ECRONICON OPEN ACCESS

EC OPHTHALMOLOGY
Editorial

27 Gauge Vitrectomy-Past, Present and Upcoming

Anant Bhosale*, Rodney Morris, VR Saravanan and Narendran V

Department of Retina and Vitreous, Aravind Eye Hospital, Coimbatore, TN, India

***Corresponding Author:** Anant Bhosale, Consultant, Department of Retina and Vitreous, Aravind Eye Hospital, Coimbatore, TN, India.

Received: September 03, 2018; **Published:** September 21, 2018

Advancement and research is the need of time. With evolving cutting edge technology- devices and instrumentation are transforming to handier and more efficient versions. With mobile phones and other electronic gadgets getting advanced and more compact, Vitreoretinal surgery is no exception to this technology evolution in modern era. The quest to find ways to improve surgical outcome with smaller gauge instruments has led to minimization of tissue trauma and faster post-operative recuperation.

Concept of "open-sky" vitrectomy was conceived by Shafer in 1950 and propagated by Kasner in 1960s [1]. Machemer., *et al*. [2] introduced Vitreous-infusion-suction cutter (VISC) system in 1971, which marked an important milestone in vitreoretinal surgery, expanding its horizons in clinical use. In 1974, O'Malley and Heintz [3] introduced a smaller 20-gauge vitrector for use with three-port sclerotomy system that became the gold standard for modern PPV and remained standard of care for almost three decades. 25-gauge vitrectomy was introduced in 2002 by Fujii and De Juan Jr., *et al*. [4] followed by 23 gauge in 2005 by Eckardt [5]. Oshima., *et al*. [6] in 2010 described further minimization of vitrectomy instrumentation with 27-gauge system with excellent visual and anatomical outcomes. This advancement in small gauge operating systems has opened up a new realm of minimally traumatizing surgeries which equates to a reduced post-operative inflammation, lesser corneal astigmatism, better postoperative comfort, and early convalescence.

A 27 gauge cannula is placed using a 1-step nonbeveled technique with a trocar-cannula system. Reduced gauge entry and sleeker instrumentation facilitates better wound closure as it is uses the property of elasticity and recoil property of scleral fibres. Reduced internal diameter of 27-gauge systems results in a decreased flow rate. This shortcoming has been overcome with higher aspiration rates and higher infusion rates with an option of high inflow cannula usage available in some operating systems. Recent advances in endoillumination techniques using mercury or xenon vapour bulbs can aid in adequate retinal exposure inspite of smaller gauge optical fibre. Actual performance (cutting and aspirating efficiency) of a vitreous cutter depends on both- gauge size and duty cycle [7]. Although internal diameter (0.275 mm) of 27-gauge vitreous cutter is smaller than that of a 25-gauge vitreous cutter (0.347 mm), the duty cycle of a 27-gauge cutter is equal to or slightly better than that of a conventional 25-gauge cutter with cut rates ranging from 1000 to 1500 cpm [6]. A smaller diameter of cutter allows its use as a substitute to forceps and scissors with appropriate altercation in cutting and vacuum parameters [8]. Cutting port in 27 gauge vitrectomy has been placed nearer to the tip (port optimization) -a feature which aids the surgeon in performing complex manoeuvres such as vitrectomy assisted membrane segmentation and delamination. Sphere of influence in 27 gauge cutters is lesser and vector forces of suction cone are limited as compared to 23 and 25 gauge. This provides a better safety profile while working near retina and prevents inadvertent retinotomies.

Reduction in size of instrumentation has pitfalls, though they can be tackled. The counter intuitive motion of cutter in peripheral area of retina is an unique problem with 27 gauge in our experience. A discord between surgeon's hand movement and actual movement of shaft is noticed while the cutter is used for peripheral base shaving. Hybrid vitrectomy coupled with other gauges is required in case of use of fragmatome and silicon oil injection. Duration of surgery has been noted to be longer when compared to larger gauge cutters [8]. Cutters of 27 gauge are manufactured to have shorter lengths to maintain stiffness and prevent breakage of the instrument during surgery which imparts a disadvantage in operating eyes with long axial lengths. Inherent complications of MIVS system like post-operative hypotony and endophthalmitis are noticed, 27 gauge being done with sutureless technique.

Recent advances in vitrectomy cutter technology are exciting. Ultrasonic cutters based on the principle of using piezoelectric transducer element, that vibrates harmonically to create a cut rate of approximately 1.7 million vibrations per minute, are on their way for use in clinical settings. Advanced port optimized bevelled 27 gauge cutters will enhance efficiency and expedite complex membrane peeling cases with time being saved. Recently introduced sliding design laser probes have simplified application of laser to peripheral retina, especially in phakic patients. Intraoperative optical coherence tomography is being used in cases of macular surgery. Many instruments in use, cast an after-shadow resulting in disturbed OCT images. Efforts are on, to mitigate this issue. Glare of endoillumination light, reflecting from steel surface of cutters has motivated researchers to use non-reflective surfaced or colour polished steel instruments.

Quest of advancement in technology- smaller is better, prevails. It has brought the research to a point where 27 gauge vitrectomy system reduces surgical trauma, inflammation, astigmatism. It has improved patient comfort, postoperative recuperation time, and ultimately patient satisfaction. Overcoming the minimal shortcomings and optimisation of small gauge system have transformed our capabilities which will determine the surgical success and encourage positive outcomes.

Bibliography

1. Kasner D., *et al*. "Surgical treatment of amyloidosis of the vitreous". *Transactions - American Academy of Ophthalmology and Otolaryngology* 72.3 (1968): 410-418.

2. Machemer R., *et al*. "Vitrectomy: a pars plana approach. Technical improvements and further results". *Transactions - American Academy of Ophthalmology and Otolaryngology* 76.2 (1972): 462-466.

3. O'Malley C and Heintz RM Sr. "Vitrectomy with an alternative instrument system". *Annals of Ophthalmology* 7.4 (1975): 585-594.

4. Fujii GY., *et al*. "A new 25-gauge instrument system for transconjunctival sutureless vitrectomy surgery". *Ophthalmology* 109.10 (2002): 1807-1812.

5. Eckardt C. "Transconjunctival sutureless 23-gauge vitrectomy". *Retina* 25.2 (2005): 208-211.

6. Oshima Y., *et al*. "A 27-gauge instrument system for transconjunctival sutureless microincision vitrectomy surgery". *Ophthalmology* 117.1 (2010): 93-102.

7. Sato T., *et al*. "Analyses of cutting and aspirating properties of vitreous cutters with high-speed camera". *Retina* 28.5 (2008): 749-754.

8. Bhende PS and Lobo A. "Micro Incision Vitrectomy Surgery (MIVS): An Overview". *Scientific Journal of Medical and Vision Research Foundations* 33.2 (2015): 57-60.

Volume 9 Issue 10 October 2018