

To Compare the Surgically Induced Astigmatism in Small Incision Cataract Surgery: Superior Tunnel Incision versus Temporal Clear Corneal Incision

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Abstract: *Cataract surgery has seen many advancements - coupling to micro phacoemulsification and the recently developed femtosecond LASER assisted cataract surgery. We conducted a study to compare surgically induced astigmatism in small incision cataract surgery, superior scleral tunnel incision versus temporal clear corneal incision. The difference in the mean surgically induced astigmatism in both the types of incision is significant, temporal being better i.e. causing less surgically induced astigmatism.*

Keywords: small incision cataract surgery, incisions, surgically induced astigmatism

1. Introduction

Cataract surgery has seen many advancements - coupling to micro phacoemulsification and the recently developed femtosecond LASER assisted cataract surgery.

To achieve negligible postoperative refraction two important aspects should be addressed – accurate biometry and minimal surgically induced astigmatism and treating the pre-existing astigmatism.[1]

The amount of surgically induced astigmatism can be controlled better, and the faster wound stability reduces the time required for visual rehabilitation. Recently preference has shifted from corneo-scleral incision to clear corneal incisions. In this study we try to compare the amount of astigmatism occurring in two types' phacoemulsification surgery superior tunnel incision and temporal clear corneal incision. [2,3]

As our approach is to get rid of spectacles, knowledge of this association is important. So that we can know the amount of astigmatism occurring in these two procedures and we can modify our surgery accordingly.[3,4]

2. Materials and Methods

We conducted an observational comparative study of 100 cataract patients who underwent uncomplicated cataract surgery with foldable PCIOL implantation by phacoemulsification within age group of 40-45 years and with uncomplicated immature senile cataract were included. Patients were randomly divided into two groups, 50 patients underwent phacoemulsification by superior scleral tunnel incision and 50 patients underwent temporal clear corneal phacoemulsification. Keratometry was repeated for all patients at one week; one month and at three months post-operative visit and the astigmatism assessed and compared

with pre-operative astigmatism. Refractive correction was given at the end of first month. Surgically Induced Astigmatism (SIA) is calculated by simple difference between preoperative and postoperative cylinder values and steeper axis was also noted so as to differentiate astigmatism into WTR and ATR both preoperatively and postoperatively.[5-10] Study was analysed using SPSS version 15.0 statistical analysis software.

3. Results

Out of total 100 patients operated, 50 patients underwent phacoemulsification by superior scleral tunnel incision and 50 patients underwent temporal clear corneal phacoemulsification. In superior scleral tunnel incision group, 24(48%) patients had with the rule astigmatism, 22 (44%) patients had against the rule astigmatism and 4 (8%) patients had nil astigmatism. In postoperative three month majority of cases are shifted to ATR (36%) followed by WTR (11%), NIL (6%). It showed a tendency of superior incision cases towards ATR. In temporal clear corneal incision group, 24(48%) patients had with the rule astigmatism, 23 (46%) patients had against the rule astigmatism and 3(6%) patients had nil astigmatism. In postoperative three months, majority of cases are shifted to WTR (32%) followed by ATR (14%), NIL (8%). It shows tendency of temporal cases towards WTR. In superior scleral tunnel incision group, postoperative induced astigmatism was 0.5D in 20 (40%) patients, 0.75D in 19 (38%) patients, 1D in 7 (14%) patients and 1.25D in 4 (8%) patients. In temporal clear corneal incision group, postoperative induced astigmatism was 0.25D in 15 (30%) patients, 0.5D in 28 (56%) patients, 0.75D in 7 (14%) patients. Surgically induced astigmatism in superior scleral tunnel incision cases was 0.73Diopters and that of temporal clear corneal incision cases was 0.46Diopters.

In preoperative WTR cases at the end of three months mean level of dioptres in superior scleral tunnel group (0.41D) was significantly less than (p value = 0.0001) temporal clear corneal group (1.18D) i.e. in preoperative WTR cases superior tunnel incision causes less astigmatism.

In preoperative ATR cases at the end of three months mean level of dioptres in superior tunnel group (1.39) is significantly higher than (p value = 0.0001) temporal clear corneal group (0.34) i.e. in preoperative WTR cases temporal clear corneal incision causes less astigmatism.

4. Discussion

The aim of the study was to compare the induced postoperative astigmatism in patients undergoing phacoemulsification with foldable PCIOL by superior scleral tunnel and temporal clear corneal incision. In addition to our aim of comparing the induced postoperative astigmatism between superior tunnel and temporal clear corneal incision we tried to analyse magnitude of induced astigmatism in both types of cataract incisions and also try to find out the relationship between the preoperative astigmatism and postoperative astigmatism with the type of cataract incisions in our study.

In group A (superior scleral incision group) the distribution of preoperative astigmatism was 48% WTR, 44% ATR and 8% NIL astigmatism among the total number of 50 patients. In postoperative period there was a shift in postoperative astigmatism and the distribution became 22% WTR, 72% ATR and 6% NIL astigmatism. This suggests that there is a shift towards ATR astigmatism in superior scleral tunnel incision. This clearly shows that superior scleral incision causes flattening of the vertical meridian which is responsible for the postoperative shift in astigmatism towards the opposite direction.

Likewise in group B (temporal clear corneal incision group) the distribution of preoperative astigmatism was 48% WTR, 46% ATR and 6% NIL astigmatism amongst the total number of 50 patients. In postoperative period there was a shift in postoperative astigmatism and the distribution became 64% WTR, 28% ATR and 8% NIL astigmatism. There was a shift towards WTR astigmatism in temporal clear corneal incision. This clearly shows that temporal clear corneal incision causes flattening of the horizontal meridian which is responsible for the postoperative shift of astigmatism towards opposite direction. While comparing the association between the preoperative astigmatism with the types of incisions we got a p value of 0.00001 which is statistically significant.

Our study correlates with the observation made by Reddy B et al where they compared the astigmatism induced by a superior and temporal incision in manual SICS and to compare the astigmatism induced by clear corneal incision versus scleral tunnel in phacoemulsification surgery finally concluded that significantly against the rule shift in astigmatism in the phacoemulsification group and the manual SICS superior incision group while the manual SICS group with temporal incision had with the rule shift in astigmatism.[11]

This was also shown in study conducted on postoperative evaluation of surgically induced astigmatism and astigmatic keratotomy effects on various self-sealing small incision by Per Julius Nielsen which stated that preoperative against the rule astigmatism was reduced significantly by temporally placed clear corneal incision and preoperative with the rule astigmatism, by superiorly placed clear corneal incisions. [12]

These findings correlate with the results shown in the study by Altan- Yaycioglu et al on "effect on astigmatism of the location of clear corneal incision in phacoemulsification of cataract" which showed that temporal and superotemporal incision resulted only in small astigmatic changes.[13] Conversely, superior, superonasal and nasal incisions induced more pronounced astigmatism.

There also exists a correlation between the type of preoperative astigmatism, the incision used and postoperative astigmatism at the end of three months. In preoperative WTR patients the superior scleral tunnel incision is better than temporal clear corneal incision in comparison to three month postoperative astigmatism (p -value = 0.0001). Similarly in the preoperative ATR patients the temporal clear corneal incision is better than the superior scleral tunnel incision in comparison to the three month postoperative astigmatism (p -value = 0.0001).

5. Conclusion

The difference in the mean surgically induced astigmatism in both the types of incision is significant, temporal being better i.e. causing less surgically induced astigmatism.

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