

Prophylactic ILM Peeling: When, Why, How?



The authors provide insights into peeling the ILM to prevent ERM in retinal detachment.

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Formation of an epiretinal membrane (ERM) with resultant macular pucker is a common sequela after vitrectomy for rhegmatogenous retinal detachment (RRD).¹ The Silicone Study Group reported that macular pucker occurs in 15% of eyes after successful pars plana vitrectomy (PPV) for retinal detachment (RD) that is complicated by proliferative vitreoretinopathy (PVR).² These membranes occasionally limit functional outcome and cause metamorphopsia. If symptomatic, they require additional intervention.

Although the role of posterior vitreous detachment is central to formation of both primary (ie, idiopathic) and secondary ERMs, the role of the internal limiting membrane (ILM) in the etiopathogenesis of secondary ERM after surgery for RRD is unclear. It is believed that ILM, corresponding to the basement membrane of Müller cells, provides a sort of scaffolding for cells that build an ERM.

If this is true, elective peeling of ILM at the time of PPV for RRD repair would reduce the incidence of ERM and macular pucker. This

has been demonstrated by Nam et al,¹ Aras et al,³ and Rao et al,⁴ who reported no ERM formation in eyes that had undergone PPV with ILM peeling for RRD.

Despite this, one must note that ILM peeling can be challenging in the presence of a detached retina and especially in the presence of a detached macula. Inadvertent trauma during peeling in eyes with good visual potential may offset the potential beneficial effect of preventing future macular pucker. Other

factors, such as coexistent PVR and vitreous hemorrhage, are believed to predispose eyes to ERM formation after RRD repair.^{5,6} These factors may in turn act as confounders when the beneficial effects of ILM peeling are assessed. Hence, consideration of potential confounders is necessary before ILM peeling can be recommended for all routine cases of RRD.

In this article, we review real-world data from a study we have conducted to make the case for prophylactic peeling of the ILM in certain situations.

AT A GLANCE

- Prophylactic ILM peeling is controversial because, although it may prevent ERM formation, inadvertent surgical trauma during peeling may lead to complications.
- Studies, including one by the authors, have found low levels of risk with prophylactic ILM peeling.
- Although the technical skills required to perform ILM peeling during RD repair may hinder the general adoption of this technique, it merits consideration by experienced surgeons.

TABLE 1. GROUP DIFFERENCES BETWEEN EYES THAT UNDERWENT ILM PEELING VS. NO ILM PEELING

Variable	No ILM Peeling (n=81)	ILM Peeling (n=78)	P Value
Preoperative Parameters			
Preoperative logMAR Visual Acuity (Snellen Equivalent)	1.24 ± 0.7 (20/320)	1.19 ± 0.7 (20/320)	.55
PVR (n, %)	0	12 (15.4%)	< .001
Vitreous Hemorrhage (n, %)	3 (3.7%)	12 (15.4%)	.014
Intraoperative Parameters			
Tamponade (n, %): Oil	42 (52%)	13 (17%)	< .001
Tamponade (n, %): Nonexpansile Gas	11 (14%)	34 (44%)	
Postoperative Parameters			
Postoperative logMAR Visual Acuity (Snellen Equivalent)	0.77 ± 0.6 (20/125)	0.48 ± 0.4 (20/63)	.003
Macular Thickness (in Microns)	262 ± 98	209 ± 62	.002
ERM (n, %)	25 (31%)	7 (9%)	.001
Abbreviations: ERM, epiretinal membrane; ILM, internal limiting membrane; PVR, proliferative vitreoretinopathy			

TABLE 2. DIFFERENCES BETWEEN EYES WITH ERM VS. NO ERM

Variable	No ERM (n=127)	ERM (n=32)	P Value
Preoperative Parameters			
Preoperative logMAR Visual Acuity (Snellen Equivalent)	1.21 ± 0.7 (20/320)	1.24 + 0.6 (20/320)	.73
PVR (n, %)	9 (7%)	3 (9%)	.66
Vitreous Hemorrhage (n, %)	13 (10%)	2 (6%)	.73
Intraoperative Parameters			
ILM Peeling	71 (56%)	7 (22%)	.001
Tamponade (n, %): Oil	39 (31%)	16 (50%)	
Tamponade (n, %): Nonexpansile Gas	38 (30%)	7 (22%)	
Postoperative Parameters			
Postoperative logMAR Visual Acuity (Snellen Equivalent)	0.51 ± 0.4 (20/63)	1.11 ± 0.6 (20/250)	< .001
Macular thickness (in Microns)	216 ± 73	313 ± 90	< .001
Abbreviations: ERM, epiretinal membrane; ILM, internal limiting membrane; PVR, proliferative vitreoretinopathy			

COMPARATIVE STUDY

In a series of 159 patients, we conducted a retrospective study to attempt to determine the difference in the rate of ERM formation between eyes that underwent ILM peeling during PPV and eyes that did not undergo ILM peeling.⁷ Clinically significant ERM was defined as a macula covered by a highly reflective band with or without loss of foveal contour and with macular thickness of 300 µm or greater.

All patients underwent three-port, 23-gauge standard PPV using the Accurus Surgical System (Alcon) with a widefield visualization system (MiniQuad XL, Volk Optical). ILM peeling was performed at the discretion of the operating surgeon without predefined criteria. The endotamponade was chosen by the surgeon, based on type of RD, location of break, and each patient’s expected compliance with head positioning.

REVIEWING THE RESULTS

During retinal reattachment surgery, 78 eyes in this series (49%) underwent ILM peeling based on the surgeon’s discretion (Table 1). Eyes in the ILM peeling group had significantly more PVR and vitreous hemorrhage than eyes in the group that did not undergo peeling. Postoperative vision was significantly better in eyes that had ILM peeling. Similarly, these eyes experienced significantly less ERM

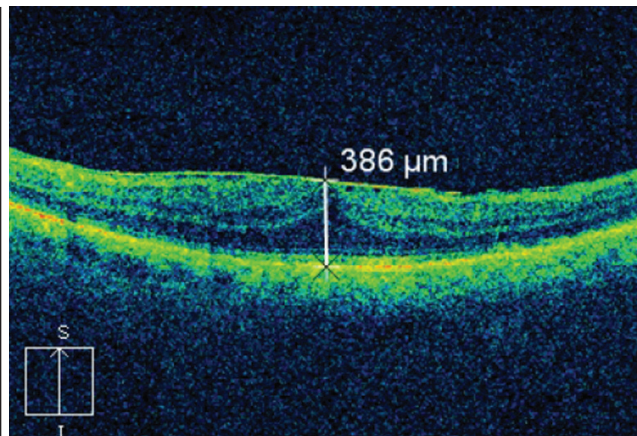


Figure 1. Postoperative OCT of a macula at 16 months after PPV surgery with C_3F_8 and no ILM peeling showing ERM formation and macular thickness of 386 μm .

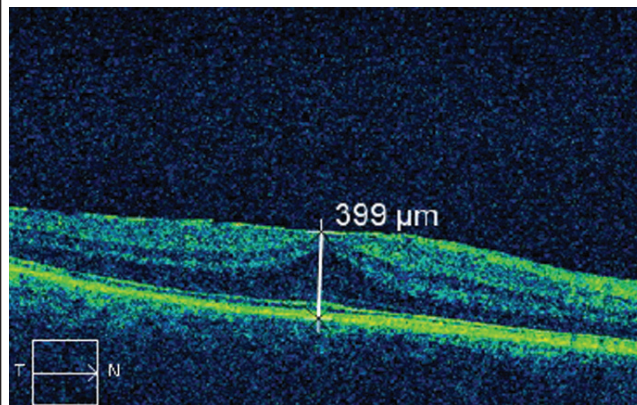


Figure 2. Postoperative OCT at 12 months after PPV and ILM peeling with C_3F_8 showing ERM formation and macular thickness of 399 μm .

formation, and the mean foveal thickness in this group was closer to normal, compared with the group in which the ILM was not peeled.

We compared the rates of ERM formation in eyes undergoing PPV for uncomplicated RRD with and without ILM peeling and found that ILM peeling reduced the likelihood of ERM formation and macular pucker by 75%. Although we excluded eyes with advanced PVR from this series, we found that the risk of ERM increased with presence of early PVR (Table 2).

PREVENTIVE PEELING

We propose that ILM peeling should be performed during primary PPV for RRD to prevent the formation of macular pucker. Our reasoning is that peeling of the ILM completely removes all epiretinal structures, including the basement membrane of Müller cells. The retinal pigment epithelium cells that are the primary culprits in ERM formation do not grow on the surface of Müller cells; they need a basement membrane to grow on. Therefore, removal of ILM theoretically precludes cells from forming ERMs.

In our study, an ERM developed in 32 of the 159 patients recruited (20.1%). ERM was observed in 31% of patients who did not undergo ILM peeling (Figure 1) and in 9% of those who underwent ILM peeling (Figure 2).

To Peel or to Not Peel

Peeling *Is* Indicated in These Scenarios:

- PVR changes, vitreous hemorrhage
- RD associated with macular hole
- Visible ILM folds on macula
- Planning for silicone oil tamponade
- Large breaks and/or giant retinal tear
- Combined RD, recurrent RD
- Presence of idiopathic ERM in fellow eye

Peeling *is Not* Advised in These Scenarios:

- Fresh RD without any PVR changes
- Novice surgeon (surgically challenging technique)
- Planning for gas tamponade

SIMILAR STUDIES

Before our study was published, Nam et al published the results of a similar retrospective study.¹ Their study evaluated the occurrence of ERM in 135 eyes undergoing primary RRD repair. These authors found that 21.5% of eyes that did not undergo ILM peeling developed ERM, compared with no eyes that underwent ILM peeling.

Major differences from our study were that Nam et al reported results exclusively from eyes that had gas tamponade alone. Additionally, Nam et al found that ERM was much more common in eyes with horseshoe tears compared with eyes that did not have such tears (57% vs. 33%).

Similarly, Aras et al studied the role of ILM peeling in eyes undergoing PPV for RRD with and without ILM peeling in 42 eyes. They too found a notable difference in the incidence of ERM formation.³ However, their study differed from ours in that all outcomes reported came from eyes having silicone oil tamponade.

The rate of ERM formation in their study was slightly lower than that reported in the group in our study that did not have ILM peeling (27%). The higher rate of ERM in our study could be explained by the fact that we defined the presence of ERM on optical coherence tomography (OCT) even if it did not affect visual acuity and may not have been obvious on slit-lamp biomicroscopy.⁸⁻¹⁰

We also found that in our study the operating surgeon favored ILM peeling in eyes with more PVR and vitreous hemorrhage and used gas tamponade more frequently when he decided to peel the ILM. This can be explained by the fact that the Silicone Study showed that ERM and macular pucker were more common in eyes with PVR,² a fact that we confirmed in our multivariable analysis. In such eyes, the ERM should be considered an extension of the PVR process involving the posterior pole, rather than resembling an idiopathic ERM.

STRENGTHS AND WEAKNESSES

The surgical challenge of peeling the ILM in a detached retina—especially with a detached macula—is far greater than the scenarios mentioned above. The safety of prophylactic ILM peeling in eyes without any macular lesion is controversial. Complications such as retinal edema; eccentric scotoma; dissociation of the nerve fiber layer; iatrogenic punctate chorioretinopathy; and subretinal, retinal, and vitreous hemorrhage are well described secondary to the surgical trauma of peeling.¹¹ Additionally, stain toxicity has been documented.¹²⁻¹⁶ Although we did not encounter any such complications after ILM peeling in our series, the risk certainly exists, especially for a novice surgeon.

The strengths of our study relate to the fact that its setting resembled a real-world scenario, allowing us to make meaningful comparisons. The study reported a single surgeon's experience with a relatively large sample size, good follow-up, and sufficient heterogeneity in variables (ie, tamponade used).

Drawbacks included the study's retrospective nature and the surgeon bias in selecting cases for ILM peeling. To attempt to eliminate further bias, OCT reports were graded in a masked manner by a different surgeon. Despite this masking and despite our use of regression analysis, the small number of ERM cases included in our study limits our ability to strongly establish a protective effect of ILM peeling in all cases undergoing PPV for RRD. However, we did see a trend of a greater beneficial effect of ILM peeling in eyes with PVR and those undergoing oil tamponade.

The bottom line is that we have documented a beneficial effect of ILM peeling in all cases of RRD undergoing PPV to minimize future occurrence of ERM, thereby resulting in better vision and preventing reoperation for ERM removal. The technical skills

required to incorporate ILM peeling during detachment repair may limit the general adoption of this technique, but we believe that our data are compelling and merit consideration by experienced retina surgeons. ■

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