Macular Detachment for Treatment of Persistent Macular Hole

Alejandro Oliver, MD, MSc, FRCS(C)
E. Joanna Wojcik, MD, MSc

ABSTRACT
The authors report a technique for treatment of persistent macular holes in cases refractory to traditional surgical techniques. With a standard pars plana vitrectomy approach, subretinal infusion of balanced salt solution was performed and followed by a fluid–air exchange. This intervention resulted in hole closure despite poor prognosis and may be considered as a treatment option for patients with persistent flat macular holes. [Ophthalmic Surg Lasers Imaging 2011;42:516-518.]

INTRODUCTION
The standard technique for repair of stage III and IV macular holes includes pars plana vitrectomy with internal limiting membrane (ILM) peel and gas endotamponade, as well as maintaining face-down positioning.1,2 A closure rate of approximately 90% has been reported following this procedure.3 Repeated surgery with more aggressive management had been reported to result in the closure of approximately 80% of persistent macular holes; the reason for failure in the remaining 20% of cases is not known, but is attributed mostly to residual epiretinal membrane traction or poor patient compliance.4-6 A more recent study, one of the largest to date, where particular emphasis had been put on performing a complete ILM peel during the first surgery, found that a second intervention had a persistent macular hole closure rate of only 46.7%.7 This was presumably caused by the absence of residual epiretinal membrane traction that could be released during the revision. To our knowledge, results of third surgical attempts to close persistent macular holes have not been published, but it is generally accepted that the probability of success is lower after each failed intervention. We suspect that this failure may be caused by intrinsic rigidity of the retina that hampers its mobilization to allow for closure of the macular hole, and we report our experience with a technique that permits such mobilization by releasing the macular area from the underlying retinal pigment epithelium.

TECHNIQUE
A 68-year-old man seeking further surgical treatment presented with a visual acuity of counting fingers in both eyes due to bilateral persistent macular holes. Repair had been attempted elsewhere 3 years prior in his right eye. His left eye had undergone two repair attempts by the same surgeon, the first intervention 4 years previously and the second intervention 2 years later. Operative reports indicate that a pars plana vitrectomy with indocyanine green-assisted ILM peel had been performed in both eyes; in addition, the absence of any residual membrane was confirmed during the second surgery in the left eye.

The macular hole configuration as visualized by optical coherence tomography (RTVue; Optovue, Inc., Freemont, CA) was of the flat or “without cuff” subtype (Fig. A), which has been reported as having worse
prognosis for closure after primary and repeat surgery. The minimal diameter of the hole in the left eye was 679 µm and the basal diameter was 975 µm. The patient was informed of the guarded prognosis given his complicated history, and the low probability of success after two failed interventions had already been made clear by his previous surgeon. Following a detailed discussion of the different surgical options, the patient decided to proceed with this new approach in his left eye.

A standard three-port pars plana vitrectomy approach was used with 23-gauge instrumentation and without additional use of indocyanine green. Using a high-magnification disposable vitrectomy lens, four puncture retinotomies (one in each macular quadrant) were performed with a 41/25-gauge rigid retinal hydrodissection cannula. Subretinal infusion of balanced salt solution was performed until each bleb connected with the macular hole, at which point it would stop enlarging. The infusion pressure was manually controlled with a syringe in the surgeon’s left hand (the syringe and the cannula were connected by extension tubing). An air–fluid exchange was performed but the subretinal fluid was not drained. C3F8 gas 14% concentration was injected into the vitreous cavity. Given the previous two surgeries, it was decided to suture all three sclerotomies and the overlying conjunctiva with 7-0 Vicryl sutures (Ethicon, Somerville, NJ). The patient received subconjunctival antibiotic and steroid as per protocol and was observed as customary at 1 day, 1 week, and 1, 3, and 6 months after surgery.

Stable closure of the macular hole in the operated eye was confirmed by optical coherence tomography 3 and 6 months after surgery (Fig. B). The patient reported a subjective improvement in his vision, although this could not be corroborated on the Snellen chart; his visual acuity continues to be counting fingers in both eyes.

**DISCUSSION**

The exact mechanism by which closure of macular holes occurs following pars plana vitrectomy is not completely understood. Histopathologic studies have suggested that the removal of cortical vitreous and ILM results in a relief of tangential traction and allows for re-approximation of the hole edges. The absence of traction presumably results in hole closure without eliciting inflammatory response.9,10

Based on the assumption that the sole approximation of macular hole edges should result in its closure, we hypothesize that in cases of chronic, persistent holes there is another force that impedes such approximation, even after relief of traction caused by the vitreous and the ILM. We believe that this can be caused by the underlying retina, which is too rigid to allow for edge closure. Furthermore, we believe that this force could be overcome if the retina in the macular area was to be released from the underlying retinal pigment epithelium by creating a posterior retinal detachment through subretinal fluid infusion. Although this induction of a macular detachment has been reported to carry a 9% risk of a rhegmatogenous retinal detachment,11 we believe that given the controlled environment in which it occurs and the guarded visual prognosis of most patients with large persistent macular holes, the risk of the procedure negatively affecting their final visual outcome is low.

We report a case where a macular hole that could not be closed by the standard approach despite repeated interventions was successfully treated by allowing for retinal mobilization. We believe this result is similar to what has been reported to occur in patients with high myopia in whom macular holes combined with retinal detachments can be successfully repaired by gas or silicone oil tamponade.12-14

It is important to mention that despite anatomical success, no objective improvement in vision was observed. This has been reported before, but it is reasonable to assume that a closed macular hole would lead to a smaller scotoma, allowing for easier fixation for
patients. This could explain the subjective improvement in vision reported by the patient. We believe our findings warrant further investigation of this technique as a possible alternative treatment for persistent flat macular holes.

REFERENCES