

Endoscopic Visualization Offers Key Advantages in Posterior Segment Surgery

Visualizing the entire posterior segment is an oft-overlooked but important aspect of retina surgery.

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On my first day as a retina fellow, 1 of the senior surgeons kicked off an introductory lecture by asking a question: "What is the most important instrument in your operating room?"

Some contended that the answer was the vitrector; others put forth scissors as the correct choice. The senior surgeon informed us that we were all wrong. "The most important instrument in the operating room for the retina surgeon is the viewing system," he said, "because you cannot cut what you cannot see." That has been the most important piece of advice I have received as a surgeon, and it is one of the core reasons I use endoscopy during almost every posterior segment procedure I perform.

Endoscopy is beneficial for visualization of posterior segment disease in cases in which there is complicated pathology near the ciliary body and posterior iris. In adults, standard cases that benefit from endoscopy include selective proliferative vitreoretinopathy and anterior loop traction. Retina surgeons have a difficult time determining whether anterior loop traction is present, and managing it surgically can be problematic because of the challenges in visualization. When a relaxing retinectomy is performed, there is a possibility of inadvertently removing a piece of the ciliary body, which can result in significant intraoperative and postoperative bleeding.

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PEDIATRIC RETINAL SURGERY

In my experience in pediatric retinal surgery, endoscopy has been helpful in diagnosing and treating retinal detachments caused by tractional fibrotic membranes pulling on the retina. Treatment involves cutting the fibrotic band from the retina and releasing the retina so that it can fall back. In adult diabetic patients with this condition, often those tractional membranes are over the macula or just outside the arcades, and visualization is relatively straightforward with a standard wideangle viewing system or contact viewing system. For pediatric tractional detachments, however, the fibrosis is flipped: It is not over the macula or over the arcades, but in the far periphery. Visualizing the far periphery is not easy with an operating microscope in an adult eye; in a pediatric eye, it is that much more difficult because the eye is so much smaller.

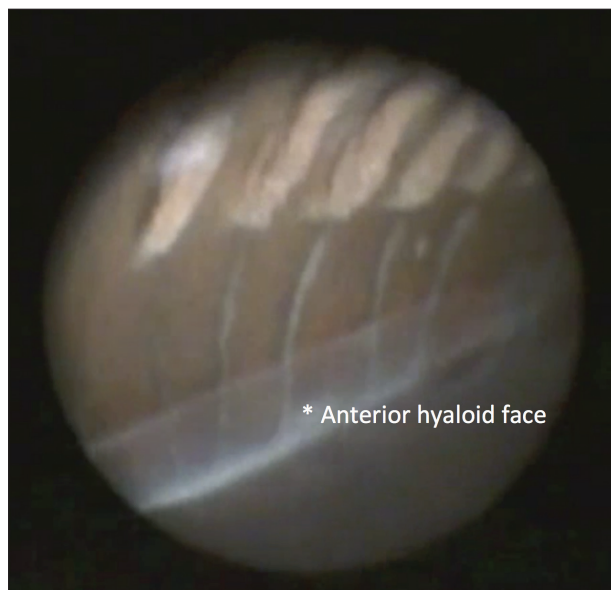


Figure 1. Coaxial lighting permits the surgeon a more comprehensive view of retina and vitreous features.

The endoscope I use in my practice (E2 laser and endoscopy system, Endo Optiks) became a critical part of my armamentarium when I realized I could go above and beyond its standard indications for traditional retinal surgery, leveraging it to visualize far-flung areas of the eye in children and babies at risk of going blind.

COAXIAL VERSUS TRADITIONAL ILLUMINATION

When I started using endoscopy, it became apparent that it provided much better visualization of the surgical field. This was particularly evident when performing vitrectomy. Vitreous is clear and transparent; as a result, identifying it with a standard light pipe and standard viewing system can be challenging. It is particularly difficult to locate the more subtle membranes, as they are semitransparent. With a light pipe, light bounces off the choroid; that light then scatters, illuminating the entire eye and penetrating the vitreous. As the light passes through the vitreous, some light reflects off the vitreous. Because of the way the surgeon's eye is oriented with respect to the light source and the vitreous, and because a certain amount of light is being scattered, visualization of the vitreous can be challenging.

With the endoscope, by contrast, the light source, surgeon's eye, and camera are all on the same side of the vitreous, so when the light is shone, it is on the same axis. Because it bounces back to the originating site—the endoscope—the light reflecting off the vitreous is captured by the camera. As a result, the vitreous looks

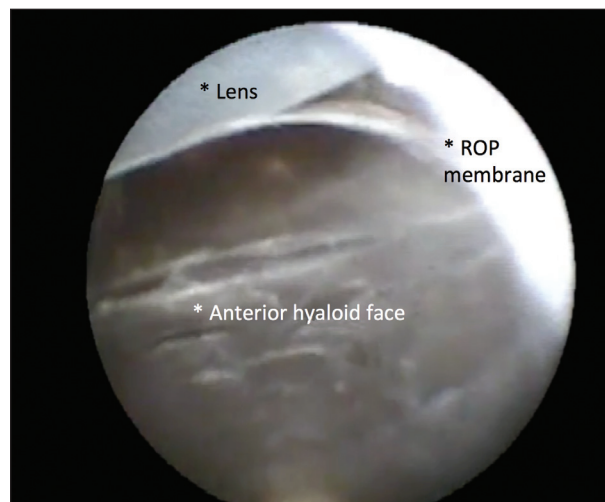


Figure 2. Example view of ocular features that are visible using endoscopy.

opaque under endoscopic viewing, thus supplying the surgeon with more optimal viewing conditions. Coaxial lighting, in contrast to a standard light pipe, highlights diaphanous, thin membranes that would normally be missed with a wideangle viewing system (Figures 1 and 2).

PEARLS FOR ENDOSCOPY

One of the main benefits of endoscopy is that the surgeon can achieve a high degree of magnification by positioning the probe close to the pathology and tissue. I make sure that, when I am looking at the screen and preparing to go into the eye, I position myself properly. Unlike a traditional operating microscope, the endoscope does not provide an overall perspective, so it is important for surgeons to orient themselves with the anatomy prior to entering the eye. Using the external view of the eye through the endoscope, I can ensure that I am positioned the proper way, which is true north, and when I am in the eye, I can acquire a landmark. I often use the ora serrata.

It can be difficult to administer laser for posterior holes due to the small amount of fluid that accumulates underneath the retina and insulates the tissue from the laser burn. Accordingly, surgeons may not get good laser uptake for this procedure. To address this problem, surgeons typically hold the laser probe in 1 hand and a light pipe in the other. When fluid accumulates under the hole, the laser probe is removed and the surgeon replaces it with an active extrusion device that extracts the fluid. Frequently, the surgeon goes into the hole to remove fluid, comes out of the eye, and goes back into





Figure 3. Magnetic resonance imaging scan of a pediatric patient with an intraocular foreign body in the left eye.

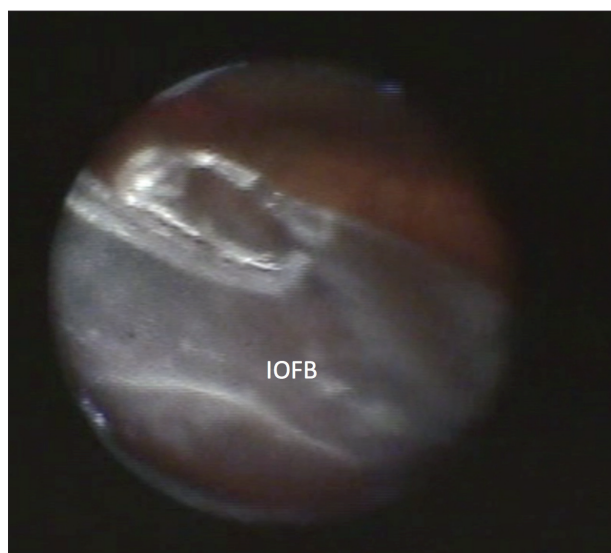


Figure 4. The use of endoscopy permitted visualization of the foreign body in the patient in Figure 3.

the eye with the laser, only to find that more fluid has accumulated under the hole. Thus, the surgeon gets caught in a burdensome cycle in which the retina is never fully evacuated. Because the endoscope encompasses a light source, laser, and imaging all in 1 device, I have a free hand that can be used to hold the active extrusion instrument and constantly drain fluid, resulting in optimal laser uptake.

CASE EXAMPLE

As a pediatric retina surgeon, I see many complicated trauma cases. In 1 case, an 11-year-old boy was referred to the Vision Center at the Children's Hospital Los

Angeles with an intraocular foreign body (a shard of plastic through the cornea and lens) resulting from an accident with an exploded plastic bottle filled with vinegar and baking soda (Figures 3 and 4).

There were a number of issues to consider in this case. First, there was a large laceration down the center of the cornea that had been tightly sutured. We were unable to view beyond the cornea because of the degree of striation, and the eye was filled with blood. However, use of an endoscope permitted the ability to begin surgery and remove blood. After starting to remove the blood, which was very thick, we were able to visualize the piece of plastic encased in a capsule the blood had created around it. We started to dissect that capsule, and, as we removed more blood away from the plastic shard, we realized that the retina itself was attached to the fragment, creating a delicate and dangerous situation.

Ultimately, after nearly 5 hours, we were able to liberate the plastic completely from the surrounding blood and vitreous. We delivered the shard out of the eye through a large incision, but, in the process, we created a giant retinal tear, which we treated with laser. We then put in silicone oil, reattached the retina and, at a later date, removed the silicone oil. Postoperatively, the patient's visual acuity was restored to 20/80: remarkable, considering the level of trauma to the eye. Visualization played a critical role in assessing the landscape and forming a plan; we would never have been able to accomplish this surgery without endoscopy.

CONCLUSION

There is often a 2-hour clock in retina surgery counting down the time the cornea and lens will remain clear. Although many surgeries performed by retina specialists are straightforward and can be completed in 1 hour or less, there are times when visualization is unclear and the path forward is ill-defined. Endoscopy provides surgeons with peace of mind, as it ensures there will always be good visualization no matter what is going on inside the eye. With use of endoscopy, there is no concern that corneal decompensation will limit visualization, or that the anatomy will not be visible after air/fluid exchange. Instead, as my mentor noted so many years ago during my training, endoscopy permits the optimal viewing conditions so the surgeon can cut what he or she sees. ■

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