Original Article

Surgically Induced Corneal Astigmatism in Conventional 20 – Gauge Versus Trans-Conjunctival Sutureless 23 – Gauge Vitrectomy

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Purpose: The purpose of the study was to evaluate and compare the effects of 23G (gauge) tran-sconjunctival pars plana vitrectomy (PPV) with conventional 20G PPV in inducing corneal astigmatism.

Material and Methods: This was comparative, consecutive interventional study done at Institute of Ophthalmology Mayo Hospital Lahore from January 2011 till June 2011. 40 patients were selected and divided into two equal groups. Group I patients underwent 23G trans-conjunctival PPV while patients in group II were operated by conventional 20G PPV. Evaluation was done on 1st postoperative day, the 1st follow-up visit (after one week), 2nd follow up visit (after one month), 3rd follow-up visit (2 months post-op) and on fourth follow-up visit (after 3 months). On each visit keratometry (Huvitz Keratometer) along with anterior segment examination, posterior segment examination and intraocular pressure measurement were performed.

Results: There were total of forty patients divided into two equal groups, 22 were males and 18 females. Group-I was operated by trans-conjunctival 23G PPV whereas the group II underwent conventional 20G PPV. The surgically induced corneal astigmatism was lower at one week postoperatively in the 23G group (*P* = .006) compared with the 20G group (*P* = .001). One month postoperatively, the surgically-induced corneal astigmatism was still lower in the 23G group (*P* = 01).

Conclusion: 23G PPV induces much less surgically induced corneal astigmatism in comparison to 20G PPV.

PPV was developed by Robert Machemer, and it was performed using a 14-gauge instrument (2.1-mm diameter). 20G vitrectomy remained in vogue in the last two decades of the 20th century. Peyman developed a 23-G PPV probe in 1990[1], primarily for vitreous and retinal biopsy. Hilton also described an office-based sutureless-vitrectomy system. Fujii and associates[2,3], modified vitrectomy instruments and introduced 25-G PPV with sutureless self-sealing sclerotomies. Reduction in postoperative discomfort along with short surgical and recovery time, are few advantages of 23G over 20G PPV[4-7]. The 23-G PPV induces no corneal astigmatism and there is very significant stability for all the measured parameters between the preoperative and the postoperative conditions[8,9]. The self-sealing sclerotomies and the sutureless scleral and conjunctival incisions explain the corneal curvature stability after the procedure. By contrast, the conventional 20-gauge vitrectomy is responsible for significant corneal topographic changes in the first preoperative days or weeks[10].

The purpose of the study was to compare the pre-operative and post-operative corneal astigmatism and

hence assess corneal stability in 20G sutured versus 23G sutureless vitrectomy.

MATERIAL AND METHODS

The study was carried out at College of Ophthalmology and Allied Vision Sciences / King Edward Medical University, Mayo Hospital Lahore. The patients were admitted from Eye OPD of Mayo Hospital Lahore. Study was of six months duration from January 2011 till June 2011.

There were 40 eyes included in this study and 20 each were assigned to 20G & 23G group. Sampling technique was a comparative, consecutive and interventional study. Patients were selected randomly in both groups. Those included in the study had epiretinal membranes (ERM), macular hole, non-clearing vitreous hemorrhage, retained lens fragments, vitreomacular traction, diabetic macular edema and tractional retinal detachment (TRD). The patients who required cataract surgery per operatively or had a corneal pathology were excluded. Patients who required relaxing incisions to cornea, removal of intra-ocular foreign body, repair of rhegmatogenous retinal detachment or silicone oil insertion were also excluded from the study.

Forty consecutive eyes of patients presenting in vitreo-retina out-patient department of the Institute of Ophthalmology, Mayo Hospital, Lahore, from 1st January 2011 to 31st March were included in our study. Examination of the eyes included the recordings of corneal astigmatism, keratometric readings [M2], slit-lamp examination of anterior segment, fundus examination, B scan, OCT and FFA if required. All data including preoperative, operative and post operative recordings were collected. Follow up period was extended over 3 months with visits on day 1, 7, 30, 60 and 90. Outcome variables included preoperative and post-operative corneal keratometric readings (astigmatism) on each follow-up visit. Data was entered and analyzed using computer program EPI Info version "10" to find out frequencies and percentages. Descriptive statistics ware applied to determine the mean and standard deviation (SD) for variables like keratometric readings and hypotony. Chi-square test was applied to evaluate the results. P-value ≤0.05 was considered significant.

RESULTS

In 20G group 11 were males and 9 were females whereas in 23G group 10 were males and 10 females. In 20G group 14 had vitreous haemorrhage, 2 had macular hole and 4 had dropped lens in the vitreous whereas in 23-g group 10 had vitreous haemorrhage, 9 had macular hole and 1 had ERM (Macular Pucker).

Posterior vitreous detachment (PVD) had to be created intra-operatively in 10 (50%) of 20 eyes in the 23G group and 6 (30%) of 20 eyes in the 20G group. Retinal breaks associated with the maneuvers performed to create a PVD occurred in 1 (10%) of 10, and 1 (16.6%) of 6 eyes in the 23G and 20G groups, respectively, and were treated effectively with photocoagulation intra-operatively. No retinal detachments developed.

No severe postoperative hypotony developed in either group, although in 23G group-1 eye had IOP less than 7 mm Hg 1stday postoperatively which increased to more than 10-mm Hg in 2 days and no surgical intervention was required. There was no significant difference in complications in either group preoperatively and postoperatively. No choroidal detachment or bacterial endophthalmitis developed in either group.

The corneal induced astigmatism was lower 1 week postoperatively in the 23G group (P=.006) as compared with the 20G group (P = .001). One month postoperatively, the surgically induced corneal astig-matism was still lower in the 23-gauge group (P = .01).

Astigmatism in 20G group on first day had ranged from 2.5 D to 3.5 D with a mean of 3.25D, which reduced to a mean of 2 D on the 7th post operative day, 1.25 D after one month, 0.75 D by 2 months and 0.5 to 0.6 D by 3 months whereas astigmatism in 23G group on 1st post-operative day ranged from 0.25 D to 0.75 D with mean of 0.6 D, 0.5 D on 7th post operative day, 0.4 D after 1 month, 0.3 D after 2 months and 0.25 D after 3 months.

DISCUSSION

In our study there had been very rapid improvement and very low surgically induced astigmatism one week after surgery in patients undergoing 23-G PPV as compared with those undergoing 20-G PPV. Less surgically induced astigmatism in patients who underwent 23-G PPV had earlier visual rehabilitation with maximum vision improvement in the first couple of weeks. Although much work has been done on 25-G PPV and its role in surgically induced astigmatism, only limited studies are available regarding surgically induced astigmatism in 20-G and especially 23-G PPV. Our study shows that in the early post-operative

period, 23-G trans-conjunctival surgery is comparable to 25-G PPV with much less post-operative astigmatism, proving these techniques to be superior to the 20-G PPV. Complications, although occasionally common with 20-G PPV, were not observed in patients undergoing 23-G PPV. A patient had post-operative hypotony and a couple of patients had flare in anterior chamber after 23-G PPV, who recovered early with treatment.

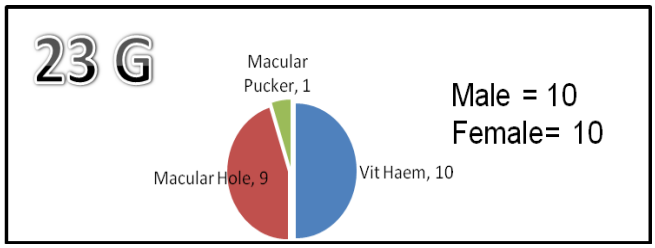


Fig. 1: - Indications for 20 G PPV

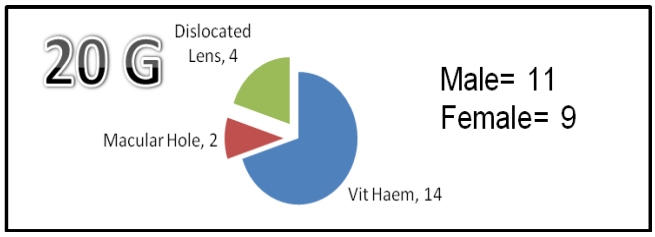
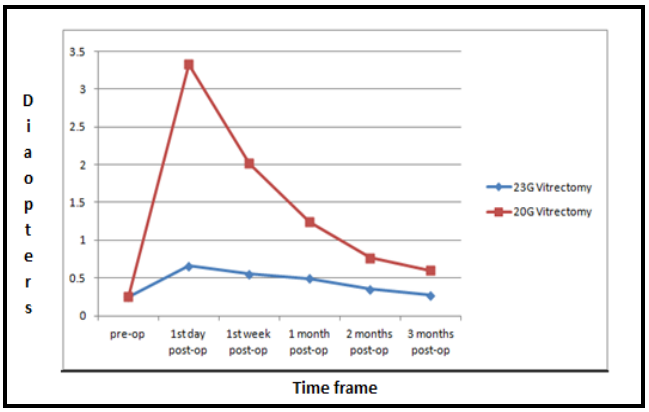


Fig. 2: - Indications for 23 G PPV



Graph: Surgically induced corneal astigmatism in 23G and 20G PPV

Domniz and associates described that the induced astigmatism in patients undergoing 20-guage vitrectomy, usually transient, may be attributed to suturing at the entry ports. Slusher et al reported that the lysis of the sutures after PPV reduce postoperative corneal astigmatism by more than 5.0 D. Bergmann et al reported that scleral cautery near the incisions changed corneal curvature by causing thermal contracture of the treated tissue and immediate central steepening. Wimpissinger and associates who compared the sutureless 23-G system with the standard 20-G system in PPV for various vitreoretinal disorders, randomly divided 60 patients into 2 groups and reported that the opening and closure times were significantly shorter and the duration of the vitrectomy was significantly longer in the 23-gauge system compared with the 20-gauge vitrectomy group. However, the degree of retinal manipulation and the overall duration of surgery did not differ significantly between the groups. Vitreous surgery for pre-retinal membranes can be a good indication for using the sutureless-trans-conjunctival 23G system to capitalize on the merits of and decrease the disadvantages of the surgical system.

CONCLUSION

The 23-gauge procedure resulted in less corneal astigmatic changes as compared to conventional 20-gauge vitrectomy.

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