CASE REPORT

Surgical management for macular folds after macular epiretinal membrane surgery: a report of two cases

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Abstract

We report two rare cases of macular fold development after membrane peeling operation for epiretinal membrane. Patient 1 developed both inner and outer retinal folds, and patient 2 developed inner retinal fold; both were partial thickness macular folds. There was no evidence of retinal detachment or any preoperative macular fold. These configurations of retinal folds after macular epiretinal membrane surgery have not been reported before. In patient 1, four retinotomy sites were required to induce a complete macula detachment, as the retina was abnormally adherent than usual. In patient 2, no macular detachment was induced, and no intravitreal tamponade was used. Soft-tip cannula was used to relieve the inner retinal attachments. To the best of our knowledge, this is the first reported case using this method to successfully manage a retinal fold. This technique avoids the potential risks associated with retinotomies, macular re-detachment, and intravitreal tamponade. Both patients achieved resolution of macular folds and improvement in visual acuity.

Key words: *Macula lutea; Retina; Visual acuity*

Introduction

First reported in 1984, macular folds after vitrectomy usually occur in patients with retinal detachment.[1,2] Risk factors known to cause macular folds include bullous rhegmatogenous retinal detachment and its associated giant retinal tears, incomplete drainage of subretinal fluid, and poor compliance to postoperative posturing. Based on optical coherence tomography (OCT), macular folds can be categorized into inner retinal folds, outer retinal folds, and full-thickness retinal folds.[1] Inner retinal folds exhibit corrugations of the inner retina, whereas outer retinal folds display hyper-reflective lesions located just above the retinal pigment epithelium that may extend into the outer nuclear layer. In full-thickness retinal folds, all layers of the neurosensory retina may separate altogether from the retinal pigment epithelium, with retinal reduplication and base-to-base photoreceptor orientation.[1] We report two cases of macular folds after macular membrane peeling operation for epiretinal membrane without retinal detachment.

Case presentation

Patient 1

In November 2018, a 41-year-old man presented to Hong Kong Sanatorium & Hospital with increased right eye distortion, which necessitated right eye occlusion for near work. Two months earlier, the patient had undergone right

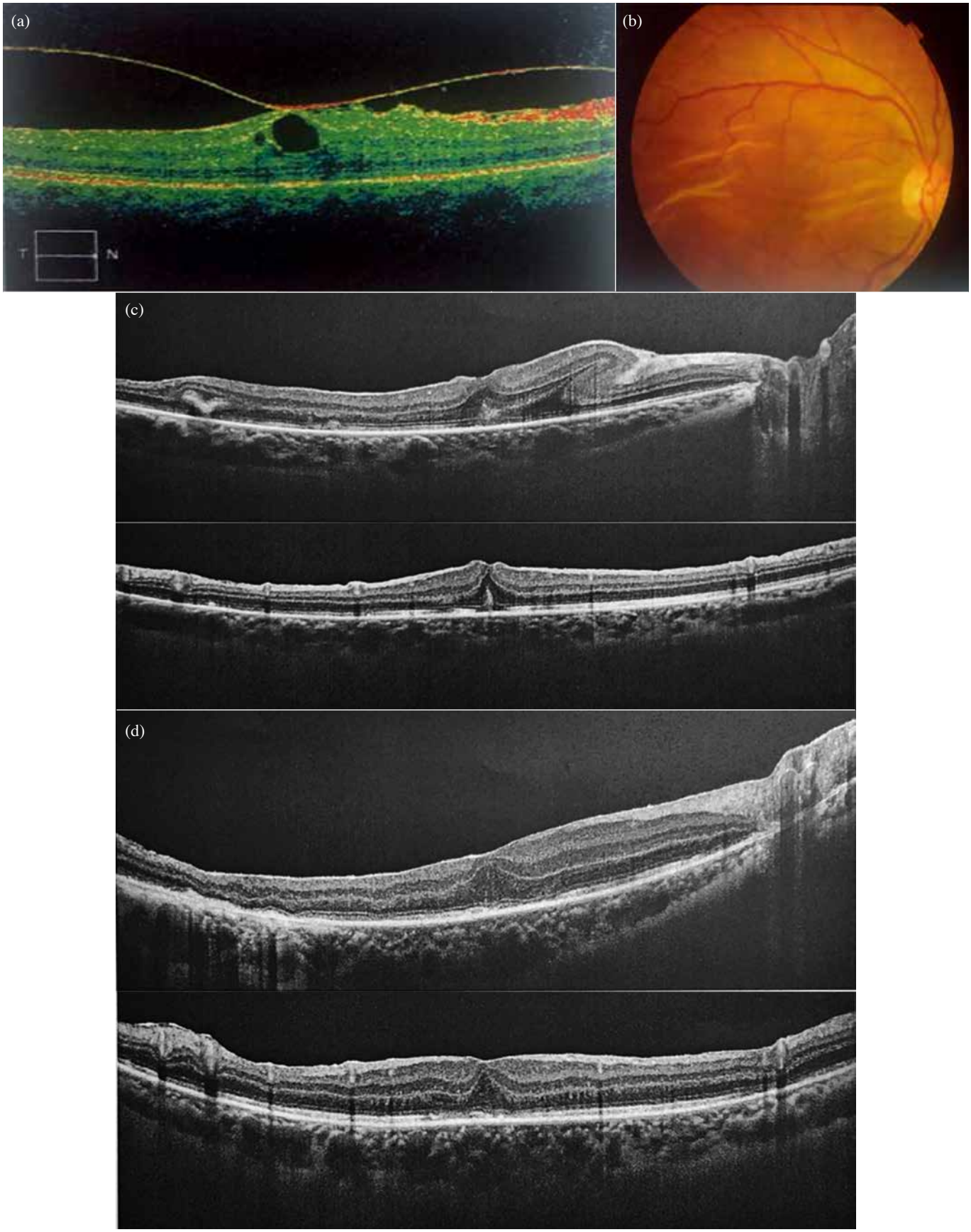

Figure 1. Patient 1: (a) optical coherence tomography before the previous operation showing epiretinal membrane with cystoid macular edema and vitreomacular traction, (b) fundus photograph at presentation showing multiple horizontal and oblique retinal folds involving fovea, (c) optical coherence tomography at presentation showing horizontal and vertical cuts of inner retinal folds involving outer plexiform layer and outer retinal folds across fovea, and (d) optical coherence tomography at postoperative 1 month showing resolution of macular folds.

eye vitrectomy and macular membrane peeling operation elsewhere for macular epiretinal membrane with cystoid macular edema and vitreomacular traction (**Figure 1a**). The patient reported that no tamponade was used in the operation and no special posturing was required after the operation. At the current presentation, the visual acuity was 20/100 for the right eye and 20/20 for the left eye. Fundus photograph showed multiple horizontal and oblique retinal folds involving the fovea in the right eye (**Figure 1b**). The right eye had four retinal holes surrounded by retinal photocoagulation inferiorly and almost 360° laser marks and lens opacities. The patient denied receiving any retinal laser procedure prior to the surgery. OCT scans showed both inner retinal folds and outer retinal folds in the right eye (**Figure 1c**). The left eye was unremarkable except for an old inferior barrier laser performed 2 months earlier.

One week later, the patient underwent second vitrectomy (by AKHK) for the right eye under general anesthesia. Three-port 25-gauge pars plana vitrectomy was performed using the Constellation Vision System (Alcon, Forth Worth, USA). Intra-operatively, thorough vitrectomy was noted. Complete macular internal limiting membrane removal in the previous operation was confirmed with MembraneBlue-Dual (DORC International, Zuidland, Netherlands). Superotemporal sclerotomy was changed to 20-gauge for submacular BSS PLUS (Alcon Laboratories, Fort Worth [TX], USA) solution injection with 42-gauge needle tip cannula through retinotomies at four sites: mid-superotemporal arcade, mid-inferotemporal arcade, peripheral temporal macula, and peripheral inferotemporal macula. Multiple retinotomies were needed as the macula was strongly adherent to the underlying retinal pigment epithelium. Regions with outer retinal folds were explored, and no subretinal fibrotic membrane was identified. Air-fluid exchange was performed to ensure detachment over the whole areas of macular folds. After air removal, the macular folds were lessened but remained rigid in nature. Endolaser was performed to the retinotomies with the aid of heavy liquid. In second air-fluid exchange, 12% C3F8 was injected. The macula remained detached at the end of the operation. Conjunctival wound and the sclerotomies were sutured with 8 'o' vicryl, and the patient was instructed to adopt a face-down position for 2 weeks.

Postoperative recovery was uneventful, with improvement of the macular folds. At 1 month, OCT scans revealed resolution of outer retinal folds, with minimal residual inner retinal undulation (**Figure 1d**). At 2 months, visual acuity improved to 20/50. At 5 months, the patient underwent uneventful cataract operation, and visual acuity improved to 20/20 after 1 week and to 20/15 after 1 year.

Patient 2

In March 2017, a 46-year-old woman underwent right eye phacoemulsification, intraocular lens implantation, macular membrane peeling, and air injection (by CFW) for macular epiretinal membrane. Preoperative OCT scan showed the epiretinal membrane (**Figure 2a**). The baseline visual acuity was 20/40 for the right eye. One day after the operation, she was noted to have hypotony with small choroidal detachment, which resolved spontaneously after a week of conservative treatment. Seven weeks after the operation, OCT scan showed an inner retinal fold involving the fovea with self-bending and apposition to the surrounding retina (**Figure 2b**), and the visual acuity for the right eye was 20/100.

One day later, the patient underwent re-operation (by CFW) using 2-port 23-gauge vitrectomy with illuminated infusion chandelier (Synergetic; O'Fallon [MO], USA). The macular fold was loosened with soft tip cannula by direct manipulation. No intravitreal gas was used. On postoperative day 1, the visual acuity was 20/120 for the right eye, but OCT scan showed much reduced inner macula fold without any inner retinal tissue apposition (**Figure 2c**). Subsequent OCT of the right eye showed the fold gradually improved and then mostly resolved at 20 months (**Figure 2d**), with visual acuity improved to 20/40.

Discussion

Postoperative retinal folds mostly occur after retinal detachment repair.[1] It is a rare complication after pars plana vitrectomy without pre-existing retinal detachment. Patient 1 developed both inner and outer retinal folds, and patient 2 developed inner retinal fold. These configurations of retinal folds after macular epiretinal membrane surgery have not been reported before. Iafe et al[3] reported the first case of outer retinal folds as a complication of epiretinal membrane peeling. The folds resolved spontaneously after 4 months, with improvement in visual acuity. It was hypothesized that the retinal folds could be induced by transient macular detachment during peeling of adherent epiretinal membrane, or secondary to hypotony, which might be mild or transient and was not evident clinically.

In patient 2, hypotony was evidenced by the choroidal detachment. In patient 1, details of previous intra- and post-operative findings were not available. We hypothesized that transient hypotony could be the cause of retinal folds in cases with flat retina, as hypotony can cause retinal folds. Gass[4] first used the term 'hypotony maculopathy' in 1972 to describe undulating macular chorioretinal folds in the presence of low intraocular pressure. Although rare, hypotony (rather than the characteristic undulating chorioretinal folds) can give rise to more severe retinal folds including appositional full thickness retinal folds.[5]

There is no consensus in the management of postoperative macular folds. For full-thickness folds involving fovea, most studies suggest surgical management because of the risk of photoreceptor loss and outer nuclear layer thinning, which may cause permanent vision loss.[6] There can be no improvement in vision even the folds resolve spontaneously.[7,8] Therefore, early/urgent operation should be considered for full-thickness macula folds involving fovea. For partial thickness folds involving fovea, management is

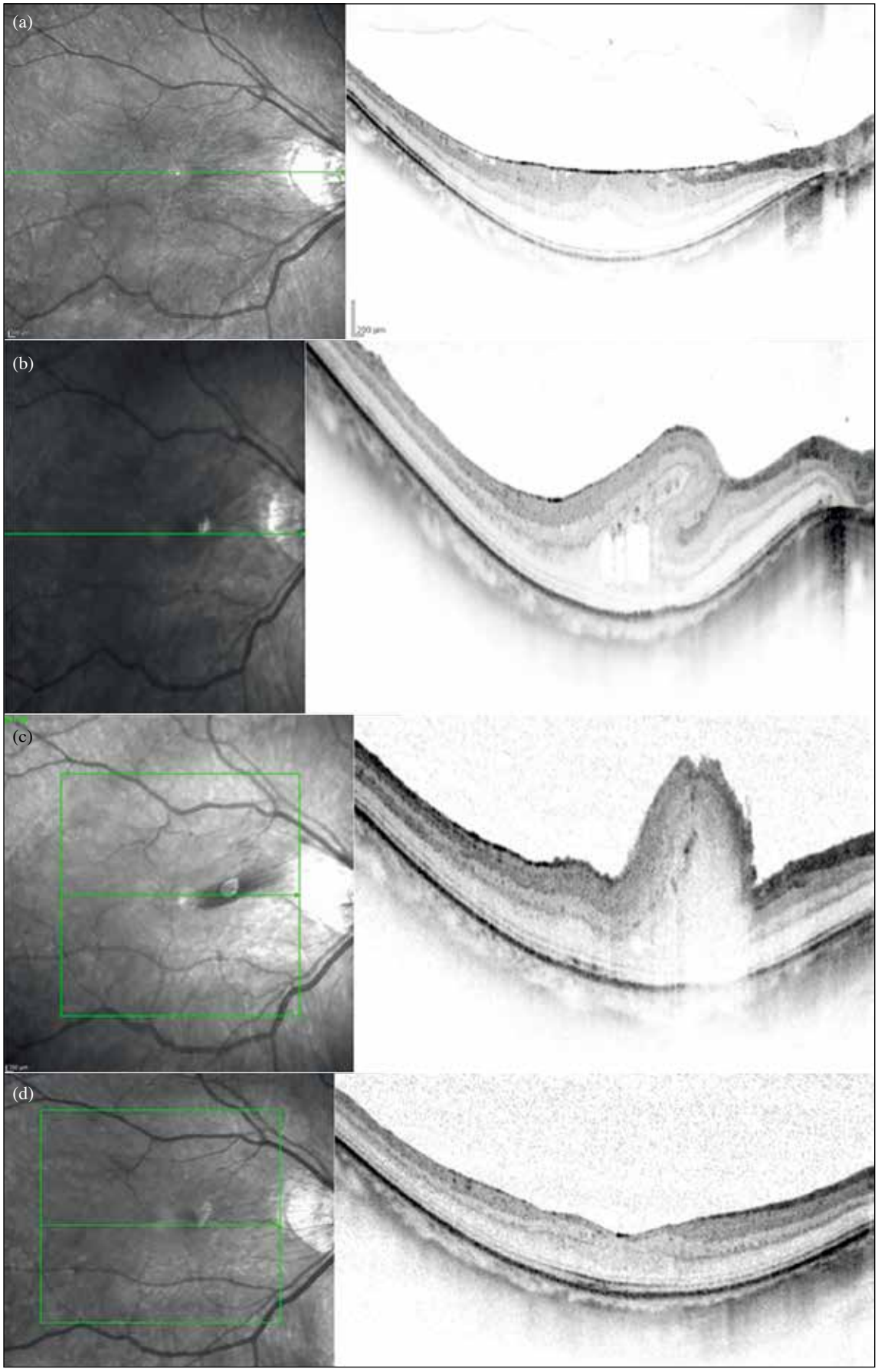

Figure 2. Patient 2: optical coherence tomographic scans showing (a) the epiretinal membrane before the first operation, (b) the inner retinal fold involving fovea at 7 weeks after the first operation, (c) the much reduced inner macula fold without inner retinal tissue apposition at 1 day after re-operation, and (d) the largely resolved macular fold at 20 months after re-operation.

more controversial. In some cases, the folds may resolve spontaneously without any surgical intervention. Three cases of symptomatic partial thickness macula folds after retinal detachment repair were reported to resolve spontaneously, with visual improvement within 2 months.[9] A case of large outer retinal fold was reported to resolve spontaneously, with visual acuity restored to 20/20.[10] Both our patients had partial thickness macular folds involving fovea. The decision of early surgical intervention was made because both patients were highly symptomatic and had severe partial thickness folds with inner retina–to–inner retina apposition.

Different surgical techniques for the management of retinal folds have been reported. All involve induction of macular detachment with injection of intravitreal tamponade agent. Fluid-air exchange is performed to merge submacular blebs after multiple injection of subretinal balanced salt solution in some cases.[10] In patient 1, four retinotomy sites were required to induce a complete macula detachment, as the retina was abnormally adherent than usual. This is likely because there was no prior retinal detachment that might have weakened the adhesion between the retinal pigment epithelium and the retina. In patient 2, no macular detachment was induced, and no intravitreal tamponade was used. Soft-tip cannula was used to relieve the inner retinal attachments. To the best of our knowledge, this is the first reported case using this method to successfully manage a retinal fold. This technique avoids the potential risks associated with retinotomies, macular re-detachment, and intravitreal tamponade.

Contributors

All authors designed the study, acquired the data, analyzed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Data availability

All data generated or analyzed during the present study are available from the corresponding author on reasonable request.

Ethics approval

The patients were treated in accordance with the tenets of the Declaration of Helsinki. The patients provided written informed consent for all treatments and procedures and for publication.

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