Dramatic improvements in ophthalmic endoscopy have occurred since Thorpe first reported using a 6.5-mm wide rigid, monocular endoscope to assist in the removal of an intraocular foreign body in 1934. In the past 30 years, developments in fiber optics and video technology, coupled with improvements in light sources, have allowed for high-resolution, flexible intraocular endoscopes.

Currently, Beaver Visitec Inc. (BVI), which recently acquired Endo Optiks, makes the most commonly used endoscopy unit, the E2 laser and endoscopy system. This system combines a 300 W xenon light source with an 810 nm diode laser and an orange-red 640 nm aiming beam. The BVI endoscope with the highest resolution (17,000 pixels) and widest field of view (140°) comes in a 19.5-gauge probe. In 2011, the company introduced a 23-gauge endoscope that fits through 23-gauge cannulas (valved or non-valved), though at a more modest 6,000-pixel resolution with a 90° field of view. The BVI endoscope with the highest resolution (17,000 pixels) and widest field of view (140°) comes in a 19.5-gauge probe. Recently, BVI announced the availability of an upgraded 23-gauge probe with 10,000 pixels and a 125° field of view. This new probe will combine the best of both worlds: improved endoscopic visualization and orientation within the context of the current vitrectomy cannula systems most commonly used by retinal surgeons.

Despite these advances in the quality of endoscopic technology, the endoscope still occupies a relatively small niche in vitreoretinal surgery. Why is this the case? Perhaps because all of vitreoretinal surgery has seen great advances recently. Improvements in operating microscopes and wide-field lenses facilitate...
better visualization of the retinal periphery. Microincisional vitrectomy systems with improved fluidics and increased cut rates allow for faster, and perhaps safer, surgery. These changes have been coupled with a shift in operating venue for vitreoretinal surgeons: procedures have been moving from hospitals to ambulatory surgery centers, where surgical efficiency demands and lower facility fees may limit the availability of endoscopy equipment or the time to master it. These factors have likely limited widespread adoption of the endoscope in vitreoretinal surgery.

That said, the endoscope remains a helpful tool to assist in vitreoretinal surgery, just as internal limiting membrane forceps are useful for membrane peeling in macular pucker and macular hole cases. The two classic indications for use of an endoscope in vitreoretinal surgery are: (1) to bypass opacification of the anterior segment that prevents adequate visualization through the operating microscope, and (2) to identify and address pathology in the retro-iris space.

Opacification of the anterior segment

Lack of corneal clarity — whether from trauma, infection, inflammation, edema, or scarring — precludes direct visualization of the vitreous cavity and retina to safely address posterior pathology with traditional microscope-assisted vitrectomy. Without an endoscope, a temporary keratoprosthesi is required at the start of the case, followed by a corneal graft at the end of the case, significantly increasing the cost and length of the procedure. In addition, coordination with an anterior segment surgeon is required, which may delay the time to surgery or bias the surgeon to manage the patient conservatively with observation. These delays may limit the visual and/or anatomic outcome, especially in cases of trauma, intraocular foreign body, or endophthalmitis.

One challenge to these cases with anterior segment opacification is that the postoperative view of the posterior segment in clinic is likewise impaired. Therefore, surgeons must manage the postoperative care with other clues and diagnostic tools. For example, in cases of vitrectomy for endophthalmitis, the corneal opacification often improves as the inflammation resolves, and the symptoms and anterior segment signs are helpful to gauge the response to surgery and manage the patient postoperatively. Echography can also be helpful to assess the status of the retina and vitreous cavity. However, in the setting of silicone oil tamponade, the usefulness of echography is limited.

Retro-iris pathology

The endoscope facilitates unimpair visualization of the retro-iris space, ciliary body, ora serrata, and farthest peripheral retina. This visualization can be helpful both for diagnostic dilemmas and to assist in treatment. With traditional viewing systems, this anatomy is often difficult to visualize. Scleral depression requires a skilled assistant and can be contraindicated in certain situations, such as in patients with open globes or trabeculectomy blebs.

In addition, scleral depression distorts the natural anatomy and pathology, whether by tamponading a sclerotomy bleed, masking the traction points of anterior proliferative vitreoretinopathy on the ciliary body in cases of hypotony, or altering the position of a pars plana tube that may be occluded with vitreous. An endoscope allows for a direct view without any external manipulation of the eye (Figure).
What pathology can lurk in this anterior-most aspect of the vitreous cavity? Retro-iris abscesses in cases of endophthalmitis with persistent inflammation and infection, retained lens fragments after complicated cataract surgery with secondary cystoid macular edema, anterior PVR contracting and detaching the ciliary body with resultant hypotony, intraocular foreign bodies, sclerotomy neovascularization and hemorrhage, and more. Cases of the endoscope being helpful for sutured intraocular lens placement and cannula insertion in cases with ciliochoroidal detachments to avoid placing the infusion line in the subretinal or choroidal space have been reported.7

In addition, the endoscope offers a high magnification of the ocular tissue as it gets closer to that tissue. This may make occult peripheral retinal breaks easier to identify and then treat. In 2011, Kita and Yoshimura reported a series of 20 cases of aphakic or pseudophakic rhegmatogenous retinal detachments in which they were unable to identify a retinal tear preoperatively with scleral depression and indirect ophthalmoscopy.8 Using the endoscope at the time of surgical repair, they were able to identify breaks in 19 cases; they reported a 100% reattachment rate, which they credited in part to the endoscope’s ability to find the occult breaks.8 Larger numbers and prospective randomization are required to more clearly determine whether use of the endoscope might actually improve single-procedure success rates in cases of retinal detachment in which no breaks are identified preoperatively or intraoperatively with traditional viewing methods.

The endoscope remains a valuable tool in select situations for the retinal surgeon. Those willing to dedicate the time and effort to gain comfort with the endoscope will find an increasing number of situations in which it can be helpful in the surgical management of vitreoretinal patients.

REFERENCES


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