COMPARISON OF INDUCED ASTIGMATISM AND VISUAL ACUITY IN 20-GAUGE VERSUS 23-GAUGE VITRECTOMY PROCEDURES

Muhammad Aftab[1], Sher Akbar Khan[2], Mahfooz Hussain[3], Mir Ali Shah[4]

[1-3] Department of Ophthalmology, Lady Reading Hospital, Peshawar - Pakistan.
[4] Department of Ophthalmology, Peshawar Medical College, Peshawar - Pakistan.
Address for correspondence:
Dr. Sher Akbar Khan
Assistant Professor
Department of Ophthalmology, Lady Reading Hospital, Peshawar - Pakistan.
Email: urhumbleme@yahoo.com
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ABSTRACT

Objective: To compare post-operative induced mean astigmatism and visual acuity in patients undergoing 20-gauge vitrectomy versus 23-gauge vitrectomy.

Methodology: It was a randomized controlled trial conducted in the Department of Ophthalmology, Lady Reading Hospital Peshawar from December 2015 till December 2016. Total 70 patients were enrolled on the basis of inclusion and exclusion criteria and were divided into group A and group B randomly on lottery method. Baseline astigmatism and visual acuity was calculated along with mean and standard deviation for each patient before surgery. Patients in group A underwent 20-gauge vitrectomy procedure while patients in group B underwent 23-gauge vitrectomy procedure. The patients were followed up at one week after the surgery. Post-operative astigmatism and visual acuity and their mean and standard deviation were calculated.

Results: In group A, mean pre operative astigmatism was 0.70 ±0.39, while in group B, it was 0.79 ±0.44. The mean post operative astigmatism in group A was 2.21 ±0.66, and in group B, it was 0.74 ±0.44. Mean induced astigmatism in group A was 1.52 ±0.51, while in group B, it was 0.08 ±0.25. The mean pre operative visual acuity in group A was 1.66 ±0.78, while in group B it was 1.41 ±0.71. The mean post operative visual acuity in group A was 0.84 ±0.42, while in group B it was 0.67 ±0.40.

Conclusion: Vitrectomy with 23-gauge instruments showed decreased induced astigmatism than 20-gauge vitrectomy; however, there was no significant difference in the visual acuity between the two procedures.

Key Words: Induced astigmatism, Vitrectomy, Visual acuity

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INTRODUCTION

Surgery induced astigmatism is an unwanted effect that can lead to poor visual and refractive outcomes in patients undergoing vitrectomy even when a technically precise procedure has been performed[1]. Conventional 20-gauge (G) pars plana vitrectomy requires that a 1.20 millimeter (mm) wide sclerotomy is made after conjunctival peritomy, both sclerotomies and conjunctival incisions should be closed with sutures. Sutures can also wrap the surface of the eye, leading to postoperative astigmatism[1]. With the newer 23G and 25G transconjunctival vitrectomy techniques, no sutures are required due to decreased sclerotomy diameter of these methods. Scleral incisions are made through the conjunctiva and are small enough to seal spontaneously. This is a safe procedure with less postoperative discomfort and requires no scleral sutures.

When performed with 23G instruments, sclerotomies have a width of 0.72mm. These sclerotomies are made by means of a tunnel incision that seal spontaneously. Instead of a usual perpendicular incision through the sclera as in 25G surgery, a tunnel-like tangential incision is made at a 30 to 40 degree angle through the sclera. Sutures are not required and the wound borders will close the incision in a valve-like manner via the intraocular pressure[2,3]. Previous research[4], demonstrated corneal topographic changes following 20-gauge and 23-gauge vitrectomy procedures. However, few researchers had done the comparison of induced astigmatism between the above two procedures.

METHODOLOGY

This was a randomized controlled trial conducted in the Department of Ophthalmology, Lady Reading Hospital Peshawar. Duration of study was 1 year, from December 2015 till December 2016. Inclusion criteria were all patients in the age range of 18 and 65 years with rhegmatogenous retinal detachment and with macula off (diagnosed through slit lamp or B-scan). Patients with previous history of any intraocular surgery with no available medical record, patients with hazy cornea assessed through slit-lamp and patients with preoperative astigmatism of ≥2.00D measured by keratometer were excluded from this study to avoid confounding factors.

A total of 70 patients were enrolled after approval of the study from hospital research ethics committee. Informed consent was taken from patients. Patients were divided into two groups; group A and group B randomly on simple random sampling (SRS). Baseline astigmatism was calculated and recorded before surgery from each patient by calculating the difference between horizontal corneal power and vertical corneal power. Same keratometer was used throughout the study by single person. Patients in group A were allotted 20-gauge vitrectomy procedure and for patients in group B, 23-gauge vitrectomy procedure was used. All patients in this study were operated by one qualified ophthalmologist with at least 5 years post fellow ship experience. The patients were followed up at one week after the surgery and post-operative astigmatism was calculated in the same way. Baseline visual acuity was calculated using snellen's chart and then converted to its logMAR equivalent for each group. Post operative visual acuity was checked at 7th post operative day using the same method. Data were analysed with SPSS version 20. The variables were pre operative and post operative astigmatism, induced astigmatism and pre & post operative visual acuity. Mean ± standard deviation of preoperative and post operative astigmatism and visual acuity were calculated. T-test was used to compare difference between pre operative mean astigmatism, visual acuity and post op induced astigmatism with unaided visual acuity in both groups. Categorical variables like gender were expressed using frequency and percentages. P value of ≤0.05 was considered as significant.

RESULTS

Total seventy patients were included in study; 35 patients were allotted to each group. In group A, 57.14% were male while in group B, 60% were males (Figure 1). The mean age of patients in group A was 53.05 ±10.84 (range 20-64 years), while that of group B was 54.48 ±8.60 (range 24-65 years).

In group A, mean pre operative astigmatism was 0.70 ±0.39, while in group B, it was 0.79 ±0.44. Mean post operative astigmatism and induced astigmatism in both groups is shown in Table 1. The p value comparing mean pre operative astigmatism between group A and group B was 0.37. Other details are shown in Table 1.

Figure 1: Gender distribution

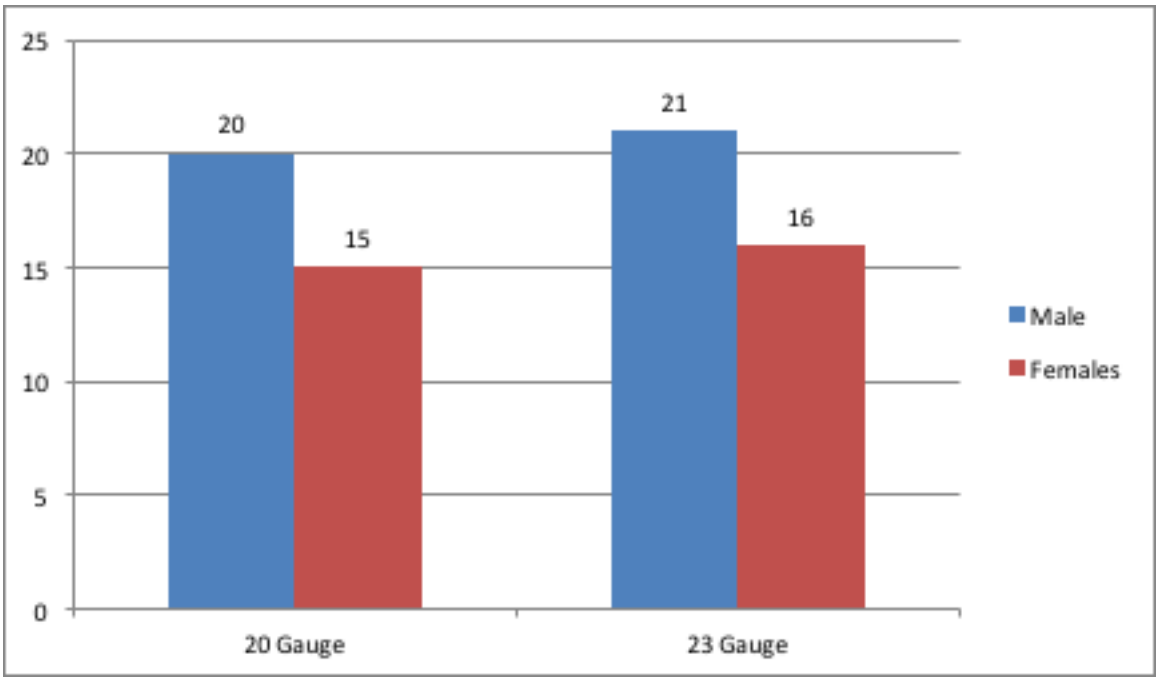

Table 1: Mean astigmatism

Astigmatism	20 Gauge	23 Gauge	P Value
Pre-op Astigmatism	0.70 ±0.39	0.79 ± 0.44	0.37
Post-op Astigmatism	2.21 ± 0.66	0.74 ± 0.44	<0.0001
Induced Astigmatism	1.52 ± 0.51	0.08 ± 0.25	<0.0001

Table 2: Visual acuities (log MAR)

Visual Acuity	20 Gauge	23 Gauge	P Value
Pre Operative Visual Acuity	1.66 ± 0.78	1.41 ± 0.71	0.16
Post Operative Visual Acuity	0.84 ± 0.42	0.67 ± 0.40	0.10
P Value	<0.0001	<0.0001	

The mean pre operative visual acuity in group A was 1.66 ±0.78, while in group B it was 1.41 ±0.71. The mean post operative visual acuity and the p value comparing pre and post operative visual acuities in both groups is shown in Table 2.

DISCUSSION

It puts the surgeon in a terrible situation when an excellent surgery is performed and the result is un expectedly poor visual outcome. The above scenario appears when there is high surgically induced astigmatism that overshadows the better visual results of the surgery. In our study, we compared the mean surgery induced astigmatism of 23-gauge pars plana vitrectomy procedures with that of 20-gauge. This study revealed less surgery induced astigmatism in 23-gauge vitrectomy group as compared to 20-gauge. This is important from early visual recovery point of view. The higher induced astigmatism in 20-gauge system is believed to be mainly due to two mechanisms, suturing of the sclerotomies and cauterization at the sites of slerotomies[5,6]. High surgery induced astigmatism overshadows the better visual results of the surgery while patients hope for early visual recovery. Early result is poor despite good long term visual prognosis in 20-G vitrectomy.

Some studies revealed that 23 gauge surgery does not induce significant changes in average corneal power hence less surgical induced astigmatism, but these do not compare it with 20-gauge system[7]. Another study by Yanyali et al[8] showed that the surgery induced astigmatic values reduced significantly after post-operative 1st week of 23-gauge procedures showing that early visual rehabilitation may be achieved with 23-gauge procedures. Again the limitation of the study is that it did not compare the 23-gauge system with either 20-gauge or 25-gauge system. Citirik et al[9], compared surgery induced astigmatism between 25 and 20-gauge vitrectomies and have shown that 25-gauge pars plana vitrectomies produce less astigmatism than 20-gauge vitrectomies.

Our study observed that 23-gauge procedure produces less induced astigmatism than 20-gauge procedure showing it to be superior. The same result was found in one other local study as well[10]. We calculated the post operative astigmatism only in the early post operative period. Studies have shown that several weeks after the surgery, the astigmastism keeps on changing and may even come to the pre operative status[11]. Our study also revealed that although the post operative visual acuity was better in 23-gauge procedure, however this difference was not statistically significant between the two groups. The visual acuity after vitrectomy procedures keep on changing during the post operative period, especially after removal of silicon oil or after absorption of gas, if used[12].

CONCLUSION

Vitrectomy with 23-gauge instrument procedure induces less astigmatism but there is no significant difference between best corrected visual acuities of 20 versus 23-gauge vitrectomy procedures. We only compared the visual acuity in early post operative period. Further evaluation of final visual outcome after a longer follow up is needed.

REFERENCES

1. Cho YJ, Lee JM, Kim SS. Vitreoretinal surgery using transconjunctival sutureless vitrectomy. Yonsei Med J 2004; 45:615-20.
2. Mentens R, Stalmans P. Comparison of postoperative comfort in 20-gauge versus 23-gauge pars plana vitrectomy. Bull Soc Belge Ophtalmol 2009; 311:5-10
3. Nagpal M, Paranjpe G, Jain P, Videkar R. Advances in small-gauge vitrectomy. Taiwan J Ophthalmol 2012; 2:6-12.
4. Grandinetti AA, Kniggendorf V, Moreira LB, Moreira Junior CA, Moreira AT. A comparison study of corneal topographic changes following 20-, 23-, and 25-G pars plana vitrectomy. Arq Bras Oftalmol 2015; 78:283-5. Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0004-27492015000550075&lng=pt&nrm=iso&tlng=en.
5. Domniz YY, Cahana M, Ayni I. Corneal surface changes after pars plana vitrectomy and scleral buckling surgery. J Cataract Refract Surg 2001; 27: 868-72.
6. Bergmann MT, Koch DD, Zeiter JH. The effect of scleral cautery on corneal astigmatism in cadaver eyes. Ophthalmic Surg 1988; 19:259-62.
7. Kim YK, Hyon JY, Woo SJ, Park KH, Yu YS, Chung H. Surgically induced astigmatism after 23-gauge transconjunctival sutureless vitrectomy. Eye 2010; 24:799–804.
8. Yanyali A, Horozoglu F, Macin A, Bozkurt KT, Aykut V, Acar BT et al. Corneal topographic changes after transconjunctival 23-gauge sutureless vitrectomy. Int Ophthalmol 2011; 31:277-82.
9. Citirik M, Batman C, Bicer T, Zilelioglu O. Keratometric alterations following the 25-gauge transconjunctival sutureless pars plana vitrectomy versus the conventional pars plana vitrectomy. Clin Exp Optometry 2009; 92:416–20.
10. Shah SRA, Mahju TM, Chaudry QL, Khan AA, Ahmad CN, Raza Z. Surgically induced corneal astigmatism in conventional 20-gauge versus transconjunctival sutureless 23-gauge vitrectomy. Pak J Ophthalmol 2013; 29:217-20.
11. Hirashima T, Utsumi T, Hirose M, Oh H. Influences of 27-gauge vitrectomy on corneal topographic conditions. J Ophthalmol 2017; 2017:8320909.
12. Nassar GA, Youssef MM, Hassan LM, Makled HS. Retinal sensitivity before and after silicone oil removal using microperimetry. J Ophthalmol 2019; 2019:2723491.

CONTRIBUTORS

MA conceived the idea, designed the study and collected data. SAK collected data, carried out literature search, calculated sample size and compiled references. MH carried out the procedure, followed up the patients for outcome; analyzed and compiled results; and carried out bibliography. MAS carried out statistical analysis, wrote and critically revised the manuscript and supervised all stages of the project. All authors contributed significantly to the submitted manuscript.