

Three Technologies That Have Changed the Way I Operate on Patients With Diabetes



Complications due to diabetes present challenges during surgery, and recent innovations have addressed them.

BY ALAN J. FRANKLIN, MD, PhD

Retina surgery thrives on innovation and surgeons' thirst for new tools that can increase safety, efficiency, and precision. Reflecting on the past year, three surgical innovations have greatly benefited me and my patients with diabetic eye disease in the OR (Video 1).

SHARKSKIN FORCEPS

Tano asymmetric forceps for 25-gauge surgery work quite well. They offer a precise grab, a fine edge, and the ability to visualize tissue through the platform. Similar satisfactory instrumentation for 27-gauge surgery, however, has been difficult to find. One's grasp of tissue is not visualized nearly as well through the platform of most 27-gauge forceps, and the edges of the instruments tend not to be as precise as on 25-gauge instruments. The surgeon must make multiple grasps and releases of tissue to find adequate purchase before a peel can begin, which means more activity near the retina. At times, it feels as though the surgeon, in trying to grasp a large enough piece of tissue to allow a full

peel, is pecking like a hen at the retina.

Still, 27-gauge is the wave of the future, and surgeons have migrated toward this gauge for multiple reasons. Surgeons who are frustrated with the imprecise nature of some 27-gauge forceps but still wish to operate with a 27-gauge platform may be interested to try Sharkskin forceps (Alcon).

The well-defined edges and serrations of the platform with the Sharkskin forceps allow the surgeon to adequately visualize tissue, make

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precise grabs, and grasp membranes with greater strength. The micro laser-etched pattern on the distal end of the

AT A GLANCE

- ▶ A new brand of 27-gauge forceps offers improved membrane purchase and well-defined edges.
- ▶ Beveled cutters on 27-gauge platforms may be useful in cases in which diabetic vitrectomy is required.
- ▶ Color filters on heads-up surgical displays may enhance visualization. Research to quantify the consequences of color filter use is forthcoming.

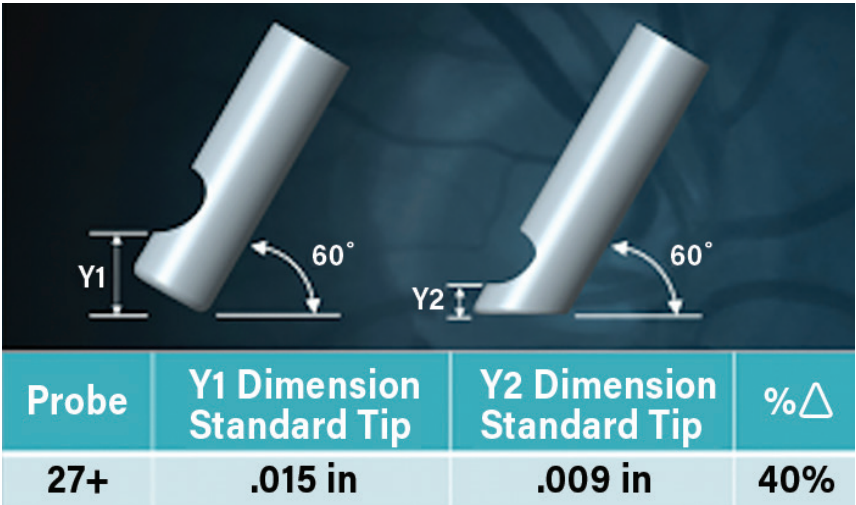


Figure 1. Beveled tips have reduced the length from the cutter tip to the cutter mouth by 40% on 27-gauge platforms.

forceps increases dynamic friction of the grasp, thereby both reducing the force to be used for delamination and trauma to the underlying retina.

When using this tool, I find that a small flap of membrane is enough to

begin a peel, and that the purchase is strong enough that I can remove a large piece of tissue efficiently.

Membrane delamination in eyes with diabetic retinopathy is easier with Sharkskin forceps than with

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VIDEO 2

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other tools during 27-gauge surgery. I find that I can better maintain my grasp on the membrane during bimanual surgery if I am using these forceps.

In summary, these forceps offer the precision and strength of their 25-gauge cousins while preserving the benefits of 27-gauge surgery.

BEVELED INSTRUMENTS

For years, retina surgeons have wanted a vitrectomy cutter that could be placed near the retina without risk

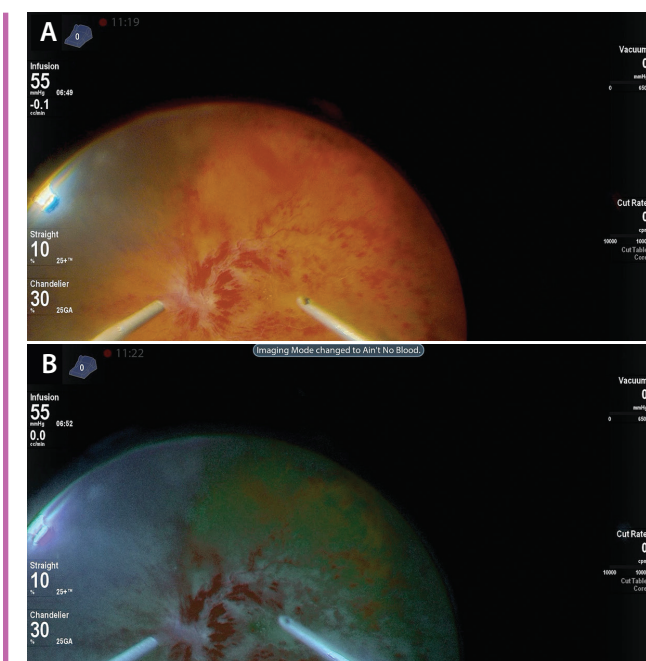


Figure 2. A view of the posterior segment without a color filter (A) and with a color filter applied to suppress vitreous blood (B).

of damaging underlying tissue. Instruments with faster cut rates, ranging from 5,000 cpm to 7,500 cpm, have certainly been an improvement, but their use near the retina was still risky.

The invention of cutters with rates up to 10,000 cpm coincided with the creation of beveled cutters for 27-gauge instrumentation. In addition, the port of the beveled vitrectomy cutter is significantly closer to the tip of the instrument within the bevel (Figure 1). This change in shape and speed results in a smaller sphere of influence and better proximity to the tissue, allowing retina surgeons to literally skim along the retina to peel tissue, thus minimizing the trauma of tissue engagement (Video 2).

This innovation has made surgery far more efficient. In cases in which posterior hyaloid removal is required, for example, I have often used triamcinolone to stain the posterior hyaloid when operating on a 25-gauge platform. With a beveled cutter on a 27-gauge platform, by contrast, I can usually skip the triamcinolone staining, as my ability to engage the vitreous near the retina is greater.

The 27-gauge beveled cutter also allows me to reach tighter areas during diabetic vitrectomy, particularly in eyes with proliferative diabetic retinopathy. With 25-gauge instrumentation, I occasionally must use scissors for diabetic membrane segmentation, and I find that the 25-gauge cutter can be difficult to position in the correct plane when membranes are highly adherent. In contrast, for 27-gauge surgery, I no longer use scissors. I can use the cutter alone for tissue manipulation and dissection even with extensive adherent pre-retinal tissue. This results in less instrument exchange during surgery.

“FOR YEARS, RETINA SURGEONS HAVE WANTED A VITRECTOMY CUTTER THAT COULD BE PLACED NEAR THE RETINA WITHOUT RISK OF DAMAGING UNDERLYING TISSUE.”

COLOR FILTERS

The digital photo filters on today's smartphones and social media platforms may be novelties, but a more useful application for color filters exists in retina surgery. Retina surgeons employing heads-up 3D surgical platforms may use digital filters to better visualize the retina in the presence of vitreous opacities, remove particular colors on the heads-up display, or enhance views through vitreous blood (Figure 2).

Surgery for vitreous hemorrhage in diabetic eyes is easier with a filter that allows the surgeon to see through the blood. The benefits to seeing “through” the hemorrhage include faster and safer vitrectomy.

My colleagues and I are researching ways to quantify the improved visualization that digital filters offer. We are using freeware from the US National Institutes of Health to compare two still images during surgery—one with a standard digital filter applied, and another with a digital filter customized to suppress vitreous blood—to investigate the enhancements in contrast that customized filters can provide. With evidence from these investigations, we may be able to change the subjective nature of visualization, and our findings may prove useful in further research on improving intraoperative visualization.

THE VALUE OF INNOVATION

Surgical innovations can range from incremental improvements to tectonic shifts. As the number of patients with diabetic eye disease increases due to the prevalence of diabetes and the aging population, increased efficiency without safety sacrifices will be highly valued. The innovations outlined in this article are steps in this direction. ■

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