

Mixed-gauge Vitrectomy

An evolving technology offers practical advantages.

BY DONALD J. D'AMICO, MD

Since its introduction less than a decade ago, small-gauge vitrectomy has been widely adopted by the retina community. The latest Preferences and Trends Survey of members of the American Society of Retina Specialists shows that most of our colleagues are using both 23- and 25-gauge instrumentation for vitrectomy surgery; 72.5% of respondents perform 23-gauge vitrectomy, and 60% perform 25-gauge vitrectomy.¹

Concerns were raised when 25-gauge instrumentation was first introduced, including the poor illumination and flow through these tiny instruments, their unacceptable flexibility, and the risks of hypotony and unpredictable gas fills due to leakage from the sclerotomies. There were also concerns over the possibility of a higher incidence of endophthalmitis with unsutured wounds, an inability to perform certain maneuvers such as lensectomy, and the loss of many elegant handheld instruments that were designed for 20-gauge technology. Some of these instruments still have not been replicated in 25-gauge.

Presented with these concerns about the early 25-gauge technology, the ophthalmic profession and industry attempted to address them in a number of ways. Manufacturers including Alcon Laboratories, Inc. (Fort Worth, TX), Bausch + Lomb (Rochester, NY), and others worked to improve and resolve the limitations of their 25-gauge platforms. Another response was to shift everything to a 23-gauge platform, and Claus Eckhardt, along with Dutch Ophthalmic USA (Exeter, NH), Alcon Laboratories, Inc., and others worked in that direction. Of course 23-gauge has its own set of advantages and disadvantages in comparison with

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25-gauge. Some, like Carl Claes and Eustratios Gotzaridis, remained with the 20-gauge platform but tried to adapt it to a transconjunctival approach. Others stayed with the modality with which they were familiar, unmodified conventional 20-gauge surgery. A counter-trend has been to explore an even smaller-gauge approach, 27-gauge surgery.

Recently I presented a retrospective review of a personal series of 273 vitrectomies performed with a variety of gauges and combinations of gauges of instrumentation.² The case mix was representative of clinical practice, including macular hole, macular pucker, retinal detachment, diabetic retinopathy, proliferative vitreoretinopathy, and giant retinal tear, but also with some unusual additions reflecting my own interests and the referral nature of university practice. These included vitrectomy in association with permanent keratoprosthesis, chorioretinal biopsy, subretinal membrane removal in younger patients, and vascular tumor excision.

GAUGE SELECTION

The gauge selection in these 273 consecutive vitrectomies, performed from January 2008 through March 2010, was as follows: 25-gauge for all ports in 114 cases

TABLE 1: INDICATIONS FOR WHICH 25-GAUGE TECHNOLOGY IS PREFERRED

- Macular pucker
- Macular hole
- Vitreous hemorrhage with endolaser
- Internal limiting membrane peeling for macular edema
- Vitreomacular traction syndrome
- Primary phakic or pseudophakic retinal detachment with good peripheral visualization
- Cystoid macular edema with vitreous to wound
- Endophthalmitis
- Vitreous biopsy
- Miscellaneous anterior segment maneuvers

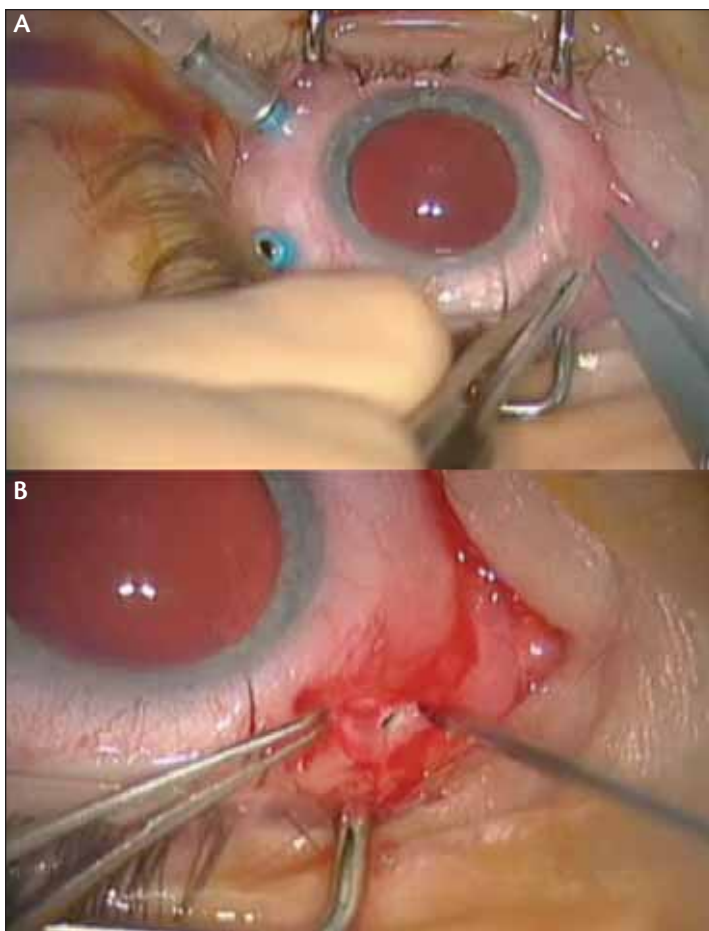


Figure 1. Two 25-gauge sclerotomies for infusion and light pipe (A) combined with one 20-gauge sclerotomy for handheld forceps or scissors or for silicone oil (B).

(42%), 23-gauge for all ports in 27 cases (10%), and 20-gauge for all ports (clustered early in the series) in 63 cases (23%). Mixed-gauge approaches were also used: 25-gauge plus 20-gauge in one or two ports in 35 cases (13%), and 23-gauge plus 20-gauge in one or two ports in 34 cases (12%).

Currently, I prefer to use 25-gauge instrumentation whenever possible, including for the removal of silicone oil. If I believe I can perform a case comfortably and with a high expectation of success with 25-gauge, I will do so. Table 1 lists indications for which I typically prefer 25-gauge.

For some cases I feel that I still require 23-gauge instruments. These include retinal detachment in eyes with proliferative vitreoretinopathy or proliferative diabetic retinopathy in which a larger cutter is desirable. I also use 23 gauge in some cases listed in Table 1 when lensectomy or conjunctival opening for other reasons, such as for scleral buckling, is required.

Early in this series, the 20-gauge vitrector was used for extremely complicated cases, such as retinal detachment with proliferative vitreoretinopathy or proliferative diabetic retinopathy in which silicone oil use was contemplated; or for trauma with intraocular foreign body, choroidal hemorrhage, or detachment. I now think the 20-gauge cutter is obsolete, and as of the latter part of this series I no longer use it. Creation of a 20-gauge sclerotomy may be helpful to allow the use of forceps in mixed-gauge surgery, but even in these cases I use the 23-gauge vitrector and note no discernable difference from the larger instrument. I plan to discontinue stocking 20-gauge vitrectomy packs if the other surgeons at our center consent.

MIXED-GAUGE SURGERY

I frequently perform mixed-gauge surgery, and I find it is often the best way to achieve my surgical goals. I do not mix 25- with 23-gauge, but I have some favored combinations of 25- and 23-gauge with 20-gauge instruments. Mixed-gauge surgery, with one or two 20-gauge sclerotomies, is selected to facilitate placement or removal of silicone oil, to remove a lens by fragmentation, to allow utilization of subretinal forceps, to deliver

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biopsy materials, and to permit the use of robust forceps during membrane peeling. In this series, 20-gauge sclerotomies were also used in miscellaneous cases when there was a need to open the conjunctiva for other reasons, such as for anterior chamber intraocular lens placement.

Selection of gauges depends on the expected difficulty of the case. For example, I use a combination of two 25-gauge transconjunctival sclerotomies plus a single 20-gauge conjunctival opening and sclerotomy for relatively easy cases that have a need for one large port (Figure 1). In this configuration, 25-gauge infusion and light pipe are inserted through the smaller openings, and the 20-gauge sclerotomy is used for lensectomy, for subretinal membrane removal with handheld forceps or scissors, or for silicone oil.

A combination of two 23-gauge transconjunctival sclerotomies plus a single 20-gauge conjunctival opening and sclerotomy is used for somewhat more difficult cases that require one large port. Again, with this configuration the infusion and light pipe go through the smaller incisions and the 20-gauge opening is used for lensectomy, handheld forceps or scissors, or silicone oil.

A third option, selected for more complex cases in which I need more flexibility, is 23-gauge transconjunctival infusion with two 20-gauge sclerotomies. This combination is preferred particularly cases in which avoiding postoperative hypotony or preserving gas fill are high priorities. These goals are achieved by suturing closed the 20-gauge sclerotomies.

PERSONAL OBSERVATIONS

The above are my own personal preferences regarding gauge selection. The following observations regarding techniques and technologies for smaller-gauge vitrectomy are also personal opinions.

I believe that long beveled scleral tunnel incisions may be too long for our 23- or 25-gauge cannulas and may result in early postoperative choroidal infusion or, rarely, choroidal hemorrhage. To avoid this, I do not bevel these incisions very much with 23-gauge, and not at all with 25-gauge. This is certainly not a mainstream approach.

As stated above, I feel there is increasingly less need to use a 20-gauge vitrector for any case. The performance of the new 23-gauge instruments is virtually indistinguishable to the surgeon. Similarly, the 25-gauge infusion cannulas, particular those of recent design, can provide excellent infusion for all cases, including for removal of silicone oil, and they provide more secure closure than 23-gauge cannulas. I would routinely employ these if they were supplied with every surgical pack.

Cryotherapy, under the microscope or with an indirect ophthalmoscope, combines beautifully with 25- and 23-gauge surgery. It is often much simpler to perform cryo than endolaser for peripheral breaks.

With increasing acceptance of 25-gauge technologies by our posterior segment colleagues, we should be sharing this knowledge with our anterior segment counterparts. Anterior segment surgeons should be trained to use 25-gauge vitrectomy instrumentation for anterior segment issues.

CONCLUSIONS

In this single-surgeon series, straightforward unmixed 25-gauge surgery was the clear preference, followed by a mixed-gauge approach with 25- plus 20-gauge and 23- plus 20-gauge instruments.

The shift to the new slit-type trocar entry from the previous chevron incision design has resulted in improvement for 25-gauge but is not yet satisfactory for 23-gauge. Sclerotomy closure with 23-gauge still requires vigilance, leading me to favor 25-gauge and to suture 23-gauge sclerotomies if there is any doubt about closure, especially in association with intraocular gas or oil.

With the transitional technology now available, I increasingly select mixed gauge surgery as the best approach for many cases. I suspect ultimately I will decrease my use of mixed-gauge approaches as 25-gauge technology becomes more refined and permits complete use of this smaller gauge. ■

Donald J. D'Amico, MD, is Professor and Chairman of the Department of Ophthalmology at Weill Cornell Medical College and Ophthalmologist-in-Chief at New York-Presbyterian Hospital, New York, NY. Dr. D'Amico states that he is a consultant for Alcon Laboratories but that the company did not support this research. He can be reached at 1 646 962 2865; or via e-mail at djdamico@med.cornell.edu.



1. American Society of Retina Specialists Annual Preferences and Trends Survey, 2010. <http://www.asrs.org>; access for members only.

2. D'Amico D J. Mixed Gauge Vitrectomy: A Practical Approach With Evolving Technology. Paper presented at Retina Society annual meeting; September 23-26, 2010; San Francisco, CA.