COMPARISON OF ASTIGMATISM BETWEEN SUPERIOR TUNNEL AND TEMPORAL TUNNEL INCISION IN MANUAL SMALL INCISION CATARACT SURGERY

Usha B. R[1], M. S Usha[2]

[1]Assistant Professor, Sri Devaraj Urs Medical College University, Kolar.
[2]Chief Ophthalmologist, Mysore Race Club Charitable Eye Hospital, Mysore.

ABSTRACT

OBJECTIVES

Analysis of postoperative astigmatism in superior tunnel versus temporal tunnel incision in manual small incision cataract surgery.

METHODS

Prospective study done at Mysore Race Club Charitable Eye Hospital. 140 Patients underwent sutureless superior tunnel or temporal tunnel cataract surgeries with single-piece Polymethylmethacrylate (PMMA) intraocular lenses. Accurate Keratometry was done with the help of Bausch and Lomb Keratometer. IOL power was calculated by using SRK (Sanders-Retzlaff-Kraff) II formula, with the help of non-immersion, contact type of A-Scan biometry. 70 patients underwent superior tunnel and rest 70 patients by temporal tunnel surgeries. The amplitude and type of astigmatism was estimated at 1 and 8 post-operative weeks. Astigmatism in preoperative and postoperative weeks are compared and analysed by student-t test statistics.

RESULTS

Temporal tunnel cases had more of postoperative as well as surgically induced astigmatism (SIA) with-the-rule (WTR). 55.7% in temporal tunnel (TT) and 37.1%in superior tunnel (ST) had WTR. Superior tunnel has induced against-the-rule astigmatism in 62.9% of cases.

CONCLUSION

Astigmatism induced by temporal tunnel is significantly less when compared to superior tunnel.

KEYWORDS

Superior Tunnel, Temporal Tunnel.

HOW TO CITE THIS ARTICLE: Usha BR, Usha MS. "Comparison of astigmatism between superior tunnel and temporal tunnel incision in manual small incision cataract surgery". Journal of Research in Ophthalmology and Visual Sciences 2015; Vol. 1, Issue 1, July-December 2015; Page: 1-8.

INTRODUCTION

Manual Small Incision Cataract Surgery (MSICS) gained popularity and it is practised by many surgeons in the developing countries. It has many advantages like, surgery can be done within a short duration time without compromising quality and visual outcome, faster return to normal activities, reduces the chances of surgically induced astigmatism or snapped sutures, ability to stop surgery at any point in the procedure; it causes less discomfort to the patient after surgery because, it is sutureless. MSICS technique is vastly adapted in community-service-oriented and charitable institutions to make their poor and under privileged patients reap the benefit of a successful surgical procedure with minimal astigmatism.

METHOD AND METHOD

Prospective study done at Mysore Race Club Charitable Eye Hospital. 168 eyes of 168 patients underwent sutureless cataract surgeries either superior tunnel approach or temporal tunnel approach with single-piece polymethylmethacrylate intraocular lenses. 140 patients out of 168 qualified for this study due to lack of follow up. Accurate Keratometry was done with the help of Bausch and Lomb Keratometer. IOL power was calculated by using SRK (Sanders-Retzlaff-Kraff) II formula, with the help of non-immersion, contact type of A-Scan biometry. 70 patients underwent superior tunnel and rest 70 patients by temporal tunnel surgeries. The amplitude and type of astigmatism was estimated at 1 and 8 post-operative weeks.

Exclusion Criteria

Complicated cataract, traumatic cataract, corneal opacities, corneal degenerations, uveitis, pseudoexfoliation, glaucoma, connective tissue disorders, previous ocular surgeries, pathological conditions of the optic nerve and retina, external eye diseases, uncontrolled diabetes, uncontrolled hypertension.

Inclusion Criteria

Senile/presenile cataract, including mature and immature cataract, well dilated pupil.

Informed consent obtained in every case, with age group ranging from 40 years to70 years. Preoperative visual acuity assessed in all 140 patients, nasolacrimal duct patency noted, intraocular pressure estimated with Goldmann Applanation

Financial or Other, Competing Interest: None.
Submission 07-12-2015, Peer Review 08-12-2015,
Acceptance 11-12-2015, Published 24-12-2015.
Corresponding Author:
Dr. Usha. B. R,
Assistant Professor,
S. D. U. M. C, Kolar.
E-mail: drushamahesh@gmail.com

Tonometer. Blood pressure recorded, urine sugar strip test was done. Fundus examination was done with indirect ophthalmoscope by using 20D lens and 90D lens wherever possible. Using Bausch Lomb Keratometer, keratometry readings within 20 degrees above or below the horizontal meridian were considered to be along 180 degrees. Readings within 20 degrees on either side of vertical meridian assumed to be along 90 degrees. Non-immersion contact type A-scan Biometry IOL power was calculated by using SRK II formula.

Preoperatively, ciprofloxacin eye drops instilled hourly into conjunctival sac, 24 hours prior to surgery. Flurbiprofen 0.3% eye drops, tropicamide 0.8%, and phenylephrine 5% eye drops started 2 hours before surgery at an interval of 15 minutes. Proper aseptic precautions were taken and 7mm conjunctival peritomy done. A frown incision of 6mm was made on superior aspect in 70 patients and converted into sclera corneal tunnel and temporal tunnel[1] of sclera in70 patients from randomly assorted cases. No.11 Bard parker blade, the summit of which was 1.5mm away from the limbus. Sclerocorneal tunnel was made with a 2.6mm crescent blade, extended 1.0mm anteriorly into the cornea.

Paracentesis was done, anterior chamber was maintained with 2% hydroxypropylmethylcellulose (HPMC). A 6 to 6.5mm continuous curvilinear capsulorhexis (CCC)[2] was done with cystitome. Anterior chamber was entered with the help of a keratome. A good cortical cleaving hydro dissection was done in relevant cases. Nucleus was prolapsed into anterior chamber with a lens dialler/sinskey hook. Irrigating vectis was used to deliver the nucleus. Thorough cortical wash was done in all cases with a two-way 22 gauge Simcoe cannula and bulb. Single- piece polymethylmethacrylate IOL of 6mm optic size was placed inside the bag in all cases.

Viscoelastic substance was thoroughly washed and the anterior chamber was formed by ringer lactate solution.

The wound integrity was checked after releasing superior rectus bridle suture. A subconjunctival injection of 0.5ml of gentamycin and 0.5ml of dexamethasone was given at the end of surgery. Postoperatively, a combination of chloramphenicol 0.5% and dexamethasone0.1% eye drops were given 8 times/day. Cyclopentolate 1% eye drops thrice a day were advised and was slowly tapered depending upon observation over a period of 8 to 10 weeks.

Amplitude of astigmatism was calculated from the difference between Keratometric readings expressed in dioptres with axis in steeper meridian.

Surgically induced astigmatism

(SIA) was calculated by vector method with the help of SIA software.

Age distribution: Out of 140 eyes selected for the study, 70 eyes underwent MSICS through superior approach (ST) and 70 eyes through temporal tunnel approach (TT).

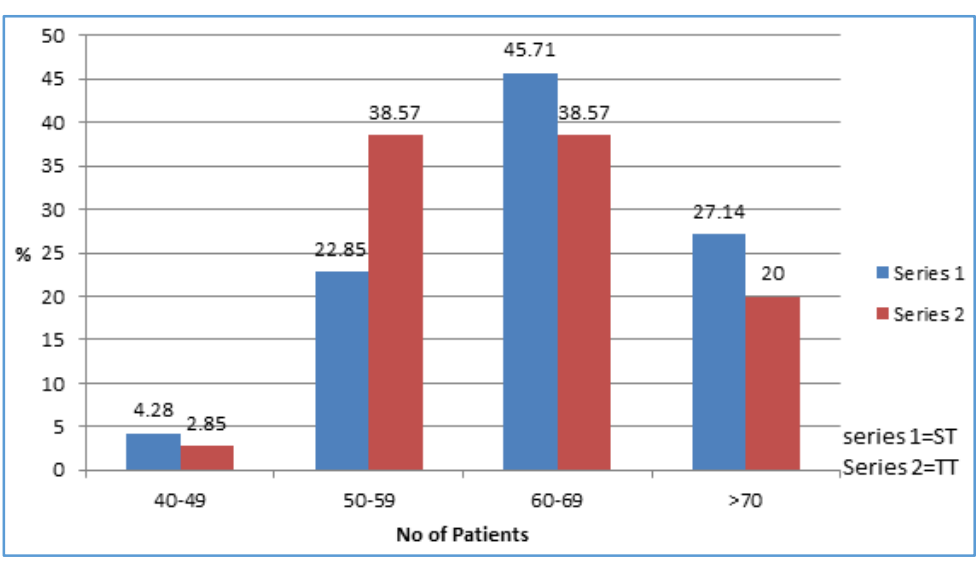
Most of the patients (72.85%) are aged between 50 and 69 years of age.

Mean age of patients in ST group is 63 years ranging from 40-85 years.

Mean age of patients in TT group is 61 years ranging from 42 to 85 years.

Age in years	Superior Tunnel(ST)		Temporal Tunnel		Total	
	No	%	No	%	No	%
40-49	3	4.28	2	2.85	5	3.57
50.59	16	22.85	27	38.57	43	30.71
60-69	32	45.71	27	38.57	59	30.71
60-69	32	45.71	27	38.57	59	42.14
>70	19	27.14	14	20	33	23.57
Total	**70**	**100%**	**70**	**100%**	**140**	**100%**

Table: 1 Age Distribution



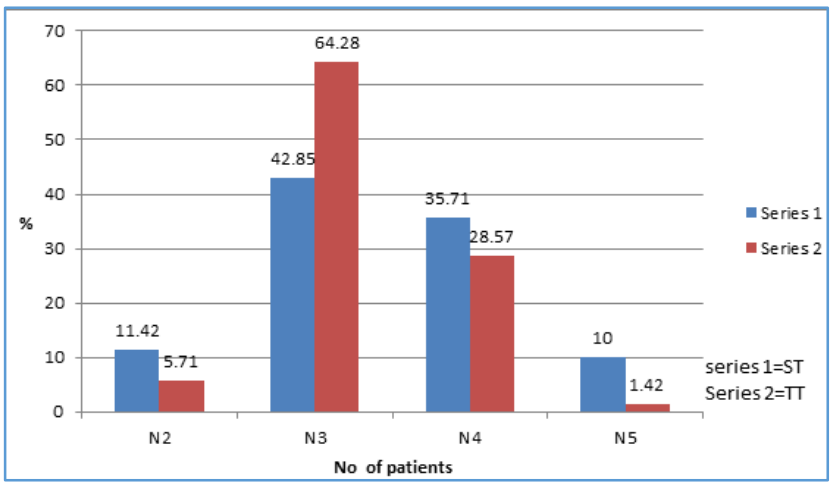
Graph 1: Age distribution

Most of the patients (72.85%) are aged between 50-69 years. Mean age of patients in ST group is 63.0+-8.73 ranging from 40-85 years. Mean age of the patients in TT group is61+-8.56 ranging from 42-81years.

Nuclear Grading

Nuclear grading	Superior Tunnel		Temporal Tunnel		Total	
	No	%	No	%	No	%
N2	8	11.42	4	5.71	12	8.57
N3	30	42.81	45	64.3	75	53.5
N4	25	35.7	20	28.5	45	32.1
SMC	7	10	1	1.4	8	5.7
Total	**70**	**100**	**70**	**100**	**140**	**100**

Table 2: Nuclear Grading



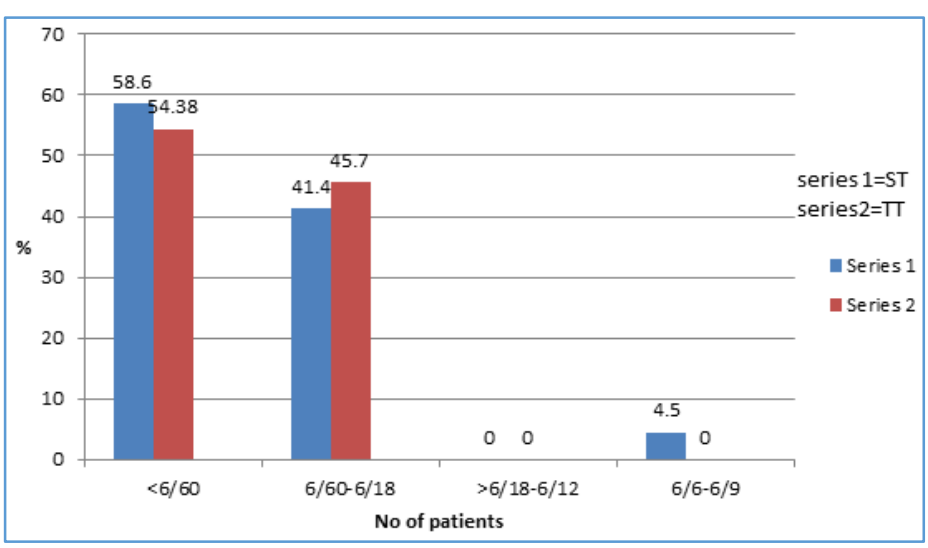
Graph 2 Nuclear Grading

Majority of patients 120 cases out of 140, 85.6% had N3 and N4 nuclear sclerosis.
N3 was predominantly seen in most cases in both ST and TT groups.

Analysis of visual acuity

The Preoperative percentage distribution of uncorrected (UCVA) visual acuity according to WHO as shown below.
In the superior tunnel group,

- 58.6% of cases had visual acuity of <6/60(poor).
- 41.4% of cases had visual acuity 6/18-6/60(Border line).
- In temporal tunnel group.
- 54.38% of cases had visual acuity of <6/60.
- 45.7% of cases had visual acuity of <6/60-6/18.



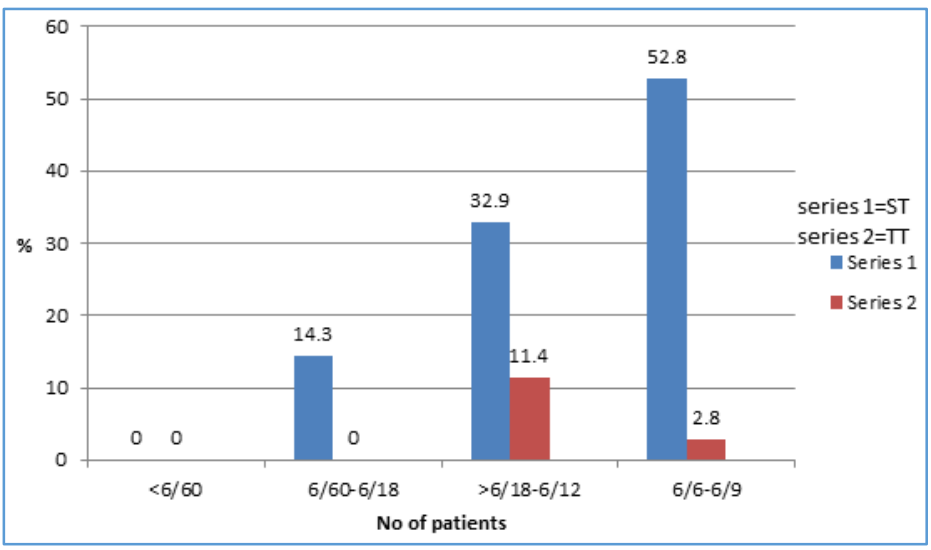
Graph 3: Pre-op UCVA in ST and TT

Post-operative UCVA in all patients are shown in Tables 3, 4, and Graph 4.

Uncorrected Visual acuity	Superior Tunnel		Temporal Tunnel		Total	
	No	%	No	%	No	%
<6/60	-	-	-	-	-	-
6/60-6/18	10	14.3	-	-	10	7.17
>6/18-/12	23	32.9	8	11.4	31	22.14
6/6-6/9	37	52.8	62	88.6	99	70.71
Total	**70**	**100**	**70**	**100**	**140**	**100**

Table 3: Post-op UCVA

92.9% of cases had good UCVA of >6/18 at 8 week postoperatively, as per WHO criteria.
On further analysis 52.8% in superior tunnel and 88.6% in temporal tunnel had UCVA of 6/6 to 6/9.



Graph 4: Post-op UCVA in ST and TT

UCVA	No	%
<6/60	0	0
6/60-6/18	10	7.1
>6/18	130	92.9
Total	**140**	**100**

Table 4: Post-op visual acuity in entire study

Type and nature of astigmatism

Preoperative: Cases were randomly distributed for surgery through superior or temporal tunnel approach, irrespective of their nature of keratometric values as shown below in table 5

Analysing all the cases after surgeries, it was found that slightly higher proportion cases with with-the-rule astigmatism (WTR 52.9%) underwent surgery through superior approach.

Relativel, larger number of cases with against-the-rule astigmatism (ATR 54.3%) underwent temporal tunnel surgeries.

Astigmatism	Superior Tunnel		Temporal Tunnel		Total	
	No	%	No	%	No	%
With-the-rule	37	52.9	32	45.7	69	49.28
Against-the-rule	33	47.14	38	54.3	71	50.72
Total	**70**	**100**	**70**	**100**	**14o**	**100**

Table 5: Preoperative astigmatism

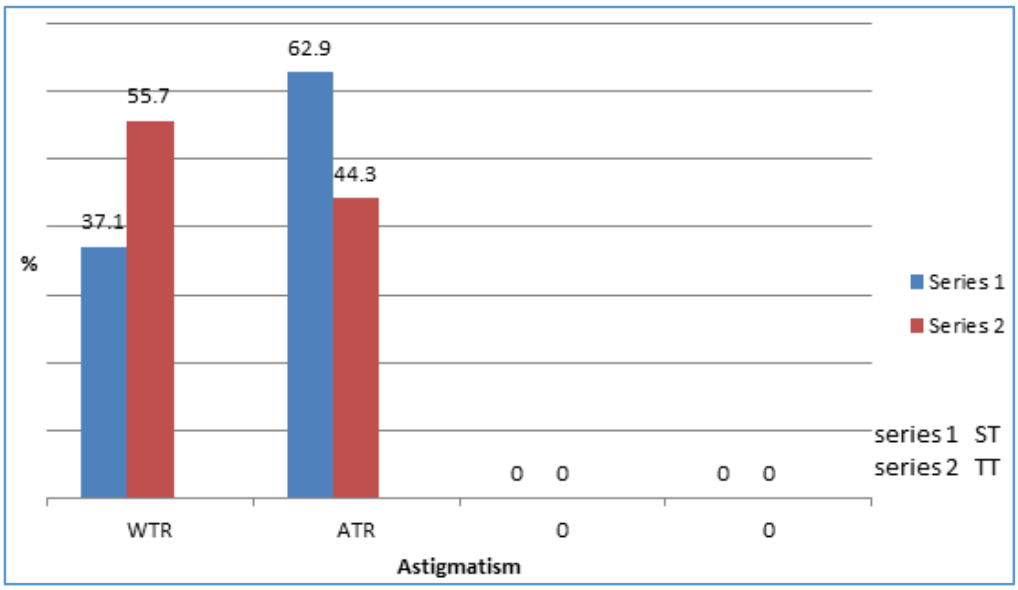
Astigmatism	Superior Tunnel		Temporal Tunnel		Total	
	No	%	No	%	No	%
With-the-rule	26	37.1	39	55.7	65	45.42
Against-the-rule	44	62.9	31	44.3	75	53.57
Total	**70**	**100**	**70**	**100**	**140**	**100**

Table 6: Postoperative astigmatism

Table 6 and Graph 5 show that, in superior tunnel surgery there is higher proportion of cases with ATR (62.9%).

Temporal Tunnel

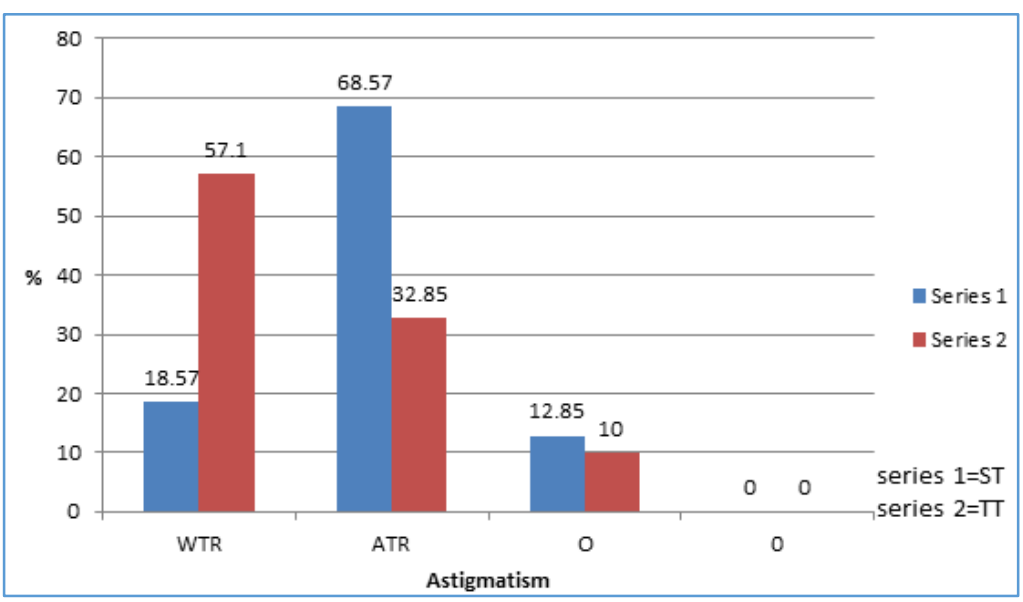
- 55.7% of cases had WTR when compared to preoperative 45.7% of cases.
- Only 44.3% had ATR in contrast to preoperative54.3% of cases.
- Thus, TT is beneficial in ATR patients to a certain extent so that they are shifted to WTR astigmatism.
- Many patients with WTR remained WTR postoperatively.
- In contrast, many patients with ATR who had surgery through superior tunnel approach remained with ATR astigmatism even postoperatively.



Graph 5: Postoperative astigmatism: WTR/ATR

Astigmatism	Superior Tunnel		Temporal Tunnel		Total	
	No	%	No	%	No	%
With-the-rule	13	18.57	40	57.1	53	37.8
Against-the-rule	48	68.57	23	32.85	71	50.71
Zero	9	12.85	7	10.0	16	11.42
Total	**70**	**100**	**70**	**100**	**140**	**100**

Table 7: Surgically induced astigmatism



Graph 6: SIA: WTR/ATR

Amplitude of Astigmatism

Amplitude of astigmatism in Diopters	Postoperative astigmatism		Surgically induced astigmatism	
	No	%	No	%
0-0.5	67	47.9	70	50
0.6-1.0	45	32.1	37	26.4
1.1-2.0	23	16.4	27	19.3
>2.0	5	3.6	6	4.3
Total	**140**	**100**	**140**	**100**

Table 8: Distribution of amplitude of astigmatism (Postop) and surgically induced astigmatism in the whole study

Table 6, 7 and Graphs 8, 9 shows that in this study 80% of had postoperative astigmatism of <1.0D; 76.4% had SIA of <1.0D and in 16 cases SIA was zero. This is reflected in a good proportion of cases (88.6%) having an uncorrected visual acuity of >6/18 in the whole study.

In the ST group postoperative amplitude of astigmatism was<1.0D in 75.75 0f cases. SIA of <1.0D was found in 67.2% of cases.

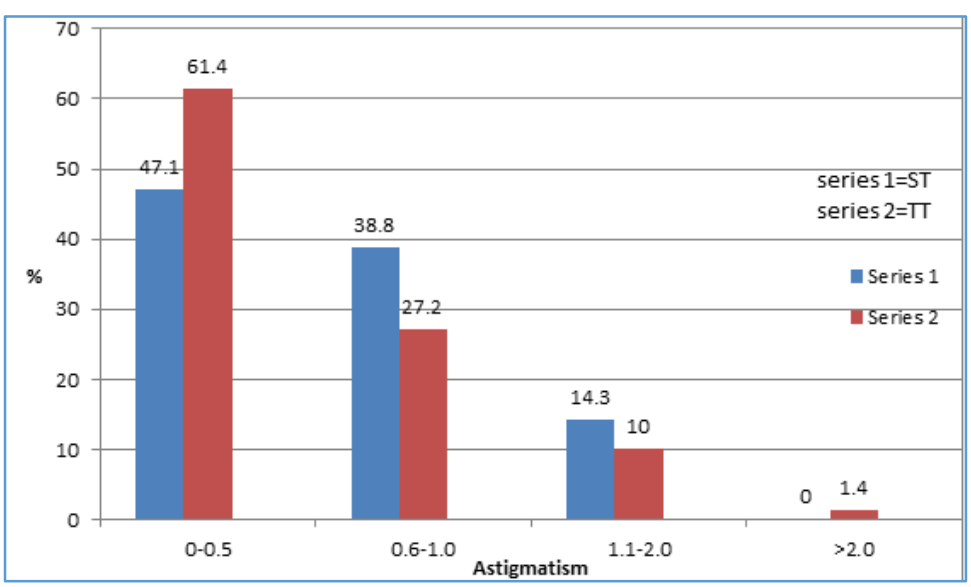
In the TT group 84.3% of patients had <1.0D of postoperative astigmatism.85.8% had SIA of <1.0D.61.55 of patients had just upto 0.5D SIA.

Amplitude of Astigmatism	No	%
0-0.5	67	47.9
0.6-1	45	32.1
1.1-2.0	23	16.4
>2.0	5	3.6
Total	**140**	**100**

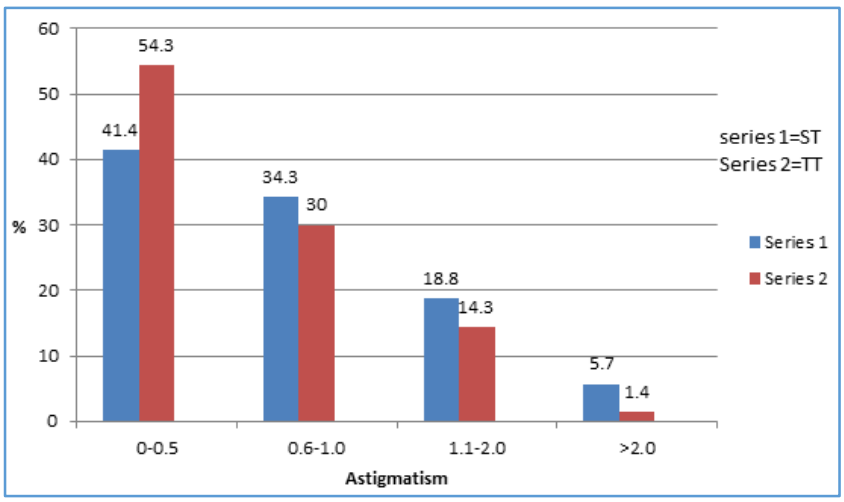
Table 9: Overall distribution of amplitude of astigmatism in the whole study

Astigmatism	Superior tunnel			Temporal Tunnel			Significance
	Mean	Standard deviation	Range	Mean	Standard deviation	Range	Probability (P)
Preoperative	0.73	o.42	0.25-2.0	0.64	0.46	0.5-2.5	P=0.234
Postoperative	0.91	o.63	0.25-3.0	0.71	o.43	0.25-2.25	P=0.033
Surgically induced	0.91	o.74	0-3.75	0.63	0.48	0-2.5	P=0.01

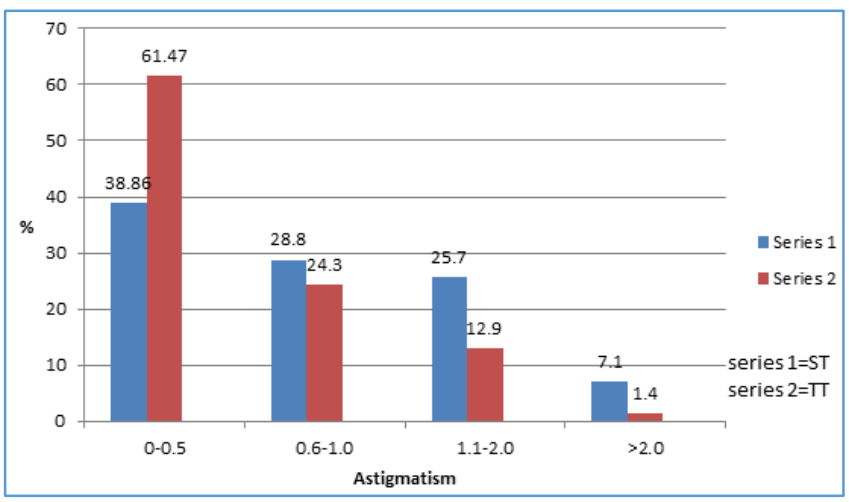
Table10: Mean amplitude of astigmatism preop, postop, SIA



Graph 7: Preoperative amplitude of astigmatism



Graph 8: Amplitude of postoperative astigmatism



Graph 9: SIA Amplitude of astigmatism

Student t-test was used to analyse this. It shows that TT group had postoperatively lesser amplitude of astigmatism (P=0.033) when compared to ST group, which is statistically significant.

Mean SIA is 0.63+0.48D in TT and 0.91+-0.74D in ST groups. Independent samples t test was used to test the significance of SIA between TT and ST groups. It shows that there is a statistically significant difference in SIA between ST and TT groups with p=0.0010.This means that SIA is significantly less in TT group when compared to ST group.

Postoperative complications: Posterior capsular opacification developed in three-piece IOL case at 8 weeks. Cystoid macular oedema developed in two cases, one in three-piece IOL group and another in single-IOL case at 8 weeks. There were no major complications like posterior capsular tear, wound leak, secondary glaucoma, retinal detachment or endophthalmitis.

DISCUSSION

Temporal tunnel[3] cases had more number of postoperative astigmatism as well as surgically induced astigmatism in terms of with-the-rule (WTR) astigmatism.55.7% in temporal tunnel and 37.1% in ST had WTR. Superior tunnel (ST) has against-the-rule astigmatism in 62.9% of cases. TT group had <1.0D of astigmatism in84.3% of cases and ST group had the same in 75.3% of cases.

Mean postoperative astigmatism and SIA were 0.71D and 0.63D respectively in TT group. Mean postoperative astigmatism was 0.91D in ST group and SIA was also the same in this group. This is almost comparable to the amplitude of astigmatism following phacoemulsification(George Roenne).[4]This degree of astigmatism could be due to various factors in the present study like ,small size of the incision (6mm),minimum cautery of conjunctival vessels.

ACKNOWLEDGEMENT

I sincerely thank Dr M S Usha, chief ophthalmologist, for her encouragement and constant support throughout my study and also thank my parents, husband and son Advait for their patience and their valuable support. I thank all the patients who participated in this study for their co-operation. I also thank Dr Lancy D Souza, Research Consultant in Statistics, Mysore for helping with the statistical analysis of this study.

CONCLUSION

Postoperative astigmatism induced by temporal approach is significantly less than through superior approach. WTR astigmatism is more common with temporal tunnel, whereas ATR is more common with superior tunnel approach.

REFERENCES

1. Ghokale NS , Sawhney S, Reduction in astigmatism in manual small incision cataract surgery through change of incision site, Indian J Ophthalmology,2005;53:pg-201-3.
2. Capsulotomy, chapter-4.4. Manual small incision cataract surgery an alternative technique to instrumental phacoemulsification, Dr G Natchiar, M S, Aravind Publications, 2000;pg-19-20.
3. M. K. Rathore, chapter-26. Temporal tunnel Incision Cataract Surgery (Manual phaco), First edition, Kamaljeet singh MS, Jaypee Brothers Medical Publishers, pg-136-139.
4. George, Ronnie, Rupauliha, Pankaj, Comparison of Endothelial Cell Loss and Surgically Induced Astigmatism following Conventional Extracapsular Cataract Surgery and Phacoemulsification, Ophthalmic Epidemiology,2005oct;Vol 12(5):pg-293-297.