



Effect of Alignment of Clear Corneal Incision on Preexisting Astigmatism in Phacoemulsification

KEYWORDS

Astigmatism, Steep corneal meridian, Alignment, phacoemulsification.

Dr. Sangeeta Shisode (Patil)

. Associate Professor , Dept of Ophthalmology, Govt. cancer Hospital, Aurangabad, Near Tapadia nagar, Darga Road, Shahnoorwadi, Aurangabad, 431005.

Dr. Sweety Balram Dahatonde

Assistant professor, Dept of Ophthalmology, Govt. Medical College & Hospital, Aurangabad, Manak nagar, By-pass Zanshi Square, (kali) Karanja Lad. Dist-Washim 444105

ABSTRACT *Introduction-* Cataract surgery is regarded as refractive surgery, aiming emmetropia which makes eliminating corneal astigmatism necessary.

Aim- To study the effect of alignment of clear corneal incision on pre-existing astigmatism in phacoemulsification

Materials & Methods- In study of 100 patients with mild to moderate corneal astigmatism 2.8mm perpendicular incision is placed on steep corneal meridian measured by Keratometry. Placement of steep corneal temporal or superior incision results in with-the-rule or against-the-rule astigmatism respectively.

Results- The mean preoperative astigmatism was 1.41 ± 0.58 D with a range from 0.75-3D. The mean post-operative astigmatism was 1.06 ± 0.49 D with a range from 0.25 to 3 diopters. The change in astigmatism was -1.25 D to + 0.50 D with a mean change of -0.52 ± 0.27 D. The difference is found statistically significant ($p < 0.0001$).

Conclusion- Alignment of clear corneal incision on steep meridian is simple way to reduce preexisting astigmatism in phacoemulsification cataract surgery. The preexisting astigmatism decreases more in superotemporal incision than superior or superonasal incision.

Introduction-

Cataract affects approximately 20 million people worldwide & figure is expected to reach 50 million by year 20201. In India, 2001- 7.75 million people were affected and figure will reach 8.25 million by year 20202. Cataract surgery, currently, among the most performed planned surgical procedures worldwide, positively impacting over patients' quality of life³. Astigmatism is a visually disabling refractive error affecting the general population, especially those with cataracts⁴. With increased patients' expectations, the trend is not only to remove the cataract, but also to address the problem of pre-existing astigmatism. Cataract surgery is currently considered as a surgical approach for refractive errors⁵. Small incision cataract surgery doesn't require suturing of wound has low risk of intraoperative and postoperative complications and results in rapid visual rehabilitation⁶. Phacoemulsification results in better postoperative visual acuity than Extracapsular cataract surgery at all postoperative intervals⁷. Therefore, phacoemulsification is almost universally preferred nowadays⁸. Spectacle or contact lenses can be used to correct astigmatism. Spectacle results in various optical aberration & contact lens wear has a number of side effects⁹. Correction of pre-existing astigmatism simultaneously with cataract surgery is attempted nowadays. Different methods of reducing astigmatism during cataract surgery include keratotomy, toric intraocular lens, opposite clear corneal incision, limbal relaxing incision⁷. A clear corneal incision given during phacoemulsification surgery at steep meridian of cornea reduces pre-existing astigmatism^{10,11}. The objective of our study was to know the mean change in pre-existing astigmatism by alignment of clear corneal incision in phacoemulsification surgery.

Materials & methods

It was a prospective hospital based study conducted at a tertiary care center.

Aim was to study the effect of alignment of clear corneal incision on pre-existing astigmatism in phacoemulsification. Total 100 patients fulfilling the inclusion criteria were included in study which was conducted over a period of 6 months.

1. Inclusion criteria-

All patients with age related cataract with pre-existing astigmatism of 0.75 D or more (mild to moderate astigmatism)

2. Exclusion criteria-

Patients with irregular astigmatism

Astigmatism due to pterygium

Previous ocular surgery

Corneal opacity

Traumatic or complicated cataract

Ethical committee approval was taken before starting study and written consent was taken from patients.

Pre-operatively detailed history was taken and complete systemic and ocular examination was done, including keratometry for the type and degree of astigmatism.

All the cases were operated by single surgeon by standard phacoemulsification technique with IOL implantation by. A 2.8 mm perpendicular clear corneal incision at the steep meridian of cornea was taken.

Post-operatively each patient received antibiotic & steroid eye drop 4 times/day. Eye drop was tapered over 6 weeks. Postoperatively patients were followed upto 6 weeks. At

follow up visit, keratometry was performed to see the effect of incision site in the form of correction of pre-existing astigmatism. All the relevant data was recorded in a pre-designed proforma. All the collected data was analyzed using SPSS version 20.0.

Observations & Results-

Total 100 patients were included in study with the age ranged from 40 to 70 years with mean age 52 ± 10.08 years. 53 (53%) patients were male while 47 (47%) patients were female.

Pre-operative astigmatism in all the patients was measured in diopters (Table 1).

The mean pre-operative astigmatism was 1.41 ± 0.58 diopters with a range from 0.75 to 3 diopters.

All patients were followed up to 6 weeks & post-operative astigmatism was recorded (table 2). The mean post-operative astigmatism was 1.06 ± 0.49 diopters with a range from 0.25 to 3 diopters.

Table 1. Pre-operative astigmatism (In Diopters)

Astigmatism (Diopters)	Frequency (%)
0.75	17
1.00	26
1.25	9
1.50	20
1.75	5
2.00	11
2.25	2
2.50	6
2.75	2
3.00	2
Total	100

Mean pre-operative astigmatism $1.41 \pm 0.58D$

Table 2 Post-operative astigmatism (In Diopter)

Astigmatism (diopters)	Frequency (%)
0.25	10
0.50	15
0.75	20
1.00	13
1.25	16
1.50	10
1.75	6
2.00	5
2.25	2
2.50	1
2.75	1
3.00	1
Total	100

Mean post-operative astigmatism $1.06 \pm 0.49D$

Difference between pre-operative & post-operative astigmatism was noted at 6 weeks. The change in astigmatism was $-1.25 D$ to $+ 0.50$ diopters with a mean change of -0.52 ± 0.27 diopters. The astigmatism decreased in 93 eyes, remained unchanged in 3 eyes and increased in 4 eyes. Student t test was applied for significance of change in astigmatism after surgery. The p value was 0.0001 which is considered to be statistically significant. It was observed that the decrease in astigmatism was more towards the temporal incision than nasal incision.

Discussion-

Modern cataract surgery aims at achieving a good refractive outcome post-operatively with minimal postoperative astigmatism¹². Patient expect their vision to improve after cataract surgery and, increasingly, they expect to be free of the glasses. To meet or exceed patient expectation, cataract surgeon must pay increasing attention to the management of pre-existing corneal astigmatism at the time of cataract surgery. Placing incision on the steepest meridian results in decreased refractive power in that meridian and an increased refractive power in the meridian perpendicular to it¹³. This concept is utilized in our study. In our study a 2.8 mm self-sealing perpendicular incision was given to the steep axis of cornea to assess the effect of a site of incision on neutralizing the pre-existing astigmatism. Our study shows that by placing a 2.8mm perpendicular clear corneal incision on steep meridian of cornea, it is possible to reduce pre-operative astigmatism of 0.75D or more. The decrease in astigmatism at the follow up was -0.52 ± 0.27 diopters.

Similar results were obtained by Akbar Khan et al¹ with a 3.2mm self-sealing incision perpendicular to steep meridian of cornea in eyes with pre-operative astigmatism of 1D or more.

Corresponding figures have been reported to be 0.5 Diopters by Tados¹⁴ and 1.5 Diopters by Khokhar¹⁰. Lever and Dahan¹⁵ reported in their study that a 3.5 mm opposite clear corneal incision in the steep meridian was effective in reducing pre-existing corneal astigmatism by a mean value of 2 Diopters.

In our study a 2.8 mm clear corneal incision was given in all cases, in the steep meridian. Post-operative keratometry was done 6 weeks after the surgery, to give time for complete wound healing and stabilization of refraction. The decrease in astigmatism at the follow up was -0.52 ± 0.27 diopters. The difference between pre-operative & post-operative astigmatism was found statistically significant ($p < 0.0001$).

However, it may not fully correct high astigmatism but it can be combined with other procedures to achieve emmetropia.

Conclusion-

We can gain effective results by aligning the 2.8mm perpendicular clear corneal incision at the steep meridian in Phacoemulsification. With the minimal investment of instruments and time, this simple technique help us to achieve emmetropia rather than adding surgical astigmatism.

REFERENCES:

1. Akbar Khan, Mumtaz Alam, Muhammad Rafiq Afridi, Imran Ahmad. Effect of incision site on pre-existing astigmatism in phacoemulsification. Pak J Ophthalmol 2014;30(1): 45-8.
2. GVS Murthy, Sanjee K Gupta. The Right to Sight initiative in India. IJO
3. Gothwal VK, Wright TA, Lamoureux EL, Pesudovs K. Measuring outcomes of cataract surgery using the Visual Function Index-14. J Cataract Refract Surg.2010;36(7):1181-8.
4. Kara-Jose Junior N, Santhiago MR. [Aspherical IOLs: clinical evaluation and options]. Rev Bras Oftalmol. 2009;68(3):175-9. Portuguese.
5. Alió JL, Agdeppa MC, Pongo VC, El Kady B. Microincision cataract surgery with toric intraocular lens implantation for correcting moderate and high astigmatism: pilot study. J Cataract Refract Surg.2010;36(1):44-52.
6. Ahmad A, Ahmad J. Combined phacoemulsification, intraocular lens implantation and trabeculectomy. Pak J Ophthalmol. 2000; 16: 26-8.

7. Yi DH, Sullivan BR. Phacoemulsification with indocyanine green versus manual expression extracapsular cataract extraction for advanced cataract. *J Cataract Refract Surg.* 2002; 28: 2165-9.
8. Chakrabarti A, Singh S. Phacoemulsification in eyes with white cataract. *J Cataract Refract Surg.* 2000; 26: 1041-7.
9. Kanski JJ. Cornea. In: Kanski JJ *Clinical Ophthalmology. A systemic approach* 7th ed. Butterworth Heinemann Elsevier 2007; 167-238.
10. Khokhar S, Lohiya P, Murugiesan V, Panda A. Corneal astigmatism correction with opposite clear corneal incisions or single clear corneal incision: Comparative analysis. *J Cataract Refract Surg.* 2006; 32: 1432-7.
11. Altan – Yaycioglu R, Akova YA, Akca S, Gur S, Oktem C. Effect on astigmatism of the location of clear corneal incision in phacoemulsification of cataract. *J Cataract Refract Surg.* 2007; 23: 515-8.
12. Rainer G, Menapace R, Vass C. Corneal shape changes after temporal and superolateral 3.0 mm clear corneal incisions. *J Cataract Refract Surg.* 1999; 25: 1121-6.
13. Elkington AR, Frank HJ, Greaney MJ. Refractive surgery. In: *Clinical Optics.* 3rd edition. 1999; 242-54.
14. Tadros A, Habib M, Tejiwani D, Lany HV, Thomas P. Opposite clear corneal incisions on the steep meridian in phacoemulsification: early effects on the cornea. *J Cataract Refract Surg.* 2004; 30: 414-7.
15. Lever J, Dahan E. Opposite clear corneal incision to correct preexisting astigmatism in cataract surgery. *J Cataract Refract Surg.* 2000; 26: 803-5.