Original Article

Effect of Internal Limiting Membrane peeling on Success of Pars Plana Vitrectomy in Epi-Macular Membrane

PJO – Official Journal of Ophthalmological Society of Pakistan

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ABSTRACT

Purpose: To determine the effect of internal limiting membrane (ILM) peeling on the success of pars plana vitrectomy (PPV).

Study Design: Quasi experimental study.

Place and Duration of Study: Al-Firdous Private Eye Hospital from 2021 and 2022.

Method: This study included patients with an epiretinal macular membrane (EMM) and visual symptoms who were scheduled for PPV. Patients with diabetes mellitus, cellophane maculopathy, or those without symptoms were excluded. A total of 40 patients were enrolled and divided into two groups (20 in each) using convenient sampling. Group A underwent PPV with EMM and ILM peeling. Group B underwent PPV with EMM but without ILM peeling. The primary outcome was the recurrence of EMM within two years. Qualitative data were analyzed using the Chi-square test in Microsoft Excel, with a significance level set at $p < 0.05$.

Results: The mean age in Group A was 43 ± 3.2 years, while in Group B, it was 45 ± 3.7 years ($p > 0.5$). Males comprised most participants (67.7%, n=27), with 16 males in Group B. Recurrence of EMM requiring a second PPV was observed in 6 patients (30%) from Group B, whereas no recurrence occurred in Group A ($p = 0.007$).

Conclusion: ILM peeling significantly reduces the recurrence rate of EMM following PPV, demonstrating its superiority in surgical success.

Keywords: Internal limiting membrane, Epimacular membrane, Pars plana vitrectomy.

How to Cite this Article: Fazaa AAH, Al-Maamar HAA, Abdulla MG. Effect of Internal Limiting Membrane peeling on Success of Pars Plana Vitrectomy in Epi-Macular Membrane. 2025;**41(2):**132-136.
Doi: 10.36351/pjo.v41i2.1922

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Received: August 05, 2024
Revised: November 12, 2024
Accepted: February 02, 2025

INTRODUCTION

Peeling of the internal limiting membrane (ILM) has become a crucial part of PPV for the treatment of many macular conditions, including macular holes, vitreomacular traction (VMT) syndrome, and epimacular membranes (EMM).[1] Studies have demonstrated that removing ILM can reduce the likelihood of EMM recurrence following surgical excision.[2] EMM can occur following any vitrectomy procedure to cure rhegmatogenous retinal detachment (RRD). The incidence of EMM after this surgery ranges from 6 to 48% as reported in published literature.[3] PPV is associated with an increased risk of developing EMM when there are frequent, big, or posterior retinal tears, as well as a longer duration of macular detachment.[4,5] The primary mechanism behind the creation EMM during the healing process of retinal detachment is the migration of retinal pigment epithelial (RPE) cells through the retinal tear,

followed by their subsequent proliferation on the surface of the macular tissue. Performing ILM peeling during primary PPV would eliminate the supporting structure necessary for the growth of these rapidly dividing cells[6-8] Multiple studies have assessed the significance of ILM peeling in preventing the formation of EMM after PPV and its effects on the microstructure and function of the macula regarding central and color vision.[9,10]

EMM also known as (epiretinal Membrane) is defined by the excessive growth of Müller cells and myofibroblasts, which are cells that have transformed into a different kind, along with a layer of extracellular matrix that envelops the ILM scaffold. This growth results in a reduction in central vision and metamorphopsia, which is a visual distortion. Excising EMM through surgery often results in a substantial decrease in retinal thickness and structural changes, which can be enhanced by simultaneously removing the ILM.[11] However, there is ongoing controversy regarding the significance of ILM peeling in PPV for patients with EMM.[12] ILM peeling enhances retinal compliance and may improve anatomical outcomes. It also eliminates Muller cell footplates, which might potentially cause Muller cell malfunction.[13]

The objective of this study is to assess the efficacy of PPV in minimizing the recurrence of EMM and enhancing surgical outcomes in retinal disease management.

METHODS

This was a quasi-experimental study prospective study which enrolled patients with symptomatic EMM. They were scheduled for PPV in AL-Firdous Private Eye Hospital between 2021 and 2022. The study was approved by the ethical committee of Ibn Sina University of Medical and Pharmaceutical Sciences **(IRB:3224).** Inclusion criteria comprised of EMM with symptoms (metamorphopsia: distortion of image). Exclusion criteria consisted of Diabetes mellitus, cellophane maculopathy, and symptomless patients. A total of forty patients were included in the study and assigned to two groups using systematic random sampling.

- **Group A:** Comprised 20 patients who underwent PPV with EMM and ILM peeling.
- **Group B:** Comprised 20 patients who underwent standard PPV with EMM without additional ILM peeling.

All patients received a detailed explanation of the potential risks and benefits of the surgery before enrollment, and written informed consent was obtained.

The primary outcome was the recurrence of EMM within two years of follow-up, as determined by slit lamp examination, optical coherence tomography (OCT) imaging, and patient-reported symptoms, including metamorphopsia and decreased vision. Additional demographic data and lens status were also recorded.

Data analysis was performed using SPSS Version 20.0, and Microsoft Excel. Qualitative data was analyzed using the Chi-square test in Excel. A p-value < 0.05 was considered statistically significant.

RESULTS

The mean age of group A was 43 ±3.2 years, while group B had a mean age of 45 ± 3.7 years, P>0.5. Male gender accounted for most of the participants 27 (67.7%). There were 16 males in group B as shown in Figure 1. It was not statistically significant, P=0.09 (Table 1).

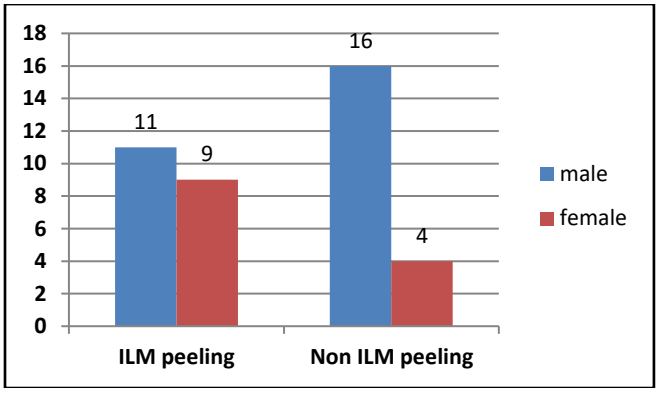

Figure 1: Gender distribution of cases according to the surgery procedure.

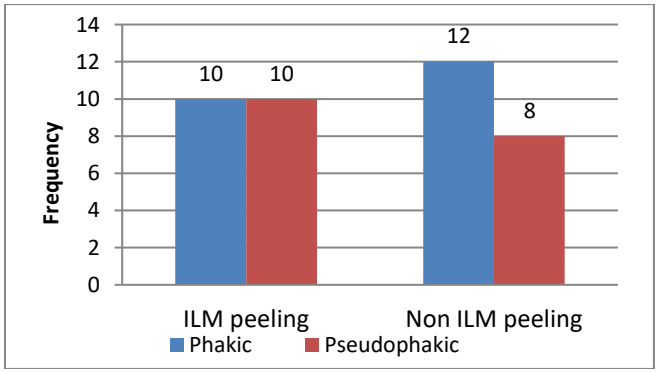

Figure 2: Lens status distribution.

Table 1: *Patient characteristics according to study groups.*

Term	ILM peeling N (%)	Non-ILM peeling N (%)	Total	P value
Male	11(55)	16(80)	27(67.5)	0.09
Female	9(45)	4(20)	13(22.5)	
Phakic	10(50)	12(60)	22(55)	0.5
Pseudophakic	10(50)	8(40)	18(45)	
Total	**20**	**20**	**40**	

Table 2: *Characteristics of patient distribution according to the surgical procedure (ILM peeling).*

Term	Recurrent	No Recurrent	Total	P value
ILM peeling	0 (0%)	20 (100%)	20	0.007
Non-ILM peeling	6 (30%)	14 (70%)	20	
Total	**6**	**34**	**40**	

The lens status was not significantly different between the two groups (P=0.5) although group B had a slightly higher rate of phakic patients 12 (60%), Figure 2.

Among group B, 6 patients had recurrent EMM requiring another PPV while none of the patients in group A had developed recurrence, P=0.007 (Table 2).

DISCUSSION

The surgical removal of EMM usually results in a substantial decrease in retinal thickness and structural changes, which can be further enhanced by concurrent removal of the ILM.[11] The significance of ILM peeling in PPV for patients with EMM is a topic of ongoing debate.[12] The process of ILM peeling has been shown to facilitate retinal compliance and can potentially increase anatomical outcomes. Nevertheless, it also eradicates Muller cell footplates, possibly leading to aberrant Muller cell functionality.[13] The present recognition of the safety and efficacy of ILM peeling during PPV therapy for EMM is limited.

Our study findings indicated that there were no instances of EMM recurrence when ILM peeling was performed, thereby eliminating the necessity for a further PPV procedure. Furthermore, patients reported significant visual recovery. Conversely, the recurrence rate of EMM was 30% when the non-ILM peeling technique was employed requiring an additional PPV. This indicates that the ILM peeling procedure was comparatively more efficient. The observed cases of recurrence in non-ILM peeling may be attributed to partial removal of the ILM. Our study results align with earlier studies that reported a recurrence rate of approximately 21% in non-ILM peeling for EMM surgery.[14-16]

From another perspective, the ILM serves as a framework for the growth of trans-differentiated Müller cells and myofibroblasts. Consequently, removing the ILM decreases the likelihood of recurring EMM.[17,18] Therefore, our investigation revealed that the removal of the ILM was linked to a reduced occurrence of EMM recurrence and the necessity for additional surgery. This finding aligns with the analysis conducted by Fang et al.[19]

There were more males in this study which is in accordance with previous studies.[20,21] The average age of the patients was 45±3.7 years, with male predominance. The lens condition varied among each patient and was not statistically different among study groups, but overall, the postoperative eyesight of EMM showed remarkable improvement. The frequency of EMM was the primary factor in deciding the ultimate visual result.

The limitations of the study include lack of randomization, small sample size and short follow up. It was a single center study limiting external validity and the ability to generalize results to other populations and clinical settings. Variability in surgical techniques, surgeon expertise, and post-operative care could have influenced the outcomes. Some assessments, such as patient-reported symptoms (metamorphopsia and decreased vision), are inherently subjective and may introduce reporting bias. While recurrence of EMM was assessed, the study did not comprehensively evaluate functional visual outcomes, such as best-corrected visual acuity (BCVA) or contrast sensitivity, which are critical for patient quality of life.

CONCLUSION

The ILM peeling in EMM revealed an increasing anatomical success rate with a decreasing recurrent rate. While there was a high recurrence rate of EMM in non-ILM peeling.

Funding: None.

Patient's Consent: 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 **(IRB:3224)**.

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Authors Designation and Contribution

Ali Abbas Hassan Fazaa; VR Consultant: *Concepts, Design, Data acquisition, Data analysis, Statistical analysis, Manuscript review.*

Hasan Abdul Amir Alma Amar; Consultant Ophthalmologist: *Concepts, Design, Literature search, Data analysis, Manuscript preparation, Manuscript editing, Manuscript review.*

Mudhher Ghani Abdulla; H.D Ophthalmology: *Concepts, Literature search, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.*