Management of Submacular Hemorrhage in Patients with AMD: An Imaging Perspective

OCT guides decision-making in these complex cases.

BY AMANI A. FAWZI, MD

In this issue of Retina Today, *Amani A. Fawzi, MD, describes the role of optical coherence topography (OCT) in the management of submacular hemorrhage in patients with age-related macular degeneration (AMD).*

We extend an invitation to readers to submit surgical pearls for publication in Retina Today. *Please send submissions for consideration to Dean Eliott, MD (deliott@doheny.org), or Ingrid U. Scott, MD, MPH (iscott@psu.edu). We look forward to hearing from you.*


—Dean Eliott, MD; and Ingrid U. Scott, MD, MPH

In the era of improved outcomes in the management of neovascular age-related macular degeneration (AMD) using antivascular endothelial growth factor (anti-VEGF) therapy, there is still a role for submacular hemorrhage displacement in selected cases. This article reviews my case selection process, with a special focus on how I use optical coherence tomography (OCT) in practice to guide the management of these complex cases.

SURGICAL DECISION

In my series, I have operated only on functionally monocular patients, of whom the majority had disciform scars in the fellow eye secondary to hemorrhagic events. These patients often present with a great degree of anxiety, as they have been through this with their first eye and know what the final outcome will likely be without intervention—20/400 to counting fingers. These patients are generally highly functional individuals who continue to read or drive, or they are the primary caregiver in their household. Therefore, they are motivated to undergo a procedure.

I spend a long time with these patients, discussing the surgery, tempering their expectations, and explaining that this is not a "fix," and that they still will need continued follow-up and anti-VEGF maintenance in the long term. Some of these patients lost vision in their first eye before the era of anti-VEGF therapy and need to hear this. For patients who elect observation (or who see me after being observed else where), I follow them weekly, inject anti-VEGF therapy as needed, and monitor their OCT results. I also look for signs of photoreceptor demise.

PREOPERATIVE ASSESSMENT

After conducting a clinical examination, I usually scrutinize the OCT for (1) subfoveal loss of the inner/outer segment line and (2) subfoveal scars or geographic atrophy, both of which would probably temper my enthusiasm to proceed.

For patients who elect to proceed, I use OCT to map out the pigment epithelial detachment (PED) (Figures 1 and 4). The hemorrhage is usually both sub-sensory retina

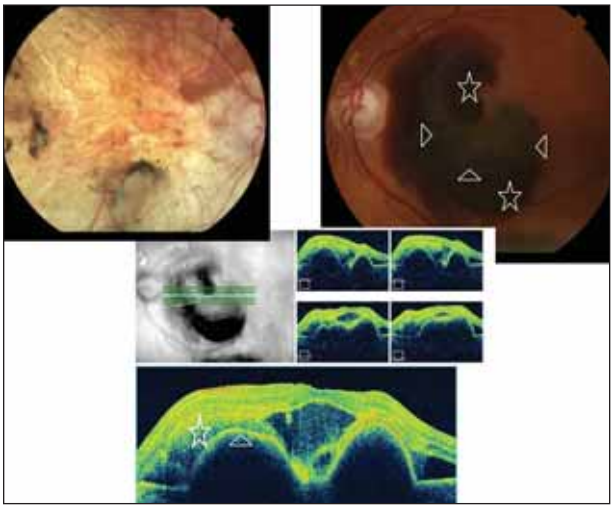

Figure 1. Patient 1, baseline. Left eye preoperative photograph (right) shows submacular hemorrhage in different layers: sub-sensory retina (star) and sub-RPE in the kidney-bean shaped PED (arrowheads); fellow eye (left) has hand-motion vision. Baseline OCT: Note the relatively regular contour of the hyper-reflective RPE line in the PED (arrowhead) compared with the irregular contour and heterogeneous reflectivity of the overlying submacular hemorrhage (star). The inability to see the Bruch membrane line underneath the PED may be due either to the extent of retinal elevation or the presence of sub-RPE hemorrhage shadowing and obscuring the underlying structures.

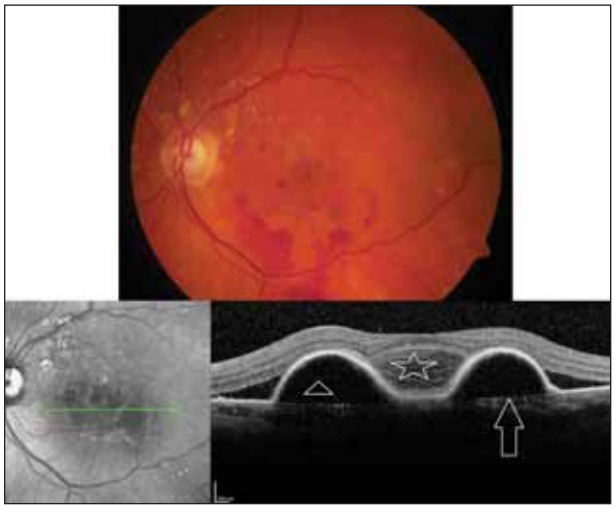

Figure 2. Patient 1, postoperative week 1. Color photograph shows successful displacement of the submacular hemorrhage and disappearance of the sub-RPE hemorrhage (top). Corresponding OCT shows layered sub-sensory fibrin (star) and clear fluid in the sub-RPE space (arrowhead). The improved ability to see Bruch's membrane in the sub-RPE space (arrow) may be another indication of the resolution of the sub-RPE hemorrhage.

and sub-retinal pigment epithelium (RPE). The presence of submacular PED does not change my management decision; however, I want to avoid intraoperatively injecting in the sub-RPE space, causing an iatrogenic RPE rip.

ANTI-VEGF TIMING

I inject an anti-VEGF agent at the initial visit if surgery is delayed by more than 1 week for medical reasons, or in patients who initially elect 1 week of observation. When surgery is to be performed the same day or the day following the examination, I inject a half dose of anti-VEGF agent at the end of surgery in a 50% gas-filled eye.

SURGICAL APPROACH

I use a combination of OCT and color photographs to determine the best location for the subretinal injection. I use OCT to evaluate the thickness of the subretinal hemorrhage. I prefer injecting in an area of subretinal hemorrhage away from large retinal vessels and away from the PED.

INTRAOPERATIVE CONSIDERATIONS

An experienced, steady-handed assistant is highly recommended for this procedure, for which 25-gauge vitrectomy is adequate. I connect the 39-gauge submacular cannula to extension tubing, then to a 3-cc syringe that contains 1 cc or less of 12 µg/0.1 mL of tissue plasminogen activator (TPA). The tubing allows the assistant some freedom in manipulating the syringe without moving the

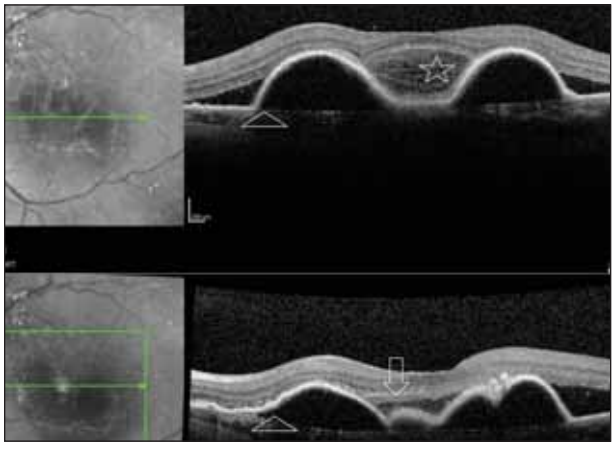

Figure 3. Patient 1, postoperative week 2 (top) and month 6. Three- to four-weekly injections of anti-VEGF agent were continued throughout the follow-up. Note the resolution of fibrin deposits (star), the relatively redundant RPE (less taut than on postoperative week 1, arrowhead), and the preservation of the inner segment/outer segment junction (arrow), all of which are consistent with patient's current visual acuity of 20/40.

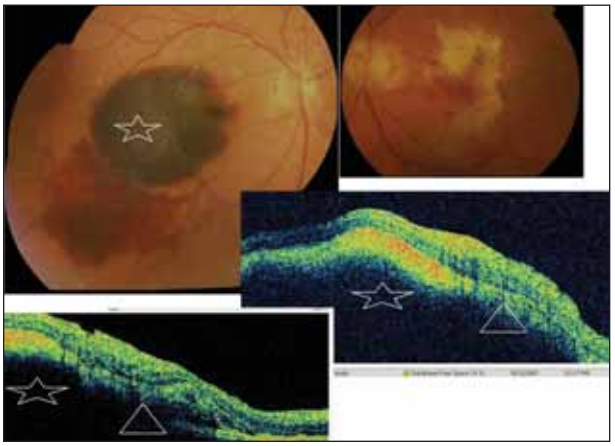

Figure 4. Patient 2, baseline. Color photos of right (top left) and left eyes. A star marks the location of the sub-RPE hemorrhage. Bottom right: OCT at presentation; even though this is time-domain OCT, one can identify regularly high reflectivity RPE contour (star) as opposed to sub-sensory hemorrhage (arrowhead). The patient elected observation for 1 week. Bottom left OCT shows persistent thick layer of sub-sensory hemorrhage (arrowhead) causing shadowing and obscuring of the underlying RPE (arrow), and persistent PED (star). At that point visual acuity was counting fingers, and the patient elected to have surgery.

Figure 5. Patient 2, postoperative week 2. Color photograph shows significant displacement of subretinal hemorrhage and some resolution of sub-RPE hemorrhage (star). This patient's surgery was delayed 2 weeks. Despite surgery and continued intravitreal anti-VEGF injections, this patient's visual acuity remained limited to 20/200. He continues to have count fingers visual acuity in the fellow eye and appreciates the improved quality of vision in the operated eye.

surgeon's hand. I first ask the assistant to inject outside of the eye to get a feel for the resistance in the system and to express all bubbles.

I begin with the preoperatively determined point of injection, but usually I make little adjustments intraoperatively. Choosing an area with subretinal hemorrhage provides some additional visual cues (evidenced by a focal displacement of hemorrhage as the cannula enters the subretinal space) as soon as the subretinal space is entered, and I believe this approach prevents unintentional injections into the sub-RPE space. I inject 0.1 mL to 0.3 mL, enough to cause a visible elevation of the retina between the arcades.

Next, I examine the periphery for entry site breaks, reexamine the macula for hemorrhage dissolution, and proceed to air-fluid exchange. I usually use a 50% to 70% fill of air-fluid exchange, which I then exchange for 10% SF_6. I do not use a longer-acting tamponade; this allows resolution in 1 to 2 weeks in preparation for further intravitreal anti-VEGF and also allows faster visual recovery to take place in these functionally monocular patients. In patients who did not receive preoperative anti-VEGF therapy, and in other selected patients, I elect a 50% gas fill and a half-dose intravitreal injection of anti-VEGF intraoperatively. I tend to use a suture to close all sclerotomies, especially with the slightest sign of leakage.

Immediately following surgery, I ask patients to remain supine for at least 1 hour (usually in the recovery area) to permit further hemorrhage liquefaction, before assuming an upright position to displace the liquefied hemorrhage.

POSTOPERATIVE FOLLOW-UP

Patients are seen at 1 day, 1 week, and 4 weeks after surgery (Figures 2, 3, and 5). I restart anti-VEGF injections at the fourth week of follow-up. Although there may be theoretical reasons to use bevacizumab (Avastin, Genentech, Inc.) in these vitrectomized eyes because of its longer half-life, I offer patients both bevacizumab and ranibizumab (Lucentis, Genentech, Inc.) and discuss the risks and benefits of each. I will continue to do this until a prospective study confirms the benefit of one over the other. If patients do not show significant improvement over a 6-month period, I consider shortening the interval between injections by 1 week because of their vitrectomized status. ■

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