

Surgery for Macular Hole and Retinal Detachment

The coexistence of these conditions must be addressed with a specific surgical approach.

BY ROBERTO ALEJANDRO GUERRA GARCÍA, MD

In this issue of Retina Today, Roberto Alejandro Guerra García, MD, discusses his surgical approach to the treatment of concomitant macular hole and retinal detachment.

We extend an invitation to readers to submit pearls for publication in Retina Today. Please send submissions for consideration to Dean Elliott, MD (dean_elliott@meei.harvard.edu); or Ingrid U. Scott, MD, MPH (iscott@hmc.psu.edu). We look forward to hearing from you.



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

Pars plana vitrectomy (PPV) allows vitreoretinal surgeons to treat a number of retinal disorders effectively, sometimes concomitantly in the same patient. A common example of this is the coexistence of macular hole and retinal detachment. Although both of these conditions have well-defined surgical treatment approaches, the coexistence of these 2 conditions presents a challenge to the vitreoretinal surgeon that must be addressed with a particular philosophy. This article discusses my standard approach to handling these concomitant disorders, regardless of the available technology and the particularities of each patient.

ENTRY

With a 20-gauge instrumentation approach, a temporal peritomy is made covering 2.5 to 3 clock hours, with another nasal peritomy in the upper quadrant covering only 1 clock hour. Generally, sclerotomies are made 3.5 mm posterior to the limbus, whether the patient is phakic or not. The incision for the irrigation cannula is set 1 clock hour below the temporal horizontal meridian. An irrigation cannula is sutured using 6-0 polyglycolic acid suture with a temporary knot that will allow the instrument to be withdrawn



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and the incision sutured at the end of surgery. Irrigation should never be connected before ensuring that the tip of the cannula is within the vitreous cavity. Penetration of the cannula is verified by indenting the sclera and examining through the microscope or looking at an oblique angle through the cornea and observing the area with the light pipe.

The incisions for instruments are created at the 9:30 and 2:30 o'clock positions. This allows convenient access to the upper quadrants, which often must be addressed with special attention, and keeps the lower retina accessible too.

When 23-gauge instrumentation is used, I make 3 incisions at the same locations and distances from the limbus, using a fixation plate or forceps to move the conjunctiva, and performing 2-step incisions at 5° and 30° angles. If necessary, a chandelier is inserted 3.5 mm



Figure 1. PVD induction with active suction must be performed carefully, as this maneuver may be associated with iatrogenic retinal breaks.



Figure 2. Triamcinolone staining enables the surgeon to recognize previously unnoticed vitreous remnants.

from the limbus at 6 o'clock. This instrument may limit the downward movement of the eye when working in the inferior periphery, interfering with maneuvers in this area. Therefore, I prefer to use a chandelier only if the case requires it.

VITRECTOMY

I usually start with a small core vitrectomy in order to create space for instilling triamcinolone in the vitreous cavity and to allow free movement of the instruments without causing peripheral traction.

It is important not to remove an excessive amount of central vitreous, in order to facilitate the subsequent induction of posterior vitreous detachment. This step is fundamental to ensure a direct approach to the internal limiting membrane (ILM). In our practice, this is usually

performed using active suction through the cutter probe itself, utilizing the peristaltic pump to control the aspiration flow and build an adequate vacuum by completely occluding the instrument's tip with vitreous material. At this time, the instrument is gently moved tangentially and gradually away from the retinal surface, generally toward the nasal quadrants. The surgeon must carefully observe the waveform at 360° that causes the hyaloid to separate from the retina (Figure 1).

This is a necessary but fairly invasive procedure that can create iatrogenic tears in areas of particularly strong vitreoretinal adhesion. If some bleeding appears, it is a signal you are working in one of these areas, so it is advisable to stop. This approach is safer with modern 23- and 25-gauge tips due to their smaller size and port designs.

Achieving posterior vitreous detachment in young patients can be very difficult, if not impossible, but it must always be attempted considering the risk-benefit ratio. In these cases, the surgeon may draw on tools such as soft-tipped cannula, forceps, and spatulas with the aim of achieving the hyaloid detachment. If there is doubt about remaining posterior hyaloid attachments, it is worth restraining with triamcinolone at this time to identify vitreous remnants. Remnants of the hyaloid over the retina are now aspirated with a soft-tipped cannula, and midperipheral vitreous is extracted up to its base using the cutter (Figure 2).

At this point in the procedure, my technique differs depending on whether the patient is phakic with a transparent crystalline lens, pseudophakic, or aphakic. In phakic patients, I prefer to begin addressing the macular hole first, as shaving the vitreous base can cause lens opacity and affect visualization in macular surgery. In pseudophakic or aphakic patients, with very mobile retinal detachment or anterior proliferative vitreoretinopathy, I prefer to begin shaving the vitreous base. I always perform this procedure with high cutting rates, using the peristaltic pump to control aspiration flow, which must be low (5 to 15 cc/min, depending on the equipment and gauge of the instruments used) to prevent iatrogenic retinal breaks.

The use of a noncontact wide-angle lens allows excellent visualization of the peripheral retina. I am aided by an experienced surgical assistant who performs scleral depression using a muscle hook. During this process, the management of light is very important, and a view of the vitreous base should always be maintained. The use of a chandelier can be very helpful.

I start shaving near the sclerotomies to avoid complications due to movements of the instruments, especially with 20-gauge instrumentation. First, 2 quadrants are



Figure 3. Vitreous shaving must be performed with special emphasis placed on areas with peripheral breaks and folds.

completed from 12 o'clock to 6 o'clock, and these should be the quadrants through which the light pipe is inserted. I then swap the instruments between hands and do the same with the other 2 quadrants. In my opinion, the direct location of the cutter probe over the vitreous base is the best way to achieve peripheral vitreous shaving and the reason I change the instrument's position when moving from 1 half to the other. For shaving the vitreous in phakic patients in this fashion, the assistant must make a slightly more intense depression in the periphery in order to avoid contact with the posterior pole of the lens because the cutter shaft is arranged diametrically in the vitreous cavity.

Ideally, I leave as little vitreous as possible. This procedure can take time, so the surgeon must be patient. I pay close attention to areas of retinal tears and folds where there is more traction (Figure 3). Shaving these zones requires special expertise. Sometimes it is necessary to split the folds or to increase the size of the tears with the cutter in order to relieve traction. Very small tears that may be forgotten can be marked with a diathermy probe to distinguish them during laser treatment. At this point, I recommend examining the retinal periphery 360° in order to look for tears and recognize any injury that may otherwise go unnoticed.

MACULAR HOLE SURGERY

The approach to treating macular holes properly also has unique features. I currently prefer to use a flat macular contact lens because it provides good magnification and stereopsis. I always stain the ILM, as this method renders the surgical approach safer. Indocyanine green is used in a concentration and a mixture with 5% dextrose in water solution that allows



Figure 4. During ILM peeling, care should be taken due to the mobility of the detached retina.

the dye to be instilled directly over the macular surface without fluid-air exchange.

With 20-gauge instrumentation, it is important to avoid undesired turbulence and prevent contact of the dye with unwanted areas by lowering the infusion bottle height. This maneuver is unnecessary with smaller-gauge instruments and valved cannulas. It is mandatory to attempt to avoid letting dye pass through the macular hole to come in contact with the pigment epithelium, as there is a greater chance of the dye spreading under the detached retina with undesired toxicity. After 10 seconds, I proceed to aspirate the indocyanine green with a soft-tipped cannula, including any that may accumulate under the retinal space through the macular hole, while being careful not to contact the pigment epithelium.

The approach to the ILM has its peculiarities. Do not expect to achieve continuous maculorrhexis, as in an idiopathic macular hole; rather, this is achieved by sectors. I prefer to grasp the membrane directly with ILM forceps at a point away from the macular hole and papillomacular bundle and then perform peeling until I obtain an area of at least 2 disc diameters around the hole. It is important to avoid excessive elevation of the retina during this procedure in order to avoid damage to adjacent structures and traction on the peripheral retina (Figure 4). I try not to use perfluorocarbon liquid (PFCL) to achieve the peeling because there is a potential risk of PFCL getting under the retina through the macular hole, especially in detachments accompanied by high retinal rigidity and big holes. Finally, in order to cause less phototoxicity to the foveal tissue, is important to minimize light exposure.

Weigh in on this topic now!



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1. Do you perform surgery for concomitant macular hole and retinal detachment?

- ☐ Yes
☐ No

2. If yes, which instrumentation do you prefer?

- ☐ 25- or 23-gauge
☐ 20-gauge
☐ It depends on individual factors in each case

LASER TREATMENT AND TAMPONADE

Once the macular hole surgery is done, I resume the use of a noncontact wide-angle lens. Next, fluid-PFCL and/or fluid-air exchange is performed depending on the localization of the breaks. When air is used, it is important to prevent accumulation of liquid in the margins of the macular hole. To avoid this, the remaining liquid is withdrawn with a soft-tipped cannula. Care must be taken not to damage the pigment epithelium. At this point, I start laser treatment of peripheral tears and extend it around 360° if necessary. Three or 4 concentric rows are made, with an effort to leave at least 2 of them posterior to the vitreous base insertion.

If heavy liquid has been used, PFCL-air exchange is performed, always aspirating the liquid over the PFCL interface. A soft-tipped cannula must be placed to prevent the liquid from entering through peripheral tears. Once the level of PFCL has passed the last break, heavy liquid is conscientiously aspirated until nothing remains at the end of surgery. It is sometimes necessary to irrigate a small amount of liquid to rinse the posterior pole and then remove it again, leaving the macula as dry as possible.

Tamponade is selected based on the same variables considered in a standard retinal detachment surgery. I prefer to leave a mixture of 14% C₃F₈ if it is safe; otherwise, I leave 1000-centistoke silicone oil. I rarely use 5000-centistoke oil.

Once again, the peripheral retina is inspected for 360° to find any potential undetected lesions. With a 20-gauge or 23-gauge technique without valved cannu-

las, this maneuver should be performed prior to placing a plug in the incision/cannula that is not being used.

With a 20-gauge technique, incision closure is performed with a 6-0 polyglycolic acid suture, making 1 pass perpendicular to each lip of the incision, passing only partially through the scleral thickness, and tying the 2 ends in the center of the incision. The conjunctiva is sutured with 8-0 silk or polyglycolic acid interrupted sutures, taking care to ensure the scleral incisions are well covered.

With 23-gauge instrumentation, standard care for closing the incisions is taken. When gas is used, suturing is usually not required, but with silicone oil it sometimes is. A single pass with 8-0 silk or polyglycolic acid suture through the conjunctiva, passing only partially through the scleral thickness, is usually adequate.

Postoperatively, I prescribe prone rest for a week, antibiotics, and anti-inflammatory ocular drops. Intraocular pressure-lowering drops may be indicated in the early hours if a mixture of C₃F₈ is left to prevent hypertensive peaks.

CONCLUSION

PPV for concomitant macular hole and retinal detachment requires a different approach from the traditional techniques used for each of these conditions separately. The pearls discussed in this article have enabled me to improve my surgical results in these cases. Specific instrumentation or technical advantages that any equipment can offer were not discussed, as, unfortunately, such technological improvements are sometimes not available to all surgeons. ■

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