

Comparative evaluation of posterior capsular opacification and Nd: YAG capsulotomy in children and adults

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Abstract

Objective: To compare the rate of posterior capsular opacification and Nd:YAG laser capsulotomy in children and adults after cataract surgery and primary intraocular lens implantation.

Materials and Methods: 38 eyes of 24 children and 53 eyes of 47 adults patients who had undergone phacoaspiration/phacoemulsification surgery with primary in the bag posterior chamber intraocular lens (PCIOL) implantation were included in the study. A retrospective analysis of data was performed. The rate of posterior capsular opacification (PCO) and Nd:YAG laser capsulotomy was compared between children and adults with different type of intraocular lenses (PMMA and acrylic).

Results: Age of the children ranged from 2 to 12 years and that of the adults from 47 to 80 years. PCO developed in 27.28% eyes of children with Acrylic intraocular lens (IOL) and in 75% eyes with square edge PMMA lens. PCO did not develop in any of the adult patients with either PMMA or acrylic IOL.

Conclusion: Rate of PCO in children is lower with acrylic IOL as compared to square edge PMMA lens. However in adults, PCO preventing effect of IOL material seems to be immaterial in the hands of an experienced phaco surgeon.

Keywords: Acrylic, Intraocular lens, Posterior capsular opacification, PMMA.

Introduction

Posterior capsular opacification is the most frequent complication of cataract surgery and is known to compromise vision and increase ocular morbidity. Advances in surgical techniques and IOL material have reduced the PCO rate; however it remains a significant problem resulting in suboptimal outcome of cataract surgery.

IOL implantation in children is associated with higher perioperative complications and an increased risk of subsequent posterior capsular opacification as compared to adults.¹ Foldable soft acrylic IOLs have lower PCO rates than polymethylmethacrylate (PMMA) lenses in adult eyes.^{2,3} There is increasing evidence of PCO reduction with newer IOL designs and materials.^{4,5} Since the incidence of PCO is very high in paediatric patients and the long term effect of the anterior vitrectomy and Nd:YAG laser capsulotomy in this group is not known, use of an IOL to inhibit PCO formation is highly desirable. In the present study we evaluated the performance of PMMA and acrylic IOL in the development of PCO in a group of paediatric patients and compared the results with the adult patients.

Materials and Methods

38 eyes of 24 children and 53 eyes of 47 adult patients who underwent cataract surgery in a tertiary care hospital in Uttarakhand were included in the study. Due permission was obtained from the institutional ethical review board. Retrospective analysis of data was performed. The inclusion criteria for the children included patients operated for unilateral or bilateral congenital or developmental cataract. The adults operated for any type of uncomplicated senile cataract with primary IO L implantation were included in the study. Patients with associated ocular disease (microphthalmos, microcornea, glaucoma, uveitis, traumatic

or complicated cataract, posterior lenticonus, coloboma), systemic disease, patients with any intraoperative complications, children in whom posterior capsulotomy with anterior vitrectomy was done and patients with secondary IOL implantation were excluded from the study. All the patients were subjected to a detailed preoperative evaluation. The visual acuity was recorded with Snellen's visual acuity chart or the illiterate E chart. Fixation pattern was noted in uncooperative patients. Slit lamp biomicroscopy was done. Intraocular pressure (IOP) was measured in most patients using Goldmann Applanation tonometer or the Perkin's Hand held tonometer. Preoperative keratometry was done and axial length (AL) was measured. In some children AL and keratometry was done on the table under GA, preoperatively. SRK -II formula was used for IOL power calculation, using IOL Master A scan machine. The IOL power was selected to ensure postoperative emmetropia. All the patients in both groups underwent clear corneal phacoemulsification/phacoaspiration with in the bag posterior chamber IOL by a single surgeon, utilizing standard surgical technique. Alcon centurion phacosystem was used in all cases. A gap of at least one month was kept before operating the other eye in cases of bilateral cataract.

Thorough hydrodissection during surgery and complete removal of the cortical matter was ensured in all the cases. The posterior capsule was left intact in all the cases. Either a 5.5 mm foldable acrylic IOL (MA30BA) or after extending the tunnel, a 5mm all PMMA IOL (IAB203) was implanted in the bag. The viscoelastic was aspirated thoroughly. Postoperatively, all patients received standard regimen of steroid antibiotic drops in biweekly tapering doses. Patients were examined on the first postoperative day and subsequently at two weeks, one month, 3 months and 6

months. At each visit, best corrected visual acuity (BCVA), intraocular pressure (IOP) were recorded along with complete slit lamp biomicroscopic examination and thorough fundus evaluation. Amblyopia therapy was given if required. PCO if found was graded as follows

Table 1: Grading of posterior capsular opacification

Grade	Severity	PCO
Grade 0	None	No evidence of PCO
Grade 1	Trace	Few discrete epithelial pearls
Grade 2	Mild	Multiple discrete epithelial pearls
Grade 3	Moderate	Multiple coalescent epithelial pearls
Grade 4	Severe	Thick sheet of epithelial pearls

Nd: YAG laser capsulotomy was done where required followed by recording of BCVA and IOP.

Results

The age of the children ranged from 2 to 12 years and that of the adults from 47 to 80 years. (Table 2)

Table 2: Age distribution of the two groups

Group	Age range
Children	2-12 years
Adults	47-80 years

Of the 24 children included in the study, 16 were male and 8 were female with the male to female ratio (M:F)2.0

Table 5: PCO and Nd:YAG laser capsulotomy rate in the group of children (total eyes =38)

Type of IOL	Acrylic (18 eyes)	PMMA (20 eyes)
PCO incidence 20 eyes (55.55%)	5 (27.78%)	15 (75%)
Grades of PCO	Grade I	3 (15%)
	Grade II	2 (10%)
	Grade III	1 (5%)
	Grade IV	9 (45%)
N:YAG cap rate 4 eyes (1.05%)	2 (11.11%)	2 (10%)

In our study, 9 eyes in the group of children were amblyopic and they needed to go for occlusion therapy following surgery. 5 children (8 eyes), who had developed clinically significant PCO, did not turn up for last follow up (6 months). One child in our study developed very thick PCO for which pars plana membranectomy was done.

In the group of adults, none of the patients developed posterior capsular opacification with either Acrylic or PMMA IOL. (Table 6)

Table 6: PCO and Nd:YAG rate in the group of adults (total eyes =53)

Type of IOL	Acrylic (34 eyes)	PMMA (19 eyes)
PCO incidence	Nil	Nil
Grades of PCO	Nil	Nil
N:YAG cap rate	Nil	Nil

and in the group of adults, 26 patients were male and 21 patients were female with the male to female ratio 1.23. (Table 3)

Group	Male	Female	M:F
Children	16	8	2.0
Adults	26	21	1.23

In the group of children 14 patients had bilateral cataract and 10 had unilateral cataract. In the adult group, 6 patients had bilateral cataract and rest had unilateral cataract. (Table 4)

Table 4: Laterality of cataract in both groups

Group	Bilateral	Unilateral	Total eyes
Children	14	10	38
Adults	6	41	53

In the group of children Acrylic IOL was implanted in 18 eyes and PMMA IOL in 20 eyes. PCO developed in 5 (27.28%) eyes with acrylic IOL and 15 eyes (75%) with PMMA IOL. In the eyes with acrylic IOL, 2 eyes (11.11%) had grade I PCO, 1 eye (5.55%) had grade III PCO and 2 eyes (11.11%) had grade IV PCO. In the eyes with PMMA IOL, 3 eyes (15%) had grade I PCO, 2 eyes (10%) had grade II PCO, 1 eye (5%) had grade III PCO and 9 eyes (45%) had grade IV PCO. Nd:YAG laser capsulotomy was done in only 4 eyes (1.05%). Eyes in which posterior capsulotomy was done, 2 eyes had acrylic IOL and 2 eyes had PMMA IOL. (Table 5)

Discussion

Phacoemulsification offers the advantage of rapid wound healing, minimal postoperative astigmatism and early visual rehabilitation.⁶⁻⁷

The incidence of PCO in children two years after surgery is almost 100%.⁸ Clinically significant PCO in children was 21.1% with acrylic IOL and 75% with PMMA IOL as reported by an Indian study. This is the reason why most of the paediatric population undergoes opaque visual axis postoperatively, which endangers their life towards amblyopia.⁹ Overall incidence of PCO in pediatric age group in our study was 55.55%. The rate of PCO was 28% with acrylic IOL and 78% with PMMA IOLs (Table 5). Our findings correlated well with the other studies conducted in the past.^{10,11}

The rate of Nd: YAG-capsulotomy following development of PCO seems to be very negligible (1.05%) in

our study, as we did not take into account the five dropped out/lost to follow up patients (8 eyes), who had clinically significant PCO. But if we logically assume that they would require Nd: YAG laser capsulotomy, then the Nd:YAG laser capsulotomy rate would have risen to much higher (31.57%). Likewise, though the capsulotomy rate in both acrylic and PMMA group was almost same (11.11% and 9.50% respectively) in our series, the capsulotomy rate would have risen in the PMMA group, if we had included the drop out cases.

In a prospective clinical study in Stockholm Sweden, Wejde G et al.¹² reported the PCO incidence (clinically significant) with Acrysof IOL in adults to be 3%. Vasavada et al. reported the incidence of PCO in adults with acrysof IOL to be 5-7%.¹³ In a comparative study conducted in Turkey in 2000, Oner FH et al.¹⁴ reported the incidence of PCO in adults to be 8.7% with acrysof IOL and 24.7% with PMMA IOL. Interestingly, in our study, we did not encounter PCO of any degree in adult eyes with both acrysof and PMMA IOLs (Table 6). This may signify importance of proper patient selection and better intraoperative technique along with careful preoperative, intraoperative and postoperative management in expert hands. More importantly, the type of IOL seems to be immaterial in view of occurrence of PCO at least in adults within six months of follow up postoperatively. Zemaitiene R et al.¹⁵ in a one year study and Hayashi K et al.¹⁶ in their two year follow up study, while comparing preventive effect of different IOLs, stated that, prevention of PCO in adults is mainly a result of IOL rectangular sharp edged optic design, although they did not ignore the significant difference of PCO rate between acrylic and PMMA IOLs.

In a tertiary care referral centre like ours, comparatively lower incidence of PCO and also lower Nd:YAG laser capsulotomy rate following clear corneal phacoemulsification seems to be very economical and also reduces post operative morbidity.

However there were certain limitations of our study. This study was purely retrospective one. Sample size was small and few patients were lost on follow up. Also there was no statistical correlation. A prospective randomized controlled trial would rather be a satisfactory one. Limited period of study and a larger sample size is warranted.

Conclusion

Proper screening and selection of the patient along with better operative technique and knowledge of good preoperative, operative and post-operative management is vital to prevent posterior capsular opacity in adults. PCO preventing effect of IOL materials seems to be immaterial at least in adults in the hands of a good phaco surgeon. Acrylic (Acrysof R) foldable intraocular lenses show better clarity of visual axis as compared to PMMA lenses in children after phaco surgery. Childhood PCO rate after implantation of varying types of intraocular lenses can be lessened easily by choosing appropriate IOL, that too without sacrifice of barrier integrity between anterior and posterior segment.

Conflict of Interest: None.

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