Original Article

TO COMPARE KERATOMETRY ASTIGMATISM FROM TEMPORAL AND SUPERIOR CORNEAL INCISIONS DURING PHACOEMULSIFICATION

Mohammad Ashraf[1], Nazullah, Samina kareem[1], Mohammad Rafique[1], Sohail[1], Gul karam[2]

[1]Department of Ophthalmology Hayatabad Medical Complex Peshawar - Pakistan

[2]Department of Community medicine, Gajju Khan Medical College, Swabi - Pakistan

ABSTRACT

Objective: *To examine the average change in keratometry's medically produced astigmatism between lateral and phacoemulsification corneal incisions.*

Study Design: *Randomized Controlled Trial*

Study Duration and place of study: Department of Ophthalmology, Khyber Institute of Ophthalmic Sciences HMC, Peshawar. From 20-07- 2020 to 21-01-2021.

Materials and Methods: *A random allocation process divided 140 cataract patients into two groups. Phacoemulsification was performed using a superior corneal incision in group A and a temporal incision in group B. Baseline and follow-up keratometry readings were used to compute the average astigmatism change.*

Results: *Patient age averaged 49.6 + 5.3 years throughout the research group. Group B patients averaged 50.4 + 4.9 years old (p 0.04), whereas group A patients averaged 48.9 + 5.8 years. Group A included 82.9% males and 17.1% women, whereas group B had 74.3% men and 25.7% women (p 0.217). Group A's mean BMI was 24.9 + 3.8 kg/m2, whereas Group B's was 25.2 + 3.7. A and B had mean baseline BCVAs of 0.8 + 0.2 and 0.8 + 0.2, respectively (p 0.858). Keratometry showed group A's mean baseline astigmatism was 0.2 + 0.06D and group B's 0.1 + 0.07 (p 0.614). Keratometry showed that group A's mean follow-up astigmatism was 1.2 + 0.2D and group B's 1.1 + 0.2 (p 0.836). According to keratometry, group A's astigmatism changed by 1.0 + 0.17D and group B's by 1.0 + 0.2 (p 0.707).*

Conclusion: *We found no statistically significant difference in mean astigmatism before and after phacoemulsification in corneal vs temporal incision groups. Our study had a limited sample size and did not account for effect modifiers, thus we urge additional studies with higher sample sizes and accounting for confounders that may affect patients' medically induced astigmatism after phacoemulsification.*

Keywords: *Senile Cataract, phacoemulsification, temporal incision superior corneal incision, astigmatism, keratometry.*

INTRODUCTION

Cataracts are the leading cause of blindness worldwide. 17.6 million people worldwide have bilateral cataracts, which make up 39% of all causes of blindness.Cataracts account for 51.5% of Pakistan's avoidable causes of blindness[1].It is estimated that 570,000 adults in Pakistan are blind, while 3,560,000 people have visual impairments owing to cataracts[2]. In poor countries like Pakistan, where cataract surgery is the standard treatment, phacoemulsification is not often utilized since it needs more sophisticated surgical training and sophisticated, expensive equipment. Manual short incision cataract surgery (MSICS) is gaining popularity as an effective alternative to phacoemulsification in underdeveloped countries such as Pakistan because to its early wound stability, minimally produced astigmatism, low complication rate, and affordability[5]. Phacoemulsification, which involves a clean corneal incision, is now the main treatment option for cataracts because of its speedy and bloodless process. Postop

Correspondence:
Nazullah
Department of Ophthalmology Hayatabad Medical Complex Peshawar
Cell: 0333-5858978
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SIA (surgical-induced astigmatism) has always been a problem for most surgeons. Better strategies provide greater SIAs than temporal approaches, according to research[6]. As compared to large (7 mm) incisions, tiny (6 mm) and medium (6.5 mm) incisions induced the least amount of SIA[7]. It has also been shown that the chevron-shaped incision leads to a lower SIA[8] when compared to the straight and frown incisions. The corneal or keratometric SIA[9] is the vector difference between the preoperative and postoperative astigmas used in astigmatism measurement. The study found that the mean SIA for the temporal incision group was 1.05 (±0.58) D, 1.13 (±0.52) D, 1.13 (±0.56) D, and 1.08 (±0.52) D on the first, seventh, twenty-first, and forty-five postoperative days, while for the superior corneal incision group it was 0.75 (±0.58) D, 0.81 (±0.54) D, 0.88 (±0.49) D, and 0.91 (±0.47) D.

The present study aims to investigate the mean SIA of temporal versus superior corneal incisions created for phacoemulsification after cataract surgery11. After doing a thorough literature search, we discovered that there were very few, if any, local studies on the impact of the phacoemulsification type of incision on SIA and other outcomes. This gave us the idea to carry out this investigation.

Moreover, it depends on the surgeon's judgment on the best course of action to avoid SIA worsening during phacoemulsification[12]. This study will provide us with local data comparing the SIA between temporal and superior corneal incisions utilized for phacoemulsification. The results of the study will be used locally as fresh, first-hand proof of research implications and recommendations for future policy[13].

MATERIALS AND METHODS

The sample size for each group was 70, determined by the following hypothesis: The temporal group's mean difference in SIA before and 21 days after surgery was 1.13 ± 0.56D, whereas the group with superior incisions had a mean difference of 0.88 ± 0.49D. 95% confidence level Eighty percent test power. Consecutive sampling, which is not probabilistic, is the sampling technique used.

Inclusion Criteria:

All patients with cataracts are admitted for phacoemulsification.

Adults with age above 40 to 65 years.

Patients with baseline astigmatism equal to or less than 0.25D.

Either gender.

Exclusion Criteria:

Children with cataracts.

Patients with a history of chronic glaucoma on medical records.

Patients with blast injuries on history.

Any history of ocular or refractive surgery in the past.

The above-mentioned conditions act as confounders and if included will introduce bias in the study results.

DATA COLLECTION

The CPSP research committee gave their approval to the study. The study comprised all OPD/ER patients with cataracts and baseline astigmatism of 0.25D or below. Each patient signed a consent form after being informed of the purpose and advantages of the trial. Every patient had a comprehensive ophthalmologic examination, which included fundoscopy, gonioscopy, slit lamp, and ultrasonographic biomicroscopy. Every patient was divided into two groups by random.

Patients in group A underwent superior corneal incisions during phacoemulsification, whereas patients in group B received temporal incisions. A single CPSP fellow ophthalmologist with at least five years of experience performed phacoemulsification on every patient. On the first postoperative day, all patients were discharged with nepafenac and their regular post-phacoemulsification medication. For three months, 0.1% Nepafenac eye drops were administered to each patient three times a day. Repeat keratometry was performed after 21 days to evaluate astigmatism both before and after surgery. Pre-designed proforma was filled up using the aforementioned data. Strict adherence to exclusion criteria was maintained to reduce bias and confounding in study results.

Statically analysis

SPSS 20 was used to analyze the data. Age, BMI, baseline astigmatism, follow-up astigmatism, and baseline visual acuity were all calculated as mean+SD.

Gender and other category characteristics were calculated as percentages and frequencies. To determine the mean change in astigmatism scores between two groups, an independent sample T-test was used; a p-value of less than 0.05 was deemed significant. Using a chi-square test with a p-value of less than 0.05, the mean astigmatism change was analyzed stratified by age, BMI, gender, and baseline visual acuity. Tables and graphs were used to display every result.

RESULTS

140 participants with age-related cataracts participated in the research. By lottery, patients were divided into two groups at random. Group B had a superior corneal incision whereas Group A underwent a temporal incision for phacoemulsification. The average age of the patients in the study group was 49.6 + 5.3 years. Patients in group B were 50.4 + 4.9 years old on average (p 0.04), whereas those in group A were 48.9 + 5.8 years old on average. The age categories in the two groups are compared in Table 1. In Group B, there were 74.3% men and 25.7% women, whereas in Group A, there were 82.9% men and 17.1% women (p 0.217). Refer to Table 2. The mean BMI of group B was 25.2 + 3.7 kg/m2, whereas that of group A was 24.9 + 3.8 kg/m2. Baseline BCVAs for A and B were 0.8 + 0.2 and 0.8 + 0.2, on average (p 0.858). Basis BCVA and BMI are shown in Tables 3 and 4. According to keratometry, group B had a mean baseline astigmatism of 0.1 + 0.07 and group A had a mean of 0.2 + 0.06D (p 0.614). According to keratometry, group B had a mean follow-up astigmatism of 1.1 + 0.2 and group A had a mean of 1.2 + 0.2D (p 0.836). According to keratometry, astigmatism in group A changed by 1.0 + 0.17D and in group B by 1.0 + 0.2 (p 0.707). The mean astigmatism change in both groups by age, gender, BMI, and baseline BCVA are shown in the following

Table 1: Comparison Of Age Categories In Both Groups (n = 70 each)

	Incision Groups		P value
	Superior corneal incision	Temporal incision	
40-50 years	40	35	0.397
	57.1%	50.0%	
Age Categories	30	35	
> 50-60 years	42.9%	50.0%	
	70	70	
Total	100.0%	100.0%	

Table 2: Comparison Of Gender Between Both Groups (N = 70 Each)

	Incision Groups		P value
	Superior corneal incision	Temporal incision	
Male	58	52	0.217
	82.9%	74.3%	
Gender	12	18	
Female	17.1%	25.7%	
	70	70	
Total	100.0%	100.0%	

Table 3: Gender Wise Stratification Of Change In Astigmatism

Gender	Incision Groups	Mean	SD	P value
Male	Superior corneal incision	.9957	.16418	0.596
	Temporal incision	1.0135	.18606	
Female	Superior corneal incision	1.1500	.17321	0.038
	Temporal incision	1.0028	.18588	

Table 4: BMI Wise Stratification Of Change In Astigmatism

BMI (kg/m^2)	Incision Groups	Mean	SD	P value
195-25	Superior corneal incision	1.0361	.18921	0.110
	Temporal incision	.9621	.17508	
> 25-29.9	Superior corneal incision	.9864	.14734	0.295
	Temporal incision	1.0333	.16574	
> 29.9-32.5	Superior corneal incision	1.0458	.17896	.722
	Temporal incision	1.0773	.23808	
	Temporal incision	1.0071	.15024	

tables.

DISCUSSION

Cataract surgery has evolved. From ancient coaching to intracapsular to phacoemulsification cataract surgery. Surgically produced astigmatism is the biggest obstacle to postoperative visual rehabilitation without correction and timely deployment. Surgeons have worked hard to create SIA-reducing incisions[13]. The outcomes of cataract surgery depend on the incision, technique, type, mechanism, and IOL type. Self-sealing transparent corneal incisions are popular worldwide because they are better than sutured limbal incisions and scleral tunnels[14]. Clear corneal incisions reduce inflammation and discomfort. Compared to scleral tunnels, clear corneal wounds speed cataract surgery and recovery. SIA after surgery varies on wound location, size, architecture, surgeon position, and comfort[15]. A little incision accelerates visual healing and lowers SIA. Several investigations compared astigmatism to tiny superior, superonasal, superotemporal, and temporal incisions. Phacoemulsification incision on the steepest corneal axis after cataract surgery may correct corneal architectural astigmatism[15]. For astigmatism above 1 diopter, toric IOLs and peripheral corneal relaxing incisions worked. Modern cataract surgery reduces corneal astigmatism, improving vision. Incisions may modify corneal astigmatism, thus curvature must be checked before and after surgery. Both groups exhibited similar preoperative SIAs. Fair SIA scores were provided to patients. Low eyesight raises SIA scores.[16]. Temporal and nasal clean corneal groups of 60 eyes. Both groups assessed UCVA and BCVA 1 and 3 months post-surgery. At 3 months, group A had a mean UCVA of 0.25±0.30 while group B had 0.17±0.15.[17]. Astigmatic results of temporal vs. nasal clear corneal incisions in phacoemulsification cataract surgery. Temporal patients had 30.00% WTR, 50% ATR, and 20% no astigmatism before surgery, whereas nasal patients had 40%, 25%, and 35%. A 6 mm foldable IOL and 3 mm temporal and nasal clear corneal incisions were used for 1.2D[18] phacoemulsification. They said temporal incision lessened SIA than nasal. After one month, the temporal group had a mean SIA of 0.81±0.64 D, whereas the nasal group had 0.92±0.53 D. The temporal group saw a decrease in SIA to 0.53±0.39 D after 3 months, whereas the nasal group had 0.62±0.48 D. Moon14 examined incision size, astigmatism efficiency, and stability. Three groups of 2.5, 3, and 3.5 mm self-sealing corneal lesions were examined. 1.05 D, 0.84 D, and 0.95 D were the SIA means for 2.5, 3.0, and 3.5 mm. 3.0 mm incisions were lowest SIA[19]. compared 2.75 mm temporal clean corneal incisions to the superior technique in 146 eyes. The temporal corneal incision was less SIA than the superior clear. A prospective randomized trial compared temporal and on-axis clean corneal incisions for SIA following phacoemulsification in mild to moderate astigmatism[20]. Temporal SIA was 0.34 D and on-axis 0.63 D at 2 months. Conclusion: clean corneal temporal incision decreased SIA more than axis. SIA was compared for temporal and superior 2.8 mm clean corneal incisions. The temporal group had a mean SIA of 0.63±0.28 D, whereas the superior group had 1.00±0.54 D, with significant differences ($p<0.05$). A 2.8 mm clean corneal temporal approach outperformed a comparable superior incision[21]. examined how corneal wound size affects medically produced astigmatism following unsutured temporal clear corneal incisions and phacoemulsification. Compare 2.5 and 3.5 mm wounds. Vector analysis using Alpin's approach calculated SIA. At 2.5 mm incision, the mean SIA was 0.84±0.53 D, whereas at 3.5 mm, it was 1.19±0.81 D. 3.5 mm has a higher mean SIA. Vector analysis showed a mean 6-week SIA of 1.17 D and 12-month SIA of 1.04 D. The incision greatly impacted SIA22. At 6 weeks, temporal incisions averaged 0.74 D and nasal 1.65 D. These levels dropped to 0.71 D and 1.41

D after 12 months. Say clean corneal incisions are tempting but hazardous. Endothelial cell loss, uneven astigmatism, and poor wound healing were drawbacks. Giasanti et al. revealed only statistically significant but minimal clinically meaningful SIA differences between superior and 8 o'clock incisions (-0.15–-0.32 D and 0.10-0.27 D). We detected significant parameter SIA differences between nasal and temporal and superior and temporal incisions, in addition to Giasanti et al.'s superior-nasal difference. Superior-temporal difference confirmed by Marek et al[9724].

CONCLUSION

In corneal and temporal incision groups, phacoemulsification did not change astigmatism. Our research had a limited sample size and did not account for impact modifiers, thus we urge bigger investigations including confounders that may influence surgically produced astigmatism in phacoemulsified individuals.

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