

Small Incision Vitrectomy

Essay

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
"قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا
إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ"

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List of Abbreviations

ASRS	: American Society of Retinal Specialists
AWG	: American wire gauge
BSS	: Balanced salt solution
C3F8	: Octafluoro-propane
CNVM	: Choroidal neovascular membrane
cpm	: Cuts per minute
cst	: Centistokes
ERM	: Epiretinal membrane
EVS	: Endophthalmitis Vitrectomy Study
ILM	: internal limiting membrane
IOFB	: Intraocular foreign body
IOP	: Intraocular pressure
MIVS	: Microincision vitrectomy surgery
MVR	: Microvitreoretinal
nAMD	: Neovascular age-related macular degeneration
PAT	: Preferences and Trends
PPV	: Pars plana vitrectomy
PVD	: Posterior vitreous detachment
PVR	: Proliferative vitreoretinopathy
RD	: Retinal detachment
RPE	: Retinal pigment epithelium
RRDs	: Rhegmatogenous retinal detachments
SCH	: Suprachoroidal Hemorrhage
SF6	: Sulfur hexafluoride
SMH	: Submacular hemorrhage
SO	: Silicone oil
TA	: Triamcinolone Acetonide
tPA	: Tissue plasminogen activator
TRD	: Tractional retinal detachments
TSV	: Transconjunctival sutureless vitrectomy
UBM	: Ultrasound biomicroscopy
VISC	: Vitreous infusion suction cutter

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Introduction

Pars plana vitrectomy is a general term for a group of operations accomplished in the deeper part of the eye, all of which involve removing some or all of the vitreous (*MacHemer, 1995*).

Pars plana vitrectomy is appropriate whenever access to the posterior segment of the eye is necessary for treatment. Common indications include rhegmatogenous or tractional retinal detachment, non resolving vitreous hemorrhage, retracted lens fragments after cataract surgery, endophthalmitis, epiretinal membrane, macular hole, vitreomacular traction, and intraocular foreign bodies (*Mehta et al., 2011*).

The evolution of vitrectomy surgery has seen experimentation and implementation of smaller surgical instruments aimed at greater functionality and minimalization of ocular trauma. The basis of sutureless pars plana vitrectomy was to stabilize intraocular pressure (IOP) during surgery, with a truly closed system, as well as to reduce surgical time by removing the need for sutured wound closure. Wound and suture related complications such as leakage, irritation, and sclera pigmentary changes could also be avoided. Concerns regarding wound compliance in a sutureless procedure have seen the modification

of the conventional straight incision to such techniques as angled, beveled, oblique, and sclera tunnel incisions (*Kwok et al., 1999*).

Transconjunctival sutureless microincision vitrectomy surgery (MIVS) was introduced by Fujii and colleagues in 2002, permitting sutureless vitrectomy for the first time (*Fujii et al., 2002*).

This major advance, which used 25-gauge instrumentation, provided several advantages over conventional 20-gauge vitrectomy, including shorter surgical time, less surgically induced inflammation, and reduced risk of postoperative corneal astigmatism, factors that ultimately led to improved patient comfort and faster visual recovery (*Kadonosono et al., 2006; Rizzo et al., 2006*).

The reduced operative time with MIVS can be attributed to the elimination of the substantial time spent opening and closing the conjunctiva and sclera, which more than compensates for the additional time spent on vitreous dissection through a 25-gauge probe (*Eckardt, 2005*).

In 2005, Eckardt introduced 23-gauge MIVS, which addressed the major concerns of 25-gauge vitrectomy. The stiffer shaft of the 23-gauge instrumentation feels much like that of a 20-gauge instrument, improving both vitreous gel removal and vitreous base shaving relative to 25-gauge instruments; in

addition, the larger diameter of the 23-gauge provides improved illumination and higher flow rate, increasing the ease with which silicone oil and other dense materials can be removed. Furthermore, it retains all of the advantages of 25-gauge vitrectomy over the 20-gauge procedure (*Yanyali et al., 2005*).

In addition to the improvements made in MIVS with the introduction of 23-gauge surgery, other enhancements made recently have increased the attractiveness of both 23-gauge and 25-gauge small-incision vitrectomy. These include the introduction of a xenon light source, which further improved illumination; minimization of gas leakage via better wound construction (due to the use of beveled incisions and recently released improved trocar blade designs); and the expansion of the array of MIVS instrumentation, including the Chow cannula for silicone oil injection and curved endolaser probes for peripheral photocoagulation. These improvements have led to a wider acceptance of MIVS in the past several years (*Williams, 2008*).

A one-step chandelier probe was developed consisting of a 27-gauge needle socket and a 29-gauge inner light fiber. Another type of 27-gauge chandelier system using twin optical fibers has recently become commercially available. Both types of 27-gauge chandelier illumination are sufficient to illuminate the fundus (*Oshima et al., 2008*).

Aim of the Work

The aim of this work is to summarize techniques, benefits, complications, and the safety profiles of sutureless vitrectomy systems.

Chapter (1):
**Indications of Pars Plana
Vitrectomy**

Pars plana vitrectomy is a general term for a group of operations accomplished in the deeper part of the eye, all of which involve removing some or all of the vitreous (*MacHemer, 1995*).

Pars plana vitrectomy is appropriate whenever access to the posterior segment of the eye is necessary for treatment. Common indications include for example: rhegmatogenous or tractional retinal detachment, vitreous hemorrhage, retained lens fragments after cataract surgery, endophthalmitis, epiretinal membrane, macular hole, vitreomacular traction, and intraocular foreign bodies (*Mehta et al., 2011*).

1. Retinal Detachment:

Several conditions, such as detachment from posterior breaks or detachment with significant media opacities, may warrant vitrectomy as the primary procedure. In cases in which the preoperative retinal view is clear and a posterior break is definitively excluded, vitrectomy does not appear to offer significant advantage over scleral buckling other than a theoretically improved ability to examine the retina microscopically with scleral depression. Performing a vitrectomy for an uncomplicated retinal detachment from a small peripheral break in which scleral buckling would be the usual procedure of choice remains controversial. Although it

may avoid the complications of scleral buckling, vitrectomy does have its own potential complications. The status of the lens, cornea, and configuration of the retinal tears and detachment should carefully be considered before vitrectomy. Proper patient selection and appropriate education are important factors in a successful outcome. Finally, from an economic viewpoint, the likelihood of success with vitrectomy in one procedure compared with other less expensive procedures should be considered (*Brazitikos, 2000*).

2. Complex Retinal Detachment:

Rhegmatogenous retinal detachments associated with proliferative vitreoretinopathy, giant retinal tears, ocular trauma, proliferative diabetic retinopathy, or necrotizing retinitis are considered more complex than those without these factors. Advancements in surgical instrumentation have led to changes in the surgical repair of rhegmatogenous retinal detachments (RRDs). Key components of RRD repair include pars plana vitrectomy (PPV), scleral buckling procedure (SBP), intraocular gas and silicone oil (SO) infusion, endolaser photocoagulation, perfluorocarbon liquids, and wide-angle viewing systems (*Brazitiko et al., 1999*).

The evolution of smaller gauge vitrectomy instruments has been a significant technological advance in vitreoretinal surgery. There has been a trend towards the use of smaller gauge vitrectomy instruments to treat increasing complex posterior segment pathology (*Lakhanpal et al., 2005*).