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Comparison of Corneal Astigmatism in SICS with Superotemporal Incision and Temporal Incision

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Design: *Retrospective review*
Materials and Methods: *Medical records of patients who underwent Manual Small incision cataract surgery with superotemporal incision or temporal incision during a nine months period from January 2016 to September 2016, with at least two months of follow up, were retrospectively reviewed to analyze the pre operative and post operative corneal astigmatism. The post operative keratometry was recorded at two months and a change in corneal astigmatism was calculated.*
Statistics: SSPA analysis
Results: *Out of the seventy two patients forty two patients had undergone SICS with superotemporal incision while 30 patients had undergone SICS with Temporal incision. The mean corneal astigmatism preoperatively was 0.7440±0.4765 in Superotemporal patients while it was 0.6333±0.4535 in Temporal group of patients. It was less than or equal to 1.25 D in 38(90.47%) patients, >1.25 D and ≤ 2 in 3(7.1%) patients and more than 2 in 1(2.3%) patient. Post operatively the mean corneal astigmatism was less than 1.25 D in 32 (76.19%) patients, more than 1.25 and ≤ 2 in 5 (11.9%) patients and more than 2 in 5 (11.9%) patients. There was a decrease in astigmatism in 10(23.8%) patients, no change in astigmatism in 6(14.2%) patients. 23 (54.7%)patients showed a moderate increase in astigmatism of ≤1D ,3(7.1%) patients showed an increase of astigmatism by >1 D*
In the Temporal group the preoperative astigmatism was ≤ 1.25 in 28(93.3%) patients, >1.25 and ≤2 in 2(6.6%) patients. Post operatively the mean corneal astigmatism was less than 1.25 in 29 (96.6%) patients, more than 1.25 and ≤ 2 in 1 (3.3%) patients. There was a decrease in astigmatism in 18(60%) patients, no change in astigmatism in 8(26.6%) patients and mild increase in astigmatism less than 0.5D in 4(13.3%) patients
Conclusion: *Manual cataract surgery with superotemporal incision can be considered as a viable option in patients with mean corneal astigmatism of 1.25 or less so as to reduce the amount of overall astigmatism, in our pursuit of giving a better spectacle free vision to the patient.*
Keywords: *Corneal astigmatism, superotemporal incision, Temporal Incision, Keratometry*

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I. Introduction

Cataract Surgery has become more of a refractive procedure these days. Spectacle independence is increasingly being expected by all patients, both rich and poor. All patients now expect at least a decent unaided distant vision. Phacoemulsification which is the best possible treatment option available these days may not be feasible for all patients due to financial constraints or due to hardness of the cataract. Apart from this, scarcity of resources in the developing world also makes phacoemulsification not a very attractive option. In such a scenario the best possible option would be small incision cataract surgery with a temporal incision as most of the elderly patients have against the rule astigmatism. But those surgeons who are used to superior incisions will have difficulty in shifting to temporal incision due to its seating arrangement as well as mild difference in the surgical technique.

Pre existing astigmatism is one of the main factors which affect visual acuity[3,8,9]. Presently there are many techniques which are available to reduce this pre-existing corneal astigmatism with placing the incision at the steep axis being one of them[7]. In this study we aim to analyze the surgically induced corneal astigmatism following manual small incision with superotemporal incision. Reddy et al (2007) studied comparison of astigmatism induced by superior and temporal section in SICS in Indian population.[16] Gokhale et al (2005) compared astigmatism induced by superior, supero-temporal and temporal incision in manual SICS. [11]This study was under taken to evaluate results in a group of 72 patients who underwent SICS with Temporal or supero temporal incision.

Manual SICS is an alternative for phacoemulsification but the astigmatism is higher due to the larger size of incision. Pre-existing astigmatism can be neutralized by changing site of incision.

II. Material and Method

Inclusion criteria-The patients with Corneal opacities, scarring degeneration, traumatic cataract, complicated cataract, lenticular subluxation, previous intraocular or corneal surgeries or glaucoma surgeries were excluded. Those patients who had a mean post operative follow up of at least two months were included in the study. The variables which were recorded from their files included demographic parameters such as age and sex, pre operative and post operative ocular findings such as visual acuity, intra ocular pressure, slit lamp findings, fundus and pupil dilatation. Astigmatism and keratometry measured using autorefractometer was also noted down. Coexistisng ocular diseases such as glaucoma, age related macular degeneration, diabetic retinopathy, pseudo exfoliation and presence of systemic diseases like diabetes mellitus, hypertension, cardiovascular diseases, neurological disorders and dyslipidemia were also recorded. The outcome variable of interest which were the post operative keratometry, post operative refraction, uncorrected visual acuity were recorded from the two months follow up report Microsoft excel and SPSS statistical packages were used for data management and analysis.

III. Results

Comparison of mean preoperative and post operative keratometry for data of 72 eyes of 72 patients was done. The medical records of 72 patients operated from January to September 2016, in Government Medical College, Palakkad were reviewed retrospectively to analyze the change in mean corneal astigmatism at 2 months post operatively. The mean age was 59.88 years and it ranged from 23 to 82 years. There were 24(33.3%) males and 48(66.6%) females. 41(56.9%) patients had their right eye operated while 31(43%) patients had their left eye operated. Coexisting systemic conditions were seen as follows: Diabetes mellitus in 2(2.7%) patients, hypertension in 25(34.7%) patients, coronary artery disease in 2(2.7%) patients, chronic obstructive pulmonary disease in 1(1.3%)patients, parkinsonism in 1(1.3% patients) and dyslipidemia in 1(1.3%)patients. 46 (63.8%)patients were nil systemically

Coexisting ocular conditions were as follows: 3(4.1%) patients had pseudo exfoliation and 1(1.3%) patient was one eyed. Pre operative visual acuity ranged between perception of light to 6/18. Cataract status ranged from nuclear sclerosis grade 2 to grade 4, posterior subcapsular cataract and mature cataract. None of these patients had any intra operative complications like posterior capsular rent with/without vitreous loss or any post operative complications.

Out of the seventy two patients 42(58.3%) patients had underwent SICS with 6mm straight superotemporal incision while 30(41.6%) patients had underwent SICS with 6mm straight Temporal incision. The rest of the surgical procedure was similar in both the groups. Corneal astigmatism was calculated from the difference in the keratometry readings at the steepest and flattest meridian. The mean corneal astigmatism preoperatively (KDIFFPRE) was 0.7440±0.4765 in Superotemporal patients while it was 0.6333±0.4535 in temporal group of patients.

Post operatively the mean corneal astigmatism (KDIFFPOST) at two months was 0.4750 ±0.401 in the temporal group and 1.035 ±0.656 in the Superotemporal group.(Table 1) This difference in the two groups is found to be statistically significant.(Table 6). Postoperative corneal astigmatism is greater than preoperative corneal astigmatism in superotemporal group while the temporal section group showed a statistically significant decline in the astigmatism. (Table 3)

Table 1

Paired Samples Statistics						
SECTION			Mean	N	Std. Deviation	Std. Error Mean
Temporal	Pair 1	KDIFFPOST	.4750	30	.40124	.07326
		KDIFFPRE	.6333	30	.45359	.08281
Superotemporal	Pair 1	KDIFFPOST	1.0357	42	.65698	.10137
		KDIFFPRE	.7440	42	.47655	.07353

Table 2

Paired Samples Correlations					
SECTION			N	Correlation	Sig.
Temporal	Pair 1	KDIFFPOST & KDIFFPRE	30	.729	.000
Superotemporal	Pair 1	KDIFFPOST & KDIFFPRE	42	.385	.012

Table 3

Paired Samples Test- Induced Astigmatism										
SECTION			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Temporal	Pair 1	KDIFFPOST - KDIFFPRE	-.15833	.31815	.05809	-.27713	-.03953	-2.726	29	.011
Superotemporal	Pair 1	KDIFFPOST - KDIFFPRE	.29167	.64609	.09969	.09033	.49300	2.926	41	.006

In the Superotemporal group the preoperative corneal astigmatism (KDIFFPRE) was less than or equal to 1.25 D(group 1.00) in 38(90.47%) patients, >1.25 D and ≤ 2(group 2.00) in 3(7.1%) patients and more than 2 (group 3.00)in 1(2.3%) patient. Post operatively the mean corneal astigmatism was less than 1.25 D in 32 (76.19%) patients, more than 1.25 and ≤ 2 in 5 (11.9%) patients and more than 2 in 5 (11.9%) patients.(Table 4)

Induced Astigmatism in superotemporal group is 0.2916±0.6460 and -0.1583 ±0.3181 in temporal group. This difference was found to be statistically significant

An analysis of the induced astigmatism showed a decrease in astigmatism in 10(23.8%) patients, no change in astigmatism in 6(14.2%) patients. 23 (54.7%)patients showed a moderate increase in astigmatism of≤ 1D ,3(7.1%) patients showed an increase of astigmatism by >1 D(Figure 1)

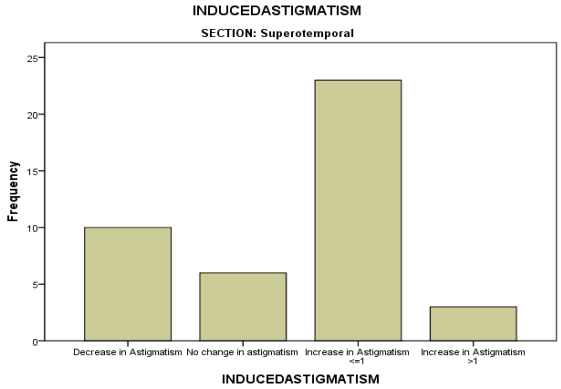

Figure 1- Bar chart showing the degree of induced astigmatism in Superotemporal groups

In the Temporal group the preoperative astigmatism was ≤ 1.25 in 28(%) patients, >1.25 and ≤2 in 2(%) patients. Post operatively the mean corneal astigmatism was less than 1.25 in 29 (96.6%) patients, more than 1.25 and ≤ 2 in 1 (3.3%) patients.(Table 4) There was a decrease in astigmatism in 18(60%) patients, no change in astigmatism in 8(26.6%) patients and mild increase in astigmatism less than 0.5D in 4(13.3%) patient(Figure 2)

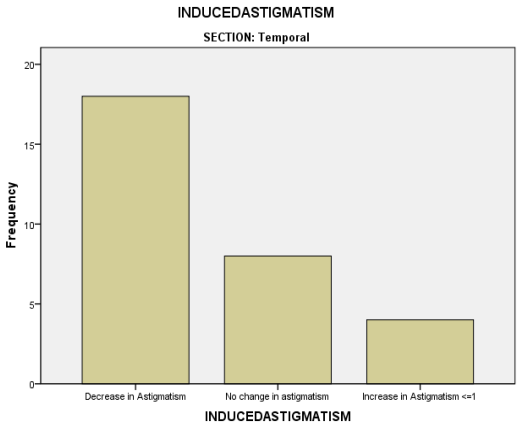

Figure 2 –Bar chart showing the degree of induced astigmatism in Temporal group

The box plot distribution of induced astigmatism (figure 3) in the two groups shows mean astigmatism to be at a lower level in temporal group(2) In the superotemporal group(3) though the mean value is higher it remains lower than 0.5D. The distribution of cases is less in temporal groups which means the values have a

high level of agreement with each other. In the superotemporal series though the values are more distributed 75% of the values are below 0.75D.

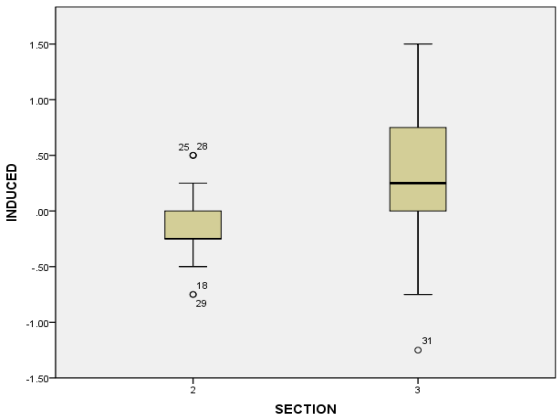

Figure 3-Box plot showing distribution of induced astigmatism in the two groups.

Table 4- Preoperative & Postoperative Corneal Astigmatism Corelation

Count						
SECTION			KDIFFPOST			
			≤ 1.25	>1.25 and ≤2	≤ 2	Total
Temporal	KDIFFPRE	≤ 1.25	28	0		28
		>1.25 and ≤2	1	1		2
	Total		29	1		30
Superotemporal	KDIFFPRE	≤ 1.25	30	4	4	38
		>1.25 and ≤2	1	1	1	3
		≤ 2	1	0	0	1
	Total		32	5	5	42

In the Temporal Section group the mean Post Operative unaided visual acuity was 0.20 ± 0.16(6/9). 100% of the patients had unaided visual acuity of 6 /18 or better at two months. 82.6% of the patients had unaided visual acuity of 6/12 or better. [20] In the superotemporal group the mean Post Operative unaided visual acuity was 0.35 ± 0.22 (6/12). 78.5% patients had unaided visual acuity of 6/18 or better.66.5% patients had unaided visual acuity of 6/12 or better. (Table 5) There was statistically significant difference in the visual acuity of the two groups (Table 6)

Table 5

Descriptive Statistics						
SECTION		N	Minimum	Maximum	Mean	Std. Deviation
Temporal	UNAIDEDVA	30	.00	.50	.2070	.16507
	INDUCED	30	-.75	.50	-.1583	.31815
	Valid N (listwise)	30				
Superotemporal	UNAIDEDVA	42	.00	1.00	.3533	.22038
	INDUCED	42	-1.25	1.50	.2917	.64609
	Valid N (listwise)	42				

Table 6

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
UNAIDEDVA	Between Groups	.375	1	.375	9.430	.003
	Within Groups	2.782	70	.040		
	Total	3.156	71			
INDUCED	Between Groups	3.544	1	3.544	12.372	.001
	Within Groups	20.050	70	.286		
	Total	23.594	71			

IV. Discussion

Corneal astigmatism which is produced post operatively is the leading cause of reduced unaided visual acuity in SICS patients. In this study we aim to study the amount of induced astigmatism in temporal and superotemporal groups. It is a well known fact that temporal incision reduces the amount of post operative corneal astigmatism in patients with pre existing against the rule astigmatism.[16] In this study we compared the astigmatism induced in superotemporal incision with that in temporal incision.

The Temporal incision caused a decrease in the pre-existing against the rule astigmatism by 0.1583D while the superotemporal incision caused an increase in the against the rule astigmatism 0.2916D. This difference though found to be statistically significant but was not found to be clinically significant in patients with low pre-existing astigmatism ≤1.25. 90.47% patients had pre-existing astigmatism of 1.25D while postoperatively still 76.19% patients retained their postoperative astigmatism ≤1.25D. 38% of patients showed a decrease in astigmatism or no change in astigmatism following superotemporal incision. 54.7% patients showed only a moderate increase in astigmatism ≤1D.Induced Astigmatism in superotemporal group is 0.2916±0.6460 and -0.1583 ±0.3181 in temporal group. This was similar to the findings of Gokhale NS et al who found that induced astigmatism was lower in the temporal and superotemporal groups compared to that in the superior group. Astigmatism in the superotemporal and temporal groups was comparable.[11]

Post operative unaided visual acuity (6/12) was also found to be comparable to the post operative unaided visual acuity (6/9) in Temporal incision.[16]This was comparable to the findings of Taneja et al who found that uncorrected myopic astigmatism more than 1 D results in a large loss of distance acuity though in our study corneal astigmatism of ≤1.25 was found to be beneficial.[7]

This is a retrospective case series with a limited number of patients. Despite these limitations it is believed that this study adequately throws light on the importance of supero temporal incision as a means of reducing corneal astigmatism which ultimately reduces the overall surgically induced astigmatism and thus paves the way for achieving a better unaided vision.

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