

Selective suture removal in astigmatism after conventional cataract surgery

Ashwini A. Sapre^{1,*}, Heena C. Radadia²

¹Associate Professor, ²Assistant Professor, Dept. of Ophthalmology, GMERS Medical College and General Hospital, Gotri, Vadodara, Gujrat, India

***Corresponding Author:**

Email: ashwinisapre@yahoo.com

Abstract

Aim: Cataract is one of the major single causes of curable blindness in India. Our duty ends only after giving good visual acuity to these patients undergoing cataract extraction surgery. Post operative corneal astigmatism following cataract surgery plays a key role for predicting results in an otherwise perfect and successful operation. The need for improved uncorrected visual acuity either owing to spectacles or contact lenses is the basis for surgical procedures for reducing astigmatism. Finer sutures such as 10.0 monofilament nylon and 9.0 silk which are intended to remain in situ tend to compress the wound thus an effective method of reducing or eliminating the wound compression is the removal of one or more interrupted sutures in the meridian of greatest corneal curvature or in the serving of a continuous suture in the area of the steepest corneal meridian. Our primary aim of the study is to Document the corneal astigmatism following cataract extraction and IOL implantation. Effect of selective suture cutting/selective suture removal of the astigmatism. Predictability of result of corneal astigmatism after suture cutting.

Materials and Methods: 50 patients who underwent conventional extra capsular cataract surgery with or without intraocular lens were recruited for the study. Pre operative keratometric readings with Bausch and Lomb keratometer and retinoscopy was done to assess the magnitude and axis of the cylinder. Extra capsular cataract surgery was performed as per standard protocol and procedure. Incision was closed with interrupted sutures. Patients were divided into pseudophakic and aphakic groups. Keratometric readings and best corrected visual acuity with subjective correction was obtained at one, three and six weeks post operatively. At sixth week selective sutureotomy/suture removal was carried out in the direction of plus cylinder. Number of sutures removed depend on the magnitude of cylinder.

Result: Post operative astigmatism was high at first week which gradually decrease and stabilize by sixth week. At sixth week patients had variable amount of astigmatism ranging from 0-7D. Average decrease in astigmatism post suture removal was 1.08D, 2.06D, 3.5D following one, two and three suture removal. Post suture removal 26% patients had no astigmatism, 24% had WTR, 40% had oblique and 10% had ATR astigmatism.

Conclusion: The interrupted sutures and their removal at appropriate time are recommended to create a spherical equivalent of refraction.

Keywords: Astigmatism, Keratometry, Cataract, Pseudophakia, Visual acuity.

Introduction

Cataract is one of the major single causes of curable blindness in India. Our duty ends only after giving good visual acuity to these patients undergoing cataract extraction surgery. Post operative corneal astigmatism following cataract surgery plays a key role for predicting results in an otherwise perfect and successful operation.

Astigmatism after cataract surgery poses a great problem in visual rehabilitation of the patients. Astigmatism of 0.5 to 1.0D usually requires some form of optical correction. As astigmatic refractive error of 1.0 to 2.0 D may decrease the uncorrected visual acuity from the 20/30 to 20/50 level whereas 1.0 to 3.0 D may correspond to uncorrected visual acuity in the 20/70 to 20/100 range.

Astigmatism corrected by spectacles may cause distortion owing to meridional magnification and giving rise to difficulties in binocular function. The need for improved uncorrected visual acuity either owing to spectacles or contact lenses is the basis for surgical procedures for reducing astigmatism. Finer sutures such as 10.0 monofilament nylon and 9.0 silk which are intended to remain in situ tend to compress the wound. This tendency is increased if the incision made more

anteriorly and if the sutures are inserted more deeply. Wound compression results in shortening of the vertical meridian of the globe. This increases the curvature in the vertical meridian and hence astigmatism with the rule. There is also some flattening of the horizontal meridian but to a lesser extent than increase curvature in the vertical meridian thus an effective method of reducing or eliminating the wound compression is the removal of one or more interrupted sutures in the meridian of greatest corneal curvature or in the serving of a continuous suture in the area of the steepest corneal meridian.

This is the basis of my study that selective suture removal is done in the axis of the plus cylinder and in axis perpendicular to it in cases of minus cylinder.

Inclusion Criteria: We have randomly enrolled 50 patients. Patients having cataract of age 50 to 80 years of both sex and who had agreed to participate in study with visual acuity < 6/60 were enrolled.

Exclusion Criteria: Patients having Pterygium, anterior segment pathology, history of ocular surgery, posterior segment pathology, trauma, glaucoma, preexistent corneal astigmatism > 2 diopter were excluded.

Aims of the Study

Our primary aim of the study is to

1. Document the corneal astigmatism following cataract extraction and IOL implantation.
2. Effect of selective suture cutting/selective suture removal on the astigmatism.
3. Predictability of result of corneal astigmatism after suture cutting.

Materials and Methods

The present study was conducted in M & J Institute of ophthalmology and uncomplicated cases of cataract who had no anterior segment pathology and no previous surgery were taken. Study included 50 eyes. Consent for participation in the study was taken and if the patient agreed then details of the patient like name, age, sex, address and indoor number were noted. Complete ocular examination including best corrected visual acuity, anterior and posterior segment examination with slit lamp and direct ophthalmoscope was carried out. Intraocular pressure was taken with schiötz tonometry. Then after keratometry reading were taken at two principal axis and Intraocular lens calculation was done in the required cases. Keratometry was done with Bausch and Lomb keratometer. Patients were subjected to conventional extracapsular cataract surgery with or without intraocular lens. Conventional cataract surgery was carried out using the standard protocol and procedure. Patients were given antibiotic steroid eye drops and cycloplegic eyedrops postoperatively for six weeks. The details of the surgery like date, Incisional details whether corneal, corneoscleral or scleral, extent of incision (in clock hours) number, type and material used for suturing was noted. Study patients were divided as Simple aphakic and Pseudophakic cases. Patients were followed at first, third, sixth and tenth week following surgery and at each visit keratometry and best corrected visual acuity was noted. At the sixth week selective suturotomy or suture removal was carried out in the direction of axis of plus cylinder and effect was noted on same day. If cylinder was up to 2.25D then 1 suture was removed, if 2.25 to 4.D then 2 Sutures were removed and if greater than 4 D then 3 sutures were removed. Patient was given antibiotic drops and/or cyclogyl eye drops and dressing on the day of suture removal. Gap between adjacent sutures, wound leak or any other complication on the day of suture removal was noted. Final prescription of the glasses was given on subsequent visit.

Result

I have studied the effect of suture removal in 50 patients among whom 25 patients were aphakic and 25 were pseudophakic. Age range from 50 to 80 years. Out of which 25 were male and 25 were females. Minimum astigmatism was "0" and maximum was 2.3 diopter on keratometry preoperatively.

Amount of astigmatism immediately following surgery was higher. In my study 66% patients had >3 diopter of astigmatism at one week. At three weeks 60% patients had astigmatism >3 diopter. While at six weeks 46% patients had astigmatism >3 diopter.

At six week: 21 patients had astigmatism <2.25 diopter so required one suture removal. 17 patients had astigmatism between 2.26 -4 diopter so needed 2 suture removal and the rest 12 patients had >4 diopter of astigmatism were subjected to three suture removal. (Table 1)

As per table 2 one aphakic and two pseudophakic cases did not show any ketatometric changes following one suture removal. Rest all cases exhibited a change in their corneal curvature and thus refractive power. 1 cases showed a decrease in diopter power in the range of 1-1.49 diopter. On an average there was 1.25D decrease in aphakic cases and 0.925D in pseudophakic cases.

As per shown in table 3 38% patients did not showed improvement of visual acuity on snellen chart. But 62.8% showed improvement in their visual acuity following one suture removal.

As shown in table 4 maximum effect obtain in keratometry following two suture removal was reduction of 4D in one aphakic case with resultant spherical refraction and 6/12 vision from 6/24. Average decrease by keratometry was 2.06D.

Table 5 shows about 82.2% patients had improved visual acuity on snellen's chart and only 17.6% did not show any improvement following two suture removal.

Average decrease in astigmatism in aphakic cases was 3.2D and in pseudophakic was 3D following 3 suture removal as shown in table 6.

87.2% of aphakic cases had astigmatism ranging between 3-4D presuture removal while post suture removal all aphakics had astigmatism <3D. while in pseudophakic groups post suture removal all patients had astigmatism <2D as shown in table 7.

Table 1: Magnitude of Astigmatism at 1 week, 3 week, and 6 week by keratometry

Amount of Astigmatism	Cases At 1 WK	%	Cases At 3 Wk	%	Cases At 6 WK	%
0.1-1	-	-	-	-	1	2
1.1-2	5	10	8	16	15	30
2.1-3	12	24	12	24	11	22
3.1-4	13	26	11	22	12	24
4.1-5	8	16	19	38	8	16

5.1-6	10	20	0	0	3	6
6.1-7	2	04	0	0	0	0
TOTAL	50	100	50	100	50	100

Table 2: Effect of 1 suture removal in terms of decrease in astigmatism by keratometry

Decrease in astigmatism	Aphakic	Pseudophakic	Total	Percentage
00 (No Change)	1	2	3	14.2
0-0.49	0	1	1	4.76
0.5-0.99	0	0	0	0.0
1-1.49	6	6	12	57.14
1.5-1.99	1	2	3	14.20
2-2.49	2	0	2	9.52
TOTAL	10	11	21	100

Table 3: Showing improvement of visual acuity on snellen's following 1 suture removal

	No change	1 line	2 line
Aphakic	2	5	3
Pseudophakic	6	4	1
Total	8	9	4
Percentage	38.2	42.8	19

Table 4: Effect of 2 suture removal in terms of decrease in astigmatism by keratometry

Decrease in astigmatism	Aphakic cases	Pseudophakic cases	Total cases	Percent
00	0	0	0	0
0-1.0	0	0	0	0
1.1-2	1	3	4	23.82
2.1-3	3	7	10	58.82
3.1-4	3	0	3	17.64
Total	10	11	21	100

Table 5: Showing improvement of vision on snellen's following 2 suture removal

Type of patients	0 line	1 line	2 line	3 line
Aphakic	0	3	3	1
Pseudophakic	3	3	2	2
Total	3	6	5	3
Percentage	17.6	35.2	29.4	17.6

Table 6: Showing effect of 3 suture removal in terms of decrease in astigmatism by keratometry

Decrease in astigmatism	Aphakic	Pseudophakic	Total	Percentage
0-1	-	-	-	-
1.1-2	1	-	1	8.2
2.1-3	1	2	3	24.60
3.1-4	3	2	5	40.00
4.1-5	2	0	2	16.40
5.25 & More	1	0	1	8.2
Total	8	4	12	8

Table 7: Comparison of magnitude of cylinder by subjective refraction before and after 3 suture removal

Aphakic		Pseudophakic		
Acceptance of cylinder	Pre suture removal	Post suture removal	Pre suture removal	Post suture removal
0-1	0	5	0	1

1.1-2	0	2	0	3
2.1-3	0	1	1	-
3.1-4	7(87.5%)	0	2	-
4.1-5	1(12.5 %)	0	0	-
5.1-6	0	0	0	-
6.1-7	0	0	1	-
TOTAL	8	8	4	4

Discussion

All patients undergoing conventional extracapsular cataract surgery develop a degree of astigmatism. Which can be attributed to

1. Corneal astigmatism (aphakics) due to (a) placement of incision i.e. limbal, posterior corneal, anterior corneal. (b) length of incision. (c) suturing techniques i.e., interrupted sutures, number of sutures, depth of sutures, width of suture, tightness of sutures. (d) healing process, excessive steroids.

2. Pseudophakic astigmatism can be attributed to corneal as well as (a) implant tilt (b) decentration (c) optical error of implant (d) distortion of the globe.

In my study, WTR astigmatism is considered 90+_15 ATR astigmatism is considered 180+_15 and the rest oblique.

All patients developed a degree of astigmatism. Majority of them had WTR astigmatism which decreases with time and decreases further following suture division.

The possible explanation for this corneal astigmatism is that suturing compresses the anterior part of cornea and this alters the corneal shape such that the central cornea is steeper than the peripheral cornea and flatter in the meridian of the suture.

The suture removal decreases this wound compression and in turn the induced astigmatism.

Removal of sutures can be performed at 6 wks. In my study, 2 pts had escape of aqueous and iris prolapsed following suture removal and had to be managed accordingly.

Table 8 shows resultant change in astigmatism after suture cutting which was compared with study conducted by R. K. Bansal, Amod Gupta, S.P.S. Gravel.

Table 9 shows comparison of my study and study conducted by R. K. Bansal, Amod Gupta, S.P.S. Gravel for pre and post suture cutting type of the astigmatism. They had observed an improvement of visual acuity in 40% eyes while my study shows improvement in 76% cases.

Post operative astigmatism was high at first week which gradually decreased and stabilized by sixth week. At sixth week patients had variable amount of astigmatism ranging from 0-7D. Average decrease in astigmatism post suture removal was 1.08D, 2.06D, 3.5D following one, two and three suture removal. Post suture removal 26% patients had no astigmatism, 24% had WTR, 40% had oblique and 10% had ATR astigmatism.

Table 8: Change astigmatism after suture cutting

Astigmatism (diopter)	My study	Study of R.K. Bansal, Amod Gupta, S.P.S. Gravel
Up to 2 D	42%	31.6%
>2-4 D	46%	10.5%
>4-6 D	6%	34.4%
No change	6%	7.9%
Increase in astigmatism	0	10.5%

Table 9: Pre suture removal and post suture removal astigmatism

Type of refraction	My study		Study of R.K. Bansal, Amod Gupta A.S.P.S. Gravel	
	Pre suture removal	Post suture removal	Pre suture removal	Post suture removal
WTR	54%	24%	77.5%	30.9%
Oblique	46%	46%	22.5%	41.0%
ATR	-	10%	-	17.9%
Spherical	-	26%	-	10%

Conclusion

The posterior corneal section probably induces less astigmatism than the anterior one. The number of sutures taken probably has little influence on the ultimate outcome. On the whole the astigmatism produced was with the rule or oblique type. Following surgery at 6th week there is a marked discrepancy in the keratometric readings at 1st week. This gradually reduces by the 6th week. The removal of offending suture/sutures produced a significant drop in the power and change in axis.

The interrupted sutures and their removal at appropriate time are recommended to create a spherical equivalent of refraction.

References

1. Dec, 1992), contemporary refractive surgery. American journal of ophthalmology, 378 to 382, vol 65., March 1968. Control of astigmatism and cataract surgery. Charles R. Iliff M.D., and Ali Khodadoust M.D.
2. Anatomy of eye and orbit by Eugene wolff, 1976.
3. Archieves of ophthalmology, vol. 105, Dec, 1987. Control of corneal astigmatism following cataract extraction by selective suture cutting. Jaw W. Kronish M.D. Richard K. Forster M.D.
4. British journal of ophthalmology 360-365, vol 61, 1977. Astigmatism in cataract surgery by Maurice Luntz and Desiree Livingston.
5. British journal of ophthalmology, 1988, 48-493. Control of astigmatism in cataract surgery. Nicholas A.P. Brown and John M. Sparrow.
6. Cataract surgery and its complications by Norman S. Jaffe, Mark S. Jaffe, Gary F. Jaffe, 1995. Postoperative astigmatism.
7. Clinical ophthalmology vol 1, Duane.
8. Current topic in ophthalmology, 1996. Wound contraction and closure in modern cataract surgery.
9. Eye surgery by H.B. Stallard.
10. Indian ophthalmology today, 1995. Analysis of complications of 10.0 suture cutting for postoperative astigmatism. Ramamurthy D. Chitra R., Sudha R.
11. Indian ophthalmology today, 1995. Selective versus all suture release in postoperative astigmatism. A corneal topographic study by Basti Surendra, Krishnamurthy Murali Rao, N. Gullapalli.
12. Indian journal of ophthalmology vol 40, no. 3, July-Sept 1992, 71-73. Selective suture cutting for control of astigmatism following cataract surgery. R.K. Bansal, Amod Gupta, S.P.S. Grewal.
13. Ophthalmology clinics of North America. (vol 5, no. 4 Astigmatism keratotomy. Peter J. Agapites. M.D., F.R. C.S.O. and Richard L. Lindstorm, M.D.
14. Ophthalmic news and views (Owv vol 2 Jan, 1985) evaluation of interrupted and continuous sutre in cataract surgery in relation to postoperative corneal astigmatism.
15. Practice of refraction by Duke Elder.
16. Parson's disease of eye. Stephen J. Miller.
17. Principles and practice of ophthalmology, 1987 by Gholam A. Peyman M.D., Donald R. Sanders, M.D., Morton Goldberg, M.D.