

POST-OPERATIVE ASTIGMATISM AFTER SICS AND PHACOEMULSIFICATION.

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Abstract :

Background: Astigmatism plays a major role in post-operative compliance after cataract extraction surgery. Recent advances in technology and intra ocular lens implantation through small incision allow early rehabilitation of patient and limits excessive post-operative astigmatism.

Material and methods: patients undergoing cataract extraction were considered for the study. 80 patients were taken for the study, 40 in each group of SICS and phacoemulsification. In all cases follow up visits thorough ocular examination was done especially looking for corrected visual acuity & correction needed for that. Keratometry was done in each follow up visits. At the end of three months surgically induced astigmatism (SIA) was calculated by deducting pre-operative astigmatism from the post-operative astigmatism.

Results: The less average SIA was noted in phacoemulsification group than in small incision cataract surgery. For SIA operative factors like incision size, shape, type, length, and location play a major role.

Keywords: Small incision cataract surgery, phaco-emulsification. surgically induced astigmatism.

Introduction:

Astigmatism plays a major role in post-operative compliance after cataract extraction surgery. Various methods of cataract extraction are used and new methods are continuously invented to minimize the post-operative astigmatism. The important factors in postoperative astigmatism are incision length, type, shape and location. Other factors which contribute are cauterization, wound healing factor. Recent advances in technology and intra ocular lens implantation through small incision allow early rehabilitation of patient and limits excessive post-operative astigmatism. Suture-less cataract extraction using tunnel incision is used in small incision cataract surgery (SICS) with manual removal of cataract and phaco-emulsification technique to remove nucleus. Even foldable lenses are advised to minimize the size of incision and thereby minimize the post-operative astigmatism. For measuring corneal astigmatism we clinically use keratometer. Post operatively healing of incision takes about 1.1/2 months. After this, surgically induced astigmatism can be measured with vector method. With help of pre-operative vector in diaptor with its axis, we can calculate effective induced astigmatism with its axis.

Aims:

Aims of the present study are (1) To Compare of post-operative astigmatism after various methods of cataract surgery: (a) Small Incision Cataract Surgery (b) Phacoemulsification. (2) To study the effect of various factors like incision length, shape, situation in relation to limbus, and other factors affecting Surgically Induced Astigmatism (SIA) following Cataract surgery.

ASTIGMATISM:

Astigmatism is a type of refractive error in which no point, focus is formed, leading to unequal refraction of incident light by the dioptric system of eye in different meridians. Consequently rays of light entering the eye cannot converge to a single point focus but form focal line. Normally the refracting power of normal emmetropic eye is about 60 D. The cornea and lens play a major role. Astigmatism can be divided in two: (1) **REGULAR ASTIGMATISM** :The regular astigmatism can be further subdivided in with the rule, against the rule, oblique and bi-oblique astigmatism. In with the rule astigmatism, vertical meridian is more curved than the horizontal meridian. In against the rule astigmatism, horizontal meridian is more curved than the vertical meridian. If the principle meridians are not vertical and horizontal but they cross each other at right angle, it is called oblique astigmatism. When the axes are not at right angle but they cross obliquely, the condition is called bi-oblique astigmatism. (2) **IRREGULAR ASTIGMATISM**: Refraction in different meridian is quite irregular it is found in corneal pathology and is due to different curvature, or different refractive index.

KERATOMETRY:

It is the measurement of the radius of curvature of anterior surface of cornea. This is done with help of an instrument called Keratometer. The keratometer used for the present study was Baush and Lomb type of keratometer. Principle: The Keratometer is an instrument that measures the radius of curvature of anterior surface of cornea by utilizing the first Purkinje image. If target of a known size is projected onto the cornea and its image is measured utilizing an image doubling technique man observing microscope. By assuming a standard index of refraction of the cornea and a known size of projected target the size of reflected image can be shown to vary according to the radius of curvature of anterior surface of the cornea. The instrument can be calibrated to read the radius of curvature directly.

FACTORS AFFECTING THE POST OPERATIVE ASTIGMATISM:

Pre Existing Astigmatism -The projection of preoperative astigmatism can be calculated either by subtraction method or by vector method. In subtraction method preoperative astigmatism is subtracted from final outcome of astigmatism to derive surgically induced astigmatism (SIA) and in vector analysis method, geometric addition of preoperative and postoperative astigmatism is done to derive induced astigmatism.

Operative Factors:

Incision:-_Shape : Straight, frown, smile **_Type** : Corneal, limbal, sclera **_Length** : Cord length of the incision **_Location**: Superior, Temporal, Nasal, Supro-temporal.

INCISION

Effect of Wound Architecture on Astigmatism :

- A. Site 1 inversely proportional to distance from centre of cornea.
- B. Shape : Straight, frown, curvilinear.
- C. Size : Directly proportional to length of incision.
- D. Cautery: increased use, induces irregular astigmatism.
- E. Location I Temporal induced less astigmatism.
- F. Post operative excessive use of topical / systemic steroids lead to delayed

MATERIALS AND METHODS: Patients undergoing cataract extraction were considered for the study with no other ocular disease was found, selected patients underwent different type of cataract extraction i.e. SICS and PHACOEMULSIFICATION 80 such patients were taken for the study, 40 in each group. Detailed history was taken and ocular examination was done with torch and slit lamp

Posterior segment examination was done with ophthalmoscope. Routine systemic examinations and laboratory investigations were carried out.

OTHER EXAMINATIONS

CORRECTION	RE				LE			
	Vn WITH GLASS	SPH	CYL	AXIS	Vn WITH GLASS	SPH	CYL	AXIS
REFRACTION (Diaptors)	HORIZ	AXIS	VERT	AXIS	HORIZ	AXIS	VERT	AXIS
KERATOMETRY (Diaptors)	HORIZ	AXIS	VERT	AXIS	HORIZ	AXIS	VERT	AXIS
AXIAL LENGTH								
IOL BIOMETRY (SRK-2)								

POST-OP-DETAILS

	KERATOMETRY				VISION			CORRECTION	
	HORIZ	AXIS	VERT	AXIS	WITHOUT GLASS	WITH GLASSS	SPH	CYL	AXIS
1 ST DAY									
1 WEEK									
2 WEEKS									
1 MONTH									
3 MONTHS									

OBSERVATIONS AND DISCUSSION:

We have done study of post-operative astigmatism following Small incision cataract surgery (SICS) & phaco emulsification (PE) surgery. In all these types of surgery 40 cases were taken in each group. During the study following observations were made :

1. Eye operated distribution

EYE	GROUP-1	GROUP-2	TOTAL
RE	24	18	42
LE	16	22	38

2. Uncorrected vision distribution

UNCORRECTED VISION	GROUP-1	GROUP-2
<CF 1 M	16	0
CF 1 M- CF 4 M	14	8
CF 4 M- CF 6 M	6	20
6/60	4	10
6/36	0	2
6/24	0	0
6/18	0	0

6/12	0	0
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3. Pre-op corrected visual acuity distribution:

CORRECTED VISION	GROUP-1	GROUP-2
<CF 1 M	14	0
CF 1 M – CF 3 M	0	0
CF 4 M – CF 6 M	12	2
6/60	6	18
6/36	4	14
6/24	4	4
6/18	0	2

4 .Cataract grading distribution:

CATARACT GRADE	GROUP-1	GROUP-2
I	0	0
II	2	14
III	24	26
IV	14	0
V	0	0

5. Incision shape distribution:

SHAPE	GROUP-1	GROUP-2	TOTAL
FROWN	6	0	6
STRAIGHT	34	40	74

6. Incision size distribution:

SIZE (MM)	GROUP-1	GROUP-2	TOTAL
9	0	0	0
8	4	0	4
7	14	0	14
6	22	12	34
5	0	10	10
4	0	0	0
3	0	18	18

7. Site of radial in relation to limbus.

SITE OF RADIAL (MM)	GROUP-1	GROUP-2	TOTAL
-1.5	-	-	-
-1.0	-	-	-
-0.5	-	10	10
0.00	-	14	14
+0.5	-	2	2
+1.0	-	6	6
+2.0	26	4	30
+3.0	14	4	18

Post-operative observations:

In all cases follow up visits thorough ocular examination was done especially looking for corrected visual acuity & correction needed for that. Keratometry was done in each follow up visits by using

boush & lomb type of keratometer. At the end of three months surgically induced astigmatism (SIA) was calculated by deducting pre-operative astigmatism from the post-operative astigmatism.

1. Site of radial induced astigmatism.

SITE OF RADIAL (mm)	NO.OF CASES	MEAN INDUCED ASTIGMATISM
-1.5	-	-
-1.0	-	-
-0.5	10	0.67 D
0.00	14	0.75 D
+0.5	2	0.38 D
+1.0	6	0.55 D
+2.0	30	0.71 D
+3.0	18	0.54 D

2. Incision cord length and induced astigmatism

WIDTH (mm)	No. of cases	Mean induced astigmatism
3.2	28	0.345 D
5.5	12	0.530 D
7.0	38	1.126 D
8-9	2	2.255 D

3. Incision shape induced astigmatism.

SHAPE	NO. OF. CASES	MEAN INDUCED ASTIGMATISM
FROWN	6	0.863 D
STRAIGHT	74	0.576 D

4. Surgically induced astigmatism.

SIA D	GROUP-1 NO. OF CASES			GROUP-2 NO. OF CASES.		
	WTR	ATR	TOTAL	WTR	ATR	TOTAL
4-5 D	0	0	0	0	0	0
3-4 D	0	0	0	0	0	0
2-3 D	0	2	2	0	0	0
1-2 D	4	0	4	0	0	0
0-1 D	22	12	34	22	18	40

5. Surgically induced astigmatism (SIA).

GROUP	GROUP-1				GROUP-2			
	WTR	AVERAGE	SD	ATR	WTR	AVERAGE	SD	ATR
I	26	0.60	0.28	14	1.03	0.68	0.75	0.50
II	22	0.38	0.26	18	0.52	0.25	0.44	0.26

(P<0.01)

In comparing the over- all surgically induced astigmatism in these two groups, it is seen that in group 1 (SICS) average SIA was 0.75 D (0.50 SD), while in group 2 (PE), average SIA was 0.44 D (0.26 SD). On statistical analysis it is derived that the difference of SIA, in group 1 and group 2 is significant (P<0.1).

Conclusions:

- The study included total 80 cases out of which 40 cases (group 1) were operated by SICS, 40 cases (group 2) were operated by phaco-emulsification surgery. Surgically induced astigmatism (SIA) after 3 months of surgery was compared in two groups.
- Majority of cases was 'with the rule' astigmatism, (WTR).
- SIA 1D-2D was noted in 4 cases (10%) in group 1, while in group 2 SIA was noted <1D in all cases.
- More cord length was associated with more astigmatism. There is definitely more astigmatism in patients with ≥ 7 mm incision, (the average SIA was $>1.0D$) than in patients with < 6 mm incision (the average SIA was $<0.6D$) at the end of three months. As incision size is reduced, SIA is reduced.
- There is more SIA in limbal section (average SIA having 0.75D) than scleral tunnel section (0.5 mm to 3 mm away from the limbus average SIA was ranging from 0.38D to 0.71D). as the site of incision moves away from the cornea, SIA is reduced. So, patients with scleral tunnel incision had very less amount of SIA.
- SIA was less with frown and straight incision (average SIA 0.6D).

Bibliography:

- Albert c. Newmann, George R. Mecarty, Donard R. Sanders, Marsha G. Raanan :- small incision to control astigmatism during cataract surgery. J cat ref surg Vol 15, Jan 1989 78-74.
- Breasley H:- keratometric changes after cataract surgery. British journal of Ophthal Vol.61; 1977; Pg: 360-365.
- Bluementhal M, Ashkenazi I, Assia E, Cahanem :- Small incision manual extracapsular cataract extraction using selective hydrodissection. Ophth surgery, 23: 699-701 1992.
- Charleux J: Post operative astigmatism Adv. Ophthal Vol. 33; 1976; Pg:243-247.
- Cravy T.V.: Calculation of change in corneal astigmatism following cataract extraction ophthal surgery Vol. 10; 1979; Pg : 381-387.
- J.A. Singer :- Frown incision for minimizing induced astigmatism after small incision cataract surgery with rigid optic IOL implantation. J Cat ref surg 1991 17 suppl 677-688.
- Joel C Axt: Longitudinal study of Post operative astigmatism. Journal of cataract and refractive surgery; Vol.13, July 87; Pg : 38-49.
- Korynta J. Vido T. : Changes in corneal refraction after cataract surgery comparision of limbal incision and scleral tunnel incision. Journal Cesk slow Oftalmol, 54: 22-9, 1998 Jan.

- Luntz M and Livingstone N.G. : Astigmatism in cataract surgery. British journal of Ophthal; 61;1977; Pg: 360-365.
- Mikael Dam Johansen, Thomas Olsen, Frank theodorsen :- The long term course of the surgically induced astigmatism after a scleral tunnel incision. Eur j implant ref surgery Vol 6 Dec 1994 337-341.
- M.J.H. Levy Keith Ch advice Anomy: Comparative study of astigmatism with incision size journal of Cut.Ref. Sur. 20: 630-3 Nov.1994.
- Olsen T. Dam-Johansen M.Bek T. Hjortdal JO :- clear corneal versus scleral tunnel incision in cataract surgery, Journal cataract Refract surg. Ophthalmol. 6:257-63, 1996 July-Sep.
- Oshika T. Tsuboi S : Astigmatic and refractive stabilization after cataract surgery, ophthalmic -surg. 1995 July-Aug: 26(4): 309-15.