Original Article

Treatment Outcome of Macular Hole Associated with Rhegmatogenous Retinal Detachment

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Abstract

Background: Macular holes are an infrequent association with rhegmatogenous retinal detachment, increasing the complexity of surgery and affecting outcome. **Aim:** To report the visual outcome, macular hole (MH) closure, and retinal reattachment rate after vitrectomy with silicone oil plus different MH closure techniques for MH associated with rhegmatogenous retinal detachment and to compare the visual outcome between the techniques. **Materials and Methods:** A retrospective, comparative study. Review of pre and postoperative Snellen best corrected visual acuity (BCVA) and the logarithm of minimum angle of resolution (LogMAR) conversion for nine eyes of 9 consecutively treated macular hole in rhegmatogenous retinal detachment patients. Pre and postoperative optical coherence tomography (OCT) macula scans and retinal reattachment three months post silicone oil removal were assessed. **Results:** Surgical techniques: Inverted internal limiting membrane flap (n = 4; 44.45%), internal limiting membrane (ILM) plug (n = 4; 44.45%), and autologous retinal transplant (n = 1; 11.1%). Outcome: Single-surgery retinal reattachment rate was 88.9% (8/9 eyes), and 100% with second surgery. Primary MH closure was 100%. One reopened MH with retinal re-detachment, post silicone oil removal, required additional surgery. The mean preoperative BCVA was 2.53 ± 0.93 LogMAR, and mean postoperative BCVA was 0.94 ± SD 0.43 LogMAR (P = 0.000). Mean change in Snellen line = 2.22 ± 1.72. The postoperative vision was the same as preoperative in 22.2% and improved in 77.8%. Mean postoperative vision for the inverted ILM flap group (n = 4) was 1.10 ± 0.62 LogMAR (P = 0.038), and for the ILM plug group (n = 4) 0.83 ± 0.23 LogMAR (P = 0.002). The surgical technique did not influence postoperative BCVA (P = 0.85). Only one eye had an outer retina on OCT evaluation. Complications were macular atrophy (55.6%), macular edema (44.4%), and epiretinal membrane (33.3%). **Conclusion:** Single-surgery retinal reattachment rate and macular hole closure using any of the techniques is high, and none showed superiority.

Keywords: *Autologous retinal transplant, internal limiting membrane flap, internal limiting membrane plug, macular hole, rhegmatogenous retinal detachment, vitrectomy*

Introduction

It is more common to have a macular hole (MH) that results in a retinal detachment in highly myopic eyes in which there is the presence of myopic chorioretinal changes and posterior staphyloma.[1,2] Several factors contribute to the occurrence of such MHs in myopia.

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The multifactorial origin of the macular hole in axial myopia includes tangential traction induced by epiretinal membranes, the taut internal limiting membrane, vertical traction on the stretched retina due to posterior elongation of the staphyloma and neurosensory retinal and pigment epithelial atrophy in the macular area. Macular holes are also infrequent in eyes with preexisting rhegmatogenous retinal detachment (RRD). The mechanism of occurrence of macular hole coexisting with RRD is related to tangential traction (possibly from epiretinal membranes) and may be a feature of chronicity and proliferative vitreoretinopathy (PVR). Najafi *et al*.[3] reported a high rate of PVR in their series on macular hole in RRD. Cunningham *et al*.[4] suggested PVR was a causative factor, reporting a 66.7% PVR rate in their series of macular hole in rhegmatogenous retinal detachment. They observed a significant association between the presence of PVR and concomitant macular hole formation. The reported prevalence of macular holes in a series of vitrectomies for RRD, with a high rate of PVR, was 8.3%.[5] In all cases, the macular hole occurred in the macular involving RRD.

The occurrence of a macular hole in RRD results in further damage to the central retina and suggests poorer visual outcome because the anatomy of the macula determines macular function and vision. A poor visual outcome can be expected following surgery for a macular hole in RRD despite anatomical closure of the MH and retina reattachment. Though several reports describe techniques for repairing macular holes in RRD, the primary treatment option is controversial because of the need for randomized clinical trials. In the past retinal laser photocoagulation was used to treat the macular hole, damaging the retina and central vision. Nowadays, techniques for treatment include the internal limiting membrane (ILM) peel,[6-8] inverted ILM flap (peeled ILM flap is inverted and placed over the macular hole),[9,10] internal limiting membrane plug (peeled ILM is inserted into the macular hole),[11] and autologous retinal transplantation of the free neurosensory retina tissue into the macular hole.[12] These recent techniques have reported superior outcomes compared to earlier reports.[13] We reviewed our treatment of macular holes in RRD to determine the visual outcome, macular hole closure rate, and retinal reattachment. We also compared the visual outcome between the two most used surgical techniques (inverted ILM flap versus ILM plug).

Materials and Methods

Retrospective, consecutive study.

All patients diagnosed with an RRD with a coexisting macular hole that appeared as a full-thickness neurosensory retina defect in the macula (centered on the fovea) confirmed by clinical examination and optical coherence tomography (OCT) scanning of the detached retina were the study sample. The presence of the macular hole was further confirmed intraoperatively and documented in the surgical case records.

Ethical approval for this study was obtained from the Eye Foundation Hospital's Health Research Ethics Committee, EFHREC/22/002. This study was waived since the research involved the retrospective review of patients' records and serial OCT images. The study was performed according to the standards stipulated in the Helsinki Declaration. All patients signed a written informed consent prior to surgery, and the patient's information and data were anonymized.

The information extracted from the patient's medical records includes patient demographics, laterality, symptom duration, and preoperative clinical examination assessing the visual acuity using a Snellen chart (Snellen acuity was converted to logarithm of the minimum angle of resolution (LogMAR) for data analysis). A slit lamp examination of the anterior segment of the eye and intraocular pressure measurement were done. Pupillary dilatation was achieved using mydriatics (a combination of phenylephrine 2.5% and tropicamide 1.0%) after the patient's consent was obtained. Fundus examination was done using a 90D non-contact binocular examination using a slit lamp microscope to assess the presence of a macular hole in the detached retina in all eyes. A macular hole was seen as a full-thickness defect in the macula. Also, a 20D indirect ophthalmoscopy was performed to examine the retina periphery and identify primary and secondary retinal breaks and retinal degenerations. The other characteristics of the RRD examined include types of retina breaks, macular involvement by RRD, quadrants of retina detached, and presence and grade of proliferative vitreoretinopathy. Also, the axial length of the eye was measured.

Surgical technique

One experienced vitreoretinal surgeon, ONO, performed all surgeries. A 25- or 23- gauge three-port pars plana vitrectomy was done using the Constellation vitrectomy machine (Alcon Laboratories, Fort Worth, TX) with a Resight fundus viewing system (Carl Zeiss Meditec Co. Ltd., Tokyo, Japan). Generally, the standard approach was a core vitrectomy and anterior extension of existing posterior vitreous detachment. Intravitreal triamcinolone was injected to highlight any residual posterior and peripheral vitreous, which was removed using a vitreous base dissection technique with indentation. A bubble of perfluorocarbon liquid (PFCL) was injected to reattach and stabilize the posterior pole and the macular hole. Duoblue (a combination of Brilliant Blue G + Trypan

Blue) was injected using a 25-guage cannula; the tip was gently placed at the interface between the retina and the PFCL bubble. With the cannula in this position, the injected Duoblue dye spreads on the surface of the retina with very minimal egress into the subretinal space through the MH. Using Eckardt forceps, the stained ILM close to the vascular arcade was peeled from the retina to a position close to the edge of the MH, inverted, and placed over the macular hole in the inverted ILM flap technique. In some eyes, the peeled ILM was inserted as a plug into the macular hole. The bubble of PFCL on the posterior pole maintained the stability of the ILM flap, or ILM plug, when a fluid air exchange was performed, allowing peripheral subretinal fluid to be drained through a preexisting retinal break or a freshly created drainage retinotomy. Endo retinal laser photocoagulation was used to achieve retinopexy of peripheral retina breaks. The bubble of PFCL was removed after laser photocoagulation of all retinal breaks, and retinotomy was completed. An air-filled vitreous cavity was then filled with 1000CS or 1500CS silicone oil. The sclerotomy was sutured using 8-0 vicryl suture. Silicone oil removal was performed using a standard technique with the active aspiration of the silicone oil and multiple air fluid exchanges to remove tiny bubbles of emulsified silicone oil.

In one eye (case 5), the cornea became hazy intraoperatively with insufficient clarity to perform an ILM peel. In this eye, surgical steps were taken to reattach the retina, followed by a silicone oil exchange. At the time of silicone oil removal, after removal of the silicone oil, the ILM was stained with Duoblue, and an ILM plug was used to close the macular hole. An air fluid exchange was performed, leaving a postoperative air-filled eye.

In the surgery for ART, a piece of free full-thickness neurosensory retina was excised from the superior mid-peripheral retina (anterior to the temporal vascular arcade after prior laser demarcation of the area of the retina from which harvest of the donor tissue was to be done). A straight intraocular scissor was used to perform the excision of the donor tissue. The end gripping forceps were used to gradually tease the retina tissue from the harvest bed and move it under the stability provided by a bubble of PFCL to the recipient macular hole bed. The piece of retina was tucked under the edges of the macular hole. See supplementary video file A. After retinopexy of the peripheral retina breaks and harvest site, additional PFCL fill of the vitreous cavity is done. The PFCL is kept in the eye for three days. On the third day post-surgery, an air fluid exchange is done and silicone oil infusion into the eye and 8-0 vicryl suture closure of the sclerotomy concludes the case.

Postoperative review was done as scheduled on day one, week one, month one, and the third month, before silicone oil removal. Each postoperative visit involved an assessment of vision, intraocular pressure measurement, slit lamp examination of the anterior segment, and 90D biomicroscopic fundus examination to assess for macular hole closure and retina reattachment. An equivalent examination was performed prior to and after silicone oil removal. All the patients had at least three months of post-silicone oil removal clinic attendance.

OCT imaging

A preoperative OCT image [Figures 1-3] was performed (except in situations when the height of the retinal detachment was higher than could be imaged or acquired by the OCT equipment), and postoperative OCT image for each eye was done at every clinic visit. The OCT images were acquired using the spectral domain (SD) OCT Optovue, Avanti. A cross-line scan centered on the fovea was taken. Postoperative OCT scans were acquired after the primary surgery and silicone oil removal. The postoperative OCT scan three months post silicone oil removal was used for analysis in this study.

Outcome

The primary outcome measure assessed was the change between the pre and postoperative Snellen visual acuity. The Snellen line change in vision and the difference between the pre and postoperative mean LogMAR values were assessed. The secondary outcome measure was anatomical macular hole closure and retinal reattachment three months after silicone oil removal. Also, the postoperative OCT was assessed to determine macular hole closure, macular morphology, and the presence of the external limiting membrane (ELM) and ellipsoid zone (EZ) in the subfoveal area.

Statistical analysis

The frequency and percentage were reported for categorical variables and the mean for continuous variables. Analysis of data was done using SPSS version 22. T-test (one sample test) was used to determine the significance of change between pre and postoperative vision. A non-parametric test (Kruskal-Wallis) was used to determine the impact of surgical technique on vision. A P value < 0.05 was taken to be statistically significant.

Results

Nine eyes of 9 consecutive patients diagnosed with an MHRRD and had vitreoretinal surgery were the study sample.

Demographics and clinical presentation of retinal detachment cases.

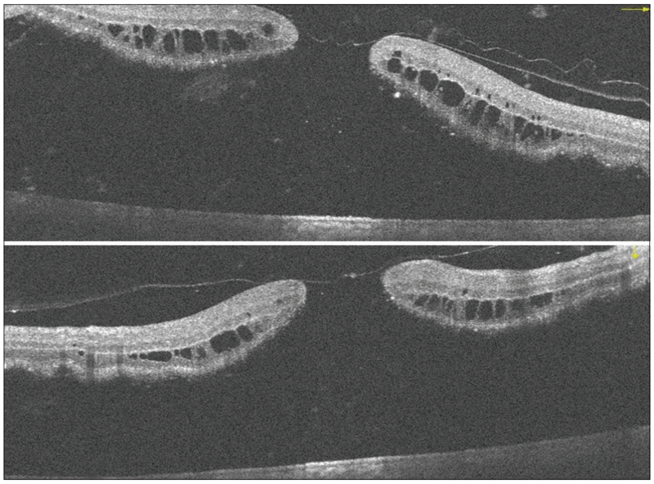

Figure 1: Optical coherence tomography (OCT) scans showing macular involving rhegmatogenous retinal detachments with macular hole. Figure 1 is a high retinal detachment

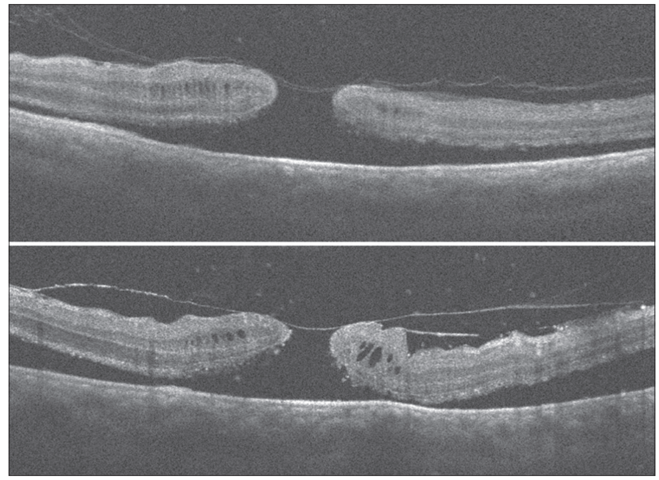

Figure 2: Is a shallow retinal detachment. Both figures 1 and 2 reveal posterior vitreous detachment and intraretinal cystic spaces, which is prominent in the outer retina in Figure 1. Figure 2 also shows an epiretinal membrane that exerts significant tangential traction on the edges of the macular hole and is linked to the pathogenesis of MHRRD

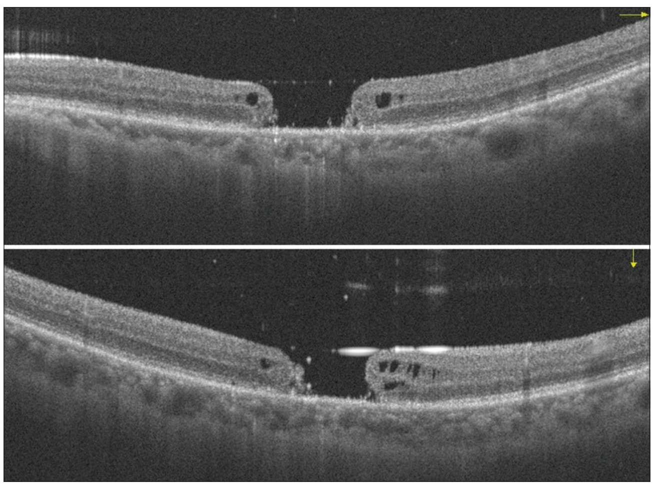

Figure 3: OCT scan of an eye that had initial retinal reattachment and subsequent macular hole surgery at the time of silicone oil removal. The retina is not free of intraretinal cysts, and the silicone oil reflex is evident

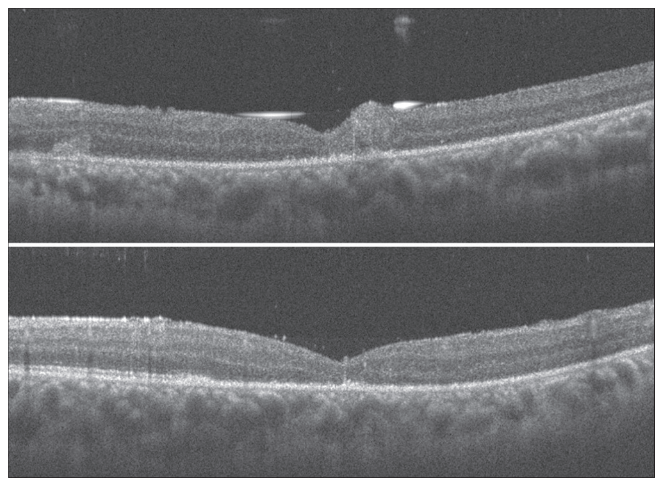

Figure 4: Closed macular hole using an inverted internal limiting membrane peel technique. Note the absence of an outer retina, including the external limiting membrane and ellipsoid zone

There were seven males (77.7%), a mean age of 51.8 ± SD 6.9 years (range 39 – 61 years), and six (66.7%) right eyes. The mean symptom duration was 1.8+/- SD 1.8 months. The mean axial length was 24.98 ± SD 1.13 mm (23.55 – 27.31 mm). The mean preoperative intraocular pressure (IOP) was 7.55 ± SD 4.6 mmHg. Lens status: Eight eyes (88.9%) were pseudophakic, and one eye (11.1%) had a cataract. The extent of RD: Seven eyes (77.8%) had a total RD, and two eyes (22.2%) had an inferior RD. Characterization of retinal breaks: macular hole only in two eyes (22.2%), a large inferior tear in 2 eyes (22.2%), a giant retinal tear in one eye (11.1%), and multiple peripheral breaks in four eyes (44.4%). Proliferative vitreoretinopathy C was present in 5 eyes (55.6%) and B in 4 eyes (44.4%). The mean follow-up duration was 14.9 ± SD 7.4 months.

Visual outcome

The mean preoperative vision for the nine eyes was 2.53 ± SD 0.93 LogMAR improving to mean postoperative vision 0.94 ± SD 0.43 LogMAR (P = 0.000). Analysis of the Snellen line change in a vision revealed a mean change of 2.22 ± SD 1.72 line improvement in vision. In two eyes (22.2%) postoperative vision remained the same as preoperative, and vision improved in 7 eyes (77.8%), Table 1. The surgical techniques used were inverted ILM flap in four eyes (44.4%), ILM plug in four eyes (44.4%), and ART in one eye (11.1%). The mean preoperative vision for the inverted ILM flap group was 1.95 ± SD 0.90 LogMAR, and the mean postoperative vision improved to 1.10 ± SD 0.62 LogMAR (P = 0.038). The mean preoperative vision for the ILM plug group

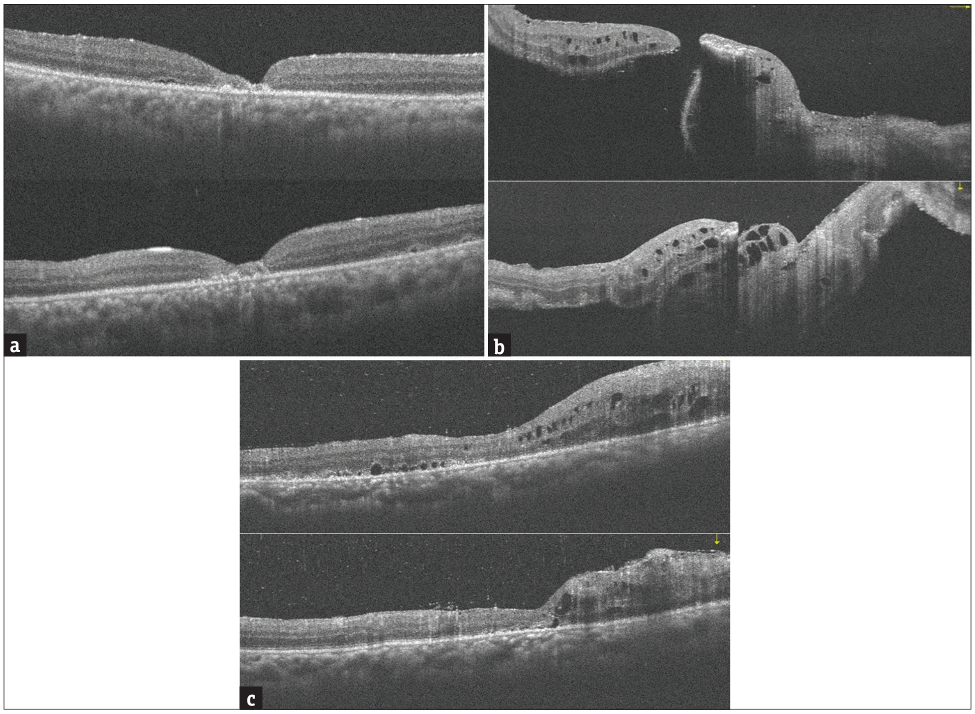

Figure 5: a – c: Reopening of initially closed macular hole with retinal re-detachment. (a) shows a closed macular hole with foveal atrophy. (b) shows a reopened macular hole with a detached retina and intraretinal cystic spaces. (c) shows closed macular hole and attached retina with significant intraretinal cystic spaces and epiretinal membrane

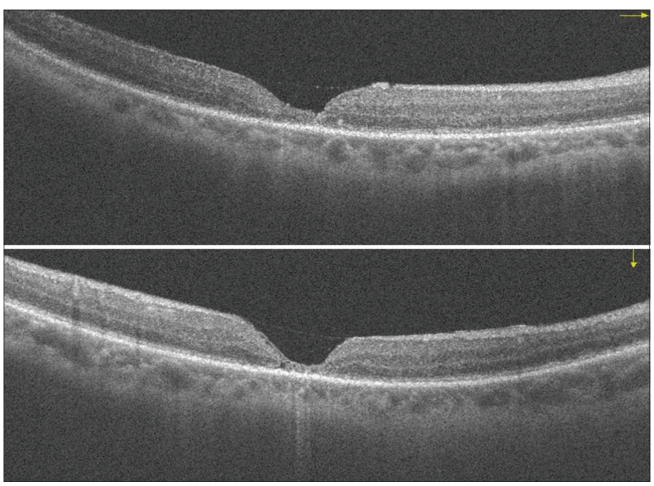

Figure 6: Foveomacular thinning post inverted internal limiting membrane flap

Table 1: Technique of macular hole closure and visual outcome

	Surgical Technique	Preoperative Snellen vision	Postoperative Snellen vision	Snellen line change in vision
Case 1	ILM Flap	CF	6/24	3
Case 2	ILM Plug	HM	6/60	2
Case 3	ILM Plug	HM	6/36	3
Case 4	ART	LP	6/36	4
Case 5	ILM Plug	HM	6/18p	5p
Case 6	ILM Flap	CF	CF	0
Case 7	ILM Flap	6/36	6/36p	0
Case 8	ILM Flap	HM	6/60	2
Case 9	ILM Plug	CF	6/60	1

ART: Autologous Retinal Transplant, ILM: Internal Limiting Membrane, CF: Counting Fingers, HM: Hand Motion, LP: Light Perception, P: Plus

was 2.75 ± SD 0.50 LogMAR, and postoperative vision improved to 0.83 ± SD 0.23 LogMAR (P = 0.002). The inverted ILM flap had a mean Snellen line improvement of 1.25 ± SD 1.5 lines compared to 2.75 ± SD 1.71 lines for the ILM plug.

Further analysis showed that preoperative vision did not influence surgical technique (P = 0.12). The surgical technique did not affect postoperative visual outcome (LogMAR vision (P = 0.85) and Snellen line change in vision (P = 0.25)). However, the two eyes with the most improved vision were case 5, which had an ILM plug (5 Snellen line improved), and case 4, which had ART (4 Snellen line improved), Table 1.

Anatomical outcome

Single-surgery retinal reattachment rate was 88.9% (8/9 eyes) and 100% (9/9 eyes) after a second surgery. Primary macular hole closure was 100% (9/9 eyes), Figure 4. After removing silicone oil, reopening of the previously closed macular hole and re-detachment of the retina through the reopened macular hole occurred in 11.1% (1/9 eyes). This occurred in an eye treated using an inverted ILM flap, Figure 5a-c. The macular hole was closed, and the retina

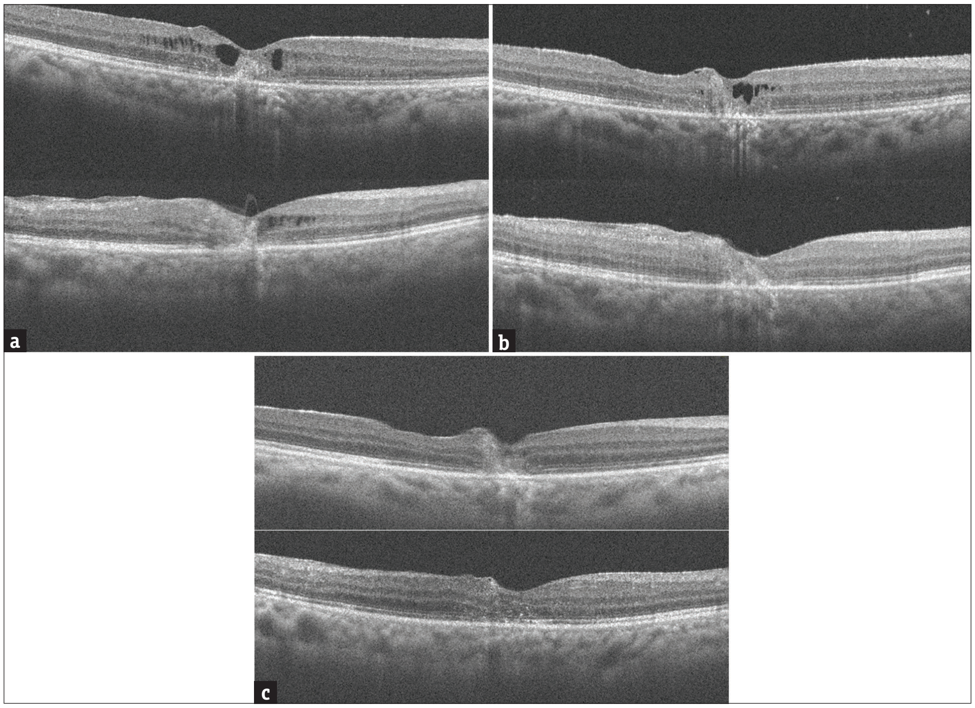

Figure 7: a – c: Evolution of postoperative intraretinal cystic fluid spaces. (a) The intraretinal cystic spaces appeared 11 months post-surgery. (b) Intraretinal cysts reduce following topical non-steroidal drops' commencement. (c) Complete resolution of intraretinal cysts two months after topical therapy

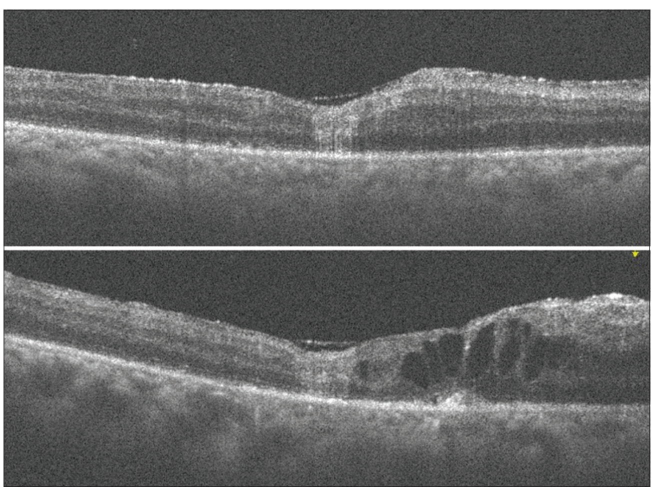

Figure 8: OCT showing large intraretinal cystic spaces and associated epiretinal membrane

was reattached with a second surgery. Optical coherence tomography observed macular morphological changes include macular thinning in 5/9 eyes (55.6%), Figure 6, intraretinal cystic spaces in 4/9 eyes (44.4%), Figure 7a-c, and epiretinal membranes (ERM) in 3/9 eyes (33.3%), Figure 8. There was postoperative presence of the outer retina (ELM and EZ) in only one eye (11.1%), and this eye had the best vision in the series and was treated using an ILM plug technique, Figure 9.

Discussion

Our study investigated primarily the visual outcome, the closure rate of macular holes and the rate of retinal reattachment following surgery. We report a high rate of macular hole closure and retina reattachment, with significant improvement in vision. We also compared the visual outcome between two techniques (inverted ILM flap and ILM plug) used for macular hole closure. We observed no significant difference in visual outcome between the inverted ILM flap and ILM plug techniques. However, the ILM plug eyes had double the Snellen line improvement in vision compared to the inverted ILM flap eyes (2.75 ± SD 1.71 lines versus 1.25 ± SD1.5 lines). Also, the mean postoperative vision of the ILM plug group, 0.83 ± SD 0.23 LogMAR, was superior to the mean postoperative vision for the entire series of patients in this study, 0.94 ± SD 0.43 LogMAR.

Controversy trails the question of which surgical technique gives superior anatomical and visual outcomes for macular hole in RRD. Some studies have reported similarly high rates of retinal reattachment and macular hole closure using the ILM peel and inverted ILM flap technique.[6,9,10] Lui, in one of the largest number of cases on macular hole in RRD, reported that though the inverted ILM flap technique provided a superior structural outcome, the functional outcome was similar to the ILM peel.[10] This finding was echoed in the meta-analysis reported by Yuan *et al*.[7] Shukla's report suggests that ILM peel should be avoided since eyes without an ILM peel did the

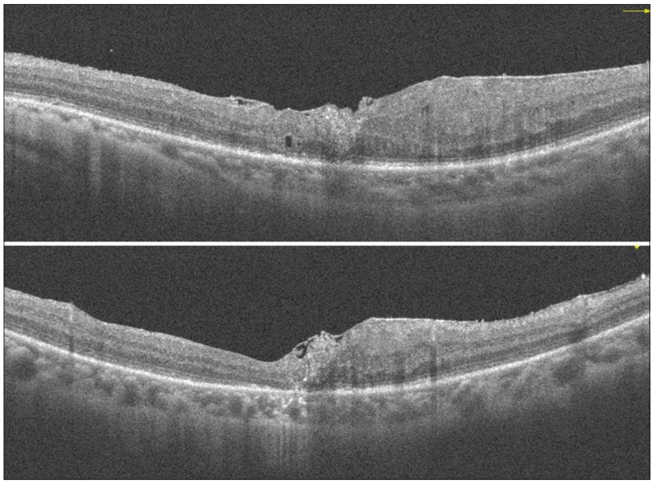

Figure 9: Postoperative reconstruction of the outer retina biomarkers of vision. The internal limiting membrane plug is shown, with an associated thin layer of external limiting membrane and ellipsoid zone present in an eye that achieved the most significant improvement in vision

same or better than eyes with ILM peel[8] Other researchers report that the inverted ILM flap technique has superior anatomical and visual outcomes compared to the ILM peel technique,[14] and nowadays, it appears to be the preferred technique for macular hole closure in macular hole in RRD.[9] One large series on macular hole in RRD compared the inverted ILM flap to the ILM plug technique and reported superior outcomes using the ILM flap.[11] Our study did not find any of the techniques (the inverted ILM flap or ILM plug) to be superior. Our small study sample size was a significant limitation and did not make for a definite conclusion to be drawn from the study. However, we observed that the eye with the most improved vision had an ILM plug, and the only eye with a postoperative reopening of the macular hole and retina re-detachment had an ILM flap. The findings of this study, in general, appear to show better outcome using the ILM plug, contrary to the finding of Zhu *et al*.[11] Randomized, multicenter study recruiting large numbers of patients will be required to answer the question of which technique gives superior outcome for the repair of macular hole in RRD.

Our study had similar retinal reattachment and macular hole closure rates compared to a recent report by Stappler *et al*.[9] in which an inverted ILM flap was used for MH closure. Stappler reported one case of retina re-detachment that was treated successfully with repeat surgery. We also had one case of retinal re-detachment caused by a reopened MH that was treated with a second surgery. The reported visual outcome in Stappler's study and other reports is superior to ours. Our patients had a high rate of proliferative vitreoretinopathy, poorer preoperative vision, longer symptom duration, and all nine eyes had a detached

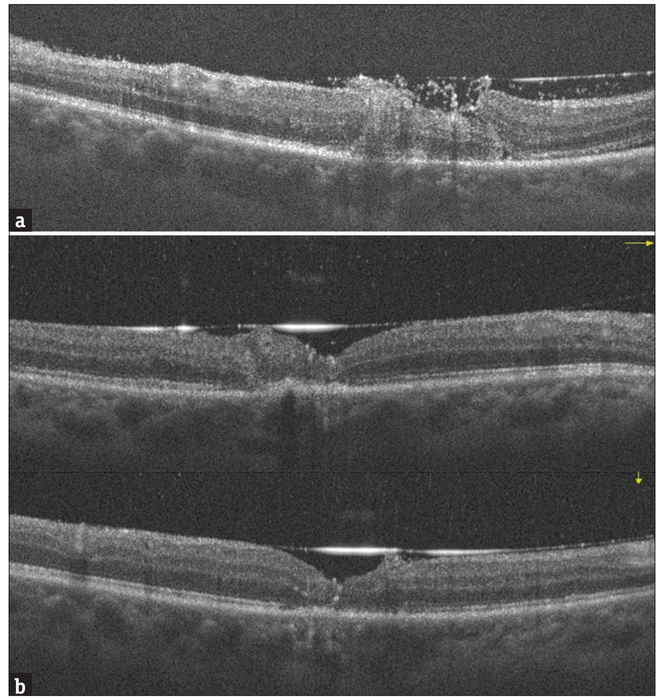

Figure 10: a and b: Autologous Retinal Transplantation of Free Retina Tissue. (a) Early postoperative period post autologous retinal transplant (ART). The piece of the transplanted retina can be seen within the macular hole and kept in place using a three-day tamponade of perfluorocarbon liquid (PFCL). (b) 3 months post ART with fewer hyperreflective dots in the pre-retinal space. PFCL has been replaced with silicone oil

macula at presentation. These preoperative findings suggest chronicity, which predicts poor visual outcome. Two studies reported high rates of PVR, 55.3% and 66.7%, similar to our study's PVR rate of 55.5%.[3,4] Najafi *et al*.[3] reported a high reoperation rate (29%). Cunningham reported a similar mean preoperative vision of 2.59 ± 0.649 LogMAR units to our report of 2.53 ± 0.93 LogMAR units.[4] However, our postoperative vision was superior, 0.94 ± 0.43 LogMAR versus 1.23 ± 1.01 LogMAR. Both studies report an improvement in visual outcomes from baseline. The findings of the two studies suggest that high PVR rates limit but do not prevent visual improvement.

We considered postoperative OCT findings in our study. The OCT scans of the macula provided helpful information on the closure of the macular hole, postoperative presence of the outer retina (ELM and EZ), the morphology of the foveo macula area and the presence of epiretinal membrane, and intraretinal cystoid spaces. The ELM and EZ were present in only one eye that had an ILM plug, and this eye had the most improved postoperative vision. Case 5 further warrants mention since delayed macular hole surgery was performed during silicone oil removal. This case was reported in the section on surgical technique earlier in the methods section of this article. The observation of two other reports supports our observation of improved vision despite delayed macular hole surgery. Ah Kiné *et al*.[15] performed primary vitrectomy to close the macular hole after successful scleral buckling to reattach the retina in rhegmatogenous retinal detachment patients with peripheral breaks and observed that all the patients had improved vision. Furthermore, our observation of visual improvement despite the delay in sequential surgery agrees with reporting by Singh, who observed improved vision in all eyes that had delayed macular surgery, and no significant difference in visual outcome between eyes that had combined retinal reattachment and macular hole surgery and eyes that had sequential surgery.[16]

The other significant lesson from the reporting of our series is that autologous retinal transplant was successfully used to treat macular hole in RRD in one patient who subsequently had a significant improvement in postoperative vision and anatomical macular hole closure, Figure 10a and b. A global study used autologous retinal transplant to treat macular hole in RRD with a 95% closure rate and improved vision.[12] Apart from the autologous retinal plug, the human amniotic membrane plug has been used with significant improvements in vision.[17] The use of retina and human amniotic membrane plugs has gained popularity. It is used to treat large macular defects in which the use of ILM flaps and plugs offers little or no hope of reconstitution of elements of the retina or, indeed, macular hole closure.[17-22] We observed that the eye treated using autologous retinal transplant did not develop postoperative ERM or intra retinal cysts as observed in our ILM plug and inverted ILM flap cases. In this study, intraretinal cysts occurred in 44% of eyes and ERM in 33%. Surgery in our ILM techniques involved using Duoblue dye to stain the ILM, which was eventually placed over the macular hole (inverted flap) or inserted into it (plug) with the Duoblue dye stain on it. With dye retention on the ILM, rare retina toxicity is possible with subretinal migration of the dye through the macular hole.[23-25] There is a possibility that retinal toxicity from the dye could be responsible for the postoperative macular edema. We observed a resolution of the intraretinal cysts using topical non-steroidal anti-inflammatory medications, suggesting an inflammatory component to the mechanism. A degenerative theory could also explain the intraretinal cystic spaces. In one study, the rates of ERM in the ILM peel and ILM flap techniques were 16.1% and 21.7%, respectively.[10] This is lower than the finding from our study. The reason for this is unclear but could be related to the high rate of PVR in our study. These secondary ERMs could significantly negatively impact the visual outcome, including the quality of vision.[26] The other finding of our study is the presence of postoperative foveomacular atrophy seen in 55.6% (5/9 eyes), which was not reported in the other studies on treatment of macular hole in RRD. As depicted in Figure 6, this macula atrophy further limits visual recovery.

This research is retrospective and, as such, is not free from bias, including selection bias, since the case selection was made by one surgeon, and objectivity is not assured. The small sample size of this hospital-based study does not allow for representation of the study findings in the general population. This form of MH, associated with rhegmatogenous retinal detachment, is uncommon. We also did not measure the size of the macula holes, which could provide some objectivity to the study. However, measuring the size of the macular hole using an OCT technique in a detached retina is a rather daunting task and could be inaccurate. The study has an important take-home that visual improvement and a high rate of anatomical reattachment can be achieved using any of the three techniques used in this study in complex proliferative vitreoretinopathy macular holes in RRD.

Conclusion

A high rate of anatomical success, macular hole closure and retinal reattachment, with visual benefit can be achieved with the current techniques for the repair of macular hole in RRD in eyes with high rate of proliferative vitreoretinopathy. The findings of this study suggest that the ILM plug has a reduced risk of postoperative reopening of the closed macular hole and retinal re-detachment. No technique is superior vision wise since visual outcome is similar in the inverted ILM flap and ILM plug techniques. However, the ILM plug had more mean Snellen line improvement in vision than the entire series of eyes and the inverted ILM flap eyes. Furthermore, another take home is that if required, the macular hole can be closed in a second surgery with reasonable visual outcome. The small sample size is a limitation to drawing compelling conclusions, and large multicenter, randomized, prospective studies are required to answer the question of which technique is best suited for treating regular-sized macular holes in RRD. The preferred technique should promote reconstitution of the outer retina (ELM and EZ), that are biomarkers for better vision. Also, retinal reattachment without complications including intraretinal cysts, ERM, and macular thinning is a desirable outcome.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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