

The Evolution of Small-gauge Incision Surgery

Improvements to MIVS instrumentation has expanded the indications for small-gauge vitrectomy.

BY STANISLAO RIZZO, MD

Microincision vitrectomy surgery (MIVS) has changed radically in the 8 years since I first performed 25-gauge vitrectomy. Like other surgeons, I was attracted to 25-gauge surgery by the potential benefits of using a minimally invasive approach: reduced trauma from conjunctival and scleral manipulation, along with reduced postoperative inflammation and corneal astigmatism.

Above all, however, the reality of enhanced patient comfort and faster postoperative recovery convinced me that 25-gauge vitrectomy would become a standard method of vitreoretinal surgery.

EXPANDING INDICATIONS FOR MIVS

Although 25-gauge instrumentation was initially used only in uncomplicated cases of macular surgery, the growing sophistication of MIVS systems and increased availability of various instruments in recent years have allowed me to increase the number of indications for which I use this technique.

New vitrectomy systems and instruments are continuing to push the boundaries of 25-gauge surgery. The enhanced performance of these proves that many of the old arguments for sticking with 20-gauge techniques no longer apply.

NEW 25-GAUGE TECHNOLOGY

The Constellation Vision System (Alcon Laboratories, Inc., Fort Worth, TX) is a classic example of the progress that has been made in this field. Combining advanced features such as a high-speed vitrectomy probe of 5000 cpm with duty cycle control, IOP control, high bright-

Effectiveness of New 25-gauge Vitrectomy			
Time (sec)	20-gauge Accurus	25-gauge Accurus	25-gauge Constellation
Complete Vitrectomy	500 ± 301	632 ± 208	473 ± 279
30 Patients: Vitrectomy with ERM removal			
- 10 Pts :	20-gauge Accurus		
- 10 Pts :	25-gauge Accurus		
- 10 Pts :	25-gauge Constellation		

Figure 1. Thirty patient study.

ness xenon illumination, a 532-nm laser and torsional phaco technology, the system enables safer and more efficient surgery of the anterior and posterior segments.

In a recent study at our clinic,¹ we compared the performance of the new 25-gauge 5000 cpm vitrectomy probe with standard 25-gauge and 20-gauge devices in 30 consecutive patients in whom we removed the epiretinal membrane. We found that the total vitrectomy time was shorter with the new probe compared with standard 25-gauge and was similar to the time with the 20-gauge device (Figure 1).

This result is due to the optimization of the duty cycle and a high-speed cut rate, which finally brings the efficiency of small diameter 25-gauge cutters in line with those of larger diameters 20-gauge cutters. Furthermore, the new high-speed vitrectomy system does not compromise on safety.

Indeed, the combination of features such as flow con-



Figure 2. Scleral incision using standard 25-gauge system.

trol, vacuum control, intraocular pressure (IOP) control, high cutting rates, and duty cycle control, provide unparalleled control over our MIVS procedures. Additionally, we are afforded the ability to customize our system rather than modifying our technique as the vitreoretinal pathology of the patient demands.

SELF-SEALING WOUND CREATION

One of the more frequent criticisms of 23- and 25-gauge vitrectomy surgery has been increased hypotony and wound leakage (Figure 2). This, however, is no longer the case. The new EdgePlus trocar/cannula system (Alcon Laboratories, Inc.) delivers a smooth, one-step entry system for 23- and 25-gauge systems with excellent wound architecture using a linear incision (Figure 3). This capability is delivered via the optimized MVR design of the surgical blade. Using a 5°/30° insertion technique, the system provides an incision that assists wound closure and requires less insertion force when placing the cannulas.

INSTRUMENT STABILITY AND EFFICIENCY

Another frequent complaint regarding 25-gauge instrumentation has involved the issue of tool flexure, which can be an issue when working in the periphery of the vitreous chamber. Again, major progress has been made in addressing these concerns. We now have stiffer and more durable instruments, such as the new Accurus 25+ vitrectomy probe (Alcon Laboratories, Inc.), that allow us to perform core vitrectomies and peripheral maneuvers more efficiently than before.

The Accurus 25+ probe offers surgeons a high-performance, lightweight probe at 2500 cpm, the same cut rate as with the 23- and 20-gauge probes. With the Constellation, the 25+ vitrectomy probe can even go faster at 5000 cpm.

Another advantage of the 25+ probe is that, because



Figure 3. Scleral incision using the EdgePlus.

of its design changes, we now can have high inflow at high cutting rates, reaching a flow of 6.8 cc/min at 600 mm Hg at 2500 cpm compared with the previous 25-gauge vitrectomy probe that had a flow of 3.5 cc/min at 600 mm Hg at 1500 cpm. With the Constellation, the flow rate is even higher, reaching 7.8 cc/min at 650 mm Hg and 5000 cpm. In my hands, this translates into vastly enhanced flow for such a small probe.

A stiffening sleeve has also been added to the new probe to closely mimic the feel and handling of larger-gauge instruments, and the port has been moved closer to the probe's tip to deliver greater control for vitreous base shaving and membrane dissection close to the retina.

Furthermore, the duty cycle of the 25+ system, equating to the proportion of the time that the vitrectomy port is open, has been enhanced to attain levels of 50%, compared with approximately 30% with the standard probe. This makes a dramatic difference in flow characteristics and is much more efficient.

SUMMARY

Overall, this is an exciting time to be involved in vitreoretinal surgery. As more advanced and sophisticated equipment continues to be introduced, the feasibility and success of MIVS will continue to improve for the benefit of our patients. ■

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1. Genovesi-Ebert F, Rizzo S, Vento A. Ultrahigh speed 5000 cut rate 25-gauge(g) vitrectomy system versus standard 25-gauge and 20-gauge in the treatment of macular epiretinal membrane (erms). Paper presented at: the annual meeting of the Association for Research in Vision and Ophthalmology; May 6, 2009; Fort Lauderdale, FL.