

Macular Buckling for Retinal Detachment in Highly Myopic Eyes With Macular Hole

Use of a modified macular buckle improved precision and allowed optimal positioning.

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High myopia is a relatively frequent condition affecting approximately 2.5% to 9.6% of the elderly world population.^{1,2} The highest rates occur among Asians, with roughly 50% to 80% of the adult population myopic.^{3–5} Macular schisis and macular detachment, with or without macular hole, are severe complications that can occur in highly myopic eyes and result in significantly reduced visual acuity. Posterior staphyloma, in combination with anteroposterior traction caused by vitreous cortex and tangential forces due to epiretinal membranes or internal limiting membrane (ILM), plays a significant role in the pathogenesis of myopic maculopathy.⁶ To address these issues, two approaches to myopic maculopathy treatment have been developed: the transvitreal approach and the macular buckling procedure.^{7,8}

In recent years, macular detachments have most frequently been treated using pars plana vitrectomy (PPV) with or without ILM peeling, but the use of macular buckling is having a resurgence. Recent designs of macular buckles have been shown to be safe and effective.^{3,4} In this article, we describe a modification to the adjustable macular buckling (AMB) device that we have used with success—the AMB model BMM4 (Micromed). In our modification, we illuminated the device's terminal plate using an optical fiber in order to facilitate the location of the fovea and to guide correct positioning of the macular buckle, reducing the risk of procedure failure. In parallel, other researchers have proposed similar modifications of the macular buckle.^{6,9} This article describes our modification of the device and our results in two patients.

USE OF THE MODIFIED AMB DEVICE

Two patients affected by myopia and macular detachment with macular hole were referred to our department, where they were operated on with a modified AMB device. They were informed about all treatment details, and each gave consent prior to the operation. Preoperative and postoperative visual acuity and optical coherence tomography (OCT) scans were evaluated, and postoperative orbital computed tomography (CT) was performed to assess the implant's position.

Case No. 1

An 83-year-old woman with retinal detachment in a highly myopic eye with macular hole had BCVA of finger counting at 60 cm. She was pseudophakic and had no history of retinal detachment. We performed a macular buckling procedure, which resulted in complete retinal reattachment and closure of the macular hole as observed on OCT.

At a Glance

- Macular buckling is an effective approach to treating myopic macular hole retinal detachment with posterior staphyloma.
- Modifying a macular buckling device by illuminating the macular plate with an optical fiber allowed visualization of the macular area and improved the accuracy of positioning.

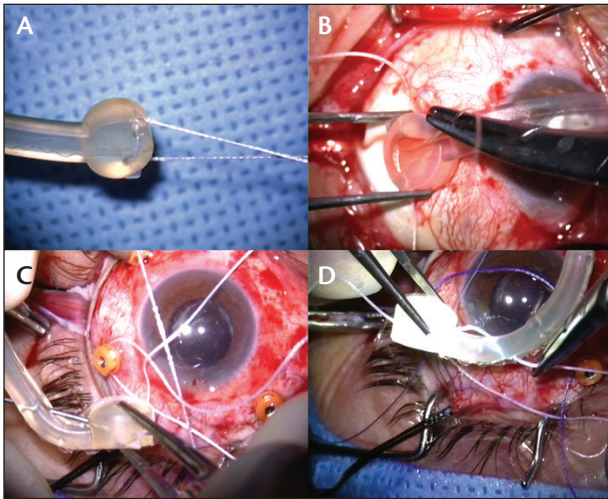


Figure 1. A double-armed 5-0 polyester suture threaded through the terminal plate of the macular buckle (A). The tip of the optical fiber being thrust into the terminal plate of the AMB (B). A canal is formed in the device's handle and terminal plate using a 25-gauge needle (C). The optical fiber is inserted into the canal (D).

Case No. 2

A monocular, 70-year-old woman with retinal detachment in a highly myopic eye with macular hole had a BCVA of 1/50. She had previously undergone three vitreoretinal operations: phacovitrectomy with posterior intraocular lens (IOL) implantation and gas tamponade, PPV with silicone oil tamponade, and subsequent PPV with silicone oil tamponade.

We first performed a complete PPV with revision of her peripheral retina, ILM peeling, and heavy silicone oil tamponade. One week after this intervention, the retina was attached and the macular hole was completely closed. Unfortunately, 3 weeks later, we observed macular redetachment and a macular hole. Episcleral macular buckling in combination with PPV, silicone oil removal, and SF6 gas tamponade were then performed. The procedure resulted in complete retinal reattachment with closure of the macular hole as demonstrated on OCT.

Details of the Surgical Technique

The AMB device we used is a silicone rubber radial element consisting of a 2-mm x 2-mm x 10-mm handle for meridian positioning and a terminal plate (5-mm diameter) designed to infold the macula. Before the surgery, we threaded one double-armed 5-0 polyester suture through the terminal plate and colored it on one side to distinguish the two sides of the suture (Figure 1A). We then modified the AMB device by illuminating its terminal plate with a 29-gauge optical fiber.

The optical fiber was inserted into the plate in one

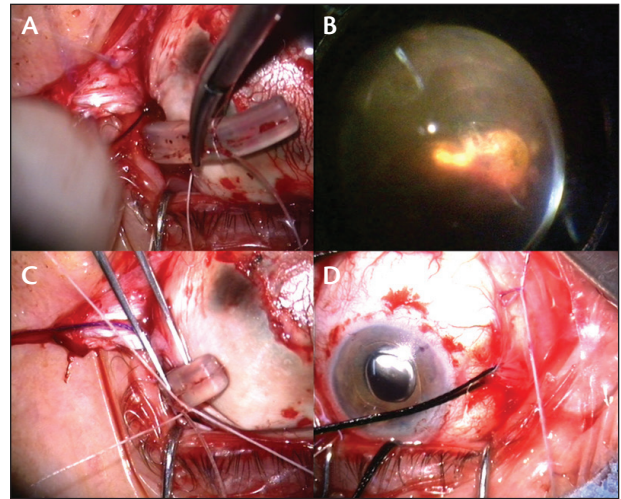


Figure 2. The buckle is inserted head-down into the superotemporal quadrant (A). Assessing the position of the luminescent terminal plate (B). Use of a mattress suture to fix the AMB's radial element to the sclera (C). The double-armed sutures can regulate macular buckle height (D).

of two different ways. In Case No. 1, we forced the tip of the optical fiber directly into the device's terminal plate (Figure 1B). In Case No. 2, we formed a canal in the handle a few millimeters above the terminal plate and in the terminal plate using a 25-gauge needle (Figure 1C) and inserted the light source into the canal (Figure 1D). We fixed the optical fiber to the handle of the AMB device with 5-0 nylon sutures.

We performed a 360° limbal peritomy, during which we isolated all rectus muscles with 1-0 silk bridle sutures. The lateral rectus muscle was disinserted and prepared for further reinsertion. The inferior oblique muscle was isolated with a 1-0 silk bridle suture to facilitate access to the posterior staphyloma. We inserted the AMB device into the superotemporal quadrant and slid the terminal plate into the area of the posterior pole (Figure 2A). Using a binocular indirect ophthalmomicroscope (BIOM; Oculus Surgical), we were easily able to assess the position of the illuminated terminal plate and center it under the fovea (Figure 2B).

When the AMB device was properly positioned, its radial element was fixed to the sclera with a mattress suture using 5-0 polyester (Figure 2C). Subsequently, both ends of the suture, which had been previously threaded through the macular plate, were passed under the rectus muscles (superior suture under the superior and medial rectus muscles, inferior suture under the inferior rectus muscle), and bites through sclera were taken, 10 mm from the limbus, at symmetric distances from the radial element of the AMB device. The tension

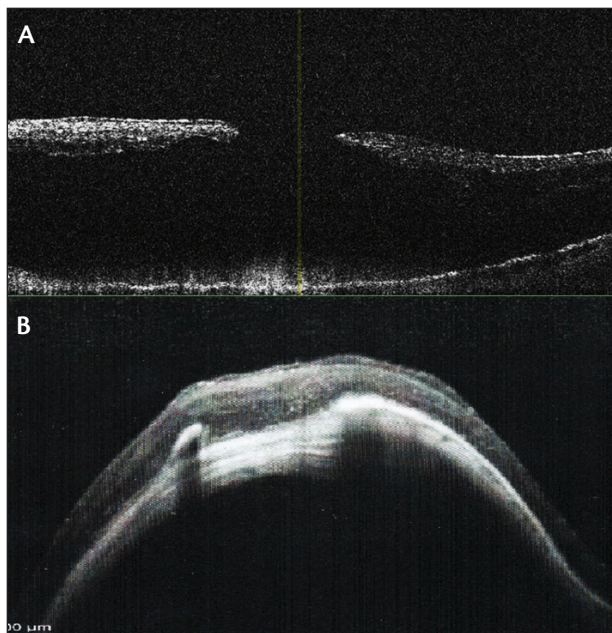


Figure 3. Preoperative OCT (A) of the highly myopic eye with macular detachment and macular hole from Case No. 1. Postoperative OCT (B) shows that the macular hole is closed and the retina is reattached.

and height of the terminal plate could be regulated by tying this double-armed suture. When the desired effect was achieved, we tied the sutures (Figure 2D) and removed the optical fiber. We finished the surgery by reinserting the lateral rectus muscle and suturing the Tenon capsule and conjunctiva.

Results

In both cases, the retina was reattached and the macular hole was completely closed the day after surgery (Figures 3 and 4). This condition was maintained during follow-up of 12 months in both cases. The illuminated AMB device was easily placed during surgery and remained properly positioned afterward, as confirmed by fundus examination, OCT, and orbital CT (Figure 5). No intraoperative or postoperative complications were observed. Intraocular pressure was stable before and after surgery in both cases. In Case No. 1, the patient's BCVA following surgery was finger counting at 40 cm. In Case No. 2, the patient's postoperative BCVA was 0.1 (Snellen decimal).

DISCUSSION AND CONCLUSIONS

For decades, surgeons have used macular buckling to treat pathologies resulting from posterior staphyloma in high myopia. Certain buckling techniques were abandoned because of surgical challenges and intra- and postoperative complications. The latest macular buckling

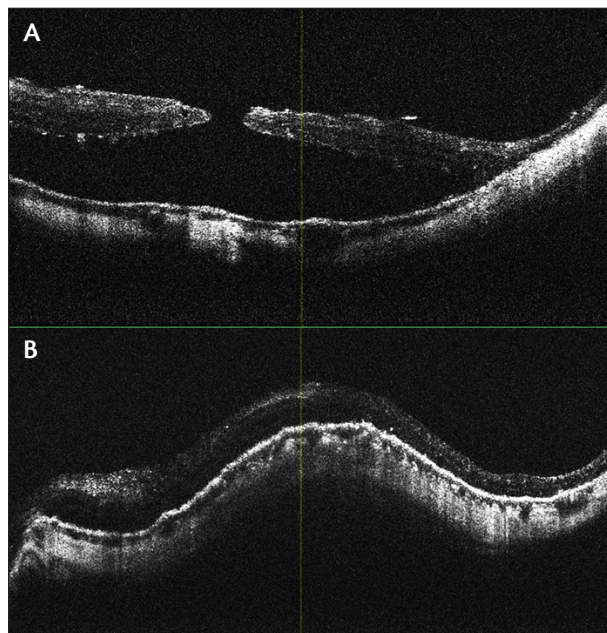


Figure 4. Preoperative OCT (A) and postoperative OCT (B) of Case No. 2.

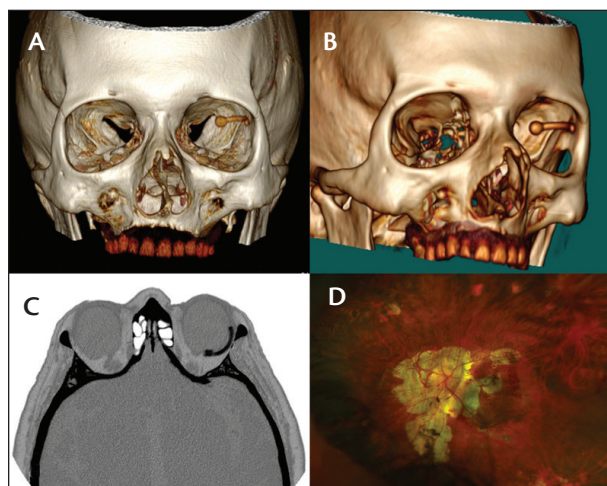


Figure 5. Positioning of macular buckle on 3-D CT scan (A, B, and C) in Case No. 1. Postoperative fundus (D).

devices are easy to implant and do not require posterior sutures or direct access to the posterior pole, making the procedure safer. Retrospective interventional studies evaluating the treatment of retinal detachment caused by macular hole in highly myopic eyes with posterior staphyloma have shown better postoperative anatomic and functional results following episcleral macular buckling procedures compared with PPV, which at one time had nearly replaced macular buckling.⁸

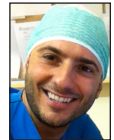
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The AMB device we used does not contain metal components, is easy to implant, and does not require posterior sutures. It allows adjustment of buckling height, tension, and macular positioning more easily than some other buckling devices. As described above, we illuminated the device's terminal plate to allow accurate assessment of its position during surgery and to enable exact placement under the fovea. Other authors have proposed similar modifications of the macular buckle, which may help to confirm the validity of this approach.^{6,10}

Macular buckling is an effective approach in the treatment of myopic macular hole retinal detachment with posterior staphyloma. In our experience, illumination of the macular buckle improved the precision of this procedure. ■

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