10:55 AM

Heads-Free!: 3D Head-Mounted Display System for Vitreoretinal Surgery

- Murat Oncel, MD
- Banu Oncel
- Sezen Akkaya

OBJECTIVE To investigate the feasibility of performing vitrectomies while using the head-mounted display system(HDS), Helmet-mounted display(HDS) without any restriction of head movement which we call it “Heads-free”.

PURPOSE To investigate the feasibility of performing vitrectomies while using the head-mounted display system(HDS), Helmet-mounted display(HDS) without any restriction of head movement which we call it “Heads-free”.

METHODS We performed vitrectomy operation on 47 patients using the Zeiss Opmi 700 Lumera microscope without the oculars, Ngenuity 3D surgical camera(Alcon), Resight(Carl Zeiss) widefield viewing system and head-mounted display system(Sony HMS-3000MT). The helmet(HDS) uses dual video inputs and is equiped with two independant OLED panels, which offers two simultenous, complete seperate HD images for user’s left and right eye providing excellent streopsis. Vitrectomy was performed on complex cases; vitrectomy alone or combined phaco-IOL implantation, epiretinal membrane, macular hole, retinal detachment, PVR, tractional diabetic macular detachment, dislocated IOL, scleral fixated IOL, trauma cases.

RESULTS The HDS was well fitted into the surgeons head and its weight was not uncomfortable. Beneath the helmet the surgeon could see his own hands and surgical instruments by looking down. Has a short and easy learning curve. Most complex cases could be performed with excellent image quality and great depth perception and spatial orientation. Operation time was not longer than using the conventional microscope looking through the oculars. The surgoen's ergonomics was better than monitor-based 3D system. Instead of continualy looking to the monitor in an angle keeping the head in the same position, the surgeon could move the head without restrictions having the same 3D view with helmet, which is much more ergonomic. Also maintains head- eye coordination much better, which is really "Heads-free". There is more natural 3D than monitor-based 3D system, crosstalking and ghostings are reduced. The OLED panels have a PIP mode, overlay guidance and intraopOCT will be in the future for viewing.

CONCLUSION Heads-free surgery using the HDS could be performed in most complex cases without any difficulty, proving excellent image quality,streopsis and great depth perception. The surgeon ergonomics where even better than monitor-based 3D viewing system. With further technical improvements the procedure should be more widely used.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

11:00 AM

Can We Enhance 3D Visualization With Optical Coherence Tomography to Improve a Surgeon's Capabilities?

- Cynthia Ann Toth, MD
- Oscar Carrasco-Zevallos, BS
- Isaac Bleicher, SB
- hesham Gabr, M.D
- Christian Viehland
- S. Tammy Hsu, BA
- Joseph A Izatt, PhD
- Lejla Vajzovic, MD

OBJECTIVE To optimize the vitreoretinal (VR) surgeon's capabilities through live intraoperative three-dimensional (3D) optical coherence tomography (OCT) visualization of retina and instrument tissue interaction.

PURPOSE Retina specialists have been challenged by the need to simplify visualization of data, and to extract pertinent information from retinal OCT volumes, especially to determine change over time. This challenge is amplified when volumes of OCT data are viewed at near video rates during surgery. We propose to translate novel methods of extracting relevant 3D OCT data for use in VR surgeries.

METHODS In prospective translational research studies, we developed, refined and tested novel methods for microscope integrated OCT surgical guidance. Investigational high-speed 3D OCT provided live visualization of VR structures during surgery and test maneuvers. We modified and tested OCT image capture, processing and visualization. Hardware and software developments progressed from bench to validation to model eye testing and analysis, and under IRB-approved protocols, to human surgery. In VR surgery, OCT images were viewed with stereoscopic heads up display within the surgical

oculars or alternately with the OCT visualization fed into the 3D 4K OLED screen (NGENUITY®, Alcon, Fort Worth, TX).

RESULTS With OCT segmentation, assessment of subretinal fluid volume in model-eye blebs was accurate and reproducible; the surgeon's estimates of leakage (11 blebs) were different from and did not correlate with OCT findings ($p<0.001$, paired t-test). The surgeon missed a subretinal air bubble (seen on OCT). Software modifications enabled the surgeon to vary size and viewpoint of the OCT volume, and the assistant to modify pixel appearance and cutaway volume. With these, the surgeon could better determine tool-tissue interactions (e.g. with retinal pigment epithelium). Volumetric and cross-sectional OCT were successfully integrated into 3D NGENUITY® system during 5 VR surgeries. The surgeon viewed the split screen through polarized glasses. OCT projection into the 4K OLED monitor was at higher resolution than in heads up display in the surgeon oculars. This was helpful to determine traction to the margin of holes, and preretinal membranes over a tractional detachment during 3D heads up surgery.

CONCLUSION Advances in investigational microscope-integrated, high speed OCT systems and live volumetric visualization provide essential feedback and improve surgeon capabilities in model surgical tests. The integration with an external heads up 3D system is a major step in providing the surgeon efficient access to high resolution data from near real-time volumetric OCT.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

11:05 AM

Scleral Transillumination With Digital Heads-up Display: A Novel Technique for Visualization During Vitrectomy Surgery

- Bozho Todorich, MD, PhD
- Maxwell S Stem, MD
- Tarek S. Hassan, MD
- George A Williams, MD
- Lisa J. Faia, MD

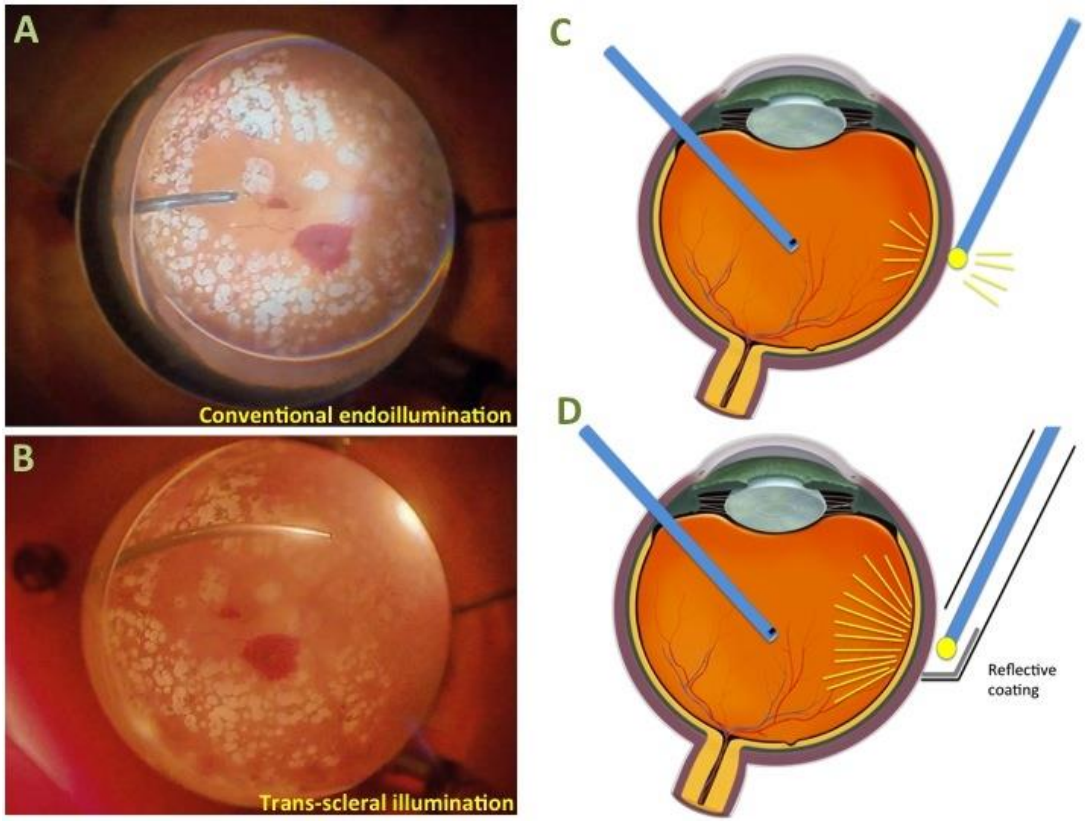
OBJECTIVE To report surgical technique of scleral trans-illumination utilizing heads-up 3D display viewing and offer a novel method for unassisted scleral depression-illumination for peripheral vitrectomy.

PURPOSE To describe a novel technique of scleral indentation and trans-illumination for single-surgeon, unassisted vitrectomy and vitreous base shaving enhanced with a digital heads up display system

METHODS This technique was utilized in six eyes of six patients during vitrectomy surgery for common vitreoretinal surgical diagnoses. In each case, the trans-illumination was performed with the traditional intraocular light pipe set at 100% power, placed obliquely just posterior to the vitreous base insertion with, or without, a trans-illumination adapter. The visualization of the vitreous cavity was digitally enhanced using a heads up display system (NGENUITY® 3D) with light amplification settings increased to near-maximal gain. In each case, the adequacy of the surgical view was judged intra-operatively by two independent surgeons who shared the same surgical view as the primary surgeon.

RESULTS In this series, the surgical view provided by the scleral trans-illumination was deemed adequate to safely perform surgery in 5 of 6 cases. In the one patient in whom this was not the case, vitrectomy was completed using traditional endo-illumination and scleral depression performed by a skilled assistant. Lighter fundus pigmentation, myopia, thin sclera, and absence of dense peripheral media opacities were associated with improved view with scleral trans-illumination. There were no intraoperative complications.

CONCLUSION Digitally enhanced scleral trans-illumination affords surgeons another option for safe and effective simultaneous scleral depression and illumination for un-assisted peripheral vitrectomy.



HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

11:10 AM

Intraoperative Use of Microscope-Integrated OCT for Subretinal Gene Therapy

- Ninel Z. Gregori, MD
- Janet L. Davis, MD
- Byron L. Lam, MD

OBJECTIVE Describe a novel surgical technique for targeted delivery of subretinal gene therapy

PURPOSE To report the novel use of microscope-integrated optical coherence tomography (MIOCT) for assuring accurate delivery of gene therapy into subretinal space.

METHODS The MIOCT-assisted technique was developed during phase II subretinal Rab-escort protein 1 in adenovirus-associated virus 2 vector for choroideremia clinical trial conducted at the Bascom Palmer Eye Institute. Retina layers were visualized in real-time with MIOCT to assure the vector was accurately delivered into subretinal space avoiding suprachoroidal injection.

RESULTS Intraoperative scanning confirmed elevation of the neurosensory retina during initial injection of balanced salt solution and then confirmed subretinal injection of the vector. Inadvertent suprachoroidal injection was prevented in 2 of 5 trial patients. Thin

foveal tissue was monitored to minimize risk of macular hole formation. Coverage of predetermined treatment target zone was assured in all cases.

CONCLUSION Intraoperative MIOCT allowed confirmation of subretinal as opposed to suprachoroidal injection of gene therapy in patients with severe retinal degeneration and highly altered retina, RPE, and choroid. Utilization of this technique would likely be helpful to the retina surgeons involved in FDA-approved gene therapy administration and future clinical trials..

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

11:15 AM

Subretinal Transplantation of Biodegradable Photoreceptor Cell Delivery Scaffolds: Surgical Tools, Procedures and Outcomes

- Elliott H. Sohn, MD
- Stephen R. Russell, MD
- Ian C Han, MD
- Chunhua Jiao
- Kristan Worthington
- Jessica Thompson, BSE
- Robert F Mullins, PhD
- Edwin Stone
- Kathleen A Chirco, Ph.D.

OBJECTIVE To describe the methods and outcomes of a novel surgical procedure and instrumentation used to implant a biodegradable polymer designed to deliver autologous iPSC-derived photoreceptor cells.

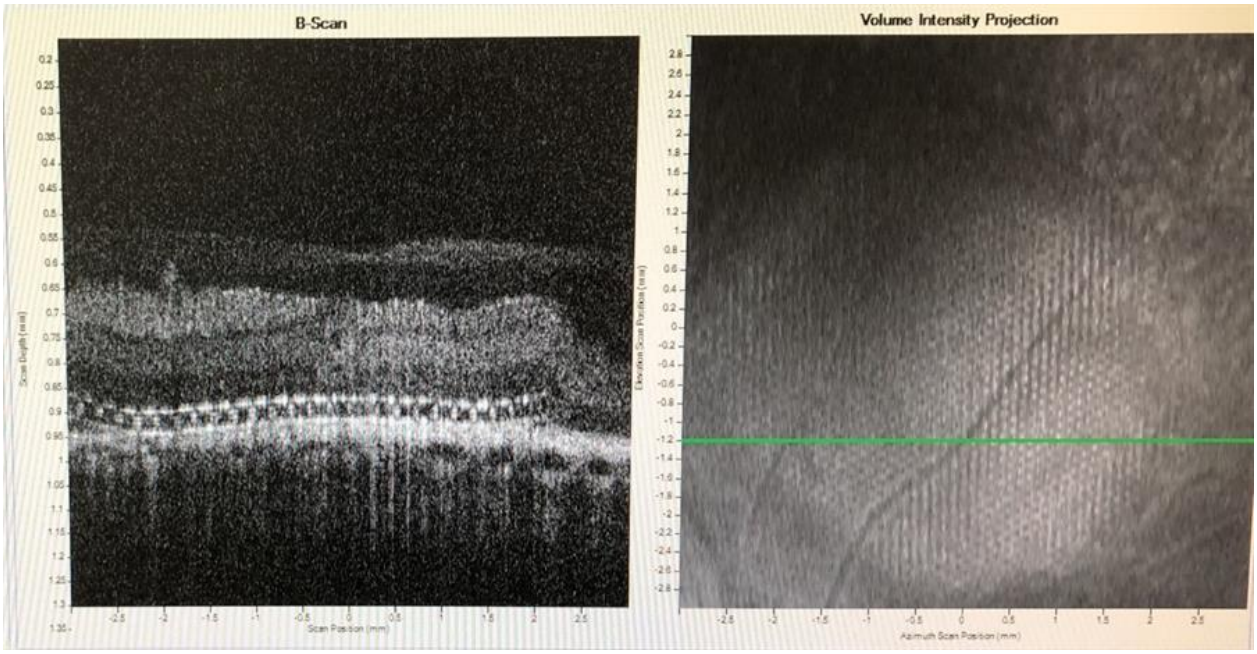
PURPOSE Photoreceptor and RPE cell loss are end stage features of GA from AMD as well as RP and LCA. Although scaffolds designed to transplant retinal cells increase cellular survival and integration, tools and procedures for reliable delivery of stem cell grafts are lacking. We describe our techniques/outcomes for implanting a biodegradable scaffold designed to deliver photoreceptor cells subretinally.

METHODS Pigs 2-6.5 months old underwent PPV. For each implantation/surgical control eye, a BSS bleb was made under the posterior retina, diathermy was applied and a linear retinotomy was created for the biodegradable polymer (PCL) to be subretinally implanted. Two different surgical instrument prototypes were tested, injecting either a

1x5mm strip (n=18 eyes) or 4-5mm diameter discs (n=33 eyes). 25 eyes were implanted with porous polymers capable of incorporating cells for transplantation. AFx was performed without gas or retinotomy laser. Control animals had sham (n=24) or no surgery (n=16). OCT was performed at sacrifice (1-4 months post-op) followed by extensive histologic characterization.

RESULTS At sacrifice, exam, fundus and OCT imaging revealed in eyes with polymer (and without polymer): retinal reattachment in 93% (100% without); severe uveitis in 0 (5% without); retinal fold in 18% (25% without); subretinal fibrosis in 20% (32% without). Collateral retinal vessels were identified near the retinotomy in 20% of eyes with polymer (18% without). Preliminary histologic analysis reveals polymers in the subretinal space with good preservation of overlying retina; some eyes with and without polymer had scant tissue above the RPE attributable to the trauma from surgery; eyes with polymer had mild to moderately increased GFAP staining around the polymer but were negative for immunologic markers IBA1, CD68 and IgG.

CONCLUSION High rate of surgical success was achieved when implanting biodegradable polymers into the subretinal space with both instruments tested. Large posterior retinotomies close spontaneously without laser, long-acting tamponade, or positioning. These scaffolds are well tolerated in the subretinal space but studies to further characterize the response to the surgical procedure and polymer are on-going.


B-Scan
Volume Intensity Projection
Scan Position (mm)
Azimuth Scan Position (mm)

11:29 AM

Utility of Hypersonic Vitrector Settings During Vitreoretinal Surgery

- Sunir J. Garg, MD
- Val Kolesnitchenko, MD
- Brian D McCary
- Nicole Bergmann
- Andrew Pilon

OBJECTIVE Evaluate intra-operative performance and clinical relevance of the hypersonic liquefaction vitrectors in vitreo-retinal surgery

PURPOSE To evaluate intra-operative performance, energy usage, and fluidics, of a novel hypersonic liquefaction cutter for vitreo-retinal surgery

METHODS Prospective, multi-center, non-randomized case series involving 71 eyes of 71 patients who underwent vitreo-retinal surgery using the novel 23G hypersonic vitrector (HV). Intra-operative energy (stroke length and time) and fluid usage (irrigation time, aspiration time, and average flow rate) were recorded and stratified by a pathology type. Surgeons were surveyed regarding: occurrence of intra-operative complications, usefulness of HV during the surgery, issues using HV, and advantages of HV compared to a guillotine-style cutter. Visual outcomes and re-op rate will be recorded at 1 w, 1 and 3 m post-operatively.

RESULTS The maximum needle stroke length (NSL) in recorded cases (N=39) was set from 20 to 60 um depending on the stage and type of procedure. The average NSL used was 38.17 ± 6.67 um with an average device active time of 5.57 ± 2.61 min. The average irrigation and aspiration times were 57.00 ± 20.77 min and 11.28 ± 5.48 min respectively. The average fluid usage and flow rate (including priming) were 53.82 ± 22.79 mL and 1.03 ± 0.50 mL/min respectively. Surgical surveys showed 97% of the

cases were completed without complications and 86% of cases were completed with HV alone. In 52% of the cases, the surgeons felt that HV had some advantages over the standard cutter.

CONCLUSION Small gauge hypersonic vitrectomy can be used for vitreo-retinal surgery. Performance, safety profile and probe design may offer some advantages compared to a guillotine-style pneumatic cutter. Further refinement of settings, evolution of technique, and evaluation of probe design may further enhance the usefulness of this instrument.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

11:34 AM

Combined Femtosecond Laser-Assisted Cataract Surgery and Small-Gauge Pars Plana Vitrectomy Using Different Devices: New Vitreoretinal Surgery Trend?

- Mauricio Maia, MD, PhD
- Bruno de Queiroz Alves, MD
- Oswaldo F Moura Brasil, MD
- Cristiano T Espinhosa
- RICARDO M JAPIASSU, MD
- Mariana Batista GonÃ§alves, MD
- AndrÃ© Maia, MD, PhD
- Emmerson Badaro, MD
- Paula Serraino Barberis, MD
- Arturo A. Alezzandrini, MD, PhD

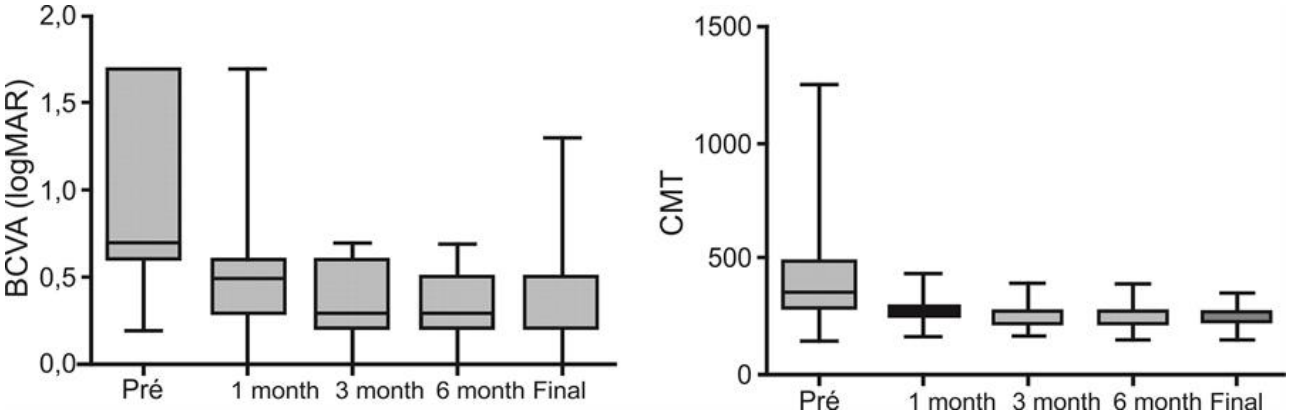
OBJECTIVE To report the efficacy, safety, and benefits of femtosecond laser-assisted cataract surgery (FLACS) combined with sutureless 23-gauge pars plana vitrectomy (PPV).

PURPOSE Literature contains few reports about combined procedures using Femtosecond laser-assisted cataract surgery (FLACS) technology and no studies have compared different commercially available devices. We report the advantages of surgery using FLACS combined with sutureless vitrectomy for a variety of vitreoretinal diseases and compare the performance of two commercially available femtosecond devices.

METHODS This multicenter retrospective chart analysis and video evaluation was performed in 43 cases with co-existing retinal pathologies and cataracts treated with combined FLACS and sutureless 23-gauge vitreoretinal surgery. The inclusion criteria included treatment with FLACS and PPV and completion of follow-up visits at 1, 3, 6 months and 1 year. Complete ophthalmic examinations were recorded for all patients (measurement of the best-corrected visual acuity (BCVA) and IOP, fundus examination and OCT). The exclusion criteria were a previous PPV or FLACS or FLACS and PPV performed during different surgeries. Patients also were excluded if information was missing from their medical records.

RESULTS In 44.2% and 55.8% of cases, respectively, the LenSx laser (femtosecond machine) and the Constellation (vitreous cutter) and the Victus (femtosecond machine) and Stellaris PC (vitreous cutter) were used. No complications developed during capsulorhexis even without a red fundus reflex, retrobulbar block, or scleral indentation. Foldable intraocular lenses remained stable in the capsular bag during the vitreoretinal surgeries and postoperative visits. The mean times of femtosecond phacoemulsification, vitreoretinal surgery, and total surgery were 22.9 ± 4.7, 43.1 ± 9.8, and 65.3 ± 8.6 minutes. The BCVA improved at all postoperative evaluations compared with the mean preoperative. The central macular thickness (CMT) was evaluated at all visits. No significant increase in the CMT was observed in any case, suggesting the absence of cystoid macular edema. It is important to point out that change in CMT does not rule out CME. The physicians affirmed that FLACS was beneficial in all surgeries.

CONCLUSION This is the largest case series to report the advantages of combined FLACS and small-gauge PPV by comparing two different femtosecond machines and this study shows the feasibility of FLACS combined with small incision PPV providing a good safety profile and benefits to eyes submitted to combined surgery. It may be a future trend for combined surgery in future.



Surgical Step	VS Group (n=24)	LC Group (n=19)	*P* Value
Duration of FLACS	20.8 ± 2.1	25.4 ± 5.7	0.004
	21 (18-25)	26 (15-35)	
Total surgical duration	68.2 ± 6.4	61.5 ± 10.3	0.003
	69 (54-77)	61 (48-93)	

P <0.001 was considered significant by the Mann-Whitney test

HUMAN RESEARCH This study involves human research.

IRB Approval Status: Approved by institutional review board

11:39 AM

Single Intraoperative Subconjunctival Triamcinolone Acetonide Injection Versus 4-6-Week Topical Steroid Taper Following Vitreoretinal Surgery

- Elizabeth A Atchison, MD
- John S. Pollack, MD
- Marina Gilca, MD
- Joseph M. Civantos, MD

OBJECTIVE To determine whether subconjunctival injection of triamcinolone acetonide at the end of surgery is an acceptable alternative to topical steroid drops post operatively.

PURPOSE To compare intraocular pressure (IOP) and inflammatory outcomes between patients receiving a single subconjunctival triamcinolone acetonide at the end of those surgery and those using traditional topical steroid drops over an extended period of time during the post-operative period.

METHODS Retrospective consecutive case series comparing patients operated on by 2 surgeons, one utilizing a single 4mg injection of triamcinolone acetonide at the end of surgery (intervention) and the other who uses dexamethasone 0.1 mL at the end of surgery and traditional topical steroid taper over a 4-6wk period (control). Exclusion criteria included use of steroid drops within 1 wk prior to surgery or < 90 days of follow up. All patients received atropine drops 2x day and moxifloxacin drops 4x a day for at

least 1 week postoperatively. Other drops were used as needed. Rates of postop IOP elevation, posterior synechiae, and need for addition of steroid drops (for intervention) were calculated.

RESULTS There were 167 eyes of 154 patients in the intervention group and 110 eyes of 103 patients in the control group. Background demographics and outcome statistics are listed in Tables 1 and 2, respectively. There was no significant difference in anterior chamber cell at 1 month postop or development of new posterior synechiae during follow-up, between the two groups. Eyes in the intervention group were not significantly more likely than eyes in the control group to have IOP >29 during the first 3 months postop or to receive IOP lowering drops postoperatively. There were no cases in patients without history of glaucoma where IOP could not be normalized with IOP drops. Five percent of eyes in the intervention group required addition of steroid drops post-op, with 21% of eyes receiving either steroid or additional IOP drops postop.

CONCLUSION The use of a single subconjunctival injection of 4mg triamcinolone acetonide at the end of retina surgery appears to be a safe and effective way to significantly reduce the need for postoperative eye drop use beyond the 1-week postop visit. This treatment strategy appears to be a reasonable alternative to the commonly used 4-6 week postoperative topical steroid drop taper.

Table 1: Background Demographics

	Intervention	**Control**	**p-value**
Mean Age	65 years	63 years	0.26
Mean Follow Up	11 months	19 months	*<0.0001*
Pre-op Glaucoma Diagnosis	20 (12%)	(18%)	0.15
Pre-op h/o steroid response	1 (<1%)	(2%)	0.34
Surgical Procedure			
Vitrectomy	149 (89%)	100 (91%)	0.21
Scleral buckle	5 (3%)	6 (6%)	0.45
Vitrectomy and Scleral buckle	13 (8%)	4 (4%)	0.16

Table 2: Outcomes

	Intervention	Control	p-value
Additional Post-op IOP drops	32 (19%)	12 (11%)	0.09
IOP >29 in the 3-months post-op	25 (15%)	9 (8%)	0.09
New Posterior Synechiae	2 (1%)	1 (<1%)	0.82
Presence of cell at 1 month	1 (<1%)	0 (0%)	0.77

HUMAN RESEARCH This study involves human research.

IRB Approval Status: Exempt from approval

11:44 AM

A Novel Biocompatible Film to Promote Retinal Break Repair and Macular Hole Closure

- Stanislao Rizzo, MD
- tomaso caporossi, MD

OBJECTIVE a new technique that leads retinal's breaks repair and macular hole closure with a biocompatible film

PURPOSE to describe the surgical outcomes of nine patients treated for persistent macular hole and rhegmatogenous retinal detachment using a novel biocompatible film to promote retinal's breaks repair and macular hole closure

METHODS seven patients with retinal detachment and 12 patients with persistent macular hole who undergone ppv with ILM peeling and gas tamponade without resolution, followed by pars plana vitrectomy and implant of the biocompatible film in macular hole, retinal breaks area; no laser retinopexy was carried out for retinal breaks. silicone oil was used in retinal detachment and SF6 in macular holes. silicone oil was removed after 3 months in all cases.

RESULTS successful retinal reattachment and macula hole closure was achieved in all 19 eyes. none retinal detachment developed PVR. after silicon oil removal none epiretinal membrane proliferation was observed after vital dying staining. no laser retinopexy was applied even after silicon oil removal. we observed retinal breaks sealing with a thin

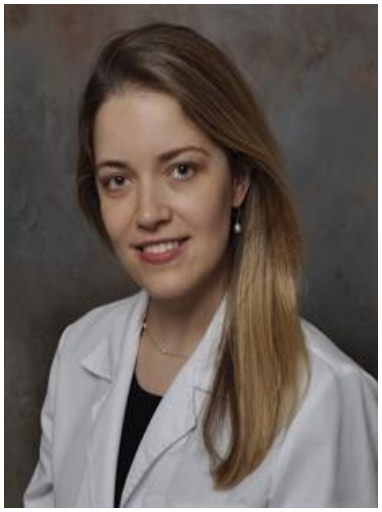
membrane. mean best corrected visual acuity preoperatively were 20/1000 and 20/400 and postoperatively were 20/32 and 20/50 in retinal detachment and macular hole group respectively. we had no postoperative complication.

CONCLUSION the film promote retinal breaks closure without laser retinopexy and macular hole closure as the autologous ILM transplantation technique. none adverse event was noticed during follow-up period.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

11:56 AM

Argus II Retinal Prosthesis Complication Profile Pre- and Post-FDA Approval



- Aleksandra V. Rachitskaya, MD
- Hossein Ameri, MD, PhD, FRCSI, MRCOphth
- David Birch
- Meghan Marino, MS, LGC
- Allen C. Ho, MD
- Raymond Iezzi, MD, MS
- Kanishka T. Jayasundera, MD,FRANZCO
- Gregg T. Kokame, MD, MMM
- Jennifer I. Lim, MD
- Naresh Mandava, MD
- Sandra Rocio Montezuma, MD
- Lejla Vajzovic, MD
- Jiong Yan, MD
- Connie Raines, CCRP
- Alex Yuan, MD, PhD

OBJECTIVE To examine the complication profile of Argus II retinal prosthesis surgery before and after FDA approval.

PURPOSE Retinal prostheses are becoming more widespread in the US and internationally. Over 250 Argus II retinal prosthesis surgeries have been performed worldwide. Understanding the complication profile is essential as more practitioners are implanting the device. The current study examines the serious adverse events seen in the pre-approval Argus II clinical trial and in the post-FDA approval cohort.

METHODS The Argus II clinical trial was a prospective, single-arm, nonrandomized study of 30 patients, the results of which led to the FDA approval of the device. The Argus II post-approval study is an ongoing 5 year prospective post-market surveillance study which began following FDA approval. To date, there are 54 patients enrolled. The type and incidence of serious adverse events (SAEs) in the two studies was compared at 1 and 2 year marks.

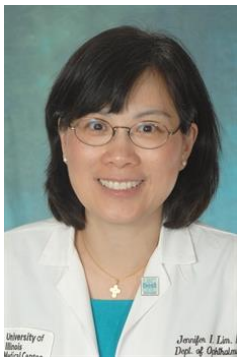
RESULTS 30 patients in the clinical trial and 25 in the PAS completed 1-year follow-up. The incidence of SAEs was: loss of eye 0% and 0%, explantation 0% and 0%, conjunctival dehiscence 10% and 0%, conjunctival erosion 10% and 8%, corneal opacity 3% and 0%, endophthalmitis 10% and 0%, hypotony 7% and 8%, array re-tacking 7% and 0%, rhegmatogenous RD 3% and 0%, tractional RD 3% and 0%, retinal tear 3% and 0%, sclerotomy leak 0% and 4%, uveitis 3% and 0%, vitreous hemorrhage (VH) 0% and 8%. 30 and 18 patients completed 2-year follow-up. The SAEs incidence was: loss of eye 0% and 0%, explantation 3% and 0%, conjunctival dehiscence 10% and 0%, conjunctival erosion 10% and 11%, corneal opacity 3% and 0%, corneal melt 3% and 0%, infectious keratitis 3% and 0%, endophthalmitis 10% and 0%, hypotony 10% and 11%, array re-tacking 7% and 0%, rhegmatogenous RD 3% and 0%, tractional RD 3% and 0%, retinal tear 3% and 0%, sclerotomy leak 0% and 6%, uveitis 3% and 0%, VH 0% and 11%, suture exposure 0% and 6%.

CONCLUSION The complication profile remains acceptable up to 2 years post-operatively as site diversity increases and more surgeons implant the Argus II post-FDA approval. The changes in surgical technique such as adding the use of pericardium allografts to cover the suture tabs appear to decrease some complications. Vitreous hemorrhage appears to be more common in the post-approval study cohort.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

12:01 PM

Comparison of Visual and Anatomic Results After Combined Boston Keratoprosthesis, Vitrectomy and Glaucoma Surgery (as Needed) to Keratoprosthesis Alone



- Jennifer I. Lim, MD
- Lindsay Machen, MD
- Andrea C Arteaga, MD
- Faris I. Karas, M.D
- Robert A Hyde, MD, PHD
- Dingcai Cao, PHD
- Marcia Niec, BS MT CCRP
- Thasarat S. Vajaranant, MD
- M. Soledad Cortina, MD

OBJECTIVE To determine if combination Type I Boston keratoprosthesis, vitrectomy and glaucoma surgery (as needed) offers any visual or anatomic advantage over Type I Boston keratoprosthesis surgery alone.

PURPOSE To determine whether one year visual and anatomic results after surgery combining pars plana vitrectomy, Boston keratoprosthesis and a glaucoma drainage device as needed are similar, better, or worse than Boston keratoprosthesis implantation alone.

METHODS We performed a 10 year retrospective review of adult patients undergoing Boston keratoprosthesis at our institution. Patient demographics, indications for Boston keratoprosthesis surgery, baseline anterior and posterior segment findings, visual

acuities at baseline and follow-up, procedures performed, intraoperative findings, intraoperative complications and post-operative complications were recorded. Visual acuity (VA) outcomes, anatomic results and complication rates of eyes undergoing combination surgery were compared to eyes undergoing keratoprosthesis placement alone. One year and final visual acuity outcomes were determined.

RESULTS There were 55 eyes in the combination and 70 eyes in the keratoprosthesis alone group. Indications for keratoprosthesis were similar. More eyes had preoperative glaucoma in the combination than keratoprosthesis alone group (42/ 55 (76%) vs. 41/ 70 (59%) p=0.037). Baseline mean log MAR VAs were worse for combination than keratoprosthesis alone eyes (p=0.027). Mean follow-up = 48.4 months for combination and 54.7 months for keratoprosthesis alone eyes. Post-op VAs improved by one month for both groups. VAs at 1-year were >/= 3 lines better in 72% combination and 78% keratoprosthesis alone eyes. 1-year rates of de novo glaucoma (p=0.015) and secondary procedures (p=0.002) were lower for combination eyes; rates of retroprosthetic membrane formation, retinal detachment, hypotony, CME, ERM, endophthalmitis and corneal melting were similar. Fewer secondary procedures were needed for combination (33 total, 18 in year 1, p < 0.001) than keratoprosthesis alone (72 total, 33 in year 1) eyes.

CONCLUSION Combining keratoprosthesis with pars plana vitrectomy and a glaucoma drainage device as needed resulted in lower rates of both de novo glaucoma and secondary surgical procedures. Visual acuity outcomes were similar for combination surgery and keratoprosthesis alone groups. Combination surgery appears to be better than keratoprosthesis alone.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

12:06 PM

Vitreous Biomarkers for Alzheimer's Disease in Patients Undergoing Vitrectomy and Cognitive Function Assessment

- Manju L. Subramanian, MD
- Thor D Stein, MD, PhD
- Jaeyoon Chung, PhD
- Kate H McConnell, BA
- Marissa Fiorello, BS
- Nicole H Siegel, MD
- Steven D Ness, MD
- Gyungah Jun, PhD

OBJECTIVE To determine if known biomarkers of Alzheimer's Disease (AD) can correlate with cognitive function or impairment in patients undergoing vitrectomy for various vitreoretinal conditions.

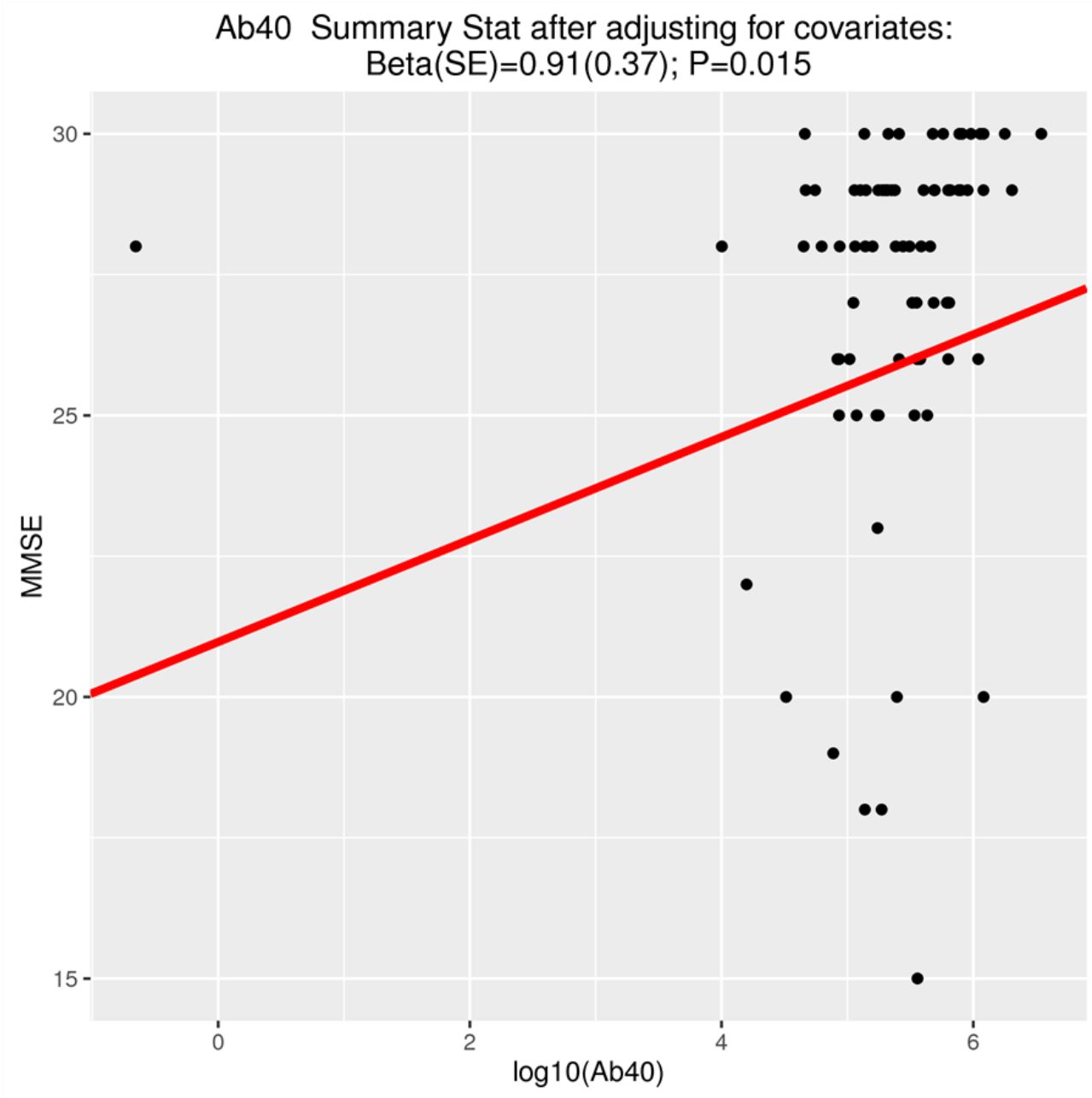
PURPOSE Beta amyloid (Aβ) and Tau in cerebrospinal fluid (CSF) are known biomarkers of AD. As therapeutic efforts are most successful in the initial stages of AD, an objective early diagnostic tool is needed. The purpose of this study was to determine if the levels of AD biomarkers present in vitreous humor correlate with cognitive impairment in patients undergoing vitrectomy.

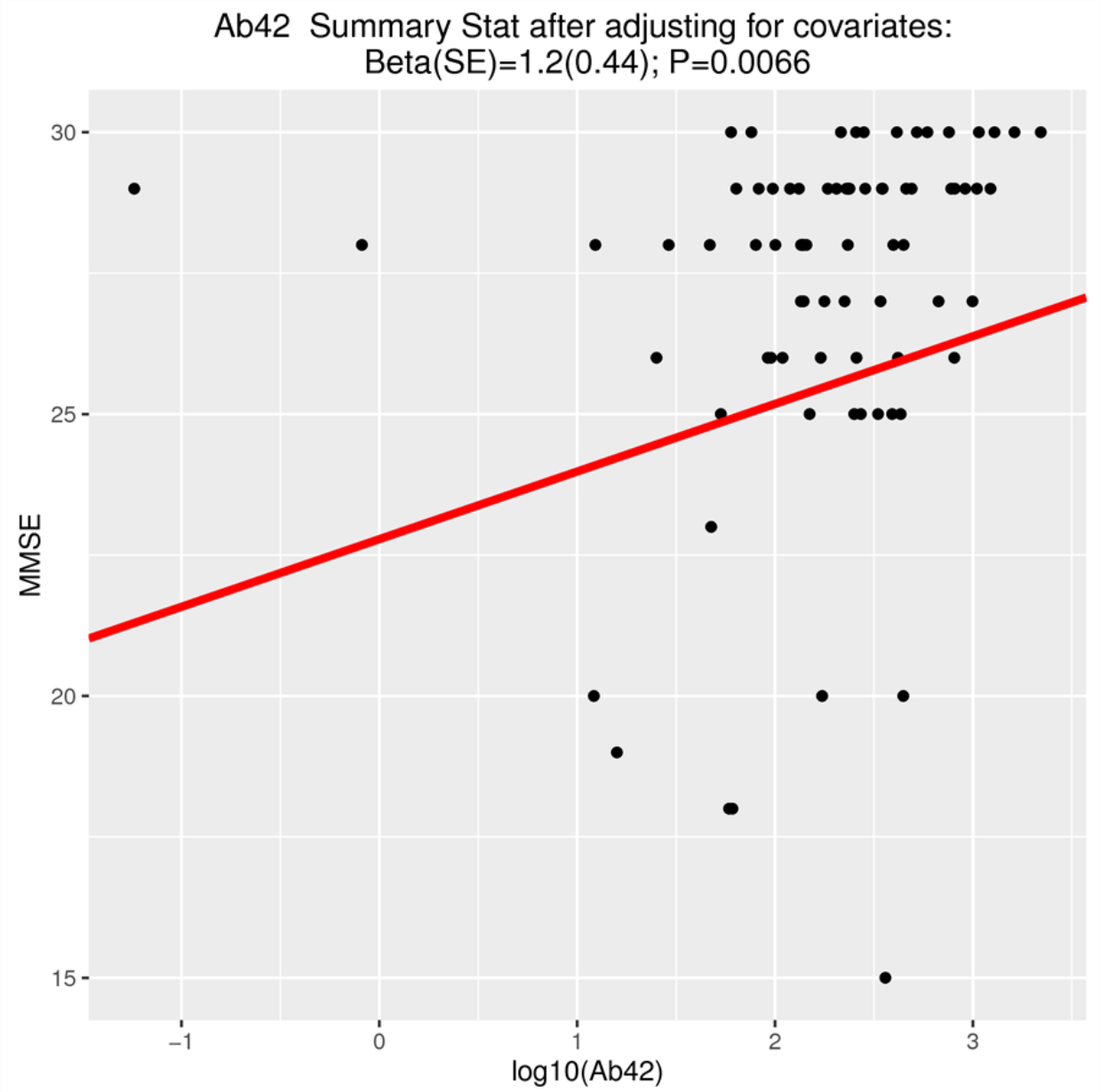
METHODS Undiluted vitreous fluid was prospectively collected during vitrectomy surgery from 80 eyes of 80 patients over the age of 18. All patients underwent a mini-mental status examination (MMSE) prior to surgery to assess their cognitive function. Demographic information, education history, and clinical data on eye disease and medical history were also obtained. Undiluted vitreous humor samples were quantitatively measured for known biomarkers of AD, which include beta amyloid

(Aβ40, Aβ42) phosphorylated Tau (pTau), and total Tau (tTau). Linear regression was used to test the association between MMSE score and AD biomarker levels, and was adjusted for age, sex, and education level of subjects.

RESULTS Eighty study participants underwent vitrectomy for various diagnoses including vitreous hemorrhage from diabetic retinopathy, retinal detachment, macular hole, and epiretinal membrane. Of those 80 subjects, nine (5 males, 4 females) exhibited mild (n=8) to severe (n=1) levels of cognitive impairment based on MMSE scores. Higher vitreous levels of Aβ40 (p=0.015), Aβ42 (p=0.0066), and tTau (p=0.0085) were significantly associated with better MMSE scores, while lower vitreous levels were associated with lower MMSE scores. Levels of pTau were not significantly associated with MMSE scores (p=0.40). Additionally, none of these four AD biomarkers were associated with any eye or vitreoretinal conditions.

CONCLUSION These results suggest patients with decreased cognitive function have significantly lower vitreous humor levels of Aβ40 and Aβ42. These findings are consistent with the abnormally low levels of CSF Aβ observed in AD patients compared with cognitively normal subjects. Our study indicates that vitreous levels of beta amyloid may have potential as an early diagnostic tool for Alzheimer's Disease.


Ab40 Summary Stat after adjusting for covariates:
Beta(SE)=0.91(0.37); P=0.015
MMSE
30
25
20
15
0
2
4
6
log10(Ab40)



HUMAN RESEARCH This study involves human research.

IRB Approval Status: Approved by institutional review board

12:11 PM

Orbital Emphysema as a Complication of Vitrectomy: Report of 12 Consecutive Cases

- Virgilio Morales-Canton, MD
- Ana Beatriz Enriquez, MD

OBJECTIVE To describe clinical characteristics and evolution of twelve patients with subcutaneous and orbital emphysema following retinal surgery.

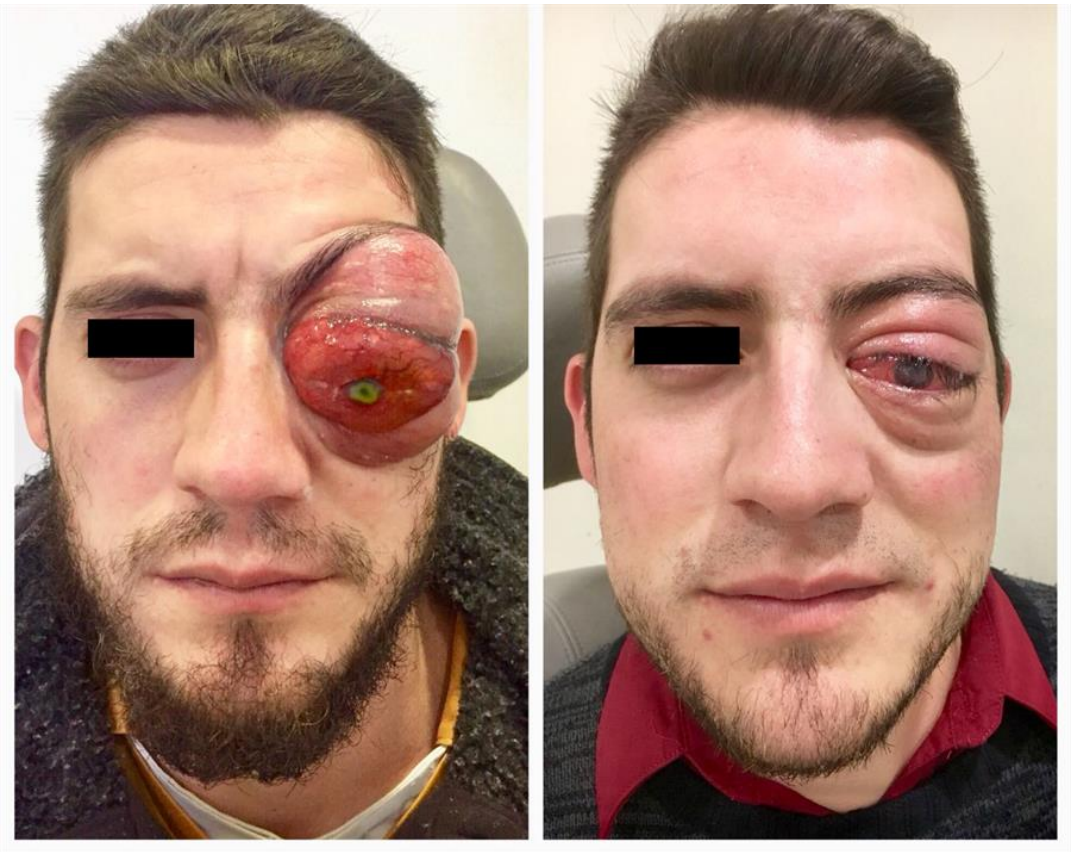
PURPOSE To describe the presence of subcutaneous and orbital emphysema as a serious complication that can occur in regular vitrectomy alone or vitrectomy with buckling procedures. The possible causes are analized and posible therapeutic options are also presented.

METHODS Retrospective, descriptive, observational case series study conducted between June 2015 and December 2017 at a large ophthalmology referral hospital located in Mexico City. Medical records from 12 patients with diagnosis of orbital emphysema following retinal surgery were reviewed. Patients with clinical diagnosis of orbital emphysema (periorbital swelling, ocular proptosis, crepitus during palpation, and limited ocular movement associated with decreased visual acuity) and orbital computed tomography (with multiple intra and extraconal air cavities) were included. A minimum

follow-up of 7 months was required. Clinical histories and tomographic findings were analyzed.

RESULTS Twelve patients were included. Mean age was 38 years (range: 6 – 69); 50% were female, 25% had one previous surgery, and 16.6% had a history of previous ocular trauma. Diagnosis of rhegmatogenous retinal detachment was established in 91.6% of patients, 8.3% of cases underwent encircling scleral buckling, 33.3% pars plana vitrectomy (PPV), 41.6% scleral buckling and PPV, and 16.6% repeated PPV. Time between retinal surgery and orbital emphysema ranged from 2 to 20 days. All cases showed a decrease in visual acuity, that ranged from count fingers to no light perception. 58.3% of cases were treated with compressive patching, 58.3% with transpalpebral drainage, 33.3% with hyperbaric oxygen therapy, and 41.6% required surgical management (orbital decompression, surgical drainage and/or tarsorrhaphy).

CONCLUSION Orbital emphysema is generally a benign, self-limited condition,. Notwithstanding, it is an uncommon complication after retinal surgery. To our knowledge, this is the most extensive case series report of patients with this condition. It is important to identify this disease promptly, in order to treat patients with the alternatives available, which can avoid its potential blinding effect.



HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board