EBAA 2025 ANNUAL MEETING

2025 SYMPOSIA PROGRAM

June 28 | San Diego, CA
#EBAA2025

EBAA SYMPOSIA

2025 Annual Meeting
Saturday, June 28, 2025
San Diego, CA

Scientific Symposium
8:00 am – 11:45 am

Physician Luncheon
12:00 pm – 1:00 pm

Medical Directors Symposium
1:15 pm – 4:15 pm

EBAA 2025 ANNUAL MEETING

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SCIENTIFIC PROGRAMS COMMITTEE

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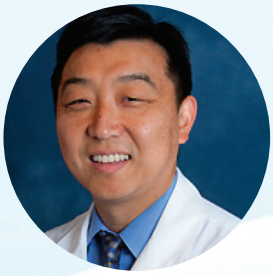

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EBAA 2025 ANNUAL MEETING

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LEARNER NOTIFICATION AND FINANCIAL INTEREST DISCLOSURES

LEARNER NOTIFICATION

Eye Bank Association of America
2025 Annual Meeting Symposia
June 28, 2025 | San Diego, CA

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Objectives - After Attending This Program You Should Be Able To:

1. Learn new developments and techniques in eye banking and corneal transplantation.
2. Understand updates in eye banking standards and practices.
3. Cite new research findings in corneal transplantation, preservation, preparation, and processing.

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PROGRAM SCHEDULE

PROGRAM SCHEDULE

SCIENTIFIC SYMPOSIUM 8:00 AM – 11:45 AM

8:00 am – 8:02 am
Welcome and Introductions
M. Soledad Cortina, MD, and Asim V. Farooq, MD

8:03 am – 8:12 am
Ocular Surface Reconstruction with Keratolimbal Allograft for Severe or Recurrent Symblepharon
Samuel Korouri,** *University of California, Irvine School of Medicine*

8:13 am – 8:22 am
Novel Technique to Thin Oral Mucous Membrane Grafts for Ocular Surface Reconstruction to Achieve Texture Mimicking Conjunctiva
Omer Siddiqui,** *University of Michigan Medical School*

8:23 am – 8:32 am
Role of Sex and Extracellular Matrix Modification on Migration Rate of Fuchs Endothelial Corneal Dystrophy Cells in Descemet's Stripping Only
Mohit Parekh, PhD, *Schepens Eye Research Institute/ Mass Eye and Ear*

8:33 am – 8:42 am
Evaluating the Role of Rho Kinase Inhibitors in Glaucoma Patients with Underlying Cornea Transplantation
Alisha Dhallan,** *Washington University School of Medicine*

8:43 am – 8:52 am
Efficacy of α-MSH in Accelerating Corneal Endothelial Regeneration Following Descemet's Stripping Only
Francesca Kahale, MD, *Schepens Eye Research Institute/ Mass Eye and Ear*

8:53 am – 9:02 am
Comparison of Orientation Markings on Endothelial Keratoplasty Grafts Over 72 Hours
Christine Xu, MD, * *University of California, Davis*

9:03 am – 9:12 am
Comparing the Characteristics and Feasibility of Donor DMEK Tissue Under Age 50: A Retrospective Review
Abhiniti Mittal, MD,+ *Oregon Health and Sciences University*

9:13 am – 9:22 am
Screening and Preventing Textural Interface Opacities in DSAEK Corneal Transplants
Marina Chatzea, MD, CEBT, * *Athens Eye Bank, National and Kapodistrian University of Athens*

9:23 am – 9:32 am
Comparison of Corneal Storage Solutions for the Preservation of DSAEK Grafts
Nicholas Hicks, CEBT, *Eversight*

9:33 am – 9:35 am
Research Grant Announcement
Asim V. Farooq, MD, and M. Soledad Cortina, MD

9:36 am - 9:39 am
Section I Wrap Up
M. Soledad Cortina, MD, and Asim V. Farooq, MD

**Medical Student, *Resident, +Cornea Fellow

9:40 am – 10:09 am	**Refreshment Break in Exhibit Hall**
10:10 am – 10:11 am	**Welcome Back** Asim V. Farooq, MD, and M. Soledad Cortina, MD
10:12 am – 10:21 am	***How Different are Donor Corneas from Diabetics versus Non-Diabetics?*** Aravind Roy, MD, *LV Prasad Eye Institute*
10:22 am – 10:31 am	***Diabetes Endothelial Keratoplasty Study (DEKS): Donor and Donor Lenticule Prep Findings*** Michael Titus, CEBT, *Eversight*
10:32 am – 10:41 am	**Evaluation of Area of Cell Damage Assessment in the DEKS-ACD Ancillary Study** Peter Bedard, MS, *Lions Gift of Sight*
10:42 am – 10:51 am	***Limbal Epithelial Cells Are Present In Eyes With Stage III/ Total Limbal Stem Cell Deficiency Evaluated By In Vivo Confocal Microscopy*** Clemence Bonnet, MD, PhD, *Stein Eye Institute, UCLA*
10:52 am – 11:01 am	**Transcriptomic Analyses of Corneal Endothelial Cells Treated with Mitochondrial-Targeted Antioxidant MitoQ during Ex Vivo Expansion for Cell-Based Therapies** Doug Chung, PhD, *Stein Eye Institute, UCLA*
11:02 am – 11:11 am	**Hydrogel-Based Grafts for Cultured Human Corneal Endothelial Cell Transplantation** Christopher Stoeger, MBA, CEBT, *OcuCell*
11:12 am – 11:39 am	**Invited Presentation: *An Update on Endothelial Cell Therapy in the United States*** W. Barry Lee, MD, *Georgia Eye Bank*
11:40 am – 11:43 am	**Best Paper of Session Award Announcement** Michelle Rhee, MD, *Eye Banking and Corneal Transplantation Journal* *Supported by an unrestricted educational grant from AltruVision*
11:44 am – 11:45 am	**Closing Remarks** M. Soledad Cortina, MD, and Asim V. Farooq, MD

PHYSICIAN LUNCHEON 12:00 PM – 1:00 PM

Facilitated Discussion moderated by Jennifer Li, MD, and Winston D. Chamberlain, MD, PhD

MEDICAL DIRECTOR SYMPOSIUM 1:15 PM – 4:15 PM

1:15 pm – 1:55 pm	**Infectious Diseases: A Primer for Medical Directors** Beverly Forsyth, MD, *Icahn School of Medicine at Mount Sinai*
1:56 pm – 2:40 pm	**Adverse Events - Reporting and Case Studies** Elmer Tu, MD, *Eversight* Winston D. Chamberlain, MD, PhD, *VisionGift* Sean Edelstein, MD, *Mid-America Transplant* Zeba Syed, MD, *Wills Eye Institute*
2:41 pm – 2:55 pm	**What's New in Accreditation?** Amy Lin, MD, *Utah Lions Eye Bank*
2:56 pm – 3:09 pm	**Break**
3:10 pm – 3:20 pm	**Advocating for Eye Banking: The Medical Director's Role in Education, Outreach, and Social Media** Lorenzo Cervantes, MD, *Eversight*
3:21 pm – 3:31 pm	**Becoming an Ambassador for Your Eye Bank** Viral Juthani, MD, *Montefiore Einstein*
3:32 pm – 4:14 pm	**Medical Director Dilemmas: What Would You Do?** Moderator: Jennifer Li, MD, *Sierra Donor Services Eye Bank* Panelists: John Bokosky, MD, *San Diego Eye Bank* Sander Dubovy, MD, *Beauty of Sight* Beverly Forsyth, MD, *Icahn School of Medicine* Shahzad Mian, MD, *Eversight*
4:15 pm	**Closing Remarks** M. Soledad Cortina, MD, *Eversight*

SCIENTIFIC SYMPOSIUM INVITED SESSION

INVITED SESSION

Invited Session:
An Update on Endothelial Cell Therapy in the United States

W. Barry Lee, MD, FACS, *Georgia Eye Bank & Eye Consultants of Atlanta*

This invited session provides a comprehensive update on the progress and status of endothelial cell therapy for corneal endothelial diseases in the United States. The presentation begins with a brief overview of the historical development of corneal endothelial cell therapy, highlighting key scientific and clinical milestones.

The session then focuses on ongoing efforts within the U.S. to bring endothelial cell injection therapy closer to FDA approval. We will review the latest clinical trial data on endothelial cell delivery. This session provides attendees with a clear understanding of where the field currently stands and what the future may hold for endothelial cell therapies.

SCIENTIFIC SYMPOSIUM ABSTRACTS

EBAA 2025 ANNUAL MEETING

SCIENTIFIC SYMPOSIUM ABSTRACT

8:03 am – 8:12 am

Ocular Surface Reconstruction with Keratolimbal Allograft for Severe or Recurrent Symblepharon

Samuel Korouri,** *University of California, Irvine School of Medicine*

Co-Authors:
Rachel Kamran and Marjan Farid, MD

Purpose:
To study long term effectiveness and outcomes in a novel technique using keratolimbal allograft (KLAL) tissue for the treatment of recurrent and severe symblepharon.

Methods:
A retrospective review of patients within the past 10 years undergoing ocular surface reconstruction with KLAL allograft for severe or recurrent symblepharon causing symptomatic restrictive diplopia in either primary or functional cardinal positions of gaze was performed. All eyes had meticulous symblepharon lysis and scar tissue removal and reconstruction with KLAL tissue used as a spacer to prevent recurrent scar formation. Outcome measures such as resolution of diplopia, recurrence of symblepharon, time to recurrence, and any complications were reviewed.

Results:
A total of 15 patients (16 total eyes) were analyzed. The range of post-operative review was 2- 43 months. All eyes showed complete resolution of diplopia in primary gaze as well as functional cardinal gazes. Three patients maintained restriction in far right or left gaze. No patients had recurrence of symblepharon over the KLAL graft. However, six patients developed recurrence to the posterior edge of the graft, two of whom required repeat surgery to place an additional KLAL segment to manage recurrence in the far periphery. One patient developed a small peripheral corneal dellen that resolved with an amniotic membrane transplant.

Conclusion:
Following a long term assessment of ocular surface reconstruction using KLAL tissue, this technique is a robust alternative to existing symblepharon treatment, successfully decreasing adhesion recurrence and associated diplopia among patients with severe or recurrent symblepharon.

** Medical Student

SCIENTIFIC SYMPOSIUM ABSTRACT

8:13 am – 8:22 am

Novel Technique to Thin Oral Mucous Membrane Grafts for Ocular Surface Reconstruction to Achieve Texture Mimicking Conjunctiva

Omer Siddiqui, ** *University of Michigan Medical School*

Co-Authors:
Nambi Nallasamy MD, and Denise Kim, MD

Purpose:
Oral mucous membrane grafting (MMG) to the ocular surface is a well-established method to replace injured palpebral, bulbar, and forniceal conjunctiva. Thinning harvested mucous membrane tissue prior to grafting improves tissue integration, tear film distribution, and cosmesis. We present a novel technique to remove submucosa and lamina propria from harvested oral mucosal epithelial grafts.

Methods:
The graft is pinned with epithelium facing down on a sterile foam surface. The exposed stroma is covered with a thin layer of OVD. The surface is debrided with a diamond burr at 40,000 RPM. At high RPM with OVD, the burr emulsifies stromal tissue rather than catching it, reducing the risk of a buttonhole. The tissue is debrided until the resultant tissue is translucent.

Results:
In our experience in over 20 cases, diamond burr debridement is straightforward to execute, leads to translucent MMGs, and provides excellent cosmesis.

Conclusion:
A bulky MMG with excess stromal or adipose tissue can lead to adverse outcomes such as acute graft displacement, reduced tissue integration, poor tear film distribution, and ectropion or entropion. Diamond burr debridement is an alternative option to standard thinning with scissors over a gloved finger for the preparation of MMGs with favorable outcomes for patients requiring ocular surface reconstruction in preparation for corneal transplantation.

** Medical Student

SCIENTIFIC SYMPOSIUM ABSTRACT

8:23 am – 8:32 am

Role of Sex and Extracellular Matrix Modification on Migration Rate of Fuchs Endothelial Corneal Dystrophy Cells in Descemet's Stripping Only

Mohit Parekh, PhD, *Schepens Eye Research Institute/ Mass Eye and Ear*

Co-Authors:
Nathan Shatz, BS; Marianne O. Price, PhD, MBA; Francis W. Price, Jr., MD; and Ula Jurkunas, MD

Purpose:
To investigate the influence of sex differences and extracellular matrix modification on corneal endothelial cell (CEnC) migration, with the objective of improving the predictability and efficacy of Descemet's Stripping Only (DSO) technique for treating Fuchs endothelial corneal dystrophy (FECD).

Methods:
CEnCs from normal and FECD specimens, obtained from male and female donors, were stained with 1 μM Hoechst 33342 and cultured with the endothelium facing upward. In the ex vivo DSO model, the Descemet's membrane from male and female donors was placed on stromal lenticule coated with or without fibronectin (FN). Cell migration was monitored using live-cell imaging, and the mean velocity (pixels/hour) was analyzed using ImageJ. The migration difference between male and female CEnCs on native DM and FN-coated and uncoated stromal lenticules were evaluated. All experiments were performed in triplicates.

Results:
On native DM, female CEnCs from normal donors displayed significantly higher velocity (1.7 ± 1.5) compared to male donors (1.4 ±1.3; $p<0.0001$). Similarly, FECD cells from females (1.9 ± 2.1) migrated faster than males (1.6 ± 1.4; $p<0.01$). In the ex vivo DSO model, normal female CEnCs migrated faster on bare stromal lenticule (4.6 ± 1.9) compared to males (3.9 ± 1.9; $p<0.0001$). FN coating further enhanced migration in both sexes, with female CEnCs migrating significantly faster (5.6 ± 2.2) compared to males (4.4 ± 2.2; $p<0.0001$). The FN coating increased migration by 20% in female CEnCs and 11% in male CEnCs.

Conclusion:
Female CEnCs demonstrated a faster migration rate, indicating that females may be more optimal candidates for DSO. Furthermore, FN coating significantly enhanced CEnC migration, which could be potentially used to reduce the rehabilitation time after DSO. The ex vivo DSO model offers a valuable platform for developing pharmaceutical interventions aimed at optimizing DSO outcomes and improving treatment efficacy.

SCIENTIFIC SYMPOSIUM ABSTRACT

8:33 am – 8:42 am

Evaluating the Role of Rho Kinase Inhibitors in Glaucoma Patients with Underlying Cornea Transplantation

Alisha Dhallan, ** *Washington University School of Medicine*

Co-Authors:
Praneetha Thulasi, MD

Purpose:
Cornea transplant survival is worse in eyes with glaucoma, partly due to toxicity from glaucoma drops. The impact of Rho kinase (ROCK) inhibitors on transplant survival remains unclear. This study examines outcomes in corneal transplant recipients with glaucoma treated with netarsudil 0.02%.

Methods:
A retrospective chart review was conducted on corneal transplant recipients with glaucoma who were treated with netarsudil between 2018 - 2022. The primary outcome was new corneal graft dysfunction. Secondary outcomes included resolution of preexisting corneal dysfunction. Cox regression analysis was performed to assess potential predictors of graft failure.

Results:
Thirty patients (mean age 64.2 years) were included. Seven developed new graft dysfunction, while five had preexisting edema that did not improve. Prior ocular surgeries (HR 2.38, p=0.06) and duration of netarsudil use (HR 0.99, p=0.07) were marginally associated with dysfunction. Despite IOP reduction, netarsudil did not demonstrate a protective effect on graft survival.

Conclusion:
In this high-risk cohort, netarsudil use was not associated with improved graft survival or resolution of dysfunction. The small study size is a limitation of our study. Given the potential impact of ROCK inhibitors on endothelial health, further studies are needed to clarify their role in corneal transplantation.

** Medical Student

SCIENTIFIC SYMPOSIUM ABSTRACT

8:43 am – 8:52 am

Efficacy of α-MSH in Accelerating Corneal Endothelial Regeneration Following Descemet's Stripping Only

Francesca Kahale, MD, *Schepens Eye Research Institute/ Mass Eye and Ear*

Co-Authors:
Reza Dana, MD, MPH, MSc; Swatilekha Hazra; Shweta Sandhy; and Rohan Bir Dhaliwal

Purpose:
The corneal endothelium has limited regenerative capacity. Our previous work demonstrated high expression of the melanocortin 1 receptor (MC1R) in corneal endothelial cells (CEnC) and highlighted the cytoprotective and regenerative functions of α-melanocyte stimulating hormone (α-MSH) supplementation following injury. In this study, we evaluated the effect of α-MSH, the pricipal agonist of MC1R, on CEnC repair in murine model of Descemet's Stripping Only (DSO).

Methods:
Corneal endothelial injury was induced by mechanically stripping 1.5 mm diameter of Descemet's membrane in the central cornea. Mice were divided into three groups: wild-type C57BL/6 mice treated with α-MSH (10^{-6}M) or vehicle (PBS) and $MC1R^{e/e}$ mice treated with α-MSH (N=5 each). Mice received intraperitoneal injections of α-MSH (3x weekly) for 4 weeks. Central corneal thickness (CCT) was measured using anterior segment optical coherence tomography on day 3 post-injury and weekly for one month. Corneas were collected on days 7 and 14 for zonula occludens-1 (ZO-1) immunostaining to assess barrier integrity. Morphometric analysis of CEnC was performed using CellChekD+ software to measure endothelial cell density (ECD), polymegathism (cell size variation), and hexagonality. One-way ANOVA test was used for statistical analysis.

Results:
α-MSH treatment significantly reduced corneal edema, preserved endothelial cell density (ECD), and improved corneal morphology. At day 3, central corneal thickness (CCT) in the treated group was significantly lower (184.4 ± 13.8 µm) compared to untreated controls (287.6 ± 23.1 µm, p=0.007) and $MC1R^{e/e}$ mice (278.75 ± 5.28 µm, p=0.0019). This difference persisted through day 7, with the treated group maintaining a lower CCT (120 ± 11.2 µm) compared to untreated controls (186 ±18.8 µm, p=0.018) and $MC1R^{\wedge e/e}$ mice (219.25 ± 9.06 µm, p<0.0001). At day 7, ECD was significantly higher in treated mice compared to untreated controls (p=0.007). Untreated controls also showed greater polymegathism (59 ± 4.9%) compared to treated mice (47.25 ± 6.9%, p=0.048) and lower hexagonality (34.5 ± 4.35%) compared to treated mice (49.25 ± 4.03%, p=0.034). Hexagonality in treated mice was also significantly higher than in $MC1R^{e/e}$ mice (p=0.047).
While these trends persisted, statistical significance was lost beyond two weeks.

Conclusion:
α-MSH promotes CEnC repair by reducing edema, preserving cell density, and improving morphology. The findings support a receptor-dependent therapeutic role for α-MSH.

SCIENTIFIC SYMPOSIUM ABSTRACT

8:53 am – 9:02 am

Comparison of Orientation Markings on Endothelial Keratoplasty Grafts Over 72 Hours

Christine Xu, MD, * *University of California, Davis*

Co-Authors:
Chris Conwell; Tiffany Ramirez; and Jennifer Li, MD

Purpose:
Orientation markings (F or S stamp) on endothelial keratoplasty (EK) grafts may change in appearance, fade, or blur over time, posing a surgical challenge. We compared the effect of various marker types and storage media on marking appearance over time.

Methods:
EK grafts (Descemet Stripping Automated Endothelial Keratoplasty (DSAEK), Descemet Membrane Endothelial Keratoplasty (DMEK), or preloaded DMEK (pDMEK)) were processed by a single eye bank. Orientation markings were placed using 5 types of Gentian Violet markers: Richard Allan, Cardinal Health, DeRoyal, Medline, and Covidien Devon. The storage media options were: Optisol with gentamicin and streptomycin (Optisol-GS), and Kerasave ± amphotericin B. Images were taken from 0 to 72 hours for 24 grafts to compare the quality of markings for each combination. The images were graded subjectively by one eye bank technician.

Results:
There were negligible differences when comparing the 3 types of storage media as well as the types of EK graft. The clarity and duration of markings was best for the Richard Allan and Cardinal Health markers, and worst for the Covidien Devon markers.

Conclusion:
The Richard Allan and Cardinal Health Gentian Violet markers provided clear and long-lasting orientation markings. More testing is needed with greater sample size, different types of markers, and more technicians.

* Resident

SCIENTIFIC SYMPOSIUM ABSTRACT

9:03 am – 9:12 am

Comparing the Characteristics and Feasibility of Donor DMEK Tissue Under Age 50: A Retrospective Review

Abhiniti Mittal, MD, + *Oregon Health and Science University*

Co-Authors:
Winston D. Chamberlain, MD, PhD; Megan M.W. Straiko; and Khoa D. Tran, PhD

Purpose:
Corneal tissue shortage is a threat to corneal transplantation due to recent regulatory changes. In the U.S., the number of DMEK procedures surpassed DSAEK procedures in 2023. US eye banks typically do not process DMEK tissue from donors under age 50. Furthermore, age restrictions on accepted DMEK tissue by many surgeons further limits supply. In this study we have characterized DMEK tissue utilization from donors ≤ age 49 compared to donors > age 50, including processing times, pre-processing endothelial cell counts, and processing success rate.

Methods:
Retrospective review of donor corneas utilized for DMEK tissue processing from 2018-2024 at a single US eye bank.

Results:
Of the 9,161 donor corneas that were available for DMEK tissue processing from 2018-2024, 253 were donors ≤ age 49 while 8,908 were donors > age 50. Donor cohort ≤ age 49 had a processing success rate of 97.8% (247/253) compared to donors > age 50 which had a success rate of 97.2% (8661/8908) ($p=0.98$). The mean pre-processing endothelial cell count in the donor cohort age ≤ 49 was 2837.6 compared to 2817.3 for donor age > 50 ($p=0.27$). The mean tissue processing time for donor age ≤ 49 was 30 minutes compared to 28.2 minutes for donors > age 50 ($p<0.005$). There were no adverse reactions (graft failure, need for re-grafting) reported for cohort ≤ age 49.

Conclusion:
DMEK surgery is now the most common form of keratoplasty in the United States. This has led to an increase demand on eye banks for tissue availability of a certain age and quality. This prompted our eye bank to investigate the feasibility of younger donors for DMEK. Early results show that processing success rate was equivalent for donors ≤ age 49 with similar endothelial cell counts and tissue processing time as donors > age 50. There were also no reported adverse reactions in the cohort ≤ age 49 among two experienced surgeons. Broader assessment across multiple eye bank process technicians and surgeons will be necessary to determine generalizability of our early success and surgeon acceptance rates.

+ Cornea Fellow

SCIENTIFIC SYMPOSIUM ABSTRACT

9:13 am – 9:22 am

Screening and Preventing Textural Interface Opacities in DSAEK Corneal Transplants

Marina Chatzea, MD, CEBT,* *Athens Eye Bank, National and Kapodistrian University of Athens*

Co-Authors:
Robert OBrien, PhD; Elizabeth Fout, MHSA; William Buras, Sr., CEBT; Concetta Triglia, CEBT; Katrina Llanes; Daniela Mora; George Kymionis; Rahul Tonk; and Sonia Yoo, MD

Purpose:
Textural Interface Opacities (TIO) have been recognized as a significant postoperative complication following Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK). Although multiple studies have explored potential associations between TIO formation and intraoperative variables, including fluid dynamics, viscoelastic application, and recipient immune response, the precise pathophysiological mechanisms remain undefined. This study aims to evaluate the association between microkeratome-assisted graft preparation and the incidence of TIO and its impact on postoperative outcomes.

Methods:
Optical coherence tomography (OCT) images of DSAEK-processed corneal grafts, prepared using a standardized microkeratome and technique for transplantation at Bascom Palmer Eye Institute, underwent blinded analysis using a newly developed grading scale. This analysis aimed to evaluate and classify the occurrence of TIO, explore its correlation with graft characteristics prior to DSAEK preparation, and assess its association with specific stages of the DSAEK cutting process. Collected data included the microkeratome head size, pre-cut and post-cut graft thickness, and the deviation between the intended and actual stromal cut. Additionally, we assessed the impact of each TIO grade on postoperative visual outcomes in transplanted patients to determine its clinical significance in graft clarity and functional vision.

Results:
The study retrospectively analyzed 422 donor corneas transplanted between 2019 and 2023. In the final multivariable ordinal logistic model, factors significantly associated with TIO included the difference in pre- and post-cut graft thickness (OR: 1.57 [99% CI: 1.22–2.06] per 50 µm) and microkeratome head size. Compared to 450 or 500 µm heads, the odds ratios for TIO were 6.95 [99% CI: 1.04–36.60] for 300 µm, 4.39 [99% CI: 0.76–19.00] for 350 µm, and 18.86 [99% CI: 2.35–175.91] for 400 µm. Greater TIO severity was correlated with worse postoperative visual acuity, as measured by logMAR. The mean logMAR VA was 0.151 [99% CI: 0.077–0.225] for corneas without TIO, increasing to 0.680 [99% CI: 0.532–0.828] for corneas with the highest TIO grade. Notably, eyes with glaucoma and other comorbidities were excluded from this analysis to isolate the impact of TIO on visual outcomes.

Conclusion:
This study introduces a novel grading scale for screening TIO in corneal grafts prior to DSAEK transplantation. Our findings demonstrate a significant correlation between TIO, as identified in OCT images of DSAEK-processed grafts, and postoperative transplantation outcomes, emphasizing the clinical relevance of preoperative TIO assessment. Furthermore, we establish a statistically significant association between TIO and microkeratome-assisted DSAEK graft preparation, identifying key factors that may contribute to its prevention.

* Resident

SCIENTIFIC SYMPOSIUM ABSTRACT

9:23 am – 9:32 am

Comparison of Corneal Storage Solutions for the Preservation of DSAEK Grafts

Nicholas Hicks, CEBT, *Eversight*

Co-Authors:
Stephanie Becker; Jessica Ludwig; Megan M.W. Straiko, PhD; Mark S. Ellison, BS, BA; Khoa D. Tran, PhD; and Onkar B. Sawant, PhD

Purpose:
To compare corneal swelling during cold storage and post-processing of pre-cut and preloaded DSAEK grafts and to examine its relationship to corneal endothelial cell viability in corneas stored in XTRA4 versus Optisol-GS.

Methods:
Mated corneas were stored in XTRA4 or Optisol-GS under hypothermic storage conditions. Corneal pairs were processed for DSAEK by pre-cutting only (N=9) or pre-cutting and preloading (N=6). Prepared grafts were measured by OCT after tissue processing, after loading (when applicable), and again in subsequent days. Corneal endothelium was evaluated using specular microscopy. Endothelial cell viability of the DSAEK grafts were measured using Calcein-AM vital dye staining and fluorescence microscopy.

Results:
Pre-cut DSAEK grafts in XTRA4 swelled by only 8% over 3 days (109 ± 10 µm to 117 ± 10 µm), whereas Pre-cut DSAEK grafts in Optisol-GS swelled by 42% over 3 days (91±10 µm to 129 ± 19 µm). A modest but higher endothelial cell loss was observed in the Optisol-GS group (12% ± 1% SEM) compared to the XTRA4 group (8% ± 2% SEM) (P=0.018). The swelling in preloaded grafts at the end of 6 days was significantly higher in the Optisol-GS group than in the XTRA4 group (P=0.014). Endothelial cell loss in pre-loaded grafts was comparable (21% vs. 23%, P=0.73, N=3), but greater swelling correlated with more folds and cell loss.

Conclusion:
XTRA4 preserves DSAEK graft thickness during cold storage, minimizing swelling in pre-cut and pre-loaded DSAEK grafts and preventing swelling and folds. These properties help reduce endothelial cell loss and improve eye bank workflows.

SCIENTIFIC SYMPOSIUM ABSTRACT

10:12 am – 10:21 am

How Different are Donor Corneas from Diabetics Versus Non-Diabetics?

Aravind Roy, MD, *LV Prasad Eye Institute*

Co-Authors:
Sujata Das

Purpose:
To study of corneal tissue parameters from diabetics and compare them with non-diabetic donors.

Methods:
Prospective comparative study of donor corneas from diabetics and non-diabetics donors from April 2022 to April 2024. Descriptive analysis for frequency and proportion for categorical variables. Continuous variables were presented as median (95% CI). Chi-square test for cross-tabulation. Mann Whitney U test for median (95% CI) of continuous variables. Kruskal Wallis H for median (95% CI) of continuous variables between more than two groups for non-normally distributed data. $P<0.05$ was significant. Corneal endothelial cell density (ECD), coefficient of variability (CV) hexagonality and pachymetry was studied.

Results:
We evaluated 2704 corneal rims; half from diabetics and the rest from non-diabetics. There was no evidence of interaction effect between age, disease duration and treatment modality of diabetes on ECD, hexagonality, CV and pachymetry ($p>0.05$). Statistically significant difference in hexagonality and pachymetry between diabetic and non-diabetics ($p<0.05$); hexagonality was found higher in non-diabetic group whereas pachymetry was higher in diabetic group. No difference in ECD and CV between diabetic and non-diabetic groups ($p>0.05$). Statistically insignificant difference in ECD and CV between diabetic and non-diabetic group in phakic eyes ($p>0.05$). Significant difference in ECD, hexagonality and pachymetry between diabetic and non-diabetic group in pseudophakic eyes ($p<0.05$).

Conclusion:
This study suggests that corneal tissue is comparable amongst diabetics and non-diabetic donors.

SCIENTIFIC SYMPOSIUM ABSTRACT

10:22 am – 10:31 am

Diabetes Endothelial Keratoplasty Study (DEKS): Donor and Donor Lenticule Prep Findings

Michael Titus, CEBT, *Eversight*

Co-Authors:
Mark Soper, CEBT; Amy Ansin; Jameson Clover, CEBT; Lindsey Elbanhawy; Gregory Schmidt, MBA, CEBT; Anthony Vizzerra, CEBT; Loretta Szczotka-Flynn, OD, PhD; Marianne O. Price, PhD, MBA; and Jonathan Lass, MD

Purpose:
Describe donor and donor lenticule prep findings in DEKS and potential impact on eye bank procedures.

Methods:
The DEKS is a multi-center RCT assessing graft success and endothelial cell loss (ECL) 1-year post 1,421 DMEKs for Fuchs, PBK, and failed EK using corneas from non-diabetic vs. diabetic donors in an assigned 2:1 minimization. Among the nearly 60 parameters prospectively collected including HbA1c testing and determination of a diabetes severity risk score (1-5), this report will discuss the donor and donor lenticule prep findings.

Results:
A total of 1421 tissues from 1,154 donors showed mean age of 65 ± 7 years, ECD of 2709 ± 275 cells/mm^2, and HbA1c [6.1% ± 1.3% (3.5% - 15.4%). 1,097 recipients (324 bilateral cases) showed mean age of 70 ± 8 years, 21% diabetic, and 95% Fuchs. HbA1c testing led to reclassifying 106 donor tissues (9%) from non-diabetic to diabetic (≥ 6.5%). Of the 509 diabetic donors, 66% had a diabetes severity score between 4-5. In total, 1469 donor tissues were prepared in the study: 48 preparations failed (3%), and 1421 successfully prepared tissues were implanted in study recipients. Post prep, 91% had endothelial cell damage estimated at <10% via trypan blue staining and 67% were single scroll.

Conclusion:
The DEKS will increase understanding of DMEK success factors and whether donor diabetes and its severity does or does not adversely affect graft outcomes. Furthermore, the DEKS will provide insight on the impact of donor diabetes severity on successful outcomes of DMEK preparation. If there is a high success rate across the diabetes severity scale, eye banks could increase the overall pool of available DMEK tissue.

SCIENTIFIC SYMPOSIUM ABSTRACT

10:32 am – 10:41 am

Evaluation of Area of Cell Damage Assessment in the DEKS-ACD Ancillary Study

Peter Bedard, MS, *Lions Gift of Sight*

Co-Authors:
Sung Lee, BS; Ching Yuan, PhD; Loretta Szczotka-Flynn, OD, PhD; Beth Ann Benetz, CRA, MA; Marianne O. Price, PhD, MBA; Jonathan Lass, MD; and Joshua H. Hou, MD

Purpose:
Trypan blue is a vital dye that stains dead endothelial cells and is a useful tool for post-processing tissue evaluation in DMEK. Quantifying the area of stain (cell damage, ACD), offers a valuable metric for judging tissue quality. ACD can be quantified from simple photos of stained corneas; however, the feasibility of standardizing imaging across different eye banks with unique processing set-ups is unknown. Additionally, the reliability of estimates versus software-based quantification of ACD is unclear. The purpose of this study was to evaluate the feasibility of standardized cornea imaging across multiple eye banks, and to compare different quantification modalities for ACD.

Methods:
Eye banks enrolled in the Diabetes Endothelial Keratoplasty Study (DEKS) were recruited to participate in the DEKS-ACD ancillary study. Participating eye banks were issued standardized cameras and trained in a common imaging protocol. Images were then acquired during routine processing of DEKS donor corneas and reviewed for image quality. ACD was quantified using automated software and compared to estimates of ACD by DMEK lenticule prep techs in the DEKS, masked to donor diabetes status from the entire DEKS cohort.

Results:
In total, 5 DEKS eye banks participated in the DEKS-ACD with 247 donor cornea images. Nine (3.6%) were unanalyzable. For the DEKS-ACD subset: 53%, 42%, 2%, and 2% of corneas had ACD<5%, 5%≤ACD<10%, 10%≤ACD<15%, and 15%≤ACD <20%, respectively. For the DEKS cohort qualitative assessment: 59%, 32%, 7%, and <1% of corneas had ACDs in each respective category.

Conclusion:
Imaging of stained corneas can be standardized across eye banks for assessment of ACD. Most corneas in DEKS had ACD<10%.

SCIENTIFIC SYMPOSIUM ABSTRACT

10:42 am – 10:51 am

Limbal Epithelial Cells Are Present In Eyes With Stage III/Total Limbal Stem Cell Deficiency Evaluated By In Vivo Confocal Microscopy

Clemence Bonnet, MD, PhD, *Stein Eye Institute, UCLA*

Co-Authors:
Merhnoosh Maalhaghfard, MD; and Sophie Deng, MD, PhD

Purpose:
Limbal stem cell deficiency is a potentially blinding corneal condition. The diagnosis remains difficult including often aspecific clinical signs. Anterior segment imaging should be performed to stage the disease, such as in vivo confocal microscopy (IVCM). The goal of this study is to evaluate the limbal epithelium characteristics of eyes with clinical signs of severe to total LSCD confirmed by IVCM.

Methods:
In our center, the diagnosis of LSCD is confirmed by IVCM since 2009. The imaging protocol includes 3 volume scans of the central cornea and each limbal quadrants (superior, inferior, nasal, temporal). We reviewed all IVCM tests performed in eyes clinically presenting with severe to total LSCD. The severity of the disease was confirmed by low basal cell density (BCD) of the central cornea. We assessed the presence of clusters of limbal epithelial cells with normal morphology among eyes with severe to total LSCD.

Results:
A total of 141 eyes clinically presenting with severe to total LSCD were included; the severity of the disease was confirmed by IVCM, showing decreased BCD, sub-basal nerve density, and epithelial thickness in the central cornea in all cases. Cell morphology was altered to grade 2 or higher in all cases. Limbal basal cell density in each quadrant was decreased in all cases with altered cell morphology (grade 2 or higher). Seventy-four eyes (52.5%) presented with clusters of limbal epithelial cells with normal (grade 0 or 1) cell morphology on at least one limbal scan.

Conclusion:
This study shows that eyes with severe to total LSCD can still present limbal epithelial cells with normal morphology. These clusters of cells could be targeted in the future by topical therapies specifically promoting in situ cell proliferation, offering new therapeutic modalities to treat LSCD and ultimately alleviating the need for limbal stem cell transplantation.

SCIENTIFIC SYMPOSIUM ABSTRACT

10:52 am – 11:01 am

Transcriptomic Analyses of Corneal Endothelial Cells Treated with Mitochondrial-targeted Antioxidant MitoQ During Ex Vivo Expansion for Cell-Based Therapies

Doug Chung, PhD, *Stein Eye Institute, UCLA*

Co-Authors:
Anthony Aldave, MD

Purpose:
The ex vivo expansion of corneal endothelial cells (CEnC) represents an alternative approach to address the global shortage of donor corneal tissue by providing a viable source of transplant-quality CEnC for cell-based therapies. However, major challenges in developing CEnC-based therapies are oxidative stress-associated cell senescence and cell-state transitions that occur during CEnC expansion. Mitochondria-targeted antioxidants, such as MitoQ, have the potential to mitigate oxidative stress-related cell damage. In this study, we investigated the impact of MitoQ supplementation of culture media of CEnC during ex vivo expansion on the CEnC transcriptomic profiles, with the aim of identifying molecular pathways that may enhance CEnC survival, proliferation, and therapeutic utility.

Methods:
Ex vivo CEnC were isolated from cadaveric human corneal tissue. At the initial passage (P0), the isolated CEnC were split into two equivalent cultures that were either supplemented with 50nM MitoQ or untreated, with media changes occurring every 2-3 days, and then expanded until passage 3 (P3). RNA was isolated from cell lysates at P0 and P3, and RNA sequencing and alignment to the hg38 human genome reference were performed. Differential expression analyses were performed and differentially expressed genes (DEG) (absolute fold-change > 2 and a false discovery rate < 0.05) were identified when comparing CEnC prior to treatment at P0 to untreated CEnC and MitoQ-treated CEnC at P3. Fisher's Exact test was performed by PANTHER to identify cellular components, molecular functions, and biological processes statistically overrepresented in the identified DEG lists compared to the human reference gene list (PANTHER annotation v19.0).

Results:
The transcriptomic profile of untreated CEnC at P3 (UT-P3) revealed 1,231 DEG compared to P0, with 573 upregulated and 658 downregulated. Similarly, MitoQ-treated CEnC at P3 (MQ-P3) identified 1,037 DEG compared to P0, with 523 upregulated and 514 downregulated. Analysis of the DEG in UT-P3 and MQ-P3 revealed 821 differentially expressed in the same direction in both compared to P0, with 421 DEG that were upregulated in both and 400 that were downregulated in both. Overrepresentation analysis identified enrichment of cellular components, molecular functions, and biological processes associated with inflammation signaling, cell adhesion, voltage-gated channel activity, regulation of Wnt signaling, and oxidoreductase activity in the 821 commonly differentially expressed genes in UT-P3 and MQ-P3 compared to P0. Among the 626 non-overlapping DEG, 410 were unique to UT-P3 vs. P0, while 216 were specific to MQ-P3 vs. P0, with enrichment in mitotic cell cycle regulation, cell proliferation, sub-cellular reorganization, DNA repair, RNA processing, and ATP hydrolysis.

Conclusion:
This study revealed significant transcriptomic alterations in CEnC during ex vivo expansion, with distinct gene expression changes influenced by MitoQ treatment. Compared to untreated CEnC, MitoQ supplementation during expansion resulted in differential regulation of key pathways associated with cell cycle control, proliferation, and metabolism. Further investigation into the functional implications of these transcriptomic shifts could inform strategies to enhance the therapeutic potential of expanded CEnC for clinical applications.

SCIENTIFIC SYMPOSIUM ABSTRACT

11:02 am – 11:11 am

Hydrogel-Based Grafts for Cultured Human Corneal Endothelial Cell Transplantation

Christopher Stoeger, MBA, CEBT, *OcuCell*

Co-Authors:
Wei Wang, PhD; Khoa D. Tran, PhD; Emily Lazarus, PhD; Xiaokun Wang, PhD; and Albert S. Jun, MD, PhD

Purpose:
To evaluate the viability, functionality, and clinical potential of cultured human corneal endothelial cells (HCECs) seeded onto a transparent hydrogel scaffold (Endo-Tek™) for treating corneal endothelial dysfunction.

Methods:
A transparent collagen hydrogel (15–25 µm thickness) was used as a scaffold for delivering in vitro cultured HCECs. Cell viability was determined via calcein-AM staining, and corneal endothelial markers were evaluated using immunofluorescence staining. In vivo functionality was assessed in a feline model with corneal endothelium removed. Endo-Tek™ grafts were transplanted, and postoperative outcomes—including corneal clarity, pachymetry, and optical coherence tomography (OCT)—were monitored over 12 weeks. Treated eyes were enucleated and analyzed with In vivo confocal microscopy and histological analysis to confirm cell and graft attachment.

Results:
The hydrogel scaffold maintained >90% transparency and supported a confluent monolayer of HCECs with typical cobblestone-like morphology and marker expression. Electron microscopy revealed that 1) the cell monolayer showed robust attachment to the collagen scaffold, and 2) the collagen scaffold exhibited microstructures similar to those of native tissue. The hydrogel's mechanical properties facilitated consistent handling and enabled graft delivery via Straiko-modified Jones tubes, reopening without incident on every procedure. Treated eyes showed significant corneal clearing by week 6 post-transplantation, with reduced corneal thickness toward baseline levels. In vivo confocal microscopy confirmed the endothelial layer, and histological analysis verified firm graft attachment.

Conclusion:
The hydrogel-based graft demonstrates excellent potential as a tissue-engineered alternative for treating corneal endothelial dysfunction, addressing limitations of donor tissue scarcity and complications associated with traditional endothelial keratoplasty. The unique properties of the hydrogel, including transparency, mechanical strength, and biocompatibility, contribute to its promising therapeutic application.

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