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Advances in Vitrectomy Probe Technology:

The Benefits of Improved Efficiency



A new 20,000-cpm vitrectomy probe equipped with the CONSTELLATION dual-pneumatic drive with a continuously open port answers many of the performance issues associated with 27 gauge.

BY KOUROUS A. REZAEI, MD

To improve visual outcomes and safety during retinal surgery the goal is to operate in such a manner that the eye does not even notice that the surgery was performed. How can we operate without the eye noticing it?

A few potential ways of getting close to achieving this goal are:

1 Being more efficient during surgery, since the more time we spend in the eye the more likely that unwanted things may happen.

2 Using smaller gauge instruments to minimize the trauma resulting from the surgical procedure,

inclusive of smaller surgical wounds, smaller instruments, minimal contact between surgical instruments and retinal tissue, a decrease in flow of fluid or air, and the list goes on. Further, smaller instrumentation provides the surgeon a greater focused accessibility to the target tissue, minimizing the collateral

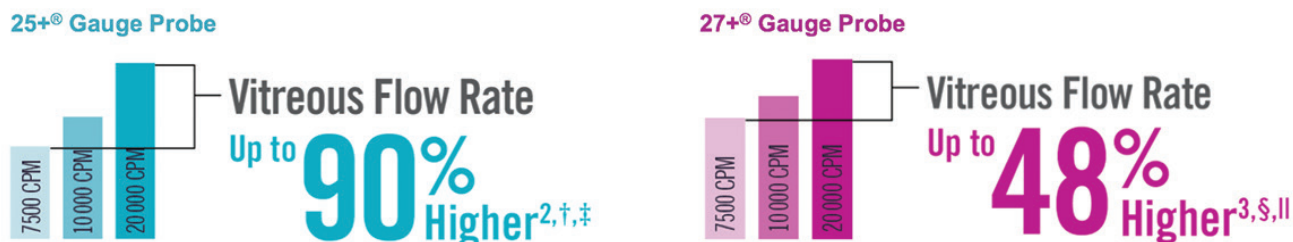


Figure 1. Increase Vitreous Flow diagram.¹

*At higher cut rates compared with traditional spring-return systems.

†HYPERVIT® Dual Blade Vitrectomy Probe 25+® Ga compared at 20 000 CPM (maximum cut rate in core mode) with Advanced ULTRAVIT® Probe 25+® Ga at 10 000 CPM (maximum cut rate in core mode) and ULTRAVIT® Vitrectomy Probe 25+® Ga at 7500 CPM (maximum cut rate in core mode).

‡95% confidence interval, n = 8 probes.

\$HYPERVIT® Dual Blade Vitrectomy Probe 27+® Ga compared at 20 000 CPM (maximum cut rate in core mode) with Advanced ULTRAVIT® Probe 27+® Ga at 10 000 CPM (maximum cut rate in core mode) and ULTRAVIT® Vitrectomy Probe 27+® Ga at 7500 CPM (maximum cut rate in core mode).

||95% confidence interval, n = 6 to 12 probes.

1. Riemann CD, Zhou J, Buboltz DC. Vitreous cutter velocities: dual pneumatic drive vs. single pneumatic drive with spring return probes. Poster presented at: 2011 Annual Meeting of the Association for Research in Vision and Ophthalmology; May 5, 2011; Fort Lauderdale, FL. 2. Alcon data on file. Alcon Laboratories, Inc; June 2018. 3. Alcon data on file. Alcon Laboratories, Inc; June 2018.

damage. A perhaps lesser appreciated aspect that speaks to the same principle for vitreous cutters is that the smaller port size also leads to a more finite sphere of influence, decreasing the likelihood of attracting the retina inside the port when removing vitreous or fibrotic tissue.

3 Minimizing instrument exchanges by using multipurpose instruments.

ADVANCES IN SMALLER GAUGE SURGERY

Retinal surgery has moved from 20 to 25 gauge being the standard over the past decade. However, moving beyond 25 gauge has not become mainstream for two reasons: efficiency and instrumentation.

The newly introduced beveled-tip HYPERVIT Dual Blade Vitrectomy probe (Alcon) may allow us to achieve some of the above goals by allowing a more efficient vitrectomy, paving the way for 27 gauge to become mainstream and fur-

ther increasing the utilization of the vitreous cutter as a multipurpose instrument.

HYPERVIT technology overcomes the inefficiency of 27-gauge probes by generating a flow efficiency similar to that of the currently available 25-gauge probes. A dual-pneumatic drive generates a cutting rate of 20,000 cuts per minute (cpm), keeping an almost continuous open port, and therefore overcoming the flow limitations of the smaller port size. This further minimizes the fluidic turbulence of the high cut rate. Indeed, compared to the ULTRAVIT High Speed Vitrectomy Probe (Alcon) at 7,500 cpm, the HYPERVIT at 20,000 cpm achieves 90% and 48% higher vitreous flow rates with the 25-gauge and 27-gauge models, respectively (Figure 1).¹

This improved performance allows the use of smaller instrumentation in a more efficient manner and should encourage surgeons to use 27-gauge instrumentation during vitrectomy surgery. The high cut rate allows for more

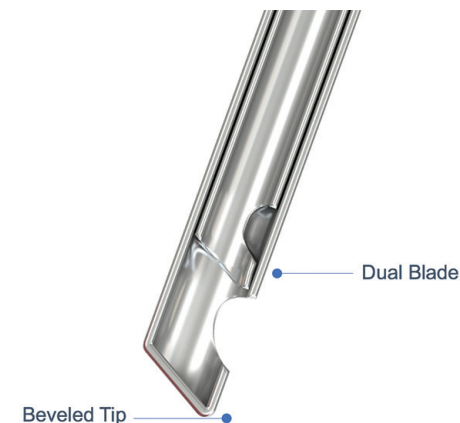


Figure 2. The HYPERVIT beveled tip.

control and less traction² while the open port allows for better flow.¹

One additional feature in the design of the HYPERVIT cutters is the beveling of the probe tip (Figure 2). This new feature allows the surgeon to get closer to the surface of the retina with all of the advantages mentioned above. In modeling studies, a 25-gauge rounded tip probe functions at about 0.017 in

from the surface, whereas the bevel tip is about 47% closer at 0.009 in.³ For 27 gauge the 0.009-in port-to-surface distance is 40% closer than the 0.015 in achieved with a rounded-tip probe.³ The beveling of the tip could be especially useful in diabetic traction retinal detachment patients allowing the cutter to be used both to create a plane and to remove the tissue. This results in exchanging fewer instruments during

surgery and is aligned with the overall objective of more efficient surgery to improve the safety of the procedure.

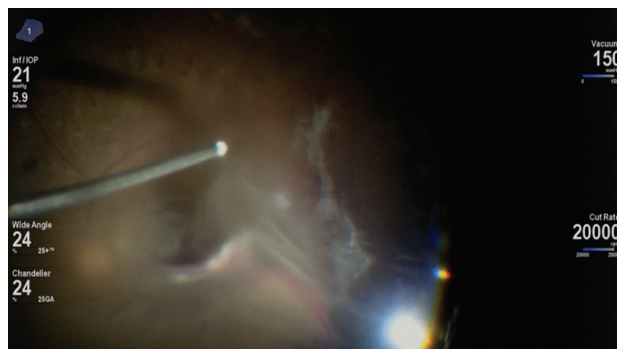
MINIMAL LEARNING CURVE

As mentioned above, the continuously open port impacts flow, which is the biggest difference surgeons will likely notice when adopting the HYPERVIT. The more often the port is closed, the greater the disruption to flow.

Conversely, when the port is open more often, high cutting speed can be used to its greatest advantage. To compensate for the change in fluidic dynamics, it is suggested to use a lower vacuum setting than one generally uses. Beyond that, there is really very little learning curve associated with incorporating the HYPERVIT into surgery because cut rate is set at 20,000 cpm, and the infusion is automatically controlled on the

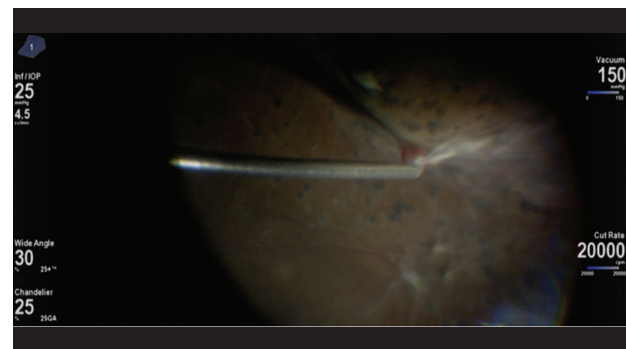
WATCH NOW Kourous A. Rezaei, MD, presents four surgical videos using the HYPERVIT Dual Blade Vitrectomy probe (Alcon).

HYPERVIT—BEFORE AND AFTER



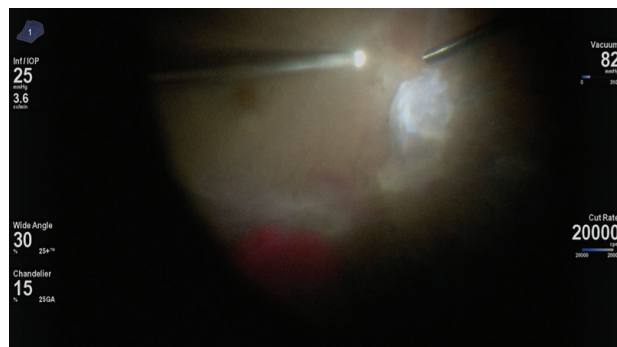
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HYPERVIT CONTROLLED PERIPHERAL SHAVING



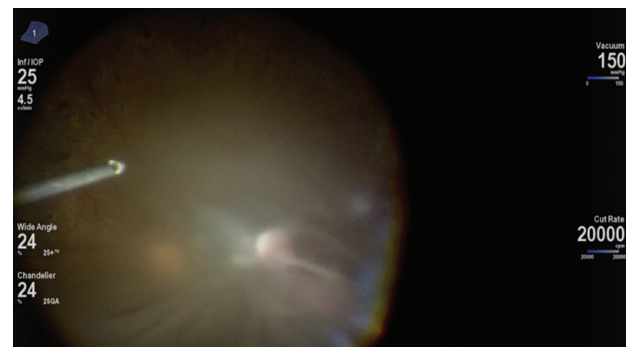
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HYPERVIT DISSECTION



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HYPERVIT VITRECTOMY



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CONSTELLATION Vision System (Alcon).

In conclusion, the HYPERVIT cutters are a great addition to the armamentarium of retina surgeons allowing them to operate more efficiently with small-gauge, multipurpose vitreous cutters, getting us closer to the goal of operating without the eye noticing it. This may lead to a better outcome for our patients.

See *Watch it Now* for a series of four surgical videos with the HYPERVIT. ■

1. Riemann CD, Show J, Buboltz DC. Vitreous cutter velocities: dual pneumatic drive vs single pneumatic drive with spring return probes. Poster presented at: 2011 Annual Meeting of the Association for Research in Vision and Ophthalmology; May 5, 2011; Fort Lauderdale, FL.
2. Irannejad A, Tambat S, Abulon DJK. Retropulsion and mass flow of 27-gauge vitrectomy probes: comparison of dual-blade/flat-tipped probes and single-blade/beveled probes. Poster presented at: 18th Congress of the European Society of Retina Specialists; September 20-23, 2018; Vienna, Austria.
3. Alcon data on file. Alcon Laboratories, Inc; May 2017.

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MVS IMPORTANT PRODUCT INFORMATION

Caution: Federal law restricts this device to sale by, or on the order of, a physician.

Indications for Use: The CONSTELLATION® Vision System is an ophthalmic microsurgical system that is indicated for both anterior segment (i.e., phacoemulsification and removal of cataracts) and posterior segment (i.e., vitreoretinal) ophthalmic surgery. The ULTRAVIT® Vitrectomy Probe is indicated for vitreous cutting and aspiration, membrane cutting and aspiration, dissection of tissue and lens removal. The valved entry system is indicated for scleral incision, canulae for posterior instrument access and venting of valved cannulae. The infusion cannula is indicated for posterior segment infusion of liquid or gas.

Warnings and Precautions: • The infusion cannula is contraindicated for use of oil infusion. • Attach only Alcon supplied products to console and cassette luer fittings. Improper usage or assembly could result in a potentially hazardous condition for the patient. Mismatch of surgical components and use of settings not specifically adjusted for a particular combination of surgical components may affect system performance and create a patient hazard. Do not connect surgical components to the patient's intravenous connections. • Each surgical equipment/component combination may require specific surgical setting adjustments. Ensure that appropriate system settings are used with each product combination. Prior to initial use, contact your Alcon sales representative for in-service information. • Care should be taken when inserting sharp instruments through the valve of the Valved Trocar Cannula. Cutting instrument such as vitreous cutters should not be actuated during insertion or removal to avoid cutting the valve membrane. Use the Valved Cannula Vent to vent fluids or gases as needed during injection of viscous oils or heavy liquids. • Visually confirm that adequate air and liquid infusion flow occurs prior to attachment of infusion cannula to the eye. • Ensure proper placement of trocar cannulas to prevent sub-retinal infusion. • Leaking sclerotomies may lead to post operative hypotony. • Vitreous traction has been known to create retinal tears and retinal detachments. • Minimize light intensity and duration of exposure to the retina to reduce the risk of retinal photic injury. ATTENTION: Please refer to the CONSTELLATION® Vision System Operators Manual for a complete listing of indications, warnings and precautions.

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