7/28/2020 12:15PM

Multilayered Inverted Internal Limiting Membrane Flap - A Unique Technique for Closure of Large Macular Holes

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OBJECTIVE To study the outcomes of Multilayered Inverted Internal Limiting Membrane(ILM) flap in large Macular Holes(MH)(>700µ) using intraoperative optical coherence tomography.

PURPOSE To study visual and anatomical outcomes of this unique Multilayered Inverted ILM flap technique in closure of large Macular Holes(MH)(>700µ).

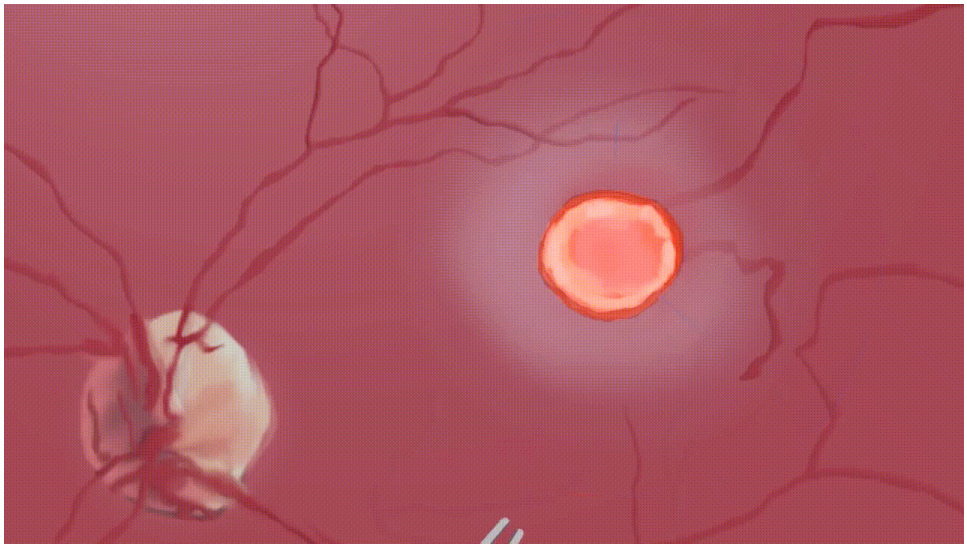
METHODS Prospective interventional study of 103 eyes of 99 patients of large macular holes treated with 25gauge vitrectomy, ILM peel with multi-layered inverted ILM flap, which was tucked into macular hole guided by i- OCT, which confirmed position of the flaps intraoperatively. C3F8(15%) gas was used for tamponade. Follow-up was done at 1 month and 3 months post-operatively. Improvement in best corrected visual acuity (BCVA) & type of hole closure noted.

RESULTS Mean age was 58.282±16.3 years. Mean Pre operative BCVA was 1.206±0.384 and at 3rd month was 0.793±0.337 in terms of Log MAR. Mean Minimum Linear Diameter was 711.96±270.744. Mean Basal Diameter was 1301.165±425.914 µm. 92.2% had Type 1 closure, 5.8% of patients had Type 2 closure and 1.9% of patients had Type 3 closure. Eyes with type 1 closure showed a significant improvement in the BCVA postoperatively at 3 months (P=< 0.001). Even in eyes with Type 2 closure, significant improvement in BCVA was noted at 3 months postoperatively(P= 0.009).

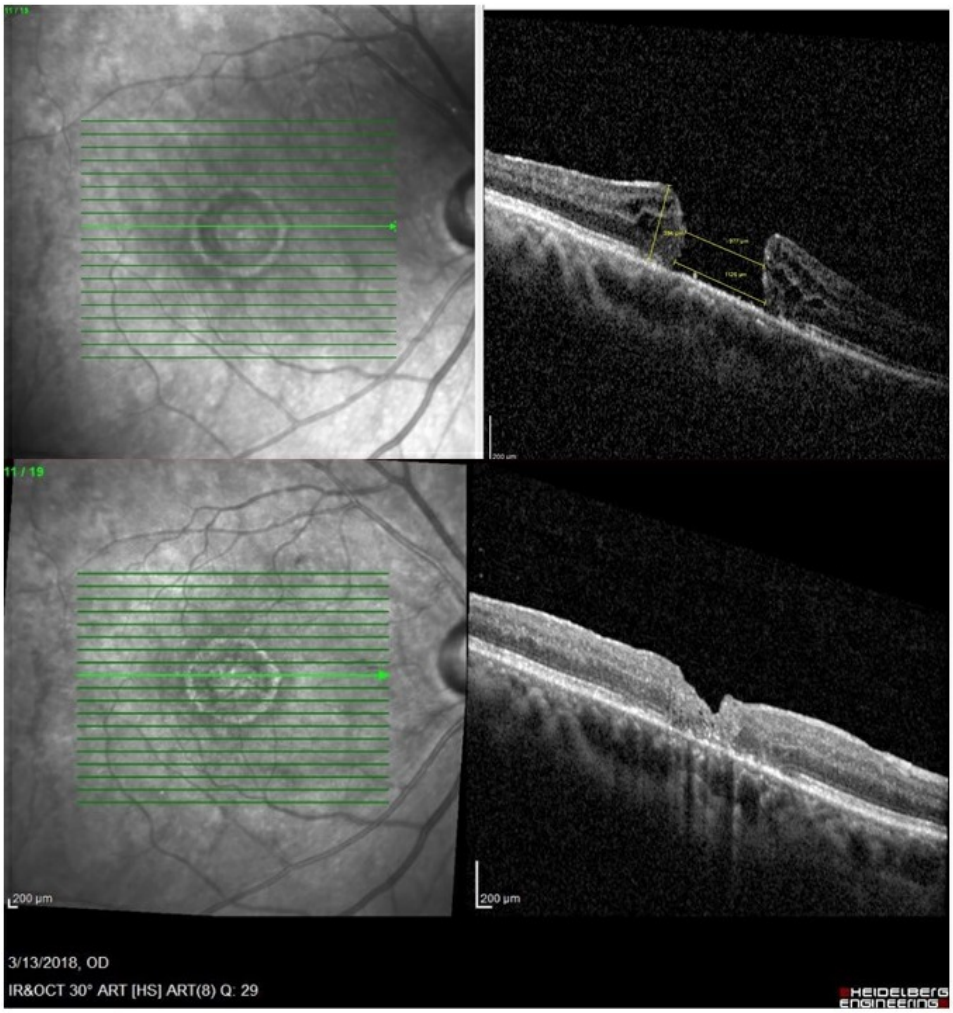
CONCLUSION Multilayered inverted ILM flap technique using i-OCT shows improved

visual and anatomical outcomes in the treatment of large macular holes. As compared to conventional inverted ILM flap technique, multilayering provides a unique technique to preserve ILM flaps without causing its unexpected dislodgement.

HUMAN RESEARCH Yes: Approved by institutional review board



Animation video showing the multilayered inverse ILM flap technique where the ILM flaps are placed one over the other on the macular hole. There are various advantages of this technique including preserving of ILM flaps without causing unexpected flap dislodgement.



REPRESENTATIVE OCT - PREOPERATIVE SCAN SHOWING MLD>900MICRON AND POSTOPERATIVE TYPE 1 CLOSURE AFTER MULTILAYERED INVERSE ILM FLAP SURGERY. THERE WAS IMPROVEMENT IN BOTH ANATOMICAL AND FUNCTIONAL OUTCOMES.

7/28/2020 12:23PM

Clinical Characteristics, Risk Factors, and Surgical Outcomes of Secondary Macular Hole After Vitrectomy

- Min Kim, MD

OBJECTIVE What contributes to the development of secondary macular hole after primary vitrectomy and what are their surgical outcomes and prognostic factors?

PURPOSE Secondary macular hole(MH) formation after vitrectomy is rare and its risk factors and pathogenesis are not clearly understood. This retrospective study was conducted to identify the risk factors of this complication and assess outcomes.

METHODS It was a retrospective non-randomized consecutive case series. The primary outcomes were the clinical characteristics associated with development of secondary MH, which included the primary diagnosis for initial vitrectomy, features on optical coherence tomography, and adjuvant surgical techniques used during the initial surgery. Secondary outcomes included the change in best-corrected visual acuity(BCVA), clinical factors associated with the need for re-operations for MH closure and prognostic factors for the visual outcomes.

RESULTS Thirty-eight eyes out of 6,354 cases (incidence 0.60%) developed secondary MH after undergoing vitrectomy for various vitreoretinal disorders over an 11-year period, most frequently after initial surgery for retinal detachment(RD) (9 eyes) and secondary epiretinal membrane (6 eyes). The mean age was 57.1 years (range: 17.8-76.7), and the mean follow-up was 51.1 months (range: 6.8 to 137.6). Prior to secondary MH formation, development of ERM was the most common OCT feature (19 eyes, 50%), and no cases of cystoid macular oedema (CME) were observed. A greater proportion of eyes with secondary MH had long axial lengths (32% ≥26 mm vs 5% of eyes ≤22 mm). MH closure surgery was performed in 36 eyes and closure was achieved in 34 (success rate 94%, final BCVA 20/86), with ≥3-line visual gain in 18 cases. BCVA at MH onset (OR=0.056, P=0.036), BCVA at post-MH surgery month 3 (OR=52.671, P=0.011), and axial length ≥28 mm (OR=28.487, P=0.030) were associated with ≥3-line visual loss; a history of macula-off RD (OR=27.158, P=0.025) was associated with the need for multiple surgeries for MH closure.

CONCLUSION In conclusion, secondary MH occurs rarely but most commonly after vitrectomy for RD. Patients with axial length ≥28 mm and poor BCVA at 3 months post-operation may have limited visual prognosis; those with a history of macula-off RD may require multiple surgeries for hole closure.

HUMAN RESEARCH Yes: Approved by institutional review board

Table 1. Baseline patient characteristics (37 patients, n=38 eyes)

Sex, no. (%)	
Male	18 (49)
Female	19 (51)
Hypertension, no. (%)	9 (24)
Diabetes mellitus, no. (%)	9 (24)
Age at primary vitrectomy, years, mean±SD (range)	55.7 ± 14.1 (17.6–75.4)
Age at onset of MH	57.1 ± 14.6 (17.8–76.7)
Median time to MH diagnosis after vitrectomy, months (range)	2.3 (0.4–90.9)
Prior vitrectomy operations, no. (range)	1.2 ± 0.5 (1–3)
BCVA, logMAR, mean±SD (Snellen)	
Prior to primary vitrectomy	1.19 ± 0.9 (20/313)
Onset of MH	1.02 ± 0.6 (20/210)
Axial length, mm, mean±SD (range)	25.1 ± 2.7 (21.5–32.3)
Short eye (≤22 mm), no. (%)	2 (5)
Average eye (22–26 mm), no. (%)	24 (63)
Long eye (≥26 mm), no. (%)	12 (32)
Very long eye (≥28 mm), no. (%)	6 (16)
Pseudophakic status, no. (%)	28 (74)

BCVA=best-correct visual acuity; logMAR=logarithm of minimum angle of resolution; MH=macular hole; SD=standard deviation

Table 2. Diagnoses, associated ocular pathologies, treatment factors, and imaging characteristics with regard to the primary initial vitrectomy

Primary diagnosis, no. (%)	38 (100)
Rhegmatogenous RD (5 macula-off)	9 (24)
Secondary epiretinal membrane	6 (16)
Vitreous haemorrhage (4 PDR, 1 PCV)	5 (13)
Oil-filled status after RD surgery (4 macula-off)	5 (13)
Idiopathic epiretinal membrane	4 (11)
Lamellar hole	3 (8)
Submacular haemorrhage (2 PCV, 1 RAM)	3 (8)
Vitreomacular traction syndrome	2 (5)
Optic disc pit-associated maculopathy	1 (3)
Co-existing pathology and clinical features prior to initial vitrectomy, no. (%)	
Epiretinal membrane detected on OCT	22 (58)
Vitreous attachment at fovea on OCT	22 (58)
Vitreous haemorrhage	11 (29)
PDR	4 (11)
Breakthrough from SMH	3 (8)
PCV	2 (5)
Branch retinal vein occlusion	1 (3)
RAM	1 (3)
Retinoschisis	5 (13)
Lamellar macular hole	4 (11)
Past surgical history of macula-off RD	3 (8)
Prior scleral encircling or buckling for RD	3 (8)
Proliferative vitreoretinopathy	3 (8)
Posterior uveitis	2 (5)
Prior oil removal history after RD	1 (3)
Serous neurosensory RD	1 (3)
RAM	1 (3)
Adjuvant techniques for primary vitrectomy, no. (%)	
ILM peeling	20 (44)
Pneumatic tamponade (SF_6 or C_3F_8 gas)	16 (42)
Silicone oil injection	12 (32)
Scleral buckle/encircling	5 (13)
Intravitreal anti-VEGF injection performed	12 (32)
No. of injections, mean±SD (range)	2.6 ± 2.0 (1–7)
Intravitreal Ozurdex® injection performed	3 (8)
No. of injections, mean±SD (range)	1.7 ± 1.2 (1–3)

ILM=internal limiting membrane; OCT=optical coherence tomography; PDR=proliferative diabetic retinopathy; RAM=retinal arterial macroaneurysm; RD=retinal detachment; SD=standard deviation; SMH=submacular haemorrhage; VEGF=vascular endothelial growth factor

7/28/2020 12:45PM

Limited Vitrectomy for Epiretinal Membranes: A Comparative Multi-Center Trial

- MATTEO M FORLINI, MD

OBJECTIVE Is limited vitrectomy as safe and effective as complete vitrectomy in eyes with epiretinal membranes?

PURPOSE To evaluate whether limited vitrectomy is as safe and effective as complete vitrectomy in eyes with epiretinal membrane (ERM).

METHODS In this multicentre European study, data from eyes with ERM that underwent vitrectomy during January 2017 to July 2018 were analysed retrospectively. In the limited vitrectomy group, a posterior vitreous detachment (PVD) was induced up till the equator as opposed to complete PVD induction till the vitreous base in the comparison group. Incidence of iatrogenic retinal breaks, retinal detachment, surgical times and visual outcomes were compared between groups.

RESULTS We included 139 eyes in the analysis (mean age = 72.2+6.9 years) of which 65 eyes (47%) underwent limited vitrectomy and 74 eyes (53%) underwent complete vitrectomy. Iatrogenic retinal tears were seen equally in both groups (5% in limited vitrectomy vs. 7% in complete vitrectomy, p=0.49) while retinal detachment occurred in 2 eyes in the limited vitrectomy group (3%) compared to none in the complete vitrectomy group (p=0.22). Visual acuity and central macular thickness improved significantly with no intergroup differences (p=0.18). Surgical time was significantly shorter in the limited vitrectomy group with 91% surgeries taking less than 1 hour compared to 71% in the complete vitrectomy group (p<0.001).

CONCLUSION A limited vitrectomy with PVD induction only up to the equator was as safe and effective as complete vitrectomy with base excision in eyes with ERM. This leads to quicker surgeries and does not increase risk of retinal tears.

HUMAN RESEARCH Yes: Approved by institutional review board

7/28/2020 12:37PM

Comparison of the Embedding and Sparing Technique in Treating Lamellar Macular Holes With Lamellar Hole-Associated Epiretinal Proliferation

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- Chung-May Yang, MD

OBJECTIVE Is lamellar hole-associated epiretinal proliferation embedding technique better than epiretinal proliferation sparing technique in treating patients with lamellar macular hole?

PURPOSE The presence of lamellar hole-associated epiretinal proliferation (LHEP) indicated a deeper and larger defect in lamellar macular holes (LMHs) and a higher incidence of ellipsoid zone (EZ) defects. Both LHEP tissue embedding and LHEP tissue sparing techniques have been reported to improve the vision in patients with LMH, but the comparison between these 2 different methods have not been reported.

METHODS Retrospective case series of 34 consecutive patients with LMH and LHEP operated with either LHEP tissue embedding or LHEP tissue sparing technique. Epiretinal membrane and internal limiting membrane were peeled in all patients. The LHEP tissue was trimmed to proper size in both groups, then it was embedded into the LMH in the former technique or left untouched without forceful removal or embedding in the latter. Baseline demographic data and optical coherence tomography (OCT) images were collected. Best corrected visual acuities (BCVA) and OCT morphologies before and after the surgery in both groups were compared.

RESULTS The mean age at operation was 62.8 ± 11.7 years old in the 17 patients underwent LHEP tissue embedding technique and 60.3 ± 12.2 in the 17 patients with LHEP tissue sparing. There were no difference between the embedding group and the sparing group regarding the size of LMH (822.0 ± 263.4 vs. 637.1 ± 325.3 μm, P=.062) and the depth of retinal defect (LMH base thickness, μm: 92.4 ± 29.1 vs. 101.4 ± 37.0, P=.563). The

two groups had similar BCVA before (embedding vs. sparing: 0.624 ± 0.230 and 0.791 ± 0.406, P=.306) and after operation (0.388 ± 0.337 and 0.465 ± 0.418, P=.812). Eight (47%) patients in the embedding group and 12 (71%, P=.296) in the sparing group had EZ disruption before surgery. After operation, 6 (35%) and 8 (47%) patients in the embedding and sparing groups still had EZ disruption (P=.728). A U-shaped hole closure with LHEP filling the gap on OCT was found in 13 (77%) patients in the embedding group and 11 (65%, P=.708) in the sparing group after operation.

CONCLUSION Both LHEP tissue embedding and sparing technique could be used to treat patients with LMH and showed similar visual as well as anatomical outcomes. Preservation of the LHEP tissue is important during surgery.

HUMAN RESEARCH Yes: Approved by institutional review board

7/28/2020 12:19PM

Spontaneous Conversion of Lamellar Macular Holes to Full-Thickness Macular Holes: Clinical Features and Surgical Outcomes

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- Jean-Pierre Hubschman, MD
- Sundeep K Kasi, MD
- Daniel Su, MD
- Anthony Joseph, MD
- Pradeep Satya Prasad, MD, MBA
- Ashkan M. Abbey, MD
- Alain Gaudric, MD
- Ehsan Rahimy, MD

OBJECTIVE Patients with lamellar macular holes may present spontaneous conversion to full-thickness macular holes with distinct anatomical features from idiopathic full-thickness macular holes.

PURPOSE To describe the clinical features and surgical outcomes of patients presenting spontaneous conversion of lamellar macular holes (LMH) to full-thickness macular holes (FTMH).

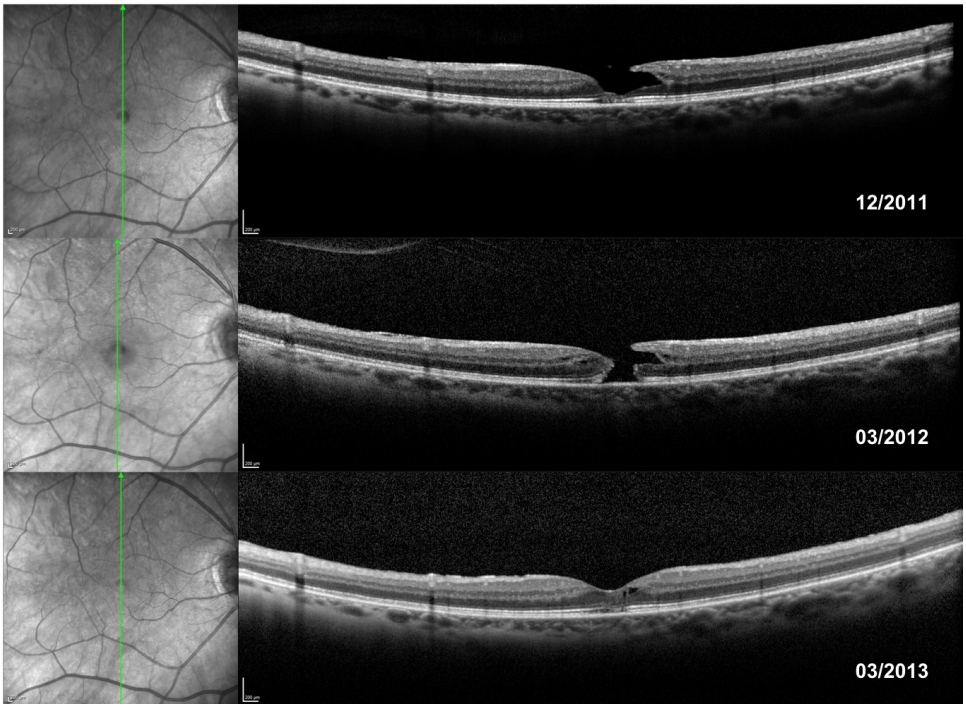
METHODS Clinical charts and optical coherence tomography (OCT) features of 19 patients who underwent pars-plana vitrectomy for FTMH derived from LMH were reviewed. All cases had a documented LMH at baseline, and showed spontaneous conversion to FTMH treated by vitrectomy. Baseline OCT characteristics included LMH measurements, presence of epiretinal membrane (ERM) and epiretinal proliferation (ERP), and outer retinal layers disruption (i.e. external limiting membrane and ellipsoidal zone). FTMH characteristics and visual acuity (VA) changes were analyzed. After surgery, functional and anatomical outcomes were studied.

RESULTS At baseline, mean VA was 0.20 ± 0.18 LogMar (Snellen equivalent: 20/31), and mean central foveal thickness was 131 ± 46 µm. ERM was noted in 13 (68%) eyes, and 16 (84%) eyes demonstrated some ERP. At FTMH diagnosis, 13 (68%) patients noticed subjective functional changes. Mean VA decreased to 0.54 ± 0.47 LogMar (Snellen equivalent: 20/69) ($P < 0.005$). Mean FTMH diameter was 225 ± 195 µm, with 14 (74%) small FTMH (>250 µm), 2 (10%) medium FTMH (250-400 µm) and 3 (16%) large FTMH (>400 µm). Mean temporal and nasal FTMH heights were 387 ± 164 µm and 375 ± 121 µm respectively. Three (16%) eyes showed no cysts within the hole edges. Eighteen (95%) cases had FTMH closure after one surgery, while one case required a second procedure. At last follow-up, mean VA increased to 0.30 ± 0.24 (Snellen equivalent: 20/39) ($P = 0.006$), but was not significantly different from baseline VA ($P= 0.068$). Eleven (58%) eyes had outer retinal layers disruption, and one eye presented a recurrent LMH.

CONCLUSION Patients with LMH may develop FTMH without vitreomacular traction.

Tangential traction from ERM may contributed to its genesis, but an inherent weakness of foveal architecture and a progressive loss of retinal tissue in LMH eyes could be sufficient. When derived from LMH, FTMH had usually a small diameter, epiretinal proliferation, limited retinal hydration, and relatively poor surgical outcomes.

HUMAN RESEARCH Yes: Approved by institutional review board



Optical coherence tomography scans showing a case of lamellar macular hole (Top), which spontaneously developed into full-thickness macular hole with limited intraretinal hydration (Middle). One year after surgery, persistent intraretinal cavitation and ellipsoidal zone disruption were visible (Bottom).

7/28/2020 12:41PM

Relation of Anatomy With Function Following the Surgical Treatment of Idiopathic Epiretinal Membrane: A Multicentric Retrospective Study

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- Levent V Karabas, MD
- MEHMET YASIN TEKE, Md
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- NILUFER KOCAK, MD
- Mehmet CITIRIK, MD
- Ali H Durukan, MD

OBJECTIVE To evaluate the functional and anatomical outcomes after idiopathic epiretinal membrane (ERM) surgery.

PURPOSE To determine the changes in foveal contour and visual acuity with respect to time and factors associated with anatomical and functional improvement and to detect any correlation in between these two.

METHODS Members of the Turkish Ophthalmology Society- Vitreoretinal Surgery Group were requested to provide data on eyes who underwent vitreoretinal surgery for idiopathic ERM. Thirty-one experienced vitreoretinal surgeons reported on 636 eyes and data included best-corrected visual acuity (BCVA) and OCT features (foveal thickness, foveal contour, ERM pattern, ellipsoid zone) preoperatively and at 6, 12, 24 months postoperatively as well as surgical details and complications. Foveal contour was graded as “normal”, “shallow”, “flat” or “convex”. Foveal contour and VA changes were analyzed with respect to time and factors associated with anatomical and functional improvement were investigated.

RESULTS At a median follow-up of 24 months, all of the eyes with shallow foveal contour, 62% of eyes with flat contour and 46% of eyes with convex contour at baseline achieved normal or shallow foveal depression ($p<0.001$). While cases with shallow or flat baseline

foveal contour did not show significant anatomical change after 12 months, lost contour cases continued to regain normal foveal depression at longer term, reaching 50% over 24-month of follow-up period($p<0.001$). Anatomic recovery was more likely in patients with younger age, thinner foveal thickness at baseline, pseudohole or tangent pattern ($R2=.245$, $p<0.001$). Cases with all types of foveal contours showed significant and progressive visual improvement over time ($p<0.001$) and BCVA change did not differ significantly between different grades of baseline foveal contour ($p=0.24$). Overall, BCVA improved by a median of 0.27 logMAR. Older age, diabetes, occurrence of any complication, mild or severe disruption of ellipsoid zone was negatively associated with significant BCVA improvement of at least 0.2 logMAR; whereas visual improvement was more likely in the presence of ILM peeling ($R2=.207$, $p=0.02$). Retinal tears were reported in 15 (2.6%) of the cases; postoperative retinal detachment in 4 (0.7%); macular holes in 3 (0.5%); and extrafoveal holes in 3 (0.4%).

CONCLUSION While preoperative foveal contour is associated with postoperative anatomy, it does not predict visual outcomes. Eyes with lost foveal contour at baseline has the potential to achieve significant functional improvement after surgery and regain foveal depression over longer time.

HUMAN RESEARCH Yes: Approved by institutional review board