

Creativity and Technology without Boundaries



APAO
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The 33rd Asia-Pacific Academy of Ophthalmology (APAO) Congress

held in conjunction with

The 29th Hong Kong Ophthalmological Symposium

Abstract Book



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Academia, Research, Teaching & Education in Ophthalmology

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S228

Concept Maps to Promote Deep Learning of Medical Knowledge

Chief Instructor: Ana **PALIS**

Instructor(s): Eduardo **MAYORGA**

Objective: At the end of this course participants will be able to teach their residents and students how to use concept maps to organize knowledge and facilitate deep learning.

Synopsis: There is growing evidence that the use of conceptual maps in medical education promotes meaningful learning, critical thinking, problem solving, and reflection in students. After discussing the benefits of a deep versus a superficial approach to learning, participants will be able to explain the rationale behind using concept maps, create a basic example of a concept map, and evaluate the quality of concept maps created by students, analyzing practical examples. They will also be presented with free software to create concept maps that allows collaboration and participation of groups in the creation of conceptual maps.

Course Outline: 1) Dialogue: Introduction. Approach to Learning: Deep versus superficial. Definition of conceptual maps. Evidence for the use of conceptual maps. 2) Practical Activity: Creation of different types of concept maps. 3) Practical Activity: Evaluation of conceptual maps created by students.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S425

Strategies to Improve Allied Ophthalmic Personnel Workforce Through Capacity Development Initiatives

Chief Instructor: William **ASTLE**

Instructor(s): Lynn **ANDERSON**, Daniel **KIAGE**, Michael **STEWART**, Jayabaskar **THIYAGARAJAN**

Objective: This symposium will discuss how to develop a comprehensive national-level human resource capacity-building strategy for allied ophthalmic personnel (AOP) through existing resources in their own countries.

Synopsis: At the 2017 APAO Congress, updates on

allied ophthalmic personnel development were shared in the allied health symposium, which highlighted the different models of AOP development initiatives from Asia. Since the Congress, there have been many activities involving this key area. Updates will be presented on the advancements by World Health Organization (WHO) and International Agency for the Prevention of Blindness (IAPB) global human resource strategies for eye care teams. Recognizing the growing need for AOPs in the Asia region, IJCAHPO is working with its key partners on initiatives to develop AOP training programs to expand human resource capacity and address the AOP needs in Asia.

Course Outline: Participants will be invited to share their initiatives for improving eye care delivery through training AOP. Attendees will benefit from the diverse background of the AOP training program materials and the resources presented that are relevant for use and implementation in their countries and exposure to the lead agencies involved in the AOP development.

Cataract

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S228

Black or White Cataract: Phaco Is Our Choice

Chief Instructor: Arulmozhi **VARMAN**

Instructor(s): Ramesh **DURAIRAJAN**, Nivean **MADHIVANAN**, Atheek **SHAIK**, Jeyanthan **SOUNDARAPANDIAN**

Objective: Attendees of this video-based course will be able to overcome the fear of doing phacoemulsification in black and white cataract and manage to reduce the chance of having complications.

Synopsis: This course aims to equip the attendee with the ability to assess a hard cataract and white mysterious cataracts, judge how to split a sticky hard lens, assess the capsular support, predict the problems that will occur, take preventive steps, and effectively manage complications that arise at any stage of the procedure.

Course Outline: Mature cataracts are always a challenge even for expert surgeons. This video-based interactive course will comprehensively discuss and demonstrate the techniques to manage challenges that ensue when mature cataracts (black and white cataracts) are treated. Strategies in evaluating and saving the endothelium by managing ultrasound settings, fluid dynamic settings, appropriate incision sizes and phaco tip choice, ultrasound technology, retrieving a difficult nucleus, splitting a reluctant lens, and managing surgically induced complications will

be discussed. Specific back-up manual techniques will be discussed. The mandatory steps to handle mature and hypermature intumescent cataracts will be demonstrated with video. Use of femtosecond laser to tame these challenging cases will be highlighted.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S226-S227

Cataract Surgery in Difficult Eyes

Chief Instructor: Soon-Phaik **CHEE**

Instructor(s): Seng Ei **TI**, Ronald **YEOH**

Objective: This video-based course aims to provide general ophthalmologists with useful tips when transitioning to phacoemulsification in more difficult eyes.

Synopsis: This video-based course aims to provide tips on useful preoperative, operative, and postoperative maneuvers in the management of difficult cataracts. Presentations will focus on the management of cataract in the presence of soft cataract, white cataract, brunescant cataract, posterior polar cataract, small pupil, phaco chop techniques, phaco in high myopia, and biometry in difficult eyes. The course includes a video discussion focusing on the management of posterior capsule rupture and surgical maneuvers to optimize post-surgical outcomes.

Course Outline: White Cataract, Posterior Polar Cataract, Management of Zonulysis: Soon Phaik Chee; Soft Cataract, Phaco in High Myopia, PCR Management Part 1: Ronald Yeoh; Brunescant Cataract, Management of PCR Part 2: Ti Seng Ei.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S428

Advanced Diagnostics for Cataract Surgeons: Additional Need or Additional Cost

Chief Instructor: Samaresh **SRIVASTAVA**

Instructor(s): Mukesh **PARYANI**, Kareeshma **WADIA**, Sonu **GOEL**

Objective: To discuss and highlight the newer diagnostics like aberrometry, posterior corneal curvature, optical biometry, optical coherence tomography (OCT), and their usefulness and advantages for cataract surgeons to achieve better and more predictable outcomes.

Synopsis: This will be a case-based interactive course where the speakers will highlight various advantages

and unexplored avenues in the use of these devices.

Course Outline: The panel of speakers will discuss the current status of newer diagnostics in a practical, case-based fashion. At the end of the course the attendees will be able to enhance their postoperative outcomes with more predictable outcomes and take home practical pearls on how to customize cataract surgery for their patients in this era where cataract surgery is becoming refractive cataract surgery.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S228

Femtosecond Laser-Assisted Cataract Surgery in Challenging Situations

Chief Instructor: Jeewan **TITIYAL**

Instructor(s): Boris **MALYUGIN**, D **RAMAMURTHY**, Soon-Phaik **CHEE**

Objective: At the end of the course, attendees will be able to understand and apply the advantages of femtosecond laser technology to manage these complex cataract cases.

Synopsis: This instruction course will be a video-assisted teaching session to highlight and demonstrate important practical tips for performing femtosecond laser-assisted cataract surgery (FLACS) in difficult situations. The intraoperative challenges faced in managing posterior polar cataracts, subluxated lens, hard nuclei, small pupils, white intumescent cataracts, and vitrectomized eyes with cataract will be highlighted. The use of femtosecond laser technology to manage these situations while enhancing the safety and visual outcomes will be demonstrated. The advantages of FLACS over conventional phacoemulsification in tackling these difficult cases will be discussed.

Course Outline: 1. Posterior Polar Cataract: Modified technique of FLACS to enhance safety and outcomes; 2. Subluxated Lens: Demonstration of closed chamber critical surgical steps with FLACS to enhance safety and efficacy; 3. Hard Cataract: Intraoperative challenges to safeguard endothelium and posterior capsule and different nucleotomy patterns of FLACS for hard nuclei; 4. Small Pupil: Modified techniques to enhance success of FLACS; 5. White Cataract: Challenges faced in various types of white cataract and FLACS to enhance safety and outcomes in intumescent white cataract; 6. Post Pars Plana Vitrectomy Cataract: Technique of FLACS to enhance safety and outcomes; 7. Discussion: Finally, there shall be adequate time to address queries that any member of the audience may have and discuss, in greater depth, any of the points made during the instruction course.

Cornea, External Eye Diseases & Eye Bank

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S223

Advances in Endothelial Keratoplasty

Chief Instructor: Marcus **ANG**Instructor(s): Maninder **BHOGAL**, Martin **DIRISAMER**, Jodhbir **MEHTA**, Gregory **MOLONEY**

Objective: To introduce recent trends and advances in endothelial keratoplasty (EK) such as Descemet membrane endothelial keratoplasty (DMEK), Descemetorhexis without endothelial keratoplasty (DWEK), Descemet membrane transfer (DMT), and other new surgical techniques.

Synopsis: EK has become the surgical technique of choice for treating corneal endothelial disease. Although Descemet-stripping endothelial keratoplasty (DSEK) is the most common technique, recent advances such as DMEK are becoming popular with advantages over DSEK. In this instructional course, we have a series of lectures and case discussions to introduce the recent developments in EK, including updates on DSEK, new DMEK techniques, DWEK, and DMT. All instructors have international experience in these endothelial keratoplasty surgical techniques with multiple peer-reviewed publications in international journals and international presentations.

Course Outline: 1. Introduction and the Evolution of Endothelial Keratoplasty: Overview and Aims of Course, Introduction to Endothelial Keratoplasty, Recent Trends in EK; 2. Advances in DSEK: New Techniques and Updates on Results, DSEK in Complex Eyes, Surgical Videos and Clinical Case Discussions; 3. DMEK Made Easy: Approach to DMEK, Surgical Videos and Clinical Case Discussions; 4. DWEK: Introduction DWEK and Case Selection; Surgical Videos and Clinical Case Discussions; 5. DMT: Introduction to DMT, Endothelial Cell Therapy; 6. Conclusions and Discussions.

Feb 10, 2018 (Sat)

14:30 - 16:00

Venue: S428

Unusual Outcomes After Corneal Collagen Crosslinking: Explanation and Management

Chief Instructor: Rohit **SHETTY**Instructor(s): Prerana **ANUJA**, Vaitheeswaran **GANESAN**, Pooja **KHAMAR**, Pallak **KUSUMGAR**

Objective: Corneal collagen crosslinking (CXL) technique has been around since 1997. However,

enigma surrounds various factors involving the patient selection and postoperative outcomes. We aim to simplify the approach to the above-mentioned problems.

Synopsis: We propose a stepwise approach to preoperative assessment of keratoconus patients, results of CXL in terms of corneal topography, factors like haze, and their importance in accurately measuring corneal parameters post-CXL which define the outcome of the procedure. Apart from topography, the role of biomarkers in influencing the outcome of CXL shall be described. Dilemmas in treatment of different post-CXL infections will be decoded.

Course Outline: The course will cover the unusual outcomes post crosslinking: How It Happened and Management. We will discuss factors for assessing patients suitable to undergo CXL. Post-CXL treatment outcome assessment and factors which affect the measurement of topographic indices will be discussed. Infections post-CXL behave differently, and we need a customized approach to diagnose and treat them. We shall discuss the following points: 1) Progression After CXL: Who Is at Fault, Surgeon/Machine?; 2) Role of Biomarkers Influencing CXL Outcomes; 3) Keratitis Post Crosslinking: Something Is Different ... ?; 4) Haze Post Crosslinking: Should I Be Happy or Sad ... ?

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S223

Comprehensive Management of Ocular Complications of Stevens-Johnson Syndrome and Toxic Epidermal Necrolysis in Asians

Chief Instructor: Kendrick **SHIH**Instructor(s): Tommy **CHAN**, Vanissa **CHOW**, Ka Wai **KAM**, Lap Ki **NG**

Objective: In regards to Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN): 1) to select appropriate treatment for acute ocular surface inflammation to minimize long-term morbidity and 2) to offer comprehensive long-term care for visual and ocular surface rehabilitation.

Synopsis: The course is divided into 1) acute ocular care of patients with SJS/TEN; 2) long-term care of late ocular manifestations; 3) surgical options for visual and ocular surface rehabilitation. The procedures discussed for this session will include autologous serum treatment, scleral contact lens fitting, amniotic membrane transplantation, ocular surface reconstruction, mucous membrane grafting, simple limbal epithelial transplantation, and keratoprosthesis. This instruction course is intended for general

ophthalmologists who are keen to develop a systematic and effective approach in the management of severe inflammatory ocular surface disease.

Course Outline: This is a comprehensive course on management of early and late ocular complications of SJS and TEN. Speakers and topics include Dr. Tommy Chan, Diagnosis and Classification: Prognostic Implications; Dr. Alex Ng, Management of Acute Ocular Surface Inflammation: Paradigm Shift Towards Early Amniotic Membrane Transplantation; Dr. Ka-Wai Kam, Ocular Surface Reconstruction; Dr. Vanessa Chow, Use of Scleral Contact Lenses for Visual and Ocular Surface Rehabilitation; and Dr. Kendrick Shih, Limbal Epithelial Transplantation and Keratoprosthesis.

Glaucoma

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: N206-N208

Microinvasive Glaucoma Surgery

Chief Instructor: Chelvin SNG

Instructor(s): Keith BARTON

Objective: Attendees will learn about the appropriate patient selection, surgical technique, associated complications, and postoperative management for microinvasive glaucoma surgery (MIGS).

Synopsis: The course will provide an overview of MIGS and the guidelines for appropriate patient selection. It will also present the techniques for implanting various MIGS devices (trabecular bypass devices, subconjunctival devices, and suprachoroidal devices), associated surgical complications, and the appropriate postoperative management. Videos will illustrate the correct surgical technique and tips to avoid common surgical pitfalls.

Course Outline: Overview; Clinical Need and Patient Selection: The role of MIGS in the current treatment algorithm will be discussed. The distinctions in patient selection between MIGS and trabeculectomy/tube implant surgery will be highlighted. Trabecular Bypass Devices: The surgical technique for implanting trabecular bypass devices (iStent) will be illustrated by surgical videos. Evidence for the efficacy of these devices and the postoperative management will be discussed. Subconjunctival Devices: The surgical technique for implanting subconjunctival devices (XEN-45, InnFocus microshunt) will be illustrated by surgical videos. The preliminary results of the XEN-45 phase IV study will be discussed. Potential complications and postoperative management will be highlighted. Suprachoroidal Devices: The surgical technique for implanting suprachoroidal devices (Cypass) will be

illustrated by surgical videos. Evidence for the efficacy of Cypass and postoperative management will be discussed. Summary; Questions & Answers.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: N206-N208

Tube Implant Surgery

Chief Instructor: Chelvin SNG

Instructor(s): Keith BARTON, Mitchell LAWLOR

Objective: Attendees will learn about the appropriate patient selection, surgical technique, associated complications, and postoperative management for tube implant surgery.

Synopsis: The course will provide an overview of tube implant surgery, including the guidelines for appropriate patient selection, selection criteria for different tube implants, surgical technique for implantation, associated surgical complications, and the appropriate postoperative management. Videos will illustrate the correct surgical technique and tips to avoid common surgical pitfalls.

Course Outline: Overview; Clinical Need and Patient Selection: The indications for tube implant surgery will be discussed, and evidence for primary tube surgery will be discussed. Valved Versus Nonvalved Tube Implants: The distinctions between valved and nonvalved tube implants will be highlighted. The surgical technique for implantation will be described with the aid of videos. Evidence comparing the efficacy of valved and nonvalved tube implants will be reviewed. Surgical Complications and How to Avoid Them: Intraoperative and postoperative surgical complications will be discussed. Modifications to the surgical technique will be proposed, so as to avoid these complications. Management of Postoperative Complications: Management strategies for common postoperative complications will be presented. Questions & Answers.

Intraocular Inflammation, Uveitis & Scleritis

Feb 10, 2018 (Sat)

14:30 - 16:00

Venue: S228

Viral Retinitis: An Asian Perspective

Chief Instructor: Ian WONG

Instructor(s): De-Kuang HWANG, Koh-Hei SONODA, Yong TAO

Objective: To discuss the basic features, treatment

options, and latest evidence regarding cytomegalovirus (CMV) retinitis and other viral retinitises.

Synopsis: The course includes basic knowledge in relation to CMV retinitis. No prior experience in the topic is required.

Course Outline: The course touches upon the various topics in the discussion of CMV retinitis and other viral retinitises, including progressive outer retinal necrosis and acute retinal necrosis, with information regarding the cause, risk factors, clinical features, treatment options and tips, and related complications. This will be a comprehensive course for general as well as subspecialty ophthalmologists.

Ocular Imaging

Feb 10, 2018 (Sat)

14:30 - 16:00

Venue: S226-S227

Introduction to OCT Angiography for General Ophthalmologists

Chief Instructor: Anna **TAN**

Instructor(s): Marcus **ANG**, Gemmy **CHEUNG**, Leopold **SCHMETTERER**

Objective: To provide an introduction to optical coherence tomography (OCT) angiography aimed at general ophthalmologists or retinal specialists unfamiliar with this technology.

Synopsis: OCT angiography is a noninvasive, emerging technology to study vasculature of ocular structures. In this instructional course, we have a series of lectures and case discussions to introduce the basic concepts of OCT angiography and clinical applications to diseases in the retina, choroid, optic disc, and anterior segment. All instructors have international experience with this relatively new technology and have published multiple peer-reviewed publications in Ophthalmology, Eye, IOVS, Retina, and the British Journal of Ophthalmology.

Course Outline: 1. Introduction to OCTA and an Approach to OCTA Interpretation; 2. OCTA Applications for Retinal and Choroidal Diseases; 3. How to Interpret OCTA for the Optic Nerve; 4. Basics of OCTA for the Anterior Segment; 5. The Future and Upcoming Advances in OCTA; 6. Case Discussions.

Ocular Oncology & Pathology

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S226-S227

Recent Advances in the Diagnosis and Management of Conjunctival Tumors

Chief Instructor: Santosh **HONAVAR**

Instructor(s): Fairooz **MANJANDAVIDA**, Raksha **RAO**

Objective: This course will enable participants to accurately diagnose and manage common conjunctival tumors.

Synopsis: The aim of this course is to provide a systematic overview of clinical manifestations of conjunctival tumors and to discuss recent concepts in the diagnosis, management, and prognosis. Clinical evaluation of a patient with conjunctival tumor will be demonstrated with well-documented clinical cases. Systemic associations will be discussed. Advantages of anterior segment imaging techniques will be highlighted. Evidence-based treatment protocols, and indications and outcome of newer treatment modalities such as topical chemotherapy and plaque brachytherapy, will be discussed. Standard surgical procedures will be demonstrated with video films.

Course Outline: I. Clinical Evaluation: A. History, B. Examination of the face, periorbital region, eyelids, and the lacrimal system, C. Examination of the conjunctival lesion with a detailed drawing, D. Presence, extent, and depth of corneal, scleral, intraocular, or orbital invasion, E. Complete ophthalmic evaluation, F. Regional lymph nodes, G. Imaging studies, H. Adjunctive procedures; II. Conjunctival Choristomas; III. Benign Epithelial Tumors; IV. Premalignant Epithelial Tumors; V. Malignant Epithelial Tumors; VI. Melanocytic Tumors; VII. Vascular Tumors; VIII. Fibrous, Neural, Xanthomatous, and Myxomatous Tumors; IX. Lymphoid Tumors; X. Protocol for Surgical Excision of Conjunctival Tumors; XI. Clinical Case Discussion; XII. Conclusion.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: N206-N208

Advanced Ocular Malignancy: Challenges and Current Management Strategies

Chief Instructor: Rajendra **MAURYA**

Instructor(s): Bhavna **CHAWLA**, Ashok **GROVER**, Syeed **KADIR**, Swathi **KALIKI**

Objective: To discuss the diagnostic challenges and

recent trends in management of advanced ocular malignancies.

Synopsis: Though ocular malignancy is a serious health care problem due to its potential threat to both sight and life, not much importance is placed in developing countries. Often lethal ocular malignancies are diagnosed late or misdiagnosed, resulting in decreased survival rate. Management of advanced stage ocular malignancy is always a challenge to the treating oncologist. Multimodal treatment has been advocated and chemotherapy reduces the tumor bulk and minimizes the recurrence rate; hence, it is a better adjuvant treatment in advanced stage ocular malignancies. We discuss the recent trends in the management of advanced ocular malignancies.

Course Outline: In this course a team of practicing ocular oncologists will combine case scenarios, images, videos, and short lectures to enumerate the varied clinical presentations, diagnostic challenges, and current management outline of common advanced stage ocular malignancies, which are important for a comprehensive ophthalmologist and oculoplastic surgeon. We will discuss recent concepts in the diagnosis and management including topical chemotherapy/immune-modulators for ocular surface squamous neoplasia (OSSN), neoadjuvant chemotherapy, intra-arterial/intravitreal chemotherapy, plaque brachytherapy; standard surgical procedures will be demonstrated with video film. Audience participants will be able to recognize common ocular malignancies and understand what to do when a patient presents with an advanced stage tumor. This course is designed to enable participants to accurately diagnose and appropriately manage/palliate cases of advanced ocular malignancy.

Orbital & Oculoplastic Surgery

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S423-S424

Recent Advances in Thyroid Eye Disease

Chief Instructor: Kelvin **CHONG**

Instructor(s): Peter **DOLMAN**, Honglei **LIU**, Suryasata **RATH**, Lay Leng **SEAH**, Timothy **SULLIVAN**

Objective: To review the latest guidelines/updates on thyroid eye disease (TED) from evaluating disease activity and offering individualized treatment approaches to highlighting challenges clinicians may encounter when handling TED patients among the Asia-Pacific populations.

Synopsis: This course summarizes consensus and advances in the assessment and management of TED

and introduces newer biological agents as well as modern surgical approaches for rehabilitation. The course is sponsored by members of the International Thyroid Eye Disease Society (ITEDS) practicing in or having vast experience in managing patients from the Asia-Pacific regions. Each topic will be presented by case scenarios highlighting consensus and cautions.

Course Outline: 1. Assessment and Clinical Evaluation Using the CAS, NOSPECS, and VISA Form, Asian Perspectives of TED; 2. Medical Management and Radiotherapy, Steroid Therapy, Radiotherapy, Immunosuppressants, and Biologics; 3. Surgical Interventions: Lateral Wall Decompression, Medial Wall Decompression, Eyelid Recession, and Blepharoplasties in TED.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S228

My Tricks in Lacrimal Surgeries: A Video-Based Instruction Course

Chief Instructor: Kelvin **CHONG**

Instructor(s): Edwin **CHAN**, Andy **CHENG**, Janice **CHEUNG**, Lawrence **LAM**, Hunter **YUEN**

Objective: To provide step-by-step video-based instruction for various lacrimal operations.

Synopsis: This course will provide step-by-step instruction for common operations for the lacrimal outflow system. The course is sponsored by the Hong Kong Society of Ophthalmic Plastic and Reconstructive Surgery (HKSOPRS). Each rapid-fire video will start with case scenarios highlighting tips and tricks, risks, and management of complications explained by senior and active members of HKSOPRS.

Course Outline: Punch punctoplasty, hidden incision external dacryocystorhinostomy (DCR), endoscopic septoplasty, endoscopic Jones tube, endoscopic DCR (primary, all adjuvants, no adjuvant, sutured), canalicular repair, congenital nasolacrimal duct obstruction (NLDO) treatment.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S224-S225

Stereoscopic 3D Oculoplasty Surgery Show

Chief Instructor: Santosh **HONAVAR**

Instructor(s): Raksha **RAO**

Objective: At the end of the course, we expect the

audience to have appreciated the key elements of common oculoplastic surgeries using stereoscopic 3-dimensional (3D) anatomy dissection and surgical videos.

Synopsis: Understanding the intricacies of applied anatomy and surgical techniques can be tedious. Recent advances in high-definition 3D videography have brought a paradigm change in the way surgical procedures can be recorded and taught. We aim to demonstrate the applied surgical anatomy of the eyelid, lacrimal system, orbit, and face by systematic cadaver dissection in stereoscopic 3D, followed by common oculoplastic surgeries (entropion, ectropion, ptosis, blepharoplasty, ocular surface and eyelid tumor excision, eyelid reconstruction, enucleation, evisceration, exenteration, socket reconstruction, orbital fracture repair, orbital decompression, transconjunctival and lateral orbitotomy, etc.) and highlight key steps and recent advances.

Course Outline: I. Introduction to the 3D Technology; II. How to Record and View 3D Surgeries; III. Stereoscopic 3D View of Applied Anatomy by Systematic Cadaver Dissection; IV. Eyelid Surgery: 1. Entropion, 2. Ectropion, 3. Eyelid tumor excision, 4. Techniques in eyelid reconstruction, 5. Ptosis surgery – levator resection, levator reinsertion, tarsofrontal sling, 6. Blepharoplasty, 7. Correction of eyelid retraction, 8. Eyelid reanimation; V. Ocular Surface Surgery Excision of Ocular Surface Tumor and Ocular Surface Reconstruction; VI. Lacrimal Surgery: 1. Lacrimal probing and intubation, 2. DCR; VII. Socket Surgery: 1. Enucleation with implant, 2. Evisceration with implant, 3. Socket reconstruction – fornix formation, mucus membrane graft, secondary implant, dermis fat graft; VIII. Orbital Surgery: 1. Orbital fracture repair, 2. Orbital decompression, 3. Transconjunctival orbitotomy, 4. Lateral orbitotomy, 5. Orbital exenteration; IX. Discussion on Key Learning Elements of Each Surgical Procedure.

Pediatric Ophthalmology & Strabismus

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: N206-N208

Management of Intermittent Exotropia: From Assessment to Surgical Management

Chief Instructor: Jason **YAM**

Instructor(s): Simon **KO**, Connie **LAI**, Julie **LOK**

Objective: At the conclusion of this course, the attendee will be able to assess and manage patients with exotropia confidently.

Synopsis: This course covers all you need to know about intermittent exotropia, from assessment,

nonsurgical management, and surgery to complications and their management. Tips and pearls in management of exotropia and its variants such as “V” pattern, large angle exotropia (at least 60 prism diopters), and adult patients with exotropia will also be discussed.

Course Outline: Welcome and overview of the course, Introduction (10 minutes). Classification and etiologies of intermittent exotropia, Ethnic differences in intermittent exotropia, The natural course of intermittent exotropia, Evaluation of patients with exotropia (10 minutes). Ocular deviation, Ocular movement, Binocular function, Tips and pearls, Nonsurgical management of intermittent exotropia (10 minutes). Spectacle correction, Orthoptic exercise, Surgical management of intermittent exotropia (20 minutes). When to operate, How to operate, Management of “V” or “A” pattern exotropia, Management of large angle exotropia, Management of adult patients with exotropia, What should be done for consecutive esotropia, Surgical tips and pearls, Q & A (10 minutes).

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S426-S427

Treatment of Retinopathy of Prematurity: Diagnosis and Management

Chief Instructor: Anna **ELLS**

Instructor(s): Atchara **AMPHONPHRUET**, Wai-Ching **LAM**, Wei-Chi **WU**

Objective: The objective of this instructional course will be to discuss and reinforce the standard and advanced approaches to medical and surgical treatments for retinopathy of prematurity (ROP) with an emphasis on innovative techniques.

Synopsis: This instructional course will be divided into 4 sections related to ROP treatment and management. The first will discuss primary and secondary laser treatment and insight into laser to the vascular and avascular retina. Tips and tricks will be provided to help attendees maximize regression of ROP using laser. The second section will review the indications, procedures, instrumentation, and advancements involved in surgical management of ROP. The third section provides an overview of pharmacological therapy options, including intravitreal anti-vascular endothelial growth factor (VEGF), and includes a discussion of pivotal clinical trials. The fourth section will discuss examples of management of difficult and challenging cases.

Course Outline: This instructional course will be divided into 4 segments of ROP treatment and management. 1. Discussion of primary and secondary laser treatment

and insight into laser to the vascular and avascular retina. Tips and tricks will be provided to help attendees maximize regression of ROP using laser. 2. Review of the indications, procedures, instrumentation, and advancements involved in the surgical management of ROP. 3. Overview of pharmacological therapy options such as intravitreal anti-VEGF treatment and a discussion of pivotal clinical trials. 4. Presentation of examples and discussion of management of difficult and challenging type I ROP cases.

Refractive Surgery

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S423-S424

Should I Try SMILE in My Practice?

Chief Instructor: Tommy **CHAN**

Instructor(s): George **CHENG**, Vishal **JHANJI**, Lap Ki **NG**, Yan **WANG**

Objective: The course aims to provide key features regarding the principles, patient selection, and surgical technique of performing small-incision lenticule extraction (SMILE).

Synopsis: SMILE is a flapless refractive surgery for the correction of myopia and myopic astigmatism. This comprehensive course includes discussion and literature review of the principles and outcomes of SMILE. Pearls regarding patient selection and surgical technique will be shared. There will be an interactive case discussion with videos on the management of intraoperative and postoperative complications.

Course Outline: 1. Science and Optics Behind SMILE, Alex Ng; 2. SMILE Procedure: Step by Step With Videos, George Cheng; 3. Learning Curve of SMILE, Tommy Chan; 4. Management of Intraoperative and Postoperative Challenges With Videos, Wang Yan; 5. Outcomes of SMILE, Vishal Jhanji; 6. Q&A.

Retina (Surgical)

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S226-S227

How to Optimize Final Visual Outcomes: A VR Surgeon's Guide to the Cataract Surgeon

Chief Instructor: Wai-Ching **LAM**

Instructor(s): Guruprasad **AYACHIT**, Shrinivas **JOSHI**, Sherman **VALERO**, Shao Onn **YONG**

Objective: To guide the cataract surgeon in the initial

step-by-step management of complications.

Synopsis: Cataract surgery complications are part of any surgeon's practice. The most feared complications in the posterior segment are posterior capsule (PC) rent, dropped nucleus, expulsive hemorrhage, and endophthalmitis. At the time of the incident, surgeons can lose their cool and may not have proper equipment to manage it, ending up with suboptimal results. This instruction course (IC) aims to guide the cataract surgeon in the initial step-by-step management of these complications. The IC also aims at providing a guide to the modifications required in operative techniques in special situations like coexisting diabetic retinopathy and high myopia.

Course Outline: This instruction course aims at guiding the cataract surgeon in the initial step-by-step management of the complications mentioned in the synopsis. The dos and don'ts in such eventualities and the timing of referral to a vitreoretinal colleague will be discussed with a view to providing the best outcomes for the patient. Topics: 1) PC Rent and Nucleus Drop: How to Achieve 20/20?; 2) Postoperative Endophthalmitis First Aid and Beyond; 3) Cataract Surgery With Coexisting Diabetic Retinopathy; 4) Cataract Surgery in High Myopia: Challenges and Solutions; 5) Expulsive Hemorrhage: Not All Is Lost!

Academia, Research, Teaching & Education in Ophthalmology

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Development of Machine Learning Algorithms for Predicting Prognosis in Diabetic Macular Edema

First Author: Shaochun **CHEN**

Co-Author(s): Chun-Chen **CHEN**, Hung-Wen **CHIU**, Chung-Ming **LO**, Lin-Chung **WOUNG**

Purpose: To apply machine learning to create an algorithm for automated predicting of the prognosis of diabetic macular edema treated with ranibizumab.

Methods: Artificial neural networks optimized for regression calculation were established by using Protocol I data set. The final visual acuity at 3 different target time points (52 weeks, 78 weeks, and 104 weeks) were set as targets. Baseline variables including gender, age, diabetes type or condition, systemic diseases, eye status, and treatment time tables were used as inputs.

Results: A total of 512, 483, and 464 eyes were included at 52 weeks, 78 weeks, and 104 weeks. Correlation coefficients of the training group, testing group, and validation group were 0.75, 0.77, 0.70 (52 weeks); 0.79, 0.80, 0.55 (78 weeks); and 0.83, 0.47, 0.81 (104 weeks). The mean standard error of final visual acuity [Early Treatment Diabetic Retinopathy Study (ETDRS) letters] for the 3 groups were 6.50, 6.11, 6.40 (52 weeks); 5.91, 5.83, 7.59 (78 weeks); and 5.39, 8.70, 6.81 (104 weeks).

Conclusions: Machine learning algorithms had good preference for predicting prognosis with ranibizumab with just baseline characteristics. These models could be useful clinical tools for expectation and explanation of treatment.

Cataract

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Antibiotic Prophylaxis Practice Patterns for Cataract Surgery in India

First Author: Aditya **KELKAR**

Co-Author(s): Jai **KELKAR**, Hetal **MEHTA**, Sabyasachi **SENGUPTA**

Purpose: To assess the current antibiotic prophylaxis

practice patterns for cataract surgery in India.

Methods: This was a questionnaire based e-survey. An email invitation to complete a 20-question online survey was sent to all members of the All India Ophthalmological Society with valid email addresses using a digital email service. Duplicate entries were prevented.

Results: Out of 1228 total respondents (8.2%) who completed the survey 38% reported using routine intracameral (IC) antibiotic prophylaxis. Another 7% place antibiotics in the irrigating solution. Of those using IC antibiotic prophylaxis, 91% adopted this practice within the past 2 years; 92% are using moxifloxacin with 56% using a commercially available moxifloxacin formulation. Those predominantly performing phacoemulsification (43% vs 25% performing mostly manual small incision cataract surgery, $P < 0.001$) and more than 500 cataract surgeries annually (45% vs 33%, $P < 0.001$) reported greater use of IC moxifloxacin. Self-reported endophthalmitis rates were significantly greater in those not using IC antibiotics (0.045% vs 0.036, $P = 0.04$). Although a majority of respondents believe that IC antibiotics are an important option (54%) and that it is important to have a commercially available solution (68%), many believe that other antibiotic prophylaxis methods are sufficient (31%).

Conclusions: Intracameral antibiotic prophylaxis for cataract surgery has sharply increased in India. In contrast to the West, intraocular moxifloxacin, which is commercially available in India, is preferred by the vast majority of users.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Clinical Outcomes of Hybrid Micromonovision-Extended Range of Vision IOL With Monofocal IOL

First Author: Sheetal **BRAR**

Co-Author(s): Sri **GANESH**

Purpose: To study the clinical outcomes in hybrid micromonovision with an extended range of vision (ERV) intraocular lens (IOL) in 1 eye and a monofocal IOL in the contralateral eye.

Methods: This was a prospective interventional study in which 15 patients (mean age: 62.5 years) were implanted with Symphony ERV IOL in the nondominant eye and a monofocal aspheric IOL in the dominant eye following phacoemulsification. Micromonovision was planned with a target postoperative refraction in the nondominant eye as -0.75 diopters (D). Patients were

tested for corrected/uncorrected distant, intermediate, and near visual acuity; reading performance (using Salzburg Reading Desk); defocus curve; and contrast sensitivity tested at 1 week, 1 month, and 6 months postoperatively.

Results: At 6 month postoperatively, the mean uncorrected distant, near, and intermediate (60 cm) visual acuity were -0.03 ± 0.09 , 0.15 ± 0.11 , and 0.04 ± 0.09 logarithm of the minimum angle of resolution (logMAR), respectively. Visual acuity remained 0.2 logMAR or better throughout defocus range (-3 D to +3 D). Contrast sensitivity and mean reading speeds improved over time. Minimal dysphotopsia was noted initially in some patients which resolved over time.

Conclusions: The patients had excellent unaided vision at all distances with good contrast sensitivity and minimal dysphotopsia at 6 months postoperatively suggesting that this combination of 1 eye with ERV IOL and the contralateral eye with monofocal IOL may provide satisfactory outcomes with good tolerance of micromonovision.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Clinical Outcomes of a Novel IOL Design Using Femtosecond Laser-Assisted Cataract Surgery

First Author: Sunil **SHAH**

Co-Author(s): Emma **BERROW**, Raquel **GIL-CAZORLA**, Shehzad **NAROO**, James **WOLFFSOHN**

Purpose: To evaluate the long-term results of a new intraocular lens (IOL) specifically designed for the latest cataract surgery technology.

Methods: Femtis IOL is a novel IOL that has been designed to be clipped in the opening of the capsule to decrease decentration, tilt, and rotation of the lens. In this prospective study, 50 eyes of 25 patients with cataract that had femtosecond laser phacoemulsification with implantation of a Femtis IOL were included. Over a 12-month follow-up period, the main outcome measures were uncorrected and corrected distance visual acuities (UDVA and CDVA, respectively), spherical equivalent (SE) refraction, and posterior capsular opacification (PCO) grading.

Results: At the 12-month follow-up visit, mean UDVA was 0.05 ± 0.16 logarithm of the minimum angle of resolution (logMAR) (range, 0.5 to -0.20 logMAR) and mean CDVA was -0.05 ± 0.16 logMAR (range, 0.50 to -0.20 logMAR). UDVA was 0.3 logMAR or better in 92% of eyes and 0.1 logMAR or better in 88% of eyes. Mean SE refraction was 0.40 ± 0.30 diopters (D) (range,

1.37 to -0.25 D), with 88% of eyes within ± 0.50 D of the attempted correction without A constant change. Mean PCO was not significant in any eye.

Conclusions: The implantation of the Femtis laser IOL in patients with cataract provided spectacular visual outcomes, predictability of refractive results, and good optical performance. This new IOL design can be the foundation for the next generation of toric and multifocal IOLs.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Comparative Prospective Analysis of Visual Performance Outcomes Between EDOF and Trifocal IOLs

First Author: Suvira **JAIN**

Purpose: To study and compare visual performance standards of extended depth of focus (EDOF) and trifocal intraocular lenses (IOLs) with respect to the uncorrected and best corrected visual acuity, the range and depth of vision as deduced from the defocus curves, the contrast sensitivity, and subjective appreciation of postoperative glare and halos.

Methods: Two sets of patients who were age matched and who had visually significant cataracts were implanted bilaterally with either EDOF IOLs (Symfony IOL, AMO and Infocus IOL, Appasamy) or trifocal IOLs (Tridiff IOL, Eyeocare). Cataracts associated with comorbid conditions like glaucoma, small pupils, zonular dialysis, and post uveitis sequelae were excluded. Cataract grades varied from grade 1 to grade 3 nuclear sclerosis with or without a posterior subcapsular element. Grade 4 (brown or black) cataracts and soft cataracts were excluded. All patients underwent phacoemulsification with a 2.8-mm superior based clear corneal incision. The second eye was operated after 5 days. Visual acuity, binocular and unocular defocus curves, contrast sensitivity measurements with the Pelli-Robson charts, and a subjective questionnaire for halos and glare were performed on the 30th day after the second eye surgery.

Results: EDOF lenses gave a good range of vision for distant and intermediate range and were found lacking for near while trifocal lenses gave a good range of vision for all distances. The halo and glare score was higher for trifocal IOLs. Contrast was better with the Symfony EDOF lenses.

Conclusions: Both the EDOF IOLs and trifocal IOLs gave patients spectacle independence.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Comparison of Astigmatism Correction Between Anterior Penetrating and Intrastromal Arcuate Incisions in Eyes Undergoing Femtosecond Laser-Assisted Cataract Surgery

First Author: Sri **GANESH**Co-Author(s): Sheetal **BRAR**

Purpose: To compare the safety, efficacy, and predictability of femtosecond-enabled anterior penetrating and intrastromal corneal incision for the correction of preoperative astigmatism at the time of cataract surgery.

Methods: This prospective, randomized, comparative study included 43 eyes from 43 patients who underwent femtolaser-assisted cataract surgery with the Catalys Precision System (AMO), of which 23 eyes received anterior penetrating (AP) and 20 eyes received intrastromal (IS) arcuate incisions for correction of corneal astigmatism in the range of 0.75 to 2 diopters (D) of astigmatism. Follow-up was conducted at 1 week, 1 month, and 6 months postoperatively. Vector analysis of astigmatism was performed using the Alpins method with ASSORT software.

Results: The mean preoperative keratometric astigmatism and target induced astigmatism (TIA) were 0.93 D and 1.28 D in the AP group and 0.90 D and 0.93 D in the IS group, respectively. There was no statistically significant difference between the postoperative keratometric astigmatism (AP = 0.59, IS = 0.78, $P = 0.1$) and surgically induced astigmatism (SIA) (AP = 0.77, IS = 0.67, $P = 0.42$) at 6 months postoperatively. Both groups demonstrated undercorrection shown by a comparable correction index (CI) of 0.72 and 0.67 ($P = 0.69$), although the IS group showed more undercorrection. Index of success (IOS) was also comparable (AP = 0.31, IS = 0.32, $P = 0.82$). A total of 90% of eyes in the IS and 73% of eyes in the AP group were within ± 0.5 D of astigmatism.

Conclusions: Both anterior penetrating and intrastromal incisions were safe and effective and demonstrated good predictability for astigmatism correction using femtolaser technology. However, both incisions showed undercorrection with time, which was more evident in the intrastromal group.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Comparison of the Accuracy of 6 Intraocular Lens Power Calculation Formulas at Different Axial Lengths

First Author: Tan **QIAN**

Purpose: To evaluate and compare the accuracy of 6 intraocular lens (IOL) power calculation formulas (Barrett Universal II, Haigis, Hoffer Q, SRK/T, SRKII, and Holladay 2) measured by Lenstar LS 900 and to find the most accurate formula.

Methods: A total of 192 consecutive patients who had undergone phacoemulsification cataract surgery during December 2016 to August 2017 were enrolled. Using optimized lens constants, the refractive prediction error of IOL power calculation formulas (Barrett Universal II, Haigis, Hoffer Q, SRK/T, SRKII, and Holladay 2) were evaluated and compared. Eyes were separated into subgroups based on axial length as follows: short (<22.0 mm), medium (≥ 22.0 to <24.5 mm), mild-long (≥ 24.5 to <27.0 mm), medium-long (≥ 27.0 to <28.4 mm), and super-long (≥ 28.4 mm).

Results: The study comprised 264 eyes of 192 patients. A statistically significant difference in the mean absolute prediction was found ($P = 0.000$). The Barrett Universal II formula had the lowest mean absolute error (MAE = 0.45) and interquartile range (0.70) among all the formulas across all axial lengths. The Barrett Universal II formula had the lowest mean absolute error in short (MAE = 0.43), mild-long (MAE = 0.46), medium-long (MAE = 0.56), and super-long groups (MAE = 0.48). The Haigis formula had the lowest MAE in the medium axial length group (MAE = 0.42). The Barrett Universal II formula yielded the highest percentage of eyes within ± 1.0 diopter (D) and ± 0.5 D of the target refraction in this study (93.94% and 62.88%) across all axial lengths.

Conclusions: The Barrett Universal II formula provides the lowest risk of refractive surprise compared to the other IOL power calculation formulas measured by Lenstar LS 900.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Enhancing Intermediate Vision and Patient Satisfaction by Combining an Enhanced Depth of Focus IOL and a Trifocal IOL Model With Different Add Powers

First Author: Matthias **GERL**

Co-Author(s): Salah **ABDASSALAM**, Riyam **ALKADHI**, Detlev **BREYER**, Florian **KRETZ**, Matthias **MUELLER**

Purpose: To evaluate the refractive and functional results, patient satisfaction, and defocus curve after implantation of a trifocal enhanced depth of focus (EDOF) intraocular lens (IOL) in the distance dominant eye and a trifocal intraocular lens (trifocal) in the near dominant eye.

Methods: In a prospective study cataract patients received the EDOF (AT LARA 829, Carl Zeiss Meditech, Germany) in their distance dominant eye and trifocal (AT LISA 839, Carl Zeiss Meditech, Germany) in their near dominant eye. Pre- and postoperative monocular and binocular functional results [CDVA, UDVA, DCIVA (90 cm, 80 cm, 60 cm), DCNVA, UNVA, defocus curve, logarithm of the minimum angle of resolution (logMAR)] refractive outcome, halo and glare simulator, and patient satisfaction score were evaluated.

Results: A total of 55% of patients had a distance dominant right eye. Median postoperative spherical equivalent for the EDOF and the trifocal eyes was 0.00 diopters (D) (0.13) and 0.00 D (0.28), respectively. Binocular UDVA, CDVA, and DCNVA were -0.05 (0.07), 0.00 (0.06), and 0.11 (0.16) with a DCIVA at 90 cm, 80 cm, and 60 cm of -0.26, 0.05, and -0.08. Binocular defocus curve analysis showed a stable visual acuity of >0.05 between 0.5 D and -2.5 D.

Conclusions: The mix and match approach with an EDOF trifocal IOL in the distance dominant eye and a trifocal IOL in the near dominant eye seems to get better results for intermediate visual acuity while offering patients a higher degree of spectacle independency.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Femtosecond Laser Versus Manual Clear Corneal Incisions in Cataract Surgery Using Spectral-Domain Optical Coherence Tomography

First Author: Xiaogang **WANG**

Co-Author(s): Jing **DONG**, Suhua **ZHANG**

Purpose: To investigate the wound healing changes of clear corneal incisions (CCIs) performed with a femtosecond laser and manual operation in cataract surgery using spectral-domain optical coherence tomography.

Methods: A total of 58 eyes and 34 eyes were included in the femtosecond laser group and control group, respectively. The incidence of posterior wound gape (PWG), Descemet membrane detachment (DMD), and posterior wound retraction (PWR) as well as the inner and outer corneal incision thicknesses (CIT) were assessed.

Results: Compared to the femtosecond laser group, there was a significantly higher incidence of PWG at 1 day postoperation ($P = 0.012$); a significantly higher incidence of DMD at 1 week ($P = 0.030$), 1 month ($P = 0.048$), and 3 months postoperation ($P = 0.048$); and a significantly lower incidence of PWR at 1 month postoperation ($P < 0.001$) and 3 months ($P < 0.001$) in the control group. The inner and outer CIT decreased over time in both groups.

Conclusions: The femtosecond laser CCIs were efficient and safe, as demonstrated by the lower incidence of PWG and DMD. However, the higher PWR incidence, which indicated that there was wound remodeling, should be noticed compared to the manual procedure.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Influence of Posterior Corneal Astigmatism on the Outcome of Toric IOL Implantation

First Author: S **JEYANTHAN**

Co-Author(s): M **NIVEAN**, S **TAMILARASI**

Purpose: To assess the changes of toric intraocular lens (IOL) cylinder power and axis with incorporation of posterior corneal astigmatism (PCA) in eyes with preoperative astigmatism and to study the impact of posterior corneal astigmatism on refractive outcomes of toric IOL implantation.

Methods: Prospective analysis of patients undergoing phacoemulsification with toric IOL implantation for significant preoperative astigmatism during the period of January 2017 to June 2017. A single surgeon performed all operations in this series. Changes in toric IOL power and axis with incorporation of PCA in IOL calculation and its influence on postoperative outcomes were analyzed.

Results: Incorporation of posterior corneal astigmatism helps to achieve optimal refractive results. Every surgeon should assess their postoperative results carefully and modify their IOL calculation accordingly.

Conclusions: In the era of refractive cataract surgery, achieving perfection lies in correcting even the smallest of errors. Incorporating posterior corneal astigmatism is one such step to achieve perfection in cataract surgery.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Long-Term Outcomes of Phacoemulsification Surgery With Intraocular Lens AT LISA Tri Implantation

First Author: Nghiem Mai **PHUONG**

Co-Author(s): Nguyen Xuan **HIEP**

Purpose: To evaluate the long-term outcomes of phacoemulsification surgery with intraocular lens (IOL) AT LISA tri implantation.

Methods: Prospective clinical interventional study on 80 eyes of patients having cataract, corneal astigmatism of lower than 1 diopter (D), no ocular disease like corneal scar, glaucoma, uveitis, etc. IOL power calculations were performed with IOLMaster or Lenstar. Surgical results were evaluated 1 week, 1 month, 6 months, and more than 1 year after surgery. Distant, near, intermediate vision in logarithm of the minimum angle of resolution (logMAR), spherical error, and contrast sensitivity were recorded. The level of glare, halos, and posterior capsule opacification (PCO) was also evaluated.

Results: At 1 week after surgery, uncorrected distant, near, and intermediate visual acuities were 0.18 ± 0.09 , 0.29 ± 0.08 , and 0.15 ± 0.08 logMAR, respectively; corrected distant, near, and intermediate visual acuities were 0.09 ± 0.06 , 0.27 ± 0.07 , and 0.12 ± 0.06 logMAR, respectively. At 1 month and 6 months after surgery, uncorrected and corrected distant, near, and intermediate visual acuities were better than before ($P < 0.01$). At 1 year postoperatively, small changes were observed in corrected and uncorrected visual acuities. The rate of posterior capsular opacification was 11.25%

but did not require neodymium:YAG capsulotomy; 43.7% experienced glares at night or halos.

Conclusions: Phacoemulsification surgery with intraocular lens AT LISA tri implantation is safe and provided complete and stable visual acuities.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Maximizing Astigmatism Correction Using Topography-Guided, Laser-Assisted Cataract Surgery

First Author: Harvey **UY**

Co-Author(s): Sunil **SHAH**

Purpose: Laser-assisted cataract surgery (LACS) is a multifunctional device that helps perform critical steps in cataract surgery. Recently, LACS machines have added new functions such as astigmatism correction using astigmatic keratotomy (AK) and creation of intrastromal toric intraocular lens alignment markings. The purpose of this study was to determine the effectiveness and safety of topography-guided astigmatic keratotomy (TG-AK) and TG intrastromal toric intraocular lens (TG-TIOL) alignment marking for astigmatism correction among eyes undergoing LACS.

Methods: Prospective series of 60 eyes that underwent astigmatism correction using uploaded topography data to guide femtosecond laser AK ($n = 30$) or TIOL alignment marking ($n = 30$). Main outcome measure was astigmatism reduction determined by comparing preoperative keratometric astigmatism (PKA) versus postoperative refractive astigmatism (PRA).

Results: Among eyes that underwent TG-AK, PRA of 0.25 diopters (D) was achieved versus PKA of 0.76 D for a reduction of 67% ($P < 0.0001$). In eyes that received TIOL placed along TG-TIOL alignment marks, PRA of 0.40 D was achieved versus PKA of 1.65 D for a reduction of 76% ($P < 0.0001$). No adverse events were observed in both groups.

Conclusions: TG-AK or TG-TIOL alignment marks appear to be effective and safe adjunctive procedures for astigmatism correction among eyes undergoing LACS. These new functionalities can add value to using LACS for cataract surgery.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Surgically Induced Astigmatism Following Phacoemulsification Using Clear Corneal Incisions in Patients With Different Corneal Diameters

First Author: Rohit **SREENATH**

Co-Author(s): Sheetal **BRAR**, Sri **GANESH**

Purpose: From the structural point of view, it is known that incisions for cataract surgery will induce a flattening effect when made on (or near) the steep axis of the cornea, which is termed surgically induced astigmatism (SIA). We evaluated the influence of corneal diameter on SIA in patients undergoing phacoemulsification and found the correlation of corneal diameter with SIA.

Methods: This prospective study included 100 eyes of patients with a corneal diameter between 11 mm and 12 mm, who underwent uncomplicated phacoemulsification with foldable intraocular lens (IOL) implantation. Group 1 included 50 eyes with a corneal diameter between 11 and 11.5 mm and group 2 had 50 eyes between 11.6 and 12 mm. Preoperatively Auto K, Orbscan, and IOLMaster 500 were done for the eyes being operated. The patients were followed up on day 1, day 15, and 3 months. Postoperatively Auto K was repeated for the operated eyes.

Results: Both the study groups were comparable in terms of age, central corneal thickness (CCT), and mean keratometry. However, the differences in corneal diameter and axial length between the 2 groups were statistically significant ($P < 0.01$ and 0.02 , respectively). The mean SIA in group 1 at 15 days and 3 months were 0.40 ± 0.06 and 0.35 ± 0.05 , respectively, and in group 2 were 0.38 ± 0.05 and 0.34 ± 0.04 , respectively.

Conclusions: A statistically significant difference in SIA was observed between group 1 and group 2 at 15 days after surgery ($P = 0.037$), whereas the difference was not statistically significant between the 2 groups after 3 months.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Therapeutic Hydrogels for Prevention of Postoperative Endophthalmitis

First Author: Helena **FILIBE**

Co-Author(s): Rogério **COLAÇO**, Andreia **PIMENTA**

Purpose: The aim of this work was to develop a drug

eluting hydrogel that could be used as a common intraocular lens to substitute the eye lens in cataract surgery and also have a role in the prophylaxis of postoperative endophthalmitis by releasing moxifloxacin (MXF) or diclofenac (DCF).

Methods: Three different monomer ratios (HEMA/MMA: 80/20, 90/10, 100/0) and crosslinking contents (0.5, 2.5, and 5% wt.) were used to produce 2-hydroxyethyl methacrylate (HEMA) and methyl methacrylate (MMA) based hydrogels. Hydrogels were drug loaded with MXF or DCF by soaking in the drug solutions. Drug release profiles in saline solution were evaluated and the most promising material was chosen for further characterization studies.

Results: Drug partition and effective diffusivity varied with different monomer compositions: 1) increase in crosslinker content reduced drug partition to the hydrogel and effective diffusivity and 2) drug partition did not vary significantly for gels without MMA (HEMA:MMA 100/0) and lowest MMA content (HEMA:MMA 90/10), whereas for HEMA:MMA 80/20 gels there was a reduction of partition for MXF and effective diffusivity for both MXF and DCF, probably generated by the MMA hydrophobic nature.

Conclusions: Extended and sustained release of MXF and DCF was obtained. It is possible to obtain a tailored and sustained release profile of both drugs by adjusting the monomer ratio and crosslinking content. In vivo efficacy is expected to be maintained for at least 3 weeks considering an MXF minimum inhibitory concentration of $0.5 \mu\text{g/mL}$ and DCF effective concentration of $0.1 \mu\text{g/mL}$.

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Visual Outcomes of Cataract Surgery With Posterior Chamber Intraocular Lens Implantation With Optical Iridectomy in Patients With Central Deep Stromal Corneal Opacities and Cataract

First Author: Anilraj **SHIVAMURTHY**

Co-Author(s): Chandrashekar **GANGANAGOUDA**, Vasudhendra **NITTUR**

Purpose: To evaluate the visual outcomes after small incision cataract surgery with posterior chamber intraocular lens implantation combined with sectoral optical iridectomy in patients with central corneal opacities and cataract, in whom outcomes of combined penetrating keratoplasty and cataract surgery are not promising due to various risk factors.

Methods: Five eyes (4 patients) who had central deep

stromal corneal opacities with cataract underwent surgery in a prospective clinical study. Preoperative best corrected visual acuity (BCVA) was counting fingers (CF) close to face in 3 patients and CF at 0.5 m in 2 patients. One patient (2 eyes) was a very high myope (axial length 32 mm), 1 patient was a 1-eyed very old (78 years) patient, and the other 2 patients had issues with treatment compliance and follow-up. Optical sectoral iridectomy was done in the superonasal quadrant in 2 patients, superotemporal in 2 patients, and in the inferonasal quadrant in 1 patient.

Results: Four patients had corneal opacities due to recurrent herpes simplex stromal keratitis and 1 had an adherent leucoma following trauma. Out of 5 patients 1 patient achieved BCVA of 20/60, 1 patient achieved uncorrected visual acuity (UCVA) of 20/120 with no further improvement, and 3 patients achieved BCVA of 20/200.

Conclusions: Combining optical iridectomy with cataract surgery is a valuable alternative in providing permanent ambulatory vision to patients to carry out their routine activities and can be done in those for whom outcomes of penetrating keratoplasty with cataract surgery are not good because of various risk factors, with subsequent increased risk of graft failure.

Cornea, External Eye Diseases & Eye Bank

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Association of Human Leukocyte Antigen Class I Genes With Stevens-Johnson Syndrome With Severe Ocular Complications in an Indian Population

First Author: Mayumi **UETA**

Co-Author(s): Sayan **BASU**, Chitra **KANNABIRAN**, Shigeru **KINOSHITA**, Varsha **RATHI**, Virender Singh **SANGWAN**

Purpose: To examine the polymorphisms in the human leukocyte antigen (HLA) class I genes of Indian Stevens-Johnson syndrome (SJS)/toxic epidermal necrolysis (TEN) with severe ocular complications (SOC) and investigate the association between HLA class I genes and SJS/TEN with SOC.

Methods: This prospective case-control study was conducted between July 2012 and June 2014. Eighty Indian patients with SJS/TEN with SOC and 50 healthy Indian volunteers were enrolled in this study. All patients were in the chronic stage of the disease with severe dry eye, corneal scarring, scarring of the palpebral conjunctiva, trichiasis, and so on. The diagnosis of SJS/TEN with SOC was based on a

confirmed history of acute-onset high fever, serious mucocutaneous manifestations with skin eruptions, and the involvement of at least 2 mucosal sites, including the oral cavity and ocular surface in the acute stage.

Results: Genotyping at HLA-A, HLA-B, and HLA-C loci showed a significant positive association with HLA-A*33:03, HLA-B*44:03, and HLA-C*07:01 alleles and a significant negative association with HLA-B*57:01 and HLA-C*06:02. We also found that the haplotypes consisting of HLA-B*44:03 and HLA-C*07:01 were strongly associated with SJS/TEN with SOC in our Indian population ($P = 1.1 \times 10^{-7}$; odds ratio, 11.0).

Conclusions: This study suggested that HLA-A*33:03, HLA-B*44:03, and HLA-C*07:01 are risk alleles and HLA-B*57:01 and HLA-C*06:02 are protective alleles and that the combination of HLA-B*44:03 and HLA-C*07:01 were strong risk haplotypes for SJS/TEN with SOC in an Indian population. Describing the association of the haplotype could facilitate the understanding of increased risk factors for developing SJS/TEN with SOC.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Comparison of Simple Excision With or Without Amniotic Membrane Graft Versus Lamellar Keratoplasty in Patients With Limbal Dermoid

First Author: Chaitali **PATEL**

Co-Author(s): Muralidhara **RAMAPPA**

Purpose: To compare the outcomes of simple excision with/without amniotic membrane graft (AMG) versus lamellar keratoplasty in the management of limbal dermoid.

Methods: Retrospective analysis of 162 eyes undergoing surgical intervention for limbal dermoid at a tertiary care center.

Results: The mean age at presentation was 12.07 years (range: 2 months to 54 years). There was a female preponderance with 54.9% eyes belonging to female patients. The diagnosis was limbal dermoid alone in 67.2% ($n = 109$), Goldenhar syndrome in 19.75% ($n = 32$), limbal dermoid with amblyopia in 9.25% ($n = 15$), and dermolipoma in 3.7% ($n = 6$). The mean preoperative logarithm of the minimum angle of resolution (logMAR) visual acuity in patients with quantifiable visual acuity was 0.68 (SD: 0.69). Eighty-one eyes (50%) underwent simple excision of dermoid with/without AMG while the rest underwent excision

of dermoid combined with lamellar keratoplasty/patch graft or penetrating keratoplasty with or without AMG. The mean duration of follow-up was 24.84 weeks (range: 2 days to 6 years). The mean postoperative logMAR visual acuity was 0.58 (SD: 0.63). Majority of the eyes had a fair cosmetic outcome ($n = 90$). The rates of complications like corneal perforation, infection, and rejections were extremely low with the majority ($n = 137$, 84.5%) suffering no complications.

Conclusions: Simple excision of dermoid with/without AMG is comparable to lamellar keratoplasty in the management of limbal dermoids. Though cosmesis is achieved in most cases, the effect on visual acuity is not significant, probably due to preexisting amblyopia.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Efficacy of 0.1% Topical Tacrolimus in High-Risk Keratoplasty: A Long-Term, Comparative Study

First Author: Yuan **QIU**

Co-Author(s): Jing **HONG**

Purpose: To compare the efficacy of 0.1% topical tacrolimus and 1% cyclosporine A (CsA) on graft rejection in high-risk keratoplasty in a retrospective cohort study.

Methods: Thirty eyes of 30 patients with high-risk characteristics for rejection were reviewed in the study. They were equally assigned to the tacrolimus or CsA group according to their postoperative treatment. The 2 groups were treated with 0.1% tacrolimus or 1% CsA eye drops 4 times daily, respectively. The frequency of administration was then gradually reduced. All patients received concurrent traditional treatment with 1% topical prednisolone, 10 mg dexamethasone intravenously, levofloxacin eye drops, and tear substitutes. The symptoms, graft clarity, and intraocular pressure of each patient were assessed at each follow-up during the duration of the 2-year study.

Results: Mean duration of graft clarity in the tacrolimus group was 21.47 ± 6.70 months and in the CsA group, 13.73 ± 10.06 months. Two eyes (13.33%) in the tacrolimus group developed irreversible rejection even with intensive topical tacrolimus treatment. Rejection episodes occurred in 7 grafts (46.67%) in the CsA group. Three patients increased frequency of topical CsA but only 1 regained graft transparency. The remaining 4 patients were switched to topical tacrolimus and 3 regained graft transparency. It was shown that 0.1% tacrolimus eye drops also significantly relieved postoperative symptoms with no adverse

effect on intraocular pressure.

Conclusions: Our study suggests that 0.1% tacrolimus was more efficacious in reducing graft rejection episodes and prolonging graft survival in high-risk keratoplasty in comparison to 1% CsA.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Effect of Cornea Preservation Time on Descemet Stripping Endothelial Keratoplasty Success and Endothelial Cell Loss: A Multicenter Randomized Clinical Trial

First Author: Shahzad **MIAN**

Purpose: To determine whether 3-year graft success rate and endothelial cell loss using corneal donor tissue preserved 8-14 days is similar to that of donor tissue preserved 0-7 days following Descemet stripping endothelial keratoplasty (DSEK).

Methods: A total of 1090 individuals (1330 study eyes) underwent DSEK at 40 clinical sites by 70 surgeons with donor corneas provided by 23 US eye banks. The donor cornea was randomly assigned in a masked fashion to the surgeon with preservation time (PT) of 0-7 days (0-7d PT) or 8-14 days (8-14d PT). Testing was performed with graft success at 3 years as the primary endpoint. In addition, endothelial cell loss (ECL) with successful DSEK at 3 years was determined by a central image analysis reading center.

Results: The 3-year graft success rate was 95.3% (0-7d PT group) and 92.1% (8-14d PT group), with more primary donor failures in the 8-14d PT group. Probability of failure after the first month was 2.4% and 3.1% in the 2 PT groups, respectively. Longer PT was associated with a lower graft success rate ($P = 0.008$). At 3 years, ECL was 37% (0-7d PT group) and 40% (8-14d PT group) ($P = 0.03$). ECL was fairly stable from 4 to 13 days of PT ($N = 878$, 36% to 43%).

Conclusions: The 3-year success rate post-DSEK was high, irrespective of PT. PT impact on graft success was small when <12 days. There was slightly greater ECL 3 years postoperatively with longer PT while fairly constant with PT from 4-13 days.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Longitudinal Study of Corneal Endothelium in Long-Term Amantadine Therapy in Asian Indian Eyes

First Author: Daggumilli **SUDHA**Co-Author(s): Vinay **GOYAL**, Noopur **GUPTA**, M **VANATHI**, Radhika **TANDON**

Purpose: To evaluate corneal endothelial changes and their progression in patients with Parkinson disease on long-term oral amantadine therapy in Asian Indian eyes.

Methods: A prospective longitudinal study of 90 Parkinson disease patients (180 eyes) on more than 6 months of oral amantadine therapy, 30 amantadine-naive Parkinson patients, and 30 age- and gender-matched healthy controls. Patients on amantadine therapy were subdivided into 3 subgroups based on dosage. Outcome measures were comprehensive slit lamp examination, corneal endothelial cell parameters [corneal endothelial cell density (ECD), percentage hexagonality, and coefficient of variation], subbasal nerve fiber density (SBNFD), and central corneal thickness (CCT) evaluated at presentation and over 1-year follow-up and the percentage changes of these parameters over 1-year follow-up were evaluated.

Results: The amantadine group had greater percentage decrease of endothelial cell density (1.51% vs 0.94% vs 0.55%) ($P = 0.47$), greater percentage decrease of hexagonality (4.98% vs 3.56% vs 2.31%) ($P = 0.01$), and greater percentage increase of coefficient of variation (6.12% vs 4.80% vs 3.30%) ($P = 0.03$) compared to amantadine-naive and controls. Amantadine subgroup with 400 mg of amantadine showed greater percentage decrease of ECD (2.03% vs 1.53% vs 1.36%), greater percentage decrease of hexagonality (12.48% vs 8.01% vs 5.22%), and greater percentage increase of coefficient of variation (7.03% vs 4.72% vs 3.37%) compared to 300 and 200 mg.

Conclusions: Amantadine likely has an effect on corneal endothelial cells in a dose-dependent manner when used long term.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Outcomes of Simple Limbal Epithelial Transplantation in Patients With Primary Failed Cultivated Limbal Epithelial Transplantation

First Author: Sashwanthi **MOHAN**Co-Author(s): Sayan **BASU**, Virender Singh **SANGWAN**

Purpose: To report the clinical outcomes of simple limbal epithelial transplantation (SLET) in patients with recurrent unilateral limbal stem cell deficiency (LSCD) due to failure of cultivated limbal epithelial transplantation (CLET).

Methods: This was a retrospective interventional case series which included 35 patients who underwent SLET between 2009 and 2016 after failure of CLET. The primary outcome measure was the success of SLET defined on the basis of improvement in 5 objective criteria: best corrected visual acuity (BCVA), grades of symblepharon, and grades of corneal conjunctivalization, vascularization, and opacification.

Results: At 1-year follow-up, 82.6% of the eyes maintained a completely epithelialized, avascular, and stable corneal surface. Vision improved from a median logarithm of the minimum angle of resolution (logMAR) BCVA of 3 to 1 ($P = 0.0026$); conjunctivalization improved from a median grade of 2 to 0 ($P \leq 0.0001$); vascularization improved from a median grade of 2 to 1 ($P = 0.0001$); while corneal opacification improved from a median of 2 to 1 ($P = 0.0003$). Although symblepharon also showed improvement from a median grade of 1 to 0, this change was not statistically significant ($P = 0.6221$). None of the donor eyes developed any complications.

Conclusions: Findings of this study show that in eyes with recurrent LSCD due to failure of CLET, SLET can not only successfully restore a normal ocular surface but can also significantly improve vision by enhancing corneal clarity. As CLET is known to fail in about one fourth of cases, SLET can be an effective and more affordable alternative to repeating CLET in such cases.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

PTK in Myopic PRK Mode Followed by Refractive Neutralization by Hyperopic PRK for Central Anterior Corneal Opacities in a Single Setting

First Author: Anjum **MAZHARI**

Purpose: To study the results of phototherapeutic keratectomy (PTK) in myopic photorefractive keratectomy (PRK) mode followed by refractive neutralization of induced hyperopic shift by neutralizing hyperopic PRK in eyes with different kinds of anterior corneal opacities involving the visual axis in a single setting.

Methods: Ten eyes presenting with anterior corneal opacities involving the visual axis due to scars of healed keratitis, Salzmann nodular degeneration with corneal opacities, corneal dystrophies, and so on were selected. The eyes were either not improving or only partially improving with refraction/glasses. The central corneal thickness (CCT), minimum corneal thickness (MCT), and central opacity thickness were measured on anterior segment optical coherence tomography (AS-OCT). Ectasia was ruled out by topography. Treatment was planned by keeping the calculated postoperative residual bed thickness between 250-280 μ m.

Results: The central corneal epithelium in the 8.0-9.0 mm zone was first ablated based on Fourier domain OCT (FD-OCT) based epithelial thickness measurement. Then PTK in myopic PRK mode was done for a 6.0-6.5 mm optical zone. Subsequently the induced hyperopic shift was neutralized by hyperopic PRK at the 6.5 mm optical zone. At 1-year follow-up there were much improvement of uncorrected distance visual acuity (UDVA) in all eyes that further improved with glasses (corrected distance visual acuity, CDVA). The CDVAs were between 20/60 to 20/30 and there was much improvement in other visual symptoms.

Conclusions: PTK in myopic PRK mode followed by neutralizing hyperopic PRK is an effective and safe alternative to PTK only, PTK with subsequent PRK in another setting, anterior lamellar keratoplasty (ALK), or deep anterior lamellar keratoplasty (DALK) for selected cases of central anterior corneal opacities with adequate corneal thickness.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Pentagram Suturing Anterior Chamber Plasty and Descemet-Stripping Automated Endothelial Keratoplasty for Bullous Keratopathy With Extensive Anterior Synechia of the Iris

First Author: Xiang **FAN**

Co-Author(s): Yansheng **HAO**, Jing **HONG**

Purpose: To observe the effect of pentagram suturing anterior chamber plasty (PSACP) before Descemet-stripping automated endothelial keratoplasty (DSAEK) that helps cure bullous keratopathy with extensive anterior synechia of the iris.

Methods: Two cases of bullous keratopathy with extensive anterior synechia of the iris formed from intraocular pressure (IOP) in well-controlled malignant glaucoma after anterior vitrectomy were analyzed. Patient A received anterior chamber plasty with synechia separation and penetrating keratoplasty (PKP). Patient B received PSACP, where pentagram sutures were placed as a barrier in front of the anterior surface of the iris to prevent the iris from peripheral anterior synechia (PAS) to extensive anterior synechia and then DSAEK would be performed. The prognosis of patients A and B were compared by the time when 360-degree PAS appeared on anterior segment optical coherence tomography (AS-OCT).

Results: At 12 weeks after surgery, patient A showed 360-degree PAS with elevated IOP while B showed normal IOP and no PAS; there was even no edema in the cornea and endothelial graft.

Conclusions: Pentagram suturing anterior chamber plasty might provide adequate space for DSAEK to help cure bullous keratopathy with vanished anterior chamber.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Reconstruction and Assessment of Monkey Tissue-Engineered Corneal Endothelium

First Author: Qing **LU**

Co-Author(s): Jing **HONG**, Rongmei **PENG**

Purpose: To identify the feasibility of reconstructing corneal endothelial cell sheets by seeding cultured monkey corneal endothelial cells on porcine Descemet membrane (DM).

Methods: Monkey corneal endothelial cells were primary cultured and passaged. The functional phenotype and the expression of function-related (Na⁺/K⁺-ATPase and ZO-1) markers of the cultured cells was evaluated. The denuded porcine DM was decellularized, then detected by histological examination and scanning electron microscopy to verify there were no residual cells. Then the cultured monkey corneal endothelial cells were seeded on porcine DM to reconstruct the tissue-engineered corneal endothelial sheet and cultured for about 2 weeks. Then the reconstructed sheet was detected by histological examination and scanning electron microscopy to verify if monkey endothelial cells grew well on the porcine DM. The functional phenotype and the expression of function-related (Na⁺/K⁺-ATPase and ZO-1) markers of the cultured cells on the porcine DM was evaluated.

Results: Monkey corneal endothelial cells cultured on the porcine DM had good phenotype and expressed function-related markers.

Conclusions: Reconstructing corneal endothelial cell sheets by seeding cultured monkey corneal endothelial cells on porcine DM is viable and it uncovers a novel potential of the engineered endothelium used for endothelial keratoplasty.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Results of Amniotic Membrane Transplantation According to Indications of Ocular Surface Disease

First Author: Chan-Ho **CHO**

Co-Author(s): Sang-Bumm **LEE**

Purpose: To evaluate the frequency and the clinical outcomes of amniotic membrane transplantation (AMT) for various ocular surface diseases including corneal perforation.

Methods: Six hundred ninety eyes who underwent AMT for ocular surface disease between January 1999 and July 2017 were reviewed retrospectively. Indications of disease, types of amniotic membrane, types of surgical procedure, and clinical results were analyzed. Success was defined as complete epithelial healing, absence of aqueous leakage, no recurrence of pterygium, surface stabilization with repeat AMT, or therapeutic keratoplasty after AMT in corneal perforation. Failure was defined as recurrence of persistent epithelial defect, pterygium, corneal ulcer, and persistent aqueous leakage.

Results: Mean age was 57.2 ± 12.7 (7-91 years, 52%

female, 48% male), and mean follow-up period was 28.5 ± 33.5 months. The indications, number of operations, and success rate of AMT were primary pterygium (482 eyes, 91.5%), corneal ulcer or perforation (85 eyes, 76.5%), persistent epithelial defect (20 eyes, 90%), bullous keratopathy and band keratopathy (32 eyes, 96.9%), chemical burn (18 eyes, 88.9%), and scleral thinning (13 eyes, 69.2%). Types of amniotic membrane were cryopreserved only (560 eyes), lyophilized only (70 eyes), and simultaneous (60 eyes). Types of surgical procedure were permanent only (417 eyes), temporary only (203 eyes), and combined surgery (70 eyes). Four eyes underwent evisceration after AMT because of corneal ulcer perforation.

Conclusions: In this study, AMT was an effective and successful method for managing various ocular surface diseases including corneal perforation. Appropriate use of permanent and temporary AMT is considered effective and useful for rapid epithelial healing and ocular surface reconstruction.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

The Efficacy of Systemic Analgesics in Management of Pain and Ocular Symptoms Following Photorefractive Keratectomy

First Author: Alireza **ESLAMPOOR**

Co-Author(s): Siamak **ZAREI-GHANAVATI**

Purpose: To evaluate the efficacy of systemic nonsteroidal anti-inflammatory drugs (NSAIDs) and GABA analogs in management of pain and ocular symptoms following photorefractive keratectomy.

Methods: This was a randomized clinical trial including 120 patients in 4 groups. All patients received topical NSAID following surgery. The patients were divided randomly into 4 groups: group 1 including 30 patients who had taken systemic NSAID (diclofenac 100 mg/day; Voltaren, Novartis), group 2 including 30 patients who had taken gabapentin [gabapentin 100 mg twice a day (BID); Jalinus Pharmacy, Iran], group 3 including 30 patients who had taken pregabalin (Lyrica 50 mg BID; Pfizer), and group 4 including 30 patients who had taken placebo. Patient pain and ocular symptoms and signs were evaluated at 24 hours following surgery using a standard visual pain scale and standard checklist.

Results: The results showed that GABA analogs including gabapentin and pregabalin had better results in pain management, conjunctival injection, and functional activity ($P < 0.05$) followed by the systemic

NSAID and placebo groups. Regarding eyelid edema and photophobia, patients in the treatment groups had better results than the control group but there was not a significant difference between treatment groups.

Conclusions: GABA analogs including gabapentin and pregabalin could be effective in the management of pain following photorefractive keratectomy. They could also be helpful in providing better functional activity.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

The Hyper-CL Multicenter Study

First Author: Ofer **DAPHNA**

Purpose: To evaluate the safety and efficacy of the Hyper-CL (HCL) lens in patients suffering from corneal edema and to compare the efficacy of the Hyper-CL lens to standard treatment with regular contact lens. The Hyper-CL therapeutic soft contact lens has a unique design that enables the capture and delivery of a drop applied on its surface resulting in increased contact time with the corneal surface.

Methods: Prospective, randomized crossover study of the HCL in subjects suffering from corneal edema. Each patient was treated in a randomized fashion through the following steps: treatment A: Hyper-CL lens only + salt solution (7 days), 1 week of washout; treatment B: regular therapeutic lens + salt solution (7 days). Best corrected visual acuity in Early Treatment Diabetic Retinopathy Study (ETDRS) letters, pachymetry, and comfort were documented.

Results: Up to date 41 patient were included. The mean visual improvement while using the HCL was 1.7 ETDRS lines and 0.4 ETDRS lines while using control bandage contact lens. The mean reduction in corneal thickness was 49 (SD: 117) μ m and 10 (SD: 67) μ m with the Hyper-CL and control lens, respectively, corresponding to a mean reduction of 4.26% (SD: 11.38%) with the Hyper-CL lens and 0.59% (SD: 13.91%) with the standard lens. No serious adverse events occurred while using the Hyper-CL.

Conclusions: The results suggest a tendency for a decrease in corneal pachymetry and an increase in visual acuity while being treated with the HCL.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S228

Treating Corneal Edema With Artificial Corneal Endothelial Implant, EndoArt: First Human Experience and 4 Years of Animal Study

First Author: Ofer **DAPHNA**

Purpose: To evaluate the safety and efficacy of an artificial implant for the treatment of corneal edema secondary to endothelial failure.

Methods: A thin silicone membrane with an adhesive coating was implanted on the posterior cornea of 17 rabbits and 23 pigs from which 17 rabbit and 11 pig Descemet membranes and endothelial cells had been removed; in 12 pigs the endothelial layer was not removed. Sixteen animals served as controls. Slit lamp examination and corneal thickness (CT) measurements were performed for up to 1 year. In addition, a first in humans trial has started with 2 patient to date.

Results: As long as the implant was attached corneal edema was completely cleared. There was a high incidence of implant partial detachment leading to recurrence or partial recurrence of corneal edema. Other complications seen in animals only included 1 case of corneal perforation and 1 case of corneal ulcer that healed with topical antibiotic.

Conclusions: An artificial silicone implant could provide an alternative to endothelial keratoplasty that would not utilize human tissue, would require less immunosuppressive medications, and could easily be implanted through a small corneal incision. The most common complication was implant detachment.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

100 MOOKPs: The Journey and the Experience

First Author: Geetha **IYER**

Co-Author(s): Shweta **AGARWAL**, Bhaskar **SRINIVASAN**

Purpose: To report the outcome of modified osteo-odonto keratoprosthesis (MOOKP) in eyes over 14 years at a tertiary eye care center.

Methods: Retrospective interventional case series.

Results: Anatomical integrity was maintained in 66% and best corrected visual acuity (BCVA) > 6/60 was maintained in 69% of the 100 [36 chemical injury, 62 Stevens-Johnson syndrome (SJS), 2 others] eyes that

underwent OOKP over a mean follow-up of 65.54 (1-168) months. Intervention to improve the longevity of the lamina like bone morphogenic protein (BMP) was done in 13 eyes, 5 of which were stable at mean follow-up of 34.7 months. The most common issue was sterile vitritis in SJS (30.6% eyes) and glaucoma in chemical injuries (38.9% eyes). Endophthalmitis occurred in 10 eyes.

Conclusions: The long-term outcome of MOOKP is comparable to other published series with certain specific issues seen in our population including lamina resorption predominantly among SJS patients.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Pythium Keratitis: Role of Adjunctive Measures in Management

First Author: Shweta **AGARWAL**

Co-Author(s): Geetha **IYER**, Bhaskar **SRINIVASAN**

Purpose: To report outcomes of and compare management options for *Pythium* keratitis.

Methods: Retrospective interventional study of 46 patients diagnosed as *Pythium* keratitis from January 2014 to June 2017. Interventions were categorized into surgery (S) [therapeutic penetrating keratoplasty (TPK)], surgical adjunct (SA) (cryotherapy ± alcohol swab with TPK), and medical adjunct (MA) (azithromycin + linezolid at presentation or after TPK).

Results: Primary treatment included MA (1 eye), SA (3 eyes), and S (42 eyes). Recurrence occurred in 27/43 eyes (MA + S group). Second surgery (S) was required in 11 eyes (TPK-2), with additional procedures (SA) in 9 eyes and evisceration in 5 eyes. Eight of 43 eyes received MA after TPK-1. One eye required TPK-3. Recurrence occurred in all eyes that received MA (100%) and in 28 of 54 TPK eyes (51.8%) with TPK-1+2+3 in 42 eyes. Recurrence was noted in 1/13 (7.6%) that underwent SA.

Conclusions: The currently available and recommended treatment for *Pythium* keratitis is surgical by means of TPK and in worse cases evisceration. In our study MA measures showed no benefit with recurrence or worsening of infection requiring resurgery. Almost 50% of TPKs had a recurrence requiring resurgery. However, adjunctive procedures (SA) during TPK appear to have additional benefit with low risk of recurrence and could be included as routine care.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

A Survey on the Attitude of Ethnic Chinese Towards Corneal Donation

First Author: King Sai **LEUNG**

Co-Author(s): Vanessa **CHOW**, Vishal **JHANJI**, Jeffrey **PONG**, Alvin **YOUNG**

Purpose: To study the attitude of ethnic Chinese towards corneal donation.

Methods: A questionnaire consisting of 30 questions was formulated to encompass 6 topics: (1) knowledge of corneal donation; (2) willingness to donate; (3) reasons for willingness or unwillingness; (4) decision-making; (5) opinions on current policy; and (6) sociodemographic factors. The relationship between willingness to donate cornea and categorized variables (knowledge on organ/cornea donation; education level; age; gender; blood donor; and healthy lifestyle) were examined.

Results: Overall, 53.7% of the respondents did not know how to register as an organ donor. Although 66.3% of respondents were willing to donate their corneas, only 20.6% of them were actually registered as an organ donor at the time of the interview. Over half (54.5%) of the respondents could make an independent decision about corneal donation. The majority (83.4%) of the respondents felt that the current government strategies to promote cornea donation were too passive and that active promotion via a healthcare institute would be effective for this cause. Multiple linear regression analysis showed that there was a positive correlation between knowledge of cornea donation and willingness to donate ($P < 0.001$) and a negative relationship between education level and willingness to donate ($P < 0.020$).

Conclusions: This is the first study to evaluate the attitude of ethnic Chinese towards corneal donation. The findings of our study would help to formulate policy-making towards gearing up corneal donation in the Far East.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Changes in Distribution of Dry Eye Disease With the New 2016 Diagnostic Criteria of the Asia Dry Eye Society

First Author: Takenori **INOMATA**

Co-Author(s): Keiichi **FUJIMOTO**, Masao **IWAGAMI**, Akira **MURAKAMI**, Yuichi **OKUMURA**, Tina **SHIANG**

Purpose: To delineate changes in the distribution of dry eye disease (DED) between the 2006 and 2016 diagnostic criteria.

Methods: We included 250 right eyes of 250 patients (age, 61.4 ± 14.3 years; women, 76.8%). All patients had complete ophthalmic evaluations including subjective symptom assessment using the Dry Eye Related Quality-of-Life Score, tear break-up time (TBUT), vital staining by corneal fluorescein staining, and Schirmer test. We classified patients using the 2006 Japanese Diagnostic Criteria into definite DED, probable DED, and non-DED based on subjective symptoms, tear function, and/or vital staining, and the 2016 criteria of the Asia Dry Eye Society and Dry Eye Society Japan into definite DED and non-DED based on subjective symptoms and decreased TBUT. Then, we examined the details of patients who were reclassified by the 2016 criteria.

Results: By the 2006 criteria, 38.8% (97/250) of patients had definite DED, 35.6% (89/250) had probable DED, and 25.6% (64/250) had non-DED. By the 2016 criteria, 79.8% (167/250) had definite DED and 20.2% (78/250) had non-DED, suggesting a significant increase in patients with definite DED. Almost all patients with definite DED and non-DED using the 2006 criteria remained in the same categories under the 2016 criteria (96/97 and 64/64, respectively). Among patients with probable DED, 79.8% (71/89) were reclassified as definite DED and 20.2% (18/89) were reclassified as non-DED using the 2016 criteria.

Conclusions: The prevalence of definite DED increased due to the redistribution of patients with probable DED by the 2006 criteria to definite DED by the 2016 criteria.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Clinical Analysis of Fungal Keratitis According to Use of Previous Topical Steroids

First Author: Sang-Bumm **LEE**

Co-Author(s): Chan-Ho **CHO**

Purpose: To compare the clinical characteristics and outcomes of fungal keratitis according to use of previous topical steroids.

Methods: Ninety-four episodes of fungal keratitis between January 2000 and December 2016 were reviewed retrospectively. Fungus was confirmed by KOH smear, culture, polymerase chain reaction (PCR), or biopsy. The microbiological profiles, epidemiology, clinical characteristics, and clinical outcomes were analyzed between the previous topical steroid use group (A, 35 eyes) and the nonuse group (B, 59 eyes). Poor clinical outcome was defined as final visual acuity less than 20/200, decrease from initial visual acuity, complications occurring, or requiring surgical intervention.

Results: KOH positivity was higher in group B (54%:75%, $P = 0.043$), but culture positivity was not different (31%:25%, $P = 0.529$). Of all the 34 isolated pathogens, *Candida* (7:10, 18%) was the most common, followed by *Fusarium* (3:5, 9%) and *Aspergillus* (5:0, 5%). There were no differences in age, sex, seasonal and occupational distribution, systemic disease, hypopyon, and initial visual acuity between group A and B. However, predisposing factors such as previous ocular surgery (35%:5%, $P < 0.001$) and previous ocular surface disease (51%:24%, $P = 0.006$) were more common in group A. During treatment, corneal perforation (23%:7%, $P = 0.051$), surgical intervention (46%:22%, $P = 0.016$), and poor clinical outcome (69%:49%, $P = 0.069$) were more frequent in group A. Overall, 13.8% needed enucleation, but there was no difference between group A and B (14.3%:13.6%, $P > 0.999$).

Conclusions: The results of this study showed that the use of topical steroids before diagnosis of fungal keratitis was more associated with poor outcomes. Therefore, clinicians should pay attention to the use of topical steroids in ocular surface disease.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Clinical Characteristics, Microbiology Examination, and Treatment Outcomes of Microsporidial Stromal Keratitis*First Author: Nga Duong NGUYEN**Co-Author(s): Nguyen Xuan HIEP, Ngoc Dong PHAM*

Purpose: To describe the clinical characteristics, microbiology examination, and treatment outcomes of microsporidial stromal keratitis.

Methods: Retrospective analysis of patients diagnosed and managed as having microsporidial stromal keratitis based on clinical, microbiology, and histopathology examination. Outcomes of medical and surgical management were documented.

Results: From October 2013 to December 2015 there were 40 eyes of 36 patients of microsporidial stromal keratitis with a mean age of 58 years and female:male ratio of 11:1. The mean duration of symptoms was 104 days. The most common clinical misdiagnosis was herpes simplex virus and fungal keratitis. Ocular complaints were decrease of vision and pain. Corneal defects were deep stromal infiltrated with corneal ulcers (87.5%), edema, and endothelium exudates. Gram staining was 100% positive with a maximum 3 times on many kinds of specimens. Polymerase chain reaction (PCR) and histopathology had positive rates of 84.6% and 100%. Symptoms were resolved in 32.5% of eyes with treatment that included topical antifungal, antibiotic, and systemic albendazole with anterior stromal infiltrates. The mean time to resolution with medical therapy was 30.9 days. Success rates were higher in the group of patients that had albendazole than those that did not. The eyes that were unsuccessful with medical therapy had deep multifocal stromal infiltrates that required penetrating keratoplasty. Best visual acuity outcome was 20/200. Recurrence occurred in a patient who underwent penetrating keratoplasty 1 year after surgery.

Conclusions: Microsporidial stromal keratitis is difficult to diagnose by clinical signs. Microbiological methods are important to define the pathogen. Keratoplasty is necessary in the majority of cases but recurrence can present after surgery.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Clinical Observation of Pranoprofen in the Treatment of Blepharokeratoconjunctivitis*First Author: Yu TING*

Purpose: To report the efficacy and safety of pranoprofen in the treatment of blepharokeratoconjunctivitis (BKC).

Methods: This study was a prospective, multicenter, randomized clinical trial. Patients with mild BKC received pranoprofen/erythromycin/sodium hyaluronate or erythromycin/sodium hyaluronate, while patients with moderate or severe BKC also received 0.1% fluorometholone for the first 7 days. At baseline and weeks 2 and 4 (for moderate and severe patients also week 6), clinical assessment of eyelid signs and symptoms, corneal and conjunctival lesions, and adverse reactions was performed.

Results: A total of 71 patients (136 eyes) were included in the per protocol population (n = 46/42 mild BKC, 24/24 moderate or severe BKC). As for mild BKC, the overall rating growth rate of patients with pranoprofen was significantly higher than that of patients without pranoprofen (0.40 ± 0.24 vs 0.33 ± 0.09 at week 2, 0.64 ± 0.16 vs 0.52 ± 0.16 at week 4, $P < 0.01$). A significant change from baseline in total efficiency, eyelid signs, and eyelid symptoms in both groups was seen at week 4, while there was no significant difference in the change of corneal and conjunctival lesions. As for moderate and severe BKC, composite signs and symptoms improved from baseline in both groups at week 6, with no significant differences between the 2 groups, while symptoms of burning, eyelid and conjunctival hyperemia, meibomian secretions, tear break-up time, and intraocular pressure (IOP) in patients with pranoprofen significantly more efficient and safer than that of patients without pranoprofen ($P < 0.05$). There were no significant differences in adverse reactions between the 2 groups.

Conclusions: Pranoprofen is an effective and safe treatment for BKC, which is significantly more effective for mild BKC.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Comparison of Organic Light-Emitting Diodes and Light-Emitting Diodes for the Level of Hazardous Effect on Corneal and Conjunctival Cells

First Author: Sangchul YOON

Co-Author(s): Soo Jung HAN, Sung Hoon LEE, Kyoung Yul SEO

Purpose: Organic light-emitting diodes (OLEDs) and light-emitting diodes (LEDs) are widely used light sources, but the former delivers less levels of blue light to the eyes than the latter. We propose to evaluate the level of hazard on external eyes from exposure to OLED and LED lighting.

Methods: We used conventional LED (peak at 430 nm) and OLED (peak at 600 nm). Conventional LED and OLED have different color temperature, and to rule out this effect, a yellow LED (yLED) was added. We irradiated to LED, yLED, and OLED at the level of 0.0277 mW/cm² on human corneal and conjunctival epithelial cells followed by incubation for 4 hours. After incubation, we analyzed cytokines related to dry eye and the production of reactive oxygen species (ROS).

Results: We did not observe any effect on viability and apoptosis. There was an increase of CX3CL1 in the LED exposed corneal epithelial cells ($P < 0.01$), but there was no sign of an increase of vascular endothelial growth factor (VEGF) and CX3CL1 in the OLED group. In conjunctiva, there was an increase of VEGF with no sign of change in the amount of CX3CL1 in all light sources. Fluorescence microscopic analysis showed higher ROS generation in LED and yLED compared to OLED in corneal and conjunctival cells ($P < 0.001$).

Conclusions: Our results raise questions about hazards from exposure to LED, yLED, and OLED, which have different blue-light intensity. LED causes more cytokines and ROS related to dry eye compared to OLED.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Corneal Neurotization in the Treatment of Neurotrophic Keratitis: Long-Term Follow-Up

First Author: Asim ALI

Co-Author(s): Gregory BORSCHER, Joseph CATAPANO, Simon FUNG, Ronald ZUKER

Purpose: To report the outcomes of corneal

neurotization, a novel surgical procedure to reinnervate neurotrophic corneas using nerve grafts and transfers.

Methods: Patients who underwent corneal neurotization for neurotrophic keratitis unresponsive to other treatments were included in this study. Data on best-corrected visual acuity (BCVA), central corneal sensation (CCS, measured in mm with Cochet-Bonnet aesthesiometry), and clinical course were prospectively collected. In the 3 patients who had corneal transplantation after neurotization, the explanted corneal tissue was examined histologically to assess the degree of corneal reinnervation. Statistical analysis was performed with Mann-Whitney U test, with $P < 0.05$ being statistically significant.

Results: Fifteen patients (18 eyes) were included. Mean age (\pm standard deviation) was 12.2 ± 28.5 years. All patients presented with persistent corneal epithelial defects (PED) and corneal perforations occurred in 3 eyes. Preoperative mean BCVA was 0.98 ± 0.69 logarithm of the minimum angle of resolution (logMAR) and mean CCS was 0.8 ± 2.6 mm. After an average follow-up of 19.1 ± 14.9 months, mean BCVA was 0.95 ± 0.83 ($P = 0.78$) and mean CCS improved to 41.2 ± 16.5 mm ($P < 0.001$). Four patients had PED postoperatively ($P = 0.0006$). Recovery of corneal sensation permitted successful corneal transplants in 3 eyes, leading to improved vision in 2 eyes at final follow-up. In vivo confocal microscopy and immunohistochemical analysis of the explanted corneal tissue demonstrated corneal reinnervation.

Conclusions: Corneal neurotization significantly improved corneal sensation, thereby enhancing ocular surface health and preserving sight. Keratoplasty was also made possible after reinnervation of the cornea, thus permitting further visual rehabilitation. Corneal neurotization should therefore be included in the treatment armamentarium of neurotrophic keratitis.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Evaluation of Crosslinked Donor Corneas in Therapeutic Keratoplasty in Cases of Fungal Keratitis

First Author: Jeewan TITIYAL

Co-Author(s): Anjana KARUNAKARAN, Manpreet KAUR, Anubha RATHI, Namrata SHARMA

Purpose: To evaluate the anatomical and functional outcomes of collagen crosslinking (CXL) of donor corneas in therapeutic penetrating keratoplasty (TPK) in fungal keratitis.

Methods: Fifty-three eyes with nonresolving fungal keratitis were randomized to undergo TPK with CXL-

treated donor corneas (group I, n = 26) or untreated donor corneas (group II, n = 27). Postoperatively, visual and anatomical outcomes were evaluated at day 1, week 1, and 3 months.

Results: Graft size was comparable in both groups ($P = 0.82$). Epithelial defect healed in all cases by 1 week. At 3 months, reinfection was significantly more in group II (group I = 0/26, group II = 6/27; $P = 0.03$). Mean time to reinfection was 14.7 days. The organisms isolated in cases of reinfection were *Aspergillus* (3/6) and *S. epidermidis* (3/6). Visual acuity ($P < 0.001$) and graft clarity ($P < 0.001$) were significantly better in group I and confocal microscopy showed typical changes of CXL.

Conclusions: CXL-treated grafts have a lower rate of reinfection and better visual and anatomical outcomes in therapeutic keratoplasty.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Microbial Profile of Infectious Keratitis With Nasolacrimal Duct Obstruction

First Author: Supriya **SHARMA**

Co-Author(s): Sujata **DAS**

Purpose: To study the microbiological spectrum of infectious keratitis in patients presenting with concurrent nasolacrimal duct obstruction and the antibiotic sensitivity pattern.

Methods: A retrospective analysis of patients with infectious keratitis with coexisting nasolacrimal duct obstruction was done from January 2012 to December 2016. The diagnosis of infectious keratitis was made based on clinical manifestations, cornea scraping for smear, and culture analysis. The presence/absence of lacrimal duct obstruction was determined by the lacrimal duct irrigation test. The bacterial isolates were tested for antibiotic susceptibility using Kirby Bauer disc diffusion technique. The treatment of keratitis included topical antibiotics and surgical intervention whenever required. Treatment of chronic dacryocystitis was external dacryocystorhinostomy.

Results: Eighty-one eyes of 81 patients were included in the study. The mean age of patients was 59.66 ± 11.02 years. Samples from corneal scraping showed 67.89% of gram positive (n = 55), 2.46% gram negative (n = 2), 8.46% of multiple (more than 1) organisms (n = 7), and 20.99% showed no organisms (n = 17) on smear examination. The most common organism identified on culture was *Streptococcus pneumoniae* (46.07%; n = 35), followed by *Staphylococcus* species (17.11%; n = 13) and *Staphylococcus aureus* (13.16%;

n = 10). Other organisms identified on culture were *Moraxella*, *Acenobacter*, *Pseudomonas* species, and others. *Streptococcus pneumoniae* isolates were found to be sensitive to cefazolin (93.75%), ofloxacin (75.76%), ciprofloxacin (60%), gatifloxacin (63.64%), and moxifloxacin (66.67%).

Conclusions: In patients presenting with infectious keratitis with coexisting lacrimal duct obstruction, the most common isolates obtained were of gram-positive organisms, mainly *S. pneumoniae* followed by *Staphylococcus* species. Most of the microorganisms were found to be sensitive to the fluoroquinolone group of drugs.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Penetration of Hydrophilic Sulforhodamine B Across the Cornea

First Author: Wanachat **CHAIYASAN**

Co-Author(s): Uday **KOMPELLA**, Pattravee **NIAMPREM**, Sangly **SRINIVAS**, Waree **TIYABOONCHAI**

Purpose: Sulforhodamine B (SRB) is a hydrophilic dye. Unlike fluorescein and its congener carboxyfluorescein, the fluorescence of SRB is relatively less pH dependent. Therefore, SRB may serve as a better tracer when there are significant changes in pH. In this study, we have examined the suitability of SRB to assess the barrier properties of the corneal epithelia using a custom-built confocal scanning microfluorometer (CSMF).

Methods: All experiments were performed with freshly isolated porcine eyes and divided into 3 groups. First, we measured penetration of SRB across the corneal epithelium following topical SRB on the cornea with and without epithelium. Next, we examined penetration after exposure to detergents to disrupt the tight junctions of the corneal epithelium. Finally, we investigated penetration across the endothelium by injection of SRB (0.1%; 40 μ L) into the anterior chamber. The concentration profiles for the dye across the cornea were characterized using CSMF and by histological evaluation.

Results: SRB did not penetrate across the corneal epithelium after topical application. However, exposure to Tween 20 significantly enhanced the penetration into the stroma. Unlike the topical application, SRB penetrated from the endothelial side easily. We calculated the permeability across the endothelium to be $\sim 4 \times 10^{-4}$ cm/min. This is a value close to that of carboxyfluorescein, a well-known hydrophilic dye.

Conclusions: As a hydrophilic dye, SRB can be used as an alternative dye tracer to assess barrier function of

the corneal epithelia in situations of marked changes in pH.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Pterygium Excision With Conjunctival Autograft and Autologous Blood: Economical and Effective Technique for Patients in Developing Nations

First Author: Prasoon PANDEY

Purpose: To assess the efficacy of securing conjunctival autograft (CAG) using a patient's own blood at the surgical site for various grades of pterygium and to analyze outcomes and shortcomings of the technique.

Methods: A single-center, prospective trial was carried out in 112 eyes of patients with primary pterygia who were advised pterygium excision with CAG with autologous blood (AB). Duration of the study was 30 months. Pterygium was graded into 3 types based upon the extent on the corneal surface. Type 1 was less than 2 mm (20 eyes), type 2 was 2-4 mm (66 eyes), and type 3 was greater than 4 mm (26 eyes). Patients were followed up for 1 year and assessed primarily for adherence and recurrence.

Results: Four eyes lost to follow-up were excluded. Of the 108 eyes on the first postoperative day, 5 eyes (4.63%) had total graft dislodgement requiring regrafting from another site or reattachment with glue. Of these 2 had type 2 (3.03%) and 3 type 3 (11.54%) pterygium. Four eyes (3.70%) developed recurrence, 1 having type 2 (1.51%) and 2 having type 3 (7.69%) pterygium. All patients with recurrence had thick fleshy progressive pterygium. Graft edema with yellowish discoloration was noted in 22 patients. One patient developed conjunctival cyst.

Conclusions: Adherence of the CAG with AB in pterygium surgery showed promising results in terms of long-term outcome and nonrecurrence, suggesting the potential for AB to be considered as a norm for pterygium surgery due to its economic advantage over fibrin glue and faster recovery compared to CAG with sutures for underprivileged patients.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S228

Tacrolimus 0.1% as an Alternative to Loteprednol 0.5% in the Management of Nummular Keratitis: A Pilot Study in 100 Cases

First Author: Madhu UDDARAJU

Purpose: The objective of the study was to assess the efficacy of tacrolimus 0.1% eye ointment for nummular keratitis in comparison with loteprednol 0.5%.

Methods: This prospective pilot study involved enrolment of 100 cases of nummular keratitis post adenoviral kertoconjunctivitis randomly either into a group that received loteprednol 0.5% or tacrolimus 0.1% apart from lubricants. Each patient was followed at an interval of 1 week post randomization and was objectively assessed for both symptomatic relief and reduction of clinical signs of keratitis.

Results: Fifty-two cases were enrolled in the tacrolimus group and 48 cases were enrolled in the loteprednol group. Symptomatic relief and reduction in clinical signs of allergy were comparable in both the groups and both the drugs were equally efficacious. Recurrences were relatively more in the loteprednol group after stopping treatment.

Conclusions: Tacrolimus 0.1% eye ointment may be used as safe and viable alternative to steroids like loteprednol in management of nummular keratitis. Further larger studies are required to validate our results.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

A Clinical Utility Assessment of the Automatic Measuring Method of the Quality of Meibomian Glands

First Author: Lei TIAN

Co-Author(s): Robert KOPROWSKI

Purpose: Based on Meibomian gland images recorded by OCULUS Keratograph 5M (K5M), a method of automatic analysis was developed to assess Meibomian glands for comparison between Meibomian gland dysfunction and healthy subjects.

Methods: The analysis made use of 57 images of patients recorded by K5M with a resolution of 1024 × 1360 pixels, including 30 eyes of healthy individuals (14 women and 16 men) and 27 eyes of

sick patients (10 women and 17 men). The diagnosis of dry eye disease (DED) was made according to the consensus of DED in China (2013). The presented method of analysis is a newly developed method enabling an automatic, reproducible, and quantitative assessment of Meibomian glands. The analysis relates to employing the methods of analysis and image processing. The analysis was conducted in the MATLAB environment Version 7.11.0.584, R2010b, Java VM Version: Java 1.6.0_17-b04 with Sun Microsystems Inc. with toolboxes: Statistical, Signal Processing i Image Processing.

Results: The presented new method of analysis of Meibomian glands is fully automatic, does not require operator intervention, allows obtaining reproducible results, and enables a quantitative assessment of Meibomian glands. Compared to the other known methods, particularly the methods described in the literature, it allows obtaining better sensitivity (98%) and specificity (100%) by 2%.

Conclusions: This noncontact meibography system is a useful and patient-friendly method to obtain information about the Meibomian gland structure. Compared to the other known methods, it allows obtaining better sensitivity and specificity.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Artificial Intelligence Imaging-Based Customized Corneal Crosslinking: A Novel Approach to Strengthen the Cornea

First Author: Vaitheeswaran **GANESAN**

Co-Author(s): Mathew **FRANCIS**, Abhijit **SINHA**, Rohit **SHETTY**

Purpose: To study the refractive and keratometric outcomes of an artificial intelligence (AI)-based approach for topography-guided customized crosslinking.

Methods: Fifteen keratoconic (KC) eyes underwent topography-guided crosslinking (Avedro Inc, USA). Three-dimensional AI-based model was used to calculate the shape and size of the cone and design concentric treatment zones to deliver differential energy. The topography was used to design a patient-specific ultraviolet (UV) beam, which was centered and had peak intensity at a point determined by the AI model. The delivered energy varied from 15 at the center to 3 J/cm² at the periphery of the UV beam. The maximum treated diameter was 8 mm. Topography was measured with Pentacam HR. Corneal deformation was measured with Corvis-ST. Refractive and keratometric

data were measured before and after (6 months) surgery.

Results: Mean manifest refractive spherical equivalent (MRSE), flat and steep axis keratometry, mean keratometry, and maximum keratometry showed reduction 3 months after the surgery. Root mean square (RMS) of anterior lower order aberration, higher order aberration, and total aberration did not show a significant difference before or 3 months after the procedure. Similar results were obtained with the RMS of the posterior corneal surface.

Conclusions: A mathematical AI-based approach was used to calculate the treatment algorithm for customizable topography-guided crosslinking. This method shows similar refractive, keratometric, and biomechanical outcomes to those reported earlier in the literature. The safety profile of AI-based crosslinking is also acceptable with no significant endothelial damage. Further study is needed with varying preprogression material property parameters.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Cellular Biomarkers and Impact on Corneal Crosslinking: A Mechanistic Approach

First Author: Pooja **KHAMAR**

Co-Author(s): Arkasubhra **GHOSH**, Abhijit **SINHA**, Rohit **SHETTY**

Purpose: Because it is not understood how the ectatic cone areas respond to crosslinking (CXL) compared to nonectatic peripheral areas of the same cornea, we evaluated the efficacy of differential energy delivery and its effect on clinical and molecular markers in patients with progressive keratoconus.

Methods: Forty-four patients of progressive keratoconus were treated with topoguided ultraviolet A (UVA) beam of differential energy delivered in a graded manner over the ectatic cornea by the KXL II system (Avedro). The surface dose varied from 3-10.8 J/cm². The treatment area was based on Pentacam HR. In a subset of 17 patients, using a 4.5-mm trephine centered on the cone apex, epithelium was debrided whereas the surrounding area was marked as periphery and debrided prior to the procedure during surgery. Expression levels were determined for TIMP1, TGFβ, collagen I/IV, MMP9, IL6, and IL10. Mean refractive spherical equivalent (MRSE), topography indices, and deformation amplitude (DA) were assessed preoperatively and at 6 months posttreatment.

Results: Mean MRSE reduced significantly by 0.66 ± 0.21 diopters (D) (P = 0.003). Kmean and kmax also

reduced, but without statistical significance. Mean DA reduced by 0.02 ± 0.01 but was not significant ($P = 0.07$). Elevated cone-specific TIMP-1 ($r = 0.77$, $P = 0.015$) and TGF- β ($r = 0.68$, $P = 0.03$) showed positive significant correlation with kmax in the 17 patients.

Conclusions: Keratometric and biomechanical parameters indicate benefits without statistical significance. Statistically significant reduction of MRSE suggests refractive benefits of the procedure. Elevated TIMP-1 and TGF- β correlating positively with kmax ($n = 17$) suggests that patients with higher levels of remodelling factors produced at ectatic areas may lead to better corneal stability post-CXL.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Combined OCT-Guided Femtosecond Laser-Assisted Intracorneal Ring Segment Implantation and Corneal Collagen Crosslinking Using Intracorneal Riboflavin Injection for the Correction of Corneal Ectasia

First Author: Minoru **TOMITA**

Purpose: To evaluate 1-year postoperative visual and refractive outcomes after femtosecond laser-assisted intracorneal ring segment (ICRS) implantation followed by corneal collagen crosslinking (CXL) using intracorneal riboflavin injection for the management of corneal ectasia.

Methods: This retrospective study included 154 eyes of 108 patients with keratoconus or post laser-assisted in situ keratomileusis (post-LASIK) ectasia. All eyes underwent optical coherence tomography (OCT) guided femtosecond laser-assisted ICRS implantation. ICRS implantation was followed by a new method of CXL involving no need for epithelium removal [riboflavin 0.25% was injected into the tunnel; after waiting for 5 minutes, the tunnel was washed with balanced salt solution (BSS) and then ultraviolet A (UVA) exposure of 18 mW for 5 minutes was applied]. At 1, 3, 6, and 12 months postoperatively, the parameters evaluated were visual acuity, refraction, and keratometry.

Results: Improvements in refractive, keratometric, and visual acuity parameters were observed at 1, 3, 6, and 12 months. At the last follow-up visit at 12 months, K mean was significantly improved to 50.38 ± 5.45 from 47.03 ± 5.80 ($P = 0.00067$) and astigmatism was significantly decreased from -4.93 ± 4.9 to -3.28 ± 1.92 ($P < 0.01$). Preoperative versus 12-month postoperative manifest refraction spherical equivalent (MRSE) were -8.40 ± 6.33 diopters (D) and -6.64 ± 5.07 D, respectively. UDVA [logarithm of the minimum

angle of resolution (logMAR)] and CDVA (logMAR) improved from preoperative levels of 1.14 ± 0.07 and 0.25 ± 0.57 , respectively, to 0.71 ± 0.20 and 0.19 ± 0.65 postoperatively.

Conclusions: OCT-guided femtosecond laser-assisted ICRS implantation followed by corneal CXL is an effective and safe treatment for keratoconus or post-LASIK ectasia. The procedure resulted in significant improvement in visual acuity, refractive, and keratometry parameters.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Corneal Crosslinking in Progressive and Stable Keratoconus

First Author: Yu Meng **WANG**

Co-Author(s): Tommy **CHAN**, Vishal **JHANJI**, Calvin **PANG**, Marco **YU**

Purpose: To compare the progression rate of corneal topographic parameters in stable and progressive keratoconus and to study the effect of corneal collagen crosslinking (CXL) in progressive keratoconus.

Methods: Based on corneal topography and clinical presentations, the keratoconus patients were differentiated to be stable and progressive. A total of 145 stable eyes were given no CXL and followed for a median duration of 31 months. Forty-five progressive eyes underwent accelerated, epithelium-off CXL and were followed for 37 months. The rate of progression was calculated using linear mixed effect models, in which the significant slope against time defined progression.

Results: Patients in the CXL group were significantly younger compared to those in stable no-CXL group ($P = 0.004$). Significant differences were observed in all parameters ($P \leq 0.035$) between the 2 groups except Ant Cyl and Post Cyl. Significant intergroup differences were noted in the progression rate of Ant Kf, Ant AvgK, Post Kf, and Post AvgK ($P \leq 0.045$). After CXL, the mean progression rate of corneal keratometry (Ant Ks, Ant Kf, Ant AvgK, Post Ks, Post Kf, Post AvgK) decreased significantly in CXL, and a significant decrease in the progression rate was noted to a level that was comparable to eyes in no-CXL. High R-squared values (<0.9) for posterior and anterior corneal parameters suggest that these can be utilized to monitor disease progression in keratoconus.

Conclusions: CXL is effective only for progressive keratoconus. Adequate and progressive changes in corneal parameters are mandatory in order to avoid unnecessary intervention.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Corneal Stromal Augmentation: An Effective Alternative to DALK in Advanced Nonscarred Keratoconic Eyes

First Author: *Lional Raj* **PONNIAH**Co-Author(s): *Heber* **ANANDAN**

Purpose: To compare the outcomes of the corneal stromal augmentation technique (CSA) with deep anterior lamellar keratoplasty (DALK) in advanced nonscarred keratoconic corneas.

Methods: Femtosecond-assisted donor corneal stromal lenticule (180-250 μm thick, 8.0-8.75 mm in diameter) was fashioned and a bed created intrastromally with 2 incisions 180 degrees apart in the nonscarred keratoconic recipient eye again using femtosecond lasers, through which the donor lenticule was transplanted for a stromal augmentation. Difference in preoperative and postoperative uncorrected and corrected visual acuity, pachymetry, anterior and posterior corneal elevation changes, and reversal of irregular astigmatism (Sim K and inferior to superior asymmetry) were compared between the stromal augmentation technique and DALK

Results: Fifteen eyes of CSA were compared with 15 eyes of DALK at a follow-up of 1 year. CSA and DALK improved vision by 4 lines and 3 lines, respectively. Both procedures increased central mean pachymetry to normal (583 μm in CSA, 573 μm in DALK). CSA and DALK flattened keratoconus significantly. DALK flattened the anterior cornea more ($P = 0.287$), though this was statistically insignificant, whereas CSA flattened the posterior cornea significantly ($P = 0.010$) more than DALK. Both reversed irregular astigmatism ($P < 0.05$) with improved Sim K values. Postoperative inferior to superior asymmetry (I/S) was closer to an assumed acceptable difference of 2.5 diopters (D) in both groups.

Conclusions: Regarding improvement in vision, flattening of cornea, reversal of ectasias, and improvement in irregular astigmatism, CSA is comparable to DALK and no worse than DALK, without sacrifice of recipient tissue and suture-related events.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Creation and Validation of a Classifier Model for Keratoconus Detection Using Interocular Asymmetry-Based Parameters

First Author: *Gaurav* **PRAKASH**Co-Author(s): *Dhruv* **SRIVASTAVA**, *Vishal* **JHANJI**

Purpose: To explore if normative limits of interocular asymmetry can be used to differentiate between normal and keratoconic eyes in a classification-based automated system.

Methods: In the first part of the study, medical records of 150 patients (100 bilateral normal, 50 bilateral keratoconus) were randomly selected and reviewed. Scheimpflug scans (Sirius, CSO, Italy) were evaluated. Corneal thinnest point, apex and central characteristics [curvature, corneal thickness (CT)], and 6-mm anterior corneal higher order aberrations (HOARMS) were evaluated. In the second part, the classifier model was built using statistical cutoffs of 1 and 2 standard deviations from the normal eyes. The sensitivity and specificity of interocular difference and interocular average were used to validate the classifier on 50 new patients (25 each keratoconus and normal).

Results: Normal eyes had lower mean curvature and HOARMS and higher pachymetry. Both measures of interocular symmetry, absolute difference and normalized absolute difference, were also significantly lower in normal eyes. The absolute difference values were as follows: HOARMS, $1.6 \pm 1.3 \mu\text{m}$ vs $0.14 \pm 0.3 \mu\text{m}$; apex keratometry, 6.1 ± 6.5 diopters (D) vs 0.8 ± 0.7 D; and thinnest CT, $38.9 \pm 42.1 \mu\text{m}$ vs $7.0 \pm 7.5 \mu\text{m}$ for keratoconic and normal eyes, respectively. This 3-variable classifier was tested on 50 new cases and had sensitivity of 1.0 for both the average and difference classifiers but specificity of 0.95 for average and of 0.29 for difference.

Conclusions: An interocular difference-based classifier considering the absolute difference between apex keratometry, thin CT, and 6-mm corneal anterior HOARMS can be used as a highly sensitive screening tool differentiating between normal and keratoconic eyes.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Histological and MicroRNA Signatures of Corneal Epithelium in Keratoconus

First Author: Tsz-Kin **NG**

Co-Author(s): Kwong Wai **CHOY**, Vishal **JHANJI**, Chi Pui **PANG**, Yu Meng **WANG**

Purpose: To illustrate the histopathology of keratoconus corneal epithelia and its microRNA (miRNA) regulation.

Methods: Corneal epithelia were collected from 27 keratoconus patients and 26 normal subjects after surgery or by impression cytology. The miRNA profile was determined using miRNA microarray. The biological roles of miRNA target genes were delineated by gene ontology and pathway analyses. The expressions of significant miRNAs were validated using TaqMan polymerase chain reaction (PCR), whereas protein localization and expression of the miRNA target genes were examined by immunofluorescence and immunoblotting analyses.

Results: Histological assessment showed that corneal epithelia in keratoconus patients were thinner with loosely packed cells as compared to that in normal subjects. Microarray analysis revealed that 12 miRNAs were significantly downregulated in keratoconus corneal epithelia. Gene ontology analysis demonstrated that the predicted miRNA target genes participated in cell junction, cell division, and motor activity, whereas pathway analysis highlighted the involvement of syndecan-mediated signaling pathway. TaqMan PCR validated the altered expression of 6 miRNAs in corneal epithelia from surgery (hsa-miR-151a-3p, hsa-miR-138-5p, hsa-miR-146b-5p, hsa-miR-194-5p, hsa-miR-28-5p, and hsa-miR-181a-2-3p) and 4 miRNAs in squamous corneal epithelial samples collected from impression cytology (hsa-miR-151a-3p, hsa-miR-195-5p, hsa-miR-185-5p, and hsa-miR-194-5p). In addition, higher S100A2 expression was found in the epithelial basal cell layer of keratoconus corneal epithelia.

Conclusions: The miRNA and histological analyses in this study demonstrated structural and biological changes in keratoconus corneal epithelia, broadening the understanding of keratoconus pathology. In addition, impression cytology is useful to collect corneal epithelial tissues for gene expression analysis.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Impact of Bubbling Pressure on Endothelial Cell Quality in Pre-Descemet Endothelial Keratoplasty Preparation

First Author: Joshua **HOU**

Co-Author(s): Peter **BEDARD**

Purpose: To evaluate the impact of inflation pressure on post-processing endothelial cell quality after pre-Descemet endothelial keratoplasty (PDEK) preparation.

Methods: Transplantable grade research donor corneas were obtained for PDEK preparation. Samples were randomized to inflation using injection of air versus Optisol. PDEK preparation was performed under continuous pressure monitoring using an in-line pressure gauge (DPI 705 series). Bubble type (1 vs 2), peak inflation pressure (PIP), and mean expansion pressure (MEP) during bubble formation were documented. Trypan blue and Fiji-imageJ software were used to grade the PDEK tissue as acceptable (<25% global cell loss) or unacceptable.

Results: In total, 25 corneas were tested. A type 1 bubble was obtained in 56.0% of cases, while a type 2 bubble was obtained in 32.0% of cases. Mean PIP was statistically higher for type 1 (1030.5 mm Hg) versus type 2 (593.1 mm Hg) ($P = 0.012$) bubbles. Mean MEP trended higher for type 1 (667.3 mm Hg) versus type 2 (449.6 mm Hg) ($P = 0.056$) bubbles. There was no difference in mean PIP or MEP between use of air (706.0 mm Hg, 510.7 mm Hg) and use of Optisol (852.9 mm Hg, 653.0 mm Hg). A total of 29% of type 1 bubbles had acceptable endothelial cell quality compared to 88% of type 2 bubbles ($P = 0.012$). Increasing PIP and MEP were associated with an increased risk of significant post-processing endothelial cell loss.

Conclusions: Significant endothelial cell loss can occur during PDEK bubbling. Type 1 bubbles are associated with higher inflation pressures and more endothelial cell loss compared to type 2 bubbles. Increasing PIP and MEP during bubble formation are both associated with cell loss and should be minimized during PDEK preparation.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Intense Pulsed Light Treatment for Dry Eye Disease and Change in Osmolarity

First Author: Francesco **CARONES**

Purpose: Chronic meibomian gland dysfunction (MGD) results in increased tear evaporation and abnormal tear osmolarity leading to ocular discomfort and dry eye disease (DED). Intense pulsed light (IPL) treatment has been shown to improve signs and symptoms of evaporative DED associated with MGD. The objective of the study was to assess changes in tear osmolarity with IPL treatment.

Methods: A prospective interventional case series was conducted with 70 patients (140 eyes) presenting with DED associated with MGD. IPL therapy (E-Swin, Paris, France) uses regulated flash technology to deliver constant luminous power to allow optimal spacing and energy to stimulate the meibomian glands and regain normal function. Tear osmolarity was measured at baseline and at day 75. Data was analyzed to report changes in tear osmolarity pre- and post-IPL therapy.

Results: Mean age was 59.8 ± 12.2 years and included 45 females and 25 males. Mean tear osmolarity at baseline was 316.0 ± 16.8 mOsm/L with intereye difference of 14.1 ± 9.4 mOsm/L. At day 75, there was significant reduction in tear osmolarity (mean: 289.9 ± 4.9 mOsm/L, $P < 0.0001$) and intereye difference of 5.9 ± 3.9 mOsm/L, $P < 0.0001$. Reduction in tear osmolarity was significantly correlated to baseline tear osmolarity ($r^2 = 0.87$, $P = 0.002$) indicating effective reduction in DED severity.

Conclusions: Significant reduction in tear osmolarity was measured following IPL therapy. Tear osmolarity provides objective and quantitative tracking of therapeutic efficacy of IPL therapy for treatment of DED with MGD.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Statistical Models to Define Treatment Failure/Inadequacy and Indications for Retreatment in Corneal Crosslinking for Keratoconus

First Author: Gaurav **PRAKASH**Co-Author(s): Vishal **JHANJI**, Reena **PHILIP**

Purpose: The purpose of this study was to review

keratoconus cases after crosslinking (CXL) (>1 year) and evaluate their intersession repeatability to define limits of normal variation and thus define numerical guidelines for considering the initial treatment as insufficient/failed.

Methods: In this cross-sectional observational study performed at a specialized hospital, 60 keratoconic eyes of 60 patients who had undergone corneal crosslinking for topographically documented keratoconus at least 1 year prior were included. Three sessions at least 3 days apart each were performed to evaluate intersession repeatability.

Results: The mean intrameasurement standard deviation (Sw) and coefficient of repeatability ($2.77 \times Sw$) were as follows: thinnest cornea (TCP), 4.2 and $11.6 \mu\text{m}$; apex curvature, 0.6 and 1.6 diopters (D); corneal volume at central 10 mm, 0.74 and 2.06 mm^3 ; steep central keratometry, 0.45 and 1.23 D; and central corneal thickness (CCT), 3.6 and $10.03 \mu\text{m}$. The intraclass correlations (absolute agreement) were as follows: TCP, 0.98; apex curvature, 0.98; corneal volume at central 10 mm, 0.90; steep central keratometry, 0.94; and CCT, 0.99.

Conclusions: Based on our intersession repeatability data, in crosslinked keratoconic eyes at least 1 year after treatment, a worsening of $>12 \mu\text{m}$ in TCP, $>10 \mu\text{m}$ in CCT, >1.6 D in apex curvature, or >1.25 D in steep central keratometry can be considered strongly suggestive (>95% certainty) of progression of the pathology. A biologically plausible combination of these parameters should be used to increase the specificity of interpretation. These guidelines may also be used to re-crosslink a keratoconic cornea if other parameters such as corneal thickness are favorable.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S224-S225

Vision-Related Quality of Life in Patients With Keratoconus

First Author: Hamideh **MAHDAVIAZAD**Co-Author(s): Shahram **BAMDAD**, Sahar **MOHAGHEGH**, Narges **ROSTA**

Purpose: The purpose of this study was to evaluate vision-related quality of life in keratoconus patients according to disease severity by using the National Eye Institute Visual Function Questionnaire-25 (NEI-VFQ-25).

Methods: In a cross-sectional study 111 patients presenting with keratoconus (keratoconus group) and 26 healthy persons (control group) were included. Both groups were matched considering age and

education level. In the keratoconus group according to their average steep keratometric value in both eyes (k) patients were divided into mild [$k < 45$ diopters (D)], moderate ($k = 45-50$ D), and severe ($k > 52$ D) groups. Best corrected distance visual acuity (BCSVA) was recorded in logarithm of the minimum angle of resolution scale. Each subject completed the 25-item NEI-VFQ-25.

Results: Overall composite score was 74.45 ± 17.13 in keratoconus and 90.73 ± 8.66 in the control group ($P = 0.00$). Difference between scores of the keratoconus and control groups was more than 15 marks in the subscale of general, distance, near and peripheral vision, mental health, and ocular pain. In both eyes BCSVA was 0.15 ± 0.16 in keratoconus and 0.00 ± 0.00 in the control group ($P = 0.00$). In the keratoconus group overall composite score was 88.24 ± 11.49 , 76.31 ± 16.89 , and 64.69 ± 17.01 in mild, moderate, and severe subgroups, respectively ($P = 0.00$).

Conclusions: Vision-related quality of life was worse in keratoconus patients. The NEI-VFQ-25 score, the same as clinical parameters such as keratometric values, can indicate the severity of keratoconus disease.

Glaucoma

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

A Multicenter Retrospective Comparison of Kahook Dual Blade Goniotomy to iStent Trabecular Bypass Device Implantation in Glaucoma Patients Undergoing Cataract Extraction

First Author: Inder **SINGH**

Co-Author(s): Syril **DORAJAJ**, Gabriel **LAZCANO-GOMEZ**, Leonard **RAPPAPORT**, Mark **GALLARDO**, Leonard **SEIBOLD**

Purpose: To compare outcomes in eyes with cataract and mild to moderate glaucoma undergoing phacoemulsification with Kahook Dual Blade (KDB) goniotomy or iStent trabecular bypass.

Methods: Retrospective analysis of intraocular pressure (IOP) and IOP medication reduction in eyes undergoing phaco with KDB goniotomy ($n = 237$) or iStent ($n = 198$) with 6 months' follow-up.

Results: Mean IOP in the KDB group decreased from 17.9 ± 4.4 mm Hg at baseline to 13.6 ± 2.7 mm Hg at month 6 ($P < 0.001$), with mean medication use decreasing from 1.7 ± 0.9 to 0.6 ± 1.0 ($P < 0.001$). In the iStent group, mean IOP decreased from 16.7 ± 4.4 mm Hg to 13.9 ± 2.7 mm Hg ($P < 0.001$), with mean

medication use decreasing from 1.9 ± 0.9 to 1.0 ± 1.0 ($P < 0.001$). Mean IOP reductions from baseline were significantly greater in the KDB group at month 6 [KDB -4.2 mm Hg (23.7%) vs iStent -2.7 mm Hg (16.4%); $P < 0.001$]. IOP reductions $>20\%$ at month 6 were achieved by 56.1% and 43.9% in the KDB and iStent groups, respectively ($P = 0.011$). Medication reduction was greater in the KDB group [-1.0 (62.9%) vs -0.6 (46.1%) medications, respectively; $P = 0.001$]. More KDB than iStent eyes discontinued >1 medication by month 6 (77.6% vs 64.1%, respectively; $P = 0.002$). Mean visual acuity improved from 0.4 ± 0.3 to 0.1 ± 0.2 logarithm of the minimum angle of resolution (logMAR) in both groups. Intraoperative blood reflux was more common in the KDB group (23.6%) compared to the iStent group (2%).

Conclusions: KDB goniotomy yields significantly greater IOP reduction and medication reduction than iStent when combined with phaco in glaucoma.

Feb 09, 2018 (Fri)

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Venue: S425

An Observational Study to Evaluate a New Scoring System for Angle Dimension in Angle Closure Disease

First Author: Supriya **SHARMA**

Co-Author(s): Aparna **RAO**

Purpose: To evaluate the applicability of a simple scoring system to indicate the overall prognosis of the disease based on gonioscopic features and anterior segment optical coherence tomography (AS-OCT).

Methods: This was an observational prospective study where 128 patients [50 controls, 15 primary angle closure suspect (PACS), 35 primary angle closure (PAC), and 38 primary angle closure glaucoma (PACG)] naive to any kind of surgical intervention were examined. Scoring system was developed based on gonioscopic and biometric features and these scores were compared with the control group and among the various subgroups of angle closure disease. AS-OCT parameters were recorded and their relation with the scoring system to stratify patients of angle closure disease was assessed.

Results: The gonioscopic features were found to be statistically different among the subgroups PACS, PAC, and PACG ($P < 0.0001$) and when compared to controls. No significant difference was observed in the biometric parameters between these groups. The scores were also found to be significantly ($P < 0.001$) different in these groups. The AS-OCT parameters were found to be different when these groups were compared to

the controls; however no significant difference was observed within these subgroups of primary angle closure disease (PACD). The AS-OCT parameters did not independently affect the scores in this study.

Conclusions: In our study gonioscopy was found to be a better tool for stratification of angle closure disease. Such a scoring system would help us to classify PACD in a better way and AS-OCT based classification needs further studies with a larger sample size.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

Anterior but not Posterior Choroid Changes Before and During Valsalva Maneuver in Healthy Chinese: A UBM and SS-OCT Study

First Author: Rouxi **ZHOU**

Co-Author(s): Fei **LI**, Xiulan **ZHANG**

Purpose: To determine if the anterior choroid is involved in ocular change during the Valsalva maneuver (VM).

Methods: Fifty-three healthy volunteers aged 18–65 years with normal visual field and no history of intraocular pressure (IOP) exceeding 21 mm Hg were recruited. Anterior and posterior choroidal changes before and during VM were recorded by ultrasound biomicroscopy (UBM) and swept source optical coherence tomography (SS-OCT), respectively. Parameters of the anterior segment included ciliary body thickness (CBT0), thickness of anterior choroid (CT4), anterior placement of the ciliary body (APCB), and trabecular-ciliary angle (TCA). Thickness of different layers of the retina and posterior choroid were also measured and compared before and during VM. IOP, blood pressure (BP), and heart rate (HR) were also recorded and analyzed.

Results: VM caused elevated IOP, systolic BP, diastolic BP, and increased HR. There was a significant increase in anterior parameters including CBT0 (from 1.00 ± 0.09 mm to 1.11 ± 0.10 mm, $P < 0.001$), CT4 (from 0.29 ± 0.04 mm to 0.36 ± 0.05 mm, $P < 0.001$), and APCB (from 0.76 ± 0.11 mm to 0.88 ± 0.13 mm, $P < 0.001$), but not in TCA or PD ($P > 0.05$). However, there was no significant change in the posterior choroid or retina ($P > 0.10$).

Conclusions: VM did not affect the posterior choroid, but it did cause thickening of the anterior choroid and the ciliary body, both of which lead to a larger anterior placement of the ciliary body and a narrowed anterior chamber. The anterior (but not the posterior) choroid could be related to IOP elevation and a narrowed anterior chamber in primary angle closure diseases.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

Characteristic Pattern of OCT Abnormalities in the RNFL Thickness Deviation Map Enables Differentiation Between False-Positive and Glaucoma in Myopic Eyes

First Author: Kunliang **QIU**

Co-Author(s): Nomdo **JANSONIUS**, Geng **WANG**, Mingzhi **ZHANG**

Purpose: (1) To describe the pattern of optical coherence tomography (OCT) abnormalities in the peripapillary retinal nerve fiber layer (RNFL) deviation map in healthy myopic eyes and (2) to compare the location of the abnormalities between healthy and glaucomatous myopic eyes.

Methods: Peripapillary RNFL thickness was assessed with Cirrus OCT in 137 myopic eyes [median spherical equivalent -4.9 diopters (D)] of 137 healthy subjects and 25 eyes (-4.6 D) of 25 glaucoma patients (group 1) and with Topcon OCT-2000 in 116 myopic eyes (-3.0 D) of 116 healthy subjects and 74 eyes (-2.0 D) of 74 patients (group 2). We recorded (1) the area of the color-coded region in the RNFL thickness deviation map and (2) the location of the color-coded region relative to the major temporal retinal vessels. We calculated the sensitivity and specificity with a positive test defined as (1) presence of a color-coded region that qualified as abnormal and (2) presence of a color-coded region that qualified as abnormal and was located at least partially on the temporal side of the major temporal vessels.

Results: By taking the location into account, the specificity increased from 22.6% to 96.4% in group 1 ($P < 0.001$) and from 62.1% to 94.0% in group 2 ($P < 0.001$). Corresponding sensitivities were 96% and 96% (group 1) and 94.6% and 91.9% (group 2).

Conclusions: The location of the color-coded region in the RNFL thickness deviation map relative to the major temporal retinal vessels offers a simple and valuable clue for differentiating between false-positive and glaucoma in myopic eyes.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

Comparison of a New Low Cost Nonvalved Glaucoma Drainage Device With Ahmed Glaucoma Valve in Refractory Pediatric Glaucoma

First Author: Sriramani **GOLLAKOTA**

Co-Author(s): Chandrasekhar **GARUDADRI**, Sirisha **SENTHIL**, Kiranmaye **TURAGA**

Purpose: Retrospective review of children (age \leq 16 years) treated with drainage implants [Aurolab aqueous drainage implant (AADI) and Ahmed glaucoma valve (AGV)] from January 2007 to December 2016 with minimum follow-up of 3 months.

Methods: Success was defined as intraocular pressure (IOP) 5 to 21 mm Hg [with or without topical antiglaucoma medications (AGM)], no repeat glaucoma surgery, and no sight-threatening complications.

Results: We analyzed 120 eyes (AADI: 36, AGV: 85). Median follow-up for the AADI and AGV groups was 11.05 (7.1, 20.2) and 27 (15.3, 52.3) months, respectively. The age, preoperative IOP, and number of AGMs were similar but the number of previous intraocular surgeries was significantly greater in the AADI group ($P = 0.05$). The success probability was similar in both the AADI and AGV groups, which was 90% at 12 months and 80% at 36 months ($P = 0.819$). The AADI group showed lower mean IOP (13.5 ± 5.8 vs 17.2 ± 6.7 , $P = 0.007$), lesser median number of AGMs [1 (0, 2) vs 2 (1, 3), $P < 0.001$], and fewer eyes with hypertensive (HT) phase (16.5% vs 40%, $P = 0.02$). In our study, complications that needed intervention were 11.1% in the AADI group and 14.1% in the AGV group ($P = 0.87$). Sight-threatening complications were seen in 1 eye in the AADI group and 5 eyes in the AGV group ($P = 0.79$).

Conclusions: In our study both AGV and AADI implants had similar efficacy at the end of 1 and 3 years. However, eyes with the AADI implant had better IOP control, needed fewer AGMs, had lesser hypertensive phase, and were cost effective compared to AGV.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

Cost-Effectiveness of Phacoemulsification Versus Combined Phacotrabeculectomy for Treating Primary Angle Closure Glaucoma

First Author: Poemen **CHAN**

Co-Author(s): Yolanda **KWONG**, Emmy **LI**, Clement **THAM**, Kelvin **TSOI**

Purpose: To compare the cost-effectiveness of phacoemulsification and combined phacotrabeculectomy for lowering intraocular pressure (IOP) in primary angle closure glaucoma (PACG) eyes with coexisting cataract.

Methods: Real-life data of 2 previous randomized controlled trials that involved 51 medically uncontrolled PACG eyes and 72 medically controlled PACG eyes were utilized to calculate the direct cost of treatment. Cost of preoperative assessments, surgical interventions, additional procedures for managing complications and maintenance of filtration, postoperative follow-up, and cost of medications were considered. Cost data of 3 different regions (United States, People's Republic of China, and Hong Kong) were included in the scenario.

Results: The corresponding average costs for treating 1 eye with newly diagnosed PACG by phacoemulsification alone and combined phacotrabeculectomy were US\$3479 and \$2439 in the United States, US\$1051 and \$861 in China, and US\$6856 and \$12087 in Hong Kong. Surgical and medication costs were the 2 key contributors. Combined phacotrabeculectomy is more cost-effective for IOP reduction when calculating with the US and China cost data, but not when calculating with the Hong Kong cost data. Furthermore, for the medically uncontrolled PACG group, phacoemulsification alone became more cost-effective when the cost of medication was reduced by more than 75%. The cost-effectiveness was insensitive to the cost of follow-up visits and investigations, cost of surgical operation, and cost of postoperative procedures but sensitive to the cost fluctuation of medications.

Conclusions: Combined phacotrabeculectomy is a more cost-effective option when aiming at maintaining IOP of ≤ 21 mm Hg for PACG eyes with coexisting cataract over a 2-year follow-up period.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

Direct and Indirect Associations Between Diabetes and Intraocular Pressure: The Singapore Epidemiology of Eye Diseases Study

First Author: Xiao Yang **LUO**

Purpose: The association between diabetes and higher intraocular pressure (IOP) is controversial. Furthermore, as diabetes has also been associated with greater central corneal thickness (CCT), and greater CCT is known to overestimate IOP, it is unclear if the higher IOP in diabetes is primarily an overestimation. We therefore aimed to clarify the diabetes-IOP association, considering CCT as a potential mediator.

Methods: We included 8636 participants from the Singapore Epidemiology of Eye Diseases (SEED) Study. IOP was measured using Goldmann applanation tonometry. Diabetes was defined as random glucose ≥ 11.1 mmol/l, HbA1c $\geq 6.5\%$, self-reported use of diabetic medication, or physician diagnosis of diabetes. Associations of diabetes, serum glucose, and HbA1c levels with IOP were assessed using path regressions models, with adjustments for multiple potential confounders. Regression-based pathway analyses were further performed to evaluate the indirect effects of diabetes on IOP through the intermediate effects.

Results: Of the subjects, 2524 (29.23%) had diabetes. Diabetes, higher serum glucose, or HbA1c levels were all associated with higher IOP (all $P < 0.01$). These associations were all significantly mediated through the indirect effect of CCT; however, the magnitude of this indirect effect was small, with a mediated proportion of 11.09%. Axial length (AL) and spherical equivalent (SE) were not intermediate variables in the diabetes-IOP association.

Conclusions: Diabetes, and higher long-term glycemic levels specifically, are associated with higher IOP. The mediatory effect of CCT on this association was small. Thus, higher IOP in diabetes is not primarily an overestimate. This may have pathophysiological significance with respect to glaucoma.

Feb 09, 2018 (Fri)

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Venue: S425

Evaluation of Ganglion Cell-Inner Plexiform Layer Thinning in Eyes With Optic Disc Hemorrhage: A Trend-Based Progression Analysis

First Author: Won June **LEE**

Co-Author(s): Jin Wook **JEOUNG**, Young Kook **KIM**, Ki Ho **PARK**

Purpose: To evaluate the rate of change in ganglion cell-inner plexiform layer (GCIPL) thickness measured by optical coherence tomography (OCT) using a trend-based approach in early-stage glaucomatous eyes with disc hemorrhage (DH) and to compare the GCIPL thinning rate with that in glaucomatous eyes without DH.

Methods: This prospective observational study included 50 patients with early-stage open-angle glaucoma and DH who underwent serial spectral-domain OCT measurements for at least 30 months. The GCIPL thinning rate in the global, superior, or inferior hemiretinas and in 6 macular sectors was determined by linear regression and compared between glaucomatous eyes with DH and fellow glaucomatous eyes without DH and between glaucomatous eyes with DH and non-DH glaucomatous control eyes.

Results: The GCIPL thinning rate was significantly more rapid in glaucomatous eyes with DH than in fellow eyes without DH in the inferior hemiretina [-1.19 ± 0.92 (mean \pm standard deviation) versus -0.61 ± 0.84 $\mu\text{m}/\text{year}$, $P = 0.008$], inferotemporal sector (-1.30 ± 1.06 vs -0.76 ± 1.04 $\mu\text{m}/\text{year}$, $P = 0.028$), and inferior sector (-1.33 ± 1.11 vs -0.66 ± 1.01 $\mu\text{m}/\text{year}$, $P = 0.017$). The GCIPL thinning rate was significantly more rapid in glaucomatous eyes with DH than in glaucomatous controls without DH in the global area (-0.87 ± 1.20 vs -0.49 ± 0.71 $\mu\text{m}/\text{year}$, $P = 0.041$), the inferior hemiretina (-1.11 ± 1.34 vs -0.59 ± 0.86 $\mu\text{m}/\text{year}$, $P = 0.017$), and the inferotemporal sector (-1.45 ± 1.18 vs -0.49 ± 1.00 $\mu\text{m}/\text{year}$, $P < 0.001$).

Conclusions: The GCIPL thinning rate on OCT was significantly more rapid in glaucomatous eyes with DH than fellow glaucomatous eyes without DH or glaucomatous control eyes without DH. DH could be associated with progression of glaucoma in terms of GCIPL thinning.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

MRI Evaluation of Ahmed Glaucoma Valve Bleb and Correlation to Intraocular Pressure in Neovascular Glaucoma

First Author: Charudutt **KALAMKAR**

Co-Author(s): Amrita **MUKHERJEE**

Purpose: To report results of morphological evaluation of blebs in patients with Ahmed glaucoma valve (AGV) implant using magnetic resonance imaging (MRI) and to correlate these parameters with preoperative and postoperative intraocular pressures (IOP).

Methods: Retrospective, consecutive, hospital-based case series of 12 adult refractory neovascular glaucoma (NVG) patients who underwent AGV implantation from September 2014 onwards. Minimum follow-up was 6 months. MRI was done to evaluate bleb morphology (bleb height, measurements in 2 axis, and bleb volume). Preoperative and postoperative IOP were correlated with bleb parameters.

Results: There was a positive correlation between postoperative IOP and bleb volume ($r = +0.557$, $P < 0.0001$) and bleb height ($r = +0.406$, $P < 0.0001$). There was no correlation between preoperative IOP or percentage reduction in IOP and bleb parameters. IOP reduced significantly from preoperative levels (preoperative: 41.5 ± 9.77 mm Hg vs postoperative: 15.5 ± 2.28 mm Hg, $P < 0.001$). MRI demonstrated presence of fluid not only above the AGV plate but also between the plate and sclera in all patients. Small sample size and shorter duration of follow-up are the main limitations of this study.

Conclusions: In patients with AGV implant, evaluation of bleb morphology using MRI may provide useful insight into the mechanisms of functioning and failure of AGV.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

Phacoemulsification Versus Phacoemulsification With iStent in Primary Angle Closure Glaucoma: 12-Month Results of a Randomized Controlled Trial

First Author: Jason **CHENG**

Co-Author(s): Anoop **THOMAS**, Tiakumzuk **SANGTAM**

Purpose: To evaluate the iStent (Glaukos) in combination with cataract surgery in primary angle

closure (PAC) and primary angle closure glaucoma (PACG).

Methods: A prospective, randomized controlled trial. Thirty-two patients with cataract and either PAC or PACG controlled on 1-3 medications were randomized to phacoemulsification (control) or phacoemulsification combined with iStent (iStent). Intraocular pressure (IOP) and the number of glaucoma medications were assessed. Success was defined as unmedicated IOP ≤ 18 mm Hg at 12 months.

Results: Preoperative mean IOP was 18.0 ± 4.0 mm Hg and 17.5 ± 4.0 mm Hg ($P = 0.52$), mean number of medications was 2.1 ± 0.8 and 1.8 ± 0.9 ($P = 0.28$), and unmedicated IOP post-washout was 27.3 ± 4.7 mm Hg and 26.0 ± 4.43 mm Hg ($P = 0.43$) in the control and iStent groups, respectively. At month 12, mean IOP was 15.0 ± 2.5 mm Hg and 14.66 ± 3.1 mm Hg ($P = 0.73$) and the mean number of medications was 0.75 ± 1.0 and 0.25 ± 0.7 ($P = 0.11$) in the control and iStent groups, respectively. At 12 months, 9/16 patients were defined as success in the control group compared to 14/16 in the iStent group ($P < 0.05$). The most common complication was IOP spike (IOP > 24 mm Hg), with 4/16 in the control and none in the iStent group. Five iStents (31%) were occluded by the iris, 2 of which required glaucoma medication.

Conclusions: Phaco plus iStent is effective in controlling IOP in PAC and PACG. There was no statistically significant difference in IOP or medication use between both groups, but the success rate of the iStent group was greater at 12 months. The use of iStent in PAC/PACG reduced early postoperative IOP spikes compared to the control group. However, there was a high rate of iris occlusion of the iStent when used in narrow angles.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S425

Single Session of Transscleral Diode Laser Cyclophotocoagulation in Refractory Glaucoma Treatment: A Retrospective Analysis

First Author: Made **WIDYANATHA**

Co-Author(s): Aldiana **HALIM**, Karmelita **SATARI**

Purpose: To investigate the efficacy of a single session of transscleral diode laser cyclophotocoagulation (TSCPC) treatment for refractory glaucoma and its effect on glaucoma medication as well as to evaluate a possible relation between intraocular pressure (IOP) reduction and TSCPC power at 3 months after treatment.

Methods: Medical records were reviewed for refractory glaucoma patients who were treated with a single session of TSCPC from January 2012 to December 2015. Main outcome measures were IOP, number of medications, and power used in treatment. Success was defined as 30% IOP reduction or more compared to pretreatment IOP.

Results: There were 108 eyes that had a single session of TSCPC treatment. Mean IOP decreased from 48 ± 10.2 mm Hg to 38.9 ± 17.8 mm Hg after the 3-month follow-up period ($P < 0.05$). Thirty-nine percent of patients were able to reduce the number of medications used, with mean reduction from 2.4 to 1.9 medications ($P < 0.05$). Kaplan-Meier analysis indicated probabilities of success at 1 day, 1 week, and 3 months after treatment were 25%, 50%, and 75%, respectively. Intraocular pressure after treatment at 3 months was not associated with the power used in treatment ($R^2 = 0.037$).

Conclusions: A single session of TSCPC was associated with IOP reduction and decreased number of antiglaucoma drugs. However, there was no association between IOP reduction and the power used in treatment.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Antifibrotic Effect of Conbercept (KH902) on Human Tenon Fibroblasts

First Author: Shaodan **ZHANG**

Co-Author(s): Wai Kit **CHU**, Lin **DU**, Hai Lin **WANG**

Purpose: To investigate the effect of conbercept (KH902) on the proliferation, extracellular matrix production, and cytokine secretion of human tenon fibroblasts (HTFs).

Methods: Human tenon tissue was obtained from adult strabismus patients during surgery. Primary cell culture for the HTFs was performed. Conbercept at 100 $\mu\text{g}/\text{mL}$ was administered for 24 hours in 10% serum conditions. The effect of conbercept on HTF proliferation and cell viability was determined using MTT assay. The mRNA expression of MKI67, alpha smooth muscle actin (α -SMA), fibronectin, and collagen type I was assessed by quantitative real-time polymerase chain reaction (PCR). Cell supernatants were tested for concentrations of secreted vascular endothelial growth factor (VEGF), monocyte chemotactic protein (MCP)-1, fibroblast growth factor (FGF-b), tumor necrosis factor- α (TNF- α), interferon gamma (IFN γ), and platelet-derived growth factor-BB (PDGF-BB) using multiplex bead analysis.

Results: Conbercept at 100 $\mu\text{g}/\text{mL}$ slightly reduced the

cell viability in cultured HTFs (93.72% of control). mRNA expression of MKI67, α -SMA, fibronectin, and collagen I was significantly downregulated by conbercept. The concentrations of secreted VEGF ($t = 3.962$, $P = 0.011$), FGF-b ($t = 4.735$, $P = 0.005$), TNF- α ($t = 4.293$, $P = 0.008$), and IFN- γ ($t = 2.796$, $P = 0.038$) were significantly lower in KH902-treated cell supernatants compared with untreated controls.

Conclusions: Conbercept could effectively downregulate the fibrosis-related mRNA and protein expression in HTFs. It may be used as a potential antifibrotic agent in glaucoma filtering surgery.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Antifibrotic Effect of Rapamycin, an Inhibitor of the mTOR Pathway, on the TGF- β 2 Induced Proliferation of Human Tenon Fibroblasts

First Author: Lin **DU**

Co-Author(s): Wai Kit **CHU**, Hailin **WANG**, Shaodan **ZHANG**

Purpose: Bleb failure by fibrotic scarring remains a major problem of glaucoma filtration surgery. Dysfunctional mammalian target of rapamycin (mTOR) signaling has recently been reported to participate in kidney, pulmonary, and cardiac fibrosis. In this study, we investigated the antifibrotic effect of rapamycin, an mTOR inhibitor, on the TGF- β 2 induced proliferation of human tenon fibroblasts (HTFs).

Methods: Human tenon tissue was obtained from adult strabismus patients during surgery. Primary cell culture for the HTFs was performed. After 24-hour incubation with TGF- β 2, HTFs were treated with rapamycin 1 nM for 48 hours. Cell viability and proliferation were measured with MTT method. The migration of HTFs was assessed by scratch wound assay. Flow cytometry of AnnexinV/propidium iodide (PI) staining was performed to measure the cell apoptosis. mRNA levels of mKi67, caspase 3, LC3B, mTOR, α -SMA, fibronectin, collagen I, and VEGF-A were analyzed by real-time polymerase chain reaction (RT-PCR).

Results: In cultured HTFs, TGF- β 2 promoted cell proliferation and migration significantly ($P < 0.01$). The mRNA expression of mKi67, mTOR, α -SMA, fibronectin, and collagen I were obviously upregulated compared with the controls. Rapamycin effectively attenuated the TGF- β 2 induced cell proliferation (80.8% of TGF- β 2 group) and migration. The upregulated MKI67, mTOR, α -SMA, fibronectin, and collagen I expression in TGF- β 2 treated HTFs was also distinctively inhibited by rapamycin. Cell apoptosis and caspase 3 mRNA

expression were not observed in all groups. The expression of VEGF-A was identical among groups.

Conclusions: Rapamycin could effectively prevent the TGF- β 2 induced proliferation and migration of HTFs without affecting cell survival.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Association Between Normal Tension Glaucoma and an Increased Risk of Alzheimer Disease: A Nationwide Population-Based Follow-Up Study

First Author: Yu-Yen **CHEN**

Purpose: To investigate a possible association between normal tension glaucoma (NTG) and an increased risk of developing Alzheimer disease (AD).

Methods: A population-based retrospective cohort study using the Taiwan National Health Insurance Research Database (NHIRD) from January 1, 2001, to December 31, 2013, was conducted. A total of 15,317 subjects with NTG were enrolled in the NTG group, and 61,268 age- and gender-matched subjects without glaucoma were enrolled in the comparison group. Kaplan-Meier curves were generated to compare the cumulative hazard of AD between the 2 groups. A multivariate Cox regression analysis was used to estimate the adjusted hazard ratios (HRs) of AD, adjusted for diabetes, hypertension, hyperlipidemia, coronary artery disease, and stroke.

Results: The mean age of the cohort was 62.1 ± 12.5 years. NTG patients had significantly higher proportions of diabetes, hypertension, hyperlipidemia, coronary artery disease, and stroke than the comparisons. NTG patients had a significantly higher cumulative hazard for AD compared to the comparisons ($P < 0.0001$). In the multivariate Cox regression after adjustment for confounders, the NTG group had a significantly higher risk of AD [adjusted HR, 1.52; 95% confidence interval (CI), 1.41 to 1.63]. Moreover, among the NTG group, when we compared the effects of different types of glaucoma eye drops, none of them was a significant risk factor or protective factor of AD.

Conclusions: People with NTG are at significantly greater risk of developing AD than individuals without glaucoma. Among NTG patients, none of the glaucoma eye drops would significantly change the risk of subsequent AD.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Can Scleral Intraocular Pressure Measurements by Schiøtz, Icare, and Icare PRO Tonometers Predict Central Corneal Goldmann Applanation Tonometry Readings?

First Author: Sriramani **GOLLAKOTA**

Co-Author(s): Raghava **CHARY**, Sanket **DESHMUKH**, Chandrasekhar **GARUDADRI**, Sirisha **SENTHIL**

Purpose: To evaluate the predictability of scleral Schiøtz, Icare, and Icare PRO intraocular pressure (IOP) measurements compared to central corneal Goldmann applanation tonometry (GAT) readings in eyes with normal corneas to extrapolate their use in abnormal corneas.

Methods: This was a prospective, cross-sectional study conducted at tertiary center in India. We included adults who consented, with various IOP ranges, with normal anterior segment anatomy and no previous corneal or vitreoretinal surgery. The order of IOP estimation was central GAT, followed by Icare and Icare PRO, followed by Schiøtz readings on the central cornea and temporal sclera. A single observer obtained all the readings. Central corneal thickness (CCT) and refractive error were noted as well. Predictive formulae for each cluster were derived by using a simple linear regression model. We used a linear mixed-effects model to account for 2 eyes of the same patient.

Results: We included 123 eyes of 69 subjects. The IOP ranged from 10-62 mm Hg. The median corneal GAT IOP was 21.25 ± 11.7 mm Hg. With multiple comparison of means by Dunnett contrasts, the mean difference in the scleral IOP by Schiøtz tonometer compared to central GAT was 1.58 mm Hg, which was not significantly different ($P = 0.58$). However, the mean difference in scleral IOP measurements by Icare (25.87 mm Hg) and Icare PRO (22.52 mm Hg) was highly variable ($P < 0.001$) compared to GAT. The validity of this model was tested with a new set of data, which showed good predictability with a sum difference of 1.6 mm Hg between the predicted and actual GAT readings ($P = 0.24$).

Conclusions: The scleral IOP readings by Schiøtz tonometer predicted the central corneal GAT IOP readings well in normal eyes.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S426-S427

Combined Phacoemulsification-Endoscopic Cyclophotocoagulation Versus Phacoemulsification Alone in Primary Angle-Closure Glaucoma: A Randomized Controlled Trial

First Author: Isabel **LAI**Co-Author(s): Noel **CHAN**, Clement **THAM**, Charlene **YIM**

Purpose: To evaluate the effects of phacoemulsification-endoscopic cyclophotocoagulation (phaco-ECP) versus phacoemulsification alone on intraocular pressure control (IOP) and medication reliance in the treatment of primary angle-closure glaucoma (PACG).

Methods: A randomized controlled interventional study of 48 PACG patients with 25 patients in the phaco-ECP group and 23 patients in the phacoemulsification alone group.

Results: For the phaco-ECP group, mean preoperative IOP was 20.04 mm Hg (SD ± 6.79). Mean IOP was 15.38 mm Hg at 6 months, with a drop of 4.81 mm Hg (24.0%) from baseline. Mean number of preoperative medications was 3.44. Mean number of medications was 1.81 at 6 months, with a drop of 1.57 from baseline. For the phacoemulsification alone group, mean preoperative IOP was 19.93 mm Hg (SD ± 5.56). Mean IOP was 15.95 mm Hg at 6 months, with a drop of 3.55 mm Hg (17.9%) from baseline. Mean number of preoperative medications was 3.09. Mean number of medications was 1.90 at 6 months, with a drop of 1.24 from baseline. Statistically significant decreases in IOP and the number of medications were demonstrated at all time points for both groups ($P < 0.05$). The phaco-ECP group had a lower mean IOP than the phacoemulsification alone group at all time points ($P < 0.05$ at 1 month and 3 months). No serious complications were reported and no additional glaucoma operations were needed.

Conclusions: Phaco-ECP and phacoemulsification alone are effective at lowering IOP at 6 months (24.0% vs 17.9%) in PACG patients, and the number of glaucoma medications required is lowered by 1.57 and 1.24, respectively.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Comparative Evaluation of Trabeculectomy With Mitomycin C Versus Trabeculectomy With Mitomycin C Augmented With Biodegradable Collagen Implant (Ologen)

First Author: Mrittika **SEN**Co-Author(s): Dewang **ANGMO**, Tanuj **DADA**, Neha **MIDHA**, Talvir **SIDHU**, Ramanjit **SIHOTA**

Purpose: To evaluate the safety and efficacy of biodegradable collagen implant combined with low-dose (0.1 mg/mL for 1 minute) mitomycin C (MMC) as an adjunct in trabeculectomy as compared to conventional trabeculectomy with low-dose mitomycin C alone.

Methods: Prospective randomized controlled trial in which 48 eyes of 48 patients with primary adult glaucoma were randomized into 2 groups. Twenty-five eyes in group 1 underwent trabeculectomy with low-dose MMC; 23 eyes in group 2 underwent trabeculectomy with Ologen implanted subconjunctally and subconjunctally with low-dose MMC. Patients were followed up for 6 months. Success was defined as intraocular pressure (IOP) ≤ 15 mm Hg with/without antiglaucoma medications. Bleb morphology was studied using anterior segment optical coherence tomography (AS-OCT).

Results: The mean highest recorded IOP was 35.44 ± 13.73 mm Hg in group 1 and 32.74 ± 12.78 mm Hg in group 2. The mean postoperative IOP in group 1 was 13.2 ± 8.72 mm Hg, 11.6 ± 6.78 mm Hg, and 11 ± 4.53 mm Hg and in group 2 was 11.56 ± 3.95 mm Hg, 12.08 ± 3.32 mm Hg, and 13.54 ± 4.7 mm Hg at 1, 3, and 6 months, respectively, with significant reduction in IOP from preoperative values ($P < 0.001$). IOP reduction was not significant between the 2 groups until 6 months ($P = 0.08$). The height of the bleb on AS-OCT was significantly more in group 2 ($P < 0.05$). Need for postoperative antiglaucoma medications and surgical interventions were similar in the 2 groups.

Conclusions: The combination of double Ologen and low-dose MMC is as effective and safe as conventional trabeculectomy for short-term IOP control. The AS-OCT shows better bleb morphology in eyes with Ologen and appears to offer encouraging results for this novel combined approach on long-term follow-up.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Diurnal Variations in the Morphology of the Schlemm Canal and Intraocular Pressure in Healthy Chinese: A Swept-Source Optical Coherence Tomography Study

First Author: Kai **GAO**

Co-Author(s): Fei **LI**, Xiulan **ZHANG**

Purpose: To characterize the diurnal variations in the dimensions of the Schlemm canal (SC) and its association with intraocular pressure (IOP) using swept-source optical coherence tomography (SS-OCT).

Methods: The temporal, nasal, inferior, and superior limbus of 102 eyes of 51 healthy subjects were imaged in vivo by SS-OCT at 5 time points of 8 am, 11 am, 2 pm, 5 pm, and 8 pm. IOP was measured at the same time by Goldmann applanation tonometry (GAT). The diameter and the cross-sectional area of the SC were measured in ImageJ. The associations between changes in the SC parameters, IOP, and other biometric parameters were determined using a general estimating equations (GEEs) model. The temporal and inferior limbus of 94 eyes of 47 healthy subjects were also imaged before and during the Valsalva maneuver (VM) at 8 pm.

Results: Mean IOPs at different time points were 13.37, 12.89, 11.9, 12.02, and 12.36 mm Hg. Of all 4 quadrants, the detectable rate of SC was highest in the superior quadrant (85.3%). We found that changes in the SC area and diameter were negatively associated with IOP changes only in the inferior quadrant ($P = 0.0046$ and $P = 0.0332$, respectively). The mean SC area and diameter during the VM were significantly higher than prior to the VM ($P < 0.001$).

Conclusions: The parameters of SC also had fluctuation during the daytime, and the changes in the SC parameters were negatively associated with IOP changes only in the inferior quadrant. The VM could expand the SC in healthy subjects.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Efficacy of Selective Laser Trabeculoplasty for Lowering Intraocular Pressure in Post-Laser Iridotomy Primary Angle Closure Disease Patients

First Author: Surishti **RAJ**

Co-Author(s): TT **FAISAL**, Basavaraj **TIGARI**, Sushmita **KAUSHIK**, Surinder **PANDAV**

Purpose: To evaluate the intraocular pressure (IOP) reduction in patients with uncontrolled post-laser iridotomy (PLI) primary angle closure disease (PACD) without medications and to analyze the changes in visual fields in patients of PACD following selective laser trabeculoplasty.

Methods: Prospective (1-year) nonrandomized interventional study of 34 PACD, 24 primary angle closure (PAC), and 10 primary angle closure glaucoma (PACG) eyes treated with selective laser trabeculoplasty (SLT) in post-laser iridotomy primary angle closure disease.

Results: The mean pre-SLT IOP of 34 patients (8 males and 26 females) was 23.76 ± 1.92 mm Hg. At the post-SLT follow-up IOP was 16.00 ± 2.74 mm on day 1, 19.76 ± 4.68 mm at 1 week, 18.67 ± 2.27 mm at 1 month, 19.09 ± 2.29 mm at 3 months, 18.42 ± 2.16 at 6 months, and 16.9 ± 2.82 at 12 months and all were significant ($P < 0.001$). There were no significant complications or side effects and no significant changes in visual fields after 6 months.

Conclusions: SLT can be an effective modality of treatment in PACD patients who continue to have moderately raised IOP after LI. SLT is a safe, cost-effective procedure and provides better compliance.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Mutation Analysis of the CYP1B1 Gene in Vietnamese Primary Congenital Glaucoma Patients

First Author: Ha **TRAN**

Co-Author(s): Khanh **TRAN**, Thinh **TRAN**, Thuy **VU**, Van **TA**

Purpose: To identify the mutations in exon 2 and exon 3 of the CYP1B1 gene in Vietnamese primary congenital glaucoma (PCG).

Methods: We used Sanger sequencing to identify

mutations in 41 Vietnamese patients with a clinical diagnosis of PCG. Mutations were screened and detected by direct DNA sequencing.

Results: A total of 12 distinct CYP1B1 mutations were identified in 11/41 unrelated probands (26.8%), including 3 mutations identified in our cohort that were reported previously (p.G61E, p.E229K, and p.V198I) and 9 novel mutations (4 definite and 5 probable mutations). Of the 4 definite mutations, 2 were homozygous frameshift mutations leading to deletions (g.6284delC and g.6290delC) and 2 heterozygous nonsense mutations (p.Q159X and p.Q164X), both of them in exon 2. The other 5 probable missense mutations (p.Q86K, p.A133T, p.L27Q, and p.D242N) were noted in exon 2 and 1 in exon 3 (p.G365E). Overall, 11 patients had mutant alleles of the CYP1B1 gene: 3 subjects were homozygous (27.3%), 2 patients were compound heterozygous (18.2%), and 6 patients were heterozygous (54.5%). Five single nucleotide polymorphisms (SNPs) were identified; all of them have been reported previously in patients with PCG (p.R48G, p.A119S, p.D218H, p.L432V, and p.N453S).

Conclusions: The mutation detection rate in exon 2 and exon 3 in Vietnamese PCG patients was 26.8%. Our research established 12 mutations, of which 9 were novel, and this may help in better understanding the pathophysiology of CYP1B1 associated PCG in Vietnamese patients.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Outcomes of Microcatheter-Assisted Trabeculotomy in the Treatment of Primary Congenital Glaucoma After Failed Glaucoma Surgeries

First Author: Huaizhou **WANG**

Co-Author(s): Man **HU**, Meng **LI**, Ningli **WANG**

Purpose: To evaluate the effectiveness and safety of microcatheter-assisted trabeculotomy to treat primary congenital glaucoma (PCG) after failed glaucoma surgeries.

Methods: Prospective, consecutive, noncomparative case series including 74 eyes of 63 consecutive patients with PCG after failed glaucoma surgeries. Microcatheter-assisted trabeculotomy was performed and initial intent for microcatheter-assisted trabeculotomy was converted to traditional trabeculotomy where the attempt to catheterize the canal failed. The medical records were reviewed. Main outcome measures were intraocular pressure (IOP) change, additional glaucoma medication, and

complication rate. Success was defined as final IOP of 21 mm Hg or less, with antiglaucoma medications (qualified success) and without (complete success).

Results: Mean follow-up period was 15.2 ± 6.8 months. Fifty (67.6%) eyes achieved a complete (22) or a partial (28) 360-degree trabeculotomy using the microcatheter. Twenty-four (32.4%) eyes underwent traditional trabeculotomy after failed initial attempt of microcatheter-assisted trabeculotomy. Mean IOP decreased from 35.3 ± 7.1 mm Hg on 2.6 ± 0.9 medications in the microcatheter-assisted trabeculotomy group and 33.1 ± 6.2 mm Hg on 3.0 ± 0.7 medications in the traditional trabeculotomy group preoperatively to 17.2 ± 9.1 mm Hg on 0.6 ± 1.2 medications ($P < 0.001$) and 26.0 ± 9.6 mm Hg on 2.0 ± 1.4 medications ($P = 0.002$) at the last postoperative follow-up, respectively. Microcatheter-assisted trabeculotomy demonstrated an 84.0% qualified and 79.3% complete success rate with 24-month follow-up whereas there were 44.9% qualified and 18.8% complete success rates of trabeculotomy with rigid probe. Qualified and complete success rates were comparable between complete and partial trabeculotomy with microcatheter (qualified success: $P = 0.761$; complete success: $P = 0.691$). Complications were minimal.

Conclusions: Microcatheter-assisted trabeculotomy (both complete and partial) achieved significant pressure-lowering effects for some cases of PCG with previous failed glaucoma surgeries and no significant complications. However, traditional trabeculotomy after failed initial attempt of microcatheter-assisted trabeculotomy did not show good outcomes.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Preliminary Study on the Noninvasive Evaluation of Cerebrospinal Fluid Pressure in Ocular Hypertension: The Beijing Intracranial and Intraocular Pressure Study

First Author: Xiaobin **XIE**

Co-Author(s): Weiwei **CHEN**, Ravi **THOMAS**, Ningli **WANG**

Purpose: To compare the orbital cerebrospinal fluid pressure (CSFP) and trans-lamina cribrosa pressure difference (TLCPD) determined noninvasively in ocular hypertension (OH) subjects and controls.

Methods: Cross-sectional observational study. Nineteen subjects with OH and 23 controls were enrolled. Magnetic resonance imaging (MRI) was used to measure orbital subarachnoid space width (OSASW) at 3, 9, and 15 mm posterior to the globe. The CSFP

(mm Hg) was estimated from a published formula as $17.54 \times \text{MRI-derived OSASW at 15 mm behind the globe} + 0.47 \times \text{body mass index} + 0.13 \times \text{mean arterial blood pressure} - 21.52$.

Results: The orbital subarachnoid space width was significantly wider ($P = 0.01$) in the OH group than in the control group at all 3 measurement locations. The MRI-derived CSFP value in OH (14.0 ± 2.0 mm Hg) was significantly higher than in the normal group (12.0 ± 2.0 mm Hg; $P < 0.01$). The estimated TLCPD value in OH (8.9 ± 4.2 mm Hg) was significantly higher than in controls (3.0 ± 3.0 mm Hg; $P < 0.01$).

Conclusions: The wider OSASW and higher estimated CSFP in OH subjects suggest a higher orbital CSFP. Despite a higher orbital CSFP that could be protective, the higher TLCPD in OH may play a significant role in the risk of developing glaucoma.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

Protective Effect of *Erigeron breviscapus* Hand-Mazz Extract in Retinal Hypoxia Models

First Author: Jingyuan **ZHU**

Co-Author(s): Yujing **BAI**, Huijuan **WU**

Purpose: *Erigeron breviscapus* Hand-Mazz (EBHM) is a multifunctional traditional Chinese herb in the neuroprotective area of cerebrovascular diseases. We aimed to evaluate the neuroprotective effect of EBHM extract (scutellarin) in retinal hypoxia models.

Methods: Our research was divided into 2 parts. In in vitro study, BV2 cells were exposed to low oxygen incubator to make hypoxia models and cultured with scutellarin in 3 dosage groups. The cell viability was measured by enzyme-linked immunosorbent assay (ELISA). The nucleotide-binding oligomerization domain, leucine rich repeat and pyrin domain containing 3(NLRP3)-inflammasomes signaling pathway including NLRP3, apoptosis-associated speck-like protein containing a caspase recruitment domain (ASC), cleaved caspase-1, interleukin-18 (IL-18), and interleukin-1 β (IL-1 β) were analyzed by Western blot and ELISA. In in vivo study, BN rats' intraocular pressure was raised to 60 mm Hg for 30 minutes to make high intraocular pressure (HIOP) models, and then BN rats were administered scutellarin by oral gavage for 2 consecutive weeks. Additionally, retinal ganglion cells (RGCs) retrogradely labeled by 4% Fluoro-Gold and retinal microglia cells stained through immunofluorescence were calculated or observed.

Results: In vitro, the 50 μM scutellarin administration

group had enhanced cell viability rate with more statistical differences ($***P < 0.001$). Scutellarin inhibited the expression of NLRP3 in vitro ($**P < 0.01$) and in vivo ($**P < 0.01$) and inhibited the functions of ASC, cleaved caspase-1, IL-18, and IL-1 β . In vivo, RGC survival rate was significantly improved by scutellarin administration ($***P < 0.001$), and impaired retinal microglia cells were significantly decreased by scutellarin compared to the HIOP model.

Conclusions: EBHM extract (scutellarin) may have a potential neuroprotective effect through inhibiting inflammations in retinal hypoxia models.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S228

Quantitative Optical Coherence Tomography Angiography Analysis of the Peripapillary Retinal Vasculature in Normal Tension Glaucoma

First Author: Yee Kiu **WONG**

Co-Author(s): Poemen **CHAN**, Carol **CHEUNG**, Dexter **LEUNG**, Clement **THAM**, Mandy **WONG**

Purpose: To investigate the relationship between quantitative peripapillary vasculature from optical coherence tomography angiography (OCT-A) and disease severity in patients with normal tension glaucoma (NTG).

Methods: This was an observational cross-sectional study including 119 NTG patients and 18 normal controls. A commercial swept-source OCT (Triton DRI-OCT) was used to obtain 3×3 mm OCT-A images of the optic disc region. A customized MATLAB program was employed to calculate fractal dimension (FD), global, and sectoral vessel density (VD) of peripapillary vasculature. Disease stage was defined as mild for mean deviation (MD) > -6 dB, moderate for MD -6 dB to -12 dB, and severe for MD < -12 dB.

Results: Compared with normal eyes, NTG eyes had significantly altered peripapillary retinal vasculature reflected by lower FD and global VD ($P < 0.05$). A significant trend of decreasing FD and global VD was observed with increasing disease severity (both $P < 0.05$). After adjusting for age, axial length, and image quality score, a less complex peripapillary vasculature shown by reduced FD was associated with worse visual field indices (per 1-SD change): MD ($\beta = 1.946$, $P < 0.01$), visual field index (VFI) ($\beta = 4.991$, $P < 0.01$), pattern standard deviation (PSD) ($\beta = -0.962$, $P < 0.01$), and decreased retinal nerve fiber layer (RNFL) thickness ($\beta = 3.872$, $P < 0.01$). Reduced global VD was associated with worse visual field indices: MD

($\beta = 0.491$, $P < 0.01$), VFI ($\beta = 1.490$, $P < 0.01$), PSD ($\beta = -0.282$, $P < 0.01$), and decreased RNFL thickness ($\beta = 1.051$, $P < 0.01$). Significant associations between sectoral VD of inferonasal, inferotemporal, temporal, and superotemporal regions and disease severity were also observed.

Conclusions: Alterations in peripapillary retinal vasculature measured by OCT-A were associated with NTG and its disease severity, suggesting quantitative OCT-A metrics may reflect circulatory insufficiency in NTG. Further work should be done to explore the causal relationship between changes in peripapillary retinal vasculature and disease progression of NTG.

Feb 10, 2018 (Sat)

09:00 - 10:30

Venue: S428

The Role of Cellular Connections in Schlemm Canal Endothelial Cells in Regulating Segmental Aqueous Outflow

First Author: Yanfeng **SU**

Co-Author(s): Haiyan **GONG**

Purpose: Aqueous outflow is segmental. The changes in cellular connectivity may play a role in segmental outflow regulation. This study aimed to determine whether there are differences in cellular connections, giant vacuoles (GVs), and pores between high-flow and non-flow areas of normal eyes.

Methods: Two normal human eyes were perfused at 15 mm Hg and exchanged with fluorescent tracer to establish high- and non-flow areas based on tracer distributions in global imaging. SC cells were 3D reconstructed based on SBF-SEM images of high-flow areas ($N = 11$ cells) and non-flow areas ($N = 11$ cells). GV, transcellular I-pores, and paracellular B-pores were reconstructed for geometric and volumetric analyses. In each SC cell, the number of cellular connections with its underlying JCT cells/matrix was determined. Overlap length was measured to determine the overlap amount between adjacent SC cell borders. Data were compared between high- and non-flow areas using unpaired t test.

Results: The number of SC/JCT connections significantly decreased in high-flow (72 ± 10 , $N = 11$ cells) versus non-flow areas (107 ± 10 , $N = 11$ cells; $P < 0.01$). Summed GV volume in individual SC cells significantly increased in high-flow ($251.01 \pm 31.06 \mu\text{m}^3$) versus non-flow areas ($98.15 \pm 14.92 \mu\text{m}^3$; $P < 0.01$). Overlap length between SC cells significantly decreased in high-flow ($0.70 \pm 0.22 \mu\text{m}$) versus non-flow areas ($1.07 \pm 0.20 \mu\text{m}$; $P < 0.03$).

Conclusions: 3D-EM reconstruction allowed us to reliably quantify cellular connections, GV size, and pore

count that no 2D imaging methods currently can. Our data suggest that decreased SC/JCT connectivity and SC endothelial cells connectivity in high-flow areas may promote GV and pore formations, thereby contributing to the regulation of segmental aqueous outflow.

Intraocular Inflammation, Uveitis & Scleritis

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S426-S427

Topical Antiglaucomatous Use in a Regional Thyroid Eye Clinic: A Prospective Cohort Study With 750 Thyroid Associated Ophthalmopathy Patients

First Author: Rachel **LEUNG**

Co-Author(s): Regine **CHAN**, Joyce **CHIN**, Kelvin **CHONG**, Chi-Lai **LI**, Alvin **YOUNG**

Purpose: To investigate and compare the differences in demographics, disease characteristics (including activity and severity), other thyroid associated ophthalmopathy (TAO) related characteristics (including intraocular pressure, strabismus, proptosis), and radiological characteristics between TAO patients receiving topical antiglaucoma (TAG) medications and TAO patients not receiving TAG medications.

Methods: A total of 750 patients referred to the thyroid eye disease clinic between January 2011 and August 2017 were selected to join the study. All patients were recorded for their TAG and steroids usage, thyroid status, and confounding factors, including gender, age, and smoking. Disease characteristics were graded using standard clinical assessment, including visual acuity (Snellen chart), intraocular pressure, extraocular movement (EOM) restrictions, clinical activity score (CAS), diplopia, proptosis, strabismus, lagophthalmos, and exophthalmos. Patients were also graded by imaging results. Cases and controls were compared via Welch paired sample t test and Chi square test. All analysis was performed using R.

Results: Mean age of the cohort was 61.2 years (SD: 9.4), and 53.8% were female. TAO patients receiving TAG had worse visual acuity, higher intraocular pressure, and lower CAS. In terms of extraocular changes, patients receiving TAG had higher EOM restrictions, higher rates of diplopia, and higher prevalence of strabismus. In terms of corneal changes, TAO patients receiving TAG also had higher rates and magnitude of punctate epithelial erosions (PEE).

Conclusions: TAO patients on TAG had worse disease characteristics (including activity and severity), while glaucomatous damage was not evaluated in this report. The risk factors and optic nerve hyperplasia

(OHT) damage in TAO associated OHT should be more systematically evaluated in longitudinal studies.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Clinical Presentation, Diagnostic Dilemma, and Management Outcomes of Chronic Postoperative Endophthalmitis Caused by *Stephanoascus ciferrii*

First Author: Vivek **DAVE**

Co-Author(s): Prachi **JHALA**, Joveeta **JOSEPH**, Rajeev **PAPPURU**, Savitri **SHARMA**

Purpose: To report the diagnosis and management of a series of chronic postoperative endophthalmitis caused by *Stephanoascus ciferrii*.

Methods: Case records of consecutive cases of chronic postoperative endophthalmitis caused by a novel fungus *S. ciferrii* were analyzed. The clinical presentations, microbiologic work-up, antifungal sensitivity, and clinical management were noted. The cases underwent anterior chamber (AC) tap, vitreous biopsy, core vitrectomy, and intraocular lens explantation. The samples underwent smear examination and culture sensitivity.

Results: The report included 4 eyes of 4 patients. All cases were diagnosed as chronic post cataract surgery endophthalmitis. All cases showed variable levels of persistent low-grade intraocular inflammation until the intraocular lens was explanted. One out of 2 isolates tested for antifungal susceptibility was resistant to amphotericin B. The minimum inhibitory concentration was high for voriconazole, itraconazole, and natamycin.

Conclusions: *S. ciferrii* is a novel fungus causing chronic postoperative low-grade endophthalmitis. A good response was obtained to therapy including pars plana vitrectomy and intraocular lens explantation.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Clinical Profile, Risk Analysis, and Treatment Outcomes of Post-Cataract Surgery Cluster Endophthalmitis Caused by Multidrug-Resistant *Pseudomonas aeruginosa*

First Author: Ronel **SOIBAM**

Co-Author(s): Isha **AGARWALLA**, Pritam **BAWANKAR**, Krati **GUPTA**, Surpriya **HAWAIBAM**, Diva **MISRA**

Purpose: The purpose of this study was to investigate

an outbreak of multidrug-resistant (MDR) *Pseudomonas aeruginosa* endophthalmitis in 13 patients after cataract surgery and to emphasize the importance of clinical profile, risk analysis, and treatment outcomes.

Methods: The present study was a hospital-based, retrospective, interventional case study. Thirteen patients who had small incision cataract surgery with intraocular lens implantation developed acute postoperative endophthalmitis. The anterior chamber taps, vitreous aspirates, and environmental surveillance specimens were inoculated for culture. Antibiotic susceptibility testing was performed by agar diffusion method.

Results: *P. aeruginosa* was isolated from all 13 eyes with acute postoperative endophthalmitis and trypan blue solution used for the surgery. Sensitivity tests revealed that all *P. aeruginosa* eye isolates had an identical MDR susceptibility profile that was found susceptible to only imipenem. Despite the prompt use of intravitreal antibiotics and early vitrectomy with intraocular lens explantation in some patients, the outcome was poor in at least 50% of cases (evisceration of 4 eyes, phthisis of 2 eyes, retinal and choroidal detachment with extensive proliferative vitreoretinopathy in 1 eye) and a moderate degree of improvement was observed in 6 eyes at the last control visit.

Conclusions: Postoperative endophthalmitis caused by *P. aeruginosa* is often associated with a poor visual prognosis despite prompt treatment with intravitreal antibiotics. The detection of multidrug-resistant isolates is a serious problem, jeopardizing an appropriate choice of treatment. Susceptibility to imipenem suggests that this antibiotic may be a potential candidate for the treatment of ocular infections caused by MDR *P. aeruginosa*.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Corneal Endothelium in Pediatric Patients With Uveitis: A Longitudinal Study

First Author: Simon **FUNG**

Co-Author(s): Asim **ALI**, Kamiar **MIRESKANDARI**, Hamza **SAMI**, Nasrin **TEHRANI**

Purpose: To study the longitudinal effect of anterior chamber inflammation on the corneal endothelium in children.

Methods: Children with anterior chamber inflammation (anterior, intermediate, or panuveitis) and those at risk of developing uveitis due to juvenile idiopathic arthritis were recruited. Demographic and clinical

data were collected. Main outcome measure was changes in central corneal endothelial cell density (ECD) determined by specular microscopy (SM). Correlations with clinical course were also determined.

Results: A total of 141 children were recruited, and 100 had follow-up assessments. Mean age was 10.0 ± 4.0 years. Mean follow-up was 13.2 ± 3.8 months. Mean total duration of activity was 28.2 ± 34.2 weeks before enrolment and 5.9 ± 9.8 weeks between enrolment and follow-up SM study, equating to $20.4 \pm 20.8\%$ and $10.6 \pm 17.7\%$ of time during which uveitis was active. No significant differences were found between mean ECD at enrolment (ECD1) and at follow-up (ECD2) in eyes without prior surgeries ($n = 106$, $P = 0.08$) or in those who had ($n = 35$, $P = 0.78$), although at both time points significant intergroup differences were found ($P < 0.01$). In 6 patients who underwent surgery during the follow-up period, there was a significant reduction of mean ECD over time ($P = 0.03$). However, in patients with unilateral uveitis and no prior surgery ($n = 18$), there was no significant reduction of ECD longitudinally. Correlations were found between ECD2 and age at final assessment (-0.57 , $P < 0.001$), duration of disease (-0.34 , $P < 0.001$), total number of surgical procedures (-0.33 , $P < 0.001$), and surgery since enrolment (-0.23 , $P = 0.02$).

Conclusions: The lack of change over the follow-up period suggests that by optimizing anterior chamber inflammation control, endothelial cell loss could be minimized.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Disease Modifying Drugs in Sclerosing Idiopathic Orbital Inflammatory Syndrome: Concept and Application

First Author: Farzad **PAKDEL**

Purpose: To describe application of combination of anti-TNF- α agents and azathioprine in patients with resistant progressive sclerosing idiopathic orbital inflammatory syndrome (sIOIS). We propose the concept of disease modifying antiorbital inflammatory drugs (DMAODs) and disease activity in the management of sIOIS.

Methods: In a prospective interventional study we used anti-TNF- α in biopsy-proven patients with progressive sIOIS. Disease activity was defined by presence of any of the criteria including progressive decrease in visual function that could not be otherwise explained; orbital pain; periorbital swelling; progressive proptosis; emergence or worsening of limitation in

extraocular motility; and progressive eyelid retraction.

Results: Five patients with sIOIS were included. Mean age was 32 (range, 19-53) years. Three had unilateral and 2 had bilateral involvement. Four had diffuse orbital involvement pattern and progressive worsening of visual functions, reduced extraocular motility, and proptosis and 1 had bilateral lacrimal gland involvement. The disease was successfully controlled with the regimen including adalimumab, etanercept, or infliximab combined with low dose prednisolone and azathioprine. Mean follow-up time was 21.3 (range, 8-66) months. No significant drug adverse effect was detected during the follow-up time.

Conclusions: A regimen including etanercept, infliximab, or adalimumab combined with azathioprine and low dose corticosteroid was effective in recalcitrant sIOIS cases and could change the course of the disease. We propose that this regimen could be considered a biological disease modifying antiorbital inflammatory drugs (DMAODs) regimen and can be regarded the mainstay of treatment of sIOIS.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Early Posttreatment Choroidal Thickness to Alert Sunset Glow Fundus in Patients With Vogt-Koyanagi-Harada Disease Treated With Systemic Corticosteroids

First Author: Kiriko **HIROOKA**

Co-Author(s): Yuki **HASHIMOTO**, Susumu **ISHIDA**, Kenichi **NAMBA**, Wataru **SAITO**

Purpose: To determine if early posttreatment central choroidal thickness (CCT) changes can predict sunset glow fundus (SGF) development in patients with Vogt-Koyanagi-Harada (VKH) disease treated using systemic corticosteroids.

Methods: This retrospective case series included 39 eyes of 21 treatment-naïve patients with acute VKH disease who could be followed up for more than 12 months after systemic corticosteroid therapy. The eyes were divided into 2 groups according to whether SGF was present or absent at 12 months (9 eyes of 5 patients versus 30 eyes of 16 patients, respectively). Using enhanced depth imaging optical coherence tomography, CCT values were measured before treatment, then at 1 week and 1 and 3 months after treatment in both groups and compared between the 2 groups.

Results: Development of SGF was found 4–11 months after treatment. Mean posttreatment CCT decreased

significantly at all examinations compared with baseline in both groups, along with resolution of serous retinal detachment. One week after treatment, mean CCT was significantly higher in eyes with SGF than in those without ($P = 0.024$). SGF was present at 12 months in 9 of 22 eyes with CCT values $> 410 \mu\text{m}$ at 1 week after starting treatment, in contrast with none of 17 eyes with CCT $\leq 410 \mu\text{m}$ at this time ($P = 0.003$).

Conclusions: The current study suggests the potential validity of early posttreatment CCT as a feasible index to alert future progression to SGF in patients with VKH disease treated using systemic corticosteroids.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Endophthalmitis Following Suture Removal: Clinical Outcomes and Microbiological Profile

First Author: Bhavik **PANCHAL**

Co-Author(s): Avinash **PATHENGAY**, Savitri **SHARMA**, Mudit **TYAGI**

Purpose: To review the clinical profile and report the microbiology and treatment outcomes of postsuture removal-related endophthalmitis.

Methods: In this single-center, retrospective interventional case series, 9 eyes of 9 patients who developed endophthalmitis following suture removal from January 2006 to July 2017 were reviewed.

Results: Eight of the 9 patients developed a culture-proven, acute onset endophthalmitis. Mean age was 13.8 ± 21.4 years (median, 4; range, 1-66). Three patients had loose corneal sutures after corneal tear repair, 3 pediatric patients had loose sutures following cataract surgery, whereas 1 had a loose suture following secondary intraocular lens (IOL) implantation. Two children underwent suture removal following penetrating keratoplasty. Mean time from most recent surgery to suture removal: 143.3 ± 76.2 days (range, 60-300). Mean time from suture removal to endophthalmitis diagnosis: 5.2 ± 3.2 days (range, 2-10). *Streptococcus pneumoniae* was the most common organism identified (6/9) and all were sensitive to vancomycin. Other bacteria were *Haemophilus influenza* and *Achromobacter denitrificans*. Treatment modalities varied and were guided by the concerned ophthalmologist. One patient with keratitis and panophthalmitis underwent a primary evisceration. The remaining 8 underwent pars plana vitrectomy along with intravitreal antibiotics and were started on topical antibiotics. Two patients underwent therapeutic penetrating keratoplasty. Mean follow-up was 21.1 ± 24.7 weeks (range, 2-80). Visual acuity outcomes

ranged from 20/40 to no light perception at last follow-up.

Conclusions: Endophthalmitis following suture removal is an important diagnosis due to its acute nature and fulminant course. *Streptococcus* was the most common isolated microbe. Visual acuity outcomes were poor despite prompt recognition of endophthalmitis and appropriate antibiotic therapy.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Real-Time Polymerase Chain Reaction in Infectious Uveitis: A Study of 87 Cases From a Tertiary Eye Care Center in South India

First Author: Jyotirmay **BISWAS**

Co-Author(s): Rajadurai **DHIVYA**, Madhuravasal Krishnan **JANANI**, Kulandai **LILY THERESE**

Purpose: To report results of real-time polymerase chain reaction (PCR) study of intraocular fluid from patients with infectious uveitis in a tertiary eye care center from South India.

Methods: Real-time polymerase chain reaction was performed on aqueous and vitreous of suspected infectious uveitis cases and clinical correlations were made.

Results: A total of 87 cases of clinically suspected infectious uveitis were included. Fifty-two were male and 35 were female, with age ranging from 11 to 74 years. A total of 52.9% of cases were unilateral and 47.1% were bilateral. The main complaint was defective vision (74.1%). The most common clinical diagnosis was granulomatous anterior uveitis followed by presumed tubercular choroiditis. Mantoux test was positive in 66.7% of cases. Twenty-three patients had high-resolution computed tomography (HRCT) chest done; 95.6% of patients had positive findings. Real-time PCR was positive in 48.27% of cases. Minimum number of copies detected was 3 and maximum was 29,164 copies. A total of 43.6% of cases were nested PCR positive. All patients where PCR was positive for *Mycobacterium tuberculosis* (TB) were put on antitubercular therapy with oral steroid. A total of 47.7% of cases showed clinical resolution of uveitis with improvement in vision.

Conclusions: Real-time polymerase chain reaction is a valuable tool in the diagnosis of infectious uveitis. The most common organism detected was *Mycobacterium tuberculosis*.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Retinal Transcriptome Profile Reveals the Involvement of RIG-I-Like Receptor Signal Pathway in the Treatment of Endotoxin-Induced Uveitis With Dexamethasone in Mice

First Author: Bo **LEI**

Purpose: To investigate the retinal transcriptome profile of dexamethasone (DEX)-treated endotoxin-induced uveitis (EIU) in mice and to explore the underlying mechanisms of the protective effect of DEX.

Methods: EIU was induced in BALB/c mice by intravitreal injection of 125 ng lipopolysaccharide (LPS). DEX eyedrop (0.1%) was locally administered every 4 hours for 24 hours. The anterior segment was examined with a slit lamp and clinical scores were assessed simultaneously. The morphology changes were assessed at the 24th hour after LPS injection. The transcriptome profile was conducted with next-generation sequencing (NGS)-based RNA sequencing (RNA-seq). The expression of inflammatory cytokines and selective differentially expressed genes (DEGs) were verified by real-time polymerase chain reaction (PCR).

Results: DEX alleviated the inflammatory response and reduced the mRNA expression of IL-6, TNF- α , MCP-1, and ICAM-1 at the 24th hour after LPS injection. A total of 52 DEGs were identified by RNA-seq. Within these DEGs, 37 genes were upregulated and 15 genes were downregulated in the LPS group when compared with DEX plus LPS group. No significantly enriched Gene Ontology (GO) term was noted. Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment showed 6 upregulated and 2 downregulated KEGG pathways. Interestingly, RIG-I-like receptor signal pathway and several immune- and inflammation-related genes including Ifit1, H2-T24, Mx2, and Eif2ak2 were significantly downregulated by DEX. The gene expression was further validated.

Conclusions: DEX alleviated the inflammatory response induced by LPS and the protective effect may be associated with RIG-I-like receptor signal pathway and several other immune- and inflammation-related genes.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Vitreous Haze Improvement with Every-Other-Month Intravitreal Sirolimus in Subjects With Noninfectious Uveitis of the Posterior Segment

First Author: Vishali **GUPTA**Co-Author(s): Raj **MATURI**

Purpose: To assess the effect of intravitreal (IVT) sirolimus on vitreous haze (VH) in the Sirolimus Study Assessing Double-Masked Uveitis Treatment (SAKURA) Program, which comprised 2 multinational phase III randomized clinical trials.

Methods: Eligibility criteria included active noninfectious uveitis of the posterior segment (NIU-PS) and baseline VH $\geq 1.5+$ (Standardization of Uveitis Nomenclature scale) in the study eye. The intent-to-treat (ITT) population was randomized to every-other-month IVT sirolimus 44 μ g (low dose) or 440 μ g ($n = 208$ each). The primary endpoint was VH = 0 at month 5. The least-squares (LS) mean change in VH from baseline was obtained from a mixed-effects model for repeated measures using data at week 2 and monthly from months 1–5. Adverse events (AEs) were assessed through month 6.

Results: In the ITT population, the proportion of subjects in the 440 μ g group who achieved VH = 0 at month 5 was significantly higher than that in the low-dose group (21.2% vs 13.5%; $P = 0.0381$). The LS mean change in VH from baseline in the 440 μ g group was consistently greater than that in the 44 μ g group, starting at week 2. At month 5, the difference was -1.18 vs -0.96 ($P = 0.0057$). The frequency of serious AEs in the study eye was similar in both groups (16.6% and 14.0% in the 44 μ g and 440 μ g groups, respectively).

Conclusions: In the ITT population of subjects with NIU-PS, 440 μ g IVT sirolimus improved VH significantly more than the low dose at month 5, without increasing the frequency of ocular serious AEs.

Neuro-Ophthalmology

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Clinical Characteristics of Optic Neuritis in Children With MOG Antibody Positive

First Author: Honglu **SONG**

Co-Author(s): Shaoying **TAN**

Purpose: The purpose of this study was to describe the clinical features and visual outcomes of optic neuritis in children with MOG antibody positive.

Methods: A retrospective study. Children with optic neuritis were enrolled in Chinese PLA General Hospital from May 2016 to April 2017. MOG antibody and AQP4 antibody in serum were tested using the cell-based assay.

Results: Forty-four children with optic neuritis were enrolled. Twenty-six cases (59.1%) were MOG antibody positive, 7 cases (15.9%) were AQP4 antibody positive, and 11 cases (25%) were negative for MOG antibody or AQP4 antibody. The children were followed up for an average of 20.5 months (3-102 months). Of 26 children with MOG antibody positive, 12 (46.2%) were female. These patients had poor eyesight; first onset visual acuity in the MOG-Ab (+) group was better than in the AQP4-Ab (+) group ($P = 0.036$). The final follow-up vision in the MOG-Ab (+) group was better than in the AQP4-Ab (+) group ($P = 0.001$). The MOG-Ab (+) group was similar to the AQP4-Ab (+) group with orbital magnetic resonance imaging (MRI) long period of involvement, both involving the optic chiasm ($P = 0.186$). Of 12 children who were MOG antibody positive and underwent head MRI, 7 (58.3%) had intracranial demyelination. Of 26 children with MOG antibody positive, 9 (34.6%) relapsed within 1 year, and 12 (46.2%) relapsed in 2 years.

Conclusions: MOG antibody positive optic neuritis in children is more common. Women are not dominant. The onset of visual impairment is severe, with long segment of optic nerve involvement in MRI; brain demyelinating lesions also exist. It has relatively good visual recovery. It is easy to relapse.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Diagnostic Yield of Investigations in Ocular Myasthenia Gravis Presenting as Ptosis

First Author: Akshay **NAIR**

Co-Author(s): David **FELL**, Rashmin **GANDHI**, Nita **SHAH**

Purpose: To assess the diagnostic yield of various diagnostic tests employed in cases of ocular myasthenia gravis (OMG) presenting as unilateral ptosis.

Methods: In this retrospective study, charts of 37 consecutive patients of OMG who presented with unilateral ptosis between September 2014 and December 2016 were analyzed. The parameters studied were clinical history and outcomes of ice test (IT), single fiber electromyography (SF-EMG), neostigmine test (NT), and anti-acetylcholine receptor antibodies (AChR-Ab).

Results: The mean age was 46.7 years. The mean duration of the symptoms was 13.3 months and 18/37 were females. Ice test positivity was seen in 94.6% of cases (34/37); SF-EMG positivity was seen in 59.5% (22/37) of the cases. Neostigmine test was positive in 56.8% (21/37) of the patients and AChR-Ab was positive in 45.9% (17/37). Neostigmine test ($P = 0.008$) and AChR-Ab ($P = 0.007$) were more likely to be positive in those with a history of ptosis for a duration ≥ 1 year. Among all tests, SF-EMG had a significantly higher rate of positivity ($P = 0.04$) among those aged ≥ 45 years and those who had a prior history of an episode of diplopia ($P = 0.02$).

Conclusions: Among the screening tests in suspected OMG presenting as ptosis, ice test has the highest sensitivity followed by SF-EMG and neostigmine test. Duration of history, age of the patient, and history of diplopia are factors that should be considered while deciding which investigation should be performed in order to maximize diagnostic yield.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Distinct Clinical Characteristics of Atypical Optic Neuritis With Seronegative Aquaporin-4 Antibody Among Chinese Patients

First Author: Huanfen **ZHOU**

Co-Author(s): Junqing **WANG**, Shihui **WEI**, Quangang **XU**, Shuo **ZHAO**

Purpose: To evaluate the clinical features and prognosis

of atypical optic neuritis (ON) with seronegative aquaporin-4 antibody (AQP4-Ab) in Chinese patients.

Methods: All patients with first or relapsing optic neuritis were recruited from the Ophthalmology Department of the Chinese People's Liberation Army General Hospital from January 2013 to December 2014 and assigned to 1 of 3 groups based on diagnosis: atypical ON, typical ON, and neuromyelitis optica spectrum disorder (NMOSD)-ON.

Results: A total of 173 patients were included in the cohort. Fifty patients (28.9%) were AQP4-Ab positive and diagnosed with NMOSD-ON. In 123 patients with seronegative AQP4-Ab, 37 (30.1%) patients had atypical ON with male predominance (25, 67.6%). The atypical ON group (compared with the typical ON and NMOSD-ON groups) had significantly lower female/male ratio (1:2.1 vs 1.8:1 and 9:1, respectively; $P = 0.001$ and $P < 0.001$), older mean age of onset (44.8, 13–71 years vs 36.9, 13–73 years and 36.2, 13–66 years; $P = 0.003$ and $P = 0.004$), lower rate of good (≥ 0.5) visual recovery (6.7% vs 79.8% and 30.9%; $P < 0.001$ and $P < 0.001$), and (compared to the NMOSD-ON group) lower recurrence rate during a 2-year follow-up (29.3% vs 60%, $P = 0.009$). However, serum MOG antibody was negative and none progressed to multiple sclerosis (MS) or NMO in the atypical ON group.

Conclusions: Atypical ON with seronegative AQP4-Ab had unique clinical features in this Chinese cohort, including male predominance, older age of onset, low prevalence of anti-MOG antibodies, and poor long-term outcomes.

day before PE therapy, 1 day after each cycle of PE therapy, and at 1-week, 1-month, 3-month, 6-month, and 12-month follow-up visits.

Results: An improving tendency of VOS scores was found in the affected eyes during the treated period. The visual function was significantly better than both at onset and 1 day before PE therapy after the first cycle of PE therapy ($P < 0.001$), with a stable tendency of VOS scores during the 12-month follow-up period ($P = 0.429$). An average of 1.9 ± 1.6 VOS scales in visual improvement was persistently maintained during the 12-month follow-up period. PE treatment was more effective in the eyes with disease course less than 30 days (19 of 21 eyes, 90.5%), compared with those exceeding 30 days (6 of 12 eyes, 50.0%) ($P = 0.015$).

Conclusions: PE could potentially be an effective therapy to improve visual function in refractory NMO-ON patients, especially in an acute phase within 30 days.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Pathological Involvement of Astrocyte-Derived Lipocalin-2 in Demyelinating Optic Neuritis

First Author: Bo Young **CHUN**

Co-Author(s): Su Jin **PARK**

Purpose: The current study was carried out to determine the role of lipocalin-2 (LCN2) in the pathogenesis of demyelinating optic neuritis using an experimental autoimmune optic neuritis (EAON) model.

Methods: EAON was induced by subcutaneous immunization with an emulsified mixture of myelin oligodendrocyte glycoprotein (MOG35-55) peptide in mice. LCN2 expression was examined in the optic nerve after MOG peptide injection. Degree of demyelination, inflammatory infiltration, glial activation, and expression profile of inflammatory mediators in the optic nerve were compared between LCN2 knockout (KO) animals and wild-type littermates by histological analysis and real-time polymerase chain reaction (PCR) following EAON induction. Plasma levels of LCN2 in patients with optic neuritis were measured by ELISA.

Results: The expression of LCN2 was notably increased in the optic nerve after EAON induction. LCN2 expression was colocalized with reactive astrocytes. A significant reduction of demyelination, inflammatory infiltration, and gliosis was demonstrated in the optic nerve of LCN2 KO mice. LCN2 KO mice also showed markedly reduced gene expression associated with

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Effectiveness of Plasma Exchange in Acute Neuromyelitis Optica-Related Optic Neuritis

First Author: Shaoying **TAN**

Co-Author(s): Da **TENG**, Junqing **WANG**, Shihui **WEI**, Quangang **XU**, Jie **ZHAO**

Purpose: To evaluate the short-term and long-term therapeutic effect of plasma exchange (PE) in Chinese patients with acute neuromyelitis optica-related optic neuritis (NMO-ON) who did not respond to high-dose intravenous corticosteroid.

Methods: Thirty-three affected eyes from 26 NMO-ON patients with first attack of acute vision loss worse than 20/60 but without neurological disability were recruited in this study. Double-filtration plasmapheresis was used on all study subjects. Visual functional improvements were evaluated based on visual outcome scale (VOS) scores documented at onset, 1

the M1-polarized glia phenotype and toll-like receptor signaling in the optic nerve. The LCN2 levels in plasma were significantly higher in optic neuritis patients (71.6 ± 10.6 ng/mL) compared to healthy controls (37.4 ± 9.1 ng/mL) ($P = 0.0284$).

Conclusions: In this study, we demonstrated a significant induction of LCN2 expression in astrocytes of the optic nerve following EAON induction. Our results imply that astrocyte-derived LCN2 may play a pivotal role in the development of demyelinating optic neuritis, and LCN2 can be a therapeutic target to alleviate immune and inflammatory damage in the optic nerve.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Potential Therapeutic Benefit of Synthetic Agents in Experimental Neuromyelitis Optica Rat Model

First Author: Hao **KANG**

Co-Author(s): Shanshan **CAO**, Tingjun **CHEN**, Shaoying **TAN**, Shihui **WEI**

Purpose: Neuromyelitis optica (NMO) is an inflammatory demyelinating disease of the central nervous system. Current NMO therapies, which have limited efficacy, include immunosuppression and plasma exchange. The objective of this study was to develop a potential new NMO therapy based on blocking of pathogenic NMO-IgG binding to aquaporin-4 (AQP4).

Methods: We established a robust NMO pathology in Lewis rats following repetitive intrathecal injection of NMO-IgG and human complement. Agents to neutralize the cytotoxicity of NMO-IgG were synthesized. Synthetic agents corresponded to extracellular segments of rat AQP4 [loops A (54-69), C (137-157), and E (207-231)]. All rats were randomized to receive either NMO patient serum with human complement or agent-processed NMO patient serum with human complement. Motor function and immunofluorescence assay were performed.

Results: Behavioral studies showed impaired motor function in the NMO-IgG injected rats. NMO lesions in the spinal cord slices showed astrocyte damage with loss of AQP4 and GFAP, inflammation with leukocyte and granulocyte infiltration, and demyelination. The agent blocked the binding of NMO-IgG to AQP4; it can protect astrocytes from NMO-IgG dependent cytotoxicity. The spinal cord slices of the neutralized agent group showed mild astrocyte damage, inflammation infiltration, and demyelination.

Compared to the NMO rats, behavioral studies showed mild impaired motor function in the neutralized agent group. The agents prevented the development of NMO lesions in an in vivo experimental NMO rat model without causing cytotoxicity.

Conclusions: Our results showed that blocker therapy to prevent binding of pathogenic autoantibodies to their targets may be useful for treatment of NMO.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Risk Factors Differentiating Nonarteritic Anterior Ischemic Optic Neuropathy Between Young and Elderly Patients

First Author: Shan **CAO**

Purpose: Features of younger patients with nonarteritic anterior ischemic optic neuropathy (NAION) in China are not fully clarified. Therefore, clarifying related features is necessary for personalized treatment in different patients.

Methods: A cross-sectional experiment was designed to analyze the differences. A total of 255 patients with NAION were divided into the young patients group (A group) and elderly patients group (B group). Neuro-ophthalmic examination, vertebral artery ultrasound, 24-hour ambulatory blood pressure monitoring, and magnetic resonance imaging were performed for these patients to identify features related to NAION.

Results: The risk factors including hypertension, diabetes, smoking, and cup-to-disc ratios were compared between these 2 groups. Compared to 6.84% in group B, the incidence of homocysteine was 18.46% in group A ($P = 0.01$). The anticardiolipin antibody syndrome was 7.70% in group A, significantly higher than that of 1.05% in group B ($P = 0.013$). Otherwise, diabetes was 29.23% in group A, which is lower than that of 50.00% in group B. In addition, being overweight was found 30.77% in group A, significantly lower than that of 47.37% in group B ($P = 0.12$). For 24-hour ambulatory blood pressure monitoring, the daytime and night diastolic pressure were 124.29 ± 17.21 mm Hg and 120.58 ± 19.98 mm Hg, respectively, in group A, which were higher than that of 120.63 ± 11.61 mm Hg and 118.43 ± 14.58 mm Hg in group B ($P > 0.05$), respectively.

Conclusions: NAION patients have a relatively good visual prognosis, but with a higher incidence of contralateral eye. Young NAION patients are more prone to homocysteine and anticardiolipin antibody syndrome.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Sensitivity and Specificity of New Visual Field Screening Software for Diagnosing Hemianopia

First Author: Patcharaporn JARU-AMPORN PAN
Co-Author(s): Parima HIRUNWIWATKUL, Rath ITTHIPANICH PONG, Supharat JARIYAKOSOL, Anita MANASSAKORN, Thanapong SOMKIJRUNGROJ

Purpose: To assess the diagnostic accuracy of visual field results generated by the newly developed software (new VF) and standard automated perimetry (SAP) in detecting hemianopia.

Methods: Forty-three subjects with hemianopia and 33 controls were tested with the new VF software on a personal computer and SAP. Hemianopia was defined as presence of hemianopic field respecting the vertical meridian on SAP as evaluated by 2 neuro-ophthalmologists, combined with the corresponding pathology on neuroimaging. Results from the new VF were independently evaluated by 2 neuro-ophthalmologists, 1 general ophthalmologist, and 1 general practitioner in terms of presence of hemianopia. Sensitivity, specificity, and kappa coefficient for interobserver reliability were calculated. Satisfaction and ease of use were evaluated with visual analog scale questionnaire and analyzed using paired t test.

Results: The sensitivity [95% confidence interval (CI)] and specificity (95% CI) of the new VF to detect hemianopia were 74.42% (58.53-85.96) and 93.94% (78.38-99.94). Kappa coefficient between neuro-ophthalmologists versus general ophthalmologist and general practitioner were 0.71 and 0.84, respectively. The mean (SD) test duration was 2.25 (0.002) minutes for the new VF and 5.38 (1.34) minutes for SAP ($P < 0.001$). Subjects reported significantly higher satisfaction and comfort using the new VF software compared to SAP.

Conclusions: The new VF screening software showed good validity and reliability to detect hemianopia compared to SAP, with shorter test duration and higher subject satisfaction. Its use should be considered for diagnostic and follow-up testing in the future.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Tear Biomarkers, Optics, and Nerves (TONE): A Novel Migraine Axis

First Author: Chaithra AROOR
Co-Author(s): Abdul RAWOOF, Swaminathan SETHU, Rohit SHETTY

Purpose: To determine the optical aberration, corneal nerve morphology, and tear cytokine profiles in migraine patients with and without photophobia.

Methods: Thirty migraine patients and 30 healthy subjects were included in the study. Wavefront aberrations and objective scatter index (OSI) were measured. Corneal nerve morphology imaged with confocal microscopy was analyzed. Tear cytokines were measured by cytometric bead array.

Results: Significantly higher total/higher order aberrations and OSI were seen in migraine patients. Corneal nerve branch density and nerve fiber area were reduced in migraine compared with controls ($P < 0.05$). Migraine patients had higher levels of interleukin (IL)-2, -4, -6, -10, and IFN α/γ than controls, while IL-1, -17, IP-10, and vascular endothelial growth factor (VEGF) were high in patients with migraine and photophobia.

Conclusions: Higher ocular aberrations and dysfunctional tear film may act as potential triggers for migraine. Altered corneal nerve morphology and tear cytokine profiles suggest their plausible role in ocular symptoms in migraine patients.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

The Good Response of Aquaporin 4 Seropositive Optic Neuritis to Low-Dose Rituximab Treatment

First Author: Shuo ZHAO
Co-Author(s): Shihui WEI

Purpose: Neuromyelitis optica associated optic neuritis (NMO-ON) usually presents with severe visual loss. B cell depletion therapy using rituximab (RTX) would be beneficial in managing NMO relapses. This study aimed to prospectively evaluate the efficacy and safety of low-dose rituximab on NMO-ON.

Methods: NMO-ON patients were treated with 100 mg RTX for 4 times as induction and followed up for 1 year. Peripheral blood CD 19+ B cell percentage and aquaporin-4 antibody (AQP4-Ab) concentration were

evaluated at each consultation. Reinfusion of 100 mg RTX was given when CD 19+ B cell percentage elevated to over 1%. The primary endpoints included annual relapse rate (ARR) and best-corrected visual acuity (BCVA).

Results: A total of 43 patients were included in this study. The B cell depletion rate was 97.7% after the induction treatment. The average time for B cell reproduction was 5.2 months (range, 2-12 months). Significantly decreased ARR (1.19 to 0.15; $P = 0.009$) was found in patients who were followed up for over 1 year. Serum AQP4-Ab level decreased significantly 1 month after the induction treatment ($P = 0.009$) and elevated at 12 months ($P = 0.025$). A total of 54.5% of relapses were accompanied by B cell depletion, while 90% of relapses presented with elevated serum AQP4-Ab. The BCVA was stable or improved in 96.2% of eyes. Infusion-related reaction and other adverse events were observed in 18.6% and 23.1% of patients, respectively.

Conclusions: Low-dose RTX showed favorable efficacy and safety in Chinese NMO-ON patients. Elevated serum AQP4-Ab may be related to relapses.

Feb 08, 2018 (Thu)

11:00 - 12:30

Venue: S428

Visual Outcomes and Clinical Manifestations of Indian Pediatric Optic Neuritis: An Institutional Study

First Author: Selvakumar **AMBIKA**

Purpose: To evaluate the clinical characteristics and visual outcomes of pediatric optic neuritis patients who presented to the neuro-ophthalmology services of a tertiary eye care institution in India.

Methods: We reviewed all medical case records of optic neuritis patients who were less than 18 years of age. All these patients were evaluated and managed in neuro-ophthalmology services and a single referral pediatric neurology hospital from 1999-2016.

Results: A total of 117 eyes of 78 children with a mean age of 11.84 ± 4.58 years were identified. Forty-two (53.8%) were females and 36 (46.2%) were males. Thirty-nine patients (50%) had bilateral involvement and 39 patients (50%) had unilateral involvement. Fifty-nine eyes (50.4%) had disc edema, 20 eyes (17.1%) had disc pallor, and 38 eyes (32.4%) had normal disc. Sixty-three cases had neuroimaging, 36 patients had magnetic resonance imaging (MRI), and 27 patients had computed tomography (CT) of the brain and orbit. Fifty-nine patients had received intravenous methylprednisolone followed by oral steroid taper.

Sixty eyes of 59 patients (71.4%) recovered Snellen visual acuity better than 20/40. Visual acuity improvement was statistically significant between initial visual acuity (logarithm of the minimum angle of resolution; logMAR) and final visual acuity (logMAR) in our patients ($P \leq 0.001$).

Conclusions: The Indian pediatric population had good visual recovery following optic neuritis treatment. Profound loss of visual acuity on presentation and bilateral involvement were significantly associated with poor visual outcome. A prospective study with larger cohort size and longer follow-up will be more useful in understanding the nature and clinical course of Indian pediatric optic neuritis.

Ocular Imaging

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

An Improvement of Machine Detection for Any Diabetic Retinopathy by Preprocessing Retinal Photographs to Entropy Images in Deep Learning

First Author: Gen-Min **LIN**

Co-Author(s): Mei-Juan **CHEN**, Min-Hui **LIN**, Yu-Yang **LIN**, Chia-Hung **YEH**

Purpose: Deep learning analysis of retinal photographs has emerged as an effective method for detecting diabetic retinopathies (DR). Preprocessing of original images may enhance the contrast between retinal lesions and unaffected areas, possibly increasing detection accuracy.

Methods: A large sample of 33,000 interpretable retinal photographs was obtained from a website free data set. All photographs were preprocessed to entropy images. The severity of DR was classified by grades 0 (unaffected, 50.0%), 1 (mild, 12.5%), 2 (moderate, 16.3%), 3 (severe nonproliferative DR, 12.5%), and 4 (proliferative DR, 8.7%), according to the International Clinical Diabetic Retinopathy Disease Severity Scale. Of these retinal photographs, 30,000 images were randomly selected as the training set, and the remaining 3,000 images were treated as the testing set. Both the original retinal photographs and the preprocessed entropy images were used as the inputs of convolutional neural network (CNN), and the detection accuracies for the 2 data sets on the presence of any DR (grades 1-4) were compared.

Results: The sensitivity, specificity, and detection accuracy for any DR in the original retinal photographs data set were 78.27%, 99.67%, and 88.97%, respectively, and by contrast those results in the

preprocessed entropy images data set increased to 86.93%, 99.93%, and 93.43%, respectively.

Conclusions: The entropy image quantifies the information amount of the retinal photograph and can efficiently accelerate generation of the feature map in CNN. Preprocessed entropy imaging of retinal photographs may increase the machine sensitivity and detection accuracy of any DR for deep learning-based systems.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Artificial Intelligence Using Deep Learning System for Diabetic Retinopathy Screening in Multiethnic Populations With Diabetes

First Author: Daniel **TING**

Co-Author(s): Carol **CHEUNG**, Gilbert **LIM**, Gavin **TAN**, Tien-Yin **WONG**

Purpose: To evaluate the diagnostic performance of a deep learning system (DLS), a novel machine learning technology, in detecting referable diabetic retinopathy (DR), vision-threatening DR, glaucoma suspect (GS), and age-related macular degeneration (AMD) in an ongoing large-scale national DR screening program.

Methods: This was a nonrandomized comparative study, evaluating 3 novel DLS systems in detecting referable DR, GS, and AMD, developed using 111,694 images, 125,189 images, and 70,986 images, respectively. First, we calculated the area under curve (AUC), sensitivity, specificity, positive predictive value, and negative predictive value of DLS in detecting referable DR. Referable DR was defined as moderate nonproliferative DR (NPDR) or worse, including diabetic macular edema (DME) and ungradable images; referable GS was defined as vertical cup-disc ratio (CDR) of 0.8 and above and glaucomatous disc changes; while referable AMD was defined as intermediate AMD or worse.

Results: The AUC, sensitivity, and specificity were 0.94, 91%, and 91% for referable DR; 0.83, 88%, and 87% for referable GS; and 0.90, 80%, and 79% for AMD. The positive predictive value for DR, GS, and AMD were 0.10, 0.16, and 0.02, respectively, whereas for negative predictive value they were all 0.99 for 3 conditions. The repeatability of all tests was 100%.

Conclusions: DLS provides superior performance in detecting common and sight-threatening eye diseases in a national DR screening program. Such approach will have important clinical significance as this will enable the DR screening exercise to be much more comprehensive, allowing those nonreferable DR

patients with signs of glaucoma or AMD to seek earlier treatment and prevent visual impairment.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Association Between Disorganization of the Retinal Inner Layers and Visual Acuity in Chinese Eyes With Diabetic Macular Edema

First Author: Zihan **SUN**

Co-Author(s): Carmen **CHAN**, Carol **CHEUNG**, Shaheeda **MOHAMED**, Danny **NG**, Tiffany **TSO**

Purpose: To investigate the relationship between disorganization of retinal inner layers (DRIL) and visual acuity (VA) in Chinese eyes with diabetic macular edema (DME) and to compare the strength of associations between DRIL and other vision-related optical coherence tomography (OCT) imaging markers with VA.

Methods: Diabetic patients with DME were recruited from a tertiary eye center and all underwent spectral-domain OCT (SD-OCT) and swept-source OCT angiography (OCT-A). Presence of DRIL was defined as the inability to distinguish any 2 of the retinal inner layers (ganglion cell/inner plexiform layer complex; inner nuclear layer; outer plexiform layer) from cross-sectional SD-OCT images. Other vision-related OCT imaging markers including OCT-A metrics [eg, foveal avascular zone area (FAZ) area and FAZ circularity], ellipsoid zone disruption, and central subfield thickness were also measured.

Results: A total 173 eyes with DME of 116 patients with diabetes were included. The presence and length of DRIL were significantly associated with VA in univariate and multivariate linear regression analysis ($P < 0.001$). In univariate logistic regression analysis, presence of DRIL [odds ratio (OR), 2.68; $P = 0.002$], length of DRIL (OR, 1.64; $P < 0.001$), ellipsoid zone disruption (OR, 2.13; $P = 0.016$), and central retinal thickness (OR, 1.06; $P = 0.006$) were found to be significantly associated with poor VA. In the multiple logistic regression analysis, only the length of DRIL showed significant correlation with poor VA [OR, 1.64; 95% confidence interval (CI), 1.11-1.96; $P < 0.001$].

Conclusions: DRIL was consistently correlated with VA in our cohort and shows stronger association with VA compared with other vision-related OCT imaging markers. Prospective studies are needed to further validate whether DRIL is a robust biomarker of visual function.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Can MRI Be Used as a Staging Tool for Retinoblastoma? A Single Center Experience With Cases of Retinoblastoma

First Author: Preethi **JEYABAL**

Co-Author(s): Gangadhara **SUNDAR**, Eric **TING**

Purpose: To analyze the magnetic resonance imaging (MRI) characteristics in retinoblastoma and correlate clinically and histopathologically.

Methods: MRI images of retinoblastoma patients imaged between 2005 and 2017 with a specific retinoblastoma protocol were reviewed by an ophthalmologist and a neuroradiologist at a tertiary care center in Singapore and analyzed. Information including demographics; group and stage; MRI features such as percentage of posterior segment involvement, optic nerve thickening, orbital, choroidal, scleral, anterior segment intracranial involvement; treatment modality; and histopathology were collected.

Results: MRI characteristics of 50 eyes of 42 retinoblastoma patients were analyzed. Mean age at diagnosis was 1.4 years (range, 3 weeks to 6.7 years). Calcification was identified in 3 patients. On histology, 5 patients had post lamina cribrosa invasion, 4 patients had choroidal invasion, and 1 had anterior segment involvement, which were detected on MRI as well. One patient had vertebral, scalp, and intracranial involvement, detected by MRI. Of these 50 eyes, 31 were enucleated as primary treatment modality. One of these patients had orbital recurrence of retinoblastoma, which was also confirmed by imaging.

Conclusions: MRI is a useful diagnostic and staging tool that is not only sensitive but also specific in detecting extent of retinoblastoma. In the future, by analyzing a much larger volume of scans, we can come up with a new staging system based on MRI imaging for retinoblastoma and manage patients accordingly with more accuracy and better outcomes. This will be especially useful in children with hereditary retinoblastoma, as decreased use of computed tomography (CT) reduces the exposure to ionizing radiation especially in germline mutation patients.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Correlation of Optical Coherence Tomography Angiography and Indocyanine Green Angiography in Polypoidal Choroidal Vasculopathy

First Author: Colin **TAN**

Co-Author(s): Louis **LIM**, Tock Han **LIM**

Purpose: Polypoidal choroidal vasculopathy (PCV) occurs more frequently in Asian populations and requires indocyanine green angiography (ICGA) to confirm the diagnosis. We aimed to correlate the ICGA features of PCV with those seen on optical coherence tomography angiography (OCTA).

Methods: In a prospective study of 24 consecutive patients diagnosed with PCV seen at a tertiary eye center, OCTA scans were performed using standardized imaging protocols. The diagnosis of PCV was confirmed on ICGA. The OCTA images of these patients were reviewed by retinal specialists and then correlated with the ICGA images.

Results: The mean age of the 24 patients was 68.5 years, with 87.5% males and 12.5% females. Using OCTA, a branching vascular network (BVN) was seen in 90.5% of eyes. In contrast, polyps were seen on OCTA only in 75% of eyes. The polyps had a variety of patterns on OCTA and did not always correlate with the appearance on ICGA. The BVN was located in the choriocapillaris layer.

Conclusions: We have described the OCTA features of PCV that correlate well with ICGA features. OCTA provides a noninvasive means to image and diagnose patients where ICGA is contraindicated and may aid in the diagnosis of PCV in the future.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Effectiveness of a 4-Year-Old Urban Teleretinal Screening Program for Diabetic Retinopathy

First Author: Christina **WENG**

Co-Author(s): Rishabh **DATE**, Mara **RIVERA**, Beena **SHAH**, Kevin **SHEN**

Purpose: To (1) determine the accuracy of teleretinal (TR) screening in detecting diabetic retinopathy (DR) or diabetic macular edema (DME) and (2) assess the compliance with follow-up of TR patients referred for

in-clinic examination.

Methods: Retrospective, observational clinical study in a large county health system where patients with diabetes mellitus were screened via a nonmydriatic fundus camera. Patients were referred if the teleretinal imaging was interpreted to show severe nonproliferative diabetic retinopathy or worse or DME. All patients screened and referred for in-clinic exam between 2013-2016 were cross-referenced with patient charts.

Results: A total of 80,804 screenings were performed during the study period. Diabetic retinopathy was detected in 42% (33,961) of all screenings while non-DR pathology was detected in 14.6% (11,804). Approximately 5% of all patients were found to have severe nonproliferative DR or worse. Overall, between TR and clinical exam diagnoses, there was moderate agreement [$\kappa = 0.39$; 95% confidence interval (CI), 0.27-0.52] in grading DR. There was agreement within 1 level of DR severity in 82.2% (95% CI, 75.7-90.3%) of patients. The positive predictive value (PPV) for detecting referable-level DR was 71.8% (95% CI, 60.3-81.1%). The PPV for detecting center-involving DME was 20.6% (95% CI, 9.3-38.4%). Only 49.5% (102/206) of patients referred for an in-clinic exam actually attended a clinic appointment.

Conclusions: Teleretinal screening was highly predictive for referable-level DR but less reliable in detecting non-DR conditions. Fewer than half of referred patients attended a clinic appointment, suggesting there may be additional barriers to ophthalmic care in a county population.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Evaluation of a New, Low-Cost Spectral Domain Optical Coherence Tomography Machine

First Author: Pik Sha **CHAN**

Co-Author(s): Paola **COJUANGCO**, Franz Marie **CRUZ**, Harvey **UY**

Purpose: Spectral domain optical coherence tomography (OCT) is an essential tool in the management of retinal diseases. Current OCT machines are expensive but newer, low-cost models have been introduced. The purpose of this study is to determine the reproducibility of retinal measurements and diagnostic agreement among eyes undergoing OCT using a standard and a new, low-cost model.

Methods: Prospective method comparison. One hundred normal and diseased eyes underwent OCT

scans (6 x 6 mm square area, 512 x 128 raster pattern) to obtain macular thickness maps using a standard (Cirrus, Zeiss Meditec, Jena, Germany) and a newly introduced, low-cost (Primus, Zeiss Meditec, Jena, Germany) OCT machine. Main outcome measures were central retinal thickness (CRT), macular volume (MV), and agreement of disease classification (normal or abnormal) by masked readers.

Results: The mean (SD) CRT measurements obtained from the Cirrus ($259 \pm 58 \mu\text{m}$) and Primus ($258 \pm 60 \mu\text{m}$) machines were similar [$P = 0.923$; 95% confidence interval (CI), -19.47 to 21.47]. The mean (SD) MV measurements from the Cirrus ($13 \pm 28 \text{ cubic } \mu\text{m}$) and Primus ($13 \pm 28 \text{ cubic } \mu\text{m}$) machines were likewise similar ($P = 1.00$; 95% CI, -10.58 to 10.58). The mean absolute difference for CRT was $10.9 \mu\text{m}$ (4.2%) and for MV was $0.4 \text{ cubic } \mu\text{m}$ (3%). The masked reader agreement rate for diagnosing an eye as normal or abnormal was 92%.

Conclusions: Both low-cost and standard machines were similar in terms of measuring CRT and MV. There was a high degree of diagnostic agreement based on images from both machines. The low-cost machine may lead to greater access to OCT testing and allow for guided management of retinal diseases.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Novel Manual Grading Technique of Optical Coherence Tomography Scans to Measure Choroidal Thickness

First Author: Louis **LIM**

Co-Author(s): Kelvin **LI**, Colin **TAN**

Purpose: Manual segmentation of optical coherence tomography (OCT) B-scans to measure choroidal thickness (CT) is laborious and time-consuming. Hence, we aimed to describe a novel and faster technique to obtain CT measurements.

Methods: A total of 200 eyes of 100 healthy patients were studied in a prospective cohort study. Spectral-domain OCT with enhanced depth imaging was performed using standardized imaging protocols and independently graded by reading center-certified graders. The standard method of manual adjustment of segmentation boundaries was performed. The new method consisted of adjusting the lower segmentation line to the choroid-scleral boundary to generate the combined choroid-retina thickness, with subtraction from the original retinal thickness (RT) to measure CT. Mean CT in the respective Early Treatment Diabetic Retinopathy Study (ETDRS) subfields were assessed

via the 2 methods and compared with intraclass correlation coefficients (ICC) and Bland-Altman plots.

Results: The mean age of the participants was 22.5 years with 59.0% males. Mean central subfield CT was 324.4 μm using the original method, compared with 328.8 μm using the new method, with a mean difference of 4.5 μm (range: -14.0 to +4.0 μm ; $P < 0.001$) and ICC for agreement of 0.9996 ($p < 0.001$). Similar comparability was achieved for mean CT across other ETDRS subfields, with mean differences ranging from 2.4 to 3.7 μm , and ICCs ranging from 0.9993 to 0.9995 (all $P < 0.001$).

Conclusions: Mean CT can be measured by subtracting the original RT from the combined choroid-retina thickness. As only 1 segmentation line needs to be adjusted, there is less error in adjustment and time required is reduced.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Pentacam Top Indices for Diagnosing Subclinical and Definite Keratoconus

First Author: Sonu **GOEL**

Co-Author(s): Sonai **MUKHERJEE**

Purpose: To determine pachymetric and topometric indices in patients with definite and subclinical keratoconus and the validity of these indices in the diagnosis of keratoconus.

Methods: We evaluated 100 keratoconic and 97 healthy eyes in this study. Pentacam (OCULUS) examination was performed for all participants, and the data of all pachymetric and topometric indices was extracted for the study population.

Results: The average of all evaluated pachymetric and topometric indices showed a significant difference between the study groups ($P < 0.001$). Belin/Ambrosio Deviation Display (BAD_D), Index of Vertical Asymmetry (IVA), and Index of Surface Variance (ISV) were identified as the best diagnostic criteria for the diagnosis of subclinical keratoconus and BAD_D and mean keratometry were identified as the best diagnostic criteria for the diagnosis of definite keratoconus ($P < 0.001$). The sensitivity and specificity of the above-mentioned models were 83.6% and 96.9% and 97.9% and 96.9%, respectively.

Conclusions: Simultaneous evaluation of BAD_D, IVA, and ISV, especially when the pattern of the corneal curvature is normal, can detect subclinical keratoconus with high sensitivity and specificity. As for definite keratoconus, each of the BAD_D and

mean keratometry has a desirable diagnostic validity. However, the aforementioned indices do not negate the importance of widely recognized and acceptable indices like keratometry and central corneal thickness.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Quantification of Retinal Microvascular Parameters Using Optical Coherence Tomographic Angiography in Adults With Systemic Hypertension

First Author: Jacqueline **CHUA**

Co-Author(s): Calvin **CHIN**, Jimmy **HONG**, Leopold **SCHMETTERER**, Tien-Yin **WONG**

Purpose: To investigate the association of retinal capillary density map (CDM) with systemic risk factors in adults with systemic hypertension.

Methods: This was an observational clinical study of adults aged 21 years and over without diabetes and ocular diseases. Participants received eye examination where optical coherence tomographic angiography (OCT-A; AngioVue; Optovue, Inc, USA) was performed and measured for CDM at the retinal and choroidal vascular plexuses. Data on 24-hour ambulatory blood pressure (BP), serum creatinine, dyslipidemia, smoking, and medication information were collected. Linear regression models were used to investigate the association of CDM with systemic risk factors.

Results: The mean (SD) systolic BP of the 37 participants [20 men; 31 Chinese; mean (SD) age, 57.2 (8.7) years] was 131.1 (13.6) mm Hg. The retinal CDM was significantly reduced in participants with resistant hypertension compared with participants with well-controlled hypertension for superficial [35.5% (6.0%) vs 39.9% (5.2%); $P = 0.037$] and deep [22.5% (14.0%) vs 34.1% (10.5%); $P = 0.010$] vascular plexuses. Those with resistant hypertension tended to have a reduced CDM at superficial [$\beta = -4.38$; 95% confidence interval (CI), -8.48, -0.28; $P = 0.037$] and deep [$\beta = -11.60$; 95% CI, -20.24, -2.96; $P = 0.010$] retinal layers but not at the choroid layer. Estimated GFR (Cockcroft-Gault equation) was associated with CDM at superficial retinal ($\beta = 0.07$; 95% CI, 0.01, 0.13; $P = 0.046$) and choroid ($\beta = 0.03$; 95% CI, 0.01, 0.05; $P = 0.023$) layers but not deep retinal layer ($P = 0.055$).

Conclusions: These findings indicate that the OCT-A may be used as a tool to study early microvascular changes as a result of systemic hypertension.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Reliability of Disorganization of the Retinal Inner Layer Measurements From Spectral-Domain Optical Coherence Tomography in Eyes With Diabetic Macular Edema

First Author: Tiffany **TSO**Co-Author(s): Carmen **CHAN**, Carol **CHEUNG**, Stephanie **KWOK**, Jennifer **MOK**

Purpose: Disorganization of the retinal inner layers (DRIL) has been proposed as a predictor of visual acuity in eyes with diabetic macular edema (DME). In this study, we evaluated the reliability of DRIL measurements with spectral-domain optical coherence tomography (SD-OCT) in eyes with DME.

Methods: Cross-sectional SD-OCT images from subjects with DME at the macula were obtained with Cirrus HD-OCT using high-definition 5-line raster-scan protocol. Two trained graders reviewed the images to assess DRIL, which was defined as the inability to distinguish any 2 of the retinal inner layers (ganglion cell-inner plexiform layer; inner nuclear layer; outer plexiform layer). A retinal specialist made a final decision on disagreement between 2 graders. The extent of DRIL was measured with a MATLAB program. The average DRIL extent was taken from 5 SD-OCT images for each eye. A subset of 29 eyes (145 images) with presence of DRIL agreed by both graders was randomly selected and DRIL extent was independently measured. The intergrader agreements for the presence/absence of DRIL and DRIL extent were measured by Cohen kappa coefficient and intraclass correlation coefficient (ICC), respectively.

Results: A total of 173 eyes with DME from 116 diabetic patients were analyzed. Two graders agreed on 88.4% for assessing presence/absence of DRIL, with a kappa value of 0.759 [95% confidence interval (CI), 0.709-0.809]. A total of 111 eyes from 78 patients were graded with DRIL after a final decision by the retinal specialist. Intergrader reliability of DRIL extent measurement was high, with an ICC of 0.887 (0.775-0.946).

Conclusions: We showed good reliability on assessment of DRIL (presence/absence of DRIL and DRIL extent measurement) from SD-OCT images in eyes with DME.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Smartphone vs Conventional Videography: The Verdict

First Author: Wern Yih **CHONG**Co-Author(s): Shatriah **ISMAIL**, Jan Bond **CHAN**, Logeswari **KRISHNA**

Purpose: To compare a smartphone videography system to a conventional video recording technique in terms of video quality and cost-effectiveness.

Methods: This is a pilot comparative observational study, involving patients from Hospital Tuanku Ja'afar Seremban ophthalmology department requiring cataract surgery. Ten surgical procedures were recorded simultaneously using both videography systems, out of which 10 seconds of the video were sampled and evaluated by 62 medical personnel (doctor vs nondoctor). Both sample videos (conventional video and smartphone) were viewed simultaneously by the viewer for 10 seconds and subsequently, the assessor graded the video using a modified Absolute Category Rating (ACR) labeled as "bad," "poor," "fair," "good," and "excellent" and they were translated to Mean Opinion Score (MOS) ranging from 1 to 5. The cost of each videography system was calculated and compared.

Results: A total of 31 doctors and 31 nondoctors participated in the study. Smartphone videography had a higher MOS value compared to the conventional method in both groups (doctor 4.1 vs 3.47, $P = 0.03$; nondoctor 4.44 vs 3.83, $P < 0.001$) and the combined group (4.22 vs 3.65, $P < 0.001$). The smartphone videography system was also cheaper than the conventional system.

Conclusions: The smartphone videography system offers better video quality and cost-effectiveness. It can help hospitals or clinics with no conventional video recording system to record ocular surgery.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Structural and Functional Assessments of Inner Retinal Layers, Optic Nerves and Chiasm, and Visual Field in Glaucoma Using OCT, MRI, and Perimetry

First Author: Kevin **CHAN**

Co-Author(s): Ian **CONNER**, Carlos **PARRA**, Vivek **TRIVEDI**, Mengfei **WU**

Purpose: To assess the classification ability of brain magnetic resonance imaging (MRI) and its association with ophthalmic structural and functional measurements in glaucoma.

Methods: This observational, cross-sectional study included 21 advanced glaucoma (aged 64.4 ± 9.8 years), 16 mild glaucoma (aged 62.4 ± 7.5 years), and 12 healthy subjects (aged 64.2 ± 8.4 years) who underwent spectral-domain optical coherence tomography (OCT), 3-Tesla anatomical MRI (MPRAGE, resolution = $1 \times 1 \times 1 \text{ mm}^3$), and standard automated perimetry. Optic nerve (ON) and optic chiasm (OC) volumes were estimated from MRI manually and compared to clinical parameters using linear mixed-effects models. Receiver operating characteristic (ROC) curves for classifying eyes/brains as glaucomatous or healthy were determined for all techniques.

Results: The average peripapillary retinal nerve fiber layer (pRNFL) thickness, average macular ganglion cell-inner plexiform layer (mGCIPL) thickness, visual field mean deviation (MD), ON volume, and OC volume were $89.4 \pm 9.2 \mu\text{m}$, $79.2 \pm 8.5 \mu\text{m}$, $-0.75 \pm 1.10 \text{ dB}$, $523.5 \pm 50.6 \text{ mm}^3$, and $174.5 \pm 19.9 \text{ mm}^3$ in healthy controls; $80.3 \pm 12.0 \mu\text{m}$, $73.3 \pm 9.2 \mu\text{m}$, $-1.69 \pm 2.93 \text{ dB}$, $473.3 \pm 64.2 \text{ mm}^3$, and $166.4 \pm 35.1 \text{ mm}^3$ in mild glaucoma; and $67.0 \pm 10.5 \mu\text{m}$, $66.3 \pm 12.6 \mu\text{m}$, $-6.75 \pm 5.91 \text{ dB}$, $380.1 \pm 71.4 \text{ mm}^3$, and $132.3 \pm 20.8 \text{ mm}^3$ in advanced glaucoma, respectively. ON and OC volumes were positively associated with pRNFL thickness ($P = 0.001$, $P = 0.02$) and MD ($P < 0.001$, $P = 0.002$) but not mGCIPL thickness ($P = 0.85$, $P = 0.25$). The areas under ROC curves were 0.87, 0.78, 0.81, 0.87, and 0.82 for pRNFL, mGCIPL, MD, ON, and OC, respectively.

Conclusions: These preliminary findings suggest that ON and OC volumes measured from high-resolution MRI may be useful in monitoring glaucomatous brain damage across stages. ON and OC volumes appeared to associate closely with clinical measurements that represent a more diffuse distribution throughout the eye but not those within the macula. ROC analysis indicated comparable abilities between ON/OC volumes and clinical parameters to distinguish healthy controls from glaucoma patients.

Feb 09, 2018 (Fri)

11:00 - 12:30

Venue: S425

Swept-Source OCT for Prosthetic Replacement of Ocular Surface: Tailoring the Fit

First Author: Radhika **NATARAJAN**

Purpose: To assess the fit of prosthetic replacement of ocular surface (PROSE) and the post-lens fluid reservoir using anterior segment swept-source optical coherence tomography (OCT).

Methods: Twenty-three eyes that were fitted with PROSE for moderate to advanced keratoconus were evaluated prospectively between February and August 2015. High-speed swept-source OCT imaging was done in 2-dimensional and 3-dimensional modes for central and peripheral fit assessment. Volume of fluid between the PROSE and the cornea was also calculated.

Results: Mean central vault height (central clearance) was 0.42 mm ($\pm 0.08 \text{ mm}$). Mean midperipheral vault height 2 mm inside the limbus was 0.74 mm ($\pm 0.12 \text{ mm}$). Mean peripheral (limbal) clearance was 0.14 mm ($\pm 0.02 \text{ mm}$). Mean volume of fluid between the BOSP and the cornea was 78.31 mm^3 ($\pm 9.3 \text{ mm}^3$). Swept-source OCT parameters correlated well with the clinical fit assessment.

Conclusions: Calculation of the central and peripheral vault heights can be done using anterior segment swept-source OCT. The volume of tears between the PROSE and the cornea, an important but largely unassessed fitting parameter, can be objectively evaluated. These measurements serve as useful adjuncts to assess and improve the clinical fit of the PROSE.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S228

Retinal Neuronal Loss in Alzheimer Disease: A Systematic Review and Meta-Analysis

First Author: Victor **CHAN**

Co-Author(s): Carol **CHEUNG**, Li **MA**, Vincent **MOK**, Zihan **SUN**

Purpose: The retina, being an extension of the central nervous system, is an excellent "window" to study cerebral neurodegenerative damage noninvasively. As several studies have inconsistently reported that thinning of the ganglion cell-inner plexiform layer (GC-IPL) and reduced macular thickness were associated

with Alzheimer disease (AD), we conducted a meta-analysis to combine results from different studies.

Methods: We searched studies published between January 2001 and August 2017 (identified through PubMed and EMBASE) that measured macular GC-IPL thickness and/or macular thickness by spectral-domain optical coherence tomography (SD-OCT) in AD patients and healthy controls (HCs). Meta-analysis was conducted using a random-effects model.

Results: A total of 202 AD patients and 294 HCs from 5 studies measuring GC-IPL and 392 AD patients and 348 HCs from 8 studies measuring macular thickness were identified. We found that when compared to HCs, patients with AD had significantly reduced GC-IPL thicknesses, in terms of both average thickness [standard mean differences in μm (SMD), -0.44; 95% confidence interval (CI), -0.79 to -0.09; $P = 0.01$] and thicknesses of most sectors (except superotemporal sector) (SMD ranged from -0.42 to -0.64; all $P < 0.03$). Furthermore, macular thicknesses at the fovea and all sectors in both inner and outer rings were all significantly thinner in AD compared to HCs (SMD ranged from -0.38 to -1.04; all $P < 0.003$).

Conclusions: GC-IPL and macular thicknesses are decreased in AD patients compared to HCs. As the macula has the highest density of retinal ganglion cells (RGCs), this confirms the neurodegenerative process in AD may be reflected by RGC neuronal loss and OCT may be used as a novel noninvasive biomarker for stratifying individuals with greater risk of AD.

Feb 11, 2018 (Sun)

11:00 - 12:30
Venue: S228

Significant Correlations Between Retinal Imaging Measures and Amyloid- β Deposition

First Author: Victor **CHAN**

Co-Author(s): Carol **CHEUNG**, Vincent **MOK**, Tiffany **TSO**, Tien-Yin **WONG**

Purpose: The retina, being an extension of the central nervous system, is an excellent “window” to study cerebral neurodegenerative damage noninvasively. Current evidence suggests that neuronal and vascular changes in the retina are associated with severity of Alzheimer disease (AD). Hence, retinal imaging may be able to stratify individuals who are more likely to develop AD. However, the relationship between retinal changes and amyloid-beta ($A\beta$) burden in the brain, an upstream neuropathology of AD, remains unclear.

Methods: We conducted a cross-sectional study recruiting 4 AD patients, 3 patients with mild neurocognitive disorder, and 12 controls. $A\beta$ burden

in brain regions was assessed by positron emission tomography with Pittsburgh compound-B. We also measured thicknesses of the ganglion cell-inner plexiform layer (GC-IPL) and retinal nerve fiber layer (RNFL) using optical coherence tomography and retinal vascular parameters (eg, tortuosity, fractal dimension, bifurcation, and caliber) from fundus photographs using a computer-assisted program.

Results: A reduction in average GC-IPL thickness was associated with higher $A\beta$ burden in gyrus rectus, precuneus, and superior parietal lobule (β ranged from 0.203-0.222 per 10 μm thinning of GC-IPL). Higher $A\beta$ burden in gyrus rectus and thalamus were correlated with decreased retinal venular tortuosity ($\beta = 0.150$ and 0.069 per SD decrease, respectively), and that of cerebellar vermis was correlated with decreased retinal venular fractal dimension ($\beta = 0.032$ per SD decrease). All P values were less than 0.05 and were adjusted for age and gender.

Conclusions: We demonstrated significant correlations between retinal changes and higher $A\beta$ burden in the brain. This provides proof-of-concept evidence that retinal imaging may be used as a risk stratification tool for AD.

Ocular Oncology & Pathology

Feb 11, 2018 (Sun)

11:00 - 12:30
Venue: S425

A New Cell Line From a Metastatic Conjunctival Melanoma Patient

First Author: Yongyun **LI**

Purpose: Conjunctival melanoma (CM) is regarded as one of the most dreaded tumors in ophthalmology, though it is of rare occurrence. This study aimed to establish a metastatic cell line derived from a CM patient whose tumor had spread to parotid lymph nodes and to screen out an effective drug for the cells and the tumor-bearing animal models.

Methods: From the surgical CM sample, the cell line CM-LEE was successfully derived by primary culture. The characterization of it was defined by morphology, growth kinetics, chromosome analysis, immunofluorescence, short tandem repeat (STR) analysis, and whole exon sequencing. Additionally, response to an MEK inhibitor according to the specific mutation type was validated both in vitro and in vivo.

Results: STR analysis indicated that CM-LEE was a unique cell different from known cell lines and was verified as a melanoma cell line. Chromosome aberration could be found in it. An NRAS mutation was

detected both in the primary tumor and the cell line. The application of an MEK inhibitor (binimetinib) could prominently suppress cell proliferation and metastasis both in vitro and in vivo.

Conclusions: Our results indicated that the novel cell line holding the metastasizing character could be a good tool for further exploring the molecular mechanism of CM and anticancer drug screening.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Anophthalmia in Retinoblastoma: Experience at Our Center

First Author: Preethi JEYABAL

Co-Author(s): Mariel Angelou PARULAN, Gangadhara SUNDAR

Purpose: To evaluate the outcomes and complications of anophthalmic sockets in retinoblastoma at a tertiary care center in Singapore.

Methods: Retrospective study of patients who underwent enucleation as sole/part of treatment for retinoblastoma at our center from 2005-2017. Details including demographics, grouping and staging, adjuvant therapy, surgery, implant, and complications were collected and statistical analyses were performed.

Results: Of 42 patients managed over the period, 31 anophthalmic sockets were analyzed. Five enucleations were done elsewhere. There were no bilateral enucleations. Mean age at enucleation was 2.3 years (range, 2 months to 3.8 years); 18/31 eyes were enucleated by the same surgeon. Twenty-nine of 31 patients had acrylic (11) or Medpor (18) implants. Techniques included baseball (28) and myoconjunctivalization (1). Wrapping materials were bovine pericardium (10) and donor sclera (6). Size of implant was 12-20 mm. Infiltration along the length of the optic nerve was found in histopathology of an eye with group E retinoblastoma. One patient without primary implant had orbital recurrence treated with chemotherapy. We did secondary socket reconstruction with implants, which were exposed/infected requiring removal and dermis fat graft. Two of 26 patients enucleated at our center had implant exposure (acrylic). One of 5 eyes enucleated elsewhere had stock eye and sunken socket with implant migration. Three patients referred to us for enucleation were conservatively managed.

Conclusions: Anophthalmic sockets in retinoblastoma had long-term implications if the primary procedure was not performed well. While the majority had good outcomes (structural and esthetic), a minority

had complications requiring additional intervention. Ophthalmologists managing retinoblastoma must be aware of these. Primary implant following enucleation had favorable outcomes with minimal complications.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Conjunctival Melanoma in Chinese Patients: Local Recurrence, Metastasis, Mortality, and Comparisons With Caucasian Patients

First Author: Chuandi ZHOU

Co-Author(s): Xianqun FAN, Renbing JIA

Purpose: To evaluate the prognosis in Chinese patients with conjunctival melanoma and determine its predictors. Further, to explore the racial differences in clinical characteristics and outcomes between Chinese and Caucasian patients.

Methods: A cohort study. The study included 57 eyes of 57 consecutive patients with pathologically verified conjunctival melanoma between 1996 and 2016. Medical records were reviewed for factors associated with local recurrence, metastasis, and tumor-related mortality. All eligible patients were followed up for these 3 outcome measures. The demographic data, clinical characteristics, and outcomes were compared between Chinese and Caucasian patients.

Results: The mean follow-up period was 52.21 ± 49.38 months. Fourteen (25%) patients died of conjunctival melanoma, with a median survival time of 24 months. The 1-year, 5-year, and 10-year tumor-related mortality was 3.8%, 30.5%, and 37.4%, respectively. Twenty (35%) patients developed metastasis. The 1-year, 5-year, and 10-year metastasis rate was 16.7%, 38.7%, and 50.9%, respectively. Tumor hemorrhage was an independent risk factors for tumor-related death (HR: 18.81, $P = 0.01$) and metastasis (HR: 4.57, $P = 0.02$). Twenty-nine (51%) patients experienced local recurrence. The 1-year, 5-year, and 10-year recurrence rates were 31.0%, 59.7%, and 66.4%, respectively. Significant differences were noted between Chinese and Caucasians patients in demographics, clinical characteristics, and outcomes.

Conclusions: Conjunctival melanoma is a rare malignancy with great potential for mortality in Chinese. Special attention should be paid to patients with tumor hemorrhage. Compared to the Caucasians, Chinese patients exhibit more aggressive clinical signs with compromised prognosis.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Eyelid Malignancies in Northern India: An Analysis of 180 Cases

First Author: Virendra **SINGH**Co-Author(s): Rajendra **MAURYA**, Rohit **SHAH**, Tanmay **SRIVASTAV**

Purpose: To report the incidence, clinicopathological profile, and management.

Methods: Prospective, interventional study of 180 cases of eyelid carcinoma was conducted over 3 years. Tumor location, size, pattern of lesion, metastasis, and histopathological differentiation and staging were done according to AJCC guidelines. Patients were treated surgically or with neoadjuvant chemotherapy (1, cis-platinum, bleomycin, and methotrexate; 2, cis-platinum and 5FU). Radiotherapy was used for nonresponders. Response to treatment was evaluated.

Results: A total of 180 cases were studied. Age ranged from 43-88 years; 56.67% were males. Predominant site was upper eyelid (54.44%). Commonest malignant tumor encountered was sebaceous gland carcinoma (41.67%) followed by squamous cell carcinoma (34.44%). Histopathologically 37.78% were well differentiated and 33.33% were poorly differentiated; 22.78% belonged to stage IC, 56.67% were in stage II with ≥ 20 mm tumor size, and 10.00% of cases were in stage IIIA. Lymph node metastasis was seen in 10.55% of cases; 52.78% of cases were managed by primary surgical excision with lid reconstruction and 47.22% underwent neoadjuvant chemotherapy followed by surgery. Most common surgery performed was Cutler beard (36.67%) followed by Tenzel rotational flap (27.78%). Exenteration was done in 10.00% of cases. The mean follow-up period was 10.26 months; 6.66% were lost in the follow-up and 12.22% of cases had recurrence. Response to chemotherapy was better in poorly differentiated carcinoma. There were no serious side effects of chemotherapy. Majority had good functional and aesthetic outcomes.

Conclusions: Sebaceous malignancies are quite common. Mostly patients presented late. Early diagnosis and appropriate multimodal treatment have been advocated.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

IgG4-Related Ophthalmic Disease: Clinical Profile and Outcome

First Author: Sameeksha **TADEPALLI**Co-Author(s): Santosh **HONAVAR**, Puneet **JAIN**, Sumeet **LAHANE**, Kaustubh **MULAY**

Purpose: To describe the clinical profile and outcome in patients with IgG4-related ophthalmic disease.

Methods: Retrospective, noncomparative interventional case series of 16 patients with IgG4-related ophthalmic disease. All patients underwent orbitotomy and biopsy with histopathological and immunohistochemical confirmation, serum IgG4 levels, and baseline systemic evaluation. Treatment was with 6 pulses of 500 mg intravenous methylprednisolone (IVMP), immunomodulation with oral azathioprine or mycophenolate mofetil, and intravenous pulse cyclophosphamide or rituximab in patients with refractory disease.

Results: Six were male and 10 were female, with a mean age of 35 (range, 9-65) years. Presenting features were proptosis (93.7%), swelling (56.3%), restriction of eye movements (31.3%), diminution of vision (18.7%), and pain (18.7%). Two patients had bilateral involvement and 14 had unilateral involvement. Lacrimal gland (50%), orbit (31.3%), eyelids (25%), limbus (6.3%), and sclera (6.3%) were involved. All the patients met histopathological diagnostic criteria. Serum IgG4 levels were raised (>135 mg/dL) in 6 patients (37.5%) and were normal in the rest. One patient had systemic manifestation (pancreatitis). Four patients (25%) responded well to 6 pulses of IVMP, while 4 (25%) required 6-12 additional pulses. Two (12.5%) were treated with intravenous cyclophosphamide and 1 with intravenous rituximab. Nine patients (56.25%) received oral azathioprine and 3 (18.7%) received mycophenolate mofetil for a mean of 7 months. Fourteen patients (87.5%) had treatment success, with complete resolution of inflammation in 4 (25%) and clinically stable partial resolution of inflammation without symptoms in 10 (62.5%) at a mean follow-up of 11 months.

Conclusions: IgG4-related ophthalmic disease is complex, with a variable, often refractory response to standard treatment. Differentiation of this entity from other orbital inflammatory conditions and customized aggressive immunomodulation is the key to success.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Intravitreal Topotecan in Retinoblastoma Group D and E Eyes

First Author: Raksha **RAO**

Co-Author(s): Santosh **HONAVAR**, Vijay Anand **REDDY**

Purpose: To evaluate the efficacy of intravitreal topotecan (IViT) for refractory and recurrent vitreous seeds in retinoblastoma group D and E eyes.

Methods: Retrospective case review of patients who received IViT (30 µg/0.15 mL) by the safety enhanced technique every 3 weeks.

Results: A total of 23 eyes (53%) belonged to International Classification of Retinoblastoma group E and 20 (47%) to group D. Primary treatment included intravenous chemotherapy (IVC) with a mean of 9 cycles (median, 6; range, 6-18). Twenty-three patients (53%) received 67 periocular carboplatin or topotecan injections with a mean of 4 injections (median, 3; range, 1-8), concurrent with IVC. A total of 113 IViT were performed in 43 eyes of 43 consecutive patients with a mean of 3 injections (median, 2; range, 2-9). Complete regression of vitreous seeds was achieved in 43 of 43 eyes (100%). At a mean follow-up of 21.2 months (median, 20; range, 7.1-40.4), 1 eye (2%) with a recurrent retinal tumor needed enucleation, and rest of the 42 eyes (98%) maintained complete regression. None of the patients developed ocular or systemic complications.

Conclusions: Diffuse vitreous seeds in advanced retinoblastoma pose a major challenge in eye salvage therapy. However, IViT appears safe and effective in controlling focal and diffuse refractory or recurrent vitreous seeds in advanced retinoblastoma.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Orbital Neurilemmoma

First Author: Sameeksha **TADEPALLI**

Co-Author(s): Santosh **HONAVAR**, Kaustubh **MULAY**

Purpose: To describe the clinical profile, management, and outcome in orbital neurilemmoma patients.

Methods: Retrospective, noncomparative, interventional case series of 53 consecutive histopathologically proven patients with orbital neurilemmoma, who underwent orbitotomy and tumor excision by a single surgeon. Clinical presentation,

radiological features, and outcome were analyzed.

Results: Thirty-six were male and 17 were female [mean age of 34 ± 14.9 (range, 1 to 71) years]. All had unilateral involvement. Common presenting symptoms were proptosis (77.4%), evident mass (28.3%), diminution of vision (24.5%), and pain (13.2%). Average duration of symptoms was 18 (1-120) months. Mean proptosis measured 6.36 ± 4.24 (2-19) mm. Palpable mass was present in 22 (41.5%) patients. Functional deficits included corneal exposure (5.6%), ocular motility restriction (50.9%), diplopia (1.8%), and compression optic neuropathy (30.1%). Computed tomography (CT) scan of the orbit showed a well-defined, homogenous mass in 42 (81.1%) patients; mass was located extraconally in 40 patients (76.5%) [superior (11.3%), superomedial (15.1%), superolateral (11.3%), lateral (3.7%), inferior (3.7%), inferomedial (3.7%), anterior (26.4%)] and intraconally in 13 (24.5%). All patients underwent complete tumor excision: 28 (52.8%) by lateral orbitotomy, 18 (33.9%) by anterior orbitotomy, 5 (9.4%) by transconjunctival approach, and 2 (3.7%) with concurrent enucleation of the blind or phthisical eyes. At a mean follow-up 6.8 months, 46 (86.7%) had complete recovery. Complications included ocular motility restriction, transient ptosis, and decreased visual acuity (>2 Snellen lines) in 2 patients each. All of them had posterior intraconal tumor extending up to the superior orbital fissure. One patient had tumor recurrence from the distal residual segment of the nerve of origin.

Conclusions: Orbital neurilemmoma is a benign tumor, presenting as painless gradually progressive abaxial proptosis caused by well-circumscribed superior orbital extraconal tumor. Complete excision offers gratifying outcomes, with adverse events being commoner in posterior intraconal tumors.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Positive Correlation Between Duration of Contraceptive Use and Estrogen-Beta Receptor in Orbitocranial Meningioma

First Author: Dhimas **SAKTI**

Co-Author(s): Muhammad **BAYU SASONGKO**, Suharjo **PAWIROANU**, Didik **SETYO HERIYANTO**, Agus **SUPARTOTO**, Indra **TRI MAHAYANA**

Purpose: To find the correlation between hormonal contraceptive use and expression of progesterone and estrogen receptors in orbitocranial meningioma patients.

Methods: Female meningioma patients from 2010-

2016 were interviewed and the paraffin blocks containing their meningioma tissue were examined using quantitative real-time polymerase chain reaction to measure estrogen receptor (ER) and progesterone receptor (PR) expression.

Results: Thirty-one patients were included in this study. The expression median of ER α in the progesterone contraception group (A), progesterone and estrogen group (B), and no contraception group (C) were 6.96, 6.50, and 4.00, respectively, with $P = 0.702$; ER β median were 10.56, 9.19, and 11.31 with $P = 0.477$; PR median were 21.11, 29.86, and 27.86 with $P = 0.772$. The expression median of <10 years contraception duration of use and >10 years duration for ER α were 6.50 and 6.96 with $P = 0.847$. Expression median of ER β were 6.06 (2.30-11.31) and 13.00 (1.87-42.22) with $P = 0.022$. Expression median of PR were 21.11 and 24.25 with $P = 0.809$. The correlations between contraception duration and expression of ER α , ER β , and PR were $r = -0.043$ ($P = 0.829$), $r = 0.440$ ($P = 0.019$), and $r = 0.052$ ($P = 0.792$).

Conclusions: Expression of ER β was significantly higher in duration of contraceptive use >10 years and positively correlated with the duration of contraceptive use. Duration of contraception use was not correlated with the expression of ER α and PR. The type of contraception was not related to the expression of ER α , ER β , and PR.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Retinoblastoma Regression Pattern Seen in Modern-Day Conservative Treatment

First Author: Purnima **RAJKARNIKAR STHAPIT**

Co-Author(s): Santosh **HONAVAR**

Purpose: The treatment of retinoblastoma has evolved from destructive surgeries like exenteration, enucleation, and external beam radiation to eye and vision saving procedures like chemotherapy, transpupillary thermotherapy, cryotherapy, and plaque brachytherapy. With this modern-day therapy combined with advanced technology like Retcam, we are now able to study in detail how retinoblastoma actually grows in the eye and how a regressed tumor appears on examination. Here we present the photographic demonstration of retinoblastoma from the day of presentation until the complete regression by conservative treatment.

Methods: This was a retrospective analysis of serial fundus photographs of 20 eyes of patients with retinoblastoma who received 1 or more of the following

treatments: systemic chemotherapy, superselective ophthalmic artery chemotherapy, transpupillary thermotherapy, cryotherapy, plaque brachytherapy, periocular, and/or intravitreal chemotherapy. Each patient was examined in detail under anesthesia before initiation of every treatment. The fundus photographs were taken with Retcam during such sessions. Eyes with opaque media or those without matching pictures and the treatment resistant were not included.

Results: Serial fundus photographic study of retinoblastoma cases is useful to study the regression pattern and behavior of different types and sizes of tumor to individual treatment methods at each cycle. It also helps to identify the warning signs in treatment-resistant cases.

Conclusions: Photographic documentation of retinoblastoma eyes helps the treating ocular oncologist to understand the disease pattern well so that better judgement can be made in subsequent cases.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Retinoblastoma With Neovascular Glaucoma: Can These Eyes Be Salvaged?

First Author: Raksha **RAO**

Co-Author(s): Santosh **HONAVAR**, Vijay Anand **REDDY**

Purpose: Traditionally, eyes with group E retinoblastoma with neovascular glaucoma (NVG) are enucleated. This study evaluated the use of systemic chemotherapy in retinoblastoma with NVG and the clinical features contributing to failure of eye salvage in these eyes.

Methods: Comparative case series of 37 retinoblastoma group E eyes with NVG.

Results: Of 37 (63%) eyes managed with intravenous chemotherapy (IVC), 21 (57%) needed secondary enucleation. Eyes that failed IVC were compared with those salvaged ($n = 16$, 43%). Clinical risk factors predictive of secondary enucleation were age at diagnosis > 6 months ($P = 0.0554$), duration of symptoms > 10 weeks ($P = 0.0031$), IOP > 26 mm Hg ($P = 0.0453$), buphthalmos ($P = 0.0135$), and sterile orbital inflammation ($P = 0.0230$). At a mean follow-up of 24 months, none of the patients developed extraocular extension or systemic metastasis.

Conclusions: Recognizing these high-risk clinical features in retinoblastoma presenting with NVG can help categorize patients for treatment aimed at possible eye salvage.

Ophthalmic Epidemiology

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Association Between the Severity of Myopia and Physical Performance of Military Males

First Author: Jia-Wei **LIN**

Co-Author(s): Chia-Hung **LI**, Gen-Min **LIN**, Fang-Ying **SU**

Purpose: Myopia may be related to a sedentary lifestyle and obesity in children, whereas the association with physical fitness in military young adults has not been investigated.

Methods: We examined the cross-sectional association in 3669 military male adults, aged 29.4 years on average, from the Cardiorespiratory Fitness and Hospitalization Events in Armed Forces (CHIEF) study in Taiwan. The severity of myopia obtained from the most affected eye was defined as mild (-0.1 to -3.0 diopters; n = 544), moderate (-3.1 to -6.0 diopters; n = 563), and high (>-6.0 diopters; n = 150). Those males without myopia were defined as unaffected (n = 2412). Physical fitness was evaluated by the performance of 3000-meter running, 2-minute sit-up, and 2-minute push-up, where all the procedures were standardized by a computerized scoring system. A multiple linear regression analysis was used to determine the relationship.

Results: As compared with the unaffected, mild, moderate, and high myopia were positively correlated with 3000-meter running duration { $\beta = 9.64$ [95% confidence interval (CI), 3.22-16.05], 12.41 [95% CI, 6.05-18.76], and 20.87 [95% CI, 9.22-32.51], respectively; all P values < 0.005} after adjusting for age, service specialty, heart rate, body mass index, systolic and diastolic blood pressures, current cigarette smoking, alcohol intake status, hemoglobin levels, and average weekly exercise times. However, there was no association of any grade of myopia with 2-minute sit-up and 2-minute push-up.

Conclusions: Our findings suggest that there was a dose-dependent inverse relationship between the severity of myopia and cardiorespiratory fitness. The mechanism is novel and requires further investigation.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Barriers to Optimal Diabetic Retinopathy Management in an Indonesian Population With Type 2 Diabetes: Jogjakarta Eye Diabetic Study in the Community (JOGED.COM)

First Author: Sarah **INDRAYANTI**

Co-Author(s): Angela **AGNI**, Yayi Suryo **PRABANDARI**, Muhammad **SASONGKO**, Idhayu **WIDHASARI**, Felicia **WIDYAPUTRI**

Purpose: The prevalence of diabetic retinopathy (DR) and blindness in the Indonesian population is very high, but factors underlying this high prevalence have not been identified. This study aimed to evaluate perceived barriers to optimal DR management in an Indonesian population with type 2 diabetes.

Methods: We interviewed 377 adults with type 2 diabetes that participated in the Jogjakarta Eye Diabetic Study in the Community, who were diagnosed as having vision threatening DR and referred to DR treatment facilities. The interview was done using validated questionnaires to determine perceived barriers, including financial, geographic, sociocultural, health care provider, awareness, and personal factors.

Results: There were 24.2% of patients that attended the referral and attained complete DR treatment. In urban areas, 28.1% had completed DR treatment. Among those who did not attend the referral, 50% felt that they had no obligation to attend because they had no eye complaints, 50% received inadequate information about the treatment cost, and 21% had lack of understanding about their conditions. In rural areas, there were only 17% of patients that attained complete DR treatment. Most patients (86%) did not get sufficient information about the treatment cost, 80% had significant family reluctance and lack of DR awareness, and 60% had significant constraints related to access to care.

Conclusions: In this study, we identified that sociocultural aspects, lack of access to care, and awareness about DR may be significant barriers to optimal DR management in this population. This highlights the need for population intervention to eliminate these factors to prevent further escalation of DR-related blindness.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425
Burden of Vision Loss Associated With Eye Disease in China 1990-2020: Findings From the Global Burden of Disease Study 2015
First Author: Bingsong **WANG***Co-Author(s):* Ningli **WANG**

Purpose: To assess the burden of vision loss due to eye disease in China between 1990 and 2015 and to predict the burden in 2020.

Methods: Data from the Global Burden of Diseases, Injuries, and Risk Factors Study 2015 (GBD 2015) were used. The main outcome measures were prevalence and years lived with disability (YLDs) for vision loss due to cataract, glaucoma, macular degeneration, other vision loss, refraction and accommodation disorders, and trachoma.

Results: Prevalence for eye diseases increased steadily from 1990 to 2015 and will increase till 2020. From 1990 to 2015, the most common eye disorder was refraction and accommodation disorders. From 1990 to 2015, the vision loss burden due to eye disease decreased for those aged 0-14 years and increased for those aged 15 years and above, with the most notable increases occurring among those aged 50 years and above. China ranked 10th when comparing YLDs for vision loss due to eye disease with the other members of the G20. Age-standardized YLD rates for vision loss due to eye disease declined in all 19 countries, except for China. The burden from vision loss due to eye disease ranked 12th and 11th among all causes of health loss in China in 1990 and 2015, respectively.

Conclusions: Alone among major economies, China has experienced an increase in the burden of age-standardized vision loss from eye disease over the past 2 decades. In the future, China may expect a growing burden of vision loss due to population growth and ageing.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425
Exercise is Associated With Less Myopia in Southern Californian Children
First Author: Donald **FONG***Co-Author(s):* Chunyi **HSU**, Bobeck **MODJTAHEDI**, Christos **THEOPHANOUS**

Purpose: To investigate the prevalence and risk factors

for pediatric myopia in Southern California.

Methods: Kaiser Permanente Southern California (KPSC) is a group model health maintenance organization (HMO) which takes care of 4.4 million members by 6000 physicians in approximately 100 medical offices. KPSC membership is diverse: 43% Hispanic, 35% non-Hispanic white, 9% African American, 11% Asian, and 2% other. Electronic medical records of patients aged 5-19 years old with at least 1 recorded refraction in 2013 were reviewed. Myopia was defined as spherical refraction ≤ -1.0 diopter (D). Demographic data were collected for each patient including sex, age, and race/ethnicity. Children/parents were asked about the exercise status at each visit to their pediatrician. Frequency and duration of exercise were collected and analyzed.

Results: Records from 60,789 children were reviewed; 41.9% of children had myopia. Myopia was more common in older children (14.8% in 5-7 years old, 59.0% in 17-19 years old). Asian/Pacific Island children (RR 1.64; CI, 1.58-1.70) had higher prevalence of myopia compared to white children. At least 60 minutes of daily exercise was associated with a lower rate of myopia (RR 0.87; CI, 0.8-0.89).

Conclusions: The prevalence of myopia increases with age. Asian children are at highest risk. Exercise may be protective and represents an important modifiable risk factor that may be a target for future public health efforts.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425
Incidence and Prevalence of Central Serous Chorioretinopathy and Associated Steroid Use in South Korea: National Sample Cohort 2002-2015
First Author: Tyler **RIM***Co-Author(s):* Sung Soo **KIM**

Purpose: To determine the population-based incidence and prevalence of central serous chorioretinopathy (CSC), as well as steroid use associated with CSC, in South Korea using a national sample cohort from 2002 to 2015.

Methods: A nationwide population-based retrospective study was performed using National Health Insurance Service-National Sample Cohort data from 2002 to 2015 (NHIS-NSC 2002-2015). Both incidence and prevalence were calculated for 5 years, from 2011 to 2015 using the sixth edition of Korean Classification of Disease, while excluding chronic cases that occurred

until December 2010. The association between steroid use and CSC was evaluated based on oral or topical steroid use from 2002 to 2010.

Results: Over the 5-year study period, a total of 102 CSC cases were observed. Incidence of CSC was 2.5 per 10,000 person-years (3.7 for men and 1.2 for women). Prevalence was 4.1 per 10,000 persons. We also found that past history of steroid use was associated with CSC. When the dose was divided into quintiles, CSC risk increased with a hazard ratio (HR) of approximately 1.5, regardless of dose. Oral use [HR, 1.44; 95% confidence interval (CI), 1.21-1.70] or combined oral and ointment use (HR, 1.65; 95% CI, 1.28-2.12) was also associated with CSC; however, use of ointment alone was not associated with increased risk of CSC (HR, 1.15; 95% CI, 0.51-2.60) compared to no steroid use.

Conclusions: Five-year incidence and prevalence of CSC were 2.5 per 10,000 person-years and 4.1 per 10,000 persons, respectively. Exposure to steroid was associated with CSC, regardless of the dose; however, use of ointment alone showed no association.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Prevalence of Refractive Error, Presbyopia, and Unmet Need of Spectacle Coverage in a Northern District of Bangladesh: Rapid Assessment of Refractive Error Study

First Author: Mohammad MUHIT

Co-Author(s): Johurul ISLAM, Muhammad Zahid JADOON, Gulam KHANDAKER, Hasan MINTO, Sumrana YASMIN

Purpose: To determine the prevalence of refractive error (RE), presbyopia, spectacle coverage, and barriers to uptake of optical services in Bangladesh.

Methods: Rapid assessment of refractive error (RARE) study following RARE protocol was conducted in a northern district (ie, Sirajganj) of Bangladesh (January 2010 to December 2012). People aged 15-49 years were selected, and eligible participants had habitual distance and near visual acuity (VA) measured and ocular examinations were performed in those with VA < 6/18. Those with phakic eyes with VA < 6/18 but improving to ≥ 6/18 with pinhole or optical correction were considered as RE and people aged ≥ 35 years with binocular unaided near vision of

Results: A total of 3043 people were examined, of which 143 had RE [4.7%, 95% confidence interval (CI): 3.9-5.5]. Among people aged ≥ 35 years, (n = 1402) 869 had presbyopia (62.0, 95% CI: 59.4-64.5). Spectacle

coverage for RE and presbyopia were 13.3% (95% CI: 7.7-18.9) and 3.2% (95% CI: 2.2-4.6), respectively. "Unaware of the problem" was the main reason for not utilizing any optical services among the people with RE (92.8%) and presbyopia (89.5%). Extrapolating the survey findings to the 2011 national census data, the magnitude of RE among people aged 15-49 years in Bangladesh is estimated to be 3,493,980 people (95% CI: 2,899,260-4,088,700), of whom 3,029,280 people do not use any spectacles.

Conclusions: The burden of RE and presbyopia is substantial in Bangladesh. Improving awareness and availability of refraction services is required to correct refractive errors and presbyopia in Bangladesh.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S228

Retinopathy Status as a Marker for More Severe Depletion in Circulating Endothelial Progenitor Cells and Systemic Atherosclerosis in Diabetics

First Author: Kendrick SHIH

Co-Author(s): Cynthia CHAN, Wee Nie KUA, Ian WONG, Kai Hang YIU

Purpose: Diabetes is associated with a reduction and dysfunction of circulating endothelial progenitor cells (EPC), which hastens the onset and progression of systemic atherosclerosis. We hypothesize that diabetic retinopathy status may serve as a marker for more severe depletion of circulating EPCs and thus systemic atherosclerosis.

Methods: We examined coronary calcifications, carotid intimal medial thickness (IMT), and arterial segment pulse-wave velocities (PWV) and their relationships with different subtypes of circulating EPC in 163 patients with type II diabetes (126 patients without retinopathy and 34 patients with retinopathy). Four subpopulations of EPC were determined by flow cytometry on the basis of surface expression of CD34, CD133, and KDR antigen: CD34+, CD34/KDR+, CD133+, and CD133/KDR+ EPC, respectively.

Results: Subjects with diabetic retinopathy had on average longer duration of diabetes than those without (15 years vs 8 years). All subjects had severely depleted levels of all circulating EPCs. Patients with diabetic retinopathy had significantly lower CD34/KDR+ (1.42% vs 1.70%) and CD34+ EPC counts (5.49% vs 6.55%) than those without. There were no significant differences between the groups in CD133+ and CD133/KDR+ counts. The mean Agatston score for coronary calcification was significantly higher in those

with diabetic retinopathy compared to those without diabetic retinopathy (248.38 vs 143.57). Furthermore, subjects with diabetic retinopathy had higher carotid IMT (0.91 mm vs 0.88 mm), heart-femoral PWV (976.68 vs 873.29), heart-ankle PWV (1084 vs 1080), and brachial-ankle PWV (1815 vs 1782) those those without.

Conclusions: Diabetic retinopathy status is a useful marker for severe depletion of circulating EPCs and systemic atherosclerosis.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Six-Year Incidence of Visual Impairment in a Multiethnic Asian Population: The Singapore Epidemiology Eye Disease Study

First Author: Yih-Chung **THAM**

Co-Author(s): Miao Li **CHEE**, Ching-Yu **CHENG**, Charumathi **SABANAYAGAM**, Tien-Yin **WONG**

Purpose: To describe the incidence of visual impairment (VI) in a multiethnic Asian population in Singapore.

Methods: The Singapore Epidemiology of Eye Diseases (SEED) Study comprised 3 major Asian ethnic groups: Malays, Indians, and Chinese. Of the 8592 eligible participants from baseline examination (year 2004-2011), 6762 (78.7% response rate) were reexamined during the 6-year follow-up (year 2011-2017). VI was categorized into low vision (LV) and blindness, which were defined as best-corrected VA <20/40 to >20/200 and best-corrected VA ≤20/200 in the better-seeing eye, respectively. Incidence of VI was evaluated among those without VI at baseline. Incidence estimates were age-standardized to the Singapore Population Census 2010. Poisson binomial regression model was used to determine factors associated with incident VI.

Results: After excluding those with VI at baseline, 6524 individuals (1800 Malays, 2143 Indians, 2581 Chinese) were included in the analysis. The overall age-standardized incidence was 3.7% [95% confidence interval (CI), 3.1%-4.6%] for LV and 0.3% (95% CI, 0.1%-0.7%) for blindness. Malays had significantly higher (all $P < 0.001$) incidences of low vision (7.3%) and blindness (1.7%) compared to Indians (LV: 2.3%; blindness: 0.2%) and Chinese (LV: 2.9%; blindness: 0.1%). Older age [per decade, relative risk (RR), 2.64; 95% CI, 2.23-3.14], chronic kidney disease (RR, 1.48; 95% CI, 1.10-2.01), and lower socioeconomic status (RR, 2.56; 95% CI, 1.83-3.59) at baseline were significantly associated with incident VI.

Conclusions: In this multiethnic Asian cohort, Malays

had the highest incidence rate of VI. These findings will be useful in the planning and designing of eye health services in Singapore and Asia.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

The Association Between Cataract Surgery and the Progression of Diabetic Retinopathy: A Systematic Review and Meta-Analysis

First Author: Lei **LIU**

Co-Author(s): Sabanayagam **CHARUMATHI**, Ching-Yu **CHENG**, Yih-Chung **THAM**, Charlene **WONG**, Tien-Yin **WONG**

Purpose: There is still controversy over the correlation between cataract surgery and diabetic retinopathy progression. Hence, this meta-analysis was performed to determine the association between cataract surgery and the progression of diabetic retinopathy (DR).

Methods: A comprehensive literature review was conducted based on searching of PubMed, Scopus, ISI Web of Science, and Google Scholar to identify eligible studies. A meta-analysis was performed and the pooled relative risk (RR) and odds ratio (OR) for cataract surgery and DR progression with 95% confidence interval (CI) were estimated using STATA software. The heterogeneity of the included studies was examined with I² statistics. The publication bias was evaluated using Begg rank correlation test and Egger linear regression test.

Results: Five eligible studies (2 prospective studies and 3 retrospective studies) involving 318 diabetic individuals with 477 eyes were included to evaluate the association between cataract surgery and DR progression. The overall pooled RR between cataract surgery and DR progression was 1.57 (95% CI, 1.06-2.31). Subgroup analysis by study design indicated that cataract surgery increased the risk of DR progression in retrospective studies, with OR of 1.98 (95% CI, 1.13-3.47), whereas in prospective studies (RR, 1.21; 95% CI, 0.6-2.46), there was no significant association. No significant publication bias or heterogeneity was detected among the included studies ($P > 0.05$).

Conclusions: These results suggest that cataract surgery has a potential risk for acceleration of DR. Future surveys are still required to strengthen the association between cataract surgery and DR progression in longitudinal population-based studies.

Orbital & Oculoplastic Surgery

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

A *Dirofilaria* Young Adult in the Anterior Chamber of the Eye: A Case Report From Sri Lanka

First Author: Lalitha **SENARATH**

Purpose: Identification of a nematode in the anterior chamber of the eye of a 68-year-old female with a history of painful red eye on her right side which was managed symptomatically and treated with oral and topical antibiotics and topical steroids.

Methods: A live worm in the anterior chamber was detected by slit lamp examination. The worm was surgically extracted through a limbal incision. To facilitate the surgical removal 1% acetylcholine was injected and viscoelastic substance was introduced into the anterior chamber and the live worm escaped via the incision. The fresh specimen was examined by a medical parasitologist. Examination revealed smoothly curved nematode of 5 mm in length that had rounded cephalic and tail ends. The vulval opening was situated 0.2 mm from the cephalic end. There were no horizontal and vertical ridges in the multilayered cuticle.

Results: Said features are more compatible with *Dirofilaria immitis* young adult. However, in Sri Lanka *D. immitis* is not reported even among dogs. In previous publications from Sri Lanka, worms removed from subconjunctiva or subcutaneous tissues of eye lids were identified as *D. repens*. Only *Wuchereria bancrofti* worms were extracted from intraocular structures such as the anterior chamber and vitreous body. Molecular analysis of the worm could not be conducted due to lost specimen.

Conclusions: However, a survey covering a group of dogs in the area where the above patient resides is planned to predict the species of the said worm. This case report highlights the timely necessity of raising awareness of ocular dirofilariasis among healthcare professionals and the community.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Asian Double Eyelid Blepharoplasty: A Prospective Study to Analyze Patient Requirements and Surgical Technique in 144 Cases

First Author: Noornika **KHURAIJAM**

Co-Author(s): Sarda **CHONGTHAM**, Romen **KEISHAM**, Sachindra **LAISHRAM**, Dinakumar **YAMBEM**, Shailendra **YENGKHOM**

Purpose: To understand the needs of patients undergoing double eyelid blepharoplasty (DEBP), identify periocular structures that can result in an ill-defined or absent lid crease, and highlight the surgical steps required to achieve aesthetic satisfaction.

Methods: A total of 144 patients that underwent DEBP were included. All patients were asked to quote the reasons for undergoing surgery. Marginal reflex distance and levator functions were recorded. Mild asymmetries, loose skin, and puffy eyelids if any were noted and rectified during surgery. Maximum tarsal height was recorded to determine the height of the lid crease. A strip of pretarsal orbicularis oculi was removed. Follow-up was done at 7 days, 1 month, and 6 months. Photographic documentation was done.

Results: Mean age was 27 years. Male:female ratio was 1:8. Reasons quoted for undergoing surgery were difficulty in eye makeup, 39%; desire for brighter looking eyes, 37%; asymmetry, 14%; and functional causes, 5%. Excessive retro-orbicularis oculi fat was noted and removed in 25%. Skin-muscle was excised in 36%. Postseptal fat was noted to be overhanging the upper tarsal edge and removed in 46%. Patient satisfaction was achieved in 93%. Six cases underwent resurgery.

Conclusions: Difficulty in eye makeup application was the predominant cause for desiring a lid crease. Excision of preseptal fat as well as retro-orbicularis fat is necessary in select cases for a good outcome. Cases above 35 years of age require skin-muscle excision. Resultant asymmetry after surgery is the commonest cause for dissatisfaction.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Autologous Fat Graft for the Treatment of Sighted Posttraumatic Enophthalmos and Orbital Depression

First Author: Hui **CHEN***Co-Author(s):* Qian **ZHANG**

Purpose: The treatment of enophthalmos and orbital depression is challenging. Although autologous fat graft (AFG) has been widely used in breast augmentation, buttock contouring, and facial rejuvenation, its application in enophthalmos and orbital depression is not yet widely utilized. The clinical safety and value of AFG in sighted patients with enophthalmos and orbital depression are unclear. The present study retrospectively analyzed the cosmetic results and safety of AFG in the correction of sighted traumatic enophthalmos and orbital depression.

Methods: AFG was performed in 9 patients with posttraumatic enophthalmos and orbital depression. The visual acuity, orbital swelling, eye movement, enophthalmos, and orbital depression were observed.

Results: From 8–24 months after AFG, enophthalmos and orbital depression in 9 patients improved significantly. Although orbital swelling occurred in the early postoperative period, no vision loss, eye movement limitation, or fat embolism occurred.

Conclusions: AFG is an effective, predictable, scarless, and minimally invasive surgery for the correction of sighted posttraumatic enophthalmos and orbital depression. It can be performed safely by experienced oculoplastic surgeons.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Comparative Study Between Probing Done With and Without Nasal Endoscopy in Management of Congenital Nasolacrimal Duct Obstruction

First Author: Smriti **BANSAL**

Purpose: To compare the outcomes of primary probing done as a blind procedure and probing done under guidance of nasal endoscopy in management of congenital nasolacrimal duct obstruction (cNLDO).

Methods: Medical records of all patients who were diagnosed as congenital nasolacrimal duct obstruction and underwent probing were collected and analyzed.

Data included the demographic details of the patient, duration of the symptoms, history of any other procedure, and follow-up after the procedure. Patients with any history of trauma, craniofacial anomalies, or history of any other surgery in the eye were excluded from the study.

Results: Data of 220 patients from January 2015 to June 2017 were collected. Average age was 16.14 months (5–84 months). Out of 220 patients 147 underwent blind probing and in 73 patients probing was done under endoscopic guidance. Out of those 220 patients, 180 were primary probing and 40 were secondary probing. In the blind probing group 90 (61%) patients had successful outcome whereas in the endoscopic-guided probing group 70 (95.5%) had successful outcome.

Conclusions: Probing done under endoscopy guidance has better outcomes and can prevent use of any other secondary procedure and also reduces the comorbidities associated with general anesthesia in children.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Double Eyelid Blepharoplasty Incorporating Epicanthoplasty Using a Modified L-Epicanthoplastic Technique

First Author: Jin **LI***Co-Author(s):* Ming **LIN**

Purpose: The present report introduces a modified L-epicanthoplastic technique for patients with a single eyelid and epicanthus.

Methods: The modified L-epicanthoplastic technique includes the epicanthus corrective line extending along the double eyelid line, excess skin being transferred, and the anterior branch of the inner canthal ligament being shortened. This novel technique was performed to correct the epicanthal folds of 29 patients in the department of ophthalmology.

Results: The results of a questionnaire survey indicated that all of the 29 patients were satisfied with their postoperative effect 24 months after surgery. The incision line at the inner canthus of 29 patients connected to the double eyelid line naturally without obvious signs of an incision trace remaining. The postoperative distance of the inner canthus was 29.55 mm, which was significantly less than the preoperative distance. Twenty-seven (93.1%) cases of epicanthus were fully corrected with the inner canthus angles completely open to create a circular-arc shape with the lacrimal caruncle completely exposed.

Conclusions: The modified L-epicanthoplasty technique introduced here has advantages in naturally forming a double eyelid radians with a minimal scar and reducing the tension of the inner canthus to get a steady effect, which is an especially suitable approach for epicanthoplasty in Asian patients.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Effect of Upper Eyelid Blepharoplasty on Tear Film Parameters and Ocular Surface Morphology in Patients With Dermatochalasis and Lash Ptosis

First Author: Nilutparna DAS

Co-Author(s): Pritam BAWANKAR, Kasturi BHATTACHARJEE, Dipankar DAS, Ganesh KURI, Diva MISRA

Purpose: A prospective study to analyze the effect of upper eyelid blepharoplasty (UEB) on tear film parameters and ocular surface morphology in patients presenting with dermatochalasis and lash ptosis.

Methods: Eighty eyelids of 40 patients underwent UEB and were assessed preoperatively and 3 months postoperatively. Ocular Surface Disease Index (OSDI) questionnaire, routine ocular examination, Schirmer test, tear volume, tear film break-up time, tear osmolarity, corneal and conjunctival staining, and conjunctival impression cytology were documented.

Results: Thirty patients (75%) had subjective dry eye symptoms preoperatively and 13 patients (32.5%) postoperatively. Statistically significant improvement ($P < 0.001$) was found between preoperative tear osmolarity (mean, 316.19 mOsm/L; SD, ± 15.95 mOsm/L) and 3 month postoperative tear osmolarity (mean, 313.90 mOsm/L; SD, ± 16.37 mOsm/L) with an age-specific postintervention reduction in the age group of 65-69 years (mean, 3.17 mOsm/L; SD, ± 2.26 mOsm/L; $P < 0.001$). Preoperative conjunctival inflammatory change was seen among 28 out of 40 patients (70%). In 11 (39.28%) of these patients epithelial cell morphology improved postoperatively; in 15 patients (53.57%) it did not change; and in only 2 patients (7.14%) squamous metaplasia was noted. In 12 patients (30%) preoperative epithelial cell morphology was normal and remained the same postoperatively.

Conclusions: UEB may be an effective treatment in alleviating the dry eye symptoms in patients with dermatochalasis and lash ptosis. Infrequent blinking due to overaction of occipitofrontalis in patients with dermatochalasis causes increased evaporation and the lash ptosis initiates an ocular surface inflammation by

microtrauma. Upper eyelid blepharoplasty provides an alternative in relieving these patients from the vicious cycle of inflammation, hyperosmolarity, and ocular surface injury.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Exploration of a Newly Introduced Operation With Combined Fascia Sheath Suspension in Ptosis Repair

First Author: Ming LIN

Co-Author(s): Jin LI

Purpose: To illustrate a new surgical procedure, which is more effective in correcting severe ptosis and can achieve a satisfactory cosmetic result.

Methods: The tarsus was sutured and suspended to the conjoint fascia sheath (CFS), the tissue between the superior rectus and the levator palpebrae superioris. This new procedure contributed greatly to the improvement of the height of the upper eyelid and to the proper adjustment of the upper eyelid radian. After 1-year follow-up, the effect was stable.

Results: There were 22 patients (27 eyes) with severe ptosis who received the treatment of CFS suspension, including 5 cases of bilateral ptosis and 17 cases of unilateral. All cases were followed up for 1 year and had achieved a satisfactory effect in 26 eyes. The other 1 eye was improved.

Conclusions: The application of CFS suspension in correcting severe ptosis shows the advantages of a relatively simple operation procedure, less damage during the operation, less hysteresis of the upper eyelid after the operation, and few complications. This technique can effectively correct severe ptosis with a stable curative effect, and it is worth wide application.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S426-S427

Long-Term Outcomes of Punch Punctoplasty With Kelly Punch and Review of Literature

First Author: Emily WONG

Co-Author(s): Emmy LI, Hunter YUEN

Purpose: To report long-term outcomes of punch punctoplasty utilizing the Kelly punch and to compare the results with other described methods of punctoplasty in the literature.

Methods: A retrospective, noncomparative interventional case series of patients who underwent punch punctoplasty at Hong Kong Eye Hospital over an 8-year period. A standard Kelly Descemet membrane punch was utilized for punctal enlargement in all cases. Patient records and their operative records were reviewed. Anatomical success was defined by well patent puncta on follow-up. Functional success was considered complete if tearing resolved completely postoperatively and partial if residual tearing remained despite patent puncta and nasolacrimal drainage system. An OVID MEDLINE review was performed to compare success rates of various punctoplasty surgeries in the literature.

Results: A total of 101 punch punctoplasties from 50 patients were performed between January 2008 and January 2016. At a mean follow-up of 34 months (range, 6-86 months), anatomical success rate was 94% (95 out of 101 puncta), whereas functional success was 92% (54 out of 59 eyes). Two cases experienced postoperative dry eyes; otherwise no major complication was observed.

Conclusions: Punch punctoplasty via the readily available Kelly punch is a simple, minimally invasive procedure that demonstrates high anatomical and functional success as a sole primary treatment for simple punctal stenosis.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Orbital Decompression With Precise Design, Refined Manipulation, and Accurate Verification in Thyroid Eye Disease

First Author: Huifang **ZHOU**

Co-Author(s): Xianqun **FAN**, Yinwei **LI**, Jing **SUN**, Ai **ZHUANG**

Purpose: Orbital decompression has been through continuous developments for 1 century. How to achieve effective orbital decompression in a most precise, safe, and minimally invasive way has always been a research hotspot for ophthalmologists. To achieve this goal, we developed navigation software apt for orbital surgery; and by further integrating the endoscope into the navigation system, we managed to realize visualization and spatial orientation in a single procedure.

Methods: Preoperatively, we established the digital model of the target orbit, and based on that, we performed multiparameter measurements. Then we proceeded to make an individual plan for the surgical procedure. Intraoperatively, we precisely located the boundaries of the decompression area under the

guidance of the endonavigation system, realizing visible manipulation, real-time navigation, and early warning of the vital structures. Postoperatively, we examined the surgical outcome by both imaging tests and clinical signs. We performed the procedure on 84 patients with thyroid eye disease.

Results: The decompression area was verified to match the preoperative design by imaging tests in 95% of the patients. The strut structure between the orbital floor and the medial wall was well retained, and sufficient decompression of the deep lateral wall was reached. After surgery, exophthalmos, diplopia, and ocular dysmotility all improved, and optic neuropathy, hypophthalmos, and exposure keratitis were thus improved as well.

Conclusions: These digitalized surgical techniques integrate precise design, accurate orientation, and objective evaluation, making precise individual therapy a reality, which remarkably improves the surgical outcomes and safety and enjoys wider surgical field of orbital decompression.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Orbital Myiasis: Clinical Spectrum and Management Outcomes With Special Emphasis on Scanning Electron Microscopic Study

First Author: Rajendra **MAURYA**

Co-Author(s): Tanmay **SHRIVASTAV**, Mahendra **SINGH**, Virendra **SINGH**

Purpose: Orbital myiasis is a rare but most devastating ocular morbidity often seen in tropical countries. The aim of this study was to describe the clinical spectrum, entomological features, and management outcomes of orbital myiasis.

Methods: Fourteen cases of orbital myiasis were evaluated for clinical presentation and complications. Maggots were mechanically removed after using turpentine oil with chloroform. Maggots were sent for entomological study. All larvae were sent for scanning electron microscopic (SEM) study.

Results: Out of 14, in 8 cases ocular/periocular carcinoma were complicated by myiasis, 4 patients had severe ocular trauma, while 2 had orbital cellulitis. Among the eyelid malignancy cases, 3 were basal cell carcinoma, 3 were squamous cell carcinoma, and the remaining 2 were sebaceous gland carcinoma. In 1 case myiasis led to intracranial extension. In 7 patients >100 larvae were removed. Six patients had blinding

outcomes. Most common species identified after surface study of maggots by using scanning electron microscopy were *Dermatobia hominis*, *Wohlfahrtia magnifica*, and *Hypoderma bovis*, etc. Complications and treatment outcomes were discussed.

Conclusions: Orbital myiasis is a rare and challenging disorder, which if untreated can lead to blindness. Mechanical removal after suffocating the maggots is the main treatment. SEM study is an important tool for entomological identification.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Periocular and Orbital Amyloidosis: Clinical Profile and Management Strategy at a Tertiary Eye Hospital

First Author: GM **FARUQUE**

Co-Author(s): Golam **HAIDER**, Ismail **HOSSAIN**, Tanjila **HOSSAIN**, Syeed **KADIR**

Purpose: To present the demographic data, clinical presentation, and management outcomes in a series of patients with periocular and orbital amyloidosis.

Methods: This retrospective study was done in 6 patients who were diagnosed with periocular and orbital amyloidosis between January 2007 and February 2017. Radiological investigation and histopathological study were done to confirm the diagnosis. After histopathological confirmation evaluation was done for evidence of systemic amyloidosis.

Results: The study included 6 patients (5 male and 1 female). There were 5 unilateral lesions and 1 bilateral lesion. Clinical signs and symptoms were visible or palpable periocular mass or tissue infiltration in 6 cases (100%), ptosis in 3 cases (50%), proptosis or globe displacement in 2 cases (33%), and limitations in ocular motility in 2 cases (33%). Among all cases 2 patients (33%) had conjunctival involvement, 1 patient (17%) had periorbital involvement, 1 patient (17%) had lacrimal gland involvement, 4 patients (83%) had eyelid involvement, and 2 patients (33%) had orbital involvement. Age ranged from 25-50 years. Mean age was 37 years. All cases were investigated to rule out systemic amyloidosis with limited facility and no systemic involvement was found. Treatment modalities were mainly surgical debulking in 4 cases (66%) and surgical excision in 2 cases (34%).

Conclusions: Periocular and orbital amyloidosis may present with a wide spectrum of clinical findings depending on the location of the disease. A mass lesion was the most common symptom. Complete surgical

excision is not feasible in many cases, and the goal of treatment is to preserve function and to prevent sight-threatening complications.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428

Permeability of Optic Nerve by Variable Concentration of Hyaluronidase for Management of Hyaluronic Acid Facial Filler Embolism

First Author: Namrata **ADULKAR**

Co-Author(s): Charles **CHENG**, Vivian **YIN**

Purpose: Blindness from retinal or ophthalmic artery embolism is the most devastating complication of cosmetic filler injections. Despite a recent report by Zhu et al showing a lack of evidence for reversing visual loss, retrobulbar injection of hyaluronidase into the orbit is still advocated by some experts. The aim of our study was to evaluate the efficacy of hyaluronidase in reversing visual loss in an in vitro model of optic nerve filler emboli.

Methods: Optic nerve specimens were dissected from enucleation specimens. Intradural and intravascular filler was injected into the ophthalmic artery and central retinal artery. The dural layer was closed on both cut ends of the optic nerve section to prevent diffusion of the filler material. The sections of nerve were immersed in 3 concentrations of hyaluronidase solution for 24 hours: 500 U, 1000 U, and 1500 U per milliliter. Histopathological examination of the specimen was performed to determine the presence of filler and its effects on the vascular endothelium were studied.

Results: Six specimens were collected with an average of 10 mm (range, 0.8 mm to 1.2 mm). Two specimens were immersed in 20 mL of each of the 3 concentrations of hyaluronidase solution with 2 samples for control in saline. After 24 hours, the specimens were fixed in formalin and examined for presence of residual hyaluronic acid.

Conclusions: Efficacy of retrobulbar hyaluronidase injection to salvage central retinal artery occlusion is questionable due to lack of penetration of hyaluronidase through the dura. Thorough understanding of anatomy of facial and ophthalmic vasculature and training before taking on cosmetic facial injections remains critical in prevention of blindness.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428**The Role of a Vital Factor in Orbital Venous Malformation***First Author: Yongyun LI*

Purpose: Orbital venous malformation (OVM) is one of the common orbital diseases, which can cause severely disfigured appearance as well as impaired visual function. The present research aimed to investigate 1 factor, which plays a significant role in OVM.

Methods: Enzyme linked immunosorbent assay was used to detect the level of growth differentiation factor-15 (GDF15) in OVM patients and healthy people. The behaviors of endothelial cells (ECs) were observed by proliferation test, wound healing experiment, and vessel formation assay. The expression of extracellular matrix in perivessel cells was determined by Western blotting and immunofluorescence.

Results: GDF15 levels in serum of OVM patients was significantly lower than in healthy people. GDF15 can enhance the angiogenesis of ECs, which is the prerequisite to maintain normal structure of vessels. Meanwhile, GDF15 could upregulate extracellular matrix expression to keep a healthy status of vessel walls.

Conclusions: The findings of our study are promising to provide scientific evidence for new therapeutic targets in the management of OVM.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428**Transconjunctival Triamcinolone Injection for Upper Lid Retraction in Thyroid Eye Disease***First Author: Stephanie YOUNG**Co-Author(s): Yoon-Duck KIM, Dong Cheol LEE, Kyung In WOO*

Purpose: Upper lid retraction (ULR) is a common clinical feature of thyroid eye disease (TED). Our purpose was to study the effect of transconjunctival triamcinolone (TA) injection for patients presenting with ULR.

Methods: Retrospective interventional review of all patients who underwent transconjunctival TA injection (40 mg/mL) for ULR secondary to TED from January 2010 to December 2016 in a single tertiary institution was performed. Our study comprised 2 groups: patients receiving only TA injection (group

1) and patients receiving both TA injection and other immunosuppressive therapy (group 2).

Results: There were a total number of 99 patients and 135 eyes. Group 1 comprised 36 eyes (26.7%), while group 2 comprised 99 (73.3%). The mean number of TA doses was 2, with a mean total dose of 1.1 mL for each eye. Normalization or improvement of marginal reflex distance-1 (MRD1) was seen in 77.4% and 97.2% of group 1 patients at early and late review, respectively, and 77.6% and 87.8% of group 2, respectively. Absence or improvement in the International Thyroid Eye Disease Society (ITEDS) inflammatory index was seen in 83.9% and 86.1% of group 1 at early and late review, respectively, and 71.9% and 76.8% of group 2, respectively. Group 2 showed significantly poorer late response for improvement in ITEDS inflammatory index ($P = 0.032$), although there was no difference in other response or injection rates between the 2 groups.

Conclusions: Transconjunctival TA injection is a simple and effective treatment option for ULR related to TED, as both a primary treatment and adjunctive therapy to other immunosuppressive therapy.

Feb 10, 2018 (Sat)

16:30 - 18:00

Venue: S428**Transorbital Endoscopic Surgery for Cranio-Orbital Tumors***First Author: Stephanie YOUNG**Co-Author(s): Jeonghee KIM, Yoon-Duck KIM, Kyung In WOO*

Purpose: Lesions involving the deep orbit, cavernous sinus, middle fossa, and infratemporal fossa are traditionally challenging to manage. We describe our initial experience using a novel, minimally invasive approach in the management of cranio-orbital tumors involving these areas.

Methods: Interventional case series on surgical management of 4 patients having cranio-orbital tumors. All patients underwent minimally invasive, neuronavigated, transorbital, endoscopic-assisted removal of their tumors via an upper lid crease incision.

Results: Four patients in our center underwent the combined neurosurgical and orbital procedure: 1) A 64-year-old male had a sphenocavernous meningioma involving the orbit, causing proptosis and optic neuropathy. Postsurgery, there was decrease in size of the mass with improvement in optic nerve function. 2) A 67-year-old female with an intraorbital schwannoma extending into the cavernous sinus through the superior orbital fissure had severe proptosis and visual loss. Her proptosis improved significantly postsurgery

with near-total removal of the mass. 3) A 39-year-old female with sphenoid wing meningioma involving the lateral orbit with 8 mm of proptosis underwent transorbital removal of the mass with complete resolution of proptosis. 4) A 45-year-old female with recurrent temporal fossa and sphenoid ridge meningioma with severe motility restriction and visual loss underwent endoscopic surgical removal of the tumor with debulking of the cranio-orbital mass.

Conclusions: The endoscopic-assisted transorbital approach can be considered as an option in the management of lesions affecting complex anatomical regions as described above, with acceptable sequelae and reduced morbidity in relation to the traditional transcranial approaches.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Computed Tomography Findings of Orbital Dermoid and Epidermoid Cysts in Correlation With Histology

First Author: Jeong Hee **KIM**

Co-Author(s): Yoon-Duck **KIM**, Dong-Cheol **LEE**, Kyung In **WOO**

Purpose: To investigate the differences between them using computed tomography (CT) and evaluate the correlation between their radiological and histopathological findings.

Methods: We retrospectively reviewed the medical records and the CT images of 69 patients with a histopathological diagnosis of dermoid or epidermoid cyst from January 2001 to August 2016. Patient demographics were collected and CT findings of cyst characteristics were analyzed according to the location, volume, bone change, and density of the cysts. The Hounsfield unit (HU) of the lesions was measured on the CT images and compared with histopathological findings.

Results: Of the 69 cases, 10 (14.5%) were epidermal cysts and 59 (85.5%) were dermoid cysts. Thirty-seven (53.6%) patients were men. The mean age of the patients was 12.8 years. A significant difference was observed in the density of the lesions; the dermoid cysts measured -67.9 ± 63.3 HU, and the epidermoid cysts measured 18.9 ± 56.2 HU ($P = 0.043$), indicating that the density of the dermoid cysts was similar to that of adipose tissue while that of epidermoid cysts was equivalent to muscle. There was a significant difference in the contents of the 2 groups, with 89.9% of dermoid cysts having the density of adipose tissue whereas no fat component was observed in

epidermoid cysts ($P < 0.05$).

Conclusions: Dermoid and epidermoid cysts can be distinguished using CT imaging by their differences in attenuation, which strongly correlate with their histologic features. Dermoid cysts demonstrate the density of adipose tissue while epidermoid cysts show the density of muscle.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Extraocular Muscle Tumors of the Orbit: A Large Case Series

First Author: Tayyab **AFGHANI**

Co-Author(s): Hassan **MANSOOR**

Purpose: To describe the prevalence and type of biopsy-proven primary tumors of the extraocular muscles.

Methods: A retrospective analysis of 640 diagnosed orbital tumors who presented from July 1, 2001, to January 31, 2016, was carried out and the prevalence and types of biopsy-proven primary extraocular muscle tumors were determined.

Results: Of the 640 orbital neoplasms, there were 19 primary extraocular muscle tumors with the prevalence of 2.96%. The 19 different tumors had 12 types of histopathological diagnoses, which were divided into 5 broad categories. Inflammatory tumors in the form of fungal granulomas, nonspecific granulomas, and idiopathic orbital inflammatory disease were the commonest. Vascular tumors like cavernous hemangioma and angiolymphoid hyperplasia were the second most common entity followed by lymphoproliferative lesions like extranodal marginal zone lymphomas, myeloid sarcoma, and pseudolymphoma. The neurogenic and myogenic tumors were the less common categories. The recti were involved in 15 cases as compared to obliques, which were involved in just 4 cases. Except for 1 patient all the patients had an isolated single-muscle involvement. All the patients underwent surgery and the diagnoses were confirmed on histopathology. Four of the 19 tumors were malignant in nature: non-Hodgkin lymphoma, alveolar soft part sarcoma, myeloid sarcoma, and rhabdomyosarcoma. Eleven out of 19 patients had some degree of loss of muscle function after the treatment.

Conclusions: This study presents the largest case series on biopsy-proven primary extraocular muscle tumors. Inflammatory lesions were the commonest followed by vascular, lymphoproliferative, neurogenic, and myogenic tumors.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Orbital Lesion as the First Presentation of Hepatocellular Carcinoma: Lessons Learned From 2 Cases

First Author: Mutmainah **MAHYUDDIN**Co-Author(s): Joshua **LUMBANTOBING**

Purpose: To demonstrate 2 cases where orbital lesion was the initial sign of late-stage hepatocellular carcinoma.

Methods: Sixty-three-year-old and 62-year-old otherwise healthy females were studied with history of protruded eyes since 3 months before. In the first case, the right eye was protruded accompanied by vision impairment and double vision. The left eye orbit was involved in the second case, with eye protrusion to inferior site and restricted ocular motility to all directions without visual acuity disturbance. Computed tomography (CT) scan of both cases showed homogenous contrast enhancing mass with distinct edge, bridging the orbital wall (the sphenoid bone in the first case and the frontal bone in the second one) with intracranial involvement. Incisional biopsy of both cases revealed malignant tumor with poor differentiation of unknown origin. Further investigation with immunohistochemical examination showed positive results in Hepar1 and AE1/3 marker and pointed to hepatocellular carcinoma metastases. Abdominal CT-scan was performed later in both cases and showed an irregular surface of the liver with a rough parenchymal structure and multiple nodules of varying sizes suspiciously due to liver malignancies. Multidisciplinary management was then planned with hemato-oncology, neurology, and neurosurgery departments.

Results: Both cases were diagnosed with hepatoma stage IVB.

Conclusions: Orbital signs and symptoms of hepatic pathology are rarely considered early in the diagnosis of disease. Although rare, this type of malignancy can be found with orbital lesions as the initial presentation in 30% of cases. An awareness of the potential for these manifestations brings some concern to the ophthalmologist and oncologist.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S425

Visual Recovery After Combining Immediate Reposition With Early Intravenous Steroid and Neuroprotective Agent Administration in a Patient With Traumatic Globe Subluxation: A Case Report

First Author: Rizki **NAULI**Co-Author(s): Kautsar **BOESOIRIE**, Shanti **BOESOIRIE**, Muhammad Rinaldi **DAHLAN**, Angga **KARTIWA**, Andika **PRAHASTA**

Purpose: To report a case of a boy with globe subluxation.

Methods: A case report of an 11-year-old boy who came to the emergency unit with the chief complaint of protruding left eye since 6 hours prior to admission after accidentally being pricked by an iron fence point while he was climbing over it. Eye examination revealed his left globe was protruded anteriorly and visual acuity was 1/60. There was a 1 x 0.3 cm lacerated wound on the upper eyelid; the patient experienced pain, complete restriction of eye movement to all directions, hyperemia and chemosis of conjunctiva, and corneal abrasion due to exposure. Pupillary light reflex was reduced with normal consensual reflex and grade II relative afferent pupillary defect was present in his left eye. Posterior segment was difficult to examine due to corneal abrasion and no bony orbit deformities were found with Schedel X-ray. The patient was diagnosed with left globe subluxation and traumatic optic neuropathy. He underwent an immediate globe reposition followed by tarsorrhaphy under general anesthesia and muscle relaxant; then he was given an artificial tear eye drop, intravenous antibiotic, steroid, and neuroprotective agent postoperatively.

Results: After 3 weeks, tarsorrhaphy was removed, left globe was in place, and visual acuity was 1.0 with good ocular movement to all directions.

Conclusions: Globe subluxation is a rare clinical case with trauma as its most common cause. An immediate reposition under general anesthesia and muscle relaxant allowed the reduction of orbicularis muscle contraction. Early steroid and neuroprotective agent also contribute to good visual outcome.

Pediatric Ophthalmology & Strabismus

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

A Double-Blind, Placebo-Controlled Trial of Fluoxetine for the Treatment of Adult Amblyopia

First Author: Arash **MIRMOHAMMADSADEGHI**
Co-Author(s): Mohammad Reza **AKBARI**, Ali Reza **MOUSAVI**

Purpose: To evaluate the effect of fluoxetine on improving visual acuity in adult amblyopia.

Methods: In a double-blind, placebo-controlled trial, 40 adult cases (>18 years old) with anisometropic or strabismic amblyopia entered the study. Usual treatments of amblyopia (glasses prescription and patching) were prescribed for all cases. The cases were assigned randomly to the fluoxetine or placebo group. The cases in the fluoxetine group received 20 mg fluoxetine, 1 time per day, for 3 months. The cases in the placebo group received placebo for 3 months. Visual acuity testing and visual-evoked potential (VEP) were performed before and after treatment. The changes in logarithm of the minimum angle of resolution (logMAR) and the changes in latency and amplitude of VEP waves were compared between the fluoxetine and placebo groups.

Results: Twenty cases were assigned to each group. The mean age of the cases was 23 ± 4 years old. The mean pretreatment logMAR was 0.7 ± 0.1 (0.4-1) in the fluoxetine group and 0.8 ± 0.1 (0.5-1) in the placebo group. The mean posttreatment logMAR was 0.6 ± 0.2 (0.2-0.9) in the fluoxetine group and 0.7 ± 0.1 (0.3-1) in the placebo group. The mean change in logMAR was 0.18 ± 0.24 (0-0.6) in the fluoxetine group and 0.03 ± 0.05 (0-0.2) in the placebo group ($P = 0.04$). The mean VEP p100 latency decreased and p100 amplitude increased significantly in the fluoxetine group ($P = 0.03$ and 0.02, respectively).

Conclusions: Fluoxetine can be a valuable treatment for adult anisometropic and strabismic amblyopia and increase visual acuity in some cases.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Altered Tear Dopamine: A Novel Biomarker for Pediatric Myopia

First Author: Ritika **DALAL**
Co-Author(s): Jyoti **MATALIA**, Rohit **SHETTY**, Pallak **KUSUMGAR**, Swaminathan **SETHU**

Purpose: To quantify the tear fluid dopamine (DA) levels in myopic children and relate its levels in different grades of myopia.

Methods: The study included 40 children who were divided into 2 groups: 1) emmetropes ($n = 10$) and 2) myopes ($n = 30$), who were further divided into low myopes ($n = 10$) with a mean refractive spherical equivalent (MRSE) < -3 diopters (D), moderate myopes ($n = 7$) with MRSE -3 D to -6 D, and high myopes ($n = 13$) with a MRSE > -6 D. Children with recent history of allergy or systemic or local autoimmune disorders were excluded from the study. The patients recruited underwent detailed ophthalmic evaluation including axial length measurement, which was done using A scan biometry, between January 2016 and February 2017. Dopamine levels were measured by enzyme-linked immunosorbent assay (ELISA) from tears collected using Schirmer strips.

Results: In the 40 children included in the study, average age of emmetropes and myopes was 11.8 ± 1.1 and 11.4 ± 0.6 years, respectively. Mean axial length was 22.9 ± 0.2 mm in emmetropes and 25.3 ± 0.3 mm in myopes. Tear DA level was significantly ($P < 0.05$) lower in myopes (165 ± 74 pg/mL) compared to emmetropes (1158 ± 650 pg/mL). Tear DA levels among myopia grades were not significantly different.

Conclusions: The lower DA levels in myopes suggest tear DA as a biomarker in predicting progressive myopia in children.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Cryopreserved Rabbit Amniotic Membrane Alleviated Inflammatory Response and Fibrosis Following Experimental Strabismus Surgery in Rabbits

First Author: Bo Young **CHUN**
Co-Author(s): Soolienah **RHIU**

Purpose: To evaluate the ability of cryopreserved rabbit amniotic membrane (AM) transplantation to reduce

postoperative inflammation and extent of fibrosis following experimental strabismus surgery.

Methods: Ten white rabbits underwent bilateral superior rectus (SR) muscle resection. In the left eye, the resected SR muscle was wrapped with cryopreserved rabbit AM. The right eye underwent SR resection only and served as a control. The eyes were enucleated 4 weeks after extraocular muscle surgery. The degree of postoperative inflammatory infiltration, extent of fibrosis, and profile of relative expression of inflammatory mediators in the SR muscle were evaluated and compared between the 2 groups by histological analysis and real-time polymerase chain reaction (PCR).

Results: There was a statistically meaningful difference in the degree of postoperative inflammatory infiltration and extent of fibrosis between the eyes treated with cryopreserved rabbit AM after SR resection and those that underwent SR resection only. A significant decrease in expression of inflammatory cytokines [interleukin (IL)-12a, IL-12b, IL-17f, and tumor necrosis factor-alpha (TNF- α)] and a markedly increased expression of anti-inflammatory cytokines [transforming growth factor-beta-1 (TGF β -1) and IL-10] was observed in the eyes treated with cryopreserved rabbit AM.

Conclusions: In this study, we demonstrated that cryopreserved rabbit AM is effective in reducing postoperative inflammation and extent of fibrosis in a rabbit model of strabismus surgery. Our results imply that a cryopreserved AM allograft may have anti-inflammatory and antiscarring properties that can prevent postoperative adhesions following strabismus surgery.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Efficacy of Primary Intravitreal Ranibizumab for Treatment of Retinopathy of Prematurity in China

First Author: Jing **FENG**

Co-Author(s): Yanrong **JIANG**

Purpose: To evaluate the efficacy of low-dose intravitreal ranibizumab (IVR) in patients with retinopathy of prematurity (ROP).

Methods: A total of 629 eyes of 331 premature infants with high-risk type 1 prethreshold or threshold ROP were included. All of the participants were treated with IVR at an initial dose of 0.25 mg/0.025 mL. Outcome measures included ROP regression and recurrence. All treated infants had at least 6 months of follow-

up and were examined until total ROP regression had occurred.

Results: Complete resolution of ROP occurred in 384 (61.0%) eyes. However, ROP recurrence occurred in 245 (39.0%) eyes at 8.57 ± 3.73 weeks after initial treatment. A comparison of the completely cured eyes with the recurrent ROP eyes showed significant differences with regard to postmenstrual age (PMA) (38.65 ± 11.59 weeks vs 37.57 ± 18.09 weeks, respectively; $P = 0.001$) and chronological age (CA) (8.84 ± 3.96 weeks vs 8.00 ± 3.31 weeks, respectively; $P = 0.007$). Significant treatment effects were also observed with regard to type 1 prethreshold ROP (84.1%), but not for aggressive posterior ROP (33.3%, $P < 0.001$), and for zone II ROP (69.0%), but not for zone I ROP (38.4%, $P < 0.001$). Retreated eyes primarily received laser therapy (145 eyes, 58.7%). After a maximum of 3 treatments, all of the eyes attained anatomic success. The mean number of IVR injections was 1.20 ± 0.49 . Macular dragging left occurred in 4 eyes.

Conclusions: IVR monotherapy shows a significant benefit in the treatment of ROP, but recurrence of ROP after initial treatment is common, so increased monitoring and close follow-up should be implemented. Recurrence is associated with ROP classification.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Identification of Gene Mutations in Atypical Retinopathy of Prematurity Cases

First Author: Yian **LI**

Co-Author(s): Jie **PENG**, Peiquan **ZHAO**

Purpose: We found some preterm infants presented with atypical retinopathy of prematurity (ROP). To make a definitive diagnosis and explore the possible genetic mechanism of atypical ROP, we used next-generation sequencing technology to do gene sequencing of these cases.

Methods: Retrospective review of infants who presented with atypical ROP from January 2012 to March 2016. The data included gender, gestational weeks, birth weight, family history, and systemic disorders. Fundus photographs and fundus fluorescein angiography (FFA) of the patients were taken with Retcam III and confirmed with indirect ophthalmoscope. FFA of their parents were also taken. Peripheral blood of the patients and their parents were collected to perform gene sequencing, including FZD4, NDP, LRP5, TSPAN12, ZNF408, KIF11, etc. The gene mutations were analyzed.

Results: A total of 20 preterm infants with atypical ROP were included. After genetic tests, 5 gene mutations were detected, including gene mutation c.3989C>T(p. A1330V), c.1123G>A(p.A375T), c.2447A>C(p.Q816P), and c.A2431G(p.I811V) in LRP5 and c.134T>G(p.V45G) in NDP. These gene mutations were all disease-causing. In 10 eyes of these 5 cases, 4 eyes presented with disease resembling zone 2 stage 1 ROP, 2 with stage 4a ROP, 2 with stage 4b ROP, and 2 with stage 5 ROP. Among them, 2 cases had positive family history.

Conclusions: Gene mutations of LRP5 and NDP may play a role in the pathogenesis of ROP and cause atypical ROP. ROP cases should be carefully differentiated from preterm familial exudative vitreoretinopathy (FEVR) cases.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Lateral Rectus Recession With Superior Rectus Transposition in Esotropic DRS With Significant Co-Contraction, Globe Retraction, and Shoots

First Author: Pramod Kumar **PANDEY**
Co-Author(s): Annu **JOON**, Ipsita **MUNI**

Purpose: Superior rectus transposition (SRT) has been recently described for esotropic Duane retraction syndrome (DRS). However, frequently seen anomalies such as co-contraction, shoots, and pattern strabismus have not been addressed as concurrent lateral recession has not been done. We present a novel procedure of SRT + lateral rectus recession (LRC) with opposite medial rectus recession (MRC) to address these frequently encountered challenging motility presentations.

Methods: Ten patients of esotropic DRS with significant co-contraction and shoots underwent SRT with LRC and contralateral MRC to correct the primary deviation, improve abduction, and limit co-contraction. The abnormal head posture (AHP), ocular deviation, abduction/adduction deficit, globe retraction and shoots, any induced vertical tropia, and fundus torsion were evaluated preoperatively and postoperatively at 1 week, 1 month, and 3 months.

Results: DRS was left sided in 9 patients, and 9 patients were female. On presentation, the AHP ranged from 0-20 degrees and reduced to less than 5 degrees in all patients postoperatively; range of ocular deviation reduced to less than 8Δ from a preoperative measure of 15-35Δ. Limitation of abduction improved by 1 grade, adduction was not altered, and shoots improved. V pattern of 5-10Δ and intorsion up to

5 degrees was induced in all patients; 2 patients complained of torsional diplopia. There was no induced vertical tropia.

Conclusions: Patients of DRS with co-contraction and shoots require an LR weakening procedure. LRC with simultaneous SRT to LR and concurrent opposite MRC works well in such patients. SRT induces V pattern and intorsion which may be treated by graded vertical transposition of operated horizontal recti.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Lens Coloboma in Marfan Syndrome: A Case Report

First Author: Jianhui **PAN**
Co-Author(s): Xia **LI**, Wenping **WU**

Purpose: To describe 2 patients of Marfan syndrome with coloboma combined dislocated lens and to evaluate the clinical effect of lens removed by anterior segment vitrectomy through a 2.4-mm limbal incision and implantation of scleral-fixated 1-piece foldable intraocular lens (IOL).

Methods: Two 5-year-old boys who suffered from Marfan syndrome were identified with lens coloboma and lens subluxated. Their dislocated lenses were removed by vitrectomy through a 2.4-mm limbal incision and implantation of scleral-fixated 1-piece foldable IOL.

Results: Coloboma lenses were found in all eyes with obviously subluxation in 2 eyes in each boy. The coloboma approximately stretched across 2 clock hours in different quadrants. The uncorrected visual acuity was improved obviously (1 case with counting fingers at 15 cm preoperatively and 20/200 postoperatively, while the other case with 20/400 preoperatively and 20/80 postoperatively). Small astigmatism was found in the 2 eyes after surgery.

Conclusions: Marfan syndrome associated with crystal dislocation is common. However, different levels of coloboma lentis are rarely found in Marfan syndrome, which cause lenticular astigmatism and amblyopia. Vitrectomy with implantation of scleral-fixated 1-piece foldable IOL is effective for these cases, although surgical results are completely dependent on the preoperative lens subluxation grades. The safety should be kept under observation for a long term and with a large sample test to support.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Ocular Anomalies and Treatment of Pediatric Incontinentia Pigmenti Patients

First Author: Jie **PENG**Co-Author(s): Qiuqing **HUANG**, Yian **LI**, Qi **ZHANG**,
Peiquan **ZHAO**

Purpose: To characterize ocular manifestations in a cohort of pediatric patients with incontinentia pigmenti (IP) and to define the guidelines for grading of IP-associated retinopathy (IPR).

Methods: This retrospective review was performed on patients under the age of 18 years with a diagnosis of IP. Data included demographics, medical history, ocular examination, and medical interventions performed. IPR was classified into 5 stages.

Results: Sixty-one children with median age of 3.1 months were observed consecutively. The median follow-up duration was 13.4 months (range, 6.5-75.0 months). A total of 47 patients had various ocular anomalies. Among them, 28 patients had bilateral ocular anomalies and 19 had unilateral anomalies. Vitreoretinal changes were noted in 73 of 122 eyes, including 8 eyes with retinal pigment epithelium changes only (stage 1), 22 eyes with retinal vascular abnormalities (stage 2), 5 eyes with epiretinal membranes or fibrotic hyperplasia combined with avascularized zones (stage 3), 6 eyes with retinal neovascularization (stage 3), 1 eye with vitreous hemorrhage (stage 3), 10 eyes with partial retinal detachment (RD) (stage 4a), 15 eyes with total RD (stage 4b), and 8 eyes with phthisis bulbi and secondary glaucoma (stage 5).

Conclusions: Various vitreoretinal disease can be found in pediatric patients and classified into 5 stages. IPR, characterized by retinal vasculopathy, tends to be asymmetrical.

lens integrity), lens structural proteins (genes related to maintaining lens transparency), and developmental transcription factors (genes playing a role in lens development) in phenotypically and etiologically distinct forms of pediatric cataract.

Methods: Lens material was sampled during routine pediatric cataract surgery (n = 53). We established 8 groups [prenatal infectious (cytomegalovirus, rubella, and combined cytomegalovirus with rubella infection), prenatal noninfectious, posterior capsular anomalies, postnatal, traumatic, secondary] and compared to clear, noncataractous lenses (n = 6). Expression levels were measured for lens structure-related genes: aquaporin-0, heat shock protein-4, crystallin gamma C; lens developmental transcription factors: musculoaponeurotic fibrosarcoma oncogene, tumor domain containing-7, forkhead box-3, pituitary homeobox-3; profibrotic genes: transforming growth factor beta- β , alpha smooth muscle actin A; bone morphogenetic protein-7; and vimentin.

Results: Pearson correlation was done for determining statistical significance of gene expression in each group. Prenatal cataracts were likely derived from problems in structural genes (correlated with $P = 0.02$, $P = 0.001$, and $P = 0.003$) that could be genetic in nature. Infectious cataract showed a different profile of high transcriptional activity with cytomegalovirus having the highest expression of all factors (correlated with $P = 0.003$, $P = 0.006$, and $P = 0.04$) as compared to rubella (correlated with $P = 0.001$, $P = 0.02$, and $P = 0.04$). There was evidence of TGF- β driven profibrotic mechanism (correlated with $P = 0.002$ and $P = 0.001$) in postnatal cataract.

Conclusions: This report illustrates differences in biological pathways leading to cataract subtypes with functional correlation. We also provide a systematic pediatric cataract phenotypic classification and its correlation with molecular expression patterns.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Prognostic Factors in Children With Congenital Cataract Associated With Congenital Rubella Syndrome

First Author: Deepti **JOSHI**

Purpose: To evaluate prognostic factors associated with final visual outcome in patients with congenital cataract associated with congenital rubella syndrome.

Methods: A prospective interventional analysis of systemic and ocular features of 120 seropositive infants (<12 months) who presented to us with

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Pediatric Cataract: Is There Any Role of Studying the Gene Expression?

First Author: Vimal **RAJPUT**Co-Author(s): Arkashubra **GHOSH**, Jyoti **MATALIA**,
Shaika **SHANBAGH**, Bhujang **SHETTY**

Purpose: In this prospective study, we evaluated expression of profibrotic factors (genes maintaining

bilateral cataract was performed. All infants were surgically treated with cataract extraction, posterior capsulorhexis, and anterior vitrectomy followed by visual rehabilitation. Intraocular lens implantation was done in children after 2 years of age.

Results: The mean follow-up period was 48.3 months. Of the 120 patients tested, 84 (70%) had visual acuity of 20/70 or better. Important factors related to poor visual prognosis were cataracts associated with microphthalmos ($P = 0.0022$), pin point pupils ($P = 0.0032$), optic atrophy (partial or total) ($P = 0.0012$), and developmental/neurological defects (such as microcephaly, mental retardation, seizures, delayed milestones) ($P = 0.0023$). We found no statistical relationship between postoperative visual outcome and preoperative nystagmus, type of cataract, salt and pepper retinopathy, cloudy cornea, and cardiovascular anomalies.

Conclusions: Cataract associated with rubella is a common cause of congenital cataract in developing countries. Determining prognostic factors helps us in preoperative counselling of parents and planning surgery.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Recurrence Rate of Retinopathy of Prematurity Following Single Injection of Anti-Vascular Endothelial Growth Factor

First Author: Rita Anil **GANGWANI**

Co-Author(s): Alay **BANKER**, Chintan **SARVAIYA**, Harita **SHAH**

Purpose: To determine the recurrence rate of retinopathy of prematurity (ROP) following a single injection of anti-vascular endothelial growth factor (anti-VEGF) and outcomes after retreatment.

Methods: Retrospective review of the records of the eyes that received a single intravitreal anti-VEGF injection monotherapy for ROP [bevacizumab (IVB) or ranibizumab (IVR)] from July 2012 to June 2017 was done and of these, eyes with recurrence of ROP were included. Primary outcome measure was recurrence rate; secondary outcome measures were complication rate and structural outcome.

Results: Primary treatment with anti-VEGF injection monotherapy was given to 460 eyes (247 infants) (427 eyes received IVB; 33 eyes received IVR). Mean birth weight of these infants was 1196.5 ± 341 grams, mean gestational age was 28.9 ± 2.9 weeks, and mean age at first injection was 37 ± 2.9 weeks. Of these, 21 eyes (4.56%) had recurrence (16 eyes in IVB group, 5 eyes in

IVR group). Additional treatment was given with anti-VEGF injection [IVB or IVR (9 eyes)], laser treatment (9 eyes), or combination of IVB plus laser treatment (3). Mean time to recurrence was 9.1 ± 6.1 (2-15) weeks. Mean follow-up time in our study was 28.5 weeks. Of the infants with recurrence, ROP completely regressed in 19 eyes while 2 progressed to retinal detachment.

Conclusions: Recurrence of ROP following single injection of anti-VEGF is variable in time. Long-term follow-up and repeat treatment with anti-VEGF or laser usually results in complete regression of ROP.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Surgical Outcomes Following Anterior Transposition and Anterior Nasal Transposition of Inferior Oblique Muscle in Dissociated Vertical Deviation

First Author: Annu **JOON**

Co-Author(s): Ipsita **MUNI**, Pramod Kumar **PANDEY**, Monika **YADAV**

Purpose: Anterior transposition of the inferior oblique muscle (ATIO) and anterior nasal transposition (ANTIO) have both been performed in the treatment of dissociated vertical deviation (DVD) with primary inferior oblique overaction (PIOOA) with variable outcomes. We studied the outcome of ATIO versus ANTIO on DVD and ocular torsion.

Methods: Ten consecutive patients (20 eyes) with bilateral DVD ($>10\Delta$) and PIOOA underwent ANTIO in the eye with larger DVD and ATIO in the other eye with less DVD. The DVD, PIOOA, pattern strabismus, and objective ocular torsion (by fundus photography) were assessed preoperatively and postoperatively at 1 week, 1 month, and 3 months. Any adverse outcomes were recorded.

Results: The patients ranged from 5-35 years of age with 6 females and 4 males. The preoperative DVD measured $20-25\Delta$ in eyes with larger DVD and $12-17\Delta$ in eyes with less DVD; PIOOA ranged from +1 to +3; all patients had V-pattern strabismus and extorsion on fundus photography. Postoperatively, residual DVD in ANTIO was $0-6\Delta$ and $0-4\Delta$ in ATIO; IOOA improved by 2 grades and V pattern improved by around 15Δ . The objective torsion improved by 2 grades in eyes with ANTIO; however, there was no significant improvement in ATIO. No antielevation syndrome was noted in any of the groups.

Conclusions: Anterior and nasal transposition of the inferior oblique muscle (ANTIO) is an effective

treatment for DVD with PIOOA, V pattern, and extorsion. ANTIO has more influence on V pattern and extorsion and may be more effective in correcting DVD as opposed to ATIO.

Feb 09, 2018 (Fri)

14:30 - 16:00

Venue: S223

Wide-Field Digital Imaging and Telemedicine for Retinopathy of Prematurity Screening: The Auckland Experience

First Author: Samantha **SIMKIN**

Co-Author(s): Shuan **DAI**, Charles **MCGHEE**, Stuti **MISRA**

Purpose: Retinopathy of prematurity (ROP) is a potentially blinding condition affecting the retinae of premature infants; however, with effective screening poor visual outcomes may be avoided. The Auckland Regional Telemedicine ROP network (ART-ROP) has exclusively utilized wide-field digital imaging to screen for ROP since 2006. This study assessed the efficacy of ART-ROP in ROP management.

Methods: A retrospective analysis of the ART-ROP database was conducted, including all children screened from 2006 to 2015. Data on infant demographics along with ROP stage, need for treatment, and outcome were collected. A cohort of screened children were prospectively recruited to evaluate long-term ophthalmic outcomes.

Results: ART-ROP screened 1181 infants between 2006 and 2015, across 3 neonatal intensive care units. Infants had a mean of 4 screening sessions. ROP treatment was required by 83 infants, who had lower birth weight ($P < 0.0005$) and gestational age ($P < 0.0005$). The number of infants requiring screening increased while treatment rates decreased across the time period. Sixty-nine children between 5 and 8 years of age were prospectively recruited and divided into 2 groups: with or without a history of ROP. No significant difference in visual outcomes was present between the 2 groups. Retinal imaging revealed peripheral avascular retinal patches in 4 children, all with regressed ROP.

Conclusions: ART-ROP solely uses wide-field digital imaging for ROP screening. The current full review indicates the efficacy of wide-field digital imaging for ROP, with no cases of ROP being missed by this method. Further research into long-term outcomes of avascular retinal patches is needed.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S426-S427

Trends in the Incidence of Retinopathy of Prematurity Over a 10-Year Period at a Tertiary Hospital

First Author: Po Chee **CHOW**

Co-Author(s): Mary **HO**, Henry **LAU**, Julie **LOK**, Wilson **YIP**, Alvin **YOUNG**

Purpose: To describe and evaluate the trends in the incidence of retinopathy of prematurity (ROP) over a 10-year period in a tertiary hospital in Hong Kong.

Methods: A retrospective review was performed on all preterm infants screened and/or treated for retinopathy of prematurity from January 2006 to December 2015 at Prince of Wales Hospital, Hong Kong. Preterm infants with incomplete records or transferred in from other hospitals/region solely for treatment of ROP were excluded. The incidence of any ROP or type 1 ROP was analyzed with gestational age and birth weight over a 10-year period with consecutive 2-year intervals to evaluate the trends.

Results: Of all 754 infants included in the study, 234 (31.0%) patients had any ROP and 34 (4.5%) infants developed type 1 ROP. The incidence of any ROP demonstrated a statistically significant decreasing trend over the 5 consecutive 2-year intervals ($P = 0.016$) but the incidence trend of type 1 ROP was not statistically significant. No infants weighing more than 1250 g developed type 1 ROP.

Conclusions: We observed a decreasing trend in the incidence of any ROP across the 10-year period in a tertiary hospital in Hong Kong while the incidence of type 1 ROP remained stable at 4.5%. The factors leading to the trend were unclear. Improved prenatal care, changing proportion of cases with different birth weight and gestational age, and oxygenation level practice in neonatal unit may all contribute to the decreasing trend. Revision of screening criteria may be made according to local experience to maximize cost-effectiveness.

Prevention of Blindness

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Agreement of Reading Acuity Measurement Using Cicendo Word Reading Chart and Conventional Bailey-Lovie Word Reading Chart

First Author: Kuku **PRASETYO**

Co-Author(s): Andrew **KNOCH**, Susanti **NATALYA SIRAIT**

Purpose: Cicendo Word Reading Chart is a reading acuity measuring tool based on the Indonesian language because linguistic comprehension influences reading acuity measurement. This study aimed to determine the agreement of reading acuity measurement using the Cicendo Word Reading Chart and conventional Bailey-Lovie Word Reading Chart.

Methods: This study was cross-sectional. Forty-nine samples were taken consecutively. They were individuals who were able to speak both English and the Indonesian language fluently. Reading acuity was measured in working distance (40 cm) and presented with logarithm of the minimum angle of resolution (logMAR) notation. Three refractionists were dedicated to measuring distant acuity and 2 different methods of near reading acuity. Mean difference and limit of agreement between the 2 measurement are presented with Bland-Altman curve.

Results: There were 49 samples in this study. Preliminary study using pretest-posttest correlation test measuring reliability showed that correlation between both paired data groups was 0.811 with a P value of 0.00. Mean difference of the 2 different reading acuity measurements was 0.0078 with limits of agreement of -0.118 to 0.113. Correlation coefficient calculated was 0.35 with a P value of 0.001, which was statistically significant.

Conclusions: Cicendo Word Reading Chart can be used to measure reading acuity for those who can only speak Bahasa Indonesia using logMAR notation as well as another notation at common working distance (40 cm).

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Barriers to Low Vision Services and Challenges Faced by Providers

First Author: Samina **TAYYAB**

Co-Author(s): Tayyab **AFGHANI**

Purpose: To identify the barriers as perceived by patients and providers to access low vision services and also to identify the challenges faced by the main providers.

Methods: To find out the barriers to accessing low vision services, interviews based on a structured questionnaire were conducted. The first group consisted of 97 visually impaired individuals attending the department of low vision services while the second group included 56 visually impaired individuals attending 4 rehabilitation centers/schools for the blind. To identify the barriers as perceived by the main providers of low vision services and challenges faced by them, interviews were conducted with 19 low vision service providers.

Results: From the patients' point of view, a major barrier to low vision services was the inability to visit the hospital/rehabilitation center alone, 29.8% in the hospital group and 33.9% in the rehabilitation center group, while the lack of social support, lack of family support, cost of traveling, long distance, affordability, hesitation in using devices, and lack of satisfaction were other barriers. From the providers' point of view, the major barrier to the uptake of services was the need for repeated follow-ups. The major challenge faced by providers was motivating patients to use low vision devices.

Conclusions: The major barrier to low vision services according to the patients was the inability to visit the hospital alone, while according to providers, the major barrier was the need for repeated follow-up. Patient motivation was the major challenge faced by providers, the majority of which were optometrists.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Community Perspective of Pediatric Oculoplastic Disorders and Intervention

First Author: Mukti **MITRA**

Co-Author(s): Nahid **FERDAUSI**, Junnatul **FERDOUSH**, Ahm Enayet **HUSSAIN**

Purpose: To identify blinding and nonblinding disorders

and to determine the extent of treatable oculoplastic disorders.

Methods: A community-based house-to-house survey was conducted among 39,351 children aged ≤ 15 years in 3 unions of an upazilla. To screen cases, field workers used World Health Organization (WHO) guides along with structured questionnaires, followed by referral to the tertiary hospital for proper management.

Results: A total of 203 cases were confirmed by pediatric ophthalmologists from 570 identified field level cases. The prevalence of nonblinding disorders such as visual impairment found were 7.8 [95% confidence interval (CI), 5.4 to 11.0] and other ocular problems (OOPs) were 32.2 (95% CI, 27.0 to 38.2) per 10,000 children. The major causes of OOPs found were strabismus and ptosis, with a magnitude of 23.8 (95% CI, 19.4 to 21.9) and 7.8 (95% CI, 5.4 to 11.0) per 10,000 children. Around 81% of the family of nonblind children knew about their problem, but among them only 35% sought health care services. To address this problem, a comprehensive framework including early identification, proper referral, appropriate management, and rehabilitation services has been developed by the combined efforts of ophthalmologists and oculoplastic surgeons. Considering this, initially 5 nonblind cases underwent surgical correction with better postoperative outcome.

Conclusions: Though avoidable childhood blindness is decreasing day by day, nonblinding oculoplastic disorders are rising public health concerns now. Nonblinding eye problems not only have an impact on one's well-being but also have social as well as economic implications. However, this situation is avertable with a feasible comprehensive framework.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Correlation of Visual Acuity Screening in Preschool Children Between Personal Computer Software Jaeb Visual Acuity Screener and Tumbling E

First Author: Karinca **ARUNDINI**

Co-Author(s): Irawati **IRFANI**, Iwan **SOVANI**

Purpose: Tumbling E is commonly used for visual acuity screening for children and adults. Currently, the American Association for Pediatric Ophthalmology and Strabismus (AAPOS) recommends a computerized visual acuity-based screening application, Jaeb Visual Acuity Screener (JVAS), with standardized optotype and illumination, quick examination, and a simple procedure that requires relatively little space with no

need for specialized training of the examiner. The aim of this study was to determine the agreement value of visual acuity screening in preschool children between using the computer application JVAS and tumbling E.

Methods: This was a correlation study between JVAS and tumbling E. Subjects selected by multistage random sampling and who met the inclusion criteria were examined using JVAS and tumbling E at intervals of 10 minutes in the same room by a refractionist. The difference between the results of the 2 charts was determined with chi-square McNemar test and the agreement values were analyzed using Kappa index method.

Results: Kappa index of 0.296 showed a poor agreement in visual acuity screening in preschool children between using the computer application JVAS and tumbling E, which showed a statistically significant difference ($P = 0.00$). There was a moderate agreement in the age group of 4 years with the results of Kappa index of 0.459 ($P = 0.500$).

Conclusions: There was no agreement in visual acuity screening in preschool children between using the computer application JVAS and tumbling E. Visual acuity screening of preschoolers should use the age-appropriate tools with normal threshold values based on age-appropriate visual development.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Early Cataract Detection by Health Workers and Cadres as Key Informants in Bandung, Indonesia

First Author: Nindya **LUBIS**

Co-Author(s): Aldiana **HALIM**, Feti **KARFIATI**, Dewi Kania **MAEMUNAH**, Made **WIDYANATHA**

Purpose: The prevalence of blindness in West Java based on a rapid assessment of avoidable blindness (RAAB) survey in 2014 was 2.8%. Cataract was the main cause with a proportion of 71.7%. The priority to improve the cataract surgery rate (CSR) is to increase the number of referrals at the community level. There are currently no community eye services in West Java. A pilot training for primary health workers and community cadres to detect visual impairment and cataract was done in Bandung in February 2017. This study aimed to evaluate the accuracy of the detections in the training.

Methods: A cross-sectional study; data were collected from documentation in the Community Ophthalmology Department at Cicendo National Eye Hospital. Training was done for cadres and health workers from the

community and primary healthcare centers with ophthalmologists and residents as the gold standard on February 22-25, 2017, in Bandung. The outcomes were analyzed using cross-tabulation.

Results: Field practices were done at 4 primary healthcare centers in Bandung with an ophthalmologist or a resident as the gold standard. A total of 152 patients (304 eyes) were examined. Visual impairment detections by health workers and cadres have sensitivity of 95% and 92%, with specificity of 95% and 88%. Detection of cataract by health workers had a sensitivity of 52% and specificity of 85%.

Conclusions: This study suggests that community cadres and primary health center workers may have a role as the key informants in cataract case findings. The program shall be implemented in more cities and areas in West Java as the first step to achieve a better cataract referral system.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Results of WHO Tool for Assessment of Diabetic Retinopathy and Diabetic Management Systems Survey in Pakistan

First Author: Tayyab **AFGHANI**

Purpose: To assess the management of diabetes mellitus (DM) and diabetic retinopathy (DR) in Pakistan and to estimate the level of cooperation and synergy between these 2 branches of health care using the WHO Tool for Assessment of Diabetic Retinopathy and Diabetic Management Systems (TADDS).

Methods: After desk-based data collection regarding prevalence data for both diabetes and vision loss from diabetic retinopathy, the key stakeholders from the public as well as private sector including patients were interviewed using the pretested and validated TADDS survey. A total of 190 interviews were held with 165 professionals and 25 patients. Results from key informant interviews were recorded in hand-written notes. The data was summarized by categories used in the TADDS. The compiled results were presented to key stakeholders in a workshop where these were validated and approved for final submission.

Results: There is a national plan for DM, but no program has been implemented. Professionals are unaware of government guidelines for DM and DR. Services partly paid by the patients are available in regional hospitals. Rural populations cannot reach services easily; transport and cost are the main barriers. There is occasional collaboration between separate providers of care for DM and DR. Training

opportunities for DM/DR care are available only in large cities. Information and education to the community is provided occasionally. A total of 55% of health care financing is out of pocket, while government provides 35% only.

Conclusions: Comprehensive management of DM and DR is not universally available in Pakistan. Networking between DM and DR care providers is very scant and patient-centered care is available only in a few centers.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

Study on Air Bacteria Colonies in the Dynamic Environment of the Operating Room in the Lifeline Express

First Author: Huan **LV**

Purpose: To study the distribution of air bacteria colonies at different periods in the Lifeline Express.

Methods: Using the flat slab exposure method, the count of air bacteria colonies in the 2 operating rooms was collected and compared at different points during surgery. The specimens from air bacteria colonies were collected before operation, after 5 operations, and after 10 operations. The trend of air colony change in the operating room at different time periods was observed and analyzed statistically.

Results: The average number of bacteria colonies in the central operating region on Friday was significant lower than that on Monday ($P = 0.00$); there was no significant difference in the count of bacteria colonies between the 2 operating rooms ($P > 0.05$). The average colony count increased after 5 operations, respectively, but after standing for 5 minutes, the colony number decreased after 10 operations.

Conclusions: The operating room of the Lifeline Express can ensure the safety of the air environment for a long time and a large number of operations. With appropriate static for 5 minutes, the air quality will be better.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S425

Using Photovoice to Understand the Perception of Eye Disease and Self-Driven Solutions to the Barriers Among Women Living in Rural Malawi

First Author: Sangchul **YOON**Co-Author(s): Hayea **JUN**, Holden **KIM**, Jongwook **LEE**, Sangeun **NHO**, Kyoung Yul **SEO**

Purpose: Barriers that impede eye health accessibility on the demand side are a key factor that needs assessment for eye health projects in developing countries. However, few studies have examined the issue, and it is difficult to investigate the perception of eye disease in rural areas due to communication limitations in terms of language and education. We proposed to examine the needs and perception of eye disease among women in rural Malawi using a photovoice method.

Methods: Ten women whose family members were suffering from eye disease were recruited. None of them had used cameras including smartphone cameras. Eight educational sessions regarding how to utilize the camera along with 4 presentation sessions for demonstration of photos followed by in-depth discussions about their relevance to eye diseases were conducted in 2 weeks.

Results: Frequency analysis of words that participants used in the presentation was conducted while categorizing them into 4 groups based on the common barriers to eye health services in order of "cost," "distance," "lack of awareness," and "fear." Self-driven solutions such as "reduction of indoor air pollution" and "improved sanitation at community level" were suggested to be reflected in future projects.

Conclusions: Our findings show that the most significant problems in eye health service accessibility are distance and cost. Furthermore, the study provides more profound barriers and solutions to proper eye health services through photovoice, which are difficult to find with conventional surveys. Thus, photovoice can be an effective approach for eye health program planning.

Refractive Surgery

Feb 09, 2018 (Fri)

09:00 - 10:30

Venue: S223

Long-Term Comparative Outcome of 5 Multifocal Intraocular Lenses

First Author: Michael **ASSOULINE**

Purpose: To compare the outcome of 5 different multifocal intraocular lens (MFIOL) designs in a consecutive series of 1714 cases performed by a single surgeon.

Methods: Retrospective study of consecutive cases comparing 4 recent MFIOL (Medicontur Bi-Flex 677M diffractive and refractive design, n = 409; OcuLentis Mplus or Comfort aspheric refractive design, n = 714 and 161, respectively; and Physiol Finevision trifocal diffractive design, n = 234) to a standard bifocal diffractive lens design (Zeiss ATLisa, n = 196).

Results: Monocular uncorrected visual acuity (MUVA) was both 20/20 at 5 m and Jaeger 1 at 35 cm (indicating an outstanding functional outcome) in 40.0%, 49.2%, and 49.3% of Bi-Flex, Mplus, and Finevision cases, respectively, as compared to 39.2% of the ATLisa implanted eyes. Intermediate distance MUVA at 65 cm was J5 or better in 94.7 %, 75.6%, and 76.8% versus 45.5% of cases, respectively, and was J4 in 56.2%, 24.7%, and 18.3% versus 6.1% of cases, respectively. Subjective defocusing curves suggested a better performance for the Bi-Flex lens for distance and of Bi-Flex, MPlus, and Finevision lenses for intermediate vision. Analysis of "mix and match" cases suggested that a combination of MPlus in the dominant eye with either Finevision or Bi-Flex in the nondominant eye is optimal to improve binocular defocusing curves and pseudoaccommodation. One Mplus lens had to be exchanged as a consequence of calcification at 4 years. Survival curve analysis of YAG capsulotomy was less favorable in the ATLisa group.

Conclusions: Advanced multifocal intraocular lens designs provide an excellent intermediate vision ability as compared to standard bifocal diffractive designs.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Clinical Evaluation of a Novel Enhanced Depth of Focus Intraocular Lens With a Low Add Trifocal, Diffractive Pattern and Correction of Chromatic Aberration

First Author: Florian **KRETZ**

Co-Author(s): Salah **ABDASSALAM**, Riyam **ALKADHI**, Gerd **AUFFARTH**, Detlev **BREYER**, Matthias **GERL**

Purpose: A prospective study to evaluate the refractive and functional results, patient satisfaction, and defocus curve after binocular implantation of an enhanced depth of focus intraocular lens (EDOF IOL).

Methods: In a prospective ongoing study 20 eyes of 10 cataract patients received binocular EDOF IOL (AT LARA 829, Carl Zeiss Meditech, Germany). Both eyes were targeted closest to emmetropia. Pre- and postoperative monocular and binocular functional results [CDVA, UDVA, DCIVA (90 cm, 80 cm, 60 cm), DCNVA (40 cm), defocus curve, logarithm of the minimum angle of resolution (logMAR)] refractive outcome, halo and glare simulator, and patient satisfaction score were evaluated.

Results: Median postoperative spherical equivalent was -0.06 diopters (D) (1.56). Mean postoperative monocular UDVA, CDVA, and DCNVA were 0.02 (0.10), 0.00 (0.06), and 0.30 (0.19), respectively, with binocular values of -0.05 (0.09), -0.10 (0.06), and 0.25 (0.14). Monocular DCIVA at 90 cm, 80 cm, and 60 cm was 0.05 (0.12), 0.10 (0.11), and 0.12 (0.15), respectively, with binocular values of -0.10 (0.15), 0.05 (0.13), and 0.02 (0.15). Defocus curve analysis showed a stable visual acuity from +0.5 to -1.5 D.

Conclusions: Binocular implantation of an EDOF IOL with a new diffractive pattern in combination with the correction of chromatic aberration showed a good refractive predictability. Functional results especially from distance to near show excellent results with a slight increase comparing monocular to binocular visual function. Still, binocular DCNVA at 40 cm shows acceptable results offering a high degree of patient satisfaction.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Comparing a New Hydroexpression Technique With Conventional Forceps Method for SMILE Lenticule Removal

First Author: Lap Ki **NG**

Co-Author(s): Tommy **CHAN**, George **CHENG**, Vishal **JHANJI**, Victor **WOO**

Purpose: We describe a modified "hydroexpression" technique for the lenticule removal during small-incision lenticule extraction (SMILE) surgery and compare the results with the conventional forceps method.

Methods: This was a retrospective, comparative study of 50 patients who underwent SMILE surgery by the same surgeon. We compared the 1-week postoperative results after SMILE using the hydroexpression technique with the conventional forceps technique. Main outcome measures included uncorrected distant visual acuity (UDVA), corrected distant visual acuity (CDVA), refractive accuracy, safety index, and efficacy index.

Results: The baseline characteristics were comparable between both groups. At 1 week after SMILE, the safety index in the forceps group and the hydroexpression group was 0.93 ± 0.11 and 0.97 ± 0.10 , respectively ($P = 0.246$), while the efficacy indices were 0.84 ± 0.17 and 0.91 ± 0.17 ($P = 0.158$). All eyes aimed for a plano target. In the forceps group, 89% of eyes were within ± 0.50 diopters (D) of target, while that in the hydroexpression group was 96%. The mean error in spherical equivalent (SEQ) correction was -0.02 ± 0.35 D for forceps and -0.03 ± 0.30 D for the hydroexpression group ($P = 0.912$).

Conclusions: Hydroexpression was simple and safe, which minimized striae on the anterior capsule that was seen during forceps lenticule removal, and was particularly useful for thin lenticule cases and for the inexperienced SMILE surgeons. This technique had early results comparable to the conventional forceps technique.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Comparison of the Outcomes of Astigmatic Correction Between Small-Incision Lenticule Extraction and Femtosecond Laser Vision Correction

First Author: Chitra **RAMAMURTHY**Co-Author(s): Ramamurthy **DANDAPANI**, Shreyas **RAMAMURTHY**

Purpose: The purpose of this study was to analyze and compare the outcome between small-incision lenticule extraction (SMILE) and femtosecond laser in situ keratomileusis (LASIK) (FL) procedures in correcting high astigmatism.

Methods: This was a retrospective comparative interventional study comparing the astigmatic outcome between SMILE and FL conducted between June 2014 and December 2015 at a tertiary eye care center. Subjects greater than 18 years of age with >2 diopters (D) of cylinder were included in the study. Patients with any tomographic abnormalities were excluded. SMILE was performed using the Visumax laser without any adjustment for cyclotorsion. FL was performed using the Wavelight EX500 laser using cyclotorsion compensation. Outcome parameters included uncorrected visual acuity (UCVA) at final follow-up, residual error(s), and the need for enhancement. Minimum follow-up period was 6 months.

Results: A hundred eyes each were included in the SMILE and FL groups. The mean cylindrical power was -2.72 Dcyl (range, -2.00 to -4.5 Dcyl) in the SMILE group and -2.75 Dcyl (range, -2.00 to -5.5 Dcyl) in the FL group. A total of 91% of eyes achieved UCVA 6/6 or better in the FL group as opposed to 81% in the SMILE group. The mean residual refractive error was -0.14 Dcyl in the SMILE group as compared with -0.07 Dcyl in the FL group. Residual refractive error was noted in 14 eyes of SMILE and 7 eyes of FL.

Conclusions: Astigmatic correction appears to be closer to target in the FL group as compared to SMILE.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Customized Laser Epithelial Removal With Collagen Crosslinking After INTACS: Clear Upgrade to INTACS

First Author: Ashima **BAJAJ**Co-Author(s): Ritika **DALAL**, Rohit **SHETTY**, Abhijeet **SINHA ROY**, Roshan **THIMMARAYAPPA**

Purpose: To evaluate a novel combination therapy of intracorneal ring segments with customized epithelial removal and collagen crosslinking in eyes with keratoconus (KC).

Methods: Twenty-five eyes of advanced keratoconus were treated with intracorneal ring segments (ICRS) first and after a week corneal tomography was done to measure change in location of cone apex. Transepithelial phototherapeutic keratectomy (PTK) was done with optical zone of 5 mm centered on the new location of cone apex to a depth 20 μ m greater than epithelial thickness at the cone apex. After PTK, surrounding epithelium was manually removed to 8 mm diameter and accelerated collagen crosslinking was performed. These eyes were evaluated in terms of visual outcomes, mean keratometry (Km), maximum keratometry (K max), and thinnest corneal thickness preoperatively and postoperatively.

Results: There was an improvement of corrected distance visual acuity (CDVA) from 0.35 ± 0.26 to 0.25 ± 0.15 logarithm of the minimum angle of resolution (logMAR). Uncorrected distance visual acuity (UDVA) changed from logMAR 0.98 ± 0.54 to 0.44 ± 0.26 . There was a significant improvement in mean refractive spherical equivalent (MRSE) by 8.04 diopters (D) (18.75-0.25 D), mean defocus equivalent (MDEQ) by 7.15 D (18.75-2 D), Km by 6.88 ± 1.86 , and K max by 9.14 ± 5.45 .

Conclusions: Treatment of well-selected patients of keratoconus with this combination method can be more effective than ICRS alone in visual rehabilitation. This combined treatment is a clear upgrade to ICRS.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Demographics of Patients Who Are Interested in Multifocal Intraocular Lenses and Their Desired Near Focus After Implantation

First Author: Yuka **OTA**

Co-Author(s): Hiroko **BISSEN**, Wakana **FUNAKI**, Manabu **HIRASAWA**, Shinichiro **OKI**, Michiru **TANAKA**

Purpose: To assess the demographics of patients who attended an information session on multifocal intraocular lenses (MF-IOLs) and evaluate their preferred near focus after implantation.

Methods: Preoperative information session on MF-IOLs to explain the characteristics and various near focus is provided for the patients who are interested in receiving MF-IOLs at our hospital. This survey included 218 patients who attended the session between May 2015 and December 2015. Patient demographics, such as age, gender, occupation, hobby, and preoperative usage of spectacles or contact lenses, and the desired distance for close work after the implantation of MF-IOL were evaluated.

Results: There were 71 males and 147 females, and their mean age was 62.1 ± 11.6 years (range, 25–86). As for occupation, 112 patients (52.8%) were employed including office workers (77.7%), healthcare-related (11.6%), and company management (10.7%). The hobbies of 34% and 17% of patients were sports and reading books, respectively. Only 26 patients (11.9%) were using spectacles or contact lenses. The desired distance for close work varied: 30 cm (17.9%), 40 cm (16.1%), 50 cm (10.1%), 30 cm and 40 cm (13.8%), 30 cm and 50 cm (11.5%), 40 cm and 50 cm (5.5%), and 30, 40, and 50 cm (18.8%). Within these patients, 169 patients underwent cataract surgery and 73.4% of them received MF-IOLs according to their preference of near focus (bifocal, 49.1%; trifocal, 20.1%; and extended depth of focus, 4.2%).

Conclusions: Female and employed patients had a tendency to choose MF-IOLs, and their desired near focus varied.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Evaluation of Visual Outcomes in Macaque Non-Human Primates After Laser Scleral Microporation

First Author: Jodhbir **MEHTA**

Co-Author(s): Annmarie **HIPSLEY**, Yu-Chi **LIU**

Purpose: To evaluate changes in visual outcomes in macaque non-human primates after the laser scleral microporation (LSM) VisioLite procedure for presbyopia correction.

Methods: An Er:YAG laser was used in 4 quadrants on the sclera to improve pliability and biomechanical efficiency of the ciliary muscles in 3 critical zones. Six monkeys were separated into 2 groups: young (>10 years of age, N = 3) and old with loss of accommodation (<10 years of age, N = 3). Ray-tracing aberrometer and double-pass wavefront were used to objectively measure visual acuity, higher-order aberrations (HOA), depth of focus (DoF), the visual Strehl ratio based upon the optical transfer function (VSOTF), true accommodation, pseudoaccommodation, and the effective range of focus. Intraocular pressure (IOP) was also assessed using a pneumatic tonometer before and after the procedure.

Results: Ray-tracing technology can objectively measure dynamic accommodation as well as specific lens behavior. LSM provided improvement in both accommodative ability and near visual acuity. Positive changes after LSM procedure were also seen in both spherical aberration and depth of focus. Pseudoaccommodation from changes in spherical aberration and increased depth of focus may contribute to near vision functionality. Additionally, average IOP was 13.0 ± 0.8 mm Hg preoperatively and significantly improved with LSM.

Conclusions: LSM performed using the VisioLite Er:YAG laser appears to be a safe and effective procedure for restoring range of visual performance. LSM can improve intermediate and near visual acuity without touching the visual axis.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Functional Visual Outcomes 2 Years After Laser Anterior Ciliary Excision

First Author: David **MA**Co-Author(s): Annmarie **HIPSLEY**, Magda **RAU**, Sheri **ROWEN**, Chi Chin **SUN**

Purpose: To evaluate the visual optical quality and visual outcomes up to 2 years following bilateral laser anterior excision (laserACE) for restoring dynamic near and intermediate vision.

Methods: An Er:YAG laser was used in 4 quadrants on the sclera to improve pliability and biomechanical efficiency of the ciliary muscles in 3 critical zones for 24 patients. Patients were over 40 years of age and showed loss of accommodative ability. Three patients were evaluated. Visual outcomes were assessed using the Early Diabetic Retinopathy Study (EDTRS) logarithm of the minimum angle of resolution (logMAR) charts at 1, 3, 6, 12, and 24 months for all patients, and after 10 years for 3 patients. Visual outcomes were also assessed using Randot stereopsis and a pneumatic tonometer.

Results: Binocular distance corrected near visual acuity (DCNVA) improved from $+0.21 \pm 0.17$ (logMAR) preoperatively to $+0.11 \pm 0.12$ (logMAR) at 24 months postoperatively ($P = 0.00026$). Uncorrected near visual acuity (UNVA) improved from $+0.20 \pm 0.16$ (logMAR) preoperatively to $+0.12 \pm 0.14$ (logMAR) at 24 months postoperatively ($P = 0.0014$). At 24 months postoperatively, there was no statistical change in DCVA or UDVA. Mean stereopsis improved from 75.77" preoperatively to 60" at 24 months postoperatively. Average patient intraocular pressure (IOP) improved from 13.56 ± 3.23 mm Hg to 11.74 ± 2.64 mm Hg at 24 months postoperatively ($P = 0.000063$).

Conclusions: LaserACE performed using the VisioLite Er:Yag laser appears to be a safe and effective procedure for restoring range of visual performance. LaserACE provided improvement in near vision functionality in these patients with long-term stability and without compromising UDVA, CDVA, or binocularity.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Intraoperative Lenticule Centroid Shift During Small Incision Lenticule Extraction

First Author: Manli **LIU**

Purpose: To evaluate the amount of lenticule centroid shift that occurs intraoperatively during small incision lenticule extraction (SMILE).

Methods: A total of 150 consecutive patients (300 eyes) who underwent the SMILE procedure were included. Decentration was measured from the lenticule center to corneal vertex with the best-fit circle method and WaveLight Oculyzer II.

Results: Ocular dominance was assessed with the hole-in-the-card test. The dominant eye was 72% of the right eyes and 28% of the left eyes. The mean manifest sphere was -4.73 ± 1.60 diopters (range: -1.50 to -9.25) in the right eye and -4.57 ± 1.64 diopters (range: -1.50 to -9.50) in the left eye ($P = 0.03$). The distance of lenticule relative to the corneal vertex was statistically significantly different between the right eye (0.16 ± 0.09 mm) and left eye (0.20 ± 0.10 mm) ($P < 0.05$). Temporal decentration was found in 82 right eyes (54.67%) and in 121 left eyes (80.67%). The vector of the lenticule center was negatively related to the vector of corneal vertex in both eyes (the pupil center was selected as the origin of coordinates, all $P < 0.05$).

Conclusions: Our results demonstrate a nearly mirror-image relationship between the lenticule center and the corneal vertex when using the pupil center as the reference for the docking procedure in SMILE. To avoid the decrease of the visual outcomes resulting from decentration, the surgeon should pay more attention to the relationship of the corneal vertex and pupil center.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Long-Term Outcomes and Complications of Posterior Chamber Phakic Intraocular Lens Implantation for the Correction of High Myopia and Astigmatism in Keratoconic Patients (5-Year Study)

First Author: Leila **GHIASIAN**

Purpose: The aim was to evaluate the long-term safety, efficacy, stability, and predictability of posterior chamber phakic intraocular lens (pIOL) implantation

to correct myopia and myopic astigmatism associated with keratoconus.

Methods: Uncorrected distance visual acuity (UDVA) and corrected distance visual acuity (CDVA), refraction, and adverse effects were evaluated in 23 keratoconic eyes of 13 patients after 5 years with Visian ICMV4 pIOL (STAAR Surgical Inc).

Results: The mean preoperative spherical equivalent (SE) and cylinder changed from -5.35 ± 2.82 diopters (D) and -3.14 ± 1.58 D to -0.78 ± 1.31 D and -1.56 ± 1.53 D, respectively, 5 years postoperatively. Before the surgery the mean Snellen decimal CDVA was 0.60 ± 0.20 . The mean UDVA and CDVA changed to 0.74 ± 0.22 and 0.88 ± 0.16 , respectively. A total of 82.5% of eyes achieved 20/40 or better UDVA postoperatively. The mean safety and efficacy indices were, respectively, 1.47 ± 0.32 and 1.24 ± 0.34 . No eye lost a line of visual acuity and 19 eyes gained 1 or more lines. A total of 7.88% endothelial cell loss occurred. No significant changes in intraocular pressure, steep, flat, and mean keratometry were seen during the study. Crystalline lens was clear.

Conclusions: The clinical outcomes of the current study demonstrate the safety, efficacy, and predictability of implantable collamer lens (toric and nontoric) in the correction of myopia and myopic astigmatism associated with keratoconus. The patients' refractions achieved early stability and remained stable during the course of the study.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Managing Presbyopia With Presbyopia-Correcting Diffractive Posterior Chamber Phakic Intraocular Lens: 6-Month Follow-Up

First Author: Minoru **TOMITA**

Purpose: To evaluate refractive and visual outcomes following presbyopia-correcting implantable phakic contact lens (IPCL) implantation. IPCL are single-piece posterior chamber phakic IOLs made from hybrid hydrophilic acrylic material.

Methods: This study included 134 eyes of 67 patients who had undergone bilateral implantation of IPCL (Care Group, Vadodara, India). The main outcome measures included uncorrected visual acuity for distance (UDVA) and near (UNVA), corrected distance (CDVA) and near (CNVA), and manifest refraction [sphere, cylinder, and spherical equivalent (SE)]. Patients were examined preoperatively and 1, 3, and 6 months postoperatively.

Results: At postoperative month 6, UDVA, UNVA, and

refraction improved significantly from preoperative values ($P < 0.05$). Preoperatively, the mean SE of -3.83 diopters (D) reduced to -0.024 D at 6 months. Mean preoperative UDVA was 20/125, which improved to 20/16 at 6 months, with no significant change in CDVA. Correspondingly, UNVA improved from J7 to J2 and CNVA remained stable over the 6 months. No intraoperative or postoperative complications were observed.

Conclusions: Implantation of IPCL for the correction of presbyopia is safe and effective, with good visual and refractive outcomes. Results were found to be stable until the last follow-up visit at 6 months.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Validity of Percent Tissue Altered as a Screening Formula for Post-Laser Assisted In Situ Keratomileusis Ectasia

First Author: Karan **BHATIA**

Co-Author(s): Shilpa **MALED**, Renuka **RATI**, KV **SATHYAMURTHY**, Aniket **SHASTRI**

Purpose: To calculate the percent tissue altered (PTA) in post-laser assisted in situ keratomileusis (LASIK) eyes and to validate its role as an independent factor to evaluate ectasia in an Indian population.

Methods: A total of 333 eyes with normal preoperative corneal topography by combined Placido and Scheimpflug imaging based topography system (SIRIUS) underwent LASIK between 2011 and 2014 at a tertiary level teaching hospital in south India. Preoperatively the patient's refraction, flap thickness (FT), ablation depth (AD), residual stromal bed, and central corneal thickness (CCT) were recorded. The formula used was $PTA = (FT+AD)/CCT$. PTA was grouped into <0.4 (low risk), $0.4-0.45$ (moderate risk), and >0.45 (high risk). All patients were called for follow-up and underwent topography to look for ectasia.

Results: A total of 60.1%, 29.1%, and 10.8% of patients had PTA of <0.4 , $0.4-0.45$, and >0.45 , respectively. However, after a minimum follow-up of 2 years, none of the patients had any sign of ectasia.

Conclusions: Careful selection of patients is mandatory before proceeding for LASIK. The role of PTA >0.4 as an independent risk factor for post-LASIK ectasia is to be evaluated further. Other factors or a modified formula suitable for Indian eyes needs to be investigated.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Visual Outcomes and Patient Satisfaction Following Implantation of Different Modern Presbyopia-Correcting Intraocular Lenses

First Author: Mike **HOLZER**

Purpose: To evaluate functional outcomes of 3 presbyopia-correcting intraocular lenses (IOLs) with different optical principles.

Methods: Cataract and refractive lens exchange patients with implantation of a trifocal IOL (PanOptix or AT Lisa tri and tri toric) and multisegmental IOL (Precizon Presbyopia) were examined 3 months postoperatively. Refraction, uncorrected/corrected distance (UDVA/CDVA), uncorrected/distance-corrected intermediate (60 or 80 cm, UIVA/DCIVA), uncorrected/distance-corrected/corrected near visual acuities (40 cm, UNVA, DCNVA, CNVA), defocus curves, and subjective questionnaires were performed.

Results: In total 71 eyes of 36 patients were examined. Median monocular and binocular uncorrected visual acuities increased in all 3 IOL groups. Median distance corrected visual acuity scores were CDVA -0.00, DCIVA -0.04, and DCNVA 0.00 in the PanOptix group; CDVA -0.08, DCIVA 0.00, and DCNVA 0.03 in the AT Lisa group; and CDVA -0.01, DCIVA 0.08, and DCNVA 0.14 in the Precizon Presbyopia group.

Conclusions: All 3 presbyopia-correcting IOLs provided good near, intermediate, and distance visual acuities. Defocus curves showed slight differences in the acuity performance of the patients. Subjective questionnaires, however, did not reveal significant differences.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Visual Outcomes and Real-Life Performance of Bilaterally Implanted Extended Vision Intraocular Lens: A Prospective Study

First Author: Shilpa **GOEL**Co-Author(s): Ajay **SHARMA**, Prem **VARDHAN**

Purpose: To study the performance of bilaterally implanted extended vision Symphony intraocular lens (IOL) in terms of 1) postoperative unaided distance (UDVA), intermediate (60 cm) (UIVA), near visual acuity (33 cm) (UNVA); 2) postoperative contrast sensitivity; 3) photic phenomenon (glare, halos, starburst if any); and 4) subjective patient and surgeon satisfaction score (0

to 10).

Methods: A multicentric prospective interventional study including 40 patients of bilaterally implanted Symphony/Symfony Toric IOL operated after January 2015. All patients underwent uneventful 2.2 mm incision phacoemulsification cataract surgery. Postoperatively patients were followed up at 1 month, 3 months, and 6 months and at each visit unilateral and bilateral distance, near, and intermediate vision and contrast sensitivity were recorded and any complaint of glare or halos was noted.

Results: Mean postoperative decimal UDVA, UIVA, and UNVA at 6 months were 0.93, 0.92, and 0.91, respectively. Thirty-three patients had UDVA ≥ 1.0 while 36 patients had UIVA ≥ 1.0 . UNVA was ≥ 1.0 in 27 out of 40 patients. Only 7.5% of patients needed glasses for intermediate and near vision in their daily activities. A total of 12.5% of patients complained of mild to moderate glare and halos in the initial postoperative period that was not significant until the last follow-up. Mean postoperative binocular contrast sensitivity at 6 months was 1.52 ± 0.12 . Patient satisfaction score was 9.5 in terms of unaided range of vision and overall surgeon satisfaction score was 9.0.

Conclusions: Extended vision Symphony IOL is effective in reducing spectacle dependence for all ranges of vision with good postoperative contrast sensitivity.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S226-S227

Visual and Topographic Outcomes After Femtosecond Laser-Assisted Intrastromal Corneal Ring Segment Implantation in Patients With Keratoconus

First Author: Duangratn **NIRUTHISARD**

Purpose: To evaluate visual and topographic outcomes after implantation of the Ferrara intrastromal corneal ring segments (ICRS) in patients with keratoconus and to compare the effect of ICRS regarding keratoconus grading.

Methods: This retrospective study included 57 keratoconic eyes (50 patients) who underwent femtosecond laser-assisted ICRS implantation (Ziemer, Port, Switzerland). Uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), corneal astigmatism (Cyl), maximum keratometric power (Kmax), and Q-value were collected preoperatively and at 1, 3, and 6 months postoperatively. Keratoconus severity was classified into 4 grades according to Amsler-Krumeich classification. Mixed model linear

regression was used to analyze changes in visual and topographic parameters and compare the effect of ICRS among keratoconic grades.

Results: Preoperative median (\pm IQR) UCVA and BCVA and mean (\pm SD) Cyl, Kmax, and Q-value were 0.10 ± 0.62 decimal, 0.32 ± 0.35 decimal, 6.26 ± 3.05 diopters (D), 62.62 ± 9.22 D, and -1.12 ± 0.58 , respectively. There were significant improvements in UCVA ($+0.11$ decimal, $P = 0.004$), Cyl (-2.95 D, $P < 0.001$), Kmax (-2.55 D, $P < 0.001$), and Q-value ($+0.39$, $P < 0.001$) at 1 month postoperation. All of these parameters remained stable for at least 6 months postoperation. At 6 months postoperation, BCVA was significantly improved ($+0.1$ decimal, $P = 0.048$). Keratoconus grade 3 and 4 displayed better improvement in BCVA, Kmax, Cyl, and Q-value when compared to grade 1 ($P < 0.05$).

Conclusions: Femtosecond laser-assisted ICRS implantation led to sustained improvement in visual and topographic outcomes in patients with keratoconus starting from 1 month postoperation. Keratoconic patients with grade 3 and 4 were more likely to have better improvement from ICRS implantation.

Retina (Medical)

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

EVA1A/TMEM166 Regulates Choroidal Neovascularization by Autophagy

First Author: Lyuzhen HUANG

Purpose: To investigate the role of EVA1A/TMEM166 in choroidal neovascularization (CNV) and the possible mechanisms.

Methods: Laser-induced CNV in EVA1A/TMEM166 transgenic and wild-type mice was used to study the effects of EVA1A/TMEM166 on angiogenesis in vivo. Fluorescein angiography was performed to evaluate the leakage area of each lesion. Plasmid-based gene transfer technology was used to increase EVA1A/TMEM166 expression and to study its effects on human umbilical vein endothelial cells (HUVECs) in vitro. Cell proliferation, migration, and tube formation were assessed. Quantitative real-time polymerase chain reaction (PCR) and Western blot were used to measure expression of ATG7, VEGF, A2M, VTN, and THBS1.

Results: Laser treatment led to less CNV and vascular leakage in EVA1A/TMEM166 transgenic mice compared with wild-type mice. Upregulation of EVA1A/TMEM166, VEGF (vascular endothelial growth factor), VTN (vitronectin), THBS1 (thrombospondin-1), and ATG7 (autophagy-related protein 7) were detected in

retina and choroidal tissue of laser-treated transgenic mice while A2M (alpha-2-macroglobulin) expression was decreased. After transfection of HUVECs with an EVA1A/TMEM166 overexpression plasmid, cell proliferation, migration, and tube formation capacities were decreased.

Conclusions: EVA1A/TMEM166 overexpression reduced angiogenic effects in both a laser-induced CNV mouse model and HUVECs. EVA1A/TMEM166 may inhibit angiogenesis by upregulating autophagy and the expression of angiogenesis inhibitors.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Shared Genetic Loci Between Systemic Lupus Erythematosus and Age-Related Macular Degeneration in East Asians

First Author: Masayuki YASUDA

Co-Author(s): Ching-Yu CHENG, Qiao FAN, Chiea Chuen KHOR, Tien-Yin WONG

Purpose: Genetic studies recently demonstrated an overlap of genetic background between age-related macular degeneration (AMD) and systemic lupus erythematosus (SLE) in European populations. However, whether there are genetic loci shared between AMD and SLE in the Asian population remains to be determined. We thus examined association of SLE risk loci with AMD in Asian populations.

Methods: Thirty-two SLE risk loci were identified from the genome-wide association study of SLE in Asians. Genotyping was carried out using the Illumina HumanOmniExpress bead chip on 2214 wet AMD cases versus 5275 non-AMD controls recruited in the Genetics of AMD in Asians (GAMA) Consortium, with samples collected from multiple sites across East Asia. Genotype imputation was carried out using IMPUTE2 software based on the 1000 genome reference panels. Logistic regression analysis on the 32 loci (all SNP within ± 10 kb of the top SNP) was performed under additive model for each cohort, followed by a fixed effect meta-analysis. Gene-based association analysis was performed using the VEGAS software.

Results: Of the 32 loci, per SNP-based association showed that 3 were significantly associated with AMD in Asians, including PCNXL3 [top SNP rs12790427: odds ratio (OR), 0.82; $P = 5.81 \times 10^{-5}$], SIPA1 (top SNP rs4930158: OR, 1.18; $P = 1.15 \times 10^{-4}$), and UBE2L3 (top SNP rs374387: OR, 1.16; $P = 2.95 \times 10^{-4}$). Gene-based association analysis showed that CLEC16A ($P = 1.03 \times 10^{-3}$), PCNXL3 ($P = 1.02 \times 10^{-3}$), SIPA1 ($P = 8.92 \times 10^{-4}$), and UBE2L3 ($P = 7.95 \times 10^{-4}$) were significantly

associated with AMD.

Conclusions: We found genetic loci shared between SLE and AMD in Asian populations. Our data may provide new insight into the genetics of AMD.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Stage of Chronic Kidney Disease as a Prognostic Factor for Diabetic Retinopathy in Patients With Previously Established Diabetes

First Author: Amash **AQIL**

Co-Author(s): Asif **MANZOOR**, Muhammad **MOIN**

Purpose: To evaluate a significant association between chronic kidney disease (CKD) and grade of diabetic retinopathy (DR) in diabetic patients.

Methods: A cross-sectional hospital-based study conducted at Lahore General Hospital, Lahore. The study included 220 CKD patients at risk of DR. Grade of CKD was calculated using creatinine clearance estimate/glomerular filtration rate (GFR) by Cockcroft-Gault equation. Presence or absence of retinopathy and its grades were documented in each case.

Results: Descriptive statistics showed that 40% of the CKD patients were males and 60% were females. Similarly 12% of patients had type 1 and 88% had type 2 diabetes. According to inferential results it was observed that with advancing stage of CKD the number of patients with progressing DR increased. Pearson correlation coefficient predicted 44% correlation between the stage of CKD and DR.

Conclusions: Different therapeutic options for DR should be considered in patients with CKD to control vision deterioration in advancing stages by early referral.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Subfoveal Choroidal Thickness and Its Influencing Factors in Patients With Thyroid-Associated Ophthalmopathy

First Author: Sisi **ZHONG**

Co-Author(s): Sijie **FANG**, Huifang **ZHOU**

Purpose: In this article, we used enhanced depth imaging spectral domain optical coherence tomography (EDI SD-OCT) to evaluate the subfoveal choroidal thickness (SFCT) in thyroid-associated ophthalmopathy

(TAO) patients with different disease activity and severity to establish a potential evaluation system for disease staging.

Methods: This was a cross-sectional study. Images were acquired using EDI SD-OCT. Two groups were established: TAO and healthy control group. SFCT of patients with different disease activity and severity were measured and we analyzed the possible factors affecting SFCT by multivariate regression. At the same time, we assessed the SFCT before and after intravenous corticosteroid treatment, respectively.

Results: Sixty-two patients and 63 healthy controls were included. SFCT was $273.52 \pm 76.54 \mu\text{m}$ in active TAO, significantly higher than that of inactive TAO patients, $234.83 \pm 47.49 \mu\text{m}$ ($P = 0.013$), and the healthy control group, $225.34 \pm 56.95 \mu\text{m}$ ($P = 0.001$). Multiple stepwise regression analysis showed that SFCT value was significantly correlated with age, clinical activity score (CAS), and axial length, and the prediction model of choroidal thickness could be established. $\text{SFCT} = 513.97 - 1.09 \times \text{age} + 11.95 \times \text{CAS score} - 9.99 \times \text{axial length}$, $R^2 = 0.40$.

Conclusions: SFCT is expected to become a staging index to evaluate the disease. Choroidal thickening was significantly related to higher CAS score, axial lengthening, and young age. SFCT changed after steroid treatment in active phase patients. EDI SD-OCT is a noninvasive way to monitor the effect of hormone therapy and may have potential follow-up value.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Visual Performance and Retinal Changes in Patients With Rheumatoid Arthritis on Hydroxychloroquine Therapy: A Sri Lankan Experience

First Author: Ganga **TENNAKOON**

Co-Author(s): Madhuwanthi **DISSANAYAKE**, Kumari **FONSEKA**, Oshadi **PEIRIS**

Purpose: To determine the influence of hydroxychloroquine (HCQ) on visual performance and retinal changes in rheumatoid arthritis patients comparative to normal eyes.

Methods: Prospective cross-sectional comparative study among 300 subjects, with 150 rheumatoid arthritis patients treated with HCQ for more than 6 months and a comparative group of 150 subjects with normal eye examination. Visual acuity was measured by Snellen Chart and "N" notations, contrast sensitivity by LEA contrast acuity chart, color vision

by Ishihara's 34 color plates, foveal sensitivity by 10-2 perimetry, and thickness of the macula, retinal nerve fiber layer thickness (RNFLT), and ganglion cell layer thickness (GCLT) by Cirrus 5000 spectral domain optical coherence tomography.

Results: A total of 124 patients were using HCQ (200 mg) for more than 2 years. Central foveal thickness in the HCQ group showed statistically significant thinning (236.2 ± 16.6) compared to the normal group with a value of 247.3 ± 13.1 ($P = 0.03$). The parafovea in the HCQ group showed thinning compared to the normal group in all quadrants ($P = 0.02$) and the perifoveal area showed thinning in patients treated with HCQ for long duration ($P = 0.02$). Moreover, with duration of treatment, contrast sensitivity reduced from 4.11 ± 0.40 to 5.8 ± 0.9 and foveal sensitivity reduced from 32.2 ± 1.2 dB to 30.6 ± 2.6 dB ($P = 0.01$). Visual acuity and color vision progressively reduced with duration of treatment ($P = 0.02$). No significant difference in RNFLT and GCLT were noted with duration of treatment ($P = 0.08$).

Conclusions: Regular advanced ophthalmic assessment is mandatory in rheumatoid arthritis patients on HCQ therapy for early detection of retinal toxicity induced by HCQ.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S426-S427

Ranibizumab With or Without Verteporfin Photodynamic Therapy for Polypoidal Choroidal Vasculopathy: Anatomical Outcomes Over 12 Months in the EVEREST II Study

First Author: Timothy LAI

Co-Author(s): Tadhg GUERIN, Philippe MARGARON, Colin TAN

Purpose: To report the anatomical outcomes at month 12 from the EVEREST II study.

Methods: EVEREST II was a 24-month, multicenter study in which 322 patients diagnosed with symptomatic polypoidal choroidal vasculopathy (PCV) were randomized to receive ranibizumab 0.5 mg plus verteporfin photodynamic therapy (vPDT; $n = 168$) or ranibizumab 0.5 mg monotherapy ($n = 154$). Anatomical parameters were assessed using spectral-domain optical coherence tomography at baseline, months 3, 6, and 12. The probability of achieving a fluid-free retina [absence of subretinal fluid (SRF), cysts, and intraretinal fluid] at month 12 was evaluated by logistic regression using 2 separate models at baseline and month 3. Possible predictive factors (demographic, functional,

anatomic, and angiographic parameters) were assessed using first a univariate model before inclusion in a backward selection multiple logistic regression analysis.

Results: At month 12, the combination therapy group showed greater reduction in central subfield thickness (CSFT; least squares mean, $-164.9 \mu\text{m}$ vs $-113.4 \mu\text{m}$; $P < 0.001$). At month 12, 56.8% and 28.7% of patients achieved fluid-free retina in the combination and monotherapy groups, respectively. Combination therapy [odds ratio (OR), 3.75 (baseline model) and 2.53, (month 3 model)] and absence of SRF at month 3 (OR, 3.90) were associated with a higher probability of achieving a fluid-free retina at month 12. In contrast, higher CSFT at baseline had a lower probability of fluid-free retina at month 12 (OR, 0.76/100 μm).

Conclusions: Combination therapy resulted in more beneficial anatomical outcomes than ranibizumab monotherapy. The results contribute to the understanding of the anatomical response of macular PCV to ranibizumab with or without vPDT.

Feb 10, 2018 (Sat)

11:00 - 12:30

Venue: S426-S427

The Influence of Household Exposure of Secondhand Smoke on Retinal Vasculature in Children: The Hong Kong Children Eye Study

First Author: Siu-Hang WONG

Co-Author(s): Carol CHEUNG, Jason YAM

Purpose: To examine the relationship between household secondhand smoke exposure and retinal vasculature in a pediatric Chinese population.

Methods: Retinal photographs of right eyes from 570 Chinese children aged 6-9 years old were obtained from the population-based cohort of the Hong Kong Children Eye Study (HKCES). A spectrum of quantitative retinal vascular parameters (caliber, tortuosity, branching angle, and fractal dimension) were measured with computer-assisted software (Singapore I Vessel Assessment). Information on parental and household smoking habits were collected via validated questionnaires.

Results: A total of 32.9% of children were exposed to household secondhand smoke; 27.1% of fathers ($n = 151$) and 3.33% of mothers ($n = 19$) were current smokers. Children with secondhand smoke exposure at home were more likely to have larger retinal arteriolar ($166.87 \mu\text{m}$ vs $163.86 \mu\text{m}$, $P = 0.009$) and venular ($230.47 \mu\text{m}$ vs $226.96 \mu\text{m}$, $P = 0.025$) calibers, compared with children from smoke-free homes. The associations with arteriolar and venular dilation persisted in multivariate analysis, after adjusting for

age, sex, systolic blood pressure, body mass index, and axial length. Nonetheless, other retinal vascular parameters were not associated with household secondhand smoke exposure.

Conclusions: Children exposed to secondhand smoke are more likely to have retinal vascular dilation.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Associations Between Visual Acuity and Retinal Microvascular Parameters Measured With Optical Coherence Tomography Angiography in Patients With Diabetic Macular Edema

First Author: Yi-Ting HSIEH

Co-Author(s): Tzyy-Chang HO, Chia-Chieh HSIAO, Tso-Ting LAI, Chang-Hao YANG, Chung-May YANG

Purpose: To evaluate the associations between visual acuity and the retinal microvascular density and morphological characteristics in patients with diabetic macular edema (DME) using optical coherence tomography angiography (OCTA).

Methods: Ninety-seven eyes from 54 patients with diabetic macular edema were enrolled in this study. OCTA was performed in each eye, and the central retinal thickness (CRT) and the 3 x 3 mm² en face OCTA images of the superficial and deep retinal layers were obtained for each eye. Microvascular parameters including the number of microaneurysms, area of foveal avascular zone (FAZ), acircularity index of FAZ, vessel density, skeleton density, vessel density index, and fractal dimension were measured accordingly. The presence of inner segment/outer segment (IS/OS) junction disruption at the fovea was also recorded. Linear mixed models were used to evaluate the correlations between best-corrected visual acuity (BCVA) and the microvascular parameters.

Results: After adjustment for CRT and IS/OS disruption at the fovea, higher acircularity index of FAZ, lower vessel density, and lower fractal dimension in the deep retinal layers were all correlated with poorer BCVA ($P = 0.030$, 0.049 , and 0.039 , respectively). As for the parameters in the superficial layer, none of them were found to be correlated with BCVA after adjustment for CRT and IS/OS disruption.

Conclusions: In eyes with DME, those with higher irregularity of FAZ, lower vessel density, or lower fractal dimension in the deep retinal layers measured with OCTA tended to have poorer vision. Such correlations persisted after adjustment for CRT and IS/OS disruption

at the fovea.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S228

Automated Quantitative Analysis of Deep Capillary Plexus With Projection-Resolved Optical Coherence Tomography-Angiography in Patients With Diabetes Mellitus

First Author: Erica CHAN

Co-Author(s): Carmen CHAN, Carol CHEUNG, Zihan SUN, Fangyao TANG

Purpose: Deep capillary plexus (DCP) can now be visualized by optical coherence tomography-angiography (OCT-A); however, common OCT-A artifacts due to projections from the superficial capillary plexus cause incorrect interpretations. This study aims to assess the reliability of quantitative DCP metrics, assessed by a new projection-resolved OCT-A algorithm, and to determine its associated factors in patients with diabetes mellitus (DM).

Methods: Patients with DM underwent OCT-A with a swept-source OCT (Triton DRI-OCT, Topcon, Inc, Tokyo, Japan), with a new projection-resolved algorithm. DCP metrics [foveal avascular zone (FAZ) area, vessel density (VD), fractal dimension (FD)] were measured from the OCT-A images by a customized automated image analysis program, the reliability of which was assessed with a subset of 25 eyes. Multivariate generalized estimating equations were performed to determine the associations of age, gender, HbA1c, diabetic retinopathy (DR) severity, presence of diabetic macular edema (DME), and visual acuity (logarithm of the minimum angle of resolution; logMAR) with the DCP metrics, adjusting for intereye correlation.

Results: A total of 177 eyes from 124 patients with DM were recruited. The intra- and intervisit reliability of the measurement were high (intraclass correlation coefficients: 0.764-0.997). In the multivariate analysis adjusting for age, gender, and logMAR, increased FAZ area [$\beta = 0.13$, 95% confidence interval (CI): 0.043-0.217, $P = 0.004$], decreased VD ($\beta = -0.021$, 95% CI: -0.037-0.004, $P = 0.014$), and FD ($\beta = 0.022$, 95% CI: 0.009-0.036, $P = 0.001$) were significantly associated with DME. Decreased VD ($\beta = -0.028$, 95% CI: -0.048-0.007, $P = 0.008$) also showed significant correlations with poorer visual acuity.

Conclusions: DCP, measured by projection-resolved OCT-A, can be reliably quantified and correlates with both the presence of DME and VA in patients with DM. Its value in predicting visual conditions in patients with DM shall be explored.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Biomarkers of Myopic Traction Maculopathy Identified by Optical Coherence Tomography Angiography: A Pathognomonic Analysis

First Author: Shih-Wen **WANG**

Co-Author(s): Tzyy-Chang **HO**

Purpose: To describe the imaging characteristics of myopic traction maculopathy using optical coherence tomography angiography (OCTA) and to analyze the biomarkers in regard to the pathogenesis of associated functional changes.

Methods: OCTA was performed in myopic traction maculopathy eyes with retinoschisis (RS group) and highly myopic eyes without traction maculopathy (control group). The RS group was further divided into the dome-shaped macula (DSM) group and non-DSM group. Biomarkers such as distinct morphologic features of macular retinoschisis and perfusion in the retina and choroid were analyzed.

Results: Twenty-seven eyes of 27 subjects in both groups were included in the study. The spherical equivalence was -12.09 ± 6.45 diopters in the RS group and -11.72 ± 4.19 diopters in the control group. The RS group was found to have poorer logarithm of the minimum angle of resolution (logMAR) best corrected visual acuity (BCVA) than control (0.4 ± 0.33 vs 0.16 ± 0.19 , $P < 0.01$). The RS group correlated with larger retinal volume ($P < 0.01$) and larger foveal avascular zone ($P < 0.01$). The vessel density in the choroid capillary over the fovea region was higher in the RS group than in the control group ($P = 0.04$). Inner retinal volumes were significantly smaller in the DSM group ($2.44 \pm 0.3 \mu\text{m}^3$) than in the non-DSM group ($2.68 \pm 0.32 \mu\text{m}^3$, $P = 0.0459$). The vessel density of the choroid capillary in the fovea was significantly larger in the DSM group ($P = 0.026$).

Conclusions: The OCTA images provide high-resolution structural and perfusion information of myopic traction maculopathy. Morphological and vascular perfusion information correlate well with functional changes, which may elucidate their pathogenetic mechanisms. DSM and retinoschisis without foveal detachment may have a rescue effect by compensatory increased perfusion shown by increased vessel density.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Characterization of the Choroidal Vasculature in Pathologic Myopia With Optical Coherence Tomography Angiography

First Author: Chee-Wai **WONG**

Purpose: Choroidal thinning is a major feature of high myopia and myopic macular degeneration (MMD), but the relation to underlying choroidal vasculature changes is unclear. We aimed to characterize the choriocapillaris (CC) in highly myopic eyes with and without MMD, using optical coherence tomography angiography (OCTA).

Methods: Prospective, clinic-based case-control study of 47 eyes of 38 patients with high myopia (≤ -6 diopters or axial length ≥ 26.5 mm). MMD was graded from fundus photographs according to the Meta-Analysis for Pathologic Myopia (META-PM) classification and presence of MMD was defined as META-PM category ≥ 2 . Macular 3×3 mm en face OCTA images were obtained with the Triton swept source OCTA. CC alterations were graded as 1, normal appearance; 2, diffuse CC loss with patchy unmasking of underlying Sattler layer (SL) vessels; 3, diffuse CC loss with generalized unmasking of underlying SL vessels; and 4, loss of both CC and SL vessels.

Results: The distribution of CC alterations were significantly different between eyes with dry AMD (grade 1: 100%), META-PM category 1 (grade 1: 88.2%; grade 2: 11.8%), category 2 (grade 1: 5%; grade 2: 77.3%; grade 3: 18.2%), and META-PM categories 3 and 4 (both grade 3: 100%, $P < 0.001$).

Conclusions: OCTA revealed features of CC loss in highly myopic eyes that precede clinically evident changes of MMD and may differentiate eyes with higher risk of MMD progression. Longitudinal studies are needed to confirm if OCTA can be the preferred imaging modality for assessing high myopes and their risk of MMD progression.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Circle of Vision

First Author: P Mahesh **SHANMUGAM**

Co-Author(s): Divyansh **MISHRA**, Rajesh **RAMANJULU**

Purpose: To evaluate the effect of a circular polarizing filter to improve vision of patients with end-stage

lesions of the optic nerve head and macula.

Methods: A total of 149 eyes of 97 patients with poor vision due to end-stage macular disease such as disciform macular scarring, macular atrophy following chronic macular edema, and vision loss due to optic atrophy were selected. A circular polarizing filter was used over the patient's refractive correction in an attempt to improve the best corrected vision (BCVA). Best corrected distance vision prior to and post polarizing filter was assessed.

Results: Mean best corrected logarithm of the minimum angle of resolution (logMAR) vision was 0.43 (20/50), 149 eyes/97 patients; median, 0.50 (20/63). This could be improved to a mean logMAR vision of 0.17 (20/32); median, 0.1 (20/25) ($P < 0.001$).

Conclusions: Circular polarizing filters can improve visual function in patients with end-stage optic nerve and macular pathologies beyond their BCVA. Further study and refinement of the use of a polarizing lens could be a boon to patients with end-stage disease that is beyond active treatment.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Clinical Characteristics and Risk Factors of Retinopathy, Macular Edema, and Retinal Neurodegeneration in Type 2 DM

First Author: Jong In YOU

Co-Author(s): Kunho BAE, Eung Suk KIM, Kiyoun KIM, Seungyoung YU

Purpose: To investigate association of genetic and environmental factors of diabetic retinopathy (DR), diabetic macular edema (DME), and retinal nerve fiber layer (RNFL) thickness in Korean diabetes patients.

Methods: A total of 183 Korean patients with type 2 DM from Kyung Hee University Hospital, Seoul, completed ophthalmic exams using fundus photography and optical coherence topography (Cirrus OCT) for segmented retinal layer thickness. Individuals were categorized according to the DR grade [no DR, nonproliferative DR (NPDR), proliferative DR (PDR)] and presence of DME. Clinical characteristics including blood chemistry, past medical, and social history information was collected with standardized questionnaires. Genotype association and logistic regression analyses were done and stepwise regression models to best predict diabetic retinopathy and DME were constructed.

Results: Age, microalbumin, BUN, Cr, dyslipidemia, and daily activity were significantly associated factors

with DR (all $P < 0.05$). Age, weight, diastolic pressure, HbA1c, microalbumin, and liver function profile were significantly associated factors with DME (all $P < 0.05$). Specific single nucleotide polymorphisms (SNPs) showed significant association with DR, DME, and RNFL thinning, which needs further confirmation with a replication cohort.

Conclusions: There were several significant environmental and biological risk factors for Korean DR and DME patients. All of the found genes are possibly involved with DR, DME, and retinal neurodegeneration, respectively. This finding nominates possible novel loci as potential DR susceptibility genes in Koreans that are independent biochemistry factors and may provide further insight into the pathophysiology of DME and retinal neurodegeneration, known as early change of DR.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Comparative Effectiveness of Predominantly Pro Re Nata Ranibizumab Versus Continuous Aflibercept in Diabetic Macular Edema Treatment at a Single Center in the United Kingdom

First Author: Aaron NG

Co-Author(s): Sahar AL-HUSAINY, Pavitra GARALA, Rupal MORJARIA

Purpose: To compare the effectiveness of continuous aflibercept versus pro re nata (PRN) ranibizumab therapy for diabetic macular edema (DME).

Methods: A single-center study on intravitreal injection-naïve DME eyes undergoing PRN ranibizumab or continuous aflibercept from a United Kingdom hospital with a catchment population of 1.5 million. Anonymized data of eyes treated from September 2015 to September 2016 were extracted. Primary outcome was change in vision at 1 year.

Results: A total of 120 eyes were included (66 eyes for ranibizumab vs 54 eyes for aflibercept). Mean age and starting visual acuity were comparable. At year 1, patients on PRN ranibizumab gained 2.5 letters with 95% confidence interval (CI) of 0.5 to 2.5 letters gained vs 6 letters gained for aflibercept with 95% CI, 1.5 to 10 letters gained ($P = 0.27$). The ranibizumab group had a mean of 37 μm improvement in average retinal thickness and the aflibercept group had a mean of 50 μm improvement ($P = 0.63$). The ranibizumab group had a mean of 96 μm improvement in central retinal thickness and the aflibercept group had a mean of 130 μm improvement ($P = 0.40$). Ranibizumab patients

received an average of 6.29 injections as compared to 5.72 injections in the aflibercept group within 12 months. The ranibizumab group had an average of 2.88 review visits vs 1.83 visits for aflibercept within 12 months.

Conclusions: Continuous aflibercept showed greater visual acuity, average retinal thickness, and central retinal thickness improvement compared to PRN ranibizumab at year 1 (not statistically significant). Aflibercept patients also had fewer injections and review visits than the PRN ranibizumab group.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Comparison of Intravitreal Aflibercept and Ranibizumab for Myopic Choroidal Neovascularization

First Author: Jia-Kang **WANG**

Purpose: To compare the efficacy of intravitreal aflibercept and ranibizumab for patients with myopic choroidal neovascularization (mCNV).

Methods: Sixty-five eyes of 65 patients with treatment-naïve mCNV were retrospectively reviewed. From October 2013 to July 2016, 30 cases received 1 plus as-needed (+PRN) intravitreal aflibercept, and 35 cases were treated by 1+PRN intravitreal ranibizumab from August 2016 to March 2017, all with monthly follow-up for 6 months. Primary outcome measures included change in central foveal thickness (CFT) in 1 mm by spectral-domain optical coherence tomography and best corrected visual acuity (BCVA) at month 6. Complications after injections were recorded. The intragroup changes in CFT and BCVA were compared with Wilcoxon signed rank test and the between-group difference compared with Wilcoxon rank sum test.

Results: The baseline demographics, duration of symptoms, spherical equivalent, BCVA, and CFT did not differ significantly ($P > 0.05$). The CFT was significantly reduced 6 months after either ranibizumab or aflibercept injections ($P < 0.05$). The BCVA significantly improved 6 months following either ranibizumab or aflibercept treatment ($P < 0.05$). There was no significant difference between the ranibizumab and aflibercept groups in final BCVA and CFT ($P > 0.05$). Number of aflibercept injections was 1.12 ± 0.41 , comparable with that of ranibizumab (1.33 ± 0.47) during the 6-month period ($P = 0.22$). There were no systemic thromboembolic events, elevated intraocular pressure, retinal detachment, or infectious endophthalmitis following injections in both groups.

Conclusions: Intravitreal aflibercept and ranibizumab

had similar efficacy and effective duration of 1 injection for mCNV during a 6-month period. No serious systemic or ocular adverse events were reported.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Diabetic Macular Edema: Aqueous and Serum Cytokine Profiling to Determine the Efficacy of Ranibizumab. The DISCERN Study

First Author: Sanjeewa **WICKREMASINGHE**

Co-Author(s): Esther **BANDALA-SANCHEZ**, Maria **KOLIC**, Lyndell **LIM**, Sheuh Wen **LIM**, Sophie **ROGERS**

Purpose: To evaluate the effect of intravitreal ranibizumab injections on aqueous concentrations of angiogenic or inflammatory cytokines in patients with diabetic macular edema (DME).

Methods: Thirty eyes of 25 patients with center-involved DME were recruited to the study. All had a central macular thickness (CMT) of $>300 \mu\text{m}$ and best corrected visual acuity (BCVA) between 28 and 70 letters. At baseline, all eyes had 0.1 mL of aqueous collected prior to ranibizumab treatment. At week 4, a second ranibizumab injection was administered and at week 8, aqueous sampling was repeated prior to a third ranibizumab injection. From week 12, all eyes were followed at 4-weekly intervals and the need for ranibizumab treatment was determined by BCVA and CMT measurements. Levels of 32 cytokines were assessed at baseline and at week 8 using the MILLIPLEX multiplex array assay.

Results: Following 2 consecutive ranibizumab injections, there was a statistically significant reduction in vascular endothelial growth factor (VEGF) ($P = 0$), as well as IL-1 β ($P = 0.00006$), IL-7 ($P = 0.00002$), IL-8 ($P = 0.00023$), IL-10 ($P < 0.00001$), IL-12 ($P < 0.00001$), IL-17 ($P = 0.00024$), MCP-1 ($P = 0.00023$), and TNF- ($P < 0.00001$). There was also an upregulation of soluble VEGF receptor-2 (sVEGFR-2) ($P = 0.00004$).

Conclusions: Ranibizumab treatment not only leads to a significant reduction in aqueous VEGF concentrations but also influences various inflammatory cytokine concentrations in patients with DME.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Dropout Rates Among Diabetic Macular Edema Patients on Anti-Vascular Endothelial Growth Factor Therapy in a Private Eye Clinic in Malaysia

First Author: Yew **WONG**Co-Author(s): Eve Lyn **CHONG**, Angeline **GOH**

Purpose: The aim of this study was to assess dropout rates and associated reasons among diabetic macular edema (DME) patients on 3 different anti-vascular endothelial growth factor (VEGF) treatments.

Methods: A retrospective review of electronic medical records was carried out to identify eligible patients who were treated from January 2014 to December 2016. A total of 134 consecutive patients were selected for telephone interviews based on a standard questionnaire to identify the reasons for dropout.

Results: The overall dropout rate from follow-up was 56%. There was no significant difference between the 3 types of anti-VEGF preparations. Financial constraint (13.0%) was the most common reason and was highest in the bevacizumab group (18%). This was followed by those who opted to continue treatment at an alternative center (9.0%). Most chose locations closer to home. In addition, 7% stopped treatment altogether due to logistical difficulties. Eight percent (8%) cited no improvement in vision as a reason for discontinuing treatment.

Conclusions: The dropout rate of patients from this center was surprisingly high. Socioeconomic status, logistical difficulties, and lack of motivation appear to be the main contributing factors. These findings offer an insight into real-world compliance toward anti-VEGF treatment for DME in this small corner of Asia. The results will also have implications on designing ways to encourage patient cooperation with this treatment regime.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Effects of Intravitreal Aflibercept and Ranibizumab on Retinal Vessel Diameter Measured Using Fluorescein Angiography

First Author: Ah Ran **CHO**Co-Author(s): Hyun Seung **YANG**

Purpose: To investigate the effect of intravitreal (IVT)

aflibercept and ranibizumab on retinal vessel diameter in patients with neovascular age-related macular degeneration (nAMD).

Methods: Forty eyes of 40 consecutive participants with treatment-naïve nAMD were included. Two groups of 20 eyes received 3 consecutive monthly treatments of IVT aflibercept or ranibizumab. Retinal vessel diameter was measured using fluorescein angiography (FA) before the first IVT injection and 1 month after the third injection. Central retinal artery equivalent (CRAE) and central retinal vein equivalent (CRVE) were calculated to represent average retinal vessel diameters.

Results: Retinal vessel diameter significantly decreased in aflibercept-treated patients; CRAE and CRVE reduced from $106.7 \pm 22.9 \mu\text{m}$ to $96.1 \pm 24.1 \mu\text{m}$ ($P = 0.028$) and from $148.8 \pm 19.6 \mu\text{m}$ to $140.8 \pm 19.6 \mu\text{m}$ ($P = 0.003$), respectively. Preinjection and postinjection arteriovenous ratios were 0.71 ± 0.08 and 0.71 ± 0.11 , respectively ($P = 0.733$). However, retinal vessel diameter was not significantly reduced in ranibizumab-treated patients; CRAE changed from $107.1 \pm 23.3 \mu\text{m}$ to $104.4 \pm 22.0 \mu\text{m}$ ($P = 0.073$) and CRVE from $139.0 \pm 13.8 \mu\text{m}$ to $139.2 \pm 14.2 \mu\text{m}$ ($P = 0.794$). Preinjection and postinjection arteriovenous ratios in the ranibizumab-treated group were 0.74 ± 0.14 and 0.72 ± 0.14 , respectively ($P = 0.163$).

Conclusions: IVT aflibercept treatment had a significant vasoconstrictive effect in eyes treated for nAMD; on the other hand, IVT ranibizumab did not significantly affect retinal vessel diameter. The aflibercept-mediated reduction in diameter was not vessel-specific.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Efficacy and Safety of Ranibizumab 0.5 mg Versus Verteporfin Photodynamic Therapy in Asian Patients With Myopic Choroidal Neovascularization: 12-Month Results From the BRILLIANCE Study

First Author: Youxin **CHEN**Co-Author(s): Arthur **FOO**, Hyoung **KOH**, Timothy **LAI**, Tarun **SHARMA**

Purpose: To evaluate the efficacy and safety of ranibizumab 0.5 mg versus verteporfin photodynamic (vPDT) therapy in Asian patients with myopic choroidal neovascularization (mCNV).

Methods: Adult patients ($N = 457$) were randomized (2:2:1) into group 1 [G1, $n = 182$; ranibizumab on day 1, month (M) 1, and thereafter as needed guided

by visual acuity (VA) stabilization]; G2 (n = 184; ranibizumab on day 1 and thereafter as needed guided by disease activity); or G3 (n = 91; vPDT on day 1 and treated with ranibizumab or vPDT or both as needed guided by disease activity from M3). Study objectives included superiority assessment of both ranibizumab treatments versus vPDT with respect to mean average best-corrected VA (BCVA) change from baseline to M1–3 (primary), noninferiority of G2 versus G1 with respect to mean average BCVA change from baseline to M1–6 (key secondary), mean BCVA change, treatment exposure, and safety over 12 months.

Results: Overall, 431 (94.3%) patients completed the 12-month study. At baseline, mean age and VA were 51.2 years and 53.5 letters, respectively. Both ranibizumab groups were superior to vPDT (G1: +9.5 and G2: +9.8 vs G3: +4.5 letters; $P < 0.001$). Ranibizumab in G2 was noninferior to G1 (10.7 vs 10.4 letters; $P < 0.001$). The mean BCVA change at M12 was 12.0 (G1) and 13.1 (G2) letters with a mean of 4.6 (G1) and 3.9 (G2) ranibizumab injections. No new safety findings were identified.

Conclusions: Ranibizumab treatment demonstrated superior efficacy in BCVA gains versus vPDT in Asian patients with mCNV up to M3 and were generally maintained through M12. Overall, ranibizumab was well tolerated.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Efficacy of Ziv-Aflibercept as an Off-Label Remedy in Treatment-Naïve Macular Edema Due to Retinal Vein Occlusion

First Author: Nishant **RADKE**

Co-Author(s): Amrita **MUKHERJEE**, Snehal **RADKE**, Charudutt **KALAMKAR**

Purpose: To study the effect of ziv-aflibercept in treatment-naïve macular edema due to retinal vein occlusion.

Methods: Case series of 8 eyes of 8 patients who underwent 3 intravitreal injections of ziv-aflibercept at monthly intervals in treatment-naïve macular edema due to central or branch retinal vein occlusion (CRVO and BRVO). Best corrected visual acuity (BCVA) was recorded before each treatment. Treatment was stopped after 3 injections and patients were observed for recurrence of edema and the duration until rebound of edema after the last injection was noted. Optical coherence tomography (OCT) was done at each visit before treatment. Informed consent was obtained for the off-label intravitreal use of ziv-aflibercept from

all patients.

Results: Mean age of the patients was 62. Male:female ratio was 5:3. Five patients had CRVO and 3 had BRVO. Mean central macular thickness at the start of treatment was 504.25 μm , which decreased to 227.75 μm after treatment. The P value was <0.0001 using unpaired t test and it was statistically significant. Mean Early Treatment Diabetic Retinopathy Study (ETDRS) letter score improved from 35.38 to 69.75 after treatment and the P value was <0.0001 with unpaired t test. Mean time for rebound of edema after the third injection was 72 days.

Conclusions: Ziv-aflibercept produced significant reduction in macular thickness with improvement in visual acuity in all patients. This case series is small and short-term results look promising, suggesting the need for further larger randomized clinical trials.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S228

Factors Associated With Predominantly Peripheral Lesions of Diabetic Retinopathy Identified on Ultrawide-Field Retinal Imaging

First Author: Thomas **LAM**

Co-Author(s): Carol **CHEUNG**, Ka Hing **LOK**, Danny **NG**, Simon **SZETO**, Raymond **WONG**

Purpose: Recent studies suggested the presence of predominantly peripheral lesions (PPLs), assessed from ultrawide-field (UWF) retinal imaging, could potentially be used as an independent predictor of diabetic retinopathy (DR) progression. In this study, we evaluated whether a range of ocular [DR severity, optical coherence tomography angiography (OCT-A) metrics], systemic (eg, blood pressure, HbA1c, eGFR), and demographic factors (eg, age, gender, duration of diabetes) influence PPLs in diabetic patients.

Methods: We conducted an observational cross-sectional study and included 299 eyes from 155 patients diagnosed with diabetes mellitus recruited from a tertiary eye center. UWF retinal imaging was performed with a confocal scanning laser ophthalmoscope (Daytona, Optos). DR lesions with a greater extent outside versus inside standard Early Treatment Diabetic Retinopathy Study (ETDRS) fields were defined as PPLs from UWF images. Retinal capillary parameters [eg, vessel density (VD), fractal dimension (FD), intercapillary area (ICA)] were measured from OCT-A at the macular area by a customized image analysis MATLAB program. We used generalized estimating equations and logistic regression models to determine the independent

variables associated with PPLs.

Results: In this study, 28 eyes (9.4%) from 24 (15.5%) patients had PPLs. Presence of PPLs was significantly associated with greater DR severity [odds ratio (OR), 2.30; 95% confidence interval (CI), 1.48-3.59], lower FD (OR, 0.44; 95% CI, 0.22 to 0.91), and larger ICA (OR, 1.61; 95% CI, 1.03 to 2.50). PPLs were not associated with other systemic factors (eg, hbA1c, eGFR, hypertension).

Conclusions: The presence of PPLs is associated with greater DR severity and a greater extent of retinal microvascular damage measured from OCT-A. The effects of these factors should be taken into consideration before PPLs can be used as a predictor for DR progression. Further longitudinal studies to elucidate the relationships between PPLs, retinal microvascular changes, and DR progression are required.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Multicenter, Randomized, Sham-Controlled Study of Dexamethasone Intravitreal Implant in Patients With Retinal Vein Occlusion in China

First Author: Xiaoxin **LI**

Co-Author(s): Xiao-Yan **LI**, Xiaoling **LIANG**, Ningli **WANG**, Gezhi **XU**

Purpose: To evaluate the safety and efficacy of dexamethasone intravitreal implant 0.7 mg (DEX) for treatment of macular edema associated with retinal vein occlusion (RVO).

Methods: Phase 3, multicenter, randomized, double-masked, sham-controlled, 6-month clinical trial with 2-month open-label study extension in patients with branch or central RVO (BRVO, CRVO). DEX (n = 129) or sham procedure (n = 130) was administered at baseline (1 study eye per patient); all patients meeting retreatment criteria were administered DEX at month 6. Efficacy measures included best-corrected visual acuity (BCVA) using the Early Treatment Diabetic Retinopathy Study (ETDRS) method and central retinal thickness (CRT) on optical coherence tomography.

Results: DEX provided earlier time to ≥ 15 -letter BCVA improvement from baseline during the first 6 months (primary endpoint) compared with sham ($P < 0.001$). At month 2 (peak effect) 35% of DEX-treated patients vs 12% of sham-treated patients achieved ≥ 15 -letter BCVA improvement from baseline ($P < 0.001$), mean BCVA change from baseline was +10.6 letters with DEX

vs +1.7 letters with sham ($P < 0.001$), and mean CRT change from baseline was $-407 \mu\text{m}$ with DEX vs $-62 \mu\text{m}$ with sham ($P < 0.001$). Subgroup analysis showed that DEX improved visual and anatomic outcomes in both BRVO and CRVO. Increases in intraocular pressure (IOP) were usually controlled with topical medication. No patient required incisional glaucoma surgery.

Conclusions: DEX demonstrated a favorable safety profile and provided clinically significant benefit in Chinese patients with BRVO and CRVO. BCVA and CRT were improved with DEX relative to sham for 3–4 months after a single implant.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Multimodal Imaging of Highly Myopic Eyes With High Axial Anisometropia

First Author: Quan **HOANG**

Co-Author(s): Gemmy **CHEUNG**, Shu Yen **LEE**, Gavin **TAN**, Chee-Wai **WONG**, Ian **YEO**

Purpose: To determine the prevalence of anisometropia of $>3 \text{ mm}$ and associated factors among a cohort of highly myopic (HM) patients.

Methods: We retrospectively analyzed a consecutive series of staphylomatous high myopia patients [< -6.00 diopters (D) and/or $> 26 \text{ mm}$ axial length (AL) in > 1 eye] who were seen a high myopia clinic between January 2017 and July 2017. All patients underwent dilated retinal exam, IOLMaster AL measurement, fundus photography/autofluorescence, and wide-field swept-source optical coherence tomography (SS-OCT).

Results: Eighty-seven Singaporean patients (60 female; 60 ± 14 years old; range, 21-92) were included. Overall, when excluding unilateral eyes $< 26 \text{ mm}$, AL was $29.99 \pm 2.2 \text{ mm}$ (26-36.7 mm). Severity of myopic macular degeneration (MMD) according to the Meta-Analysis for Pathologic Myopia (META-PM) classification was MMD category 1 in 33 eyes (22%), MMD category 2 in 49 (33%), MMD category 3 in 47 (31%), and MMD category 4 in 21 (14%). Among the 150 HM eyes, 21 (14%) had choroidal neovascularization (CNV), 5 (3%) lacquer cracks, 21 (14%) foveoschisis, 6 (4%) macular/lamellar hole, 10 (7%) vitreomacular adhesion, 11 (7%) dome-shaped macula, and 2 (1%) had tilted disc syndrome. Twelve of 87 patients (14%) had high anisometropia of $> 3 \text{ mm}$ AL (range, 3-11.2 mm). Of these 12 patients, among the shorter eyes AL was $25.56 \pm 2.1 \text{ mm}$ (23.30-29.45 mm), 4/12 (33%) had no staphyloma, 2/12 (17%) had dome-shaped macula, 2/12 (17%) had peripapillary staphyloma, and 4/12 (33%) had wide macular staphyloma. Of the 4 eyes

with AL <24 mm, 2 were MMD category 0/1, 1 was MMD category 3 with foveoschisis and Fuch spot, and 1 was MMD category 4 with dome-shaped macula and CNV.

Conclusions: The shorter eyes in patients with anisometropia (based on refraction or AL alone) may have shorter AL attributable to dome-shaped macula or an eccentric, nonfoveal location of the staphyloma apex and therefore remain at risk for MMD changes.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Optical Coherence Tomography-Angiography Features in Diabetic Eyes With and Without Diabetic Retinopathy

First Author: Shishir **SINGH**

Co-Author(s): Pranita **CHAUDHARY**, Manish **NAGPAL**

Purpose: To describe the optical coherence tomography-angiography (OCT-A) features of diabetic retinopathy (DR).

Methods: A total of 57 diabetic eyes were imaged on OCT-A and fluorescein angiography (FA), and the ability to visualize microaneurysms (MA), capillary nonperfusion (CNP) areas, foveal avascular zone (FAZ) alteration, and neovascularization (NV) in DR was compared.

Results: MAs appeared as focally dilated saccular or fusiform capillaries seen more in the deep capillary plexus in OCT-A; while such segmentation details regarding level of capillary plexus involved is not possible in FA. CNP and FAZ appeared as areas with no or sparse capillaries, better visualized on OCT-A due to leak in FA obscuring details. In diabetics mean FAZ area measured on OCT-A was significantly enlarged compared to the control group ($P < 0.01$). Preretinal NV was better visualized by segmenting OCT-A into the vitreous as it is 3-dimensional imaging; while in FA, the leak from NV obscures its architectural details.

Conclusions: OCT-A is a noninvasive technique that can visualize MA, measure FAZ area, and provide additional information regarding the localization and morphology of NV and CNP areas, suggesting that it is noninferior for posterior pole DR alterations compared with FA, which remains the gold standard.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Optical Coherence Tomography-Angiography in Choroidal Neovascularization Undergoing Treatment With Intravitreal Anti-VEGF Injections

First Author: Shishir **SINGH**

Co-Author(s): Pranita **CHAUDHARY**, Manish **NAGPAL**

Purpose: To describe effects of anti-vascular endothelial growth factor (anti-VEGF) treatment in eyes with choroidal neovascularization (CNV) on optical coherence tomography-angiography (OCT-A).

Methods: Patients ($n = 30$) undergoing intravitreal anti-VEGF injections for CNV were examined with OCT-A and followed up on day 7 and day 30 post injections. Comparisons of scans were done exactly at the same landmarked site of the pathology.

Results: All eyes showed reduction in fine vessel density in the neovascular tuft. In 12 eyes, decrease in the area of CNV with shrinkage of blood vessels at the edge of the CNV network was noted. Central vessels of the CNV network and the perilesional halo persisted. Recurrences in 4 eyes revealed small tufts of new sprouting seeming to originate from the central vessels of the CNV.

Conclusions: OCT-A may allow direct visualization and noninvasive analysis of CNV networks and their remodelling during intravitreal anti-VEGF treatment follow-up, aiding in treatment decision.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Predictors of Complete Polyp Regression Over 12 Months in the EVEREST II Study

First Author: Colin **TAN**

Co-Author(s): Tadhg **GUERIN**, Tock Han **LIM**, Philippe **MARGARON**

Purpose: To evaluate the potential predictors of complete polyp regression (CPREG) in EVEREST II.

Methods: EVEREST II was a 24-month, multicenter study in which 322 patients diagnosed with symptomatic polypoidal choroidal vasculopathy (PCV) were randomized 1:1 to receive ranibizumab 0.5 mg plus verteporfin photodynamic therapy (vPDT) ($n = 168$) or ranibizumab 0.5 mg monotherapy ($n = 154$). Presence and size of polyps were assessed using indocyanine green angiography (ICGA) by the Fundus

Image Reading Center at baseline, months 3, 6, and 12. Predictors of CPREG at month 12 were studied by backward selection multiple logistic regression using demographic, functional, anatomic, and angiographic parameters in 2 separate models that used either the baseline predictors or on-treatment predictors at month 3.

Results: Baseline ICGA characteristics were comparable between both treatment groups. At month 3, 71.4% of patients treated with combination therapy achieved CPREG and the rates were stable at months 6 and 12 (71.3% and 69.7%, respectively). In the ranibizumab monotherapy group, the proportion increased from 23.3% at month 3 to 28.0% and 33.8% at months 6 and 12, respectively. Treatment with combination therapy [odds ratio (OR) 4.60 (baseline model) and 2.25 (month 3 model)], absence of pulsation of nodule at baseline (OR 2.67), and presence of CPREG at month 3 (OR 6.7) were associated with a higher probability of CPREG at month 12.

Conclusions: At month 12, treatment with combination therapy was associated with higher probability of achieving CPREG than ranibizumab monotherapy. The results contribute to the further understanding of the response of PCV-associated polyps to ranibizumab with or without vPDT.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Protecting Against Photoreceptor Loss With Chronic Electrical Stimulation

First Author: Chi **LUU**

Co-Author(s): Carla **ABBOTT**, Penelope **ALLEN**, David **NAYAGAM**

Purpose: To determine the effect of chronic electrical stimulation (CES) on preserving photoreceptor function in the P23H-3 rat model of retinal degeneration.

Methods: Animals were divided into 3 groups of control (n = 6), passive (n = 6), and active stimulation (n = 7). Active stimulation treatment commenced at 8 weeks of age and consisted of 1 hour of electrical stimulation twice per week for 4 weeks. Electroretinography (ERG) was performed at 6 (baseline) and 12 weeks of age as a surrogate measure of photoreceptor survival. The ERG responses of the 3 study groups were compared to determine the effect of CES on photoreceptor survival.

Results: In the active stimulation group, the ERG a-wave response amplitude at 12 weeks of age was slightly reduced in the stimulated eyes ($83.8 \pm 38.1 \mu\text{V}$, $P = 0.413$) but markedly reduced in the nonstimulated fellow eyes ($33.7 \pm 19.7 \mu\text{V}$, $P < 0.001$), compared to

the baseline value ($100.3 \pm 29.9 \mu\text{V}$). In the control and passive groups, the ERG a-wave amplitude of both eyes was also markedly reduced (of the same magnitude as the nonstimulated fellow eyes of the stimulation group) at 12 weeks of age compared to the baseline value ($P < 0.001$ for both groups and eyes).

Conclusions: Chronic electrical stimulation preserved retinal function in the P23H-3 rat model of retinal degeneration. Further studies with a longer follow-up period are warranted to determine the long-term safety and efficacy of CES in arresting photoreceptor death in retinal degeneration.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Randomized, Open-Label Study to Evaluate 2 Intravitreal Aflibercept Treat-and-Extend Dosing Regimens in Wet Age-Related Macular Degeneration: 52-Week Outcomes From ALTAIR

First Author: Tomoko **SAWADA**

Co-Author(s): Masato **KOBAYASHI**, Masahito **OHJI**, Annabelle **OKADA**, Kanji **TAKAHASHI**, Yasuhiro **TERANO**

Purpose: To evaluate 2 intravitreal aflibercept (IVT-AFL) treat-and-extend (T&E) dosing regimens in wet age-related macular degeneration (wAMD).

Methods: ALTAIR (NCT02305238) was a 96-week, randomized, open-label, phase 4 study conducted at 40 sites across Japan. Patients received 3 monthly doses of IVT-AFL before randomization (1:1) at week 16 to IVT-AFL with a 2-week (IVT-AFL-2W) or 4-week (IVT-AFL-4W) adjustment. Primary endpoint was mean change in best-corrected visual acuity [BCVA; Early Treatment Diabetic Retinopathy Study (ETDRS) letters] from baseline to week 52. Other endpoints included the proportion of patients losing <15 ETDRS letters, mean change in central retinal thickness (CRT), and treatment-emergent adverse events (TEAEs) at week 52.

Results: A total of 254 Japanese patients were included in safety analyses and 246 patients were included in efficacy analyses. Baseline BCVA was 54.8 (IVT-AFL-2W) and 55.3 (IVT-AFL-4W) ETDRS letters. Mean change in BCVA from baseline to week 52 was 9.0 (IVT-AFL-2W) versus 8.4 (IVT-AFL-4W) ETDRS letters. Proportion of patients losing <15 ETDRS letters was 96.7% (IVT-AFL-2W) versus 95.9% (IVT-AFL-4W). Mean change in CRT was -134.4 (IVT-AFL-2W) versus -126.1 (IVT-AFL-4W) μm . Mean number of injections was 7.2 (IVT-AFL-2W) and 6.9 (IVT-AFL-4W). Mean injection interval (weeks 16–52) was 10.0 (IVT-AFL-2W) and 10.9 (IVT-AFL-4W).

The most common ocular TEAEs were conjunctival hemorrhage (2.4%) and retinal pigment epithelial tear (2.4%) (IVT-AFL-2W) and conjunctival hemorrhage (5.7%) (IVT-AFL-4W).

Conclusions: Both IVT-AFL T&E regimens improved visual and anatomical outcomes at week 52 with extended dosing intervals in wAMD patients. Ocular TEAEs were consistent with the known safety profile of IVT-AFL.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Ranibizumab 0.5 mg in Treatment-Naive Asian nAMD Patients With and Without Polypoidal Choroidal Vasculopathy: 1-Year Results From the Real-World LUMINOUS Study

First Author: Adrian KOH

Co-Author(s): Timothy LAI, Wayne MACFADDEN, Philippe MARGARON

Purpose: LUMINOUS (NCT01318941) was designed to assess the long-term effectiveness, safety, and treatment patterns with ranibizumab 0.5 mg in routine clinical practice across all approved indications. We report baseline characteristics and 1-year outcomes of ranibizumab treatment in treatment-naive neovascular age-related macular degeneration (nAMD) patients of Asian descent with or without polypoidal choroidal vasculopathy (PCV), a frequent subtype of nAMD, enrolled in LUMINOUS.

Methods: This 5-year global observational study involving 42 countries and 488 sites recruited over 30,000 patients who were treated as per the local ranibizumab label. According to investigators' discretion, patients with nAMD were assigned to the PCV or non-PCV group, based on lesions present at baseline.

Results: Treatment-naive Asian patients with nAMD were categorized as PCV (n = 421) and non-PCV (n = 1396). At baseline, mean age was 72.5/71.8 years, 67.5/59.8% were male, and mean visual acuity (VA, letters) was 54.9/46.3 for PCV/non-PCV patients, respectively. At 1 year, in PCV and non-PCV patients, mean VA improved by 6.3 (baseline, 57.5; n = 186) and 4.8 (baseline, 51.8; n = 483), with a mean of 3.4 and 2.9 ranibizumab injections and 7.3 and 6.0 visits, respectively. Adverse events (AEs) such as retinal and vitreous hemorrhage occurred in 1 (0.238%)/4 (0.287%) patients and 1 (0.238%)/1 (0.072%) patient in the PCV/non-PCV groups, respectively. A single case of vitreous hemorrhage was reported as a serious AE in the non-

PCV group.

Conclusions: LUMINOUS confirms the benefits of ranibizumab in treatment-naive Asian patients with nAMD, with similar visual outcomes irrespective of the PCV status at 1 year. No new safety signals were identified.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Ranibizumab With or Without Verteporfin Photodynamic Therapy for Polypoidal Choroidal Vasculopathy: Predictors of Visual Acuity Gains in the EVEREST II Study

First Author: Gemmy CHEUNG

Co-Author(s): Tadhg GUERIN, Philippe MARGARON

Purpose: To assess predictors of best-corrected visual acuity (BCVA) gains at month 12 in the EVEREST II study.

Methods: A 24-month, multicenter study in which 322 patients diagnosed with symptomatic polypoidal choroidal vasculopathy (PCV) were randomized to receive ranibizumab 0.5 mg plus verteporfin photodynamic therapy (n = 168) or ranibizumab 0.5 mg monotherapy (n = 154). Predictors of BCVA gains at month 12 were studied by backward selection multiple logistic regression using demographic, functional, anatomic, and angiographic parameters in 2 separate models that used either the baseline predictors or on-treatment predictors at month 3.

Results: At month 12, patients gained +8.3 letters and +5.1 letters in the combination and monotherapy arms, respectively (P = 0.013). Younger age and lower baseline BCVA were associated with higher BCVA gains at month 12 (-0.317 letters/year, P = 0.0002 and -0.233 letters/letter). Combination therapy was associated with higher BCVA gains over monotherapy in patients irrespective of the polyp size at baseline. An increase of 0.5 mm² in baseline polyp size estimates a 1.2 letter gain in the combination therapy arm and 3.5 letter loss in the monotherapy arm. In the month 3 model, younger age, lower central subfield thickness, lower BCVA, and smaller branching vascular network size were associated with higher BCVA gains at month 12 (-0.226 letters/year, P = 0.0002; -1.80 letters/100 µm, P < 0.0001; -0.142 letters/letter, P = 0.0001; -0.524 letters/mm², P = 0.0084, respectively).

Conclusions: These findings contribute to further understanding on the role of various parameters in the functional response of eyes with PCV lesions to treatment.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Real-World Data of Intravitreal Aflibercept in Macular Edema Secondary to Central Retinal Vein Occlusion From Japan: 6-Month Outcomes of the J-PMS CRVO Study

First Author: Masahiko **SHIMURA**Co-Author(s): Mami **MIURA**, Toshiaki **SAKAGUCHI**, Yasuhiro **TERANO**

Purpose: To assess the safety and effectiveness of intravitreal aflibercept (IVT-AFL) in patients with macular edema secondary to central retinal vein occlusion (ME/CRVO) in Japan.

Methods: J-PMS is a postmarketing surveillance study with postapproval commitment by the Japanese authority. It is a prospective, multicenter, observational study that is monitoring 24-month outcomes following IVT-AFL for ME/CRVO. Safety, visual, and anatomical outcomes were assessed over 6 months.

Results: Safety data from 353 patients and effectiveness data from 283 patients were analyzed. The mean age of patients was 72.0 years, 51.0% were male, 52.4% had nonischemic ME/CRVO, and 25.2% had ischemic ME/CRVO. The majority of patients (61.8%) were treatment-naïve and, among previously treated patients (36.3%), the main reason for switching was insufficient response to other anti-vascular endothelial growth factor agents (43.0% of previously treated patients). The mean number of IVT-AFL injections for 6 months was 2.1. Serious adverse events (SAEs) were reported (retinal vein occlusion: 0.57%; glaucoma: 0.28%; and facial paralysis: 0.28%). The mean change in best-corrected visual acuity from baseline to month 6 was -0.13 logarithm of the minimum angle of resolution (logMAR) [+6.5 Early Treatment Diabetic Retinopathy Study (ETDRS) letters]. The mean reduction in central retinal thickness was -199.3 μ m. The proportion of patients who avoided ≥ 0.3 logMAR (15 ETDRS letters) loss at month 6 was 96.3%.

Conclusions: These real-world safety findings are consistent with the known safety profile of IVT-AFL. The extent of frequency of injection and the visual gain were less than in clinical trials. Visual acuity gains following IVT-AFL treatment were also observed in this real-world study.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Real-World Data of Intravitreal Aflibercept in Wet Age-Related Macular Degeneration From Japan: 24-Month Outcomes of the J-PMS AMD Study

First Author: Yuji **OSHIMA**Co-Author(s): Tatsuro **ISHIBASHI**, Hide **MIGITA**, Ryusaburo **MORI**, Toshiaki **SAKAGUCHI**, Yasuhiro **TERANO**

Purpose: To assess the safety and effectiveness of intravitreal aflibercept (IVT-AFL) in patients with wet age-related macular degeneration (wAMD) in Japan.

Methods: J-PMS is a postmarketing surveillance study with postapproval commitment by the Japanese authority. The J-PMS AMD Study is a prospective, multicenter, observational, regulatory study for wAMD in Japan. A total of 4371 patients were registered; 3531 patients were included in the safety data set. Visual and anatomical outcomes were assessed in 839 patients who were followed for 24 months.

Results: The mean age of the patients was 74.3 years. The most commonly reported serious adverse events (SAEs) were vitreous hemorrhage (0.23%) and retinal hemorrhage (0.23%). The mean change in best-corrected visual acuity from baseline to months 12 and 24 was -0.091 logarithm of the minimum angle of resolution (logMAR) [+4.5 Early Treatment Diabetic Retinopathy Study (ETDRS) letters] and -0.038 logMAR (+1.9 ETDRS letters), respectively. The proportion of patients who avoided ≥ 0.3 logMAR (15 ETDRS letters) loss was 94.9% at month 12 and 88.0% at month 24. The mean change in central retinal thickness from baseline to months 12 and 24 was -98.6 μ m and -93.4 μ m, respectively. The mean number of IVT-AFL injections was 5.3 for 12 months and 7.7 for 24 months.

Conclusions: SAEs were consistent with the known safety profile of IVT-AFL. Patients are undertreated under real-world conditions leading to poor visual acuity outcomes when compared to stricter, more regular dosing regimens in clinical trials.

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Real-World Outcomes of Ranibizumab 0.5 mg in Patients With Neovascular Age-Related Macular Degeneration: 1-Year Results From the LUMINOUS Study

First Author: Masahito **OHJI**

Co-Author(s): Wayne **MACFADDEN**

Purpose: LUMINOUS (NCT01318941) evaluated the long-term effectiveness, safety, and treatment patterns of ranibizumab 0.5 mg in clinical practice across all approved indications. The effectiveness and safety of ranibizumab in treatment-naïve patients with neovascular age-related macular degeneration (nAMD) from the final analysis of LUMINOUS are presented here.

Methods: LUMINOUS is a recently completed, 5-year, global, observational study. Consenting adult patients were treated as per the local ranibizumab label. The 1-year visual acuity (VA; primary treated eye) and injection pattern for the treatment-naïve nAMD patients and adverse events (AEs) and serious AEs (SAEs) for the total treatment-naïve nAMD cohort were determined.

Results: Baseline and 1-year VA data were available for 3379 treatment-naïve nAMD patients. At baseline, the mean (SD) age was 75 (10.2) years, 54.9% were female, and 66.5% were Caucasian. The VA gains at 1 year in the treatment-naïve patients receiving <3, 3–6, >6, and ≥10 injections were 1.6 letters (n = 537), 3.3 letters (n = 1924), 3.7 letters (n = 918), and 5.7 letters (n = 224) from 45.5, 52.4, 54.6, and 53.1, respectively, at baseline. In all treatment-naïve nAMD patients, the mean (SD) VA gain of 3.1 (16.5) at 1 year from 51.9 (21.0) at baseline was achieved with a mean (SD) of 5.0 (2.7) ranibizumab injections and 8.8 (3.3) monitoring visits. Across all treatment-naïve nAMD patients (n = 6241), the incidence of ocular/nonocular AEs and SAEs was 8.2%/12.8% and 0.9%/7.4%, respectively.

Conclusions: LUMINOUS confirms the effectiveness of ranibizumab in treatment-naïve nAMD patients and indicates a relationship between VA improvement and the number of ranibizumab injections administered to each patient.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Retinal Pigment Epithelial Detachment Changes in Age-Related Macular Degeneration Treated With Aflibercept, Ranibizumab, and Bevacizumab

First Author: Pawimon **CHATCHUTIMAKORN**

Co-Author(s): Yuda **CHONGPISON**, Cameron **HURST**, Apivat **MAVICHAK**, Pear **PONGSACHAREONNONT**

Purpose: To compare the effects of 3 anti-vascular endothelial growth factor drugs (anti-VEGFs) (bevacizumab, ranibizumab, and aflibercept) on retinal pigment epithelial detachments (RPEDs) in naïve wet age-related macular degeneration (AMD) patients.

Methods: The charts of 130 patients (130 eyes) with RPED in naïve wet AMD treated with anti-VEGF monotherapy for at least 6 months were reviewed. RPED height, RPED type, visual acuity (VA), height of subretinal fluid (SRF), central macular thickness (CMT), and number of hyperreflective foci (HRF) were obtained each month consecutively. The primary outcome, the change of RPED height from baseline, was analyzed using linear mixed model. A P value less than 0.15 was considered the significance level for interaction between time and treatment effects and a P value less than 0.05 was considered the significance level for difference between groups.

Results: Baseline RPED heights were 262.50, 231.03, and 228.72 µm for the bevacizumab, ranibizumab, and aflibercept groups, respectively. After adjusting for gender, RPED type, fluorescein angiographic pattern, comorbidity of studied eyes, and number of HRF, there was a time modification on treatment effects (P = 0.11). At 6-month follow-up, the decrease in height of RPED from baseline in the bevacizumab group (71.16 µm) was greater than in the ranibizumab and aflibercept groups (35.28 and 32.64 µm, P = 0.04 and 0.03, respectively).

Conclusions: Compared with ranibizumab and aflibercept, there is a significant decrease in RPED height after being treated with bevacizumab in patients with newly diagnosed wet age-related macular degeneration.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Risk Effect of a Promoter Deletion in PGF Against Neovascular Age-Related Macular Degeneration

First Author: Li **MA**Co-Author(s): Vesta **CHAN**, Haoyu **CHEN**, Li Jia **CHEN**, Tsz-Kin **NG**, Calvin **PANG**

Purpose: We have recently identified a common variant in the placental growth factor (PGF) gene associated with neovascular age-related macular degeneration (AMD). In this study, we aimed to identify the disease-associated rare variants in the PGF gene.

Methods: The promoter region, coding sequences, and splicing regions of the PGF gene were sequenced in a Hong Kong Chinese cohort of 230 neovascular AMD patients and 430 controls and a Shantou Chinese cohort of 180 neovascular AMD patients and 840 controls. The transcription activity of the PGF 18 base-pair deletion variant was determined in human ARPE-19 cells by the promoter-luciferase analysis.

Results: We identified a novel heterozygous 18 base-pair deletion, located in the promoter region of PGF, in 3 (1.3%) patients with neovascular AMD and 1 (0.23%) control subject [$P = 0.13$; odds ratio (OR) = 5.61; 95% confidence interval (CI): 0.58-54.26]. In the Shantou cohort, this deletion variant was detected in 2 (1.1%) neovascular AMD patients and 2 (0.24%) controls ($P = 0.15$; OR = 4.51; 95% CI: 0.63-32.25). Combined analysis of both cohorts showed a significant association of the deletion variant with neovascular AMD ($P = 0.026$; OR = 5.08, 95% CI: 1.21-21.36). The 18 base-pair deletion variant was predicted to alter the transcription factor binding sites in the PGF promoter, and the promoter analysis demonstrated higher luciferase expression in ARPE-19 cells transfected with the deletion variant plasmid than the wildtype plasmid ($P = 0.0002$).

Conclusions: This study identified the increased transcription activity of a rare, functional variant in the promoter of the PGF gene, conferring a 5-fold increased risk for neovascular AMD.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Subthreshold Micropulse Diode Laser Versus Observation in Acute Central Serous Chorioretinopathy

First Author: Supriya **ARORA**Co-Author(s): Tarun **ARORA**, Mohit **CHHABRA**, Basudeb **GHOSH**, Richa **PYARE**, Preethi **SRIDHARAN**

Purpose: To evaluate subthreshold micropulse diode (SMD) laser as a treatment modality in acute central serous chorioretinopathy (CSC) and compare it with standard of care (observation).

Methods: Randomized controlled trial on 68 eyes (34 eyes in the SMD laser group and 34 eyes in the observation group) with acute CSC with a single angiographic leak and duration of complaints less than 2 months. Detailed history, examination, and investigations [fundus fluorescein angiography and spectral domain optical coherence tomography (SD-OCT)] were performed at baseline and at regular intervals up to 6 months.

Results: Eyes in the laser group had significantly higher best corrected visual acuity (BCVA) at 2 weeks ($P = 0.002$), 4 weeks ($P < 0.001$), 8 weeks ($P < 0.001$), 16 weeks ($P = 0.042$), and 6 months ($P = 0.008$) and higher contrast sensitivity (CS) at 8 weeks ($P = 0.008$), 16 weeks ($P < 0.001$), and 6 months ($P < 0.001$). Subfoveal choroidal thickness (CT) was significantly lower in the laser group at 8 weeks ($P = 0.030$), 16 weeks ($P = 0.049$), and 6 months ($P < 0.001$) compared to the observation group. Of SMD laser treated eyes, 11.76% versus 29.41% of eyes in the observation group had a recurrent/persistent neurosensory detachment (NSD) ($P = 0.036$) at the end of 6 months.

Conclusions: SMD laser produces faster and superior visual rehabilitation without any adverse effects. It also reduces the chances of CSC becoming chronic and recurrences compared to standard of care (observation).

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

The Effect of Citicoline on Electroretinography Abnormalities in Patients With Nonproliferative Diabetic Retinopathy

First Author: Anna **UTAMI**

Co-Author(s): Elvioza **ELVIOZA**, Mohamad **SIDIK**

Purpose: To determine the effect of citicoline 1000 mg oral supplementation given for 4 weeks on electroretinography abnormalities in patients with nonproliferative diabetic retinopathy (NPDR).

Methods: A prospective, double blind, randomized clinical trial. Thirty-eight patients who met the inclusion and exclusion criteria were randomized into 2 groups: placebo (P-NPDR) and citicoline (C-NPDR). In the end, there were 18 eyes in the C-NPDR group and 16 eyes in the P-NPDR group. The primary outcome was P50 and N95 amplitude in PERG within group and intergroup, which were taken at the baseline and 4 weeks after treatment.

Results: At the end of treatment, the N95 amplitude in C-NPDR showed improvement: 4.85 (1.9-10.3) μ V before treatment to 5.7 (1.9-17.1) μ V after treatment ($P = 0.04$). Median P50 amplitude improved in both groups, with C-NPDR of 3.1 μ V to 3.8 μ V ($P = 0.89$) and P-NPDR of 3.5 μ V to 4.5 μ V ($P = 0.10$). Delta Δ N95 amplitude was higher in C-NPDR, while delta Δ P50 amplitude was higher in P-NPDR, with P values of 0.35 and 0.45.

Conclusions: Oral citicoline may induce a significant improvement in mean N95 amplitude before and after treatment. P-NPDR showed a positive trend in P50 amplitude while C-NPDR showed a positive trend in N95 amplitude, but these values were not statistically significant ($P = 0.45$; $P = 0.35$).

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S428

Vascular Endothelial Growth Factor Concentration in the Aqueous Humor Before and After the Intravitreal Injection of Bevacizumab in Eyes With Diabetic Macular Edema

First Author: Nguyen **HAO**

Co-Author(s): Vũ **ANH**

Purpose: To study the concentration of vascular endothelial growth factor (VEGF) in the aqueous humor

before and after intravitreal injection of bevacizumab in eyes with diabetic macular edema (DME) and the correlation to the disease.

Methods: In this prospective, interventional case series, 15 mg of bevacizumab was injected into the vitreous cavity to treat DME in 20 eyes of 14 patients. Aqueous humor samples were obtained just before and 1 week after injection. The VEGF concentration in the aqueous humor was measured using an enzyme-linked immunosorbent assay.

Results: VEGF concentration ranged from 107 to 1559 pg/mL (464.87 ± 383.01 pg/mL) before and decreased to 0 to 516 pg/mL (20.29 ± 19.29 pg/mL) ($P < 0.001$) after injection. There was no correlation between VEGF concentration to age, diabetes duration, glycemia, HbA1C, vision loss duration, visual acuity, central retinal thickening, and cube volume ($P > 0.05$). VEGF concentration was significantly higher in patients with proliferative diabetic retinopathy than in nonproliferative diabetic retinopathy ($P < 0.001$) and was significantly higher in patients with hyperfluorescent DME than in those with minimally fluorescent DME ($P < 0.05$). There was no difference in concentration levels of VEGF between morphologic groups: diffuse retinal thickening, cystoid macular edema, serous retinal detachment ($P > 0.05$).

Conclusions: Intravitreal injections of bevacizumab resulted in a substantial decrease in VEGF in the aqueous humor. The correlation between the aqueous humor VEGF concentration with the disease parameters provides a better understanding of the role of VEGF in the unclear pathogenesis of DME. Further study is warranted to elucidate these issues.

Feb 11, 2018 (Sun)

11:00 - 12:30

Venue: S223

Vascular Presentation Pattern of Type 2 Macular Telangiectasia Among 3 Optical Coherence Tomography Angiography Algorithms

First Author: Pear **PONGSACHAREONNONT**

Co-Author(s): Buravej **ASSAVAPONGPAIBOON**, Apivat **MAVICHAK**, Thanapong **SOMKIJRUNGROJ**, Adisai **VARADISAI**

Purpose: To compare macular telangiectasia type 2 (MacTel2) lesions among 3 optical coherence tomography angiography (OCTA) devices: DRI OCT Triton SS-OCT (Topcon), AngioPlex SD-OCT (Zeiss), and AngioVue SD-OCT (Optovue).

Methods: All the MacTel2 cases visiting in 2017

were recruited in the study. The 3 x 3-mm OCTA images were graded and the devices were ranked by scoring. Agreement of macular thickness (MT) and nonperfusion area and correlation of vascular density (VD) from each device was assessed.

Results: Fourteen eyes (mean age, 64.82 years) were recruited in this study. From the rankings, the AngioVue was superior in the detection of abnormal decorrelation and the AngioPlex demonstrated the least motion artifacts. Based on the 3 devices, intraclass correlation coefficients (ICC) for the perfusion of the superficial capillary plexus (SCP) and deep capillary plexus (DCP) and for MT at the central fovea were 0.867, 0.720, and 0.939, respectively. Due to lack of automated VD from Triton, only the data from AngioVue and AngioPlex were evaluated. Pearson correlation coefficient for VD at the fovea was 0.672.

Conclusions: Split-spectrum amplitude-decorrelation angiography (SSADA) algorithm from AngioVue gives the best overall detection of abnormal positive decorrelation consistent with MacTel2. En-face OCT image inspection along with OCTA image interpretation gives better detection of motion artifact and other image artifacts. The DCP is the slab that best demonstrates abnormal decorrelation in MacTel2 which was mostly found at the area temporal to the fovea.

Retina (Surgical)

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

An Objective Analysis of Quality of Vision in Patients Undergoing YAG Vitreolysis for the Treatment of Symptomatic Floaters

First Author: Inder **SINGH**

Purpose: To objectively analyze quality of vision in patients undergoing YAG vitreolysis using wavefront aberrometry.

Methods: Thirty-six eyes of 26 consecutive symptomatic patients who complained of reduced daily functioning due to floaters were preoperatively diagnosed with amorphous type floaters located near the central visual axis and scheduled to undergo YAG vitreolysis using the Ultra Q Reflex YAG laser (Ellex, Adelaide, Australia). Prior to and within 6 weeks after vitreolysis, patients were scanned prior to dilation using the iTrace wavefront aberrometer (TRACEY Technologies, Texas, USA). Pre- and postoperative scans were reviewed and compared for changes in higher order aberrations (HOA), modular transfer function (MTF) curves, and dysfunctional lens index (DLI), an

assessment of internal quality of vision.

Results: HOA reduced in all 26 patients, with a mean reduction of 53% and the greatest reduction observed in trefoil and then coma (mean total HOA preoperatively: 0.233, mean postoperatively: 0.11). In MTF analysis, the mean area under the curve increased by 40% (mean preoperatively: 0.290, mean postoperatively: 4.10). The mean DLI improved from 5.3 to 8.9. No adverse events were reported and Snellen visual acuity did not change on postoperative exams.

Conclusions: This pilot study on objective analysis using wavefront aberrometry demonstrates that YAG vitreolysis has the potential to improve quality of vision in patients experiencing symptomatic floaters. A larger study is currently being conducted to corroborate these findings.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Autologous Lens Capsular Flap Transplantation Combined With Autologous Blood Application in the Management of Refractory Macular Hole

First Author: Jie **PENG**

Co-Author(s): Chunli **CHEN**, Haiying **JIN**, Peiquan **ZHAO**

Purpose: To report results of lens capsular flap transplantation (LCFT) and autologous whole blood application in refractory macular hole (MH) treatment.

Methods: Seven phakic and 3 aphakic eyes with persistent MH after standard surgery with internal limiting membrane peeling were studied. Lens capsule flap was acquired from the same eye in 8 cases (7 phakic and 1 aphakic). The fellow eye was used in 2 aphakic eyes without sufficient lens capsule. The fellow eye underwent simultaneous phacoemulsification. All eyes underwent complete vitrectomy, LCFT into the MH, whole blood application, and 15% perfluoropropane (C3F8) tamponade. The patients were instructed to maintain a face-down or prone position for 2 weeks postoperatively. Structural and functional changes were evaluated.

Results: The mean preoperative MH diameter was $1472.78 \pm 736.88 \mu\text{m}$. The MH was completely closed in 9 eyes: 8 eyes receiving same-eye LCFT and 1 receiving fellow-eye LCFT. In the other fellow-eye LCFT recipient, the MH was partially closed. Visual acuity improved from 1.84 ± 0.49 logarithm of the minimum angle of resolution (logMAR) (median Snellen acuity: 20/1750, range: 20/4000 to 20/125) preoperatively to 1.34 ± 0.59 logMAR (median Snellen acuity: 20/450,

range: 20/4000 to 20/63) postoperatively ($P = 0.009$).

Conclusions: LCFT and autologous whole blood application may improve anatomical and visual outcomes in refractory MH cases. The lens equator and fellow eye may be promising sources of LCF.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Characteristics and Surgical Outcome of Rhegmatogenous Retinal Detachment in Young Patients: A 7-Year Review

First Author: Tiffany **YEUNG**

Purpose: To evaluate the clinical characteristics, retinal detachment morphologies, and surgical outcomes of rhegmatogenous retinal detachment (RRD) in young patients. We aimed to identify the prognostic factors for successful outcomes.

Methods: Consecutive cases of RRD patients under the age of 40 that received surgical repair at a tertiary eye center over a 7-year period were retrospectively reviewed. Subgroup analysis was done according to the 5 different etiologies leading to retinal detachment, surgical technique (scleral buckling or vitrectomy), as well as the presence or absence of posterior vitreous detachment (PVD). The primary outcome examined was primary anatomical success at 6 months and secondary outcome was postoperative visual acuity (VA) at 1 year.

Results: Sixty eyes of 60 patients were included. The mean age was 28.32. The most common etiology was high myopia (35%), followed by idiopathic (30%), trauma (20%), atopic dermatitis (11.7%), and congenital diseases (3.33%). The mean preoperative visual acuity was logarithm of the minimum angle of resolution (logMAR) 0.84. The mean postoperative 1-year logMAR visual acuity was 0.55 ± 0.45 . PVD was found in 38 eyes and the youngest patient was 14 years old. When compared with pars plana vitrectomy (PPV), cases that received scleral buckling (SB) alone had statistically significantly better final visual acuity ($P = 0.005$) and significantly less risk of developing cataract ($P = 0.000$). The primary anatomical success rates for the SB and PPV groups were 96.2% and 97.2%, respectively ($P = 0.847$).

Conclusions: The most common etiological factor for young RRD was high myopia. Scleral buckling offers much better outcome to young patients than vitrectomy. PVD could happen in patients of all age.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Comparison of Oral Methylprednisolone and Placebo Regarding Incidence and Severity of Epiretinal Membrane After Pars Plana Vitrectomy in Rhegmatogenous Retinal Detachment

First Author: Salmarezka **DEWIPUTRI**

Co-Author(s): Elvioza **ELVIOZA**

Purpose: To compare oral methylprednisolone and placebo regarding the incidence and severity of epiretinal membrane after pars plana vitrectomy in rhegmatogenous retinal detachment.

Methods: This was a prospective, double blind, randomized clinical trial. Forty-six eyes that met inclusion criteria were randomized into 2 groups: 26 patients received oral methylprednisolone 0.8 mg/kg BW/day for 6 days, 0.4 mg/kg BW/day for 4 days, and 0.2 mg/kg BW/days for 4 days. The control group of 26 patients received placebo in a comparable manner.

Results: Four weeks after vitrectomy incidences of epiretinal membrane were 47.6% and 58.8% in the methylprednisolone group and placebo group, respectively. Eight weeks after vitrectomy incidences of epiretinal membrane were 47.6% and 56.2% in the methylprednisolone group and placebo group, respectively. At 4 weeks the severity of epiretinal membrane in the methylprednisolone group was 60%, 0%, and 40% in grade 0, 1, and 2, respectively. Meanwhile, in the placebo group it was 60%, 10%, and 30% in grade 0, 1, and 2, respectively. Eight weeks after vitrectomy the severity of epiretinal membrane in the methylprednisolone group was 40%, 0%, and 60% in grade 0, 1, and 2, respectively. Meanwhile, in the placebo group it was 55.6%, 11.1%, and 33.3% in grade 0, 1, and 2, respectively. There was no significant difference of the final visual outcome in both groups.

Conclusions: There were no significant differences in incidence and severity of epiretinal membrane at 4 and 8 weeks among the 2 groups. Oral methylprednisolone had a tendency for lower incidence of epiretinal membrane compared to placebo.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Effects of Intraocular Pressure Control at the End of Vitrectomy on the Anatomical and Visual Recovery Process in Patients With Vitreous Hemorrhage: A Prospective, Randomized, Comparative, Interventional Study

First Author: Chuandi **ZHOU**Co-Author(s): Qinghua **QIU**

Purpose: To compare structural and functional improvements in patients with nonclearing vitreous hemorrhage (VH) with different intraocular pressures (IOPs) reestablished at the end of pars plana vitrectomy (PPV).

Methods: A prospective, randomized, comparative, interventional study. Ninety-five patients with VH underwent PPV with normalized IOPs of 15 mm Hg (group I: 32 eyes), 25 mm Hg (group II: 32 eyes), and 35 mm Hg (group III: 31 eyes) at the conclusion of surgery. The grade of vitreous opacity and best-corrected visual acuity (BCVA) on postoperative day 1, week 1, month 1, and month 3 were compared with a mixed model for repeated measures analysis.

Results: All 3 groups achieved significant improvement postoperatively in BCVA and vitreous opacity (all $P < 0.01$). The group difference was significant at the end of week 1 and showed a trend of higher IOP set at the end of PPV with better anatomical and visual recovery. However, at postoperative month 1 and month 3, equivalent anatomical (month 1: $P = 0.56$; month 3: $P = 0.36$) and visual outcomes (month 1: $P = 0.16$; month 3: $P = 0.88$) were obtained in the 3 groups. The average effect of the group difference on BCVA [II vs III: effect size (ES): 0.41, I vs III ES: 0.66, all $P < 0.01$] and vitreous opacity (II vs III: ES: 0.70, I vs III: ES: 1.09, all $P < 0.01$) over the course of the study period was statistically significant.

Conclusions: A relatively higher IOP set at the end of vitrectomy could result in more stable and rapid recovery with fewer complications after PPV in patients with noncomplex VH.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Long-Term Outcome of Conventional and Half-Fluence Photodynamic Therapy for Chronic Central Serous Chorioretinopathy

First Author: Sanghyu **NAM**Co-Author(s): Kunho **BAE**, Eung Suk **KIM**, Bo Kwon **SON**, Seungyoung **YU**

Purpose: To evaluate the long-term efficacy and safety of conventional photodynamic therapy (PDT) and half-fluence PDT in chronic central serous chorioretinopathy.

Methods: Retrospective review of chronic CSC patients treated with conventional PDT or half-fluence PDT and a minimum follow-up of 12 months between October 2007 and June 2015. Best-corrected visual acuity (BCVA), central retinal thickness (CRT), neural retinal thickness (NRT), choroidal thickness (CT), recurrence of CSC after PDT, and resolution of subretinal fluid (SRF) at 12, 24, and 36 months were assessed.

Results: The study included 52 eyes that completed the 36-month follow-up. Twenty-eight eyes received conventional PDT and 24 eyes received half-fluence PDT. The mean follow-up period was 45 months. The mean logarithm of the minimum angle of resolution (logMAR) BCVA improved significantly ($P < 0.001$), both in the conventional group (from 0.36 ± 0.32 to 0.15 ± 0.27) and in the half-fluence group (from 0.31 ± 0.29 to 0.15 ± 0.28) at 36 months, without significant difference between the 2 groups ($P = 0.711$). The mean CRT decreased significantly ($P < 0.001$), both in the conventional group (from 395.2 ± 185 to 205.2 ± 45.8) and in the half-fluence group (from 341.8 ± 97.9 to 205.6 ± 50.1) at 36 months, without significant difference between the 2 groups ($P = 0.362$). Both groups showed significant reduction in CT at month 36 after PDT with significant difference ($P < 0.001$). At 36 months, all patients in both groups had complete absorption of subretinal fluid (SRF). There was no recurrence of SRF during the follow-up.

Conclusions: Both treatments were effective and safe in chronic central serous chorioretinopathy treatment with a significant improvement in the long term, both anatomic and visual, without recurrence of SRF.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Optic Disc Pit Maculopathy Successfully Treated With Autologous Platelet-Rich Plasma: Report of a Surgical Technique

First Author: Muhammad Faisal **MURTAZA**

Purpose: To assess the anatomical and functional outcomes of optic disc pit maculopathy managed by pars plana vitrectomy (PPV) using autologous platelet-rich plasma and C3F8 gas tamponade.

Methods: A young woman presented with decreased vision due to optic disc pit maculopathy in her right eye. She underwent 3-port PPV, posterior vitreous was detached (PVD), air-fluid exchange was done, and autologous platelet-rich plasma was injected over the optic disc pit, followed by C3F8 gas tamponade. The patient was instructed to maintain face-up position for 2 hours followed by face-down posture for 10 days. The patient was followed on the first postoperative day, 1 week, 1 month, 3 months, and 6 months. Visual acuity (VA) and central foveal thickness (CFT) were recorded.

Results: After follow-up of 6 months, VA improved from counting fingers (CF) at 1 foot to 6/18 and there was a remarkable reduction in CFT on optical coherence tomography (OCT).

Conclusions: For patients with optic disc pit maculopathy, combination of PPV, PVD induction, air-fluid exchange followed by autologous platelet-rich plasma injection on the optic disc pit and C3F8 gas use as long-term tamponade is an effective technique with stable anatomical and functional results.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Predictive Factors and Long-Term Outcome of Rhegmatogenous Retinal Detachment Associated With Choroidal Detachment

First Author: Hoi Yau **TANG**

Co-Author(s): Derek **CHUNG**, Kenneth **LI**, Patrick **LI**, Tiffany **YEUNG**

Purpose: To evaluate baseline characteristics and final visual outcomes of patients diagnosed with rhegmatogenous retinal detachment (RRD) with choroidal detachment (CD) in order to identify the risk factors that may be associated with this condition and also to determine whether the outcome is significantly different from those without choroidal detachment.

Methods: A retrospective cohort study was conducted to evaluate the baseline characteristics that may contribute to choroidal detachment and outcomes between the 2 cohorts. Data were collected from a single tertiary center from July 2008 to June 2015.

Results: A total of 375 cases of RRD were identified within the period. Eighteen cases of choroidal detachment (4.8%) were identified. Logistic regression analysis found that the presenting intraocular pressure ($P = 0.026$), area of retinal detachment ($P = 0.08$), presence of giant tear ($P = 0.013$), presence of anterior chamber cells ($P = 0.01$), and preoperative proliferative vitreoretinopathy ($P = 0.012$) were associated with a significantly higher chance of choroidal detachment. Patients with preoperative choroidal detachment also had significantly poor final visual acuity.

Conclusions: Consistent findings of low intraocular pressure, proliferative vitreoretinopathy, and anterior chamber inflammation in previous literature were found in our series. Large area of retinal detachment, which was reported in some studies, and giant retinal tear, which is a new finding, were identified in our series. Despite a similar 1-year reattachment rate to the control group, final visual acuity was significantly worse in patients with RRD CD.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Reliability of the New Innovative Eye Shield for Head Tracking Devices

First Author: Wannasiri **LIMSUKNIRUN**

Co-Author(s): Pear **PONGSACHAREONNONT**, Chusak **THANAWATTANO**, Adisai **VARADISAI**

Purpose: To study the reliability of head tracking devices for position monitoring with self-notification for integration in patients with gas-filled eyes.

Methods: Devices included an innovative eye shield connected to a smartphone application interface via Bluetooth for head position tracking. The position determined the degree of deviation from baseline default positions. In this study, the reference points were set at 0, 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, and 180 degrees from the reference plane according to standard medical inclinometer. Deviation degrees of 2 devices and reference point were done by agreement analysis. There were 2 devices in this study. Each degree of deviation was tested 100 times for each device. Intraclass correlation coefficient (ICC) was used for statistical analysis to test the overall reliability; 0.8 or greater was an acceptable scale mean.

Results: The total number of tests for each device in

all degrees was 1300. The ICC for overall intrameasure reliability demonstrated that device 1 and 2 compared with the standard device were 1.00. There were no deviations of devices more than 1 degree in each testing plane with perfect agreement. There were no reports of abnormal electrical circuit during the test (7 days).

Conclusions: A new innovative eye shield might help patients with positioning and head positioning tracking devices provided high reliability for the degree of deviation from a set point.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Retinal Endovascular Surgery With tPA Injection for Central Retinal Artery Occlusion

First Author: Atsushi **HAYASHI**

Co-Author(s): Akio **MIYAKOSHI**, Yasuhito **NITTA**, Yuta **TAKATA**

Purpose: To examine effects of retinal endovascular surgery (REVS) with tissue plasminogen activator (tPA) for central retinal artery occlusion (CRAO).

Methods: Two patients with acute CRAO who were successfully treated within 8 hours after the occurrence of CRAO were included. The patients underwent REVS with tPA injection into the retinal artery at the optic disc after vitrectomy and cataract surgery. The tPA solution was adjusted as 80,000 units/mL (Monteplase, Eisai, Japan) with saline and 0.3 mL to 0.6 mL was injected into the retinal artery with a specially made stainless microneedle (Nihon Surge, Ltd, Tochigi Seiko, Co Ltd, Japan). The patients were followed up with examination of visual acuity, optical coherence tomography (OCT), OCT angiography, and laser speckle flowgraphy (LSFG).

Results: Both patients successfully recovered decimal visual acuity from counting fingers before REVS to 0.6 to 1.2 within 1 month after REVS and the visual acuity was stable. OCT showed high reflectivity in the inner retina slightly reduced after REVS. OCT angiography showed recovery of capillary perfusion after REVS. LSFG showed recovery of blood flow at the optic disc after REVS by 1 month after REVS, but it did not recover to those of fellow eyes. At 6 months after REVS, thickness of the inner retina was reduced compared to the normal control.

Conclusions: REVS with tPA injection for acute phase of CRAO may be effective to recover visual acuity and ocular blood flow.

Feb 09, 2018 (Fri)

16:30 - 18:00

Venue: S425

Role of Control of HbA1c in Attaining Maximum Results of Panretinal Photocoagulation in Patients With Proliferative Diabetic Retinopathy

First Author: Sara **RIAZ**

Purpose: To observe the efficacy of panretinal photocoagulation (PRP; laser) in patients with controlled HbA1c in terms of visual acuity and central macular thickness measured on optical coherence tomography (OCT).

Methods: A total of 150 patients with proliferative diabetic retinopathy were selected from the outpatient department of our hospital from January 2015 to 2017. This was an experimental study. Visual acuity was noted on first visit, 1 month, 2 months, and 6 months. OCT was done at their first visit and then after 6 months. HbA1c was done at presentation, then 3 months and 6 months after the initial visit. All patients were sent for systemic management to the internist. Panretinal photocoagulation was done for proliferative diabetic retinopathy at regular intervals with the help of double frequency Nd:YAG laser.

Results: Patients with proliferative diabetic retinopathy had maximum improvement after control of HbA1c following sessions of panretinal photocoagulation in terms of visual acuity along with decrease in central macular thickness.

Conclusions: Control of HbA1c in diabetic patients has an important role in attaining maximum results of PRP in patients with proliferative diabetic retinopathy.

Translational Research in Ophthalmology

Feb 11, 2018 (Sun)

09:00 - 10:30

Venue: S426-S427

A Generally Applicable Twin System for Effective hiPSC-Derivation of 3-Dimensional Retinal Tissue via Wnt Signaling Regulation

First Author: Jian **GE**

Purpose: Effective derivation of 3-dimensional (3D) retinal tissue from human induced pluripotent stem cells (hiPSCs) could provide models for drug screening and facilitate patient-specific retinal cell replacement therapy. However, limitations including large-scale generation and generally applicable differentiation process have been problematic for researchers.

Methods: Here, we developed a twin system consisting of 2 approaches. This system could meet various requirements with different ways of embryoid body formation. Otherwise, we found that Wnt signaling pathway antagonist Dickkopf-related protein 1 (DKK-1) enables a rescuing effect on the inabilities of deriving 3D retinal tissue in some specific hiPSC lines.

Results: By evaluating DKK-1 expression tendency and supplying it if necessary, retinal organoids could be differentiated from 6 hiPSC lines, which were reprogrammed from 3 common initiating cell types. Retinal tissues derived from this twin system were well-organized and capable of surviving for further maturation.

Conclusions: Using this twin system, we were able to generate retinal tissues in a high efficiency. This novel system has many potential applications in regenerative therapy for several eye diseases.

Visual Sciences

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Age-Related Decline of NAD⁺ Levels in Rat Retinal Ganglion Cells

First Author: Tianmin **REN**

Co-Author(s): Christopher **LEUNG**, Heather **MAK**, Jasmine **YUNG**

Purpose: Recent findings have shown that an age-related decline of nicotinamide adenine dinucleotide (NAD⁺), a key molecule in energy and redox metabolism, is associated with various neurodegenerative diseases. This study aims to quantify the age-related changes of NAD⁺ levels in the subcellular cytoplasmic, mitochondrial, and nuclear compartments of rat retinal ganglion cells (RGCs).

Methods: Primary RGCs were isolated from Sprague Dawley (SD) rats at different developmental ages (E21, embryonic day 21; P6, postnatal day 6; P30, postnatal day 30) and were transduced with a genetically encoded fluorescent biosensor that detects free NAD⁺ levels in the cytoplasm, nucleus, and mitochondria, in which lower and higher fluorescent intensities represented higher and lower subcellular levels of NAD⁺, respectively. Subcellular levels of NAD⁺ were detected using a confocal microscope on day 4, 7, 11, 14, and 21. Fluorescent intensities were measured by image analysis. A multivariable linear mixed model was used for comparison of fluorescent intensities between different ages, with fixed coefficients on day.

Results: Detected fluorescent signals from RGCs of

older ages were significantly higher than embryonic RGCs in all subcellular compartments. Fluorescent signals significantly increased from E21 to P6 and P30 RGCs by 1.006 ± 0.001 -fold ($P = 0.019$), 1.002 ± 0.001 -fold ($P = 0.032$), and 1.007 ± 0.001 -fold ($P < 0.001$) in the cytoplasm, mitochondria, and nucleus, respectively.

Conclusions: Along with the aging process, retinal NAD⁺ level declines and contributes to the increasing vulnerability of RGCs to disease-related insults. Restoring cellular NAD⁺ levels by supplementing NAD⁺ intermediates may thereby be a promising way to slow down the axon degeneration in RGC, counteracting retinal neurodegenerative diseases.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Amino Acid Transporter Slc38a5 Regulates Retinal Vasculature Development and Endothelial Cell Function

First Author: Jing **CHEN**

Co-Author(s): Chi-Hsiu **LIU**, Ye **SUN**, Zhongxiao **WANG**

Purpose: Familial exudative vitreoretinopathy (FEVR) and Norrie disease are related eye diseases with impaired retinal vasculature due to mutations in the Wnt signaling, including ligand Norrin, receptor Frizzled-4, and coreceptor low-density lipoprotein receptor-related protein 5 (LRP5). Amino acid transporter Slc38a5 (solute carrier family 38 member 5) was downregulated in FEVR and Norrie disease retinas (Lrp5^{-/-} and Norrin γ ^{-/-} mice). This project investigated the role of Slc38a5 in retinal vascular development and endothelial cell function.

Methods: Slc38a5 levels were analyzed in Lrp5^{-/-} and Norrin γ ^{-/-} retinas. Effects of Slc38a5 inhibition with small interfering RNA (siRNA) were analyzed in vivo for retinal vessel development and in vitro in human retinal microvascular endothelial cells for cell proliferation, tubular formation, and gene expression.

Results: Slc38a5 mRNA and protein levels were substantially reduced in both Lrp5^{-/-} and Norrin γ ^{-/-} whole retinas compared with their respective wild type controls. Slc38a5 expression was highly enriched in laser-capture microdissected retinal blood vessels compared with whole retinas and largely downregulated in both Lrp5^{-/-} and Norrin γ ^{-/-} retinal vessels relative to their wild type vessels. In endothelial cell culture, SLC38A5 siRNA markedly suppressed SLC38A5 expression by ~85% and significantly inhibited cell proliferation and tubular formation, as well as expression of receptors for vascular endothelial growth factor, fibroblast growth factor, and insulin-like

growth factor 1. Moreover, suppression of Slc38a5 by siRNA in vivo significantly delayed the development of both superficial and deep layers of mouse retinal vasculature.

Conclusions: Slc38a5 may regulate retinal vascular development and endothelial cell function through modulating amino acid availability.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Antagonism of Angiotensin II Receptor Delays the Progression of Diabetic Retinopathy in a Type I Diabetic Mouse Model

First Author: Peng **QIN**

Co-Author(s): Ian **WONG**

Purpose: Intraocular angiotensin II (Ang II) has long been viewed as a proinflammatory factor that may contribute to the pathogenesis of diabetic retinopathy. We aimed to determine if antagonism of intraocular Ang II by candesartan could ameliorate elevated pathogenic vascular endothelial growth factor (VEGF) and its associated neurovascular pathology in experimental diabetic retinopathy.

Methods: Candesartan (0.1 ug/g/day or 1.0 ug/g/day in drinking water) was given to Ins2Akita/+ mice, a spontaneous type I diabetes mouse model. Vehicle-treated Ins2Akita/+ mice and their wildtype littermates, Ins2+/+ mice, were used as controls. Retinal function and neurovascular pathology were assessed after 8, 12, 22, and 32 weeks of hyperglycemia with or without candesartan treatment. As the cellular origin of pathogenic VEGF was thought to be Muller cells, effects of both Ang II and candesartan on Muller cell-derived VEGF were investigated.

Results: Vehicle-treated Ins2Akita/+ mice (n = 8) showed the following retinal abnormalities (P < 0.05) when compared with age-matched wildtype littermates (n = 8): decreased b-wave amplitude in scotopic electroretinogram (ERG), increased intravascular leukostasis, overexpression of Muller cell-derived VEGF, vascular leakage, microglial activation, and atrophy of astrocytes. Treatment with candesartan of either dose (n = 8) exhibited attenuation (P < 0.05) of increased number of reactive microglia and leukostasis, overexpression of Muller cell-derived VEGF, and vascular leakage as well as amelioration (P < 0.05) of retinal dysfunction and astrocyte atrophy in Ins2Akita/+ mice.

Conclusions: Early and long-term treatment with

candesartan conferred a beneficial effect on the maintenance of retinal function as well as vascular integrity and astrocyte survival within neurovascular units in experimental diabetes, possibly by downregulating Muller cell-derived pathogenic VEGF.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Charged Lipid Nanoparticles for Targeted Retinal Delivery of Nucleic Acid Therapeutics

First Author: Xiaonan **HUANG**

Co-Author(s): Ying **CHAU**

Purpose: Efficient targeted retinal delivery is essential for the treatment of posterior ocular diseases. Regarding the complexity of the anatomical structure of the retina, drug and gene delivery via nanocarriers to target specific retinal cell layers remains challenging. The surface charge of intravitreally injected nanocarriers is a crucial parameter for tuning their distribution and targeting sites in the retina. Herein, we investigated this parameter systematically with lipid nanoparticles for targeted retinal delivery of nucleic acid therapeutics.

Methods: Charged nanoparticles were prepared through changing the molar ratio of cationic/anionic lipids with ethanol-injection-dilution method. HEK293 and GFP (green fluorescent protein)-positive HEK293 cell line were treated with GFP plasmid/siGFP-loaded lipid nanoparticles, respectively. The in vitro GFP gene expression and inhibition were analyzed by fluorescent microscope and flow cytometry, respectively. For in vivo experiments, after intravitreal injection, retinal biodistribution of fluorescent-labeled nanoparticles was observed by confocal microscope.

Results: Lipid nanoparticles with various charges were characterized with the size around 100 nm. It was observed that cationic lipid nanoparticles had significantly higher in vitro GFP gene transfection and suppression efficiency than neutral and anionic nanoparticles after 72 hours. For animal study, only weakly charged cationic lipid nanoparticles could efficiently cross the barrier of vitreous with targeting of retinal ganglion cells.

Conclusions: Lipid nanoparticles with weak cationic charge may be most promising for delivering nucleic acid therapeutics to target the retinal ganglion cell layer compared with the ones with neutral or negative charge. Therefore, nanocarriers with weak cationic charge may be applied for treating ocular diseases.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Ephrin-A5 Involved in Retinal Neovascularization in Oxygen-Induced Retinopathy

First Author: Wei **DU**

Co-Author(s): Xiaoxin **LI**

Purpose: Retinal neovascularization (RNV) is a major cause of blindness. While recent studies suggest that ephrin-A5 participates in neovascularization, this study aimed to determine its role in RNV.

Methods: The expression and effect of ephrin-A5 were investigated in a mouse model of oxygen-induced retinopathy (OIR), retinal pigment epithelium (RPE), and RF/6A retinal endothelial cell line. Firstly, the expression of ephrin-A5 was determined by real-time polymerase chain reaction (PCR). Then, lentiviral shRNA was used to silence the expression of ephrin-A5 in vitro and in vivo. Retinal flat mounts and tube formation assays were performed to evaluate the function of ephrin-A5 in the neovascularization process in vivo and in vitro.

Results: Ephrin-A5 was upregulated in RF/6A and RPE cells by hypoxia-mimetic CoCl₂ treatment. We also found that ephrin-A5 was significantly overexpressed in the retina of P12, P13, P15, and P17 OIR mice compared with the control mice. These results demonstrate that the expression of ephrin-A5 closely correlated with the RNV process in the OIR mice, as the OIR mice experienced RNV between P12 and P17 and spontaneous RNV regression between P17 and P25. Moreover, intravitreal injection of Efna5-shRNA at P12 effectively silenced the expression of ephrin-A5 and markedly decreased the number of neovascular tufts, whereas intravitreal injections of lentivirus encoding nonsilencing shRNA were ineffective.

Conclusions: This study suggests that ephrin-A5 could be upregulated by hypoxia stimulation and plays an important role in hypoxia-driven neovascularization. Furthermore, silencing of ephrin-A5 could suppress pathologic RNV, which suggests that ephrin-A5 is a potential target against hypoxia-driven neovascularization.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Expanding Genetic Landscape and Phenotypic Spectrum of 540 Chinese Patients With Nonsyndromic High Myopia

First Author: Xue-Bi **CAI**

Co-Author(s): Zi-Bing **JIN**

Purpose: High myopia (HM) is generally considered as a complex trait determined by both environmental and genetic factors. Based on previous studies of high myopic pedigrees and sporadic cases, 6 genes have been discovered as replicable disease-causing genes of nonsyndromic HM, including ZNF644, SCO2, CCDC111, LRPAP1, SLC39A5, and LEPREL1. The purpose of our study is to achieve a clear picture of mutational spectrum in a large cohort of Chinese patients with nonsyndromic HM and reveal the genotype-phenotype correlation.

Methods: Clinical data and genomic DNA were collected from 540 Chinese patients with nonsyndromic HM. Mutational screening was performed on all coding sequences and intron/exon junctions. Finally, we assessed the clinical relevance of identified mutations, under the guidance of ACMG.

Results: The phenotypic severity of each patient was classified into 5 stages, based on the refractive errors, axial length, and fundus manifestations. Thirty-eight index cases were confirmed to harbor mutations in the known pathogenic genes; among them there were 15 novel mutations. Thereinto, SLC39A5 accounted for the largest proportion with a mean mutation rate of 2.3% (13/540, 2.3%), followed by ZNF644 (12/540, 2.2%), CCDC111 (7/540, 1.3%), SCO2 (5/540, 0.9%), and LRPAP1 (1/540, 0.2%). No homozygous or compound heterozygous variants were found in LEPREL1.

Conclusions: We uncovered an expanding genetic landscape and phenotypic spectrum through the study of 540 Chinese patients with nonsyndromic HM. A biological link was firstly established between the genetic deficiency and phenotypic traits. To the best of our knowledge, this is hereunto the largest cohort with HM that has ever been studied.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Generation of Optic Vesicle-Like Structures in Adherent Culture With Urine-Derived hiPSCs

First Author: Xiufeng **ZHONG**Co-Author(s): Liwen **HE**, Guilan **LI**, Bingbing **XIE**

Purpose: Studies have shown that human induced pluripotent stem cells (hiPSCs) could be generated from urine, a form of body waste. However, it is unknown whether and to what extent hiPSCs derived from urine cells can be induced to retinal fate. This study aims to explore the capability of urine-derived hiPSCs to generate retinal tissues.

Methods: Urine-derived hiPSCs were maintained in feeder-free condition with TeSR1 medium and MatrGel substrate and directed to differentiate into retinal cells with a modified protocol from a published one by Zhong (*Nature Communications*, 2014). Morphological changes were closely observed under inverted microscope. Immunofluorescence was done with markers specific for the retinal cells, such as VSX2, HuC/D, Brn3, recoverin, and opsins.

Results: The urine-derived hiPSCs were able to self-form optic vesicle-like structures with NR and retinal pigment epithelium (RPE) in adherent conditions. After detachment of the OV subject to suspension culture later on, the NRs grow and differentiate into retinal cell lineages, from retinal progenitor cells expressing VSX2 and MCM2 to major retinal subtypes including retinal ganglion cells positive for Brn3 and islet 1, photoreceptor cells positive for recoverin and otx2, and RPE.

Conclusions: Our results demonstrate that urine-derived hiPSCs have the similar potential of retinal differentiation as hiPSCs derived from other somatic cells. This success with urine hiPSCs provides many opportunities for personalized medicine as urine cells can be conveniently collected without any invasive procedure.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

IL-17A Promotes RANTES Expression, but not IL-16, in Orbital Fibroblasts via CD40-CD40L Combination in Thyroid-Associated Ophthalmopathy

First Author: Huifang **ZHOU**Co-Author(s): Xianqun **FAN**, Sijie **FANG**, Yinwei **LI**, Jing **SUN**, Sisi **ZHONG**

Purpose: This present study aims to investigate the phenotype of interleukin (IL)-17A-producing T cells in thyroid-associated ophthalmopathy (TAO) and the role of IL-17A on RANTES and IL-16 expression in orbital fibroblasts (OF) from TAO patients.

Methods: Blood samples were obtained from TAO patients and healthy controls and were subjected to enzyme-linked immunosorbent assay (ELISA) and flow cytometry analysis. Primary human OFs cultured from surgical waste were stimulated with IL-17A in the presence or absence of CD40L and were examined by quantitative real-time polymerase chain reaction (qRT-PCR), ELISA, Western blotting, and apoptosis assays.

Results: We reported upregulated IL-17A, IFN- γ , RANTES, and IL-16 serum levels and increased frequency of IL-17A- and IFN- γ -producing T cells in peripheral blood mononuclear cells from patients with TAO compared with healthy controls. In addition, TAO orbital tissues were rich in T lymphocytes, expressing more IL-17A, IFN- γ , RANTES, and IL-16. Moreover, IL-17A could enhance the expression of RANTES, but not IL-16, in cultured primary OFs in cooperation with CD40L. We further validated that MAPK signaling was largely responsible for RANTES production in IL-17A-treated OFs. Finally, we demonstrated that IL-17A could not promote apparent apoptosis in OFs from TAO patients and healthy controls.

Conclusions: Our results indicate the potent effect of IL-17A-induced RANTES expression on OFs and elaborate a possible mechanism in understanding Th17 cells in the pathology of TAO and its potential as a target in immunotherapy of TAO and other autoimmune disorders.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Notch Signaling Activation Enhances Human Adipose Tissue-Derived Stem Cell Retinal Differentiation

First Author: Yuqiang **HUANG**

Co-Author(s): Chong Bo **CHEN**, Tsz Kin **NG**, Chi Pui **PANG**, Mingzhi **ZHANG**

Purpose: We have shown human periodontal ligament-derived stem cells can be directed into retinal lineage. This study aimed to characterize the retinal differentiation of human adipose tissue-derived stem cells (hADSCs) and the role of Notch signaling modulation.

Methods: hADSCs at passage 3 to 5 were first cultured with Noggin/Dkk-1/IGF-1 induction media in stepwise nonadherent and Matrigel-coated plates and then subjected to Notch signaling activation (20 μ M Jag1) or inhibitory (10 μ M DAPT) treatment. Retinal progenitor cell (PAX6), retinal ganglion cell (ATOH7), and photoreceptor marker (CRX, NRL, RHO, RCVRN) gene expressions were determined by Sybr polymerase chain reaction (PCR) at various time points and compared to the regular treatment and noninduced groups. In addition, the function of the retinal-induced hADSCs was evaluated by glutamate-induced calcium response.

Results: hADSCs expressed mesenchymal stem cell markers (CD44, CD90, and CD105) but not hematopoietic stem cell markers (CD14, CD34, and CD45). hADSCs, upon the Noggin/Dkk-1/IGF-1 induction treatment, showed elevated expression of PAX6, ATOH7, CRX, NRL, RHO, and RCVRN genes, compared to the noninduced group. Retinal marker expressions were further increased in the Jag1 treatment group, compared to the regular treatment group. In addition, Jag1 also enhanced the glutamate-induced calcium response of retinal-induced hADSCs.

Conclusions: hADSCs possess retinal differentiation potential when subjected to the Noggin/Dkk-1/IGF-1 induction treatment, which can further be enhanced by Notch signaling activation.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Postnatal Periodontal Ligament as a Novel Adult Stem Cell Source for Regenerative Corneal Cell Therapy

First Author: Gary **YAM**

Co-Author(s): Bee Tin **GOH**, Jodhbir **MEHTA**, Ercia **TEO**

Purpose: Corneal opacities are a leading cause of global blindness. They are conventionally treated by the transplantation of donor corneal tissue, which is restricted by a worldwide donor material shortage and allograft rejection. Postnatal periodontal ligament (PDL) contains a population of adult stem cells, which has a similar embryological origin as CSK, ie, cranial neural crest. This study investigated if postnatal PDL could be differentiated into corneal stromal keratocytes (CSKs).

Methods: We harvested PDL cells from young adult teeth extracted due to nonfunctional or orthodontic reasons and differentiated them towards CSK phenotype using a 2-step protocol with spheroid formation followed by growth factor and cytokine induction in a stromal environment (human amnion stroma and porcine corneal stroma).

Results: PDL-differentiated CSK-like cells expressed CSK markers (CD34, ALDH3A1, keratocan, lumican, CHST6, B3GNT7, and Col8A2) and had minimal expression of genes related to fibrosis and other lineages (vasculogenesis, adipogenesis, myogenesis, epitheliogenesis, neurogenesis, and hematogenesis). Introduction of PDL spheroids into the stroma of porcine corneas resulted in extensive migration of cells inside the host stroma after 14-day organ culture. Their quiescent nature and uniform cell distribution resembled that of mature CSKs inside the native stroma.

Conclusions: Our results demonstrated the differentiation potential of periodontal ligament stem cells into corneal stromal keratocytes. This could offer a suitable choice of cells for regenerative cell therapy.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Predictive Analysis of Accommodation and Biomechanics of Ciliary Muscle Forces Utilizing 3D Finite Element Model

First Author: Annmarie **HIPSLEY**Co-Author(s): Silvia **BLEMKER**, Daniel **GOLDBERG**, Katie **KNAUS**

Purpose: To develop a multicomponent 3-dimensional (3D) finite element model (FEM) of the accommodative mechanism that includes the extralenticular and lenticular anatomy capable of performing whole eye accommodation simulations suitable for testing therapeutic and surgical applications.

Methods: We developed representative 3D models of the ocular structures. Geometric meshing and FEM analysis were performed using advanced multiphysics simulation (AMPS) technology on representative 3D models of ocular structures. These simulated zonular pretensioning of the lens to the unaccommodated state and ciliary muscle contraction to the accommodated state were modeled and analyzed. Ciliary muscle fiber groups were activated in isolation to quantify each's contribution to accommodative action. Model predictions for surgical intervention and therapies were analyzed including scleral treatments and accommodating intraocular lenses.

Results: FEM predicted lens deformations and displacements related to accommodative amplitude changes that were consistent with experimental observations from the literature. FEM demonstrated contractile forces of the ciliary muscle and the resultant changes to the ocular structures during accommodation. FEM revealed specific contributions of ciliary fiber groups to lens changes, with circular fibers contributing most to circumferential deformation, and radial fibers contributing most to anterior displacement. Sensitivity analysis of the differences in accommodation between the "young/healthy" and "old/presbyopic" eye identified the age-related changes that contribute most to symptoms of presbyopia. Virtual surgical and therapeutic applications were also simulated revealing biomechanical implications.

Conclusions: This computational 3D FEM provides novel insight into the interactions and biomechanics of the components of the accommodative mechanism and was effectively validated with existing data.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Regulation of Orbital Fibrosis and Adipogenesis by Pathogenic Th17 Cells in Graves Orbitopathy

First Author: Sijie **FANG**Co-Author(s): Xianqun **FAN**, Yazhuo **HUANG**, Jing **SUN**, Sisi **ZHONG**, Huifang **ZHOU**

Purpose: To study the phenotype of Th17 cells in patients with Graves orbitopathy (GO) and healthy subjects, investigate the fibrosis and adipogenesis in orbital fibroblasts (OFs) modulated by IL-17A, and determine the interaction between Th17 cells and OFs.

Methods: Blood samples and orbital tissues from GO patients and healthy controls were collected. We conducted multicolor flow cytometry, immunohistochemical and immunofluorescent stainings, Western blotting, Pathscan intracellular signaling assay, Luminex and enzyme-linked immunosorbent assays, and protein mass spectrum.

Results: IFN- γ and IL-22-expressing Th17 cells are increased in GO patients, which are positively related to clinical activity score. Costimulatory molecules are highly expressed in GO orbits and the majority of GO OFs are CD90+. IL-17A promotes TGF- β -induced fibrosis in CD90+ OFs but impedes 15d-PGJ2-induced adipogenesis in CD90- OFs. Th17 cells promote proinflammatory cytokine secretion in both CD90+ and CD90- OFs. Meanwhile, both CD90+ and CD90- OFs contribute to Th17 cell differentiation through prostaglandin E2 production, which can be attenuated by indomethacin. Furthermore, Th17 cells upregulate costimulatory molecule expression on OFs.

Conclusions: Our findings unravel the pathogenicity of IL-17A in the initiation and progression of GO. In-depth interpretation of the molecular basis of OFs delineated by CD90 and Th17-OF interaction will help to provide a novel approach to better therapeutic strategies for GO.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Targeted Deletion of miR-183 Leads to Retinal Dysfunction in Mice

First Author: Chang-Jun **ZHANG**Co-Author(s): Xue-Jiao **CHEN**, Xiao-Long **FANG**, Zi-Bing **JIN**, Kun-Chao **WU**, Lue **XIANG**

Purpose: microRNA-183 cluster (miR-183/96/182) is

expressed abundantly in mammalian retina. In our previous studies, we found that miR-183/96 double knockout (DKO) but not miR-182 knockout (KO) in mice leads to significant transcriptional and phenotypic changes, suggesting that one of miR-183 or miR-96 may be a major determinant for retinal morphogenesis. To address this issue, we generated miR-183 KO mice and aimed to determine the effects on retinal maturation and function.

Methods: miR-183 KO mice were generated using CRISPR/Cas9 genome editing system and genotyped by Sanger sequencing. Electroretinogram (ERG), fundus photography (FP), spectral domain optical coherence tomography (SD-OCT), and immunostaining were carried out to investigate the changes of retinal structures and function. RNA-seq was performed to compare the gene expression changes between wild-type and KO mice.

Results: Fluorescein angiography, OCT, and immunostaining data showed no apparent changes in retinal structures in the miR-183 KO mice, including the diameters of vessels and retinal thicknesses. We observed significantly decreased ERG responses in miR-183 KO mice at different postnatal days. RNA-seq analysis showed that defects in retinal function may be associated with dysregulation of gene networks including photoconduction, ciliogenesis, and apoptosis. In vivo and in vitro experiments revealed that Rnf217 was a direct target of miR-183 negatively interacting with Bbs3.

Conclusions: Our findings demonstrate that miR-183 is necessary for retinal functionality but not for retinal morphology in mice. This microRNA regulates the function of the retina via balancing the gene networks involved in photoconduction, ciliogenesis, and apoptosis.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Therapeutic Effect of Novel Single-Stranded RNAi Agent Targeting (Pro)renin Receptor in Ocular Inflammation

First Author: Atsuhiro **KANDA**

Co-Author(s): Susumu **ISHIDA**, Erdal **ISHIZUKA**, Ye **LIU**, Kousuke **NODA**

Purpose: The receptor-associated prorenin system (RAPS) refers to the pathogenic mechanism whereby prorenin binding to (pro)renin receptor [(P)RR] dually activates the tissue renin-angiotensin system (RAS) and RAS-independent intracellular signaling. Here, we developed a new class of single-strand RNA

interference (RNAi) molecule selectively targeting human and mouse (P)RR and confirmed its efficacy in suppressing ocular acute (uveitic) and chronic (diabetic) inflammation in mice.

Methods: C57BL/6 mice with lipopolysaccharide-induced acute inflammation or streptozotocin-induced chronic inflammation were treated with (P)RR-PshRNA. Leukocyte adhesion to the retinal vasculature was evaluated with a concanavalin A lectin perfusion-labeling technique. Retinal mRNA expression of inflammation-associated molecules was examined by quantitative real-time polymerase chain reaction (RT-PCR).

Results: Real-time qPCR showed that the levels of (P)RR/ATP6AP2 mRNA significantly decreased following exposure to human retinal pigment epithelial (RPE) and mouse endothelial cells with (P)RR-PshRNA as well as a conventional double-strand (P)RR-siRNA. Compared to mice treated with control-PshRNA or PBS, mice treated with intravitreal injection of (P)RR-PshRNA showed a significant attenuation of inflammation-induced retinal adherent leukocytes and a notable decrease in retinal mRNA expression levels of (P)RR/Atp6ap2 and various inflammation-associated molecules.

Conclusions: Our findings show a significant implication of RAPS in the pathogenesis of uveitis and diabetic retinopathy and the potential usefulness of (P)RR-PshRNA as a therapeutic agent to reduce acute and chronic ocular inflammation.

Feb 08, 2018 (Thu)

09:00 - 10:30

Venue: S428

Zebrafish si:ch73-103b11.2 (CEP250) Is Required for Normal Retinal Development

First Author: Wan **CHENG**

Co-Author(s): Ru-Yi **HAN**, Xiu-Feng **HUANG**, Zi-Bing **JIN**, Lue **XIANG**, Si-Si **ZHENG**

Purpose: Retinitis pigmentosa (RP) is a clinical and genetic disease that is highly heterogeneous, characterized by severe night blindness and reduced visual acuity. Disease-causing mutations in the gene encoding CEP250 account for a few percent of RP cases. However, the role of CEP250 in tissue development is poorly understood. The present study investigated the function of CEP250 in vertebrate retinal development using morpholino knockdown in zebrafish.

Methods: Antisense morpholino oligonucleotides (MOs) targeted to the zebrafish CEP250 transcripts were diluted to the appropriate doses prior to injection. Microinjection of CEP250 mRNA was used to rescue CEP250-mediated defective morphants. Embryo

development, eye defects, and toxicity were examined at 24, 48, and 72 hours post fertilization (hpf). TUNEL staining and immunostaining were used to evaluate apoptotic cells during embryonic development and to compare the retinal structures, respectively. Zebrafish behavior experiments and visual motor responses (VMR) were performed to screen the vision of MO-injected and control-injected larvae.

Results: Injection of increasing doses of CEP250 MOs exhibited eye and heart developmental defects, even embryo death. After rescue, the portion of normal embryos increased significantly. TUNEL staining revealed that CEP250 knockdown resulted in apoptotic cell accumulation and epiboly dysplasia. Immunostaining showed significant changes in retinal structures. CEP250 morphant embryos responded worse than wild-type with lower VMR peak under the same visual stimuli.

Conclusions: Our data reveal a specific role of CEP250, especially in the development of organs such as the eye and heart during early embryonic development in zebrafish. CEP250 mediated across systems may be involved in retinal diseases.

Academia, Research, Teaching & Education in Ophthalmology

Poster No.: EX1-001

Panel No.: 001

"Student-Doctor" Method of Training Undergraduate Medical Students on Diabetic Retinopathy Screening at Community Clinics

First Author: Prabhu VENKATESAN

Co-Author(s): Soumendra SAHOO

Purpose: To explore the possible benefits of the "Student-Doctor" approach to learning by undergraduate medical students at community clinics regarding diabetic retinopathy screening.

Methods: This was a mixed-methods design to explore the benefits gained by 104 fourth-year medical undergraduates as perceived by them and by the preceptors at community clinic where they received training. The quantitative analysis was through survey questions on a 5-point Likert scale. Both open-ended semistructured interview questions and focus group discussion were used to further explore student perceptions of this way of learning.

Results: The average score for the statements such as improvement in communication skills and improving clinical examination skills were 4.27 and 4.41, respectively. All participants strongly agreed that this approach was helpful for future practice. The majority of students expressed that the techniques helped in understanding the complex mixture of physical, emotional, and social elements in holistic and personalized patient care. A few students felt that such way of learning was fun and interactive as it was not just sitting in a classroom or behind a desk studying a disease and its pathophysiology but getting the chance for real-life experiences. The preceptors felt the method satisfying as they could do workplace assessment on the learners.

Conclusions: Community-based education through hands-on training is effective as it makes the learning authentic by looking into implications in real-life practice. We recommend placing more emphasis on training medical students in diabetic retinopathy screening at community settings.

Poster No.: EX1-002

Panel No.: 002

First Simulation-Based Teaching in Cambodia: Effectiveness and Students' Perspectives

First Author: Namgech KHOEM

Purpose: Our aims were to assess the effectiveness of using simulation to learn neurological clinical skills

and determine students' perspectives towards this approach.

Methods: In total, 500 students between years 3-6 were taught neurological clinical skills using a simulation-based approach. Pre- and post-test objective structured clinical examination (OSCE) evaluation was performed for 33 year 3 students as an objective measure of effectiveness, and surveys were used to assess perception.

Results: A total of 82% (n = 500) of students agreed that they were more confident in performing history taking after simulation classes; 94% of them found it to be enjoyable. In the meantime, the mean score of post-OSCE testing was significantly increased compared to the pre-OSCE testing on the examination of upper limbs and cranial nerves.

Conclusions: This project has demonstrated the positive impact of simulation on students' learning and supports its integration into the evolving curriculum.

Poster No.: EX1-003

Panel No.: 003

Impact of Virtual Reality Simulation on Learning Barriers to Phacoemulsification Perceived by Residents

First Author: Danny NG

Co-Author(s): Simon KO, Ka Hing LOK, Clement THAM, Alvin YOUNG

Purpose: To identify the residents' perceived learning barriers to phacoemulsification procedures and whether simulation training on Eyesi (VRmagic, Holding AG, Mannheim, Germany) changed these perceptions.

Methods: A survey on the perceived difficulties (1 = least and 5 = most difficult) in performing phacoemulsification based on the well-validated International Council of Ophthalmology-Ophthalmology Surgical Competency Assessment Rubric was conducted among residents from 5 public hospitals in Hong Kong. Mann-Whitney U test compared the mean scores between those who had prior training on Eyesi or not. Regression analyses were performed for the potential predictors [higher trainee, can complete phacoemulsification most of the time (90%) without supervisor's intervention, and certification in the Eyesi training course] and their associations with the tasks for which Eyesi simulation trained-residents had significantly lower difficulty scores.

Results: The 3 surgical steps with the highest mean difficulty scores were as follows: i) cracking or chopping of lens (4.1 ± 0.8), ii) completion of capsulorrhexis (3.6 ± 0.9), and iii) rotation and manipulation of lens (3.4 ± 1.2). There were 68.4% of trainees who had prior Eyesi training and their mean difficulty scores for these steps

were significantly lower compared to those without Eyesi training. After adjusting for higher trainees and prior experience in completing phacoemulsification, Eyesi training was significantly associated with lower difficulty scores on these surgical tasks in multivariate analyses.

Conclusions: Residents who had Eyesi simulation training had higher confidence in performing the most difficult tasks perceived during phacoemulsification.

Cataract

Poster No.: EX1-004

Panel No.: 004

Clinical Outcomes and Safety of Scleral Suture-Fixated Intraocular Lens Implantation in Aphakic Adults Without Sufficient Capsular Support

First Author: Ka Wai **KAM**

Co-Author(s): Anthony **CHAN**, Gillian **SIU**, Alvin **YOUNG**

Purpose: To evaluate long-term clinical outcomes and safety of scleral suture-fixated posterior chamber intraocular lens (SFIOL) implantation in a tertiary eye clinic in Hong Kong.

Methods: Retrospective review of medical records of patients who underwent SFIOL implantation at Prince of Wales Hospital between 2012 and 2017. Demographic data, operation details, preoperative and postoperative visual outcomes, intraoperative, and postoperative complications were analyzed.

Results: Ninety-one eyes from 87 patients were identified from our search. One eye was excluded as the patient received postoperative care in private. Of the 86 patients, 49 (57%) were male. The mean age at operation was 64.4 ± 13.8 years. The mean preoperative logarithm of the minimum angle of resolution visual acuity (logMAR VA) was 1.29 ± 0.73 . The mean postoperative logMAR VA at 1 year was 0.50 ± 0.59 . Significant improvement was achieved upon all follow-ups compared to preoperative vision (all $P < 0.00001$). Eleven of 90 eyes (12.2%) had intraoperative complications. Thirty-nine eyes (43.3%) had early postoperative complications within the first postoperative week, with elevated intraocular pressure (21 eyes; 23.3%) being the most common, and transient vitreous hemorrhage (20 eyes; 22.2%). Twenty-four eyes (26.7%) had late postoperative complications. Retinal detachment occurred in 3 eyes (3.3%) and no infectious endophthalmitis (0%) was encountered.

Conclusions: SFIOL implantation improved vision significantly at 1 month postoperatively and was maintained satisfactorily for 1 year. Transient

intraocular pressure rise and vitreous hemorrhage were common postoperatively but the majority were self-limiting. Major blinding complications such as retinal detachment and infectious endophthalmitis were rare.

Poster No.: EX1-005

Panel No.: 005

Clinical Outcomes of Cataract Surgery Using the Zepto Precision Micropulse Capsulotomy Technology: A Western Australian Study

First Author: Johnny **WU**

Co-Author(s): Tze **LAI**

Purpose: To determine anterior capsulotomy morphology, surgical safety profile, and vision outcomes using the Zepto micropulse technology in cataract surgery in Western Australia.

Methods: A case series analysis of the first 20 eyes treated with the Zepto micropulse capsulotomy technology in Western Australia was conducted to examine its initial vision and safety outcomes. All patients consented and were treated according to the Declaration of Helsinki by a single surgeon using the same intraocular lens type in a single day surgery hospital. Anterior capsulotomy morphology was measured using the same Haag-Strait slit lamp graticule for horizontal and vertical diameters and the resultant correlation to a "perfect" Euclidean circle. Intraoperative rate of complications from anterior capsular tear/posterior capsular rupture was examined. Postoperative vision and refraction outcomes were measured at 1 day, 1 week, and 1 month.

Results: The median horizontal and vertical diameters of the Zepto anterior capsulotomy were 5.5 mm and 5.25 mm, respectively, with a high correlation to a circular morphology. There were no intraoperative complications from capsular tears or rupture. Vision outcome ranged from 6/18-6/6 at 1 day to 6/12-6/6 at 1 week and 1 month. Residual refraction showed spherical equivalent of 0.31 diopters (D) at 1 day and 1 week and 0.18 D at 1 month.

Conclusions: Zepto anterior capsulotomy can create "near perfect" circular openings with almost identical horizontal and vertical diameters, with no reportable surgical complication in this study. Vision and refraction outcomes are consistent with standard cataract surgery. Zepto capsulotomy can be a useful and safe tool in cataract surgery. Future prospective study could yield comparative results to manual and femtosecond laser-assisted cataract surgery.

Poster No.: EX1-006
Panel No.: 006

Clinical and Visual Outcomes After Secondary Implantation of an Additional Ciliary Sulcus IOL in Pseudophakic Eyes

First Author: Francois **LE GUYADER**

Co-Author(s): Jean Luc **BERTHOLOM**, *Typhaine* **LOUESDON**, *Aude* **MASSOT**, *Anaëlle* **PINEAU**, *Tanneguy* **RAFFRAY**

Purpose: To review our cases after secondary implantation of a novel add-on intraocular lens (IOL) for sulcus implantation in pseudophakic eyes.

Methods: All cases with the same additional lens (Reverso, Cristalens, France) implanted in the ciliary sulcus of pseudophakic patients were reviewed; indications, visual acuity, refraction, and side effects were screened.

Results: Eight out of 13 patients desired a multifocal lens after their cataract surgery, 1 for high astigmatism. In 4, high residual hyperopia due to preoperative biometry error or presbyopia was motivating the secondary IOL. Except for 1 patient with multifocal IOL in the capsular bag, they all benefited from a +3 diopter (D) diffractive addition. Mean uncorrected and distance-corrected visual acuities were 0.09 ± 0.09 and 0.05 ± 0.05 logarithm of the minimum angle of resolution (logMAR) and all patients achieved distance visual acuity better than 0.3 logMAR. Near visual acuity was better or equal to logMAR 0.18 in all cases. The postoperative spherical equivalent was 0.04 ± 0.09 D. No complication was noticed.

Conclusions: Visual outcomes and refractive accuracy were satisfactory. No surgical complications or adverse events were observed in our series. These encouraging outcomes may motivate surgeons to propose a reversible solution to presbyopia of monofocal pseudophakia.

Poster No.: EX1-007
Panel No.: 007

Comparison of 2 Modified Sutureless Techniques of Scleral Fixation of Intraocular Lens

First Author: Aditya **KELKAR**

Co-Author(s): Sampada **CHITALE**, *Jai* **KELKAR**, *Akshay* **KOTHARI**, *Hetal* **MEHTA**

Purpose: To compare the visual outcome and complications of 2 different sutureless scleral-fixed intraocular lens (IOL) implantation techniques, namely, modified intrascleral IOL fixation technique and modified Yamane technique of scleral fixation of IOL.

Methods: Patients who underwent scleral fixation

of IOL (SFIOL) between January 2015 and December 2016 with more than 6 months of follow-up were examined retrospectively. Improvement in visual acuity, intraocular pressure (IOP) measurements, endothelial cell count, central macular thickness, and intraoperative/postoperative complications were compared at 6 months of follow-up.

Results: Seventy eyes were analyzed. The mean follow-up was 10.5 ± 1.5 months. The mean age in group A was (55.80 ± 20.85) and in group B was (57.06 ± 16.90). The final visual outcomes in both groups, namely, the modified intrascleral IOL fixation technique (group A) and modified Yamane technique (group B), were comparable. The indications for surgery were aphakia ($n = 15$), subluxated/dislocated cataract ($n = 31$), and dislocated/subluxated IOL ($n = 24$). The majority of the eyes (92%) improved to visual acuity of 0.3 or better on the logarithm of the minimum angle of resolution (logMAR) scale. The uncorrected distance visual acuity, endothelial cell density, and central macular thickness at 6 months of follow-up were comparable in both groups. No IOL tilt/decentration was noted. Postoperatively, transient IOP rise occurred in 18 eyes, retinal detachment in 2 eyes, vitreous hemorrhage in 1 eye, and cystoid macular edema in 2 eyes.

Conclusions: Both the techniques have favorable visual outcome; however, modified 27-g needle-assisted Yamane technique is technically superior since it does not require scleral dissection/conjunctival incision and is associated with reduced risk of intraoperative haptic damage.

Poster No.: EX1-008
Panel No.: 008

Depth of Focus in the Intermediate-Near Range Induced by Synergistic Dissymmetrical Addition IOLs for Cataract Surgery

First Author: Tanneguy **RAFFRAY**

Co-Author(s): Jean Luc **BERTHOLOM**, *Typhaine* **LOUESDON**, *Francois* **LE GUYADER**, *Aude* **MASSOT**, *Anaëlle* **PINEAU**

Purpose: Comparison of the distance, intermediate, and near vision between the binocular implantation of a bifocal +3 diopter (D) intraocular lens (IOL) and the combination of +3 D/+2.5 D.

Methods: This study includes 24 patients with bilateral cataract (>18 years) in a 3-month nonrandomized prospective study comparing the binocular implantation of a +3 D diffractive bifocal intraocular lens to the association of 2 diffractive +3 D/+2.5 D intraocular lenses, with 12 patients in each group. The distance, intermediate (60 cm), and near (40 cm) logarithm of the minimum angle of resolution (logMAR) visual acuities, IOL centration, monocular and binocular

defocus curves, and contrast sensitivity were recorded. The subjective assessment of vision was carried out using a questionnaire offered to the patient.

Results: No significant difference was observed in the distance acuity of the 2 groups. The monocular defocus curves conformed to expectations and the binocular defocus curve exhibited a larger peak in the intermediate/near vision range in the combined +2.5 D/+3 D additions with respect to the bilateral implantation of the same addition +3 D. Contrast sensitivities were within the norms. The satisfaction survey showed comparable scores between the 2 cohorts.

Conclusions: The implantation of 2 combined additions +2.5 D/+3 D allows a slight increase in depth of field for patients desiring intermediate and near functional vision without heavy dependence on the amount of light.

Poster No.: EX1-009
Panel No.: 009

Global Patterns of Health Burden Due to Cataract: An Analysis Based on Global Burden of Disease 2015 Study

First Author: Miao **HE**
Co-Author(s): Wenyong **HUANG**, Wei **WANG**

Purpose: To evaluate the global patterns in health burden due to cataract in terms of disability-adjusted life years (DALY) and correlations with socioeconomic development.

Methods: Global, regional, and national DALY numbers, crude rate, and age-standardized DALY rate of cataract by age and sex were obtained from the database of Global Burden of Disease Study 2015. The human development index (HDI) was derived from the United Nations Human Development Report. Regression analysis was used to explore the correlations between age-standardized DALY rate and socioeconomic variables.

Results: From 1990 to 2015, the global DALY numbers and crude DALY rate due to cataract increased by 89.42% and 36.28%, respectively. The age-standardized DALY rate in 2015 was similar to that in 1990. The global health burden of cataract increased with age, and females suffered more than males at each age group (all $P < 0.001$). The age-standardized DALY rate was higher in lower HDI countries ($P < 0.01$). The national age-standardized DALY rates in 2015 were significantly associated with HDI ($P < 0.001$). The Expected Years of Schooling Index was the most influential component of HDI and explained 55.6% of global variations in age-standardized DALY rates.

Conclusions: The global health burden due to cataract

has not improved during the past 25 years, highlighting sustained demands for more cataract surgical services. Older age, female sex, less education, and poor socioeconomic status were associated with higher burden of cataract.

Poster No.: EX1-010
Panel No.: 010

IOL Power Calculation in Phacoemulsification Combined With Pterygium Surgery: Application of the Contralateral Corneal Refractive Power

First Author: Li **SUN**
Co-Author(s): Tanjiang **HUANG**, Xia **LI**, Shuangning **WANG**, Jianbao **YUAN**

Purpose: To evaluate the efficacy, safety, and applicable objects of intraocular lens (IOL) power calculation with contralateral corneal refractive power.

Methods: Prospective clinical study. Fifteen eyes in 15 patients with pterygium (contralateral eyes with no pterygium or pterygium size < 2.2 mm) and cataract were included in this study. All eyes accepted pterygium excision combined limbal conjunctival transplantation and phacoemulsification with intraocular lens implantation. Preoperative and postoperative 3-month cataract examination such as visual acuity, Pentacam, and optometry were collected. We compared visual acuity preoperatively and postoperatively, residual spherical degree and residual astigmatism postoperatively, and IOL power calculated with contralateral corneal refractive power and affected corneal refractive power. Visual acuity was transformed into logarithm of the minimum angle of resolution (logMAR). SPSS 17.0 software was used for statistical analysis.

Results: The visual acuity was improved in all patients, including uncorrected visual acuity (1.24 ± 0.44 vs 0.21 ± 0.16 , $P < 0.05$) and best corrected visual acuity [0.52 (0.82) vs 0.00 (0.15), $P < 0.05$]. After operation, the diopter of residual spherical ranged from -0.5 D to $+1.0$ D and the absolute value of residual cylinder ranged from 0 D to 2.0 D. Residual corneal astigmatism was in the range of 0.5 D to 3.6 D; 9/15 in patients of residual corneal astigmatism were lower than 1.5 D, and 6/15 of the value were large than 1.5 D. The range of IOL power deviation was -5.5 D to $+3.5$ D; average IOL power deviation was 1.9 D.

Conclusions: This method for calculating IOL power application of the contralateral corneal refractive power in pterygium combined with cataract surgery is safe and effective, with good predictability.

Poster No.: EX1-011
Panel No.: 011

Intracameral Cefuroxime Use in Penicillin-Allergic Patients During Cataract Surgery: How Safe Is It?

First Author: Madyan QURESHI
Co-Author(s): Yajati GHOSH

Purpose: In 2007, the European Society of Cataract and Refractive Surgeons found that using intracameral cefuroxime during cataract surgery reduced the rate of endophthalmitis 5-fold, with subsequent studies showing a reduction of up to 28-fold. The aim of our study was to assess the safety of administering intracameral cefuroxime in penicillin-allergic patients.

Methods: Data was collected retrospectively from 2010-2016. Patients with documented penicillin allergy were included and patients with penicillin anaphylaxis and/or cephalosporin allergy were excluded. A proforma was used to collect the data including patient demographics, type of penicillin allergy, intraoperative reaction, postoperative reaction, intraoperative complications, and grade of operating surgeon.

Results: Forty-two eyes were identified from a total of 403 operations. There were 12 males (28.5%) and 30 females (71%) with ages ranging from 51-90 years old. The operating surgeons varied from ST1 to consultant with 33 eyes (78.5%) being treated by a consultant. The type of penicillin allergy was recorded in 8 eyes (19%) including swelling (5%), lethargy (5%), rash (7%), and gastrointestinal (GI) upset (5%). Thirty-one eyes (74%) of patients did not have a documented penicillin reaction. All patients received intracameral cefuroxime. There were no documented immediate or delayed allergic reactions to cefuroxime and no documented cases of endophthalmitis.

Conclusions: Our data has shown that patients with a documented penicillin allergy did not have any adverse reaction to intracameral cefuroxime with no cases of endophthalmitis. The benefits of cefuroxime in reducing the rates of endophthalmitis are now well supported through current research and it should be considered safe in patients with penicillin allergy.

Poster No.: EX1-012
Panel No.: 012

Phacoemulsification of "Shield Cataract" in Young Adult Patients With Atopic Dermatitis

First Author: Yin-Yang LEE

Purpose: To report phacoemulsification in 2 young adult patients with "shield cataract" (anterior subcapsular plaque with radiating cortical opacities) complicated with atopic dermatitis.

Methods: Retrospective case review of 2 patients of "shield cataract" complicated with atopic dermatitis. Appropriate techniques with capsular staining were performed to visualize the capsule and to keep away from tight adherence of plaque to the anterior capsule during capsulorhexis.

Results: The best corrected visual acuity (BCVA) of 3 eyes of 2 patients improved to 6/6. Postoperatively both patients had excessive inflammation and transient corneal edema that resolved within 2 weeks with intense oral and topical steroid. All 3 eyes received neodymium:YAG capsulotomy for posterior capsule opacification (PCO) during follow-up.

Conclusions: "Shield cataract" complicated with atopic dermatitis is a challenge for the cataract surgeon; however, by using additional dyes and appropriate techniques, the rate of complications may be reduced. Postoperative inflammation and posterior capsule opacification requiring capsulotomy were common in this series. An increased rate of retinal detachment has been reported in atopic patients with cataracts who undergo surgical correction that needs careful follow-up.

Poster No.: EX1-013
Panel No.: 013

Primary Intraocular Lens Implantation in Congenital Cataract in Children Aged 7 to 24 Months: Report From a Western Province of China

First Author: Shuangning WANG
Co-Author(s): Tanjiang HUANG, Xia LI, Jianbao YUAN, Zhanghao ZHU

Purpose: To investigate outcomes following cataract surgery with primary intraocular lens (IOL) implantation in children between ages 7 and 24 months with congenital cataract.

Methods: Records from July 2010 to April 2016 were retrospectively reviewed for 31 eyes of 20 patients who underwent cataract surgery with primary intraocular lens implantation between ages 7 and 24 months. Best corrected visual acuity (BCVA), intraocular pressure, axial length, and optometry were examined after operation. Follow-up times, adverse events, strabismus, need for additional surgery, and refractive growth were recorded. Visual acuity was transformed into logarithm of the minimum angle of resolution (logMAR).

Results: The mean follow-up was 36.45 months and the mean frequency of follow-up was 5.65 times. The rate of visual axis opacity was 5 in 31 eyes (16.13%); 4 eyes accepted surgical removal under general anesthesia and 1 eye received YAG laser capsulotomy. Four of 31 eyes (14.81%) had pupillary deformation

and shift. The rate of strabismus correction was 1 in 6 patients (16.7%). Incision leakage, secondary glaucoma, bleeding, endophthalmitis, and retinal detachment were not found. The median BCVA was 0.7. Of 31 eyes, 23 eyes had amblyopia, including all the children with unilateral cataract. The mean postoperative spherical equivalent refraction was $+1.88 \pm 2.46$ diopters (D), ranging from -2.50 D to +5.625 D.

Conclusions: The use of primary IOLs in congenital cataract surgery in children between ages 7 and 24 months is safe and effective and also has a low rate of adverse events. The poor vision may be attributable to low frequency of follow-up and the lack of standard amblyopia treatment.

Poster No.: EX1-014
Panel No.: 014

Results of Femtosecond Laser-Assisted Cataract Surgery

First Author: Nguyen Xuan HIEP
Co-Author(s): Hoang Tran THANH, Pham Thi Minh KHANH, Tran Ngoc KHANH

Purpose: To report the results of femtosecond laser-assisted cataract surgery in Vietnamese patients.

Methods: In this prospective study, 41 eyes of 32 patients with cataract underwent femtosecond laser-assisted cataract surgery and intraocular lens (IOL) implantation from January to August 2017. The visual acuity, refraction, and keratometry were evaluated preoperatively and 1 week, 1 month, and 3 months after surgery. The complications were recorded.

Results: The postoperative uncorrected distant visual acuity (UDVA) was 20/40 or more at 1 week, 1 month, and 3 months (in 87.8%, 92.7%, and 97.6% of the eyes, respectively); the rate of UDVA of 20/25 at 3 months was 73.2%. The postoperative refraction spherical equivalent was within ± 0.50 diopters (D) and ± 1.0 D at 3 months (in 82.9% and 95.2% of the eyes, respectively). The average preoperative corneal astigmatism was 1.30 ± 1.04 D; postoperative corneal astigmatism decreased to 0.67 ± 0.49 D. The capsulorhexis was continuous in 97.6% of the operated eyes. The frequency of IOL in the centered position was 100%. Among the complications, 9 patients developed fine subconjunctival hemorrhage and eye redness, and 2 patients had mild corneal edema which disappeared within less than 5 days. There was 1 case with anterior capsule tear in a patient with intumescent cataract (2.4%).

Conclusions: Femtosecond laser-assisted cataract surgery is a new method of cataract extraction that improves the visual acuity, refraction outcomes, the accuracy of capsulorhexis, and the centering of the IOL position, reducing corneal astigmatism with the

accurate incisions. The rate of complications was low with rapid recovery of vision after surgery.

Poster No.: EX1-274
Panel No.: 274

Femtosecond-Assisted Anterior Capsulotomy With Optic Capture of the Intraocular Lens in Pediatric Cataract

First Author: Yong WANG

Purpose: To evaluate the clinical efficacy and safety of femtosecond-assisted anterior capsulotomy combined with optic capture of the intraocular lens (IOL) in pediatric cataract.

Methods: A total of 27 patients, ranging from 2 to 12 years old, with pediatric cataract underwent femtosecond-assisted anterior capsulotomy with optic capture of the 3-piece acrylic foldable posterior IOL (43 eyes). Femtosecond laser-assisted capsulotomy of the anterior capsule diameter was set at 4.5 mm. Manual posterior capsulotomy diameter was 3 mm. The uncorrected visual acuity, best corrected visual acuity, location of intraocular lenses, incidence of secondary cataract, and other complications were recorded before and after surgery. The follow-up period ranged from 1 year to 3 years.

Results: All cases underwent successful anterior continuous curvilinear capsulorhexis, and the actual diameter was extended from 5 mm to 6 mm. The postoperative best corrected visual acuity was from 20/200 to 20/20. Complete posterior annular capsulorhexis and IOL optic capture was successfully performed in 39 eyes, with a success rate of 90.7%. Four cases were all replaced by manual capsulorhexis failure, anterior vitrectomy resection of central posterior capsule, and then IOL implanted into the capsular bag. No posterior cataract and intraocular lens translocation occurred in optic capture cases. The major complications of optic capture included anterior chamber fibrous exudation (9.3%), iris posterior synechia (7%), and lenticular precipitates (11.6%).

Conclusions: Femtosecond laser is helpful to improve the accuracy and success rate of anterior capsulotomy. Optic capture of IOL is beneficial to reduce posterior cataract and improve intraocular lens stability.

Cornea, External Eye Diseases & Eye Bank

Poster No.: EX1-015

Panel No.: 015

10-Year Audit of *Pseudomonas aeruginosa* Keratitis Antibiotic Sensitivity in a Tertiary Center

First Author: Gillian SIU

Co-Author(s): Alvin YOUNG

Purpose: This study intends to review the culture sensitivity of *Pseudomonas aeruginosa* keratitis in the past 10 years, which may act as a guide for future treatment of similar conditions.

Methods: Cases were searched via our hospital's clinical data analysis and reporting system with the keywords "corneal ulcer" and "bacterial culture and ST within hospital stay with organism *Pseudomonas* species" from 2006 to 2016.

Results: A total of 161 patients were found. Ciprofloxacin and gentamicin had the best sensitivity of 97% and 98%, respectively, towards *Pseudomonas* keratitis. Only 105 patients were reported sensitive to ceftazidime by our microbiological lab.

Conclusions: As we do not have ciprofloxacin eye drops in our unit, we suggest adding fortified gentamicin 1.4% to our treatment protocol of bacterial keratitis.

Poster No.: EX1-016

Panel No.: 016

3 Decades of Radial Keratotomy Journey

First Author: Thanendthire SANGAPILLAI

Purpose: To illustrate the advantage of combining corneal collagen cross-linking and toric intraocular lens (IOL) implantation in managing corneal ectasia with hyperopic and astigmatism shift following radial keratotomy.

Methods: A patient presented with progressive hyperopic and astigmatism shift 12 years after radial keratotomy performed in the right and left eye. Both eyes were treated with riboflavin ultraviolet (UV)-A corneal collagen cross-linking. Proparacaine hydrochloride 0.5% was used prior to the procedure; 7-mm diameter, mechanical scraping of the epithelium was done followed by 30 minutes of riboflavin dextran isotonic instillation every 2 minutes and 30 minutes of UV-A radiation, 3 mW/cm² was delivered. Left eye was treated followed by right eye 1 year apart. Riboflavin hypotonic dextran solution was not indicated as central corneal thickness was 628 µm in the right eye and 611 in the µm left eye. No adverse effects were documented.

Results: After the procedure, astigmatism worsened by 2 diopters (D) in the left eye; however, there was minimal change in the hyperopic status bilaterally. Best corrected visual acuity remained 6/9 even 2 years after the procedure. Bilateral phacoemulsification with toric IOL (SN60T9 6D cylinder) implantation was done 1 year after corneal collagen cross-linking. Spherical equivalent prior to the procedure was +0.40 D in the right eye (RE) and +1.25 D in the left eye (LE) and improved to -0.25 D RE and -0.125 D LE after surgery.

Conclusions: Corneal collagen cross-linking is useful in maintaining the integrity of the cornea and progression of the hyperopic shift was controlled. In view of high astigmatism, toric IOL implantation was done to provide better final visual outcome.

Poster No.: EX1-017

Panel No.: 017

Change in Corneal Biomechanics With Warm Compression for Treatment of Meibomian Gland Dysfunction

First Author: Somporn CHANTRA

Purpose: To compare visual acuity, corneal curvature, corneal astigmatism, and refraction before and after Meibomian gland dysfunction (MGD) treatment with warm compression.

Methods: MGD patients were asked to do lid scrubs and warm compression by using gel pad with controlled temperature of 35-40°C for 10 minutes once daily. Visual acuity, corneal curvature, corneal astigmatism, and refraction were measured before treatment and at 4-week and 8-week visits. Statistical analysis of the results was performed.

Results: The data of 76 eyes from 38 patients were analyzed. Mean best corrected visual acuity were 0.13 ± 0.13, 0.14 ± 0.12, and 0.15 ± 0.13 logarithm of the minimum angle of resolution (logMAR) at baseline, 4-week, and 8-week visit, respectively. Mean flattest and steepest curvatures were 44.20 ± 1.70 and 45.09 ± 1.72 at baseline, 44.11 ± 1.63 and 45.07 ± 1.73 at 4-week visit, and 44.15 ± 1.63 and 45.04 ± 1.67 diopters at 8-week visit. Mean astigmatism was -0.89 ± 0.59 at baseline, -0.96 ± 0.74 at 4-week visit, and -0.89 ± 0.69 diopters at 8-week visit. Spherical equivalence was 0.52 ± 1.75, 0.60 ± 1.83, and 0.62 ± 1.83 diopters at baseline, 4-week, and 8-week visits, respectively. There were no statistically significant differences in visual acuity, corneal curvature, corneal astigmatism, and refraction parameters at each visit. All patients reported no worsening in their vision and some of them had better vision than before treatment.

Conclusions: There were no statistically significant changes of visual acuity, corneal curvature, corneal

astigmatism, and refraction following warm compression in subjects presenting with MGD.

Poster No.: EX1-018

Panel No.: 018

Clinical Characteristics and Outcomes of Corneal Lenticule Patch Graft

First Author: Niluh WARDHANI

Co-Author(s): Susi HERIYATI

Purpose: To describe clinical characteristics and outcomes of corneal lenticule patch graft.

Methods: Medical records of patients who underwent corneal lenticule patch graft surgery between January and December 2015 were reviewed. Data collected to evaluate clinical outcome after corneal lenticule patch graft included best-corrected visual acuity (BCVA), restoration of ocular integrity, and complications.

Results: Seventeen eyes (62.96%) with corneal perforation and 10 eyes (37.04%) with corneal defect who underwent corneal lenticule patch graft were reviewed. Mean age patients was 46.5 years. Most common causes of corneal defect were infection (85.2%), with size of perforation mostly < 3 mm (55.56%). Ocular integrity was achieved in 100% in 2 weeks, 92.31% at 1 month, and 72.73% at 3 months, respectively. A total of 6 eyes that had complications underwent reoperation.

Conclusions: Corneal lenticule patch graft seems to be an effective alternative surgical method for corneal defect and perforation closure when the perforation size ranges from 1.0 to 5.0 mm. The procedure was a relatively simple and inexpensive alternative treatment in case of emergency or lack of donor.

Poster No.: EX1-019

Panel No.: 019

Clinical Profile and Outcome in Pure *Acanthamoeba* Keratitis Compared to Mixed Infection

First Author: Arshi SINGH

Co-Author(s): Sujata DAS

Purpose: To compare clinical and visual outcomes in patients with *Acanthamoeba* keratitis (AK) with bacterial coinfecting AK cases.

Methods: A retrospective analysis of AK cases presenting to a tertiary care center over a 9-year period was done to study the differences in the cases. Microbiological diagnosis was made for all patients.

Results: Fourteen eyes in the coinfecting group (group 1) and 21 eyes with AK (group 2) were analyzed. There was no difference in demographic profile

and presenting features in the 2 groups. Duration of symptoms, history of prior steroid usage, and ocular trauma were also similar for both groups, with contact lens usage being reported only in coinfecting cases (14%). Diffuse corneal infiltrate was commonly seen (6/14 vs 9/21, group 1 versus group 2) with ring infiltrate being most frequent (33%) in group 2. Hypopyon was present in 4/14 of group 1 versus 11/21 of group 2 eyes. Coinfection occurred in 40% of AK cases, the commonest pathogen isolated being *Staphylococcus* species. Though visual acuity at presentation and last follow-up was similar across groups, visual recovery in the coinfecting group was significantly better ($P = 0.042$). Surgical intervention in the form of keratoplasty/plaque removal/evisceration was required in the 2 groups at rates of 35% versus 42% (group 1 vs 2).

Conclusions: Coinfection is common in AK with no significant difference in presentation. Thus, there is a need for thorough and early microbiological work-up and prompt treatment.

Poster No.: EX1-020

Panel No.: 020

Comparative Outcomes of Compression Sutures With Intracameral C3F8 Versus C3F8 Gas Alone in Acute Corneal Hydrops

First Author: Bhupesh SINGH

Co-Author(s): Neha BHARTI, Sudhank BHARTI

Purpose: To evaluate the efficacy and safety of intracameral perfluoroethane (C3F8) gas along with compression sutures versus C3F8 gas alone for the treatment of acute hydrops secondary to keratoconus.

Methods: Prospective, interventional case series of 20 eyes of 20 patients who presented with acute hydrops secondary to keratoconus. Patients were divided into 2 groups. Group 1 cases were treated with 14% isoexpansile concentration of C3F8 gas along with compression sutures. Group 2 cases were treated with intracameral C3F8 gas alone. All the patients were followed up for 6 months. Preoperative and postoperative best-corrected visual acuities (BCVA), intraoperative and postoperative complications, and time taken for resolution of corneal edema were assessed.

Results: The mean age of the cohort was 24.1 ± 5.5 years. All the patients required only 1 injection during the treatment period. The C2F6 gas persisted in the anterior chamber between 6 and 10 days. Mean BCVA at presentation was 6/60 or less in all patients. Improvement of BCVA was achieved postoperatively in all cases (100%). There was a statistically significant difference between the visual outcomes in the 2 groups. The average time between initial presentation

and complete resolution of corneal edema was 14 ± 7 days in group 1 and 62.0 ± 30 days in group 2. There was no intraoperative or postoperative complication noted during the follow-up period.

Conclusions: Compression sutures with intracameral isoexpansile concentration of C3F8 gas serves as a safe and effective treatment modality for patients with acute hydrops. Combined procedure is better than conventional intracameral gas injection.

Poster No.: EX1-021
Panel No.: 021

Corneal Backward Scattering and Higher-Order Aberrations in Children With Vernal Keratoconjunctivitis and Normal Topography

First Author: Tommy CHAN
Co-Author(s): Jason CHAN, Yu Meng WANG, Emily WONG

Purpose: To investigate the corneal backward scattering and higher-order aberrations (HOAs) in children with vernal keratoconjunctivitis (VKC) and normal topography.

Methods: Thirty-six eyes of 22 VKC patients and 54 eyes of 34 normal subjects were included. All participants had clear cornea, absence of dry eye, and normal corneal tomography. Scheimpflug imaging was used to measure corneal backward scattering in zones centered on the corneal apex (central 2-mm zone and paracentral 2- to 6-mm zone), and HOAs were compared between VKC and normal controls.

Results: The mean age of participants was 12.0 ± 4.1 years in the VKC group and 11.2 ± 4.1 years in the control group ($P = 0.339$). There was no significant intergroup difference in mean keratometry, astigmatism, and apex pachymetry ($P \geq 0.076$). Total corneal backscatter was higher in the VKC group compared to the control group ($P \leq 0.012$). Anterior and posterior cornea displayed a higher level of backward scattering in the VKC group ($P < 0.001$ for anterior; $P \leq 0.048$ for posterior). Patients with VKC exhibited higher total HOAs and coma ($P \leq 0.036$). There were significant correlations between total anterior HOAs and backward scattering measured at the central ($r = 0.500$; $P = 0.032$) and paracentral zones ($r = 0.470$; $P = 0.024$) for VKC.

Conclusions: The current study showed optical quality changes in patients with clear corneas and quiescent VKC. An increase in corneal backward scattering and HOAs was noted in patients with VKC as compared to normal patients.

Poster No.: EX1-022
Panel No.: 022

Corneal Densitometry in High Myopia

First Author: Jing DONG
Co-Author(s): Xiaogang WANG, Yaqin ZHANG

Purpose: To investigate corneal densitometry captured by Scheimpflug tomography in normal and high myopia (HM) eyes and to assess the differences in densitometry values between them.

Methods: High myopic and normal corneas were examined using the Pentacam Scheimpflug imaging system. Corneal densitometry was automatically measured over a 12-mm diameter area, dividing using annular concentric zones (0-2 mm, 2-6 mm, 6-10 mm, 10-12 mm, total diameter) and depth (anterior layer: inner 120 μ m; center layer: from 120 μ m to the last 60 μ m; posterior layer: last 60 μ m; total corneal thickness).

Results: One hundred normal and 100 HM eyes were enrolled in this study. For total corneal thickness densitometry, the HM group showed significantly lower values than the normal group in 4 annuli, including central 2 mm in diameter, annulus 2-6 mm in diameter, annulus 6-10 mm in diameter, and total 0-12 mm in diameter. For anterior layer densitometry, the HM group demonstrated statistically lower values in annulus 2-6 mm and annulus 6-10 mm in diameter. For the center layer and posterior layer, the HM group showed lower values in all annuli.

Conclusions: The densitometry map revealed that light backscatter was lower in most portions of the HM cornea than in the normal cornea.

Poster No.: EX1-023
Panel No.: 023

Corneal Endothelial Cell Study in Fuchs Endothelial Corneal Dystrophy

First Author: Monthira JERMJUTITHAM
Co-Author(s): Ngamjit KASETSUWAN, Usanee REINPRAYOON

Purpose: To examine the rate of endothelial cell density (ECD) loss and study corneal biomechanical properties of Fuchs endothelial corneal dystrophy (FECD).

Methods: This was a retrospective-prospective, longitudinal, descriptive study of patients diagnosed with FECD. Eye examination was performed using slit-lamp biomicroscopy, confocal microscopy, Pentacam rotating Scheimpflug camera, and corneal visualization Scheimpflug technology (Corvis ST). Patients were classified into 3 stages regarding the presence of guttae, clinically evident edema, and corneal opacification. Multivariate analysis was used

to estimate ECD over time and between groups. The Corvis ST parameters were also compared.

Results: Eighty eyes of 80 patients were enrolled (mean age, 61.9 ± 11.1 years). Multivariate analyses showed that only family history (FH) had a significant impact on ECD ($P < 0.05$), 357 cells/mm² less than those without FH. After each additional year, 88.9 cells/mm² reduced [μ^{\wedge} EMM = 88.9, 95% confidence interval (CI): 65.3–112.6, $P < 0.001$], which is equivalent to 6.8%, 7.1%, and 7.9% cell loss per year in stage 1, 2, and 3, respectively. Mean corneal thickness of stage 1, 2, and 3 were 555.7 ± 31.7 mm, 623.3 ± 33.2 mm, and 648.2 ± 50.0 mm, respectively. The Corvis ST parameters were as follows: A-1 lengths were 1.79 ± 0.05 mm, 1.84 ± 0.05 mm, and 1.92 ± 0.09 mm; A-1 times were 6.89 ± 0.25 ms, 6.83 ± 0.23 ms, and 6.66 ± 0.39 ms; deformation amplitudes were 1.18 ± 0.12 , 1.19 ± 0.1 , and 1.20 ± 0.15 mm in stage 1, 2, and 3, respectively.

Conclusions: Endothelial cell reduction estimates 88.9 cells/mm² for an additional year (6.8%, 7.1%, and 7.9%/year in FECD stage 1, 2, and 3, respectively) and more decrease with having family history. Corneal biomechanical properties change according to increasing corneal thickness, indicating that corneal edema tends to show less elasticity.

Poster No.: EX1-024

Panel No.: 024

Effect of 3% Diquafosol Ophthalmic Solution on Changes in Ocular Surface Temperature Over Soft Contact Lenses

First Author: Takashi **ITOKAWA**

Co-Author(s): Yuichi **HORI**, Hiroko **IWASHITA**, Yukinobu **OKAJIMA**, Takashi **SUZUKI**

Purpose: To investigate the changes in the ocular surface temperature (OST) with instillation of 3% diquafosol ophthalmic solution (DQS), a dry eye formulation, over soft contact lenses (SCLs).

Methods: Twenty-four eyes of 24 normal SCL wearers (mean age, 24.0 ± 3.7 years) were enrolled. One-day disposable silicone hydrogel lens (narafilecon A) was used in this study. DQS was instilled into the right eye after 6 hours of SCL wear. Using an ocular surface thermography (TG-1000, Tomey, Japan), we measured the OST over the SCLs for 10 seconds immediately after eye opening. We defined the difference in the OST from 0 to 10 seconds as the Δ OST. We also measured the tear meniscus height (TMH), noninvasive tear break-up time (NIBUT), and tear break-up pattern (BUP) using tear film interferometry (DR-1 Alpha, KOWA, Japan). The parameters were measured before and 5, 15, 30, and 60 minutes after DQS instillation.

Results: The TMH and NIBUT increased significantly

($P < 0.05$, Steel test, for both comparisons) up to 30 minutes after DQS instillation. The differences in the Δ OST decreased significantly ($P < 0.05$, Steel test) up to 15 minutes. Among the BUPs, a thin aqueous layer and line break decreased significantly ($P < 0.05$, Steel-Dwass test) in the Δ OST compared with the other BUPs.

Conclusions: DQS instillation decreased significantly in the Δ OST up to 15 minutes in SCL wearers, indicating that DQS improves tear film stability over the SCL due to the increased amount of tear fluid.

Poster No.: EX1-025

Panel No.: 025

Effects of Dry Eyes on Corneal Keratometry Measured by VERION Image Guided System

First Author: Somporn **CHANTRA**

Purpose: To investigate the effect of dry eye and artificial tears on parameters associated with corneal curvature, corneal astigmatism, recommended toric intraocular lens (IOL) placement axis, recommended IOL spherical power, recommended IOL cylindrical power, and calculated residual astigmatism measured by VERION Image Guided System in subjects planned for cataract surgery with toric IOL implantation.

Methods: This was prospective, quasi-experimental study. All subjects were classified into the non-dry eye or dry eye group. All parameters were obtained using VERION at baseline, 5 minutes, and 30 minutes after artificial tear instillation. All measurements were analyzed using repeated measures analysis of variance (ANOVA).

Results: Seventy eyes of 35 subjects were included. Twenty-eight eyes were classified as dry eye level 1, 19 eyes as level 2, 8 eyes as level 3, 1 eye as level 4, and 14 eyes had did not have dry eye. In subgroup analysis, there were no statistically significant differences in the mean corneal curvature, amount of refractive cylinder, recommended IOL placement axis, recommended IOL spherical power, and recommended IOL cylindrical power between baseline and 5 minutes and 30 minutes after artificial tear instillation in all subgroups ($P > 0.05$). There was a statistically significant difference in calculated residual astigmatism between baseline and 30 minutes in the dry eye level 2 subgroup ($P = 0.01$).

Conclusions: The accuracy of VERION measurements may be affected by dry eye disease, especially in dry eye greater than level 2. Accurate corneal parameters must be obtained for calculating the correct IOL placement axis, toric IOL spherical, and cylindrical power.

Poster No.: EX1-026

Panel No.: 026

Efficacy of Intense Regulated Pulsed Light Therapy in Meibomian Gland Dysfunction-Related Dry Eye

First Author: Serge DOAN

Co-Author(s): Isabelle COCHEREAU, Eric GABISON, Damien GUINDOLET

Purpose: To report the efficacy of intense regulated pulsed light (IRPL) therapy in meibomian gland dysfunction (MGD) related dry eye.

Methods: This prospective noncontrolled study included 20 patients (20 eyes) with MGD and evaporative dry eye, who failed lid hygiene. IRPL was applied on the periocular area with the E-Eye device (E-Swin, France) at day 0, 15, and 45. At each visit and also at day 75, symptoms [evaluated by visual analog scale (VAS) and Standardized Patient Evaluation of Eye Dryness (SPEED) questionnaire], fluorescein tear break-up time (BUT), and meibum grading were performed.

Results: Compared to day 0, mean global symptom VAS at day 75 decreased from 69 to 55 ($P = 0.048$), and mean SPEED score decreased from 22 to 19 ($P = 0.03$). A total of 70% of cases had more than 20% decrease of EVA or SPEED. BUT increased from 4.2 to 5.9 s (NS). The number of expressible meibomian glands (out of 15 glands) increased from 5.9 to 8.1 ($P = 0.04$).

Conclusions: IRPL seems to be an interesting option for treating MGD-related dry eye, although BUT was not significantly changed in our study.

Poster No.: EX1-027

Panel No.: 027

Evaluation of Dry Eye After Endoscopic Dacryocystorhinostomy

First Author: Minwook CHANG

Co-Author(s): Min Han KIM, Jihyun PARK

Purpose: To evaluate subjective dry eye after endoscopic dacryocystorhinostomy (EDCR) in patients with nasolacrimal duct obstruction (NLDO).

Methods: From March 2013 to April 2017, patients diagnosed with NLDO who underwent EDCR were divided into 2 groups according to a questionnaire about subjective dry eye symptoms after surgery. The medical records were retrospectively analyzed. The proportion of patients with subjective dry eye symptoms after EDCR was analyzed. Korean guidelines for the diagnosis and management of dry eye were used to assess the dry eye level of patients with subjective dry eye symptom after EDCR. Before and after surgery, we compared the tear layer height, tear break up time (TBUT), meibomian gland dysfunction

(MGD), and the presence of punctate epithelial erosion (PEE).

Results: At 6 months after EDCR, the proportion of patients with subjective symptoms was 30.2% in a total of 63 patients. Using Korean guidelines for the diagnosis and management of dry eye, 10 patients who started treatment with dry eye at level 2 or more were 15.9% of the total operated patients. The duration of epiphora and TBUT before EDCR were higher in the group without subjective symptoms and the proportion of patients with PEE after EDCR was higher in the group with subjective symptoms.

Conclusions: Dry eye after EDCR was significantly correlated with PEE, TBUT, and duration of epiphora. If a patient complains of dry eye symptoms after surgery, it may be considered to treat dry eye syndrome depending on the level of dry eye.

Poster No.: EX1-028

Panel No.: 028

Evaluation of Early Postoperative Ocular Pain Following Photorefractive Keratectomy and Corneal Crosslinking

First Author: Siamak ZAREI-GHANAVALI

Purpose: To evaluate and compare early postoperative pain after photorefractive keratectomy (PRK) and corneal crosslinking (CXL).

Methods: Sixty-eight patients were enrolled in the study. The PRK group consisted of 34 patients with simple refractive errors whereas the CXL group included another 34 patients with clinical keratoconus. The groups were compared regarding the level of pain [based on 3 pain scaling systems including the visual analog scale (VAS), verbal rating scale (VRS), and Wong-Baker FACES pain rating scale] and epithelial defect (ED) size immediately after surgery and 6 hours, 1, 3, and 7 days after surgery.

Results: The mean ages of patients in the PRK and CXL groups were 29 ± 1.19 and 28 ± 0.73 years, respectively. The ED size was significantly smaller in the CXL group than in the PRK group ($P < 0.001$), but the amount of pain was significantly higher after CXL than after PRK based on VAS and VRS ($P = 0.04$ and $P = 0.019$, respectively). The VAS and VRS pain scores decreased with time in both groups. In the FACES scale, the pain score was also higher in the CXL group than the PRK group. However, the difference was not statistically significant. No intra- or postoperative complications were observed during follow-up.

Conclusions: We found a significantly faster ED healing rate in the CXL group compared to the PRK group. However, the level of pain was greater in the CXL group, suggesting that postsurgical pain might be

influenced by other factors than ED.

Poster No.: EX1-029

Panel No.: 029

Femtosecond Laser-Assisted Conjunctival Autograft Preparation for Pterygium Surgery

First Author: Yu-Chi LIU

Co-Author(s): Minas CORONEO, Matthias FUEST, Jodhbir MEHTA, Erica TEO

Purpose: Conjunctival autografting (CAG) after pterygium resection is the gold standard treatment. Thinner CAGs without Tenon tissue provide better results but are technically difficult to achieve. We report a new technique in the use of femtosecond laser (FSL) to prepare CAGs.

Methods: The feasibility and reproducibility of FSL-assisted CAG preparation were evaluated using porcine eyes. CAGs of different diameters were created by an experienced consultant and a less experienced fellow using the Ziemer LDV Z8. The CAG dimension was measured and thickness analyzed by optical coherence tomography and histology. Further to the porcine eyes study, we conducted a pilot study in which 5 patients underwent FSL-assisted pterygium surgery with a 60 μ m CAG. Clinical outcomes were reported.

Results: In porcine eyes, the experienced and less experienced surgeons produced 60 μ m grafts of comparable thickness (68.3 ± 14.3 and 73.9 ± 11.9 μ m, respectively; $P = 0.62$) and comparable variability ($P = 0.74$). The CAG area measured after dissection (37.5 ± 12.1 mm²) did not differ significantly from the FSL settings (40.6 ± 12.7 mm²; $P = 0.36$). Graft separation time was not significantly influenced by graft depth or surgeon. In the clinical trial, CAGs were cut in uniform thickness (central and peripheral thickness: 75.6 ± 13.7 and 77.7 ± 13.2 μ m; $P = 0.38$). No buttonholes or CAG tags occurred. During the follow-up period of 1 month, no postoperative complication occurred. The conjunctival epithelium had healed at the CAG resection site within 1 week with no evidence of scarring.

Conclusions: The FSL allowed the accurate and reliable preparation of thin CAGs, independent of surgeon experience. It may represent a valuable tool in pterygium surgery.

Poster No.: EX1-030

Panel No.: 030

Kawasaki Disease and its Unknown Sequelae: Case Report

First Author: Sujatha MOHAN

Co-Author(s): Mohan RAJAN, S SHALINI

Purpose: A 5-year-old boy came with complaints of

a growth on the upper portion of the white part of his left eye for 3 years. At the age of 3 months the child suffered from a fever of 103°F with bilateral conjunctivitis, erythema of lips and tongue, and was diagnosed and treated for Kawasaki disease. Informant noted a history of recurrent conjunctivitis at 1 year 3 months which subsided; at 1 year 9 months the current lesion was noticed.

Methods: His best corrected visual acuity (BCVA) was 6/9+2 with -0.75 DSph in the right eye and 6/18+ NIP with +0.50 DSph/-8.00 DCyl x 10° in the left eye. Anterior segment of the right eye was normal and the left eye had a fleshy growth extending from the upper fornix to the limbus. B-scan was normal. Growth excision with patch graft was done and the tissue sent for histopathological evaluation (HPE).

Results: HPE reports revealed benign fibroblastic proliferation with storiform pattern. Postoperatively the left eye improved to 6/12p with a correction of -1.00 DSph/-1.25 DCyl x 140°. The graft was in place. Glasses were prescribed with occlusion therapy. We report this as a rare and unusual sequelae of Kawasaki disease.

Conclusions: Therefore, we are first to report this unknown and rarest sequelae of Kawasaki disease.

Poster No.: EX1-031

Panel No.: 031

Lichen Planus Conjunctivitis: A Report of 2 Cases

First Author: Ho Yan CHAN

Co-Author(s): Ka Wai KAM, Alvin YOUNG

Purpose: To report 2 cases of autoimmune conjunctivitis which were later diagnosed as isolated lichen planus and to review the current literature on diagnosis and management.

Methods: Report of 2 cases and literature review.

Results: A 58-year-old woman had severe bilateral chronic cicatrizing conjunctivitis. After excluding infective causes, her conjunctival inflammation responded only partially to topical steroid. Biopsy found conjunctival squamous epithelium with lichenoid inflammatory infiltrate. Inflammation subsided with systemic and topical cyclosporine; however, 1 eye developed limbal stem cell deficiency. A 63-year-old man had bilateral diffuse bullous conjunctival inflammation, chemosis, and later symblephara formation. Biopsy showed lichenoid lymphohistiocytic and plasma cell infiltrate. Immunofluorescein staining was negative for ocular cicatricial pemphigoid. He demonstrated partial response to topical steroid. Conjunctival inflammation subsided with systemic steroid and azathioprine.

Conclusions: Lichen planus conjunctivitis is one of the differential diagnoses of chronic cicatrizing conjunctivitis. Histology and immunostaining are useful to clinicians in distinguishing lichen planus conjunctivitis from other autoimmune causes such as ocular cicatricial pemphigoid. Treatment of lichen planus conjunctivitis includes adequate immunosuppression, both topically and systemically.

Poster No.: EX1-032
Panel No.: 032

Management and Outcomes of Intraoperative Microperforations During Deep Anterior Lamellar Keratoplasty

First Author: Olivia HUANG

Co-Author(s): Amy CHAN, Hla Myint HTOON, Jodhbir MEHTA, Donald TAN

Purpose: To report the management and outcomes of intraoperative Descemet membrane (DM) perforations during deep anterior lamellar keratoplasty (DALK).

Methods: A retrospective audit of all DALK cases performed from 2004 to 2015 in a tertiary center, with and without intraoperative DM perforations. We excluded cases with preexisting corneal perforations before surgery.

Results: There were a total of 540 DALK cases, of which 101 cases (18.7%) had intraoperative DM perforations. These included 79 cases (78.2%) with microperforations and 15 cases (14.9%) with macroperforations. The most common steps at which DM perforation occurred intraoperatively was during deep lamellar dissection (32 cases; 31.7%), air injection (27 cases; 26.7%), and suturing (21 cases; 20.8%). Management of the DM perforations included a combination of intracameral air bubble injection (49 cases; 48.5%), stromal patching (10 cases; 9.9%), fibrin glue (8 cases; 7.9%), placing of viscoelastic over the defect (1 case; 1.1%), and suturing of the defect (1 case; 1.1%). There were 2 cases (0.37%) that were converted to penetrating keratoplasty (PK). There were no significant differences in the postoperative unaided or best corrected visual acuity, or the numbers of patients with postoperative graft failure, graft rejection, or subsequent surgery at postoperative years 1 and 3.

Conclusions: DALK cases with DM perforations intraoperatively are often able to be managed without conversion to PK. Cases with DM perforations intraoperatively have equivalent visual acuity outcomes compared to those without DM perforations and did not have any increased risk of graft failure, rejection, or subsequent surgery at postoperative years 1 and 3.

Poster No.: EX1-033
Panel No.: 033

Ocular Cicatricial Pemphigoid: Clinical Characteristics and Outcomes

First Author: Sashwanthi MOHAN

Co-Author(s): Somasheila MURTHY, Virender Singh SANGWAN

Purpose: To describe clinical characteristics and outcomes of patients diagnosed as ocular cicatricial pemphigoid (OCP) in a tertiary care hospital in India.

Methods: This was a retrospective case series of 71 eyes of 36 patients with clinical diagnosis of OCP from 2001-2016 with follow-up of at least 6 months. Parameters assessed were visual acuity, staging, treatment modalities, and disease progression.

Results: Mean age of presentation was 56.6 (± 12.8) years; 58.33% (21/36) were female. Mean duration of follow-up was 48.47 (± 45.4) months. At presentation the proportion of eyes at early stages of the disease (stage 1-2) was 50.7% and late stages (stage 3-4) was 49.3%, which became 22.48% and 74.6%, respectively, at final follow-up. Conjunctival biopsies were obtained from 21/36 patients and reported as positive in 33.33% (7/21). Systemic immunosuppressants were used in 75% of the patients (27/36). Visual outcomes were analyzed and 42.2% (30/71) of eyes had visual acuity ≥ 2 lines worse than at presentation. Progression of disease was noted in 46.47% (33/71) of the eyes at final follow-up.

Conclusions: In this study, we found that 50% of the eyes presented in the early stages of the disease (stage 1-2). Despite treatment, progression was noted in almost 50% of the eyes. A more aggressive and tailored treatment approach is needed to prevent progression of early stages of the disease and to maintain good visual acuity.

Poster No.: EX1-034
Panel No.: 034

Outcome of Deep Anterior Lamellar Keratoplasty for Limbal Dermoids

First Author: Tuyet Nhung DO

Co-Author(s): Ngoc Dong PHAM

Purpose: To evaluate the outcomes of deep anterior lamellar keratoplasty (DALK) for limbal dermoids in Vietnam National Institute of Ophthalmology (VNIO).

Methods: A retrospective study was done on 23 eyes (23 patients) undergoing DALK for limbal dermoids from 2013-2017 at VNIO. Manual DALK was done with the graft from the anterior flap of pre-cut cornea used for Descemet stripping automated endothelial keratoplasty (DSAEK). The patients' demography, best-

corrected visual acuity (BCVA), cosmetic outcomes, and surgical complications were measured as outcome indicators.

Results: The average age at surgery was 5.11 years (range, 8 months to 19 years) with 13 males and 10 females. Most (20 of 23) patients had inferotemporal limbal dermoids. Four patients suffered from Goldenhar syndrome with an accessory ear. The mean size of dermoids was 6.02 ± 1.16 mm (range, 4–9 mm). All patients had good cosmetic results. The grafts were clear and had no vascularization in 8/23 (34.7%) eyes. Mild graft haze with minimal vascularization was found in 10/23 (43.5%) eyes, with moderate graft haze and vascularization in 3/23 (13%) eyes. Two eyes (8.8%) had opaque grafts with deep vascularization. All patients were satisfied with the surgical outcome. Visual acuity was unchanged in almost all patients due to amblyopia. There were no recurrent cases. Surgical complications included prolonged reepithelialization and interface neovascularization.

Conclusions: DALK with anterior flap from precut cornea was a safe and effective surgery to treat limbal dermoids. The cosmetic results were good with no change in vision.

Poster No.: EX1-035

Panel No.: 035

Pigment Epithelium-Derived Factor Promotes Self-Renewal of Limbal Stem Cells and Limbal Regeneration Through Sustaining Sonic Hedgehog Pathway

First Author: Nai-Wen FAN

Co-Author(s): Tsung-Chuan HO, Yeou-Ping TSAO

Purpose: To investigate the mechanism of pigment epithelium-derived factor (PEDF)-mediated limbal regeneration.

Methods: Mouse partial limbal deficiency was created using a metal burr to remove the inferior limbal stem cells (LSCs). After being treated with PEDF peptide 44-mer, the expression of stem cell markers was evaluated by immunostaining at 2 weeks, 1 month, and 3 months. Central corneal epithelium 2 mm in diameter was removed to assess the function of limbus. LSCs were harvested from normal rabbit limbus. Inhibitors for sonic hedgehog (SHH) and STAT3 were added to evaluate the impact on PEDF function on LSC self-renewal and mouse limbal regeneration.

Results: Compared with the controls, 44-mer PEDF promoted limbal regeneration with evidence of expression of Δ NP63 α and Lrig1 positive cells within limbal wound at 2 weeks and accelerating central corneal epithelium healing after wound challenging. Inhibitors for SHH and STAT3 significantly decreased the

PEDF effect on Δ NP63 α and Lrig1 expression in mice as well as the LSC expansion in cell study. Using organ culture and cell study, PEDF sustained the upregulation of SHH activity accompanied with nuclear translocation of Gli3 at 6 hours after surgery, which was repressed by STAT3 inhibitor.

Conclusions: We demonstrated that LSC expansion and limbal regeneration promoted by PEDF was mediated by STAT3 and SHH-Gli signaling pathway. Limbal regeneration promoted by PEDF may be dependent on the sustained SHH pathway through phosphorylation of STAT3.

Poster No.: EX1-036

Panel No.: 036

Ring Again

First Author: Thanendthire SANGAPILLAI

Purpose: To report the outcome and safety of reinserting intrastromal corneal ring segments (ICRS) in managing keratoconus using femtosecond laser.

Methods: ICRS of 340 degrees were implanted in a 16-year-old patient with keratoconus after corneal tunnel creation with the aid of femtosecond laser. An inner diameter of 4.8 mm, outer diameter of 6.5 mm, and outer depth of 400 μ m was programmed with the laser software. During the first attempt, tunnel was created at 80% of the corneal thickness. The insertion of the ring was smooth and no perforation was suspected during and after the procedure. The ICRS migrated into the anterior chamber 9 days after the procedure and was surgically removed from the anterior chamber. The patient was followed up closely after removal of ICRS and no adverse effects were documented. Reinsertion of ICRS was done 4 months after the first insertion and minor alterations were made for the tunnel data setting using inner diameter of 4.8 mm, outer diameter of 6.2 mm, outer depth of 340 μ m, and the tunnel was created at 70% of the corneal thickness.

Results: ICRS implantation significantly improved uncorrected visual acuity from 6/36 to 6/12 in this patient, decreased the spherical equivalent by 7.5 diopters (D), and the Kmax significantly reduced from 71.26 D preoperatively to 53.34 D at 6 months postoperatively. The integrity of the cornea was maintained despite reinsertion of the ICRS.

Conclusions: Reinsertion of ICRS following inadvertent perforation into the anterior chamber is still effective and safe without disrupting the corneal integrity and provides promising outcomes.

Poster No.: EX1-037
Panel No.: 037

Role of Topical Aminocaproic Acid in Reducing Secondary Bleeding in Traumatic Hyphema Patients

First Author: Ferdinand LUMINTA
Co-Author(s): Annisa Citra PERMADI

Purpose: To determine whether topical aminocaproic acid (ACA) is beneficial to prevent secondary bleeding in traumatic hyphema patients.

Methods: Literature search was conducted through reliable databases on PubMed and Cochrane. Selection was made by title and abstract screening and applying inclusion and exclusion criteria. There were 2 randomized controlled trial studies selected for this evidence-based case report.

Results: Pieramici et al discovered that the rebleeding rate in the placebo group was 3 times higher compared to the 30% ACA gel group (30% vs 8%), which was clinically significant, although, due to premature termination of the trial and small sample size, the difference was not statistically significant. Visual acuity improvement was also observed more in the ACA gel group [11 of 24 (46%)] compared to the placebo group [9 of 27 (33%)] ($P = 0.03$). Karkhaneh et al found no significant difference of rebleeding occurrences between the 25% ACA gel group and the control group. The group receiving 25% ACA gel needed more time for clot absorption compared to the control group ($P < 0.04$).

Conclusions: The 2 journals that were appraised found contradicting conclusions. The different ACA concentration used (30% vs 25%) may contribute to these differing results. Even though the evidence was limited, administering 30% ACA gel in traumatic hyphema patients may prevent rebleeding events, although the time needed for the clot to be reabsorbed might be prolonged. Studies with a larger number of participants should be conducted to confirm these findings.

Poster No.: EX1-038
Panel No.: 038

Serum Glucose, Glycosylated Hemoglobin, and Central Corneal Thickness: The Singapore Epidemiology of Eye Diseases Study

First Author: Xiao Yang LUO

Purpose: Diabetes was found associated with central corneal thickness (CCT). We aimed to assess the association between the levels of serum glucose or glycosylated hemoglobin (HbA1c) and CCT to better understand the plausible mechanism underlying

diabetics having thicker CCT.

Methods: A total of 10,033 adults (3280 Malay, 3400 Indian, and 3353 Chinese) living in Singapore were included. Participants underwent standardized systemic and ocular examinations. CCT was measured using ultrasound pachymetry. Diabetes was defined if any of the following criteria was met: random glucose ≥ 11.1 mmol/l, self-reported use of diabetic medication, physician diagnosis of diabetes, or HbA1c $\geq 6.5\%$. Linear regression models were used to assess the association of CCT with either serum glucose or HbA1C level, adjusting for age, gender, race, corneal curvature, axial length, and body mass index.

Results: Mean CCT was 545.33 ± 33.65 μm among participants with diabetes and 544.84 ± 33.86 μm in those without diabetes ($P = 0.389$). In the multivariable regression model, diabetes was significantly associated with thicker CCT [$\beta = 4.88$ μm ; 95% confidence interval (CI), 3.25-6.51 μm ; $P < 0.001$]. Similarly, each mmol/l increase in serum glucose levels was associated with 0.56 μm thicker CCT, while each percent increase in HbA1C was associated with 1.53 μm thicker CCT (all $P < 0.001$). Subgroup analysis showed that these associations with serum glucose or HbA1c were observed in participants with diabetes only and were consistent across 3 ethnicities.

Conclusions: Findings from this study support the hypothesis of hyperglycemia underlying the association between diabetes and CCT. Having high glucose or HbA1c level results in thicker corneas, in particular in people with diabetes.

Poster No.: EX1-039
Panel No.: 039

Smart Cornea Services: Role of Smartphone-Based Applications in Reaching Out to Rural India

First Author: Madhu UDDARAJU

Purpose: To elicit the clinical and financial implications in diagnosing and treating corneal diseases by utilizing smartphone-based applications in primary eye care centers and outreach screening camps.

Methods: Internet-enabled simple smartphones with decent cameras for vision technicians and treating physicians were made available. Slit lamp and clinical microscope attachments were included for these smartphones to take clinical images and microbiological smear images. Smart cornea services were implemented in 8 of our primary eye care centers along with 300 outreach screening camps in a period of 1 year (January to December 2016).

Results: In the first year of our smart cornea services we could reach out to 10,262 patients of which 6090

were through our primary eye care center network and the remaining 4172 were in outreach screening camps. This initiative helped the patients save an average of 25 USD individually on travel and loss of wages for a day that accounted for cumulative savings in unnecessary expenditure of 256,550 USD.

Conclusions: Smart cornea services can be used efficiently in reaching out to more patients in the rural community by enabling expert-guided correct diagnosis and ensuring proper follow-up. The role of smart cornea services especially in corneal foreign bodies, corneal ulcers, and keratoplasty follow-up cases was indispensable.

Poster No.: EX1-040
Panel No.: 040

The Use of Terahertz Scanning System as a Quantitative Tool in the Evaluation of Corneal Edema

First Author: Yu-Chi **LIU**
Co-Author(s): Lin **KE**, Jodhbir **MEHTA**

Purpose: To evaluate the feasibility and accuracy of using the terahertz scanning system as a quantitative tool in the evaluation of corneal edema.

Methods: Compressed collagen sheets that contained different water concentrations ranging from 8% to 92% were first scanned with the TPS Spectra 3000 TeraView terahertz scanning system. The peak intensity of the curve from the spectral domain was recorded and used to establish the standard curve. Porcine eyes ($n = 50$) with different extents of corneal edema resulting from different time duration after procurement (0 days to 4 days) were then scanned with the terahertz and anterior segment optical coherence tomography systems to obtain the hydration level and central corneal thickness (CCT), respectively. The correlation between the hydration level and CCT was also analyzed.

Results: The terahertz scanning system had the capacity to differentiate different extents of corneal stromal edema (Figure). For the corneas with the procurement time of 0, 1, 2, 3, and 4 days, the mean peak signal intensity was $159,951 \pm 5122$, $177,338 \pm 5012$, $224,761 \pm 6223$, $250,290 \pm 5665$, and $327,236 \pm 6368$ atomic units, and the corresponding hydration level was $75.3 \pm 7.8\%$, $79.2 \pm 6.2\%$, $84.7 \pm 8.2\%$, $89.7 \pm 10.9\%$, and $96.8 \pm 10.1\%$, respectively. The mean CCT was 682 ± 45 , 745 ± 68 , 836 ± 48 , 1006 ± 66 , and $1225 \pm 62 \mu\text{m}$, respectively. The peak signal intensity was positively and significantly correlated with CCT measurements ($r = 0.91$, $P = 0.002$).

Conclusions: The terahertz scanning system has the potential to provide a novel tool to quantitatively evaluate corneal hydration status. It may be helpful in

monitoring disease progression in patients with corneal edema.

Poster No.: EX1-041
Panel No.: 041

Validation of Pterygium Classification

First Author: Angel **JUNG**
Co-Author(s): Hla Myint **HTOON**, Yu-Chi **LIU**, Jodhbir **MEHTA**

Purpose: To assess the validity of a pterygium grading system.

Methods: A modified pterygium grading system was developed from the Tan classification, characterizing the fleshiness of the pterygium, the vascularity and thickness of the pterygium head and body, and the size of the pterygium head, pterygium body, and width of pterygium along the limbus. Twenty-nine pterygiums in 27 patients were graded from slit-lamp photographs. Two independent doctors graded the pterygiums at one point for interobserver variability. A week later, they graded the same set of photos to assess reproducibility of the findings. Weighted analysis was performed using Medcalc to assess intra- and interobserver reliability.

Results: Mean age was 63 and there were 23 male eyes in the pterygiums graded. Intraobserver reliability was constantly greater than interobserver reliability. In all except 1 (length of pterygium body) of the categories, the second interobserver reliability improved. Width of pterygium had the strongest intra- and interobserver reliability (intraobserver reliability 0.958, 0.874; interobserver reliability 0.837, 0.914), followed by length of pterygium head on the cornea (intraobserver reliability 0.955, 0.835; interobserver reliability 0.868, 0.836). The reproducibility of length of pterygium body was poor (0.422, 0.680 for intraobserver reproducibility and 0.448, 0.370 for intraobserver reproducibility).

Conclusions: This modified pterygium grading shows that the categorized size of the pterygium head on the cornea and along the limbus is reliable. It also demonstrates that repeated measurements improve the grader's ability to understand the classification better.

Poster No.: EX1-042
Panel No.: 042

Validity of the Tagalog and Cebuano Translations of the Standard Patient Evaluation of Eye Dryness Questionnaire as a Dry Eye Screening Test in a Philippine Setting

First Author: Corinna Elise **SAMANIEGO**
Co-Author(s): Victor Jose **CAPARAS**

Purpose: To create Tagalog and Cebuano translations of the Standard Patient Evaluation of Eye Dryness

(SPEED) questionnaire that are culturally and clinically validated for use in screening for dry eye in the Filipino population using a cross-cultural adaptation process (CCAP).

Methods: The original SPEED questionnaire for dry eye was translated into Tagalog and Cebuano using the CCAP 9-step guideline. Cultural validity of the adapted questionnaires was tested through expert committee reviews, back translations, and focus group discussions with different subjects. The adapted questionnaires were then tested and compared against the results of clinical tests for dry eye to assess for objective validity. Internal consistency and test-retest reliability were also determined.

Results: Cronbach alpha and intraclass correlation coefficient values of the Tagalog and Cebuano adaptations of the SPEED questionnaire revealed acceptable internal consistency and test-retest reliability. A difference was observed between SPEED scores of subjects without dry eye versus subjects with dry eye. Scores from the adapted versions of the questionnaire were found to be positively correlated with ocular surface staining scores and negatively correlated with Schirmer test and tear break-up time (TBUT) results.

Conclusions: The CCAP as applied to the SPEED questionnaire for dry eye resulted in Tagalog and Cebuano translations with semantic, idiomatic, experiential, and conceptual equivalence to the original version. The Tagalog and Cebuano adaptations of the SPEED questionnaire are culturally and clinically valid and reliable instruments that may be used for screening patients with dry eye in the Filipino population.

Poster No.: EX1-043

Panel No.: 043

Vitamin D Deficiency and Dry Eye Disease: Causal or Factual Link?

First Author: Rashmi DESHMUKH

Co-Author(s): Charmy DEDHIYA, Arkasubhra GHOSH, Swaminathan SETHU, Rohit SHETTY

Purpose: To study the association between serum vitamin D levels with clinical features of dry eye disease (DED) including Ocular Surface Disease Index (OSDI), confocal microscopy features, and tear inflammatory proteins.

Methods: A total of 40 evaporative dry eye patients and 30 controls were included in this cross-sectional study. Routine dry eye investigations including tear break-up time (TBUT), Schirmer 1 test, and ocular discomfort grading using OSDI questionnaire were performed. Confocal imaging (Heidelberg Engineering GmbH) using a 400 x 400 μm^2 frame was done to

assess the subbasal nerve plexus (SBNP) features in the central cornea, followed by quantitation (CCMetrics, UK). Corneal dendritic cell density (DCD) was estimated using Cell CountR (Heidelberg) from the confocal images. Total serum vitamin D and tear inflammatory factors were quantified by enzyme-linked immunosorbent assay (ELISA) and cytometric bead array, respectively.

Results: TBUT and Schirmer 1 test values was significantly lower in DED patients than controls. OSDI score and corneal DCD were higher and nerve fiber density and branching was decreased in DED. There was positive correlation observed between OSDI discomfort subscale scores and DCD in DED patients. Vitamin D levels exhibited an inverse association with OSDI scores and DCD. Interestingly, higher vitamin D was observed in tears compared to serum in the study cohort. Furthermore, increased levels of tear inflammatory cytokines including IL-17A/F, IFN γ , and MCP1 were observed in DED patients compared to controls. It is important to note that some of the controls though deficient in vitamin D did not exhibit signs and symptoms of DED.

Conclusions: Results suggest that DED pathogenesis could be multifactorial and vitamin D level could be one of the factors, but not the only factor, that contributes to the disease process.

Poster No.: EX1-275

Panel No.: 275

Analysis of Bacterial Species Distribution According to Severity of Dry Eye Disease in Ocular Surface

First Author: Hyungbin HWANG

Co-Author(s): Baknoon HAM, Sang Hoon JUNG, Kui Dong KANG, Man Jae KWON, Sunkyoung PARK

Purpose: The ocular surface maintains a homeostasis that can normally resist infection by normal flora. However, when this homeostasis is destroyed and changes in the distribution of the population by specific bacteria occur, the disease occurs and the ocular surface is damaged. The purpose of this study was to investigate the variation of the distribution of the microbial community and the distribution of microorganisms according to the degree of severity in dry eye syndrome patients.

Methods: We performed a swab on the conjunctival surface in 50 eyes of 100 patients diagnosed with dry eye syndrome, in 20 eyes of a normal control group, and in 40 eyes. All subjects underwent tear break up time (TBUT), Schirmer I test, corneal erosion staining (NEI scoring), and Ocular Surface Disease Index scoring (OSDI scoring). Sampling was performed by swabbing the palpebral conjunctiva under sterile swabs,

followed by DNA extraction and DNA sequencing. Clone libraries were constructed from 16S rDNA amplified with bacterial complementary primers (8F, 1492R). From each sample, 50 clones were obtained by M13 polymerase chain reaction (PCR) screening method, purified and sequenced, followed by PCR. We determined whether there was a difference in microbial community distribution according to the degree of severity of the dry eye evaluation item.

Results: Changes in microbial species observed on the ocular surface were observed according to the severity of dry eye syndrome and the diversity of microbial community distribution was observed.

Conclusions: In patients with dry eye syndrome, the homeostasis of the microbial community distribution on the ocular surface is impaired.

Glaucoma

Poster No.: EX1-044

Panel No.: 044

24-Hour Blood Pressure and Disease Progression in Primary Angle Closure Glaucoma

First Author: Shaoying TAN

Co-Author(s): Nafees Begum BAIG, Poemen CHAN, Clement THAM, Shihui WEI, Marco YU

Purpose: To study the influence of 24-hour blood pressure (BP) variability and fluctuation during normal daily activities on glaucomatous progression in primary angle closure glaucoma (PACG) patients.

Methods: Continuous BP was recorded by ambulatory 24-hour blood pressure measurement (ABPM) in PACG patients who had been followed up for over 24 months with at least 5 prior visual field (VF) tests by Humphrey automated perimetry (HAP). Glaucoma progression was documented with serial changes in visual field index (VFI). The variability of BP was compared between the progressive and stable groups by Mann-Whitney U Test. The 24-hour BP profiles were smoothed using Fourier transform and described by functional data analysis. The signals were compared by permutation tests on functional t-statistics.

Results: Twenty-nine PACG patients were recruited including 6 (20.7%) with progressive VF and 23 (79.3%) stable patients. The 24-hour systolic BP (SBP) weighted mean and minimum readings were statistically significantly lower in the progressive group ($P = 0.041$ and $P = 0.005$), especially during the daytime ($P = 0.019$ and $P = 0.009$). Higher hypotensive time index (PTD) and hypotensive load (Leese) were found in the progressive group during 24 hours (PTD, $P = 0.004$; Leese, $P = 0.005$) and daytime (PTD, $P = 0.009$; Leese,

$P = 0.014$). Significantly lower SBP profile was found in the progressive group during 14:00 to 15:00, 22:00 to 03:00, and 09:00 to 12:00 ($P < 0.05$).

Conclusions: Significantly lower SBP was found in progressive PACG patients. Hypotension, or over-treated hypertension, may be a risk factor for glaucomatous progression in PACG patients.

Poster No.: EX1-045

Panel No.: 045

3-Year Results of Protocol-Driven Adjustment of Ocular Hypotensive Medication in Patients at Low Risk of Conversion to Glaucoma

First Author: Jason CHAN

Co-Author(s): Poemen CHAN, Vivian CHIU, Christopher LEUNG

Purpose: To investigate the long-term safety of decreasing medication use in subjects with low-risk ocular hypertension (OH).

Methods: This was a prospective, longitudinal study of low-risk OH subjects whose intraocular pressure (IOP)-lowering medications were removed at baseline after a comprehensive risk assessment. They were followed up regularly for 3 years by a glaucoma specialist with assessment of IOP, visual field (VF), vertical cup-to-disc ratio (vCDR), central corneal thickness (CCT), and optical coherence tomography imaging (OCT).

Results: One hundred seven eyes of 69 patients who had 5-year risk of developing glaucoma of $<15\%$ were included in the study and were followed up for 3 years. In the first year, 1 eye out of 107 eyes developed repeated VF defect and resumed medication. Sixteen patients (26 eyes) defaulted follow-up. The remaining 80 eyes of 53 patients completed the 3-year follow-up without the need of resuming medications. Mean IOP (18.7 ± 2.94 mm Hg vs 20.2 ± 3.03 mm Hg, $P < 0.001$), pattern standard deviation (PSD) (1.52 ± 0.37 dB vs 1.66 ± 0.54 dB, $P = 0.029$), and 5-year risk ($5.91 \pm 3.26\%$ vs $8.88 \pm 7.66\%$, $P < 0.001$) were significantly increased. Out of the 81 eyes, 7 eyes had risk greater than 15%. There were no additional detectable repeated VF defects at the end of the study.

Conclusions: It is safe to monitor moderate- to low-risk OH subjects without medication for 3 years. Further study is required to determine the clinical importance of the statistically significant increment of IOP, PSD value, and 5-year risk profile.

Poster No.: EX1-046
Panel No.: 046

A Case Series of Iridocorneal Endothelial Syndrome: Understanding the Difficulties in Management

First Author: Wing Lau HO

Co-Author(s): Bonnie CHOY, Jimmy LAI

Purpose: Iridocorneal endothelial syndrome is an uncommon disease affecting the cornea and results in secondary angle closure glaucoma.

Methods: Three consecutive cases of iridocorneal endothelial syndrome managed in a local ophthalmological center during the years 2014-2017 have been reviewed and the management progress has been reviewed and compared with the literature.

Results: One patient received primary Ahmed valve implantation with subsequent blockage of the tube requiring laser membranotomy. One patient had primary ExPress shunt implantation with early failure requiring secondary Ahmed valve implantation. One patient had Ahmed valve implantation, which needed to be implanted into the sulcus. The intraocular pressure of all patients was under control but needed medication.

Conclusions: The case analysis illustrates the difficulties in the management of patients with iridocorneal endothelial syndrome.

Poster No.: EX1-047
Panel No.: 047

A Deep Learning Algorithm for Tracking Dendritic Growth of Retinal Ganglion Cells Derived From Human Pluripotent Stem Cells

First Author: Kangjun LI

Co-Author(s): Jian GE

Purpose: To apply deep learning to create an algorithm for automated detection of induced pluripotent stem cell (iPSC)-derived retinal ganglion cell (RGC) growth.

Methods: Deep learning was used to build a predictive model from changes in global dendritic and axon changes of RGCs for neural constructs exposed to mediums by time-lapse analysis. It was then compared with published RGCs images [nature and all other data; using image analysis algorithm in artificial intelligence (AI)].

Results: Convolutional neural networks to predict and construct models correctly classified 9 of 10 types. Risk stratification and culture suggestions accurately predict and provide culture decisions for iPSC-RGCs in an in silico test and in a nano-scaffold test. We also showed that the AI agent and individual lab worker perform

equally well.

Conclusions: This combined strategy demonstrates the value of human cell-based assays for predictive cell growth types and should be useful for both cell development and regeneration effect assessment.

Poster No.: EX1-048
Panel No.: 048

A Rabbit Model for MIGS Devices in Narrow Angles: A Pilot Study

First Author: Saumya NAGAR

Co-Author(s): Alexandra ALMAZAN, Susan LEE, Werhner ORILLA, Lakshmi RAJAGOPALAN, Michael ROBINSON

Purpose: There are no established animal models to investigate the safety and efficacy of minimally invasive glaucoma surgical (MIGS) devices in narrow angles. Optical coherence tomography (OCT) angle parameters for a variety of species (ie, cat, owl monkey, beagle dog, minipig, rhesus monkey, cynomolgus monkey) are larger than those previously published in angle-closure glaucoma (ACG) patients. Herein, we investigated the rabbit as a potential animal model for assessing MIGS devices in narrow angles, including the XEN Gel Stent.

Methods: OCT was performed in New Zealand white (NZW) rabbits (n = 6) and standard iridocorneal angle assessments were performed. XEN surgery was performed in NZW rabbits, followed by ocular examinations to evaluate the angle fit and safety/tolerability for up to 3 months.

Results: The OCT demonstrated that the rabbit angle is much narrower compared with other larger laboratory animals examined to date. Angle parameters in the rabbit [values \pm standard error of the mean (SEM)] were as follows: AOD500, 0.185 ± 0.016 mm; AOD750, 0.239 ± 0.044 mm; TISA500, 0.089 ± 0.007 mm²; TISA750, 0.137 ± 0.012 mm²; ACA, 10.697 ± 1.119 degrees. These values were in the range of those reported previously for ACG patients. XEN surgery in NZW rabbits was performed. Anterior segment (AS)-OCT imaging confirmed good stent placement in the angle without postoperative trauma to the corneal endothelium and iris.

Conclusions: The NZW rabbits have anatomically similar angle parameters to patients with ACG and are a relevant model to evaluate the angle fit and safety/tolerability of MIGS devices in patients with narrow angles. The XEN, with its small diameter and soft gelatin composition, demonstrated no safety/tolerability issues in this pilot rabbit study and continued evaluation is warranted.

Poster No.: EX1-049

Panel No.: 049

An Optical Coherence Tomography Study of the Peripapillary Vessel Density and Retinal Nerve Fiber Layer Thickness in the Normal Hemifield of Glaucomatous Eyes With Visual Field Defects Restricted to 1 Hemifield

First Author: Shivani **DIXIT**

Co-Author(s): Sathi **DEVI**, Zia **PRADHAN**, Harsha **RAO**

Purpose: In glaucomatous eyes with visual field defects restricted to 1 hemifield, to compare the optical coherence tomography (OCT)-measured peripapillary vessel density (VD) and retinal nerve fiber layer (RNFL) thickness in the hemiretinae corresponding to the normal hemifield with that of healthy eyes.

Methods: This cross-sectional study included 40 eyes with open-angle glaucoma having field defects limited to 1 hemifield and 54 age-matched healthy eyes. All the patients underwent visual fields, spectral-domain OCT, and OCT angiography. VD and RNFL thickness were measured in 8 peripapillary sectors [temporal-upper (TU), superotemporal (ST), superonasal (SN), nasal-upper (NU), nasal-lower (NL), inferonasal (IN), inferotemporal (IT), and temporal-lower (TL)]. The OCT parameters in the peripapillary sectors corresponding to the normal hemifield of glaucomatous eyes were compared with matching sectors of healthy eyes using t test.

Results: The mean VDs of all sectors in the hemiretinae corresponding to the normal hemifield of glaucomatous eyes (52.8% to 61.7%) were significantly lower ($P < 0.05$) than the matching sectors of healthy eyes (57.4% to 64.9%). The mean RNFL thickness in the hemiretinae corresponding to the normal hemifield of glaucomatous eyes was significantly thinner in the ST, SN, NU, IT, and IN sectors when compared to the matching sectors of normal controls ($P < 0.05$).

Conclusions: Glaucomatous eyes with hemifield defects show reduced RNFL thickness and VD in their perimetrically intact regions suggesting that both structural and vascular loss precede functional decline. Although RNFL thinning was mainly limited to the superior and inferior poles, VD reduction was noted in all peripapillary sectors implying that the loss in vasculature may precede the RNFL thinning.

Poster No.: EX1-050

Panel No.: 050

Anterior Chamber Tube Shunt to Encircling Band: A Case Report

First Author: Christopher Cyrille **CABRERA**

Co-Author(s): Jose Ma **MARTINEZ**

Purpose: To describe a case of an anterior chamber tube shunt to encircling band implantation.

Methods: Case report.

Results: A 27-year-old male was being followed and treated for secondary open angle glaucoma. The patient underwent retinal detachment surgery with silicone oil injection and scleral buckling 5 years prior. Postoperatively, there was persistent intraocular pressure (IOP) elevation despite removal of silicone oil, maximal antiglaucoma medications, and transscleral cyclophotocoagulation. To address this problem, an anterior chamber tube shunt to encircling band implantation using a gauge 23 nasolacrimal stent was done. At 3 months postoperatively, intraocular pressure was maintained at normal levels without any antiglaucoma medications but forward migration of the tube into the anterior chamber was observed and subsequently repaired.

Conclusions: The use of a nasolacrimal stent as an anterior chamber tube shunt may be a viable option for patients with preexisting encircling bands for control of IOP.

Poster No.: EX1-051

Panel No.: 051

Anterior Choroidal Thickness Increase in POAG and PACD Eyes Evidenced by UBM and SS-OCT

First Author: Fei **LI**

Co-Author(s): Kai **GAO**, Xiulan **ZHANG**

Purpose: To compare the anterior and posterior choroidal thickness (ACT and PCT, respectively) in primary open-angle glaucoma (POAG), primary angle-closure disease (PACD), and healthy control subjects.

Methods: Ultrasound biomicroscopy (UBM) was used to measure the ACT at a distance of 4 mm from the root of iris in all participants. Swept-source optical coherence tomography (SS-OCT) was used to measure PCT in all eyes. Different groups' average ACT and PCT were compared. Other ocular parameters including the axial length (AL) and spherical equivalent (SE) were also recorded. Association study was also carried out between ACT and other biometric parameters.

Results: Both the POAG and PACD eyes had a thicker anterior choroid than healthy eyes measured by UBM

($P < 0.01$). The POAG eyes had the thickest at 0.4544 ± 0.05124 mm ($P < 0.01$), followed by PACD and healthy eyes at 0.3898 ± 0.04856 and 0.3018 ± 0.05074 mm, respectively. Compared to early/moderate stage eyes of POAG, advanced stage eyes had similar ACT ($P > 0.05$). PACG eyes had a thinner anterior choroid than PAC/PACS eyes ($P < 0.01$). However, no statistically significant difference was noted for POAG, PACD, and normal control eyes' PCT using SS-OCT ($P > 0.05$). A thinner anterior choroid was associated with older age and diagnosis (PACG eyes had a thinner anterior choroid than PACS/PAC eyes).

Conclusions: POAG/PACD eyes had a thicker anterior choroid than the controls. However, there was no significant difference in the PCT among the groups. The anterior choroid might play a role in the pathogenesis of glaucoma, warranting further investigation.

Poster No.: EX1-052

Panel No.: 052

Assessment of the Visual Function Loss in Patients With Acute Primary Angle Closure After Early Phacoemulsification or Early Laser Peripheral Iridotomy: 10-Year Results After the Last Randomized Controlled Trial

First Author: Poemen CHAN

Co-Author(s): Thomas LAM, Fangyao TANG, Clement THAM

Purpose: To assess the visual function in patients with acute primary angle closure (APAC) 10 years after initial early phacoemulsification and laser peripheral iridotomy (LPI).

Methods: Sixty-one patients were involved in the previous randomized controlled trial (RCT) that compared early phacoemulsification (phacoemulsification group) versus LPI (LPI group) for treating APAC 10 years ago. They were invited to undergo a comprehensive ophthalmic assessment.

Results: Thirty-six Chinese patients (15 in the phacoemulsification group and 21 in the LPI group) were successfully invited. For the affected eyes, there were no significant differences between the 2 groups for the mean Snellen visual acuity (0.60 ± 0.20 vs 0.47 ± 0.30 , $P = 0.268$), intraocular pressure (IOP) [14.5 ± 3.0 (range, 10-20) vs 16.38 ± 11.09 (range, 8-62) mm Hg, $P = 0.872$], vertical cup-to-disc ratio (VCDR) (0.70 ± 0.19 vs 0.61 ± 0.24 , $P = 0.225$), and the number of IOP-lowering eye drops used (0.13 ± 0.35 vs 0.67 ± 1.02 , $P = 0.079$). There were no significant differences in the mean deviation (MD), pattern standard deviation (PSD), and visual field index (VFI) of visual field between the phacoemulsification group (MD: -12.45 ± 9.19 dB, PSD: 4.94 ± 3.18 dB, and VFI: $70.25 \pm 33.85\%$) and the LPI group (MD: -10.05 ± 8.40 , $P = 0.626$; PSD: $4.28 \pm$

2.65 , $P = 0.452$; and VFI: $78.6 \pm 30.52\%$, $P = 0.657$). According to the US Social Security Administration (SSA) definition, 1 patient had statutory blindness and 1 patient had visual impairment in the LPI group. Whereas 2 patients had visual impairment and none had statutory blindness in the phacoemulsification group.

Conclusions: Initial treatment of APAC by early phacoemulsification or LPI may not affect the long-term visual function; most patients in either group did not suffer from severe visual disability.

Poster No.: EX1-053

Panel No.: 053

Automatic Assessment of Biometric Parameters in Optic Nerve Head Area by Zhongshan ONH Calculator

First Author: Fei LI

Co-Author(s): Xiulan ZHANG

Purpose: To test the reproducibility of the Zhongshan ONH Calculator (ZOC) software in terms of selected optic nerve head (ONH) parameters commonly used in glaucoma research.

Methods: Forty-two horizontal single-line and twenty 3-dimensional (3D) scans were selected to test the repeatability and reproducibility of the ZOC software. Images from both normal eyes and glaucomatous eyes were selected. Each image (including 2D and 3D images) was measured by the same researchers on 2 separate occasions with an interval of at least 7 days. Several important 2D and 3D parameters of the ONH area were selected. The 2D parameters include length of BMO, optic cup depth (OCD), depth of the anterior surface of the LC (ALCD), rim thickness on both sides, and optic cup area (OCA). The 3D parameters include optic cup volume (OCV), RA, and average ALCD (AALCD).

Results: The mean difference between repeated measurements was small when the ZOC was used by the same researchers. A paired t test showed no statistical significance between repeated measurements of all parameters ($P > 0.05$). The mean difference between different observers was also generally small ($P > 0.05$). Results showed a statistical significance in terms of the mean differences between repeated measurements taken by the same researchers manually or using software ($P < 0.05$).

Conclusions: This study presented the design and development of software for the automatic measurement of ONH images with good reproducibility. Improvements to the resolution of the LC and other parts in the ONH area will make the ZOC a powerful tool in glaucoma research.

Poster No.: EX1-054
Panel No.: 054

Changes in Intraocular Pressure After Motorized Injector-Assisted Intrasceral Intraocular Lens Fixation

First Author: Jia-Horung HUNG
Co-Author(s): Fu-Chin HUANG

Purpose: For eyes with deficient capsular support, intraocular lens (IOL) implantation has long been a technical challenge. Recently, intrasceral fixation of the haptics of a 3-piece posterior chamber IOL has become a popular option. We have developed a modified technique with the use of a motorized injector to improve the ease and safety of the externalization of the leading haptic. However, intraocular pressure fluctuation becomes a potential concern because the final position of the haptics is adjacent to the angle structure. We aimed to study the changes in intraocular pressure in our case series.

Methods: This is a single-center, consecutive observational case series including 40 patients undergoing this technique. Medical records of patients were reviewed retrospectively. Clinical features and intraocular pressure changes were analyzed.

Results: Corrected-distance visual acuity improved significantly after surgery ($P < 0.05$). No postoperative retinal detachment, endophthalmitis, or IOL decentration was noted during the follow-up period. One patient developed hypotony on postoperative day 1. All of the patients had normal intraocular pressure at 1 and 4 weeks of follow-up.

Conclusions: Motorized injector-assisted intrasceral intraocular lens fixation does not have a short-term or long-term effect on intraocular pressure.

Poster No.: EX1-055
Panel No.: 055

Comparison of Intraocular Pressure Measurement by Noncontact Tonometer and Goldmann Applanation Tonometer

First Author: Aprajita SINHA

Purpose: The purpose of this study was to compare intraocular pressure (IOP) readings by noncontact tonometer (NCT) and Goldmann applanation tonometer (GAT) and to correlate the IOP readings by these 2 instruments with different ranges of IOP and central corneal thickness (CCT).

Methods: A total of 500 eyes in 256 patients above the age of 10 years were examined by both NCT and GAT over a period of 12 months. Patients with active ocular infection and those with known allergy to local anesthetic were excluded. Measurement of central

corneal thickness was done using an ultrasound pachymeter.

Results: Mean IOP measured by GAT was significantly different than NCT. NCT did not give comparable results as compared to GAT in patients with IOP > 24 mm Hg. There was a significant correlation between the IOP readings taken with both NCT and GAT and the CCT. The correlation coefficient of CCT with both NCT and GAT was statistically significant, suggesting that IOP readings with both instruments vary significantly with CCT except in cases where CCT is between 510-530 μm .

Conclusions: Readings of NCT are clinically comparable with those obtained with GAT in a population with IOP within the normal range. NCT may be useful in screening and clinical settings but borderline high IOP readings should be confirmed with GAT. Our findings suggest that CCT is an essential variable to consider in interpreting IOP readings, especially for NCT measurements.

Poster No.: EX1-056
Panel No.: 056

Comparison of Retinal Nerve Fiber Layer Defect Detection Among Color, Red-Free, and High-Dynamic-Range Disc Photography

First Author: Ubonwan RASARUCK
Co-Author(s): Sunee CHANSANGPETCH, Rath ITTHIPANICHONG, Anita MANASSAKORN, Prin ROJANAPONGPUN, Visanee TANTISEVI

Purpose: To evaluate sensitivity and specificity of high-dynamic-range disc photography (HDR-DP), a novel image enhancing method for retinal nerve fiber layer defect (RNFLD) detection, by comparing with color (C-DP) and red-free (RF-DP) disc photography in cases with and without media opacity.

Methods: This cross-sectional study included 48 eyes of 48 subjects, which comprised 24 glaucoma patients (12 with media opacity) and 24 normal (12 with media opacity). The diagnosis was made by 3 glaucoma specialists. C-DPs were processed by software to obtain RF-DPs and HDR-DPs. All disc photos were independently assessed by 3 glaucoma specialists, 3 general ophthalmologists with more than 5 years of experience, and 3 general ophthalmologists with 1-5 years of experience. Sensitivity and specificity of these 3 techniques for RNFLD detection were compared in the non-media opacity and media opacity subgroups.

Results: The sensitivity [95% confidence interval (CI)] for RNFLD detection in HDR-DP was higher than C-DP in the media opacity group [67% (54%-80%) vs 35% (22%-49%)]. However, there was no significant difference in the non-media opacity group [87% (78%-97%) vs 74% (62%-86%) vs 73% (60%-86%) for HDR-DP, RF-DP, and

C-DP]. The specificity of HDR-DP, RF-DP, and C-DP were comparable [57% (43%-71%) vs 55% (41%-69%) vs 65% (52%-79%)].

Conclusions: The HDR technique significantly increased sensitivity to detect RNFLD in subjects with media opacity, with limited specificity. This might be an alternative screening tool for general ophthalmologists and trainees.

Poster No.: EX1-057

Panel No.: 057

Curcumin Poly(lactide-co-glycolide) Nanoparticles Protected Human Trabecular Meshwork Cells Against Oxidative Damage

First Author: Yu-Chieh KO

Co-Author(s): Yung-Hsin CHENG, Shih-Hwa CHIOU, Catherine LIU

Purpose: To understand the antioxidant effect of curcumin poly(lactide-co-glycolide) nanoparticles (CUR-NP) in acellular status and its protective effect against oxidative stress in human trabecular meshwork (hTM) cells.

Methods: CUR-NP was produced by nanoprecipitation and characterized by particle size and polydispersity index (PDI) using dynamic light scattering. The safety profile of curcumin and CUR-NP on hTM cells was established using cell viability assay. The antioxidative effect of curcumin and CUR-NP against H₂O₂ was determined by chemiluminescence assay in acellular status and cell viability assay of stressed hTM cells. The possible rescuing effects of CUR-NP on oxidatively stressed hTM cells were evaluated by inflammatory gene expression profile, mitochondrial reactive oxygen species scavenge, and apoptosis assay.

Results: The mean diameter and PDI of CUR-NP were 186.8 ± 4.2 nm and 0.097 ± 0.017 , respectively. Using cell viability assay, CUR-NP had a better safety profile than free curcumin; and 15 μ M of CUR-NPs might be the threshold dose to treat TM cells without causing cytotoxicity. Both curcumin and CUR-NP are effective reactive oxygen species scavengers in acellular status. CUR-NP treatment reduced H₂O₂-induced hTM cell death. The protective effect of CUR-NP on oxidatively stressed hTM cells may be related to mitochondrial reactive oxygen species scavenge, suppressed inflammatory gene expression, including IL-1 α , IL-6, and IL-8, and reduced caspase 3 activation.

Conclusions: CUR-NP treatment protected hTM cells against oxidative damage, which may be exerted both in aqueous phase and at a cellular level. The protective effect of CUR-NP may be exerted through decreasing inflammatory cytokine expression, mitochondrial ROS production, and apoptotic pathway activation.

Poster No.: EX1-058

Panel No.: 058

Deep Optic Nerve Head Morphologic Characteristics Predict the Location of Visual Field Defect in Open Angle Glaucoma

First Author: Jong Chul HAN

Purpose: To understand whether visual field (VF) defect can be associated with deep optic nerve head (ONH) morphology in open angle glaucoma (OAG).

Methods: OAG patients who visited glaucoma clinics between January 2014 and March 2017 were included. The patients underwent enhanced depth imaging (EDI) optical coherence tomography (OCT) and 30-2 Humphrey VF test. The VF characteristics were divided into 2 groups based on the following: 1) glaucomatous VF defect location (superior vs inferior), 2) central field involvement, 3) both hemifield involvement.

Results: Totally, 172 eyes from 172 patients were included in the analysis. First, the locations of dominant VF defect were consistent with the location of maximum externally oblique border tissue (EOBT) length, maximum ONH tilt angle, and maximum optic canal (OC) obliqueness ($P < 0.05$, respectively). Second, when the OAG eyes were divided into 2 groups based on the presence of central VF defect, the OAG eyes with central VF defect were associated with relatively inferotemporal direction compared to the eyes without central VF defect.

Conclusions: Deep ONH deformation parameters such as EOBT length, ONH tilt angle, and OC obliqueness seem to be associated with the pattern of VF defect in OAG eyes.

Poster No.: EX1-059

Panel No.: 059

Detection of Mutations in MYOC, OPTN, NTF4, WDR36, and CYP1B1 in Chinese Juvenile Open Angle Glaucoma by Exome Sequencing

First Author: Chukai HUANG

Purpose: To investigate the frequencies of variants in MYOC, OPTN, NTF4, WDR36, and CYP1B1 in Chinese juvenile open angle glaucoma (JOAG) patients.

Methods: Genomic DNA of 67 JOAG patients were analyzed by whole exome sequencing. Variants in MYOC, OPTN, NTF4, WDR36, and CYP1B1 were analyzed with bioinformatics. Candidate variants were confirmed by Sanger sequencing and validated in 125 nonglaucoma controls.

Results: Totally 6 variants were detected in 8 of 67 JOAG patients. There were 2 heterozygous mutations

in MYOC (c.C1109T:p.P370L; c.G1150Cp.D384H), 2 heterozygous mutations in OPTN (c.A985G:p.R329G; c.T1481G:p.L494W), and 2 homozygous mutations in CYP1B1 (c.T1412G p.I471S; c.G1169A p.R390H). Of the 6, D384H in MYOC and R329G and L494W in OPTN were novel. No mutation was detected in NTF4 or WDR36. The mutations were confirmed by Sanger sequencing.

Conclusions: Our results provide additional evidence of the mutation spectra and frequencies of MYOC, OPTN, and CYP1B1 in Chinese JOAG. No mutation of NTF4 or WDR36 was detected in this cohort.

Poster No.: EX1-060
Panel No.: 060

Dose Finding Studies of Omidenepag Isopropyl, a Selective EP2 Agonist, in Subjects With Primary Open Angle Glaucoma or Ocular Hypertension

First Author: Makoto **AIHARA**
Co-Author(s): Hisashi **KAWATA**, Kathy **LIU**, Fenghe **LU**, Noriko **ODANI-KAWABATA**, Naveed **SHAMS**

Purpose: To determine the optimal dose of omidenepag isopropyl ophthalmic solution (OMDI, coded as DE-117) in subjects with primary open angle glaucoma (POAG) or ocular hypertension (OHT) to advance into the phase III clinical development program.

Methods: Three phase II dose finding studies have been conducted in the United States and Japan, separately. All 3 studies were randomized, masked, parallel-group, multicenter studies with either placebo and/or active-control. A total of 338 subjects were enrolled and dosed once daily at night for 1-3 months. Seven OMDI concentrations ranging from 0.0003% to 0.003% were tested. Safety, tolerability, and intraocular pressure (IOP) lowering effects were assessed.

Results: The OMDI ophthalmic solution 0.002-0.003% showed clinically significant IOP reduction, which was similar to that of latanoprost 0.005%. The IOP reduction stabilized from month 1 to month 3. The lower DE-117 doses demonstrated a typical dose response relationship, while the highest dose (0.003% DE-117) was not as effective as the 0.002% or 0.0025% doses. OMDI 0.002% was selected as the optimal dose with the best efficacy and safety profile. All doses of OMDI were well-tolerated. The most frequently reported adverse event (AE) was conjunctival hyperemia, followed by eye pain and photophobia. The majority of them were mild in severity. All recovered either during the study or after discontinuation of OMDI.

Conclusions: OMDI showed good IOP-lowering effect and OMDI 0.002% was selected as the optimal dose.

All OMDI doses were well-tolerated.

Poster No.: EX1-061
Panel No.: 061

Dural Cavernous Fistula With Intractable Intraocular Pressure Elevation

First Author: Kim Paolo **LORENZO**
Co-Author(s): Rainier Victor **COVAR**, Felice Katrina **RANCHE**

Purpose: In patients with dural cavernous fistula, elevation of intraocular pressure (IOP) is caused by increased episcleral venous pressure. Lowering of IOP is usually accomplished with topical medications until the fistula resolves or is embolized. We report a case of dural cavernous fistula with persistently elevated intraocular pressure requiring multiple surgeries.

Methods: This is a case of a 62-year-old hypertensive Filipino female who presented with 1-year history of gradually progressive blurring of vision of both eyes, associated with proptosis and eye redness. IOP for both eyes was 60 mm Hg, uncontrolled by maximum medical therapy, with open angles and cup-disc ratio of 0.3. She underwent trabeculectomy in both eyes. IOP remained above 30 mm Hg for both eyes despite medications and revision of trabeculectomy twice for each eye. Venous stasis retinopathy was seen in the right eye. A dural cavernous fistula was suspected.

Results: Orbital computed tomography showed dilated superior ophthalmic vein, enlarged recti, proptosis, and enlarged lacrimal gland on both sides. Alternating carotid compression was started. There was gradual decrease in proptosis and redness. IOP-lowering medications were tapered then discontinued, with IOP maintained at 11 mm Hg. Cerebral angiography was done 5 weeks after her last surgery. No arteriovenous fistula was noted, confirming spontaneous resolution.

Conclusions: Despite being low-flow shunts, dural cavernous fistulas may result in intractable elevation of IOP. Patients may require surgery while awaiting resolution or embolization of the abnormal connection. Ophthalmologists should make a comprehensive evaluation of the patient to formulate an effective treatment strategy.

Poster No.: EX1-062
Panel No.: 062

Effect of a Tight Necktie on Intraocular Pressure

First Author: Md Sharfuddin **AHMED**

Purpose: Many patients wear tight neckties throughout the day. We hypothesised that this may elevate intraocular pressure (IOP) by increasing episcleral

venous pressure. If the patient consistently were to wear a tight necktie as a normal preference in daily life, this could lead to a sustained increase in IOP and could predispose to the development of glaucomatous optic neuropathy. We evaluated the effect of tight neckties on IOP measurement by Goldmann applanation tonometry.

Methods: Sixty eyes of 30 normal subjects and 30 open angle glaucoma patients (all male) were enrolled. IOP was measured with an open shirt collar, 3 minutes after placing a tight necktie, and 3 minutes after loosening it. All measurements were made by the same examiner. Normal subjects and open angle glaucoma patients were enrolled in this prospective study. All subjects were male, had best corrected visual acuity of 6/12 or better, and wore collared shirts.

Results: Mean IOP in normal subjects increased by 2.2 mm Hg and in glaucoma patients by 1.4 mm Hg. In normal subjects, IOP in 12 eyes was increased by ≥ 2 mm Hg and in 9 eyes by ≥ 4 mm Hg. In glaucoma patients, IOP in 10 eyes was increased by ≥ 2 mm Hg and in 7 eyes by ≥ 4 mm Hg.

Conclusions: A tight necktie increases IOP in both normal subjects and glaucoma patients and could affect the diagnosis and management of glaucoma.

Poster No.: EX1-063

Panel No.: 063

Evaluation of the Visual Field Index for Glaucoma Diagnosis

First Author: Giang BUI

Purpose: To evaluate the visual field index (VFI) in different stages of glaucoma and to evaluate the relationships between the VFI and other visual field indices: optical coherence tomography (OCT) retinal nerve fiber layer (RNFL) thickness.

Methods: This cross-sectional study included 103 eyes of 58 patients (77 glaucomatous eyes in all stages, 26 eyes with ocular hypertension or suspected glaucoma). These eyes were divided into 2 groups: 1) eyes with cataract, 2) eyes without cataract. Each subject performed 24-2 Swedish Interactive Threshold Algorithm (SITA) Standard test.

Results: Based on the distribution of VFI values, the limit between 2 stages was the 95th percentile of the VFI value in the more severe group. VFI value in the group without defect in visual field was $\geq 98\%$, in the early group was from 90% to 97%, in the moderate group was from 74% to 89%, in the severe group was from 51% to 74%, and in the advanced group was $\leq 50\%$. There was no statistically significant difference in VFI value between the 2 groups ($P > 0.05$) but was significant in mean deviation index (MDI) ($P < 0.05$).

The relationship between RNFL thickness and VFI was a linear correlation and was stronger than the correlation between RNFL thickness and MDI, particularly in the group with cataract ($R = 0.618$ and 0.45).

Conclusions: VFI may contribute to the accurate diagnosis of the stages of glaucoma. VFI seems to be less affected by cataract than MDI.

Poster No.: EX1-064

Panel No.: 064

Kahook Dual Blade Goniotomy With Goniosynechialysis and Phacoemulsification for Angle Closure Glaucoma

First Author: Syril DORAIRAJ

Co-Author(s): Khaled BAHJRI

Purpose: Angle closure glaucoma (ACG) often presents with anterior synechiae and high intraocular pressure (IOP). In this study, we report clinical outcomes of goniotomy using the Kahook Dual Blade (KDB) combined with phacoemulsification (PE) and goniosynechialysis in eyes with ACG.

Methods: Retrospective analysis of 22 eyes with severe ACG undergoing combined PE plus KDB. Clinical data were collected through 12 months of follow-up.

Results: Mean baseline IOP was 24.7 ± 5.5 mm Hg on 2.3 ± 0.6 medications. Mean IOP ranged from 12.1-19.3 mm Hg during follow-up ($P < 0.001$). At 12 months, mean IOP was 12.5 ± 2.0 mm Hg (-12.2 mm Hg reduction from baseline; $P < 0.001$) on a mean of 0.2 ± 0.5 medications (-2.1 medications from baseline, $P < 0.001$); 100% had achieved $>20\%$ IOP reduction, IOP < 18 mm Hg from baseline, and had a reduction in 1 or more medications. Self-limited hyphema occurred in 7 (31.8%) eyes which resolved by day 1 postsurgery.

Conclusions: Goniotomy performed in eyes with angle closure glaucoma using the Kahook Dual Blade, in combination with goniosynechialysis and phacoemulsification, safely and significantly lowers IOP over 12 months with 100% of eyes experiencing a reduction in 1 or more medications.

Poster No.: EX1-065

Panel No.: 065

Longitudinal Clinical Characteristics of Primary Open Angle Glaucoma Patients With Disc Hemorrhage Receiving Anticoagulant or Antiplatelet Therapy

First Author: Jiyun LEE

Co-Author(s): Kyung Rim SUNG

Purpose: To evaluate longitudinal clinical characteristics of primary open angle glaucoma (POAG) patients with disc hemorrhage receiving anticoagulant or antiplatelet

therapy.

Methods: The medical records of POAG patients with disc hemorrhage were retrospectively reviewed. Patients receiving (group 1) and not receiving anticoagulant or antiplatelet therapy (group 2) were compared in terms of disc hemorrhage recurrence at the same site, visual field (VF) progression rate, and cumulative probability of VF progression determined by Kaplan-Meier analysis.

Results: A total of 91 eyes were included in the final analysis. Among 11 eyes in group 1, 7 eyes had recurrent disc hemorrhage (DH) at the same site while 36 eyes among 80 eyes in group 2 experienced recurrent same site DH ($P = 0.352$). The cumulative probability of VF progression determined by Kaplan-Meier analysis and VF progression rate were not different between the 2 groups.

Conclusions: POAG patients with disc hemorrhage who were under treatment with anticoagulant or antiplatelet therapy did not differ in terms of VF progression when compared with patients who did not take such medicine.

Poster No.: EX1-066

Panel No.: 066

Longitudinal Profile of Corneal Hysteresis Measurements in Glaucoma Patients

First Author: Wai Yee FUNG

Co-Author(s): Christopher LEUNG

Purpose: While corneal hysteresis (CH) is a risk factor for development of disease progression in glaucoma patients, the longitudinal profile of CH has not been adequately investigated. This study examined the rate of change of CH and its determining factors in glaucoma patients.

Methods: A total of 257 eyes of 145 patients with primary open-angle glaucoma followed up every 4 months for an average of 3.1 years were included in the study. Cirrus HD-OCT (Carl Zeiss Meditec, Dublin, CA) was used to measure the retinal nerve fiber layer thickness (RNFL) and CH was measured by Ocular Response Analyser (Reichert Instruments, Depew, NY). The rate of change of CH was estimated by linear mixed modelling.

Results: The rate of change of CH was 0.34 mm Hg/year ($P = 0.047$). Baseline age and RNFL thickness were significantly associated with the rate of change of CH after adjustment of intraocular pressure. For each year older in age, the rate of change of CH decreased by 0.0018 mm Hg/year ($P = 0.026$). For each μm increase in the RNFL layer, the rate of change of CH decreased by 0.0014 mm Hg/year ($P = 0.036$).

Conclusions: The rate of change of CH was influenced

by age and disease severity in patients with glaucoma.

Poster No.: EX1-067

Panel No.: 067

MicroRNA Expression Profiles and Glaucomatous Optic Neuropathy in an Animal Model of Acute Ocular Hypertension

First Author: Yaoming LIU

Co-Author(s): Shida CHEN, Jiawei WANG, Yayi WANG, Xiulan ZHANG

Purpose: To determine the microRNA (miRNAs) profiles induced after acute glaucoma and to expound their possible roles in the pathogenesis of acute glaucoma.

Methods: An animal model of acute glaucoma was induced in rats by a 30-gauge infusion needle connected to a container carrying normal saline. MiRNA expression profiling was determined by miRNA microarrays for retinas extracted at 7 days after the onset of acute ocular hypertension. Several selective miRNAs were further verified by quantitative real-time polymerase chain reaction (PCR). Degeneration of nerve fiber bundles inside the retina, cell number of retinal ganglion cells (RGCs), and microglia were also evaluated.

Results: Through miRNA microarray analysis, 31 miRNAs were determined to be differentially expressed. Compared with the fellow eyes, 9 miRNAs were upregulated and 23 miRNAs were significantly reduced in the acute glaucoma eyes. The selected miRNAs were further verified by quantitative real-time PCR. Gene ontology and functional annotation analyses indicated that a cluster of signaling pathways were regulated by the differentially expressed miRNAs, in particular the inflammatory pathway and apoptosis pathway. Besides, acute ocular hypertension led to severe degeneration of nerve fiber bundles, RGCs death (only 18.9% of RGCs survived in the acute glaucoma eyes), and increased density of retina microglia.

Conclusions: Acute ocular hypertension led to changes in miRNA expression. These dysregulated miRNAs, whose target genes were previously associated with the regulation of microglia-mediated neuroinflammation or neural apoptosis, may be affiliated with the RGC apoptosis inside the retina and therefore may serve as future targets for therapeutic applications in acute glaucoma.

Poster No.: EX1-068

Panel No.: 068

Optic Disc Characteristics of Myopic Subjects on Optical Coherence Tomography

First Author: Giang BUI

Purpose: To determine the characteristics of myopic

optic discs on optical coherence tomography (OCT) and to evaluate the relationship between OCT images and myopic grades.

Methods: Cross-sectional descriptive study was performed, including 234 eyes of 127 subjects with myopia ranging from -0.50 DS to -8.00 DS, divided into the 3 groups of mild, moderate, and high myopia. Cirrus HD was used to examine the retinal nerve fiber layer (RNFL) of the optic disc. A 95% confidence interval (CI) was used for calculating mean and standard deviation. Correlations between RNFL measurements and axial length and spherical equivalent were evaluated by linear regression analysis.

Results: Mean thickness of the RNFL at I, N, S, and T alternately were 95.96 ± 7.93 , 120.97 ± 18.06 , 119.46 ± 18.06 , 62.81 ± 9.46 , and 82.95 ± 15.66 (μm). The thickness of the peripapillary RNFL was always more than 80 (μm). Lowest I_{max} and S_{max} index were 120 (μm). RNFL thickness at the 7 o'clock position was thickest (152.32 ± 19.90 μm), followed by RNFL at the 11 o'clock position (140.06 ± 21.34 μm), and RNFL at the 3 o'clock position was thinnest (56.02 ± 10.08 μm). Mean disc area was 1.80 ± 0.40 (mm^2); mean cup volume was 0.12 ± 0.15 (mm^3), disc diameter was 1.51 ± 0.16 (mm), and mean rim area was 1.35 ± 0.24 (mm^2). There was a reverse relationship between RNFL of inferior and superior optic disc and axial length and degree of myopia.

Conclusions: There is a strong relationship on OCT between the thickness of RNFL and axial length as well as the degree of myopia.

Poster No.: EX1-069

Panel No.: 069

Pilot Series of South-East Asian Eyes That Underwent Combined iStent Trabecular Microbypass Device Implantation and Cataract Surgery

First Author: David HERNSTADT

Co-Author(s): Paul CHEW, Chelvin SNG

Purpose: Analysis of single-surgeon outcomes following combined iStent trabecular microbypass device (iStent, Glaukos Corp, USA) implantation with cataract surgery.

Methods: We included 30 eyes of 25 patients who underwent iStent implantation with cataract surgery. Twelve eyes were diagnosed with primary open angle glaucoma (POAG) and 18 eyes were diagnosed with primary angle closure glaucoma (PACG). A single iStent was implanted in 7 eyes while 2 iStents were implanted in 23 eyes. Postoperatively, patients were assessed on days 1 and 7 and at months 1, 3, and 6. The intraocular pressure (IOP), glaucoma medication use, and complications were assessed at each visit.

Results: The mean preoperative IOP was 16.7 ± 3.6

mm Hg with 1.2 ± 0.5 glaucoma medications and 23.9 ± 2.5 mm Hg without medications after washout. At 6 months after the surgery, there was a significant decrease in both the mean number of glaucoma medications (0.03 ± 0.18 , $P < 0.001$) and the mean IOP compared to the preoperative medicated and unmedicated IOP (14.9 ± 2.6 mm Hg, $P = 0.01$ and $P < 0.001$, respectively). There was no significant difference in preoperative and postoperative IOP and glaucoma medications between POAG and PACG eyes or between eyes implanted with 1 and 2 iStents. Two eyes had postoperative hyphema which resolved by 1 week after the surgery and there were no other complications.

Conclusions: Outcomes from this pilot series of South-East Asian eyes that underwent combined iStent implantation with cataract surgery suggest that meaningful IOP and medication reductions can be achieved for at least 6 months with a favorable safety profile.

Poster No.: EX1-070

Panel No.: 070

Preliminary Results of CO2 Laser-Assisted Sclerectomy Surgery in the Treatment of Glaucoma in a Chinese Population

First Author: Dajiang WANG

Purpose: To evaluate the safety and efficacy of CO2 laser-assisted deep sclerectomy surgery (CLASS) in patients with open angle glaucoma.

Methods: A prospective single-arm, nonrandomized clinical investigation for the evaluation of technology. Forty-three eyes of 33 consecutive patients diagnosed with primary open angle glaucoma, pseudoexfoliation glaucoma, or secondary glaucoma from ocular trauma and uveitis who were candidates for glaucoma filtration surgery were included. The average age of the patients was 43.3 ± 17 years. Laser-assisted deep sclerectomy using a CO2 laser system was performed in all patients. A one third to half-thickness scleral flap was created, and part of the Tenon capsule was cut off for some younger patients. Antifibrotic material of 0.04% mitomycin C or 5-FU for 120 seconds was applied under the scleral flap and the under the conjunctiva. A CO2 laser with a beam-manipulating system was used to achieve deep scleral lake (reservoir) and unroofing of the Schlemm canal zone. Visual acuity, complete ophthalmologic examination, and intraocular pressure (IOP) were measured and documented at baseline, 1 day, 1 week, and at 1, 3, 6, and 12 months. Complete success was defined as $5 \leq \text{IOP} \leq 21$ mm Hg with no medication at the 12-month endpoint visit. Qualified success was defined as a similar IOP reduction with medication.

Results: The preoperative IOP of 29.34 ± 12.42 mm Hg (mean \pm SD) dropped to 16.07 ± 2.69 mm Hg at

6 months and 16.46 ± 2.11 mm Hg at 12 months postoperatively. The complete success rate after 12 months was 61.5%, whereas qualified success was 92.3%.

Conclusions: CLASS procedure is a safe and effective procedure for open angle glaucoma patients.

Poster No.: EX1-071

Panel No.: 071

Reduced ATP Level in the Aqueous Humor of Primary Open-Angle Glaucoma

First Author: Shida **CHEN**

Co-Author(s): Yaoming **LIU**, Yayi **WANG**, Xiulan **ZHANG**

Purpose: Evidence has shown that primary open-angle glaucoma (POAG) is a mitochondrial dysfunction-related disease and that energy crises lead to the susceptibility of cells to pathogenic factors. In the present study, we asked how the adenosine triphosphate (ATP) level changes in patients with POAG.

Methods: We collected aqueous humor from 28 eyes of 28 POAG patients and 20 eyes of 20 cataract patients. The level of ATP in the aqueous was checked by chemiluminescence luciferin luciferase reaction. The clinical information of the patients was also collected and analyzed.

Results: The concentration of ATP in the aqueous humor of the POAG patients was almost 6-fold lower than that of the cataract patients ($P < 0.001$). There was a trend of negative correlation between ATP level and intraocular pressure (IOP), although it was not statistically significant ($P = 0.485$). Treatment with different antiglaucoma drugs did not affect the ATP concentration (all $P > 0.05$).

Conclusions: In conclusion, low ATP levels were observed in the aqueous humor of POAG patients and this may be due to mitochondrial dysfunction in the cells. Maintaining ATP balance may serve as a promising therapy for POAG patients.

Poster No.: EX1-072

Panel No.: 072

SENSIMED Triggerfish as Adjunct to Tonometry to Identify Primary Open Angle Glaucoma Patients With Measured Intraocular Pressure Below the Diagnostic Threshold

First Author: Satomi **MOROKADO**

Co-Author(s): Tomomi **HIGASHIDE**, Sonja **SIMON-ZOULA**, Kazuhisa **SUGIYAMA**, Shunsuke **TSUCHIYA**, Thierry **VARIDEL**

Purpose: To evaluate the potential of a 24-hour

SENSIMED Triggerfish profile (TF; Sensimed, Lausanne, Switzerland) and a tonometric intraocular pressure (IOP) reading to indicate the likelihood of IOP exceeding the diagnostic threshold within a 24-hour period, to help identify primary open angle glaucoma (POAG) patients with IOP measured below the diagnostic threshold.

Methods: IOP of 40 Japanese patients with normal tension glaucoma without or washed-out of IOP-lowering treatment was measured with Goldmann applanation tonometry (GAT) every 3 hours (9 am to 12 pm). The subsequent day a 24-hour TF profile was recorded in the same eye. For each patient, IOP values were ranked based on the TF profile in a diagram, estimating the likelihood of IOP to exceed the threshold of 20 mm Hg any time within the 24-hour period. For each time point a statistical analysis was performed and results were compared to the outcome of the full diurnal IOP curve.

Results: Thirty-five patients, 12 males and 23 females (mean ages: 53.7 ± 16.6 and 52.5 ± 11.1 years, respectively) were available for the analysis. Combining TF profile with IOP at 3 pm or 6 pm, all (100%) patients identified as POAG using the diurnal curve were correctly detected (94% and 87% specificity, respectively). Considering each single IOP value, only 50% of the POAG patients would have been identified.

Conclusions: TF can be used in conjunction with a single tonometry reading to determine patients' likelihood of having IOP exceeding the diagnostic threshold within a 24-hour period, allowing the identification of POAG patients potentially misclassified, without the need to perform a 24-hour tonometric curve.

Poster No.: EX1-073

Panel No.: 073

10-Year Outcomes of Cataract Surgery for Primary Angle Closure

First Author: Shogo **YAMAMOTO**

Co-Author(s): Fumitaka **HIROSE**, Masashi **FUJIHARA**, Yasuo **KURIMOTO**

Purpose: Primary angle closure glaucoma is a major cause of blindness, particularly in East Asia. The purpose of this study was to evaluate the long-term efficacy of cataract surgery for primary angle closure.

Methods: Ninety-five eyes of 52 patients with primary angle closure, which included 28 eyes with primary angle closure suspect (PACS), 38 eyes with primary angle closure (PAC), and 29 eyes with primary angle closure glaucoma (PACG), were treated with cataract surgery alone, with a minimum 10-year follow-up. Eyes that had a past history of acute PAC or that had undergone intraocular surgery were excluded. Seventeen eyes had undergone laser peripheral

iridotomy. We retrospectively evaluated intraocular pressure (IOP) and glaucoma medications up to 10 years (Y) after cataract surgery.

Results: Seven eyes with PACG needed additional glaucoma surgery. The average preoperative IOP from all eyes in the sample was 17.8 mm Hg (N = 95), which reduced to 14.6 mm Hg at 10 Y (n = 88) (P < 0.001). There was no significant difference in the number of glaucoma medications. The average preoperative IOP was 16.5 ± 2.2 mm Hg, which reduced to 14.5 ± 2.1 mm Hg (P < 0.001) at 10 Y in PACS; 17.3 ± 3.4 mm Hg reduced to 14.9 ± 3.6 mm Hg (P < 0.001) in PAC; and 19.6 ± 6.8 mm Hg reduced to 14.2 ± 2.9 mm Hg (P = 0.003) in PACG.

Conclusions: Cataract surgery was effective in controlling IOP in eyes with primary angle closure, and a controlled IOP was maintained up to 10 Y.

Poster No.: EX1-074

Panel No.: 074

The Relationship Among Obesity, Cerebrospinal Fluid Pressure, and Intraocular Pressure in a Korean Population

First Author: Jae Yeun LEE

Co-Author(s): Joon Mo KIM, Jung Min KIM

Purpose: The purpose of this study was to analyze the relationship among body mass index (BMI), cerebrospinal fluid pressure (CSFP), and intraocular pressure (IOP) in a Korean population.

Methods: A total of 7750 participants aged ≥ 19 years and who participated in the Korean National Health and Nutrition Examination Survey from 2010 to 2011 were included. Blood pressure, weight, height, and IOP were recorded and BMI, CSFP, ocular perfusion pressure (OPP), and translamina cribrosa pressure difference (TLCPD) were calculated. Based on BMI, participants were divided into normal weight (BMI, 18.5-23), low weight (BMI < 18.5), overweight (BMI, 23.0-25), and obese (BMI ≥ 25).

Results: OPP and CSFP were highest in the obesity group rather than the normal group [coefficient: 6.96 (0.51), 95% confidence interval (CI) 5.96-7.96; coefficient: 3.95 (0.18), 95% CI 3.60-4.30, respectively]. IOP was also highest in the obesity group rather than the normal group [coefficient: 0.52 (0.21), 95% CI 0.11-0.93]. However, TLCPD was lowest in the obesity group rather than the normal group [coefficient: -3.43 (0.27), 95% CI -3.95 to -2.91]. The risk of high IOP (≥ 18 mm Hg) was 1.5 times higher in the obesity group than the normal group after adjustment for age and sex.

Conclusions: We tried to find out the association of BMI with IOP by analyzing CSFP, OPP, and TLCPD. BMI seemed to have association with IOP, but further study

is needed to find out the exact mechanism.

Poster No.: EX1-075

Panel No.: 075

The Safety and Efficacy of Supraciliary Stenting Following Failed Glaucoma Surgery

First Author: Nathan KERR

Co-Author(s): Keith BARTON, Jing WANG

Purpose: To evaluate the safety and efficacy of supraciliary microstenting following failed glaucoma surgery.

Methods: Twenty eyes from 20 patients with uncontrolled intraocular pressure despite prior trabeculectomy and/or glaucoma drainage device insertion underwent supraciliary microstenting of the suprachoroidal space (CyPass Micro-Stent; Alcon, Fort Worth, TX). Outcome measures included the incidence of ocular adverse events, further glaucoma surgery, visual acuity, intraocular pressure (IOP), and glaucoma medication use from baseline through 12 months.

Results: Mean baseline IOP was 22.5 ± 8.0 mm Hg and the number of medications was 2.7 ± 1.0 . There were no serious intraoperative complications or major adverse events following supraciliary stenting. The most common adverse events included transient hyphema (3/20, 15%), transient IOP > 30 mm Hg (4/20, 20%), and transient IOP < 6 mm Hg (4/20, 20%). At 12 months, mean IOP was 15.1 ± 4.0 mm Hg, a 32.9% reduction (P = 0.03). Mean medication usage decreased 56% to 1.2 ± 1.3 medications at 12 months (P = 0.03). Forty percent of patients were medication-free at 12 months. Two patients (20%) required subsequent aqueous shunt insertion. No vision-threatening microstent-related adverse events occurred.

Conclusions: Ab interno supraciliary microstenting is safe and associated with a sustained reduction in IOP and glaucoma medication requirements at 12 months in eyes where previous glaucoma surgery has failed. Supraciliary stenting represents a minimally invasive alternative for glaucoma refractory to trabeculectomy and/or glaucoma drainage device insertion.

Poster No.: EX1-076

Panel No.: 076

Transient Myopic Shift After 24-Hour Monitoring of IOP-Related Profile Using a Contact Lens Sensor

First Author: Miho KUMOI

Co-Author(s): Naoyuki MAEDA, Atsuya MIKI, Kohji NISHIDA

Purpose: To investigate the influence of 24-hour monitoring of intraocular pressure (IOP) rhythm

with a contact lens sensor (CLS) on visual acuity and refraction.

Methods: Twelve eyes of 12 consecutive subjects with normal tension glaucoma who underwent 24-hour monitoring with a CLS were retrospectively investigated. Distance corrected visual acuity (DCVA) and spherical equivalent (SE) in manifest refraction before, immediately after, and at the second visit (3 to 10 days) after the monitoring were examined and statistically compared. Baseline factors that were associated with change in SE were statistically investigated.

Results: The 24-hour monitoring with the CLS significantly altered SE from -5.62 ± 2.85 to -6.39 ± 2.95 [$P < 0.001$, one-way analysis of variance (ANOVA) repeated measures followed by Tukey test] and decreased DCVA (logarithm of minimal angle of resolution, logMAR) from 0.11 ± 0.27 to 0.41 ± 0.21 ($P < 0.001$). Both SE (-5.7 ± 3.2) and logMAR (0.05 ± 0.28) significantly improved at the second visit after the monitoring and were not significantly different from the premonitoring status ($P = 0.608$ and 0.874 , respectively). Medium curve lens caused significantly bigger change in refraction than steep lens ($P = 0.039$, t test), while other baseline factors were not associated with the magnitude of change.

Conclusions: The use of 24-hour monitoring with a CLS caused transient myopic shift and decrease of vision, which recovered to a premonitoring level within several days without any additional treatment. Although these self-limiting conditions did not harm the relevance of 24-hour monitoring, clinicians should inform patients of these potential changes in vision before using a CLS for 24-hour monitoring.

Poster No.: EX1-077

Panel No.: 077

Transscleral Electrical Stimulation Enhances Retinal Ganglion Cell Survival After Optic Nerve Crush via Upregulation of pAkt, SOD2, and NQO-1

First Author: Leanne CHEUNG

Co-Author(s): Kin CHIU, Vincent LEE, Xin TANG, Shasha YU

Purpose: To determine the role of antioxidative mechanisms in the observed protective effects of transscleral electrical stimulation (TsES) on retinal ganglion cells (RGCs) in a rat optic nerve crush (ONC) model.

Methods: Male SD rats were divided into groups ($n = 6$ each): untreated control, ONC model, pad control, and TsES treatment. RGCs were retrogradely labelled with Fluoro-Gold (FG) 7 days before ONC. The right

optic nerve was crushed 1.5 mm from the optic nerve head. At 3 days post-ONC, a pair of tailor-made gold pads were applied to the scleral surface of the pad control and TsES treatment animals. TsES was applied at 100 mA, 20 Hz for 30 minutes, while no stimulation was applied to the pad controls. At 1 week post-ONC, FG labelled RGCs and activated microglia were counted on flat-mounted retinas and compared among groups. Expression of oxidative stress-related proteins, including pAKT, SOD2, and NQO-1, was analyzed in retinal sections.

Results: Applying TsES 3 days post-ONC resulted in a significant increase in RGC survival, up from 34% and 36% in the ONC model and pad controls to 50% after stimulation 1 week after ONC. Furthermore, expression of the survival protein pAKT as well as the antioxidative factors SOD2 and NQO-1 was upregulated in the RGCs following TsES treatment.

Conclusions: TsES increases RGC survival when applied 3 days after ONC. Upregulated expression of pAKT, SOD2, and NQO-1 after stimulation indicates that antioxidative pathways may play a role in the mechanism underlying TsES-mediated neuroprotection.

Poster No.: EX1-078

Panel No.: 078

Treatment With Second-Generation Trabecular Microbypass Stents and Postoperative Prostaglandin in Eyes With Open-Angle Glaucoma Taking 2 Preoperative Medications: Outcomes Through 30 Months

First Author: Robert ANG

Purpose: To evaluate safety and intraocular pressure (IOP) following implantation of 2 second-generation trabecular microbypass stents (iStent inject) as a standalone procedure combined with topical prostaglandin in open-angle glaucoma (OAG) patients on 2 preoperative ocular hypotensive medications.

Methods: Fifty-three subjects with OAG and preoperative IOP ranging from 18-30 mm Hg on 2 glaucoma medications and 22-38 mm Hg after medication washout underwent implantation of 2 iStent inject devices as a standalone procedure with travoprost started at 1 day postoperatively. Study assessments included IOP, best-corrected visual acuity, adverse events, and findings from slit-lamp, gonioscopy, and fundus/optic nerve examinations. All subjects have been followed through 30 months (M30); follow-up through 5 years is planned.

Results: At 30 months postoperatively, the study demonstrated successful management of OAG to a mean IOP of 13 mm Hg or lower with reduction of 1 medication. Mean postoperative IOP on travoprost

was 11.7 mm Hg at M30 compared to 19.7 mm Hg on 2 preoperative medications, representing a 41% IOP reduction. Mean unmedicated IOP (post-washout) at M25 was 16.5 mm Hg compared to 24.9 mm Hg following preoperative medication washout, representing a 39% IOP reduction. A favorable safety profile has been observed to date with minimal to no adverse events.

Conclusions: This study demonstrates that implantation of 2 iStent inject stents as a standalone procedure combined with postoperative topical prostaglandin is safe and that clinically meaningful IOP reduction through M30 can be achieved. Microinvasive glaucoma surgery (MIGS) with implantation of iStent inject provides a new avenue of treatment for patients with mild to moderate OAG.

Poster No.: EX1-079
Panel No.: 079

Use of CO₂ Laser-Assisted Sclerectomy Surgery in Advanced Glaucoma Patients: 24-Month Results

First Author: Doris YICK
Co-Author(s): Jacky LEE, Susanna TSANG, Can YUEN

Purpose: The aim of this study was to evaluate the efficacy and safety of CO₂ laser-assisted sclerectomy surgery (CLASS) in advanced glaucoma patients.

Methods: Patients with advanced glaucoma with suboptimal intraocular pressure (IOP) control despite maximally tolerated antiglaucoma eye drops who were candidates for glaucoma filtration surgery were recruited. The main outcome measures were the changes in IOP and number of medications, complications, and the success rate of the procedure.

Results: A total of 20 patients (23 eyes) who had CLASS between November 2014 and September 2015 aged 68.1 ± 11.9 years were included. All recruited cases had advanced glaucoma with an average cup to disc ratio of 0.82 ± 0.14 . The average preoperative IOP was 24.1 ± 1.5 mm Hg whilst on 3.4 ± 1.1 types of antiglaucoma medications. The IOP and the number of eye drops were significantly reduced at 24 months. Only 1 patient had intraoperative trabeculo-Descemet membrane perforation during the use of CO₂ laser intraoperatively. No other significant complication was encountered.

Conclusions: CLASS is an effective glaucoma procedure with a moderate IOP reduction. It is an overall very safe alternative treatment for patients with advanced glaucoma.

Poster No.: EX1-080
Panel No.: 080

Usefulness of Anterior Segment Optical Coherence Tomography-Derived Attenuation Coefficient Images to Visualize the Internal Structure of the Filtering Bleb

First Author: Satoru TSUDA
Co-Author(s): Taiki KOKUBUN, Hiroshi KUNIKATA, Toru NAKAZAWA, Masahiro YAMANARI

Purpose: To improve the contrast of deep-tissue images of intrableb structures with attenuation coefficient imaging and investigate the usefulness of this technique in visualizing and evaluating the filtering bleb after trabeculectomy (Trab).

Methods: This study included 25 eyes of 24 patients 6 months after Trab. The bleb of each patient was scanned with a prototype, swept-source optical coherence tomography (OCT)-based PS-AS-OCT system. Attenuation coefficient images of blebs were calculated from OCT intensity signal information. The deep-tissue contrast level of the images (ie, scleral flap intensity/bleb surface wall intensity) was determined for both the attenuation coefficient images and original intensity images. The original intensity and attenuation coefficient images were composited with birefringence images in order to highlight the highly birefringent scar tissue.

Results: The deep-tissue contrast level of the attenuation coefficient images was significantly improved: it was 9.5 ± 4.6 times higher than the original intensity images ($P < 0.01$). Additionally, the interior bleb structure and scleral flap were clearer in most of the attenuation coefficient images than in the original intensity images. Furthermore, the composited attenuation coefficient and birefringence images enabled superior visualization of intrableb structure and evaluation of the birefringence characteristics of the bleb, in comparison with the composited original intensity and birefringence images.

Conclusions: The attenuation coefficient images may improve the visibility of the structure of bleb and be a useful way to evaluate changes in the structure and optical properties of the filtering bleb, especially in composited birefringence images.

Poster No.: EX1-081
Panel No.: 081

Utility of Goldmann Applanation Tonometry for Monitoring Intraocular Pressure in Glaucoma Patients With a History of Laser Refractory Surgery

First Author: Sang Yeop LEE
Co-Author(s): Hyoung Won BAE, Chan Yun KIM, Hee Jung KWON, Gong Je SEONG

Purpose: To investigate the utility of Goldmann applanation tonometry (GAT) for monitoring intraocular pressure (IOP) in open-angle glaucoma (OAG) patients with a history of laser refractive surgery, comparing IOP fluctuations measured using GAT and dynamic contour tonometry (DCT) on the same day.

Methods: In this retrospective study, patients were divided into 1 of 2 subgroups according to IOP fluctuation values using GAT: 43 eyes in the low IOP fluctuation group [LIFG (GAT fluctuation ≤ 1.7 mm Hg)] and 55 eyes in the high IOP fluctuation group [HIFG (GAT fluctuation > 1.7 mm Hg)]. IOP fluctuation was defined as the standard deviation of all IOP values during follow-up. IOP parameters using GAT were compared with those of DCT. Correlation analyses were performed among IOP parameters and between IOP fluctuation and associated factors including central corneal thickness, corneal curvature, and axial length.

Results: All IOP parameters demonstrated significantly high values in the HIFG compared with those in the LIFG. Mean and peak IOP using DCT were significantly higher than those using GAT in both groups. However, there were no significant differences in IOP fluctuation and reduction using both tonometry methods in the HIFG ($P = 0.946$ and $P = 0.986$, respectively). Bland-Altman analysis revealed similar fluctuations using GAT and DCT. In multivariate analyses, there was a significant correlation between fluctuations using GAT and DCT in the HIFG ($P = 0.043$).

Conclusions: These results suggest that IOP monitoring using GAT is a reliable method of monitoring IOP change in glaucoma patients with a history of laser refractive surgery.

Poster No.: EX1-082
Panel No.: 082

Visual Impairment Among Glaucoma Patients Seen in a Philippine Tertiary Hospital

First Author: Cathleen Camille CABRERA
Co-Author(s): Joseph Anthony TUMBOCON

Purpose: To determine the prevalence of visual impairment among glaucoma patients according to the International Classification of Diseases Clinical

Modification (ICD-9-CM) definition and evaluate the factors associated with it.

Methods: Data were gathered via chart review of glaucoma patients seen between January 2011 and June 2016 in a Philippine tertiary hospital. Visual acuities were categorized based on the ICD-9-CM definition. Diagnoses were based on the International Society for Geographic and Epidemiological Ophthalmology classification and staged using the Brusini staging system 2. The prevalence and factors affecting visual impairment were analyzed using chi-square test and multiple logistic regression.

Results: Out of 435, 234 (53.8%) had (near-) normal vision, 124 (28.5%) had low vision, and 77 (17.7%) had (near-) blindness. Univariate analysis revealed that less than 40 years old, male, glaucoma more than 10 years, negative family history, ocular comorbidities, unilateral disease, cup-to-disc ratio greater than 0.7, secondary glaucoma, and closed angle had greater percentage of patients with low vision and (near-) blindness. On multivariate analysis, the odds ratio for low vision and (near-) blindness was 2.73 [95% confidence interval (CI), 1.27-5.87] for males compared to females, 3.34 (95% CI, 1.44-7.71) for those with ocular comorbidities compared to those without, and 21.33 (95% CI, 2.39-190.61) for a generalized field defect compared to those with a localized pattern.

Conclusions: The most prevalent level of visual impairment was (near-) normal vision. The male sex, presence of ocular comorbidities, and a generalized field defect are significantly associated with low vision and (near-) blindness.

Poster No.: EX1-083
Panel No.: 083

Whole Population Trends in Glaucoma Surgery in Western Australia (1992-2013)

First Author: Jonathon NG
Co-Author(s): Antony CLARK, Nigel MORLET

Purpose: To describe glaucoma surgery trends in a whole population.

Methods: All trabeculectomies and tube operations were identified using linked hospital data.

Results: Over 21 years annual trabeculectomy incidence decreased 7% [incidence rate ratio (IRR) 0.93, $P < 0.001$, 32/100,000 in 1992 versus 13/100,000 in 2013] whilst tube operations increased 15% (IRR 1.15, $P < 0.001$, 0.07/100,000 in 1992 versus 4.4/100,000 in 2013). Since 2000, the decreasing trabeculectomy incidence slowed markedly (IRR 0.98) compared to before 2000 (IRR 0.91). Men were more likely to have trabeculectomy (IRR 1.11, $P < 0.001$) and tube surgery (IRR 1.25, $P = 0.003$) than women. Incidence increased

in older age groups for trabeculectomy and tube surgery.

Conclusions: Incidence of trabeculectomy decreased over 21 years but remained overwhelmingly more common than tube surgery. The marked decrease in trabeculectomies in the late 1990s may be related to the introduction of topical prostaglandin analogs.

Poster No.: EX1-276
Panel No.: 276

Efficacy and Complications of Single Releasable Sutures Versus Single Permanent Sutures in Early Postoperative Period After Combined Surgery

First Author: Amit SOLANKI

Purpose: To compare the postoperative intraocular pressure (IOP) and the incidence of early complications after combined surgery with single releasable sutures to combined surgery with single permanent sutures.

Methods: Seventy-eight patients diagnosed as primary open angle glaucoma with visually significant cataract were randomly selected to 2 treatment groups: group A, single permanent suture at the apex of the scleral flap (40 patients); and group B, single releasable suture at the apex of the scleral flap (38 patients). The postoperative IOP and complications after surgery were compared at frequent follow-up visits during the first 2 months after the surgery.

Results: IOP at first week was significantly higher in group B but no difference was observed after the second week. Group A patients had significantly higher frequency of hypotony and shallow anterior chambers.

Conclusions: The 2 surgical procedures showed equivalent efficacy in IOP control after the first week. But the surgeries performed with releasable suture were better tolerated than those without releasable suture.

Poster No.: EX1-277
Panel No.: 277

Factors Associated With Zonular Instability During Cataract Surgery in Eyes With Acute Angle Closure Attack

First Author: Junki KWON
Co-Author(s): Kyung Rim SUNG

Purpose: To compare the demographics and ocular characteristics, including anterior segment optical coherence tomography images and zonular instability, in eyes with a history of acute angle closure (AAC) attack and subsequent cataract surgery.

Methods: A total of 68 eyes of 56 patients with a history of AAC attack who underwent cataract surgery

were enrolled in this retrospective and comparative study. Fourteen eyes were assigned to the zonular instability (+) group and 54 were assigned to the zonular instability (-) group based on the presence of zonular instability during cataract surgery. The peak intraocular pressure, preoperative spherical equivalent (SE), axial length (AL), anterior chamber depth (ACD), and lens vault (LV) were measured and compared between the 2 groups. Intereye (intraindividual) comparison was also performed. Factors associated with zonular instability were assessed.

Results: In the zonular instability (+) group, 9 eyes were from male and 5 from female participants. Eyes in the zonular instability (+) group showed less hyperopic SE values, longer AL, shallower ACD, and higher LV, as compared with those in the zonular instability (-) group (all $P \leq 0.001$). Moreover, eyes in the zonular instability (+) group had less hyperopic SE, shallower ACD, and higher LV than their fellow eyes. Less hyperopic SE, longer AL, and higher LV were significantly associated with zonular instability on multivariate logistic regression analysis.

Conclusions: Clinicians should consider the possibility of zonular instability during cataract surgery for eyes with less hyperopic SE, longer AL, and higher LV among those a history of AAC attack.

Poster No.: EX1-278
Panel No.: 278

Intraoperative Versus Delayed Postoperative Application of Mitomycin C in Trabeculectomy: A Pilot Study

First Author: Surinder PANDAV
Co-Author(s): Natasha GAUTAM, Sushmita KAUSHIK, Srishti RAJ, TT FAISAL

Purpose: To evaluate the use of delayed postoperative application of mitomycin C following trabeculectomy.

Methods: Glaucoma patients scheduled for surgery for intraocular pressure (IOP) control were randomized into 2 groups. Group I (n = 9) received intraoperative mitomycin C in a dose of 0.2 mg% for 2 minutes. Group II (n = 8) received postoperative mitomycin C of 0.01 mg (0.25 mL of 0.04%) injected subconjunctivally between days 10-14 postoperatively. Outcome measures were IOP, bleb morphology, and complications at different time points up to 1 year.

Results: Seventeen patients of comparable age with a spectrum of glaucoma diagnosis were included in the study. The preoperative IOP in group I was 25.3 ± 11.18 while in group II was 34.75 ± 11.31 on 2.8 ± 1.6 and 3.3 ± 0.71 antiglaucoma drops, respectively. The postoperative mean IOP at 3 months, 6 months, and 1 year was 12.5, 11.9, and 15.2 mm Hg in group I which was not significantly different from group II.

The mean number of topical antiglaucoma drugs at final follow-up was 0.5 in group I and 0.6 in group II. Two patients developed choroidals in group I of which 1 required anterior chamber (AC) reformation, 2 had persistent hypotony, 2 had hyphema which was managed conservatively while 1 needed bleb needling for elevated IOP. In group II, hyphema and choroidals were seen in 2 patients each which were managed conservatively. Two patients developed tenon cyst, 1 of which resolved spontaneously while 1 required needling.

Conclusions: Delayed postoperative mitomycin C application is comparable to intraoperative application in efficacy with marginally less complications. Postoperative application gives us the option to use mitomycin C only when needed and at the appropriate time.

Intraocular Inflammation, Uveitis & Scleritis

Poster No.: EX1-084
Panel No.: 084

A 10-Year Retrospective Review of the Clinical Features and Visual Outcomes of Acute Retinal Necrosis

First Author: Stephanie **CHEUNG**
Co-Author(s): Carmen **CHAN**, Shaheeda **MOHAMED**

Purpose: To examine the presenting features, anatomic, and visual outcomes of acute retinal necrosis (ARN) in a cohort of polymerase chain reaction (PCR)-positive eyes.

Methods: This retrospective observational cohort study included 16 eyes of 15 patients diagnosed between 2006 and 2016 with ARN, who were PCR-positive for herpes simplex virus (HSV), varicella zoster virus (VZV), or cytomegalovirus (CMV), and followed up for at least 1 year. Baseline clinical characteristics, results of PCR viral DNA analysis, ocular sequelae including retinal detachment, and final visual acuity (VA) were evaluated.

Results: VZV was detected in 80.0% (12/15) of eyes, HSV in 13.3%, and CMV in 6.7%. Presenting VA was generally poor (20/50 to >20/200 in 80%; >20/50 in 20%). All patients received intravenous acyclovir and oral antiviral therapy with systemic corticosteroids. A total of 87.5% of eyes received intravitreal ganciclovir and/or foscarnet. A total of 81.3% received prophylactic barrier laser to areas posterior to the necrotic retina, 62.5% (8/13) of which developed retinal detachment (RD) requiring surgical intervention. Of the 18.7% (3/16) of eyes that did not receive barrier laser, 66.7% of eyes developed RD. Epiretinal membrane was seen in 50% of eyes. Final VA was ≥ 0.1 in 62.5% of eyes and < 0.1 in

37.5% of eyes mainly due to RD. Prophylactic laser or use of double-agent intravitreal agents did not make a significant difference to visual outcomes ($P = 0.81$).

Conclusions: VZV was the most common cause of ARN. Despite therapy, a significant number of patients developed RD, and visual prognosis was guarded despite surgical intervention.

Poster No.: EX1-085
Panel No.: 085

Adult-Onset Orbital Xanthogranuloma Associated With Systemic IgG4-Related Disease

First Author: Peter **LEUNG**

Purpose: Adult-onset xanthogranulomatous disease (AOX) of the orbit is characterized by xanthelasma-like masses in the orbital adnexa, with foamy macrophages and Touton giant cells on histology. IgG4-related orbital disease (IgG4-RD) is a systemic fibroinflammatory disorder that may have orbital involvement: histology is characterized by storiform fibrosis and IgG4 positive plasma cells. Interestingly, these 2 diseases share a common denominator. Here, we present a 61-year-old with biopsy-proven AOX and systemic IgG4-RD, demonstrating the need for greater awareness of this association.

Methods: A 61-year-old man presented with a 1-year history of unilateral periorbital swelling, with a history of parotid enlargement and autoimmune pancreatitis. Relevant clinical, radiological, and histopathological findings are shown.

Results: Magnetic resonance imaging (MRI) revealed enhancement over the preseptal area of the left globe. Anterior orbitotomy and biopsy showed foamy histiocytes and Touton giant cells, all of which are pathognomonic findings in xanthogranulomas. The lesion regressed with a steroid regimen but recurred upon cessation. The condition progressed, leading to an irreversible compressive optic neuropathy and severe vision degradation. Positron emission tomography did not reveal any evidence of Erdheim-Chester disease. Laboratory results confirmed elevated serum IgG4 levels, and biopsy immunostaining for IgG and IgG4 was positive. This, together with histological features from a previous parotid biopsy sample, satisfied the criteria for systemic IgG4-RD.

Conclusions: An association exists between AOX and systemic IgG4-RD. This current case highlights the importance of seeking clinical, histological, and extraorbital manifestations of IgG4-RD when a patient is diagnosed with histologically proven AOX.

Poster No.: EX1-086
Panel No.: 086

An Unusual Presentation of Masquerade Syndrome

First Author: Michelle Marie SUPAPO

Co-Author(s): Jesus Jacinto BAUTISTA, Almira MANZANO

Purpose: To describe an unusual presentation of masquerade syndrome in the form of bilateral hypopyon in a 2-month-old female.

Methods: This was a retrospective and descriptive case report based on clinical records, laboratory, and diagnostic examinations.

Results: Masquerade syndromes comprise a group of disorders that present with intraocular inflammation which may or may not be neoplastic in nature. It may involve an underlying primary cause that is not immune mediated. It may also be associated with an apparent clinical picture in the form of intraocular inflammation. A high index of suspicion is warranted when this apparent clinical picture is seen in extremes of age. We report an atypical presentation of a presumed case of juvenile myelomonocytic leukemia who presented with a 3-week history of a whitish opacity in the anterior chamber of both eyes. Visual acuity at this time was reaction to bright light in both eyes. External eye examination showed slight proptosis of both eyes with noted <0.5 mm hypopyon on the right eye and an approximately 1.5 mm hypopyon on the left eye. B scan was done which showed minimal choroiditis of both eyes. Other diagnostic examinations were done including complete blood count (CBC) which showed hemoglobin of 80 (low), white blood cell (WBC) of 10 (high), and platelet of 35 (low). Peripheral smear showed the presence of 17% atypical mononuclear blast cells.

Conclusions: A high index of suspicion is warranted when clinicians are presented with such atypical clinical presentations.

Poster No.: EX1-087
Panel No.: 087

Atypical Histological Features of Orbital IgG4-Related Sclerosing Disease

First Author: Stacey Carolyn LAM

Co-Author(s): Wah CHEUK, Hunter YUEN

Purpose: To report 3 unusual cases of IgG4-related diseases with atypical histological features.

Methods: Case series of 3 patients who presented to a tertiary hospital in Hong Kong.

Results: Case 1 and 2 were middle-aged men who presented with bilateral periorbital swelling. Both of

them had IgG4-related orbital disease with typical clinical, morphological, and immunohistochemical features; however, histology showed presence of multifocal perifollicular granulomas. Case 3 was a middle-aged man with bilateral lacrimal gland enlargement. Histology showed scattered Hodgkin-like cells in the lymphoid infiltrate, which exhibited morphologic and immunohistochemical features overlapping with neoplastic Reed-Sternberg (RS) cells.

Conclusions: The diagnosis of IgG-related sclerosing disease requires clinical, hematological, and histopathological review. Clinical signs are characteristic diffuse or localized swelling or mass in single or multiple organs. Hematological evidence is serum IgG4 more than 135 mg/dL. Histopathological features are marked lymphocyte and plasmacytic infiltration and fibrosis and infiltration of IgG4 plasma cells. Our first 2 cases had typical features of IgG4 disease except for the presence of multifocal perifollicular granulomas, which are more typical of granulomatous disease such as granulomatosis with polyangitis. The third case also had typical features except presence of Hodgkin-like cells, which are also seen in malignant lymphoma. Based on our 3 cases, we propose that perifollicular granuloma indeed may represent 1 morphologic manifestation of IgG4-related disease, and the consensus diagnostic criteria of IgG4-related disease may need to be modified to accommodate this feature. Moreover, the presence of RS-like cells does not exclude the diagnosis of IgG4-related disease.

Poster No.: EX1-088
Panel No.: 088

Cold Presenters and Congestive Disease Based on MRI STIR Sequence in Chinese Thyroid-Associated Orbitopathy Cohort

First Author: Amy YU

Co-Author(s): Kelvin CHONG

Purpose: To validate the concept of cold presenters and congestive disease based on magnetic resonance imaging (MRI) short tau inversion recovery (STIR) sequence in a Chinese thyroid-associated orbitopathy cohort.

Methods: MRI STIR coronal images, clinical activity scores (CAS), and patient demographics were collected from the electronic patient record system for patients that attended the university thyroid eye clinic from 2013 to 2017. The signal intensity of the extraocular muscles was compared to the signal of the temporalis muscle of each individual patient and an increase in signal corresponded to active thyroid eye disease. CAS were determined by ophthalmologists at the university thyroid eye clinic and CAS equal to or greater than 3 were considered as clinically active TAO.

Results: A total of 268 TAO patients with MRI of the orbit were recruited and 67 patients with STIR sequence were analyzed. A total of 30% of patients with CAS < 3 had increased MRI STIR signal intensity, characterizing the cold presenters of TAO. A total of 25% of patients with clinically active disease had normal MRI STIR signal, representing patients with congestive TAO. Of the cold presenters, the majority were female nonsmokers with diplopia as the most common complication, whereas patients with congestive TAO were mostly affected by dry eyes.

Conclusions: The concept of cold presenters and congestive disease in TAO is well demonstrated by comparing clinical activity score with MRI STIR signal intensity. Validation of such concept can be clinically helpful in diagnosis and treatment selection for Chinese TAO patients. The use of MRI STIR imaging has promising potential to be a useful clinical tool, which is justification for further studies to be done.

Poster No.: EX1-089
Panel No.: 089

Comparative Study of Clinical, Pathological, Serological Features, and Therapeutic Approaches of Patients With IgG4-Related Ophthalmic Disease, Idiopathic Orbital Inflammation, and Sarcoidosis of the Orbit/Ocular Adnexa

First Author: Jiaying ZHANG

Purpose: To compare and contrast the clinical, pathological, serological features, and therapeutic approaches of patients with IgG4-related ophthalmic disease (IgG4-ROD), idiopathic orbital inflammation (IOI), and ocular sarcoidosis.

Methods: A retrospective case series of 8 patients was undertaken for orbital and systemic manifestations and reactions to treatment from records of our hospital from 2013 to 2016. Clinical, serological, and a variety of histopathologic features were collected for 3 patients with IgG4-ROD, 4 patients with IOI, and 1 ocular sarcoidosis patient. Oral prednisone was initiated at 1 mg/kg daily and gradually tapered to a minimum effective dose. Efficacy was assessed on the basis of an objective observation of decreased swelling.

Results: Seven of 8 patients displayed decreased symptoms of swelling eyelid (3 IOI), enlargement of lacrimal glands (3 IgG4-ROD and 1 sarcoidosis), and serological signs (IgG4-ROD). Discriminating serological features were the levels of IgG4 and IgE. Low-dose prednisone was able to induce a durable response in the authors' patients.

Conclusions: IgG4-ROD, IOI, and sarcoidosis share clinical, imaging, and histopathological features

including IgG4+ plasma cells. Significant differences were the eyelid involvement in IOI, lacrimal gland involvement, and an elevated IgG4 serologically in IgG4-ROD.

Poster No.: EX1-090
Panel No.: 090

Culture-Positive Endogenous Endophthalmitis: 12-Year Experience at a Tertiary Eye Hospital

First Author: Bhavik PANCHAL

Co-Author(s): Avinash PATHENGAY, Savitri SHARMA

Purpose: To investigate clinical features, microbiology, and treatment outcomes associated with endogenous endophthalmitis.

Methods: A retrospective review of 118 consecutive patients with culture-proven endogenous endophthalmitis was done from January 2006 to March 2013.

Results: In total, 118 cases of endogenous endophthalmitis were identified over the study period with a mean age of 53.5 years, and 52.5% were male. The mean follow-up was 13.4 ± 10.9 months. Final visual acuity of 20/200 or better was seen in 33.2% of eyes. Of the total 118 culture-positive endogenous endophthalmitis cases, 96 (81.36%) were bacterial and 22 (18.64%) were fungal isolates. Gram-positive cocci (49/96, 51.04%) were more common than Gram-negative organisms (42/96, 43.75%). *Streptococcus pneumoniae* (30/49, 61.22%) was the most common isolate among the Gram-positive cocci and *Pseudomonas* (12/42, 28.57%) among the Gram-negative organism group. Gram-positive isolates were most susceptible to vancomycin (97.9%), chloramphenicol (93.8%), and cefazolin (91.8%) whereas Gram-negative isolates to ciprofloxacin (76.2%), chloramphenicol (66.6%), and amikacin (64.2%). The fungal isolates included *Aspergillus* as the most common organism in 9/22 (40.9%), followed by *Candida* in 3/22 (13.6%), *Fusarium* in 3/22 (13.6%), and *Scedosporium spp* in 2/22 (9.1%).

Conclusions: Endogenous endophthalmitis is a rare but serious ocular condition and has a varied etiology. This study provides information about the clinical and microbiologic profile. Filamentous fungi were more common than yeast in cases of fungal endogenous endophthalmitis.

Poster No.: EX1-091
Panel No.: 091

Effects of Green Tea Extract in Experimental Autoimmune Uveoretinitis

First Author: Jian LI

Co-Author(s): Sun On CHAN, Wai Kit CHU, Calvin PANG, Jialin REN, Wong Ying YIP

Purpose: Uveitis is a group of blinding diseases of intraocular inflammation. However, the current standard therapy, corticosteroid, has many potential side effects. A considerable portion of patients even fail to respond to the steroid. Therefore, effective alternative treatments are desirable. Green tea extract (GTE) has been extensively studied as an herbal remedy due to its antagonistic effects against oxidation and inflammation. The present work investigates the anti-inflammatory effects of GTE on an experimental autoimmune uveoretinitis (EAU) model.

Methods: By following a robust procedure, EAU was induced in C57BL/6J mice. Controls were mock induced with PBS. Different doses of GTE, steroid, or water treatment were administered orally. Long-term effects of GTE on EAU were monitored in real time by noninvasive technologies such as optical coherence tomography, fundus fluorescein angiography, and electroretinography (ERG). Histological changes and proinflammatory gene expression were assessed after killing the animals.

Results: GTE effectively alleviated ocular inflammation in EAU by improving the clinical signs of ocular inflammation, reducing the fold change of retinal-choroidal thickness and the major retinal vessel diameter, reserving the ERG scotopic and photopic amplitudes during EAU, and suppressing the expression of proinflammatory genes ($P < 0.05$). The therapeutic effect was dose-dependent. Remission of the EAU as a result of GTE treatment was comparable to that in dexamethasone-treated EAU mice ($P > 0.05$). No detectable defects were observed in histology of the liver and kidney after GTE treatment.

Conclusions: Our findings show that GTE is a potent anti-inflammatory agent against the inflammation of autoimmune uveitis.

Poster No.: EX1-092
Panel No.: 092

Endogenous Endophthalmitis From Renal Abscesses: A Case Report and Review of the Literature

First Author: Daniel WONG

Co-Author(s): Kenneth LI, Candice LIU, Man Kit TONG

Purpose: We present a case of endogenous

endophthalmitis due to an unusual bacterium, *Citrobacter koseri*. We also reviewed the available literature on renal abscess-related endogenous endophthalmitis.

Methods: Case report and review of literature.

Results: A 57-year-old woman without prior history of eye surgery or trauma presented with diabetic ketoacidosis and a painful right eye with reduction of vision. *C. koseri* was identified in blood culture and vitreous culture.

Conclusions: Cases of endogenous endophthalmitis caused by *Citrobacter* are very limited, and a review of all published cases in the English literature and the present case revealed that endogenous *Citrobacter* endophthalmitis arose almost entirely from *Citrobacter* renal infection. A review of the literature also suggests prompt recognition and drainage of renal abscess to lower the chance of uncontrolled infection and endogenous spread to the eyes.

Poster No.: EX1-093
Panel No.: 093

Identification of Risk Factors for Uveitis Among Patients Diagnosed With Axial Spondyloarthritis in a Chinese Population

First Author: Oi Man WONG

Co-Author(s): Shirley CHAN, Ho Yin CHUNG, Chak Sing LAU, Helen TSANG

Purpose: To identify the associating factors for uveitis in Chinese patients with axial spondyloarthritis (SpA).

Methods: Patients fulfilling Assessment of SpondyloArthritis (ASAS) axial SpA criteria were consecutively recruited from 3 rheumatology centers in Hong Kong. Clinical, biochemical, and radiological parameters were collected. History of uveitis was enquired from both history and medical records. All patients received whole spine and sacroiliac (SI) joint magnetic resonance imaging (MRI). Clinical and radiological findings were compared between patients with and without uveitis with independent Student t test. Factors associated with uveitis were identified with univariate analysis and multivariate logistic regression.

Results: Among 227 patients, 73 (32.2%) patients had history of uveitis. Male to female ratio was 57.2 to 42.9. Age (45.8 vs 41.8 years; $P = 0.03$) and HLA-B27 positivity (92.3% vs 73.8%; $P = 0.002$) were significantly higher in the uveitis group (UG). Patients in the UG had significantly less smokers (19.2% vs 36.4%; $P = 0.01$), MRI SI joint inflammatory score (SPARCC score 2.1 vs 4.2; $P = 0.03$), swollen joint count (0.3 vs 0.8; P

= 0.004), and C-reactive protein (0.7 vs 1.3 mg/dL; $P = 0.003$). Radiological ankylosing spondylitis (AS) was less prevalent in the UG (58.9% vs 71.9%; $P = 0.05$). Multivariate regression showed older age [odds ratio (OR), 3.55; $P = 0.02$] and HLA-B27 positivity (OR, 1.03; $P = 0.03$) were positively associated with uveitis, while radiological AS (OR, 0.46; $P = 0.04$) and smoking (OR, 0.36; $P = 0.02$) were negatively associated with uveitis.

Conclusions: Older age and HLA-B27 positivity were associated with significantly higher risk for development of uveitis among SpA patients. Occurrence of uveitis was negatively associated with smoking and the presence of radiological AS.

Poster No.: EX1-279
Panel No.: 279

Measurement of Aqueous Flare Using a Confocal Ocular Spot Fluorometer

First Author: Sangly **SRINIVAS**
Co-Author(s): Pavani **MURTHY**, *Subashree* **MURUGAN**,
Prema **PADMANABHAN**, *Rachapalle Reddi* **SUDHIR**,
Sirisha **TADEPALLI**

Purpose: In this study, we employed a spot fluorometer equipped with a lock-in amplifier for aqueous flare measurements in a cohort of post-cataract patients. The inclusion of the lock-in amplifier overcomes the influence of external light and electronic noise in the measurements. Therefore, we expect to enhance the dynamic range of the measurements.

Methods: We used a custom-made fluorometer (axial resolution = 100 μm) to measure light scatter from the anterior chamber (AC) as an index of aqueous flare. For scatter measurements, we removed the blue excitation filter, positioned the focal diamond in the AC, and employed excitation slits at 0.5/0.25 mm. The excitation and emission arms were held 45 degrees apart for all measurements.

Results: The light scatter in normal subjects was 0.1478 ± 0.0054 mV and 0.0562 ± 0.0036 mV ($n = 52$ eyes) and in post-cataract subjects (day 1), it was 0.2949 ± 0.0132 and 0.1407 ± 0.0083 mV ($n = 61$ eyes) at 0.5 mm and 0.25 mm slit widths, respectively. By the fourth postoperative day, the light scatter from the AC decreased to 0.1925 ± 0.0056 and 0.0688 ± 0.0037 mV ($n = 28$ eyes) at 0.5 mm and 0.25 mm slit widths, respectively. In all subjects, the light scatter was proportionately higher with increasing grade of aqueous flare as per Standardization of Uveitis Nomenclature (SUN) scoring system.

Conclusions: Our spot fluorometer with slit widths of 0.5/0.25 mm can reliably grade aqueous flare quantitatively. Hence, our approach can replace the subjective SUN scoring system in monitoring the efficacy of pharmacological strategies in uveitis.

Poster No.: EX1-094
Panel No.: 094

Ocular Manifestations in HIV/AIDS Patients in a Tertiary Referral Hospital in Indonesia from January 2014 to December 2016

First Author: Made **SUSIYANTI**
Co-Author(s): Lisa **MAULIDA**

Purpose: Patients with HIV/AIDS may show numerous symptoms related to direct damage caused by the virus or their decreased immunity. Ocular manifestation in those patients is more common nowadays due to the increased life expectancy in the era of highly active antiretroviral therapy (HAART). This study aims to acknowledge the ocular manifestations and profile in patients with HIV/AIDS.

Methods: Medical records of new patients with HIV/AIDS that came to a tertiary referral hospital in Indonesia from January 2014 to December 2016 were reviewed retrospectively. Demographic and clinical characteristics were evaluated.

Results: From January 2014 until December 2016, there were 60 new patients with HIV/AIDS that came to the hospital and only 45 patients were evaluated. Most of them were male (68.9%), with age ranging around 25-49 years (84.4%). The most common risk factor found was sexual behavior (24.4%). Cytomegalovirus (CMV) retinitis was the most prevalent diagnosis (35.6%), followed by retinochoroiditis toxoplasma (11.1%) and retinochoroiditis tuberculosis (8.9%). A total of 48.5% of subjects had both eyes involved. There were 48.3% of eyes with best corrected visual acuity (BCVA) of $<3/60$ at the first visit, which increased to 62.7% at the end visit. At the first visit, CD4 count of most patients was less than 200 cell/ μL (48.9%), with 51.1% already on HAART at the first visit.

Conclusions: CMV retinitis, retinochoroiditis toxoplasma, and retinochoroiditis tuberculosis were the 3 most common ocular manifestations in our study. Male, young age, and high-risk sexual behavior comprised the most common profile of the patients.

Poster No.: EX1-095
Panel No.: 095

Post Fever Retinal Vasculitis With Retinitis: A Novel Hypothesis About the Natural History and Resolution

First Author: Bhavik **PANCHAL**
Co-Author(s): Avinash **PATHENGAY**, *Rajeev* **REDDY**

Purpose: To propose a novel hypothesis about the natural history and resolution pattern of post fever retinal vasculitis with retinitis.

Methods: This was a retrospective observational study

of 25 eyes (15 patients). Cases diagnosed as post fever retinal vasculitis with retinitis, irrespective of the etiology, were identified from our database from January 2012 to June 2016 and studied for patient demography, clinical presentation, and treatment.

Results: Average age was 31.5 years (range, 12–59). Bilateral involvement was seen in 10/15 cases. History of fever prior to vision loss was noted in 10/15 cases. The mean visual acuity was 0.9 ± 0.6 at presentation and 0.4 ± 0.4 at final follow-up. Mean follow up was 22 weeks. The common morphological presentation was unifocal (10/25 eyes) or multifocal (15/25 eyes) retinitis lesions at the posterior pole predominantly juxtapapillary. Fluorescein angiography showed initial hypofluorescence with late perilesional hyperfluorescence. Optical coherence tomography showed increased hyperreflectivity with loss of inner retinal architecture which returned to normal after resolution. Foveal thinning was noted in 9/25 eyes wherein the lesions involved the fovea and led to reduced vision. This was the same subset of eyes that showed immediate worsening following treatment. Treatment included steroids either oral or intravitreal (7/15), oral antibacterials (12/15), and anti-vascular endothelial growth factor (anti-VEGF; 11/15). Complications included neovascularization of the disc (3/25), disc edema, and secondary branch retinal artery occlusion (BRAO; 1/25).

Conclusions: Post fever retinal vasculitis with retinitis presents with a similar morphological pattern regardless of the etiology. Immediate worsening may be noted in some cases and these eyes may demonstrate foveal thinning on resolution leading to reduced visual acuity.

Poster No.: EX1-096

Panel No.: 096

Sporadic Cases of Delayed-Onset Toxic Anterior Segment Syndrome Mimicking Chronic Postoperative Inflammation: Role of Enzymatic Detergent

First Author: Premala Devi SIVAGURUNATHAN

Purpose: To present sporadic cases of delayed toxic anterior segment syndrome (TASS) at Kuala Pilah Cluster Hospitals after cataract surgery.

Methods: Fifteen eyes of 15 patients who presented sporadically with delayed TASS over a 12-month period were studied. Patients were from 2 centers within the Kuala Pilah Cluster Hospitals. Detailed anterior segment, fundus examinations, and B-scan were performed. During the follow-up period, all possible causes were evaluated including perioperative risk factors, duration of surgery, surgeon, complications, type of phacoemulsification machine used, operating

theatre temperature and humidity, processing such as sterilization technique of surgical instruments, irrigating solutions, drugs, viscoelastic substance (VES), and intraocular lens.

Results: Patients presented with blurring of vision and discomfort from as early as day 1 to 6 months postoperatively. Most patients had only mild anterior chamber reaction except for 2 patients who presented with diffuse corneal edema with fibrin and hypopyon. Two patients had suspicious vitreous opacity. Eight patients responded well to topical steroids alone, 5 patients needed additional oral steroids, and 2 patients were treated as endophthalmitis requiring vitreous tap and intravitreal antibiotics although later the vitreous tap yield was negative. Eleven patients had good outcome, 3 patients developed intractable neovascular glaucoma, and 1 patient developed secondary glaucoma with epiretinal membrane. Suspected cause for TASS was enzymatic detergent used to clean instruments. No new case has occurred after stopping usage of this product.

Conclusions: Enzymatic detergents appeared to increase the risk of TASS without providing any additional benefits and possibly due to immunological response some patients are more susceptible.

Poster No.: EX1-097

Panel No.: 097

Sympathetic Ophthalmia After Vitreoretinal Surgery: Clinical Characteristics and Outcomes

First Author: Komal AGARWAL

Co-Author(s): Rajeve PAPPARU, Mudit TYAGI

Purpose: To describe the clinical characteristics and outcomes of sympathetic ophthalmia after vitreoretinal surgery without any antecedent trauma.

Methods: A retrospective, noncomparative chart review of patients with sympathetic ophthalmia (SO) presenting between January 2010 and June 2017. Nine patients who underwent any pars plana procedure and subsequently developed SO were included. Cases with any history of antecedent trauma were excluded. Demographical data, presenting visual acuity, presenting symptoms, and signs were noted. Interval between surgical procedure and onset of symptoms was noted. Type of immunosuppression given was reviewed. Best corrected visual acuity after treatment was recorded.

Results: Nine eyes of 9 patients were included in the study. The median age at presentation was 36.3 years with a range of 22 to 56 years. The time from surgery to presentation of SO ranged from 1 month to greater than 14 years. The most common presenting symptom

was decrease in vision present in 100% of patients. Six (66.6%) patients presented with nongranulomatous anterior uveitis. Six (66.6%) patients also had exudative retinal detachment or neurosensory detachment at the time of presentation. Six patients received intravenous (IV) methylprednisolone at the time of presentation. All patients received systemic steroids and 7 received systemic immunosuppressants. Eight out of 9 patients showed significant improvement in the final visual acuity.

Conclusions: Sympathetic ophthalmia can present even years after a pars plana vitrectomy. A high index of suspicion is needed to identify SO after a pars plana vitrectomy. The prognosis of SO after pars plana procedures is better with present immunosuppression modalities.

Poster No.: EX1-098
Panel No.: 098

Variation of Ophthalmic Manifestations in Congenital Cytomegalovirus Infection Associated With Systemic Diseases: A 10-Year Review in the Department of Ophthalmology, Rajavithi Hospital

First Author: Matya SUWANSIRIKUL

Purpose: To describe the variability of clinical presentation of the ophthalmic manifestations in congenital cytomegalovirus (CMV) infection and also the presentation of associated systemic disease at a single institution (Rajavithi Hospital) in Thailand.

Methods: Retrospective review of medical records of patients diagnosed with congenital CMV infection from 2007-2016. The birth weight, gestational age, clinical presentation, ophthalmic findings, systemic symptoms, and treatment were recorded.

Results: Fifty-three cases were diagnosed with congenital CMV infection. Average birth weight was 2370 grams and 49% were preterm. A total of 66% had clinical presentation with systemic disease (hepatosplenomegaly, jaundice, sepsis, and microcephaly) and others presented with ocular symptoms. Thirty-three percent of ophthalmic findings were retinitis, 11% had cataract, 9% had retinal detachment, and 5% had optic disc atrophy.

Conclusions: Congenital CMV infections presenting with various clinical manifestations in our study had severe systemic infection and were a significant cause of blindness. Ophthalmic manifestations of the infection are variable with an unpredictable presentation. The clinical characteristics of active eye infection are important to recognize early, leading to proper systemic treatment.

Neuro-Ophthalmology

Poster No.: EX1-099
Panel No.: 099

Chloramphenicol-Induced Optic Neuropathy

First Author: Tiffany MA

Co-Author(s): Neil ABURN, Neil AVERY

Purpose: Chloramphenicol-induced optic neuropathy is a rare and serious complication of systemic use of this antibiotic. This toxic reaction was predominantly recognized in the 1960s in children with cystic fibrosis pulmonary disease caused by bacteria requiring prolonged courses of treatment. Reports are now infrequent reflecting modern prescribing trends. Chloramphenicol is still a drug reserved for refractory cases as antibiotic resistance increases, and therefore it is important to be aware of this potential complication with its use. We present a case of a cystic fibrosis patient with *Burkholderia cepacia* chronic lung disease requiring systemic chloramphenicol use and ophthalmological monitoring of optic nerve function.

Methods: Review of a case from initial presentation in childhood through to re-presentation 13 years later, followed by a literature review.

Results: Our case developed bilateral optic nerve swelling with prolonged use of systemic chloramphenicol in childhood that resolved on discontinuation of this antibiotic. Re-exposure of chloramphenicol later in life resulted in re-demonstrable optic neuropathy, which again completely resolved on drug withdrawal.

Conclusions: This case shows that optic nerve swelling and neuropathy is reproducible on recommencement of chloramphenicol therapy and still can have good to almost complete recovery upon drug cessation. Toxic optic neuropathy secondary to chloramphenicol is reported less often now due to declining use, but it remains important to recall this rare side effect as avoidance of prolonged courses or high doses can prevent this adverse reaction.

Poster No.: EX1-100
Panel No.: 100

Giant Cell Arteritis in a Patient With Waldenstrom Macroglobulinemia

First Author: Lucy LU

Purpose: To present a case of giant cell arteritis (GCA) in a patient with a complex medical background. The aim is to inform ophthalmologists and improve knowledge and awareness of systemic conditions that can affect the diagnosis and management of ocular

disease.

Methods: A case report of GCA diagnosed in a 77-year-old female with a background of Waldenstrom macroglobulinemia (WM) and multiple medical comorbidities. The clinical presentation, investigations, and differential diagnoses are discussed to reflect the clinical reasoning involved. A literature review was performed to update our understanding of WM and its ocular manifestations.

Results: The patient presented with sudden reduction of right vision on waking. Her corrected visual acuity was 6/18. She had a right relative afferent pupillary defect, intact color vision, superior hemifield loss, and a swollen optic nerve head with a disc hemorrhage. She had no systemic symptoms. Her history and examination were consistent with nonarteritic anterior ischemic optic neuropathy (NAAION); however, she had markedly elevated inflammatory markers. This was complicated by her background of WM and bronchiectasis which can raise these markers. She was initially treated as NAAION but a subsequent temporal artery biopsy was positive for GCA.

Conclusions: GCA is a well-recognized ocular emergency that requires prompt diagnosis and treatment with high dose steroid therapy. It shares many clinical characteristics with NAAION but they have vastly different management and visual prognosis. Waldenstrom macroglobulinemia is a rare hematological malignancy that has multiple systemic and ocular manifestations. This is the second report in the literature of GCA occurring in a patient with WM.

Poster No.: EX1-101

Panel No.: 101

Joubert Syndrome: A Rare Ocular Motility Disorder

First Author: Rehan NAQAISH

Co-Author(s): Naqaish SADIQ

Purpose: Joubert syndrome is a rare autosomal recessive disorder predominantly involving the cerebellar vermis and brain stem. It is characterized clinically by global developmental delay, abnormal ocular movements, hypotonia, ataxia, intellectual disability, and neonatal breathing abnormalities. Radiologically, the diagnosis essentially relies upon the finding of the "molar tooth" sign on magnetic resonance imaging (MRI). Due to its uncommon and unconventional presentation, its diagnosis is usually delayed. We report a case of a 5-year-old boy who presented with abnormal eye movements, regression of milestones, and developmental delay. MRI examination revealed the characteristic molar tooth sign and bat wing shaped fourth ventricle.

Methods: A 5-year-old boy was brought to the eye

clinic by his parents in November 2016 for poor vision and abnormal eye movements, hypotonia, and global developmental delay. On ocular examination his VAR was 3/60 and VAL was 6/60. He had jerky and nonfixing eye movements. Pursuit movements were absent and only saccades were visible. Exotropia of the right eye in the primary position, oculomotor apraxia, and see-saw nystagmus were observed. Both pupils were round and reactive to light. The retina was hypopigmented with no foveal landmark. The retinal vasculature and optic disc were normal in both eyes. MRI was done.

Results: MRI examination revealed the bat wing shaped fourth ventricle and the characteristic molar tooth sign, which is pathognomonic for Joubert syndrome.

Conclusions: High levels of clinical suspicion and a holistic approach to such children with delayed milestones and abnormal eye movements will help in early detection and diagnosis of even the rarest pathologies.

Poster No.: EX1-102

Panel No.: 102

Linezolid-Induced Optic Neuropathy

First Author: Xiao-Ming LI

Purpose: Optic neuropathy is a well-known cause of visual disturbances in linezolid-treated patients. We report a toxic optic neuropathy who was prescribed linezolid 400 mg once a day for 11 months.

Methods: A 33-year-old man with extensively drug-resistant pulmonary tuberculosis treated with linezolid for 11 months presented with painless loss of vision in both eyes. The patient received neuro-ophthalmic examination.

Results: The patient's best corrected visual acuity was 4/50 in both eyes. Fundus examination revealed mild disc edema, and color vision was severely disturbed on Ishihara color plates (11 of 36 and 9 of 36 plates) and Farnsworth-Munsell 100 [total error score: right eye (OD), 196; left eye (OS), 248]. Cecocentral scotomas were evident on visual field examination. Optical coherence tomography (OCT) revealed only mild optic disc swelling in superior margin. Pattern visual evoked potentials (PVEPs) showed both decreased amplitudes. Flash electroretinography (FERG) demonstrated passable waves in both eyes. Sixteen days after the cessation of linezolid, visual acuity was restored to 9/10 in both eyes. The color vision and visual field had improved markedly.

Conclusions: Doctors should be aware of impairments in vision among patients on long-term linezolid treatment and promptly discontinue treatment to prevent irreversible vision loss.

Poster No.: EX1-103

Panel No.: 103

Neuromyelitis Optica Pathology Produced in Rats by Intrathecal Administration of Human NMOIgG

First Author: Hao KANG

Co-Author(s): Shanshan CAO, Tingjun CHEN, Shaoying TAN, Shihui WEI

Purpose: Neuromyelitis optica (NMO) is a recurrent inflammatory disease that predominantly attacks the optic nerves and spinal cord. The goal of this study was to overcome the limitations of existing animal models of NMO and establish a robust model of NMO lesion in rats produced by repetitive intrathecal (i.th.) application of NMO-IgG and human complement.

Methods: Experiments were done using weight-matched Lewis rats. Intrathecal catheters (intrathecal length: 7.5 cm) were placed. After allowing recovery for 5 days, animals were randomized to receive either NMO patient serum with human complement or health control serum with human complement. All i.th. injections were painless as judged by daily observation of the rats and were done in the awake rat while gently immobilizing them for 30 seconds. Established ledge and hind limb clasping tests were used to score motor function. Immunofluorescence assay and RNA sequencing assay were performed.

Results: Behavioral studies showed impaired motor function in the rats receiving intrathecal NMO patient-IgG and human complement, including hind limb weakness and paralysis, along with urine or fecal incontinence. A NMO-like lesion was seen with loss of AQP4, GFAP, and MBP immunofluorescence around the site of injection in rats receiving NMO-IgG. NMO lesions in the spinal cord slices showed astrocyte damage with loss of AQP4 and GFAP, inflammation with leukocyte and granulocyte infiltration, and demyelination. The control group did not show these changes.

Conclusions: Behavioral studies and NMO spinal cord slices showed that we established a robust NMO pathology in Lewis rats following repetitive intrathecal injection of NMO patient-IgG and human complement.

Poster No.: EX1-104

Panel No.: 104

Primary Antiphospholipid Syndrome Presenting With Homonymous Quadrantanopsia

First Author: Sang Beom HAN

Purpose: To report a case of primary antiphospholipid syndrome presenting with isolated homonymous superior quadrantanopsia.

Methods: A 50-year-old Korean man presented with subjective visual disturbance for 1 month. Visual field testing showed a right homonymous superior quadrantanopsia.

Results: Brain magnetic resonance imaging (MRI) revealed an old infarct in his left occipital lobe and multiple lesions in other areas of the brain. Laboratory tests showed a marked increase in serum anti- $\beta 2$ glycoprotein I antibody, which remained elevated after 12 weeks. He was diagnosed with primary antiphospholipid syndrome and started anticoagulation therapy.

Conclusions: This is the first case report of primary antiphospholipid syndrome presenting with isolated homonymous quadrantanopsia. Antiphospholipid syndrome should be considered as a differential diagnosis in patients with homonymous visual field defects accompanying multiple cerebral infarcts.

Poster No.: EX1-105

Panel No.: 105

Too Much of a Good Thing?

First Author: Cheuk Ling YIM

Co-Author(s): Carmen CHAN, Noel CHAN, Jerry LOK

Purpose: Hypervitaminosis A is known to be associated with intracranial hypertension and papilledema. There were reported cases associating excessive consumptions of carrots, animal livers, or vitamin A supplements with elevated intracranial pressure. However, there is a wide interpersonal variability in the level eliciting toxicity and clinical diagnosis can be challenging. There is limited literature of hypervitaminosis A presented to neuro-ophthalmologists.

Methods: This is a retrospective case report of 2 patients presenting to the neuro-ophthalmic service with bilateral disc swelling, normal neuroimaging studies, and the presumed diagnosis of hypervitaminosis A. Current literature on hypervitaminosis A was also reviewed.

Results: We report 2 cases of suspected hypervitaminosis A with bilateral disc swelling. The first case was a 22-month-old infant that presented with bilateral cranial nerve (CN) VI palsy and papilledema. Lumbar puncture revealed opening pressure of >50 cm H₂O. He was later found to have consumed health supplements, with an elevated vitamin A level detected in blood. Repeated opening pressure was lowered spontaneously upon termination of health supplement consumption. The second case was a middle aged female who presented with bilateral visual blurring and occipital headache upon regular consumption of vitamin A supplements and carrot juice. Fundal examination revealed bilateral disc swelling which

resolved spontaneously upon cessation of ancillary vitamin A intake.

Conclusions: Despite the well-established relationship between hypervitaminosis A and papilledema, history of vitamin A intake was initially overlooked in these 2 cases. The diagnosis of hypervitaminosis A demands high clinical suspicion and our cases highlight the importance of thorough history taking in patients presenting with bilateral disc swelling.

Poster No.: EX1-280

Panel No.: 280

Ocular Complications of External Carotid Artery Angiography and Selective Embolization

First Author: Amit SOLANKI

Purpose: To study the possible etiology or ocular complications of external carotid angiography, which is normally considered as a safe procedure.

Methods: Nasopharyngeal angiofibromas are highly vascular tumors that receive their main blood supply from the internal maxillary artery; due to high vascularity, they are traditionally difficult to manage. We report 2 cases of nasopharyngeal angiofibroma that underwent external carotid artery angiography and selective embolization by polyvinyl particles (PVA particles). The procedures were uneventful.

Results: A few hours later, 1 patient developed ipsilateral loss of vision and the second patient reported bilateral loss of vision after the procedure. The first case had ipsilateral central retinal artery occlusion due to excessive run-off and unplanned embolization by PVA particles and he did not improve. The second case had bilateral toxic anterior optic neuropathy due to iodine-based contrast medium and improved with a high dose of intravenous methylprednisolone.

Conclusions: The purpose of these reports is to highlight the potential risk of permanent blindness following external carotid artery embolization, which is assumed to be a safe procedure.

Ocular Imaging

Poster No.: EX1-106

Panel No.: 106

A Method of Measuring Retinal Vascular Density From Optical Coherence Tomography Angiography

First Author: Colin TAN

Co-Author(s): Kelvin LI, Louis LIM

Purpose: The study of retinal vessel density is crucial in

evaluating disease severity and progression especially in retinal diseases such as diabetic retinopathy. This capability is not available on all optical coherence tomography angiography (OCTA) devices. Hence, our study aims to describe a novel technique of evaluating retinal vessel density using OCTA images.

Methods: In a prospective cohort study of 14 volunteers (7 healthy and 7 pathological cases), 3 mm x 3 mm OCTA scans were performed on both eyes using the AngioVue OCTA system. OCTA scans of the superficial retinal vasculature were exported and assessed using ImageJ (version 1.49, W. S. Rasband, Maryland, USA). The images were binarized using a preselected autothresholding method. Vessel density of each image was obtained by calculating the percentage of area occupied by retinal vessels. Calculated vessel density values were then compared to the density values generated by the AngioVue OCTA system.

Results: The mean vessel density was 41.96 (range, 38.37–55.21) on the AngioVue OCTA system and 48.72 (range, 28.60–53.18) as measured by our method ($P = 0.242$). The difference between the 2 methods ranged from 3.57% to 25.47% with a mean of 6.71%. There was no significant difference between the 2 methods when comparing normal and pathological eyes (15.35% and 12.50%, respectively; $P = 0.549$).

Conclusions: Our method is comparable to the automated density measurement as provided by the AngioVue OCTA system with an error of 6.71%. Hence, it is reliable in serving as a viable method of measuring retinal vessel density in both normal and pathological eyes.

Poster No.: EX1-107

Panel No.: 107

A Method to Achieve Retinal Thickness and Volume Comparability Between Spectral Domain and Time Domain Optical Coherence Tomography Through Adjustment of Segmentation Lines

First Author: Kelvin LI

Co-Author(s): Tock Han LIM, Colin TAN

Purpose: Spectral domain (SD-OCT) and time domain optical coherence tomography (TD-OCT) retinal measurements are incomparable due to the different placement of outer retinal segmentation boundaries. We describe a novel method of adjusting the segmentation lines of SD-OCT to enable comparison with TD-OCT and assess factors affecting its accuracy.

Methods: In a prospective study, SD-OCT and TD-OCT were sequentially performed on 200 eyes of 100 healthy individuals. Central retinal thickness (CRT), central point thickness (CPT), and 1-mm volume of the

Early Treatment Diabetic Retinopathy Study grid were compared between the 2 machines. The segmentation lines on SD-OCT were manually adjusted by a trained operator and the parameters compared again with TD-OCT.

Results: The mean CRTs of Spectralis and Stratus were significantly different ($268.2\ \mu\text{m}$ vs $193.9\ \mu\text{m}$, $P < 0.001$). After adjustment of segmentation lines, the mean adjusted Spectralis CRT was $197.3\ \mu\text{m}$, with the difference between SD-OCT and TD-OCT measurements decreasing from $74.3\ \mu\text{m}$ to $3.4\ \mu\text{m}$ ($P < 0.001$). Similar trends were obtained for central 1-mm volumes and CPT. Interoperator and intraoperator repeatability for adjustment of the segmentation lines were good, with an intraclass correlation of 0.99 for both.

Conclusions: Manual adjustment of SD-OCT segmentation lines reliably achieves retinal thickness and volume measurements that are comparable to that of TD-OCT. This is valuable to allow comparisons in multicenter clinical trials where different OCT machines may be used.

Poster No.: EX1-108

Panel No.: 108

Clinical Utility of Swept-Source Optical Coherence Tomography in Patients With Intraretinal Hemorrhage: A Case Series

First Author: Hideyuki **SHIMIZU**

Co-Author(s): Hiroki **KANEKO**, Rina **NAMBA**, Norie **NONOBE**, Hiroko **TERASAKI**

Purpose: It is not easy to evaluate the tissue structures under intraretinal hemorrhage. If the hemorrhage is large, it is difficult to use spectral domain optical coherence tomography (SD-OCT). The purpose was to evaluate the clinical utility of swept-source optical coherence tomography (SS-OCT).

Methods: This prospective case series included 4 patients with intraretinal hemorrhage due to ruptures of retinal microaneurysms from 2016 to 2017. All patients underwent vitreous surgeries and were preoperatively evaluated by SS-OCT and SD-OCT.

Results: In all cases, the retinal structures under intraretinal hemorrhage could be acquired by SS-OCT, but not by SD-OCT, and it was proved that there were no retinal microaneurysms at the macula. During surgery, ruptures of retinal microaneurysms were found around the macula and laser photocoagulation was used. Surgeries were successful. After a few weeks, hemorrhages disappeared and visual acuity was restored.

Conclusions: SS-OCT uses a longer wavelength than SD-OCT. This wavelength penetrates more easily through hemorrhages. SS-OCT is useful because we can

evaluate the structures under intraretinal hemorrhage before surgery and plan the surgical procedure.

Poster No.: EX1-109

Panel No.: 109

Comparison of Optical Coherence Tomography Angiography to Indocyanine Green Angiography for Corneal Vascularization in an Animal Model

First Author: Kavya **DEVARAJAN**

Co-Author(s): Marcus **ANG**, Jodhbir **MEHTA**

Purpose: To evaluate the use of optical coherence tomography angiography (OCTA) for serial imaging of corneal vascularization in an animal model compared to indocyanine green angiography (ICGA) and slit-lamp photography (SLP).

Methods: Corneal vascularization was induced using an established suture method in rabbits and the same regions of interest (ROI) were imaged using OCTA, ICGA, and SLP. Vessel density measurements were calculated and compared between the follow-up weeks and among techniques. Agreement of vessel density measurement between the 3 techniques was assessed using Bland-Altman 95% limits of agreement.

Results: Overall vessel density measurements from OCTA showed good correlation values with ICGA (0.957) and SLP (0.992). Vessel density measurements by OCTA were significantly higher than ICGA and SLP (mean = $20.77 \pm 9.8\%$, $15.71 \pm 6.28\%$, and $17.55 \pm 8.36\%$, respectively; $P < 0.05$). OCTA was able to depict corneal vascularization from the same ROI similarly to SLP and ICGA, though it could better detect small diameter vessels. The main advantage of the OCTA was the ability to estimate the depth of corneal vessels via the "en face" segmentation and cross-sectional angiography images.

Conclusions: Our study suggests that OCTA is comparable to ICGA and SLP in delineating and providing objective measurements of corneal vessels in an animal model. This preliminary data suggests a better detection of small vessels and ability to determine vessel depth using OCTA compared to ICGA and SLP. Further studies are required to confirm these advantages and the applications for antiangiogenic treatment in an animal model.

Poster No.: EX1-110

Panel No.: 110

Different Patterns of Central Serous Chorioretinopathy on Fundus Fluorescein Angiography

First Author: Sidrah **RIAZ**

Purpose: To study the different patterns of central

serous chorioretinopathy (CSCR) on fundus fluorescein angiography (FFA).

Methods: This hospital-based descriptive study of 16 male patients was conducted in the department of ophthalmology at Akhtar Saeed Trust Hospital from January 2014 to June 2016. These patients were selected from the outpatient department (OPD). The diagnosis was clinical. All patients who had clinical diagnosis of CSCR were sent for FFA. Serial photographs were taken up to 30-45 minutes with Topcon digital fundus camera.

Results: In this hospital-based study 16 male patients with clinical diagnosis of CSCR were included. The age range was 26-50 years with a mean age of 30.62 years. Total number of eyes was 17, out of which 15 had unilateral disease and 1 patient had bilateral disease. The clinical features of patients with CSCR were blurred vision, positive central scotoma, decreased contrast sensitivity, increasing hypermetropia, and dome-shaped elevation at the macula. The duration of visual symptoms on presentation was from 7 days to 2 months (average, 2 weeks). On FFA ink blot pattern was seen in 13 eyes and 4 eyes showed smokestack appearance.

Conclusions: On FFA ink blot pattern is seen more frequently than smokestack pattern in patients with CSCR.

Poster No.: EX1-111
Panel No.: 111

Macular Microvasculature Changes in Retinitis Pigmentosa Using Optical Coherence Tomography Angiography

First Author: Yoshito KOYANAGI
Co-Author(s): Masato AKIYAMA, Jun FUNATSU, Yasuhiro IKEDA, Yusuke MURAKAMI, Koh-Hei SONODA

Purpose: We investigated the macular microvasculature changes by optical coherence tomography angiography (OCTA) and analyzed the correlation between these changes and central visual function in patients with retinitis pigmentosa (RP).

Methods: We measured the area of the foveal avascular zone (FAZ) and the foveal and parafoveal flow density (FFD and PFD, respectively) in the superficial (S) and deep (D) retinal plexus by OCTA (AngioVue) and compared these values between 73 RP patients and 36 healthy controls. We analyzed the relationships between these microvasculature measurements and central visual functions such as visual acuity (VA) and the values of static perimetry tests (Humphrey Field Analyzer, the central 10-2 program) in the RP patients.

Results: The FFD-S, PFD-S, and PFD-D were significantly decreased in the RP patients compared to the controls,

whereas there was no significant difference in the FAZ-S, FAZ-D, or FFD-D. A subgroup analysis showed that the RP patients with VA < 20/20 had increased FAZ-S compared to the controls and RP patients with VA ≥ 20/20 (P = 0.01 and P = 0.007, respectively). Spearman rank testing demonstrated that PFD-S and PFD-D were significantly correlated with all of the central visual parameters (all P < 0.01). The FAZ-S and FFD-S were significantly correlated with VA, and FAZ-D and FFD-D showed no significant correlation.

Conclusions: Both the superficial and deep layers of the parafoveal microvasculature are attenuated in RP and correlated with reduced central visual function. The foveal microvasculature, especially in the deep layer, was relatively preserved until mild to moderately advanced stages.

Poster No.: EX1-112
Panel No.: 112

Optical Coherence Tomography Angiography Evaluation of the Superficial and Deep Foveal Avascular Zone

First Author: Louis LIM
Co-Author(s): Srinivas SADDA, Colin TAN

Purpose: To evaluate the size and characteristics of the foveal avascular zone (FAZ) in the superficial and deep capillary plexus in healthy adults using optical coherence tomography angiography (OCTA).

Methods: In a prospective cohort study of 85 healthy volunteers, 3 x 3-mm OCTA scans were performed using the AngioVue OCTA system. The superficial and deep FAZ boundaries were manually traced by trained graders and the FAZ area and characteristics were calculated. Circularity represents the degree of resemblance of the area to a perfect circle (a value of 1.0 denotes a perfect circle).

Results: The mean age of the 85 participants was 22.7 years. The mean areas of the superficial and deep FAZ were 0.25 mm² and 0.38 mm², respectively. Comparing the 2 vascular layers, the deep FAZ size was significantly larger compared to the superficial FAZ (mean difference 0.13 mm², P < 0.001). The mean circularity index was 0.81 (range, 0.54 to 0.95) for the superficial FAZ and 0.89 (range, 0.76 to 0.97) for the deep FAZ. The mean maximum diameter was 0.65 mm for the superficial FAZ and 0.78 mm for the deep FAZ (P < 0.001).

Conclusions: The FAZ area of the superficial and deep capillary plexus varies significantly among healthy adults. There is strong correlation between the areas of the superficial and deep FAZ. Deep FAZ area and Feret diameter are significantly larger than the superficial FAZ.

Poster No.: EX1-113

Panel No.: 113

Optical Coherence Tomography Angiography of the Foveal Avascular Zone in Children With a History of Treatment-Requiring Retinopathy of Prematurity

First Author: Hiroki KANEKO

Co-Author(s): Rina NAMBA, Norie NONOBE, Hideyuki SHIMIZU, Hiroko TERASAKI

Purpose: To examine the characteristics of the foveal vascular structure of patients with retinopathy of prematurity (ROP) by optical coherence tomography angiography (OCTA).

Methods: Ten patients with a history of laser photocoagulation or cryopexy treatment for stage 3 (zone \geq II) ROP and 10 normal subjects (controls) were enrolled. Foveal avascular zone (FAZ), vessel density (VD), vessel length (VL), and vascular diameter index (VDI) were measured by OCTA using the 3×3 -mm Early Treatment Diabetic Retinopathy Study (ETDRS) sectors.

Results: The median FAZ values of the ROP patients and controls were 0.103 mm^2 and 0.260 mm^2 , respectively ($P = 0.0025$). The medians of the VD, VL, and VDI of the ROP patients were $0.218 \text{ mm}^2/\text{mm}^2$, $11.75 \text{ mm}/\text{mm}^2$, and $18.00 \text{ }\mu\text{m}$, respectively, in ETDRS sector 1 and did not significantly differ from those of the controls ($P = 0.940$, 0.733 , and 0.705 , respectively). For the average of ETDRS sectors 2 to 5, the medians of the VD, VL, and VDI for the ROP patients were $0.347 \text{ mm}^2/\text{mm}^2$, $18.95 \text{ mm}/\text{mm}^2$, and $18.28 \text{ }\mu\text{m}$, respectively; VD and VL were significantly smaller than those of the controls ($P = 0.002$ and 0.003 , respectively), but there was no significant difference in VDI ($P = 0.286$).

Conclusions: OCTA-guided FAZ was significantly smaller in ROP patients than in controls. Our results indicate that foveal vascular development may be altered in patients with a history of treatment-requiring ROP.

Poster No.: EX1-114

Panel No.: 114

The Morphological Change in Meibomian Glands After Radiation Therapy in Patients With Orbital Lymphoma

First Author: Suk-Woo YANG

Co-Author(s): So-Youl KIM, Sung-Eun KIM

Purpose: To examine the morphological changes in meibomian glands using noncontact infrared meibography in ocular lymphoma patients undergoing radiotherapy.

Methods: The study was designed in a prospective manner with 16 eyes of 12 patients who were diagnosed as low grade ocular lymphoma and treated

primarily with radiation. An infrared meibography was used to obtain pictures of meibomian glands in upper and lower eyelids for 16 subjects before and 3 months after the radiation therapy. The morphological changes in meibomian glands were evaluated by meibograde. In addition, evaluation of lid margin abnormalities, Ocular Surface Disease Index (OSDI), tear film break-up time (BUT), Schirmer test, and corneal surface changes were carried out before and after the radiation therapy.

Results: The meibograde before radiation was 0.44 ± 0.39 in upper eyelids and 0.56 ± 0.74 in lower eyelids. After the radiation therapy, meibograde changed to 2.06 ± 0.60 in upper eyelids and 3.25 ± 1.11 in lower eyelids and this increase in meibograde showed statistical significance. There were also statistically significant changes in lid margin abnormalities, OSDI, tear film break-up time, and corneal surface stain after the radiation. Among these factors, morphological changes in meibomian glands were significantly correlated with lid margin abnormality and tear film break-up time.

Conclusions: Meibography can detect postirradiation changes in meibomian glands. Infrared meibography may be a useful and patient-friendly method for evaluation of ocular side effects such as dry eye disease after orbital irradiation along with BUT and OSDI.

Poster No.: EX1-115

Panel No.: 115

Topographic Variations in Macular Retinal and Choroidal Thicknesses From Different Optical Coherence Tomography Modalities

First Author: Louis LIM

Co-Author(s): Kelvin LI, Colin TAN

Purpose: The retina and choroid are important structures for the perception of light, common sites for ocular diseases, and important structures for vision. Retinal thicknesses (RT) and choroidal thicknesses (CT) are therefore important parameters used in the diagnosis and management of these diseases. Swept-source optical coherence tomography (SS-OCT) and spectral-domain OCT (SD-OCT) are the current gold standard devices used to measure these parameters. However, measurements using these devices are not comparable. This study aimed to evaluate the topographic patterns and compare RT and CT measurements obtained from SS-OCT and SD-OCT.

Methods: In a prospective cohort study of 125 participants, OCT scans were performed sequentially with Topcon DRI-OCT-1 and Spectralis OCT using standardized imaging protocols. RT and CT were independently measured by masked reading center-certified graders, respectively. Paired t tests and intraclass correlation coefficients (ICCs) were

performed.

Results: The mean central RT differed significantly between Topcon and Spectralis (240.0 μm vs 273.1 μm ; $P < 0.001$), with a mean difference of 33.1 μm . The mean central CT also differed significantly between Topcon and Spectralis (265.6 μm vs 313.7 μm ; $P < 0.001$), with a mean difference of 48.1 μm . Following manual adjustment of segmentation boundaries, the CT difference between Topcon and Spectralis was reduced from 48.1 μm to 18.3 μm (62.0% reduction; $P < 0.001$). The interdevice ICC for RT was 0.957 and 0.757 for CT.

Conclusions: RT and CT measurements obtained from SS- and SD-OCT devices differ significantly and should be accounted for when comparing measurements. Manual adjustment of segmentation boundaries can reduce the difference between CT measurements.

Poster No.: EX1-116

Panel No.: 116

Visualization of Choroidal Vessels in Eyes With Central Serous Chorioretinopathy Using Wide-Field En-Face Optical Coherence Tomography

First Author: Yuki OGAWA

Co-Author(s): Eriko HASHIMOTO, Tomohiro IIDA, Hideki KOIZUMI, Ichiro MARUKO, Nobuhiko MIZUNO

Purpose: To visualize the luminal area of the choroid in eyes with central serous chorioretinopathy (CSC) using wide-field en-face optical coherence tomography (OCT).

Methods: Thirty-five eyes of 30 patients in CSC (23 men, 12 women; average age, 48.4 years) were included. Volume scan (12 \times 12 mm-square) was clearly obtained at the same time with OCT angiography scanning (PLEX Elite 9000 Swept-Source OCT, Zeiss). Wide-field en-face image flattened at the Bruch membrane was binarized to lumen and stroma according to Bernsen method at the segmentation slab in a half of choroidal thickness. In 30 healthy eyes of 35 cases (21 men, 14 women; average age, 55.7 years), the wide-field en-face choroidal images were also binarized as control. Wide-field en-face images were cropped to exclude the optic disc.

Results: Mean cropped image size was 9.57 \times 9.57 mm in the eyes with CSC and 9.42 \times 9.42 mm in the healthy eyes, which did not reach significance ($P > 0.05$). Luminal area of the choroid in the eyes with CSC was 61.6 \pm 7.5%, which was significantly larger than that in the healthy eyes (48.1 \pm 9.0%, $P < 0.01$).

Conclusions: Luminal area of the choroid in the eyes with CSC was clearly and noninvasively visualized using wide-field en-face choroidal OCT obtained at the same

time as OCT angiography scanning.

Poster No.: EX1-281

Panel No.: 281

Associations Between Individual Retinal Layer Thicknesses and Diabetic Peripheral Neuropathy Using Retinal Layer Segmentation Analysis

First Author: Min KIM

Purpose: To evaluate clinical correlations between the thicknesses of individual retinal layers in the foveal area of diabetic patients and the presence of diabetic peripheral neuropathy (DPN).

Methods: This retrospective, observational cross-sectional study enrolled a total of 120 eyes from 120 patients. The eyes were divided into 3 groups: normal controls ($n = 42$ eyes), patients with diabetes mellitus (DM) ($n = 42$ eyes) but no DPN, and DM patients with DPN ($n = 36$ eyes). The primary outcome measures were the thickness of all retinal layers in the central 1-mm zone measured by using the segmentation analysis of spectral domain optical coherence tomography (SD-OCT). Correlations between the thicknesses of the individual retinal layers and the development of DPN were also analyzed. Logistic regression analyses were used to determine which change of layer thickness had the most significant association with the development of DPN.

Results: The mean thicknesses and the ratios of retinal nerve fiber layers (RNFLs) to total retinal thicknesses in the DPN group were 10.77 \pm 1.79 μm and 4.10 \pm 0.55%, significantly lower than those in normal controls and the DM with no DPN group ($P = 0.014$ and $P = 0.001$, respectively). Logistic regression analyses also showed the decrease in thicknesses of the RNFLs and the INL are significant factors for predicting a higher risk for DPN development (odds ratio = 8.264 and 2.061; $P < 0.001$ and $P = 0.001$, respectively).

Conclusions: A decrease in the RNFL and the INL thickness was significantly associated with development of DPN.

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Poster No.: EX1-117

Panel No.: 117

A Case of Apocrine Poroma at Palpebral Conjunctiva

First Author: Yukio SAKAI

Co-Author(s): Mayumi INABA, Kayako MIWA, Testuya NISHIMURA, Kanji TAKAHASHI

Purpose: Poroma is a benign tumor, which proliferates outside conduit of sweat glands such as the eccrine gland in eyelid skin. Little had been reported regarding poroma detected at the conjunctiva; thus, we report a case of poroma detected at the palpebral conjunctiva.

Methods: A 23-year-old man was aware of a hemorrhagic tumor in his left eye 2 weeks previously and was referred to our hospital. At initial examination, he had a pedunculated papillary tumor (9 x 4 mm) with blood coagula in the left palpebral conjunctiva. We excised the tumor and critical tissue.

Results: Histopathological examination revealed papillary proliferation, ductal structures, and decapitated secretion of poroid cells. He was diagnosed with conjunctival apocrine poroma. We have not detected recurrence of the poroma in over 6 months of follow-up.

Conclusions: In this case, the site where the tumor developed corresponded to that of the accessory lacrimal gland, and this tumor histopathologically showed characteristics of apocrine gland. These findings suggested that the tumor developed from the Wolfring gland. We should recognize poroma as one of the papillary tumors that can develop at the conjunctiva.

Poster No.: EX1-118

Panel No.: 118

A Case of Conjunctival Kaposi Sarcoma in a Patient With Acquired Immune Deficiency Syndrome

First Author: Yasuo MATSUYAMA

Co-Author(s): Maki KURO, Masato MATSUOKA, Kayako MIWA, Tetsuya NISHIMURA, Kanji TAKAHASHI

Purpose: There are few reports on conjunctival Kaposi sarcoma in patients with acquired immune deficiency syndrome. We report a case of conjunctival Kaposi sarcoma that was confirmed by conjunctival biopsy.

Methods: A 49-year-old male was referred to a local clinic with conjunctival injection in his right eye. Because of prolonged symptoms, he was referred to our hospital in October 2013. At our initial examination,

he had severe subconjunctival hemorrhage and injection in his right eye. Some painless elevated lesions were observed at palpebral and bulbar conjunctiva. There was no symptomatic improvement with topical corticosteroid therapy; hence, he was checked by a hematological examination and conjunctival biopsy.

Results: Human immunodeficiency virus (HIV)-1 antibody was positive according to the hematological examination. CD31, CD34, D2-40, and HHV-8 were positive and spindle cells were detected by conjunctival biopsy. From these data, he was diagnosed with conjunctival Kaposi sarcoma.

Conclusions: Biopsy is effective for the diagnosis of Kaposi sarcoma in patients with painless conjunctival tumor that resists medical treatment.

Poster No.: EX1-119

Panel No.: 119

A Case of Parasitic Subconjunctival Tumor

First Author: Hoang CUONG

Purpose: Adnexal ocular lymphoid proliferative disorders have become more and more popular, especially in Asian countries. A subconjunctival tumor designated as a "salmon patch" is featured in images of B-cell lymphoma. However, there are complex cases that have been diagnosed incorrectly. Therefore, treatment is not justifiable. This case study is an illustration.

Methods: Case report.

Results: A 31-year-old male was admitted to the hospital because of eyelid edema. Two weeks before the patient had swelling and itching in the eyelid, accompanied by blurred vision increasing without any treatment and visit to the Vietnam National Institute of Ophthalmology (VNIO). Two months before the patient underwent surgery to remove conjunctival tumors with anatomopathology result of reactive lymphoid hyperplasia. Diagnosis was tumor recurrence at the upper eyelid and eye socket that needed to be removed with lab retest. The tumor was white, fibrous, well-capsuled, adherent with adjunct tissue; inside the tumor was white liquid. It was bovine embedded and transferred for lab histology. The tissue was organized by fibers and infiltrated by many inflammatory cells: lymphocytes, histiocytes, and polymorphonuclear leukocytes. There were also 2 necrosis drives, surrounded by macrophages and many giant cells. On magnetic resonance imaging (MRI), there were some images of larval trematode cysts phase III-IV scattered in the left cerebral hemisphere and also multifocal cerebral edema. The patient was transferred to the Malaria and Parasites National Institute for general treatment.

Conclusions: The end diagnosis was granulomas after chronic inflammation, possibly caused by parasites. "Salmon patch" is quite specific for a subconjunctival mucosa-associated lymphoid tissue (MALT) lymphoid tumor. We had anatomopathology analysis but the patient was still misdiagnosed with a tumor of parasites in this case.

Poster No.: EX1-120
Panel No.: 120

A Rare Case of Benign Neuromuscular Hamartoma

First Author: Fitri **NATHIN**
Co-Author(s): Mutmainah **MAHYUDDIN**, *David* **TANDIAN**

Purpose: Neuromuscular hamartoma or benign "triton" tumor is a very rare peripheral nerve tumor composed of well-differentiated skeletal muscle and nerve fibers. This report demonstrates a rare case of neuromuscular hamartoma that occurred in the orbit.

Methods: A 16-year-old girl presented with protruded left eye (LE) and sudden visual loss for 8 months. There was pain in the left eye and headache. The visual acuity in the LE was no light perception with axial proptosis and no restriction of ocular movement. There was positive relative afferent pupillary defect (RAPD) and atrophy of the left optic nerve head. Magnetic resonance imaging (MRI) revealed an intraconal lesion that involved the optic nerve and optic nerve sheath. Based on the clinical appearance and imaging, optic nerve glioma was suspected in this case. Tumor removal surgery was done by a neurosurgeon via a transcranial approach.

Results: Most of the tumor was excised via a transcranial approach. Histopathological examination revealed that the tumor was composed of well-differentiated skeletal muscle and nerve fibers that confirmed a neuromuscular hamartoma. Two months after surgery, the left eye was no longer protruded with some restriction in the ocular movement to all directions. Postoperative imaging showed that the mass was markedly reduced.

Conclusions: Although it is a very rare condition, neuromuscular hamartoma can also be found in the optic nerve. Surgical debulking in our case can be achieved with acceptable results via a transcranial approach due to difficulty in approaching the tumor from anterior or lateral orbitotomy.

Poster No.: EX1-121
Panel No.: 121

A Rare Case of Multiple Cavernous Hemangioma of Orbit and Cranium

First Author: Purnima **RAJKARNIKAR STHAPIT**
Co-Author(s): Rohit **SAIJU**

Purpose: Cavernous hemangioma is the most common benign vascular tumor of the orbit. It usually presents as a solitary intraconal and sometimes extraconal mass. Here we report a rare case of multiple cavernous hemangiomas of the orbit and cranium.

Methods: A 32-year-old male presented with left-sided gradual onset painless progressive proptosis for 4 years. On examination, visual acuity and extraocular movements were normal. Proptosis was 4 mm with negative Valsalva. Computed tomography (CT) scan of the brain and orbit showed multiple (at least 16) well-defined round to oval, intra- and extraconal masses in the left orbit; size ranged from 0.4 to 2.3 cm in largest diameter. The left zygomatic, frontal, and parietal bones were found to be thickened with cystic spaces. Similar lesions were seen in tentorium, falx, and scalp as well. With the provisional diagnosis of multiple cavernous hemangioma of the orbit, he was scheduled for lateral orbitotomy for excision biopsy of the lesions.

Results: Intraoperative findings were multiple solid, solitary dark red-colored lesions which were removed as much as possible. Histopathology confirmed the diagnosis of cavernous hemangioma.

Conclusions: Neurosurgical consultation confirmed the cranial lesions as the same and advised no intervention but to wait and watch.

Poster No.: EX1-122
Panel No.: 122

Antitumor Effects of 4-Methylumbelliferone on Uveal Melanoma

First Author: Fang **LI**
Co-Author(s): Xianqun **FAN**, *Shengfang* **GE**

Purpose: Uveal melanoma (UM) is a lethal intraocular malignancy without effective drugs. Here, we investigated the antitumor activity of 4-methylumbelliferone (4-MU) on uveal melanoma in vitro and in vivo.

Methods: The proliferation rate was assessed by CCK8 and colony formation assay after UM cells were treated with different concentrations of 4-MU. Transwell assay was performed to investigate the effects of 4-MU on migration in vitro; 4-MU was injected intraperitoneally every day after the tumors become palpable to detect the therapeutic effect in a UM xenograft mouse model. The in vivo effect of metastasis was also assessed

using mouse transfer model. RNA-seq was performed to detect the pathways affected by 4-MU. Real-time, Western blot, and immunofluorescence were used to confirm the pathway changes.

Results: We showed that 4-MU potently inhibited UM cell proliferation, induced apoptosis, and reduced migration and invasion. Also, 4-MU exerted potent in vivo antitumor activity in a UM xenograft mouse model and in vivo imaging. Tumors from 4-MU treated animals also showed reduced microvessel density. Mechanistically, 4-MU induced UM cell apoptosis through abrogating the activation of the Akt pathway in UM cells, and 4-MU reduced the expression of CD44, CXCR4, MMP2, and MMP9. The reduction of CD44 and the induction of apoptosis proteins were also confirmed in protein levels.

Conclusions: 4-MU was able to inhibit the proliferation, metastasis, and invasion of UM cells through inducing apoptosis and inhibiting Akt signaling.

Poster No.: EX1-123

Panel No.: 123

Ciliary Body Metastasis Masquerading as Scleritis

First Author: Kelvin WAN

Co-Author(s): Wendy LAM, Evan YIU

Purpose: We report an unusual case of ciliary body metastasis presenting as scleritis.

Methods: Case report.

Results: A 68-year-old woman with good past health presented with subacute left eye redness. Slit lamp examination revealed sectoral anterior scleritis; she was treated with systematic nonsteroidal anti-inflammatory drugs (NSAID) and topical steroid without improvement. At follow-up, she developed left eye anterior uveitis, posterior synechiae, and localized cataract. Anterior bowing of the peripheral iris was noted adjacent to the sectoral scleritis. Fundal exam revealed a peripheral iris mass extending into the ora serrata, with no evidence of choroidal/retinal involvement. B-scan ultrasonography confirmed a solitary, dome-shaped, acoustically dense ciliary body mass. Subsequent positron emission tomography computed tomography (PET-CT) revealed a hypermetabolic lung nodule, multiple hypermetabolic uterine lesions, and cervical spine metastasis. Bronchial biopsy failed to identify any evidence of malignancy while hysteroscopic biopsy revealed poorly differentiated carcinoma. Tumor markers were normal; immunohistochemical profile and oncogene testing found mutation of the anaplastic lymphoma kinase (ALK) gene. Without definitive histological indication of the tumor origin, further investigations including lobectomy, hysterectomy, ciliary body fine needle

aspiration, and iridocyclectomy were offered but declined. She was managed as metastatic non-small cell lung carcinoma and was started on crizotinib. The size of the ciliary body tumor is stable after orbital radiotherapy.

Conclusions: Ophthalmologists should be alert when scleritis does not improve with first-line treatment. Uveal metastasis is the most common intraocular malignancy and often the first sign of dissemination. The conventional practice is to perform systemic investigations, resorting to ocular biopsy if previous tests are inconclusive.

Poster No.: EX1-124

Panel No.: 124

Clinical Characteristics, Management, and Recurrences of Lacrimal Gland Tumor: A Retrospective Review

First Author: Tessa ANINDYA

Co-Author(s): Rossalyn Sandra ANDRISA

Purpose: This study provides substantial information regarding clinical characteristics, management, and recurrences of lacrimal gland tumor.

Methods: Thirty patients who were diagnosed with lacrimal gland tumor between 2012 and 2016 were retrospectively reviewed. Age, clinical manifestations, histological subtypes, treatment modalities, metastases, and recurrences were evaluated.

Results: Thirty patients were diagnosed with lacrimal gland tumor. Mean age was 41.5 years, ranging from 17 to 70 years. All patients were found with proptosis and inferomedial globe displacement (100%). Other frequent ocular signs were palpable mass (83.33%) followed by ocular movement restrictions (70%) and ocular pain (30%). Imaging results with bone destruction were found in 50% of patients. Malignant tumors constituted 53.33% of all histological findings, while the rest were benign tumors (46.66%). Almost half of the malignant subtype were adenoid cystic carcinoma, while the most common benign tumors were pleomorphic adenoma (33.33%). All of the patients with benign tumor underwent lateral orbitotomy. In patients with malignant tumor, treatment of choice was lateral orbitotomy combined with radiotherapy (66.6%), while 33.3% had to be exenterated. In patients with malignant histological findings, 33.33% were found with bone and lung metastatic lesions and 20% of patients showed recurrences within 2 years.

Conclusions: In this population, the number of patients with malignant and benign tumors were nearly equal. The most common benign tumor was pleomorphic adenoma, while the most common malignant tumor was adenoid cystic carcinoma. We found that 33.33%

of malignant tumors showed metastatic lesion in lung and bone, while 20% showed recurrences within 2 years.

Poster No.: EX1-125

Panel No.: 125

Congenital Orbital Teratoma Presenting as Congenital Cystic Eye

*First Author: Neni **ANGGRAINI***

*Co-Author(s): Evelina **KODRAT**, Indrati **SUROYO***

Purpose: To present an unusual presentation of congenital orbital teratoma mimicking congenital cystic eye.

Methods: A case of a term 15-day-old baby girl was referred for massive swelling of the left eye since birth. On examination, there was severe proptosis with transilluminated massive soft cystic lesion without recognizable eyeball. Imaging illustrated encapsulated mass with cystic component in the anterior and solid in posterior. There was a hypointense lesion in solid component, which was suspected as calcification. Corpus callosum agenesis was noted. Based on those findings, diagnosis of congenital cystic eye was made.

Results: Aspiration and exploration were done. During exploration, we excised structures suspected as choroid and other primordial eyeball tissues. Histopathologic examination revealed a cystic tissue with mature parenchymal tissue neuroglia and immature tubular-like neuroepithelial component, as well as stratified squamous epithelium coated tissue, glandular epithelium, connective tissue, fat, muscle fiber cross, and blood vessels. It was discovered that the structure resembled the retina and choroid and foci of calcification. The definitive diagnosis was immature congenital orbital teratoma.

Conclusions: At first, clinical examination and complete absence of eyeball supported the diagnosis of congenital cystic eye, but histopathology results showed congenital orbital teratoma. Congenital orbital teratoma is a very rare tumor, composed of a variety of mature or immature tissues derived from 3 germinal layers. Teratoma usually have a normal eyeball, but not in this case. Besides aspiration, it is important to explore and excise the discovered mass. Definitive diagnosis should be made by histopathologic examination.

Poster No.: EX1-126

Panel No.: 126

Congenital Simple Hamartoma of the Retinal Pigment Epithelium

*First Author: Yuka **ITO***

*Co-Author(s): Masahito **OHJI***

Purpose: To report a case with congenital simple hamartoma of the retinal pigment epithelium (CSHRPE), which is a rare benign tumor of the retinal pigment epithelium characterized by a focal, darkly pigmented nodule in the macular lesion in healthy persons.

Methods: A case report.

Results: A 41-year-old Japanese woman was incidentally discovered to have a dark lesion on the fundus of the left eye. We evaluated the patient by measuring her best-corrected visual acuity (BCVA) and by slit-lamp biomicroscopy, fundus color photography, and optical coherence tomography (OCT) over a 10-year period. The BCVA gradually declined during the early follow-up period, having decreased from 1.2 to 0.8 in the left eye 3 years after the initial examination and then was maintained for the following 7 years. The lesion did not show a change in OCT 10 years after the first examination.

Conclusions: It is important to follow a CSHRPE carefully for the long term because visual acuity might decrease.

Poster No.: EX1-127

Panel No.: 127

Frequency and Distribution of CD4+CXCR5+ Follicular B Helper T Cells Within Involved Tissues in IgG4-Related Ophthalmic Diseases

*First Author: Huimin **YANG***

Purpose: To elucidate the profile and distribution of follicular B helper T cells (Tfh cells) in involved tissues from patients with immunoglobulin G4-related ophthalmic disease (IgG4-ROD) compared to those of type 1 autoimmune pancreatitis (AIP) and patients with IgG4-related lymphadenopathy (IgG4-RL).

Methods: A total of 7 patients with IgG4-ROD, 7 patients with type 1 AIP or IgG4-RL, and 7 IgG4-negative controls were evaluated. The expression of Tfh cell immunological proteins, the inducible T-cell costimulator, B-cell lymphoma 6 protein, C-X-C chemokine receptor type 5 (CXCR5), and interleukin-21 (IL-21) in affected tissues was analyzed using immunohistochemical staining and dual immunofluorescence.

Results: It was demonstrated that patients with IgG4-ROD exhibited a significantly increased number

of CD4+CXCR5+ Tfh cells compared with the IgG4-negative controls. Furthermore, CD4+CXCR5+ Tfh cells were detected in and outside of GCs in patients with IgG4-ROD and IgG4-RL, whereas CD4+CXCR5+ Tfh cells were randomly distributed in areas demonstrating type 1 AIP. Fewer CD4+CXCR5+ Tfh cells were observed in patients with type 1 AIP compared with patients with IgG4-ROD and IgG4-RL. In addition, increased expression of IL-21 was observed in patients with IgG4-ROD and IgG4-RL compared with type 1 AIP. IL-21 expression was positively correlated with the IgG4/IgG ratio in immunohistochemically positive cells.

Conclusions: The results of the present study indicate that Tfh cells are involved in the histopathological pathogenesis of IgG4-ROD and may play a different role in IgG4-ROD and type 1 AIP. Tfh cells may play a direct role in the IL-21-mediated pathogenesis of IgG4-ROD.

Poster No.: EX1-128
Panel No.: 128

Hybrid Perineuroma: Neurofibroma of the Orbit

First Author: Peter LEUNG

Purpose: Hybrid peripheral nerve sheath tumors (HPNST) are relatively recently described tumors consisting of elements of neurofibroma, schwannoma, or perineuroma. Recognizing this tumor morphology is important as it is shown to be associated with neurofibromatosis and schwannomatosis. Only 2 cases of hybrid neurofibroma/schwannoma were reported in the literature involving the orbit. We hereby report a case of an unusual orbital tumor with histological features of both perineuroma and neurofibroma.

Methods: Clinical and pathological features are presented in a 32-year-old female Chinese patient with unilateral orbital swelling.

Results: Magnetic resonance imaging of this patient revealed a heterogeneously enhancing right orbital mass. An anterior orbitotomy with computed tomography (CT) navigation was subsequently performed. Histopathological evaluation revealed a tumor with distinct features of neurofibroma and perineuroma. The patient did not exhibit clinical signs of neurocutaneous stigmata and did not meet the diagnostic criteria for neurofibromatosis or schwannomatosis. Follow-up examination showed no recurrence of tumor. There was no evidence of malignant transformation in this case.

Conclusions: This case represents the third reported case of HPNST of the orbit and the first with histological combination of perineuroma and neurofibroma. Its close association with neurofibromatosis and schwannomatosis warrants attention. Recognition of HPNST as a distinct clinical entity may facilitate

diagnosis in orbital tumors.

Poster No.: EX1-129
Panel No.: 129

Increasing Diagnostic Sensitivity for Primary Vitreoretinal Lymphoma: A 10-Year Audit on Vitreous Biopsy Methods in Hong Kong Eye Hospital

First Author: Jason CHAN

Co-Author(s): Angie FONG, Chi Wai TSANG

Purpose: This audit was to review all the cases of vitreous biopsy performed for the past 10 years and to compare the diagnostic sensitivity for primary vitreoretinal lymphoma (PVRL) of different vitreous biopsy methods.

Methods: Medical records with "vitreous biopsy" as the operative procedure in Hong Kong Eye Hospital from June 2007 to June 2017 were reviewed. Data including date, vitreous biopsy method, pathological findings and diagnosis, systemic diagnosis, other pathological diagnosis, subsequent treatment, and clinical outcomes were recorded. The cases were divided into 2 groups, old and new, depending on their date. Since 2015, we have standardized a new method for vitreous sampling. An undiluted sample was collected with the vitreous cutter and was mixed with CytoRich preservative fluid. A diluted sample was made by collecting the vitrectomy fluid in a cell culture flask and mixing it with CytoRich preservative fluid. The sensitivity for diagnosing PVRL of the old and new method was compared.

Results: Thirty-three biopsies of 24 patients were included. Fifteen cases had a final diagnosis of PVRL. Using the old technique, 4 out of 9 cases had a positive vitreous biopsy result, giving a sensitivity of 44.44%. Using the new technique, 5 out of 6 cases had a positive vitreous biopsy result, giving a sensitivity of 83.33%.

Conclusions: Using the new standardized vitreous biopsy method, the sensitivity for detecting PVRL was nearly doubled. Although our study is limited by its small sample size, it suggests that the new vitreous sampling method is useful for the detection of PVRL.

Poster No.: EX1-130
Panel No.: 130

Integrated Treatment During the Intravitreal Melphalan Era: Concurrent Intravitreal Melphalan and Systemic Chemoreduction

First Author: Jonathan KIM

Co-Author(s): Diana LEE

Purpose: To evaluate the outcome of retinoblastoma

eyes that received concurrent intravitreal melphalan (IVM) and intravenous chemotherapy.

Methods: Retrospective chart review of patients diagnosed with retinoblastoma from 2014 to 2017 who received IVM treatment concurrent with cycles of systemic chemotherapy. Overall, 6 eyes of 6 patients were included; salvage therapy included systemic chemoreduction with vincristine, etoposide, and carboplatin with local consolidation and intravitreal injection of melphalan for persistent seeding. Primary outcome measurement was seeding response, toxicity, and globe salvage.

Results: Overall, 6 retinoblastoma eyes were included, with a total of 25 IVM injections. Of the 6 retinoblastoma eyes included, 4 eyes were salvaged and 2 eyes were enucleated. Success in eradicating vitreous seeds was 100%. IVM was initiated for all eyes at cycle 4 of their chemotherapy. Median follow-up for the group of 6 eyes was 11.5 months (SD, 8.5 months).

Conclusions: During a 3-year period that included the initiation of intravitreal melphalan at our institution, the salvage rate of the small cohort of patients who received concurrent intravitreal melphalan for seeding with chemotherapy was 67% (4/6 eyes). Systemic chemoreduction combined with intravitreal melphalan for seeding demonstrated a similar overall salvage rate for retinoblastoma eyes while sparing the child additional examinations under anesthesia due to concurrent intravitreal injections.

Poster No.: EX1-131

Panel No.: 131

Malignant Lacrimal Sac Tumors: A Case Series

First Author: Kim Paolo LORENZO

Co-Author(s): Felice Katrina RANCHE

Purpose: Lacrimal sac malignancies are rare tumors that are often misdiagnosed, causing delay in management, hence the importance of early detection. This case series aims to report different histopathologic types of malignant lacrimal sac tumors, describe their clinical presentation, and discuss treatment options.

Methods: Three different cases of malignant lacrimal sac tumors are reported in this series. Case 1 was a 41-year old male initially diagnosed to have a dacryoceles. Case 2 was a 76-year-old female initially diagnosed with primary acquired nasolacrimal duct obstruction. Case 3 was a 55-year old male referred for suspicion of malignancy. All patients presented with epiphora and mass over the area of the medial canthal tendon. Computed tomography revealed a mass in the lacrimal sac fossa and widening of the nasolacrimal canal in all patients. All underwent incision biopsy.

Results: Incision biopsy for case 1 revealed squamous cell carcinoma. He underwent dacryocystectomy,

partial maxillectomy, and subsequent radiotherapy and is tumor-free 8 months after surgery. Biopsy for case 2 revealed B-cell non-Hodgkin lymphoma. She underwent 6 cycles of chemotherapy and is tumor-free 4 years after treatment. Biopsy for case 3 revealed basosquamous carcinoma. He underwent excision biopsy and medial maxillectomy.

Conclusions: The heterogenous epithelial lining of the lacrimal drainage system can give rise to a variety of lacrimal sac tumors. Epiphora combined with a noncompressible mass over the area of the medial canthal tendon should alert ophthalmologists to the possibility of malignancy. Definitive treatment will depend on clinical and histopathologic findings.

Poster No.: EX1-132

Panel No.: 132

Malignant Tumors of the Eyelid in Bangladesh: An Analytical Report on 256 Cases

First Author: Syeed KADIR

Co-Author(s): Golam HAIDER, Ismail HOSSAIN, Tanjila HOSSAIN, Nishat PARVEEN

Purpose: The aim of this study is to explicate the clinical features and management strategies of malignant tumors of the eyelid in Bangladesh.

Methods: We analyzed 256 patients with histologically confirmed malignant eyelid tumors in 4 tertiary eye care hospitals in Bangladesh during the 9-year period from January 2008 to December 2016.

Results: On the basis of histopathology, the malignant tumors of the eyelid consisted of sebaceous gland carcinoma (SGC) in 108 cases (42.2%), followed by basal cell carcinoma (BCC) in 101 cases (39.4%), squamous cell carcinoma (SqCC) in 42 cases (16.4%), and malignant melanoma in 5 cases (2%). Of the total, 136 (53.13%) patients were male and 120 (46.87%) were female. The mean age of all patients was 61.4 years (34-94 years). Among the patients with basal cell carcinoma, pigmented lesion was seen in 90 (89%) cases. Invasion of the orbit was found in 25 (9.76%) cases, involvement of lymph nodes in 18 (7.03%) cases, and metastasis was assessed in 7 (2.73%) cases. Frozen section biopsy was performed in 129 (50.39%) cases, and excision biopsy was done in 116 (45.13%) cases; however, 11 (4.29%) cases needed orbital exenteration (7 sebaceous gland carcinoma, 3 squamous cell carcinoma, and 1 basal cell carcinoma). A new technique named triangular musculocutaneous flap was performed in 19 (7.75%) cases to reconstruct the moderate eyelid defect following local resection.

Conclusions: Various clinical and histopathology proven malignant tumors of the eyelid were noted, where sebaceous gland carcinoma had the highest in

occurrence in Bangladesh.

Poster No.: EX1-133

Panel No.: 133

Ocular Involvement in Extranodal Natural Killer Cell Lymphoma

First Author: Stephanie YUK

Co-Author(s): Raymond TANG

Purpose: Natural killer (NK) cell lymphoma is a type of non-Hodgkin lymphoma, with a geographical predilection for South-East Asian and South American populations. The majority of cases occur primarily in the nose and upper aerodigestive tract, but there could be rare occurrences in the orbit. We report 2 cases of extranodal NK cell lymphoma with ocular involvement.

Methods: Case reports.

Results: A 68-year-old male, with known history of NK cell lymphoma and in remission after chemotherapy, complained of blurring of vision in both eyes. Examination revealed bilateral panuveitis and vitreous tap showed predominantly NK cells. The patient was started on topical steroid, intravitreal methotrexate, and systemic pembrolizumab and lenalidomide. He subsequently developed a rapidly enlarging right lower lid mass, which biopsy confirmed to be extranodal NK cell lymphoma (Epstein-Barr virus-encoded small RNA positive). Radiotherapy (30 Gy) was commenced and good tumor shrinkage was achieved. There was no recurrence of orbital mass and bilateral eye inflammation is now controlled on follow-up. A 76-year-old male presented with acute onset right eye redness, diplopia, and proptosis for 1 week. Imaging showed a right inferior orbital mass with enlargement of inferior rectus and metastatic disease involving adrenal glands, omentum, and bone marrow. Subsequent biopsy confirmed the diagnosis of NK cell lymphoma. There was rapid disease progression and the patient succumbed 2 weeks after diagnosis due to tumor lysis syndrome and sepsis.

Conclusions: Although rare, extranodal NK cell lymphoma may present primarily with ocular signs and symptoms. As it runs an aggressive clinical course, timely diagnosis and treatment are essential.

Poster No.: EX1-134

Panel No.: 134

Orbital Lymphoma: Clinical Profile at a Tertiary Care Center in Bangladesh

First Author: Golam HAIDER

Co-Author(s): Sharmin AHMED, Narayon CHANDRA, Tanjila HOSSAIN, SM Mosoddeka ISLAM, Syeed KADIR

Purpose: To explore the baseline clinical profile

of orbital lymphoma at a tertiary care center in Bangladesh.

Methods: This study was done from January 2010 to June 2017. Meticulous history taking and clinical examination was done to evaluate the lesion. Computed tomography (CT) scan was done to localize lymphoma; histopathological study to confirm the diagnosis and immunocytochemistry was done in 16 cases for further evaluation.

Results: Out of 123 patients, 116 (94.30%) were non-Hodgkin lymphomas, 1 (0.8%) was Hodgkin lymphoma, and 7 (5.7%) were pseudolymphomas. Male:female ratio was 2.23:1 and age range was 8 to 82 years with a median age of 50 years. Among all cases 82 (66.7%) had orbital involvement; conjunctival and eyelid involvement were seen in 32.5% and 37.4%, respectively. Bilateral cases were found in 17.1%. In this study intermediate grade tumors were predominant in 59 (48.0%), followed by low grade in 42 (34.1%) and high grade in 6 (4.9%).

Conclusions: Orbital lymphoma is a disease of the elderly. It tends to be localized to the orbit at the time of diagnosis. Geographically it is a common disease in Asia and in our country its occurrence is also not so uncommon.

Poster No.: EX1-135

Panel No.: 135

Outcomes of Enucleation by the Myoconjunctival Technique Using Silicone Orbital Implant in Patients With Retinoblastoma

First Author: Raksha RAO

Co-Author(s): Santosh HONAVAR, Raju KUMAR

Purpose: To evaluate the outcomes of enucleation by the myoconjunctival technique using silicone implant in patients with retinoblastoma.

Methods: Retrospective interventional study.

Results: Of 186 patients with retinoblastoma managed by enucleation, 3 patients underwent bilateral enucleation (189 eyes). The mean age at the time of surgery was 2.3 years (5 months to 11 years). Primary enucleation was done in 111 eyes (59%) and secondary in 78 eyes (41%). Indications were advanced retinoblastoma (n = 111, 59%), recurrent disease (n = 70, 37%), and orbital retinoblastoma (n = 8, 4%). The average size of the silicone implant used was 19 mm (range, 17-20 mm). Adjuvant chemotherapy was necessary in 44 patients (23%), and 14 patients (7%) also required radiotherapy. There was no case of wound infection, extrusion, and implant migration. At an average follow-up of 29 months (6-51 months), all patients had satisfactory static and dynamic cosmesis.

Conclusions: Patients with retinoblastoma undergo enucleation at a young age and may also require adjuvant chemotherapy and radiotherapy. Enucleation by the myoconjunctival technique using silicone implant is an excellent method to prevent wound dehiscence and provide good cosmesis.

Poster No.: EX1-136

Panel No.: 136

Rare Case of Orbital Malignant Solitary Fibrous Tumor

First Author: Joshua LUMBANTOBING

Co-Author(s): Neni ANGGRINI, Nuryati SIREGAR

Purpose: To demonstrate a rare case of orbital malignant solitary fibrous tumor and emphasize the important role of immunohistochemistry assay in diagnosing the disease.

Methods: Case report. A 14-year-old girl came with proptosis of the left eye in the past 2 years prior to the visit that was massively increasing in the past 2 months. It followed with orbital pain that spread to her head. Orbital computed tomography showed inhomogeneous massive orbital mass with contrast enhancement, rectus muscle involvement, and lateral wall destruction. The mass had invaded to the intracranial region with a high suspicion of malignancy.

Results: Histopathology result confirmed an orbital rhabdomyosarcoma. As the clinical findings were in line with the histopathology result, we proceed to therapy. After the initial therapy, no improvement was found. Immunohistochemistry evaluation was performed to reevaluate the tumor. Positive results of vimentin, CD34, and BCL2 confirmed a malignant solitary fibrous tumor of the orbit.

Conclusions: Rarity of malignant solitary fibrous tumor is in concordance with our experience in diagnosing this case. For the last 10 years of our clinical experience, this is the first case of orbital malignant solitary fibrous tumor in our institution. It brought its own challenges to diagnose and manage the disease. Immunohistochemistry had an important role to confirm the definitive diagnosis. The presence of this case brought an awareness for clinicians regarding malignant solitary fibrous tumor in Indonesia.

Poster No.: EX1-137

Panel No.: 137

Risk Factors for Tumor Growth of Posterior Uveal Melanocytic Lesions With Thickness Greater Than 2 mm and Without Other Known Factors Predictive of Growth in 142 Consecutive Patients

First Author: Antoine SAFI

Co-Author(s): Paulina BARTOSZEK, Patrick DE POTTER, Annie ROBERT

Purpose: To define the clinical and ultrasonographic risk factors for growth of melanocytic posterior uveal tumors presenting with a thickness of 2 mm or more without other known factors predictive of tumor growth as labelled TFSOM-UHHD.

Methods: Noncomparative observational case series including 142 patients with posterior uveal lesions measuring 2 mm or more in thickness as a unique risk factor for growth at initial visit. Kaplan-Meier analyses were used to assess time to growth and Cox proportional hazards regressions evaluated factors predictive of tumor growth.

Results: The mean age at diagnosis was 65 years old. The mean largest tumor diameter was 9 mm (range, 4 to 20) and tumor thickness was 2.6 mm (range, 2 to 5.6). The mean distance to the disc was 6 mm (range, 0.5 to 16) and the fovea was 5.4 mm (range, 0 to 16). Tumor growth was documented in 27 patients (19%) after a median follow-up of 75 months (interquartile range, 40 to 114). The factors predictive of growth included greater diameter (>9 mm), greater thickness (>3 mm), and lack of drusen. The global cumulative risks for tumor growth were 3% at 1 year, 16% at 5 years, and 25% at 10 years.

Conclusions: Among posterior uveal melanocytic lesions with tumor thickness greater than 2.0 mm and no other known factor predictive of tumor growth (TFSOM-UHHD), those with a diameter greater than 9 mm, a thickness greater than 3 mm, and those without drusen carried a significant risk for growth and should be strictly monitored.

Ophthalmic Epidemiology

Poster No.: EX1-138
Panel No.: 138

5-Year Follow-Up Pattern and Associated Factors After Pediatric Cataract Surgery in the Visually Developing Age Group

First Author: Pratik **CHOUGULE**

Co-Author(s): Ramesh **KEKUNNAYA**, Ashik **MOHAMED**, Shamsiya **MURAT**

Purpose: To study the pattern of follow-up in children less than 5 years of age undergoing surgery for congenital and developmental cataract over a period of 5 years.

Methods: This was a retrospective study in children less than 5 years of age undergoing cataract surgery from January to December 2010 for congenital or developmental cataract and their follow-up visits until December 2015 were recorded. Factors like age, sex, distance from hospital, late presentation, socioeconomic status, laterality, morphology and type of cataract, implantation of intraocular lens (IOL), and interventions done were noted. Their follow-up pattern at postoperative 1 week, 1 month, 3 months, 6 months, 1 year, and then once a year until 5 years were recorded.

Results: A total of 169 patients were included with median follow-up of 22 months and median age of 10 months; age at surgery had a negative correlation with total follow-up. Male to female ratio was 1.82. Logarithmic curve of follow-up was noticed with 61%, 55%, 52%, 39%, and 28% of patients attending the follow-up at 3 months, 6 months, 1 year, 3 years, and 5 years, respectively. Low socioeconomic group had poor follow-up ($P = 0.009$) but the curve of follow-up was similar in low and high socioeconomic groups. Children with multiple interventions had better follow-up ($P < 0.0001$).

Conclusions: A substantial number of children were lost to follow-up within 3 months of surgery implying that the strategies to improve follow-up need to be implemented in the immediate postoperative period. Low economic status is the most important factor associated with poor follow-up.

Poster No.: EX1-139
Panel No.: 139

A Review of 57 Orbital Dermoid Cysts and a Case of Rare Location

First Author: Xi **WANG**

Co-Author(s): Jin **LI**, Ming **LIN**

Purpose: To review Chinese patients with orbital dermoid cysts and investigate the general demographics and regional position.

Methods: Cases of orbital dermoid cysts were collected from 2010 to 2017 in the department of ophthalmology to analyze histopathological changes and clinical data. Archival orbital dermoid cysts were retrieved in the department of pathology.

Results: A total of 57 consecutive Chinese patients with orbital dermoid cysts were identified at our institution (aged 1 to 74 years; mean, 17.24 years; 27 males, 30 females). This condition most commonly occurred in the 0-15 years age group; ages 16-25 accounted for only 8.8% of cases, and ages 26+ accounted for 31.6% of cases. The most common area affected was the upper-outer quadrant of the orbit, followed by the superior quadrant of the orbit, the eyelid, and the inner and outer canthus. Among the 57 cases, the most frequent location was outside of the orbital cavity; only 4 cases were located in the orbital cavity (1 case in the inner muscle cone, 3 cases in the outer muscle cone).

Conclusions: Teenagers aged 10-15 are the most susceptible population. The most common site was the upper-outer quadrant of the orbit, and cases located in the orbital cavity were not typical, especially inner muscle cone. However, it is worth mentioning that 1 case, in a 62-year-old woman, occurred within the muscle cone, with the preoperative imaging examination and postoperative pathology showing the existence of calcification in cystic contents. It is a rare case and should be paid attention to.

Orbital & Oculoplastic Surgery

Poster No.: EX1-140
Panel No.: 140

Enterobius vermicularis in Anterior Chamber of the Eye

First Author: Kabindra **BAJRACHARYA**

Co-Author(s): Arjun Malla **BHARI**, Saraswati **PANDEY**, Salma **RAI**, Sweetie **UPADHYAY**

Purpose: To present an unusual case of *Enterobius vermicularis* in the anterior chamber of the right eye in a 3-year-old girl.

Methods: Visual acuity assessment, slit lamp

examination, and ultrasonography of the eye were performed.

Results: The worm was found in the anterior chamber of the right eye at 8-9 o'clock position, coiling at presentation. The living, white worm was freely moving and changing position frequently. There was hypopyon with exudates inferiorly. The pupil was irregular, and posterior synechiae was present with cataractous lens. The living worm was removed surgically under general anesthesia and sent for microbiological examination. Synecholysis with lens aspiration and posterior chamber intraocular lens implantation was done in a second surgery.

Conclusions: An adult worm in the anterior chamber is rare. Treatment is surgical removal. The visual prognosis is bad when the case presents with severe anterior uveitis and complicated cataract.

Poster No.: EX1-141

Panel No.: 141

A Case of Necrotizing Autoimmune Myopathy

First Author: Loraine CHOW

Co-Author(s): Sharon CHOW, Wing Lau HO

Purpose: To present a case of necrotizing autoimmune myopathy in a 65-year-old woman who presented with binocular diplopia.

Methods: A 65-year-old woman presented with sudden onset of diplopia. On initial presentation, her extraocular movements were normal. However, 1 week later, she presented with bilateral complete ptosis and restricted extraocular movement in all directions. Investigations done showed a high creatinine kinase >35,000 with raised inflammatory markers. Magnetic resonance imaging (MRI) showed thickened extraocular muscles. Otherwise all other blood tests and positron emission tomography computed tomography (PET-CT) done were unremarkable. On further workup, urine myoglobin was positive. Five days later, she developed bilateral vocal cord palsy requiring tracheostomy. Electromyogram (EMG) and muscle biopsy of laryngeal muscles showed myopathic changes.

Results: The patient was treated with intravenous (IV) steroids and IV immunoglobulin followed by oral steroids and azathioprine. Her ptosis and extraocular movement showed gradual improvement. Her creatinine kinase eventually normalized and she was diagnosed with necrotizing autoimmune myopathy.

Conclusions: A case of necrotizing autoimmune myopathy presented with sudden onset of diplopia, complete ptosis, and frozen globe with improvement in condition after treatment with IV steroid and immunoglobulin.

Poster No.: EX1-142

Panel No.: 142

Amblyopia in Congenital Ptosis

First Author: Khairun NESA

Co-Author(s): Sharmin AHMED, Tanjila HOSSAIN, Syeed KADIR

Purpose: To assess the frequency of different types of congenital ptosis and also to report the rate of amblyopia in congenital ptosis.

Methods: This analytical cross-sectional study was carried out in 2 tertiary care eye hospitals in Bangladesh from July 2012 to December 2016. We included all types of congenital ptosis from 6 years to 35 years of age. Visual acuity, refractive status, and axial length were measured in all cases.

Results: We evaluated 116 ptotic eyes in 103 patients. A total of 87.4% of patients had unilateral ptosis and 12.6% had bilateral. Males were 60.2% and females were 39.8%. Of the total, congenital simple ptosis (CSP) was seen in 52.4%, congenital aponeurotic ptosis in 5.8%, Marcus Gunn ptosis in 15.5%, congenital ptosis with monocular elevation defect in 13.6%, blepharophimosis syndrome (BPS) in 7.7%, congenital third nerve palsy in 2.9%, and congenital fibrosis syndrome in 1.94%. All BPS cases (100%) presented with bilateral ptosis and only 9.2% of CSP presented with bilateral ptosis. Difference of >0.5 mm axial length was observed in 35 (38.8%) ptotic eyes and 4.4% in nonptotic eyes of unilateral ptosis ($P = 0.005$). Compound myopic astigmatism was the significant refractive error in 53.4% of ptotic eyes. Amblyopia was found in 24.3% in all congenital ptosis, 26.7% in unilateral congenital ptosis, and 86% in severe unilateral ptosis.

Conclusions: Myopic astigmatism was the significant refractive error in congenital ptosis and amblyopia was more prevalent in severe unilateral ptosis. Early management will help to prevent amblyopia in congenital ptosis.

Poster No.: EX1-143

Panel No.: 143

An Unusual Ophthalmic Presentation of Systemic Lupus Erythematosus

First Author: Tom BETTS

Co-Author(s): Joshua ERCEG, Rebecca STACK, Rob WEATHERHEAD

Purpose: We aim to highlight an unusual ophthalmic presentation of systemic lupus erythematosus (SLE) and provide an up to date review of the literature of the ophthalmic manifestations and their management.

Methods: We present a case of a woman from the Pacific Islands who attended with gross unilateral

periorbital swelling and a normal eye examination. She was otherwise well with no other signs or symptoms. Imaging identified bilateral gross lacrimal gland swelling and she underwent thorough investigation with only positive antineutrophil cytoplasmic antibodies (ANCA). We prescribed her several treatments of oral steroids when she developed bilateral periorbital swelling. Six months later she developed arthritis in her fingers and a malar rash. She was diagnosed with SLE and is being successfully managed with the assistance of the rheumatologist. We have clinical photographs from throughout this patient's management.

Results: Ocular complications occur in a third of SLE patients and can represent the initial manifestation of the disease. Orbital involvement is a rare manifestation and lacrimal gland and periorbital swelling has not previously been described.

Conclusions: We present an ophthalmic manifestation of SLE not previously described. We will highlight other SLE ophthalmic manifestations and the disease diagnosis and management.

Poster No.: EX1-144

Panel No.: 144

Challenging Reconstruction of Large Eyelid Defect Following Excision of Bilateral Benign Fibrous Histiocytoma

First Author: Wida SETIAWATI

Co-Author(s): Neni ANGGRAINI, Hernawita SUHARKO

Purpose: Management of eyelid defects after tumor excision is a challenging procedure. The aim of this case report is to emphasize the management of large eyelid defects, particularly the selection of the surgical technique and donor site of the eyelid reconstruction.

Methods: A 44-year-old man complained of multiple mass on both eyelids since 18 years previously. Pathology anatomy examination showed benign fibrous histiocytoma. Computed tomography (CT) scan revealed homogenous mass on both palpebra. Excisional surgery of the right palpebra tumor was done, causing partial thickness eyelid defects sized 14 x 60 mm on the superior palpebra and 13 x 58 mm on the inferior palpebra. Afterwards, the surgery was followed by eyelid reconstruction surgery using temporal flap, advanced flap, and retroauricular graft technique. Excisional surgery of the left palpebra tumor was done on the next surgery, causing partial thickness eyelid defects sized 15 x 62 mm on the superior palpebra and 10 x 55 mm on the inferior palpebra. Similar reconstruction surgical technique was done on the left palpebra.

Results: After the excisional surgery followed by eyelid reconstruction surgery, the wound was healed properly.

In the right eye, there was lagophthalmos 1 mm without corneal exposure. In the left eye, there was minimal ectropion and lagophthalmos 3 mm without corneal exposure. The patient was very satisfied with the outcomes.

Conclusions: Large eyelid reconstruction after tumor excision is a challenging procedure. Selection of the surgical technique for large eyelid defect must be adjusted with location, size, and thickness of the eyelid defect. All of these will lead to satisfactory result, restoring eyelid form and function.

Poster No.: EX1-145

Panel No.: 145

Cyanoacrylate Glue in Orbital Exenteration

First Author: Sameeksha TADEPALLI

Co-Author(s): Santosh HONAVAR, Puneet JAIN, Sumeet LAHANE

Purpose: To evaluate the efficacy of intraoperative cyanoacrylate glue in minimizing intraoperative and postoperative bleeding in orbital exenteration.

Methods: Retrospective, interventional case series of 3 patients who underwent eyelid sparing exenteration with marginal blepharorrhaphy. Cyanoacrylate glue (1 mL) was applied to the residual tissue at the orbital apex and allowed to polymerize. Intraoperative hemostasis and postoperative socket aspirate were assessed.

Results: Indications for orbital exenteration were eyelid sebaceous gland carcinoma with orbital extension in 2 patients aged 72 years and 65 years each and diffuse ocular surface squamous neoplasia with orbital extension in 1 patient aged 52 years. Intraoperative hemostasis was immediate upon polymerization of the glue and the socket was completely dry by postoperative day 10. All the patients achieved a smooth concave skin cover and were ready to fit an orbital prosthesis in 6 weeks.

Conclusions: Use of cyanoacrylate glue in orbital exenteration can help hasten intraoperative hemostasis and postoperative recovery.

Poster No.: EX1-146

Panel No.: 146

Endoscopy-Guided Probing in Congenital Nasolacrimal Duct Obstruction

First Author: Saumendranath GHOSE

Co-Author(s): Tushar Kanti HAZRA

Purpose: To detect the efficacy of endoscopy-guided probing in congenital nasolacrimal duct (NLD) obstruction and to determine prognostic factors for successful probing.

Methods: Prospective case series analyzing 32 eyes of 24 children with history of watering since birth and failed fluorescein dye disappearance test (FDDT). Children with previous failed probing were excluded. Probing was considered successful when patients became asymptomatic and FDDT became normal.

Results: Endoscopy-guided probing was successful in 87.5% (28/32), 100% (1/1) for punctal stenosis, 0% (0/3) for canalicular block, 100% (18/18) for distal soft NLD block, and 90% (9/10) in distal bony NLD block. Age and sex had no prognostic value. Site of obstruction was strongly related to success of probing; proximal obstruction was likely to fail in comparison with distal.

Conclusions: Endoscopy-guided probing allows direct visualization of nasal structures and gives a clear idea about the site of obstruction. The site of obstruction is a major determining factor in the success of probing.

Poster No.: EX1-147

Panel No.: 147

Evaluation of Ocular Lesions and Anatomic-Histopathologic Features in Lacrimal Gland Lymphoproliferative Disorders

First Author: Hoang CUONG

Purpose: To evaluate ocular lesions and anatomic-histopathologic features in lacrimal gland lymphoproliferative disorders (LGLD).

Methods: A prospective cross-sectional study on 36 patients (40 eyes) examined at Vietnam National Institute of Ophthalmology (VNIO) during the period 2011-2012.

Results: Mean age was 56, with male dominance (52%). Main clinical signs cited: ptosis and eyelid edema (50%), tumor palpation (36%), ptosis (39%). Most tumors were located on the superior temporal orbit (97%). Computed tomography (CT) scan using contrast substance and evaluation of orbital structure are very important tools to help in diagnosis. LGLD had characteristics such as the following: mass effect of mixed hyper- and hypodensity (88%), poorly defined limitation of lesions (90%), infiltrates to superior and medial rectus muscles as well as lacrimal glands (97%), no bone erosion. Main features of anatomic-histopathologic study included the following: a normal lymph node architecture, a dense infiltration of small histologically bland lymphocytes with the formation of reactive lymphoid follicles, the germinal centers were observed. In hematoxylin and eosin (HE) stained specimen we found 12% were reactive lymphoid hyperplasia (RLH), and the others were AOL (88%).

Conclusions: LGLD has various signs and diversity of symptoms, among which anatomic-histopathologic exam is an exclusive tool to diagnose and guide

therapy.

Poster No.: EX1-148

Panel No.: 148

Evaluation of Silicone Tube and Carbon Dioxide Laser in Treating Punctal Stenosis

First Author: Ha NGUYEN

Co-Author(s): Ha HA, Duong NGUYEN, Hien NGUYEN, Van PHAM, Van PHAM

Purpose: To evaluate the efficacy of silicone tube and carbon dioxide laser in treating punctal stenosis.

Methods: Nineteen eyes with punctal stenosis were selected and evaluated for flow blockage. Carbon dioxide was done to enlarge the punctum and then silicone tube was inserted.

Results: All 19 eyes were relieved of eye watering without significant irritation.

Conclusions: Silicone tube may be a reasonable adjunct to snip operation.

Poster No.: EX1-149

Panel No.: 149

Harvesting Fascia Lata: A Comparison of Various Techniques in Ophthalmology

First Author: Syeed KADIR

Co-Author(s): GM FARUQUE, Golam HAIDER, Narayan CHANDRA, Moinul HOQUE

Purpose: To describe the clinical use of fascia lata in ophthalmology and to analyze the outcomes of fascia lata in different surgical techniques.

Methods: This study was done in 2 tertiary eye hospitals in Bangladesh from July 2012 to June 2017. We obtained enough fascia lata from 2 small skin incisions on the thigh for frontalis brow suspension (FBS) and 1 incision for fascia lata patch graft, wrapping orbital implant, fascial sling, etc.

Results: In total, 63.3% of patients were male and 36.7% were female. Autogenous fascia lata was used for FBS in 30 ptotic eyelids of 25 (41.67%) cases of congenital ptosis (CP) above 5 years of age, scleral patch graft in ciliary staphyloma (18.3% of cases), wrapping orbital implant (15% of cases), repair of implant extrusion (8.3%), and fascial sling to correct recurrent paralytic ectropion (1.67%). Preserved fascia lata was used to correct ptosis under 5 years of age (15%). Mean follow-up time was 5.32 (3–18) months. Complications such as wound hematoma (1.9%), pain at rest (100% for 4 days), pain on walking (100% for up to 3 days, 70.6% for 7 days), and less scarring in all cases were found after harvesting fascia lata. The mean MRD1 was +0.5 preoperatively and +3.10

after 2 months of FBS in all cases. Ocular motility was satisfactory (100%) following fascia lata wrapping of orbital implant.

Conclusions: Harvesting fascia lata was a successful technique with the least scarring on the thigh to correct ptosis, ciliary staphyloma, repair extruded implant, and wrapping of orbital implant to get better cosmesis and motility.

Poster No.: EX1-150

Panel No.: 150

Hasner Valve Incision With Nasal Endoscopy for Congenital Dacryocystitis

First Author: Shiwei HUANG

Co-Author(s): Jizhe CUI, Jun WANG, Shuai WU

Purpose: To evaluate the feasibility and curative effect of the operation of Hasner valve incision with nasal endoscopy on congenital dacryocystitis.

Methods: In this retrospective study, 6 eyes (of 6 patients) diagnosed with congenital dacryocystitis were treated in our hospital between July 2016 and December 2016. The infants were aged between 18 months and 36 months at the time of surgery. Mean age was 29 months. All cases underwent endoscopic Hasner valve incision.

Results: The procedure was successful in all infants without any early or late complications.

Conclusions: The great majority of congenital dacryocystitis stem from Hasner valve area pathologies. Nasal endoscopy helps intraoperative visualization and is the only method that confirms the correct anatomic position of the catheterization in real time. Endoscopic Hasner valve incision is a very effective and safe way of treatment.

Poster No.: EX1-151

Panel No.: 151

Hemangiopericytoma of the Lacrimal Sac: A Case Report

First Author: Unnkade BHAKTIKAMALA

Co-Author(s): Sunisa SINTUWONG

Purpose: To report a case of hemangiopericytoma of the lacrimal sac.

Methods: Case report.

Results: A 48-year-old man complained of epiphora and mass just below the right medial canthus for 3 months. A smooth, firm, painless mass was palpated over the lacrimal sac area. The nasolacrimal duct of the right eye was 90% patent on irrigation with watery reflux. Examination of the opposite eye was unremarkable. Computed tomography (CT) of the orbit

revealed a well-defined homogeneously enhancing mass at the right lacrimal sac with mild bony remodeling at the lacrimal sac fossa. After tear trough incision, a rubbery brownish tan ovoid mass with an estimated size of 1.5 x 1 x 1 cm was identified in the lacrimal sac fossa. The mass was excised. Histopathological findings were compatible with hemangiopericytoma. Immunohistochemical staining showed positivity to CD34. The tumor margin was not free. Re-excision with wide margins was performed, and histopathology revealed free margins on specimen. The patient has been free of symptoms for 3 months.

Conclusions: Hemangiopericytoma of the lacrimal sac is rare. Only 10 cases of English articles have been reported. We report a case that had bony remodeling at the lacrimal sac fossa on CT of the orbit. This similar finding was only found in 1 report (Lim et al). The patient will require regular long-term follow-up due to the risk of recurrence from an incomplete initial resection. The recurrence rate of orbital hemangiopericytoma is estimated to be 30% or higher in cases of incomplete removal. Recurrence has been observed up to 33 years after surgical excision.

Poster No.: EX1-152

Panel No.: 152

Improving the Predictability and Outcome of Posterior Approach Levator Advancement Ptosis Surgery in Asian Patients

First Author: Petrina TAN

Co-Author(s): Raman MALHOTRA, Johnny WONG

Purpose: Posterior approach white-line levator advancement techniques (WLA) have been reported with success in Caucasian patients. These results may not be reproducible in Asians due to known differences in eyelid anatomy. This study aimed to assess the efficacy and predictability of the WLA technique for correction of involutional ptosis in Asians.

Methods: Retrospective chart review of patients with involutional ptosis who underwent WLA by a single surgeon. Objective outcome measures included upper eyelid margin reflex distance (uMRD) and the interlid difference in uMRD and eyelid contour. Patient satisfaction after surgery was noted.

Results: Thirty-six eyelids of 20 patients (13 females) were included. Mean age was 55.9 years (SD = 16.6). Mean follow-up period was 6.8 months. Preoperative and postoperative mean uMRD were 0.76 mm (SD = 1.26) and 3.10 mm (SD = 0.95), respectively. There was statistically significant mean improvement in uMRD (mean difference = 2.33 mm, $P < 0.001$). Interlid difference in uMRD ranged from 0.5-1 mm. Interlid difference in eyelid contour was not found in all patients. All patients except for 1 were completely

satisfied with their surgical outcome. This patient requested repeat surgery even though she agreed there was significant improvement after surgery (uMRD: 1 mm to 3 mm). No intraoperative complications or postoperative corneal exposure problems were encountered.

Conclusions: WLA was effective for predictable and reproducible correction of involuntional ptosis with at least moderate levator function in Asians. Careful patient selection and a detailed knowledge of anatomy to accurately locate the “white line” during surgery are pertinent to improve surgical outcome.

Poster No.: EX1-153
Panel No.: 153

Is Congenital Ichthyosis Amenable to Medical Management?

First Author: Sumeet LAHANE

Co-Author(s): Santosh HONAVAR, Puneet JAIN, Abhilasha Maheshwari MAHESHWARI, Raksha RAO

Purpose: To evaluate the outcomes of medical management in congenital ichthyosis with cicatricial ectropion, lagophthalmos, and corneal exposure.

Methods: Retrospective interventional case series of 6 patients of congenital ichthyosis who underwent protocol-based medical management with systemic retinoids (acutretin) and topical retinoids (tretinoin 0.5%) along with external application of intensive-action moisturizing agents. Main outcome measures were improvement in skin quality and reversal of ectropion, lagophthalmos, and exposure keratopathy.

Results: Age ranged from 18 months to 12 years. On presentation, all children had severe ectropion of all 4 eyelids, lagophthalmos, and exposure keratopathy. One child had bilateral bacterial keratitis and another had fungal keratitis. Three children had bilateral central and inferior corneal scars. Two children needed temporary bilateral paramedian tarsorrhaphy and 1 child needed permanent tarsorrhaphy. At a mean follow-up of 36 months, all of them showed marked improvement in skin quality, resolution of ectropion, lagophthalmos, and exposure keratopathy.

Conclusions: Monitored medical management and supportive treatment can result in improvement in general and ophthalmic morbidity associated with congenital ichthyosis and help avoid surgery.

Poster No.: EX1-154
Panel No.: 154

Lacrimal Gland Enlargement in Thyroid Eye Disease

First Author: Stephanie YUK

Co-Author(s): Chee CHEUNG

Purpose: Lacrimal gland enlargement has been reported in patients suffering from thyroid eye disease (TED). However, this may not be solely due to fat hyperplasia from TED. We report a case of bilateral lacrimal gland enlargement with clinical and radiological features of TED, as well as IGG4-related disease.

Methods: Case report.

Results: A 38-year-old female, with history of Graves disease, had hemithyroidectomy and radioactive iodine (RAI) done, resulting in postoperative hypothyroidism. One year after RAI, she developed exophthalmos and dry eye. Imaging showed bilateral symmetrical enlarged lacrimal glands, submandibular glands, and sublingual glands, while extraocular muscles were normal. She was diagnosed with Sjogren syndrome, and swelling improved with a course of oral steroids. Fifteen years later, she developed progressive diplopia and lid swelling. Clinically, she displayed signs of TED [lid swelling, conjunctival and caruncular injection, restricted elevation of the left eye, and increased intraocular pressure (IOP)]. Imaging showed bilateral symmetrical tendon-sparing thickening of superior and inferior rectus muscles, together with bilateral enlarged lacrimal glands and thickened frontal and infraorbital nerves. Her serum IgG4 level was raised. In view of her elevated IOP despite glaucoma medication, left orbitotomy and incisional biopsy of the lacrimal gland were done. Histology showed IgG4 dacryoadenitis. She was started on mycophenolate mofetil, and oral prednisolone 40 mg was slowly tapered off. IOP was well controlled on follow-up.

Conclusions: Lacrimal gland swelling in a TED patient may be multifactorial. It is important to keep in mind the different possibilities, such that timely diagnosis and appropriate treatment can be given.

Poster No.: EX1-155
Panel No.: 155

Normative Measurements of Inferior Oblique Muscle Thickness in Japanese by Magnetic Resonance Imaging

First Author: Eri ISHIKAWA

Co-Author(s): Hirohiko KAKIZAKI, Maria Suzanne SABUNDAYO, Yasuhiro TAKAHASHI

Purpose: To measure the thickness of the inferior oblique muscle (IOM) among Japanese by magnetic

resonance imaging (MRI).

Methods: This retrospective observational study included 79 patients (29 males and 50 females) who underwent MRI for detection of a unilateral orbital tumor. The thickness of the IOM was measured on the side without the orbital tumor. On the quasisagittal plane through the optic nerve, the major and minor axes of the cross-section of the IOM were measured. On the coronal plane, the maximum thickness perpendicular to the course of the IOM was measured. All measurements were performed using the digital caliper tool of the viewing software.

Results: The major and minor axes on the quasisagittal plane and the maximum IOM thickness on the coronal plane were 8.03 ± 1.82 mm, 2.86 ± 0.57 mm, and 2.98 ± 0.52 mm, respectively. There were no significant differences in IOM thickness measurements between sexes and sides ($P > 0.050$, Student *t* test). No significant correlation with the major axis ($r = 0.065$, $P = 0.567$), minor axis ($r = 0.190$, $P = 0.094$), or the maximum thickness on the coronal plane ($r = 0.156$, $P = 0.171$) was found in relation to age (Pearson correlation coefficient).

Conclusions: The normative IOM thickness in Japanese was presented on MRI, which were similar among all ages irrespective of sex and side. The technique we used is easily applicable, and the results may serve as a guide to detect IOM involvement in inflammatory and neoplastic conditions of the orbit.

Poster No.: EX1-156

Panel No.: 156

Orbital Decompression Surgery in Thyroid Eye Disease: A Tertiary Center Experience

First Author: Tom BETTS

Co-Author(s): Jonathan CHAN, Joshua ERCEG, Rebecca STACK, Scott STEVENSON, Rob WEATHERHEAD

Purpose: To assess outcomes of orbital decompression in thyroid eye disease (TED) in the interest of improved patient information. The 2 principal outcomes measured were proptosis change and development of diplopia, with comparison of these outcomes for each decompression approach.

Methods: We retrospectively reviewed 50 consecutive patients with orbital decompression for TED over a 10-year period, conducted by 3 surgeons [2 oculoplastic, 1 otolaryngology (ENT)]. We reviewed preoperative status of ophthalmic and medical disease with postoperative data at 1 month and 6 months. Data was stored and analyzed using Microsoft Excel.

Results: All patients had 6 months of postoperative follow-up. Combined medial and lateral wall decompression achieved the most significant reduction

with an average of 5.5 mm reduction in proptosis. Lateral wall decompression achieved an average of 3 mm reduction. Medial wall decompression performed in the context of optic nerve decompression had an average of 1.5 mm reduction. Approximately 40% of patients that preoperatively did not have diplopia developed it this after surgery. Those undergoing medial wall decompression had the highest incidence of postoperative diplopia (66%). Lateral wall decompression had the lowest reported onset of diplopia (12%).

Conclusions: We report the postoperative outcomes of our orbital decompressions for TED. We found that a significant proportion of patients developed postoperative diplopia, greatest in the isolated medial wall group. An average of 2.5 mm of reduction in proptosis was achieved. We are now better placed to advise our patients of the risks and benefits of various surgical approaches.

Poster No.: EX1-157

Panel No.: 157

Plant Foreign Body in the Orbit: Diagnosis and Treatment

First Author: Duong DIEU

Purpose: A branch of eucalyptus tree had perforated through the lower eyelid and into the globe causing orbital abscess and diplopia. This case was diagnosed and operated for removal of the foreign body on day 24 after onset.

Methods: Case report of the clinical diagnosis and intervention. Paraclinical and clinical signs and patient history were observed. On x-ray, no sign was detected as twigs did not show opacity on x-ray. Ultrasound showed foreign body in the orbit but did not specify the shape and size of the object.

Results: On day 24 after the foreign body entered the eye, local anesthesia and conjunctiva was done. Surgical exploration was done for freeing abscess pus. Then the foreign body was extracted by strabismus hook. The foreign object was a twig from a tree with size measuring 5 mm x 20 mm. One week after surgery, the abscess had collapsed, with less conjunctiva hyperemia, less bruising of the lid, and no diplopia. Three weeks after surgery, the right eye had completely returned to normal.

Conclusions: Initial management and close monitoring of patients every day has an important role in removing the foreign body as soon as possible to minimize complications contributing to the success of treatment. The clinical signs including deep orbital abscess, hyperemia of conjunctiva, diplopia, ptosis, and results of ultrasound, X-ray, and computed tomography (CT) are useful. In complicated cases, surgery for abscess

debridement as well as detecting and removing a foreign body sooner should yield the above expected results.

Poster No.: EX1-158

Panel No.: 158

Practical Classification System for Orbital and Orbitofacial Fractures: A Preliminary Report

*First Author: Mariel Angelou **PARULAN***

*Co-Author(s): Gangadhara **SUNDAR***

Purpose: To present a classification of orbital and orbitofacial fractures that is practical, simple, and relevant to orbital/oculoplastic specialists that will facilitate easy communication and guide management in a multidisciplinary setting.

Methods: A retrospective descriptive study of all cases of orbital and orbitofacial fractures that underwent surgery in a period of 1 year (March 2014 to July 2016). Demographic and radiologic data were obtained and analyzed. Fractures were classified into simple [linear, blowout (1- or 2-wall), blow-in (1- or 2-wall)] and complex [zygomaticomaxillary complex (ZMC), naso-orbitoethmoidal (NOE), cranio-orbital, orbitofacial, cranio-orbitofacial, panfacial] fractures. Patient descriptors included age, bilaterality, complexity, displacement, entrapment, foreign body, and globe injury (ABCDEFGF). Two independent reviewers evaluated and classified each patient's orbital fracture category with reasonable concurrence.

Results: A sample of 85 patients operated upon during the study period was studied. Classification of the fractures of the study patients were as follows. Simple: linear fractures (0), blowout 1-wall (17.6%), 2-wall (16.5%), blowout 3-2 wall (0). Complex fractures: ZMC fractures (28.2%), NOE fractures (3.5%), orbitofacial LeFort II fractures (2.3%), Le Fort III (9.4%), cranio-orbital fractures (4.7%), canio-orbitofacial fractures (14.1%), panfacial fractures (4.7%). Patient descriptor analysis was as follows: adults (93%), unilateral (85.9%), complex fractures (66%), displaced (100%), muscle entrapment (34%), foreign body (0%), closed globe injury (97.6%).

Conclusions: Orbital fractures frequently extend beyond the orbit. While most simple orbital fractures are 1- or 2-wall blowout fractures, the most common complex fractures are ZMC > cranio-orbital > cranio-orbitofacial > LeFort III > panfacial > NOE fractures. This proposed classification system offers a simple yet practical and reproducible method of defining orbital and orbitofacial fractures facilitating communication, treatment planning, research methodologies, and monitoring outcomes.

Poster No.: EX1-159

Panel No.: 159

Successful Management of Bilateral Lacrimal Duct Obstruction and Nasal Deformity With External Dacryocystorhinostomy: A Case Report

*First Author: Astriviani **SWITANIA***

*Co-Author(s): Kautsar **BOESOIRIE**, Shanti **BOESOIRIE**,*

*Rinaldi **DAHLAN**, Angga **KARTIWA***

Purpose: To report a case of a patient with bilateral lacrimal duct obstruction and nasal deformity that underwent external dacryocystorhinostomy.

Methods: A 9-year-old boy presented with watering and intermittent mucopurulent discharge in both eyes since he was born. There was a history of topical medication with a period of relapse and remission of the symptoms. On examination, mucopurulent discharge flowed from the upper and lower puncta upon pressure on the medial canthus in both eyes. Nasal deformities were identified on clinical examination with enlarged inferior concha identified on computed tomography. Irrigation of the lacrimal drainage system under anesthesia revealed reflux of the irrigation fluid through the opposite puncta in both eyes confirming the diagnosis.

Results: External dacryocystorhinostomy was performed on the right side followed by the same procedure on the left side 2 months later. During each procedure, lacrimal sac could not be identified and the ostiums were made by drilling the nasal bone into the nasal cavity below the inferior concha. Irrigation was performed 1 month after each procedure to confirm the patency of the canal with no reflux found from the superior and inferior puncta in both eyes.

Conclusions: External dacryocystorhinostomy remains as the mainstay therapy in nasolacrimal duct obstruction. Deformity of the nasal structure makes the procedure more challenging which requires modified technique and excellent understanding of the lacrimal drainage system anatomy and surrounding structures.

Poster No.: EX1-160

Panel No.: 160

The Evaluation of Facial Development in Children With Microphthalmia and Anophthalmia Using 3-Dimensional Scanning System

*First Author: Bo **YUAN***

*Co-Author(s): Dong **LI***

Purpose: Children with congenital and acquired microphthalmia and anophthalmia have different degrees of eyeball dysplasia. The eyeball dysplasia

also leads to orbital dysplasia and facial development delays. Nowadays, the meaningful treatment is to implant materials such as hydrogels to expand the orbit and the face as well. However, an effective measurement method to assess the facial 3-dimensional (3D) structure is lacking.

Methods: The 3D scanning system is the emerging facial 3D shape measurement method. It has many advantages such as no radiation injury, high repeatability, objectivity, and accuracy. We selected 35 microphthalmia and anophthalmia children with an age range from 6 to 84 months. All of the children had never received any treatment. We used ultrasound to measure the axial length, and the orbital length was measured with computed tomography (CT). Then, the facial 3D appearance was evaluated with the scanning system. Statistical methods were used to analyze the data consistency.

Results: The horizontal eyelid diameter, eyeball diameter, and orbital volume were 16.44 ± 3.24 mm, 11.99 ± 3.33 mm, and 14.19 ± 2.37 mL; they were all smaller than the healthy side. Each part of the facial volume had positive correlation with the orbital volume and was less than the healthy side.

Conclusions: Children with microphthalmia and anophthalmia show facial development delays, and the eyeball diameter is the main influencing factor. The 3D scanning system has the ability to assess the children's facial appearance and can effectively evaluate the treatment effect.

Poster No.: EX1-161

Panel No.: 161

The Measurement of Normal Orbital Bony Cavity and Soft Tissue Volume Based on 3-Dimensional Reconstruction by CT Scans

First Author: Jun **CHEN**

Co-Author(s): Yi **DU**, Bing-Yao **LU**, Jian-Feng **HE**

Purpose: To provide reference values for orbital parameters in southern Chinese adults and analyze orbital parameters to assess any correlation between general conditions. Then, to compare orbital parameters between southern Chinese adults and Caucasians.

Methods: Computed tomography (CT) scans of 103 orbits from 52 men and 51 women, aged 18-81 years, not affected by orbital disease were retrospectively evaluated. Orbital bony cavity volume (OV), fat volume (FV), extraocular muscle volume (MV), and optic nerve volume (NV) were calculated using Mimics software. Eyeball volume (BV), transverse globe protrusion (EX), and posterior pole of eyeball to orbital apex (PA) were measured. Furthermore, we also analyzed the

correlation between orbital parameters and general conditions, including age, gender, height, weight, and body mass index (BMI).

Results: OV, FV, MV, and NV in males were 22.21 ± 2.17 cm³, 8.89 ± 1.79 cm³, 1.94 ± 0.34 cm³, and 0.41 ± 0.08 cm³ and in females were 20.18 ± 1.54 cm³, 8.09 ± 1.74 cm³, 1.57 ± 0.28 cm³, and 0.36 ± 0.07 cm³, respectively. OV, FV, MV, and NV were all significantly larger in males than in females ($P < 0.05$), and all volumes in southern Chinese are smaller than in Caucasians. In both male and female adults, OV had no relation with age, FV increased with increasing age, whereas MV and NV decreased. OV, FV, and MV showed positive correlations with weight. FV, MV, FV/OV, and MV/OV showed positive correlations with EX and PA but negative correlations with BV/OV.

Conclusions: This study provides reference values for orbital parameters in healthy southern Chinese adults. Age and weight are related to many orbital parameters. All volumes in southern Chinese are smaller than in Caucasians.

Poster No.: EX1-162

Panel No.: 162

Triangular Flap/Tail Flap for Eyelid Reconstruction: An Alternative to Tenzel Flap

First Author: Golam **HAIDER**

Co-Author(s): Sharmin **AHMED**, Tanjila **HOSSAIN**, Mosaddeka **ISLAM**, Syeed **KADIR**

Purpose: To describe a technique of eyelid reconstruction with the tail or triangular flap method and to evaluate the surgical outcome in a group of patients.

Methods: A retrospective review of 6 patients who underwent eyelid reconstruction with the tail or triangular flap method was conducted between July 2014 and July 2017. The follow-up lasted for varying periods during which the preoperative and postoperative photographs were compared as well.

Results: In a total of 6 patients with 7 eyelid defects, 2 (33%) patients had unilateral eyelid coloboma, 1 (17%) had lower lid defect associated with Treacher-Collins syndrome, 1 (17%) had bilateral upper eyelid coloboma associated with craniofacial anomalies, 1 (17%) had juvenile xanthogranuloma of the left upper eyelid, and 1 (16%) had Meibomian gland carcinoma of the right lower eyelid; all underwent lid reconstructive surgery with triangular flap. In total 7 eyelid defects of 6 patients were repaired with the triangular flap technique, 4 (57%) in the upper eyelid and 3 (43%) in the lower eyelid. The defects were completely covered in all patients with triangular flap. The cosmetic outcome of surgical intervention was excellent in all cases.

Conclusions: Triangular/tail flap is an alternative surgical method to the Tenzel flap in eyelid reconstruction.

Poster No.: EX1-163
Panel No.: 163

Using Bovine Dermal Matrix to Lengthen Levator in Dysthyroid Upper Eyelid Retraction

First Author: Jing **SUN**

Co-Author(s): Xianqun **FAN**, Xingtong **LIU**, Sisi **ZHONG**, Huifang **ZHOU**

Purpose: Eyelid retraction is the most common and often the first sign of thyroid eye disease (TED). Upper eyelid retraction causes both functional and cosmetic problems and requires surgical correction. Many procedures have demonstrated good outcomes in mild and moderate cases; however, unpredictable results have been obtained in severe cases. An innovative technique for levator lengthening using bovine acellular dermal matrix as a spacer graft is introduced for severe upper eyelid retraction secondary to TED.

Methods: Dryden introduced an upper eyelid-lengthening procedure using scleral tissue as a spacer graft; however, the results of the scleral defect were unsatisfactory. Two improvements were made during this study: first, fibrous cords scattered on the surface of the levator aponeurosis were excised carefully; next, the fat pad anterior to the aponeurosis was pulled out, and the skin was closed using skin-tarsus-fat-skin sutures.

Results: The modified levator-lengthening surgery was performed on 32 eyelids in 26 patients, including 21 women and 5 men (mean age, 37.8 years; age range, 19-67 years). After corrective surgery, the average upper margin reflex distance was lowered from 7.7 ± 0.85 mm to 3.3 ± 0.43 mm. A total of 18 cases (69%) demonstrated perfect results, while 6 cases (23%) displayed acceptable results. No other complications, such as infection or hematoma, occurred after surgery.

Conclusions: A modified levator-lengthening procedure using bovine acellular dermal matrix as a spacer graft ameliorated both the symptoms and signs of severe upper eyelid retraction secondary to TED. This procedure is a reasonable alternative for TED-related severe upper eyelid retraction correction.

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Poster No.: EX1-164
Panel No.: 164

10-Year Results of Minus Lens Therapy in the Management of Children With Intermittent Exotropia

First Author: Mostafa **SOLTAN SANJARI**

Co-Author(s): Kaveh **ABRI AGHDAM**

Purpose: To evaluate efficacy and safety of minus lens therapy as a first-line treatment in children with intermittent exotropia.

Methods: In this retrospective case series, children with intermittent exotropia who had received minus lens therapy for at least 6 months and had a minimum of 12-month follow-up were included. Visual acuity, refractive error, deviation angle, and the level of control in exotropia were recorded.

Results: In total, 163 subjects met the inclusion criteria. The mean age was 3 years (range, 1-6 years). Ninety-nine of the children were male (60.7%). The power of the lenses used ranged from -1.00 to -4.00 diopters. Mean angle of deviation at initial visit was 24.7 prism diopters (PD) that improved to 10.6 PD with the overminus lens treatment. In 69.3% of patients the final angle of deviation ≤ 10 PD. Sixty-eight (42%) patients with minus lens therapy had a good control score and did not require surgical intervention. Of the 92 (56%) patients who underwent surgery, failure in minus therapy termination in 44 individuals led to surgery after an average time of 37.9 months despite a good control score. The other 48 patients with a poor control score had surgery after an average time of 25.3 months. Three remaining patients developed esotropia that disappeared after cessation of therapy. No significant association was found between the annual change in refractive error and lens power or treatment duration.

Conclusions: Minus lens therapy is a safe and viable option for initial management of intermittent exotropia in children with intermittent exotropia.

Poster No.: EX1-165
Panel No.: 165

Acquired Convergent Strabismus Fixus in a Myopic Elderly Filipino Male: A Case Study

First Author: Kaye Lani Rea **LOCAYLOCAY**

Co-Author(s): Patricia Yukiji **VILLA**

Purpose: To describe the pathophysiology, clinical manifestations, imaging findings, and management of acquired strabismus fixus (SF) in an elderly Filipino

male with progressive myopia.

Methods: This is a case report on SF in an elderly Filipino male with progressive myopia since childhood who acquired esotropia in adulthood progressing to convergent SF. Both PubMed and local databases were used to review the current literature on SF. Data was then correlated to the patient's case in order to describe the epidemiology, pathophysiology, clinical manifestations, imaging findings, and the management of SF.

Results: SF is a rare oculomotor abnormality that may be acquired and associated with myopia. This is a case of a 65-year-old male who presented with a history of progressive myopia and esotropia. The patient had strabismus fixus, right eye more than the left, with esodeviation of more than 100 prism diopters. Magnetic resonance imaging of the orbits showed bilateral atrophic lateral rectus muscle insertions and superotemporal displacement of the right globe, hence the greater esodeviation in the said eye. These findings were consistent with previous imaging studies of patients with myopic SF. Surgical treatment was attempted to improve visual acuity of the right eye given that the fixating left eye had already undergone vitrectomy.

Conclusions: Early detection and prompt diagnosis of the progressive esotropia in this patient could have prevented SF and improved visual prognosis. Counseling and medical advice were also extended to the patient's children who were also known myopes.

Poster No.: EX1-166

Panel No.: 166

Application Value and Therapeutic Efficacy of Wide-Field Digital Pediatric Retinal Imaging System (Retcam III) Fundus Fluorescein Angiogram-Assisted Photocoagulation on Familial Exudative Vitreoretinopathy

First Author: Yian LI

Co-Author(s): Jie PENG, Qi ZHANG, Peiquan ZHAO

Purpose: To observe the application value and therapeutic efficacy of a wide-field digital pediatric retinal imaging system (Retcam III) fundus fluorescein angiogram (FFA)-assisted photocoagulation on familial exudative vitreoretinopathy (FEVR).

Methods: The data were collected from 46 eyes of 34 patients with stage 2 FEVR. All patients underwent fundus photography and peripapillary FFA. We compared the vessel reliability of fundus photography with FFA. The hyperfluorescent area of FFA underwent semiconducting photocoagulation under indirect binocular ophthalmoscope, with wavelength 532 nm, duration 0.25 s, and energy 200-280 mW. Ocular

fundus was examined after operation. The missed area after laser was at once supplemented. The follow-up duration was 14.4 months. In 3 months after surgery, we observed whether there was neovascularization, exudation, vitreous retraction, or fusion of laser spots. After 3 months, we observed whether there was proliferation, dragged disc, tractional retinal detachment, vitreous hemorrhage, or Coat-like. We also observed complications.

Results: Using fundus photography it was difficult to discriminate the vessel and might miss the avascularity; it cannot distinguish neovascularization from vessels, while FFA can discover neovascularization easily. Operator can easily locate the retinopathy by combining FFA with fundus photography. All eyes did not have any missing area. In 3 months, all eyes had no neovascularization, exudation, or vitreous retraction. At the end of follow-up, all eyes had no adverse retinal structures. All patients had no complication.

Conclusions: Using Retcam III FFA before laser photocoagulation on FEVR, we could clearly recognize neovascularization, with location accuracy. Under its guidance laser photocoagulation can be successful once, with no complication either ocular or systemic.

Poster No.: EX1-167

Panel No.: 167

Association Between ETCO₂ and PaCO₂ in Anesthesia Using Laryngeal Mask for Vitrectomy Treating Retinopathy of Prematurity Stage IV-V

First Author: Luyen NGUYEN

Co-Author(s): Minh PHAM, Ha TRAN, Thanh VU

Purpose: To study the association between ETCO₂ and PaCO₂ in anesthesia using a laryngeal mask for children with retinopathy of prematurity (ROP) stage IV-V.

Methods: We conducted anesthesia using a laryngeal mask in 37 patients with ROP stage IV-V. ETCO₂ was recorded at 1, 5, 10, 20, and 30 minutes since maintaining and before removing the mask; PaCO₂ was taken from the heel capillary blood at 10 and 20 minutes to evaluate and compare with ETCO₂ at T5 and T6.

Results: Average ETCO₂ at follow-up times was 37.56 ± 5.73 , 38 ± 5.74 , 38.40 ± 6.14 , 38.59 ± 5.35 , 40.35 ± 5.89 , and 41.64 ± 6.37 mm Hg. PaCO₂ (T5) was 42.29 ± 5.83 and PaCO₂ (T6) was 45.67 ± 6.37 mm Hg; PaCO₂ at these times had strict linear correlation with $R = 0.843$ ($P < 0.001$). ETCO₂ (T5) and PaCO₂ (T5) were different with statistical significance ($P < 0.001$). They had linear covariate correlation with $R = 0.384$ ($P < 0.05$). ETCO₂ (T6) and PaCO₂ (T6) were different with statistical significance ($P < 0.001$). They had linear covariate

correlation with $R = 0.466$ ($P < 0.05$). PaCO_2 (T5) - ETCO_2 (T5) = 4.34 ± 6.48 and PaCO_2 (MT6) - ETCO_2 (T6) = 7.46 ± 7.15 with linear covariate correlation $R = 0.746$ ($P < 0.001$).

Conclusions: In anesthesia using a laryngeal mask for vitrectomy in children with ROP stage IV-V, ETCO_2 monitoring can reflect the CO_2 partial pressure in the arterial blood; their values had statistically significant difference and linear covariate correlation.

Poster No.: EX1-168
Panel No.: 168

Botulinum Toxin as an Initial Therapy for Management of Sixth Nerve Palsies Caused by Nasopharyngeal Carcinomas

First Author: Emily WONG

Co-Author(s): Carol LAM, Flora LAU, Winnie LAU, Jason YAM

Purpose: To evaluate the efficacy and safety of botulinum toxin injection as a primary treatment for strabismus in a cohort of nasopharyngeal carcinoma (NPC)-related chronic sixth nerve (CN 6) palsy.

Methods: Retrospective review of NPC-related CN 6 palsy receiving botulinum toxin injection at Hong Kong Eye Hospital between January 2009 and January 2016. Only cases with diplopia for at least 6 months and that failed a trial of Fresnel prism therapy were recruited. We excluded cases with prior strabismus surgery and multiple cranial nerve palsies. Patients were offered botulinum toxin injection as primary treatment for their strabismus and were given further injections or offered surgery if diplopia persisted.

Results: Twenty-five patients were recruited. There was a statistically significant reduction in the mean deviation at distance after the last injection compared to that at presentation ($P < 0.001$). Overall, 7 patients (28%) achieved clinical success and 15 patients (64%) remained diplopia-free by repeated botulinum toxin injections alone. Nine patients went on to receive definitive surgery and all achieved good ocular alignment after surgery. Transient ptosis or vertical deviation was seen in 7 patients, which resolved within 3 months, and no serious complications arose from the treatment in our series.

Conclusions: Botulinum toxin injection is a less invasive alternative to surgery that can be done in a topical anesthesia setting, which improves patient quality of life via reduction in diplopia. It is a recommendable initial option in patients with chronic nerve palsies who may have higher risks associated with strabismus surgery.

Poster No.: EX1-169
Panel No.: 169

Comparison and Correlation of Anomalous Head Posture and Fundus Torsion Prior to and After Surgery for Unilateral Congenital Superior Oblique Palsy

First Author: AS KARTHIKEYAN

Co-Author(s): Claudia KUANG, Dennis LAM

Purpose: To compare the pre- and postoperative anomalous head posture (AHP) and fundus torsion (FT) and to analyze the clinical correlation between AHP and FT in patients operated for unilateral congenital superior oblique palsy (SOP).

Methods: In a retrospective consecutive case series, the charts of 13 patients (at least 3 months of follow-up) operated for unilateral congenital superior oblique palsy were reviewed. Patients with acquired SOP and those who had prior surgery were excluded. A complete strabismus evaluation was performed. AHP was documented with photographs and FT was graded either with fundus photographs (when cooperation permitted) or clinically with indirect ophthalmoscopic examination (when cooperation was limited). The pre- and postoperative AHP and fundus torsion were compared and correlated.

Results: Ten male and 3 female patients were operated for unilateral congenital SOP. Eight had right and 5 had left SOP. The mean pre- and postoperative vertical deviation was 27.99 prism diopters (PD) and 4.85 PD, respectively. Coexistent horizontal strabismus was seen in 9 patients (6 exotropia and 3 esotropia). Preoperatively, all patients had a contralateral head tilt. AHP was totally corrected in 4 patients, significantly improved in 8 patients, and in 1 changed to smaller opposite head tilt. All 4 patients who had complete resolution of AHP showed maximum reduction in excyclotorsion postoperatively. Among 8 patients with partial improvement in AHP, 5 showed improvement and 3 showed no significant change in torsion.

Conclusions: AHP improved in most patients following surgery. Excyclotorsion also reduced in the majority of patients. Patients with the best surgical outcome had maximal reduction in excyclotorsion.

Poster No.: EX1-170
Panel No.: 170

Comparison of Outcomes of Lateral Rectus Muscle Surgery for Intermittent Exotropia According to Preoperative Angle Deviation

First Author: Hae Jung PAIK

Purpose: To evaluate the success rate of lateral rectus muscle recession by analyzing the alignment of eyes

and the effect/dose ratio of surgery according to preoperative angle deviation.

Methods: We retrospectively studied the medical records of patients who underwent bilateral lateral rectus muscle recession and visited our hospital at least for 2 years after operation. We classified them into 2 groups: preoperative large angle deviation group [(35 prism diopters (PD) or more] and small angle deviation group (20 PD or less). Best-corrected visual acuity, stereoacuity, age at surgery, and horizontal deviation angles at distance and near for these patients were measured pre- and postoperatively. Surgical success was defined as an alignment between 10 PD of exodeviation and 5 PD of esodeviation both at distance and at near.

Results: Preoperative angle deviation of the large angle deviation group was 39.34 ± 5.13 PD and the small angle deviation group was 19.49 ± 1.62 PD. At postoperative 1 day, the alignments of the eyes of the 2 groups were -8.32 ± 9.31 PD and -13.11 ± 6.94 PD, respectively, and the effect/dose ratios were 3.11 ± 0.57 PD/mm and 3.38 ± 0.67 PD/mm, respectively. At the date of final follow-up, the alignments of the eyes of the 2 groups were -4.63 ± 8.94 PD and 1.22 ± 8.01 PD, respectively, and the effect/dose ratios were 2.25 ± 0.62 PD/mm and 1.94 ± 0.78 PD/mm, respectively. Both groups showed postoperative exodrift patterns and similar success rate (75.0% and 80.2%, respectively). There was no significant difference between the success rate ($P = 0.268$).

Conclusions: The small angle deviation group showed a large effect of correction immediately postoperative and high exodrift pattern. Finally, preoperative angle deviation and operative success rate were not related.

Poster No.: EX1-171

Panel No.: 171

Comparison of Refractive Error Measurements Between KR-1W Wavefront Analyzer and KR-8800 Automatic Refractometer in Schoolchildren

First Author: Jing DONG

Co-Author(s): Xiaogang WANG

Purpose: To compare refractive error measurements taken by KR-1W wavefront analyzer and KR-8800 automatic refractometer and study factors influencing the refractive error values, such as age and gender.

Methods: One eye of 57 schoolchildren underwent refractive error measurements with the sequence of KR-8800 and KR-1W with a time interval less than 5 minutes under uncycloplegic conditions. The interdevice agreement was evaluated using Bland-Altman analysis, Pearson correlation coefficient, and

paired 2-tailed t test. Vector analysis was used to compare astigmatism measurements.

Results: Spherical power measured by the KR-8800 was significantly more negative by about 0.16 ± 0.51 diopters (D) than that of the KR-1W ($P = 0.024$). Cylinder power measured by the KR-8800 was significantly more positive by about 0.11 ± 0.32 diopters than that of the KR-1W ($P = 0.014$). Moreover, KR-8800 and KR-1W were significantly different in astigmatism measurements using vector analysis. There was a significant linear correlation between the KR-8800 and KR-1W instruments for spherical error ($r = 0.974$, $P < 0.0001$) and cylinder power ($r = 0.807$, $P < 0.0001$). The interdevice 95% LoA range for spherical error and cylinder power were 2.02 D and 1.25 D, respectively. Age was negatively correlated with spherical error and cylinder power and the spherical error showed much more negative correlation values than cylinder power. However, gender showed no significant correlations with either spherical error or cylinder power of both instruments.

Conclusions: Spherical power and astigmatism were significantly different between the KR-1W and KR-8800 devices. However, the measurements of the 2 instruments showed significant linear correlation to each other.

Poster No.: EX1-172

Panel No.: 172

Crouzon Syndrome: A Case Report

First Author: Dessira ARIANY

Purpose: To report a case of Crouzon syndrome, a rare genetic disorder characterized by distinctive malformations of the skull and facial region.

Methods: Case report.

Results: A 6-year-old girl presented with ocular protrusion in both eyes. Her eyes had protruded since 5 months after birth. Review of systems was normal. There was no anomaly in any sibling reported. There was no anomaly on extremities or systemic condition. External examination found retruded forehead, flattened bridge, and dental malocclusion. Visual acuity of both eyes was normal. The child displayed proptosis, incomplete lid closure with inferior scleral show, and hypertelorism. Dilated fundus examination showed optic disc edema in both optic discs. Head radiography showed brachycephaly due to craniosynostosis. Soft tissue head radiography showed adenoid enlargement with airway obstruction. Polysomnography performed by ENT and neurology department revealed severe obstructive sleep apnea (OSA). Artificial tears have been given for her presenting eye conditions to prevent exposure keratitis. She will undergo computed tomography (CT) scan of the head and

orbit. Nasal continuous positive airway pressure and adenoidectomy will be planned after the CT scan has been done. She will also consult with the neurosurgery department and orthodontist for reconstructive surgery to restore craniofacial morphology and decrease intracranial pressure, and will be planned for manipulation of orbits and expansion of orbital volumes depending on CT scan result.

Conclusions: We have reported a rare case of Crouzon syndrome, which can cause obstructive sleep apnea and optic disc edema because of craniofacial anomalies. Reconstructive surgery will be planned later depending on CT scan results.

Poster No.: EX1-173
Panel No.: 173

Evaluation of Potential Systemic Adverse Events Related to Fluorescein Angiography in Pediatric Patients

First Author: Ru-Ik CHEE

Co-Author(s): RV Paul CHAN, Michael CHIANG, Mrinali GUPTA, Karyn JONAS, Anton ORLIN

Purpose: To evaluate the systemic safety profile of fluorescein angiography (FA) in pediatric patients.

Methods: Retrospective chart review of patients 0-18 years who underwent FA between 2010 and 2015. Detailed intraoperative physiological parameters from Anesthesia Information Management System (AIMS) and presence of significant adverse events <24 hours after FA were reviewed. Peri-injection effects of intravenous fluorescein were evaluated by 2-tailed paired t test comparison of mean 5-minute preinjection and 5-minute postinjection AIMS data.

Results: A total of 214 FAs (129 outpatient, 85 inpatient) in 115 patients were included. Mean age at time of inpatient FA was 2.5 years (4 weeks to 16.2 years) and for outpatient FA was 10.7 years (3.8-17.8 years). Retinopathy of prematurity accounted for 44.7% of inpatient FAs but only 1.6% of outpatient FAs. Twenty-seven inpatient visits had an exact documented time of fluorescein injection for comparison of pre- and postinjection physiological parameters: heart rate ($P = 0.64$), respiratory rate ($P = 0.34$), MAP ($P = 0.74$), systolic blood pressure (SBP) ($P = 0.65$), diastolic blood pressure (DBP) ($P = 0.93$), oxygen saturation ($P = 0.38$), tidal volume ($P = 0.64$), peak inspiratory pressure ($P = 0.2$), peak end-expiration pressure ($P = 0.18$), sevoflurane rate ($P = 0.2$), and end-tidal CO₂ levels ($P = 0.63$). Only 1 of 214 visits (inpatient preterm infant) had significant medical events (apnea, bradycardia, and desaturation) within 24 hours of FA that had also occurred prior to FA and were not causally associated with FA.

Conclusions: No significant systemic adverse events or changes in physiologic parameters were found to be associated with FA in pediatric patients. Young age was the most common reason for performing inpatient FA. Outpatient ultra-widefield FA is commonly successful in patients over 4 years.

Poster No.: EX1-174
Panel No.: 174

Juvenile Xanthogranuloma of the Iris in a Pediatric Patient: A Case Report

First Author: Patricia Anne TECSON

Co-Author(s): Patricia Yukiji VILLA

Purpose: To report an interesting case of juvenile xanthogranuloma (JXG) with ocular involvement of the iris.

Methods: A retrospective, noncomparative case report of JXG with ocular involvement. An 8-month-old pediatric patient presented with nontraumatic hyphema of the left eye of a few days' duration. Ocular problems included spontaneous hyphema and mild corneal edema, with a whitish-yellowish iris nodule on the left eye. Intraocular pressure, ultrasonography, and fundus examination were normal and showed no other intraocular lesions. Cutaneous manifestations of whitish-yellowish papules were seen as well on the left upper eyelid, face, trunk, back, and arms. Referral to pediatric dermatology service was done and JXG was diagnosed. Initial treatment with topical steroid, cycloplegics, and brinzolamide was given and the patient was closely followed up afterwards.

Results: The patient demonstrated initial resolution of hyphema and corneal edema after 2 weeks of treatment. Size of the iris nodule was noted to progressively decrease, but after 1 month hyphema was noted to recur. Treatment was continued for another month, and resolution of the nodule was noted after 2 months with no recurrence of the hyphema.

Conclusions: Although JXG is a rare, self-limited skin disorder, manifestations can occur on the uveal tract and present as an important cause of spontaneous, recurrent hyphema in pediatric patients. Other complications such as rebleeding, staining of the cornea, and secondary glaucoma are important to watch out for in these patients. Proper recognition and awareness of the ocular involvement of this dermatologic condition can aid in the management of its ocular manifestations.

Poster No.: EX1-175

Panel No.: 175

Kids Copy Adults: Irvine-Gass Syndrome in a Child

First Author: Pavan SHROFF

Co-Author(s): Guruprasad AYACHIT, Deepti JOSHI, Shrinivas JOSHI

Purpose: To report a case of Irvine-Gass syndrome in a child.

Methods: A 10-year-old male child visited our clinic with the complaint of diminished vision in the right eye (RE). On evaluation, the RE could perceive only hand movements and the left eye (LE) had best corrected visual acuity (BCVA) of 6/18. The patient was diagnosed with developmental cataract in both eyes. B-scan imaging of RE was found to be normal. LE had normal fundus. The patient was treated with RE phacoemulsification and intraocular lens implantation. On postoperative day (POD) 11, altered foveal reflex (FR) was seen in the RE; optical coherence tomography (OCT) was done using Heidelberg Spectralis. OCT imaging showed cystoid macular edema (CME) with central macular thickness (CMT) of 356. BCVA of the RE was 6/18. The patient was continued on topical steroids and topical nepafenac was added. On POD 28, RE OCT showed increased CME (CMT 615) and presence of subfoveal fluid (SFF). Posterior subtenon injection of triamcinolone was given.

Results: On POD 47, RE OCT showed complete resolution of CME and SFF. The BCVA in the RE was 6/9.

Conclusions: Pseudophakic CME (PCME) is certainly less common among pediatric eyes but it is a possible complication and needs to be ruled out during evaluation after surgery. PCME in children might be an underdiagnosed condition and vision loss due to PCME is likely to be attributed to amblyopia. It is advisable to screen the child for PCME using OCT wherever possible.

Poster No.: EX1-176

Panel No.: 176

Long-Term Outcomes of Augmented Unilateral Recess-Resect Procedure in Children With Intermittent Exotropia

First Author: Jin-Soo KIM

Co-Author(s): Jeong-Min HWANG, Hee Kyung YANG

Purpose: To compare the long-term results of augmented unilateral lateral rectus recession-medial rectus resection procedure (RR) in exotropic children with original surgery.

Methods: A retrospective cohort study was performed on a total of 121 children with intermittent exotropia

who underwent RR from February 2005 to December 2012 with follow-up for at least 24 months. In 64 patients, RR based on original surgical table was conducted. In 57 patients, amount of medial rectus muscle resection was increased by 1 mm.

Results: In the original RR group, 47 of 64 patients (73.4%) had a successful outcome, 13 patients (20.3%) had recurrence, and 4 patients (6.3%) had overcorrection at the 2-year follow-up examination. In the augmented RR group, 45 of 57 patients (79.0%) were successful, 4 patients (7.0%) had recurrence, and 8 patients (14.0%) had overcorrection at the 2-year follow-up examination. Recurrence rate was significantly lower in the augmented RR group than in the original RR group, whereas the overcorrection rate was not significantly different between the 2 groups at postoperative 2-year follow-up ($P = 0.036$ and $P = 0.153$, respectively). This result sustained to postoperative 3-year follow-up, with higher statistical significance ($P = 0.019$ and $P = 0.180$, respectively). The cumulative probability of freedom from recurrence was higher in the augmented group at 36 months after surgery ($P = 0.046$, log rank test).

Conclusions: The long-term success rate of augmented RR in exotropia children was 79.0% and the recurrence rate was significantly lower than original RR with comparable overcorrection rate. Augmented RR can be considered as a good alternative procedure in children with basic and convergence insufficiency type of exotropia.

Poster No.: EX1-177

Panel No.: 177

Long-Term Results After Congenital Cataract Surgery With Intraocular Lens Implantation in Children

First Author: Anh DAO

Co-Author(s): Thanh PHAM, Thuy VU

Purpose: To evaluate long-term results after congenital cataract surgery with intraocular lens (IOL) implantation in children.

Methods: Medical records of 51 children with congenital cataract aged 6 years or younger at surgery were reviewed retrospectively. Long-term visual and anatomical results of the patients were evaluated. All patients had at least 3 years of follow-up after surgery and the patients submitted to an intentional ophthalmological examination. Age at surgery, unilateral or bilateral cataract, best corrected visual acuity (BCVA), binocular vision, refractive error, axial length (AL), postoperative ocular complications, and level of treatment compliance were recorded.

Results: There were 51 patients with 74 eyes. Mean

age at surgery was 19.1 months old; 51% of patients had surgery in the first year of life. BCVA better than 20/30 was seen in 4.8%; 13% of the patients had binocular vision. Mean refractive error index was -0.36 diopters (D). Axial length increased 2.78 mm on average. There was better axial length development in the operated eye compared to the nonaffected eye in patients with unilateral cataract. A total of 16.9% of eyes had IOL dislocation and 15.5% of eyes had secondary posterior capsule opacity; 7.2% of eyes had ocular hypertension and all these eyes had surgery before 1 year old. Overall results based on anatomical outcome and visual acuity were divided to 3 levels including good, average, and poor with the proportion of each at 6.4%, 61.3%, and 32.3%, respectively.

Conclusions: Functional visual outcome was poor in most eyes. Average refractive error was disposed to be myopia. Most common complications were IOL dislocation and secondary posterior capsule opacity.

Poster No.: EX1-178
Panel No.: 178

Long-Term Visual Outcomes for Pediatric Patients With Coats Disease

First Author: Hannah CHIU

Co-Author(s): Wai-Ching LAM, Michael WAN

Purpose: To report the long-term visual outcomes for a cohort of pediatric patients with Coats disease.

Methods: This was a retrospective, cohort study at a tertiary care pediatric hospital. The study included all patients diagnosed with Coats disease from 2000 to 2016. The primary outcome was visual acuity at final follow-up.

Results: There were 35 patients with Coats disease during the study period. All cases were unilateral and 91% were male. At presentation, 40% of patients had subretinal exudates and 60% had a partial or total exudative retinal detachment. The majority of patients (94%) received treatment. All treated patients underwent laser photocoagulation and/or cryopexy as primary treatment, combined with anti-vascular endothelial growth factor (VEGF) injection in 7 patients, posterior sclerotomy in 6 patients, and pars plana vitrectomy in 1 patient. Of the 33 treated patients, 19 required more than 1 treatment. After a mean follow-up of 4.2 years, visual acuity was $\geq 20/50$ in 14%, 20/60 to 20/150 in 14%, 20/200 to counting fingers in 23%, and hand motions or worse in 49%. On multivariate analysis, the risk factors for a poor visual outcome were greater severity of disease ($P = 0.001$) and younger age ($P < 0.04$) at presentation. In terms of complications, 26% of the affected eyes developed cataracts and 6% degenerated to phthisis bulbi, but no patients required enucleation.

Conclusions: The visual prognosis for children with Coats disease remains poor, particularly in patients who present with advanced disease. Aggressive treatment can achieve good anatomical outcomes and minimize the need for enucleation.

Poster No.: EX1-179

Panel No.: 179

Long-Term Visual and Functional Outcomes of Diode Laser-Treated Retinopathy of Prematurity in Hong Kong Kowloon West Cluster

First Author: Lok Yoong MAK

Co-Author(s): Abbie LUK, Eva WONG

Purpose: To evaluate the long-term visual outcome, refractive status, and structural outcome in patients with retinopathy of prematurity (ROP) treated with diode laser.

Methods: A total of 48 eyes of 24 patients with ROP requiring laser therapy from 2004-2013 in Princess Margaret Hospital in Hong Kong were included in this retrospective study.

Results: The mean follow-up duration was 8.42 years. Overall at last follow-up, 29 eyes (60.4%) achieved a Snellen visual acuity (VA) of 0.7 or better, and 34 eyes (70.8%) achieved a Snellen visual acuity of 0.5 or more. Three eyes (6.3%) had an unfavorable visual outcome of VA < 0.1 , including 1 eye which progressed to vision of no light perception. For refractive outcome, 34 eyes (72.3%) were myopic, among which 31.9% progressed to high myopia of ≥ -6.0 diopters (D) on latest follow-up. Overall mean spherical equivalent was -4.85 D. Anisometropia of >1.50 D between both eyes was present in 43.5% of patients. Seven patients (29.2%) developed manifest squint with 3 patients (12.5%) requiring squint surgery.

Conclusions: Favorable visual and anatomical outcome were achieved in the majority of ROP cases treated with diode laser photocoagulation. Despite the benefits of laser therapy, development of significant refractive error including myopia and astigmatism is common in laser-treated eyes. Anisometropia, amblyopia, and strabismus are common sequelae of laser-treated ROP and should be actively managed in long-term follow-up.

Poster No.: EX1-180

Panel No.: 180

Management of Aniridia

First Author: Melissa MARSELINA

Co-Author(s): Mayasari Wahyu KUNTORINI

Purpose: To report 2 cases of aniridic patients.

Methods: Case series of 2 patients.

Results: Two cases of bilateral aniridia, bilateral cataract, bilateral microspherophakia, and bilateral foveal hypoplasia presented to our pediatric ophthalmology clinic. The first patient was 7 years old and the second patient was 6 years old. Both patients were male. The preoperative visual acuity (VA) was 2/60 in both eyes for the first patient and 1/60 in both eyes for the second patient. Nystagmus was only present in the second patient. Cataract extraction was done for both patients and bifocal spectacles were given to both patients at 1 week after surgery. Best-corrected visual acuity (BCVA) at 1 week for the first patient was 0.3 for the right eye and 0.2 for the left eye; meanwhile BCVA at 1 week for the second patient was 2/60 for both eyes.

Conclusions: The clinical manifestations of both patients were cataract, microspherophakia, and foveal hypoplasia with preoperative VA of less than 20/100. Aniridia management includes the use of filtering lens to reduce glare, observation of the astigmatism and amblyopia, and observation of intraocular pressure. Cataract extraction was done for both patients and bifocal spectacles were given to both patients at 1 week after surgery with guarded prognosis for the first patient and worse prognosis for the second patient.

Poster No.: EX1-181

Panel No.: 181

Outcome of Laser Indirect Ophthalmoscope at Different Postmenstrual Age in Retinopathy of Prematurity

First Author: Melissa MARSELINA

Co-Author(s): Rova VIRGANA

Purpose: To report the outcome of laser indirect ophthalmoscope (LIO) in spite of different postmenstrual age (PMA) at treatment.

Methods: A case series of 3 patients that consulted from the pediatric ophthalmology outpatient clinic to our vitreoretinal outpatient clinic.

Results: The first patient [stage 3 zone II retinopathy of prematurity (ROP) with plus disease of both eyes] was treated with LIO for both eyes at PMA of 37 weeks and was given supplemental LIO for both eyes 1 week later. The second patient (stage 3 zone II ROP with plus disease of both eyes) was treated with LIO for both eyes at PMA of 38 weeks. The third patient (stage 3 zone II ROP of both eyes with plus disease of the left eye) was treated with LIO for both eyes at PMA of 36 weeks. At their latest visits all 3 cases showed regression of ROP.

Conclusions: All 3 cases showed regression of ROP despite different PMA at treatment.

Poster No.: EX1-182

Panel No.: 182

Refractive Error and Visual Outcome in Premature Babies Treated by Intravitreal Bevacizumab Injection for ROP

First Author: Xuan Tinh NGUYEN

Co-Author(s): Pham Thi CHAU, Van Huy NGUYEN

Purpose: To evaluate refractive error and visual outcome among premature babies with retinopathy of prematurity (ROP) 6 years after intravitreal injection of bevacizumab.

Methods: A prospective study with 33 infants who had type 1 ROP treated by intravitreal bevacizumab injection of 0.025 mL (0.625 mg) between January 1, 2010, and December 31, 2011, included. Sixty-five eyes (33 patients) underwent cycloplegic refraction (with Cyclogyl 1%) using autorefractometer. Visual acuity (VA) with best correction was recorded.

Results: Of 33 patients, 21 (65.6%) were male. The mean birth weight (BW) was 1250 ± 236 g (range, 600–2000 g). The mean gestational age (GA) was 29.3 ± 1.28 weeks (range, 25–33 weeks). The mean age at study was 6.55 ± 0.45 years. The mean spherical equivalent was -2.50 ± 2.37 diopters (D). Nearly two thirds of the eyes were myopic (40 eyes, 61.54%), 12 eyes (18.46%) had high myopia (≥ 5.00 D), 21 eyes (32.31%) had hyperopia from 0.25 to 4.0 D, and emmetropia was seen in 4 eyes (6.15%). VA was obtainable in 58 eyes of 29 patients. Forty-eight eyes (82.75%) had VA above 20/70 to 20/20, 8 eyes (13.79%) had VA from 20/200 to 20/70, and 2 eyes (3.45%) had VA of counting fingers.

Conclusions: Refractive error was found in 96.55% of eyes with ROP treated by intravitreal injection of bevacizumab, and myopia was still the main cause of refractive error. Visual outcome was very good, and 82.75% of eyes could obtain VA above 20/70.

Poster No.: EX1-183

Panel No.: 183

Results of ROP Screening at 4 Government Hospitals in Pakistan

First Author: Muhammad MOIN

Co-Author(s): Alysia CHEEMA, Umar MIAN, Ahsan MUKHTAR, Soorath NOORANI

Purpose: To assess survival rates, estimate retinopathy of prematurity (ROP) disease burden, and appropriateness of initial screening criteria.

Methods: Data was collected from 4 government hospitals in 4 different cities in Pakistan that joined the network. Initial screening criteria were agreed upon by consensus: gestational age < 35 weeks or birth weight 2 kg or less. Neonatologists collected information on

gestational age, birth weight, and survival rate and identified patients requiring screening. Participating ophthalmologists screened infants for ROP and tracked subsequent follow-up and survival rates.

Results: The combined data from all 4 centers showed that 1500 babies were screened, in which the survival rate was 50% as inpatients and type I ROP was found in 2.6% of patients. There was poor follow-up data from 2 centers of 1027 babies, with follow-up of 6% and type I ROP in 1.2% of babies. In good follow-up data from 1 center there were 329 patients with a 60% survival rate (inpatient and outpatient) with follow-up of 80%. Type I ROP was seen in 5.9% of cases and any ROP in 30.5% of cases. Good follow-up ophthalmic-only data from 1 center had 90 patients with >80% follow-up with type I ROP in 22% of patients and any ROP in 40% of patients.

Conclusions: Our initial ROP screening criteria seem to be appropriate for Pakistan. A type 1 ROP rate of up to 20% was consistent with rates seen worldwide when ROP screening is implemented. Both screening rates and follow-up rates increased dramatically with the introduction of a young female ROP coordinator.

Poster No.: EX1-184
Panel No.: 184

Slow-Releasing Thalidomide in Polytetrafluoroethylene/Poly lactide-Co-Glycolide Laminate Allows Delayed Adjustable Strabismus Surgery in a Rabbit Model

First Author: Hee Kyung YANG
Co-Author(s): Sang Beom HAN, Jeong-Min HWANG

Purpose: To evaluate the efficacy of polytetrafluoroethylene/poly lactide-co-glycolide (PTFE/PLGA) laminate containing sustained-release thalidomide for delayed adjustable strabismus surgery.

Methods: This was a prospective, masked-observer, controlled study using 50 eyes of 25 rabbits. After the superior rectus muscle (SRM) recession, a PTFE/PLGA laminate containing thalidomide (group PT, 20 eyes), PTFE/PLGA laminate alone (group P, 20 eyes), or no barrier (group C, 10 eyes) was applied around the SRM. Delayed adjustment was performed on each SRM at 3 or 5 weeks postoperatively by a masked investigator. Adjustability, adjustment lengths, adjustment forces, and degrees of adhesion were evaluated.

Results: Both groups PT and P showed significantly better adjustability compared to group C at both 3 weeks (100%, 80%, and 0%, respectively) and 5 weeks (100%, 90%, and 0%, respectively). Between groups PT and P, adjustability, adjustment lengths, and forces were not significantly different at 3 and 5 weeks. Group PT showed significantly lower grade of adhesion

between SRM and sclera (SRM/S) compared to group C at both 3 weeks ($P = 0.007$) and 5 weeks ($P = 0.001$), respectively. Group P showed no significant difference in adhesion between SRM/S compared to group C at 3 weeks ($P = 0.302$) but had lower grade of adhesion after 5 weeks ($P = 0.007$). There was no significant difference between groups PT and P at 3 weeks ($P = 0.143$) and 5 weeks ($P = 0.716$).

Conclusions: PTFE/PLGA laminate containing slow-releasing thalidomide was effective in reducing adhesion and allowed delayed adjustment in all eyes at both 3 and 5 weeks postoperatively.

Poster No.: EX1-185
Panel No.: 185

Study of Accommodation in Patients With Idiopathic Infantile Nystagmus

First Author: Shashikant SHETTY
Co-Author(s): P Vijayalakshmi PERULMASWAMY, Rohit TIWARI

Purpose: To measure accommodation amplitude (AA) in patients with idiopathic infantile nystagmus (IIN) and to find out whether any accommodation anomalies exist in these patients.

Methods: A total of 10 patients with IIN were selected for study. Inclusion criteria were age >6 years and <40 years and best corrected visual acuity (BCVA) of 6/60 in both eyes. IIN patients' near point of accommodation (NPA) was measured using the Royal Air Force (RAF) rule. NPA value was converted to AA value in diopters (D). AA was compared with predicted accommodation amplitude for age given by Hoffsteter formula. Minimum AA for age = $15 - 1/4$ (age in years). Average AA for age = $18.5 - 1/3$ (age in years).

Results: A total of 50% were males, and 50% were females. Mean age of the patients was 15.1 years (SD 9.31; range, 6-36 years). Mean AA was 14.12 D (range, 4.54-20 D). Mean AA of patients was better than mean minimum and average expected AA. Mean AA for females was 15.66 D and for males was 12.57 D (difference not statistically significant). AA was highest for ≤10 years group and least for >20 years group. Mean AA of <10 years and 11-20 years groups were lesser than mean of average expected AA for respective groups but that for >20 years group was better than mean of average expected AA for the group.

Conclusions: Patients with IIN had mean AA amplitude better than mean of minimum expected AA. Females had higher AA as compared to males. AA was higher in younger age groups.

Poster No.: EX1-186

Panel No.: 186

Superior Oblique Myokymia

First Author: Mia ZHANG

Co-Author(s): Aubrey GILBERT, David HUNTER

Purpose: Superior oblique myokymia (SOM) is a rare condition of unclear etiology. We aim to clarify the history, etiology, clinical features, differential diagnoses, management, and prognosis of SOM.

Methods: We conducted a meta-analysis of all 116 cases published since SOM was first described in 1906 and performed in-depth statistical analysis on the data collected. All valid case studies and their references were reviewed to source further SOM research.

Results: The age at examination was 17-72 years (mean, 42 years). There was a right-sided preponderance in 61% of cases ($P < 0.02$) that was statistically significant in females (63%, $P < 0.04$) but not in males (59%, $P = 0.18$). The pathophysiology of SOM is most likely neurovascular compression and/or ephaptic transmission. Although various pharmacological and surgical approaches to SOM treatment have been proposed, the rarity of the condition has made it impossible to conduct clinical trials evaluating the safety and efficacy of these approaches.

Conclusions: Recently, topical beta-blockers have managed SOM symptoms in a number of cases, including the first case treated with levobunolol. Systemic medications, strabismus surgery, and neurosurgery have been used to control symptoms, with strabismus surgery carrying a moderate risk of postoperative diplopia in downgaze. While there is no established treatment for SOM, we encourage clinicians to attempt topical therapy before considering medical therapy or surgery.

Poster No.: EX1-187

Panel No.: 187

The Incidence of Coexistent Vertical Deviation and its Effect on Surgical Outcome in Esotropia With a Partial Refractive Accommodative Element

First Author: Lei ZHU

Co-Author(s): AS KARTHIKEYAN, Dennis LAM

Purpose: To report the incidence of coexisting vertical strabismus and to analyze its effect on the outcome of adjustable suture strabismus surgery using the Fell technique in esotropia with a partial refractive accommodative element.

Methods: In a retrospective consecutive case series review, the charts of 13 patients [8 patients with partial refractive accommodative esotropia (PRAET)

and 5 patients with infantile esotropia with an accommodative element (IETWAE)] during a 2-year period were included. The target angle was the average of the minimum angle (distance deviation with glasses) and the maximum deviation (near deviation without glasses). Vertical strabismus > 5 prism diopters (PD) was considered significant. The postoperative deviation was measured at 1 and 3 months. Success was defined as motor success (< 8 PD esotropia) and sensory success (presence of at least binocular fusion).

Results: The results are described as PRAET/IETWAE. The average age at surgery was 6.5 years/5.3 years. Vertical strabismus was seen in 8 patients (4/4). Amblyopia was seen in 3 (3/0). Ten patients achieved binocular fusion (6/4). All 5 patients without vertical deviation achieved binocularity. None of the patients with vertical component developed stereopsis. Adjustment was required in 6 (4/2). Adjustment rate was 75%/50% when vertical strabismus was present.

Conclusions: Coexistent vertical deviation is common in esotropia with an accommodative element. Patients with vertical deviation more often required postoperative adjustment. They had lesser chances of achieving binocularity and stereopsis. However, the presence of vertical strabismus did not appear to increase the risk of amblyopia.

Poster No.: EX1-188

Panel No.: 188

To Determine Factors for Corneal Biomechanical Properties and the Association With Myopia in a Children Cohort and Parent Cohort

First Author: Shumin TANG

Co-Author(s): Li Jia CHEN, Carol CHEUNG, Ka Wai KAM, Jason YAM, Marco YU

Purpose: To investigate the factors associated with corneal biomechanics and to explore the structural relationship of corneal biomechanics via different factors to myopia in Chinese children and their parents.

Methods: We included 1473 Chinese children and 1994 parents from an ongoing population-based study. All subjects underwent a standardized ocular examination including autorefractometry, corneal curvature, central corneal thickness (CCT), and axial length. The corneal biomechanics parameter of maximum deformation amplitude of cornea (DA) was measured with Corvis ST. Linear regression was first used to identify determinants of corneal biomechanics. Structure equation model was then fitted to further evaluate the association of DA with myopia via the determinants.

Results: The corneal biomechanics were significantly different in adults and in children. DA of corneal

biomechanics was significantly associated with axial length, corneal curvature, age, and intraocular pressure (IOP) in both adults and children. The coefficient of age for DA in adults was higher than in children (adults: $\beta = 0.0015$; children: $\beta = 0.011$; $P: 2.90E-07$). DA was significantly associated with spherical equivalent (SE); however, the association resulted from its association with axial length and corneal curvature.

Conclusions: Corneal biomechanics were different between adults and children. Longer axial length, steeper corneal curvature, older age, and lower IOP correspond to more corneal deformation. In children, with the increase of age, DA may increase faster in children than in adults. The association between DA and SE was mainly due to the association of DA with axial length and with corneal curvature.

Poster No.: EX1-189
Panel No.: 189

Usefulness of Intravitreal Bevacizumab for Retinopathy of Prematurity With Severe Dilated Tunica Vasculosa Lentis and Poor Mydriasis

First Author: Tomoaki HIGASHIYAMA
Co-Author(s): Sanae MURAKI, Masahito OHJI

Purpose: To report 2 cases in which intravitreal bevacizumab (IVB) was effective for the treatment of retinopathy of prematurity (ROP) with severe dilated tunica vasculosa lentis and poor mydriasis.

Methods: A report of 2 cases.

Results: Case 1: A male infant was born with a birth weight of 382 g after a 23-week gestation. As laser therapy could not be performed due to dilated tunica vasculosa lentis and poor mydriasis, IVB (0.625 mg/0.025 mL) was administered to both eyes. Following the treatment, ROP gradually improved, with regression of the dilated tunica vasculosa lentis and improvement of the mydriasis in both eyes. Case 2: A male infant was born with a birth weight of 698 g after a 25-week gestation. Because laser therapy could not be performed due to severe dilated tunica vasculosa lentis and poor mydriasis, IVB (0.625 mg/0.025 mL) was administered to both eyes. Following the treatment, ROP gradually improved with regression of the dilated tunica vasculosa lentis and improvement of the mydriasis in both eyes.

Conclusions: IVB is potentially more useful than laser therapy for the treatment of severe ROP with dilated tunica vasculosa lentis and poor mydriasis.

Prevention of Blindness

Poster No.: EX1-190
Panel No.: 190

Evaluation of a Virtual Reality Low Vision Aid in Patients With Low Vision

First Author: Nam Ju MOON
Co-Author(s): Jeong Woo KANG, Joon Hyung YEO

Purpose: To evaluate the usefulness of a virtual reality low vision aid (VRLVA) for patients with low vision.

Methods: A prospective study was conducted between January 1 and July 31, 2017. A total of 40 patients with low vision were enrolled in this study. Binocular best-corrected distance, intermediate, near visual acuity (BCDVA, BCIVA, BCNVA), contrast sensitivity, and reading performance were evaluated at baseline and at the end of study (2 weeks after the training course). At the end of the study, patients also completed a self-rated functional score (SFS) and satisfaction questionnaire on their experience with VRLVA.

Results: Thirty-nine patients with a mean age of 54.64 years completed the study. After using Relumino, significant improvements in BCDVA, BCIVA, BCNVA, and contrast sensitivity were found ($P < 0.001$ for all). Using Relumino had no effect on reading speed, but reading accuracy was significantly improved ($P = 0.027$). SFS improved from a mean of 11.74 to 19.54 ($P < 0.001$). Most patients were satisfied with the improvement in visual function and thought that VRLVA was a useful tool to aid low vision in daily life. No device-related adverse events occurred throughout the study.

Conclusions: This study demonstrates that Relumino provides benefits to patients with low vision in daily life and is believed to be safe to use.

Poster No.: EX1-191
Panel No.: 191

Leaving No One Behind: Strengthening Access to Eye Health Programs for People With Disabilities in 6 Low- and Middle-Income Countries

First Author: Manfred MORCHEN
Co-Author(s): Asahel BUSH, Petra KIEL, David LEWIS, Babar QURESHI

Purpose: The World Report on Disability 2011 highlighted that people with disabilities face significant barriers to accessing health services. In recent years efforts have been made to mitigate some of these barriers by embedding disability-inclusive development principles into eye health programs. We report salient results of a synthesis evaluation to assess the impact

of inclusive eye health programs from 6 low- and middle-income countries with different sociocultural backgrounds.

Methods: Ten purposively selected evaluations were synthesized. Data were collected from predominantly qualitative reports. The narrative analysis was informed by a practical framework for improvement of inclusive practices in eye health programs.

Results: Across all programs physical accessibility of medical facilities for people with physical impairments was improved. Accessible health information materials and inclusive communication approaches for people with visual, hearing, and intellectual impairment needs more attention. Collection of disability-disaggregated data posed significant challenges, making it difficult to assess how eye patients with different impairments benefitted from inclusive practices. Training about inclusion resulted in increased awareness and more positive attitudes of eye health staff toward persons with disabilities. An overly narrow approach to making eye health services disability-inclusive particularly at the primary eye health level resulted in limited understanding of the relevance of inclusion of other vulnerable populations.

Conclusions: Embedding long-term complex inclusive development approaches in prevention of blindness programs addressing immediate eye health needs requires detailed contextual analysis in the design phase. Preliminary results suggest that access barriers can be mitigated but further analysis is urgently needed regarding the World Health Organization's (WHO's) goal of universal eye health.

Poster No.: EX1-192

Panel No.: 192

The Identification of Fragmented Letters and Visual Acuity During Eccentric Viewing

First Author: Tomoko RO-MASE

Co-Author(s): Satoshi ISHIKO, Kazuhiro SUGAWARA, Tatsuhisa TAKAHASHI, Akitoshi YOSHIDA

Purpose: To compare the correct identification rate of fragment letters (FLs) and the results of visual acuity (VA) during eccentric viewing.

Methods: Sixteen eyes of 8 healthy subjects (3 men, 5 women; mean age \pm standard deviation, 28.0 \pm 6.2 years) participated in this study. FLs of Japanese Hiragana were made to erase the constituent pixels from the original letters and were randomly displayed for 2 seconds on a tablet device with our newly developed program. Three grades of difficulty in identifying FLs were defined as erasure rates of 60%, 70%, and 80%. Each subject performed 3 reading tasks with central and eccentric viewing at visual axis of 0°, 5°, 10°, and 15° in the temporal direction. The correct

answer rates (CAR) were recorded. The near best-corrected VA (NBCVA) was also measured at the same degrees of eccentricity and converted to the logarithm of the minimum angle of resolution.

Results: CARs at visual axes of 0°, 5°, 10°, and 15° were 93.8 \pm 5.6%, 74.4 \pm 6.7%, 49.6 \pm 9.9%, and 33.0 \pm 10.9%, respectively, with a negative correlation ($r = 0.94$, $P < 0.01$). The NBCVAs in the right eye were 0.0 \pm 0.0, 0.40 \pm 0.06, 0.57 \pm 0.11, and 0.98 \pm 0.12, respectively, with a correlation ($r = 0.96$, $P < 0.01$). A significant negative correlation was observed between CAR and NBCVA ($r = 0.88$, $P < 0.01$).

Conclusions: The results of FL identification during eccentric viewing have a tendency similar to those of VA.

Poster No.: EX1-193

Panel No.: 193

Virtual Reality Low Vision Aid Application in a Patient With Abnormal Head Position for Eccentric Viewing: A Case Report

First Author: Nam Ju MOON

Co-Author(s): Jeong Woo KANG, Joon Hyung YEO

Purpose: To report successful rehabilitation of a patient with abnormal head posture by using a virtual reality low vision aid (VRLVA).

Methods: A case report.

Results: A 75-year-old male who was diagnosed with age-related macular degeneration 15 years ago presented with abnormal head position for eccentric viewing. He had central scotoma within the central 10 degrees and the patient's preferred retinal locus (PRL) was located in the inferonasal retina. The patient underwent training on the use of VRLVA, which has an image remapping function to remap a distorted image or image falling on the scotoma to another location on the screen. After explanation of the aid and its use, the patient was then given the VRLVA to use in his regular setting for 2 weeks. Two weeks after training, the patient could face straight ahead by using VRLVA without abnormal head position. In addition, reading performance including reading speed and accuracy was improved. He experienced no device-related adverse events.

Conclusions: By using VRLVA, low vision patients with abnormal head position can shift the image falling on the central scotoma to PRL, minimizing their abnormal head position, and improve reading performance. We expect that future technological advances such as a wearable design and the use of lightweight material will further improve the performance and acceptability of VRLVA.

Refractive Surgery

Poster No.: EX1-194

Panel No.: 194

Clinical Outcomes of Micromonovision Small Incision Lenticule Extraction for the Correction of Presbyopia and Myopia

First Author: Chang Rae RHO

Purpose: To evaluate refractive and visual outcomes after micromonovision small incision lenticule extraction (SMILE) in patients with presbyopia and myopia.

Methods: In total, 72 patients (144 eyes) with a mean age of 46.0 ± 4.9 years were included in this study. The dominant eye was treated for distance vision and the nondominant eye for near vision by targeting between -0.50 and -1.75 diopters (D).

Results: Six months postsurgery, binocular uncorrected distance visual acuity (UDVA) was better than or equal to 20/20 in 88% of eyes. No loss in 2 or more lines was observed in the Snellen lines of corrected distance visual acuity. Mean spherical equivalent (SE) for the distance eye was -0.18 ± 0.37 D, whereas the attempted and achieved SE in the near eye were -0.90 ± 0.44 and -0.99 ± 0.54 D, respectively. In total, 79% of eyes were within ± 0.50 D, and 98% within ± 1.00 D, of the intended refraction. A UDVA of 0.0 logarithm of the minimum angle of resolution (logMAR) (20/20) or better, and an uncorrected near visual acuity of Jaeger (J) of 3 (20/32) or better, were observed in 84% of patients.

Conclusions: Micromonovision refractive surgery using SMILE enhanced functional near vision in presbyopic patients.

Poster No.: EX1-195

Panel No.: 195

Comparison of Axial Length, Anterior Chamber Depth, and Intraocular Lens Power Between IOLMaster and Ultrasound in Normal, Long, and Short Eyes

First Author: Xiaogang WANG

Co-Author(s): Jing DONG, Yaqin ZHANG

Purpose: To compare the axial length (AL), anterior chamber depth (ACD), and intraocular lens power (IOLP) taken by IOLMaster and ultrasound in normal, long, and short eyes.

Methods: One hundred five normal eyes, 98 long eyes, and 100 short eyes underwent AL and ACD measurements with both devices, with the sequence of IOLMaster and then ultrasound. The IOLP were

calculated using the free online Ladas IOL formula calculator.

Results: The difference in AL and IOLP between IOLMaster and ultrasound was statistically significant in all 3 groups. The difference in ACD between IOLMaster and ultrasound was statistically significant in the normal and short eye groups ($P < 0.001$) but not in the long eye group ($P = 0.357$). For the IOLP difference between IOLMaster and ultrasound in the normal group, the percentage of difference $< \pm 0.5$ diopters (D), $\geq \pm 0.5$ D $< \pm 0.75$ D, $\geq \pm 0.75$ D $< \pm 1.0$ D, and $\geq \pm 1.0$ D was 89.5%, 9.5%, 1%, and 0%, respectively. The long eye group was 88.8%, 7.1%, 4.1%, and 0%, respectively. The short eye group was 61%, 25%, 10%, and 4%, respectively. Moreover, the AL difference between IOLMaster and ultrasound were negatively correlated with IOLP difference between them in each group.

Conclusions: The IOLMaster and ultrasound have statistically significant differences in AL measurements and IOLP for normal, long eyes, and short eyes. The 2 instruments agree on ACD measurement for the long eye group but differ in the normal and short eye groups. Moreover, the high percentage of IOLP differences of more than 0.5 D should be noticed in the short eye group.

Poster No.: EX1-197

Panel No.: 197

Corneal Ectasia Risk in Myopic Patients Presenting for Refractive Surgery: Extending the Percent Tissue Altered Range

First Author: Hon Shing ONG

Co-Author(s): Mohamed FAROOK, Jodhbir MEHTA, Benjamin TAN

Purpose: Corneal ectasia is an important sight-threatening complication following corneal refractive surgery. For patients with normal preoperative corneal topographies, a percent tissue altered (PTA) score of ≥ 40 is thought to be a significant independent risk factor for predicting postoperative ectasia following laser in-situ keratomileusis (LASIK). This study evaluates the range of PTA scores of eyes of patients presenting for refractive surgery and ascertains the prevalence of postoperative ectasia.

Methods: Retrospective case review was performed for patients who presented for refractive surgery at a specialist center. To assess the risk of corneal ectasia had they undergone LASIK, PTA scores were calculated using standard LASIK ablation depths and flap thicknesses (100-120 μ m).

Results: A total of 94 eyes (56 patients) were included. Mean age was 30.7 ± 7.3 years. Mean preoperative spherical equivalent refractive error was -6.01 ± 2.12

diopters (D). For flap thickness of 120 μm , mean PTA score was 36.3 ± 5.8 ; 30/94 (31.9%) eyes had PTA ≥ 40 . For flap thickness of 110 μm , the mean PTA score was 34.5 ± 5.8 ; 18/94 (19.1%) eyes had PTA ≥ 40 . For flap thickness of 100 μm , the mean PTA score was 32.7 ± 5.8 ; 10/94 (10.6%) eyes had PTA ≥ 40 . All eyes underwent small incision lenticule extraction (SMILE). None of the 29 eyes having 3-year follow-up were found to have postsurgical ectasia; of these 7/29 (24.1%), 6/29 (20.7%), and 4/29 (13.8%) eyes had PTA ≥ 40 (assuming LASIK flaps of 120 μm , 110 μm , and 100 μm , respectively).

Conclusions: The PTA range for corneal ectasia to develop is higher in SMILE. Absence of ectasia in this cohort despite high PTA in significant proportions supports the hypothesis that, compared to LASIK, SMILE offers better biomechanical corneal stability.

Poster No.: EX1-198
Panel No.: 198

Enhancement After Myopic Small Incision Lenticule Extraction Using Surface Ablation

First Author: Martin DIRISAMER
Co-Author(s): Nikolaus LUFT, Siegfried PRIGLINGER, Walter SEKUNDO, Jakob SIEDLECKI, Rainer WILTFANG

Purpose: This study was conducted to report the feasibility and outcomes of secondary surface ablation after small incision lenticule extraction (SMILE).

Methods: The databases of 4 independent laser centers in Germany, Austria, and Luxembourg were screened for patients who had undergone surface ablation after myopic SMILE. A total of 1963 eyes were treated with myopic SMILE; in 43 eyes of 31 patients (2.2%), photorefractive keratectomy (PRK) retreatment was performed with a minimum follow-up of 3 months.

Results: Surface ablation resulted in a spherical equivalent (SE) of 0.03 ± 0.57 diopters (D) at 3 months ($P < 0.0001$). Mean uncorrected visual acuity (UCVA) improved from 0.23 ± 0.20 logarithm of the minimum angle of resolution (logMAR) to 0.08 ± 0.15 logMAR ($P < 0.0001$).

Conclusions: Combined with the intraoperative application of mitomycin C, surface ablation seems to be a safe and effective method of secondary enhancement after SMILE.

Poster No.: EX1-199
Panel No.: 199

Evaluation of Barrett Universal II Formula in Asian Indian Eyes

First Author: Nikhil KUTHIRUMMAL
Co-Author(s): Noopur GUPTA, M VANATHI, Rohit SAXENA, Radhika TANDON

Purpose: To evaluate the Barrett Universal II (BU II) intraocular lens (IOL) power calculation formula in Asian Indian eyes.

Methods: This was a prospective observational study. Data of patients undergoing uneventful phacoemulsification with IOL implantation recorded included demographic details, biometry data, IOL power used, and postoperative refraction. Predicted refractive outcome by 4 IOL formulas (modified SRK II, SRK/T, Olsen, and BU II) and actual refractive outcome were noted. Mean absolute error (MAE) in predicted refraction was calculated; data was analyzed in 3 groups [axial length (AL): <22.0 mm, 22.0 – 24.5 mm, >24.5 mm]. The differences in mean absolute prediction error in postoperative refraction among the formulas were assessed by Freidman test (a nonparametric test). In the event of a significant result, post-hoc analysis was done by Wilcoxon signed-rank test

Results: In 244 patients (mean age, 60.2 ± 9.8 years), the BU II formula had the lowest MAE. IOL power calculation with BU II also had the lowest MAE in all 3 groups ($P < 0.0005$). IOL power calculation by the BU II was comparable to the Olsen formula in eyes with AL 22 – 24.5 mm. There was a statistically significant difference between MAE by the modified SRK II, SRK/T, and BU II formulas ($P < 0.0005$). Percentage of eyes with prediction errors within ± 0.5 diopters (D) (71.07%) and ± 1.0 D (97.97%) of target refraction was highest with the BU II formula.

Conclusions: IOL power calculation with the BU II formula is more accurate in predicting postoperative refractive error in eyes with short, normal, and long axial length.

Poster No.: EX1-200
Panel No.: 200

Influence of Pupil Dilation on Predicted Postoperative Refraction and Recommended IOL Power in Monofocal and Bifocal IOLs to Obtain Target Postoperative Refraction Calculated by Third- and Fourth-Generation IOL Power Calculation Formulas

First Author: Takeshi **TESHIGAWARA**

Co-Author(s): Akira **MEGURO**, *Nobuhisa* **MIZUKI**

Purpose: To evaluate the influence of pupil dilation on predicted postoperative refraction (PPR) and recommended intraocular lens (IOL) power in monofocal (SN60WF, Alcon) and bifocal (ZLB00, AMO) IOLs to obtain target postoperative refraction calculated by third- (Hoffer Q and SRK/T) and fourth-generation (Haigis and Holladay 2) IOL power calculation formulas using a new optical biometer (IOLMaster 700, Zeiss).

Methods: This study included 280 eyes (162 SN60WF and 118 ZLB00). PPR, recommended IOL power, anterior chamber depth (ACD), and LT were measured pre- and post-dilation. Change of PPR in each formula and change of ACD and LT were evaluated pre- and post-dilation. Dilation's influence on recommended IOL power calculated by each formula was analyzed.

Results: Mean absolute change pre- and post-dilation in PPR in fourth-generation was significantly higher than in third-generation formulas. ACD and LT significantly changed pre- and post-dilation. Change of pre- and post-dilation in PPR in fourth-generation formulas showed positive correlation with change in ACD and negative correlation in LT but not in third-generation. Recommended IOL power calculated by fourth-generation formulas changed pre- and post-dilation in both monofocal and bifocal IOLs, whereas third-generation showed no or few changes.

Conclusions: PPR and recommended IOL power in both IOLs were significantly changed by dilation in fourth-generation formulas compared to third-generation. ACD and LT were significantly changed by dilation. Given significant correlation between change in PPR pre- and post-dilation in fourth-generation formulas and change in ACD and LT, change of ACD and LT is key in the influence of dilation on fourth-generation formulas. Conversance to dilation's influence on fourth-generation formulas is key to improving IOL calculation.

Poster No.: EX1-201
Panel No.: 201

Outcome of Ab-Externo Scleral Fixation of Intraocular Lens

First Author: Chunu **SHRESTHA**

Purpose: Evaluation of a simplified technique of scleral fixation of posterior chamber intraocular lens (IOL) in terms of visual outcome and complications.

Methods: This was a prospective study enrolling 23 eyes of 23 patients who underwent anterior vitrectomy followed by ab-externo scleral fixation of posterior chamber IOL using 10.0 polypropylene suture from January 2016 to September 2016 in Nepal Eye Hospital, Nepal. To avoid erosion of the knots through the conjunctiva, scleral flap at 3 and 9 o'clock meridian was used to cover the knots. Main outcome measures included best corrected visual acuity, indications, and postoperative complications.

Results: The visual outcome was good. Best corrected visual acuity was 6/6 to 6/18, 6/24 to 6/60, and worse than 6/60 in 82.60%, 8.69%, and 4.34%, respectively, at 6-month follow-up. The mean spherical equivalent before surgery was +10 and -1.14 post surgery. The most common indications were trauma (60.86%), surgical aphakia (21.73%), spontaneous posterior subluxation (13.0%), and subluxated intraocular lens (4.34%). The most common complications were astigmatism (91.30%), decentered IOL (4.34%), and uveitis (4.35%).

Conclusions: Ab-externo SFIOL is a safe and effective option for visual rehabilitation with low postoperative risk.

Poster No.: EX1-202
Panel No.: 202

Posterior Corneal Surface Changes After Uncomplicated Myopic LASIK

First Author: Prasoon **PANDEY**

Purpose: To study posterior corneal surface changes after uncomplicated myopic laser-assisted in situ keratomileusis (LASIK).

Methods: Average corneal posterior mean power, posterior elevation, and pachymetry were assessed from 6 concentric central areas using the Orbscan II statistical analysis device pre- and post-LASIK (1, 3, 6, and 12 months) in 104 eyes that underwent myopic LASIK. Apex-fixed best (AFB) fit corneal curvature and posterior elevation difference methods were evaluated in elevation maps at 6 fit zones at 2 time points.

Results: Postoperative posterior mean power change of around -0.50 diopters (D) was found in areas smaller than 1 mm and -0.25 D in 2-mm areas. Posterior

elevation increment of $46.10 \pm 15.30 \mu\text{m}$ to $-1.40 \pm 3.27 \mu\text{m}$ was detected at 1 month and $45.53 \pm 19.70 \mu\text{m}$ to $-0.58 \pm 3.91 \mu\text{m}$ at 12 months. Posterior mean power and posterior elevation changes became close to zero beyond the 2-mm zone. Preoperative mean central (2 mm) thickness was $547 \pm 29.74 \mu\text{m}$ and varied postoperatively from $439.06 \pm 43.20 \mu\text{m}$ at 1 month to $447.92 \pm 44.40 \mu\text{m}$ at 12 months. Calculated mean thickness difference and mean programmed ablation ($100.39 \pm 36.49 \mu\text{m}$) were the same with significance ($P = 0.001$), Pearson correlation (0.62-0.85). Both float and AFB method showed corneal steepening.

Conclusions: The Orbscan II statistical analysis of concentric areas detects thinning and increase of posterior elevation and posterior mean power of the central cornea after myopic LASIK. Ectasia is suspected when changes in areas smaller than 3 mm are progressively larger and/or when areas with 5 mm had an important postoperative change. This study explains why others fail to find changes on posterior corneal surface after myopic LASIK.

Poster No.: EX1-203
Panel No.: 203

Results of Femtosecond Laser-Assisted LASIK and ReLEx SMILE Surgery at VNIO

First Author: Nguyen Xuan **HIEP**
Co-Author(s): Nguyen Thi Mai **HUONG**

Purpose: To evaluate results and safety of femtosecond (FS) assisted laser-assisted in situ keratomileusis (LASIK) and refractive lenticule extraction (ReLEx) small incision lenticule extraction (SMILE) surgery for myopic patients \pm astigmatism.

Methods: Prospective descriptive study on the results of FS LASIK (for 250 eyes of 125 patients) and ReLEx SMILE (for 250 eyes of 126 patients). The spherical equivalents were -5.68 ± 1.74 diopters (D) (ranged from -1.50 D to -12.00 D) in the FS LASIK group and -6.12 ± 1.67 D (ranged from -1.50 D to -12.00 D) in the SMILE group. Follow-up was done at 1 day, 1 week, 1, 3, and 6 months after surgery to evaluate visual acuity (VA), refraction, safety, and postoperative result predictability.

Results: At the sixth month after surgery, in the FS LASIK group, uncorrected visual acuity (UCVA) $\geq 20/20$ was found in 84.1% and UCVA $\geq 20/40$ in 98.2%. These figures in the SMILE group were 85.3% and 98.6%, respectively. No eye lost 2 lines of VA in either group. UCVA was increased by 1 line compared to best corrected visual acuity (BCVA) before surgery in 24 eyes of the FS LASIK group and in 26 eyes of the SMILE group. At the sixth month after surgery, residual RE of ± 0.50 D was found in 82.3% and ± 1.00 D in 96.4% of the FS LASIK group. In the SMILE group these figures

were 81.1% and 95.7%.

Conclusions: Both FS LASIK and SMILE surgeries are effective to correct myopia \pm astigmatism at the 6-month follow-up. Both are good at achieving high VA after surgery, with safe and predictable outcomes.

Poster No.: EX1-204
Panel No.: 204

SMILE Monovision: An Option for Myopic Patients With Presbyopia

First Author: Rohit **SREENATH**
Co-Author(s): Sheetal **BRAR**, Sri **GANESH**

Purpose: To study the utility of small-incision lenticule extraction (SMILE) monovision as a treatment modality for myopes with presbyopia.

Methods: Hospital-based, longitudinal study done at a tertiary care eye hospital in Bangalore from February 2016 to March 2017; 18 patients were included in the study. Patients with simple myopia and compound myopic astigmatism with presbyopia above the age of 40 years comfortable with monovision correction after a trial were included.

Results: Eighteen patients with a mean age of 44.8 ± 3.8 years were included in the study. The mean preoperative best corrected visual acuity (BCVA) in the dominant eye was -0.01 ± 0.08 logarithm of the minimum angle of resolution (logMAR) and the nondominant eye was 0.02 ± 0.1 . The postoperative BCVA binocularly was 0.10 ± 0.09 . The preoperative spherical equivalent (SE) in the dominant eye was -5.5 ± 2.7 and in the nondominant eye was -6.1 ± 2.7 . The postoperative SE in the dominant eye was -0.85 ± 0.8 and in the nondominant eye was -1.41 ± 0.5 . The fine stereopsis improved from 141 ± 113 to 96 ± 66.5 . The SRD testing showed that the reading speed after correction changed from 0.14 to 0.16 logMAR for a reading distance of 40 cm. The SRD for the intermediate range of 60 cm changed from 0.12 to 0.15 logMAR. The SRD for the intermediate range of 80 cm changed from 0.14 to 0.148.

Conclusions: Both the SRD examination and the Early Treatment Diabetic Retinopathy Study (ETDRS) at the end of 6 months showed improvement in the near and intermediate range vision. The patient satisfaction was excellent for near and intermediate vision. It can be used as an alternate modality for the treatment of myopic patients in the presbyopic age group requiring spectacle independence.

Poster No.: EX1-205

Panel No.: 205

Scleral Approaches to Presbyopia Past and Future

First Author: Mitchell JACKSON

Co-Author(s): Brad HALL, Annmarie HIPSLEY

Purpose: To present the historical scleral techniques that attempted to address the loss of accommodation in presbyopia along with the mechanisms of action and surgical technique. To further present the progress in scleral techniques, technologies, and results.

Methods: A literature review was conducted of the historical scleral approaches to presbyopia and their clinical findings. Specific reference was made to the future of the scleral surgical space for treating presbyopia.

Results: Scleral surgical procedures seek to restore effective range of near and intermediate vision through both true accommodation and pseudoaccommodation. The most important advantage over other more invasive options to treat presbyopia is the ability to treat presbyopia without touching the optical axis of the eye. The early scleral techniques did not meet adequate standards for efficacy and safety and were still extremely invasive. One next-generation scleral technology has demonstrated objective increases in accommodation averaging 1.25 diopters (D) to 1.50 D, including 0.25 D in true accommodation, with no change in the optical and geometric properties of the eye.

Conclusions: The issues of visual disturbance or reduced best-corrected acuity that are associated with multifocal and aspheric approaches limit their appeal. Corneal inlays and onlays still require cutting the cornea and extending depth of focus still comes with some compromises. An effective scleral solution that increases both dynamic accommodation and expands depth of focus without compromise or altering the optical and geometric properties of the eye would appear both desirable and achievable.

Poster No.: EX1-206

Panel No.: 206

Toric IOL "Induced" Astigmatism

First Author: Kumar RAVI

Co-Author(s): Preeti SHARMA

Purpose: An attempt to understand the possible causes of postoperative increase in astigmatism following toric intraocular lens (IOL) implantation.

Methods: A 46-year-old Indian male reported to us with complaints of increase in his glasses power following implantation of toric IOL in his right eye

about a year previously. On evaluating the old records, preoperative biometry, and existing refractive values, we noted that he had an increase in his astigmatic correction following surgery [right eye preoperative best corrected visual acuity (BCVA) was 6/9 Snellen with -3.5 DSph, -1.75 Dcyl at 180 vs postoperative BCVA of 6/6 Snellen with -3.75 Dcyl at 175]. He was given a surgical option of IOL rotation/exchange; however, he decided to continue with his existing glasses.

Results: We postulate the following possible causes which may lead to this error: 1) wrong biometry; 2) rotation of toric IOL in the bag following implantation; 3) incorrect alignment of IOL during surgery.

Conclusions: We suggest the following measures to prevent the possibility of unexpected astigmatic error while implanting a toric IOL: 1) meticulous marking of the axis on cornea; 2) placement of biometry sheet in the operating room with correct depiction of desired IOL orientation; 3) proper viscoelastic wash after placement of IOL; 4) dilated examination of patient in the early postoperative period to reconfirm the correct orientation on IOL axis in bag. (IOL redialing in the early postoperative period may give a more predictive result in comparison to late-stage surgical options like IOL redialing/exchange).

Poster No.: EX1-207

Panel No.: 207

Visual Outcomes Following Diffractive-Refractive Multifocal Intraocular Lens Implantation: Literature Review

First Author: Yulinda LAKSMITA

Co-Author(s): Tjahjono GONDHOWIARDJO

Purpose: To evaluate the result of diffractive-refractive multifocal intraocular lens (IOL) implantation regarding the visual acuity, spectacle independency, and also related disturbing visual phenomenon such as halo and glare.

Methods: Seventeen articles collected from multiple sources including PubMed, Clinical Key, and Ophthalmology Advance were reviewed. Five types of diffractive-refractive multifocal IOLs were found including ReSTOR SA60D3, SN60D3, SA6AD3, SA6DA1, and AT Lisa 809M. Uncorrected and corrected visual acuity, spectacle independency, and undesired visual phenomenon data of each IOL were analyzed.

Results: For binocular uncorrected distance and intermediate vision, ReSTOR SN6AD1 was better than other IOLs. Meanwhile, in binocular uncorrected near visual acuity, ReSTOR SA60D3 was superior. Highest percentage of patients reporting spectacle independency was found in the ReSTOR SA60D3 group. Halo was found in each IOL group, ranging from 32 to

65 percent of patients. Glare was found in a smaller percentage, ranging from 25 to 61 percent of patients.

Conclusions: The best option for patients aiming for best visual acuity in distance to intermediate activity without spectacle use is ReSTOR SN6AD1. Meanwhile, the best option for patients aiming for best near visual acuity is ReSTOR SA60D3. Comprehensive preoperative education is crucial, considering the cost and benefit aspects of multifocal IOL implantation.

Poster No.: EX1-208
Panel No.: 208

Wound Healing Profiles Following the Laser Scleral Microporation VisioLite Procedure for Presbyopia Correction

First Author: Jodhbir **MEHTA**

Co-Author(s): Annmarie **HIPSLEY**, Yu-Chi **LIU**, Chan Lwin **NYEIN**

Purpose: To evaluate scleral wound healing following the laser scleral microporation (LSM) VisioLite procedure for presbyopia correction.

Methods: Two cynomolgus macaque nonhuman primates (n = 4 eyes) at presbyopic age underwent the LSM VisioLite procedure using an Er:YAG presbyopic laser. Half of the eyes, randomly selected, underwent concurrent collagen gel treatment. Slit lamp, anterior segment optical coherence tomography (ASOCT), and intraocular pressure (IOP) measurements were performed postoperatively. The eyes were harvested 1 month postoperatively for histological analysis by hematoxylin and eosin staining, along with immunohistochemistry analysis with the markers for inflammation (CD11b and CD 45), wound healing [fibronectin, α -smooth muscle actin (α -SMA), tenascin, Thy-1, collagen I and III], cellular stress response (HSP-47), and proliferative activity (Ki-67).

Results: The laser spots were at 42-50% of the depth of the sclera as assessed by ASOCT. There were no significant changes in IOP postoperatively. Histological analysis revealed inflammatory cell infiltrates and focal coagulative necrosis around the scleral wound, with less observed in the collagen gel-treated group. No obvious inflammatory response was observed around the ciliary body. At the scleral laser area, there was moderate expression of HSP-47, Thy-1, and tenascin, with less expression in the collagen gel-treated eyes. The expression of fibronectin was more distinct in the collagen-treated group. In all eyes, there was no expression of CD11b, CD45, α -SMA, and Ki-67 in the sclera.

Conclusions: Concurrent collagen treatment reduced the postoperative inflammation and enhanced the wound healing responses following the LSM VisioLite

laser procedure. Study of the wound healing profiles in the late postoperative period is ongoing.

Retina (Medical)

Poster No.: EX1-209
Panel No.: 209

9-Year Treatment Outcomes of Naive Polypoidal Choroidal Vasculopathy in Clinical Practice

First Author: Byungju **JUNG**

Co-Author(s): Jaehyung **LEE**, Won Ki **LEE**

Purpose: To evaluate the 9-year treatment outcomes of naive polypoidal choroidal vasculopathy (PCV) in clinical practice.

Methods: Forty-seven treatment-naive PCV eyes were reviewed retrospectively. Initial treatment was photodynamic therapy (PDT) alone or PDT combined with anti-vascular endothelial growth factor (VEGF). Adjuvant anti-VEGF or PDT was applied based on recurrence or retreatment criteria. The main outcome measures were best-corrected visual acuity (BCVA) and number of anti-VEGF injections at the end of each year. For subgroup analysis, we conducted the distribution of BCVA into 3 groups: improved, stable, and deteriorated. We divided into another 3 groups regarding the PDT sessions: group A (PDT = 1), group B (PDT = 2), and group C (PDT \geq 3).

Results: The total mean \pm SD logarithm of the minimum angle of resolution (logMAR) BCVA at baseline and year 1, 2, and 9 were 0.49 ± 0.32 , 0.30 ± 0.29 , 0.38 ± 0.38 , and 0.63 ± 0.47 , respectively. In the subgroup analysis, there was improvement of 0.15 logMAR in group A, decline of 0.23 logMAR in group B, and decline of 0.46 logMAR in group C. The total mean \pm SD number of anti-VEGF injections during 9 years was 21.6 ± 14.3 . In the subgroup analysis there were 16.1 ± 9.8 in group A, 21.9 ± 11.0 in group B, and 29.0 ± 19.1 in group C. The percentages of improved or stabilized eyes at the 9th year were 61.7% in total, 78.9% in group A, 57.1% in group B, and 42.8% in group C. A total of 93.6% showed recurrence in the follow-up period.

Conclusions: Although most PCV eyes experienced recurrence, 9-year prognosis of PCV showed favorable visual outcomes. PDT is a good treatment option, but minimizing the total number of PDT is important for final outcomes.

Poster No.: EX1-210
Panel No.: 210

A Comparative, Prospective, Observational Study on the Effect of Intravitreal Ranibizumab Injection, Monthly for 3 Months Then PRN Basis, on the Anatomical and Functional Outcomes of Diabetic Macular Edema Between Ischemic and Nonischemic Groups

First Author: Arnab PAL

Co-Author(s): Ashim Kumar DEY, Aniruddha MAITI

Purpose: To evaluate the impact of macular ischemia on functional and anatomical outcomes after 0.5 mg monthly intravitreal ranibizumab for 3 months then pro re nata (PRN) for diabetic macular edema (DME) treatment.

Methods: Sixty eyes of 60 patients diagnosed clinically as DME were selected from the outpatient department (OPD) and divided into ischemic and nonischemic groups of 30 patients each according to foveal avascular zone (FAZ) diameter on baseline fluorescein angiography [Early Treatment Diabetic Retinopathy Study (ETDRS) group report 11]. Patients of both groups were administered intravitreal ranibizumab as per above protocol, followed up to 6 months, and evaluated monthly for best corrected visual acuity (BCVA) and central macular thickness and every 3 months for FAZ diameter.

Results: Both groups showed BCVA improvement at the end of follow-up; but improvement was significant ($P < 0.05$) in the nonischemic group while it was nonsignificant ($P > 0.05$) in the ischemic group. Both groups showed statistically significant ($P < 0.05$) reduction in central macular thickness at the end of follow-up. Lastly, though mean FAZ diameter decreased over time in both the groups, it was not significant ($P > 0.05$).

Conclusions: Our study suggests that macular ischemia may have a negative impact 6 months after intravitreal ranibizumab treatment in DME patients, though it does not worsen the preexisting macular ischemia. It also reinforces the fact that macular ischemia has no effect whatsoever on anatomical outcomes, which were improved significantly with ranibizumab treatment irrespective of the status of macular ischemia.

Poster No.: EX1-211
Panel No.: 211

A New Examination Pattern for Microperimetry

First Author: Satoshi ISHIKO

Co-Author(s): Tomoko RO-MASE, Kazuhiro SUGAWARA, Akitoshi YOSHIDA

Purpose: The examination points in the default examination pattern in 2 MP-3 microperimeters (MP-3, Nidek, and MAIA, Centervue) were on the boundary of the Early Treatment Diabetic Retinopathy Study (ETDRS) macular grid sector using optical coherence tomography (OCT). We developed a new examination pattern for microperimetry that corresponds to the ETDRS macular grid.

Methods: We located the examination points on the boundary of the area of each half-sector. In the central area, we located the points in the center and in 4 directions, ie, at every 90 degrees. In the other sector, we located the points in 12 directions, ie, at every 30 degrees.

Results: In this new examination pattern, 5 examination points are in the central area and 3 examination points are in each sector. When we calculated the mean values of the sensitivities in each area, they corresponded easily with the retinal thickness value obtained using the OCT ETDRS macular grid. Furthermore, when we used this pattern, 1 examination point was in each hexagonal area within a 20-degree diameter by the Visual Evoked Response Imaging System.

Conclusions: Using this examination pattern for microperimetry, we can compare the retinal sensitivity with both the retinal thickness and multifocal electroretinography. This pattern is clinically useful because it enables easy comparisons of the retinal sensitivities with different examination data at the corresponding lesion.

Poster No.: EX1-212
Panel No.: 212

Acute Endophthalmitis After Intravitreal Bevacizumab Injections at a Tertiary Center in Nepal

First Author: Eli PRADHAN

Co-Author(s): Sanyam BAJIMAYA, Sushma DUWAL, Govinda PAUDYAL, Raba THAPA

Purpose: The drug-related adverse events associated with intravitreal bevacizumab use have been reported but there is no data from Nepal. Therefore, the aim of this study was to report the incidence and management of acute endophthalmitis after intravitreal injection of bevacizumab.

Methods: This is a clinical retrospective, noncomparative study, which included 4182 intravitreal injections of 1.25 mg bevacizumab consecutively performed for diabetic macular edema, exudative age-related macular degeneration, and other retinal diseases. The total number of endophthalmitis cases following intravitreal bevacizumab injections was collected from the endophthalmitis registry.

Results: Two eyes of 2 patients with acute postoperative endophthalmitis were identified in the first week following intravitreal injections of 1.25 mg bevacizumab among a total of 4128 injections with an incidence of 0.048% [95% confidence interval (CI): 0.00 to 0.12]. One case of endophthalmitis was culture-negative and another one was culture-positive with the organism isolated being *Staphylococcus aureus*. Immediate intervention was performed, including injection of intravitreal antibiotics as well as early pars plana vitrectomy after clinical appearance of postinjection endophthalmitis. However, the final visual acuity was worse in both eyes, although none of the eyes developed phthisis bulbi or required enucleation.

Conclusions: The incidence of endophthalmitis after intravitreal injection of bevacizumab in our retrospective study is comparable with other studies. Acute postinjection endophthalmitis following intravitreal bevacizumab can result in severe loss of vision. Therefore, prompt recognition and treatment are an important part of management in such patients.

Poster No.: EX1-213

Panel No.: 213

Assessing Choroidal Vasculature by Indocyanine Green Angiography in Treatment-Resistant Neovascular Age-Related Macular Degeneration

First Author: Kimberly **SPOONER**

Co-Author(s): Andrew **CHANG**, Thomas **HONG**, Rashmi **NAIR**

Purpose: To describe structural changes in choroidal vasculature among a cohort of patients with treatment-resistant neovascular age-related macular degeneration (nAMD) switched to intravitreal aflibercept.

Methods: Forty-seven patients with treatment-resistant nAMD and active choroidal neovascularization (CNV) were included in this prospective, open-label, non-controlled, clinical trial. Patients underwent intravitreal aflibercept injections every 4 weeks for 3 months followed by further injections every 8 weeks for 12 months. An individualized regimen was adopted for the subsequent 24 months. Optical coherence tomography (OCT) and indocyanine green angiography (ICGA) were performed at baseline, 12, and 24 months. ICGA was used to assess choroidal vasculature.

Results: Forty-seven study eyes and 14 fellow eyes serving as controls for normative observational data were included in the analysis. Mean baseline visual acuity, central macular thickness, subfoveal choroidal thickness (SFCT), and choroidal vessel diameter (CVD) were measured. Mean CVD at baseline in the study and observational groups was $119.02 \pm 53.91 \mu\text{m}$ and $148.00 \pm 12.04 \mu\text{m}$, respectively ($P < 0.001$). Mean choroidal thickness was $164.20 \pm 60.85 \mu\text{m}$ and $157.43 \pm 61.30 \mu\text{m}$ in the study and control groups, respectively ($P = 0.664$). Mean CNV lesion size was $8.68 \pm 7.14 \text{ mm}^2$. The choroidal VD and CNV lesion size on ICGA 24 months post switching decreased by $17.59 \pm 20.41 \mu\text{m}$ ($P < 0.001$) and $0.11 \pm 2.67 \text{ mm}^2$ ($P < 0.001$), respectively, over the course of the study.

Conclusions: Baseline choroidal vasculature biometrics on eyes with treatment-resistant nAMD were shown to be significantly thinner than the observational group. These significant differences in choroidal vasculature may prove useful in the understanding of AMD pathogenesis and serve as a prognostic indicator in patients with anti-vascular endothelial growth factor (anti-VEGF) treatment resistance.

Poster No.: EX1-214

Panel No.: 214

Association of Serum Uric Acid Level With Age-Related Macular Degeneration

First Author: Fazil **KHURRUM**

Co-Author(s): Pritam **BAWANKAR**, Harsha

BHATTACHARJEE, Saurabh **DESHMUKH**, Patel Dhaval

GHANSHYAMBHAI, Diva **MISRA**

Purpose: 1) To establish higher level of serum uric acid as a risk factor for age-related macular degeneration (AMD); 2) to study associations between body mass index (BMI), waist circumference, and lens opacity with AMD, if any; and 3) to study associations between BMI, waist circumference, and lens opacity with serum uric acid, if any.

Methods: The study population was divided into 2 groups; the first group included 50 consecutive eyes diagnosed with AMD. The other group was control, which included 50 eyes with no retinal pathology. Inclusion criteria included age above 40 years and patients with neovascular and nonneovascular AMD. Those patients who refused to give consent, had coexisting retinal pathology, any systemic diseases, and media opacity were excluded from the study. A thorough systemic examination including body weight in kilograms, height in centimeters, and BMI calculated using weight (kg)/height (m^2) was done. A detailed ocular examination including visual acuity, slit lamp examination, Amsler grid test, intraocular pressure, slit lamp biomicroscopy, indirect ophthalmoscopy, fundus fluorescein angiography, and indocyanine green

angiography was performed. Serum uric acid was determined by taking 2 mL of blood from anticubital vein and analyzing via enzymatic photometric test using 2,4,6-tribromo-3-hydroxybenzoic acid.

Results: It was observed that the mean serum uric acid level was higher in patients with neovascular AMD (505 ± 13.57 umol/l) than in nonneovascular AMD (322 ± 26.26 umol/l) as compared to the control group (318.42 ± 76.23 umol/l). Every unit increase in BMI led to the expected increase of 4.282 times greater chance of AMD, which was statistically significant at a 95% confidence interval and with a P value < 0.001.

Conclusions: A statistically significant correlation exists between serum uric acid levels and severity of AMD. Patients with neovascular AMD have higher uric acid levels.

Poster No.: EX1-215
Panel No.: 215

Autophagy Protects Retina Against Light-Induced Damage in Aged Mice With Retinal Pigment Epithelium

First Author: Huika XIA

Co-Author(s): Lvzhen HUANG, Luoia LI, Xiaoxin LI

Purpose: Light exposure can be involved in the pathogenesis of dry age-related macular degeneration (AMD). Here, we investigated the effects of autophagy against light-induced retinal degeneration.

Methods: Ten-month-old healthy mice (had retinal pigment epithelium) were exposed to blue light at 2000 lux for 4 hours and the same mice without light exposure as control. Before blue light exposure and after light exposure at 1 day, 3 days, and 5 days, retinal function was examined by scotopic electroretinography (ERG). Hematoxylin and eosin (H&E) staining and electron microscopy were used to assess histopathological changes. In order to evaluate apoptotic cell death, terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) was used. Furthermore, the level of autophagy in the retina after blue light exposure was measured using Western blot analysis.

Results: Between the 2 groups, no significant difference was found in optic nerve layer (ONL) thinning, and no apoptosis of retinal cells was found. After blue light exposure, scotopic ERG showed amplitudes of a-waves and b-waves resulted in a decrease; electron microscopy revealed the outer segments (OS) of photoreceptors had structural disorder, with cone and rod cell nucleus pyknosis in the outer nuclear layer. However, both retinal function and structure of OS were improved day by day. Moreover, Western blot indicated that autophagy markers P62 and LC3I/LC3II showed strong expression in the experimental group

compared with the control group.

Conclusions: These results suggest that cell autophagy has protective effects against blue light-induced retinal degeneration in the murine retina. Retinal cell autophagy may play a role in dry AMD.

Poster No.: EX1-216
Panel No.: 216

Autophagy in Hypoxic R28 Retinal Precursor Cells

First Author: Larissa TANG

Co-Author(s): Frederic FUNG, Amy LO

Purpose: Retinal ischemia/reperfusion (I/R) injury is a common cause of visual impairment and retinal cell death in ocular diseases, such as diabetic retinopathy. The role of autophagy modulation has been garnering interest but its role in retinal I/R injury remains controversial. Our previous in vivo research demonstrated autophagy upregulation in the inner retinae of diabetic and wild-type mice. Here, an in vitro model was used to investigate the effect of hypoxia on autophagy in retinal cells.

Methods: The R28 retinal precursor cell line (R28) was used due to its heterogenous nature, which reflects the presence of neuronal and glial cells in the retina. R28 cells were cultured in low glucose DMEM medium, with additional glucose added to 1 group to mimic a hyperglycemic state. pCPT-cyclic AMP was added to induce cell differentiation into a more neuronal-like phenotype. Hypoxia was chemically induced in both low- and high-glucose-treated cells using cobalt (II) chloride. Cell morphology, cell viability, and autophagy was assessed using microscopy, MTS assay, and the detection of microtubule-associated light chain protein LC3 (autophagosome marker) by Western blot, respectively.

Results: Significant autophagic upregulation was observed in both low-glucose and high-glucose-treated cells subjected to hypoxia. High-glucose-treated cells demonstrated higher levels of LC3 expression as compared with low-glucose-treated cells placed under hypoxic conditions.

Conclusions: Autophagic activation was observed in cells subjected to hypoxia. Elevated glucose levels may exacerbate retina I/R injury-induced autophagy, as seen in both our in vivo and in vitro results. Autophagy modulation may be a potential therapeutic target for treating retinal I/R injury-related diseases.

Poster No.: EX1-217

Panel No.: 217

Characteristics of Type 3 Neovascularization Evaluated by Cross-Sectional Optical Coherence Tomography Angiography

First Author: Keiko KATAOKA

Co-Author(s): Yasuki ITO, Jun TAKEUCHI, Hiroko TERASAKI

Purpose: To study the expansion of type 3 neovascularization (NV) by using cross-sectional optical coherence tomography angiography (OCT-A) images.

Methods: The data of consecutive patients with treatment-naïve type 3 NV were collected retrospectively. Color fundus photography, fluorescein angiography (FA), indocyanine green angiography (ICGA), and OCT-A were performed in all the patients. Abnormal flow in cross-sectional OCT-A images was defined as intraretinal NV (IRN), subretinal NV (SRN), subretinal pigment epithelium (sub-RPE) NV, and choroidal neovascularization (CNV) based on the localization of abnormal flow on cross-sectional OCT-A images.

Results: A total of 22 eyes of 19 patients were analyzed. One of 22 eyes did not show IRN on OCT-A, although FA/ICGA suggested the presence of IRN. The OCT images showed that there were 5 of 22 eyes without RPE disruption and 17 of 22 eyes with RPE disruption. Among the eyes without RPE disruption on OCT, OCT-A showed no IRN in 1 of 5 eyes, IRN in 1 of 5 eyes, and both IRN and SRN in 3 of 5 eyes. Among the 17 of 22 eyes with RPE disruption on OCT, OCT-A showed flow penetrating RPE existed in 13 of 17 eyes. There were 4 of 17 eyes with sub-RPE NV located along the basal side of RPE without any anastomosis with choroidal flow. Anastomosis with sub-RPE NV and CNV was found in 7 of 17 eyes.

Conclusions: Cross-sectional OCT-A images are useful to identify IRN and evaluate the expansion of NV in eyes with type 3 NV.

Poster No.: EX1-218

Panel No.: 218

Choroidal Thickness Analysis in Patients With Erectile Dysfunction

First Author: Yong-Kyu KIM

Co-Author(s): Jang Hoon LEE, Sung Pyo PARK, Dae Yul YANG

Purpose: To investigate the morphological features of choroidal vasculature in patients with erectile dysfunction (ED) by analyzing choroidal thickness using optical coherence tomography.

Methods: We enrolled 39 patients with ED and 19 controls. ED was defined as an erectile function domain

score < 26 on the International Index of Erectile Function (IIEF) questionnaire. Small choroidal vessel layer (SCVL) thickness was calculated by subtracting large choroidal vessel layer thickness from total choroidal thickness. Choroidal thickness was compared between the ED and control groups, and between patients with and without diabetes.

Results: SCVL thickness was lesser in the ED group than in the control group (control, $69.8 \pm 24.3 \mu\text{m}$ vs ED, $55.1 \pm 19.9 \mu\text{m}$; $P = 0.017$). Among patients without diabetes, the ED group showed significantly lesser SCVL thickness than did the control group (control, $77.1 \pm 22.7 \mu\text{m}$ vs ED, $56.5 \pm 20.9 \mu\text{m}$; $P = 0.021$). However, among patients with diabetes, choroidal thickness showed no significant intergroup difference. Multiple linear regression analysis revealed that spherical equivalent (standardized coefficient $\beta = 0.294$; $P = 0.019$) and the IIEF erectile function score (standardized coefficient $\beta = 0.313$; $P = 0.012$) were significantly associated with SCVL thickness.

Conclusions: SCVL thickness, including the choriocapillaris layer and medium-sized choroidal vascular layer, decreased in proportion to ED severity, suggesting that microvascular changes in choroidal vessels may occur before specific ocular diseases in patients with ED.

Poster No.: EX1-219

Panel No.: 219

Clinical Features of Macular Serous Detachment According to Age Groups in Koreans

First Author: Kunho BAE

Co-Author(s): Eung Suk KIM, Hakyoun KIM, Seungyoung YU

Purpose: To investigate the causes of macular serous retinal detachment without hemorrhage at the macula in patients 40 years and older.

Methods: A total of 394 eyes of 363 consecutive Korean patients 40 years and older with macular serous retinal detachment were examined using spectral domain optical coherence tomography, fluorescein, and indocyanine green angiographies.

Results: Of 394 eyes, 178 eyes (45.2%) had central serous chorioretinopathy (CSC), 171 eyes (43.4%) had polypoidal choroidal vasculopathy (PCV), 32 eyes (8.1%) had occult choroidal neovascularization (CNV) secondary to age-related macular degeneration, 8 eyes (2.0%) had pure retinal pigment epithelial detachment, 1 had macular telangiectasia, and another had retinal macroaneurysm. A total of 162 of 237 (68.4%) eyes of patients in the sixth decade of life and older had PCV.

Conclusions: PCV is a primary cause of macular serous retinal detachment without hemorrhage in Korean

patients over 50 years of age. Since clinical and fluorescein angiographic findings are indistinguishable among CSC, PCV, and occult CNV, indocyanine green angiography might help to establish a more definitive diagnosis.

Poster No.: EX1-220

Panel No.: 220

Comparison of Efficacy of Fenofibrate Versus Bevacizumab in the Reduction of Diabetic Macular Edema

First Author: Irum RAZA

Purpose: To compare the efficacy of fenofibrate versus bevacizumab in the reduction of diabetic macular edema (DME).

Methods: This quasiexperimental study was conducted from July 1, 2015, to September 30, 2016, on 90 patients. The history included symptoms, dyslipidemia, and previous ocular treatment. Visual acuity and macular function tests were done. Optical coherence tomography was done to record the numerical value of DME. Systemic investigations included blood pressure, fasting glucose level, glycosylated hemoglobin (HbA1c), and complete fasting cholesterol profile. Then patients were divided into 2 groups. Group A was given fenofibrate capsule 200 mg orally once daily in collaboration with a physician. Group B was injected with 3 intravitreal bevacizumab injections at 1-month intervals. Good glycemic control was advised. Patients were called for follow-ups at the end of the third, sixth, and 12th month. On every visit, all investigations were repeated. Data was analyzed by SPSS version 20.

Results: There were a total of 90 patients. The mean and standard deviation of age was 58.37 ± 5.48 while the age range was 51-70 years. Fifty percent of the patients were aged 51-57 years and females were 59%. A 29.17% reduction of DME was seen in patients with 6.5 to 7.5% HbA1c, signifying its definite role in reducing DME. Cholesterol level did not show any significant effect on final outcome ($P = 0.763$). Efficacies of fenofibrate and bevacizumab were 28.9% and 11.11%, respectively ($P = 0.03$).

Conclusions: Fenofibrate is more efficacious than bevacizumab in reducing DME in the long run and is helpful to patients fearful of intravitreal injections.

Poster No.: EX1-221

Panel No.: 221

Comparison of Peripheral Choroidal Thickness Measured From Wide-Field OCT in Healthy Eyes

First Author: Sungrae NOH

Co-Author(s): Eung Suk KIM, Seungyoung YU

Purpose: To evaluate the range of peripheral choroidal thickness in young healthy human subjects by wide-field optical coherence tomography (OCT) and to compare peripheral choroidal thickness according to fixation points.

Methods: Prospective study of 10 healthy human eyes measured by 55-degree Spectralis wide-field OCT with enhanced depth imaging (EDI) mode. Peripheral choroid thickness was measured at 5 fixation points (internal fixation target): central point for scanning the macula and 4 eccentric locations for superior, inferior, nasal, and temporal peripherals. Peripheral choroidal thickness was of the same point at 7000 μm distance from the fovea after the participants looked at 5 fixation points.

Results: Peripheral choroidal thickness of central fixation with the same 7000 μm distance from the fovea was measured at 4 points: superior (211.60 ± 34.955), inferior (154.70 ± 48.569), nasal (175.20 ± 35.295), and temporal (273.10 ± 70.798). Four eccentric peripheral fixations for superior, inferior, nasal, and temporal were also measured at the same 7000 μm distance from the fovea: superior (228.50 ± 44.677), inferior (165.40 ± 47.615), nasal (187.50 ± 32.074), and temporal (283.40 ± 70.387). Difference of choroidal thickness according to fixation point (eccentric – central) assessed: superior (16.900 ± 22.708), inferior (10.700 ± 6.865), nasal (12.300 ± 15.748), and temporal (10.300 ± 13.433).

Conclusions: In healthy eyes, choroidal thickness was the highest in the subfoveal area, followed by temporal, superior, nasal, and inferior periphery. There was significant difference in the measurement of peripheral choroidal thickness by moving the fixation target of wide-field OCT ($P < 0.05$). Difference between measured and actual choroidal thickness should be considered when evaluating pathologic lesions in the peripheral choroid.

Poster No.: EX1-222
Panel No.: 222

Compliance Towards Treatment of Age-Related Macular Degeneration Could Be Enhanced Through Intensive Patient Counselling

First Author: Pascale **SHEN**

Co-Author(s): Karin **HO**, Natalie **LAU**, Brian **SIU**, Charmaine **WONG**, Miranda **YEUNG**

Purpose: To explore the subject of compliance in treatment for age-related macular degeneration (AMD) and to evaluate the efficacy of one-on-one counselling on compliance rates.

Methods: Chinese subjects aged 50-80 with history of AMD were recruited for the study. A structured questionnaire was used to evaluate their baseline compliance towards management and the factors that may have influenced compliance. Counselling regarding compliance towards treatment was delivered following the questionnaire interview. A second stage questionnaire was conducted over the phone after 4 weeks to re-evaluate the compliance and the efficacy of the counselling.

Results: Forty-one subjects were recruited; 28 were male (68.3%). Prior to counselling, only 9 (22.0%) felt they understood their illness, with 8 (19.5%) scoring more than 70% in a short quiz about awareness of AMD. A total of 73.2% reported that they have been fully compliant to the prescribed management by their ophthalmologist. Of the remaining 11 (26.8%) subjects, 7 (63.6%) and 4 (36.4%) reported noncompliance for diet modifications and self-monitoring by Amsler grid, respectively. Reasons for noncompliance included forgetfulness (45.5%) and a perceived lack of effectiveness of the prescribed management (27.3%). Twenty-two subjects (53.7%) were satisfied with the doctor's explanation of their illness and the management plan. At the second stage phone interview, all subjects found the counselling to be "useful" or "somewhat useful" and 5.6% (1 of 17) wished to receive counselling in future.

Conclusions: Subjects' knowledge on AMD is insufficient. Doctors spending time to provide more information about AMD and the rationale behind its management could improve overall compliance.

Poster No.: EX1-223
Panel No.: 223

Correlation Between Overrefraction and Distance and Near LogMAR of Multifocal Soft Contact Lenses

First Author: Yoshiyuki **ARIGA**

Co-Author(s): Masayoshi **KAJITA**

Purpose: We investigated the correlation coefficient (r) between overrefraction when wearing multifocal soft contact lenses (MF-SCL) and distance logarithm of the minimum angle of resolution (logMAR) and near logMAR for each MF-SCL.

Methods: There were 84 subjects (average age, 44.7 ± 13.4 years old) for whom MF-SCL had been prescribed. Seven types of MF-SCL were used: Proclear 1 day multifocal (PCMF), high add and low add Medalist multifocal (MDMF), med add and low add AIR OPTICS AQUA multifocal (AOMF), and +0.75 diopter (D) add of 1 day Pure multistage (1PMS). As a condition, a person obtained the spherical equivalent (SE) of the overrefraction of the left and right eyes, with the differential of 0.75 D or less and the cylinder power of the overrefraction of -0.75 D or less. We checked for correlation with SE of the left and right eyes; SE on the minus side was examined for near logMAR, and SE on the plus side was examined for distance logMAR.

Results: Statistically significant correlations were found in distance logMAR ($r = 0.53$) in PCMF, distance logMAR ($r = 0.58$) in AOMF low add, distance logMAR ($r = 0.75$) in AOMF med add, distance logMAR ($r = 0.64$) in FFMF low add, distance logMAR ($r = 0.81$) in FFMF high add, and distance logMAR ($r = 0.68$) in MDMF low add.

Conclusions: It is suggested that overrefraction may be a reference value for determining SCL power in prescribing MF-SCL.

Poster No.: EX1-224
Panel No.: 224

Detection of Choroidal Neovascularization in Age-Related Macular Degeneration by Optical Coherence Tomography Angiography

First Author: Yoshimi **NAGAI**

Co-Author(s): Tomoyuki **CHIHARA**, Motoki **KIMURA**, Kazuki **NAKAGAWA**, Masayuki **OHNAKA**, Kanji **TAKAHASHI**

Purpose: Fluorescein angiography (FA) and indocyanine green angiography (IA) have been essential for the detection of choroidal neovascularization (CNV) in wet age-related macular degeneration (AMD). Because optical coherence tomography (OCT) angiography (OCTA) can visualize blood vessels without intravenous dye injection, we investigated how much it can detect

CNV in a retrospective study.

Methods: Seventy-two patients with exudative AMD who had visited Kansai Medical University Hospital were included. All cases underwent FA, IA, spectral-domain OCT (SD-OCT), and swept-source OCTA (SS-OCTA; PLEX Elite, Carl Zeiss Meditec, Inc, Dublin, CA). AMD subtype was classified as typical AMD in 34 eyes (predominantly classic CNV: 2 eyes; minimally classic CNV: 2 eyes; occult with no classic CNV: 30 eyes) and polypoidal choroidal vasculopathy (PCV) in 38 eyes.

Results: Seventy-two eyes of 72 patients (48 male, 24 female) were studied. Average age was 74.4 years. OCTA was performed for all cases and the detection rate of CNV was investigated. Detection of CNV was judged from both image findings of en face OCTA and structural OCT. The detection rate of CNV was 88.2% for typical AMD (predominantly: 100%; minimally: 100%; occult: 86.7%). In PCV, polypoidal lesions were detected in 81.6% and branching vascular networks were detected in 84.2%.

Conclusions: As it was possible to detect CNV from SS-OCTA in high frequency, it is considered possible to reduce the frequency of invasive angiography. However, because there are lesions that could not be detected with SS-OCTA, it is desirable to improve image interpretation criteria and equipment resolution.

Poster No.: EX1-225

Panel No.: 225

Does the Number of Anti-Vascular Endothelial Growth Factor Injections Influence the Outcome of Myopic Choroidal Neovascularization?

First Author: Yee Yan **CHAN**

Co-Author(s): Derek **CHUNG**, Kenneth **LI**

Purpose: To investigate whether the number of intravitreal anti-vascular endothelial growth factor injections influences the outcome in myopic choroidal neovascularization (CNV).

Methods: Retrospective review of consecutive case of myopic CNV cases over a 5-year period. Cases that received 2 initial monthly injections were compared with those that received 3 initial monthly injections.

Results: A total of 40 eyes of 40 patients were included. Sixteen and 20 cases received 2 and 3 monthly injections, followed by pro re nata injections, respectively. Overall mean baseline visual acuity was logarithm of the minimum angle of resolution (logMAR) 1.04, with visual improvement to logMAR 0.86 ($P = 0.026$) at 1 year and to logMAR 0.82 at the latest follow-up ($P = 0.007$). All cases had complete CNV regression. When comparing cases that received 2 and 3 initial injections, the mean number of injections

were 2.5 and 3.3 respectively ($P < 0.001$). There was no statistically significant difference in visual acuity at 1 year (logMAR 0.78 versus 0.90, $P = 0.59$) and at the latest follow-up (logMAR 0.74 versus 0.89, $P = 0.633$). Recurrence rate was the same between the 2 groups (12.5%, $P = 1.00$).

Conclusions: Two initial monthly injections are noninferior to 3 initial monthly injections in myopic CNV.

Poster No.: EX1-226

Panel No.: 226

Effect of Various Intravitreal Injections for Macular Edema Secondary to Branch Retinal Vein Occlusion on Intraocular Pressure

First Author: Suria **SUDHAKARAN**

Co-Author(s): Balaji **RAMANATHAN**

Purpose: To compare the safety of intravitreal triamcinolone acetone (IVTA) versus intravitreal bevacizumab (IVB) for treatment of macular edema (ME) secondary to branch retinal vein occlusion (BRVO) in terms of increase in intraocular pressure (IOP).

Methods: One hundred eyes of patients diagnosed with BRVO were included in the study. Patients included were of >40 years, diagnosed cases of BRVO with ME (central macular thickness $> 300 \mu\text{m}$), with visual acuity of 6/12 or less, phakic, aphakic, pseudophakic. Patients were allocated to 1 of 2 treatments by block randomization using blocks of 4. Fifty patients each were randomized to IVTA and IVB injection as treatment; 0.4 mg/0.1 mL was injected for the triamcinolone group, and 1.25 mg/0.05 mL was injected for the bevacizumab group.

Results: In the triamcinolone group, mean IOP (\pm SD) was 11.96 ± 2.347 before the injection and was 20.22 ± 6.059 , 21.52 ± 7.251 , 17.36 ± 2.562 , and 17.06 ± 3.171 mm Hg at 1, 3, 6, and 9 months. Differences from baseline to 1, 3, 6, and 9 months were significant ($P < 0.001$). Patients with significant increase in IOP were started on treatment with timolol 0.5% e/d. Eighteen out of 50 patients (36%) had raised IOP (>21 mm Hg) during follow-up in the IVTA group. Percent of patients who had raised IOP after IVTA injection was 32%, 26%, 0%, and 2% after 1, 3, 6, and 9 months, respectively. In the bevacizumab group, IOP (\pm SD) before injection was 12.40 ± 2.204 mm Hg and at 1, 3, 6, and 9 months after injection was 12.70 ± 2.043 , 12.42 ± 2.148 , 11.70 ± 2.033 , and 12.34 ± 2.191 mm Hg, respectively. During the follow-up period, there were no significant differences in IOP from baseline within the bevacizumab group ($P = 0.369$, 0.963, 0.098, and 0.878, respectively, at 1, 3, 6, and 9 months vs baseline).

Conclusions: In terms of safety, the triamcinolone group showed a statistically significant rise in IOP compared to the bevacizumab group.

Poster No.: EX1-227

Panel No.: 227

Evolution of Intermediate AMD on Color Fundus Photo and SD-OCT

First Author: Akshay **HARNE**

Co-Author(s): Sarang **LAMBAT**, Vinay **NANGIA**

Purpose: The purpose was to follow up (FU) patients with intermediate age-related macular degeneration (IAMD) using color fundus photos (CFP) and spectral domain optical coherence tomography (SD-OCT) to determine the changes in drusen over time.

Methods: We included 31 subjects (45 eyes) with IAMD in at least 1 of the eyes. All subjects were +40 years (66.71 ± 9.98). There were 11 females. CFP and a foveal line scan (FLS) and 7-line macular scan with OCT were done. Risk factor scoring was done on CFP. The drusens were measured and counted initially and at mean FU of 78.5 ± 54.8 weeks.

Results: CFP showed mean risk score of 1.38 ± 0.88 and on follow-up it was 1.74 ± 0.92 ($P = 0.007$). Risk scoring of 2.00 was seen in 42.2% of eyes at presentation and 55.5% of eyes at FU. Two eyes had late AMD at presentation. The mean number of drusen in the FLS at presentation was 4.8 ± 4.33 and at FU was 5.4 ± 4.14 . Largest drusen height and width (μm) initially were 61.92 ± 31.57 and 366.68 ± 405.54 and at FU were 52.00 ± 37.48 and 375.24 ± 605.62 , respectively (height $P = 0.05$, width $P = 0.86$). The height and width of the smallest drusen initially were 34.21 ± 15.39 and 92.76 ± 52.06 and at FU were 28.79 ± 31.21 and 149 ± 353.37 , respectively (height $P = 0.36$, width $P = 0.36$).

Conclusions: Risk score progressed over 78.5 ± 54.8 weeks. Except for a decrease in the mean height of the largest drusen ($P = 0.05$), the size of the drusen showed minor changes. IAMD shows waxing and waning in size of drusen.

Poster No.: EX1-228

Panel No.: 228

Immediate Aspirin Use in Central Retinal Artery Occlusion to Prevent Ischemic Stroke in Taiwan: Prospective Cohort Database Study

First Author: Yu-Chuan **KANG**

Co-Author(s): Yun-Hsuan **LIN**, Caesar **LUO**, Nan-Kai **WANG**, Wei-Chi **WU**, Ling **YEUNG**

Purpose: To understand the efficacy of aspirin use for preventing ischemic stroke after central retinal artery

occlusion (CRAO).

Methods: A population-based study. A total of 9437 participants with newly diagnosed CRAO were identified. Participants who had a previous stroke, retinal vascular occlusion, were aged <20 years, or used aspirin 3 months before the event were excluded. There were 3778 eligible participants matched by propensity score, and they were divided into aspirin ($n = 434$) and aspirin-naïve groups ($n = 1736$) after matching. Main outcome measure was the incidence of ischemic stroke in the aspirin and aspirin-naïve groups within 1 year after CRAO.

Results: Of the 3778 patients with newly diagnosed CRAO, 151 had a subsequent ischemic stroke within 1 year. The risk was especially high during the first week of CRAO. No difference between the aspirin and aspirin-naïve groups was found in risk of ischemic stroke, bleeding events, or all-cause mortality. Risk factors for ischemic stroke within 1 year of CRAO included male gender ($P = 0.031$) and age ($P = 0.032$). Patients with atrial fibrillation had an increased risk of ischemic stroke ($P = 0.083$).

Conclusions: Immediate aspirin use after CRAO showed no benefit in attenuating the risk of ischemic stroke. The risk of ischemic stroke was increased after CRAO especially during the first week. Male gender and age were risk factors for ischemic stroke after CRAO.

Poster No.: EX1-229

Panel No.: 229

Indocyanine Green Angiography-Based Classification of Polypoidal Choroidal Vasculopathy: Pathogenic Significance

First Author: Kunho **BAE**

Co-Author(s): Eung Suk **KIM**, Hakyoun **KIM**, Seungyoung **YU**

Purpose: To elucidate the clinical characteristics of a typical polypoidal choroidal vasculopathy (PCV) in comparison with an interconnecting channel with microaneurysm (ICM) and expand the spectrum of the pathogenesis of PCV.

Methods: A total of 215 eyes of PCV patients by using a criteria of the EVEREST Study were included. Eyes were divided into 2 groups according to the indocyanine green angiography (ICGA) findings. Eyes with a definite polyp thicker than the diameter of the retinal vein were defined as typical PCV and ambiguous microaneurysms connected with choroidal vascular network were defined as ICM. We compared the results of fluorescein angiography (FA) and optical coherence tomography (OCT) between the 2 groups and analyzed the changes of maximum corrected visual acuity and central macular thickness up to 12 months

after intravitreal injection of anti-vascular endothelial growth factor (anti-VEGF).

Results: A total of 123 cases (57.2%) were classified as typical PCV, and 92 eyes (42.8%) were classified as ICM. Subfoveal choroidal thickness was 232.8 μ m in the typical PCV group and 272.7 μ m in the ICM group and the difference was significant ($P < 0.001$). Choroidal hyperfluorescence in the late phase of ICGA was noted in 62.3% of typical PCV patients and 93.4% of ICM patients ($P < 0.001$). Based on FA, 40.2% of ICM patients were suspected of having central serous chorioretinopathy (CSC) and the difference was significant (7.3% in typical PCV, $P < 0.001$). There was no significant difference in best corrected visual acuity (BCVA) between baseline and 12 months after anti-VEGF treatment.

Conclusions: Polypoidal choroidal vasculopathy could be classified into 2 subgroups using ICGA. Characteristic features of CSC were identified in the ICM group, which was distinguished from typical PCV.

Poster No.: EX1-230

Panel No.: 230

Irregular Pigment Epithelial Detachment in Chronic Central Serous Chorioretinopathy: SD-OCT and OCTA Findings

First Author: Seul Ki BANG

Co-Author(s): Eung Suk KIM, Seungyoung YU

Purpose: To evaluate the prevalence of irregular pigment epithelial detachment (PED) in chronic central serous retinopathy (CSC) and to identify the incidence of neovascular changes in patients with CSC during follow-up.

Methods: The medical records of 142 eyes with chronic CSC which were examined in the ophthalmology department of Kyunghee University Hospital were reviewed retrospectively. Analysis of spectral domain optical coherence tomography (SD-OCT), fluorescein angiography (FA), indocyanine green angiography (ICGA), and optical coherence tomography angiography (OCTA) findings was done.

Results: Forty-seven eyes of 142 eyes (33.1%) showed irregular PED on macular OCT. The mean age was 53.45 years in the irregular PED group and 49.73 years in the nonirregular PED group. In 12 eyes of 47 eyes (25.5%) neovascular change occurred during follow-up, especially 9 eyes with choroidal neovascularization (CNV) and 3 eyes with PCV. Mean duration at onset of neovascular change was 41.83 ± 46.28 months. To compare between eyes with and without neovascular change in patients with irregular PED, follow-up duration of the neovascular change group was 45.25 months and of the control group was 21.46 months.

There was a significant difference between the groups ($P = 0.009$). The presence of optically filled sub-retinal pigment epithelial (RPE) space was seen in 11 eyes (91.7%) in the neovascular change group and 14 eyes (40.0%) in the control group. There was a significant difference between the groups ($P = 0.011$). Type 1 neovascular networks were detected in 5 out of 8 eyes (67.5%) on OCTA (3 x 3 mm).

Conclusions: The presence of irregular PED was significantly correlated with neovascular change. The opacity of the sub-RPE space was significantly correlated with progression of neovascular change.

Poster No.: EX1-231

Panel No.: 231

Knowledge, Attitudes, and Practices on Diabetic Eye Disease Among Physicians

First Author: Eli PRADHAN

Co-Author(s): Manish POUDEL, Barsha SUWAL

Purpose: To find out the knowledge, attitudes, and practices among physicians regarding diabetes and diabetic retinopathy.

Methods: This was a descriptive, cross-sectional study of 45 physicians to ascertain knowledge, attitudes, and practices regarding diabetes and diabetic retinopathy. A set of questionnaires was formulated based on the "Guideline for Conducting a Knowledge, Attitude and Practice (KAP) Study" by K Kaliyaperumal (IEC expert). Data analysis was completed in SPSS version 20. Chi square/Fisher exact test was used wherever applicable. The written and informed consent from all the participants was taken and the confidentiality of the participants was maintained.

Results: All the participants were aware of eye complications due to diabetes. A total of 24.4% of them identified retinopathy alone as its complication. A total of 55.6% of the physicians said they routinely performed direct ophthalmoscopy to examine the retina ($P = 0.551$). However, among them, less than half (44%) did not know the importance of dilating the pupil ($P = 0.69$). Only 48.9% of participants said they referred 6 monthly for eye examination. A total of 64.4% of the participants said that they referred pregnant diabetic patients for eye examination ($P = 0.072$). A total of 8.9% of the participants said that they did not need to worry about ocular complications when blood sugar was well controlled. With regards to barriers for screening, the factors were lack of training (52.5%), lack of time (42.5%), or both (5%) ($P = 0.001$).

Conclusions: There was good knowledge and attitude among the participants. However, in order to increase the practice, barriers for dilated eye examination as perceived by physicians need to be addressed.

Poster No.: EX1-232
Panel No.: 232

Longitudinal Changes in Disc and Retinal Lesions Among Highly Myopic Adolescents in Singapore Over a 10-Year Period

First Author: Yee-Ling WONG

Co-Author(s): Quan HOANG, Ecosse LAMOUREUX, Charumathi SABANAYAGAM, Seang Mei SAW, Chee-Wai WONG

Purpose: To examine the progression pattern of disc and retinal lesions in highly myopic Chinese adolescents over a 10-year period in Singapore.

Methods: This longitudinal study included Chinese participants who had high myopia [spherical equivalent (SE) of ≤ -5 diopters (D)], no history of refractive surgery, and available fundus photographs at both 2006 (baseline) and 2016 (10-year follow-up) visits. Forty-four adolescents (aged 12-16 years at baseline) who were re-examined later at follow-up were included. Cycloplegic refraction, biometry, and fundus photography were performed at both visits. A trained grader classified myopic macular degeneration (MMD) based on the META-Analysis for Pathologic Myopia (META-PM) classification and disc lesions from fundus photographs. Choroidal thickness (CT) measurements were performed at 10-year follow-up using swept source optical coherence tomography (SS-OCT). The ocular parameters and lesions were compared between baseline and follow-up.

Results: There was a significant worsening of high myopia at follow-up to -7.5 ± 1.8 D [mean SE \pm standard deviation (SD)] versus -6.2 ± 1.3 D in 2006 ($P < 0.001$). The 10-year changes included increased degree of tessellation (26 eyes, 29.5%), development of new tessellated fundus (19 eyes, 21.6%), disc tilt (7 eyes, 8.0%), and expansion of peripapillary atrophy size (33 eyes, 37.5%). Eyes with early-onset tessellation (present at baseline, 48 eyes) had significantly thinner CT ($P < 0.05$) compared to eyes with late-onset tessellation (incidence at 10-year follow-up, 19 eyes). No cases of MMD were recorded at baseline or 10-year follow-up.

Conclusions: Although there was no incidence of MMD, the retinal and disc lesions worsened over the follow-up period. Early-onset fundus tessellation was associated with thinner CT.

Poster No.: EX1-233
Panel No.: 233

Multimodal Imaging Findings in Incontinentia Pigmenti

First Author: Tin Yan LIU

Co-Author(s): Morton GOLDBERG, Ian HAN, Maggie LINZ, Adrienne SCOTT

Purpose: To assess and compare pathological retinal changes seen across different imaging modalities in patients with incontinentia pigmenti (IP), a rare genetic disease with multiorgan involvement and known retinal vasculopathy.

Methods: We conducted an institutional review board (IRB)-approved, prospective, cross-sectional study. All patients received multimodal imaging with spectral-domain optical coherence tomography (SD-OCT), optical coherence tomography angiography (OCTA), as well as ultra-widefield color fundus photography and fluorescein angiography (FA), with the exception of 1 patient who declined FA.

Results: A total of 9 eyes from 5 patients (median age, 20.5 years; range, 8.4 to 54.2 years) were included. Median visual acuity was Snellen 20/32 (range, 20/16 to 20/63). Ultra-widefield FA identified retinal vascular abnormalities in all 7 eyes in which FA was obtained. These abnormalities included microaneurysms, areas of nonperfusion, and vascular anastomoses, most of which were peripheral to the standard view of 30-degree FA with sweeps. Structural abnormalities were seen in 3 eyes on macular SD-OCT, including inner retinal thinning and irregularities of the middle retinal layers, especially the outer plexiform layer. Abnormalities were seen in 3 eyes on OCTA, including abnormal vascular loops and flow loss in the superficial and deep plexuses, which corresponded to areas of retinal thinning on SD-OCT.

Conclusions: Multimodal imaging is useful for detecting structural and vascular abnormalities that may not be clinically apparent in patients with IP. Further study is needed to characterize the correlation between macular and peripheral abnormalities in IP patients.

Poster No.: EX1-234
Panel No.: 234

Ocular Circulation Measured by Laser Speckle Flowgraphy in a Cytomegalovirus Retinitis Patient

First Author: Arimura TETSUSHI

Co-Author(s): Yuichi HORI, Shun KUMASHIRO, Tomoaki SHIBA, Yuka YAMAGUCHI

Purpose: To report a case of cytomegalovirus (CMV) retinitis in which the ocular circulation was measured

by laser speckle flowgraphy (LSFG), along with the treatment course.

Methods: A 66-year-old female had the chief complaint of visual disturbance of the left eye that had begun 1 month earlier. Visual acuity was 10/20. Slight inflammation in the anterior chamber, white exudative lesion, and hemorrhage were observed around the posterior pole. We diagnosed CMV retinitis based on the positive reaction in a CMV antigenemia test and aqueous polymerase chain reaction (PCR) test. Intravenous ganciclovir was administered for 2 weeks, and oral valganciclovir was administered for 5 weeks. The mean blur rate (MBR), blowout time (BOT), and blowout score (BOS), which are pulse waveform analysis parameters in the optic nerve head, were measured by LSFG.

Results: At the end of valganciclovir treatment, the retinal exudative lesions were scarred, and the patient's vision had recovered to 20/20. The MBR, BOT, and BOS of the right eye were 15.7, 44.6, and 61.6 at the start of treatment; 15.0, 47.9, and 65.4, at the end of ganciclovir treatment; and 15.0, 47.3, and 65.3 at the end of valganciclovir treatment. The corresponding values in the left eye showed remarkable changes from 6.5, 39.5, and 47.7 at the beginning of treatment; 8.4, 46.5, and 61.8 at the end of ganciclovir; and 11.3, 49.8, and 68.4 at the end of valganciclovir.

Conclusions: The measurement of ocular circulation by LSFG is a useful method for elucidating the pathophysiology of CMV retinitis.

Poster No.: EX1-235

Panel No.: 235

Ocular Perfusion Pressure and Choroidal Thickness in Central Serous Chorioretinopathy and Pigment Epitheliopathy

First Author: Cheolmin YUN

Co-Author(s): Seong-Woo KIM, Jaeryung OH

Purpose: To investigate ocular perfusion pressure (OPP) in patients with central serous chorioretinopathy (CSC) and pigment epitheliopathy (PE).

Methods: In this retrospective study, we included acute idiopathic unilateral CSC patients and age- and gender-matched normal controls. The CSC patients were classified into 2 groups according to PE presence in their fellow eyes. We compared OPP among CSC patients with or without PE and normal controls.

Results: Among a total of 47 CSC patients, 21 were classified into the PE group and 26 into the non-PE group. The mean OPP (\pm standard deviation) of CSC and fellow eyes in the PE group (50.02 ± 4.98 and 50.83 ± 4.12 mm Hg, respectively) was greater than that of

the non-PE group (43.69 ± 6.88 and 44.0 ± 6.57 mm Hg) and normal controls (45.64 ± 8.73 mm Hg) (all $P < 0.05$). The mean macular choroidal thickness (CT) of CSC and fellow eyes in the PE group (344.4 ± 31.8 and 310.1 ± 37.0 μ m) was thicker than that of the non-PE group (318.5 ± 43.8 and 282.8 ± 36.1 μ m) (all $P < 0.05$). Greater macular CT and higher OPP were associated with PE ($P = 0.002$ and $P = 0.003$).

Conclusions: Forty-five percent of acute unilateral CSC patients had PE in their fellow eyes. Increased OPP may influence the development of bilateral CSC characteristics.

Poster No.: EX1-236

Panel No.: 236

Optical Coherence Tomography Angiography Findings in Retinal Vein Occlusion Treated With Anti-Vascular Endothelial Growth Factor

First Author: Eung Suk KIM

Co-Author(s): Hakyoung KIM, Seungyoung YU

Purpose: To study correlations in patients with retinal vein occlusion (RVO) between the vascular densities in the superficial and deep capillary plexus (SCP and DCP) obtained using wide-field optical coherence tomography angiography (OCTA) and the data from conventional examination, particularly visual acuity and frequency of intravitreal anti-vascular endothelial growth factor (VEGF) injections.

Methods: Retrospective, observational study of patients with retinal vein occlusion who underwent a comprehensive ophthalmic examination including OCT and wide-field (12 x 12 mm) swept source OCTA using the AngioPLEXTM ELITE 9000 (Carl Zeiss Meditec, Germany). Vascular densities in the SCP and DCP, as well as the area of the foveal avascular zone and nonperfusion, were measured using ImageJ software.

Results: Among 29 eyes of 28 patients (12 men, mean age: 63.5 years), 20 eyes were branch retinal vein occlusion (BRVO) and 9 eyes were central retinal vein occlusion (CRVO). In BRVO, significant negative correlation was shown between vascular density in DCP and logarithm of the minimum angle of resolution (logMAR) visual acuity at baseline and final visit ($P = 0.019$, $P = 0.005$, respectively). In CRVO, we also found significant negative correlation between vascular density in DCP and logMAR visual acuity at final visit ($P = 0.023$). Number of intravitreal anti-VEGF injection per month was positively correlated with the area of nonperfusion in SCP ($P = 0.034$) and in DCP ($P = 0.031$).

Conclusions: Using wide-field swept source OCTA, we may do qualitative and quantitative analysis of macular and peripheral area by layers in RVO. OCTA may be considered as a clinical utility tool for the diagnosis and follow-up of RVO patients.

Poster No.: EX1-237

Panel No.: 237

Purtscher-Like Retinopathy as Harbinger of Ischemic Stroke: A Case Report

First Author: Yueh-Chang LEE

Co-Author(s): Yuan-Chieh LEE

Purpose: To describe a case of Purtscher-like retinopathy with subsequent ischemic stroke to raise awareness of this rare presentation, especially as the related stroke is prone to be disabling and fatal.

Methods: Case report.

Results: A 63-year-old male patient presented with left spastic headache, left eye blurred vision, and visual field defect for several weeks. He had a history of hypertension and left retromolar trigone squamous cell carcinoma treated with surgical resection and radiotherapy in 2003 and suffered from osteoradionecrosis of the jaw afterwards. The patient was hospitalized for a second course of hyperbaric oxygen therapy. Upon examination, visual acuity was 0.3 in the right eye and 0.5 in the left eye; ophthalmoscopy showed cotton-wool spots and Purtscher flecken confined to the peripapillary retina and macular area of both eyes. Optical coherence tomography revealed hyperreflectivities in the inner retinal layers corresponding to cotton-wool spots and variable degrees of macular edema. Fluorescein angiography demonstrated marked delay of arteriole filling time, occluded retinal arterioles, and areas of capillary nonperfusion. Autoperimetry reported constricted visual fields. Under the impression of Purtscher-like retinopathy, we suggested his primary care physician arrange carotid and cardiac sonography and survey pancreatic/renal enzymes. However, the patient was found dysarthric with poor comprehension and reduced lower extremity muscle power of the right side on the next day. Brain magnetic resonance imaging (MRI) showed left internal carotid artery occlusion with left middle cerebral artery territory acute infarction, findings of disabling ischemic stroke.

Conclusions: Our case report underscores the awareness of Purtscher-like retinopathy as a precursor of carotid artery occlusion-related disabling ischemic stroke.

Poster No.: EX1-238

Panel No.: 238

Retinal Degeneration Induced by Intravitreal Injection of N-Methyl-N-Nitrosourea in Rabbit Eyes

First Author: Seong-Woo KIM

Co-Author(s): Ji Yun HAN, Cheolmin YUN

Purpose: To evaluate morphological and functional

changes in the retinas of rabbit eyes following intravitreal injection of N-methyl-N-nitrosourea (MNU).

Methods: Twenty male New Zealand white rabbits were divided into 6 groups by the dose of MNU or sodium iodate (SI), with $n = 4$ for the MNU injection group (0.5, 1.0, 1.5, and 2.0 mg of MNU) and $n = 2$ for the SI injection group (0.4 and 0.8 mg of SI). Fundus infrared reflectance (IR) photo, spectral domain optical coherence tomography (SD-OCT), histology, and multielectrode array were performed at baseline, 1 week, or 1 month after intravitreal injection.

Results: In the individual 0.5-mg and 1.0-mg MNU injection groups, the retinal thickness on OCT was normal in 3 eyes and decreased in 1 eye, although retinal changes were not homogenous within each section. In the 1.5-mg and 2.0-mg MNU injection groups and the SI injection group, severe atrophic change of the retina was induced in the first week after injection. Using hematoxylin and eosin (H&E) staining and immunohistochemistry, retinal layer destruction was observed, especially in the outer layer. In a microelectrode array (MEA) recording, the population of spike-firing retinal ganglion cells diminished in both eyes as the MNU concentration increased. On transmission electron microscopy (TEM), photoreceptor layers were destroyed as MNU dose increased, while retinal pigment epithelial (RPE) cells were not significantly affected.

Conclusions: Morphological and functional changes of the retina became more destructive with increasing MNU dose. However, these results were not homogeneous within each image (section) or consistent in all eyes. The fellow eye was also affected in an MEA study, although significant changes were not observed through histology and immunohistochemistry.

Poster No.: EX1-239

Panel No.: 239

Retinal Microvascular Changes in Diabetic Macular Edema Using Swept-Source Optical Coherence Tomography Angiography After Being Treated With Anti-Vascular Endothelial Growth Factor

First Author: Pulthip CHAROENPHOL

Co-Author(s): Cameron HURST, Pear PONGSACHAREONNONT, Thanapong SOMKIJRUNGROJ

Purpose: To measure microaneurysm (MAs) and retinal vascular changes using optical coherence tomography angiography (OCTA) in patients with diabetic macular edema (DME) treated by bevacizumab, ranibizumab, and aflibercept.

Methods: A prospective analytic study. All patients

were evaluated by OCTA, fundus photo, and spectral domain OCT (SD-OCT) before and 4-6 weeks after anti-vascular endothelial growth factor (anti-VEGF) injection. Early Treatment Diabetic Retinopathy Study (ETDRS) macular layout was superimposed on the image and MAs were counted. Each ETDRS area was analyzed separately. Foveal avascular zone (FAZ) area and capillary nonperfusion area were measured. Poisson mixed effect regression with rate ratio was used for analyzing the MA changes. Linear mixed model with propensity score adjusted was performed to evaluate the effect of time and treatment type on each parameter.

Results: A total of 152 eyes were included. The mean age was 58.89 years. The mean FAZ of the superficial (SCP) and deep capillary plexus (DCP) was 0.38 and 0.42 mm². After anti-VEGF injection, the mean FAZ of SCP and DCP was 0.32 and 0.36 mm². The mean baseline capillary nonperfusion area was 0.85 and 1.49 mm². After treatment it was 0.71 and 1.41 mm². In overall analysis there was evidence that the nature of difference between groups changes over time ($X^2 = 6.97$; $df = 2$; $P = 0.03$). MA rate was reduced by 40% relative to baseline [RR = 0.61; 95% confidence interval (CI), 0.53-0.7; $P < 0.001$]. Ranibizumab had the most reduction of MAs. MA rate was 44% lower for the ranibizumab group at follow-up (RR = 0.56; 95% CI, 0.5-0.65; $P < 0.001$).

Conclusions: Our study indicated the amount of microaneurysm decrease after anti-VEGF treatment. The DCP had larger FAZ and capillary nonperfusion area. The changes in MAs after treatment were significantly different between anti-VEGF drugs.

Poster No.: EX1-240
Panel No.: 240

Short-Term Intraocular Pressure After Intraocular Injection of 0.05 mL Bevacizumab (Avastin): Comparison Between Straight vs Tunnelled Technique in an Asian Population

First Author: Rajya GURUNG

Purpose: To compare tunnelled scleral intravitreal injection with straight scleral intravitreal injection concerning short-term intraocular pressure (IOP) changes in an Asian population.

Methods: A total of 120 consecutive patients posted for intravitreal injection at the vitreoretinal department of Biratnagar Eye Hospital were randomly allocated to 2 groups: straight (group 1) and tunnelled (group 2). IOP was measured immediately before and after (1, 5, 10 minutes) injection. IOP was measured postinjection in the contralateral eye also. Occurrence of vitreous reflux, patient discomfort, and any complications were noted.

Results: IOP increased significantly in the tunnelled group immediately (1 minute) postinjection in comparison to the straight technique. Five minutes postinjection there was no statistically significant difference in IOP between the 2 groups, though vitreous reflux was significantly higher in the straight group. There was no effect of intravitreal injection on the IOP of the contralateral eye. None of the eyes required any intervention or antiglaucoma medication for high IOP. Severity of pain was comparable in both groups. No serious complication other than subconjunctival hemorrhage was noted, which was significantly greater in the tunnelled technique.

Conclusions: Both straight and tunnelled techniques are safe techniques for intravitreal injection, though the amount of reflux was statistically higher in the straight technique.

Poster No.: EX1-241
Panel No.: 241

Spectral Domain Optical Coherence Tomography Features of Patients With Diabetic Macular Edema

First Author: Sarang LAMBAT

Co-Author(s): Akshay HARNE, Vinay NANGIA

Purpose: The purpose of our study was to evaluate the spectral domain optical coherence tomography (SDOCT) features of diabetic patients undergoing macular evaluation.

Methods: One hundred seven eyes of 60 patients undergoing SDOCT for macular evaluation were included in the study. All patients underwent ophthalmic evaluation including visual acuity, anterior segment examination, intraocular pressure, fundus examination, fundus photography, and SDOCT. Scans were evaluated by 2 retinal specialists independently.

Results: Mean age was 58.29 ± 8.02 years. A total of 66.8% of patients were male. The visual acuity at presentation was 0.516 ± 0.342 decimal units. Ninety (84.1%) eyes had presence of macular edema (ME) with mean central foveal thickness of 292.19 ± 152.78 μ m. Forty-nine (55.1%) eyes had center-involving edema. ME was spongy in 75 (83%) eyes, cystoid in 47 (56.6%) eyes, epiretinal membrane in 25 (24.5%) eyes, and subsensory fluid in 11 (12.9%) eyes. The ellipsoid zone was distorted at the fovea in 55 (55%) eyes and absent in 3 eyes. Choroidal thickness (CT) at the fovea was 329.12 ± 103.65 μ m. ME had a negative correlation ($-0.242, 0.028$) with CT at the fovea. Spongy edema had a positive correlation ($0.368, 0.00$) with hard exudates.

Conclusions: The most frequent pattern of macular edema was spongy type. Areas adjoining hard exudates may be more likely to have spongy edema. Eyes with

thin choroids have more edema at presentation. Center-involving macular edema and abnormal ellipsoid zone have a bearing on visual acuity. Characterization of edema is known to help in prognosticating outcomes and deciding the mode of treatment.

Poster No.: EX1-242

Panel No.: 242

Spectral Domain Retinal Thickness Measurements Among Myopic Filipinos

First Author: Camille Elaine ZABALA

Co-Author(s): Jubaida MANGONDATO-AQUINO, Jose Ma MARTINEZ, John Mark DE LEON

Purpose: To provide mean macular and retinal nerve fiber layer (RNFL) thickness measurements of myopic Filipinos using spectral domain optical coherence tomography (SD-OCT) and to evaluate the effects of age, gender, and the different degrees of myopia on these measurements.

Methods: This study was an observational cohort of myopic patients seen consecutively at an outpatient department of a government eye institution. Subjects were divided into 2 groups: low-moderate myopia [spherical equivalent from -0.50 diopters (D) to -6.00 D] and high-pathologic myopia (spherical equivalent less than -6.00 D and axial length > 26.5 mm). Macular and RNFL thickness were measured using a Spectralis SD-OCT. Kruskal-Wallis test determined if measurements differed across degrees of myopia. Stepwise multiple regression analysis provided prediction equations of thickness measures considering effects of degrees of myopia, age, and gender. Statistical significance was based on a P value ≤ 0.05 .

Results: Of 156 eyes included in the study, 88/156 had low-moderate myopia and 68/156 had high-pathologic myopia. Average spherical equivalent ($P < 0.0001$) decreased while axial length ($P < 0.0001$) increased with degree of myopia. Multivariate analysis showed that degree of myopia and age significantly affected macular and RNFL thickness measures except for the following measures where only the degree of myopia was a significant factor: central foveal subfield, temporal parafoveal, nasal perifoveal, inferior, and nasal RNFL thickness.

Conclusions: The central foveal subfield, temporal parafoveal, nasal perifoveal, inferior RNFL, and nasal RNFL thicknesses may be better SD-OCT measurement parameters among myopic Filipino patients to monitor for disease since they may be less influenced by age.

Poster No.: EX1-243

Panel No.: 243

TSPO Ligands Promote Cholesterol Efflux in RPE Cells: Implications for Age-Related Macular Degeneration

First Author: Lincoln BISWAS

Co-Author(s): Annette GRAHAM, Xinhua SHU

Purpose: Age-related macular degeneration (AMD) is the commonest progressive blinding disease among the elderly, accounting for 54% of legal blindness. Cardinal features of AMD are accumulation of cholesterol in drusen, aging Bruch membrane, and subretinal lesions, suggesting abnormal lipid homeostasis in the progression of this disease. The present study aimed to investigate the role in the pathogenesis of AMD of the cholesterol trafficking mediated in retinal pigment epithelium (RPE) by the mitochondrial protein TSPO.

Methods: Expression of the target protein, TSPO, in RPE cells was confirmed by Western blot and immunocytochemistry. The functional activity of TSPO was manipulated with selective TSPO ligands. Cellular responses were analyzed by cholesterol efflux assay, lipid uptake and accumulation assay, quantitative real-time polymerase chain reaction (qRT-PCR), immunoblotting, immunocytochemistry, and flow cytometry. Furthermore, TSPO gene was deleted from RPE cells using the clustered regularly interspaced short palindromic repeats (CRISPR)/Cas9 engineering system. Eventually, mitochondrial homeostasis was monitored by different mitochondrial markers.

Results: We confirmed that TSPO-specific ligands significantly promote cholesterol efflux in RPE cells, while deletion of TSPO impaired cholesterol efflux. The oxidized LDL uptake and accumulation increased markedly in TSPO^{-/-} RPE cells due to LDLR dysregulation. Consequently, in TSPO^{-/-} RPE cells the reactive oxygen species (ROS) level was significantly increased and upregulated the expression of proinflammatory cytokines. We also demonstrated the impairment of mitochondrial homeostasis in TSPO-deleted RPE cells.

Conclusions: This study sheds light on molecular and cellular aspects of AMD pathogenesis and suggests that TSPO is a potential therapeutic target for treating AMD.

Poster No.: EX1-244
Panel No.: 244

The Inhibitory Effect of Substance P on Retinal Neurodegeneration in a Diabetic Rat Model

First Author: Eung Suk KIM

Co-Author(s): Hyun Sook HONG, Hakyoun KIM, Kiyoun KIM, Seungyoung YU

Purpose: To evaluate the inhibitory effect of retinal neurodegeneration changes in type 2 diabetic rats (OLETF) after intravenous substance P (SP) injection.

Methods: Retinal nerve fiber layer (RNFL) thicknesses were measured manually at 1300 μ m from the center of the optic nerve head using spectral domain optical coherence tomography (SD-OCT); 5 nmole/kg substance P was injected intravenously twice a week from 27 to 30 weeks. Histologic and immunologic cell staining, serum inflammatory cytokines, and bone marrow colony forming efficiency were measured at 31 weeks.

Results: At 28 weeks, RNFL thickness was significantly lower in OLETF than in the control group. From 29 weeks (2 weeks after injection) RNFL thickness showed significant increase in the SP injection group maintained at 31 weeks. In histologic analysis, the SP injection group presented decrease of GFAP staining, cell apoptosis, and serum inflammatory cytokines. Whereas, infiltration of inflammatory cells and bone marrow colony forming efficiency were higher than the control group.

Conclusions: Substance P injection showed inhibitory effect in retinal neurodegeneration as early change of diabetic retinopathy via anti-inflammatory effect and enhancements of mesenchymal stem cell-mediated immune modulation.

Poster No.: EX1-245
Panel No.: 245

The Level of Intercellular Adhesive Molecule-1 in Proliferative Diabetic Retinopathy. Effect of Laser Photocoagulation and Intravitreal Bevacizumab

First Author: Andi VICTOR

Co-Author(s): Rahayuningsih DHARMA, Tjahyono GONDHOWIARDJO, Sri JUSMAN, Vivi YANDRI, Ressa YUNETA

Purpose: To identify the level of vitreous intercellular adhesive molecule-1 (ICAM-1) in proliferative diabetic retinopathy (PDR) patients treated by laser photocoagulation (LP) and intravitreal bevacizumab (IVB).

Methods: A cross-sectional study was conducted

during 2015-2016. In total, 65 consecutive PDR patients who underwent single/multiple-session LP or IVB therapy were enrolled in this study. ICAM-1 was extracted from undiluted vitreous fluid via vitrectomy and measured by enzyme-linked immunosorbent assay (ELISA).

Results: Of 65 subjects, 13 were treated with IVB, 10 with single LP (sLP), and 9 with multiple-session LP (mLP). The remaining patients who only underwent vitrectomy served as the control group ($n = 33$). There were 45 (69.2%) female and 20 (30.8%) male patients with a mean age of 51 years. We found an increase of ICAM-1 level in PDR patients treated with IVB and mLP, yet there was no statistically significant difference between these therapy groups ($P > 0.05$). HbA1c level and insulin usage had no significant association with ICAM-1 level ($P = 0.54$ and $P = 0.52$, respectively). On the contrary, there was an association between ICAM-1 level and the duration of diabetic mellitus ($P < 0.05$).

Conclusions: IVB injection 1-2 weeks prior to vitrectomy was not enough to decrease the level of vitreous ICAM-1, while mLP might induce the increase level of vitreous ICAM-1.

Poster No.: EX1-246
Panel No.: 246

Treatment Burden and Concerns of Patients Undergoing Intraocular Injection for Diabetic Macular Edema in Australia

First Author: Andrew CHANG

Co-Author(s): Gerry GUINAN, George LABIB, Jodi TANTON, Karen WINKLER

Purpose: To determine treatment burden in diabetic macular edema (DME) patients undergoing treatment with intraocular injections.

Methods: Sixty-five DME patients across Australia, median age 53 years, who have received an average of 6.7 intraocular injections treatment for DME and at least 1 within the previous 6 months completed an online survey between February and May 2017.

Results: A total of 66% of respondents were male; 48% work full time. A total of 75% lived with their partner, while 20% lived alone. A total of 52% of patients stated their most recent injection made them extremely anxious, and 95% felt fewer injections would improve their treatment experience. Key improvements desired by patients were fewer appointments (91%) and fewer injections (48%). A total of 69% of patients perceived their disease and its functional impact to be fairly serious or serious; patients thought about their DME weekly (37%), daily (35%), or constantly (6%). Over the previous 6 months, patients averaged 12.5 visits to different types of healthcare professionals for DME and associated conditions, requiring on average 11.6

hours across consultations. A total of 62% of patients took at least 24 hours off work per injection. A total of 89% of patients required carer accompaniment for appointments (mean of 4 hours per appointment), and 50% of carers took time off work for this. A total of 72% of patients expressed guilt about asking for carer help and 64% stated that it added to their pretreatment anxiety.

Conclusions: DME patients and their carers experience considerable treatment burden; and the intravitreal injections impose a considerable psychological burden.

Poster No.: EX1-247

Panel No.: 247

Unilateral Retinitis Pigmentosa

First Author: Fazil KHURRUM

Co-Author(s): Isha AGARWALLA, Pritam BAWANKAR, Nilutparna DAS, Diva MISRA, Ronel SOIBAM

Purpose: To report 3 cases of unilateral retinitis pigmentosa confirmed by characteristic findings seen on ophthalmoscopy, visual field testing, and electroretinography, which presented at a tertiary eye center in North East India.

Methods: Retrospective design. Three diagnosed cases of unilateral pigmentary retinopathy visited our outpatient department for an annual eye examination. Other causes of unilateral pigmentary retinopathy were ruled out and the diagnosis of unilateral retinitis pigmentosa was confirmed on ophthalmoscopy, visual field testing, and electroretinography.

Results: Posterior segment evaluation of all 3 cases revealed unilateral findings of optic disc pallor, arteriolar narrowing, and variable amounts of bone spicule-shaped pigment deposits in the midperipheral retina with sparing of the posterior pole. Full-field 120-point screening test with a Humphrey perimeter showed normal findings in 1 eye with residual small central island of vision in the fellow eyes of all 3 cases. Full-field electroretinography showed unilateral extinguished responses with normal amplitudes in other eyes. The François and Verriest criteria were fulfilled and diagnosis of unilateral retinitis pigmentosa confirmed.

Conclusions: To conclude, unilateral retinitis pigmentosa is an uncommon entity, with fewer than 100 cases reported in the literature. Therefore, clinical signs and symptoms, a minimum of a 5-year follow-up period, and confirmatory electroretinography and visual field testing are very helpful in elucidating the unilateral pattern of the disease and in monitoring these individuals.

Poster No.: EX1-248

Panel No.: 248

Vascular Endothelial Growth Factor Concentration in the Aqueous Humor With Diabetic Retinopathy and the Influence of Therapy With Bevacizumab

First Author: Vü ANH

Co-Author(s): Nguyen HAO

Purpose: To study the concentration of vascular endothelial growth factor (VEGF) in the aqueous humor before and after the intravitreal injection of bevacizumab in eyes with diabetic retinopathy and the correlation to the disease.

Methods: In this prospective, interventional case series, 1.25 mg of bevacizumab was injected into the vitreous cavity to treat diabetic macular edema or proliferative diabetic retinopathy in 30 eyes of 20 patients. Aqueous humor samples were obtained just before intravitreal injection of bevacizumab and 1 week after the injection, just before the vitrectomy. The VEGF concentration in the aqueous humor was measured using an enzyme-linked immunosorbent assay.

Results: VEGF concentration in the aqueous humor ranged from 107.2 to 1559 pg/mL (406.91 ± 333.29 pg/mL) before intravitreal injection of bevacizumab and decreased to 0 to 51.56 pg/mL (18.32 ± 18.07 pg/mL) ($P < 0.001$) in all eyes 1 week after injection. There were no substantial differences among the subgroups with vitreous hemorrhage, tractional retinal detachment, or diabetic macular edema ($P > 0.05$).

Conclusions: Intravitreal injections of bevacizumab resulted in a substantial decrease in VEGF concentration in the aqueous humor. There was no substantial difference in the VEGF concentrations in the aqueous humor among the subgroups.

Poster No.: EX1-282

Panel No.: 282

New Anti-VEGF Therapy Protocol for Macular Edema Associated With Retinal Vein Occlusion

First Author: Hidetaka NOMA

Co-Author(s): Masahiko SHIMURA, Kanako YASUDA

Purpose: Anti-vascular endothelial growth factor (VEGF) agents are effective for retinal vein occlusion (RVO) with macular edema, but recurrence is common. The effect varies widely among RVO patients, so it is difficult to set the protocol for anti-VEGF therapy. Therefore, we investigated the relationship between recurrence of macular edema and the visual prognosis while monitoring cytokine kinetics and determined a

new estimated follow-up interval for anti-VEGF therapy.

Methods: In 37 RVO patients, after the first dose of anti-VEGF therapy, examination was performed every 2 weeks until recurrence. Aqueous humor levels of VEGF, soluble VEGF receptor (sVEGFR)-1, sVEGFR-2, and inflammatory factors were measured by the suspension array method.

Results: After the first dose of anti-VEGF therapy, anti-VEGF therapy at the estimated interval (set by examination every 2 weeks until recurrence) maintained significantly improved best corrected visual acuity with reduction of sVEGFR and inflammatory cytokines.

Conclusions: These findings suggest that anti-VEGF therapy at every estimated interval maintains best corrected visual acuity. This is supported by the finding that sVEGFR and inflammatory cytokines are reduced by this approach.

Retina (Surgical)

Poster No.: EX1-249

Panel No.: 249

A Novel Technique of ILM Peeling for Full Thickness Macular Hole

First Author: Shireen PANDEY

Co-Author(s): Prasoon PANDEY

Purpose: The purpose of this study was to demonstrate a new technique of internal limiting membrane (ILM) peeling with the conventional inverted flap for full thickness macular holes.

Methods: We demonstrated a case series of 6 cases with full thickness macular hole (stage 3 and 4) documented on optical coherence tomography (OCT) for which ILM peeling was done only in the temporal half of the macula with inverted flap technique and gas tamponade and 6 hours of prone positioning. The hole closure was documented at 1 month postoperatively with OCT.

Results: We achieved a 100% closure rate in all our patients at 1 month postoperatively. Mean preoperative vision was 20/200 which improved to a mean of 20/40.

Conclusions: This is a safer method of ILM peeling since the nasal half of the ILM remains intact, thereby minimizing the damage to the papillomacular bundle and offering better visual recovery. The minimal hours of postoperative prone position were just to ensure the flap position.

Poster No.: EX1-250

Panel No.: 250

Acute Retinal Necrosis Associated With Epstein-Barr Virus

First Author: Anthony MAK

Co-Author(s): Nicholas FUNG, Lawrence IU, Jimmy LAI, Wai-Ching LAM, Ian WONG

Purpose: Acute retinal necrosis (ARN) is a rare infectious viral uveitis syndrome, usually associated with herpesviruses. We report a case of atypical ARN presenting with panuveitis, complicated by retinal detachment and late signs of necrotizing inflammation.

Methods: Case report.

Results: A 33-year-old engineer from Guatemala with good past health presented with left eye pain and blurring of vision for 1 month. The visual acuity progressively decreased to 20/100. On examination, the clinical picture was consistent with nongranulomatous panuveitis, with posterior segment features such as vitritis, vasculitis, and snow-banking. There was no clinical evidence of any infiltrates or necrotizing inflammation on initial presentation. Initial imaging including magnetic resonance imaging (MRI) of the brain was negative, and blood tests were unremarkable, except for a false positive Venereal Disease Research Laboratory test, which delayed the commencement of oral and subtenon steroid treatment. The patient subsequently developed worsening vitritis and retinal detachment, which was treated by vitrectomy, encircling band, and scleral buckle. Confluent areas of retinal necrosis were noted during surgery. Vitreous sample was sent for virology polymerase chain reaction (PCR) and was positive for Epstein-Barr virus (EBV). Postoperatively, he was started on long-term oral acyclovir and his retina was successfully reattached with a final visual acuity of 20/32.

Conclusions: ARN can present as panuveitis without signs of necrotizing inflammation in the early stages of presentation. Early aqueous or vitreous tapping is invaluable in identifying the potential etiology. ARN associated with EBV has been reported sparingly in the past; however, EBV should be included in the virology PCR panel for vitreous or aqueous samples.

Poster No.: EX1-251

Panel No.: 251

Anterior Proliferative Vitreoretinopathy in a Patient With Coats Disease

First Author: Satoru KASE

Co-Author(s): Susumu ISHIDA, Shohei MORI, Kousuke NODA

Purpose: Coats disease is a congenital retinal vascular

malformation characterized by retinal telangiectasis, intraretinal and subretinal exudation, which sometimes develops proliferative vitreoretinopathy (PVR). The aim of this study is to report a case of advanced Coats disease with anterior PVR treated with vitrectomy and excision of the PVR membrane.

Methods: A 12-year-old boy suffered from ocular pain and vision loss in his left eye (OS). Examination revealed best corrected visual acuity OS of hand motions and intraocular pressure was 40 mm Hg OS. There was rubeosis iridis suggestive of total retinal detachment OS. After written informed consent was obtained from the parents, the patient underwent pars plana vitrectomy 4 times. Marked anterior PVR with tractional retinal detachment was noted in an initial vitrectomy. The retina revealed massive exudation with normal intraocular pressure under silicone oil tamponade 6 months after the initial surgery.

Results: Histological findings of the excised PVR membrane at the initial surgery demonstrated cholesterol clefts admixed with CD34-positive neovessels and CD3-positive T cell infiltration.

Conclusions: Anterior PVR may be caused by an advanced process consisting of neovascularization, lipid leakage from neovessels, and chronic inflammation.

Poster No.: EX1-252
Panel No.: 252

Clinical Use of Optical Density Ratio in Determining Prognosis of Central Serous Chorioretinopathy

First Author: Jae Yon WON

Purpose: To predict the prognosis of central serous chorioretinopathy (CSC) and to rationally select treatment modalities by calculating the optical density ratio (ODR) from subretinal fluid using optical coherence tomography, which is the most commonly used device for the diagnosis of CSC.

Methods: A retrospective cohort study was conducted based on 100 patients initially diagnosed as CSC from January 1, 2014, to March 31, 2015, at Seoul St. Mary's Hospital. Patients with coexisting ophthalmic pathology or secondary CSC were excluded from the study. ODR value and best corrected visual acuity (BCVA) at initial visit and 3-month follow-up were obtained. ODR was also calculated before and after treatment, if the patients were treated with photodynamic therapy, retinal photocoagulation, or intravitreal injection.

Results: Higher initial ODR value was significantly associated with chronification of CSC ($P < 0.05$) and lower BCVA ($P < 0.05$). Among typical CSC patients, ODR value significantly decreased after photodynamic therapy or retinal photocoagulation ($P < 0.05$) but

exhibited no significant change after intravitreal injection ($P = 0.897$). However, ODR value significantly decreased after intravitreal injection among patients with atypical CSC ($P < 0.05$).

Conclusions: A significant difference in ODR value obtained from initial OCT was found among patients with acute and chronified CSC. Therefore, initial ODR calculated on the day of diagnosis may be used to predict spontaneous resolution or chronification of CSC; furthermore, changes in ODR value after treatment may be helpful in treatment result assessment and in differential diagnosis of other retinal diseases with subretinal fluid accumulation.

Poster No.: EX1-253
Panel No.: 253

Comparison of Foveal-Sparing With Foveal-Involving Photodynamic Therapy for Myopic Choroidal Neovascularization

First Author: Colin TAN

Co-Author(s): Tock Han LIM

Purpose: To evaluate the visual outcomes of choroidal neovascularization (CNV) secondary to pathological myopia in eyes treated with photodynamic therapy (PDT) and to determine the effect of lesion location and foveal involvement on visual prognosis.

Methods: Interventional case series of 24 consecutive patients with myopic CNV treated with PDT. The main outcome measure was final logarithm of the minimum angle of resolution (logMAR) visual acuity (VA).

Results: Of 24 eyes, the CNV lesion was subfoveal in 11 and extrafoveal in 13. Overall, the mean logMAR VA at 24 months was 0.72. Extrafoveal CNV lesions achieved significantly better final VA compared to subfoveal CNV (logMAR 0.45 vs 1.05, $P = 0.012$). Eyes with extrafoveal CNV lesions were subdivided into foveal-sparing PDT (where the PDT laser spot did not involve the foveal center) and foveal-involved PDT (where the PDT laser covered the fovea). At all time points, the group with foveal-sparing PDT had significantly better VA compared with the foveal-involved group. The final logMAR VA for the foveal-sparing PDT group was 0.26 compared to 1.00 for foveal-involved PDT ($P = 0.003$). At 24 months, 77.8% of foveal-sparing PDT cases achieved VA of $\geq 20/40$, compared to 25% of foveal-involved PDT and 9.1% of subfoveal CNV lesions ($P = 0.006$).

Conclusions: For patients with myopic CNV, foveal-sparing PDT results in significantly better long-term visual outcomes compared to those with foveal-involved PDT. Foveal-sparing PDT may be of value for treatment of myopic CNV patients who are not suited for treatment with anti-vascular endothelial growth factor injections.

Poster No.: EX1-254
Panel No.: 254

Correlation Between Distortion of Outer Nuclear Layer and Metamorphopsia Before and After Epiretinal Membrane Surgery

First Author: Daiki SAKAI

Co-Author(s): Masashi FUJIHARA, Yasuhiko HIRAMI, Yasuo KURIMOTO, Seiji TAKAGI

Purpose: To evaluate preoperative anatomical changes in the outer nuclear layer (ONL) and to assess the correlation with retinal function during follow-up in patients with epiretinal membrane (ERM).

Methods: We conducted vitrectomy for 38 eyes of 37 patients with ERM (15 men; mean age, 71.7 ± 8.4 years). The distortion of outer nuclear layer (DONL) was defined as the angle between the lines perpendicular to the fovea and the ONL tips, using horizontal (H-DONL) and vertical (V-DONL) optical coherence tomography (OCT) images. Patients were divided into 2 groups based on the integrity of the inner segment ellipsoid in each OCT image: ISe(+) and ISe(-). Functional changes were evaluated in accordance with metamorphopsia charts (M-CHARTS) to determine the horizontal (MH) and vertical (MV) metamorphopsia scores and the best-corrected visual acuity (BVCA) at before vitrectomy, 3 months, and 12 months after vitrectomy.

Results: Mean H-DONL and V-DONL were 10.24 ± 11.84 and 7.46 ± 6.16 degrees, respectively. H-DONL was significantly correlated with preoperative MH score ($r = 0.378$, $P = 0.045$) and with the change in MH score 3 months after vitrectomy ($R = -0.354$, $P = 0.043$). However, there was no significant correlation between V-DONL and MV scores or between H-DONL and V-DONL before and after BVCA evaluation. Furthermore, H-DONL and V-DONL did not differ significantly between the ISe(+) and ISe(-) groups.

Conclusions: Our results suggest that a horizontal distortion in outer nuclear layer on OCT could be considered a prognostic parameter before surgery for ERM.

Poster No.: EX1-255
Panel No.: 255

Epiretinal Proliferation in Eyes With Full Thickness Macular Hole

First Author: Hiroyuki TAKAHASHI

Co-Author(s): Akito HIRAKATA, Kazunari HIROTA, Makoto INOUE, Yuji ITOH, Takashi KOTO

Purpose: Epiretinal proliferation (EP) has been described in eyes with lamellar macular hole (MH) and full thickness MH. The aim of this study was to

investigate the clinical characteristics of EP in MH eyes.

Methods: The consecutive 391 eyes of 385 patients who were diagnosed as full thickness MHs were studied, whereas eyes with previous vitrectomy, trauma, and other retinal diseases were excluded. The age, gender, axial length, MH stage, best-corrected visual acuity (BCVA), and presence of foveal morphological disorder were compared with eyes with or without EP. After pars plana vitrectomy with internal limiting membrane peeling and gas tamponade, the difference of MH closure rate, the presence of hyperreflective tissue at the inner layer of the closed MH, and visual acuity were analyzed between the 2 groups at postoperative 6 months.

Results: EP was detected in 32 eyes (8.2%) of MH eyes. The MH eyes with EP had longer axial lengths ($P = 0.001$) and more advanced stages ($P = 0.006$), but BCVA was not significant ($P = 0.09$). Eyes with EP were more frequently accompanied with epiretinal membrane ($P < 0.001$) and intraretinal splitting ($P < 0.001$). Of 314 surgically treated eyes, 310 eyes achieved MH closure with initial surgery, whereas 4 eyes without EP needed additional treatment. Hyperreflective tissue is more frequently present in eyes with EP and correlated with worse postoperative visual acuity ($P < 0.001$).

Conclusions: EP developed more frequently in MH eyes with advanced stages, epiretinal membrane, and myopic configurations. EP correlated with residual tissue at the closed MH and postoperative visual acuity.

Poster No.: EX1-256
Panel No.: 256

Estimation of Distance Between Retinal Break and Limbus With Wide-Field Fundus Imaging for Scleral Buckling

First Author: Keiichi ISHIKAWA

Co-Author(s): Eiichi HASEGAWA, Ri-Ichiro KOHNO, Shintaro NAKAO, Koh-Hei SONODA, Shigeo YOSHIDA

Purpose: Accurate scleral marking of retinal breaks is essential for successful scleral buckling. The aim of this study was to investigate if wide-field fundus images obtained with an Optos are useful to determine distance from the limbus to retinal breaks.

Methods: Retrospective review of 30 eyes in 27 patients with rhegmatogenous retinal detachment who received scleral buckling with anatomically successful repair. They underwent wide-field fundus photography with Optos. In the pre- or postoperative fundus images, we measured distances from the macula to retinal tears (TM), to the center of vortex veins (VM), to the optic disc (DM), and to the posterior edge of scleral buckle (BM).

Results: The values of BM minus VM to DM ratio were

significantly correlated with the distances from the limbus to the posterior edge of scleral buckle that were determined intraoperatively. We applied a regression line derived from the correlation with the value of TM minus VM to DM ratio in order to calculate estimated distances between retinal breaks and limbus. The calculated distances were all within the range of distances from the limbus to the anterior and posterior edge of scleral buckle.

Conclusions: This study suggests that wide-field fundus imaging is useful to estimate the distance from the limbus to retinal breaks so that surgeons can perform accurate scleral marking.

Poster No.: EX1-257
Panel No.: 257

Multilayered Internal Limiting Membrane: A Novel Technique for Closure of Large Macular Holes

First Author: Shravan MASURKAR
Co-Author(s): Guruprasad AYACHIT, Shrinivas JOSHI, Ulka PANKAR

Purpose: To evaluate the outcomes of large macular holes (MH) in multilayered inverted internal limiting membrane (ILM) flaps.

Methods: An interventional study of 32 eyes of 32 patients with large macular hole [$>400\ \mu\text{m}$ minimum linear diameter (MLD)] was conducted. All the eyes underwent 25G pars plana vitrectomy with induction of posterior vitreous detachment. ILM peeling was done in a multilayered fashion and ILM flaps were placed over the macular hole [intraoperative optical coherence tomography (OCT) guided]. C3F8 gas was injected after fluid-air exchange. Prone position was advised for 1 week and patients were followed up for a minimum of 3 months. Functional and anatomical outcomes were analyzed.

Results: In this study 32 eyes of 32 patients were included. Mean age was 54.43 years. A total of 90% had idiopathic macular hole and 10% had traumatic macular hole. Mean MLD was $800.03 \pm 316.36\ \mu\text{m}$, with the largest MLD being $2406\ \mu\text{m}$. The mean basal diameter was $1407.18 \pm 463.04\ \mu\text{m}$ and mean macular hole index (MHI) was 0.67 ± 1.00 . Mean logarithm of the minimum angle of resolution (logMAR) visual acuity improved from 1.27 ± 0.28 to 0.82 ± 0.30 . There was a significant improvement in best corrected visual acuity (BCVA). Out of 32 patients, 28 (88%) achieved type 1 macular hole closure. The remaining 4 eyes (12%) showed good visual outcome despite having type 2 closure of macular hole.

Conclusions: Multilayered inverted internal limiting membrane flap technique contributes to improved

anatomical and visual outcomes for closure of large macular hole. Compared to conventional inverted ILM flap technique multilayering provides a novel technique for type 1 macular hole closure and preserving the ILM without causing unexpected flap dislodgment during surgery.

Poster No.: EX1-258
Panel No.: 258

Outcome of 27-Gauge Microincision Vitrectomy Surgery for a Spectrum of Vitreoretinal Diseases

First Author: Muhammad Amer AWAN

Purpose: To report our experience, clinical outcome, and safety profile of 27-gauge 3-port pars plana vitrectomy (3PPV) in eyes with vitreoretinal disease.

Methods: Prospective, single-center, interventional study that included the eyes that underwent 27-gauge transconjunctival 3PPV for different vitreoretinal diseases. The ethics committee of the hospital approved this study. The patients who had significant cataract also had phacoemulsification cataract surgery at the same time. The outcome measures included change in visual acuity, intraoperative, and postoperative complications with minimum follow-up of 3 months.

Results: A total of 103 eyes had 27-gauge 3PPV in this prospective, single-center, interventional study. Mean logarithm of the minimum angle of resolution (logMAR) visual acuity improved from 1.02 ± 0.67 (20/210 Snellen equivalent) preoperatively to 0.50 ± 0.61 (20/63 Snellen equivalent) postoperatively ($P < 0.001$). Mean follow-up was 125 days (median, 113 days; range, 90–244 days). No cases of postoperative endophthalmitis, sclerotomy-related retinal tears, or choroidal detachments were encountered in the follow-up period.

Conclusions: The 27-gauge 3PPV was well tolerated and safe with low rates of intraoperative and postoperative complications across varied surgical indications.

Poster No.: EX1-259
Panel No.: 259

Primary Core Vitrectomy Technique Before Cataract Surgery in Combined Phaco-Vitrectomy for Eyes With Dense Vitreous Hemorrhage

First Author: Jungyeul KIM

Purpose: To investigate efficacy and safety of primary core vitrectomy technique in combined phaco-vitrectomy in eyes showing poor red reflex due to dense vitreous hemorrhage before cataract surgery.

Methods: A total of 156 eyes from 156 patients, who underwent combined phaco-vitreotomy because of cataract and dense vitreous hemorrhage, were included. Subjects were divided into a primary phacoemulsification group (group A, 80 eyes) who underwent phacoemulsification first and a primary vitrectomy group (group B, 76 eyes) who underwent core vitrectomy first and cataract surgery followed. Conventional 23-gauge combined phaco-vitreotomy was performed in all patients. We evaluated operation time, including total continuous curvilinear capsulorhexis (CCC) time and total cataract surgery time, and the incidence of surgery-related complication in the 2 groups.

Results: Diabetic retinopathy was the most common cause for vitreous hemorrhage in both groups (group A: 51 eyes, B: 39 eyes). Total CCC time ($P = 0.001$) and total cataract surgery time ($P = 0.036$) were significantly shorter in group B than in group A. Among the complications, radial tear occurred more frequently in group A than group B, but these differences were not statistically significant ($P = 0.211$). Pupil size reduction during cataract surgery was more observed in group B than in group A ($P = 0.034$). There was no significant difference in posterior capsular rupture and posterior capsular opacity between the 2 groups.

Conclusions: The primary core vitrectomy in combined phaco-vitreotomy of patients who have dense vitreous hemorrhage helps to gain good red reflex; therefore, it enables the surgeon to perform successful cataract surgery.

Poster No.: EX1-260

Panel No.: 260

Silicone Oil Endotamponade Is Associated With Accelerated Retinal Thinning After ILM Peeling in Proliferative Diabetic Retinopathy

First Author: Rina NAMBA

Co-Author(s): Hiroki KANEKO, Toshiyuki MATSUURA, Hideyuki SHIMIZU, Hiroko TERASAKI

Purpose: To evaluate the change in retinal thickness after vitrectomy with internal limiting membrane (ILM) peeling and/or silicone oil (SO) endotamponade in proliferative diabetic retinopathy (PDR).

Methods: We retrospectively studied 87 eyes of 87 patients who underwent vitrectomy surgeries for severe PDR from January 2010 to September 2015. The actual amount and ratio of changes in the retinal thickness were calculated.

Results: Compared with eyes in ILM-peeling(-)/SO(-), the central, superior inner, and temporal inner retina in ILM-peeling(+)/SO(-); the central and superior inner retina in ILM-peeling(-)/SO(+); and the central, inferior

inner, temporal inner, and nasal inner retina in ILM-peeling(+)/SO(+) showed significant reduction of the retinal thickness, and the central, superior inner, and temporal inner retina in ILM-peeling(+)/SO(-); the central and superior inner retina in ILM-peeling(-)/SO(+); and the central, superior inner, inferior inner, and temporal inner retina in ILM-peeling(+)/SO(+) showed significant increased reduction rate of the retinal thickness.

Conclusions: Macular retinal thinning in PDR was observed after ILM peeling and SO endotamponade, and it was increased by the combination of these 2 factors.

Poster No.: EX1-261

Panel No.: 261

The Outcome of Surgical Management for Giant Retinal Tear

First Author: Dang Tran DAT

Purpose: 1) To evaluate the surgical outcomes of management for giant retinal tear (GRT) detachment at Vietnam National Institute of Ophthalmology (VNIO) from 2014 to 2016. 2) To identify the factors for surgical outcomes associated with giant retinal tear detachment management.

Methods: This was a cross-sectional study. Twenty-three eyes of 23 patients underwent pars plana vitrectomy with assistance of endoscopy, perfluorocarbon liquid and silicone oil or gas exchange, and retinopexy. Three eyes of 3 patients were operated in combination with scleral buckle.

Results: Complete anatomical success was achieved in 26 (100%) eyes at the time of research. Improvement of best corrected visual acuity was achieved in 24 (92.30%) eyes, did not change in 1 (3.85%) eye, and worsened in 1 (3.85%) eye. Preoperative best corrected visual acuity was 2.30 ± 0.82 (logarithm of the minimum angle of resolution, logMAR) and increased to 1.22 ± 0.35 at the last follow-up. Factors significantly associated with anatomical outcomes after management of giant retinal tears are patient age and time to diagnosis. Factors associated with visual outcomes included patient age, time to diagnosis, macular detachment, and later complication of the surgery.

Conclusions: GRTs are an emergency condition in ophthalmology. The majority of patients underwent pars plana vitrectomy, perfluorocarbon liquid use, and silicone oil tamponade. Endoscopy is very useful in surgical management for GRT. The results achieved high rates of anatomical success but visual outcomes were variable.

Poster No.: EX1-262

Panel No.: 262

Using the Mixture of Trypan Blue 0.08% and Glucose 10% 1:1 for Staining the Internal Limiting Membrane in Macular Hole Surgery

First Author: Chau NGUYEN

Purpose: To report on the use of the mixture of Trypan blue 0.08% and glucose 10% for staining the internal limiting membrane (ILM) during vitrectomy.

Methods: A total of 27 consecutive patients with macular hole of stage 2, 3, and 4 with different etiologies were recruited for vitrectomy and ILM peel in the retinal department of Vietnam National Institute of Ophthalmology (VNIO) during the period from January 2015 to September 2015. ILM peeling was done with the mixture of Trypan blue 0.08% and glucose 10% 1:1 assisted. The results were evaluated based on the ability of internal limiting membrane staining and the possibility of totally peeling the membrane during the surgery. Postoperatively, the results were evaluated based on anatomical and functional outcomes.

Results: There was a total of 88.9% coverage with ILM staining; 99.3% of eyes had total ILM peeling during the surgery. Three months postoperatively, 85.2% of eyes had total macular hole closure, and 14.8% of eyes had partial macular hole closure. All of the eyes had improvement in visual acuity, and 66.7% of eyes had visual acuity improvement of more than 2 lines on Snellen chart.

Conclusions: The mixture of Trypan blue 0.08% and glucose 10% 1:1 provided mediocre but adequate staining of internal limiting membrane for macular hole surgery.

Poster No.: EX1-263

Panel No.: 263

Vitrectomy With Inner Limiting Membrane Repositioning and Autologous Blood Clot Technique for Macular Hole Retinal Detachment in Highly Myopic Eyes

First Author: Masashi KAKINOKI

Co-Author(s): Sachi NISHINO, Masahito OHJI, Mihoko OSADA, Osamu SAWADA

Purpose: Macular hole retinal detachment in highly myopic eyes is a severe vision threatening disease. Various kinds of treatments have been performed; however, macular hole closure rate and retinal reattachment rate were worse than that in idiopathic macular hole and in regular rhegmatogenous retinal detachment. We evaluated the efficacy of vitrectomy combined with inverted inner limiting membrane repositioning (ILMR) and autologous blood clot (ABC)

for macular hole retinal detachment (MHRD) in highly myopic eyes, which was developed by Dr. Lai (Lai CC, 2016 Ophthalmology).

Methods: Five cases of MHRD in highly myopic eyes that underwent vitrectomy combined with ILMR, ABC, and gas tamponade were reviewed.

Results: After the first surgery, macular hole was closed in 4 cases while macular hole was closed after the second surgery in the other eye. The retina was reattached in 3 cases after the first surgery. The retina was not reattached in the other 2 eyes after the first surgery because of failure of macular hole closure in 1 eye and another retinal break that developed in the posterior pole in the other eye. Macular hole was closed and the retina reattached after the second ILMR and ABC. The retina reattached after the second vitrectomy combined with scleral shortening.

Conclusions: Vitrectomy with ILMR combined with ABC and gas tamponade would be an effective treatment for MHRD in highly myopic eyes.

Translational Research in Ophthalmology

Poster No.: EX1-264

Panel No.: 264

Doxycycline-Terminable Intraocular Drug Delivery Cell-Encapsulating Device

First Author: Kin TSANG

Co-Author(s): Barbara CHAN, Amy LO, Francisca WONG, KM YAO

Purpose: A cell-encapsulating device provides a platform for localized and sustained delivery of freshly made therapeutics to the retina. We have previously developed an intravitreally injectable device, composed of collagen-alginate hydrogel and glial cell-derived neurotrophic factor (GDNF) secreting-cells that carried a Tet-On controlled termination mechanism, which showed photoreceptor rescue in rats with inherited retinal degeneration. Here, we further tested the device termination efficiency in vivo after 72 hours of doxycycline (Dox) administration.

Methods: The cell-encapsulating device was intravitreally injected into healthy Royal College of Surgeons (RCS) rats at postnatal day 28. At postimplantation day 5, drinking water, with or without 1 mg/ml Dox, was administered to the animals for 72 hours. Rats were sacrificed at day 8 and day 28 postimplantation. The device was retrieved and examined with phase contrast microscopy. Dox-induced cell death in these devices was studied by MTS cell viability assay and Live/Dead assay. Retinal cytoarchitecture of these animals was assessed by hematoxylin and eosin (H&E) staining.

Results: While healthy cell colonies were observed in non-Dox-treated cell-encapsulating devices under phase contrast microscopy, only cell debris was present in Dox-treated devices at both times of retrieval. For the nontreated group, MTS assay and Live/Dead assay showed that most of the encapsulated cells remained viable at day 28. As for the Dox-treated group, no viable cell was detected at both time points. H&E staining revealed a similar retinal cytoarchitectural in all treatment groups and duration of device implantation.

Conclusions: We have successfully established a Dox-terminable intraocular drug delivery cell-encapsulating device with good biocompatibility and stability.

Visual Sciences

Poster No.: EX1-265
Panel No.: 265

A Spatiotemporal Requirement of Prickle 1-Executed PCP Signaling for Eyelid Morphogenesis and Homeostasis

First Author: Dianlei GUO

Purpose: Tissue closure/fusion is a fundamental process during organogenesis, driven in part by the Wnt/planar cell polarity (Wnt/PCP) pathway. This study explored the spatial and temporal aspects of PCP signaling in eyelid development through analysis of mice lacking Prickle 1, a core PCP component, and the Prickle 1-dependent signaling networks underlying eyelid development.

Methods: Wild type and Prickle 1 compound mutant mice with a hypomorphic and a null allele were bred and used to study eyelid morphogenesis. The time course of embryonic eyelid fusion and postnatal reopening was examined by light microscopy of tissue sections and scanning electron microscopy. Immunohistochemistry was conducted to monitor cell proliferation, death, and molecular identities through pre- and postnatal eyelid development.

Results: Prickle 1 mutant embryos exhibited profound delay in eyelid closure at embryonic ages but manifested precocious eyelid reopening postnatally, with ensuing corneal dysplasia. Mutant embryonic eyelid had reduced actin cable intensity with downregulation of phosphorylated c-Jun and upregulation of increased b-catenin in separate cell populations of the eyelid front area. Increased cell death was observed in postnatal mutant eyelid junction prior to eyelid reopening. While broadly expressed in many tissues, Prickle 1 was spatially restricted to the eyelid front at E15.5, a location that c-Jun and b-catenin were altered in Prickle 1 mutants.

Conclusions: The study suggests a spatiotemporal

requirement of Prickle 1-executed PCP signaling for eyelid morphogenesis and homeostasis through cross-talking with existing networks including Wnt/b-catenin and JNK/c-Jun signaling pathways. The study further provides a useful animal model for studying congenital ocular surface diseases.

Poster No.: EX1-266
Panel No.: 266

Conversion of Mouse Embryonic Fibroblasts Into RPE-Like Cells by Small Molecule Cocktails

First Author: Kai-Wen HE

Co-Author(s): Yu-Chen CHEN, Zi-Bing JIN, Shao-Hui PAN

Purpose: Retinal pigment epithelium (RPE) replacement therapy has recently been considered as a promising treatment to supplant lost or defective host RPE cells involved in retinal degenerative diseases. To obtain an optimized source of RPE, we sought to develop a method to directly transdifferentiate mouse embryonic fibroblast (MEF) cells to RPE-like cells chemically.

Methods: MEF cells were first induced stepwisely by a cocktail of small molecule compounds for 16 days, next cultivated in RPE differentiation medium with the mixture of 3 compounds for 7 days, and the resulting were cultivated in RPE mature medium for a terminal RPE-like state. The specificity of RPE cell-related gene expression was qualitatively described by immunofluorescence staining and quantitatively analyzed by real-time polymerase chain reaction (RT-PCR).

Results: Epithelial colonies from MEF cells showed morphologic changes, and epithelial colonies formed with the first induction of a combination of 5 compounds for 16 days. With the committed induction of a combination of 3 compounds for 7 days, the RPE-like cells produced a typical cobblestone appearance and hexagonal shape. In maturing medium with further cultivation, cells produced pigmentation gradually, resembling RPE cells in their development. Representative markers ZO-1, Mitf, and PAX6 were expressed in these RPE-like cells. Several RPE-related genes (ZO-1, Mitf, TYR, Pax6, Bestrophin) were upregulated in this chemically inducing process.

Conclusions: We derived a method for stepwise conversion of mouse embryonic fibroblasts into RPE-like cells by a cocktail of small molecules, providing a prospect for a novel approach of obtaining a nonimmunogenic source of RPE cells for regenerative therapy.

Poster No.: EX1-267
Panel No.: 267

Differentiation of NSCs Under Exogenous Electrical Stimulation on Carbon Nanotube Multilayers

First Author: Liumin HE

Co-Author(s): CK CHIU, Tam Ka LONG, CY TSUI, Rong ZHU

Purpose: In modern neuroscience, exogenous electrical stimulation has been documented to potentially promote nerve regeneration; the mechanism, however, is not fully understood and thus remains to be elucidated.

Methods: In this study, we fabricated carbon nanotube multilayered nanocomposites by layer-by-layer assembly of negatively charged carbon nanotubes (CNTs) with positively charged polymer. Neural stem cells were cultured on the multilayers with exogenous electrical stimulation. The differentiation of NSC, neurite outgrowth, and electrophysiological functions were investigated.

Results: Our results showed that electrical stimulation could enhance neurite extension of NSC-derived neurons when cultured on the CNT multilayers. The presentation of electrical stimulation resulted in an almost 2-fold increase in neurite outgrowth relative to the control. We further observed the neurons cultured on CNT multilayers showed morphological diversity after electrical stimulation, and the intercellular relationship seemed to be increased.

Conclusions: Multilayer carbon nanotubes combined with exogenous electrical stimulation could promote the growth and differentiation of neural stem cells in vitro and holds great potential in the development of in vivo nerve regeneration.

Poster No.: EX1-268
Panel No.: 268

Direct Transdifferentiation of Mouse Corneal Endothelial Cells by Chemical Cocktails

First Author: Shao-Hui PAN

Co-Author(s): Kai-Wen HE, Zi-Bing JIN

Purpose: Corneal endothelial dystrophy is age related and a major cause of blindness. The aim of this study was to generate corneal endothelial cells (CECs) from mouse fibroblasts under defined chemical cocktail culture conditions.

Methods: Corneal endothelial cell induction was driven by chemical cocktail culture conditions. In the induction process, mouse fibroblasts were reprogrammed to neural crest stem cells (NCSCs) and became periorbital mesenchymal precursors (POMPs). Then, CECs were

derived from POMPs by suppressing TGF- β and ROCK signaling.

Results: After 16 days of induction under chemically defined conditions, the majority of cells expressed the neural crest markers p75-NTR, HNK-1, and AP-2 α . The NCSCs could be propagated. Subsequently, spindle-like POMPs were induced from adherent NCSCs in the presence of chemicals. During 6 weeks of induction, monolayer CEC-like cells became visible. The CEC-like cells expressed CEC markers, such as N-Cadherin, ZO-1, Na⁺/K⁺ ATPase, and AQP1.

Conclusions: Our study demonstrates a novel chemical approach of conversion of fibroblasts to CECs without introducing exogenous factors.

Poster No.: EX1-269
Panel No.: 269

Effect of Indocyanine Green on Tight Junction Structural Proteins in Human Retinal Pigment Epithelium ARPE-19 Cells

First Author: Yo-Chen CHANG

Co-Author(s): Kuo-Jen CHANG, Ying-Hsien KAO, Wen-Chuan WU

Purpose: It is generally believed that diabetic macular edema is a microvascular disease, but there is more evidence that retinal pigment epithelium close to the functional abnormalities can also cause the development of this disease. The close connection of the epithelium is composed of many specific proteins, including occluding and zonula occludens (such as ZO-1, ZO-2). This study aimed to investigate the effect of indocyanine green (ICG) on the growth of human retinal pigment epithelial ARPE-19 cells in a high glucose environment and to observe the effect of ICG on cell growth and tight junction (TJ) regulation of structural protein expression.

Methods: Human retinal pigment epithelium ARPE-19 cell line was used. The cells were cultured in low glucose (low glucose; LG; containing 5.5 mM D-glucose) and high glucose (high glucose; HG; containing 25 mM D-glucose) and then treated with ICG. The treated ARPE-19 cells were used for cell proliferation assay, Western blot, and immunofluorescence staining.

Results: Western blotting confirmed that ICG inhibited the normal distribution of ZO-1, ZO-2, and occludin proteins in ARPE-19 cells. Fluorescence immunostaining results showed that ICG reduced the distribution of ZO-1 protein on the cell membrane.

Conclusions: ICG significantly inhibited the cell viability of ARPE-19 cells and even inhibited the expression of ZO-1, ZO-2, and occludin protein in ARPE-19 cells in a high glucose environment and reduced the activity of ZO-1 protein cell membrane distribution. These

results suggest that the application of ICG in the retina of diabetic patients may worsen the integrity of the retina.

Poster No.: EX1-270

Panel No.: 270

Genetic Investigation of Intraocular Pressure in Children

First Author: Shiyao LU

Co-Author(s): Li Jia CHEN, Calvin PANG, Shumin TANG, Jason YAM

Purpose: Intraocular pressure (IOP) is an endophenotype for glaucoma. Its elevation increases risk of glaucoma development and progression. Previous genome-wide association studies (GWAS) have identified genetic variants associated with the variance of IOP in adults. In this study, we evaluate the correlation between reported IOP-related single nucleotide polymorphisms (SNPs) and IOP in children, with a view to assess the similarities and differences in the IOP genetic profiles between children and adults.

Methods: This study involved 1073 children from the Hong Kong Children Eye Study. Ten GWAS SNPs of IOP were genotyped in all subjects by using TaqMan real-time polymerase chain reaction (PCR) assays. Linear regression was utilized to fit an allelic model for IOP, adjusted for age, gender, and central corneal thickness.

Results: Only one SNP, rs9913911 in GAS7 (allele G: $\beta = -0.191$, $P = 0.039$), showed a marginally significant correlation with IOP level, and it had the same trend of effect to that reported in the previous GWAS (allele G: $\beta = -0.179$). Other SNPs did not show significant correlation, but 4 SNPs (rs2472493, rs59072263, rs2286885, and rs58073046) showed the same trends with those reported in GWAS.

Conclusions: Our study reveals different genetic patterns of IOP between children and adults, suggesting that some genes may exert their effects on IOP later in life. Ongoing studies will involve both children and adults for a direct comparison.

Poster No.: EX1-271

Panel No.: 271

Growth Hormone-Releasing Hormone in Retinal Progenitor Cell Differentiation

First Author: Tsz-Kin NG

Co-Author(s): Sun On CHAN, Chi Pui PANG, Chi Chiu WANG, Jasmine YUNG

Purpose: Precise retinal cell maturation requires specific signaling pathways to guide retinal progenitor cell differentiation. We previously demonstrated that growth hormone-releasing hormone (GHRH)

is expressed in the retina and participates in retinal disease development. This study aimed to delineate the role of GHRH in retinal development and retinal progenitor cell differentiation.

Methods: Retinal GHRH receptor expression was determined by immunofluorescence analysis on embryonic day (E) 14 to postnatal day (PN) 6 in retinas of Sprague-Dawley rats. Retinal progenitor cells from E18 and PN1 rat retinas were isolated, purified, and cultured on the nonadherent culture dishes for 3 days, followed by the treatment of retinal differentiation medium with or without the addition of GHRH. Retinal cell specification was evaluated by immunofluorescence analysis of specific retinal cell markers [Brn3b for retinal ganglion cells (RGCs), rhodopsin for photoreceptors, and S100 for Müller glia].

Results: The expression of GHRH receptor was not observed in E14 retina until E18 in the retinal progenitor cell and RGC layer, which was indicated by the immunofluorescence signal of retinal progenitor marker Pax6. GHRH receptor signal persisted to E21 and PN6 and was confined in the RGC layer, suggesting its involvement in RGC specification. Increased Brn3b-expressing cells were found in retinal progenitor cell differentiation treatment with GHRH by 3-fold for E18 and 5-fold for PN1 ($P < 0.001$).

Conclusions: GHRH receptor expresses in retinal progenitor cells and the RGC layer during retinal development, and GHRH promotes the specification of retinal progenitor cells towards retinal ganglion cell lineage.

Poster No.: EX1-272

Panel No.: 272

Improving Differentiation Efficiency of Photoreceptor Production in 3-Dimensional Retinal Organoids From Human Pluripotent Stem Cells

First Author: Xi-Xi XIA

Co-Author(s): Mei-Ling GAO, Zi-Bing JIN, Hui LIU, Deng PAN, Shao-Hui PAN

Purpose: Photoreceptor transplantation is the most promising way to remedy blindness. Despite the great efforts made in generation of photoreceptor cells from human stem cells, limited efficiency is a bottleneck for therapeutic purposes. We attempted to improve the differentiation efficiency of human photoreceptor cells in 3-dimensional (3D) retinal organoids from pluripotent stem cells (PSCs).

Methods: A tdTomato fluorescent reporter line was generated to trace CRX expression in human embryonic stem cells (ESCs), since CRX indicates photoreceptor

precursors and mature photoreceptor cells. Flow cytometry and immunofluorescence were used to characterize the cell lines at different developmental stages. On this basis, a maternal BMP, TGF β , and Wnt inhibitor COCO (DAND5) was employed in 3D retinal organoid differentiation systems for further photoreceptor production. The efficacy of COCO on photoreceptor generation was estimated by quantitative polymerase chain reaction (qPCR), flow cytometry, and immunofluorescence.

Results: Successful generation of CRX-tdTomato human ESC line was validated by genotyping on PSC stages. OTX2, a key transcription factor necessary for photoreceptor development, was upregulated more than 1.4-fold in COCO-treated 3D organoids at day 35. Compared to the control group, COCO-treated organoids appeared with obvious fluorescence enhancement at day 45, indicating more CRX expression in the signaling pathway modulation. Higher level of S-opsin appeared at day 60 in the COCO-treated group, suggesting an improvement of S-cone in these retinal organoids.

Conclusions: COCO improves the efficiency of developing photoreceptors in 3D retinal organoid differentiation from human pluripotent stem cells. This approach provides a new photoreceptor cell enrichment prospect for intensive demands, including future photoreceptor transplantation therapy.

Poster No.: EX1-273

Panel No.: 273

Riboflavin and Ultraviolet A Irradiation for the Prevention of Progressive Myopia in a Guinea Pig Model

First Author: Miaoqin **WU**

Co-Author(s): Jinjing **HE**, Xiaoxia **LI**, Hui **LIU**, Lan **ZHANG**, Luyi **ZHANG**

Purpose: In this study, we evaluated the effect of oral administration of riboflavin combined with whole-body ultraviolet A (UVA) irradiation on the biochemical and biomechanical properties of sclera in a guinea pig model to control the progression of myopia.

Methods: Experimental groups were administered 0.1% riboflavin solution with or without vitamin C by gavage from 3 days before myopic modeling and during the modeling process. Guinea pigs underwent 30 minutes of whole-body UVA irradiation after each gavage for 2 weeks. For control groups, guinea pigs were administered vitamin C and underwent either whole-body UVA irradiation without 0.1% riboflavin solution or whole-body fluorescent lamp irradiation with or without 0.1% riboflavin solution.

Results: Myopia models were established with an

increased axial length and myopic diopter. Compared with myopic eyes in the control groups, the net increase in axial length, diopter, and strain assessment decreased significantly, and the net decrease in scleral thickness, ultimate load, and stress assessment decreased significantly in experimental groups. MMP-2 expression showed a lower net increase, while TIMP-2 expression showed a lower net decrease. In addition, hyperplasia of scleral fibroblasts was more active in myopic eyes of experimental groups.

Conclusions: Our results showed that oral administration of riboflavin with whole-body UVA irradiation could increase the strength and stiffness of sclera by altering the biochemical and biomechanical properties, and decreases in axial elongation and myopic diopter are greater in the guinea pig myopic model.

Academia, Research, Teaching & Education in Ophthalmology

Innovative Peer-Learning Activity for Neuroanatomy in Cambodia

First Author: Namgech **KHOEM**

Purpose: This study aims to evaluate the efficacy and effectiveness of this innovative peer-learning activity and explore students' perceptions towards this approach.

Methods: To measure the efficacy of this method we assessed neuroanatomy knowledge in a multiple choice question (MCQ) style pre- and posttest. Students' perceptions were gauged using a qualitative analysis by focus group interviews in association with selected questionnaires. We used interactive activity stations, around which students rotated in small groups to learn through labelling exercises, 3D visual aids, and clinically relevant cases. We present data on student perception using a survey, and efficiency of learning using a paper-based assessment, of the innovative peer-learning activity in undergraduate medical students.

Results: All 143 students completed a 72-point MCQ assessment. The overall average pretest score was 40 (56%), which improved to a posttest score of 59 (82%), the difference being statistically significant ($P < 0.001$). Over 92% (134/145) of students found this innovative peer-learning activity enjoyable, and they prefer this way of learning neuroanatomy.

Conclusions: In this innovative peer-learning activity, neuroanatomy is learned in an effective, enjoyable, and clinically relevant way, and this supports self- and peer-learning. We plan to incorporate this into the undergraduate medical curriculum. We believe that this innovative peer-learning activity can transform the way students learn anatomy from a traditional, passive, and teacher-centered way to an active, student-centered, and clinically relevant approach. This can be applied to a range of subjects and educational settings, especially in ophthalmology in Cambodia.

Resident and Young Physician Experience With Complex Cataract Surgery and Exposure to New Cataract and Refractive Technology in India

First Author: Tarun **ARORA**
Co-Author(s): Supriya **ARORA**

Purpose: To study the current level of training of residents and young physicians of India in managing difficult cataract surgical case scenarios, implanting premium intraocular lenses (IOLs), and experience with laser cataract and refractive surgery.

Methods: An anonymous survey was conducted from June 30 to July 30, 2017 for residents and young physicians trained in India. The online survey responses were downloaded and analyzed using Excel software. Descriptive statistics were performed on the data.

Results: One hundred six respondents from India identified themselves as physicians in training or young physicians with 5 or fewer years of experience. Of these, 60 (56.6%) were women. Seventy-two (67.9%) identified themselves as residents in training and 34 (32.1%) were within the first 5 years of practice. Forty-four (41.5%) respondents had performed more than 10 cases of limbal relaxing incisions and felt adequately confident. Twenty-one respondents (19.8 %) had implanted multifocal IOLs and 92 (86.8%) respondents felt inadequately confident in implanting premium IOLs. Eleven (10.4%) respondents felt confident in tackling complex cataract surgical case scenarios, while 10 (9.4%) respondents felt adequate confidence in laser cataract and refractive surgery.

Conclusions: The results of the survey showed that residents and young physicians felt inadequate confidence in the training provided to them in managing complex cataract surgical scenarios. Most respondents had inadequate confidence in laser cataract and refractive surgical skills.

Cataract

1-Year Clinical Outcomes With a New Design of Posterior Chamber Capsular Fixation Intraocular Lens

First Author: Sheetal **BRAR**
Co-Author(s): Sri **GANESH**

Purpose: To study the long-term outcomes with a new design of posterior chamber capsular fixation intraocular lens (IOL).

Methods: Twenty-five eyes from 25 patients with a mean age of 65 years underwent implantation with the new IOL design after routine phacoemulsification in 14 eyes and femtolaser-assisted cataract surgery in 6 eyes. The IOL is a hydrophilic, acrylic, foldable IOL with 2 extra polymethylmethacrylate (PMMA) haptics at the 3 and 9 o'clock positions, which can swivel over a pivot. After implantation into the bag, the swivel haptics were captured onto the anterior capsulotomy. The mean follow-up was 6 months \pm 12 days.

Results: The mean power of the IOLs implanted was $+21.0 \pm 0.7$ diopters (D). The preoperative mean spherical equivalent (SE) was -2.27 ± 0.9 D, which reduced to -1.22 ± 0.6 D at 6 months. The mean anterior chamber depth (ACD) measurements with IOL Master 700 were 4.33 ± 0.33 mm, 4.24 ± 0.19 mm,

and 4.27 ± 0.63 mm at day 1, 2 weeks, and 6 months postoperatively ($P > 0.05$). The rotational stability of the lens was evaluated with serial clinical photographs until 6 months postoperatively, and all IOLs were found to be stable with no change in the position of swivel haptics. Two eyes showed minimal posterior capsule opacification (PCO) at 6 months.

Conclusions: The new capsular fixation IOL was safe and easy to implant and appeared to maintain a stable position inside the eye, potentially ensuring a stable effective lens position. Other potential advantages may be its simple design, easy loading and insertion, no or minimal dysphotopsia, good stability on toric and multifocal platform, and easy explantation if required.

A Comparison of 3 Different Corneal Marking Methods Used to Determine Cyclotorsion in the Horizontal Meridian

First Author: Ya-Jung **CHUANG**

Co-Author(s): Hung-Yuan **LIN**, Pi-Jung **LIN**

Purpose: This retrospective, comparative case series aimed to analyze the rotational deviation, or cyclotorsion, of 3 corneal marking methods: VERION digital marker (VDM; reference), horizontal slit beam marking (HSBM), and subjective direct visual marking (SDVM) on the table (using a bevel knife tip).

Methods: Subjects included 81 eyes of 61 patients undergoing scheduled cataract surgery. A preoperative reference image was taken of each eye. Subsequently, a slit lamp with the light beam turned to the horizontal meridian was used to align the seated patient's head, and 2 reference marks were placed at the 3- and 9-o'clock positions (HSBM). Upon transfer to the surgical table, the VDM was used to display a real-time dial scale on the patient's eye, with the entrance of the temporal clear corneal incision (CCI) at 0 degrees (horizontal meridian). Simultaneously, a bevel knife tip was used to create a marker based on the surgeon's visual determination of the temporal 0-degree point (SDVM).

Results: We used the VDM to quantitatively evaluate the accuracy of axis alignment via deviation from the horizontal reference meridian. Compared with the reference meridian, the SDVM (-3.46 ± 7.32 degrees; range, -18 to 13 degrees) exhibited greater average relative cyclotorsion versus the HSBM (0.41 ± 4.92 degrees; range, -10 to 10 degrees). Furthermore, the mean average misalignment was significantly less in the HSBM group versus the SDVM group ($t = 4.179$, $P < 0.001$).

Conclusions: The VDM is likely a reliable marking method, similar to the HSBM. VDM usage may prevent inaccurate preoperative manual marking during toric intraocular lens (IOL) implantation.

Cholesterolosis Bulbi of the Anterior Chamber With Hypermature Cataract: Case Report

First Author: Ming-Hsuan **CHIANG**

Co-Author(s): Chien-Liang **WU**

Purpose: Cholesterol crystals in the anterior chamber are a rare and interesting finding. We report a case of cholesterolosis bulbi of the anterior chamber with hypermature cataract.

Methods: Case report.

Results: A woman aged 61 years old who had an underlying history of epilepsy presented with a history of redness and pain in the right eye for 3 months. According to the medical records, visual acuity of the affected right eye was no light perception since 10 years prior. Intraocular pressure (IOP) was 37 mm Hg, indicating secondary glaucoma. Slit lamp biomicroscopy examination revealed conjunctival hyperemia, hypermature cataract, and dynamic sparkling crystals in the anterior chamber. Phacoemulsification and posterior chamber intraocular lens implantation was performed smoothly. Vision remained no light perception and IOP improved (18 mm Hg) after cataract surgery. She was advised to have regular follow-up and had stable IOP control.

Conclusions: Anterior chamber cholesterolosis with hypermature cataract could cause secondary glaucoma. In chronic diseased eyes, the visual prognosis is poor despite performing a successful cataract surgery. The intraocular pressure was finally under control after the surgery.

Comparison of Continuous Linear and Multiburst Linear Modes Used in Phacoemulsification Surgery

First Author: Nina **HANDAYANI**

Purpose: To compare different ultrasound modes used (continuous linear vs multiburst linear) in phacoemulsification surgery in terms of their phacoemulsification time (PT), cumulative dissipated energy (CDE), and fluid usage.

Methods: A total of 80 patients with similar stage of cataract diagnosis who underwent phacoemulsification surgery in Malang Eye Center between May 2017 and July 2017 were included in the study and were prospectively analyzed. All cases received phacoemulsification by 1 surgeon and were randomly assigned into 2 groups based on the phacoemulsification mode used (continuous linear and multiburst linear). The phaco machine used was Centurion (Alcon). The PT, CDE, and fluid usage were recorded and compared between the 2 groups.

Results: The mean PT in group II (multiburst linear

group) was shorter than group I (continuous linear group) (8.20 ± 13.11 vs 21.12 ± 19.33) which was statistically significant ($P = 0.00$). The mean CDE in group II was lower than group I (6.02 ± 4.05 vs 9.22 ± 3.94) which was statistically significant ($P = 0.00$). The fluid usage in group II was higher than group I (61.85 ± 15.77 vs 57.87 ± 15.15) but was not statistically significant ($P = 0.251$).

Conclusions: The multiburst linear mode in phacoemulsification shows shorter PT and lower CDE compared with the continuous linear mode. The use of multiburst linear mode phaco power has significant benefits including minimal trauma and achieving early rehabilitation. It is also safe to use this mode for the beginner phaco surgeons.

Comparison of Efficacy and Safety of Difluprednate 0.05% and Nepafenac 0.1% in Reducing Macular Thickness and Volume After Cataract Surgery

First Author: Prateep **PHADIKAR**

Co-Author(s): Ankita

Purpose: To evaluate and compare efficacy and safety of topical difluprednate ophthalmic emulsion 0.05% with nepafenac ophthalmic suspension 0.1% in patients undergoing uneventful cataract surgery with respect to postoperative macular thickness and volume.

Methods: Phacoemulsification was done by a single surgeon in 206 patients (group N = 106, group D = 100). Group N were given topical treatment with nepafenac ophthalmic suspension 0.1% 3 times per day (TID) starting 24 hours before surgery and continued postoperatively for 4 weeks. Group D were given difluprednate ophthalmic emulsion 0.05% 4 times per day (QID) post surgery for 2 weeks followed by 2 times per day (BID) for 2 weeks. Postoperative assessment of patients were done on the first day and on the first, eighth, and 12th weeks for best corrected visual acuity (BCVA) by logarithm of the minimum angle of resolution (logMAR) scale, intraocular pressure (IOP) by applanation tonometry, and macular thickness and volume by spectral domain optical coherence tomography (SD-OCT).

Results: There was an increase in the measured mean central subfield thickness (CST) at 8 and 12 weeks as compared to 1 week in both the study groups ($P < 0.05$). On comparing the volume (in mm^3) and average thickness (in μm) at 1 week, it was observed that the thickness of group N ($266.82 \pm 25.06 \mu\text{m}$) was statistically higher than that of group D ($253.14 \pm 22.21 \mu\text{m}$) ($P = 0.03$). The comparison of BCVA (logMAR) and IOP recordings showed no difference between patients in the 2 studied groups recorded at 1 week, 8 weeks, and 12 weeks.

Conclusions: Both nepafenac ophthalmic suspension 0.1% and difluprednate ophthalmic emulsion 0.05% are equally effective in controlling change of macular thickness after uneventful cataract surgery.

Corneal Astigmatism and Refractive Outcome After Combined Femtosecond Laser-Assisted Phacoemulsification and Intrastromal Arcuate Keratotomy: 2-Year Results

First Author: Hungwon **TCHAH**

Co-Author(s): Hyuntae **KIM**, Jae Young **KIM**, Myoung Joon **KIM**, Chang Mok **LEE**, Jin Ah **LEE**

Purpose: To evaluate the long-term effects of changes in astigmatic correction and in spherical equivalent after combined femtosecond laser-assisted phacoemulsification (FLACS) and intrastromal arcuate keratotomy (ISAK).

Methods: We retrospectively reviewed the charts of patients who underwent combined FLACS and ISAK. FLACS and ISAK were performed using the Catalys Precision system (Abbott Medical Optics Inc, Santa Ana, CA). The programmed intrastromal incision parameters were 20% uncut anterior, 20% uncut posterior, and 90-degree side cut angle at an 8-mm optical zone. Corneal astigmatism and autorefraction measurements obtained preoperatively and at 1 month, 6 months, 1 year, and 2 years postoperatively were analyzed.

Results: Twenty-one eyes of 19 patients were included. The mean preoperative corneal astigmatism was 0.92 ± 0.41 diopters (D). This was reduced to 0.62 ± 0.49 D at 1 month, 0.69 ± 0.43 D at 6 months, 0.63 ± 0.40 D at 1 year, and 0.49 ± 0.27 D at 2 years ($P = 0.02$, $P = 0.04$, $P = 0.02$, $P < 0.01$, respectively) postoperatively. The spherical equivalents (SEs) at 1 month and 2 years postoperatively were significantly lower than that at 6 months postoperatively ($P = 0.011$, $P = 0.022$). The mean target induced astigmatism (TIA) was 1.34 ± 1.02 D. The mean surgically induced astigmatism (SIA) were 1.28 ± 1.05 D at 1 month, 1.22 ± 1.06 D at 6 months, 1.17 ± 0.98 D at 1 year, and 1.15 ± 1.05 D at 2 years postoperatively. High correlations were noted between TIA and SIA at 1 month ($r = 0.906$, $P < 0.01$), 6 months ($r = 0.874$, $P < 0.01$), 1 year ($r = 0.786$, $P < 0.01$), and 2 years ($r = 0.793$, $P < 0.01$).

Conclusions: We found that the corrective effect of astigmatism was maintained for 2 years by using combined FLACS and ISAK.

Evaluation of Ocular Biometry in Vietnamese Cataract Patients

First Author: Tran Ngoc **KHANH**

Co-Author(s): Nghiem Mai **PHUONG**, Nguyen Thi Mai **HUONG**, Nguyen Xuan **HIEP**, Pham Thi Minh **KHANH**

Purpose: To explore the ocular biometry in Vietnamese

cataract patients.

Methods: Retrospective study on 3863 eyes of patients aged 18 and older with cataract surgery from March 2017 to August 2017. Ocular biometry was done with LENSTAR LS900 including axial length (AL), corneal power, astigmatism, central corneal thickness (CCT), anterior chamber depth (ACD), lens thickness (LT), corneal diameter (WTW), and intraocular lens (IOL) power.

Results: The mean patient age was 67.32 ± 11.83 (from 18 to 104); aged 60 and older comprised 77.4%. The mean AL was 23.34 ± 1.14 mm; only 10.8% of the eyes had AL longer than 24.5. The mean corneal power was 44.46 ± 1.62 diopters (D). The mean astigmatism (AST) was 1.08 ± 0.92 (AST > 1.0 D in 40.4% of the eyes). The mean CCT was 523.99 ± 37.78 μ m. The mean ACD was 3.09 ± 0.45 mm, in which ACD < 3.0 mm was 43.3%. The mean LT was 4.38 ± 0.48 mm. The mean IOL power (with constant A = 118.8) was 20.43 ± 3.92 , of which the lowest power was -9.0 D and the highest was 38.8 D.

Conclusions: The ocular biometry in our study was similar to other studies but the rates of anterior chamber depth under 3.0 mm and corneal astigmatism greater than 1.0 D were high. The profile of ocular biometric data and corneal astigmatism may help ophthalmologists improve their surgical procedures including appropriate IOL choice and more accurate corneal incision to gain a high quality of postoperative vision.

Evaluation of a Rotational-Asymmetric Multifocal Intraocular Lens With a Standard Toricity and a +1.5 D Near Addition

First Author: Florian KRETZ

Co-Author(s): Salah ABDASSALAM, Gerd AUFFARTH, Detlev BREYER, Matthias GERL, Matthias MÜLLER

Purpose: Clinical evaluation of a rotational-asymmetric multifocal intraocular lens (MIOL) with a standard toricity and a +1.5 diopter (D) near addition for the correction of presbyopia and astigmatism during cataract surgery.

Methods: In a prospective multicenter study patients that underwent cataract surgery with a corneal astigmatism ≥ 0.75 D received a rotational-asymmetric multifocal intraocular lens with a standard toricity and a +1.5 D near addition (LS-313MF15 T1-T6, Oculentis, Germany). The preoperative biometry was performed with the IOL-Master 700 (Carl Zeiss Meditech, Germany). Subjective refraction, corrected and uncorrected visual acuity, monocular and binocular (decimal) for distance (UDVA), intermediate (UIVA), and near (UNVA) as well as binocular defocus curve analysis and rotational stability were evaluated.

Results: A significant reduction of astigmatism from -1.36 D to -0.25 D was found. The mean postoperative monocular UDVA was 1.06, the UIVA was 1.02, and the UNVA was 0.51, respectively. Mean IOL rotation was 1.6 degrees.

Conclusions: Rotational-asymmetric multifocal intraocular lenses with a standard toricity and a +1.5 D near addition based on a plate haptic design show an excellent rotational stability and sufficient astigmatism correction even for small grades of astigmatism. The evaluated +1.5 D near addition MIOL shows benefits for distance and intermediate visual acuity while still offering acceptable near visual acuity.

Femtosecond Laser-Assisted Cataract Surgery in Patients With Phakic Intraocular Lenses and Low Endothelial Cell Count

First Author: Hung-Yu LIN

Co-Author(s): Chia-Yi LEE

Purpose: To report the practice of femtosecond laser-assisted cataract surgery (FLACS) in patients who have received phakic intraocular lens (PIOL) implantation previously and who have low corneal endothelial cell count.

Methods: Case report and review of the literature.

Results: Two patients were enrolled. Preoperative corrected distance visual acuity (CDVA) and diopter sphere (DS) were 20/32 and -0.25 D in patient 1 and 20/32 and -3.00 D in patient 2. Specular microscope examination revealed an endothelial cell density (ECD) of $1532/\text{mm}^2$ in patient 1 and $1620/\text{mm}^2$ in patient 2. Capsulotomy was done smoothly by femtosecond laser. Postoperative CDVA improved in both eyes, with a difference of DS less than 1 D from preoperative estimation. Specular microscope examination revealed decreased ECD in patient 2 but no signs of corneal decompensation were detected.

Conclusions: The influence of using PIOL on capsulotomies performed via FLACS, in combination with preoperative refraction calculation, is minimal. A mild decrease in ECD may occur, but there is a low probability of severe corneal decompensation, even in patients with low endothelial cell count.

Initial Experience With a Novel Single-Piece Diffractive Trifocal Intraocular Lens

First Author: Fook Meng CHEONG

Co-Author(s): Eunice HIEW

Purpose: To evaluate the efficacy of a novel single-piece diffractive trifocal intraocular lens (IOL) in reducing spectacle dependence in patients undergoing cataract surgery.

Methods: Prospective consecutive case series.

Inclusion criteria were eyes with visually significant cataracts and corneal astigmatism less than 1.50 diopter (D), with no other comorbidities. A total of 50 eyes in 30 patients were recruited. Of these, 20 patients had bilateral implantations of the Acrysof IQ PanOptix trifocal IOL. A single surgeon performed all operations in a standard manner. Outcome measures were (i) distance, intermediate, and near visual acuities; (ii) defocus curves; (iii) patients' perceived symptoms of halos and glare; (iv) patients' spectacle independence; and (v) overall satisfaction.

Results: At 1 month postoperatively, 86% of eyes could see 20/25 or better unaided. When tested binocularly, all patients could see 20/25 or better for distance, intermediate, and near. All 20 patients could read J1 for near and J3 or better under dim light conditions. Defocus curve evaluations revealed a continuous sustained vision of 20/25 or better across 35 to 60 cm distances. Halos were reported by 80% of patients but none were affected significantly in their daily activities. All patients were spectacle independent for all distances and had no or little difficulty in their daily routines. A high level of satisfaction was noted in all patients.

Conclusions: This novel trifocal IOL was found to be highly effective in providing spectacle freedom for near, intermediate, and distance vision. The lens was well tolerated. Patients' overall satisfaction was high.

Iris Reconstruction: "In-the-Bag" Implantation of a Customized Iris Implant

First Author: Jina HAN

Co-Author(s): Charles MCGHEE, Mohammed ZIAEI

Purpose: Posttraumatic partial or total iris defects often cause significant visual impairment, with symptoms of glare, photophobia, as well as cosmetic concerns. Traditionally surgical methods have utilized simple iris prosthesis; however, customized color-matched silicone iris prostheses have been utilized recently with favorable functional and cosmetic outcomes. We present a case and surgical video of "in-the-bag" implantation of a custom-made artificial iris implant. A 26-year-old female was referred for iris reconstruction following excisional biopsy of a malignant iris melanoma resulting in a 4 clock hour iris defect. The uncorrected distance visual acuity (UDVA) in the affected eye was 20/30 due to glare and early cataract.

Methods: A custom iris prosthesis was color-matched to the patient's contralateral eye. A clear corneal incision and 2 paracenteses were made. After staining with Trypan Blue a continuous curvilinear capsulorhexis was created, cataract removed, and intraocular lens (IOL) injected into the bag. The artificial iris (HumanOptics Iris Implant) was trephined 10 mm centrally, 2 3-mm

peripheral hemicycle "iridectomies" created, then folded and introduced through the corneal incision into the capsular bag.

Results: Postoperative UDVA was 20/25. The IOL-iris prosthesis complex was well positioned within the capsular bag.

Conclusions: Custom-made artificial iris implants in patients with iris defects can result in excellent functional and cosmetic outcomes. Importantly in this case, the iris prosthesis was placed in the capsular bag, allowing for the anterior chamber angle, residual peripheral iris, and ciliary processes in the area of prior tumor excision to still be fully visualized on gonioscopy.

Obesity and the Risk of Age-Related Cataracts: A Meta-Analysis of Prospective Cohort Studies

First Author: Wei WANG

Co-Author(s): Liangping LIU, Mingxing WU

Purpose: To determine the association between obesity and the risk of age-related cataracts (ARCs).

Methods: Eligible prospective cohort studies were identified via computer searches and reviewing the reference lists of the obtained articles. The adjusted risk ratios (RRs) from individual studies were pooled via a random-effect model.

Results: Eleven prospective cohort studies involving a total of 319,756 participants were ultimately included in this meta-analysis. Obesity was statistically significantly associated with the increased risk of any ARCs, with a pooled RR of 1.27 [95% confidence interval (CI): 1.18, 1.37] after adjusting for potential confounding factors. Little evidence of heterogeneity was observed. Regarding the various types of cataracts, the summary RR for obesity versus nonobesity was 1.37 (95% CI: 1.06, 1.77) for cortical cataracts, 1.14 (95% CI: 1.02, 1.28) for nuclear cataracts, and 1.34 (95% CI: 0.95, 1.90) for posterior subcapsular cataracts (PSCs). Being obese was associated with a significant increase in PSC risk among non-Asians, but this was not found to be true among Asians.

Conclusions: Obesity significantly increased the risk of developing ARCs. Further efforts should be made to confirm these findings and clarify the underlying biological mechanisms.

Ocular Surface Damage and Cataract Surgery

First Author: Weihan TONG

Co-Author(s): Louis TONG

Purpose: Various studies show that cataract surgery can worsen dry eye. However, most studies evaluated patients up to 3 months postoperatively, with uncertain long-term implications. This study aims to investigate

if prior history of cataract surgery increases dry eye severity in known dry eye patients.

Methods: The study data were from a standardized prospective database of 1507 patients with dry eye newly referred to a dedicated dry eye clinic. Univariate/multivariate analysis was performed using prior cataract surgery as the independent factor. Outcomes measured include severity of dry eye symptoms (eg, grittiness, burning, light sensitivity, blurred vision, tearing), tear film break-up time (TBUT), corneal fluorescein staining (FS), and Schirmer test (ST).

Results: The age of patients was 54.2 ± 15.1 years with a preponderance of women (76.1%). A total of 237 subjects (15.7%) had previous cataract surgery. A control group from this database ($n = 237$) was compared and age was the major determinant of all dry eye parameters ($P < 0.001$). Therefore, a second age-matched control group ($n = 108$) was selected and compared. A history of cataract surgery was not associated with any of the dry eye parameters. Further analysis adjusting for confounding factors (eg, contact lens use, Sjogren syndrome) produced the same conclusion.

Conclusions: Dry eye severity in known patients is associated primarily with increasing age, not with prior cataract surgery. This suggests that current management of cataract surgery patients is sufficient to avoid long-term ocular surface damage. Cataract surgery may worsen tear function in people without dry eye but possibly not to a severity worse than those with idiopathic dry eye.

Outcomes of Pediatric Cataract Surgery

First Author: Su Ann TAY

Co-Author(s): Boon Long QUAH

Purpose: To report the management outcomes of children that underwent cataract surgery in 2 major tertiary referral centers in Singapore.

Methods: This was a retrospective review based on a clinical audit that was performed annually on all children aged 16 years and younger who underwent cataract surgery from 2002 to 2015. The age and gender of the patient, laterality, cataract morphology, the type of cataracts, ocular/systemic associations, the presenting visual acuity (VA), and the age at which surgery was performed were recorded. Postoperatively, the type of surgery performed, phakic status, any complications, and visual outcomes were recorded.

Results: A total of 253 children (339 eyes) were studied. Fifty-seven percent of children had unilateral cataracts and 42.7% had bilateral cataracts. Eighty-eight children (34.8%) had congenital cataracts, 90 (35.6%) had developmental cataracts, 30 (11.9%) had traumatic cataracts, and 24 (9.5%) had steroid-related

cataracts. In a subgroup analysis that included children who had follow-up till age 8 ($n = 80$), 70% had VA of 6/18 or better. In those with bilateral cataracts, 83.3% had VA 6/18 or better compared to only 55.3% who had unilateral cataracts. Fewer cases with congenital cataracts (27.3%) had VA $\leq 6/18$ compared to those with developmental cataracts (67.6%). Posterior capsular opacification occurred in 14.8%, glaucoma in 5.9%, and retinal detachment in 1.7% of cases.

Conclusions: In our series, 6/18 or better vision was achieved in 83% of children. Those with bilateral and developmental cataracts had better visual outcomes. Poorer visual outcomes were associated with amblyopia and postoperative complications.

Role of Perioperative Aberrometry for Selecting Intraocular Lens Power in Pediatric Eyes

First Author: Sudarshan KHOKHAR

Purpose: To study the usefulness of the ORA for refining the intraocular lens (IOL) power in pediatric eyes.

Methods: We operated on around 45 eyes of patients ranging in age from 2 to 6 years. The biometry was done after inducing the patient using autokeratometry and axial length using A scan. The power was calculated using the SRK-II formula. All these eyes were checked with ORA after cortical aspiration as well. The results of the perioperative aberrometry and manual calculations were analyzed.

Results: The IOL powers calculated manually and using perioperative aberrometry showed similar powers in about 85% of patients. In 15% of cases the power was different; these were cases in which intraocular pressure (IOP) of 21 mm Hg was not achieved during the capturing of perioperative aberrometry images.

Conclusions: ORA is very useful in planning IOL in pediatric cataracts.

Safety and Efficacy of New Generation Extended Range of Vision IOL infocus

First Author: M NIVEAN

Co-Author(s): Pratheeba DEVI NIVEAN, Nishanth MADHIVANAN, Kavithaa RAMAMOORTHY, JK REDDY, Jeyanthan SOUNDARAPANDIAN

Purpose: To evaluate the visual acuity of near, intermediate, and distance and subjective visual outcomes in patients who had new generation foldable infocus intraocular lens (IOL) implantation.

Methods: Thirty-one patients aged 40 and above with uncomplicated senile cataract and with astigmatism less than 1 diopter (D) underwent standard 2.8-mm phacoemulsification with new generation IOL infocus.

Visual acuity (VA) for near, intermediate, and distance was measured using Snellen, Good-Lite, and logarithm of the minimum angle of resolution (logMAR) chart, respectively. Contrast sensitivity was measured using Mars contrast chart. Patient satisfaction with vision, visual symptoms, and spectacle dependence was assessed using a standardized questionnaire.

Results: A total of 91% of patients had VA between 0 and 0.17; 87% of them had intermediate vision of 0 to 0.17; and 71% of them had near vision of N6. A total of 75% of the patients had a contrast sensitivity of 1.92 to 1.72. A total of 74% of the patients had no spectacle dependency for near or distance.

Conclusions: The new generation extended range of vision IOL infocus is a good option for extended range of correction with excellent visual outcomes for distance, intermediate, and near vision without compromising contrast sensitivity and also minimizing glare and halos.

Surgical Outcome of Posterior Polar Cataract in Adults

First Author: Ashma MANANDHAR

Purpose: To evaluate the results and complications of phacoemulsification surgery in eyes with posterior polar cataracts.

Methods: Prospective descriptive study done from November 2016 to March 2017. The surgical techniques, intraoperative complications, preoperative and postoperative visual acuities, and the causes of impaired visual acuity after surgery were analyzed. All the patients underwent phacoemulsification and/or lens aspiration. Posterior capsule was not polished after the surgery. The patients were followed up on the first postoperative day, first week, 1 month, 2 months, 3 months, 5 months and 6 months.

Results: A total of 60 eyes of 59 patients were included in the study, out of which only 3.05% had posterior capsular rupture. In 3 cases after posterior capsular rupture, anterior chamber intraocular lens was implanted as the posterior capsular defect was large in 1 case; sulcus placement of posterior chamber intraocular lens was done while in the last 1 case posterior chamber intraocular lens was placed in the bag. There was no cases of cortical or nuclear drop. Two cases were converted to small incision cataract surgery due to hard nucleus. Mean age of patients in our study was 49.35 ± 9.5 years (range, 35–73 years). There were 34 male patients and 26 female patients; 4 had family history. Mean axial length was 23.40 mm. Out of 60 eyes 12 eyes had bilateral posterior polar cataract. Mean preoperative visual acuity was 0.949 while first postoperative visual acuity was 0.5137, which was statistically significant ($P < 0.0001$) (paired t

test).

Conclusions: Intraoperative complications during posterior polar cataract surgery can be minimized by careful and appropriate surgical procedure.

Surprise of Multifocal Intraocular Lens Implantation

First Author: An-Fei LI

Co-Author(s): Chia-Wei LEE, Yih-Shiuan KUO

Purpose: To report the unusual causes of 2 cases complaining of blurred vision after implantation of multifocal intraocular lens (MFIOL).

Methods: Interventional case report.

Results: Two elderly women complained of blurring after multifocal intraocular lens (MFIOL) implantation. One received MFIOL explantation 1 month after initial implantation and monofocal IOL was introduced. However, no improvement was noticed. Further investigation revealed pituitary adenoma. Best corrected visual acuity (BCVA) returned to 6/7.5 after surgical treatment of the adenoma. The second case received toric MFIOL 6 months previously though no corneal astigmatism was found. There was no change in her blurring left eye after surgery and YAG capsulotomy. No macular pathology nor abnormal kappa angle were found. Optic nerve fiber layer thickness was found to be reduced in the right eye. Since, the patient complained of waxy vision and she felt worse than the preoperative condition. She asked for MFIOL explantation. Detailed communication of the patient's visual symptoms after her surgery and subsequent examination revealed giant internal carotid artery aneurysm. She received coil embolization.

Conclusions: Complaints after MFIOL implantation may be blurred vision (far, near, or intermediate) or subtle photic phenomena (halo, glare, dysphotopsia). Before explantation of MFIOL, detailed communication with patients about their dissatisfaction might lead to different solutions or surprising outcomes as in our cases. Equally important is careful evaluation before cataract surgery.

Survival Analysis of Visual Improvement After Cataract Surgery in Advanced Retinitis Pigmentosa

First Author: Stacey Carolyn LAM

Co-Author(s): Tommy CHAN, Shaheeda MOHAMED, Raymond WONG

Purpose: To investigate the duration of visual improvement following cataract surgery in patients with retinitis pigmentosa.

Methods: Consecutive records of patients with retinitis pigmentosa who underwent phacoemulsification

cataract extraction from January 2001 to December 2015 at Hong Kong Eye Hospital were reviewed. All patients were followed up annually. The duration at which postoperative best-corrected visual acuity (BCVA) returned to preoperative values was traced. Kaplan-Meier survival analysis was performed to evaluate the duration of visual improvement following cataract surgery.

Results: Sixty-seven eyes of 42 patients with retinitis pigmentosa had phacoemulsification and intraocular lens implantation during the study period. The average age of cataract extraction was 59.2 ± 12.3 years. Preoperative BCVA improved from 1.27 ± 0.42 to 0.92 ± 0.49 and 0.97 ± 0.53 at 3 months and 1 year postoperatively ($P < 0.001$). Using survival analysis, the mean duration of visual improvement following cataract surgery was 8.10 ± 0.83 years (95% confidence interval, 6.47 to 9.72 years) (Figure 1). Preoperatively, visual field was <10 degrees in 43 eyes (64.2%) and ≥ 10 degrees in 24 eyes (35.8%). There was no significant difference in the duration of visual improvement between the 2 groups (log-rank test, $P = 0.345$). Premorbid ocular diseases were noted in 25 (37.3%) eyes. No significant difference was found in the duration of visual improvement between eyes with or without premorbid ocular diseases (log-rank test, $P = 0.754$).

Conclusions: The current study showed that these patients could achieve visual improvement over a significant duration after cataract surgery. Our findings support cataract surgery in patients with advanced retinitis pigmentosa and can provide useful information for preoperative counseling.

The "Flap Motility" Sign of Posterior Capsule Rupture in Peripherally Extended Anterior Capsular Tears

First Author: Shruti MAHAJAN

Co-Author(s): Rohit OM PARKASH, Tushya OM PARKASH

Purpose: To describe various types of anterior capsular tears and an early diagnostic "flap motility" sign for posterior capsular rupture following posterior extension of radial tears.

Methods: A prospective study of 4331 eyes undergoing phacoemulsification in a private practice setting from April 2015 to February 2016. Twenty-six consecutive cases of anterior capsular tears were included. Morphological features of anterior capsular tears and resultant complications were evaluated. Parameters studied were surgical step during which the tear occurred, shape of tear, its extension in relation to the equator and flap nature, and motility in tear extending up to the equator. Motility and nature of flaps in anterior capsular radial tears and in relation to

posterior capsule rupture were noted.

Results: Based on shape, extent, and angulation, anterior capsular tears were categorized into 5 types, ie, type I, preequatorial radial tear (26.92%); type II, postequatorial radial tear (3.85%); type III, Argentinean flag sign preequatorial tear (57.69%); type IV, Argentinean flag sign postequatorial tear (7.69%); and type V, mini punch (3.85%). Flaps were either seen to be everted and fluttering or inverted and nonfluttering. In all cases with everted, fluttering flaps no posterior capsular rupture (PCR) was observed while in cases with inverted, nonfluttering flaps a PCR was observed ($P < 0.05$).

Conclusions: Everted and fluttering flaps of the anterior capsular tear indicate preequatorial tear while inverted and nonfluttering flaps indicate posterior capsule rupture following tear extension beyond the equator.

The Impact of the Standardization of Operating Room Protocols Set Forth by the Joint Commission International on Operating Room Time Periods in Phacoemulsification and Aspiration With Intraocular Lens Implantation

First Author: Atsuko EGUCHI

Co-Author(s): Atsushi AMANO, Takenori INOMATA, Ju MIZUNO, Akira MURAKAMI, Yuichi OKUMURA

Purpose: Juntendo University Hospital (JUH) was accredited by the Joint Commission International (JCI) on December 12, 2015. We evaluated the impact of JCI requirements on operating room time periods in phacoemulsification and aspiration with intraocular lens implantation (PEA+IOL) at JUH.

Methods: We included 3128 patients who had PEA+IOL under local anesthesia at JUH between March 2014 and June 2016. Patients were classified as before and after JCI accreditation (before JCI accreditation: 2582 patients; after JCI accreditation: 546 patients). The primary study outcome was total procedure/surgery time. Secondary study outcomes include the time periods comprising the total procedure/surgery time: pre-procedure/surgery time, procedure/surgery time, and post-procedure/surgery time. We compared these time periods using unpaired t test between patients before and after JCI accreditation.

Results: Characteristics of patients did not change significantly (age: 71.6 ± 10.3 vs 71.9 ± 10.6 years old; corrected visual acuity: 0.58 ± 0.36 vs 0.55 ± 0.31 ; intraocular pressure: 14.1 ± 3.2 vs 14.4 ± 3.1 mm Hg, before and after JCI accreditation, respectively). The procedure/surgery time did not change significantly (16.8 ± 6.7 vs 16.2 ± 6.3 min, $P = 0.064$). However, pre-procedure/surgery time (19.8 ± 10.5 vs 13.9 ± 8.3 min, $P < 0.001$) and post-procedure/surgery time (3.5 ± 4.6

vs 2.6 ± 2.1 min, $P < 0.001$) were significantly decreased after JCI accreditation. As a result, total procedure/surgery time was reduced by 7.3 minutes per person after JCI accreditation (40.1 ± 13.3 vs 32.8 ± 10.9 min, $P < 0.001$).

Conclusions: The standardization of operating room protocols set forth by JCI reduced total procedure/surgery time in PEA+IOL.

Visual Outcomes After Cataract Phacoemulsification With Implantation of Multifocal Intraocular Lens With +2.5 D Addition Power

First Author: Tran Ngoc **KHANH**

Co-Author(s): Hoang Tran **THANH**, Pham Thi Minh **KHANH**, Tran Thi Chu **QUY**

Purpose: To evaluate visual outcomes after cataract phacoemulsification with implantation of multifocal intraocular lens with +2.5 diopters (D) addition power and factors related to visual function.

Methods: A cross-sectional descriptive study on 98 eyes of 80 patients with ReSTOR +2.5 D. All patients were examined at the third month after surgery. Outcome measures were uncorrected and corrected distance (UDVA, CDVA), intermediate (UIVA, CDIA), near visual acuity (UNVA, CNVA), contrast sensitivity, glare, and halos.

Results: The mean age was 51.72 ± 11.93 . Males comprised 65%, and female were 35%. The mean UDVA was 0.09 ± 0.13 logarithm of the minimum angle of resolution (logMAR) (20/25) and the mean CDVA was 0.00 ± 0.09 logMAR (20/20). The UDVA $\geq 20/25$ rate was 72.4%. The mean UIVA was 0.18 ± 0.12 logMAR (20/27) and the mean CIVA was 0.03 ± 0.01 logMAR (20/20). The UIVA $\geq 20/40$ rate was 91.8%. The mean UNVA was 0.29 ± 0.08 logMAR (20/40 or G5) and the mean CNVA was 0.10 ± 0.07 logMAR (20/25 or G3). The UNVA $\geq 20/40$ rate was 79.6%. Contrast sensitivity was normal in 86 eyes. Glare rate was 6.0%, and halo rate was 5.1%. Independent of glasses for far and intermediate work was seen in 90.8% and 85.7%. Rate of satisfaction was high (93.9%).

Conclusions: Multifocal lenses with +2.5 D addition are suitable for patients who work more at far and intermediate distance. The near work should be done at more than 40 cm. This lens should be favored for people travelling and working at night with less glare and halos.

Comprehensive Ophthalmology

Oculodentodigital Dysplasia: A Rare Case Report

First Author: Khevna **PATEL**

Co-Author(s): Debtanu **MUKHERJEE**, Debdas **MUKHOPADHYAY**

Purpose: We report a rare case of oculodentodigital dysplasia. The clinical and characteristic radiological features and the investigations that were carried out, along with the treatment options, are discussed.

Methods: Oculodentodigital dysplasia (ODDD) is an extremely rare autosomal dominant disorder with high penetrance, intra- and interfamilial phenotypic variability, and advanced paternal age in sporadic cases. It has been diagnosed in fewer than 300 people worldwide with an incidence of around 1 in 10 million. The human connexin 43 genes, or GJA1, are located at human chromosome 6q22-q23 within the candidate region for the oculodentodigital dysplasia locus. This autosomal dominant syndrome presents with craniofacial (ocular, nasal, and dental) and limb dysmorphisms, spastic paraplegia, and neurodegeneration. Syndactyly type III and conductive deafness can occur in some cases, and cardiac abnormalities are observed in rare instances.

Results: The common clinical features include facial dysmorphism with thin nose, microphthalmia, syndactyly, and tooth anomalies such as enamel hypoplasia, anodontia, microdontia, early tooth loss, and conductive deafness. Other less common features are abnormalities of the skin and its appendages, such as brittle nails and sparse hair. Neurological abnormalities have been reported. We report a case of oculodentodigital dysplasia.

Conclusions: ODDD is one such rare syndrome. Early recognition can prevent blindness, dental problems, and learning disabilities. ODDD includes treatment plans for all the affected organs. Patients with ODDD and relatives should be properly counseled and their cooperation during the course of treatment is essential as it involves multiple follow-ups and consultation with different specialists.

Cornea, External Eye Diseases & Eye Bank

A Case of Combined Penetrating Keratoplasty and Posterior Vitrectomy Using Temporary Keratoprosthesis

First Author: Cheong Yi **FONG**

Co-Author(s): Ho Wa **LAI**, Hiliary **TSANG**, Ngai **YANG**, Po Fat **YIU**

Purpose: To report a case of combined penetrating keratoplasty and posterior vitrectomy using temporary keratoprosthesis in an eye with corneal rupture and uncontrolled endophthalmitis.

Methods: Case report and literature review.

Results: A 53-year-old man presented with left eye rupture with corneal laceration with visual acuity of light perception. After laceration repair and traumatic cataract extraction, he suffered from severe corneal infection which later resulted in uncontrolled endophthalmitis. A combined penetrating keratoplasty and posterior vitrectomy using temporary keratoprosthesis was done. The vitritis was cleared and the retina was found to be flat with patchy hemorrhages. The recipient cornea was found to have aspergillus species. The graft failed and another penetrating keratoplasty was done. There was no sign of reinfection. The eye later became phthisical.

Conclusions: We report a case of successful posterior vitrectomy combined with penetrating keratoplasty with the use of temporary keratoprosthesis in a case of completely opacified cornea due to trauma and infection. This technique can be applicable in future cases with vitreoretinal pathologies and an opacified cornea.

A Cluster of Fungal Endophthalmitis Following Elective Corneal Transplants Using Hypothermically Stored Donor Corneas

First Author: Nicola **LAU**

Co-Author(s): Romesh **ANGUNAWELA**, Declan **FLANAGAN**, Rohini **MANUEL**, Rupesh **PATEL**, Mark **WILKINS**

Purpose: We report the clinical course of 6 patients with fungal endophthalmitis following routine uncomplicated corneal transplants in a single center. To date, this is the largest cluster of fungal postkeratoplasty endophthalmitis (PKE). All patients had received donor material sourced from a single eye bank in America.

Methods: A Trust-wide investigation was initiated with input from Public Health England and the Centers for Disease Control and Prevention. Clinical records of each case were analyzed. Data included patient

demographics, types of storage media, geographic location of eye bank, surgical techniques, donor autopsy reports, preservation-to-surgery time, and clinical outcomes. A case-control study was conducted.

Results: The rate of infection was 0.71%. Five out of 6 patients had endothelial keratoplasty, and 1 had penetrating keratoplasty (PK). Two cases were mate corneas from 1 donor. Organisms isolated were *Candida glabrata*, *Candida albicans*, and *Purpureocillium liliacinum*. Average onset was 48 days postoperatively. All patients were treated with a combination of intraocular, systemic, and topical antifungals. All cases required surgical intervention. A total of 50% of patients underwent removal of grafts and achieved good outcome. One patient developed perforation and underwent tectonic PK. The remaining patients achieved clinical clearance of fungus.

Conclusions: There is a rise of fungal PKE. It is predominantly associated with hypothermically stored donor materials and endothelial keratoplasty. Donor-to-recipient contamination and lack of antifungal agents in the hypothermic storage media could be a major cause. There is emerging evidence showing benefits of antifungal fortification for hypothermic storage media. Corneoscleral donor rim culture is particularly useful as it collates well with clinical fungal infection.

A Comparative Study of Ocular Aberrations: Before and After Pterygium Surgery

First Author: Kosol **KAMPITAK**

Purpose: To evaluate the effect of pterygium excision on ocular aberrations.

Methods: Thirty-two patients with primary pterygium were enrolled. Ocular aberration values including defocus, astigmatism, secondary astigmatism, coma, secondary coma, trefoil, spherical aberration, quadrafoil, and pentafoil were measured with wavefront analysis techniques. Those parameters were recorded before pterygium excision and 1 month after the operation and were analyzed by paired t test.

Results: Of the 32 patients, there were 9 males (28%) and 23 females (72%); mean age was 58.4 ± 10.6 years. Mean ratio of pterygium size to corneal diameter was 0.31 ± 0.02 . Mean values of ocular aberrations in micrometers (before:after surgery) were $0.91 \pm 4.82:0.45 \pm 4.09$ for defocus, $0.22 \pm 2.83:0.32 \pm 1.04$ for astigmatism, $0.09 \pm 0.44:-0.01 \pm 0.37$ for secondary astigmatism, $-0.03 \pm 1.10:-0.07 \pm 0.65$ for coma, $-0.05 \pm 0.57:0.02 \pm 0.17$ for secondary coma, $0.70 \pm 2.48:0.09 \pm 0.83$ for trefoil, $0.29 \pm 0.42:0.05 \pm 0.26$ for spherical aberration, $-0.10 \pm 0.72:0.14 \pm 0.45$ for quadrafoil, and $-0.02 \pm 0.49:0.02 \pm 0.24$ for pentafoil. All parameters showed no statistically significant difference between pre- and 1 month postsurgery ($P > 0.05$) except for

spherical aberration ($P = 0.012$).

Conclusions: Excision of pterygium can reduce spherical aberration.

Application of Tear Film Temperature Decline Ratio in Dry Eye Diagnosis

First Author: Tai-Yuan **SU**

Co-Author(s): Shu-Wen **CHANG**

Purpose: To compare the tear film temperature decline ratio (TFDR) in dry eye and normal eye groups and to evaluate its potential for clinical applications.

Methods: Patients with positive corneal staining, Schirmer test of less than 5 mm, and fluorescent tear film break-up time (TFBUT) of less than 5 seconds were included as dry eyes ($n = 32$). Normal eyes ($n = 27$) had no corneal staining, Schirmer test of greater than 5 mm, and TFBUT of greater than 5 seconds. Tear meniscus height (TMH) was measured with an anterior segment optical coherent tomographer. Ocular surface temperature was measured by a customized thermographic system. The center area of the tear film temperature was measured for 4 seconds (30 film/sec). Then the normalized TFDR was calculated and its sensitivity and specificity in dry eye screening analyzed.

Results: The control group was aged 38.5 ± 14.3 while the dry eye group was aged 49.6 ± 13.3 ($P = 0.9$). There was no difference in gender distribution (16 females, 11 males and 17 females, 15 males for the control and dry eye groups, respectively; $P = 0.1$). The TMH was significantly less in the dry eye group (279 ± 177 and 132 ± 101 mm for the control and dry eye group, respectively; $P < 0.001$). The tear film temperature declined significantly faster in the dry eye group. TFDR 0.96 at film 30 had a sensitivity of 0.74 and specificity of 0.80 in dry eye diagnosis.

Conclusions: Tear film temperature decline ratio provided a useful and quick tool for tear film assessment.

Assessment of a New Severe Dry Eye Disease Diagnostic Algorithm as a Follow-Up Tool in Dry Eye Patients Participating in a Clinical Trial

First Author: Marc **LABETOULLE**

Co-Author(s): Christophe **BAUDOUIN**, Dahlia **ISMAIL**, Andrea **LEONARDI**, Gysbert **VAN SETTEN**

Purpose: To assess a new severe dry eye disease (SDED) diagnostic algorithm (ODISSEY algorithm) as a follow-up tool for treatment efficacy in dry eye patients participating in clinical trials.

Methods: A total of 246 dry eye patients from the SANSIKA trial (IKERVIS, 1 mg/mL ciclosporin cationic emulsion versus vehicle) were retrospectively assessed

with the ODISSEY algorithm (dedicated to identifying SDED patients).

Results: At baseline of SANSIKA, 99.4% of patients in the IKERVIS group versus 95.5% in the vehicle group were diagnosed with SDED based on the algorithm. The percentage of SDED patients at month 6 with IKERVIS was 54.2% versus 72.3% with vehicle ($P = 0.0096$). From months 6 to 12, vehicle patients switched to IKERVIS and 42.4% were still severe at month 12 versus 40.5% for those receiving IKERVIS from baseline.

Conclusions: These data suggest that the ODISSEY algorithm may help not only in the diagnosis of SDED at the time of selection, but also in the evaluation of treatment efficacy in clinical trials involving SDED patients.

Association of Long-Term Glycemic Control on Tear Break-Up Times and Dry Eye Symptoms in Chinese Patients With Type 2 Diabetes

First Author: Kendrick **SHIH**

Co-Author(s): Vishal **JHANJI**, Andre **MA**, Martin **MAK**, Alex **NG**, Louis **TONG**

Purpose: To evaluate tear film stability and dry eye symptoms and association with vascular risk factors in Chinese patients with type 2 diabetes.

Methods: A cross-sectional study was conducted in Hong Kong at the Lo Fong Siu Po Eye Centre (Grantham Hospital) from January to March 2017. Eighty Chinese patients with type 2 diabetes mellitus (T2DM) were recruited from the diabetes clinic of Queen Mary Hospital. Noninvasive tear film assessment was performed using the Oculus Keratograph 5M (Oculus Inc, Germany) to evaluate the noninvasive tear break-up time (NITBUT). Ocular symptoms were evaluated using the Ocular Surface Disease Index (OSDI). The associations between OSDI, NITBUT, and metabolic parameters relating to diabetes were evaluated using multiple linear regression.

Results: Among the 80 patients (mean age, 64.95 ± 10.97 years; 44% women), 20% [95% confidence interval (CI), 11-30%] had NITBUT ≤ 5 seconds. There were significant inverse Pearson correlations between glycated hemoglobin (HbA1c) and NITBUT ($r = -0.314$, $P = 0.007$) and a positive but weak correlation between HbA1c and OSDI ($r = 0.249$, $P = 0.022$). Stepwise multiple linear regression analysis confirmed HbA1c to be the only significant independent variable for NITBUT ($R^2 = 0.099$, $P = 0.014$) and OSDI ($R^2 = 0.062$, $P = 0.044$) after controlling for potential confounders.

Conclusions: In our study, symptomatic tear film instability was observed in 1 in every 5 patients with T2DM. Our findings highlight the importance of good glycemic control as a modifiable risk factor for both dry

eye symptoms and tear film instability in patients with T2DM.

Boston Keratoprosthesis Type 1: Experiences at Vietnam National Institute of Ophthalmology

First Author: Dong **PHAM**

Co-Author(s): Anthony **ALDAVE**, Thi Hai Yen **PHAM**

Purpose: To evaluate the outcomes of Boston keratoprosthesis (Kpro) type 1 with at least 1 year of follow-up for corneal blindness at Vietnam National Institute of Ophthalmology (VNIO).

Methods: A prospective clinical trial was carried out on 11 eyes of 11 patients who underwent Boston keratoprosthesis type 1 at VNIO between April 2014 and April 2016. Preoperative, intraoperative, and postoperative characteristics of each patient were collected.

Results: In all eyes, preoperative visual acuity (VA) was counting fingers (CF) at 1 m or worse, with 7 eyes (63.1%) having a VA of hand movements (HM). Preoperative diagnoses included repeat graft failure (27%), failed corneal graft with severe neovascularization (36.5%), and eye burns (36.5%). Mean follow-up time was 21.9 ± 7.3 months. The retention rate at the last follow-up was 91%. Best achieved VA ranged from 20/40 to CF at 1 m, with 6 eyes (55%) achieving VA of $\geq 20/200$ at some point during their postoperative course. At the last follow-up, VA ranged from 20/50 to no perception of light (NPL), with 4 eyes (36%) achieving VA of $\geq 20/200$. The most common complications were retroprosthetic membrane (45%) and elevated intraocular pressure (45%); among them glaucoma drainage device erosion was noted in 1 eye. Corneal melting occurred in 3 eyes (27%); among them 1 eye developed Kpro extrusion. Other complications included retinal detachment (1 eye) and aqueous leakage (1 eye).

Conclusions: Boston keratoprosthesis type 1 improved VA in a majority of cases. With the first 11 surgeries at VNIO, Kpro allows a new direction in the treatment of corneal blindness in Vietnam.

Challenging Management of Limbal Stem Cell Deficiency: A Case Series

First Author: Brenda **HAYATULHAYA**

Purpose: The aim of this case report is to emphasize optimal management for patients with bilateral limbal stem cell deficiency (LSCD).

Methods: This study reported 3 patients with bilateral LSCD. All of the patients underwent surgery with limbal stem cell graft and bevacizumab injection. Outcome measures included symptoms, best-corrected visual

acuity, ocular surface stability, and additional surgeries required.

Results: Best-corrected visual acuity improved: for the first patient right eye was 6/40 to 6/12 cc and 1/60 to 5/60 cc for the left eye; for the second patient right eye was 6/30 to 6/24 cc and 6/15 to 6/9 cc for the left eye; and for the third patient undercorrected visual acuity was 6/60 and 6/30. All 3 patients had good results after the surgery in reducing ocular manifestation in limbal stem cell deficiency.

Conclusions: The important lesson learned from these cases is that in all cases of limbal stem cell deficiency, an appropriate management must be done. Early recognition of clinical symptoms and signs and integrated management are required in making the correct and definitive diagnosis; thus, early medical treatment could prevent worsening course of the disease.

Changes in Corneal Tomographic Parameters Following Epithelial Debridement in Keratoconic Patients Undergoing Corneal Collagen Crosslinking

First Author: Mohammed **ZIAEI**

Co-Author(s): Akilesh **GOKUL**, Charles **MCGHEE**, Jay **MEYER**, Hans **VELLARA**

Purpose: To compare the tomography of the corneal epithelium and Bowman layer in eyes with moderate to severe keratoconus before and after epithelial debridement.

Methods: Prospective, interventional case series. Dual-channel Scheimpflug combined with Placido disc tomography was used to measure corneal parameters of eyes with keratoconus undergoing corneal collagen crosslinking immediately before and after epithelial debridement. Differences in pachymetry, axial keratometry, astigmatism magnitude, asphericity, total corneal power and spherical aberrations were computed.

Results: The study comprised 30 eyes of 30 patients. Following epithelial removal, the central (0-4 mm) and midperipheral (4-7 mm) corneal zones were significantly thinner: $21 \pm 14 \mu\text{m}$ and $35 \pm 44 \mu\text{m}$, respectively. Changes in anterior axial flat keratometry (+1.71 D), steep keratometry (+2.14 D), KMAX (+2.13 D), corneal astigmatism (+1.11 D), asphericity (-0.31), and total corneal power (+2.03 D) were significantly different following epithelial debridement. There were no significant changes in posterior corneal flat and steep keratometry, posterior corneal astigmatism, and posterior asphericity. There were no significant differences in the mean astigmatic axis (anterior and posterior corneal surfaces) or spherical aberration after epithelial debridement.

Conclusions: In eyes with moderate to severe keratoconus, the tomography of Bowman layer was significantly steeper than that of the epithelium, thus epithelial debridement increased the magnitude of anterior corneal keratometry, astigmatism, and prolateness. These data suggest that corneal epithelium smooths underlying Bowman layer irregularity in keratoconus.

Characteristics of Infectious Keratitis in Old Japanese Patients

First Author: Koji **TORIYAMA**

Co-Author(s): Atsushi **SHIRAIISHI**, Takashi **SUZUKI**

Purpose: To determine possible correlations between patient backgrounds including activities of daily living (ADL) and living status, predisposing risk factors, causative agents, and severity with infectious keratitis in old (≥ 75 years of age) patients.

Methods: We retrospectively reviewed 54 old patients who were hospitalized for infectious keratitis. The focus occupancy ratio (FOR) was defined as the total focus area/entire cornea area.

Results: The mean patient age was 82.9 ± 5.6 years. Dementia was found in 8 patients (14.8%), but the most common predisposing risk factor was postkeratoplasty (15 patients, 27.8%). However, 10 patients (18.5%) had unknown risk factors. In all, 16 patients (29.6%) had low ADL, including being bedridden or being unable to go outside without assistance, and 19 patients (35.2%) lived alone. Causative agents were detected in 31 patients (57.4%) and included bacteria in 22 patients and fungi in 9 patients. Seventeen patients (31.5%) had $>25\%$ focus size of the corneal area. The average FOR was $12.1 \pm 14.1\%$, and the mean best-corrected visual acuity (BCVA) at the first and final visits was 1.88 ± 0.71 and 1.52 ± 1.03 logarithm of the minimum angle of resolution (logMAR), respectively. The mean final BCVA in patients living alone was significantly worse than that in patients living with someone. Multivariate analyses showed that age correlated with FOR and the final BCVA.

Conclusions: Infectious keratitis occurs in old patients with postkeratoplasty, dementia, and a low ADL. Therefore, age and living status may affect visual prognoses.

Combined Retropupillary Iris-Claw Aphakic Intraocular Lens Implantation and Penetrating Keratoplasty in a Case of Traumatic Eyeball Rupture

First Author: Chien-Liang **WU**

Purpose: To report a case of traumatic eyeball rupture with severe corneoscleral perforating injury that was treated with retropupillary iris-claw aphakic intraocular

lens (IOL) implantation and penetrating keratoplasty.

Methods: Case report.

Results: A 19-year-old female suffered from traumatic eyeball rupture with severe corneal and scleral laceration due to an accident of an explosion of a beer glass bottle. The presenting vision was no light perception and emergency repair of the ruptured globe was done with suturing of corneoscleral laceration and the lens and part of the iris were lost due to the eye injury. Corneal transplantation was done with iris-claw IOL, which was fixated behind the iris 3 months later. The postoperative BCVA was 0.05, and the cornea remained clear at 6 months of follow-up.

Conclusions: Corneal transplantation with concomitant retropupillary fixation of an iris-claw intraocular lens is effective in the treatment of a severely traumatized eye with good short-term results.

Congenital Corneal Anesthesia: A First Case Report in Vietnam

First Author: Hang **DO**

Co-Author(s): Dong **PHAM**

Purpose: Congenital corneal anesthesia (CCA) is a rare clinical entity that poses a diagnostic dilemma due to lack of attention. The sensory deficit usually occurs in both eyes, may occur as an isolated abnormality or as part of a complex neurological syndrome, or it may occur in association with multiple somatic abnormalities and congenital insensitivity to pain. Due to the sensory deficit, a patient usually has keratitis or corneal ulcer, occurring in the first 3 years. Early diagnosis and treatment are important to prevent progression to more serious stages. The purpose of this case report is to discuss the diagnosis and treatment for this disease.

Methods: A 4-year-old girl suffered from bilateral corneal ulcer due to CCA associated with congenital insensitivity to pain, deafness, and delayed mental and physical development. With physical examination, patient history, current literature, and studies, we report and discuss the first case of CCA diagnosis in Vietnam.

Results: Treatment was mainly by using lubricant, artificial tears, tarsorrhaphy, or amniotic membrane transplantation. The ulcer healing occurred slowly with neovascularization.

Conclusions: The treatment of CCA is still a big challenge for ophthalmologists. Accurate diagnosis and recognition of risk factors is important for lessening long-term sequelae of this condition.

Corneal Dynamic and Tomographic Analysis Between Both Eyes of Unilateral Keratoconus and Normal Eyes

First Author: Tommy **CHAN**

Co-Author(s): Vishal **JHANJI**, Yumeng **WANG**, Marco **YU**

Purpose: To investigate and compare the diagnostic ability of corneal tomography and dynamic corneal response to differentiate both eyes of unilateral keratoconus from normal eyes.

Methods: Corneal tomography was performed using Pentacam (Pentacam HR, Oculus, Wetzlar, Germany). Corneal deformation response was captured using Corvis ST (Oculus, Wetzlar, Germany) using a beta version of Corvis software. Classification analysis between normal and forme fruste keratoconus as well as between normal and keratoconus were evaluated using receiver operating characteristic (ROC) curves. The area under the ROC curve (AUC) and partial AUC (pAUC) for each classifying parameter was compared.

Results: Twenty-one unilateral keratoconus patients (21 eyes with forme fruste keratoconus and 18 eyes with keratoconus) were compared with 73 eyes of 38 healthy subjects. The mean age of the participants was comparable between groups ($P = 0.480$). Comparative analysis between Pentacam and Corvis parameters showed significantly lower AUC and pAUC for Corvis parameters in differentiating keratoconus from normal eyes ($P \leq 0.049$). However, comparable AUC and pAUC was observed between Corvis biomechanical index (AUC = 0.785; pAUC = 0.079) and D value of Belin/Ambrosio Enhanced Ectasia Display (AUC = 0.757; pAUC = 0.068) ($P \geq 0.477$) for detection of forme fruste keratoconus with sensitivities of 63.2% and 52.6% given a common specificity of 80.3%.

Conclusions: The current study showed the feasibility of use of nontomographical parameters obtained from Corvis ST for differentiating normal and keratoconus eyes. The diagnostic ability of Corvis ST was comparable to that of Pentacam for differentiating forme fruste keratoconus and normal eyes.

Correlations Between Subjective Symptoms and Tearing and Lens Parameters in Patients Wearing Soft Contact Lenses

First Author: Takashi **SUZUKI**

Co-Author(s): Yuichi **HORI**, Takashi **ITOKAWA**, Yukinobu **OKAJIMA**

Purpose: We used a Keratograph 5M platform to examine the tearing and surface characteristics of soft contact lenses (SCLs) and to investigate relationships between these parameters and subjective symptoms (dryness and discomfort).

Methods: We enrolled 50 subjects who wore SCLs for

>3 hours daily. Subjective symptoms were evaluated with the aid of the Contact Lens Dry Eye Questionnaire (CLDEQ-8). Tear meniscus height (TMH) when wearing SCLs was measured at the center of the eyelid, and meibographic data were obtained using a Keratograph 5M platform (Oculus). Meibomian gland morphology was scored (from 0-6) using the meiboscope. SCL surfaces were observed using the "assessment of interference" subroutine of the Keratograph 5M, and the tear breakup time when wearing SCLs was also measured. SCL deposits were scored as follows: (0: none; 1: partial; 2: <1/3 of the entire SCL area; 3: >1/3 of the entire SCL area). Correlations between CLDEQ-8 scores, tearing parameters, and SCL status were calculated using Spearman test.

Results: The CLDEQ-8 scores did not differ significantly between SCLs that were disposable on either a daily or a fortnightly basis, or between SCLs with hydrogel or silicone hydrogel lenses. The CLDEQ-8 score correlated significantly with the meiboscope ($r = 0.402$, $P < 0.05$) and the extent of SCL deposits ($r = 0.304$, $P < 0.05$), but not with the TMH or tear breakup time.

Conclusions: Dryness and discomfort associated with SCL use may reflect SCL deposits and/or eyelid/SCL friction. The meibomian gland may play a critical role in the development of SCL symptoms.

Crosslinked Donor Corneas Resist Infections and Melt in Boston Type 1 Keratoprosthesis: A Case Series

First Author: Lional Raj **PONNIAH**

Co-Author(s): Heber **ANANDAN**, Srinivasan **RAO**

Purpose: To demonstrate the efficacy of crosslinking of donor corneas in resisting postoperative infections and corneal melts in Boston type 1 keratoprosthesis in eyes with ocular surface disorders (OSD).

Methods: A conventional epithelium-off corneal collagen crosslinking was performed with riboflavin and ultraviolet (UV) light in a de-epithelialized donor cornea mounted on an artificial anterior chamber; subsequently, the cornea was used as a carrier for Boston type 1 keratoprosthesis and transplanted in eyes with OSD and multiple failed corneal grafts. The patients were followed up for corneal integrity to resist infection and corneal melts, which are common following Boston keratoprosthesis and especially in cases of OSD.

Results: Three cases of Boston keratoprosthesis in OSD were studied, with a follow-up of 18 months. All 3 grafted eyes were healthy in resisting long-term postoperative infections and corneal melts.

Conclusions: Crosslinking of donor corneal buttons before Boston type 1 keratoprosthesis with riboflavin and UV rays is effective in improving long-term

postoperative strength and outcome of corneas, especially in cases of ocular surface disorders.

Diclofenac Controlled Release From Antibacterial-Coated Soft Contact Lenses

First Author: Helena FILIPE

Co-Author(s): Helena GIL, Guilhermina MOUTINHO, Benilde SARAMAGO, Ana Paula SERRO, Diana SILVA, Hermínio SOUSA

Purpose: Silicone-based contact lenses can be used as drug carriers for therapeutic purposes. Layer-by-layer (LbL) coatings may be used to create a lens surface barrier and achieve controlled drug release. These coatings could additionally prevent the adhesion of microorganisms. The main objective of this work was to develop LbL coated lenses loaded with an anti-inflammatory drug (diclofenac).

Methods: A silicone-based hydrogel was produced, loaded with diclofenac by soaking, and coated with 3 different coatings prepared by combining polyelectrolytes like alginate (ALG), chitosan (CHI), hyaluronate (HA), and poly-L-lysine (PLL), and using 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide hydrochloride (EDC) as crosslinker. The coatings consisted of 2 double layers of ALG/PLL/EDC, HA/EDC/CHI, or HA/PLL + EDC + drug. The drug release kinetics in NaCl solution were investigated in sink conditions. The wettability, surface roughness, transmittance, and refractive index of the materials were studied. Hydrogel-lachrymal protein interaction was evaluated using a quartz-crystal microbalance with dissipation (QCM-D). Antibacterial activity against *S. aureus* and *P. aeruginosa* was also studied.

Results: The coatings revealed a controlled drug release profile and adequate biological and physical properties for safe contact lenses wear. QCM-D data revealed possible degradation of the coatings by lysozyme. The addition of a new top layer of HA to the ALG/PLL(EDC) coating offered protection against lysozyme and maintained the material properties and the controlled release of the drug.

Conclusions: The LbL coating with ALG/PLL(EDC + HA) proved to be effective in obtaining a controlled diclofenac release resistant against lysozyme degradation and simultaneously presenting antibacterial properties.

Dry Eye Manifestations Vary With Age

First Author: Hsin-Yu WENG

Co-Author(s): Shu-Wen CHANG, Chiung-Yi CHIU, Wei-Ting HO, Tzu-Yun TSAI

Purpose: To investigate the difference in subjective and objective dry eye manifestations in various age groups.

Methods: Our cross-sectional study enrolled 1230 patients with dry eye manifestation between November 2015 and July 2017. Patients with contact lens wear, current topical medication other than artificial tears, and previous ocular trauma and/or surgeries were excluded. All participants completed both Standardized Patient Evaluation of Eye Dryness (SPEED) and Ocular Surface Disease Index (OSDI) questionnaires for subjective symptoms. Lipid layer thickness (LLT) and meibography were measured with LipiView II interferometer. The number of expressible meibomian glands (MGE) was observed with Meibomian Gland Evaluator. Meiboscale, blink/incomplete blink rates, and Schirmer test with anesthetics were also recorded. The participants were divided according to age, ie, <21, 21 to 40, 41 to 60, 61 to 80, and >80 years old. Differences in gender, SPEED, OSDI, LLT, MGE, meiboscale, and blink among the 5 groups were examined.

Results: There were significantly more males in younger groups and more females in older groups. SPEED scores were significantly higher in the 21-40 and 41-60 age groups. OSDI scores were significantly higher in the 41-60 age group. Age showed a positive correlation with LLT level ($P < 0.0001$, $r = 0.227$) and meiboscale ($P < 0.0001$, $r = 0.331$) and a negative correlation with the number of MGE ($P < 0.0001$, $r = -0.175$). Older age had significantly fewer total and incomplete blinks ($P < 0.0001$, $r = -0.184$ and -0.106 , respectively).

Conclusions: Dry eye manifestations vary with age. Younger patients had more severe subjective symptoms, less LLT, and more blink.

Dry Eye Manifestations Vary With Seasons

First Author: Chiung-Yi CHIU

Co-Author(s): Shu-Wen CHANG, Wei-Ting HO, Tzu-Yun TSAI, Hsin-Yu WENG

Purpose: To investigate the seasonal variations in subjective and objective dry eye manifestations.

Methods: We enrolled 1230 dry eye patients between November 2015 and July 2017. They were divided into spring, summer, fall, and winter groups according to the time of their first visit. Standardized Patient Evaluation of Eye Dryness (SPEED) and Ocular Surface Disease Index (OSDI) questionnaires were completed to evaluate subjective symptoms. Lipid layer thickness (LLT), blinking/incomplete blink rates, and Meibography were measured using the LipiView II interferometer. LLT change was defined as maximal LLT minus minimal LLT. The number of expressible Meibomian glands (MGE) was evaluated with Meibomian Gland Evaluator. Schirmer test with topical anesthetics was measured at 5 minutes. Differences in age, gender, menopausal status, Schirmer test results, LLT, and MGE among the 4

groups were examined.

Results: The SPEED and OSDI scores were significantly higher in fall (SPEED, 11.8 ± 5.7 ; OSDI, 39.3 ± 21.9) and winter (SPEED, 10.7 ± 5.6 ; OSDI, 38.3 ± 22.4) than those in spring (SPEED, 10.0 ± 5.5 ; OSDI, 35.7 ± 19.9) and summer (SPEED, 9.8 ± 5.2 ; OSDI, 31.8 ± 20.5) ($P < 0.0001$). The LLT was significantly higher in summer (97.9 ± 10.1 nm), followed by spring (73.9 ± 8.9 nm), winter (51.9 ± 6.5 nm), and fall (35.4 ± 5.4 nm). The MGE was significantly lower in winter (5.4 ± 4.1) than in other seasons (6.9 ± 3.8 , 7.5 ± 4.0 , and 7.5 ± 4.2 in spring, summer, and fall, respectively). There was no difference in age, gender, menopausal status, blinking rate, Meiboscale, Schirmer test, or LLT change.

Conclusions: Season is a significant risk factor in Meibomian gland dysfunction. Patients showed lower LLT level and MGE in fall and winter, which resulted in more severe subjective symptoms.

Epithelial Downgrowth: 3 Case Reports

First Author: Thuy NGUYEN

Purpose: To report 3 cases of epithelial downgrowth after intraocular surgery and penetrating trauma.

Methods: Observational case reports.

Results: In the first case, epithelial downgrowth presented as a big cyst in the anterior chamber (AC) with local corneal decompensation 1 year after cataract surgery. The patient was successfully managed by surgical excision of the cyst. In the second case, epithelial downgrowth was noted with the presence of a cyst in the AC after penetrating limbal cornea. After 1 injection of 5-fluorouracil (5-FU) in the cyst, the cyst initially regressed. In the third case, 2 years after limbal and scleral injury, epithelial downgrowth presented as a sticky membrane spread on the surface of iris, angle, and corneal endothelium and resulted in corneal decompensation and refractory glaucoma. This case was treated by surgical excision, injection of 5-FU, keratoplasty combined with lensectomy and vitrectomy, transcleral cyclophotocoagulation, and transcorneal cryotherapy. After the severe period, with these interventions, the patient's eye became quiet with the opaque graft and well-controlled intraocular pressure (IOP).

Conclusions: Despite being rare, epithelial downgrowth is an important clinical entity to recognize, as its sequelae can lead to significant ocular morbidity and blindness. Although treatment outcomes of epithelial downgrowth are still limited, there have recently been some promising advances.

Evaluation of DEQS to Identify Corneal and Conjunctival Epithelial Disorder by ROC Analysis

First Author: Yuichi OKUMURA

Co-Author(s): Atsuko EGUCHI, Takenori INOMATA, Masao IWAGAMI, Akira MURAKAMI, Tina SHIANG

Purpose: Despite its importance in evaluating the severity of dry eye disease (DED), the new 2016 dry eye diagnostic criteria by the Asia Dry Eye Society excluded the presence of keratoconjunctival epithelial disorder. In this study, we examined the relationship between the Dry Eye-Related Quality-of-Life Score (DEQS) and corneal fluorescein staining (CFS).

Methods: We conducted a prospective cross-sectional study of 191 eyes (62.4 ± 14.9 years old, 70.7% female) between November 2015 and April 2017. All patients had complete ophthalmic evaluations including subjective symptom assessment using DEQS (0-100), tear break-up time (TBUT, second), Schirmer test I (mm), and CFS (0-9). Using the 2016 criteria from the Asia Dry Eye Society and Dry Eye Society Japan, we classified patients into DED and non-DED groups. We examined the cutoff value of DEQS for patients with a CFS score of 3 or more using receiver operating characteristic (ROC) analysis.

Results: We compared the non-DED group (78 eyes, 65.2 ± 14.3 years old, 60.3% female) and the DED group (113 eyes, 60.5 ± 0.5 years old, 77.9% female): DEQS, 15.5 ± 5.5 vs 38.5 ± 8.5 ; TBUT, 5.0 ± 3.1 vs 2.2 ± 1.2 ; CFS score, 1.2 ± 1.4 vs 2.1 ± 1.8 ; Schirmer test I, 8.1 ± 6.1 vs 7.2 ± 7.2 . The area under the ROC curve was 0.63. The cutoff value of DEQS was 30 for patients with a CFS score of 3 or more; the sensitivity was 58.5% and the specificity was 69.1%.

Conclusions: Patients with a DEQS over 30 require clinical workup for keratoconjunctival epithelial disorder.

Evaluation of Ocular Higher-Order Aberrations in First-Degree Relatives of Patients With Keratoconus

First Author: Siamak ZAREI-GHANAVATI

Purpose: To evaluate the corneal higher-order aberrations (HOAs) in first-degree relatives of keratoconus (KCN) patients and compare these data with the normal population.

Methods: In this prospective comparative study 210 eyes from 105 family members of 28 keratoconus patients and 210 normal eyes of 105 control subjects were enrolled. In each eye, corneal topography and Orbscan IIz were performed. Ocular aberrations were evaluated by ZyWave aberrometer.

Results: The study included 61 (58.1%) female and 44

(41.9%) male subjects with a mean age of 31 years (range, 15–50 years) and 105 age-sex matched controls with normal topographic cornea. In 14 of 105 first-degree relatives (13.33%) of keratoconus patients, keratoconus was diagnosed by 3 expert refractive surgeons with a male preponderance (71.5% male, 28.5% female). With regards to comparison between groups, irregularity indices in the 3-mm and 5-mm zones in Orbscan were significantly higher in the relative group. Other irregularity indices of TMS-4 topography including SRI, SAI, DSI, SDP, and IAI were significantly higher in family members. The most prevalent pattern in the control group was the symmetric bowtie (57.1); that of the relative group was the asymmetric bowtie (39.5%). We also detected significantly thinner corneal pachymetry in the relative group.

Conclusions: Because genetic screening is limited by epigenetic factors and the multifactorial nature of KCN, the presence of a positive family history may be a clue to consider the patient as a potential case of developing KCN in the future. Due to high prevalence of undiagnosed KCN in KCN family members, keratorefractive surgery should be considered cautiously in these individuals.

Femtosecond Laser-Assisted Crosslinking Better Than Conventional: Proof of Concept of “Deeper the Better”

First Author: Lionel Raj PONNIAH

Purpose: To compare femtosecond laser-assisted crosslinking (CXL) outcomes with conventional procedures and to prove the concept that deeper stromal crosslinking better dampens progression of ectasias.

Methods: We compared conventional epi-off CXL with femtosecond-assisted CXL (creation of a corneal stromal bed of 8.5-9.0 mm in diameter, 140-160 μ m deep with 2 incisions 180 degrees apart, into which isotonic riboflavin A was infused, in addition to transepithelial application). Outcomes included visual acuities, central thinnest pachymetry, K max value, astigmatism (Sim K), and anterior segment optical coherence tomography (AS-OCT) derived demarcation line (DL). Follow-up was 1 year. Statistical analysis between femto CXL and conventional groups and historical samples of accelerated, transepithelial, and iontophoresis groups arrived.

Results: Twenty-five femto CXL and 21 conventional CXL eyes were enrolled. Uncorrected visual acuity (UCVA) improved by 2 and 1 lines in femto and conventional CXL, respectively ($P < 0.0001$). Best corrected visual acuity (BCVA) was similar. Central pachymetry was maintained in femto CXL ($P = 0.01$) and reduced by 28 μ m ($P < 0.05$) in conventional. Crosslinking flattened

the cornea in both groups. Astigmatism reduced in femto CXL by 0.31 diopters (D) and increased by 0.27 D in conventional. DL detected at 1 month was deep in femto CXL ($393 \pm 23.9 \mu$ m) versus $243 \pm 15.9 \mu$ m in conventional ($P < 0.0001$). Femto-assisted stromal bed for riboflavin enables deeper crosslinking than any other modalities. No endothelial changes were noted in both groups.

Conclusions: Femtosecond laser assists in achieving crosslinking of the posterior corneal stroma deeper than 250 μ m more than any other conventional procedures, favoring an effective stabilization of keratoconus concerning preventing steepening and further thinning of the cornea, as a proof of the “Deeper the Better” concept.

In Vitro Antimicrobial Activity of Multipurpose Contact Lens Solutions Against Standard Strains of Common Ocular Pathogens: The Effect of Duration From First Use

First Author: Eleonore IGUBAN

Purpose: This study aims to determine the in vitro antimicrobial efficacy of opened multipurpose contact lens solutions on common contact lens-related ocular pathogens. Specifically, this study intends to compare the log reduction in microbial concentration when exposed to newly opened, opened for 5 months, and opened for 10 months multipurpose contact lens solutions.

Methods: This is a single-blind controlled experiment evaluating 5 locally available multipurpose contact lens solutions (MPS) in terms of their antimicrobial efficacy towards common contact lens-related ocular pathogens using standalone criteria. Newly opened, 5-month old, and 10-month old multipurpose contact lens solutions were compared based on their effect in reducing microbial concentration at 6 hours of exposure.

Results: MPS containing polyquaternium-1, myristamidopropyl dimethylamine (MAPD), and polyhexamide reduced the bacterial concentrations by 3 log and fungal concentrations by 1 log, enabling them to fulfill the standalone criteria for disinfecting solutions. This antimicrobial efficacy was most evident with newly opened contact lens solutions, followed by those opened for 5 months. Those which were opened for 10 months showed limited antimicrobial activity for both bacteria and fungi.

Conclusions: Multipurpose contact lens solutions demonstrated variability in their antimicrobial activity. MPS containing polyquaternum and MAPD are preferred due to broad spectrum efficacy and effectivity. They must also be utilized before 5 months

from the date of first use to prevent contact lens-related ocular infections brought about by exposure to a humid climate.

Increased Risk of Keratopathy After Psoriasis: A Nationwide Population-Based Study

First Author: Ming-Hwei **TSAI**

Co-Author(s): Hung-Chi **CHEN**, Chia-Yi **LEE**

Purpose: To evaluate whether the presence of psoriasis increases the risk of keratopathy incidence by using Taiwan's National Health Insurance Research Database (NHIRD).

Methods: This retrospective cohort study used data from the NHIRD for the period from 2009 to 2013. A total of 3777 patients diagnosed with psoriasis were enrolled in the study group while another 15,108 individuals were selected as the control group. The study group was age- and gender-matched with a group of controls who had not received a diagnosis of psoriasis. Multivariate Cox regression analysis was performed to estimate the adjusted hazard ratio (aHR) of keratopathy.

Results: The flowchart of patient selection is shown in Figure 1. For the events of keratopathy, 24 patients in the study group and 48 patients in the control group developed keratopathy (incidence rate ratio, 2.00; $P < 0.01$). The multivariate analysis revealed that the risk of keratopathy was higher in patients who had psoriasis (aHR = 1.97, $P < 0.01$), were older than 60 years (aHR = 3.43, $P < 0.01$), and had a low income level (aHR = 4.07, $P = 0.02$) (Table 1). Subgroup analysis showed that a follow-up interval of >1 year (aHR = 2.25, $P = 0.02$) and being male (aHR = 2.86, $P < 0.01$) were indicative of a higher risk of keratopathy in the study group.

Conclusions: In conclusion, psoriasis correlates with an increased risk of keratopathy in patients without preexisting prominent corneal disease. Moreover, the risk of incident keratopathy increases with exposure to psoriasis for at least 1 year.

Inflammatory Eye Disease Nursing Support in Corneal and External Eye Disease Clinic

First Author: Allie **LEE**

Co-Author(s): Yan Yu **CHAN**

Purpose: To evaluate the effectiveness of adding nursing support in monitoring of systemic side effects of immunosuppressant use in patients with inflammatory corneal and external eye diseases.

Methods: A protocol to standardize systemic monitoring scheme, including relevant vital signs, blood tests, and radiological investigations, was established. Qualified nurses who received subspecialized training in inflammatory eye diseases were recruited. Patients

on immunosuppressants for inflammatory corneal and external eye diseases would see the nurse after each visit. The percentage of missing investigations before and after establishment of the service would be compared.

Results: Percentage of number of missing investigations 6 months before and after commencement of inflammatory eye disease nursing support was documented. The type of eye disease and immunosuppressants were also documented. Data analysis is underway and the statistical significance level would be at 0.05.

Conclusions: Patients with inflammatory eye diseases receiving immunosuppressants need regular monitoring of the associated systemic side effects. Trained nursing support would be conducive in ensuring compliance.

Management of Peripheral Ulcerative Keratitis With Extensive Corneal Thinning: A Case Report

First Author: Vatien **RAHMAWATI**

Purpose: Peripheral ulcerative keratitis is an autoimmune, unilateral crescent form of stromal inflammation, involving the juxtalimbal cornea with sectoral thinning at the affected site. The incidence is only 3 cases per million in a year. This case report aimed to report a rare case of peripheral ulcerative keratitis with extensive corneal thinning that was successfully treated by medical and surgical management.

Methods: Case report.

Results: A 38-year-old-man presented to the outpatient clinic of the ophthalmology department with complaints of blurred vision, redness, photophobia, and tearing of the right eye. There was no history of trauma or eye surgery. General examination found no abnormality. Ophthalmology examination revealed visual acuity in the right eye was hand movements and in the left eye was 5/8.5 ph 5/5. Right eye showed mix injection, extensive peripheral corneal thinning at 1-10 o'clock, and epithelized iris prolapse at 2-4 and 5-6 o'clock. Funduscopy of both eyes showed no abnormality. The patient was diagnosed with right eye peripheral ulcerative keratitis. Keratoplasty could not be done because a corneal donor was not available. The patient was managed with oral steroid, antiglaucoma medication, lubricant eyedrops, and bandage contact lens. He underwent conjunctival resection, amniotic membrane transplant, and pericardial graft under general anesthesia. Laboratory work-up showed increase of rheumatoid factor, but the diagnosis of rheumatoid arthritis was not established. One month of follow-up showed visual acuity of the

right eye improved to 5/12 with correction of 5/7.5 and there was marked improvement of corneal thinning.

Conclusions: Peripheral ulcerative keratitis, if detected and diagnosed early, can be successfully managed by a medical and surgical approach and can preserve vision.

Metagenomic Analysis for Lacrimal Stones and Discharge: A Case of Lacrimal Canaliculitis

First Author: Yukinobu **OKAJIMA**

Co-Author(s): Yuichi **HORI**, Hiroko **IWASHITA**, Takashi **ITOKAWA**, Takashi **SUZUKI**

Purpose: Lacrimal canaliculitis, which is rare, often misdiagnosed, and insufficiently treated, is caused by formation of lacrimal stones. Difficulty isolating and identifying the stones can result in infections of the lacrimal canaliculus, and pathogen identification is important for proper diagnosis. We report a case of successful pathogen detection with metagenomic analysis in a patient with lacrimal stones.

Methods: The institutional review board approved the study. Clinical samples of the lacrimal stones and discharge were obtained and transported to the laboratory for microbiologic analysis using an anaerobic transport medium. The shotgun sequencing library was prepared from the extracted DNA from resected samples. We then performed 150-base pair single-end metagenomic shotgun sequencing using a MiSeq platform (Illumina), and human genome sequences were subtracted. The resulting sequences were subjected to a MEGABLAST search against the GenBank nucleotide and Whole Genome Shotgun (WGS) databases followed by taxonomic classification using MEGAN5.

Results: Sample culturing identified *Fusobacterium nucleatum*, *Streptococcus milleri*, and *Prevotella melaninogenica* in the lacrimal stones; *S. milleri* was detected in the discharge. However, metagenomic analysis detected 698,597 bacterial reads, with no fungal or viral reads. The bacterial loads found in the lacrimal stones were as follows: *Prevotella* 62.8%, *Parvimonas* 8.9%, *Fusobacterium* 9.0%, and *Actinomyces* genus 3.8%. The bacterial loads in the discharge were *Prevotella* 83.0%, *Parvimonas* 7.9%, *Fusobacterium* 2.7%, and *Actinomyces* genus 0%.

Conclusions: Mixed bacterial infections can develop in the lacrimal canaliculus. In the current patient *Prevotella*, *Parvimonas*, *Fusobacterium*, and *Actinomyces* genus were identified in the lacrimal canaliculus.

Monochromatic LEDs Modulate Mucin Expression in Human Corneal Epithelial Cells

First Author: Tsan-Chi **CHEN**

Co-Author(s): Shu-Wen **CHANG**

Purpose: To explore whether monochromatic light-emitting diodes (LEDs) interfere with mucin expression in human corneal epithelial cells (HCEs).

Methods: HCEs in 10% fetal bovine serum (FBS) containing DMEM/F12 were exposed separately to ultraviolet (UV) LED (360 nm), violet LED (420 nm), blue LED (470 nm), green LED (530 nm), amber LED (590 nm), deep red (DR) LED (660 nm), and far red (FR) LED (740 nm) by periodic exposures (up to 2 days) or continuous exposures at final doses of 10 J/cm² and 20 J/cm². Cell viability was analyzed by CCK-8 cell proliferation assay. Expression of Muc1, Muc4, and Muc16 were analyzed by immunoblotting. Secretory Muc5AC was determined by dot blotting.

Results: Except periodic exposures to UV LED and violet LED at 20 J/cm² causing significant suppression of HCE cell growth and endogenous Muc1 expression, continuous exposures and other periodic exposures did not interfere with HCE cell growth and protein expressions of Muc1, Muc4, and Muc16 up to 20 J/cm². Secretory Muc5AC was slightly suppressed after continuous exposure to UV LED at 20 J/cm² but significantly increased after periodic exposures to both DR LED and FR LED.

Conclusions: Monochromatic LEDs might regulate the ocular surface environment via changing of surface Muc1 and secretory Muc5AC in human corneal epithelial cells.

Outcome of Pterygium Surgery by Reverse Stripping With Elaborate Subpterygium Tenectomy With Conjunctival Autograft Without the Use of Perioperative Antimetabolites in an Eastern Part of Rural India

First Author: Khevna **PATEL**

Co-Author(s): Rakesh **KUMAR**, Debtanu **MUKHERJEE**, Debdas **MUKHOPADHYAY**

Purpose: To study the outcome, complications, and recurrence rate after pterygium surgery by reverse stripping with conjunctival autograft without the use of perioperative antimetabolites in an eastern part of rural India.

Methods: This was a retrospective cohort study. A total of 168 patients (198 eyes) with primary pterygia were included in the study who underwent reverse stripping technique with conjunctival limbal autograft without the use of perioperative antimetabolites and secured by 8-0 vicryl sutures. Demographic data was collected.

A detailed history, visual acuity (pre and post), refractive status (pre and post), duration of outdoor exposure, cosmetic acceptance, and recurrence rate were recorded. All patients had follow-up of at least 6 months.

Results: There were a total of 198 eyes of 168 patients. Female patients presented more frequently (73%). Maximum incidence was from 41-60 years. Outdoor workers were found to be more prone (68%). With this technique, recurrence rate was only 1%. Complications were Tenon cyst in 1 case and grittiness in 19. Resultant corneal opacities (22) were only nebular in nature. No patient had any damage to the medial rectus muscle.

Conclusions: We found reverse stripping with conjunctival autograft without the use of perioperative antimetabolites was very effective. This method showed negligible recurrence and good cosmetic outcome. The rural female population was found to be cosmetically concerned. Possible complications of the use of antimetabolites during surgery and disposal of the residue after surgery were avoided.

Predisposing Factors and Clinical Characteristics of Severe Infectious Keratitis at a Tertiary Referral Center in Bangkok, Thailand

First Author: Jirat **NIMWORAPHAN**

Co-Author(s): Varintorn **CHUCKPAIWONG**, Passara **JONGKHAJORNPOONG**, Kaewalin **LEKHANONT**

Purpose: To study risk factors and characteristics of severe infectious keratitis in a tertiary care center in Thailand.

Methods: A retrospective chart review of all admitted patients diagnosed with infectious keratitis was done from January 2010 to December 2014. Demographics, clinical history, ocular findings, KOH and gram stain, and culture results from corneal scraping were reviewed and analyzed.

Results: A total of 116 eyes with severe infectious keratitis was recruited. The mean age was 54.10 (range, 2-91 years) and male:female ratio was 1.11. Major predisposing factors included history of ocular trauma (31.90%), previous ocular surgery (31.03%), and ocular surface diseases (29.31%). Bacterial keratitis (59.48%) showed the most prevalence followed by fungal keratitis (34.48%) and *Pythium insidiosum* (4.31%). Among identified bacteria, *Pseudomonas aeruginosa* (34.48%) was the most common organism followed by *Staphylococcus spp.* (5.17%) and *Propionibacterium acnes* (5.17%). Of all identified fungi, *Fusarium spp.* (6.03%) was the most common organism followed by *Aspergillus spp.* (5.17%), *Lasiodiplodia theobormae* (1.72%), and *Botryosphaeria spp.* (1.72%). By using stepwise multivariate analysis, the presence

of endothelial plaque and satellite lesions were significantly higher in fungal infection with the odds ratio (OR) of 10.21 [95% confidence interval (CI), 3.11-33.53] and 4.47 (95% CI, 1.21-16.57) compared to bacterial infection. Corneal melting or perforation was significantly lower in fungal infection with the OR of 0.20 (95% CI, 0.06-0.68).

Conclusions: Ocular trauma was the most common predisposing factor for severe infectious keratitis. Endothelial plaque was the most important finding associated with severe fungal keratitis, although corneal melting was the only significant sign related to severe bacterial infection.

Prognostic Factors for Corneal Graft Survival: A Comparison Between Penetrating Keratoplasty and Endothelial Keratoplasty

First Author: Nichaboon **CHOTKAJORNKIAT**

Co-Author(s): Varintorn **CHUCKPAIWONG**

Purpose: To compare the survival rate and possible prognostic factors for graft failure after penetrating keratoplasty (PKP) and Descemet stripping automated endothelial keratoplasty (DSAEK).

Methods: A retrospective cohort study was conducted. We reviewed 104 patients who underwent PKP and DSAEK surgery from January 2007 to December 2015. Demographic data, preoperative, intraoperative, and donor risk factors were subjected to Kaplan-Meier survival analysis, univariate analysis, and multivariate analysis by Cox proportional hazards regression modeling. The primary outcome was 5-year survival rate. The secondary outcome was prognostic factors for graft failure.

Results: The mean follow-up period was 3.9 years for the PKP group and 3.2 years for the DSAEK group. The main indications for surgery were pseudophakic bullous keratopathy (23.8%) and corneal scar (13.4%) for the PKP group, Fuchs endothelial dystrophy with corneal decompensation (45.8%), and pseudophakic bullous keratopathy (31.9%) for the DSAEK group. Kaplan-Meier survival rates for PKP were 97.4%, 91.7%, and 59.8% while the survival rates for DSAEK were 100.0%, 100.0%, and 75.0% at 1, 2, and 5 years, respectively. Endothelial rejection and corneal decompensation accounted for graft failure in 50.5% of PKP and 15.3% of DSAEK.

Conclusions: The DSAEK group had higher survival rates compared to the PKP group in long-term outcomes for optical indication. Endothelial rejection and corneal decompensation were the major prognostic factors for graft failure.

Prospective Analysis of Association of Eye Rubbing and MMP9 Positivity in Patients With Newly Diagnosed Keratoconus Presenting for Refractive Surgery

First Author: Sujatha **MOHAN**

Co-Author(s): Mohan **RAJAN**, Mugundhan **RAJARAJAN**

Purpose: To investigate association of eye rubbing and expression of MMP9 in the tear film of newly diagnosed keratoconus as potential risk factors for keratoconus.

Methods: This was a prospective interventional case control study comparing 60 newly diagnosed keratoconus patients with 60 nonkeratoconus patients who had also come for refractive surgery. For everyone a meticulous history and clinical examination including best corrected visual acuity (BCVA), retinoscopy, slit lamp biomicroscopy, MMP9 estimation with Inflamm package insert, topography, and Pentacam were done.

Results: The sample of 60 subjects with keratoconus included 22 males and 38 females, with a mean age of 22 (range, 12 to 36). The control sample of 60 nonkeratoconic subjects comprised 26 males and 34 females, for whom the mean age was 20 years (range, 18 to 30 years). The eye rubbing rate was significantly higher in the keratoconus group versus the control nonkeratoconus group [76.6% (46/60) versus 46.6% (28/60)]. The history of atopy was more in keratoconus subjects [73.3% (44/60)]. MMP9 was found to be positive in 75% (45/60) of keratoconus patients. Patients having inflammatory markers positive in tear film were put on appropriate anti-inflammatory therapy.

Conclusions: The noninvasive way of collecting tears makes it an optimal biological fluid to study with minimal discomfort to the patient. Identification of inflammatory markers, therefore, has paramount importance in keratoconus patients, so that effective intervention can be done to improve the quality of life of keratoconus patients in the coming years.

Role of Tacrolimus in Management of Atopic Keratoconjunctivitis

First Author: Benita **JAYACHANDRAN**

Co-Author(s): Sivaraj **GOWTHAM**, Hannah **RANJEE WILLIAMS**, Elfride **SANJANA**

Purpose: To describe a rare and classical presentation of atopic keratoconjunctivitis secondary to atopy that responded well to tacrolimus skin ointment.

Methods: A 30-year-old man who was a known case of atopic dermatitis presented with diminished vision in both eyes for 15 days which was sudden in onset, progressive, associated with redness, pain, photophobia, and burning sensation in both eyes.

Ocular examination was done and he was diagnosed as a case of atopic keratoconjunctivitis. He was started on treatment with a combination of moxifloxacin and loteprednol eye drops 0.5% 4 times a day, olopatadine eye drops (an antihistamine eye drop) 2 times a day, Refresh Tears eye drops (a tear substitute) every 2nd hourly, and tacrolimus eye ointment 2 times a day.

Results: Over a period of 1 week the patient had resolution of symptoms, decrease in size of lesion, and resolution of punctate epithelial erosions.

Conclusions: Tacrolimus is an immunosuppressive macrolide, which is an effective and reasonable alternative to cyclosporine and topical steroids. Its emerging role in the management of refractory chronic allergic eye disease should be further elucidated.

Short-Wavelength Monochromatic LED Enhanced Tight Junction Formation in Human Corneal Epithelial Cells

First Author: Shu-Wen **CHANG**

Co-Author(s): Tsan-Chi **CHEN**

Purpose: To explore whether exposure to monochromatic light-emitting diodes (LEDs) affects the tight junction (T-J) formation in human corneal epithelial cells (HCEs).

Methods: HCEs were cultivated in DMEM/F12 with 10% fetal bovine serum (FBS) and exposed to ultraviolet (UV) LED (360 nm), violet LED (420 nm), blue LED (470 nm), green LED (530 nm), amber LED (590 nm), deep red (DR) LED (660 nm), and far red (FR) LED (740 nm) at 10 J/cm²/day for up to 2 days, respectively. Cell viability was analyzed by CCK-8 cell proliferation assay. Expression and distribution of endogenous ZO-1 in HCEs were analyzed by immunoblotting and immunofluorescent staining.

Results: There was no significant difference in HCE cell viability following 1-day exposure to both UV LED and violet LED. However, 2-day exposure to UV LED significantly suppressed HCE cell viability. In contrast, 2-day exposure to green LED, amber LED, DR LED, and FR LED did not interfere with HCE cell viability. Interestingly, 1-day exposure to UV LED, violet LED, and blue LED promoted the T-J formation but did not alter protein expression of endogenous ZO-1. However, 2-day exposure to UV LED significantly reduced protein expression of endogenous ZO-1. There was no alteration in both T-J formation and endogenous ZO-1 protein expression following 2-day exposure to green LED, amber LED, DR LED, and FR LED.

Conclusions: Nonlethal exposure of short-wavelength monochromatic LEDs might contribute to the T-J formation in human corneal epithelial cells.

Subconjunctival Hemorrhage After the Onset of Dermatologic Vasculature Diseases

First Author: Ming-Hwei **TSAI**

Co-Author(s): Hung-Chi **CHEN**, Chia-Yi **LEE**

Purpose: To evaluate the relationship between subconjunctival hemorrhage (SCH) and dermatologic vasculature diseases.

Methods: This retrospective cohort study used data from the National Health Insurance Research Database (NHIRD) for the period from 2009 to 2013. A total of 871 patients diagnosed with dermatologic vasculature diseases were enrolled in the study group while another 3486 individuals who had not received a diagnosis of dermatologic vasculature diseases were selected as the control group matched for age and gender. The outcome was set as the diagnosis of SCH. Multivariate Cox regression analysis was performed to estimate the adjusted hazard ratio (aHR).

Results: The gross flowchart of patient selection is shown in Figure 1. The age, gender, and degree of urbanization were identical between the study group and the control group due to the matching. The Cox proportional regression was conducted and the results are shown in Table 1. There were 17 patients in the study group with SCH while another 22 patients in the control group were diagnosed with SCH; the result was statistically significant ($P = 0.04$) and the aHR was 2.34. No significant relationship between subconjunctival hemorrhage and diseases in Charlson comorbidity index, corneal diseases, cataract, glaucoma, or age-related macular degeneration were observed ($P > 0.05$).

Conclusions: In conclusion, the presence of dermatologic vasculature diseases contributes to the development of SCH. Further study should be conducted to evaluate the relationship between each dermatologic vasculature disease and SCH.

Successful Management of Subperiosteal Orbital Abscess With Exposure Keratitis in a Child: A Case Report

First Author: Adisti **LUKMAN**

Co-Author(s): Julie **BARLIANA**, Lukman **EDWAR**

Purpose: Subperiosteal orbital abscess (SPOA) with visual compromising condition in children is an emergency that needs prompt management. The aim of this study was to demonstrate successful treatment of an acute SPOA with exposure keratitis in a child.

Methods: An 18-month-old boy presented with severe proptosis of the left eye and forehead protrusion since 4 days before admission. The condition was worsened by coexistence of large exposure keratitis due to wide lagophthalmos. Orbital computed tomography (CT) scan revealed dense mass with contrast

enhancement in subperiosteal space of intraconal orbital at superomedial area extending to medial and left frontal region; all paranasal sinuses were clear. Initial intravenous antibiotic was given under close monitoring for 72 hours. Immediate surgical drainage was performed after the initial treatment showed no response.

Results: Our patient demonstrated a remarkable improvement after surgery. The abscess was drained thoroughly via drainage tube, whereas the left eye proptosis and forehead protrusion disappeared entirely at 1-month follow-up. Keratitis exposure also healed completely, leaving only a sheer scar on the inferior cornea without compromising the visual axis.

Conclusions: Subperiosteal orbital abscess is known as a condition with rapid progression and capability of cranial extension. The treatment goals are to eradicate the infection, save the visual function, and avoid dreadful complications. In our case, intravenous antibiotics still remain the first choice of therapy. However, if the initial approach fails, the critical decision to alter the management to surgical procedure should be made at once.

Superficial Keratectomy for Gelatinous Drop-Like Corneal Dystrophy in a Developing Country

First Author: Bijaya **BHUSAL**

Co-Author(s): Purushottam **JOSHI**

Purpose: To study the effectiveness of manual superficial keratectomy for the management of gelatinous drop-like dystrophy (GDLD) in 3 patients presenting to a remote eye hospital in a developing country.

Methods: Three patients were clinically diagnosed as GDLD by a corneal surgeon. All 3 were aged below 25 years and had photophobia and progressive loss of vision. Corneal lesions were typically bilateral white nodular deposits beneath the epithelium. Two of them were siblings and the third was an isolated case of GDLD. The first case had undergone penetrating keratoplasty in both eyes previously and had recurrence bilaterally. All 3 denied keratoplasty as they could not come for regular follow-ups. They underwent unilateral superficial keratectomy with bandage contact lens by a single surgeon. Patients were examined postoperatively on day 1, day 3, and after 6 weeks.

Results: All 3 patients achieved better vision in the operated eyes after 6 weeks. Best corrected visual acuity improved from counting fingers to 6/24, 6/60 to 6/12, and 1/60 to 6/18, respectively, with some residual opacity and haze. All 3 had decreased ocular symptoms.

Conclusions: Manual superficial keratectomy is a

safe, easy, and effective treatment option for patients with GDLD presenting to a remote eye hospital in a developing country where patient compliance and follow-ups are a real concern after keratoplasty.

The Effect of Breastfeeding on Post Photorefractive Keratectomy Results: A Matched-Cohort Study

First Author: Alireza **ESLAMPOOR**

Co-Author(s): Siamak **ZAREI-GHANAVATI**

Purpose: To evaluate the effects of breastfeeding on post-photorefractive keratectomy (PRK) results.

Methods: Retrospective matched-cohort study. Twelve women (23 eyes) who underwent PRK within the past 3 years while they were still breastfeeding and continued it for a few months (breastfeeding group, B) and 12 women (23 eyes) who were matched by age, diopters (D), and operation data (nonbreastfeeding group, NB) were covered in the study. Post-PRK results and complications were compared between the 2 groups. T test, generalized estimating equation, Fisher exact, and 2χ tests were used for comparison of data. P value less than 0.05 was considered statistically significant.

Results: The average breastfeeding period before and after surgery in B were 11.25 ± 4.60 and 8.25 ± 4.50 months. Use of mitomycin C was 58.3% and 75.0%; 0.96 ± 0.09 , 0.97 ± 0.05 ; best corrected visual acuity (BCVA) before and after surgery was 1.0; and the efficacy indices were 96.97 and 97.3. After surgery, respectively, in B and NB, mild dry eye was seen in 58.3% and 66.7% of cases; spherical equivalent (SE) was 0.35 ± 0.60 and 0.28 ± 0.60 D ($P = 0.157$) ($P = 0.82$); vertical trefoil (μm) was 0.019 ± 0.101 and 0.089 ± 0.127 ($P = 0.02$); minimal corneal thickness (μm) was 457.72 ± 46.78 and 434.54 ± 101.97 ($P = 0.25$); the best anterior fit sphere (D) was 42.05 ± 1.104 and 40.87 ± 0.986 ($P = 0.00$); posterior (D) was 53.06 ± 1.932 and 51.90 ± 1.738 ($P = 0.03$); cylindrical equivalent in corneal topography (D) was 0.91 ± 0.414 and 0.88 ± 0.434 ($P = 0.01$). Ectasia, corneal haze, and myopic regression were not seen.

Conclusions: This study was performed for the first time; moreover, 3 years after PRK, the results did not show adverse effects of breastfeeding but continuing the study with more cases is required.

The Potential of Using Different Forms of Human Platelet Lysate in the Treatment of Ocular Surface Problems

First Author: Chien-Jung **HUANG**

Co-Author(s): Wei-Li **CHEN**

Purpose: To evaluate whether lyophilized human platelet lysate (HPL) powder can preserve the growth factor concentrations and epitheliotropic properties of liquid HPL and potentially be used as a clinically

friendly treatment option.

Methods: Two commercialized liquid HPLs were obtained and converted to lyophilized powder. After redissolution, lyophilized powder HPLs were compared with liquid HPLs, human peripheral serum (HPS), and fetal bovine serum (FBS). Human corneal epithelial cell line was incubated with various concentrations of blood derivatives in liquid and redissolved powder forms and evaluated for cell migration, proliferation with scratch-induced directional wounding, and MTS assays. Cell differentiation was examined by inverted microscopy and transepithelial electrical resistance (TEER). Sprague-Dawley rats were used to evaluate in vivo corneal epithelial wound healing after debridement and topical application of liquid and redissolved powder HPLs at 2-hour intervals for 48 hours.

Results: The concentrations of growth factor were similar in both groups ($P > 0.05$). In vitro experiments on cell migration, proliferation, and differentiation demonstrated no significant difference between the liquid form and the redissolved lyophilized powder form of different blood derivatives ($P > 0.05$). In vivo corneal wound healing assay in rat corneas also demonstrated similar results.

Conclusions: Both commercialized HPLs, no matter in dry form or cryoprecipitated forms, showed comparable corneal epitheliotropic abilities and wound healing rates compared to HPS and FBS in both in vivo and in vitro studies. Our results may imply the potential of using a liquid or powder form of HPLs to replace HPS in the treatment of corneal epithelial healing problems.

The Use of Corneal Scrubbing Associated With Matrix Therapy in the Treatment of Chronic Ulcers

First Author: Sihem **LAZREG**

Co-Author(s): Christophe **BAUDOUIN**, Marc **LABETOULLE**

Purpose: To treat refractory chronic ulcers secondary to severe ocular surface diseases using corneal scrubbing and matrix therapy; in dermatology practice they use the same method in severe burns for skin healing, where the cutaneous scrubbing removes necrosed tissues and helps healthy tissues to progress faster.

Methods: Retrospective study on chronic corneal ulcers evolving for several weeks without responding to conventional treatments. All the corneal ulcers were scrubbed with cotton buds. Some of them received matrix therapy in the dose regimen of a drop every other day until corneal healing and preservative-free lubricants 3 times a day. For the painful cases we performed bandage contact lenses; a few patients

received the bandage contact lenses without matrix therapy. Ocular examination was performed at day 0 (D0), D3, D7, D15, and D30, with slit lamp examination, fluorescein coloration, and measurement of the size of the ulcers.

Results: Eighteen patients were included and divided into 3 groups: the first group with corneal scrubbing, matrix therapy, lubricant, and contact lenses; the second group with corneal scrubbing, matrix therapy, and lubricant without contact lenses; the third group with corneal scrubbing, lubricant, and contact lenses. All the ulcers were healed at D30. In the first and second group corneal healing was faster by 7 to 10 days. No complications were reported despite 1 case of descemetocoele at D3, with a good outcome at D15.

Conclusions: Corneal scrubbing may accelerate corneal healing and helps matrix therapy to be more efficient.

Topical Steroids in Microbial Keratitis

First Author: Georgia CLEARY

Co-Author(s): Mark DANIELL, Shivesh VARMA

Purpose: To evaluate the effect of topical steroids on the clinical course of microbial keratitis (MK) treated in an outpatient setting in a tertiary hospital population.

Methods: In this retrospective study patients diagnosed with MK from May to October 2016 were identified. All were treated with intensive topical ofloxacin as per hospital protocol; topical steroid use after 48 hours was discretionary. Best-corrected visual acuity (BCVA), infiltrate, and epithelial defect size were recorded at each visit. Timing of topical steroid commencement, duration of follow-up, and number of visits were recorded.

Results: A total of 102 patients with MK were included; 52 received topical steroids. Steroid recipients had poorer initial BCVA [0.35 logarithm of the minimum angle of resolution (logMAR) vs 0.14 logMAR, $P = 0.02$], larger infiltrates (1.0 mm^2 vs 0.5 mm^2 , $P = 0.03$), and larger epithelial defects (1.3 mm^2 vs 0.4 mm^2 , $P = 0.01$). At resolution, steroid receivers had longer follow-up (23.5 days vs 12.7 days, $P < 0.01$) and more outpatient visits (3.7 vs 2.4, $P < 0.01$). Final BCVA was equivalent in both groups and no eyes lost vision. Steroids were started at day 2 or 3 in 23 patients ("early") and were started at day 4 or later in 29 patients ("late"). "Early" steroid therapy was associated with shorter follow-up (19.3 days vs 26.8 days, $P = 0.05$) and fewer outpatient visits (3.1 vs 4.1, $P < 0.01$) compared with "late."

Conclusions: Topical steroid treatment appeared to be reserved for eyes with more severe MK, possibly accounting for their longer follow-up compared with nonsteroid patients. Earlier initiation of steroids resulted in a shorter duration of disease and fewer outpatient visits compared with late treatment. Topical

steroids in MK were safe.

Why I Prefer PDEK (Pre-Descemet Endothelial Keratoplasty)? Advantages Over DSEK/DMEK/PK

First Author: Lional Raj PONNIAH

Co-Author(s): Heber ANANDAN, Srinivasan RAO, S REKHA, Maramganty VAMSHIDHAR

Purpose: To evaluate the outcomes of pre-Descemet endothelial keratoplasty (PDEK) in varied endothelial dysfunctions and to compare with conventional procedures of penetrating keratoplasty (PK), Descemet membrane endothelial keratoplasty (DMEK), and Descemet stripping endothelial keratoplasty (DSEK).

Methods: Cases of varied endothelial dysfunctions such as Fuchs dystrophy, bullous keratopathies, failed grafts, iridocorneal endothelial (ICE) and pseudoexfoliation syndromes, post hydrops, and post trabeculectomy glaucoma were enrolled. With endothelial side up and a 26-gauge needle attached to 5-mL air-filled syringe, a pneumatic dissection of the pre-Descemet layer with a single bubble was created and stained with Trypan blue. A 7.5-8 mm donor tissue (PDEK graft) was excised and implanted through Mediceal (MIL) injector after conventional Descemet stripping. Graft was then unrolled and attached to the recipient cornea with air injection.

Results: There were 48 eyes with a mean follow-up of 6 months \pm 21 days. Of these, 39 (81.25%) achieved postoperative vision of 20/60 or better ($P < 0.0001$). PDEK graft was possible in donors of any age versus above 40 years with DMEK (pneumatic separation was better). Endothelial preservation in PDEK with pneumatic dissection (mean cell loss was 22.13%) was better than DMEK (manual dissection). Corneal thickness of PDEK ($565.97 \pm 44.79 \mu\text{m}$) was closer to normal versus DSAEK ($618 \mu\text{m}$). PDEK had better pain and recovery scores than PK (7-10 days in PDEK vs 6-12 months in PK). There were no suture emergent adverse events.

Conclusions: Pneumatic dissection of PDEK graft was technically easier, better in endothelial preservation, and could be done in donors of any age when compared to manual dissection of DMEK and DSAEK; it was free of suture-related issues unlike PK.

Glaucoma

A Case of Subarachnoid Hemorrhage Presenting as Bilateral Acute Angle-Closure Glaucoma

First Author: Shih-Chun **CHAO**

Co-Author(s): Michael **CHOU**

Purpose: To report a case of subarachnoid hemorrhage presenting as bilateral acute angle-closure glaucoma (AACG).

Methods: Case report.

Results: A 64 year-old male with a history of hypertension came to our ophthalmology department complaining of sudden onset bilateral blurred vision accompanied with dizziness and vertigo. Initial examination revealed counting fingers in both eyes; intraocular pressure (IOP) via pneumatic tonometry revealed 51.2 and 50.5 mm Hg in the right and left eyes, respectively. Ocular exam revealed edematous cornea with shallow anterior chamber and mid-dilated sluggish pupils of both eyes. Acute angle-closure glaucoma was diagnosed. Intravenous mannitol was prescribed for IOP control. Due to the patient's systemic symptoms and rarity of bilateral acute angle-closure glaucoma, we suggested the patient visit the emergency department (ER) or neurologist for further tests. The patient eventually went to the ER at our suggestion, where neurologic imaging was arranged to rule out brain infarction. Noncontact brain computed tomography (CT) revealed subarachnoid hemorrhage over the left brain. He was admitted to the neurosurgical care unit where frontotemporal craniotomy was arranged.

Conclusions: Bilateral acute angle-closure glaucoma is a rare condition that can be classified as secondary angle-closure glaucoma, as it is usually induced by an external factor. There have only been a handful of published reports on bilateral AACG. Our patient presented with bilateral AACG, which led to the incidental finding of intracranial hemorrhage. Such cases have not been published in the previous literature, and the relationship between intracranial hemorrhage and bilateral AACG is still unknown. Further investigation of such relationship and its mechanism is warranted.

Anterior Chamber Angle After Phacoemulsification in Primary Open Angle Glaucoma and Primary Angle Closure Glaucoma

First Author: Widya **ARTINI**

Purpose: To compare anterior segment angle and intraocular pressure changes after phacoemulsification

and intraocular lens (IOL) between cataract with primary angle closure glaucoma (PACG) and cataract with primary open angle glaucoma (POAG) and to determine the correlation between IOP reduction with different parameters.

Methods: This was a parallel interventional design study. A total of 29 eyes underwent phacoemulsification plus IOL in PACG and 29 eyes in POAG subjects. Intraocular pressure and anterior segment optical coherence tomography examination (AS-OCT) were performed before and after phacoemulsification plus IOL. Angle parameters [the angle opening distance (AOD) and trabecular-iris space area (TISA)] were measured at a distance of 500 and 750 μ m from the scleral spur on the nasal and temporal quadrants. The changes were calculated based on the difference between the 2 groups.

Results: There was a reduction of IOP and an increase in ACD; the value of the angle parameters after phacoemulsification plus IOL in PACG and POAG eyes were significantly different. The correlation in reduction of IOP and the changes of the angle in PACG eyes was significantly different but not in POAG eyes.

Conclusions: All angle parameters were greater with moderate correlation to IOP reduction after phacoemulsification plus IOL in PACG eyes but not in POAG eyes.

Association Between Body Mass Index and Retinal Nerve Fiber Layer, Ganglion Cell Complex, and Optic Nerve Head Vascularity

First Author: Bonnie **CHOY**

Co-Author(s): Jimmy **LAI**, Michael **NI**, Ian **WONG**

Purpose: To evaluate if obesity affects peripapillary retinal nerve fiber layer (RNFL) and ganglion cell complex (GCC) measured by optical coherence tomography (OCT) and vascular density and flow measured by optical coherence tomography angiography (OCTA).

Methods: The subjects were recruited from a family cohort for eye screening. OCT was performed to assess the optic disc, peripapillary RNFL thickness (average, superior, and inferior quadrants), and GCC [average, superior, and inferior quadrants, global loss volume (GLV), and focal loss volume (FLV)]. OCTA was performed to assess the flow area, blood flow of the whole image, inside the disc, peripapillary, nasal, inferonasal, inferotemporal, superotemporal, superonasal, and temporal quadrants. The subjects were divided into 4 groups according to their body mass index (BMI), namely <18.5 (underweight), 18.5 to <25 (normal), 25 to <30 (overweight), and \geq 30 (obese) according to World Health Organization classification.

Results: A total of 494 subjects were included. The

peripapillary RNFL, average, superior, and inferior quadrants were consistently thinner in the obese group whose BMI was >30, compared to the group with normal BMI. The GCC on average, superior, and inferior quadrants were similar in all groups. However, the FLV and GLV were higher among the obese subjects. The vascular densities at the optic disc were lower as a whole; in the peripapillary region, nasally, and inferotemporally were lower in obese subjects.

Conclusions: Obese subjects had a thinner peripapillary RNFL, higher loss of volume, and diminished ocular blood flow at the optic nerve head. Obesity might be considered as a risk factor for glaucoma.

Bevacizumab Modulates the Expression of Matrix Metalloproteinase 2 in Cultivated Scleral Fibroblasts: Potential Adjuvant for Trabeculectomy in Neovascular Glaucoma

First Author: Fu-Ching HUANG

Purpose: As diabetic-associated neovascular glaucoma has low success rates of trabeculectomy, preoperative intravitreal injection or subconjunctival application of bevacizumab is used for adjuvant therapy. It is unknown, however, which mechanism is involved after applying the anti-vascular endothelial growth factor (anti-VEGF) on human sclera. Our aim was to investigate the anti-VEGF agent effect on scleral fibroblasts (SF) in vitro.

Methods: Passage 2 to 6 of SF cultivated from human corneoscleral buttons were exposed to low glucose (5.6 mM) or high glucose (30 mM) with or without insulin 10^{-7} M for 7 days and bevacizumab 0.5 mg/mL was added. Conditioned medium and cellular lysate were collected. Gelatine zymography was used to evaluate the expression of matrix metalloproteinase 2 (MMP2). Western blotting was used to assay the expression of tissue inhibitor of metalloproteinases 2 (TIMP2).

Results: As adding bevacizumab, cellular morphology changed in SF. No difference of proMMP2 expression was noted between the low glucose and high glucose groups. Insulin induced overexpression of proMMP2. Bevacizumab decreased the expression of proMMP2 in all groups with or without insulin. Insulin-induced overexpression of active MMP2 was inhibited significantly by bevacizumab because of overexpression of TIMP2.

Conclusions: Our study demonstrated that scleral fibroblast-associated extracellular matrix was affected by anti-VEGF. Bevacizumab modulated the expression of active and latent forms of MMP2 no matter how much glucose or insulin was present. For diabetic patients with neovascular glaucoma, bevacizumab may play a role in trabeculectomy surgery.

Comparison of Corneal Endothelial Cell Density in Trabeculectomy With and Without 2% Hydroxypropyl Methylcellulose

First Author: Fitri WISNUWARDANI

Co-Author(s): Muhammad Rinaldi DAHLAN, Elsa GUSTIANTY, Andika PRAHASTA, Maula RIFADA

Purpose: Trabeculectomy surgery can cause endothelial cell loss. Use of viscoelastic in glaucoma surgical procedures have been tried in several studies because it can stop the bleeding and protect tissues from damage. This study will assess the differences in corneal endothelial cell density in trabeculectomy with and without administration of 2% hydroxypropyl methylcellulose (2% HPMC).

Methods: This was a randomized controlled clinical trial with single-blind masking. Subjects were taken consecutively and randomized, then divided into 2 groups (conventional trabeculectomy and trabeculectomy with administration of 2% HPMC). Patients were examined using specular microscope (Topcon SP 3000p) before surgery and 1 month after surgery.

Results: The average density of endothelial cells after surgery in the conventional trabeculectomy group (2279.6 ± 373.4) was significantly less than the trabeculectomy group with 2% HPMC (2459.7 ± 438.7) ($P = 0.048$). There was no significant difference between the average decrease in the density of endothelial cells in the conventional trabeculectomy group (102.0 ± 290.2) and trabeculectomy group with 2% HPMC (43.7 ± 315.3) ($P = 0.444$).

Conclusions: Clinically there was a smaller decrease of endothelial cell density in trabeculectomy with 2% HPMC than conventional trabeculectomy, but this was not statistically significant.

Comparison of Cytological Appearance of Ocular Surface in Glaucoma Patients After Using Nonpreservative Timolol Maleate 0.5%, Latanoprost 0.005%, and Timolol-Latanoprost Fixed Combination Eye Drops

First Author: Maretha AMRAYNI

Co-Author(s): Elsa GUSTIANTY, Susi HERIYATI, Andika PRAHASTA, Maula RIFADA

Purpose: The long-term use of topical antiglaucoma medications might cause ocular surface instability due to the active substance or preservative used. Impression cytology examination may reveal superficial epithelial cells on the conjunctiva and cornea, including goblet cells. Goblet cell density decrease is the most important parameter for evaluation of ocular surface disorders. This study aimed to understand ocular surface remodeling due to active substance of topical

antiglaucoma medication with impression cytology examination in patients before and 3 months after therapy.

Methods: This was a randomized controlled trial with single-blind masking. As many as 45 eyes from 31 patients were used as subjects and distributed into 3 groups based on antiglaucoma treatment, which were timolol maleate 0.5%, latanoprost 0.005%, and timolol-latanoprost fixed combination. All topical antiglaucoma medications in this study were preservative free.

Results: There were differences between the 3 groups in goblet cell density 3 months after therapy ($P = 0.030$). Goblet cell density in the timolol maleate group was lower than latanoprost ($P = 0.041$) and fixed combination ($P = 0.045$). There were no differences between the 3 groups in degrees of conjunctival epithelial metaplasia ($P = 0.706$) and corneal epithelial cell to cell contact ($P = 0.66$). However, the degree of conjunctival epithelial metaplasia was increased in the timolol maleate ($P = 0.008$) and fixed combination ($P = 0.046$) groups; most of the subjects had grade 1 metaplasia after 3 months of therapy.

Conclusions: Timolol maleate 0.5% caused lower goblet cell density after 3 months of therapy compared with latanoprost and fixed combination. There were no differences in the degrees of conjunctival epithelial metaplasia and corneal epithelial cell to cell contact among the 3 groups.

Comparison of Intraocular Pressure and Anterior Chamber Angle Changes Between Pilocarpine and Laser Peripheral Iridotomy

First Author: Ardiella YUNARD

Co-Author(s): Virna ASRORY, Joedo PRIHARTONO, Widya WIYOGO

Purpose: To compare intraocular pressure (IOP) and anterior chamber angle changes between pilocarpine and laser peripheral iridotomy (LPI) in primary angle closure.

Methods: This was a prospective clinical trial with a total 34 eyes of 29 patients with primary angle closure. Intraocular pressure and anterior segment optical coherence tomography were performed at 3 separate times: on the initial conditions, after 3-5 days of administration of topical pilocarpine 2%, and 1 week after LPI. The changes following pilocarpine were calculated based on the difference between the value of post-pilocarpine and initial, while the changes following LPI were the difference between the value of post-LPI and initial.

Results: The IOP reduction following pilocarpine was significant compared to LPI: 3.9 mm Hg (-32.5 to 0.20) versus 1.8 mm Hg (-33.5 to 2.30) ($P = 0.002$). Meanwhile, the increment of angle parameters

following LPI were significant compared to pilocarpine. The AOD750 increment of both nasal and temporal quadrants following LPI were significant compared to pilocarpine: 0.13 mm (-0.27 to 0.28) versus 0.05 mm (-0.35 to 0.29) ($P = 0.003$) and 0.12 mm (-0.10 to 0.34) versus 0.04 mm (-0.27 to 0.19) ($P = 0.002$), respectively. The TISA750 increment of both nasal and temporal quadrants following LPI were also significant compared to pilocarpine: 0.05 mm² (-0.06 to 0.20) versus 0.02 mm² (-0.12 to 0.13) ($P = 0.023$) and 0.04 mm² (-0.04 to 0.17) versus 0.01 mm² (-0.14 to 0.18) ($P = 0.012$), respectively.

Conclusions: Laser peripheral iridotomy widened the angle more than topical pilocarpine, but topical pilocarpine lowered the IOP more than LPI.

Comparison of Visual Field Tests in Glaucoma Patients With a Central Visual Field Defect

First Author: Hye-Young SHIN

Co-Author(s): Chan Kee PARK, Hae-Young Lopilly PARK

Purpose: To compare the 24-2 and 10-2 visual fields (VFs) and investigate the degree of discrepancy between the 2 tests in glaucomatous eyes with central VF defects.

Methods: In all, 99 eyes of 99 glaucoma patients who underwent both the 24-2 VF and 10-2 VF tests within 6 months were enrolled. Glaucomatous eyes involving a central VF defect were divided into 3 groups based on the average total deviation (TD) of 12 central points in the 24-2 VF test: group 1 (tercile with the lowest TD), group 2 (intermediate TD), and group 3 (highest TD). The TD difference was calculated by subtracting the average TD of the 10-2 VF test from the average TD of 12 central points in the 24-2 VF test. The absolute central TD difference in each quadrant was defined as the absolute value of the TD value obtained by subtracting the average TD of 4 central points in the 10-2 VF test from the innermost TD in the 24-2 VF test in each quadrant.

Results: The TD differences differed significantly between group 1 and groups 2 and 3. In the superonasal quadrant, the absolute central TD difference was significantly greater in group 2 than in group 3. In the superotemporal quadrant, the absolute central TD difference was significantly greater in group 1 than in groups 2 and 3.

Conclusions: Our results indicate that the results of VF tests for different VFs can be inconsistent, depending on the degree of central defects and the VF quadrant.

Corneal Changes After MicroPulse Laser Trabeculoplasty and Selective Laser Trabeculoplasty

First Author: Yoly **FONG**

Co-Author(s): Felix **LI**, Billy **WONG**, Alvin **YOUNG**

Purpose: To compare the changes in endothelial cell count and central corneal thickness (CCT) after a session of MicroPulse laser trabeculoplasty (MLT) and selective laser trabeculoplasty (SLT) for open angle glaucoma (OAG).

Methods: This prospective study compared the use of MLT and SLT in 40 eyes in 20 subjects with OAG. Subjects received MLT and SLT to 360 degrees of the trabecular meshwork. Endothelial cell count and CCT were measured at baseline and 1 week and 1 month after the procedure.

Results: The mean endothelial cell count decreased from 2484 ± 311 cells/mm² at baseline to 2380 ± 352 cells/mm² at 1 week but returned to baseline levels (2440 ± 380 /mm²) after SLT. There were no significant changes in endothelial cell count after MLT or CCT after MLT or SLT.

Conclusions: Transient reductions in endothelial cell count occur after SLT and return to baseline levels in 1 month. There are no significant corneal changes after MLT.

Differentiation of Brain Changes Between Clinical Stages of Glaucoma Using Diffusion Tensor Imaging

First Author: Yue **CHEN**

Co-Author(s): Kevin **CHAN**, Ian **CONNER**, Carlos **PARRA**, Vivek **TRIVEDI**

Purpose: To investigate the extent of transsynaptic brain changes across glaucoma severity using diffusion tensor imaging (DTI).

Methods: Sixteen early glaucoma (aged 62.4 ± 7.5 years), 21 advanced glaucoma (aged 64.4 ± 9.8 years), and 12 healthy control subjects (aged 64.2 ± 8.4 years) underwent DTI using 3-Tesla magnetic resonance imaging (MRI). Three regions of interests (ROIs) were drawn manually on the optic radiations (OR) of each hemisphere using color-encoded fractional anisotropy (FA) directionality map and diffusion tensor tractography as spatial reference. DTI-derived parameters [FA, mean diffusivity (MD), axial diffusivity (AD), and radial diffusivity (RD)] were extracted for each ROI and compared across groups using analysis of variance (ANOVA) and post-hoc multiple comparisons correction tests. Receiver operating characteristic (ROC) curves for each parameter were estimated for each subject group.

Results: Mean FA of OR was significantly lower

in advanced glaucoma (0.51 ± 0.05) than in early glaucoma (0.57 ± 0.03 , $P < 0.05$) and in healthy controls (0.58 ± 0.06 , $P < 0.05$). Mean MD and RD were significantly higher in advanced glaucoma ($0.88 \pm 0.05 \times 10^{-3}$ mm²/s, $0.61 \pm 0.06 \times 10^{-3}$ mm²/s) than in early glaucoma patients ($0.84 \pm 0.06 \times 10^{-3}$ mm²/s, $0.54 \pm 0.04 \times 10^{-3}$ mm²/s) and healthy controls ($0.82 \pm 0.06 \times 10^{-3}$ mm², $0.52 \pm 0.08 \times 10^{-3}$ mm²/s, $P < 0.05$ for both parameters). No significant DTI differences were observed between healthy controls and early glaucoma patients ($P > 0.05$). No distinct trend was observed for AD between groups ($P > 0.05$). The areas under ROC curves for early versus advanced glaucoma were 0.872 (FA), 0.708 (MD), 0.563 (AD), and 0.815 (RD), whereas those for healthy control versus early glaucoma were 0.583 (FA), 0.589 (MD), 0.551 (AD), and 0.620 (RD).

Conclusions: DTI may provide useful noninvasive markers for transsynaptic disease progression in glaucoma. Unlike AD, changes in FA, MD, and RD may be used to track glaucomatous brain damage.

Glaucoma in a Refractory Scleritis Patient Related to Granulomatosis With Polyangiitis

First Author: Fu-Ching **HUANG**

Purpose: To report the successful control of ocular hypertension in a refractory scleritis patient related to granulomatosis with polyangiitis (GPA) with pulse methylprednisolone and rituximab therapy.

Methods: Case report.

Results: A 63-year-old woman with GPA with multiorgan involvement presented with unilateral painful red eye. Anterior segment examination showed congested scleral vessels and peripheral corneal infiltrates without anterior chamber inflammation in her right eye. A diagnosis of scleritis was made. Over 18 months, the secondary glaucoma had not improved even under multiple antiglaucoma agents and corticosteroid treatment. Her systemic vasculitis had become more active, causing otitis media with effusion, vertigo, and lung involvement. She received an intravenous infusion of rituximab treatment. Intravenous pulse methylprednisolone 1 g for 3 days was also given. After rituximab infusion, all her systemic symptoms greatly improved. The scleritis was also resolved significantly and ocular hypertension was under control without surgical intervention.

Conclusions: Glaucoma is a common serious complication of immune-mediated ocular diseases. Not only the inflammatory disease, but also its treatment (corticosteroids) may contribute to the development of glaucoma. The new systemic therapeutic modalities offer an alternative to reduce and avoid complications of glaucoma.

Intraocular Hemorrhage Mimicking an Intraocular Mass Causing Angle-Closure Glaucoma in a Diabetic Patient

First Author: Aubhugn **LABIANO**

Co-Author(s): Rolando Enrique **DOMINGO**

Purpose: To report massive vitreous and subretinal hemorrhage causing acute angle-closure glaucoma and appearing like an intraocular mass on B-scan in a diabetic patient.

Methods: A 61-year-old diabetic male poorly compliant with medications presented with progressive blurring of vision of 1-month duration. On initial consult, visual acuity was hand movements and intraocular pressure was 15 mm Hg. Dilated ophthalmoscopy showed retinal detachment sparing the superior and temporal periphery. One week later, intraocular pressure was elevated at 48 mm Hg, gonioscopy showed closed angles, and ophthalmoscopy showed total choroidal detachment. B-scan ocular ultrasound demonstrated a choroidal mass with subretinal exudation. Considerations were choroidal melanoma, metastasis, and hemorrhage. Within the next 5 days, vision in the left eye deteriorated to no light perception. Choroidal tap was considered but was not carried out due to the possibility of tumor seeding into the orbit. Magnetic resonance imaging of the orbit was requested but was not done due to financial constraints. Enucleation of the left eye was eventually performed to address the diagnostic dilemma and to treat the painful blind eye.

Results: Gross examination of the enucleated globe revealed a pigmented mass occupying the entire vitreous cavity. Microscopically, there was total retinal detachment and massive subretinal hemorrhage. The iris was completely attached to the lens posteriorly. No tumor was seen.

Conclusions: Massive vitreous and subretinal hemorrhage occurring in the setting of poorly controlled diabetes can cause angle-closure glaucoma and appear like an intraocular tumor on B-scan. Enucleation is a diagnostic and treatment option.

Management of Steroid-Induced Glaucoma: A Less Invasive Approach

First Author: Kumar **RAVI**

Co-Author(s): Preeti **SHARMA**

Purpose: To report the surgical management of 2 patients referred for glaucoma filtering surgery for uncontrolled intraocular pressure (IOP) secondary to presumed posterior sub-Tenon (PST) depot steroid injection.

Methods: A 32-year-old, post renal transplant, Indian patient and an 18-year-old patient from Bangladesh presented with uncontrolled high IOP of 30 mm Hg

in both eyes and the left eye, respectively. Both the patients were given PST injections, respectively, for unknown etiology. On slit lamp examination a white deposit was noted superotemporally close to the limbus presumably as a result of depot steroid injection in all 3 eyes with high IOP. The rest of the anterior and posterior segments were within normal limits. Patients were evaluated in the retina and uvea departments but the reason for presumed posterior sub-Tenon depot injection remained unknown to the authors. As IOP was high even on maximum antiglaucoma medication, the decision to surgically remove the presumed depot steroid was made. Conjunctiva overlying depot was dissected and en bloc excision of depot was performed; conjunctiva and Tenon were approximated with vicryl sutures. Both the patients were evaluated postoperatively.

Results: After excision of depot steroid IOP reduced to normal levels below 20 mm Hg within a week. At 3 months' follow-up, the IOP in all 3 eyes was within normal limits off antiglaucoma drugs.

Conclusions: Surgical excision of depot steroid, wherever possible, should be considered as primary treatment in cases where IOP is not controlled despite maximum medical therapy in presumed steroid-induced glaucomas, before planning glaucoma filtering surgery.

New Surgical Technique of Combined Ahmed Glaucoma Valve Implantation With Trabeculectomy to Reduce Risk of Hypertensive Phase: "Double Flap Method"

First Author: Charudutt **KALAMKAR**

Co-Author(s): Amrita **MUKHERJEE**

Purpose: To present a new surgical technique, "double flap method," which would reduce the risk of Ahmed glaucoma valve (AGV) implantation related hypertensive phase (HP) in patients undergoing AGV FP7 model for refractory neovascular glaucoma (NVG).

Methods: Fourteen eyes of adult patients with refractory NVG underwent combined AGV implantation with trabeculectomy with releasable suture. Instead of using graft to cover the tube, partial thickness scleral flap was made. Trabeculectomy with releasable suture ensured intraocular pressure (IOP) control in initial 6 months. Use of releasable suture reduced the risk of shallow anterior chamber or hypotony due to overfiltration.

Results: None of the cases developed hypertensive phase in our series. Two cases (14.3%) developed hypotony which was successfully managed conservatively. IOP reduced significantly from preoperative levels ($P < 0.001$).

Conclusions: Use of the double flap method will reduce

the risk of hypertensive phase without increasing complications. Larger studies and longer follow-up periods are required to confirm our findings.

Nocturnal IOP Control: A Dilemma in POAG Management

First Author: Shahzad **SAEED**

Purpose: To study the intraocular pressure (IOP) lowering effects of different antiglaucoma medications in reducing nocturnal rise of IOP in patients with primary open angle glaucoma (POAG).

Methods: The patients (321 eyes of 164 patients) over a period of 2 years were divided into 3 groups according to the treatment regimen as follows: I) prostaglandin (173 eyes); II) prostaglandin plus beta blockers/carbonic anhydrase inhibitors (CAIs)/alpha agonists (45 eyes); III) beta blockers/CAIs/alpha agonists (66 eyes). Twenty-two patients did not follow up or were inconsistent in taking medication and were excluded. IOP (applanation tonometry) was taken at 14:00 and 02:00 once monthly for 2 years. Exclusion criteria were secondary glaucomas and surgically treated glaucomas.

Results: Contrary to previously published studies, there was no statistically significant difference in lowering nocturnal IOP in the different groups. However, nocturnal IOP showed fewer spikes in groups I and II: group I, IOP 2-3 mm more at night; group II, IOP 2-5 mm more at night; group III, IOP 3-7 mm more at night.

Conclusions: Nocturnal IOP rise causes glaucomatous damage in eyes whose IOP is within normal limits during the daytime. Previous studies claimed that prostaglandins reduce nocturnal rise and should be given at bedtime. In our study there was no statistically significant difference in all 3 groups. However, patients on prostaglandins had slightly lower IOP at night as compared to those who were not using prostaglandin analogues but this was statistically insignificant to give an edge to prostaglandins for effective lowering of nocturnal IOP as compared to other groups.

Optical Coherence Tomography Angiography in the Survey of Normal Tension Glaucoma and High Myopia

First Author: Shih-Chun **CHAO**

Co-Author(s): Chia-Yi **LEE**, Chin-Hsing **LIU**

Purpose: To evaluate the structural difference between normal tension glaucoma (NTG) and high myopia with the utilization of optical coherence tomography angiography (OCTA).

Methods: A prospective cross-sectional study was conducted and patients diagnosed with NTG and high myopia more than 6.00 diopters (D) were enrolled.

The exclusion criteria included (1) any previous ocular tumors, (2) history of eyeball rupture, (3) any ocular surgery history except intravitreal injection, and (4) initial best-corrected visual acuity (BCVA) worse than counting fingers. In addition, a group of patients without major ocular diseases were selected as the control group. The OCTA examination was performed 1 time for each patient while other examinations were also arranged and the above data recorded for analysis.

Results: There were 10 patients in the NTG group, 14 patients in the high myopia group, and 14 patients in the control group. The demography did not show a significant difference. The BCVA was significantly worse in the high myopia group while the NTG group had the worst visual field value. The peripapillary capillary density and vascular density of the deep retinal layer were significantly reduced in the NTG group when compared to the high myopia group and the control group. The vascular density of the superficial retinal layer was similar in the NTG group and the high myopia group.

Conclusions: In conclusion, OCTA can be applied to differentiate NTG and high myopia with a lesser vascular density of peripapillary and deep retinal regions in patients with NTG.

Optical Coherence Tomography Angiography of the Superficial Microvasculature in the Macular and Peripapillary Areas in Glaucomatous and Healthy Eyes

First Author: Henry **CHEN**

Purpose: To quantitatively evaluate the superficial microvasculature in the macular and peripapillary areas in glaucomatous and healthy eyes using optical coherence tomography angiography (OCT-A).

Methods: We enrolled 26 eyes of medically managed primary open-angle glaucoma patients and 27 eyes of healthy subjects in this prospective study. Measurements of OCT-A vessel density were acquired both in the macular and peripapillary areas. We compared vessel density values, the circumpapillary retinal nerve fiber layer (cpRNFL), the ganglion cell complex (GCC), and standard automated perimetry (SAP) parameters across study groups. Areas under the receiver operating characteristic (AUROC) curves were used to evaluate diagnostic accuracy. Quadratic regression models were used to determine the correlations between SAP severity and outcome measures.

Results: The whole image vessel density (wiVD) in glaucomatous eyes was lower than that in healthy eyes in the macular ($38.5\% \pm 2.2\%$ vs $43.2\% \pm 2.3\%$, $P < 0.001$) and peripapillary areas ($43.8\% \pm 5.7\%$ vs $53.3\% \pm 3.0\%$, $P < 0.001$). The circumpapillary vessel density

(cpVD) was also lower in glaucomatous eyes ($53.3\% \pm 7.0\%$ vs $61.5\% \pm 3.2\%$, $P < 0.001$). We found the AUROCs for discriminating between glaucomatous and healthy eyes were highest for cpRNFL (0.95) and GCC (0.95), followed by macular wVD (0.94), peripapillary wVD (0.93), and cpVD (0.89).

Conclusions: Medically managed glaucomatous eyes show sparser superficial microvasculature in the macular area than do healthy eyes. The measurement of the macular superficial vessel density had similar diagnostic accuracy to peripapillary RNFL and macular GCC thickness for differentiating between glaucomatous and healthy eyes.

Outcome of Glaucoma Drainage Device in Post-Penetrating Keratoplasty Glaucoma

First Author: Surishti RAJ

Co-Author(s): Gaurav GUPTA, Sushmita KAUSHIK, Surinder PANDAV

Purpose: To study the outcome of glaucoma drainage devices (GDD) in post-penetrating keratoplasty glaucoma (PPKG) and compare the efficacy of Ahmed glaucoma valve (AGV) with Aurolab aqueous drainage implant (AADI).

Methods: Retrospectively, data of 56 patients who underwent GDD for PPKG and had minimum follow-up of 6 months was analyzed and type of GDD used, intraocular pressure (IOP), best corrected visual acuity (BCVA), graft clarity, and complications were studied.

Results: Preoperatively, mean IOP was 27.80 ± 11.74 . A total of 76.78% were on ≥ 3 topical and 96.43% were on oral antiglaucoma medications. After GDD implantation, significant reduction of IOP was noted at postoperative 6, 12, and 24 weeks ($P < 0.001$) and last follow-up ($P < 0.001$). Mean follow-up duration was 23.46 ± 29.10 months. Mean IOP at last follow-up was 13.89 ± 7.23 . On last follow-up, 39.3% of patients did not require any antiglaucoma medications; 87.5% of patients required ≤ 2 topical antiglaucoma medications and none required oral antiglaucoma medications. No significant improvement in BCVA was noted. No significant difference in final mean IOP and BCVA was found between AGV and AADI.

Conclusions: GDDs are effective in controlling IOP in cases of PPKG. They provide good IOP control for longer duration so can be used as first-line therapy in such cases. AADI is equally effective as AGV but is comparatively cheaper, so AADI can be a cost-effective alternative to AGV in these cases.

Outcome of Various Treatment Modalities in Refractory Glaucoma Cases

First Author: Mahmood ALI

Co-Author(s): Farah AKHTAR

Purpose: To report the clinical outcomes of various treatment modalities in terms of visual acuity and intraocular pressure control in refractory glaucoma cases.

Methods: All cases of primary and secondary glaucoma in which IOP was not controlled despite maximum medical treatment and where filtration surgery had either failed or carried a poor prognosis were included. A thorough evaluation was done including a detailed history, clinical examination, and relevant investigations. The purpose of detailed evaluation was to review the initial diagnosis and suggest a proper treatment plan. Treatment modalities included change of medical treatment, cataract extraction, selective diode laser cycloablation, and glaucoma shunt implant. Success was defined as IOP greater than 8 mm Hg and less than 20 mm Hg on the last 2 visits with a decrease of no more than 2 lines in visual acuity.

Results: A total of 48 eyes of 47 patients were included. The commonest type of refractory glaucoma was neovascular glaucoma, followed by pseudoexfoliation glaucoma. The mean pretreatment IOP was 31.26 ± 7.12 mm Hg. Treatment modalities included change of medical treatment in 4 eyes, cataract extraction in 9 eyes, selective diode laser cycloablation in 16 eyes, and glaucoma shunt implant in 19 eyes. IOP was successfully controlled in 43 eyes with or without antiglaucoma medication. Visual acuity was retained in 32 eyes, improved in 11 eyes, and decreased in 5 eyes.

Conclusions: Treatment of refractory glaucoma is complex but individualized care based on thorough evaluation can help in appropriate management.

Outcomes of Glaucoma Drainage Device Implantation by Glaucoma Fellows

First Author: Cris Martin JACOBA

Co-Author(s): John Mark DE LEON

Purpose: To determine the surgical outcomes of glaucoma drainage device (GDD) implantation by glaucoma fellows and to identify possible factors that influence the surgical outcomes at a tertiary unit for ophthalmic care in the Philippines.

Methods: This was an observational case series. The authors reviewed the insertion of 17 GDDs performed by 2 fellows from February 2015 to March 2017. A total of 17 GDDs were inserted in 16 patients. All patients had at least 6 months of follow-up, with a mean follow-up of 11.18 ± 6.74 months.

Results: From a mean preoperative intraocular

pressure (IOP) of $28.16 \text{ mm Hg} \pm 10.69 \text{ mm Hg}$, the mean postoperative IOP was $16.29 \pm 3.50 \text{ mm Hg}$ (42% IOP reduction). Number of medications decreased, from $3.39 \pm 1.05 \text{ mm Hg}$ preoperatively to 0.88 ± 0.39 postoperatively (74% medication reduction). Vision decreased from mean preoperative logarithm of the minimum angle of resolution (logMAR) of 0.84 ± 0.53 to 0.92 ± 0.58 postoperatively (9% decrease in vision). Patients were classified as success 6/17 (35%), qualified success 9/17 (53%), and failure 2/17 (12%). Complication rate was 9/17 (53%) while eyes reoperated for the complications were 4/17 (24%).

Conclusions: GDD implantations by fellows performed well in terms of IOP control and decrease in number of medications, with good preservation of vision. However, complication rates remained high. Overall success rates were good with minimal failures.

PS-OCT Evaluation of Scarring Distribution in the Filtering Bleb

First Author: Mayo **KOSUGI**

Co-Author(s): Taiki **KOKUBUN**, Toru **NAKAZAWA**, Satoru **TSUDA**, Masahiro **YAMANARI**

Purpose: Inflammatory cytokines in the aqueous humor are thought to promote scarring of the filtering bleb, likely around the bleb cleft. However, there have been no definitive reports. Therefore, we used polarization-sensitive optical coherence tomography (PS-OCT), a prototype swept-source OCT-based system, to examine the distribution of scarring in the filtering bleb around the cleft.

Methods: We used PS-OCT to scan the bleb in 19 eyes of 19 open-angle glaucoma patients who had undergone trabeculectomy 2 weeks previously. We then semi-automatically segmented the bleb cleft in the B-scans, using attenuation imaging. Next, we divided the bleb wall, just above the cleft, into upper, middle, and lower layers and compared the birefringence of each layer.

Results: Birefringence in the upper, middle, and lower layers was 0.10 ± 0.03 , 0.12 ± 0.04 , and 0.16 ± 0.05 radians, respectively. Birefringence was stronger in the middle layer than the upper layer and stronger in the lower layer than either the upper or middle layers [one way analysis of variance (ANOVA) followed with Bonferroni method; upper layer vs middle layer: $P = 0.014$, middle layer vs lower layer: $P < 0.001$, lower layer vs upper layer: $P < 0.001$].

Conclusions: The degree of bleb scarring varied depending on the layer of the bleb wall, and the scarring response of the filtering bleb was stronger in layers closer to the aqueous humor. This suggests that inflammatory cytokines in the aqueous humor promote scarring of the filtering bleb.

Prognosis of Trabeculectomy in Patients With Cytomegalovirus Uveitic Glaucoma

First Author: Chien-Jung **HUANG**

Co-Author(s): Chien-Chia **SU**

Purpose: To elucidate the long-term prognosis of trabeculectomy in patients with cytomegalovirus (CMV) uveitic glaucoma.

Methods: Seventeen patients with diagnosis of CMV anterior uveitis-related glaucoma receiving trabeculectomy were enrolled. Thirty-seven patients diagnosed as non-CMV uveitic glaucoma who received trabeculectomy were collected as a control group. Surgical failure was defined as intraocular pressure $\geq 21 \text{ mm Hg}$ or the necessity of an additional glaucoma surgery. The initial presentations and follow-up data of the CMV group and non-CMV group were compared.

Results: The CMV group had more male patients (82.35% vs 45.95%, $P = 0.011$) and better preoperative visual acuity [0.36 in logarithm of the minimum angle of resolution (logMAR) vs 0.67 in logMAR, $P = 0.043$] compared to the non-CMV group. Average follow-up time was 3.06 years. Surgical failure was observed in 1 patient in the CMV group (5.58%) and 16 patients in the non-CMV group (43.2%). Kaplan-Meier survival analysis showed a better survival rate in CMV uveitic glaucoma ($P = 0.013$, log-rank test).

Conclusions: Although uveitic glaucoma is often termed refractory glaucoma, in our study, CMV uveitic glaucoma had a better clinical outcome of trabeculectomy than uveitic glaucoma with other uveitic etiology.

Randomized Trial Comparing 4 Fixed Combinations of Prostaglandins/Prostamide With Timolol Maleate

First Author: Jaime **KELLY-RIGOLLET**

Co-Author(s): Martin Ignacio **KELLY-MUÑOZ**, Maria Concepcion **LABRADOR**, Pilar **MAYOL**, Juan Antonio **ONDATEGUI**

Purpose: We studied the efficacy and side effects of tafluprost (a prostaglandin analog) and timolol maleate in a fixed combination, Taptiqom, in a group of patients diagnosed with open angle chronic glaucoma (OACG) or ocular hypertension (OHT) previously using more than 1 antiglaucoma drug. We placed emphasis on decreasing intraocular pressure (IOP). Once the records were finished, we decided to incorporate them into the database of our study: "Randomized trial comparing three fixed combinations of prostaglandins / prostamide with timolol maleate" (Dove Medical Press 2011:5).

Methods: Prospective single-blind study. After 1-month washout period, 41 cases were randomly assigned

to the survey. We did the evaluation monthly, by the same observer, for the first 3 months and at the 6 month using Taptiqom. The pachymetry was included. Then we added the results to the database of the 3 combinations. We had 167 cases with no statistically significant initial differences.

Results: The 4 medicines lowered the IOP continuously, showing significant differences between them. Since the second month, the decrease in IOP with Taptiqom was statistically significant compared with all other medicines. We found differences in side effects especially in red eye, itching sensation, and dryness sensation. We must know that Taptiqom is the only one without conservatives.

Conclusions: According to our results, the 4 drugs decrease IOP effectively. Taptiqom decreased IOP statistically significantly ($P < 0.05$) compared to the rest of the drugs.

Relationship of Changes in Intraocular Pressure After Laser Peripheral Iridotomy With Ultrasound Biomicroscopy Laser

First Author: Qian LIU

Purpose: To evaluate the relationship between anterior chamber angle and intraocular pressure (IOP) after laser peripheral iridotomy (LPI) treatment.

Methods: Fifty-eight patients (58 eyes) diagnosed with primary angle closure glaucoma (PACG) were included in this study. Ultrasound biomicroscopy (UBM) parameters in angle opening distance (AOD), anterior chamber space area (TISA), and angle recess area (ARA) examination were performed before laser treatment (LPI). The changes in IOP were compared between different time points. The relationship between anterior chamber angle and IOP after LPI treatment was explored.

Results: Fifty-eight eyes of 58 cases attended medical visits throughout the follow-up period. The preoperative IOP and UBM parameters were significantly different between groups with IOP >21 mm Hg and ≤ 21 mm Hg after LPI. The mean IOP was increased at 1 hour and 2 hours and lowered at 2 weeks, 6 months, and 12 months after LPI in comparison with before operation with the general difference groups ($P < 0.01$). The UBM parameters were significantly increased at 2 weeks, 6 months, and 12 months after LPI in comparison with preoperation ($P < 0.01$). Postoperative IOP was significantly associated with preoperative IOP and UBM parameters.

Conclusions: UBM parameters were correlated with the IOP variations after LPI. In PACG, UBM structured observation can improve the surgical success rates and safety to further prevent complications.

Repeated Acute Angle Closure Attacks in 2 Patients After Cataract and Vitreoretinal Surgeries

First Author: Billy WONG

Co-Author(s): Felix LI, Gabriel LI, Alvin YOUNG

Purpose: To report the diagnoses and management of 2 pseudophakic patients with repeated angle closure due to presence of Sommering ring.

Methods: We report 2 pseudophakic patients with histories of vitreoretinal surgeries that presented with symptoms of acute angle closure. Ultrasound biomicroscopy was performed and Sommering rings were found in both patients. Peripheral laser iridotomies were performed successfully to control the condition.

Results: Patient A: A 73-year-old man with history of vitrectomy for retinal detachment 4 years prior followed by cataract surgery in Thailand. He presented with recurrent episodes of elevated intraocular pressure with iris bombe. Patient B: A 61-year-old man was pseudophakic and with high myopia. He underwent vitrectomy for retinal detachment 2 years after cataract removal and later developed symptoms and signs of acute angle closure. Ultrasound biomicroscopy were performed in both patients and Sommering rings were detected; this was believed to cause acute angle closure in these 2 pseudophakic patients. They were treated with peripheral iridotomies and no further attacks were detected.

Conclusions: Acute angle closure in pseudophakic patients is uncommon. Early detection is important and with the aid of ultrasound, we can detect the underlying pathology and treat it accordingly as in these cases with laser iridotomies.

Successful Intraocular Pressure Reduction by Cataract Surgery in "Silent" Neovascular Glaucoma Eyes

First Author: Chi-Hsin HSU

Purpose: We report successful intraocular pressure (IOP) reduction by cataract surgery in a patient with proliferative diabetic retinopathy (PDR) and bilateral silent neovascular glaucoma (NVG).

Methods: An interventional case report. Best corrected visual acuity (BCVA) and IOP were checked and recorded before surgery; at postoperative day 1, day 7, day 14, day 30; and every month.

Results: A 59-year-old woman had a history of diabetic mellitus and suffered from PDR-related neovascular glaucoma. After panretinal photocoagulation (PRP) and intravitreal anti-vascular endothelial growth factor (VEGF) therapy, no neovascularization was noticed for more than 4 years but IOP control was still poor

under full medication. For better IOP control and visual acuity, we performed cataract surgery in her eyes subsequently. The preoperative IOP level was 30 mm Hg in the right eye (OD) and 46 mm Hg in the left (OS); BCVA OD was 0.4 and OS was no light perception (NLP). Gonioscopy OD showed nearly 360 degrees of peripheral anterior synechiae (PAS) and no NV; OS showed 360 degrees of PAS and no NV. The IOP successfully decreased after surgery and was recorded as follows: after 1 week, OD 8.5 and OS 15.5 mm Hg; after 2 weeks, OD 16.0 and OS 17.5 mm Hg; after 1 month, OD 7.5 and OS 15.0 mm Hg; after 2 months, OD 9.0 and OS 19.0 mm Hg; and on the most recent visit, OD 12.0 and OS 19.0 mm Hg, which were 9 months and 5 months after surgery.

Conclusions: We tried cataract surgeries on this NVG patient, who received PRP and intravitreal anti-VEGF therapy previously but still had poor IOP control. Obvious IOP reduction was observed and lasted for at least 5 and 9 months.

Surgical Excision of Triamcinolone Plaques for Subtenon Triamcinolone Acetonide-Induced Glaucoma

First Author: Jia-Horung HUNG

Co-Author(s): Fu-Chin HUANG

Purpose: Posterior subtenon injection of triamcinolone acetonide is a common ophthalmic procedure for various diseases, including refractory diabetic macular edema and cystoid macular edema due to uveitis. Two cases of subtenon triamcinolone acetonide-induced glaucoma recalcitrant to medical treatment are described. Surgical excision alleviated ocular hypertension in these 2 patients.

Methods: A retrospective study was conducted. Striking clinical pictures, histology, serial changes in the intraocular pressure and optical coherence tomography (OCT) findings, along with visual field findings pre- and postoperatively were presented.

Results: A 31-year-old man with a history of uveitis and cystoid macular edema and a 44-year-old man with thyroid-associated ophthalmopathy were described. Both of the patients received the diagnosis of ocular hypertension and evidence of glaucomatous optic nerve damage after treatment with subtenon injection of triamcinolone acetonide. Maximal intraocular pressure-lowering agents were administered but in vain. Surgical excision of the visible triamcinolone plaques normalized the intraocular pressure effectively within 1 week in both cases.

Conclusions: In subtenon triamcinolone acetonide-induced ocular hypertension refractory to medical treatment, surgical excision of subtenon triamcinolone plaques provided intraocular pressure normalization.

The African Descent and Glaucoma Evaluation Study: Racial Differences in the Rate of Retinal Nerve Fiber Layer Thinning in Eyes Suspected of Glaucoma: 5-Year Follow-Up

First Author: Takuhei SHOJI

Co-Author(s): Tadamichi AKAGI, Luke SAUNDERS, Robert WEINREB, Linda ZANGWILL

Purpose: To assess racial differences in the rates of circumpapillary retinal nerve fiber layer (cpRNFL) loss in patients suspected of having glaucoma who developed visual field damage (VFD) and in those who did not develop VFD.

Methods: This study was a prospective, multicenter, longitudinal, observational cohort study. Glaucoma suspects of African and European descent without repeatable VFD at baseline with at least 5 years of follow-up from the Diagnostic Innovations in Glaucoma Study and the African Descent and Glaucoma Evaluation Study were included. A joint longitudinal survival model used the estimated cpRNFL slope to predict the risk of developing VFD while adjusting for potential confounding variables.

Results: Four hundred twenty-two eyes of 296 patients suspected of glaucoma were included. The number of spectral domain optical coherence tomography (SD-OCT) examinations averaged 8.7 ± 3.4 with a median follow-up of 5.0 years (range, 3.0–7.4 years). One hundred eyes (23.7%) developed VFD. The joint longitudinal survival model showed each 1- $\mu\text{m}/\text{year}$ faster rate of global cpRNFL loss corresponded to a 2.37-fold higher risk of developing VFD [95% confidence interval (CI), 1.43–3.95; $P = 0.001$]. Subjects of African descent had a 2.0-fold higher risk of developing VFD (95% CI, 0.34–0.84; $P = 0.006$) than subjects of European descent.

Conclusions: This study showed that faster rate of cpRNFL loss corresponded to a higher risk of developing VFD, and African descent resulted in a 2-fold higher probability of developing. These results suggest that measuring the rate of cpRNFL loss would be useful to help identify patients at a high risk of developing visual field loss.

The Brown Lesion Lurking Behind the Iris

First Author: Helena FILIPE

Co-Author(s): Pedro CRUZ SILVA

Purpose: To demonstrate the value of ultrasound biomicroscopy (UBM) in anterior segment imaging to diagnose and follow up retroiridian lesions and the impact on intraocular pressure (IOP).

Methods: An 84-year-old woman was referred for UBM for a recently diagnosed brown lesion of the iris in her

left eye. She had previously undergone peripheral laser iridotomy followed by uneventful phacoemulsification in both eyes. IOP could only be controlled with dorzolamide and timolol. Best-corrected visual acuity was 0.6 in both eyes and the IOP was 17 mm Hg. Slit lamp examination showed a smooth, ovoid, dark brown lesion behind the temporal pupillary margin in front of the intraocular lens (IOL). Cup-disc ratio was approximately 0.6 in both eyes.

Results: UBM revealed a 3.5 mm x 1.23 mm, thin, hyperechogenic walled lesion with sonolucent interior extending to the ciliary body, protruding at the pupillary margin. All 4 quadrants of both eyes presented multiple smaller iridociliary sulcus cysts causing anterior rotation of the ciliary body and narrowing the anterior chamber angle through a pseudoplateau iris configuration. The echograms showed in-the-bag IOL centered with the pupil without apparent tilting and no significant goniosynechia.

Conclusions: After laser treatment and cataract removal there was still the need for antihypertensive eyedrops to control IOP. UBM is indispensable for differentiating anterior segment cystic and solid tumors, especially larger retroiridian lesions extending to the ciliary body. Iridociliary sulcus cysts larger than 0.8 mm or multiple and extensive cysts may determine an occludable or angle closure associated with high intraocular pressure.

The Seasonality of Acute Attack of Primary Angle-Closure Glaucoma

First Author: Jingyuan **ZHU**

Co-Author(s): Huijuan **WU**, Yang **XU**

Purpose: To analyze the relationship between acute attack of primary angle-closure glaucoma (PACG) and seasonality, sex, and age.

Methods: This retrospective case series included 283 patients with acute attack of PACG from a university-based clinic over 4 years. Patients' age and sex, and especially the date and season of onset, were analyzed. Descriptive analysis and von Mises distribution were used for statistical analysis.

Results: Two hundred women and 83 men were included (age range, 37 to 96 years; 68.2 ± 10.3 years). The highest incidence of acute attack of PACG was observed in those aged 60–69 years (34.6%). Frequency of acute attack of PACG was greater in June and July for men, November for women, and July and November for both; it was greater in the summer and winter for men, winter for women, and winter for both. An angular plot (technique of von Mises distribution) of the estimated peak of onset revealed the individual dates of onset on September 11 and November 8 for men and women, respectively.

Conclusions: Acute attack of PACG affected females more than males, with the highest incidence in the age group of 60–69 years. Monthly and seasonal onset variations of acute attack of PACG were obviously showed, which might be related to weather variations.

Intraocular Inflammation, Uveitis & Scleritis

Enterococcus Endophthalmitis: Clinical Settings, Antimicrobial Susceptibility, and Management Outcomes

First Author: Bhavik **PANCHAL**

Co-Author(s): Vivek **DAVE**, Avinash **PATHENGAY**

Purpose: To report the clinical features, antibiotic sensitivities, and visual acuity outcomes in endophthalmitis caused by *Enterococcus* species.

Methods: A single center, retrospective interventional case series. Clinical and microbiological records of 25 eyes of 25 patients with culture-positive endophthalmitis caused by *Enterococcus* species between January 2005 and December 2015 were reviewed and analyzed.

Results: The clinical setting of endophthalmitis in 25 eyes was open globe injury in 15/25 (60%), endogenous endophthalmitis in 6/25 (24%), and postoperative endophthalmitis in 4/25 (16%). Two eyes had an associated intraocular foreign body. Presenting visual acuity ranged from light perception to counting fingers close to face. Initial treatment strategy was vitreous biopsy with intraocular antibiotic injection in 4 cases and vitrectomy with intraocular antibiotics in 21 cases. Phthisis bulbi was seen in 7/25 eyes (28%) at the last follow-up. A visual acuity of 20/200 or better was achieved in 8/25 (32%) patients at the last follow-up. *E. casseliflavus* was the commonest *Enterococcus* species isolated (12/25, 48%) followed by *E. faecalis* (7/25, 28%). Vancomycin sensitivity was seen in 23/25 isolates (92%). The overall sensitivity to vancomycin by the *Enterococcus* species was 92%, of which *E. casseliflavus* showed 100% sensitivity.

Conclusions: Trauma was the commonest cause of *Enterococcus* endophthalmitis. The management outcomes were generally poor, indicating the virulent nature of the organism which is species specific. The incidence of vancomycin-resistant *Enterococcus* is on the rise; however, our study shows that it is still very much sensitive and can be the first line of management.

***Klebsiella* Endophthalmitis as the Herald of Occult Colorectal Cancer**

First Author: Andrew **MAK**

Co-Author(s): Vesta **CHAN**, Helena **SIN**, Alvin **YOUNG**

Purpose: To report a case of *Klebsiella* endogenous endophthalmitis without a clinically evident source of sepsis, where a thorough investigation revealed occult colorectal cancer.

Methods: Case records of the patient including clinical notes, surgical records, and pathological results were reviewed.

Results: A 67-year-old Chinese male presented with acute onset left eye decreased vision and pain with hypopyon. The patient was afebrile with no systemic symptoms at presentation. Diagnosis of endogenous endophthalmitis was made with vitreous tap yielding *Klebsiella pneumoniae*. Pars plana vitrectomy was performed. Thorough microbiological investigations showed no septic foci. Whole body positron emission tomography computed tomography (PET-CT) revealed rectal tumor and biopsy showed adenocarcinoma. The patient was treated with neoadjuvant chemoradiation followed by surgery to resect the tumor. The patient survived with no distant metastases. Vision in the left eye was hand movements at 12 months postoperatively.

Conclusions: *Klebsiella* endogenous endophthalmitis requires thorough investigation of the septic source. It might be related to occult gastrointestinal malignancy, for which prompt diagnosis and treatment might be life-saving.

A Case Report on Bilateral Cataract With Sensorineural Hearing Loss and Vitiligo Seen at a Tertiary Medical Center

First Author: Tathiana **MARCELO**

Purpose: To report a rare case of a 59-year-old male presenting with bilateral cataract, sensorineural hearing loss, and vitiligo seen at a tertiary medical center.

Methods: This is a case of a 59-year-old male who presented with blurring of vision, vitiligo, poliosis, hearing loss, and bald spots. A thorough clinical history was done accompanied by a complete ophthalmological examination. Ancillary tests that were requested include ocular ultrasound and pure-tone audiometry.

Results: On ocular examination, visual acuity in the right eye was hand movements with good light projection and 6/60 best corrected to 6/30 in the left eye. Poliosis was present in both eyes. The cornea had multiple keratic precipitates and multiple stromal opacities bilaterally. There was no noted

anterior chamber reaction. Both eyes had significant cataractous lenses. On indirect ophthalmoscopy, sunset glow fundus was noted in the left eye with multiple hyperpigmented nummular lesions. There was no view of the right eye. Ocular ultrasound of the right showed unremarkable findings except for a complete posterior vitreous detachment. Pure-tone audiometry was done with results suggestive of bilateral sensorineural hearing loss. The patient underwent unremarkable cataract surgery on the right eye with a final postoperative visual acuity of 6/48.

Conclusions: Vogt-Koyanagi-Harada disease is defined as a bilateral granulomatous panuveitis that affects pigmented structures. The exact pathogenesis is still a matter of inquiry. Prompt diagnosis followed by early, aggressive, and directed treatment toward prevention of associated complications is mandatory to achieve optimal visual outcomes.

A Case of Ocular Leptospirosis

First Author: Emilio **ADRIANO**

Co-Author(s): Egidio **FORTUNA**, Cristina **GARCIA**

Purpose: To present a rare case of ocular leptospirosis.

Methods: A case report of a 31-year-old male who consulted with the clinic for hyperemia of both eyes associated with blurring of vision and eye pain.

Results: Slit lamp, optical coherence tomography, and fundus photography were performed and revealed ocular inflammation on both the anterior and posterior segments of both eyes. Rapid test for leptospira was requested, which was positive for IgM.

Conclusions: Ocular leptospirosis has a recorded incidence of 2% among all leptospirosis patients. Early diagnosis of ocular leptospirosis can result in immediate treatment leading to complete recovery.

Acute Idiopathic Blind Spot Enlargement: A Case Report

First Author: Chan-Wei **NIEN**

Purpose: To report a case with acute idiopathic blind spot enlargement (AIBSE).

Methods: Case report.

Results: A 26-year-old Asian man presented with a chief complaint of a black spot in the vision of his right eye (OD), which had been present for about a week. The onset was acute and not accompanied by pain, headache, or any other symptom. An episode of varicella infection was noted a few days before the acute eye condition. The same condition had once happened years ago and was self-limited over his left eye (OS). There were negative findings of relative afferent pupillary defect. Confrontation fields were full

OS and demonstrated a significantly enlarged blind spot OD. Humphrey visual field testing confirmed the enlarged blind spot, which was approximately 30 x 15 degrees. The patient returned in follow-up 3 weeks later, with no new symptoms. All aspects of his clinical appearance remained stable.

Conclusions: The etiology of the patient's enlarged blind spot continues to remain elusive. This may be a presentation of AIBSE. However, due to the laboratory test results, more testing is underway to rule out any other etiology. Volpe et al defined AIBSE as an "absolute symptomatic enlargement of the blind spot without commensurate swelling of the optic nerve head occurring in conjunction with presumed disease of the optic nerve and peripapillary retina." AIBSE is considered a diagnosis of exclusion and its cause remains unknown.

Acute Syphilitic Posterior Placoid Chorioretinitis: Multimodal Imaging and Electrophysiology

First Author: Wendy **WONG**

Co-Author(s): Mayuri **BHAGARVA**, Caroline **CHEE**, Lingam **GOPAL**, Thet **NAING**

Purpose: To describe the clinical course of acute syphilitic posterior placoid chorioretinitis (ASPPC) in the preplacoid stage, placoid stage, and following treatment with penicillin.

Methods: Retrospective case report of the serial multimodal imaging and electrophysiology studies of a patient with ASPCC, with 18 months of follow-up.

Results: A 47-year-old male presented with blurring of vision and redness of his right eye. Clinical examination revealed bilateral panuveitis. The patient subsequently defaulted follow-up and returned after his vision deteriorated with the development of placoid lesion. Systemic investigations were positive for neurosyphilis and retroviral disease, and treatment was initiated. Serial spectral-domain optical coherence tomography revealed the earliest change was loss of the ellipsoid zone. In the placoid stage, there was nodular elevation of the retinal pigment epithelium and punctuate hyperreflectivity of the inner choroid. With treatment, the ellipsoid zone was restored. At presentation, fundus fluorescein angiogram (FFA) showed peripapillary vasculitis and disc leak, while indocyanine green angiogram (ICGA) revealed multiple hypofluorescent spots that were not visible clinically in the peripapillary region and posterior pole. The changes on FFA and ICGA resolved after treatment. Electrophysiology demonstrated bilateral reduction of the photopic and scotopic responses, pattern electroretinogram (ERG), and abnormalities in the multifocal ERG at presentation, with improvement after treatment.

Conclusions: To our knowledge, this is the first case report of the multimodal imaging and electrophysiology findings in a patient with ASPCC prior to the development of the classic placoid lesion. We also document the reversal of structural and functional pathology after systemic treatment.

Clinical Characteristics and Management Outcomes of Anterior Uveitis at an Academic Referral Hospital

First Author: Ovi **SOFIA**

Co-Author(s): Harir **RAHMANIAH**

Purpose: To determine the clinical characteristics and management outcomes of patients with anterior uveitis at Saiful Anwar Hospital, Malang, Indonesia.

Methods: Data were taken retrospectively from medical records of patients with anterior uveitis from 2012 to 2014. The data of affected eye, patient demographics, laboratory investigations, treatment, follow-up outcomes, and complications were recorded.

Results: There were 77 eyes from 70 patients included in this study. Anterior uveitis commonly occurred in the middle age group (17-56 years). Most disease was unilateral (90%). A majority of the patients presented with red eyes (44.4%). Uncorrected visual acuity (UCVA) at presentation was 20/40-20/20 in 42.9% of patients. The duration of most cases were limited (80.5%), and the course of disease was mostly acute (80%). Normal intraocular pressure (IOP) was noted in 72.7% of the subjects. Most cases (57.1%) were well controlled by topical corticosteroid only. Posterior synechiae could be completely released by cycloplegic therapy in about 62% of patients. A total of 81% of patients did not experience complications at the end of the follow-up. UCVA was improved in more than half of the patients (53.2%).

Conclusions: A tailored examination based on age, history, and clinical findings is needed to facilitate a diagnosis of anterior uveitis. Prompt, early, and adequate treatment ensures good visual outcome. Regular follow-up is needed for early detection of ocular complications that may occur secondary to the cause of uveitis or its treatment.

Clinical Characteristics and Management of Ocular Toxoplasmosis at a Tertiary Referral Hospital

First Author: Rizqi **HARIYONO**

Co-Author(s): Ovi **SOFIA**

Purpose: To determine the clinical characteristics and management of ocular toxoplasmosis (OT) at the outpatient clinic of a tertiary referral hospital.

Methods: This was a retrospective study from the

infection and immunology and vitreoretina outpatient clinics of the Ophthalmology Department, Saiful Anwar General Hospital. The data were taken from medical records, including age, sex, bilaterality, visual acuity, serum serological titer, therapeutic regimens, and complications, in the period of January 2013 to December 2015.

Results: There were 48 eyes from 38 patients included in this study; 25 patients were female (34%) and 13 patients were male (66%), with a mean age of 33.5 years (10-70 years). The highest frequency was noted in the age group of 11-20 years (31.57%). Unilateral infections were more frequent (87.5%) than bilateral (12.5%). The most common complaint was diminution of vision (73%). Most of the lesions (22 eyes; 81.4%) were located on the macular region and in 5 eyes (18.6%) were extramacular. All patients had increasing IgG antitoxoplasma serum and 2 patients had positive IgM antitoxoplasma. Twenty-two patients received oral trimethoprim-sulfamethoxazole either as a single therapy or in combination with other antibiotics and oral steroid. The mean follow-up period was 2.8 months. Improvement of visual acuity was found in 6 patients and 70.8% of lesions healed completely. Complications were found in 3 patients, which were retinal detachment and choroidal neovascularization.

Conclusions: Active OT is more likely to be a unilateral infection with impairment of visual acuity as the commonest symptom. Most of our patients had good response to oral trimethoprim-sulfamethoxazole and oral steroid.

Clinical Profile of Scleritis Patients in a Tertiary Government Center in the Philippines

First Author: Cristina **GARCIA**

Co-Author(s): Egidio **FORTUNA**

Purpose: The purpose of this study was to review the clinical experiences of patients with scleritis in a Filipino population in a tertiary government center during a 2-year period.

Methods: This is a retrospective case series of 20 patients diagnosed with scleritis over the period of 2 years in the outpatient department of a tertiary government center. The medical charts, slit lamp photographs, and other pertinent ancillary data were reviewed. Age, gender, laterality, as well as previous ocular surgical history, and ocular complications were collected.

Results: Of the 20 patients diagnosed with scleritis, 15 of the 20 (75%) were female, 11 of 20 (55%) were within the age range of 6–35 years, none of the patients had previous ocular surgery, and most did not have ocular complications except for 1 patient who came to our clinic with scleromalacia perforans and

another who eventually developed posterior scleritis combined with anterior scleritis.

Conclusions: Scleritis is a relatively rare type of ocular inflammation, and of the 20 patients seen in our clinic over a period of 2 years, there was a higher incidence of the disease in the younger population (6–35 years). Most of our patients achieved good control of inflammation, some with recurrences; however, 1 patient's inflammation could not be adequately controlled despite giving oral and intravenous steroid sparing agents.

Conservative Approach in the Treatment of *Propionibacterium acnes* Endophthalmitis

First Author: Ronel **SOIBAM**

Co-Author(s): Pritam **BAWANKAR**, Nilutparna **DAS**, Saurabh **DESHMUKH**, Surpriya **HAWAIBAM**, Diva **MISRA**

Purpose: To report a conservative approach for successful management of a case of *Propionibacterium acnes* endophthalmitis without intraocular lens removal.

Methods: A 68-year-old man who underwent successful phacoemulsification with intraocular lens implantation presented 4 months later with ocular inflammation, hypopyon, anterior chamber (AC) reaction, posterior capsular plaque, raised intraocular pressure, and vitreous haze. Ultrasonography B scan, aqueous tap smear examination, and polymerase chain reaction (PCR) were done. Ultrasonography B scan revealed multiple dot vitreous echoes. AC tap PCR was positive for *P. acnes*. The patient was administered 2 doses of intracameral and in the bag vancomycin (1 gm/0.1 mL).

Results: Intraocular inflammation subsided and improvement in visual acuity was noted.

Conclusions: This report highlights that in the bag antibiotic can successfully treat the condition without intraocular lens removal if it is diagnosed in a timely manner.

Endogenous *Klebsiella pneumoniae* Endophthalmitis in a Patient With Diabetes Mellitus Type 2 and Pyogenic Liver Abscess

First Author: Jan Patrick **CHU**

Co-Author(s): Egidio **FORTUNA**

Purpose: To present a case of endogenous endophthalmitis in a patient with diabetes mellitus type 2, pyogenic liver abscess, and *Klebsiella pneumoniae* bacteremia.

Methods: This is a case of a 35-year-old diabetic male who had a 2-day history of blurring of vision associated with eye redness, tearing, and burning

sensation of the left eye. His visual acuity deteriorated from counting fingers at 3 feet to hand movements. He developed axial proptosis, periorbital swelling, marked conjunctival chemosis, corneal haze, anterior chamber plasmosis, hypopyon, ophthalmoplegia, and elevated intraocular pressure. B-scan showed vitritis and posterior scleritis.

Results: Intravenous ceftriaxone and moxifloxacin ophthalmic drops were started. An abscess was noted on the right hepatic lobe based on triphasic whole abdominal computed tomography scan. Blood culture showed heavy growth of *K. pneumoniae*, which prompted augmentation of medications with intravenous metronidazole. The patient's ophthalmic condition worsened with deterioration of the visual acuity to no light perception and intractable eye pain; thus, a decision was made to do enucleation. Gross and histopathological examination showed a vitreous cavity filled with abscess with anteriorly displaced lens and fibrinoid necrosis with masses of red blood cells and predominantly neutrophilic infiltrates in all chambers of the eye. The aforementioned pathological findings confirmed the diagnosis.

Conclusions: Endogenous endophthalmitis is a rare condition that has poor visual outcome despite aggressive treatment. Diagnosis is often challenging. Endogenous *Klebsiella* endophthalmitis is highly associated in pyogenic liver abscess patients, with diabetes being the major underlying comorbidity. A multidisciplinary approach is an integral part of management as it is a multifactorial disease.

Endogenous Methicillin-Resistant *Staphylococcus aureus* Endophthalmitis

First Author: Lo **LIN**

Co-Author(s): Umi Kalthum **MD NOH**

Purpose: To report a case of endogenous endophthalmitis in an immunocompromised patient, with good visual outcome following prompt management.

Methods: Case report.

Results: A 69-year-old man was admitted to the medical ward for unstable angina secondary to anemia. He was previously diagnosed with myelodysplastic syndrome and underwent chemotherapy. He complained of subacute blurring of vision in his right eye associated with mild pain and floaters. He developed fever and had severe thrombophlebitis on his right arm from intravenous cannulation 2 days previously. On presentation, vision was counting fingers and 6/18 in the right and left eyes, respectively. There was moderate anterior chamber reaction, with dense vitreous cells obscuring most of fundus view. Following plasma transfusion, intravitreal tap and

empirical intravitreal vancomycin and ceftazidime were given, along with topical steroid and antibiotic. Blood culture was positive for methicillin-sensitive *Staphylococcus aureus* and systemic antibiotic was instituted accordingly. His vision continued to improve to 6/12 at day 16 after injection. Despite inconclusive results of vitreous tap, the vitritis cleared up, providing a view of the healthy optic disc and macula. He maintains current vision, which was slightly affected by progressing cataract.

Conclusions: This case highlights the importance of early diagnosis and management. Despite negative vitreous tap, positive blood culture aids tremendously in narrowing the infection. A high level of suspicion is mandatory in immunocompromised patients.

IgG4 or IgG2 Related Orbital Disease?

First Author: Sunny **SHEN**

Co-Author(s): Anita **CHAN**

Purpose: To determine the role of serum and tissue IgG2 in orbital biopsies with histological features of IgG4-related disease (IgG4-RD).

Methods: An international (United Kingdom and Singapore) collaborative, retrospective case review of all patients with orbital inflammatory biopsies between 2002 and 2016. Clinical information and histology were reviewed and cases classified into 3 groups: group 1, IgG4-related orbital disease; group 2, idiopathic orbital inflammatory disease; and group 3, autoimmune-related orbital inflammation. Serum IgG subtype levels were collated where available and immunohistochemistry (IHC) for tissue IgG2 plasma cells performed.

Results: Dual immunohistochemistry showed IgG2 plasma cells as a distinct population from IgG4 plasma cells. Significant (2-fold) serum iGG2 elevation was noted between IgG4-related orbital disease (IgG4-ROD; group 1) and idiopathic and autoimmune-related orbital inflammation (group 2 and 3). Significant elevation of tissue IgG2 plasma cells was also seen between IgG4-ROD (group 1) and idiopathic and autoimmune-related orbital inflammation (group 2 and 3).

Conclusions: Significant elevations of serum IgG2 and tissue IgG2 plasma cells are present in IgG4-ROD in comparison to non-IgG4 conditions, suggesting that IgG2 may play a role in IgG4-ROD. A serum IgG2 cut off > 5.3 g/L was found to be 80% sensitive and 85% specific for IgG4-ROD with accuracy of 0.80. Tissue IgG2 and IgG4 subclass reporting may thus provide additional insight regarding the "IgG4-ROD" pathogenesis.

Ocular Syphilis as Initial Manifestation of Neurosyphilis in a Human Immunodeficiency Virus and Hepatitis B Virus Infected Patient

First Author: Angga **FAJRIANSYAH**

Co-Author(s): Susi **HERYATI**, Resky **MAYNORA**, Arief **MUSTARAM**

Purpose: To report a case of ocular syphilis as a manifestation of neurosyphilis in a previously undiagnosed patient with human immunodeficiency virus (HIV) and hepatitis B virus (HBV) infection.

Methods: A 41-year-old male patient presented with complaints of red eyes and blurry and foggy vision. Ophthalmology examination found best visual acuity was 0.2 in the right eye and 0.125 in the left eye. Anterior segment examination revealed anterior chamber flare/cell +1/+1, posterior synechia, lens opacity, and vitreous cells +2 on the posterior segment. B-scan ocular ultrasound showed vitreous opacity caused by suspected inflammatory cells. Laboratory results showed normal IgG-IgM TORCH, rheumatoid factor, and antinuclear antibody (ANA) test. HIV and HBV positive was found. Serology blood test showed Venereal Disease Research Laboratory (VDRL) test was 1:1024 and Treponema pallidum hemagglutination test (TPHA) was greater than 1:20480; from cerebrospinal fluid VDRL titer was 1:16 and TPHA titer was 1:2560. The patient was diagnosed as bilateral panuveitis, uveitic cataract, and neurosyphilis with HIV and HBV infection.

Results: The patient was treated with procaine penicillin 2.4 million units (intramuscularly), antiretroviral drugs, methylprednisolone 1 mg/kg BW, prednisolone acetate eyedrop 6 times daily, and cyclopentolate eyedrop 3 times daily. VDRL titer serum decreased at the third month, inflammation was controlled, and visual acuity became 0.5 in the right eye and 0.3 in the left eye.

Conclusions: Ocular syphilis as the manifestation of neurosyphilis led us to a diagnosis of HIV infection, which emphasizes that patients with ocular syphilis must be screened for HIV coinfection. Early diagnosis and therapy should be done to prevent morbidity and mortality.

Pattern of Endophthalmitis: 6-Year Retrospective Study in a Tertiary Eye Center of North-East India

First Author: Pranjal **MISHRA**

Co-Author(s): Pritam **BAWANKAR**, Diva **MISRA**, Harsha **BHATTACHARJEE**, Vivek **PAULBUDDHE**

Purpose: To analyze the clinical profile, microbial spectrum, modes of intervention, and treatment outcomes in patients of culture-positive

endophthalmitis due to various causes reporting to a tertiary eye care institute from 2005 to 2010.

Methods: Medical records of 117 consecutive cases of culture-proven endophthalmitis were reviewed. The culture was termed positive if there was a semiconfluent growth on at least 1 solid medium, 2 or more liquid media, or growth on 2 media from 2 different study samples. Antibiotic susceptibility of these isolates were determined using the Kirby-Bauer disk-diffusion test.

Results: Diminution of vision (87%) was the most common symptom and presence of hypopyon (65%), the most common sign. The culture-positive rate was 27.2%. Visual outcomes after endophthalmitis were generally poor with 25% eyes having total or near total loss of vision at last follow-up. This series on endophthalmitis attributes the main organism involved in fulminant and acute cases to be *Pseudomonas*, a Gram-negative organism.

Conclusions: Our study provides summary data on the clinical profile, various risk factors and causes for endophthalmitis, microbial analysis, and treatment options. Identifying patients at high risk of this sight-threatening eye disease is important from both the public health and clinical perspectives as this would facilitate detection of disease before the onset of irreversible visual loss enabling earlier intervention.

Periocular Tuberculosis at a Tertiary Referral Center in Southern Pakistan: Case Series

First Author: Ashok **KUMAR**

Purpose: To discuss the experience of periocular tuberculosis (TB) patients presenting to a tertiary referral center over a 7-year period.

Methods: We reviewed all patients with a diagnosis of periocular TB from 2007 to 2014 in the Department of Ophthalmology, Liaquat University of Medical and Health Sciences, Jamshoro.

Results: Four patients were identified over the 7-year period. There was 1 case of dacryocystitis and 3 cases of cutaneous tuberculosis. Each cutaneous lesion had a different presentation: 1 case had solid upper lid lesion, another had periocular abscess formation, and the last one had sinus formation. All patients belonged to the rural population of southern Pakistan. All patients were immunocompetent and had neither history of pulmonary tuberculosis nor its treatment. All patients presented with periocular lesions and after poor response to conventional treatment by antibiotics were investigated for microbiological and histopathological diagnosis and then referred to a physician for antituberculosis therapy. All patients completed their course and had not developed recurrences in 3 years of follow-up. One patient of dacryocystitis received

dacryocystorhinostomy.

Conclusions: From these case reports it can be concluded that tuberculosis should be considered in the differential diagnosis of chronic painless periocular lesions, and histopathological reports may be obtained for every such lesion; prompt treatment with antituberculosis regime can prevent permanent structural damage.

Posterior Uveitis and the Story of Tuberculosis

First Author: Pankaj **ROY**

Purpose: To find out the cause of unexplained vision loss in patients who attended the uvea and retina clinic and to raise interest in the causation of posterior uveitis by mycobacterium tuberculosis (MT).

Methods: This was a prospective case-control study conducted from July 2014 to June 2017. A total of 98 posterior uveitis patients of unknown etiology were included in this study. Sixty patients who were MT positive (>15 mm) received anti-TB drugs and in whom no recurrences were found during the follow-up period were regarded as the study group and 38 patients who were MT negative were the control group of the study.

Results: A total of 60 patients and 84 eyes were affected. Vasculitis with or without retinal hemorrhage was seen in 20 eyes (24%), multifocal choroiditis in 18 eyes (21%), disseminated choroiditis in 17 eyes (20%), vitreous hemorrhage in 8 eyes (10%), single focal choroiditis in 6 eyes (7%), vasculitis with branch retinal vein occlusion (BRVO) in 5 eyes (6%), serpiginous choroiditis in 4 eyes (5%), vasculitis with tractional retinal detachment in 3 eyes (4%), and exudative detachment due to choroiditis in 3 eyes (4%).

Conclusions: Sixty patients (61%) of a group of 98 patients with primarily unexplained visual loss due to chronic posterior uveitis had tuberculosis (TB). Posterior uveitis presents as focal, multifocal, or diffuse areas of retinitis or choroiditis, with varying degrees of vitreous cellular activity and/or involvement of the retinal vasculature. Early diagnosis and treatment is needed to reduce mortality and morbidity due to posterior uveitis resulting from mycobacterium tuberculosis.

Punctal Plug-Related Corneal Perforation in an Immunocompromised Host

First Author: Wan-Lin **WU**

Co-Author(s): Shu-Wen **CHANG**, Hsin-Yu **WANG**

Purpose: To report a case of punctal plug-related canaliculitis complicated with corneal perforation.

Methods: A 79-year-old female with breast cancer undergoing chemotherapy presented with bilateral

blurred vision and eye pain for years. She was treated with punctal occlusion with smart plug and autoserum for more than 1 year without improvement. Slit-lamp examination in February 2016 revealed bilateral confluent corneal erosion with descemetocoele in the right eye. Best corrected vision at presentation was 0.1 in the right eye and 0.16 in the left eye. Three amniotic membrane transplantations failed to prohibit corneal perforation, which was then rescued with corneal patch graft. However, 6 episodes of recurrent bacterial conjunctivitis and canaliculitis were noticed in the right eye in the following 1.5 years. Repeated culture yielded resistant strains of *Pseudomonas aeruginosa*, *Candida albicans*, *Staphylococcus epidermidis*, and *Enterococcus* species that could not be completely eradicated. Granuloma in the lower canaliculus protruding from the punctum was noticed and excised in February 2017, which resulted in dramatic improvement in infection control. However, recurrent bacterial conjunctivitis associated with recurrent canalicular granuloma was found in May 2017.

Results: Extensive excision of canalicular granuloma led to clearance of bacterial canaliculitis and conjunctivitis, although Schirmer test results decreased from 6 and 4 mm in February 2016 to 3 and 2 mm in June 2017 in the right and left eye, respectively.

Conclusions: Punctal plug insertion could lead to repeated infection in an immunocompromised host and should be inserted with more caution.

Sympathetic Ophthalmia After Penetrating Injury and Retinal Detachment Repair: A Case Report With Optical Coherence Tomography Findings

First Author: Ellen **YU-KEH**

Co-Author(s): Juan **LOPEZ**

Purpose: Sympathetic ophthalmia is a rare, bilateral, granulomatous uveitis that occurs after penetrating injury or intraocular surgery. We describe the treatment outcome of sympathetic ophthalmia following penetrating globe injury with retinal detachment repair and findings using optical coherence tomography.

Methods: Case report.

Results: We report the case of a 32-year-old female with sympathetic ophthalmia following penetrating globe injury and retinal detachment repair. Optical coherence tomography of the sympathizing eye revealed multilobular neurosensory retinal detachment. The subretinal space was noted to be divided into compartments by subretinal septa, previously described in Vogt-Koyanagi-Harada syndrome. Final visual acuity was 20/20 in the sympathizing eye following systemic immunosuppression.

Conclusions: Optical coherence tomography findings in sympathetic ophthalmia may show similar findings reported in Vogt-Koyanagi-Harada syndrome. Visual prognosis is good with prompt, aggressive immunosuppression.

The Prognostic Factors of Infectious Endophthalmitis Over the Past Decade

First Author: Eunyoung **CHOI**
Co-Author(s): Min **KIM**

Purpose: To investigate the prognostic factors of infectious endophthalmitis (IE) in Korea over the past 10 years (2007-2016).

Methods: Medical records from 2 large tertiary medical institutions were analyzed for etiology, treatment types, and visual outcomes.

Results: Among 171 total cases of IE, 70.8% occurred after intraocular surgery, 21.6% endogenously, and 5.3% after trauma. *Staphylococcus aureus* was the major pathogen in both endogenous and postoperative cases, and 71.8% showed multidrug resistance. Higher resistance was associated with worse final visual acuity ($P = 0.027$). Gram-negative bacterial cases had the poorest outcomes compared to other culture-positive cases ($P = 0.011$). Higher visual outcomes were reported when treatment was started within 2 days after the onset ($P = 0.049$). Eyes treated with vitrectomy primarily showed better visual prognosis than eyes that received injections before vitrectomy ($P = 0.037$).

Conclusions: Early vitrectomy would help in successful treatment of IE that is expected to have poor visual prognosis.

Thyroid Associated Orbitopathy: A Concern of Thyroid Dysfunction Diseases

First Author: Golam **HAIDER**
Co-Author(s): Sharmin **AHMED**, Tanjila **HOSSAIN**, SM
Mosaddeka **ISLAM**, Syeed **KADIR**, Mukti **MITRA**

Purpose: The purpose of this study was to find out the relationship between hormonal status and radiological imaging status in thyroid associated orbitopathy at a tertiary care hospital in Bangladesh.

Methods: A retrospective observational study of 48 patients was conducted at a tertiary care hospital in Bangladesh from 2009 to 2017. Patients with thyroid associated orbitopathy were selected by comprehensive ophthalmological examination as well as from computed tomography (CT) scan of the orbit and thyroid function tests. Serum FT4 and FT3, TSH, TGAb titer, and TPOAb titer were taken into account to determine the thyroid function status of the cases.

Results: A total of 48 patients were evaluated, of which

the male:female ratio was 0.92:1 with a mean age of 35.08 ± 13.05 years. Among all cases, 20 (41.7%) were hyperthyroid, 15 (31.3%) were euthyroid, and rest 13 (27%) were hypothyroid. CT scan findings revealed that 12 (92.3%) hypothyroid and 16 (80%) hyperthyroid patients had extraocular muscle enlargement. Statistically, extraocular muscle enlargement was not significantly associated with different types of thyroid dysfunction ($P = 0.431$).

Conclusions: Although thyroid associated orbitopathy is well established in hyperthyroidism, in the current study hypothyroidism was also noted as a remarkable percentage. Thus, all thyroid dysfunction patients, both hypothyroidism and hyperthyroidism, should be evaluated by ophthalmologists to determine their orbital status.

Use of Ultra-Widefield Fluorescein Angiography to Decide Treatment for Idiopathic Retinal Vasculitis, Aneurysms, and Neuroretinitis: Case Report and Literature Review

First Author: Chun-Ju **LIN**
Co-Author(s): You-Ling **LI**

Purpose: We reported a young female with bilateral retinal vasculitis but with limited finding from 50-degree fluorescein angiography (FA). Ultra-widefield FA (UWFA) played an important role to confirm the diagnosis of idiopathic retinal vasculitis, aneurysms, and neuroretinitis (IRVAN) and to determine the corresponding treatment.

Methods: Interventional case report.

Results: A 26-year-old female complained of blurred vision in the right eye (OD) for 1 week. Her best corrected visual acuity (BCVA) was 0.6 OD and 1.0 in the left eye (OS). Fundus examination showed bilateral vitreous cells and retinal vasculitis. FA with 55 degrees of view revealed focal venous leakage and mild optic disc leakage but no visible capillary nonperfusion. IRVAN was diagnosed by the clinical features. She had received oral prednisolone but still had fluctuating ocular condition. After 4 months, she had decreased BCVA. UWFA showed multiple peripheral background hypofluorescent areas corresponding to capillary nonperfusion. Panretinal laser photocoagulation (PRP) was performed for capillary nonperfusion areas to decrease the risk of visual loss.

Conclusions: IRVAN is one of the differential diagnoses of retinal vasculitis and is named to highlight the salient features. PRP for retinal ischemia or areas of neovascularization may preserve vision and prevent disease progression. FA, traditionally with 55-degree view, is essential for the diagnosis but has limitation in detecting peripheral capillary nonperfusion areas.

Sweeping the image is possible with the ultra-widefield 102-degree lens to allow greater coverage of the retinal periphery to greater than 150 degrees. UWFA is a useful tool for detecting peripheral retinal ischemia, which may have direct implications in the diagnosis, follow-up, and treatment such as targeted peripheral PRP.

Neuro-Ophthalmology

A Case Report of Direct Carotid Cavernous Fistula With Unusual Clinical Presentation

First Author: Anissa WITJAKSONO

Co-Author(s): Mohamad SIDIK, Syntia NUSANTI

Purpose: To present a case of direct carotid cavernous fistula (CCF) that had an unusual clinical appearance and to show the management approach.

Methods: A case report. A 38-year-old male presented with a swollen right eye for 2 weeks, with previous trauma history. Ophthalmological examination at presenting time showed no light perception in the right eye with ophthalmoplegia and intraocular pressure of 65 mm Hg. There was proptosis, erythema, palpebra spasm, and hazy cornea; therefore, the posterior segment was not visible, yet no bruit presented. Ultrasonography examination showed vitreous haziness and bulbar deformity. Initial computed tomography (CT) scan showed features of orbital cellulitis, and the patient was treated with intravenous antibiotic. With no improvement after 1 week of administration, CT angiography was performed.

Results: CT angiography showed dilated right vena ophthalmica and right cavernous sinus with prominent vena facialis derived from right carotid internal artery, confirming CCF type A. Two months later the patient underwent digital-subtraction angiography and detachable balloon embolization. Three months post embolization the symptoms had resolved; however, phthisical eye had developed.

Conclusions: CCF is a rare condition, mostly related to trauma. CCF is signaled by a clinical triad of proptosis, chemosis, and orbital bruit. Our case presented with only 1 of the clinical triad, causing challenges in establishing prompt diagnosis initially. Thorough history taking supported by CT angiography examination confirmed the diagnosis of CCF type A. Unfortunately, even with prompt treatment, advanced stage development of the disease was inevitable.

A Rare Case of Traumatic Orbital Apex Syndrome

First Author: Ishwarya SRIDHAR

Co-Author(s): Sivaraja GOWTHAMAN, Hannah RANJEE PRASANTH, Elfride SANJANA

Purpose: To describe a rare case of traumatic orbital apex syndrome, for which the reported incidence is only 0.3% to 0.8%.

Methods: A 32-year-old male presented with an alleged history of road traffic accident with craniofacial trauma. On examination there was no perception of light in the right eye. Corneal anesthesia and decreased sensation in the right frontal side of the face was present. Pupils revealed grade 4 relative afferent pupillary defect in the right eye. There was complete ptosis and limitation of movements in all directions of gaze in the right eye. Left eye was within normal limits.

Results: Computed tomography (CT) of the orbit showed comminuted fracture involving the right lateral and medial wall and roof, sphenoid and displaced fracture of right clinoid process resulting in impingement of structures passing through the superior orbital fissure and optic canal. The patient was treated with intravenous methylprednisolone as per protocol and vision improved to hand movements from perception of light with mild improvement in extraocular movements at the end of 1 week.

Conclusions: Shearing forces after fractures can be great enough to transect the nerve leading to immediate and irreversible blindness. Delayed and progressive loss of vision implies that a viable nerve is being compressed by edema and bleeding. In such cases, early treatment may improve recovery.

AQP4 Antibody Positive Paraneoplastic Optic Neuropathy: Analysis of 1 Case

First Author: Honglu SONG

Co-Author(s): Shaoying TAN

Purpose: A paraneoplastic optic neuropathy is a syndrome (a set of signs and symptoms) that is the consequence of cancer in the body which is mediated by humoral factors excreted by tumor cells or by an immune response against the tumor.

Methods: A 50-year-old female was admitted to the hospital because of decreased visual acuity in both eyes. She had double vision and ptosis in the right eye 3 years ago.

Results: She was diagnosed as myasthenia gravis and underwent surgery to remove thymoma. Biopsy indicated B3 type thymoma. Orbital magnetic resonance imaging (MRI) indicated T2 signal and enhancement in the left optic nerve. Laboratory work indicated CV2 antibody positive and AQP4 antibody

positive in serum and cerebrospinal fluid. After being diagnosed as paraneoplastic optic neuropathy, she was treated with high dose steroid and mycophenolate mofetil. She had good recovery in her left eye.

Conclusions: AQP4 antibody may associate with paraneoplastic optic neuropathy and be a biomarker for early diagnosis.

An Unusual Case of Orbital Lymphoma Presenting as Orbital Apex Syndrome

First Author: Eunice GOH

Co-Author(s): Kong Yong GOH

Purpose: To report an unusual case of orbital lymphoma presenting as orbital apex syndrome.

Methods: Case report.

Results: A 52-year-old Chinese woman was referred from a neurologist. She presented with diplopia for 8 days associated with blurring of vision of the left eye and loss of hearing in the left ear for 1 day. She did not report any epistaxis. On examination, there was 2 mm proptosis of her left eye. Her visual acuity was 6/7.5-1 in the right and 6/15 to 6/12-3 in the left eye. Her intraocular pressures were 15.7 in the right and 12 in the left. A left rapid afferent pupillary defect was noted and there was limited downgaze and abduction. Visual fields were intact. Red-green color vision was lost in the left eye. Brightness comparison was 50% on the left compared to the right. Slit lamp examination was normal. Neurological examination revealed an intact trigeminal nerve with no cerebellar signs. An initial diagnosis of orbital pseudotumor was made and she was admitted for pulse intravenous steroid therapy. A nasoendoscope biopsy revealed lymphoid hyperplasia in the lateral wall of the nasopharynx negative for malignancy. Positron emission tomography scan showed a degree of mild enhancement. Subsequent cerebrospinal fluid (CSF) cytology was positive for small B-cell lymphoma. She was then referred to a medical oncologist and chemotherapy was commenced.

Conclusions: An orbital lymphoma can sometimes mimic a pseudotumor.

Anterior Ischemic Optic Neuropathy as a Presenting Feature of Takayasu Arteritis

First Author: Supriya ARORA

Co-Author(s): Tarun ARORA, Mohit CHHABRA, Basudeb GHOSH, Preethi SRIDHARAN

Purpose: To describe an unusual presentation of Takayasu arteritis.

Methods: A 25-year-old female presented to the ophthalmic department with sudden loss of vision in the right eye for 1 day and generalized weakness in the body for 3 months. On general physical examination,

radial pulse was not detectable and blood pressure not recordable in upper limbs. She denied perception of light in the right eye and vision was 20/20 in the left eye. In the right eye relative afferent pupillary defect was apparent and fundus examination revealed a pallid disc edema suggestive of anterior ischemic optic neuropathy (AION). Left eye was clinically normal. On fundus fluorescein angiography multiple microaneurysms in the periphery were seen in both eyes. The patient was referred to other departments for further evaluation.

Results: The patient was hospitalized and diagnosed as a case of type 1 Takayasu aortoarteritis. She was started on intensive oral steroids, antiplatelets, and antihypertensives immediately and was planned for percutaneous transluminal coronary angioplasty (PTCA). However, within 10 days of loss of vision in the right eye and 2 days before her planned surgery, the patient had a sudden loss of vision in the left eye also. On ophthalmic examination, she denied perception of light and fundus examination revealed a pallid disc edema in the left eye suggestive of AION.

Conclusions: AION can be the presenting feature of Takayasu arteritis. Despite maintenance with intensive treatment, the other eye can become involved within days. This highlights the importance and urgency of PTCA in such patients.

Assessment of Optic Disc Parameters and Their Correlation With Visual Outcome in Nonarteritic Anterior Ischemic Optic Neuropathy Patients

First Author: Valenchia CHANDRA

Co-Author(s): Mohamad SIDIK, Syntia NUSANTI

Purpose: To describe optic disc and retinal nerve fiber layer (RNFL) parameters in nonarteritic anterior ischemic optic neuropathy (NAION) patients and to illustrate their correlation with visual field defect and visual acuity (VA).

Methods: Twenty-seven patients diagnosed with NAION were included. The following examinations were carried out in a cross-sectional fashion: Humphrey HFA II-i 750, 24-2 threshold, best corrected VA with Snellen chart, and optical coherence tomography (OCT) Stratus fast optic disc and fast RNFL 3.4 mm.

Results: We found 14 eyes (25.9%) with optic disc edema, 21 eyes (38.9%) with optic disc atrophy, and 19 eyes with normal optic disc. Disk area (DA) and rim cross-sectional area (RCSA) could differentiate edema, atrophy, and normal disc (DA: 3.52 ± 1.16 ; 2.73 ± 0.55 ; 2.59 ± 0.44 ; $P = 0.01$) [RCSA: 2.44 ± 1.34 ; $1.52(0.94-3.02)$; 1.83 ± 0.34 ; $P = 0.014$], respectively. RNFL thickness in all quadrants also could differentiate the disc morphology. No correlation was found between

optic disc-RNFL parameters and visual field defect. We found fair correlation between RNFL temporal quadrant thickness and best corrected VA ($r = -0.433$; $P = 0.05$).

Conclusions: Optic disc and RNFL parameters on OCT could be used to differentiate morphology of the optic disc. The temporal quadrant of RNFL thickness is a good predictor of central visual acuity in patients with NAION due to macular function.

Atypical Optic Neuritis in Human Immunodeficiency Virus: A Case Report

First Author: Mary Czarina **SAN DIEGO**

Purpose: This study reports a case of an apparently healthy male with human immunodeficiency virus (HIV), who initially presented with optic neuritis. Cases of optic neuritis in HIV were previously reported with systemic manifestations, caused by secondary infections. A direct causal link between HIV and optic neuritis has been suggested but presents with systemic manifestations. This report describes a case of optic neuritis with no other clinical manifestations in a patient with HIV, which in turn is significant and alarming in our country given its high prevalence in the Philippines.

Methods: The patient came in with visual acuity of 20/125 in the right eye and no light perception in the left. Relative afferent defect on the left eye was noted. Fundoscopy initially showed normal then progressed to blurred disc margins on both eyes. The laboratory findings, including complete blood count, urinalysis, and optical coherence tomography of the macula, were unremarkable except for positive HIV antibody, junctional scotoma on perimetry, and optic neuritis on magnetic resonance imaging. Intravenous steroids for 3 days, then shifted to oral for 11 days, were given.

Results: Steroids given provided improvement to best corrected visual acuity of 20/20-2 in the right and 20/50+1 in the left eye. Seven months later, his vision is maintained, with no associated signs or symptoms, while on antiretroviral therapy consisting of lamivudine, zidovudine, and efavirenz.

Conclusions: All cases of atypical optic neuritis should be suspected to have underlying HIV infection. Optic neuritis may be the initial and only manifestation in an HIV patient.

Brainstem Infarction Presenting With Horizontal One and a Half Syndrome

First Author: Fon-Man **CHANG**
Co-Author(s): Chia-Yi **LEE**

Purpose: To report a case of solitary horizontal one and a half syndrome (OAHS) resulting from brainstem

hemorrhage without previous neurological defect.

Methods: Case report and review of the literature.

Results: A 63-year-old man without congenital oculomotor disturbance or other neurological disorder visited our emergency room for an abrupt onset of bilateral diplopia accompanied with general dizziness. On examination, the visual acuity was 20/25 in both eyes but limitation to right gaze in the left eye (Fig. 1) and limitation of horizontal eye movement in the right eye (Fig. 2) were observed by diplopia test. The rest of the neurologic examination revealed unstable gait but without upper limb weakness. One and a half syndrome was then diagnosed and immediately magnetic resonance imaging was arranged, which showed ischemic infarction at the level of the brainstem and pons. He received routine oral aspirin control 1 time per day and intravenous fluid resuscitation, and the symptoms disappeared 10 days later.

Conclusions: In conclusion, one and a half syndrome can present with solitary diplopia without other ocular signs including prominent nystagmus or dissociated vertical deviation. The possibility should not be overlooked and a thorough neurological investigation is mandatory to evaluate the intracranial lesions.

Challenging Diagnosis of Neuromyelitis Optica Presenting as Recurrent Bilateral Optic Neuritis

First Author: Veda **PUTRI**

Purpose: To demonstrate that diagnosing neuromyelitis optica can be challenging, especially if isolated optic neuritis is the only presenting clinical condition at onset, and to demonstrate that a delayed diagnosis and treatment could affect the visual outcome.

Methods: A case report.

Results: A 47-year-old female presented with sudden blurred vision in the left eye. She previously already had recurrent bilateral optic neuritis attacks over a decade; best corrected visual acuity (BCVA) was 6/6 initially but the visual acuity deteriorated after each attack. On ophthalmology examination, her BCVA was 6/40 in the right eye and 1/60 in the left eye with a positive relative afferent pupillary defect. Fundoscopic examination of the both eyes showed optic nerve head atrophy. Visual field testing showed an altitudinal visual defect in the right eye and generalized depression in the left eye. Brain, spinal cord, and orbital magnetic resonance imaging (MRI) were normal. Laboratory examinations and lumbar puncture results for multiple sclerosis were unremarkable. After the aquaporin 4 antibody test was positive, the diagnosis of neuromyelitis optica spectrum disorder was finally confirmed. She was then treated with steroid initially during the acute attack and oral mycophenolate mofetil

for preventing relapse.

Conclusions: In the case of recurrent optic neuritis without other neurological signs and symptoms with incomplete recovery, the diagnosis of neuromyelitis optica spectrum disorder should be considered along with aquaporin 4 antibody test, since the visual prognosis is worse if diagnosis and treatment are delayed.

Childhood Ocular Myasthenia Gravis in Ramathibodi Hospital

First Author: Kasamon **LOWWONGNGAM**

Purpose: To study the ocular manifestations of children with ocular myasthenia gravis (OMG), which have rarely been reported in the literature.

Methods: Medical records of 62 subjects, who were less than 15 years of age at the time OMG was diagnosed and evaluated between January 2005 and August 2015, were reviewed retrospectively. Demographics, presenting ocular features, diagnostic testing, treatment outcome, interval from OMG onset to generalized MG (GMG) conversion, and signs and symptoms of GMG were reviewed.

Results: Mean age at onset was 49 months. Female to male ratio was 1.5:1. Initially, ptosis was found in 60 subjects (97%), while ophthalmoparesis was presented in 28 subjects (45%). Of all the subjects who presented with ptosis, 52% were unilateral and 48% were bilateral. Total ophthalmoparesis was the most frequent pattern of ocular motility limitation observed both at presentation and during follow-up. The mean follow-up period was 95 months. The pattern of ophthalmoparesis was variable and changed frequently during the follow-up period (68% of subjects with ophthalmoparesis). Pyridostigmine alone was the most common maintenance treatment used, and ptosis was more responsive to medical treatment than ophthalmoparesis. Conversion to GMG during follow-up was found in 19% of subjects with mean interval of 9 months, and respiratory failure was the most frequent symptom.

Conclusions: Children with OMG were found to have a high incidence of ptosis. Total ophthalmoparesis was the most common pattern of ocular motility limitation. Variability of ophthalmoparesis was found frequently during follow-up. Ptosis was more responsive to medical treatment than ophthalmoparesis.

Clinical Profile of Inflammatory Optic Neuritis in Chinese Patients: A 5-Year Case Series

First Author: Nikki **FAR**

Co-Author(s): Nelson **YIP**, Alvin **YOUNG**

Purpose: To report the clinical features and outcomes

of inflammatory optic neuritis (ON) in a tertiary hospital over 5 years.

Methods: Medical records of all patients diagnosed with inflammatory ON from August 2012 to July 2017 were retrospectively reviewed. Other etiologies of ON such as infection were excluded. Clinical features, radiological findings, perimetry, and optical coherence tomography (OCT) results as well as treatment regime were retrieved and analyzed.

Results: A total of 43 patients with clinical and radiological findings confirming the diagnosis of inflammatory ON were included. Of these, 65.1% (n = 28) were female. Mean age was 51.0 ± 1.0 . A total of 58.1% (n = 25) of the patients had recurrent ON, whereas 9.3% (n = 4) were diagnosed with multiple sclerosis (MS) and 6.9% (n = 3) were found to have neuromyelitis optic (NMO). Mean logarithm of the minimum angle of resolution (logMAR) visual acuity at presentation was 1.00 ± 0.16 . A total of 93% (n = 40) received systemic steroid following Optic Neuritis Treatment Trial (ONTT) protocol. The remaining 3 patients did not receive steroid due to coexisting fever or patient worries about treatment side effects. Mean logMAR recovered to 0.32 ± 0.14 at 3 months after presentation. Patients with NMO had poorer visual acuity, lower visual field mean deviation (MD), and thinner average retinal nerve fiber layer (RNFL) than patients with MS, although the differences were statistically insignificant.

Conclusions: Majority of inflammatory ON in our locality were idiopathic, while patients with NMO tended to have poorer visual outcome than patients with MS.

Diagnostic Errors in Neuro-Ophthalmology: Review of Literature and Personal Encounters

First Author: Jonathan **HO**

Co-Author(s): Simon **KO**

Purpose: To alert ophthalmologists to the potential blind spots in diagnosing neuro-ophthalmological conditions.

Methods: A PubMed search of English articles with the keywords "error," "malpractice," "litigation," and "ophthalmology" was performed, and articles related to neuro-ophthalmology were reviewed. Those related to diagnostic errors were summarized and further case illustrations encountered by the authors were given.

Results: Neuro-ophthalmology constituted 3% of ophthalmology claims and had 1 of the 3 highest numbers of claims for severe adverse outcomes in a 15-year retrospective study in the United Kingdom. Failure or delay in diagnosing cerebrovascular disease and brain tumors are among the commonest causes of malpractice. Another study from a tertiary center in

the United States reported overdiagnosis of presumed idiopathic intracranial hypertension in 39.5% of patients, resulting in unnecessary and invasive testing. Illustrative case examples included missed pituitary apoplexy, ocular myasthenia treated as aponeurotic ptosis, immunoglobulin-G4 related lid swelling misled by xanthelesma-like masses, failure of diagnosing rod-cone dystrophy sine pigmento, and superior segmental optic hypoplasia misdiagnosed as glaucoma.

Conclusions: Neuro-ophthalmologists are vulnerable to commit certain pitfalls in diagnosing potentially life- and vision-threatening conditions.

Efficacy of Digital Pupillometry for Diagnosis of Horner Syndrome

First Author: Jeong-Min **HWANG**

Co-Author(s): Hee Kyung **YANG**, Yung Ju **YOO**

Purpose: To evaluate the efficacy of digital pupillometry in the diagnosis of Horner syndrome.

Methods: A retrospective study including 19 patients with unilateral Horner syndrome (Horner group) and 30 age-matched normal controls was performed. Pupillary light reflex (PLR) of the Horner group and controls were measured by PLR-200. Minimal and maximal (min/max) pupil diameters, latency, constriction ratio/velocity, dilation velocity, and total time taken by the pupil to recover 75% of maximal pupil diameter (T75) were noted. PLR were measured at baseline in both groups and at 30-45 minutes after 0.5% apraclonidine instillation in the Horner group.

Results: In the Horner group, pupil diameters and T75 showed significant difference between the affected and unaffected eye at baseline ($P < 0.00625$). Intereye difference of pupil diameters and T75 were significantly larger in the Horner group ($P < 0.001$). After apraclonidine, changes in pupil diameter and constriction ratio were significantly larger in the affected eye ($P < 0.00625$). The area under receiver operating characteristic (ROC) curves (AUC) for diagnosing Horner syndrome were largest for baseline intereye difference in min/max pupil sizes (AUC = 0.975, 0.994), T75 (AUC = 0.838), and change in min/max pupil sizes after apraclonidine (AUC = 0.923, 0.929). The diagnostic criteria for Horner syndrome was defined as 1) smaller maximal pupil diameter in affected eye with an intereye difference greater than 0.5 mm or 2) T75 greater than 2.61 seconds in the affected eye (94.7% sensitivity, 93.3% specificity). The diagnostic accuracy of apraclonidine testing showed a sensitivity of 84.6% and specificity of 92.3%.

Conclusions: Digital pupillometry is an objective method for quantifying PLR. Baseline intereye difference in maximal pupil sizes and dilation lag measured by T75 was equally effective in the diagnosis

of Horner syndrome compared to the reversal of anisocoria after apraclonidine instillation.

Management of Bitemporal Hemianopia: A Case Report

First Author: Rusti **SARI**

Co-Author(s): Antonia **KARTIKA**, Bambang **SETIOHADJI**

Purpose: To report a case of bitemporal hemianopia caused by pituitary adenoma.

Methods: A 28-year-old man came with the chief complaint of blurring in his left eye since 1 year before. He also complained of having headache frequently without any nausea or vomiting. Ophthalmologic examination found best visual acuity in the right eye was 0.8 and left eye was 1/60. Anterior segment examination revealed decrease of direct and indirect pupillary light reflex in both eyes; fundusoscopic examination showed optic disc swelling with slight pallor at the temporal side in both eyes. Color vision and sensitivity contrast were impaired in the left eye. Humphrey 30-2 examination showed temporal hemianopia in the right eye, and with confrontation test showed temporal hemianopia of the left eye. The patient underwent magnetic resonance imaging (MRI) of the brain with contrast, which revealed intracranial tumor with obliteration of suprasellar and optic chiasm. The patient was diagnosed with suspect bitemporal hemianopia caused by pituitary adenoma and advised to consult to neurosurgery.

Results: Three months after admission, he had transphenoid tumor removal. Histological microscopic investigation showed it was pituitary adenoma. One month after the surgery, the ophthalmology examination revealed best visual acuity in the right eye was 1.0 and left eye was 0.125, with decrease of visual field defect especially in the right eye.

Conclusions: Complete neuro-ophthalmic evaluation of the signs and symptoms is essential for diagnosis. Even eyes with severely affected visual acuity and/or visual field may have remarkable improvement if surgical decompression of the optic apparatus is undertaken early.

Midbrain Ring Enhancing Lesion Presenting as Isolated Muscle Palsy: A Diagnostic Challenge

First Author: Namrata **ADULKAR**

Purpose: Ring enhancing lesions of the brain are not an unusual presentation in the Indian scenario and the 2 most common differential diagnoses include neurocysticercosis (NCC) and tuberculomas. They have similar clinical and neuroimaging features and differentiating the 2 can be a challenge.

Methods: Case 1: A 23-year-old female presented with sudden onset diplopia and upward deviation of the right eye for 5 days. On complete ophthalmic evaluation, she had right inferior rectus palsy with vertical down beating nystagmus. Case 2: A 26-year-old female presented with subacute onset, severe occipital headache associated with nausea and vomiting and diplopia for 2 weeks. On ophthalmic evaluation, she had right inferior rectus palsy and medial rectus paresis with signs of meningism. Neuroimaging of both patients showed single well-defined ring enhancing lesion in right midbrain. However, in the second case a small scolex along with perilesional edema was noted on the scan, clinching the diagnosis of neurocysticercosis. The first patient had negative systemic workup for tuberculosis. Magnetic resonance spectroscopy (MRS) of the lesion identified increased choline/creatine ratio and decreased in N-acetylaspartate (NAA) suggestive of tuberculoma.

Results: Patient 1 was treated with antitubercular treatment along with oral steroids. Patient 2 was treated with oral albendazole 400 mg for 21 days along with intravenous followed by oral steroids. Both patients improved clinically at 1-month follow-up.

Conclusions: A high index of suspicion is required in appropriate clinical settings to have best clinical outcome. MRS is helpful in differentiating these 2 conditions.

Miller Fisher Syndrome in a Patient With Atypical Optic Neuritis

First Author: Honglu SONG
Co-Author(s): Shaoying TAN

Purpose: Miller Fisher syndrome is an autoimmune neuropathy characterized by the clinical triad of ataxia, areflexia, and external ophthalmoplegia. Ophthalmologic involvement in this syndrome is most often represented by motility disorders.

Methods: A 37-year-old woman presented with atypical optic neuritis for 9 months. She walked unsteadily for 9 days.

Results: A neurological examination showed hyporeflexia in the right leg. Her serum anti-GM1 antibody test was positive. Lumbar puncture showed albuminocytologic disassociation, with a high protein and a normal cellular composition in the cerebrospinal fluid (CSF). She was finally diagnosed with Miller Fisher syndrome. Intravenous high-dose steroid therapy and IVIG improved the patient's ataxia.

Conclusions: Optic neuritis may be a part of the clinical features of Miller Fisher syndrome, which is very rare in a clinical setting.

Neurovascular Incident Following Orbital Floor Reconstruction: A Case Report

First Author: Szu-Yuan LIN
Co-Author(s): Shwu-Huey LEE, Hsin-Ching SHEN, I-Hua WANG

Purpose: Visual loss following orbital fracture repair is infrequent but has been well documented before. We present a case of combined branch retinal artery occlusion, anterior ischemic optic neuropathy, and oculomotor nerve palsy occurring post orbital floor fracture repair.

Methods: A case report.

Results: A 69-year-old male had a syncopal episode and fell down, hitting his left eye (OS) 6 days previously. Orbital floor fracture was diagnosed. Preoperative visual acuity was 0.8 (OS). His past history was unremarkable except arrhythmia. Orbital floor reconstruction was performed 5 days later. The next morning following surgery, the patient complained of severe visual loss in his left eye. Ocular examination revealed normal ocular pressure, fixed dilated pupil, and extraocular eye movement limitation (OS). His visual acuity decreased to only light perception (OS). Fundus exam revealed retinal whitening around superior temporal part and disc edema. Emergent computed tomography (CT) showed localized hematoma. Branch retinal artery occlusion and anterior ischemic optic neuropathy were diagnosed. Two weeks after the incident, his vision improved to 0.1 (OS). Persistent pupil dilatation and eye movement limitation led to the impression of oculomotor nerve involvement.

Conclusions: Ocular neurovascular injury is a rare complication post orbital floor fracture repair. It was possibly an embolic event related to his systemic vascular risk factors such as arrhythmia or caused by direct injury during the operation combined with increased local orbital pressure, which compromised the orbital neurovascular component. Careful monitoring of pupil state, orbital pressure, and vision are important in postoperative care of such patients.

Nonarteritic Anterior Ischemic Optic Neuropathy and Its Association With Obstructive Sleep Apnea: A Health Insurance Database Study

First Author: Chia-Yi LEE
Co-Author(s): Joyce LIAO, Hung-Yu LIN, Chi-Chin SUN, Ming-Hui SUN

Purpose: The aim of this study was to evaluate the association between nonarteritic anterior ischemic optic neuropathy (NAION) and obstructive sleep apnea (OSA).

Methods: This retrospective, longitudinal cohort study used the National Health Insurance Research Database of Taiwan covering the period of 1996-2013. Patients without NAION at the diagnosis of OSA or who developed NAION 1 year after the diagnosis of OSA were enrolled. The patients were followed until death or the last day of the study. Cox proportional hazard regression was used to compute hazard ratios (HRs) and 95% confidence intervals (CIs) to investigate the association between OSA and NAION.

Results: There were 10,819 patients in the OSA group and 43,276 in the control group (without OSA), for a ratio of approximately 1:4. The percentages of NAION were 0.36% and 0.17% in the OSA and control groups, respectively, with a statistically significant difference ($P < 0.01$; chi-square test), and this significant difference remained in multivariate analysis ($P < 0.01$) with a significantly higher HR (2.05; 95% CI: 1.39-3.03). There were significant differences in the 0-29 and 30-39 years age groups in multivariate analysis (both $P < 0.01$; HR: 9.33 and 6.30, respectively).

Conclusions: There was a strong association between NAION and OSA, and the patients with OSA had a higher risk of NAION. Further large-scale, prospective studies are warranted to evaluate the effect of OSA on developing NAION.

Optic Neuropathy in Children: A Case Series

First Author: Syntia NUSANTI

Purpose: To demonstrate several cases of optic neuropathy in children.

Methods: A 6-year-old boy presented with severe headache and diplopia for 5 days. There was a history of mumps infection. Position of the globe was 15 degrees ET. There was bilateral VIth nerve paresis. Visual acuity (VA) in the right eye (RE) was 6/6 and in the left eye (LE) was 6/12 uncorrected. There were indistinct edges of the optic nerve; cup-disc ratio was difficult to evaluate in both eyes. The patient was diagnosed as idiopathic intracranial hypertension (IIH). An 11-year-old boy presented with sudden blurred vision 2 days previously in both eyes. VA in RE was hand movements and in LE was 1/60; relative afferent pupillary defect (RAPD) was positive in RE. Optic nerve was within normal limits. Magnetic resonance imaging (MRI) showed active focal area and diffusion restriction, subcortical and periventricular multiple plaques in both hemispheres, and also plaque in both optic nerves. A 14-year-old boy presented with blurred vision in LE for 1 month and RE for 6 months. He had a history of dengue fever. VA was 3/60 in RE and 6/12 in LE. Brain MRI was normal.

Results: Case 1: The patient received acetazolamide 3 x 250 mg. After 2 months, there was no headache.

Position of the globe was orthophoria. Case 2: The patient was given intravenous steroid. After 1 month VA became 6/6 and 6/7.5. Case 3: After 1 month the VA became 3/60 and 6/7.5.

Conclusions: Pediatric cases of optic neuropathy such as IIH or optic neuritis can be associated with previous viral infection and also multiple sclerosis. Prompt diagnosis and medical management are important to have complete resolution of visual abnormalities.

Perioperative Vision Loss Following Nonocular Surgery: A Case Report

First Author: Prem SAI

Co-Author(s): Sivaraja GOWTHAMAN, Hannah RANJEE PRASANTH, Elfride SANJANA

Purpose: To describe a rare and classical presentation of anterior ischemic optic neuropathy following aortic valve replacement surgery where the incidence is 1 in 60,965.

Methods: A 47-year-old male presented with sudden diminution of vision in both eyes, right eye more than left eye, for 5 days following aortic valve replacement surgery done 7 days prior. On ocular examination best corrected visual acuity in the right eye was 1/2/60 and in the left eye was 6/12. Grade 4 relative afferent pupillary defect was present in the right eye. Fundus examination revealed clear media in both eyes, pallid disc edema, and peripapillary nerve fiber layer edema in the right eye more than the left eye. Right eye disc showed optociliary collaterals in the superonasal quadrant.

Results: The most common postoperative sudden visual loss defects are related to ischemic optic neuropathy (ION), central retinal artery occlusion (CRAO), and cortical blindness. Most cases with ischemic optic neuropathy have bilateral simultaneous involvement, usually with very poor visual function.

Conclusions: There is no effective treatment as of now which can prevent permanent vision loss due to perioperative surgeries. As there is a rising number of cardiac surgical procedures, cardiac surgeons and ophthalmologists should consider the possibilities of this serious postoperative event.

Pineal Cyst in a Case of Sturge-Weber Syndrome With Homonymous Hemianopsia

First Author: Bo WAN

Purpose: To evaluate the manifestations and mechanism of Sturge-weber syndrome (SWS) and pineal cyst.

Methods: We describe an 11-year-old Asian boy with SWS presenting as facial port-wine nevi on the left involving the forehead, eyelid, nose, and cheek.

He had a 4-year history of bilateral decreased vision accompanied with headache and epilepsy from childhood.

Results: Visual field showed homonymous hemianopia and magnetic resonance imaging revealed encephalatrophy due to brain angioma. Meanwhile, optical coherence tomography (OCT) confirmed retinal nerve thinning and fluorescence angiography was normal. As a benign tumor, pineal cyst was also found in imaging findings, which was reported for the first time with Sturge-Weber syndrome.

Conclusions: The same mechanism may exist in both pineal cyst and Sturge-Weber syndrome. The impaired development of the cell precursors in the neural crest during the first embryological trimester can play a key role in pathogeny.

Profile of Brain Tumors Having Ocular Manifestations in a Tertiary Eye Care Institute of North-East India: A 3-Year Retrospective Study

First Author: Saurabh **DESHMUKH**

Co-Author(s): Pritam **BAWANKAR**, Dipankar **DAS**, Krati **GUPTA**, Ganesh **KURI**, Diva **MISRA**

Purpose: The aim of this study was to determine the ocular signs and symptoms in patients with brain tumors presenting to a tertiary eye care center in North-East India.

Methods: A 3-year retrospective study on 17 patients with intracranial space-occupying lesions presenting to a tertiary eye care center in North-East India.

Results: Out of the 17 patients there were 11 females (65%) and 6 males (35%). Average age was found to be 43 years (SD ± 11.74). Most common presenting symptom was found to be diminution of vision followed by headache and vertigo. Most common sign was optic disc changes, namely, optic atrophy followed by disc pallor and papilledema. Meningiomas (41%) were the commonest tumor followed by pituitary macroadenomas (29%).

Conclusions: Ophthalmic signs and symptoms form a major part of presentation in patients with intracranial tumors. By careful ophthalmic evaluation, early diagnosis of intracranial space-occupying lesions can be made, thereby allowing localization and early management of these tumors. Various significant signs and symptoms of the eyes are found in patients with brain tumors. By performing comprehensive ophthalmic examination, it is possible to diagnose these tumors in the early phase and reduce morbidity and mortality.

Relationship Between Recurrent Corneal Erosion and Cranial Nerve Disorders

First Author: Fon-Man **CHANG**

Co-Author(s): Chia-Yi **LEE**

Purpose: To evaluate the association between recurrent corneal erosion and cranial nerve palsy using the National Health Insurance Research Database (NHIRD) in Taiwan.

Methods: This retrospective cohort study was conducted with a total of 4248 patients diagnosed with cranial nerve disorders including facial nerve palsy, extraocular muscle impairment, and trigeminal nerve disorder enrolled in the study group while another 8496 individuals who had not received a diagnosis of cranial nerve disorders were selected as the control group. Primary outcome was defined as the occurrence of recurrent corneal erosion by the diagnostic code. Multivariate Cox regression analysis was performed to estimate the adjusted hazard ratio (aHR) of recurrent corneal erosion.

Results: A total of 12 patients in the study group and another 16 patients in the control group were diagnosed with recurrent corneal erosion. The aHR of cranial nerve disorders for recurrent corneal erosion was 1.09, which was without statistical significance ($P = 0.07$). Regarding other possible risk factors, age, gender, and degree of urbanization showed similar influence in both groups. There was no case with blepharitis in the whole population. However, the corneal diseases demonstrated a significant aHR of 6.39 for recurrent corneal erosion ($P = 0.003$). No significant aHR in the subgroup analysis of each cranial nerve disorder was observed when comparing to the control group.

Conclusions: In conclusion, there is no significant association between recurrent corneal erosion and cranial nerve disorders in current study. Further study is needed to evaluate the relationship between recurrent corneal erosion and facial nerve palsy.

Risk Factors for Acute Optic Neuritis Recurrence: Reanalysis of the Optic Neuritis Treatment Trial

First Author: Yi **DU**

Co-Author(s): Jian-Feng **HE**, Xi **XU**

Purpose: To explore clinical factors that affect acute optic neuritis recurrence.

Methods: The patients were grouped according to recurrence and nonrecurrence. Kaplan-Meier and Cox regression analysis of the Optic Neuritis Treatment Trial (ONTT; a prospective randomized controlled trial) data set was performed. Our models included effects of time, status, treatment groups, as well as demographic

covariates of age, sex, race, visual acuity, et al.

Results: Cox regression analysis showed that the factors cause relatively high recurrence rates in the oral prednisone group [hazard ratio (HR), 1.694; 95% confidence interval (CI), 1.145-2.507; $P = 0.008$]. When age of onset was more than 30, patients had less risk factors for recurrence (HR, 0.637; 95% CI, 0.460-0.883; $P = 0.007$). The data identified no relationship of sex, race, magnetic resonance imaging (MRI) result, contrast sensitivity, visual acuity outcomes, clinical center, optic disc edema, macular exudates, affected eye hemorrhage, family history of multiple sclerosis (MS), history of neurological symptoms, viral syndrome in the past 30 days, or morbidity season.

Conclusions: Age of onset less than 30 and oral prednisone (1 mg/kg prednisone/day) are important risk factors of acute optic neuritis recurrence.

Risk Factors for Frequent Relapses of Neuromyelitis Optica in China

First Author: Shuo **ZHAO**

Co-Author(s): Shihui **WEI**

Purpose: Relapses of neuromyelitis optica (NMO) may lead to severe visual loss and disability, but the risk factors for frequent relapse remain uncertain. This study aimed to evaluate the risk factors related to the activity of the disease.

Methods: Retrospective review of the documents of hospitalized patients in the department of neurology and ophthalmology of a Chinese PLA general hospital. Annual relapse rates (ARRs) were compared between patients with different clinical characters and analyzed for possible risk factors that may contribute to frequent relapse using the logistic regression method.

Results: Clinical data of 182 NMO patients were selected and reviewed. Of these patients, 51.1% had optic neuritis (ON) as their initial symptom, and among them, 84.6% had monocular involvement. Mean times of attack from ON onset to definite NMO were 1.8. Elderly (age > 40 years) patients and patients without immunosuppression treatment may have higher ARR; both elderly onset and non-ON onset could be independent risk factors for frequent relapses.

Conclusions: Elderly onset and combination of auto-antibodies (auto-abs) may correlate to frequent relapse in NMO-ON.

Successful Management of Toxic Optic Neuropathy After Snake Bite: A Case Report

First Author: Rani **INDIRA SARI**

Co-Author(s): Syntia **NUSANTI**, Muhamad **SIDIK**

Purpose: To acknowledge a rare case of toxic optic neuropathy caused by snake bite and demonstrate the

successful management and therapy.

Methods: A 19-year-old female patient had sudden visual loss and ophthalmoplegia for 5 hours before admission. Other complaints included choking, nausea, headache, paralysis of the limb, and shortness of breath. There was a history of snake bite 15 hours prior. Visual acuity was 1/300 in both eyes, and eye movement was restricted in all directions. Funduscopic examination revealed a distinct edge of the optic nerve head (ONH) with slight pallor area at the temporal site. Cup-disc ratio was hard to evaluate, and macular reflex was decreased. The patient received anti-snake venom serum, antibiotic, and anti-inflammatory agents. Plasmapheresis was also performed to detoxify the venom. Intravenous methylprednisolone 250 mg was given 4 times a day for 3 days, continued with oral methylprednisolone 0.8 mg/kg body weight a day, tapered off every week.

Results: Visual acuity showed good results and improvement in 1 month of observation, with 6/6 in both eyes and eye movement was good in all directions. Fundus photograph showed slight pallor at the temporal ONH. Humphrey perimetry showed a normal visual field of the left eye and slight visual field defect with atypical pattern on the right eye.

Conclusions: High-dose methylprednisolone therapy is widely used for toxic optic neuropathy. Our case showed that optic neuritis following snake bite is a rare yet distinct entity. Visual prognosis is fairly good when managed adequately and methylprednisolone has a definite role in hastening recovery.

The Diagnostic Ability of the Three-Step Test According to the Presence of Trochlear Nerve in Superior Oblique Palsy

First Author: Jeong-Min **HWANG**

Co-Author(s): Jae Hyoung **KIM**, Ji Eun **LEE**, Hee Kyung **YANG**

Purpose: To compare the diagnostic ability of the 3-step test in unilateral superior oblique palsy (SOP) according to the presence or absence of the trochlear nerve on high-resolution thin-section magnetic resonance imaging (MRI).

Methods: Eighty-seven patients who had a normal trochlear nerve (present group) and 79 patients without a trochlear nerve (absent group) were included. The sensitivities of 3 components of the 3-step test [(1) ipsilateral hypertropia in primary position, (2) increasing hyperdeviation on contralateral gaze, and (3) larger hyperdeviation on ipsilateral head tilt] were evaluated as well as factors related to positive results of each step.

Results: All 3 steps were positive in 78% of the present group and 72% of the absent group. Step 1 plus 2 were

positive in 83% of the present group versus 73% of the absent group. Step 1 plus 3 were satisfied in 95% of the present group versus 99% of the absent group. Patients who were positive in all 3 steps (complete group) had greater hypertropia differences between both lateral gazes ($P < 0.001$) and both tilt gazes ($P = 0.008$) compared to those who were negative in at least 1 step (incomplete group).

Conclusions: The overall sensitivity of the 3-step test in unilateral SOP was less than 80% regardless of the presence of the trochlear nerve. The results of the 3-step test do not reflect the presence or absence of the trochlear nerve.

Unusual Presentation of Behcet Disease

First Author: Hazel Anne LIN

Purpose: Neurological involvement in Behcet disease (BD) is uncommon. We describe a young patient who had an atypical presentation of BD, with ocular and neurological involvement.

Methods: Case report of a 38-year-old Turkish male, who was treated for idiopathic intracranial hypertension (IIH) and was later found to have BD with neurological involvement.

Results: Our patient had a year's history of progressive visual loss on the left. On examination, he was found to have reduced optic nerve function and bilateral swollen discs. The rest of the fundus and neurological examination were normal. Magnetic resonance imaging (MRI) and lumbar puncture (LP) were unremarkable apart from raised opening pressures (OP) of 35.4 cm H₂O. He was treated for IIH with oral acetazolamide and defaulted follow-up. He returned a year later, with worsening vision. There was bilateral disc swelling, mild vitritis, and areas of subretinal fluid. Anterior segment examination was normal. He admitted to having recurrent oral and genital ulcers, which raised suspicion of BD. Repeat MRI was normal, with absence of venous sinus thrombosis. However, there was an increase in cerebrospinal fluid (CSF) proteins on LP. Investigations for infections, cytology, and autoimmune panel were performed and were normal except for positive HLA B51, and OP remained elevated at 32 cm H₂O.

Conclusions: Our patient had an unusual presentation of isolated raised intracranial pressure (ICP) and subsequently posterior uveitis secondary to BD. We successfully managed him with a combination of steroids, acetazolamide, and azathioprine.

Unusual Visual Manifestation of Suprasellar Tumor: A Case Report

First Author: Rusti SARI

Co-Author(s): Bambang SETIOHADJI, Antonia KARTIKA

Purpose: To report a case of homonymous hemianopia visual field defect caused by suprasellar tumor.

Methods: A 43-year-old woman came with the chief complaint of blurred vision in her right eye since 2 months before. Ophthalmologic examination found best visual acuity in the right eye was 1/60 and left eye was 0.32, pinhole 0.8. Anterior segment examination revealed decrease of pupillary light reflex in the right eye with relative afferent pupillary defect (RAPD) grade III. Funduscopic examination was normal in both eyes and it was confirmed by optical coherence tomography (OCT). Color vision and sensitivity contrast were difficult to access in the right eye but in the left eye were 13/14 and 1.25%. Humphrey 30-2 examination showed homonymous hemianopia sinistra.

Results: Computed tomography (CT) scan showed suprasellar tumor suggestive of meningioma. The patient was diagnosed with homonymous hemianopia caused by suspect suprasellar meningioma with prefixed chiasm. She was referred to neurosurgery.

Conclusions: Bitemporal field defect is the most common visual abnormality produced by suprasellar lesion. Certain conditions such as prefixed chiasm in suprasellar lesion can show other variants of visual field defect. Complete neuro-ophthalmic evaluation of the signs and symptoms is essential for diagnosis followed by neuroimaging to confirm the position of the lesion.

Ocular Imaging

Evaluation of the Repeatability of Peripapillary Vascular Density With Swept-Source Optical Coherence Tomography Angiography

First Author: Yuji YOSHIKAWA

Co-Author(s): Junji KANNO, Itaru KIMURA, Kei SHINODA, Takuhei SHOJI

Purpose: To evaluate the repeatability of peripapillary vascular density (VD) with swept-source optical coherence tomography angiography (SS-OCTA).

Methods: This study was conducted in Saitama Medical University between April and May 2017. Subjects without ocular disease except for mild ametropia were included. All eyes underwent a scan of the optic nerve head over a 3×3 -mm field with SS-OCTA (PlexElite9000, Carl Zeiss) 2 times. The VDs of the superficial retinal layer (SRL) and the whole retinal layer (WRL) in the

peripapillary region were calculated after binarization with ImageJ software. To evaluate the repeatability, the coefficient of variation (CV) was calculated.

Results: Thirty-six eyes from 18 subjects were enrolled and 32 eyes were eligible for analysis. The patient demographics were as follows: age, 38.8 (24.8, 38.8) years [median (25, 75 percentile)]; axial length, 24.5 (23.5, 24.9) mm; intraocular pressure, 14.3 (11.3, 16.7) mm Hg; mean deviation, 0.09 (-0.80, 0.68) dB. VD of SRL (VD:SRL) was 74.9 (73.3, 76.5)% and 75.1 (72.4, 76.5)%; VD of WRL (VD:WRL) was 81.2 (79.3, 83.0)% and 81.6 (79.5, 82.9)%. The CV was 0.71% for VD:SRL and 0.80% for VD:WRL.

Conclusions: Measurement of peripapillary VD with SS-OCTA showed good repeatability and the VD value was higher than that in previous reports with spectral-domain OCTA.

Indistinct Bruch Membrane Opening in High Myopia and Glaucomatous Eyes on Spectral-Domain Optical Coherence Tomography

First Author: Feihui ZHENG

Co-Author(s): Christopher LEUNG

Purpose: The Bruch membrane opening (BMO) based optic nerve head parameters were reported to yield high accuracy in distinguishing glaucoma. However, we found anomalous optic disc morphology in glaucomatous and highly myopic eyes may pose a challenge in BMO detection.

Methods: A total of 117 non-high myopia [SE > -6 diopters (D)], 137 high myopia (SE ≤ -6 D) control eyes, 116 non-high myopia, and 133 high myopia glaucoma eyes were included. Standard automated perimetry (SAP) and spectral-domain optical coherence tomography (SD-OCT) were assessed. Indistinct BMO of each eye was manually marked in 24 radial scans by 2 observers. Factors contributing to BMO visibility were obtained by multilevel logistic regression.

Results: The agreement for BMO detection between the 2 observers was good [kappa: 0.85; 95% confidence interval (CI): 0.79-0.91]. The proportion of eyes with ≥1 indistinct BMO location was 0.8%, 27.0%, 6.9%, and 38.3%, respectively, in the non-high myopia control, high myopia control, non-high myopia glaucoma, and high myopia glaucoma group. The proportion of highly myopic eyes with at least 6 locations of indistinct BMO reached 12.4% and 15.0% in the control and glaucoma groups, respectively. The most frequent indistinct BMO position was located at the temporal meridians of highly myopic eyes in both control and glaucoma groups. Visual field mean deviation (MD) (odds ratio: 0.9, 95% CI: 0.9-1.0) and axial length (AL) (odds ratio: 3.0, 95% CI: 1.8-4.8) showed significant association with BMO visibility.

Conclusions: BMO in highly myopic and glaucomatous eyes is liable to fail detection on SD-OCT, especially in the temporal meridians, which may pose challenges for glaucoma diagnosis.

Nonmydriatic Ultra-Widefield Scanning Laser Ophthalmoscopy Compared With Dilated Fundal Examination for Assessment of Diabetic Retinopathy and Diabetic Macular Edema in Chinese Individuals With Diabetes Mellitus

First Author: Simon SZETO

Co-Author(s): Carol CHEUNG, Jerry LOK, Danny NG, Raymond WONG

Purpose: Nonmydriatic ultra-widefield scanning laser ophthalmoscope (UWF-SLO) has shown good agreement with standard 7-field Early Treatment Diabetic Retinopathy Study (ETDRS) photographs and clinical examination for detection of diabetic retinopathy (DR) and diabetic macular edema (DME). We aimed to assess the diagnostic performance of the UWF-SLO as a screening tool to detect referable DR and vision-threatening DR (VTDR) in Chinese adults with diabetes mellitus (DM).

Methods: A retrospective cohort study included 328 eyes from 164 Chinese patients with DM. Each patient underwent dilated fundal examination by a retinal specialist and fundus photography with nonmydriatic 200-degree UWF-SLO. The severity of DR and DME from UWF images were graded by ophthalmologists using the International Clinical Diabetic Retinopathy Disease Severity Scale and standard ETDRS classification systems. Referable DR was defined as moderate or severe nonproliferative DR, proliferative DR, and/or DME. VTDR was defined as severe nonproliferative DR, proliferative DR, and/or DME. Kappa (κ) value, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to assess the performance of UWF-SLO, using retinal specialists' clinical assessment as reference standard.

Results: Using the international classification system, the κ value, sensitivity, specificity, PPV, and NPV were 0.767, 82.4%, 93.4%, 86.6%, and 91.1% for referable DR and 0.707, 72.6%, 96.0%, 78.7%, and 94.4% for VTDR, respectively. The agreement of DR severity (κ: 0.634) and DME detection (κ: 0.694) between UWF-SLO and the reference standard were substantial. The pattern of performance was similar when the ETDRS classification system was used.

Conclusions: Our findings further validate UWF-SLO as a screening tool in diabetic populations.

Optical Coherence Tomography Angiography Compared to Indocyanine Green Angiography in Chronic Central Serous Chorioretinopathy

First Author: Jinfeng **QU**

Purpose: To determine agreement between optical coherence tomography angiography (OCTA) and indocyanine green angiography (ICGA) in patients with central serous chorioretinopathy (CSC).

Methods: The prospective cross-sectional observational clinical study included 44 patients with CSC. All eyes underwent best-corrected visual acuity (BCVA), OCTA, ICGA, and fluorescein angiography (FA). OCTA was analyzed for the presence of abnormal findings and compared to the other imaging devices.

Results: Abnormal areas were annotated in all OCTA. OCTA showed 3 main types of findings at the choriocapillaris: A, coarse granulated highly reflectant area; B, roundish halo around type A; C, coarse granulated low reflectant area inside type A. Type A in OCTA was larger than the hyperfluorescent area in ICGA ($8.25 \pm 4.76 \text{ mm}^2$ vs $5.87 \pm 4.27 \text{ mm}^2$, $P < 0.01$) but still with moderate agreement between the 2 devices (mean JI, 0.56). Bland-Altman analysis revealed a good consistency between OCTA and ICGA.

Conclusions: OCTA was able to observe dilated choriocapillaris and may become a substitute for ICGA in diagnosis and follow-up in CSC.

Optical Coherence Tomography Angiography in Incomplete Acute Vogt-Koyanagi-Harada Disease

First Author: Jian-Sheng **WU**

Purpose: To report the findings of optical coherence tomography angiography (OCTA) in a patient with incomplete acute Vogt-Koyanagi-Harada (VKH) disease.

Methods: Case report.

Results: A 70-year-old man complained of blurred vision in both eyes (OU). The best corrected visual acuity (BCVA) was 20/50 in the right (OD) and 20/40 in the left eye (OS). He denied headache and hearing impairment. The anterior segment examinations of both eyes were unremarkable. The fundus examination revealed bilateral exudative retinal detachments. OCT revealed retinal pigment epithelial (RPE) undulations, retinal detachments with fluid accumulation, a thickened choroid with many hyperreflective points, and choroidal folds. Incomplete acute VKH disease was suspected. OCTA was normal in the superficial and deep plexus. The en face OCTA scans at the level of the choriocapillaris showed multiple, discrete, dark areas which were variable in shape and size and widespread

in distribution. The corresponding structural en face and cross-sectional OCTA images did not show any loss of signal transmission in these dark areas, indicating that these may likely represent true flow void. After 6-week steroid therapy, the BCVA improved to 20/40 OD and 20/30 OS. The exudative retinal detachments subsided. OCTA disclosed improvement in previous dark areas at the level of choriocapillaris.

Conclusions: OCTA allows high-resolution imaging of inflammatory foci suggestive of choriocapillaris hypoperfusion in acute VKH disease noninvasively. OCTA may be very helpful in the follow-up of such patients.

Quantitative Assessment of Blood Vessel Density in Prelaminar Area With Swept-Source Optical Coherence Tomography Angiography in Healthy Subjects

First Author: Kimitake **OZAKI**

Co-Author(s): Junji **KANNO**, Itaru **KIMURA**, Kei **SHINODA**, Takuhei **SHOJI**, Yuji **YOSHIKAWA**

Purpose: To quantify the vessel density (VD) in the prelaminar area with swept-source optical coherence tomography angiography (SS-OCTA) and to evaluate the reproducibility of its measurement.

Methods: Eighteen subjects without ocular disease except ametropia were enrolled. Optic nerve head (ONH) over a $3 \text{ mm} \times 3 \text{ mm}$ area was scanned by SS-OCTA (Plex Elite 9000, Carl Zeiss) twice on the same day. Two masked examiners manually segmented the prelaminar area as the slab between the internal limiting membrane (ILM) to the anterior lamina surface independently and defined disc margin using fundus photographs. En face images in the prelaminar area were binarized to quantify the VD in ONH. Intraexaminer, interexaminer, and intraeye image intraclass correlation coefficients (ICC) and coefficient of variation (CV) of VD were measured.

Results: Thirty-three eyes from 18 subjects were eligible for analysis. The age and axial length were 27.0 (25.0, 36.5) [median (25, 75 percentile)] years and 24.5 (23.5, 24.9) mm. The ICC and CV were 0.99 (0.99 to 1.00, 95% confidential interval) and 0.15% (0.07% to 0.23%) for intraobserver, 0.99 (0.93 to 0.99) and 0.26% (0.09% to 0.44%) for interobserver, and 0.88 (0.76 to 0.94) and 1.14% (0.80% to 1.47%) for intraeye, respectively.

Conclusions: This SS-OCTA study showed good reproducibility of definition of segmentation and measurement of VD in the prelaminar area. These results suggest that VD in the prelaminar area can be quantitatively assessed using SS-OCTA.

Spatial Flow Density of OCT Angiography Predicts Retinopathy in Diabetic Patients

First Author: Haruka **SEKIRYU**

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Purpose: The purpose of this study was to examine whether the spatial pattern of retinal flow density (FD) in diabetic patients is valuable for the detection of diabetic retinopathy (DR) using optical coherence tomography angiography (OCTA).

Methods: This retrospective case-control study included 64 diabetic patients (30 eyes with no DR and 34 eyes with DR) who underwent OCTA examination (RTVue XR Avanti, Optovue Inc, Fremont, CA). Retinal FD of the whole 3 x 3-mm area as well as 4 divided areas (superior, inferior, lateral, nasal) excepting foveal avascular zone (FAZ) area were measured in OCT angioflow images centered on the fovea using NI Vision Builder (National Instruments, Texas). We analyzed the predictors of DR using univariate analysis followed by a multivariate logistic regression model that included predictors with $P < 0.1$ in the univariate analyses and their 2-way interaction terms. The predictions of retinopathy were evaluated using the area under the receiver operating characteristic curve (AUC).

Results: The FD of deep OCTA predicted DR with AUC of 0.81, which was better than the FD of superficial OCTA with AUC of 0.67 ($P = 0.0003$). Furthermore, the AUC of lateral deep OCTA was also significantly better than the AUC of all other areas ($P < 0.05$). The AUC of lateral FD of deep OCTA was also significantly better than the prediction by FAZ area (0.61) and HbA1c (0.51) but not duration of diabetes (0.75) ($P < 0.01$).

Conclusions: Our data suggests lateral deep FD could be useful for prediction of DR in diabetic patients.

Superiority of Ultra-Widefield Retinal Imaging Compared to Nonmydriatic Fundus Photography in the Comprehensive Medical Checkup

First Author: Hideaki **USUI**

Co-Author(s): Norio **HASEGAWA**, Aki **KATO**, Yuichiro **OGURA**, Noriaki **TAKASE**, Tsutomu **YASUKAWA**

Purpose: Nonmydriatic fundus photography has been commonly used in comprehensive medical checkups in Japan. The purpose of this study was to compare ultra-widefield retinal imaging and nonmydriatic fundus photography in the comprehensive medical checkup.

Methods: A total of 10,742 eyes of 5371 people were photographed by nonmydriatic retinal camera (Canon CR-DG10) between April 2014 and March 2015 (retinal camera group). A total of 10,602 eyes of 5301 people were photographed by ultra-widefield fundus camera

(Optos Daytona) between April 2015 and March 2016 (Daytona group). Both the ratio of defective images at the posterior pole and the ratio of detection of various diseases were reviewed retrospectively.

Results: Retinal detachment (8 eyes), peripheral retinal break (28 eyes), and peripheral retinal degeneration (45 eyes) were detected in group 2 although none of the peripheral lesions were detected in group 1. Diabetic retinopathy and macular degeneration were detected in 36 eyes and 47 eyes in group 1, with 48 eyes and 66 eyes in group 2. The defective image ratio in group 1 (112 eyes, 1.04%) was significantly higher than in group 2 (4 eyes, 0.04%).

Conclusions: Ultra-widefield retinal imaging is very useful to detect peripheral retinal lesions compared to nonmydriatic fundus photography in the comprehensive medical checkup.

Ocular Oncology & Pathology

A Rare Case of BDUMP in a Patient Treated for Thyroid Carcinoma

First Author: Raja **NARAYANAN**

Co-Author(s): Rohit **GOUD**, Avinash **PATHENGAY**

Purpose: To report a case of bilateral diffuse uveal melanocytic proliferation (BDUMP) in a patient suffering from thyroid carcinoma.

Methods: Case report.

Results: A 67-year-old male presented with the chief complaint of decreased vision in the right eye. His best corrected visual acuity (BCVA) in the right and left eye were 20/30 and 20/25, respectively; near vision was N6. Anterior segment was normal; retina was normal with few drusen seen at the posterior pole. He was diagnosed as dry age-related macular degeneration (AMD) in both eyes. Three years later he was diagnosed with thyroid carcinoma. Surgery, chemotherapy, and radiation were done for the same. In his subsequent visits vision dropped to 20/60, N10 and 20/50, N10 in the right and left eyes, respectively; both eyes showed significant cataract. In both eyes the retina showed retinal pigment epithelium (RPE) changes with hard exudates at the macula and yellow-orange lesions near the arcades. In both eyes fluorescein angiography (FA) showed early and late hyperfluorescent spots. Indocyanine green (ICG) showed hypofluorescent spots. Optical coherence tomography (OCT) showed subretinal fluid with subretinal hyperreflective material and electroretinogram (ERG) showed significant reduction in a and b waves. Infrared image showed alterations at the level of the RPE corresponding to "giraffe sign." There was significant cataract in both eyes. These features were suggestive of bilateral

diffuse uveal melanocytic proliferation (BDUMP).

Conclusions: In a patient with a history of carcinoma with significant cataract, RPE changes, and persistent subretinal fluid, uveal melanocytic proliferation should be suspected.

Bilateral Cavernous Sinus Thrombosis Complicating Sinusitis: A Rare Case

*First Author: Wern Yih **CHONG***

*Co-Author(s): Shatriah **ISMAIL**, Jan Bond **CHAN***

Purpose: To report a rare case of bilateral cavernous sinus thrombosis and left dural sigmoid sinus thrombosis with bilateral orbital cellulitis complicating sphenoid and ethmoidal sinusitis.

Methods: Case report.

Results: A 20-year-old male military trainee visited our hospital for proptosis, chemosis, and ophthalmoplegia. The patient also had fever, lethargy, bilateral periorbital edema, left nasal, cheek, and labial swelling. Contrast-enhanced computed tomography (CECT) showed prominent bilateral superior ophthalmic veins (left more than right), bilateral proptosis, and bilateral frontal soft tissue swelling with no loculation. Magnetic resonance imaging (MRI) showed absence of flow-related enhancement at the left sigmoid sinus, persistent filling defect within the cavernous sinus bilaterally, left sigmoid sinus, dural sinus, and visualized intracranial left internal jugular vein. Ethmoidal and sphenoid sinuses showed mucosal thickening with air-fluid level. Left maxillary sinus showed minimal mucosal thickening. He was diagnosed with bilateral orbital cellulitis with bilateral cavernous sinus thrombosis and left dural sigmoid sinus thrombosis complicating sphenoid and ethmoidal sinusitis. The patient was started on intravenous antibiotics, intravenous antivirals, and intravenous hydrocortisone. Clinical symptoms and signs improved after early appropriate medical treatment.

Conclusions: Bilateral cavernous sinus thrombosis rarely occurs, but it has high morbidity and rarely full recovery. High index of suspicion and imaging are required to make a correct diagnosis. MRI is more superior than CECT in aiding the physician to come to a correct diagnosis. Early and aggressive medical treatment contributes to the successful management of this life-threatening complication.

Case Report: A Case of Orbital Granulocytic Sarcoma as the Initial Manifestation of Acute Myeloid Leukemia

*First Author: Maria Clarissa **SOBRIO***

*Co-Author(s): Romeo **CRUZ Jr***

Purpose: Granulocytic sarcoma, a malignant solid

tumor composed of immature white blood cells, is an extramedullary manifestation of acute myeloid leukemia (AML). Granulocytic sarcoma as an initial presentation of AML is a rare occurrence. It most commonly presents in young children but it is a rare orbital tumor in childhood.

Methods: This study presents a case of a 28-year-old male who initially complained of lid swelling, which did not resolve with any antibiotic. Lid swelling progressed to proptosis, which eventually led to loss of vision after 1 month. Cranial and orbital computed tomography (CT) scan with contrast was done with a preliminary diagnosis of a malignant intraorbital mass. Diagnosis was changed to idiopathic orbital inflammatory syndrome because no intraorbital or intraparenchymal mass was noted, but instead enlargement of the superior, lateral, and medial rectus were seen. Erythrocyte sedimentation rate (ESR) was elevated 2.5 times compared to normal. However, complete blood count showed pancytopenia; hence, diagnosis of leukemia was entertained.

Results: Bone marrow biopsy was done, which showed acute myeloid leukemia; hence, diagnosis of orbital granulocytic sarcoma was made. Due to the aggressive presentation, the patient was referred right away for chemotherapy.

Conclusions: A diagnosis of leukemia should be a consideration in a young patient who presents with rapidly occurring proptosis. Granulocytic sarcoma may be an initial manifestation of underlying AML.

Case Report: A Rare Case of Maxillary Low-Grade Fibroblastic Osteosarcoma Presenting as Proptosis

*First Author: Maria Clarissa **SOBRIO***

*Co-Author(s): Manuel **PALMERO***

Purpose: Fibroblastic osteosarcoma of the maxilla, a rare type of osteosarcoma, can often initially present as proptosis. Low-grade fibroblastic osteosarcoma is often confused with fibrous dysplasia because of similar features that can be seen on histopathology. Fibrous dysplasia, a benign fibro-osseous disorder, can also behave malignantly with a rapidly enlarging mass that destroys bone. An open biopsy has a 98% diagnostic yield and should be performed when there is conflict between radiologic and histopathologic evidence.

Methods: This is a case of an 18-year-old female initially presenting with proptosis of 4 months duration who was initially diagnosed to have fibrous dysplasia and was confirmed to be low-grade fibroblastic osteosarcoma of the maxilla with orbital and cranial extension after excision biopsy.

Results: Low-grade fibroblastic osteosarcoma should be suspected in recurrent cases of fibrous dysplasia

that produce significant soft tissue extension and bone destruction. The few mitotic figures and minimal cytological atypia in low-grade osteosarcoma could be easily confused and diagnosed as a benign fibro-osseous lesion. Malignancy should be suspected when the stroma is too cellular and there is an increase in fibroblasts and vascular endothelial cells in histopathology instead of a loosely arranged stroma and less cellular presentation, as what would be expected in fibrous dysplasia.

Conclusions: This study emphasizes the importance of meticulous analysis of available data to arrive at the correct diagnosis. A high level of suspicion is life-saving in benign disease that behaves aggressively because it can, in fact, be a malignant one.

Choroidal Melanoma, Our Experience: A Case Series

First Author: Diwa HAMAL

Co-Author(s): Ben LIMBU, Eli PRADHAN, Purnima RAJKARNIKAR STHAPIT, Rohit SAIJU

Purpose: Choroidal melanomas are diagnosed in approximately 6 out of 1 million Americans per year, and although their incidence is low, they are the most common primary intraocular tumor in adults. We would like to share our experience with choroidal melanoma.

Methods: To report 7 cases of unilateral choroidal melanoma with their presentation, histopathological variations, and systemic associations.

Results: There were 7 patients, 5 male and 2 female, with an age range of 18-70; median age was 62. All presented with decreased vision ranging from 6/24 to hand movements (HM) of less than 3 months. Fundus showed choroidal mass associated with vitreous hemorrhage (VH) and retinal detachment (RD). Two male patients showed bilateral lung granuloma on chest radiography. Four patients were managed with enucleation with chemotherapy and radiotherapy. One underwent only enucleation. One patient with lesion size less than 10 mm underwent plaque brachytherapy. Histopathological examination of enucleated patients revealed epithelioid cell melanoma grade 3 in 4 and spindle cell melanoma in 1 case. One case each of epithelioid cell melanoma and spindle cell melanoma had scleral involvement. Indications for radiotherapy and chemotherapy were scleral involvement on histopathological examination and lung metastasis.

Conclusions: Despite having different fundal pathology, the patient is sometimes asymptomatic as in these cases. The patients came for eye examination only with the complaint of decreased vision. Further detailed examinations revealed presence of tumor. Being rare among Asians, it can endanger sight and cause life-

threatening problems. Annual eye examination with routine dilated fundus exams can help in prevention and early diagnosis of this condition.

Clinical Presentation and Outcome of Sebaceous Cell Carcinoma: A 10-Year Review in a Tertiary Center in Hong Kong

First Author: Emmy LI

Co-Author(s): Stacey Carolyn LAM, Hunter YUEN

Purpose: To describe the clinical features, management, and prognosis of sebaceous cell carcinoma, a rare but malignant neoplasm.

Methods: This is a single-center retrospective case series involving 18 consecutive patients with sebaceous cell carcinoma of the eyelid. Presenting features, location of the carcinoma, management, histopathologic findings, incidence of recurrence, metastasis, and mortality were reviewed.

Results: The median age at presentation was 63.9 years old, with 67% female. The left to right ratio was 1:1, with 83% on the upper lid. Initial diagnoses were chalazion (61%), suspicious mass for investigation (33%), and recurrent blepharoconjunctivitis (11%). All had pathologically confirmed diagnosis of sebaceous cell carcinoma; 17% showed intraepithelial (pagetoid) involvement and 11% were positive for fat staining. A total of 72% of patients underwent excision with local reconstruction, 11% with orbital exenteration, 6% with radiotherapy, and the rest opted for conservative treatment.

Conclusions: Despite the fact that clinical features of sebaceous cell carcinoma have been widely reported, time lag from presentation to diagnosis is still common, resulting in morbidity and mortality.

Clinical Profile and Surgical Outcomes in Ocular Surface Squamous Neoplasia in Human Immunodeficiency Virus Patients

First Author: Rama RAJAGOPAL

Co-Author(s): Geetha IYER, Jyotirmoy BISWAS, Nilay NITINKUMAR PATEL, Bhaskar SRINIVASAN

Purpose: To study the clinical profile, surgical outcome, and histopathologic features of ocular surface squamous neoplasia (OSSN) in human immunodeficiency virus (HIV) positive patients.

Methods: Retrospective review of 13 patients who underwent surgical excision of OSSN in HIV between January 2010 and December 2016.

Results: Records of 13 patients (11 males, 2 females) were reviewed. Mean age at presentation was 38.7 years. Seven had HIV prior to presentation (antiretroviral therapy, 68.05 months) and 6 were diagnosed after ocular evaluation with mean CD4+

count of 180.23 cells/uL. Commonest presentation with mean duration of 5.38 months was growth in eye followed by redness (11, 2). Commonest morphology was papillary followed by nodular (4, 2). Conjunctival and corneal involvement was seen in 11, with nasal (4) location being commonest. American Joint Committee on Cancer (AJCC) T2 tumor was most common. Mean duration from presentation to surgery was 27 days. Primary excision surgery was done for 13. Two patients with intraoperative residual tumor required plaque brachytherapy and exenteration (1 each). One patient with scleral patch graft developed autoevisceration postoperatively. Histopathology revealed dysplasia in 4 (30.8%) and squamous cell carcinoma in 9 (69.2%). Four patients were lost to follow-up after surgery. No recurrence was noted in 6 patients at an average follow-up of 17 months postoperatively.

Conclusions: HIV and OSSN can coexist. Systemic evaluation in HIV should be coupled with detailed ocular evaluation as well.

Conjunctival Lymphoid Lesions: Benign or Malignant?

First Author: Rama **RAJAGOPAL**

Co-Author(s): Krishna **KUMAR**, Pavani **MURTHY**, Nilay **NITINKUMAR PATEL**

Purpose: To review different clinical manifestations and histopathological diagnosis of patients presenting with conjunctival lesions clinically suspicious of lymphoma.

Methods: Case records of 7 patients (over 3 years) presenting with conjunctival lesions suspicious of lymphoma and their histopathological diagnosis were retrospectively reviewed.

Results: Mean age was 45.1 years (4 male, 3 female). Lesions were unilateral in 5 eyes (right eye in 2 patients, left eye in 3 patients). Bilateral involvement was noted in 2 patients. Commonest presenting symptom was mass (4 patients), followed by redness (2 misdiagnosed as scleritis), and 1 was found on routine clinical examination. Average duration of presentation was 9.7 months. Lesions were unifocal in 6 patients and multifocal in 1. Classical salmon hue was seen in 3 eyes. Excision biopsy was performed in 5 eyes and incisional biopsy in 2. Histopathological diagnosis included conjunctival reactive hyperplasia (3), extranodal marginal zone lymphoma/MALT (3), and plasmacytoma (1). Further immunohistochemistry was performed in 5 patients. One patient had recurrence of benign lesion, and 1 patient developed new lesion in the other eye during 1-year follow-up. Patients with lymphoma were further referred to the oncologist for systemic evaluation and management.

Conclusions: Conjunctival lymphomatous lesions could be benign or malignant. Although most commonly

unilateral/unifocal, they can present as bilateral multifocal lesions as well. Lesions can be easily misdiagnosed. Salmon hue is an important indicator of the disease. High index of clinical suspicion is necessary for early diagnosis. Prompt referral to an oncologist for systemic evaluation could be life saving. Periodic ocular evaluation for early recognition of recurrence is recommended.

Cytokine Concentrations in Aqueous Humor of Eyes With Uveal Melanoma

First Author: Jing **FENG**

Co-Author(s): Yong **CHENG**, Jianhong **LIANG**

Purpose: To investigate the aqueous concentrations of angiogenic, inflammatory, and chemotactic cytokines in eyes with uveal melanoma.

Methods: This clinical comparative study included a study group of 38 patients with uveal melanoma and a control group of 22 patients undergoing cataract surgery. Aqueous humor samples were assessed for interleukin 6 and 8 (IL-6 and IL-8, respectively), interferon-inducible protein-10 (IP-10), placental growth factor 1 (PIGF1), regulated on activation normal T cell expressed and secreted (RANTES), monocyte chemoattractant protein 1 (MCP1), nerve growth factor-beta (NGF- β), epidermal growth factor (EGF), basic fibroblast growth factor (bFGF), and vascular endothelial growth factor A (VEGF-A) by multiplex bead assay.

Results: In the study group as compared with the control group, significantly higher concentrations were measured for IL-6 ($P = 0.006$), IL-8 ($P = 0.018$), IP-10 ($P = 0.004$), RANTES ($P = 0.008$), MCP1 ($P = 0.02$), NGF- β ($P = 0.013$), EGF ($P < 0.001$), PIGF1 ($P = 0.01$), bFGF ($P = 0.016$), and VEGF ($P = 0.017$).

Conclusions: Numerous cytokines are associated with the presence and the amount of uveal melanoma.

FAK Promotes Uveal Melanoma Tumorigenicity and Metastasis by Activating Cancer Stem-Cell Traits and EMT

First Author: Ying **LIU**

Co-Author(s): Zhongyi **FAN**, Yifei **HUANG**

Purpose: Focal adhesion kinase (FAK) is involved in tumorigenesis, tumor recurrence, and metastasis and has been shown to be overexpressed in several cancers including uveal melanoma (UM). However, the underlying mechanism of FAK functions remains unclear in UM. The purpose of this study was to evaluate the mechanism of FAK regarding tumor recurrence and metastasis in UM cells.

Methods: FAK expression was assessed in 25 UM specimens and TCGA data. UM cells were examined

for expression or knockout of FAK. Their contribution to the tumor recurrence and metastasis of UM cells was assessed using sphere formation assay and cell migration assays. These results were corroborated in tissue from UM animal models.

Results: FAK was positive in most UM specimens and TCGA data. Overexpression of FAK activated Wnt/ β -catenin signaling and EMT-related genes, and then promoted CSC traits and EMT phenotype in vitro and tumor recurrence and metastasis in vivo. Antagonizing FAK potently inhibits tumor initiation and progression in xenografted animal models.

Conclusions: FAK expression correlates with the overall- and recurrence-free survival of UM patients. FAK promoted tumor recurrence and metastasis in UM via activated CSC traits and EMT. These findings suggest that FAK mediates the constitutive activation of Wnt/ β -catenin signaling and EMT, likely serving as a potential therapeutic target for UM.

Histopathologic Findings Associated With Secondary Enucleations Performed for Loss of Fundus View in Retinoblastoma Patients

First Author: Jonathan KIM

Purpose: To evaluate the outcomes of secondary enucleations following failure of chemoreduction and assess the histopathologic findings in eyes with loss of fundus view.

Methods: A 20-year single-institution retrospective chart review of patients diagnosed with retinoblastoma in at least 1 eye initially treated with systemic chemoreduction and requiring secondary enucleation between January 1, 1995 and August 1, 2015. Principal outcome measures were indications for secondary enucleation (including loss of fundus view), active tumor found on histopathology of the enucleated globe, and presence of high-grade histopathologic features.

Results: Of 65 secondarily enucleated eyes, 37 were enucleated for recurrent tumors, 3 for a blind painful eye, and 25 for loss of fundus view. In total, 3 eyes had high-grade histopathologic features and all 3 patients received an average of 5 cycles of adjuvant chemotherapy. The average time from diagnosis to loss of fundus view was 8.5 months, and the average time from loss of fundus view to enucleation was 4.4 months. Of the 25 secondarily enucleated eyes with loss of fundus view, 23 were noted to have viable tumor cells on histopathology.

Conclusions: Loss of fundus view was a common indication for secondary enucleation after chemoreduction. Given the high prevalence of active, viable tumor cells on histopathology, loss of fundus view likely represents an advanced stage of intraocular

disease that carries a higher risk of tumor relapse. Enucleation for loss of fundus view in eyes treated for advanced retinoblastoma should not be delayed more than a few months to decrease the risk of tumor spread.

Iris-Ciliary Body Melanoma in a Young Patient

First Author: Bui Dao QUAN

Co-Author(s): Dang Tran DAT, Hoang Anh TUAN, Nguyen Quoc ANH, Nguyen Xuan HIEP, Tham Truong Khanh VAN

Purpose: Malignant uveal melanoma is one of the most common primary intraocular tumors in adults. However, it is very rare in children. The prevalence rate of malignant uveal melanoma is about 6-7 cases per 1 million people, but just only 0.8% of them are children. More than 90% of cases involve the choroid, and the remainder are iris and ciliary body. Iris-ciliary body melanoma in children is difficult to diagnose and manage. We report a few rare clinical cases which have been treated.

Methods: We report 2 cases where patients had tumors developing from the iris-ciliary body.

Results: The first patient received surgery to remove the tumor completely. Globe and vision remained. The result of histopathology was ciliary body melanoma mixed-cell type. The second patient needed enucleation. Postoperative results of both cases were positive after long-term follow-up.

Conclusions: Iris-ciliary body melanoma is very rare in general and rarest in children. The cause is still unknown. Authors argue that there is a connection between oculo(dermal) melanocytosis and uveal melanoma. Our patients also had this disease sign. Diagnosis and treatment of uveal melanoma in young patients in a timely manner is very important, though a challenge for ophthalmology doctors. If the tumor is still small (< mean 4 o'clock) with no seeding, the eye can remain and still have vision. However, this type of tumor has a high rate of developing and symptoms are not shown in the early course of the disease, hence the delay in treatment.

Lacrimal Gland Biopsy Revealing Non-Hodgkin Lymphoma in Disseminated Tuberculosis

First Author: Bhagwati WADWEKAR

Purpose: Non-Hodgkin lymphoma (NHL) presenting with tuberculosis (TB) is an indistinguishable clinical situation. Herein we report a case diagnosed as disseminated TB at many places and later diagnosed as lymphoma after lacrimal gland (LG) biopsy. Hence, awareness of lymphoma coexisting with TB should be

raised.

Methods: Case report. A 40-year-old male presented with fever, night sweats, and generalized lymphadenopathy. Fine needle aspiration biopsy of cervical lymph node (LN) revealed granulomatous lymphadenitis. Bone marrow biopsy showed positive acid fast bacilli (AFB) stain. The patient was diagnosed and treated for disseminated TB. Despite treatment he worsened and developed left eye ptosis, swelling in the superotemporal quadrant of the orbit, and prolapse of the LG in conjunctival fornix. Left sided preauricular, postauricular, and submandibular LN were enlarged. We made a diagnosis of tubercular dacryoadenitis and sent a biopsy of LG. Histopathology showed marginal zone B-cell lymphoma. LN excision biopsy also showed NHL and was confirmed by immunohistochemistry.

Results: TB and lymphoma presenting together is rare. TB may hide lymphoma or vice versa. In this report, diagnosis of TB was confirmed by positive AFB bone marrow biopsy; the patient was eventually diagnosed with coexisting diffuse large B-cell lymphoma after LG biopsy. Only a few reports have described the coexistence of TB and NHL. Lymphoma may cause suppression of cell-mediated immunity, which predisposes to a concomitant TB infection, and the risk of NHL is significantly increased with severe TB.

Conclusions: Whenever a patient is diagnosed with TB and does not respond despite regular treatment, we should have a high index of suspicion of lymphoma.

Local Recurrence of Malignant Melanoma Following Orbital Exenteration

First Author: Indha KARTIKASARI

Purpose: Malignant melanoma of the uveal tract is a rare ocular malignancy and the incidence of local recurrence after treatment is low. We report an unusual case of local recurrence of malignant melanoma in a 38-year-old woman who had previously undergone orbital exenteration of the right blind eye.

Methods: A 38-year-old had the chief complaint of a dark-colored mass on the right orbit. Six months earlier, she was diagnosed with right eye proptosis; intraorbital tumor was suspected and diagnosed as malignant melanoma, initially treated with orbital exenteration. Head and orbital computed tomography (CT) scan showed extended mass to the right intracranial frontotemporal lobe followed by destruction of orbital wall, paranasal sinuses, basis cranii, and cerebral edema. There was no metastatic finding from liver and chest examination. Patient was planned to have radiotherapy after surgery but refused.

Results: A woman was diagnosed with uveal malignant melanoma, which was confirmed by histopathology due to orbital exenteration. Six months after surgery,

local orbital recurrence occurred and was managed with chemotherapy and radiotherapy.

Conclusions: Uveal tract melanoma is a rare form of cancer; nevertheless, it is the most common primary intraocular malignancy in adults and the incidence of local recurrence after treatment is low. The diagnosis is established from head and orbital CT scan, histopathological examination, metastatic finding through liver function test, abdominal ultrasonography (USG), and chest x-ray. Local recurrence of malignant melanoma in this patient occurred about 6 months after orbital exenteration. Management after surgical treatment includes chemotherapy and radiotherapy, along with close follow-up examination and monitoring every 6 months for detecting any early tumor metastasis.

Ocular Manifestations of Aplastic Anemia

First Author: Ferriya AGUSTIN

Purpose: To report a rare case with ocular manifestations of aplastic anemia.

Methods: A 29-year-old woman presented with a proptotic eyeball in her right eye suspected to be caused by retrobulbar hemorrhage. Visual acuity was 1/300, while no abnormality was found in her left eye. There was no history of eye complaints before. Twenty days later, the patient's eye underwent choroid prolapse suspected due to necrotizing scleritis, exposure keratitis caused by lagophthalmos, and visual acuity was light perception (LP)(-). The diagnosis was established by history taking, physical examination, laboratory findings, and clinical manifestations. Bone marrow puncture showed aplastic anemia.

Results: In this case, there were various problems in her right eye so it was treated with enucleation, and during surgery ocular cardiac reflex occurred several times. Four months later, we found retinal hemorrhages in the left eye.

Conclusions: Aplastic anemia is a systemic disease with various ocular manifestations. Management and prognosis of ocular manifestations depend on progression and management of aplastic anemia.

Papilledema Caused by Glioblastoma Multiforme

First Author: Seskoati PRAYITNANINGSIH

Purpose: To report a case of papilledema caused by glioblastoma multiforme tumors. Through this case, doctors are expected to explore history taking with thorough eye examination and multidisciplinary approach.

Methods: A 37-year-old man came with a complaint of his right and left eye blurred accompanied by dizziness,

headache, impaired speech, decrease of motor function, and consciousness. Visual acuity was no light perception for right and left eyes. Anterior segment showed quiet conditions. Fundoscopy showed bilateral papilledema, but examination of optic nerve function, perimetry, fundus photographs, and optical coherence tomography could not be performed due to visual loss. Orbital-head magnetic resonance imaging (MRI) with or without contrast showed intraaxial heterogenous mass at the left frontotemporoparietal region, suggesting glioblastoma multiforme.

Results: The patient was diagnosed with bilateral papilledema caused by glioblastoma multiforme tumors. The goals of managing these patients are to reduce the patients' complaints and to prolong survival. The management depends on the cause of papilledema. The choice of treatment in this case was surgical resection followed by radiotherapy, but the patient refused.

Conclusions: We have reported a case of papilledema caused by glioblastoma multiforme tumors. Medical treatment was given as carbonic anhydrase inhibitors and corticosteroid. Multidisciplinary approach was required to obtain the best treatment and can prolong survival.

Unusual Case of Intraocular Medulloepithelioma

First Author: Delfitri **LUTFI**

Co-Author(s): Hendrian **SOEBAGJO**, *Susy* **FATMARIYANTI**

Purpose: Medulloepithelioma is an unusual congenital neoplasm from the nonpigmented epithelium of the ciliary body, retina, and optic nerve usually diagnosed in childhood. Medulloepithelioma is the second most common primary intraocular neoplasm during the first decade of life. We report a case of a 3-year-old girl with leukocoria suspected as retinoblastoma that turned out to be medulloepithelioma.

Methods: A 3-year-old girl presented with a progressing white pupillary reflex in the LE (left eye) for 1.5 years. She had a history of LE recurrent redness and poor vision for the past 5 months. There was no history of eye tumor nor other tumors on her pedigree. Ultrasonography revealed hyperechoic lesion occupying the posterior segment of the globe with irregular internal reflectivity and multiple hypoechoic areas (multicystic) and no calcium deposits. We assessed the patient as a LE intraocular mass with differential diagnosis of retinoblastoma and medulloepithelioma. The parents were offered the option of enucleation to treat and make a definitive diagnosis.

Results: We performed surgical enucleation and sent the eyeball specimen for histopathology examination

(HPE). HPE results revealed a ciliary body surrounded by ribbon, cords, and small sheets of blue tumor cells and occasional Flexner-Wintersteiner rosettes supporting the diagnosis of medulloepithelioma.

Conclusions: Because of its rarity, this tumor presents a potentially challenging diagnosis. There is often a misdiagnosis especially when patients present at the advanced intraocular stage. Ultrasonography can offer certain information and when combined with an ophthalmologic examination can lead to the true diagnosis. However, the definitive diagnosis for intraocular medulloepithelioma should be made by a histopathology examination.

Unusual Presentation of Periocular Basal Cell Carcinoma

First Author: Jose Carlo **ARTIAGA**

Co-Author(s): Felice Katrina **RANCHE**

Purpose: Periocular basal cell carcinoma (BCC) is the most common malignancy in the eyelid, usually presenting as a slow-growing mass with a pearly appearance and rolled and raised borders with central ulceration at the lower lid. We present an unusual case of periocular BCC with lateral canthal involvement, orbital invasion, and multiple tumor foci with different clinical and histologic subtypes.

Methods: This is a case of a 61-year-old Filipino fisherman with a 4-year history of a gradually enlarging hyperpigmented left lateral canthal mass with central ulceration and fusion of the eyelids. Computerized tomography showed a homogenous, ill-defined eyelid mass extending into the lateral orbit beyond the equator of the globe. Section biopsy revealed basal cell carcinoma. Orbital exenteration with frozen section control of skin margins and wide excision of a 7 x 4-mm hyperpigmented forehead mass were done.

Results: Histopathologic examination of the orbital specimen revealed separate primary foci of infiltrative BCC at the periocular skin and bulbar conjunctiva, with invasion of the lateral orbicularis oculi muscle. The forehead specimen showed nodular basal cell carcinoma. Work-up done for conditions presenting with multiple BCCs turned out negative.

Conclusions: Although fairly common, periocular BCC may present atypically, which may require different approaches in both diagnosis and management. The lateral canthus is the least commonly involved area of the lids. Orbital invasion and primary conjunctival involvement are rare. Infiltrative histology presents with aggressive growth, while multiple primary BCCs may be the hallmark of systemic diseases. Orbital exenteration remains the best option for cases of periocular BCC with orbital invasion.

Ophthalmic Epidemiology

Attitude and Practice Patterns Toward Wearing Spectacles for Refractive Error Correction Among High School, College, and Undergraduate Students: A Qualitative Study in Bangladesh

First Author: Nahid **FERDAUSI**

Co-Author(s): Ahm Enayet **HUSSAIN**

Purpose: The purpose of this study was to explore the attitudes toward spectacle use and to detect practice patterns of refractive error toward correction. This study also addressed the barriers in the uptake of refractive services.

Methods: This study adopted a qualitative narrative research design. Twelve in-depth interviews and 8 focus group discussions were conducted among students at high school, college, medical college, and engineering university during the period from February to July 2017. Participants were asked to reflect on their own experience and the experiences of those they knew and attitudes they perceived as having an influence on spectacle use. Thematic analysis was carried out.

Results: This study identified that attitude toward spectacle use largely varies between rural and urban students and also on level of education. The stigma attached to spectacle use is high in girls, as they tend to believe that girls with spectacles are not best fit for marriage. They also felt that spectacles hindered their participation in sport and other extracurricular activities. However, the perception of most of the respondents was positive with regards to the use of spectacles, as they helped to continue their education and improved their quality of life. Good quality, comfortable, attractive, and fashionable spectacles are essential to ensure continued use of spectacles.

Conclusions: Consumers' perspectives should be given high importance when designing refractive error programs. The prevalence of low self-esteem and stigmas of spectacle use among students can be effectively corrected with health and education information through the students who are using spectacles and improving their quality of life.

Blepharitis as an Early Sign of Metabolic Syndrome: A Nationwide Population-Based Study

First Author: Wu-Ting **CHANG**

Co-Author(s): Hung-Chi **CHEN**, Chia-Yi **LEE**

Purpose: To investigate the relationship between blepharitis and metabolic syndrome (MetS) by using the Longitudinal Health Insurance Database (LHID) of

Taiwan.

Methods: This retrospective cohort study was conducted using data collected from the LHID for the period from 2009 to 2013. This study enrolled patients who received a diagnosis of blepharitis according to the International Classification of Diseases, Ninth Revision, diagnostic code. The exclusion criteria were legal blindness, eyeball removal, ocular tumors prior to the diagnosis of blepharitis, and diagnosis of MetS before blepharitis. An age- and gender-matched population without blepharitis served as the control group. Multivariate analysis with a multiple Cox regression model was applied to analyze the data.

Results: In this study, a total of 14,488 patients with blepharitis were included in the study group, and another 57,952 participants without blepharitis were included in the control group. Patients with blepharitis had a higher probability of developing MetS than controls ($P < 0.01$) (Table 1). According to subgroup analysis, hyperlipidemia, coronary artery diseases, cerebrovascular diseases, and acute ischemic heart diseases were significantly correlated with the prior development of blepharitis ($P < 0.05$). However, hypertension and diabetes mellitus (DM) showed no correlation with blepharitis ($P = 0.46$ and 0.66 , respectively). Similarly, the Kaplan–Meier curves of cumulative proportion revealed a higher cumulative probability in the study group for all MetS, except for DM.

Conclusions: In conclusion, blepharitis is significantly related to MetS and can serve as an early sign of MetS. Additional studies should examine the relationship between blepharitis and MetS in terms of severity.

Pattern of Ocular Trauma in Pondicherry: A Hospital-Based Study

First Author: Bhagwati **WADWEKAR**

Co-Author(s): Bennita **JAYACHANDRAN**, TS **ISHWARYA**

Purpose: To find the incidence of ocular trauma in our institute and to study the pattern of ocular trauma in Pondicherry in a hospital-based set-up.

Methods: We analyzed records of cases with ocular emergencies reporting to our hospital from January 1, 2016, to December 31, 2016. Records were analyzed in detail for demographics, cause, type of injury, setting of injury, and ocular examination.

Results: There were 15,701 emergencies, of which 204 were ocular emergencies. Incidence of ocular injuries in our study was 0.87%. Male to female ratio was 4:1. Road traffic accident (RTA) was the major cause of trauma. Lid laceration was the most common finding on examination, followed by periorbital edema. All cases had blunt trauma. Other findings were subconjunctival hemorrhage, foreign body, corneal

abrasion, optic neuropathy, hyphema, mydriasis, third nerve paralysis, choroid rupture, etc.

Conclusions: Incidence of ocular trauma in our study was 0.87%, with the major cause due to RTA. Hence, ocular trauma should be recognized as a public health problem, as a lack of understanding of this epidemic leads to a lack of educational and preventive efforts.

Prevalence of Presbyopia, Presbyopia Correction Coverage, and Barriers to Uptake of Eye Care Services for Near Vision Impairment Among the Indigenous Population in the Northern Part of Bangladesh

First Author: Nahid FERDAUSI

Purpose: The purposes of this study were to determine the prevalence of presbyopia, presbyopia correction coverage (PCC), and self-perceived barriers to accessing services for near vision impairment in the financially challenged, mostly illiterate indigenous population in the northern rural part of Bangladesh.

Methods: This population-based, cross-sectional study was carried out in an organized eye camp on men and women of 40 years of age and above. PCC was defined as $\text{met-need}/\text{total need} \times 100$. Presbyopic people were provided with glasses free of cost and those who needed distance correction were referred appropriately. Participants were asked about self-perceived barriers to the uptake of eye care services for near vision impairment.

Results: Among 396 participants, 210 were female and 186 were male. The mean age of the participants was 53.48 years. A total of 233 (58.8%) participants identified the need for presbyopic correction. Age-adjusted data showed a significantly higher need for presbyopic correction in females than males. The unmet need was 57.8% and the met need was only 1%. The PCC was 1.71C%. The common barriers mentioned to the uptake of services for near vision impairment were financial incapability (34%), lack of awareness that simple spectacle usage could improve vision (23%), and setting priority (11%).

Conclusions: Even though it can be easily corrected with spectacles, presbyopia correction coverage remains significantly very low in this marginal community. As presbyopia affects every individual aged 40 years and above, bringing these services to communities will provide an opportunity for public awareness, screening, early detection, and management of other blinding eye diseases which are also common in this age group.

Orbital & Oculoplastic Surgery

A Giant Schwannoma of the Supraorbital Nerve in a Patient With Neurofibromatosis Type I: A Case Report

First Author: Mukti MITRA

Co-Author(s): Md Sharfuiddin AHMED, Anisur ANJUM, Golam HAIDER, Ava HOSSAIN

Purpose: In neurofibromatosis type I, all the nerves of the orbit are diffusely thickened with soft or bag of worms consistency. These cannot be excised completely, so debulking is usually done. This case report describes an unusual case of neurofibromatosis where the schwannoma, involving the supraorbital nerve with its branches, was completely removed.

Methods: A 14-year-old girl presented with the history of gradual painless swelling of the left eyelid from early childhood causing severe mechanical ptosis. She was clinically diagnosed as a case of neurofibromatosis type I. All the baseline evaluations were done including computed tomography (CT) scan of the brain and orbit to exclude optic nerve glioma. The patient was planned for debulking and reconstruction of the upper lid under general anesthesia. After making the incision at the marked lid crease, the supraorbital nerve was found thickened along its branches, which were removed completely. Lid reconstruction was done by horizontal and vertical shortening and reattachment of levator muscle. Lid crease was formed. Histopathological confirmation was done.

Results: The patient was satisfied with the postoperative appearance of the upper lid with no recurrence to the last follow-up visit.

Conclusions: Usually, the orbital nerves cannot be identified separately in neurofibromatosis. For that reason excision is difficult. But in this rare case, complete excision with good cosmetic outcome was possible.

A Rapidly Enlarging Bleeding Mass Proves Benign: A Case Report

First Author: Maria Isabel UMALI

Co-Author(s): Alex TAN

Purpose: Nodular fasciitis is a benign fibroproliferative tumor that may easily be mistaken for a malignancy due to its clinical appearance. This case emphasizes the importance of histopathologic studies to determine malignancy and thus direct management.

Methods: We present a rare case of a 29-year-old male who had a 7-month history of rapidly growing lower lid mass which started at the right medial canthus. On consult, the mass measured 6 cm x 5 cm x 4 cm and

was firm, fleshy, bleeding, and fixed overlying the right medial canthus and lower lid, already partially covering the right eye due to its large size.

Results: Computed tomography (CT) scan showed no orbital involvement or bony erosion. Biopsy revealed spindle cell proliferation, while immunohistochemical studies were positive for smooth muscle actin but negative for cytokeratin, desmin, and CD68. The KI-67 labeling index was less than 5%. The mass was excised and final biopsy result revealed nodular fasciitis.

Conclusions: To the author's knowledge, this is the first case of nodular fasciitis presenting at this location with this size. This case also highlights the importance of biopsy and immunohistochemical studies in differentiating between benign and malignant lesions and thus aids in their definitive management.

Acute Primary Angle Closure After Periorbital Facial Procedures: Report of 4 Cases and Literature Review

First Author: Mohsen KASHKOULI

Co-Author(s): Parya ABDOLALIZADEH, Maria SHAREPOUR, Hamed SIANATI

Purpose: The literature includes 5 previous reports of acute primary angle closure (PAC) after blepharoplasty and blepharoptosis procedures. The aim of this study is to report 3 more cases of PAC after blepharoplasty and 1 after endoscopic forehead lifting procedures (2003-2016) and review the previously reported cases in the literature to find the risk factors.

Methods: Four female subjects with an age range of 50-67 years developed PAC 2-5 days after blepharoplasty and endoscopic forehead lifting procedures. All presented with pain, nausea, blurred vision, red eye, and eyelid swelling. Diagnosis was delayed in the first subject because of considering the signs and symptoms as usual postoperative ones. Presumed risk factors for PAC were female gender (all), advanced age (all), pupillary dilation (all), and hyperopia (case 2).

Results: Medical treatment controlled the pressure, which was followed by bilateral YAG laser iridotomy. They fully recovered with no optic neuropathy at last follow-up examination 10 months to 10 years after the procedure.

Conclusions: The risk of PAC should be investigated preoperatively and its presentation should be considered in the postoperative follow-up of subjects with periorbital facial procedures.

Botox: A Miracle Drug Acts as a Blessing for Hemifacial Spasm Patients for its Safety and Longer Duration of Action

First Author: Nishat PARVEEN

Co-Author(s): Golam HAIDER, Mukti MITRA

Purpose: To describe the long-term effectiveness and safety of Botox treatment in patients with hemifacial spasm (HS).

Methods: This prospective observational study was carried out from June 2014 to June 2017 at a government institution. The patients had been informed about the study. Informed consent and detailed history was taken. HS was diagnosed and differentiated from benign essential blepharospasm (BEB) according to presenting symptoms and signs. Injections were made subcutaneously around the eye and face. Duration of improvement was assessed subjectively and reported in months. Follow-up of 146 patients of HS was done for over 3 years. After taking all the standard precautions for Botox injection, 5-7 (mean, 6) sites for injecting 1.5 to 2.0 IU of the toxin were selected depending upon the severity and duration of the problem.

Results: Desirable effects of the injection appeared in almost all patients within 48 hours. Immediately visible effects were seen in 72 (49.31%) patients after injection. There were minor side effects and very few patients suffered from those side effects. Five (3.42%) patients developed mild bruising, which subsided over 7-8 days. Four (2.74%) patients experienced pain at injection sites, which also subsided over 1 week. Two (1.27%) patients developed mild ptosis, which subsided over 2 weeks.

Conclusions: Botox has now become a blessing for both HS and BEB patients. Most of the HS patients are satisfied with the outcome. Botox has a comparatively prolonged effect on HS patients. Factors like unilateral involvement, age, sex, smoking, exposure to sunlight, and so on might be the causes. Further large-scale study and long-term follow-up is essential to reach a conclusion.

Calcification in Pleomorphic Adenoma of the Lacrimal Gland

First Author: Marie Jeazelle REDONDO

Co-Author(s): Felice Katrina RANCHE

Purpose: Pleomorphic adenoma of the lacrimal gland is a benign epithelial tumor characterized by a slow-growing mass, painless proptosis, and remodeling of the lacrimal gland fossa. Management entails excision of the mass with its pseudocapsule intact. Fine needle aspiration, incision biopsy, or tumor debulking have been shown to increase the risk of recurrence and malignant transformation. These are all management

options for lacrimal gland malignancies, and misdiagnosis may lead to future harm for patients with benign lesions.

Methods: We report a case of a 47-year-old Filipino male with a 12-year history of gradual proptosis of the left eye, associated with occasional pain. There was anteroinferomedial displacement of the left globe, limitation of upgaze, and a palpable mass beneath the superior rim. Computed tomography scan showed an irregularly shaped mass in the lacrimal gland fossa with dense intraparenchymal calcifications and bone remodeling. Despite the history and physical examination pointing to a benign process, a lacrimal gland malignancy was considered because of the radiologic findings. Excision biopsy via anterior orbitotomy was performed.

Results: A well-encapsulated nodular soft tissue mass was excised en bloc. Histopathologic examination showed pleomorphic adenoma of the lacrimal gland with dystrophic calcifications. The patient shows no signs of recurrence 9 months after surgery.

Conclusions: Dense calcifications in pleomorphic adenomas are rare. In the setting of equivocal clinical and radiologic findings for lacrimal gland tumors, en bloc excision when possible is a safer alternative than incisional surgery.

Cicatricial Ectropion of the Upper Eyelid Repaired by Cicatricial Release With Full Retroauricular Skin Graft

First Author: Hendriati JEFRIANTO

Purpose: To report 2 cases of cicatricial ectropion with lagophthalmus of the upper eyelid repaired by cicatricial release with retroauricular full skin graft.

Methods: Two patients were diagnosed with cicatricial ectropion of the upper eyelid and underwent a cicatricial release with retroauricular full skin graft. Lagophthalmus was measured preoperatively and postoperatively.

Results: Lagophthalmus of the first patient was 5 mm preoperatively and became 1 mm at the fifth day postoperatively. After 1 month lagophthalmus was 1.5 mm. Meanwhile lagophthalmus of the second patient was 3 mm preoperatively and became 0.5 mm at the fifth day and 1 month postoperatively.

Conclusions: Released traction and lengthening of the anterior lamella with retroauricular full skin graft showed good results in cicatricial ectropion of the upper eyelid marked by reducing of lagophthalmus.

Clinical Results of Antiadhesion Adjuvants After Endonasal Dacryocystorhinostomy

First Author: Hye-Young SHIN

Co-Author(s): Ji-Sun PAIK, Suk-Woo YANG

Purpose: Various absorbable adhesion agents have been used to prevent postoperative synechia formation after endonasal surgery. The purpose of this study was to evaluate the antiadhesion effects of HyFence and Mediclore after endonasal dacryocystorhinostomy (DCR) as compared to a mixed solution of hyaluronic acid and sodium carboxymethylcellulose (Guardix-Sol).

Methods: In this retrospective study, endonasal DCR and silicone tube intubation were performed on 198 eyes of 151 patients. Three different antiadhesion adjuvants were applied to the osteotomy site in the nasal cavity after standard endo-DCR procedure and the subjects were classified into 3 respective groups: group A (71 eyes, Guardix-Sol 1.5 g), group B (89 eyes, HyFence 1.5 mL), group C (38 eyes, Mediclore 1 cc). The results of the 3 groups were evaluated by asking patients about subjective symptoms, lacrimal irrigation tests, and endoscopic examinations.

Results: There were no statistically significant differences in age, sex, timing of tube removal, or follow-up period among the 3 groups. There were no statistically significant differences in success rate among the 3 groups [$P = 0.990$, 91.5% (65/71), 92.1% (82/89), and 92.1% (35/38), respectively].

Conclusions: HyFence and Mediclore are safe and effective adjunctive modalities following endonasal DCR as compared to Guardix-Sol. Therefore, these agents can be considered as a good alternative to Guardix-Sol to increase the success rate of endonasal DCR in treating patients with poor prognosis.

Comparison of Conjunctival Autograft to Treat Pterygium by Using Suture, Fibrin Glue, and Autologous Blood: Case Series

First Author: Nurul WIDIATI

Co-Author(s): Haryono

Purpose: To assess and compare the outcome of 3 surgical options in the treatment of primary pterygium: conjunctival autograft with sutures, conjunctival autograft affixed with fibrin glue, and conjunctival autograft affixed with autologous blood.

Methods: Thirty patients, who had excision of primary pterygium, were divided equally into 3 groups (A, B, C). Group A had conjunctival autograft with sutures and group B had conjunctival autograft affixed with fibrin glue, while autologous blood was used in group C. They were compared in terms of postoperative comfort and recurrence.

Results: In this study, pain and foreign body sensation

was markedly less in groups B and C. At the end of final follow-up at 6 months, no group had any recurrence. One case from group B and 2 cases from group C were not assessed at 6 months of follow-up.

Conclusions: In this study, conjunctival autograft with suture had more recurrence risk than the other techniques. Variables like geographic location, exposure to sun, and other environmental factors can influence its recurrence after surgery. Meanwhile, fibrin glue and autologous blood can produce less postoperative discomfort, but fibrin glue is more expensive and hard to obtain in some areas.

Comparison of Radio Frequency With Bilamellar Tarsal Rotation for Treatment of Trichiasis Combined With Entropion

First Author: Esmat **KARBASSI**

Co-Author(s): Mohamad **AHMADINEJAD**, Hashem **SHADMAN**, Ehsan **ZIAESISTANI**

Purpose: Trichiasis and entropion have separate and specific therapeutic techniques with various surgical procedures such as posterior lamellar tarsal rotation (PLTR) and bilamellar tarsal rotation (BLTR), of which, both methods have a high recurrence rate and complications.

Methods: This study was a single blinded randomized clinical trial on patients with trichiasis and entropion except severe cicatricial entropion. The subjects were divided in 2 groups: the first group for radio frequency (RF) treatment and the second group were treated with BLTR. All patients were followed for 1 year and all data were analyzed by SPSS software.

Results: In this study 45 patients were treated with the RF technique, and another 45 patients were treated with BLTR. The success rate was 95.6% in the first group and 93.3% with BLTR. There were 13.9% recurrences in the group treated with the RF method while 38% recurrences were seen in the group treated with BLTR. During surgery and follow-up of patients treated with RF, to assess possible complications such as bleeding, infection, corneal burns, eyelid necrosis, and so on, no complications related to the RF technique were seen.

Conclusions: Recurrence rate was significantly reduced in the RF technique compared to the BLTR method. Surgical time was about 10 minutes in the RF technique instead of at least 30 minutes in the BLTR method. There was another advantage in the RF method because it was less invasive, had a lower recurrence rate, and fewer recorded complications. Thus we strongly suggest further studies with a large number of patients and longer follow-up to replace RF with conventional surgical treatment.

Desirable and Undesirable Outcome of Botulinum Toxin Type A in Benign Essential Blepharospasm and Hemifacial Spasm

First Author: Syeed **KADIR**

Co-Author(s): Golam **HAIDER**

Purpose: To assess the desirable and undesirable outcomes of botulinum toxin injection in patients suffering from benign essential blepharospasm (BEB) and hemifacial spasm (HFS).

Methods: This quasi study was done in a tertiary care eye hospital in Bangladesh from January 2013 to June 2017. Variables such as mean age, gender, scoring of eyelid spasm, onset of action, and spasm-free period were evaluated in this study. Twenty-five units of botulinum toxin type A were injected in each patient. We followed all patients up to 24 weeks after treatment. Paired t test was done.

Results: Ninety patients had BEB and 90 had HFS. Male patients numbered 69 (38.3%) and females totalled 11 (61.7%). The mean age was 57.38 years (BEB) and 44.72 years (HFS). The mean baseline eyelid spasm score was 3.60 in BEB and 3.40 in HFS. The mean eyelid spasm score was 0.41 (BEB) and 0.39 (HFS) after 2 weeks of treatment. The mean onset of action of botulinum toxin was 3.54 days in BEB and 4.08 days in HFS. The efficacy was poor in BEB associated with dry eye (30%), apraxia of lid opening (15%), and facial muscle spasm (5%). Undesirable effects were minimal pain (100%), tiny hematoma (6.7%), mild ptosis (2.7%), and epiphora (2.1%). Satisfactory outcome was better in HFS after 4 weeks of treatment than BEB ($P < 0.05$).

Conclusions: Botulinum toxin type A is effective and safe to relieve benign essential blepharospasm and hemifacial spasm. The efficacy of botulinum toxin is greater in hemifacial spasm than benign essential blepharospasm.

Erdheim-Chester Disease Presenting as Bilateral Orbital Xanthogranuloma: A Case Report and Review of Literature

First Author: Pei-Shin **HU**

Co-Author(s): Chen-Ni **CHEN**, Ming-Chieh **HSIEH**

Purpose: Erdheim-Chester disease (ECD) is a rare form of non-Langerhans cell histiocytosis with multiorgan involvement. We report a case of ECD that initially presented with bilateral orbital intraconal masses.

Methods: A retrospective case report.

Results: A 42-year-old man presented to our clinic with progressive bilateral exophthalmos for 1 year and loss of vision in the left eye for 3 months under systemic steroid therapy with the impression of orbital pseudotumor in another hospital. He also had renal hypertension for 1 year related to fibrotic change

in the perirenal fat and renal hilum. Orbit image revealed infiltrative bilateral retrobulbar orbital masses surrounding optic nerves. Anterior orbitotomy and tumor incisional biopsy were done. The final pathology report disclosed xanthogranulomatous inflammation with histiocytic infiltration, which was CD68-positive and CD1a-negative. We made a diagnosis of ECD with involvement of the orbits. The patient received systemic steroid plus immunosuppressant treatment and returned to the original hospital for follow-up of the systemic condition.

Conclusions: The diagnosis of Erdheim-Chester disease with orbital involvement, a rare disease, is difficult and requires increased awareness.

Evaluation of Ptosis Surgery in Ocular Myopathy

First Author: Golam **HAIDER**

Co-Author(s): GM **FARUQUE**, Moinul **HOQUE**, Syeed **KADIR**, Mukti **MITRA**, Nishat **PARVEEN**

Purpose: To retrospectively evaluate surgical outcome and complications of ptosis correction by frontalis brow suspension with 2/0 prolene in ocular myopathy patients.

Methods: The medical records of all ocular myopathy patients with severe ptosis obscuring the visual axis who underwent ptosis surgery between June 2003 and June 2017 were obtained. Patient profiles, surgical details and measurements, and complications were recorded.

Results: Out of 19 patients evaluated, there were 11 (58%) patients with chronic progressive external ophthalmoplegia (CPEO), 1 (5%) patient with myotonic dystrophy (MD), 6 (32%) patients with myasthenia gravis, and 1 (5%) patient with Kearns Sayre syndrome. Male:female ratio was 0.9:1. Age range was from 13 to 68 years, with an average age of 41 years. Brow suspension procedures were done to adjust eyelid height with 2/0 prolene to expose visual axis. Marginal reflex distance was 2 mm in 12 cases and 1 mm in 7 cases. Satisfactory results were found in 12 (63%) patients. Postoperative complications seen in 7 patients (37%) included overcorrection and exposure keratopathy, which were successfully treated.

Conclusions: Our results demonstrate surgical outcome following frontalis brow suspension surgery with a low complication rate and thus improvement of quality of life in ocular myopathy patients.

Human Ocular Thelaziasis: A Case Report From Northeast India

First Author: Erani **BORAH**

Co-Author(s): Diva **MISRA**

Purpose: To report a case of human ocular thelaziasis presenting as cystic swelling in the right lacrimal sac area.

Methods: A 42-year-old female presented with swelling on the side of her nose near the inner corner of the right eye (OD) with pain and redness for 8 months. There was no history of any systemic illness. Best corrected visual acuity (BCVA) in OD was 6/9 and in the left eye (OS) was 6/6. On palpation, there was cystic swelling in the right lacrimal sac area and all other findings on slit lamp examination were normal; fundus examination revealed no abnormality. As management, excision biopsy of the cystic lesion was done and sent for histopathological examination (HPE). On exploration of the cyst, a thread-like live worm was found.

Results: HPE report was reviewed. The cystic lesion was a granulomatous inflammation. Morphologically, the worm was thin and thread-like. Microscopically, depending on the features the worm was identified as *Thelazia callipaeda*.

Conclusions: *T. callipaeda* is an Oriental eye worm. Dogs and cats are the most common source of the infection in humans. Patients do not seek medical treatment in most occasions as spontaneous exit of the worms usually cures the disease, and there is a lack of awareness of the problem among the medical community. It is a neglected ocular infection and an accidental finding in most cases.

IgG4-Related Disease With Presentation of Orbital Pseudotumor: A Case Report

First Author: Pei-Jane **BAIR**

Purpose: To report a case of IgG4-related disease with presentation of orbital pseudotumor.

Methods: Case report.

Results: A 66-year-old Taiwanese female presented to the outpatient clinic with a 15-month history of left ocular protrusion associated with pruritus, burning sensation, and excessive tearing. She had no previous medical conditions. On examination, there was left exophthalmos, with unilateral palpebral edema, conjunctival hyperemia, and pain resulting from ocular globe compression. Ocular motricity was preserved, but visual acuity was reduced on the right field, with blurred vision on the right. The remainder of the physical examination was unremarkable. Laboratory tests of thyroid function and autoantibodies were normal. Kidney function was appropriate for age, and pancreatic and hepatic enzymes were in the normal

range. Search for antinuclear antibodies (ANA), anti-SSA/Ro, and ANC showed negative results, and viral serologies (hepatitis B and hepatitis C, HIV) were negative. Immunoglobulin G class 4 was 796 mg/dL (normal, 8 to 140 mg/dL). A computed tomography (CT) scan of the head showed an expansive lesion in the left orbit, with a solid mass on the retroorbital space and contrast enhancement of rectus medial and rectus lateral of the corresponding eye. A biopsy was done and revealed an infiltrate rich in plasma cells with increased proportion of positive IgG4 cells, positivity for CD138 antigen, kappa, and lambda, with polyclonal aspect.

Conclusions: We believe that anti-B cell therapies (such as rituximab or belimumab) may be promising choices, as the disease probably relies on B lymphocytes to progress.

Intraorbital Bullet Foreign Body: A Case Report

First Author: Ni Luh WIDHYASTI

Purpose: To report a case of intraorbital bullet foreign body, its management, and complications.

Methods: A descriptive study. A 6-year-old boy was referred due to a bullet foreign body entering the orbital cavity causing trauma to the superior and inferior lateral rectus muscles and sclopetaria.

Results: Visual acuity of the right eye was 1/60 with edema and eyelid spasm, temporal conjunctival chemosis, round pupil with decreased light reflex, and relative afferent pupillary defect (RAPD). Macular reflex was slightly decreased, with dot and blot hemorrhage in the retina. Ocular movement was limited to superonasal, nasal, and inferonasal. Computed tomography (CT) scan showed round metal foreign body located at the superoposterolateral aspect of the orbit. Corpus alienum evacuation was performed with fluoroscopy guidance. The visual acuity outcome at 1-month follow-up was 1/60 with subretinal scar, blot hemorrhage, and retinal tear at 8-9 o'clock, with limited ocular movement. Panretinal photocoagulation laser was performed. Visual acuity at 2-month follow-up improved to 6/60 with retinal fibrosis and limited ocular movement to nasal direction. At 8-month follow-up the visual acuity was 6/60, with retinal fibrosis and no limitation of ocular motility.

Conclusions: Any case presenting with intraorbital foreign body must undergo corpal evacuation with fluoroscopy guidance to exactly locate the position of the foreign body to prevent further complications.

Lacrimal Sac Rhinosporidiosis: Surgical Outcome

First Author: Syeed KADIR

Purpose: The aim of this study was to characterize the clinical features of lacrimal sac rhinosporidiosis and compare the surgical outcome between 2 methods of surgical approach.

Methods: This interventional study was carried out in 3 tertiary eye care hospitals in Bangladesh during the period of 10 years from January 2007 to December 2016. We included all 40 cases of histologically proved lacrimal sac rhinosporidiosis. Excision of lacrimal sac rhinosporidiosis was performed under general anesthesia in all cases and hemostasis was made. Group A included 20 cases managed by modified dacryocystorhinostomy (DCR) with large nasal mucosal flap and group B comprised 20 cases of modified DCR with harvesting of buccal mucosal flap.

Results: Of the total 40 cases, there were 24 (60%) male and 16 (40%) female patients. The mean age was 17.46 years (3-65 years). Clinical features were doughy swelling over the lacrimal sac region in all cases (100%), bloody discharge through nose in 11 cases (27.5%), epiphora in 9 cases (22.5%), lacrimal fistula in 4 cases (10%), and recurrent inferior orbital growth in 1 case (2.5%). In group A, out of 20 patients, 18 patients had good results and 2 patients had a recurrence at the lacrimal sac region (1-tail $P = 0.0002$). In group B, recurrence was not found during the study period (1-tail $P < 0.0001$).

Conclusions: Doughy swelling in the lacrimal sac region should be considered for rhinosporidiosis; modified DCR is a good option to excise the lesion and to prevent recurrence of the disease.

Management of Orbital Trauma in Transorbital Intracranial Penetrating Injury Caused by a Metal Bar

First Author: Irma VERA

Purpose: To report the management challenges of orbital trauma in transorbital intracranial penetrating injury caused by a metal bar.

Methods: A 40-year-old man was referred from a remote area with a penetrating cranial injury from a metal bar. He was in a deep coma; his right eye was covered by the metal bar, and the left pupil was miotic. Computed tomography (CT) demonstrated the bar passing through the right orbit and emerging from the left parietal bone which fractured by direct compaction. There was a subarachnoid hemorrhage in the right frontoparietal with severe cerebral edema. Metal bar extraction was done by a neurosurgeon with craniectomy and partial lobectomy. The globe

was evacuated from maxillary sinus and positioned to lateral rim of the orbit by an ophthalmologist. Forming the orbital floor and medial wall was done by a plastic surgeon with open reduction internal fixation (ORIF) plating on the superior and inferior orbital rim.

Results: The operation was successful, but the inflammation was severe and the patient developed methicillin-resistant *Staphylococcus aureus* (MRSA) infection, leading to septic condition. The patient died a month after surgery.

Conclusions: Managing orbital trauma is important for saving the eyeball and the patient's cosmetic appearance. A multidisciplinary team must work together for taking care of the patient.

Management of Retained Intraocular Foreign Body by Pars Plana Vitrectomy

First Author: Pankaj ROY

Purpose: The objective of the study was to evaluate the structural and functional outcomes of retained intraocular foreign body located in the posterior segment.

Methods: This prospective study was conducted from January 2014 to June 2017. Sixty-four consecutive eyes of 64 patients were included in the study. The mean age was 26.34 ± 9.40 years, with an age range of 16-41 years. There were 60 males and 4 females who underwent pars plana vitrectomy. Visual acuity, slit lamp biomicroscopy, intraocular pressure (IOP), posterior segment examination, B-scan, and computed tomography (CT) scan of the orbit were done for all cases.

Results: Size of removed metallic foreign bodies were 2-16 mm. Preoperative visual acuity was no perception of light in 2 eyes, only perception of light in 4 eyes, perception of light and projection of rays in 16 eyes, counting fingers up to 0.5 m in 20 eyes, counting fingers from 0.5 m to 1/60 in 16 eyes, 2/60 to 5/60 in 4 cases, and 6/60 in 2 eyes ($P = 0.003$). Anatomic success was obtained in 96.77% (62) of eyes. The postoperative visual acuity improved 5.24 ± 3.4 letters on the Snellen visual acuity chart. Severe inflammation was noticed in 24 (37.5%) eyes in the early postoperative period, IOP was elevated in 26 (40.63%) eyes, 1 silicone oil filled eye developed band keratopathy, and 1 eye became phthisical.

Conclusions: Pars plana vitrectomy is an important, effective, and essential surgical approach for maintaining ocular integrity and better functional outcome for management of retained intraocular foreign body in the posterior segment.

Modified Single Anterior Flap External Dacryocystorhinostomy: Does Complete Excision of Posterior Remnant Tissue Improve Surgical Outcome?

First Author: Bhagwati WADWEKAR

Co-Author(s): Kambam GAINATI REDDY, Shivraj GOWTHAM

Purpose: This study aims to analyze the impact of complete excision of posterior remnant tissue (ExPRT) on the outcome of modified single anterior flap external dacryocystorhinostomy (mSAF-EDCR).

Methods: We analyzed records of all patients with primary acquired nasolacrimal duct obstruction (PANDO) who had undergone mSAF-EDCR with complete ExPRT between August 2014 and October 2016. We analyzed operative time, complications, and surgical outcome. Absent or occasional postoperative watering was considered subjective success, whereas patent syringing 1 month after surgery was considered objective success. We recorded presence of persistent watering, nonpatent, and partially patent syringing as surgical failure.

Results: Forty-one patients had undergone mSAF-EDCR with complete ExPRT. Average surgical time was 36 minutes (range, 28 to 50). The most common complication was intraoperative bleeding in 4 cases. Other complications were torn sac flap in 2 cases, laceration of nasal mucosa in 1 case, and extension of skin incision in 1 case. Follow-up was done at the tenth day and 1 month postoperatively. There was complete absence of watering in 36 patients and occasional watering in 5 patients. Syringing was patent in all 41(100%) patients. Hence, both subjective and objective success rates were 100%.

Conclusions: Our series of cases with mSAF-EDCR demonstrated a 100% success rate, which may be attributed to complete ExPRT. Our study also indicates that mSAF-EDCR is technically easier and time saving and should be preferred over conventional EDCR. The complications related to flap damage are also more easily manageable in mSAF-EDCR than conventional EDCR.

Ocular Trauma Scoring: Limitation and Pitfalls

First Author: Annu JOON

Co-Author(s): Mainak BHATTACHARYYA, Piyush TEWARI

Purpose: Ocular Trauma Score (OTS) is used to predict the visual outcome of patients after open-globe trauma and has a predictive accuracy of approximately 80%. We evaluated the ocular survival after penetrating injuries of the globe by metallic foreign body with concurrent traumatic cataract in 20 patients and compared the outcome with the predictive outcome of

OTS.

Methods: Twenty eyes of penetrating ocular injuries with traumatic cataract were studied. All patients had best corrected visual acuity (BCVA) of perception of light (PL)/hand movements (HM) and OTS 2 (calculated with relation to perforating injury since no category for penetrating injury is described). Posterior segment involvement was noted in 2 eyes [1 posterior segment intraocular foreign body (IOFB), 1 vitreous hemorrhage]. Primary repair with anterior segment foreign body removal (when in situ) was undertaken within 12 hours. The patient with posterior segment IOFB was referred to a vitreoretinal surgeon after primary wound closure. Cataract extraction with intraocular lens (IOL) implantation was done in all patients (7 eyes, primary sitting; 13 eyes, secondary sitting). Ocular survival was assessed qualitatively over 6 months on the basis of structure and function.

Results: All but 1 patient recovered with BCVA > 6/18. The predictive visual outcome of an OTS 2 for BCVA > 6/60 is 28%. However, our surgical outcome was 100% for BCVA of 6/60 and above. No evidence of phthisis bulbi was noted at 6 months.

Conclusions: Noninclusion of cataract at presentation in OTS leads to a misleading probable visual outcome, particularly in effectively managed open-globe injuries with normal posterior segment. A provision of penetrating injury should be made in the OTS with allotted "raw points" less than -14 (allotted for perforating). A larger study group is required for further validation.

Ophthalmic Plastic and Orbital Surgery in Taiwan

First Author: Wen-Ming HSU

Purpose: To describe the current status of ophthalmic plastic and orbital surgery in Taiwan.

Methods: Data were collected from the Bureau of National Health Insurance of the Taiwanese government, the open information of the Taiwan Medical Association, and the bulletin of the Taiwan Society of Ophthalmic Plastic and Orbital Surgery.

Results: There are 95 oculoplastic surgeons (5.7% of all 1680 ophthalmologists) in Taiwan. About one third of the 95 surgeons underwent their subspecialty training abroad, while two thirds of ophthalmic plastic and orbital surgeons received their fellowship training in medical centers throughout Taiwan. The Taiwan Society of Ophthalmic Plastic and Orbital Surgery was founded in 2013 with a total of 75 members. There are approximately 200 academic papers published in the field of oculoplastic surgery. Average number of oculoplastic surgeries performed per year is as follows: entropion correction, 9800; ptosis surgery,

5880; excision of benign lid tumor, 6200; excision of malignant lid tumor, 80; dacryocystorhinostomy (DCR), 280; orbital tumor removal, 120; orbital fracture repair, 150; upper blepharoplasty, 70,000; lower blepharoplasty, 45,000; periorbital aesthetic procedures and botulinum toxin injections, 400,000; filler injection, 160,000. Only 30% of aesthetic procedures were performed by ophthalmologists. The operation fee for oculoplastic surgery is relatively low, for example, the payment for levator muscle resection is only two thirds of the cataract operation fee (around US\$300).

Conclusions: The manpower for ophthalmic plastic and orbital surgery in Taiwan is adequate. The operation fees for oculoplastic surgery are relatively low. Competition and conflicts among ophthalmologists, plastic surgeons, and dermatologists in the field of periorbital aesthetic procedures are issues to be faced.

Outcome of Probing and Syringing in Congenital Nasolacrimal Duct Obstruction at Various Age Groups

First Author: Koshal SHRESTHA

Purpose: To evaluate the efficacy of probing and syringing in cases of congenital nasolacrimal duct obstruction in various age groups.

Methods: This was a hospital-based, prospective, cross-sectional study undertaken between January 2015 and June 2016 at Lumbini Eye Institute. All children of various ages with congenital nasolacrimal duct obstruction who did not improve despite sac massage and antibiotic for 1 month or more and underwent probing and syringing were included into the study. Probing and syringing was done under general anesthesia and the procedure was repeated in those patients whose symptoms were not relieved. Data were entered and analyzed using SPSS version 20.

Results: Altogether, 72 eyes of 58 patients were included in the study. Commonest age group was 13-24 months (22/58) with a median and interquartile range of 24 and 34, respectively. Eyes of children as young as 6 months (1/72) to as old as 72 months (4/72) underwent probing and syringing in our study. No gender disparity was found. Operative findings showed a predominance of membranous obstruction (42/72) over bony obstruction (30/72). Repeat probing was done in 19 cases. Overall success was 80.6% (58/72), which was statistically significant when analyzed with age ($P = 0.006$). The majority of cases with successful outcome were below 24 months of age (90.62%).

Conclusions: Outcome of probing and syringing in congenital nasolacrimal duct obstruction has better results if performed at an early age. Membranous obstruction shows favorable outcomes in the majority

of cases whereas firm obstruction has a poorer outcome.

Superotemporal Orbital Mass

First Author: Pankaj GUPTA

Purpose: A variety of masses have been reported in the superotemporal orbit. Those commonly reported are lacrimal gland mass, schwannoma, dermoid cyst, and neurofibroma. The present retrospective study describes the clinical profile of all patients presenting with superotemporal orbital mass to our institution in the past 10 years.

Methods: Case records of all patients presenting to our institution in past 10 years with superotemporal orbital masses were reviewed. Parameters specifically looked for included patient demographic details, clinical features at presentation, management, final diagnosis, and outcome. Based upon the study, the authors attempt to present a flow chart depicting the management strategy for such patients.

Results: There were a total of 34 patients who presented during the study period with superotemporal orbital mass. The commonest diagnosis was pleomorphic adenoma followed by dermoid cyst and lymphoma.

Conclusions: A wide variety of masses present in the superotemporal quadrant of the orbit. Pleomorphic adenoma of the lacrimal gland is the commonest entity to present in such manner followed by dermoid cyst and lymphoma. The management of these can be challenging at times and outcome is satisfactory when managed promptly.

The Role of Postoperative Closed Suction Drainage in Anterior Orbitotomy

First Author: Pankaj GUPTA

Purpose: The use of postoperative closed suction drainage in orbitotomy is largely decided by surgeon preference. The present retrospective study intends to evaluate the role of postoperative closed suction drainage in anterior orbitotomies.

Methods: The case records of all patients who had undergone orbitotomy with mass excision during the past 10 years were reviewed. The patients for whom postoperative closed suction drains were used were grouped into group A (n = 47) and the rest were grouped into group B (n = 39). The parameters included visual acuity at presentation; amount of proptosis or globe deviation; time for subsidence of postoperative edema and proptosis; and postoperative visual acuity. These parameters were compared between these groups.

Results: Group A patients had earlier subsidence

of postoperative edema than group B patients (P = 0.003). The patients in both groups had similar visual outcomes at 3 months (P = 0.8).

Conclusions: The use of postoperative closed suction drainage in orbitotomy is associated with earlier subsidence of postoperative edema and had no impact on final visual outcome.

The Use of Adjuvants for Mechanical Endoscopic Dacryocystorhinostomy

First Author: Joyce CHIN

Co-Author(s): Regine CHAN, Kam Lung CHONG, Chi-Lai LI, Alvin YOUNG

Purpose: To compare stenting and packing regarding outcomes after mucosal-sparing mechanical endoscopic dacryocystorhinostomy (MMED) for primary acquired nasolacrimal duct obstruction (PANLDO).

Methods: Consecutive patients with PANLDO received 1 of the following after standardized MMED without topical mitomycin: no stenting or packing (group 1), ostium packing by ribbon gauze (group 2) or gelfoam (group 3) for 1 week, or bicanalicular stenting (group 4) for 8 weeks. Efficacy, using objective (irrigation, endoscopic dye test, and photo) and subjective (Munk score) measures, and safety data was retrieved from medical records up to postoperative 12 months.

Results: A total of 113 adults (90 females) aged 61.3 ± 11.3 (29-86) underwent 116 MMED during the study period. A total of 104 patients (92%) had 12-month outcomes available for analysis. Number of patients, age, gender ratio, operating surgeon, choice of anesthesia, and osteotomy size were not significantly different among the 4 groups (all $P > 0.4$). Marginal significance was found in anatomical (group 1: 80%, group 2: 96.6%, group 3: 96%, group 4: 96.4%, $P = 0.05$) but not functional success (group 1: 85%, group 2: 85.7%, group 3: 83.3%, group 4: 88.9%, $P = 0.75$) at postoperative 12-month visit. Patients receiving any intervention (ie, packing or stenting) achieved significantly better anatomical success (96.3% versus 80%, $P = 0.015$) but not functional success (85% versus 86.1%, $P = 0.90$) compared to those receiving none. Patients receiving stenting developed significantly more granulation tissue than the other 3 groups (87% versus 63.4%, $P = 0.04$).

Conclusions: Our results favored the use of either stenting or packing for better anatomical success with no difference found between 1-week packing using ribbon gauze or gelfoam, or 8-week stenting.

Two Cases of IgG4-Related Sclerosing Disease Presenting at the Tarsal Conjunctiva

First Author: Janice **CHEUNG**

Purpose: IgG4-related disease is a relatively recent disease entity, increasingly recognized for its involvement of the orbital tissues and lacrimal glands. We report a series of 2 patients with unusual presentations of IgG4-related sclerosing disease of the eyelid.

Methods: We report of 2 unusual cases of eyelid conjunctival mass where biopsy result was found to be IgG4-related sclerosing disease.

Results: A 66-year-old man with a 9-month history of right eye discomfort was incidentally found to have large and firm conjunctival nodules over the right upper eyelid tarsal plate; the largest size was 13 x 8 mm. An incisional biopsy showed IgG4-related sclerosing disease with IgG4 plasma cells over 100 HPF and IgG4:IgG ratio over 80%. The patient had normal serum IgG level. Topical antibiotic and steroid ointment was given afterward. Residual nodules resolved spontaneously. The second case was a 51-year-old female with a 2-month history of right eye epiphora. An excisional biopsy showed increased proportion of IgG4+ plasma cells. The IgG4/IgG plasma cell ratio was 70%. Presence of lacrimal glands was also noted in the specimen. Serum IgG level was normal and IgG4 was high at 1.228 g/L (N = 0.168-1.000 g/L). In both cases computed tomography (CT) of the orbit showed no orbital mass and there was no systemic involvement. Both patients did not receive any systemic steroid treatment. There was no recurrence after 3 years and 7 months in the first case and 15 months in the second case.

Conclusions: IgG4-related disease can have a wide range of ocular manifestations including eyelid conjunctival involvement.

Use of Autologous and Donor Fascia Lata for Management of Anophthalmic Socket and Exposed or Extruded Orbital Implants

First Author: Mukti **MITRA**

Co-Author(s): Md Sharfuddin **AHMED**, Anisur **ANJUM**, Ava **HOSSAIN**

Purpose: To describe the techniques of reconstruction of anophthalmic contracted socket by the use of autologous or donor fascia lata and its role in the management of exposed or extruded orbital implants.

Methods: Eighty-six patients were operated on from 2007 to 2016. Among them 40 patients had exposed or extruded orbital implants following evisceration or enucleation and 46 patients had anophthalmic contracted socket. Age range was 3 years to 50 years.

Donor fascia lata was used in 3 cases. Exposed implant was covered with fascia lata irrespective of the type of implant. In cases of extruded implants (PMMA or hydroxyapatite) fascia lata was used as a wrapping material to cover the spherical PMMA implant. In contracted socket after preparing adequate space, PMMA implants were placed following wrapping with fascia lata. Lower fornix was fixed internally in cases of contracted socket.

Results: In 2 patients fascia lata wrapped PMMA implants were extruded, which were reconstructed further. In 2 patients with severely contracted socket sufficient volume replacement was not achieved due to previous radiation therapy. Acceptable cosmetic results were obtained in others.

Conclusions: Considering the availability, cost, and procedure, fascia lata can be used as an efficient tool to reconstruct the volume deficit in anophthalmic socket and to retain the implants whenever exposure or extrusion occurs with minimal complications.

Pediatric Ophthalmology & Strabismus

0.02% Atropine Eye Drops: A Different Choice for Low Myopia Control in Children. A Retrospective Cohort Study

First Author: Pei-Tzu **KUAN**

Purpose: To compare 0.02% atropine eye drops (ATE) as low myopia control in Taiwanese children with previous studies.

Methods: Participants received one drop of 0.02% atropine daily into each eye over a year. A range of physiological, functional, and quality of life measures were assessed at baseline, 1 month, 3 months, 6 months, and 1 year later.

Results: One hundred fifty-six participants were initially screened in this study. Seventy-two participants were excluded because they did not meet the inclusion criteria (n = 25), met the exclusion criteria (n = 19), and declined to participate this study (n = 29). Therefore, 79 children were randomly divided into the intervention group and control group, with each group having 40 and 39 participants, respectively. Of those included participants, 13 were excluded because of the discontinuation of intervention (n = 7) and loss to contact (n = 6). Thus, 66 participants completed all the treatment. Fortunately, we used an intention-to-treat (ITT) approach to analyze all outcome data. There were no significant differences in age, race, ethnicity, sex, spherical equivalent (SE), and axial length (AL) at baseline between the 2 groups. Compared with placebo, 0.02% ATE can reduce the myopic progression, as measured by SE (P < 0.01) and AL elongation, as

measured by AL ($P < 0.01$) at every episode.

Conclusions: The results of this study demonstrated that 0.02% atropine eye drops could effectively control the progression of low myopia in children. However, future studies that focus on longer treatment and follow-up durations are required to confirm and build on the present results.

A Comparative Study of Occlusion Versus Visual Stimulation Therapy in Treatment of Amblyopia

First Author: Rohit **SREENATH**

Co-Author(s): Sri **GANESH**

Purpose: A hospital-based retrospective data analysis of the pediatric population under 15 years having amblyopia. To compare efficacy and reliability of Vision Therapy Software 4 (VTS4) and home therapy system (HTS) in comparison to conventional occlusion therapy for management of amblyopia.

Methods: Patients were studied from January 2015 to December 2015 and divided into 2 groups: group 1 underwent therapy with VTS4 and HTS and group 2 underwent only occlusion therapy. Improvements in best corrected visual acuity (BCVA), stereopsis, and contrast sensitivity in both groups were compared. Children with anisometropic amblyopia, strabismic amblyopia with esotropia or exotropia less than 30 degrees, phorias, and stimulus deprivation amblyopia were included. Exclusion criteria included patients with retinal pathology, vertical tropias, strabismic amblyopia with esotropia or exotropia more than 45 degrees, patients with a history of surgery for squint, and anisometropia of more than 6 diopters (D).

Results: Improvement in BCVA was significant in both groups after 3 months (group 1, $P = 0.17$; group 2, $P = 0.007$), 6 months (group 1, $P = 0.19$; group 2, $P = 0.000$), and 9 months of follow-up (group 1, $P = 0.005$; group 2, $P = 0.000$).

Conclusions: VTS4 and HTS are as effective as the conventional occlusion therapy in improving BCVA. However, compliance and repeatability of VTS4 is better than conventional occlusion therapy in terms of ease of follow-up and monitoring progression. The improvement in gross and fine stereopsis and in contrast sensitivity was significant in the VTS4 group as compared to occlusion therapy.

A Rare Case of Epibulbar Complex Choristoma in Epidermal Nevus Syndrome

First Author: Ratika **SUGANDA**

Co-Author(s): Irawati **IRFANI**, Feti **KARFIATI**

Purpose: To report a case of epibulbar complex choristoma.

Methods: A 43-day-old baby girl presented with the chief complaint of mass in the left eye since birth. Her mother had a history of contact with chemotherapy agent 1 year before. There was no history of illness or taking any medication in the pregnancy period. There was no family history of the same complaint. There was alopecia, large black nevus, and elevated skin at the face and scalp. On ophthalmology examination, visual acuity in the right eye was blink reflex (+); in the left eye, there was limbal dermoid grade II on Mann classification. Left eye ultrasound imaging showed irregular globe. Right eye fundus photography showed retinal hypopigmentation, suspecting choroidal choristoma/retinal hamartoma.

Results: The patient was diagnosed with epibulbar complex choristoma in the left eye and epidermal nevus syndrome. The patient was planned for mass excision and penetrating keratoplasty.

Conclusions: Epibulbar complex choristoma is rare and can be associated with epidermal nevus syndrome. Epibulbar complex choristoma can be sporadic or inherited. The best surgical option in this case is mass excision with penetrating keratoplasty.

Bilateral Leukocoria in a Newborn: A Diagnostic Conundrum

First Author: Neha **SINGH**

Co-Author(s): Siddharth **AGRAWAL**, Pallavi **MISHRA**, Vinita **SINGH**

Purpose: To report a rare case of bilateral primary hyperplastic persistent vitreous (PHPV) in a newborn.

Methods: A 28-day-old male child presented with the inability to open the left eye from birth. The child had a full-term normal vaginal delivery with a birth weight of 3500 g. Ophthalmological examination revealed bilateral leukocoria. A detailed examination was done under general anesthesia which showed microcornea in both eyes, cataract, and shallow anterior chamber in the left eye. Right eye fundus examination revealed vitreous hemorrhage; left fundus was not visualized. Further B-scan and magnetic resonance imaging (MRI) were planned.

Results: Ultrasonography (USG) B-scan showed echogenic membrane extending from the retrolental area to the optic disc, with the lens capsule thickened and compressed by the lesion anteriorly. The presence of blood vessels was noted in color Doppler. MRI demonstrated T1/T2 hypointense soft tissue structure extending from the posterior surface of the lens to the optic nerve with subretinal hemorrhage, suggestive of bilateral PHPV.

Conclusions: While evaluating cases of bilateral leukocoria, the possibility of PHPV should be kept in mind. Typical findings on ultrasonography, color Doppler,

and MRI help in differentiating it from the more dreadful entity of retinoblastoma.

Changes in Conjunctival-Scleral Thickness After Strabismus Surgery Measured With Anterior Segment Optical Coherence Tomography

First Author: Hiroko SUZUKI

Co-Author(s): Akiko HIKOYA, Yoshihiro HOTTA, Miwa KOMORI, Miho SATO

Purpose: To evaluate changes in the conjunctival-scleral thickness with anterior segment optical coherence tomography (AS-OCT) following recession and resection/plication surgeries of horizontal rectus muscles.

Methods: The distances between the conjunctival epithelium and the inner wall of the sclera were measured with AS-OCT before and 3–5 months after horizontal rectus muscle surgeries. The measurements were performed 1.5 mm (group: limbus), 7.0 mm (group: insertion), and 8.0 mm (group: posterior) posterior to the scleral spur, respectively, on the lateral rectus muscle (LR); and 1.5 mm (group: limbus), 4.0 mm (group: insertion), and 5.5 mm (group: posterior) posterior to the scleral spur, respectively, on the medial rectus muscle (MR).

Results: A total of 35 extraocular muscles from 27 subjects were studied. Sixteen LRs underwent recession, 6 MRs underwent recession, 8 MRs underwent resection/plication, and 5 LRs underwent resection/plication. When the patients underwent bilateral surgery, we chose 1 eye for the evaluation. When the patients underwent a recess-resect/plication procedure on 1 eye, both muscles were included. The thickness became significantly less at both the insertion and the posterior after LR recession and at the posterior after MR recession. The thicknesses of all 3 parts became significantly greater after both MR resection/plication and LR resection/plication.

Conclusions: Conjunctival-scleral thicknesses measured with AS-OCT showed dramatic changes after strabismus surgery; this method may be helpful in suspecting previous strabismus surgeries.

Clinical Presentation of Congenital Rubella Syndrome at Cicendo Eye Hospital

First Author: Sesy WARSITA

Co-Author(s): Irawati IRFANI, Mayasari Wahyu KUNTORINI, Feti Karfiati MEMED, Primawita OKTARIMA

Purpose: The aim of this study was to describe the clinical findings of congenital rubella syndrome (CRS).

Methods: This retrospective observational study was

carried out at the National Eye Center, Cicendo Eye Hospital in Bandung, Indonesia from January to June 2017. A total of 28 congenital cataract patients less than 1 year old suspected of CRS were enrolled in this study. Ophthalmological examination, cardiovascular examination, hearing problem assessment, developmental assessment, and serological test for rubella antibody were done in specialized centers.

Results: The mean (\pm SD) age of subjects was 5.25 (\pm 2.56) months (range, 2–10 months); 42.86% were male and 57.14% were female. All of the subjects had congenital cataract; congenital heart disease was found in 17.86% of cases and hearing impairment was detected in 67.86% of cases. Pigmentary retinopathy (3.57%), microphthalmia (14.29%), microcephaly (53.57%), and developmental delay (17.86%) were also found in this study. Serum for rubella specific antibody revealed positive IgM in 32.14% of cases and IgG in 42.86% of cases. Based on WHO criteria, we found 21.43% suspected CRS cases, 21.43% clinically confirmed CRS cases, and 57.14% laboratory confirmed CRS cases.

Conclusions: Recognition of the clinical presentation of CRS cases is crucial for proper management and better prognosis for the affected children.

Comparison Between Orthokeratology and Low-Concentration Topical Atropine for Myopic Retardation in School-Aged Children

First Author: Chin-Chun YU

Co-Author(s): Chia-Yi LEE

Purpose: To evaluate the effectiveness on myopic retardation between these 2 therapeutic programs.

Methods: Patients with myopia less than 6.00 diopters (D) were enrolled into the current study after informed consent was signed. Patients were separated into the orthokeratology group, atropine group, or control group randomly. The orthokeratology and 0.02% topical atropine administration were done by 1 pediatric ophthalmologist with a follow-up period of 6 months. The best-corrected visual acuity (BCVA) and manifestation refraction including spherical error and cylinder error were recorded in the medical chart. Statistical analysis with logarithm of the minimum angle of resolution (logMAR) and spherical equivalent was done.

Results: There were 14, 13, and 13 patients in the orthokeratology group, the atropine group, and the control group, without prominent differences in their demographic data. The mean BCVA maintained from 0.64 ± 0.20 to 0.61 ± 0.12 in the orthokeratology group, similar to the trend of the atropine group (0.52 ± 0.54 to 0.22 ± 0.60) and better than the control group (0.57 ± 0.15 to 0.83 ± 0.16). Regarding spherical equivalent,

no significant deterioration was found by intragroup analysis of the orthokeratology group and the atropine group but a significant deterioration was found in the control group. In the comparison among groups, the final value of spherical equivalent (Table 2) did not show significant difference but the visual outcome of the control group showed a worse result.

Conclusions: Orthokeratology showed similar effect on myopic retardation compared to the atropine group and better than the control group. Further large-scale study to compare the effect of orthokeratology and lower concentration of topical atropine is mandatory.

Congenital Fibrovascular Pupillary Membranes: The Clinical, Operative, and Histopathological Findings

First Author: Tian-Wei LIANG

Co-Author(s): Da-Yong BAI, Li LI, Chun-Xia PENG, Cheng-Yue ZHANG

Purpose: To investigate the clinical, operative, and histopathological findings associated with congenital fibrovascular pupillary membranes.

Methods: Eleven patients (11 eyes) underwent a membranectomy, pupilloplasty, and/or a lensectomy and/or trabeculotomy. Histopathological examination was performed on the excised membranes in 2 patients. Fixation ability, intraocular pressure, and pupil size were observed before and after the operation.

Results: These patients had white pupillary membrane unilaterally with negative family history. The boundary between membranes and the iris was not clear, but the barrier of membranes from the crystalline lens was clear. The crystalline lens was clear in 8 eyes but locally cloudy in 3 eyes. Three eyes (3/11) had glaucoma with corneal expansion. Two patients had posterior embryotoxon in the affected eye. A membrane protruded from the back of the iris to the basal iris in 1 eye. Three eyes recurred after membranectomy and pupilloplasty. Histopathological examination of 1 primary pupillary membrane showed fibrovascular tissue. In contrast, histopathology of a recurrent pupillary membrane revealed fibroblast. Fixation ability after surgery was better than that before the operation. Intraocular pressure was controlled after 1 or more surgeries. The pupil size was enlarged after the operation.

Conclusions: Congenital fibrovascular pupillary membrane in infants develops progressively and tends to recur if incompletely excised. If the pupil is completely blocked, glaucoma may develop. A membranectomy and pupilloplasty should be done when the pupil is blocked. A lensectomy should be avoided if possible. The histopathology approximates to persistent fetal vasculature.

Congenital Orbital Fibrosis Associated With Congenital Cytomegalovirus Infection: Symptomatic or Asymptomatic?

First Author: Julie LOK

Co-Author(s): Henry LAU, Wilson YIP, Alvin YOUNG

Purpose: To report a rare case of congenital orbital fibrosis with a known background of congenital cytomegalovirus infection.

Methods: Case report and review of congenital cytomegalovirus infection.

Results: A term Chinese baby with known intrauterine growth restriction, microcephaly, small for gestation age, and low birth weight was diagnosed with congenital cytomegalovirus (CMV) infection by urine sample on the first day of life. Clinical ophthalmic examination showed unilateral enophthalmos, lagophthalmos, absence of eye movement, and macular scar. There were no signs of uveitis, retinitis, or neuropathy. The other eye was not affected. Family history was unremarkable. Orbital imaging showed compatible findings of congenital orbital fibrosis.

Conclusions: This is the first reported case, to the best of our knowledge, of congenital orbital fibrosis associated with congenital cytomegalovirus infection. Managing congenital orbital fibrosis as part of symptomatic cytomegalovirus infection remains controversial. Early awareness of the condition would be essential in determining the management plan to maximize visual gain.

Cutoff Values of Gestational Age and Birth Weight to Predict Retinopathy of Prematurity With Receiver Operating Characteristic Analysis

First Author: Lawrence IU

Co-Author(s): Benjamin CHU, Michelle FAN, Connie LAI

Purpose: To determine the optimal cutoff values of gestational age (GA) at birth and birth weight (BW) for predicting retinopathy of prematurity (ROP).

Methods: All premature infants born with GA \leq 32 weeks and/or BW \leq 1500 grams between 2012 and 2015 in a public hospital in Hong Kong were studied. Receiver operating characteristic (ROC) analysis was performed to determine the optimal cutoff values of GA and BW for predicting ROP and type 1 ROP development.

Results: A total of 360 infants were included. The area under the ROC curve was 0.9338 and 0.9163 for GA and BW, respectively. The optimal cutoff values of GA and BW for predicting ROP development were 28 weeks + 5.5 days (sensitivity = 85.14%, specificity = 86.71%) and 1092.5 grams (sensitivity = 91.89%,

specificity = 80.77%), respectively. There were significantly more infants developing ROP below the GA and BW cutoff values than above (17.5% vs 3.1%, $P < 0.001$ and 18.9% vs 1.7%, $P < 0.001$, respectively). The optimal cutoff values of GA and BW for predicting type 1 ROP development were 27 weeks + 1.5 days (sensitivity = 90.91%, specificity = 86.53%) and 802.5 grams (sensitivity = 100.00%, specificity = 89.40%), respectively. There were significantly more infants developing type 1 ROP below the GA and BW cutoff values than above (2.8% vs 0.3%, $P < 0.001$ and 3.0% vs 0.0%, $P < 0.001$, respectively).

Conclusions: The cutoff values of GA (28 weeks + 5.5 days and 27 weeks + 1.5 days) and BW (1092.5 grams and 802.5 grams) were useful for predicting ROP and type 1 ROP development. Parental education, vigilance, and early preparation are warranted for infants born below the cutoff values.

Long-Term Results of Secondary IOL Implantation in Children

First Author: Xuan LE

Co-Author(s): Nguyen Van HUY, Tran Kim UYEN, Trinh Ngoc QUYNH

Purpose: The purpose of our study was to evaluate the role and clinical outcomes of secondary intraocular lens (IOL) implantation in children.

Methods: A cross-sectional study was carried out in children who underwent secondary lens implantation from January 2011 to December 2014 to evaluate the results.

Results: Eighty-seven pediatric aphakic eyes in 50 children, ranging in age from 3 to 15 years, were operated on with secondary IOL: 14 eyes (16.1%) that underwent IOL implantation in the capsular bag, 41 eyes (47.1%) with implantation of sulcus-fixated IOL supported by capsular remnant, and 32 eyes that underwent scleral-fixated (sutured) posterior chamber IOL implantation were included in this analysis. There were no intraoperative complications associated with the surgery. Median age at the time of surgery was 8 ± 4.1 . All patients had at least 2 years of follow-up. Final best-corrected visual acuity was 20/40 or better in 26.4%, 20/50 to 20/200 in 62.1%, and under 20/200 in 11.5%. Poor final visual acuity was associated with deprivation amblyopia or optic nerve dysplasia or hypoplasia. Complications included mild IOL decentration in 6 eyes (6.9%) and elevated intraocular pressure controlled with medication in 1 eye. There were no postoperative retinal complications or cases of IOL dislocation during the follow-up period. Eight eyes (9.2%) developed reopacification of the visual axis. The visual axis was restored by pars plana membranectomy in 6 eyes and 2 eyes of 1 patient underwent neodymium:YAG laser membrane discission.

Conclusions: Secondary IOL implantation in children was safe and effective.

Long-Term Results of Strabismus Surgery in Children With Exotropia

First Author: Xuan LE

Co-Author(s): Do Quang THO, Nguyen Xuan TINH, Pham Minh CHAU

Purpose: To determine motor and sensory results after surgical correction of children with exotropia.

Methods: A cross-sectional descriptive and prospective study of 124 consecutive children with exotropia who were operated and followed up for a minimum of 1 year.

Results: Medical records of 124 consecutive patients who underwent R-R procedure. Median age at the time of surgery was 7.5 ± 3.3 , ranging from 2 to 15 years. Males were 40.3% and females were 59.7%. Intermittent exotropia was seen in 49 patients (39.5%) and true exotropia in 75 patients (60.5%). Satisfactory results [± 5 prism diopters (PD) of orthophoria] were obtained in 79.03%. In the age group from 2-5 years old, good results were highest at 84.6%; the age group from 6-11 years old was 80%; older children >11 years old had good results of 60%. Satisfactory results were obtained more in the group with deviation from 20–40 PD: 84.4%. In the group from 41-60 PD the percentage was 82.3%, and in the group with large deviation from 61–90 PD it was 38%. Before surgery patients who had binocular vision accounted for 23.6%; after surgery and follow-up binocular vision was noted in 60.4%.

Conclusions: Satisfactory results of surgery for exotropia in children depend on the age of surgery and initial deviation. Long-term alignment can obtain good binocular vision.

Long-Term Surgical Outcome of V-Pattern Intermittent Exotropia: A 7-Year Retrospective Review in Hong Kong

First Author: Julie LOK

Co-Author(s): Henry LAU, Wilson YIP, Alvin YOUNG

Purpose: To evaluate the surgical outcomes of patients with V-pattern intermittent exotropia with different grades of inferior oblique overaction (IOOA) who underwent bilateral lateral rectus recession combined with upward transposition of lateral rectus muscles or inferior oblique weakening procedure.

Methods: The surgical records of all patients with V-pattern exotropia with different grades of IOOA who underwent either of the above procedures from 2009-2015 and had at least 12 months of follow-up were retrospectively reviewed in a local tertiary eye center in Hong Kong. Pre- and postoperative visual acuity,

pattern, strabismus control, and stereoacuity were analyzed up to 1 year after operation.

Results: There were 31 patients in the upward transposition group and 46 patients in the inferior oblique (IO) recession group. Successful outcome was achieved in 17 patients (54.9%) in the transposition group and 33 patients (71.7%) in the IO recession group in terms of horizontal misalignment. Collapsed V-pattern was achieved in 28 cases (90.3%) in the transposition group and 39 cases (84.8%) in the IO recession group. There was also encouraging improvement in near stereopsis in both surgical groups as secondary gain.

Conclusions: Both operations are effective in IOOA and collapsed V-pattern; however, the inferior oblique weakening procedure may carry slightly better long-term horizontal misalignment correction outcomes. This could possibly suggest that V-pattern formation and IOOA might share the same spectrum of condition but at different degrees. Suitable surgical procedure(s) should be tailored to each patient according to the severity of strabismus and grade of IOOA. Prompt intervention might be beneficial in achieving earlier improvement of near stereopsis.

Long-Term Surgical Outcomes Following Amount of Unilateral Lateral Rectus Muscle Recession in Intermittent Exotropia of 20 Prism Diopters

First Author: Shin Yeop OH

Co-Author(s): Sei Yeul OH

Purpose: We compared surgical outcomes following the amount of unilateral lateral rectus muscle recession (ULR) and factors related to recurrence in 20 prism diopters (PD) of intermittent exotropia (IXT).

Methods: A total of 163 patients with 20 PD IXT who received at least 2 years of follow-up after surgery were included in this study. We performed a retrospective study in patients who underwent ULR between January 2010 and May 2015. Patients were divided into 3 groups according to the amount of recession (8.0/8.5/9.0 mm) and surgical results were compared in 3 groups. We investigated surgical outcomes and factors related to recurrence.

Results: The mean length of follow-up was 3.71 ± 2.32 years after surgery. The rate of recurrence within 2 years was clinically different (8.0 mm, 25.71%; 8.5 mm, 18.97%; 9.0 mm, 8.57%) in each group. In comparison between the recurrence and nonrecurrence group in all patients, the age at operation was significantly different ($P = 0.012$). Younger age at the time of surgery and 8 mm ULR were significant risk factors for recurrence of ULR. Changing pattern of spherical equivalent between operative and nonoperative eyes was not significant

after surgery.

Conclusions: This study showed that ULR is an effective surgical method for treatment of 20 PD IXT. Because younger age at the time of surgery and 8.0 mm ULR were risk factors for recurrence, we suggest 9.0 mm ULR or more of recession for surgery in 20 PD IXT.

Management of a Traumatic Isolated Lateral Rectus Muscle Rupture

First Author: Anna BANI

Co-Author(s): Gusti SUARDANA

Purpose: To report a case of the least frequent traumatic extraocular muscle [isolated lateral rectus (LR)] rupture and surgical outcome of the Hummelsheim transposition procedure without medial rectus (MR) recession in terms of alignment and adverse effects.

Methods: Case report.

Results: A 61-year-old male injured his left eye upon falling onto a jagged cement construction. His uncorrected visual acuity was 6/24 with no worsening compared to before the accident but with double vision in all positions of gaze. Hirschberg examination showed > 45 degrees of esotropia (ET), with limitation in elevation and a -5 abduction. A 10-mm stump of LR muscle was hanging from the insertion. The palpebrae and sclera were completely intact. Computed tomography (CT) scan revealed a severed LR muscle, being retracted to behind the globe, without signs of orbital wall fracture. Surgical exploration revealed many adhesions among surrounding structures. After careful separation, parts of the inferior oblique muscle were identified to be attached to the LR stump. Unable to retrieve any parts of the proximal LR, a Hummelsheim procedure was performed without MR recession. Ocular alignment 1 day postsurgery improved to 15 ET and abduction to -2 . After almost 2 years, the ocular alignment measured 15 exotropia (XT), with full abduction. There were no signs of anterior segment abnormalities.

Conclusions: In devastating cases of severed extraocular muscles with unretrievable proximal parts, the Hummelsheim procedure is a reliable management option giving favorable results. By its ciliary arteries-sparing technique and refraining from MR recession, a further benefit of avoiding anterior segment ischemia is achieved.

Optic Disc Cyst: A Case Report

First Author: Jyoti SHRESTHA

Purpose: To report a case of unilateral optic disc cyst in an asymptomatic child.

Methods: A 9-year-old male child presented to a

pediatric eye clinic for a regular eye check-up. Upon examination the best corrected visual acuity was 20/20 in the right eye and 20/40 in the left eye. Examination of the anterior segment showed no particular findings. Pupillary reaction in both eyes was normal. Fundus examination revealed the presence of a cystoid body overlying the head of the optic nerve, completely obscuring the optic nerve head in left eye.

Results: Optical coherence tomography (OCT) demonstrated a cystic lesion arising from the left optic nerve head of a 9-year-old male child. Optic nerve function was normal.

Conclusions: Though cysts of the optic nerve head have been described by various authors, this is the first reported case of a congenital optic disc cyst in an asymptomatic patient from Nepal.

Optimizing the Clinical Algorithm of Early Photoscreening in Young Children Aged 12 to 24 Months at Pediatric Well-Baby Clinics

First Author: Yao-Lin **LIU**

Co-Author(s): Shu-Wen **CHANG**, Chia-Jung **LEE**, Jao-Shwann **LIANG**, Tzu-Hsun **TSAI**

Purpose: To evaluate the performance of photoscreening in young children aged 12 to 24 months and to establish a proper clinical algorithm for early vision screening at pediatric well-baby clinics.

Methods: Early photoscreening was introduced to the caregivers of young children aged 12 to 24 months at well-baby clinics. Children first received plusoptix photoscreening conducted by 1 technician. Subsequent comprehensive ophthalmologic examinations including cycloplegic retinoscopy were performed by 1 pediatric ophthalmologist who was masked to the screening results. Presence or absence of amblyopia risk factors (ARFs) was then determined, according to the 2013 American Association for Pediatric Ophthalmology and Strabismus (AAPOS) guideline. Risk factor analysis was used to define the proper population at risk, and the optimal screening cut point was determined through receiver operating characteristic (ROC) curve analysis.

Results: One hundred sixty-four children received plusoptix photoscreening and complete ophthalmologic examinations. The area under the curve (AUC) of plusoptix photoscreening was 0.96 (95% confidence interval: 0.93–0.99). Sequential screening algorithm including birth weight (<2900 g) and photoscreening with the cut point of high specificity yielded net sensitivity of 76.2%, net specificity of 94.4%, positive predictive value of 66.7%, and negative predictive value of 96.4%.

Conclusions: Being incorporated into the practice of pediatric well-baby clinics, photoscreening is effective and efficient with proper selection of screening

population and screening cut point in young children aged 12 to 24 months. Young children with higher risk of positive ARF may benefit from hospital-based early photoscreening.

Outcomes of the Use of Intravitreal Bevacizumab in the Treatment of Patients With Retinopathy of Prematurity at the National Center for Maternal and Children Health, Mongolia

First Author: Tsengelmaa **CHULUUNBAT**

Co-Author(s): Karyn **JONAS**, Leslie **MACKEEN**, Altankhuu **MOLOM**, Baylag **MUNKHUU**, RV Paul **CHAN**

Purpose: To investigate the outcomes of intravitreal anti-vascular endothelial growth factor (VEGF) in the treatment of retinopathy of prematurity (ROP) at the National Center for Maternal and Children Health (NCMCH), Ulaanbaatar, Mongolia.

Methods: This was a prospective cohort study of premature infants with treatment-requiring ROP who received intravitreal bevacizumab (IVB) injections from December 17, 2015 to January 1, 2017.

Results: A total of 611 premature infants with birth weight (BW) ≤ 2500 g and/or gestational age (GA) ≤ 34 weeks were screened for ROP during the study period. Twenty-eight of the 611 infants screened required treatment. The 28 infants who received treatment had a mean GA of 28.6 ± 2.11 weeks and mean BW of 1315.50 ± 230.71 g. After receiving IVB injections, 4 of 28 (14.3%) patients had at least 1 eye that did not respond to treatment and progressed to retinal detachment. Six eyes of 4 patients had progression of ROP despite treatment (2 patients had bilateral progression and 2 patients had progression in 1 eye). The mean age at the time of injection was 35.2 ± 2.1 weeks postmenstrual age. Mean follow-up time was 13.7 months (range, 8–20). No significant local or systemic complications related to the IVB injections were observed at the most recent follow-up exam.

Conclusions: After IVB, resolution of ROP was noted in approximately 85% of the patients who had treatment-requiring ROP. However, 14.3% of patients treated with IVB had at least 1 eye that did not respond and progressed to retinal detachment.

Pars Plana Posterior Capsulotomy and Anterior Vitrectomy Approach in Pediatric Cataract Surgery: Results of Surgery in the Pediatric Ophthalmology Division, Kirana Cipto Mangunkusumo Hospital

First Author: Perlita **KAMILIA**

Co-Author(s): Rita **SITORUS**

Purpose: To assess efficacy and safety of pediatric

cataract surgery with pars plana posterior capsulotomy and anterior vitrectomy in the pediatric division of Kirana Cipto Mangunkusumo Hospital.

Methods: Retrospective descriptive study; 41 eyes from 29 children with cataract who underwent pars plana posterior capsulotomy and anterior vitrectomy with intraocular lens (IOL) implantation between January 2014 and March 2017 were included in this study. If the medical records could not be retrieved or the follow-up was less than 1 month, subjects would be excluded. The outputs of this study were visual axis opacification, best corrected visual acuity, and complication rates at 1, 3, and 6 months of postoperative follow-up.

Results: There was 0% visual axis opacification after 1-month follow-up in 41 eyes. Furthermore, there was 0% visual axis opacification after 3-month follow-up in 36 eyes. There was 0% visual axis opacification after 6-month follow-up in 22 eyes. There was 67% pre- and postoperative improvement of best corrected visual acuity in 30 eyes after 1, 3, and 6 months of follow-up. Moreover, out of 41 eyes, only 1 patient had complications during 6-month follow-up, which was updrawn pupil 2 months after surgery.

Conclusions: In this study of the patients who underwent a pars plana approach, 100% had no visual axis opacities and 67% had pre- and postoperative improvement in visual acuity. Furthermore, the approach was 99% safe.

Pediatric Cataract Surgery in Patients Who Have Undergone Bone Marrow Transplantation

First Author: Kimberly YEN

Purpose: Bone marrow transplantation (BMT) and pretreatment conditioning increases the risk of developing pediatric cataracts. We present the outcome of cataract surgery in children who have had BMT.

Methods: This is a retrospective chart study which involved 15 BMT patients (28 eyes) who underwent cataract extraction between 2002 and 2012. Outcome measures included change in visual acuity and complications.

Results: Seven (47%) patients had acute lymphoid leukemia, 3 (20%) had acute myeloid leukemia, 2 (13%) had myelodysplastic syndrome, 1 (7%) had Fanconi anemia, 1 (7%) had juvenile myelomonocytic leukemia, and 1 (7%) had adrenoleukodystrophy. Patients received BMT at a mean age of 47.2 ± 19.2 months. Twelve (80%) patients received total body irradiation (TBI) and 3 of these 12 received cranial irradiation in addition to TBI; 1 (7%) received only cranial irradiation. Mean age of cataract surgery was 109.3 ± 27.1 months; mean follow-up was 55.9 ± 45.1 months. All cataracts

were posterior subcapsular subtype. Mean visual acuity improved from 0.7 ± 0.4 logarithm of the minimum angle of resolution (logMAR) to 0.3 ± 0.5 logMAR ($P < 0.001$). Twenty-three of 28 eyes (80%) had cataract extraction with intraocular lens placement; 5/28 (20%) of the eyes had cataract extraction with primary posterior capsulotomy plus anterior vitrectomy (PC/AVx). All 23/23 (100%) of the eyes without primary PC/AVx were diagnosed with PCO at an average of 2.3 ± 6.9 months after surgery. No eyes with primary PC/AVx eyes developed PCO.

Conclusions: Children with history of BMT have a predisposition of developing posterior subcapsular cataracts. Need for treatment for PCO is high in this population.

Prominent Adverse Effects of Orthokeratology: Diseases and Symptoms

First Author: Chin-Chun YU

Co-Author(s): Chia-Yi LEE

Purpose: To survey the adverse effects, concerning diseases or symptoms, in patients who received orthokeratology.

Methods: Patients who received orthokeratology management since 2014 were reviewed by medical chart records. The exclusion criteria involved (1) any orbital tumors before the use of orthokeratology, (2) ocular penetrating trauma before the use of orthokeratology, (3) eyeball rupture before the use of orthokeratology, and (4) the orthokeratology had been used for less than 3 months. The primary outcome including any symptoms recorded in the medical chart, epithelial defect, corneal staining, lens binding, tear film instability, microbial keratitis, etc. Descriptive analysis was used to present the frequency of adverse effects.

Results: A total of 196 patients who received orthokeratology during the period were enrolled. There were 102 males and 94 females with a mean age of 9.5 years old. Concerning the adverse effects, a total of 79 complaints were found. Mild ocular discomfort was the most common symptom that accounted for nearly one third of our population, with 66 patients. Other ocular symptoms, including grittiness sensation and ocular pain, are shown in Table 2. Epithelial defect was the most common disease that was observed in 9 patients, while corneal staining and decreased tear film stability accounted for 8 and 2 patients. The summary of ocular diseases resulting from orthokeratology is demonstrated in Table 3.

Conclusions: In conclusion, orthokeratology is a safe management for myopic progression without severe adverse effects in most cases. However, immediate management should be performed if corneal damage

is suspected in such patients.

Retinopathy of Prematurity in High-Risk Pregnancy

First Author: Suhana DATTA

Co-Author(s): Krishnapada BAIDYA, Pramatha Nath DATTA, Sudeb MUKHERJEE

Purpose: Retinopathy of prematurity (ROP) is one of the most important causes of congenital blindness around the world. All over the world many studies have been carried out to establish the risk factors of ROP and have established that low gestational age, low birth weight, and high-flow oxygen are the risk factors for ROP. Although maternal health plays an important role in babies' health, no such risk factors are established. To increase the awareness and decrease the modifiable risk factors of high-risk pregnancy, this study was carried out.

Methods: Retrospective study in the outpatient department of our ophthalmology department. A total of 170 babies having ROP were included. Study duration was 6 months. Inclusion criteria were all babies having ROP; exclusion criteria were acutely sick babies.

Results: Total number of babies screened for ROP was 300. Total number of babies having ROP was 200. Percentage of ROP was 66.66%. High-risk pregnancy mothers [ie, those with existing health conditions, such as high blood pressure, diabetes, or human immunodeficiency virus (HIV)-positive; being overweight or obese; multiple births] totalled 165. The percentage of high-risk pregnancy babies having ROP was 75, so the P value was <0.01.

Conclusions: High-risk pregnancies, one of the most neglected and placing a huge burden on developing countries, are an important factor of retinopathy of prematurity.

Superior Oblique Muscle Tuck Combined With Anterior Transposition of Inferior Oblique Muscle in Large Hypertropia: Case Report

First Author: Chih-Yu CHEN

Purpose: To report a new surgical approach for correcting very large vertical deviation induced by superior oblique muscle palsy.

Methods: A 37-year-old male patient was referred to our clinic for large vertical upward deviation in the right eye for a long time. Thirty-five prism diopters of hypertropia in the right eye in every field of gaze was found. Traction test was positive when checked in the operating room. A superior oblique tuck of 8 mm combined with anterior transposition of the inferior

oblique muscle (ATIO) was done.

Results: No hypertropia or hypotropia was found in primary position and downgaze 3 months postoperatively. The patient was satisfied with the surgery result, even though there was some limitation with obvious hypotropia (-2 to -3 degrees) in upgaze in the right eye.

Conclusions: In very large hypertropia, superior oblique muscle tuck combined with anterior transposition of inferior oblique muscle may be a surgical consideration.

Surgical Management of Anterior Plagiocephaly Causing Superior Oblique Deficiency and Ocular Torticollis

First Author: Kinei RA

Purpose: Bagolini and coworkers reported a new clinical entity in 1982. The essential condition of Bagolini syndrome consists of the triad of synostotic frontal plagiocephaly, superior oblique deficiency, and ocular torticollis. The aims of this article are to describe the spectrum of anomalies and discuss possible surgical treatments.

Methods: During the past 15 years, the authors have observed 35 patients with plagiocephaly and 25 patients mimicking a fourth cranial nerve palsy. Computed tomography (CT) evaluations were carried out in 25 patients with plagiocephaly due to unilateral coronal synostosis to elucidate the details of anatomic anomalies. Anterior transposition of the inferior oblique was performed in 15 cases of plagiocephaly associated with desagittalization of the superior oblique with at least 20 prism diopters of hypertropia in the primary position.

Results: CT studies disclose that 14 orbits were actually short and the trochleas of the affected side were displaced posteriorly. Fourteen of 35 plagiocephalies were noted to have the characteristic finding of superior oblique desagittalization. The head tilt in these patients resolved completely following the initial surgical correction of strabismus.

Conclusions: Bagolini syndrome is a special subtype of congenital superior oblique deficiency. Preoperative CT study is necessary to confirm the diagnosis. Results of treatment are satisfactory.

The Effect of Progressive Addition Lenses on Myopia Progression in Children: Meta-Analysis of Randomized Clinical Trials

First Author: Indah SARASWATI

Co-Author(s): Cecilia ANGGRAINI, Evan REGAR

Purpose: To evaluate the effect of progressive addition lenses (PAL) on myopia progression in children between 6 and 15 years old.

Methods: We searched PubMed and ScienceDirect from January 1998 to August 2017. We also searched the reference lists and Science Citation Index for additional, potentially relevant studies. Relevant parameters were explored using Review Manager V5.0. We included randomized clinical trials (RCTs) in which participants were treated with PAL or single vision lenses (SVL) with a duration of at least 1 year for analysis. The outcomes were the mean of spherical equivalent refractive error (SER) and axial length (AL).

Results: Five studies (1063 total participants) were identified. As we only included RCTs in the report, the studies were at low risk of bias for selection bias. PAL were found to delay myopia progression in this meta-analysis; children who utilized PAL could decrease myopia progression on average 0.26 diopters (D) [95% confidence interval (CI), 0.17 to 0.35; $P < 0.01$] lower than SVL wearers. However, there was significant heterogeneity in these studies ($I^2 = 93\%$). In the second outcome, we only included 3 studies, which evaluated the AL. We found that the increase of AL in the PAL group was less than the SVL group (mean difference, -0.10 mm; 95% CI, -0.20 to -0.01; $P = 0.03$), yet this result also had high heterogeneity ($I^2 = 85\%$).

Conclusions: PAL may be able to delay myopia progression in children between the ages of 6 and 15 years, yet there was a significant heterogeneity in these included studies.

Prevention of Blindness

Knowledge, Attitude, and Practices on Diabetic Retinopathy Among Adult Diabetic Patients at a Tertiary Hospital

First Author: Ana Marie SANTOS

Co-Author(s): Jubaida MANGONATO-AQUINO

Purpose: To assess the knowledge, attitude, and practices on diabetic retinopathy (DR) among diabetic patients aged 20-79 years old at a tertiary hospital.

Methods: This study was conducted on 122 diabetic patients seen at the ophthalmology outpatient department (OPD) from August 25, 2016 to September 10, 2016. Patients with DR and those who sought consult for eye complaints due to diabetes were included in the study. A Filipino KAP questionnaire determining the demographics, literacy, awareness of risk factors, and treatment of DR was administered to the subjects. SPSS version 20 was used in data processing and analysis.

Results: Most patients were female (60%) and residing in urban areas (92%). A majority (92%; $P = 0.000$) were aware that diabetes can lead to eye damage. About half (51%; $P = 0.798$) said they had knowledge

of the treatment of DR. Lifestyle modification (39%; $P = 0.000$) and maintenance medications (39%; $P = 0.000$) were the most commonly mentioned treatments. Three-fourths (75%; $P = 0.000$) reported that they had consulted with an ophthalmologist. Of these 92 patients, 54% ($P = 0.000$) went to see an ophthalmologist on their own volition while only 25% (23) were encouraged by doctors. A majority (59%; $P = 0.005$) reported that good control of blood sugar results in less frequent consultation with an ophthalmologist. Knowledge of eye involvement in diabetes was significantly associated with knowledge that DR is treatable ($P = 0.018$).

Conclusions: There was good awareness of the knowledge about DR. However, the role of physicians in referring patients for DR screening to an ophthalmologist is low and should be emphasized.

Refractive Surgery

A Novel Inverse Finite Element Approach to Analyze Corneal Deformation After SMILE and LASIK

First Author: Piyush TEWARI

Co-Author(s): Mathew FRANCIS, Vaitheeshwaran LALGUDI, Rohit SHETTY, Abhijit SINHA

Purpose: Current evidence of biomechanical changes after small incision lenticule extraction (SMILE) and femtosecond laser-assisted in-situ keratomileusis (FS-LASIK) have been debatable. This study aims to analyze the acute biomechanical changes associated with SMILE and FS-LASIK using a novel inverse finite element model (IFEM).

Methods: A total of 18 patients were recruited with similar bilateral refraction. The patients underwent SMILE in one eye and FS-LASIK in the other eye. After detailed clinical examination, patients underwent imaging on Pentacam HR and Corvis-ST before and after surgery (1, 3, and 6 months). Corneal tomography from Pentacam HR was used to construct 3-dimensional (3-D) corneal model and mesh. The IFEM derived the best fit material properties to describe the corneal deformation measured by Corvis-ST. Using the computed properties, stress strain analogue for each measurement was formulated by simulating intraocular pressure (IOP; 0-60 mmHg) The displacement of the corneal apex was calculated from stress-strain analogue.

Results: At an IOP = 30 mm Hg, displacement of the corneal apex was noted. In LASIK eyes, the displacement increased acutely at 1 month followed by continued remodelling (-9.3%) up to 3 months. However, there was slight recovery of corneal biomechanical strength up to 6 months (+12.8%). In

SMILE, corneal displacement remained the same at 1 and 3 months indicating biomechanical stability. Up to 6 months, there was significant recovery such that corneal displacement was less (+27.8%). Similar trends were observed at all other IOPs.

Conclusions: SMILE showed more biomechanical stability and improved recovery of biomechanical strength than LASIK.

A Retrospective Case Series on the Outcomes of a Trifocal Intraocular Lens After Myopic Laser In Situ Keratomileusis

First Author: Sharon **CHOW**

Co-Author(s): Tommy **CHAN**, Alvin **KWOK**, Lap Ki **NG**

Purpose: To report the best uncorrected (UNVA, UDVA) and corrected monocular visual acuity (CNVA, CDVA) at near and distance, the refractive outcome, the visual symptoms including halo and glare, as well as the spectacle independence in post myopic laser in situ keratomileusis (LASIK) eyes after the implantation of a trifocal intraocular lens (IOL; AT LISA tri839MP).

Methods: This retrospective case series was conducted from July 2014 to January 2017. All patients had a history of myopic LASIK and underwent phacoemulsification by 1 single surgeon with AT LISA tri839MP IOLs implanted. Outcome measures were taken at 6 months after surgery.

Results: The study evaluated 20 eyes of 13 patients. The mean UDVA was 0.14 ± 0.24 while the mean spherical equivalent (SE) was -2.13 ± 2.20 diopters (D). The mean targeted refraction was -0.32 ± 0.15 D. At 6 months, the postoperative UDVA was 0.28 ± 0.29 , while the CDVA was 0.06 ± 0.14 . The mean postoperative UNVA was 0.02 ± 0.05 , while the CNVA was 0.01 ± 0.02 . The mean postoperative SE was -0.92 ± 0.76 D. There was a statistically significant difference between the preoperative and postoperative refraction ($P = 0.02$). There was also a statistically significant difference between the mean targeted and postoperative SE ($P = 0.00$). One out of 20 eyes (0.05%) reported halo and glare symptoms. Ten out of 20 eyes (50%) were able to be glasses free.

Conclusions: In eyes that had myopic LASIK, AT LISA tri839MP provides a good visual outcome at both near and distance, but it is more predictable at near. There is a myopic shift in the postoperative SE, which allows surgeons to adjust their targeted refraction in such cases. Visual quality is satisfactory and most patients can remain spectacle free.

Bilateral Retinal Detachment After Implantable Collamer Lens Surgery

First Author: Weihan **TONG**

Co-Author(s): Mohamad **ROSMAN**

Purpose: The aim of this case report is to highlight the potential risk of retinal detachment in implantable collamer lens (ICL) surgery and the need to always counsel patients regarding this risk. This holds true not only for highly myopic patients, but for all myopic patients, especially those with a positive family history of retinal detachment.

Methods: A 46-year-old man, with moderate myopia and family history of retinal detachment, underwent ICL surgery in both eyes on different dates.

Results: In the postoperative period, both of his eyes sustained the complication of rhegmatogenous retinal detachment (RD). After development of RD in the first eye, prophylactic 360-degree laser photocoagulation was performed on the second eye preoperatively. This, however, did not prevent RD from developing in this eye as well.

Conclusions: It is vital to warn patients regarding RD symptoms and to monitor patients closely in the postoperative period in order to detect this complication early.

Clinical Outcomes of Blending a Trifocal Intraocular Lens With a Bifocal Lens in the Fellow Eye

First Author: Fook Meng **CHEONG**

Co-Author(s): Eunice **HIEW**

Purpose: Bilateral implantations of trifocal intraocular lenses (IOL) are conventional practices to achieve maximum binocular summation for good overall vision and presbyopia correction. However, this is not always possible in certain circumstances. This study aimed to evaluate the visual and clinical outcomes of blending a trifocal intraocular lens with a bifocal lens in the fellow eye, as an alternative to bilateral trifocal implantations.

Methods: Observational study of 12 patients who had unilateral implantation of a trifocal IOL combined with a bifocal IOL in the fellow eye. A single surgeon performed all operations in a standard manner, with no intraoperative complications. Outcome measures were (i) distance, intermediate, and near visual acuities; (ii) defocus curves; (iii) patients' perceived symptoms of halos at night; (iv) patients' spectacle independence; and (v) overall satisfaction.

Results: Reasons for this blending strategy were (i) to extend the multifocality of a bifocal IOL in the contralateral eye and (ii) to complement the use of a higher power toric bifocal IOL in the fellow eye. All patients achieved 20/20 vision for near,

intermediate, and distance. Binocular defocus curves were comparable to that seen in bilateral trifocal implantations. Halos were seen by 75% of patients but none were affected significantly in their daily activities. A total of 100% spectacle independence was achieved. Overall satisfaction was high.

Conclusions: Blending a trifocal IOL with a bifocal IOL appears to provide patients with good overall vision for all distances. Spectacle independence was 100%, with high satisfaction scores. The disparity in the lenses seems to be well tolerated by patients.

Iris Diaphragm Intraocular Lens Implantation in Traumatic Aniridia: A Retrospective Analysis

First Author: Krati **GUPTA**

Co-Author(s): Pritam **BAWANKAR**, Nilutparna **DAS**, Saurabh **DESHMUKH**, Diva **MISRA**, Ronel **SOIBAM**

Purpose: To evaluate the clinical outcomes of 13 patients with posttraumatic aniridia, who were treated with pars plana vitrectomy and scleral fixation of a brown colored iris diaphragm intraocular lens (IOL).

Methods: We describe 13 eyes of posttraumatic aniridia with aphakia, who presented at our institution from August 2010 to February 2016. Primary repair with extraction of cataractous lens was done elsewhere. All patients were followed up for a period of 4-9 months after first presentation. All the patients with traumatic aniridia, insufficient capsular support for IOL implantation, and normal intraocular pressure (IOP) (<21 mm Hg) underwent pars plana vitrectomy and scleral fixation of a colored iris diaphragm IOL using 311 aniridia lens II was planned.

Results: Best-corrected visual acuity (BCVA) improved in all 13 eyes. Glare and photophobia decreased in all patients. Postoperatively, persistent intraocular inflammation was seen in 9 eyes, raised IOP observed in 5 eyes which was controlled with topical antiglaucoma medication, and transient hyphema developed in 4. Intraoperatively, ciliary sulcus bleeding occurred in 2 cases and haptic break during lens insertion in 1. Scleral-fixed IOL was well centered in all the cases.

Conclusions: The scleral fixation of brown iris diaphragm IOL seems to be a good option for the management of traumatic aniridia and aphakia. Although secondary glaucoma and reduced visibility of peripheral fundus are still a concern, our experience with the colored diaphragm lens has been rewarding in terms of visual and aesthetic rehabilitation.

Iris-Fixated Aphakic Intraocular Lenses for Treatment of Dislocated Scleral-Fixated Intraocular Lenses in a Patient With Previous Traumatic Cataract

First Author: Hung-Yu **LIN**

Co-Author(s): Chia-Yi **LEE**

Purpose: To report a case of dislocated intraocular lenses with previous traumatic cataract surgery treated successfully by iris-fixated aphakic intraocular lens (IOL) concerning the visual and refractive outcome.

Methods: Case report and review of the literature.

Results: A 58-year-old male experienced traumatic cataract after a car accident and received phacoemulsification accompanied with posterior IOL implantation by scleral fixation 17 years ago. The initial postoperative best corrected visual acuity (BCVA) was 20/20 and the spherical equivalent (SE) was -4.00 diopters (D) with IOL located at the orthogonal site. However, inferior IOL dislocation was noted during routine clinical examination with BCVA decreased to 20/200 and a SE of -5.25 D in October 2016. Then he received removal of dislocated IOL and implantation of iris-fixated aphakic IOL with preoperative SE estimation of -0.25 D. Retinal detachment with cystoid macular edema were observed 1 day postoperatively; then he had oral prednisolone for 2 weeks and trans pars plana vitrectomy was performed 4 days later. Then indirect ophthalmoscope and B-scan revealed recovery of the retinal detachment and cystoid macular edema. One month after the surgery, the BCVA recovered to 20/25 and the SE diminished to -1.00 D. No further IOL dislocation was observed at the last visit.

Conclusions: In summary, the implantation of iris-fixated IOL may be a reversible, effective, stable, safe procedure for dislocated IOL after traumatic cataract concerning visual and refractive outcome. Still, the long-term corneal endothelial condition should be followed as decreased endothelial count may develop.

Simulation by Adaptive Optics and Linking it to Virtual Reality Technology in Presbyopes: Saver Protocol

First Author: Shruti **KOCHAR MARU**

Co-Author(s): Vaitheeswaran **GANESAN**, Abhijit **SINHA**, Rohit **SHETTY**

Purpose: To evaluate the tolerance limit of spherical aberration (SA) that improves depth of focus in presbyopic patients using an adaptive optics simulator (VAO) and its potential application in presbyopic surgery and to use virtual reality (VR) technology to generate real-life situations and assess SA tolerance binocularly.

Methods: VAO was used to assess unocular visual

acuity (VA) before and after modification of SA in 100 presbyopic subjects. Effect of change in SA on distance, intermediate, and near VA was measured. Induced change in SA was converted to equivalent spherical correction for possible surgical modifications. VR technology was used to produce virtual, augmented 3-dimensional scenarios and the optimum SA was assessed binocularly.

Results: Adding negative SA led to better near and intermediate VA but less distance VA. Median intermediate and near VA improved by 0.1 decimal but distance VA reduced by -0.15 decimals ($P < 0.0002$). Half the eyes needed refractive correction of ≥ 1 diopter (D) to improve near and intermediate vision. Virtual reality simulators helped the patients to see virtual prototypes better prior to any intervention.

Conclusions: An adaptive optics simulator gives patient-specific tolerance limits of spherical aberration and the ability to study its impact on distance, near, and intermediate vision. Virtual reality offers scientists and clinicians a cost-effective tool to study and replicate interactions in a controlled environment. This can be used in increasing acceptability of lens implants or laser in situ keratomileusis (LASIK), customizing laser presbyopia surgery, and choosing the right candidates for treatment.

Surgical Outcomes of Retropupillary Iris Claw Intraocular Lens Implantation for the Treatment of Intraocular Lens Dislocation

First Author: Min **KIM**

Purpose: To investigate the safety and efficiency of secondary retropupillary iris claw intraocular lens (RPICOL) in complete intraocular lens (IOL) dislocation patients.

Methods: Patient records and operative reports of patients who underwent RPICOL implantation by a single surgeon between September 2014 and October 2016 were analyzed. Removal of dislocated IOL, pars plana vitrectomy, and secondary RPICOL implantation was done. The visual acuity, intraocular pressure (IOP), spherical equivalent (SE), and endothelial cell count (ECC) were followed up until 12 months. Postoperative complications were investigated during the follow-up period.

Results: A total of 45 eyes of 45 patients were analyzed. At 12 months after the operation, the best corrected visual acuity (BCVA) was significantly improved when compared to preoperative uncorrected visual acuity [0.496 ± 0.119 logarithm of the minimum angle of resolution (logMAR) vs 1.247 ± 0.123 logMAR, $P < 0.0001$]. There was no significant difference between postoperative SE and preoperative target diopter (D) (-0.486 ± 0.193 D vs -0.697 ± 0.159 , $P = 0.111$). IOP

was significantly lowered ($P = 0.012$) and ECC was unaffected ($P = 0.328$). Postoperative complications showed 6 instances of temporary IOP elevation, 2 redislocation cases, and 1 case of cystoid macular edema.

Conclusions: Secondary RPICOL implantation is a relatively safe and simple procedure that is effective in correcting IOL dislocation of various causes.

Toric Intraocular Lenses for Correction of Significant Astigmatism and Myopia Following Keratoplasty: Refractive and Visual Outcomes

First Author: Jina **HAN**

Co-Author(s): Charles **MCGHEE**

Purpose: To evaluate the refractive and visual outcomes of toric intraocular lens (IOL) implantation in eyes with significant astigmatism following keratoplasty.

Methods: A retrospective review was conducted on eyes with toric IOL implantation following previous penetrating keratoplasty (PKP) or deep anterior lamellar keratoplasty (DALK). All cases of toric IOL performed on postkeratoplasty patients by a single surgeon at a single center between the years 2006-2016 were included.

Results: Twenty-six eyes of 22 patients were included in the study. Twenty-one of these eyes had undergone previous PKP, and 5 had undergone DALK. The mean unaided decimal visual acuity (VA) improved from 0.14 preoperatively to 0.63 postoperatively. All eyes showed an improvement in uncorrected VA with 84% achieving 6/12 or better. There was significant decrease in the magnitude of astigmatism from 7.19 cylinder to a refractive cylinder correction of 1.86 (74% reduction). The mean spherical equivalent reduced from -2.63 to -0.32 (88% reduction). There were no intraoperative complications. Postoperatively all but 1 eye was within 5 degrees of the target axis.

Conclusions: Toric IOLs may be a safe and effective treatment option in reducing significant astigmatic and refractive errors in eyes following keratoplasty, with careful patient selection and surgical planning.

Visual Performance of Patients With Interface Haze After Femtosecond Laser-Assisted Laser In Situ Keratomileusis

First Author: Chi-Chin **SUN**

Co-Author(s): Shin-Yi **CHEN**, Ching-Hsi **HSIAO**, Jerry **HUANG**

Purpose: To investigate the visual performance in eyes with corneal haze after thin-flap femtosecond laser-assisted LASIK (FS-LASIK).

Methods: This was a retrospective case-control study. A total of 13 patients (26 eyes) who underwent FS-LASIK were recruited. Corneal haze was observed in 14 eyes (haze group). All eyes that developed corneal haze had unintended ultrathin flaps (<70 µm thickness) under 90 µm thickness flap setting. The other 12 eyes were recruited as control group (nonhaze group). Haze grading, visual acuity, and contrast sensitivity were measured preoperatively and at 1 month, 3 months, 6 months, and 12 months postoperatively. Flap thickness was measured by intraoperative pachymeter and corneal optical coherence tomography (OCT) at 6 months postoperatively.

Results: Postoperative best spectacle-corrected visual acuity (BCVA) was significantly improved at 1, 6, and 12 months in both haze and nonhaze groups. There was no significant difference of visual acuity between haze and nonhaze groups ($P = 0.311$). The logarithmic units of contrast sensitivity score (logCS) improved postoperatively in both groups, especially in higher spatial frequencies and under scotopic condition. There was no significant difference of LogCS in all spatial frequencies under both photopic and scotopic conditions in both groups. The measured flap thickness was significantly thinner than the programmed thickness, and the error of applanation cone correction was thought to contribute to this discrepancy.

Conclusions: Corneal haze after FS-LASIK rarely occurs, and it did not affect visual performance measured by BCVA and contrast sensitivity. Applanation cone correction with the correct lot number is crucial to obtain the accurate flap thickness.

Retina (Medical)

A Case Study on Dexamethasone Implant in Treatment of Diabetic Macular Edema and Ocular Sarcoid

First Author: Isha **AGARWALLA**

Co-Author(s): Pritam **BAWANKAR**, Saurabh **DESHMUKH**, Krati **GUPTA**, Diva **MISRA**, Ronel **SOIBAM**

Purpose: To study the effect of dexamethasone implant in the treatment of diabetic macular edema and ocular sarcoidosis.

Methods: Case report, along with multimodal imaging techniques such as color fundus photo and optical coherence tomography.

Results: A patient aged 50 years old, with a 6-year history of diabetes mellitus, presented to the outpatient department (OPD) with gradual, painless, progressive loss of vision for 2 months. On examination of the right eye, vision was counting fingers (CF) at 0.5 m and 6/24 in the left eye. On indirect ophthalmoscopy vitreous cells, hard exudates, retinal hemorrhage,

and balls of exudate of ocular sarcoid were seen in both eyes following which a provisional diagnosis of nonproliferative diabetic retinopathy (NPDR) plus clinically significant macular edema (CSME) plus panuveitis was made. High-resolution computed tomography (HRCT) and serum ACE confirmed ocular sarcoid. Optical coherence tomography revealed increased retinal thickness in both eyes. An intravitreal injection of dexamethasone implant was given in both eyes (right eye 2 doses, left eye 1 dose) along with oral methotrexate. Subsequently the patient was followed up and on his final visit a visual acuity of 6/9 was recorded in both eyes. Optical coherence tomography showed resolution of edema.

Conclusions: Thus dexamethasone implant turned out to be a good treatment option for patients with uncontrolled diabetes mellitus in treating both NPDR and ocular sarcoidosis.

A Case of Choroidal Osteoma With Recurrent Episodes of Choroidal Neovascularization

First Author: Bao **TRAN**

Purpose: To present a case of bilateral choroidal osteomas with recurrent episodes of choroidal neovascularization in the left eye treated with anti-vascular endothelial growth factor (anti-VEGF) agents.

Methods: A case report. A 40-year-old female patient was diagnosed with bilateral choroidal osteomas with choroidal neovascularization in her left eye. She was then treated with 7 intravitreal injections of anti-VEGF agents from August 2015 to September 2016. The patient underwent surgically sterile preparation and totally had 3 injections of aflibercept, 2 injections of ranibizumab, and 2 injections of bevacizumab.

Results: Functional improvement was achieved after each injection; however, the choroidal neovascularization recurred around 1 month after injection. Her best-corrected visual acuity before and after injections were 6/20 and 4/20; her central retinal thickness before and after injections were 299 and 497 µm.

Conclusions: Choroidal osteoma is a rare benign tumor, usually diagnosed in young female patients, that may be complicated by choroidal neovascularization, which causes deep loss of visual acuity. Combination of anti-VEGF agents and photodynamic therapy should be considered.

A Rare Case Report of Choroidal Neovascular Membrane Following Endogenous Endophthalmitis

First Author: Krishnendu **NANDI**

Purpose: We report here a rare case of choroidal neovascular membrane (CNVM) following endogenous

endophthalmitis with subretinal abscess in the left eye due to *Scedosporium apiospermum* in an immunocompetent individual.

Methods: The patient suffered from diabetic ketoacidosis and liver abscess, which was managed successfully. Subsequently, the patient developed endophthalmitis in the right eye (OD) and subretinal abscess in the left eye (OS). Left eye was treated with intravitreal antifungal and steroid injection. Systemically, the patient was treated with intravenous antibiotics and oral voriconazole. Left eye showed gradual improvement with reduction in abscess size with intravitreal injections. After 6 months, the patient developed CNVM in the left eye, which was then treated successfully with 3 monthly injections of Lucentis. She was then followed up for 3 years.

Results: At presentation, best corrected visual acuity was 6/6, N6 in OS. At 3 years of follow-up following injection of Lucentis, best corrected visual acuity was 6/18, N12 in OS.

Conclusions: Our case was unique due to the rarity of presentation in an immunocompetent individual with no history of ocular trauma of vegetative origin or otherwise. This report also highlights the aggressive medical and surgical management required to salvage eyes affected by fungal endophthalmitis with subretinal abscess in the other eye. Such patients can develop CNVM related to subretinal scar tissue. Early detection, energetic treatment, and long follow-up are critical in such cases.

A Rare Case of Choroidal Osteoma

First Author: Ishwarya SRIDHAR

Co-Author(s): Kambam GAINATHI, Hannah RANJEE PRASANTH, Elfride SANJANA

Purpose: To describe a rare and classical presentation of choroidal osteoma in a young female.

Methods: A 22-year-old woman experienced sudden diminution of vision in the right eye and temporal field defect in 2011. She was diagnosed to have macular edema and symptoms resolved with treatment. Routine examination done in 2016 showed that macular edema had subsided completely with evidence of residual macular atrophy, suggestive of previous choroidal neovascularization. There was a yellow uniformly raised lesion just superior to the disc. Optical coherence tomography (OCT) was ordered.

Results: OCT showed a lattice pattern in a calcified tumor similar in appearance to cancerous bone just below the retinal pigment epithelium, confirming the diagnosis of choroidal osteoma.

Conclusions: Choroidal osteoma should be considered in a differential diagnosis of choroidal

neovascularization in young adults.

Axial Elongation Difference in Unilateral Myopic Patients Treated With Monocular Orthokeratology

First Author: Cheng-Jen CHIU

Co-Author(s): Yuan-Chieh LEE, Wei-Shan TSAI

Purpose: To compare the axial elongation difference between both eyes in unilateral myopic patients wearing monocular orthokeratology (Ortho-K) lens.

Methods: This is a retrospective cohort study. Subjects with unilateral myopia wearing monocular Ortho-K lens from May 2009 to January 2017 were enrolled. The axial length (AL) difference rate, defined as the AL difference between both eyes divided by the AL in the fellow eye, was calculated. Generalized estimating equations (GEE) model was used to evaluate the associated risk factors.

Results: A total of 31 cases were enrolled. The average initial wearing age was 12.32 ± 3.07 years old. In myopic eyes, the average initial spherical equivalent was -2.73 ± 0.95 diopters, and the average initial AL was 24.15 ± 1.13 mm. The mean follow-up time was 2.01 ± 1.48 years. The AL difference rate decreased significantly, from $3.57 \pm 1.97\%$ at baseline to $1.98 \pm 2.07\%$ at 24 months ($P < 0.001$). The GEE model showed an association between larger initial AL difference rate with higher degrees of myopia ($P < 0.001$) and higher degrees of anisometropia ($P < 0.001$), which could be reversed after long-term Ortho-K lens wear. Four nonwearing eyes with myopic progression starting Ortho-K lens wear also showed slower AL growth ($P = 0.068$).

Conclusions: Our study demonstrated that the myopic eyes in unilateral myopia patients, when treated with monocular Ortho-K, had less axial length growth than the contralateral emmetropic eye. The larger axial length difference rate in high myopia and high anisometropia patients will be reversed after long-term Ortho-K lens wear. Axial length growth after myopia progression could be slowed down by add-on Ortho-K treatment.

Biosimilar Intravitreal Ranibizumab (Razumab) in Macular Pathology

First Author: Umesh BHAMMARKAR

Purpose: To study the clinical safety and efficacy of biosimilar intravitreal ranibizumab (Razumab) for the treatment of macular disorders such as diabetic macular edema (DME), neovascular age-related macular degeneration (nAMD), and macular edema secondary to retinal vein occlusions (RVOs).

Methods: Retrospective analysis of 56 eyes with

macular pathology treated with biosimilar ranibizumab (Razumab) with at least 3 months of follow-up time. Macular edema was diagnosed by clinical examination, fundus photo, and Cirrus optical coherence tomography (OCT). Patients' data were collected and included details of best corrected visual acuity (BCVA) by Snellen chart and OCT at baseline and on each visit during follow-up. Number of injections and potential complications were recorded. Outcome measures were safety parameters that included signs of clinical ocular toxicity and changes in BCVA and central macular thickness (CMT) on OCT, respectively.

Results: Fifty-six eyes of 40 patients received biosimilar intravitreal ranibizumab injection for DME, nAMD, and macular edema secondary to RVO between June 2016 and July 2017. Mean pretreatment BCVA was 2/60 to 6/24, and postinjection BCVA at day 30 was 6/60 to 6/6 with reducing CMT on OCT. No serious drug-related ocular or systemic adverse events were identified.

Conclusions: Biosimilar ranibizumab for DME, nAMD, and macular edema secondary to RVO was well tolerated with improvements in BCVA and CFT without any detectable ocular and systemic toxicity. While the long-term safety and efficacy remain unknown, these short-term results suggest that biosimilar Razumab could become a safe, low-cost therapy for macular diseases. Further studies are needed to determine safety, efficacy, and side effects.

Changes of OCTA Findings After Treatment in Polypoidal Choroidal Vasculopathy

First Author: Jae Min KIM

Co-Author(s): Eung Suk KIM, Seungyoung YU

Purpose: The purpose of this study was to investigate the optical coherence tomography angiography (OCTA) findings after single therapy (only intravitreal injection) or combination therapy [photodynamic therapy (PDT) and intravitreal injection] in patients with polypoidal choroidal vasculopathy (PCV).

Methods: The study design was a retrospective chart review of 16 eyes with a clinical diagnosis of treatment-naïve PCV seen at Kyunghee University Hospital between May 2016 and January 2017. Indocyanine green angiography (ICGA) and OCTA were used to further analyze the polypoidal lesion and the branching vascular network (BVN). Aflibercept and ranibizumab were used for intravitreal anti-vascular endothelial growth factor (anti-VEGF) injection.

Results: Sixteen eyes of 16 patients (11 male, 5 female) were studied. Average age was 68.43 ± 9.07 years. Single therapy (only intravitreal injection) was performed in 11 eyes and PDT combination therapy was performed in 5 eyes. The polypoidal lesions were detected in 16 eyes (100%) by ICGA and in 7 eyes (44%)

by OCTA. The BVN were detected in 7 eyes (44%) by ICGA and in 11 eyes (69%) by OCTA. The decrease of polypoidal lesion and BVN after single therapy or combination therapy was detected in 6 eyes (85%) and in 8 eyes (73%).

Conclusions: Branching vascular networks showed more clearly on OCTA than on ICGA. Polypoidal lesions had variable patterns on OCTA and showed more clearly on ICGA than on OCTA. OCTA is a noninvasive imaging tool for detecting vascular changes in PCV and OCTA patterns of the polypoidal lesions and the BVN are helpful in understanding the pathology of PCV and therapeutic effects.

Characterization of the Choriocapillaris in Myopic Macular Degeneration With Optical Coherence Tomography Angiography

First Author: Chee-Wai WONG

Co-Author(s): Gemmy CHEUNG, Shu Yen LEE, Tien-Yin WONG, Doric WONG

Purpose: Choroidal thinning is a major feature of myopic macular degeneration (MMD) but the relation to underlying choroidal vasculature changes is unclear. We aimed to characterize the choriocapillaris (CC) in highly myopic eyes with various severity of MMD, using optical coherence tomography angiography (OCTA).

Methods: Prospective, clinic-based study of 47 eyes of 38 patients with high myopia (≤ -6 diopters or axial length ≥ 26.5 mm). MMD was graded from fundus photographs according to the Meta-analysis for Pathologic Myopia (META-PM) Classification. MMD was defined as META-PM category 2. Macular 3 x 3-mm en-face OCTA images were obtained with the Triton swept-source OCTA. Choriocapillaris segment was obtained using a 10 μ m slab from the retinal pigment epithelium (RPE)-Bruch membrane complex. CC alterations were graded as 1: normal appearance, 2: patchy loss with partial unmasking of Sattler layer (SL), 3: confluent loss with generalized unmasking of SL, and 4: loss of SL.

Results: The distribution of CC alterations was different between eyes without MMD (CC grade 1: 82.4%, CC grade 2: 17.6%) and eyes with MMD (CC grade 1: 0%, CC grade 2: 70%, CC grade 3: 23.3%, and CC grade 4: 6.7%, $P < 0.001$). CC alterations were strongly correlated with axial length ($r = 0.63$, $P < 0.001$), subfoveal choroidal thickness ($r = -0.74$, $P < 0.001$), and had moderate correlation with logarithm of the minimum angle of resolution (logMAR) best corrected visual acuity ($r = 0.47$, $P = 0.001$).

Conclusions: OCTA revealed features of CC flow impairment in highly myopic eyes without MMD, suggesting that CC changes may precede the development of MMD. Longitudinal studies are needed to assess the utility of OCTA for the early detection of

individuals at risk of MMD progression.

Choroidal Thickness Evaluation of Healthy Eyes, Central Serous Chorioretinopathy, and Fellow Eyes Using Spectral Domain Optical Coherence Tomography in an Indian Population

First Author: Supriya ARORA

Co-Author(s): Tarun ARORA, Mohit CHHABRA, Basudeb GHOSH, Preeti SRIDHARAN

Purpose: The purpose of this study was to establish a normative database of subfoveal choroidal thickness (CT) in healthy young Indians using spectral domain optical coherence tomography (SD-OCT). Evaluation and comparison of CT of central serous chorioretinopathy (CSC) and fellow eyes was also performed.

Methods: This was a prospective, cross-sectional, and observational study. It included 112 normal eyes of 112 healthy volunteers who had no evidence of ocular or systemic disease, 84 CSC eyes with acute treatment-naïve CSC, and 69 fellow eyes with no evidence of neurosensory detachment or pigment epithelium detachment on SD-OCT. Complete history, examination, and SD-OCT was performed in all eyes.

Results: Mean age of 81 patients (84 eyes) with CSC was 35.04 ± 8.86 years, 69 fellow eyes was 34.61 ± 8.71 years, and 112 healthy volunteers (112 eyes) was 33.16 ± 9.4 years ($P < 0.05$). Mean subfoveal CT of CSC eyes was 429 ± 74.18 μm , fellow eyes was 360 ± 57.99 μm , and normal eyes was 301.80 ± 46.59 μm ($P < 0.001$).

Conclusions: CT varies not only with age, axial length, and refractive error but also with race. Therefore, it is important to establish a normative database in a particular population before carrying out further research in diseased states. CT in CSC eyes is significantly thicker than fellow eyes and CT of fellow eyes is significantly thicker than normal eyes. This reinforces the fact that choroidal permeability is increased in both eyes of patients with CSC.

Clinical Profile and Prognostic Indicators of Retinitis Pigmentosa

First Author: Harvey UY

Co-Author(s): Pik Sha CHAN, Ryan COLLANTES, Paula TAN

Purpose: Retinitis pigmentosa (RP) is the most commonly inherited retinal disorder affecting 1 in 4000 individuals. We conducted this study to determine demographic data, clinical characteristics, and factors associated with visual outcomes of RP patients.

Methods: Retrospective chart review of 100 patients with RP at a multisubspecialty practice from 2013

to 2016. The following data were obtained: age at presentation, age of diagnosis, gender, best-corrected distance visual acuity (BCDVA), central retinal thickness, and mean deviation during automated visual field (MD AVF) testing.

Results: The mean age at presentation was 50.3 ± 16.8 years (range, 9-82); mean age at diagnosis was 47.3 ± 16.7 years (range, 7-81). Male:female ratio was 53:46. Twenty-seven patients (27%) reported positive family history. Of 200 eyes, the mean BCDVA at presentation was 0.36 ± 0.34 (range, 0-1); IOP elevation (>22 mm Hg) was observed in 5 (2.5%); mean CRT was 228.2 ± 90.9 (range, 40-641); mean MD AVF was -24.4 ± 7.1 (range, -6.1 to -34.8). Associated conditions were cataract/pseudophakia (39%) and maculopathies (8%). BCDVA was positively correlated with CRT ($r = 0.35$) and MD AVF ($r = 0.44$), negatively correlated with age at presentation ($r = -0.32$), and uncorrelated with age at diagnosis ($r = 0.05$).

Conclusions: RP becomes visually significant during middle age and affects both genders equally. RP is associated with cataract and maculopathies. Age of diagnosis has no prognostic value. MD AVF is correlated with BCDVA and may be better than CRT for monitoring RP progression.

Effective Long-Term Management of Choroidal Neovascularization Secondary to Angioid Streaks With Pro Re Nata Intravitreal Bevacizumab Injections

First Author: Jiyeon KIM

Co-Author(s): David DALZIEL

Purpose: To show how a patient who has developed recurrent episodes of choroidal neovascularization (CNV) secondary to angioid streaks can be managed successfully with a pro re nata (PRN) regimen of intravitreal bevacizumab injection over an 8-year period.

Methods: A 32-year-old Caucasian female with pseudoxanthoma elasticum (PXE) has been followed up in the eye clinic over an 8-year period for management of recurrent episodes of CNV in both eyes. She was educated to recognize the early signs and symptoms of CNV. Physical examination including visual acuity and slit lamp examination as well as investigations such as macular optical coherence tomography (OCT) and OCT angiography were performed to assess her. A series of bevacizumab injections were given when she was diagnosed with CNV.

Results: Multiple episodes of CNV have been treated with a PRN regimen of intravitreal bevacizumab injections. The patient was able to maintain excellent visual acuity of 0 logarithm of the minimum angle of resolution (logMAR) even after suffering multiple

recurrent episodes of CNV.

Conclusions: This case report supports that the PRN regime of intravitreal bevacizumab injection therapy can be used successfully to treat recurrent episodes of CNV in a patient with PXE over an 8-year period. Early diagnosis by patient education and use of appropriate diagnostic tools such as OCT angiography have enabled us to deliver treatment early, resulting in excellent outcomes in this patient.

Efficacy of Off-Label Ziv-Aflibercept in Refractory Diabetic Macular Edema

First Author: Nishant **RADKE**

Co-Author(s): Amrita **MUKHERJEE**, Snehal **RADKE**, Charudutt **KALAMKAR**

Purpose: To study the effect of ziv-aflibercept as an off-label treatment of refractory diabetic macular edema.

Methods: Seven eyes of 4 patients with diabetic macular edema refractory to monthly intravitreal anti-vascular endothelial growth factor (VEGF) injections like bevacizumab and ranibizumab were included and studied. Cases with proliferative diabetic retinopathy, macular ischemia, any intraocular eye surgery within the preceding 3 months, uveitis, and trauma were excluded. Metabolic control in the form of controlled blood pressure, glycosylated hemoglobin, lipid profile, and kidney function were assessed. Cases with poor systemic control were excluded.

Results: Average age was 55.25 years. Average number of previous injections received was 7 prior to initiation of therapy with ziv-aflibercept. Average number of ziv-aflibercept injections needed was 3. Average central foveal thickness at the start of any kind of treatment, diagnosis of refractory nature, and after treatment with ziv-aflibercept were 426.29, 412.57, and 228.14 μm , respectively. P value for unpaired t test between means of treatment prior to initiation of ziv-aflibercept and after treatment was less than 0.0001, which was statistically significant. Average Early Treatment Diabetic Retinopathy Study (ETDRS) letter scores before starting any treatment, before initiating ziv-aflibercept treatment, and at the end of treatment with ziv-aflibercept were 47.29, 47.29, and 70, respectively. The P value for unpaired t test for ETDRS letter scores before and after treatment with ziv-aflibercept was 0.0003.

Conclusions: Short term results of ziv-aflibercept in treatment of refractory diabetic macular edema are encouraging and can lead to good structural and functional outcomes.

Evaluating Safety and Efficacy of Low Dose Intravitreal Injection of Triamcinolone Acetonide in Adjunct to Anti-VEGF in Diabetic Macular Edema

First Author: Durgesh **KUMAR**

Co-Author(s): Pankhuri **JOHARI**

Purpose: To evaluate the safe and effective dose of intravitreal triamcinolone in eyes with diabetic macular edema.

Methods: A total of 588 normotensive, nonglaucomatous eyes of patients with type II diabetes having clinically significant macular edema were examined clinically with best corrected visual acuity, slit lamp biomicroscopy, and applanation tonometry. All patients were investigated with optical coherence tomography (OCT) and angiography to rule out macular ischemia. Mean macular thickness observed in the study group was 490 μm . Then 2 mg triamcinolone acetonide in 0.05 mL was injected with anti-vascular endothelial growth factor (anti-VEGF; ranibizumab 0.05 mL). Postinjection follow-ups were on the fifth day, second week, and then every month.

Results: On the second postinjection visit mean macular thickness reduced to below 270 μm and this was maintained till 6-month follow-up in 69.7% of eyes and in 47% of eyes at 12-month follow-up. Those who maintained good recovery at 12-month follow-up had glycemic control with postprandial blood sugar below 160 mg/dL. Intraocular pressure (IOP) rise of less than 5 mm Hg from baseline was seen in 21% of cases and more than 5 mm Hg in 4.8%. None of them presented with intractable glaucoma.

Conclusions: Intravitreal injection of 2 mg triamcinolone acetonide with ranibizumab was found to be safe and effective in rapid and sustained resolution of diabetic macular edema.

Hemodynamic Changes of Vitreomacular Traction Syndrome on Optical Coherence Tomography Angiography: A Pilot Study

First Author: Derek **CHUNG**

Co-Author(s): Kenneth **LI**

Purpose: To study the hemodynamic changes of vitreomacular traction syndrome (VMT) with optical coherence tomography angiography (OCTA).

Methods: This is a consecutive case series of VMT patients who attended the ophthalmic clinics of United Christian Hospital during the period from July 1 to August 30, 2015. After the diagnosis of VMT was confirmed with spectral-domain optical coherence tomography (SD-OCT), the patients underwent OCTA using the AngioVue software on the RTVue XR Avanti Spectral Domain OCT (Optovue Inc, Fremont, CA). The

respective size of the foveal avascular zone (FAZ) at the superficial and deep retinal layers on OCTA was measured with the pixel counting technique previously described. In each case, the derived FAZ size was compared with the mean FAZ size in healthy subjects in the literature (superficial layer, $0.266 \pm 0.097 \text{ mm}^2$; deep layer, $0.495 \pm 0.227 \text{ mm}^2$).

Results: In the study period, 4 cases of VMT were recruited. The OCTA of the 4 cases of VMT showed enlargement of FAZ on both the superficial and deep retinal layers, even in cases without full-thickness macular hole or lamellar hole. There was vascular congestion around the enlarged FAZ in the deep retinal layer.

Conclusions: Apart from tractional forces, ischemia and vascular congestion may have clinical roles in the pathogenesis and functional disturbance of VMT.

Intravitreal Anti-VEGF Injections in Branch Retinal Vein Occlusion With Good Visual Acuity

First Author: Raja **NARAYANAN**

Co-Author(s): Rohit **GOUD**, Baruch **KUPPERMANN**

Purpose: To analyze the visual outcome of anti-vascular endothelial growth factor (anti-VEGF) injections in eyes with branch retinal vein occlusion (BRVO) with macular edema, who had a baseline visual acuity of 20/40 or better.

Methods: In this retrospective study, we included eyes with best-corrected visual acuity (BCVA) of 20/40 or better. Patients received intravitreal anti-VEGF injections at baseline and at subsequent visits if there was fluid on optical coherence tomography (OCT). The primary outcome measure was the final BCVA. Secondary outcome measures were central retinal thickness on OCT and the mean number of injections.

Results: Twenty eyes of 20 patients over a period of 2 years were analyzed, with a mean age of 52.3 years. Seven patients had hypertension. Mean duration of follow-up was 5.85 months. The mean baseline BCVA was 0.18 logarithm of the minimum angle of resolution (logMAR) (20/30) and the final BCVA was 0.10 logMAR (20/25). Three patients had 20/20 vision at baseline. The mean number of injections required per eye was 1.75. The mean baseline macular thickness was 362 μm and the final thickness was 211 μm . Nine patients had final visual acuity of 20/20. Overall 10 patients (50%) showed improvement in vision. None of the eyes had a drop in vision of 3 or more lines.

Conclusions: This study shows that there is significant improvement in visual acuity after very few intravitreal anti-VEGF injections in eyes with macular edema due to BRVO who had good visual acuity at presentation.

Intravitreal Ziv-Aflibercept With or Without Steroid for Subretinal Hyperreflective Material Associated With Wet AMD

First Author: Avantika **DOGRA**

Co-Author(s): Jay **CHHABLANI**, Ravi **SHARMA**

Purpose: To evaluate the efficacy of intravitreal triamcinolone (IVTA) in combination with intravitreal ziv-aflibercept (IVZ) in eyes with subretinal hyperreflective material (SRHM) associated with wet age-related macular degeneration (AMD).

Methods: Six eyes with SRHM associated with wet AMD underwent IVZ therapy with or without IVTA, 3 eyes each. All patients underwent comprehensive ophthalmic examination including fluorescein angiography, swept source optical coherence tomography, and pro-re-nata IVZ therapy. Single IVTA (2 mg/0.1 mL) was administered at baseline in the steroid group. Parameters including visual acuity, SRHM height, presence of subretinal and intraretinal fluid at baseline and at first treatment end point, and number of injections up to 6 months of follow-up were noted.

Results: Average reduction in SRHM height in the combination group was $73.3 \pm 23.6\%$ in comparison to $1.8 \pm 85.3\%$ in the IVZ monotherapy group. The visual acuity slightly improved (mean of 3 letters) in the combination group; however, there was a mean drop of a single letter in the IVZ monotherapy group. Total number of IVZ injections during 6 months of follow-up in the combination group was 1.66 ± 0.57 and that of the monotherapy group was 3.6 ± 0.57 .

Conclusions: Combination of IVTA with IVZ therapy reduces the SRHM height and the number of injections in wet AMD. SRHM reduction helps to maintain or improve the visual acuity by reducing the scar size. Addition of intravitreal steroid therapy may be considered in the presence of SRHM associated with wet AMD.

Juvenile X-Linked Retinal Schisis: Response to Topical Dorzolamide Therapy

First Author: Krati **GUPTA**

Co-Author(s): Pritam **BAWANKAR**, Dipankar **DAS**, Saurabh **DESHMUKH**, Fazil **KHURRUM**, Diva **MISRA**

Purpose: To report the clinical course of a patient presenting with bilateral juvenile X-linked retinal schisis in response to topical dorzolamide treatment.

Methods: Case report with multimodal imaging findings including fundus photo, visual evoked potential (VEP), optical coherence tomography, and fluorescein angiography. Topical dorzolamide hydrochloride 2% drops were used 3 times per day.

Results: We identified a 22-year-old male patient who presented with history of diminution of vision in both

eyes for 15-16 years. A cartwheel lesion at the macula was seen in the fundus photo in both eyes. The VEP showed poor electroretinogram (ERG) wave form with subnormal scotopic and photopic response. Optical coherence tomography showed macular cysts. The fluorescein fundus angiography was unremarkable. The patient was started on dorzolamide eye drops 3 times a day for 6 weeks. The best corrected visual acuity in both eyes improved from 6/60 to 6/9. Optical coherence tomography showed resolution of macular cysts.

Conclusions: Juvenile X-linked retinal schisis can be a devastating problem causing decrease in vision. Dorzolamide eye drops have been shown to be a good treatment option in terms of visual as well as anatomical recovery. Further prospective studies are vital to better elucidate our understanding of this disease identity.

Living With Anti-VEGF From 2006 to 2016: A Saga of 27 Anti-VEGF Injections in 1 Eye

First Author: Krishnendu NANDI

Purpose: To describe a rare case of anti-vascular endothelial growth factor (anti-VEGF) therapy for 8 years.

Methods: A 70-year-old female presented with decreased vision in the right eye for 6 months and left eye for 1 month in December 2006. Her best corrected visual acuity was 3/60 and 6/12 in the right and left eye, respectively. On clinical examination her anterior segment was normal with stable pseudophakia. Intraocular pressure (IOP) was 18 and 16 mm Hg in the right and left eye, respectively. Fundus examination showed scarred choroidal neovascular membrane (CNVM) in the right eye with active CNVM in the left eye with cystoid edema and retinal hemorrhage. Fundus fluorescein angiography (FFA) was done and confirmed the clinical diagnosis. Ranibizumab was then newly introduced in India. She was advised to receive injection of ranibizumab (Lucentis) in the left eye. Then the saga continued from 2006 to 2014.

Results: In the left eye she received 27 injections of ranibizumab with waxing and waning of vision and disease process. In between she underwent OCT 18 times and FFA 6 times. The last injection was given in December 2014. At that time her vision was 6/18 in the left eye. She was then followed up monthly till April 2016. At last follow-up her vision was maintained at 6/18 in the left eye.

Conclusions: This is a very uncommon case that received so many anti-VEGF injections, still maintaining good vision. Patience is needed on the part of the patient and doctor to treat such a patient.

Long-Term Clinical Course in a Patient With Complete Congenital Stationary Night Blindness

First Author: Hideki IIDA

Co-Author(s): Katsuhiko HOSONO, Yoshihiro HOTTA, Kentaro KURATA

Purpose: Congenital stationary night blindness (CSNB) is considered to be nonprogressive, but there are few reports based on long-term observation. The purpose of this study was to assess the long-term clinical course in a 46-year-old man with complete congenital stationary night blindness (CSNB1) who has been followed up for 39 years.

Methods: The patient first visited our hospital as a 7-year-old boy with a complaint of low visual acuity. Best corrected visual acuity (BCVA) was 0.5 in the right eye and 0.6 in the left eye. The refractive error was approximately -5.0 diopters (D) in both eyes. The fundus showed only myopic changes. A bright flash electroretinogram (ERG) revealed a negative configuration. We diagnosed CSNB and corrected the refractive error with glasses. We continued to monitor the ERG and various waveform components as well as visual acuity and the appearance of the fundus. All NYX exons were screened for a causative mutation by polymerase chain reaction amplification, and direct sequencing was performed.

Results: BCVA had increased by correcting myopia with glasses. The fundus showed only myopic changes. No changes were seen in the amplitude or implicit time of either the a-wave, b-wave, or b/a-wave ratio. A novel hemizygous insertion mutation, c.1205_1206insT, p.(Glu404Argfs*89), was detected in exon 2 of the NYX gene.

Conclusions: To our knowledge, this is the longest follow-up of a patient with CSNB1. No changes in the clinical course have been seen during follow-up. These findings may assist with predicting prognosis in patients with CSNB1.

Macular Infarction as the Presenting Feature of Rheumatic Heart Disease With Hyperhomocysteinemia

First Author: Supriya ARORA

Co-Author(s): Tarun ARORA, Mohit CHHABRA, Basudeb GHOSH, Preeti SRIDHARAN

Purpose: To report a case of macular infarction as the presenting feature of rheumatic heart disease with hyperhomocysteinemia.

Methods: A 31-year-old male presented with sudden painless loss of vision in the right eye for 1 day. Visual acuity was perception of light, projection of rays (PL+ PR) accurate temporally in the right eye and 20/20 in

the left eye. Clinical examination, fundus fluorescein angiography (FFA), and spectral domain optical coherence tomography (SD-OCT) were performed. A thorough systemic evaluation and consultation from a cardiologist as well as neurologist was obtained.

Results: In the right eye relative afferent pupillary defect (RAPD) was present and fundus examination revealed retinal opacification at the posterior pole with cherry red spot at foveola suggestive of central retinal artery occlusion (CRAO). Left eye was normal. FFA of the right eye demonstrated features of macular infarction and SD-OCT showed features suggestive of arterial occlusion. On systemic evaluation, he was discovered to have severe rheumatic heart disease and moderate hyperhomocysteinemia. For prevention of further embolic episodes, oral anticoagulants were prescribed and the patient was planned urgently for mitral valve replacement surgery.

Conclusions: Macular infarction can be the presenting feature of RHD and ophthalmologists can be the first doctor encountering a life-threatening systemic disease whose course can be modified by carefully evaluating the patients.

Microvascular Change in Acute Macular Neuroretinopathy by Using Optical Coherence Tomography Angiography: A Case Report

First Author: Yen-Chih CHEN
Co-Author(s): Chen-Ni CHEN

Purpose: To report a case of acute macular neuroretinopathy (AMN) in a preeclamptic pregnant female who underwent cesarean section and where the subsequent microvascular change was identified by optical coherence tomography (OCT) angiography.

Methods: A case report.

Results: A 27-year-old pregnant female underwent cesarean section due to preeclampsia. Two days after the delivery she presented with acute onset of blurred vision in the left eye. OCT revealed characteristic findings of AMN in both eyes. During the follow-up, her vision improved gradually but outer nuclear layer (ONL) thinning with disruption of the ellipsoid zone (EZ) was identified from OCT. OCT angiography was arranged and revealed vascular defect in both the superficial and deep vascular plexus, which correlated with previous AMN lesions in both eyes.

Conclusions: We report an AMN case with subsequent microvascular change found in both the superficial and deep vascular plexus, which is different from the current consensus that AMN is mainly involved in the deep vascular plexus. By using OCT angiography we can better visualize the detailed retinal vascular structure and may identify the real mechanism in this rare retinal

disorder.

Myopic Macular Atrophy After Treatment With Intravitreal Bevacizumab Injection

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Co-Author(s): Yoshitugu INOUE, Daisuke NAGASE, Fumie OTANI, Shinichi SASAKI, Ryu UOTANI

Purpose: To retrospectively investigate long-term visual prognosis and characteristics of myopic macular atrophy after intravitreal bevacizumab injection.

Methods: Fifty eyes of 51 patients with myopic choroidal neovascularization (mCNV) followed up for more than 3 years after initial treatment were enrolled in this study. All eyes initially received intravitreal injection of 1.25 mg bevacizumab followed by pro re nata treatment by bevacizumab or ranibizumab. The changes in visual acuity, age, the number of recurrences, and the change of atrophy area were evaluated.

Results: CNV-related macular atrophy developed in 21 eyes (41%) over 3 years. The total cases were divided into the atrophy group and nonatrophy group. Mean age at baseline was 70.3 years in the atrophy group and 62.1 years in the nonatrophy group. In the patients less than 50 years old, only 1 case developed macular atrophy during the period. Visual acuity of both groups improved after initial treatment, followed by gradual deterioration in the atrophy group. Mean best corrected visual acuity (BCVA) in logarithm of the minimum angle of resolution (logMAR) units improved from 0.48 at baseline to 0.27 in the nonatrophy group but was unchanged from 0.83 at baseline to 0.73 in the atrophy group over 3 years. Macular atrophy appeared in 70% of recurrent CNV cases. Mean number of intravitreal injections was 1.5 in the nonatrophy group and 2.9 in the atrophy group. Macular atrophy expanded toward concentric (33.3%), nasal region (33.3%), temporal region (14.3%), and others (19.0%) and had the tendency to expand in relation to posterior staphyloma and preexisting chorioretinal atrophy.

Conclusions: The cases with CNV-related macular atrophy had poor visual prognosis, and there is a relationship between age and CNV recurrence.

Novel Compound Heterozygous Mutations in the POC1B Gene Underlie Peripheral Cone Dystrophy in a Chinese Family

First Author: Xin JIN
Co-Author(s): Lanlan CHEN, Houbin HUANG

Purpose: To describe the clinical characteristics of a Chinese family with peripheral cone dystrophy (PCD), which is a very rare type of retinal dystrophy, and identify the gene mutations causing PCD.

Methods: The Chinese PCD pedigree underwent comprehensive ophthalmic examinations, including visual acuity, slit lamp examination, funduscopy, visual field examination, autofluorescence (FAF), fundus fluorescein angiography (FFA), indocyanine green angiography, full-field electroretinograms (ERGs), and spectral-domain optical coherence tomography (SD-OCT). Targeted next-generation sequencing of COD or CORD genes was used to identify the causative mutation.

Results: The patient complained of photophobia for many years, while the fundus examinations, FFA and FAF imaging, were normal. The peripheral visual field examination presented a relative paracentral scotoma. The amplitudes of the dark-adapted rod ERGs were mildly decreased, but single-flash cone response and the 30-Hz cone flicker responses were both extinguished. SD-OCT demonstrated slightly dark ellipsoid zone and obviously indistinct interdigitation zone throughout the macular region except for the center of the fovea. The novel compound heterozygous mutation, c.1353C>T and c.710A>G, in POC1B was identified in the patient; the mutations were segregated with the PCD phenotype in the family and were absent from ethnically matched control chromosomes. Prediction analysis demonstrated the novel missense mutation, POC1B c.710A>G, might be damaging.

Conclusions: PCD was a type of COD or CORD and the novel compound heterozygous mutation in POC1B was responsible for the PCD phenotype in the family.

OCT Angiography Imaging in Evaluation of Flow Area and CRT Dynamics in Anti-VEGF Therapy in Wet AMD

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Purpose: To assess the dynamics of flow area and central retinal thickness (CRT) changes during anti-vascular endothelial growth factor (anti-VEGF) therapy in wet age-related macular degeneration (AMD) patients using optical coherence tomography (OCT) angiography (OCTA).

Methods: Fifteen eyes of 15 patients qualified for anti-VEGF injections were included in the study. OCT angiography (RTVue XR Avanti, Optovue Inc, USA) was used to assess the therapy effects. Observation period was 8 weeks, which included 2 injections for each patient. The flow area of choroidal neovascularization (CNV) on OCTA and CRT were measured before injection on the same day and 2 weeks after each injection.

Results: OCT angiography showed regression of the

CNV lesion over 8 weeks in all patients. CNV flow area fluctuations over follow-up period were observed. Although in all patients there was a visible decrease in the CNV flow area in 2 weeks after the first injection, in 9 of them revascularization of the CNV lesion was revealed shortly before applying the second dose. CRT decreased in all patients over the observation period.

Conclusions: OCT angiography proved to be a useful and effective tool in evaluation and monitoring of the anti-VEGF therapy efficacy in wet AMD patients. This study confirms reduction of flow area and CRT in all patients over the observation period.

Optical Coherence Tomography in a Primary Care Diabetic Retinopathy Screening Cohort

First Author: Gavin TAN

Co-Author(s): Carol CHEUNG, Ecosse LAMOUREUX, Tien-Yin WONG

Purpose: To assess the use of optical coherence tomography (OCT) for identification of diabetic macular edema (DME) and other ocular conditions at a primary care diabetic retinopathy screening service.

Methods: Patients attending a primary care diabetic retinopathy telemedicine screening service were recruited to participate in this study. Participants had macula-centered and optic nerve-centered spectral domain optical coherence tomography imaging performed. OCT images were graded remotely by trained graders at a centralized reading center. DME was diagnosed by the presence of intraretinal or subretinal fluid and thickening without any other secondary cause.

Results: A total of 500 patients who agreed to participate in this study (63% male) were included. The mean duration of diabetes was 7.2 (SD \pm 7.9) years and the mean HbA1c was 7.6% (SD \pm 1.7). Twenty subjects (4%) had DME identified on OCT. Of these 20 subjects with DME, only 8 (40%) would have been identified on fundus imaging alone. Sixty-seven subjects were identified as glaucoma suspects on OCT. Other conditions identified on OCT included advanced age-related macular degeneration (n = 10), epiretinal membrane (n = 7), full thickness macular hole (n = 2), retinal detachment (n = 1), and central serous chorioretinopathy (n = 1).

Conclusions: OCT can identify patients with DME who would have been missed with fundus photography screening alone. A significant number of glaucoma suspects were identified.

Outcome of Aflibercept and Ranibizumab for Branch Retinal Vein Obstruction

First Author: Daisuke **NAGASATO**

Purpose: We compare the 12-month outcomes of aflibercept (IVA) and ranibizumab (IVR) given by intravitreal injection for macular edema (ME) with branch retinal vein occlusion (BRVO).

Methods: Subjects were 63 patients (32 males, 31 females, aged 67.6 ± 10.1) who underwent IVA or IVR for more than 12 months for ME with BRVO. There were 16 eyes in the IVA group (group A) and 47 eyes in the IVR group (group R). The administration method was 3 times during the introduction phase plus as needed (PRN). We examined the 12-month injection count, vision, central retinal thickness (CRT), and central choroidal thickness (CCT). Then, the amount of change between both groups in each parameter was compared.

Results: The average number of injections in groups A and R was 4.2 ± 1.0 and 4.3 ± 1.4 , which was not significantly different. The mean decimal visual acuity of groups A and R significantly improved from baseline 0.40 and 0.38 to 0.95 and 1.00 ($P < 0.01$, $P < 0.01$). CRT of groups A and R decreased significantly from baseline 527 ± 142 and $548 \pm 181 \mu\text{m}$ to 197 ± 40 and $190 \pm 38 \mu\text{m}$. CCT of groups A and R decreased significantly from baseline 259 ± 55 and $264 \pm 65 \mu\text{m}$ to 224 ± 51 and $221 \pm 49 \mu\text{m}$. There was no significant difference in the amount of change between the 2 groups in each parameter.

Conclusions: Anti-vascular endothelial growth factor (VEGF) therapy for ME with BRVO was effective in improving visual acuity and decreasing CRT in both groups. There was no significant difference in both groups including the number of injections.

Ozurdex vs Lucentis in Management of Macular Edema Secondary to Branch Retinal Vein Occlusion

First Author: Rajvardhan **AZAD**
Co-Author(s): Bhuvan **CHANANA**

Purpose: To compare the effectiveness and safety of Ozurdex and Lucentis in macular edema (ME) secondary to branch retinal vein occlusion (BRVO).

Methods: We retrospectively analyzed records of 39 consecutive eyes with treatment-naïve ME secondary to BRVO, treated with either Ozurdex (group 1, $n = 18$) or Lucentis (group 2, $n = 21$) injections. Recorded parameters included percent of patients with ≥ 3 lines gain, best corrected visual acuity (BCVA), central macular thickness (CMT), number of injections, and occurrence of any complications.

Results: The mean follow-up duration was 12 months.

Mean BCVA and CMT improved significantly in both groups ($P = 0.001$). Fourteen eyes (67%) at 1 month and 8 eyes (44%) at 3 months gained ≥ 3 lines in group 1. In group 2, 15 eyes (71%) at 1 month and 8 eyes (38%) at 3 months showed a gain ≥ 3 lines. The average number of Ozurdex injections required were 1.56 (range, 1-3), with only 6 eyes (33%) requiring more than 1 injection. The average number of Lucentis injections were 2.8 (range, 1-11), with 10 eyes (48%) requiring more than 1 and 5 eyes (24%) requiring more than 3 Lucentis injections. No serious adverse events were recorded.

Conclusions: Both Ozurdex and Lucentis are effective and have a favorable safety profile in management of macular edema secondary to BRVO. However, the recurrence of macular edema is more frequent with Lucentis as compared to Ozurdex injection. The need for repeated injections is less with Ozurdex and hence it is more cost effective also.

Pattern of Macular Thickness and Retinal Nerve Fiber Layer Defects in Highly Myopic Eyes in a Malay Population: An Optical Coherence Tomography Study

First Author: Zurin **YACOB**
Co-Author(s): Zaki **AI**

Purpose: To investigate the pattern of macular and retinal nerve fiber layer (RNFL) changes in highly myopic eyes by using spectral domain optical coherence tomography (OCT).

Methods: A cross-sectional study was conducted in patients with myopia more than -6.00 diopters (D) and free from other eye diseases. Participants who met the inclusion criteria were selected and underwent clinical examination followed by study of macular thickness and RNFL thickness by spectral domain optical coherence tomography (OCT).

Results: A total of 60 eyes with the mean age of 27.93 ± 9.11 years old completed the tests. Mean thickness for the macula was $241.31 \pm 55.70 \mu\text{m}$ while mean macular volume was 7.56 ± 0.35 . Meanwhile, for RNFL, superior quadrant was the thickest (136.13 ± 15.84) followed by inferior quadrant (130.80 ± 21.45), temporal (82.55 ± 16.38), and nasal (71.43 ± 14.78). There were statistically significant differences between the mean inferior and superior quadrants in highly myopic eyes compared to the normal group where inferior was [$P = 0.014$; 95% confidence interval (CI), 3.06, 26.21] and superior was ($P = 0.015$; 95% CI, 2.19, 19.30). However, there were no significant differences found for gender, age, and macular thickness parameters with macular thickness and RNFL.

Conclusions: There is a localized thinning of RNFL at the inferior and superior quadrant of the optic disc in relation to high myopia. Evaluation of functional

relationship activities of macular thickness and RNFL are necessary to look at locality defects for predicting and analyzing early changes of neuronal dimension in highly myopic eyes.

Persistent Vitreous Hemorrhage After Intravitreal Injection of Dexamethasone Intravitreal Implant in Patients With Diabetic Macular Edema

First Author: Meng-Syuan LI

Co-Author(s): Shwu-Jiuan SHEU

Purpose: To report 3 cases of persistent vitreous hemorrhage after intravitreal injection of dexamethasone implant (0.7 mg Ozurdex, DEX) for diabetic macular edema (DME) and its management.

Methods: Case reports and literature review.

Results: Three DME cases that developed persistent vitreous hemorrhage after intravitreal injection of DEX were reported. All of the 3 patients underwent pars plana vitrectomy due to nonclearing vitreous hemorrhage after conservative treatment for 2 to 3 months. During operation, there was neovascular membrane, but no posterior vitreous detachment (PVD) was observed in each case. The implants were carefully preserved, and so were the effects in reducing macular edema.

Conclusions: Persistent vitreous hemorrhage after Ozurdex injection is rare but manageable without interrupting the effect on DME. Eyes with neovascular membrane but no PVD might be at risk of developing vitreous hemorrhage after Ozurdex injection.

Retinal Detachment Following Postpartum Preeclampsia: A Case Report

First Author: Evan REGAR

Co-Author(s): Cecilia Anggraini HARYONO, Indah SARASWATI

Purpose: To present a case of ocular complication in a rare postpartum preeclampsia as a recognition pattern.

Methods: Chief complaint, ocular findings, diagnostic challenge, and follow-up result are reported.

Results: A 15-year-old female, with 1 preterm birth and no abortions, presented to a district hospital with bilateral sudden visual loss since 2 days prior to admission. Initially, she complained of "paper covering her visual field," which progressively worsened. Seven days before admission the patient had uneventful parturition, with no peripartum complication. She was normotensive during her pregnancy. Except for visual symptoms, the patient reported no other complaints. Blood pressure was 160/100 with new onset proteinuria. Consultation with ophthalmologist was done. On initial exam, visual acuity was 3/60 and

2/60 in the right and left eyes, respectively. No anterior segment abnormalities were found, and intraocular pressure was normal. Fundus examination revealed bilateral exudative retinal detachment with no retinal break. The patient was hospitalized. Daily observation was made with improving visual acuity and less marked exudative retinal detachment. Six days later, visual acuity improved to 6/9 and 6/12. The patient was discharged.

Conclusions: As postpartum preeclampsia is a rare condition, we need to address the complication, including ocular findings. It is important to notice and take action for women who complain of visual symptoms after parturition. Retinal detachment, especially exudative, should be considered in this particular condition. In most cases, spontaneous resolution may occur within 1 to 2 weeks.

Retinal Profile: A Clinical Indicator of Severity in Dengue Fever in a Suburban Indian Environment

First Author: Diva MISRA

Co-Author(s): Pritam BAWANKAR, Rajendra BUNDELA, Pragati GARG, Rubii MALHOTRA, Luxmi SINGH

Purpose: To study the retinal changes in subjects suffering from dengue fever and check if these changes can be taken as sufficient indicators of severity and progression of the disease.

Methods: A detailed history was recorded of 118 patients on whom ocular examination, including direct ophthalmoscopy, indirect ophthalmoscopy, and coloured fundus photography, was performed.

Results: Forty-seven percent of patients were found to have posterior segment abnormalities. Retinal vein dilatation or tortuosity was the most common finding, followed by changes in the optic disc (8.4% of patients) and background hemorrhage (6.7% of patients). With increasing severity of thrombocytopenia, the proportion of patients with retinal abnormalities increased. In patients with grade I thrombocytopenia, no fundal abnormality was found. In those with grade II thrombocytopenia, fundal abnormality was found in 13.63% of patients, whereas in the grade III category it was 27.90%.

Conclusions: Severity of thrombocytopenia had a significant association with retinal abnormalities. Occurrence of fundus changes increases with an increase in severity of thrombocytopenia. Fundus changes were found in all patients with grade IV thrombocytopenia.

Retinal Vessel Caliber Change, Vascular Endothelial Growth Factor Concentration, and Electrophysiology Findings in Central Retinal Vein Occlusion: An Open-Label Study on the Efficacy of Ranibizumab Treatment at 6 Months

First Author: Yu-Chien **CHUNG**

Co-Author(s): Shih-Jen **CHEN**, Ling-Ing **LAU**, An-Fei **LI**

Purpose: To evaluate vessel caliber, vascular endothelial growth factor (VEGF) concentration, and electrophysiology findings along with visual acuity and central foveal thickness (CFT) after treatment in central retinal vein occlusion (CRVO).

Methods: Prospective interventional study. Patients with fresh CRVO were enrolled and followed a monthly pro re nata (PRN) ranibizumab regimen. Retreatment was applied if measured CFT ≥ 250 μm . Best corrected visual acuity (BCVA), optical coherence tomography (OCT), and fundus photography were recorded in every monthly visit. Fluorescein angiography and electroretinograms were done trimonthly. Aqueous humor was collected if available. Retinal vessel calibers were measured using the IVAN software.

Results: There were 14 patients that completed the protocol. The mean BCVA and CFT improved significantly from month 1 and sustained until the end of treatment. VEGF concentration dropped at month 1 from 6005 pg/mL to 1138 pg/mL and remained at low levels. Significant reduction in central retinal vein equivalent (CRVE) and increment in artery-to-vein ratio (AVR) were observed at month 3 and sustained through the course (mean CRVE: 240.00 ± 61.63 μm at baseline, 203.07 ± 27.89 μm at month 3, $P = 0.013$; mean AVR: 0.47 ± 0.07 at baseline, 0.54 ± 0.08 at month 3, $P = 0.004$). Artery caliber gradually decreased with maximum level at month 4. The ratio of b/a wave amplitude slightly increased while implicit times of the a- and b-wave were stable.

Conclusions: Our results showed positive clinical response in CRVO after intravitreal ranibizumab. Evidence of resolved stagnated flow can be shown in reduction of CRVE and increment of AVR. With multiple aspects of treatment outcome evaluated from this study, improved microenvironment (ie, VEGF concentration) and anatomical recovery (ie, central foveal thickness) can be observed prior to vessel caliber and electrophysiological change.

Role of Caspase-3, VEGF, and Ki-67 in Refractory State of Proliferative Diabetic Retinopathy in Type 2 Diabetes Mellitus

First Author: Karmelita **SATARI**

Co-Author(s): Johanes **MOSE**, Mieke **SATARI**

Purpose: To analyze cysteinyl aspartate specific proteinase (caspase-3) on apoptosis, vascular endothelial growth factor (VEGF) on angiogenesis, and Ki-67 on proliferation in subjects with refractory and stable (nonrefractory) proliferative diabetic retinopathy (PDR) and type 2 diabetes mellitus (DM).

Methods: Vitreous, serum, and epiretinal membrane samples were obtained from PDR patients receiving pars plana vitrectomy (PPV) and membrane peeling and observed at least 2.5 months, divided into refractory and nonrefractory state. Examinations of VEGF were performed with enzyme linked immunosorbent assay (ELISA) (pg/mL) Gemway Kit; examination of epithelial cell Ki-67 and caspase-3 of epiretinal membrane were done with immunohistochemical method (semiquantitative). Data analysis was performed using SPSS version 20 and t test for normal distribution and for the category using Chi-square test.

Results: Immunoexpression of caspase-3 was not different between refractory and nonrefractory subjects and caspase-3 level ($P = 0.703$). The VEGF value between both groups was median (min-max) 83.5 (14.9-615.9) pg/mL for the refractory subjects and 6.3 (13.7-858.6) pg/mL for nonrefractory subjects ($P = 0.239$); Ki-67 immunoexpression ($P = 0.803$).

Conclusions: VEGF level in vitreous, immunoexpression of Ki-67, and caspase-3 in epiretinal membrane are not different between refractory and nonrefractory subjects of PDR in type 2 DM in high risk and late stage of PDR.

Sensitivity and Specificity of Automated Analysis of Single-Field Nonmydriatic Fundus Photographs by Bosch DR Algorithm—Comparison With Mydriatic Fundus Photography for Screening in Undiagnosed Diabetic Retinopathy

First Author: Pritam **BAWANKAR**

Co-Author(s): Harsha **BHATTACHARJEE**, Nilutparna **DAS**, Surpriya **HAWAIBAM**, Diva **MISRA**, Ronel **SOIBAM**

Purpose: To compare sensitivity and specificity of automated analysis of single-field nonmydriatic fundus photographs by Bosch diabetic retinopathy (DR) Algorithm with mydriatic fundus photography for screening in undiagnosed diabetic retinopathy.

Methods: A total of 564 consecutive subjects (1128 eyes) were recruited from 6 centers in India. Each subject was evaluated at a single outpatient visit.

Forty-four of 1128 images (3.9%) could not be read by the algorithm and were categorized as inconclusive. In 4 subjects, neither eye provided an acceptable image: these 4 subjects were excluded from the analysis. This left 560 subjects for analysis (1084 eyes). Patients suffering from diabetes for at least 5 years were included if they were 18 years or older. Patients already diagnosed with DR were excluded. Physiologic mydriasis was achieved by placing the subjects in a dark room. Images were captured using a Bosch Mobile Eye Care fundus camera. The images were analyzed by the Retinal Imaging Bosch DR Algorithm for the diagnosis of DR. All subjects also subsequently underwent pharmacological mydriasis and Early Treatment Diabetic Retinopathy Study (ETDRS) imaging. Nonmydriatic and mydriatic images were read by ophthalmologists.

Results: The algorithm correctly diagnosed 531 of 560 cases. The sensitivity, specificity, and positive and negative predictive values were 91%, 97%, 94%, and 95%, respectively.

Conclusions: The Bosch DR Algorithm shows favorable sensitivity and specificity in diagnosing DR from nonmydriatic images and can greatly simplify screening for DR. This also has major implications for telemedicine in the use of screening for retinopathy in patients with diabetes mellitus.

Single-Center Audit Assessing the Safety Profile and Efficacy of Combined BMICS and ILUVIEN in Chronic Diabetic Macular Edema Insufficiently Responsive to Other Therapies

First Author: Sam Yuen LEE

Purpose: To assess the safety profile and early efficacy of combined bimanual microincision cataract surgery (BMICS) and ILUVIEN (fluocinolone acetonide) implants in patients with diabetic macular edema (DME).

Methods: Patients were identified from the theater register. All patients included had chronic DME, had significant lens opacities, and were insufficiently responsive to intravitreal injections of anti-vascular endothelial growth factor (anti-VEGF) and/or laser. A single surgeon carried out all procedures. Efficacy of ILUVIEN was assessed from changes in central macular thickness (CMT) from baseline using optical coherence tomography (OCT) and vision assessment. Any complications were recorded.

Results: Five eyes from 5 patients were followed up for a mean duration of 144 days (range, 14-347) following combined BMICS and ILUVIEN implant. The mean age of our cohort of patients was 73 with a mean duration of DME lasting 16.4 months (range, 12-24). All patients had prior treatment for DME [100% Lucentis (average 8) and 3 (60%) had previous focal/grid/panretinal

photocoagulation (PRP) laser]. Two patients (40%) needed to go back to intravitreal Lucentis injections due to worsening of DME. When treated with ILUVIEN the mean reduction in CMT was 52.6 μ m (from average baseline of 374.2 μ m). At 3 months, the average number of letters gained was 9.6 letters and only 1 patient (20%) required temporary intraocular pressure (IOP) lowering therapy. Following the combined procedure 4 patients (80%) were within 1 diopter (D) of their aimed spherical equivalence using IOLMaster. No cases of endophthalmitis or uveitis were reported.

Conclusions: This combined procedure is an effective and safe option for patients with chronic DME refractory to anti-VEGF or laser treatment.

The Effect of Age and Initial Central Retinal Thickness on Earlier Need of Repeat Ozurdex Treatment for Macular Edema Due to Retinal Vein Occlusion: A Retrospective Case Series

First Author: Chun-Ju LIN

Co-Author(s): Cheng-Wen SU, Peng-Tai TIEN

Purpose: To evaluate the effects of dexamethasone intravitreal implant (Ozurdex) and identify risk factors for repeated treatment in patients with macular edema due to branch retinal vein occlusion (BRVO) or central retinal vein occlusion (CRVO).

Methods: Patients followed up for at least 6 months were enrolled from 2013 to 2016. Dexamethasone intravitreal implant was given as the baseline treatment. For evaluation of dexamethasone intravitreal implant effects and complications, the demographics, medical history, best-corrected visual acuity (BCVA), intraocular pressure (IOP), and central retinal thickness (CRT) were recorded. Multivariate Cox proportional hazard model and logistic regression were used to identify factors for repeated treatment.

Results: A total of 23 BRVO and 11 CRVO patients were enrolled. There were 15 males and 19 females. Fifteen (44.12%) patients needed only 1 dexamethasone intravitreal implant. The peak CRT and BCVA significantly improved. Comparing single-injection with multiple-injection groups, age and initial CRT more than 400 μ m were significantly higher in the multiple-injection group. From multivariate logistic regression and Cox proportional hazards analysis, patients with age older than 55 years and initial CRT more than 400 μ m had higher risk for multiple injections.

Conclusions: Patients receiving as-needed schedule of dexamethasone intravitreal implant had significant peak CRT and BCVA improvement. Age older than 55 years and initial CRT more than 400 μ m were significant risk factors associated with repeated dexamethasone intravitreal implant treatment.

The Influence of Anti-Vascular Endothelial Growth Factor for Vascular Infarction-Related Molecules During Diabetic Macular Edema Treatment

First Author: Masahiko **SUGIMOTO**

Co-Author(s): Mineo **KONDO**, Kaname **NAKATANI**,
Hideo **WADA**, Yasuko **WAKAMATSU**

Purpose: To evaluate whether anti-vascular endothelial growth factor (VEGF) treatment for diabetic macular edema (DME) affects the behavior of vascular infarction-related molecules.

Methods: This study included 41 eyes with DME [22 eyes of 22 patients treated with 2 mg of aflibercept (IVA group) and 19 eyes of 19 patients treated with 0.5 mg of ranibizumab (IVR group)]. Serum and plasma samples were collected before anti-VEGF treatment, 1 week, and 1 month after treatment. The concentration of vascular infarction-related molecules (cardiac myoglobin, cardiac troponin, ICAM-1, MCP-1, MMP-8, PIGF, tenascin-C, TIMP-1, TSP-2, VCAM-1, and VEGF) and coagulation-related molecules (D-dimer, FDP, and soluble fibrin) were evaluated.

Results: Significant VEGF decrease was seen for the IVA group at 1 week after treatment (101.7 ± 87.1 vs 51.7 ± 70.0 pg/mL, $P = 0.02$) and no significant change was seen for the IVR group (154.0 ± 58.2 vs 129.2 ± 58.2 , $P = 0.13$). Significant PIGF increase was seen for the IVA group at 1 week (4.38 ± 2.79 vs 6.00 ± 2.86 , $P = 0.004$) and no significant change was seen for the IVR group (4.0 ± 2.5 vs 3.4 ± 2.3 , $P = 0.29$). At 1 month after injection, these changes disappeared. No significant changes were seen for other vascular infarction-related molecules or coagulation-related molecules during observation.

Conclusions: Anti-VEGF treatment for DME does not affect the behavior of vascular infarction-related molecules other than VEGF and PIGF.

The Relationship Between Carotid Intima-Media Thickness and Ophthalmological Findings in Type 2 Diabetes and Early Diabetic Retinopathy

First Author: Kohei **ICHINOHASAMA**

Co-Author(s): Azusa **ITO**, Hideki **KATAGIRI**, Hiroshi **KUNIKATA**, Toru **NAKAZAWA**, Shojiro **SAWADA**

Purpose: To evaluate clinical findings including ocular blood flow and carotid intima-media thickness (IMT) in diabetic retinopathy (DR) compared with those having no diabetic retinopathy (NDR) and investigate the risk factors contributing to DR.

Methods: This study included 129 eyes of 129 type 2 diabetes patients with no DR or with nonproliferative DR. Standard statistical techniques were used to

determine associations between clinical findings, including diabetes duration, blood levels of creatinine and hemoglobin A1c, optical coherence tomography-measured macular thickness (CMT), laser speckle flowgraphy-measured mean blur rate (MBR), and ultrasound-measured carotid IMT.

Results: Diabetes duration, IMT, and CMT were significantly higher in nonproliferative DR patients than patients with no DR ($P = 0.004$, $P = 0.008$, and $P = 0.003$, respectively), while MBR in all optic nerve heads (MBR-A) were conversely lower. Furthermore, logistic regression analysis revealed that diabetes duration [odds ratio (OR), 1.11; $P = 0.007$], diastolic blood pressure (OR, 0.93; $P = 0.03$), heart rate (OR, 1.07; $P = 0.003$), IMT (OR, 8.47; $P = 0.005$), and CMT (OR, 1.03; $P = 0.004$) were independent factors contributing to the presence of DR. Spearman rank correlation test also showed that IMT was negatively correlated with MBR-A ($P < 0.01$).

Conclusions: Increased IMT may be closely associated with ocular ischemia in type 2 diabetes patients and also contributes to the presence of DR, suggesting that IMT is a potential early biomarker of DR.

Unheeded Focal Choroidal Excavations in Recurrent CSCR

First Author: VV **SAMEERA**

Co-Author(s): Guruprasad **AYACHIT**, Shrinivas **JOSHI**,
Pavan **SHROFF**

Purpose: To analyze the prevalence and characteristics of focal choroidal excavation (FCE) concurrent with central serous chorioretinopathy (CSCR) using multimodal imaging.

Methods: Prospective study with clinical features and multimodal imaging findings were investigated in eyes with CSCR and FCEs, using imaging methods including spectral domain optical coherence tomography (SD-OCT), enhanced depth imaging (EDI), fluorescein angiography (FA), infrared reflectance (IR), and fundus autofluorescence (FAF).

Results: Five eyes out of 19 eyes with chronic CSR had FCEs. All were males. Mean age of the patients was 47 years. Three eyes had macular FCEs. Two had distant extramacular FCEs. All eyes had type 2 FCEs. One patient had bilateral FCEs. We noted these FCEs as hyperautofluorescent areas on FAF which corresponded to the leaks as well on FFA. Mean choroidal thickness of the uninvolved choroid was thicker than normal in all the eyes. No scleral ectasia was seen. In 3 months the subretinal fluid resolved completely with 577 nm micropulse laser therapy over the FCEs.

Conclusions: FCE is not uncommon in patients with CSCR. Multimodal imaging predicts the areas of FCEs and leaks and can aid in noninvasive localization of

areas concerned for laser therapy. We recommend 12-mm scans in patients with CSCR to pick up extrafoveal FCEs as well.

Unusual Traumatic Retinopathy

First Author: Jian-Sheng WU

Purpose: To report 2 cases of unusual retinopathy after head injury.

Methods: Case report.

Results: The first case was a 40-year-old man presenting with blurred vision in both eyes (OU) after head injury. The best corrected visual acuity (BCVA) was 6/6 in the right (OD) and 6/120 in the left eye (OS). Fundoscopy revealed subhyaloid hemorrhage OD, multiple cotton wool spots (CWS) surrounding the optic nerve, and retinal and subhyaloid hemorrhage OS. Optical coherence tomography (OCT) scan disclosed retinal pigment epithelial detachment (RPED) on the macula OS. Fluorescein angiography (FAG) revealed filling defect at the CWS and leakage with window defect on the macula OS. Visual field disclosed central scotoma OS. Combined retinal pigment epithelial (RPE) contusion with detachment and Purtscher retinopathy was suspected. Systemic and topical nonsteroidal anti-inflammatory drugs (NSAID) were administered. The RPED subsided 4 days later. The hemorrhage resolved and central scotoma improved during follow-up. The BCVA was 6/6 OU at the last visit. The second case was a 23-year-old man presenting with blurred vision OD 2 days after a traffic accident. The BCVA was 6/60 OD and 6/6 OS. Ocular examination showed unremarkable anterior segment except relative afferent pupillary defect (RAPD) OD. Fundoscopy revealed multiple CWS, retinal hemorrhage, and submembrane hemorrhage OD. OCT scan disclosed thickening retinal nerve fiber layer of the macula and optic disc OD. Combined Purtscher retinopathy and Valsalva retinopathy was suspected. The hemorrhage totally resolved half a year later. The BCVA was 6/30 OD at the last visit. Mild pale disc OD was noted. OCT scan revealed retinal nerve fiber layer thinning OD.

Conclusions: Blunt ocular trauma may cause a variety of posterior segment abnormalities. Advanced examinations could detect the abnormalities early and provide treatment guidance for the clinician and patient.

Retina (Surgical)

A Case of Optic Pit Maculopathy

First Author: Raphael Anthony GUBALLA
Co-Author(s): Ronaldo JARIN

Purpose: To report a case of optic pit maculopathy, its

clinical findings, and management.

Methods: A 59-year-old female had a 1-year duration of unilateral blurring of vision in the right eye. Visual acuity of the right eye was counting fingers at 3 feet, not improving to refraction. Anterior segment was unremarkable. Fundus exam revealed yellow pinkish optic nerve with distinct disc borders and a cup-to-disc ratio of 0.5. There was a notable increase in tortuosity of retinal vessels and an epiretinal membrane covering the superotemporal aspect of the optic nerve causing traction overlying the macula, with a questionable macular hole.

Results: Spectral domain optical coherence tomography (OCT) of the right eye revealed subretinal fluid and epiretinal membranes inducing vitreomacular traction with a lamellar hole. Subretinal fluid in the macula extended to the optic nerve head, suggesting an anomalous communication. The patient underwent pars plana vitrectomy, epiretinal and internal limiting membrane peeling, and 16% perfluoropropane tamponade of the right eye. Postoperatively, there was a decrease in subretinal fluid and foveal contour was restored on repeat OCT; clinically, there was noted gradual improvement in the blurring of vision.

Conclusions: Optic pit is a rare congenital optic disc anomaly that is often complicated with maculopathy. There are no standardized treatment options as of now. For this case, pars plana vitrectomy, epiretinal and internal limiting membrane peeling, and 16% perfluoropropane tamponade without laser photocoagulation were effective in decreasing the subretinal fluid, which resulted in gradual improvement of visual acuity significantly after the procedure.

A Prospective Study of Vitrectomy, Inverted Internal Limiting Membrane Flap Repositioning, and Autologous Blood for Macular Hole Retinal Detachment in High Myopia

First Author: Shaheeda MOHAMED
Co-Author(s): Carol CHEUNG, Andrew FOK, Angie FONG, Chi Wai TSANG, Raymond WONG

Purpose: To report the surgical results of pars plana vitrectomy (PPV), internal limiting membrane peeling (ILMP), inverted ILM flap repositioning (ILR), and autologous blood for macular hole retinal detachment (MHRD) in highly myopic eyes.

Methods: This prospective interventional study included 12 eyes of 12 patients with MHRD who underwent PPV, ILMP, inverted ILM flap repositioning, autologous blood (acting as a seal and biological glue), and 12% C3F8 gas tamponade, with follow-up for 1 year. Anatomic outcomes were evaluated with fundus examination and swept-source optical coherence

tomography (SS-OCT). Functional outcomes of best-corrected visual acuity (BCVA) were evaluated by comparing preoperative and postoperative logarithm of the minimum angle of resolution (logMAR) visual acuity. Baseline and intraoperative characteristics were evaluated.

Results: The mean age was 62.3 ± 9.5 years, and mean axial length was 29.16 ± 1.45 mm. All eyes had a posterior staphyloma. A total of 58.3% of eyes had incomplete posterior vitreous detachment. Retinal detachment extended beyond the macula in 83.3% (4 of 12 eyes had total retinal detachment) and was confined within the macula in 16.7% of eyes. All eyes underwent cataract extraction at or prior to surgery. After a single surgery, the retinal reattachment rate was 100%, and the macular hole closure rate was 100%. Only 1 eye had persistent subretinal fluid after gas reabsorption, which subsequently resolved. The mean BCVA improved significantly from 1.54 ± 0.31 logMAR before surgery to 0.86 ± 0.35 logMAR at 6 months and at final follow-up ($P = 0.011$).

Conclusions: Vitrectomy with inverted ILM flap repositioning and autologous blood for MHRD in highly myopic eyes produces good anatomical and functional outcomes.

A Rare Complication of Posterior Subtenon Injection

First Author: Rajya GURUNG

Purpose: To report a case of iatrogenic retinal detachment and retinal necrosis secondary to inadvertent subretinal injection of triamcinolone following posterior subtenon injection.

Methods: A 65-year-old female who was on treatment for left eye (LE) pseudophakic cystoid macular edema was given posterior subtenon injection. Post injection, the patient developed severe pain and profound diminution of vision. On examination, her visual acuity was hand movements (HM) and there was hyphema in the anterior chamber. Fundus evaluation revealed subretinal triamcinolone and superior retinal detachment.

Results: The patient underwent immediate pars plana vitrectomy with removal of subretinal triamcinolone along with silicone oil insertion. At 1-month follow-up, the retina was attached but there were patchy necrotic areas involving the superior half of the retina. The best corrected visual acuity at 1-month follow-up was HM.

Conclusions: We propose that there might be inadvertent subretinal injection of triamcinolone with any subtenon approach and one should be aware of this vision-threatening complication of posterior subtenon injection of steroids. One should adhere to the standard practice of injecting slowly to avoid

excessively forceful injection and to stop the injection as soon as any undue pressure is felt during injection.

Angioma Surface Disruption: Bane Turned Boon

First Author: Umesh BEHERA

Co-Author(s): Anup KELGAOKAR, Savla Laxmi PRABHAVATHI, Arshi SINGH

Purpose: Retinal capillary angiomas respond unpredictably to treatment with thermal laser ablation or cryotherapy and often require multiple treatment sessions for complete regression. We reviewed the charts of the treated cases to look for the surrogate markers of tumor regression when treated with lasers and cryotherapy.

Methods: Retrospective review of the fundus images of all the retinal hemangioblastomas measuring more than 1 disc diameter treated at a tertiary eye care center was done. Decreased tumor size and perilesional exudate, reduction in feeder vessel caliber, and tortuosity were considered the signs of tumor regression. Follow-up less than 6 months and charts without fundus images were excluded.

Results: Only 3 out of 13 eyes met the inclusion and exclusion criteria. These eyes showed signs of complete regression. One of the eyes with a large (5 mm) angioma was treated with cryotherapy. The rest of the angiomas (1.5 to 2 mm size) were treated with laser photocoagulation. All these eyes had an inadvertent bleed from the tumor surface during treatment. The laser-treated tumors showed pigmented surface fibrosis on resolution. The median follow-up of these treated eyes was 9 months, average reduction in tumor size was 28.8%, and the feeder vessel caliber was reduced by 43.1%. None of them needed any further treatment.

Conclusions: Disruption of the surface of the angioma with laser or cryoablation may lead to faster tumor regression. Appearance of a surface bleed while treating and evidence of postoperative pigmented fibrosis on the tumor surface could be regarded as surrogate markers of angioma regression.

Autologous Internal Limiting Membrane Fragment Transplantation With Whole Blood for Postoperative Refractory Macular Hole

First Author: Wen-Chuan WU

Co-Author(s): Yo-Chen CHANG

Purpose: In the current study, we evaluated the anatomical and functional outcomes of autologous internal limiting membrane (ILM) transplantation combined with whole blood for the treatment of eyes with postvitrectomized refractory macular hole.

Methods: Ten eyes of 10 patients suffered from postvitrectomized refractory macular hole. All patients underwent a transconjunctival 25-gauge vitrectomy and indocyanine green (ICG) assisted ILM peeling. A small piece of ILM was peeled off to make a free flap, then the free flap of ILM was transplanted and placed inside the macular hole. The free flap was stabilized by placing whole blood plaque and then gas tamponade with SF6. The main outcome measures used in this study were macular hole closure and best-corrected visual acuity (BCVA).

Results: Macular holes were closed completely in 8 eyes (80%) after autologous transplantation of the ILM. Partial closure of macular holes was observed in 2 eyes (20%). The postoperative BCVAs were significantly better than the preoperative BCVAs ($P = 0.0003$, paired t test). Postoperative BCVAs improved by more than 0.2 logarithm of the minimal angle of resolution units in 8 eyes (80%) and were unchanged in 2 eyes (20%).

Conclusions: Although this is a pilot study, the results suggest that the combination of autologous ILM transplantation and whole blood application may contribute to improved anatomic and visual outcomes.

Comparative Study of Internal Limiting Membrane Flap Inversion and Internal Limiting Membrane Peeling for Macular Hole

First Author: Hiroya OTA

Co-Author(s): Naoko AIZAWA, Hiroshi KUNIKATA, Toru NAKAZAWA

Purpose: To evaluate the anatomical closure rate and visual outcome in patients undergoing microincision vitrectomy surgery (MIVS) with internal limiting membrane (ILM) flap inversion or ILM peeling for the treatment of macular hole (MH).

Methods: This was a retrospective, comparative, interventional case series. We reviewed the medical records of 91 eyes with MH. The patients were classified into 2 groups based on MIVS procedure (group 1: ILM flap inversion, 46 eyes; group 2: conventional ILM peeling, 45 eyes). Clinical findings were analyzed, including the relationship between preoperative clinical findings, postoperative MH closure, and 6-month postoperative visual acuity (VA).

Results: Though preoperative characteristics were similar in the 2 groups, the surgical success rate was significantly higher in group 1 than group 2 ($P = 0.04$; 46/46: 100% and 42/45: 93%, respectively). Multiple regression analysis revealed that axial length and MH diameter were independent factors predicting 6-month postoperative BCVA in group 2 ($P < 0.001$ and $P = 0.02$, respectively), and that MH diameter was an independent factor predicting 6-month postoperative VA in group 1 ($P = 0.03$). Logistic regression analysis revealed that axial length [odds ratio (OR) = 2.12; $P =$

0.02; area under the curve: 0.94; cut off score: 28.4 mm] was an independent factor indicating surgical failure in group 2.

Conclusions: Our results suggest that MIVS with ILM flap inversion is best suited to treat MH, particularly in patients with high myopia.

Comparison of Half-Time and Half-Irradiance Photodynamic Therapy in Nonresolving Central Serous Chorioretinopathy

First Author: Jihwan LEE

Co-Author(s): Christopher LEE, Sung Chul LEE

Purpose: To compare the efficacy of half-time and half-irradiance photodynamic therapy (PDT) in patients with nonresolving central serous chorioretinopathy (CSC).

Methods: This retrospective, interventional, comparative study included 32 patients with nonresolving CSC. Of 32 patients, 14 patients were treated with half-time PDT and 18 patients underwent half-irradiance PDT. Therapeutic outcomes including central retinal thickness (CRT), subretinal fluid (SRF) height, subfoveal choroidal thickness (SFCT), thickness of the Haller and the Sattler layer, and best-corrected visual acuity (BCVA) were measured at baseline, at 1 month, and at 3 months after treatment.

Results: There were no significant differences in baseline characteristics between the 2 groups. CRT, SRF, and SFCT decreased significantly at 1 month and 3 months after treatment in both groups. Thickness of the Haller layer decreased significantly at 1 month and 3 months whereas thickness of the Sattler layer did not. Ratio of the Haller layer/SFCT decreased significantly at 3 months in the half-time group only. BCVA showed a significant improvement at 3 months in both groups.

Conclusions: Both half-time and half-irradiance PDT were similarly effective in SRF resolution and visual improvement. Half-time PDT might be more effective in decreasing the thickened Haller layer in patients with nonresolving CSC than half-irradiance PDT.

Efficacy of Modified Inverted Internal Limiting Membrane Flap Technique for the Treatment of Chronic and Large Idiopathic Macular Hole Presenting to a Tertiary Eye Care Center in North-East India

First Author: Ronel SOIBAM

Co-Author(s): Pritam BAWANKAR, Krati GUPTA, Surpriya HAWAIBAM, Fazil KHURRUM, Diva MISRA

Purpose: To evaluate the efficacy of modified inverted internal limiting membrane (ILM) flap technique for the treatment of chronic and large idiopathic macular hole presenting to a tertiary eye care center in North-East India.

Methods: A retrospective, interventional study. The patients with chronic (>12 months) idiopathic macular holes larger than 700 μm were included. Eleven eyes of 11 patients underwent standard 3-port pars plana vitrectomy with modifications of inverted internal limiting membrane flap technique that improve retention of the ILM flap on the macular surface. In this technique after folding ILM flap inside the macular hole, approximately 0.2 mL of viscoelastic is injected over the ILM flap, forming a “viscoelastic cap” that helps in retention of flap inside macular hole during the fluid gas exchange. Preoperative and postoperative visual acuity (at 1 week, 1, 3, 6, and 12 months) and spectral domain optical coherence tomography images were evaluated. The main outcome measure was visual outcome and macular hole closure rate.

Results: Mean visual acuity improved from 1.2 logarithm of the minimum angle of resolution (logMAR) to 0.56 logMAR. We confirmed the closure of the macular hole with spectral domain optical coherence tomography in all cases. The closure of the macular hole began in the inner retinal layers, and the architecture gradually filled with tissue.

Conclusions: We present a modified ILM flap technique to improve retention of ILM flap within the macular hole and improve the reliability and reproducibility of the operation. This is a procedure suitable for redo cases where there is no ILM bordering the macular hole.

Efficacy of Standard vs Inverted Internal Limiting Membrane Flap Technique for the Treatment of Large Idiopathic Macular Hole (>700 μm) Presenting to a Tertiary Eye Care Center in North-East India

First Author: Pritam **BAWANKAR**

Co-Author(s): Nilutparna **DAS**, Surpriya **HAWAIBAM**, Diva **MISRA**, Ronel **SOIBAM**

Purpose: The present study is to evaluate the efficacy of standard vs inverted internal limiting membrane flap technique for the treatment of large idiopathic macular hole (>700 μm) presenting to a tertiary eye care center.

Methods: A retrospective, comparative, and interventional study. Patients with idiopathic macular holes (MH) larger than 700 μm were included. In group 1, 15 eyes of 15 patients underwent standard 3-port pars plana vitrectomy with air. In group 2, 15 eyes of 15 patients underwent a modification of the standard technique, called the inverted internal limiting membrane (ILM) flap technique. We compared changes in best-corrected visual acuity (BCVA) before and after surgery and closure rates of MH between both groups.

Results: Preoperative mean visual acuity was 1.059 ± 0.22 logarithm of the minimum angle of resolution

(logMAR) in group 1 and 1.055 ± 0.29 logMAR in group 2. Macular hole closure was observed in 53% of patients in group 1 and in 93% of patients in group 2. A flat-hole roof with bare retinal pigment epithelium (flat-open) was observed in 27% of patients in group 1 and 7% of patients in group 2. Mean postoperative visual acuity 12 months after surgery was 1.02 ± 0.26 logMAR in group 1 and 0.83 ± 0.30 logMAR in group 2.

Conclusions: The inverted ILM flap technique improves both the functional and anatomic outcomes of vitrectomy for macular holes with a diameter greater than 700 μm . Spectral domain optical coherence tomography after vitrectomy with the inverted ILM flap technique suggests improved foveal anatomy compared with the standard surgery.

Epiretinal Membrane Peeling in Diabetic Macular Edema: Response to Therapy

First Author: Umesh **BEHERA**

Co-Author(s): Monica **BUDHWANI**, Arshi **SINGH**

Purpose: To study the change in vision and central subfield thickness on optical coherence tomography (OCT) in subjects undergoing vitrectomy and epiretinal membrane peeling for diabetic macular edema (DME) with coexistent epiretinal membrane (ERM).

Methods: Twenty-five eyes of 23 subjects were included in the study. Twelve eyes with a follow-up of ≥ 6 months were analyzed for treatment response. Based on the additional postoperative treatment with intravitreal anti-vascular endothelial growth factor injections (anti-VEGF) they were divided into 2 groups: group A (n = 5) received anti-VEGF and group B (n = 7) served as control. The primary objective was to assess change in postoperative vision and central subfield thickness on OCT. Secondary objective was to study the effect of intravitreal anti-VEGF on macular thickness and vision.

Results: The mean age was 59.7 years, mean duration of diabetes was 31.52 months, 91% had type 2 diabetes, and proliferative diabetic retinopathy was seen in 72% of subjects. Mean corrected preoperative and postoperative vision was 47.92 ± 18.88 and 47.25 ± 28.18 Early Treatment Diabetic Retinopathy Study (ETDRS) letters, respectively. Mean change in central subfield thickness of the macula on OCT ($481.33 \pm 151.86 \mu\text{m}$ and $310.67 \pm 104.06 \mu\text{m}$ pre- and post-ERM peeling, respectively) was significant ($P = 0.003$) but it did not translate to vision gain ($P = 0.927$). Anti-VEGF injections did not improve visual acuity ($P = 0.481$) or central subfield thickness ($P = 0.157$). Mean follow-up was 6.6 months (range, 1-19 months).

Conclusions: Epiretinal membrane peeling may result in significant reduction in central subfield thickness but vision gain may remain marginal. Post-ERM peeling

anti-VEGF in DME may not significantly reduce macular edema or improve vision.

Evaluation of Rise in Intraocular Pressure With Increasing Altitude Following Vitreoretinal Surgery

First Author: Nicole TSIM

Co-Author(s): Marten BRELEN, Karen CHAN, Vesta CHAN, Wai-Ching LAM, Alvin YOUNG

Purpose: To evaluate the impact of elevator travel and change in altitude on intraocular pressure after intraocular gas injection following vitreoretinal surgery and to study the safety of early postoperative discharge and travel in elevators after intraocular gas injection.

Methods: A prospective cohort case-control study. Postoperative measurements of intraocular pressure were taken on postoperative day 1 on the ward, and then patients were taken to the top floor (12th floor) without interruption via hospital elevators. We would then remeasure their intraocular pressure immediately upon arrival to evaluate whether there was a significant rise. From these measurements, using mathematical models (finite element method) of the eye we extrapolated whether the intraocular pressure rise would be significant at various heights in high-rise buildings.

Results: Thirteen consecutive patients were recruited. There was a significant increase in pressure (mean, 1.8846; $P = 0.001$) with ascent from the fourth to 12th floor hospital wards.

Conclusions: Currently, there is no scientific evidence to advise against travel in skyscrapers in the immediate postoperative period for patients who have undergone vitreoretinal surgeries with intraocular gas in situ. The difference in intraocular pressure is significant when traveling in an elevator over the short ascent of 8 floors; these results can be extrapolated and significantly impact those who need to travel routinely to higher floors of residential or commercial buildings in a busy metropolis. We caution against traveling in high-rise buildings, particularly in modern time-efficient elevators where a rapid ascent could equate to a transient rapid rise in intraocular pressure, putting patients at risk of postoperative complications.

Exudative Retinal Detachment Following Photodynamic Therapy for a Retinal Capillary Hemangioma in Von-Hippel Lindau Syndrome Treated With Intravitreal Ranibizumab

First Author: Caryssa YAN

Co-Author(s): Marten BRELEN, Vesta CHAN, Mary HO, Helena SIN, Alvin YOUNG

Purpose: To report a case of exudative retinal

detachment (RD) following photodynamic therapy (PDT) for Von-Hippel Lindau (VHL) syndrome associated with retinal capillary hemangioma (RCH) treated successfully with intravitreal ranibizumab monotherapy.

Methods: A case report.

Results: An 18-year-old female patient presented to the accident and emergency department with a sudden onset of floaters in her right eye. Clinical examination revealed a large RCH of 2 disc diameters, located in the inferior retina, associated with a localized vitreous hemorrhage. She was treated with triple fluence PDT (3×83 s at 50 mJ/cm^2). Three days later, she developed a complication of an exudative RD which continued to progress in size over the following 5 days. On day 8 she was treated with an intravitreal injection of ranibizumab which resulted in exudate regression and subretinal fluid resolution. By 1 month, the retina was dry and the visual acuity was 20/13 in both eyes. This was her first presentation and she was subsequently confirmed to have VHL.

Conclusions: The management of exudative detachment after PDT treatment of a RCH remains controversial. This case report demonstrates a successful treatment of this complication using intravitreal ranibizumab.

ILM Peel and Filling the Optic Disc Pit With Homologous Whole Blood for Treatment of Serous Macular Detachment Secondary to Optic Disc Pit

First Author: Hussain KHAQAN

Purpose: To determine the role of internal limiting membrane (ILM) peeling and filling the optic disc pit with whole blood in closure of optic disc pit and resolution of serous macular detachment.

Methods: Thirteen eyes of 13 patients were included in the study with serous macular detachment secondary to optic disc pit. A 23-gauge pars plana vitrectomy, ILM peeling, filling the pit with homologous whole blood at the end of surgery under air, and endotamponade of air were done in all 13 cases. Patients were followed for 6 months. Optical coherence tomography (OCT) was performed preoperatively and postoperatively.

Results: Optic disc pit found filled with blood was confirmed with OCT in all 13 eyes on the first postoperative day. On the third day postoperatively a fibrous tissue was observed in the area of pit in 9 (69.2%) eyes, while in 4 (30.7%) eyes no fibrous tissue was observed in the area of pit. Serous macular detachment resolved completely in 8 (61.5%) eyes within 7 days postoperatively and in 1 (7.6%) eye on the 12th day. Visual improvement was found in all 9 (69.2%) eyes. In 4 (30.7%) eyes optic disc pit remained

opened at 4-week follow-up; there was little to no resolution of serous macular detachment and no improvement in vision in these eyes at 6-month follow-up.

Conclusions: ILM peeling and filling of optic disc with homologous whole blood and endotamponade of air play a significant role in closure of optic disc pit, resolution of serous macular detachment, and improvement of vision.

Inverted Epiretinal Proliferation Technique for Lamellar Macular Hole With Lamellar Hole-Associated Epiretinal Proliferation

First Author: Takahiro KAWAJI

Co-Author(s): Tomoki SATO, Akiomi TAKANO

Purpose: To report surgical outcomes using inverted epiretinal proliferation technique for lamellar macular hole (LMH) with lamellar hole-associated epiretinal proliferation (LHEP).

Methods: This was a retrospective, interventional case series. We examined 16 eyes of 16 consecutive patients who underwent 25-gauge vitrectomy for LMH with LHEP and at least 6-month follow-up. Best-corrected visual acuity (BCVA) and spectral-domain optical coherence tomography (SD-OCT) were assessed. Cataract surgery was performed simultaneously, if necessary. Following a previous report, epiretinal membrane and LHEP were centripetally peeled off from the retina and then left attached to the edge of the LMH. These tissues were trimmed and covered the whole LMH. Next, brilliant blue-assisted inner limiting membrane peeling was performed around the LMH in a circumferential manner. At the end of surgery, air-fluid exchange was performed.

Results: The median follow-up period was 12 months (range, 6–18 months). The mean BCVA improved significantly from 0.42 logarithm of the minimum angle of resolution (logMAR) preoperatively to 0.20 logMAR at the final postoperative visits ($P = 0.01$, paired t test). The BCVA improved by 0.2 logMAR in 12 eyes (75%). SD-OCT demonstrated the disruption of the ellipsoid zone before surgery in 12 eyes (75%) and, in 9 of these 12 eyes, the continuity was restored after surgery.

Conclusions: This technique seemed to be effective for morphologic and functional improvement of LMH with LHEP.

Management of Foveal Detachment Secondary to Intrachoroidal Cavitation With Vitrectomy and Capsular Membrane Transplantation

First Author: Raymond WONG

Co-Author(s): Andrew FOK, Angie FONG, Ka Hing LOK, Shaheeda MOHAMED, Chi Wai TSANG

Purpose: To report the visual and anatomical outcome of a patient with foveal detachment secondary to intrachoroidal cavitation after vitrectomy and capsular membrane transplantation.

Methods: A 53-year-old woman with high myopia of -10.0 diopters bilaterally presented to us with progressive blurring of left eye vision. Physical examination revealed subretinal fluid over the left macula; optical coherence tomography (OCT) scans showed subretinal hyperreflective deposits in addition to subretinal fluid. Detailed assessment of OCT scans revealed peripapillary intrachoroidal cavitation and a direct communication between the choroidal cavitation and the vitreous cavity at the region around the temporal margin of the optic disc. Fundus fluorescein angiography (FFA) did not show any leakage accounting for the subretinal fluid accumulation. Phacoemulsification with insertion of intraocular lens, 23G pars plana vitrectomy (PPV), anterior capsular membrane transplantation (ACMT), and autologous blood injection to retinal defect were performed when the absence of spontaneous improvement was confirmed after 6 months of observation.

Results: The operation was uneventful; serial OCT scans and visual acuity measurement were used to monitor the progress. The foveal subretinal fluid was noted to reduce with time after the operation, and complete resolution of the foveal detachment with recovery of the outer retinal layers (including external limiting membrane, ellipsoid zone, and interdigitation zone) on OCT was documented 18 months postoperatively. Her best corrected visual acuity (Snellen) improved from 0.7 preoperatively to 1.0 18 months postoperatively.

Conclusions: PPV with ACMT and autologous blood injection to retinal defect could be a promising solution to foveal detachment associated with intrachoroidal cavitation.

One-Year Outcome of Subthreshold Micropulse Yellow (577 nm) Laser for Diabetic Macular Edema

First Author: Frank LAI

Co-Author(s): Rose CHAN, Robert LAM, Susanna TSANG, Tiffany WOO, Can YUEN

Purpose: To investigate the treatment efficacy of subthreshold micropulse yellow (577 nm) laser for

fovea-involving diabetic macular edema (DME).

Methods: Patients with fovea-involving DME were prospectively recruited for this study. Patients received grid pattern subthreshold micropulse yellow (577 nm) laser combined with direct photocoagulation to microaneurysms. The primary outcomes included change in the central macular thickness (CMT) and best corrected visual acuity (BCVA) at 1 year post treatment.

Results: Twenty-four eyes of 19 patients were recruited in this study. The mean number of laser treatments received was 2.6 ± 0.8 . The CMT changed from $440.65 \pm 150.99 \mu\text{m}$ at baseline to $335.07 \pm 101.34 \mu\text{m}$ at 1 year post treatment ($P = 0.013$). The logarithm of the minimum angle of resolution (logMAR) BCVA changed from 0.64 ± 0.36 at baseline to 0.46 ± 0.22 at 1 year post treatment ($P = 0.019$).

Conclusions: Subthreshold micropulse yellow (577 nm) laser can achieve improvement in CMT and visual acuity in patients with fovea-involving DME.

Operative Time and Outcome of Primary Rhegmatogenous Retinal Detachment Using Sutureless Microincision Vitrectomy, With Lumera and Resight Wide-Angle Viewing Systems

First Author: Chun-Ju LIN

Co-Author(s): Wei-Hsun KUNG, Chun-Ting LAI

Purpose: To evaluate the efficacy of sutureless microincision pars plana vitrectomy (PPV) using Lumera and Resight noncontact wide-angle viewing systems (WAVS) for primary rhegmatogenous retinal detachment (RRD) and to report the anatomical and visual outcomes.

Methods: The retrospective, noncomparative, interventional case series reported here was conducted from June 2014 through November 2016. Enrolled patients presented with primary RRD and received sutureless microincision PPV with/without cryopexy using the Lumera and Resight noncontact WAVS. All patients were followed up for a minimum of 3 months. Variables collected included patient demographics, best-corrected visual acuity (BCVA), and macular status. The number and position of retinal break(s), and the use of cryopexy, were recorded. Outcome measures included operative time, single operation anatomical success rate, final anatomical success rate, recurrence rate, postoperative BCVA, and surgical complications. The end points were operative time, anatomical outcome, and functional outcome.

Results: In total, 110 eyes from 110 patients (68 men and 42 women) were treated. Of these, 103 (93%) eyes were reattached after primary vitrectomy. All 110 eyes (100%) reached final anatomical success. The mean operative time was 50.55 minutes. Intraoperative

cryopexy and multiple breaks increased operative time significantly. The postoperative vision of 79 eyes (72%) improved and 16 eyes (15%) remained stable.

Conclusions: The outcome of primary RRD repaired by sutureless PPV using the Lumera and Resight WAVS was not inferior to any other published method. This instrument combination resulted in a relatively rapid and comfortable procedure without serious postoperative complications. Cryopexy and multiple breaks affected operative time significantly. Shorter operative times and pre-PPV macula-on status are associated with better final visual outcomes.

Outcomes of Segmentation and Peeling in Tractional Retinal Detachment in Advanced Diabetic Eye Disease

First Author: Hussain KHAQAN

Co-Author(s): Huma SAIGOL

Purpose: To evaluate surgical and visual outcomes in cases of tractional retinal detachment in advanced diabetic eye disease.

Methods: A total of 1020 eyes with tractional retinal detachment in advanced diabetic eye disease were included in the study. Eyes associated with rhegmatogenous retinal detachment were excluded from the study.

Results: In 892 (87.4%) eyes tractional retinal detachment was treated by segmentation and peeling and the retina was flat after surgery with balanced salt solution inside the vitreous cavity at the end of surgery. In 128 (12.4%) eyes iatrogenic breaks were formed during segmentation and peeling at the posterior pole and the retina was completely flat at the end of surgery with air inside the vitreous cavity in 62 eyes, C3F8 in 44 eyes, and silicone oil of 1000 cs in 22 eyes. In 841 (82.4%) eyes best corrected visual acuity (BCVA) improved by at least 2 Early Treatment Diabetic Retinopathy Study (ETDRS) lines from baseline, while in 139 (13.6%) eyes BCVA improved by at least 1 ETDRS line; in 30 (2.94%) eyes no vision improvement was observed and in 10 (0.98%) eyes vision decreased by a mean of 1 ETDRS line.

Conclusions: Segmentation and peeling play a significant role in anatomical and visual restoration in cases of tractional retinal detachment in advanced diabetic eye disease.

Performance Evaluation of Small Gauge 25+ High-Speed Vitrectomy Probes

First Author: Dina ABULON

Purpose: To assess the performance of small gauge instruments by measuring vitreous flow rates of 25-gauge dual-pneumatic probes and high-speed cut

rates up to 10,000 cpm.

Methods: Six 25+ gauge Advanced UltraVit vitrectomy probes were tested using the CONSTELLATION Vision System (Alcon Laboratories, Inc). Each probe was evaluated at 3 duty cycle modes (ie, port biased open, 50% port open time, port biased closed) at various cut rates, using 650 mm Hg vacuum. During simulated vitrectomy, an electronic balance (Mettler Toledo MS 2014S) measured the volume of aspirated porcine vitreous during a 1-minute time frame. Average vitreous flow rates were calculated using the density of vitreous, change in weight, and duration of aspiration.

Results: The 25-gauge vitreous flow rates associated with the biased-open mode increased from 2.72 ± 0.34 to 2.83 ± 0.27 as cut rate increased from 2500 cpm to 10,000 cpm. Vitreous flow rates associated with the 50% port open duty cycle increased from 2.19 ± 0.23 cc/min to 2.84 ± 0.27 cc/min as cut rates increased from 2500 cpm to 10,000 cpm. In the biased-closed duty cycle mode, vitreous flow rates also increased from 1.89 ± 0.31 cc/min at 2500 cpm to 2.78 ± 0.15 cc/min at 10,000 cpm. With all 3 duty cycles, maximum vitreous flow rates were associated with the maximum cut rate of 10,000 cpm.

Conclusions: With small, 25-gauge instrumentation at 650 mm Hg vacuum, maximum vitreous flow was observed at the maximum cut rate for all duty cycle modes. The 10,000 cpm cut rates of the dual-pneumatic high-speed vitrectomy probes may optimize vitreous aspiration.

Pneumoretinopexy Versus Scleral Buckling in Superior Break Retinal Detachments: Which Is Superior?

First Author: Arshi **SINGH**

Co-Author(s): Umesh **BEHERA**

Purpose: To study single surgery reattachment rate, refractive shift, cost, and the complications involved in pneumoretinopexy (PR) as compared to scleral buckling (SB) in retinal detachments with superior breaks.

Methods: Rhegmatogenous retinal detachment with superior breaks treated either with pneumoretinopexy (n = 15) or scleral buckling surgery (n = 17) treated from 2013 through 2016 at a tertiary eye care center were analyzed retrospectively to study the treatment outcome and the economics. Combined scleral buckling with intraocular tamponade, history of trauma, retinal break extent exceeding 1 clock hour, retinal dialysis, retinal breaks on the horizontal meridian and below, follow-up less than 3 months, and records with inadequate data were excluded.

Results: Refractive shift in spherical equivalents (P = 0.024), total cost involved (cost of resurgery included) to attach the retina (P = 0.028), and the total surgical

time (including managing complications) (P = 0.015) was significantly lower with pneumoretinopexy. Patient age (P = 0.147), duration of vision loss (0.056), history of previous intraocular surgery (P > 0.999), single surgery reattachment rate (P > 0.999), median visual acuity at presentation (P = 0.479), and at final follow-up visit (0.0738) were not significantly different in either of the procedures. Complications like cataract progression (P = 0.678) and glaucoma (P = 0.712) were analogous among the groups. Horseshoe tears were associated with failed primary surgery in 60% of pneumoretinopexy and 75% of scleral buckling procedures.

Conclusions: Given the surgical successes and complications involved in the treatment of rhegmatogenous retinal detachments with superior breaks, pneumoretinopexy could prove to be a more economical and less invasive alternative to scleral buckling surgery.

Silicone Oil Tamponade Might Assist Macular Hole Closure in Patients With Persistent Macular Hole After Primary Internal Limiting Membrane Peeling and Gas Tamponade

First Author: Shu-Ting **KAO**

Co-Author(s): I-Chia **LIANG**, Kwan-Rong **LIU**

Purpose: To report the successful use of silicone oil as intraocular tamponade for the treatment of persistent macular holes in 3 patients with macular hole (MH) that failed to close after primary macular hole surgery with internal limiting membrane (ILM) peeling and C3F8 tamponade.

Methods: Case series.

Results: We performed a retrospective study on 3 eyes with persistent MHs after vitrectomy combined with ILM peeling and gas tamponade, which was performed by the same experienced vitreoretinal surgeon. All the eyes received secondary vitreoretinal surgery with silicone oil tamponade and the macular hole healed within 1 week to 3 months under the measurement of optical coherence tomography (OCT). The silicone oil was removed after the hole sealed and cataract surgery was done due to cataract formation. Best corrected visual acuity (BCVA), slit-lamp examination, and fundus examination were used for evaluation pre- and postoperatively. The main outcome measures were anatomic closure of holes and final BCVA.

Conclusions: Our report showed that retreatment with silicone oil can be effective in patients with persistent macular hole.

Vitrectomy With Silicone Oil Tamponade for Myopic Foveoschisis

First Author: Yiru **LIN**

Purpose: To report 5 cases of myopic foveoschisis treated by vitrectomy with silicone oil (SO) tamponade.

Methods: A standard 25-G 3-port pars plana vitrectomy (PPV) was performed, followed by posterior cortical vitreous and epiretinal membrane removal without internal limiting membrane (ILM) peeling. Sequential air-fluid exchange and SO injection were performed.

Results: Postoperatively, there was nearly complete resolution of foveoschisis in these 5 cases, and best-corrected visual acuity (BCVA) remained stable.

Conclusions: Macular hole was not detected after operation.

Vitreous Flow Rates of 23-Gauge High-Speed Vitrectomy Probes (10,000 Cuts per Minute)

First Author: Dina **ABULON**

Purpose: To characterize porcine vitreous flow rates associated with 23-gauge dual-pneumatic probes under various duty cycle modes and high-speed cut rates (up to 10,000 cpm).

Methods: The CONSTELLATION Vision System was tested with Advanced UltraVit vitrectomy probes at 450 mm Hg vacuum (Alcon Laboratories, Inc). Six 23-gauge probes were evaluated at 3 duty cycle modes (ie, port biased open, 50% port open time, port biased closed) and at various cut rates (ie, 2500, 5000, 7500, and 10,000 cpm). Harvested porcine vitreous was placed on an electronic balance (Mettler Toledo MS 2014S) and volume of removed vitreous was measured during simulated vitrectomy. Average vitreous flow rates were calculated using the change in weight and duration of aspiration.

Results: In the biased-open duty cycle mode at 450 mm Hg vacuum, the vitreous flow rates of 23-gauge probes increased from 3.16 ± 0.39 to 3.33 ± 0.21 cc/min as cut rate increased from 2500 to 10,000 cpm. With the 50% port open duty cycle, vitreous flow rates also increased as cut rate increased from 2.44 ± 0.24 cc/min at 2500 cpm to 3.41 ± 0.16 cc/min at 10,000 cpm. In the biased-closed duty cycle, vitreous flow rates increased from 2.03 ± 0.56 cc/min at 2500 cpm to 3.23 ± 0.37 cc/min at 10,000 cpm. For all 3 duty cycle modes, maximum vitreous flow was observed at the 10,000 cpm cut rate setting.

Conclusions: Vitreous flow rates generally increased with increasing cut rates for all duty cycle modes. Vitreous aspiration of high-speed dual-pneumatic 23-gauge vitrectomy probes appears to be most efficient at the maximum cut rate of 10,000 cpm.

Translational Research in Ophthalmology

Increased Serum Ionic Calcium Is Associated With Increase in Diabetic Macular Edema and Photoreceptor Ellipsoid Zone Disruption

First Author: Ankita

Co-Author(s): M Kaleem **AHMAD**, Abbas **MAHDI**, Sandeep **SAXENA**

Purpose: To study the association of serum total and ionic calcium with increase in macular thickness parameters and photoreceptor ellipsoid zone (EZ) disruption in diabetic macular edema (DME).

Methods: Sixty-six consecutive cases, divided into 22 cases each with no diabetic retinopathy (no DR), nonproliferative diabetic retinopathy (NPDR), and proliferative diabetic retinopathy (PDR), and 22 healthy controls were included. Best corrected visual acuity (BCVA) was measured on logarithm of the minimum angle of resolution (logMAR) scale. Central subfield thickness (CST), cube average thickness (CAT), and EZ disruption were assessed using spectral-domain optical coherence tomography (SD-OCT). Serum total calcium and ionic calcium were measured using standard protocol. Data was analyzed statistically.

Results: Significant correlation was found between increase in CST and increase in serum total calcium and serum ionic calcium. Similarly, increase in CAT was significantly correlated with increase in serum total calcium and serum ionic calcium. Grades of EZ disruption and logMAR BCVA were also found to be significantly positively associated with serum total calcium and ionic calcium.

Conclusions: Increased levels of serum ionic calcium are associated with increase in macular thickness and EZ disruption in DME.

Visual Sciences

Association of the PAX6 Gene With Extreme Myopia Rather Than Lower-Grade Myopia

First Author: Shumin **TANG**

Co-Author(s): Li Jia **CHEN**, Shiyao **LU**, Li **MA**, Calvin **PANG**, Jason **YAM**

Purpose: To investigate the association of the paired box gene 6 (PAX6) with different severities of myopia.

Methods: A total of 4 haplotype-tagging single-nucleotide polymorphisms (SNPs; rs2071754, rs3026354, rs3026390, and rs628224) and 2 previously reported SNPs (rs644242 and rs662702) in the PAX6 gene were analyzed in a Hong Kong Chinese cohort of 1291 myopia subjects (including 255 extreme myopia,

277 high myopia, 393 moderate myopia, and 366 mild myopia) and 791 controls without myopia. Allelic association analyses were performed for individual SNPs in different subgroups of myopia and in combined myopia, followed by a meta-analysis of our current data with reported data on PAX6 in myopia.

Results: The tagging SNPs rs2071754 and rs644242 were marginally associated with extreme myopia [rs2071754: odds ratio (OR) = 1.25, $P = 0.031$; rs644242: OR = 1.33, $P = 0.032$]. In the meta-analysis, rs644242 showed an enhanced, significant association with extreme myopia [OR = 1.27, 95% confidence interval (CI): 1.10-1.46, $P = 0.001$; $I^2 = 0\%$]. In contrast, there was no significant association between the PAX6 SNPs and high, moderate, or mild myopia. No linear correlation was found between the PAX6 SNPs and axial length.

Conclusions: This study provides new evidence suggesting that the PAX6 SNP rs644242 is associated with extreme myopia but not with lower-grade myopia. Thus, PAX6 may be implicated in the progression of myopia. Further longitudinal studies are warranted.

Design of a Cooling TRPM8 Agonist to Treat Ocular Discomfort

First Author: Edward WEI

Purpose: Ocular discomfort is common. Current methods for rapid (<5 min) and prolonged (>2 h) relief of irritation, dryness, asthenopia, pruritus, and pain are limited. Physical cooling of the eye relieves discomfort, but translating this event to drug treatment has not been much studied. TRPM8, an ion channel target on nerve endings associated with cooling, was chosen as drug target for screening lead candidates. The agonists called 1-dialkylphosphorylalkanes (Dapa) were selected as prototypes. In design of an ideal agent, the goals are to pick the correct target and deliver the right molecule to the right place at right time.

Methods: Dense TRPM8 innervation was found on mouse eyelid and cornea, but not on conjunctiva. The eyelid receptors were selected as drug targets. Lead candidates potently and selectively activate TRPM8 (linked to cooling) but not TRPV1 or TRPA1 (linked to nociception).

Results: A prototype Dapa called cryosim-3 (C3) was tested in subjects with mild forms of dry eye disease. C3 applied to upper eyelids ($n = 30$) elicited cooling lasting 46 minutes and increased tear secretion. C3, 2 mg/mL in water, or water in a single-unit dispenser was applied 4 times daily for 2 weeks ($n = 20$ per group) and data analyzed before and at 1 and 2 weeks thereafter. In questionnaires of ocular discomfort (VAS, OSDI, and CVS symptoms), C3 treatment clearly improved symptoms at 1 and 2 weeks, with an increase

of basal tear secretion. No signs of irritation or pain were reported.

Conclusions: C3 is a promising candidate for relief of ocular discomfort.

Functional Study of RAD21 Mutation Identified From a Peripheral Sclerocornea Pedigree

First Author: Bining ZHANG

Co-Author(s): Tommy CHAN, Li Jia CHEN, Wai Kit CHU, Calvin PANG

Purpose: A RAD21 heterozygous missense mutation was identified in a peripheral sclerocornea Chinese family. We aimed to study the possible pathological mechanism of sclerocornea and how this RAD21 mutation leads to this disease.

Methods: Lymphoblastoid cell lines (LCLs) were established from 4 affected and 2 unaffected family members. Heterozygosity expression of RAD21 was checked by sequencing cDNA and Western blotting of the protein. Chromosome number and cell cycle distribution were checked for all LCLs.

Results: Thirty genes were selected from previous sclerocornea or RAD21 studies and transcription regulation datasets to undergo quantitative polymerase chain reaction (qPCR) and Western blot. Furthermore, rad21 mRNA was injected into *X. laevis* embryos for analyses of the eye phenotypes and quantification of the above mentioned genes.

Conclusions: Our study identified RAD21 mutation in a sclerocornea family influencing expressions of genes mediating lipid metabolism, early eye development, and apoptosis. These are possible pathological mechanisms of sclerocornea and further studies should lead to a better understanding of RAD21 extramitotic functions.

Geldanamycin, a HSP90 Inhibitor, Attenuates the Hypoxia-Induced Vascular Endothelial Growth Factor Expression in Retinal Pigment Epithelium Cells In Vitro

First Author: Wen-Chuan WU

Co-Author(s): Yo-Chen CHANG

Purpose: Hypoxia is the most common factor contributing to the pathogenesis of choroidal neovascularization, which is a major cause of blindness and occurs in proliferative diabetic retinopathy and age-related macular degeneration. The purpose of this study is to investigate the role of retinal pigment epithelial (RPE) cells in the regulation of subretinal neovascularization under hypoxia and the possible function of a heat shock protein 90 (HSP90) inhibitor, geldanamycin (GA), in the regulation of vascular

endothelial growth factor (VEGF) expression.

Methods: An in vitro hypoxic experimental model was used to mimic the ischemic microenvironment of RPE cells. The cell growth was measured by proliferation assay and the morphological observation was documented by microscope. The gene expression of VEGF, hsp70, hsp90a, and hsp90b were measured using semiquantitative real-time polymerase chain reaction (RT-PCR). The VEGF release from RPE cells were detected by enzyme-linked immunosorbent assay (ELISA).

Results: No alteration in growth rate and cell morphology under 1% O₂ condition for 24 hours was noticed. The proangiogenic growth factor VEGF, but not bFGF, released from hypoxia-treated cells were significantly higher than those of normoxic controls. A similar tendency of VEGF165 isoform gene expression, detected by RT-PCR, was noticed in hypoxia-treated cells. Heat shock pretreatment elevated hsp70 and VEGF165 gene expression and augmented the hypoxia-induced VEGF gene expression and protein release. Pretreatment with GA can significantly suppress the hypoxia-induced VEGF gene expression in and peptide release from RPE cells.

Conclusions: These in vitro findings suggest that HSP90 inhibitors could be considered as novel antiangiogenesis agents for diseases with intraocular neovascularization.

Genetic Association of Axial Length in Chinese Children

First Author: Li Jia CHEN

Co-Author(s): Vesta CHAN, Ka Wai KAM, Chi Pui PANG, Jason YAM, Alvin YOUNG

Purpose: Previous genome-wide association studies (GWAS) of ocular quantitative traits have been reported. This study investigated the genetic variations reported by GWAS in their association with axial length (AL) in children.

Methods: In this study, 1073 children from the Hong Kong Children Eye Study conducted at the CUHK Eye Centre were included. Seven single-nucleotide polymorphisms (SNPs) from previous GWAS of axial length, ie, rs4074961, rs994767, rs9811920, rs11073058, rs12321, rs4373767, and rs10453441, were genotyped in all subjects by using TaqMan real-time polymerase chain reaction (PCR) assays. Linear regression was utilized to fit an allelic model for AL, adjusted for age, gender, and height.

Results: Four SNPs that had been shown to be associated with AL in adult study subjects in previous GWAS, namely, rs12144790, rs4428898, rs10453441, and rs4373767, showed the same trends of association in our cohort of children, but the P values (0.0229,

0.0484, 0.0503, and 0.0518, respectively) were at borderline. The other 3 SNPs showed the opposite trends to those in the GWAS.

Conclusions: There is no SNP significantly associated with AL in this pediatric cohort after correction for multiple testing. This could be due to insufficient sample size. A larger sample of children and an independent adult cohort will be applied to confirm the findings. However, differential rates of eyeball development in children could affect the associations. Our preliminary findings suggest differential genetic effects on axial length between adults and children. Certain genes may exert their effects later in life or through interaction with other (eg, environmental) factors.

Preliminary Evaluation of Retinal Function and Morphology in a Triple-Transgenic Mouse Model of Alzheimer Disease

First Author: Shasha YU

Co-Author(s): Chuen Chung CHANG, Kin CHIU, Abby MANTHEY

Purpose: In the current study, we sought to determine the functional and morphological changes in the retinas of 3xTg Alzheimer disease (AD) mice during disease progression in order to elucidate novel AD biomarkers.

Methods: Retinal function was evaluated in 3xTg-AD and age-matched C57B/6J mice (2, 4, 6, 8, and 10 months old) using scotopic flash electroretinography (ERG) with a flash intensity of 3.0 cd/m². Retinal sections including an intact optic nerve were stained with hematoxylin and eosin to evaluate inner nuclear layer (INL) thickness and retinal ganglion cell (RGC) number using Stereo-Investigator.

Results: Compared to control mice, we observed a progressive decrease in retinal function in the 3xTg-AD mice starting at 4 months of age. The amplitude of the a-wave was decreased 20.5%, 29.2%, and 54.9% at 4, 6, and 8 months of age, respectively, while the amplitude of the b-wave was decreased 14.7%, 18.9%, and 21.9% at these ages. Notably, while the function of the 3xTg-AD retinas was significantly affected by 8 months of age compared with the controls, histopathological changes in the retinas were not detected until 10 months of age. We also found a significant decrease in INL thickness (37% loss) and RGC number (49.4% loss) in the 10-month-old 3xTg-AD mice compared with the controls.

Conclusions: These data indicate that deteriorated retinal function can be detected before morphological changes in the 3xTg-AD mouse model, indicating that functional testing of this tissue could be used for early diagnosis of AD.

Academia, Research, Teaching & Education in Ophthalmology

3D Printing in Ophthalmology: Not There Yet!

*First Author: Tarun **ARORA***

*Co-Author(s): Supriya **ARORA***

Purpose: Three-dimensional (3D) printing or additive manufacturing is a process of making 3D solid objects from a digital file. The creation of a 3D printed object is achieved using additive processes, in which an object is created by laying down successive layers of material until the object is created.

Methods: Part of the reason 3D-printed solutions are often cost-effective is the technology. Items can be assembled directly from a digital model, increasing precision and removing room for error. However, 3D printers will have to adapt to handle multiple materials, biological components, and different sets of software solutions.

Results: It is predicted by some additive manufacturing advocates that this technological development will change the nature of commerce because end users will be able to do much of their own manufacturing rather than engaging in trade to buy products from other people and corporations. The possibility for “individual” manufacturing capabilities requires more comprehensive data collection and tracking for each patient, a process some manufacturers might not want to take responsibility for.

Conclusions: Although 3D printing is an innovative technology its use in ophthalmology by hospitals or independent physicians at present poses varying challenges. Who is truly “responsible” for a device that is manufactured in this way? This raises an interesting question from a product liability perspective, as the lines are blurred regarding who truly is the “manufacturer” of the final medical product—is it the 3D manufacturer, the hospital, or the physician?

Cataract

Addressing Iris Tissue Inadequacies: A Comprehensive Guide to Iris Tissue Loss Management

*First Author: Suvira **JAIN***

Purpose: In this video presentation we aim to comprehensively demonstrate techniques to appropriately manage iris tissue loss in various case scenarios. Based on the assessment of the integrity of the residual iris tissue and the quantum of iris tissue loss, the decision making process and the surgical

techniques are discussed.

Methods: Scenarios include small defects with primary surgical repair using the Siepser knot technique and larger defects necessitating the use of aniridia segments. In cases requiring cataract surgery and iris repair, the use of an aniridia implant is successfully demonstrated. Useful tips on the implantation and use of these devices shall be explained.

Results: This video aims to equip the viewer with the ability to make a correct surgical decision and employ an accurate technique in iris tissue loss management.

Conclusions: Traumatic or surgery induced loss of iris tissue can lead to glare, photophobia, monocular diplopia, and a host of other visual disturbances. The correct decision making process, suitable investigative modalities, and the appropriate surgical techniques and interventions can address and alleviate these problems.

Fine Needle Aspiration Controlled Curvilinear Capsulorhexis

*First Author: M **NIVEAN***

*Co-Author(s): Pratheeba **DEVI NIVEAN**, Nishanth **MADHIVANAN**, Shruti **NISHANTH**, Mohan **RAJAN**, Atheek **SHEIK***

Purpose: To demonstrate a novel technique of dealing with a mature intumescent cataract during surgery.

Methods: The challenge for all ophthalmologists is to get a complete continuous curvilinear capsulorhexis (CCC) in a mature intumescent cataract. This video depicts a novel yet simple technique of handling mature intumescent cataracts. It involves controlled decompression of intralenticular liquefied cortex with the help of a stab incision by a straight beveled down 26G needle.

Results: With this technique any intumescent cataract can be brought to its knees, minimizing the chances of an “Argentinean flag sign” and ensuring a round stable CCC in all cases.

Conclusions: This technique is safe and repeatable with a simple learning curve. A good capsulorhexis can prevent catastrophic complications especially in such difficult cases.

Hunting the Great Whites

*First Author: Aditya **KELKAR***

*Co-Author(s): Neha **GUPTA**, Jai **KELKAR***

Purpose: This video highlights how phacoemulsification can be an effective and ultimate surgical option in dealing with different types of mature cataracts.

Methods: Management of white cataracts by the technique of phacoemulsification and the

difficulties encountered intraoperatively based on the characteristics of the cataract are demonstrated in this video. It also highlights the importance of preoperative evaluation and planning according to anticipated situations for a good outcome. It features various possible situations while performing capsulorrhexis manually with cystitome or forceps or with Zepto and femtosecond laser, use of vital dyes and suitable viscoelastics, and role of endoilluminator and endodiathermy. Best suited techniques for nucleus removal along with possible difficulties due to posterior capsular rent, laxity of zonules, or incomplete separation of nuclear plate and their management are elucidated. It also showcases techniques to conquer difficult situations like small pupil or corneal opacity in mature cataracts.

Results: White cataracts are a challenge to surgeons all across the world owing to the high risk of intraoperative complications from fragile capsule and zonules, shallow anterior chamber, small pupil, difficulty in capsulorrhexis, division of nucleus, and its separation from epinucleus. Good visual outcome in the early postoperative period can be obtained by phacoemulsification despite the high risk of complications in white cataracts.

Conclusions: White cataracts can be safely operated using phacoemulsification with a step-by-step approach and meticulous surgical planning to achieve good visual outcome.

Intraocular Lens Scaffold Technique for Phacoemulsification of a Hypermature Cataract With Spontaneous Posterior Capsular Dehiscence

*First Author: Shaheeda **MOHAMED**
Co-Author(s): Chi Wai **TSANG***

Purpose: A surgical video demonstrating successful management of a hypermature senile cataract (HMSC) with spontaneous posterior capsular dehiscence using an intraocular lens (IOL) scaffold to allow phacoemulsification of the shrunken nucleus.

Methods: A 70-year-old man presented with a hypermature cataract, phacolytic glaucoma, and hand movement vision in his left eye. There was spontaneous dehiscence of the posterior capsule (confirmed with anterior segment optical coherence tomography) and sinking of the shrunken nucleus. The anterior capsule was intact. The surgical video demonstrates an anterior approach to removal of the nucleus by phacoemulsification using the IOL scaffold technique pioneered by Agarwal to provide posterior capsular support, taking care to protect the corneal endothelium. The IOL was then placed in the sulcus.

Results: Phacoemulsification of the hypermature

cataract was successfully performed in the presence of a posterior capsular rent using the IOL scaffold technique. The sulcus IOL remained stable, and vision improved postoperatively at 3 months.

Conclusions: Surgical management of a hypermature or Morgagnian cataract is challenging, especially in the presence of a spontaneous posterior capsular dehiscence resulting from raised intralenticular pressure. An anterior approach by phacoemulsification of the shrunken nucleus can be safely performed using the IOL scaffold technique to compartmentalize the eye and prevent dropping of nuclear fragments through the posterior capsular rent. This avoids necessitating a large corneoscleral incision or a posterior approach to remove the nucleus.

Locked In: Optic Capture Revisited

*First Author: Samaresh **SRIVASTAVA**
Co-Author(s): Abhay **VASAVADA***

Purpose: The film highlights and describes the technique as well as extended applications of optic capture. Optic capture of the intraocular lens (IOL) ensures stable IOL fixation as well as locks in proliferating lens epithelial cells, thereby preventing visual axis obscuration. The indications of optic capture in various situations will be noted.

Methods: The role of optic capture is highlighted in pediatric/adult cataracts to lock in epithelial cells and prevent posterior capsule opacification. Further, it provides excellent IOL stability and centration by locking in the IOL, especially where the anterior/posterior capsule are discontinuous.

Results: Optic capture provides stability to the lens despite inadequate lens support in compromised situations.

Conclusions: We have highlighted the technique and applications of optic capture.

Management of Intraoperative Prolapse During Cataract Surgery

*First Author: Kendrick **SHIH**
Co-Author(s): Keith **CHAN**, Jennifer **LEE**, Suk Ming **YIM***

Purpose: The aim of this educational video is to highlight methods to prevent intraoperative iris prolapse and describe techniques to proceed with cataract surgery in the event that it happens.

Methods: It is important to identify at-risk eyes prior to cataract surgery during preoperative assessment, including eyes with short axial length and/or atonic pupils. For such eyes, prophylactic measures early in surgery including adjusting incision site, tunnel length, and the use of intracameral 2.5% phenylephrine solution can greatly reduce the risk of intraoperative

iris prolapse. In the event that intraoperative iris prolapse occurs, techniques are described to balance the pressure gradient on the iris while continuing with cataract surgery. At the end of surgery, incision wounds are sutured to maintain pressure balance.

Results: Iris prolapse during surgery can result in a more difficult procedure with worse visual outcomes. Patients will be at increased risk of ocular pain and bleeding, and there is risk of permanent iris damage/atrophy, causing glare. Identifying at-risk patients and modifications in surgical techniques can greatly reduce the risk of iris prolapse. However, knowledge of the reasons for iris prolapse can greatly facilitate continuation of cataract surgery and prevention/minimization of further iris damage. It is important to suture incision wounds at the end of surgery, with special care to avoid suturing prolapsed and floppy iris to the wound.

Conclusions: This educational video highlights methods to minimize this in at-risk eyes and describes methods to proceed with surgery in the event that it occurs.

Soemmering Ring: Management Using a New Technique

First Author: Athiya **AGARWAL**
Co-Author(s): Amar **AGARWAL**

Purpose: To present management of Sommering ring using a new technique.

Methods: Sommering ring was managed using a new technique.

Results: The results were good.

Conclusions: We presented management of Sommering ring using an effective new technique.

Vitrectomy-Assisted Phacoemulsification for Lenticular Coloboma

First Author: Amar **AGARWAL**

Purpose: Lenticular colobomas can be treated.

Methods: Vitrectomy-assisted phacoemulsification was performed for lenticular coloboma.

Results: This technique showed good results.

Conclusions: Vitrectomy-assisted phacoemulsification produced good results.

Cornea, External Eye Diseases & Eye Bank

Boston Type 2 KPro: Surgical Steps

First Author: Geetha **IYER**

Co-Author(s): Shweta **AGARWAL**, Nilay **NITINKUMAR PATEL**, Bhaskar **SRINIVASAN**

Purpose: To present the surgical technique of Boston type 2 keratoprosthesis (Kpro).

Methods: The surgical technique of Boston type 2 Kpro, though in part similar to the Boston type 1 KPro in relation to the assembly and suturing of the same, is distinctly different with respect to the rest of the procedure including mandatory pars plana vitrectomy (PPV) and AGV.

Results: The entire conjunctiva is meticulously excised leaving the ocular surface bare and a more meticulous lid dissection and suturing at the end of the procedure are very important to contributing to a successful outcome.

Conclusions: This video highlights the steps of the surgery with postoperative care and outcomes along with case illustrations.

Conjunctivoplasty or Gunderson Flap Made Easy for the Beginner: It Will Not Fail!

First Author: Quresh **MASKATI**

Purpose: It seems almost anachronistic to describe a surgical procedure that is many decades old and does not require expensive gadgets. Conjunctivoplasty, however, has fallen out of favor and is now hardly performed in teaching institutions. Thus, recently qualified eye surgeons venturing into private or hospital practice have rarely seen this surgery performed and are unaware of its benefits in restoring comfort. The aim of my video is to educate the viewer, especially younger eye surgeons, about the current indications for this procedure and the step-by-step approach to doing the surgery so as to prevent retractions and maintain semi-transparency.

Methods: The video describes all the surgical steps including preferred anesthesia used by the author. The commentary lucidly explains tips and tricks to avoid and tackle complications intraoperatively and to prevent retraction of the flap postoperatively.

Results: In the author's hands the success rate of this surgical procedure is over 90%. This can be achieved by all by following the author's guidelines.

Conclusions: There are still several indications for performing conjunctivoplasty. A well-done Gunderson flap can save many an eye from going into phthisis and can give tremendous pain relief in painful blind eyes

due to bullous keratopathy.

Corneal Allogenic Intrastromal Ring Segments: A New Treatment for Keratoconus

First Author: Athiya **AGARWAL**

Co-Author(s): Amar **AGARWAL**

Purpose: To present corneal allogenic intrastromal ring segments (CAIRS), a new treatment for keratoconus.

Methods: CAIRS was performed for keratoconus.

Results: The results were good.

Conclusions: CAIRS can help keratoconus.

DALK Procedure for Management of Keratoglobus

First Author: Alireza **ESLAMPOOR**

Purpose: To show the technique and interesting finding in a deep anterior lamellar keratoplasty (DALK) procedure for the management of a keratoglobus patient.

Methods: In this video I tried to do DALK in a keratoglobus case and I faced with an interesting finding of anterior stromal dissection without any force intraoperatively.

Results: Pre-Descemet DALK was done easily in this patient and it had an acceptable result.

Conclusions: Pre-Descemet DALK could be considered as a treatment choice in keratoglobus cases.

Mucus Membrane Grafting for Lid Margin Keratinization in SJS

First Author: Shweta **AGARWAL**

Co-Author(s): Geetha **IYER**, Nilay **NITINKUMAR PATEL**, Bhaskar **SRINIVASAN**

Purpose: A vital procedure in eyes afflicted by the sequelae of Stevens-Johnson syndrome (SJS)—lid margin keratinization (LMK), “sine qua non” of the disease in the eye—is illustrated in the video describing the steps of the procedure along with case illustrations.

Methods: A video describing the steps of the procedure along with case illustrations.

Results: The constant sandpaper effect of the LMK on the cornea leads to vision-threatening complications and is addressed by the mucus membrane graft (MMG).

Conclusions: Well-done mucus membrane graft goes a long way in stabilizing the ocular surface in these eyes, and in some helps improve the vision and symptoms.

Primary Sclerocorneal Cyst in a Pediatric Patient

First Author: Charudutt **KALAMKAR**

Co-Author(s): Amrita **MUKHERJEE**, Jaideep **POPLI**

Purpose: To present a rare case of primary sclerocorneal cyst in a 7-year-old female child which was treated successfully with excision and scleral patch grafting.

Methods: Surgery was planned as the cyst covered the pupillary axis. Localized peritomy was done to expose underlying scleral cyst. Anterior wall of the cyst was removed by excision of the scleral roof. There was a narrow passage through the limbus connecting the scleral cyst to the corneal cyst. Fluid was drained from the intrastromal part of the cyst and the cavity was repeatedly washed with balanced salt solution (BSS). After thorough wash the cyst collapsed. Base and walls were scraped to remove epithelial cells. Connecting track at the limbus was cauterized. Scleral defect was covered with preserved scleral graft to reduce the risk of complications due to scleral thinning.

Results: Surgical excision with scleral graft was performed leading to improvement in visual acuity. No recurrences were observed until last follow-up at 18 months.

Conclusions: Corneoscleral cyst represents a development anomaly and can be treated safely by cyst excision combined with scleral patch grafting along with irrigating the cyst with BSS. It should be considered in the differential diagnosis of cystic ocular surface disorders in the pediatric age group. An ideal irrigating solution for complete destruction or removal of lining epithelial cells of cysts needs to be investigated further.

Role of Mitomycin C in Endothelial Keratoplasty

First Author: Chaitali **PATEL**

Co-Author(s): Muralidhara **RAMAPPA**

Purpose: To describe a surgical technique of non-Descemet stripping endothelial keratoplasty (nDSEK) in combination with a superficial keratectomy with or without mitomycin C application in cases with congenital hereditary endothelial dystrophy (CHED).

Methods: We describe a surgical technique of nDSEK in combination with a superficial keratectomy with or without mitomycin C application in cases with CHED.

Results: The nDSEK procedure can be performed easily and reduces surgical time. It also eliminates the risk of lens injury and inadvertent pull on posterior stromal fibers.

Conclusions: This technique is safe and provides

excellent visual outcomes in patients with CHED, even in the presence of dense stromal haze.

Simplified Technique of Stitchless Descemet Membrane Endothelial Keratoplasty

*First Author: Samar **BASAK***

*Co-Author(s): Soham **BASAK***

Purpose: This teaching video demonstrates a simplified technique to perform stitchless Descemet membrane (DM) endothelial keratoplasty (DMEK) which is highly reproducible.

Methods: This video shows a simplified way of preparing the donor roll and also a simple donor injector system. The actual surgery is sutureless via a 3.0-mm scleral tunnel incision rather than via corneal incision with suture(s).

Results: This tunnel helps in injecting donor roll parallel to the iris. There is no need for putting suture(s) before unrolling the DM scroll. Gentle tapping and play with balanced salt solution (BSS) from side ports helps complete unrolling of the donor tissue, even if it is in reverse direction. After complete unrolling, inject air from 1 of the side ports after placing the needle near the pupil.

Conclusions: Stitchless DMEK is simple and reproducible. There is no need for suture removal and the incision is astigmatically neutral.

Surgical Treatment of Boston Keratoprosthesis Extrusion: The KKESH Experience

*First Author: Hernan **MARTINEZ OSORIO***

*Co-Author(s): Jose **VARGAS***

Purpose: To describe the surgical treatment of the Boston keratoprosthesis (KPro) extrusion at KKESH.

Methods: Several surgical techniques have been described to manage Boston KPro extrusion. We will show the surgical treatment with gluing, amniotic membrane transplantation (AMT), penetrating keratoplasty (PKP) regraft, partial PKP regraft, and Boston KPro replacement.

Results: Regarding the preoperative assessment of Boston KPro extrusion, the proper surgical technique should be selected in order to increase the midterm survival of Boston KPro extrusion surgery. The knowledge of these surgeries increases the anatomical survival of the Boston KPro surgery.

Conclusions: The surgical techniques shown in the video are successful in the treatment of Boston KPro extrusion.

Understanding Corneal Collagen Crosslinking: Dark Side of the Moon

*First Author: Pallak **KUSUMGAR***

*Co-Author(s): Ashima **BAJAJ**, Tushar **GROVER**, Pooja **KHAMAR**, Rohit **SHETTY***

Purpose: To describe various challenging situations and complications before and after collagen crosslinking, their management, and the use of cell biology in solving the unanswered questions in crosslinking.

Methods: Four scenarios are described in the video. An algorithm was designed to decide the correct timing and protocol of treatment. Repeated topography was done post crosslinking to rule out the effect of haze in deciding whether there was any progression or not. Patients with post crosslinking infectious keratitis were triaged and treated based on the size and site of infiltration. Pediatric keratoconus patients were treated for allergic eye disease prior to subjecting them to crosslinking.

Results: The algorithmic approach helps to decide when and how to treat different patients with keratoconus. Repeatability is affected due to haze post crosslinking and it may falsely show progression of keratoconus in comparative scans. Treating post crosslinking infectious keratitis using microbiological evaluation of the causative organism and its management with topical fortified antibiotics ensures resolution with minimal sequelae. Prior treatment of allergic eye disease prevents progression of keratoconus and failure of crosslinking in children.

Conclusions: A systematic approach to crosslinking, consideration of haze in interpretation of progression, and specific treatment of postoperative infectious keratitis and associated allergic eye disease in pediatric keratoconus patients ensures appropriate management of such challenging situations. Further analysis of tear cytokines and genetics in understanding the behavior of keratoconus is likely to play a major role in future management of keratoconus.

Use of Intense Pulsed Light Therapy for Treatment of Meibomian Gland Dysfunction-Related Dry Eye Disease

*First Author: Kendrick **SHIH***

*Co-Author(s): Jasmine **CHUANG**, Jimmy **LAI**, Christie Nicole **LUN**, Louis **TONG***

Purpose: Meibomian gland dysfunction is the leading cause of dry eye disease and is characterized by obstructed glands with toothpaste-like secretions. Meibomian gland expression is a commonly performed office-based procedure that can relieve obstructed glands. However, it can be an extremely unpleasant and traumatizing experience, with erythema, bruising, and discomfort experienced up to hours or days after

the procedure. Intense pulsed light therapy (IPL) is an eyelid warming procedure that is rapidly gaining popularity in ophthalmology.

Methods: Through a video presentation, our team demonstrates the indication, settings, and technique used for intense pulsed light therapy treatment. Furthermore, the cumulative change in medium quality and expressibility after 2 courses of IPL therapy (1 month apart) are shown on slit lamp examination.

Results: The more fluid medium facilitates gentle expression using a cotton bud and without the need for local anesthetic. On follow-up, patients have significantly improved tear film metrics and dry eye symptom scores.

Conclusions: Intense pulsed light therapy is a useful adjunct for dry eye treatment, especially in patients with significant meibomian gland dysfunction.

Walking With Dying Spheres or Die Another Day: The Journey of a Stem Cell Sphere to Fulfil the Promise of Regenerative Medicine

First Author: Salim ISMAIL

Co-Author(s): Ye LI, Jeremy John MATHAN, Jennifer Jane MCGHEE, Trevor SHERWIN, Jinny YOON

Purpose: To showcase the trials and tribulations of limbal stem cell spheres for not only the researcher but also the stem cells themselves during laboratory experimentation.

Methods: Sphere cell labelling using fluorescence-based systems for cytotoxicity (live/dead) and cell cycle (Fluorescence Ubiquitination Cell Cycle Indicator, FUCCI) were coupled with time-lapse imaging, fluorescence, and confocal microscopy to enable tracking of stem cell-enriched spheres placed on a collagen surface in vitro or implanted into human corneal rims in situ.

Results: Time-lapse imaging showed the recruitment of individual cells into stem cell spheres and their subsequent migration, division, and potential differentiation as they repopulated their given substrate. Nutrient availability along with bacterial and fungal (yeasts and hyphae) competitors were all challenges faced by stem cells in their quest for survival. Successful spheres could populate collagen surfaces and when implanted in tissue, repopulate the entire corneal surface with some evidence of limbus formation.

Conclusions: From the moment of surgical excision, the stem cell faces a fight for survival in the laboratory culture environment. For those that win this challenge, migration, division, and differentiation allow them to fulfil their potential in the promise of corneal regeneration. This could indicate a new surgical

technique in the treatment of corneal diseases such as limbal stem cell deficiency.

Glaucoma

New Mobile Autoperimeter Using Virtual Reality

First Author: Amar AGARWAL

Purpose: To present a new mobile autoperimeter using virtual reality.

Methods: This is a good autoperimeter.

Results: Results are good.

Conclusions: This is a good autoperimeter.

Single-Pass 4-Throw Pupilloplasty in Silicone Oil-Induced Secondary Glaucoma

First Author: S REKHA

Co-Author(s): Amar AGARWAL, Athiya AGARWAL, Lional Raj PONNIAH

Purpose: To show the effect of new technique: the single-pass 4-throw pupilloplasty (SFT) in silicone oil-induced secondary glaucoma.

Methods: This was a case of silicone oil in the anterior chamber with secondary glaucoma, fully dilated pupil, and iris plastered to endothelium. Silicone oil removal with SFT was planned. After oil removal, iris was pulled towards the center breaking all peripheral synechiae. SFT was performed using a single arm 10-0 polypropylene suture. Long arm needle was passed through the side port incision and passed through the proximal iris leaflet. A 26-gauge needle was introduced from the opposite end and was passed through distal iris leaflet. The long needle was railroaded into the 26-gauge needle track and withdrawn from the eye. A loop was formed from distal suture end and the proximal end of suture was passed into the loop 4 times, with both ends of sutures pulled to form a perfect knot.

Results: Preoperative vision was counting fingers close to face with intraocular pressure (IOP) of 56 mm Hg with 3 antiglaucoma medications (AGM). Postoperative day 1 IOP was 12 mm Hg without any AGM. One month postoperatively, best corrected visual acuity was 6/24, N10 with IOP maintained at 12 mm Hg.

Conclusions: SFT mechanically opens up the angles by pulling the iris towards the center. SFT is an easy technique to be performed by a vitreoretinal surgeon with an easy learning curve. Multiple entry into anterior chamber is reduced in SFT, reducing the chances of corneal damage and iris tissue injury with hyphema, which hinders further visualization of suture

ends. After SFT, pupillary dilatation occurs well for fundus examination.

Surgical Management of Suprachoroidal Hemorrhage: Technique

First Author: Suria SUDHAKARAN

Purpose: To show a technique of suprachoroidal hemorrhage drainage.

Methods: The technique is to insert an anterior chamber maintainer to increase intraocular pressure (IOP). The location of maximal fluid accumulation is noted preoperatively to determine the optimal drainage site. After conjunctival peritomy, a 2- to 3-mm radial incision is made in the sclera about 3 to 4 mm posterior to the limbus. The incision is deepened until the suprachoroidal space is entered and fluid is released. (The fluid is clear and yellowish in serous choroidals or dark red with blood clots in hemorrhagic choroidals.) The incision's edges are pulled apart by forceps or cautery to facilitate fluid efflux. The sclerotomy site is left open with closure of overlying conjunctiva. A second sclerotomy may be needed to drain fluid from another quadrant. Throughout the procedure, the eye should be kept pressurized with injection of balanced salt solution, a viscoelastic substance in the anterior chamber, or an anterior chamber maintainer. At the end, air bubble should be left in the anterior chamber. The sclerostomy site should be left open and may be cauterized a little more to ensure further drainage of suprachoroidal fluid in the postoperative period. Conjunctiva is sutured in a continuous mattress fashion with 8-0 vicryl sutures.

Results: To conclude, the surgical procedure for choroidal drainage procedure is safe, effective, and can be performed easily whenever indicated.

Conclusions: While most choroidal effusions resolve spontaneously, surgical drainage may be necessary in some cases to restore normal anatomy and visual function.

Titration of Early Filtration

First Author: Amit SOLANKI

Purpose: In this video, I will demonstrate step by step the technique of making releasable sutures, when to remove them, how to remove them, what to do next after removing, and the limitations and complications of releasable sutures.

Methods: The aim of glaucoma surgery is to maintain a steady flow of aqueous out of the anterior chamber into the subconjunctival space. However, maintaining the right amount of flow is a challenge to the surgeon. Very tight sutures can result in tight scleral flap closure and thus reduced flow of aqueous into the bleb causing

a low bleb and raised or normal intraocular pressure (IOP). If the sutures are very loose, it will result in overfiltration and thus hypotony and flat chamber in early the postoperative period. This is where titration of filtration in the early postoperative period becomes important. Many methods are proposed for that.

Results: Releasable sutures offer the benefit of modification of the filtration rate postoperatively via slit lamp with relative ease without the need of laser.

Conclusions: Failure of trabeculectomy may be early or late. One of the common causes of early bleb failure is tight flap suturing. This video will demonstrate everything about releasable sutures which titrate filtration in the early postoperative period.

Orbital & Oculoplastic Surgery

Bladeless and Bloodless: Radiofrequency-Assisted Excision of an Eyelid Kissing Nevus

First Author: Sumeet LAHANE

Co-Author(s): Santosh HONAVAR, Chalamala JANGAIAH, Raksha RAO

Purpose: To demonstrate an innovative excision technique for eyelid kissing nevus using high-frequency radio-wave electrosurgery.

Methods: A kissing or a divided nevus is a rare form of congenital melanocytic nevi of the eyelid. Although a periocular nevus rarely becomes malignant, it may cause functional problems because of its size and also cosmetic concerns, thus prompting excision. These are conventionally managed by epidermal stripping or staged surgical excision and reconstruction with a skin graft or a myocutaneous flap, but the resultant suboptimal cosmetic appearance continues to be an unsolved issue. We introduce a new simple surgical approach with high-frequency radio-wave electrosurgery using a fine needle electrode to excise and completely vaporize an eyelid kissing nevus without requirement for a reconstruction procedure.

Results: Complete excision of nevus with preserved cosmetic appearance of the eyelid is achieved with the use of high-frequency radio-wave electrosurgery.

Conclusions: This technique provides a preferable alternative to help reduce postoperative discomfort, accelerate recovery, minimize scarring, preserve eyelashes, and provide a gratifying cosmetic outcome.

Dacryocoele: A Nick in Time Saves Nine

First Author: Akshay NAIR

Co-Author(s): Renuka BRADDOO, Nayana POTDAR, Kshitij SHAH, Chhaya SHINDE

Purpose: To demonstrate the clinical presentation

and endoscopic surgical management of a rare case of bilateral dacryoceles (dacryocystoceles) with intranasal cysts.

Methods: Dacryocela is a rare clinical presentation of congenital nasolacrimal duct obstruction. Dacryocela presents as a bluish swelling over the medial canthus. When seen endoscopically through the nose, there usually is an intranasal pus-filled cyst present in such cases. These cysts can be large enough to block the airway passage in the nose on the affected side. In our video, we describe the case of an 18-day-old child with bilateral congenital dacryoceles. The case was treated surgically by endoscopic intervention where cruceate marsupialization of the intranasal cysts was performed along with probing.

Results: Cruceate marsupialization of the intranasal cysts associated with dacryoceles gives satisfactory outcomes.

Conclusions: Infants are obligate nasal breathers and in bilateral dacryoceles, the nasal passages on both sides are blocked and the child may present with respiratory distress. During breastfeeding there is a possibility of the baby choking as well. Therefore, intervention in bilateral dacryocela is essential. In this video, we discuss the pathology and etiogenesis of dacryoceles and show the correct endoscopic technique of marsupialization of dacryoceles. Ophthalmologists must be aware of the possible complications that may arise from dacryoceles.

Hughes Procedure for Eyelid Reconstruction: Tips and Tricks

First Author: Sumeet **LAHANE**

Co-Author(s): Santosh **HONAVAR**, Chalamala **JANGAIAH**, Raksha **RAO**

Purpose: To describe the Hughes procedure of eyelid reconstruction and important tips in each step of surgery.

Methods: In this video, we demonstrate the Hughes tarsoconjunctival flap from the upper eyelid for the posterior lamina along with vertical sliding flap of skin-orbicularis for the reconstruction of the anterior lamina for the reconstruction of a lower eyelid coloboma in a 60-year-old patient with eyelid sebaceous gland carcinoma.

Results: Primary surgical excision is the standard treatment for most of the malignant eyelid tumors. Appropriate reconstruction is challenging and aims at providing acceptable cosmesis and eyelid function. There are several techniques for eyelid reconstruction and the choice depends on the location and size of the coloboma. Hughes procedure stage 1 and 2 was utilized for complete resection of tumor with reconstruction of lower lid.

Conclusions: Anatomical and functional outcome of the Hughes procedure can be gratifying if attention is paid to the details and basic principles are adhered to.

Intraocular Gnathostomiasis

First Author: Fazil **KHURRUM**

Co-Author(s): Pritam **BAWANKAR**, Harsha **BHATTACHARJEE**, Nilutparna **DAS**, Pranjal **MISHRA**, Diva **MISRA**

Purpose: Video presentation on the removal of intraocular gnathostomiasis.

Methods: A 48-year-old woman presented with complaints of decreased vision and a floater in the left eye of 6 days' duration. The onset of symptoms was sudden. Her medical history was unremarkable. She was not vegetarian, with fish being the staple diet. On examination, best-corrected distant visual acuity was 20/20 in the right eye and 20/30 in the left eye. On slit lamp examination of the anterior segment of the left eye, there was sludging of blood circulation in the conjunctival and episcleral blood vessels, with no signs of cellular reaction. Fundus examination revealed an actively moving parasite overlying the disc and the macula in the left eye with hemorrhage on the superior, temporal, and nasal aspect of the disc. The optic nerve head was edematous. For surgical removal of the parasite 3-port pars plana vitrectomy was performed, and blood around parasite was aspirated. The parasite was encapsulated within a pseudocapsule from which it was dissected out. A cannula fitted with a flute needle was used for aspirating parasites. On removing the blood clot from the superior pole of the optic disc, a bleeding point from the superior nasal branch of the central retinal arteriole was found, indicating the possible route of entry of the parasite into the eye. Fluid-gas exchange and C3F8 gas tamponade was done.

Results: Examination of a wet mount of the parasite showed a larva of *Gnathostoma spinigerum*. Route of entry and parasitic migration pattern in ocular tissue can be seen.

Conclusions: This video shows an effective way of managing a parasite in the posterior segment.

Living Parasite in the Eyelid

First Author: Golam **HAIDER**

Co-Author(s): Nesar **AHMED**, Tanjila **HOSSAIN**, Syeed **KADIR**

Purpose: To report a rare case of living parasite in the eyelid.

Methods: This case report was done in a tertiary care eye hospital in Bangladesh. We evaluated the patient thoroughly. Computed tomography (CT) scan of the

orbit and histopathology helped to diagnose the case. Peroperative video recording as well as preoperative and postoperative photographs were documented properly.

Results: An 8-year-old boy presented with swelling of the right upper lid for the past 1 year with occasional pain and redness which was relieved by nonsteroidal anti-inflammatory drugs (NSAIDs) and antihistamine. On examination, we found skin overlying the swelling was intact and showed no blister. A firm, nontender mass about 10 mm x 10 mm in diameter was located in the right upper eyelid. Anterior and posterior segment revealed normal studies; vision was 6/6 in both eyes. CT scan of the orbit showed cystic lesion with thickened hazy irregular outline. A live worm about 10 cm in length was revealed and extracted with cystic wall from the right upper eyelid peroperatively. Histopathology reported parasitic infestation compatible with *Loa loa*.

Conclusions: Ophthalmologists should be aware of atypical parasitic presentation of the eyelid and adnexa; coupled with a high index of clinical suspicion, this may help in early management.

Management of Congenital Nasolacrimal Obstruction: A Video Presentation

First Author: Mariel Angelou **PARULAN**

Co-Author(s): Gangadhara **SUNDAR**

Purpose: To present a video that demonstrates the spectrum of management for congenital nasolacrimal duct obstruction (NLDO).

Methods: A case series of patients with congenital NLDO that underwent different management approaches.

Results: Congenital nasolacrimal duct obstruction occurs in approximately 5% of normal newborn infants. Although typically the blockage is from noncanalization of the inferior end of the nasolacrimal duct (valve of Hasner), it may be at other locations including upper system and not infrequently at multiple locations as well. Patients may present with tearing alone, or with discharge and rarely with a mucocoele/dacryocoele, mucopyocoele, an acute dacryocystitis, or rarely respiratory obstruction as well. It is easily diagnosed based on the history including onset, clinical features, a positive fluorescein dye disappearance test, regurgitation on pressure over the lacrimal sac, or a medial canthal lesion. While over 90% of patients spontaneously improve with establishment of patency, assisted procedures may be indicated for persistent symptomatic obstructions, in older infants/young children, or if mucocoeles and dacryocystitis develop.

Conclusions: In this video we present various management techniques including the Crigler-Najjar massage, lacrimal irrigation with probing, lacrimal

intubation, balloon dacryoplasty, and in the rare occasion, pediatric endonasal dacryocystorhinostomy with intubation. Indications, procedures, techniques, and outcomes are presented in this video.

Posterior Vitreocapsulorrhexis: A New Method for IOFB

First Author: M **NIVEAN**

Co-Author(s): Sridhar **BARATAN**, *Pratheeba* **DEVI**, *Nidhee* **JAIN**, *Mohan* **RAJAN**, *Sangeetha* **SEKARAN**

Purpose: Retained intraocular foreign body (IOFB) is a leading cause of ocular morbidity in young patients. The morbidity results from the mode of injury, the site of injury, and its associated complications such as endophthalmitis, siderosis, etc. Hence, managing these cases appropriately is essential for good visual outcomes.

Methods: Presenting a case of retained metallic intraocular foreign body involving the macular region in a young patient. Various methods can be employed for the removal of the foreign body. We showcase a novel technique of 23G pars plana vitrectomy along with phacoemulsification of the lens and creation of a primary posterior vitreocapsulorrhexis through which the foreign body was brought into the anterior chamber and removed through the phacoemulsification clear corneal tunnel. A new extended depth of focus posterior chamber intraocular lens was then placed in the bag for good range of vision in a young patient.

Results: This young patient did well postoperatively with a good vision of 6/24, N 12. He has been on follow-up for 6 months' duration with no new complaints.

Conclusions: This unique sutureless technique maximizes the postoperative visual recovery for the patient with minimal tissue trauma and good surgical outcomes in a single surgery.

Radiofrequency-Assisted Excision of Epibulbar Dermolipoma: An Innovative Approach

First Author: Sameeksha **TADEPALLI**

Co-Author(s): Santosh **HONAVAR**, *Chalamala* **JANGAIAH**, *Sumeet* **LAHANE**

Purpose: To describe the surgical excision of epibulbar dermolipoma in an 11-year-old child by radiofrequency (RF)-assisted microsurgery and ocular surface reconstruction with amniotic membrane graft.

Methods: RF-assisted microsurgery was performed to excise the dermolipoma en bloc with overlying conjunctiva adherent to it, while preserving unaffected conjunctiva and safeguarding the palpebral lobe of the lacrimal gland. A pretenon plane dissection was

carried out to protect the rectus muscle and excision was truncated at the fornix. Inherent hemostasis provided by RF provided excellent visibility and planar tissue dissection. Ocular surface was reconstructed by sutureless amniotic membrane graft with Tisseel glue.

Results: There was good postoperative comfort and scarless cosmesis at a follow-up of 6 weeks.

Conclusions: Careful RF-assisted microsurgery of epibulbar dermolipoma with ocular surface reconstruction minimizes complications, accelerates recovery, prevents recurrence, and provides gratifying cosmetic outcome.

Revision of Conjunctivodacryocystorhinostomy

First Author: Farzad PAKDEL

Purpose: In this video we show the role of endoscopy in conjunctivodacryocystorhinostomy (CJDCR) in a case with a complete bi-punctocanalicular obstruction and vague history of past surgery. We planned endoscopic endonasal CJDCR.

Methods: After shrinkage of middle turbinate we unexpectedly observed extensive synechia and an entrapped Pyrex Jones tube migrated posteriorly toward the nasopharynx. We made meticulous dissections, released, and then removed the migrated entrapped tube. Releasing the Pyrex tube collar from the tight bone ostium was tricky and required specific maneuvers that are shown in the video.

Results: Endoscopic revision of CJDCR with Jones tube insertion was performed.

Conclusions: Endonasal endoscopic exam is recommended before revision of CJDCR. Special maneuvers might be required for releasing an entrapped tube.

Small Incision (10 mm) LPS Resection

First Author: Syeed KADIR

Purpose: To assess the surgical outcome of 10 mm levator resection to correct aponeurotic ptosis.

Methods: This study was carried out in a tertiary care eye hospital in Bangladesh. We selected moderate to severe aponeurotic ptosis with good levator function. Surgery was performed under local anesthesia. All cases were followed up to 6 months.

Results: Of a total of 10, 60% of cases were male and 40% were female. The mean margin reflex distance 1 (MRD1) was -1.0 mm preoperatively and +3.5 mm 3 months after surgery. Patient satisfaction was 100%.

Conclusions: Small incision levator resection is a better option to correct aponeurotic ptosis with good levator function.

Surgical Videos on the Removal of Large Intraocular Foreign Body

First Author: Rajvardhan AZAD

Co-Author(s): Bhuvan CHANANA

Purpose: Large foreign bodies are usually removed through the anterior route by sacrificing the lens. We present 3 surgical videos demonstrating removal of large oblong intraocular foreign bodies through the pars plana route, following posterior vitreous detachment and complete vitrectomy.

Methods: An iron foreign body was present in 2 cases and glass in 1. In the first case, an iron foreign body was present in the vitreous cavity and in the second case, an iron foreign body was impacted in the retina close to the fovea. The third case had a very large glass foreign body entangled in the vitreous inferiorly with inferior retinal breaks and retinal detachment. All the eyes were phakic. All eyes underwent a complete vitrectomy with posterior vitreous detachment using triamcinolone acetonide and removal of foreign body through the pars plana route.

Results: The foreign bodies although large in size had a greater length as compared to width. They could thus be successfully removed by marginally increasing the scleral port incision and rotating the foreign body in the eye with the help of endoilluminator, such as to align the foreign body along its longer axis. The lens was spared in all cases.

Conclusions: The videos demonstrate that large foreign bodies which are greater in length can be removed through the pars plana route by orienting them appropriately. This method also helps to preserve the lens and avoid anterior segment manipulation.

Pediatric Ophthalmology & Strabismus

Iris-Claw Lenses for Correction of Aphakia in Children

First Author: Mohammad MOSTAFA HOSSAIN

Purpose: Surgical treatment of aphakia without capsular support in children is a great challenge, particularly in uniocular aphakia and noncompliant patients.

Methods: A prospective interventional case series was undertaken in 13 eyes of 9 children with aphakia without capsular support who underwent iris-claw lens implantation through superior limbal incision by lens forcep and then positioned retropupillary by traditional enclavation of both haptics 1 by 1 into the iris midperiphery posteriorly through paracentesis near 3 o'clock and 9 o'clock position by dialer or Sinskey hook from October 2014 to August 2017. A detailed record

of visual acuity, slit-lamp examination, and fundus evaluation was carried out. Patients were followed up for about 3.5 years.

Results: The study enrolled 13 eyes of 9 children. The age of patients ranged from 5 to 10 years. Among them, 6 were male and 3 were female. Patients who underwent posterior iris-claw lens implantation showed improvement in visual acuity from 1/60 preoperatively to 6/12 postoperatively at least. We encountered no postoperative complication. Amblyopia was a vision limiting factor.

Conclusions: This study revealed that retropupillary iris-claw lens implant (posteriorly) is simple, safe, and effective in aphakia with no capsular support in children when noncompliance with spectacles and amblyopia are great concerns. However, further study is warranted with larger sample size and longer follow-up.

Refractive Surgery

Known Devil, Unknown Work: Refractive Surgery Outcomes

First Author: Pooja KHAMAR

Co-Author(s): Ashima BAJAJ, Rohit SHETTY

Purpose: A total of 3350 patients underwent uneventful refractive surgery over the past 1 year at our institute. Of these, 134 were found to be unhappy. This video aims to describe a stepwise approach to decipher symptoms in these unhappy patients.

Methods: The first step was assessment of tears, epithelial mapping (Optovue), stroma, and internal optics (iTrace). The next step was anatomical assessment consisting of lenticular changes, biomechanics (Corvis-ST), and in vivo confocal microscopy (Rostock Corneal Module/Heidelberg Retina Tomograph II). The third step was electrophysiology along with visual fields and contrast sensitivity. The fourth and fifth steps were neurological and psychological examinations, respectively, with pupillometry (Konan RAPDx) and neuroimaging in patients with no ocular diagnosis.

Results: We found 85.7% had dry eye, 16.08% had epithelial abnormalities (poor vision due to scatter), 53.6% had nutritional deficiencies with associated ocular symptoms, 29.48% had abnormalities in optics, and 10.72% had neurological or psychological factors.

Conclusions: We present a simplified algorithm to decode the complaints and streamline treatment for the same in unhappy patients after refractive surgery.

Retrieving and Scleral Fixation of Same Dropped IOL

First Author: Hussain KHAQAN

Purpose: To retrieve a dropped intraocular lens (IOL) and perform scleral fixation of the same IOL.

Methods: A 23-gauge pars plana vitrectomy (PPV) was done to free the dropped IOL from the vitreous. IOL was grasped with end grasping forceps and brought to the anterior chamber; 10/0 prolene suture was passed through at 6 o'clock and 12 o'clock where it was grasped with forceps and brought out from the limbal wound at 11 o'clock and tied with prolene. It was then rotated with dialer to 6 o'clock position behind the iris and tied at the sclera. A similar manner was done for the other haptic which was rotated at 12 o'clock behind the iris and tied at the sclera. From a single limbal wound of 2.00 mm both haptics were tied and scleral fixation done of the same dropped IOL, without removal of the IOL from the eye.

Results: IOL was centered and well placed at the first postoperative day and visual acuity was 6/6 at 3 months of follow-up.

Conclusions: Retrieving a dropped IOL and scleral fixation of the same IOL through a single limbal wound is a good alternative technique for scleral fixation of the same dropped IOL.

Simple Technique for IOL Fixation: Retropupillary Approach

First Author: Min KIM

Purpose: To describe a surgical technique for correcting intraocular lens (IOL) dislocation using a retropupillary iris claw IOL (RPIC IOL).

Methods: After performing core vitrectomy and peripheral shaving, conjunctival flap from 11 to 1 o'clock position was made with spring scissors. A 5.5-mm scleral flap was made by using a round blade under the conjunctival flap. The scleral tunnel incision was made into the anterior chamber at the previously constructed scleral flap with a diamond phaco blade and the posteriorly dislocated capsular bag-IOL complex was grasped and lifted with intraocular endoforceps. After injecting viscoelastic material into the anterior chamber, the dislocated capsular bag-IOL complex was translocated into the anterior chamber and was gently removed through the scleral tunnel using IOL forceps. After removing residual capsular fragments from the vitreous cavity, 2 side port incisions were made at 2 o'clock and 10 o'clock positions with a sharp blade, and RPIC IOL was inserted into the anterior chamber through the previously formed scleral tunnel. The claws of RPIC IOL were fixated at 3 o'clock and 9 o'clock position of the iris by using enclavation needle.

Scleral tunnel incision was closed by using 10-0 nylon sutures. Additional retinal procedures such as fluid air exchange, endolaser photocoagulation, and intravitreal gas or silicone oil injection were performed according to the combined retinal pathology.

Results: Surgery was successfully completed in all the patients without any significant complications.

Conclusions: RPIC IOL implantation is a simple, safe, and effective procedure for correcting IOL dislocation of various causes.

Spectroscopic Revelation

First Author: Minu MATHEN

Purpose: To demonstrate the biomechanical changes on the anterior lens capsule after staining with Trypan blue dye by laser spectroscopy.

Methods: Trypan blue-stained anterior lens capsules were subjected to laser spectroscopy at different dilutions of the dye and for different durations of time. Biomechanical changes at the molecular level were analyzed.

Results: The dye-stained capsules showed changes in their protein structure from tightly packed triple helical structure to random coils. These changes happened after 15 seconds of exposure in capsules stained with 1 in 5 dilution of the dye.

Conclusions: Trypan blue-stained capsules become less elastic and stiffer. These effects start after 15 seconds of exposure of 1 in 5 diluted dye.

Retina (Surgical)

2-Stage En-Bloc Excision of a Retinal Hemangioma

First Author: Komal AGARWAL

Co-Author(s): Jay CHHABLANI, Mahima JHINGAN, Padmaja KUMARI RANI

Purpose: To discuss a 2-stage procedure in the surgical management of retinal capillary hemangioma focusing on intraoperative challenges.

Methods: A 31-year-old male presented with diminution of vision in the right eye for 10 days with a visual acuity of hand motions only. On examination, festooned pupil and a complicated cataract were noted with no view of the retina. Ultrasonography of the right eye showed retinal detachment in all quadrants with suspected areas of traction. Left eye examination was within normal limits. He underwent a pars plana lensectomy following which an inferior large retinal hemangioma was noted as a surgical surprise with dilated and tortuous feeder artery and draining vein.

The hemangioma was managed by a 2-stage procedure including ligation of the feeding artery in the first step and the en-bloc excision of the angioma later on.

Results: The postoperative period was uneventful with visual acuity maintained at 20/200 with attached macula; however, inferior recurrent retinal detachment was noted at 6 months' follow-up. No reproliferation of the angioma was noted. A 2-stage procedure ensured a bloodless field. By the time of the second surgery the size of the angioma had significantly reduced with shrinkage in size of feeder vessels, thus making our intraoperative manipulations easier.

Conclusions: This video demonstrates a novel approach to the management of complex retinal detachments associated with retinal capillary hemangiomas.

Diabetic Vitrectomy: The Whole Show

First Author: Vivek DAVE

Co-Author(s): Rajeev PAPPURU

Purpose: To demonstrate various surgical scenarios that a surgeon encounters while operating on a case of proliferative diabetic retinopathy.

Methods: A series of cases will be described showing different surgical scenarios including vitreous hemorrhage, taut posterior hyaloid, tractional and combined retinal detachment, and vitreoschisis. Concepts about intraocular entry, cortical vitreous removal, posterior hyaloid management, and endolaser will be discussed. Identifying and managing the difficult scenario of vitreoschisis shall also be discussed.

Results: The audience will be educated about the various surgical difficulties and nuances of operating in a diabetic eye.

Conclusions: Diabetic vitrectomy is a challenging surgical scenario which requires the vitreoretinal surgeon to assess every case uniquely with precise surgical manipulation for optimal results.

Endoscopic Pars Plana Vitrectomy: Tips and Tricks

First Author: Komal AGARWAL

Co-Author(s): Jay CHHABLANI, Rajeev PAPPURU, Sumit RANDHIR SINGH

Purpose: Vitreoretinal surgeries in cases of anterior segment opacities were highly challenging in the past. With the advent of endoscopic techniques, vitrectomy is made possible without any concomitant corneal intervention. This video demonstrates the various case scenarios like rhegmatogenous retinal detachment and intraocular foreign body removal in patients with media opacities.

Methods: Endoscopic viewing systems have 3

components: xenon light source, a charge-coupled device (CCD) camera for image capture, and an endolaser. Endoscopic vitrectomy in cases of rhegmatogenous retinal detachment involves surgical steps similar to conventional vitrectomy including vitrectomy, break identification, endolaser, and silicone oil injection. The differences (ie, side on viewing, 2-dimensional view, learning curve for orientation, magnification) provide certain unique challenges to surgeons.

Results: Endoscopic vitrectomy provides acceptable results in some of these nonsalvageable eyes with anterior segment opacities. Early removal of intraocular foreign body through the limbal route can help prevent its encapsulation and development of endophthalmitis. Eyes with keratoprosthesis in situ regain visual acuity after retinal detachment surgery (ie, vitrectomy and silicone oil tamponade). Similarly, diagnostic endoscopy helps visualize the optic disc, macula, and presence of ciliary body membranes, thereby helping in prognostication and planning any future surgeries.

Conclusions: Endoscopic techniques provide a new surgical tool in the armamentarium of vitreoretinal surgeons. However, the learning curve is steep along with certain inherent limitations such as 2-dimensional view, absence of bimanual instrumentation at present, and difficult postoperative evaluation. On the other hand, it eliminates blind spots with visualization and access to areas inaccessible with conventional viewing systems.

Endoscopic Vitrectomy in Complex Retinal Detachments

First Author: Vivek DAVE

Co-Author(s): Rajeev PAPPURU, Mudit TYAGI

Purpose: To describe the set-up, application, and outcomes of endoscopic vitrectomy in various clinical scenarios.

Methods: The video will explain the hardware requirements for setting up an endoscopic vitrectomy unit. The functions and utility of the various parts shall be described. The various indications of using endoscopy in vitreoretina shall be discussed. This will be followed by various case examples where endoscopic vitrectomy was applied to obtain a favorable outcome which otherwise would not have been possible with conventional surgery. The results of our in-house experience in this art shall be discussed.

Results: The video will acquaint viewers with the entire set-up and application of endoscopic vitrectomy and allow them to consider including the skill in their armamentarium.

Conclusions: Endoscopic vitrectomy is an indispensable tool in dealing with posterior segment pathology where

visualization is compromised due to anterior segment disease.

Inverted Internal Limiting Membrane Flap Technique for the Treatment of Large Idiopathic Macular Hole

First Author: Diva MISRA

Co-Author(s): Pritam BAWANKAR, Nilutparna DAS, Fazil KHURRUM, Pranjal MISHRA, Ronel SOIBAM

Purpose: Video presentation of inverted internal limiting membrane (ILM) flap technique for the treatment of large idiopathic macular hole.

Methods: A 69-year-old female presented to the vitreoretina department of our institute with the chief complaint of progressive loss of vision in the right eye over the period of 6 months. On examination her best corrected visual acuity in the right eye was counting fingers at 3 meters and 6/36 in the left eye. The patient underwent right eye cataract surgery 1 year prior. The patient had less vision in the left eye due to nuclear cataract. Fundus examination and optical coherence tomography confirmed large idiopathic macular hole (628 μ m) in the right eye. She was advised to undergo right eye macular hole surgery. The patient underwent standard 3-port pars plana vitrectomy with a modification of the standard technique, called the inverted ILM flap technique. In the inverted ILM flap technique, instead of completely removing the ILM after Brilliant Blue staining, a remnant attached to the margins of the macular hole was left in place. This ILM remnant was then inverted upside down to cover the macular hole. Fluid-air exchange was then performed. She was advised prone position for 1 week.

Results: Best corrected visual acuity of 6/9 was achieved in the right eye at 3-month postoperative follow-up with U-shaped closure observed on optical coherence tomography.

Conclusions: The inverted internal limiting membrane flap technique improves both the functional and anatomic outcomes of vitrectomy for large macular holes.

Management of Rhegmatogenous Retinal Detachment Secondary to a Full Thickness Macular Hole in Juvenile Retinoschisis

First Author: Kaustubh HARSHEY

Co-Author(s): R MADHUKUMAR

Purpose: To describe the surgical management of a rhegmatogenous retinal detachment (RD) secondary to a large full thickness macular hole in a patient with juvenile retinoschisis and correlation of optical coherence tomography (OCT) findings to intraoperative behavior of the vitreomacular interface.

Methods: A 13-year-old male presented with sudden painless loss of vision in the right eye. Clinical examination and spectral domain OCT revealed a large full thickness macular hole with vitreomacular traction, foveal schisis, and total rhegmatogenous RD in the right eye whereas the left eye showed typical features of juvenile retinoschisis. The right eye underwent pars plana vitrectomy with Brilliant Blue G-assisted internal limiting membrane (ILM) peeling, endolaser, and silicone oil injection.

Results: The OCT of the macular hole showed peculiar outward rolled edges of the retina with vitreomacular traction. The floating operculum was the posterior layer of vitreoschisis as correlated surgically during vitrectomy. Following surgery, the retina attached and the hole achieved a type 2 closure at 1 month with oil in situ and a best corrected visual acuity of 6/60 in the operated right eye.

Conclusions: This is the first report of surgical management of rhegmatogenous RD secondary to a macular hole in juvenile retinoschisis. OCT is an invaluable tool to predict the intraoperative vitreomacular interface relationship in these cases. Pars plana vitrectomy with ILM peeling is a viable option to manage such cases and attention should be paid to the vitreomacular interface in these patients due to the frequent occurrence of vitreoschisis which will impact the eventual outcome.

Management of Suprachoroidal Hemorrhage With Concurrent Rhegmatogenous Retinal Detachment

First Author: Christina WENG

Purpose: To demonstrate the management of a challenging patient with multiple ocular comorbidities who presented with suprachoroidal hemorrhage and concurrent rhegmatogenous retinal detachment.

Methods: Utilization of video footage to demonstrate surgical intervention which reveals placement of anterior chamber infusion line and one technique of suprachoroidal drainage (scleral cut-down 8 mm posterior to the limbus with utilization of a cyclodialysis spatula to remove clots). Additionally, strategies for performing the subsequent pars plana vitrectomy are also shown.

Results: After surgery, the patient's intraocular pressure normalized and her vision improved back to baseline. Unfortunately, she redetached 2 months postoperatively. Vitrectomy was repeated and she has remained attached for over 1 year.

Conclusions: The presence of a suprachoroidal hemorrhage and a concurrent rhegmatogenous retinal detachment is a rare situation and management is not well-described in the literature. This video

shares many surgical pearls including a technique of suprachoroidal hemorrhage drainage which includes use of an anterior chamber infusion and cyclodialysis spatula, strategy for trocar placement, and application of B-scan ultrasonography to follow the liquefaction of a suprachoroidal hemorrhage.

Managing Vitreoretinal Interface in Diabetic Vitrectomy: Different Case Scenarios

First Author: Bhuvan CHANANA

Co-Author(s): Sudhank BHARTI

Purpose: To demonstrate management of the vitreoretinal interface in proliferative diabetic retinopathy.

Methods: The posterior hyaloid phase in proliferative diabetic retinopathy (PDR) is usually thick, taut, and firmly adherent to the underlying retina at multiple sites. Induction of posterior vitreous detachment (PVD) is often difficult due to strong attachments at the disc and areas of neovascularization and frequent presence of vitreoschisis. Advances in vitreous surgery like microincision vitrectomy systems, better viewing devices, and careful dissection techniques have made it possible to manage such difficult cases.

Results: Video clips demonstrating successful PVD induction in difficult situations, management of dense subhyaloid hemorrhage in PDR, dissection of thick and firmly adherent fibrovascular fronds in advanced end-stage PDR, and use of perfluorocarbon liquids (PFCL) during diabetic vitrectomy will be presented.

Conclusions: The posterior hyaloid phase in PDR is usually thick and firmly adherent to the underlying retina at multiple sites. However, with a microincision vitrectomy system, advanced instrumentation, and careful dissection techniques, most of the cases can be managed successfully.

Modified Inverted Internal Limiting Membrane Flap Technique for the Treatment of Chronic and Large Idiopathic Macular Hole

First Author: Pritam BAWANKAR

Co-Author(s): Nilutparna DAS, Surpriya HAWAIBAM, Diva MISRA, Ronel SOIBAM

Purpose: Video presentation of modified inverted internal limiting membrane (ILM) flap technique for the treatment of chronic and large idiopathic macular hole (MH).

Methods: A 76-year-old female presented to the vitreoretina department of our institute with a chief complaint of progressive loss of vision in the left eye (LE) over the period of 12 months. On examination, her best corrected visual acuity in the LE was 20/400 and 20/80 in the right eye. She underwent left eye

cataract surgery 1 year prior. The patient had less vision in the right eye due to nuclear cataract. On ophthalmoscopy and optical coherence tomography, large idiopathic macular hole (728 μm) in the LE was confirmed. The patient was advised for LE macular hole surgery. The patient underwent standard 3-port pars plana vitrectomy with modifications of inverted ILM flap technique that improve retention of the ILM flap on the macular surface. In this technique after folding the ILM flap inside the macular hole, approximately 0.2 mL of viscoelastic is injected over the ILM flap, forming a “viscoelastic cap” that helps in retention of the flap inside the macular hole during a fluid-gas exchange.

Results: Best corrected visual acuity of 20/80 was achieved in the LE at 3 months’ postoperative follow-up with U-shaped closure observed on optical coherence tomography.

Conclusions: We present a modified ILM flap technique to improve retention of the ILM flap within the macular hole and improve the reliability and reproducibility of the operation. This is a procedure suitable for redo cases where there is no ILM bordering the macular hole.

Novel Techniques of Macular Hole Repair

First Author: Avantika DOGRA

Co-Author(s): Jay CHHABLANI, Sumit RANDHIR SINGH

Purpose: Conventional internal limiting membrane (ILM) peeling has a high closure rate of more than 90%. However, some special situations like recurrent, large, traumatic, and chronic macular holes merit special attention in which anatomical success has been low. Over the past decade, a number of modifications have been introduced which have brought a paradigm shift in the hole closure rates along with good functional outcome. This video intends to highlight these innovative techniques along with the surgical outcomes.

Methods: The inverted ILM flap technique involves placing a small remnant of peeled ILM that was left attached to the hole margins on the macular hole upside down. Similarly, a free flap with similar dimension to the macular hole is recovered from the margin of previously peeled ILM in the ILM free flap technique. Autologous neurosensory retinal free flap involves lifting a full thickness flap from a nearby location and placing it over the hole. Lens capsular flap transplantation offers an alternative of using anterior or posterior lens capsule at the base of the hole.

Results: These newer modalities were employed for large or refractory macular holes. A favorable anatomical outcome was observed in all of the cases followed by a modest improvement in visual acuity.

Conclusions: The above described techniques are

found suitable in these special situations where conventional ILM peeling procedures have traditionally been found to give unsatisfactory results either in the form of nonclosure or type 2 closure (flat open). However, long-term functional outcomes and effects of structural remodeling are yet to be analyzed.

Pearl in the Oyster!

First Author: Krishnendu NANDI

Purpose: To report a rare case of misdirection of Ozurdex implant into the crystalline lens and how that implant was replaced again in the vitreous cavity.

Methods: A known diabetic patient reported with diabetic macular edema and nonproliferative diabetic retinopathy in both eyes with baseline vision of 6/18, N 12 in the right eye and 4/60, N 24 in the left eye. The patient was advised to receive injection Ozurdex in both eyes. Injection was given in the left eye first. Ozurdex implant was misdirected into the crystalline lens instead of the vitreous cavity. The patient was then taken up for phacoemulsification with intraocular lens implantation along with vitrectomy with posterior vitreous detachment (PVD) induction.

Results: It was a challenge to preserve the Ozurdex implant while doing phacoemulsification and vitrectomy. The case was managed successfully and the implant was placed in the vitreous cavity.

Conclusions: To the best of our knowledge such a case has never been reported before.

The Humble Needle

First Author: P Mahesh SHANMUGAM

Purpose: In the era of robotic vitreoretinal surgery, we look at the other end of the technology spectrum. The myriad ways a simple, disposable, hypodermic needle can be used to perform critical steps of different vitreoretinal surgical procedures is the highlight of this video.

Methods: A simple disposable needle has been used in myriad ways to facilitate various steps of vitreoretinal surgery.

Results: Various simple and complex steps of vitreoretinal surgery were accomplished with the disposable needle.

Conclusions: A simple disposable needle is an essential instrument in vitreoretinal surgery.

Triamcinolone Acetonide-Assisted Removal of Cortical Vitreous in Vitrectomy in High Myopes

First Author: Kelvin LI

Co-Author(s): Elizabeth CHIN, Louis LIM, Tock Han LIM, Wei Kiong NGO, Colin TAN

Purpose: Identification and removal of cortical vitreous can be difficult during vitrectomy in patients with high myopia, particularly in the setting of a rhegmatogenous retinal detachment, due to the mobility of the detached retina. Residual posterior hyaloid can subsequently lead to proliferative vitreoretinopathy. In this video, we demonstrate the use of triamcinolone acetonide (TA) in elucidation of cortical vitreous in highly myopic patients with rhegmatogenous retinal detachment.

Methods: A patient with high myopia who had rhegmatogenous retinal detachment underwent vitrectomy as part of the repair of his retinal detachment. As the detached retina was highly mobile, we opted to use TA to visualize the cortical vitreous to aid removal. A Tano scraper was also used to remove the cortical vitreous.

Results: We successfully demonstrated the use of triamcinolone acetonide in elucidation of cortical vitreous and its removal using Tano scraper and active aspiration during vitrectomy in a highly myopic patient with rhegmatogenous retinal detachment.

Conclusions: Triamcinolone acetonide-assisted cortical vitreous stripping using sequential or bimanual Tano scraper/aspiration technique can successfully remove patches of attached cortical vitreous in highly myopic patients even with rhegmatogenous retinal detachment with mobile retina.

Unconventional Ways of PVD Induction in Difficult Cases of Vitrectomy: Mega Weiss Ring Technique

First Author: Naresh BABU

Co-Author(s): Jayant KUMAR, Kim RAMASAMY

Purpose: To demonstrate the ways of inducing posterior vitreous detachment (PVD) during vitrectomy.

Methods: PVD induction is a major step in vitreoretinal surgeries, the importance of which has often been understated. We present a video compilation of the unconventional ways of PVD induction in difficult situations where the conventional method of starting from the margins of the disc does more damage than help.

Results: Advanced diabetic retinopathy cases often result in multiple retinal breaks in the posterior pole while removing the membranes and vitreous from the posterior pole, compromising the final visual outcome. Our video clearly demonstrates how inducing PVD

from the periphery and extending it to the posterior pole actually helps in smooth execution of the surgery without unwanted retinal breaks. Another major difficulty often faced is dealing with the thin sheet of vitreous in cases with anomalous PVD. We have demonstrated the method for complete PVD induction in cases of anomalous PVD in retinal detachment, re-retinal detachment, and also in pediatric vitrectomy cases. The video depicts a coordinated use of Tanos, perfluorocarbon liquid (PFCL) bubble, and forceps in a manner which is easy to learn and which provides consistent results.

Conclusions: In this video we also demonstrate the mega Weiss ring method of inducing PVD in vitrectomy.

Various Challenges Encountered in Cases of RD Secondary to Acute Retinal Necrosis and the Surgical Approach in These Cases

First Author: Hitesh AGRAWAL

Co-Author(s): Rajeev PAPPURU, Mudit TYAGI

Purpose: The purpose of this video is to demonstrate the various challenges encountered in cases of retinal detachment (RD) secondary to acute retinal necrosis (ARN) and the surgical approach in these cases.

Methods: In this video we have demonstrated the various challenges encountered in cases of RD secondary to ARN and the surgical approach in these cases.

Results: Retinal detachment, often complicated by proliferative vitreoretinopathy, occurs in up to three quarters of patients with ARN and can have both rhegmatogenous and tractional components.

Conclusions: Scleral buckle in such cases does not seem to significantly affect visual and anatomical outcomes. However, a relatively better prognosis is reported in patients who underwent vitrectomy and silicone oil tamponade during the initial surgery.

Vitrectomy in Cases of Endophthalmitis

First Author: Muhammad KHAN

Purpose: To highlight difficulties in vitrectomy in cases of endophthalmitis.

Methods: An interventional study comprising 3 cases of endophthalmitis that underwent vitrectomy: 1) post-cataract surgery endophthalmitis; 2) posttraumatic (penetrating trauma) endophthalmitis; 3) redo vitrectomy in case of vitrectomy with silicone oil.

Results: To achieve favorable results in terms of vision and cosmesis early and complete vitrectomy is indicated in cases of endophthalmitis.

Conclusions: Earlier and complete vitrectomy resulted in better visual prognosis.

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