Intraocular Pressure (IOP) Optimized Performance Settings with Posterior Adaptive Fluidics (PAF), and 25 Gauge 25,000 cpm Dual-Action Vitrectomy Cutters

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Posterboard#: B0575

Abstract Number: 914 - B0575

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Purpose
IOP stability during vitrectomies with dual action cutters can be achieved using inflow outflow compensation factors. We aim to explain the new IOP system options with dual action cutters and to inform surgeons on how this may optimize and streamline surgeries.

Methods
Clinical: Surgical case data with infusion pressure, vitrectomy time, and vacuum level from 465 surgeries without PAF were downloaded from the Eyetelligence® cloud. These were compared to 30 surgeries case summary data during a clinical study with PAF enabled. All the surgeries were executed by a single surgeon with the 25g, 15 kcpm bi-blade® dual action cutter.

Benchtop: 25g bi-blade® and standard single port vitrectomy probes were driven by the Stellaris Elite Image enhancements system (Bausch & Lomb, LLC), aspirating BSS in a silicone test chamber from 0 to 25,000 cpm. A pressure transducer (Fluke DPM2Plus) connected to oscilloscope (Tektronix DPO3014) measured IOP. 5 tests per vacuum were measured at: 100, 200, 400, 660 mmHg with and without PAF. Infusion and aspiration rates were measured using scales after 1 minute in an open vessel.

Results
Clinical: PAF enabled surgeries showed 62% reduction in average infusion pressure during PAF enabled surgeries at 21.7±8.9 PAF and 56.5±6.9 mmHg non-PAF ($p<0.001$) , with similar vitrectomy times 4:15±2:54 and 4:12±2:29 min:sec ($p>0.4$), and similar vacuum levels 473±123.1 and 507±90 mmHg ($p>0.05$), respectively.
Benchtop: 25g Bi-Blade BSS flow rates were insensitive to cut rate and provided constant high aspiration flows of 15.3 +-0.8 ml/min compared to a single action cutter from 15.4 ml/min at 0 cpm down to 6 ml/min at 7.5 kcpm. Infusion rates correlated to infusion pressures and 15 ml/min was achieved at 33 mmHg. Test chamber IOP results show significant improvement with PAF and maintained a range closer to physiological IOP (10 – 20 mmHg) with average improvements over no-PAF of: 4.2 mmHg at 200 mmHg vacuum, 11.8. mmHg at 400 mmHg vacuum, and 24 mmHg at 660 mmHg vacuum (all with $p<0.01$).

Conclusions
Posterior Adaptive Fluidics significantly increases IOP performance during vitrectomies and can maintain IOP at any given cut rate (0 to 25,000 cpm). The dual action 25g cutters with PAF can increase usability and de-necessitates infusion pressure change during vitrectomies.

Long-Term Efficacy of Genipin Cross-Linked Sclera Reinforcement in Maculoschesis: Visual Acuity and Reattachment Outcomes

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Posterboard#: B0576

Abstract Number: 915 - B0576

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DisclosureBlock: Anas Abu Said, None; Yanfeng Su, None; ShuangQian Zhu, None; ShiHao Chen, None;

Purpose
Evaluating the long-term efficacy of genipin cross-linked sclera for posterior scleral reinforcement in treating maculoschesis, including the fovea, without macular hole or foveal detachment. Focuses on visual acuity and retinal reattachment impacts over follow-ups to 6.5 years.

Methods
Retrospective analysis of 28 patients (34 eyes) treated with scleral reinforcement for maculoschesis included measuring and analyzing both preoperative and postoperative BCVA (standardized to LogMAR), axial length, and spherical equivalent at intervals of 1 week, 1-6 months, 1-2 years, and 2-6.5 years. Paired and unpaired t-tests were employed for statistical analysis.

Results
Preoperative Metrics:
BCVA LogMAR: 0.506
Spherical Equivalent: -14.50 diopters
Axial Length: 29.54 mm
Postoperative Metrics:
1 week: BCVA LogMAR 0.727, Spherical Equivalent -9.76D, Axial Length 27.23 mm.
1-6 months: BCVA 0.592, Spherical -11.31D, Axial Length 27.48 mm; Mean Follow-up: 97.5 days, Range: 30-220 days.
1-2 years: BCVA 0.492, Spherical -9.89D, Axial Length 27.95 mm; Mean Follow-up: 510.3 days, Range: 316-730 days.
2-6.5 years: BCVA 0.389, Spherical -11.69D, Axial Length 28.51 mm; Mean Follow-up: 1309.5 days, Range: 750-2280 days.
Reattachment Rates:
1-6 months: 15 eyes achieved full foveal reattachment (7 complete maculoschesis); 8 eyes had partial reattachment out of 30.
1-2 years: Full foveal reattachment in all eyes; 24 eyes achieved complete maculoschesis (17 new); 5 had partial reattachment.
2-6.5 years: One eye redeveloped foveoschesis; 15 maintained complete maculoschesis reattachment of the 22 followed.
Statistical Findings:
No significant long-term change in BCVA.
Post-surgery, axial length and spherical equivalent significantly decreased.
Specific Cases:
3 eyes developed CNV, worsening BCVA.
1 glaucoma eye showed further BCVA decrease.

Conclusions

Posterior scleral reinforcement using genipin cross-linked sclera demonstrates substantial long-term benefits in maintaining reattached maculoschesis including the fovea. The majority of patients experienced significant improvements in visual acuity, despite no significant change in BCVA at extended follow-up intervals. The procedure also led to a significant decrease in axial length and spherical equivalent, underlining its effectiveness in managing maculoschesis.These findings highlight the importance of extended follow-up in maculoschesis treatment.

Effect of COVID-19 pandemic on surgical utilization, presentation and outcomes of pars-plana vitrectomy for complications of diabetic retinopathy within a county system.

Posterboard#: B0577

Abstract Number: 916 - B0577

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DisclosureBlock: Weilin Song, None; Reza Kianian, None; Judy Figueroa, None; Jack B. Margines, None; Jiwei Sheng, None; Hamid Hosseini, None; Pradeep Prasad, None; Kirk Hou, None;

Purpose
To examine the effect of the COVID-19 pandemic on the presentation and outcomes of county patients with complications of proliferative diabetic retinopathy (PDR) treated with pars plana vitrectomy (PPV).

Methods
Chart review was conducted of all eyes of adult patients who underwent PPV for complications of PDR from March 20, 2018 – March 20, 2022 at two county hospitals. March 20, 2020 was used as the cut-off date to separate the pre- and post-COVID periods. Demographics, preoperative and postoperative characteristics were collected. All eyes were included for analysis of preoperative characteristics, while repeat PPVs and/or eyes that did not have six months of follow up were excluded from postoperative outcomes. Primary outcome was best-corrected visual acuity (BCVA) at postoperative month six (POM6).

Results
During the pre-COVID period, 401 (38% of all PPVs) PPVs were performed for PDR, and 253 eyes had at least six months of follow up. During the post-COVID period, 347 (45%) PPVs were for PDR and 234 eyes had at least six months of follow up. There was no difference in demographics or preoperative BCVA on date of surgery request between the groups. Mean wait time from evaluation to surgery increased from 39 to 57 days (p=0.0004). More PPVs were done for tractional retinal detachment (TRD) [167 (48%) vs. 139 (35%); p=0.0009], and more eyes presented with mac-involving detachment post-COVID [91 (26%) vs. 77 (19%); p=0.0024] (Table 1). The mean BCVA at POM6 was worse post-COVID [logMAR (±SE); 1.11 (±0.05) vs 0.94 (±0.05); p=0.0132], and there were fewer patients who had 20/40 or better vision [34 (14%) vs 61 (24%); p=0.0098] (Table 2). Within six months, there were fewer incidences of vitreous hemorrhage [70 (20%) vs 103 (41%); p=0.0129] post-COVID, and no difference in incidences of elevated IOP or subsequent interventions for postoperative complications.

Conclusions
During the post-COVID period, there were more cases of TRD and macula-involving detachment despite no difference in total PPV cases for PDR. This pattern – which likely contributes to the worse visual outcomes at six months despite lower rates of postoperative complications – persisted even two years after the shutdown and illustrates the lingering negative effects of pandemic-related interruptions in care on PDR severity and postoperative visual outcomes.

	Pre-COVID (N = [illegible] eyes)	Post-COVID (N = [illegible] eyes)	P-value
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
New Patients (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
Total PPV (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
Preoperative Visual Acuity (VA)			
Operative Eye (logMAR, SD)	[illegible]	[illegible]	[illegible]
20/20 – 20/50	[illegible]	[illegible]	[illegible]
20/60 – 20/200	[illegible]	[illegible]	[illegible]
Worse than 20/200	[illegible]	[illegible]	[illegible]
Fellow eye (logMAR, SD)	[illegible]	[illegible]	[illegible]
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] PPV [illegible] (mean days, SD)	[illegible]	[illegible]	[illegible]
[illegible] surgery [illegible] (eyes, %)	[illegible]	[illegible]	[illegible]

[illegible]

	Pre-COVID (N = [illegible] eyes)	Post-COVID (N = [illegible] eyes)	P-value
POM1 VA (logMAR, SD)	[illegible]	[illegible]	[illegible]
POM6 VA (logMAR, SD)	[illegible]	[illegible]	[illegible]
20/20 – 20/50	[illegible]	[illegible]	[illegible]
20/60 – 20/200	[illegible]	[illegible]	[illegible]
Worse than 20/200	[illegible]	[illegible]	[illegible]
[illegible] POM6 (eyes, %)	[illegible]	[illegible]	[illegible]
Elevated IOP within POM6 (eyes, %)	[illegible]	[illegible]	[illegible]
[illegible] within POM6 (eyes, %)	[illegible]	[illegible]	[illegible]
Repeat PPV within POM6 (eyes, %)	[illegible]	[illegible]	[illegible]

[illegible]

Clinical Implications of Densiron 68 Endotemponade after Pars Plana Vitrectomy: A Systematic Review and Meta Analysis

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Posterboard#: B0544

Abstract Number: 883 - B0544

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Purpose
Managing rhegmatogenous retinal detachments (RRD) associated with inferior retinal breaks remains challenging despite advancements in vitreoretinal surgery. Densiron® 68 and Densiron XTRA have shown potential in reducing inflammatory complications compared to their Heavy Silicone Oil (HSO) predecessors. However, their adoption in traditional surgical settings, especially in the United States, is limited. This systematic review and proportional meta-analysis evaluate the incidence of inflammatory complications and the overall anatomical success of Densiron formulations in treating complex retinal detachment cases.

Methods
We conducted comprehensive literature searches from January 1, 1990, to present, on Ovid MEDLINE, EMBASE, and Cochrane CENTRAL. Eligibility criteria encompassed original studies with a minimum of five participants detailing inflammatory complications linked to Densiron endotamponade, primary surgical anatomical success and discussing preoperative attributes. The study prevalence was pooled using a random effects model. Analysis was performed using R (version 4.3.1). This review is registered under the International Prospective Register of Systematic Reviews database (CRD42023381617).

Results
We identified 759 references. After the screening process, 29 of them were eligible for systematic review (1218 eyes). Pooled proportion of oil dispersion and emulsification was 8.2% (95% CI: 4.7%-14.2%). Pooled incidence of Intraocular inflammation had a combined estimate of 6.9% (95% CI: 3.5%-13.1%). Oil migration into the anterior chamber had a pooled incidence of 5.5% (95% CI: 2.9%-10.3%). Anatomical surgical reattachment until last follow up after Densiron endotamponade had a pooled proportion of 82.7% (95% CI: 76.3%-87.6%).

Conclusions
Despite the high prevalence of inflammatory complications seen with earlier formulations of HSOs, newer formulations of Densiron 68 and Densiron XTRA demonstrate a much lower propensity for such complications than previously published results. Furthermore, their use as an endotamponade agent in highly complex primary and secondary RDs has demonstrated their utility in achieving a high level of anatomical retinal reattachment.

Three-Dimensional Quantitative Analysis of Macular Changes Related to Internal Limiting Membrane Peeling in Retinal Detachment Repair with Silicone Oil Tamponade

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Posterboard#: B0581

Abstract Number: 920 - B0581

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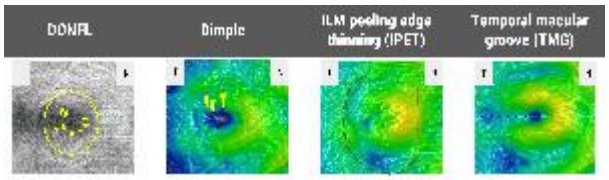
DisclosureBlock: Yung-Ray Hsu, None; Tzu-Han Hsieh, None;

Purpose
This study aimed to assess microstructural macular changes associated with internal limiting membrane peeling (ILMP) using three-dimensional optical coherence tomography (OCT) in a case series of primary macula-off rhegmatogenous retinal detachment (RRD) repairs with silicone oil (SO) tamponade.

Methods
We conducted a qualitative comparative analysis of macular changes among patients who underwent primary RD repair with or without ILMP. Subsequently, we performed detailed quantitative analyses of ILMP-related microstructural changes using both 3D and 2D OCT images.

Results
In the qualitative comparative analysis, we included 22 eyes without ILMP and 21 eyes with ILMP. Macular microstructural changes were observed in 95% (n = 20) of ILMP eyes and 5% (n = 1) of non-ILMP eyes ($p < 0.001$). In the quantitative analysis, we included 56 eyes that underwent ILMP. Four major ILMP-related macular microstructural changes were detected: dimples (56 eyes, 100%), dissociated nerve fiber layer (DONFL) (31 eyes, 55%), ILM peeling edge thinning (IPET) (36 eyes, 64%), and temporal macular groove (TMG) (13 eyes, 23%). Dimples ($n = 251$, average 4.5 ± 5.8 per eye) could be further classified into type I (confined to the inner plexiform layer (IPL); 73%) and type II (beyond IPL, 27%). Signs of tissue loss were detected in both types of dimples. These dimples were predominantly located in the inner circle (74%) in the ETDRS subfield, with the deepest dimples averaging a depth of 58 ± 18 µm. The extent of IPET was 6 ± 3.7 clock hours. The average length of TMG was 1.8 ± 0.4 mm. The inner temporal over nasal retinal thickness ratio (T/N ratio) as demarcated by ETDRS subfield was significantly lower in ILMP eyes compared to fellow eyes ($p < 0.001$).

Conclusions
Macular microstructural changes are common after ILMP in RD repair, encompassing both focal changes (dimples, DONFL) and zonal changes (IPET, TMG). DONFL and dimples may be part of a continuum of findings stemming from the same mechanism. IPET and TMG may contribute to the temporal atrophy observed on 2D OCT following ILMP. The alterations in the T/N ratio and signs of TMG suggest a nasal shift of macular tissue due to neurovascular bundle contracture. These novel findings enhance our understanding of ILMP-related retinal changes.



Sutureless vitrectomy with removal of dense posterior capsule opacification in patients with vitreous floaters or macular pucker

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Posterboard#: B0578

Abstract Number: 917 - B0578

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DisclosureBlock: William Illiano, None; John Mason, None;

Purpose
Surgical removal of posterior capsule opacification (PCO) with vitrectomy is a novel, combined approach for treating severe vitreous floaters (SVF) with concomitant PCO. We hypothesize that this approach may be similarly effective in treating macular pucker (MP) with concomitant PCO. To this end, we performed a retrospective, observational clinical study to compare the outcomes of this procedure in patients with MP to those of patients with SVF.

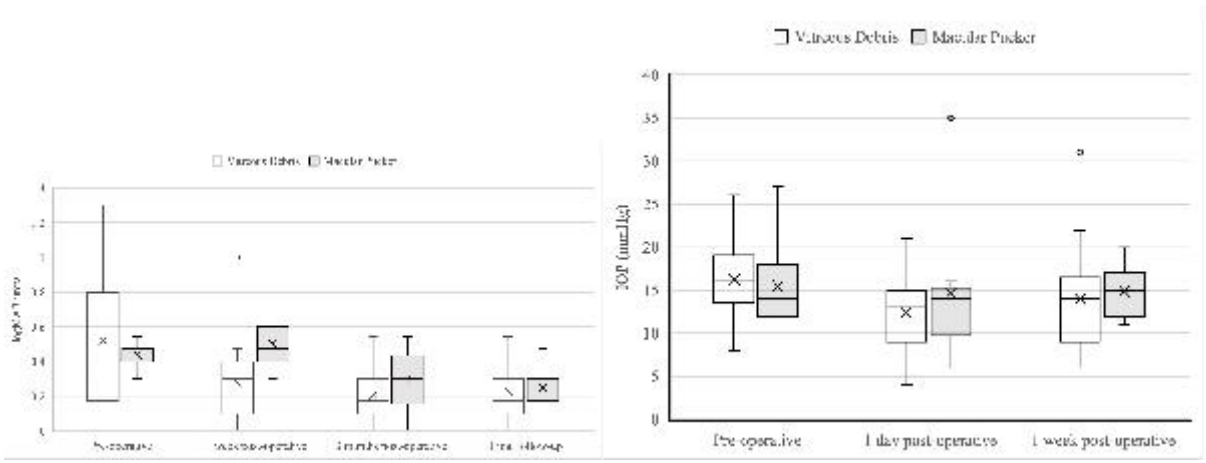
Methods
17 patients with SVF (mean age 64.8, n = 14 females, 3 males) and 11 patients with MP (mean age 71.0, n = 6 females, 5 males) who underwent this combined procedure from 2017 to 2021 at a single center were included. Inclusion criteria were a preoperative best-corrected visual acuity (BCVA) of 20/30 or worse and > 3 months of follow-up. Exclusion criteria were additional significant ocular pathology. The primary outcome was BCVA, measured in logMAR units, and was assessed preoperatively and postoperatively at 1 week, 3 months, and the final follow-up visit (mean 13.8 months). The mean change in BCVA was compared between the SVF and MP groups via an unpaired t-test. Secondary outcomes included pre- and postoperative intraocular pressure (IOP) and intra- and postoperative complications.

Results
Mean BCVA preoperatively was 0.52 ± SD 0.39 logMAR (~20/66 Snellen) and 0.44 ± SD 0.08 (~20/55) in the SVF and MP groups respectively, improving to 0.23 ± SD 0.17 (~20/34) and 0.25 ± SD 0.14 (~20/36) at the final postoperative visit ($p < 0.001$, both groups). The mean improvement in BCVA was not significantly different between groups ($p = 0.294$). There were 2 cases of elevated IOP postoperatively, both of which normalized with appropriate treatment. No significant intra- or postoperative complications were observed in either group.

Conclusions
A similar improvement in BCVA was observed in both groups without significant complications, suggesting that this combined approach may be similarly safe and effective in these patient populations. These results further support the use of this approach as an alternative treatment option to YAG capsulotomy in these populations. Further studies are warranted to directly compare these approaches.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
Cataract surgery is the most common surgery performed in the United States and can often lead to a clouding of the part of the eye that holds the lens. This is normally treated with a laser procedure called YAG capsulotomy. However, for some individuals undergoing surgery for another eye condition, this

clouding can be removed surgically. This approach is known to be effective in patients being treated for floaters in their vision. Our study showed that the procedure is similarly safe and effective at improving vision in patients being treated for another condition known as macular pucker.



Efficacy of Pneumatic Retinopexy versus Vitrectomy with Scleral Buckle in Repairing Uncomplicated Rhegmatogenous Retinal Detachment

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Posterboard#: B0582

Abstract Number: 921 - B0582

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DisclosureBlock: Deborah Li, None; David Szanto, None; Emily R. White, None; Nicholas Fazio, None; Khurram Chaudhary, None;

Purpose
To compare the outcomes of pneumatic retinopexy (PnR) and pars plana vitrectomy with scleral buckle (PPV/SB) for uncomplicated rhegmatogenous retinal detachment (RRD).

Methods
In a retrospective study for comparing reattachment rates of repairing RRD fulfilling requirements for PnR, 42 patients underwent PnR and 19 patients underwent PPV/SB. For each patient, we collected the preoperative and current visual acuity (VA) and intraocular pressure (IOP), operation outcome, and recovery time to pre-detachment VA. We analyzed VA with conversion to Logarithm of the Minimum Angle of Resolution (LogMAR). We performed paired t-tests to compare preoperative and current VA. We compared differences in VA between procedures with a two-sample test for equality.

Results
Primary reattachment rate was 79% and 84% in the PnR and PPV groups respectively, with no statistically significant difference between the groups ($p = 0.61$). In PnR, recovery of best visual acuity (VA) to baseline occurred in 55% of patients with a median recovery time of 28 days, while those receiving PPV/SB recovered to prior VA 33% of the time with a median recovery time of 59 days. VA significantly improved in both groups ($p = 0.001$ in PnR and $p = 0.003$ in PPV/SB), and there was no significant difference in visual acuity improvement between groups ($p = 0.10$).

Conclusions
PnR should be regarded as the first-line option for RRD that meets PIVOT trial criteria. There was no statistically significant difference in primary reattachment rate between PnR and PPV/SB. Importantly, PnR is associated with a faster recovery time and is significantly less invasive and costly.

Comparison of Proliferative Vitreoretinopathy (PVR) between Mice and Rabbits

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Posterboard#: B0545

Abstract Number: 884 - B0545

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DisclosureBlock: lichun zhong, None;

Purpose
The study compares PVR in mice versus rabbits as models to advance therapeutic development targeting PVR which can cause rhegmatogenous retinal detachment repairs to fail.

Methods
The mouse PVR model was induced by the intravitreal (IVT) injection of a spontaneously arising retinal pigment epithelia - 19 (ARPC-19) cell line. The rabbit PVR model was induced by IVT of rabbit conjunctival fibroblast cells. Twelve female C57BL/6 mice, eight male and eight female New Zealand red pigmented rabbits were utilized in the study. Only one eye per animal was induced the PVR model for 28 days. The following were performed on all animals: clinical observation and moribundity/mortality daily; body weights pre-study and pre-sacrifice; ocular examinations and PVR gradings pre-study, weekly, and pre-sacrifice; fundus photography (FP), electroretinography (ERG), Spectral Domain Optical Coherence Tomography (SD-OCT) pre-study and pre-sacrifice. At termination, all animals were euthanized and both eyes were enucleated and fixed in 10% Formalin for histopathological evaluation.

Results
On Day 28, PVR gradings between mice and rabbits were similar, PVR scores reached stages 4 or 5. FP in the mouse PVR model indicated fibrous membrane in vitreous body and FP in the rabbit PVR model showed cloudy in vitreous body. ERG in the mouse PVR model indicated weak responses and ERG in the rabbit PVR model showed no response. SD-OCT in the mouse PVR model indicated fibrous membrane in vitreous body and in the front of retina and SD-OCT in the rabbit PVR model showed no scanned images. Histopathological findings indicated both PVR models had mild to severe PVR in the vitreous body and retinal detachment.

Conclusions
The mouse or rabbit PVR model provides a stable, effective and reliable method for testing new treatment for patients with PVR. The mouse PVR model, due to closed to PVR in patients, would be recommended over the rabbit PVR model for testing.

Outcomes of Eyes with Retinoschisis-Related Retinal Detachment

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Posterboard#: B0583

Abstract Number: 922 - B0583

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DisclosureBlock: Bita Momenaei, None; Asad Farooq Durrani, None; Kristine Wang, None; Jason Hsu, Code C (Consultant/Contractor) consultant for IvericBio and Gyroscope Therapeutics, Code F (Financial Support) grant support from IvericBio, Aldeyra Therapeutics, and Genentech/Roche

Purpose
To investigate visual and anatomic outcomes in patients who have undergone primary interventions for schisis-detachment.

Methods
A retrospective review was conducted on eyes that underwent a procedure for schisis-related retinal detachment (RD) between January 2015 and November 2022. Eyes with X-linked retinoschisis, isolated macular schisis, RD unrelated to schisis, and <6 months of follow-up were excluded. Primary outcome measures were the incidence of redetachment following the initial intervention, as well as visual and anatomic outcomes at 6 months and the final visit.

Results
After reviewing 174 eyes, 67 eyes of 67 patients met the inclusion criteria. The mean (standard deviation, SD) follow-up duration was 38.3 (24.3) months. Macular involvement was observed in 27 eyes (40.3%), and proliferative vitreoretinopathy (PVR) was present in 8 eyes (11.9%) at the time of primary RD. The initial repair methods included laser retinopexy in 23 eyes (34.3%), vitrectomy in 23 eyes (34.3%), combined vitrectomy and buckle in 13 eyes (19.4%), and buckle alone in 8 eyes (11.9%). The initial procedure failed in 7 eyes (30.4%) that underwent laser and 9 eyes (20.5%) that underwent surgery (P=0.381) after a median time (interquartile range, IQR) of 70 days (14-623) and 65 days (29-187), respectively. Single surgery anatomic success (SSAS) for RD repair was achieved in 81.8% of eyes (36/44) at 3 months. The anatomic success rate for reattachment was 91.3% at 6 month and 95.7% at the final visit in the laser group, and 97.7% at 6 months and at the final visit in the surgical group, with 8 eyes and 5 eyes remaining silicone oil-filled at these visits. The mean (SD) logarithm of the minimal angle of resolution (logMAR) visual acuity at the 6 month and final visit was 0.52 (0.55, Snellen equivalent: 20/66) and 0.37 (0.54, 20/47), showing no significant change compared to vision at the time of RD diagnosis (0.46 (0.66), 20/58) (P=0.844 and 0.276).

Conclusions
The treatment of schisis-detachment appears to lead to generally acceptable anatomical outcomes with preservation of vision. However, the relatively high redetachment rate suggests that these types of RDs may be more difficult to treat than non-schisis related rhegmatogenous RDs.

Effectiveness, safety, and practicality of robotic systems in eye surgery: A systematic review

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Posterboard#: B0549

Abstract Number: 888 - B0549

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DisclosureBlock: Arun James Thirunavukarasu, None; Monica L. Hu, None; William P. Foster, None; Kanmin Xue, None; Jasmina Cehajic Kapetanovic, None; Robert E. MacLaren, None;

Purpose
Uptake of robotic systems for ocular surgery is impeded by the challenges of a rotationally mobile field, rapid surgery in awake patients, and little tolerance for aberrant motion. However, as surgical outcomes and innovation are becoming limited by human physiology, robotic assistance offers a means by which the therapeutic repertoire of ophthalmologists may be expanded. This systematic review aimed to identify how robotic systems have been applied in eye surgery, and to appraise their effectiveness, practicality, and safety.

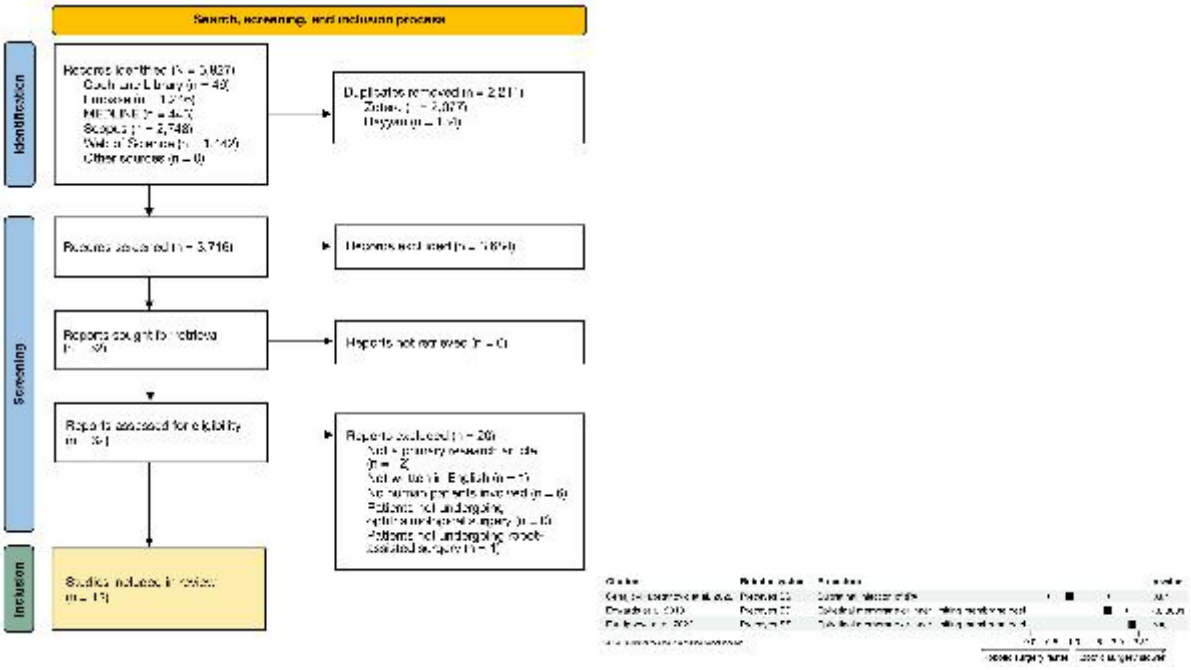
Methods
The Cochrane Library, Embase, MEDLINE, Scopus, and Web of Science were searched with records fulfilling the following criteria included: English language; primary research article; human patients; eye surgery; robot-assisted or robot-mediated surgery. Joanna Briggs Institute Tools for Critical Appraisal were used for quality assessment. Data extraction captured study design, location, surgical procedures, and outcome measures of clinical effectiveness, safety, and practicality for surgeons. The study was pre-registered on PROSPERO (CRD42023449793).

Results
12 studies were identified: three randomised-control trials (RCTs), seven case series, and two case reports. Robotic systems have been used to assist with a variety of tasks in corneal, orbital, and vitreoretinal surgery. All RCTs trialled the Preceyes BV system. RCT results indicated no significant differences in clinical outcomes or adverse events between patients undergoing robot-assisted and conventional surgery but were underpowered to appraise non-inferiority or superiority ($N_{max} = 15$). Robotic assistance was associated with longer duration of surgery in 2/3 RCTs ($p < 0.05$). One study reported lesser movement distance of robot-assisted instruments, indicating greater efficiency. Surveyed surgeons were positive regarding ergonomics and intuitiveness. Preceyes has received CE marking approval to assist trained vitreoretinal surgeons in theatre.

Conclusions
Robotic systems have safely assisted with ophthalmic surgery in proof-of-concept studies, including some that extend human capability such as retinal vessel cannulation. However, robot-assistance increases procedure duration. Further technological refinements are necessary to design interventions to improve clinical outcomes and justify adoption of robotic systems in ophthalmology.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.

The effectiveness, practicality, and safety of robotic systems used to assist eye surgery is relatively unexplored by clinical researchers. In this study, we find that although proof-of-concept studies have successfully trialled robot-assisted eye surgery, studies are too small to draw conclusions about the clinical effectiveness of these procedures. Robotic assistance may improve the efficiency of instrument movements, but currently extend the duration of surgery. Further work is required to design and trial robotic systems which improve the conduct and outcomes of eye surgery for patients and practitioners. Our study also indicates the potential future benefits of innovative systems, which may improve existing surgical procedures and facilitate invention of new procedures to improve treatment of eye disease.



Role of Oral Methotrexate in Preventing Proliferative Vitreoretinopathy and Retinal Re-detachment

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Posterboard#: B0584

Abstract Number: 923 - B0584

AuthorBlock: *Effie Z. Rahman[1,2], Charles Clifton Wykoff[1], David M. Brown[1], Rajiv Shah[2]*
[1]Retina Consultants of Texas, Houston, Texas, United States; [2]Ophthalmology, Atrium Health Wake Forest Baptist, Winston-Salem, North Carolina, United States;

DisclosureBlock: Effie Z. Rahman, None; Charles Clifton Wykoff, None; David M. Brown, None; Rajiv Shah, None;

Purpose
Oral (PO) MTX is commonly used for the treatment of inflammatory uveitis, but has not been studied in preventing proliferative vitreoretinopathy (PVR). We aim to determine whether PO MTX, dosed 10-15 mg weekly with daily folic acid supplementation, decreases the risk of PVR development and rate of redetachment.

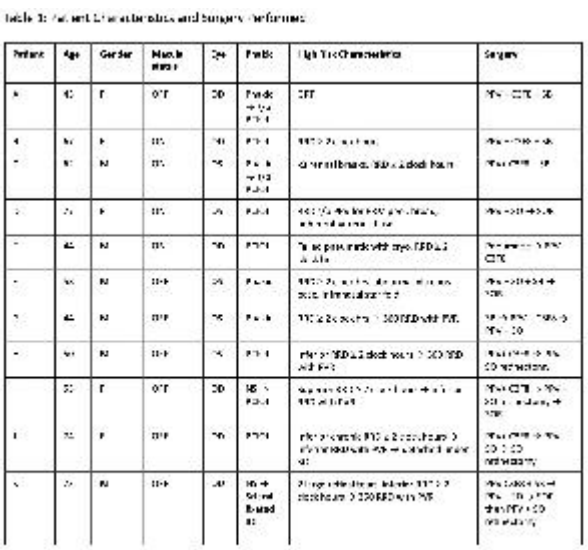
Methods
A multi-center retrospective series involving both an academic institute and a large private practice. Selection criteria included patients with rhegmatogenous retinal detachments (RRD) who met high risk characteristics including 1 ≥ of the following: recurrent detachments, detachments involving > 2 quadrants, extensive vitreous hemorrhage, retinal tears > 2 clock hours, active uveitis/post globe repair, or chronic subretinal fluid for over 2 months duration. 11 patients met the above qualifications. All patients were started on 10 mg PO MTX each week and daily folic acid on post-op day 1. Surgeries included pars plana vitrectomy (PPV) or PPV + scleral buckle (SB) with either C3F8 gas or silicone oil (SO). Patients were maintained on MTX each week for at least 6 months.

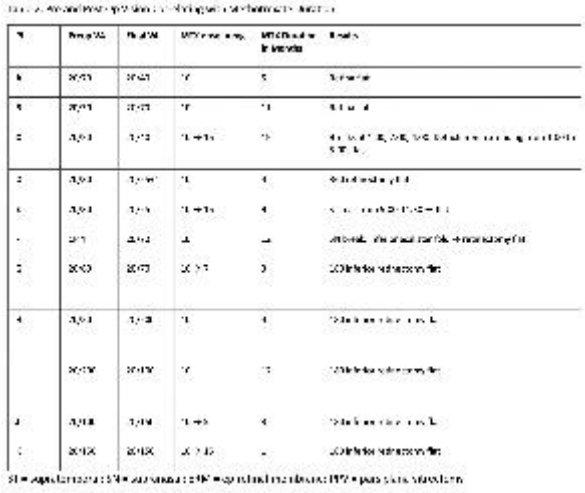
Results
11/11 patients have remained attached, quiet on exam, and have not required additional surgery. 7/11 patients had SO placed. 3/7 SO patients underwent SO removal at the time of reporting. 5/11 patients have had at least 3 recurrent RRDs, requiring at least 3 surgeries before starting MTX but have remained attached following their third surgery while on MTX. 4/11 of phakic patients underwent cataract surgery. 5/11 patients had final BCVA of ≥ 20/40.

Conclusions
This multi-center study suggests that a 6+ month course of low dose PO MTX with folic acid supplementation may help prevent PVR and re-detachment in those with high-risk characteristics, particularly in patients who have detached multiple times. Oral MTX may serve as a good alternative to intravitreal MTX in preventing PVR and recurrent detachments. MTX is economically feasible, easier to obtain compared to intravitreal MTX, and is less stressful to deliver to the patient.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
Oral methotrexate (MTX) is commonly used to treat inflammatory uveitis, but it has not been studied in preventing proliferative vitreoretinopathy (PVR) formation and recurrent retinal detachments. We aim to determine whether PO MTX, dosed 10-15 mg weekly with daily folic acid supplementation, decreases the risk of PVR development and the rate of re-detachment. 11 patients who have re-detached previously were

started on MTX. 5/11 patients had re-detached at least twice before and required a third surgery; however, all 11 patients had a 100% success rate of attachment with no signs of PVR formation after starting MTX. 5/11 patients were able to see well enough to legally drive. Oral MTX is a good alternative to intravitreal MTX as it is cheaper, easier to obtain, and is less stressful to deliver to the patient.





Incidence of Management Changes on Postoperative Day One After Epiretinal Membrane Peel

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Posterboard#: B0579

Abstract Number: 918 - B0579

AuthorBlock: *Hannah E. Anderson[1], Fatima Rizvi[1], Anza Rizvi[1], Hana A. Mansour[1], Bita Momenaei[1], Sunir Garg[1]*
[1]Retina, Wills Eye Hospital, Philadelphia, Pennsylvania, United States;

DisclosureBlock: Hannah E. Anderson, None; Fatima Rizvi, None; Anza Rizvi, None; Hana A. Mansour, None; Bita Momenaei, None; Sunir Garg, None;

Purpose
Vitrectomy for epiretinal membrane (ERM) traditionally has required patients to return to the clinic on postoperative day 1 (POD1), week 1 (POW1), month 1 (POM1), and month 3 (POM3). Recent advancements in diagnostic and surgical techniques for vitrectomy and ERM peel have improved surgical efficiency and resulted in a lower rate of procedure-related complications. Therefore, this study aims to investigate the complications associated with ERM peels to determine the necessity of mandating patients to return for POD1 visits.

Methods
All eyes with a diagnosis of ERM that underwent ERM peel with or without internal limiting membrane (ILM) peel, from January 2015 to January 2023, and completed POD1 through POM3 visits, were included. Baseline characteristics, surgical outcomes, and complications were assessed. Main outcome measures included postoperative complications assessed at each visit, including ocular hypertension or hypotension (intraocular pressure, (IOP), greater than 24 mmHg or less than 6 mmHg), retinal detachment or tear, vitreous hemorrhage (VH), hyphema, endophthalmitis, and the need for changes in management.

Results
A total of 339 eyes of 339 patients were examined. Of the complications investigated, 3 eyes (0.9%) developed an IOP exceeding 30 mmHg at POD1. IOP-lowering drops were prescribed for 2 of them. At POD1, 15 eyes (4.4%) had an IOP less than 6 mmHg, with 14 resolving spontaneously by POW1. Additionally, at POD1, a hyphema was noted in 1 eye, corneal abrasion in 1 eye, and VH in 3 eyes. No non-standard steroids or non-standard antibiotics were required at POD1. 4 patients (1.2%) necessitated a change in follow-up interval due to complications at POD1: 1 due to corneal abrasion, 1 for symptomatic acute endophthalmitis, and 2 for ocular hypotension, all requiring additional intervention.

Conclusions
Management changes on POD1 after ERM peel occurred in 1.2% of cases, all of which caused patient symptoms. Flexibility regarding the features of the POD1 encounter, such as an IOP check with an ophthalmic technician or non-retinal eye care, accompanied by a provider phone call to inquire about symptoms, may be reasonable in certain circumstances.

TP53 Arg72Pro polymorphism as a potential biomarker for functional prognosis in patients with retinal detachment: Insights from real-world clinical data and an experimental mouse model of retinal detachment

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Posterboard#: B0585

Abstract Number: 924 - B0585

AuthorBlock: *Salvador Pastor[1,2], NADIA REGINA CABELLO GALINDO[1], Eva M. Sobas Abad[1,3], Rebeca Lapresa[5], Angeles Almeida[6], Jose-Carlos Pastor[1], RICARDO USATEGUI-MARTIN[1,4]*
[1]IOBA, University of Valladolid, , Spain; [2]Hospital Clinico Universitario de Valladolid, Valladolid, Castilla y León, Spain; [3]Universidad de Valladolid Facultad de Enfermeria, Valladolid, Castilla y León, Spain; [4]Department of Cell Biology, Genetics, Histology and Pharmacology, Faculty of Medicine, University of Valladolid, Valladolid, Spain., Spain, , Spain; [5]Institute of Biomedical Research of Salamanca (IBSAL), Salamanca, Spain, Spain, , Spain; [6]Institute of Biomedical Research of Salamanca (IBSAL), Salamanca, Spain, Spain, , Spain;

DisclosureBlock: Salvador Pastor, None; NADIA REGINA CABELLO GALINDO, None; Eva M. Sobas Abad, None; Rebeca Lapresa, None; Angeles Almeida, None; Jose-Carlos Pastor, None; RICARDO USATEGUI-MARTIN, None;

Purpose
To evaluate the impact of T*p*53 Arg72Pro (rs1042522) polymorphism, apoptosis, inflammation and stress response genes on the final clinical outcomes in patients after a successful retinal detachment (RD) surgery and in an experimental RD mouse model.

Methods
Hospital-based prospective cohort design involving 180 patients (so far) who underwent RD surgery and 30 humanized T*p*53 Arg72Pro-expressing mice. Genotyping for p.Arg72Pro *Tp53* polymorphism was conducted using the PCR-RFLP technique on DNA extracted from peripheral blood. *Tp53* exon 4, where BstU1 RFLP is located, was amplified by PCR. Total RNA extraction from human and mouse retinal tissue was performed using PureLink RNA Mini Kit. For mRNA expression analysis, cDNA was synthesized by reverse transcription using a commercial High-Capacity cDNA Reverse Transcription Kit. qPCR was performed using SYBR Green PCR master mix and gene-specific primer sets for apoptosis, stress and inflammation-related genes. The patients underwent a complete ophthalmologic examination. Statistical analyses were performed using IBM SPSS Statistics v.25.

Results
There were statistical differences in the relative expression of glial fibrillary acidic protein (GFAP) and inflammation-related genes according to p.Arg72Pro *Tp53*polymorphism distribution in mice. In addition, Being a carrier of Arg/Arg variant for p.Arg72Pro *Tp53* polymorphism was associated with an increase in the relative expression of *BAX*, *CASP3, and CASP9* apoptosis-related genes in human and mouse retinal tissue after RD. However, patients carrying the Pro variant showed worse anatomical and functional outcomes when the surgery was performed more than 7 days after the initial diagnosis compared with patients with Arg/Arg genotype.

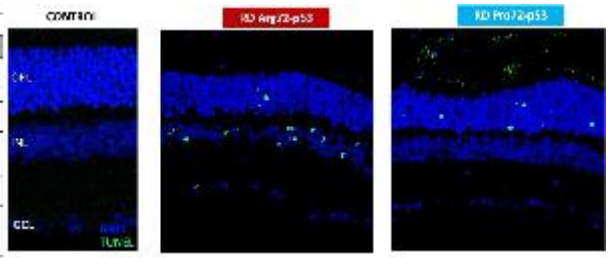
Conclusions
The TP53 Arg72Pro polymorphism may influence the balance between pro- and anti-apoptotic gene expression in the retina after RD. Clinical outcomes and GFAP in mice vary when surgery is performed after

7 days, depending on the p.Arg72Pro Tp53 polymorphism distribution. If these results are confirmed, it could serve as a genetic biomarker for functional prognosis.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.

This study addresses the importance of identifying mechanisms that prevent photoreceptor cell loss associated with retinal detachment (RD) in humans and an experimental RD mouse model. It underscores the role of the host's genetic variability, including specific genetic polymorphisms like Tp53 Arg72Pro (rs1042522), in influencing the functional prognosis of these patients. The study highlights the critical nature of minimizing surgical delays, especially in patients with a higher risk of apoptosis, to achieve improved outcomes, even in cases where the macula is not involved in RD (macula ON RD).

Clinical Characteristics				
Genotype	Arg/Arg	Arg/Pro + Pro/Pro	p-value CI 95%	
Total BCVA, LogMAR, mean ± SD	2.40 ± 2.40	0.27 ± 0.5	0.7650 [-0.15 – 0.22]	
Final BCVA, LogMAR, by previous fovea status (CH+CTT) mean ± SD	0.2 ± 0.15	0.51 ± 0.54	0.2305 [-0.03 – 0.11]	0.2079 [-0.30 – 0.06]
Number of lesions gained after surgery	From 25 to 45	From 35 to 70	-	
Number of lesions gained by previous fovea status (CH+CTT)	From 75 to 90	From 5 to 60	From 60 to 85	From 15 to 35	-	-
% (n) of ROYCA/CTT patients with BCVA ≥0.48 or equal to worse	42.10% (16)	50.00% (18)	0.6016	
% (n) of ROYCA/CH patients with BCVA ≥0.48 or worse	52.94% (9)	20.0% (4)	0.1151	
Final BCVA, LogMAR, in MACULA OFF RD (+72/+78) years ± SD	0.45 ± 0.27	0.63 ± 0.53	0.33 ± 0.64	0.75 ± 0.55	0.3514 [-0.17 – 0.42]	0.2547 [-0.46 – 0.14]
Foveal Reattachment by OCT	2	6	0.1532	
Cataract surgery (phaco + IOL)	19	31	n.s.(1)	
Post-surgical OCT findings				
Genotype		Arg/Arg	Arg/Pro + Pro/Pro	p-value CI 95%
EZ & ELM Grading*	Grade I	19	17	1.000
	Grade II	21	19	1.000
	Grade III	13	6	0.1351
	Grade IV	3	9	0.0247
Central retinal thickness, (µ) (mean ± SD)	55 (274.4 ± 47.61)	51 (303.3 ± 112.1)	0.2819 [-61.6 – 1.73]	
Choroidal thickness, (µ) (mean ± SD)	55 (183.9 ± 77.69)	51 (172.5 ± 63.45)	0.4120 [-11.04 – 33.84]	
Presence of EIRH, % (n)	9.09% (3)	23.52% (12)	0.2617	
Presence of macular edema, % (n)	7.27% (4)	17.64% (9)	0.1181	



Long-term outcomes of pars plana vitrectomy without gas tamponade for myopic foveoschisis with foveal detachment

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Posterboard#: B0580

Abstract Number: 919 - B0580

AuthorBlock: *Wenyi Tang*[1]
[1]Eye and ENT Hospital, Department of Ophthalmology, Fudan University, Shanghai, Shanghai, China;

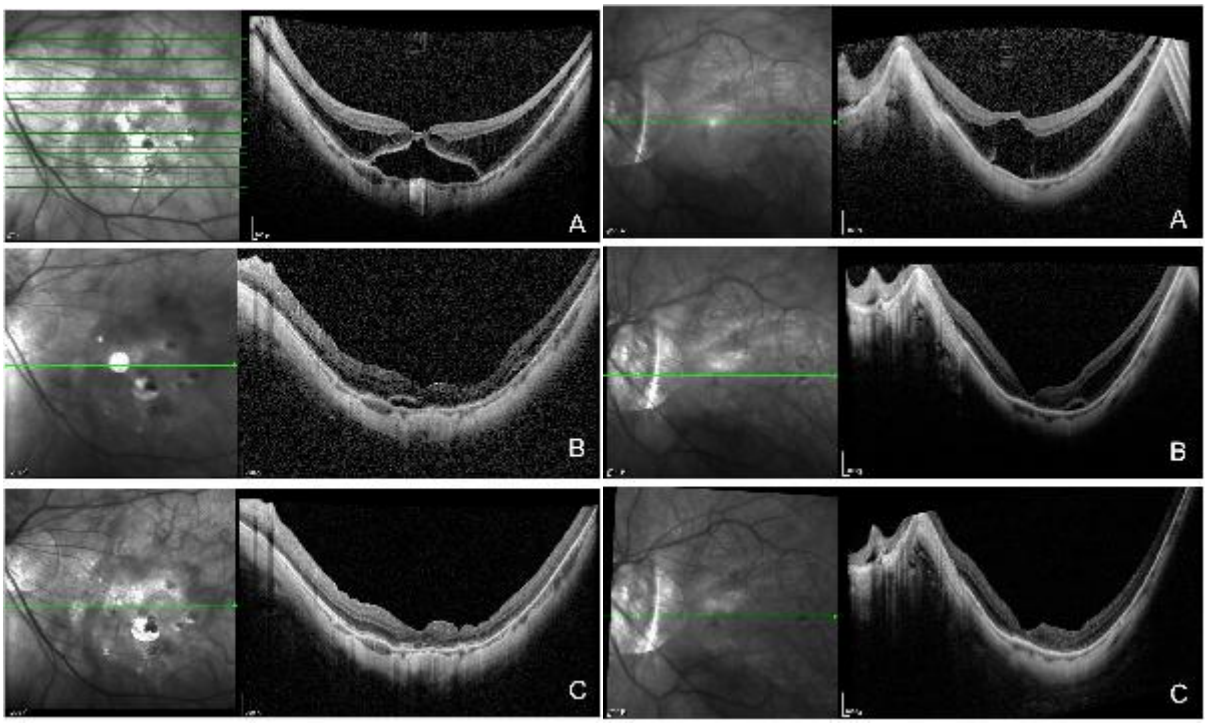
DisclosureBlock: Wenyi Tang, None;

Purpose
It remains controversial whether gas tamponade is necessary for myopic foveoschisis (MF) with foveal detachment (FD). We performed a retrospective case series study to learn about the long-term outcomes after pars plana vitrectomy (PPV) without gas tamponade in patients with MF accompanied by FD.

Methods
In May 2018 to December 2021, forty eyes in 40 highly myopic patients with MF and FD underwent PPV with or without ILM peeling, and no intraocular gas tamponade were used. All patients completed a minimal follow-up of 12 months. Functional and anatomic outcomes were determined by measurement of best corrected visual acuity (BCVA) and central foveal thickness (CFT) on optical coherence tomography (OCT). Postoperative complications were also assessed. The statistical analysis methods include independent sample *t* test, paired sample *t* test, chi-square test, Fisher′s exact test, univariate and multivariate linear regression analysis.

Results
At the 12-month follow-up, the LogMAR BCVA improved significantly from 1.15 ± 0.58 to 0.73 ± 0.39 (t=6.11, P□0.01). The mean CFT decreased from 610.1±207.2 μm preoperatively to 155.9±104.1 μm postoperatively(t =13.47, P□0.01). Complete resolution of MF with foveal reattachment was observed in 32 (80.0%) eyes. Subgroup analysis revealed that the logMAR BCVA and the CFT were not significantly different in groups with (n=21) or without (n=19) ILM peeling. The incidences of postoperative macular holes and rhegmatogenous retinal detachment were both 2.5%. Multivariate linear regression analysis showed that the baseline logMAR BCVA was independently and significantly associated with the logMAR BCVA at month 12 (β=0.433, P□0.001).

Conclusions
Vitrectomy without intraocular gas tamponade appeared to be effective and safe for patients with highly MF with FD. The results are comparable between groups with or without ILM peeling.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Assessing functional retinal recovery in the treatment of large persistent Macular Holes by subretinal Autologous Internal Limiting Membrane Transplantation

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Posterboard#: B0551

Abstract Number: 890 - B0551

AuthorBlock: *Nina Lucia Francesca Giudici[1], Hanna Camenzind-Zuche[1,2], Christian Pruente[1,2]*
[1]Universitatsspital Basel Augenklinik, Basel, Basel-Stadt, Switzerland; [2]Institute of Molecular and Clinical Ophthalmology Basel, Basel, Basel-Stadt, Switzerland;

DisclosureBlock: Nina Lucia Francesca Giudici, None; Hanna Camenzind-Zuche, None; Christian Pruente, None;

Purpose
To evaluate retinal functional recovery, in the macular region of the subretinal internal limiting membrane (ILM) transplantation in patients after ILM transplantation for persistent full thickness macular hole (FTMH).

Methods
In this prospective observational, consecutive case series, patients were included who underwent vitrectomy with subretinal ILM transplantation and air tamponade for large persistent FTMH after prior unsuccessful vitrectomy with posterior hyaloid detachment and ILM peeling. For all eyes, high-definition spectral domain optical coherence tomography scans (SD-OCT Spectralis, Heidelberg Engineering GmbH, Germany) of the macula, Clarus fundus photography (ZEISS Clarus), visual acuity testing (qVA) and microperimetry analysis (MAIA, 4-2 strategy, 10-2°, 72 points) were obtained at least 6 weeks after the surgery.

Results
5 consecutive eyes (4 female, 1 male) were included. The mean (min-max) age was 70 years (65-75). The mean preoperative diameter of the macular hole (MH) was 627µm (511-835). Mean follow-up was 28.8 months (12-54). In all cases ILM transplantation resulted in anatomical closure of the MH during the follow up period. Mean retinal sensitivity was 17.1 dB (14.5-21.30, normal >25dB) and fixation stability measured as bivariate contour ellipse area (BCEA) was 6.8 deg^2 (3.9-13.3deg^2, normal 2.40 ± 2.04deg^2). All patients demonstrated to have a preferred retinal locus located in the upper and nasal area of the previous MH with at least partial coverage of the ILM transplant.

Conclusions
Autologous subretinal ILM transplantation does result in anatomic closure and it can lead to partial recovery of visual function in persistent FTMH. This technique seems to be a reasonable alternative procedure for long-standing or persistent FTMH to achieve anatomic closure and partial functional recovery.

From Injury to Ice: Examining the Return to Sport After Retinal Injuries in the National Hockey League

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Posterboard#: B0586

Abstract Number: 925 - B0586

AuthorBlock: *Justin Pennington[1], Viren Rana[2], Brian Savoie[3], Gary Legault[4], David J. Ramsey[1]*
[1]Ophthalmology, Beth Israel Lahey Health, Boston, Massachusetts, United States; [2]Ophthalmology, Yale University, New Haven, Connecticut, United States; [3]Ophthalmology, Brown University, Providence, Rhode Island, United States; [4]Ophthalmology, Brooke Army Medical Center, Fort Sam Houston, Texas, United States;

DisclosureBlock: Justin Pennington, None; Viren Rana, None; Brian Savoie, None; Gary Legault, None; David J. Ramsey, None;

Purpose
To forecast the recovery time and assess the probability of return to active play for National Hockey League (NHL) athletes with retinal tears or detachments.

Methods
This retrospective study identified high-impact eye injuries in NHL players between January 1, 2000 and January 1, 2022 using a comprehensive online injury database (www.ProSportsTransactions.com). Return to sport was defined as the number of days between injury and participation in an NHL game. A retinal injury was defined as a documented retinal tear or retinal detachment. Injury details and time to return to sport based upon listing on the active roster were cross-referenced with publicly available press releases and online injury reports (www.hockey-reference.com). Players who played at least one game and experienced a retinal injury in the identified period were included in this study.

Results
Over the 22-year study period, 95 eye injuries were reported in the NHL. Of these injuries, 16 players experienced 17 (17.8%) retinal injuries, and all were included in the study. Fifteen players returned to sport within a range of 11 to 573 days (average 102.6 ± 147.8 days). One player was unable to resume play because of the retinal injury. Mechanisms of eye injury included trauma from hockey stick (47%), hockey puck (35%), ice skate (5.9%), and non-contact related events (11.8%).

Conclusions
Retinal tears and detachments, often occurring in high-impact sports injuries, pose a risk of prolonged disability and potentially permanent vision loss despite surgical repair. Our study reveals a diverse timeframe for NHL players to return to active play after retinal injury, reflecting the varying severity of high-impact eye injuries. This information aids ophthalmologists in counseling patients on surgical recovery timelines and the likelihood of resuming athletic activities.

Study of Aspiration Volumes of Back-flush Needle and Infusion Volumes of Vitrectomy Devices.

Posterboard#: B0552

Abstract Number: 891 - B0552

AuthorBlock: *Masaharu Mizuno[1], Takashi Koto[1], Kosuke Nakajima[1], Tomoka Ishida[1], Makoto Inoue[1]*
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DisclosureBlock: Masaharu Mizuno, Code F (Financial Support) Alcon Japan Ltd, Code R (Recipient) Alcon Japan Ltd, Kowa Campany Ltd, Takashi Koto, Code F (Financial Support) Alcon Japan Ltd, Code R (Recipient) Alcon Japan Ltd, Kosuke Nakajima, None; Tomoka Ishida, None; Makoto Inoue, Code F (Financial Support) Alcon Japan Ltd, Code R (Recipient) Alcon Japan Ltd

Purpose
During vitreous surgery, the stability of the eye is important to control the volume of intraocular infusion and aspirating fluid. If not controlled, the eyeball can collapse. We investigated the infusion and aspiration rate when using a back-flush needle in a non-clinical setting.

Methods
Four types of 25G or 27G back-flush needles manufactured by Alcon (A), DORC (D), VitreQ (V), and MedOne (M) were compared. The inner diameter and total length of the silicone soft tip of each needle were measured. The aspiration rate of balanced salt solution (BSS), ethylene glycol (EG) mimicking subretinal fluid, and air was measured at aspiration pressures of 200, 400, and 650mmHg with the Constellation Vision System. The infusion rate of BSS and air from the infusion cannula was measured at IOP set at 10, 30, and 50mmHg.

Results
The aspiration rate of BSS at aspiration pressure of 400mmHg by 25G-instruments was A, 16.7ml/min; D, 12.8ml/min; V, 10.8ml/min; M, 9.7ml/min; and that by 27G-instruments was A, 15.6ml/min; D, 8.6ml/min; V, 6.3ml/min; M, 5.0ml/min. The aspiration rate of air at aspirating pressure of 400mmHg by 25G-instruments was A, 375.6ml/min; D, 268.8ml/min; V, 204.0ml/min; M, 166.8ml/min; and that by 27G-instruments was A, 373.2ml/min; D, 208.8ml/min; V, 151.2ml/min; M, 133.2ml/min. The aspiration rate generally increased in proportion to the increase in the aspiration pressure and was positively correlated with the inner diameter and cross-sectional area of the soft tips, and negatively with the total lengths. The aspiration rate of BSS was significantly higher than that of EG for all IOP settings. Both BSS and air infusion rates increased in proportion to higher IOP settings, with the 25G infusion rate significantly higher than that of the 27G. At an IOP of 30mmHg, the BSS infusion rate was 42.6ml/min for 25G and 24.3ml/min for 27G. The infusion rates of BSS exceeded than aspiration rate of EG for all parameters. At an IOP of 30mmHg, the air infusion rate was 340.8ml/min for 25G and 204.0ml/min for 27G, but it was lower than the aspiration rate depending on the setting.

Conclusions
The aspiration rate of the back-flush needle was positively correlated with the inner diameter and cross-sectional area of the soft tip, and negatively correlated with the total length. The results suggest that aspiration of air under air infusion may cause a collapse of the eye due to insufficient infusion rate.

Demographic variations among presentation and management of rhegmatogenous retinal detachments

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Posterboard#: B0587

Abstract Number: 926 - B0587

AuthorBlock: *Ryan Duong[1], Michael Cusick[1]*
[1]Ophthalmology, UVA Health, Charlottesville, Virginia, United States;

DisclosureBlock: Ryan Duong, None; Michael Cusick, None;

Purpose
We seek to evaluate how disparities in age, gender, and ethnicity affect the presentation and management of rhegmatogenous detachments in a single institution.

Methods
This was a retrospective case series of adult eyes undergoing rhegmatogenous retinal detachment repair from 2012-2019. Descriptive and comparative statistics were used to characterize basic demographic information with respect to factors such as severity of detachment, time to presentation, surgical approach, follow up, and visual outcome.

Results
A total of 378 eyes were included comprising 130 (34.4%) female and 247 (65.3%) male patients with an mean age of 57.6+14.9 years. The cohort comprised 303 (80.2%) Caucasian, 37 (9.8%) African American, 4 (1.1%) Hispanic, 21 (5.6%) Asian, and 13 (3.4%) unknown ethnicities. Younger mean age of presentation was observed among African American (p=0.00) and Hispanic (p=0.00) eyes compared to Caucasian eyes. Mean pre-operative visual acuity differed among ethnic groups overall (p=0.00) with a trend towards higher pre-operative mean logMAR visual acuity (worse vision) in African American eyes compared to Caucasians (p=0.44). There were no differences with respect to pre-operative macular involvement or timing of surgical repair among gender or ethnic groups (p>0.05). Operative procedures included vitrectomy (n=209), scleral buckle (n=50), pneumatic retinopexy (n=93), and combined vitrectomy/scleral buckle (n=22). There were no significant differences in repair procedure among demographic groups, but operative case length for the vitrectomy and scleral buckle cases was longer in African American eyes compared to Caucasian eyes by a mean of 32.7+11.0 minutes (p=0.017). Post-op mean logMAR visual acuity was worse in Black (p=0.04), Asian (p<0.01), and un-identified (0=0.01) eyes compared to Caucasian eyes. The mean observed post-operative follow up was widely variable 24.6+24.6 months and not significantly different with respect to age, sex, or ethnicity.

Conclusions
Ethnic variations account for differences in rhegmatogenous retinal detachment presentation, operative case length, and post-operative visual acuity following repair. Additional socioeconomic research is needed to identify high risk patient characteristics.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
We sought to evaluate how gender, age, and ethnicity affects severity and management of retinal detachments at a single university. We found African American eyes also associated with worse presenting vision and longer operative case length compared to Caucasion eyes. African American eyes, Asian, and Unknown ethnicities were also associated with worse post-operative vision. These results demonstrate

ethnic variations in retinal detachment presentation and management. Further work should continue to evaluate socioeconomic and demographic factors influencing retinal detachment care.

Postoperative Rhegmatogenous Retinal Detachment Following Vitrectomy and Subretinal Tissue Plasminogen Activator for Submacular Hemorrhage

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Posterboard#: B0588

Abstract Number: 927 - B0588

AuthorBlock: *Jordan Safran[2,1], Bita Momenaei[2], Jonathan Lee Martin[2,1], Benjamin Crain[2,1], Hana A. Mansour[2], Collin Richards[2], Jason Hsu[2]*
[1]Thomas Jefferson University Sidney Kimmel Medical College, Philadelphia, Pennsylvania, United States; [2]Retina, Wills Eye Hospital, Philadelphia, Pennsylvania, United States;

DisclosureBlock: Jordan Safran, None; Bita Momenaei, None; Jonathan Lee Martin, None; Benjamin Crain, None; Hana A. Mansour, None; Collin Richards, None; Jason Hsu, Code C (Consultant/Contractor) Bausch + Lomb, Gyroscope Therapeutics, and Iveric Bio

Purpose
To investigate the outcomes of rhegmatogenous retinal detachment (RRD) occurring after pars plana vitrectomy (PPV) and subretinal tissue plasminogen activator (tPA) for submacular hemorrhage (SMH).

Methods
A single center, retrospective chart review of patients who underwent PPV/subretinal tPA for SMH between April 2014 and September 2023 was performed. Patients with <3 months follow-up were excluded. In cases where bilateral surgery was performed, only one eye was randomly selected for inclusion. The visual and anatomic outcomes of eyes that developed RRD following PPV/subretinal tPA were collected.

Results
Out of 167 eyes that underwent PPV/subretinal tPA for SMH, 15 (9%) eyes developed RRD, with macular involvement in 12 (80%) and proliferative vitreoretinopathy (PVR) in 9 eyes (60%). The mean follow-up for all patients was 43.9 months, and the median follow-up time for RRD cases was 32 months. The median (interquartile range, IQR) time from PPV/subretinal tPA until RRD diagnosis was 41 (22-81) days. Of these cases, 12 were treated with PPV, 1 with scleral buckle, while 2 were observed due to poor visual prognosis. Single-surgery anatomic success was achieved in 14 eyes (93.3%) at three months after the first RRD repair and 11 eyes (73.3%) at the final visit. The final anatomic success rate for reattachment was 86.7% (13 eyes) with 7 (46.7%) remaining silicone oil (SO)-filled. Retinal reattachment without SO at the final visit was achieved in 6 eyes (40%). Three eyes (20%) developed recurrent RRD and underwent additional repair during the follow-up period. The median (IQR) logarithm of the minimal angle of resolution (logMAR) [Snellen] visual acuity (VA) at the preoperative visit following SMH was 2 (2-2.3) [20/2000] and increased to 2.3 (2.2-2.7) [20/3991] at the time of RRD diagnosis (P=0.01). The median (IQR) logMAR VA [Snellen] at the final visit was 2.3 (2-2.7) [20/3991] with no significant change compared to VA at the date of RRD diagnosis (P=0.15).

Conclusions
Postoperative RRD occurred in 9% of eyes after PPV/subretinal tPA for SMH and was associated with a high rate of PVR and suboptimal visual outcomes.

Treating Full-Thickness Macular Holes with peeled ILM reposition results in better preserved RNFL

Posterboard#: B0553

Abstract Number: 892 - B0553

AuthorBlock: *Warda Darwisch[1], André Maurice Trouvain[1], Dominik Weber[2], Philipp K Roberts[1], Kathi Savioli[1], Peter Szurman[1], Boris Victor Stanzel[1]*
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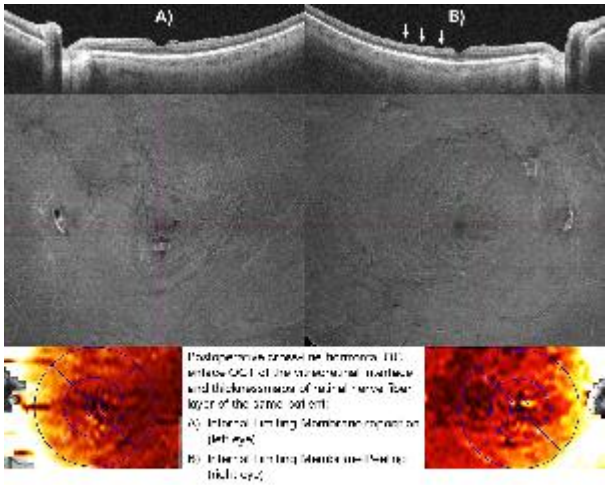
DisclosureBlock: Warda Darwisch, None; André Maurice Trouvain, None; Dominik Weber, None; Philipp K Roberts, None; Kathi Savioli, None; Peter Szurman, None; Boris Victor Stanzel, Code F (Financial Support) Roche, Pixium, Abbvie, Heidelberg Engineering, Meridian Medical, C. Zeiss Meditec, Samsara Vision, Apellis, Geuder, Bayer, Code C (Consultant/Contractor) Roche, C. Zeiss Meditec, Samsara Vision, Apellis, Bayer, Novartis, Iridex, Tenpoint Therapeutics

Purpose
The treatment standard for full-thickness macular holes is pars-plana-vitrectomy (PPV) and internal limiting membrane (ILM) peeling followed by gas tamponade. Despite an outstanding closure rate, ILM peeling leads to inner retinal defects. Considering this adverse effect, we describe functional and anatomical outcomes with an ILM reposition technique.

Methods
We retrospectively investigated consecutive patients with full-thickness macular holes operated by multiple surgeons [n(A)=3, n(B)=5] between October 2022 and June 2023. Exclusion criteria were macular holes associated with high myopia, macular pseudoholes, and prior PPV. Patients were separated by surgical technique into group A (ILM flap reposition) and group B (ILM peeling alone). Primary endpoint was the morphological outcome at 6 months after surgery assessed by Optical Coherence Tomography (SD-OCT, Heidelberg Engineering) and measured as mean thickness and volume of parafoveal (3 mm ETDRS subfields) and perifoveal (6 mm EDTRS subfields) retinal nerve fiber layer (RNFL). Secondary endpoints were anatomical closure rate, best-corrected visual acuity (BCVA) and change of base diameter (BD) as well as minimal linear diameter (MLD).

Results
We included 29 [n(A) = 14, n(B) = 15] eyes of 26 patients. Anatomic closure was achieved in 85.71% (A) and 66.67% (B). To facilitate even comparison, all further analysis ensued on successfully closed holes. The parafoveal RNFL preservation analyzed by permutation test was significantly better in group A by thickness ($p < .001$) and volume ($p = .014$). Also, the decrease in perifoveal RNFL was lower in group A than group B by thickness ($p = .086$) and volume ($p = .029$). Visual acuity improved significantly in both groups ($p < .001$ vs. $p = .009$), with improvements of 0.38 ± 0.26 (A) and 0.40 ± 0.44 (B) logMAR, respectively. The preoperative BD was 635 ± 425 µm (A) vs. 647 ± 332 µm (B) with a mean change of –621 ± 402 µm ($p < .001$, A) and –553 ± 342 µm ($p < .001$, B). The preoperative MLD was 279 ± 209 µm (A) vs. 302 ± 206 µm (B) with a mean change of –279 ± 209 ($p < .001$, A) and –221 ± 176 µm ($p = .003$, B).

Conclusions
Compared to ILM peeling, macular hole treatment by ILM flap repositioning results in a better preserved RNFL, a higher closure rate and similar visual acuity. Future work will further the OCT volumetry.



Posterior pole asymmetry (PPA) analysis of the macular surface and the thickness of retinal nerve fiber layer of the optic papilla.

(A) Inferior limiting membrane curvature (left eye).

(B) Inferior limiting membrane curvature (right eye).

Transcorneal Vitrectomy in Eyes with Regressed Retinoblastoma

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Posterboard#: B0554

Abstract Number: 893 - B0554

AuthorBlock: *Yicheng Bao[1], Gisella Sanchez[2], Thomas C. Lee[1,2], Jesse L. Berry[1,2], Aaron Nagiel[1,2]*
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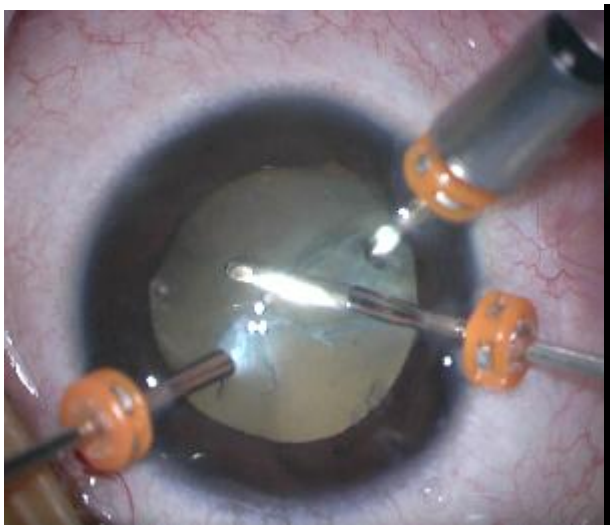
DisclosureBlock: Yicheng Bao, None; Gisella Sanchez, None; Thomas C. Lee, None; Jesse L. Berry, None; Aaron Nagiel, Code C (Consultant/Contractor) Atsena, Lexitas, Janssen, Astellas, Eyebiotech, Immuneering, Blackstone, Novartis

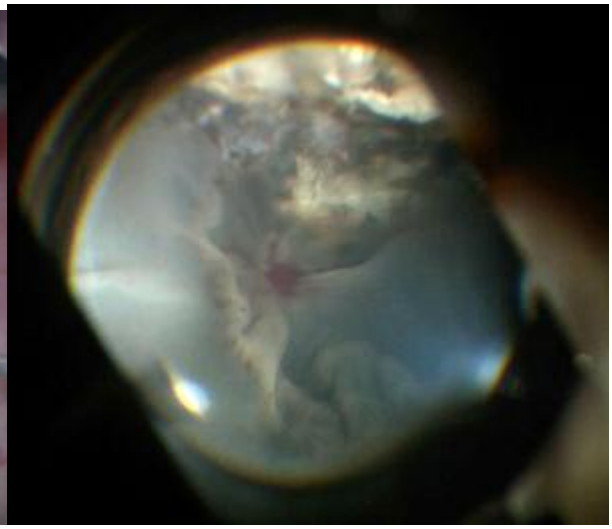
Purpose
Current treatment paradigms for retinoblastoma (RB) facilitate globe salvage, but there is controversy on vitreoretinal approaches for eyes with regressed retinoblastoma. Here we describe a transcorneal 23G or 25G vitrectomy approach that avoids the use of chemotherapy or cryotherapy.

Methods
Retrospective chart review was performed on five consecutive patients with regressed retinoblastoma at Children’s Hospital Los Angeles who had vitrectomy between November 1, 2022 and December 1, 2023. All eyes were deemed to be quiescent and Group D/ct2b.

Results
Five patients with regressed retinoblastoma underwent 8 vitrectomies for a variety of indications: IOL fibrosis, vitreous hemorrhage, cataract, vitreous opacities, tractional retinal detachment, combined tractional/rhegmatogenous retinal detachment, and silicone oil removal. Mean age at first vitrectomy was 6.2 years (range 2 - 9 years) and mean time from last retinoblastoma treatment was 50.4 ± 31.4 months (range 20 - 82 months). Radially oriented corneal incisions were made with the 23G or 25G trocar system and the Versa HD Lenz (Oculus Surgical) was utilized with the RESIGHT (Zeiss) system. No melphalan or other chemotherapeutic agent was used, nor was cryotherapy performed at the wounds. Wounds were sutured parallel to the limbus with 10-0 vicryl and a water rinse was performed to lyse any retinoblastoma cells. There were no cases of retinoblastoma spread with a mean follow-up since last vitrectomy of 6.0 months (range: 3 – 11 months). Vision remained stable in all cases.

Conclusions
This vitrectomy technique for eyes with regressed retinoblastoma permits top-down viewing with the Versa HD Lenz. Radial placement of corneal wounds avoids suturing through the uveal tract, and a postsurgical water rinse lyses any extraocular retinoblastoma cells. In light of concerns for retinoblastoma spread, this technique avoids the need for chemotherapeutics or cryotherapy.





Evaluation of outcomes of Recurrent Retinal detachment repair with use of perfluoro-n-octane as medium-term tamponade

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Posterboard#: B0589

Abstract Number: 928 - B0589

AuthorBlock: *Marib Akanda[1], K V Chalam[1]*
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DisclosureBlock: Marib Akanda, None; K V Chalam, None;

Purpose
This study aims to evaluate the effectiveness of pars plana vitrectomy with subsequent 'medium-term' perfluoro-n-octane (PFO) in managing recurrent inferior retinal detachment complicated by Grade C-D proliferative vitreoretinopathy (PVR)

Methods
We conducted a retrospective analysis on a consecutive series of patients presenting with recurrent inferior retinal detachment and Grade C-D PVR. Each patient underwent a 23-gauge pars plana vitrectomy, followed by a postoperative PFO for a duration of 2 months. Following this, all patients had the PFO removed in a carefully planned, staged procedure.

Results
The study encompassed 38 eyes of 38 patients. The mean follow-up duration for these patients was 18.2 ± 6.92 months. Successful retinal reattachment was achieved in 92% of the cases (35 out of 38). Notably, the rates of reattachment were statistically equivalent, irrespective of whether the patients had undergone previous scleral buckle surgery. The primary reasons for redetachment in the remaining cases included hypotony with recurrent inferior PVR In addition to these outcomes, temporary elevation of intraocular pressure observed in 16% of the patients, and transient ocular inflammation noted in 12% of the cases. Further analysis revealed that two factors, specifically the macula-off status at the time of surgery ($P = 0.02$) and the persistent elevation of intraocular pressure ($P = 0.02$), were associated with poorer visual outcomes post-treatment.

Conclusions
The application of medium-term PFO following pars plana vitrectomy emerges as a viable and effective technique for the operative management of patients with recurrent inferior retinal detachments complicated by Grade C-D PVR. It is noteworthy that the primary method of retinal repair, whether through scleral buckle or pars plana vitrectomy, did not significantly influence the rates of retinal reattachment. However, potential complications associated with this technique, particularly transient inflammation and elevation in intraocular pressure, warrant attention and careful patient monitoring and management in the postoperative period

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
This study examined a specific eye surgery technique for treating a recurrent type of retinal detachment complicated by an eye condition called proliferative vitreoretinopathy (PVR). The technique involved a surgery called pars plana vitrectomy followed by a temporary application of a special substance named perfluoro-n-octane (PFO). It was found to be quite effective, successfully fixing the detachment in 92% of the cases. However, there were some complications like increased eye pressure and transient

inflammation. Overall, this method offers a promising option for treating this complex eye problem, but careful monitoring for side effects is important.

12-Month Outcomes of Pneumatic Retinopexy for Primary Rhegmatogenous Retinal Detachment in a Japanese Cohort: a Multicenter Study

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Posterboard#: B0590

Abstract Number: 929 - B0590

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Purpose
To evaluate the outcomes of pneumatic retinopexy (PnR) over a 12-month follow-up period for the treatment of rhegmatogenous retinal detachment (RRD) in a Japanese population.

Methods
In this multicenter study, eyes treated for initial RRD with PnR from December 2020 to November 2022 and were followed for 12 months were retrospectively assessed in terms of the primary anatomical reattachment rate (PARR) and visual acuity outcomes. The criteria for inclusion in the current analyses were similar to those applied in the PIVOT clinical trial (Ophthalmology, 2019): retinal breaks (single or multiple) within the upper 240 degrees (8 o'clock to 4 o'clock), distribution of the retinal breaks ≤ 30 degrees, and inferior breaks or lattice degeneration in the attached retina being allowed if photocoagulation was performed prior to gas injection. Eyes with PVR≥grade C were excluded. The treatment was performed with the following steps: (1) anterior chamber fluid drainage, (2) intravitreal injection of 100% SF6 gas (0.4-0.8 cc), (3) positioning based on the location of the causative retinal breaks, including the steam-roller procedure when needed, and (4) retinal photocoagulation after reattachment of the retinal breaks. The post-operative best-corrected visual acuities (BCVAs) at 6-months and 12-months were compared to preoperative BCVA, and the PARR was assessed throughout the study period. Information of adverse events were also collected from the medical record.

Results
Of 58 eyes treated with PnR during the study period, 28 eyes met the inclusion criteria and were included in the analyses. BCVA (logMAR) significantly improved from 0.34±0.70 preoperatively to 0.04±0.26 at 6 months postoperatively and 0.02±0.25 at 12 months postoperatively (Friedman's test, p=0.02). The PARR was 92.9% (26 out of 28 eyes). Failure in two cases was caused by redetachment from the original break in one case and formation of a new break in another case. Secondary reattachment was achieved with pars plana vitrectomy in these eyes. Neither intra-operative nor post-operative adverse events were documented in association with the PnR procedures.

Conclusions
Favorable anatomical and visual acuity outcomes were demonstrated over 12 months after PnR in a Japanese population when performed in eyes meeting the previous clinical trial criteria.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study

itself and the associated details.

Pneumatic retinopexy (PnR) is a minimally-invasive treatment for rhegmatogenous retinal detachment that can be performed without operation-room setting, but is not currently considered as a first-line treatment in many countries especially in Asia. Although the effectiveness of this procedure has been shown in some previous literature, the outcomes might be varied among different countries with different patients characteristics and different culture because the successful reattachment of the retina after PnR largely depends on the compliance of the patients to keep the proper face position for several days or even a couple of weeks. Here, we conducted a multicenter study involving Japanese patients treated with PnR under a standard criteria similar to those in a previous clinical trial and demonstrated favorable anatomical and functional outcomes. Notably, our primary success rate was even better than had been reported from other countries before, which strongly suggests the relevance of this procedure as the first-line treatment in appropriate cases of retinal detachment in the Japanese population.

Intraocular Pressure Elevation After Pars Plana Vitrectomy for Rhegmatogenous Retinal Detachments.

Posterboard#: B0591

Abstract Number: 930 - B0591

AuthorBlock: *Jonathan Volkin[1], Nathan Grove[3], Lauren Arguinchona[2], Jennifer Patnaik[1], Leonard Seibold[1], Niranjan Manoharan[1]*
[1]Ophthalmology, University of Colorado Anschutz Medical Campus, Aurora, Colorado, United States;
[2]University of Colorado Anschutz Medical Campus School of Medicine, Aurora, Colorado, United States;
[3]Ophthalmology, University of Colorado Anschutz Medical Campus, Aurora, Colorado, United States;

DisclosureBlock: Jonathan Volkin, None; Nathan Grove, None; Lauren Arguinchona, None; Jennifer Patnaik, None; Leonard Seibold, None; Niranjan Manoharan, None;

Purpose
Despite remaining a key issue in post operative management, little data exists regarding the rates, risk factors, and treatment strategies for elevated intraocular pressure (IOP) after pars plana vitrectomy (PPV) for rhegmatogenous retinal detachments (RRD). We performed a retrospective cohort study to evaluate the rates and risk factors for post-operative IOP-lowering drop use following PPV to repair RRDs and to characterize use of post-operative IOP lowering treatment practices.

Methods
Patients who underwent PPV without scleral buckle at an academic center between 2012-2016 were identified in the primary RRD database. Patients with prior glaucoma or IOP lowering drops were excluded. Peri-operative characteristics were analyzed using ANOVA for continuous variables, and Fisher's Exact Test for categorical variables.

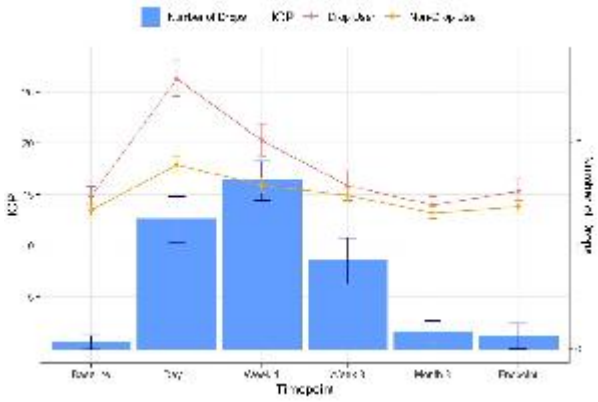
Results
251 patients who underwent PPV for RD repair were identified. 87 (34.7%) patients developed elevated IOP and started IOP lowering therapy following surgery. Patients undergoing first time intraocular surgery were significantly more likely to develop a post-operative IOP elevation (37.7% versus 20.5%, p=0.036). Sex, Race, BMI, smoking history, diabetes, lens status, myopia, history of uveitis, history of ocular trauma, time from detachment symptoms to presentation, macula status, number of retinal breaks, tears or holes, number of quadrants detached, presence of vitreous hemorrhage and presence of giant retinal tear were not associated with treatment for post operative IOP rise. There were no associations between post-operative IOP elevations and retinal detachment procedure type, vitrectomy gauge, tamponade type, or poor positioning. Of the 87 patients who were started on drops, 60 had drops started on post operative day 1 (69.0%), and 82 (94.3%) were started on drops prior to post operative day 11. 67% of patients discontinued drops by week 6 and 93.1% discontinued drops by week 14. Three patients (1.2%) developed glaucoma.

Conclusions
Our results show about a third of patients developed elevated IOP requiring treatment following PPV for RRD repair. Additionally, first-time intraocular surgery was a significant risk factor for IOP elevation, and most patients were successfully treated medically, with normalization of IOP by post operative week 6-14. Further work should examine specific IOP lowering drop regimens.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study

itself and the associated details.

Elevation in eye pressure is a common complication that occurs after surgery for retinal detachments. Elevation of eye pressure can lead to damage to the eye and blindness, so it is important to understand risk factors for having elevated eye pressures after surgery. This study looked at patients who underwent surgery for rhegmatogenous retinal detachment and a variety of demographic, preoperative and intraoperative risk factors. We found one third of patients developed post operative rises in eye pressure and a significant risk factor was first time intraocular surgery. We also examined our institution's practice when it comes to treating elevated eye pressure in this scenario and found all patients were treated with pressure lowering drops rather than surgery or laser treatments and that in almost all cases the use of these drops was temporary, with pressure returning to normal after several weeks. This study suggests patients who have retinal detachments and are undergoing first time intraocular surgery are at higher risk of post operative eye pressure rise, that this pressure rise can be safely treated medically, and pressure will likely normalize after several weeks of therapy.



In-Office Lens Repositioning for Anterior Crystalline Lens Dislocation

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Posterboard#: B0555

Abstract Number: 894 - B0555

AuthorBlock: *Lindsay Klofas Kozek[1], Prasida Unni[2], Jonathan D. Tijerina[3], Sandra Alhoyek[1], Caroline Cotton[4], Humberto Salazar[3], Kenneth Fan[3], Nimesh Arvind Patel[1,3]*
[1]Massachusetts Eye and Ear, Boston, Massachusetts, United States; [2]Boston University Chobanian & Avedisian School of Medicine, Boston, Massachusetts, United States; [3]University of Miami Health System Bascom Palmer Eye Institute, Miami, Florida, United States; [4]University of Virginia, Charlottesville, Virginia, United States;

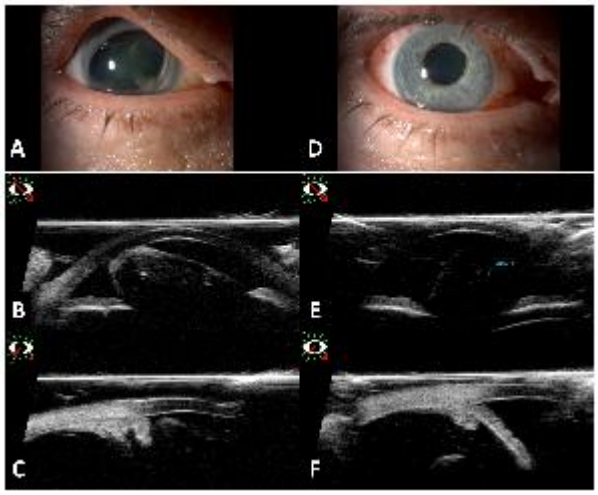
DisclosureBlock: Lindsay Klofas Kozek, None; Prasida Unni, None; Jonathan D. Tijerina, None; Sandra Alhoyek, None; Caroline Cotton, None; Humberto Salazar, None; Kenneth Fan, None; Nimesh Arvind Patel, None;

Purpose
The standard treatment for anterior crystalline lens dislocation is surgical. In the acute setting, surgical complications can occur at higher rates. We describe an effective technique for in-office lens repositioning capable of avoiding or postponing the need for surgical intervention.

Methods
A retrospective review of patients with spontaneous or traumatic anterior crystalline lens dislocation who underwent in-office lens repositioning technique was performed, identifying a case series of four patients. Outcome measures after repositioning included intraocular pressure, visual acuity, slit lamp and B-scan ultrasonography findings before and after repositioning, and ultimate need for surgery.

Results
Four patients with acute anterior dislocation of the crystalline lens underwent in-office lens repositioning. The repositioning technique consisted of supine patient positioning, gentle pressure with a cotton tip on the peripheral cornea to guide the lens into the posterior chamber, and the use of a miotic agent afterwards to prevent subsequent subluxation. In the four cases described, the in-office technique successfully restored the lens to the posterior chamber, improved vision, and decreased intraocular pressure, in most instances by resolving the angle closure secondary to pupillary block. Three patients ultimately underwent planned surgeries to remove and/or replace the lens, and one patient was lost to follow up.

Conclusions
We describe an in-office lens repositioning technique that can be used as an acute non-surgical intervention and/or temporizing measure for anterior crystalline lens dislocation, resulting in improved vision and normalization of intraocular pressure.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The Utility of Preoperative Gas Injection as an Adjunctive Therapy to Pars Plana Vitrectomy in the Repair of Rhegmatogenous Retinal Detachments

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Posterboard#: B0592

Abstract Number: 931 - B0592

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[1]Ophthalmology, Loma Linda University, Loma Linda, California, United States;

DisclosureBlock: Hyelin You, None; Meenakshisundaram Subramanian, None; K V Chalam, None;

Purpose
To describe the role of preoperative gas placement as an adjunctive therapy to pars plana vitrectomy (PPV) in patients with rhegmatogenous retinal detachments (RRD) undergoing surgical repair.

Methods
This is a retrospective case series of RRDs with breaks in the superior quadrants requiring PPV who received intravitreal injection of sulfur hexafluoride (SF6) gas 1-2 weeks prior to PPV between 2016 and 2020 at a tertiary care center.

Results
A total of 15 eyes with superior RRDs underwent preoperative gas placement, 80% of which had macular involvement. The RRDs involved the superior half of the retina and all breaks were also confined to the superior half. The retinal breaks were no larger than 1.5 clock hours in size, with no more than 1 clock hour between the breaks if multiple breaks were present. On clinical examination, the subretinal fluid involving the area of the detached retina was noted to have dissipated after SF6 gas injection, before PPV, in 100% of cases. A 95% primary anatomical success rate was achieved over the median follow-up time of 120 days (range: 60-180). A final visual acuity of 20/80 or better was achieved in 60% of patients.

Conclusions
Preoperative gas placement as an adjunctive therapy to PPV may facilitate ease of surgery as well as increase the anatomical and functional success for RRDs that fall within the criteria for pneumatic gas placement and retinopexy.

DEVELOPMENT OF A MICRONEEDLE FOR INTRAOPERATIVE CANNULATION OF RETINAL VESSELS

Posterboard#: B0556

Abstract Number: 895 - B0556

AuthorBlock: *Tongalp H. Tezel[1], Aykut Aksit[2,3], David Koenigstein[1], Ahmet Hondur[1], Anil K. Lalwani[3], Jeffrey W. Kysar[2,3]*
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DisclosureBlock: Tongalp H. Tezel, None; Aykut Aksit, Code O (Owner) Haystack Medical, Inc, David Koenigstein, None; Ahmet Hondur, None; Anil K. Lalwani, Code C (Consultant/Contractor) Spiral Therapeutics, Code O (Owner) Haystack Medical, Inc, Jeffrey W. Kysar, Code O (Owner) Haystack Medical, Inc

Purpose
To develop a microneedle for intraoperative cannulation of the retinal vessels.

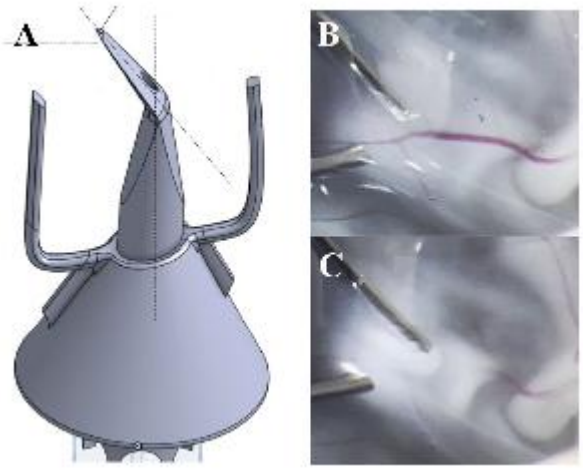
Methods
Two-photon polymerization lithography was employed to fabricate microneedles (80 µm outer diameter/60 µm inner diameter) with ultrasharp tips and curved lumina. Several different designs were tested for the ease of entering the retinal vessels using freshly enucleated (< 12 hours) pig eyes. Design modifications were made to puncture the retinal vessels in a minimally damaging fashion and increase their cannulation ability.

Results
An 80 µm microneedle (60 mm inner diameter) with a curved tip was the most suitable microneedle to puncture the retinal vessels. (Figure 1a) It allowed the surgeon to visualize the tip of the needle and correctly position it over the retinal vessels. A serrated blade-like manufacturing of the microneedle's edge allowed it to slice the upper vessel wall along the direction of the vessel wall fiber. Wing-like extensions were added to the design to align the needle tip with the vessel that will be cannulated and limit the insertion depth of the needle, thus preventing the perforation of the retinal vessel wall. Using the finalized design, retinal vessels were entered and perfused successfully. (Figure 1 b, c)

Conclusions
The novel retinal microneedle design allows for perfusion of the retinal vessels. This transformative technology has the potential to make possible treatment of several retinal diseases including, retinal vascular occlusions, subretinal gene therapy, removal of subretinal perfluorocarbon droplets as well as selective chemotherapy of retinal malignancies.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
Cannulation of the retinal vessels can open a new era in treating several retinal vascular diseases and malignancies. Herein, we developed a microneedle that allows access to the retinal vessels in a minimally invasive manner. The microneedle has undergone several design modifications and in vitro tests using pig

eyes to allow accurate and safe cannulation of the retinal vessels.



Feasibility of a double dose of iPSC-RPE patch transplantation in a laser-induced RPE ablation swine model

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Posterboard#: B0557

Abstract Number: 896 - B0557

AuthorBlock: *Juan Amaral[2,1], Irina Bunea[2,1], Mandeep Singh[3], ruchi Fnu[2,1], Jair Montford[2,1], Francesca Barone[2,1], Kristi Creel[2,1], Arvydas Maminishkis[2,1], Teresa Magone De Cuadros Costa[2], Amir H. Kashani[3], Kapil Bharti[2,1]*
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DisclosureBlock: Juan Amaral, None; Irina Bunea, None; Mandeep Singh, None; ruchi Fnu, None; Jair Montford, None; Francesca Barone, None; Kristi Creel, None; Arvydas Maminishkis, None; Teresa Magone De Cuadros Costa, None; Amir H. Kashani, None; Kapil Bharti, None;

Purpose
Retinal Pigment epithelium (RPE) cell-based therapy is being tested for degenerative retinal diseases with the goal of replacing atrophied RPE cells for restoration of degenerating photoreceptors. To compare transplants side-by-side (empty scaffold/RPE-patch), and develop double dose of RPE-patch, we tested the feasibility of delivering two transplants while minimizing surgical damage.

Methods
A micro pulse laser was used to selectively ablate RPE cells in Yucatan minipigs leading to outer retinal degeneration. A custom-made injector was used for PLGA/RPE-patch delivery. Nine surgeries were performed with follow-ups up to 23 weeks (OCT/ angiography). In five cases, a custom-made clamp closed the scleral wound between maneuvers. Perfluoro Octane (PFO) was used in 5 cases to protect the retina during the sclerotomy. In 3 cases a subretinal cannula was used to extend the size of the retinal detachment (RD)

Results
In all cases both (empty PLGA and PLGA-RPE) transplants were successfully delivered. In cases where no clamp was used, turbulence and hypotony made maneuvers difficult. Hypotony was associated with poor prognosis as noted in follow-ups. In one case with bleeding from the sclerotomy, PFO protected the retina making it easier to aspirate blood. In cases with subretinal cannula use, two developed post-surgical vitreous hemorrhage. One developed RD; the other developed extensive retinal fibrosis and tractional RD. Five cases developed an inflammatory reaction below the RPE-patch not the empty scaffold, suggesting reaction to xeno-cells, confirmed by OCT and angiography. In four cases methotrexate (MTX) was used intravitreally to resolve the inflammation; three cases responded to a single injection.

Conclusions
Our custom-made clamp prevented complications secondary to turbulence and hypotony while PFO protected the retina when there was bleeding from the sclerotomy. Sub-retinal cannula use should be minimized to prevent extensive retinal damage. MTX was effective in controlling inflammatory reactions secondary to xeno-cell transplantation.
Successful delivery of two patches demonstrated feasibility of the technique, opening the possibility of treating larger areas of retinal degeneration. Lessons learned can be applied to minimize surgical and post-surgical complications.

Vitreous hemorrhage following 27-gauge pars plana vitrectomy (PPV) for diabetic tractional retinal detachment (DM-TRD)

Posterboard#: B0593

Abstract Number: 932 - B0593

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DisclosureBlock: Xiaoyu Cai, None; Ryan Duong, None; Naveen Ambati, None; Yevgeniy (Eugene) Shildkrot, None;

Purpose
The 27-gauge (27g) sutureless transconjunctival vitrectomy system is increasingly being utilized in more complex operations, however there exists a knowledge gap on the postsurgical complications with this system, of which vitreous hemorrhage (VH) is one of the most common. We conducted a retrospective, observational clinical study to evaluate the incidence, risk factors, and outcomes of VH after 27g PPV for DM-TRD.

Methods
This is a single-center, retrospective interventional case study of patients who underwent 27g PPV by a single surgeon for DM-TRD. Subjects' medical and ocular risk factors, intraoperative variables, and postoperative visual acuity (VA) information were collected through chart review. These variables were analyzed to determine their relationships with postoperative vitreous hemorrhage (PoVH), spontaneous clearing postoperative VH (SC), and reoperation for non-clearing postoperative VH (ReOp).

Results
91 eyes from 72 patients were analyzed. 43 eyes (47.3%) developed or redeveloped VH within 12 months of 27g PPV treatment of DM-TRD. Of these, 25 cases (58.1%) were SC and of the remaining 18 eyes that were non-SC, 14 (77.8%) underwent reoperation for VH clearance. On statistical analysis, better preoperative VA was associated with less PoVH (p=0.04) and ReOp (p=0.03). Intraoperatively, retinotomy creation (Ret) was associated with greater ReOp (p=005) and filling the eye with filtered air was significantly associated with greater SC (p=0.04) compared to filling with silicone oil or gas. In terms of VA, having PoVH significantly decreased VA at all follow up visits up to one year after 27g PPV compared to not having PoVH. However, there was no significant difference in VA between SC eyes and non-SC eyes or between SC eyes and ReOp eyes at any point in follow up.

Conclusions
The incidence rate of VH after 27g PPV was found to be comparable to that of other PPV gauges. A majority of PoVH cases were SC with only 18 cases of 91 (19.8%) requiring ReOp. Preoperative VA, intraoperative Ret creation, and eye fill represent potential variables to examine for predictors of PoVH, SC, and ReOp. Postoperative VA only differed significantly between cases of PoVH and no PoVH and not between SC vs. non-SC or SC vs. ReOp cases. Additional analysis is required to further elucidate the risk factors and outcomes for postoperative VH after 27g PPV treatment of DM-TRD.

Real-time Optical Coherence Tomography overlay in Epiretinal Membrane Peeling for enhanced intraoperative visualization: A Pilot Study

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Posterboard#: B0558

Abstract Number: 897 - B0558

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DisclosureBlock: Keisuke Ueda, Code E (Employment) Medical Dataway AG, Amr Saad, None; Luca von Felten, Code E (Employment) Medical Dataway AG, Takashi Matsumoto, Code E (Employment) Medical Dataway AG, Ferhat Turgut, Code C (Consultant/Contractor) Roche, Zeiss, Bayer, Gabor Mark Somfai, Code C (Consultant/Contractor) Allergan, Bayer, Novartis, Roche, Zeiss, Matthias Becker, Code C (Consultant/Contractor) Roche

Purpose
The integration of preoperative Optical Coherence Tomography (OCT) images into vitreoretinal surgery holds promise for optimizing surgical approaches and improving outcomes. In this pilot study, we present a real-time overlay of OCT thickness map onto surgical video to aid surgeons in intraoperative decision-making.

Methods
Five surgical videos were segmented into frames, and feature points were extracted using the Shi-Tomasi method. The optical flow between consecutive frames was calculated using the Lucas-Kanade method, ensuring corresponding feature points (Figure 1). A homography transformation matrix aligned feature points between frames and the OCT image. Corresponding feature points on the initial frame of the video and the OCT image were manually annotated, calculating the homography transformation matrix from the OCT image to the first frame. Recursively, for each video frame, we computed the homography transformation matrix from the OCT image, overlaying the transformed OCT image onto each frame. The resulting frames were reassembled to reconstruct the surgical video with the OCT overlay (Figure 2). Successful matching of two consecutive frames was manually measured, excluding frames with obscured or out-of-focus retina. Statistical analyses were not conducted due to the limited number of videos.

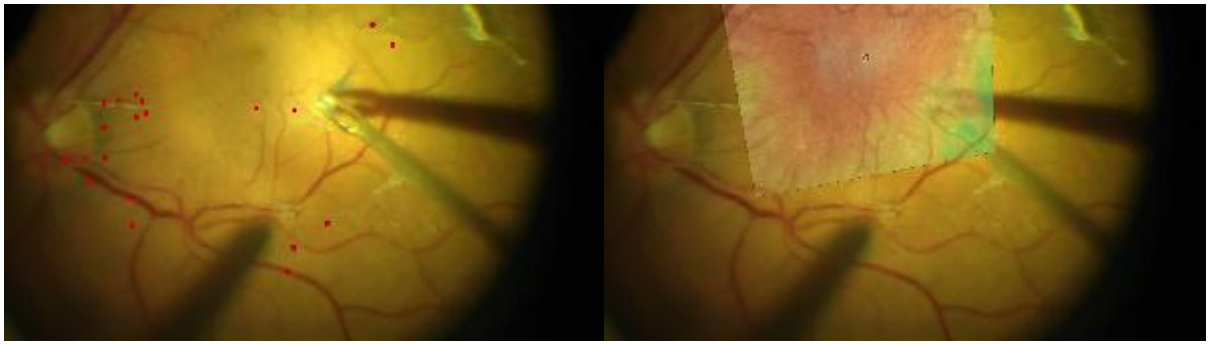
Results
Our method successfully achieved optical flow detection and feature point pairing in 92.7% of consecutive frame pairs. Qualitative analysis of the feature points selected between frames indicated a tendency of our algorithm to choose points near the vascular tree. Frames, with a resolution of 1024×576 WSVGA, were rendered at an average of 7.56 FPS.

Conclusions
This study demonstrates the successful and efficient overlay of OCT images onto epiretinal membrane peeling surgery videos using classical algorithms. The real-time integration of OCT data not only supports surgical decision-making but also has potential applications in surgical training and robotic-assisted vitreoretinal surgery.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists

can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.

Our pilot study introduces a groundbreaking approach in vitreoretinal surgery, where we enhance the surgical process by integrating advanced real-time imaging techniques. The core idea is to superimpose detailed images from preoperative Optical Coherence Tomography (OCT), which show the thickness of the retina, onto the live video feed of the surgery. This allows surgeons to see a map of the retina's preoperative thickness directly on their operating field, aiding them in making precise and informed decisions during delicate procedures like epiretinal membrane peeling. The implementation of this technique involves sophisticated image processing methods to ensure the OCT images accurately align with the surgical video frames, providing a clear and real-time guide for the surgeons. In our study, this method proved highly effective, with a success rate of 92.7% in aligning images. The implications of this technology are significant. Not only does it promise to improve the planning, accuracy, and outcomes of vitreoretinal surgeries, but it also has the potential to enhance surgical education by providing trainees with a more comprehensive, multimodal view of the surgical field and complement robotic-assisted vitreoretinal surgery. This innovative approach represents a step forward in combining technology and medicine for better patient care.



Rhegmatogenous Retinal Detachment Complicated by Retinopathy of Prematurity at Scar Stage Requiring Multiple Surgeries

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Posterboard#: B0594

Abstract Number: 933 - B0594

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DisclosureBlock: Kazuhiko Umazume, None; Takuto Yamamoto, None; Kumiko Sone, None; Hiroshi Goto, None;

Purpose
It is known that patients who have undergone retinal cryotherapy and retinal photocoagulation for retinopathy of prematurity develop rhegmatogenous retinal detachment at the age of adulthood. We investigated the clinical background and postoperative outcomes of patients who recently underwent initial scleral buckling surgery but required multiple surgeries due to retinal re-detachment during follow-up.

Methods
Four patients (mean age 42 years, 3 males and 1 female) with retinopathy of prematurity at the scar stage who underwent initial scleral buckling surgery at Tokyo Medical University Hospital or another institution and were restored to normal position at least once, but re-detached during follow-up were retrospectively evaluated based on their medical records. The main study items were time from initial scleral buckling to re-detachment, status of posterior vitreous detachment at the time of vitrectomy, postoperative recovery rate, and preoperative and postoperative visual acuity.

Results
In all six eyes, retinal cryotherapy and retinal photocoagulation were performed in the neonatal period. The average time from initial scleral buckling to re-detachment was 6 years and 3 months. Posterior vitreous detachment was complete to the vicinity of the arcade in all six eyes, but stopped at the scar margin, and an organic vitreous membrane was present to the periphery. Preoperative visual acuity averaged 0.41 ± 0.56 on the LogMAR scale, and postoperative visual acuity averaged 0.47 ± 0.63, with no significant improvement in visual acuity. All patients were filled with silicone oil as the filling material for the initial vitrectomy and had good restoration after removal.

Conclusions
Rhegmatogenous retinal detachment associated with retinopathy of prematurity at scar stage is difficult to treat even with advances in vitrectomy, and the number of cases is expected to continue to increase.

An exploratory study of vitrectomy with intravitreous ranibizumab instead of panretinal photocoagulation for vitreous hemorrhage from proliferative diabetic retinopathy

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Posterboard#: B0559

Abstract Number: 898 - B0559

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DisclosureBlock: Yong Wei, None;

Purpose
To assess the efficacy and safety of vitrectomy with intravitreous ranibizumab instead of panretinal photocoagulation (PRP) for vitreous hemorrhage from proliferative diabetic retinopathy (PDR) and to study proper timing of PRP.

Methods
This was a prospective and interventional study of patients with vision loss due to vitreous hemorrhage from PDR. Patients underwent vitrectomy combined with intraoperative and postoperative intravitreal injection of ranibizumab without intraoperative PRP. All the eyes were operated by the same surgeon to complete the vitrectomy and received initially 3 injections. Additional injections were received according the neovascular, macular edema and visual acuity. The results of best-corrected visual acuity (BCVA), central subfield thickness (CST), diabetic retinopathy severity score (DRSS), visual field (VF) and intraoperative complications were evaluated during follow-up.

Results
13 eyes of 13 patients (5 females) were enrolled and the mean age was 48 ± 12 years. The mean duration of vitreous hemorrhage was 2.69 ±1.84 months and the mean result of HbA1c was 8.19 ±1.46%. During 24 to 36 months follow-up, mean BCVA improved significantly from 1.10 ± 0.56 logMAR (Snellen equivalent, 20/252) preoperatively to 0.10 ± 0.13 logMAR (Snellen equivalent, 20/25) postoperatively. The mean preoperative intraocular pressure was 14.1 ± 3.7mmHg and the mean postoperative result was 15.6 ± 3.9mmHg. The mean CST was 248.2 ± 57.9μm at one month postoperatively and 263.2 ± 56.8μm at final visit. The MD of VF was -9.6 ± 5.6dB at 3 months and -5.9 ± 3.8dB at 12 months operatively. The mean postoperative DASS was 44 ± 5.6 at 3 months and remained 43.2 ± 8.3 at final visit. The mean number of injections over 2 years was 4.4 ± 1.5 in first year and 0.9 ± 1.2 in second year, respectively. One of the patients suffered tractional retinal detachment and received reoperation. Neovascular glaucoma occurred in two of the patients but no additional operation for glaucoma was need.

Conclusions
Vitrectomy with intravitreous ranibizumab is safe and effective for simple vitreous hemorrhage from PDR. The DASS kept low score with a quite acceptable low times of intravitreous injection. The retina survived with deferred or without PRP and kept the possibility of recovery in the future.

Peripapillary changes of Retinal Nerve Fiber Layer (RNFL) after a successful surgery for rhegmatogenous retinal detachment - 1 year results

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Posterboard#: B0546

Abstract Number: 885 - B0546

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Purpose
To evaluate the peripapillary nerve fiber layer (RNFL) thickness over time after successful repair of rhegmatogenous retinal detachment (RRD).

Methods
Forty nine eyes, which underwent surgery for primary RRD, were included in the study. Successful retinal repair surgery by pars plana vitrectomy, retinopexy and SF6 gas tamponade or pneumatic retinopexy was done in all eyes. Eyes with known conditions that have impact to the RNFL (e.g. history of glaucoma) or eyes that demanded extensive manipulations during surgery were excluded from the study. Spectral-domain optical coherence tomography (SD-OCT) was used for the evaluation of the peripapillary RNFL. Values calculated by the device in 6 peripapillary sectors were used. Pre-operative measurements and at 1, 6 and 12 months time post-operative were compared. As study sector of peripapillary RNFL was used the sector that corresponds best to the most severely affected part of the detached retina. Control RNFL sector was the same sector of the fellow eye at each time point as well as the most unaffected sector of the detached eye.. Demographic and clinical characteristics of patients were also recorded. Twenty seven patients have completed the 12 month follow up .

Results
27 patients who completed the twelve month follow up were analysed. Peripapillary RNFL values of the 27 affected (detached) eyes were measured in each follow up (at 1, 6 and 12 month post operatively). A statistically significant reduction of RNFL thickness over time was found after comparing values of the most affected sector of the detached eye at 1st, 6th and 12th month post-op. Comparison of the same RNFL sector thickness values of the fellow eye at the same time points did not reveal any change over time. Finally, RNFL thickness values of the most unaffected sector of the detached eye were compared at 1st, 6th and 12th month. A less severe but still statistically significant reduction of thickness was observed in this sector too.
Analysis was performed with one-way Anova

Conclusions
RNFL values in the sectors related to the detached retina seem to be affected over time despite successful retinal detachment repair. Even after an anatomically successful repair of RRD, changes can be triggered in the retinal tissue including the retinal nerve fibre layer and these changes could be reflected in the peripapillary area.

Subretinal Autologous Internal Limiting Membrane Transplantation for the repair of large persistent macular holes

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Posterboard#: B0560

Abstract Number: 899 - B0560

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DisclosureBlock: Christian Pruente, Code C (Consultant/Contractor) Alcon, Bayer, Novartis, Oertli, Opharmic, Roche, Code F (Financial Support) Bayer, Hanna Camenzind-Zuche, None;

Purpose
Various surgical techniques have been described for managing persistent macula holes following unsuccessful vitrectomy with ILM peeling. However the closure rate and functional improvement after these procedures are limited. This study investigates the clinical outcome of subretinal autologous internal limiting membrane (ILM) transplantation during pars-plana vitrectomy for persistent full-thickness macular hole (FTMH) repair.

Methods
Retrospective, consecutive case series of 13 eyes (13 patients) undergoing small-incision re-vitrectomy with ILM transplantation and air tamponade for large persistent FTMH after prior unsuccessful vitrectomy with posterior hyaloid detachment and ILM peeling. In all eyes, high-definition SD-OCT scans (SD-OCT Spectralis, Heidelberg Engineering GmbH, Germany) of the macula were routinely performed before surgery, 1 and 4 weeks after surgery, and at the final follow-up visit. Furthermore, age, gender, axial length, macular hole diameter, biomicroscopic fundus evaluation and best-corrected visual acuity (BCVA) in logMAR and Snellen at baseline, 1 and 4 weeks after surgery, and at the final follow-up visit were analyzed.

Results
Anatomic closure was achieved in all 13 FTMH (100%) after 3 days. Closure patterns were classified according to Rossi et al (2020). Mean baseline BCVA logMAR was 0.93, mean postoperative BCVA logMAR was 0.66 with a mean postoperative follow-up period of 11.4 months. BCVA improved significantly in 9 eyes (69%), remained stable in 2 eyes (15%) and deteriorated in 2 eyes ude to retinal pigment epithelial atrophy. No re-opening occurred during the observation period.

Conclusions
The results of this case series suggest that autologous ILM-transplant into the subretinal space under the margin of the FTMH in persistent macula holes supports anatomic closure and functional improvement in large persistent FTMHs.

Assessing vitreoretinal surgical training experience by leveraging instrument maneuvers and visual attention with deep learning neural networks

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Posterboard#: B0561

Abstract Number: 900 - B0561

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DisclosureBlock: Rogerio Nespolo, None; George R. Nahass, None; Mahtab Faraji, None; Darvin Yi, None; Yannek Isaac Leiderman, None;

Purpose
To develop a platform that uses deep-learning neural networks to distinguish the level of experience of vitreoretinal surgeons when analyzing their instrument maneuvers and areas of visual attention-via gaze tracking-, when performing standardized tasks with a surgical simulator.

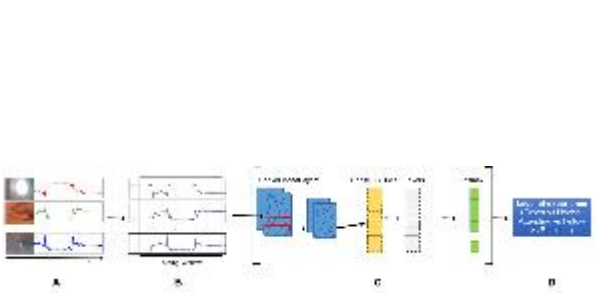
Methods
Four attending surgeons, three fellows, and two resident surgeons were invited to perform a series of ophthalmic surgical tasks using a surgical simulator. These tasks included membrane peeling, hyaloid manipulation, endolaser photocoagulation, general vitrector use, and retinal detachment repair. An instance segmentation neural network was trained to track instrument maneuvers and to extract the gaze position provided by an eye-tracking bar. A second spatio-temporal neural network (CNN + LSTM) was trained to classify the level of experience of each subject by analyzing the acquired instrument maneuvers and areas of visual attention.

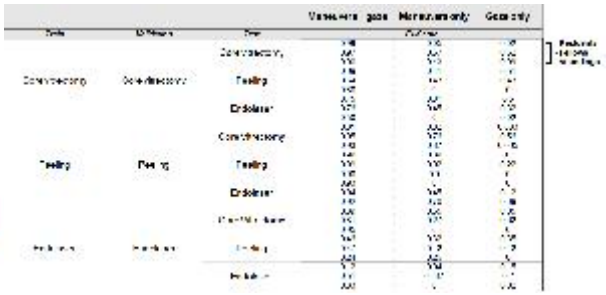
Results
Combining instrument maneuvers and gaze behavior proves most effective in discerning surgeons' experience levels, especially within core vitrectomy and membrane peeling tasks (M = 0.983, SD = 0.017). Notably, endolaser tasks exhibit lower efficacy (M = 0.32, SD = 0.159). Cross-task validation models successfully identify surgeons' experience (M = 0.733, SD = 0.216). Exclusive reliance on instrument maneuvers for training and evaluation outperforms gaze behavior assessment in predicting surgical experience (M = 0.456, SD = 0.319 vs. M = 0.254, SD = 0.241). Membrane peeling task models consistently demonstrate superior performance across all scenarios: combined maneuvers with gaze (M = 0.938, SD = 0.051), maneuvers alone (M = 0.707, SD = 0.284), and gaze alone (M = 0.242, SD = 0.277).

Conclusions
Vitreoretinal surgeons' experience levels can be distinguished by analyzing their surgical maneuvers and gaze behavior using deep-learning neural networks. Combining assessment of instrument maneuvers with gaze behavior was the most effective approach.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
Surgical education by means of objective assessments is a reality in heterogeneous invasive fields. Recent advances in artificial intelligence, such as machine learning and deep learning-based computer vision, have made it possible to evaluate surgeons’ skills using sensors and video recordings objectively and quantitatively across different surgical procedures. Although, no study of this kind was performed aiming

for vitreoretinal surgical training. In this study, we invited different levels of surgeons to perform various eye surgeries on a simulator while their instrument maneuvers and gaze positions were tracked. Our findings reveal that the best way to determine surgeons' experience levels via a spatio-temporal neural network is by combining the analysis of instrument maneuvers and gaze behavior, especially during core vitrectomy and membrane peeling tasks. This method outperformed relying solely on instrument maneuvers or gaze behavior. The study concludes that our system effectively distinguishes surgeons' experience levels by combining these two aspects.





Long-Term *In vivo* Biocompatibility of a Hyaluronan-based Vitreous Substitute

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Posterboard#: B0562

Abstract Number: 901 - B0562

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DisclosureBlock: Adam Forman, None; Hong Cui, None; Peng Yan, None; Gareth D. Mercer, None; Parnian Arjmand, None; Thomas Wright, None; Jonathan M. Labriola, None; Lia Huo, None; Margaret T. Ho, None; Alexander E.G. Baker, Code O (Owner) Synakis, Code P (Patent) WO2021000050A1, Robert G. Devenyi, Code O (Owner) Synakis, Valerie A. Wallace, None; Molly S. Shoichet, Code O (Owner) Synakis, Code P (Patent) WO2021000050A1

Purpose
Intraocular tamponades used in retinal surgery are limited by optical degradation, patient posturing, and, for some, need for surgical removal. We developed an oxime-crosslinked hyaluronan-based hydrogel vitreous substitute (HA-oxime) designed to overcome these limitations by providing clear vision, avoiding post-surgical head posturing, and biodegrading slowly without swelling. We tested the long-term biocompatibility of HA-oxime in rabbit eyes.

Methods
Bilateral vitrectomies were performed on New Zealand White (NZW, n = 18) and Dutch-Belted Pigmented (DBP, n = 8) rabbits, followed by injection of HA-oxime in one eye, and balanced saline solution (BSS) in the contralateral eye as a control. Intraocular pressure (IOP) was monitored weekly. Histological analysis of the retinal tissue was completed at 30-, 90-, and 180-day endpoints, and average thickness of the outer nuclear layer (ONL) and inner nuclear layer (INL) were quantified. Immunostaining of the retinal tissue was performed with GFAP monoclonal antibody (GA5) as a marker for inflammation. In DBP rabbits, electroretinography (ERG) was measured pre-surgery (baseline) and at 1-, 2-, 3-, and 6-months post-surgery.

Results
Average weekly IOP over 180 days ranged from 12.3 ± 3.2 to 17.3 ± 5.1 mmHg for HA-oxime eyes (n = 6–18 per timepoint) and 11.3 ± 3.3 to 18.0 ± 5.3 mmHg for BSS eyes (n = 6–18). The average thickness of the ONL at 30-, 90-, and 180-day endpoints ranged from 4.3 ± 0.5 to 5.1 ± 0.4 nuclei for HA-oxime (n = 4–6 per endpoint) and from 4.8 ± 0.6 to 5.1 ± 0.4 nuclei for BSS (n = 6). The average thickness of the INL ranged from 1.8 ± 0.5 to 2.0 ± 0.3 nuclei for HA-oxime (n = 4–6) and from 1.9 ± 0.4 to 2.0 ± 0.2 nuclei for BSS (n = 6). Immunostaining with GA5 showed no signs of inflammation for both HA-oxime and BSS eyes at all endpoints. ERG measured a baseline v_{max} of 207 ± 53 µV for HA-oxime eyes (n = 5) and 201 ± 42 µV for BSS eyes (n = 6), and at 2 months a v_{max} of 351 ± 87 µV for HA-oxime and 256 ± 56 µV for BSS.

Conclusions
HA-oxime is biocompatible in rabbit eyes over 180 days. Stable IOP post-injection confirmed HA-oxime is non-swelling. Histological analysis of retinal tissue demonstrated HA-oxime is non-toxic. Immunostaining showed HA-oxime is non-inflammatory. ERG measurements showed preservation of retinal function post-injection. HA-oxime is a promising candidate as a next-generation vitreous substitute for vitreoretinal surgery.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
Various retinal diseases, including retinal detachment and macular holes, require a vitrectomy: surgical removal of the eye’s central gel ('vitreous') to access and repair the retina. The gel is then replaced with a substitute material to ensure the retina stays in place during recovery. Current clinical substitutes – namely inert gases and silicone oils – carry major drawbacks during patient recovery, which typically include blurred vision, risk of high ocular pressure, particular head posturing requirements, and for some, a second removal surgery. There is an unmet need for a new biomimetic substitute to improve patients' quality of life during recovery from retinal surgery. We developed a novel hydrogel substitute composed of hyaluronan, a component of the native vitreous gel, and polyethylene glycol. Our hydrogel is transparent, biodegradable, non-swelling, and possesses similar physical properties to the native vitreous including density and refractive index. This novel hydrogel is a promising candidate as a vitreous substitute for patients recovering from retinal detachment surgery and other retinal diseases.

Adaptive Optics Imaging in Retinal Detachment: A Retrospective Analysis

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Posterboard#: B0547

Abstract Number: 886 - B0547

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DisclosureBlock: Andrew Mihalache, None; Ryan Huang, None; Marko Popovic, Code F (Financial Support) PSI Foundation, Fighting Blindness Canada, Michael Balas, None; Mariam Issa, None; Isabela Martins Melo, None; Aurora Pecaku, None; Sue Ellen Demian, None; Rajeev Hemant Muni, Code C (Consultant/Contractor) Alcon, Apellis, AbbVie, Bayer, Bausch Health, Roche, Code F (Financial Support) Alcon, AbbVie, Bayer, Novartis, Roche

Purpose
En face visualization of photoreceptors via adaptive optics (AO) imaging allows for a quantitative analysis of the cone mosaic beyond what may be discernable on optical coherence tomography. In this retrospective case series, we investigated the hypothesis that associations exist between AO photoreceptor parameters and clinical outcomes in postoperative retinal detachment (RD) patients.

Methods
RD patients over 18 years old that underwent AO imaging in 2021 following RD repair were included in our retrospective case series. AO imaging was performed at 2° and 4° eccentricities using the RTX1 camera (Imagine Eyes, Orsay, France) and data pertaining to the following photoreceptor parameters were collected: cone regularity, density, spacing, and dispersion. Associations between photoreceptor parameters and logMAR best-corrected visual acuity (BCVA), metamorphopsia, and aniseikonia were examined using multivariable linear regression models on Stata v.17.0 (StataCorp LLC, College Station, Texas), adjusting for age, sex, and the number of days between AO imaging and each outcome. Ethics approval was obtained from the University of Toronto Research Ethics Board.

Results
In 49 eligible patients imaged with AO, 41 RD eyes and 28 control eyes were included in our analysis. 38 (77.6%) patients were male and 11 (22.4%) were female, with a mean ± standard deviation age of 60.8 ± 11.8 years old. LogMAR BCVA was associated with cone spacing at 2° (p=0.033) and 4° eccentricities (p=0.016). Moreover, logMAR BCVA was inversely associated with cone density at 2° (p=0.045) and 4° eccentricities (p=0.009). Vertical and horizontal metamorphopsia were both inversely associated with cone density at 2° (p=0.029 and p=0.034, respectively) and 4° (p=0.012 and p=0.013, respectively) eccentricities. Vertical metamorphopsia was also associated with cone spacing at 4° eccentricity (p=0.020). The difference in cone dispersion between contralateral eyes was associated with vertical and horizontal aniseikonia at 2° (p=0.033 and p=0.025, respectively) and 4° (p=0.016 and p=0.022, respectively) eccentricities.

Conclusions
Several AO photoreceptor parameters were associated with clinical outcomes in this case series of postoperative RD patients. Future prospective trials should explore associations between clinical characteristics and AO parameters in diverse RD patient populations to evaluate the prognostic value of

photoreceptor data in this setting.

Comparison of Traction Forces in Ex-situ Vitrectomy Using 25-Ga 20000 CPM Dual Blade Vitrectomy Probes and 25-Ga 10000 CPM Single Blade Vitrectomy Probes

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Posterboard#: B0563

Abstract Number: 902 - B0563

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DisclosureBlock: Brian McDonell, Code E (Employment) Alcon, Ying Zhu, Code E (Employment) Alcon, Kevin Phan, Code E (Employment) Alcon, Vara Wuyyuru, Code E (Employment) Alcon, Steve Charles, Code C (Consultant/Contractor) Alcon

Purpose
This study compared the traction forces produced in an ex-situ vitrectomy setting at flow-matched conditions between 25+ Ga HYPERVIT® Dual Blade vitrectomy probes operating at 20000 CPM and single blade 25+ Ga Advanced ULTRAVIT® vitrectomy probes operating at 10000 CPM.

Methods
Testing was performed using bovine vitreous. Ten Alcon 25+ Ga HYPERVIT® beveled 20K CPM vitrectomy probes and Alcon 25+ Ga Advanced ULTRAVIT® beveled 10K CPM vitrectomy probes were used in flow-matched conditions. Vitreous flow testing was first performed on both types of probes to determine the vacuum levels that resulted in an equivalent flow rate when aspirating pure vitreous. Each probe was advanced towards the vitreous which was suspended in a chamber filled with BSS. The vitreous also was attached to a force sensor. The traction force, flow rate, probe position, and pressure signals were recorded. The data was analyzed to determine the force distribution as well as the mean force, peak force in each cut cycle, and maximum force. Statistical analysis was performed with $P < 0.05$.

Results
The flow testing identified the flow-normalizing vacuum settings during aspiration were 260 mmHg for the 25+Ga HYPERVIT® 20K probes and 340 mmHg for the 25+Ga Advanced ULTRAVIT® 10K probes.
When tested at the flow-normalizing aspiration levels, 25+ HYPERVIT® Dual Blade probes generated fewer high traction forces compared to 25+ Advanced ULTRAVIT® probes. After removing the low force regions (<0.5mN), for each percentile above the 66th percentile, the force was significantly lower for the HYPERVIT® compared to the Advanced ULTRAVIT® at the same percentile level ($P<0.05$). For example, the 90th, 95th, and 99th percentile forces were smaller by 12.8%, 14.4%, and 14.4%, respectively. Again, removing the low force regions, 25+ HYPERVIT® showed decreased average force, average peak force, and average maximum force during the whole process by 8.01%, 15.78%, and 12.22%, respectively, compared to 25+ Adv ULTRAVIT® probes ($P<0.05$).

Conclusions
The study revealed that 25+Ga HYPERVIT® dual blade probes generated lower traction forces compared to 25+Ga Advanced ULTRAVIT® probes when removing vitreous at the same flow rate suggesting their potential advantage during vitrectomy with a lower likelihood of high traction force occurrence and reduced adverse events.

Evaporative Heavy Liquids for Retinal Tamponade

Posterboard#: B0548

Abstract Number: 887 - B0548

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DisclosureBlock: Avnish Deobhakta, Code C (Consultant/Contractor) Alimera Sciences, Inc., Code P (Patent) Avant Sciences, Inc., Code O (Owner) Avant Sciences, Inc., Richard B. Rosen, Code C (Consultant/Contractor) Visionix (OptoVue), Boehringer-Ingelheim, Regeneron, CellView, Lumithera, Code P (Patent) Visionix (OptoVue), Code F (Financial Support) Visionix (OptoVue), Ocusciences, Opticology, Topcon, Canon, Code I (Personal Financial Interest) Visionix (OptoVue), Guardion, Opticology, CellView, Code O (Owner) Avant Sciences, Inc., Paul Lee, Code P (Patent) Avant Sciences, Inc., Code O (Owner) Avant Sciences, Inc., Harriet Lloyd, Code O (Owner) Avant Sciences, Inc.

Purpose
To identify a set of non-toxic optically clear heavy liquids for retinal tamponade that can evaporate within the vitreous cavity under normal biological conditions.

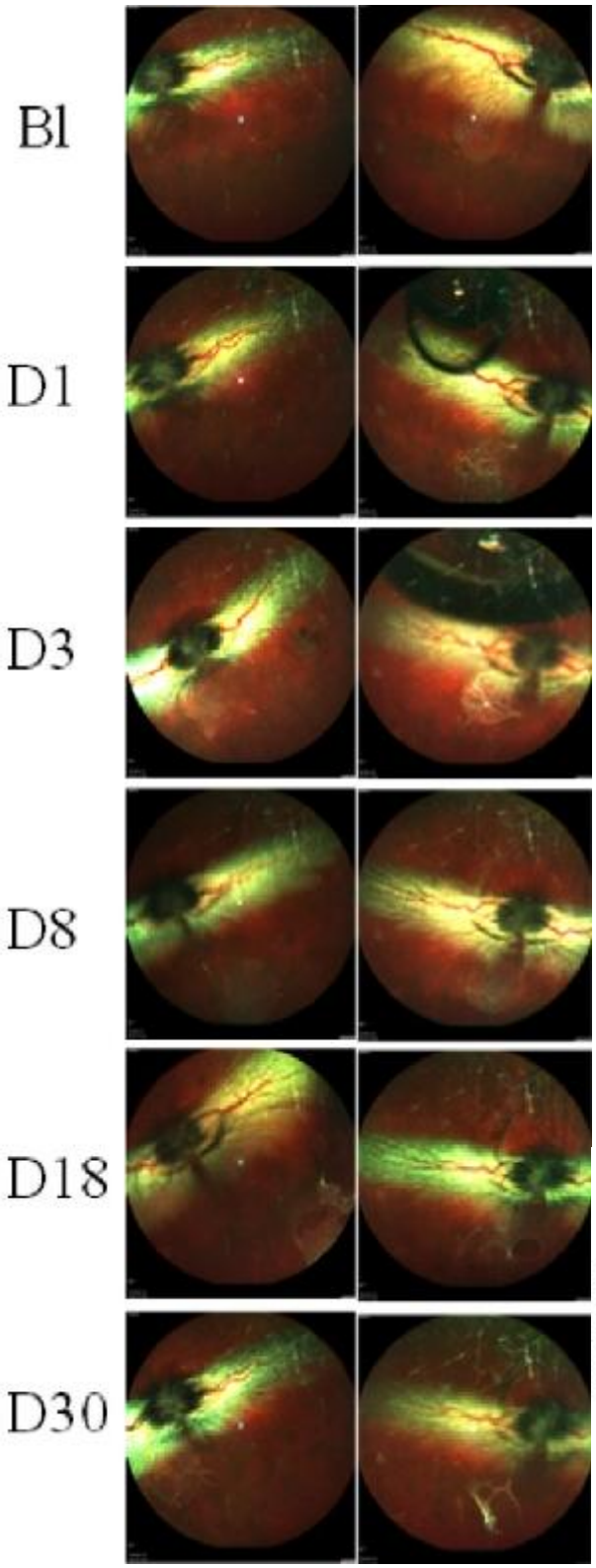
Methods
Four eyes of four non-vitrectomized 9 week old Dutch Belted Rabbits were injected with 8 microliters of a novel heavy liquid EOD-2, with an equivalent amount of balanced salt solution (BSS) in the other four eyes as a control. Clinical exams, fundus photos, and intraocular pressures were obtained at baseline and days 3, 8, 18, and 30.

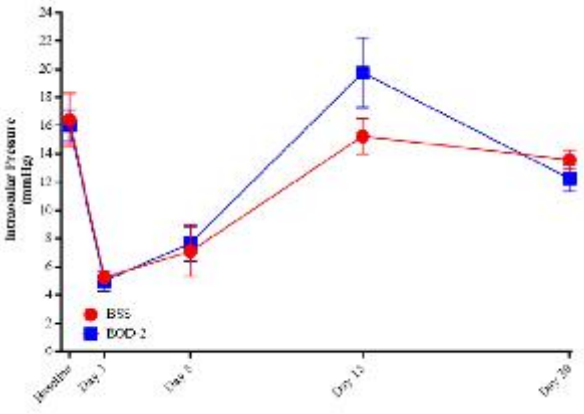
Results
EOD-2 was noted in the posterior pole on post-injection Day 1 in all 4 treated eyes. By Day 3, EOD-2 had evaporated in all eyes, leaving a relatively large superior gas bubble near the lens. By Day 8, this gas bubble had completely disappeared, and did not return on Day 18 and Day 30 (Figure 1). Outside of the existence of EOD-2, clinical examinations and fundus photography showed no significant differences between the test eyes and those treated with BSS. Intraocular pressure readings did not differ with statistical significance relative to the eyes treated with BSS at baseline, Day 3, Day 8, Day 18, and Day 30, and showed a similar trend in fluctuations throughout the study (Figure 2).

Conclusions
EOD-2 is part of a suite of novel heavy liquid retinal tamponades that appear to be non-toxic and can evaporate and reabsorb under normal biological conditions. Much like previously reported EOD-1, EOD-2 could be used intraoperatively akin to other heavy liquid tamponades without the known drawbacks of heavy liquid retention within the eye, albeit with a faster evaporation rate from the eye.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.
Retinal tamponades are often use to stabilize the retina during medical emergencies such as retinal detachments. However, there are often drawbacks, particularly with intraoperative liquid retinal tamponades - namely that they must be actively removed lest they cause severe intraocular complications. We have discovered a suite of non-toxic liquid retinal tamponades that can evaporate into a gaseous form, and then leave the body, all under biological conditions. These tamponades have the novel ability to act

both as liquids and gases, which may provide newer and safer ways to fix retinal detachments and possibly opens up their use in other difficult to treat conditions.





Outcomes of Vitreoretinal Surgery for Retinal Detachment Associated with Retinal Hemangioblastoma in Von Hippel-Lindau Disease

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Posterboard#: B0550

Abstract Number: 889 - B0550

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Purpose
Von Hippel-Lindau (VHL) disease is an autosomal dominant genetic disorder caused by mutations in the tumor suppressor gene VHL and is characterized by retinal hemangioblastomas (RH) and other tumors. Pars plana vitrectomy (PPV) has been used to treat patients with multiple, large RHs and associated retinal detachment (RD). However, the recurrence of RHs after surgery is relatively common and the visual and anatomic outcomes in the long-term have not been well investigated. This case series aims to analyze the clinical characteristics, management, and long-term outcomes of eyes with RH and RD.

Methods
A retrospective chart review was conducted on all patients with a diagnosis of VHL from the Retina Service, Wills Eye Hospital, who had RD requiring vitreoretinal surgery between the year 2014 to 2022. Baseline demographic variables, RH characteristics and associated features, procedures performed, baseline, pre-operative, and final visual acuities, and complications were recorded.

Results
A total of 3 out of 225 VHL patients met inclusion criteria. Of the three cases, the mean patient age at initial evaluation was 21.33 ± 12.10 (range 12-35). All patients were female. The mean presenting logMAR vision was 0 (20/20) for patient 1, 1.30 (20/400) for patient 2, and 0 (20/20) for patient 3. The median interval from date first seen to RD was 6.58 years. Pre-operative logMAR vision was 1 (20/200), 2 (CF), and 0.10 (20/25) for patients 1, 2, 3, respectively. Median follow-up duration after RD repair was 11 months. Patient 1 exhibited traction RD-rhegmatogenous RD (TRD-RRD); patient 2 exhibited TRD-exudative RD (ERD); and patient 3 exhibited TRD. Initially, patients 1 and 3 received scleral buckle repair and patient 2 received PPV with air-fluid tamponade. Two out of 3 (patients 1 and 2) required additional repairs with PPV and silicone oil injection due to retinal re-detachment. Within the first 6 post-operative months, proliferative vitreoretinopathy was noted in patient 1. Silicone oil was removed from both patients, and at the most recent and final visit, the retina remained attached in all three patients. The final logMAR vision was 1.30 (20/400) for patient 1, 3 (NLP) for patient 2, and 0.18 (20/30) for patient 3.

Conclusions
Patients with VHL disease can present with complex RD and require multiple vitreoretinal surgeries with guarded long-term visual outcomes.

Vitrectomy Technique Modification Alters Intraocular Pressure Dynamics During Subretinal Bleb Formation

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Posterboard#: B0564

Abstract Number: 903 - B0564

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DisclosureBlock: Vahid Ownagh, None; Bo Hansen, None; Michelle McCall, None; Sandra S. Stinnett, None; Cynthia A. Toth, Code O (Owner) Theia Imaging, LLC, Code R (Recipient) Alcon, Code C (Consultant/Contractor) EMMES, Lejla Vajzovic, Code C (Consultant/Contractor) Alcon

Purpose
Subretinal injection of therapeutic agents and gene therapy vectors are increasingly employed in vitreoretinal surgery. The optimal technique for delivering subretinal agents has not been fully understood. Based on our previous intravitreal injection studies, we hypothesized that additional focused vitrectomy around the infusion port may prevent intraocular pressure (IOP) spikes during subretinal injections.

Methods
Experiments were carried out on 21 porcine eyes, half assigned to complete PPV (group 1, 10 eyes) and on the other half to complete PPV plus focused vitrectomy around the infusion port (group 2, 11 eyes). Each PPV group was subdivided based on infusion pressure of 15 or 25 mmHg set on Constellation (Alcon). A needle placed into the anterior chamber was connected to a pressure transducer to record IOP and calibrated to within 2mm of infusion pressure prior to injection of 100 µL of balanced salt solution into a subretinal bleb. Injections were carried out via a 41-gauge subretinal needle (DORC) connected to a pneumatic syringe set at 12 PSI foot-controlled pressure.

Results
The mean ± SD of maximum IOP change from baseline during subretinal injection was 26 ± 24 mmHg for all eyes. It increased by 39 ± 21 mmHg in PPV group 1 versus 11 ± 19 mmHg in group 2 (P=0.011). The difference between groups 1 and 2 was not significant when starting infusion pressure was 15 mmHg, (n= 4 and 5, 35 ± 20 vs 21 ± 24 mmHg, P=0.46), but it was significant when infusion pressure was 25 mmHg, (n= 7 and 5, 42 ± 23 vs 1.5 ± 2 mmHg, P=0.021). Time for IOP to return to baseline was recorded across the groups and eyes in group 1 had longer return of IOP to baseline than eyes in group 2 (264 ± 224 vs 71 ± 139 sec., P=0.013). In eyes with infusion pressure of 15 mmHg, time to baseline IOP was not significantly different between the PPV groups (380 ± 300 vs 130 ± 186 sec., P=0.140), while for eyes with infusion pressure of 25 mmHg, this difference was statistically significant (group 1 vs 2, 197 ± 156 vs 13 ± 18 sec., P=0.025).

Conclusions
In model eyes 100 µL subretinal bleb formation is associated with IOP spikes. More through vitrectomy around infusion port results in less severe IOP spikes and faster return of IOP to baseline. Differences are less pronounced with lower baseline IOP.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.

Gene therapy for inherited and non-inherited retinal disorders is revolutionizing clinical care in vitreoretinal surgery. There are many clinical trials underway to evaluate safety and efficacy of gene therapy to treat retinal disorders. However, there are limited data on optimization of current vitreoretinal surgery techniques for delivery of gene therapy vectors. Here we introduced a modified vitrectomy technique which is capable of reducing intraocular pressure spikes during subretinal bleb formation in model eyes. Potentially, this may have important implications in development of more efficient vitrectomy techniques for gene therapy vectors delivery.

Posture and ergonomics of the cervical spine in vitroretinal surgery, a comparative study between 3D heads-up versus surgical microscope

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Posterboard#: B0565

Abstract Number: 904 - B0565

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DisclosureBlock: Pablo Alberto Juarez Vargas, None; Elsa Cynthia Hernandez Piñamora, None; Jans Fromow-Guerra, None; Alejandra Solana Sanchez, None; Andrea Gonzalez Ceballos, None; Virgilio Morales Catón, None; José Gerardo García Aguirre, None; Vidal Soberon Ventura, None; Guillermo Salcedo Villanueva, None;

Purpose
Spinal conditions are one of the main causes of early retirement in ophthalmologists, so new surgical visualization technologies seek to address this problem by promising better posture during surgery, however they have never been compared to the surgical microscope.
Our purposes were to compare the total time for vitreoretinal surgery with an ergonomically desirable position, the craniovertebral angle (CVA) and the gaze angle (GA) between Heads-up 3D and the use of a surgical microscope.
We performed a prospective, longitudinal, comparative, randomized study to learn which equipment gave the best posture and greatest time in an ergonomically desirable position.

Methods
We studied 4 experienced retina-vitreous surgeons, in a total of 80 retinal surgeries regardless of the type of procedure, 40 in Heads-up and 40 in the surgical microscope.
The photometry method was standardized for measuring CVA and GA, which are values that represent the position of the head using anatomical points as reference. Likewise, using the Upright Go equipment (sensor accelerometer, gyroscope & magnetometer) the ergonomic posture was measured in time during surgery.
Independent sample T Test was made to analyze the data. We compared first the two equipments and then we divided the surgeons in two groups < 40 years old and > 40 years old.

Results
We first analyzed the normal and abnormal posture time. In the surgical microscope we observed that of an average of 76.88±29.28 minutes that the surgery lasted, the surgeons on average had a time in abnormal posture of 55.25±31.71 compared to the 3D Heads-up the average surgical time was 79.92±35.83 minutes of which 65.17±35.01 minutes were in abnormal posture (*p* 0.188) and only in the microscope there was a normal posture on average of 21.60±34.73 minutes compared to Heads-up 3D which obtained 14.60±19.06 minutes (*p* 0.268). Given these results, each equipment was analyzed among the groups of surgeons where similar results are observed. This can be seen in the attached tables. When comparing the values of CVA and GA obtained during surgery in both equipment, we observed that neither of the two equipment provided values within normality throughout the surgical time.

Conclusions

Although our study had standardized measurements, N of 80 patients, and a control for possible confounders, we cannot rule out the presence of bias.

	Young			Senior		
Variable	Microscope	Ngenuity	P	Microscope	Ngenuity	P
Total fatigue	2.38 ± 1.7	2.05 ± 1.2	0.2035	2.38 ± 1.65	2.75 ± 1.74	0.493
Final fatigue	2.13 ± 1.47	2.05 ± 1.35	0.6778	2.75 ± 1.62	2.95 ± 1.79	0.725
Total surgical time	85.11 ± 29.11	92.76 ± 40.6	0.5023	95.41 ± 28.03	97.08 ± 26.16	0.782
Normal posture time	30.68 ± 42.45	3.95 ± 21.54	0.1638	7.14 ± 14.42	0.5 ± 1.5	0.3333
Abnormal posture time	67.17 ± 42.77	75.31 ± 28.79	0.0174	67.05 ± 30.77	82.05 ± 24.41	0.177

Variable	Microscope	NGenuity	p
Age	45.53 ± 10.17	44.33 ± 9.73	0.592
Hours of sleep	6.95 ± 0.61	6.90 ± 0.79	0.006
Initial fatigue	2.48 ± 1.66	2.35 ± 1.57	0.731
Final fatigue	2.55 ± 1.75	2.25 ± 1.37	0.397
Total surgical time	90.00 ± 29.28	95.92 ± 33.03	0.600
Normal posture time	21.60 ± 34.73	14.60 ± 19.06	0.268
Abnormal posture time	68.25 ± 31.91	68.17 ± 25.01	0.100

Autologous retinal transplantation in a porcine model of retinal hole

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Posterboard#: B0566

Abstract Number: 905 - B0566

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DisclosureBlock: Madeline Evers Olufsen, None; Jens Hannibal, None; David H. W. Steel, None; Grazia Pertile, None; Nina Buus Sørensen, None; Anders Tolstrup Christiansen, None; Jens F. Kiilgaard, Code C (Consultant/Contractor) Aura Biosciences

Purpose
Autologous retinal transplantation (ART) has been used successfully in treatment of large macular holes refractory to standard surgical treatments. Patients transplanted with a peripheral neurosensory retinal graft interestingly showed improved visual acuity which was not suspected. In this study we wanted to investigate whether this visual gain was due to integration of the graft.

Methods
Landrace pigs were vitrectomized in full anesthesia and a subretinal bleb was created within the major arcades on both sites of the optic disc. A retinal hole of approx. 2-3000 µm in size was cut temporally using a 25G vitrector. The graft, of a matching size, was harvested from the nasal retina using vertical scissors, and diathermy was applied to larger vessels near the site. The graft was moved with forceps toward the retinal hole under perfluoro-n-octane (PFO). The graft was either placed 1) edge to edge with host retina, or with 2) some tucked under and some above the host retina. After ensuring correct graft placement it remained under PFO for 5 min., before air-fluid exchange was performed. Endolaser was applied around the graft site. Either air or oil tamponade was used. Sclerotomies were sutured with 7-0 vicryl. Prior to surgery and 2 -and 6 weeks after surgery, the eyes were examined by Optical Coherence Tomography (OCT) and Fundus Photos. At the end of followup, the eyes were enucleated for histology.

Results
Hole closure was achieved in 9 out of 10 cases, with the graft remaining in situ in 6 out of 10 cases. In 3 cases, OCT scans indicated preservation of the outer retinal layers and apparent integration with the adjacent retina. Corresponding histology revealed preservation of the photoreceptor - and the outer nuclear layer (ONL) in the graft, but there was no evidence of graft integration. In the remaining cases, the graft had degenerated. Interestingly, the distance between the retinal hole margins (measured as the distance between the ONL) reduced during followup, suggesting that the graft contracts, drawing the surrounding retina toward the center.

Conclusions
ART is a great tissue scaffold for retinal hole closure. However, no graft integration was observed. The outer retinal layers were preserved in some cases, probably due to the choroidal blood supply. The visual gain in patients that have undergone ART might be explained by improved retinal function of the surrounding host retina that moves toward the center.

Short-term results of combinated surgery of vitrectomy and phacoemulsification with implantation of extended-depth-of-focus intraocular lens: A case series.

Posterboard#: B0567

Abstract Number: 906 - B0567

AuthorBlock: *Alfredo Ingratta[1], Fernando Sergio Pagani[1], Anibal Andrés Francone[1], Rodrigo Albano[1], Martina Donoso[1], María Paz Cirillo[1], Tomas Castro Feijoo[2], Martín Charles[1], Maria Julia Minetto[1]*
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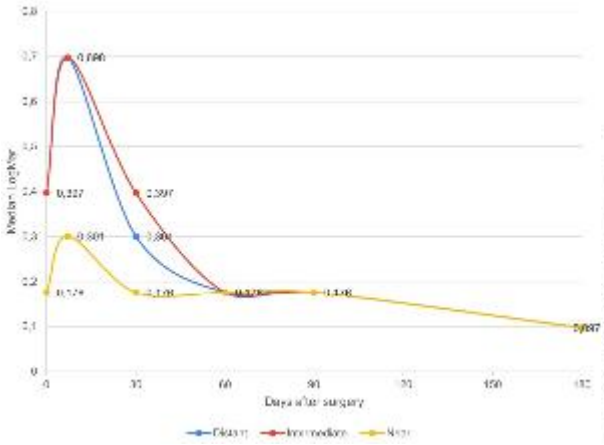
DisclosureBlock: Alfredo Ingratta, None; Fernando Sergio Pagani, None; Anibal Andrés Francone, None; Rodrigo Albano, None; Martina Donoso, None; María Paz Cirillo, None; Tomas Castro Feijoo, None; Martín Charles, None; Maria Julia Minetto, None;

Purpose
There are no previous studies analyzing the feasibility of implantation of extended-depth-of-focus (EDOF) intraocular lens (IOL) in patients with symptomatic epiretinal membranes. The aim of our study was to evaluate the clinical outcomes of the implantation of EDOF IOLs in eyes that underwent combined phacovitrectomy surgery to treat epiretinal membrane (ERM).

Methods
This is a retrospective series of cases of adult patients with epiretinal membrane complaining of symptomatic decreased visual acuity (VA) or metamorphopsia who underwent phacovitrectomy with extended-range intraocular lens implantation between March 2021 and June 2022 in two specialized clinics in Buenos Aires, Argentina. The main outcome measures were: near VA, intermediate VA, distant VA, refractive error and macular thickness at regular intervals between baseline and 180 days. Descriptive statistics was reported according to the distribution of the variables. Changes in visual acuity and macular thickness were compared with the paired t-test or Wilcoxon sign rank as appropriate.

Results
Twenty-seven patients with a mean age of 70.92 years (SD 6.35) were included, 14 (52%) were women. The median preoperative distance visual acuity was 0.397 logMAR (IQR 0.301-0.477), at 30 days 0.301 logMAR (IQR 0.176-0.544), at 60 days 0.176 (IQR 0.097-0.397), at 90 days 0.176 (IQR 0.097-0.301) and at 180 days 0.097 (IQR 0.097-0.176). The residual refractive error at 90 days was -0.35 diopters (SD 0.21). Preoperative macular thickness was 442.4 µm (SD 85.5) and at 90 days (N=27) 330.5 µm (SD 66.0), p= <0.001.

Conclusions
We observed that after the seventh postoperative day, visual acuity progressively improved and stabilized by day 90. The refractive error was less than 1 diopter in every patient at 90 days. Our study shows that the implantation of EDOF IOLs is a valid option in phacovitrectomies for the treatment of symptomatic epiretinal membranes.



	Baseline N=27	30 days N=27	60 days N=24	90 days N=27	180 days N=27
Macular Thickness, mean (SD), R%	442.4 (35.5)	359.6 (70.6)	345.9 (73.6)	330.5 (66.0)	328.2 (74.6)
Biopsies in different layers, N (%)	34 (35.4)	33 (34.4)	-	19 (70.4)	16 (76.5)
Number of eyes with intraretinal cystoid spacing for EP94 stage, N (%)					
1	0 (0.0)	0 (0.0)		2 (0.0)	0 (0.0)
2	0 (0.0)	0 (0.0)		2 (0.0)	0 (0.0)
3	17 (63.0)	15 (55.5)		15 (40.1)	15 (48.1)
4	7 (25.9)	7 (25.9)		6 (22.2)	5 (18.5)
EPL thickness, mean (SD)	165.3 (38.5)	74.7 (49.9)		56.5 (33.9)	56.3 (32.5)

Macular Thickness: P value between baseline and 30, 30-60 and 60-90 days <0.01
EPL thickness: P value between baseline and 30 <0.001, 30-60 days 0.016

New insight of residual Perfluorocarbon Liquid removal in vitreoretinal surgery

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Posterboard#: B0568

Abstract Number: 907 - B0568

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DisclosureBlock: Ying Chen, None; Wang Yee Chu, None; Zhongdui Long, None; Yau Kei Chan, None;

Purpose
PURPOSE: Current methods for removing residual perfluorocarbon liquid (PFCL) mostly rely on empirical procedures without a standardization. Our study aims to investigate PFCL evaporation by *in vitro* and computational model under various surgical conditions, thereby exploring a more efficient surgical procedure for PFCL removal.

Methods
METHODS: We examined the evaporation rate of PFCL, including perfluoro-n-octane (PFO) and perfluoro-decalin (PFD) with a volume of 100 µL *in vitro* under varying air irrigation pressures ranging from 10 mmHg to 40 mmHg (N = 3). A theoretical model based on the *in vitro* study on the evaporation of thin film of PFCL under varying vapor pressures was derived to interpret the experimental results. Furthermore, we utilized a 3D printed artificial eye model, combining with the computational fluid dynamic (CFD) simulation to capture PFCL evaporation dynamics under different clinical scenarios. One-way ANOVA followed by Bonferroni test was used for statistical analysis.

Results
RESULTS: In our *in* vitro 3D printed eye model, PFCL with a volume of 100 µL can completely evaporate within 50 seconds for PFO and 6 min for PFD respectively, by infusing air at a surgically representative pressure of 30 mmHg. Additionally, the evaporation rate of PFCL increased proportionally when the air pressure increased from 10 mmHg to 30 mmHg ($P < 0.05$). The evaporation rate plateaued afterwards, with no statistical significance observed ranging from 30 mmHg to 40 mmHg ($P>0.05$). The experimental results can be well interpreted by the theoretical model, which shows that the infused air pressure accelerates the removal of PCFL vapors from the eye and thus lowering the vapor pressure to enhance the evaporation rate. A linear relationship between evaporation rate and air pressure can be derived, which is consistent with the experiments. Moreover, the evaporation dynamics of PFCL and the removal of its vapor driven by the air pressure can be simulated and visualized through CFD.

Conclusions
CONCLUSIONS:
Based on our estimates from both *in vitro* and computational models, trace amount of PFCLs could evaporate completely under a surgically representative air pressure without extending the manipulation time during surgery, which provide a potential in serving as guidance for vitreoretinal surgeons to rationally design surgical procedures in removing residual PFCL.

Enhancing silicone oil removal efficiency: A comparative study of ultrasonic vitrectomy handpieces and conventional methods

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Posterboard#: B0569

Abstract Number: 908 - B0569

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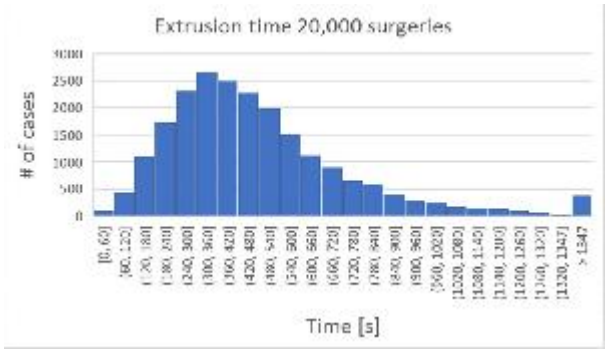
DisclosureBlock: Grant Higgins, Code E (Employment) Bausch & Lomb, Asael Papour, Code E (Employment) Bausch & Lomb

Purpose
Eyetelligence® cloud data from 20,000 surgeries shows that Silicone Oil (SiO) extrusion takes longer than 6 minutes in 62% of surgeries. Ultrasonic vitrectomy cutters have shown to be capable of removing SiO, although the rate at which they do so is previously unknown. We demonstrate the rate advantage of ultrasonic vitrectomy in removing three types of SiO compared to conventional methods. Ultrasonic vitrectomy devices like Vitesse may offer small gauge and suture-less methods of removing high density SiO like Oxane Hd.

Methods
The devices tested for low density (0.96 g/ml) SiO (Oxane 1300, ADATO SIL-OL 5000) removal were 25ga ultrasonic vitrectomy handpiece (Vitesse), 25ga overcap, and 20ga 7mm canula. High-density (1.02 g/ml) SiO (Oxane Hd) removal involved 25ga Vitesse, 20ga 7mm canula, and 18ga 40mm needle. For Vitesse, SiO was weighed and covered in BSS. The device was then operated at 31.5 kHz, 60 um stroke, and 660 mmHg vacuum for 1 minute. After SiO extraction, BSS was removed by evaporation on a hot plate. The remaining SiO was weighed again. For all other devices, the tip was attached to the Stellaris extrusion connector and run at 660mmHg vacuum for 1 minute. The remaining SiO was weighed.

Results
SiO removal rates were favorable and significant with the ultrasonic action. 5000 PaS SiO, 20ga 7mm canula had a rate of 0.28g/min, the 25ga overcap had a rate of 0.36g/min, and Vitesse had a rate of 0.52g/min ($p<0.01$). 3700 PaS SiO, 20ga had a rate of 0.33g/min, the 18ga 40mm needle 0.49g/min, and Vitesse 0.54g/min ($p<0.001$). 1300 PaS SiO, 20ga had a rate of 0.85g/min, 25ga overcap 1.14g/min, and Vitesse 0.68g/min ($p<0.001$). Normalized for size of incision (25ga, 20ga, 18ga), Vitesse proves 5 times faster than 20ga, and 6.6 times faster than 18ga at removing high density SiO like Oxane Hd.

Conclusions
Ultrasonic vitrectomy devices may offer small gauge, suture-less solutions to the removal of high density (heavy) SiO. Ultrasonic vitrectomy devices also prove to be quicker at removing high viscosity SiO (3700 PaS, 5000 PaS) than the conventional methods used in surgery today. Having an effective and small gauge removal solution may allow for increased use of heavy SiO’s in patients with inferior retinal detachments, preventing the need for prone positioning.


Extrusion time 20,000 surgeries
# of cases
3000
2500
2000
1500
1000
500
0
Time [s]

User Interface for Bimanual Robotic System in Posterior Segment Surgery – Survey Study

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Posterboard#: B0570

Abstract Number: 909 - B0570

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DisclosureBlock: Aleksandra Goch, None; Kirsty Clarke, None; Ning Wang, None; Marco Anastasi, None; Marinko V. Sarunic, Code I (Personal Financial Interest) Seymour Vision Inc., Danail Stoyanov, None; Riaz Asaria, Code C (Consultant/Contractor) Roche Holding AG, Bayer AG, Agostino Stilli, None;

Purpose
A novel robotic arm for retinal surgery has been used to create a bimanual robotic system. This study aims to design and construct a physical user interface to facilitate transition into robot-assisted surgery for clinicians.

Methods
This is a prospective longitudinal pilot survey study. An initial literature search identified 16 papers that discussed surgical user interface set-ups. Based on 50% (8) of the papers, survey was the preferred way of gathering user feedback. After obtaining consent, a pilot survey study was performed among ophthalmic surgeons. The questions inquired into haptic interface design, movement feedback to the operator, non-sterile staff assistance, foot pedal set-up, eyepiece and seating arrangement, safety mechanisms, customization options, and attitude towards a prospect of robot-assisted surgery. Demographic data from the survey provided information on handedness, and factors like time in training, and surgical simulator experience vs the preferences. The survey identified 6 categories of haptic user interface based on grip type and hand position, 3 categories of feedback, 6 categories of eyepiece arrangements, and 7 categories of seating arrangements. The expected number of respondents is 200.

Results
As of December 2023, 20 responses were received. Over 83.3% (15) of the respondents favoured pen-like grip, with audio feedback (66% of respondents; 12), constant background tone with changing frequency with proximity to retina (77.8% of respondents; 14), and access to additional foot pedal for robot control (90% of respondents). Almost all the respondents (95%) expressed preference to having customizable interface options, and safety mechanisms for hard stop or external control. The sitting arrangement question identified back (90%) and neck (85%) as needing the most support. A 3D model was created to visualise and construct a novel user-centred interface set-up expressing these results.

Conclusions
So far, there has been little progress in integrating the innovation into theatres in a user-friendly manner. The presented results suggest the best way of overcoming the integration obstacles is adapting the haptic interface to simulate familiarity, like the shape of currently used instruments, or haptic interface of surgical simulators. As the collection of survey responses continues, it will allow us to further identify the desirable features and better the set-up model.

Chorioretinal atrophy after treatment with Voretigene Neparvovec in clinical practice

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Posterboard#: B0571

Abstract Number: 910 - B0571

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Purpose
To analyze the prevalence and features of chorioretinal atrophy (CA) in a large series of patients treated at the same site with subretinal injection of voretigene neparvovec-rzyl (VN) for RPE65-related inherited retinal dystrophy.

Methods
Twenty-nine patients ranged between 6 and 62 years old were treated. Of these, 25 (41 eyes) were followed up for 6 months after surgery and were divided into 2 groups according to whether they developed CA (group 1) or not (group 2). Demographic data, best-corrected visual acuity (BCVA), fundus photographs, visual field (VF), full-field stimulus threshold (FST) and optical coherence tomography (OCT) were collected. All patients underwent the same surgical procedure, performed by the same surgeon, consisting of OCT-guided 25-gauge vitrectomy followed by manual subretinal injection of VN. Each patient received oral prednisone according to protocol.

Results
At 6 months, 9 out of 25 patients (36%) developed CA in both eyes, categorized as: nummular (5 patients) and mixed pattern (4 patients), characterized by nummular and perifoveal atrophy. The majority of patients also developed a focal atrophy at the injection site. Demographic analysis showed that group 1 was younger than group 2 (20,5±18,5 and 30,3±19,3 years, respectively, p:0,231). At baseline, group 1 had better BCVA (p:0,012), white (p:0,040) and blue (p:0,009) FST when compared to group 2. After retrospective evaluation of the surgery, we observed no significant difference in the number of blebs between the 2 groups. Intraoperative foveal detachment (IFD) occurred in 10 eyes (58,8%) among group 1 and 4 eyes (16,7%) in group 2. However, this correlation was found questionable when analyzing both eyes of each patient and within siblings with CA, as CA development was observed independently of IFD. Group 1 showed significant improvements from baseline in terms of BCVA, VF and FST. Analysis between the two groups showed no significant differences in improvement except for blue FST (-40.6±37.4 dB and -22.7±10 dB in groups 2 and 1, respectively; p:0.028).

Conclusions
CA occurred in one-third of our patients, who were younger and had a better baseline clinical status when compared to patients without CA. Our results confirm that CA does not interfere with clinical improvement

at 6 months after VN injection. More data are needed to understand the causes of CA and its impact on visual function over time.

Retention rates of subretinal gene therapeutic agents based on AAV serotype 2 and 8 using different drug-delivery materials

Posterboard#: B0572

Abstract Number: 911 - B0572

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DisclosureBlock: Felix Reichel, None; Peter Kiraly, None; Immanuel Philipp Seitz, None; M Dominik Fischer, Code F (Financial Support) Adelphi Values, Advent France Biotechnology, Adverum, Alder Therapeutics, Alphasights, Arctos Medical, Astellas, Atheneum, Atsena, Axiom Healthcare Strategies, Bayer, Biogen, Cambridge Consultants, Coave Therapeutics, Decision Resources, Dialectica, DORC, Frontera Therapeutics, Hoffmann Eitle, Janssen Research & Development, MedScape, Mogrify, Navigant, Novartis, PeerVoice, Physicians Education Rescource, Roche, RegenxBio, Sirion, Sovinnova Partners, Sparing Vision, STZeyetrial, System Analytic, Techspert, THEA, Vindico Medical Education., Code C (Consultant/Contractor) Fischer Consulting Limited

Purpose
Voretigene neparvovec (VN) is the first approved gene therapeutic agent for an inherited retinal dystrophy. Classified as an advanced therapy medicinal product (ATMP), it is a genetically modified organism (GMO) on the basis of an Adeno-associated Virus (AAV). For the subretinal delivery of VN a subretinal injection cannula with a polyamide micro tip with an inner diameter of 41 gauge is used. The purpose of this study was to investigate the amount of AAV vector lost within the injection instrument by comparing the retention rates of four different subretinal injections needles from two different manufacturers. Retention rates were calculated for VN, which is based on the AAV serotype 2 and an AAV serotype 8 vector currently in clinical testing.

Methods
A standardized qPCR assay was developed to quantify vector concentration before and after passing the agent through the different instruments. The ITR sequence as an essential component of all AAV based therapies was used as the target sequence. Measurements were performed in technical triplicates and the experiment repeated twice. The instruments compared were the PolyTip® cannula 25 g/38 g by MedOne Surgical, Inc., Sarasota FL, and three different subretinal injection needles by D.O.R.C, Zuidland, The Netherlands (1270.EXT Extendible 41G subretinal injection needle (23G), DORC 1270.06 23G Dual bore injection cannula, DORC 27G Subretinal injection cannula)

Results
The retention rate of the DORC products (10-29%) of AAV2 based viral vector (VN) was comparable to that of the retention rate (33%) found for the PolyTip® cannula 25 g/38 g that is mentioned in the FDA approved prescribing information for VN. For the AAV8 vector, the PolyTip® cannula showed a retention rate of 14% which was also similar to the retention rate of the DORC products (0-15%).

Conclusions
The DORC instruments used seem to be compatible with Luxturna (voretigene neparvovec, VN) and AAV8 serotype vectors as they show comparable retention rates to that seen in an instrument (PolyTip® cannula 25 g/38 g (MedOne Surgical, Inc.; Sarasota, FL) listed in the FDA approved prescribing information for VN.

41-gauge subretinal injection needle for surgical removal of submacular perfluorocarbon fluid.

Posterboard#: B0573

Abstract Number: 912 - B0573

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DisclosureBlock: Stephania Chavez Cobian, None; Efrain Romo-Garcia, None; Amairani Tanairi Rodriguez de la Vega, None;

Purpose
To present an effective surgical approach to remove submacular perfluorocarbon fluid (PFCL) with minimal surgical trauma to the foveal structures.

Methods
A case series is presented with a technique to remove submacular PFCL using a 41G gauge extendible subretinal injection needle. All surgeries were performed by one surgeon (ERG) using the same technique. The transconjunctival 27-gauge 3-port pars plana pars vitrectomy technique using the Constellation Surgical System (Alcon Laboratories, Fort Worth, TX) and a non-contact wide-angle viewing system (RESIGHT Zeiss and NGENUITY® 3D Alcon) was used in all patients. Silicone oil extraction is performed. The 41-gauge needle was carefully advanced into the subretinal space through a self-sealing retinotomy caused by the needle until the PFCL bubble was reached, by passive aspiration the PFCL was sucked out in a controlled manner until complete removal was verified, retinal reattachment was performed with liquid-air exchange and SF6 gas was used as endotamponade.

Results
Case 1: 42-year-old male referred for submacular PFCL retention following pars plana vitrectomy for rhegmatogenous retinal detachment plus silicone oil in the right eye. BCVA (best corrected visual acuity) FC (finger count) one meter. The presence of PFCL was confirmed on optical coherence tomography showing omega sign. The PFCL was removed by the above mentioned technique. Six months after surgery his BCVA improved to 20/80.

Case 2: 64-year-old male was referred with retained subfoveal PFCL, six months after pars plana vitrectomy for macula off rhegmatogenous retinal detachment plus silicone oil. BCVA was FC at 30 centimeters. The presence of PFCL was confirmed on optical coherence tomography. Surgical removal of the subfoveal PFCL was performed using the same mentioned technique. Six months after surgery, her BCVA improved to 20/200 and OCT confirmed the elimination of the PFCL bubble.

Conclusions
This described technique appears to be an effective surgical method to remove retained subfoveal PFCL, and also helps to limit the risk of photoreceptor damage or foveal rupture, even in a six-month case, there was improvement in visual acuity after surgical removal of the PFCL.

Advancing Intraocular Surgery Analysis: A Tailored Video Annotation Tool for Enhanced Grading and AI Training

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Posterboard#: B0574

Abstract Number: 913 - B0574

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DisclosureBlock: James Xu, None; Josiah K. To, None; Dakari Harris, None; Andrew Browne, Code C (Consultant/Contractor) Jcyte, Alimera, JeniVision, Code P (Patent) United States patent US20200336638, United States patent US20200163737, United States patent US10295526

Purpose
This research focuses on developing a custom video annotation software for ophthalmic surgery. The objective was to create a user-friendly tool enabling graders to select and annotate surgical instrument types, surgical instrument tip location in 3D space, chapters denoting surgical maneuvers, and ocular anatomy in high-resolution from individual video frames. The software aims to address the limitations of existing tools, providing a foundation for developing artificial intelligence systems for objective data extraction from surgical videos.

Methods
The software development process was grounded in Python, with key dependencies like PyQt5 for constructing the graphical user interface and ffmpeg-python for efficient video processing. A systematic and logical architecture was implemented to store information in a readable way. The graphical user interface design centers around a video window, surrounded by customizable annotation buttons. These annotations provide a comprehensive label-set for the surgical video. Cursor tracking functionalities were incorporated to facilitate the precise labeling of surgical instrument tip locations. Furthermore, the inclusion of scrolling bars provides the ability to track instruments' depth.

Results
The video annotation tool accurately displays the graphical interface featuring a central video frame encircled by annotations. The software records desired annotations of surgical tools in the XY and Z planes successfully. Beta testing demonstrated efficient surgical video annotation, with subjective feedback indicating greater facility and easier workflow than existing video annotation software.

Conclusions
The development of this beta software for surgical video annotation has yielded a tool that is subjectively more user-friendly for surgical video graders than existing options. The software is platform-independent and adaptable to label any surgical video. Anticipated to be a valuable asset, this tool lays the foundation for the future development of artificial intelligence systems to extract objective data from surgical videos, contributing to advancements in surgical research, surgical safety tools and education.