

Surgically Induced Astigmatism after Phacoemulsification with Clear Corneal 3.2 Mm Incision While Using Superior versus Temporal Approach

Farhan Ali

1. Senior registrar
Sir Ganga ram
Hospital, Lahore

Abstract... Objective: is to assess incidence of surgically induced astigmatism followed by phacoemulsification with clear corneal 3.2mm incision while using temporal and superior approach. **Study Design:** Quasi Experimental trial. **Place and duration:** study was conducted at ophthalmology department of Ghazi medical collage Dera Ghazi Khan from December 2021 to November 2022 in one year period. **Methodology:** Patients were enrolled in two groups, temporal approach with clear corneal incision and superior approach with clear corneal incision was used. Main variables of study were astigmatism (D) after cataract surgery through phacoemulsification. For outcome measure at 1st postoperative day keratometry was performed and after that followed up at 2 weeks and 8 weeks period. SPSS versio 24 was used for data analysis. **Results:** Overall, 250 patients were included in our study. The Group I included 125 patients had 130 eyes. The Group II included 125 patients had 132 eyes. The average age of Group I and Group II was 56.45 ± 3.92 years and 57.97 ± 3.61 years, respectively. ($p=0.275$). The sex distribution of both the group was almost equal, ($p=0.893$). Whereas, the mean astigmatism of Group I was less than Group II, as 0.51 ± 0.22 and 0.85 ± 0.29 , respectively, ($p<0.001$). **Conclusion:** Clear corneal incision 3.2 mm and temporal approach induces less surgical astigmatism, even it can be used in against the rule astigmatism cases where horizontal meridian is steeper.

Keywords: Astigmatism, phacoemulsification, surgical association, temporal approach

Correspondence Address:
Dr. Farhan Ali
dr.farhanali85@gmail.com
Mob #+923346971080

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INTRODUCTION

Cataract surgery underwent numerous advances in interventions since it was described. In ancient couching was performed that was transferred to intracapsular surgical technique for cataract and after that latest phacoemulsification¹. Primary aim of all types of cataract surgeries is visual rehabilitation with earlier mobilization, but surgically induced astigmatism (SIA) is main obstacle and challenge for ophthalmic surgeons². With passage of time and along different inventions many surgeons strived hard to overcome this hurdle through adopting different surgical approaches³. Number of factors like type of surgery, incision type, type of lens and technique of intraocular lens insertion are involved in results of cataract surgery because of their own associated complications and safety measures⁴. Clear corneal incision has benefits of reduced pain and swelling, increased safety and reduced incidence of surgically induced astigmatism, it can also reduced surgical time and fast recovery⁵. Surgically induced astigmatism depends upon size, location, surgeon's position, wound architecture and comfort ability of procedure⁶.

Size of incision is also associated with stable and rapid optical recovery and reduced incidence of surgically induced astigmatism⁷. Number of studies was conducted on comparison of different types of incisions like superonasal, superior, temporal and supratemporal and incidence of astigmatism^{8,9}. During phacoemulsification at the time of cataract surgery incision at the steepest corneal axis provides small correction of astigmatism. Toric IOLs and peripheral corneal relaxing incision were also effective and safe incision types when preexisting astigmatism is more than 1 diopter¹⁰.

Methodology

This randomized quasi trial was conducted at ophthalmology department of Ghazi medical collage Dera Ghazi Khan from December 2021 to November 2022 in one year period. Study was started after ethical approval from hospital ethical committee. Non probability consecutive sampling technique was used. Written informed consent was obtained from patients after detail description of study and ensuring about confidentiality of their data. Sample size was calculated by using openepi.com online software with 95% confidence interval, 80% study power

and mean astigmatism in temporal group 0.48D and in superior group it was 0.99D in superior clear corneal incision.

All surgeries were performed by a single team of ophthalmic surgeons. Patients with astigmatism above 0.5D, sensitive to study drugs and who are not willing to give consent were excluded from the study. All patients were divided into two groups by lottery method. Patients admitted from outpatients department of hospital day before surgeries. Preoperative assessment of all patients includes measurement of visual acuity, intraocular pressure, funduscopy, slit lamp examination.

Javel Schiortz Keratometer was used for measurement of IOP. Surgery was performed under peribulbar injection of local anesthesia (Bupicaine 0.5% and Lignocaine 2%). In all patients a clear corneal injection was used. In temporal incision approach position of surgeon sitting was 3 o'clock in left eye and 9 o'clock in right eye. Similarly in superior approach at 12 o'clock position was used to make main port and 3 o'clock position used for side port in left sided eye.

Patients were advised a combination of topical antibiotics and steroids and follow up at 2 and 8 week. At every follow keratometry and auto refraction was done along with subjective refraction at 8 weeks follow up. SPSS version 24 was used for data analysis. Mean and SD was calculated for numerical data and frequency percentages for categorical data. Test of significance were applied and p values ≤0.05 was taken as significant.

Results

Overall, 250 patients were included in our study. The Group I included 125 patients had 130 eyes. The Group II included 125 patients had 132 eyes. The average age of Group I and Group II was 56.45±3.92 years and 57.97±3.61 years, respectively. (p=0.275). The sex distribution of both the group was almost equal, (p=0.893). Whereas, the mean astigmatism of Group I was less than Group II, as 0.51±0.22 and 0.85±0.29, respectively, (p<0.001). (Table. I).

The induced astigmatism distribution at different levels for one or two eyes, for Group I and Group II were shown in table II, the differences were statistically significant, (p<0.001). (Table. II).

Table-I: Demographic and clinical characteristics among the groups

Variable	Group		p-value
	Temporal clear corneal incision n=125	Superior clear corneal incision n=125	
Age (years)	56.45±3.92	57.97±3.61	0.275
Sex			
Male	83 (66.4)	84 (67.2)	0.893
Female	42 (33.6)	41 (32.8)	
Astigmatism	0.51±0.22	0.85±0.29	<0.001

Table. II

No. of eye	Group	Induced astigmatism distribution for one or two eye(s) in both the groups									Total	
		Induced astigmatism										
		0.25 D	0.56 D	0.85 D	0.75 D	0.45 D	0.35 D	0.55 D	1.00 D	1.50 D	1.25 D	
1	TCCI	8	7	13	8	18	10	18	0	0	0	82
	SCCI	0	0	0	30	0	0	0	20	8	35	93
	Total	8	7	13	38	18	10	18	20	8	35	175
2	TCCI	6	4	8	0	-	-	-	0	0	0	18
	SCCI	0	0	0	2	-	-	-	3	4	2	11
	Total	6	4	8	2	0	0	0	3	4	2	29

* Temporal clear corneal incision, *Superior clear corneal incision, p<0.001

Discussion

Primary goal of modern cataract surgery with phacoemulsification is to reduced corneal astigmatism after surgical procedure. Exact evaluation of corneal curvature is requiring as a result of surgery because this may induce different proportions of corneal astigmatism¹¹. Giansanti et al¹² conducted a study on 146 patients and compare temporal and superior clear corneal incision, SIA was found lower in temporal corneal incision approach as compared to superior approach. Incision size was 2.75mm in this study.

In our study demographics of patients were almost same. Another study was conducted by Marek et al¹³ and compared SIA incidence in 2.8mm temporal and superior incisions. On temporal group mean SIA was 0.63±0.28 D and in superior group it was 1.00±0.54 D, results in both groups were statistically significant p<0.05. Kohnen T et al¹⁴ also give favor to temporal 3.5mm incision approach when compared with other surgical approaches when final results evaluated after six month duration.

In our study mean astigmatism was observed in 0.51±0.22 in temporal incision approach and 0.85±0.29 in superior group. Another study by Moon SC et al¹⁵ reported in his study that 3.2 mm incision through temporal technique can hardly cause astigmatism as compared to superior approach and nor induced any change in preoperative astigmatism. In other Barequet et al¹⁶ compared temporal corneal incision with nasal and concluded that induced astigmatism is 0.74 D in temporal incision and 1.65 D in nasal incision technique.

Similarly Borasio et al¹⁷ compared clear corneal temporal incision with clear corneal on axis incision and after 2 months follow up of phacoemulsification astigmatism was noted 0.34 D in temporal group and in on axis group it was 0.63 D. Wei et al¹⁸ conducted a study and performed phacoemulsification using 3mm temporal incision and 3mm nasal clear corneal incision and concluded that temporal incision induces less SIA although 6mm foldable IOL was used.

In latest ophthalmic advances cataract surgery and intraocular lens implantation were considered and

appreciated as refractive surgery targeting emmetropia postoperatively¹⁹. Like our observation previous literature also reported that clear corneal temporal incision can cause less incidence of astigmatism. Pakravan et al²⁰ also compared temporal and nasal clear corneal incisions in cataract surgery with phacoemulsification technique. In post operative follow up 20% and 35% astigmatism was observed in both groups respectively.

Conclusion

Clear corneal incision 3.2 mm and temporal approach induces less surgical astigmatism, even it can be used in against the rule astigmatism cases where horizontal meridian is steeper.

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