

Predicting Factors of Post Operative Visual Outcome of Pediatric Cataract

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Abstract: ***Purpose:** The aim of this study is to identify factors which predict post-operative visual outcome of paediatric cataract (birth to 18 years). **Method:** This prospective study was done on 44 eyes of 40 patients with congenital cataract. Lens aspiration with posterior capsulotomy with anterior vitrectomy was done depend on age of patient. Corneal diameter and thickness, intraocular pressure, interocular axial length difference, morphology of cataract, intraocular lens implantation were noted. **Results:** After 1 year of followup we found that patients who presented after 7 year of age having unilateral congenital cataract with thickened posterior capsule, increased IALD >0.5mm and poor vision were having poor postoperative visual outcome. Posterior capsulorrhexis with anterior vitrectomy in patient <5 year and surgical preference of aphakia with secondary IOL implantation in <2 year were having favourable visual outcome. **Conclusion:** Cataract surgery in early age significantly improves vision in pediatric patients.*

Keywords: Pediatric cataract, IALD interocular axial length difference, visual acuity

1. Introduction

Paediatric cataract is a treatable cause of childhood blindness. It is estimated that there are 1.5 million blind children in the world. In which 1 million children living in Asia¹. It can be congenital or acquired, unilateral or bilateral. Early diagnosis and treatment are essential to prevent the development of irreversible visual deprivation amblyopia.² Untreated cataracts in children lead to tremendous social, economical, and emotional burden to the child, family, and society.

The aim of cataract surgery in children is restoration of normal visual function. Cataract surgery by lens aspiration with or without IOL implantation is the surgical technique.

Aphakic correction can be achieved by spectacles, contact lens or intraocular lenses (IOLs). IOLs are being increasingly used to correct aphakia in children after cataract surgery. The use of IOLs to correct pediatric aphakia is now regarded as a well-accepted approach for children beyond infancy³. While Primary IOL implantation appears to be advantageous over a secondary implantation⁴.

Here we are going to study the visual outcomes in paediatric cataract taking into account all preoperative and postoperative variables like visual acuity, type of cataract, laterality of cataract, intraocular pressure, corneal diameter, axial length, and post-operative capsular opacity, post-operative glaucoma, posterior synechiae, inflammation and aphakia correction, which are responsible for postoperative visual outcome

2. Materials and Methods

All subjects (birth to 18 year) of age who underwent cataract surgery in department of ophthalmology at Regional Institute of Ophthalmology, MLN Medical College Prayagraj, in one year period were included in the study.

Study was conducted after approval from the Institutional review Board. All the procedures were carried out after obtaining written consent from the guardian. Traumatic

cataract, Ocular abnormalities, Retinal abnormalities, Mental retardation, Subluxated cataract, Uveitis, Glaucoma, Cerebral palsy child were excluded from the study. Detailed history, ophthalmological examination general physical examination was carried out. Preoperative and postoperative visual acuity was measured using snellen's distance visual acuity charts or Allen picture cards. In infant and preverbal children visual acuity was measured by fixation pattern, intraocular pressure (IOP) corneal thickness (CT) corneal diameter (CD) keratometry (K) axial length (AL) and IOL power calculation, IOL calculation in patients less than 3 years of age appears to be challenging, we calculated IOL power by axial length measurement in less than 2 year of age by doing B-scan and axial length calculated by the help of A-scan or B-scan biometry (SRK-II).

All surgery was done under GA/LA/sedation depend on age of patients. Mydriasis was achieved with use of tropicamide and phenylephrine drops instilled 3 times every 10 to 15 minutes before surgery. Povidine iodine (5%) was instilled in the conjunctival sac.

The conjunctiva is resected from 10 to 12 o'clock hours of the limbus, fine episcleral vessels were cauterised and sclerocorneal tunnel or clear corneal tunnel of about 2.5 to 3 mm is made and the anterior chamber was entered by a 2.2 keratome. A continuous curvilinear capsulorhexis was made by capsulotomy needle or utrata forceps, after injecting ocular viscoelastic devices and lens aspiration was done.

After that posterior capsulorrhexis of 3 to 4 mm performed was done with utrata forceps or capsulotomy needle and anterior vitrectomy was done and IOL implantation is done in the bag, above two year of age, while they left aphakic below two year of age. The IOL was centred by dialling and eye.

Postoperatively, all operated patient received eye drop tobramycin, prednisolone 1% 2 hourly for 2 days and tapered and discontinued after 6 week, and atropine eye drops and ointment. Aphakic glasses were prescribed for visual rehabilitation in all patients with aphakia based on retinoscopy findings. Patient with unilateral cataract occlusion therapy was given for amblyopia therapy

postoperatively. Visual outcome was evaluated at each follow up.

3. Results

A total 44 eyes of 40 children upto 18 years of age underwent cataract surgery. 28 children were below 7 years of age, 16 patient were more than 7 years of age. Male and female ratio was 1:1. 16 patient were of Unilateral cataract of and 28 Bilateral cataract. 20 congenital cataract 24 developmental cataract . Based on morphology 30 patient had zonular cataract , 8 Absorbed cataract, 6 had thickened posterior capsule or plaque .

4 patients having corneal diameter <9mm and 40 pt. have >9mm . 38 patients have IALD of <0.5 mm 6 have > 0.5mm . 22 patients underwent PCC with anterior vitrectomy 22 patients had intact posterior capsule. All 44 patients had IOP upto 14.93 mmHg. 38 patient had primary IOL implantation 6 were left aphakia. 16 patients who had VA > 6/36 and were able to fix and follow the light and object have postop visual acuity improved to 100%. 28 patients who had VA < 6/36 of which 18 (64.28%) showed VA > 6/36. So we find better preoperative visual acuity is associated with better postoperative visual outcome and poor preoperative visual acuity is associated with poor postoperative visual outcome.

Table 1: Preoperative and Postoperative Comparative Visual Acuity in Group 1 (n=28)

BCVA	Preoperative	%	Postoperative	%
<3/60	12	42.85	0	0
3/60-6/60	2	7.14	6	21.42
6/18-6/60	0	0	6	21.42
6/6-6/18 (fix and follow)	14	50.00	16	57.14

Chi-square with Yates correction is 3.8111, p=0.050914

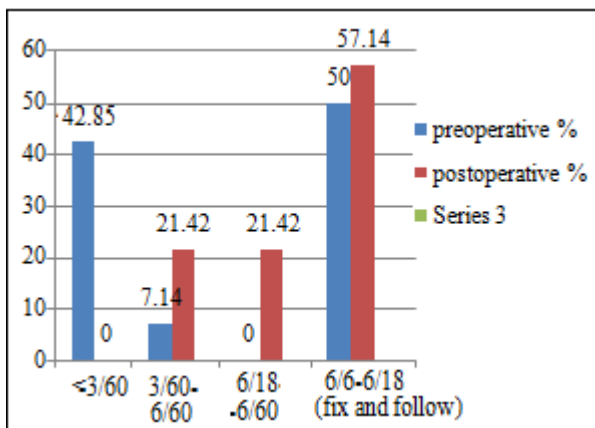
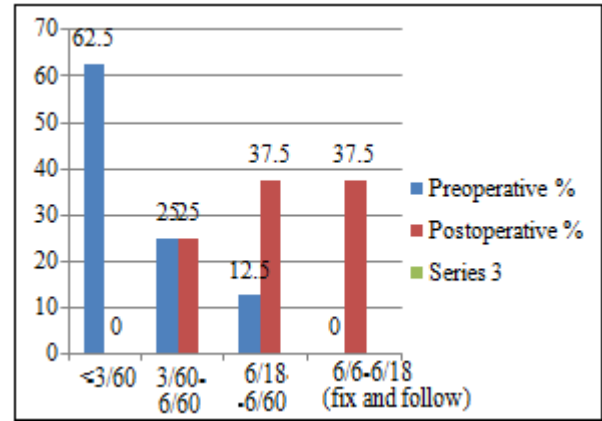


Table 2: Preoperative And Postoperative Comparative Visual Acuity In Group 2 (n=16)

BCVA	Preoperative	%	Postoperative	%
<3/60	10	62.50	0	0
3/60-6/60	4	25.00	4	25.00
6/18-6/60	02	12.50	6	37.50
6/6-6/18 (fix and follow)	0	0	6	37.50

Chi-square with Yates correction is 10.2857, p=.001341



Preoperative Factors Affecting Postoperative Visual Outcomes

Factors		Total No. of eyes	Postoperative visual acuity >6/36 and fix and follow (%)
Age	<7year	28	22 (78.57%)
	>7year	16	12 (75.00%)
Gender	male	22	18 (81.81%)
	female	22	16 (72.72%)
Laterality	U/L	16	10 (62.50%)
	B/L	28	24 (85.71%)
Etiology	congenital	20	14 (70%)
	developmental	24	20 (83.33%)
Morphology	zonular	30	30 (100%)
	absorbed	8	4 (50%)
	thickened posterior capsule/plaque	6	(0%)
Corneal Diameter (Horizontal)	<9.00mm	4	4 (100%)
	>9.00mm	40	30 (75%)
IALD	<0.5mm	38	34 (89.47%)
	>0.5mm	6	(0%)
Surgical Technique	PCC with anterior vitrectomy	22	18 (81.81%)
	Intact posterior capsule	22	16 (72.72%)
IOP	14.93mmHg to 17.17mmHg	44	34 (77.27%)
IOL	primary IOL implantation	38	28 (73.68%)
	aphakia	6	6 (100%)
VA	>6/36 and fix and follow	16	16 (100%)
	<6/36	28	18 (64.28%)

Unilateral (U/L), Bilateral (B/L), Interocular axial length difference (IALD), Intraocular pressure (IOP), Intraocular lens (IOL), Visual acuity (VA).

4. Discussion

Any opacification of the lens and its capsule in paediatric age is called paediatric cataract. In our study we included children upto 18 year of age. Visual prognosis of children with congenital cataracts has improved dramatically these days because of early detection, prompt treatment, amblyopia management, and advances in microsurgical techniques, instrumentation, and IOL developments.

Wright et al⁶ have shown that sensorial fusion exists in 60% of children with eye surgery 9 weeks after birth. Birch et al⁷ found that visual acuity reached 20/40 if surgery is undertaken before the age of 6 weeks. Laurence C Lesueuret

al³ says visual outcome of bilateral cataract was less satisfactory in children with abnormal foveolar function.

In our study higher number of patient were male (55%) between different categories male percentage were even higher in early presenting group below 7 year of age (61 %). While female preponderance was more (57 %) after 7 yrs of age. The study by Katibeh M et al⁹ showed that rate of cataract surgery in males was 10% higher than females. Which is supported by study of Rajiv khandekar et al¹⁰ the proportion of cataract is higher in males than in females.

Over all in our study postoperative visual outcome in male gender 81.81% eyes have >6/36 while in female gender 72% have >6/36, so in our study male gender having better postoperative visual outcome as compared to female gender. This may be due to parents concern more for their male child, who presented early for treatment which is common in many parts of developing world.

In our study we found that percentage of bilateral cataract was higher (71%) in children were presenting early, while the children were presented late, incidence of unilateral and bilateral cataract is almost same. According to Afia Matloob Rana et al¹¹. Unilateral cataracts have poor prognosis because of the chances of amblyopia as compare to bilateral cataract. In our study according to the etiology percentage of congenital cataract was higher (57.14 %) in children were presenting early, while the incidence of development cataract is higher (75%), with no significant etiological difference ($p = 0.3118$). By Elizabeth Joseph¹² in developing countries, the prevalence of blindness from congenital cataract is higher, about 1–4/10,000 births. It accounts for 7.4%–15% of paediatric blindness.

In our study as per morphology, percentage of zonular cataract were found to be higher 18 eyes (64 %) in group 1 followed by absorbed 6 (21 %) and thickened posterior capsule 4 eyes (14.2 %) while children who presented late (>7 year) incidence of zonular cataract was even higher (75 %) while incidence of absorbed and thickened posterior capsule almost same. In patient having zonular cataract postoperative visual acuity (100% eye) was >6/36 and in absorbed cataract 6/36- 6/60 and in thickened posterior capsule it was <6/60. So we found that thickened posterior capsule and absorbed cataract was associated with poor visual prognosis as compared to zonular cataract. By Lim Z et al¹³ posterior subcapsular cataract is more common than total cataract, nuclear cataract, anterior polar cataract, lamellar and cortical cataract and this study contradicts with my study. Microcornea is associated with frequent complication such as corneal edema, posterior capsular rent, and risk of unplanned aphakia. In my study in group I (28) two patient (7.14%) have horizontal corneal diameter less than 9mm these patients are left aphakic. Mean horizontal corneal diameter in group 1 patients is 10.6+ 0.886mm and 11.56+ 0.310mm in group II (16) patients (p value 0.0002).

In group 1 interocular axial length difference (IALD) >0.5mm was found in 4 (14.28%) patients while in group 2 IALD >0.5mm is found in 2 (12.50 %) patients. postoperative visual acuity of 4 patients in group 1 was <3/60 and of 2 patients in group 2 was <6/60. Overall in our study

6 eyes (13.63%) have IALD >0.5mm and postoperative visual outcome in these eyes is <6/36. While in 38 eyes (86.36 %) have IALD is <0.5mm, in which 34 eyes (89.5%) have postoperative visual outcome is better than 3/36. So we found in patients who have IALD >0.5mm have presented with poor postoperative visual acuity.

Ashley C. Gochnauer et al¹⁴ says interocular axial length difference of greater than 0.5mm is rare in the general population, Eyes with unilateral cataract more often are associated with greater IALD because of both aforementioned factors. They found poor postoperative visual outcome in these patients.

We performed CCC, posterior capsulorrhexis with anterior vitrectomy in 22 eyes (50 %) in less than 5 year of age where in more than 5 year of age 22 eyes (50%) we had done CCC with phacoaspiration. In previous literature incidence of PCO formation is 39 % to 100 % if posterior capsule is left intact and less than 33% if primary posterior capsulotomy with anterior vitrectomy is performed. The peak incidence of PCO was 18 month after surgery.

O'Keefe et al¹⁵ reported PCO 33% of cases following primary posterior capsulotomy when anterior vitrectomy was not performed and PCO formation is less than 33 % if primary posterior capsulotomy with anterior vitrectomy was performed. The (CCC) technique provides additional safety and facilitates in-the-bag fixation. Patient who had performed PCC with anterior vitrectomy, out of 22 eyes 18 eyes (81.81%) have postoperative visual outcome was better than 6/36.

The expectation of IOL implantation in comparison with contact lens correction is continuous and more manageable full-time optical correction and amblyopia prevention. IOL implantation 06 (21.42%) patients who were less than 2 year of age are left aphakic with contact lens correction, in all other patients primary IOL implantation was done. secondary IOL implantation in aphakic patients has been planned after children records 2 year of age. All aphakic patients were of <2 year of age and visual acuity assessment is challenging in these patients so we did not comment on visual acuity of these children but we hypothesize if cataract is operated before stimulus deprivation develop, good visual prognosis is achieved and this is assessed by fixation pattern of these patients.

Implantation of posterior chamber IOL at the time of surgery in children has become common, but the incidence of posterior capsular opacification, lens dislocation and reoperation rate is higher in these patients. This was responsible for poor postoperative visual outcome.

Posterior chamber IOL implantation after unilateral and bilateral congenital cataract removal has been shown to provide good visual outcomes and reduced postoperative complications.

5. Conclusion

Cataract surgery significantly improves vision in paediatric patients. Poor preoperative visual acuity was the strongest

predictor of poor postoperative visual outcome. Early removal of unilateral/ bilateral cataracts with posterior capsulotomy and anterior vitrectomy with or without primary IOL implantation depends on age of patient may provide good postoperative visual outcome and less complication.

6. Lacuna of our Study

Visual acuity evaluation in preverbal children was done by fixation pattern, finger counting, or by Snellens picture chart, C chart or E chart which was not very reliable, Small sample size and only a year follow up period. So further studies with bigger sample size and long follow are needed.

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