Excentric Macular Hole Following Epiretinal Membrane Surgery: two case reports

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ABSTRACT

Excentric macular hole (EMH) is a rare complication following epiretinal membrane (ERM) and macular hole surgery. The most common factor implicated in the development of EMH is mechanical damage to the retina during internal limiting membrane (ILM) peeling. In this article, we present two cases of extrafoveal EMH detected in the macula following ERM surgery without ILM peeling. The aim is to highlight the possible reasons for the development of two EMH cases solely after ERM peeling, along with 24-month follow-up results, emphasizing attention to this rare complication.

Keywords: Excentric macular hole, epiretinal membrane, vitreoretinal surgery

INTRODUCTION

The current treatment of vitreomacular interface diseases includes pars plana vitrectomy (PPV) and the peeling of epiretinal membrane (ERM) and/or internal limiting membrane (ILM).[1]Although it is one of the rare complications of PPV surgery performed due to ERM and macular hole (MH), eccentric macular hole (EMH) cases that occur at different times in the postoperative periods have begun to be reported in recent years.[2-8] The first report was in 2005 by Rubenstein et al., who described four cases of EMH that developed after MH surgery combined with ILM peeling.[2] Subsequent case reports have mainly focused on EMH cases that developed after ILM peeling.[3-7] The most commonly suspected factor in the formation of EMH is the mechanical damage to Müller cells during ILM peeling.[4]

This paper presents two cases in which only PPV and ERM peeling were performed without ILM peeling due to ERM, and EMH developed postoperatively. There are very few cases in the literature where EMH developed solely after ERM peeling, and its pathogenesis remains unclear. The aim of this study is to investigate the possible causes of EMH development, a rare complication of ERM surgery, and its prognosis.

CASE 1

A 73-year-old male patient presented to our clinic with complaints of decreased vision and metamorphopsia in his right eye. His medical history revealed that he had been receiving topical prostaglandin analogue (bimatoprost) treatment for primary open-angle glaucoma for the past 10 years. The patient's best corrected visual acuities (BCVA) were 20/100 in the right eye and 20/25 in the left eye, and intraocular pressures were measured at 17 mmHg in both eyes. On anterior segment examination, the right eye had an

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intraocular lens in the posterior chamber, while the left eye had stage 2 nuclear sclerosis. Fundus examination revealed a cup-to-disc ratio of 8/10 in both eyes, and ERM was noted in both eyes. Optical coherence tomography (OCT) imaging (SD-OCT, Spectralis, Heidelberg) confirmed the diagnosis of ERM, and the patient underwent PPV and ERM peeling surgery in his right eye. The PPV was performed using the 25-gauge Constellation Vision System (Alcon Laboratories, Fort Worth, TX) and was completed with a serum-air exchange. To enhance the visualization of the ERM, 0.15% tripan blue dye was applied for 15 seconds. No complications were observed during the intraoperative and early postoperative periods. During the 1-month follow-up, the BCVA in the right eye was 20/63. OCT imaging passing through the fovea showed improvement in the foveal contour in the right eye. At the 3-month follow-up, BCVA in the right eye had improved to 20/40; however, fundus examination revealed the appearance of an EMH in the upper temporal fovea (Image 1A). OCT imaging through the lesion showed a macular hole with the presence of ERM, especially along the edges of the hole (Image 1B). Fundus autofluorescence imaging showed a clearer depiction of the EMH located inferior to the superior vascular arc (Image 1C). The patient was placed on an observation-only regimen without treatment. At the 24-month follow-up, the BCVA in the right eye remained stable at 20/40, and the EMH was stable. The patient's follow-up continues.

CASE 2

A 69-year-old male patient presented to our clinic with complaints of decreased vision in the right eye. On examination, the BCVA was 20/200 in the right eye and 20/22 in the left eye. Intraocular pressures were measured at 13 mmHg in the right eye and 15 mmHg in the left eye. Anterior segment examination revealed a stage 3 corticonuclear cataract in the right eye. Fundus examination showed ERM in the right eye, while the left eye fundus appeared normal. Preoperative OCT (SD-OCT, Spectralis, Heidelberg) imaging confirmed the presence of ERM.

The patient underwent phacoemulsification and intraocular lens implantation surgery, followed by PPV, ERM peeling with the aid of 0.15% tripan blue dye (applied for 15 seconds), and a serum-air exchange. The cataract surgery was performed using the CENTURION® Vision System (Alcon Laboratories, Texas, USA), and the vitrectomy was performed using the 25-gauge Constellation Vision System (Alcon Laboratories, Fort Worth, TX). No complications were observed during the intraoperative or early postoperative periods.

At the 1-month follow-up, BCVA in the right eye had improved to 20/100. At the 6-month visit, BCVA in the right eye had further improved to 20/40. Fundus imaging revealed an EMH in the temporal fovea of the right eye (Image 2A). OCT imaging passing through the EMH confirmed the presence of the hole (Image 2B).

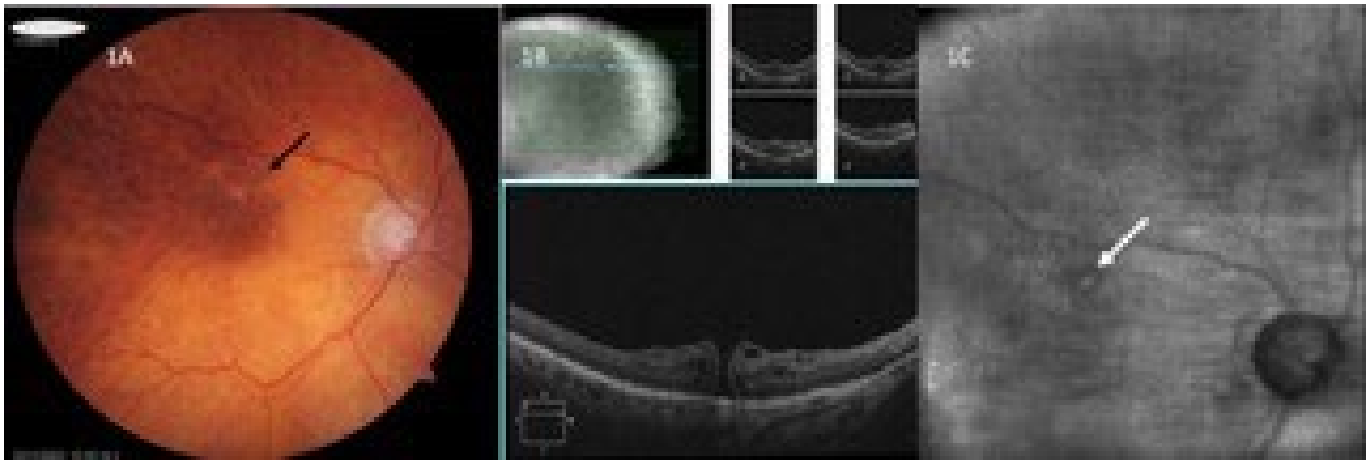

Figure 1: *In the color fundus photograph of Case 1, an excentric macular hole (black arrow, 1A) is observed inferior to the superior vascular arc in the macula. Optical coherence tomography (OCT) image (1B) through the lesion shows a full-thickness excentric macular hole accompanied by an epiretinal membrane. Fundus autofluorescence imaging (1C) also demonstrates the excentric macular hole (white arrow) inferior to the superior vascular arc.*

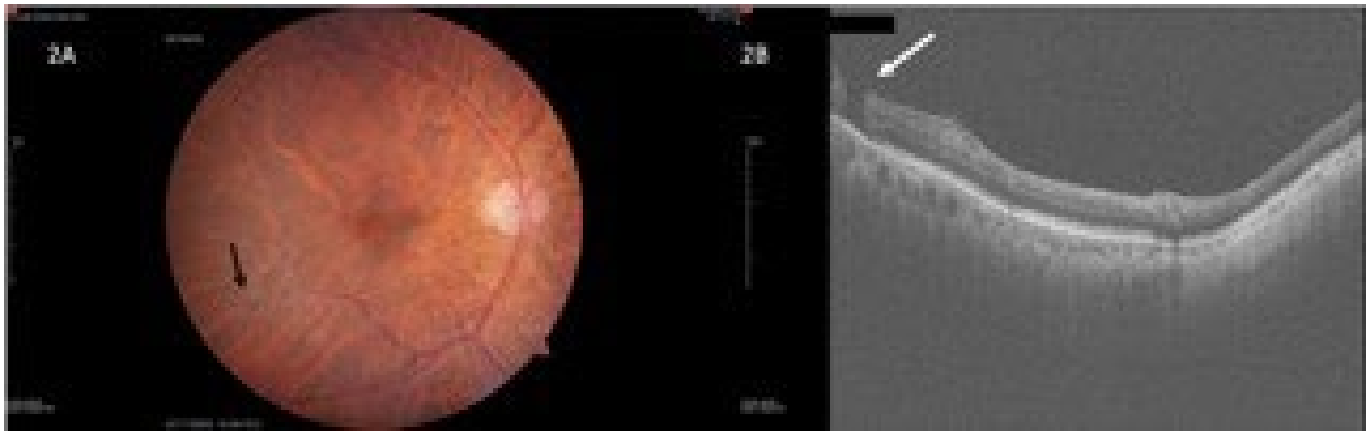

Figure 2: *In the color fundus photograph of Case 2, an excentric macular hole (black arrow, 2A) is visible temporally in the macula. OCT imaging (2B) shows a full-thickness excentric macular hole (white arrow) in the temporal macula.*

At the 24-month follow-up, BCVA in the right eye remained stable at 20/40, and no progression or complications were observed in the excentric macular hole.

DISCUSSION

We have shared two rare cases of EMH development following PPV surgery with only ERM peeling and without ILM peeling. ERM surgery is one of the most commonly performed posterior segment surgeries nowadays. Thanks to advanced surgical techniques, the chances of anatomical and functional success are high. However, in addition to the general complications of PPV, such as cataracts, vitreous hemorrhage, and retinal detachment, ERM surgery also carries the risk of complications like retinal tears and macular hole formation due to membrane peeling.[1] Among these complications, EMH development is rare.[4]

Although several theories have been proposed regarding the pathophysiology of postoperative EMH development, there is no general consensus.[4-5] The incidence of EMH has been reported to be between 0.6% and 2.5%, with the condition typically emerging between the 2nd and 12th postoperative weeks.[4-5] Intraoperative iatrogenic trauma, particularly during attempts to grasp the ERM and ILM with forceps, is often cited as the most frequent cause. Since ILM is a very thin and transparent membrane, retinal damage can occur due to unnoticed forceps trauma during peeling, as reported in the literature.

It has been observed that the foot processes of Müller cells are attached to the ILM, and after ILM peeling, the Müller cell processes can attach to ILM remnants. This suggests that ILM peeling could potentially damage Müller cells and lead to delayed degeneration of adjacent neurons.[6] ILM peeling may induce glial apoptosis, weakening the glial structure and causing macular hole formation. Residual ILM tangential contraction and epimacular proliferation induced by ILM peeling have also been proposed as potential etiopathogenic mechanisms.[7]Although ILM peeling contributes to the development of EMH, as seen in our two cases, EMH can develop even without ILM peeling.[5-8] In such cases, retinal damage caused by microinstruments and/or retinal traction due to the tight attachment of the hyaloid membrane to the perifoveal region during ERM peeling are considered the most likely contributing factors.[5] In both of our cases, remnants of the ERM are observed along the edges of the EMH. Therefore, we can hypothesize that the residual ERM after surgery might trigger macular hole formation. Additionally, the history of prostaglandin analogue use in the first case brings up a possible link between prostaglandin analogues and ERM, but studies have not found a direct association between prostaglandin analogues and ERM development.[9]

Another perspective is that the toxic effects of vital dyes used during surgery to stain ILM and ERM may also contribute to the development of excentric macular holes. However, the toxicity of indocyanine green (ICG), previously used for staining, is typically associated with retinal pigment epithelium damage and has not been linked to macular hole formation.[10] More recent dyes, such as

trypan blue and brilliant blue, have also not been shown to be associated with EMH formation.[11] According to reported studies, most EMHs are located away from the fovea, and therefore, they do not affect visual function. As a result, EMH is generally considered an asymptomatic, stable complication that does not require further intervention, and follow-up is recommended unless additional pathology develops.[2-4] In the decision for re-surgical treatment, three criteria should be considered: best corrected visual acuity, changes in the size of the hole, and its proximity to the fovea.[4-12] In cases where the EMH is located near the fovea or nasally in the macula and increases in size over time, and if visual acuity decreases surgical treatment involving additional ILM peeling and, if necessary, gas tamponade is recommended. Both of our cases had a total follow-up period of approximately 24 months, and during this time, no complications such as an increase in the size of the macular hole or a decrease in visual acuity were encountered.

CONCLUSION

Althoughit is rare, one of the complications that may develop after ERM surgery is the formation of EMH. Despite the fact that it usually does not affect visual acuity, EMHs located close to the fovea can lead to poor visual prognosis. To prevent this complication, retinal damage caused by microinstruments should be minimized. Additionally, based on our two cases, ensuring more extensive ERM peeling during surgery may help prevent the development of this complication.

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