

Original Research Article

COMPARATIVE STUDY OF SURGICALLY INDUCED ASTIGMATISM WITH CLEARCORNEAL INCISION VS SCLEROCORNEAL INCISION IN CATARACT SURGERY BY PHACOEMULSIFICATION WITH FOLDABLE INTRAOCULAR LENS IMPLANTATION

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ABSTRACT

Background: The aim is to compare surgically induced Astigmatism with clearcorneal incision Vs Sclerocorneal incision in cataract surgery by Phacoemulsification with foldable intraocular lens implantation with the follow up period of up to 6 weeks by randomized clinical trial.

Results: In the present study, Majority of the patients were aged between 41-60 years in both the groups. Average age was 52.8years and 54.4yrs in Clearcorneal group and Sclerocorneal group respectively. In clear corneal incision group, 57% of patients had with-the-rule astigmatism, 23% of patients had against-the-rule astigmatism, and 20% had no astigmatism. In sclerocorneal incision group, 53% of patients had with-the-rule astigmatism, 27% of patients had against-the-rule astigmatism, and 20% had no astigmatism. Mean surgically induced astigmatism was 0.94D (0.56 SD) in clearcorneal group and 0.75D (0.49D) in sclerocorneal group ($p=0.15$). In both the groups 97% of pts had UCVA at 6 weeks post op/ 87% in clearcorneal group had UCVA > 6/12, whereas 80% in sclerocorneal group had UCVA > 6/18. In both the groups 97% of patients had BCVA > 6/9 at 6 weeks post op.

Conclusion: Present study concluded that, surgically induced astigmatism was higher in clear corneal group than sclerocorneal group but the difference was small and statistically insignificant ($P=0.15$). In patients with pre existing with-the-rule astigmatism, superior incisions resulted in decreased average postoperative keratometric astigmatism and in against-the-rule astigmatism has resulted in increased average postoperative keratometric astigmatism. Clear corneal incision has the advantage of sparing of conjunctiva, can be done under topical anaesthesia and relatively bloodless field.

Keywords: Astigmatism, clearcorneal incision, Sclerocorneal incision, Phacoemulsification, conjunctiva.

INTRODUCTION

Age related cataracts represent the most common cause of blindness in the world. Worldwide 14,000 new patients with cataract appear every day. Cataract surgery has become one of the safest, most successful and most frequently performed outpatient surgeries in the industrialized world. Approximately 6,000,000 implants are being done worldwide each year.

Cataract is the leading cause of avoidable blindness in India. Cataract surgery forms the major workload of most ophthalmic units in the country. An estimated 3.8 million people become blind because of cataract every year.^[1]

Conventional ECCE, Manual small incision cataract surgery and Phacoemulsification are the three most popular forms of cataract surgery in India and the rest of the world.

Phacoemulsification surgery, in which an ultrasound probe emulsifies the cataractous lens through a 2.8 mm incision, has become popular in the past decade as the method of choice for cataract surgery. Modern cataract surgery aims not only to improve vision but also to provide a good unaided visual acuity.^[2-9]

Astigmatism has considerable impact on quality of vision and has been shown to significantly affect patient's satisfaction with the postoperative outcome. Astigmatism is affected by surgical technique, the type and size of the incision, and wound location. Decreasing surgically induced Astigmatism has been a major goal in the advancement of cataract surgery.^[3]

Our study aims to compare surgically induced Astigmatism with clearcorneal incision Vs Sclerocorneal incision in cataract surgery by Phacoemulsification with foldable intra ocular lens.

Aims and Objectives

To compare surgically induced Astigmatism with clearcorneal incision Vs Sclerocorneal incision in cataract surgery by Phacoemulsification with foldable intraocular lens implantation with the follow up period of upto 6 weeks by randomized clinical trial.

MATERIALS AND METHODS

This is a prospective, randomized study conducted at Sarojini Devi Eye Hospital, Hyderabad from October 2009 to October 2011. 60 patients requiring cataract surgery were randomized into 2 groups. 30 eyes of 30 patients underwent Phacoemulsification with clear corneal incision with foldable IOL. 30 eyes of 30 patients underwent Phacoemulsification with

sclerocorneal incision with foldable IOL cataract surgery. Age of patients ranged from 40–70 years.

Inclusion Criteria

Age related cataracts of nuclear, cortical and posterior subcapsular types were included (immature cataracts).

Exclusion Criteria

- Complicated cataract
- Traumatic cataracts
- Cataracts with pterygium
- Cataracts with fundus pathology like diabetic retinopathy, ARMD.

The surgeries by both techniques were performed by the same surgeon and the operative conditions remained the same to enable better comparison.

All patients underwent complete preoperative evaluation including uncorrected and best corrected visual acuity by Snellens, slit lamp examination, fundus evaluation by direct ophthalmoscope and 90 D. B scan was done where required. Lacrimal syringing, IOP recording and systemic evaluation for diabetes and hypertension was done. IOL power calculation was done by keratometry and A scan Biometry using the SRK T formula.

Follow up of each case was done regularly, and on first postoperative day, 1st week and at 6 weeks, uncorrected and best corrected visual acuity, astigmatism by keratometry and automated refractometer, slit lamp examination, fundus evaluation and any postoperative complications were noted.

The surgery induced astigmatism was calculated based on the preoperative and postoperative keratometer readings using SIA software, appropriate statistical tests were used to analyse the results. (students t test).

RESULTS

Table 1: Age Distribution

Age group (yrs)	Clearcorneal	Sclerocorneal incision
30-41	2	1
41-50	11	12
51-60	11	9
61-70	6	8

Majority of the patients were aged between 41-60 years in both the groups. Average age was 52.8years

and 54.4yrs in Clearcorneal group and Sclerocorneal group respectively.

Table 2: Gender Distribution

Gender/Incision	Clearcorneal Incision (n=30)	Sclerocorneal Incision (n=30)
Male	18	14
Female	12	16

Clearcorneal group has 60% males and 40% females, Sclerocorneal groups has 49% males and 51% Females.

Table 3: Preoperative Astigmatism

Astigmatism/Incision	Clearcorneal Incision (n=30)	Sclerocorneal Incision (n=30)
White in the-rule	17(57%)	16(53%)
Against- the- rule	7(23%)	8(27%)
No astigmatism	6(20%)	6(20%)

In clear corneal incision group, 57% of patients had with-the-rule astigmatism, 23% of patients had against-the-rule astigmatism, and 20% had no astigmatism. In sclerocorneal incision group, 53% of

patients had with-the-rule astigmatism, 27% of patients had against-the-rule astigmatism, and 20% had no astigmatism.

Table 4: Surgically Induced Astigmatism

SIA/Incision	Clearcorneal Incision (n=30)	Sclerocorneal Incision (n=30)
0-0.75	15	19
1-1.75	12	10
2-2.50	2	1

Mean surgically induced astigmatism was 0.94D (0.56 SD) in clearcorneal group and 0.75D (0.49D) in sclerocorneal group (p=0.15)

Table 5: Mean surgically induced astigmatism (SD)

Incision/ follow up	1st POD	1ST week	6th week
Clearcorneal	1.22D(0.46)	1.13D(0.50)	0.94D(0.56)
Sclerocorneal	0.99D(0.32)	0.94D(0.36)	0.75D(0.49)
P value	0.02	0.09	0.15

Table 6: Accepted Cylinder

Accepted Cylinder/Incision	Clearcorneal Incision (n=30)	Sclerocorneal Incision (n=30)
Zero	6(20%)	6(20%)
0.25-0.75	14(47%)	16(53%)
1.00-1.75	9(30%)	8(27%)
2.00-2.50	1(3%)	0

Average cylinder correction was 0.57D in clearcorneal group and 0.52D in sclerocorneal group.

Table 7: Uncorrected visual acuity at 6 weeks

UCVA/Incision	Clearcorneal Incision (n=30)	Sclerocorneal Incision (n=30)
6/6	6(20%)	4(13%)
6/9	13(44%)	15(50%)
6/12	7(23%)	5(17%)
6/18	3(10%)	5(17%)
6/24	1(3%)	1(3%)

In both the groups 97% of pts had UCVA at 6 weeks post op/ 87% in clearcorneal group had UCVA >

6/12, whereas 80% in sclerocorneal group had UCVA > 6/18.

Table 8: Best corrected visual acuity at 6 weeks

BCVA/Incision	Clearcorneal Incision (n=30)	Sclerocorneal Incision (n=30)
6/6	22(74%)	21(70%)
6/9	7(23%)	8(27%)
6/12	1(3%)	1(3%)

In both the groups 97% of patients had BCVA >6/9 at 6 weeks post op.

DISCUSSION

Age related cataracts represent the most common cause of blindness in the world. Cataract surgery has become one of the safest, most successful and most frequently performed outpatient surgeries in the industrialized world.

Modern cataract surgery aims at not only to improve vision but also to provide a good unaided visual acuity.

Astigmatism has considerable impact on quality of vision and has been shown to significantly affect patient's satisfaction with the postoperative outcome. Decreasing surgically induced astigmatism has been a major goal in the advancement of cataract surgery. Astigmatism is affected by surgical technique, the type and size of the incision, and wound location.^[10] In this prospective randomized interventional study conducted in Sarojini Devi Eye Hospital over a period of 2 years, 60 eyes of 60 patients undergoing phacoemulsification were studied for the effect of location of incision on surgically induced astigmatism. The cases were randomized into 2 groups. 30 eyes of 30 patients underwent

phacoemulsification with clear corneal incision with foldable IOL and 30 eyes of 30 patients underwent phacoemulsification with sclerocorneal incision with foldable IOL. All the incisions were taken superiorly. Average age was 52.8 yrs and 54.4 yrs in clear corneal and sclerocorneal groups respectively. Clear corneal group had 60% males and 40% females, whereas sclerocorneal group had 49% males and 51% females. Mean preoperative keratometric astigmatism was 0.56 D in clear corneal group and 0.61 D in sclerocorneal group.

In clear corneal group mean surgically induced astigmatism was 1.22 (0.46 SD) at 1 POD, 1.13(0.50 SD) at 1st week and 0.94 (0.56 SD) at 6 weeks.

In Neilson PJ et al.10 study mean surgically induced astigmatism was 0.93 (0.89 SD) at 1 POD, 0.56 (0.57 SD) at 3 weeks, and 0.55 (0.57 SD) at 6 weeks.

In sclerocorneal group mean surgically induced astigmatism was 0.99 (0.32 SD) at 1 POD, 0.94 (0.36 SD) at 1st week, and 0.75 (0.49 SD) at 6 weeks. In Oshima et al study, mean surgically induced astigmatism was 0.76 (0.41 SD) at 1st week, 0.65 (0.44 SD) at 4 weeks, and 0.67 (0.37 SD) at 3 months.

In our study mean SIA at 6 weeks was higher in clear corneal group than sclero corneal group but the difference was small and statistically insignificant. ($p = 0.15$).

Clear corneal incision being closer to corneal centre causes more astigmatism than the scleral incision. In addition the collagen fibres of cornea provide lesser stability to wound compared to collagen fibres of sclera because of difference in their elasticity.

In Oslen et al study,^[11] conclusion was that clear corneal incision induces significantly more astigmatism than sclerocorneal incision; our study results are different when compared to it, possible explanation is in Oslen et al study incisions were made on steep axis of corneal astigmatism whereas in our study all the incisions are taken superiorly.

Poor-van Nouhuijs HM, Hendrickx KH, Van Marie WF, Boesten I, Beekhuis WH,^[12] compared the astigmatism induced by clear corneal incisions (CCIs) and corneoscleral tunnel incisions (CSIs) for cataract surgery over 6 months. Corneal topography was performed by computerized videokeratoscopy preoperatively and 6 months postoperatively. Their conclusion was the CCI for cataract surgery did not produce significantly greater astigmatism than the CSI. Concern over CCIs having a greater risk of increasing corneal astigmatism is unfounded and does not justify withholding the technique from patients it could benefit.

In clear corneal group 57% of patients had pre existing with-the-rule astigmatism, 23% had against-the-rule astigmatism and 20% had no astigmatism. Average preoperative keratometric astigmatism in with-the-rule patients was 0.70 D which decreased to 0.47 D postoperatively. In against-the-rule patients pre op astigmatism was 0.71 D which increased to 1.39 D postoperatively. In patients with no pre existing astigmatism there was 0.68 D postoperative astigmatism.

In sclero corneal group 53% of patients had preexisting with-the-rule astigmatism, 27% had against-the-rule astigmatism and 20% had no astigmatism. Average preoperative keratometric astigmatism in with-the-rule patients was 0.79 D which decreased to 0.32 D postoperatively. In against-the-rule patients pre op astigmatism was 0.71 D which increased to 1.37 D postoperatively. In patients with no preexisting astigmatism there was 0.83 D postoperative astigmatism.

Our study results are comparable with Neilsen et al's 10 study which showed preoperative against-the-rule astigmatism was reduced significantly by temporally placed clear corneal incisions and preoperative with-the-rule astigmatism, by superiorly placed clear corneal incisions. If one considers the preoperative astigmatism when selecting incision type and location for small incision cataract surgery, one can minimize postoperative keratometric astigmatism.

In both the groups 97% of patients had UCVA $\geq 6/18$ at 6 weeks post op. 87% in clear corneal group had UCVA $\geq 6/12$, whereas 80% in sclerocorneal group

had UCVA $\geq 6/12$. Patients with pre existing with-the-rule astigmatism were more in clear corneal group, which resulted in better UCVA in clear corneal group.

Average cylinder correction was 0.57 D in clear corneal group and 0.52 D in sclerocorneal group.

CONCLUSION

Surgically induced astigmatism was higher in clear corneal group than sclerocorneal group but the difference was small and statistically insignificant ($P=0.15$). In patients with pre existing with-the-rule astigmatism, superior incisions resulted in decreased average postoperative keratometric astigmatism and in against-the-rule astigmatism has resulted in increased average postoperative keratometric astigmatism. Clear corneal incision has the advantage of sparing of conjunctiva, can be done under topical anaesthesia and relatively bloodless field. Comparative studies with large number of subjects and long term follow up are necessary.

Limitations

Limitations of our study are small sample size and short duration of follow up. Astigmatism was calculated based on manual keratometric readings, corneal topography was not done due to non availability in our hospital.

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