

# “A Comparative Study on Corneal Astigmatism Induced By Superior Versus Temporal Incision In Small Incision Cataract Surgery”

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## INTRODUCTION

Astigmatism, the so called final frontier of cataract surgery, is an area of research where few venture. Cataract surgery incisions have been known for more than a century to influence astigmatism. Significant astigmatism may be visually disabling causing diminution in visual acuity, glare, monocular diplopia, asthenopia and distortion. A number of procedures have been developed to minimize and stabilize surgically induced astigmatism. Manual small incision cataract surgery(SICS) is one of the most innovative and popular technique[1]. The use of small cataract incision is thought to reduce surgically induced astigmatism resulting in more stable refraction[2]. There are many factors responsible for surgically induced astigmatism such as the location and type of cataract incision, size, configuration of wound, suture material used, technique of wound closure etc [3]-[8]. Wound closure has become much more secure and accurate since the advent of microsurgery. This has greatly reduced the incidence of postoperative complications such as hyphaema, iris prolapse, wound leakage, and shallow anterior chamber, which are related to defective wound healing. However, firm wound closure can induce astigmatism, and in cataract surgery, contrary to previous experience, this is usually 'with the rule.' Many papers have been published on this surgically induced astigmatism and how to control it. This knowledge has led to the advent of small incision cataract surgery which returns to the patient, the greatest amount of functional vision in the least amount of time. A small incision about 3 mm long is ideal to

perform cataract removal and intraocular lens insertion. However, because of practical considerations a slightly larger wound is used[9].

## METHODOLOGY

The present study was a prospective, randomized, comparative study of astigmatism induced by superior & temporal sections in manual SICS conducted among 100 patients in the Dept. of ophthalmology, Rangaraya Medical College, GGH, Kakinada from October 2013 and March 2014.

Sample size: The study included 100 cases who were diagnosed to have cataract. Of them, 50 cases underwent superior incision SICS and 50 cases underwent temporal incision SICS were grouped randomly based on surgeon's choice of incision.

### Inclusion criteria:

1. Patients diagnosed to have cataract.
2. Patients with clinically normal cornea.
3. Patients in the age group of 30-80 yrs.
4. Patients who gave consent to participate in the study.

### Exclusion criteria:

1. Patients with corneal degeneration / dystrophies.
2. Patients with scleral diseases
3. Patients with connective tissue disorders.
4. Patients unable to co-operate for pre & post - operatives keratometry.
5. Traumatic and Paediatric cataracts.

Cases selected for study were subjected to detailed history taking & clinical examination and their pre keratometry readings were recorded. post keratometry readings were recorded 1st Week, 3rd Week, 6th Weeks. Amplitude of pre-operative & post-operative astigmatism is calculated from difference in keratometric values in steeper and flatter meridians. Amplitude of surgically induced astigmatism is calculated from pre-operative & post-operative amplitudes by subtraction method.

In superior sclera incision type, a sclera incision of 6.5mm was fashioned 3mm behind the limbus in superior sclera extending from 11 O’Clock to 1 O’Clock meridians. In the super temporal sclera incision type, an incision of 6.5 mm was fashioned 3mm behind the limbus extending from 9 O’Clock to 11 O’Clock meridians. A backward cut of 1-1.5mm, radial to the limbus was made from each edge of the incision. A scleral tunnel was fashioned with a crescent blade. The incision extended approximately 1mm into the cornea. The dissection was carried out towards the limbus on both sides to create a funnel shaped "pocket". Anterior chamber was entered with the keratotome and then formed with vicomet. Anterior capsulotomy was performed with a bent 26-gauge needle. Hydro dissection was done. The incision was then extended and the nucleus was delivered out by sandwich method. Cortical aspiration was done using Simcoe cannula. Posterior chamber intra ocular lens (PCIOL) was inserted in all cases. The anterior chamber was then reformed with balanced salt solution.

For simplification of analyses, all astigmatic changes (Pre operative & post operative) were studied only in the vertical or horizontal axes (only at 90° or 180°). If readings were oblique, they were regarded as being with (at 90°) or against (at 180°) the rule, depending on their values (within 30°) proximity with the corresponding vertical or horizontal axes.

**Ethics:**

Written informed consent was taken from the study participants. Confidentiality of the information is maintained by blinding the study participants name.

**RESULTS AND DISCUSSION**

The present study was conducted in 100 patients with 50 patients undergone the SICS by temporal scleral incision and the other 50 patients by superior scleral incision. Out of the 100 cases 52% were males and 48% were females. The patients were grouped by age and 41% of the patients belong to 51-60 yrs age group confirming the peak age

incidence of cataract among that age group. The findings correspond to the study of Murthy GV, Gupta SK, Bachani D, Jose R, John N Using the age-specific data for those aged 50 years and above f it was observed that the prevalence of blindness at different age cohorts above the age of 50 years changed over the three decades with a peak in cataract blindness prevalence rates in 1989.

The prevalence of blindness (presenting vision < 20/200) was observed to be 8.5% [95% CI: 8.1 - 8.9] in the recent survey. It appears that there is a declining trend over the period 1989-2001. Extrapolating the observations to the entire country it was estimated that in 2001, there were 7.75 million individuals whose blindness could be attributed to cataract and this would increase to 8.25 million by 2020[10].

Table 1: Follow up of astigmatism pattern in patients undergoing temporal and superior scleral incision

Astigmatism in Diopters	temporal scleral incision	superior scleral incision
	Number(%)	Number(%)
< 0.5	27(54)	7(14)
0.6 – 1.0	14(28)	6(12)
1.1 – 1.5	3(6)	11((22)
1.6 - 2.0	2(4)	13(26)
2.1 – 2.5	4(8)	10(20)
>2.5	0(0)	3(6)

The eyes that underwent temporal scleral incision showed > 2.5D astigmatism in 0% cases at 6th postoperative week. In comparison to this, 26% in superior scleral incision showed up same level of astigmatism.

Table : 2 Decay of Mean Astigmatism in Temporal Scleral and Superior Scleral

Post-op Weeks	Temporal Scleral				Superior Scleral			
	ATR		WTR		ATR		WTR	
	No	%	No	%	No	%	No	%
1	32	64	12	24	38	76	11	22
3	29	58	11	22	40	80	4	8
6	32	64	15	30	42	84	7	14

In our study in the temporal scleral group, there was reduction of pre-operative ‘against the rule’ astigmatism from 66% to 64%. and there is no change in ‘with the rule’ astigmatism of Pre-operative(30%) & 6 weeks post operative which is also 30%. ATR astigmatism in both groups is explained by superior incision, that is astigmatism after cataract extraction is generally of the against the-rule variety, which is caused by some degree of flattening of the corneal meridian at a right angle to the direction of the incision. That is, when the incision is made above, in its usual location, a postoperative flattening of the vertical meridian results. Hennig A et al in 2003, reported data of 500 eyes in which SICS was performed. Six weeks postoperatively, 85.5% of eyes had against the rule astigmatism, which is comparable to our study[11].

Reddy et al in 2007, studied the astigmatism induced by superior incisions in manual SICS and in scleral tunnel phacoemulsification surgery. They found a significant against the rule shift in astigmatism in the phacoemulsification group and the manual SICS superior incision group, which is comparable to our study[12].Gokhale et al, studied mean surgically induced astigmatism in superior incision in manual SICS with viscoexpression. Mean astigmatism induced by surgery was 1.28D, which is comparable to our study[13].

Table : 3 Surgically induced astigmatism the groups

Astigmatism	Temporal Scleral		Superior Scleral	
	No	%	No	%
<0.5	17	34	9	18
0.6-1.0	14	28	12	24
1.1-1.5	13	26	21	42
1.6-2.0	6	12	4	8
2.1-2.5	0	0	2	4
> 2.5	0	0	2	4

Surgically induced astigmatism of <1D was found in 62% cases from temporal scleral group, whereas only 42% cases from superior scleral group had <1D SIA in our study.George et al in 2005 compared surgically induced astigmatism (SIA) following MSICS and phacoemulsification (PE) in eyes with nuclear sclerosis of grade 3 or less. Mean SIA was 1.17D in the SICS group and 0.77D in the Phacoemulsification group which is comparable to our study[14]. Suzuki R et al, respectively examined the

induction and spontaneous regression of corneal astigmatism from preoperative against-the-rule astigmatism in Kelman phacoemulsification (KPE), in 618 patients and extracapsular cataract extraction (ECCE) in 192 patients. They found that postoperative against-the-rule astigmatism was more frequent after KPE, which is comparable to our study[15].

## CONCLUSIONS

The results of the study show that the decay of astigmatism from third to sixth week in temporal scleral incision was negligible (0.068 D) implying early wound stabilization. Therefore, early spectacle correction by third week possible in temporal scleral group. Superior scleral incision shows a significant post-operative ‘against the rule’ drift as compared to temporal scleral incision. Therefore, superior scleral incision should not be done in patients with ‘ATR’ astigmatism. Surgically induced astigmatism of < 1D was seen in 62% in temporal scleral as compared to only 42% in superior scleral incision. This implies that, temporal scleral incision induces less astigmatism when compared to superior scleral incision. Temporal scleral incision give a substantial improvement in surgical exposure, especially in patients with deep set eyes or prominent eyebrows. Temporal scleral incision is more advantageous than superior scleral incision in astigmatically neutral patients, patients with ‘Against the rule’ astigmatism, patients with ‘with the rule’ astigmatism upto < 1D and superior scleral incision is preferred only if ‘with the rule’ astigmatism is > 1D.

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Dr.M.Venkata Bhavani received M.B.B.S from Rangaraya Medical College in the year 1986 and worked as medical officer from there on and finished her M.S Ophthalmology in the year 2004 from Rangaraya Medical College. She is presently working as Assistant Professor in the Department of Ophthalmology, Rangaraya Medical College, Kakinada.