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Cataract How Important Is Age of Intervention?

Research Article

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Abstract

Purpose: To study effect of age of intervention on visual outcome following treatment of pediatric patients with cataract.

Setting: Tertiary eye care centre in Dahod at the trijunction of Gujarat, Madhya Pradesh, and Rajasthan states in central western India.

Participants: 705 eyes of 1047 patients

Methods: This is a prospective cohort study. We studied a consecutive series of pediatric patients with congenital, developing, or COMPLICATED cataracts who underwent surgery between January, 1999 and April, 2012 at our center. Patient demographics, cataract type, presenting symptoms, surgical intervention, postoperative visual acuity, and follow-up refractive changes were recorded.

Primary Outcome measures: vision.

Results: In total, 1305 eyes of 1047 children were included: unilateral cataracts were present in 786 (60.2%) eyes. There were 600 (46.7%) traumatic and 705 (53.3%) non-traumatic cases. Ages at surgery ranged from 1 to 215 months. Eyes were grouped by the age of surgical intervention performed: Group 1,</= 5 years including 177 (25.1%) eyes, and Group 2, >5 years, including 528 (74.9%) eyes either by anterior or pars plana route ± IOL placement. The mean follow-up time was 117 days. Ultimately, 128 (18.2%) Group 1 and 213 (30.2%) Group 2 patients achieved a visual acuity better than 20/80 ($P < 0.001$). Age at intervention was significantly related (all $P < 0.001$) to visual outcome.

Conclusions: Age of intervention affects visual outcome significantly ($p<0.001$).

Keywords: Pediatric Cataract; Visual Outcome; Age of Intervention

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Introduction

Childhood cataracts are responsible for 5–20% of blindness in children worldwide and for an even higher percentage of childhood visual impairment in developing countries. [1,2,3,4,5]. The overall incidence of clinically significant cataracts (unilateral or bilateral) in childhood is unknown, but has been estimated to be as high as 0.4%. [6,7] The prevalence of childhood cataract varies from 1.2 to 6.0 cases per 10,000 infants. Pediatric cataracts are responsible for more than one million cases of childhood blindness in Asia. In developing countries, such as India, 7.4–15.3% of childhood blindness is due to cataracts [8,9]. Internationally, the incidence is unknown. Although the World Health Organization and other health organizations have made outstanding progress in vaccination and disease prevention, the rate of congenital cataracts remains much higher in underdeveloped countries.

The visual results of cataract surgery in children have generally. [10,13] been poorer than in adults. [1-3],[6,12,13] This difference is due, in part, to the various types of amblyopia that develop in children with cataracts, the association of nystagmus with early onset cataracts, and the presence of other ocular abnormalities that adversely affect vision in eyes with developmental lens opacities. Since the introduction of the aspiration technique for cataract removal by Scheie in 1960 , surgical procedures for the removal of the lens in childhood have improved [14,15,16] and earlier surgery for congenital cataracts has been encouraged [17-19].

Any opacification of the lens and its capsule in children is defined as a pediatric cataract. Pediatric cataracts can be unilateral or bilateral. They can be subdivided based on morphology, as well as a aetiology. Morphologically, the most common type of pediatric cataract is the zonular cataract, characterized by opacification of a discrete region of the lens. This type includes nuclear, lamellar, sutural, and capsular cataracts [6,10].

Polar cataracts are opacities of the subcapsular cortex in the polar

regions of the lens. Almost all (90%) anterior polar cataracts are unilateral; bilateral anterior polar cataracts are commonly asymmetric and typically do not progress over time. Posterior polar cataracts are often small, but even a small posterior polar cataract can impair vision. A distinctive type of posterior polar cataract is the posterior lentiglobus or lenticonus, in which a protrusion of the posterior capsule is present. Membranous cataracts form when the lens, cortex, and nucleus are partially or completely reabsorbed, leaving a small amount of opacified lens material between the anterior and the posterior lens capsules .

Persistent hyperplastic primary vitreous (PHPV) is usually a unilateral ocular condition associated with a retro lenticular fibrovascular membrane. Although the lenses in most eyes with PHPV are initially clear, they often become opacified over time. Even when the lens remains clear, the retro lenticular membrane is usually sufficiently opaque to affect vision.

In terms of aetiology, pediatric cataracts occur due to genetic diseases, metabolic diseases, maternal infections, and trauma, and can also be idiopathic. The aetiology of cataracts can be established in up to half of the children with bilateral cataracts, but in only a small proportion of children with unilateral cataracts.

Congenital cataracts are one of the most common causes of treatable blindness in children, particularly in developing countries. [1] A recent report indicated that infants with bilateral congenital cataract who underwent early surgery (within 1 month of birth) and received appropriate optical rehabilitation could obtain visual acuity of better than 0.4 and could even achieve stereopsis. [2] However, because of typically relatively late detection and diagnosis, the nonavailability of facilities for infant anaesthesia, and poor compliance with long-term follow-up, the visual prognosis for infants with congenital cataract in developing countries differs markedly from that in industrialized countries. Visual loss is primarily attributable to amblyopia, most importantly, to "stimulus-form deprivation amblyopia," with the additional factor of ocular rivalry in unilateral disease. Thus, improved understanding of the critical periods of visual development has resulted in to surgical intervention for dense cataracts being deemed necessary within the first 3 months of life, possibly as early as the first 6 weeks in unilateral disease. Clinical factors believed to be important to visual outcome in children include age at diagnosis and surgery, type of refractive correction, type of cataract surgery, compliance with occlusion regimen, aetiology of the cataract, presence of non-ophthalmic disorders, development of capsular opacity or secondary membrane, and serious ocular postoperative complications.

Primary posterior capsulotomy and anterior vitrectomy are considered "routine surgical steps," especially in younger children. Previously, preparation for secondary intraocular lens (IOL) implantation at a later date was not considered. However, widespread acceptance of IOL implantation in children has caused this to be revised. Thus, management of the posterior capsule should eliminate or delay the formation of visual axis opacity and yet leave sufficient capsular support to achieve the desired "in-the-bag" (or ciliary sulcus) fixation of an IOL. Even when IOL implantation is not performed with the primary procedure, it is important to treat and prepare the eye in such a way that secondary implantation can be achieved subsequently.

Materials and Methods

The study was approved by the hospital ethics committee. This was a prospective hospital-based study at a tertiary care eye hospital in western India over 20 years, from January, 1992 to April, 2012. All pediatric patients (0 to 18) with cataracts presenting to our department during this period were enrolled in the study.

Patient primary details and history were documented using a pretested online format. Vision was checked according to the American Academy of Paediatrics vision check protocol. Both eyes were assessed. Anterior segment examinations were conducted using a slit lamp bio-microscope. The pupils were dilated.

Ocular pressure was measured using a Perkin's hand-held tonometer. If this was not possible, the pressure was measured under general anaesthesia. This procedure was omitted for eyes with open globe injuries. The posterior segment of the eye was evaluated with the help of an indirect ophthalmoscope and a +20 D lens and an ultrasound 'B' scan if the media was not clear.

The surgical technique was decided based on aetiology, cataract morphology, and the position of the lens. Surgery was done by the anterior or pars plana route. Anterior route surgeries were performed using a phacoemulcifier or manual suction. Membranectomies and lensectomies were performed using a pneumatic cutter. Intraocular lenses were not implanted in patients younger than 1.5 years. Children below this age underwent lensectomies/membranectomies; secondary implant placement was conducted later. Patients were rehabilitated using glasses or contact lenses in-between. For IOL power calculations, we followed published guidelines.[20,21]

Postoperative follow-up was performed according to a pretested online format, including vision, anterior and posterior segment findings and intra ocular pressure, over an appropriate follow-up schedule. Glasses were prescribed when the media were clear and the final prescription was at 6 weeks post-operation. Patients underwent orthoptic evaluations and amblyopic patients were treated with appropriate patching. Aphakic patients were rehabilitated using glasses or contact lenses. Patients were evaluated for stereopsis and contrast sensitivity using a Titmus vision tester or a Titmus fly test.

Patients developing later cataracts underwent membranectomies and vitrectomies as required. For children operated on below the age of 1.5 years, secondary lens implantation was performed after they reached 2 years of age.

Data were analyzed using the SPSS software (ver. 19.0; SPSS Inc., Chicago, IL, USA). Univariate parametrical analyses were used. A P-value of < 0.05 was considered to indicate statistical significance.

Results

The enrolled patient group consisted of 1305 eyes in 1047 pediatric patients with cataracts. There were 432 (61.3%) males and 273 (38.7%) females (Table 1). The mean patient age was 9.1±4.9 years (range, 0-18). Of the cataracts, 600 (45.9%) were traumatic and 705 (54.1%) were congenital or developmental. Of the eyes, 1117 (85.6%; Table 2) had diminished vision and 188 (14.4%) presented with leukocoria. The follow-up period was 1–3084 days (mean, 117.4 days). We analyzed non traumatic cataract for current study.

Table 1. Age and Sex Distribution

	Sex	
Age(Years)	Female	Male
0 TO 2	37	56
3 TO 5	67	119
6 TO 10	156	293
11 TO 18	187	390
TOTAL	447	858

Table 2. Aaetiology of Cataract

Type of Cataract	Frequency	Percent
Complicated	29	2.2
Congenital	293	22.5
Developmental	373	28.6
Traumatic	610	46.7
Total	1305	100.0

Table 3. Comparision of visual outcome according to aaetiology

	Type of cataract			
Visual acuity	Complicated	Congenital	Developmental	Traumatic
Uncooperative	0	9	6	5
<20/1200	20	66	66	201
20/1200 to 20/400	3	61	65	69
20/200 to 20/100	2	17	50	46
20/80 to 20/60	3	128	92	94
20/40 to 20/30	0	5	30	53
20/20 to 20/15	1	5	62	140
Total	29	291	371	608

P=0.000

Table 4. Comparision of visual outcome according to pre operative visual acuity

	Visual Acuity (Preoperative)						
Visual acuity	Uncooperative	<20/1200	20/1200 to 20/400	20/200 to 20/100	20/80 to 20/60	20/40 to 20/30	20/30 to 20/20
Uncooperative	7	13	0	0	0	0	0
<20/1200	7	321	11	11	3	1	0
20/1200 to 20/400	1	128	54	11	5	0	0
20/200 to 20/100	0	74	28	10	3	0	0
20/80 to 20/60	7	132	37	99	41	0	2
20/40 to 20/30	1	62	15	3	7	1	0
20/20 to 20/15	5	140	24	23	12	3	3
Total	28	870	169	157	71	5	5

P=0.000

Table 5. Comparision of visual outcome amongst traumatic and non traumatic group

	Cataract	
Visual acuity	Non traumatic	Traumatic
Uncooperative	15	5
<20/1200	153	201
20/1200 to 20/400	130	69
20/200 to 20/100	70	46
20/80 to 20/60	224	94
20/40 to 20/30	36	53
20/20 to 20/15	69	140
Total	697	608

P=0.000

Table 6. Comparision of visual outcome according to age of intervention

	Cataract			
Visual Acuity	0 to 2	3 to 5	6 to 10	11 to 18
Uncooperative	1	6	12	1
<20/1200	5	58	130	160
20/1200 to 20/400	3	26	67	102
20/200 to 20/100	0	11	50	54
20/80 to 20/60	81	75	88	73
20/40 to 20/30	0	3	39	46
20/20 to 20/15	2	5	62	139
Total	92	184	448	575

P=0.000

Table. 7 Comparision of visual outcome amongst i ntervention under and above 5 years

	Category		Total
	</=5	>5	
Un cooperative	8	12	20
<20/1200	64	291	353
20/1200 to 20/400	29	169	198
20/200 to 20/100	12	105	115
20/80 to 20/60	162	155	317
20/40 to 20/30	4	86	88
20/20 to 20/15	7	201	208
Total	286	1019	1305

P=0.000

Table 8. Visiual outcome according to traumatic and non traumatic group above 5 years

	Category		Total
	Non Traumatic	Traumatic	
Un cooperative	9	3	12
<20/1200	125	165	290
20/1200 to 20/400	105	64	169
20/200 to 20/100	65	39	104
20/80 to 20/60	87	68	155
20/40 to 20/30	34	51	85
20/20 to 20/15	66	135	201
Total	491	525	1016

P=0.000

Table 9. Visiual outcome according to traumatic and non traumatic group under 5 years

	Category		Total
	Non Traumatic	Traumatic	
Un cooperative	6	2	8
<20/1200	27	36	63
20/1200 to 20/400	24	5	29
20/200 to 20/100	4	7	11
20/80 to 20/60	136	26	162
20/40 to 20/30	1	2	3
20/20 to 20/15	2	5	7
Total	200	83	283

P=0.000

Table 10. Visiual outcome according to age group above 5 years

	Age Group		Total
	6 to 10	11 to 18	
Un cooperative	12	0	12
<20/1200	130	160	290
20/1200 to 20/400	67	102	169
20/200 to 20/100	50	54	104
20/80 to 20/60	88	67	155
20/40 to 20/30	39	46	85
20/20 to 20/15	62	139	201
Total	448	568	1016

P=0.000

Table 11. Visiual outcome according to age group under 5 years

	Age Group		Total
	0 to 2	3 to 5	
Un cooperative	2	6	8
<20/1200	5	58	63
20/1200 to 20/400	3	26	29
20/200 to 20/100	0	11	11
20/80 to 20/60	84	78	162
20/40 to 20/30	0	3	3
20/20 to 20/15	2	5	7
Total	96	187	283

P=0.000

Table 12. Visiual outcome in non traumatic group above 5 years

	Age Group		Total
	6 to 10	11 to 18	
Un cooperative	9	0	9
<20/1200	49	76	125
20/1200 to 20/400	34	71	105
20/200 to 20/100	26	39	65
20/80 to 20/60	52	35	87
20/40 to 20/30	18	16	34
20/20 to 20/15	27	39	66
Total	215	276	491

P=0.000

Table 13. Visiual outcome in traumatic group above 5 years

	Age Group		Total
	6 to 10	11 to 18	
Un cooperative	3	0	3
<20/1200	81	84	165
20/1200 to 20/400	33	31	64
20/200 to 20/100	24	15	39
20/80 to 20/60	36	32	68
20/40 to 20/30	21	30	51
20/20 to 20/15	35	100	135
Total	233	292	525

P=0.000

Table 14. Visiual outcome in non traumatic group under 5 years

	Age Group		Total
	0 to 2	3 to 5	
Un cooperative	2	4	6
<20/1200	3	24	27
20/1200 to 20/400	2	22	24
20/200 to 20/100	0	4	4
20/80 to 20/60	78	58	136
20/40 to 20/30	0	1	1
20/20 to 20/15	0	2	2
Total	85	115	200

P=0.000

Table 15. Visiual outcome in traumatic group under 5 years

	Age Group		Total
	0 to 2	3 to 5	
Un cooperative	0	2	2
<20/1200	2	34	36
20/1200 to 20/400	1	4	5
20/200 to 20/100	0	7	7
20/80 to 20/60	6	20	26
20/40 to 20/30	0	2	2
20/20 to 20/15	2	3	5
Total	11	72	83

P=0.172

Table 16. Summary

Over all	</=5	>5
Pre post treatment	0.000	0.000
UL/BL	0.000 Bilateral doing well	0.000 Unilateral doing well
Cat traumatic	0.000 Non Traumatic better	0.000 Traumatic better
Age of intervention	0.0000 Early intervention	0.000 Late intervention
Non traumatic		
Pre post treatment	0.000	0.000
Age	0.000 Early intervention	0.000 Late intervention
Traumatic		
Pre post treatment	0.767	0.000
Age	0.172 no differenceemme	0.000 Late intervention

In the non-traumatic group, eyes were further subdivided into congenital (276), developmental (402), and secondary cataracts (27) Tables 2). According to the statistical analysis, the demographic factors analyzed, including socioeconomic status (74.5% were of lower socioeconomic status) and residence (92% were from rural areas), had no significant relationship with the final visual acuity.

Regarding patient entry, 9.2% of the patients had received primary treatment prior to reaching our center; this was not associated with a significant difference in the final visual outcome (P = 0.2). Of the total patients enrolled, 26.4% entered via an outreach department, and 71% were self-referred.

A comparison of pre- and post-operative visual acuities showed that treatment significantly improved visual acuity (Table 3; P < 0.001, Pearson's $\chi 2$ test; P = 0.001, ANOVA).

Final visual acuity following cataract surgery was > 20/200 in 419 eyes (59.3%) and ≥ 20/40 in 118 eyes (16.7%) in the non-traumatic group.

The follow-up period ranged from 1 day to 3084 days, with a mean of 117.4 days.

We have compared visual outcome according to age of intervention we found significant difference better results achieved in age range between 6 to 18, e group.(Table-4,5,p=0.000)

We have also compared groups above and under 5 years amongst age sub groups(Table-5,6) and found significant difference when we studied for sub group under five years early intervention better in </= 5 group.(Table 6 p<0.001), We have also studied effect of laterality over all bilateral cases are doing well (p<0.001) but when we tried to study laterality in association with age of intervention we found significant difference with bi laterality above 5 group. (Table.7 p<0.001)

An intraocular lens was implanted in cases 692(98.2%) and was significantly associated with improved visual acuity (Table.8,P < 0.001).

Discussion

The enrolled patient group consisted of 1305 eyes of 1047 pediatric patients. The mean patient age was 9.1±4.9 years. The mean age in another report was 7.1. [22] Age at intervention had a significant effect on visual outcome (Table 4). Other investigators have reported similar findings. [23]

With regard to unilateral and bilateral cases, we found that bilateral cataracts did better, in above 5 group while it did not make significant difference under 5 group, similar to some other reports (Table 7). [10].

A prospective study of the outcome of surgery for cataracts in the pediatric age group has several limitations. Although we believe that all patients included in the study had congenital, developmental, or traumatic lens opacities, not all patients were seen and followed by us from the time of birth. In particular, some patients with lamellar cataracts were not seen by us until they were several years old.

Regarding timing of intervention, our study suggests that visual outcome is affected by age of intervention, aetiology, and laterality. Patients in the non-traumatic group did well in the case of type 1 morphology if the intervention was early and in the case of type 2 morphology (partial opacity), if the intervention was late. In cases of unilateral cataracts, sooner is better. These findings were similar in the non-traumatic group. [10] On the other hand, their lens opacities were characteristic of congenital lamellar cataracts. [10]

The surgeries performed in our series of patients were not identical in all cases. For example, the posterior capsule was handled differently at different times during the study period. Additionally, the timing of surgery was not dictated by an established protocol, but was determined by age at the time of referral and by the visual status of individual patients. Finally, some observations that would have been useful for analysis were missing from the records because of loss to follow-up.

Nevertheless, we feel that some useful observations can be made on the basis of this review of patients. There seem to be two general categories of patients with congenital and developmental cataracts. One is characterized by extensive lens opacity and an early, obvious reduction in vision. These patients, who come for cataract surgery in the first year of life, often have smaller-than-normal corneal diameters, poorly dilating pupils, and a vulnerability to delayed postoperative open-angle glaucoma. The other category includes patients with partial, often lamellar lens opacities, corneas of normal size, and a remarkably good visual prognosis. Lamellar cataract did significantly better when compared with other morphologies in the non-traumatic group, similar to other studies. [10] Of the patients in the first category, 222 (17%) developed nystagmus at 2–4 months of age, which was accompanied by a reduction in visual acuity despite a good anatomical result from surgery.

Our study suggesting various outcomes according to age (>5 and </=5) similar to study by robb , [10] The visual prognosis in this group of patients, whose surgery is usually performed after 5 years of age, at a time when increasing visual needs begin to exceed the limits imposed by 528 Bilateral Congenital/Developmental Cataracts the lens opacities, is excellent. The only patients in this second general category who fell short of this high expectation were a few who also had the unfortunate combination of nystegmus and high myopia.

Treatment of strabismic amblyopia following bilateral congenital cataract surgery is useful, although the ocular' misalignment is sometimes hard to identify, and the amblyopia may be profound by the time it is recognized.[10]

Deprivational amblyopia due to asymmetry of cataracts from the outset is very difficult to reverse, similar to the situation in patients with monocular congenital cataracts. [24,25,26,27] An early start of treatment would seem to be the only hope -of success in these asymmetrical cases.[10]

Conclusion

Age of intervention affects visual outcome significantly and our conclusions out of this study are-

- Non traumatic group cataract morphology is type-1 early age intervention has better outcome.(p=0.000)
- Over all visual outcome is better when age of intervention >5 and bilateral , if age is </=5 no significant difference in out come with laterality.

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