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SHORT COMMUNICATION

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Epimacular proliferative response following internal limiting membrane peeling for idiopathic macular holes

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Abstract *Purpose:* To present two patients who underwent surgery for an idiopathic macular hole (IMH) with internal limiting membrane (ILM) peeling and developed an epimacular proliferative response. *Methods:* Observational case report. Two patients with an IMH underwent pars plana vitrectomy with ILM peeling. Ophthalmic examination including optical coherence tomography (OCT) was performed pre- and postoperatively. In both cases, scanning laser ophthalmoscopy (SLO) was performed postoperatively. *Results:* In the first case, the closure of the macular hole (MH) was confirmed ophthalmoscopically and by OCT following the surgery. At 2 months postoperatively, a thin epiretinal membrane (ERM) developed over the nasal macula area where the ILM had been peeled. The patient's visual acuity had recovered to 1.0 but she complained of metamorphopsia. At 18 months postoperatively, the thin ERM around the nasal fovea remained and her visual acuity was still 1.0. In the second case, the MH was sealed after the surgery, and the patient's visual acuity had improved to 1.0 at 3 months, but an indistinct ERM developed in the macular region where the ILM had been peeled. Two years after the operation, her VA was still 1.0. One and two years postoperatively, a thin epimacular proliferation remained unchanged; in addition, the OCT and SLO images remained stable. *Conclusion:* Two patients who underwent IMH surgery with ILM peeling developed an epimacular proliferative response postoperatively. We suggest that the injury associated with the ILM peeling may have stimulated glial proliferation.

Introduction

The removal of the internal limiting membrane (ILM) during macular hole (MH) surgery has been widely advocated, and excellent anatomic success rates have been reported [1, 4, 6, 7]. It has been suggested that ILM peeling may signal glial cells to proliferate and lead to the sealing of the MH [2, 5]. Because the Müller cell footplates make up the outer part of the ILM, the Müller cells will probably sustain some degree of injury by the ILM peeling, and this injury may induce gliosis. We present the cases of two patients who underwent MH surgery with ILM peeling and developed an epimacular proliferative membrane postoperatively.

Case reports

Case 1

A 77-year-old woman presented with a complaint of metamorphopsia in her right eye of one month duration. Her visual acuity was 0.4 OD and 0.8 OS. Ophthalmoscopic examination and optical coherence tomography (OCT) showed a stage 4, full-thickness MH with a posterior vitreous detachment (PVD) (Fig. 1A), associated with a lesion of retinal pigment epithelial atrophy temporal to the macula (Fig. 2A). The patient underwent phacoemulsification and aspira-

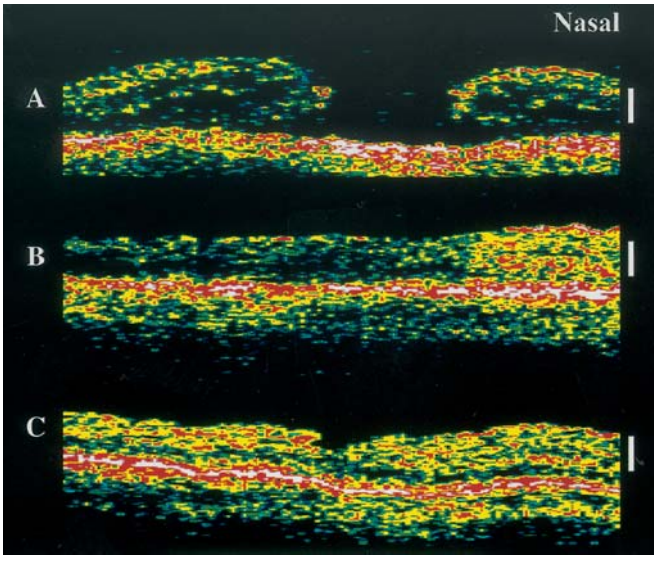


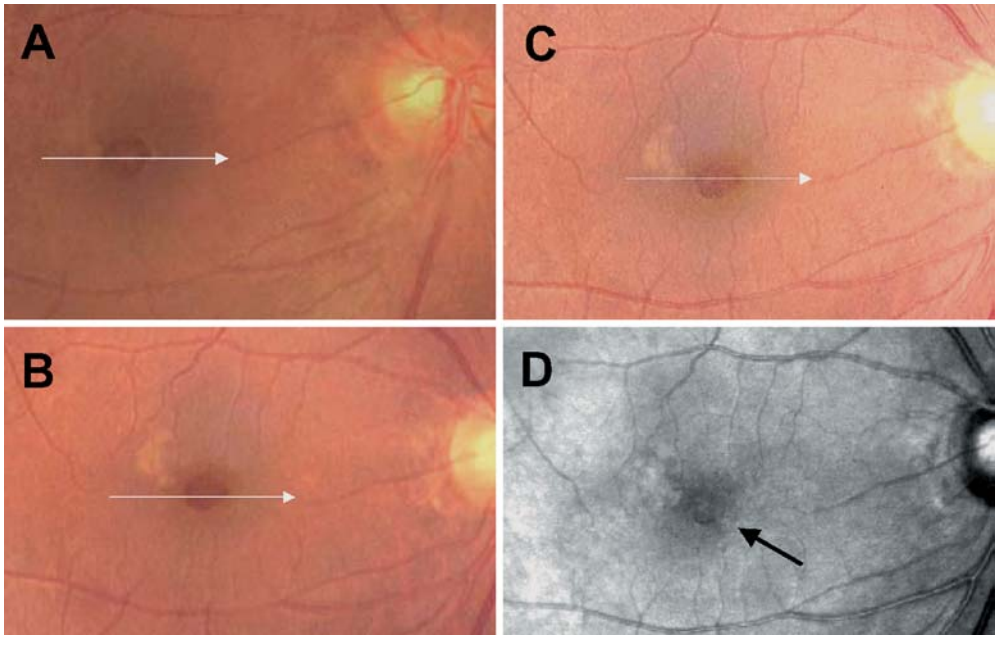
Fig. 1A–C Case 1. **A** Horizontal OCT tomogram showing a stage 4, full-thickness hole with a surrounding cuff of retinal edema. Decreased reflectivity can be noted in the outer retinal layers surrounding the hole, corresponding to the cystic changes. The calibration marker is 250 μm. **B** This horizontal OCT scan shows a mildly swollen macula with a highly reflective nasal macular surface that corresponds with the ERM at 2 months postoperatively. The image demonstrates an absence of the foveal depression and the presence of low-reflective cystoid spaces within the macula. The calibration marker is 250 μm. **C** Horizontal OCT image at 18 months postoperatively. The normal contour of the foveal pit is absent but macular thickness is slightly decreased following the reduction of the low-reflective cystoid spaces within the macula. The highly reflective band on the nasal macula area that corresponded with the ERM is still present. The calibration marker is 250 μm

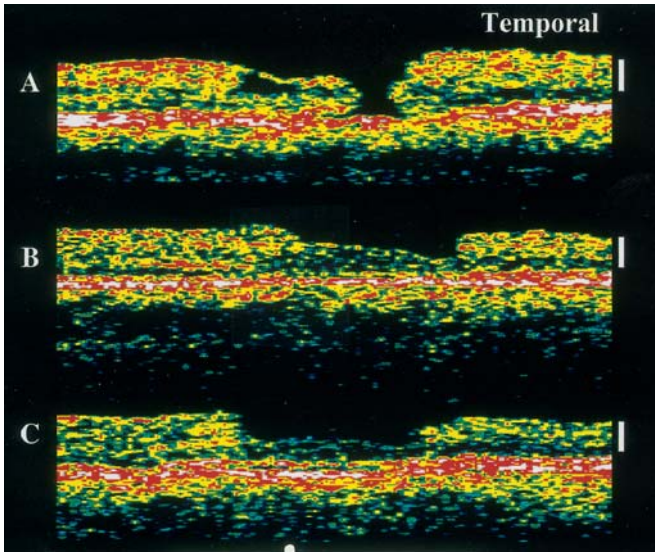
tion of the lens and pars plana vitrectomy (PPV). The ILM was stained with indocyanine green (ICG) [3] and was thoroughly removed for 3 disc diameters around the MH in a circular capsulorrhexis maneuver. An intraocular lens was inserted, and 20% sulfur hexafluoride (SF_6) was injected into the vitreous cavity as a gas tamponade. A face-down position was maintained for 1 week.

One month after the operation, the patient's VA was 0.4 and the MH was closed. At 2 months, a thin epiretinal membrane (ERM) had developed over the nasal macula area where the ILM had been peeled (Fig. 2B). OCT showed a highly reflective band over the nasal macular area that corresponded with the ERM. In addition, OCT demonstrated the absence of a foveal depression and the presence of low-reflective cystoid spaces within the macula (Fig. 1B).

Eighteen months after the operation, the patient's VA had recovered to 1.0 but she complained of metamorphopsia. The OCT image was partly changed; the normal contour of the foveal pit was absent but macular thickness was slightly decreased following the reduction of the low-reflective cystoid spaces within the macula (Fig. 1C). Fundus photographs and the scanning laser ophthalmoscopic (SLO) images showed a thin ERM around the nasal macula (Fig. 2C,D).

Fig. 2A–D Case 1. **A** Fundus photograph showing a stage 4, full-thickness MH, associated with a lesion of retinal pigment epithelial atrophy temporal to the macula. The *arrow* indicates the OCT scanning line of 2.8 mm for the tomogram shown in Fig. 1A. **B** Fundus photograph showing an indistinct epimacular membrane in the nasal macular surface at 2 months postoperatively. The white lesion temporal to the macula had been also observed before the surgery. The *arrow* indicates the OCT scanning line of 2.8 mm for the tomogram shown in Fig. 1B. **C** Fundus photograph showing an indistinct epimacular membrane in the nasal macular surface at 18 months postoperatively. The white lesion temporal to the macula had been also observed before the surgery. The *arrow* indicates the OCT scanning line of 2.8 mm for the tomogram shown in Fig. 1C. **D** Confocal image of the fundus obtained with the SLO showing an indistinct epiretinal proliferation (*arrow*) around the nasal fovea at the 18 months postoperatively. The irregular spots of the temporal macular surface corresponded to the yellow lesion in the fundus photograph





Case 2

A 44-year-old woman was referred for declining visual acuity (0.4) in her left eye of 3 months' duration. Funduscopic examination revealed a stage 2, full-thickness MH without a PVD. Two weeks later, fundus examination and OCT showed a stage 3, full-thickness MH without a PVD (Figs. 3A, 4A). PPV combined with ILM peeling with ICG staining [3] was performed for 2.5 disc diameters around the MH. Then, fluid–air exchange with room air tamponade was performed.

Fig. 3A–C Case 2. **A** The OCT tomogram show a full-thickness hole with moderate retinal edema surrounding the hole. The calibration marker is 250 µm. **B** A horizontal OCT scan showing a highly reflective band surrounding the macula region with the macula edge sharpen and flatly sunken 3 months after surgery. The calibration marker is 250 µm. **C** The OCT scans showed a highly reflective membrane surrounding the macular, and the macula is flat and sunken with steep surrounding edges. The image remained unchanged at 12 months postoperatively. The calibration marker is 250 µm

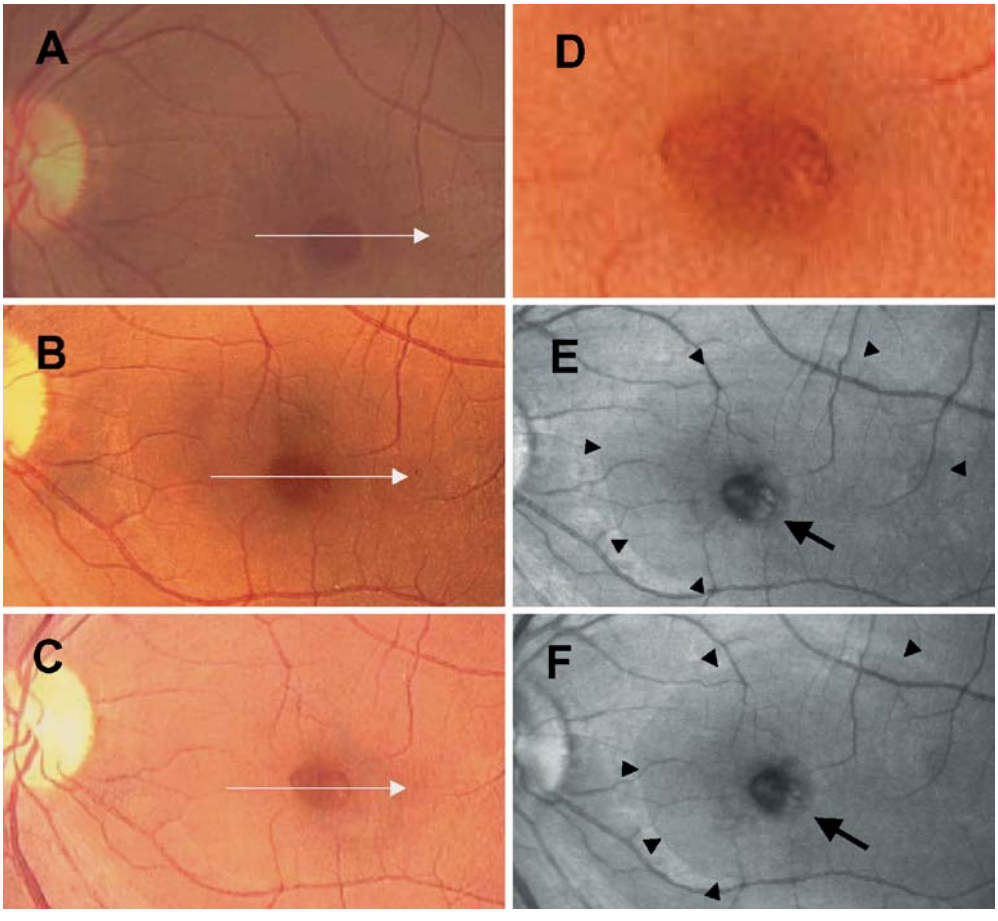


Fig. 4A–F Case 2. **A** Fundus photograph showing a stage 3, full-thickness MH. The *arrow* indicates the OCT scanning line of 2.8 mm for the tomogram shown in Fig. 3A. **B** Fundus photograph showing a successfully closed macular hole with an indistinct epimacular membrane at 3 months postoperatively. The area of the ILM peeling within the vascular arcade can be seen. The *arrow* indicates the OCT scanning line of 2.8 mm for the tomogram shown in Fig. 3B. **C** Fundus photograph showing a successfully closed macular hole with a thin epimacular proliferation at 12 months postoperatively. The area of the ILM peeling within the vascular arcade can be barely seen. The *arrow* indicates the OCT scanning line of 2.8 mm for the tomogram shown in Fig. 3C. **D** Fundus photograph of Fig. 4C at higher magnification. Thin epiretinal membrane around the fovea can be seen. **E** Confocal image of the fundus obtained using the SLO showing a thin epiretinal proliferation (*arrow*) around the fovea, and the area of the ILM peeling (*arrowheads*) at 3 months postoperatively. **F** Confocal image of the fundus obtained with the SLO showing a thin epiretinal proliferation (*arrow*) around the fovea, and the area of the ILM peeling (*arrowheads*). Twelve months postoperatively, the image remains unchanged except for the obscure outline of the ILM peeling (*arrowheads*)

Two months after surgery, the patient's VA was 0.8 and the MH was closed. Three months postoperatively, her VA had improved to 1.0 and an indistinct ERM had developed in the macular region (Fig. 4B). OCT showed a highly reflective membrane surrounding the macula, and the macula was flat and sunken with steep edges (Fig. 3B). Examination with the SLO showed a thin and well-demarcated ERM at the macula and also showed the area of the ILM peeling around the MH (Fig. 4E). Two years after the operation, the patient's VA was still 1.0. One and two years postoperatively, a thin epimacular proliferation remained unchanged (Fig. 4C,D); in addition, the OCT and SLO images remained stable (Figs. 3C, 4F).

Discussion

These patients with postoperative proliferative responses over the macular area were 2 of 44 consecutive cases that had undergone MH surgery with ILM peeling between August 1998 and April 2001 in our institution. Thus, we believe that such proliferative responses cannot be attributed to an initial learning effect for the ILM peeling. We had performed more than 135 MH surgeries without ILM peeling from 1994 through 1998 before the ILM peeling was introduced, and no such postoperative proliferation has ever been observed in any of them. Similarly, postoperative proliferation was not reported in the 170 eyes that underwent vitrectomy with removal of the adherent cortical vitreous and stripping of epiretinal membranes but no ILM peeling [8]. However, in support of our finding, a postoperative ERM has been reported in 3 of 58 eyes that underwent vitrectomy for MH with ILM peeling. ILM peeling is considered to defuse the contractile forces produced by the glial cells that migrate onto the ILM surface and play a role in the formation and enlargement of the MH. However, in the process of peeling the ILM, the Müller cell footplates will most likely sustain some degree of injury. Histopathological studies have shown that the Müller cells and fibrous astrocytes proliferate and seal an MH following the removal of the cortical and epicortical vitreous, and/or the peeling of the ILM [5]. Thus, the postoperative ERM may have been made up of the glial cells that migrated onto the macular surface through a defect in the ILM [5]. With the available data, we suggest that the injury associated with the ILM peeling promotes glial proliferation. Additional studies are needed to evaluate the efficacy of the ILM peeling.

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