

Primary Internal Limiting Membrane Peel and Its Effects on Epiretinal Membrane After Pars Plana Vitrectomy for Rhegmatogenous Retinal Detachment



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ABSTRACT

Purpose: To determine the effect of internal limiting membrane (ILM) peel in post-operative development of epiretinal membrane and to see visual outcomes of patients undergoing pars plana vitrectomy with and without ILM peel.

Study Design: Quasi experimental study.

Place and Duration of Study: Retina clinic of Al-Ibrahim Eye Hospital from July 2022 to December 2022.

Methods: A total of 60 eyes which underwent pars plana vitrectomy (PPV) with silicone oil for Rhegmatogenous retinal detachment (RRD) were included. Patients with previous vitreoretinal surgery or ocular trauma, macular diseases or coexisting conditions that could affect the outcomes or complicate the surgery were excluded. Group A included patients with ILM peel and Group B included patients with no ILM peel (30 eyes each). Frequency was calculated for gender, epiretinal membrane formation. and was compared between both groups using chi square.

Results: Mean age in group A was 47.63 ± 8.61 years and in group B was 45.36 ± 6.63 years. Gender distribution showed 66.6% males in group A and 43.3% in group B. After 3 months the group A had significantly lower frequency of ERM formation (3.33%) as compared to group B (16.67%) with $p < 0.05$. However, post operative visual acuity was not significantly different between the two groups ($p > 0.05$).

Conclusion: This study shows that primary ILM peel diminishes the development of ERM and decreases the need for second surgical procedure. However, postsurgical visual acuity between the two groups showed no significant difference.

Key Words: Epiretinal Membrane, Pars plana Vitrectomy, internal limiting membrane, rhegmatogenous retinal detachment.

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INTRODUCTION

Pars plana vitrectomy (PPV) is the most widely performed surgical technique for rhegmatogenous retinal detachment (RRD).^{1,2} Following the

introduction of small-gauge Pavilioned oil (SO), Perfluorocarbon liquids (PFCL), high-speed cutters and greater-field of visualization system the anatomic success is documented to be between 81.8% and 100% along with better visual outcomes.^{3,4} Although the anatomic success is high but sometimes due to postsurgical complications, functional outcomes are compromised. One of the complications is epiretinal membrane (ERM) formation.^{5,6} Time for ERM formation after PPV for RRD varies from 3 to 6 months.^{7,8} While its incidence is described between

6% and 28.5%, ILM peeling during PPV has been reported to halt ERM formation.⁹

ERM is formed as a result of multiplication of retinal pigment epithelial (RPE) cells liberated after a retinal break. These cells move towards the direction of inner most layer of macula and use ILM as a platform for their growth and organization.¹⁰ The variability in the reported incidence of post-operative ERM can be attributed, in part, to the diagnostic methods used. Rates of ERM detection tend to be lower when relying on biomicroscopic fundus examination, ranging from 6% to 13%.¹¹ In contrast, when utilizing optical coherence tomography (OCT) for diagnosis, the rates of ERM detection following vitrectomy for RRD shows a significant increase, ranging from 35.1% to 70.3%.¹²

The rationale for primary ILM peel during 3-port-PPV for RRD lies in its potential to mitigate the development of ERM as a subsequent complication. By proactively removing ILM, serving as a scaffold for proliferating RPE cells and ERM formation, the incidence of ERM can be significantly reduced. This preventive approach aims to enhance the success of RRD repair while minimizing the need for additional surgical interventions and their associated risks.

METHODS

A quasi-experimental study was carried out in Retina clinic of Al-Ibrahim Eye Hospital. It was conducted from July, 2022 to Dec, 2022. Prior ethical approval was sought from review board (REC/IPIO/2022/-44(33)/055). WHO calculator was used for sample calculation. By using 80% power, a 5% level of significance, and taking anticipated percentage of epiretinal formation with ILM peeling (3%) and without ILM peeling (29%).¹⁰ Sample was found out to be 60. Patients were divided in two groups (taking 30 eyes in each group).

Patients from 18 to 80 years of age, either gender and diagnosed with RRD were enrolled in the study. Patients with tractional or exudative retinal detachment, complicated RD, history of previous vitreoretinal surgery or ocular trauma, macular diseases like ARMD, macular hole or coexisting conditions that could affect the outcomes of surgery were excluded. Patients with severe systemic conditions that may pose significant risks during surgery or recovery were also excluded. Informed consent was taken and all the participants of study

were briefed about the study goals and eligibility conditions in accordance with the standards for clinical trials. The patients were allocated in either group by lottery method.

In Group A, vitrectomy with ILM peeling was performed and in Group B, patients were managed with vitrectomy without ILM peeling. Preoperative Best-corrected Visual Acuity (BCVA) was measured by Log MAR Chart, anterior segment examination, intraocular pressure and fundus examination was done with 90D and indirect ophthalmoscope. Pre-operative OCT was done to exclude patients with ERM and postoperative OCT was done to document the development of ERM. An experienced surgeon performed 23-gauge PPV.

PPV was done after inducing posterior vitreous detachment followed by drainage of sub retinal fluid (SRF). Once the retina was attached, internal tamponade was done with Silicone oil.

Patients in Group-A, had one additional step of ILM peeling. ILM peeling was done at macular area for about 2-disc diameters. After that silicon oil was injected and surgery was completed. Post-operative examination was done at day one, week one, first month and third month. At each visit assessment of visual acuity, anterior segment examination, IOP assessment, and fundus examination with 90D was done. SD-OCT was used to see ERM formation at 3 months.

Demographic data like gender, age and body mass Index were entered in a pre-designated proforma. ERM formation was detected at macular area after 3 months of procedure on OCT.

All data were analyzed and assessed in SPSS version 25. Shapiro Wilk's test was used to check the normality of data. Quantitative data like age, BCVA was presented as mean \pm S.D. Qualitative data such as gender, epiretinal membrane formation (yes/no) was presented in the form of frequency and percentage. In order to compare mean age between two groups independent sample t test was used. To compare ERM in both groups, Chi-square/fishers exact test was applied. P-value \leq 0.05 was considered as significant.

RESULTS

A total of 60 eyes (30 in each group) were included in the study. Mean age in ILM peel group was 47.63 ± 8.61 years and without ILM peel group was $45.36 \pm$

6.63 years ($p < 0.05$). Gender distribution showed 20 (66.6%) males in ILM peel group and 13 (43.3%) in without ILM peel. Pre-operative BCVA in group A was 1.39 ± 0.52 logMAR and group B was 1.36 ± 0.48 log MAR. ($p > 0.05$). Post-operative BCVA was not significantly different between the two groups when followed at 1st month and 3rd month postoperatively with $p > 0.05$ (Table 1).

Table 1: Best corrected visual acuity between the groups.

Variables	Groups	N	BCVA (Mean±S.D)	P-value
Post-operative BCVA (log MAR) at 1 st month	A	30	0.64±0.06	0.27
	B	30	0.63±0.04	
Post-operative BCVA (log MAR) at 3 rd month	A	30	0.45±0.036	0.42
	B	30	0.43±0.037	

Epiretinal formation was seen in one eye (3.33%) in group A and in five eyes (16.67%) in group B at the end of 3 months which was confirmed with SD OCT (Table 2).

Table 2: Comparison of Epiretinal membrane formation (ERM) between groups.

Groups	Epiretinal Formation at three months		p-value
	Yes n (%)	No n (%)	
Group A	1 (3.33)	29 (96.67)	0.024
Group B	5 (16.67)	25 (83.33)	

DISCUSSION

The results of this study emphasized the significance of primary ILM peeling as an adjuvant step in PPV for RRD. There was only one case of ERM formation in patients who underwent ILM peeling with PPV. During vitrectomy, peeling of ILM is widely adopted method for treating macular disorders.¹³ Among them the most common are macular hole, macular pucker, diabetic macular edema and ERM.^{14,15} ILM peeling can successfully halt the formation of ERM after PPV.¹⁶

Considering the potential complexities arising from primary vitrectomy, leading to the necessity of a second surgical intervention, certain researchers and specialists have passionately advocated for a proactive strategy involving prophylactic peeling of ILM during primary PPV for RRD. Literature shows that that post-operative ERM mostly appear within first 3 months

after surgery.¹⁷ It is also reported that its frequency increases in cases where no ILM peeling is done.

This finding supports the existing theory that ILM can act as a framework for ERM development. By eliminating the ILM, Surgeons can effectively reduce this complication after surgery, which has implications for improving visual outcomes and long-term patient satisfaction.^{18,19}

This particular study found no significant change in best-corrected vision between both groups at the end of 3 months. However, other studies have documented improvements in visual acuity following ILM peel.¹⁶ This is plausible as ERM formation contributes to a decrease in BCVA. Mahmood et al. reported similar results, showing a decrease in ERM formation after ILM peeling, but the improvement in BCVA was not statistically significant compared to cases without ILM peel.¹⁴ Similarly, a meta-analysis found that 29% of patients who underwent RRD surgery without ILM peeling developed ERM.¹⁰

There is a wide range in the frequency of ERM development after PPV without ERM peel (35.1%-70.3%) when assessed using optical coherence tomography (OCT).¹⁹ Obata et al, documented that in ILM peel group 20.5% of eyes had developed ERM, on the other hand, the group with no ILM peel had 42.6% of eyes with ERM formation.²⁰

Nam et al, documented better vision after surgery in the ILM peel group, attributing this to a decreased likelihood of macular pucker development post-surgery.¹⁷ According to Martinez-Castillo et al, the frequency of ERM formation was 9% after retinal detachment surgery, and although there was an initial drop in mean BCVA, it improved after ERM removal.²¹ Conversely, Pietres-Trzpiel found no significant change in BCVA in either group for both distant and near vision.²² Thus, the functional outcomes reported in different studies are mixed.^{23,24,25}

There are several limitations which need to be addressed in further studies. The sample size is small and study design lacks randomization leading to selection bias. A follow-Up of 3 months may be insufficient to fully assess the long-term effects of ILM peeling on ERM formation and visual outcomes. The study primarily focuses on the formation of ERM and visual acuity but does not include other potentially relevant outcomes such as patient-reported visual function, quality of life, or other complications related to the surgery.

CONCLUSION

This study emphasizes the value of ILM peel in diminishing the development ERM and decreasing the need for second surgical procedure. However postsurgical BCVA in two groups shows an increase from baseline but in between two groups show no significant change. Further research is warranted to explore the durability and comprehensive implications of these findings.

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Patient's Consent: All participants provided written informed consent, and researchers followed the guidelines set forth in the Declaration of Helsinki.

Conflict of Interest: Authors declared no conflict of interest.

Ethical Approval: The study was approved by the Institutional review board/Ethical review board (REC/IPIO/2022/055).

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Authors Designation and Contribution

Uzma Haseeb; Assistant Professor: *Concepts, Design, Literature search, Manuscript preparation.*

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