

# Effect of 3.2 mm Superior Scleral Incision For Phacoemulsification on Corneal Curvatures (Assessed by K-Readings)

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**Purpose:** To see the effect of 3.2mm superior scleral incision 1mm posterior to limbus for phacoemulsification on vertical (k1) and horizontal (k2) meridian of cornea.

**Material and Method:** Retrospective study of 100 eyes of 85 patients operated by phacoemulsification with foldable IOL at Eye Department CMH Lahore, from September 2003 to August 2004.

**Results:** Out of 85 patients  $\pm$  48 (56.47%) were females and 37(43.53%) were males. Their age range was from 18 to 90 years. Out of 100 eyes, in 30 eyes in mean pre operative K and mean post operative k were compared. In these 30 eyes pre and post operative K2 readings remained the same in 24 (80%) eyes while in remaining 6 (20%) eyes the difference was  $\pm$  0.25D. In remaining 70 eyes difference between pre operative and post operative k1 and pre operative and post operative K2 was considered separately. Difference between pre and post operative k1 remained zero in 35 (5%) eyes  $\pm$  0.25D in 30(42.8%) eyes,  $\pm$  0.50D in 4 (5.7%) eyes and  $\pm$  0.75D in 1 (1.43%) eye only. Similarly difference between pre operative and post K2 readings was found zero in 36 (51.4%) eyes  $\pm$  0.25D in 18 (25.7%) eyes;  $\pm$  0.50D in 13 (18.6%) eyes and  $\pm$  0.75D in 3 (4.3%) eyes only. While considering difference in mean K preoperatively and postoperatively it was observed that no difference was noted in 53 (53%) eyes; while this difference remained  $\pm$  0.25D in 33 (33%) eyes;  $\pm$  0.50D in 11(11%) eyes and 0.75D in 3 (3%) eyes.

**Conclusion:** 3.2mm superior scleral incision 1mm posterior to limbus for phaco foldable IOL produces negligible incision induced astigmatism.

Cornea is transparent, anterior 1/6<sup>th</sup> portion of the eye, its refractive index is 1.38; diameter is 12mm and dioptric power is +43D<sup>1</sup>. Anterior surface of cornea is smooth and allows about 70% refraction of light rays<sup>2</sup>. However its vertical meridian is slightly more curved than horizontal one. Measurement of dioptric power of vertical (k1 or kv) and horizontal (k2 or kh) meridian of central corneal zone is required to incorporate in the biometric formula to calculate the power of intraocular lens (IOL)<sup>3</sup>.

Surgically induced astigmatism can be determined by comparing postoperative k reading with preoperative k reading<sup>4,5</sup>. Anterior segment surgery like trabeculectomy, stitching of traumatic corneal wounds, in addition to cataract surgery also affects curvature of cornea which can be measured with ray transference technique instead of using pre and post operative k-readings<sup>6</sup>.

Corneal curvature is affected by size and location of incision for cataract surgery<sup>4</sup>. Technique of stitching

of incision also influences curvature of cornea in vertical or horizontal or both meridian<sup>7</sup>.

The objective of this study is to see the effect of 3.2mm superior scleral incision for phacoemulsification on corneal curvature by comparing post operative k1 and k2- reading with pre operative k1 and k2-readings.

## MATERIAL AND METHODS

100 eyes of 85 patients were involved in this retrospective study. Every patient included in this study had cataract as the only significant ocular pathology. One day before operation every patient was called for biometry. K-readings were taken on Canon RK-2 Auto Ref-Keratometer. Mean of three K-readings was taken and recorded. Sonomed Biometer was used for A-scan (axial-length) and calculation of IOL power.

Every patient was subjected to phacoemulsification with foldable IOL through 3.2mm scleral incision 1mm posterior to limbus. During 1<sup>st</sup> follow up visual acuity, slit-lamp examination and K- readings were again taken on Canon RK-2 Auto Ref Keratometer. Mean of 3 K-readings was again recorded. Similar exercise was carried out on every subsequent follow-up after one week, 4-weeks and 6-months. Mean of all postoperative K-readings was compared with preoperative K-readings in every patient.

Patients were divided in two groups. In group 1 both pre and post operative K and K2 were compared where as in group II mean preoperative K and mean post operative K was compared.

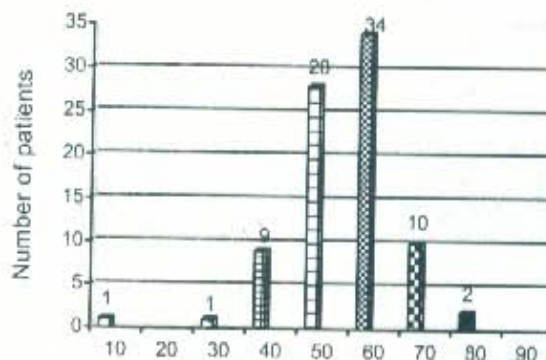
## RESULTS

100 eyes of 85 patients were included in this study. Out of 85 patients 15 patients (17.65%) were those in whom both the eyes were operated with an interval of not less than one week. Out of 85 patients 48 (56.47%) were females and 37 patients (43.53%) were males (Table 1).

One (1.176%) patient was of 18 years and one (1.176%) was of 32 years. Age of 9 (10.5%) patients varied in between 40 and 50 years. Age of 28 (32.9%) patients varied between 51 and 60 years. Age of 34 (4%) patients varied between 61 and 70 years. Age of 10 (11.7%) patients varied between 71 and 80 years. One (1.2%) was of 82 and one (1.2%) was of 90 years (Fig. 1).

**Table 1:** Sex distribution

Sex	No. of eyes n (%)
Female	48 (56.47)
Male	37 (43.53)
Total	85 (100)



**Fig. 1:** Age Distribution

In group 1, difference was noted in pre and post operative K1 reading in 35 (50%) eyes,  $\pm 0.25D$  difference in 30 (42.8%);  $\pm 0.50D$  difference in 4 (5.7%) and  $\pm 0.75D$  difference only in 1(1.4%) eye. (Table.2a)

No difference was found in pre and post operative K2 reading in 36 (51.4%) eyes;  $0.25D$  difference in 18 (25.7%);  $\pm 0.50D$  difference in 13(18.6%) and  $\pm 0.75$  difference was noted only in 3(4.3%) eyes (Table 2b).

No difference was noted in pre and post operative K1 and K2 readings both in 24 (80%) eyes and  $\pm -0.25D$  difference was noted in only 6 (20%) eyes (Table 2).

In both group 1 and 2, no difference was noted in pre and post operative K1 and K2 and mean K in 53 eyes,  $0.25 D$  difference in 33 eyes,  $0.50 D$  difference in 11 eyes and  $0.75$  difference in 3 eyes (Table 3).

## DISCUSSION

Corneal curvature is affected by size and location of incision for cataract surgery. Comparing pre and postoperative k-readings easily assesses induced astigmatism. Large superior corneal incision for ICCE and ECCE have been in vogue for a long period of time. Technique of stitching of wound closure has passed through various phases of improvement. But in spite of all these efforts some astigmatism remained which needed correction with cylindrical glasses<sup>8-11</sup>.

**Table 2a:** Difference in pre and post operative K1 and K2

Difference	K1 n (%)	K2 n (%)
0.00	35 (35)	36 (36)
0.25	30 (30)	18 (18)
0.50	4 (4)	13 (13)
0.75	1 (1)	3 (3)
Total	70 (70)	70 (70)

**Table 2b:** Difference in pre and post operative mean K

Difference in D	Mean K n (%)
0.00	24 (24)
0.25	6 (6)
0.50	0 (0)
0.75	0 (0)
Total	30 (30)

**Table 3:** Difference in pre operative and post operative K1 and K2 and mean K

Difference	Pre and post operative K1 and K2 and mean K		
	Male	Female	Total n (%)
0.00	23	30	53 (53)
0.25	15	18	33 (33)
0.50	3	8	11 (11)
0.75	2	1	3 (3)
Total	43	57	100 (100)

Small incision cataract surgery with phacoemulsifier without stitching has been now found the best for quick visual rehabilitation without any incision or stitching-induced astigmatism<sup>12</sup>. 3.2 mm, 3 mm, 2.8 mm, 2.2 mm has been a standard temporal corneal incision for phacoemulsification and now micro incision of 1.4 mm for CMP (cold microincision phaco) is making its place. Further more phaconit

(needle incision tunnel of 0.9mm) has also been introduced for CMP. Implantation of rollable thin lens through microincision after CMP is a wonder of the day<sup>13-16</sup>.

In this study size of incision was restricted to 3.2 mm at superior scleral region, 1mm. posterior to limbus for phacoemulsification with foldable IOL. Effect of this small incision on corneal curvature was studied by measuring and seeing change in pre and post operative k-readings and found that even this much small incision for phacoemulsification produced incision induced corneal astigmatism (though ignoreable). My study is comparable to the study of Merriam JC et al. on changes on the horizontal and vertical meridians of the cornea after cataract surgery' in which it was proved that in 3.2mm superior scleral incision for phaco-foldable IOL, k-readings stabilized and returned to almost equal to preoperative k-readings within 3 months<sup>17</sup>.

Location of incision for phacoemulsification though produces similar results regarding incision induced astigmatism but superior scleral incision has additional advantages<sup>18,19</sup>. There is minimal requirement of conjunctival dissection and there is no pooling of irrigating solution on cornea to reduce operative visibility as it occurs in limbal incision, which causes edema of perilimbal conjunctiva. There are no corneal scar as it occurs in clear corneal incisions.

## CONCLUSION

Choice of 3.2mm superior scleral incision for phaco-foldable IOL is considered relatively better because:

1. It produces no or negligible change in vertical (k1) and horizontal (K2) meridian of cornea after phacoemulsification. So no or ignorable induced astigmatism is being observed postoperatively as observed in scleral tunnel, limbal and clear corneal incision for phaco.
2. Incision is well covered and protected under conjunctival flap as in scleral tunnel but conjunctival dissection is much less in superior scleral incision.
3. Tissue burn by phaco-energy (as can be seen in corneal incision) is invisible.
4. No surgical scar is visible a few weeks after operation as we see in corneal incision for phaco.
5. No conjunctival edema occurs in superior scleral incision as it occurs in limbal incision during operation.

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