

Vintage Vitrectomy in 2015

The case for traditional vitrectomy machines in modern surgery.

BY ANDREA MERCANTI, MD

Technology has radically changed our habits in recent years. Over the past 10 years, smartphones, personal computers, cameras, and other technologies have so greatly evolved as to radically change the habits and behaviors of all of us. This general technological evolution could not help but also affect medicine and surgery, and so it has. Even so, a legitimate question remains: Is what new technology offers us really always necessary or useful?

In ophthalmology, and particularly in eye surgery, many innovations have been introduced in recent years. These include improvements in 3-D microscopes, optical coherence tomography angiography, new intraocular lenses able to correct both astigmatism and presbyopia, microincisional surgery technologies, and vitrectomy techniques.

IN WITH THE NEW

The standard guillotine-type vitreous cutter blade has not substantially changed over the past 40 years because of its simple and robust design. The asynchronous suction and cutting action typical of these regular blades permits complete port obstruction, which generates flow instability and fluid acceleration that results in limited efficiency and eventually retinal traction. Newer blade shapes that allow residual flow even when the port is “closed” have been introduced,

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A further improvement in blade design, the constant flow blade (CFB), was recently introduced (Twedge Cutter Blade, Optikon 2000). This design maintains the amount of open port surface without variation throughout the duty cycle, achieving a much higher flow while doubling the cut rate.¹ The CFB outer shaft has a slightly enlarged port compared with a regular blade (Figure), while the inner cylinder has a rectangular opening and a double-beveled blade that slides like a cursor between the two ends of the port (positions A and C). The blade cuts both at the proximal end of its run (position A) and at the distal end (position C), leaving the entire port surface open in both cases. In between the two ends (position B), the blade occupies only a fraction of the port, leaving two inversely proportional openings on either side that add up to exactly the same opening surface as the entire port in positions A and B. The overall free port surface, therefore, remains unchanged and constant regardless of blade position, exactly matching the width of the open regular blade.

The regular blade, by contrast, leaves the port completely open only in position A, and closes progressively and eventually completely as the blade slides toward position C, leaving only half the port open in position B.

At a Glance

- The constant flow blade has a slightly larger port than a regular blade and achieves a higher flow.
- Despite recent advances in technology, standard vitrectomy machines can still be used to perform safe and efficient retinal surgery.

The CFB blade proved both experimentally and surgically extremely interesting and capable of offering significant advantages over the regular guillotine blade in terms of higher efficiency and safety.¹

OUT WITH THE OLD?

Will the introduction of these new probes lead to the disappearance of standard vitrectomy probes? Is there really that big a difference? Is the advantage of the new probes really so significant?

One of the main goals of every retina surgeon is to minimize traction generated by the cutter close to the retina. An efficient way to reduce traction is to cut only small pieces of vitreous; this can be achieved in three ways:

1. by reducing the flow rate/vacuum,
2. by reducing the size of the opening of the cutter (using a venturi pump), or
3. by increasing the cutting rate.

With option No. 3, however, there can be no compromise on the fluidics; if it is not done expertly, higher cutting rates will cause a degradation in the fluidics. In order to have perfect fluidics, the cutter has to remain open for no less than 50% of the cutting cycle. This is difficult to accomplish with cutters for which the closing cycle depends on a spring because the spring is simply too slow and will not allow complete and fast opening of the cutter.

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CONCLUSION

Although the main advantages of high-speed cutting will become manifest when the surgeon is working close to the retina, the high cutting rates can also be used in core vitrectomy without losing aspiration efficiency.

Standard guillotine-shaped vitreous cutters already possess all of these features. Therefore, although the

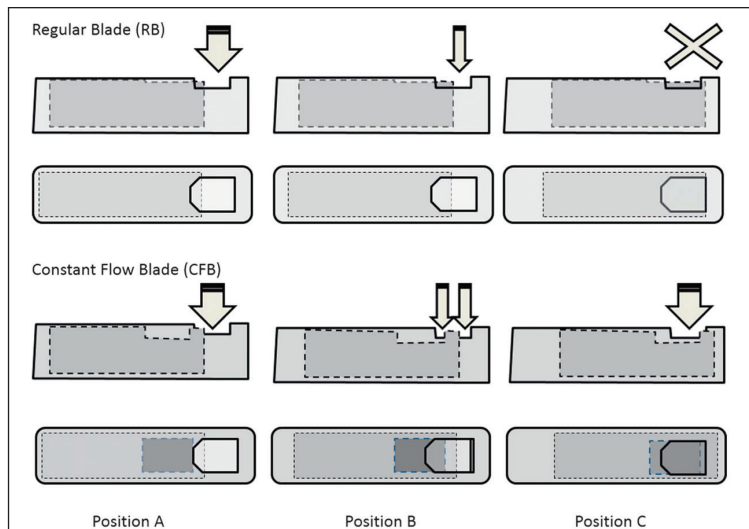


Figure. Schematic drawing of blade shapes. The upper panel represents a regular blade. The port is completely open only in position A, closes progressively in position B, and is completely obstructed in position C. The lower panel represents the CFB. The CFB port opening is slightly larger than that of the regular blade to compensate for the inner blade residual port obstruction in positions A and C. The double-edged blade (proximal and distal) occupies a limited surface of the port in position B and allows effective cutting action in both positions A and C, resulting in a de facto doubling of the cut rate.

new-generation vitrectomy platforms can probably perform faster vitrectomy with reduced vitreoretinal traction, this does not mean that it is not possible with a standard vitrectomy machine to perform safe and efficient retinal surgery.

What may seem like a huge difference when we are analyzing only technical data may not be confirmed in practice. This sometimes happens in real life, as well as in clinical and surgical practice. Some recent revolutionary innovations have proven to be failures, but others represent important technological advances that are likely to be improved upon over time. And while the latest vitrectomy platforms are quite safe and effective, the "older" probes can still perform safe surgical procedures—even in the hands of beginner retina surgeons—and should therefore not be discounted. ■

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1. Rossi T, Querzoli G, Malvasi C, Iossa M, Angelini G, Ripandelli G. A new vitreous cutter blade engineered for constant flow vitrectomy. *Retina*. 2014;34(7):1487-1491.