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## Astigmatism after Phacoemulsification while Using Superior versus Temporal Approach

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### 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.

**Methods:** 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 1<sup>st</sup> postoperative day keratometry was performed and after that followed up at 2 weeks and 8 weeks' period. SPSS version 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  $56.45 \pm 3.92$  years and  $57.97 \pm 3.61$  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  $0.51 \pm 0.22$  and  $0.85 \pm 0.29$ , 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:** Phacoemulsification, Surgically induced astigmatism, Superior approach, Temporal approach.

## 1. 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 phacoemulsification<sup>1</sup>. Primary aim of all types of cataract surgeries is visual rehabilitation with earlier mobilization, but surgical induced astigmatism (SIA) is main obstacle and challenge for ophthalmic surgeons<sup>2</sup>. With passage of time and along different inventions many surgeons strived hard to overcome this hurdle through adopting different surgical approaches<sup>3</sup>.

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 measures<sup>4</sup>. Clear corneal incision has benefits of reduced pain and swelling, increased safety and reduced incidence of surgical induced astigmatism, it can also reduce surgical time and fast recovery<sup>5</sup>. Surgically induced astigmatism depends upon size, location, surgeon's position, wound architecture and comfort ability of procedure<sup>6</sup>.

Size of incision is also associated with stable and rapid optical recovery and reduced incidence of surgically induced astigmatism<sup>7</sup>. Number of studies was conducted on comparison of different types of incisions like superonasal, superior, temporal and supratemporal and incidence of astigmatism<sup>8,9</sup>. 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 diopter<sup>10</sup>.

## 2. 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 approved by hospital ethical committee. 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 temporal 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.

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Patients were advised a combination of topical antibiotics and steroids and follow up at 2 and 8 weeks. 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  $\leq 0.05$  was taken as significant.

### 3. 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  $56.45 \pm 3.92$  years and  $57.97 \pm 3.61$  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  $0.51 \pm 0.22$  and  $0.85 \pm 0.29$ , 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, ( $p < 0.001$ ). (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)	$56.45 \pm 3.92$	$57.97 \pm 3.61$	0.275
Sex			
Male	83 (66.4)	84 (67.2)	0.893
Female	42 (33.6)	41 (32.8)	
Astigmatism	$0.51 \pm 0.22$	$0.85 \pm 0.29$	<0.001

**Table. II**

**Induced astigmatism distribution for one or two eye(s) in both the groups**

No. of eyes	Gr ou p	Induced astigmatism										Total
		0.2 5 D	0.5 6 D	0.8 5 D	0.7 5 D	0.4 5 D	0.3 5 D	0.5 5 D	1.0 0 D	1.5 0 D	1.2 5 D	
I	TC CI	8	7	13	8	18	10	18	0	0	0	82
	SC CI	0	0	0	30	0	0	0	20	8	35	93
	To tal	8	7	13	38	18	10	18	20	8	35	175
	2	TC CI	6	4	8	0	-	-	-	0	0	0
SC CI	0	0	0	2	-	-	-	3	4	2	11	
To tal	6	4	8	2	0	0	0	3	4	2	29	

### 4. DICSCUSSION

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 astigmatism<sup>11</sup>. Giansanti et al<sup>12</sup> 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 al<sup>13</sup> and compared SIA incidence in 2.8mm temporal and superior incisions. On temporal group mean SIA was  $0.63 \pm 0.28$  D and in superior group it was  $1.00 \pm 0.54$  D, results in both groups were statistically significant  $p < 0.05$ . Kohnen T et al<sup>14</sup> 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  $0.51 \pm 0.22$  in temporal incision approach and  $0.85 \pm 0.29$  in superior group. Another study by Moon SC et al<sup>15</sup> 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 al<sup>16</sup> 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 al<sup>17</sup> 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 al<sup>18</sup> 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 postoperatively<sup>19</sup>. Like our observation previous literature also reported that clear corneal temporal incision can cause less incidence of astigmatism. Pakravan et al<sup>20</sup> 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.

## 5. 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.

## REFERENCES

1. Kaushal J, Lune AA, Mushtaq I, Singh M. Comparative study of astigmatic outcomes and incisional integrity in temporal clear corneal incision and superior scleral incision phacoemulsification surgery. *Indian Journal of Clinical and Experimental Ophthalmology*. 2019;5(4):432-6.
2. Kanwal M, Tahir MA, Rabani A, Rehman AU, Cheema A, Ateeq A.

- Changes in Corneal Astigmatism after Closing Clear Corneal Incision by Simple Hydration Undergoing Phacoemulsification at the Department of Ophthalmology JPMC. *Pakistan Journal of Medical & Health Sciences*. 2022 Oct 2;16(08):p493.
3. Makayee AA, Nazir N, Nabi M, Ayoob S. A Comparative Study of Surgically Induced Astigmatism after Phacoemulsification by Temporal Clear Corneal and Superior Clear Corneal Approach.2019;18(1):13-18.
4. Kumar J, Batham S. Surgically Induced Corneal Astigmatism Following Cataract Surgery.2021;20(6):14-17.
5. Qian YS, Huang J, Liu R, Chu RY, Xu Y, Zhou XT et al.. "Influence of internal optical astigmatism on the correction of myopic astigmatism by LASIK". *J cataract Refract Sur* 2011; 37 (12): 863–868.
6. Piao J, Joo CK. Site of clear corneal incision in cataract surgery and its effects on surgically induced astigmatism. *Scientific Reports*. 2020 Mar 3;10(1):1-9.
7. Pattanayak S, Mathur S, Nanda AK, Subudhi BN. Postoperative astigmatic considerations in manual small-incision cataract surgery-A review. *Indian Journal of Ophthalmology*. 2022 Nov 1;70(11):3785-90.
8. Ahmed SM, Sayed MY, Mahran WM. Refractive changes with corneal incision 2.8 mm after phacoemulsification. *Egyptian Journal of Medical Research*. 2022 Oct 1;3(4):72-85.
9. Nikose AS, Saha D, Laddha PM, Patil M. Surgically induced astigmatism after

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- phacoemulsification by temporal clear corneal and superior clear corneal approach: a comparison. *Clin Ophthalmol.* 2018 Jan 3;12:65-70.
10. Alpíns N, Stamatelatos G. "Customized photoastigmatic refractive keratectomy using combined topographic and refractive data for myopia and astigmatism in eyes with forme fruste and mild keratoconus". *J cataract Refract Surg* 2007; 33 (4): 591–602.
  11. Je HY, Kyun HK, Dong HN. Surgically induced astigmatism after 3.0 mm temporal and nasal clear corneal incisions in bilateral cataract surgery. *Indian J Ophthalmol.* 2013;61(11):645–648.
  12. Giansanti F, Rapizzi E, Virgili G, et al. Clear corneal incision of 2.75 mm for cataract surgery induces little change of astigmatism in eyes with low preoperative corneal cylinder. *Eur J Ophthalmol.* 2006;16:385–393.
  13. Marek R, Kluś A, Pawlik R. Comparison of surgically induced astigmatism of temporal versus superior clear corneal incisions. *KlinOczna.* 2006;108(10–12):392–396.
  14. Kohnen T, Dick B, Jacobi KW. Comparison of the induced astigmatism after temporal clear corneal tunnel incisions of different sizes. *J Cataract Refract Surg* 1995; 21(4): 417-24.
  15. Moon SC, Mohamed T, Fine IH. Comparison of surgically induced astigmatism after clear corneal incisions of different sizes. *Korean J Ophthalmol.* 2007; 21: 1–5.
  16. Barequet IS, Yu E, Vitale S, et al. Astigmatism outcomes of horizontal temporal versus nasal clear corneal incision cataract surgery. *J Cataract Refract Surg.* 2004;30:418–423.
  17. Borasio E, Mehta JS, Maurino V. Surgically induced astigmatism after phacoemulsification in eyes with mild to moderate corneal astigmatism: temporal versus on-axis clear corneal incisions. *J Cataract Refract Surg.* 2006;32(4):565–572.
  18. Wei YH, Chen WL, Su PY, Shen EP, Hu FR. The influence of corneal wound size on surgically induced corneal astigmatism after phacoemulsification. *J Formosan Med Assoc.* 2012;111:284–289.
  19. Buckhurst PJ, Wolffsohn JS, Davies LN, N aroo SA. Surgi cal cor r e c tion of astigmatism during cataract surgery. *Clin Exp Optom* 2010;93(6): 409-18.
  20. Pakravan M, Nikkhah H, Yazdani S, Shahabi C, Sedigh Rahimabadi M. Astigmatic outcomes of temporal versus nasal corneal phacoemulsification. *J Ophthalmic Vis Res.* 2009;4(2):79–83.