ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Study of Surgically Induced Astigmatism Following Small Incision Cataract Surgery with PCIOL Implantation Combined with Trabeculectomy

Yerasi Kranthi[1], D. Udaya Kumar[2], G. Chandana Yashaswini Reddy[3]

[1]Post Graduate, Department of Ophthalmology, Narayana Medical College and Hospital, Nellore, Andhra Pradesh, India.
[2]Professor & HOD, Department of Ophthalmology, Narayana Medical College and Hospital, Nellore, Andhra Pradesh, India.
[3]M.S. Ophthalmology, Winvision Eye Hospital, Moosarambagh Branch, Hyderabad, India.

Abstract

Background: The present aim of our study is to study the surgically induced astigmatism after SICS with PCIOL implantation combined with trabeculectomy. **Material and Methods:** A hospital based non-randomized, clinical study was conductedon a group of 50 individuals at ophthalmology department, Narayana Medical College Hospital, Nellore from December 2020 to September 2022, who were undergoing combined SICS with PCIOL implantation with trabeculectomy. **Results:** In 50 patients total, the range of age was 45 years to 80 years and the overall mean ± SD age (years) was 59.70 ± 10.22 years. According to age group, 20 (40.0%) patients had age between 45-55 years, 16 (32.0%) patients had age between 56-65 years, 9 (18.0%) patients had age between 66-75 years, and, 5 (10.0%) patients had age > 75 years. 30 (60.0%) patients were males, and 20 (40.0%) patients were females. Out of 50 patients, 30 patients were males among them, 12 (40.0%) patients were fall in the age group of 45-55 years, 9 (30.0%) patients were fall in the age group of 56-65 years, 6 (20.0%) patients were fall in the age group of 66- 75 years, and 3 (10.0%) patients had aged more than 75 years. Whereas in the total of 20 females, among them, 8 (40.0%) patients were fall in the age group of 45-55 years, 7 (35.0%) patients were fall in the age group of 56-65 years, 3 (15.0%) patients were fall in the age group of 66-75 years, and 2 (10.0%) patients had age more than 75 years respectively. According to the incidences of amount of pre-operative astigmatism, 2 (4.0%) cases had between 0.25D-0.50D, 19 (38.0%) cases of eyes had between 0.75D to 1.0D, and 18 (36.0%) cases of eyes had the between 1.0D to 3.0D respectively. Mean astigmatism at post-op follow up visits for 1st week was 0.87, for 3rdweek was 0.73, and for 6th week was 0.44 respectively. The mean±SD of Vertical Keratometry of pre-op was 45.65±1.86, and for post-op of 1st week was 44.14±1.99, for post-op of 3rd week was 43.86±1.84, and for post-op of 6th week was 44.07±1.35 respectively. The comparison of mean difference of pre-op with 1stweek (P=0.0002), 3rd week (P<0.0001), and 6th week (P<0.0001) was shown statistically significant. By the Comparison of Post-Operative (1st week, 3rd week, & 6th week) combined Astigmatism. For post-op of 1st week, 80.0% of cases had ATR, 6.0% of cases had Nil, 14.0% of cases had WTR. For post-op of 3rd week,74.0% of cases had ATR, 10.0% of cases had Nil, 16.0% of cases had WTR. For post-op of 6th week, 54.0% of cases had ATR, 20.0% of cases had Nil, 14.0% of cases had WTR. **Conclusion:** In the present study, we concluded that Surgically induced astigmatism depends on presence, type & amount of pre- existing astigmatism in combined SICS with trabeculectomy when performed through superior corneoscleral tunnel. Post op surgically induced astigmatism tends to shift towards an Against the rule astigmatism irrespective of preexisting astigmatism type.

Keywords: Astigmatism, SICS, Trabeculectomy, Surgical Implantation, Corneoscleral tunnel.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Corresponding Author: Dr. D. Udaya Kumar, Professor & HOD, Department of Ophthalmology, Narayana Medical College/Hospital, Nellore, AP, India.

Introduction

Controlling postoperative astigmatism is an important challenge that has sparked a lot of research in recent years. It is significant because post-operative astigmatism affects the visual outcome and increases patient pain and discomfort. Higher degrees of astigmatism, alone or in conjunction with axial abnormalities can cause glare, distortion, monocular diplopia, and asthenopia in the patient.

In developing countries, manual SICS is a better alternative and less expensive in comparison to phacoemulsification and thus the incision is a major determining factor causing high rates of postoperative astigmatism resulting in poor visual outcomes. Thus, modifications to the incision site are needed to reduce pre- existing astigmatism and prevent postoperative astigmatism. Modification to superotemporal incision relieves pre-existing astigmatism majorly due to its characteristic neutralizing of against-the-rule astigmatism, which is more prevalent among elderly population and thus improves the visual outcome.[1]

Glaucoma is the most common cause of permanent blindness across the world for which trabeculectomy is the preferred surgical procedure. Combined extraction of cataract and trabeculectomy is the procedure of choice if cataract and glaucoma are coexisting. Trabeculectomy alone can be done when patients are suffering from glaucoma alone. Incision and its related factors are important in determining surgically induced astigmatism. When compared to larger incisions, smaller incisions induce less astigmatism. As a result, post-operative astigmatism is a complication that frequently causes delays in visual rehabilitation, restricts visual outcomes, and diminishes the procedure's efficacy.

Cataract is the primary cause of blindness worldwide, followed by glaucoma, and cataract frequently coexists with glaucoma. The surgical intervention for cataract is surgical removal of the cataractous lens followed by implantation of an intraocular lens, with extracapsular cataract extraction being the recommended approach Combining a trabeculectomy operation for glaucoma with cataract surgery is an option for people with cataract and co-existing glaucoma.[2]

Corneal astigmatism is a side effect of both cataract and trabeculectomy surgery. It is necessary because post-operative astigmatism worsens the visual outcome. Glare, monocular diplopia, distortion, and asthenopia are among symptoms that can be caused by higher degrees of astigmatism alone or in conjunction with axial abnormalities. Astigmatism can produce off-axis blur, eyestrain, and visual field constriction even after spectacle correction. As a result, post-operative corneal astigmatism is an issue that frequently delays visual rehabilitation, restricts visual outcome, and diminishes the procedure's efficacy.

The combination of trabeculectomy with cataract extraction is a treatment that is frequently performed. In conditions such as lens-induced glaucoma, hard cataract, non-dilating pupil with shallow chamber, corneal opacities, or non-availability of phacomachine, manual small incision cataract surgery (MSICS) is favoured over phacoemulsification in conjunction with trabeculectomy.[3]

As a result, the goal of this study is to see how medically generated astigmatism affects the outcome of small incision cataract surgery with PCIOL implantation with trabeculectomy.

Aim of the Study:

The present aim of our study is to study the surgically induced astigmatism after SICS with PCIOL implantation combined with trabeculectomy.

Objectives of the Study:

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

The objectives of the present study are:

- To study post-operative corneal astigmatism after combined cataract extraction with PCIOL implantation and trabeculectomy.

Material and Methods

Study Design: This study is a Prospective observational cohort study.

Duration of the Study: 2years (December 2020 to September 2022)

Sampling Method: Purposive sampling.

Sample size: The present study included all glaucoma patients who had no other eye problem and were sent to an ophthalmology department, Narayana medical college and hospital, Nellore, Andhra Pradesh were taken into study. The minimum sample size of this study was 50 samples.

Methodology

- A hospital based non randomized, clinical study was conducted on group of 50 individuals at the ophthalmology department , Narayana Medical College Hospital, Nellore from December 2019 to October 2021 who were undergoing combined cataract extraction with PCIOL implantation and trabeculectomy procedure.
- Keratometric values were collected pre operatively, one, three & six weeks post operatively.
- Apart from routine ophthalmic examination, following pre & post-operative investigations were performed:
  - Snellen's charts for distant and near visual acuity examinations.
  - Streak retinoscopy with Heine’s streak retinoscopy.
  - Slit lamp examination with slit lamp bio-microscopy.
  - Pachymetry
  - Keratometry using Bausch and Lomb keratometer.
  - Our study was carried out after approval from institute’s ethical committee and taking written consent from the parents.
- All the samples were collected and values documented.

Inclusion & Exclusion criteria

All the glaucoma patients who met the following criteria were included present study.

Inclusion Criteria

- All glaucoma cases who had no other ocular complaints.
- All glaucoma cases with co-existing cataract and normal cornea.

Exclusion Criteria

- Patients with any corneal pathologies.
- Prior history of ocular surgery.
- Patients who were not followed up post operatively till six weeks duration.
- Patients with post-operative complications.

Statistical Analysis

The data was entered into MS-Excel, and the statistical analysis was carried out with IBM SPSS Version 25.0. The data values for categorical variables are expressed as numbers and percentages. Association between groups was tested with chi-square test. Data values for constant variables are shown as mean and standard deviation. The mean differences across groups were compared using a student's t-test. All P-values less than 0.05 are considered statistically significant.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Figure 1: Conjunctival Peritomy

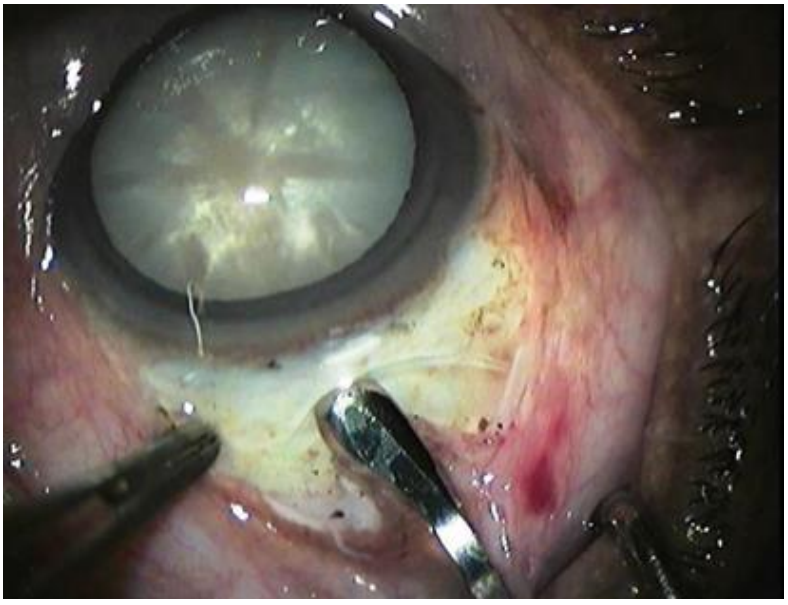

Figure 2: Scleral Incision

Figure 3: Anterior Capsulotomy

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Figure 4: Prolapsed Nucleus Into AC

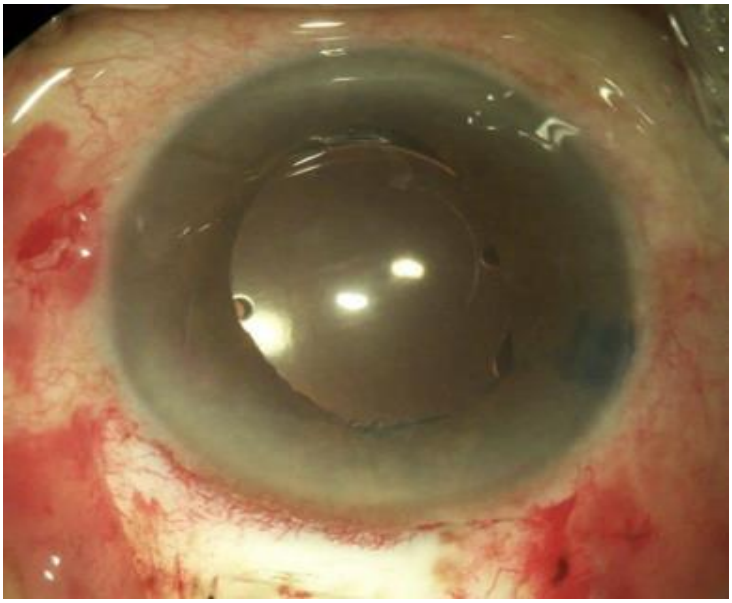

Figure 5: Following PCIOL Implantation in Bag

Figure 6: Scleral Flap Cut Ends

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

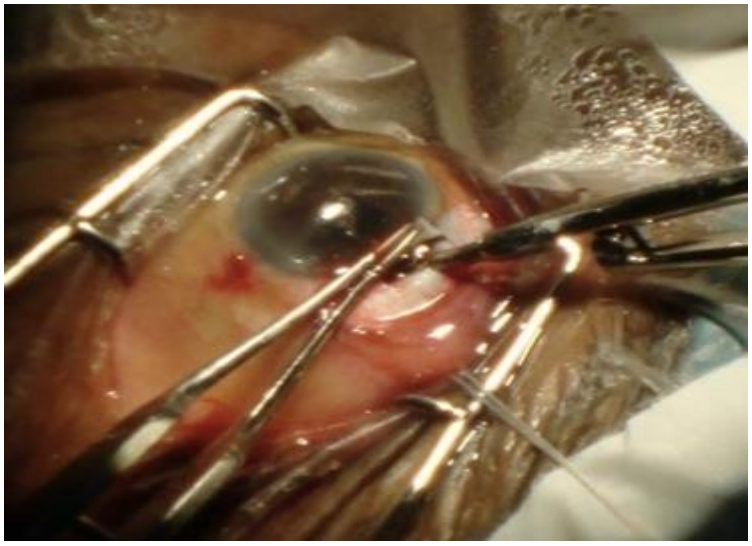

Figure 7: Trabeculectomy with Kelly's Descemet's Punch

Figure 8: Sutured Edges of Scleral Flap

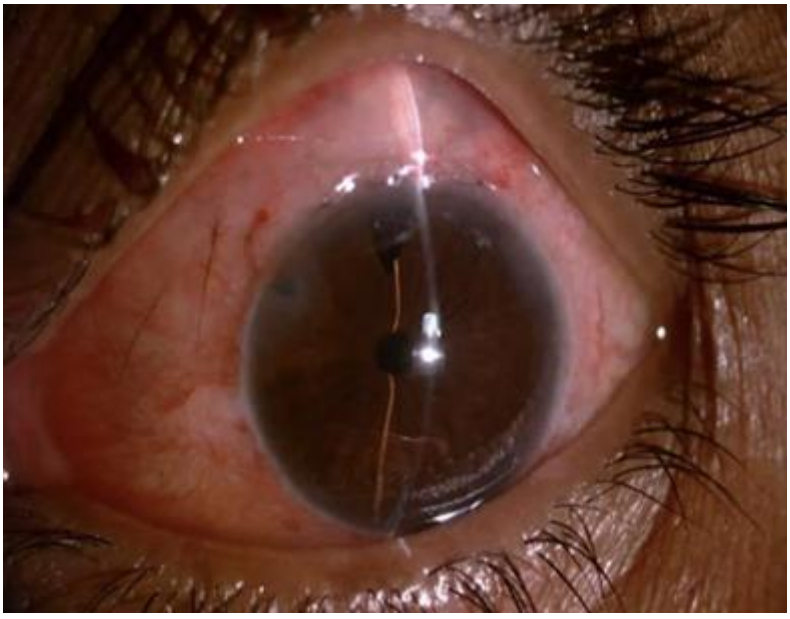

Figure 9: Diffuse Conjuctival Bleb Formed Post OP

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

RESULTS

A hospital based non-randomized, study was performed on a group of 50 individuals at ophthalmology department, Narayana Medical College Hospital, Nellore from Dec 2020 – Sept 2022, who were undergoing combined small incision cataract surgery with PCIOL implantation with trabeculectomy procedure.

Table 1: Age Distribution in the present study

Age group	Number	Percentage (%)
45-55	20	40.00%
56-65	16	32.00%
66-75	9	18.00%
> 75	5	10.00%
Total	50	100.00%

[Table 1] showed that the age distribution in this study population. Of a total 50 patients, the range of age was 45 years to 80 years and the overall mean ± SD age (years) was 59.70 ± 10.22 years. According to age group, 20 (40.0%) patients had age between 45-55 years, 16 (32.0%) patients had age between 56-65 years, 9 (18.0%) patients had age between 66-75 years, and, 5 (10.0%) patients had age > 75 years.

Table 2: Sex Distribution in study population

Sex group	Number	Percentage (%)
Males	30	60.00%
Female	20	40.00%
Total	50	100.00%

[Table 2] showed that the sex distribution in study population. In this study, 30 (60.0%) patients were males, and 20 (40.0%) patients were females.

Table 3: Association between Age and Sex Distribution

Age group	Male	Female	Total
45-55	12 (40.0%)	8 (40.0%)	20 (40.0%)
56-65	9 (30.0%)	7 (35.0%)	16 (32.0%)
66-75	6 (20.0%)	3 (15.0%)	9 (18.0%)
> 75	3 (10.0%)	2 (10.0%)	5 (10.0%)
Total	30 (60.0%)	20 (40.0%)	50 (100.0%)

Chi-square value = 0.260, P-value = 0.967 (Not Sig.)

[Table 3] showed that the association between age and sex distribution. Out of 50 patients, 30 patients were males among them, 12 (40.0%) patients were fall in the age group of 45-55 years, 9 (30.0%) patients were fall in the age group of 56-65 years, 6 (20.0%) patients were fall in the age group of 66-75 years, and 3 (10.0%) patients had aged more than 75 years. Whereas in the total of 20 females, among them, 8 (40.0%) patients were fall in the age group of 45-55 years, 7 (35.0%) patients were fall in the age group of 56-65 years, 3 (15.0%) patients were fall in the age group of 66-75 years, and 2 (10.0%) patients had age more than 75 years respectively. There was no statistically significant association between age and sex distribution (P=0.967).

Table 4: Incidence of pre-operative astigmatism

Amount of astigmatism	Number of eyes	Percentage (%)
0.25D - 0.50D	2	4.00%
0.75D - 1.0D	19	38.00%
1.0D - 3.0D	18	36.00%

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

[Table 4] showed that the incidences of amounts of pre-operative astigmatism in the study. In this study, 2 (4.0%) cases of eyes had amount of astigmatism between 0.25D-0.50D, 19 (38.0%) cases of eyes had between 0.75D to 1.0D, and 18 (36.0%) cases between 1.0D to 3.0D respectively.

Table 5: Descriptive statistics for amount of pre-operative astigmatism

Count	50
Mean	0.49
Standard Error	0.02
Median	0.45
Mode	0.38
Standard Deviation	0.16
Minimum	0.25
Maximum	0.75

[Table 5] showed that the descriptive statistics for the amount of pre-operative astigmatism. In the present study population, the mean±SD of pre-operative astigmatism amount was 0.49±0.02, with a range of 0.25 to 0.75.

Table 6: Type of preexisting astigmatism

Amount of astigmatism	**Number**	**Percentage (%)**
With-the-Rule	13	26.00%
Against- the- Rule	27	54.00%
Nil Astigmatism	10	20.00%

[Table 6] showed type of preexisting astigmatism (n=50), 13 (26.0%) eyes had with- the rule, 27 (54.0%) eyes had against-the rule, and 10 (20.0%) eyes had nil astigmatism.

Table 7: Induced astigmatism amount at post op follow up visits

Post-op	**Mean**	**Max**
1st week	0.87	2.5
3rd week	0.73	1.75
6th week	0.44	2.0

[Table 7] showed that induced astigmatism amount at post-op follow up visits. In this study, mean astigmatism for 1st week was 0.87, for 3rd week was 0.73, and for 6th week was 0.44 respectively.

Table 8: Type of astigmatism at post op follow-up visits

TIME	**NIL**	**WTR**	**ATR**
Pre existing	11	12	27
1st week	7	9	34
3rd week	3	7	40
6th week	3	12	35

[Table 8] showed that astigmatism type at post op follow-up visits. In this study, for pre-op time, 11 were nil, 12 were WTR, and 27 were ATR. For post-op of 1st week, 7 were nil, 9 were WTR, 34 were ATR, for post-op of 3rd week, 3 were nil, 7 were WTR, and 40 were ATR, and for post-op of 6th week, 3 were nil, 12 were WTR, 35 were ATR respectively.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

Table 9: Changes in keratometric readings – vertical corneal meridian

Vertical Keratometry		n	Variable 1		Variable 2		Paired differences			
			Mean	SD	Mean	SD	Mean	SD	95% CI	P-value
Pre_ OP	1st_ week	50	45.65	1.86	44.14	1.99	1.51	2.69	0.7487 to 2.2797	0.0002
Pre_ OP	3rd_ week	50	45.65	1.86	43.86	1.84	1.79	2.62	1.0443 to 2.5313	<0.0001
Pre_ OP	6th_ week	50	45.65	1.86	44.07	1.35	1.58	2.17	0.9645 to 2.1975	<0.0001

[Table 9] showed that the changes in keratometric readings-vertical corneal meridian. The mean±SD of Vertical Keratometry of pre-op was 45.65±1.86, and for post-op of 1st week was 44.14±1.99, for post-op of 3rd week was 43.86±1.84, and for post-op of 6th week was 44.07±1.35 respectively. The comparison of mean difference of pre-op with 1st week (P=0.0002), 3rd week (P<0.0001), and 6th week (P<0.0001) was shown statistically significant.

Table 10: changes in keratometric readings – horizontal corneal meridian

Horizontal Keratometry		n	Variable 1		Variable 2		Paired differences			
			Mean	SD	Mean	SD	Mean	SD	95% CI	Pvalue
Pre_OP	1st_week	50	44.58	1.35	44.88	1.70	0.30	1.82	-0.2126 to 0.8190	0.2432
Pre_OP	3rd_week	50	44.58	1.35	44.57	2.05	-0.01	2.32	-0.6651 to 0.6527	0.985
Pre_OP	6th_week	50	44.58	1.35	44.18	1.51	-0.40	1.57	-0.8451 to 0.04546	0.0773

[Table 10] showed that the changes in keratometric readings-horizontal corneal meridian. The mean±SD of horizontal Keratometry of pre-op was 44.58±1.35, and for post-op of 1st week was 44.88±1.70, for post-op of 3rd week was 44.57±2.05, and for post-op of 6th week was 44.18±1.51 respectively. The comparison of mean difference of pre-op with 1st week (P=0.243), 3rd week (P=0.985), and 6th week (P=0.077) was shown statistically not significant.

Table 11: Comparison on Change in Astigmatism

Astigmatism	Number	Percentage (%)
WTR-WTR	5	10.00%
WTR-ATR	5	10.00%
WTR-NIL	0	0.00%
ATR-ATR	18	36.00%
ATR-WTR	12	24.00%
ATR-NIL	2	4.00%
NIL-WTR	0	0.00%
NIL-ATR	3	6.00%
NIL-NIL	5	10.00%

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

[Table 11] showed that the comparison on change in astigmatism. 36.0% of cases are stable at ATR-ATR, 24.0% of cases moved from ATR to WTR, 10.0% of cases changed from WTR-WTR, WTR-ATR, and NIL-NIL, 6.0% of cases changed from NIL-ATR, and none of the cases were moved from WTR-NIL, and NIL-WTR.

Table 12: Comparison of pre op & Post-Operative SIA

Vertical Keratometry	N	Mean	Standard Deviation
Pre op	50	45.65	1.86
1st week post op	50	44.14	1.99
3rd week post op	50	43.86	1.84
6th week post op	50	44.07	1.35

[Table 12] showed that the comparison on Change in Astigmatism for vertical keratometry for pre-op, post-op changes at 1st, 3rd& 6th weeks. The mean±SD of VerticalKeratometry of pre-op was 45.65±1.86, and for post-op of 1st week was 44.14±1.99, for post-op of 3rd week was 43.86±1.84, and for post-op of 6th week was 44.07±1.35 respectively.

Table 13: Comparison of Post-Operative (1st week, 3rd week, & 6th week) combined Astigmatism.

Combined		ATR	NIL	WTR	TOTAL
1st week	Count	40	3	7	50
	%	80.00%	6.00%	14.00%	100.00%
3rd week	Count	37	5	8	50
	%	74.00%	10.00%	16.00%	100.00%
6th week	Count	27	10	13	50
	%	54.00%	20.00%	26.00%	100.00%

[Table 13] Comparison of Post-Operative (1st week, 3rd week, & 6th week) combined Astigmatism. For post-op of 1st week, 80.0% of cases had ATR, 6.0% of cases had Nil, 14.0% of cases had WTR. For post-op of 3rd week, 74.0% of cases had ATR, 10.0% of cases had Nil, 16.0% of cases had WTR. For post-op of 6th week, 54.0% of cases had ATR, 20.0% of cases had Nil, 14.0% of cases had WTR.

DISCUSSION

A hospital based prospective observational, study was done on a group of 50 individual sat ophthalmology department, Narayana Medical College Hospital, Nellore from Dec 2020 - Sept 2022 who were undergoing combined SICS with PCIOL implantation with trabeculectomy procedure. Keratometry was done pre operatively and 1st, 3rdand 6thweeks post operatively.

A steeper meridian incision is a simple, safe, and effective procedure for correcting mild to moderate preoperative astigmatism during combined procedure.

Because of the change in surgical orientation, the temporal and superotemporal approaches may require little practise; however, by considering preoperative astigmatism when choosing location of incision, one can minimise post-operative keratometric surgically induced astigmatism.

In the past, glaucoma triple procedures were controversial due to their higher surgical trauma and success rate. When SICS and trabeculectomy were performed separately, IOP control was less than what could be expected.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

SICS increases the likelihood of performing a simultaneous trabeculectomy with better IOP control, less surgical trauma, and a high success rate.

A common procedure is a combined trabeculectomy and cataract extraction. In situations such as lens-induced glaucoma, hard cataract, non-dilating pupil with shallow chamber, corneal opacities, or non-availability of phacomachine, MSICS is preferred over phacoemulsification in combination with trabeculectomy. Malik (2016),[3] described a simple technique of MSICS-trabeculectomy with lens implantation using anterior chamber maintainer that results in satisfactory IOP control with minimal induction of astigmatism.

Astigmatism is a condition in which a point of light does not form on the retina, which occurs when the toricity of any of the optical system's refractive surfaces produces two principal foci delimiting an area of intermediate focus known as the "conoid of sturm." Astigmatism causes image distortion; the distortion in the principal meridian is around 0.3 percent per dioptre of astigmatism, and oblique astigmatism produces only 0.4 degree of tilt per dioptre monocular but causes significant changes in binocular perception. Astigmatism can be caused by a curvature, centering, or refractive index error. Curvature astigmatism is a type of corneal astigmatism. Most common type of corneal astigmatism error is one in which the vertical curvature exceeds the horizontal curvature (about 0.25 D). In most cases, this is referred to as Direct or "With-the-rule astigmatism" and is considered physiological. It is caused by constant pressure by upper eyelid. It tends to increase to a very slight extent as one gets older, but as one gets older, it tends to disappear or even reverse itself to "Inverse astigmatism" or "Against-the-rule astigmatism," in which the vertical curvature is less than the horizontal curvature.

Steps taken during surgery to avoid astigmatism induction:

To lessen the amount of astigmatism generated, several changes to intraoperative procedure have been recommended.

To lessen wound gape and "sinking" caused by tissue removal, a smaller sclerostomy has been advised. This can be accomplished with the use of a Kelly punch, a "one punch only" approach, or even the implantation of an Ex-PRESS shunt.

When performing the radial cuts, take care to ensure a small, brief scleral flap and to preserve the limbal ring intact.

Overtight or unequally tensioned scleral flap sutures should be avoided.

Reduced energy or the use of a point-tip or wet field cautery, particularly near the limbus, can help to limit excessive cautery.

Overhanging and intracorneal dissection of the bleb should be avoided since they can lead to long-term astigmatism and impaired visual acuity. The use of a fornix- based conjunctival flap rather than a limbus-based conjunctival flap, as well as a broader, more posterior administration of MMC, may aid. An aberrometer can also be used to assess any intraoperative corneal changes.

Management of induced astigmatism after surgery:

It's helpful to know that, three months after surgery, the induced astigmatism tends to stabilise, if not fully resolve. As a result, it's a good idea to tell patients that they'll have to wait at least 3 months for a stable refraction.

If astigmatic correction is required, having new glasses prescribed is a viable alternative. Contact lenses should be avoided after a trabeculectomy because of the risk of infection.

Because of the possibility of capsular bag decentration, toric IOLs may be less suited for patients with pseudoexfoliative glaucoma.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

To eliminate the IOP increase during LASIK flap generation, PRK (photorefractive keratectomy) may be recommended over LASIK (laser-assisted in-situ keratomileusis) if laser corneal astigmatism treatment is adopted.
Doctors must be thorough in their preoperative counselling about the refractive outcomes of combined surgery, especially in the early postoperative period.
Complications like hypotony can lead to even more axial length changes and SIA

Comparison of present study results with other studies: -
Richard P Kraft (1983) was first surgeon to move posteriorly from limbus towards sclera, thus enhancing healing of wound & reducing surgically induced astigmatism.[6]
Cravy TV (1991),[7] used 6.5mm sclera temporal incision & found that minimal & stable post-operative astigmatism, along with early & sustained visual recovery.
In 50 patients total, the range of age was 45 years to 80 years and the overall mean ± SD age (years) was 59.70 ± 10.22 years. According to age group, 20 (40.0%) patients had age between 45-55 years, 16 (32.0%) patients had age between 56-65 years, 9 (18.0%) patients had age between 66-75 years, and, 5 (10.0%) patients had age > 75 years.
In this study, a total of 50 patients, 30 (60.0%) patients were males, and 20 (40.0%) patients were females.
In study by Soumyadeep et al. (2021),[1] out of 100 patients, 51% of patients were males, and 49% of patients were females.
In present study, the incidences of amounts of pre-operative astigmatism, 2 (4.0%) cases of eyes had amount of astigmatism between 0.25D-0.50D, 19 (38.0%) cases of eyes between 0.75D to 1.0D, and 18 (36.0%) cases of eyes between 1.0D to 3.0D respectively.
Irina et al (2004),[8] in their prospective study, 178 eyes were studied. At 6 weeks' temporal incision yielded a mean SIA of 0.74D & the nasal incision of 1.65D. This trend of SIA persisted at 6 months, 0.71 D temporal & 1.41 D for nasal incision.
Vass & Menapace (1994),[9] studied 20 cases & showed that in patients who had temporal incision, there was mean flattening of 0.4 to 1.0D in temporal region.
Nikhil & Saurabh (2005),[10] in their study concluded that amplitude of astigmatism in superior incision was 1.45±0.94 D than in temporal incision group which was 0.67±0.65 D.
In the present study, according to type of preexisting astigmatism (n=50), 13 (26.0%) eyes had with-the rule, 27 (54.0%) eyes had against-the rule, and 10 (20.0%) eyes had nil astigmatism.
In the present study, mean±SD of pre-operative astigmatism amount was 0.49±0.02, with a range of 0.25 to 0.75.
Mean astigmatism post operatively for 1st week was 0.87, for 3rd week was 0.73, and for 6th week was 0.44 respectively.

According to the type of astigmatism at post op follow-up visits were as follow:
for pre-existing time, 11 were nil, 12 were WTR, and 27 were ATR. For post-op of 1st week, 7 were nil, 8 were WTR, 34 were ATR, for post-op of 3rd week, 3 were nil, 7 were WTR, and 40 were ATR, and for post-op of 6th week, 3 were nil, 12 were WTR, 35 were ATR respectively.
Neilson (1995),[11] studied the refractive effects of clear corneal & corneoscleral tunnel incision, 3.5mm & 5.2mm respectively in cataract surgery. The temporal incision resulted in WTR induced change & superior incision resulted in ATR induced changes.
Morlet et al (2001),[4] concluded that any residual astigmatism is best when it is WTR than ATR & worse when it is oblique.
In a study by Soumyadeep et al (2021),[1] 37% of cases had WTR, 43% of cases had ATR, and 20% of cases had NIL.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

In present study, changes in keratometric readings-vertical corneal meridian. The mean±SD of Vertical Keratometry of pre-op was 45.65±1.86, and for post-op of 1st week was 44.14±1.99, for post-op of 3rd week was 43.86±1.84, and for post-op of 6th week was 44.07±1.35 respectively. The comparison of mean difference of pre-op with 1st week (P=0.0002), 3rd week (P<0.0001), and 6th week (P<0.0001) was shown statistically significant.

Changes in keratometric readings-horizontal corneal meridian. The mean±SD of horizontal Keratometry of pre-op was 44.58±1.35, and for post-op of 1st week was 44.88±1.70, for post-op of 3rd week was 44.57±2.05, and for post-op of 6th week was 44.18±1.51 respectively. The comparison of mean difference of pre-op with 1st week (P=0.243), 3rd week (P=0.985), and 6th week (P=0.077) was shown statistically not significant.

In present study, according to comparison on change in astigmatism. 36.0% of cases are stable at ATR-ATR, 24.0% of cases moved from ATR to WTR, 10.0% of cases changed from WTR-WTR, WTR-ATR, and NIL-NIL, 6.0% of cases changed from NIL-ATR, and none of the cases were moved from WTR-NIL, and NIL-WTR.

In a study by Khurana et al (2011),[5] pre-operatively observed astigmatism was treated the cases with topical anti-glaucoma therapy.

In this study, according to comparison on Change in Astigmatism for vertical keratometry, the mean±SD of Vertical Keratometry for pre-op was 45.65±1.86, and for post-op of 1st week was 44.14±1.99, for post-op of 3rd week was 43.86±1.84, and for post-op of 6th week was 44.07±1.35 respectively.

In this study, By the Comparison of Post-Operative (1st week, 3rd week, & 6th week) combined Astigmatism. For post-op of 1st week, 80.0% of cases had ATR, 6.0% of cases had Nil, 14.0% of cases had WTR. For post-op of 3rd week, 74.0% of cases had ATR, 10.0% of cases had Nil, 16.0% of cases had WTR. For post-op of 6th week, 54.0% of cases had ATR, 20.0% of cases had Nil, 14.0% of cases had WTR.

In a study by Soumyadeep et al (2021),[1] By 2ndand 4th week,the number of patients with increased and reduced WTR astigmatism became constant to 14 (73.68%) and 4 (21.05%) respectively.

Limitations

- Our sample size was small and the study was conducted in a single centre, so study group may not represent adequately.
- As this was an observational study, a multi-centric double blinded randomized control trial may have yielded better results.
- Due to limit in follow up period of 6 weeks' effect of sutures cannot be known.
- Because of involvement of multiple surgeons, Type & amount of astigmatism may be influenced due to surgeon related differences.

CONCLUSION

From this prospective, non-randomized observational study, we concluded that:

- Surgically induced astigmatism depends on presence, type & amount of pre- existing astigmatism in combined SICS with trabeculectomy when performed through superior corneoscleral tunnel.
- Astigmatic decay is not significant by 6 weeks.
- Post op surgically induced astigmatism tends to shift towards an Against the rule astigmatism irrespective of preexisting astigmatism type.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 01, 2023

REFERENCES

1. Soumyadeep H, Tapes Kanti S. A comparative study of post-operative astigmatism in superior versus superotemporal scleral incisions in manual small incision cataract surgery in a tertiary care hospital. 2021 Aug 5;5(2):009– 15. Available from: http://repository-tnmgrmu.ac.in/id/eprint/3614.
2. Casson RJ, Salmon JF. Combined surgery in the treatment of patients with cataract and primary open-angle glaucoma. 2001;27(11):1854–63.
3. Malik KPS. `Flying Eagle` Incision for Combined Manual Small Incision Cataract Surgery-Trabeculectomy. 2016;27(2):124–7. Available from: https://www.djo.org.in/articles/27/2/flying-eagle4.html.
4. Morlet N, Minassian D, Dart J. Astigmatism and the analysis of its surgical correction. 2002;86(12):1458–9.
5. Khurana AK, Chawla U, Passi N, Jyoti, Archana, Yogesh. A comparative study of combined small-incision cataract surgery with sutureless trabeculectomy versus trabeculectomy using W-shaped incision. 2011;3(5):13–8. Available from: https://www.nepjol.info/index.php/NEPJOPH/article/view/4272.
6. Richard L L, Douglas D K, Robert H O, Li Wang. Control of astigmatism In cataract patients, Roger F Steinert. Cataract surgery techniques complications & management. 2nd edition. Philedelphia: Saunders 2004;253-266.
7. Cravy T V. Routine use of lateral approach to the cataract extraction toachieve rapid & sustained stabilisation of post operative astigmatism.Journal Of Cataract & Refractive surgery 1991;17(4):415-423.
8. Irina S B, Edwart Y, Susan V, Sandi C, Dimitri T A, Walter J S Astigmatism outcomes of horizontal temporal versus nasal clear cornealincision cataract surgery. Journal Of Cataract & Refractive surgery2004:30:418-23.
9. Vass C, Menapace R. Computerised statistical analysis of corneal topography for the evaluation of changes in corneal shape after surgery.Am J Ophthalmology 1994;118: 177-84.
10. Gokhale NS, Sawhney S. Reduction in astigmatism in manual small incision cataract surgery through change of incision site. Indian journal of ophthalmology. 2005 Jul 1;53(3):201-3.
11. Neilson P J. Prospective evaluation of surgically induced astigmatism & astigmatic keratotomy effects of various self-sealing small incisions. Journal of Cataract & Refractive surgery 1995;21(1):43-8