Original Research Article

Assessment of surgical induced astigmatism with foldable and non-foldable intraocular lens implantation after phacoemulsification cataract surgery

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Abstract

Background: Phacoemulsification cataract surgery can be done with temporal incision foldable posterior chamber intraocular lens (PCIOL) implantation. An extended temporal incision can also do it with rigid (non-foldable) intraocular lens implantation. The size of the incision may impact the magnitude of postoperative Astigmatism and visual outcome. The foldable lens requires a small incision but is expensive as compared to a rigid lens and may not be affordable for poor patients. **Methods:** The present prospective study was done at the Ophthalmology Department at a tertiary care centre in Maharashtra. 100 eyes of 100 patients were included in the study. Depending on the type of intraocular lens implant inserted in the eyes of the patients, they were divided into two groups irrespective of the type of astigmatism. **Results:** The study comprised of 100 patients with 54 males and 46 females. Mean age in group I group II was 60.68 ± 11.8 years and 63.16 ± 9.32 years respectively. Mean Surgical induced astigmatism on day 42 in group I group II was 0.56 ± 0.5 and 0.62 ± 0.6 respectively with no statistically significant difference between the two groups. Also, there was no statistically significant difference between the two groups on day 42 with respect to corrected visual acuity. **Conclusions:** From study results it can be concluded that there were similar results with regard to surgical induced astigmatism and corrected visual acuity after Phacoemulsification cataract surgery using foldable PCIOL and rigid PCIOL implantation. Considering the patient affordability factor, Phacoemulsification cataract surgery with rigid (non-foldable) lens implantation can be an acceptable option.

Key Word: Rigid posterior chamber intraocular lens, Phacoemulsification, Astigmatism.

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INTRODUCTION

Cataract remains the leading cause of blindness contributing to over half of the patients with blindness across the globe.[1,2] The treatment for cataract includes cataract surgery and intraocular lens implantation, to restore vision to near normal. Safe surgery, early visual rehabilitation and postoperative emmetropia are requirements for present-day cataract surgery. Various surgical techniques have been used in the management of cataract which includes intracapsular cataract extraction, extracapsular cataract extraction and ultrasonic Phacoemulsification. With the advent of Phacoemulsification, cataract extraction became more efficient with rapid visual recovery. [3] Also, now flexible,

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foldable lenses are available which can be inserted using a much smaller incision than the incision required for rigid lens insertion. It has been reported that small incision for cataract surgery reduces postoperative astigmatism and gives better visual outcome post surgery. [4] In advanced countries, rigid lenses have largely been replaced by foldable lenses. [5-7] However, in developing countries, the cost factor also plays an essential role in treatment decisions. Considering the cost difference between foldable and rigid lenses, the use of low-cost, rigid intraocular lens insertion with Phacoemulsification makes it more affordable especially for poor patients in developing countries. Moreover, it has been reported that Phacoemulsification with foldable as well as rigid lens insertion gave similar results.[8,9] The present study was done to assess the postoperative Astigmatism following temporal incision Phacoemulsification with posterior chamber foldable intraocular lens implantation and extended temporal incision with rigid (non-foldable) intraocular lens implantation.

METHODS

The present prospective observational study was done at the Ophthalmology Department at a tertiary care centre in Maharashtra. The eyes of patients that underwent Phacoemulsification cataract surgery with posterior chamber foldable and rigid (non-foldable) intraocular lens implant by temporal incision were included. 100 eyes of 100 patients were included in the study. Depending on the type of intraocular lens implant inserted in the eyes of the patients, they were divided into two groups irrespective of the type of astigmatism. Group one included cases who underwent Phacoemulsification with temporal corneal tunnel (2.8mm) incision and posterior chamber intraocular lens implantation. Group two included cases that underwent Phacoemulsification with extended temporal corneal tunnel (5.3–5.5 mm) incision and posterior chamber intraocular lens implantation. Inclusion criteria were the patients diagnosed with visually significant cataract with reasonable visual potential and who gave informed consent for the procedure and inclusion in the study. Patients with a history of any prior ocular surgery, retinal detachment, corneal disorders like corneal opacity, corneal thickening or decreased corneal clarity; severe external eye disease, uncontrolled preoperative glaucoma, history of long term steroid use or irregular astigmatism were excluded. Complete general, systemic and ophthalmology examination was performed on each patient. All standard protocols for surgical intervention were followed. Postoperatively, detailed ophthalmology examination was done on day 1, day 7 and day 42. Keratometric astigmatism and surgical induced astigmatism was assessed and compared in patients in Group I and Group II. Surgical induced astigmatism was calculated using simple subtraction method involving calculation by subtracting one value from the other without regard to the axis. Data were entered in Microsoft Excel spreadsheet. The analysis was done to assess the statistical significance of study parameters and p-value < 0.05 was considered as statistically significant.

OBSERVATIONS

Table 1: Age Distribution of the Study Groups

Age in Years	Group I	Percentage	Group II	Percentage
Less than 50	8	16	3	6
50 – 59	7	14	10	20
60 – 69	26	52	25	50
70 above	9	18	12	24
Total	**50**	**100**	**50**	**100**
Mean ± Standard Deviation (Age in years)	**60.68 ± 11.8**		**63.16 ± 9.32**	

Table 2: Gender Distribution of the Study Groups

Gender	Group I	Percentage	Group II	Percentage
Male	30	60	27	54
Female	20	40	23	46
Total	**50**	**100**	**50**	**100**

Table 3: Preoperative Visual Acuity in the Study Groups

Visual Acuity	Group I	Percentage	Group II	Percentage
6/6 – 6/24	3	6	2	4
< 6/24	47	94	48	96
Total	**50**	**100**	**50**	**100**

Table 4: Type of Cataract in the Study Groups

Cataract	Group I	Percentage	Group II	Percentage
Grade 2 Nuclear Sclerosis Cortical	22	44	20	40
Grade 3 Nuclear Sclerosis Cortical	28	56	30	60
Total	**50**	**100**	**50**	**100**

Table 5: Comparison of Mean Surgically Induced Astigmatism in the Study Groups

Type of Intraocular Lens	Surgically Induced Astigmatism (D) (Mean ± Standard Deviation)		
	Day 1	Day 7	Day 42
Group I (Foldable PCIOL)	0.04 ± 0.2	0.24 ± 0.43	0.56 ± 0.5
Group II (Rigid PCIOL)	0.14 ± 0.41	0.4 ± 0.53	0.62 ± 0.6
p value	**0.121 (NS)**	**0.103 (NS)**	**0.59 (NS)**

NS: Statistically not significant.

Table 6: Comparison of Best Corrected Visual Acuity in the Study Groups

Corrected Visual Acuity (Day 42)	Group I	Percentage	Group II	Percentage	p value*
6/6	39	78	37	74	
6/9	10	20	13	26	0.486
6/12	01	02	0	00	**(NS)**
Total	**50**	**100**	**50**	**100**	

NS: Statistically not significant. * Fisher's Exact Test used

DISCUSSION

The present study observed that mean surgical induced astigmatism on day 42 in group I group II was 0.56 ± 0.5 and 0.62 ± 0.6 respectively with no statistically significant difference between the two groups. Also, there was no statistically significant difference between the two groups on day 42 with respect to corrected visual acuity. The correlation of the incision size and surgical induced astigmatism has been of interest to ophthalmologists, and there are reports of a positive correlation.[10-12] However, a recent Cochrane review has suggested that there may not be a significant, consistent impact of the size of the incision of Phacoemulsification surgery on the surgically induced astigmatism or postoperative visual acuity over a longer term. The review reported that there might be less astigmatism with coaxial micro incision Phacoemulsification surgery, but even that difference was small in the range of 0.2 D with uncertain evidence. [13] Hennig A et al. have explained that although the rigid IOL requires a 5-mm incision which is wider than the required incision for foldable IOL, it may not alter the surgically induced astigmatism as it is further posterior, which may reduce its propensity to cause astigmatism. They studied compared the outcome after Phacoemulsification cataract surgery with 2.5 mm incision (foldable IOL insertion) 5 mm incision (rigid IOL insertion). Based on their study results, they concluded that if the surgeon is experienced, the results of both 2.5 mm incision and 5 mm incision Phacoemulsification cataract surgery are excellent and the use of rigid lens implant will lower the cost and make it more affordable for poor patients especially from low income countries. [9] However, on the contrary, Olson and Crandall study evaluated the long term astigmatic shift and visual acuity following the 3.2 mm and 5.5 mm Phacoemulsification cataract surgery. This prospective randomised trial concluded that over a longer term, there was statistically significant difference in the astigmatic shift and visual acuity with the 3.2 mm and 5.5 mm Phacoemulsification cataract surgery with better results obtained in the smaller 3.2 mm incision. [12] The study limitation is a short duration of follow up and a smaller sample size. Also, it was not possible to ascertain that surgeons were equally adept at Phacoemulsification with 2.8mm incision and foldable PCIOL insertion and extended incision with rigid PCIOL insertion. There was no data collection about complications and other confounding factors. Further studies with a large sample and better study design allowing for the accounting of the confounding factors is needed to evaluate the impact of foldable or rigid IOL implant Phacoemulsification cataract surgery on the surgical induced astigmatism and overall visual outcome.

CONCLUSIONS

From study results, it can be concluded that there were similar results concerning surgical induced astigmatism and corrected visual acuity after Phacoemulsification cataract surgery using foldable PCIOL and rigid PCIOL implantation. Considering the patient affordability factor,

Phacoemulsification cataract surgery with rigid (non-foldable) lens implantation can be an acceptable option.

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