

PFCL and ILM peeling in macular hole with retinal detachment

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Abstract

- **AIM:** To demonstrate the operative technique and surgical outcome of using perfluorocarbon liquids (PFCL) in internal limiting membrane (ILM) peeling of eyes with macular hole associated with retinal detachment (RD).
- **METHODS:** The study consists of 8 consecutive eyes of 8 patients diagnosed to have total RD with macular hole between December 2001 and October 2002. The age ranged from 13 to 65 years (mean 39 years). The male female ratio was 5:3. Four eyes were in Non-myopic Group and 4 eyes in Myopic Group. The patients underwent vitrectomy, ICG dye to stain the ILM, PFCL to flatten the retina intraoperatively, ILM peeling, fluid air exchange and endolaser was performed around the peripheral breaks. Tamponade with either silicone oil or C3F8 was used.
- **RESULTS:** The follow-up ranged from 6 to 9 months (mean 6.5 months). In Non-myopic Group. Macular hole was completely closed at the end of follow-up in 3 eyes (75%) and decreased size with flat edge in 1 eye (25%). In Myopic Group. All 4 eyes had successful closure of macular hole at the end of the follow-up. Comparing the groups, complete closure of macular hole was achieved in 7 eyes (88%) and open hole with flat edge was seen in 1 eye (12%) at the end of follow-up.
- **CONCLUSION:** Using PFCL is helpful in the peeling of ILM for macular hole associated with RD.
- **KEYWORDS:** macular hole; retinal detachment; ICG; internal limiting membrane

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INTRODUCTION

Macular hole is an uncommon cause of rhegmatogenous retinal detachment (RD); however, it can occur with associated peripheral breaks. Macular hole responsible for RD is mostly seen in high myopic eyes and detachment are primarily confined to the posterior pole. However, besides uncomplicated cases, macular hole with RD may be associated with proliferative vitreoretinopathy (PVR) or ocular trauma.

In such situations, closure of macular hole is not mandatory for retinal reattachment. Generally, the aim of surgery is to reattach the retina by closure of the peripheral retinal break (s). Surgeons do attempt to close the hole during primary repair of the detached retina but no published reports existed. However, Desiree *et al*^[1] reported the importance and provided the satisfactory results of macular hole surgery during primary retinal reattachment surgery.

It was reported earlier that the formation of macular hole resulted from tangential traction on the fovea by pre-foveal cortical vitreous^[2,3]. Since then the success rate of primary hole closure has been improved to 80% with vitrectomy, aggressive posterior hyaloid peeling and C₃F₈ tamponade^[4-6]. At present, the success rate is more than 90% after internal limiting membrane (ILM) peeling. Hence, it appears justified to attempt macular hole closure during primary reattachment surgery for associated RD by ILM peeling. However, stripping the ILM in a totally detached retina is a practical difficulty. This is primarily due to flaccid and mobile retina where posterior counter traction is absent to aid in the peeling of the ILM.

Hence, we described the operative technique and effectiveness of peeling the ILM under the perfluorocarbon liquids after staining with ICG dye in RD with macular hole.

MATERIALS AND METHODS

The study consisted of 8 consecutive eyes of 8 patients diagnosed to have total RD with macular hole between December 2001 and October 2002. The age ranged from 13

to 65 years (mean 33.87 years). The male female ratio was 5:3. They were divided into 2 groups: Myopic ($n=4$) and Non-myopic Group($n=4$). All patients underwent preoperative evaluation consisting of visual acuity testing (Snellen's chart), slit lamp examination, fundus examination with 90D biomicroscopy and indirect ophthalmoscopy with or without fundus photography. Details of fundus examination were noted to determine the presence or absence of peripheral hole and PVR preoperatively. Postoperatively, besides routine evaluation, fundus photography was performed. Only patients on whom vitrectomy is necessary for RD were included and not for macular hole per se. Decision was based on surgeon's choice. Informed consent was taken from all the patients before surgery.

The patients underwent vitrectomy, ICG dye to stain the ILM, PFCL to flatten the retina intraoperatively, ILM peeling, fluid air exchange, and endolaser was performed around the peripheral breaks. Internal tamponade with either silicone oil or C_3F_8 was used. Informed consent was taken prior to surgery.

Success of the surgical procedure was taken as attached retina 3 months after removal of silicone oil or after complete absorption of C_3F_8 . Success of macular hole closure was defined as complete closure of hole or decreased size with open hole and flattened edge. Failure was defined as open hole with lifted edge.

SURGICAL TECHNIQUE

Standard three-port pars plana vitrectomy was performed. Posterior cortical vitreous was removed and residual attached posterior hyaloid was stripped. Initial scleral buckling was done according to the site of the break. After the completion of vitrectomy, ILM is stained with ICG dye. The 0.2mL of 5g/L of ICG dye was used for staining. We preferred to wait for 30 seconds and then aspirate the dye so that there was no prolonged contact of ICG in the eye. Care was taken that the dye did not pass through the hole and at the end of aspiration of the residual dye, soft tipped extrusion cannula was used transiently to aspirate if any dye had passed through the macular hole. After the stain of ILM, PFCL was injected to flatten the posterior pole. The ILM was then incised with 20G MVR blade about 1 000 microns temporal to the fovea. The cut edge of the ILM was grasped with Eckardt's flat bottom end gripping forceps and lifted to peel in a circular fashion. While the posterior pole was

temporarily under PFCL, fluid gas exchange was performed to flatten the rest of the retina through the peripheral hole. Endolaser was done around the peripheral hole and/or 360° barrage along the posterior edge of the scleral buckle. PFCL- C_3F_8 or silicone oil exchange was then done. Sclerotomy closed with 8-0 vicryl and peribulbar antibiotic was given. Conjunctival peritomy was then closed with 8-0 vicryl, and 0.5ml subconjunctival antibiotic injection was given.

RESULTS

In Non-myopic Group ($n=4$, Table 1): the macular hole with RD was traumatic in origin in 2 eyes (25%) and with previous history of scleral buckling in 2 eyes (25%). In Myopic Group ($n=4$; Table 2), spherical equivalent was > 10 dioptre. Eyes in myopic group were associated with macular degeneration (chorioretinal atrophy and posterior staphyloma). The follow-up ranged from 6 to 9 months (mean 6.5 months).

In Non-myopic Group (Table 1), silicone oil was used as an internal tamponade in 2 of 4 eyes and C_3F_8 in the rest. One eye, which had C_3F_8 as the primary tamponade, developed recurrent RD primarily affecting the posterior pole. This patient underwent silicone oil injection during resurgery. Silicone oil was removed in all the eyes (3 of 4 eyes) at the end 3 months from the time of injection. Macular hole was completely closed at the end of follow-up in 3 eyes (75%) and decreased size with flat edge in 1 eye (25%).

In Myopic Group ($n=4$; Table 2), silicone oil was used as an internal tamponade in 2 eyes (50%) and C_3F_8 in the rest. Two eyes had macular detachment with opening of the macular hole (1 with silicone oil as primary tamponade and 1 with C_3F_8 as primary tamponade). Each of these eyes underwent resurgery with silicone oil injection. Hence eventually, 3 of 4 eyes in this group had silicone oil as internal tamponade. All 3 eyes underwent silicone oil removal at the end of 3mo from the time of injection. All 4 eyes had successful closure of macular hole at the end of the follow-up. Comparing the groups, complete closure of macular hole was achieved in 7 eyes (88%) and open hole with flat edge was seen in 1 eye (12%) at the end of follow-up. In this study silicone oil tamponade was required in 6 of 8 eyes (75%) and appeared to show better surgical outcome than C_3F_8 as a tamponade, however, the sample size was too small to conclude.

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Table 1 Non-myopic Group

Case	Age/Sex	Diagnosis	Primary Sx	2nd Sx	Follow up (month)	MH status	SOR	Remarks
1	17/M	Trauma RD, PVR	SOI	SOR	7	closed	Yes	
2	13/M	Trauma RD	C ₃ F ₈	none	6	Dec. size Flat edge		
3	42/F	Rec. RD s/p SB	C ₃ F ₈	SOI	6	closed	Yes	Rec. RD
4	60/M	Rec. RD PVR	SOI	SOR	6	closed	Yes	

RD: retinal detachment; Rec: recurrent; SB: scleral buckling; PVR: proliferative vitreoretinopathy; SOI: silicone oil injection; SOE: silicone oil exchange; SOR: silicone oil removal; MH: macular hole Sx: surgery; Detach: detachment

Table 2 Myopic Group

Case	Age/Sex	Diagnosis	Primary Sx	2nd Sx	Follow up(month)	MH status	SOR	Remarks
1	23/F	High Myopia RD	C ₃ F ₈	none	6	closed		
2	41/M	High Myopia RD	SOI	SOE	6	closed	Yes	Macular Detach.
3	35/M	High Myopia RD	C ₃ F ₈	SOI	6	closed	Yes	Macular Detach.
4	40/F	High Myopia RD	SOI	SOR	9	closed	Yes	

RD: retinal detachment; SOI: silicone oil injection; SOE: silicone oil exchange; SOR: silicone oil removal; MH: macular hole; Sx: surgery; Detach: detachmen

During the surgery, no subretinal migration of PFCL was seen. There was no evident residual ICG dye clinically in the postoperative period. However, infrared reflectance was not done to validate the persistence of residual ICG molecules in the fundus. During the surgery, the scrolling of the lifted ILM edge was also noticed. No complications related to ILM peeling were noticed on the retina during the surgery (Table 1 and 2).

DISCUSSION

Since the introduction of macular hole surgery by Kelly and Wendel^[4], anatomical and functional success of surgery have improved considerably by refinement of surgical techniques. Yoon *et al*^[7] reported the importance of ILM in the pathogenesis of macular holes. At present, the success rate is more than 90% after ILM peeling, either selectively or intentionally. Removal of ILM is surgically difficult in a detached retina, more so, in a high myopic eye^[8] with posterior staphyloma and chorioretinal atrophy. Absence of counter traction in a flaccid and detached retina and lack of

background contrast in high myopic eye constitute the surgical difficulty in the peeling of ILM for successful closure of macular hole associated with RD. Nishimura *et al*^[9] have also reported the technique of using PFCL to assist ILM peeling in a detached retina caused by macular hole. His study consisted of 2 cases and without any evidence of adverse effect due to use of PFCL and ICG dye. Our case series have shown the surgical feasibility and ease to peel the ILM when performed under the PFCL. PFCL have helped to flatten the posterior retina and provided sufficient counter traction for successful peeling. No intraoperative subretinal migration of ICG dye or PFCL was observed. During the surgery, the scrolling of the lifted ILM edge was noticed which is primarily due to high specific gravity of PFCL that tends to flatten and scroll the thin ILM. ILM peeling in such situation probably can also be achieved by initial fluid gas exchange to flatten the retina, to stain the ILM with a drop ICG dye and then perform the surgery under PFCL to provide adequate counter traction. We

believe that performing ILM staining under the air may allow ingress of dye in the subretinal space; however, both techniques in the initial staining method should not cause any difference in the technique to peel under the PFCL.

If extrapolated, the case series also showed that silicone oil tamponade was a better tamponading agent in macular hole with RD, especially in high myopic eyes. Probably, this requires a larger case series with longer follow-up consisting of both myopic and non-myopic groups to prove its effectiveness.

The primary aim that the operative technique of PFCL assisting in peeling of the ILM in a detached retina holds true in this study.

Here we emphasize the technique of ILM peeling and the surgical outcome at the end of mean follow-up of 6.5 months. Even though the follow-up is short, the technique does address to method of ILM peeling in macular hole with RD.

CONCLUSION

Usage of PFCL can aid the peeling of ILM in a detached retina for possible successful closure of macular hole associated with RD.

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