

## A Prospective Comparative Study of Astigmatism Following Manual Small Incision Cataract Surgery: Superior Verses Temporal Approach

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### Abstract:

**Introduction:** Cataract surgery has become one of the most common and successful procedures in ophthalmology. In addition to improving visual acuity (VA), one of the goals of modern cataract surgery is to reduce pre-existing astigmatism (PEA), a factor that may reduce VA and affect the quality of vision.

**Materials and Methods:** 100 patients of cataract attending to District Hospital Baramulla with the rule and against the rule astigmatism were included in the study. The astigmatic profile and the effect of surgical incision on astigmatism were studied. A prospective study was done in which patients were divided into two groups. MSICS was performed with superiorly located incision in group I and temporally located incision in group II.

**Results:** Out of the total 100 patients undergoing MSICS, 59 patients had ATR, 36 patients had WTR and 5 patients had no astigmatism. Thus the pre-operative astigmatic profile shows that ATR is more common type of astigmatism in this group. Among 50 patients in superior incision group, 18 had pre-operative WTR, 29 had ATR and 3 did not have astigmatism. Postoperatively the no. of patients with WTR decreased to 10, the no. of patients with ATR increased to 35 showing that superior incision flattens vertical meridian and steepens the horizontal meridian causing ATR shift. Among 50 patients in temporal incision group, 18 had pre-operative WTR, 30 had ATR and 2 did not have astigmatism. Post operatively the no of patients with WTR increased to 25, the no of patients with ATR decreased to 20.

**Conclusion:** Placement of incision on steep axis reduces pre-existing astigmatism. Thus in ATR astigmatism it is placed temporally and in WTR astigmatism it is placed superiorly. Thus a simple modification in incision placement can minimize surgically induced astigmatism and reduce pre-existing astigmatism

**Key words:** Astigmatism, Small incision cataract surgery, temporalincision, SIA.

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### I. Introduction

Cataract surgery has become one of the most common and successful procedures in ophthalmology. In addition to improving visual acuity (VA), one of the goals of modern cataract surgery is to reduce pre-existing astigmatism (PEA), a factor that may reduce VA and affect the quality of vision.<sup>1</sup>The main aim of the cataract surgery is to provide a good vision quantitatively as well as qualitatively and an early visual rehabilitation. Astigmatism means “without a point”. Miller Stephen J defined astigmatism as a condition of refraction in which a point of light cannot be made to produce a punctate image upon the retina by a correcting spherical lens.<sup>2</sup>

Surgically induced astigmatism (SIA) calculates the magnitude and axis of postoperative induced astigmatism by various methods introduced by Alpins and Goggin<sup>3</sup> Holladay et al.,<sup>4</sup> and many others. Postoperative astigmatism is affected by various factors such as preoperative astigmatism, location, type, size, closure, and healing of the surgical incision, amount of scleral cauterization performed, type of suturing material used and its placement, position of IOL, postoperative use of steroids. All these have effects on corneal curvature.<sup>5</sup>

With this background we keep the aim of our study to compare between the surgically induced astigmatism (SIA) in manual SICS by superior incision and temporal incision.

## II. Materials And Methods

This was a prospective study of 100 patients undergoing manual small incision cataract surgery at Government district Hospital Baramulla.

### *Inclusion criteria*

1. Regular astigmatism (with the rule astigmatism (WTR)).
2. Against the rule astigmatism (ATR).

### *Exclusion criteria*

1. Irregular astigmatism.
2. Traumatic cataract.
3. Corneal dystrophies and degenerations.

A thorough preoperative evaluation of the cases including pre-operative keratometry, slit lamp examination of anterior segment, fundus examination with 90D and A scan were done. The incision was placed on the steep axis where the astigmatism was  $>1D$ . In cases where the astigmatism was  $<1D$ , the incision was placed either superiorly or temporally MSICS was performed with superiorly located incision in group I and temporally located incision in group II.

### *Procedure*

After preparing the eye for surgery, fornix based conjunctival flap was taken at superior or temporal limbus and gentle cautery was done. A frown shaped scleral incision of about 5.5-6 mm was placed 2mm behind the limbus superiorly or temporally. Dissection of sclerocorneal tunnel was done with crescent up to 2.0 mm inside the cornea. A side port was made at 10', 7' or 2' o clock position. Viscoelastic was injected into anterior chamber and a continuous curvilinear capsulorrhexis approximately 5 mm was done with cystitome through side port. Then the sclerocorneal tunnel was completed using 3.2mm keratome and extended to 5.5-6mm. The internal corneal opening was made 2mm larger than external opening. Thorough hydro dissection was done and nucleus was prolapsed into the anterior chamber and viscoelastic was injected in front and behind the lens nucleus. Lens nucleus was delivered out using sandwich technique using vectis and Sinsky Hook. Remaining cortical matter was removed with Simcoe cannula and 6mm optic (overall 12.5 mm) PMMA single piece posterior chamber lens was inserted in the capsular bag. The remaining viscoelastic was aspirated and the anterior chamber was reformed with BSS through the sideport. The main wound was checked for any leakage and then conjunctiva was closed using cautery.

Post-operative treatment included topical steroid & antibiotic combination for a week followed by only topical steroid in a tapering dose for 5 wks. Patients were examined on 1st POD (postoperative day), 1 week, 2 weeks, 4 weeks and 3 months for keratometry readings.

For simplification of analysis all astigmatic changes were studied only in the vertical & horizontal meridian. Oblique astigmatism was not studied. The results of two groups were compared with regard to post-operative astigmatism. Analysis of astigmatism was performed by subtraction method. Paired and unpaired T-test was applied to find out the significant difference between the superior and temporal incisions.

## III. Results

The preoperative astigmatic profile of patients shown in Table 1 shows that the no. of patients with WTR is 36, ATR is 59 and without any astigmatism is 5 (Table 1).

The preoperative astigmatic profile in WTR in superior incision is 18 and postoperative is 1 the preoperative astigmatic profile in WTR in temporal incision is 18 and postoperative is 25. The preoperative astigmatic profile in ATR in superior incision is 29 and postoperative is 35. the preoperative astigmatic profile in ATR in temporal incision is 30 and postoperative is 20 (Table 2).

| Type of Astigmatism | No of patients |
|---------------------|----------------|
| WTR                 | 36             |
| ATR                 | 59             |
| No Astigmatism      | 5              |

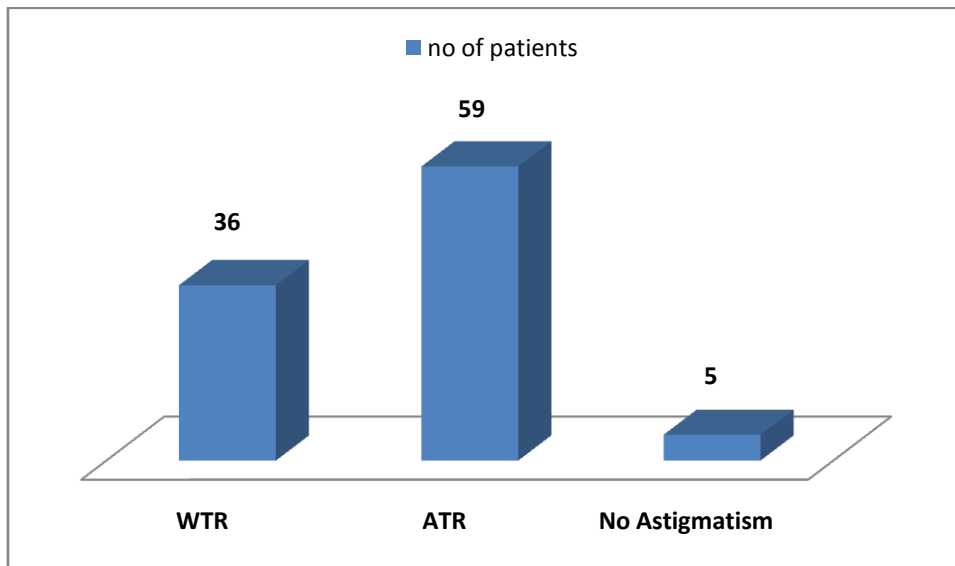
**Table 1:** Pre-operative astigmatic profile of cataract patients

| Type of Astigmatism | Superior Incision |                | Temporal Incision |                |
|---------------------|-------------------|----------------|-------------------|----------------|
|                     | Pre operative     | Post operative | Pre operative     | Post operative |
| WTR                 | 18                | 10             | 18                | 25             |
| ATR                 | 29                | 35             | 30                | 20             |
| No Astigmatism      | 3                 | 5              | 2                 | 5              |

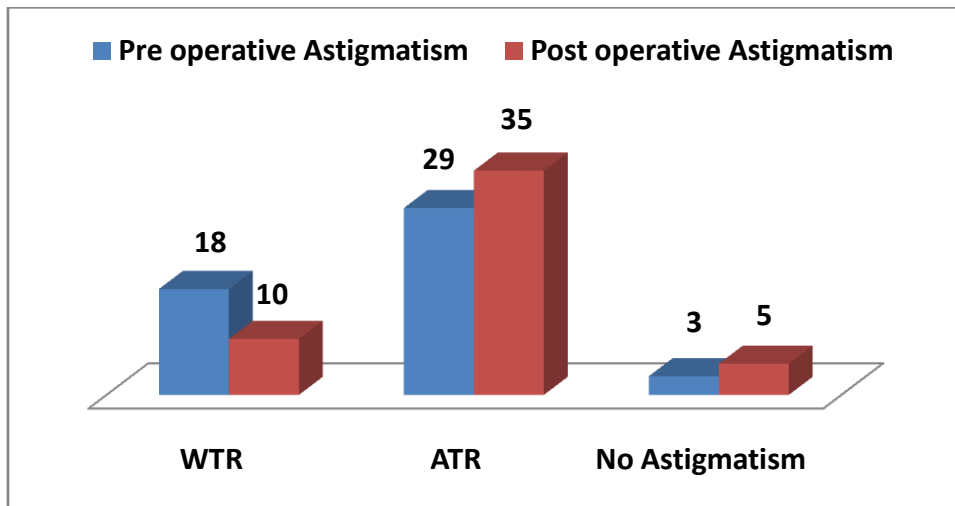
**Table 2:** Pre and post-operative astigmatic profile in superior and temporal incision groups

|                                | Superior Incision | Temporal Incision | P value |
|--------------------------------|-------------------|-------------------|---------|
| Mean preoperative Astigmatism  | 0.84±0.73         | 0.63±0.23         | 0.805   |
| Mean postoperative Astigmatism | 1.55±1.15         | 0.48±0.32         | 0.0001  |
| Mean SIA                       | 0.95±0.4          | 0.57±0.4          | 0.0001  |

**Table 3:** Pre, post and surgically induced astigmatism in superior and temporal incision groups



**Figure 1:** Pre-operative astigmatic profile of cataract patients



**Figure 2:** Pre and post-operative astigmatic profile in superior incision group

#### IV. Discussion

While phacoemulsification remains the more advanced and technically superior method of cataract surgery, it is not always appropriate either from a cost perspective or the density of the cataracts involved. MSICS is the first choice alternative to phacoemulsification retains most of the advantages of “phacoemulsification” giving visual results equivalent to phacoemulsification at a lower cost and it is the surgery for the masses and appropriate for a developing country. The surgery is cheap, fast, safe and easy to learn and needs fewer resources. However, the larger incision used induces greater astigmatism than

phacoemulsification. High astigmatism is an important cause of poor uncorrected visual acuity after cataract surgery. In view of these findings, this study was done with the aim to study the effect of location of incision on pre-existing and surgically induced astigmatism.<sup>6</sup>

In our study out of the total 100 patients undergoing MSICS, 59 patients had ATR, 36 patients had WTR and 5 patients had no astigmatism. Thus the pre-operative astigmatic profile shows that ATR is more common type of astigmatism in this group of patients undergoing cataract surgery group.<sup>7</sup> This is because in normal healthy eyes stiff upper tarsal plate causes pressure on cornea resulting in with the rule astigmatism but with increasing age this pressure gradually decreases resulting in against the rule astigmatism.

In our study, based on the pre-operative keratometric values, the incision was placed on the steep axis where the astigmatism was >1D. In cases where the astigmatism was <1D, the incision was placed either superiorly or temporally.

In our study the sub-analysis of change in astigmatism in cases with ATR shows that in superior incision group the mean astigmatism increased from 0.81+/- 0.65 to 1.50+/-0.5 post operatively and in the temporal incision group the mean astigmatism decreased from 1.45+/-0.5 to 1.05+/-0.2 post operatively.<sup>8</sup> Thus in cases with ATR the superior incision showed an increase in post-operative astigmatism while a temporal incision showed decrease in astigmatism.<sup>9</sup>

In our study the sub-analysis of change in astigmatism in cases with WTR shows that in superior incision group the mean astigmatism decreased from 1.15+/-0.6 to 0.70+/-0.5 post operatively and in the temporal incision group the mean astigmatism increased from 0.65+/-0.5 to 0.75+/-0.5 post operatively. Thus in cases with WTR the superior incision showed a decreased in post-operative astigmatism while a temporal incision showed a minimal increase in astigmatism.<sup>10</sup>

## V. Conclusion

Pre-operative astigmatic profile shows that ATR is more common type of astigmatism than WTR and astigmatically neutral cases in older age group. Superior incision causes ATR shift and temporal incision causes WTR shift. Temporal approach MSICS produces less post-operative astigmatism compared to superior incision. Placement of incision on steep axis reduces preexisting astigmatism. Thus in ATR astigmatism it is placed temporally and in WTR astigmatism it is placed superiorly. Thus a simple modification in incision placement can minimize surgically induced astigmatism and reduce preexisting astigmatism. Hence all cataract surgeons should familiarize with temporal incision in cataract surgery.

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