

# Tips and Tricks for Small-gauge Vitreous Surgery

These guidelines can help shorten the learning curve and transition to MIVS.

BY MARÍA H. BERROCAL, MD

**T**he introduction of microincision vitrectomy surgery (MIVS) in 2002 has dramatically transformed the way we perform vitreoretinal surgery.<sup>1</sup> In my opinion, MIVS is the most significant innovation in the field of vitreoretinal surgery of the past decade. MIVS technology has changed vitreoretinal surgical procedures from tedious, lengthy, and cumbersome to elegant, flowing, efficient events. Together with the optimized technology that has been developed to maximize its benefits, MIVS has made us better, safer, and more proficient surgeons.

At its inception, many surgeons resisted adopting MIVS. This was primarily due to the limitations of the technologies that were available. According to the American Society of Retina Specialists 2010 Preferences and Trends (PAT) survey, 72.5% of retinal surgeons perform 23-gauge vitrectomy, and 60% perform 25-gauge vitrectomy.<sup>2</sup> Like all new procedures, there is a learning curve for MIVS, but this can be reduced by applying tips and tricks such as those suggested in this article.

## PATIENT SELECTION

For the surgeon who is comfortable performing 20-gauge vitrectomy, the transition to 23-gauge is simple because the feel and rigidity of the instruments resemble those of 20-gauge instrumentation. Once one is comfortable with 23-gauge, the transition to 25-gauge occurs almost automatically.

The best way to become comfortable with any new technology is to initially select easy cases. When you have become comfortable with all of the steps of the easier cases, you can start to increase the number of complex cases. The best cases to begin with are vitrectomies with low risk of iatrogenic breaks, such as macular puckers, simple vitreous hemorrhages, and opacities.

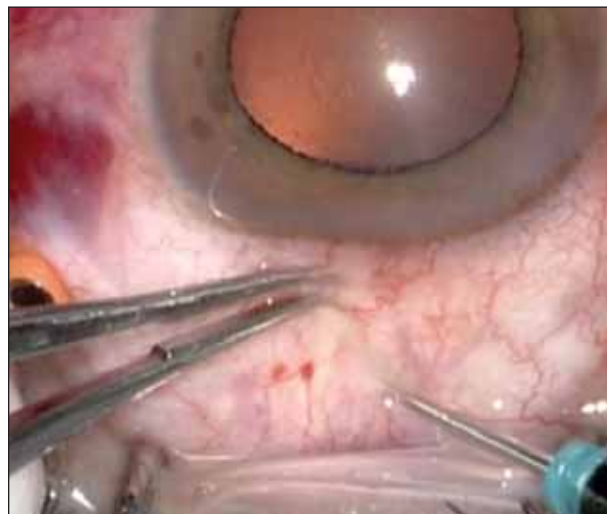
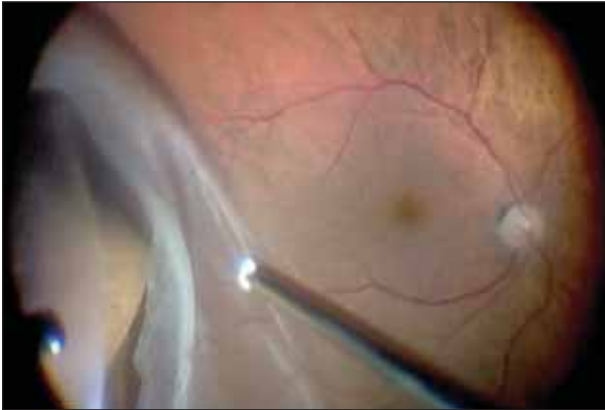


Figure 1. Displacing the conjunctiva with forceps and angled entry of the 25-gauge trocar/cannula system for the use of a 25-gauge chandelier.

After performing some of these cases with MIVS, then you can advance to macular holes, traction detachments, rhegmatogenous retinal detachments, and severe diabetic cases. Some surgeons, myself included, feel that MIVS with smaller vitreous cutters is ideal for more complex cases because of the enhanced precision and control that they offer.

## WOUND CONSTRUCTION

Wound creation is important for two reasons: to prevent the cannulas from slipping out of the eye during the procedure, and to provide a self-sealing wound that closes well without leakage at the end of the case. This prevents hypotony, reduces the risk of endophthalmitis, and obviates the need for suturing.



**Figure 2.** Illumination provided by the 25-gauge chandelier during vitrectomy for a giant retinal tear. The surgeon indents the sclera with the left hand.

Trocar cannulas can be awkward to use initially. Earlier trocars created chevron incisions, but the newer blade-like models create slit incisions that provide better closure. For trocar cannula placement, displacing the conjunctiva and making an angled wound results in optimized closure (Figure 1). During placement of the infusion, it is important to check that the light pipe completely enters the vitreous cavity to avoid suprachoroidal infusion.

### VITRECTOMY

Initially, the biggest difficulties that surgeons experienced with MIVS were poor lighting and slow flow rates through the small-gauge vitreous cutters and light pipes. Today, new machines offer optimized 25-gauge xenon lights that provide illumination comparable to 20-gauge, as well as comparable flow rates.

MIVS is performed similarly to 20-gauge vitrectomy. The only limitation is the lack of availability of multifunctional instruments, such as lighted scissors and forceps. However, I find that I do not need these instruments because chandeliers placed with trocar cannulas in 25-gauge MIVS provide superb illumination for bimanual techniques (Figure 2).

Because the small-gauge vitreous cutters have openings closer to the tip and the newer vitrectors offer very high cut rates, the cutters themselves can serve as multifunctional tools. They can shave membranes from the surface of the retina with high cut rates and reduced aspiration. The vitrector can get under membranes and dissect them in a scissor-like fashion (Figure 3). With application of suction, the cutter can be used as forceps to lift membranes and detach the posterior hyaloid. The cutter can also be used as a flute needle and to blow out blood in reflux mode, which is available on some



**Figure 3.** A 25-gauge vitreous cutter is used as scissors in an eye with diabetic tractional and rhegmatogenous retinal detachment.

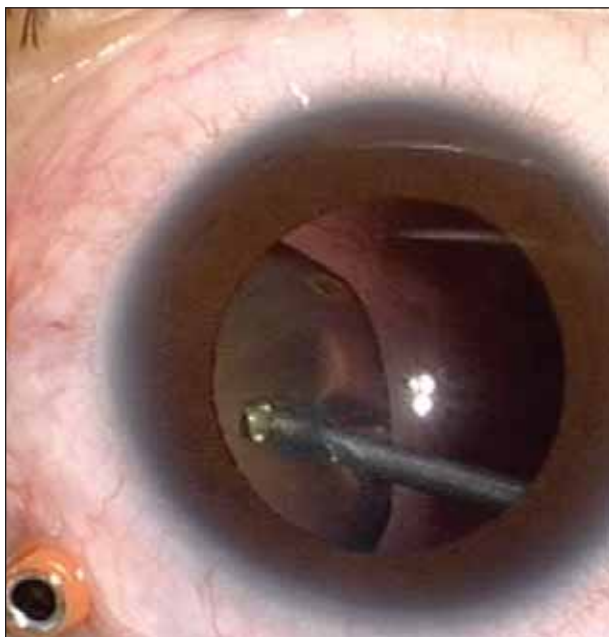
machines. With the cut rate reduced, the vitreous cutter can be used to engage pieces of tissue, nibble them, and remove large blood clots and lens fragments (Figure 4).

These maneuvers are not possible with the less delicate 20-gauge vitreous cutters. Optimized control of the pressure inside the eye also reduces the need for diathermy, as well as scissors, forceps, and tissue manipulators. The possibility of adequately controlling intraocular pressure (IOP) is important for preventing bleeding and damage to the optic nerve, particularly in eyes with advanced glaucoma.

Chandeliers placed with trocar cannulas in 25-gauge MIVS provide superb illumination for bimanual techniques.

### WOUND CLOSURE

Adequate wound closure, which is essential in all vitreous surgery, begins with optimal wound construction. Nevertheless, managing wounds at the end of a case is also important. During cannula removal, an instrument should be placed in the lumen, and the IOP should be around 20 to 25 mm Hg to prevent vitreous wicking, incarceration, and the possibility of bacterial entry through the wound. Some surgeons prefer performing a partial air-fluid exchange at the end of the procedure so that the air bubble tamponades the wounds from the inside. If leakage is noted through a sclerotomy, a suture should be placed to provide complete closure. This prevents hypotony and its associated complications of



**Figure 4.** A 23-gauge vitreous cutter is used as a fragmatome to remove a dislocated cataract in an eye of a patient with Marfan syndrome.

bleeding, choroidal formation, and potential endophthalmitis.

Kunimoto et al reported increased incidence of retinal tears and endophthalmitis with MIVS.<sup>3</sup> These results were possibly due to inadequate wound construction and closure. Another explanation could be that the surgeries included in the study were performed with poor illumination during the learning curve stage of this technique. Wu and colleagues in the Pan-American Collaborative Study Group (PACORES) retrospectively reviewed more than 33,000 pars plana vitrectomies to assess differences in the incidence of endophthalmitis among the different gauges. The investigators found no statistically significant differences in incidence of endophthalmitis between 20-, 23- and 25-gauge vitrectomies.<sup>4</sup>

## TRANSITION

A concern and barrier for many surgeons considering transitioning to MIVS is the cost associated with replacing 20-gauge instrumentation. There are three reasons why switching to MIVS is not a costly endeavor. First, the need for ancillary instrumentation is markedly reduced with MIVS. For instance, I have not used scissors in several years. Second, 20-gauge instrumentation can still be used in some cases. For example, 23- or 25-gauge trocars can be used for instruments for the nondominant hand, and the sclerotomy on the domi-

nant side can be opened to 20 gauge. This allows the use of 20-gauge instruments such as foreign-body forceps, viscodissection setups, or fragmatomes. Or, in a case started in small gauge, the conjunctiva can be opened and the sclerotomy enlarged to 20-gauge to accommodate the required instruments. Third, an important point relative to the cost of new instrumentation is the efficiency of MIVS. The surgeon can perform more cases in less time with reduced turnover time. As time is our most precious, irreplaceable commodity, the value of optimal efficiency is priceless.

## CONCLUSION

MIVS is a wonderful technology that allows exquisite precision and control as well as flowability and seamlessness during vitrectomy procedures. The technological support has been catching up, making it possible for surgeons to optimize outcomes and reduce complications, reaping the full benefits of this wonderful technology. Currently, improved 25-gauge technology offers the best control with minimal invasiveness. In the future, even smaller gauges will be the norm. Do not be afraid to embrace this technology. MIVS will dramatically enhance your efficiency, outcomes, and total OR experience as a vitreoretinal surgeon. ■

*María H. Berrocal, MD, is an Assistant Professor at the University of Puerto Rico School of Medicine in San Juan and a member of the Retina Today Editorial Board. Dr. Berrocal reports that she is a consultant to Alcon and Alimera. She can be reached at +1 787 725 9315; or via e-mail at mariaherberrocal@hotmail.com.*



1. Au Eong KG, Fujii GY, de Juan, E Jr., et al. A new three-port cannular system for closed pars plana vitrectomy. *Retina*. 2002;22(1):130-132.
2. American Society of Retina Specialists Annual Preferences and Trends Survey, 2010. <http://www.asrs.org>; access for members only.
3. Kunimoto DY, Kaiser RS. Incidence of endophthalmitis after 20- and 25-gauge vitrectomy. *Ophthalmology*. 2007;114(12):2133-2137.
4. Wu L. Risk factors for the development or progression of tractional retinal detachment after intravitreal bevacizumab used before vitrectomy for severe proliferative diabetic retinopathy. Paper presented at: the American Academy of Ophthalmology Annual Meeting; October 17, 2010; Chicago.

## SHARE YOUR FEEDBACK

Would you like to comment on an author's article?

Do you have an article topic to suggest?

Do you wish to tell us how valuable

*Retina Today* is to your practice?

We would love to hear from you. Please e-mail us at [letters@bmctoday.com](mailto:letters@bmctoday.com) with any thoughts or questions you have regarding this publication.