Original Article

Surgically Induced Astigmatism of Microcoaxial Phacoemulsification Using 2.2 mm Incision Compared with Conventional Phacoemulsification Using 3.2 mm Incision.

Bhuyan MMH[1], Huq DMN[2], SharmeeTH[3] .

ABSTRACT

To evaluate the surgical outcome between micro coaxial phacoemulsification using 2.2mm incision and phacoemulsification using 3.2mm incision with respect to surgically induced astigmatism after temporally oriented clear corneal incision cataract surgery.

this study was designed as a prospective observational study. A total of 60 patients were taken and divided into two groups- group A and group B. Each group contains 30 patients. Group A patients undergone microcoaxial phacoemulsification using 2.2mm incision and Group B patients undergone phacoemulsification using 3.2mm incision. Preoperative and postoperative keratometric astigmatism at 6 weeks was measured by using manual keratometry. Surgically induced astigmatism was calculated by deducting preoperative astigmatism from postoperative astigmatism.

the mean surgically induced astigmatism was 0.58± 0.79 D with the 2.2mm microcoaxial incision and 0.60± 0.73 D with the 3.2mm phacoemulsification.(p > 0.o5)

Microcoaxial phacoemulsification using 2.2mm incision offers an equal advantage in reducing surgically induced astigmatism compared with phacoemulsification using 3.2mm incision.

Introduction:

Recent progress in cataract surgery has heightened patient's expectations of outcome. Good post-operative vision without spectacles is considered the normal. Surgically Induced Astigmatism (SIA) is one of the important factor that hamper post- operative visual outcome. Thus control of post-operative astigmatism is a key factor in meeting these expectations. Akura 2ooo [1]

Wound construction is very important in case of cataract surgery. The length of the incision has an essential effect on induced astigmatism. Small incision especially without suture induces minimal early post-operative astigmatism which remains stable.Smyk 1998[4]

Small incision reduces the incidence of induced with the rule astigmatism in the initial post-operative period as well as long term against the rule astigmatism. Lower astigmatism in the immediate post-operative period is associated with faster recovery of visual acuity and lower astigmatism over time is associated with a more stable refraction and better uncorrected vision. Therefore smaller incisions are replacing other types of cataract incision. Johns 2001[2]

Today most surgeons use cataract incision size between 2.75 and 3mm and achieve very good results. The latest trend in cataract surgery is toward smaller incision. In microcoaxial phacoemulsification 2.2mm incision is used. The smaller wound reduces post operative induced astigmatism. It increases immediate post operative wound tightness and therefore reduces the associated risk of infection. It also decrease post operative surface discomfort in the incision area.

Materials and methods:

A total of 60 patients with age related cataract were included in this study. Among them 30 patients were taken from Ahmed Medical Center, Dhaka and undergone microcoaxial phacoemulsification using 2.2mm incision (Group A). another 30 patients were taken from Department of Ophthalmology, Dhaka Medical College Hospital and undergone phacoemulsification using 3.2mm incision (Group B). All patients underwent uncomplicated cataract extraction by a single surgeon. Patients were excluded from the study if they required suturing of the incision, had previous corneal surgery or other corneal pathology such as scaring that might interfere with keratometric measurement. In this study, keratometric astigmatism was measured prior to surgery and post operatively at 1st week and at 6th week.

1 Dr. Md. Motahar Hossain Bhuiyan
Associate Professor & Head, Department of Ophthalmology, Enam Medical College & Hospital, Savar, Dhaka.
2. Prof. Dr. Deen Mohd Noorul Huq
Director & Professor, National Institute of Ophthalmology, Dhaka.
3. Dr. Tania Hossain Sharmee
Registrar, National Institute of Ophthalmology.

Observation and Results:

Table I: Preoperative astigmatism

Astigmatism in	Group A		Group B		Total	
diopter	No	%	No	%	No	%
0-0.50	14	46.7	12	40.0	24	40.0
0.51-1.0	10	33.3	9	30.0	19	31.7
1.01-1.5	5	16.7	7	23.3	12	20.0
1.51-2.0	1	3.3	2	6.7	3	5.0
Total	30	100.0	30	100.0	60	100.0

The above table shows the pre operative astigmatism in both groups. In Group A 0-0.5D in 14 (46.7%) cases ; 0.5-1.0 D in 10 (33.3%) cases ; 1.01-1.5 D in 5 (16.7%) cases ; 1.51-2.0 D in 1 (3.3%) cases . In Group B astigmatism were 0-0.5 D in 12 (40.0%) cases ; 0.51-1.0 D in 9 (30.0%) cases ; 1.01-1.5 D in 7 (23.3%) cases ; 1.51-2.0 D in 2 (6.7%) cases.

Table II: Postoperative astigmatism at 1st week

Astigmatism in	Group A		Group B		Total		P value
diopter	No	%	No	%	No	%	
0-0.50	19	63.3	13	43.3	32	53.3	z=1.585
0.51-1.0	9	30.0	12	40.0	21	35.0	z=0.816
1.01-1.50	2	6.7	4	13.3	6	10.0	z=0.857
1.51-2.0	0	0.0	1	3.3	1	1.7	z=1.012
Total	30	100.0	30	100.0	60	100.0	

P value reached from Z test;
p> 0.05 (Not significant)

The above table shows the post operative astigmatism at 1st week. In Group A 0-0.5 D in 63.3% cases ; 0.5-1.0 D in 30.0% cases ; 1.01-1.5 D in 6.7% cases. In Group B 0-0.5 D in 43.3% cases ; 0.51-1.0 D in 40.0% cases ; 1.01-1.5 D in 13.3% cases ; 1.51-2.0 D in 1.7% cases.

Table III: Postoperative astigmatism at 6th week

Astigmatism in	Group A		Group B		Total		P value
diopter	No	%	No	%	No	%	
0-0.50	20	66.7	19	63.4	39	65.0	z=0.268
0.51-1.0	8	26.7	9	30.0	17	28.3	z=0.284
1.01-1.50	2	6.7	1	3.3	3	5.0	z=0.606
1.51-2.0	0	0.0	1	3.3	1	1.7	z=1.012
Total	30	100	30	100	60	100.0	

P value reached from Z test; p>0.05 (not significant)

The above table shows that the post operative astigmatism at 6th week was less than 1.0 D in 93.4% cases in Group A and 93.4% cases in Group B. Only 6.7% cases in each group shows more than 1.0 D which was statistically insignificant.

Table IV : Surgically induced astigmatism at 1st week

Astigmatism in	Group A		Group B		P value
diopter	No	%	No	%	
0-0.50	15	50.0	9	30.0	z=1.615
0.51-1.0	10	33.3	15	50.0	z=1.331
1.01-1.50	5	16.7	5	16.7	z=0.0
1.51-2.0	0	0.0	1	3.3	z=1.012
Total	30	100.0	30	100.0	

Mean ± SE in Group A= 0.67 ± 0.11
Group B= 0.72 ± 0.12
P value reached from Z test. p> 0.05 (not significant)
The above table shows that the surgically induced astigmatism at 1st week was less than 1.0 D in 83.3% cases in Group A and 80.0% in Group B. Similarly more than 1.0 D found 1.7% in each group. Surgically induced astigmatism was calculated by deduction of pre operative astigmatism from post operative astigmatism.

Table V : Surgically induced astigmatism at 6th week

Astigmatism in	Group A		Group B		Total		P value
diopter	No	%	No	%	No	%	
0 - 0.50	16	53.3	12	40.0	28	46.7	z=1.041
0.51 - 1.0	9	30.0	10	33.3	19	31.7	z=0.274
1.01 - 1.50	5	16.7	7	23.3	12	20.0	z=0.641
1.51 - 2.0	0	0.0	1	3.3	1	1.7	z=1.012
Total	30	100.0	30	100	60	100	

Mean± SE in Group A= 0.58 ± 0.79 and

Group B=0.60 ± 0.73

P value reached from Z test ; p>0.05 (not significant)

The above table shows that the surgically induced astigmatism at 6th week was 0.50 D in 53.3% ; 0.51-1.0 D in 30.0% ; 1.01-1.5 D in 16.7% in Group A and in Group B 40.0% , 33.3% , 23.3% and 3.3% respectively

Discussion:

A total of 60 patients were included in this study. The preoperative astigmatism was in group A 0-0.5D in 46.7% cases, 0.5-1.0 D in 33.3% cases, 1.01-1.5D in 16.7% cases. In group B astigmatism were 0-0.5D in 40% cases, 0.51-1.0D in 30% cases, 1.01-1.5D in 23.3% cases (Table- I).

The post operative astigmatism after 1st week in Group A was 0-0.5 D in 63.3%; 0.51-1.0 D in 30.0%; 1.01-1.5 D in 6.7% cases and in Group B 0-0.5 D in 43.3%; 0.51-1.0 D in 40.0%; 1.01-1.5 D in 13.3% and 1.51-2.0 D in 1.7% cases (Table-II).

After 6 weeks the post operative astigmatism in Group A was less than 1.0 D in 93.3% cases, 1.01-1.5 D in 6.7% cases and in Group B 0-0.5 D in 63.4% cases, 0.51-1.0 D in

30.0% cases, 1.01-1.5 D in 3.3% cases and 1.51-2.0 D in 3.3% cases (Table-III).

Surgically induced astigmatism was calculated by deduction of preoperative keratometric reading (astigmatism) from post operative keratometric reading (astigmatism). Here during 1st week 83.3% surgically induced astigmatism was less than 1.0 D in Group A and 80.0% in Group B and similarly more than 1.0 D astigmatism was found in 16.7% in each group (Table-IV).

Surgically induced astigmatism in 6th week was 0-0.5 D in 53.3%; 0.51-1.0 D in 30.0%; 1.01-1.5 D in 16.7% in Group A, in Group B 0-0.5 D in40%; 0.51-1.0 D in 33.3%; 1.01-1.5 D in 23.3% and 1.51-2.0 D in 3.3% (Table-V).

The mean surgically induced astigmatism was found during 1st week was in Group A= 0.67± 0.11 and in Group B= 0.72± 0.12 which was not statistically significant (p> 0.05). During 6th week the mean surgically induced astigmatism was 0.58± 0.79 D in Group A and 0.60± 0.73 D in Group B. There was no statistical significance (p> 0.05) between two groups.

Masket 2009[3] observed the mean change in the magnitude of keratometric astigmatism was 0.10± 0.08 D with 2.2mm microcoaxial incisions and 0.32± 0.20 D with the 3.0mm traditional incisions (p=0.0002). Using vector analysis, the mean magnitude of SIA was 0.35± 0.21 D with the 2.2mm incisions and 0.67± 0.48 D (p=0.006) with the 3.0mm incisions, which was statistically significant but in the present study reading was taken by manual keratometry instead of Hand held Nikon Retinomax K plus 2 autorefractor, comparison between 2.2mm incision and 3.2mm incision were done in different patients not taken in same patient and short follow up was taken, for these reasons in this study the result was not statistically significant though better outcomes were observed in 2.2mm incision group than 3.2mm incision group.

In this study it seems that 2.2mm microcoaxial phacoemulsification offers an equal advantage in reducing surgically induced astigmatism compared with 3.2mm incision.

REFERENCE

1. Akura, J, Kaneda, S, Hatta, S, Matsura, K, 'Controlling astigmatism in cataract surgery requiring relatively large self-sealing incision', J Cataract Refrat Surg 2000;26:1650-59.
2. Johns, KJ, Feder, RS, Hamill, MB, Miller-Meeks, MJ, Rosenfeld, SI, Surgery for cataract, In: Lens and Cataract (section 11) American Academy of Ophthalmology, San Fransisco, 2001;91.
3. Masket, S, Wang, L, Belani, S, 'Induced astigmatism with 2.2 and 3.0mm coaxial phacoemulsification incisions', J Cataract Refract Surg, 2009;25:347-53.
4. Smyk, A, Kropinska, E, Orzalewicz, A, 'The effect of corneal incision method on astigmatism after cataract extraction', Klin Oczna 1998;100:101-5.