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ANALYSIS OF POSTOPERATIVE OUTCOME IN PAEDIATRIC CATARACT SURGERY IN A TERTIARY CARE HOSPITAL

Ophthalmology

Dr Nayana A. Potdar — Professor (Additional), Department of Ophthalmology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai, Maharashtra, India

***Dr SimranjeetAulakh** — Specialty Medical Officer,Department of Ophthalmology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai, Maharashtra, India *Corresponding Author

Dr Swaranjali Gore — Resident, Department of Ophthalmology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai, Maharashtra, India

Dr Swapnil Ware — Resident, Department of Ophthalmology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai, Maharashtra, India

Dr.AmolGanvir — Resident, Department of Ophthalmology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai, Maharashtra, India

Dr ChhayaShinde — Professor and Head , Department of Ophthalmology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai, Maharashtra, India

ABSTRACT

The prevalence of childhood blindness in developing countries is 10 times higher (1.5/1000) than that in the developed countries. Around 2,00,000 children are globally blind due to bilateral cataracts. Paediatric cataract poses as the most common cause of preventable blindness in the developing countries.This is prospective interventional non-comparative study doneon 50 eyes having congenital or developmental cataract, to provide a review of visual outcome and complications faced during Pediatric cataract surgery at a tertiary care hospital in Mumbai. Eight eyes were kept aphakic, the remaining (42) had Intra-ocular lens implantation done. The results were encouraging with 40% of children having visual acuity 6/18 or better, 14% had vision between 6/60-6/24, 38% had vision less than 6/60,and 8% had visual acuity of fixing and following light. Early complications observed were few, namely corneal edema (14%),and commonest late complication was PCO (4%) and IOL in vitreous (4%).

KEYWORDS

INTRODUCTION

Worldwide, 1.4 million children are estimated to be blind.(1) Out of these, one third live in Asia and Africa. The prevalence of childhood blindness in developing countries is 1.5 in 1000 cases, 10 times higher than that in the developed countries(2). The burden of disability is huge for a blind child surviving into adulthood, a concept termed as years of blindness. As reported by Foster and Gilbert, 0.5million children become blind annually, and they are expected to remain in the population for the next 50 years(3). Around 2,00,000 children are globally blind due to bilateral cataracts. Paediatric cataract poses as the most common cause of preventable blindness in the developing countries.

The goal of Vision 2020 'The Right to Sight' is to reduce worldwide childhood blindness from current level of 0.75/1000 to 0.4/1000(4). Being a reversible cause, surgery for cataract in Paediatric patients is essential to reduce the socioeconomic burden of a blind person. It requires interdisciplinary interventions to lead to the end result of providing sight to the patients. The diagnosis must be reached at the correct time, so as to ensure timely intervention. The surgical technique, along with utilizing latest technologies, is a hard task to master by the surgeon. Once the surgery is done, the job does not end there. Paediatric patients, post cataract surgery, may develop several complications, which may still lead to low vision or blindness. Thus, ensuring strict follow up is very essential to address the overall burden of childhood preventable blindness.

Several studies have been done worldwide and in India, analyzing surgical outcome in Pediatric cataracts (4)(5)(6)(7)(8)(9) (10)(11) (12)(13)(14). Several reports on the outcome of Pediatric cataract are available from South Asia, but had a one week to six weekly follow up. This prospective study aims to provide a review of visual outcome and complications faced during Pediatric cataract surgery at a tertiary care hospital in Mumbai.

AIMS AND OBJECTIVES

1. To study the visual outcome in patients operated for Pediatric cataract surgery at our institute
2. To study and manage postoperative complications in these patients.

MATERIALS AND METHODS

A prospective study over a period from 23 months from January 2015 to November 2016 was carried out at a tertiary care hospital in Mumbai. Clearance was obtained from the Institutional Ethics Committee. All children aged 0-12 years with congenital or developmental cataract were included in the study. Congenital cataract was defined as that which developed within the first year or life, and developmental cataract was defined as that which developed after the first year of life.

A detailed history was obtained by the parents regarding chief complaints along with birth history and any significant systemic associations were ruled out. Visual assessment was done for all patients. For children aged 0-2 years, fixation patterns were observed for visual assessment, in the form of central, steady or unsteady, maintained or unmaintained fixation, or no fixation at all. Tumbling E chart, LEA symbols were used for visual acuity in pre-school children aged 2-5 years. Snellen's chart was used to determine visual acuity in verbal children aged 5-12 years.

A thorough Ophthalmic evaluation was done for each patient, with uncooperative or young patients being evaluated under anaesthesia. Intra-ocular pressure was recorded using Perkin's Tonometer or Applanation Tonometer. Lacrimal sac patency was confirmed on ROPLAS. An undliated and dialted slit lamp examination was also done where possible. For neonates and younger children distant direct ophthalmoscopy was done. Posterior segment evaluation was done with indirect ophthalmoscopy. Where the details were not visualized, a

B-scan ultra-sound was obtained.

(Image 1: Bilateral Total Cataract in a 6 month old)

(Image 2: Bilateral Total cataract in a 4 year old)

Intra-ocular lens power calculation was done using SRK-II formula. The keratometry values were obtained from auto-refractrometer in co-operative children. Age wise average keratometry values were used for younger and un-cooperative patients(15). Axial length was obtained by A-scan, or B-scan. The required correction for appropriate IOL power was done following the recommendations put forth by Dahan et al(16).

All patients were evaluated by a Paediatricitan. Systemic associations were ruled out with appropriate investigations, for example, routine investigations, TORCH titers, urine reducing substances, serum calcium, etc. Anaesthesia evaluation was done and fitness was obtained for all the patients to be operated under general anaesthesia.

The surgery was performed by Faculty of our Institute. Procedure was selected as per age of patient. For patients up to 1 years of age, lens aspiration along with primary posterior capsulorrhexis and anterior vitrectomy was done and left aphakic. For elder children, lens aspiration with primary posterior capsulorrhexis with anterior vitrectomy was done with intra-ocular lens implantation. All wounds were sutured using 10-0 nylon/10-0 vicryl suture material as per availability. The eye was padded till next day, and patient was started on topical drops of Moxifloxacin (0.5%) 6 times a day, Prednisolone acetate (1%) 6 times a day and Atropine 1% eye ointment or Homide 2% eye drops 2 times a day. Systemic prednisolone with short taper was also given to alleviate immediate post-operative inflammation in cases with prolonged surgical time.

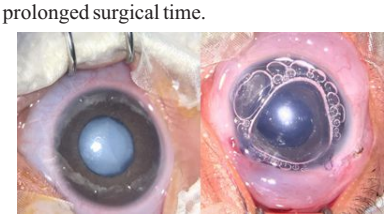


Image 3: Pre- O **Image 4: Immediate Post-Operative**

Patients were observed post-operatively for 3 days, and then discharged and followed-up at 3 weeks, 6 weeks, and 6 months. Each time visual acuity, intra ocular pressure, anterior segment evaluation, refraction and indirect ophthalmoscopy was done either in out-patient basis, or under anesthesia. At 3 week post operative follow up, refractive correction was given to, where deemed necessary. At 6 weeks, all wound suture removal was done and refraction with near correction was prescribed to the patient. Where necessary, occlusion therapy along with emphasis of near vision activities was explained to the parents to tackle amblyopia. Repeat refraction was done at next follow up.

Data was collected and tabulated. Correlation analysis was done by employing Chi-sqaure test and Wilcoxin Signed Rank test using the SPSS software.

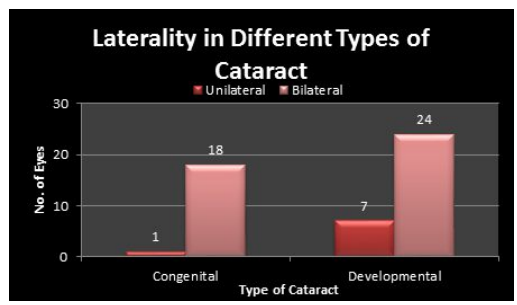
OBSERVATION AND RESULTS

All the data collected in this study were compiled in completed data forms. A total of 50 eyes of 29 children were included in the study. The youngest patient was 3 months old, and the eldest 11 and a half years, with the average age being 4.71 +/- 3.62 years (mean +/- SD). There were 20 males (35 eyes) and 9 females (15 eyes).

Table 1: Age wise distribution of laterality of cataract

Age	Laterality		Total
	Unilateral	**Bilateral (patients)**	
0-2	2	14 (7)	16
0-5	3	14 (7)	17
5-12	3	14 (7)	17
Total	8	42 (21)	50 (29)

Eight patients had unilateral cataract and 21 had bilateral cataract (Table 1). In eyes aged 0-2 years, 2 were unilateral, and 14 were bilateral. In age group 2-5 years, 3 eyes were unilateral and 14 were bilateral, and in age group 5-12 years, 3 were unilateral and 14 were bilateral.



Amongst those patients with congenital cataract, 9 patients (18 eyes) were bilateral and only 1 unilateral, while amongst the 19 patients with developmental cataract, 12 patients (24 eyes) were bilateral and 7 unilateral (Graph).

Table 2: Morphological Types of Cataract

Morphologic Type	No. of eyes
Nuclear	2
Lamellar	17
Cortical	3
PSC	2
Total/Diffuse	16
Lamellar + Cortical	3
ASC + Lamellar + Cortical	2
Coralliform + Coronary	2
Blue Dot + Coronary	2
ASC + Nuclear + PSC	1
TOTAL	50

PSC: Posterior Subcapsular Cataract; ASC: Anterior Subcapsular Cataract

As seen in table 2, the most prevalent morphological type of cataract in our study was Lamellar (34%), followed by Diffuse Cataract (32%). Lamellar with cortical cataract was seen in 3 eyes. Coronary with Coralliform Cataract, and Coronary with Blue Dot Cataract was present in 2 eyes each. Anterior Subcapsular Cataract and Posterior Subcapsular Cataract was present in 3 eyes respectively.

All the patients were investigated and evaluated systemically for etiopathogenesis for causal factor. Of the 29 patients, 3 were found to be Rubella positive. A 2 year old male patient had Leber's Congenital Amaurosis, which was confirmed with an extinguished ERG. There

was an 11 year old male child with Down's syndrome, having bilateral developmental cataract, and no other systemic association.

Table 3: Incidence of early complications	
Complications	No. of eyes
Corneal edema	7
Fibrin reaction/Uveitis	1
Shallow anterior chamber	1
Peaked pupil	2
De-centered IOL	1
IOL capture	1

IOL: Intra-ocular Lens

Immediate post operative complications, shown in Table 3, included corneal edema, peaked pupil shallow anterior chamber and anterior chamber reaction. On post operative day 1, 7 (14%) of the eyes had corneal edema, 1 (2%) eye developed fibrin reaction. All responded to the instillation of steroids within one week. One eye had peaked pupil, which required no active intervention. One eye was found to have shallow AC on day 1, which responded to homide patching. On post operative day 2, one eye of a 2 year old male patient was found to have peaked pupil, and the next day, also a de-centered IOL. Vitreous was seen pushing the IOL, for which anterior vitrectomy with IOL repositioning was performed after 3 weeks.

Table 4: Complications at 3 week follow up				
Complications				**Age(yrs)**Total
	0-2	2-5	5-12	
Peaked Pupil	1	0	0	1
De-centered IOL	1	0	0	1
IOL in vitreous	0	0	1	1
PCO	0	0	1	1
IOL Capture	1	0	0	1
Peaked pupil with de-centered IOL	1	0	0	1
Raised IOP	0	0	0	0
Total	4	0	2	6

IOL: Intra-ocular Lens; Posterior Capsule Opacitfication; IOP: Intra-ocular Pressure From table 4, it can be observed that a total of 6 (12%) eyes developed complications of cataract surgery at 3 weeks post operative, the majority of which (8%) were within the 0-2 age group. The complications were peaked pupil (2%), de-centered IOL (2%), IOL in vitreous (2%), PCO (2%), optic capture (2%) and a peaked pupil with de-centered IOL (2%).

Table5: Complications at 6 week follow up				
Complication	**Age (yrs)**			**Total**
	0-2	**2-5**	**5-12**	
Peaked pupil	1	0	0	1
De-centered IOL with PCO	0	0	1	1
IOL in vitreous	1	0	1	2
IOL capture	1	0	0	1
Raised IOP	0	0	0	0
Total	3	0	2	5

IOL: Intra-ocular Lens; Posterior Capsule Opacitfication; IOP: Intra-ocular Pressure

At week 6 follow up, the one eye with PCO at week 3 came with a de-centered IOL. Patient was treated with membranectomy under general anesthesia. Intra-ocular lens had dislocated into anterior vitreous in a 6 month old child with unilateral congenital cataract. Patient was posted for 3 Ports pars planavitrectomy. (Table 5)

Table 6: Complications at month 6 follow up				
Complication	**Age (yrs)**			**Total**
	0-2	**2-5**	**5-12**	
Peaked Pupil	1	0	0	1
IOL in vitreous	0	0	1	1
PCO	0	0	1	1
IOL Capture	1	0	0	1
Raised IOP	0	0	0	0
Total	2	0	2	4

IOL: Intra-ocular Lens; Posterior Capsule Opacitfication

At 6 month follow up, 10% eyes had complications (table 6). Another eye of age 10 years developed PCO, which was treated with laser Nd:YAGcapsulotomy. Patient with peaked pupil was left without any intervention. As the 11 year old high myopic patient with dislocated IOL in vitreous had no signs of inflammation at follow up, no surgery was planned, and spectacle correction was given.

At the end of 6 months, out of 50 eyes, 23 eyes had vision less than 6/60, of which 4 (8%) were not fixing and following light. Four eyes (8%) attained visual acuity 6/60, 2 (4%) 6/36, 1 (2%) of 6/24. Total number of eyes with vision 6/18 or better, were 20 (40%).

Table 7: VA outcome based on type of Cataract				
Type of Cataract	VA Outcome	Total	P value	
	Improved	Not improved		
Congenital	10	9	19	0.02075
Developmental	27	4	31	
Total	37	13	50	

Table 7 shows, from the total 19 congenital cataracts, 10 (53%) showed improved vision at 6 months. From the 31 developmental cataracts, 27 (87%) showed improved vision at 6 months. This observation is statistically significant ($p<0.05$), and better visual outcome was seen in developmental cataracts than in congenital cataracts.

Table 8: Age-wise VA Outcome at 6 month Post Surgery (compared to Pre-operative vision)				
Age (yrs)	**VA Outcome**		Total	P value
	Improved	**Not improved**		
0-2	6	10	16	0.000
2-5	17	0	17	
5-12	14	3	17	
Total	37	13	50	

The overall visual acuity (VA) outcome observed at 6 month follow up post operatively showed 10 of the 16 eyes less than 2 years had no change in VA, whilst 6 had improved vision post surgery. All of the eyes within age 2-5 years had improved VA. Amongst eyes above 5 years of age, only one eye had decreased vision, 2 retained their pre-operative VA, and 14 had improved VA. Chi-square analysis was done to assess correlation between age and visual acuity outcome. The result was statistically significant (<0.05) with better visual acuity outcome amongst 2-5 years age group (Table 8).

Table 9: Age-wise type of Surgery Performed				
Age (yrs)	**Type of Surgery**			Total
	LA + PPC + AV	**LA + PPC + AV + PCIOL**	**LA + PCIOL**	
0-2	8	8	0	16
2-5	0	17	0	17
5-12	0	3	14	17
Total	8	28	14	50

LA: Lens Aspiration, PPC: Primary Posterior Capsulorrhexis, AV: Anterior Vitrectomy, PCIOL: Posterior Chamber Intra-Ocular Lens

Three types of surgery were performed according to age. Lens aspiration with primary posterior capsulorrhexis and anterior vitrectomy (LA + PPC + AV) was performed in 8 (16%) of the 9 eyes aged 0-1 years. One eye aged 6 months, having unilateral dense cataract, underwent lens aspiration with primary posterior capsulorrhexis with posterior chamber intra-ocular lens implantation (LA + PPC + AV + PCIOL). All 7 eyes aged 1-2 years and all 17 eyes aged 2-5 years also underwent same procedure. Primary posterior capsulorrhexis and anterior vitrectomy was not done for 14 eyes aged 7 years or older (LA + PCIOL). (Table 9)

Table 10: VA Outcome at 6 months post surgery as per type of surgery performed				
Type of Surgery	**VA Outcome**		Total	P value
	Improved	**No Improvement**		
LA+PPC+AV	2	6	8	0.001

LA+PPC+AV+PCIOL	23	5	28	
LA+PCIOL	12	2	14	
Total	37	13	50	

LA: Lens Aspiration, PPC: Primary Posterior Capsulorrhexis, AV: Anterior Vitrectomy, PCIOL: Posterior Chamber Intra-Ocular Lens

Data analysis showed that eyes that underwent LA + PPC + AV + PCIOL had better visual acuity outcome with p value 0.001 (<0.05). Thus the type of surgery can be considered to be a factor determining visual acuity outcome. (Table 10)

Table 11: Treatment at 6 month follow up

Treatment	Age (yrs)			Total
	0-2	2-5	5-12	
No treatment	1	1	2	4
Aphakic glasses	9	0	0	9
Spectacles for residual refraction	4	9	4	18
Spectacles for residual refraction s with amblyopia treatment	2	4	4	10
Spectacles with amblyopia treatment with squint surgery	0	3	5	8
Spectacles with Nd:YAGPCOtomy	0	0	1	1
Total	16	17	17	50

At final follow up, from 50 eyes, 46 (92%) required refractive correction. At the last follow up, amongst those 0-2 years, a total of 8 eyes required aphakic glasses and 1 eye required contact lens in view of unilateral aphakia. Only spectacles were prescribed to 18 eyes. Eighteen eyes (36%) required amblyopia therapy along with spectacles, among which 8 also needed to undergo strabismus surgery (Table 11).

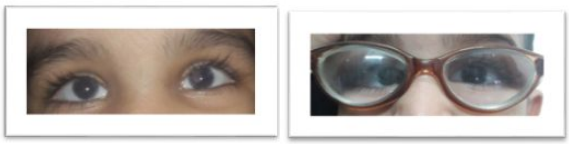


Image5: Both eyes Aphakia**Image 6:** AphakicGlasssesin 1 yr old

Major cause of non-improvement of vision, was found to be Amblyopia. Hence, aggressive amblyopia therapy was simultaneously initiated.

Discussion

Twenty-nine patients were included in our study of pediatric cataract surgery outcome. They presented to us with parents complaining of diminution of vision in the form of either inability to fix objects or faces in infants and toddler, or scholastic backwardness, frequent falls etc in elder children. In a few cases, only whitish reflex was complained by some parents. Associated symptoms of deviation or abnormal movement of eyes was also reported by the parents of a few patients.

Eight (28%) cases were unilateral, and the remaining 21 (72%) cases had bilateral cataracts. Of the 50 cataracts, 19 (38%) were congenital and 31 (62%) were developmental. The data of visual outcome based on several factors, was analyzed using chi-square test and Wilcoxin signed rank test.

Based on the morphology, 34% were Lamellar cataract, 32% were Total Cataract, 6% were Cortical , 4% were Nuclear, 4% were Posterior Subcapsular and the remaining 20% were of mixed type. Several other authors have reported the commonest morphological type to be lamellar, followed by total cataract. (17)(18)

In this cohort of 50 eyes, not many complications were observed. Commonest early post operative complication was corneal edema (14%), and commonest late complication was PCO (4%) and IOL in vitreous (4%). Several authors have reported variable incidences of these complications. Posterior Capsule Opacification has a reported incidence from 27.4% to a very high 98.6% (6)(19)(20)(21). In this study, from 50 eyes, only 2 (4%) developed PCO during the 6 month follow up. This could be attributed to the type of surgery performed. Fourteen (28%) eyes aged above 7 years underwent lens aspiration with PCIOL without posterior capsulotomy, from which 2 (14.3%) developed PCO. Thereby, the small sample falling in this category might have resulted in us having a lesser incidence of PCO formation. PCO was managed by membranectomy in one patient with Down's Syndrome, and the other patient was treated with Nd: YA Gcapsulotomy. Intraocular lens dislocation into vitreous was seen in 4% eyes. One case of IOL in vitreous was in a patient operated by lens aspiration with primary posterior capsulorhhexis with anterior vitrectomy, and the 2nd patient had an inadvertent posterior capsule rent during surgery, following which IOL dislocated into vitreous cavity at 3 week follow up. Dislocation of lens in vitreous is being reported more and more as the use of phacoemulsification for Pediatric cataract is increasing. (22) However, literature reports no such complications occurring in pediatric cataract operated cases. (6)(19)(20)(21)(23). A study by Yorston in Eastern Africa(17), showed de-centered of IOL as a complication of cataract surgery with intraocular lens implantation, but no cases with dislocation of IOL in vitreous.

In this study 37 (74%) of the eyes had improved visual acuity after 6 months of follow up. A total of 20 (40%) eyes had visual acuity of 6/18 or better. This outcome is comparable to outcomes reported in other studies conducted in India. Khandekar et al (24) reported only 16.4% of their cases having visual acuity better than 6/18. Two studies by Gogate et al, one in 2009 with 6 week follow up, and the other in 2014 with a 3-8 year follow up, observed similar outcome in 35.8% and 42.2% respectively(25)(20). The best outcome seen in India was observed by Rohit et al, with 85% of their cases had visual acuity 6/18 or better.

Results of this study are also comparable to results from other developing nations. Study conducted by Congdon et al in Mexico (26) reports 40% cases improved to 6/18 or better, and study by You C (27) in China observed 30.4% fairing with similar outcome, while Yorston (4) in Kenya reported 44% with visual acuity 6/18. Outcomes of Pediatric Cataract surgery in developed nations ranged from 46.6 in USA, to 87.5% in Ireland (28)(6)(11).

Gogate et al (17) reported age, type of cataract, type of surgery, type of intra-ocular lens, pre-operative vision, and development of post-operative complications as significant factors determining visual acuity outcome. In the present study, significant factors determining visual acuity outcome were age of child, onset of cataract, and type of surgery performed. Later the onset of cataract better was the visual outcome, as at presentation, the visual maturation was superior to their younger counterparts. As a result, older children had better visual outcome.

CONCLUSION

Childhood blindness due to cataract is preventable, and thus ensuring proper management will aid in improving the development of children, and reduce the burden of disability. We conducted this study, in order to observe and analyze the visual outcome and rate of complications of pediatric cataract operated at a tertiary care center in Mumbai.

Four patients (8%) had visual acuity of fixing and following light, 38% had vision less than 6/60, 14% had vision between 6/60-6/24, and 40% had visual acuity 6/18 or better.

Our results signify that if Pediatric Cataract patients are well managed with timely intervention and good follow up, we can have excellent visual outcomes with minimal complications at a tertiary care center (Mumbai), which are comparable to similar Indian studies, thus helping in reducing burden of worldwide childhood blindness, and achieving goal of Vision 2020, the Right to Sight. Aggressive and timely initiation of visual rehabilitation by the treating surgeon and with the help of parents and care givers of the patients, better visual functionality in this population is thus established. Newer surgical techniques, and improved IOL designs have improved visual outcome in pediatric cataract. The need for early diagnosis and surgery, followed by aggressive amblyopia therapy whenever required, needs to be stressed upon, as factors determining visual outcome.

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