COMPARATIVE STUDY OF SURGICALLY INDUCED ASTIGMATISM AND BEST CORRECTED VISUAL ACUITY BY SUPERIOR VERSUS TEMPORAL MANUAL SMALL INCISION CATARACT SURGERY.

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ABSTRACT

Introduction: The aim of cataract surgery now-a-days is to provide best corrected visual acuity with minimal post operative astigmatism.

Purpose: To compare astigmatism induced by the superior and temporal section in manual small incision cataract surgery (SICS) in the Indian population.

Materials And Methods: Sixty patients were operated for the study. Eyes having a steeper vertical keratometry reading were assigned to the superior SICS group whereas eyes with a steeper horizontal keratometry reading were assigned to the temporal SICS group both the groups had 30 patients each. Eyes in Group A underwent manual SICS with a superior tunnel and eyes in Group B underwent manual SICS with a temporal incision. The patients were examined on postoperative 1st day, 1st week, 1 month, 2 month, 3 month. Uncorrected and best-corrected visual acuity was recorded, slit-lamp examination, auto-refracto-meter and keratometry examinations were done.

Statistics: All calculations were performed using surgically-induced astigmatism (SIA) Calculations version 1.0, a free software program.

Results: The mean SIA in Group A was found to be 1.63 +/-0.22 and in Group B it was 0.74 +/-0.66 at 1 month. The p value applied was found to be 0.01 and 0.03 respectively which is statistically significant. The p value was found to be statistically insignificant at 2 month and 3 month. Hence, it was concluded that SIA induced by the superior incision is more than by the temporal incision.

Conclusion: SICS with the temporal approach provides a better stabilization of the refraction with a significantly less SIA than superior approach.

KEYWORDS

Astigmatism, Small Incision Cataract Surgery, Temporal Section, SIA

BACKGROUND:

In the evolution of cataract surgery, Manual small incision cataract surgery (MSICS) was later addition, much after phacoemulsification. MSICS was developed mainly as the cost-effective alternative to phacoemulsification cataract surgery. The Western world graduated from extracapsular cataract extraction to phacoemulsification. In developing countries where cost is a major issue, MSICS was developed after the advent of phacoemulsification, and hence it is relatively younger technique than the latter. It is a safe, simple, consistent, stable, and cost effective way of cataract removal and lens implantation.

Small incision cataract surgery has the potential to reduce post operative astigmatism and hasten visual rehabilitation of patients when compared with other surgical techniques. Small incision cataract surgery technique (SICS), is the first choice and alternative to phacoemulsification, as it does not require the high tech phaco machine neither conventional large incision of ECCE and is cost effective. Hence it is ideal for mass surgery in camps, all grades of cataract including grade IV-V hard cataracts and the technique is easy to learn. Self-sealing incisional incisions were mentioned by Kratz et al1 in 1980 and by Girard in 19842 In 19953 Kratz thought of scleral tunnel as an astigmatic neutral way of entering the anterior chamber.

In 1984, it was shown by Thrasher et al that a 9.0mm posterior incision induces less astigmatism than a 6.0mm limbal incision4. Jaffe has stated that 7mm incision, 2mm behind the limbus can be left unsutured without the fear of inducing against the rule astigmatism. Surgically induced astigmatism has remained the only obstacle to achievement of good unaided visual acuity after cataract surgery. It can be calculated by various methods introduced by Alpins and Gogggin,5 Holladay et al6 and many others.

Postoperative astigmatism is affected by various factors such as:
1. Preoperative astigmatism
2. Location of incision
3. Type of incision
4. Size of incision
5. Closure of surgical incision
6. Healing of the surgical incision
7. Amount of scleral cataract performed
8. Type of suturing material used and its placement
9. Position of IOL
10. Postoperative use of steroids all these have effects on corneal curvature.

Location of incision preoperatively is decided by the keratometric readings of the patient, temporal location is farthest from the visual axis, and any flattening due to wound is less likely to affect the corneal curvature at the visual axis. When incision is located superiorly, both gravity and eyelid blink tend to create a drag on the incision. These forces are better neutralized with temporal incision because it is parallel to the vector of the forces. With-the-rule astigmatism induced by a temporal incision is advantageous because most elderly patients have preoperative against-the-rule astigmatism.

Supero-temporal incision is also free from the effect of gravity and eye lid pressure and tends to induce less astigmatism. A number of studies have shown that surgically induced astigmatism, particularly against the rule (ATR) astigmatism is the commonest cause of unsatisfactory UCVA after cataract surgery. Astigmatism is a condition of refraction wherein a point focus of light cannot be formed upon the retina, due to unequal refraction of light in different meridian.

In our study, we have observed the effect of one of these factors i.e. surgical incisions taken at two different sites - superior and temporal on preexisting astigmatism along with visual outcome by both the incisions.

MATERIALAND METHOD:
The study was conducted in Department of Ophthalmology, Subharti Medical College, Meerut. The study group consisted of 60 patients. The study received ethical clearance from the Ethical Committee of Subharti Medical College, Meerut. An informed consent was taken from all the patients in the study.

Inclusion Criteria:
1. Keratometric astigmatism between 0 to 1.5D
2. Good fixation
3. Age >50 years of either sex

Exclusion Criteria:
1. Complicated cataract
2. Pre-existing corneal opacities
3. Pre-existing Glaucoma
4. Pre-existing Uveitis
5. Posterior segment pathology causing diminution of vision or any other optic nerve pathology
6. Keratometric astigmatism of >1.5D or more
7. Patients who has history of any other previous ocular surgeries.

Preoperatively the patients were divided randomly into two groups of 30 eyes each. Group A received superior incision and group B received temporal incision. Complete history of the patients was taken followed by a thorough general physical examination and
ophthalmological examination. Uncorrected Visual acuity (UCVA) and Best corrected visual acuity (BCVA) in each case was determined using Snellen’s chart.

Examination of anterior segment, Intraocular pressure was recorded using Non Contact Tonometer.

Posterior segment was examined by direct ophthalmoscope and slit lamp biomicroscopy using a +90D Volk lens. Keratometry readings were recorded using an auto-keratorefрактометрия. A-scan was done using Appuscan Max. SRK II regression formula was used for calculation of intraocular lens power after performing A scan for determination of axial length of the eyeball. Specular microscopy used to record corneal endothelial cell density and corneal thickness and informed consent was taken. All surgeries were done by the same surgeon under peribulbar anaesthesia. The incision architecture was same in both the groups, a 6mm incision of 1/3-1/2 thickness of sclera, 1.5mm posterior to the limbus given superiorly and temporally. The scleral scratch was made with 15 number blade mounted on B.P. handle. The groove was entered by 2.8mm crescent knife at a depth of 0.3mm, scleral tunnel was dissected forward till limbus when blade was lifted up along the dome of cornea to dissect the clear corneal tunnel upto 2mm creating a funnel shaped tunnel of about 45 degrees then using keratome entry was made into the anterior chamber. A side port entry was made at 10 o’clock position with side port entry blade. Continuous curvilinear capsulorhexis was performed followed by hydrodissection and nucleus delivered by viscoexpression. Posterior chamber IOL was inserted in the bag. Patients were examined on 1st day, 1st week, 1month, 2 month, 3 month.

RESULTS:
Total of 60 patients were operated. 30 patients were in group1 (Superior incision) and 30 in group 2 (Temporal incision), and follow up was done for 90 days. Distribution of patients according to age and gender is mentioned in the table below.

### Table 1: Demographic Data Among The Study Groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A (Superior incision) (N=30)</th>
<th>Group B (Temporal incision) (N=30)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>N %</td>
<td>N %</td>
<td>0.92</td>
</tr>
<tr>
<td>Male</td>
<td>15 50.0</td>
<td>14 46.7</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>15 50.0</td>
<td>16 53.3</td>
<td></td>
</tr>
<tr>
<td>Age (in years)</td>
<td></td>
<td></td>
<td>0.17</td>
</tr>
<tr>
<td>40-50</td>
<td>4 13.33</td>
<td>2 6.66</td>
<td></td>
</tr>
<tr>
<td>51-60</td>
<td>10 33.33</td>
<td>8 26.67</td>
<td></td>
</tr>
<tr>
<td>61-70</td>
<td>13 43.34</td>
<td>12 40.00</td>
<td></td>
</tr>
<tr>
<td>&gt;71</td>
<td>3 10</td>
<td>8 26.67</td>
<td></td>
</tr>
</tbody>
</table>

Maximum number of subjects were from the age group of 61-70 years followed by 51-60 years among both the groups. When gender and age distribution was compared statistically among both the groups, it was found to be statistically insignificant (table 1).

### Table 2: Operated Eye Among The Study Groups

<table>
<thead>
<tr>
<th>Eye</th>
<th>Group A (Superior incision) (N=30)</th>
<th>Group B (Temporal incision) (N=30)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>56.66</td>
<td>63.33</td>
<td>0.69</td>
</tr>
<tr>
<td>Left</td>
<td>43.34</td>
<td>36.67</td>
<td></td>
</tr>
</tbody>
</table>

In group A and B right and left eyes were compared and results were found to be insignificant

### Table 3: Comparison Of Pre-op Mean Difference With Post-op 1 Month Between K1-K2 At Different Intervals Among The Groups

<table>
<thead>
<tr>
<th>K1-K2:</th>
<th>Group A (Superior incision) (N=30)</th>
<th>Group B (Temporal incision) (N=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop</td>
<td>Mean SD</td>
<td>Mean SD</td>
</tr>
<tr>
<td>Post op 1 month</td>
<td>1.63 0.26</td>
<td>0.74 0.66</td>
</tr>
<tr>
<td>p value (paired t Test)</td>
<td>0.03*</td>
<td></td>
</tr>
</tbody>
</table>

*: statistically significant

Table 3 shows the comparison of preop and post op at 1month mean difference between K1-K2 at different intervals among the groups. When mean difference at preop was compared with 1 month in group A and B, it was found to be statistically significant in both groups.

### Table 4: Comparison Of Pre-op Mean Difference With Post-op 2st Month And 3rd Month Between K1-K2 At Different Intervals Among The Groups

<table>
<thead>
<tr>
<th>K1-K2:</th>
<th>Group A (Superior incision) (N=30)</th>
<th>Group B (Temporal incision) (N=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop</td>
<td>Mean SD</td>
<td>Mean SD</td>
</tr>
<tr>
<td>Post op 2 month</td>
<td>2.01 2.57</td>
<td>1.16 1.09</td>
</tr>
<tr>
<td>Post op 3 month</td>
<td>2.13 2.04</td>
<td>1.29 1.17</td>
</tr>
<tr>
<td>p value (paired t Test)</td>
<td>0.10 0.08</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 shows the comparison of pre-op and post-op 2 month and 3 month mean difference between K1-K2 at different intervals among the groups. When mean difference at preop was compared with 2 month and 3 month in group A and B, it was found to be statistically insignificant.

### Table 5: Comparison Of BCVA At Preop With Post Op 3 Month Among The Study Groups

<table>
<thead>
<tr>
<th>BCVA</th>
<th>Group A (Superior incision) (N=30)</th>
<th>Group B (Temporal incision) (N=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop</td>
<td>Mean SD</td>
<td>Mean SD</td>
</tr>
<tr>
<td>Post op 3 month</td>
<td>1.09 0.61</td>
<td>0.86 0.24</td>
</tr>
<tr>
<td>p value (paired t Test)</td>
<td>0.06 0.13</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows the comparison of BCVA at preop with post op 3 month among the study groups. No significant difference was found between mean day 1 BCVA and 3 month BCVA in group A as well as group B.

DISCUSSION:
Astigmatism following cataract surgery consists of two components: preoperative astigmatism, which is intrinsic to the patient, and surgically induced astigmatism (SIA), which is a result of the procedure. Burgansky et al have reported an increase in astigmatism with an increase in the incision size. A pre-existing astigmatism can be neutralized by changing the site of the incision. This study was conducted to compare the refractive status in postoperative patients, which is mainly dependent on the type of incision that is superior incision or temporal incision in small incision cataract surgery, which will be helpful to reduce the amount of astigmatism which is the major problem after surgery.

SIA induced by superior incision was more as compared to temporal incision. Similar results were reported by Malik VK et al in their study. They revealed that the mean SIA in superior incision group was found to be 1.45 ±0.7387 and in temporal incision was 0.75± 0.4067 with statistically significant difference. It can be explained by the fact that temporal location is farthest from the visual axis and any flattening due to the wound is less likely to affect the corneal curvature at the visual axis. When the incision is located superiorly, both gravity and due to the wound is less likely to affect the corneal curvature at the visual axis. When the incision is located superiorly, both gravity and

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superior scleral straight incision and the same results were obtained in my study.

CONCLUSION:
To conclude, temporal scleral incision in MSICS produces lesser surgically induced astigmatism as compared to superior scleral incision. Pre-existing against the rule astigmatism which is commonly seen in elderly patients gets nullified through a temporal incision. Superior incision tends to worsen it. Hence, temporal incision is preferred for better post-operative unaided visual acuity.

REFERENCES: