# Secondary Epiretinal Membrane After Peripheral Laser Photocoagulation: A Retrospective OCT Study

*Burcu Polat Gültekin[1], Rukiye Aydın Arslan[1], Ece Doğruel[2], Merve Özbek[2]*


## ABSTRACT

**Purpose:** The aim of this study was to determine the frequency of macular epiretinal membrane (ERM) formation in eyes treated with peripheral laser photocoagulation (LPC) for symptomatic peripheral retinal degeneration or breaks.

**Methods:** Medical charts of 185 patients who underwent peripheral LPC for symptomatic peripheral retinal degeneration or break between January 2015 and January 2025 were reviewed. The patients' records and optical coherence tomography (OCT) images were retrospectively analyzed to assess the frequency and progression of ERM.

**Results:** The mean age of the participants was 54.8 ± 12.0 (range:18-82 years). The mean follow-up period was 31.7 ± 18.7 months (range:6-108 months) among a total of 185 participants (90 male and 95 female). ERM developed in 26 (14 %) patients during follow-up, with detection on OCT images occurring at a mean of 19.2 ± 15.4 months after laser treatment. The incidence of ERM formation was 21% in patients treated for lattice degeneration, 14.2% in those treated for retinal holes, and 12% in those treated for retinal tears. Among affected patients, 12 had stage 1 ERM, 8 had stage 2 ERM and 6 had stage 3 ERM. Notably, all patients with stage 3 ERM had undergone LPC for retinal tears. The progression time from stage 1 to stage 2 ERM was 16.8± 5.4 months, while progression from stage 1 to stage 3 ERM occurred at 34± 6.36 months. Overall, none of the patients had undergone surgery for ERM.

**Conclusion:** In our study, the incidence of ERM was 14 % following peripheral LPC for symptomatic peripheral retinal degeneration or retinal tears. The average time for ERM formation after laser treatment was 19.2 ± 15.4 months. Given the potential for ERM development and progression after peripheral LPC, careful monitoring during follow-up is essential.


**Keywords:** Epiretinal membrane, laser photocoagulation, optical coherence tomography.

## INTRODUCTION

Epiretinal membrane (ERM) formation involves the pre-retinal proliferation of myofibroblastic cells accompanied by extracellular matrix layer overlying the internal limiting membrane (1). Optical coherence tomography (OCT) is a non-invasive and sensitive imaging technique that provides high-resolution images for evaluating ERM (2). Secondary ERM formation has been associated with numerous clinical condition, including treatment of retinal tears (3).

Laser photocoagulation (LPC) is a widely used treatment to reduce the risk of progression from peripheral retinal degeneration or retinal tears to retinal detachment (4). The primary objective of LPC is to decrease vitreoretinal traction, prevent the leakage of liquefied vitreous into the subretinal space and to create chorioretinal adhesions around lesions (5).

1 Department of Ophthalmology, Izmir City Hospital, Izmir, Türkiye
2 Department of Ophthalmology, Beyoğlu Eye Hospital, Istanbul, Türkiye

**Received:** 23.01.2026
**Accepted:** 24.04.2026
*J Ret-Vit 2026; 35: 161-164*
DOI:10.37845/ret.vit.2026.35.21

**Correspondence author:**
Burcu Polat Gültekin
**Email:** drburcupolat@gmail.com

Copyright © 2026 The author(s). This is an open-access article under the terms of the Creative Commons Attribution License (CC BY) which permits unrestricted use, distribution, and reproduction in any medium or format, provided the original work is properly cited.

Despite its benefits, LPC is associated with potential complications, including blurred vision, reduced visual acuity, decreased contrast sensitivity, vitreous hemorrhage, retinal hemorrhage, choroidal neovascular membrane (CNV) formation and epiretinal membrane (ERM) development (6, 7).

The aim of this study was to determine the incidence of macular ERM formation in eyes that underwent peripheral LPC for symptomatic peripheral retinal degeneration or tears.

## METHODS

This study included all cases of retinal tears, holes and lattice degeneration treated with peripheral laser photocoagulation (LPC) retinopexy between January 2015 and January 2025 at Beyoğlu Eye Training and Research Hospital and İzmir City Hospital. The study protocol was approved by the Ethics Committee of Şişli Hamidiye Etfal Training and Research Hospital.

Medical records of patients who underwent peripheral LPC for symptomatic peripheral retinal degeneration, retinal holes, or retinal tears were retrospectively analyzed. Data collected included the indication of LPC, patient age, gender, prior ocular surgery, presence of coexisting ocular pathology and follow-up duration. The incidence of ERM development after laser treatment was assessed by reviewing optical coherence tomography (OCT) images obtained during periodic follow-up visits.

Patients aged 18 years or older who underwent laser photocoagulation for retinal degeneration or breaks and had a follow-up period of at least 6 months were included in the study. Exclusion criteria were a history of uveitis or retinal vascular occlusion, pre-existing ERM at baseline, prior intraocular or vitreoretinal surgery and previous pneumatic retinopexy.

A 532nm frequency-diode laser (Integre Pro ScanTM, Ellex medical corporation, USA) was used to treat the patient with a SuperQuad 160 contact lens, which provides a laser spot magnification of 2.0. Treatment involved three to six rows of 300 µm spot size, a 20ms pulse duration and a spot spacing equal to one spot width to secure the retina around the retinal lesions (8).

## STATISTICAL ANALYSIS

Baseline patient characteristics were summarized using descriptive statistics, with continuous data presented as mean (standard deviation, SD), and categorical data as frequency (%). All statistical analyses were conducted using SPSS for Windows version 22.0.

## RESULTS

A total of 185 patients underwent peripheral laser photocoagulation for retinal degeneration and breaks. The study included 90 males and 95 females, with a mean age of 54.8 ± 12.0 (range:18-82 years). The average follow-up period was 31.7 ± 18.7 months (ranging from 6 to 108 months).

None of the patients had a history of predisposing ocular disease or prior surgery that could have contributed to the formation of an epiretinal membrane (ERM) before laser treatment or during the follow-up period. ERMs developed in 26 patients (14 %), over the course of the study. ERM formation was detected on OCT images at a mean of 19.2 ± 15.4 months after laser treatment.

ERM developed in 21% of patients who underwent LPC for lattice degeneration, 14.2% of those treated for a retinal hole, and 12% of those treated for a retinal tear. Among the affected patients, 12 had stage 1 ERM, 8 had stage 2 ERM and 6 had stage 3 ERM. Notably, all patients with stage 3 ERM had undergone LPC for a retinal tear (Table 2).

The progression time from stage 1 to stage 2 ERM was 16.8± 5.4 months, while the progression from stage 1 to stage 3 took 34± 6.36 months. None of the patients underwent surgery for ERM during the study (Table 2).

**Table 1.** *Demographics and clinical features of the patients.*

| Parameter | Value |
|---|---|
| N of patients | 185 |
| Patients with ERM (%) | 26 (14 %) |
| Gender (Male/Female) | 90/95 |
| Mean age (years) ± SD | 54.8 ± 12.0 |
| Average follow-up period (months) ±SD | 31.7 ± 18.7 (Range:6-108) |
| Mean time to ERM detection (months) ±SD | 19.2 ± 15.4 |

N: number, ERM: epiretinal membrane, SD: standard deviation.

**Table 2.** *The characteristics of the epiretinal membrane (ERM).*

| | |
|---|---|
| ERM occurrence based on LPC indication | |
| - Lattice degeneration | 21% |
| - Retinal hole | 1.2 % |
| - Retinal tear | 12 % |
| ERM stages | |
| - Stage 1 | 12 patients |
| - Stage 2 | 8 patients |
| - Stage 3 | 6 patients |
| Time to progression | |
| - Stage 1 to Stage 2 ERM (months) ±SD | 16.8± 5.4 |
| - Stage 1 to Stage 3 ERM (months) ±SD | 34± 6.36 |

## DISCUSSION

In this study, we aimed to evaluate the incidence of ERM development after LPC and found that it occurred in 14 % of cases during an average follow-up of 31.7 ± 18.7 months, with the highest incidence observed in patients who underwent laser treatment for lattice degeneration. ERM formation was detected on OCT images at a mean of 19.2 ± 15.4 months after laser treatment.

There are a limited number of studies in the literature investigating the incidence of ERM formation after laser retinopexy. In a study by Blackorby et al., 2257 eyes that underwent laser retinopexy or cryoretinopexy for retinal tears were retrospectively evaluated. They reported an ERM incidence of 4.3% after cryoretinopexy and 2.9% after laser retinopexy. The mean time to ERM formation in this study was 11.5 months after cryoretinopexy and 12 months after laser retinopexy (9). Mester et al. conducted a retrospective study of 2000 eyes with a mean follow-up period of 46 months, detecting ERM formation on the macula in four eyes (0.2%). Notably, three of these four eyes received significantly higher laser energy (mean 34.4 mJ) compared to the other eyes in the study (mean 7.2 mJ). Saran et.al. studied 205 eyes and reported a higher incidence of macular pucker formation after laser treatment or cryoretinopexy, with rates of 40 and 43 %, respectively. (10).

In contrast, a recent 6-month follow-up study of 33 eyes from 23 patients found no ERM development and no statistically significant differences in macular and RNFL OCT values after laser retinopexy (8). This outcome might be attributed to the shorter follow-up period or the smaller sample size.

In the study by Israilevic et al., which examined 42 eyes, it was reported that secondary ERM developed in cases with laser retinopexy for retinal tears within less than 180 days and predominantly consisted of stage 4 ERM cases (11). In our study, stage 3 ERM was detected in 6 cases, while most cases showed stage 1 ERM. The pathophysiology of this rapidly forming ERM remains unclear but may be linked to a more vigorous proliferation of released retinal pigment epithelial cells, similar to the process observed in proliferative vitreoretinopathy (12).

In addition, stage 3 ERM was observed more frequently in eyes treated for at least one retinal tear. Retinal tears are commonly associated with stronger vitreoretinal traction, microhemorrhage, and localized disruption of the internal limiting membrane, all of which may promote glial cell proliferation and an epiretinal fibrocellular response (13). Furthermore, laser treatment applied around retinal tears is generally denser than that used for lattice degeneration or atrophic holes, potentially increasing the degree of postoperative inflammation. These factors may explain the higher risk of ERM progression and greater severity observed in the retinal tear subgroup within this cohort.

The limitations of the study include its retrospective design and the absence of a strict follow-up protocol. Additionally, the lack of a control group may be considered another drawback.

Following peripheral laser retinopexy, vitreoretinal surface abnormalities and microstructural changes in the macula may occur. Although laser photocoagulation is a safe procedure, regular follow-up of patients is crucial to monitor potential macular changes.

## CONCLUSION

In our study, the incidence of ERM was 14 % following peripheral LPC for symptomatic peripheral retinal degeneration or retinal tears. The average time for ERM formation after laser treatment was 19.2 ± 15.4 months.

Although the incidence of ERM is higher in patients treated for lattice degeneration, advanced ERM is observed more frequently in eyes treated for retinal tears. Given the potential for ERM development and progression after peripheral LPC, careful monitoring during follow-up is essential.

**Presented In:**

This study was presented as a poster at the 57th Turkish Ophthalmological Society National Congress.

## REFERENCES

1. Fung AT, Galvin J, Tran T. Epiretinal membrane: a review. Clinical & experimental ophthalmology. 2021;49(3):289-308.
2. Meuer SM, Myers CE, Klein BE, Swift MK, Huang Y, Gangaputra S, et al. The epidemiology of vitreoretinal interface abnormalities as detected by spectral-domain optical coherence tomography: the beaver dam eye study. Ophthalmology. 2015;122(4):787-95.
3. Pournaras CJ, Donati G, Brazitikos PD, Kapetanios AD, Dereklis DL, Stangos NT, editors. Macular epiretinal membranes. Seminars in ophthalmology; 2000: Taylor & Francis.
4. Garoon RB, Smiddy WE, Flynn HW. Treated retinal breaks: clinical course and outcomes. Graefe's archive for clinical and experimental ophthalmology. 2018;256:1053-7.
5. Wilkinson CP. Interventions for asymptomatic retinal breaks and lattice degeneration for preventing retinal detachment. Cochrane Database of Systematic Reviews. 2014(9).
6. Reddy SV, Husain D, editors. Panretinal photocoagulation: a review of complications. Seminars in ophthalmology; 2018: Taylor & Francis.
7. Mester U, Volker B, Kroll P, Berg P. Complications of prophylactic argon laser treatment of retinal breaks and degenerations in 2,000 eyes. SLACK Incorporated Thorofare, NJ; 1988. p. 482-4.
8. Johari M, Khani S, Amini A, Bolkheir A. Effect of peripheral laser photocoagulation retinopexy on macular morphology and optic nerve fiber layer thickness; a prospective case series. BMC ophthalmology. 2022;22(1):453.
9. Blackorby BL, Jeroudi AM, Blinder KJ, Shah GK. Epiretinal membrane formation after treatment of retinal breaks: cryoretinopexy versus laser retinopexy. Ophthalmology retina. 2019;3(12):1087-90.
10. Saran BR, Brucker AJ. Macular epiretinal membrane formation and treated retinal breaks. American journal of ophthalmology. 1995;120(4):480-5.
11. Israilevich R, Salabati M, Mahmoudzadeh R, Cai L, Ammar M, Xu D, et al. Secondary epiretinal membrane after laser retinopexy for retinal tear or localized retinal detachment: surgical outcomes and optical coherence tomography structural analysis. Retina. 2022;42(1):38-45.
12. Khan MA, Brady CJ, Kaiser RS. Clinical management of proliferative vitreoretinopathy: an update. Retina. 2015;35(2):165-75.
13. Blindbæk S, Grauslund J. Prophylactic treatment of retinal breaks–a systematic review. Acta Ophthalmologica. 2015;93(1):3-8.