Review of Surgical Outcomes in Pediatric Cataract

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ABSTRACT

Introduction: Pediatric cataracts causing visual impairment are responsible for 10-30% of childhood blindness. Successful cataract surgery in this age group requires, early diagnosis, Management of post operative complications with visual rehabilitation for desired outcomes.

Material and Methods: Prospective study was done in 47 eyes of congenital and developmental cataract at tertiary care hospital. 31 children underwent cataract surgery with post operative follow up of 6 months analysing complications and surgical outcomes.

Results: Out of 31 patients 16 patients underwent surgery for bilateral while 15 patients for unilateral cataracts. The lamellar cataract was the commonest type followed by nuclear cataract. In the present study, 2 eyes (100%), developed secondary glaucoma, 4 eyes (8.5%) that developed mild uveal inflammation which resolved rapidly and with topical steroids. Total 16 out of 36 patients (44.4%) who underwent AcrySof IOL implantation developed visual axis opacification. On assessment of visual acuity with Snellen's chart, 17 eyes (36.2%) had best corrected visual acuity better than 6/18 after cataract extraction at last visit i.e. at 6 months. 66.7% of patients undergoing surgery for bilateral cataract achieved a best corrected visual acuity between 6/6 and 6/12 as compared to 38.5% in unilateral cases.

Conclusion: This study highlights the importance of early detection, meticulous surgical technique and Optical rehabilitation in children with congenital cataract. Changes in refraction and post-operative complications like PCO make functional outcome unpredictable despite satisfactory technical outcomes.

Keywords: Congenital Cataract, Posterior Capsular Opacification, Amblyopia

INTRODUCTION

Pediatric cataracts are common and represent one of the most treatable causes of lifelong visual impairment in this population. It is responsible for 10-30% of childhood blindness. The global estimate of 1.5 million severely visually impaired and blind children is relatively low compared to the 17 million adults who are blind owing to cataracts Management of pediatric cataract is often difficult and tedious. It requires a dedicated team effort by parents, pediatricians, ophthalmologists, anesthetists, orthoptists and community health providers. Presently, the only known treatment for a cataract is the surgical removal of the opaque lens. This is often followed by implantation of an intraocular lens (IOL), even in early childhood. Management of congenital and childhood cataracts is more challenging than cataract management in adults. This is because; in a child the decision to operate requires an absolute knowledge on the part of surgeon of the physiology of child's eye, the effect of the cataract on the visual development of the child's brain and the difference in surgical behaviour of child's eye depending upon the age of child. Increased intraoperative difficulties, a propensity for increased postoperative inflammation, the changing refractive state of the eye, more common postoperative complications, such as capsule opacification, secondary membranes, and postoperative glaucoma, and the tendency to develop amblyopia all add to the difficulty of achieving a good outcome. Development of techniques for cataract surgery specific to children is necessary because of the low scleral rigidity, increased elasticity of the anterior capsule, and high vitreous pressure. Also, microphthalmia and pupillary miosis often add to the surgical complexity. Finally, surgical timing and adequate visual rehabilitation are paramount to avoiding irreversible visual damage secondary to amblyopia. As time passed and technology improved, publications appeared supporting the safety and effectiveness of IOLs in children of nearly all ages. Study was done in pediatric cataract to determine the relationship with visual prognosis according to age at operation and surgical procedure adopted. Also the management post operative complications and visual rehabilitation were evaluated.

MATERIAL AND METHODS

The present study was done at Ophthalmology department of tertiary care hospital after due approval from Institutional ethics committee. In this prospective study 47 eyes of 31 patients below 18 years of age with cataract were included for analysing the surgical results and post operative visual outcome. They were followed up for at least 6 months after surgery. Patients with visually significant unilateral or bilateral congenital or developmental cataract were selected for this study. Exclusion criteria were cataracts associated with retinal anomalies, trauma and systemic diseases and patients not willing to be part of study. Fifteen children underwent unilateral cataract surgery and sixteen underwent bilateral cataract surgery. Preoperative evaluation included a detailed history including white spot in pupillary area, diminution of vision, nystagmus, deviation of eye and associated symptoms of systemic disease, if present was

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Group	Age	Surgical technique	No of eyes	Percentage
1	< 2yrs	Anterior vitrectomy without IOL implantation	11	23.4
2	2-6 yrs	IOL implantation with anterior vitrectomy	23	53.2
3	>6 yrs	IOL was inserted without anterior vitrectomy	13	23.4
	Total		47	100.0

Table-1: Pediatric cataract and surgical technique

Sr No	Complications	Group 1	Group 2	Group 3
1	PC0	8	8	8
2	Secondary glaucoma	2	0	0
3	Uveal Inflammation	3	1	0
4	IOL Decentration	0	1	0

Table-2: Post operative complications in patients with pediatric cataract

Visual acuity	Hand -6/60	6/36-6/18	>6/18	Total
Group II	14	4	0	18
Group III	5	8	0	13

Table-3: Pre Operative visual acuity

Obtained. A thorough ophthalmologic examination was performed preoperatively with assessment of visual acuity and biomicroscopic examination was performed using Haag-Streit slit lamp system (Table-3). The type, size, density and morphology of cataract were noted using diffuse, focal and retro-illumination. Fundus examination was done with indirect ophthalmoscope, wherever fundus evaluation was not possible due to total cataract, a B Scan ultrasound examination was performed to rule out any posterior segment pathology. The central corneal curvature was measured using autokeratometry. Lens power was determined using the modified SRK-II, T and Hoffer Q formulae, aiming for emmetropia. Intraocular pressure was assessed by non-contact tonometer. Lab investigations for anaesthesia fitness were done along with TORCH titres, galactokinase levels, amino acids and urine for reducing substances. Patients were divided into three groups according to the age and subsequent surgical steps. Group 1 included patients below 2 years of age. Group 2 included patients of age 2-6 years while group 3 included patients of age more than 6 years. (Table 1) In group 1, two limbal incisions were made with side port at 10 and 2 O'clock positions, one for anterior chamber (AC) maintainer and other one for aspiration cannula. Sodium hyaluronate 1.4% was injected. Anterior Capsulorhexis was done with the help of trypan blue staining. Hydrodissection was done to separate nucleus from capsule to allow safe in-bag nuclear aspiration Lens material was aspirated using bimanual irrigation aspiration or phacoaspiration Thorough cortical clean up was done. Posterior capsulorhexis i.e. PCC (3.5-4 mm) was performed using capsulorhexis forceps. Limited anterior vitrectomy (one third) was performed .IOL was not implanted in this group. In group 2, the same procedure was performed with an AcrySof foldable IOL 12-12.5 mm in size (5.5-6 mm optic size) was implanted in the bag. In group 3, a procedure similar to group 2 is performed but no PCCC and anterior vitrectomy was done.(Table 1). A combination of antibiotic-corticosteroid eye drops every 1 hourly with a mild mydriatic agent twice daily was given for the first week with tapering over 3 weeks. Short course of systemic corticosteroids (1mg/kg body weight) was used in tapering dose to overcome the intense inflammatory response in the younger children. Patients were meticulously followed up on first postoperative day, three months and six months and complications if any were recorded and treated . During follow up, spectacle correction of residual ametropia and occlusion therapy were performed as early as possible after cataract surgery. Typical occlusion therapy regimens for infantile onset were 6 to 8 hours per day and for later onset, 2 to 6 hours per day in unilateral cases, with adjustments according to the degree of amblyopia in bilateral cases.

Statistical analysis

Statistical data were obtained using SPSS 11.2 software. Qualitative data (complication rates and visual outcomes between the three different groups associated with surgical procedures) were compared using the chi-square test and Mann-Whitney U test. P-values of <0.05 were considered significant. The results were correlated with those in the available literature.

RESULTS

Our study shows that lamellar cataract was the commonest followed by nuclear variety. Visual acuity could be tested with a Snellen's acuity chart in 22 of 31 patients, age ranging from 3 to 13 years (verbal group) while in 9 patients with age less than 2, fixation method was used. Thirty-two eyes from 16 patients underwent surgery for bilateral congenital cataracts and fifteen eyes from 15 patients underwent surgery for unilateral cataract. Out of the total 47 eyes operated, 24 (51.1%) developed PCO while 2 developed secondary glaucoma, 4 had mild uveal inflammation and 1 had IOL decentration. We also compared the complication rates between the patients who underwent cataract surgery before and after 1 year of age. Total 24 of 47 eyes (51.1%) developed PCO (Table 2). The only patient who underwent a bilateral cataract surgery at 1 month age, developed bilateral secondary glaucoma. Four of the 47 eyes (8.5%) developed mild uveal inflammation. Post op complications such as endophthalmitis, Cystoid macular edema or retinal detachment were not observed in current study. Out of the 31 patients, visual acuity could not be assessed with Snellen's chart in all 11 patients (16 eyes) below 2 years of age. Of the 31 eyes that could be checked for visual acuity with Snellen's chart, 17 eyes (36.2%) had best corrected visual acuity better than 6/18 after cataract extraction at last visit (Table 4). We also studied the best corrected visual acuity on Snellen's chart according to the laterality of the pathology

Visual acuity	HM-6/60	6/36-6/18	>6/18	Total
Group II	1	7	10	18
Group III	0	6	7	13

Table-4: Post Operative visual acuity

and depending upon the presence or absence of associated ocular anomalies viz. strabismus and nystagmus. Out of the 15 cases of unilateral cataract, visual acuity could be tested in 14 cases while in one of the patient below 2 years it could not be tested by Snellen's chart. Out of the 16 cases of unilateral cataract, visual acuity could be tested in 9 cases by Snellen's chart. Thus 66.7% of patients undergoing surgery for bilateral cataract achieved a best corrected visual acuity between 6/6 and 6/12 as compared to 38.5% in unilateral cases. Unilateral congenital cataracts (p=0.025) showed significantly poorer visual outcomes than bilateral cataracts. Nuclear cataracts had a significantly poorer visual outcome than lamellar cataracts (p=0.016) while total cataracts had a poorer outcome than nuclear cataracts (p=0.012). Congenital cataracts with strabismus (p=0.019) showed significantly poorer visual outcomes than without strabismus.

DISCUSSION

According to the World Health Organization (WHO), every minute one child goes blind somewhere in the world[5] In 1992 WHO estimated that there are 1.5 million children with severe visual impairment (SVI) or blindness (BL) in the world.[6] The prevalence of childhood cataracts has been reported as 1 to15 per 10,000 children.[7] The wide range is because of the variety of methods, different age groups, and varying case definitions used in the studies, as well as true differences between populations.[7] Childhood cataracts can be classified as congenital, infantile, or juvenile, depending on the age at onset. In this study 31 patients with congenital cataracts were evaluated with respect to the laterality, cataract type, associated ocular pathologies (strabismus, nystagmus), age at the time of surgery and surgical technique. The age of the patients varied from 1 month to 13 years. The mean age at the time of surgery was 5.08 years. Study included significantly more number of males (18) than females (8). The mean age of presentation of cataract in current study was 5.08 years. This is consistent with the results in study conducted by Khandekar et al[9] in central India. They attributed it to less access to eye care facilities available to females in India. Late presentation for congenital cataract is associated with poor visual outcome and is a matter of concern in developing countries like India. In the current study 16 patients underwent surgery for bilateral congenital cataracts while 15 patients underwent surgery for unilateral cataracts. This indicates that there was no significant difference in unilateral or bilateral cataracts. This is discordant with Khandekar et al[8] who found that the rate of unilateral cataract to be six times the number of bilateral cataract. This can be attributed mainly to the exclusion of traumatic cataract in the present study, which is the main cause of cataracts in countries like India. We found better visual prognosis in lamellar cataract. This improved prognosis has been related by Pandey et al to the later development of the lamellar cataract such that during the critical period of visual development, the cataract does not preclude normal visual development.[9] The evolution of pediatric cataract surgery continues, with many adult cataract surgery techniques being applied to children with only minor technical adjustments. Implanting IOL in children aged two years and more is now widely accepted.[10] Lambert et al[11] reported that primary IOL implantation in cases of unilateral cataract surgery during first six months of life resulted in improved visual outcomes but a higher complications requiring reoperation. We performed primary AcrySof IOL implantation in all patients older than 2 years while PCC with anterior vitrectomy was performed in the rest of the patients. Hydrophobic AcrySof IOLs have been used more frequently during recent years. Although the use of AcrySof IOLs has improved intraoperative and postoperative outcomes in pediatric cataract surgery, these lenses have not obviated primary capsulectomy and anterior vitrectomy in children. Vasavada AR et al evaluated 103 consecutive eyes of 72 children with congenital cataract for visual axis opacification (VAO) after AcrySof intraocular lens implantation in pediatric eyes and concluded that AcrySof IOL implantation with appropriate management of the posterior capsule resulted in 39.8% of eyes with visual axis opacification.[13] In the current study we found that 44.4% of patients developed visual axis opacification after AcrySof intraocular lens implantation. In aggregate, the literature on VAO[13-14] in children suggests that when the posterior capsule is left intact, pediatric patients show a similar VAO rate when implanted with an AcrySof IOL or a PMMA IOL. However, VAO after AcrySof implantation with an intact posterior capsule is more "proliferative," as opposed to the "fibrous" reaction commonly seen in conjunction with PMMA IOLs. After a primary posterior capsulotomy and an anterior vitrectomy, VAO is rare regardless of whether an AcrySof or a PMMA IOL is inserted. When it does occur, it is usually in a baby operated on in the first year of life. This form of VAO tends to occur within the first 6 months after cataract and implant surgery if it is going to occur at all. This finding on the anterior vitreous face was usually not visually significant. Vasavada AR et al recommended AcrySof IOL implantation combined with a posterior capsulotomy and an anterior vitrectomy from infancy until age 5 years.[12,14] We compared the rate of PCO formation in patients with IOL implantation in eyes with or without anterior vitrectomy. PCO formation was significantly less common in patients undergoing anterior vitrectomy (34.8%) than without anterior vitrectomy (61.5%).Post operative complication noted in 47 eyes of 31 patients included (Table 2) secondary glaucoma, 4 had mild uveal inflammation and 1 had IOL decentration. In the present study, 2 eyes (100%), both of which underwent surgery within the first month after birth developed secondary glaucoma, This is comparable with the results of the reports previously mentioned. Kim et al[15] also described 4 cases (5%) of uveal inflammation in 81 eyes operated for congenital cataract. Two of which developed endophthalmitis. Cystoid macular edema or

retinal detachment was not observed in our study. Trivedi et al[13] noted mild, clinically non-significant decentration of an AcrySof IOL in 2 of 29 (6.9%) eyes operated on for cataracts during the first year of life. In this study 1 of 36 (2.8%) eyes operated on for IOL implantation developed AcrySof IOL decentration. Of the 31 eyes that could be checked for visual acuity with Snellen's chart, 17 eyes (36.2%) had best corrected visual acuity better than 6/18 after cataract extraction at last visit i.e. at 6 months (Table 4). It was found that 66.7% of patients undergoing surgery for bilateral cataract achieved a best corrected visual acuity between 6/6 and 6/12 as compared to 38.5% in unilateral cases. This is in accordance with retrospective study by Casaer et al.[17] They found that 45.5% of unilateral cataract and 63.7% of bilateral cataract had final best corrected visual acuity of 20/60 and 20/25 or better respectively. Wilson et al[19] reported the Snellen's visual acuity recorded for 67 eyes implanted with an AcrySof IOL. Of those, 48 (72%) had 20/40 or better best corrected visual acuity (BCVA) at the last follow-up and 63 eyes (94%) had 20/100 or better visual acuity. The results in current study are comparable with these results. We studied effect of association of strabismus and nystagmus on visual outcome as tested on Snellen's chart. The visual acuity could be tested in 3 out of 6 patients with strabismus and 1 out of 3 patients with nystagmus. None of these patients could achieve vision better than 6/18. Thus indicating that strabismus, and nystagmus are associated with poor visual outcome. This is in accordance with Kim et al.[15] According to Wade et al[16] occlusion was the factor most strongly associated with visual outcome in bilateral and unilateral disease, which also represents a critical limitation of the present study.

CONCLUSION

Managing pediatric cataract poses important problems related to technical aspects of surgery, changing refraction and functional outcome. The timing of treatment is crucial to the visual development and successful rehabilitation of children. The present study revealed that visual outcome was significantly better in bilateral than unilateral cataracts, lamellar than nuclear and total cataracts, those operated at younger than at an older age. Cataracts associated ocular pathologies (strabismus, nystagmus) had poorer outcomes than those not associated with them. We detected higher rates of complications (PCO, secondary glaucoma and anterior uveitis) in children younger than one year. The PCO formation was significantly less common in patients undergoing anterior vitrectomy. Inability to accurately measure visual acuity in preverbal group, shorter follow up period, smaller sample size, compliance with occlusion and lack of evaluation of cataract density were important limitations of the present study.

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