ORIGINAL RESEARCH PAPER

Ophthalmology

VISUAL OUTCOME OF 25-GAUGE INSTRUMENT SYSTEM FOR TRANSCONJUCTIVAL MICROINCISION VITRECTOMY SURGERY IN VARIOUS VITREORETINAL DISEASES.

KEY WORDS: Microincision Vitrectomy Surgery (mivs),transconjunctival Sutureless Vitrectomy (tsv),pars Plana Vitrectomy(ppv)

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ABSTRACT

OBJECTIVE- To evaluate the efficiency, safety, and feasibility of a 25-gauge instrument system for transconjunctival microincision vitrectomy surgery (MIVS) in a variety of vitreoretinal diseases.

MATERIAL AND METHOD: The medical records of 50 eyes that had undergone 25-gauge vitrectomy for cases like Vitreous haemorrhage, retinal detachment ,subluxated cataract or IOL, Macular hole or PDR from 2016 to 2018 at Tertiary centre were included in the study. Intra- and post-operative complications were analyzed. The postoperative best corrected visual acuity (BCVA) was evaluated and recorded at the end of 6 months.

RESULT- Mean age of distribution are 42.92 years in 25 gauge vitrectomy. Among 50 cases 35 are males and 15 are females. There is significant difference in BCVA between preoperatively and postoperatively. P value for pre operative to post operative vision in 25 -gauge vitrectomy is <0.05 i.e. there is definite improvement in vision.

CONCLUSION-25-gauge micro incision vitrectomy surgery (MIVS) is an effective sutureless pars plana vitrectomy surgery which has good visual outcome in various retinal condition with minimum manageable complications.

INTRODUCTION

In 1971, Machemer et al[1], described the use of a 17-gauge vitreous cutter, with a diameter of 1.5 mm through a 2.3 mm scleral incision. The approach was modified in 1974, with the introduction of a 20- -gauge vitrector (0.9 mm diameter) by O Malley and Heintz(O Malley C, Heintz RM.,1975). This was the origin of the three port, pars plana sclerotomy system that became the gold standard in vitrectomy surgery. It involved the creation of three access ports with a 1.4 mm linear sclerotomy. This was undertaken with a micro- vitreo-retinal (MVR) blade. One port had an infusion line sewn into place, while the remaining two were utilized for introduction of a light source and a vitreous instrument such as a cutter. De Juan and Hickingbotham devised and introduced a range of 25- -gauge instruments in 1990 for use through conventional sclerotomies (De Juan and Hickingbotham, 1990). However, it was only in 2002, with the advent of the microcannulae array, that the 25 gauge transconjunctival sutureless vitrectomy (TSV) system was introduced by Fujii et al (Fujii et al, 2002)[2]

This was followed by the introduction of a 23-gauge system by Eckardt in 2005. Initially, both 23- and 25-gauge systems were available with a limited gamut of intraocular instruments. However, as the techniques rapidly became widely utilized, almost all intraocular instruments have been developed and made available for sutureless vitrectomy system (Ecka rdt,2005)[3].

By reducing the diameter of instruments(figure 1),MIVS procedure allowed wounds to self seal without suturing.

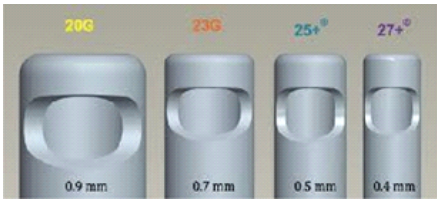


Fig.1 showing Comparison of vitrectomy sizes and des igns.

AIMS AND OBJECTIVE

1) To determine visual acuity following 25-Gauge sutureless vitrectomy.
2) To determine incidence of postoperative hypotony and postoperative infection.
3) To determine success rate of achieving the goal of vitrectomy.

MATERIAL AND METHOD

Patients were screened from the ophthalmic department of a Tertiary care centre. Total 50 Cases were included in the study. Case records of all patients who underwent 25 gauge sutureless vitrectomy were analyzed. The mean follow-up period for patients was 2 years.

The study was approved by the Institutional Ethics Committee consisting of a nine-member team. All patients included in the study had undergone a complete ophthalmic evaluation, which included detailed history, preoperative visual acuity, intraocular pressure (IOP), keratometry, slit lamp, and fundus evaluation.

STATISTICAL ANALYSIS

Data were statistically described in terms of mean (±SD), frequencies (number of cases) and percentages when appropriate. Data were tested first for normal distribution by Kolmogorov–Smirnov test. Mann–Whitney U test was used for non-normally distributed quantitative data. Exact test was used instead when the expected frequency is less than 5. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs Microsoft Excel 2007 (Microsoft Corporation, NY, USA) and SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 21.

SELECTION OF CASES

INCLUSION CRITERIA:

Patients with preoperative diagnoses of

- vitreous haemorrhage (either diabetic or non-diabetic),
- diabetic traction retinal detachment classed as moderate or below,
- cystoid macular oedema, macular pucker,
- full-thickness macular hole,
- vitreous opacities,
- rhegmatogenous retinal detachment,
- subluxated cataract
- nucleus drop in Vitreous
- other less-complicated vitreoretinal pathologies

EXCLUSION CRITERIA:

- Had under gone prior sclera buckling and pars plana
- Previous vitrectomy
- High myopia >6D
- Sever grade 3 cataract
- Combined pars plana vitrectomy and scleral buckling surgery done.

After taking proper informed consent of the patient, they were examined as follows.

Whether any history of trauma, significant family history or any known systemic illnesses were asked. Whether any history of using spectacles, any treatment taken for other ocular problem. A brief history of symptoms was taken and following details were noted. The name, age (number of completed years) and sex of the patient. The presenting complaint of decreased vision, diplopia documented. Preoperative and post-operative intraocular pressure is measured with non-contact tonometer. Preoperative and post-operative astigmatism measured with Autore fra cto meter or Keratometry value is measured. Preoperative and post-operative fundus examination done by indirect ophthalmoscopy. B-scan ultrasound was done for posterior segment evaluation if the fundus was not visible. All patients were referred to physician to look for any syndromes or systemic associations. In patients in whom surgery was indicated, sac syringing was done. Blood investigations like hemoglobin, complete blood counts, liver function test, renal function test, serum electrolytes and blood sugar were done. Urine sample was tested for Homocysteine. ECG was done and cardiac referral was done when indicated. Patients were admitted in In patient department for atleast 3 days 1 preopday ,operative day and post operative day 1. Preoperative oral antibiotics and preoperative systemic steroids were given to all patients irrespective of group.

DAY OF SURGERY-

Mydriasis was achieved by using a combination of eyedrops tropicamide (0.8%) and phenylephrine (5%) every ten minutes one hour before surgery. Surgery was performed under local or general anesthesia. Under all aseptic precautions, cleaning and draping was done. Lid speculum was applied. All patients underwent PPV with 25 -gauge, standard 3-port approach. View of the posterior segment was achieved with binocular wide-field viewing system or contact A core vitrectomy was performed. First described by Fujii et al[4], in 2002,this system utilizes a microcannula array to introduce a wide range of vitreoretinal instruments. The TSV, revolves around microcannula with insertion trocars, an infusion cannula, and cannula plugs. The microcannula is a thin walled polyamide tube of 3.6 mm in length with an external collar which can be grasped with forceps. Insertion is accomplished by first displacing the conjunctiva laterally by approximately 2 mm. An initially oblique, then a perpendicular tunnel is made parallel to the limbus through the conjunctiva and sclera, thus, creating a self-sealing wound[5]. The trocar, when inserted into the cannula forms a continuous bevel, can then be withdrawn. The port is then in place for insertion of the desired instrument, with plugs available if required to maintain a closed system. This system ensures misalignment between the conjunctival and scleral entry site. The infusion cannula is composed of a 5 mm metallic tube, which fits through the microcannula array. These include vitrectomy cutters, light pipe, micro vertical scissors, extendable curved pick, tissue manipulator, aspirating pick, aspirator, laser probe, and diathermy probe. At the completion of surgery, the microcannulae are simply removed by grasping the collar and withdrawing, with assessment of IOP and wound sites for any possible leak.

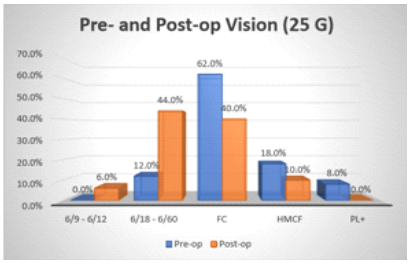
OBSERVATION AND RESULT

Amongst 50 cases 35 are males (70%) and 15 are fem ales (30%) with male:female ratio of 2.33:1. Mean age of distrib ution is 49.92 in 25 -gauge group with p value of 0.828 which is statistically insignificant.

Out of total 50 patients,13 patients of Retinal detachments,12 patients of subluxated/ dislocated lens or IOL,6 patients of macular hole,2 patients of ERM,17 cases from Vitreous haemorrhage with multiple causes like Diabetic retinopathy, CNVM, Traumatic vitreous haemorrhage. P value is 0.748 which is statistically insignificant.

Table 1 and graph 1 showing P value for pre operative to post operative vision in 25 -gauge is <0.05 i.e. there is definite improvement in vision.

Vision	25-G		Total
	Pre-op	Post-op	
6/6 - 6/12	0	3	3
	0.0%	6.0%	3.0%
6/18 - 6/60	6	22	28
	12.0%	44.0%	28.0%
FC	31	20	51
	62.0%	40.0%	51.0%
HMCF	9	5	14
	18.0%	10.0%	14.0%
PL+	4	0	4
	8.0%	0.0%	4.0%
Total	50	50	100
	100.0%	100.0%	100.0%
p- value <0.05			



Graph 1 showing P value for pre operative to post operative vision in 25 -gauge is <0.05 i.e. there is definite improvement in vision.

Mean pre operative intraocular tension is 15.66 mm of hg and Mean post operative intraocular tension is 13.22 mm of hg in 25 -gauge of vitrectomy group. P value <0.01 signifies that definite change in preoperative to post operative intraocular tension(Table 2).

Table 2 showing pre-op and post-op IOP in 25-G Group.

25-G Group	N	Mean	SD	p- value
Pre-op Tension	50	15.66	4.46	<0.01
Post-op Tension	50	13.22	4.31	

There was no significant difference in the degree of Surgical induced astigmatism preoperatively and the postoperatively in the present study. As preoperative and postoperative P value is 0.081 which is not statistically significant.(Table 3)

Table 3 showing preoperative and postoperative Surgical induced astigmatism.

25-G Group	N	Mean	SD	p- value
Pre-op Astigmatism	50	0.38	2.05	0.081
Post-op Astigmatism	50	-0.13	1.88	

DISCUSSION

The present study is concerned with use of 25 -gauge vitrectomy for cases like Vitreous haemorrhage, retinal detachment , subluxated cataract or IOL, Macular hole or PDR .

There are very few studies measuring visual outcome in 25 -gauge vitrectomy. Since the introduction of vitrectomy in the early 1970s, numerous retinal conditions like retinal detachment, macular hole and diabetic retinopathy are managed surgically. Recently, the procedure has undergone a series of revisions, allowing for smaller angled incisions that do not require suture support and are self sealing, thus, potentially laying the groundwork for a more efficient and patient friendly procedure. Besides 20 gauge systems, today 25 -gauge systems are marketed by ophthalmic device makers. Simplicity of entry is desirable, and that's why a one-step angled incision was made in 25 -gauge series with self-retaining cannula. This techniques 25 -gauge required stabilizing the eye on entry into the globe.

A total of 50 patients with posterior segment disease were included in this study and result obtained using appropriate statistics. Amongst them 35 are males (70%) and 15 in 25 -gauge are females(30%) with male:female ratio of 2.33:1. This study shows males are more affected than females. Mean age of distribution is 49.92 in 25 -gauge group with p value of 0.828 which is statistically insignificant. Out of total 50 patients,13 patients of Retinal detachments,12 patients of subluxated/ dislocated lens or IOL,6 patients of macular hole,2 patients of ERM,17 cases from Vitreous haemorrhage with multiple causes like Diabetic retinopathy, CNVM, Traumatic vitreous haemorrhage. P value is 0.748 which is statistically insignificant. But P value for pre operative to post operative vision in 25 -gauge is <0.05 i.e. there is definite improvement in vision.

MIVS allows for sutureless wounds and less wound leakage. It was reported that Surgically Induced Astigmatism after 25G[6] vitrectomy was significantly less than that after 20G vitrectomy. According to study 25G TSV does not induce regular or irregular corneal astigmatism[7].As preoperative 25-G and postoperative 25-G has P value of 0.07 respectively which is not statistically significant. No entry site retinal tears were seen. Fine et al reported no intraoperative sclerotomy site tears in 77 patients undergoing 23 -gauge vitrectomy. However, their study was only on 23 -gauge technique and not 25 -gauge. In comparison to 23 -gauge, 25 -gauge PPV is much more tedious and requires careful handling.The instruments are thin, flexible and bend easily with threat of breakage. Luckily, no instrument broke but bending of 25 -gauge fiberoptic light occurred during surgery in few cases. Also, peripheral vitreous shaving was incomplete in 25 -gauge series as globe rotation was difficult due to flexible instruments and scleral indentation helped complete the work. On completion of pars plana vitrectomy, suture closure was not needed. Though scanty leakage of silicone oil was observed in 3 eyes (6%) in 25-gauge series, suture closure wasn't required as IOP was maintained within normal range. Misra et al[8] also reported similar findings with only one out of one hundred and fifty cases requiring suturing of a sclerotomy port while Eckardt's[9] series of fourty four patients needed no port sutured. Lakhanpal et al[10] in his 25 -gauge series reported 10 cases (7.1%) requiring suture placement at a single sclerotomy site. Inoue M et al in his case series reported intra-operative breakage of 25 -gauge cutter during vitrectomy[11], while Tomic et al reported bending of 25 -gauge light pipe during surgical procedure.[12] We assume that slight displacement of the conjunctiva, overlying the sclerotomies while inserting and removing the trocars, prevents intraocular air or fluid leakage.No such problems arose in our study.

Post-operative hypotony following 25 -gauge suture less vitrectomy has been raised as a concern in the litera ture[13].Mean pre operative intraocular tension is 15.66 mm of hg and Mean post operative intraocular tension is 13.22 mm of hg in 25 -gauge of vitrectomy group. P value <0.01 signifies that definite change in preoperative to post operative intraocular tension. Out of all 25 -gauge vitrectomy cases had IOP less than 8 on post operative day 1 which increases to normal within 3 to 4 days. None of these patients developed hypotony related complications like choroidal detachment. IOP returned to normal range within first 48 – 72 hours with no adverse outcome on visual acuity.Tomic et al[14] published their comparative study between 23 -gauge and 25 -gauge PPV and reported a higher rate (41%) of transient hypotony in their 25 -gauge series compared to 14% in 23 -gauge group.

Out of all 50 cases of vitrectomy , all cases achieved desired effect, i.e. 100% success rate achieved with 25-gauge sutureless vitrectomy. However,the study period is very small to define further failure or need of re- surgery.

CONCLUSION

In summary, 25 gauge suture less vitrectomies is safe and minimally invasive. They enhance post-operative recovery. For 25 gauge vitrectomy, we need to select vitreo-retinal conditions requiring minimal tissue manipulations and dissection. Overall, procedures induce minimal ocular trauma, decrease inflammatory response and allows faster patient and visual recovery. Numerous studies have shown that sutureless small-incision cataract surgery reduces the postoperative inflammatory response. Similarly, it has been proposed that there is a reduced postoperative inflammatory reaction and faster postoperative recovery with the 25-gauge TSV system, compared with the conventional method of PPV[15,16]. In addition, there would be no suture-related irritation or local inflammatory reaction at the sclerotomy sites[17]. The frequency of local inflammatory reaction has been reported as 32% with Dacron, and 5% with polyglycolic acid suture[18].Eyes operated with the TSV system have been observed to be less-injected on the first postoperative day when compared with conventional PPV. There is no limbal stem cell damage due to conjunctival dissection, so it may be advantageous in eyes with corneal or conjunctival diseases such as dry eye. Further studies with longer follow-ups are warranted to determine if procedures involving more extensive fibrovascular proliferation should be performed especially with 25 – gauge instruments. Small gauge vitrectomy systems are gaining popularity among vitreoretinal surgeons owing to a decreased operation time, faster visual recovery and less patient discomfort[19,20]. The advances in vitrectomy cutters, illuminating probes and accessory instruments allow the surgeons for an easier access to the vitreous base, and surgical maneuvers can be performed in a greater range of motion.

The 25 gauge TSV system is feasible, effective, safe, and practical procedure for a variety of vitreoretinal disorders. The TSV allows for completely sutureless closed vitrectomy, obviates the need for conjunctival peritomy and suturing, and decreases surgically induced trauma, operation time, convalescence period, and postoperative inflammatory response. So, this study indicates 25- gauge vitrectomy surgery are effective in almost all the type of surgeries.

DISCLOSURE

The authors report no conflicts of interest in this work.

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