A COMPARATIVE STUDY OF TEMPORAL VERSUS SUPERIOR SCLERAL INCISION IN MANUAL SMALL INCISION CATARACT SURGERY

Suhas Shamrao Sarawade[1], Shraddha Dnyaneshwar Mahadik[2]

[1]Professor and HOD, Department of Ophthalmology, Dr. Vaishampayan Memorial Government Medical College, Solapur.
[2]Juniour Resident, Department of Ophthalmology, Dr. Vaishampayan Memorial Government Medical College, Solapur.

ABSTRACT

BACKGROUND

Cataract surgery has become one of the most common and successful procedures in ophthalmology. Cataract surgery is no more a blind rehabilitation surgery. Good post-operative vision is considered norm. Surgically induced Astigmatism (SIA) is one of the important factors that hampers post-operative good visual outcome. One of the goals of modern cataract surgery is to reduce SIA, a factor that may reduce VA and affects the quality of vision.

Aims and objectives- 1. To compare the two incisions as a function of location with regard to postoperative astigmatism and type of astigmatism. 2. Comparison of postoperative uncorrected visual acuity and postoperative best corrected visual acuity in both the groups.

MATERIALS AND METHODS

In this prospective, interventional, hospital based, comparative study 100 patients were studied. The patients were randomly assigned to any of the two groups having 50 patients each. The patients in group A underwent manual small incision cataract surgery (MSICS) with superior incision and the patients in group B underwent MSCICS with the temporal incision. The patients were examined on postoperative days 1st, 7th, 4th week, 6th week and 3rd month. The uncorrected and best corrected visual acuity was recorded, slit-lamp, autorefractometer and keratometry examinations were done.

RESULTS

After 6 weeks postoperatively, out of 50 patients in superior scleral incision group, 64% patients had ATR astigmatism and 28% patients had WTR astigmatism, in temporal scleral incision group 58% of the patients had WTR astigmatism and 26% had ATR astigmatism. The SIA in temporal incision group was significantly less (0.63 ± 0.42 D) than the superior incision group (1.20 ± 0.50 D) after 6 weeks postoperatively ($t=6.43$, $p<0.01$). Postoperative uncorrected visual acuity was better with temporal incision than superior incision, although there was no difference in best corrected visual acuity in both the groups.

CONCLUSION

This study reveals that temporal approach MSICS produces less postoperative astigmatism and has manifold advantages over superior incision MSICS with excellent visual outcome.

KEYWORDS

Manual Small Incision Cataract Surgery, Superior Incision, Temporal Incision, Surgically Induced Astigmatism.

HOW TO CITE THIS ARTICLE: Sarawade SS, Mahadik SD. A comparative study of temporal versus superior scleral incision in manual small incision cataract surgery. J. Evid. Based Med. Healthc. 2018; 5(12), 1089-1094. DOI: 10.18410/jebmh/2018/225

BACKGROUND

Cataract is defined as "opacity in the lens capsule or its substance". It is the most common cause of treatable blindness in the world and especially in developing countries.[1] The mainstay of the management of cataract is surgery. The aims of modern cataract surgery are rapid visual rehabilitation, best possible uncorrected visual acuity and minimum postoperative astigmatism.

One of the major obstacle to achieve best uncorrected visual acuity is the surgically induced astigmatism after cataract surgery.

Small incision cataract surgery (SICS) through a sclerocorneal tunnel has come as a boon as it has been demonstrated that smaller the incision, lesser the number of sutures and valvular construction of wound would induce minimal astigmatism.[2] Manual small incision cataract surgery (MSICS) has emerged as a popular technique and it has been possible to deliver quality surgery to the masses in developing countries. Apart from being a procedure that restores vision due to lenticular opacity it is changing into a procedure that aims for postoperative emmetropia. The cataract incision itself may be looked upon as a refractive procedure capable of permanently reducing the astigmatic component of the postoperative refractive error.

There are certain characteristics of self-sealing small incision with respect to the length, shape, location (corneal

Financial or Other Competing Interest: None.
Submission 23-02-2018, Peer Review 27-02-2018,
Acceptance 18-03-2018, Published 19-03-2018.
Corresponding Author:
Dr. Shraddha Dnyaneshwar Mahadik,
Room No. 10, Resident Doctors Hostel,
Civil Hospital Campus, Opposite to District Court,
Solapur – 413003, Maharashtra.
E-mail: dr.shraddhamahadik@gmail.com
DOI: 10.18410/jebmh/2018/225

vs. Scleral), direction (superior vs. temporal) of incision that impart not only self-sealing property but also astigmatic neutrality to these incisions. The evolution & refinement of small incision cataract surgery have almost diminished controversies regarding the length, width and shape of incisions.[3]

The depth of the incision has been reported to have little influence on the amount of induced astigmatism.[4] On the other hand, the location and the direction of the wound can still have a impact on surgical outcome. Thus in the present study, we have endeavoured to evaluate surgical outcome in superior and temporal scleral incision in MSICS with respect to the postoperative astigmatism and post-operative uncorrected and best corrected visual acuity.

MATERIALS AND METHODS

This was a prospective, interventional, hospital based, comparative study carried out from September 2015 to August 2017.

We used following inclusion and exclusion criteria for study.

Inclusion Criteria

The patient who present to Ophthalmology outdoor patient department in our hospital and diagnosed as having senile cataract.

Exclusion Criteria

Patients with congenital, traumatic or complicated cataract, glaucoma or previously operated for glaucoma, lens induced glaucoma, corneal opacity, iridocyclitis, subluxated or dislocated lens, grade 4 nuclear sclerosis, pseudoexfoliation, previous ocular surgery, high myopia.

Methods

Total 100 patients with senile cataract fulfilling the above criteria were divided randomly into following two groups-

- *Group A*- Comprised of 50 patients who underwent manual small incision cataract surgery with superior scleral incision.
- *Group B*- Comprised of 50 patients who underwent manual small incision cataract surgery with temporal scleral incision.

Thorough preoperative evaluation of the patient was carried out in which all the patients were subjected to detailed history, systemic and ocular examination which included visual acuity, detailed slit lamp examination, Intraocular pressure recording, lacrimal sac syringing and detailed fundus examination after pupillary dilatation.

Keratometry readings were recorded and IOL power calculated by A - scan Biometry. The amount and type of pre-operative astigmatism was noted in all patients. Then investigations were advised and undertaken. Pre-operatively mydriasis was achieved with instillations of Tropicamide and Phenylephrine combination and Flurbiprofen eye drops. All patients were operated under Peribulbar block with 5 ml of 2% xylocaine with adrenaline and injection hyaluronidase. Ocular hypotony achieved by digital massage.

Surgical Technique

Manual Small Incision Cataract Surgery with Superior Scleral Incision

With all aseptic precautions painting and draping of the eye to be operated was done. Superior and inferior rectus sutures were taken Fornix based conjunctival flap prepared. Hemostasis achieved by wetfield bipolar cautery. A frown incision was made on the sclera using blade no. 15. Sclerocorneal tunnel was made with crescent blade. Anterior chamber entry was made with 3.2 mm keratome. Trypan blue dye injected and washed away. A side port entry was made 2-3 clock hours away from primary incision. A continuous curvilinear capsulotomy was started at 9 o'clock and completed for 360 degrees. Incision was extended on either side with enlarger with to and fro movements. Hydro-dissection was done Nucleus was prolapsed into the anterior chamber by tilting the nucleus with 26 no. cystitome. The nucleus was brought out with visco-expression. Cortex in the pupillary area and equatorial cortex beneath the iris were aspirated with Simcoe's two-way irrigation and aspiration cannula. A posterior chamber single piece PCIOL, 6 mm optic and 12.5 mm haptic (overall diameter) implanted in the capsular bag. The viscoelastic material aspirated out with the help of Simcoe's two-way irrigation and aspiration cannula. Sub conjunctival gentamycin and dexamethasone injected. Eye pad and protective shield applied.

Manual Small Incision Cataract Surgery with Temporal Scleral Incision

Manual small incision cataract surgery with temporal scleral incision does not differ much from superior incision but needs some modification of surgeon's procedures. The surgeon needs to sit on the temporal side of the eye to be operated and corresponding shift of operating microscope. Fornix based conjunctival flap was taken from 10 o'clock to 8 o'clock, scleral frown incision was placed posterior to limbus. Side port was made around 1 to 2 clock hours away from the main port. Rest of the steps used in this procedure were similar to the superior incision group.

Follow Up

Patients were followed on following visits postoperatively - 1st day, 1st week, 4th week, 6th week and 3rd month. A detailed post-operative work-up including visual acuity, slit lamp examination, keratometry readings was done on each follow up visit. At 6th week, Retinoscopy was done and refraction given.

Cases with steep axis at $90^0 \pm 30^0$ were considered having WTR astigmatism and those with steeper axis at $180^0 \pm 30^0$ were considered having ATR astigmatism.

The amplitude of pre-operative and postoperative astigmatism was calculated from the difference in the keratometric values in the steeper and flatter meridian using the plus cylinder notation. Astigmatism was considered a vector with a magnitude equal to this value directed towards the steeper meridian. The amplitude of surgically induced astigmatism was calculated using

surgically induced astigmatism calculator a free software program.

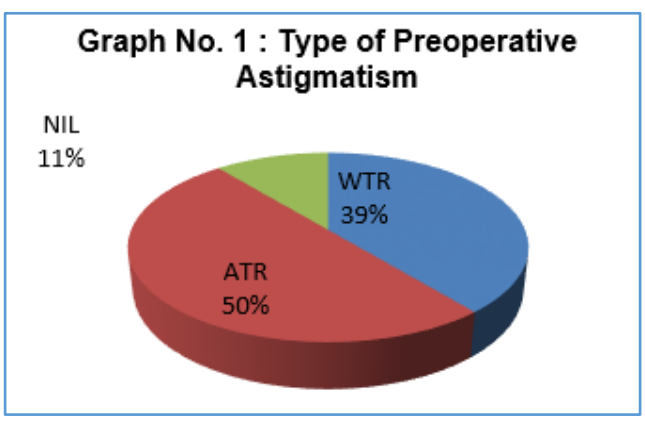
RESULTS

Mean age of our study participants in group A was 62 ± 8.7 and group B was 60 ± 7.8.

Out of the total 100 patients, 45% were males and 55% were females.

Type	Group A (Superior)		Group B (Temporal)		Total		Q test	P Value
	No. of Patients	%	No. of Patients	%	No.	%		
WTR	20	40.00	19	38.00	39	39	0.19	>0.05
ATR	24	48.00	26	52.00	50	50		
Nil	6	12.00	5	10.00	11	11		
Total	**50**	**100**	**50**	**100**	**100**	**100**		

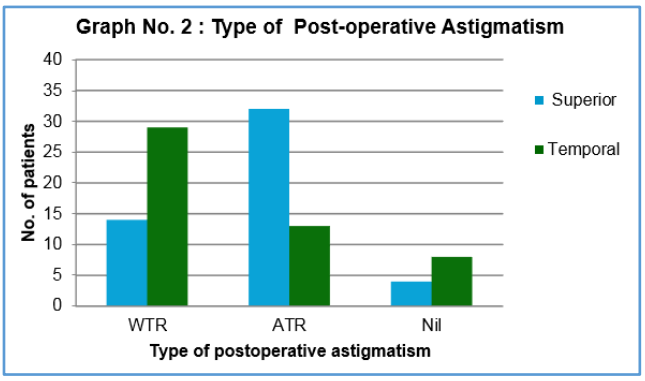
Table 1. Type of Preoperative Astigmatism



Pre-op astigmatism was similar in two groups and there was no statistical significance (q=0.19, P>0.05). Total number of patients with WTR astigmatism was 39 (39%), ATR astigmatism was 50 (50%) and nil astigmatism was 11(11%).

Type	Group A (Superior)		Group B (Temporal)		Q test	P Value
	No. of Patients	%	No. of Patients	%		
WTR	14	28.00	29	58.00	14.58	<0.01
ATR	32	64.00	13	26.00		
Nil	4	8.00	8	16.00		
Total	**50**	**100**	**50**	**100**		

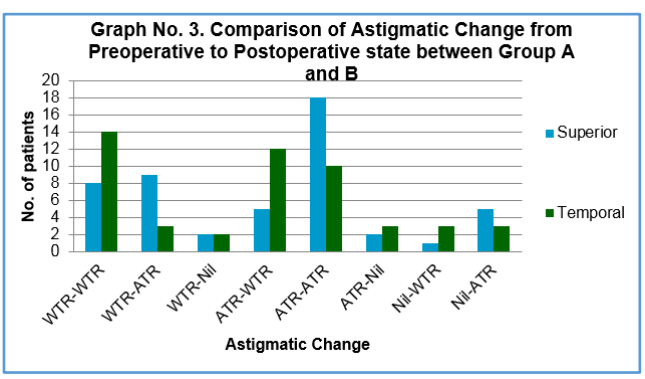
Table 2. Type of Postoperative Astigmatism



Statistically there was significant difference observed in postoperative WTR, ATR, cases with no astigmatism between group A and group B (p<0.01). Postoperative ATR type of astigmatism was more in group A than in group B Postoperative WTR type of astigmatism was more in group B than in group A.

Change	Group A (Superior)		Group B (Temporal)		Z test	p value
	No. of Patients	%	No. of Patients	%		
WTR – WTR	08	16.00	14	28.00	1.44	>0.05
WTR-ATR	09	18.00	3	6.00	1.84	=0.05
WTR – Nil	2	4.00	2	4.00	-	
ATR – WTR	5	10.00	12	24.00	1.86	=0.05
ATR – ATR	18	36.00	10	20.00	1.78	=0.05
ATR – Nil	2	4.00	3	6.00	0.45	>0.05
Nil – WTR	1	2.00	3	6.00	1.02	>0.05
Nil – ATR	5	10.00	3	6.00	0.73	>0.05
Total	**50**	**100**	**50**	**100**		

Table 3. Comparison of Astigmatic Change from Preoperative to Postoperative State Between Group A and B



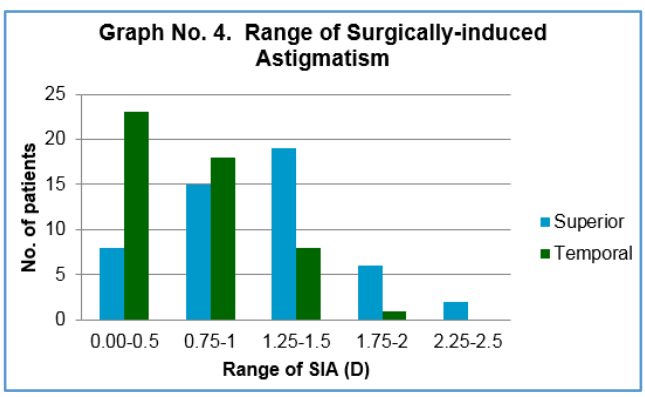
Astigmatic Change from Preoperative WTR type to Postoperative ATR type was found in 18% patients in superior incision and 6 % patients in temporal incision, From Preoperative ATR type to Postoperative WTR type was found in 10% patients in superior incision and 24% patients in temporal incision. From preoperative to postoperative ATR type was found in 36% patients in superior incision and 20% patients in temporal incision.

From preoperative to postoperative ATR type was found in 36% patients in superior incision and 20% patients in temporal incision. From preoperative WTR to

postoperatively no astigmatism was found in 4% patients in superior incision and 4% patients in temporal incision. From preoperative ATR to postoperatively no astigmatism was found in 6% patients in superior incision and 4 % patients in temporal incision.

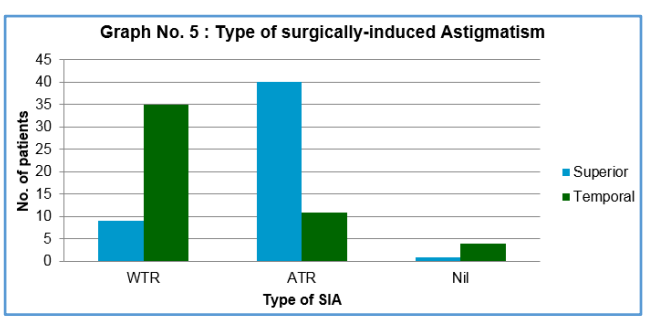
Range of SIA (Diopters)	Group A (No. of Cases)	%	Group B (No. of Cases)	%	Z test	P value
0.00- 0.5	8	16.00	23	46.00	3.24	<0.01
0.75 – 1	15	30.00	18	36.00	0.63	>0.05
1.25 – 1.5	19	38.00	8	16.00	2.47	<0.01
1.75 – 2	6	12.00	1	2.00	1.95	<0.05
2.25 – 2.5	2	4.00	0	0.00	1.42	>0.05
Total	**50**	**100**	**50**	**100**		

Table 4. Range of Surgically-Induced Astigmatism



Type of SIA	Group A (No. of cases)	%	Group B (No. of cases)	%	Z test	P value
WTR	9	18.00	37	74.00	5.61	<0.01
ATR	41	82.00	7	14.00	6.80	<0.01
Nil	0	0.00	6	12.00	2.52	<0.05
Total	**50**	**100**	**50**	**100**		

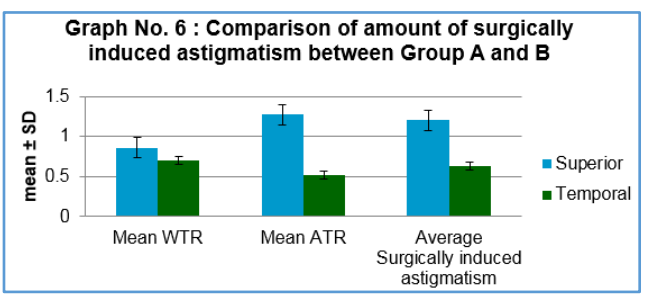
Table 5. Types of Surgically-Induced Astigmatism



In group A, 8 patients (16%) had astigmatism in the range 0.00 to 0.5 D out of which 1 (2%) had no surgically induced astigmatism. 15 (30%) had induced astigmatism in range of 0.75 to 1 D. 19 (50%) had astigmatism in the range of 1.25 to 2 D. 2 (4%) had astigmatism in the range of 2.25 to 2.50 D. WTR type of induced astigmatism was found in 18 % cases, ATR type of induced astigmatism in 82% cases. In group B, 23 (46%) had induced astigmatism in the range 0.00 to 0.5 D, out of which 4 (8%) had no surgically induced astigmatism. 18 (36%) had SIA in range of 0.75 to 1 D. 8 (16%) had astigmatism in the range of 1.25 to 1.5 D. 1 (2%) had SIA in the range 1.75 to 2 D. No patients in this group had astigmatism in the range of 2.25 to 2.50 D. WTR type of induced astigmatism was found in 74 % cases, ATR type of induced astigmatism in 14% cases and no astigmatism in 12% cases.

SIA	Group A	Group B	t test	p value
Mean WTR	0.86 ± 0.52 D	0.70 ± 0.46 D	1.61	>0.O5
Mean ATR	1.27 ± 0.50 D	0.52 ± 0.26 D	9.31	<0.01
Average surgically induced astigmatism	1.20 ± 0.50 D	0.63 ± 0.42 D	6.43	<0.01

Table 6. Comparison of amount of surgically induced astigmatism between Group A and B



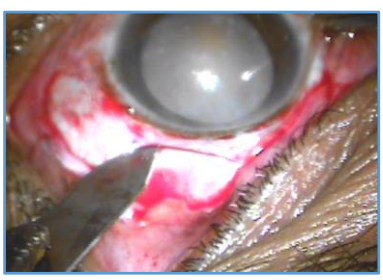
In our study, temporal incision induced less average surgically induced astigmatism than superior incision. Statistically there was significant difference observed in average surgically induced astigmatism between groups A and B (t= 6.43, p < 0.01). Statistically there was no significant difference in mean WTR of two incisions. (p>0.05). Mean ATR type of SIA was greater in superior than temporal group.

The number of patients with uncorrected visual acuity between 6/6 – 6/9 by 3rd month postoperatively was greater in temporal incision group (74%) than in superior group (46%). Statistically there was significant difference between numbers of patients with uncorrected visual acuity between 6/6 – 6/9 by 3rd month postoperatively in both the groups. (p<0.01).

Statistically there was no significant difference observed in best corrected visual acuity(BCVA) at 6 week between groups A and B (p>0.05).By 6 weeks post-operatively, majority of the patients (97%) had (BCVA) better than 6/12.

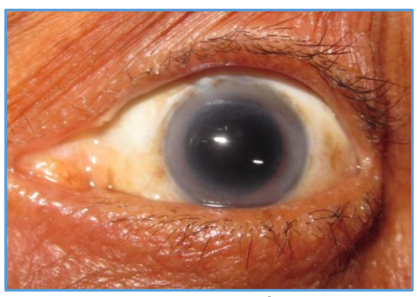
Photographs

Superior Incision Group



Frown Incision

Postoperative 1st Day

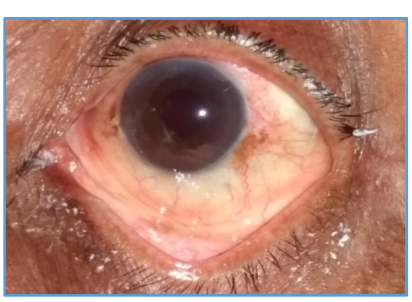


Postoperative 4th Week

Temporal Incision Group

Frown Incision

Postoperative 1st Day



Postoperative 4TH Week

DISCUSSION

The present study was designed to compare superior incision and temporal incision in manual small incision cataract surgery with respect to the post-operative astigmatism induced by each incision and the uncorrected and best corrected visual acuity achieved by each incision.

In our study, in Group A, postoperative astigmatism was ATR type in 64% cases and WTR type in 28% cases. Nil astigmatism found in 8% cases. In Group B, postoperative astigmatism was WTR type in 62 % cases and ATR type in 22 % cases. 16% of patients showed nil astigmatism. In a study conducted by H N Sowbhagya et al[5] in 2012 the proportion of eyes with WTR astigmatism had decreased significantly after surgery and the proportion with ATR astigmatism had increased significantly. In a study conducted by K. J. N. Sivacharan et al.[6] in 2010 – 2012, after 6 weeks, 86% in superior section showed ATR astigmatism and 12 % showed WTR astigmatism and 2% showed no astigmatism. In temporal section 86% had WTR astigmatism, and 8% had ATR astigmatism and 6% showed no astigmatism. Based on this it can be stated that superior incision shows ATR type of postoperative astigmatism and temporal incision shows WTR type of postoperative astigmatism in majority of the patients.

The mean post-operative astigmatism in superior incision group was 1.21 ± 0.93 D and in temporal incision was 0.60 ± 0.36 D. There is statistically significant difference in the mean post-operative astigmatism in superior and temporal incision groups. ($p<0.01$) The mean WTR type of induced astigmatism in superior and temporal incision was 0.86 ± 0.52 D and 0.70 ± 0.46 D respectively which was of no statistical significance ($p>0.05$). The mean ATR type of induced astigmatism in superior and temporal incision was 1.27 ± 0.50 D and 0.52 ± 0.46 D respectively which was of high statistical significance($p<0.01$). The average surgically induced astigmatism in superior and temporal incision was 1.20 ± 0.50 D and 0.60 ± 0.42 D respectively. We found that temporal incision group had less average surgically induced astigmatism than superior incision. Statistically there was significant difference observed in average surgically induced astigmatism between groups A and B ($p<0.01$).

In a study conducted by Gokhale NS, Sawhney et al[7] in 2005 the amplitude of postoperative astigmatism was higher in superior incision group (1.45 + 0.94) than in superotemporal (0.43 + 0.27) and in temporal (0.67 + 0.65). The amplitude of surgically induced astigmatism was also higher in superior incision group (1.36 + 1.03) than in superotemporal (0.51 + 0.49) and in temporal (0.40 + 0.40).

In a study conducted by Renu M Magdum[8] et al in 2012 Mean SIA in temporal incision group was found to be 0.62 D + 0.72 and in superior incision was 0.95 D + 0.68.

In a study conducted by Mallik VK, Kumar S[9] et al in 2012, the mean SIA in superior incision group was found to be 1.45 ± 0.7387 and in temporal incision it was 0.75 ± 0.4067. The SIA induced by the superior incision was 48.28% more than by the temporal incision. Thus, the

study also concluded that SICS with the temporal approach provides a significantly less SIA than superior approach.

Thus, it can be stated that temporal incision induces less astigmatism as compared to superior incision.

This is because, superior location of the incision results in a corneal scar that is closer to the visual axis. The effect of gravity and eyelid blink create drag on the incision. These factors impart significant corneal shape changes resulting in high SIA. These forces are neutralized better with temporally placed incision. Temporally placed incision is away from the visual axis because horizontal diameter of cornea is greater than the vertical diameter. Temporally placed incision is not only away from the visual axis but also free from the effect of gravity and lid blink thus leading to less SIA. Since the temporal incision is away from the visual axis and is more stable is less likely to affect corneal curvature resulting in less astigmatism.

The number of patients with uncorrected visual acuity between 6/6 – 6/9 by 3rd month postoperatively was greater in temporal incision group (74%) than in superior group (46%). Statistically there was significant difference between numbers of patients with uncorrected visual acuity between 6/6 – 6/9 by 3rd month postoperatively in both the groups. ($p<0.01$).

Statistically there was no significant difference observed in best corrected visual acuity (BCVA) at 6 week between groups A and B ($p>0.05$).

Zawar S V, Gogate P,[10] concluded that temporal manual small incision cataract surgery gives excellent visual outcome with minimal astigmatism and low complication rate at economic cost.

Pawar V S and Sindal D K[11] concluded that SICS with temporal and supero-temporal incisions provides better quality of vision due to a significantly less astigmatism. Thus, by minimizing postoperative astigmatism we can accelerate visual recovery with temporal incision.

CONCLUSION

Superior incision causes ATR shift and temporal incision causes WTR shift in majority of the patients. Thus, a simple modification in incision placement depending upon the pre-operative astigmatism can minimize surgically induced astigmatism and reduce pre-existing astigmatism. Manual small incision cataract surgery with temporal scleral incision provides good quality of vision as it produces less surgically induced astigmatism than superior scleral incision. By minimizing postoperative astigmatism, we can accelerate visual recovery with temporal incision.

REFERENCES

[1] Brian G, Taylor H. Cataract blindness - challenges for the 21st century. Bull World Health Organ 2001;79(3):249-256.

[2] Malik KPS, Goel R. Small incision cataract surgery: an introduction. Manual of small incision cataract surgery. 1st edn. New Delhi: CBS Publishers & Distributors 2003: p. 1-2.

[3] Neumann AC, McCarty GR, Sanders DR, et al. Small incisions to control astigmatism during cataract surgery. J Cataract Refractive Surg 1989;15(1):78-84.

[4] Anders N, Pham DT, Antoni HJ, et al. Postoperative astigmatism and relative strength of tunnel incisions: a prospective clinical trial. J Cataract Refract Surgery 1997;23(3):332-336.

[5] Sowbhagya HN, Kumar KL, Nikhil N, et al. Importance of serological workup in cataract cases of out-reach programmes. Journal of Evolution of Medical and Dental Sciences 2013;2(14):2229-2233.

[6] Sivacharan KJN, Hanumantharao G. Study of astigmatism in small incision cataract surgery between temporal and superior incisions. Journal of Evolution of Medical and Dental Sciences 2014;3(54):12472-12476.

[7] Gokhale NS, Sawhney S. Reduction in astigmatism in manual small incision cataract surgery through change of incision site. Indian J Ophthalmol 2005;53(3):201-203.

[8] Magdum RM, Gahlot A, Maheshgauri RD, et al. A comparative study of surgically induced astigmatism in superior and temporal scleral incision in manual small incision cataract surgery. National Journal of Medical Research 2012;2(4):497-500.

[9] Mallik VK, Kumar S, Kamboj R, et al. Comparison of astigmatism following manual small incision cataract surgery: superior and temporal approach. Nepal J Ophthalmol 2012;4(1):54-58.

[10] Gogate PM. Small incision cataract surgery: complications and mini-review. Indian J Ophthalmol 2009;57(1):45-49.

[11] Pawar VS, Sindal DK. A comparative study on the superior, supero-temporal and the temporal incisions in small incision cataract surgeries for postoperative astigmatism. Journal of Clinical and Diagnostic Research 2012;6(7):1229-1232.