Purpose: Glaucoma and cataract are the leading cause of vision loss in elderly patients. The use of trifocal lenses has been proscribed in the field of glaucoma as alterations of contrast sensitivity had been described. We present a study in which we analyze performance of patients with glaucoma before and after cataract surgery with trifocal lens implant.

Methods: We present a longitudinal, prospective and analytic study. Inclusion criteria were: presence of cataract, glaucoma suspect or mild glaucoma, previous examination of visual field and nerve fiber layer oc. Exclusion criteria were: severe glaucoma damage, concomitant ocular diseases, previous ocular surgeries and more than 1 diopter astigmatism. We examined near and far visual acuity, contrast sensitivity, and nerve fiber layer at baseline, first day, seventh day, 2 weeks and 1 month after surgery.

Results: 9 eyes of 5 patients were included between 66 and 87 years with mean age of 73.2 ± 7.6. Visual acuity had a clinical improvement of 2 lines in far sight and 6 lines in near sight. No statistical significant changes were observed in visual fields standard deviation (p=0.37), fiber nerve layer thickness (p=0.12) nor contrast sensitivity at the baseline and post-surgery results.

Conclusions: The use of AT LISA can be an alternative for cataract surgery in mild glaucoma or glaucoma suspect as it doesn’t affect contrast sensitivity and follow up studies for glaucoma.

Commercial Relationships: Luis Daniel García Arzate, None; Angela García Valencia, None; Mariana Escalante, None; Jesús Jiménez-Roman, None; Rafael Castañeda Díez, None

Program Number: 4922 Poster Board Number: B0340
Presentation Time: 3:45 PM–5:30 PM
Association between intravitreal TriMoxi and IOP outcomes in microincisional glaucoma/cataract surgery
Samantha Ayoub, Nathaniel Tracer, Daniela Alvarez, Nathan M. Radcliffe, ’Ophthalmology, New York University School of Medicine, NY, NY; ’Asociación Para Evitar la Ceguera en México, IAP, Mexico City, Mexico.

Purpose: Glaucoma patients who undergo cataract and microincisional glaucoma surgery (MIGS) are burdened with eye drop requirements. Intravitreal delivery of triamcinolone/ moxifloxacin (TriMoxi) potentially eliminates the need for postoperative anti-inflammatory and antibiotic topical medications, but raises concern for increased steroid-related intraocular pressure (IOP). This study retrospectively compared IOP outcomes and glaucoma medication requirements in MIGS patients who received topical medications (Group 1) or TriMoxi injections (Group 2).

Methods: Fifty patients who underwent MIGS, using the VISICO360 instrument, from 2015 to 2016 were selected. Twenty-five patients received post-operative topical drops, including prednisolone acetate 1% and an antibiotic, and 25 patients received a TriMoxi intravitreal injection during surgery. Age and baseline IOP were matched between groups. IOP’s were collected from baseline to 6 months after surgery. The two groups were analyzed for differences in post-operative IOP and glaucoma medication drops.

Results: The mean patient age was 66.3±8.8 years for Group 1 and 68.3±9.5 years for Group 2 (p > 0.05). The mean baseline IOP was 16.4 ± 3.4mmHg for Group 1 and 16.8±3.3mmHg for Group 2 (p > 0.05). There were no significant differences in postoperative IOP’s at day 1, month 1, month 2, month 3, and month 6 between Group 1 (13.6±6.5, 15.2±4.5, 14.8±2.7, 14.3±4.3, 15.2±2.8mmHg) and Group 2 (12.4±5.3, 15±3.2, 14.9±3.9, 15±3, 14.4±4mmHg; p > 0.05 for all).

Group 2 had lower IOP’s at week 1 (17.8±4.8 vs. 13.7±5.4 mmHg, p <0.05). There were no significant differences in glaucoma treatment eye drops taken at baseline or follow-up at week 1, month 1, month 2, month 3, month 6 and 12 months after surgery.

Conclusions: The study demonstrates the clinical and economic benefits of preoperative and postoperative use of Intravitreal TriMoxi in patients who underwent MIGS surgery.
2, month 3, and month 6 between Group 1 (1.28±0.74, 1.16±0.75, 1.05±0.80, ±0.76, 0.89±0.78, 1.05±0.78) and Group 2 (1.24±1.42, 0.75±0.74, 0.67±0.82, 0.8±0.63, 0.8±0.84, 0.63±0.83; p<0.05 for all). When considering total eye drop usage (including steroid and antibiotics), Group 2 used significantly fewer drops at week 1 (3.16±0.75 vs. 0.75±0.74, p<0.05).

Conclusions: The use of intravitreal TriMoxi was not associated with IOP elevations or increased glaucoma medication requirements when compared to postoperative topical agents, but it did decrease total drop usage. TriMoxi injections may alleviate compliance issues with antibiotic and anti-inflammatory medications and potentially minimize burden on post-operative patients.

Commercial Relationships: Samantha Ayoub, None; Nathaniel Tracer, None; Daniela Alvarez, None; Nathan M. Radcliffe, Alcon Laboratories (C), Transcend Medical (C), Reichert (C), Iridex (C), Glaukos (C), New World Medical (C), Bausch + Lomb (C), Aerie Pharmaceuticals (C), Beaver-Visitec International (C), Alimera (C), Lumenis (C), Allergan (C)

Program Number: 4923 Poster Board Number: B0341
Presentation Time: 3:45 PM–5:30 PM
Vision Blue for the Assessment of Filtering Bleb Functioning During Cataract Surgery
Arjun S. Patel1, Edward S. Yung2, Kamran Rahmatenejad2, Marlene R. Moster MD. 1, Sidney Kimmel Medical College, PHILADELPHIA, PA; 2Glaucoma Research, Wills Eye Hospital, Philadelphia, PA.

Purpose: Trabeculectomy is a filtering surgical procedure commonly used to reduce intraocular pressure (IOP). Inflammation after cataract surgery theoretically has a negative impact on bleb survival. The purpose of this study is to explore VisionBlue (trypan blue) as a means of intraoperatively assessing preexisting bleb function during phacoemulsification and predict future bleb failure.

Methods: Prospective study of participants with a history of trabeculectomy placed for glaucoma undergoing phacoemulsification were enrolled. Participants with any intraocular surgery or laser within 3 months of scheduled cataract surgery, active ocular inflammation, history of tube shunt placement, or allergy to ophthalmic dyes were excluded. 0.5 cc of VisionBlue was injected intraoperatively during cataract surgery and photographs were taken. Bleb staining was graded as mild staining or diffuse staining for final analysis. Decrease in bleb function was defined as a greater than 20% increase in IOP from baseline, need for additional IOP lowering medications, and need for additional surgical intervention.

Results: 11 participants were enrolled into the study and had completed post-operative month 3 data. 6 participants were categorized as mild staining, and 5 were categorized as diffuse staining. Mean baseline IOP was 9.77 ± 2.47 mmHg in the mild staining group and 9.12 ± 3.55 mmHg in the diffuse staining group (p=0.36). IOP at three month post-operatively increased by 0.55 ± 1.56 mmHg and 1.282 ± 3.56 mmHg in the two groups, respectively (p=0.34). The number of glaucoma medications needed was increased by 0.83 ± 0.98 and decreased by 0.2 ± 0.44, respectively (p=0.03). Decreased bleb function occurred in 86% and 40%, respectively (p=0.08).

Conclusions: Intraoperative VisionBlue during phacoemulsification allows visualization of filtering bleb function. A significantly greater number of glaucoma medications was needed to control IOP in the mild staining group compared to the diffuse staining group. A greater trend towards decreased bleb function was seen in the mild staining group, though it was not statistically significant. Greater bleb staining may predict a significantly decreased need for glaucoma medications and a trend towards decreased risk of early bleb failure after cataract surgery. This potentially allows us to predict the need for concurrent glaucoma procedures such as bleb needling during phacoemulsification.

Commercial Relationships: Arjun S. Patel, None; Edward S. Yung, None; Kamran Rahmatenejad, None; Marlene R. Moster MD, None
Support: Wills Eye Innovation Grant# 15-494

Program Number: 4924 Poster Board Number: B0342
Presentation Time: 3:45 PM–5:30 PM
Complications of Lens Extraction with Intraocular Lens Placement in Patients with Primary Angle Closure Spectrum Disease
spencer hayes, laura baker, Alice Chuang3, Lauren S. Blieden2, Robert M. Feldman2, Nicholas P. Bell3, 1Robert Cizik Eye Clinic, Houston, TX; 2Riz University of Ophthalmology and Visual Science, McGovern Medical School at The University of Texas Health Science Center at Houston, Houston, TX.

Purpose: To estimate intra- and postoperative complication rates of lens extraction in patients with primary angle closure spectrum disease (PACSD) and anatomically normal angles (ANA).

Methods: Patients with PACSD and best-corrected vision (BCVA) 20/80 or better who underwent lens extraction with capsular bag placement of an intraocular lens (LE-IOL) between January 1996 and July 2015 were reviewed. Eyes with previous acute angle closure attack, intraocular incisional surgery or injections, scleral buckle, combined surgery with LE-IOL, or < 3 months follow-up were excluded. PACSD eyes were matched with eyes that had an ANA with BCVA 20/80 or better and had undergone LE-IOL by same surgeon. In the ANA group, additional exclusion criteria included traumatic cataract and secondary glaucoma. The first eligible eye per patient was selected. Demographics and ocular characteristics, including intraocular pressure (IOP), manifest refraction (spherical equivalent), vision (BCVA), corneal keratometry (K1, K2), axial length (AL), and anterior chamber depth (ACD) were recorded. The number and type of intra- and postoperative complications were recorded. Postoperative complications included corneal edema at month 1, cystoid macular edema (CME) at month 1, and not reaching visual potential (worse than 20/25 at 2 consecutive visits after month 1 without any pre-existing conditions). Demographics and baseline ocular characteristics were compared using Fisher’s exact test or 2-sample t-test.

Results: 129 patients (67 ANA, 62 PACSD) having LE-IOL by 3 surgeons were included. More females (P=0.032), better vision (P=0.003), shallower anterior chamber (P<0.001), shorter eye (P=0.001), and more hyperopia (P<0.001) were observed in PACSD eyes than in ANA eyes before LE-IOL. Three intraoperative complications occurred in 3 (2%) eyes (1 [1.5%] in ANA, 2 [3%] in PACSD). A total of 15 postoperative complications occurred in 12 (9%) eyes: 4 (6%) eyes in ANA and 8 (13%) in PACSD. Postoperative complications included 4 incidences of corneal edema (1 ANA, 3 PACSD), 3 CME (2 ANA, 1 PACSD), 6 eyes (3 ANA, 3 PACSD) did not reach BCVA goal, and 2 other complications in PACSD.

Conclusions: The incidence of intra- and postoperative complications from LE-IOL was nearly 2 times higher in eyes with PACSD than those with ANA. However, the sample size was not large enough to reach statistical significance.

Commercial Relationships: spencer hayes, None; laura baker, None; Alice Chuang, None; Lauren S. Blieden, None; Robert M. Feldman, None; Nicholas P. Bell, None
Support: Hermann Eye Fund

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Outcomes of Phacoemulsification Vs Combined Phacoemulsification and iStent Implant in Glaucomatous Eyes
Kevin Lodewyk, Nariman Nassiri, Chae Sik Kim, Anju Goyal, Justin Tannir, Aman Shukairy, Mark S. Juzych, Bret A. Hughes.
Kresge Eye Institute, Detroit, MI.

**Purpose:** The iStent has gained popularity in the treatment of mild to moderate glaucoma. In this retrospective longitudinal study, we aimed to investigate 18-month outcomes of phacoemulsification with or without combined iStent implantation in glaucoma patients.

**Methods:** We included glaucoma patients who underwent phacoemulsification with or without combined iStent implantation at Kresge Eye Institute from April 2007 to July 2016. Two groups were compared at baseline and different intervals with regard to best-corrected visual acuity (BCVA), intraocular pressure (IOP), number of IOP-lowering medications (Table 1). Chi square and t test were used to compare the study outcomes between two groups. P value < 0.05 considered statistically significant.

**Results:** The two groups were comparable with regard to age, gender, race, diabetes, hypertension, BCVA, number of IOP-lowering medications and severity of glaucoma based on mean deviation (MD) at baseline (p > 0.05; Table 1). The combined group had statistically higher baseline IOP compared to the phacoemulsification group (17.5 ± 5.1 vs. 15.8 ± 4.2, respectively; p=0.006; Table 1). While BCVA and IOP were comparable between groups, eyes in the combined group required significantly less IOP-lowering medications during all follow-up visits (p<0.001; Table 2). Compared to baseline, IOP and number of medications significantly reduced from 15.8 ± 4.2 and 1.4 ± 0.95 at baseline to 15.72 ± 3.37 (p=0.006) and 0.22 ± 0.69 (p<0.001) at 18 months in the combined group (Table 2). Compared to baseline, IOP statistically reduced to 14.29 ± 3.63 (p=0.02) at 12 months and 14.05 ± 3.23 (p=0.02) at 18 months in the phacoemulsification group; however, the number of medications did not show any significant difference at 12 and 18 months (p>0.05 for both; Table 2).

**Conclusions:** While two groups were comparable with regard to BCVA and IOP, eyes in the combined group required less IOP-lowering medications during 18 months of follow up. Compared to baseline, IOP significantly reduced 12 and 18 months after surgery in both groups while number of medication only reduced in the combined group.
Program Number: 4927 Poster Board Number: B0345
Presentation Time: 3:45 PM–5:30 PM
Comparison of Outcomes Between Kahook Dual Blade and VISCO360 in the Treatment of Primary Open-Angle Glaucoma
Nathaniel Tracer1, Samantha Ayoub1, Daniela Alvarez2, Nathan M. Radcliffe1. 1Ophthalmology, New York University School of Medicine, New York, NY; 2Asociación Para Evitar la Ceguera en México, IAP, Mexico City, Mexico.
Purpose: The relative efficacies of new ab interno surgical approaches to intraocular pressure (IOP) reduction in the treatment of primary open-angle glaucoma (POAG) are unclear. We performed a retrospective case-controlled study comparing outcomes between ab interno canaloplasty with viscoanastomosis using the Sight Sciences VISCO360 Viscosurgical System and excision of trabecular meshwork using New World Medical’s Kahook Dual Blade (KDB).
Methods: 10 patients diagnosed with POAG who underwent trabecular meshwork excision using the KDB and 20 patients diagnosed with POAG who underwent canaloplasty with viscoanastomosis using the VISCO360 were included in this study. The reviewer selected patients to be included by matching the patients’ ages and baseline IOP between the two groups. The mean baseline age and IOP for the KDB group were 72.2±8.2 years and 18.1±4.7 mmHg, respectively. The mean baseline age and IOP for the VISCO360 group were 67.1±6 years and 17.3±3.2 mmHg, respectively. The mean IOP and mean number of drops used at 1 day, 1 week, 1 month, and 6 months follow-up between the two groups were then compared using two-tailed t-tests.
Results: At 1 day, 1 week, 1 month, and 6 months follow-up mean pressures were 13.6±6.4, 16.67±2.1, 14.2±2.7, and 12.3±3.4 mmHg in the KDB group and 14.35±6.9, 18.6±8.8, 15.56±4.7, and 15.6±2.6 mmHg in the VISCO360 group (P=.77, P=.37, P=.5, P=.6). The percentage change in IOP for the KDB group and 14.35±6.9, 18.6±8.8, 15.56±4.7, and 15.6±2.6 mmHg in the VISCO360 group (P=.77, P=.37, P=.5, P=.6).
Conclusions: Neither surgical procedure showed a significantly greater reduction in IOP or drop usage at 1 day, 1 week, 1 month, and 6 months. However, the KBD group exhibited a more consistent IOP decrease compared to the VISCO360 group at 1 day, 1 week, 1 month, and 6 months follow-up. A larger study would likely be required to show if the differences observed are statistically significant.
Commercial Relationships: Nathaniel Tracer, None; Samantha Ayoub, None; Daniela Alvarez, None; Nathan M. Radcliffe, Alcon Laboratories (C), Transcend Medical (C), Reichert (C), Iridex (C), Glaukos (C), New World Medical (C), Bausch + Lomb (C), Aerie Pharmaceuticals (C), Beaver-Visitec International (C), Alimera (C), Lumenis (C), Allergan (C)
B0346

Khaled A. Bahjri1, Suhaib A. Abdullah, Mark C. Jasek2, Nathan M. Radcliffe, Jesus Jimenez-Roman, Gabriel S. Lazcano, Leonard K. Seibold1, John P. Berdahl, Jason K. Darlington3, Syril K. Dorairaj4, Ahmad A. Aref5. 1R & D, New World Medical, Inc., Rancho Cucamonga, CA; 2B Through C, LLC, Burleson, TX; 3New York Eye Surgery Center, New York, NY; 4APEC, Mexico City, Mexico; 5University of Colorado, Denver, CO; 6Vance Thompson Vision, San Diego, CA; 7The Eye Institute, Melbourne, FL; 8Mayo Clinic, Jacksonville, FL; 9University of Illinois, Chicago, IL.

Purpose: The Kahook Dual Blade (KDB, New World Medical Rancho Cucamonga, CA) is a single-use goniotomy knife designed to make parallel incisions in the trabecular meshwork allowing aqueous humor unimpeded access to collector channels. The study’s purpose was to assess the IOP lowering efficacy of combined KDB and phacoemulsification (PE). Reduction of dependence on IOP lowering medications as well as the safety profile of the procedure was also assessed.

Methods: This was a prospective consecutive case series of patients undergoing combined KDB goniotomy and PE with participation from eight surgeons at six surgical centers in the United States and one in Mexico. Glaucoma type and severity, glaucoma medications, and baseline pretreatment IOP were collected on the operative day. Adverse events (AE) were collected on the operative day and on each subsequent visit. Each surgeon also completed an ease of use questionnaire after each case. Changes in IOP and dependence on glaucoma medications from baseline were analyzed using mixed models.

Results: Data were collected on 71 eyes of which 70% had primary open angle glaucoma, 17% chronic angle closure glaucoma, 6% pigmentary glaucoma and 3% pseudoxfoliation glaucoma. 35% and 23% of the eyes were assessed as severe and moderate glaucoma respectively. In 96% of cases, surgeons either strongly agreed or agreed that KDB use was straightforward, entry into the canal of Schlemm was uncomplicated and advancement along the treatment pathway was smooth. In 75% of eyes, blood reflux was observed intraoperatively, indicating a patent distal outflow pathway. At 12 months, IOP was significantly reduced to 12.4±2.6 mmHg compared to 17.4±1.6 at baseline (P=0.001). Glaucoma medication burden was also significantly reduced to 0.9±1.0 at 12 month from 1.6±1.3 at baseline (p=0.001). The most common AE was retained anterior chamber blood in 3.4% of eyes at 1 week. There was one case each of iridodialysis, clycldodialysis and a small descemet tear, none of which required treatment or resulted in deterioration of vision.

Conclusions: KDB+PE resulted in statistically significant reduction of IOP and dependence on glaucoma medications after 12 months of follow-up. The KDB treatment was safe with a short learning curve. Further data collection is ongoing to help understand the IOP lowering efficacy of KDB when combined with cataract extraction beyond one year of follow-up.

Commercial Relationships: Khaled A. Bahjri, New World Medical, Inc. (E); Suhaib A. Abdullah, New World Medical, Inc. (E); Mark C. Jasek, B Through C, LLC. (C); Nathan M. Radcliffe, New World Medical, Inc. (F); Jesus Jimenez-Roman, New World Medical, Inc. (F); Gabriel S. Lazcano, New World Medical, Inc. (F); Leonard K. Seibold, New World Medical, Inc. (F); John P. Berdahl, New World Medical, Inc. (F); Jason K. Darlington, New World Medical, Inc. (F); Syril K. Dorairaj, New World Medical, Inc. (F); Ahmad A. Aref, New World Medical, Inc. (F)

Program Number: 4929
Poster Board Number: B0347

Rapid learning curve assessment in an ex vivo training system for microincisional glaucoma surgery

CHAO WANG1, Yalong Dang1, Susannah Woxman1, Hardik Parikh1, Igor I. Bussel1, Ralitsa Loewen1, Xiaobo Xia2, Kira L. Lathrop1, Richard A. Bilonick1, 2, Nils Loewen1. 1Department of Ophthalmology, School of Medicine, University of Pittsburgh, Pittsburgh, PA; 2Department of Ophthalmology, Xiangya Hospital of Central South University, Changsha, China; 3Biostatistics, University of Pittsburgh Graduate School of Public Health, Pittsburgh, PA; 4Xiangya School of Medicine, Central South University, Changsha, China.

Purpose: Microincisional glaucoma surgeons operate in a highly confined space, making it difficult to learn by observation or assistance alone. An ex vivo model would allow for better refinement of technique, quantification of progress and computation of a learning curve.

Methods: Seven resident trainees without angle surgery experience performed nine ab interno trabeculectomies in pig eyes after preparing with training slides and videos. They placed the eyes on a tiltable mannequin head, visualized the trabecular meshwork gonioscopically through an ophthalmic microscope and removed it by trabecome- mated plasma ablation(Figure 1). An expert surgeon observed, guided, and rated the procedure using an Operating Room Score (ORS). The extent of accessed outflow beds was estimated with canalograms using 0.5-micron fluorescent microscopes. Data was fit using mixed effect models.

Results: ORS was fit by an asymptotic nonlinear mixed effects model with a fixed upper asymptote, an estimated lower asymptote, and an estimated logarithmic rate constant, and including random effects for the lower asymptote and for the rate constant. A half-maximum was achieved after 2.5 eyes. Surgical time decreased by 1.4 minutes per eye in a linear fashion. The ablation arc followed a sigmoidal function with a half-maximum inflection point after 5.3 eyes and the mean arc improved from 73 to 135°. Despite these changes, canalograms revealed that the improvement in arc angle did not correlate well with improvement in outflow(Figure 2).

Conclusions: This inexpensive pig eye model provides a safe and effective training model for ab interno trabeculectomy and allows for quantification of outcomes. Trainees without prior angle surgery experience proceeded quickly on the learning curve. Actual outflow improvements progressed at a slower rate, a reminder to remain humbly committed to training.
We hypothesized that electrospinning can be used to fabricate small lumen shunts that prevent post-operative hypotony.

**Methods:** Electrospinning was used to manufacture shunts with an internal diameter of 50 µm, and composed of polyethylene terephthalate (PET) nanofibers. Size and morphology were characterized via scanning electron microscopy. Fluid flow through shunts of varying diameter and length at different flow rates was modeled using the Hagen-Poiseuille equation (HPE). *In vitro* fluid flow experiments were conducted using a syringe pump, and the pressure change was measured using a manometer. Biocompatibility was evaluated through histology of shunts implanted in rabbit eyes for 14 days (N=3). Intraocular pressure (IOP) was monitored for 25 days in normotensive rabbits with the proximal end of either a closed (N=3) or open shunt (N=3) implanted in the anterior chamber and distal end implanted in the subconjunctival space. Shunt patency was evaluated 25 days after placement in rabbit eyes (N=3).

**Results:** Modeling predicted that a 6 mm long, 50 µm inner diameter shunt could provide for significant IOP reduction at physiologically relevant flow rates. PET shunts had wall thickness of 350 ± 15 µm, length of 5, 6, or 7 mm, and 50 µm inner diameter created by removal of a 50 µm diameter template wire. *In vitro* experiments revealed that the HPE accurately predicted the flow of phosphate buffered saline through PET shunts, and that shunts were leak-proof and maintained structural integrity after one week. Shunts implanted in rabbit subconjunctival tissue elicited a reaction comparable to silicone tubing from a commercial glaucoma drainage implant (GDI). Post-operative hypotony was not observed following *in vivo* placement and shunts remained patent *in vivo*.

**Conclusions:** Electrospinning provides a suitable platform for the development of biocompatible shunts that are durable, leak-proof, and shunts remain patent *in vivo*.

**Commercial Relationships:** Kunal S. Parikh, Johns Hopkins University (P); Aditya Josyula, None; Ju Young Ahn, None; Revaz Omiadze, None; Laura M. Ensign, None; Amanda K. Bicket, Johns Hopkins University (P); Ian Pitha, Johns Hopkins University (P)

**Support:** Robert H. Smith Family Foundation, National Science Foundation Grant BGE-1232825, National Institutes of Health Grant K08EY024952, National Center for Advancing Translational Sciences Grant UL1TR001079

**Program Number:** 4931 *Poster Board Number:** B0349

**Presentation Time:** 3:45 PM–5:30 PM

**Thermal Sclerostomy Outcomes in a Retrospective Cohort**

Nathan W. Liles, Sophia Wang, Joshua D. Stein, Paul Lichter. Ophthalmology, University of Michigan, Ypsilanti, MI.

**Purpose:** Thermal sclerostomy was once the most widely used glaucoma filtering procedure. Although this surgery has been supplanted by other procedures, it may still have a role for patients who require aggressive intraocular pressure (IOP) lowering. We evaluate the short and long-term outcomes of thermal sclerostomy.

**Methods:** We identified 24 patients who underwent thermal sclerostomy between 1988 and 2003, at the Kellogg Eye Center. Demographic data, best-corrected visual acuity, IOP, complications, and number of glaucoma medications required were collected preoperatively and at postoperative day 1, 7, 30, 90, 365, and the last recorded visit or final visit documenting bleb failure. Blebs that were noted as no longer functioning or that required revision or additional incisional glaucoma surgery were recorded as having failed. Kaplan-Meier survival analysis was performed to evaluate bleb survival.

**Results:** The median follow-up time after surgery was 11.9 years. The majority of the patients had primary open-angle glaucoma.

**Program Number:** 4930 *Poster Board Number:** B0348

**Presentation Time:** 3:45 PM–5:30 PM

**Development and characterization of a nano-structured glaucoma shunt**

Kunal S. Parikh1,2, Aditya Josyula1, Ju Young Ahn1,2, Revaz Omiadze1,4, Laura M. Ensign1,4, Amanda K. Bicket1, Justin Hanes1,4, Ian Pitha1,4. 1Center for Nanomedicine, Johns Hopkins University School of Medicine, Baltimore, MD; 2Biomedical Engineering, Johns Hopkins University School of Medicine, Baltimore, MD; 3Chemical and Biomolecular Engineering, Johns Hopkins University, Baltimore, MD; 4Ophthalmology, Johns Hopkins University School of Medicine, Baltimore, MD

**Purpose:** Hypotony following glaucoma filtering surgery can be prevented by using small lumen shunts that limit fluid outflow. Electrospinning is a promising platform for the development of shunts, as it allows for incorporation of almost any polymer and/or therapeutic moiety into nano or microfibers that can be configured into devices of various dimensions and conformations.

We hypothesized that electrospinning can be used to fabricate small lumen shunts that prevent post-operative hypotony.
To determine the surgical outcomes of 360-degree suture

NPDS improves IOP control, reduces medication needs

Both Ex-Press implant and DS were effective and safe,

Patients undergoing thermal sclerostomy achieved a significant and sustained reduction in IOP and a reduction in the mean number of glaucoma agents used over 11.9 years of follow-up, with a high bleb survival rate of 79% at 10 years. This suggests that thermal sclerostomy may still be a valuable surgical option for patients requiring long-term bleb survival accompanied by aggressive IOP control.

Program Number: 4932 Poster Board Number: B0350
Presentation Time: 3:45 PM–5:30 PM

Purpose: To evaluate safety and endothelial cell count results of a prospective and randomized comparison of Ex-Press Vs Deep Sclerectomy combined surgery in glaucoma patients

Methods: Prospective, multicentre, single-blinded, and randomized trial. Eyes with open angle glaucoma and cataract, requiring combined surgery, were randomly assigned to either filtration surgery with Ex-Press (Alcon) or DS with ESNOPER implant (AJL). Main outcomes measures were mean IOP and incidence of complications. Total sample size was 100 subjects (50 in each group) and 2 subjects died during the study due to causes unrelated to surgery.

Interventions: Phacoemulsification with Ex-PRESS P50 device or cataract.

Purpose of IOP reduction of 8.0 mmHg at 1 year of follow-up (p=0.05) and 5.0 mmHg (p<0.05) at the final visit from a mean pre-operative value of 16.8 mmHg. Fifteen patients (62.5%) at the final visit had a reduction of IOP by ≥20% from their preoperative value, and 11 (45.8%) had an IOP between 5 and 12 mmHg. At the final recorded visit, patients were using 1.4 fewer glaucoma agents (p=0.05). Additionally, 16 patients (66.7%) were using no glaucoma agents in the operated eye and only 1 patient (4.2%) was on ≥2 agents at the final visit. Mean pre-operative LogMar vision was 0.3 and dropped to 0.6 at the final visit. Early complications included hypotony maculopathy (n=1), choroidal detachment (n=9), corneal edema (n=3), and hyphema (n=1). Endophthalmitis occurred in 4 patients (16.7%) with a median onset of 6.3 years after surgery. Kaplan Meier survival probability for functioning blebs at 10 years was 0.79 (95% CI 0.54 - 0.90).

Conclusions: Patients undergoing thermal sclerostomy achieved a significant and sustained reduction in IOP and a reduction in the mean number of glaucoma agents used over 11.9 years of follow-up, with a high bleb survival rate of 79% at 10 years. This suggests that thermal sclerostomy may still be a valuable surgical option for patients requiring long-term bleb survival accompanied by aggressive IOP control.

Commercial Relationships: Nathan W. Liles; Sophia Wang, None; Joshua D. Stein, None; Paul Lichter, None

Program Number: 4932 Poster Board Number: B0350
Presentation Time: 3:45 PM–5:30 PM

One year safety and endothelial cell count results of a prospective and randomized comparison of Ex-Press vs Deep Sclerectomy combined surgery in glaucoma patients

MARUCOS R. MUNOZ, Alcon (F); Alfonso Anton-Lopez, Aerie (C), Thea (C), BrudiLab (F), None; Jose Luis Urcelay, Alcon (F); Francisco Muñoz-Negrete, Alcon (F); Gil Alfonso, Alcon (F); Alberto Martinez, Alcon (F); Marta Castany, Alcon (F); Gianluca Fatti, None; Javier Moreno-Montanes, Alcon (F)

Clinical Trial: https://register.clinicaltrials.gov/ct2/results?cond=Time%20of%20Treatment%20When%20Administered&rt=Result&urlMode=redirect&rank=1&results=1&result_group=1&result_type=1&work=1&cond_op=AND&cond=Time%20of%20Treatment%20When%20Administered

Purpose: To compare intraocular pressure control, visual field defect progression and medication need in patients with chronic glaucoma before and after non penetrating deep sclerectomy (NPDS).

Methods: We included 50 eyes of 36 patients with uncontrolled chronic mild or moderate glaucoma who underwent non penetrating deep sclerectomy (alone or with phacoemulsification) with a follow up of 12 months or more. Pre and post operatory IOP, number of medications, and visual fields were evaluated and compared. Rates of visual field loss were calculated using mean defect (MD) and loss of variance (LV). Linear regression models were used to compare rates of change in visual field before and after surgery.

Results: Post operatory IOP decreased 64% at 15 days, 29% at 1 year, 22% at 3 years and 24% at 6 years. Mean number of medications passed from a mean of 2.7 before sclerectomy to 0.8 at the last follow up after sclerectomy. Rates of visual field progression before and after NPDS changed from 0.07 dB/year to -0.02 dB/year for the MD; and from 0.71 dB/year to 0.61 dB/year for the LV. These improvements were non significant.

Conclusions: NPDS improves IOP control, reduces medication needs in operated eyes and halts the potential progression of visual field loss in patients with chronic mild or moderate glaucoma.

Commercial Relationships: Luis A. Pareja Aricó, None; Maria I. Canut, None; Francisco Ruiz Tolosa, None; Ralph Michael, None

Program Number: 4934 Poster Board Number: B0352
Presentation Time: 3:45 PM–5:30 PM

Outcomes of 360-degree suture trabeculotomy with deep sclerectomy


Purpose: To determine the surgical outcomes of 360-degree suture trabeculotomy with deep sclerectomy.

In operated eyes and halts the potential progression of visual field loss in patients with chronic mild or moderate glaucoma.

Commercial Relationships: Luis A. Pareja Aricó, None; Maria I. Canut, None; Francisco Ruiz Tolosa, None; Ralph Michael, None
trabeculotomy with deep sclerectomy (S-LOTDS) on eyes with different types of glaucoma.

**Methods:** This was a retrospective study of 20 eyes of 18 cases that underwent S-LOTDS at the Chiba University Hospital between July 2012 through October 2015. The postoperative follow-up period was 12 months. The outcome measures were the surgical success rate, the mean postoperative intraocular pressure (IOP), the mean number of anti-glaucoma medications, and the surgical complications. When the suture did not pass through the entire circumference, the trabecular meshwork was incised as much as possible by suture or metal trabeculotomy.

**Results:** There were 14 men and 4 women whose mean age at the time of surgery was 66±16.7 years. The subtypes of glaucoma were: exfoliation glaucoma (12 eyes), primary open-angle glaucoma (5 eyes), and steroid-induced glaucoma (3 eyes). Nine eyes had cataract surgery during the S-LOTDS. The mean preoperative IOP was 26.4±5.9 mmHg, and the mean postoperative IOPs after 1, 3, 6, and 12 months were 16.4±9.5 mmHg, 12.2±2.9 mmHg, 13.3±2.8 mmHg, and 12.6±3.1 mmHg, respectively. The mean preoperative number of anti-glaucoma medications was 4.9±1.3, and the mean postoperative numbers of anti-glaucoma medications after 1, 3, 6, and 12 months were 1.7±2.4, 1.1±1.9, 0.9±1.6, and 1.0±1.5, respectively. The mean extent of the incision was 339 degrees. When the surgical success was defined as an IOP less than 15 mmHg or 18 mmHg at 12 months, the surgical success rate was 75% and 95%, respectively. The complications included hyphema in all eyes (100%) and a transient elevation of the IOP above 30 mmHg within one month after the surgery in 8 eyes (40%).

**Conclusions:** Although a transient elevation of the IOP occurred in 40% of the cases, S-LOTDS is an effective surgical option for lowering the IOP to under 15 mmHg.

**Commercial Relationships:** Yuichi Kitamura, None; Shuichi Yamamoto, None; Suguru Shirato, None

**Program Number:** 4935 Poster Board Number: B0353

**Presentation Time:** 3:45 PM–5:30 PM

**The West London View on Phaco-iStent versus Phaco Alone**

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**Purpose:** Of the minimally-invasive glaucoma devices, the Glaukos iStent has been increasingly used in Glaucoma centres, however there is a lack of long-term safety and efficacy data from the UK major centres. The aim of the current study is to assess the efficacy of iStent in lowering IOP and in reducing glaucoma medications over a long-term follow-up.

**Methods:** Sixty three consecutive eyes of patients undergoing combined iStent with cataract extraction (phaco-iStent) were retrospectively reviewed. Inclusion and exclusion criteria for this study were: diagnosis of mild to moderate primary open angle glaucoma or ocular hypertension, and no previous glaucoma surgery. The following outcome measurements were recorded at baseline, and at 1 day, and at 3, 6, 9, 12 and 24 months after surgery: Intraocular pressure (IOP), number of IOP lowering medications, best corrected visual acuity (BCVA) and mean deviation (MD) on 24-2 Humphrey Visual Field Analyzer. Post-operative complications were also recorded. All data are expressed as mean ± SD with P <0.05 considered as significant.

**Results:** The mean preoperative IOP and number of drops were 21.3 ± 6.5 mmHg and 2.4 ± 1.1 respectively. Significant reduction in IOP compared with baseline was observed at each interval with maximal reduction at 3 months (IOP 14.5 ± 3.2 mmHg P <0.05). This IOP reduction was sustained at 12 and 24 months (14.9 ± 2.7, and 15.1 ± 3.7 mmHg (P <0.05)). This was associated with a significant reduction in number of drops to 1.0 ± 1.2 at 1 year, and 0.5 ± 0.6 at 2 years (P <0.05). Non-significant changes of MD over the course of the study (-8.33 dB at baseline, -8.36 dB at 12, -9.80 dB at 24 months) were observed. No further glaucoma surgery was required at 24 months post-operatively. The following complications were successfully managed: transient post-operative IOP spike (>21 mmHg) (n=7), peripheral anterior synchiae (n=1), cystoid macular oedema (n=1), and IOL repositioning (n=1).

**Conclusions:** Cataract surgery alone is known to lower IOP in addition to improving visual function. In our study we found an enhanced IOP reduction when performing phaco-iStent which correlated with less drops and less follow-up appointments compared to cataract extraction alone. This study in conclusion suggests that phaco-iStent can be regarded as a safe and effective procedure in lowering IOP and in reducing glaucoma medications over long-term follow-up in patients with mild to moderate glaucoma.

**Commercial Relationships:** Meena Arunakirinathan, None; Daniel Sibley, None; Eduardo M. Normando, None; Faisal Ahmed, None

**Program Number:** 4936 Poster Board Number: B0354

**Presentation Time:** 3:45 PM–5:30 PM

**Performance of a new ab interno gelatin stent in refractory glaucoma and 18-month safety results**

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**Purpose:** Nonadherence to treatments requiring daily dosage is common in chronic, asymptomatic diseases such as glaucoma and has been linked to worse outcomes. This multicenter study assessed the intraocular pressure (IOP)-lowering performance and safety of an ab interno placed gelatin stent (XEN®45, Allergan plc).

**Methods:** Patients (≥45 y old) with refractory glaucoma (ie, history of failed filtering/cilioablative procedure or uncontrolled IOP on maximum-tolerated topical therapy), medicated IOP ≥20 and ≤35 mmHg, and visual field mean deviation ≤-3 dB were implanted with the 6-mm gelatin stent. Primary outcomes: patients (%) achieving ≥20% IOP reduction from baseline on the same or fewer medications, and mean IOP change from baseline at 12 months. Procedure-related complications and ocular adverse events (AEs) were assessed at 18 months.

**Results:** 65 patients received the stent (intent-to-treat population); 83.1% and 75.4% completed the 12- and 18-month visits, respectively. At baseline, 84.6% of patients had failed a prior glaucoma procedure, 69.2% had undergone cataract surgery, and mean medicated IOP ± standard deviation (SD) was 25.1±3.7 mmHg. At 12 months, 76.3% of patients achieved ≥20% IOP lowering from baseline on the same or fewer medications; mean IOP change was -6.4 mmHg (95% CI: -8.8, -4.0). Observed data yielded similar results (n=61). Mean ± SD medication count fell from 3.5±1.0 (baseline) to 1.7±1.5 (12 months). No intraoperative complications or unexpected postoperative AEs were reported. Most AEs were mild or moderate and transient. Sixteen (24.6%) patients experienced transient hypotony (IOP <6 mmHg) requiring no surgical intervention. One case of stent exposure (after an implant repositioning procedure) was repaired at approximately 8 months.

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post-surgery, without further complications. There were no cases of hypotony, migration, exposure, endophthalmitis, or unanticipated AEs after the 12-month visit. Overall, needling was performed in 24 (36.9%) patients (21 had no complications, 1 had transient hypotony, and 2 had worsening of biomicroscopy findings) and 14 (21.5%) patients underwent another glaucoma procedure or device explant.

**Conclusions:** Ab interno placement of the gelatin stent reduced IOP and medication use without unexpected safety concerns over 18 months, confirming this approach as a surgical option in patients with refractory glaucoma.

**Commercial Relationships:** Davinder S. Grover, Reicheck Technologies (R), Allergan plc (R), Allergan plc (C);
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Arsham Sheybani, Allergan plc (C);
Yi-Jing Duh, Allergan plc (C);
Barbara Niksch, Allergan plc (E)

**Support:** Allergan plc

**Clinical Trial:** NCT02036541

**Program Number:** 4937 Poster Board Number: B0355
**Presentation Time:** 3:45 PM–5:30 PM

**Surgeon Perspectives and Learning Curve with an Ab-Interno Gelatin Microstent**

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**Purpose:** Minimally invasive glaucoma surgery (MIGS) aims to provide a lowering of intraocular pressure with an excellent safety profile. However, there is a lack of data describing the learning process of these techniques and how it compares to other surgeries. In this study, we aim to evaluate and compare an ab interno gelatin microstent (XEN-45, Allergan) to other glaucoma surgeries from the surgeon's perspective.

**Methods:** A cross-sectional survey study was conducted using a survey instrument developed to measure factors associated with learning and clinical use of the gelatin microstent. The survey was validated using input from 3 experienced glaucoma surgeons. Evaluation criteria included prior surgical experience, patient selection criteria, stepwise analysis of device implantation, post-operative care and incorporating the device into practice. 30 surgeons in Canada who used the gelatin microstent were identified and emailed the anonymous survey instrument (FluidSurveys, Survey Monkey).

**Results:** Surgeons were in early-mid career (11.8 ±7.2 operating years) and experienced with filtration surgery (94.1% very comfortable). Most surgeons selected patients for implantation on the following criteria: moderate to advanced disease (88.2% and 76.5% of surgeons, respectively), diagnosis of POAG or PXG (70.6%), on 2, 3, or 4 glaucoma medications (70.6%, 75.5%, 70.6%, respectively), and had prior MIGS (70.6%). Creation of the scleral tunnel into the subconjunctival space and stent deployment were rated the most difficult steps of the surgery. Most surgeons (52.9%) required 6-10 months to become comfortable with the procedure and felt it was easier to gain proficiency with gelatin microstent implantation than filtration surgery (94.1% agree or strongly agree).

**Conclusions:** A group of experienced glaucoma surgeons used an ab interno gelatin microstent to manage patients with moderate to advanced glaucoma and thought the procedure was easier to learn than traditional filtration surgery. We hope that this data, as well as key learning points shared by surgeons who participated, will be helpful to guide surgeons who are beginning to use this device.

**Commercial Relationships:** Gokulan Ratnarajan, None;
Andrei-Alexandru Szigiato, None; Simrenjeet Sandhu, None; Michael Dorey, None; Iqbal Ahmad, None

**Program Number:** 4938 Poster Board Number: B0356
**Presentation Time:** 3:45 PM–5:30 PM

**Outcomes of resident-performed trabeculectomies with combined cataract surgery**

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**Purpose:** One variable in glaucoma surgery is whether it is combined with a second procedure, most often cataract extraction with intraocular lens placement. Here we examine the effect of combined cataract surgery in trabeculectomies performed by residents.

**Methods:** The study was a retrospective chart review. Included was primary open-angle glaucoma patients ≥18 years with IOP >16 and ≤40 mmHg who received a resident-performed trabeculectomy between 1/2006 and 7/2012. Only trabeculectomies without prior glaucoma surgery were included. We recorded intraocular pressure (IOP) and number of glaucoma drops pre-op, 3 (±1) months post-op, and 5 (±0.5) years post-op. Other outcomes were bleb dysfunction (over or under filtration) by 3 months, cumulative reoperation rates by 5 years, and development of no light-perception (NLP) vision. Outcomes were compared between trabeculectomies with and without combined cataract extraction (CE). Statistical analyses were performed with two-tailed Student t-test and Fisher’s exact test.

**Results:** 231 filtering glaucoma surgeries were identified in the study period. 191 were excluded. Primary reasons were incomplete records (44%), failure to follow to 5 years (37%), or secondary forms of glaucoma (12%). Of the 40 trabeculectomies to meet all inclusion criteria, 28 were combined with CE and 12 were not. Groups were not significantly different in terms of age (p=0.11), gender (p=0.49), ethnicity (p=1.0), diabetes (p=0.49) hypertension (p=0.99), and average preoperative IOP (p=0.81). At 3 months post-op IOP decreased by 38±25% in the CE group and 49±15% in the non-CE group (p=0.17). At 5 years IOP reduction was 38±26% for CE and 40±26% for non-CE. Glaucoma drops for CE and non-CE groups were 2.9±0.5 and 2.8±0.9 pre-op (p = 0.91), 1.8±1.1 and 1.8±1.4 at 3 months (p = 0.92), and 2.4±0.9 and 1.8±1.5 at 5 years (p = 0.41). No included patients progressed to NLP vision. Early bleb dysfunction was more common in CE (61%) than non-CE (33%) trabeculectomies but not significantly (p=0.17). Reoperation rates were 21.4% in the CE group and 16.7% in the non-CE group (p=1.0) at 5 years.

**Conclusions:** Resident-performed trabeculectomies appear to have similar 5-year outcomes when combined with cataract surgery. A limitation of our study was decreased power due to few patients with long-term follow up.

**Commercial Relationships:** Benjamin T. Whigham, None;
Aliza Aziz, None; Wei Hou, None; Inci Dersu, None
**Program Number:** 4939  
**Poster Board Number:** B0357  
**Presentation Time:** 3:45 PM–5:30 PM

**Surgical Trabeculectomy Training - Are we safe at supervising?**  
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James Huxtable4, Anthony King5, James Kirwan6, Alex MacLeod7,  
Andrew I. McNaught8, Sam Naylor9, Martyn Senior10, Peter Shah11,  
Freda Si12, Suzy Turner13, Andrew Walkden14, Archana Bhargava15  
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2University Hospital Birmingham NHS Foundation Trust, Birmingham, United Kingdom;  
3Gloucestershire Hospitals NHS Foundation Trust, Cheltenham, United Kingdom;  
4Calderdale & Huddersfield NHS Foundation Trust, Huddersfield, United Kingdom;  
5Southampton General Hospital, Hampshire, United Kingdom;  
6Norfolk and Norwich University Hospital NHS Foundation Trust, Norwich, United Kingdom;  
7Nottingham University Hospital, Nottingham, United Kingdom.

**Purpose:** UK Trainee glaucoma surgical exposure is limited due to constraints of service, the European working time directive and increasing subspecialisation. Limited knowledge exists on trainee trabeculectomy outcomes. Our study analyses outcomes of supervised trabeculectomy outcomes performed by trainees in a large cohort.

**Methods:** Retrospective case note review of all patients that had trabeculectomy surgery with mitomycin-C by Consultant and trainee surgeons between March 2011 and November 2013 across multiple UK centres. All eyes have 2-year follow-up. Data includes intraocular pressure (IOP) which is pre-operative, 1 and 2 years and Snellen acuities. Failure rate and surgical complications were recorded. Success was determined using WGA guidelines. Two-tailed p-values were obtained using Fisher’s exact test to ascertain statistical significance between groups.

**Results:** 324 eyes were reviewed. 6 cases (1.85%) were excluded due to incomplete follow up data, leaving 318 eyes for analysis. Mean age was 72.7 years (range 35-98 years). 211 (66.4%) cases were performed by Glaucoma Consultants. 107 (33.6%) cases were performed by trainee ophthalmologists with limited trabeculectomy experience. The modal diagnosis in each group was primary open angle glaucoma. Post operative IOP control showed no significant difference between consultant and trainee groups at year 1 and year 2 (p=0.88 and 0.61 respectively). Success rates showed no significant difference between consultant and trainee cases (p=0.22, 0.52 respectively). Failure rates at year 1 showed a significant difference between the two groups (p=0.04). No significant difference was seen at year 2 (p=0.50). Bleb leak and hypotony were the most common complications for both groups (n=15 for each) with the trainees having significantly more, compared with the Consultants (p=0.02). Snellen visual acuity change was not statistically significant between the two groups (p=0.41).

**Conclusions:** The 2 year outcomes of trainee trabeculectomy compare favourably with Consultants. Trainee cases had a higher rate of reintervention, but overall outcomes are good. These findings help guide informed consent for trainee surgery. It is possible to safely train the next generation of glaucoma surgeons.

**Commercial Relationships:** Hayun Lee, None; Nitin Anand, None; David C. Broadway, None; James Huxtable, None; Anthony King, None; James Kirwan, None; Alex MacLeod, None; Andrew I. McNaught, None; Sam Naylor, None; Martyn Senior, None; Peter Shah, None; Freda Si, None; Suzy Turner, None; Andrew Walkden; Archana Bhargava, None

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**Program Number:** 4940  
**Poster Board Number:** B0358  
**Presentation Time:** 3:45 PM–5:30 PM

**Surgical outcome of trabeculectomy with phakia, pseudophakia, and phaco trabeculectomy for open-angle glaucoma - Utilizing the data from the Collaborative Bleb-Related Infection Incidence and Treatment Study**  
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1Medical Innovation and Translational Medical Science, Kyoto Prefectural University of Medicine, Kawaramachi Kamigyoiku Kyoto, Japan; 2Biostatistics, Kyoto Prefectural University of Medicine, Kyoto, Japan; 3Mathematics and Statistics in Medical Sciences, Kyoto prefectural university of Medicine, Kyoto, Japan; 4Frontier Medical Science and Technology for Ophthalmology, Kyoto prefectural university of Medicine, Kyoto, Japan; 5Ophthalmology, Kyoto prefectural university of Medicine, Kyoto, Japan.

**Purpose:** To compare the surgical outcomes of initial trabeculectomy (TLE) with lens status (TLE with phakia, pseudophakia, and phaco TLE) for open-angle glaucoma (OAG) utilizing data from the Collaborative Bleb-Related Infection Incidence and Treatment Study (CBITIS), a multicenter prospective cohort study conducted by the Japan Glaucoma Society.

**Methods:** This observational study involved 467 primary OAG or exfoliation glaucoma patients out of 1,098 cases from the CBITIS data sets. Intraocular pressure (IOP) and bleb shape were described at 6-month intervals throughout the 5-year follow-up period. Bleb morphology was evaluated by the characteristics of width (W) and depth (D). IOP and each bleb characteristic were compared among the three groups. Surgical failure was defined using the following IOP levels at 2 consecutive visits: 22mmHg [criterion (crit)-A], 19mmHg (crit-B), 16mmHg (crit-C), or greater. Bleb failure was defined as blebs became smaller than the scleral flap size at W or D (crit-W, or crit-D, respectively). When additional glaucoma surgery was required and performed, it was regarded as a failure for all criteria. The Cox proportional hazards regression model was used after adjustment for sex, age, those with a fornix- or limbal-based flap, subtype of OAG, preoperative IOP, and number of preoperative topical anti-glaucoma medications used.

**Results:** Of the 1,098 cases, 319 underwent TLE with phakic eyes (TLE_phak), 98 underwent phaco TLE (phaco TLE), and 50 underwent TLE with pseudophakic eyes (TLE_IOL). The failure-free advantage in favor of the TLE_phak to phaco TLE, and TLE_IOL was HR: 0.58; 95%CI: 0.31-1.13, HR: 0.80; 95%CI: 0.37-1.95 for crit-A, HR: 0.50; 95%CI: 0.28-0.92, HR: 0.53; 95%CI: 0.27-1.11 for crit-B, HR: 0.64; 95%CI: 0.41-1.02, HR: 0.54; 95%CI: 0.33-0.90 for crit-C, and HR: 0.43; 95%CI: 0.26-0.72, HR: 0.51; 95%CI: 0.28-0.98 for crit-W and HR: 0.63: 95%CI: 0.41-0.98, HR: 0.77; 95%CI: 0.45-1.37 for crit-D. The failure-free period of the TLE_phak was statistically longer than those of the phaco TLE or TLE_IOL during the 5-year follow-up period in all criteria.

**Conclusions:** TLE with phakia may maintain lowest IOP and best filtering blebs compared with phaco TLE or TLE with pseudophakia.

**Commercial Relationships:** Yuji Yamamoto, Kazuhiko Mori, None; Isao Yokota, None; Kengo Yoshii, None; Yoko Ikeda, None; Morio Ueno, None; Kojiro Imai, None; Satoshi Teramukai, None; Shigeru Kinoshita, None; Chie Sotozono, None

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Transconjunctival Suturing of the Scleral Flap to Treat Persistent Hypotony after Anti-metabolite Supplemented Trabeculectomy

One-Year Results on Efficacy and Safety

Yesenia Y. Dorantes Diez1, Jose A. Paczka1, Montserrat Romo Sainz1, Luz A. Giorgi Sandoval1,2, Karla J Aguilera Ruiz2.

1Universidad de Guadalajara, Jalisco, Mexico; 2Research and development, Instituto Mexicano del Seguro Social, Guadalajara, Mexico.

Purpose: Transconjunctival suture of scleral flap (TCSSF) is a straightforward surgical option to be used when other more conservative methods have failed. This study assessed efficacy and safety of transconjunctival scleral flap suturing in a cohort of Latino patients with persistent hypotony after trabeculectomy.

Methods: A series of consecutive cases which underwent mitomycin C (MMC) supplemented trabeculectomy were retrospectively assessed. Cases with complete clinical information with at least one year of follow-up, and in which TCSSF was performed to treat hypotony (IOP ≤5mmHg) persisting for at least 2 months were selected for analysis. Best-corrected visual acuity (LogMAR) and IOP values at baseline as well as those of the follow-up were collected until the final examination; in addition, relevant perioperative information, number of sutures applied, success rate and frequency of complications were recorded.

Results: From 417 eyes (366 patients, 225 female) which underwent MMC- supplemented trabeculectomy in a glaucoma referral center during a 5-year period, 11 (2.6%) of them were identified with persistent ocular hypotony (mean duration 3.9±1.4 months) requiring TCSSF. A mean pre-suture IOP 3.4±1.3 mmHg (range 0-5 mmHg) was statistically different (P=0.001) as compared to all mean post-TCSSF values: 9.5±2.4 mmHg (day 1), 11.2±2.5 mmHg (week 1), 10.3±3.0 mmHg (month 1), 15.6±3.8 mmHg (month 3), 13.7±3.4 mmHg (month 6) and 12.8±3.1 mmHg (month 12). Three cases (27%) persisted with hypotony; two of them underwent additional TCSSF with resolution of hypotony in one of them. The remaining non-responder cases required partial resection of the filtering bulb and direct repair of the scleral flap to get hypotony completely solved. Range of sutures used on the scleral flap was 1-4 (median=2). Best-corrected visual acuity significantly improved after TCSSF (0.5±0.3 to 0.2±0.12, P <0.01). No relevant complications related to the procedure were recorded.

Conclusions: Persistent ocular hypotony due to post-trabeculectomy over-filtration is a well-recognized complication. The transconjunctival suture technique seems to be an effective and safe option to approach persistent hypotony.

Commercial Relationships: Yesenia Y. Dorantes Diez, None; Jose A. Paczka, None; Montserrat Romo Sainz, None; Luz A. Giorgi Sandoval, None; Karla J Aguilera Ruiz, None.

Program Number: 4942 Poster Board Number: B0360
Presentation Time: 3:45 PM–5:30 PM

Needling procedures following trabeculectomy – predictive factors and a retrospective study of outcomes

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Purpose: To measure the ocular hypotensive effect of needling revision procedures performed post-trabeculectomy at Addenbrooke’s Hospital in glaucoma patients over a 10 year period as well as assessing risk factors that predict the success or failure of needling.

Methods: Retrospective case series of 91 patients (96 eyes) who had undergone post-trabeculectomy needling during this period, with at least 1 year follow-up post-procedure. Success was defined with respect to intraocular pressure (IOP) targets (21 and 18mmHg) qualified by the need for topical anti-glaucoma medications. Bleb morphology was a secondary outcome described at each visit. Relevant risk factors were analysed retrospectively against both success criteria via Cox proportional hazards regression analysis.

Results: The mean (±SD) follow-up period was 3.09±1.75 years. Median interval between trabeculectomy and first needling was 41.5 days. The mean IOP for all eyes reduced from 24.6±8.1 mmHg immediately pre-needling to 13.2±6.6 mmHg (p<0.0001) at the first postoperative check. Complete success (IOP<21mmHg, without new medications) was 72% at final follow-up. Complete success (IOP<18mmHg, without new medications) was 53% at final follow-up. Survival curves indicated most of the failure of needling occurred in the first few months after the procedure. There was a significant change in description of bleb morphology with fewer flat or fibrotic blebs and more diffuse blebs 1 year after needling (chi-square with Yates correction = 45.9, p<0.0001). Risk factors predicting failure of the needling were an IOP >10mmHg at first post-needling check, and a non-injected bleb morphology before needling. A period greater than 90 days between trabeculectomy and first bleb needling was a significant risk factor for failure defined by IOP>21mmHg. No clinically important adverse outcomes were identified.

Conclusions: Needling represents a useful intervention following trabeculectomy which may be preferable to medication or more invasive methods of controlling IOP. The ocular hypotensive effect was maintained for at least a year in the majority of patients. Bleb morphology (26%) was a predictor of trabeculectomy survival and of needling success. Achieving a low IOP immediately following trabeculectomy needling has a favourable outcome.

Commercial Relationships: Toby Al-Mugheiry, None; Jonathan Than, None; Jesse Gale, None; Keith R. Martin, None.
Antimetabolite augmented slit-lamp needling for the management of post-trabeculectomy failing bleb

Montserrat Romo Sainz1, Jose A. Paczka2,4, Yesenia Y. Dorantes Diez2, Luz A. Giorgi Sandoval1, Monica Montserrat M. Gonzalez Lomeli1, Karla J Aguilera Ruiz2, Andrea Orozco Garcia1.1 Instituto de Oftalmología y Ciencias Visuales, Universidad de Guadalajara, Guadalajara, Mexico; 2Oftalmología, Instituto Mexicano del Seguro Social, Guadalajara, Mexico; 3Oftalmología, Antiguo Hospital Civil de Guadalajara, Guadalajara, Mexico; 4Research & Development, Unidad de Diagnóstico Temprano del Glaucoma, Guadalajara, Mexico.

Purpose: To evaluate efficacy and safety of 5 fluorouracil (5-FU) or mitomycin C (MMC) augmented slit-lamp needling to manage post-trabeculectomy failing blebs in a cohort of Latino patients affected by diverse types of glaucoma.

Methods: Four hundred seventeen consecutive cases of trabeculectomy supplemented with intra-operative mitomycin C (MMC) with at least one year follow-up were retrospectively assessed. A total of 75 cases underwent either 5-FU (250 mcg / 0.1ml) or MMC (0.25 mg / 0.1 ml) augmented bleb needling in at least one eye. Major outcome variables were mean decrease of IOP, number of antiglaucoma medications, success rate and presence of complications.

Results: Intraocular pressure decreased from 19.9 ± 5.8 mm Hg (5-FU group) and 20.2 ± 5.1 mm Hg (MMC group) to 15.3 ± 3.6 mm Hg (P = 0.001) and 13.9 ± 3.2 mm Hg (P = 0.001), respectively, at 12 months. Antiglaucoma medications decreased from 2.2 ± 0.8 (5-FU) and 2.5 ± 0.9 (MMC) to 1.8 ± 0.4 (P = 0.0001) and 1.1 ± 0.3 (P = 0.0001), respectively, at 12 months. Global success rate was 72.1% (5FU) and 81.2% (MMC) (P = 0.042), at 12 months. Most common complication was persistent hypotony, presented in 4.7% of the 5-FU group and in the 12.5% of MMC group (P = 0.02).

Conclusions: Antimetabolite augmented slit-lamp needle revision confirms to be an effective and safe option to treat post-trabeculectomy failing blebs in a cohort of Latino patients. MMC might be more effective than 5-FU, although with higher risk of persistent hypotony.

Commercial Relationships: Montserrat Romo Sainz, None; Jose A. Paczka, None; Yesenia Y. Dorantes Diez, None; Luz A. Giorgi Sandoval, None; Monica Montserrat M. Gonzalez Lomeli, None; Karla J Aguilera Ruiz, None; Andrea Orozco Garcia, None

Program Number: 4943 Poster Board Number: B0361
Presentation Time: 3:45 PM–5:30 PM

Is bleb needling after failed trabeculectomy a procedure worth considering? 5 year outcome with a standardized technique

Corrado Gizzi1,2, Jibran Mohamed-Noriega1,3, Winifred Nolan1, Tuan Ho1, David Garway-Heath1.1 NIHR Biomedical Research Centre, Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology, London, United Kingdom; 2DIBINEM, University of Bologna, Bologna, Italy; 3Departamento de Oftalmología, Hospital Universitario, UANL, Monterrey, Mexico.

Purpose: Restoring adequate intraocular pressure (IOP) control after trabeculectomy failure is challenging for the ophthalmologist. We performed a retrospective analysis of in-theatre needle trabeculectomy revision (‘needling’) to evaluate its efficacy.

Methods: We included one eye, selected randomly if both were eligible, of all consecutive patients (n=188) who had needling after failed trabeculectomy with the same technique over a period of 10 years (2004–2014) in a single centre (Moorfields Eye Hospital, London, UK). All interventions were undertaken in theatre with a far superior conjunctival entry. A 29G or 25G needle was used to access the subconjunctival/subtenon space to revive the bleb drainage with one or more of a sequence of steps: breakage of the fibrotic adhesions with sweeping movements of the needle (type 1), identification of the scleral bed and elevation of the overlying scleral flap (type 2), or restoration of the fistula entering the AC with the needle (type 3). All patients had subconjunctival 5-FU and steroids injection at the end. Number of medications and IOP were compared pre and post needling using the paired Student t test. Success was calculated with Kaplan-Meier statistics and defined with Criteria A, B and C when IOP was under 21, 18, 15 mmHg and a reduction of ≥20%, ≥25%, ≥30% from baseline, respectively; for each criterion, success was classified as complete if the patients were off glaucoma drops and qualified if drops were needed.

Results: The mean (SD) IOP at baseline was 22.6 mmHg (6.0) with a mean of 1.6 (1.4) medications (Table 1). Overall success (95%CI) at 1, 2 and 5 years for criteria A were 71.2 (63.1–77.9), 63.3 (54.5–70.8), and 48.9 (36.9–59.8); for criteria B were 60.3 (51.9–67.7), 54.3 (45.6–62.2), and 34.3 (23.8–45.0); for criteria C were 52.4 (44.0–60.1), 41.7 (33.4–49.8), and 22.5 (13.6–32.8) respectively (Figure 1). There was a statistically significant lower mean IOP at last follow up compared to baseline (Table 2). Complications were similar to previous reports with similar long follow-up (Table 1).

Conclusions: Our standardized needling technique is an effective option to be considered as first approach to failed trabeculectomy.

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Thirty eyes of 15 unrelated ARB patients with ACG (angle
wenjun bao
All patients had macular cystoid edema, RPE irregularity,
To compare the long-term outcome of trabeculotomy with

Commercial Relationships: None; Akira Sawada, None;

C30-2 (p=0.002 and 0.009 for trabeculectomy and trabeculotomy, respectively, Wilcoxon signed rank test). Central 10-2, however, showed significant progression in the trabeculotomy group only (p= 0.001 and 0.06 for trabeculotomy and trabeculectomy, respectively, Wilcoxon signed rank test). There was no relationship between postoperative mean IOP and postoperative MD slope in both groups.

Conclusions: Trabeculotomy can maintain the IOP less than 16mmHg for up to 12 years in significantly more cases as compared with trabeculectomy. Trabeculotomy keeps the central visual field, as well. This study suggests that trabeculotomy attains better IOP control and more stabilized central visual field than does trabeculectomy for long time.

Commercial Relationships: wenjun bao; Hailong Huang, None; Kazuhide Kawase, None; Tetsuya Yamamoto, None

Program Number: 4946 Poster Board Number: B0364
Presentation Time: 3:45 PM–5:30 PM
Clinical characteristics of autosomal recessive bestrophinopathy (ARB) with angle-closure glaucoma (ACG) and surgical outcomes of trabeculectomy and iridotomy
Xing Liu, Jingyi Luo, Yimin Zhong, Hui Xiao. Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangzhou, China.

Purpose: About 42.8–50% patients with ARB have ACG. Few studies analyze the clinical characteristics of ACG and glaucoma treatment in ARB patients. The purpose of this study is to analyze the clinical characteristics of 15 patients of ARB with ACG and to compare the surgical outcomes of trabeculectomy and iridotomy.

Methods: Thirty eyes of 15 unrelated ARB patients with ACG (angle closure > 180°, evaluated by gonioscope) were recruited. Bilallelic mutations in BEST1 gene were confirmed in all patients. Intraocular pressure (IOP), central anterior chamber depth (ACD), axial length (AL), fundus photography were performed. Subfoveal choroidal thickness was measured using enhanced depth imaging (EDI) of spectral domain optical coherence tomography (SD-OCT). Fourteen eyes underwent trabeculectomy (Group A) and 16 eyes underwent iridotomy (Group B). All patients were followed up for at an average of 18 months.

Results: All patients had macular cystoid edema, RPE irregularity, extensive serous retinal detachment with multifocal subretinal vitelliform deposits at the posterior poles. All preoperative parameters, including baseline IOP, ACD, AL, C/D ratio and choroidal thickness, were not significantly different between the two groups (all P > 0.05, Figure 1). At 1-year postoperative follow-up, IOP was 10.67 ± 0.81 mmHg in Group A, compared to 15.25 ± 1.10 mmHg in Group B (P = 0.008). All eyes in Group A had persistent flatten anterior chamber for at least 2 months, and none of the eyes in Group B had any surgical complications (P < 0.001, Figure 2).

Conclusions: ARB patients often have characteristics of shallow anterior chamber angles and short axial lengths, causing high risk of developing secondary angle-closure glaucoma. Trabeculectomy is more likely to result in persistent flatten anterior chamber postoperatively. Iridotomy may be a safer option for these patients.
Dexamethasone nanoparticle eye drops to replace Mitomycin C

**Purpose:** To compare postoperative use of novel 1.5% dexamethasone nanoparticles (DexNP) eye drops after trabeculectomy with Mitomycin C, MMC, and Maxidex®. Can DexNP eye drops replace MMC? **Methods:** A randomized double masked clinical trial included 25 patients undergoing primary trabeculectomy for poorly controlled primary open angle glaucoma. The study group included 15 patients treated with DexNP eye drops QID postoperatively compared to 10 patients in the control group treated with MMC intraoperatively and Maxidex® x6/day postoperatively. The drops were tapered over 8 weeks. The main outcome measure was intraocular pressure (IOP). Secondary outcome measure included glaucoma medications, success rate (IOP <=15 mmHg) and complications. **Results:** Study and control group showed similar postoperative course and reduction in IOP. IOP in the DexNP and control group was 25.5 mmHg and 24.4 mmHg, respectively at baseline and was reduced to 15.4 mmHg and 12.7 mmHg at 3 months and 14.0 mmHg and 13.4 mmHg at 12 months. The IOP reduction was 11.3 mmHg in the study group (p=0.0001) and 11.0 mmHg in the control group (p=0.0018) at 12 months. The success rate was 75% in both groups at 12 months. The success rate was not significantly different in the two groups over the 12 month period (p=0.99). There was no significant difference in the use of anti-glaucoma medications postoperatively or in the rate of complications. **Conclusions:** DexNP eye drops are effective postoperative treatment following trabeculectomy. DexNP are potent anti-inflammatory and anti-fibroblast agents that may offer an alternative to Mitomycin C in glaucoma surgery. **Commercial Relationships:** Einar Stefansson, Oculis (C), Oculis (P), Oculis (S); Gauti Johannesson, Oculis (I); Gudrun M. Asgrimsdottir, Oculis (E); Thorsteinn Loftsson, Oculis (C), Oculis (P), Oculis (S); Maria S. Gottfredsdottir, Oculis (I) **Clinical Trial:** 2013-001093-16

**Program Number:** 4947 **Poster Board Number:** B0365 **Presentation Time:** 3:45 PM–5:30 PM

**Antifibrotic effect of rapamycin, an inhibitor of mTOR pathway, on the TGF-β2 induced proliferation of human tenon fibroblasts**

**Shaoqian Zhang, Lin Du, Di Wu, Chi Liu, Hailin Wang.** Department of Ophthalmology, The Fourth People’s Hospital of Shenyang, Shenyang, China.

**Purpose:** Bleb failure by fibrotic scarring remains a major problem of glaucoma filtration surgery. Dysfunctional PI3K/mTOR signaling has recently been recognized as a driver of aberrant proliferative responses in kidney, pulmonary and cardiac fibrosis. In this study, we investigated the antifibrotic effect of rapamycin, an mTOR inhibitor, on the TGF-β2 induced proliferation of human tenon fibroblasts (HTFs).

**Methods:** Human tenon tissue was obtained from adult strabismus patients during surgery. Primary cell culture for the HTFs was performed. After 24 hour incubation with 2ng/mL TGF-β2, the cells were treated with rapamycin 1nM for 48 hours. Cell viability and proliferation were measured with MTT assay. Cell migration was assessed by scratch wound assay. Flow cytometry of AnnexinV/propidium iodide (PI) staining was performed to measure the cell apoptosis. Expression of proliferative gene MKi67, pro-apoptotic gene caspase 3, and autophagy related gene LC3B were analyzed by real-time PCR.

**Results:** TGF-β2 significantly promoted the proliferation (138% of controls, p<0.01) and migration of HTFs, as well as the mRNA expression of MKi67. Rapamycin effectively attenuate the TGF-β2 induced cell proliferation (80.8% of TGF-β2 group), and migration. The up-regulated MKi67 expression in TGF-β2 treated HTFs was also distinctively inhibited by rapamycin. Cell apoptosis, as assessed by both flow cytometry and caspase 3 mRNA expression, was not observed in all groups. As an autophagy inducer, rapamycin significantly up-regulated the mRNA expression of LC3B, an important autophagy marker, in the HTF cells with and without TGF-β2.

**Conclusions:** Rapamycin could effectively prevent the TGF-β2 induced proliferation and migration of HTF cells without affecting the cell survival. The involvement of mTOR and the underlying mechanism of autophagy need further investigation. Rapamycin may become a potential anti-fibrotic agent that may facilitate the therapeutic effect of glaucoma filtering surgery.
Program Number: 4949 Poster Board Number: B0367
Presentation Time: 3:45 PM–5:30 PM

Blockade of Kca3.1: A Novel Therapeutic Target To Treat TGF-β1 Induced Fibrosis Associated With Glaucoma Filtration Surgery

govindaraj anumanthan1, 2, Philip J. Wilson1, Tripathi Ratnakar1, 2, Suneel Gupta1, 2, Nathan P. Hesemann1, 3, Elizabeth A. Giuliano1, Rajiv R. Mohan1, 2. 1Dept.of Vet. Medicine and Surgery, University of Missouri, Columbia, MO; 2Harry S. Truman Memorial Veteran Hospital, Columbia, MO; 3Mason Eye Institute, School of Medicine, Columbia, MO.

Purpose: Postoperative scarring (fibrosis) is a major complication after filtration surgery in glaucoma patients. The currently used drugs (Mitomycin C and 5-fluorouracil) extend short-term benefit but cause cytotoxicity and complications including damage to the corneal endothelium. The calcium-activated potassium channel Kca3.1 plays an important role in cellular proliferation, tissue remodeling, and fibrosis. However, the role of Kca3.1 channel in treating fibrosis seen after glaucoma filtration surgery remained unknown. We sought to explore the anti-fibrotic role of Kca3.1 channel using a selective blocker, TRAM34, in preventing TGF-β1 induced fibrosis seen in conjunctival fibroblasts after glaucoma filtration surgery using an in vitro model.

Methods: Primary human conjunctival fibroblast (HCF) cultures were generated from donor human conjunctival tissues, and fibrosis was produced by growing cultures in TGFβ1 (5ng/ml). PCR and immunofluorescence were performed to confirm Kca3.1 mRNA and protein expression in HCF. Anti-fibrotic effects of Kca3.1 was examined by growing HCF in +/- TGFβ1 (5ng/ml) and TRAM34 (0, 10, 25µM) for 72h under serum-free conditions and quantifying fibrotic gene expression by quantitative real-time PCR (qPCR) and western blot. Further, TRAM34 role in TGFβ1 signaling was analyzed by smad2/3 nuclear translocation using immunofluorescence.

Results: Significant Kca3.1 gene and protein levels were detected in HCF. The Kca3.1 gene expression increased in response to TGFβ1 treatment. TRAM34 showed no significant toxicity to HCF in histology or trypan blue assay (p<0.05). Kca3.1 channel inhibition by TRAM34 significantly attenuated TGFβ1-induced Smad2/3-dependent transcription of fibrotic markers, αSMA (p<0.01), fibronectin (p<0.05), collagen I (p<0.001) and collagen III (p<0.001). Further TRAM34 also significantly inhibited TGFβ1-dependent αSMA protein expression (p<0.01) and smad2/3 nuclear translocation in HCF.

Conclusions: Our study suggests that TRAM34 (Kca3.1 inhibitor) could be a useful therapeutic option to treat TGFβ1-induced fibrosis in conjunctival fibroblasts and may improve filtration bleb fibrosis outcome. In vivo studies using rabbit model of glaucoma filtration surgery are underway.

Commercial Relationships: govindaraj anumanthan, None; Philip J. Wilson, None; Tripathi Ratnakar, None; Suneel Gupta, None; Nathan P. Hesemann, None; Elizabeth A. Giuliano, None; Rajiv R. Mohan, None

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**Program Number:** 4950  
**Poster Board Number:** B0368  
**Presentation Time:** 3:45 PM–5:30 PM  
**A single dose of layer-by-layer nanoparticles prolongs endogenous gene silencing for the treatment of fibrosis**  
Yang Fei Tan1, Li-Fong Seet1, Subbu S. Venkatraman1, Tina T. Wong1,  
1School of Material Science & Engineering, Nanyang Technological University, Singapore, Singapore; 2Singapore Eye Research Institute, Singapore, Singapore.  

**Purpose:**  
Fibrosis is a progressive process requiring sustained inhibition for successful treatment. The purpose of the study is to evaluate the first example of using multi-layered nanoparticles to extend the anti-fibrotic effect by endogenous gene silencing in a single dose, establishing a method for safe and effective treatment of fibrosis.  

**Methods:** SPARC siRNA loaded layer by layer nanoparticles was fabricated with hydroxyapatite (HA) as the core and poly-L-arginine (ARG) as protective layers in an optimised configuration targeted at sustained gene silencing. Modified glaucoma filtration surgeries were performed on 60 mice. Mice were then injected with either siSPARC or scrambled siRNA-loaded nanoparticles (n=60). The mice were sacrificed on days 7 and 14, and the conjunctival tissues harvested. Immunoblotting was performed on the tissues to quantify SPARC and collagen I protein levels. Annexin V in conjunctival tissues was measured by flow cytometry to evaluate toxicity of the particles in vivo. Picrosirius red and immunofluorescence of cryosections of 14 day-old treated eye tissues were also performed to evaluate amount of collagen present and toxicity of the treatment.  

**Results:** SPARC protein levels reduced by 1.18 folds on day 7 and 1.79 folds on day 14 relative to control samples. Collagen protein levels reduced by 2.35 folds on day 7, and 1.67 folds on day 14, relative to controls. Annexin V levels and histological immunofluorescence cryosections showed no significant toxicity of the treatments in vivo. Picrosirius red stained cryosections showed particles surrounded by collagen fibres of similar amount and maturity as areas without particles, further proving insignificant toxicity of treatment.  

**Conclusions:** SPARC silencing with the multi-layered nanoparticle system reduced collagen expression for 14 days and no significant local toxicity was observed. Delivery of siRNA using this nanoparticles platform is a promising alternative for the treatment of fibrosis.  

**Commercial Relationships:** Yang Fei Tan, None; Li-Fong Seet, None; Subbu S. Venkatraman, None; Tina T. Wong, None

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**Program Number:** 4951  
**Poster Board Number:** B0369  
**Presentation Time:** 3:45 PM–5:30 PM  
**A Novel Flexible Microfluidic Meshwork to Reduce Fibrosis in Glaucoma Surgery**  
Behzad Amoozgar1, Xiaoling Wei1, Jun Hui Lee1, Michele Bloomer1, Zhenguo Zhao1, Paul Coh1, Fei He1, Lan Luan1, Chong Xie2, Ying Han1,  
1Ophthalmology, University of California, San Francisco, San Francisco, CA; 2Department of Biomedical Engineering, The University of Texas at Austin, Austin, TX; 3Department of Physics, College of Natural Sciences, The University of Texas at Austin, Austin, TX.  

**Purpose:** Fibrosis and hence capsule formation around the glaucoma drainage devices (GDD) are the main reasons for glaucoma implant failure. To address this critical issue, we developed a novel ultra-flexible microfluidic implant for glaucoma device that affords mechanical compliance similar to that of the eye tissue. Here, we tested the amount of capsule formation around this new microfluidic meshwork and compared it with capsule formation around a conventional GDD.  

**Methods:** The new implant was made from negative photoresist SU-8 by using micro-fabrication techniques. The size of the meshwork was 7mm ×7mm with a grid period of 100 μm. Six eyes from 3 New Zealand rabbits were randomized to receive either the new meshwork or a plate of Ahmed glaucoma valve model FP7 (AGV FP7) (Fig 1). Both implants were placed in the subtenon space at the supratemporal quadrant in a standard fashion. All animal eyes were examined for signs of infection and implant erosion on days 1, 3, 7, and 14 and monthly thereafter. The eyes were enucleated at 3 months. Histology slides of the implant and the surrounding tissues were prepared and stained with hematoxylin-eosin (HE). The histologic sections were examined using light microscopy by a pathologist who was blinded to the different groups. Thickness at the bottom of the capsule around the implant was measured for each eye. Paired student’s t-test was used to compare the difference in the thickness of fibrous capsule between the two groups.  

**Results:** As shown in Fig 2, in both cross section (Fig 2A and 2B) and histological slides (Fig 2C and 2D), a dense capsule formed around the plate of AGV FP7 but nearly no capsule formed around the brown microfluidic implant. Thickness of the fibrotic capsules beneath the AGV FP7 plate from the 3 rabbit eyes was 90μm, 82μm, and 95μm, respectively. The thickness at the bottom of fibrotic capsules around the microfluidic implant were 1μm, 2μm, and 1μm, respectively. The difference in thickness of capsule between the two groups was significant (P=0.002). Both implants were tolerated well by all rabbits and no complications were noticed.  

**Conclusions:** The novel meshwork elicited minimal fibrosis and capsule formation and hence provides exciting evidence to aid in future developments of a novel GDD that will provide minimal scar formation and better long-term surgical outcomes. In further, we will incorporate the meshwork with a drainage tube to test a new GDD.
Would healing modulation in glaucoma surgery: an experimental study

Hayana Rangel1, 2, Hevila Rolim1, Ivana Duval de Araujo1, Paula Vidigal1, Sebastiao Cronemberger1. 1Federal University of Minas Gerais, Brazil, Belo Horizonte, Brazil; 2Santa Luzia Eye’s Hospital, Recife, Brazil.

Purpose: This study investigates the effect of the use of Bevacizumab, Mitomycin C (MMC) and Triamcinolone (isolated and in association) on postoperative scarring after experimental glaucoma filtration surgery (GFS) in rabbits.

Methods: Forty-five New Zealand White rabbits underwent bilateral GFS and received different treatments: Saline (group 1-control); MMC (group 2); Triamcinolone (group 3); Triamcinolone and MMC (group 4); Bevacizumab (group 5); Bevacizumab and MMC (group 6). The MMC and saline were used below the scleral flap; Triamcinolone and Bevacizumab were used after GFS in subconjunctival injection(isolated and in association with MMC). The rabbits were evaluated on different days after GFS; intraocular pressure (IOP) was measured and the bleb’s analysis was based on Moorfields Bleb Grading System. The animals were killed on postoperative day: PD3, PD14, and PD30. Histology and immunohistochemistry were performed to examine the scarring after GFS.

Results: Postoperative IOP in all groups was lower than preoperative IOP and remained stable throughout the study, with no significant differences between groups. Group 6 presented better clinical parameters in the maximum bubble height, central bubble area and maximum bubble area (P<0.05); the results of these parameters were better in group 4 than in the MMC group (P<0.05). Vascularization analysis of the central area and maximum area bubble showed in PD14 and PD30 lower results in the groups 2, 4 and 6 (P<0.05). In the evaluation of cellularity, in the PD14 the groups of MMC, MMC associated with Triamcinolone and Bevacizumab showed less inflammation than the other groups. In the PD30, the group of Triamcinolone in association with MMC showed the lowest cellularity (Fig. 1)(P<0.001). In the immunohistochemical evaluation, in the PD3 the group of the Saline presented greater marking of angiogenesis. In PD14, group 6 presented lower response to angiogenesis (P<0.05). In the PD30, the MMC group presented lower angiogenesis (Fig. 2)(P<0.05).

Conclusions: The healing cascade is a complex process, and for its modulation it is necessary the use of different agents. Our results suggest a synergistic effect of Bevacizumab and Triamcinolone when used in association with MMC, reducing the cicatricial response in GFS.
control glaucoma. We performed a retrospective observational study to compare surgical outcomes among these entities in patients with uveitic glaucoma.

**Methods:** The records of 147 eyes (17 TE, 22 AGV, 108 BGI) from 147 patients with uveitic glaucoma at the University of Southern California Department of Ophthalmology were reviewed. Preoperative and postoperative intraocular pressure (IOP), medication use, visual acuity, complications, and time to failure were recorded. Similar to the Tube Versus Trabeculectomy and Ahmed Versus Baerveldt studies, failure was defined as postoperative IOP >21mmHg or <5mmHg with supplemental medication, reoperation, or loss of light-perception. Logistic regression, Kruskal-Wallis, Fisher’s Exact, Wilcoxon, chi-squared and log-rank tests were used for statistical analysis.

**Results:** There was no significant difference in baseline demographic or ocular characteristics between groups. Mean IOP, percent IOP reduction, glaucoma medication use, and visual acuity at 6 and 12 months follow-up were similar in all groups. Overall there was a significant difference in postoperative hypotony rate across TE (53%), BGI (24%), and AGV (18%) groups (P=0.027); other complication rates were similar. BGI patients had significantly lower failure rates at 6 months (P=0.0063) and 12 months follow-up (P=0.0015), as well as lower cumulative failure probability compared to TE (P=0.0054) and AGV (P=0.0008) patients. Specifically, BGI patients were 67% less likely than TE patients to fail (odds ratio 0.33, 95% CI 0.091-0.96) and 73% less likely than AGV patients to fail (odds ratio 0.27, 95% CI 0.087-0.85) overall.

**Conclusions:** While there was no difference in mean IOP reduction between TE, AGV and BGI, there was a lower rate of failure (as defined above) in the BGI group compared to other groups. The AGV group had the lowest, and the TE group had the highest, rate of postoperative hypotony.

**Commercial Relationships:** Audrey Chow, None; Bruce Burkemper, None; Rohit Varma, None; Damien C. Rodger, Allergan Inc. (C); Narsing A. Rao, None; Grace M. Richter, None

**Support:** Unrestricted institutional grant from Research to Prevent Blindness (USC Roski Eye Institute), American Glaucoma Society Mentoring for Advancement of Physician Scientists (GMR)

**Program Number:** B0372

**Presentation Time:** 3:45 PM–5:30 PM

**Treatment Outcomes and Post-Operative Complications of Trabeculectomy and Glaucoma Drainage Device Surgery by Age Michael Abendroth1, 3, George Papachristou1, Erik Lehman2, Christine Callahan1. 1 Penn State Hershey Eye Center, Penn State College of Medicine, Hershey, PA; 2 Department of Public Health Sciences, Penn State College of Medicine, Hershey, PA; 3 MacNeal Hospital, Berwyn, IL.

**Purpose:** Prior studies have compared the treatment outcomes and post-operative complications of trabeculectomy and glaucoma drainage device surgery, but to our knowledge, none have stratified these comparisons by patient age. Our study compares the outcomes and complications of trabeculectomy and glaucoma drainage device surgery by age.

**Methods:** This was a retrospective, consecutive case series of 142 eyes (123 patients) that had uncontrolled glaucoma on maximum tolerated medical therapy that underwent trabeculectomy with mitomycin C or glaucoma drainage device surgery. Primary outcome measures were IOP, treatment failure (IOP >21 mmHg or reduced by <20% on two consecutive follow-up visits, IOP <5 mmHg on two consecutive follow-up visits, reoperation for glaucoma, or loss of light perception vision), and post-operative complications, defined as non-serious (e.g. corneal edema) or serious (e.g. choroidal hemorrhage). Results were stratified into age groups of <60, 60-69, 70-79, and ≥80 and then compared using the Wilcoxon signed-rank test and Chi-square test.

**Results:** At one year, the median percent decrease from pre-operative IOP in the trabeculectomy and glaucoma drainage device groups was 39% vs. 56% overall (P<.001), 44% vs. 53% in the <60 age group (P=.591), 33% vs. 48% in the 60-69 age group (P=.114), 14% vs. 26% in the 70-79 age group (P=.035), 57% vs. 21% in the 60-69 group (P=.035), 14% vs. 26% in the ≥80 age group (P=.035), 57% vs. 21% in the 60-69 group (P=.035), 14% vs. 26% in the ≥80 age group (P=.035), 57% vs. 21% in the 60-69 group (P=.035).
Three years success rates were 69.4% and 80.0% in group

**Conclusions:** Glaucoma drainage device surgery was more effective than trabeculectomy overall and for each age group. There were no significant differences in the probabilities of failure or non-serious or serious complications for any age group.

**Commercial Relationships:** Michael Abendroth, None; George Papachristou, None; Erik Lehman, None; Christine Callahan, None

**Program Number:** 4955 **Poster Board Number:** B0373 **Presentation Time:** 3:45 PM–5:30 PM

**First day postoperative evaluation after Ahmed Valve implant surgery**

**Daniela Sánchez-Pereda.** Ophthalmology, Hospital Nuestra Señora de La Luz, Mexico, Mexico.

**Purpose:** Ahmed valve is the most widely used filtering device in the world for the management of Glaucoma not responsive to initial treatment. At Nuestra Señora de la Luz Hospital (HNSL) Ahmed valve implant surgery is done with relative frequency it is useful to know the incidence of early complications and the changes in intraocular pressure before and after the surgical placement of the Ahmed valve.

**Methods:** A retrospective, descriptive and transversal study was done. 57 eyes from 57 patients from the Glaucoma department at HNLSL underwent Ahmed valve implant surgery from March to July 2015 and were submitted to exploration 24 hours after the procedure in search of early complications. Patients who underwent Ahmed valve implant surgery at other institutions were excluded from this review.

**Results:** Of the 57 included patients 32 (56%) were men and 25 (44%) were women. Neovascular Glaucoma was the main cause for Ahmed valve implant surgery in 54% of cases, the average age of patients at the moment of the study was reported to be 36 years among patients from 16 to 85 years old. Ocular hypotony was found to be the most frequent complication 24 hours after the procedure in 23 out of 57 patients. The average of postoperative intraocular pressure was 14.04 mmHg. A comparative analysis was made between preoperative and postoperative intraocular pressure which showed that among patients with or without complications intraocular pressure was reduced with a statistically significant p value of p=0.001.

**Conclusions:** Ocular hypotony and hyphema are the most frequent complications associated with Ahmed valve implant surgery. In this review it was found that a preoperative intraocular pressure higher than 31mmHg was the most frequent associated factor with the presentation of ocular hypotony and a preoperative intraocular pressure higher than 44mmHg was the most frequent associated factor with the presentation of hyphema.

**Commercial Relationships:** Daniela Sánchez-Pereda, None

**Program Number:** 4956 **Poster Board Number:** B0374 **Presentation Time:** 3:45 PM–5:30 PM

**What are the risk factors for failure of the first glaucoma drainage implant surgery?**

**Satoshi Watanabe,1 Kanae Kobayashi,1 Tetsuro Sakurai,1 Nobuo Ishida,1 Nobuyuki Ebihara,1 Teruhiko Hamanaka,2 1Ophthalmology, Juntendo urayasu hospital, Urayasu, Japan; 2Japanese Red Cross Medical Center, Shibuya-ku, Japan; Ishida eye clinic, Joetsu, Japan; 3Tokyo University of Science, Suwa, Chino, Japan.

**Purpose:** IOP lowering effect of glaucoma drainage implant (GDI) surgery is believed to be dependent on the permeability of aqueous humor through encapsulated tissue around the plate. However, the abnormalities of the trabecular meshwork (TM) and Schlemm’s canal (SC) may also affect the outcome of this surgery.

We have investigated the risk factors for the failure of (GDI) surgery by dividing group I (required two DGIs) and II (required single DGI).

**Methods:** Thirty eight eyes of 33 cases (group I) and 269 eyes of 250 cases (group II) were clinically investigated as for age, sex, pre-op IOP, type of glaucoma, the number of previous glaucoma surgery, combination of trabeculectomy (TLE), type of GDI, final IOP and success rate (IOP<21 and IOP reduction≥20%). TLE samples which were obtained before the first or second GDI surgeries were also histologically investigated by dividing group I (22 eyes) and II (26 eyes, failed and TLE combined eyes were excluded).

The refractory nature of glaucoma was accessed by the following histological parameters; the length of SC stained by thrombomodulin, percentage of thrombomodulin-negative area (PTNA), intensity of D240 (podoplanin) staining (grading score: 0-III) in juxtacanalicular meshwork (D240-JCT), corneoscleral meshwork (D240-CSM) and uveal meshwork (D240-UM).

**Results:** Three years success rates were 69.4% and 80.0% in group I and II respectively. Pre-op IOPs (P<0.001) and IOP reduction (>0.001) in group II were significantly higher in the eyes of TLE combined GDI. Male (P=0.006) and younger patients (P=0.006) in group I were significantly dominant when compared to group II. SC length (P=0.0092), and intensity grading score of D240-JCT (0.041) in group I were significantly smaller than those in group II.

**Conclusions:** The failure of GDI surgery may be significantly dependent on severity of impaired outflow routes.

**Commercial Relationships:** Satoshi Watanabe, None; Kanae Kobayashi, None; Tetsuro Sakurai, None; Nobuo Ishida, None; Nobuyuki Ebihara, None; Teruhiko Hamanaka, None

**Program Number:** 4957 **Poster Board Number:** B0375 **Presentation Time:** 3:45 PM–5:30 PM

**Magnetic Resonance Imaging in Eyes with Baerveldt Glaucoma Implants**

**Kentaro Iwasaki1, Masayuki Kanamoto1, Yuji Takihara2, Shogo Arimura3, Yoshitaka Takamura4, Hiroshi Kinamura5, Masaru Inatani1. 1Department of Ophthalmology, University of Fukui, Yoshida, Fukui, Japan; 2Radiological Center, University of Fukui Hospital, Fukui, Japan; 3Department of Radiology, University of Fukui, Fukui, Japan.

**Purpose:** To evaluate and quantify the filtering bleb after the Baerveldt glaucoma implantation using magnetic resonance imaging (MRI).

**Methods:** This cross-sectional case series study included 62 patients who underwent Baerveldt glaucoma implants. High resolution orbital images were obtained using 3-Tesla MRI with phased-array head coil in six months or later after surgery. Three dimensional images were constructed, and the filtering bleb volume was measured. The
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at 3 years. At 3 years, there was no difference in failure between eyes without previous trabeculectomy (19.4% [5.2%]) and eyes with previous trabeculectomy (37.3% [10.7%]) (p = 0.137), and between eyes with primary glaucoma (22.2% [5.7%]) and eyes with secondary glaucoma (28.6% [9.9%]) (p = 0.362). Tube insertion in the supranasal quadrant (p = 0.017, 95% CI 1.33 – 18.76), higher pre-operative cup-disc ratio (p = 0.038, 95% CI 1.26 – 3151.64) and occurrence of post-operative hyphaema (p = 0.042, 95% CI 1.05 – 14.58) were significant risk factors for failure.

Conclusions: AGV surgery is effective in IOP control for Asian eyes with glaucoma. Further studies are needed to compare our results with trabeculectomy.

Commercial Relationships: Jessica Choo, None; David Chen, None; Victor T. Koh, None; Shen Liang, None; Maria Cecilia D. Aquino, None; Joel Aduan, None; Chelvin Sng, None; Paul Chew, None

Program Number: 4960 Poster Board Number: B0378

Presentation Time: 3:45 PM–5:30 PM

Patterns of Tube Shunt Scleral Graft Melt


Purpose: Tube shunt scleral grafts melt is a known complication after tube shunt surgery. Previous studies examined risk factors for exposure and rate of exposure of different kinds of grafts, but no study looked at patterns of graft melt over time. We hypothesized that over time there is a decrease in the area, change in vascularity, and overall thinning of the graft.

Methods: We performed a retrospective chart review adhering to IRB protocol of patients at the Rutgers Institute of Ophthalmology from September to November 2016. Standardized scleral graft slit lamp imaging (8x8mm diffuse beam, neutral density filter, 10x magnification) was performed (HD 12 MP, file size ~0.5 to 1.2MB) to obtain graft photos. A masked physician reviewed and graded the photos based on percentage of graft remaining, thickness of graft, and vascularity after the tube shunt surgery. Patients were divided into two groups: follow up < 2 years vs. follow up > 2 years after the surgery. For transparency, patients were assigned a value from 0-3: 0-100% view, 1-66% view, 2-33% view and 3-0% view. The scale for vascularity ranged from 0 to 3: 0- no vascularity 1- mild, 2-moderate, and 3-severe vascular injections. Student t-tests were performed.

Results: 43 eyes of 38 patients (Average Age 63 years old, 19 males, 24 females) were enrolled. 20 (46.5%) had POAG, 8 (18.6%) had uveitic glaucoma, 5 (11.6%) had chronic angle closure glaucoma, 4 (9.3%) had mixed type, 2 (4.7%) had pediatric glaucoma, 2 (4.7%) had neovascular glaucoma, 1 (2.3%) had traumatic glaucoma, and 1 (2.3%) had exfoliation glaucoma. The mean value of the area of scleral graft remaining for patients with follow up <2 years was 48.8% +/- 41.7; in patients with follow up >2 years, it was 22.6% +/- 34.9 (p=0.038). For transparency, the mean value for patients with follow up <2 years after the surgery was 1.5 +/- 1.2. For patients with follow up >2 years, the mean transparency score was 0.59 +/- 0.93 (p=0.011). For vascularity, the mean value for patients with follow up <2 years after the surgery was 1.27 +/- 1.0 on a scale from 0-3. For patients >2 years after the surgery, the mean value was 0.53 +/- 0.62 (p=0.0097).

Conclusions: Tube shunt grafts melt over time through loss of total area, loss of vascularity, and overall thinning significantly within two years of tube shunt surgery. Further studies can examine risk factors affecting patterns of graft melt.

Commercial Relationships: Priyal Shah, None; Tian Xia, None; Albert S. Khouri, None
**Visual and Intraocular Pressure Outcomes of Combined Phacoemulsification and Ahmed Valve Implantation**

*Program Number: B0380*

*Presentation Time: 3:45 PM–5:30 PM*

*Comparison of tube implants versus trabeculectomy surgery outcomes among Medicare beneficiaries in the treatment of glaucoma*

Taylor Jones, Sandra Johnson. 1University of Virginia School of Medicine, Charlottesville, VA; 2Ophthalmology, University of Virginia Health System, Charlottesville, VA.

**Purpose:** The methods of glaucoma surgery have not been compared much among Medicare-aged patients alone. This study evaluates the outcomes of the Ahmed tube shunt, the Baerveldt tube shunt, the Express Glaucoma Shunt, and trabeculectomy surgery in Medicare beneficiaries.

**Methods:** We analyzed medical records for patients ages 65 and older who received glaucoma surgery between January 2010 and May 2016 at the University of Virginia to determine the short-term outcomes in patients receiving each type of surgery. Intraocular pressure (IOP) and number of medications were recorded at 3 months post-operation to include major complications (choroidal and choroidal hemorrhages) which often occur by then.

**Results:** 523 eyes were enrolled (83 Express shunts, 251 trabeculectomies, 89 Ahmed shunts, and 100 Baerveldt shunts). For open angle patients, the average 3-month IOP was 11 in the Express group, 11 in the trabeculectomy group, 16 in the Ahmed group, and 14 in the Baerveldt group. In closed angle patients, the average 3-month IOP was 20 in the Express group, 13 in the trabeculectomy group, 18 in the Ahmed group, and 11 in the Baerveldt group. Complications were most frequent in the trabeculectomy group, with 10 patients presenting with complications within the post-operative period. 5 Baerveldt and 4 Ahmed patients had post-op complications. None were noted for the Express shunt patients. For open angle patients, the average number of glaucoma medications was 0.10 for the Express group, 0.32 for the trabeculectomy group, 1.15 for the Ahmed group, and 1.08 for the Baerveldt group. In patients with closed angle glaucoma, the average number of medications was 0.50 for Express and Baerveldt patients, 0.47 for trabeculectomy patients and 1.00 for Ahmed patients.

**Conclusions:** In open angle glaucoma patients, Express shunts achieved the lowest IOP and number of medications at 3 months post-op. In the closed angle group, Baerveldt patients had the lowest 3-month IOP; however, the trabeculectomy patients took the fewest medications at 3 months. Express shunt patients also had the fewest short-term complications across both glaucoma types. Though this review may offer insight into safety and efficacy of glaucoma surgical procedures for Medicare-aged patients, it also shows varied sample sizes for each surgery (with the more traditional procedures used more frequently) and a short-term focus.

**Commercial Relationships:** Taylor Jones, None; Sandra Johnson, None

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**Optimization of Stent Diameter for Use with Baerveldt Glaucoma Implants: a Laboratory Study**

Mark DiSclafani. Ophthalmology, University of South Florida, Treasure Island, FL.

**Purpose:** Purpose: To determine optimum stent diameter for immediate post-operative pressure control using a Baerveldt Glaucoma Implant (BGI), when the stent method is used at the time of implantation of such non-valved devices. We previously determined (ARVO, 2016) that 5-0, 4-0, and 3-0 monofilament nylon stents do not reduce flow to the physiologic rate of 2.75 +/- 0.63 ul/ min (Brubaker, 1991).

**Methods:** Methods: Laboratory setup included a custom model eye (University of South Florida Invention Disclosure, M. DiSclafani, 2015), made water-tight and connected to a source of balanced salt solution (BSS, at controlled elevation); a digital manometer (Dwyer Instruments Model 490A-1); and a BGI (tube inner diameter 300 microns). Uniform diameter of experimental stents was documented with a digital micrometer (Mitituyo Model IP 65, 1- micron accuracy). Height of the BSS source was controlled to create pressures ranging from 20 to 40 mm Hg, and stents with diameters > 200 u (the USP diameter of 3-0 nylon) were tested. Flow rates were measured though the BGI tubing, either unblocked or partially occluded by stents with diameters of 226, 235, and 250 u. The BGI plate was left uncovered and unobstructed; resistance due to Tenon’s capsule and/or conjunctiva, as expected clinically, was therefore not accounted for.

**Program Number:** 4966 *Poster Board Number: B0382*

**Presentation Time:** 3:45 PM–5:30 PM

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Proficiency in glaucoma surgery is a central goal of training. Selection of Glaucoma drainage device (GDD) for hands of glaucoma fellows need to happen in a way that compare favorably to published GDD outcomes. Our study was to compare outcomes and complications between GDD and other glaucoma surgeries. We identified 136 eyes that underwent either Ahmed or Baerveldt tube shunt implantation by a fellow with attending surgeon supervision at the Feinberg School of Medicine, Northwestern University, Chicago, IL; University Eye Specialists, Chicago, IL. Purpose: Proficiency in glaucoma surgery is a central goal of glaucoma fellowship training. Outcomes of glaucoma drainage device (GDD) surgery by fellows are important to determine areas for improvement and for patient safety. This is a retrospective, observational study that evaluates outcomes of tube shunt surgery performed by glaucoma fellows as primary surgeon. Methods: We identified 136 eyes that underwent either Ahmed or Baerveldt tube shunt implantation by a fellow with attending surgeon supervision at the Feinberg School of Medicine, Northwestern University, Chicago, IL; University Eye Specialists, Chicago, IL. Only one eye per patient was included. All eyes had at least one year of follow-up. Primary outcome measures compared intraocular pressure (IOP), number of IOP lowering medications, and visual acuity before and after surgery. The number and variety of intra-operative and post-surgical complications and requirement for additional surgical intervention were analyzed.

Results: Of the eyes studied so far, implantation of a GDD reduced IOP by 9.3 ± 12.4 mmHg, 12.3 ± 11.2 mmHg, 14.0 ± 9.6 mmHg, 14.6 ± 9.8 mmHg at post-operative month 1, 3, 6, 12 respectively. P < 0.001 for all time points compared to baseline. Overall, there was a 14 mmHg or 45% reduction in IOP after 1 year. The number of IOP lowering medications decreased after implantation of a GDD by 1.3 ± 2.2, 1.3 ± 2.0, 1.4 ± 2.2, and 1.0 ± 2.4 at post-operative month 1, 3, 6, 12 respectively. P < 0.001 for all time points compared to baseline. Overall, one less medication was required at 1 year. LogMAR visual acuity at the most recent visit was 0.64 ± 0.7 compared to the pre-operative value of 0.51 ± 0.5, p = 0.087. Post-surgical complications such as choroidal detachment, tube occlusion, tube erosion, infection, or corneal decompensation was 36% (19/53). The need for secondary surgical intervention including placement of another tube shunt or trabeculectomy, removal of the drainage device, or tube irrigation was 23% (12/53).

Conclusions: Our preliminary results show that GDD surgery in the hands of glaucoma fellows have outcomes and complication rates that compare favorably to published GDD outcomes.

Commercial Relationships: Victor L. Quan, None; Dianna Liu, None; Noureen Khan, None; Angelo P. Tanna, None; Lisa Rosenberg, None

Support: Research to Prevent Blindness, Chicago Center for Vision Research

Factors Affecting Conjunctival Erosion Following Ahmed Valve Implantation

Xiao Yi Zhou, Nariman Nassiri, Di Zhou, Chaesik Kim, Justin Tannir, Anju Goyal, Shukairy Aman, Mark S. Juzych, Bret A. Hughes. Kresge Eye Institute, Wayne State University School of Medicine, Detroit, MI.

Purpose: Conjunctival erosion is a surgical complication of Ahmed valve implantations. The purpose of this study is to identify potential factors associated with conjunctival erosion after Ahmed valve implantation.

Methods: This was a retrospective interventional case series of patients who had Ahmed valve implantations between October 2006 and July 2016 at Kresge Eye Institute. Different demographic, clinical, and surgical data were collected. The frequency of conjunctival erosion was measured and the association between erosion and different factors were studied by bivariate and logistic analyses.

Results: 306 eyes of 277 patients were included in the study. 23 of the 306 eyes (7.52%) had conjunctival erosions. Mean follow-up time was 30.1 ± 30.1 months in the non-erosion group, and 39.8 ± 38.2 months in the erosion group. The mean and median time to erosion was 10.8 ± 16.6 and 5.8 months, respectively. In bivariate analyses, there was no statistically significant difference between erosion and non-erosion groups in all factors except for lens status, having no tube covering and hypertension (Table 1). There was no significant difference in erosion between different patch grafts used to cover the tube (p = 0.57) (Table 1&2). Having no tube covering (p = 0.01) and aphakia (p = 0.01) were significantly more common in the erosion group. On logistic regression analysis we only found aphakia (p = 0.01; odds ratio = 16.81) to be significantly associated with erosion (Table 2). Having no tube covering was not found to be significantly associated with erosion (p = 0.30). Patients who used more than 6 months of topical steroids postoperatively (vs. <6 months) was found to have significantly less erosion (p = 0.04; OR = 0.12) only in the logistic regression and not the bivariate analysis (p = 0.25). Based on bivariate (Table 1) and logistic (Table 2) analyses, association between conjunctival erosion and postoperative steroid use is inconclusive.

Conclusions: We did not find a significant association between several demographic, clinical and surgical factors and conjunctival erosion after Ahmed valve implantation except for aphakia, which was significantly associated with more conjunctival erosion. Further prospective studies are warranted to evaluate different attributing factors to conjunctival erosion.
Table 1. Baseline demographics and clinical characteristics.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Odds ratio (95% CI)</th>
<th>P Value</th>
</tr>
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<tr>
<td>Age</td>
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<td>na†</td>
<td>0.26</td>
</tr>
<tr>
<td>Gender, Male</td>
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<td>(0.12-0.43)</td>
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<td>Race</td>
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<td>(0.05-0.63)</td>
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<td>Others vs. African American</td>
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<td>2.56</td>
<td>(0.36-18.52)</td>
</tr>
<tr>
<td>Type of glaucoma</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>NVG vs. POAG</td>
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<td>1.68</td>
<td>(0.32-3.49)</td>
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<td>Uveitic Glaucoma vs. POAG</td>
<td>1.75</td>
<td>5.26</td>
<td>(0.75-41.44)</td>
</tr>
<tr>
<td>Angle Closure Glaucoma vs. POAG</td>
<td>-0.38</td>
<td>0.68</td>
<td>(0.09-5.00)</td>
</tr>
<tr>
<td>Traumatic vs. POAG</td>
<td>-0.47</td>
<td>0.62</td>
<td>(0.04-10.54)</td>
</tr>
<tr>
<td>Mixed mechanism vs. POAG</td>
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<td>0.28</td>
<td>(0.02-5.00)</td>
</tr>
<tr>
<td>Others vs. POAG</td>
<td>-13.15</td>
<td>0.00</td>
<td>(0.00-13.15)</td>
</tr>
</tbody>
</table>

Table 2. Logistic regression showing association between conjunctival erosion different factors.

Commercial Relationships: Xiao Yi Zhou, None; Narimani Nassiri, None; Di Zhou, None; Chae-Sik Kim, None; Justin Tannir, None; Anju Goyal, None; Shukairy Aman, None; Mark S. Juzych, None; Bret A. Hughes, None

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Dynamics of Ahmed Glaucoma Valve® in vitro
Ashutosh Richhariya1, Swathi Vallabh Badakere2, Nikhil Choudhari1, Sai Naga Sri Harsha Chittajallu1, Sirisha Senthil1, Chandrasekhar Garudadri2. 1Institute of Translational Research Engg and Advancement of Technology, L. V. Prasad Eye Institute, Hyderabad, India; 2VST Glaucoma Centre, L. V. Prasad Eye Institute, Hyderabad, India.

Purpose: A valved glaucoma drainage device can reduce the risk of early post-operative hypotony but has an opening pressure. This study was designed to evaluate whether the priming pressure or the area of separation of the valve leaflets during priming has any effect on performance of the Ahmed Glaucoma Valve® (AGV) (New World Medical, Rancho, USA), and to study the role of valve action under simulated physiological conditions.

Methods: Ten new AGV devices were tested. Each device was connected to a digital manometer and was primed with normal saline using a 5 cc syringe under a microscope fitted with a high speed digital camera (Figure 1; A & B). Subsequently, the AGV was placed in a saline bath and was connected to an open manometer, a digital manometer and an infusion pump. Saline was infused into the system at the rate of 3µL/min for 24 hours. Digital manometer readings were recorded at 4 Hz using computerized data logging. The pressure curves were plotted against time in MATLAB® (Mathworks Inc., Massachusetts, USA). Transient state opening pressure of AGV was defined as the peak pressure before attaining steady state (Figure 2). Opening and closing pressure was defined as the maximum and minimum pressure in steady state.

Results: The mean (standard deviation; SD) priming pressure was 1173 (256) mm Hg. The mean duration (SD) of the transient phase was 357.5 (287.3) minutes. The transient state opening pressure varied between 8 and 45 mm Hg. The mean (SD) opening and closing pressures were 13.1 (2.6) mm Hg and 6.9 (1.2) mm Hg, respectively (Figure 2). The mean (SD) area of separation of valve leaflets & width of outlet nozzle showed increase from 6.2 (1.9) mm² & 0.3 (0.1) mm during priming to 11.6 (1.4) mm² and 1.8 (0.8) mm, respectively, when assessed after attaining the steady state. The correlation between priming & opening or closing pressure, and the area of leaflet separation or width of outlet nozzle & duration of transient phase was statistically insignificant.

Conclusions: The device undergoes a transient state of opening of valve leaflets beyond that in priming, before reaching the steady state. The priming pressure or the area of separation of the valve leaflets did not affect the steady state performance of AGV. The device functions as a valve which opens and closes intermittently in steady state. This study shows variable in vitro performance of AGV; however, the steady state pressures were in the desirable range.

Long-Term Outcome of Combined Implantation of Ahmed Valve Shunt and Intravitreal Flucinolone Acetonide in Uveitic Glaucoma
Jason Horowitz, Nariman Nassiri, Chaesik Kim, Justin Tannir, Anju Goyal, Shukairy Aman, Mark S. Juzycz, Bret A. Hughes, Wayne State University School of Medicine, Detroit, MI.

Purpose: Combined Ahmed valve placement and intravitreal flucinolone acetonide (Retisert) implantation has been shown to reduce the number of glaucoma medications required to maintain healthy intraocular pressure (IOP) in patients with chronic uveitis at 12 and 24-month follow-ups. In this retrospective study, we aimed to investigate the long-term outcomes of combined Ahmed valve placement and Retisert implantation in patients with uveitic glaucoma at longer follow-up durations of up to 60 months.

Methods: We included patients who underwent combined Ahmed valve placement and Retisert implantation at the Kresge Eye Institute between October 2008 and March 2011. Demographic and clinical data were collected (Table 1). Best-corrected visual acuity (BCVA), intraocular pressure (IOP) and number of IOP-lowering medications at each follow-up visit were compared with those at baseline (Table 2). Two-tailed Student’s t-test was used for statistical analysis. P value < 0.05 was considered as statistically significant.

Results: A total number of 12 eyes of 9 patients with the mean ± SD age of 51.3 ± 9.1 were included in the study. Table 1 shows patients’ demographic and baseline clinical data. Compared to baseline, mean IOP was lower with a statistically significant reduction in IOP-lowering medications at all follow-up intervals, beginning 1 month postop (Table 2). At 60 months follow-up, mean IOP decreased from 19.3 ± 9.2 mm Hg at baseline to 13.8 ± 7.1 mm Hg (p=0.12), and the number of IOP-lowering medications reduced from 2.50 ± 1.24 at baseline to 0.75 ± 1.22 (p=0.005) (Table 2). In addition, statistically significant improvement in BCVA occurred from 3 months postop until 48 months postop (Table 2). At 48 months follow-up, BCVA (LogMAR) improved from 1.09 ± 0.83 (20/200 Snellen) at baseline to 0.22 ± 0.23 (20/40 Snellen) (p=0.004) (Table 2).

Conclusions: Combined Ahmed valve placement and Retisert implantation significantly reduced the number of IOP-lowering medications required to maintain healthy IOP in the management of uveitic glaucoma for up to 60 months after treatment.
Glaucoma drainage device and trabeculectomy surgery is associated with a higher rate of post-operative blepharoptosis compared to cataract extraction in a prospective cohort

Gavin W. Roddy1, Chengbo Feng2, Zhao Bingying2, Jasmina Bajric1, 2, Cheryl Khanna1.
1 Ophthalmology, Medical College of Wisconsin, Milwaukee, WI; 2 Ophthalmology, Mayo Clinic, Rochester, MN.

**Purpose:** Blepharoptosis (or ptosis) is a complication following cataract extraction (CE) and trabeculectomy occurring as frequently as 4 – 21% and 10%, respectively, while its incidence in glaucoma drainage device (GDD) placement is unknown. We sought to determine the rate of post-operative ptosis in patients who underwent, trabeculectomy, GDD placement, and/or CE.

**Methods:** 48 patients were prospectively and consecutively enrolled who underwent GDD placement, trabeculectomy, and/or CE by a single surgeon at Mayo Clinic, Rochester, MN and completed one month follow-up. Palpebral fissures were measured pre-operatively and one month post-operatively. Ptosis was defined as a decrease in palpebral fissure of ≥ 2 mm when compared pre and post-operatively.

**Results:** Twenty patients underwent trabeculectomy surgery (5 of these were combined trabeculectomy and CE), 16 patients who underwent GDD placement (one underwent combined GDD placement and cataract extraction), and 12 patients who underwent CE by phacoemulsification alone. Patients undergoing CE had change in palpebral fissures of 0 ± 0.9 mm and a rate of ptosis of 8%. Patients undergoing trabeculectomy had a decrease in palpebral fissure length of 1 ± 1.3 mm and a rate of ptosis of 25% (p=0.3 vs. cataract extraction alone). Patients undergoing GDD placement had a decrease in palpebral fissure length of 1 ± 1.2 mm (p=0.07 vs CE alone) and a rate of ptosis of 25%.

**Conclusions:** In our prospective single surgeon study, patients undergoing glaucoma surgery including trabeculectomy or GDD placement had a higher incidence of post-operative ptosis than patients who underwent CE alone. In our study, one out of every four patients who underwent glaucoma surgery developed post-operative ptosis. This is significant for patients as ptosis may further limit their already restricted visual field. We hypothesize that the greater incidence of ptosis with glaucoma surgery is secondary to greater conjunctival dissection, manipulation of the extraocular muscles, and duration of surgery compared to CE alone. Glaucoma surgeons may elect to discuss the high risk of post-operative ptosis in the pre-operative setting for patients undergoing trabeculectomy and GDD placement.

**Commercial Relationships:** Gavin W. Roddy, Chengbo Feng, None; Zhao Bingying, None; Jasmina Bajric, None; Cheryl Khanna, None.

Program Number: 4969 Poster Board Number: B0387
Presentation Time: 3:45 PM–5:30 PM

Pilot Study Assessing the Use of High-Density Polyethylene (Su-Por®) for Tube Shunt Patch Grafts

Benjamin D. Abramowitz, Marlene Moster, Michael Pro, Courtland Schmidt, Elizabeth Dale, Edward S. Yung, Alice Williams. Glaucoma, Wills Eye Hospital, Washington, DC.

**Purpose:** Given the rising costs of healthcare, measures to provide cost-effective yet high quality care are of the utmost importance. Current approaches to cover tube shunts and reduce the incidence of tube exposure most commonly utilize sterilized human tissue (ie pericardium, sclera, cornea). This FDA-approved high-density polyethylene biomaterial has been successfully used for orbital and facial reconstruction. Our pilot study assessed the viability of this

**Commercial Relationships:** Jason Horowitz, None; Nariman Nassiri, None; Chae Sik Kim, None; Justin Tannir, None; Anju Goyal, None; Shukairy Aman, None; Mark S. Juzych, None; Bret A. Hughes, None.

Program Number: 4970 Poster Board Number: B0388
Presentation Time: 3:45 PM–5:30 PM

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Device surgery
Reza Alizadeh, Handan AKIL, James C. Tan, Simon K. Law, Joseph Caprioli. Glaucoma, Jules Stein Eye Institute, UCLA, Los Angeles, CA; Doheny Eye Institute, Los Angeles, CA.

Purpose: Several surgical options are available after a glaucoma drainage device (GDD) fails to provide sufficient IOP reduction. Although not widely considered to be a viable option we evaluate the success rate of trabeculectomy after GDD failure.

Methods: In this retrospective study, all patients from the Stein Eye and Doheny Eye Institutes who had trabeculectomy with MMC after a GDD were included. Demographic data, diagnosis, systemic conditions, surgery information, IOP, vision and number of medication in each visit are recorded. Criteria used to define success are defined in the Table.

Results: Twenty eyes of 20 patients were included. Diagnoses were: primary open-angle glaucoma (10), uveitic glaucoma (4), chronic angle closure glaucoma (2) and iridocorneal endothelial syndrome (1). Median follow up was 3.7 years (range 1.1 to 10.2 years). Median time between GDD surgery and trabeculectomy surgery was 22.1 months (range 2 weeks to 6 years). Mean MMC usage was 6.2 ± 5.4 mg.min/ml. One serious complication was recorded as hypotony tube exposure.

Criteria for success were: (A) final IOP ≤ 18 mmHg and one of the following: 20% reduction of IOP or a reduction of 2 medications with final IOP ≤ baseline if baseline IOP ≤ 18 mmHg; (B) final IOP ≤ 15 mmHg and one of the following: 25% reduction of IOP or a reduction of 2 medications with final IOP ≤ baseline if baseline IOP ≤ 15 mmHg; (C) final IOP ≤ 12 mmHg and one of the following: 30% reduction of IOP or a reduction of 2 medications with final IOP ≤ baseline if baseline IOP ≤ 12 mmHg.


Program Number: 4971 Poster Board Number: B0389
Presentation Time: 3:45 PM–5:30 PM

Conclusions: Widely used options for glaucoma treatment after prior GDD surgery include additional GDD surgery and endoscopic cyclophotocoagulation (ECP). The results of trabeculectomy with MMC after GDD are at least comparable to these surgical options. Results for trabeculectomy after GDD surgery appear superior to those of repeat trabeculectomy surgery, perhaps due to less scarring of the limbal conjunctiva. Trabeculectomy is a reasonable option for surgical treatment of glaucoma in selected patients who have had one glaucoma drainage device implanted.

Criteria for use defined for success after trabeculectomy with Mitomycin C after failed glaucoma drainage device surgery

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Definition</th>
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<tr>
<td><strong>Criterion A</strong></td>
<td>Final IOP ≤ 18 mmHg and one of the following: 20% reduction of IOP or a reduction of 2 medications with final IOP ≤ baseline if baseline IOP ≤ 18 mmHg</td>
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<tr>
<td><strong>Criterion B</strong></td>
<td>Final IOP ≤ 15 mmHg and one of the following: 25% reduction of IOP or a reduction of 2 medications with final IOP ≤ baseline if baseline IOP ≤ 15 mmHg</td>
</tr>
<tr>
<td><strong>Criterion C</strong></td>
<td>Final IOP ≤ 12 mmHg and one of the following: 30% reduction of IOP or a reduction of 2 medications with final IOP ≤ baseline if baseline IOP ≤ 12 mmHg</td>
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Program Number: 4972 Poster Board Number: B0390
Presentation Time: 3:45 PM–5:30 PM

Long-Term Outcome of Second Ahmed Valves in Glaucoma
Nucharee Partvisutti, Reza Alizadeh, grace ang, Esteban Morales, Nima Fatehi, Joseph Caprioli. Glaucoma, Jules Stein Eye Institute, Los Angeles, CA.

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**Purpose:** To evaluate the long-term outcomes of second Ahmed valve implants in eyes with glaucoma.

**Methods:** A retrospective review of the success rates of patients who have had a second Ahmed valve implanted in one eye from 1994 to 2016 was conducted. Success was defined with three criteria: (A) IOP ≤21 mmHg and IOP reduction of 30%; (B) IOP ≤18 mmHg and IOP reduction of 20%; and (C) IOP ≤15 mmHg and IOP reduction of 25%. The primary outcome was a 5-Year Kaplan-Meier survival rate for each criterion. Other failure criteria were loss of light perception, requirement for additional glaucoma surgery, hypotony, and serious complications.

**Results:** 148 eyes from 140 patients (58 males and 82 females) were included with a median follow-up of 3.5 years (interquartile range [IQR] 0.9 to 6.6 years). The median age was 74.0 years (IQR: 41.5 to 86.6 years). The interval between first and second surgeries was 2 weeks to 11.3 years (median 1.9 years, with IQR: 0.6 to 3.9 years). Diagnoses were POAG (26%), congenital glaucoma (16%), secondary ACG (12%), uveitic glaucoma (11%) and NVG (10%). The 5-year Kaplan-Meier survival rates were 35.4% (±4.1%), 18.5% (±3.8%) and 10.2% (±3.6%) for criteria A, B and C, respectively (Figure 1).

**Conclusions:** A second AGV is effective in reducing IOP in patients who require additional IOP lowering after a first AGV. The success rates are comparable to primary AGV implantation in POAG patients and are higher than in patients with secondary glaucoma, such as uveitic glaucoma or silicone oil induced glaucoma. The success rate is higher than in patients who had prior failed trabeculectomy. A second AGV is a viable option in eyes with inadequate IOP control after GDD along with.
Conclusions: Our results suggested that in mouse model of the filtration surgery, the lymphatic flow do not recover to the preoperative state.

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