

Novel Techniques for Diabetic Vitrectomy

Smaller gauges allow new approaches.

BY MARÍA H. BERROCAL, MD

The evolution of vitrectomy reaches back more than 40 years, from the description of an open-sky approach by Kasner et al,¹ to the closed pars plana vitrectomy technique pioneered by Machemer and colleagues,² and on to the development of modern 3-port vitrectomy. Instrumentation has improved in many respects as well, with progression to increasingly smaller-gauge instruments—from 19- and 20-gauge in early years to 23, 25, and now even 27-gauge instrumentation at present—as well as innovations in high-speed cutting and fluidics systems.

The introduction of these advances, especially smaller-gauge instrumentation, has helped to improve the safety and efficacy of surgical techniques for diabetic eye disease. However, it also requires a rethinking of the way these instruments are used.

OLD VS NEW

An important aim in diabetic vitrectomy surgery for tractional retinal detachment (TRD) is the relief of antero-posterior traction, especially through the delamination of proliferative fibrovascular membranes. En-bloc delamination could also be performed, leaving the posterior hyaloid



Figure 1. In 27-gauge surgery for a tractional retinal detachment (TRD), the probe is used with suction to peel the posterior hyaloid.



intact for countertraction. With earlier instrumentation, this often required bimanual maneuvers, with illuminated pick or forceps in 1 hand and scissors or vitreous cutter in the other. Viscodelamination was also frequently used, creating space for safe removal of abnormal fibrovascular tissues.

The instrumentation for these time-consuming bimanual maneuvers included the cumbersome, large-gauge vitrectomy probe with a large port. The 20-gauge port, with its cumbersome fluidics, required manipulations to be performed far from the retinal surface to avoid damage to the retina. Iatrogenic retinal breaks were frequent. Forceps and scissors were also required, and diathermy was frequently needed because significant bleeding could result.

The introduction of microincision vitrectomy surgery (MIVS) has changed much of the above. The smaller sclerotomies used with smaller-gauge instrumentation

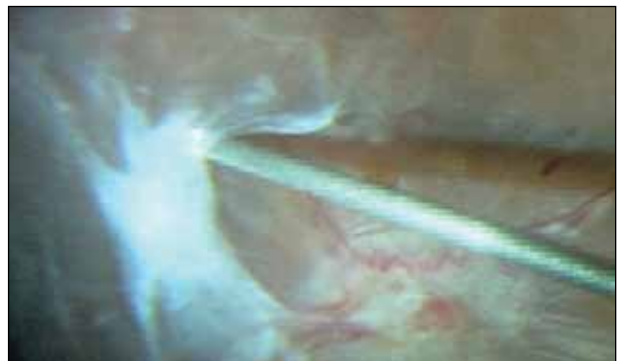


Figure 2. A 25-gauge vitrector is used to repair combined TRD and rhegmatogenous retinal detachment (RRD). The retina is very thin, ischemic and mobile. The vitrector is used to shave and dissect membranes from the surface and from blood vessels.



Figures 3 and 4. A combined TRD and RRD is repaired by removal of fibrovascular tissue utilizing blunt dissection and back-shaving techniques.



Figure 5. In a long-standing combined diabetic TRD and RRD, fibrotic membranes were first dissected with a 27-gauge probe at 7500 cuts/min. Blunt dissection with the vitrectomy probe was then performed, and alternating suction and shaving were utilized to lift membranes from the detached retinal surface to safely shave them. In this image, a thick subretinal membrane is then removed with 27-gauge forceps.

improve intraocular pressure control, resulting in less intraoperative bleeding and therefore less need for diathermy. The smaller wounds also allow sutureless closure in many cases, speeding surgery and making recovery less burdensome for the patient.

Smaller vitrectomy probes allow controlled membrane cutting with minimal traction on the delicate underlying retina. It appears that smaller is better in this regard: 27 gauge is better than 25 gauge, which is better than 23 gauge. The probes are also much more versatile than their larger predecessors, as they can be used to dissect, shave, lift, and peel tissues safely.

This attribute is ideal in surgery for diabetic TRD, whether alone or in combination with rhegmatogenous retinal detachment. The probe can be used to accomplish multiple functions: blunt dissection of tissues; separation of membranes via use of suction through the small, distal port; and controlled tissue shaving with high cutting speeds. All of this is accomplished with minimal dependence on bimanual maneuvers with scissors or forceps.

The small-gauge probe allows the surgeon to perform maneuvers such as lifting membranes off the retina and reaching underneath them while simultaneously cutting them from behind. Minimal traction is placed on the underlying retina, making these maneuvers very safe, minimizing complications and iatrogenic breaks.

The new technology that is available—including 27- and 25-gauge vitrectomy probes and vitrectomy machines with optimized fluidics, cutting, and pressure control—require novel surgical techniques to take full advantage of their benefits. New techniques such as the “lift and shave,” in which the vitrectomy probe is utilized to separate, bluntly dissect, shave, and back-cut membranes, is an optimal technique for complicated diabetic vitrectomy. It allows safe, efficient removal of traction and abnormal tissue from an ischemic or detached retina.

Some of the capabilities of these newer instruments are illustrated in the accompanying figures, as described in the captions to Figures 1-5.

CONCLUSION

Vitrectomy is currently undergoing a paradigm shift as surgeons realize the expanded capabilities of smaller-gauge instrumentation. Smaller-gauge surgery is no longer reserved for simpler cases; increasingly it is recognized that smallness instead has its own distinct benefits. Tiny vitreous cutters can do things that big ones cannot and are ideal instruments for very complex surgical cases. The small gauges

WATCH DR. BERROCAL'S SURGICAL VIDEOS ON EYETUBE



IATROGENIC BREAK

This movie shows an iatrogenic break formed during tissue removal utilizing older 20-gauge technology with suboptimal fluidics. The underlying retina is seen "jumping" toward the probe opening.



TRACTION RETINAL DETACHMENT

In this 27-gauge surgery of a traction retinal detachment (TRD) we can see how the probe is used with suction to peel the posterior hyaloid and then to blunt-dissect fibrous tissue from the mobile retina inferiorly. The back-cutting technique and shave techniques utilizing 7500 cuts/min are shown.



BLUNT DISSECTION AND BACK-SHAVING FOR REMOVAL OF FIBROVASCULAR TISSUE

This combined TRD and rhegmatogenous retinal detachment (RRD) is repaired by removal of fibrovascular tissue utilizing mostly blunt dissection and back-shaving techniques.



COMBINED DIABETIC TRACTION RETINAL DETACHMENT AND RHEGMATOGENOUS RETINAL DETACHMENT

In this long-standing combined diabetic TRD and RRD, fibrotic membranes are dissected with the 27-gauge probe at 7500 cuts/min. Blunt dissection with the vitrectomy probe is performed and alternating suction and shaving are utilized to lift membranes from the detached retinal surface to safely shave them. A thick subretinal membrane is removed with 27-gauge forceps. Subretinal fluid is aspirated with the vitrectomy probe to perform an air-fluid exchange.



TWENTY-FIVE GAUGE VITRECTOMY FOR TRD AND RRD REPAIR

The 25-gauge vitrector is utilized to repair this combined TRD and RRD. The retina is very thin, ischemic and mobile. The vitrector is used to shave and dissect membranes from the surface and from blood vessels. The laser probe is utilized for diathermy on bleeders, and forceps are used to remove subretinal membranes. Subretinal fluid is aspirated through the preexisting break, and laser photocoagulation is applied. A long-acting gas tamponade is utilized. At 6 months follow-up, visual acuity was 20/100.



once considered "extreme"—25 and 27 gauge—are now accepted as not only usable but advantageous.

It is necessary, however, to realize that these instruments must be used differently from their larger counterparts. Newer techniques must be developed to take full advantage of the new technologies now available for vitreoretinal surgery. As these instruments make their way into more hands, inventive surgeons around the world are sure to develop ingenious new ways to let them reach their full potential. ■

María H. Berrocal, MD, is an Assistant Professor at the University of Puerto Rico School of Medicine and the Director of Berrocal and Associates in San Juan. She is also a member of the Retina Today Editorial Board. Dr. Berrocal states that she is an advisor to Alcon. She can be reached at +1 787 725 9315; or mariaherrocal@hotmail.com.



Jorge A. Fortun, MD, is an Assistant Professor of Ophthalmology at the Bascom Palmer Eye Institute, University of Miami Miller School of Medicine. Dr. Fortun is Co-Section Editor of the VBS page in Retina Today and on Eyetube.net. He may be reached at jfortun@med.miami.edu.



Rohit Ross Lakhanpal, MD, FACS, is a Partner at Eye Consultants of Maryland and is the Vice President of the Vit-Buckle Society. Dr. Lakhanpal is Co-Section Editor of the VBS page in Retina Today and on Eyetube.net. He may be reached at retinaross@gmail.com or at GVoice #443-684-2020.



1. Kasner D, Miller GR, Taylor WH, Sever RJ, Norton EW. Surgical treatment of amyloidosis of the vitreous. *Trans Am Acad Ophthalmol Otolaryngol.* 1968;72(3):410-418.

2. Machemer R, Buettner H, Norton EW, Parel JM. Vitrectomy: a pars plana approach. *Trans Am Acad Ophthalmol Otolaryngol.* 1971;75(4):813-820.