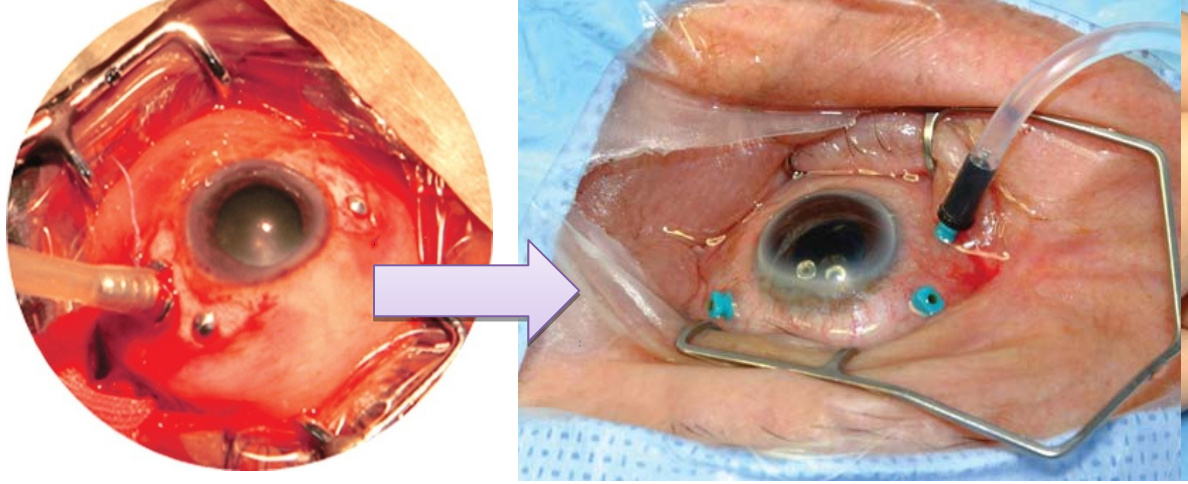

NEW PARADIGM IN POSTERIOR VITRECTOMY
MIVS

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Micro incision vitrectomy surgery Introduction

- Minimally invasive surgery
- Everything from smart phones to surgical incisions are getting smaller and more refined
- Ophthalmology ,
  - Cataract surgery trending towards smaller incisions
  - Similar trend followed in vitreoretinal field.
- Better understanding of vitreoretinal diseases, superior instrumentation, desire to reduce surgery times and hasten postoperative recovery

History

- Robert Machemer- VISC 1971, 17 Gauge
- O'Malley and Heintz, 1974, 20G 3port pars plana vitrectomy
- Trend toward MIVS started in 1990
  - Steve Charles, one of the pioneers of MIVS
  - 25 gauge instruments by de Juan and associates
  - 23 gauge system first used by Singh n associates 1995
  - Full set of 23 G instruments introduced by Eckardt 2005 with better rigidity and stability
  - 2010 Oshima introduce 27 Gauge instrumentation

- 23 G vitrectomy system has become popular among VR surgeon and almost all replaced 20-gauge as the gold standard.

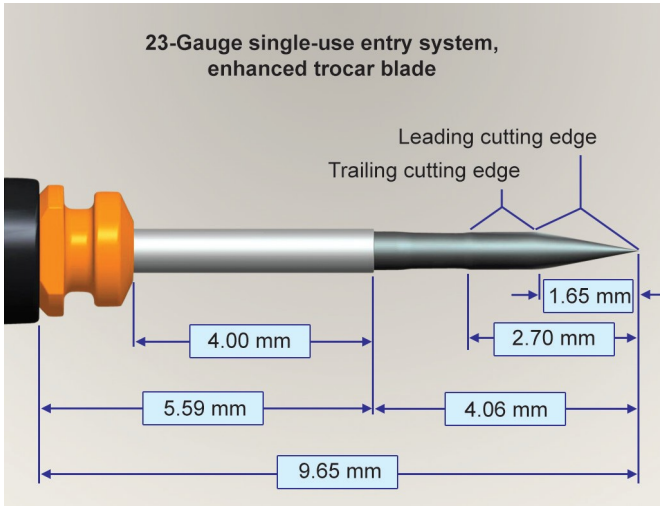
Indications

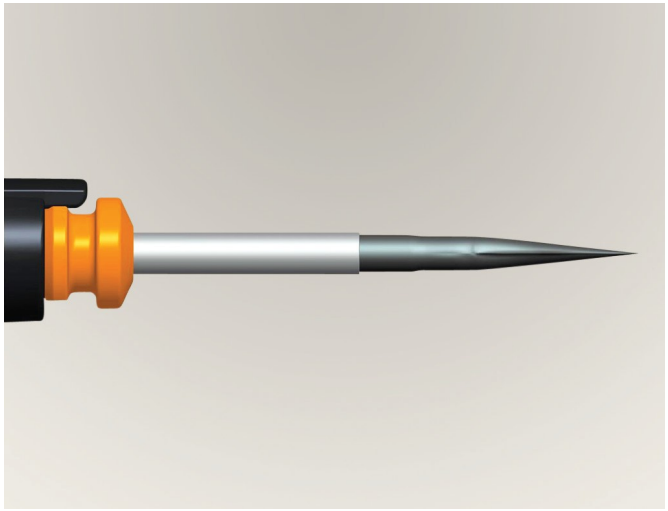
- Ideal for macular surgery
  - Macular hole
  - Epiretinal membrane
  - Vitreomacular traction
- Retinal detachment
- Surgery for diabetic complications
- Endophthalmitis surgery
- Trauma
- Intraocular foreign body
- Nucleus drop/ dislocated lens fragments management

Wound construction and microcannula placement

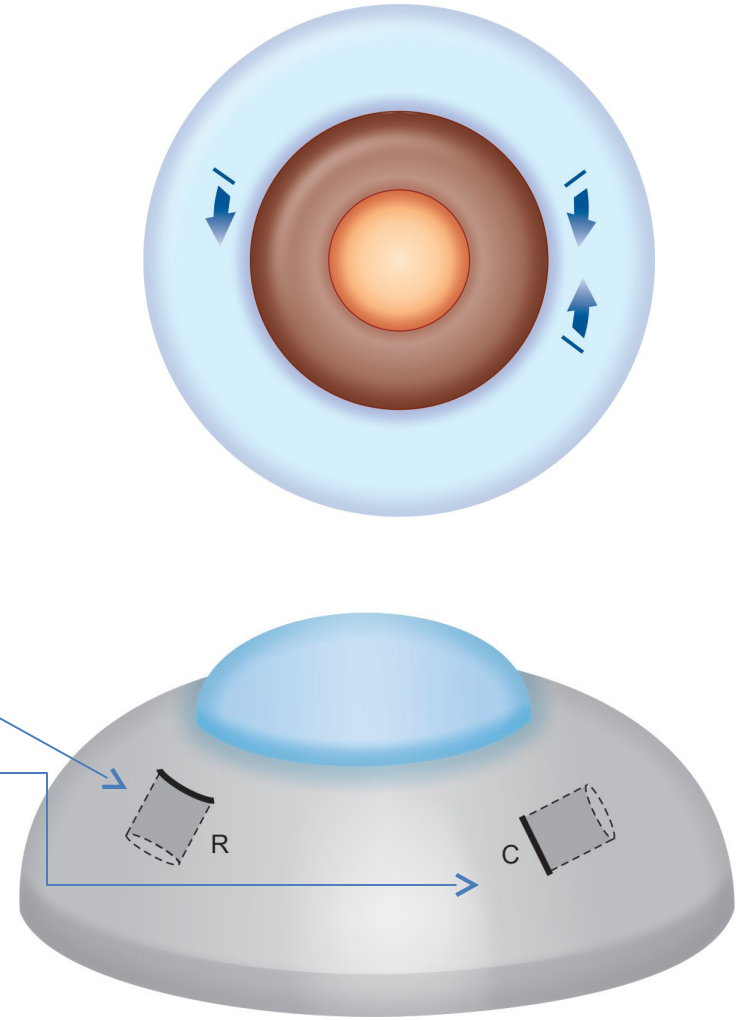
- Proper wound construction is vital to the success of MIVS
- The principle of wound construction for MIVS is misalignment
- Two techniques
  - Two-step technique by Eckardt
  - One- step technique utilizes a trocar-cannula set

- The conjuntiva is held by forceps or by cotton tip and displaced laterally about 2-3mm
- The trocar is introduced obliquely through the sclera to create the incision
- Microcannula is left behind in place as trocar is withdrawn

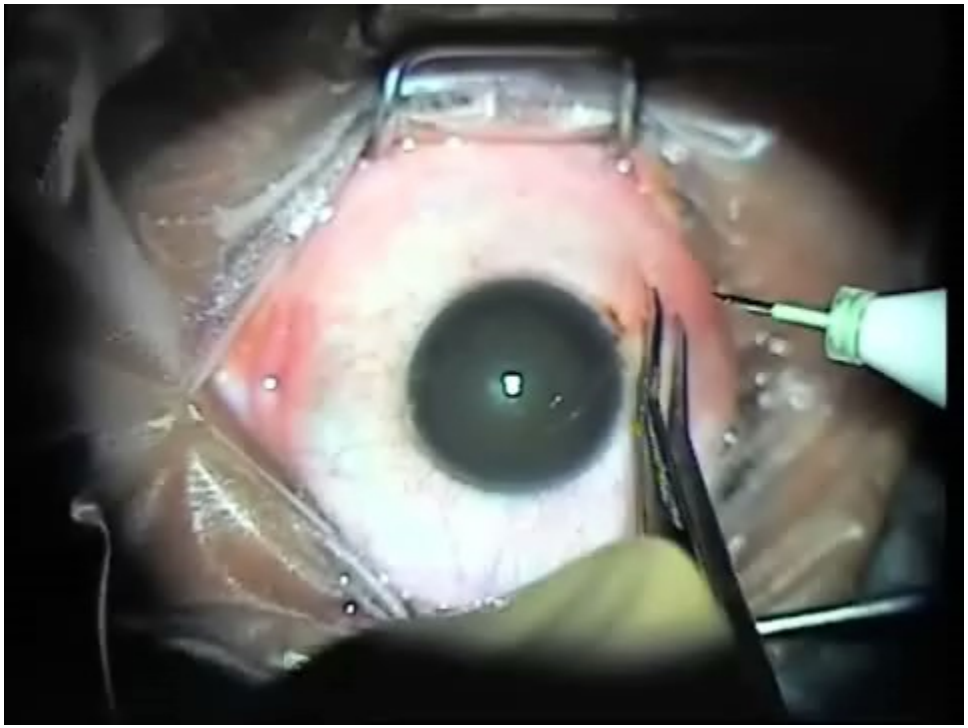




- Microincision wounds are essentially scleral tunnels
  - Surface entry
  - Intrascleral path
- Scleral entry
  - Parallel (circumferential)
    - Intrascleral path anteroposterior(radial)
  - Perpendicular(radial)
    - Intrascleral path parallel(circumferential)



23Gauge Microcannula Placement



25Gauge Microcannula Placement

Surgery

- Infusion cannula is secured first in inferotemporal quadrant
- Tip of infusion cannula should visualised
- Once correct placement is confirmed, the infusion can be turned on
- Active sclerotomies, preferably placed 1 clock hour above the horizontal
- Distance from limbus; phakic eyes 4mm, aphakic or pseudophakic eyes 3-3.5mm

Surgery

- Vacuum setting 350-400mm Hg
- Cut rates 2,500-5000 cpm
- Avoid unnecessary movements and drifting in vit cavity
- PVD can be induced with vit cutter with suction of 300-400 mm Hg

- Peripheral vitrectomy can be carried out with improved safety as compare to 20G
- Scleral depression can be used for peripheral vitreous removal
- For tough tissue we need to reduce cut rate with proportional reduction in suction.

- Lumen area of 23 G instruments is half of the 20 G
- Smaller gauge reduces flow, thus affects efficiency of vitreous removal. To counter the same, higher vacuum settings need to be used
- The Port of the 23G vitrectomy probe is closer to the tip(0.229mm Vs 0.4

- Having the port closer to the tip enhances 23G versatility manifold
- Cutter easily performs the role of
  - Curved scissors
  - Vertical scissors
  - Blunt spatula tip
  - Blunt hemostat n extrusion
- We can perform membrane dissection without multiple instrument exchange and its associated problems

Microcannula removal and wound closer

- Adequate attention at the end of surgery ensures that the case concludes with the achievement of the aims of MIVS
- Secure wound closer prevents- hypotony and endophthalmitis
- Infusion pressure should be lowered during microcannula removal
- Light probe is inserted through microcannula and then microcannula should be pulled out slowly

Microcannula Removal

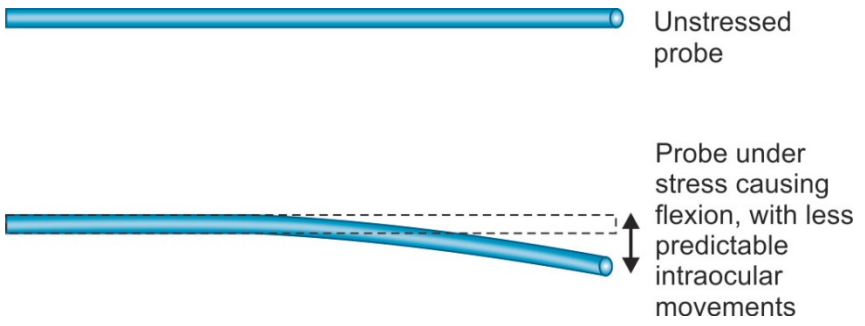
- The light probe then slowly withdrawn and gentle massage is done over the sclera
- After removing both superior microcannula always check the wound leak by raising infusion pressure
- Leaky wound should be secured with a single 7-0 or 8-0 vicryl suture
- The infusion cannula is removed the last

- Factors associated with wound leaks include
  - Eyes under going resurgery
  - Multiple instrument exchanges
  - Extensive vitrectomy with base dissection
  - Low scleral rigidity e.g. Children
- A large study found sclerotmy leakage need suturing in silicone oil (20%) > fluid BSS filled eyes(4.9%) > Gas filled eyes(1.9%)
- Desire for sutureless sx should not supersede the need for safer sx

25 Gauge vitrectomy

- 25 G cutters and infusion cannulas gives high resistance due to small diameter of lumen
- To compensate it have to increase infusion pressure
- The Alcon constellation pressurized infusion system and Accurus vented gas forced infusion (VGFI)
- High vacuum 650mm Hg and cut rate 5000 cpm

- Tool flexion is the most significant complaint about 25G system
- Careful positioning of the sclerotomies reduces tool flexion
  - Superonasal- lowest point on the bridge of the nose
  - Superotemporal port- low point on the brow
- Contact based wide angle viewing (Volk,AVI) decreases the need for extreme eye rotation compared to non contact visualization (BIOM, EIBOS)



Combined 25G/23G and 20 G vitrectomy

- Certain limitations of 25G/23G vitrectomy can be overcome by combined vitrectomy
- One sclerotomy can be enlarged for fragmantom (20G) to manage dropped nucleus and dislocated lens material
- IOFB can also be removed same way
- It’s a mismatch of inflow and outflow of fluid
  - Infusion pressure need to increase
  - Avoid aspiration when there is no lens fragments

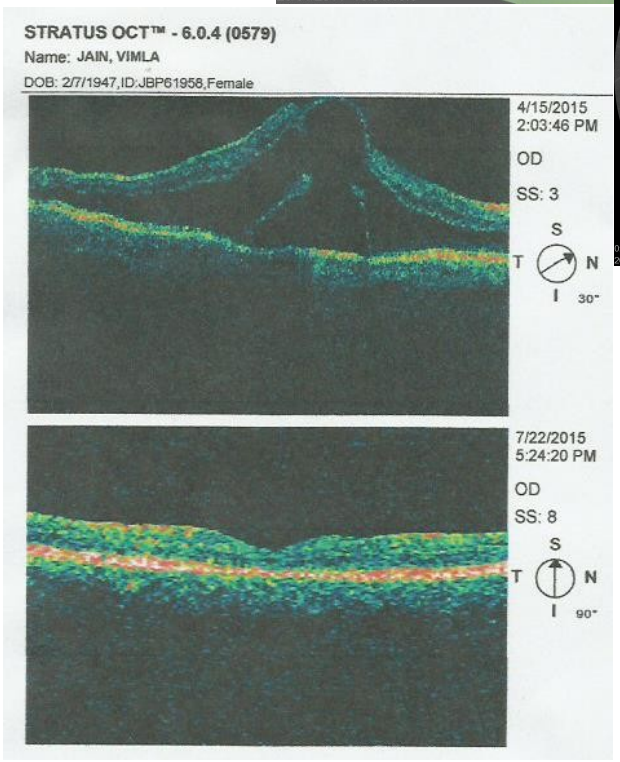
27-Gauge vitrectomy

- Oshima et al 2010
- Indications
  - Macular surgeries
  - Floaters only vitrectomy (FOV)
  - Vitreous biopsy
  - Thin sclera, low scleral rigidity
- Instruments
  - 27 G cutter have shaft length 25mm (32 mm standard)

  - High flow infusion
  - Cutter port larger and closer to the tip
  - Duty cycle is better then 25 G
  - Xenon and mercury vapor endoilluminator, chandelier light source available
- 27 G sclerotomies are made perpendicular to sclera in a single step
- Only 5% surgeon in USA and 10% surgeons worldwide using 27 G

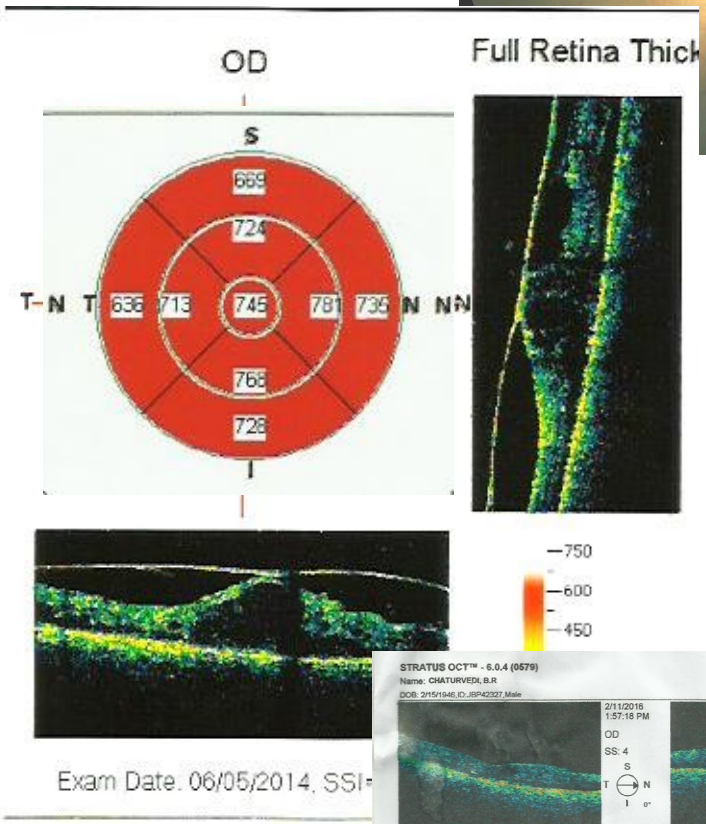
Case 1-JBP61958

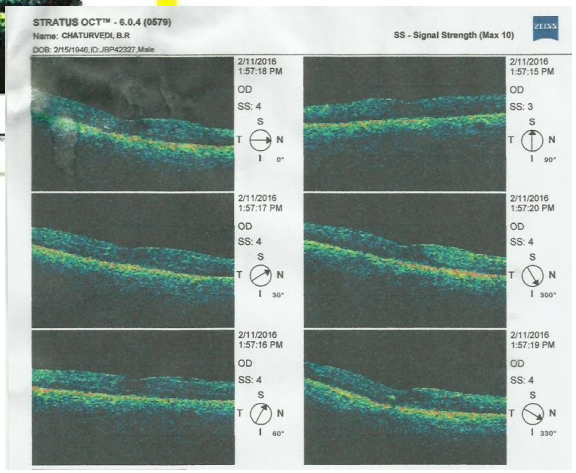
- 68Y/F , NO HTN,NO DM
- Vn OD-5/60, OS-6/36-6/18
- Cataract NSII (BE)
- OD- vitreomacular Traction(VMT)
- Phaco+ IOL+ (MIVS)23G PPV+ ILM peeling+ C3F8
- Post op Vn, 2 months 6/18



Case 2- JBP4232

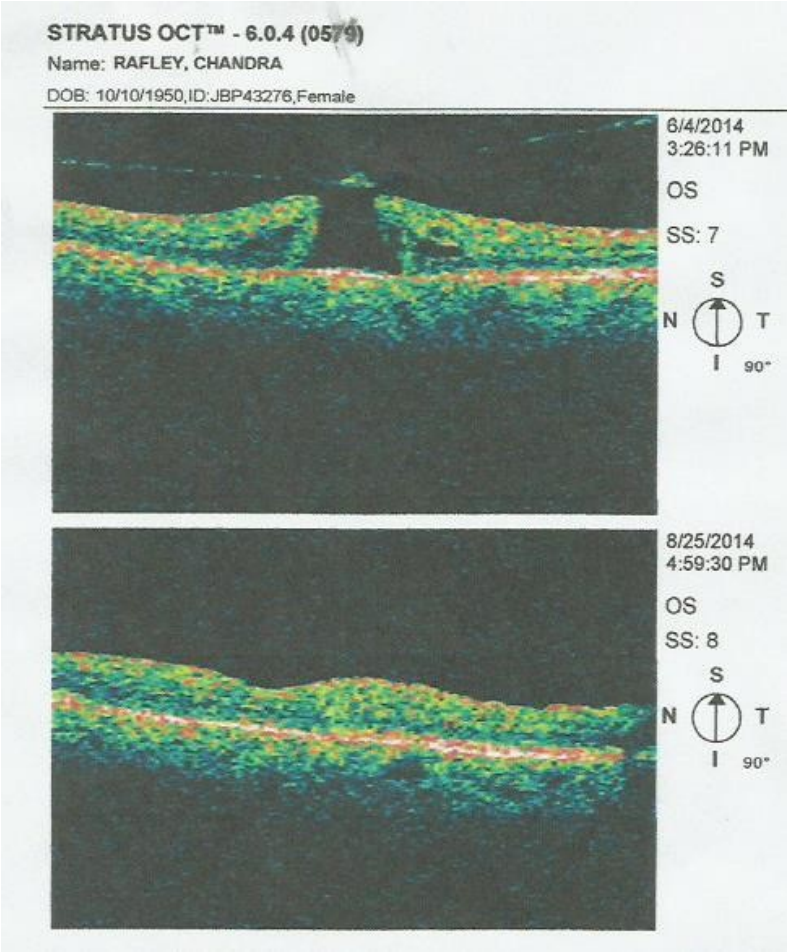
- 67/M Vn OD-6/60, OS-6/9
- HTN-5 yrs, DM-15 yrs
- c/o DOV RE
- h/o PRP 3 sittings, inj bevacizumab 3 inj in RE
- Cat –NSII
- OCT- RE-thick taut posterior hyaloid
- Phaco+ IOL+ 23G PPV+ posterior hyaloid removal
- Post op BCVA OD- 6/12





Case 3-JBP043276

- 63y/F , NO- HTN, NO- DM
- Vn OD-6/9, OS-6/60
- Ant seg- Early peripheral cortical cat
- LE- stage III macular hole
- LE- (MIVS)23G PPV+ ILM peeling+ C3F8
- Post op Vn 6/24
- 6 moths LE cat+ IOL
- Post op BCVA LE 6/12



20 gauge	23 gauge	25 gauge
O'Malley and Heintz	Eckardt	de Juan
Bulky and stiff instruments	Less rigid instruments	Stiffness of 23G is double of 25G
Bulkier cutter and larger flow rate reduce safety while working close to retina, Multiple instrument exchange leads incision related complications	Enough stability to perform peripheral vitrectomy 23G cutter port is closer to the tip, facilitates segmentation, delamination	Counter-intuitive movements
Low vacuum, low cut rates	High vacuum, high cut rates	High vacuum, high cut rate
Sometimes 20G is the only feasible option Phacofragmatome, FB magnet forceps	Limited availability of fragmantom, multifunction instruments like aspiration cautery, lighted picks or lighted infusion cannula	Can be combined with 20 G to overcome this problem

20G	23G	25G
Postoperative discomfort, suture related complications, Surgically induced astigmatism Postoperative conjuntival scarring, scleral thinning. Postoperative hypotony and related complications are less	Better comfort, faster healing and recovery of visual acuity MIVS related complications Hypotony, Choroidal detachment, Endophthalmitis	Better comfort, faster healing and recovery of visual acuity MIVS related complications Hypotony, Choroidal detachment, Endophthalmitis

Conclusion

- The development of MIVS has provided surgeons with new options in the surgical treatment of vitreoretinal diseases.
- Each system has its advantages and disadvantages.
- The optimum gauge and settings have to be selected after careful deliberation to provide the best possible surgical outcome.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