CORNEAL ASTIGMATISM AFTER ECCE: A COMPARATIVE STUDY BETWEEN SILK VERSUS NYLON SUTURE

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ABSTRACT: INTRODUCTION: Cataract as a potent cause of loss of vision in old age persons is probably known since the dawn of human civilization. Post operative astigmatism after cataract extraction remains a big problem for cataract surgeons since Jacques Daviel era. Astigmatism is that type of refractive anomaly in which no point focus is formed owing to the unequal refraction of the incident light by the diopteric system of the eye in different meridians. The goal of modern cataract surgery is to produce a pseudophakic with the quality of vision of a normal phakic eye. Various studies to find out any effect of IOL on post operative astigmatism were carried out but results are controversial. **MATERIAL AND METHODS:** 60 patients suffering from cataract and fit for extraction were enlisted during the month of August 2008 to February 2009. The general, physical and local examination including preoperative Keratometry, vision and tension were recorded. **RESULTS:** In the present study, male patients were 38 (63%) and female patients were 22 (37%). Out of the total 60 cases studied, corneo-scleral section of 28 cases (47%) were sutured with 10-0 nylon suture (Group A) while sections of 32 cases were sutured with 8-0 black virgin silk suture (Group B).Out of 28 cases of Group A, interrupted sutures were applied in 14 cases (50%) (Group A_1). Cross interrupted sutures were applied in 9 cases (32%) Group A_2, while bootlace continuous sutures were applied in 5 cases (18%) (Group A_3). Out of 32 cases of Group B, interrupted sutures were applied in 26 cases (80%) (Group B_1), cross interrupted were applied in 3 cases (10%) (Group B_2), while bootlace continuous suture were applied in 3 cases (Group B_3). In the present series, 19 cases (31%) showed with the rule astigmatism, 21 cases (36%) showed astigmatism against the rule and 20 cases (33%) showed no astigmatism preoperatively, 16 cases were in the range of 0.50D to 1.0D and 12 cases were in the range of 1.0D to 1.50D. **CONCLUSION:** To conclude the findings, 10-0 nylon cross interrupted sutures and 8-0 silk cross interrupted sutures are relatively better and causes less degree of postoperative astigmatism in comparison to other suture technique. Decreased postoperative astigmatism can be achieved by posterior limbal incision, small section, limited use of sclera cauterization, proper depth of suture bite and limited use of topical steroids. Type of suture material and suture technique plays a minor role on postoperative astigmatism.

INTRODUCTION: Cataract as a potent cause of loss of vision in old age persons is probably known since the dawn of human civilization. Post operative astigmatism after cataract extraction remains a big problem for cataract surgeons since Jacques Daviel era. Astigmatism is that type of refractive anomaly in which no point focus is formed owing to the unequal refraction of the incident light by the diopteric system of the eye in different meridians. Astigmatisms may be due to cornea or lens or a combination of both. Post operative astigmatisms after cataract extraction is entirely due to corneal problems. Advances in micro surgical techniques and Pharmacology (access antibiotic and

steroids) have by and large eliminated the formerly dreaded severe complication of cataract surgery. Newer techniques like SICS and Phacoemusification are introduced in higher centres for cataract surgery which produces least astigmatism. But still the traditional ECCE is common due to scarcity of modern instruments and lack of phaco surgeons.

A reduction of residual post operative astigmatism produces more rapid visual rehabilitation, grater patient satisfaction and better optical results free of cylindrical distortion. Davis original incision was made in the cornea. The poor result which followed these operations lead Von Graefe (1853) to abandon corneal incisions and he proposed a modified linear incision which was made in the sclera just above the upper border of the limbus. Further work by Busacca (1932), Davis (1950), Jaffe (1975), Thygeson (1979), etc concluded that a posterior limbal incision produces less astigmatism than the anterior or corneal incision.

The first attempt to applying sutures after cataract extraction was credited to William (1869) who described silk suture. Mc Clean (1940) in his studies observed that Astigmatism was maximum where no sutures were applied and was least when corneo-scleral sutures were applied. Allis and Alvis (1952), Schieie (1958), Taylor (1959), Hilding (1962), Nirankari (1968) proved that application of four or more number of suture results in less postoperative astigmatism.

Different types of suture materials like cotton, human hair, stainless steel, chromic catgut, silk, nylon were used to suture corneo-scleral incision but by different studies by Salthouse (1977), Thygeson (1979), Moore (1980), Wishart (1986), kronish (1987), Cravy (1989) concluded that use of fine nylon mono filament suture is the best.

Cataract surgery with IOL implant has evolved as a procedure of increasing sophistication and success in recent years. The goal of modern cataract surgery is to produce a pseudophakic with the quality of vision of a normal phakic eye. Various studies to find out any effect of IOL on post operative astigmatism were carried out but results are controversial.

AIMS AND OBJECTIVE:

1. Comparison of nylon suture versus silk suture in relation to postoperative astigmatism.
2. To evaluate role of Interrupted, Cross interrupted and continuous sutures in elimination of astigmatism with a constant surgical technique.
3. To find out any correlation between preoperative and postoperative final astigmatism.

MATERIAL AND METHODS: 60 patients suffering from cataract and fit for extraction were enlisted during the month of August 2008 to February 2009. The general, physical and local examination including preoperative Keratometry, vision and tension were recorded.

INCLUSION CRITERIA

a. The patient has no previous diseases of the cornea or anterior segment of the eye including lid pathology.
b. No previous history of intraocular surgery which may have a bearing effect on astigmatism.
c. Cases in which no intra operative or post operative complications occurred.

EXCLUSION CRITERIA

a. The patients having history of corneal diseases.
b. The patients having history of intraocular surgery.
c. Cases in which intra operative or post operative complications occurred.

OBSERVATION: Sixty cases of cataract were selected in present series after evaluation of post-operative astigmatism after cataract operation in relation to different types of suture materials and suture technique. Any correlation between keratometric readings was studied.

Range of age	Males	Females	Total	%
21-30	3	0	3	05.0
31-40	1	1	2	03.3
41-50	9	3	12	20.0
51-60	13	12	25	41.6
61-70	5	3	8	13.3
71-80	6	3	9	15.0
81 and above	1	0	1	01.6
Total	38 (63%)	22(37%)	60	100.0

Table-1: Age and sex distribution in the present study

In the present study, male patients were 38 (63%) and female patients were 22 (37%). In the age group of 51-60 years, there were 25 cases (42%) and in 41-50 years age group, there were 12 cases (20%) only one case was in the age group of 20 years and above number of operated right eyes and left eyes were equal (30) in the present study.

Type of suture material	Suture technique			Total	%
	Interrupted	Cross Interrupted	Continuous		
10-0 monofilament nylon (Gr.A)	14	09	05	28	47
8-0 black virgin silk (Gr. B)	26	03	03	32	53

Table–2: Use of different suture material and suture techniques.

Out of the total 60 cases studied, corneoscleral section of 28 cases (47%) were sutured with 10-0 nylon suture (Group A) while sections of 32 cases were sutured with 8-0 black virgin silk suture (Group B).

Out of 28 cases of Group A, interrupted sutures were applied in 14 cases (50%) (Group A_1). Cross interrupted sutures were applied in 9 cases (32%) Group A_2, while bootlace continuous sutures were applied in 5 cases (18%) (Group A_3).

Out of 32 cases of Group B, interrupted sutures were applied in 26 cases (80%) (Group B_1), cross interrupted were applied in 3 cases (10%) (Group B_2), while bootlace continuous suture were applied in 3 cases (Group B_3).

Out of 60 cases, IOL were inserted in all cases.

Type of Astigmatism	Up to 0.5D	0.15D to 1.0D	1.0D to 1.5D	1.5D & above	Total
With the rule	1	6	8	4	19
Against the rule	2	10	4	5	21
No Astigmatism	0	0	0	0	20

Table – 3: Degree of Pre-operative Astigmatism

In the present series, 19 cases (31%) showed with the rule astigmatism, 21 cases (36%) showed astigmatism against the rule and 20 cases (33%) showed no astigmatism preoperatively, 16 cases were in the range of 0.50D to 1.0D and 12 cases were in the range of 1.0D to 1.50D.

Time period	Interrupted	Cross Interrupted	Continuous	P value
	K	K	K	
Pre operative	1.03D	0.85D	0.40D	
15 days post operative	3.73D	2.69D	1.95D	0.023
30 days post operative	2.26D	1.86D	1.95D	
60 days post operative	1.78D	1.83D	1.95D	
90 days post operative	1.50D	1.36D	1.95D	

Table–4: Relation of postoperative astigmatism with time and suture technique in Group A (10-0) Nylon suture.

Table – 4 shows that average preoperative astigmatism in cases where interrupted (10-0) nylon suture (Group A_1) were applied was 1.03D. 15 days postoperatively average keratometric astigmatism 3.73D.

30 days post operatively Group A_1 showed average keratometric astigmatism 2.26D.

60 days post operatively cases with group A_1, showed average keratometric astigmatism of 1.78D.

90 days postoperatively cases with Group A_1showed keratometric astigmatism 1.50D.

Cases in which cross interrupted nylon sutures Group A_2 were applied average preoperative astigmatism was 0.85D.

15 days postoperatively Group A_2 showed average keratometric astigmatism of 2.69D, 30 days postoperatively group A_2showed average astigmatism of 1.86D. 60 days and 90 days postoperatively Group A_2showed average keratometric astigmatism of 1.83D to 1.36D respectively.

Cases in which boot lace continuous nylon suture group A_3 were applied average preoperative astigmatism was 0.40D.

15 days after operation in cases of Group A_3 average keratometric astigmatism was 1.95D. 30 days and 60days postoperative average keratometric astigmatism was 1.95D.

90 days postoperatively average keratometric astigmatism was 1.95D.

P-value of this study was 0.023.

Time period	Interrupted Group A_1			Cross Interrupted Group A_2			Continuous Group A_3		
	W.R.	A.R.	N.A.	W.R.	A.R.	N.A.	W.R.	A.R.	N.A.
Pre-op	4	3	7	5	4	0	1	2	2
15 days postop.	12	2	0	9	0	0	5	0	0
30 days postop.	6	8	0	5	4	0	4	1	0
60 days postop.	2	12	0	1	8	0	1	4	0
90 days postop.	0	14	0	1	8	0	1	4	0

Table–5: Change in type of astigmatism with time in Group A (10-0 nylon suture)

Table – 5 shows that out of 14 cases with interrupted nylon sutures Group A_1, 7 cases showed no astigmatism, 4 cases (30%) showed with the rule and 3 cases (20%) showed against the rule astigmatism preoperatively. 15 days postoperatively, 12 cases (85%) showed with the rule astigmatism and 2 cases (15%) showed against the rule astigmatism.

30 days postoperatively 6 cases (43%) showed with the rule astigmatism and 8 cases (57%) showed against the rule astigmatism.

60 days later, 2 cases (15%) showed with the rule astigmatism and 12 cases (85%) showed against the rule astigmatism.

90 days postoperatively, all the cases showed against the rule astigmatism.

Out of 9 cases with cross interrupted nylon suture Group A_2, 5 cases (55%) showed with the rule astigmatism and 4 cases (45%) showed against the rule astigmatism preoperatively . 15 days post operatively all the 9 cases showed with the rule astigmatism.

30 days post operatively, 5 cases (55%) showed with the rule astigmatism.

60 days and 90 days post operatively, 1 case (11%) showed with the rule astigmatism 8 cases (89%) showed against the rule astigmatism.

In cases with continuous nylon sutures (Group A_3) out of 5 cases, one case (20%) showed with the rule astigmatism and in 2 cases (40%) showed against the rule astigmatism and in 2 cases (40%) no astigmatism was present. 15 days and 30 days later trend was towards with the rule astigmatism, but 60 days later, trend shifted towards against the rule (80%) although one case (20%) showed with the rule astigmatism 90 days postoperatively.

Time period in days (post-operatively)	Interrupted Group A_1			Cross Interrupted Gr A_2			Continuous Gr A_3		
	6/6-6/12	6/18-6/24	6/36-6/60	6/6-6/12	6/18-6/24	6/36-6/60	6/6-6/12	6/18-6/24	6/36-6/60
15 days	11	3	0	7	1	1	4	1	0
30 days	14	0	0	9	0	0	5	0	0
60 days	14	0	0	9	0	0	5	0	0
90 days	14	0	0	9	0	0	5	0	0

Table–6: Improvement in corrected visual acuity postoperatively with time in Group A (10-0 nylon sutured)

Table – 6 shows that out of 14 cases of Group A_1, (where interrupted nylon sutures were applied) 11 cases (78%) showed corrected visual acuity better than 6/12, 3 cases (22%) showed visual acuity between 6/18 to 6/36 15 days postoperatively.

30 days post operatively, all the 14 cases (100%) showed corrected visual acuity better than 6/12.

In Group A_2 (with cross interrupted nylon sutures) out of 9 cases; 7 cases (77%) showed corrected visual acuity better than 6/12, 1 case (11.5%) showed visual acuity between 6/18 to 6/36 and one case (11.5%) showed visual acuity between 6/36 to 6/60 15 days postoperatively.

30 days postoperatively all the 9 cases (100%) showed corrected visual acuity better than 6/12.

In Group A_3 with bootlace continuous nylon sutures out of 5 cases, 4 cases (80%) showed corrected visual acuity better than 6/12 and one case (20%) showed visual acuity between 6/18 to

6/24; 15 days postoperatively, all the 5 cases (100%) showed corrected visual acuity better than 6/12.

Time period	Interrupted	Cross Interrupted	Continuous	P-value
Pre operative	0.50D	0.66D	1.58D	0.047
15 days post operative	4.97D	3.66D	2.25D	
30 days post operative	3.25D	2.50D	1.75D	
60 days post operative	2.40D	1.50D	1.17D	
90 days post operative	2.00D	1.00D	1.00D	

Table–7: Relation of postoperative astigmatism with time and suture technique in Group B (8-0) silk suture.

TABLE – 7 shows that in cases with interrupted silk sutures (Group B_1) average preoperative astigmatism was 0.50D 15 days postoperatively in cases of Group B_1 average keratometric astigmatism was 4.97D.

30 days postoperatively amount of keratometric astigmatism decreased to3.25D in cases of Group B_1. 60 days and 90 days postoperatively keratometric astigmatism was 2.40D and 2.00D respectively.

In cases with cross interrupted suture (group B_2) average preoperative astigmatism was 0.66D.

15 days postoperatively, average keratometric astigmatism was 3.66D which gradually decreased to final astigmatism to 2.00D 90 days postoperatively.

In cases with continuous silk suture (group B_3) average pre operative astigmatism was 1.58D in 15 days postoperatively, average keratometric astigmatism was 2.25D in group B_3. 30 days postoperatively astigmatism was 1.75D which finally decreased to 1.00D.

P-value of this study was 0.047.

Time period in days (post operatively)	Interrupted Gr B_1			Cross Interrupted Gr B_2			Continuous Gr B_3		
	WR	AR	NA	WR	AR	NA	WR	AR	NA
Preoperative	7	8	11	2	1	0	0	3	0
15 days postoperative	19	7	0	2	1	0	2	1	0
30 days postoperative	4	21	1	0	3	0	1	2	0
60 days postoperative	0	25	1	0	3	0	1	2	0
90 days postoperative	0	24	2	0	3	0	0	3	0

Table–8: Change in type of astigmatism with time in group B (8-0 silk sutures)

Table – 8 shows that preoperatively out of 32 cases of group B. 8 cases (25%) showed with the rule astigmatism. 13 cases (40%) showed against the rule astigmatism, 11 cases (35%) showed no astigmatism.

Out of 26 cases of group B_1 (with interrupted sutures), 19 cases (73%) showed with the rule astigmatism and 7 cases (27%) showed against the rule astigmatism 15 days postoperatively.
30 days postoperatively, 21 cases (80%) showed against the rule astigmatism. 4 cases (16%) showed with the rule astigmatism, and one case (4%) was without astigmatism.

60 days postoperatively, 25 cases (96%) showed against the rule astigmatism and one case (4%) was without astigmatism.

90 days postoperatively, 24 cases (92%) showed against the rule astigmatism and 2 cases (8%) showed no astigmatism.

Out of 3 cases of group B_2 (with cross interrupted sutures), 2 cases (67%) showed with the rule astigmatism and one case (33%) showed against the rule astigmatism 15 days postoperatively. After 30 days all 3 cases showed against the rule astigmatism.

Out of 3 cases of group B_3, 2 cases (67%) showed with the rule and one case (33%) against the rule.

30 & 60 days postoperatively, one case (33%) showed with the rule astigmatism and two cases (67%) showed against the rule astigmatism.

90 days postoperatively, all the 3 cases (100%) showed against the rule astigmatism.

Time period in days (postoperatively)	**Interrupted Gr B_1**			**Cross Interrupted Gr B_2**			**Continuous Gr B_3**		
	6/6-6/12	6/18-6/24	6/36-6/60	6/6-6/12	6/18-6/24	6/36-6/60	6/6-6/12	6/18-6/24	6/36-6/60
15 days	8	12	6	3	0	0	2	1	0
30 days	16	10	0	3	0	0	3	0	0
60 days	20	6	0	3	0	0	3	0	0
90 days	24	2	0	3	0	0	3	0	0

Table–9: Improvement in corrected visual acuity postoperatively with time in Group B (9-0 nylon sutures)

Table – 9 shows that out of 26 cases of group B_1 (with interrupted silk sutures), 8 cases (30%) showed corrected visual acuity better than 6/12, 12 cases (46%) showed corrected visual acuity between 6/18 to 6/24 and 6 cases (24%) showed corrected visual acuity between 6/36 to 6/60, 15 days postoperatively.

30 days postoperatively 16 cases (62%) showed corrected visual acuity better than 6/12 while 10 cases (38%) showed corrected visual acuity between 6/18 to 6/24.

60 days postoperatively, 20 cases (77%) showed corrected visual acuity better than 6/12 and 6 cases (23%) showed corrected visual acuity between 6/18 to 6/24.

90 days postoperatively, 24 cases (92%) showed corrected visual acuity better than 6/12 and 2 cases (8%) showed corrected visual acuity between 6/18 to 6/24.

Out of 3 cases of group B_2 (with cross interrupted sutures) all the cases (100%) showed corrected visual acuity better than 6/12, all the time postoperatively.

Out of 3 cases group B_3 (with boot lace continuous sutures), 2 cases (67%) showed corrected visual acuity better than 6/12 and one case (33%) showed corrected visual acuity between 6/18 to 6/24, 15 days postoperatively.

30 days postoperatively, all the 3 cases (100%) showed corrected visual acuity better than 6/12.

	10-0 Nylon suture			8-0 Silk suture			P value
	Interrupted	Cross Interrupted	Continuous	Interrupted	Cross Interrupted	Continuous	
Pre operative	1.03D	0.85D	0.40D	0.50D	0.66D	1.58D	0.86
Post operative	1.50D	1.36D	1.95D	2.00D	1.00D	1.00D	

Table–10: Comparison of preoperative and final postoperative keratometric astigmatism.

Table 10 shows that in the group A_1 average preoperative keratometric astigmatism was 1.03D and average postoperative astigmatism was 1.50 D. in the group A_2 average preoperative astigmatism was 0.85D and average postoperative final astigmatism was 1.36D.

In the group A_3, average preoperative astigmatism was 0.40D and average postoperative final astigmatism was 1.95D.

In the group B_1, average preoperative astigmatism was 0.50D and average postoperative astigmatism was 2.00D.

In the group B_2, average preoperative astigmatism was 0.66D and average postoperative astigmatism was 1.00D.

In the group B_3, average preoperative astigmatism was 1.58D and average postoperative astigmatism was 1.00D.

P-value of this study was 0.86.

DISCUSSION: In this series of 60 patients, 38 patients (63%) were male and 22 patients (37%) were female. 25 patients (42%) were in the age group of 51-60 years. Only one was in the age group of 80 years and above.

According to table-2, out of 60 cases, 10-0 monofilament sutures were applied in 28 cases (47%) (Group A) and 8-0 black virgin silk sutures in 32 cases (53%) (Group B).

Out of 28 cases of Group A, 14 cases (32%) were sutured with interrupted suture technique (Group A_1). 09 cases (32%) with cross interrupted suture technique (Group A_2)and five cases (18%) with bootlace continuous suture technique (Group A_3).

In this series 33% cases showed no astigmatism preoperatively while 31% cases showed with the rule and 36% cases showed against the rule astigmatism.

Singh and Goel found no astigmatism in 69% cases, with the rule astigmatism in 21% cases and against the rule astigmatism in 10% cases preoperatively.

Kamlesh and Behari found no astigmatism in 50% cases, with the rule astigmatism in 21% cases and against the rule astigmatism in 29% cases preoperatively.

This indicates, that while in other studies no astigmatism was found in more than 50% cases, our study showed no astigmatism only in 33% cases. The studies of Singh and Goel showed more incidence of with the rule astigmatism compared to against the rule astigmatism, while this series and study of Kamlesh and Behari showed more incidence of against the rule astigmatism preoperatively.

According to table 3, maximum cases (46%) were in the range of 0.5D to 1.5D of astigmatism preoperatively. While maximum cases (32%) were in the range of 0.25D to 0.75D astigmatism in the study of Kamlesh and Behari.

According to table 4, cases in which 10-0 mono filament nylon sutures were applied, showed low astigmatism in continuous suture (1.95D) while high degree of astigmatism in cross interrupted and interrupted 3.73D and 2.69D respectively in early postoperative period i.e. 15 days. The degree of astigmatism decreased rapidly in the early postoperatively period (i.e. up to 30 days) and then slowly up to 90 days postoperatively.

Final postoperative astigmatism was less in cross interrupted (1.36D) in comparison to interrupted (1.50D) and continuous (1.95D). since p value is <0.05 that means this difference is statistically significant.

Luntz and Livingstone compared the interrupted and continuous suture techniques with 10-0 monofilament nylon sutures and found no difference in both techniques. They concluded that suture materials and suture techniques play no role in post operative astigmatism.

Shetty and Prashant in their study on different patterns of sutures in ECCE with IOL and post operative concluded that cross interrupted 10-0 nylon sutures caused least postoperative astigmatism in comparison to interrupted and continuous nylon sutures. They explained that cross interrupted sutures causes minimum pull with minimal opposition compression force distributed uniformly over a larger area of incision as it has a large base.

According to table 7, cases in which 8-0 black virgin silk sutures were applied, showed higher degree of astigmatism in the cases where interrupted sutures were applied (4.97D) in comparison to cross interrupted (3.66D) and continuous (2.25D) suture groups in the early postoperative period i.e. 15 days. The degree of astigmatism decreased rapidly in the early postoperative period and slowly up to 90 days. After 90 days final astigmatism in the cross interrupted and continuous suture group was equal (1.00D) where twice (2.00D) in cases of interrupted suture group. Since P value is < 0.05 that means the difference is statistically significant.

Results of study of Moore conclude with the results of this study. He claimed more amount of astigmatism (1.72D) with interrupted sutures in comparison to continuous sutures (0.97D).

Luntz and Livingstone in their study though did not compare different sutures techniques with 8-0 block virgin silk suture, but found higher spherical equivalent (11.9D) with interrupted 8-0 silk sutures in comparison to interrupted 10-0 nylon suture (10.7D).

According to table-5, cases where 10-0 nylon sutures were applied, irrespective of the suture technique, 90% cases showed with the rule astigmatism in the early postoperative period (i.e. 15 days). This may be explained by the theory of wound compression in the early postoperative period, but gradually trend shifted towards against the rule astigmatism and up to 60 days, 90% cases showed against the rule astigmatism, though with the rule astigmatism was present in two cases, with cross interrupted and continuous suture group.

According to table 8, where 8-0 silk sutures were applied irrespective of the suture technique, showed with the rule astigmatism in 70% of the cases, in the early post-operative period (i.e. 15 days) but there was early and pronounced shift towards against the rule astigmatism in comparison to nylon sutures (80% cases showed against the rule astigmatism at the end of 30 days in comparison to 50% cases of nylon suture group) and at the end of 90 days, 95% of the cases showed against the rule astigmatism and 5% of the cases showed no astigmatism.

Results of this study coincide with the results of Glenfloyd. Elennuis and Karo and Wishart who found with the rule astigmatism in the early postoperative period, which reduced rapidly in the first one month period and then gradually over next six months. They explained this phenomenon

due to traction of corneoscleral sutures which caused steepening of vertical curvature. Removal of corneoscleral sutures later on, may be a factor of charge of astigmatism against the rule.

Contrary to our study Duke Elder, Nirankari and Khanna and Singh and Goel observed against the rule astigmatism in the early post-operative period (10th day). They concluded that this postoperative findings of against the rule astigmatism is due to flattening in the vertical meridian due to weak opposition of wound edge as well as decrease in refractive power in vertical meridian and decrease in refractive power in the horizontal meridian.

John-Thygeson and William T. Parker used 10-0 monofilament nylon sutures were applied. He concluded that postoperative astigmatism depends on (a) The length of incision (b) the number of sutures (c) prevention of sideways shift of the wound (d) variation in the suturing technique (e) the use and value of operating keratometer (f) distance of incision from limbus.

Jaffe explained the change in axis of astigmatism on the basis of wound gape and wound compression. He suggested that finer suture which remain in situ without irritation, causes wound compression and increases vertical curvature hence astigmatism with the rule. Larger sutures allows the wound to gape thus reduces vertical curvature hence astigmatism against the rule.

Shetty and Prashant observed against the rule astigmatism, in cases with cross interrupted 10-0 nylon sutures while with the rule astigmatism in cases of interrupted and continuous 10-0 nylon sutures and interrupted 8-0 silk sutures. They explained that cross interrupted sutures causes uniform distribution of opposition compression force thereby causing against the rule astigmatism while interrupted sutures causes maximum opposition compression force at a single point thereby with the rule astigmatism. We can explain our observations on the theory of wound gape and wound compression as suggested by Jaffe.

In the early post-operative period i.e., 15 days both the groups with silk and nylon sutures showed with the rule astigmatism in most of the cases. This can be explained by the wound compression by the sutures, irrespective of the suture technique as well as reactionary tissue edema, resulting in steepening of the vertical meridian, hence astigmatism with the rule.

We observed early shift towards against the rule astigmatism in cases of 8-0 silk sutures. As biodegradation of silk sutures occur early, in comparison to the nylon sutures. This may allow wound to gape and flattening of the vertical meridian. Otherwise, also silk suture cause more tissue reaction i.e. oedema and necrosis of tissue, this may also allow loosening of the sutures may also relieve wound compression therefore astigmatism against the rule.

In cases of 10-0 monofilament nylon suture group, we observed delayed shift towards against the rule astigmatism. This may be explained by the fact that as the nylon sutures are fine, causes less tissue reaction and delayed biodegradation so they may remain in situ for s longer period, causing wound compression and astigmatism with the rule. But most of the cases showed against the rule astigmatism, 90 days post operatively. This can be explained by the following facts.

- Relatively more posterior incision.
- Relatively superficial suture bites.
- Removal of sutures in few cases.

In the Group A (with 10-0 nylon sutures) 78% cases showed corrected visual acuity better than 6/12, 15 days postoperatively. While only 40% cases showed corrected visual acuity better than 6/12 in Group B (with 8-0 silk sutures), 15 days postoperatively.

As we have already excluded those cases which were showing keratitis, dense posterior capsule and macular edema postoperatively, the difference in corrected visual acuity in these 2 groups can be explained on the basis of high degree of post operative astigmatism in group B cases (especially with interrupted sutures, few of them were showing even up to 10.0D astigmatism 15 days post-operatively). In Group A, 100% cases showed corrected visual acuity better than 6/12, 90 days postoperatively (as in table 9). We do not have figures to compare our results with other studies in this regard.

One of the aim of this study was to observe any correlation between preoperative and post operative keratometric astigmatism. According to table 10, P value is > 0.05 so this data is insignificant. We did not find any correlation in any group which is similar to the results of Luntz, Kamlesh and Bihari, John Thygeson.

SUMMARY AND CONCLUSION: A postoperative study of 60 cases, after extra capsular cataract extraction was carried out.

Two different types of suture materials and three different types of suture techniques were applied keratometry was done preoperatively as well as after 15, 30, 60 and 90 days post operatively.

The results were evaluated with reference to find out best suture material, best suture technique and any correlation between preoperative and postoperative astigmatism.

With this study, it is evident that cross interrupted sutures produced minimum degree of postoperative astigmatism in comparison to other suture technique when 10-0 monofilament nylon sutures were used.

Though degree of postoperative final astigmatism was equal with cross interrupted and continuous suture techniques, when 8-0 black virgin silk sutures were applied, but application of continuous suture was not found feasible with such coarser sutures. So cross interrupted suture technique was found superior in comparison to interrupted technique with 8-0 black virgin silk sutures.

One important fact which came in light with this study is that against the rule astigmatism occurs irrespective of the suture materials and suture techniques. There was no relation of degree and type of preoperative astigmatism with postoperative astigmatism.

Comparatively poor visual acuity in cases with interrupted silk sutures may be attributed to high postoperative astigmatism.

To conclude the findings, 10-0 nylon cross interrupted sutures and 8-0 silk cross interrupted sutures are relatively better and causes less degree of postoperative astigmatism in comparison to other suture technique. Decreased postoperative astigmatism can be achieved by posterior limbal incision, small section, limited use of sclera cauterization, proper depth of suture bite and limited use of topical steroids. Type of suture material and suture technique plays a minor role on postoperative astigmatism.

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