7/16/2022 01:55 pm

Surgery Symposium 6

Pathophysiology and Implications of Outer Retinal Corrugations in Rhegmatogenous Retinal Detachment

- Rajeev Muni, MD, MSC, FRCS(C), FASRS
- Masoud Norouzi Darabad, PhD
- Paola Oquendo, MD
- Wei-Wei Lee
- Isabela Melo
- Aditya Bansal, MD

Objective:
To understand the pathophysiology and the implications of outer retinal corrugations (ORCs) in rhegmatogenous retinal detachment (RRD).

Purpose:
ORCs in RRD that do not fully resolve prior to retinal reattachment may lead to the development of outer retinal folds which are associated with worse functional outcomes. The purpose of this study is to investigate the dynamic evolution of ORCs in vivo with multimodal imaging and human eye mathematical models.

Methods:
Prospective cohort study. Eyes with RRD that underwent repair were assessed longitudinally with multimodal imaging at baseline and at frequent intervals for up to 3 months post-operatively. We observed the evolution and resolution of ORCs with swept-source optical coherence tomography (SS-OCT) and/or ultra-widefield guided SS-OCT and developed human eye mathematical models to formulate a novel theory on the pathophysiology of ORCs. The primary outcome was the relationship between RPE control of the subretinal space and presence of ORCs.

Results:
Fifty-four eyes in 50 patients were assessed and followed. 33 patients were fovea-off at presentation with a mean duration of fovea-off of 6.8 days (SD=7.1) and 2.2 (SD=0.8) detached quadrants. 61.1% (33/54) of eyes had ORCs and 38.9% (21/54) had no ORCs at presentation. Mean baseline logMAR visual acuity was 1.55 (SD= 0.79) and 0.46 (SD= 0.43) in patients with and without ORCs at baseline ($p<0.0001$).

100% (33/33) of eyes at baseline with ORCs had complete and acute loss of RPE control with a substantial RRD (>=2 clock hours) vs 19.0% (4/21) of patients with no ORCs ($p<0.001$). In these 4 cases with acute loss of RPE control and no ORCs it was noted that the duration of retinal detachment was very short (<2 days in all cases). Among the remaining 17 eyes without ORCs the RPE was still in relative control of the subretinal space in all cases.

Mathematical models indicate that the ratio of the modulus of elasticity of the outer retina to that of the inner retina ([endif]-->) needs to be of the order of magnitude of 0.1 or smaller to develop the observed corrugation frequency. Also the height of the detachment has to be below a specific critical height for ORCs to develop. This critical height is proportional to the basal dimensions of the RRD.

Conclusion:
This prospective study describes a novel dynamic RPE-control theory of ORCs in RRD with the use of in vivo multimodal imaging in humans and human eye mathematical models. The study demonstrates that RRDs with loss of RPE-control for more than 2 days are more likely to develop ORCs. Clinical observations and mathematical models suggest that exposure of the outer retina to liquefied vitreous for more than 2 days leads to a structural change in the outer retina with mathematical models suggesting a greater than 10 fold reduction in the modulus of elasticity of the outer retina relative to the inner retina. Furthermore, the RRD has to have a height below a critical height to develop corrugations. Understanding the pathophysiology of ORCs could lead to a modification of vitreoretinal surgical approach and timing for RRD repair that allow ORCs to resolve prior to reattachment or to be prevented in the first place.

IRB APPROVAL Yes

7/16/2022 02:01 pm

Surgery Symposium 6

Repair of Progressive Retinal Detachment Complicating Degenerative Retinoschisis: Surgical Management and Outcomes in Phakic Eyes

- J. Fernando Arevalo, MD, PhD, FACS, FASRS
- Bradley Beatson, BS
- Alex Pham, BS
- Sally Ong, MD
- Ishrat Ahmed, MD, PhD
- James Handa, MD

Objective:
The objective herein is to analyze the anatomic and functional outcomes of PSRDCR and retinal re-detachment in 18 phakic eyes (17 patients) that were repaired with SB, PPV, or a combined PPV/SB procedure.

Purpose:
Degenerative retinoschisis is a common condition defined by the splitting of the neurosensory retina that may rarely be associated with progressive retinal detachment (RD). Here, we aim to describe the anatomic and functional outcomes of surgical treatment of progressive symptomatic retinal detachment complicating degenerative retinoschisis (PSRDCR) using pars plana vitrectomy (PPV), scleral buckle (SB), or combined PPV/SB procedure.

Methods:
A retrospective chart review of patients with PSRDCR between Jan 1, 2008-Dec 31, 2019 was conducted. Data regarding demographics, surgical approach, and anatomic/functional outcomes were collected.

Results:
Of the 4973 charts with RD repair during the study period, 36 eyes (0.7%) had retinoschisis with RD. 18 eyes met inclusion criteria (0.4%). The median age was 54 years (range 18 to 74) and all eyes were phakic. All eyes had outer layer breaks (OLBs) and 16 eyes (89%) had identifiable inner layer breaks. All OLBs were posterior to the equator in charts where position was recorded (16 eyes). The single surgery anatomic success (SSAS) and final anatomical success rates were 66% (12/18) and 100%, respectively. Eyes treated with PPV/SB had an SSAS rate of 75% (9/12), while PPV and SB had SSAS rates of 66% (2/3) and 33% (1/3), respectively.

Conclusion:
PSRDCR is an exceedingly rare complication of degenerative retinoschisis associated with an SSAS rate lower than for uncomplicated rhegmatogenous RD. The majority of PSRDCR were repaired via combined PPV/SB in our study, and the rarity of this complication limits statistical support of an optimal surgical method in our and prior studies. The role of SB combined with PPV for PSRDCR requires further investigation.

IRB APPROVAL Yes

7/16/2022 02:07 pm

Surgery Symposium 6

Proliferative Choroidopathy: Clinical Presentation and Surgical Pearls in Complex Retinal Detachment with Advanced Proliferative Vitreoretinopathy

- Flavio Rezende, MD, PhD

Objective:
To describe the clinical presentation and spectrum of choroidal changes in complex retinal detachment associated with advanced proliferative vitreoretinopathy.

Purpose:
To describe the clinical presentation, spectrum of choroidal changes named here proliferative choroidopathy, its surgical approach and caution steps to avoid potentially deadly complications in cases of advanced proliferative vitreoretinopathy in eyes with complex retinal detachment.

Methods:
This was a single-surgeon, retrospective, observational, case series conducted in accordance with the tenets of the Declaration of Helsinki. Medical records from the Department of Ophthalmology at Maisonneuve-Rosemont Hospital, University of Montreal, Quebec, Canada and São Vicente de Paulo Hospital, Rio de Janeiro, Brazil were screened for patients who underwent PPV for retinal detachment associated with advanced proliferative vitreoretinopathy (PVR) between January, 2008 and January 2019. Eyes with choroidal stiffness changes, named here proliferative choroidopathy, that interfered with retinal reattachment despite $\geq$ 180 retinectomy were identified. Pre- and intra-operative clinical characteristics, associated ocular/systemic conditions, intra- and post-operative complications, and surgical outcomes at last visit were analysed.

Results:
Among the 350 eyes with advanced PVR screened, 6 eyes (1.71%) presented with proliferative choroidopathy. All eyes required relaxing choroidectomy because the choroidal stiffness kept the retina from reattachment, despite $\geq$ 180 retinectomy. Two different patterns were identified: Group 1- In two eyes with vascular retinopathies (1 with Eales disease and 1 with history of retinopathy of prematurity) and chronic tractional/rhegmatogenous retinal detachment, the choroidal stiffness was associated with shallow choroidal detachment. Group 2- Four eyes had recurrent retinal detachment with associated bullous serous and/or hemorrhagic choroidal detachment. Typical feature in these eyes was persistent choroidal detachment despite drainage and use of perfluorocarbon liquid. A choroidal hole was identified with endoscopy in all four eyes. All eyes in both groups had very limited visual outcomes (counting fingers or worse) despite retinal reattachment under silicone oil. The first case in Group 1 evolved with fatal pulmonary air embolism at the conclusion of the surgery.

Conclusion:
Proliferative choroidopathy is a rare presentation in eyes with complex rhegmatogenous retinal detachment and advanced proliferative vitreoretinopathy with very limited surgical outcomes. Surgical tips will be provided for choroidectomy techniques and how to avoid air embolism from choroidal vessels exposure.

IRB APPROVAL Yes

7/16/2022 02:13 pm

Surgery Symposium 6

Retinal Detachment Associated With Giant Retinal Tears in 2 Stages Using Short-Term Tamponade With Perfluorocarbon Liquid Against Single-Stage Vitrectomy

- Naresh Kannan, MS, FNB(V R),MBA (H R),FASRS,
- Sagnik Sen, MD
- Piyush Kohli
- Bhavani Sankaran, MD

Objective:
Comparing the outcomes of pars plana vitrectomy of retinal detachments associated with giant retinal tears in two stages using short term tamponade with perfluorocarbon liquid (PFCL) against single-stage vitrectomy

Purpose:
To compare outcomes of pars plana vitrectomy of retinal detachments associated with giant retinal tears in two stages using short term tamponade with perfluorocarbon liquid (PFCL) against single-stage vitrectomy

Methods:
This prospective interventional study included all patients with retinal detachment associated with giant retinal tear. Patients underwent either the conventional single stage surgery or two-stage surgery with a short-term PFCL endotamponade. The primary outcome measure of the study was anatomic reattachment at the final postoperative visit. Intraoperative and postoperative complications, final visual acuity improvement, resurgery rate, PVR changes and intraocular pressure were noted as secondary outcomes.

Results:
Thirty eyes of 30 patients (25 male, 5 female) were included in this study. Average age was 41.6 +- 16.5 years. 20/30 eyes (66.7%) had total retinal detachment with GRT and 10/30 eyes (33.3%) had subtotal detachment with GRT. All eyes had detached macula. 12 eyes underwent single stage surgery and 18 eyes had two staged surgery. The final attachment rate was 83% in 2-stage group versus 75% in 1-stage group. The median duration of follow-up was 8.43+-2.79 months. Visual acuity improved from 1.87+-0.5 logMAR at baseline to 1.26+-1.00 logMAR at final follow-up in 2-stage surgery group and from 2.01+-0.6 logMAR at baseline to 1.54+-0.71 logMAR at final follow-up in 1-stage surgery group.

Conclusion:
The outcomes of 2-stage surgery in our series was marginally better anatomically and functionally. With the 2-stage surgery, there is no risk of slippage of the retina posterior to the GRT and immediate postoperative positioning is not necessary for retinal attachment. Moreover, with the 2-stage surgery, the controversies regarding usage of scleral buckle can be obviated.

IRB APPROVAL Yes

7/16/2022 02:17 pm

Surgery Symposium 6

Surgical Outcomes of Rhegmatogenous Retinal Detachment in Patients 30 Years of Age or Younger at 3-Month, 1-Year, and 5-Year Follow-ups

- Samuel Minaker, MD, MSc
- Sarah Abdel-Hadi
- Makena Parker, BA, M Phys
- Mathew MacCumber, MD, PhD

Objective:
The primary objective of this study is to investigate associations as well as short- and long-term outcomes in patients under 30 years of age with rhegmatogenous retinal detachment.

Purpose:
The purpose of this study is to investigate the associations with and surgical outcomes of rhegmatogenous retinal detachments in young adults with three months, one and five years of follow up. Patients in this age group often have concerns about the long-term implications of this condition, cataract formation, short- and long-term complications, the likelihood of redetachment and during what period they may be at highest for this. Currently in the literature, there are no great answers to these questions.

Methods:
A retrospective consecutive case series of patients 30 years of age or younger who underwent surgical repair for RRD between 2014 and 2021 at a single practice (12 offices).

Results:
101 patients (109 eyes) were included with at least 3 months of follow up. 67 patients (74 eyes) and 17 patients (19 eyes) were followed for at least 1 year and 5 years respectively. The most common association was myopia 66 eyes (60.1%) followed by trauma 8 eyes (7.3%) and prior ocular surgery 7 eyes (6.4%). Median pre-op Snellen visual acuity was 20/40. The macula was attached in 31 eyes. Five eyes (4.6%) presented with giant retinal tear detachments. The most common method of surgery was Scleral buckle alone (SB) in 71 eyes followed by Vit buckle in 29 eyes and PPV alone in 8 eyes. Single surgery anatomical success was 88.7% for SB, 89.7% for SB/PPV and 75% for PPV. The median final post-operative Snellen visual acuity was 20/30. 12 Patients presented with bilateral retinal detachments and the most common treatment was sequential surgery in 8 patients followed by 4 patients who underwent surgery with laser barricade in the fellow eye. 14 eyes developed a retinal tear or detachment in the fellow eye with a mean interval of 8 months from presentation, the longest interval was 3 years and 11 months. Of the 17 patients that were followed for at least 5 years, 3 patients (17.6%) developed a retinal tear or detachment in the fellow eye. After initial anatomical success 4 eyes (3.6%) developed redetachment with the most common cause being proliferative vitreoretinopathy. The longest interval of redetachment from initial repair was 9 months.

Conclusion:
The most common association of rhegmatogenous retinal detachment in this study was myopia. Scleral buckle was the most common surgical intervention. Outcomes were generally favorable. Surgeons and patients should be aware of the risk of bilateral retinal detachment as well as the risk of retinal tear and detachment in the fellow eye. Patients require long term surveillance in both eyes.

IRB APPROVAL Yes

7/16/2022 02:33 pm

Surgery Symposium 6

Localization of the Internal Limiting Membrane Flap After Macular Hole Surgery.

- Homayoun Tabandeh, MD, FASRS
- Christine Morozova, BS
- Andy Morozov, BS
- Dan Kamen, BA
- Rossella Favale, MD
- Jin Zhang, MD
- Mark Walsh, MD, PhD
- Francesco Boscia, MD
- David Boyer, MD

Objective:
To evaluate the status of the internal limiting membrane (ILM) flap following various ILM flap techniques for macular holes (MH).

Purpose:
ILM flaps may be unstable and susceptible to intra and post-operative displacement.

Postoperative position of the flap relative to the MH has not been studied extensively. The current study evaluates ILM flap status following MH surgery.

Methods:
Retrospective case series including eyes that underwent pars plana vitrectomy (PPV) and ILM flap for MH. The flap techniques included conventional ILM flap (C-ILM), temporal ILM flap (T-ILM), superior wide-base ILM flap transposition (SWIFT), and pedicle ILM flap (P-ILM). Postoperative imaging included ICG fluorescence imaging (ICG-FI) and optical coherence tomography (OCT).

Results:
49 eyes of 40 patients, mean age 68.3 years, with mean follow-up of 10.3 months were included in the study. Ten (20%) eyes were highly myopic, 22 (45%) eyes had chronic MH, and 7 (14%) eyes had history of prior MH surgery. The ILM flap technique included C-ILM / T-ILM (22 eyes), SWIFT (25 eyes), and P-ILM (2 eyes).

The MH closed in 46 (94%) eyes. ICG fluorescence attributable to ILM flap was detected in all eyes, however, in 3 eyes the flap borders were not discernable. The ILM flap covered the MH completely in 36 (75%) eyes, partially in 7 (15%) eyes, and provided no coverage in 5 (10%) eyes. In 1 eye it was not possible to ascertain coverage on ICG-FI or OCT. In the 2 eyes with P-ILM the ICG-FI showed a displaced flap with no coverage of the MH.

In cases with closed MH, OCT demonstrated intraretinal ILM fragments in 5 (23%) eye in I-ILM /T-ILM groups, and in none of the eyes in SWIFT or P-ILM groups. Imaging with ICG-FI / OCT showed folding of the ILM flap in 14 (64%) eyes in I-ILM / T-ILM group, in 6 (24%) eyes in SWIFT /P-ILM group, and in 1 eye in P-ILM group.

Conclusion:
ILM flap techniques are associated with a high MH closure rate and are useful in the management of MHs with high-risk characteristics. Postoperative multimodal imaging including ICG-FI and OCT indicates good coverage of the MH by the ILM flap in the majority of the cases.

IRB APPROVAL No - exempt

7/16/2022 02:37 pm

Surgery Symposium 6

Transretinal Subretinal Fluid Injection Technique for Refractory or Chronic Large Macular Holes

- Gregory Lee, MD
- Yogin Patel, MD

Objective:
To demonstrate a new technique for subretinal fluid injections for new large chronic macular holes, or recurrent/unclosed macular holes with previous internal limiting membrane peel.

Purpose:
There are many techniques currently being used for chronic large macular holes with good surgical closure rates. Subretinal saline injections have been demonstrated to be a helpful adjucntive technique but some surgeons may not have subretinal injection equipment readily available or may have hesitation to do subretinal injections due to RPE or subretinal hemorrhage complication risks. This novel technique demonstrates the use of a soft tip cannula on proportional reflux to inject fluid trans-retinally into the subretinal space with good surgical success, and no complications of eccentric macular holes, retinal detachments, subretinal hemorrhage, or retinal/RPE effects as demonstrated on follow up autofluorescence

Methods:
Retrospective review of 10 patients who had previously undergone macular hole surgery with vitrectomy, internal limiting membrane peel and gas tamponade but failed to close their hole (2), or had large chronic previously untreated macular holes, who were treated with a pars plana vitrectomy, wider internal limiting membrane peel, subretinal injections of balanced salt solution, and gas fluid exchange. The subretinal injections were performed using a novel technique utilizing the soft tip cannula filled with balanced salt solution on proportional reflux against an area of the retina where internal limiting membrane had previously been peeled, without piercing the retina or needing a subretinal needle.

Results:
10 out of 11 holes closed. The average size of the holes was 587 microns for the large chronic untreated macular holes, none of which had concurrent vitreomacular traction. The average time to surgery from initial vitrectomy for the recurrent/recalitrant holes was 1 month. In the recurrent holes, 12% C3F8 gas was used in 2 cases and 20% SF6 in 1, while in the large chronic untreated group, there were 2 surgeries which utilized 12% C3F8 and 8 which utilized 20% SF6. In all surgeries the internal limiting membrane was peeled wider, and the parafoveal area was confirmed to be free of any residual epiretinal membrane or internal limiting membrane. The hole that failed to close was 849 microns wide, the largest in the series. Follow up OCT at 3-6 months showed interrupted ellipsoid and external limiting membrane bands in the area of the previous holes. Visual acuity improved in all cases of the large chronic untreated group. Visual acuity in the recurrent/recalictrant holes was unchanged from initial presenting vision prior to their first macular hole surgery. Follow up autofluorescence demonstrated no abnormal hyper- or hypo-autofluorescence in the area of the subretinal injections.

Conclusion:
A new technique on an existing concept of subretinal saline injections was successfully used to close the holes in large chronic untreated macular holes and was a useful technique in eyes which had previously undergone internal limiting membrane peel and had failed to close. The technique utilizes equipment already included in most vitrectomy surgeries without additional risk of retinal injury or subretinal hemorrhage, which can occur in subretinal needle techniques. This method can be used as an adjunctive technique to increase the rate of hole closure in macular holes which are generally more difficult to close.

IRB APPROVAL No - no IRB or exemption

7/16/2022 02:41 pm

Surgery Symposium 6
Nasal Crowding and Nasal Tilting of the Macula After Epiretinal Membrane Surgery

- Kyu Hyung Park, MD
- Ki Won Jin, MD
- Seok Hyun Bae

Objective:
Is the 2-dimensional nasal movement of the foveal tissue the only structural change after epiretinal membrane surgery?

Purpose:
To identify postoperative deviation of macula after epiretinal membrane surgery and investigate its effect on visual acuity and metamorphopsia

Methods:
Design: Retrospective cohort study of a single tertiary referral hospital in South Korea

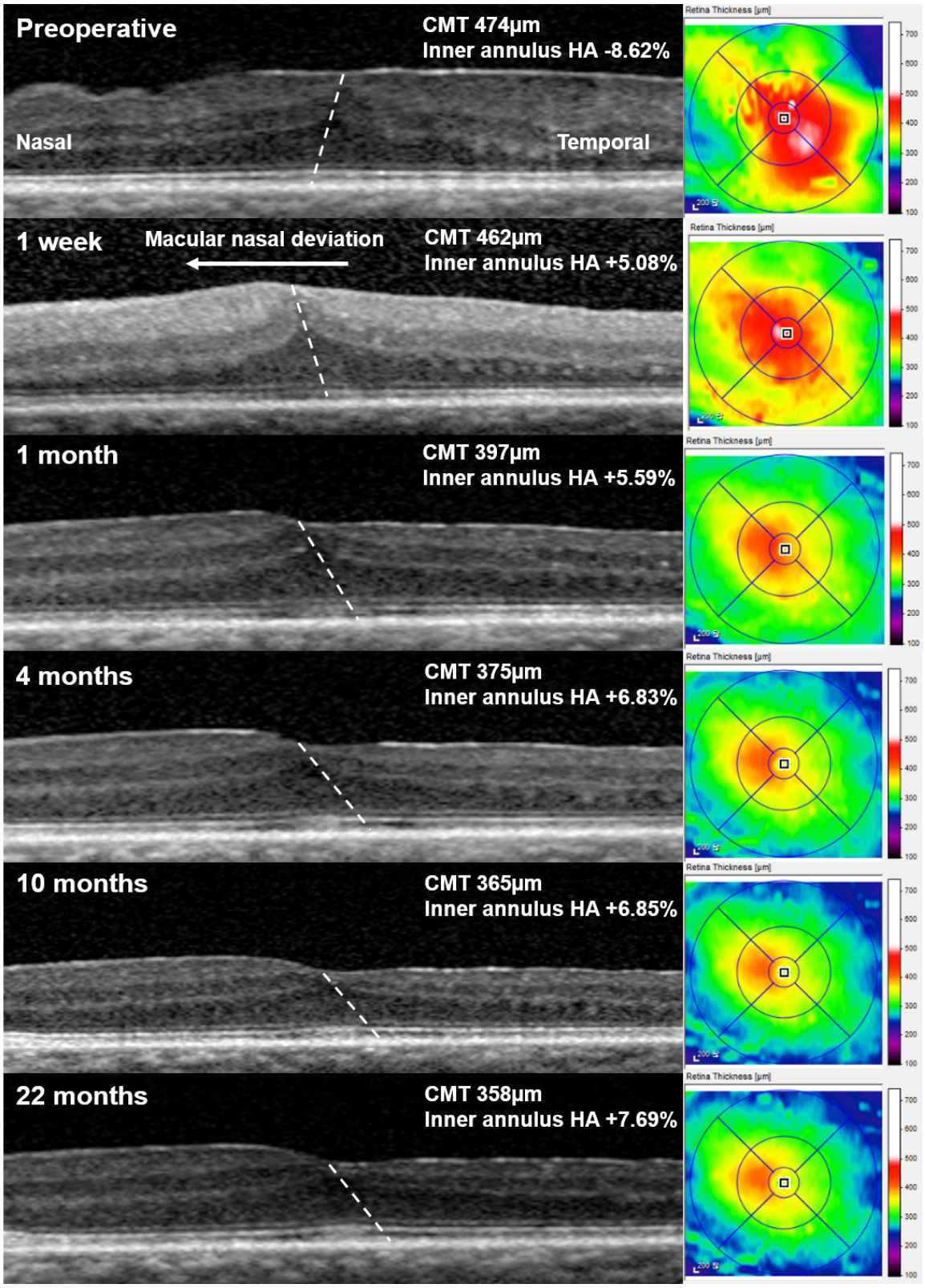
Participants: Patients with unilateral idiopathic epiretinal membrane who underwent epiretinal membrane removal (postoperative follow-up >12 months)

Main Outcomes and Measures: Postoperative macular deviation was evaluated using the following parameters: disc margin-to-fovea distance, foveal angle, horizontal and vertical asymmetry of retinal thickness and volume. Horizontal and vertical asymmetry was defined as percentile asymmetry of thickness or volume on the horizontal plane (between nasal and temporal quadrant) and vertical plane (between superior and inferior quadrant), respectively. The association between postoperative changes in macular deviation parameters and best-corrected visual acuity and metamorphopsia were evaluated. Baseline and postoperative parameters were compared in patients with mild epiretinal membrane and severe epiretinal membrane.

Results:
Data from 102 eyes (102 patients) with a mean follow-up duration of 21.14 months were analyzed. Disc margin-to-fovea distance and foveal angle decreased with time, and only horizontal, not vertical, asymmetry of thickness and volume increased with time, showing nasal crowding. Postoperative changes of disc margin-to-fovea distance and horizontal asymmetry of thickness and volume at both the inner and outer annulus were associated with visual acuity. Compared with mild epiretinal membrane eyes, eyes with severe epiretinal membrane showed more temporal-deviated horizontal asymmetry of both thickness and volume preoperatively, and greater postoperative nasal deviation.

Conclusion:
Postoperative nasal crowding and nasal tilting after epiretinal membrane removal was quantitatively identified with longitudinal en-face or volumetric evaluation of foveal morphology. The causal layers for nasal deviation might be the inner retinal layers, as the foveal angle decreased with time, resulting in nasal tilt. Postoperative disc margin-to-fovea distance shortening and nasal-deviated horizontal asymmetry were correlated with postoperative best-corrected visual acuity improvement.

IRB APPROVAL Yes



Postoperative nasal crowding and tilting of foveal tissue after epiretinal