Vitreoretinal Surgery Without the Aid of an Ophthalmic Surgical Assistant

Strategies for performing independent surgery of the vitreous and retina.

BY YANNEK I. LEIDERMANN, MD, PhD

Historically, surgery of the vitreous and retina has required a surgeon and an assistant skilled in the techniques and modalities of this highly subspecialized discipline. Advances in vitreoretinal surgical instrumentation have introduced the possibility of vitreoretinal surgery for most indications in the absence of an assistant specifically trained to assist with such procedures.

The chief impediment to efficient independent surgery has been the inability to perform peripheral vitrectomy with the aid of scleral depression, a mainstay of rhegmatogenous retinal detachment repair via pars plana vitrectomy. A number of strategies have been developed to overcome this and other technical challenges in “independent” vitreoretinal surgery. This article describes my preferred technique together with practical advice to facilitate the transition to independent vitreoretinal surgery.

BASIC TECHNIQUES

Posterior Segment Visualization

A variety of commercially available systems developed for wide-angle viewing of the fundus are amenable to independent surgery, including self-retaining and sew-on contact lens systems and noncontact visualization systems. My colleagues and I most commonly use either the SDI-BIOM Wide Angle Panoramic Viewing System (Insight Instruments, Inc.) or the Resight Fundus Viewing system (Carl Zeiss Meditec). In addition to superior optics, important features of both platforms include hands-free, surgeon-controlled focusing and automated or hands-free image inversion.

We perform macular surgery using either a disposable 36° field-of-view macular contact lens (SuperView Tornambe Contact Lens, Insight Instruments, Inc.) or the Resight macular lens (Carl Zeiss Meditec) noncontact viewing system. One disadvantage of using a self-retaining contact lens system is decentration; this may be minimized by the application of a matchhead-sized or smaller quantity of viscoelastic agent to the concave surface of the contact lens prior to initial lens placement. Application of the lens in this manner promotes adhesion and stability of the lens.

Trocar Placement

Several instruments have been developed to facilitate independent accurate cannula insertion in microinci-
sional vitrectomy surgery (MIVS), including devices that simultaneously stabilize the globe and allow displacement of the bulbar conjunctiva (eg, Dugel Entry Plate, Peregrine Surgical Ltd.) and trocar-cannula instruments incorporating calipers. I use valved cannulas (EdgePlus, Alcon Laboratories, Inc.) for independent surgery, as 2 independent instruments are necessary for the placement and removal of cannula plugs, which, in the absence of an assistant, can lead to unsafe intervals of low outflow resistance.

Peripheral Vitrectomy

There are a number of commercially available instruments to facilitate independent peripheral vitrectomy with the aid of scleral depression, including extraocular transscleral light sources, operating microscope-based transpupillary illumination (OFFISS, Topcon Medical Systems), and intraocular self-retaining illumination. The latter are now widely used devices in vitreoretinal surgery, and designs include single- or twin-fiber sources that may be inserted via instrument cannulae or de novo. I use the Alcon 25-gauge Chandelier Illumination System, a single-fiber endoilluminator that may be inserted via a fourth MIVS cannula or via a preexisting cannula. One advantage of this system is that an additional (fourth) cannula need not be placed for peripheral vitrectomy; the endoilluminator may be inserted via any 1 of the existing 3 cannulae, and may then be reinserted in any other cannula to facilitate optimal intraoperative illumination. In the majority of cases, the infusion need not be displaced, and adequate illumination is obtained by using 1 or both of the superior instrument cannulae. Intraoperative adjustments to the endoilluminator orientation may be necessary for optimal visualization. To facilitate simple and rapid reorientation of the endoilluminator, I fixate the semiflexible portion of the cable in a gooseneck configuration (Figure 1); the axis of illumination can then be adjusted in the same fashion as that of a gooseneck desk lamp. The surgical video, “Independent Surgery of the Retina and Vitreous,” available on eyetube.net, illustrates independent peripheral vitrectomy with the aid of scleral depression using a chandelier endoilluminator without the need for placing an additional instrument cannula. Glare from a chandelier illuminator can be bothersome during fluid-air exchange, in which case the chandelier may be extinguished or replaced with a light pipe.

Examination of the Peripheral Retina

I perform examination of the periphery with the aid of scleral depression for 360° at the conclusion of every vitreoretinal surgical procedure. Although there are data to suggest that the incidence of iatrogenic or occult retinal breaks is very low in the setting of MIVS, the rate is not zero. Moreover, the influence of chandelier endoillumination or other factors during independent surgery is unknown with regard to new or missed intraoperative retinal breaks. One time-tested approach is to perform scleral depression using a cryopexy probe so that any breaks or suspicious lesions can be treated as they are noted. If a self-retaining endoillumination source has been used previously during the procedure,
this may be used to facilitate simultaneous scleral-depressed peripheral examination and treatment of any lesions with endolaser.

In the more common scenario, in which I am working with a qualified assistant and have not used a chandelier, I often prefer to perform independent peripheral examination with treatment of any lesions via endolaser (Figures 2 and 3). A number of illuminated endolasers conferring high-resolution intraocular visualization are available in a variety of MIVS platforms. Peripheral examination and laser application can be performed using an illuminated curved endolaser (see video, "Independent Surgery of the Retina and Vitreous"). This technique may also be used for peripheral scatter panretinal photocoagulation. It is worth noting that some surgeons still prefer to examine the retinal periphery via intraoperative binocular indirect ophthalmoscopy, with treatment of peripheral lesions via concomitant cryopexy or laser indirect ophthalmoscopy; this technique is worth noting in the event that the aforementioned tools are unavailable.

Air-Gas Exchange

The prime considerations in air-gas exchange are control of intraocular pressure via maintenance of resistance to outflow and minimizing the potential for iatrogenic injury. Although a 2-needle approach to air-gas exchange offers excellent control of outflow resistance, it may be technically challenging during independent surgery. Using a valved-cannula system, I prefer to inject gas via a syringe connected to the silastic infusion tubing while passive egress occurs via an instrument cannula. Note that it is critical to place a bypass channel ("vent") in the valve of the egress cannula to allow the efflux of intraocular gases (a vent is included with most valved cannula systems).

TECHNIQUES FOR COMPLEX PATHOLOGY

Combined Pars Plana Vitrectomy and Scleral Buckle

In the execution of combined vitrectomy-buckle surgery, most surgeons now use a solid silicone rubber encircling band. Most commonly I place a Type 41 or Type 42 encircling band approximated with a silicone rubber sleeve to support the vitreous base. Although it may be helpful for an ophthalmic assistant, such as the scrub nurse, to manipulate the rectus bridle sutures, placing a relatively narrow band immediately posterior to the rectus muscle insertions is readily done; often, the band may be localized without the aid of an assistant.

Anterior Dissection

Thorough anterior dissection in the setting of anterior proliferative vitreoretinopathy is often performed with simultaneous deep scleral indentation and vitrectomy via direct transpupillary visualization with the aid of (Continued on page 44)
external illumination provided by a skilled assistant. A skilled assistant may be indispensable in the execution of this surgical element. Nonetheless, some cases may be performed using chandelier endoillumination. In select cases, simultaneous self-retaining endoillumination as well as external illumination may be helpful, particularly with an inexperienced assistant.

CONCLUSIONS

Commercially available vitrectomy platforms and ancillary tools allow safe and efficient surgery without the aid of an ophthalmic surgical assistant for a wide variety of pathologies affecting the posterior segment. As with any modification of surgical procedure or technique, early success depends upon judicious case selection, familiarity with new technologies and tools, and thorough pre- and intraoperative communication among the core ophthalmic surgical team members comprised of surgeon, scrub nurse, and circulator. Formal clinical studies are required to assess the therapeutic effectiveness, safety, efficiency, and cost effectiveness of independent vitreoretinal surgery.

Yannek I. Leiderman, MD, PhD, is a surgeon on the Retina Service of the Eye and Ear Infirmary and Director of the Vitreoretinal Microsurgery Laboratory at the University of Illinois at Chicago. Dr. Leiderman states that he has received research support from Alcon Laboratories, Inc. (laboratory equipment). He may be reached via email at yannek@uic.edu.

Dean Elliott, MD, is Associate Director of the Retina Service, Massachusetts Eye and Ear Infirmary, Harvard Medical School, and is a Retina Today Editorial Board member. He may be reached by phone: +1 617 573-3736; fax: +1 617 573-3698; or via email at dean_elliott@meei.harvard.edu.

Ingrid U. Scott, MD, MPH, is a Professor of Ophthalmology and Public Health Sciences, Penn State College of Medicine, Department of Ophthalmology, and is a Retina Today Editorial Board member. She may be reached by phone: +1 717 531 4662; fax: +1 717 531 8783; or via email at iscott@psu.edu.