



New England Ophthalmological Society

770th meeting

**COMPLICATIONS OF EMERGING
SURGICAL PROCEDURES**

Samir Melki, MD, PhD
MODERATOR

Jeremy Kieval, MD
PROGRAM COMMITTEE COORDINATOR

**SUBSPECIALTY SESSIONS:
NEURO-OPHTHALMOLOGY**

Thomas Hedges, MD
MODERATOR

UVEITIS MASQUERADES

Nicholas Butler, MD
MODERATOR

Michael Yoon, MD
PROGRAM COMMITTEE COORDINATOR

NEOS ANNUAL HECHT POSTER CONTEST

Donna Siracuse-Lee, MD
MODERATOR

JUNE 1, 2018

Back Bay Event Center
180 BERKELEY STREET | BOSTON, MA 02110

the 770th meeting of



New England Ophthalmological Society

A Public Foundation for Education in Ophthalmology

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June 1, 2018

BACK BAY EVENT CENTER
180 Berkeley Street
Boston, MA 02110

COMPLICATIONS OF EMERGING SURGICAL PROCEDURES!

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Accreditation:

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The New England Ophthalmological Society is accredited by the Massachusetts Medical Society to provide continuing medical education for physicians.

PRESIDENT'S MESSAGE



While I am unable to be with you at this June NEOS meeting, as I am out of the country on yet another medical mission, I wanted to take this opportunity to review the accomplishments of the Executive Board of NEOS for this past year. It has been an exciting year to have led NEOS as its President. Your Board has been proactive in developing an ad hoc CME Board Seat which was recognized by our accrediting organization which saw its way to grant NEOS another 4 years re-accreditation for its CME credits. This, was essentially, the longest available re accreditation term available for an organization of our nature. We also developed an ad hoc Board seat for the Young Ophthalmologist Committee. Your Board considers this new Committee to be a cornerstone of the future development of our membership. Hence, its important is reflected in the development of its Board seat. In addition, your Board developed bylaw changes to elect Members in Training and allowing them NEOS status so that they have access to the Freeman Video Library and meetings. We were active in awarding the Distinguished Achievement Award to Dr. Langston this past April. Furthermore, your Board has finally moved to a more electronic format for its meetings. And as always, the Program Committee has been exceptional in leading us to excellent sessions throughout this past year. Compliments to all on the Program Committee, especially its Chairperson, Dr. Joel Geffin.

Finally, I would like to take this opportunity to thank all the members of NEOS for allowing me to become President this year. It has been an honor and privilege to serve as your President. Enjoy your meeting, posters, Grand Rounds, and collegiality.

Yours in NEOS,

A handwritten signature in black ink, appearing to read "John J. Dagianis". The signature is fluid and cursive.

John J. Dagianis, MD
President

GUEST OF HONOR



AMAR AGARWAL, MS, FRCS, FRCOphth

Past President- International Society of Refractive surgery (ISRS)

Secretary General- Indian Intraocular Implant and Refractive Society (IIRSI)

Amar Agarwal is the pioneer of Phakonit which is Phako with a Needle Incision Technology. This technique became popularized as Bimanual phaco, Microincision cataract surgery (MICS) or Microphaco. He is the first to remove cataracts through a 0.7 mm tip with the technique called Microphakonit. He has also discovered No anesthesia cataract surgery and FAVIT a new technique to remove dropped nuclei. The air pump which was a simple idea of using an aquarium fish pump to increase the fluid into the eye in bimanual phaco and co-axial phaco has helped prevent surge. This built the basis of various techniques of forced infusion for small incision cataract surgery. He has also discovered a new refractive error called Aberroopia. He has also been the first to do a combined surgery of microphakonit (700 micron cataract surgery) with a 25 gauge vitrectomy in the same patient thus having the smallest incisions possible for cataract and vitrectomy. He is also the first surgeon to implant a new mirror telescopic IOL (LMI) for patients suffering from age related macular degeneration. He has also been the first in the world to implant a Glued IOL. In this a PC IOL is fixed in an eye without any capsules using fibrin glue. The Malyugin ring for small pupil cataract surgery was also modified by him as the Agarwal modification of the Malyugin ring for miotic pupil cataract surgeries with posterior capsular defects. Dr. Agarwal's eye hospital has also done for the first time an Anterior segment transplantation in a 4 month old child with anterior staphyloma. He also has brought out the technique of IOL Scaffold in which a three piece IOL is injected into an eye between the iris and the nucleus to prevent the nucleus from falling down in posterior capsular ruptures. He has combined Glued IOL and IOL scaffold in cases of PC rupture where there is no iris or capsular support and termed the technique Glued IOL Scaffold. Dr Agarwal's eye hospital has also done for the first time a glued endocapsular ring in cases of subluxated cataract.

Pre Descemet's Endothelial Keratoplasty or PDEK was started by Prof Agarwal . In this the Pre Descemets layer and the Descemet's membrane with endothelium are transplanted en bloc in patients with diseased endothelium. Dr Agarwal's eye hospital has also done for the first time CACXL or Contact lens assisted collagen cross linking a new technique for cross linking thin corneas and have also worked on E PDEK in which an endoilluminator is used to assist in PDEK surgeries. Dr Agarwal has designed the new instrument called the Trocar anterior chamber maintainer now in complicated cases which helps give infusion through the anterior chamber and works like a trocar cannula. He has also started a new technique of iris suturing called Single pass Four Throw (SFT) pupilloplasty. This is used for closed angle glaucoma and for mydriatic cases.

Dr. Agarwal has performed more than 150 live surgeries at various conferences. His videos have won many awards at the film festivals of ASCRS, AAO and ESCRS. He has also written more than 60 books which have been published in various languages- English, Spanish and Polish. He also trains doctors from all over the world in his center on phaco, glued IOL, lasik and retinal surgeries. He is Chairman and managing director of Dr. Agarwals group of eye hospitals which has 75 eye hospitals all over the world.

MORNING SESSION

COMPLICATIONS OF EMERGING SURGICAL PROCEDURES

Moderator: Samir Melki, MD, PhD

Program Committee Coordinator: Jeremy Kieval, MD

Professional Practice Gaps:

Using feedback from NEOS members and discussion by the Program Committee, we have identified the following practice gaps: New complications emerging with new techniques; prevention measure associated with a new set of complications; management of new complications not in current armamentarium.

NEOS Program Objectives:

The content and format of this educational activity has been specifically designed to fill the practice gaps in the audience's current and potential scope of professional activities by: Identifying complications associated with emerging surgical procedures; discuss etiology and prevention of a new set of unfamiliar complications; to prepare the surgeon to better manage a new set of complications as they embrace new surgical techniques.

7:00 am	Registration/Exhibits
7:30-8:30	NEOS GRAND ROUNDS – Freedom Room – Lower Level
7:30	Best of the NEOS Hal Freeman Video Library – MAIN HALL
8:30	Introduction.....Samir Melki, MD, PhD
8:35	The Latest in Corneal Surgery: Climbing the Steep Learning Curve Joseph Williams, MD
8:50	New Refractive Frontiers: Facing the Unexpected.....Jason Brenner, MD
9:05	Emerging Glaucoma Surgery: Lower IOP without Raising the Risk.....Susan Liang, MD
9:20	Introduction of Guest of Honor.....Samir Melki, MD, PhD
9:25	Glued IOLs, IOL Scaffold and Other Anterior Segment Acrobatics Amar Agarwal, MS, FRCS, FRCOphth
9:50	<i>Business Meeting</i>
10:00	<i>Refreshment break / Exhibits</i>
10:30	Oculoplastics: Risks and Perils of Novel Procedures.....John Mandeville, MD
10:45	What's Emerging Behind the Lens: New Retina Procedures and associated PitfallsArchana Seethala, MD

MORNING SESSION (continued)

- 11:00 Corneal Transplantation with Pre-Descemet's Endothelial Keratoplasty and Single Pass 4 Throw Pupiloplasty:
Bold and Beautiful Amar Agarwal, MS, FRCS, FRCOphth
- 11:25 Questions and Panel Discussion Samir Melki, MD, PhD, *Moderator*
Amar Agarwal John Mandeville, MD
Jason Brenner, MD Archana Seethala MD
Susan Liang, MD Joseph Williams, MD

11:45 **LUNCHEON SEMINARS:**

I. I. Young Ophthalmologists Luncheon I - *What I should have said... How to Discuss Complications with Patients.*

Drs. Carolyn Kloek and Chandru Krishnan
Freedom Room

This luncheon is open to all, there is no fee, and no CME credit, but must be preregistered

II. Cornea and Anterior Segment Disasters

Dr. Amar Agarwal
Patriot Room

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Be Sure to Scan in for Luncheon II and Afternoon Session to Receive Credit

AFTERNOON SUBSPECIALTY SESSION MAIN HALL

NEURO-OPHTHALMOLOGY

Moderator: Thomas Hedges, MD

Program Committee Coordinator: Michael Yoon, MD

Professional Practice Gaps: Using feedback from NEOS members and Program committee, attendees need more information regarding tests used to evaluate neuro-ophthalmic disorders, especially neuroradiology, electrophysiology and serum analysis for genetic defects and infectious.

NEOS Program Objectives:

The content and format of this education activity has been specifically designed to fill the practice gaps in the audience's current and potential scope of profession activities by:

1. Reviewing when and how to order MRI and CT scans;
2. Discussing when to get genetic and antibody tests;
3. Recommending OCT, visual field and electrophysiology tests.

1:00 pm	Introduction.....	Thomas Hedges, MD
1:05	CAT: Still Useful?.....	Joseph Rizzo, MD
1:20	MRI: How to Order the Right One	Bart Chwalisz, MD
1:35	Genetic Testing for Neuro-ophthalmic Disorders	Marc Bouffard, MD
1:50	Antibody Testing for Neuro-ophthalmology.....	Crandall Peeler, MD
2:05	<i>Refreshment Break/Exhibits</i>	
2:35	OCT for Visual Pathway Diseases	Laurel Vuong, MD
2:50	VEP and ERG in Neuro-ophthalmology	Nurhan Torun, MD
3:05	Visual Fields for Neuro-ophthalmology Diagnosis and Management	Geetha Athappilly, MD
3:20	Panel Discussion	Thomas Hedges, MD, <i>Moderator</i>
	Geetha Athappilly, MD	Crandall Peeler, MD
	Marc Bouffard, MD	Joseph Rizzo, MD
	Bart Chwalisz, MD	Nurhan Torun, MD
4:00	Adjourn	

AFTERNOON SUBSPECIALTY SESSION FREEDOM ROOM (Lower Level)

UVEITIC MASQUERADES

Moderator: Nicholas Butler, MD
Program Committee Coordinator: Michael Yoon, MD

Professional Practice Gaps: Using feedback from NEOS members and Program committee, identified the following professional practice gaps: 1) Non-neoplastic and neoplastic masquerades in uveitis; 2) Identifying signs and symptoms suggestive of a uveitic masquerade, which may help the clinician to differentiate the presentation from that of true ocular inflammatory disease.

NEOS Program Objectives:

The content and format of this education activity has been specifically designed to fill the practice gaps in the audience's current and potential scope of profession activities by:

1. Providing an overview of the various non-neoplastic uveitic masquerades, such as retinitis pigmentosa (especially sine pigmenti variant), pigment dispersion syndrome, ocular ischemic syndrome, ocular amyloid, among others, with particular attention to the various signs and symptoms that may help to differentiate these diseases from uveitis.
2. Updating the audiences' understanding of the various presentations of and diagnostic approach to lymphomatous disease of the eye, focusing on primary intraocular lymphoma while also addressing primary uveal lymphoma and systemic lymphoma.
3. Reviewing additional neoplastic masquerades, including other hematologic malignancies such as leukemias and multiple myeloma, as well as solid tumors in both the adult and pediatric populations.

1:00 pm	Introduction of Session	Nicholas Butler, MD
1:05	Introduction of the Uveitic Masquerades.....	Ninani Emang Kombo, MD
1:20	Primary Intraocular Lymphoma	C. Stephen Foster, MD
1:35	Non-CNS Ocular Lymphoma: Primary Uveal Lymphoma and Systemic Lymphoma	Lucia Sobrin, MD
1:50	Other Hematologic, Neoplastic Masquerades.....	Robert Janigan, MD
2:05	Solid Tumor Masquerades in Adults.....	Jay Duker, MD
2:20	Juvenile Neoplastic Masquerades.....	Ankoor Shah, MD
2:35	<i>Refreshment Break/Exhibits</i>	
3:05	Panel: Mystery Case Presentations of Uveitic Masquerades	Nicholas Butler, MD, <i>Moderator</i>
	Jay Duker, MD	Ninani Emang Kombo, MD
	C. Stephen Foster, MD	Ankoor Shah, MD
	Robert Janigan, MD	Lucia Sobrin, MD
4:00	Adjourn	

THE LATEST IN CORNEAL SURGERY: CLIMBING THE STEEP LEARNING CURVE

Joseph M. Williams, MD, PhD

WORCESTER, MA

Objective: To discuss emerging cornea procedures and identify complications associated with these procedures

The last 25 years has seen both a revolution and evolution of corneal surgery encompassing both corneal modification procedures and corneal replacement procedures. When compared to the last 100 years this has occurred at a head spinning pace and has resulted in a virtual alphabet soup of abbreviations to describe these new surgical procedures: PRK, LASIK, LASEK, SMILE, cornea CXL, epi on CXL, epi-off CXL, intrastromal rings/segments, PKP, ALK, ALTK, DALK, DLEK, DSEK, DSAEK, UT-DSAEK, NT-DSAEK, PDEK, DMEK, DSET, DWEK, DSO . The common thread to the evolution of these procedures is standardization of the techniques and minimizing operative and post-operative complications. Complications may occur intra-operatively or post-operatively and can be broadly grouped as mechanical, inflammatory, and infectious. Complications specific to these evolving procedures that will be addressed include: pupillary block; graft preparation, unfolding, orientation; graft adherence/dislocation; Descemets perforation in DALK; post-operative complications of interface infections; increased incidence of fungal infections. There are excellent resources on the internet that allow an incredible amount of self-education, discussion, and online debate of these revolutionary and evolutionary techniques with complete surgical videos. While these resources are not peer reviewed they are real time and more current than any print journal. It is up to each individual ophthalmologist to determine and evaluate the validity of these sources. The internet blog “kera-net” offers some of the best current information on these evolving corneal surgical procedures.

References: “Kera-net” --- May be joined through the Cornea Society website

Moloney MD, Greg DWEK/DSO: https://www.youtube.com/watch?v=E7qhbsfx_yY

Davies E, Jurkunas U, Pineda II, R. Predictive Factors for Corneal Clea

NEW REFRACTIVE FRONTIERS: FACING THE UNEXPECTED

*Jason Brenner, MD
Boston Eye Group*

BROOKLINE, MA

Objective: To review complications of emerging refractive procedures that may be routinely encountered and how to address them.

A case based series of refractive complications will be presented with corneal and ocular imaging as well as surgical video when appropriate. Topics discussed will include corneal haze after presbyopia correcting corneal inlays (Raindrop and Kamra), cataract surgery in the setting of corneal inlays and phakic intraocular lenses (Visian ICL), intraoperative LASIK flap creation issues with the femtosecond laser and enhancement options after small incision lenticule extraction (SMILE).

References: Fadlallah, A, Melki S. (2017) LASIK Emergencies, A Video Primer. Thorofare, NJ: Slack.

Brennan, K. Risk Management for Corneal Inlays. Review of Ophthalmology, July 2017.

Siedlecki J et al. Enhancement after Myopic SMILE using Surface Ablation. JRS 33(8)

EMERGING GLAUCOMA SURGERY: LOWER IOP WITHOUT RAISING THE RISK

Susan Liang, MD
Tufts Medical Center

BOSTON, MA

Objective: To review complications associated with the most current Micro-Invasive Glaucoma Surgeries and their management.

In today's glaucoma treatment paradigm, tube shunts and trabeculectomy continue to be most efficacious in lowering eye pressure. According to the TVT studies, the 5- year average IOP for tube and trabeculectomy was 14.4 mmHg and 12.6 mm Hg respectively. Although highly effective, both surgeries carry similar rates of dreaded and potentially vision-threatening complications, like blebitis, endophthalmitis, hypotony maculopathy, and choroidal hemorrhage. Micro-invasive glaucoma surgery (MIGS) has emerged to provide safer, and less invasive surgical treatment options with modest efficacy. This presentation will review the safety profile of the most current MIGS that target increasing trabecular, suprachoroidal, and subconjunctival flow, and discuss strategies to manage complications as these new surgeries are implemented in daily practice.

References: Samuelson TW, et al. Randomized Evaluation of the trabecular micro-bypass stent with phacoemulsification in patients with glaucoma and cataract. *Ophthalmology* 2011; 118(3): 459-467.

Vold S, et al. Two year COMPASS trial results: supraciliary microstenting with phacoemulsification in patients with open angle glaucoma and cataract. *Ophthalmology* 2016; 123: 2103-2112.

Grover DS, et al. Performance and safety of a New Ab Interno Gelatin Stent in Refractory Glaucoma at 12 Months, *American Journal of Ophthalmology* 2017; 183: 25-36.

GLUED IOLS, IOL SCAFFOLD AND OTHER ANTERIOR SEGMENT ACROBATICS

Amar Agarwal, MS, FRCS, FRCOphth

CHENNAI, INDIA

Various sticky situations are there in cataract surgery in which implanting an IOL is difficult. In such cases the Glued IOL works well and can restore vision to the patient. In this two scleral flaps are created 180 degrees apart and the three piece PC IOL haptics externalised through the sclerotomies and tucked into intrascleral pockets and the. Glued down using fibrin glue. Marfans syndrome, traumatic cases. PC ruptures all can benefit from this procedure .

OCULOPLASTICS: RISKS AND PERILS OF NOVEL PROCEDURES

John Mandeville, MD

BOSTON, MA

Objective: To identify and initiate management of complications from novel oculoplastic surgeries.

Novel procedures in the field of ophthalmic plastic surgery tend to fall in one of a few categories: (1) the application of new materials, (2) alternate anatomic approaches to address pathology, and (3) use of new technology or instruments. Due to the high success rates of standard oculoplastic techniques, the adoption of novel procedures in oculoplastic surgery may lag behind other ophthalmic specialties. Complications from these newer procedures are relatively rare and procedure-specific, published as case reports or presented at specialty-specific meetings. In this discussion, we will review different types of complications that arise from novel oculoplastic techniques, including adverse reactions to implanted materials, migration of implants, hemorrhage and infection, malposition of the lids or globe, and failure to correct the underlying problem. We will also address diagnosis and management options from the general ophthalmologist's perspective.

Reference: Ganguly A, Pappuru RR, Ali MJ, Mishra DK, Naik MN. Ophthalmic Artery Occlusion Following Transconjunctival Orbitotomy. *Ophthal Plast Reconstr Surg*. 2017 May/June;33(3S Suppl 1):S171-S173.

Jordan DR, Stoica B. Filler Migration: A Number of Mechanisms to Consider. *Ophthal Plast Reconstr Surg*. 2015 Jul-Aug;31(4):257-62.

Ko MJ, Morris CK, Kim JW, Lad SP, Arrigo RT, Lad EM. Orbital fractures: national inpatient trends and complications. *Ophthal Plast Reconstr Surg*. 2013 Jul-Aug;29(4):298-303.

WHAT'S EMERGING BEHIND THE LENS: NEW RETINA PROCEDURES AND ASSOCIATED PITFALLS

Archana Seethala, MD
Boston University Medical Center

BOSTON, MA

Objective: To highlight cutting edge advancements in the field of vitreoretinal surgery as well as their associated risks and complications.

We have seen incredible progress in the field of vitreoretinal disease over the last few decades including but not limited to - intravitreal injections, OCT/ OCT angiography, and small (27) gauge vitrectomy - which have all changed the scope of how we approach and treat retinal disease. These innovations continue to improve the way we practice, as well provide further options for our patients.

During this presentation we will discuss several of these developments including sutureless scleral fixated IOLs, Argus II retinal implants, stem cell / gene therapy for dry macular degeneration and hereditary retinal dystrophies . We will also briefly introduce advanced 3D surgical imaging.

While promising, all of these advancements do have their own respective limitations, complications and concerns.

References: Humayun MS et al. A bioengineered retinal pigment epithelial monolayer for advanced dry age related macular degeneration. *Sci Transl Med.* 2018 Apr 4;10(435)

Ameri H. Prospect of retinal gene therapy following commercialization of voretigene neparvovec-rzyl for retinal dystrophy mediated by RPE65 mutation. *J Curr Ophthalmol.* 2018 Feb 16;30(1)

Prenner JL. A novel approach for posterior chamber intraocular lens placement or rescue via a sutureless scleral fixation technique. *Retina* 2012;32 853-855.

Coppola M , et al. Heads up 3D vision systems for retinal detachment surgery. *Int J Retina Vitreous* 2017 Nov 20;3:46

Da Cruz L, Dorn JD, Humayun MS , et al . Five – year safety and performance results from the argus II retinal prosthesis system clinical trial. *Ophthalmology.* 2016 Oct;123(10):2248-54.

**CORNEAL TRANSPLANTATION WITH PRE-DESCEMETS ENDOTHELIAL
KERATOPLASTY AND SINGLE PASS 4 THROW PUPILLOPLASTY:
BOLD AND BEAUTIFUL**

Amar Agarwal, MS, FRCS, FRCOphth

CHENNAI, INDIA

PDEK implants the endothelium Descemets membrane and the pre Descemets later. This is about 25 micron. The biggest advantage is that this can be prepared from any donor age. It has the advantages of both DSEK and DMEK without their disadvantages. Single pass 4 throw pupilloplasty helps open the closed angle glaucoma cases and also helps in cases of bad pseudo phakic bullous keratopathy. This is a simple procedure which can be easily replicated.

NEOS SCIENTIFIC POSTER PROGRAM

Hecht Awards for Best Resident and Fellow Posters

Residents and fellows from all the New England ophthalmologic teaching programs have submitted abstracts for our annual scientific poster presentation contest being conducted today. Posters will be judged on originality and scientific merit. Awards will be made for the first prize \$500.00, second prize \$300.00, third prize \$200.00 and three honorable mentions of \$50.00 each. Funding for the awards is derived from a gift to the NEOS Education Endowment Fund honoring the late Sanford Hecht, MD.

Please take some time to stop by these interesting posters in the lower lobby.

NEOS thanks Donna Siracuse-Lee, MD, the Moderator of the Poster Contest, and this year's judges, Crandall Peeler, MD, Veena Mathew, MD and Angela Turalba, MD

DOXORUBICIN (DXR) & HIF-1 INHIBITOR (HIF-1I) POLYMER CONJUGATES IN CHOROIDAL (CNV) AND RETINAL NEOVASCULARIZATION (RNV) MODELS

Rishi Chadha, BS

Frank H. Netter School of Medicine at Quinnipiac University

HAMDEN, CT

Objective: To determine the efficacy of novel therapeutics for the treatment of retinal and choroidal neovascularization.

Ocular neovascularization is a huge cause of vision loss in individuals throughout the world. The two main types are retinal (RNV) and choroidal neovascularization (CNV). RNV occurs in ischemic retinopathies such as diabetic retinopathy, the most common cause of moderate to severe vision loss in working class Americans. CNV occurs in diseases such as age related macular degeneration (AMD) and is the leading cause of vision loss in people ages 50 and over. While there are treatments, many have limited efficacy thus requiring consistent treatment which can lead to reduced patient compliance. Doxorubicin (DXR) and HIF-1 Inhibitor (HIF-1I) targets HIF-1, a master regulator of angiogenesis. This study will evaluate whether DXR and HIF-1I are effective treatment options for RNV and CNV. We used CNV and oxygen-induced retinopathy (ROP) generated mice models and conducted intraocular injections of both the DXR and HIF-1I particles as well as controls. Flat mounts of the choroid and retina were taken and neovascularization was measured using fluorescence microscopy and image analysis. Intraocular injection of 1 μ g of HIF-1I in the ROP mice model resulted in a 37% in NV while the injection of 1 μ g of DXR2 resulted in a 28% reduction. Intraocular injection of 1 μ g of HIF-1I immediately after rupture of Bruch's membrane resulted in a 44% reduction in CNV while the injection of 1 μ g of DXR2 resulted in a 38% reduction. Both of these particles showed significant reduction in neovascularization in both CNV and ROP model mice. Future studies may include attempting suprachoroidal injections in rat CNV models. Suprachoroidal injections as this would allow the drug to be in a location where it is needed as well as reduce the risk of many complications such as vitreous hemorrhage, retinal detachment and floaters.

ROLE OF OCT IN MONITORING FOR ETHAMBUOL INDUCED OPTIC NEUROPATHY

*Sona Chaudhry, MD
Boston Medical Center*

BOSTON, MA

Objective: To assess the utility of ocular coherence tomography (OCT) in detecting subclinical ethambutol-induced optic neuropathy.

Introduction: Toxic optic neuropathy is a rare but serious complication of ethambutol use. The incidence of optic neuropathy increases with sustained periods of the drug's standard loading dose (25 mg/kg/day). To date, there are no known strategies for detecting subclinical ethambutol-induced toxicity, which if detected early may be reversed upon stopping the drug. We assess the utility of ocular coherence tomography (OCT) in detecting subclinical ethambutol-induced optic neuropathy.

Methods: We present a prospective case series of seven patients started on ethambutol and referred to the ophthalmology clinic for monthly screening while on the medication. Visual acuity, color vision, automated perimetry, and OCT of the optic nerve head with retinal nerve fiber layer (RNFL) analysis were obtained and analyzed. Progression analysis from the Heidelberg OCT was utilized to track the RNFL thickness over time. Statistical significance was defined as a p-value <0.05.

Results: All seven patients had a baseline BCVA of 20/20, full color vision, and normal RNFL thickness on OCT. All but one patient had full baseline visual field testing. Ethambutol doses ranged from 12.5mg/kg/day to 26.0mg/kg/day. Mean follow up was 5.6 months from initial screening (Range 1-12 months). No patients in the cohort developed afferent visual dysfunction but three of seven cases showed an upward trend in RNFL thickness, although not statistically significant (p-value 0.57 to 1.0).

Conclusion: We demonstrate an upward trend in RNFL thickness in patients following initiation of ethambutol therapy. We hypothesize that this thickening results from subclinical optic nerve toxicity, manifest as subtle axonal swelling that may precede the development of frank optic atrophy. Larger studies are required to determine whether a "threshold" value of thickening exists that is associated with clinical changes in afferent visual function.

THE EFFECT OF EPIRETINAL MEMBRANE ON DRUSEN VOLUME AS QUANTIFIED BY SD-OCT

Emily Li, MD
Yale University

NEW HAVEN, CT

Objective: To quantitatively investigate the relationship between presence of ERM and macular drusen volume in patients with non-exudative AMD.

Background: Macular drusen is a characteristic feature of age-related macular degeneration (AMD), a common disease affecting one in ten adults 75 years and older.¹ The pathophysiology behind drusen accumulation remains uncertain, and there is no known treatment to decrease drusen load, though there have been reports of spontaneous drusen resorption and drusen regression after laser photocoagulation, rhegmatogenous retinal detachment, intravitreal anti-vascular endothelial growth factor injection, and vitrectomy with internal limiting membrane peeling.^{2,3} Select cases from our clinical context suggest there may be an unexplored relationship between the macular drusen present in non-exudative AMD and epiretinal membranes (ERM).

Objective: We aimed to quantitatively investigate the relationship between presence of ERM and macular drusen volume in patients with non-exudative AMD.

Methods: We retrospectively searched records from January 1, 2007 to December 31, 2016 to identify patients who have concurrent diagnoses of macular drusen or non-exudative AMD and ERM using ICD-9 and ICD-10 billing codes. Exclusion criteria included age under 18 years and history of trauma, intravitreal injection, exudative AMD, retinal laser photocoagulation, vitreoretinal surgery, and diabetes mellitus. Of the 163 patients identified, 8 met the inclusion criteria of having macular drusen in both eyes and ERM in one eye, as well as available Heidelberg spectral domain optical coherence tomography (SD-OCT) imaging. Our primary outcome was macular drusen volume in a 6 mm-diameter macular area on SD-OCT, obtained using Heidelberg segmentation software. We derived the drusen volume between Bruch's membrane (BM) and the retinal pigment epithelium (RPE) by first removing automated segmentation of each retinal layer. We manually outlined BM and the RPE such that there was space between the two lines only when drusen was present and obtained volume through Heidelberg segmentation software. Two investigators independently performed this task and average volumes between the two data sets were used in analysis. The Yale University Institutional Review Board approved this study.

Result: The averaged drusen volume was higher in the eye without an ERM compared to the ERM eye in eight out of eight patients. The eyes without an ERM had a mean drusen volume of 0.256 mm³ [+/- 0.153 mm³] while the fellow eyes with an ERM had a mean drusen volume of 0.188 mm³ [+/- 0.063 mm³]. A two-tailed paired t-statistic test yielded a p-value of 0.150.

Conclusion: Our cohort of non-exudative AMD patients with concurrent bilateral macular drusen and unilateral ERM had lower drusen volumes in the ERM eye compared to the fellow eye, as measured by manual segmentation on Heidelberg SD-OCT. Although this difference was not statistically significant in our sample, all eight patients conformed to this trend. Findings warrant further investigation in the relationship between ERM and drusen accumulation with a larger study size. Elucidating a better understanding of macular drusen deposits, a finding present in various vision-threatening diseases including AMD, may benefit global comprehension of their pathophysiology and the driving forces behind the disease processes in which they manifest.

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**OPTIMIZATION OF THE DIAGNOSIS AND MANAGEMENT
OF RETROBULBAR HEMORRHAGES
IN THE ADULT EMERGENCY ROOM SETTING:
A RESIDENTS-EDUCATING-RESIDENTS INITIATIVE**

*Emily Li, MD
Yale University*

NEW HAVEN, CT

Objective: To investigate the effect of implementing a formalized resident-teaching-residents curriculum on the preparation of emergency department residents.

Background: Retrobulbar hemorrhages are one of the most serious ophthalmological emergencies often presenting first to the emergency room setting. Prompt diagnosis and rapid intervention—lateral canthotomy and cantholysis—are crucial to visual prognosis. Given this urgency, it is fundamental to optimize the efficiency and efficacy of recognition and intervention. In the Yale-New Haven Hospital (YNHH) Adult Emergency Department (ED), emergency room providers are almost always the first responders to patients with retrobulbar hemorrhages, followed subsequently by ophthalmology residents. It is unknown whether a formalized curriculum for emergency medicine residents would enhance the preparation of providers to recognize and treat patients with retrobulbar hemorrhages presenting to the YNHH Adult ED.

Methods: We conducted a prospective interventional study to investigate the effect of implementing a formalized resident-teaching-residents curriculum on the preparation of emergency department residents. Our intervention consisted of a 45-minute lecture designed to educate emergency medicine residents on the recognition and treatment of retrobulbar hemorrhages. Our primary outcome measure was the difference in scores from a one-paged written assessment given prior to and after the intervention. The evaluation consisted of five prompts that measured subjective comfort level and objective knowledge base. We asked each resident to disclose their post-graduate year (PGY) and the number of lateral canthotomy and cantholysis procedures they performed prior to our intervention. We used paired t-test to compare scores from before and after our intervention and analysis of variance (ANOVA) to compare scores among the PGY cohorts. We used a two-tailed p-value cutoff of <0.1 to indicate statistical significance.

Result: A total of 21 emergency department residents—six PGY-1, seven PGY-2, two PGY-3, and seven PGY-4—were included in the study. Of these, two residents indicated they each have performed one lateral canthotomy and cantholysis procedure before the study intervention. The mean score was 1.86 prior to intervention and 3.55 after intervention ($p < 0.0001$). We did not perform subgroup analysis within each PGY cohort given their lower n-values do not provide enough statistical power. There was no statistically significant difference in scores among the three PGY cohorts ($p = 0.64$).

Conclusion: Retrobulbar hemorrhages are sight-threatening emergencies that require prompt recognition and management through the performance of a lateral canthotomy and canthoysis to prevent permanent vision loss. We implemented a peer education initiative that significantly improved the preparation of YNHH emergency medicine residents to be able to provide appropriate care for patients with retrobulbar hemorrhages in the YNHH ED.

ENDOCYCLOPHOTOCOAGULATION OUTCOMES FOR DIFFERENT GLAUCOMA TYPES AND STAGES

Michael Lin, MD
Massachusetts Eye and Ear Infirmary

BOSTON, MA

Objective: To evaluate endocyclophotocoagulation outcomes for different glaucoma types and stages.

Purpose/Relevance: Minimally invasive glaucoma surgery has traditionally been thought to be less effective for more advanced stages of glaucoma. Endocyclophotocoagulation shrinks ciliary processes and is thought to decrease intraocular pressure (IOP) by opening the drainage angle and reducing aqueous production. Therefore, this study seeks to determine whether angle configuration and glaucoma disease staging affect ECP outcomes for reduction of both IOP and glaucoma medications.

Methods: Retrospective chart review of eyes that underwent ECP, with or without concurrent cataract extraction, between October 2010 and December 2016 at one institution. Exclusion criteria included not having follow-up at 1 year after surgery. Based on the Hodapp-Parrish-Anderson staging system, patients were divided into mild, moderate, and advanced glaucoma. Outcome measures were degree of IOP reduction and change in number of glaucoma medications.

Results: There were 118 eyes of 97 patients that had at least 1 year of follow-up. Of these, 105 had concurrent cataract extraction. Eyes undergoing standalone ECP had greater IOP reduction than eyes undergoing ECP with concurrent phacoemulsification, but not greater medication reduction (9.1 vs 2.9 mmHg, $p=0.001$; 0.9 vs 0.6 medications, $p=0.36$). Glaucoma severity was mild in 39 eyes, moderate in 34, and advanced in 26. At 1 year, there was no difference in IOP reduction or medication reduction for eyes with mild, moderate, or advanced glaucoma (decrease of 3.0, 3.4, and 2.0 mmHg, respectively, $p=0.56$; decrease of 0.5, 0.8, and 0.7 medications, respectively, $p=0.49$). Greater pre-operative IOP was directly correlated with greater IOP reduction ($R^2=0.69$). The 30 eyes with chronic angle closure glaucoma (CACG) had greater IOP reduction and medication reduction than the 55 eyes with open angle glaucoma (5.5 vs 1.9 mmHg, $p=0.01$; 1.1 vs 0.2 medications, $p=0.0001$).

Discussion: In this study, eyes with CACG were more responsive to ECP than eyes with other types of glaucoma. Stage of glaucoma was not associated with degree of IOP reduction or medication reduction after ECP.

Conclusion: ECP can reduce IOP and medication use, particularly in CACG, and it can be employed for all stages of glaucoma.

POSTER #5 (continued)

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DIRECT-TO-CONSUMER VIRTUAL VISITS: FEASIBILITY OF A NEXT-GENERATION HEALTH CARE DELIVERY SYSTEM IN OPHTHALMOLOGY

*Marissa Lynn, BA
Harvard Medical School*

ROXBURY CROSSING, MA

Objective: To evaluate the feasibility and economics of direct-to-consumer virtual visits (VVs) connecting patients to clinicians on a secure video platform allowing access to care from any location.

Methods: Retrospective review of ophthalmology VVs conducted at Boston Children's Hospital on a custom-designed, device-agnostic, secure video platform. Primary outcome was provider-defined visit efficacy as measured by provider-facing surveys. Secondary outcomes were provider and patient metrics obtained via surveys and comprehensive chart review. Cost savings were calculated with a subset of assumptions for economic modeling of clinical business development used across BCH.

Results: In 13 months, 3 providers conducted 57 VVs with 91% of encounters rated as effective. Patient satisfaction was 90% overall with benefits of convenience (100%), efficiency (82%), and improved access (73%). Providers saw post-operative (26), return (26), and new (5) visits with 37 strabismus, 7 orbital, and 13 ocular surface diagnoses. No negative outcomes were encountered. In comparison to the consumer expense of in-person visits, VVs saved patients ~\$18,686 and >179 hours of travel and wait time.

Conclusions: VVs can provide high patient/provider satisfaction. While there were no negative outcomes, prospective comparisons will be required to evaluate quality and safety. Additionally, VVs offered significant time and cost savings for patients. Provider-sided economics does need to be estimated next to understand if there is similar savings before the economics of VVs is fully understood.

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OUTCOMES IN RESIDENT-PERFORMED CATARACT SURGERIES WITH IRIS CHALLENGES: RESULTS FROM THE PCIOI STUDY

Giannis Moustafa, MD

BOSTON, MA

Objective: A study on surgical education attempting to examine the outcomes of resident and attending surgeons when operating on eyes with iris challenges, and compare between them.

Purpose: To assess the outcomes of resident-performed cataract surgeries with iris challenges and to compare these outcomes to similar surgeries performed by attending physicians.

Setting: Massachusetts Eye and Ear Infirmary, Harvard Medical School.

Design: Retrospective chart review.

Methods: All cases of cataract extraction by phacoemulsification with intraocular lens insertion performed by comprehensive ophthalmologists between January 1 and December 31, 2014, were reviewed, and cases with pre- or intraoperative miosis, iris prolapse, and floppy iris syndrome (IFIS), were included. Visual outcomes and the rate of perioperative untoward events were compared for resident and attending cases. Factors predicting untoward events were also assessed.

Results: In total, 1931 eye cases of 1434 patients were reviewed, and 65 resident and 168 attending cases were included. Mean logMAR best-corrected visual acuity was better in the resident group one month after surgery (0.051 ± 0.10 versus 0.132 ± 0.30 , $p=0.03$), but the difference was eliminated when controlling for macular disease. Mean operative time was 43.8 ± 26.5 and 30.9 ± 12.6 minutes for cases performed by resident and attending surgeons, respectively ($p < 0.0001$). Residents utilized supplemental pharmacologic dilation or retraction more frequently than attendings (98% versus 87% of cases, $p=0.008$). The overall rate of untoward events was no different between residents and attendings ($p=0.16$). Dense nuclear sclerosis predicted untoward events in cataract cases with iris challenges (adjusted odds ratio=1.86, $p=0.001$, 95% confidence interval 1.17-2.94).

Conclusion: Although requiring a longer operative time and more surgical manipulation, resident-performed cataract surgeries with iris challenges achieve outcomes comparable to those performed by attending surgeons, and residents should be given the opportunity to operate on these cases.

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3. Woodfield, *Ophthalmology* 2011;118(5):954-958.

GELATIN-BASED HYDROGEL AS A VEHICLE FOR RETINAL PROGENITOR CELL TRANSPLANTATION

*Jeayoung Park, BS
Yale University*

NEW HAVEN, CT

Objective: Evaluation of in vitro biocompatibility and in vivo transplant survival of retinal progenitor cell grafts using injectable polymer materials as a cell delivery method inside rats.

One of the current limitations of retinal transplantation of stem cells as well as other cell types is loss of cells and low graft survival. Gelatin-Hydroxyphenylpropionic acid (Gtn-HPA) is a biodegradable hydrogel that can undergo gelatinization in vivo, which can preserve injected cells. We tested the hypothesis that Gtn-HPA hydrogel supports survival and integration of RPC transplantation. In vitro biocompatibility of Gtn-HPA with human RPCs (hRPCs) as well as in vivo survival of xenografted GFP+ pig RPCs (pRPCs) in rats were characterized with immunocyto/histochemistry. hRPCs showed equivalent % viability when cultured in a thin layer of Gtn-HPA compared to fibronectin-coated cover slides (control group). Caspase-3 Staining showed minimal apoptotic cells by day 4, and Ki-67 staining demonstrated proliferating cells in all days in culture. Transplanted pRPCs were found in tighter clusters in the subretinal space when injected with Gtn-HPA compared to saline control. GFP+ cell population was roughly equivalent in numbers between the hydrogel and liquid vehicle groups. Subretinal grafts showed no visible immune cell infiltration when stained with CD45. Gtn-HPA shows promise as an injectable and biodegradable polymer vehicle for subretinal stem cell transplantation.

REGIONAL VESSEL CALIBER, RETINAL OXIMETRY AND PREDOMINANTLY PERIPHERAL DIABETIC RETINAL LESIONS AS SURROGATE MARKERS OF NONPERFUSION ON ULTRAWIDE FIELD ANGIOGRAPHY IN DIABETIC EYES

Alex Pisig, MD
Joslin Diabetes Center

ROSLINDALE, MA

Objective: To evaluate whether predominantly peripheral lesions (PPL), regional differences in retinal vessel diameters and oximetry changes are associated with the extent of retinal nonperfusion (NP) on ultrawide field fluorescein angiography in diabetic eyes.

Methods: Vessel diameters, ETDRS diabetic retinopathy (DR) severity and presence of PPL were evaluated on UWF 200-degree images. Retinal oximetry and UWF-FA were obtained at the same visit. Vessel calibers at 1-disc diameter (DD, inner-AVR) and 3.5 DD (outer-AVR) from the center of the disc were measured using a customized semiautomated computer program. Retinal NP (mm²) was measured from UWF-FA images. Venous oxygen saturation (VO₂, %) and arteriovenous difference (A-V, %) were calculated within a 2 DD ring centered on the optic disc.

Results: A total of 39 eyes from 20 subjects with mean age 40.7±10.7 yrs, diabetes duration 21.1±10.4 yrs, HbA1c 7.7%±1.1, 65.0% male and 75.0% type 1 diabetes were evaluated. DR severity was no DR 10.3%(4 eyes), mild nonproliferative DR (NPDR) 48.7%(19), moderate 20.5%(8), severe 10.3%(4), and proliferative DR 10.3%(4). PPL were present in 56.4%(22) of eyes and associated with increasing DR severity (p=0.006) as well as increasing NP & VO₂, and decreasing A-V. In all eyes, NP was associated with increasing DR severity (r=0.60, p<0.0001) and increasing outer venular diameters (r=0.46, p=0.03). In eyes with PPL (N=22), increasing NP was correlated with increasing inner-AVR (r=0.43, p=0.04) and larger differences between outer- and inner-AVR (r=0.44, p=0.04). In eyes without PPL (N=17), NP was correlated with increasing inner (r=0.45, p=0.0370) and outer (r=0.68, p=0.0021) venular diameters. Correlation between inner and outer AVR was present only in eyes with no PPL (r=0.50, p=0.03) suggesting differences between inner and outer zones in eyes with PPL (r=0.29, p=0.18).

Conclusions: In this cohort, increasing NP was associated with increasing DR severity, venular dilation, increased VO₂ and decreased A-V, suggesting greater areas of retinal ischemia, presence of venous shunting and reduced retinal oxygen utility. In eyes with PPL, regional differences in vessel caliber were correlated with increasing peripheral NP and provide further evidence that the risk of progression with PPL is driven by retinal ischemia.

OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY (OCTA) VISIBILITY OF DIABETIC MICROANEURYSMS (MAS): ASSOCIATIONS WITH WALL CHARACTERISTICS AND BLOOD FLOW PARAMETERS

Omar Abu-Qamar, MD

Beetham Eye Institute/Harvard Medical School

BOSTON, MA

Objective: To identify diabetic MA wall characteristics on adaptive optics scanning laser ophthalmoscopy as well as blood flow parameters estimated by computational fluid dynamics modeling that are correlated with OCTA MA visibility.

Purpose: OCTA does not successfully image all MAs, yet it is unclear what determines MA OCTA visibility. Our goal was to identify diabetic MA wall characteristics on adaptive optics scanning laser ophthalmoscopy (AOSLO) as well as blood flow parameters estimated by computational fluid dynamics (CFD) modeling that are correlated with OCTA MA visibility.

Methods: Retinal MAs in diabetic eyes were imaged by AOSLO and OCTA (Optovue, software ver 2017.1.0.149) at the same visit. AOSLO images were graded for wall hyperreflectivity (WH), wall deformability (WD), cross-sectional area, clot presence, perfusion percentage and morphology. On OCTA, MAs were assessed as fully visible (FullVis), partially visible (PartVis) or not visible (NoVis). Multimodal images for each MA were registered. CFD modeling estimated shear rate drop (SRD) and wall shear stress drop (WSSD) within a subset of MAs. Statistical analyses adjusted for correlations between follow-up images of individual MAs.

Results: A total of 162 MAs (45 eyes) were imaged (259 sessions, 97 MAs with >1 follow-up). On OCTA, MAs were 58.7% (N=152) FullVis, 21.2% (55) PartVis and 20.1% (52) NoVis. FullVis MAs had greater perfusion percentage (FullVis mean±SD: 71.4±29.9%, PartVis: 52.8±32.3% NoVis: 41.5±36.4%, $p<0.0001$).

Conclusion: In this study, over 40% of MAs present on AOSLO were not fully visible in superficial or deep capillary plexus OCTA images. OCTA visibility appeared to be more dependent on MA perfusion than size. Thus, OCTA evaluation of MA may particularly underestimate MAs with limited perfusion. Computational modeling may help identify MAs with slower blood flow that may be less visible on OCTA. These data support future investigations to determine the implications of MA OCTA visibility for predicting local neural retinal pathology and visual dysfunction in the diabetic eye.

EFFICACY OF GONIOSURGERY FOR NEWBORN VERSUS INFANTILE PRIMARY CONGENITAL GLAUCOMA

Helen Yeung, MD
Massachusetts Eye and Ear Infirmary

BOSTON, MA

Objective: To report the surgical results of goniosurgery (goniotomy or trabeculotomy) for newborn and infantile primary congenital glaucoma (PCG).

This is a retrospective review of patient records with newborn PCG and infantile PCG who underwent initial goniosurgery. Newborn PCG were those children with PCG diagnosed within the first 1 month of age and infantile PCG were those children with PCG diagnosed later, between 1 and 13 months of life. Complete success was defined as intraocular pressure (IOP) less than 23, qualified success as IOP less than 23 with medications, and failure as IOP greater than 23 requiring other types of glaucoma surgery.

For the newborn PCG group, there was a total of 38 patients with 72 eyes. 92% (66 of 72 eyes) failed in controlling IOP after goniosurgery while 8% (6 of 72 eyes) achieved either qualified or complete success. The interval of goniosurgery to failure was 0.75 years (range: 3 days – 11 years). For the infantile PCG group, there were a total of 142 patients with 220 eyes. 97% (213 of 220 eyes) achieved complete success in controlling IOP while 3% (7 of 220 eyes) failed. The average postoperative interval follow-up was 10.5 years (range: 8 months – 40 years).

Careful gonioscopy and inspection of the irides are imperative to determine the correct PCG diagnosis and the severity of the related filtration angle anomalies in order to select the appropriate surgical technique to perform for the proper subtype of PCG. Goniosurgery is not successful in all forms of PCG. It is highly successful in controlling IOP in the infantile PCG group compared to newborn PCG. Therefore, these results and the correct diagnosis of children with PCG are important in determining the appropriate glaucoma surgery for these young patients.

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ANNUAL MEETINGS FOR OMP AND ADMINISTRATORS		
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2019		
March 1	Cornea	Adam Sise, MD
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April 12	Anterior Segment Case Presentations	Michael Price, MD
	Glaucoma (with Chandler-Grant Lecture)	Noelle Pruzan, MD
May 31	Uveitis	Lana Rifkin, MD
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