

Rookie Errors and Complications in Vitreoretinal Surgery

WITH CONTRIBUTIONS FROM JASON HSU, MD



You can do a capsulorrhexis with your toes and can quick chop with your eyes closed. You have a tendency to be disappointed if your patient is only 20/25 uncorrected on postop day 1. And now you want to be a vitreoretinal surgeon.

Reset.

True, the skills and dexterity you fostered during residency serve as a springboard as you enter life in the posterior segment. But, as with cataract surgery, many rookie pitfalls exist that can be avoided with practice, teaching, and preparation. In this installment of Fellows' Focus, we offer advice to help you avoid complications and stay off the sidelines. We would like to extend special gratitude to Jason Hsu, MD, who provided invaluable insights for this article and has spent nearly countless hours teaching each of us how to operate.

– Darrell E. Baskin, MD; Jeremy D. Wolfe, MD; and Chirag P. Shah, MD, MPH

1. Befriend the retrobulbar block. Errors associated with retrobulbar blocks range from blocking the wrong eye to complications such as retrobulbar hemorrhage. Local anesthesia is common in retina surgery, and given the frequency of myopic eyes and patients on anticoagulants, it is important to pay close attention to the anesthesia plan. Here are some recommendations for minimizing errors and complications. Examine the operative eye prior to surgery. There is no better way to confirm you are performing the correct surgery on the correct eye. Perform an additional time-out and site verification in the operating room prior to block. Carefully review the patient's medications in preop. If the patient is a high myope or is anticoagulated consider extraconal ("peribulbar") anesthesia or performing a conjunctival cut down to give sub-Tenon's anesthesia, respectively.

2. Corneal abrasions are not cool during buckle procedures. An iatrogenic epithelial sustained defect during a scleral buckling procedure can markedly undermine the view of the fundus and compromise the efficacy and placement of cryopexy. In order to avoid abrading the cornea, one must be ever cognizant of both the need for corneal rewetting and the possibility of inadvertent touch of the cornea either by suture material or instruments (both tips and handles). One could also consider using a

more viscous material on the cornea or a corneal shield.

3. Cut conjunctiva, not muscle. Rectus muscle injury is a rare complication of 360° peritomy. This preventable adverse event is more likely to occur when your conjunctival peritomy is created more than 2 mm posterior to the limbus. Some surgeons advocate that all peritomies be performed 1 to 2 mm from the limbus in order to preserve the limbal stem cells (especially for young, contact lens-wearing patients) and to facilitate a more cosmetic closure. If you are concerned about lacerating a muscle, the first step is to know your anatomy, namely the distance between the limbus and each rectus muscle. Actively remind yourself to stay within 1 mm to 2 mm of the limbus (use calipers if needed), and consider sitting down while performing the peritomy. Avoid rushing the procedure, and use loupes or the microscope for the entire procedure.

4. Surgeon, know thy machine. Your vitrectomy machine is like a BMW M3. It is an extremely powerful and effective machine if handled correctly, but a dangerous weapon for the ill prepared. Foot pedals, buttons, beeps—there is a lot to learn, and you should arrange an in-service session with your vitrector's company representative. Once you get past learning the features on your vitrectomy system, there are three things that should be on your preoperative checklist to keep you cruising

throughout the case: (1) the bottle height, (2) the vented gas-forced infusion (VGFI), and (3) the vacuum. The bottle height should be around the patient's head or a little higher. An infusion bottle strapped to the ceiling will elevate the intraocular pressure and clamp the central retinal artery. Likewise, a high VGFI will also compromise vascular perfusion; if you are using Alcon's Accurus 23-gauge setup, keep it around 30 mm Hg to 35 mm Hg and bump it up as needed. The vacuum usually defaults to 425 mm Hg to 450 mm Hg; however, you may want more or less depending on the case and your comfort. The settings vary according to surgical machine and gauge of instruments.

5. Do not underestimate the importance of infusion cannula placement. Infusing into the subretinal or suprachoroidal space is a dreaded complication for the budding vitreoretinal surgeon. To ensure proper placement, the infusion should not be turned on until the tip of the cannula is clearly viewed. Some surgeons verify the correct placement by turning off the operating microscope light and using the endoilluminator externally while gently directing the infusion cannula by hand or with Nugent utility forceps. Other surgeons advocate direct viewing of the cannula through the microscope with the microscope illumination. Regardless of the approach, it is imperative that the view be unimpeded. If there is any doubt about the proper placement, one may create another sclerotomy elsewhere and try again with the same 4-mm cannula or consider a 6-mm cannula (available only with 20-gauge). Alternatively, an anterior chamber maintainer can be used. Another trick is to leave a small air bubble in the infusion line; if you visualize the air bubble behind the lens after turning on the infusion, you're in. Finally, it is very important that the infusion line is secured so that the tip is normal to the sclera (perpendicular to the tangent plane of the sclera). Secure 23- or 25-gauge infusions with tape; secure 20-gauge with suture.

6. Use the BIOM, Luke. The binocular indirect ophthalmoscope (BIOM 3m; Oculus, Lynnwood, WA) is a beautiful thing when used effectively. It enables up to a 120° view of the retina in primary position. The hard part is keeping the eye in primary position. It is easy to rotate the eye into various directions and then chase your view with the foot joystick. To use the BIOM effectively to maximize visualization, however, the instruments must be pivoted around the oarlock (cannula or sclerotomy) to keep the eye in primary position. Further, doing so will minimize corneal striae, a lesson we all learned while chasing nuclear material with a phacoemulsification tip through a clear corneal incision. If your hand is confined by a prominent nose, excyclo-

tort the globe with your instruments to keep the eye in primary position while liberating your nasal hand.

7. Play nice with the lens. The crystalline lens may be nice, but it sure can get in the way of the new retina surgeon. The lens can be injured while placing ports, creating sclerotomies, inserting instruments into the eye, or during vitrectomy. Impaling the lens is rarely looked upon kindly by your attending, so pay close attention. Measure carefully for the cannula and sclerotomy locations. In a phakic patient, the sclerotomy should be 3.5 mm to 4 mm posterior to the limbus. Take the time to measure and mark your location, and pay attention to your angle when entering the eye in order to avoid the lens. Insert instruments more vertically. After learning phaco, where everything was about flattening your hand or wrist, you must now do the opposite to avoid injuring the lens. Once you can visualize your instrument, you can then move more anteriorly as appropriate. Work within the same hemisphere as your cutter's cannula or sclerotomy. Avoiding the lens when performing vitrectomy in phakic patients will become more natural with experience. A good rule of thumb when starting is to avoid crossing the center of the eye with the cutter. Certainly, if crossing midline with the tip of the cutter, one should not extend anterior to the equator to avoid dinging the lens. Finally, consider impaling the lens deliberately. If you are going to perform a lensectomy, consider starting the vitrectomy and exploring what it takes to ding the lens. Of course, this should only be done when it will not affect the patient and with the explicit approval of your attending.

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cannula placement.

8. Avoid the Vulcan death grip on surgical instruments. When the going gets tough, do your best to refrain from gripping the instruments too tightly. This death grip can compromise intraocular dexterity, and it can sometimes distort the cornea and degrade the optical clarity. When performing close macular work, try to actively think about relaxing your hands and use the wrist rest or stabilize your hands by planting the fifth digits on the patient's head.

9. Do not spear the frontal lobe. Self-retaining ports in 23- and 25-gauge vitrectomy mark significant advances in vitreoretinal surgery. As opposed to 20-gauge sclerotomies, there is no feedback with small-gauge vitrectomy as an instrument slips in and out of a port. The ports are

so slick that one can easily and unknowingly advance the light pipe (or other instruments) into the retina, resulting in hemorrhage and holes. This often occurs when one hand is holding the light pipe within the posterior segment while the other is reaching for another instrument. Solution: remove the light pipe from the globe when your eyes and attention are directed elsewhere. With more experience, you will be able to hold the light pipe in the eye safely while you use your other hand to sign *War and Peace* to the scrub tech.

10. Maximize visibility. If the cornea starts clouding, do not be afraid to roll it with cotton tips or even scrape it. If the IOL is clouding under air, you can use instruments (soft tip) to wipe it or if it keeps clouding too fast, use a glob of viscoelastic material on the posterior lens surface. You have to be able to see what you are doing if you are going to do a good job.

11. Laser surgeons, start your engines. Many fellows start off trying to move too quickly and end up lasering the same area over and over or creating irregular patterns. The other danger when trying to move too quickly is hitting the retina with the tip or getting too close to the retina and popping through the choroid. It is better to slow down the repeat frequency initially and take your time. The goal is to titrate the power and the distance from the retina to get uniform burns. Once you figure out the distance you need to be from the retina, you must try to maintain this distance while keeping in mind that the globe curves. The aiming beam can often be a useful ally, especially if the view is suboptimal. If the view becomes larger and diffuse, you are getting too far from the retina. If it becomes smaller and more focused, you are getting too close.

12. Avoid hypotony with small-gauge vitrectomy. Wound competence with small-gauge surgery can be an issue, especially if there was significant manipulation of the cannula throughout the surgery or more complete vitreous removal. The following tips may help one avoid low intraocular pressure. Remove the cannulas with a solid instrument (eg, endoilluminator) inside. In principle, this reduces vacuum formation and resulting vitreous wick, theoretically decreasing the likelihood of hypotony and endophthalmitis. Some surgeons perform a partial air-fluid exchange on all small-gauge vitrectomy cases in an attempt to internally tamponade the wounds and reduce the risk of hypotony. Following cannula removal, immediately massage the wound with a cotton tip or equivalent instrument. If after massaging a bleb forms or air or gas escapes do not be afraid to close the wound with a suture—it is better to be safe than sorry. A single transconjunctival 8-0 vicryl suture will close small-incision vitrectomy wounds well. It is important to make

sure the bite is partial thickness through the sclera to prevent a direct conduit inside the eye.

13. Stay away from the hood. Conjunctival closure is likely the first portion of a vitreoretinal case that most residents or fellows will begin to perform. If you want to progress further along the surgical ladder, one should learn this skill. With small-gauge surgery, conjunctival closure has become less common, but is an important skill to maintain for both 20-gauge vitrectomy and scleral buckle procedures. Hooding occurs when one closes the conjunctiva in such a manner that it overlies the cornea by several millimeters, thus creating the appearance of a "hood." This is not only cosmetically unacceptable but creates functional issues as well, such as difficulty with contact lens wear, dellen, and, in rare instances, impingement on the visual axis. The solution to this problem begins with the peritomy; careful attention to your relaxing incisions will help facilitate an efficient and anatomic closure. The edges of the conjunctiva should be identified and brought up for 360° before suturing begins. Make sure you are using the edge of conjunctiva; otherwise conjunctival cysts may form, which are undesirable. Then bring the edges of the relaxing incision together and assess the conjunctiva in relation to the limbus. Perfection is ideal, but 1 mm of recession is acceptable. If there is conjunctiva overlying the cornea, simply place the suture more posteriorly in the relaxing incision. Ideally the conjunctiva will come to the limbus, or end up 0.5 to 1.0 mm posterior to the limbus, without overriding the cornea, and if a vitrectomy was performed the sclerotomies must be covered. If you succeed at this step, your time in the surgeon's chair is sure to increase.

SUMMARY

The best preparation for vitreoretinal surgery is observation and knowledge. At some point, however, you need to practice, ideally with a patient and attentive teacher. We hope the aforementioned solutions will help prevent some common mistakes of the beginner vitreoretinal surgeon. ■

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