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Original Research

Comparison of visual outcome and complications between Scleral Fixated Intraocular Lens and Anterior Chamber Intraocular Lens in Aphakes

[1]Mandeep Kaur, [2] V K Mohindra

[1]Assistant Professor, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab, India
[2]Consultant Aster Hospital, Kuwait road, Dubai, UAE

ABSTRACT:

Background: A successfully performed cataract extraction is the first step in the visual rehabilitation of a cataract patient. Thus aphakia is the first complication of cataract surgery that actually is the absence of the lens in the eye due to surgical removal, a perforating wound, ulcer or congenital anomaly. It causes loss of accommodation, hyperopia, deep anterior chamber and is associated with complications like detachment of the vitreous or retina and glaucoma. The present study was conducted with the aim to compare the visual outcome in subjects with Scleral Fixated Intra Ocular Lens (SFIOL) implantation and Anterior Chamber Intra Ocular Lens (ACIOL) implantation in aphakes and to compare intraocular pressure (IOP) and endothelial count (EC) amongst them. **Materials and methods:** The present study was conducted in the out-patient department of ophthalmology at INHS Asvini, Mumbai. A total of 40 aphakic eyes were included. The aphakic eyes were divided at the random into two groups - Group A and Group B with 20 patients in each group. Group A underwent SFIOL and Group B went ACIOL implantation respectively. Classic Ab Externo Technique for secondary Ciliary Sulcus SFIOL Fixation was performed to insert single piece Poly Methyl Methacrylate lens with eyelets and for secondary ACIOL implantation Single piece Poly Methyl Methacrylate flexible open loop ACIOL was used. Visual acuity, IOP and Endothelial Count were measured in all eyes at post-operative Day 1, Day 4, Day 15, Day 30 and Day 45. Subjects were also examined after 6 months and 12 months of surgery. All the data thus obtained was arranged in a tabulated form and analyzed using Student's unpaired 't' test. Probability value of less than 0.05 was considered as significant. **Results:** Visual acuity (expressed in log MAR) improved from 0.94 ± 0.11 to 0.44 ± 0.13 in group A and group B eyes showed improvement from 0.95 ± 0.11 to 0.24 ± 0.09. Preoperative mean IOP in SFIOL (17.2 ± 2.09 mmHg) increased by 13.95% to 19.6 ± 2.11 mm Hg after surgery. An increase of 21.08% was seen in preoperative IOP levels of 16.6 ± 2.98 mmHg to 20.1 ± 2.86 mmHg after ACIOL implantation. SFIOL implantation in group A lead to 5.42% fall in Endothelial Count as compared to ACIOL implantation that caused a fall of 11.66% in group B eyes. A statistically significant improvement was seen in visual acuity after ACIOL implantation as compared to SFIOL implantation. The comparison of post operative IOP levels of SFIOL and ACIOL revealed statistical significance. However there was no statistical difference in the endothelial count between the groups. **Conclusion:** We have reported higher rise in IOP after ACIOL implantation. Endothelial count decreased with both implantations but more so with ACIOL implantation. As SFIOL implantation is technically more difficult than ACIOL implantation, the decisive factor in choosing a secondary IOL is surgical experience.

Keywords: Cataract, implantation, Endothelial, Ocular.

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Corresponding author: Dr. Mandeep Kaur, Assistant Professor, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab, India

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INTRODUCTION

Cataract has been documented to be the most significant cause of bilateral preventable blindness in India where cataract has been reported to be responsible for 50-80% of the bilaterally blind in the country.[1-4] A successfully performed cataract extraction is therefore only the first step in the visual rehabilitation of a cataract patient. Thus aphakia is the first complication of cataract surgery that actually is the absence of the lens in the eye due to surgical removal, a perforating wound, ulcer or congenital anomaly. It causes loss of accommodation, hyperopia, deep anterior chamber and is associated with complications like detachment of the vitreous or retina and glaucoma.[5] IOL implantation is surgical implantation of lens inside the eye as a prosthetic device for correcting aphakia and this procedure is called pseudophakia. Thus, the quality of vision obtained with an IOL more closely resembles that of phakic eye than the vision obtained by any other known method, with no constriction of peripheral field and least amount of

aniseikonia (1-2%). Perhaps the most dramatic example of the benefit of an IOL is the case of monocular aphakic patient (Secondary IOL implantation) [6]. Secondary IOL implantation refers to IOL insertion at a time remote from the initial cataract extraction. Most often, secondary IOL implantation is performed on a patient who had a previous unilateral cataract extraction, contralateral pseudophakia or had aborted primary IOL implantation. For secondary IOL implantation, there are four types of IOLs in use today: anterior chamber IOLs, iris-fixated IOLs, posterior chamber IOLs and sulcus-fixated IOLs [6]. The present study was conducted with the aim to compare the visual outcome in subjects with Scleral Fixated Intra Ocular Lens (SFIOL) implantation and Anterior Chamber Intra Ocular Lens (ACIOL) implantation in aphakes and to compare intraocular pressure (IOP) and endothelial count (EC) amongst them.

MATERIALS AND METHODS

The present study was conducted in the out-patient department of ophthalmology at INHS Asvini, Mumbai. A total of 40 aphakic eyes were included. The subjects between 55-70 years with minimum preoperative BCVA of 5/60 were enrolled in the study. The study was approved by the institutional ethical board and a written consent was obtained from all in their vernacular language. Any eye with disease of lacrimal apparatus, lids, corneal opacities, glaucoma, uveitis, squint or disease of posterior segment (retinopathy, maculopathy and optic neuropathy) and eyes with pre-operative EC less than 1500/mm^2 were excluded from the study. Subjects with uncontrolled systemic issues were also not included in the study. The aphakic eyes were divided at the random into two groups - Group A and Group B with 20 patients in each group. Group A underwent SFIOL and Group B underwent ACIOL implantation respectively. In both the groups, visual acuity was measured using Snellen‘s chart, slit lamp biomicroscopy for anterior segment evaluation, sac syringing for patency of lacrimal sac and fundus examination to rule out any posterior segment disease with direct and indirect ophthalmoscope. IOP was measured by Goldman applanation tonometer using Haag streit slit lamp. EC was measured by non-contact specular microscopy (Model Topcon SP 2000 P). Keratometry for axial length of eye was done and diopteric power of IOL’s to be implanted was calculated by using SRK II formula. Group ‘A’ eyes were instilled 0.8% Tropicamide and 5% Phenylepherine drops to dilate the pupil and 2% Pilocarpine drops were instilled in Group B eyes to constrict the pupil 3-4 times at 10 minute interval 1-2 hours before surgery. The peribulbar anaesthesia and akinesia of the eyes was achieved by injecting a mixture of 5 ml of 2% Lignocaine and 5 ml of 0.5% Bupivacaine mixed with Hyaluronidase (1500 IU). Classic Ab Externo Technique for secondary Ciliary Sulcus SFIOL Fixation was performed to insert single piece Poly Methyl Methacrylate lens with eyelets and for secondary ACIOL implantation Single piece Poly Methyl Methacrylate flexible open loop ACIOL was used. Visual acuity, IOP and Endothelial Count were measured in all eyes at post-operative Day 1, Day 4, Day 15, Day 30 and Day 45. Subjects were also examined after 6 months and 12 months of surgery. All the data thus obtained was arranged in a tabulated form and analyzed using Student’s unpaired ‘t’ test. Probability value of less than 0.05 was considered as significant.

RESULTS

Table 1 illustrates the Pre-operative and Post-operative parameters between SFIOL and ACIOL implantation. Visual acuity (expressed in log MAR) improved from 0.94 ± 0.11 to 0.44 ± 0.13 in group A and group B eyes showed improvement from 0.95 ± 0.11 to 0.24 ± 0.09. Preoperative mean IOP in SFIOL (17.2 ± 2.09 mmHg) increased by 13.95% to 19.6 ± 2.11 mmHg after surgery. An increase of 21.08% was seen in preoperative IOP levels of 16.6 ± 2.98 mmHg to 20.1 ± 2.86 mmHg after ACIOL implantation. In group A, SFIOL implantation lead to fall in Endothelial Count from 1908.04 ± 103.4 cells per sq mm to 1804.8 ± 98.81 cells per sq mm (5.42% fall). Similarly ACIOL implantation caused a fall of 11.66% in group B eyes (Preoperative 1898.2 ± 130.58 cells per sq mm; Post operative 1676.9 ± 115.06 cells per sq mm).

Table 2 shows the Statistical comparison of Post Operative IOP, Endothelial Count and Visual Acuity after SFIOL and ACIOL implantations. A statistically significant improvement was seen in visual acuity after ACIOL implantation as compared to SFIOL implantation. The comparison of post operative IOP levels of SFIOL and ACIOL revealed statistical significance. However there was no statistical difference in the endothelial count between the groups.

Table 1: Comparison of Pre-operative and Post-operative parameters between SFIOL and ACIOL implantation

	SFIOL		**ACIOL**	
	Pre operative	**Post operative**	**Pre operative**	**Post operative**
Visual acuity (log MAR)	**0.94 ± 0.11**	**0.44 ± 0.13**	0.95 ± 0.11	0.24 ± 0.09
Intra Ocular Pressure (mmHg)	17.2 ± 2.09	19.6 ± 2.11	16.6 ± 2.98	20.1 ± 2.86
Endothelial Count (No. of cells/ sq mm)	1908.4 ± 103.40	1804.8 ± 98.81	1898.2 ± 130.58	1676.9 ± 115.06

Table 2: Statistical comparison of Post Operative IOP, Endothelial Count and Visual Acuity after SFIOL and ACIOL implantations

	SFIOL	ACIOL	Unpaired 't' test
Intra Ocular Pressure (mmHg)	19.6 ± 2.11	20.1 ± 2.86	t=2.78, df=38*
Endothelial Count (No. of cells/ sq mm)	1804.8 ± 98.81	1676.9 ± 115.06	NS
Visual Acuity (log MAR)	0.44 ± 0.13	0.24 ± 0.09	t=1.38,df=38*
*** = significant p ≤ 0.05; NS = Non significant**			

DISCUSSION

Our findings of more improvement in visual acuity after ACIOL than SFIOL implantation are very contrary to the view of older generation ophthalmologists, as they believed that placing ACIOL near to sensitive structures like iris root, trabecular meshwork and corneal endothelium will result in more complications. Our results matched with the retrospective study of Kwong et al [7] which reported better BCVA in ACIOL as compared to SFIOL implantation. Sujata et al from New Delhi had also compared outcomes of ACIOL and SFIOL implantations and reported that 82.6 % of ACIOL implanted eyes showed post op BCVA of 6/18 or better as compared to 54.3% of eyes implanted with SFIOL. [8] Inaccurate placement and erosion of the scleral fixation sutures have been reported to be associated with lens tilt, astigmatism and retinal detachment[8] Also SFIOL implantation takes considerably longer to perform and prolonged phototoxicity from the operating microscope may play a role in light-induced retinal injury. Such incidences have been reported in 0% to 28% of uncomplicated surgeries [7]. In our study we did not measure the exact time taken for the surgeries, however, time taken for SFIOL implantation was longer than ACIOL implantation. BCVA also improved after SFIOL implantation in our study and 65% of our SFIOL implanted eyes could see 6/12 (log MAR= 0.3) or better although this improvement was shown to be not significant as compared to ACIOL implantation [9]. Corneal endothelium is very sensitive to physical manipulation done during any of the surgeries performed on the eye. Studies by Hahn TW et al [10] and Ravalico et al [11] have reported much higher decrease in mean Endothelial Count with ACIOL implantation as compared to posterior chamber IOL implantation. Inspite of using flexible open loop ACIOl, we encountered 11.66% of endothelial loss. This can be further justified by the theory of "turbulence endotheliopathy" which explains the flow of aqueous in anterior chamber[12]. The study conducted by Ravalico et al in 2003 indicated that the endothelial cell loss was related to surgical trauma rather than the presence of an IOL in the anterior chamber[11]. Nevertheless, SFIOL implantation is optically physiological as lens is implanted in the same plane as crystalline lens and does not interfere with endothelial integrity. There are studies which have reported almost same corneal endothelial loss in relation to SFIOLs.. We observed marginally lower (5.42%) fall in endothelial count in SFIOLs after a mean follow up period of 9 months. We observed 21.08% rise in post operative IOP after ACIOL implantation and 13.95% rise after SFIOL implantation. Our findings of much higher transient rise in IOP with ACIOL implantation as compared to SFIOL implantation as secondary procedure are in line with the study by Evereklioglu published in 2003 [9]. Nevertheless, 13.95% of rise in IOP seen with SFIOL was in line with results of a study published by Donaldson et al which reported 38% ACIOL and 42% of sutured posterior chamber intraocular lenses were associated with elevated IOP [12]. IOP rise could be due to excessive inflammation with formation of posterior synechiae to the IOL and rubbing of iris pigment epithelium against the periphery and haptics of SFIOL leading to dispersion of pigment granules resulting in obstruction of trabecular mesh work.

CONCLUSION

Secondary Intraocular lens implantation is the preferred method for treating aphakia. It seemed to provide a more favorable outcome and a lower complication rate than the open-loop ACIOL. We have reported higher rise in IOP after ACIOL implantation. Endothelial count decreased with both implantations but more so with ACIOL implantation. As SFIOL implantation is technically more difficult than ACIOL implantation, the decisive factor in choosing a secondary IOL is surgical experience.

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