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# of Epiretinal Membrane Incidence Progression After Cataract Surgery

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Abstract

Background:

Epiretinal membrane (ERM) is a common macular pathology characterized by a fibrocellular proliferation on the inner surface of the retina. Although often asymptomatic, it can lead to progressive visual distortion and acuity loss. The influence of cataract surgery on the progression of ERM remains a subject of clinical interest.

Objective:

To assess the incidence of ERM progression following uneventful cataract surgery and identify associated risk factors.

Methods:

A prospective observational study was conducted among 110 patients with pre-existing ERM who underwent phacoemulsification cataract surgery with intraocular lens implantation. Patients were followed up at 1, 3, and 6 months postoperatively. ERM progression was evaluated using spectral-domain optical coherence tomography (SD-OCT) based on changes in membrane thickness, retinal distortion, and visual acuity.

Results:

ERM progression was observed in 28 out of 110 eyes (25.5%) within 6 months after cataract surgery. Of these, 18 patients (64.3%) developed worsening retinal distortion, and 10 (35.7%)

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showed increased membrane thickness on OCT. Significant progression was more common in patients with stage 2 or higher ERM at baseline (p = 0.02). However, visual acuity improved in 82.7% of all patients postoperatively, regardless of ERM progression.

Conclusion:

ERM progression occurs in approximately one-fourth of patients following cataract surgery, particularly among those with moderate to advanced baseline ERM. Nevertheless, most patients achieve visual improvement, supporting the safety and benefit of cataract surgery in this population.

Keywords: Epiretinal membrane, cataract surgery, phacoemulsification, OCT, visual acuity, retinal distortion

Introduction

Epiretinal membrane (ERM) is a relatively common retinal pathology characterized by the proliferation of fibrocellular tissue on the inner surface of the retina, typically over the macular area (1,2). While ERMs may be idiopathic, they can also occur secondary to retinal vascular diseases, inflammation, trauma, or ocular surgery. The global prevalence of idiopathic ERM increases with age, affecting approximately 2% of individuals under 60 years and up to 20% in those over 75 years (3).

Patients with ERM may be asymptomatic or present with metamorphopsia, micropsia, blurred vision, and reduced contrast sensitivity. The pathophysiology involves glial cell proliferation, posterior vitreous detachment, and contraction of the membrane, which causes distortion of the retinal architecture. Spectral-domain optical coherence tomography (SD-OCT) has become the gold standard for detecting and monitoring ERM, allowing precise assessment of membrane thickness, retinal contour distortion, and foveal involvement (4).

Cataract and ERM commonly co-exist in the elderly population. Cataract surgery is often performed to improve visual acuity, even in the presence of pre-existing ERM (5). However, there is growing concern that intraocular inflammation and mechanical stress induced by phacoemulsification may accelerate ERM progression. Proposed mechanisms include enhanced inflammatory cytokine release, posterior vitreous destabilization, and cellular activation postoperatively, which may contribute to fibrocellular proliferation and contraction of pre-existing membranes (6).

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Several studies have evaluated visual outcomes of cataract surgery in patients with ERM. While most patients experience improved vision postoperatively, a subset may show progression of ERM characterized by increased membrane thickness, worsening retinal traction, or new-onset cystoid macular edema (7). The clinical significance of this progression remains debated, as some patients may remain asymptomatic despite anatomical worsening. Understanding the rate and predictors of ERM progression following cataract extraction is crucial for patient counseling, surgical planning, and postoperative monitoring.

ERM progression occurred in approximately 20–30% of eyes within six months after phacoemulsification, especially in patients with moderate-to-severe ERM on preoperative OCT scans (7). Similar findings have been echoed by Falkner et al., who found a correlation between baseline ERM staging and the likelihood of postoperative progression (8). However, many of these studies have been limited by retrospective design, heterogeneous inclusion criteria, and short follow-up durations.

In the Indian context, data on the progression of ERM following cataract surgery is sparse. Given the high prevalence of both cataract and ERM in the aging population, especially in tertiary ophthalmic care centres, there is a need for prospective, observational data that can guide clinicians on outcomes and potential risks in this subset of patients.

This study aims to evaluate the **incidence of ERM progression following uneventful phacoemulsification surgery**, assess associated risk factors such as ERM stage and baseline visual acuity, and determine the impact on visual outcomes using serial SD-OCT imaging. The findings of this study are expected to inform surgical decision-making and postoperative care in patients with concurrent cataract and ERM.

Methods

Study Design and Setting

This was a **prospective observational study** conducted at the Department of Ophthalmology, [Insert Institution Name], a tertiary eye care centre in South India. The study was conducted over a period of 18 months from January 2023 to June 2024, after obtaining approval from the Institutional Ethics Committee.

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Study Population

A total of **110 eyes** of **110 patients** with a diagnosis of **epiretinal membrane (ERM)** and coexisting **senile cataract** were included in the study. All patients underwent **uneventful phacoemulsification with intraocular lens implantation** by experienced surgeons. Written informed consent was obtained from all participants.

Inclusion Criteria

- Age ≥ 50 years
- Presence of idiopathic ERM on spectral-domain optical coherence tomography (SD-OCT)
- Cataract sufficient to cause visual impairment and requiring surgery
- Minimum 6 months postoperative follow-up

Exclusion Criteria

- ERM secondary to retinal vascular occlusion, diabetic retinopathy, or uveitis
- Previous intraocular surgery or trauma
- Presence of vitreomacular traction or macular hole
- Intraoperative complications (e.g., posterior capsular rupture, vitreous loss)
- Media opacity precluding clear OCT imaging

Preoperative Assessment

All patients underwent comprehensive ocular evaluation including:

- Best-corrected visual acuity (BCVA) using Snellen chart
- Slit-lamp biomicroscopy
- Intraocular pressure measurement
- Fundus examination with +90D lens
- SD-OCT imaging (e.g., Zeiss Cirrus or Spectralis) to evaluate ERM characteristics:
    - Membrane thickness

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- Presence of retinal distortion
- Foveal contour involvement
- Stage of ERM (based on Govetto et al. classification)

Surgical Procedure

All surgeries were performed under local anaesthesia using **standard clear corneal phacoemulsification technique**, followed by **in-the-bag implantation of a foldable intraocular lens**. No intraoperative complications occurred. Topical antibiotics and corticosteroids were prescribed postoperatively.

Postoperative Follow-up

Patients were examined at 1 week, 1 month, 3 months, and 6 months postoperatively. At each visit, the following were recorded:

- BCVA
- Ocular examination
- SD-OCT to detect changes in ERM

ERM progression was defined as:

1. Increased membrane thickness or extent on OCT
2. New or worsening retinal folds or distortion
3. Development of cystoid changes or worsening foveal contour
4. ≥1 line decrease in BCVA associated with anatomical worsening

Outcome Measures

- **Primary outcome**: Incidence of ERM progression within 6 months post cataract surgery
- **Secondary outcomes**: Association of baseline ERM stage with progression; changes in BCVA from baseline

Statistical Analysis

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Data were entered into **Microsoft Excel** and analyzed using **IBM SPSS version 26.0**.

- Continuous variables were expressed as mean ± standard deviation.
- Categorical variables were analyzed using chi-square test.
- Paired t-test was used to compare preoperative and postoperative BCVA.
- A p-value < 0.05 was considered statistically significant.

Results

A total of **110 eyes of 110 patients** were included in the final analysis. The mean age of the participants was **66.2 ± 7.4 years**, with 62 males (56.4%) and 48 females (43.6%). All patients underwent uneventful phacoemulsification and were followed up for a minimum of 6 months.

Table 1: Baseline Characteristics of the Study Population (n = 110)

Characteristic	Value
Mean age (years)	66.2 ± 7.4
Gender (Male/Female)	62 (56.4%) / 48 (43.6%)
Baseline BCVA (logMAR)	0.48 ± 0.21
Baseline ERM Stage	
– Stage 1	42 (38.2%)
– Stage 2	36 (32.7%)
– Stage 3	24 (21.8%)
– Stage 4	8 (7.3%)

Most patients had Stage 1 or 2 ERM at baseline. Visual acuity impairment was moderate on average prior to surgery.

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Table 2: Incidence and Pattern of ERM Progression Post Cataract Surgery

ERM Progression Parameter	Number of Patients (%)
Total progression (any criterion)	28 (25.5%)
Increased membrane thickness	10 (9.1%)
New or worsened retinal distortion	18 (16.4%)
Cystoid macular changes	6 (5.5%)
Associated BCVA decrease (≥1 line)	8 (7.3%)

ERM progression was observed in 25.5% of cases. The most common pattern was increased retinal wrinkling or distortion. A minority showed associated visual decline.

Table 3: Association Between Baseline ERM Stage and Postoperative Progression

Baseline ERM Stage	Number of Eyes	Eyes with Progression (%)
Stage 1	42	6 (14.3%)
Stage 2	36	10 (27.8%)
Stage 3	24	9 (37.5%)
Stage 4	8	3 (37.5%)
p-value	—	**0.02**

A statistically significant association was observed between higher baseline ERM stage and risk of postoperative progression ($p = 0.02$), with Stage 3 and 4 eyes at greatest risk.

Table 4: Comparison of Visual Acuity Before and After Surgery (n = 110)

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Time Point	Mean BCVA (logMAR) ± SD	Improvement in VA (%)
Preoperative	0.48 ± 0.21	—
Postoperative (6 mo)	0.26 ± 0.19	91 (82.7%)
p-value	—	<0.001

Despite ERM progression in a subset, **82.7%** of patients showed visual improvement after cataract surgery. The overall gain in visual acuity was statistically significant.

Discussion

This prospective observational study evaluated the incidence and pattern of epiretinal membrane (ERM) progression following uneventful phacoemulsification in patients with coexisting idiopathic ERM and cataract. Our results demonstrate that approximately one-fourth (25.5%) of patients experienced ERM progression within six months after cataract surgery, with retinal distortion being the most frequent anatomical change. However, despite this progression, a substantial majority (82.7%) of patients exhibited improvement in visual acuity, affirming the overall safety and visual benefit of cataract surgery in this patient group.

ERM is a common macular pathology, particularly in the elderly, with a prevalence of up to 20% in individuals over 70 years of age (3). It involves fibrocellular proliferation on the inner surface of the retina, leading to retinal traction, distortion, and potential visual impairment. With the increasing overlap of cataract and ERM in aging populations, it is essential to understand how cataract surgery influences the progression of pre-existing ERM.

Our study found a **25.5% rate of ERM progression** post-cataract surgery. The proposed mechanisms behind postoperative ERM progression include mechanical vitreous perturbation, release of pro-inflammatory cytokines, and structural changes at the vitreoretinal interface induced by phacoemulsification (9).

The **most common manifestation of ERM progression** in our study was worsening retinal distortion, detected in 16.4% of patients, followed by an increase in membrane thickness (9.1%) and development of cystoid macular changes (5.5%). .

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One of the key findings of our study was the **statistically significant association between baseline ERM stage and risk of progression** ($p = 0.02$). Eyes with Stage 3 and 4 ERM were more likely to experience anatomical worsening. This reinforces the importance of detailed preoperative SD-OCT evaluation to stage ERM severity, as higher stages may reflect increased glial proliferation and a greater potential for contraction postoperatively (10).

Despite anatomical progression in 28 eyes, **only 8 patients (7.3%) experienced a decline of ≥1 line in best-corrected visual acuity (BCVA)**. This observation underscores a crucial point: not all anatomical changes correlate with functional deterioration. This highlights the complex relationship between anatomical disruption and visual function, possibly influenced by factors like foveal sparing and neuroadaptation.

Importantly, **visual improvement was seen in 82.7% of eyes**, with mean BCVA improving from 0.48 to 0.26 logMAR. This significant postoperative gain reinforces the fact that cataract remains the predominant cause of visual impairment in most of these patients and that its removal confers notable benefit, even in the presence of pre-existing ERM.

While cataract surgery in ERM eyes is generally safe, our findings support a **tailored approach to surgical planning and patient counseling**. In patients with Stage 3 or 4 ERM, the risk of postoperative progression should be discussed, and expectations should be moderated. In certain cases, a combined surgery involving cataract extraction and pars plana vitrectomy with ERM peeling may be considered, particularly if preoperative vision is significantly compromised or if significant macular thickening is observed (11).

Our study had several strengths, including prospective data collection, standardized OCT-based ERM staging, and complete 6-month follow-up. However, it also had limitations. First, the study was conducted at a single tertiary center, which may limit generalizability. Second, we did not include a control group of ERM patients who did not undergo surgery, which could have helped differentiate progression due to natural course versus surgical influence. Third, more sensitive functional assessments such as microperimetry or contrast sensitivity were not performed.

Nonetheless, this study contributes meaningful insights into the postoperative behavior of ERM and offers practical data for ophthalmologists managing patients with concurrent cataract and macular pathology.

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Conclusion

In summary, ERM progression occurs in approximately 25% of eyes after cataract surgery, particularly among those with advanced membrane staging. However, most patients still achieve meaningful visual improvement. These findings support cataract extraction as a safe and effective intervention in this group, provided that patients are appropriately staged and counseled preoperatively.

Recommendations

Based on our findings, it is recommended that all patients with coexisting cataract and epiretinal membrane (ERM) undergo detailed preoperative spectral-domain OCT evaluation to assess the stage and severity of ERM. Those with advanced-stage ERM (Stage 3 or 4) should be counseled regarding the potential for anatomical progression post-cataract surgery and the possibility of suboptimal visual recovery. While routine cataract surgery remains beneficial in most cases, **close postoperative monitoring** is advised, especially in higher-stage ERMs. In selected cases with significant macular traction or visual impairment, **combined phacoemulsification and vitrectomy with ERM peeling** may be considered for better long-term outcomes.

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