# Wills Eye Hospital at ARVO 2021 Annual Meeting

A total of 25 papers and posters with Wills Eye Attendings/Faculty and Trainees *(Fellows, Residents, Medical students, and interns)* as primary presenters were accepted for ARVO Annual Meeting 2021

| **Sunday, May 2nd** | |
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| 9:00 - 10:45 AM | |
| Poster Session: Aging, social and environmental determinants and the eye | |
| | **Eyelid Cancer Prevalence and Associated Factors in the AAO IRIS® Registry**<br>***Zeynep Bas***[1], *James Sharpe*[2], *Antonio Yaghy*[1], *Qiang (Ed) Zhang*[2], *Carol Shields*[1], *Leslie Hyman*[2] |
| 11:15 – 1:00 PM | |
| Poster Session: Amblyopia and Pediatric Ophthalmology | |
| | **Virtual Vision Outreach Program: Give Kids Sight Day (GKSD) 2020**<br>***Rujuta Gore***[1], *Connie Wu*[2], *Michael Lai*[3], *Caitlin Green*[4], *Rebecca Elias*[2], *Barry Wasserman*[1] |
| Poster Session: Endophthalmitis/trauma | |
| | **Systemic immunosuppression and risk of endophthalmitis after intravitreal anti-vascular endothelial growth factor injections**<br>***Julie S. Kim***[1], *Samir N. Patel*[1], *Philip P. Storey*[2], *Anthony Obeid*[1], *Jason Hsu*[1], *Sunir J. Garg*[1] |
| | **The influence of universal face mask use on endophthalmitis risk after intravitreal anti-vascular endothelial growth factor injections during the COVID-19 pandemic**<br>***Samir N. Patel***[1], *Peter Tang*[2], *Philip P. Storey*[3], *Jeremy Wolfe*[4], *Jordana Fein*[5], *Priya Vakharia*[5], *Sumit P. Shah*[6], *Jonathan Prenner*[6], *Eric Chen*[7], *Patrick Williams*[8], *Chirag Shah*[9], *Philip ferrone*[10], *Michelle Liang*[11], *Maxwell Stem*[12], *Yoshihiro Yonekawa*[1], *Sunir J. Garg*[1] |
| Poster Session: Retinal vascular diseases | |
| | **Outcomes of Eyes with Retinal Vein Occlusion that are Lost to Follow-up after Anti-Vascular Endothelial Growth Factor Therapy**<br>***Mirataollah Salabati***[1], *Raziyeh Mahmoudzadeh*[1], *Jae-Chiang Wong*[2], *Dillan Patel*[3], *Samir N. Patel*[1], *Rebecca R. Soares*[1], *JOHN W. HINKLE*[1], *Anthony Obeid*[1], *Jason Hsu*[1] |
| 7:00 – 8:00 PM | |
| | **ARVO Foundation Gala**<br>***Julia Haller MD*** *serving as emcee* |

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| **Monday, May 3rd** | |
| 11:15 – 12:45 PM | |
| Paper Session: Advances in Diagnosis and Treatment of Uveal Melanoma | |
| | **Outcomes of The Cancer Genome Atlas (TCGA) Classification in Uveal Melanoma by Patient Age in 1001 Eyes**<br>***Zaynab Sajjadi*[1]**, *Zeynep Bas[1], Eileen L. Mayro[1], Arupa Ganguly[2], Carol Shields[1]* |
| Paper Session: Vitreoretinal surgery | |
| | **Development of cystoid macular edema following rhegmatogenous retinal detachment surgery**<br>***Matthew Starr*[1]**, *Louis Cai[1], Michael Ammar[1], Luv Patel[1], Anthony Obeid[1], Ed Ryan[2], Claire Ryan[2], Antonio Capone[3], Geoffrey Emerson[4], Daniel Joseph[5], Dean Eliott[6], Omesh Gupta[1], Carl Regillo[1], Jason Hsu[1], Yoshihiro Yonekawa[1]* |
| 11:15 – 1 PM | |
| Poster Session: Drug delivery and Gene therapy | |
| | **Suprachoroidal Injections Across Species Analyzed via Multimodal Imaging**<br>***Allen Ho*[2]**, *Cherry Wan[1], Thomas A. Ciulla[1]* |
| Poster Session: Retinal detachment | |
| | **Intravitreal HC-HA/PTX3, a soluble matrix component of amniotic membrane, inhibits proliferative vitreoretinopathy (PVR) in a mouse model of PVR**<br>***Ajay E. Kuriyan*[1,2]**, *Alison Heffer[2], Victor Wang[2], Hua He[3], Megha Mahabole[3], Steven E. Feldon[2], Richard T. Libby[2], Scheffer C. Tseng[3], Collynn Woeller[2]* |
| | **Retinal Displacement Following Incisional Rhegmatogenous Retinal Detachment Repair**<br>***Raziyeh Mahmoudzadeh*[1]**, *Mirataollah Salabati[1], Yoshihiro Yonekawa[1], Ajay E. Kuriyan[1], M.Ali Khan[1], Michael A. Klufas[1], Sunir J. Garg[1], Omesh Gupta[1], Carl Regillo[1], Michael N. Cohen[1]* |
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| **Tuesday, May 4th** | |
| 10:15 – 11:45 AM | |
| Paper Session: Advances in diagnosis and management of retinoblastoma and congenital eye diseases | |
| | **Likelihood of Germline Mutation with Solitary Retinoblastoma Based on Tumor Location at Presentation**<br>***Philip Dockery*[1]**, *Megan Ruben[1], Antonio Yaghy[1], Carol Shields[1]* |
| 2:15 – 4:00 PM | |
| Poster Session: AMD and Retinal Disease Epidemiology | |
| | **Evaluation of geographic atrophy secondary to age-related macular degeneration in clinical practice: *analysis of the American Academy of Ophthalmology IRIS® Registry***<br>***M. Ali Khan*[1]**, *Ehsan Rahimy[2], Ray Hsieh[3], Ramiro Ribiero[5], Allen Ho[4], Nancy M. Holekamp[6]* |
| 4:00 – 6:00 PM | |
| Special Event: NEI and ARVO Discuss DEI | |
| | ***Leslie Hyman PhD*, *Eduardo Alfonso, Michael Chiang, Joan Miller, Iris Rush, Santa Tumminia, William Brunken, Cheryl Rowe-Rendleman, Justine Smith, Terri Young*** |

| **Wednesday, May 5th** | |
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| 9:00 – 11:00 AM | |
| Symposium | **Epidemiology of diabetic retinopathy and age-related macular degeneration: Past, present and future**<br>*Co-Organizer and Introduction –* ***Leslie Hyman PhD*** |
| 9:00 – 10:45 AM | |
| Poster Session: Surgery and wound healing I and II (Glaucoma) | |
| | **Hemorrhagic Complications Following Trabecular Bypass Microstent Surgery in the Setting of Antithrombotic Therapy**<br>***Joseph Bechay[1]***, *Sonali Patel[1], Sophia Lam[1], Izzy Zadrozny[1], Johannie N. Reyes[1], Wesam S. Shalaby[1], daniel lee[1], Jonathan S. Myers[1], Michael J. Pro[1], Marlene R. Moster[1], Aakriti Garg Shukla[1]* |
| | **Evaluation of the Hypertensive Phase after Ahmed Glaucoma Valve Implantation in Neovascular Glaucoma**<br>***Sunidhi Ramesh[1]***, *Wesam S. Shalaby[2], Jonathan S. Myers[2], L. Jay katz[2], Marlene R. Moster[2], Reza Razeghinejad[2], Aakriti Garg Shukla[2]* |
| | **Sociodemographic and Economic Factors in Outcomes of Tube Shunts for Neovascular Glaucoma**<br>***Amirmohsen Arbabi[1]***, *Wesam S. Shalaby[1], Jonathan S. Myers[1], Marlene R. Moster[1], Reza Razeghinejad[1], L. Jay katz[1], Aakriti Garg Shukla[1]* |
| | **Retrospective, multicenter, 12-month evaluation of ab-externo XEN Gel Stent placement: real-world data from the EXPAND Study Group**<br>***Natasha N. Kolomeyer[1]***, *Joshua Kim[2], William Flynn[3], George Tanaka[4], Susan Simonyi[5], John Walt[6], Vanessa Vera[6], Steven Vold[7]* |
| | **Gonioscopy-assisted transluminal trabeculotomy for the treatment of glaucoma in uveitic eyes**<br>***Devayu A. Parikh[1,2]***, *Phoebe L. Mellen[1], Tony Kang[4], Wesam S. Shalaby[3], Marlene R. Moster[3], James P. Dunn[1]* |
| | **The Effect of Phacoemulsification on the Functioning Tube Shunts in Open Angle Glaucoma**<br>***Wesam S. Shalaby[1,2]***, *Sophia Lam[3], Allen Ganjei[4], Sonali Patel[3], Aakriti Garg Shukla[1], Natasha N. Kolomeyer[1], daniel lee[1], L. Jay katz[1], Marlene R. Moster[1], Jonathan S. Myers[1], Reza Razeghinejad[1]* |
| Poster Session: Healthcare Delivery and Quality of Care | |
| | **Geographic access disparities to clinical trials in retinopathy of prematurity in the United States**<br>***Rebecca R. Soares[1]*** |
| Poster Session: Vitreoretinal interface diseases/PVR | |
| | **Good Visual Acuity Outcomes Following Retinectomy During Repair of Retinal Detachment with Proliferative Vitreoretinopathy**<br>***Rachel Israilevich[1]***, *Matthew Starr[2], Vishal Swaminathan[1], Mirataollah Salabati[2], Raziyeh Mahmoudzadeh[2], Michael Ammar[2], Luv Patel[2], Jason Hsu[2]* |
| 2:45 – 4:30 PM | |
| Poster Session: Ophthalmology Training/Careers, Health Economics and Telemedicine | |
| | **Descriptive Analysis of Cornea Fellowship Program Directors in 2020**<br>***Sophia S. Lam[1]***, *Aakriti Garg[2], Wesam S. Shalaby[3], Zeba A. Syed[3]* |
| | **Feasibility of Ophthalmic telemedicine Consultation in Urgent Settings (FOCUS)**<br>***Ann Murchison[1]***, *Jurij R. Bilyk[2]* |
| Poster Session: Corneal transplantation and surgeries | |
| | **Graft Survival after Penetrating Keratoplasty in Patients with History of Incisional Glaucoma Surgery**<br>***Sarah M. Stuccio[1]***, *Aakriti Garg Shukla[2], Wesam S. Shalaby[2], Eric J. Shiuey[1], Zeba A. Syed[3]* |

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| **Thursday, May 6th** | |
| 11:15 – 1:00 PM | |
| Poster Session: Stem cells/gene therapy/ transplantation/ laser/ local therapy | |
| | **Outcomes In Eyes Lost to Follow-up After Treatment with Steroid Injections for Retinal Pathology**<br>***JOHN W. HINKLE[1,2]***, *Raziyeh Mahmoudzadeh[1,2], Rachel Israilevich[3], Mirataollah Salabati[1,2], Anthony Obeid[1], Jason Hsu[1,2], Sunir J. Garg[1,2]* |
| **Friday, May 7th** | |
| 2:15 – 4:00 PM | |
| Poster Session: Healthcare Delivery during COVID Pandemic | |
| | **Synchronous Audio-Visual Telemedicine at Wills Eye Hospital During Covid-19**<br>***Joseph Anaya[1]***, *John Anhalt[1], Zeynep Bas[1], Jurij R. Bilyk[1], Mary Fuska[1], Sara Lally[1], Phoebe L. Mellen[1], Ann Murchison[1], Marisa Schoen[1], Carol Shields[1], Antonio Yaghy[1], Julia Haller[1]* |

## ABSTRACTS

**Eyelid Cancer Prevalence and Associated Factors in the AAO IRIS® Registry**

***Zeynep Bas***[1], *James Sharpe*[2], *Antonio Yaghy*[1], *Qiang (Ed) Zhang*[2], *Carol Shields*[1], *Leslie Hyman*[2]

[1] Ocular Oncology, Wills Eye Hospital Ocular Oncology Service, Philadelphia, Pennsylvania, United States; [2] Vickie and Jack Farber Vision Research Center, Wills Eye Hospital, Philadelphia, Pennsylvania, United States

**Purpose:** To estimate prevalence of eyelid cancers in the AAO IRIS® Registry and evaluate associated factors.
**Methods:** All patients with ICD-9/10 codes for eyelid cancers*(basal cell carcinoma [BCC],squamous cell carcinoma[SCC],malignant melanoma[MM],melanoma in-situ[MIS], sebaceous cell carcinoma/other specified malignant neoplasm[SBCC] and unspecified malignant neoplasm[UMN]),*in the IRIS® registry between 12/1/2010-12/1/2018, were included. Prevalence was estimated overall, by age (categorical),race(White[W],Hispanic[H],African-American[A-A], Asian[A],Other[O],Unknown[UK]), sex (Male[M], Female[F]), and smoking status. Prevalences were compared using $\chi 2$ tests or Fisher's exact tests. Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated using multivariable logistic regression.
**Results:** 81,802 eyelid cancer patients were identified. Prevalence of Any Eyelid Cancer (AEC) was 0.14%. Tumor-specific prevalences ranged from: 0.088% (BCC), to 0.026% (UMN), 0.011% (SCC), 0.005% (SBCC), 0.004% (MM), and 0.0004% (MIS). Prevalence increased with increasing age for AEC and each tumor type (all $p<0.0005$), was higher in M than F for any eyelid cancer and BCC, SCC, MM (all: $p<0.0001$) and MIS ($p=0.03$), but not UMN or SBCC. Prevalence was highest in W's compared with any other race for BCC, SCC, and SBCC (all $p<0.0001$). Prevalence was also higher in current/former smokers vs. non-smokers for AEC and all tumor types (all $p<0.01$). In the model, having AEC was associated with older ages [<20 yrs (ref.); OR (CI): 20-39 yrs: 3.6 (3.2-4.0); 40-65 yrs: 16.0 (14.7-17.6); >65 yrs: 25.6 (23.4-28.0)], M sex [F (ref.); 1.2 (1.2-1.2)], former/current smoking [never (ref.); former: 1.1 (1.1, 1.1), current: 1.2 (1.2-1.2)] and W race (inverse associations with A-A (0.1 (0.1-0.1), A (0.3 (0.3-0.3)) H (0.6 (0.5-0.6)) and O (0.6 (0.5-0.7)). Older age was associated with all tumor types, while other factors varied by type.
**Conclusions:** This is the first study to report on overall and tumor-specific prevalence of eyelid cancers from a large national clinical population. Associations with older age, male sex and white race are consistent with prior studies. The association with smoking for eyelid tumors offers guidance for disease prevention. This epidemiologic "real-world" data on eyelid cancers is valuable for risk factor assessment, planning treatment strategies, allocating medical resources, and improvements in cancer care.

**Virtual Vision Outreach Program: Give Kids Sight Day (GKSD) 2020**

***Rujuta Gore***[1], *Connie Wu*[2], *Michael Lai*[3], *Caitlin Green*[4], *Rebecca Elias*[2], *Barry Wasserman*[1]

[1] Wills Eye Hospital Department of Pediatric Ophthalmology, Philadelphia, Pennsylvania, United States; [2] Wills

Eye Hospital, Philadelphia, Pennsylvania, United States; [3] Rowan University Cooper Medical School, Camden, New Jersey, United States; [4] Thomas Jefferson University, Philadelphia, Pennsylvania, United States

**Purpose:** Give Kids Sight Day is an annual free outreach program in Philadelphia region, targeting low-income and underinsured communities. In 2020, a novel virtual screening program was conducted to face the challenges presented by the COVID19 pandemic. Continual innovation in vision screening methods is necessary to help reduce rates of blindness and visual impairment in children and adolescents. We performed a retrospective chart review to describe the outcomes of this new program.
**Methods:** Families to be screened were sent a packet with an eye chart and a 5-foot string, as well as instructions. On GKSD, screeners called the families and instructed the adults through screening the children over the phone. Results were collected and children who failed screening were sent to Wills Eye Hospital for an in-person appointment for re-screening and evaluation. After the Wills Eye Hospital Institutional Review Board approved this study, registration forms and clinical charts of all patients who attended GKSD 2020 were reviewed retrospectively. Demographic characteristics and ophthalmic findings were analyzed. Visual acuity on virtual screening was compared with in-person vision testing using Pearson correlation coefficient. Further subgroup analysis is being conducted at the time of abstract submission.
**Results:** Four hundred and seventy five children registered for virtual vision screening. Consequently, 151 children (43% female; 27% speaking languages other than English) with median age 11 years (age range 5-17 years) who failed screening received in-person evaluation. Out of these, 19% children underwent an eye exam for the first time. Refractive errors correctable with glasses were seen in 88%; 30 children with other diagnoses were referred to pediatric ophthalmology for further evaluation and management. There was a moderate correlation between screening and in-person visual acuity without refractive correction (R= 0.66 OD, 0.58 OS); and a strong correlation between screening and in-person visual acuity with refractive correction (R= 0.76 OD, 0.91 OS).
**Conclusions:** The GKSD virtual visual acuity testing demonstrated good correlation with in-person visual acuity testing, supporting the virtual screening approach as a useful tool for future applications in vision outreach programs.

**Systemic immunosuppression and risk of endophthalmitis after intravitreal anti-vascular endothelial growth factor injections**

***Julie S. Kim*[1]**, *Samir N. Patel*[1], *Philip P. Storey*[2], *Anthony Obeid*[1], *Jason Hsu*[1], *Sunir J. Garg*[1]
[1] Wills Eye Hospital, Philadelphia, Pennsylvania, United States; [2] Austin Retina Associates, Austin, Texas, United States

**Purpose:** The impact of systemic immunosuppressive therapy on the rates and outcomes of endophthalmitis following intravitreal anti-vascular endothelial growth factor (VEGF) injections remains largely unexplored. The aim of this study was to examine whether systemic immunosuppressive therapy alters a patient's risk for developing endophthalmitis after anti-VEGF injections.
**Methods:** This is a retrospective, single-center cohort study examining all eyes that underwent intravitreal anti-VEGF injections (bevacizumab, ranibizumab, or aflibercept) from January 2016 to September 2019. Two cohorts (no immunosuppression vs immunosuppression) were created based on immunosuppressive status at time of intravitreal injection. The primary outcome was the occurrence of endophthalmitis rates, while visual acuity (VA) and culture-positive cases were secondary outcomes. Within both cohorts, patients who developed presumed post-injection endophthalmitis that underwent ocular tap with intravitreal antibiotics were identified and compared using Chi-Square or Mann-Whitney U. $P < 0.05$ was considered significant.
**Results:** Of 270,347 anti-VEGF injections administered to 23,252 patients, 1300 (0.48%) injections were administered to 412 patients who were on systemic immunosuppressive therapy. In this cohort of eyes, five developed endophthalmitis for a rate of 0.38% (1 in 260 injections) compared to 100 eyes not on systemic immunosuppressants for a rate of 0.037% (1 in 2690 injections) with an odds ratio (OR) of 9.86 (95% CI: 4.0-24.3, $P<0.001$). Among the five eyes with presumed endophthalmitis, 3 had positive cultures (0.023%, 1 in 433 injections) compared to the 2 (0.012%, 1 in 8,407 injections) in the immunocompetent group for an OR of 19.4 [95% CI: 5.9-63.4, $P<0.001$]. Symptom onset occurred 2.51 (95% CI: 0.15-4.87, $P=0.040$) days earlier in the immunosuppressed patients; however, visual outcomes at 6 months were similar between the two groups.
**Conclusions:** Eyes receiving intravitreal anti-VEGF injections who are concurrently on systemic immunosuppressive therapy may be at an increased risk for developing PIE. However, final visual outcomes following post-injection endophthalmitis treatment is similar regardless of systemic immunosuppression status. Additional studies are indicated to further elucidate the role, if any, of immunosuppressive therapy in the management of PIE.

**The influence of universal face mask use on endophthalmitis risk after intravitreal anti-vascular endothelial growth factor injections during the COVID-19 pandemic**

***Samir N. Patel*** [1], *Peter Tang* [2], *Philip P. Storey* [3], *Jeremy Wolfe* [4], *Jordana Fein* [5], *Priya Vakharia* [5], *Sumit P. Shah* [6], *Jonathan Prenner* [6], *Eric Chen* [7], *Patrick Williams* [8], *Chirag Shah* [9], *Philip ferrone* [10], *Michelle Liang* [11], *Maxwell Stem* [12], *Yoshihiro Yonekawa* [1], *Sunir J. Garg* [1]

[1] Wills Eye Hospital, Philadelphia, Pennsylvania, United States; [10] Vitreoretinal Consultants of New York, New York, United States; [11] Tufts Medical Center, Boston, Massachusetts, United States; [12] Pennsylvania Retina Specialists, Pennsylvania, United States; [2] VitreoRetinal Surgery, Minnesota, United States; [3] Austin Retina Associates, Austin, Texas, United States; [4] Associated Retinal Consultants, Michigan, United States; [5] Retina

Group of Washington, District of Columbia, United States; [6] NJ Retina, New Jersey, United States; [7] Retina Consultants of Texas, Houston, Texas, United States; [8] Texas Retina Associates, Texas, United States; [9] OCB, Boston, Massachusetts, United States

**Purpose:** Routine use of face masks for both patients and physicians during intravitreal anti-vascular endothelial growth factor (VEGF) injections has increased with the emergence of the COVID-19 pandemic. This study evaluates the impact of physician, ancillary staff, and patient face mask use on rates and outcomes of post-injection endophthalmitis.
**Methods:** In this retrospective comparative cohort study, all eye receiving intravitreal anti-VEGF factor injections from 10/1/2019 to 7/31/2020 were included from twelve centers. Cases were divided into a "no face mask" group if no face masks were worn by the physician or patient during intravitreal injections or a "universal face mask" group if face masks were worn by the physician, ancillary staff, and patient during intravitreal injections. The main outcome measures were rate of endophthalmitis, visual acuity, and microbial spectrum.
**Results:** Of 505,968 intravitreal injections administered, 85 of 294,514 (0.0289%; 1 in 3,464 injections) cases of endophthalmitis occurred in the "no face mask" group, and 45 of 211,454 (0.0213%; 1 in 4,699 injections) cases occurred in the "universal face mask" group (odds ratio, 0.74; 95%CI, 0.51–1.18; p=0.097; Table 1). In the "no face mask" group, there were 27 cases (0.0092%; 1 in 10,908 injections) of culture-positive endophthalmitis compared to 9 cases (0.004%; 1 in 23,494 injections) in the "universal face mask" group (OR, 0.46; 95%CI, 0.22–0.99; p=0.041). Three cases of oral flora-associated endophthalmitis occurred in the "no face mask" group (0.001%; 1 in 98,171 injections) compared to one (0.0005%; 1 in 211,454) in the "universal face mask" group (p=0.645). At endophthalmitis presentation, mean logMAR visual acuity was 2.04 for "no face mask" group compared to 1.65 for the "universal face mask" group (p=0.022), although no difference was observed three months after treatment (p=0.764; Table 2).
**Conclusions:** Universal face mask use during intravitreal anti-VEGF injections did not show a statistically significant reduction in presumed endophthalmitis, but there was a reduced rate of culture-positive endophthalmitis. Future studies are warranted to assess the role of face mask use to reduce endophthalmitis risk, particularly that due to oral flora.

**Layman Abstract (optional):** Routine use of face masks for both patients and physicians during intravitreal injections has increased with the emergence of the COVID-19 pandemic. Recently, experimental investigations have suggested that patient face mask use during intravitreal injections may direct bacterial dispersion and expiratory airflow toward the eye which could potentially increase the risk of endophthalmitis. Despite these findings, it is unknown if these face mask protocols alters the clinical risk of post-injection endophthalmitis. Of 505,968 intravitreal injections administered over a six-month period, physician and patient face mask use during intravitreal anti-VEGF injections did not show a statistically significant reduction in presumed endophthalmitis. However, intravitreal injections administered with a universal face mask policy were associated with significantly lower rates of culture-positive endophthalmitis. Additional studies are warranted to assess the potential role of face mask use and the risk of oral flora-associated endophthalmitis.

**Outcomes of Eyes with Retinal Vein Occlusion that are Lost to Follow-up after Anti-Vascular Endothelial Growth Factor Therapy**

***Mirataollah Salabati*** [1], *Raziyeh Mahmoudzadeh* [1], *Jae-Chiang Wong* [2], *Dillan Patel* [3], *Samir N. Patel* [1], *Rebecca R. Soares* [1], *JOHN W. HINKLE* [1], *Anthony Obeid* [1], *Jason Hsu* [1]
[1] Mid Atlantic Retina, Wills Eye Hospital, Philadelphia, Pennsylvania, United States; [2] Rowan University School of Osteopathic Medicine, Stratford, New Jersey, United States; [3] Lewis Katz School of Medicine at Temple University, Philadelphia, Pennsylvania, United States

**Purpose:** To evaluate the effect of loss to follow up (LTFU) on outcomes in eyes with retinal vein occlusion (RVO) treated with anti-vascular endothelial growth factor (VEGF) injections
**Methods:** In this retrospective single center case series, patients with RVO receiving intravitreal injections who were LTFU >6 months were eligible for inclusion. Visual acuity (VA) and optical coherence tomography features

were collected from the visit before LTFU, the return visit, 3 months after return, 6 months after return, 12 months after return and the final follow-up visit.
**Results:** Ninety-one eyes of 84 patients with a mean age (±standard deviation) of 74.2 (±11.2) years were included. Forty-nine (58.4%) of the patients were female. Fifty (54.9%) patients had branch RVO and 41 (45.1%) had central RVO. Mean LTFU duration was 278.2 (±108.8) days and patients were followed for mean 739.8 (±366.7) days after return. Patients had received a mean of 8.5 (±5.7) injections before being LTFU and received a mean of 8.3 (±7.6) injections after return. Mean logMAR VA at the visit before LTFU was 0.72 (±0.67) [Snellen 20/104] which significantly worsened at the return visit [1.05 (±0.79), Snellen 20/224, p<0.001], 3 months after return [0.92 (±0.70), Snellen 20/166, p< 0.001], 6 months after return [0.97 (±0.80), Snellen 20/186, p<0.001], 12 months after return [ 0.94 (±0.78), Snellen 20/174, p<0.001] and the final follow-up visit [1.02 (±0.85), Snellen 20/209, p<0.001] (Figure1). The mean central foveal thickness (CFT) increased when comparing the visit before LTFU [251 (±129) µm] to the return visit [404 (± 241) µm, p<0.001]. No significant difference in CFT was noted by 3 months [256 (±139) µm, p=0.68], 6 months [241 (±122) µm, p=0.59], or 12 months after return [250 (±134) µm, p=0.98]. The CFT was significantly thinner at the final visit [214 (±114) µm, p=0.017](Figure2). Three (4.2%) eyes (2 CVRO, 1 BRVO) presented with neovascular glaucoma (NVG) and 4 (4.5%) eyes (3 CRVO, 1 BRVO) with new onset vitreous hemorrhage (VH) at the return visit.
**Conclusions:** RVO patients receiving anti-VEGF treatment who were LTFU for a prolonged duration experienced a significant decline in VA that did not return to the levels seen before LTFU despite restarting therapy and subsequent improvement in CFT. LTFU might also increase the risk of unfavorable outcomes like NVG and VH in RVO patients.

**Outcomes of The Cancer Genome Atlas (TCGA) Classification in Uveal Melanoma by Patient Age in 1001 Eyes**
***Zaynab Sajjadi*[1]**, *Zeynep Bas*[1], *Eileen L. Mayro*[1], *Arupa Ganguly*[2], *Carol Shields*[1]
[1] Wills Eye Hospital Ocular Oncology Service, Philadelphia, Pennsylvania, United States; [2] Genetics, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania, United States

**Purpose:** The Cancer Genome Atlas (TCGA) is a genetic based classification of 33 types of cancer including uveal melanoma and is highly predictive of uveal melanoma-related metastasis and death. We performed a retrospective, cohort study to evaluate TCGA classification and outcomes for uveal melanoma based on patient age at presentation.
**Methods:** Retrospective analysis of patients with uveal melanoma at a single ocular oncology center treated with plaque radiotherapy or enucleation from 1998 to 2020 and who completed genetic testing of chromosome 3 and 8 after fine needle aspiration biopsy. Patients were classified by age group (<21 years vs. 21-40 years vs. 41-60 years vs. >60 years) at presentation. Categorical variables were compared using $\chi 2$ tests or Fisher's exact tests. Kaplan-Meier analysis was performed for metastasis (liver metastasis, any metastasis) and death from uveal melanoma.

**Results:** Of 1001 eyes with uveal melanoma, 9 (1%) were <21 years, 104 (10%) were 21-40 years, 420 (42%) were 41-60 years and 468 (47%) were >60 years of age at presentation. By comparison, the older age group had higher frequency of class D tumor (0% vs. 4% vs. 10% vs. 14%, $p$<0.001) and greater tumor basal diameter (11.6 vs. 12.0 vs. 11.7 vs. 12.6, $p$=0.02) and the younger age group had higher frequency of 20/400-no light perception (NLP) vision (56% vs. 8% vs. 8% vs. 11%, $p$<0.001). By Kaplan-Meier analysis (10 years), the older age group had higher rate of liver metastasis (0% vs. 14% vs. 11% vs. 14%, $p$=0.017), any metastasis (0% vs. 14% vs. 12% vs. 14%, $p$=0.033), and uveal melanoma-related death (0% vs. 2% vs. 1% vs. 3%, $p$=0.049).
**Conclusions:** Uveal melanoma diagnosis at an older age is associated with more advanced TCGA classification, larger tumor size, and higher metastasis and death rate.

**Development of cystoid macular edema following rhegmatogenous retinal detachment surgery**

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**Purpose:** Cystoid macular edema (CME) following cataract surgery is a well-known phenomenon. Less is known regarding the risk factors, though, of developing CME following repair of rhegmatogenous retinal detachments (RRD).
**Methods:** This is a subgroup analysis of the Primary Retinal Detachment Outcomes (PRO) study, a multi-institutional study of consecutive primary RRD surgeries from 1/1/2015 through 12/31/2015. The primary outcome was development of post-operative CME following RRD surgery. The analysis was limited with those with post-operative optical coherence tomography imaging and at least 3 months of follow up following RRD repair.

**Results:** There were 1,466 eyes that met the inclusion criteria, and 140 (9.6%) developed post-operative CME following primary RRD repair. Multivariate analyses with statistically significant associations were older patient age (OR 1.03 per year, 95% CI 1.01 to 1.05), pre-operative proliferative vitreoretinopathy (PVR, OR 1.74, 95% 1.03 to 2.95), and cataract surgery following RRD repair (OR 2.18, 95% CI 1.47 to 3.25). Of the 843 (57.7%) phakic eyes, 76 (9.0%) developed post-operative CME. Multivariate analysis showed that cataract surgery following RRD repair was an independent risk factor ($p < 0.0001$) in this subset. Of the 623 (42.3%) pseudophakic eyes, 60 (9.9%) developed post-operative CME. Older age was an independent risk factor ($p = 0.0075$). When examining only eyes that underwent successful retinal re-attachment with a single surgery, 77 of 1211 (6.4%) eyes developed CME. Post-operative cataract surgery ($p = 0.0005$) and pre-operative PVR ($p = 0.0011$) were the independent risk factors for CME based on multivariate analyses in this subgroup. Of note, vitrectomy and vitrectomy with scleral buckle resulted in higher rates of CME compared to scleral buckle alone on univariate analyses, but did not remain statistically significant on multivariate regression analysis.
**Conclusions:** CME occurred in nearly 10% of eyes following RRD repair. The biggest risk factors were recurrent retinal detachment, preexisting PVR, older age, and cataract surgery following RRD repair.

**Layman Abstract (optional):** This study was a subgroup analysis of the PRO database which housed over 3000 eyes that underwent repair of primary rhegmatogenous retinal detachments during 2015. This study found that cystoid macular edema (swelling of the retina) occurred in 10% of eyes with retinal detachment with the biggest risk factors being recurrent retinal detachment, evidence of proliferative vitreoretinopathy, older age, and cataract surgery following retinal detachment repair.

**Suprachoroidal Injections Across Species Analyzed via Multimodal Imaging**

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**Purpose:** Potential spaces in anatomy refer to the area between apposed organs or tissues and can represent "druggable" targets, including the epidural space, used to deliver anesthetics, and the suprachoroidal space (SCS), currently undergoing clinical trial with several therapeutics. In clinical trials, optical coherence tomography (OCT) imaging has demonstrated acute and transient opening of the SCS in preclinical and clinical studies. This imaging study characterized the biomechanical response of injection into the SCS in comparison to intravitreal (IVT) injection.
**Methods:** Suprachoroidal and IVT injections were performed in *ex vivo* porcine eyes and the biomechanical response was visualized using the imaging modalities: external photography, spread visualization via ultraviolet (UV) with fluorescence, internal endoscopy, and cryo-freeze sectioning under microscopy. Suprachoroidal injections were performed with the SCS Microinjector®. IVT injections were performed with a 1-mL syringe and standard 30-G needle. Tissues change, injectate spread, and globe behavior were analyzed for both therapeutic delivery methods.
**Results:** Imaging modalities demonstrated differences between suprachoroidal and IVT injection in distribution of injectate, tissue change, and globe behavior. When evaluated under UV light, suprachoroidal injection of

fluorescing particles showed spread circumferentially and posteriorly. No injectate spread was visible with IVT injection, as fluorescence is muted by the pigmented choroid and RPE. Cryofreezing and section showed suprachoroidally injected injectate spread posteriorly toward the macula, between sclera and choroidal tissues. IVT injection showed a bolus of injectate located in the vitreous. Endoscopic footage of an *ex vivo* porcine suprachoroidal injection show a localized depression of the choroidal tissues when the procedure is begun, followed by SCS expansion as fluid is injected. Corresponding imaging during IVT delivery demonstrated differences in spread of injectate within the globe.
**Conclusions:** In contrast to intravitreal delivery, suprachoroidal drug delivery results in acute opening of the SCS, supporting the potential to target affected tissue layers in chorioretinal disorders.

**Intravitreal HC-HA/PTX3, a soluble matrix component of amniotic membrane, inhibits proliferative vitreoretinopathy (PVR) in a mouse model of PVR**

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**Purpose:** Proliferative vitreoretinopathy (PVR) occurs in 10% of retinal detachments and is the most common cause of failure of retinal detachment surgery. There are currently no approved treatments for inhibiting PVR. We studied the ability of intravitreal HC-HA/PTX3, a soluble matrix component of amniotic membrane, to inhibit PVR in a mouse model. Additionally, we assessed the safety of intravitreal HC-HA/PTX3 on the mouse retina.
**Methods:** PVR was induced in 38 control and 43 treatment eyes of 6-8 week old female C57BL/6J mice. A posterior vitreous detachment was induced by intravitreal injection of 0.5µL $SF_6$ gas. One week later, immediately prior to injection, freshly harvested ARPE-19 cells (immortalized retinal pigment epithelial cells [RPE]) were mixed with PBS alone (control) or PBS with HC-HA/PTX3 to yield solutions containing $2x10^4$ RPE cells and 0.15 (n=15), 0.30 (n=15), or 0.6 (n=13) µg/ml HC-HA/PTX3 per microliter. 1µL of the solution was injected intravitreally and weekly fundus photos were used to grade PVR development for 4 weeks. Additionally, mice received intravitreal injection of PBS (n=2) or 0.6 µg/ml HC-HA/PTX3 (n=5) and ERG a- and b-wave amplitudes compared after 4 weeks to assess safety. Mann-Whitney U test was used to compare PVR grades.
**Results:** After 4 weeks, eyes injected with RPE/PBS (control mice) developed a mean PVR grade of 2.75 out of 6 (SD: 1.35), which was significantly higher than mice treated with intravitreal 0.6 µg/ml HC-HA/PTX3 (1.77, SD:

0.73, p = 0.018). The difference in PVR grade compared to control mice approached statistical significance in mice treated with intravitreal 0.3 µg/ml HC-HA/PTX3 (1.93, SD: 1.16, p = 0.062) and was not significantly different compared to mice treated with intravitreal 0.15 µg/ml HC-HA/PTX3 (2.93, SD: 1.44, p = 0.803). There was no difference in a or b wave ERG amplitudes after 4 weeks in mice treated with intravitreal PBS or 0.6 µg/ml HC-HA/PTX3.
**Conclusions:** Intravitreal HC-HA/PTX3 (0.6 µg/ml) inhibits PVR in a pre-clinical mouse model without any deleterious effects on ERG amplitude measurement.

**Layman Abstract (optional):** This study demonstrates that a soluble matrix component of amniotic membrane (HC-HA/PTX3) is able to decrease the development of proliferative vitreoretinopathy (PVR) and does not cause toxitcity to the retina in mice. PVR is a scarring process that is the most common cause of retinal detachment surgery failure and has no approved treatments. This study provides evidence that HC-HA/PTX3 is a potential novel treatment for PVR that warrants from early human testing.

**Retinal Displacement Following Incisional Rhegmatogenous Retinal Detachment Repair**
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**Purpose:** To report the incidence of post-operative retinal displacement detected on fundus autofluorescence (FAF) imaging following rhegmatogenous retinal detachment (RRD) repair with pars plana vitrectomy (PPV), scleral buckle (SB), or PPV/SB.
**Methods:** Single-center, prospective consecutive series conducted at Wills Eye Hospital (Philadelphia, PA, USA). Optos (Dunfermline, UK), FAF images were performed in eyes post RRD repair between April and December 2020. Images were assessed by two independent graders, masked to surgical technique. Retinal displacement was identified by imprinted retinal vessels on FAF images.
**Results:** Ninety-four eyes of 88 patients (73% male, mean age 62(±13) years) were included. Nineteen eyes (21%) had a macula-on RRD, 75 (79%) had a macula off RRD. Thirty-two eyes (34%) had proliferative vitreoretinopathy (PVR). Forty-four (46.8%) eyes underwent PPV alone, 9 (9.6%) underwent SB alone, and 41 (43.6%) underwent combined PPV/SB. The mean time from surgical procedure to FAF imaging was 112 days. A total of 9 eyes (9.6%) had retinal vessel imprinting on FAF consistent with retinal displacement. The mean (±SD) displacement was 0.18 mm (± 0.11; range 0.09-0.4 mm). 5 of 44 (11.3%) PPV patients and 4 of 41 (9.8%) of PPV/SB patients had displacement. No displacement was found in the SB only patients. There was no statistically significant difference in the proportion of eyes with displacement between the three surgical groups (p=0.88). All observed displacement involved the inferior vasculature. Two cases of displacement were found in patients with PVR (n=32, 9.1%), and 7 were found in patients without PVR (n=62, 11.3%; p=0.71). Mean (±SD) preoperative logMAR visual acuity was 1.46 (±0.96; Snellen equivalent 20/570) and mean (±SD) postoperative logMAR visual acuity was 0.55 (±0.37; Snellen equivalent 20/70, p<0.001). Among patients with macula-off RRD,

the mean (±SD) postoperative logMAR visual acuity in the group without displacement (0.51 ± 0.34, Snellen equivalent 20/64) was significantly better than those with displacement (0.8 ± 0.37; Snellen equivalent 20/126, p= 0.035).
**Conclusions:** Retinal displacement after incisional retinal detachment repair occurs in approximately 10% of cases. PPV and PPV/SB showed a similar percentage of displacement. In eyes with macula-off detachments, those with displacement had worse postoperative visual outcomes compared to those without detectable displacement.

**Likelihood of Germline Mutation with Solitary Retinoblastoma Based on Tumor Location at Presentation**
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**Purpose:** To evaluate the likelihood of germline mutation in patients presenting with solitary retinoblastoma, based on tumor location at presentation.
**Methods:** Retrospective analysis of 482 consecutive patients with solitary, unilateral, unifocal retinoblastoma for likelihood of germline mutation (family history of retinoblastoma and/or genetic testing germline Rb1 mutation present and/or development of additional new tumors) based on overall tumor location at presentation (macular vs. extramacular).
**Results:** Of the overall group (n=482 consecutive patients) with solitary retinoblastoma, macular tumors at presentation were more likely to have a smaller basal diameter (12.5 mm vs. 18.9 mm, $p<0.001$) and thinner (6.1 mm vs. 10.7 mm, $p<0.001$) than extramacular tumors. Patients with tumors located in the macula were more likely to have a family history of retinoblastoma (13% vs. 2%, OR=4.89 [1.85–12.97], $p<0.001$) and to develop new tumors (10% vs. 4%, OR=3.17 [1.27–7.93], $p=0.014$) compared to patients with tumor located outside the macula at presentation. There was no statistically significant difference in genetic testing for Rb1 mutation (25% vs. 16%, $p=0.078$) or likelihood of germline mutation (23% vs. 14%, $p=0.066$).
**Conclusions:** Patients with solitary unilateral macular retinoblastoma are more likely to express phenotypic outcomes of germline retinoblastoma, such as development of new tumors and family history of retinoblastoma, while trending toward increased risk of possessing germline Rb1 mutation.

**Evaluation of geographic atrophy secondary to age-related macular degeneration in clinical practice: *analysis of the American Academy of Ophthalmology IRIS® Registry***

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**Purpose:** To study patients with geographic atrophy (GA) across clinical practices in the United States and evaluate clinical characteristics and disease progression in patients with GA.

**Methods:** Retrospective analysis was conducted of patients with ICD-10 codes for GA (extrafoveal or foveal) in ≥1 eye from 2016 to 2017 with ≥2 years follow-up. Neovascular AMD in the study eye before GA diagnosis was exclusionary. Presenting clinical characteristics, visual acuity (VA) change, and disease progression through 24 months were analyzed.

**Results:** A total of 256,635 patients were identified, of which 69,441 were eligible for inclusion. Of these, 44,120 (64%) had bilateral GA (GA:GA) and 25,321 (36%) had CNV in the fellow eye (GA:nAMD). Cohorts were balanced for age, gender, and race. In the GA:GA cohort, study eyes with extrafoveal GA had better VA at index (mean 67 letters) compared to those with foveal GA (mean 59 letters). However, over 2 years, changes in VA were similar for both the extrafoveal and foveal lesion groups with a difference of -6.8 and -6.6 mean letters, respectively. Also in this cohort, 16.7% of study eyes progressed from extrafoveal to foveal GA over a median time of 66 weeks; 11.4% of the extrafoveal study eyes and 10.2% of foveal study eyes progressed to nAMD over a median time of 74 and 66 weeks, respectively. In the GA:nAMD cohort, changes in VA values at index and after 2 years were similar to those seen in the GA:GA group. However, patients with fellow-eye nAMD progressed more often to study eye nAMD in both the extrafoveal (29.3%) and foveal (26.0%) lesion categories, over a median time of 63 and 60 weeks, respectively. Additionally, 12.5% of study eyes in the GA:nAMD cohort progressed from extrafoveal to foveal GA over a median of 61 weeks.

**Conclusions:** This analysis confirms that GA is a prevalent and progressive disease with deteriorating impact on vision.

**Hemorrhagic Complications Following Trabecular Bypass Microstent Surgery in the Setting of Antithrombotic Therapy**

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**Purpose:** To compare the incidence of postoperative hemorrhagic complications in patients on antithrombotic therapy (ATT), including antiplatelet (AP) or anticoagulant (AC) therapy, and controls following combined trabecular stent implantation and phacoemulsification.

**Methods:** This single center, retrospective, case-control study included patients on chronic ATT who underwent iStent/iStent inject (Glaukos Corp., Laguna Hills, CA) or Hydrus (Ivantis Inc., Irvine, CA) with phacoemulsification between 2013-2019 and had ≥3-month follow-up. The primary outcome measure was hemorrhagic complications within the 3-month postoperative period. Changes were not made to ATT therapy during this time. Secondary measures included visual acuity (VA), intraocular pressure (IOP), and number of glaucoma medications.

**Results:** Of 333 patients (435 eyes), 161 patients (211 eyes) were on ATT, and 172 patients (224 eyes) were controls. Baseline characteristics including age, sex, VA, IOP, cup-to-disc ratio, and number of glaucoma medications were similar between groups. Hyphema, the only hemorrhagic complication, was seen in 94 eyes (21.6%). Hyphema incidence differed by stent type (21.8% in iStent, 11.8% in iStent inject, and 42.4% in Hydrus (P=0.002)).

Incidence and duration of hyphema did not vary between ATT and control groups (P=0.827) (Figure 1). Of 35 ATT eyes with hyphema, 7 eyes (20.0%) were on AC therapy, 29 eyes (82.9%) were on AP therapy, and 1 eye was on combined therapy. Of the 102 patients who had two eyes included, hyphema was present in both eyes in 18 patients (17.6%). Hyphema was associated with an IOP increase of ≥10mmHg from baseline in 22 ATT eyes (10.4%) and 25 control eyes (11.2%) (P=0.878). Reoperations were not required for hyphema or associated IOP spike. At month 3, VA improvement, reduction of IOP, and number of glaucoma medications were similar between the ATT and control groups (P<0.001 for all).

**Conclusions:** Hyphema was present in 21.6% of eyes, and was most common following Hydrus microstent and least common following iStent inject. ATT was not identified as a risk factor for the presence or prolonged duration of hyphema. Although hyphema was associated with an IOP increase of ≥10mmHg from baseline in approximately one-tenth of eyes, reoperations were not required for this indication, and nearly all hyphemas resolved by postoperative month 1.

**Evaluation of the Hypertensive Phase after Ahmed Glaucoma Valve Implantation in Neovascular Glaucoma**

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Purpose: To evaluate the short- and intermediate-term outcomes of the Ahmed glaucoma valve (AGV) in neovascular glaucoma (NVG), comparing eyes with and without a hypertensive phase (HP).

Methods: This was a single-center retrospective case series of consecutive NVG eyes that underwent AGV implantation with ≥ 6-month follow-up. HP was defined as intraocular pressure (IOP) >21mmHg at ≥ 2 visits within the first 3 months following surgery. Reported outcomes included failure at month 6 and at the most recent visit. Failure was defined as IOP >21mmHg, progression to no light perception (NLP) vision, or glaucoma reoperations (all with IOP-lowering medications). Other secondary outcomes included IOP and number of glaucoma medications.

Results: 76 eyes of 74 patients (37 without HP and 39 with HP) with follow-up duration of 28.9±25.7 months (P=0.602) were included. Patient demographics, visual acuity (VA), number of medications, NVG etiology, and perioperative retina treatment were similar in both groups. Baseline IOP was higher in the HP group (P=0.001). At month 6, 13 HP (33.3%) eyes vs. 3 non-HP (8.1%) eyes met the failure criteria (P=0.01). However, at the most recent visit, failure was higher in the HP group; the difference did not reach statistical significance (53.8% vs 35.1%; P=0.113). Kaplan-Meier analysis showed similar cumulative failure in both groups (P=0.180) (Figure 1). Reasons for failure were similar between groups (P=0.237): high IOP in 9 (26.5%) eyes, progression to NLP in 10 (29.4%) eyes, glaucoma reoperation in 14 (41.2%) eyes, and tube removal in 1 (2.9%) eye.
With the exception of post-operative day 1, IOP during the first 6 postoperative months was significantly higher in the HP group (P<0.05 for all). At the most recent visit, IOP was similar in both groups (P=0.211) (Figure 2A), but number of medications was higher in the HP group (P=0.023) (Figure 2B). Postoperative complications were similar and infrequent in both groups.

Conclusions: HP eyes had higher preoperative IOP and more commonly failed in the first 6 months following AGV implantation in NVG compared to non-HP eyes. This study did not detect a significant difference in surgical failure at the most recent visit between the two groups, but HP eyes required a significantly higher number of medications.

**Sociodemographic and Economic Factors in Outcomes of Tube Shunts for Neovascular Glaucoma**

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**Purpose:** To determine the potential impact of sociodemographic and economic factors on the neovascular glaucoma (NVG) tube shunt surgery outcomes

**Methods:** This retrospective, single center, comparative case series included consecutive patients who underwent tube shunt surgery for NVG and had ≥ 6 months of follow-up. Regional average adjusted gross income (AGI) was determined by cross-referencing self-reported residential zip codes with average AGI per zip code supplied by the Internal Revenue Service. Two groups were created: 1) lower income - individuals from neighborhoods with the lowest 10% of AGI (near the United States poverty line), 2) higher income – the remaining 90% of individuals. Main outcome measures were visual acuity (VA), intraocular pressure (IOP), and glaucoma medication number at 6 months and the most recent visit.

**Results:** Mean annual AGI in the higher income group (130 patients) was $69,596 ±39,700 and the lower income group (16 patients) was $27,487 ±1,600 (P < 0.001). Age, sex, distance to the clinic, language, and all baseline clinical variables (including VA and IOP) were comparable between groups. Lower income was associated with non-white race (81.3% vs. 52.3%; P = 0.024). At month 6, VA in the lower income group (median: HM, range: 20/70 – NLP) was worse than the higher income group (median: CF, range: 20/25 – NLP) (logMAR VA : 2.32 ± 0.8 vs. 1.77 ± 1.1; P = 0.02); these trends persisted through the most recent visit (P = 0.043) (Figure 1). Follow-up IOP and medications were similar between groups.

**Conclusions:** Our study analyzed a possible relationship between income and outcomes after surgery for NVG and found that despite similar preoperative characteristics in the two groups, those with lower income had significantly worse VA at postoperative month 6 and at their most recent visit. Furthermore, the lower income group had a higher proportion of non-white race, which may have affected surgical outcomes. Additional study on this potential association is warranted and may help guide clinicians in counseling patients and provide further insight regarding reasons for worse visual outcomes in the most vulnerable populations.

**Retrospective, multicenter, 12-month evaluation of ab-externo XEN Gel Stent placement: real-world data from the EXPAND Study Group**

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**Purpose:** The XEN gel stent was approved for ab-interno implantation and has been used for >10 years. Recently, surgeons worldwide have developed and adapted a novel approach, implanting the gel stent ab externo. This is the first evaluation of real-world data of the gel stent when placed ab externo.

**Methods:** In this multicenter, retrospective, chart review, consecutive ≥18-year old patients with elevated intraocular pressure (IOP) requiring surgical intervention were included. Patients underwent ab-externo placement of gel stent alone or combined with phacoemulsification, with or without opening of the conjunctiva, ≥12 months before study inclusion. Mean IOP and number of topical IOP-lowering medications at baseline and 12 months were recorded, as well as ocular adverse events (AEs). Available preoperative, operative, and postoperative data were collected.

**Results:** The analysis included 472 eyes from 412 patients; 382 (80.9%) eyes received the gel stent alone. Mean age was 75.1 years (range, 21-98) and 54.7% of patients were female. Month-12 data was available for 193 eyes. Mean (standard deviation [SD]) IOP decreased from a medicated baseline of 20.8 (7.6) mmHg to 14.9 (5.1) mmHg at 12 months, a mean reduction of ~6 mmHg (~28%). 181 (93.8%) eyes required topical IOP-lowering medications at baseline vs 110 (57.0%) at 12 months, including 11 and 3 patients who also required oral therapy, respectively. The most frequent AEs were transient, self-resolving hypotony (<6 mmHg – n=66, 22.8%), uncontrolled IOP requiring secondary surgical intervention (n=39, 13.5%), bleb leak (n=37, 12.8%), implant exposure/extrusion/conjunctival erosion (n=20, 6.9%) and choroidal effusion/hemorrhage/mixed effusion hemorrhage (n=24, 5.9%).

**Conclusions:** When placed via the novel ab-externo technique, the gel stent effectively lowered IOP and the IOP-lowering medication count, with a predictable and acceptable safety profile.

**Gonioscopy-assisted transluminal trabeculotomy for the treatment of glaucoma in uveitic eyes**

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**Purpose:** To evaluate the outcomes of gonioscopy-assisted transluminal trabeculotomy (GATT) for the management of open-angle glaucoma in the setting of uveitis.

**Methods:** A retrospective chart review was performed of patients diagnosed with uveitis who underwent GATT between January 1st, 2014 and December 31st, 2019 due to medication-refractory open-angle glaucoma in the setting of uveitis. The primary outcomes analyzed included success rate, defined as IOP reduction >20% from baseline or IOP between 5-21mmHg at the 3-month visits; on a stable number or fewer IOP lowering agents, and no need for additional glaucoma surgery. Additional endpoints include IOP, number of glaucoma medications, and steroid regimen.

**Results:** 16 eyes from 13 patients were included in the study. The average age was 45.3±12.7 years (56% female). Average follow-up period was 29.5±14.7 months (range of 7.2-48.9 months). The predominant cause of glaucoma was inflammatory in 56%, steroid-induced in 19% and a mixture of both in 25%. At 12 months, the cumulative success rate was 81%. The 19% of eyes that failed required reoperation due to IOP spikes >25 mmHg. Mean IOP was 37.8±13.0 mmHg at baseline and 12.2±3.0 mmHg at 12 months (68% reduction; *p<0.0001*). The average number of glaucoma medications was 4.6±1.3 at baseline and 2.2±0.7 at 12 months (52% reduction; *p<0.0001*). At the 12-month visit when compared to the baseline, not only were a greater number of patients on both oral and topical steroid regimens, the mean dose was higher. Transient hyphema was the most common post-operative complication seen in 44% of eyes at 1 week, but all cases self-resolved by 1 month.

**Conclusions:** This small retrospective study shows that GATT is successful, effective and safe for the management of glaucoma in uveitic adult eyes. As a conjunctival-sparing, minimally-invasive procedure, GATT is promising as an initial treatment for refractory glaucoma in uveitis.

**The Effect of Phacoemulsification on the Functioning Tube Shunts in Open Angle Glaucoma**

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**Purpose:** To evaluate intraocular pressure (IOP) following phacoemulsification in eyes with prior tube shunts.
**Methods:** Retrospective chart review of consecutive open angle glaucoma patients with a prior tube shunt and IOP ≤ 21 mmHg, who underwent phacoemulsification and had ≥24 months of follow-up following cataract surgery. The main outcome measure was cumulative surgical failure at post-operative month 24, which was defined as IOP >21 mmHg, progression to no light perception (NLP) vision, glaucoma reoperation, or removal of the implant. Additional analysis of surgical failure defined as IOP >18 and >15 mmHg (for eyes with baseline IOP below these cutoff points) was performed. Changes in visual acuity (VA), IOP, and medications number were also assessed.
**Results:** 27 eyes of 27 patients with mean age of 64.2±10.8 years and 2-year follow-up duration were included. The average interval between the tube shunt and cataract surgeries was 28.8±25.0 months. All patients had moderate to severe glaucoma. At month 24, 4 (14.8%) eyes met the failure criteria, and mean time to failure was 19.3±3.8 months. Reasons for failure were high IOP in 2 (50.0%) and glaucoma reoperation in 2 (50.0%) eyes. No eyes progressed to NLP vision. Additional analyses of surgical failure defined as IOP >18 and >15 mmHg showed increasing failure rate (18.5% and 48.5%, respectively). Kaplan-Meier survival analysis showing the cumulative rate of surgical failure at 24 months using the main and alternate failure criteria is displayed in *Figure 1*. The mean IOP and number of glaucoma medications remained stable at month 24 compared to baseline (P=0.131 and P=0.302, respectively). VA showed initial improvement at month 6 (P=0.001), but at month 24 this improvement was not significant (P=0.430).
**Conclusions:** IOP remained controlled in most eyes with prior tube shunt surgery 2 years following phacoemulsification.

**Geographic access disparities to clinical trials in retinopathy of prematurity in the United States**

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**Purpose:** To identify geographic and socioeconomic variables predictive of residential proximity to retinopathy of prematurity (ROP) clinical trial locations.

**Methods:** This was a cross-sectional, retrospective study. Deidentified census-tract level data from public datasets and trial-level data from ClinicalTrials.gov were analyzed. We used an origin-destination cost-matrix to calculate the driving distance and travel time from the population-weighted United States (US) census tract centroid to the nearest clinical trial site. We then used data from the U.S. Census Bureau's American Community Survey and the Centers for Disease Control and Prevention to identify census-tract level socioeconomic factors predictive of driving distance and time. The primary outcomes were time traveled >60 minutes and distance traveled >60 miles from population-weighted census tract centroid to the nearest ROP clinical trial site.

**Results:** In a multivariable model, driving time >60 minutes had a significant association with rural vs. urban location [1.19 (1.17-1.22), adjusted odds ratio (aOR) (95% confidence interval), p<0.0001], percentage of population <200% of federal poverty level (FPL) compared to the first quartile [second quartile 1.04 (1.03-1.05), third quartile 1.07 (1.06-1.08), fourth quartile 1.17 (1.16-1.19), p<0.0001], and South [1.06 (1.05-1.07)] and West [1.24 (1.22-1.26), p<0.0001] region as compared to Northeast. Driving time was inversely associated with county-level number of births < 1500g per 1000 people 0.98 (0.98-0.98), p<0.0001. Similar predictors were found in distanced traveled >60 miles.

**Conclusions:** Conclusions: There are geographic maldistributions of clinical trial sites for ROP in the United States. Those with higher travel burden are more likely to reside in a census tract that is rural, low-income, and from areas outside the Northeast. Conversely, patients from counties with higher rates of very-low birth weight infants are less likely to live further from clinical trial sites.

**Good Visual Acuity Outcomes Following Retinectomy During Repair of Retinal Detachment with Proliferative Vitreoretinopathy**

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**Purpose:** To investigate pre- and intra-operative metrics associated with good visual acuity (VA) following retinal detachment (RD) repair for proliferative vitreoretinopathy (PVR) that included relaxing retinectomy at time of surgery.

**Methods:** This was a single-institution, retrospective study evaluating all patients (pts) undergoing retinectomy during repair of RD with PVR from 1/1/2015-12/31/2019 with a final VA of 20/70 or better.

**Results:** Of 3,789 pts undergoing RD surgery during the study period, only 57 underwent retinectomy at time of RD surgery and had a final VA of 20/70 or better. 16 pts were female (28%) and the mean age was 61.8 ± 10.5 years. The mean time from diagnosis to initial surgery was 2.1 ± 1.1 days. The mean initial RD size was 160 ± 60 degrees. 22 eyes (39%) were macula on at time of initial diagnosis. Only 7 eyes' (12%) macula never detached during the study period. The mean pre- and post-operative logMAR VA was 0.93 ± 0.85 and 0.33 ± 0.16 respectively. The mean number of surgeries was 2.4 ± 0.9. The average retinectomy size was 151 ± 12.1 degrees. 14 eyes (25%) had a scleral buckle (SB) placed at initial surgery (Table 1). There was no difference in mean number of surgeries in eyes with a SB placed at initial surgery compared to those that did not (2.1 ± 0.6 vs 2.4 ± 1.0, p = 0.28), or in mean final VA (0.28 ± 0.16 vs 0.34 ± 0.17, p = 0.20). 16 eyes (28%) had primary PVR, of which 7 eyes (44%) had primary retinectomy (Table 2). Significantly fewer surgeries were required in these 7 eyes compared to the 9 eyes not undergoing primary retinectomy for initial RD with baseline PVR (1 ± 0.0 vs 2.3 ± 0.7, p = 0.0002), but no difference in final VA was seen (0.33 ± 0.16 vs 0.39 ± 0.11, p = 0.52). The mean time from recurrent RD diagnosis to surgery was 2.5 ±1.2 days, with no difference in time to surgery for recurrent RDs in eyes with macula on versus off RDs (3.1 ± 2.4 vs 2.3 ± 1.4 days, p=0.12, Table 2). 2 eyes (3.5%) had silicone oil tamponade at the final visit.

**Conclusions:** Eyes undergoing primary or secondary retinectomy during repair of RD with PVR can still achieve good VA. Macula status and time to surgery may be important factors in determining visual outcomes.

**Descriptive Analysis of Cornea Fellowship Program Directors in 2020**

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**Purpose:** To assess demographic qualities, institutional backgrounds, and academic achievements of program directors in Cornea and External Disease, Refractive Surgery, and Anterior Segment fellowships.
**Methods:** Program directors of Cornea and External Disease, Refractive Surgery, and Anterior Segment fellowships were identified on the San Francisco Match website. Demographic characteristics, educational and training background, and academic productivity were analyzed using the director's institutional profile, PubMed, and Scopus database. Board certification was confirmed using the American Board of Ophthalmology website. Membership in journal editorial board, Cornea Society board, or Heed fellowship was based on the respective websites. Other fellowship qualities reviewed included academic or private practice type, number of cornea faculty, and sex of chairperson.
**Results:** We reviewed 47 Cornea and External Disease, 29 Refractive Surgery, and 10 Anterior Segment fellowships. Of reviewed programs, 64.0% were considered academic, 34.9% were private practice, and 1.2% were both. Overall, 23.9% of program directors were women and the mean age was 52.6±2.5 years old. More female program directors were in departments with a female chairperson compared to male program directors (6±28.6% vs. 4±6.0%, p=0.011). Of program directors, 20.5% were Heed Fellows, and the average number of publications was 44.6±11.8. Mean H-index was 16.5±3.3 and was higher in Cornea, External Disease, and Refractive Surgery than Anterior Segment fellowships (18.2±15.5 vs. 7.1±11.4, p=0.008). Mean H-index was higher in academic than private practice fellowships (19.9±15.1 vs. 11.2±14.7, p=0.011). Of all program directors, 1.1% were Instructors, 14.8% were Assistant Professors, 25.0% were Associate Professors, 34.1% were Full Professors, 18.2% were Endowed Chairs, 12.5% were on the Editorial Boards of the 3 highest impact journals in ophthalmology and cornea, and 6.8% were Cornea Society Board Members.
**Conclusions:** The majority of fellowships are academic programs led by program directors with a high number of publications, H-index, and level of professorship. Cornea and External Disease and Refractive Surgery fellowship directors had a higher academic productivity than those in Anterior Segment programs. Female program directors remain the minority and are more common in departments with female chairpersons, demonstrating an opportunity for further representation.

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**Feasibility of Ophthalmic telemedicine Consultation in Urgent Settings (FOCUS)**

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Purpose: Ophthalmologist are not always available for on-site consultation in emergency departments. We performed a prospective, double-masked pilot study to determine the feasibility for an ophthalmologist to provide triage consultation virtually.

Methods: This study used a convenience sample of adult patients from an eye emergency department. Ophthalmic telemedicine consultation was provided by an ophthalmology attending physician (OAP) using a synchronous telehealth interface and in-person consultation was provided by second OAP. The remainder of the visit followed usual care. The primary outcomes were feasibility and urgency of recommended in-person ophthalmic examination. Feasibility was measured as the ability to enroll patients and transmit the necessary audiovisual information. Urgency of recommended full ophthalmic examination was collected from both the in-person and virtual ophthalmic triage providers. The secondary outcome was time to perform ophthalmic consultation. An exploratory outcome was concordance of triage-based diagnoses between the in-person and telehealth OAPs. Descriptive statistics were used for evaluation.

Results: This pilot study enrolled 31 of 33 (93.9%) patients. The majority (74.2%) were female and the median age was 57 years (range 24-86; mean 54.2). The majority of patients identified as African American (48.4%) followed by Caucasian (45.2%). There were no dropped calls or audiovisual problems reported with the telemedicine interface. The recommended urgency of in-person full examination between the in-person and telemedicine consultation was concordant 90.3% of the time. The duration range of the consultation was 1.5-6 minutes via telemedicine and 2-7 minutes in person with a mean of 2.5 and 2.7 minutes, respectively. The exploratory outcome of diagnostic concordance was 93.5%.

Conclusions :Telemedicine emergency ophthalmic consultation appear to be feasible, with good patient acceptance and ability to obtain necessary audio and visual data. The duration of the visits was similar for in person and telemedicine consultations, supporting the potential feasibility. The diagnostic concordance was high between both the telemedicine and in person ophthalmic consultation compared to the full ophthalmic evaluation. More data on this approach in general emergency room settings would be useful to aid in expediting urgent ophthalmic care and make ophthalmic consultation more widely available.

**Graft Survival after Penetrating Keratoplasty in Patients with History of Incisional Glaucoma Surgery**

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**Purpose:** Prior incisional glaucoma surgery is a known risk factor for graft failure and decreased visual function after penetrating keratoplasty (PK). However, little is known about the risk factors regarding specific types of glaucoma surgery and role of intraocular pressure (IOP)-lowering medications on graft outcomes. We aimed to determine an association between PK outcomes and glaucoma surgical and medical interventions.
**Methods:** In this retrospective cohort study, electronic medical records at Wills Eye Hospital were queried for PKs performed between May 1, 2007 and September 1, 2018 in patients with glaucoma incisional surgery prior to PK. We obtained details of the type of glaucoma surgeries, topical and systemic treatments, and IOP before and after PK. The main outcome measures included graft failure and rejection.
**Results:** We identified 148 PKs of 148 eyes (148 patients) who had glaucoma surgery prior to PK. IOP-lowering medications established by 3 months after PK and type of glaucoma surgery are shown in Table 1. The mean baseline IOP and maximum postoperative IOP for this population were 15.5 (SD=5.3) and 25.9 (SD=8.4) mmHg, respectively. Graft rejection was associated with maximum postoperative IOP (p=0.011) and IOP difference (p=0.015), defined as the difference between baseline IOP and maximum postoperative IOP. Graft failure was associated with higher maximum postoperative IOP (p<0.001), higher baseline IOP (p=0.041), IOP difference (p=0.017), and younger age (p=0.006). We did not detect a significant association between prior tube shunt surgery and graft rejection, but this relationship approached statistical significance (p=0.093). Other relationships that approached statistical significance include graft failure and use of topical carbonic anhydrase inhibitors (CAIs) (p=0.070) and the use of systemic CAIs among patients with tube shunts in the anterior chamber (p=0.052).
**Conclusions:** In patients with a history of glaucoma surgery prior to PK, increased IOP both before and after PK is associated with worse graft outcomes. Future studies are needed to determine a possible relationship between graft failure and postoperative use of CAIs or prior tube shunt placement. Our results suggest that medical and surgical risk factors should be considered when optimizing PK outcomes in patients with prior glaucoma surgery.

**Outcomes In Eyes Lost to Follow-up After Treatment with Steroid Injections for Retinal Pathology**

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**Purpose:** To evaluate the effect of loss to follow-up (LTFU) on eyes treated with intraocular and periocular steroid injections.
**Methods:** Patients receiving intraocular or periocular steroid injections for retinal diseases and who were subsequently LTFU for at least 180 days after injection were included. Charts were reviewed for visual acuity (VA), intraocular pressure (IOP), and central foveal thickness (CFT) at the treatment visit before LTFU, the first return visit, and visits 3, 6, and 12 months later.
**Results:** Fifty-three eyes of 47 patients were identified. Mean age was 62.3 years, mean LTFU duration was 295 days, and mean follow-up period after returning was 392 days. Indications for steroid injections were: uveitis-associated cystoid macular edema (CME) 23/53 (43.5%) , diabetic macular edema (DME) 13/53 (24.5%), post-surgical CME 13/53 (24.5%), and retinal vein occlusion (RVO) 4/53 (7.5%). The injection preceding LTFU was peri-ocular triamcinolone in 31/53 (58%) eyes and intravitreal steroid in 22 of 53 eyes (42%) (dexamethasone intravitreal implant in 15/53 (28%) and triamcinolone in 7/53 (14%)). Compared to mean VA prior to LTFU [0.59, Snellen ~20/77], the mean VA was not significantly different at each time point after return (first return visit [0.62, Snellen ~20/83, p=0.6], month 3 [0.55, Snellen ~20/70, p=0.6], month 6 [0.55, Snellen ~20/70, p=0.5], month 12 [0.64, Snellen ~20/87, p=0.6].
Overall, at all return visits, there was a slight increase in IOP. At the first return visit, 8/53 (15%) had IOP ≥ 21 mmHg (range= 8-31) but only 2 patients required treatment with a single new anti-hypertensive medication. No patient required glaucoma surgery. The DME group showed greater mean IOP at first return visit [17.45 mmHg, p=0.04] and at 12 month after return [20.25 (5.2), p=0.02] compared to before LTFU (13.76 mmHg). CFT increased after return visit (392 mm) compared to prior to LTFU (369 mm, p=0.35). The mean CFT declined significantly by month 6 [294 mm, p=0.005] and month 12 [269 mm, p<0.001].
**Conclusions:** Eyes LTFU after receiving steroid injections did not experience signfiicant morbidity. Mean VA, IOP, and CFT were not significantly worse immediately after LTFU and 12 months later, though patients with DME did experience a more significant increase in IOP.

**Synchronous Audio-Visual Telemedicine at Wills Eye Hospital During Covid-19**
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**Purpose:** To describe the use of synchronous audio-visual telemedicine at Wills Eye Hospital (WEH) during the COVID-19 pandemic.
**Methods:** A retrospective chart review was performed on visits coded as synchronous, audio-visual telemedicine, covering March 15th to May 15th, 2020. Telemedicine software reported the length of synchronous

patient and physician time in the visit. Patient satisfaction surveys were completed at the conclusion of each visit. Results are analyzed with descriptive statistics.
**Results:** During the study period, WEH performed synchronous, audio-visual telemedicine for 495 patients. Patients averaged 51 years of age, with a range from 1 to 98 years. 61% of patients were female and 44% identified as white. The Primary Eyecare Service performed the plurality of evaluations (40%), with the remainder performed by the departments of Ocular Oncology (20%), Cornea (12%), Neuro-Ophthalmology (11%), Oculoplastics (6%), Pediatric Ophthalmology (6%), Glaucoma (5%), and Retina (1%). The most common diagnosis categories were blepharitis or dry eye (10%); stye, chalazion or other eyelid pathology (8%); glaucoma (6%); anterior uveitis (4%); choroidal melanoma (4%); corneal abrasion (3%); allergic conjunctivitis (3%); herpetic dermatitis (3%); viral conjunctivitis (2%); and strabismus (2%). Median synchronous patient-physician time in the visit was 9 minutes. Patients, on average, answered 9.2 out of 10 as their likelihood of recommending the service to a friend.
**Conclusions:** During the initial phase of the COVID-19 pandemic, WEH employed synchronous audio-visual telemedicine across a wide range of clinical indications with acceptable operational efficiency and high patient satisfaction.