CORNEA and EYE BANKING FORUM 2020

VIRTUAL EVENT

SATURDAY, NOVEMBER 7

EYE BANK ASSOCIATION OF AMERICA

Cornea Society
Advancing the treatment of corneal disease

FINAL PROGRAM

CorneaSociety.org | RestoreSight.org

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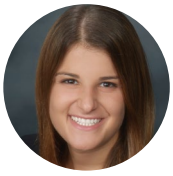

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The Eye Bank Association of America and the Cornea Society gratefully acknowledge the unrestricted educational grants received in support of this program.

BEST PAPER OF SESSION AWARD

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2020

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November 1 - 30, 2020

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$50 registration fee supports the mission of the Eye Bank Association of America and may be tax-deductible. Consult with your advisor for more information.

LEARNER NOTIFICATION

EBAA/ Cornea Society
2020 Cornea & Eye Banking Forum
November 7, 2020
Online Event

Acknowledgement of Financial Commercial Support

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

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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.

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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://CORN.cmecertificateonline.com**
2. Click on the “2020 Cornea & Eye Banking Forum” link.
3. Evaluate the meeting.
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EYE BANK ASSOCIATION OF AMERICA®

EYE DONATION MONTH
NOVEMBER 2020

PROGRAM SCHEDULE

SESSION I
10:00 – 11:15 AM EST

10:00 - 10:02 am **Welcome and Introductions**
Marjan Farid, MD, and Sophie Deng, MD, PhD

10:02 - 10:44 am **MINI-SYMPOSIUM: COVID-19 AND THE DONOR CORNEA**

Eye Banking in the Time of COVID: Current EBAA Guidelines
Jennifer Li, MD, *University of California, Davis*

Can SARS-CoV-2 be Transmitted through Donor Corneal Tissue? An in vitro Infection Study
Josh Hou, MD, *Lions Gift of Sight/ 2020 Targeted Research Grant Recipient*

Assessing Prevalence of SARS-CoV-2 in Human Post-Mortem Ocular Tissues
Onkar Sawant, PhD, *Eversight*

The Impact of the COVID-19 Pandemic on the Cornea Donor Pool and the Role of Routine COVID-19 Testing for all Donors
Dena Ballouz,* *University of Michigan Kellogg Eye Center*

Discussion & Q&A

10:45 - 10:51 am **Treatment and Outcomes of Fungal Infections Following Descemet Membrane Endothelial Keratoplasty**
Anthony Aldave, MD, *Stein Eye Institute, UCLA*

10:52 - 10:58 am **Optimizing Methods to Decontaminate Fungus from Corneal Tissue**
Roheena Kamyar, MD, *University of Pittsburgh Medical Center/ Center for Organ Recovery and Education*

10:59 - 11:05 am **Microbial Keratitis after Boston Type 1 Keratoprosthesis Implantation**
Reza Ghaffari, MD,* *Stein Eye Institute, UCLA*

11:06 - 11:14 am **Panel Discussion and Q&A**

11:15 am **Session Closing**

* Medical Student, Resident, or Fellow

PROGRAM SCHEDULE

SESSION II
11:30 AM – 12:30 PM EST

11:30 - 11:32 am	**Introduction** Marjan Farid, MD, and Olivia Lee, MD
11:33 - 11:39 am	**A Novel Carrier and Technique for Delivery by Injection of In-Advance Pre-Loaded Endothelial Grafts for DSAEK Through a Small Wound** Eric Abdullayev, MD, MBA, CEBT, *Lions Eye Institute for Transplant and Research*
11:40 - 11:46 am	**Histological Study of Recurrent Ectasia in Corneal Transplants** Joseph Ciolino, MD, *Massachusetts Eye and Ear*
11:47 - 11:53 am	**A Novel Dual-Chamber Vial for Corneal Graft Preservation** Joana Karanxha,* *Bascom Palmer Eye Institute*
11:54 - 12:00 pm	**Anterior Segment Optical Coherence Tomography Angiography in the Assessment of Ocular Surface Lesions** William Binotti, MD, *Tufts Medical Center*
12:01 - 12:08 pm	**Panel Discussion and Q&A**
12:09 - 12:12 pm	**R. Townley Paton Award Introduction** Shahzad Mian, MD, *2019 Paton Award Recipient*
12:12 - 12:28 pm	**R. TOWNLEY PATON AWARD LECTURE: Reflections During COVID-19: My Important but Little Known Research and Our Legacy** Stephen C. Kaufman, MD, PhD, *2020 Paton Award Recipient*
12:28 - 12:30 pm	**Closing**

MODERATED DISCUSSIONS
1:00 PM – 2:00 PM

1:00 - 2:00 pm	**Paton Brunch: Moderated Clinical Discussion for Physicians** Moderated by Marian Macsai, MD
1:00 - 2:00 pm	**Eye Bank Brunch Moderated Discussion** Moderated by Patricia Dahl

* Medical Student, Resident, or Fellow

PROGRAM SCHEDULE

SESSION III
2:30 - 3:45 PM EST

2:30 - 2:32 pm	**Introduction** Sophie Deng, MD, and Maria Woodward, MD
2:33 - 2:48 pm	**INVITED SESSION: Therapeutic Applications of Mesenchymal Stroma Cells for Cornea and Ocular Surface Diseases** Ali Djalilian, MD, *University of Illinois, Chicago*
2:49 - 2:55 pm	**Predictors of Receiving Keratoplasty for Keratoconus** Chanon Thanitcul,* *Johns Hopkins School of Medicine*
2:56 - 3:02 pm	**Long-Term Outcomes after Cornea Transplant and Cataract Extraction in Children after Penetrating Ocular Trauma** Allison Umfress, MD, *Vanderbilt Eye Institute*
3:03 - 3:09 pm	**Outcome of Lamellar Keratoplasty in Children and Infants with Congenital Corneal Dermoids** Jijo Wang, MD, *New York Medical College*
3:10 - 3:16 pm	**Prevalence of Neurotrophic Keratopathy in Patients with Chronic Ocular Graft-Versus-Host Disease** Rohan Bir Singh, MD, MPH, *Massachusetts Eye and Ear*
3:17 - 3:26 pm	**Panel Discussion and Q&A**
3:27 - 3:29 pm	**Richard Troutman Award Introduction** Douglas Lazzaro, MD, *NYU Langone Health*
3:30 - 3:40 pm	**RICHARD TROUTMAN AWARD LECTURE: Increasing Povidone-Iodine Exposure in Endothelial Keratoplasty Tissue Processing and Fungal Infection Impact** C. Drew Salisbury, *2020 Troutman Award Recipient*
3:41 - 3:45 pm	**Closing**

* Medical Student, Resident, or Fellow

PROGRAM SCHEDULE

SESSION IV
4:00 PM – 5:10 PM EST

4:00 - 4:01 pm	**Welcome Back** Sophie Deng, MD, PhD, and Marjan Farid, MD
4:02 - 4:20 pm	**INVITED SESSION: An Update on Injectable Endothelial Cell Technology** Shigeru Kinoshita, MD, PhD, *Kyoto Prefectural University*
4:21 - 4:27 pm	**Viability and Function of Cultured Human Corneal Endothelial Cells (HCECs) for Transplantation** Wei Wang, PhD, *Johns Hopkins University*
4:28 - 4:34 pm	**Randomized, Double-Masked Trial of Netarsudil for Treatment of Corneal Edema in Fuchs Dystrophy** Marianne Price, PhD, *Cornea Research Foundation of America*
4:35 - 4:41 pm	**Endothelial Cell Viability in Viscoelastic-Aided DMEK Graft Preparation and Marking** Ellen Koo, MD, *Bascom Palmer Eye Institute*
4:42 - 4:48 pm	**Prediction of DMEK-Grafts at Risk for Future Rejection from Pre-Clinical Diagnosis Endothelial Cell Images** Naomi Joseph, BS, *Case Western Reserve University*
4:49 - 4:57 pm	**Panel Discussion and Q&A**
4:58 - 4:59 pm	**Best Paper of Session** *Supported by an unrestricted educational grant from The Eye-Bank for Sight Restoration*
5:00 – 5:05 pm	**Claes Dohlman Award Presentation** Presented to Eduardo Alfonso, MD, 2020 Award Recipient
5:10 pm	**Closing**

CORNEA SOCIETY BUSINESS MEETING
5:15 PM EST

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INVITED SESSIONS

SESSION I

Mini-Symposium: COVID-19 and the Donor Cornea

Eye Banking in the Time of COVID: Current EBAA Guidelines
Jennifer Li, MD
University of California, Davis

Can SARS-CoV-2 be Transmitted through Donor Corneal Tissue? An in vitro Infection Study
Josh Hou, MD
Lions Gift of Sight/ 2020 Targeted Research Grant Recipient

Assessing Prevalence of SARS-CoV-2 in Human Post-Mortem Ocular Tissues
Onkar Sawant, PhD
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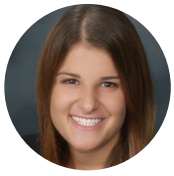

The Impact of the COVID-19 Pandemic on the Cornea Donor Pool and the Role of Routine COVID-19 Testing for all Donors
Dena Ballouz
University of Michigan Kellogg Eye Center

Discussion and Q&A
Shahzad I. Mian, MD
University of Michigan/ Eversight/ 2020 Targeted Research Grant Recipient

SESSION III

Therapeutic Applications of Mesenchymal Stroma Cells for Cornea and Ocular Surface Diseases

Ali Djalilian, MD
University of Illinois, Chicago

Mesenchymal stem/stromal cells (MSCs) are found in most adult tissues, including the bone marrow, fat and cornea/limbus, and play an important role in tissue repair and maintenance. They have been increasingly investigated for their therapeutic potential in a wide range of human diseases given their anti-inflammatory and regenerative properties. In pre-clinical studies, MSCs have been shown to prevent scarring, block neovascularization, inhibit inflammation and promote tissue regeneration in the cornea. Clinical studies to establish safety, dosing and the optimal delivery mechanisms of MSCs for the cornea / ocular surface are just getting underway at multiple institutions and are hoped to provide guidance on the design of clinical trials to establish efficacy as a cell-based therapy.

SESSION IV

An Update on Injectable Endothelial Cell Technology

Shigeru Kinoshita, MD, PhD
Kyoto Prefectural University of Medicine

Understanding the biological and immunological characteristics of human corneal endothelial cells (CECs) is essential to establishing new strategies for treating corneal endothelial dysfunction such as Fuchs endothelial corneal dystrophy (FECD), intraocular-surgery-related bullous keratopathy, and graft failure. Along this important pathway, our research group has been developing a 'CEC-injection therapy' that involves the injection of cultured human CECs into the anterior chamber, which we expect will open the door to entirely new treatment strategies. Towards this end, we have successfully induced non-proliferative CECs obtained from donor corneas to proliferate, without the induction of cell-state transition including epithelial-mesenchymal transition. Our findings in over 60 clinical trial cases have shown this approach to be promising. However, to apply this novel approach to actual clinical practice, several key safety issues must first be addressed and assured, from the aspect of regulatory science.

AWARD LECTURES

R. TOWNLEY PATON AWARD LECTURE

SESSION II: 12:12 – 12:28 PM

Reflections During Covid-19:
My Important but Little-Known Research and Our Legacy

R. Townley Paton Award Recipient

Stephen C. Kaufman, MD, PhD

Lions Gift of Sight

TROUTMAN AWARD LECTURE

SESSION III: 3:30 – 3:40 PM

Increasing Povidone-Iodine Exposure in Endothelial Keratoplasty Tissue Processing and Fungal Infection Impact*

Richard Troutman Award Recipient

C. Drew Salisbury, MD

Premier Medical Group

Co-Authors: Carter N. Kirk, MD; W. Barry Lee, MD; Stephen M. Hamilton, MD; Alan M. Kozarsky, MD; Eric Meinecke, CEBT; and R. Doyle Stulting, MD, PhD

Purpose: To evaluate the effect on donor rim cultures and postoperative infections of doubling the povidone-iodine exposure time during corneal tissue recovery before its use in keratoplasty.

Methods: Consecutive donor cornea recoveries were evaluated for positive donor corneal rim cultures and postoperative infections before and after a protocol change of doubling the exposure time of povidone-iodine during donor preparation.

Results: In 631 consecutive cornea donor recoveries, 18 (2.9%) had positive fungal rim cultures and 41 (6.5%) had positive bacterial rim cultures. Three (0.48%) developed postoperative fungal infections, and no bacterial infections occurred. After doubling the povidone- iodine exposure time during the recovery process, 725 consecutive corneas were reviewed. Four (0.6%) had positive fungal rim cultures, and 29 (4.0%) had positive bacterial rim cultures. No postoperative fungal or bacterial infections occurred. No noticeable increase in epithelial toxicity developed between the 2 groups.

Conclusions: Increasing the povidone-iodine exposure time during the donor cornea recovery process decreased the rate of positive donor corneal rim fungal cultures (P = 0.001), positive donor corneal rim bacterial cultures (P = 0.04), and postoperative fungal infections (P = 0.06).

*Originally published in Cornea, Volume 38, Number 9, September 2019

SCIENTIFIC ABSTRACTS

10:17-10:23 am

Assessing Prevalence of SARS-CoV-2 in Human Post-Mortem Ocular Tissues

Onkar Sawant, PhD, *Eversight*

Co-Authors: Sneha Singh, PhD; Robert Emery Wright, III; Kayla M. Jones, CEBT; Michael S. Titus, CEBT; Eugene Dennis; Eric Hicks; Parag Majmudar, MD; Ashok Kumar, PhD; and Shahzad I. Mian, MD

Purpose: The 2019 novel Coronavirus (SARS-CoV-2) that causes the severe acute respiratory syndrome disease (COVID-19) has been found in conjunctiva and tears of COVID-19 patients. Proteins required for cellular susceptibility to SARS-CoV-2 entry and infection are expressed in human ocular surfaces. Therefore, the main purpose of this study was to determine the prevalence of SARS-CoV-2 RNA in human post-mortem ocular tissues.

Method: We analyzed the expression of SARS-CoV-2 RNA in various ocular tissue swabs using RT-PCR method and levels of SARS-CoV-2 IgG and IgM antibodies in 10 donors that had COVID-19 at the time of death. We also measured the expression of SARS-CoV-2 RNA from cornea and sclera from 33 surgical-intended donors that were either asymptomatic but later tested positive for SARS-CoV-2 during post-mortem testing or ruled out from a surgical path after recovery according to the EBAA guidelines or Medical Director consult.

Results: Out of 10 donors that had positive pre-mortem COVID-19 tests, 6 exhibited positive post-mortem nasopharyngeal swab PCR results and 8 donors had positive IgG results. Among all 20 eyes, 3 conjunctival, 1 anterior corneal, 5 posterior corneal and 3 vitreous swabs were tested positive for SARS-CoV-2 RNA. In a parallel study, we tested 66 surgical-grade corneal and scleral tissues from 33 different donors and observed a similar positivity rate of approximately 13%.

Conclusion: Taken together, our findings suggest that there is a small but noteworthy prevalence of SARS-CoV-2 RNA in the ocular tissues from donors that were COVID-19 positive or had related signs and symptoms. This highlights the importance of the donor screening guidelines and post-mortem nasopharyngeal PCR testing to eliminate any tissue that has presence of SARS-CoV-2 RNA. However, it is very important to note that detection of viral RNA by RT-PCR does not equate with infectivity. Immunofluorescence studies to detect the virus capsule proteins are currently underway to validate the presence of actual virus in the ocular tissues.

SCIENTIFIC ABSTRACTS

10:24-10:30 am

The Impact of the COVID-19 Pandemic on the Cornea Donor Pool and the Role of Routine COVID-19 Testing of all Donors

Dena Ballouz,* ***University of Michigan Kellogg Eye Center***

Co-Authors: Onkar Sawant, PhD; Michael Titus, CEBT; Susan Hurlbert; Parag Majmudar, MD; Ashok Kumar, PhD; and Shahzad Mian, MD

Purpose: To evaluate the impact of the COVID-19 pandemic on corneal tissue supply and potential benefit of routine COVID-19 testing of all donors.

Method: In this single eye bank study, the number of donor referrals and eligible donors were retrospectively examined. Number of donors ruled out due to Eye Bank Association of America (EBAA), local eye bank policies, and post-mortem COVID-19 nasopharyngeal swab testing were evaluated.

Results: Donor data from March through June of 2019 and 2020 were compared. The average number of donors deemed eligible for surgical transplantation per month in 2020 was 194, compared to 382 in 2019 during this period. This reflects both a reduction in demand for corneal tissue and donors ruled out due to EBAA guidelines. The average number of scheduled surgeries per month in 2020 was 293 compared to 623 in 2019. Donor tissue ruled out due to EBAA guidelines made up 41% of ineligible donors. Routine post-mortem COVID-19 testing of all eligible donors captured 13 potential tissue donors who passed EBAA screening.

Conclusion: Both EBAA and eye bank restrictions related to the coronavirus pandemic significantly impacted corneal tissue donors. Routine post-mortem screening may be useful in capturing asymptomatic donors whose tissues would otherwise be used for transplantation.

* Medical Student

SCIENTIFIC ABSTRACTS

10:45 - 10:51 am

Treatment and Outcomes of Fungal Infections Following Descemet Membrane Endothelial Keratoplasty

Anthony Aldave, MD, ***Stein Eye Institute, UCLA***

Co-Authors: Kourtney Houser, MD; Brittany Wong; Clemence Bonnet, MD; Reza Ghaffari, MD; and Angela Chen

Purpose: To provide surgeons with evidence-based guidelines regarding the management of fungal infection following DMEK.

Method: We reviewed all cases of published and unpublished culture proven (donor, recipient or both) fungal infection after DMEK reported to the Online Adverse Reaction Reporting System (OARRS) from January 2013 to July 2020. Information regarding treatment and outcomes were requested from the surgeon.

Results: A total of 30 cases were identified: 13 published (8 reported to OARRS) and 17 unpublished (14 reported to OARRS). The indication for DMEK was Fuchs endothelial dystrophy in 27 cases (90%) and repeat graft in 3 (10%). Donor rim fungal cultures were performed for 14 corneas: 13 (93%) were positive, all Candida species. The mean time to presentation of infection was 64 days after surgery: 18 eyes presenting with keratitis and 2 eyes with isolated vitritis (no data in 10 eyes). Host fungal cultures were performed for 23 eyes: 20 (87%) were positive, 19 Candida species. Treatment history was available for 21/30 cases. All were treated medically, including topical (21), intrastromal (7), intracameral (20), intravitreal (9) and systemic (21). 16 (76%) were treated surgically, including DMEK explantation (11), repeat DMEK or DSEK (8), PK (6) and vitrectomy (4). At a mean follow-up of 20.7 months, 11 eyes (52%) had a CDVA > 20/50, while 6 eyes (33%) had a CDVA of < CF. 6/7 eyes (86%) treated with intrastromal injections had CDVA > 20/50, compared to 4/11 eyes (36%) that did not (P = 0.066).

Conclusion: Fungal infection following DMEK is a rare but devastating complication that is associated with the development of keratitis approximately 2 months after surgery and results in CDVA of CF or worse in 1/3 of affected individuals. Intrastromal antifungal injections, reported in small case series to be an effective treatment for interface fungal keratitis following DSEK, are associated with a trend toward better visual outcomes.

SCIENTIFIC ABSTRACTS

10:52 - 10:58 am

Optimizing Methods to Decontaminate Fungus from Corneal Tissue

Roheena Kamyar, MD, ***University of Pittsburgh Medical Center, Center for Organ Recovery and Education***

Co-Authors: Regis P. Kowalski, MS M(ASCP); Michelle Rhee, MD; Vishal Jhanji, MD; Alex Mammen, MD; Deepinder K. Dhaliwal, MD; Gaurav Prakash, MD; and Julia Shatten, MD

Purpose: To evaluate different methods to eliminate fungi on corneal tissue stored under refrigeration, including anti-fungal supplementation of preservation medium, topical antiseptics, and mechanical washing.

Method: Three yeast and two mold isolates were tested at 4 loads of fungus: 0, 10^1, 10^2, and 10^3 colony forming units (CFU) to eliminate fungi from corneal tissue. In the first method, the rims were placed in Optisol with and without amphotericin B 2.5 µg/ml (AmpB), clotrimazole 10 µg/ml, and an antifungal synergistic mixture (ASD), respectively. In method 2, rims were treated topically (5 minutes) with 5% povidone iodine (PI) or 0.01% hypochlorous acid (HOCL) and placed in Optisol. Another rim set was treated twice with PI and placed in Optisol plus AmpB. In method 3 (wash-dilute), the rims underwent a wash, topical PI, wash, rest period, topical PI, wash, and placement in Optisol supplemented with ASD or AmpB. The rims for all methods were refrigerated at 6° C. After 48 hours, all corneal rims were cultured and monitored for viable fungi for 7 days.

Results: Methods 1 and 2 were not effective for eliminating fungi. Method 3 was the most effective protocol, with almost complete elimination, except for Candida albicans growth in the ASD supplemented Optisol at 1000 CFU, and Aspergillus fumigatus growth in the AmpB supplemented Optisol at 100 CFU.

Conclusion: Elimination of fungal contamination of donor corneal tissue may require complementing approaches of antifungal supplementation of preservation medium, topical antiseptics, and mechanical washing to reduce post-keratoplasty infections.

SCIENTIFIC ABSTRACTS

10:59 - 11:05 am

Microbial Keratitis after Boston Type 1 Keratoprosthesis Implantation

Reza Ghaffari,* MD, *Stein Eye Instiute*

Co-Authors: Clemence Bonnet; Madeline Yung; Christina Bostan; Mona Harrissi-Dagher, MD; and Anthony J. Aldave, MD

Purpose: To identify the incidence, risk factors, and outcomes of microbial keratitis following Boston type 1 keratoprosthesis (KPro) implantation.

Method: Retrospective, consecutive case series of KPro procedures performed by 2 surgeons (AJA and MHD) May 2004 – Dec 2018. Cox proportional hazard ratios (HZ) were calculated to evaluate the association of risk factors and outcomes.

Results: Fifty-seven cases of presumed infectious keratitis were identified following 53/349 procedures (15.2%) in 50/295 eyes (16.9%) of 49/268 patients (18.3%). The incidences of culture-positive bacterial and fungal keratitis were 0.015 and 0.004 per eye-year, respectively. Cicatricial disease (HR:1.98, 95% confidence interval [CI]: 1.02-3.83) and persistent corneal epithelial defect formation ($p < 0.001$) were associated with a significantly higher incidence of infectious keratitis. For the 53 cases with a known outcome, medical therapy achieved resolution of infection in 34 cases (64.2%) while KPro explantation was required in 19 cases (35.8%). Infectious keratitis was associated with an increased risk of KPro explantation (HR: 3.09, 95% CI: 1.92-4.79).

Conclusion: Microbial keratitis develops in approximately 17% of eyes after KPro implantation, with a higher rate of culture-positive bacterial than fungal keratitis. Additional topical antimicrobial prophylaxis should be considered in eyes at higher risk, such as those with cicatricial disease and that develop a postoperative persistent corneal epithelial defect.

* Research Fellow

SCIENTIFIC ABSTRACTS

11:33 - 11:39 am

A Novel Carrier and Technique for Delivery by Injection of In-Advance Pre-Loaded Endothelial Grafts for DSAEK through a Smaller Wound

Eric Abdullayev, MD, MBA, CEBT, ***Lions Eye Institute for Transplant and Research***

Co-Authors: Steve Kane MD; Benjamin Lambright MD; Arthur Kurz; and Elina Minkhuzina, MD

Purpose: To introduce a novel carrier and technique for delivering by injection of in-advance preloaded DSAEK grafts through a smaller 3.5-3.6 mm wound.

Method: A novel DSAEK graft glass carrier was used for human donor corneas with healthy endothelium but not suitable for transplant. We compared the endothelial viability of 8mm corneal grafts with thickness of an average 80 microns pre-loaded into the novel carrier for a period of 24hrs (n=13) and 48hrs (n=5), then connected to BSS loaded 3ml syringe and unloaded by injection. Specular microscopy and vital dye staining was performed, and devitalized areas were semi-quantitatively assessed by digital imaging. Digital images were processed with ImageG-win 64 software. Insertion wound size was measured. Graft position after overnight shipping was evaluated.

Results: All insertions were performed through 3.5-3.6 mm wound size and grafts unloaded from the novel carrier by injection without observed difficulties. Mean devitalized areas 5.5% after 24hrs and 4.4% after 48hrs preloaded were observed. Average endothelial cell density prior to preloaded (2735 cells/mm^2) weren't significantly different when compared with 24hrs (2799 cells/mm^2) and 48hrs (2688 cells/mm^2) preloaded. The same graft position was observed after overnight shipping.

Conclusion: A novel glass carrier allows delivery by injection of in-advance preload DSAEK grafts into anterior chamber through a significantly smaller 3.5-3.6 mm incision and demonstrates little endothelial damage and appears to be safe for the endothelial cells promoting better clinical outcomes.

SCIENTIFIC ABSTRACTS

11:40 - 11:46 am

Histological Study of Recurrent Ectasia in Corneal Transplants

Joseph Ciolino, MD, ***Massachusetts Eye and Ear***

Co-Authors: Paula C. Barrantes, MD; Mehenaz Hanbazazh, MD; Pia Leon, MD; Lynette Johns, OD; and Thaddeus P. Dryja, MD

Purpose: To study in a masked fashion whether histological features consistent with corneal ectasia are present within excised corneal transplants from eyes with a history of keratoconus (KCN).

Method: Two ocular pathologists performed a masked histological analysis of slides from donor buttons, which were recovered from 22 consecutive eyes undergoing repeat Penetrating Keratoplasty (PK) with a history of KCN, 11 KCN eyes that underwent their first PK (served as positive controls), and 11 eyes with endothelial cell dysfunction that underwent a repeat PK (served as negative controls). Multiple breaks in Bowman's Membrane served as the pathological feature consistent with corneal ectasia.

Results: Pathological features consistent with corneal ectasia were present in 88% of the corneas recovered from repeat PK with a history of KCN, 88% of KCN corneas, and in 18% of corneas from eyes with endothelial cell dysfunction that underwent a repeat PK. Pathological evidence of corneal ectasia was more common (p-value = 0.0007, Fischer Exact Test) in donor tissue recovered from eyes with a history of KCN than in eyes with endothelial dysfunction. The same percentage of KCN corneas had ectactic pathological features as those from corneal buttons recovered from KCN that had previously underwent a PK.

Conclusion: This study provides histological evidence that recurrent ectasia commonly develops within the donor tissue in eyes with KCN.

SCIENTIFIC ABSTRACTS

11:47 - 11:53 am

A Novel Dual-Chamber Vial for Corneal Graft Preservation

Joana Karanxha,* ***Bascom Palmer Eye Institute, University of Miami Miller School of Medicine***

Co-Authors: Angela Gomez B.; Katrina Llanes; William Buras; Elizabeth Fout; and Alfonso L. Sabater, MD, PhD

Purpose: To introduce a novel dual-chamber corneal storage container comprised of two compartments physically separated by the corneal graft. This device allows for isolation of the corneal epithelial and endothelial layers during storage thus maintaining each cell type in its own physiological environment.

Method: Donor human corneal pairs were recovered by the Florida Lions Eye Bank, with one cornea stored in a viewing chamber (VC) (Bausch & Lomb) and one cornea stored in the dual-chamber vial (DCV) (TissueCor). All corneal pairs were preserved in Optisol-GS media and stored at 2–8°C for two weeks. Corneal thickness and endothelial cell density were evaluated at days 1, 7 and 14. LDH and Annexin V levels were measured in the preservation media and corneal tissue (epithelium vs. endothelium), respectively, to assess for cytotoxicity and apoptosis.

Results: Preliminary results revealed a significant increase in corneal thickness at day 14 in the VC whereas it remained stable in the DCV. While there was no significant difference in endothelial cell density between both chambers, there was a marked reduction in endothelial apoptosis in the DCV. Interestingly, there was no difference in corneal epithelial apoptosis between both chambers.

Conclusion: Use of the DCV minimizes corneal swelling and reduces the levels of endothelial apoptosis during corneal cold storage by physically separating the epithelium and endothelium in different compartments. The DCV has the potential to transform the way corneal grafts are preserved and will provide scientists with a platform to develop new customized preservation solutions.

* Medical Student

SCIENTIFIC ABSTRACTS

11:54 - 12:00 pm

Anterior Segment Optical Coherence Tomography Angiography in the Assessment of Ocular Surface Lesions

William Binotti, MD, ***Tufts Medical Center***

Co-Authors: Huan Mills, MD; Ricardo Nosé, MD; Helen Wu, MD; Jay Duker, MD; and Pedram Hamrah, MD

Purpose: Describe the utility of anterior segment optical coherence tomography angiography (AS-OCTA) to assess ocular surface lesions.

Method: Retrospective, case-control study of 10 eyes of 9 patients with malignant lesions and 23 eyes of 22 patients with benign lesions. Lesions included 13 epithelial, 10 pigmented and 10 lymphoid lesions. Graders performed an average of 3 depth and diameter measurements of the vessels entering or surrounding the lesion on AS-OCTA with borders being defined on en face AS-OCT. The maximum lesion thickness was measured on AS-OCT B-scans. Statistical models accounted for bilateral eye inclusion, age, gender and lesion thickness.

Results: In the benign and malignant groups, age was 49.5 ± 22.4 and 64.3 ± 10.6 years (p=0.145) with 45% males and 55% males (p=0.458), in their respective groups. The lesion thickness was 526.9 ± 233.9µm and 574.4 ± 428.6µm (p=0.899), respectively. AS-OCTA showed greater peri-lesional vessel depth and diameter in malignant lesions (315.2 ± 73.0µm, p<0.001 and 76.4 ± 18.2µm, p<0.001; respectively) compared to benign lesions (199.4 ± 34.1µm and 44.0 ± 9.4µm, respectively). All lesions with vessel depth >231µm and diameter >68.3µm were malignant, except for 1 epithelial case (225µm) and 2 pigmented cases (62.1 ± 3.6µm), respectively.

Conclusion: AS-OCTA shows greater depth and diameter of malignant lesions compared to benign lesions, which may represent feeder vessels. This imaging modality provides novel and non-invasive functional vascular parameters that can potentially aid the assessment of ocular surface lesions.

SCIENTIFIC ABSTRACTS

2:49 - 2:55 pm

Predictors of Receiving Keratoplasty for Keratoconus

Chanon Thanitcul,* ***Johns Hopkins School of Medicine***

Co-Authors: Varshini Varadaraj, MD, MPH; Uri Soiberman, MD; Joseph Canner, MHS; Fasika Woreta, MD, MPH; and Divya Srikumaran, MD

Purpose: To determine sociodemographic factors and comorbid conditions associated with receiving keratoplasty for keratoconus (KCN)

Method: Health records of KCN patients from 2010 to 2017 were obtained from the Truven Health Marketscan Database. A multivariable model was used to examine factors associated with receiving keratoplasty.

Results: Of 117,825 total KCN patients identified, 3,791 (3.2%) patients had keratoplasty to treat KCN. In an adjusted analysis, female sex (OR=0.87 [95% CI=0.81-0.93]) and living in metropolitan areas (OR=0.80 [0.72-0.89]) were associated with lower odds of having keratoplasty. Compared to individuals aged 10-19 years, those aged 20-29 (OR=1.79 [1.49-2.14]) and 30-39 (OR=1.51 [1.26-1.80]) were more likely to have keratoplasty, while those aged 60-64 (OR=0.60 [0.48-0.76]) were less likely to have keratoplasty. Conditions associated with higher odds of having keratoplasty were pseudophakia/aphakia (OR=5.38 [4.15-6.95]), corneal hydrops (OR=4.79 [4.30-5.33]), Leber congenital amaurosis (LCA) (OR=3.33 [1.75-6.37]), sleep apnea (OR=1.63 [1.48-1.79]), depression (OR=1.15 [1.03-1.29]), atopic diseases (OR=1.11 [1.03-1.19]), and hyperlipidemia (OR=1.11 [1.03-1.21]). Conditions not associated with receiving keratoplasty include Down syndrome, dementia, and aortic aneurysm.

Conclusion: This analysis of a large sample of KCN patients reveals previously unidentified risk factors associated with receiving keratoplasty including sleep apnea, LCA, and depression. Young patients with these conditions may benefit from more frequent follow-ups or possibly early crosslinking to reduce the need for subsequent keratoplasty.

* Medical Student

SCIENTIFIC ABSTRACTS

2:56 - 3:02 pm

Long Term Outcomes after Cornea Transplant and Cataract Extraction in Children after Penetrating Ocular Trauma

Allison Umfress, MD, ***Vanderbilt Eye Institute***

Co-Authors: Christine Shieh, MD, and Gerald Zaidman, MD

Purpose: To report the long-term graft survival and clinical outcomes after pediatric keratoplasty and cataract extraction after penetrating cornea trauma.

Method: Retrospective chart review was conducted of pediatric patients with a history of ruptured globe repair who underwent penetrating keratoplasty (PKP) and cataract extraction with intraocular lens implantation (CEIOL).

Results: 10 children who underwent PKP and CEIOL were analyzed. 7 had combined PKP/CEIOL, 1 had PKP with secondary IOL, 2 were aphakic and had combined PKP with IOL insertion. Visual acuity at the time of presentation ranged from 20/150 to LP. Mean age at time of surgery was 67.7 months (range 23 months to 9.25 years). Mean interval from original injury to surgery was 8.8 months. Mean follow up interval was 79.3 months (range 5 months to 14 years). Graft survival was 90% at 6 months, 80% at 12 months, 60% at 24 months, 50% at 5 years. At their final follow up visit (ranging from 7.6-14.1 years) 5 patients had clear grafts. Seven patients temporarily required medication to control their intraocular pressure, 2 of whom developed glaucoma. Average best corrected visual acuity at postop month (POM) 6 was logMAR 0.92 (20/160), at POM12 logMAR 0.54 (20/70). Overall, average best corrected visual acuity at final follow up was logMAR 1.24 (20/300). For those with clear grafts, the average final best corrected visual acuity was logMAR 0.35 (20/40).

Conclusion: Ocular trauma is one of the most common causes of vision loss in children. Our results demonstrate good graft survival and visual acuity outcomes after keratoplasty and cataract extraction after penetrating trauma.

SCIENTIFIC ABSTRACTS

3:03 - 3:09 pm

Outcome of Lamellar Keratoplasty of Cornea and Sclera Graft as Treatment for Children with Dermoids

Jijo Wang,* MD, ***New York Medical College***

Co-Authors: Niki Song and Gerald W. Zaidman, MD, FACS

Purpose: The treatment of symptomatic corneal dermoids ranges from observation to partial-thickness grafts or full thickness grafts. Some surgeons also use amniotic membrane transplantation or autologous stem cell grafts. We will present our experience using lamellar corneal transplants with corneoscleral excision as the treatment for congenital dermoids.

Method: A retrospective study was conducted on infants and children under the age of 10 with symptomatic limbal corneal dermoids. All subjects had a lamellar keratoplasty with a corneoscleral excision performed between 2000-2019. All sutures were removed by postoperative month 3. Graft clarity, visual acuity, preoperative and postoperative complications, and length of follow up were analyzed.

Results: 24 patients (25 eyes) had surgery. The mean age was 3.4 years old. 5 eyes were in children < 6 months of age; 4 eyes in children between 6 months- 2 years old; and 16 eyes were in children >2 years old. The mean follow-up from surgery was 38.8 months (3.2 years), ranging from 2 months to over 16 years. The pre-operative visual acuity was obtained in children older than 2 years of age (16 eyes). In 14 (87.5%) of these eyes, post-operative vision remained the same or within +/- 2 lines of pre-operative vision. One eye gained 7 lines of vision. One eye lost 3 lines of vision. 22 (88%) of the eyes had clear grafts, 2 eyes had slightly hazy grafts, and one eye had a rejected graft.

Conclusion: Lamellar corneal transplant with corneoscleral excision is successful in treating children and infants with congenital limbal dermoids with few complications. It results in good visual acuity and excellent cosmesis.

* Resident

SCIENTIFIC ABSTRACTS

3:10 - 3:16 pm

Prevalence of Neurotrophic Keratopathy in Patients with Chronic Ocular Graft-Versus-Host Disease

Rohan Bir Singh, MD, MPH,* ***Massachusetts Eye and Ear, Department of Ophthalmology, Harvard Medical School, Boston, MA***

Co-Authors: Hamid Alemi, MD, MPH; Shruti Sinha, MD; Thomas H. Dohlman, MD; Yukako Taketani, MD, PhD; Jia Yin, MD, PhD, MPH; and Reza Dana, MD, MSc, MPH

Purpose: To determine the prevalence and clinical characteristics of neurotrophic keratopathy in patients with chronic ocular graft-versus-host disease (oGVHD).

Method: We performed a chart review of patients diagnosed with chronic oGVHD, between January 2015 and December 2018 at a single academic institution, and recorded demographic data, systemic and ocular comorbidities, history of hematoncological diagnosis, transplant characteristics, oGVHD severity scores, adnexal and ocular examination findings. We analyzed the change in the corneal nerve sensation recorded by Cochet-Bonnet esthesiometry and objective ocular surface parameters, including corneal fluorescein staining (CFS) scores, Schirmer's test scores, and Tear Breakup Time. The data were analyzed to determine the prevalence of neurotrophic keratopathy (NK) in patients with oGVHD, and multivariate logistic regression was performed to determine the factors significantly associated with NK.

Results: We identified 223 patients diagnosed with chronic oGVHD following stem cell or bone marrow transplantation from our electronic patient database and computed the prevalence of NK in the cohort to be 13.6% (n=39). The mean age of oGVHD patients was 63.5 ± 12.2 years; 15 (51.7%) were women, 19 patients had unilateral and ten patients had bilateral NK. Amongst the cohort, 56.4% (n=22), 10% (n=8) and 24% (n=19) patients were diagnosed with grade 1, 2 and 3 of NK, respectively. The mean time for diagnosis after transplantation was 52.85 ± 45.43 months. The patients diagnosed with NK had a significantly higher NIH (p=0.04) severity score, and a profoundly reduced corneal sensation score (p<0.0001) compared to the rest of the cohort. Our analyses showed significantly higher CFS scores (p=0.02) and a moderately lower Schirmer test scores and tear break up time in oGVHD patients with NK. A significantly higher prevalence of persistent epithelial defect (p=0.03), corneal ulceration (p=0.02), and corneal perforation (p=0.04) was observed in oGVHD patients diagnosed with NK. The logistic regression analysis to determine factors associated with NK showed diabetes (odds ratio=1.082.15, p=0.05) to be significantly associated with its development.

Conclusion: The prevalence rates of NK in chronic oGVHD are 13.6% over three years. Our analysis shows that oGVHD patients with a high NIH severity score are at an increased risk of developing NK, and may progress to severe sequelae like PED, corneal ulceration, and perforation.

* Research Fellow

SCIENTIFIC ABSTRACTS

4:21 - 4:27 pm

Viability and Function of Cultured Human Corneal Endothelial Cells (HCECs) for Transplantation

Wei Wang, PhD, ***Johns Hopkins University, School of Medicine***

Co-Authors: Albert S. Jun, MD, PhD; Megan M.W. Straiko, PhD; Chris G. Stoeger, MBA, CEBT; Corrina Patzer, BA; Xiaokun Wang, PhD; Jennifer H. Elisseeff, PhD; and Khoa D. Tran, PhD

Purpose: To examine cell viability and function of HCECs on a collagen-based vitrigel carrier for transplantation

Method: A transparent, thin vitrigel was used as a carrier to deliver cultured HCECs. Calcein-AM staining was examined to determine cell viability. To examine the function of HCECs in vivo, grafts were transplanted into an animal model after the native endothelium had been damaged. 28 days post-surgery, corneal clarity was assessed; OCT and in vivo confocal microscopy were acquired; and enucleated experimental eyes were examined as histological sections.

Results: Propagated HCECs cultured on vitrigel exhibited cobblestone-like morphology and expressed corneal endothelial markers similar to a traditional DMEK graft. Viability of grafts stored for 14 days and shipped long-distance was > 90%. On day 28 post-op, the eyes transplanted with the grafts cleared substantially more than the control eyes with carriers only. OCT revealed that the cornea was significantly thinner in the graft group than in the control group (620 µm vs 936 µm (122% vs 186% baseline)). In vivo confocal microscopy clearly showed a confluent mosaic layer of polygonal HCECs on the graft, and histological results showed the graft firmly attached to the stroma and presence of human cells.

Conclusion: The HCECs cultured on the vitrigel remained viable after long-distance shipping. The eyes transplanted with cell-vitrigel grafts had thinner and clearer corneas than the controls suggesting restoration of the corneal function. This cell-based therapy for corneal endothelial dysfunction delivered by a collagen vitrigel carrier could be an alternative tissue for traditional endothelial keratoplasty.

SCIENTIFIC ABSTRACTS

4:28 - 4:34 pm

Double-Masked Randomized Trial of Netarsudil for Reduction of Corneal Edema in Fuchs Dystrophy

Marianne Price, PhD, ***Cornea Research Foundation of America***

Co-Authors: Francis W. Price, Jr., MD

Purpose: To evaluate use of netarsudil 0.02% ophthalmic solution for reduction of corneal edema in patients with Fuchs endothelial corneal dystrophy (FECD).

Method: This pilot study enrolled and randomized 29 subjects with symptomatic FECD to use of netarsudil or placebo eye drops once nightly for 3 months. The main outcomes were change in central corneal thickness between baseline and 1 month and between baseline and 3 months. The secondary outcomes were change in scotopic corrected distance visual acuity (CDVA) and change in scores on a validated FECD disability questionnaire between baseline and 3 months.

Results: Compared with placebo, netarsudil produced a significant reduction in central corneal thickness at 1 month (mean difference, -20 microns, p=0.001) and 3 months (mean difference, -26 microns, p=0.002) as well as significant improvement in scotopic CDVA at 3 months (mean difference +1.6 lines, p = 0.029). Questionnaire scores did not change significantly between baseline and 3 months in either arm. One subject assigned to the netarsudil arm had epithelial bullae at baseline and withdrew from the study because of disabling glare.

Conclusion: In this pilot study, once-daily use of netarsudil by FECD patients was associated with improvement in corneal edema and scotopic CDVA. Additional studies are indicated to more fully evaluate patient satisfaction and visual acuity in different lighting conditions and to compare use of netarsudil with alternatives like endothelial keratoplasty.

SCIENTIFIC ABSTRACTS

4:35 - 4:41 pm

Endothelial Cell Viability in Viscoelastic-Aided DMEK Graft Preparation and Marking

Ellen Koo, MD, *Bascom Palmer Eye Institute*

Co-Authors: Courtney Goodman; Angela Gomez Bedoya; Elizabeth Fout-Caraza; William Buras; Sabrina Rodriguez, CEBT; Melissa Pottinger, and Alfonso Sabater, MD, PhD

Purpose: To evaluate the endothelial cell viability of a novel viscoelastic-aided method of Descemet Membrane Endothelial Keratoplasty (DMEK) graft preparation and marking.

Method: A total of 20 DMEK donor grafts were prepared by a single eye-bank technician. Pre-processing and post-processing endothelial cell counts were obtained using the Konan CellChek D Specular Microscopes. Five grafts were assigned to the first control group, to be prepared with “S-Stamp” orientation mark without usage of viscoelastic. Five grafts were assigned to be second control group with peripheral “I,II” orientation marks without usage of viscoelastic. Ten grafts underwent DMEK processing first with dispersive viscoelastic coating the endothelial side, followed by the standard SCUBA peeling method. Out of the 10, 5 received the “S-Stamp” orientation mark, and the other 5 received the peripheral “I,II” mark. Following tissue processing, endothelial cell viability was determined using Ready Probes™-Cell Viability Imaging Kit (ThermoFisher, USA). Cell viability was evaluated at the center, periphery and stained areas of the graft using a fluorescence microscope (Keyence, Japan).

Results: The DMEK donor grafts processed using viscoelastic-aided preparation and marking showed less endothelial cell loss, and decreased loss of viable cells compared to the control grafts that were processed in the usual standard fashion ($p<0.05$). Compared to the “S-Stamp,” the peripheral “I,II” markings showed significantly decreased loss of viable cells, both with or without the usage of viscoelastic ($p<0.05$).

Conclusion: Viscoelastic-aided method of Descemet Membrane Endothelial Keratoplasty (DMEK) graft preparation and marking showed better preservation of endothelial cells, and improved cell viability profile compared to the standard method of graft preparation and marking. The “S-Stamp” orientation mark was associated with higher endothelial cell loss and decrease cell viability compared to the peripheral “I,II” orientation marks.

SCIENTIFIC ABSTRACTS

4:42 - 4:48 pm

Prediction of DMEK-Grafts at Risk for Future Rejection from Pre-Clinical Diagnosis Endothelial Cell Images

Naomi Joseph, BS, ***Case Western Reserve University***

Co-Authors: Beth Ann Benetz, MA, CRA; Harry Menegay, PhD; Silke Oellerich, PhD; Lamis Baydoun, PhD; Gerrit Melles, MD, PhD; Jonathan Lass, MD; and David Wilson, PhD

Purpose: Evidence suggests that morphometric changes seen on specular microscopic endothelial cell (EC) images occur prior to clinical signs of keratoplasty rejection. We utilized extensive quantitative EC image analysis to identify Descemet membrane endothelial keratoplasties (DMEK) at-risk for future rejection within the next 1-12 months from imaging.

Method: We collected 171 retrospective EC images from post-DMEK eyes, performed semi-automatic deep learning segmentation, and extracted over 190 novel quantitative features. We trained, validated, and tested random forest classifiers using 5-fold cross validation along with minimal Redundancy Maximal Relevance (mRMR).

Results: From the 5-fold cross validation, we report an area under the receiver operating characteristic (ROC) curve (AUC) of 0.89 ± 0.04 with a sensitivity of 0.92 ± 0.11 and a specificity of 0.86 ± 0.11 for predicting future rejection. This translates to a clinical setting where for every 100 rejection eyes, our algorithm accurately identified 92 eyes with future graft rejections prior to clinical recognition date.

Conclusion: The results indicate we can accurately detect at-risk corneas before clinical signs become apparent and prior to rejection diagnosis, offering clinicians the possibility to modify and/or institute topical corticosteroid therapy earlier, with the hope of lowering the risk of graft failure from rejection.

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1990	Richard C. Troutman, MD
1989	S. Arthur Boruchoff, MD
1988	Frank Polack, MD
1987	Herbert Kaufman, MD
1986	David Maurice, MD
1985	Phillips Thygeson, MD
1984	Yves I. Pouliquen, MD
1983	Alberto Urrets, Zavalia, MD
1982	Saiichi Michima, MD
1981	Claes H. Dohlman, MD
1980	A. Edward Maumenee, MD
1979	Max Fine, MD
1978	David G. Cogan, MD
1977	Jose I. Barraquer, MD
1976	Ramon Castroviejo, MD
1975	A. Gerard Devoe, MD

CLAES DOHLMAN AWARD

PRESENTED BY THE CORNEA SOCIETY

Cornea Society
Advancing the treatment of corneal disease

Eduardo Alfonso, MD

2020 Dohlman Award Recipient

PAST AWARDEES

2019 Ivan Schwab, MD
2018 Ronald Smith, MD
2017 Mark J. Mannis, MD
2016 Deborah Pavan-Langston, MD
2015 Roger F. Steinert, MD
2014 Dan B. Jones, MD
2013 Richard K. Forster, MD
2012 Prof. Peter Watson
2011 S. Arthur Boruchoff, MD
2010 Herbert E. Kaufman, MD
2009 Jay H. Krachmer, MD
2008 Gilbert Smolin, MD
2007 Peter R. Laibson, MD
2006 Claes H. Dohlman, MD, PhD

TROUTMAN AWARD

PRESENTED BY THE CORNEA SOCIETY

Cornea Society
Advancing the treatment of corneal disease

C. Drew Salisbury, MD

2020 Troutman Award Recipient

PAST AWARDEES

2019 Marina Bertolin, MSc
2018 Gregory Moloney, MBBS, BSc (Med), MMed, FRANZCO
2017 Khoa D. Tran, PhD
2016 Konstantinos T. Tsaousis, MD
2015 Mark A. Greiner, MD
2014 Fei-fei Huang, MM
2013 Rafael A. Oechsler, MD
2012 Kaevalin Lekhanont, MD
2011 Daniel Bohringer, MD
2010 Vanitha Ratnalingam, MSurg (Ophthal)
2009 Jay Bradley, MD
2008 Hui-Jung Yeh, MS

CORNEA and EYE BANKING FORUM 2020

VIRTUAL EVENT

SATURDAY, NOVEMBER 7

EYE BANK ASSOCIATION OF AMERICA

Cornea Society