Small Incision Cataract Surgery (SICS) with Clear Corneal Incision and SICS with Scleral Incision – A Comparative Study

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Abstract

Background: *Age related cataract is the leading cause of blindness and visual impairment throughout the world. With the advent of microsurgical facilities simple cataract extraction surgery has been replaced by small incision cataract surgery (SICS) with posterior chamber intra ocular lens implant, which can be done either with clear corneal incision or scleral incision.* ***Objective:*** *To compare the post operative visual outcome in these two procedures of cataract surgery.* ***Materials and method:*** *This comparative study was carried out in the department of Ophthalmology, Delta Medical College & Hospital, Dhaka, Bangladesh, during the period of January 2010 to December 2012. Total 60 subjects indicated for age related cataract surgery irrespective of sex with the age range of 40-80 years with predefined inclusion and exclusion criteria were enrolled in the study. Subjects were randomly and equally distributed in 2 groups; Group A for SICS with clear corneal incision and group B for SICS with scleral incision. Post operative visual out come was evaluated by determining visual acuity and astigmatism in different occasions and was compared between groups. Statistical analysis was done by SPSS for windows version12.* ***Results:*** *The highest age incidence (43.3%) was found between 61 to 70 years of age group. Among study subjects 40 were male and 20 were female. Preoperative visual acuity and astigmatism were evenly distributed between groups. Regarding postoperative unaided visual outcome, 6/12 or better visual acuity was found in 19.98% cases in group A and 39.6% cases in group B at 1st week. At 6th week 6/6 vision was found in 36.3% in Group A and 56.1% in Group B and 46.2% in group A and 66% in group B without and with correction respectively. With refractive correction, 6/6 vision was attained in 60% subjects of group A and 86.67% of group B at 8th week. Post operative visual acuity was statistically significant in all occasions. Postoperative astigmatism of >0.50D was in 82.5% subjects of group A and 52.8% subjects of group B at 1st week. At 6th week postoperative astigmatism of less than 1D was in 79.95% subjects of Group A and 83.34% subjects of Group B. About 20% subjects in Group A and only 3.3% in Group B showed astigmatism of more than 1D and these differences on both the occasions were statistically significant.* ***Conclusion:*** *The post operative visual outcome was better in SICS with scleral incision (group B) than in SICS with clear corneal incision (Group-A).*

Keywords: *SICS; clear corneal incision; scleral incision; astigmatism.*

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Introduction

Age related cataract is the leading cause of blindness and visual impairment throughout the world. With the general aging of the population, the overall prevalence of visual loss as a result of lenticular opacity is increasing each year. Senile cataract is the most important cause of reversible blindness in India and other developing countries.[1] Now-a-days, all techniques of cataract extraction are being modified to give best uncorrected visual acuity and early rehabilitation.[2]

With the advent of microsurgical facilities that is operating microscope, micro-instruments, etc. simple cataract extraction surgery has been replaced by small incision cataract surgery (SICS) with intra ocular lens implantation.[3] For developing countries like India, manual SICS was affordable and had encouraging results in a comparison study.[4] Since then various modifications have been tried. It has been seen that frown incision offers minimal astigmatism in SICS.[5]

Various techniques of nucleus delivery have also been described like visco-expression, hydro-expression, sandwich technique, modified fish hook technique, use of anterior chamber maintainer (ACM), irrigating cannula, and 2 Sinskey hook method.[6-12] But it was seen that uncorrected visual acuity was decreased to 6/60. This was mostly due to postoperative surgery induced astigmatism.[13] There are many ways of incision in SICS surgery like scleral incision, mid limbal incision, clear corneal incision, etc.[14] Clear corneal incision can also be done by temporal approach with good result but astigmatism is more. Post operative astigmatism is the main cause of reduced vision.[15]

There have been previous studies comparing the surgically induced astigmatism in phaco and SICS.[4,16] Reddy et al.[17] studied comparison of astigmatism induced by superior and temporal section in SICS in Indian population. Gokhale et al.[18] compared astigmatism induced by superior, supero-temporal and temporal incision in manual SICS. In this study, every effort has been made to evaluate the post operative visual acuity and refractive status of the subjects with manual SICS with clear corneal incision and that of scleral incision in our population.

Materials and method

A total 60 subjects irrespective of sex with uncomplicated age related cataract with the age range of 40-80 years except age related macular dystrophy, diabetic retinopathy and cataract due to trauma were included in this study. This comparative study was carried out in the deparment of Ophthalmolty, Delta Medical College & Hospital, Dhaka, Bangladesh, during January 2010 to December 2012. After explaining the study, method of surgery and probable out come, written informed consent was taken from all the subjects. The studied subjects were then categorized randomly and equally in to two groups, namely Group A and Group B. Surgery with clear corneal incision and scleral incision were performed in Group A and Group B respectively. The ocular parameters of the study subjects were taken into consideration. Visual acuity was measured both preoperatively and postoperatively at day1, 1st week, 6th and 8th week. Measures of astigmatism both preoperatively and after surgery at 1st and 6th week were also documented in both groups. Data were analyzed by applying chi-square test (where applicable) with SPSS for windows, version 12.

Results

In this study total 60 subjects were enrolled. The subjects were distributed in two groups; designated as Group A and Group B. Small incision cataract surgery (SICS) with clear corneal incision was performed on Group A and SICS with scleral incision was performed on Group B. Highest incidence of occurrence was found between 61-70 years of age group (36.6% in Group A and 50% in Group B) followed by 51-60 years age group (Table I).

Table I: Distribution of age

Age range (years)	Group A (n=30) Frequency (%)	Group B (n=30) Frequency (%)	Total frequency (N=60) (%)
40-50	4 (13.3%)	4 (13.3%)	8 (13.3%)
51-60	12 (40%)	9 (30%)	21 (35.0%)
61-70	11 (36.6%)	15 (50%)	26 (43.3%)
71-80	3 (10.0%)	1 (6.6%)	5 (8.3%)

Table II shows sex distribution. In Group A, out of 30 cases 19 (63.3%) were male and 11 (36.7%) were female where as 21 (70%) were male and 9 (30%) were female in Group B among 30 cases. In total male were 40 and female was 20 in numbers.

Table II: Distribution of sex

Grouping of the study subjects	Sex	
	Male	Female
Group A (n=30)	19 (63.3%)	11 (36.7%)
Group B (n=30)	21 (70%)	9 (30%)
Total (N=60)	40 (66.33%)	20 (33.33%)

Only 5 subjects (8.3%) came with vision better than 6/60 and remaining 55 (91.66%) subjects had 6/60 or poorer vision and 30 (50%) had hand movement (HM) and counting finger (CF) vision preoperatively.

The distributions of visual acuity between the groups were not statistically significant (p>0.05) (Table III).

Table III: Distribution and comparison of preoperative visual acuity in groups

Pre operative visual acuity	Group A (n=30)	Group B (n=30)	Total (N=60)
6/24	1 (3.33%)	1 (3.33%)	2
6/36	2 (6.67%)	1 (3.33%)	3
6/60	12 (40%)	13 (43.33%)	25
CF	10 (33.33%)	12 (40%)	22
HM	5 (16.67%)	3 (10%)	8

Chi-square value = 1.05; p>0.05

After surgery 6/12 or better visual acuity was attained in 6 (20%) cases of Group A and 12 (39.96%) cases of Group B. On the other hand 6/18 vision was found in 7 (23.33%) and 10 (33.33%) cases respectively in Group A and Group B after 1 week (unaided). Statistically significant improvement (p<0.05) in Group B was observed at the end of 1st week (Table IV).

Table IV: Distribution and comparison of postoperative visual acuity at 1st week (unaided) between groups

Postoperative visual acuity at 1st week	Group A (n=30)	Group B (n=30)	Total (N=60)
6/9	0	2 (6.67%)	2
6/12	6 (20%)	10 (33.33%)	16
6/18	7 (23.33%)	10 (33.33%)	17
6/24	6 (20%)	6 (20%)	12
6/36	7 (23.33%)	2 (6.67%)	9
6/60	4 (13.33)	0	4

Chi-square value = 13.39; p<0.05

Table V shows that after six weeks 6/6 vision was in found in 17 subjects (56.75%) in Group B and 11 subjects in Group A, 6/9 vision in 10 subjects (33.3%) in Group A and 10 (33.3%) subjects in Group B. In group B, 6/9 or better visual outcome was found in 27 subjects (89.9%) and 21 subjects (69.99%) in Group A. The improvement in visual recovery (unaided) at 1st week in Group B was found statistically significant (p<0.05).

Table V: Distribution and comparison of postoperative visual acuity after 6 weeks (unaided) between groups

Postoperative visual acuity after 6 week	Group A (n=30)	Group B (n=30)	Total (N=60)
6/6	11 (36.66%)	17 (56.75%)	28
6/9	10 (33.33%)	10 (33.33%)	20
6/12	5 (16.66%)	2 (6.66%)	7
6/18	2 (6.66%)	1 (3.33%)	3
6/24	1 (33.33%)	0	1
6/60	1 (3.33%)	0	1

Chi-square value = 9.488; p<0.05

All the subjects were also evaluated for visual acuity (unaided) at 8th week. Twenty three subjects (76.67%) of Group B had 6/6 vision which was 11 (36.67%) for Group A. Total 28 subjects of Group B and 19 subjects of Group A had 6/9 or better vision. These differences were also statistically significant (p<0.05) (Table VI).

Table VI: Distribution and comparison of postoperative visual acuity at 8th week (unaided) between groups

Postoperative visual acuity at 8th week without glass	Group A (n=30)	Group B (n=30)	Total (N=60)
6/6	11 (36.67%)	23 (76.67%)	34
6/9	8 (26.67%)	5 (16.65%)	13
6/12	10 (33.33%)	2 (6.66%)	12
6/18	1 (3.33%)	0	1

Chi-square value = 8.98; p<0.05

Table VII shows the distribution of visual out come at 8th week with correction. It shows that 26 subjects (86.67%) had 6/6 vision in group B whereas it was 18 (60%) in group A. All the subjects in Group B had better than 6/9 but 1 subject in Group A had 6/12 vision. Statistically there was significant difference between the groups (p<0.05).

Table VII: Distribution and comparison of postoperative visual acuity after 8th week (with glass) between groups

Postoperative visual acuity at 8th week with glass	Group A (n=30)	Group B (n=30)	Total (N=60)
6/6	18 (60%)	26 (86.67%)	44
6/9	11 (36.67%)	4 (13.33%)	15
6/12	1 (3.33%)	0	1

Chi-square = 7.815; p< 0.05

Table VIII shows the preoperative distributions of astigmatism. Majority (46.66%) astigmatism was between 0.51-1.0D followed by 0-0.50D (36.66%). The distributions of astigmatism between the groups were not statistically different (p>0.05).

Table VIII: Distribution and comparison of preoperative astigmatism between groups

Preoperative astigmatism	Group A (n=30)	Group B (n=30)
0-.50D	10 (33.3%)	11 (36.66%)
0.51-1.0D	13 (43.4%)	14 (46.66%)
1.1-1.5D	6 (20.0%)	4 (16.7%)
1.51-2.0D	1 (3.3%)	1 (3.3%)

Chi-square value = 6.88; p>0.05

Postoperative astigmatism at 1st week in Group A, 0-0.5D was in 16.65% subjects, 0.51-1.0D was in 66.67% subjects, 1.1-1.50D was in 16.32% subjects and 1.51-2.0D was in 3.3% subjects and in Group B, 0-0.5D was in 46.7% subjects, 0.5-1.0 D was in 40.0% subjects, 1.1-1.50D was in 9.9% subjects and 1.51-2.0D was in 3.3% subjects. These differences were statistically significant (p<0.05) (Table IX).

Table IX: Distribution and comparison of postoperative astigmatism between groups at 1st week

Postoperative astigmatism at 1st week	Group A (n=30)	Group B (n=30)
0-.50D	5 (16.65%)	14 (46.2%)
0.51-1.0D	20 (66.66%)	12 (40%)
1.1-1.50	4 (16.32%)	3 (9.99%)
1.51-2.0D	1 (3.3%)	1 (3.3%)

Chi-square value = 6.73; p<0.05

Table X shows that postoperative astigmatism of less than 1.0D at 6th week was in 79.95% subjects of Group A and 83.34% subjects of Group B. About 20% cases in Group A and only 3.3% in Group B showed astigmatism of more than 1.0D. So, astigmatism was found more in Group A and it was statistically significant (p<0.05).

Table X: Distribution and comparison of postoperative astigmatism between groups at 6th week

Postoperative astigmatism at 6th week	Group A (n=30)	Group B (n=30)
0 -.50D	10 (33.33%)	18 (59.94%)
0.51-1.0D	14 (46.62%)	11 (23.4%)
1.1-1.5D	6 (19.96%)	1 (3.3%)

Chi-square value = 7.815; p<0.05

Discussion

Despite excellent facilities and skilled surgeons, people in the developing world are deprived of the visual benefits of the intra ocular lens because of inability to afford.[19] Astigmatism is more as the incision is given more anteriorly like clear corneal incision.[14] It is also documented that surgically induced astigmatism is higher in clear corneal manual SICS than in sclerocorneal.[20]

In this study the surgery was done with incision length of 5.0 mm to 6.0 mm. Incision was given 1.5 to 2.0 mm behind the limbus in case of SICS with scleral incision and in the cornea anterior to the limbus in case of SICS with clear corneal incision.

Overall postoperative visual outcome in terms of visual acuity was found better in SICS with scleral incision than those with clear corneal incision. Similar findings were documented by Hayashi et al.[21] They compared changes in corneal astigmatism and shape after 2.0 mm clear corneal incision and scleral incision and also after 3.0 mm clear corneal incision and scleral incision. They found that astigmatism occurring after 3.0 mm clear corneal incision was significantly greater than those occurring after 3.0 mm scleral incision, whereas the compared variables were virtually the same after both the 2.0 mm SICS, which suggests that clear corneal incision is suitable for microincision cataract surgery (phacoemulsification method).

Postoperative astigmatism was found less in scleral incision in our study than clear corneal incision. It is documented that astigmatism varies according to the size of incision. In SICS the astigmatism is more because of the size of incision. Burgansky et al.[22] in their study by vector analysis have shown an increase in astigmatism with an increase in incision size. Again Kimura et al.[23] have shown by vector analysis that surgically induced astigmatism is less with an oblique incision than with a superior incision. Pre-existing astigmatism can be neutralized by changing site of incision. The findings of this study regarding post operative astigmatism is comparable to the study done by Menapace et al.[24] In their study 4 mm sclerocorneal tunnel incision was given 3 mm behind the surgical limbus. But the mean value of surgically induced astigmatism is higher in this study in both groups. The reason behind this is that the length of the incision was 5.5 mm - 6.0 mm in size in this series, which was larger than the study of Menapace et al.[24] Another fact is that

They used incision 3 mm behind the surgical limbus. In this series it was 1.5 mm - 2 mm behind the limbus.

Our post operative astigmatism findings are also comparable to phacoemulsification study carried out by Pfleger et al.[25], where phacoemulsification was done with 5.1 mm scleral tunnel incision and mean surgically induced cylinder calculated by Jaffe's method of vector analysis was found 1.61D in 1st day; 1.40D in 2nd week; 1.13D in 1 month; 0.98D in 2nd month and 0.75D in 3rd month. In this study, slightly lower value of surgically induced astigmatism might be due to more posterior placed incision, or exclusion of extreme astigmatic cases and extreme aged patients. Venkatesh et al.[26] and Haripriya et al.[27] compared SICS and phacoemulsification and both techniques achieved excellent visual outcomes with low complication rates including similar incidence of surgically induced astigmatism.

Early wound stabilization and less astigmatism are important for early visual recovery. SICS with scleral incision is more beneficial for quick stabilization of wound thereby early recovery of vision because there is less astigmatism, better wound healing and early visual recovery.

It can be concluded from the study that post operative outcome in terms of visual acuity and astigmatism is better in subjects performing SICS with scleral incision than that with clear corneal incision. Moreover this type of surgery is quick with almost no risks of corneal endothelial damage, chances of wound leakage are less and wound healing is faster. In the hands of skill surgeon the postoperative surgical complications are not much rather better compared to that of SICS with clear corneal incision surgery.

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