10/12/2021 8:00AM

Real-Time In Vivo Assessment of Retinal Reattachment in Humans Using Swept-Source Optical Coherence Tomography

- Rajeev H. Muni, MD, MSC, FRCS(C), FASRS
- WEI WEI LEE, MD
- Tina Felfeli, MD
- Aditya Bansal, MD

OBJECTIVE To assess the in vivo physiology of retinal reattachment in humans using swept-source optical coherence tomography (SS-OCT) in real-time.

PURPOSE To perform a longitudinal assessment of early post-operative SS-OCT images immediately following pneumatic retinopexy (PnR) to establish the stages of retinal reattachment and assess how delayed progression through the stages could lead to post-operative anatomic abnormalities.

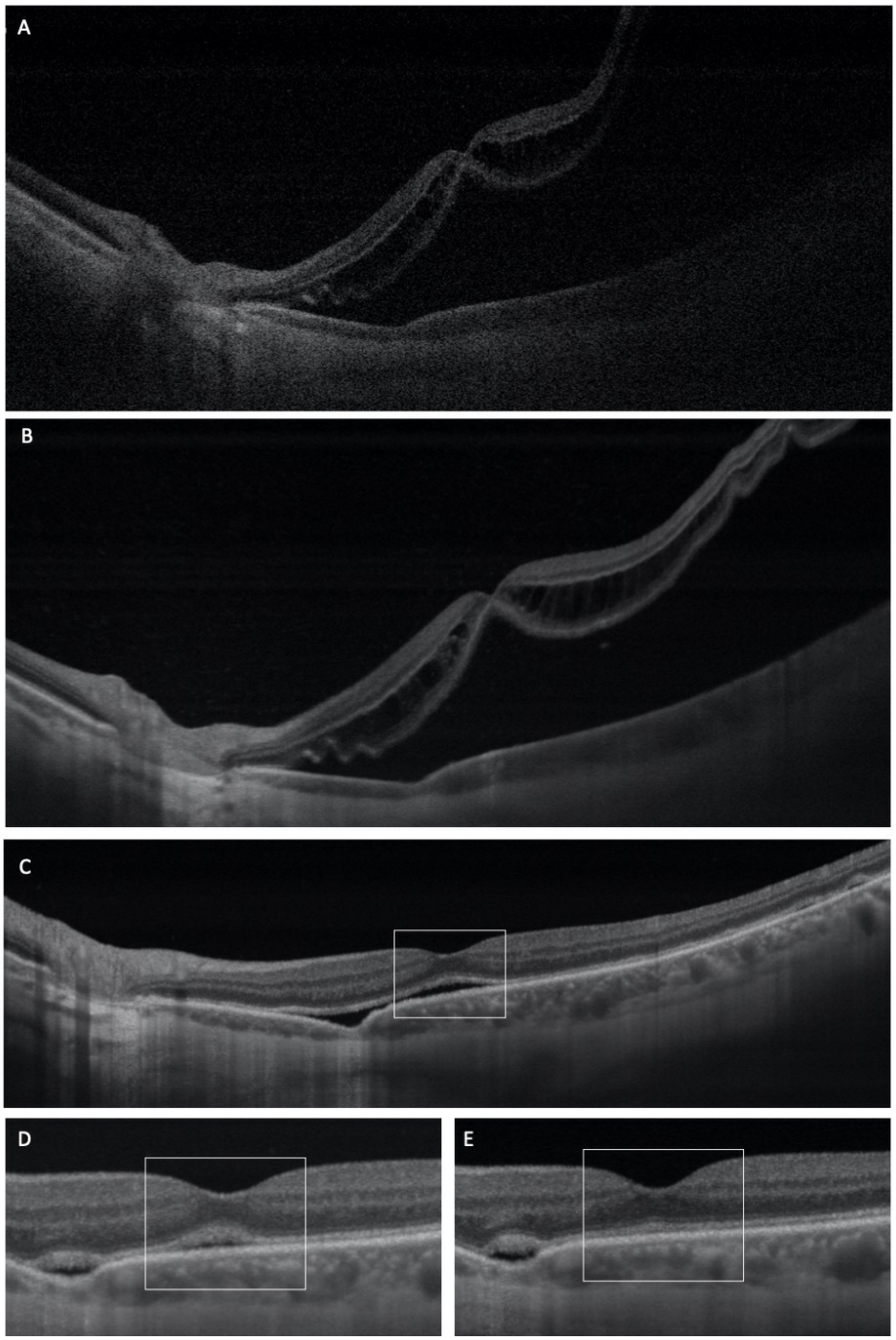
METHODS A prospective consecutive case series of 15 patients with fovea-involving rhegmatogenous retinal detachment (RRD) undergoing PnR at St Michael's Hospital/Unity Health Toronto, Toronto, Canada between July 1, 2020 and September 30, 2020. SS-OCT was performed at presentation and every 2 hours for the first six hours, at day 1, 2, 5, and at week 1, 2, 4 and 6 after PnR. Imaging of the detached retina was performed with the tracker off, with the aim of capturing a foveal scan. After retinal attachment, images were captured using FastTracTM that mitigates eye motion and operator-related artifacts to allow the same point to be compared over time.

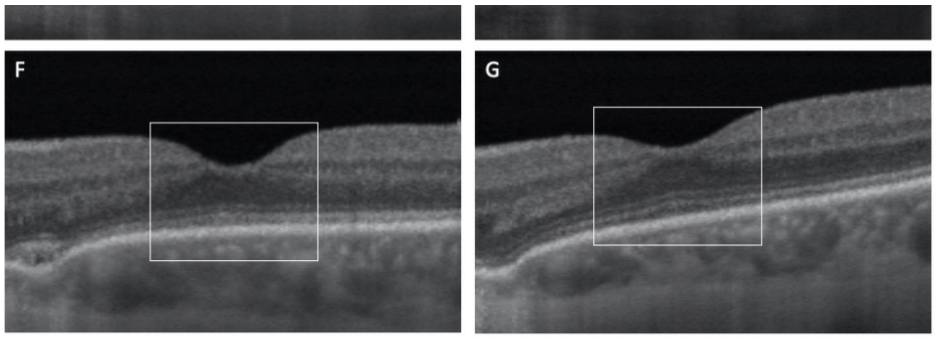
RESULTS 93.3% (14/15) had reattachment at a median follow-up duration of 13 weeks (IQR 7.5-18.0). Reattachment occurred in five stages: Stage 1, redistribution of fluid and approach of the retina towards the retinal pigment epithelium (RPE) occurred in 100% (15/15). Stage 2, reduction in cystoid macular edema and improvement of outer retinal corrugations was achieved in 100% (15/15). Stage 3, contact of the retina with the RPE occurred completely in 66.7% (10/15). Stage 4, deturgescence of the inner and outer segments of the photoreceptors occurred in 66.7% (10/15). Stage 5, recovery of photoreceptor integrity occurred in three specific sub-stages, 5A: external limiting membrane recovery (10/15, 66.6%), 5B: ellipsoid zone recovery (9/15, 60%), 5C: interdigitation zone/foveal bulge recovery (3/15, 20%). 20% (3/15) had delayed progression through Stage 2, with formation of outer retinal folds and 33.3% (5/15)

developed residual subfoveal fluid blebs (delayed progression to stage 3).

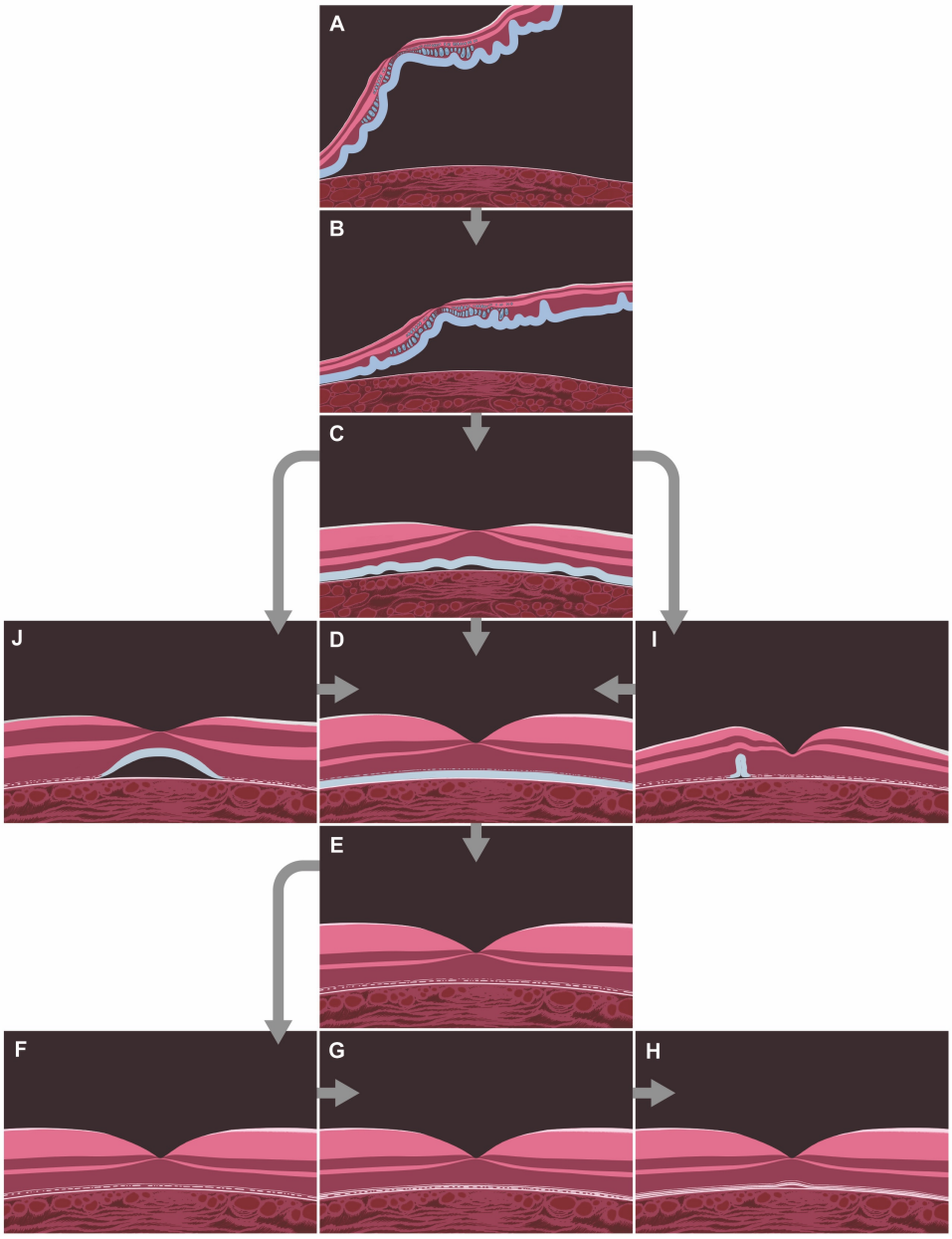
CONCLUSION This study characterizes the in vivo physiology of retinal reattachment in humans using high-resolution SS-OCT. Retinal reattachment occurs in five specific stages. Delayed progression through certain stages was characterized by post-operative anatomic abnormalities

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.





A) Baseline SS-OCT showing RRD, cystoid macular edema(CME), and outer retinal corrugations(ORCs). B) 2 hours after PnR, the retina starts approaching RPE (Stage 1). C&D) 6 & 24 hours later, resolution of CME and ORCs (Stage 2). E) On day 2, contact between the retina and RPE (Stage 3). F) On day 3, deturgescence of inner and outer segments of photoreceptors (Stage 4). G) At 6 weeks, recovery of photoreceptor integrity: foveal bulge (Stage 5c).



A) Baseline status demonstrating a detached retina with CME and ORCs. B) Stage 1: reduction in the height of RRD. C) Stage 2: improvement in CME and ORCs. D) Stage 3: initial contact of the retina to the RPE. E) Stage 4: deturgescence of the photoreceptor inner and outer segments. F) Recovery of photoreceptor integrity, 5a: ELM. G) 5b: EZ. H) 5c: IZ and foveal bulge. I) Outer retinal fold. J) Subretinal fluid bleb .

10/12/2021 8:06AM

Postoperative Outer Retinal Folds in Pneumatic Retinopexy vs Pars Plana Vitrectomy for Rhegmatogenous Retinal Detachment: PIVOT Post Hoc Analysis

- WEI WEI LEE, MD
- Aditya Bansal, MD
- Srinivas Reddy Sadda, MD
- David Sarraf, MD
- Alan R. Berger, MD, FRCS(C), B. Sc.
- David T.W. Wong, MD, FRCS(C), FASRS
- Peter J. Kertes, MD, FRCS(C)
- Radha P Kohly, MD, PhD, FRCSC
- Roxane J Hillier, FRCOphth
- Rajeev H. Muni, MD, MSC, FRCS(C), FASRS

OBJECTIVE To assess the incidence of post-operative outer retinal folds in pars plana vitrectomy vs pneumatic retinopexy for rhegmatogenous retinal detachment repair and its association with functional outcome.

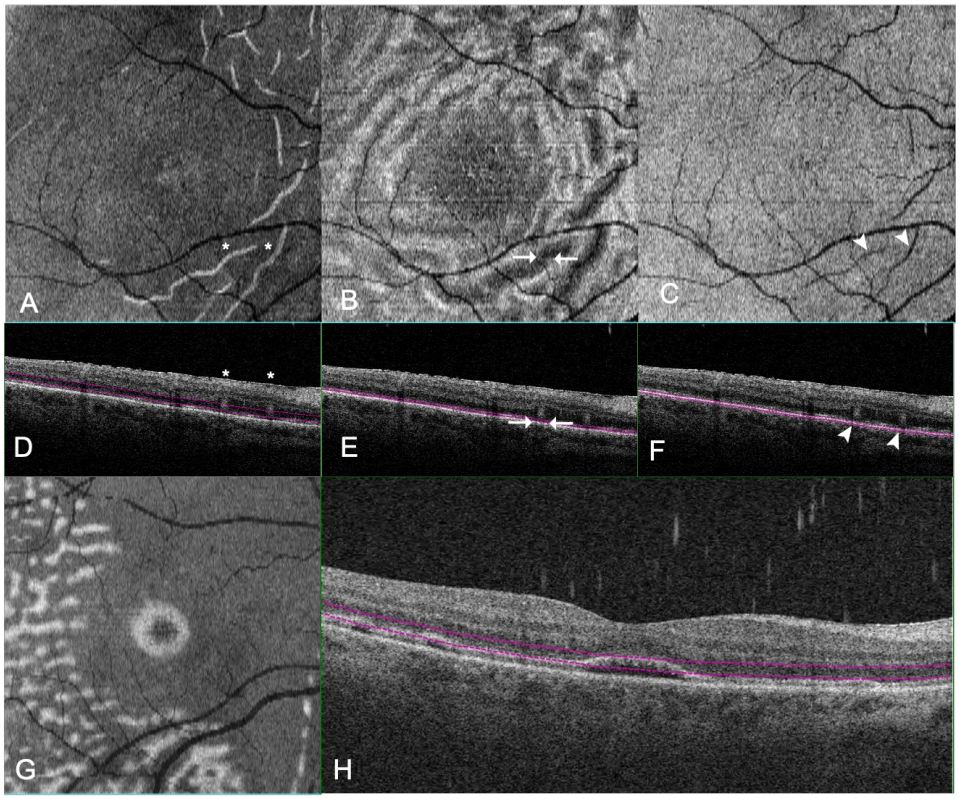
PURPOSE To assess the incidence of post-operative outer retinal folds in pneumatic retinopexy vs pars plana vitrectomy with en face and cross-sectional spectral-domain optical coherence tomography (SD-OCT) following rhegmatogenous retinal detachment (RRD) repair and to determine the association of ORFs with visual acuity (ETDRS letter scores) and metamorphopsia (M-CHARTS) at 12 months post-operatively.

METHODS This study is a post-hoc analysis of the PIVOT randomized controlled trial comparing two surgical interventions, pneumatic retinopexy (PnR) vs pars plana vitrectomy (PPV) for the management of primary RRD. The incidence and morphological features of the ORFs were assessed with en face and cross-sectional OCT at 1 month post-operatively. Quantitative assessment of morphological features was performed with Image J. ETDRS letter score and quantitative metamorphopsia (using M-CHARTs) were measured at 1 year.

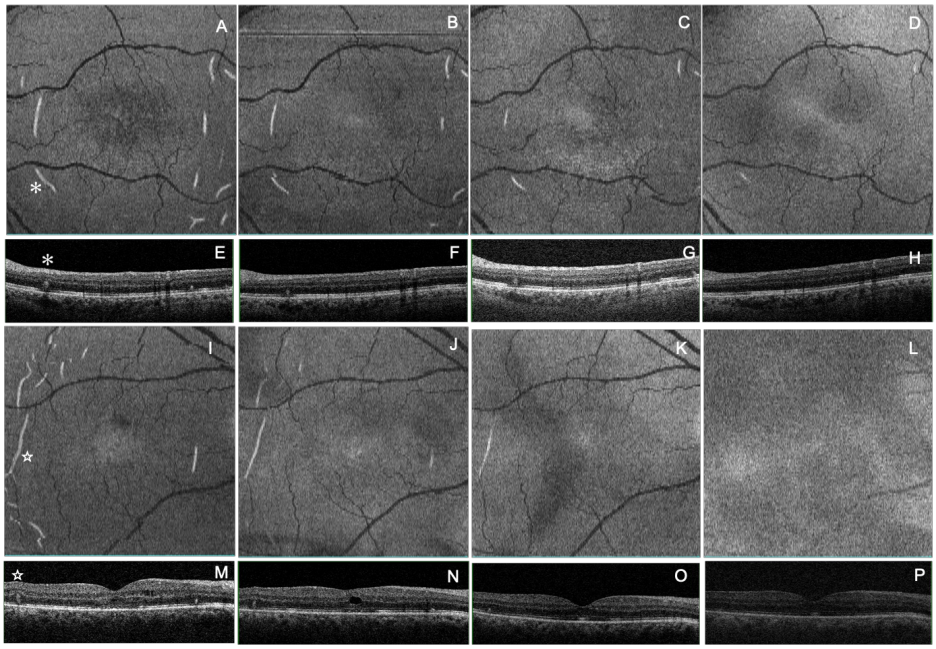
RESULTS Eighty-eighty of the 176 participants enrolled in PIVOT were macula-off RRD. 94.3% (83/88) had month 1 post-operative OCT scans that were gradable, 95.5% (42/44) in the PnR group and 93.2% (41/44) in the PPV group. The incidence of ORFs formation was 34.1% (14/41) in the PPV group and 14.3% (6/42) in the PnR group (p=0.034). ETDRS letter score at 1 year was 65.7±6.6 in patients with ORFs vs 75.1±1.4 without ORFs (difference=9.4, 95% CI=7.5-11.3, p=0.047). In the PPV group, ETDRS letter score at 1 year was 62.8 ± 24.7 in patients with ORFs vs 75.4 ± 9.2 without ORFs (difference=12.6, 95% CI=0.05-24.59, p=0.04). Horizontal (MH) and vertical (MV) metamorphopsia scores were similar in patients with vs without ORFs: MH: 0.35 ± 0.12 vs 0.29 ± 0.07 (difference=0.06, 95% CI=0.01-0.11, p=0.69) and MV: 0.25±0.07 vs 0.29±0.07 (difference=0.04, 95%CI=0-0.08, p=0.60). There was a negative correlation between the closest distance of the ORFs from the fovea with the MV score (r=-0.507, p=0.045).

CONCLUSION ORFs occur more often in eyes undergoing PPV compared to PnR. The presence of ORFs at 1 month was significantly associated with a worse ETDRS visual acuity letter score at 1 year. There was a negative correlation between the distance of the ORF from the fovea and vertical metamorphopsia.

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.



A-C) En face OCTs generated from 3 different segmentations (D-F) showing varying appearance of ORFs. (A,D) A customized segmentation extending from the junction of outer plexiform/outer nuclear layer to myoid/ellipsoid zone demonstrating hyperreflective curvilinear ORFs. (B,E) automated ellipsoid zone segmentation and (C,F) RPE segmentation. (G,H) Differentiating ORFs from retina over subretinal blebs.



Evolution of ORFs on en face and cross-sectional OCT month 1 to 6. A,I) En face OCTs show presence of ORFs characterized by curvilinear hyperreflective lines and E,M) corresponding cross-sectional OCTs. B-D, J-L) En face OCTs at month 2, 3 and 6 with a gradual reduction in number, width and length of the ORFs over time. F-H, N-P) Corresponding cross-sectional OCTs over time.

10/12/2021 8:12AM

Retinal Displacement After Pneumatic Retinopexy vs Vitrectomy for Rhegmatogenous Retinal Detachment (ALIGN STUDY)

- Verena Juncal, MD
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- Samara Barbara Marafon, MD
- Natalia Figueiredo, MD
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- Nishaant Bhambra, MD(c)
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- Filiberto Altomare, MD, FRCSC
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- Deven Deonarain
- Roxane J Hillier, FRCOphth
- Rajeev H. Muni, MD, MSC, FRCS(C), FASRS

OBJECTIVE To compare the proportion of eyes with retinal displacement following pneumatic retinopexy (PnR) vs pars plana vitrectomy (PPV) for rhegmatogenous retinal detachment (RRD) repair.

PURPOSE Unintentional retinal displacement is very common following PPV for RRD repair and is associated with poor quality of vision and distortion. Retinal displacement can be detected on fundus autofluorescence (FAF) imaging by the presence of retinal vessel printings (RVPs), which demonstrate the original location of retinal blood vessels.

METHODS Multicenter prospective cohort study. 204 consecutive patients presenting with acute primary macula-off RRD at 3 institutions in Canada and the United Kingdom were enrolled. Exclusion criteria included previous vitreoretinal surgery, significant proliferative vitreoretinopathy and preexisting retinal pathology. Ultra-widefield FAF, best-corrected visual acuity (BCVA) and objective quantitative metamorphopsia and aniseikonia were performed at 3-months post-op. FAF images were assessed for retinal displacement by 2 masked graders. Retinal displacement was also measured and assessed in terms of location, with zone 1 representing the posterior pole.

RESULTS The proportion of eyes with retinal displacement on FAF was 14.7% for PnR (10/68) and 50.7% for PPV (35/69) ($P < .001$) after successful repair. Additionally, the proportion of eyes with retinal displacement involving the posterior pole was 8.8% for PnR (6 of 68) and 43.9% for PPV (29 of 69) ($P < .001$). Aniseikonia scores were worse in eyes

undergoing successful PPV vs PnR (4.22 +/- 5.45 vs 2.03 + 3.77; p = 0.01). Aniseikonia scores were worse in patients with retinal displacement compared to those without retinal displacement (4.52 +/- 6.05 vs 2.31 +/- 3.51; p = 0.017). There were no significant differences in BCVA and metamorphopsia scores between treatment groups and between eyes with vs without displacement. Among eyes with retinal displacement there was a moderate correlation between the maximum amplitude of displacement and aniseikonia (r=0.402; p=0.003), vertical metamorphopsia scores (r=0.313; p=0.02) and BCVA (r=0.376; p=0.004).

CONCLUSION PPV is associated with higher rates of retinal displacement compared to PnR. Retinal displacement is associated with worse aniseikonia and the amplitude of displacement is correlated with functional outcomes. This study provides insights on the integrity of retinal reattachment and suggests that modifications to surgical techniques to minimize retinal displacement may improve functional outcomes.

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.

10/12/2021 8:26AM

Postoperative Intravitreal Methotrexate Injections Reduce Reoperations in Eyes With Proliferative Vitreoretinopathy and Diabetic Retinopathy

- Alan J. Franklin, MD, PhD
- Lauren Gibson, MD

OBJECTIVE The objective of this study is to identify potential benefits postoperative intravitreal methotrexate after vitrectomy for advanced proliferative vitreoretinopathy or diabetic retinopathy.

PURPOSE Fibrous and glial proliferation is one the largest surgical challenges that present to retinal specialists. Studies have indicated a potential role for postoperative intravitreal methotrexate after previous failed retinal detachment surgery. We included previously unoperated eyes at high risk for failure because of pre-existing advanced proliferative vitreoretinopathy or diabetic retinopathy.

METHODS This is a retrospective chart review of patients who underwent retinal detachment surgery for the following reasons: 1) Failed previous retinal reattachment surgery, 2) Advanced Proliferative Diabetic Retinopathy, 3) Initial surgery for retinal detachment associated with trauma, or 4) Primary retinal detachments associated with Grade C proliferative vitreoretinopathy. Methotrexate, 200µg, was administered intravitreally via the inferotemporal par plana at post op weeks 1, 2, 4, 7, and 11. Data including reoperation rate, visual acuity, physical exam, and OCT biomarkers were analyzed.

RESULTS A total number of 112 eyes were evaluated in this study. 14 eyes received intravitreal methotrexate and 98 eyes did not. The average number of re-operations among eyes treated with methotrexate was 0.57, compared to an average number of 1.12 among those who did not, $p < 0.05$. Many eyes had previously underwent multiple operations for

proliferative vitreoretinopathy, and required no further operations after postoperative intravitreal methotrexate. Similarly, many patients with advanced proliferative diabetic retinopathy who required surgery in both eyes required less operations in the eyes that received postoperative intravitreal methotrexate compared to the fellow eye that was not injected. On exam, eyes injected with methotrexate had less postoperative epiretinal membrane proliferation compared to uninjected eye. Initial analysis also suggests a trend in better visual acuity for eyes that underwent intravitreal methotrexate. OCT biomarker analysis is pending.

CONCLUSION We report that 5 postoperative intravitreal injections of methotrexate reduce reoperation rates in both eyes that have failed previous retinal reattachment surgery and eyes that are higher risk to fail primary surgery because of advanced proliferative vitreoretinopathy or diabetic retinopathy. Less postoperative epiretinal membrane formation is also evident in eyes injected with methotrexate.

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.

10/12/2021 8:32AM

Outcomes of Intravitreal Methotrexate for Proliferative Vitreoretinopathy in the Perioperative Period of Retinal Detachment Repair

- Michelle Abou-Jaoude, MD
- Thomas W. Stone, MD
- Miguel A. Busquets, MD, FACS
- Zachary H Tarter

OBJECTIVE To evaluate the real-world outcomes of perioperative use of intravitreal methotrexate in treating proliferative vitreoretinopathy following retinal detachment.

PURPOSE To describe the outcomes of patients treated with intravitreal methotrexate (IVM) for proliferative vitreoretinopathy (PVR) in the setting of rhegmatogenous retinal detachment (RRD). PVR is a devastating complication of RRD that is a main reason for failure to repair. Previous case series reported potential efficacy of IVM for PVR. This study aims to examine outcomes in a cohort of 36 patients.

METHODS Retrospective cohort study of all patients who received IVM for PVR following RRD at a private-practice from March, 2018 and January, 2020. IVM administration schedules were at the treating physician's discretion. Baseline data was collected at the initial visit for RRD and from the initial operation. Baseline data included vision, macular status, and PVR grade. Outcomes data was collected from the most recent visit before August 1, 2020 including vision, macular status, and presence of oil. Exclusion criteria included greater than mild diabetic retinopathy, uveitis, previous major ocular surgery, or follow-up of less than two weeks.

RESULTS 71 eyes were identified, and after exclusion criteria were applied a total of 36 eyes were examined. 19/36 (52.7%) patients were male. At time of treatment, 9 patients had grade B PVR and 24 had grade C PVR. 30/36 (83.3%) had macula-off detachments. On average, patients underwent 2.4 detachment surgeries, not including removal of silicone oil or isolated peeling of epiretinal membranes. They received an average of 4.4 injections of intravitreal methotrexate (range 1-14). Final reattachment rate was 88.8%. Initial visual acuity was 1.70 LogMar (20/1002 Snellen), and average final visual acuity was 1.11 LogMar

(20/257 Snellen). 15/36 (42.9%) were under oil at the final follow-up date. The average follow-up recorded from the most recent IVM was 11.1 months, with an average total follow-up of 17.0 months.

CONCLUSION The perioperative use of IVM for PVR in the setting of retinal detachment in this cohort demonstrated promising reattachment rates and visual acuity improvements at the 11 month mark with an average of 4.4 injections. Further study is warranted, especially regarding the ideal protocol for the implementation of IVM into real-world practice.

IRB APPROVAL No — I received a determination that the study/activity qualified for **exempt status or that it did not require IRB approval** from an IRB or another authorized oversight body *(IRB Exemption Letter may be requested)*.

10/12/2021 8:36AM

Smoking and Increased Risk of PVR: Is Increased TNF-α a Key Causative Factor?

- Ajay E Kuriyan, MD, MS
- Victor Wang
- Alison Heffer, PhD
- Elisa Roztocil, BS
- Collynn Woeler, PhD

OBJECTIVE To study the pathogenesis of the increased risk of prolifertive vitreoretinopathy (PVR) among smokers. Understanding this relationship may help identify pharmacologic targets for therapeutic agents.

PURPOSE Cigarette smoke is the only known modifiable risk factor for PVR, but the mechanism is unknown. In other diseases processes, cigarette smoke drives epithelial mesenchymal transition (EMT), a key pathologic process in PVR, via the TNF-α/NF-κB/Snail pathway. This study examined the impact of cigarette smoke on the proinflammatory TNF-α/NF-κB/Snail pathway in RPE cells and in a mouse PVR model.

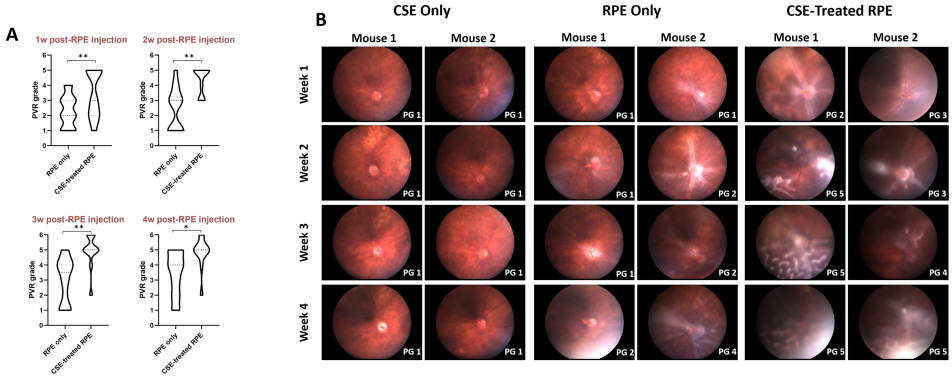
METHODS In vitro, ARPE-19 cells were cultured with 1% concentration of cigarette smoke extract (CSE) . They were harvested after 24 hours and TNF-α, Snail, IL-6, IL-8, and α-SMA levels were analyzed by qPCR and/or western blotting. The impact of pre-treatment with a TNF-α inhibitor (Cas 1049741) or NF-κB inhibitor (Bay-11) was also assessed. Differences in severity of PVR formation was assessed in a murine model of PVR after intravitreal injection of ARPE-19 cells pre-treated with 0.5% CSE compared to controls, using fundus and OCT imaging, and histologic analysis after 4 weeks (n=25).

RESULTS Treatment of ARPE-19 cells with 1% CSE for 24 hours led to a 30-fold increased TNF-α, 130-fold increased Snail, 1.8-fold increased IL-6, and 9.2-fold increased IL-8 expression of mRNA, relative to control media (all $p<0.05$). Western blot analysis was consistent with qPCR results, showing elevated Snail and α-SMA, a key marker of EMT,

after treatment with 1% CSE (7-fold and 5-fold, respectively), compared to control) by 24 hours. Pre-treatment with inhibitors of TNF-α (Cas) and NF-κB (Bay-11) resulted in a significant decrease in CSE-induced of IL-6, IL-8, and Snail mRNA expression (all $p<0.05$). After 4 weeks there was a more severe mean PVR grade (4.82) in mice injected with ARPE-19 cells cultured in 0.5% CSE in a mouse model of PVR, compared to mice injected with ARPE-19 cells cultured in control media (mean PVR grade 3.43, $p<0.05$). On histologic analysis were more makers of EMT in the CSE-cultured RPE cell mice compared to the control media-cultured RPE cell mice.

CONCLUSION Our data suggests that TNF-α plays a key role in driving cigerette smoke-induced RPE cell EMT in vitro and cigerette smoke exposure drives more severe PVR with more EMT marker expression in a mouse model of PVR. TNF-α/NF-κB/Snail pathway is a potential target for inhibiting EMT and PVR progression that warrants further study.

IRB APPROVAL Not applicable — I responded "No" to previous question regarding human subjects.



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PVR Grade ≥5	RPE Only	CSE-Treated RPE	p-value (χ2)
Week 1	0/14 (0%)	5/11 (45%)	<0.01
Week 2	1/14 (7%)	7/11 (64%)	<0.01
Week 3	2/14 (14%)	9/11 (82%)	<0.01
Week 4	4/14 (29%)	9/11 (82%)	<0.05

Figure 3. Intravitreal injection in mice with CSE-treated RPE cells resulted in more rapid and severe PVR development. RPE only injections consisted of 2,000 ARPE-19 cells resuspended in 1uL media (N=14). CSE-treated RPE injections consisted of 2,000 ARPE-19 cells cultured and resuspended in 0.5% CSE (N=11). PVR grades are based on fundus photography. A) Both RPE only and CSE-treated RPE injected eyes developed more severe PVR over time, although CSE-treated RPE injected mice developed significantly worse PVR at every timepoint. B) Representative fundus images of eyes injected with CSE only, RPE only, or CSE-treated RPE at each timepoint. C) Table comparing PVR grades of eyes injected with RPE only or CSE-treated RPE cells, by fraction/percentage of mice with PVR grade ≥5.

Intravitreal injection in mice with CSE-treated RPE cells resulted in more rapid and severe PVR development.

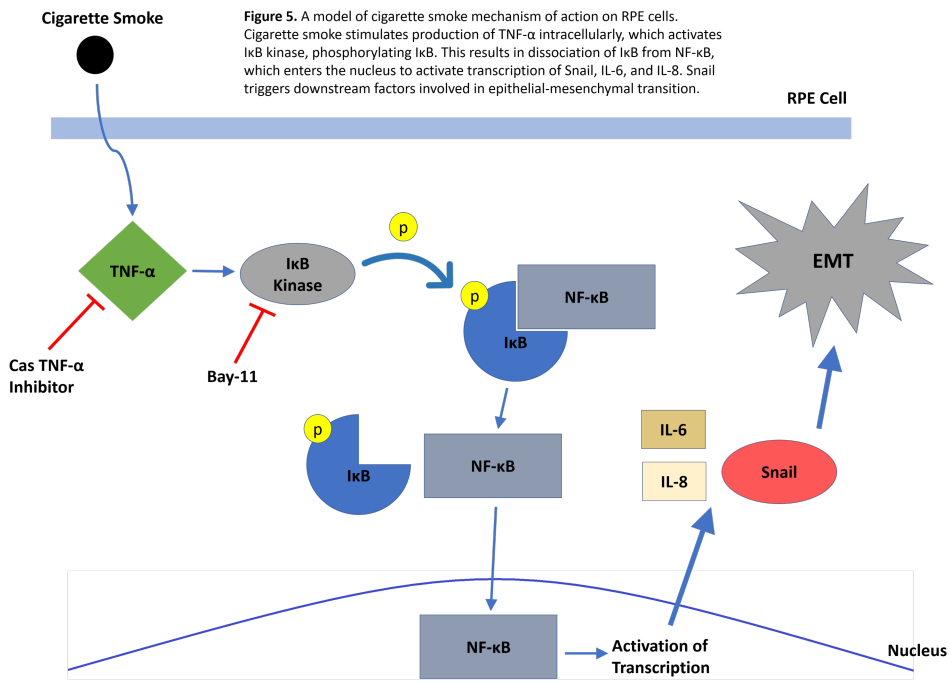
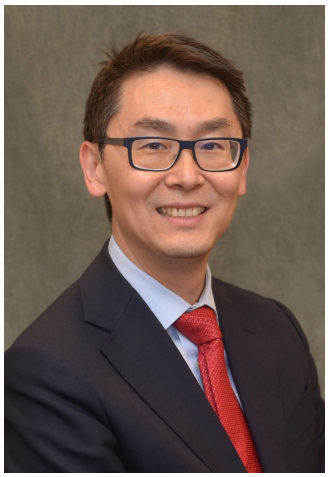


Figure 5. A model of cigarette smoke mechanism of action on RPE cells. Cigarette smoke stimulates production of TNF-α intracellularly, which activates IκB kinase, phosphorylating IκB. This results in dissociation of IκB from NF-κB, which enters the nucleus to activate transcription of Snail, IL-6, and IL-8. Snail triggers downstream factors involved in epithelial-mesenchymal transition.

10/12/2021 8:40AM

Rho-kinase Inhibition on an In Vitro Patient-Derived Model of Proliferative Vitreoretinopathy



- Leo A. Kim, MD, PhD
- Dhanesh Amarnani, MS
- Leslie Ramos
- Joseph Arboleda-Velasquez, MD, PhD

OBJECTIVE What is the effect of Rho-kinase inhibition on patient-derived cells in proliferative vitreoretinopathy?

PURPOSE Proliferative vitreoretinopathy (PVR) is a common cause of recurrent retinal detachment currently lacking medical treatment. Proliferation and migration of PVR cells, the formation of contractile membranes, and subsequent retinal detachment are hallmarks of PVR. This study aims to investigate the effect of Rho-kinase inhibition using an in vitro patient-derived cell and explant model of PVR.

METHODS PVR membranes from human donors were cultured into a single cell suspension creating PVR cell cultures. Explants were made from fragments of PVR membranes embedded into Matrigel. The effect of Rho-kinase inhibitors: ripasudil, netarsudil, fasudil and Y-2762 were tested. We examined the response of these inhibitors on cell proliferation of PVR cell cultures. Cell migration was also measured with treatment of Rho-kinase inhibitors. The activation of RhoA in PVR cells via TGF-β2 was measured using a Rho activation assay. The effect of Rho-kinase inhibitors was also tested on our PVR explants. Phase contrast images were taken at 7 and 14 days, and outgrowths were measured.

RESULTS At 48 hours, ripasudil, netarsudil and fasudil significantly reduced proliferation of PVR cells by 44%, 95%, and 20% at 10μM concentration; 25%, 37% and 39% at 1μM concentration; and 21%, 39%, 24% at 0.1μM concentration. Outgrowths were observed growing from the freshly isolated PVR explant samples at 7 and 14 days (28.58 mm and 207 mm respectively). Ripasudil (0.8 mm and 15 mm), and netarsudil (4.2 mm and 37 mm)

successfully inhibited and reduced explant growth at 7 and 14 days. The explants treated with fasudil and Y-2762 showed no outgrowths at all time points. Rho-kinase inhibitors significantly inhibited the migration of PVR cells. Ripasudil, netarsudil and fasudil significantly reduced migration in PVR cells by 65%, 100%, and 40% respectively. TGF-β2 induced a 1.5 fold increase in RhoA activation compared to control 15 minutes post stimulation, a 2 fold increase over control at 30 minutes, and a slight decrease over control at 60 minutes.

CONCLUSION Currently, there are no specific therapeutic agents to prevent PVR. Using our patient-derived models, Rho-kinase inhibition significantly decreased PVR cell proliferation and migration. Further TGF-β2 stimulation of PVR cells induced RhoA activation indicating activation of the Rho-kinase pathway. These data suggest that the Rho-kinase pathway may be targeted for the treatment PVR.

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.

10/12/2021 8:54AM

Contemporary Management of Complex and Non-complex Rhegmatogenous Retinal Detachment Due to Giant Retinal Tears

- Thomas J Wubben, MD, PhD
- Katie Xiaoou Li
- Nicholas Michael Carducci, MD
- Omar Moinuddin, MD
- Yunshu Zhou, MS
- David C Musch, PhD, MPH
- David N. Zacks, MD, PhD
- Cagri G Besirli, MD, PhD, FASRS

OBJECTIVE To investigate the clinical features and surgical outcomes of complex and non-complex rhegmatogenous retinal detachment (RRD) associated with giant retinal tears (GRTs) at a tertiary referral center.

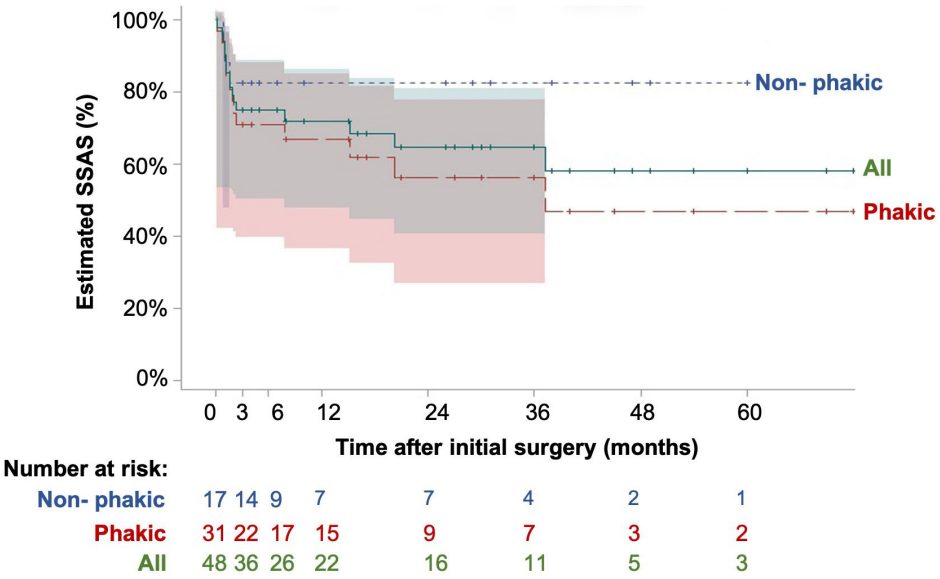
PURPOSE Multiple case series have examined the outcomes of GRT-associated RRDs. The applicability of the conclusions from these series is limited by the exclusion of trauma, children, and proliferative vitreoretinopathy (PVR). Thus, an unmet need exists for an assessment of all-encompassing GRTs. This study assessed the functional and anatomic outcomes of surgical repair for complex and non-complex GRTs.

METHODS A retrospective, non-consecutive interventional case series of GRT-associated RRDs that underwent primary surgical repair at a tertiary referral center between January 1, 2011 and July 1, 2020. The aggregated data included children, subjects with history of trauma including open-globe injury, hereditary vitreoretinopathies, or those with PVR-C at baseline. Clinical characteristics and preoperative, perioperative, and postoperative data were collected. Kaplan-Meier analysis was used to estimate the long-term probability of sustained reattachment. Functional success was represented by change in visual acuity (VA) from baseline to the most recent follow-up.

RESULTS 48 eyes of 47 patients with GRTs were included, including those that were children (<12 years, N=4, 8%), had a history of trauma (N=20, 42%) or had PVR-C (N=7, 15%). Median age was 46 years (range: 4 to 72 years), median follow-up was 28 months (range: 3-124 months), and 83% (N=40) of subjects were male. Primary repair included PPV (N=40, 83%), SB (N=1, 2%), or combined PPV/SB (N=7, 15%). Surgery commonly involved use of perfluorocarbon liquid (N=43, 90%) and gas tamponade (N=39, 81%). Single surgery anatomic success (SSAS) was 75% (95% CI: 60%, 85%) at 3 months and 65% (95 CI: 47%, 78%) at 2 years. Non-phakic eyes had an 82% (95% CI: 55%, 94%) SSAS at 3 months and 2 years while phakic eyes had a SSAS of 71% (95% CI: 52%, 84%) and 56% (95% CI: 35%, 73%) at 3 months and 2 years, respectively (log-rank p=0.15). Final anatomic success was achieved in all eyes. Median VA improved from 20/250 preoperatively to 20/60 at final follow-up, with 44% of eyes achieving a VA of 20/40 or better.

CONCLUSION In this series from a tertiary referral center, both complex and non-complex GRT-associated RRDs were most commonly managed with PPV alone, perfluorocarbon liquid, and gas tamponade. The results demonstrate that contemporary repair of some of the most complicated GRTs, including those associated with trauma, PVR, and children, lead to high rates of anatomic and functional success.

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.



Kaplan-Meier estimates of sustained retinal attachment. Dotted blue line: the Kaplan-Meier analysis of single surgery reattachment in the non-phakic group. Red line: the Kaplan-Meier analysis of single surgery reattachment in the phakic group. Green line: the Kaplan-Meier analysis of single surgery reattachment of all patients. Text under graph indicates the number available at defined time intervals. 95% Hall-Wellner Bands denote 95% confidence intervals.

10/12/2021 8:58AM

Real-World Trends in Surgical Care for Retinal Detachment Repair Among Vitreoretinal Surgeons in the United States

- Avni P Finn, MD, MBA
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- Katherine E Talcott, MD
- Prethy Rao, MD, MPH

OBJECTIVE To describe variations in current surgical practice patterns among retinal surgeons in the United States managing retinal detachment repair.

PURPOSE Variation in surgical techniques amongst surgeons is well established. This may be due to a lack of consensus among practitioners regarding optimal care patterns. This study was designed to survey current practices among vitreoretinal surgeons in the United States (US) to identify variations in anesthesia, wound care, and post-operative recommendations.

METHODS This was a US-based cross-sectional survey of retina specialists. Respondents completed a 48 question, anonymous, internet-based survey querying practice patterns related to wound closure, post-operative medications, anesthesia, post-operative appointment timing, positioning, and activity restrictions. Statistical analysis was performed to assess for trends in the variation in surgical care recommendations by number of years in independent practice after fellowship; practice type; geographic region; and number of cases performed per day. Chi-squared test was used to assess for significant variation. A p-value < 0.05 was considered significant.

RESULTS 298 total responses were received. 28% of respondents had > 20 years (yrs) of experience, 34% for 6-20 yrs, 38% for 5 yrs or less. 60%, 23%, and 16% were in private, academic, and hybrid practice respectively. For anesthesia blocks: 59% perform retrobulbar, 20% peribulbar, and 20% subtenon's (ST). ST block use varied significantly by yrs of experience ($p<0.0001$). 60% perform primary scleral buckles (SB), 55% combined

SB/pars plana vitrectomy (PPV) and 11% primary PPVs under GA, respectively. GA use for primary SB varied significantly by yrs of experience and practice setting (p-values: 0.0007 and 0.003). 62% recommend face down positioning for macula-off detachments and 49% for macula-on detachments. 95% of surgeons restrict patient activities after surgery. 46% of surgeons do not advise stopping blood thinners before surgery and this varied significantly by yrs of experience and practice type (p=0.002 and 0.031).

CONCLUSION This study provided real world trends in surgical care variation among retina surgeons in the United States. There is significant variation in type of block performed, anesthesia, and recommendations for blood thinner cessation during surgery with years out in independent practice having the largest impact.

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.

Table 2: Statistical Analysis of Survey Responses Stratified by Years of Experience
(Percentages listed are categorized by years of experience)

	<5 years	**6-20 years**	**>20 years**	**P=value[+]**
	n (%)	n (%)	n (%)	
Type of Block				
Retrobulbar	49 (42%)	66 (66%)	61 (75%)	<0.0001
Peribulbar	26 (23%)	19 (19%)	14 (17%)	
Cutdown/Subtenon's	40 (35%)	15 (15%)	6 (7%)	
Anesthesia for Primary SB				
MAC with Block	33 (29%)	47 (46%)	39 (48%)	0.007
General	82 (71%)	55 (54%)	42 (52%)	
Anesthesia for SB/PPV				
MAC with Block	40 (35%)	54 (53%)	41 (51%)	0.015
General	75 (65%)	48 (47%)	40 (49%)	
Anesthesia for PPV				
MAC with Block	108 (94%)	91 (89%)	66 (80%)	0.013
General	7 (6%)	11 (11%)	16 (20%)	
Stopping any pre-operative blood thinners				
Yes	10 (9%)	20 (19%)	25 (30%)	0.002
No	69 (59%)	48 (45%)	33 (39%)	
Depends	38 (32%)	38 (36%)	26 (31%)	

SB= scleral buckle, PPV=pars plana vitrectomy, MAC=monitored anesthesia care
[+]Statistical analysis is chi-squared test

Statistical Analysis of Survey Responses Stratified by Years of Experience(Percentages listed are categorized by years of experience)

10/12/2021 9:02AM

Impact of the COVID-19 Pandemic on Characteristics of Retinal Detachments: The Canadian Experience

- Parnian Arjmand, MD, MSc, FRCSC
- Fahmeeda Murtaza, BSc
- Arshia Eshtiaghi
- Marko Popovic, BHSc Candidate
- Peter J. Kertes, MD, FRCS(C)
- Kenneth T. Eng, MD, FRCS(C)

OBJECTIVE Did the COVID-19-related restrictions impact characteristics and outcomes of retinal detachments?

PURPOSE To describe the impact of the coronavirus disease 2019 (COVID-19) pandemic on the characteristics of retinal detachments (RD) at a tertiary centre.

METHODS Retrospective non-randomized non-masked consecutive case series. 190 eyes of 188 patients with primary, rhegmatogenous RD who presented over a 1-year period (September 14, 2019 to September 13, 2020) with at least 1 month of follow-up following pneumatic retinopexy, or at least 6 weeks after pars plana vitrectomy (PPV), scleral buckle (SB), or combined PPV/SB. Exclusion: history of pre-existing maculopathy, amblyopia or prior RD. The relationship between demographic, anatomic, and visual acuity parameters were compared before and after onset of the pandemic using generalized estimating equations. Main outcome measures: Macular status and corrected distance visual acuity on presentation.

RESULTS One hundred and eighty-seven eyes, divided into 2 cohorts: pre-COVID (n = 100 September 14, 2019 to March 13, 2020) and post-COVID (n = 87, March 14, 2020 to September 13, 2020). Of the eyes, 63.2% (n = 87) presented with macular detachment in the post-COVID group compared with 45% (n = 100) in the pre-COVID group (odds ration [OR], 2.14; 95% confidence interval [CI],1.19-3.86; p = 0.011). As well, eyes in the pre-pandemic cohort had significantly fewer detached quadrants on initial examination (OR, 0.53; 95% CI, 0.30-0.93; p = 0.026). Patients in the post-COVID group had a significantly

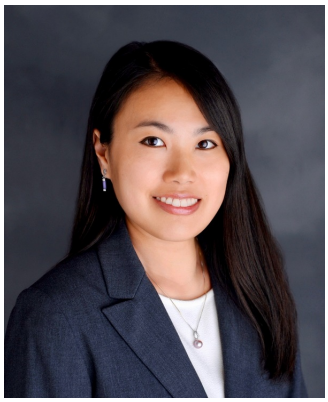
worse corrected distance visual acuity at baseline (mean difference [MD] = -0.35 logMAR, 95% CI, -0.60 to -0.09; p = 0.008), but not at 1 month or at final follow-up. No differences were seen between groups with respect to demographics, lens status, treatment, time to presentation, or chronicity. Pneumatic retinopexy was the most commonly performed procedure in both cohorts, with a 71.5% success rate.

CONCLUSION Closures after the COVID-19 pandemic affected the characteristics of RDs at presentation with respect to macular detachment, extent of RD, and presenting visual acuity. At final follow-up, final visual acuity and anatomic outcomes were similar between the 2 groups. These data are helpful for future patient education, triaging, and treatment decision making.

IRB APPROVAL Yes — *IRB Approval Letter may be requested*.

10/12/2021 9:06AM

Opportunity Cost of Retinal Detachment Surgery Versus Office-Based Patient Care



- Ella H Leung, MD
- Henry A Leder, MD
- Shriji Patel, MD
- Rahul K. Reddy, MD, MHS
- Nick Boucher
- Jill F. Blim, MS
- Chakshu Sharma
- Paul Hahn, MD, PhD, FASRS

OBJECTIVE To evaluate physician cost for retinal detachment repair surgery relative to office-based patient care.

PURPOSE To determine the opportunity cost of physician work in retinal detachment (RD) surgery and perioperative patient management compared to office-based patient care in equivalent time.

METHODS A theoretical model from a physician perspective was constructed for vitrectomy surgery for RD repair (CPT code 67108) based on the 2021 physician reimbursement rates measured in work relative value units (wRVU) set forth by the Centers for Medicare and Medicaid Services (CMS). In the reference case, valuation for office-based patient care was modeled with a physician seeing 40 patients per 8 hour day using real-world Vestrum Health practice data. In the probability sensitivity analyses, the surgical time, perioperative time, clinical volumes (30-50 patients per day), follow-up visits, costs, and incidences of complications were varied.

RESULTS The current CMS reimbursement for the physician work component for 67108 is 17.13 wRVUs, based on 90 minutes of surgery time, with a conversion factor of $34.89 per RVU. Based on a Vestrum-derived mean of 2.60 wRVUs per encounter, a physician who sees 40 patients per day with 5 postoperative visits in the global period could produce 36.1 wRVU in the office during the equivalent period, which translates to an overall opportunity

cost of 52.6% of potential office-based productivity (53% preop, 39% intraop, and 74% postop). This disparity existed even for the least busy clinician modeled (30 patients per day). Postoperative complications resulted in higher modeled physician costs. In threshold analyses, a surgeon in the reference case would have to complete the surgery, including perioperative paperwork, patient counseling, and turnover time within 55 minutes and be limited to 1.32 postoperative visits to equal the CMS valuation.

CONCLUSION Current CMS reimbursement for retinal detachment surgery results in a significant opportunity cost for the physician, particularly for more efficient clinicians. Postoperative complications may increase the loss. Further reductions in surgery reimbursement relative to office-based patient care could widen the disparity.

IRB APPROVAL Not applicable — I responded “No” to previous question regarding human subjects.