CORNEA and EYE BANKING FORUM 2021

NEW ORLEANS, LA
FRIDAY, NOVEMBER 12

EYE BANK ASSOCIATION OF AMERICA

Cornea Society

FINAL PROGRAM

CorneaSociety.org | RestoreSight.org

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Advancing the treatment of corneal disease

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The Eye Bank Association of America and the Cornea Society gratefully acknowledge the unrestricted educational grants received in support of this program.

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Med-Logics, Inc.

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Virtual 5K Run/Walk

November 2021

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EYE BANK ASSOCIATION OF AMERICA

LEARNER NOTIFICATION AND FINANCIAL INTEREST DISCLOSURES

LEARNER NOTIFICATION

EBAA/ Cornea Society
2021 Cornea & Eye Banking Forum
November 12, 2021
Astor Crowne Plaza - New Orleans, LA

Acknowledgement of Financial Commercial Support

- Lions Gift of Sight
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ACKNOWLEDGEMENT OF IN-KIND COMMERCIAL SUPPORT

No in-kind commercial support was received for this educational activity.

SATISFACTORY COMPLETION

Learners must complete an evaluation form to receive a certificate of completion. Partial credit of individual sessions is not available. If you are seeking continuing education credit for a specialty not listed below, it is your responsibility to contact your licensing/certification board to determine course eligibility for your licensing/certification requirement.

ACCREDITATION STATEMENT

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CEBTS

Eye Bank Association of America approves this activity for a maximum of 7 CEUs. An evaluation will be sent to CEBTs following the event, the evaluation must be completed to receive credit for attending.

OBJECTIVES – AFTER ATTENDING THIS PROGRAM YOU SHOULD BE ABLE TO

1. Learn new developments, techniques and therapies in sight restoration.
2. Analyze the efficacy of emerging technologies and innovative processes in corneal transplantation and eye banking that can improve patient outcomes.
3. Cite new research findings in cornea regarding disease, treatment, transplantation, preservation, preparation and processing.

HOW TO GET YOUR CERTIFICATE

1. Go to **http://EBAA.cmecertificateonline.com**
2. Click on the “2021 Cornea & Eye Banking Forum” link.
3. Evaluate the meeting.
4. Print all pages of your certificate for your records.

Questions? Email **Certificate@AmedcoEmail.com**

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PROGRAM SCHEDULE

CORNEA and EYE BANKING FORUM 2021

PROGRAM SCHEDULE

Registration: 7:00 am – 2:00 pm
Breakfast: 7:00 am – 8:00 am

SECTION I

8:00 am – 8:03 am
Welcome and Introductions
Sophie Deng, MD, PhD, and Marjan Farid, MD

8:04 am – 8:50 am
INVITED SESSION: FUTURE OF THE TREATMENT OF CORNEAL ENDOTHELIAL AND STROMAL DISEASE

Presenters:
Jorge Alió, MD, PhD, FEBO, *University Miguel Hernández of Elche*
Kathryn Colby, MD, PhD, *NYU Langone Health*
Ula Jurkunas, MD, *Mass Eye and Ear*
Jodhbir Mehta, MBBS, FRCOphth, FRCS(Ed), FAMS, PhD, *Singapore National Eye Centre*

8:51 am – 9:02 am
Topical Ivmed-80 Eyedrops for Pharmacologic Crosslinking of Keratoconus without UV Light or Surgery
Balamurali Ambati, MD, PhD, *Pacific Clear Vision Institute*

9:03 am – 9:14 am
Nicergoline: A Potential Novel Treatment for Severe Persistent Corneal Epithelial Defects
Valeria Oliva-Biénzobas, MD, *Centro de la Vision*

9:15 am – 9:26 am
Topical 1% 5-fluorouracil as Primary Treatment for Ocular Surface Squamous Neoplasia: Long-Term Follow-up Study
Adam Wylegala, MD, DMS, FEBO,** *Bascom Palmer Eye Institute*

9:27 am – 9:38 am
Phlyctenular Disease Associated with Increased Incidence and Severe Corneal Sequelae in Hispanic Pediatric Patients
Aaron R. Kaufman, MD,* *University of Illinois at Chicago, Illinois Eye and Ear Infirmary*

9:39 am – 9:50 am
Outcomes of Fluid-Filled Scleral Lens Devices for the Management of Limbal Stem Cell Deficiency
Clémence Bonnet, MD, *Stein Eye Institute, UCLA*

9:51 am – 10:05 am
Cornea Society Business Meeting

10:05 am – 10:20 am
Break

* Resident
** Cornea Fellow

PROGRAM SCHEDULE

SECTION II

10:20 am – 10:21 am	**Welcome Back** Marjan Farid, MD, and Sophie Deng, MD, PhD
10:22 am – 10:24 am	**2021 EBAA High Impact Research Grant Award Announcement** Bennie Jeng, MD, *Chair, EBAA Research Committee*
10:25 am – 10:36 am	**Effect of Increasing Povidone Iodine (PVP-I) Exposure on Tissue Quality and Impact on Donor Rim Cultures** Onkar Sawant, PhD, *Eversight*
10:37 am – 10:48 am	**Double Povidone Iodine Wash: Effectivity in Reducing the Infection Rate of Recovered Corneal Tissue** Stephen C. Kaufman, MD, PhD, *University of Minnesota*
10:49 am – 11:00 am	**Induction of Antimicrobial Peptide Expression in Human Donor Corneas Using Andrographolide** Madeline Yung, MD*, University of California, Davis*
11:01 am – 11:12 am	**The Impact of Amphotericin B Fortified Preservation Media on Rates of Endothelial Keratoplasty Detachment** Vincent Hussey, MS,+ *University of California, Irvine*
11:13 am – 11:24 am	**Endophthalmitis Rates Following Cornea Surgery in the Medicare Population from 2016 to 2019** Fasika Woreta, MD, MPH, *Wilmer Eye Institute*
11:25 am – 11:36 am	**The Microbiome in Stevens-Johnson Syndrome** Michael Zilliox, PhD, *Loyola University Chicago*
11:37 am – 11:41 am	**R. Townley Paton Introduction** Stephen C. Kaufman, MD, PhD, *2020 R. Townley Paton Award Recipient* Mark Mannis, MD, *1996 R. Townley Paton Award Recipient*
11:42 am – 12:05 pm	**R. Townley Paton Lecture: Well-Behaved Women Seldom Make History: The Advancement of Women in Ophthalmology** Jennifer Li, MD, 2021 *R. Townley Paton Award Recipient*
12:06 pm – 12:10 pm	**Closing**

+ Medical Student

PROGRAM SCHEDULE

R. TOWNLEY PATON LUNCHEON

12:15 pm – 1:25 pm

R. Townley Paton Luncheon
Includes a seated lunch and a moderated discussion. Physician attendees are invited.

SECTION III

1:30 pm – 1:31 pm

Afternoon Session Welcome
Sophie Deng, MD, PhD, and Marjan Farid, MD

1:32 pm – 1:43 pm

Descemet Membrane Endothelial Keratoplasty (DMEK): 10-year Clinical Outcomes and Graft Survival
Viridiana Kocaba, MD, PhD, FEBO, *Netherlands Institute for Innovative Ocular Surgery (NIIOS)*

1:44 pm – 1:55 pm

Two Year Changes in Corneal Power after Endothelial Keratoplasty: Results from the Randomized Controlled DETECT Trial
Winston Chamberlain, MD, PhD, *Oregon Health & Science University*

1:56 pm – 2:07 pm

Primary Graft Failure Following Descemet Membrane Endothelial Keratoplasty Using Nondiabetic Donor Tissue
Andrea Blitzer, MD,** *University of Iowa*

2:08 pm – 2:19 pm

Does the Size and Duration of the Bubble in DMEK Surgery Affect the Attachment and Endothelial Cell Loss of the DMEK Graft?
Jessica Chen, MD,** *Devers Eye Institute*

2:20 pm – 2:31 pm

Comparison of Graft Viability in Tri-Folded Endothelium-In and Scrolled Endothelium-Out Preloaded Descemet Membrane Endothelial Keratoplasty
Matthew Hartman, MD, *Southeast Eye Specialists*

2:32 pm – 2:43 pm

Difference in Postoperative Graft Adherence Between Descemet Membrane Endothelial Keratoplasty with and without Cataract Surgery
Anne-Marie Kladny, MD,* *University of Freiburg*

2:44 pm – 2:55 pm

Novel Preloaded Injectable UT-Descemet's Stripping Automated Endothelial Keratoplasty (UT-DSAEK): No Touch Surgical Technique and Early Surgical Results
Steven Kane, MD, *Tailored Eyes*

2:56 pm – 3:07 pm

An Alternative Time Efficient Method to Specular Microscopy Following DMEK Preparation Using Trypan Blue Staining
Michael Szkarlat, BS, *Eversight*

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** Cornea Fellow

PROGRAM SCHEDULE

3:08 pm – 3:10 pm	**Richard Troutman Prize Award Introduction** Kathryn Colby, MD, PhD, *NYU Langone Health*
3:11 pm – 3:20 pm	**Richard Troutman Prize Lecture: Accelerated Epi-On Versus Standard Epi-Off Corneal Collagen Cross-Linking for Progressive Keratoconus in Pediatric Patients: Five Years of Follow-Up** Maria A. Henriquez, MD, MSc, PhD, *Oftalmosalud Instituto de Ojos*
3:20 pm – 3:35 pm	**Break**

SECTION IV

3:35 pm – 3:36 pm	**Welcome Back** Marjan Farid, MD, and Sophie Deng, MD, PhD
3:37 pm – 4:07 pm	**INVITED SESSION: Future of Artificial Cornea** *Presenters:* Esen Akpek, MD, *Johns Hopkins University* Julie Daniels, PhD, *University College London* Anthony Aldave, MD, *Stein Eye Institute, UCLA*
4:08 pm – 4:19 pm	**Regulatory T-cells Promote Corneal Graft Survival by Modulating Post-Transplantation Alloimmune Response** Hamid Alemi, MD, MPH, *Schepens Eye Research Institute/ Massachusetts Eye and Ear*
4:20 pm – 4:31 pm	**Association Between Anti-Human Leukocyte Antigen (HLA) Antibodies and Graft Rejection in Pediatric Keratoplasty** Angela Zhu, MD, *Bascom Palmer Eye Institute, University of Miami*
4:32 pm – 4:43 pm	**Hyaluronic-Acid Based Bioengineered Corneal Stromal Substitute** Roza Vaez Ghaemi, PhD, *University of British Columbia*
4:44 pm – 4:55 pm	**Prospective, Randomized, Multicenter, Double-Masked, Clinical Trial Evaluating Corneal Crosslinking of Keratoprosthesis Carrier Tissue** Joseph B. Ciolino, MD, Schepens Eye Institute/ Mass Eye and Ear
4:56 pm – 4:59 pm	**Best Paper of Session Award Presentation** *Supported by an unrestricted educational grant from Lions Gift of Sight*
5:00 pm	**Closing Remarks** Sophie Deng, MD, PhD, and Marjan Farid, MD

SAVE THE DATE!

CORNEA and EYE BANKING FORUM 2022

CHICAGO, IL

FRIDAY, SEPTEMBER 30

EYE BANK ASSOCIATION OF AMERICA

Cornea Society
Advancing the treatment of corneal disease

INVITED SESSIONS

INVITED SESSIONS

Future of the Treatment of Corneal Endothelial and Stromal Disease

SECTION I: 8:04 AM – 8:50 AM

Utilizing Mesenchymal Stem Cells for the Treatment of Keratoconus
Jorge Alió, MD, PhD, FEBO, *University Miguel Hernández of Elche*

Current Status of Descemet Stripping Only (DSO)
Kathryn Colby, MD, PhD, *NYU Langone Health*

Antioxidant Treatments for Fuchs Dystrophy: What is New?
Ula Jurkunas, MD, *Mass Eye and Ear*

Cultivated Endothelial Cell Sheets for Endothelial Failure
Jodhbir Mehta, MBBS, FRCOphth, FRCS(Ed), FAMS, PhD, *Singapore National Eye Centre*

Moderated Q&A
All presenters

Future of Artificial Cornea

SECTION IV: 3:37 PM- 4:07 PM

The Predicted Future of the Artificial Cornea and Where are We Headed?
Anthony Aldave, MD, *Stein Eye Institute, UCLA*

Biocompatibility of a Novel Synthetic Corneal Device
Esen Akpek, MD, *Johns Hopkins University*

Cornea Equivalent for the Treatment of Stromal Disease
Julie Daniels, PhD, *University College London*

Moderated Q&A
All presenters

AWARD LECTURES

AWARD LECTURES

R. TOWNLEY PATON AWARD LECTURE

Well-Behaved Women Seldom Make History: The Advancement of Women in Ophthalmology

Jennifer Li, MD, *University of California, Davis/Sierra Donor Services Eye Bank*
2021 R. Townley Paton Award Recipient

Approximately 150 years ago, Isabel Hayes Chapin Barrows became the first woman to practice ophthalmology in the United States. Since that time, women have made tremendous strides within ophthalmology. During this year's Paton Lecture, we will celebrate the pioneering women who have helped pave the way for us, and reflect on how far we have come in our efforts to break down the gender gap. We will also explore areas where further progress is still needed for women in ophthalmology.

RICHARD TROUTMAN PRIZE LECTURE

Accelerated Epi-On Versus Standard Epi-Off Corneal Collagen Cross-Linking for Progressive Keratoconus in Pediatric Patients: Five Years of Follow-Up*

Maria A. Henriquez, MD, MSc, PhD, *Oftalmosalud Instituto de Ojos*

Co-Authors: Gustavo Hernandez-Sahagun, MD, Jorge Camargo, MD, and Luis Izquierdo, Jr, MD, MSc, PhD

Purpose: The purpose of this study was to evaluate and compare the 5-year efficacy and safety of accelerated transepithelial (A-epi-on) corneal collagen cross-linking (CXL) with standard CXL (epi-off) in children with progressive keratoconus (KC).

Methods: This prospective cohort study included 78 eyes of patients aged 18 years old or younger with progressive KC who underwent CXL at the Oftalmosalud Institute of Eyes, Lima, Peru. A-epi-on CXL was performed in 32 eyes (309 of impregnation/59 of irradiation at 18 mW/cm2) and epi-off CXL was performed in 46 eyes (309of impregnation/309 minutes of irradiation at 3 mW/cm2). Visual acuity, refraction, and the Scheimpflug imaging parameters were evaluated preoperatively and postoperatively at 1 and 5 years.

Results: The best corrected visual acuity improved to 0.06 logarithm of the minimum angle of resolution (SD: 0.19, P = 0.03) and 0.09 logarithm of the minimum angle of resolution (SD: 0.13, P, 0.001) in the A-epi-on and epi-off groups, respectively. The mean flattening in the mean keratometry was 0.09 diopters (D) (SD: 0.68, P = 0.33) and 3.18 D (SD: 5.17, P, 0.001) in the A-epi-on CXL and Epi-off groups at the 5-year follow-up. Significant differences were found in the change at 1 and 5 years between the groups for cylinder reduction, flat and mean K, and pachymetry (all P, 0.05). The KC progression rate was 9.37% (3/32) in the A-epi-on CXL; no progression was found in the epi-off CXL group at the 5-year follow-up.

Conclusions: Both procedures halted the progression of KC at the 5-year follow-up; however, epi-off CXL was safer and more effective when compared with A-epi-on CXL.

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SCIENTIFIC ABSTRACTS

SCIENTIFIC ABSTRACT

8:51 am – 9:02 am

Topical Ivmed-80 Eyedrops for Pharmacologic Crosslinking of Keratoconus without UV Light or Surgery

Balamurali Ambati, MD, PhD, *Pacific Clear Vision Institute*

Co-Authors: Sarah Molokhia, PhD; Hironori Uehara, PhD; Arturo Chayet, MD; Cynthia Roberts, PhD; Sabine Kling, PhD; and Farhad Hafezi, PhD

Purpose: To determine whether IVMED-80 eyedrops, which increase lysyl oxidase, can flatten the cornea in patients with keratoconus.

Methods: Pre-clinical IVMED-80 studies determined if it increased LOX activity of keratoconic fibroblasts and rabbit corneas, improved human donor and rabbit corneal biomechanics, and flattened rabbit corneas. A Phase 1/2a prospective, randomized, double-masked, controlled trial was performed to determine the safety and preliminary efficacy of BID dosing of IVMED-80 eyedrops ind 36 patients with a history of progressive keratoconus, between 18 to 42 years of age. Three subarms included vehicle control, 6 and 16 weeks of therapy, with 6 months follow-up. Endpoints included Kmax, BCVA, endothelial cell count, IOP, and adverse event analysis.

Results: IVMED-80 increased LOX activity of fibroblasts 4-fold, and flattened rabbit corneas by 1.8 diopters with 6 weeks of treatment. Four month clinical trial follow-up data is currently available. In patients (mean age of 27.3 +/- 6.8 years), we observed flattening of Kmax by 1.0 diopters in the 16 week therapy group, while the 6 week therapy group had initial flattening of 0.40 diopters at 1 month, but rebounded to baseline by month 4. Vehicle-treated patients demonstrated continued progression. No significant changes on BCVA, endothelial cell count, or IOP were observed. No adverse events were observed.

Conclusion: IVMED-80 induces pharmacologic crosslinking by delivering copper to increase corneal LOX, which genetic and biochemical studies show is reduced in keratoconus. We demonstrate improved donor and rabbit corneal biomechanics, and flattening of rabbit corneas. IVMED-80 reduced Kmax of 1.0 D with 16 weeks of therapy in patients without adverse events.

SCIENTIFIC ABSTRACT

9:03 am – 9:14 am

Nicergoline: A Potential Novel Treatment for Severe Persistent Corneal Epithelial Defects

Valeria Oliva-Biénzobas, MD, *Centro de la Vision*

Co-Authors: Alejandro Navas; Victor Boullosa; Arturo Ramirez; and Enrique O. Graue-Hernandez, MD, MSc

Purpose: The aim of this study was to determine the effect of nicergoline in patients with persistent corneal epithelial defect.

Methods: This is a prospective, non-comparative interventional study. The study included 10 eyes of 9 patients with persistent corneal epithelial defect unresponsive to conventional therapy. Patients were treated with 10 mg nicergoline orally twice a day for at least 2 weeks. Slit-lamp examination, photography, corneal fluorescein dye testing, and best-corrected visual acuity were performed before and after treatment.

Results: Two male and seven female patients with persistent corneal epithelial defect unresponsive to conventional therapy treated with oral nicergoline were included. Average age was 60.9 years (51-76 years). The most frequent diagnoses associated with persistent corneal defect were neurotrophic (3 patients) and exposure ulcer (2 patients). In eight eyes (72.7%), epithelial defects healed completely between 10 and 28 days of treatment with nicergoline (mean resolution time 17 days). Epithelial defects persisted in 2 eyes (27.3%).

Conclusion: Nicergoline represents a potential therapeutic option in patients with abnormal corneal healing responses. Further studies and clinical trials need to be conducted to prove safety and efficacy as a treatment for persistent corneal epithelium defects in humans.

SCIENTIFIC ABSTRACT

9:15 am – 9:26 am

Topical 1% 5-fluorouracil as Primary Treatment for Ocular Surface Squamous Neoplasia: Long-Term Follow-up Study

Adam Wylegala, MD, DMS, FEBO,** *Bascom Palmer Eye Institute*

Co-Authors: Wathanee Sripawadkul; Mike Zein; Osmel Alvarez; Anat Galor, MD MSPH; and Carol L. Karp, MD

Purpose: To assess the clinical outcomes of patients with ocular surface squamous neoplasia (OSSN) treated with 1% 5-fluorouracil (5-FU) as a primary therapeutic modality.

Methods: Retrospective study of individuals with OSSN who received treatment with topical 1% 5-FU eye drops. Patients were excluded if they received adjuvant treatment along with 5-FU. The primary endpoint was frequency of complete lesion resolution. Secondary endpoints included frequency of recurrence and side effects of treatment. Other data points collected included patient demographics and clinical tumor characteristics.

Results: A total of 266 individuals treated with 1% 5-FU were included in the final analysis. The patient population was predominately male (75%), white (85%), and Hispanic (56%), with a mean age of 67.21±11.96 years. Clinical features included opalescent (69%), gelatinous (51%), leukoplakic (30%), and papillomatous appearance (25%), with 82% of cases involving the cornea. The mean lesion size was 29.72±36.76 mm^2. Eighty-seven percent (231) achieved complete clinical resolution with topical 5-FU 1% eyedrops with a mean of 4 + 2 cycles of 4 times a day for one week and 3 weeks off. The recurrence rate was 7% at 1 year and 11% at 2 years. Mean follow-up was 694.69±578.31 days. Reported side effects of treatment were mild hyperemia (24%) mild ocular pain (21%) and tearing (18%).

Conclusion: Topical 1% 5-FU eye drops led to resolution of squamous tumors in almost 90 % of patients, demonstrating that it is an effective primary treatment modality for OSSN.

***Cornea Fellow*

SCIENTIFIC ABSTRACT

9:27 am – 9:38 am

Phlyctenular Disease is Associated with Increased Incidence and Severe Corneal Sequelae in Hispanic Pediatric Patients

Aaron R. Kaufman, MD,* *University of Illinois at Chicago, Illinois Eye and Ear Infirmary*

Co-Authors: Priyanka Chhadva, MD; Sneha Bontu, MD; Carmen S. Bueno, MD; Sandeep Jain, MD; Elmer Y. Tu, MD; Ali R. Djalilian, MD; Joel Sugar, MD; and M. Soledad Cortina, MD

Purpose: To evaluate characteristics and outcomes of phlyctenulosis in pediatric patients at a tertiary care center and to compare Hispanic vs. non-Hispanic patients.

Methods: Retrospective cohort study of patients diagnosed with phlyctenulosis under age 18 years at the University of Illinois at Chicago from 2002-2018. Demographics, presenting features, treatment regimens, and outcomes were analyzed.

Results: A total of 70 patients (95 eyes) with phlyctenulosis were identified in the study period of whom 77.1% (54 patients and 70 eyes) were Hispanic. The proportion of cases who were Hispanic patients significantly exceeded the proportion of all pediatric visits to our center by Hispanic patients, 53.8% ($p<0.0001$). Bilateral and recurrent disease was more common in Hispanic than non-Hispanic patients (38.9% vs. 25%) and (37.3% vs. 25%) respectively. Similar high complication rates were found in both Hispanic and non-Hispanic groups including corneal haze/scarring (69.3% vs. 60.0%), corneal neovascularization (40.0% vs. 40.0%), and amblyopia (14.7% vs. 25.0%). 5 patients had severe corneal sequelae, all of whom were in the Hispanic group. These included corneal perforation (3 eyes, 4.0% - 2 requiring penetrating keratoplasty), extensive limbal stem cell deficiency (1 eye, 1.3%), and Salzmann nodular degeneration (1 eye, 1.3%). Average Snellen visual acuity at last follow-up was 20/32.1 in Hispanic vs. 20/37.2 in non-Hispanic patients. Proportion of patients with visual acuity worse than 20/40 at last follow-up was similar in Hispanic vs. non-Hispanic patients (23.7% vs. 30.0%).

Conclusion: Our study is the largest reported cohort of phlyctenulosis in Hispanic pediatric patients and shows an increased incidence in this ethnic group. Pediatric phlyctenular disease is associated with high rates of corneal complications including scarring and neovascularization that can lead to vision loss. Severe corneal complications including corneal perforation necessitating transplantation were seen only in the Hispanic group suggesting more aggressive disease in this population.

*Resident

SCIENTIFIC ABSTRACT

9:39 am – 9:50 am

Outcomes of Fluid-Filled Scleral Lens Devices for the Management of Limbal Stem Cell Deficiency

Clémence Bonnet, MD, ***Stein Eye Institute, UCLA***

Co-Authors: Andrew Lee; Vivian Shibayama; Chi-Hong Tseng; and Sophie Deng, MD, PhD

Purpose: To evaluate the clinical and visual outcomes of fluid-filled scleral lens devices (SLD) wear in patients with limbal stem cell deficiency (LSCD).

Methods: A total of 27 eyes with LSCD confirmed by in vivo confocal microscopy at the Stein Eye Institute and fitted with SLD were included. Correlations between corrected distance visual acuity (CDVA) and LSCD stage determined by clinical grading were performed between baseline (after the SLD fit) and the last follow-up (the time of discontinuation of SLD wear or the last visit in eyes in which SLD were continued). In a subset of patients that had worsened LSCD while using SLD, anterior segment optical coherence tomography (AS-OCT) and anterior segment fluorescein angiogram (AS-FA) were performed.

Results: Baseline LSCD grading was stage I in 12 eyes (44.4%), stage 2 in 12 eyes (44.4%), and stage III in 3 eyes (11.1%). At the last follow-up, CDVA was improved in 7 eyes (25.9%), remained stable in 13 eyes (48.1%) and decreased in 7 eyes (25.9%, P=0.16). The LSCD stage was improved in 7 eyes (25.9%), remained stable in 8 eyes (29.6%) and worsened in 12 eyes (44.4%, P=0.10). AS-OCT and AS-FA, performed in 5 eyes, showed limbal compression and delayed fluorescein filling.

Conclusion: SLD can improve visual acuity and maintain the ocular surface in the majority of eyes. Worsening of the ocular surface might be a result of limbal hypoxia. Close monitoring of SLD fit is necessary in these compromised eyes.

SCIENTIFIC ABSTRACT

10:25 am – 10:36 am

Effect of Increasing Povidone Iodine (PVP-I) Exposure on Tissue Quality and Impact on Donor Rim Cultures

Onkar Sawant, PhD, *Eversight*

Co-Authors: Susan Hurlbert; Stephanie How; Michael S. Titus, CEBT; Indu Vadakkepattath; Xiang Shen, PhD; and Ali R. Djalilian, MD

Purpose: The purpose of this study was to assess the effect of a second PVP-I application at the time of donor tissue recovery on overall tissue quality. We were also interested in analyzing the rate of positive fungal and bacterial rim cultures before and after implementing increased PVP-I exposure.

Methods: We implemented a double PVP-I soak procedure in Nov 2019. Clinical characteristics of epithelium, stroma and endothelium, positive rim culture rate and incidences of infectious postoperative adverse reactions were compared for a period of 14 months before and after implementation of increased PVP-I protocol.

Results: Increasing PVP-I exposure did not affect the clinical characteristics of the corneal epithelium, endothelium and central corneal thickness. We observed a modest increase in percentage of tissues with mild edema after implementation of increased PVP-I exposure. Nonetheless, the percentage of tissues with moderate or severe edema were unaltered between two groups. Between Sep 2018 to Dec 2020, we provided 16,285 tissues for various types of corneal transplantation surgeries. Average positive rim culture rate was 1.17% between Sep 2018 to Oct 2019. After implementation of the double PVP-I soak procedure, this rate significantly decreased to 0.76% ($P<0.05$). There are no reports of infectious postoperative adverse reactions to our eye bank since implementation of double PVP-I soak procedure. Whereas, there were five reports for a period of 14 months before implementation of increased PVP-I protocol.

Conclusion: These results indicate that new donor preparation methods with an additional 5-minutes PVP-I exposure does not affect tissue quality, reduces positive rim cultures, and leads to lower incidence of postoperative infection.

SCIENTIFIC ABSTRACT

10:37 am – 10:48 am

Povidone Iodine Wash: Effectivity in Reducing the Infection Rate of Recovered Corneal Tissue

Stephen Kaufman, MD, PhD, *University of Minnesota*

Co-Authors: Christina Gillmor, MD; and Patricia Dahl, CEBT

Purpose: Until October 2018, there was no standardized protocol for aseptic technique when recovering corneal tissue from donors. Individual eye banks each had their own protocol for using a pre-recovery povidone-iodine (PI) wash. In October 2018, the Eye Bank Association of America mandated a national standard for aseptic technique involving a double Povidone-Iodine (PI) wash of donor corneal tissue at the time of recovery. Although penetrating keratoplasty associated infections are rare, the increased use of endothelial keratoplasty has resulted in an escalation in the incidence of fungal keratitis. There is a significant correlation between positive fungal donor rim culture results with the development of subsequent clinical keratitis or endophthalmitis, indicating that the source of these clinical infections is contamination of the donor tissue. The purpose of this study is to evaluate the effect of a standardized double Povidone-Iodine wash, compared to a single Povidone-iodine wash, at the time of corneal tissue recovery on donor culture positivity in the state of New York, where corneal rim culture reports are mandated for all types of keratoplasty.

Methods: Keratoplasty reports from The Eye-Bank For Sight Restoration (New York City, NY) were analyzed before (for year 2017-18. N=994) and after (for years 2018-20. N=2707) initiation of the EBAA guidance for double povidone iodine wash at the time of tissue recovery. The results were analyzed for statistically significant differences between the two groups using the Chi-square test and Fisher exact test.

Results: The number of corneal transplants associated with a single PI wash was n=994. The number of post keratoplasty infections in this group was 13 (1.31%). The number of corneal transplants associated with the double PI wash was 2707. The number of post keratoplasty infections in this group was 23 (0.85%). The Chi-square test resulted in $p = 0.208$. The Fisher exact test resulted in $p = 0.255$.

Conclusion: Although there was no statistically significant difference between the infection rate of donor corneal rim tissue undergoing a single versus a double povidone-iodine wash at the time of recovery, there was a trend towards reduction in infection rates after initiation of the double PI wash (1.31% down to 0.85%).

SCIENTIFIC ABSTRACT

10:49 am – 11:00 am

Induction of Antimicrobial Peptide Expression in Human Donor Corneas Using Andrographolide

Madeline Yung, MD, *University of California, Davis*

Co-Authors: Melinda Quan; Theint Aung; Christopher J. Murphy, DVM, PhD; Jennifer Y. Li, MD; and Brian C. Leonard, DVM, PhD

Purpose: Upregulation of endogenously expressed antimicrobial peptides, such as - -defensins, by the corneal epithelium may be a novel method for antimicrobial prophylaxis of corneal storage media. This study evaluated the ability of andrographolide to induce - -defensin expression in human donor corneas.

Methods: Human donor corneas were incubated with andrographolide in Optisol GS under varying concentrations, temperatures, and durations of exposure. Corneal epithelial RNA was isolated, and human - -defensin 3 (HBD3) expression was measured using quantitative polymerase chain reaction. Cellular toxicity of andrographolide was assessed by immunolabeling of corneal epithelium and endothelium for ZO-1 and phalloidin. The supernatants of the incubated corneas were collected, and antimicrobial assays are planned.

Results: Incubation of donor corneas with andrographolide increased HBD3 expression up to 10-fold over control. Parameters for optimal induction of HBD3 expression were found to be at 65 μM andrographolide at 37 degrees Celsius for 24 hours. Immunofluorescence microscopy demonstrated normal localization of ZO-1 and phalloidin to cell-cell boundaries, indicating preservation of corneal epithelial and endothelial functional morphology. The results of the antimicrobial assays are pending.

Conclusion: Andrographolide effectively induced HBD3 expression from corneal epithelial cells in human corneal donor tissue. In the face of rising antibiotic resistance, andrographolide may represent a novel method of augmenting antimicrobial prophylaxis for donor corneas.

SCIENTIFIC ABSTRACT

11:01 am – 11:12 am

The Impact of Amphotericin B Fortified Preservation Media on Rates of Endothelial Keratoplasty Detachment

Vincent Hussey, MS,* *University of California, Irvine*

Co-Authors: Catherine Sheils, MD; and Marjan Farid, MD

Purpose: Graft detachment is the most frequent complication of endothelial corneal transplants. Amphotericin B is an antifungal commonly added to cornea graft preservation media. The impact of antifungal-containing corneal preservation media on detachment rates of endothelial keratoplasties (EK) is unknown. This study aims to determine whether the addition of Amphotericin B to corneal preservation media changes the rate of post-operative graft non-adherence in Descemet's membrane endothelial keratoplasty (DMEK) and Descemet stripping automated endothelial keratoplasty (DSAEK) procedures.

Methods: Retrospective chart review of DMEK and DSAEK surgeries of one corneal surgeon at a single tertiary care academic institution. Data was analyzed using Chi Square statistical analysis.

Results: A total of 195 endothelial keratoplasty surgeries performed by a single surgeon between 2016 and 2021 were analyzed. 81 transplants were stored in preservation media without Amphotericin B, and 114 in media with Amphotericin B. The rate of graft non-adherence with a need for rebubbling of EK grafts stored in Amphotericin B was 26%, compared to 22% for those grafts stored without Amphotericin B. This difference was not statistically significant (p=0.51). Sub-group analysis of each EK procedure, DMEK and DSAEK, also did not show a statistically significant difference in rate of detachment (p=0.35 and p=0.68, respectively).

Conclusion: The addition of Amphotericin B to graft storage media did not impact detachment rates for EK surgeries. Surgeons may not need to be concerned with impacting the rate of detachment when considering whether to include Amphotericin B in their corneal storage media.

* Medical Student

SCIENTIFIC ABSTRACT

11:13 am – 11:24 am

Endophthalmitis Rates Following Cornea Surgery in the Medicare Population from 2016 to 2019

Fasika Woreta, MD, MPH, *Wilmer Eye Institute*

Co-Authors: Ariel Chen, MD; Christina Rapp Prescott, MD, PhD; and Divya Srikumaran

Purpose: To determine endophthalmitis rates following cornea surgery in the Medicare population from 2016 to 2019.

Methods: 100% Medicare fee-for-service claims were used to identify all patients who underwent cornea surgery including penetrating keratoplasty (PK), endothelial keratoplasty (EK), anterior lamellar keratoplasty (ALK) and keratoprosthesis. Endophthalmitis cases within 42 days of surgery were identified using ICD-10 CM diagnostic codes. Patients with diagnosis of endophthalmitis 12 months prior to surgery and had an intraocular procedure 42 days before or after were excluded.

Results: A total of 45,740 cornea surgeries were performed among Medicare beneficiaries from 2016 to 2019. 57.2% of patients were female and 85.7% were white. The overall 42-day postoperative endophthalmitis rate was 4.7 per 1000 cornea surgeries. By surgery type, the postoperative endophthalmitis rate was 12.6 per 1000 PKs (132 of 10,476), 2.0 per 1000 EKs (68 of 34,468), 11.5 per 1000 ALKs (9 of 781), and 34.8 per 1000 keratoprothesis (4 of 115).

Conclusion: The overall 42-day postoperative endophthalmitis rate after cornea surgeries was 4.7 per 1000 surgeries between 2016 to 2019. Endophthalmitis rates were lowest for EK and highest for keratoprosthesis.

**Resident*

SCIENTIFIC ABSTRACT

11:25 am – 11:36 am

The Microbiome in Stevens-Johnson Syndrome

Michael Zilliox, PhD, ***Loyola University, Chicago***

Co-Authors: Charles Bouchard, MD, MA; and Paul De Bustros, MD

Purpose: We observed that the ocular surface microbiome (OSM) was less diverse in patients with Stevens-Johnson Syndrome (SJS) compared to healthy eyes. The OSM in SJS patients had more *Staphylococcus* than healthy eyes and less *Lactobacillus*. We collected data on an additional 19 patients, including those with the more severe form of the disease, Toxic Epidermal Necrolysis (TEN).

Methods: Negative and positive controls were used to assess contamination during sequencing of the 16S rRNA gene. Concurrent use of topical antibiotics, steroids, and bandage contact lenses (BCLs) was documented.

Results: We observed that half of patients had distinct OSMs in each eye despite the eyes having similar diversity measures, which we have confirmed. In SJS, there were 6 ocutypes (distinct communities) with the ocutypes being dominated by *Corynebacterium*, *Achromobacter*, *Stenotrophomonas*, *Staphlococcus*, *Corynebacterium* or a diverse population with no dominant genera. Pathogens not previously associated with SJS included *Achromobacter*, *Stenotrophomonas* and *Sphingobacterium*. Alpha diversity was lower in SJS patients compared to healthy eyes. The two *Corynebacterium* genera may be in opposition as one was predominantly in SJS and the other in TEN patients.

Conclusion: SJS patients have less diverse OSMs than healthy eyes, suggesting that strategies to limit any decrease in biodiversity of the OSM in the chronic stage may be helpful in restoring the homeostasis of the ocular surface.

SCIENTIFIC ABSTRACT

1:32 pm – 1:43 pm

Descemet Membrane Endothelial Keratoplasty (DMEK): 10-year Clinical Outcomes and Graft Survival

Viridiana Kocaba, MD, PhD, FEBO, *Netherlands Institute for Innovative Ocular Surgery (NIIOS)*

Co-Authors: Viridiana Kocaba, MD, PhD; Indrė Vasiliauskaitė; Lisanne Ham, PhD; Isabel Dapena, MD, PhD; Lamis Baydoun, MD; Korine van Dijk, BOptom, PhD; Silke Oellerich, PhD; and Gerrit Melles, MD PhD

Purpose: To evaluate graft survival and clinical outcomes up to 10 years after Descemet membrane endothelial keratoplasty (DMEK).

Methods: Retrospective cohort study conducted at the Netherlands Institute for Innovative Ocular Surgery. 750 consecutive DMEK eyes, not including the very first 25 DMEK eyes that constitute the technique learning curve, were included. Main outcome parameters (survival, best-corrected visual acuity (BCVA), central endothelial cell density (ECD)) were evaluated up to 10-years postoperatively and postoperative complications were documented. Outcomes were analyzed for the entire study group and separately for the subgroup of the first 100 DMEK eyes.

Results: For the subgroup of 100 DMEK eyes, 82% and 89% reached a BCVA of ≥20/25 (Decimal VA ≥0.8) at 5- and 10 years postoperatively, respectively, and preoperative donor ECD decreased by 59% at 5 years and 68% at 10 years postoperatively. Graft survival probability for the first 100 DMEK eyes was 0.83 [95% Confidence Interval (CI), 0.75-0.92] and 0.79 [95% CI, 0.70 -0.88] at 5- and 10-years postoperatively, respectively. For the total study group, clinical outcome in terms of BCVA and ECD were comparable, but graft survival probability was significantly higher at 5- and 10-year postoperatively.

Conclusion: Most eyes operated in the pioneering phase of DMEK showed excellent and stable clinical outcomes with a promising graft longevity over the first decade after surgery. The increase in DMEK experience resulted in a lower graft failure rate and positively affected longer-term graft survival probability.

SCIENTIFIC ABSTRACT

1:44 pm- 1:55 pm

Two Year Changes in Corneal Power after Endothelial Keratoplasty: Results from the Randomized Controlled DETECT Trial

Winston Chamberlain, MD, PhD, *Oregon Health & Science University*

Co-Authors: Charles Lin, MD; Elizabeth Shen, MD; and Jennifer Rose-Nussbaumer, MD

Purpose: To compare changes in corneal power measurements after Descemet membrane endothelial keratoplasty (DMEK) vs. ultrathin Descemet stripping automated endothelial keratoplasty (UT-DSAEK).

Methods: A total of 50 eyes (38 patients) with endothelial dysfunction from Fuchs endothelial dystrophy or pseudophakic bullous keratopathy were randomized to DMEK or UT-DSAEK 1 to 2 days prior to surgery. Total Corneal Refractive Power (TCRP) and anterior/posterior simulated keratometry were obtained using Scheimpflug imaging at postoperative 3, 6, 12, and 24 months. Spectacle refractions were performed at 6, 12, and 24 months post-operatively.

Results: Mean decrease in TCRP from baseline to 12 months was 0.80±1.1 ($p=0.002$) in the DMEK group and 0.69±0.84 ($p<0.001$) in the UT-DSAEK group. Posterior corneal curvature (Km) decreased by 0.42±0.10 ($p<0.001$) in DMEK and 0.54±0.09 ($p<0.001$) in UT-DSAEK. Mean change in TCRP and posterior corneal curvature did not differ between DMEK and UT-DSAEK (TCRP, $p=0.71$; posterior Km, $p=0.36$).

Conclusion: Sustained steepening in posterior corneal curvature with loss in total corneal power contributes to hyperopic shifts after endothelial keratoplasty. Changes in corneal measurements do not differ between DMEK and UT-DSAEK.

SCIENTIFIC ABSTRACT

1:56 pm – 2:07 pm

Primary Graft Failure Following Descemet Membrane Endothelial Keratoplasty Using Nondiabetic Donor Tissue

Andrea Blitzer, MD,** *University of Iowa*

Co-Authors: Jennifer J. Ling, MD; Christopher S. Sales, MD, MPH; Gregory A. Schmidt, MBA, CEBT; and Mark A. Greiner, MD

Purpose: To determine the trend of primary graft failure (PGF) following Descemet membrane endothelial keratoplasty (DMEK) using data from a single eye bank that excludes diabetic tissue from DMEK preparation.

Methods: Donor corneas procured by Iowa Lions Eye Bank (ILEB) from 2014-20 were studied. Adverse reactions submitted by operating surgeons were reviewed retrospectively for outcomes of PGF and early regraft. PGF was defined as corneal edema failing to clear ≥8 weeks after keratoplasty. Early regraft was defined as repeat keratoplasty <8 weeks after initial transplant. Results were analyzed using descriptive statistics.

Results: A total of 1783 consecutively prepared DMEK grafts were placed by ILEB during this period. PGF was reported for 5 grafts (0.28%) and early regraft was reported for 9 grafts (0.50%). Preloaded tissue resulted in a higher incidence of PGF and early regraft combined than non-preloaded tissue (1.60% vs 0.65%, p=0.12). In years in which both PGF and early regraft were reported (2016-20), the cumulative incidence remained stable over time (1.01% in 2016 vs 1.12% in 2020).

Conclusion: PGF and early regraft are infrequent complications of DMEK. Despite national data from EBAA Online Adverse Reaction Reporting System suggesting PGF after DMEK is increasing, our data from exclusively nondiabetic donor tissue shows a stable incidence of PGF over time.

***Cornea Fellow*

SCIENTIFIC ABSTRACT

2:08 pm – 2:19 pm

Does the Size and Duration of the Bubble in DMEK Surgery Affect the Attachment and Endothelial Cell Loss of the DMEK Graft?

Jessica Chen, MD,** *Devers Eye Institute*

Co-Authors: Alyssa J. Snyder; Alex J. Bauer; Michael D. Straiko, MD; and Mark A. Terry, MD

Purpose: To determine if there is a correlation of the SF6 bubble size or absorption rate with graft detachment or 6 month endothelial cell loss (ECL) in Fuchs' eyes receiving DMEK.

Methods: One hundred Fuchs' Dystrophy eyes receiving DMEK surgery, and no re-bubble postop, had the SF6 bubble size (as a % of anterior chamber) measured at day 1 and at day 6 and the absorption rate was also determined, (Group 1). Correlation analysis with the ECL at 6 months was performed. Bubble size and absorption rate was also measured in a separate group of DMEK eyes suffering detachment and rebubble, (Group 2, n=40). The measurements were then compared between the two groups.

Results: SF6 bubble size correlation at day 1, day 6, and absorption rate with 6 months ECL in group 1 was not statistically significant, p=0.46, p=0.84, and p=0.91, respectively. Mean bubble size at day 1 and day 6 for group 1 was 66%±10% and 22%%±14% and group 2 was 65%±14% and 19%±14%, p=0.33 and p=0.40, respectively. Mean absorption rate from day 1-6 in group 1 was 67%±21% and 70%±23% in group 2, p=0.32.

Conclusion: The size of the SF6 bubble and the speed at which it goes away does not affect the endothelial cell loss at 6 months after DMEK. Grafts requiring a re-bubble do not have a smaller initial bubble nor a shorter lasting bubble for support than eyes not re-bubbled.

***Cornea Fellow*

SCIENTIFIC ABSTRACT

2:20 pm – 2:31 pm

Comparison of Graft Viability in Tri-Folded Endothelium-In and Scrolled Endothelium-Out Preloaded Descemet Membrane Endothelial Keratoplasty

Matthew Hartman, MD, *Southeast Eye Specialists*

Co-Authors: Michael J. Taravella, MD; Richard Davidson, MD; John Lohmeier; and Stacy Terrin

Purpose: In this study we compared endothelial cell viability between pre-loaded descemet membrane endothelial keratoplasty (DMEK) grafts prepared in a modified Jones Tube with grafts that were tri-folded and loaded into a DMEK Endoglide.

Methods: DMEK grafts were prepared at the Rocky Mountain Lions Eye Bank. The grafts were tri-folded and loaded into a DMEK Endoglide with the endothelium-in, or scrolled and loaded endothelium-out in a modified Jones tube. The grafts in the DMEK Endoglide were further categorized as those having been prepared with a drop of Viscoat on the endothelium and those without. Following shipment, the grafts were then removed from the cartridge, stained with Calcein AM and imaged with a fluorescent microscope. Endothelial cell loss was graded by FIJI segmentation and two investigators.

Results: A total of 20 grafts in the tri-folded DMEK Endoglide were evaluated and imaged after shipment. Ten had been prepared with viscoat and ten without. Ten grafts shipped with the modified Jones tube were imaged. The grafts had an average of 45 hours shipping time prior to evaluating endothelial cell loss. The mean area of cell loss was 12.9% in the tri-folded Endoglide group without viscoat (n = 10) compared with 11.0% in the scrolled Jones Tube group (n = 10). This difference did not achieve statistical significance (P = 0.49). The mean area of cell loss for the Endoglide group prepared with Viscoat was 25.7%, which was statistically significant when compared to the Jones Tube group (P=0.01).

Conclusion: In this study, we showed that DMEK grafts can be successfully tri-folded and preloaded in a plastic cartridge in an eye bank setting, shipped in Optisol, and achieve a level of endothelial cell loss not inferior to grafts that are preloaded in a scroll configuration.

SCIENTIFIC ABSTRACT

2:32 pm – 2:43 pm

Difference in Postoperative Graft Adherence Between Descemet Membrane Endothelial Keratoplasty with and without Cataract Surgery

Anne-Marie Kladny, MD,* *University of Freiburg*

Co-Authors: Daniel Zander, BSc; Judith Lieberum, MD; Franziska Brandi-Dohrn; Andreas Glatz, MD; Stephanie Bixler, MSc; Thomas Reinhard, MD; and Katrin Wacker, MD

Purpose: To evaluate graft adherence in the first two weeks after Descemet membrane endothelial keratoplasty (DMEK).

Methods: A trained and validated neural network for image segmentation analyzed graft detachment on anterior segment optical coherence tomography (AS-OCT) images of participants of three prospective studies who underwent uncomplicated DMEK for Fuchs' dystrophy. Using generalized estimating equation models, the percent area and volume of graft detachment was compared between DMEK and DMEK combined with cataract surgery (Triple-DMEK).

Results: Among 206 participants included, 75 eyes had DMEK and 190 eyes had Triple-DMEK. In the first scan 3 days after DMEK, the mean percent area of graft detachment was 29% for DMEK and 36% for Triple-DMEK (mean difference, 6.1% when adjusting for the size of the air bubble; 95% confidence interval [CI], 1.6–10.7). In the second scan, the mean percent area of graft detachment was 16% in DMEK and 23% in Triple-DMEK (mean difference at postoperative day 15, 7.2%, 95% CI, 2.0–12.5). At postoperative day 15, the total volume of graft detachment was higher with Triple-DMEK than with DMEK (mean difference= +0.24 mm^3, 95% CI 0.09–0.40).

Conclusion: The automated segmentation of AS-OCT images allowed precise quantification of graft detachment over time to identify risk factors such as combined DMEK with cataract surgery.

*Resident

SCIENTIFIC ABSTRACT

2:44 pm – 2:55 pm

Novel Preloaded Injectable UT-Descemet's Stripping Automated Endothelial Keratoplasty (UT-DSAEK): No Touch Surgical Technique and Early Surgical Results

Steven Kane, MD, *Tailored Eyes*

Co-Authors: Eric Abdullayev, MD, MBA, CEBT; Art Kurz; and Karen DeMarco, BS

Purpose: To describe a novel UT-DSAEK delivery technique, its advantages and intra-operative surgical results using grafts preloaded in a delivery device, stored overnight, and delivered by small incision using fluid injection with no anterior chamber maintainer (ACM)

Methods: 235 preloaded UT-DSAEK grafts distributed with 57 case follow-up reports provided. Grafts were prepared by eye bank using microkeratome and donor punch with average diameter of 8mm and thickness of 64 microns, then preloaded with Optisol into a novel modified Jones Tube. O.R. assembly time, main wound size, graft positioning and orientation, number of sutures, and surgical complication rates are reported

Results: Average O.R. injector assembly time was <2 min. Avg. wound size was 3.4 mm. When used as indicated, 95% of grafts were injected into AC with correct orientation with no need for ACM. 86% of grafts opened without instrumented manipulation. On average, 2 sutures were used for closure. 10 reported implant complications may be attributed to the learning curve, including graft ejection prior to reaching the eye, graft ejection out of primary wound, or complication due to complex eye comorbidity.

Conclusion: This is the first report of a novel preloaded, UT-DSAEK technique inserted with fluid injection through a 3.4 mm incision. This novel technique shortens O.R. time, minimizes wound size, minimizes graft insertion trauma due to instrumented manipulation, and requires no ACM. There is a short learning curve associated with this new DSAEK delivery device

SCIENTIFIC ABSTRACT

2:56 pm – 3:07 pm

An Alternative Time Efficient Method to Specular Microscopy Following DMEK Preparation Using Trypan Blue Staining

Michael Szkarlat, BS, *Eversight*

Co-Authors: Michael S. Titus, CEBT; Nick Hicks, CEBT; and Onkar B. Sawant, PhD

Purpose: To establish a validated method, consistent with EBAA Medical Standards, for evaluating endothelial cell loss (ECL) as an alternative to specular microscopy immediately following DMEK preparation with trypan blue and the operating microscope.

Methods: 29 surgical corneas were prepared for DMEK by a single technician. Following preparation, the endothelium was stained with trypan blue for 20-30 seconds. The technician estimated total cell loss as a percentage of the graft and captured an image. Specular microscopy was performed and the image was evaluated by a blinded technician using ImageJ software. Processing intervals were analyzed 4 months before and after implementation of this method for preloaded DMEK tissues.

Results: For the 29 grafts, there was no statistical difference (t-test, P=0.285) between ECL estimated by a processor (mean=5.8%; range=2-14%) and ECL calculated using an ImageJ software (mean=5.1%; range=1.8-13.2%). The processor tended to estimate ECL higher than actual determined by ImageJ (paired t-test, P=0.022). Nonetheless, 45% of estimate were within 1% of actual ECL. Comparatively, post-processing ECD measured by specular were higher compared to the pre-processing ECD (mean=4.5% P<0.05). Processing time interval using this evaluation method for single and mated tissues were reduced by 55% and 45%, respectively compared to the specular microscopy (P<0.001).

Conclusion: Our results show that visual ECL estimation via trypan blue by processing technicians is a reliable and time efficient method for endothelial assessment of DMEK grafts. Unlike specular, this achieves comprehensive visualization of the entire endothelium. This method reduces warming time, and decreases total time required to prepare and evaluate DMEK tissue.

SCIENTIFIC ABSTRACT

4:08 pm – 4:19 pm

Regulatory T-cells Promote Corneal Graft Survival by Modulating Post-transplantation Alloimmune Response

Hamid Alemi, MD, MPH, *Schepens Eye Research Institute/ Massachusetts Eye and Ear*

Co-Authors: Rohan Bir Singh, MD; Tomas Blanco, PhD; Hayate Nakagawa, MD, PhD; Thomas Dohlman, MD; Yihe Chen, MD; Sunil Chauhan, DVM, PhD; Jia Yin, MD, PhD; and Reza Dana, MD, MPH MSc

Purpose: Corneal transplants performed in inflamed high-risk (HR) host beds result in markedly higher rejection rates, primarily due to the maturation of host-bed antigen presenting cells (APCs) post-transplantation and their swift migration to draining lymph nodes, leading to the generation of T helper 1 (Th1) cells. Herein, we examined the immunomodulatory function of regulatory T cells (Tregs) in regulating APC maturation after corneal transplantation.

Methods: High risk (HR) and low risk (LR) allogeneic corneal transplantations were performed using C57BL/6 mice as donors and BALB/c as hosts. On days 3 and 7, post-transplantation $CD4^+CD25^+FoxP3^+$ Tregs and $B220^-CD11b^+MHC\text{-}II^{hi}$ APCs were assessed by flow cytometry in graft recipient mice. Tregs were magnetically isolated from HR or LR recipient mice and co-cultured in 1:20 with $CD11b^+$ APCs (derived from bone marrow with GM-CSF, 20ng/ml) in the presence of IL-2 (10ng/ml) and LPS (100ng/ml) for 48 hours and phenotypic maturation of APCs was evaluated using flow cytometry. Additionally, Tregs isolated from HR or LR mice were co-cultured with syngeneic bone marrow-derived dendritic cells (DCs) and sonicated allo-splenocytes (in 1:20:21) as above. Subsequently, Tregs were removed, DCs and $CD4^+CD25^-$ naïve T cells were added, and T cell proliferation was assessed after 5-days with BrdU-proliferation assay.

Results: Treg function (measured by FoxP3 expression) was significantly higher in LR compared to HR ($p<0.01$), but no significant difference in Treg-frequencies was observed. $CD11b^+$ $MHC\text{-}II^{hi}$ APC frequencies were significantly lower in LR compared to HR ($p<0.001$). Expression of MHC-II, CD80, CD86, CCR7, and IL-12 was significantly reduced in APC co-cultured with LR compared to HR ($p<0.001$) Tregs. Blocking with either IL-10 or TGF- beta1 abolished the effect of Tregs in LR. APCs cultured with Tregs in the LR setting have an augmented T-cell suppressive capacity measured by IFN-gamma production and T-cell proliferation, compared to Tregs in the HR setting.

Conclusion: These results provide a novel insight into the role of Tregs in suppressing APC maturation in graft recipient mice and consequently Th1 immunity regulation. These results suggest a potential therapeutic application of Tregs in corneal transplantations.

SCIENTIFIC ABSTRACT

4:20 pm - 4:31 pm

Association Between Anti-Human Leukocyte Antigen (HLA) Antibodies and Graft Rejection in Pediatric Keratoplasty

Angela Zhu, MD, *Bascom Palmer Eye Institute, University of Miami*

Co-Authors: Jyh Haur Woo, MBBS, FRCOphth; Chia Wei Teoh, MSc, MBChB, BAO, LRCSI, MRCPI; Jinguo Wang, PhD, D(ABI); Kamiar Mireskandari, MBChB, PhD, FRCOphth; and Asim Ali, MD, FRCSC

Purpose: As no data exists on the immune profile of pediatric keratoplasty patients, our goal was to determine the prevalence and characteristics of anti-HLA antibodies in children post-keratoplasty with prior graft rejection episodes compared to those without rejection.

Methods: Serum HLA typing and anti-HLA panel reactive antibody (PRA) testing was performed on 23 pediatric patients with a history of at least one penetrating keratoplasty (13 with history of graft rejection, 10 without) and 35 age-matched controls with no history of grafts. The prevalence of anti-HLA alloantibodies, typing profile, and specificity was compared.

Results: Eight of 13 patients (62%) with history of graft rejection exhibited antibodies to either HLA class I or II alleles, compared to 3/10 (30%) rejection-free patients and 6/35 (17%) controls ($P < 0.05$). The average calculated PRA (quantitative measurement of sensitization) was 20.9% in patients with history of graft rejection, compared to 5.0% in those without and 1.3% in controls ($P < 0.05$).

Conclusion: A trend exists toward increased prevalence of anti-HLA antibodies in pediatric keratoplasty patients with prior graft rejection, suggesting that donor-host HLA matching may have more importance in pediatric corneal transplantation than previous adult studies showed. Additional larger, prospective studies are necessary to determine if HLA matching affects long-term graft survival in the high-risk pediatric population.

SCIENTIFIC ABSTRACT

4:32 pm – 4:43 pm

Hyaluronic-Acid Based Bioengineered Corneal Stromal Substitute

Roza Vaez Ghaemi, PhD, *University of British Columbia*

Co-Authors: Vikramaditya G. Yadav; Sonia N. Yeunga; and Alfonso Iovieno, MD, PhD

Purpose: To develop a durable, biocompatible, transparent, artificial corneal stromal substitute that would mimic the human corneal stroma in key physical and physiological functions. Also, we aimed at incorporating an anti-angiogenic compound to prevent corneal neovascularisation.

Methods: A hyaluronic acid (HA)-based 500 µm hydrogel was fabricated and then crosslinked. Compounds ratios as well as crosslinking condition was systematically evaluated by assessing swelling ratio (hydrogel weight after submerging in PBS), mechanical strength (rheometer with cone-and-plate geometry), biodegradability (remaining weight after submerging in an enzyme cocktail), optical transparency (spectrophotometer at UV-Visible wavelengths) and glucose/albumin permeability (glucose and albumin concentration across the hydrogel) of the resulting hydrogels. The hydrogel was then coated with an antiangiogenic compound to prevent neovascularization.

Results: Our results show that all composites were completely clear (>88% transmittance) with refractive index of ~1.3, which is very close to that of the human cornea. Hydrogels were shown to have an equilibrium water content of ~90% with less than 5% degradation in enzymatic solution over 2 months. Tensile strength and maximum elongation of the hydrogels were found to be 1.47 MPa and 8.57% respectively, which are comparable to native cornea. The presence of the specific bonds in the hydrogel structure and the crosslinking of the antiangiogenic compound coating on the walls were confirmed by Fourier Transform Infrared Spectra.

Conclusion: We have been able to produce a HA-based co-polymer with optical and mechanical properties similar to the human corneal stroma. Further studies would be needed to test biocompatibility in vitro and in animal models.

SCIENTIFIC ABSTRACT

4:44 pm - 4:55 pm

Prospective, Randomized, Multicenter, Double-Masked, Clinical Trial Evaluating Corneal Crosslinking of Keratoprosthesis Carrier Tissue

Joseph B. Ciolino, MD, *Mass Eye and Ear*

Co-Authors: Sofia De Arrigunaga, MD, MPH; David Zurakowski PhD; Natalie A. Afshari, MD; Esen K. Akpek, MD; Anthony J. Aldave, MD; Guillermo Amescua, MD; James V. Aquavella, MD; Brandon D. Ayres MD; Jose de la Cruz, MD; Edward J. Holland, MD; Dr Ula Jurkunas, MD; Mark Mannis, MD; Shahzad I. Mian, MD; Victor L. Perez, MD; and Joseph Tauber, MD

Purpose: Evaluate the safety and efficacy of donor collagen crosslinked corneas as carriers for Boston Keratoprosthesis (KPro) in patients with high risk of corneal melt after keratoprosthesis.

Methods: Candidates for KPro at increased risk for sterile cornea ulceration were randomized to either crosslinked or non-crosslinked donor corneas as carrier tissue for KPro. There was a 52-week follow-up period followed by standard of care for three years every six months or until study closure. Main efficacy measure was KPro retention. Safety measures include incidence of delayed epithelial healing at day 30, time from surgery to retroprosthetic membrane treatment and occurrence of vitritis. Unmasked survival analysis of efficacy and safety measures will be presented in detail. A multivariable Cox proportional hazards regression model will be used to assess the effect of crosslinking in preventing corneal melts and increasing KPro retention time independent of patient covariates and adjusting for center.

Results: Data collection has been completed. Sixty-eight KPros were implanted in 68 eyes (56 with previous sterile corneal ulceration) in 68 patients (15 with autoimmune disease) between 2017 - 2020 across 13 sites. The average age at the time of surgery was 62 [24-89] years and 42 (62%) subjects were male. The mean follow-up time was 91 weeks (SD= 47.6). A total of 20 KPros were removed with an average survival time of 70 [6-160] weeks.

Conclusion: We will present unmasked safety and efficacy data on the use of crosslinked carrier tissue for KPros.

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