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Combined Surgical Approach for Repair of Refractory Macular Hole in Myopic Traction Maculopathy

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Abstract

Purpose: To present a combined surgical approach for repair of a persistent full-thickness macular hole (MH) in patients with myopic traction maculopathy. **Methods:** Two cases were evaluated. **Results:** Combining a macular buckle and pars plana vitrectomy with a controlled subretinal injection of a balanced salt solution resulted in MH closure and vision improvement in both cases. Case 1 also had significant recovery of macular sensitivity on microperimetry evaluation. **Conclusions:** Retinal redetachment was avoided by using the buckle indentation to provide external support of the posterior pole, resulting in successful closure of the MH and improvement in functional outcomes.

Keywords

macular buckle, pars plana vitrectomy, refractory macular hole, myopic traction maculopathy, retinal detachment, balanced salt solution subretinal injection, surgical technique

Introduction

Full-thickness macular hole (FTMH)–associated retinal detachment (RD) secondary to myopic traction maculopathy is classified as stage 4c according to the myopic traction maculopathy staging system[1] and still represents a surgical challenge. Surgery for stage 4c myopic traction maculopathy has 2 goals; that is, reattachment of the retina and closure of the MH with full apposition of its edges. The long-term anatomic and functional outcome results are better when both goals are met.[2,3]

Several techniques are used to treat this condition, including macular buckle placement, pars plana vitrectomy (PPV) with gas tamponade, or a combination. The success rates differ between the techniques. When PPV is performed, the rate of success depends on whether internal limiting membrane (ILM) peeling or ILM flap creation is performed. Studies have reported a retinal reattachment rate of 82% with ILM peeling and 97.8% with ILM flap creation and an MH closure rate of 38.5% and 93.5%, respectively, with no difference in visual outcomes.[4–6]

However, the use of a macular buckle alone or combined with PPV leads to a higher rate of complete anatomic success (ie, reattachment and MH closure) with better functional outcomes than PPV alone,[7–9] even in patients with recurrent MH-associated RD.[10] When a persistent MH is present after PPV for stage 4c myopic traction maculopathy, the surgeon can choose surveillance (risk of redetachment)[11] or a second surgery with more complex maneuvers, such as free autologous ILM transplantation,[12] autologous retinal transplantation,[13] or human amniotic membrane patch placement.[14] These techniques involve tissue components being inserted into the MH to reduce the rate of redetachment, which may prevent functional improvement.[14–16] A higher closure rate was found with the injection of a balanced salt solution to induce a controlled macular detachment with partial or complete restoration of the retinal layers.[17]

Here, we report 2 patients who presented with myopic traction maculopathy stage 1c after initial surgery failed to close a persistent FTMH with RD. The surgeries were performed by the same surgeon (B.P.) at Eyecare Clinic, Brescia, Italy.

Case Reports

Case 1

A pseudophakic woman presented 3 months after treatment with PPV, ILM flap creation, and gas tamponade in the right eye for a

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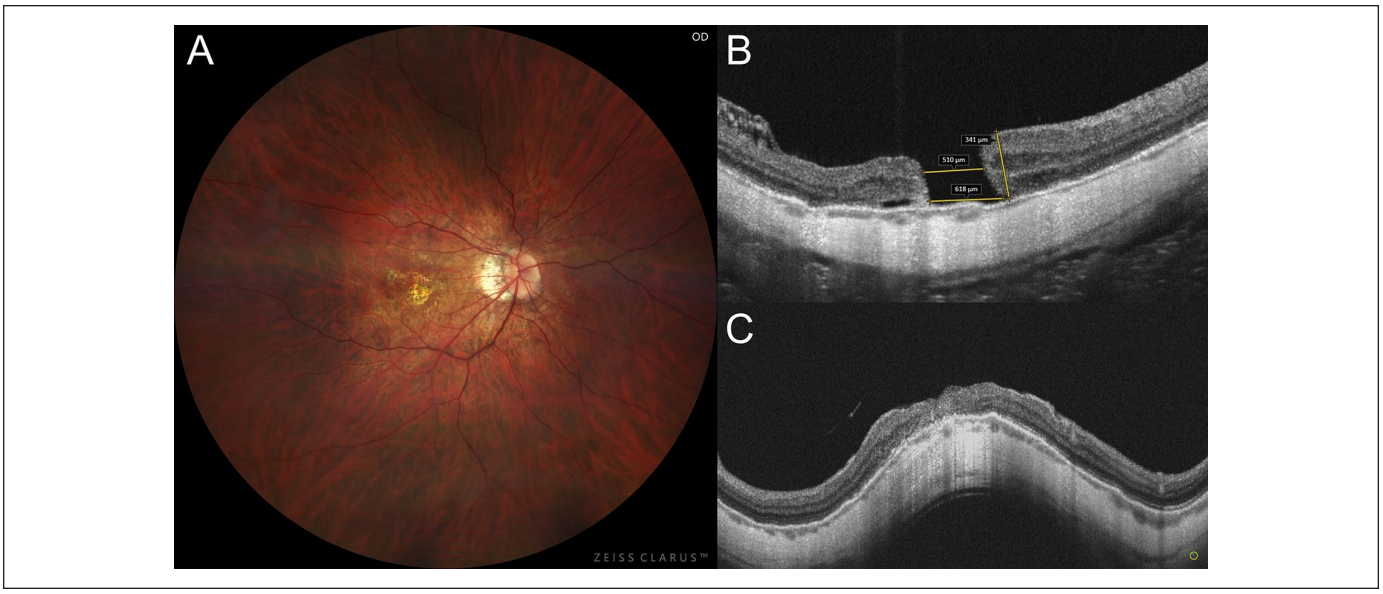

Figure 1. Right eye of a 49-year-old woman. (A) Fundus photograph shows myopic maculopathy with atrophic changes in the fovea. (B) Preoperative optical coherence tomography (OCT) B-scan shows a large macular hole (MH) with a minimum linear diameter of 510 µm. (C) Postoperative OCT shows complete closure of the MH with a well-centered indentation from the macular buckle.

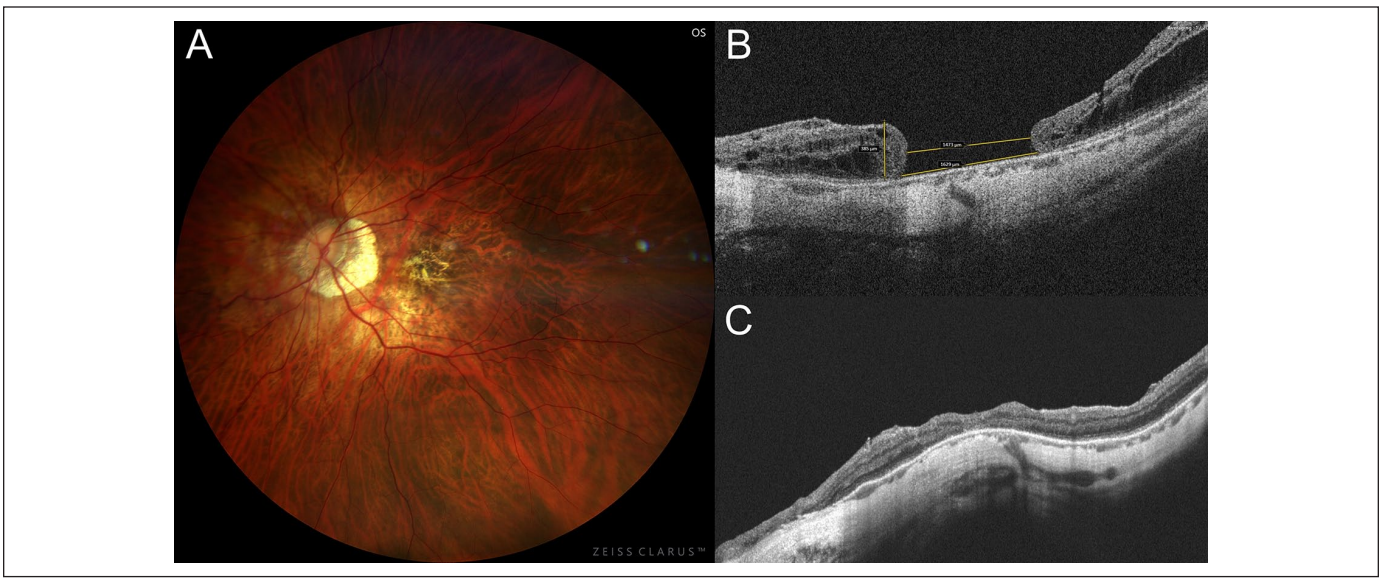

Figure 2. Left eye of a 48-year-old woman. (A) Fundus photograph shows a wide area of atrophy along the fovea. The macular hole (MH) is not visible as a result of atrophic changes. (B) Preoperative optical coherence tomography (OCT) shows an MH with a minimum linear diameter of 1473 µm. (C) Postoperative OCT shows a closed MH with no maculoschisis as a result of the indentation from the macular buckle.

persistent FTMH. She reported no change in vision after the initial intervention. The best-corrected visual acuity (BCVA) was 1.0 logMAR, and the axial length (AL) was 29.96 mm. The minimum linear diameter of the MH on swept-source optical coherence tomography (SS-OCT) was 510 µm (Figure 1).

Case 2

A pseudophakic woman presented 5 years after treatment with PPV, ILM flap creation, and gas tamponade in the left eye for a persistent FTMH. The BCVA was 1.0 logMAR, and the AL was 30.09 mm. The minimum linear diameter on SS-OCT was 1473 µm (Figure 2).

Case 1 and Case 2

In both patients, a macular buckle device (NPB buckle, AJL) was implanted in the superotemporal quadrant and fixed with a 6-0 Ti-Cron braided polyester suture (Medtronic) (Figure 3). The absence of vitreous remnants was confirmed with the insertion

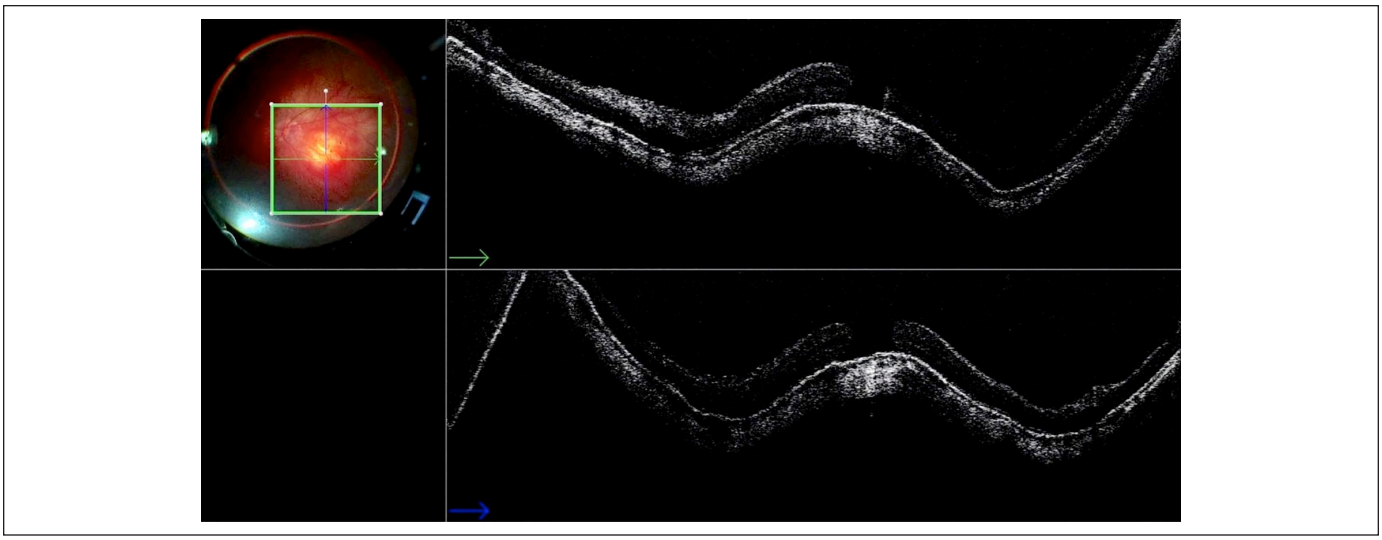

Figure 3. Intraoperative optical coherence tomography confirms the correct position of the macular buckle device before fixation.

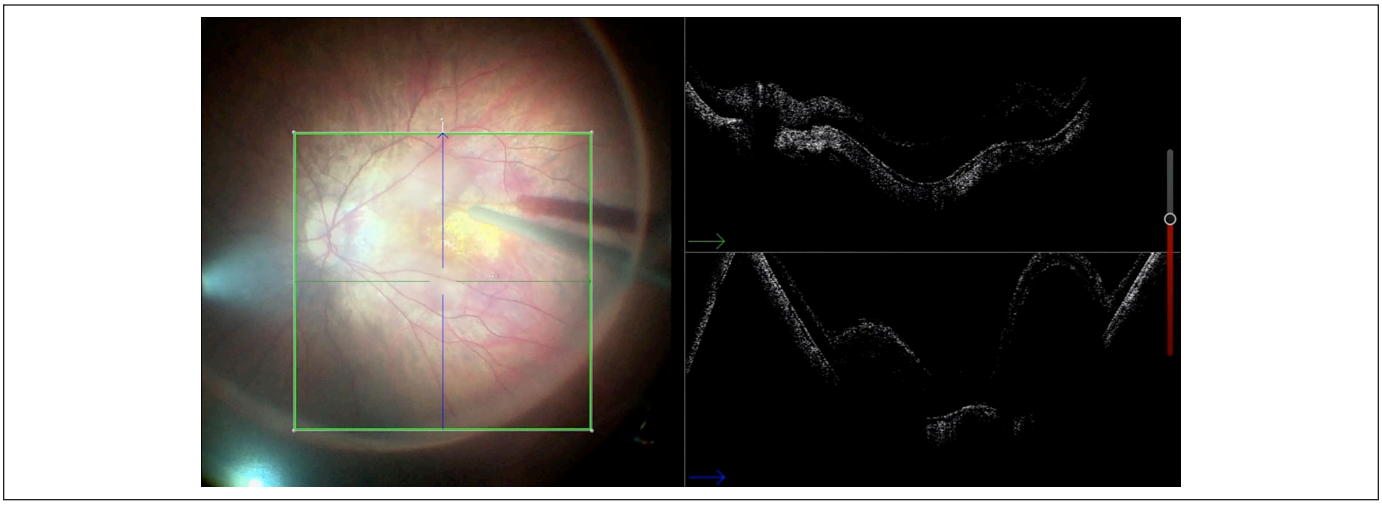

Figure 4. (Left) Subretinal injection of a balanced salt solution creates 3 blebs around the macular hole. (Right) Intraoperative optical coherence tomography B-scans show the controlled retinal detachment.

of 23-gauge trocars. A blue stain (Double Lutein Blue, Bausch + Lomb) was gently poured into the vitreous chamber to confirm the absence of ILM remnants. Without elevating the edges of the MH, a balanced salt solution was injected with a syringe and a 41-gauge needle, creating 3 subretinal blebs and inducing the macular detachment (Figure 4).

The detached retina was gently touched with a Tano diamond-dusted membrane scraper (Synergetics, Inc.) with centripetal movements to complete the detachment and mobilize the MH edges toward the center of the fovea, without creating bleeding or iatrogenic retinal lesions and without touching the retinal pigment epithelium (Figure 5). The macula was then reattached through fluid–air exchange, maintaining the backflush needle near and in front of the hole, which facilitated the edges' reapposition. The trocars were removed, and 0.8 mL of 100% sulfur hexafluoride gas was injected into the vitreous chamber through a syringe connected to a 30-gauge needle. The patients were asked to maintain a facedown position for 3 days.

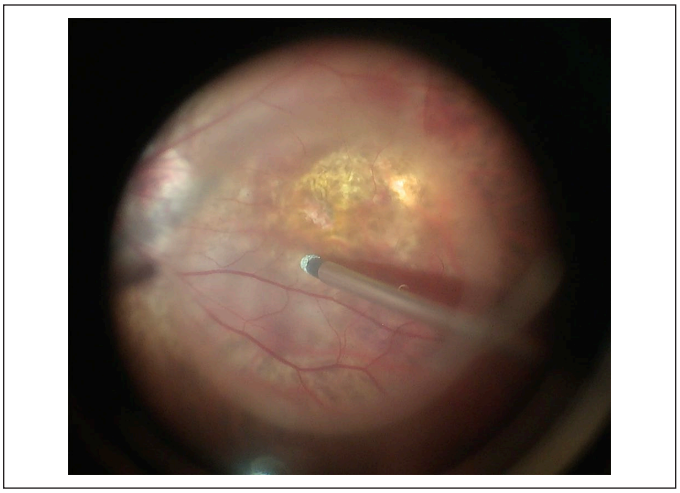

Figure 5. Centripetal movements with the Tano scraper to achieve the detachment and reapposition of the macular hole's edges.

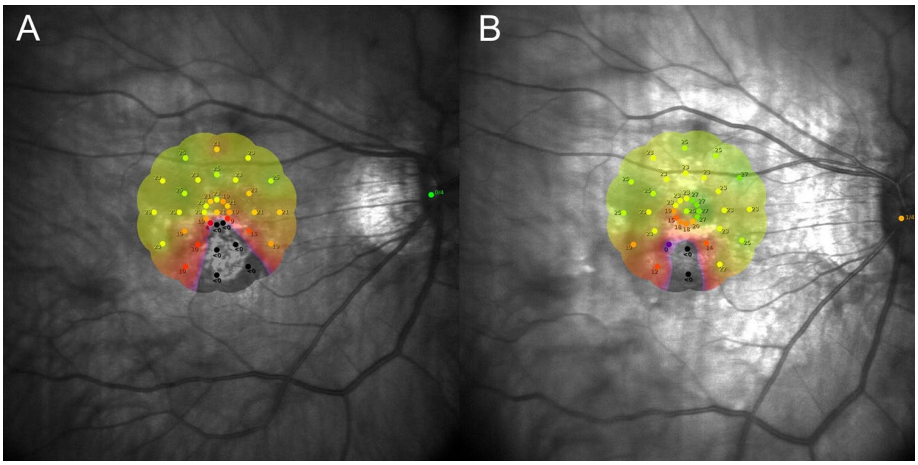

Figure 6. Sensitivity map of the macular integrity assessment microperimetry. (A) Preoperative microperimetry with an absolute scotoma (0 dB) of 6 points in the fovea and inferior parafoveal region. (B) One month after surgery, the absolute scotoma has decreased in size to 3 points, with sensitivity being gained around the affected area.

Three days after the procedure, the patients had a complete slitlamp examination and widefield SS-OCT (Xephilio S1, Canon). The retina remained attached, and the MH was closed in both cases (Figures 1 and 2). By the 1-month follow-up, the BCVA had increased to 0.4 logMAR in Case 1 and to 0.7 logMAR in Case 2. The AL shortened to 28.19 mm in Case 1 and to 28.91 mm in Case 2. Retinal sensitivity measurements were obtained with macular integrity assessment microperimetry (CenterVue), showing a significant improvement in Case 1 from a mean sensitivity of 16.5 dB to 20.6 dB with more stable fixation (Figure 6). Case 2 had no improvement in microperimetry, which can be explained by the characteristics of the MH and preoperative extension of the macular atrophy.

A summary of the patients' demographics and characteristics is shown in Table 1.

Table 1. Summary of Demographic and Ophthalmic Data.

Parameter	Case 1	Case 2
Sex	Female	Female
Age (y)	49	48
Lens status	Pseudophakic	Pseudophakic
Axial length (mm)	29.96	30.09
First surgery (time)	3 mo	5 y
OCT measures		
MLD (μm)	510	1473
Basal diameter (μm)	618	1629
Height (μm)	341	385
BCVA		
Baseline		
LogMAR	1.0	1.0
Snellen	20/200	20/200
Final		
LogMAR	0.4	0.7
Snellen	20/50	20/100

Abbreviations: BCVA, best-corrected visual acuity; MLD, minimum linear diameter; OCT, optical coherence tomography.

Conclusions

We present an alternative surgical approach for the treatment of stage 1c myopic traction maculopathy with combined macular buckle and subretinal injection of a balanced salt solution after failed surgery for myopic traction maculopathy stage 4c comprising a PPV and ILM flap technique. Myopic traction maculopathy is a progressive disease caused by centrifugal forces secondary to the elongation of the eye. More severe stages of the disease include macular detachment with or without an FTMH.[18] We believe that placing a macular buckle was necessary to achieve better anatomic outcomes, as reported previously,[19] by maintaining retinal attachment and avoiding the use of silicone oil (SO).

Complete closure of the MH is fundamental to avoid redetachment of the retina, the rate of which can be as high as 100% in patients with persistent MHs after SO removal.[11] Inducing a controlled macular detachment resulted in closure of the MH and a significant vision gain in both patients, with improvement of macular sensitivity in Case 1. In a retrospective study of 41 eyes with refractory (large to giant) MHs treated with subretinal fluid injection, the closure rate was 85.36%. Overall, there was a statistically significant improvement in vision.[20]

In conclusion, the combination of macular buckle placement with subretinal injection of a balanced salt solution to treat a persistent MH secondary to myopic traction maculopathy might lead to better anatomic and functional results. Further comparative studies with a greater number of cases are needed to evaluate and support this approach.

Ethical Approval

This case report was conducted in accordance with the Declaration of Helsinki. The collection and evaluation of all protected patient health information were performed in a US Health Insurance Portability and Accountability Act–compliant manner.

Statement of Informed Consent

Informed consent was obtained from the patients before the surgery. No informed consent was necessary for the publication of this paper because it does not include images or information that identifies the patients.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of the article.

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