Purpose: To analyze trends in the surgical management of glaucoma in Ontario over the last two decades and compare these to published trends elsewhere.

Methods: Ontario Health Insurance Plan billing service claims between 1992 and 2012 were analyzed for the yearly number of glaucoma laser and incisional surgical procedures. Data for combined procedures was only available from 2000. The yearly number of Ontarians with primary open-angle glaucoma (POAG) was estimated by applying composite prevalence curves to published population data and the yearly number of procedures per 1000 Ontarians with POAG was calculated.

Results: Per 1000 people with POAG, laser trabeculoplasty rates (LT) increased nearly 2 fold (185%) from 138 in 1992 to 255 in 2012, with the rates stabilizing between 2008-2012. LT rates increased 8% from 1992-1996, decreased 52% from 1996-2001, and increased 288% from 2001-2008. Total glaucoma filtration procedure (GFP) rates (trabeculotomy, glaucoma drainage device (GDD) and combined GFP and cataract extraction) per 1000 people with POAG in 2012 were similar to those in 1992 (33.5 vs 34.6, respectively), with a peak rate in 1996. GFP rates increased 37.7% from 1992-1996, decreased 32% from 1996-2010 and increased 10.5% from 2010-12. From 2000-12 the rates of trabeculotomy alone remained unchanged, the number of GDD alone increased over 5 fold, combined trabeculotomy and cataract extraction decreased 81% while combined GDD and cataract extraction increased from 6 in 2000 to 420 in 2012. GDD represented 0.9% of the GFP performed in 1992 increasing to 33% in 2012. Combined GDD and cataract extraction represented 0.4% of combined cataract extractions in 2000 and 26.3% in 2012.

Conclusions: Over the past two decades there was an overall increase in the rate of LT; no change in the rate of trabeculectomies and an increase in GDD which in 2012 accounted for 1/3rd of GFP. These changes coincide with the introduction of SLT and MIGS. Decreases in the rate of combined cataract trabeculotomy can be attributed to replacement by combined cataract and GDD. In 2012, almost 1 in 5 GFP were repeat surgeries. Comparable rates in GFP over a similar period were also seen in the UK, Australia, and the Netherlands. Only one US study showed comparable rates of LT, but none have shown an unchanged rate from 2009 onwards.

Commercial Relationships: Yvonne M. Buys, None; Andrei-Alexandru Szigiato, None; Graham E. Trope, None; Yaping Jin, None

Program Number: 2660 Poster Board Number: A0228
Presentation Time: 8:30 AM–10:15 AM
Early Reoperation Rate and Outcomes in Resident-Performed Glaucoma Surgery

Yen Hsia, Qi Cui, Jay Stewart, Naseri Ayman, Ying Han.
Ophthalmology, University of California San Francisco, San Francisco, CA.

Purpose: Glaucoma filtering surgeries are part of surgical training in ophthalmology residency. The surgeries are challenging and carry a relatively high risk of vision loss. The aims of this study are to examine the rates and the clinical outcomes of reoperation after resident-performed glaucoma surgeries within the 90 days postoperative period.

Methods: A retrospective cohort analysis of resident-performed glaucoma surgeries (trabeculoplasty with mitomycin C, Ex-Press shunt, and Ahmed valve) at the San Francisco Veterans Affairs Medical Center from the period of 1999 to 2014 was performed. Patients requiring reoperation within 90 days of initial surgery were included in our study. Primary outcomes were reoperation rates between the three surgeries. Statistical difference were analyzed
using the Fisher’s exact test. Preoperative and postoperative ocular data were recorded.

**Results:** A total of 202 resident-performed glaucoma surgeries were completed, with eight reoperations within the 90 days post-operative period, resulting in a 4.0% reoperation rate for all glaucoma surgeries. Reoperation rate for trabeculectomy with MMC was 3.03% (1/33); 3.9% for Ex-PRESS shunt placement (4/102), and 4.5% for Ahmed valve placement (3/67). There was no statistical difference between the reoperation rates (p = 1.0). Four out of eight patients had permanent decrease in vision of greater than 3 lines on Snellen visual acuity after reoperation. Four out of eight patients required the same or greater number of glaucoma medications following reoperation. Two post-Ex-PRESS patients and one post-Ahmed patient required Ahmed valve placements for intraocular pressure control.

**Conclusions:** Third year ophthalmology residents demonstrated reoperation rates comparable to those of experienced glaucoma specialists. Reoperation rates were similar between the trabeculectomy with MMC, Ex-PRESS shunt, and Ahmed valve. Patients who required early reoperation due to post-operative complications were more likely to have poor surgical outcomes with worse final visual acuity, persistently elevated IOP, and a need for additional glaucoma surgery.

**Commercial Relationships:** Yen Hsia, None; Qi Cui, None; Jay Stewart, None; Naseri Ayman, None; Ying Han, None

**Support:** NIH-NEI EY02162

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**Program Number:** 2661 **Poster Board Number:** A0229  
**Presentation Time:** 8:30 AM–10:15 AM  
**The Influence of Diabetes on Glaucoma Surgical Outcomes in the Minority Population**  
Usiwoma Abugo, Leslie S. Jones, John Kwagyan. Ophthalmology, Howard University Hospital, Washington, DC.

**Purpose:** To identify the role diabetes plays in the success of a primary glaucoma surgical intervention and the incidence of surgical complications in a predominately African American metropolitan hospital clinic population.

**Methods:** A retrospective chart review was conducted at Howard University Hospital from 1/1/2004-4/3/2014. Inclusion criteria were age >18, and documented diagnosis of glaucoma or ocular hypertension by optic nerve appearance and visual field loss. Patients <18 or with secondary interventions were excluded. Variables included diabetes and/or hypertension, type of diabetes, HbA1C level, blood sugar, body mass index (BMI), blood pressure pre-op, pre and post-op mean ocular perfusion pressure (MOPP), pre and post-op IOP, and complications. The outcomes were analyzed with SPSS software using various methods with failure of a primary invasive glaucoma intervention being defined as post-op IOP being greater than 17 mmHg at the last documented visit.

**Results:** A total of 93 patients (59 F, 34 M, average age 66.5±12.9) were included. The participants were Black (88%), Hispanic (3%), and Indian (2). The majority of the patients had primary open angle glaucoma (53.8%), neovascular glaucoma (11.9%) and chronic angle closure (9.7%). The interventions were aqueous tube shunt placement (41), combined procedures (27), Trabeculectomy with Mitomycin C (12), Ex-PRESS glaucoma filtration device insertion (12), and Trabectome (1). 49.5% of the patients did not have diabetes vs 50.5% with diabetes. Having a diagnosis of diabetes did not correlate to failure of surgery (p = .871). When comparing diabetics to non diabetics, diabetics had a greater percentage of complications (53.7% vs 46.3%, p = .462). For Trabeculectomies, diabetics had a significantly higher rate of complications (p = .017). The post-operative MOPP approached significance (p = .071). The BMI pre-operatively was statistically significant (p = .004). For the patients with HbA1c data available it was seen that a higher HbA1c was related to more complications (57% vs 42%, p = .857).

**Conclusions:** No significant difference was seen in success rates for diabetics vs non diabetics. Diabetics had a higher rate of complications after glaucoma surgery. Having an elevated BMI in our study significantly increased complications. Our study shows the importance of tight blood sugar control and weight management in the clinical management of any patient undergoing invasive glaucoma surgery.

**Commercial Relationships:** Usiwoma Abugo, None; Leslie S. Jones, Alcon (C); John Kwagyan, None

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**Program Number:** 2662 **Poster Board Number:** A0230  
**Presentation Time:** 8:30 AM–10:15 AM  
**Change in the rate of loss in corneal endothelial cell after Ahmed Glaucoma Valve Implantation**  
Chang-Sik Kim, Min-su Kim, Han-min Lee, Il-hwan Shin, Kyoung Nam Kim. Ophthalmology, Chungnam National University Hospital, Daejeon.

**Purpose:** To evaluate the change in the rate of loss of corneal endothelial cell density (CED) after Ahmed glaucoma valve (AGV) implant surgery in refractory glaucoma patients.

**Methods:** Medical records of refractory glaucoma patients who had undergone AGV (S2 or FP7, New World Medical, Rancho Cucamonga, CA, USA) implantation for treatment of refractory glaucoma were reviewed retrospectively. Patients who have got specular microscopy examination (Noncon Robo SP-8000; Konan Medical Inc, Tokyo, Japan) before surgery and at least 3 times after surgery by interval of 6 or more months were enrolled to the study. CED data at the corneal center before surgery and up to 5 years after surgery were collected. The rate of progressive loss in CED was determined by linear regression and compared with that of the control group. Control was collected from the contralateral eye of the subject, when the eye was diagnosed having glaucoma, receiving anti-glaucoma medication, and no history of previous ocular surgery. The relevant demographic factors were subjected to a correlation analysis to the rate of CED loss.

**Results:** Seventy two eyes of 72 refractory glaucoma patients were enrolled to the subject group, and compared to the 31 control eyes. Overall rate of loss in CED was – 7.0 ± 8.1% in subject group and - 0.1 ± 2.4% per year in the control for 45.3 months and 46.4 months of average follow-up respectively (p<0.001, Mann-Whitney U test). The annual loss rate decreased with time; –10.7% from baseline to 1 year after surgery, –6.9% from 1 year to 2 years, –4.2% from 2 years to 3 years, and –2.7% thereafter (p<0.001, 0.037, 0.230, and 0.111 respectively compared the control group, Mann-Whitney U test). Regression analysis indicated that the presence of an AGV implant (B = –6.895, P < 0.001) was the only independent factor significantly associated with more rapid CED loss, no other clinical factor affected to the rate of CED loss significantly.

**Conclusions:** There was a progressive CED loss for average of 46 month after AGV implantation. But the rate of loss in the CED was decreased with time; it was significantly greater compared to the control during the first and second year after surgery, but was not significantly different from the control group after 2 years from the surgery.

**Commercial Relationships:** Chang-Sik Kim, None; Min-su Kim, None; Han-min Lee, None; Il-hwan Shin, None; Kyoung Nam Kim, None
Toric IOL implantation during phacoemulsification and trabeculectomy combined procedures: One year follow up results.
Gian Franco Diez, Rafael Castañeda-Diez, Jesús Jiménez-Román, Angela María García-Valencia, Carolina Prado, Sandra Karina Silva-Romano, María Luisa Zavala Aznar.

Purpose: To evaluate the keratometric, refractive and visual outcomes in glaucoma patients who underwent phacoemulsification with toric intraocular lens implant and trabeculectomy assisted with femtosecond laser technology.

Methods: A prospective, longitudinal and interventional study design in which seven glaucoma patients, with astigmatism over 1 diopter, candidates for cataract phacoemulsification and trabeculectomy without MMC where operated using femtosecond laser technology (Alcon LenSx) with toric intraocular lens (IOL SN6A T3-T6) implantation by one surgeon (RCD). Toric IOL power was calculated using the online calculator provided by the manufacturer considering the average induced astigmatism of the surgery (-0.43±0.43 D). Follow up visits were appointed at 1, 3, 6 and 12 months after the procedure; keratometric and refractive astigmatism, visual acuity and intraocular pressure were assessed on months 3 and 12.

Results: Seven eyes of seven patients were included (3 male; 4 female) of which 5 patients completed follow up. Mean age was 71.7 (±7.65 DS; range 58-80). Mean uncorrected visual acuity (UCVA) was 0.31 and 0.2 LogMar at 3 and 12 months respectively with statistically significant improvement (p=0.024). Best corrected visual acuity (BCVA) was 0.11 and 0.4 (±0.2 DS) LogMar at 3 and 12 months follow up. The mean keratometric astigmatism was found to be -1.64 at the 3 month interval and -1.95 (±0.97 DS) at 12 months, with a mean axis of 92.86 (±31.1 DS), respectively. Mean refractive astigmatism was 1.11 and -0.85 (±0.85 DS) at 3 and 12 months; with a mean axis of 57.140 at 3 months and 410 (±37.64 DS) a year after the surgery. Mean IOP measurements were 14 mmHg at 3 months the and 10 mmHg one year after the surgery.

Conclusions: There was improvement of visual acuity and lower IOP levels at 3 and 12 months follow up of patients implanted with toric IOL during phacoemulsification and trabeculectomy surgery assisted with femtosecond laser. Four out of the five patients with complete follow-up registered lower refractive astigmatism on the last visit.

Commercial Relationships: Gian Franco Diez, None; Rafael Castañeda-Diez, None; Jesús Jiménez-Román, None; Angela María García-Valencia, None; Carolina Prado, None; Sandra Karina Silva-Romano, None; María Luisa Zavala Aznar, None.
**Purpose:** To evaluate the progression of glaucomatous disc damage in patients who have undergone Boston Keratoprosthesis (KPro) implantation.

**Methods:** A total of 20 eyes of 19 patients who underwent KPro implantation between Feb 2007 and Aug 2012 were included in this retrospective study. Inclusion criteria limited patients to those with ≥1 year of post-operative follow-up and good quality optic disc photos. The following data were collected: demographics, ocular history, presence/absence of glaucoma, baseline intraocular pressure (IOP), best corrected visual acuity (BCVA), and number of glaucoma medications at 1, 3, 6, 9, 12, 18, 24, 36, and 48 months or at last follow-up. Serial optic disc photographs were analyzed and the vertical and horizontal cup-to-disc ratios (C/D) were graded by an independent ophthalmologist. The percentage of patients who demonstrated progression of glaucomatous disc damage (C/D increase of ≥0.1 or ≥0.2) was calculated.

**Results:** The mean follow-up time was 48.4 months. The mean age at the time of KPro implantation was 48.6 years. There were 11 females (55%) and 9 males (45%). The three most common indications for KPro were chemical burn, herpetic keratitis, and aniridia. Glaucoma drainage implants, cyclophotocoagulation, or trabeculotomy were performed in 15/20 (75%); concurrently with KPro (8/20), pre-KPro (4/20), or post-KPro (7/20). Pre-KPro, the mean BCVA, mean IOP, and mean number of glaucoma medications was 2.2 logMar, 20.2 mmHg, and 1.3, respectively. At last follow-up, the mean BCVA, mean IOP, and mean number of glaucoma medications was 0.5 logMar, 18.5 mmHg, and 1.15, respectively. A vertical or horizontal C/D increase of ≥0.1 or ≥0.2 was seen in 5/20 (25%) and 2/20 (10%), respectively. The mean vertical C/D among each patients’ initial disc photographs was 0.51 and the mean vertical C/D among final disc photographs was 0.50.

**Conclusions:** Despite the high incidence of glaucoma in this patient population, close monitoring and aggressive treatment with possible early surgical intervention can be successful in minimizing development or progression of glaucomatous nerve damage.

**Commercial Relationships:** Mohsin H. Ali, None; Ahmad A. Aref, Alcon Laboratories (R), Carl Zeiss Meditec (R), New World Medical, Inc. (C); Anthony Finder, None; Jose de la Cruz, None; Thasarat S. Vajaranant, None; M. S. Cortina, None

**Support:** NIH Core Grant (EY001792) and unrestricted departmental grant from Research to Prevent Blindness
Conjunctival cyst in the setting of Baerveldt glaucoma implant: Clinicopathologic correlation of three cases.


Conde de Valenciana, Mexico City, Mexico; Florida Lions Ocular Pathology Laboratory, Bascom Palmer Eye Institute of the University of Miami Miller School of Medicine, Miami, FL; Ophthalmology, Bascom Palmer Eye Institute, Miami, FL.

**Purpose:** To describe the clinicopathologic features of conjunctival inclusion cysts that may occur in the setting of placement of a Baerveldt glaucoma implant.

**Methods:** In a non-comparative, consecutive case series the surgical specimens, clinical photographs and medical records of patients who were diagnosed with epithelial conjunctival cysts in the setting of glaucoma filtration implant surgery were reviewed. The term conjunctival cyst and glaucoma implant were searched in the case file database of the Florida Lions Ocular Pathology Laboratory from 1998 to 2014. Light microscopic examination of formalin fixed, paraffin embedded and hematoxylin and eosin stained slides was performed. The medical records and digital slit lamp photographs were obtained and reviewed.

**Results:** A total of 3 patients with demonstrated epithelial conjunctival cysts after Baerveldt glaucoma implant were included. Pathologic examination demonstrated cysts lined by goblet cell containing mucosal epithelium. All 3 cysts were located anterior to the implant filtration plate, and in contrast to Tenon’s capsule these cysts were thin walled with scant vascularity. All 3 patients were female, had left eye involvement and the age of onset ranged from 52 to 67 years. The preoperative diagnoses were primary open angle glaucoma, trido-corneal endothelial syndrome and chronic angle closure glaucoma. Clinically, the 3 cases presented with foreign body sensation and ocular irritation. Excision of the inclusion cysts resolved foreign body sensation and did not affect intraocular pressure control. No recurrences have been observed on follow-up.

**Conclusions:** Conjunctival epithelial cysts that develop after glaucoma drainage implant surgery should be differentiated from the thick walled fibrovascular capsule that forms overlying the glaucoma filtration device. If indicated, en-bloc cyst excision may be performed without entering the filtering bleb that is associated with the drainage implant.

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Intravitreal triamcinolone at the time of cataract surgery may be beneficial for glaucoma patients with previous filtration surgery

Gerassimos Lascaratos, Alex Banke, Megan Jeffries, Adanna Obi, Saurabh Goyal, K Sheng Lim. St Thomas’ Hospital, London, United Kingdom.

Purpose: Scarring following small incision cataract surgery (phaco) remains an important cause of bleb failure. This study aims to explore the potential role of intravitreal triamcinolone (IVTA) during phaco in improving filtration surgery outcomes.

Methods: Case-control study of two groups of 8 open angle glaucoma patients each that underwent phaco with IVTA 4mg (IVTA group) or with no additional intervention (control group). The IVTA group comprised of 5 patients with previous tube surgery and 3 with previous trabeculectomy. The latter 3 patients also received subconjunctival SFU 5mg at the time of phaco. The control group comprised of 4 tube and 4 trabeculectomy patients. Complete success [intraocular pressure (IOP) ≤21 without IOP lowering medications], qualified success (IOPs 21 on IOP lowering treatment) and failure (IOP>21 or additional glaucoma surgery or loss of light perception) were documented before and after phaco.

Results: The mean (±SD) age in the control and IVTA groups was 73(±13) and 58(±21), respectively. The mean (±SD) follow-up (in months) in the control and IVTA groups was 18(±11) and 13(±7), respectively. The mean IOP slightly increased over time following phaco in the control group (12.3 at baseline, 14.6 at 3 months and 14.0 at last follow-up), while it showed a trend to improve in the IVTA group (16.8 at baseline, 14.0 at 3 months and 13.3 at last follow-up). The mean number of IOP-lowering medications also tended to increase with time in the control group (0.875 at baseline, 1.0 at 3 months and 1.375 at last follow-up), while it remained stable in the IVTA group (1.5 at baseline, 0.625 at 3 months and 1.25 at last follow-up). One step improvement in the final outcome (from qualified to complete success) was noted in 25% of IVTA patients, but none of the control patients. One step worsening in the final outcome was found in 50% of the control patients, but only in 25% of the IVTA patients. An acute IOP rise was not found in any of the IVTA patients. Serious complications following phaco were not encountered in either group, with the exception of one IVTA patient that developed fulminating CMV retinitis due to local immunosuppression.

Conclusions: These preliminary results suggest that IVTA injection during phaco may be a useful tool in enhancing the success of filtration surgery, although risks of local immunosuppression should be considered.

Commercial Relationships: Gerassimos Lascaratos, None; Alex Banke, None; Megan Jeffries, None; Adanna Obi, None; Saurabh Goyal, None; K Sheng Lim, None

Intravitreal pressure response to intravitreal Triesence injection

Elizabeth A. Atchison, Sophie J. Bakri. Ophthalmology, Mayo Clinic, Rochester, MN.

Purpose: Elevated intravitreal pressure (IOP) is the most frequent adverse event associated with intravitreal triamcinolone acetate (IVTA) injection. The incidence of this has been examined in older, preserved forms of IVTA but to our knowledge the effect of newer, preservative free formulations has not been clinically evaluated. This study is a retrospective, observational clinical study aiming to examine the frequency of IOP related adverse events after intravitreal Triesence injection.

Methods: Patients (pts) who received intravitreal Triesence between March 2008 and April 2014 were included in our IRB-approved study. Patients without at least 1 IOP recorded after injection were excluded. For each patient age, sex and history of ocular hypertension or glaucoma were recorded. For each injection, the pre-injection IOP, maximum IOP (IOP max) within 6 months or until the next injection, dose of injection and indication for injection were collected. Pressure rise was calculated as IOP max minus preinjection pressure. Comparison of means was by Student’s T test.

Results: 14 pts received 72 injections of Triesence in 19 eyes. All injections were done for CME with etiologies of: uveitis (1 pt), branch retinal vein occlusion (1 pt), central retinal vein occlusion (4 pt), and diabetes mellitus (8 pt). 7 pts had a history of glaucoma or OH. For all pts the mean preinjection IOP was 15.4 mmHg and the mean IOP max was 19.8 mmHg. The mean IOP max occurred 63 days after injection. For the 2 mg dose the average IOP max was 20.7 mmHg. For the 4 mg dose the average IOP max was 19.0 mmHg. This difference was not statistically significant (p=0.26).

Table 1 shows the frequency of IOP max and IOP rise of different magnitudes. 1/14 pts required surgery to control IOP. 2/14 pts required medical therapy to control IOP. Specifically, one pt had a long history of glaucoma on maximum medical therapy and needed a tube shunt 5 months after injection. Another had no glaucoma history and required brominomide and then dorzolamide/timolol to control IOP while receiving IVTA. Another with a history of OHT required therapy with dorzolamide/timolol 1 month after injection.

Conclusions: The IOP related adverse events with Triesence are similar in frequency and severity to older, preserved forms for IVTA. In our small study this effect was not dose dependent.

Commercial Relationships: Elizabeth A. Atchison, None; Sophie J. Bakri, Allergan (C), Genetech (C)

Support: Research to Prevent Blindness, unrestricted grant

Intraocular Pressure Changes after Intravitreal Injection in Patients with Glaucoma

Sabin Dang, Sonia Rana, Cajal Patel, Johnstone Kim, Asheesh Tewari. Department of Ophthalmology, Kresge Eye Institute, Wayne State University, Detroit, MI.

Purpose: The use of intravitreal injections to treat retinal disease is increasing. Multiple studies have reported short-term increased intraocular pressure (IOP) elevations after injection. Our group hypothesizes that impaired aqueous outflow in patients with glaucoma predisposes them to an increased post intravitreal injection IOP elevation.

Methods: We performed a retrospective analysis of all patients who received intravitreal ranibizumab injections over a 6-month period. The charts were reviewed and pre-injection as well as 5- and 10- min post injection IOP was recorded. The charts were reviewed to determine if patients had a documented glaucoma diagnosis. Additional clinical variables recorded included: cup-to-disc ratio, phakic status, number of glaucoma medications, and reason for intravitreal injection.

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Results: A total of 42 patients received ranibizumab during the study time period. 10 patients had existing diagnoses of primary open angle glaucoma (POAG). There was no statistical difference between the mean pre-injection IOP for the glaucoma group and the control group (mean 15.81, p = 0.67). Both the glaucoma group and the control group had a statistically significant increase in IOP at the 5- and 10- minute checks relative to pre-injection IOP (p < 0.01 for both groups). There was no significant interaction between subject’s glaucoma status and IOP (p = 0.27).

Conclusions: Our data suggests that there is a trend towards increased IOP in patients with glaucoma relative to those without. However, this effect appears to be of short duration. Given this information, there appears to be little benefit in pre-treatment with IOP lowering medications in patients with known diagnoses of glaucoma who are also receiving intravitreal medications.

Commercial Relationships: Sabin Dang, None; Sonia Rana, None; Cajal Patel, None; Johnstone Kim, None; Asheesh Tewari, None

Program Number: 2673 Poster Board Number: A0241
Presentation Time: 8:30 AM–10:15 AM
Intraocular pressure changes after repeat intravitreal dexamethasone implant injections in retinal vein occlusions, uveitis and diabetic macular edema
Anna Sala-Puigdollers, Javier Zarranz-Ventura, Jessica Matas, Marina Mesquida, Victor Llorens, Blanca Molins, Maria Socorro Alforja, Juan Giralt, Maite Sainz De La Maza, Alfredo Adan Civera.
Hospital Clinica de Barcelona, Barcelona, Spain.

Purpose: To address the effect in intraocular pressure (IOP) of repeat intravitreal dexamethasone implant (IDI, Ozurdex®) injections in retinal vein occlusions (RVO), uveitis (UV) and diabetic macular edema (DME).

Methods: Retrospective, single-center cohort study. 73 eyes of 65 patients treated with ≥ 2 IDI injections for RVO, UV or DME were included. IOP was assessed prior to and 1-2 weeks and 1 month after each IDI injection procedure. Differences in IOP changes, percentage of eyes with IOP change ≥10mmHg and percentage of eyes on hypotensive eyedrops with each injection were addressed. Subgroup analysis was performed for each treatment indication.

Results: IOP spiked at month 1 in all timepoints and subgroups. Mean IOP increase at 1 month was 3.3±5.5 for the first, 2.1±4.4 for the second and 4.1±5.2 mmHg for the third IDI injection, without significant differences between injections (p=0.10, p=0.54). The percentage of eyes with IOP change ≥10mmHg at 1 month timepoint after the first injection was 13.2%, after the second injection was 8.6% and after the third injection was 10.7% respectively, without significant differences among groups (p=0.45). The percentage of eyes on hypotensive drops at baseline was 20% and 1 month after the first injection was 28.7% (p=0.30), after the second injection was 28.5% (p=0.52) and after the third injection was 36.6% (p=0.01). In the subgroup analysis by treatment indication, the percentage of eyes with IOP change ≥10mmHg was similar in eyes treated for RVO, UV or DME after the first (15%, 14.3% and 13.2%, p=0.91), second (13.3%, 4.5% and 9.5%, p=0.63), and third injection (20%, 0% and 11.1%, p=0.37).

Conclusions: Repeat IDI injections did not increase significantly IOP compared to the effect observed with the first injection. The IDI does not appear to have cumulative effect in IOP rise in our cohort of treated eyes, however, the percentage of eyes on hypotensive treatment was higher after 3 IDI injections than baseline. In our series, the effect on IOP was not significantly different in the subgroup analysis by treatment indication.

Commercial Relationships: Anna Sala-Puigdollers, None; Javier Zarranz-Ventura, None; Jessica Matas, None; Marina Mesquida, None; Victor Llorens, None; Blanca Molins, None; Maria Socorro Alforja, None; Juan Giralt, None; Maite Sainz De La Maza, None; Alfredo Adan Civera, None

Program Number: 2674 Poster Board Number: A0242
Presentation Time: 8:30 AM–10:15 AM
Intraocular Pressure Control after the Implantation of an Ahmed Glaucoma Device in Eyes with a Failed Trabeculectomy
Rui Barroso Schimiti1, 2, Ricardo Y. Abe1, Jose Paulo C. Vasconcellos2, Carla M. Tavares1, Vital P. Costa1, 2. Ophthalmology, University of Campinas, Londrina, Brazil; 2Ophthalmology, Hospital de Olhos de Londrina, Londrina, Brazil.

Purpose: To evaluate the results of the Ahmed glaucoma drainage device in eyes that had a failed trabeculectomy.

Methods: This retrospective study evaluated 61 eyes (61 patients) with a failed trabeculectomy that underwent the implantation of an Ahmed glaucoma drainage device (model S2- n=29, model FP7-n=32) due to uncontrolled IOP under maximal medical therapy. Outcome measures included IOP, visual acuity, number of antiglaucoma medications, and complications. Success was defined as IOP ≤21mmHg (criterion 1), or 20% reduction in IOP (criterion 2) with or without antiglaucoma medications. Persistent hypotony (IOP < 5 mmHg after 3 months of follow-up), loss of light perception, and re-intervention for IOP control were defined as failure.

Results: Mean preoperative IOP and mean IOPs at 6 months, 12 months, 18 months, and 24 months were 21.93 ± 6.32 mmHg (n=61), 14.15 ± 4.33 mmHg (n=59), 13.21 ± 4.44 mmHg (n=56), 12.21 ± 3.73 mmHg (n=34), and 13.60 ± 3.27 mmHg (n=25), respectively. Mean IOP reductions were statistically significant at all time intervals (p<0.001). Mean number of antiglaucoma medications preoperatively, at 6 months, 12 months, 18 months, and 24 months were 3.95 ± 0.85 (n=61), 2.19 ± 1.38 (n=59), 2.48 ± 1.44 (n=56), 2.24 ± 1.37 (n=34), and 2.40± 1.32 (n=25), respectively. The reductions in the mean number of antiglaucoma medications were statistically significant at all time intervals (p<0.001). According to criterion 1, the Kaplan-Meier survival curve disclosed success rates of 75% at 12 and 24 months. According to criterion 2, the Kaplan-Meier survival curve disclosed success rates of 57% at 12 months and 55% at 24 months. The most frequent complications were shallow anterior chamber (16.4%), choroidal detachment (4.9%), and hypertensive phase (4.9%).

Conclusions: Ahmed glaucoma device implantation may effectively reduce IOP in eyes with uncontrolled glaucoma with a failed trabeculectomy, and is associated with relatively few complications.

Commercial Relationships: Rui Barroso Schimiti, None; Ricardo Y. Abe, None; Jose Paulo C. Vasconcellos, None; Carla M. Tavares, None; Vital P. Costa, New World Medical, Inc (F)

Program Number: 2675 Poster Board Number: A0243
Presentation Time: 8:30 AM–10:15 AM
Matrix stiffness plays a key role in modulating the MRTF/ SRF pathway and genes associated with conjunctival fibrosis
Cynthia Yu-Wai-Man1, 2, Richard Treisman2, Peng T. Khaw1, Maryse Bally1. 1NIHR Biomedical Research Centre at Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology, London, United Kingdom; 2Cancer Research UK London Research Institute, London, United Kingdom.

Purpose: The Myocardin-related transcription factor/ Serum response factor (MRTF/ SRF) pathway is a paradigm of how important gene transcription is in conjunctival fibrosis. Recent studies have also shown that matrix stiffness plays a key role in fibrosis, and new biomaterials with different substrate stiffness are currently being developed for tube implants in glaucoma. We hypothesised that
matrix stiffness would be an important modulator of the MRTF/SRF pathway and genes associated with conjunctival fibrosis.

Methods: The localisation of MRTF-A was characterised in human Tenon’s fibroblasts using immunofluorescence and hydrogels of 0.5 kPa (soft matrix) and 50 kPa (stiff matrix). The effect of matrix stiffness on the expression of serum response factor and key fibrotic genes, ACTA2, CTGF, and MYL9, was measured using real-time qPCR. All mRNA values were normalised relative to that of GAPDH, and each experiment was carried out as independent triplicates (n=3) under different conditions. Statistical analysis was performed using the Student’s t-test to calculate statistically significant differences and individual p values. Western blotting was also used to measure the expression of SRF, ACTA2, and MYL9 proteins using different matrix stiffness.

Results: Human Tenon’s fibroblasts (HTFs) showed marked changes in cell morphology when plated on soft matrix compared to stiff matrix. MRTF-A localisation in HTFs was nuclear on stiff matrix (50 kPa) compared to soft matrix (0.5 kPa). The expression of serum response factor and key fibrotic genes, ACTA2, CTGF, and MYL9, were all significantly increased when HTFs were plated on stiff matrix compared to soft matrix (p<0.05). The expression of SRF, ACTA2, and MYL9 proteins were also increased in HTFs with stiff matrix compared to soft matrix.

Conclusions: Human Tenon’s fibroblasts are highly sensitive to mechanotransduction. There is a significant increase in the expression of serum response factor and other key fibrotic genes in the conjunctiva with stiff matrix (50 kPa) compared to soft matrix (0.5 kPa). These data suggest that biomaterials with low substrate stiffness will tend to be less fibrogenic, which is important when designing materials for glaucoma tube implants and other drug delivery devices in the eye.

Commercial Relationships: Cynthia Yu-Wai-Man, None; Richard Treisman, None; Peng T. Khaw, None; Maryse Bailly, None

Program Number: 2676 Poster Board Number: A0244
Presentation Time: 8:30 AM–10:15 AM
Prospective observational study for conjunctival scar after phacoemulsification

Makoto Gozawa1, Yoshihiro Takamura1, Seiji Miyake1, Satoshi Yokota1,2, Masanori Sakashita1, Masaru Inatani1. 1Ophthalmology, University of Fukui, Yoshida Fukui, Japan; 2Ophthalmology, University of Kyoto, Kyoto, Japan.

Purpose: Conjunctival scar after lens extraction is a risk factor for the surgical failure of trabeculectomy. We examined whether conjunctival incision during phacoemulsification causes conjunctival scar.

Methods: Transscleral Phacoemulsification was performed with superior conjunctival incision in 25 eyes (the superior group) and temporal conjunctival incision in 25 eyes (the temporal group). Anterior segment optical coherence tomography (AS-OCT) image in the superior conjunctiva was taken before, and at 1 week, 1, 3, and 6 months after surgery. We quantified the length of 3 layers; epithelium, stroma and Tenon’s capsule layers in the superior conjunctiva. We defined the length of the layers / 3 mm x 100% as the preserved rate. It was compared between the superior group and the temporal group. The relationship between OCT image and histology was evaluated with the rabbit conjunctiva after phacoemulsification.

Results: Despite of no significant difference (p=1.0) between the 2 groups before surgery, the preserved rates after surgery were significantly (p<0.0001) lower in the superior group than the temporal group (60 ± 2% vs 100 ± 0% at 1 week, 52 ± 5% vs 99 ± 1% at 1 month, 63 ± 2% vs 100 ± 0% at 3 months, 61 ± 3% vs 100 ± 0% at 6 months, respectively). AS-OCT image for the rabbit phacoemulsification model also demonstrated significantly (p<0.0001) less preserved rates in the conjunctival lesion with surgical incision than the lesion without surgical incision at 1 day (39 ± 4% vs 100 ± 0%), 7 days (49 ± 9 % vs 100 ± 0%) and 1 month (35 ± 3% vs 100 ± 0%). The thickness of the conjunctiva was significantly higher in the lesion with surgical incision than the lesion without surgical incision on 1 day (347 ± 32 mm vs 217 ± 16 mm, p=0.05) and 7 days (363 ± 36 mm vs 216 ± 15 mm, p=0.01). The densities of neutrophils and α-SMA-positive cells were significantly higher in the lesion with surgical incision than the lesion without incision on 1 day (4913 ± 839 / mm² vs 59 ± 20 / mm², p=0.0001) and 7 days (8967 ± 876 / mm² vs 1259 ± 91 / mm², p=0.0001), respectively.

Conclusions: Conjunctival incision during phacoemulsification disturbs the 3-layer structure in the conjunctiva. The disturbance corresponds to the conjunctival wound healing process. Temporal incision during phacoemulsification may contribute to the surgical success of trabeculectomy because the 3-layer structure in the superior conjunctiva is unaffected.

Commercial Relationships: Makoto Gozawa, None; Yoshihiro Takamura, None; Seiji Miyake, None; Satoshi Yokota, None; Masanori Sakashita, None; Masaru Inatani, None
Support: MEXT

Program Number: 2677 Poster Board Number: A0245
Presentation Time: 8:30 AM–10:15 AM
Effect of porcine chondrocyte derived extracellular membrane (CDECM) on postoperative wound healing in an experimental rabbit model of glaucoma filtration surgery

Junglim Kim, JaeWook Yang. ophthalmology, busan paik hospital, Busan, Korea (the Republic of).

Purpose: To determine the anti-angiogenic effect of porcine chondrocyte-derived extracellular membrane (CDECM) and to investigate whether the CDECM can reduce postoperative scar formation in an experimental rabbit model of glaucoma filtration surgery.

Methods: 12 New Zealand white rabbits underwent the modified glaucoma filtering surgery and received subconjunctival injections as follows: CDECM (group 1) and normal saline (group 2). In vivo, the effect of the CDECM on the rabbit model of modified glaucoma filtering surgery was investigated using histopathological and immunohistochemical analyses of the inflammation, fibrosis and angiogenesis.

Results: The degree of inflammation in the area of the sclera flap lesion at 4 weeks postoperatively was not significantly different between groups 1 and 2 (P=0.19). However, a significant reduction in the degree of fibrosis and in the vascularization in the sclera flap were observed in group 1 (P=0.002, P=0.002).

Conclusions: Reductions in angiogenesis and fibrosis, which are related to wound healing, were verified in the experimental rabbit model of glaucoma filtration surgery with a CDECM subconjunctival injection. Therefore, it was expected that CDECM in glaucoma filtration surgery would have had an anti-scarring effect.

Commercial Relationships: Junglim Kim, None; JaeWook Yang, None
Support: This study was supported by a grant from the Korea Healthcare Technology R&D Project, Ministry of Health and Welfare Affairs, Republic of Korea (grant #: HI12C0005)

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Program Number: 2678 Poster Board Number: A0246
Presentation Time: 8:30 AM–10:15 AM

Histone deacetylase inhibitor attenuates TGF-β2 induced human conjunctival fibroblast activation

**Purpose:** Excessive scar tissue formation of conjunctiva is a common cause of failure in glaucoma filtration surgery. Fibroblasts can be activated by a variety of inflammatory cytokines and differentiate into myofibroblasts, characterized by a-SMA expression and extracellular matrix production, and this activation is known to play a pivotal role in fibrogenesis. Recent studies highlighted the role of antibiotic activity of histone deacetylase (HDAC) inhibitors. The present study was aimed to evaluate the effects of HDAC inhibitor on TGF-β2 induced human conjunctival fibroblast activation.

**Methods:** Human conjunctival fibroblasts were exposed to 5 ng/ml TGF-β2 to induce myofibroblast differentiation. The cultures were pretreated with suberoylanilide hydroxamic acid (SAHA 1.0-5.0 μM) for 1 hour and subsequently incubated with 5 ng/ml TGF-β2 for 48 hours. The effects of SAHA on human conjunctival fibroblasts were analyzed by Western blot analysis and immunocytochemistry. Cell viability and cytotoxicity were assessed using WST-8 assay and Hoechst 33342/propidium iodide (PI) dual staining, respectively.

**Results:** The expression of a-SMA in TGF-β2 treated human conjunctival fibroblasts was increased in both Western blot analysis (p=0.0009) and immunocytochemistry, and SAHA significantly reduced a-SMA expression (p=0.0011). TGF-β2 increased the proliferation of human conjunctival fibroblasts (p=0.0001), and the effect was significantly attenuated by SAHA (p=0.0001). SAHA did not cause any cellular toxicity at the tested doses.

**Conclusions:** HDAC inhibitor SAHA attenuated human conjunctival fibroblast differentiation into myofibroblast. Our results suggest that HDAC inhibitors might have a therapeutic potential in the prevention of excess scarring after glaucoma filtration surgery.

Commercial Relationships: Akiko Futakuchi, None; Toshihiro Inoue, None; Tomokazu Fujimoto, None; Utaka Kuroda, None; Miyuki M. Inoue, None; Eri Takahashi, None; Kohei Shobayashi, None; Saori Ohira, None; Sachi Kojima, None; Hidenobu Tanihara, None

Program Number: 2679 Poster Board Number: A0247
Presentation Time: 8:30 AM–10:15 AM

Safety and efficacy of incisional glaucoma surgery in Nuevo Progreso, Guatemala
Rebecca Sorenson1, Ethan Kutzscher2, Andrew L. Sorenson3, Ingrid U. Scott.

**Purpose:** Approximately half of patients presented with primary open angle glaucoma (34, 49.3%), followed by pseudoxfoliation (20, 29.0%), uveitic (3, 4.3%), and traumatic (3, 4.3%) glaucoma. Average presenting IOP was 33.6 mmHg (range, 12-58). The average cup-to-disc ratio was 0.87 (range, 0.3-0.99). Fifty-two patients (75.3%) had a visual acuity of count fingers or worse at presentation. Thirty-five patients (50.7%) received a glaucoma-only procedure, and 34 patients (49.3%) received a combined cataract extraction and glaucoma procedure. Mean follow-up was 26.4 months, with 65.2%, 31.9% and 20.3% of patients followed at 6, 24 and 60 months postoperatively, respectively. Among the 53 patients followed beyond 1 month, the mean IOP at last visit was 14.1 mmHg (range, 0-54). Eleven patients (20.8%) were considered to have failed surgical outcomes based on bleb failure (n=6, 11.3%), postoperative phthisis (n=3, 5.7%), inadequate IOP lowering despite an intact bleb (n=1, 1.9%) and postoperative no light perception vision (n=1, 1.9%). Thirty-nine patients (73.6%) were considered to have successful surgical outcomes based on bleb formation and IOP reduction of at least 20% from baseline.

**Conclusions:** In this study of patients who underwent incisional glaucoma surgery in Nuevo Progreso, Guatemala, 73.6% achieved an IOP reduction of at least 20%. The overall rate of surgical failure was 20.8%, as compared to reported rates of trabeculectomy and tube shunt failure of approximately 10% per year in the developed world. Our study reflects the challenges of glaucoma management in this setting, including the often advanced stage of disease at presentation and poor return for follow-up, and highlights the need for improved glaucoma management in the developing world.

Commercial Relationships: Rebecca Sorenson, None; Ethan Kutzscher, None; Andrew L. Sorenson, None; Ingrid U. Scott, None

Program Number: 2680 Poster Board Number: A0248
Presentation Time: 8:30 AM–10:15 AM

The Accuracy of Power Prediction for Cataract Surgery and Triple Procedure in Patients with Open-Angle Glaucoma
Hyoun Won Bae1, Sang Hyeup Lee2, Si Hyung Lee2, Samin Hong1, Gung Je Seong1, Chan Yun Kim1.

1Department of Ophthalmology, Yonsei University College of Medicine, Seoul, Korea (the Republic of); 2Department of Ophthalmology, Soonchunhyang University, Bucheon, Korea (the Republic of).

**Purpose:** To compare the power prediction accuracies of patients with open-angle glaucoma (OAG) who underwent cataract surgery only, cataract surgery with previous trabeculectomy, or triple procedure.

**Methods:** A total of 56 eyes of 56 OAG patients who had a cataract surgery or triple procedure between July 2006 and June 2013 were enrolled. We classified OAG subjects into 3 groups: (1) only phacoemulsification (OP) group; (2) phacoemulsification after trabeculectomy (PAT) group; and (3) phacoemulsification combined with trabeculectomy (PCT) group.

**Results:** The mean age was significant lower in PAT group and the portion of female was larger in OP group. Preoperative intraocular pressure was significantly higher in PCT group. When comparing 3 groups at 2 months after surgery, spherical equivalents (SEs) of PAT and PCT groups showed a significant myopic shift than that of OP group. Prediction error (PE; the difference between postoperative and predicted SE) of PCT group was significantly more myopic than that of OP group (p=0.005), and the absolute value of PE (APE) of PAT group was significantly higher than that of OP group (p=0.033). Using linear mixed model, the PE calculated by SRK II formula was more accurate than SRK T formula in PAT and PCT groups (p=0.032 and p=0.035, respectively).

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Conclusions: The power prediction accuracies of PAT and PCT group were inferior to that of OP group. The postoperative SEs of PAT and PCT group tended to shift more myopically than predicted. The SRK II formula was considered to be more appropriate for predicting the postoperative refractive power in PAT and PCT groups.

Commercial Relationships: Hyong Won Bae, None; Sang Hyup Lee, None; Si Hyung Lee, None; Samin Hong, None; Gong Je Seong, None; Chan Yun Kim, None

Program Number: 2681 Poster Board Number: A0249
Presentation Time: 8:30 AM–10:15 AM

What is driving the decision to perform filtering surgery in glaucoma patients?
Alain M. Bron1, 2, Aurelie De Lazzer1, Philippe Koehrer1, Niyazi Acar1, Lionel Bretillon1, Catherine P. Garcher1, 2. Ophthalmology, University Hospital, Dijon, France; 1INRA, Eye and Nutrition Research Group, Dijon, France.

Purpose: To assess what is driving the decision to perform a filtering procedure in glaucoma patients.

Methods: Retrospective study in one single University center. All the indications for filtering glaucoma surgeries (alone or combined with cataract extraction) performed in 2013 by the same surgeon were reviewed. The indications were as follows: clinical evaluation of the optic disc, visual field progression, progression on imaging (OCT), poor tolerance to medical treatment, poor control of intraocular pressure (IOP) and cataract.

Results: The filtering surgeries (n = 159) were as follows: 78 trabeculectomies, 45 combined cataract and deep sclerectomy, 24 combined cataract and trabeculectomy, 9 deep sclerectomies and 3 tubes. The types of glaucoma were as follows: primary open-angle glaucoma (76%), secondary glaucoma (14%) and angle closure glaucoma (10%). Poor control of IOP was the first indication (51%) followed by cataract (13%), clinical evaluation of the optic disc (12%), visual field progression (12%), poor tolerance to medical treatment (11%) and progression on imaging (1%).

Conclusions: In this series, the yield of imaging seems very poor to help the decision to perform a filtering procedure in glaucoma patients. The indications for glaucoma surgery may be highly variable according to the country, the practice and the surgeon. A multicenter study should be useful to better define what is driving the indications for glaucoma surgery.

Commercial Relationships: Alain M. Bron, None; Aurelie De Lazzer, None; Philippe Koehrer, None; Niyazi Acar, None; Lionel Bretillon, None; Catherine P. Garcher, None

Program Number: 2682 Poster Board Number: A0250
Presentation Time: 8:30 AM–10:15 AM

Non-penetrating glaucoma surgery using a new Schlemm’s canal expander device for open-angle glaucoma
Gordana Sunaric-Megevand1, 2, Alexandre Rizzato2, Alexandros N. Stango2, 3. 1Ophthalmology, Geneva, Switzerland; 2Centre Ophthalmologique de Florissant, Geneva, Switzerland; 3Clinical Research Unit, Rothschild Foundation, Geneva, Switzerland.

Purpose: To evaluate the safety profile of a new Schlemm’s canal expander device in non-penetrating glaucoma surgery.

Methods: We invited all patients with uncontrolled open-angle glaucoma (OAG) on maximally tolerated medication between September 2013 and March 2014 to participate in a prospective, non-comparative, intervention study. We included patients with primary or pseudoxfoliative OAG. All cases were operated under local anesthesia by the same surgeon (GSM) using a standardized canaloplasty procedure with 360-degrees dilatation of Schlemm’s canal using a flexible ophthalmic microcannula (Science Surgical Corporation, Menlo Park, CA) followed by the insertion of the new 9mm long and 240µm wide polyimide stent (Ophthalmos GmbH, Switzerland) into both surgically created Schlemm’s ostia. Primary outcomes: percentage of eyes without intra- or post-operative complications; percentage of eyes losing > 3 lines of best-corrected visual acuity (BCVA) at 6 months. Secondary outcomes: mean change of intraocular pressure (IOP) following surgery; percentage of eyes with successful insertion of the device in Schlemm’s canal.

Results: 20 of 20 patients were recruited. All were Caucasians of whom 13 (65%) were female. Mean age (±SD) at the time of surgery was 74.5 ± 5.78 years. Mean follow-up was 10.2 ± 2 months (range: 6-12). 9 eyes (45%) were pseudophakic. Mean BCVA (logMAR) before surgery was 0.11 ± 0.1 whereas, no eye lost > 3 lines 6 months after surgery. 10 eyes (50%) had no surgery-related complication. 7 eyes (35%) had a spontaneously resolved micro-hyphema; 2 eyes (10%) had a localized Descemet’s membrane detachment; 3 eyes (15%) had hypotony that resolved spontaneously within 3 months. One eye (5%) developed anterior uveitis, which responded to steroid drops. 2 eyes (10%) had YAG laser gonipuncture for iris incarceration into the Descemet’s window. Mean IOP decreased from 23.12 ± 7.0 mmHg before surgery to 5.82 ± 3.0, 10.9 ± 4.06, 10.5 ± 5.08, 11.1 ± 3.39, 12.1 ± 2.5, 13 ± 6.26 at week-1, month-1, -3, -6, -9, -12 respectively. Insertion of the canal expander was successful in 17 eyes (85%) whereas, the stent had to be trimmed in 3 cases (15%) due to some resistance during insertion.

Conclusions: Insertion of the new canal expander device in combination with canaloplasty for OAG did not cause sight-threatening surgical complications. Short-term data showed promising IOP lowering results.

Commercial Relationships: Gordana Sunaric-Megevand, None; Alexandre Rizzato, None; Alexandros N. Stango, None

Program Number: 2683 Poster Board Number: A0251
Presentation Time: 8:30 AM–10:15 AM

Long-term clinical results of canaloplasty in open angle glaucoma
Huiyi Chen, Darrell Wudunn, Louis B. Cantor. Ophthalmology, Eugene and Marilyn Glick Eye Institute, Indianapolis, IN.

Purpose: Our previous study showed canaloplasty with phaco has better IOP-lowering effects compared to phaco alone. This study is to present the long-term clinical results on efficacy and survival of IOP-lowering effect of canaloplasty surgery in open angle glaucoma.

Methods: This is a retrospective study on consecutive canaloplasty with or without phaco performed by 1 surgeon in open-angle glaucoma patients from 1/1/2008 to 6/30/2014. Intraocular pressure (IOP), number of medications, and complications were analyzed. Survival rates were analyzed using the Kaplan-Meier life-table analysis. Success criteria were IOP less than 21mmHg and one of the followings: 25% or greater reduction in IOP; or 15% or greater reduction in IOP on at least one fewer medication; or equal or lower IOP on at least 2 fewer medications.

Results: Sixty four eyes from 48 patients underwent canaloplasty with phaco (56 eyes) or canaloplasty only (8 eyes). There were 25 males and 23 females; 46 Caucasian and 2 African-Americans. The follow-up ranged from 1- 76 months with mean 33.2±24.3 months. The mean age was 72.3±10.0 years. The mean preoperative IOP was 19.4±5.9 mmHg. The mean IOP at the final follow-up was 16.2±9.3 mm Hg (P=0.0021). The mean preoperative number of medications was 5.08, 3.39, 7.0 mmHg before surgery to 5.82 before surgery was 0.11 ± 0.1 whereas, no eye lost > 3 lines 6 months after surgery. 10 eyes (50%) had no surgery-related complication. 7 eyes (35%) had a spontaneously resolved micro-hyphema; 2 eyes (10%) had a localized Descemet’s membrane detachment; 3 eyes (15%) had hypotony that resolved spontaneously within 3 months. One eye (5%) developed anterior uveitis, which responded to steroid drops. 2 eyes (10%) had YAG laser gonipuncture for iris incarceration into the Descemet’s window. Mean IOP decreased from 23.12 ± 7.0 mmHg before surgery to 5.82 ± 3.0, 10.9 ± 4.06, 10.5 ± 5.08, 11.1 ± 3.39, 12.1 ± 2.5, 13 ± 6.26 at week-1, month-1, -3, -6, -9, -12 respectively. Insertion of the canal expander was successful in 17 eyes (85%) whereas, the stent had to be trimmed in 3 cases (15%) due to some resistance during insertion.

Conclusions: Insertion of the new canal expander device in combination with canaloplasty for OAG did not cause sight-threatening surgical complications. Short-term data showed promising IOP lowering results.

Commercial Relationships: Gordana Sunaric-Megevand, None; Alexandre Rizzato, None; Alexandros N. Stango, None
Is trabecular surgery (Hydrus-Ivantis) really safe? Operative and post-operative complications of a single site clinical group

**Antonio M. Fea, Giulia Consolandi, Paola cannizzo, Giulia pignata, Carlo Lavia, Teresa Rolle. Ophth/I Clinicina Oculistica, Universita di Torino, Torino, Italy.**

**Purpose:** Trabecular surgery has been introduced to overcome the complications of traditional glaucoma surgery (trabeculectomy, shunt surgery). To evaluate clinically the number and type of complications of a new trabecular bypass in a one site clinical group of phakic patients.

**Methods:** Intraoperative complications of phakic patients undergoing consecutive trabecular stent implantation (Hydrus-Ivantis) by a single surgeon were evaluated. The patients were evaluated at 1 month, 3 months and at 1 year considering visual acuity, visual field, and gonioscopy.

**Results:** 41 caucasian patients (12 males and 29 females) with a mean age of 67.4 ± 8.5 years (range: 49-84) were included in the study. All patients had a diagnosis of primary open angle glaucoma with a mean visual field MD of -0.4 and a PSD of 4.3. The mean cup to disk ratio was 0.7 ± 0.2. Pre-operative BCVA was 20/23, the mean medicated IOP was 19.8 ± 3.4 and the mean number of medications was 1.6. At the end of surgery two patients presented a hyphema (2mm). In one patient, the stent was repositioned during the surgical procedure. 36 patients were followed up to 3 months and 33 up to one year. The IOP decreased to 17.5 ± 3.3 at three months and to 18 ± 3.2 at one year. At 3 months 19.4% and at one year 42.4% of the patients were medicated (mean number of medications: 0.4 and 0.9 respectively). During the follow up no patient had a BCVA loss ≥ 2 Snellen lines. Cup disk ratio and visual field MD were not statistically significant compared to baseline. In 6 patients new peripheral anterior synechiae (PAS) were observed. The occurrence of PAS did not modify the IOP nor required additional medical or surgical therapy.

**Conclusions:** The Hydrus trabecular stent allowed a significant reduction of therapy in this group of phakic patients, with 57.6% unmedicated patients up to one year. The mean number of medications decreased significantly compared to baseline (1.6 vs 0.9; p<0.05). Mild intraoperative complications were observed. During the follow-up, some patients developed peripheral anterior synechiae which did not seem to be clinically significant.

**Commercial Relationships:** Antonio M. Fea, None; Giulia Consolandi, None; Paola cannizzo, None; Giulia pignata, None; Carlo Lavia, None; Teresa Rolle, None

**Support:** Research to Prevent Blindness (RPB) Unrestricted Grant

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Surgical effect of modified 360-degree suture trabeculotomy compared to trabeculectomy

**Takeshi Ono, Daisuke Shiba, Sayaka Adachi, Rihito Ui, Naoki Ozeki, Kenya Yuki, Kazuo Tsubota. Ophthalmology, Keio Univ School of Medicine, Tokyo, Japan.**

**Purpose:** To investigate the intraocular pressure (IOP) lowering effects and safety of modified 360-degree trabeculotomy (S-LOT) for glaucoma in comparison with trabeculectomy (LOT). We included the eyes which underwent S-LOT or LOT as a sole procedure and followed for 2 or more months in this retrospective study. For cases of S-LOT which were unable to pass through 360 degree we incised the trabecular meshwork as possible by suture or metal trabeculome. We investigated IOP, number of antiglaucoma medication (eye drops: 1 point, internal use: 2 points) and complications in the survey periods. Surgery was deemed to have failed when the IOP of the operated eye was 18 mmHg or more at any two consecutive follow-up examinations or when the patient required a trabeculectomy during the observation period.

**Results:** 111 eyes of 97 Japanese glaucoma patients were included in this study. S-LOT was performed on 79 eyes and LOT was performed on 32 eyes. The mean preoperative IOP values (the mean number of antiglaucoma medications) were 31.6±8.8mmHg (4.0±1.4) in S-LOT group and 32.8±9.3mmHg (4.3±1.3) in LOT group, respectively. The mean postoperative IOP values (the mean numbers of antiglaucoma medications) at 12 months was 13.9±3.9mmHg (0.9±1.3) in the S-LOT group and 17.5±11.5mmHg (1.2±1.3) in the LOT group. Kaplan-Meier survival analysis showed that survival rates at 12 months were 71.4% in the S-LOT group and 54.8% in the LOT group, respectively. Log rank test showed there was a significant difference between two groups (P<0.05). 14 eyes (17.7%) in S-LOT group and 9 eyes (28.1%) in LOT group underwent additional trabeculectomies because of the inadequate IOP reductions. Transient IOP elevations above 30mmHg occurred more frequently in LOT group (20 eyes, 62.5%) than in S-LOT group (21 eyes, 26.6%) (P<0.001). Other complications included hyphaema in 76 eyes (96.2%) and 24 eyes (75.0%), and Descemet’s membrane detachment in 4 eyes (5.1%) and 1 eye (3.1%) and malignant glaucoma in 0 eye(0%) and 1 eye (3.1%), respectively, after S-LOT and LOT.

**Conclusions:** S-LOT had a higher success rate compared to LOT.

**Commercial Relationships:** Takeshi Ono, None; Daisuke Shiba, None; Sayaka Adachi, None; Rihito Ui, None; Naoki Ozeki, None; Kenya Yuki, None; Kazuo Tsubota, None

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Case-Matched Intraocular Pressure Results of Trabectome Ab Interno Trabeculectomy versus Ahmed Glaucoma Implant

**Sushma Kola1, Eric Brown1, Kevin Kaplowitz2, Steven Wang3, Julia K. Polat1, Joel S. Schuman1, 3, Nils A. Loewen1, 3. 1Department of Ophthalmology, UPMC Eye Center, Eye and Ear Institute, Ophthalmology and Vision Science Research Center, University of Pittsburgh School of Medicine, Pittsburgh, PA; 2Stony Brook University Medical Center, Stony Brook, NY; 3Department of Bioengineering, Swanson School of Engineering, University of Pittsburgh, Pittsburgh, PA.**

**Purpose:** To compare outcomes of ab interno trabeculectomy (T, Trabectome, Neomedix, Tustin, CA) to that of a valved glaucoma drainage device (AGI, Ahmed FP7, New World Medical, Rancho Cucamonga, CA) using an automated matching algorithm.

**Methods:** Retrospective, case-matched study of intraocular pressure (IOP) after T or AGI. Procedures were performed by the
same surgeon group on similar patients for primary and secondary open-angle as well as primary angle-closure glaucomas. The only exclusion criterion was neovascular glaucoma. Cases were matched by age, gender, glaucoma type, number of preoperative medications, and whether prior phacoemulsification occurred. Weighted linear regression was significant when p<0.05. Reoperation was considered a complication.

**Results:** Prior to matching, T (n=103) had a preoperative IOP of 20.8±8.1 mmHg on 2.7±1.8 medications and AGI (n=41) had a preoperative IOP of 30.0±13.4 mmHg on 3.0±1.4 medications. After 1 year, the number of medications decreased to 1.9±1.7 for T and increased to 4.2±1.6 for AGI. For T, only 16% required further surgery vs. 41% for AGI.

After matching, there was no significant difference between T and AGI at 1 week, 1 month, 3 months and 6 months (all p>0.05). The IOP reduction at 1 week was 7.7±10.4 mmHg for 31 T vs. 13.1±14.3 mmHg for 31 AGI, at 1 month 2.5±10.9 mmHg for 40 T vs. 10.0±14.9 mmHg for 32 AGI. At 3 months, 32 T had a baseline IOP of 26.4±9.1 mmHg that decreased to 15.7±4.1 mmHg vs. 33 AGI with a baseline of 27.1±10.9 mmHg that decreased to 14.8±8.1 mmHg. At 6 months, 24 T had a baseline IOP of 26.4±9.4 mmHg that decreased to 17.1±5.8 mmHg vs. 19 AGI with a baseline of 26.7±10.2 mmHg that decreased to 15.5±5.5 mmHg. At 1 year, matched T (n=14) had a baseline IOP of 28.1±9.2 mmHg that decreased to 16.4±6.2 mmHg compared to AGI (n=11) with a baseline of 26.9±8.5 mmHg that decreased to 11.7±4.5 mmHg (p<0.01). AGI patients required twice as many medications to achieve this goal and had a more complicated postoperative course.

**Conclusions:** In this retrospective study of T matched to AGI, there was no difference in IOP lowering at 1 week and 1, 3, and 6 months. At 1 year, AGI patients achieved a lower IOP that required twice as many drops as T.

**Commercial Relationships:** Sushma Kola, None; Yiannis Iordanous, None; Sangita Patel, None; Wendy Wang, None; Cindy M. Hutnik, None; Monali Malvankar, None.

**Program Number:** 2688 Poster Board Number: A0256
**Presentation Time:** 8:30 AM–10:15 AM
**Retrospective analysis of glaucoma associated with lens in Asociación Para Evitar la Ceguera en México**

**Purpose:** To study cases of glaucoma associated with a lens that have been treated in the Asociación Para Evitar la Ceguera en México (APEC) over the past 20 years. To determine how many cases of phacomorphic, phacolytic and phacoanaphylactic glaucoma were treated and determine the clinical presentation, medical and surgical management, visual prognosis and if there is any relationship between the duration of the acute attack and a poor prognosis.

**Methods:** We carried out a retrospective, cross-sectional, observational and descriptive study. All records of patients with glaucoma associated with lens were studied over a period of 20 years (1994-2013) in APEC.

**Results:** We found 59 patients: 42 eyes with phacomorphic glaucoma (71.1%), 13 with phacolytic glaucoma (22%) and 4 with phacoanaphylactic glaucoma (6.7%). Of the patients with phacomorphic glaucoma (71.1%), 13 with phacolytic glaucoma (22%) and 4 with phacoanaphylactic glaucoma (6.7%). Of the patients with phacomorphic glaucoma, 83% were female. With an average age of 70.47 ± 13.1 years, a visual acuity (VC) on admission of logMAR 2.38 ± 0.48 and final VC of 1.23 ± 0.79. Average of intraocular pressure (IOP) on admission was 43.73 ± 13.55 mmHg on 2.91 ± 0.9 glaucoma drugs and final IOP was 11.36 ± 3.19 on 0.81 ± 1.47 drugs. The average time between the acute attack and surgery was 7.7 ± 10.5 days. Surgical treatment consisted on combined glaucoma and cataract surgery in 50% of the cases and cataract alone on the other 50%; decided by the surgeon. Of patients with phacolytic 54% were female, mean age of 69.61 ± 12.89 years, VC on admission was 2.52 ± 0.19 and 1.0 ± 0.41 at final visit. With an average presurgical IOP of 44.08 ± 10.62 mmHg on 2.5 ± 0.90 drugs and a final IOP of 11.74 ± 1.29 on 1.25 ± 1.5 drugs. The average time between the acute attack and surgery was 15.6 ± 24 days. Treatment consisted on cataract extraction on 100%. We found 4 patients with phacoanaphylactic glaucoma of whom 3 had a history of systemic diseases.
of trauma and one had a history of trauma and surgery. They had a mean age of 40.5 ± 13 years and an initial IOP of 42.67 ± 5.24 mmHg.

**Conclusions:** The patients with glaucoma associated with lens treated in our hospital were more frequently females; this is probably due to a smaller eye size, and are more frequent in the sixth decade of life. The greatest incidence corresponds to phacomorphic glaucoma. We note that there are two factors of poor prognosis, one is the time between acute attack and surgical treatment and second is a visual acuity at first visit worse than light perception.

**Commercial Relationships:** Natalie Juez Reyna, None; Alejandra Hernandez-Oteyza, None; Magdalena García-Huerta, None; Jesus Jimenez-Roman, None; Armando Castillejos-Chévez, None

**Program Number:** 2689 **Poster Board Number:** A0257  
**Presentation Time:** 8:30 AM–10:15 AM

Open-angle glaucoma Mexican patients treated with Canaloplasty: first 6-month post-operative report from a 5-year follow-up

**Maria de los Angeles Ramos Cadena**, 1 Margot K. Brechetl Bindel, 2 Armando Castillejos-Chévez. 1Ophthalmology, Hospital General Dr. Manuel Gea González, Mexico City, Mexico; 2Ophthalmology, Asociación Para Evitar la Ceguera en México, Mexico City, Mexico.

**Purpose:** Several studies have described the efficacy of canaloplasty for lowering the intraocular pressure (IOP) and thus slowing the rate of progression of glaucoma in different populations. We performed a prospective, experimental, 5-year follow-up, pilot study in Mexican patients with open-angle glaucoma (OAG) to evaluate if canaloplasty intervention decreases the IOP to ranges where progression does not occur.

**Methods:** Ten OAG eyes from 8 patients, without previous glaucoma surgery, were included in the study. Full ophthalmologic examination was performed, as well as achromatic visual fields (AVF), optical coherence tomography (OCT) of the optic nerve and retinal nerve fiber layer. All patients underwent canaloplasty, which was performed with the GlaucoLight device (DORC®). A follow-up evaluation was done 24 hours after surgery and then repeated at weeks 1, 2, 4 and 8; evaluations were done at the 4th and 6th months. The best-corrected visual acuity (BCVA) and IOP were measured at every visit and in the last one VF and OCT were performed to assess disease progression.

**Results:** The descriptive variables of the study group are presented in table 1. Six-month-follow-up IOP in all eyes was statistically significantly lower compared to basal IOP (p<0.005 95% CI [9.89 - 16.30]), and pre-operative IOP (p<0.001 [95% CI 1.59 - 4.81]). The decrease in topical hypotensive medication per patient between the pre-operative period and the last follow-up visit was also statistically significant (p<0.005 [95% CI 2.27 - 3.52]). No statistical significant difference was observed between the basal and 6 month AVF and OCT.

**Conclusions:** Eyes treated with canaloplasty, after 6 months of follow-up, showed lower IOPs compared with the pre-operative and basal ones, without topical hypotensive medication. None of the patients disclosed progression of the disease evaluated with AVF and OCT. It will be interesting to evaluate the clinical/functional outcome of the subjects after 12 months of follow-up.

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</table>

©2015, Copyright by the Association for Research in Vision and Ophthalmology, Inc., all rights reserved. Go to iovs.org to access the version of record. For permission to reproduce any abstract, contact the ARVO Office at pubs@arvo.org.
Conclusions: Our early experience with the iStent indicates it to be a safe surgical intervention for the appropriate patient. While mean IOP did not change significantly, patients used fewer topical medications to control their intraocular pressure, and we found a potential protective effect at preventing pressure spikes in the early post-operative period.

Commercial Relationships: Paul Baciu, None; Aly R. Sheraly, None; David Crandall, None; Nauman R. Imami, None

Program Number: 2691 Poster Board Number: A0259
Presentation Time: 8:30 AM–10:15 AM
Effect of iStent trabecular micro bypass device on outflow system morphology
Nisreen Mesiwala1, Nicholas Hess1, Catherine Marando2, Richard Bilonick1, Leonard Seibold5, Joel S. Schuman4, Malik Y. Kahook2, Larry Kagemann1,3.
1ophthalmology, UPMC Eye Center, Pittsburgh, PA; 2University of Colorado, Aurora, CO; 3Bioengineering, University of Pittsburgh, Pittsburgh, PA.

Purpose: Implantation of the iStent (Glaukos Corp, Laguna Hills, CA) is thought to lower intraocular pressure by creating a direct channel between the anterior chamber and Schlemm’s canal (SC). This retrospective study analyzed the effect of a single iStent on the morphology of SC by comparing the parameters of SC before and after placement, specifically looking at the cross-sectional area (CSA), inner to outer wall distance (IOD) of SC and the thickness of trabecular meshwork (TM).

Methods: Six patients with primary-open angle glaucoma had the iStent placed. SD-OCT images of nasal and temporal quadrants of each study eye were taken before and after surgery. Ten measurements of SC were manually measured over a consecutive 1mm segment of SC on FIJI ImageJ. The average obtained from the ten measurements represented the mean SC-CSA. Similarly, the SC-IOD and the TM thickness were measured 10 times over a consecutive 1mm segment of SC both in the nasal and temporal quadrants and averaged. The effect of the iStent on these parameters was then quantified by linear mixed effects modeling.

Results: The total SC-CSA prior to iStent placement was 3321.08 microns, standard deviation (SD) +/-1464.66 microns, standard error-of-mean (SEM) 422.81 microns; post-placement SC-CSA was 4570.923 microns (+/-1212.91 microns and SEM 383.557 microns). The SC-CSA in the nasal quadrant increased from 3398.39 microns (+/-1464.66; SEM 464.14) to 4743.45 microns (+/-1323.24, 540.210). The SC-CSA in the temporal quadrant also increased from 3243.764 microns (+/-1136.909, SEM 754.16) to 4312.135 microns (+/-1160.335, SEM 580.17). The total SC-IOD pre-op was 226.679 microns (+/-51.797) and increased to 264.299 microns (+/-54.169) post-op (p=0.0139). The nasal pre-op SC-IOD was 248.79 micron (+/- 27.04) and increased to 285.03 microns (+/-52.99) post-op; this was statistically significant (p=0.0433). The temporal pre-op SC-IOD was 204.56 microns (+/-63.23) and increased to 233.20 microns (+/-44.41). The TM thickness was 187.51 microns (+/-96.46) pre-op and increased to 222.29 microns (+/-119.20) post-op. Unless specified, p<0.05 for parameters.

Conclusions: While changes in SC-CSA and temporal SC-IOD did not reach statistical significance, there was a trend to these parameters increasing post implantation of the iStent. A single iStent implant did significantly increase the width of Schlemm’s canal (SC-IOD measurement) nasally where it is placed.
or combined with cataract surgery (n=32). Trabeculotomy opening and anterior chamber depth (ACD) were measured with an anterior segment spectral domain OCT (Tomey SS-1000). The IOP was taken with Goldmann applanation tonometry pre-operatively and at a single follow-up exam (follow-up time 151 ± 101 days (mean±SD)). The relationship between the IOP reduction and the OCT parameters as well as possible confounding factors was analysed using a multiple linear regression model.

**Results:** The trabeculotomy opening size was not correlated with the IOP reduction (p=0.35). In contrast, ACD and pre-operative lens status (phakic / pseudophakic) were significantly correlated with the postoperative IOP reduction (p=0.037 and 0.002, respectively). Potential confounding factors such as the number of eye drops at follow-up or the follow-up time were not correlated.

**Conclusions:** The fact that the trabeculotomy opening size was not correlated with IOP reduction points to the poorly understood role of the distal aqueous outflow pathway in glaucomatous IOP elevation.

**Commercial Relationships:** Christian van Oterendorp, None; Thomas Wecker, None; Matthias Neuburger, None; Jens F. Jordan, None

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**Program Number:** 2693 **Poster Board Number:** A0261  
**Presentation Time:** 8:30 AM–10:15 AM

**Comparison of Trabeculectomy Ab Interno Trabeculectomy to Baerveldt Glaucoma Implants using Propensity Score Matching**

Steven Z. Wang1, 2, Eric Brown1, Kevin Kaplowitz1, Sushma Kola1, 2, Julia K. Polat1, Joel S. Schuman1, 3, Nils A. Loewen1, 4

1. University of Pittsburgh School of Medicine, Pittsburgh, PA; 2. Ophthalmology, UPMC Eye Center, Pittsburgh, PA; 3. Stony Brook University Medical Center, Stony Brook, NY; 4. Bioengineering, Swanson School of Engineering, University of Pittsburgh, Pittsburgh, PA.

**Purpose:** To compare the reduction of intraocular pressure (IOP) and number of medications after trabecular meshwork ablation between the trabeculectomy (AIT) and Baerveldt (BGI) glaucoma implants which bypass the conventional drainage system in similar patient populations.

**Methods:** This was a retrospective study of outcomes of AIT (n=91) vs BGI (n=64) surgeries. Procedures were performed by the same group of surgeons on comparable patient populations with primary and secondary open angle and chronic angle closure glaucoma. Neovascular glaucoma and cases with less than 6 months of follow-up were excluded. AIT and BGI were matched using propensity-score matching using a genetic algorithm based on age, gender, type of glaucoma, if there was a concurrent phacoemulsification, baseline number of medications, and baseline IOP. Cases of AIT or BGI too different from their counterparts were excluded. Linear regression examined IOP change versus treatment (AIT vs BGI) and baseline IOP.

**Results:** Pre-matching the 155 cases resulted in 50 cases with 6 months of follow-up similar enough to match and justifiably compare. The effect of baseline IOP on surgery effect (IOP change) was statistically significant (for every 1 mm Hg increase in baseline IOP, the surgically-induced decrease in IOP was 0.82 ± 0.06 mm Hg), as was the surgery type, since BGI resulted in a 2.4 ± 0.9 mm Hg lower IOP than AIT after 6 months (p=0.02). For both surgical modalities, the reduction in number of medications from baseline was significant. AIT reduced from 2.7 ± 1.8 medications at baseline to 1.9 ± 1.7 medications at 1 year (p=0.002). BGI reduced the number of medications from 2.9 ± 1.2 at baseline to 2.0 ± 1.4 meds at 1 year (p<0.001). The difference in medication change when comparing between AIT and BGI was not significant (p=0.71).

**Conclusions:** In this retrospective study of two glaucoma surgeries with well established, highly different profiles of complications, costs and length of procedure, BGI lowered IOP approximately 2.4 mmHg more than AIT in closely matched patient populations with similar reduction of medications.

**Commercial Relationships:** Steven Z. Wang, None; Eric Brown, None; Kevin Kaplowitz, None; Sushma Kola, None; Julia K. Polat, None; Joel S. Schuman, Zeiss (P); Nils A. Loewen, Neomedix Inc. (C)

**Support:** Research to Prevent Blindness (department grant)

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**Program Number:** 2694 **Poster Board Number:** A0262  
**Presentation Time:** 8:30 AM–10:15 AM

**Retrospective analysis of resident-performed microinvasive glaucoma surgery with the iStent**

Wade Reardon1, Robert A. Sharpe1, Elizabeth Sharpe1, 2

1. Ophthalmology, Medical University of South Carolina, Charleston, SC; 2. Ophthalmology, Ralph H Johnson VA Medical Center, Charleston, SC.

**Purpose:** Microinvasive glaucoma surgery (MIGS) is a burgeoning field with no available data to date regarding outcomes when performed by residents in training. In a retrospective, observational fashion, we evaluated early efficacy and safety outcomes of resident-performed MIGS using the iStent in a veteran population.

**Methods:** Data were collected through a retrospective chart review at a Veterans Affairs Medical Center (VAMC) since the iStent became locally available in 2014. Patients were included who underwent combined cataract extraction and placement of an iStent by an ophthalmology resident in his/her 3rd year of training under the supervision of a single, fellowship-trained glaucoma surgeon. Baseline parameters were obtained, including demographics, intraocular pressure (IOP), number of ocular antihypertensive medications (meds), cup-to-disc (C:D) ratio, and best corrected logMAR visual acuity (BCVA). Mean age at surgery was 72.4 ± 8.6 years. Measurements were evaluated postoperatively at 1 day, 1 week, and 1 month. In addition, intraoperative and post-operative complications were recorded.

**Results:** Of 25 iStents placed by residents in 2014 at the VAMC, 24 eyes in 19 patients were included. One was excluded due to failure to place the device. Preoperatively, mean IOP was 18.0 ± 4.9 mmHg (range: 11-32). IOP averaged 19.6 ± 4.9 mmHg (range: 11-25) (n = 22), representing a 6.7% reduction in IOP from baseline (P = 0.32). Baseline C:D ratio was 0.65 ± 0.16. BCVA improved from 0.45 ± 0.39 to 0.07 ± 0.11 by 1 month (P = 0.02). Number of meds was not statistically different at 1 month (P = 0.81). There were no intraoperative complications associated with the iStent. Within the first week, 5 eyes developed a microphyma within the first week, which all resolved without intervention.

**Conclusions:** When performed by senior ophthalmology residents, MIGS, when combined with cataract surgery, impose minimal risk to patients and produce modest early reductions in IOP in a veteran population. These data may aid with counseling patients preoperatively for resident-performed iStent implantation.

**Commercial Relationships:** Wade Reardon, None; Robert A. Sharpe, None; Elizabeth Sharpe, None
Program Number: 2695 Poster Board Number: A0263
Presentation Time: 8:30 AM–10:15 AM
Istent implantation combined with phacoemulsification compared to phacoemulsification alone in primary angle closure and primary angle closure glaucoma
Purpose: To study the safety and efficacy of combined Istent implantation and phacoemulsification compared to phacoemulsification alone in primary angle closure or primary angle closure glaucoma.
Methods: A consecutive comparative study of 106 eyes with primary angle closure with ocular hypertension or glaucoma, underwent phacoemulsification alone (n=53 group I) or combined with surgical implantation of one or two Istents (n=53, group II). Preoperatively, all patients had a mean angle size of 0-20° on gonioscopy and required glaucoma medications. Pre and post-operative measures recorded included patient demographics, visual acuity, IOP, number of glaucoma medications and any complications. Patients were assessed preoperatively and on postoperative weeks 1, 3 and months 6 and 12.
Results: Postoperatively at 6 months, mean IOP decreased from 16.8 mmHg to 14.2 mmHg in group I, from 16.7 mmHg to 14.1 mmHg in group II. Mean glaucoma medication decreased from 1.9 to 1.8 in group I, from 2.3 to 1.2 in group II (p<0.05). There were no cases of Istent blockage. No major per- or postoperative complications were recorded in either groups.
Conclusions: Istent implantation combined with phacoemulsification was uncomplicated in eyes with narrow angles. Combined surgery resulted in similar IOP reduction to phacoemulsification alone, but achieved a significantly greater reduction in glaucoma medications. This may have positive implications for compliance, quality of life and health care costs in angle closure patients.
Commercial Relationships: Mohamad El Wardani, None; Farid Achache, None; Ciara Bergin, None; Kenza Bradly, None; Eamon Sharkawi, None.

Program Number: 2696 Poster Board Number: A0264
Presentation Time: 8:30 AM–10:15 AM
Measuring Fluid Outflow in Rabbits Post Glaucoma Implant Surgery with iMvalv
Fabio A. Guarnieri1, 3, Rodrigo M. Torres2. 1Bioengineering, CIMEC, Santa Fe, Argentina; 2Instituto Lóndolo, Paraná, Argentina; 3Lab BioMEMS, UNER, Oro Verde, Argentina.
Purpose: The iMvalv is an ocular implant with MEMS technology to produce aqueous humor drainage with an active mechanism. It was built with silicone multiple layers, for their plate and tube and has the capability of an active mechanism powered by a spiral antenna and a hybrid microcircuit. A first exploratory in-vivo implantation study in rabbits was performed and hydraulic conductivity was assessed in vivo and compared with in vitro testing.
Methods: Four New Zealand male rabbits underwent insertion of a iMvalv implant into the anterior chamber of their right eyes. Left eyes were used as controls. Both eyes had outflow measurements performed at day 44 after surgery. Measurements were performed by cannulating the drainage tube ostium in situ with a needle attached to a fluid column at 10, 15, 20 and 25 mmHg. The drop in the fluid column was measured by a video camera. For the control eyes the anterior chamber of the unoperated fellow eye was cannulated with a needle attached to a fluid column. The drop in the fluid column was also measured. Then, Perkins tonometry was performed in order to calibrate previous measurements (pre and post surgery) with this fluid column pressure.

Results: Perkins tonometry and manometric readings were compared in control eyes. Manometric readings of 10, 15, 20 and 25 mmHg gave mean values of 5, 6, 9 and 9.5 mmHg from simultaneous Perkins tonometries. In one implanted eye, a manometric column 20 mmHg was dropped to 11.4 mmHg and from 15 to 14.4 mmHg. In a second implanted eye the drop was from 21.6 to 21.1 mmHg. After euthanasia (day 50) conductivity of each valve was verified with a manometric column and a syringe pump concluding that one implant had still high conductivity while the other had low conductivity.
Conclusions: We described a model to directly measure hydraulic conductivity in a rabbit glaucoma surgery implant with iMvalv and calibration of Perkins tonometry. The drainage of each implant can be reliably quantified and measured.
Imvalv tube cannulated by a needle with a manometric fluid column for conductivity measurements.

**Commercial Relationships:** Fabio A. Guarnieri, CONICET (F), CONICET (P), iMvalv (I), UNER (F); Rodrigo M. Torres, iMvalv (C)

**Support:** PICT 2010-2090

**Program Number:** 2697  **Poster Board Number:** A0265  **Presentation Time:** 8:30 AM–10:15 AM

**Imvalv Implantation: exploratory study in rabbits**

*Rodrigo M. Torres*¹, Fabio A. Guarnieri.² ¹Ocular Surface & Immunology, Centro de Ojos Dr Lodolo, Colonia Avellaneda, Entre Rios, Argentina; ²BioMEMS Laboratory, Faculty of Engineering, University of Entre Rios (FI-UNER), Oro Verde, Argentina.  

**Purpose:** The iMvalv is an ocular implant with MEMS technology to produce aqueous humor drainage. It was built with silicone multiple layers, (for their plate and tube) and has the capability of an active mechanism powered by a spiral antenna and a hybrid microcircuit. This is the first exploratory in-vivo study in rabbits to implant it and to describe and evaluate its surgical, clinical and histological performance.

**Methods:** Five New Zealand male rabbits were anesthetized and his right eyes were operated (left eyes were controls) with similar equipment and technique utilized for humans glaucoma implants procedures. Briefly, after conjunctiva and tenon were opened (4 millimeters at the limbus), a pocket was created and the iMvalv plate was implanted. Then, the tube was introduced in the anterior chamber and conjunctiva was closed (sutured with nylon 10.0). Previously, intraocular pressure (IOP) were measured with Perkins tonometer (for both eyes) and measurements were taken again 1, 7, 21 and 50 days after surgeries. Also, clinical evolution were evaluated at the same time-points. Post-operative topical drops (gatifloxacin 0.3; dexametason 1%) were instilled four times a day during 10 days. At day 50, animals were euthanized, right eyes were enucleated and the histological study were performed (heatoxilin-eosine).

**Results:** From the five eyes, the first has suffered the tube extrusion one day after surgery and the animal was euthanized and excluded from the study. The remains four operated eyes finished the complete study and their IOP were lower than controls at all the different time-points (2-3mmHg versus 5-6mmHg in controls). However, one eye reach 6 mmHg one day after surgery (clinical evaluation shows fibrin reaction in the anterior chamber), which spontaneously decrease to 3 mmHg one week after (anterior chamber reaction disappear). No other clinical alteration were described in all of the eyes. The histological study shows foreign body tissue reaction in the implant area (the same in all of the eyes).

**Conclusions:** The iMvalv device were successfully implanted in four eyes from five and IOP were lower than controls during all of the study. Clinical and histological evolution were similar than could be observed in non complicated humans glaucoma valves implants surgeries. New studies will be necessary to improve the design and to probe all of the potential advantages of this new conceptual technology for glaucoma devices.

**Commercial Relationships:** Rodrigo M. Torres, None; Fabio A. Guarnieri, iMvalv (P)

**Support:** PICT 2010-2090

**Program Number:** 2698  **Poster Board Number:** A0266  **Presentation Time:** 8:30 AM–10:15 AM

**Comparison of Outcomes of Resident- vs. Attending-Performed Baerveldt Glaucoma Drainage Device (GDD) Surgery**

Steven Tucker, Allison Weinstock, George Papachristou, Christine Callahan. Ophthalmology, The Pennsylvania State University - College of Medicine, Hershey, PA.

**Purpose:** Outcome data reviewing the efficacy and safety of resident-performed GDD surgeries is lacking. This retrospective cohort study compared the success and complications of resident- to attending-performed Baerveldt GDD surgery at a US residency program.

**Methods:** A retrospective review was performed of patients who underwent Baerveldt GDD surgery at Penn State Hershey Eye Center from Jan. 2010 to July 2014. Inclusion criteria into the resident-performed group consisted of age>18, pre-operative diagnosis of glaucoma or ocular hypertension warranting surgical intervention, and majority of surgery performed by resident under direct attending supervision. The same criteria applied for the attending group except the attending performed the majority of the surgery. A total of 115 GDD cases were performed during the study period. 35 met the criteria for inclusion into the resident group and were...
Comparison of surgical outcomes between Ex-Press Shunt and Non Penetrating Deep Sclerectomy at 3 months follow-up

May E. Cadena, Antonio Remolina, Armando Castillojos-Chévez, Fernando Del Real, Lorena Tora Hoffner, Jesus Jimenez-Roman.
Glaucoma, Asociación Para Evitar la Ceguera en México, Mexico, Mexico.

Purpose: Compare these two techniques in order to determine their safety and effectiveness in IOP control.

Methods: Retrospective study of patients with diagnosis of glaucoma who underwent glaucoma surgery. The techniques evaluated were Ex-Press shunt implantation (ESI) versus Non Penetrating Deep Sclerectomy (NPDS). We followed them through 3 months with intraocular pressure (IOP), visual fields (VF), complication rate and requirement of glaucoma medication.

Results: 19 patients (12 females and 7 males) were included in this study, 9 underwent NPDS and 10 ESI. In the NPDS group there was a mean age of 59 years (±15.47), all of them with diagnosis of Primary Open Angle Glaucoma. VA pre-intervention average was 0.34 LogMar (±0.27). VA post-intervention was 0.46 LogMar (±0.35). Basal IOP of 14.75 mmHg (±3.77). Post-surgical evaluation went as follows: 1 day IOP 18.11 mmHg (± 8.23), 1 week IOP 9.62 mmHg (±4.4), 1 month IOP 11 mmHg (±3), 3 months IOP13.62 mmHg (±3.62). VF -11.06 (±8.4).

In the ESI group the mean age was 47 years (±24.96). Only in 1 patient mitomycin was trans-surgically applied. VA pre-intervention average was 0.21 LogMar (±0.24). VA post-intervention was 0.25 LogMar (±0.35). Basal IOP of 29.2 mmHg (±11.35) Post-surgical evaluation: 1 day IOP 6 mmHg (±6.25),1 week IOP 6.4 mmHg (±5.71), 1 month IOP 12.5 mmHg (±3.62), 3 months IOP 11.9. VF -21.43 MD (±5.62). Post-surgically 5 patients required 5 fluorouracil application.

Conclusions: Both groups (NPDS and ESI) were analized using ANOVA and we found no statistically significant difference between IOPs during the follow-up period. There is no difference between both techniques efficacy, however a larger sample of patients will be needed to verify this data.

Commercial Relationships: May E. Cadena, None; Antonio Remolina, None; Armando Castillojos-Chévez, None; Fernando Del Real, None; Lorena Tora Hoffner, None; Jesus Jimenez-Roman, None

Program Number: 2700 Poster Board Number: A0268
Presentation Time: 8:30 AM–10:15 AM
The Ex-PRESS glaucoma shunt versus non penetrant deep sclerectomy in open-angle glaucoma: a prospective randomized study, Interim results.

Alfonso Anton-Lopez1, Marcos Muñoz2, Javier Moreno-Montanes3, Jose Urcelay4, Alfonso Gil5, marta castany6, Alberto Martinez-Compardre7, Francisco Muñoz-Negrete8, Antonio Morilla-Grasa9, Virgina Garcia7. 'Glaucoma / Research, ICR and Parc Salut Mar, Barcelona, Spain; 2Glaucoma, ICR, Barcelona, Spain; 3Glaucoma, Clinica Universitaria de Navarra, Navarra, Spain; 4Glaucoma, Hospital Gregorio Maranon, Madrid, Spain; 5Hospital San Eloy, Bilbao, Spain; 6Hospital Ramón y Cajal, Madrid, Spain; 7Hospital Vall d Hebron, Barcelona, Spain.

Purpose: Purpose: Express device and non-penetrant deep sclerectomy (NPDS) are effective at reducing intraocular pressure (IOP) but have not been compared in combined surgery. This are interim results of a prospective, multicenter, single-blinded, randomized trial to evaluate efficacy and safety of Ex-PRESS implant vs. NPDS combined with cataract surgery at 12 months.

Methods: Methods: Eyes were randomly assigned to either Ex-PRESS or NPDS. Main outcomes measures were mean IOP, success rate, postoperative medications and incidence of complications. Complete success was defined as an IOP of < 18 mmHg without medications. Total sample size is 100 subjects, 50 in each group. Double tail Student t test was used to compare both groups. Inclusion criteria: Primary open angle uncontrolled glaucoma. Exclusion criteria: secondary glaucoma other than pigmentary and pseudoxefoliation; previous glaucoma surgery, myopia > 6 diopters, hyperopia > 5 diopters, tilted discs or advanced glaucoma. Interventions: Phacoemulsification with Ex-PRESS device or NPDS. Postoperative visits: day 1, weeks 1, 2 and 3 and months 1, 3, 6 and 12. Adverse events were checked in every visit.

Criteria for withdrawal were surgical complications which could influence the result or patient's wish.

Results: Results: As of now 62 of the eyes included in the study have completed over 3 months of follow up. ExPRESS group represented 51% (32 cases) and NPDS 49% (30 cases). Mean age (SD) was 76 (± 9) years old. Mean preoperative IOP was 19 (±4) mmHg. Mean postoperative IOP in the ExPRESS and in the NPDS group, respectively: at month 3 was 12.28 (±4.5) mmHg vs. 12.6 (±4.8) mmHg; at month 6 was 13.2 (±4.6) mmHg vs. 12.9 (±3.8) mmHg and at month 12 was 13.4 (±4.7) mmHg vs. 13.5 (±3.6) mmHg. IOP was significantly reduced with surgery in both group at all follow up times (p<0.05). No significant differences were found in IOP between groups at any follow up time. At month 6 complete success rates was 85% and 84% in ExPRESS and NPDS groups respectively. Complications: No major complications occurred in either group.

Conclusions: CONCLUSIONS: In this interim analysis of combined cataract and glaucoma surgery, the ExPRESS implant has been observed to be as effective and safe to reduce IOP as NPDS with similar levels of postoperative interventions and complications.
Ab interno cyclodialysis: Retrospective safety and efficacy outcomes

Brian McMillan, Tony Realini, Kenneth Mitchell. Ophthalmology, West Virginia University, Morgantown, WV.

Purpose: We performed a retrospective, observational clinical study to determine the safety and efficacy of ab interno cyclodialysis as a conjunctival sparing method of intraocular pressure reduction in eyes with glaucoma.

Methods: 29 consecutive patients aged 18 years or older who underwent ab interno cyclodialysis for treatment of various glaucomas (POAG: N=18, NVD: N=5, Uveitic N=2), chronic ACG (N=1), Pigmentary (N=1), NTG (N=1), Sturge-Weber (n=1) were followed for up to 12 months. The primary outcome measure was IOP reduction from baseline with secondary endpoints: success/failure, number of glaucoma medications and effect on visual acuity. Absolute success was defined as a percent IOP reduction from baseline of 15% or greater on no medications, and qualified success requiring the addition of medications. Success/failure was based on the first 3 years of follow-up.

Results: Of 29 subjects, 6 failed before 1 year and 7 were lost to follow-up. Mean pre-op IOP mmHg (25.38 +/- 8.20) was statistically significantly reduced at 1 wk 16.95 +/- 10.87 (p=0.002), 1 mon 18.58 +/- 11.60 (p=0.025), 3 mon 16.95 +/- 8.43 (p=0.003), 6 mon 17.75 +/- 9.07 (p=0.036) and 12 mon 17.13 +/- 9.48 (p=0.036).

Success at 12 months among those not lost to follow-up was 55% (12/22). The average pre-op glaucoma drops 2.79 +/- 0.77 increased with the addition of pilocarpine at 1 day 3.18 +/- 1.06 and 1 wk 2.96 +/- 1.57, and decreased at 1 mon 1.84 +/- 1.55, 3 mon 1.87 +/- 1.51, 6 mon 1.94 +/- 1.58, 12 mon 2.00 +/- 1.61.

An avg of 4.6 +/- 3.76 lines of vision were lost at day 1, returning to baseline at 1 +/- 1.59 mon. 4 patients did not return to baseline (2 absolute success, 1 qualified, 1 failure).

Hyphema was the most common complication seen in 83% at day 1 and typically resolved by 1 month. Additional complications included vitreous prolapse, hypotony maculopathy, hyphema requiring alteplase, phacodonesis, PCIOL dislocation, cataract.

Conclusions: Ab interno cyclodialysis may represent an effective means of lowering intraocular pressure while offering an alternative to more traditional procedures which result in conjunctival scarring. The procedure can result in significant complications and future studies will be needed to better describe the optimal indications for clinical use.

Commercial Relationships: Brian McMillan, None; Tony Realini, None; Kenneth Mitchell, None
Support: Research to Prevent Blindness

Program Number: 2701 Poster Board Number: A0269
Presentation Time: 8:30 AM–10:15 AM

Success rates were evaluated using Kaplan-Meier survival analysis.

Results: Eighty-four eyes from 83 patients were enrolled including 41 eyes in the PS group and 43 eyes in the PS group. Eyes with PS had at least one prior surgical procedure consisting of trabeculectomy (n=30), penetrating keratoplasty (n=7), pars plana vitrectomy (n=7), and scleral buckle (n=4). Mean baseline age (years) in PT (72.15) and PS (70.12) groups were similar (p=0.55). Mean baseline IOP (mmHg) and medication use in PS eyes (27.6±9.9 and 3.6±0.97) were significantly greater (p=0.01 and 0.03) compared to PS eyes (23.4±8.8 and 3.1±1.2). At 3 years, IOP (mean ± 5D) was 14.5±4.3 in the PS group and 13.9±4.1 in the PS group (p=0.70), and the number of glaucoma medications (1.93±1.4 and 2.32±1.5) was similar (p=0.45). The cumulative probability of failure during the first 3 years of follow-up was 47% in the PT group and 39% in the PS group (p=0.48, Log Rank test). The rate of reoperation for glaucoma was 31% and 22% (p=0.21, Log Rank test) in the PT and PS groups, respectively.

Conclusions: Glaucomatous eyes with and without prior conjunctival scarring have similar failure rates after GDD surgery. Both groups had similar IOP reduction and use of supplemental medical therapy at 3 years.

Commercial Relationships: Tracy M. Wright, None; Iman Goharian, None; William J. Feuer, None; Wei Shi, None; David S. Greenfield, None

Program Number: 2702 Poster Board Number: A0270
Presentation Time: 8:30 AM–10:15 AM

Support: Conjunctival scarring represents a major risk factor for trabeculectomy failure. The purpose of this study was to compare the 3-year clinical outcomes of glaucoma drainage device (GDD) surgery in glaucomatous eyes with and without prior conjunctival incisional surgery.

Methods: A retrospective chart review was conducted to identify glaucoma patients that had undergone Baerveldt™ GDD surgery (350 mm²) for uncontrolled intraocular pressure (IOP) from 2006 to 2010. All eyes had a minimum of 6 months of postoperative follow-up. Eyes were categorized as primary tube (PT) or prior scarring (PS) based upon the presence or absence of prior conjunctival incisional surgery. Failure was defined as IOP > 21 mmHg or not reduced by 20% below baseline on two consecutive follow-up visits after 3 months, reoperation for glaucoma, or loss of light perception vision. Success rates were evaluated using Kaplan-Meier survival analysis.

Results: Forty-eight eyes from 44 patients were enrolled including 41 eyes in the PT group and 43 eyes in the PS group. Eyes with PS had at least one prior surgical procedure consisting of trabeculectomy (n=30), penetrating keratoplasty (n=7), pars plana vitrectomy (n=7), and scleral buckle (n=4). Mean baseline age (years) in PT (72.15) and PS (70.12) groups were similar (p=0.55). Mean baseline IOP (mmHg) and medication use in PS eyes (27.6±9.9 and 3.6±0.97) were significantly greater (p=0.01 and 0.03) compared to PS eyes (23.4±8.8 and 3.1±1.2). At 3 years, IOP (mean ± 5D) was 14.5±4.3 in the PS group and 13.9±4.1 in the PS group (p=0.70), and the number of glaucoma medications (1.93±1.4 and 2.32±1.5) was similar (p=0.45). The cumulative probability of failure during the first 3 years of follow-up was 47% in the PT group and 39% in the PS group (p=0.48, Log Rank test). The rate of reoperation for glaucoma was 31% and 22% (p=0.21, Log Rank test) in the PT and PS groups, respectively.

Conclusions: Glaucomatous eyes with and without prior conjunctival scarring have similar failure rates after GDD surgery. Both groups had similar IOP reduction and use of supplemental medical therapy at 3 years.

Commercial Relationships: Tracy M. Wright, None; Iman Goharian, None; William J. Feuer, None; Wei Shi, None; David S. Greenfield, None

Program Number: 2703 Poster Board Number: A0271
Presentation Time: 8:30 AM–10:15 AM

Purpose: Neovascular glaucoma (NVG) requires aggressive management to prevent secondary angle closure; PAS formation limits the ability to control the intraocular pressure (IOP) without surgery and thus visual prognosis is poor. Aqueous tube shunts at Los Angeles County/University of Southern California Medical Center were reviewed. Patients with prior tube surgeries may improve visual prognosis and longterm IOP.

Methods: A retrospective chart review of 90 eyes that received tube shunts at Los Angeles County/University of Southern California Medical Center were reviewed. Patients with prior tube surgeries...
within the 4 month review period were excluded. Patients were stratified into early and late groups. Patients who received surgery within 2 weeks of diagnosis were placed in the early group and those after 2 weeks in the late group. Primary outcome measures were change in visual acuity from baseline presentation and change in IOP. Categorical visual acuity measures were assessed with Fisher’s exact test and two-tailed Student’s t-test was used to analyze IOP.

Results: 43 eyes (47.8% of eyes reviewed) received tubes with NVG as an indication. Nine (20.9%) received tubes within 2 weeks of diagnosis. 34 (80.1%) received tubes after 2 weeks. Early and late groups received surgery within 6.1±4.4 and 116±184.1 days, respectively. There was no statistical difference between early and late treatment groups in presenting IOP (early 53.3±18.6, late 53.3±18.6; p = 0.25) or IOP after medical therapy but prior to tube placement (early 40.4±22.0, late 39.6±14.5; p = 0.89). There was also no difference in postoperative visual acuity from baseline between groups on postoperative day 1, week 2, week 6, and month 4 (Fisher’s exact test, p = 0.55, p = 0.61, p = 0.99, p = 0.31 respectively). Additionally, there was no significant difference in IOP between groups at the 4 month follow up (4 month early 15.3±5.4, late 15.8±5.7; p = 0.97).

Conclusions: Our results suggest that early tube placement for NVG does not improve visual prognosis or postoperative IOP. However, these findings must be interpreted with caution due to small sample size. Inability to control pressure with medical management likely dictates surgical timing over a therapeutic window. Further analysis is required to elaborate on the timing and effectiveness of tube surgery in NVG.

Commercial Relationships: Jian Do, None; Jessica Cao, None; Sahar Bedrood, None; Malvin Anders, None; Jesse berry, None
Support: Research to Prevent Blindness, New York, NY 10022

Program Number: 2704 Poster Board Number: A0272
Presentation Time: 8:30 AM–10:15 AM

Baerveldt shunt surgery versus combined Baerveldt shunt and phacoemulsification: a prospective comparative study

Purpose: To examine the efficacy and safety of Baerveldt tube (BT) implantation compared to combined phacoemulsification and Baerveldt tube implantation (PBT) in refractory glaucoma at two years.

Methods: Seventy six patients with medically uncontrolled glaucoma underwent either BT Implantation with Phacoemulsification (Group PBT; n=38) or BT Implantation alone (group BT; n=38, pseudophakic eyes only). Groups were matched for glaucoma subtype and preoperative IOP. Pre and post-operative measures recorded included patient demographics, visual acuity, IOP, number of anti-glaucoma medications prescribed and all complications. Where possible all patients were followed up for a minimum of 24 months.

Results: There was a significant difference in failure rates between groups at 24 months (PBT 29% vs BT 9%, p=0.02). The PBT group had fewer previous glaucoma surgeries (excluding phacoemulsification; 23 eyes vs 30 eyes) and included significantly younger patients (61 vs 69 yrs, p=0.03). There was no significant difference for PBT vs BT in preoperative baseline ocular characteristics: median IOP =23mmHg vs 23mmHg, p=0.86; mean number of anti-glaucomatous =3.1 vs 2.7, p=0.21; and median VA=0.5 logMAR vs 0.3 logMAR, p=0.07. At year two: median IOP =14mmHg vs 11 mmHg, p=0.07; mean number of anti-glaucomatous medications=0.9 vs 1.0 p=0.73; median VA=0.3 vs 0.5, p=0.28.

Complication rates were similar between the two groups (8% vs 10%).

Conclusions: There were statistically significant differences in failure rates at 24 months. Median IOP was higher in the PBT group at 24 months but this did not reach significance. This suggests that simultaneous phacoemulsification does have a marked effect on tube function.

Commercial Relationships: Kenza Bradly, None; Mohamad El Wardani, None; Ciara Bergin, None; Farid Achache, None; Eamon Sharkawi, None

Program Number: 2705 Poster Board Number: A0273
Presentation Time: 8:30 AM–10:15 AM

Outcomes associated with reduced suture placement during glaucoma tube shunt implantation
Caroline N. Pham1, Daniel Vu1, Christopher Starr2, Nathan M. Radcliffe3, 1New York University, New York, NY; 2Department of Ophthalmology, NYU Langone Medical Center, New York, NY; 3Department of Ophthalmology, Weill Cornell Medical College, New York, NY.

Purpose: To compare the outcomes of different surgical techniques for glaucoma tube shunt surgery through sutureless placement of the patch graft, tube plate, and/or tube including intraocular pressure (IOP) changes and complications.

Methods: This was a retrospective cohort study of consecutive surgeries in which tube shunts were placed using various techniques between July 2008 and September 2013. Patients were divided into groups based on whether the patch graft (PG), tube plate, and/or tube were sewn or simply placed without anchoring sutures. Operative details including the tube shunt device type and location of tube tip placement were recorded. Baseline and post-op IOP measurements, number of glaucoma medications, and adverse events were documented and compared using two sample t-tests.

Results: For 85 participants of mean age 63.0 ± 18.5, the mean baseline IOP was 27.7 ± 9.5 mm Hg. While 20 patients had the tube shunt device placed using a sewn PG/plate/tube, 16 had a sewn plate/tube, 25 had only a sewn tube, and the remaining 24 had sutureless placement of the PG, plate, and tube. The conjunctiva was sewn closed with 8-0 polyglactin in all cases. Following implantation of the tube shunt device, IOP at post-op day 1, week 1, and month 1 were 16.6 ± 10.5 mm Hg, 18.3 ± 12.2 mm Hg, and 18.8 ± 10.0 mm Hg, respectively (p<0.0001). The decrease in number of glaucoma medications at baseline and post-op visits was also statistically significant (p<0.0001). There were no significant differences for IOP reduction and number of medications at each visit between the groups based on surgery technique. Furthermore, 0% of patients experienced any PG/tube/plate migration or any cases of exposed tube due to patch graft migration.

Conclusions: Sutureless placement of the patch graft, plate, and/or tube during glaucoma tube shunt implantation is associated with comparable outcomes versus the traditional technique. Performance of this technique reduces the overall number of steps in the surgical procedure. There were no cases of any tube shunt migration or receding conjunctiva in this study.

Commercial Relationships: Caroline N. Pham, None; Daniel Vu, None; Christopher Starr, None; Nathan M. Radcliffe, None

Program Number: 2706 Poster Board Number: A0274
Presentation Time: 8:30 AM–10:15 AM

Novel Anterior Chamber Tube Shunt with Tissue Autograft
KYLE PACKER1, 2, Sien Chen1, Larry Andreo1, Jake Lowry1, Steve Zumbro1, 1Eisenhower Army Medical Center, Fort Gordon, GA; 2Walter Reed National Military Medical Center, Bethesda, MD.

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**Purpose:** To construct an anterior chamber tube shunt with saphenous vein autografts and compare functional outcomes with those of Ahmed valve implants.

**Methods:** Twelve adult male New Zealand White rabbits were divided into two cohorts of six rabbits in this study, the first arm includes autograft vs the control fellow eye. We harvested saphenous venous grafts to serve as a functional reservoir in a tube shunt system. The venous graft was secured to an Ahmed model TE tube extender and implanted beneath the conjunctiva following the standard method aqueous drainage device insertion. The second arm includes Ahmed model FP8 valves vs the control fellow eye. The rabbits were housed in an IACUC approved facility for 60 days postoperatively and received a standard medication regimen. 30 minutes prior to sacrifice, the rabbits were sedated and 1cc of cationic ferritin tracer was injected in the operated eye via intracameral method. The operated eye was enucleated and half of the graft site was excised and flash frozen in liquid nitrogen for ELISA analysis. The remainder of the graft site was tagged with a 6.0 nylon suture and placed in formalin fixative for 24h prior to pathologic sectioning.

**Results:** We assayed four main outcome measures. (1) Intraocular pressure on operated eye vs. the control fellow eye. (2) Patency of tube shunt apparatus at 2 months evaluated histologically with cationic ferritin tracer and Prussian Blue stain. (3) Histologic evidence of inflammation and fibrosis in and around the apparatus at 2 months with H&E stain. (4) Immunologic assay for TNF alpha in the draining aqueous humor. Initial results on six rabbits with Ahmed implants and four rabbits with autografts demonstrate a statistically significant difference in intraocular pressure among control, Ahmed, and autograft eyes. Histologic samples are in process. Initial ELISA of aqueous humor TNFalpha measurements shows a statistically significant difference between control and Ahmed eyes and between control and autograft eyes. One autograft rabbit has not completed the protocol at submission date.

**Conclusions:** Study is ongoing, however our hypothesis is that inflammation and fibrosis will be decreased in this design compared to standard designs as the immune system will recognize the graft as 'self' and not as a foreign body. With decreased fibrosis, the flow of aqueous humor can be maintained providing an improved functional outcome compared to standard surgical therapy.
Program Number: 2707 Poster Board Number: A0275
Presentation Time: 8:30 AM–10:15 AM

Perioperative course and midterm follow-up of FP8 (pediatric) Ahmed glaucoma valves in adults
Andrew C. Crichton1, Annalise Abbott1. 1Division of Ophthalmology, University of Calgary, Calgary, AB, Canada; 2University of Alberta, Edmonton, AB, Canada.

Purpose: Purpose: To determine the safety and efficacy of the surgical implantation of FP8 Ahmed Glaucoma Valves in adult patients focusing on three cohorts consisting of 1. patients over the age of 85, 2. patients who have had a previous Ahmed valve implanted in addition to the FP8, and 3. patients who have only had the FP8 and are under the age of 85.

Methods: Methods: A retrospective review of the medical records of 47 patients over the age of 18 (49 eyes) who underwent FP8 Ahmed Glaucoma Valve implant surgery by Dr. Andrew Crichton in Calgary, Alberta with a minimum of six months follow-up. Preoperative, intraoperative and postoperative data was recorded including age, ocular history, best-corrected visual acuity, intraocular pressure (IOP), number of glaucoma medications and surgical complications or reoperations. Outcome measures include change in IOP, visual acuity, number of glaucoma medications and complications related to surgery. Two-tailed Student's t-test was used for statistical analysis.

Results: Results: Of the 47 patients reviewed, 23 were male and 24 were female with a mean age of 74.4±17.5 years. IOP was reduced in the total patient group from a mean of 24.6±7.5mmHg (n=49) at baseline to 17.8±4.9mmHg at 6 months (n=48, P<0.001), 16.9±5.9mmHg at 12 months (n=33, P<0.001) and 16.3±5.7mmHg at 18 months (n=21, P<0.001). The number of glaucoma medications decreased from a mean of 3.3±1.2 (n=49) to 1.6±1.4 at 6 months (n=48, P<0.001), 1.5±1.3 at 12 months (n=33, P<0.001) and 1.8±1.4 at 18 months (n=21, P<0.001). Visual acuity in the operative eye decreased from baseline at 6 months by a mean of 1.1±2.4 lines (n=48), 0.7±2.6 lines at 12 months (n=33) and 0.8±2.1 lines at 18 months (n=21). Statistically significant decreases in IOP and number of glaucoma medications were also seen at all visits in the three cohorts. Two patients required additional glaucoma surgery to control pressures. The immediate post-operative course was relatively stable with mean IOPs between 10.7-12.7mmHg in the first week.

Conclusions: Conclusion: The FP8 Ahmed Glaucoma Valve appears to be a viable device for the surgical management of glaucoma in adults. Potential advantages include fewer complications due to the smaller endplate and its use as an adjunctive therapy. The results indicate it can be effective in the three cohorts: advanced age, secondary valve implantation and primary valve implantation.

Commercial Relationships: Andrew C. Crichton, None; Annalise Abbott, None
implanted after 2011 received injections of MMC and/or 5-FU (+injection) postoperatively whereas none of the valves implanted before or during 2011 received adjunctive treatment (-injection). IOP, BCVA, and the number of glaucoma medications were examined at the preoperative visit, and at postoperative time points of one month, 3 months, 6 months, and one year. The number and types of early (occurring ≤ one month postoperation) and late (occurring > one month postoperation) complications were also recorded. The rates of treatment failure, defined as reoperation for glaucoma, or as two consecutive visits after 3 months in which the patient had inadequately reduced IOP (IOP > 21 mm Hg or < 20% reduction below preoperative baseline), were calculated for each group.

**Results:** The +injection group included 38 patients and 44 eyes, and the -injection group included 21 patient and 22 eyes (Table 1). Preoperative IOP and the number of glaucoma medications were comparable between groups (Table 2). At postoperative month one, IOP and the number of glaucoma medications were significantly lower in the +injection compared to the -injection group (p = 0.04 and 0.002, respectively). IOP and the number of glaucoma medications were comparable at all other time points. The rates of early complications were comparable between the +injection and -injection groups, with 16 (36%) and 10 (45%) eyes, respectively. Five eyes (12%) experienced late complications in the +injection group, and a single (5%) late complication occurred in the -injection group (p < 0.05). For eyes with follow-up duration of ≥ 12 months, treatment failure occurred in 7 eyes in both groups (20 and 37%, for +injection and -injection groups, respectively; p < 0.05).

**Conclusions:** The use of anti-fibrotic was associated with: 1) blunting of the hypertensive phase, 2) fewer treatment failures, and 3) more late complications for a follow-up duration of ≥ 12 months. This study suggests that anti-fibrotics could play a role in Ahmed valve implantation surgery.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of subjects/Number of eyes</th>
<th>Age (yr)</th>
<th>Sex</th>
<th>Latentast (mmHg)</th>
<th>Diagnosis (POAG/NMAG/CAUG /PACG/Other)</th>
<th>Previous Glaucoma surgery (yes)</th>
<th>Number of MMC/5-FU injections (Mean ± SD)</th>
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<td>70±8.10</td>
<td>36/0</td>
<td>25/19</td>
<td>28/3/9/16</td>
<td>10</td>
<td>4.5 ± 2.0</td>
</tr>
<tr>
<td>-injection</td>
<td>21/22</td>
<td>70±13.7</td>
<td>20/1</td>
<td>14/8</td>
<td>12/3/2/14/4</td>
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**Table 1**

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<th>Time point</th>
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<th>IOP (mmHg)</th>
<th>Number of eyes</th>
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<td>17.41</td>
<td>6.14</td>
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</tbody>
</table>

**Table 2**

**Commercial Relationships:** Qi N. Cui, None; Yen-Cheng Hsia, None; Nitisha Mehta, None; Naseri Ayman, None; Ying Han, None.

**Support:** This work was made possible in part, by the Research to Prevent Blindness Unrestricted Grant; NIH-NEI Core Grant EY002162 – Core Grant for Vision Research; and That Man May See, Inc.

**Program Number:** 2709 Poster Board Number: A0277
**Presentation Time:** 8:30 AM–10:15 AM
**Clinical Outcomes of Pars Plana Tube Surgery**

**Mona Kaleem1,2, Nakul Singh1, Edward J. Rockwood2.**

1 Ophthalmology, University of Maryland, Baltimore, MD; 2 Cole Eye Institute, Cleveland Clinic, Cleveland, OH; 3 Biostatistics, Harvard School of Public Health, Boston, MA.

**Purpose:** To describe one year clinical outcomes of patients undergoing pars plana tube shunt surgery with an Ahmed Glaucoma Implant (PP AGI).

**Methods:** Records of patients with a pars plana vitrectomy and aqueous tube shunt surgery at the Cole Eye Institute between 2001 and 2013 were retrospectively reviewed. Patients were identified by CPT codes for pars plana vitrectomy (67036) and aqueous shunt to extraocular reservoir (66180) or revision of shunt to extraocular reservoir (66185). Only those with an Ahmed Glaucoma Implant (model FP-7 or FP-8) were included in the study. Patients with less than one year follow up data were excluded. Data collected included demographics, pre and post operative visual acuity, intraocular pressure (IOP), number of medications, and complications. Statistical analysis was performed with Stata version 10. Changes in visual acuity were tested using the Wilcoxon signed rank test for matched samples. Differences in IOP were tested using the paired t-test. Differences in medications were tested using the student’s t-test. Risk factors for failure were assessed using univariate exact logistic regression.

**Results:** Complete data was available on 57 patients with an average follow up time of 38.5 months. Average age of patients was 64.1 years with a range from one to 88 years. OAG (43.9%), developmental (19.3%), and inflammatory/uvetic glaucoma (12.3%) were the leading diagnoses amongst those undergoing a PP AGI. One third of patients (29.8%) had previously undergone a glaucoma filtering procedure. Visual acuity stayed the same or improved in 73.7% (p=0.07). IOP was lowered from 31.2 mm Hg to 16.3 mm Hg (<0.001). A decrease in the number of medications from 2.9 preoperatively to 0.9 postoperatively was observed (p<0.001). The leading complication was corneal decompensation (14%). Two patients required subsequent glaucoma surgery. Two patients experienced a complication related to the posterior segment. There was no plate or tube erosion. Overall surgical success was defined as IOP between six and 21 on or off medications, no loss of light perception vision, and no further glaucoma surgical intervention. Success was achieved in 78.9% of patients (CI=66.1-88.6%). Risk factors for failure were assessed but none were found to be statistically significant.

**Conclusions:** PP AGI surgery is a safe surgical option for complex glaucoma cases. Corneal decompensation remains a challenge, however, issues of plate or tube erosion are uncommon.

**Commercial Relationships:** Mona Kaleem, None; Nakul Singh, None; Edward J. Rockwood, None
Purpose: To determine the incidence of long-term vision loss versus transient loss and recovery after tube shunt placement and to identify potential risk factors associated with permanent visual loss.

Methods: The medical records of 242 eyes in 217 patients undergoing Baerveldt tube shunt implantation were reviewed from Doheny and USC Eye Institutes between January 1998 and May 2011, as well as MEEI from November 2005 to January 2012. Postoperative vision loss was categorized as mild or moderate (decrease in Snellen visual acuity of 3-5 lines) vs severe (decrease of >5 lines in Snellen visual acuity or semiquantitative categories of low vision). Postoperative vision loss was considered permanent if visual acuity did not have a return of 3 lines within a 6-month follow-up period. Preoperative, intraoperative, and postoperative variables of patients with permanent vision loss were compared to those of patients with transient or no vision loss.

Results: Permanent vision loss occurred in 38 of 242 eyes (15.7%): 24 (63.2%) had mild or moderate vision loss, and 14 (36.8%) had severe vision loss. 10 of 24 eyes (41.2%) with permanent mild or moderate vision loss and 4 of 14 eyes (28.6%) with permanent severe vision loss had no attributable cause. On univariate analysis, the number of quadrants with split fixation (p=0.022), post-operative day one (POD1) visual acuity (p=0.028), and the difference between preoperative and POD1 visual acuity (p=0.015) were all risk factors for any degree of permanent vision loss. On multivariate analysis, only POD1 visual acuity was found to be significant (p=0.012). Looking specifically at cases of severe permanent vision loss, no variables were found to be significant, but several reached near-significance on univariate analysis: preoperative IOP (p=0.058), the number of quadrants with split fixation (p=0.062), and POD1 visual acuity (p=0.081). On multivariate analysis, POD1 visual acuity reached near clinical significance (p=0.054). Of note, all patients with severe, permanent visual loss were female.

Temporary vision loss occurred in 84 of 242 eyes (34.7%): 50 (59.5%) had mild or moderate vision loss, and 34 (14.0%) had severe vision loss.

Conclusions: Permanent, severe vision loss is not uncommon after Baerveldt tube shunt implantation. Predictive risk factors for permanent vision loss are the degree vision loss on POD1 and possibly the presence of split fixation on preoperative HVF.

Commercial Relationships: Esther L. Kim, None; Marc Toetberg-Harms, None; Jeffrey S. Tran, None; Jasdeep S. Chahal, None; Douglas J. Rhee, None; Vikas Chopra, None; Rohit Varma, None; Brian A. Francis, None

Support: An unrestricted grant from Research to Prevent Blindness, New York, NY 10022

Program Number: 2711 Poster Board Number: A0279
Presentation Time: 8:30 AM–10:15 AM
Outcomes of Glaucoma Drainage Implant vs Combined Glaucoma Drainage Implant and Fluocinolone Acetonide Intravitreal Implant for Management of Uveitic Glaucoma

Ingrid Chang, Divakar Gupta, Philip Chen, Mark A. Slabaugh, Gurunadh Vemulakonda. Ophthalmology, University of Washington, Seattle, WA.

Purpose: To assess the safety and efficacy of glaucoma drainage implant (GDI) vs GDI combined with fluocinolone acetonide intravitreal implant (Retisert; Bausch and Lomb Inc) in the treatment of chronic uveitic glaucoma.

Methods: Retrospective case review of patients with uveitic glaucoma who underwent GDI or GDI combined with Retisert performed by a single glaucoma surgeon (MAS for GDI or MAS and GAV for combined cases) from January 2006 to June 2014. Outcome measures included intraocular pressure (IOP), glaucoma medication use, complications, and additional glaucoma surgery.

Results: 31 eyes in 25 patients were studied, with a mean age (±SD) of 45.1± 18.1, and mean follow-up duration of 70 weeks. There were 14 eyes in the GDI only group (13 Ahmed, 1 Baerveldt), and 17 eyes in the combined group (17 Ahmed). Prior to surgery, the GDI only group had a mean IOP of 32.0 ±8.35 mmHg on mean of 3.1 ±0.88 topical glaucoma medications. The combined group had a mean IOP of 18.5± 7.08 mmHg on a mean of 1.56 ±1.55 topical glaucoma medications. The pre-operative mean IOP and number of glaucoma drops were lower in the combined group (p<0.001 and p=0.002, respectively). At one year, mean IOP was 15.4 ±6.21 mmHg in the GDI group and 12.2 ±3.19 mmHg in the combined group (p=0.16). At one year, the mean IOP was lower compared to pre-operatively for both GDI only and combined group (p<0.001 and p=0.01 respectively). Glaucoma medications at one year were 1.57 ±0.98 in the GDI only group vs 0.08 ±0.29 in the combined group (p>0.001), which were significantly lower compared to pre-treatment for both GDI alone and combined group (p=0.002 and p=0.003, respectively). Hypotony occurred in 3 patients (21.4%) in the GDI only group and 3 patients (17.7%, p= 0.81) in the combined group. HypHEMA occurred in 1 patient (7.1%) in the GDI only group, and endophthalmitis occurred in 1 patient (7.1%) in the GDI only group. One patient (5.9%) in the combined group received a second Ahmed GDI for intraocular pressure control.

Conclusions: Both the GDI only and combined method were effective in lowering IOP and reducing the number of glaucoma medications at 1 year after treatment. The use of fluocinolone acetonide intravitreal implants did not result in worse IOP control nor more complications. Complications included hypotony, hyphema and endophthalmitis.

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Comparison of Pre-Operative Characteristics and Tube Shunt Model in the Long-Term Surgical Management of Glaucoma

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Purpose: To evaluate the long-term outcomes of tube shunt surgeries (IOP, need for medications) performed at a tertiary attending medical practice according to tube shunt type (Ahmed FP-7, Baerveldt 103-250 and Baerveldt 101-350) and baseline patient characteristics (gender, ethnicity, glaucoma type).

Methods: A retrospective chart review was performed on all tube shunt surgeries performed in the Baylor College of Medicine faculty practice between 1/1/2000 and 6/30/2010. Patients were not excluded based on type of tube shunt implant, past ocular history, past surgical history, or type of glaucoma. The primary outcome was intraocular pressure (IOP) and secondary outcomes included IOP difference from baseline, medication need, visual acuity, and complications. Data was collected for the following time points: post operative month (POM) 1, POM 2, POM 6, post operative year (POY) 1, POY 2, and POY 3. Parametric and non-parametric statistics were used as required.

Results: Mean IOP by did not differ according to tube shunt type, gender, or glaucoma type, but did differ according to ethnicity.
Results: 211 patients (112 male, 99 female) were included in the analysis. The mean age of all participants was 61.93 years. Patient ethnicities were 90 Caucasian, 28 Hispanic, 79 Black, and 14 Asian. 90 patients had primary open angle glaucoma (POAG), while 121 had a non-POAG glaucoma diagnosis including secondary, inflammatory, neovascular, traumatic, chronic angle closure, congenital, steroid-induced, developmental, and low tension. 47 patients received an Ahmed Glaucoma Valve FP7 (New World Medical, Rancho Cucamonga CA), 63 received a Baerveldt Glaucoma Implant (BGI) 103-250 (Abbott Medical Optics, Abbott Park, IL) and 101 received a BGI 101-350. The mean baseline IOP was 28.67 mmHg with a standard deviation (SD) of 11.34. At three years of follow up, the mean IOP was 15.65 mmHg with a SD of 6.94. The mean IOP reduction at three years of follow up was 13.01 mmHg with a SD of 12.27. The mean number of IOP lowering medications at three years of follow up was 1.63 with a SD of 1.29. 18 patients (8.5%) underwent additional glaucoma incisional or laser surgery within the three year follow up period. 47 patients (22%) experienced at least one postoperative complication.

Conclusions: In a tertiary practice that treats eyes with wide range of past ocular histories, past surgical histories, and glaucoma types, tube shunt surgery is effective surgical management of glaucoma. The percentage of patients who underwent additional glaucoma surgical intervention was similar to previously reported studies. The number of patients with postoperative complications was lower than recently published studies.

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Presentation Time: 8:30 AM–10:15 AM

Anterior segment ocular coherence tomography evaluation of intraluminal deposits in glaucoma tube shunts

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Purpose: Glaucoma tube shunts (TS) are presumed inert following insertion. Novel intraluminal deposits noted in exposed TS of several patients led to an observational study using spectral domain optical coherence tomography (SD-OCT) to characterize these TS deposits.

Methods: Fifteen TS in 11 patients diagnosed with primary open angle, neovascular, aphakic, and uveitic glaucomas underwent 5-line raster anterior segment SD-OCT imaging. Ahmed (n=11) and Baerveldt (n=4) TS were examined. Patients with TS were randomly selected from 2013 to 2014, adults older than 18 years, had light perception or better visual acuity, and no history of retinal surgery with silicone oil. TS were classified as having or not having luminal deposits.

Results: The exposed tubes of two patients had highly reflective intraluminal deposits in the corresponding exposed areas. Six tubes without exposure had a thin rim of highly reflective material. Seven tubes were clear of luminal deposits. The most common diagnosis in the study was uveitic glaucoma in 5 of the 15 eyes (33% with deposits). The next most common diagnosis was primary open angle glaucoma in 4 of the 15 eyes (25% with deposits). The distribution of diagnoses within each group was insignificant for this sample size (p=0.19 deposit, p=0.22 clear). Type of TS was likewise insignificant (p=0.09 deposit, p=0.41 clear). There were 2 non-valved Baerveldt tubes in each group. The mean duration since tube shunt implantation was 15.0 months in the deposit group and 33.7 months in the group without luminal deposits. The majority of patients in each group were using eye drops upon presentation (88.9% deposit, 83.3% clear) and the average intraocular pressure was 20.2 mmHg and 19.0 mmHg in the deposit and the clear groups, respectively.

Conclusions: This study describes intraluminal deposits in tube shunts that may occur as a response to the implanted drainage device.
This novel finding suggests that the aqueous tube shunts in glaucoma drainage devices are not inert objects and future studies are needed to examine the functional impact of tube deposits.

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Podoplanin expression in encapsulated tissue caused by glaucoma long tube surgery

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**Purpose:** To date, limited research has focused on the question of further aqueous humor drainage over the bleb in filtration surgery. Recently, it was reported that lymphatic drainage pathways may play an important role in filtration surgery (Yu et al., Prog Retin Eye Res, 2009). Podoplanin (PDN) is one of the potent markers for lymphatic endothelial cells. In this study, we retrospectively investigated whether encapsulated tissue (ECT) due to glaucoma long tube surgery (ECT-GTS) expresses PDN by comparing ECT due to trabeculectomy (ECT-TLE), a leaking bleb, normal conjunctiva, the Tenon’s capsule, and the sclera.

**Methods:** Twenty-four ECT-GTS samples with different periods of aqueous humor exposure (range: 6-2,347 days) were embedded in paraffin and processed for hematoxylin and eosin (HE), elastica van Gieson, Masson, and immunohistochemical staining of D2-40 (anti-PDN), CD 68, CD 34, and thrombomodulin. Control tissues included 12 ECT-TLE, 6 leaking bleb, and 5 overhanging bleb samples caused by TLE, 15 normal Tenon’s capsule pieces including conjunctiva, 7 normal sclera pieces obtained at pterygium resection and deep sclerectomy, respectively, and 3 normal cervical lymph nodes.

**Results:** Fibroblasts in all normal Tenon’s capsule pieces that were not irrigated by aqueous humor did not express PDN. Fibroblasts in whole-thickness ECT-GTS samples obtained within 23 days post tube ligation release expressed PDN, however, those in the center of ECT-GTS obtained after 30 days post tube ligation release expressed PDN only at the site facing the aqueous humor. Strong expression of PDN in fibroblasts was observed at the anterior parts of all ECT-GTS samples, where abundant PDN-positive vessels were observed. A similar pattern of PDN-positive vessels, but less PDN-positive fibroblasts, were also observed in ECT-TLE samples. Blood vessels that stained positive for CD34 and thrombomodulin were observed at the opposite side of ECT-GTS specimens facing the aqueous humor.

**Conclusions:** Tenon’s capsule fibroblasts may express PDN when they are irrigated by aqueous humor. Encapsulated tissue may have lymph-like characteristics as a trabecular meshwork, which functions as a filter for cleaning aqueous humor. Although there may be small differences between ECT-GTS and ECT-TLE, lymph-angiogenesis may be important for the formation of ECT in glaucoma filtration surgery.

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