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Original Article

Visual Outcomes in Children Undergoing Secondary Intraocular Lens Implant after Primary Cataract Surgery for Congenital Cataracts

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Abstract

Background: The most frequent surgical approach for cataracts is a micro-incision aspiration with intraocular lens (IOL) implantation. Multiple factors are involved in the long-standing effect of Pediatric cataract surgery.
Objective: The purpose of this study was to assess the visual outcomes following secondary implantation of IOL in children who have undergone primary cataract surgery for congenital cataracts.
Study type, settings & duration: This was a cross-sectional study performed at the Pediatric section of Al-Ibrahim Eye Hospital, Karachi from January 2018 to December 2019.
Methodology: Fifty-seven files were retrieved for data collection. All children who had congenital cataracts and were aged 1-3 years and had undergone primary cataract surgery were included. Children with congenital cataract had undergone a primary surgery at six months to one year after which a secondary IOL implant had been done on them aged 15-36 months.
Results: Visual acuity improved to 6/12 in 40.4% patients, 6/9.5 in 33.3% patients, and 6/15 in 10.5% patients. The final visual outcome through log MAR chart revealed that most of the children improved visual acuity. Of the total 19 (33.3%) had a 0.2 score that is equivalent to 6/9.5 on the Snellen chart. Likewise, 23 (40.4%) had 0.3 score that is equivalent to 6/12 on the Snellen chart, 6 (10.5%) had 0.4 on the log MAR chart.
Conclusion: The bilateral congenital cataract was more prevalent. Overall an improvement in the visual outcome was seen after secondary Intraocular lens implantation in patients with bilateral congenital cataracts.
Key words: Congenital cataract, bilateral and unilateral congenital cataract, primary cataract surgery.

Introduction

A cataract is defined as a pathology in which the crystalline lens opacifies.[1] Cataract is a very serious issue affecting millions of people as it remains the most common cause of blindness worldwide. Statistical data showed that there were thirty seven million people that were blind; however, 40% of them were blind only due to cataracts, thereby showing its immense predominance of causing blindness.[2] Various risk factors can be associated with causing opacity in the lens leading to cataracts in the populations. Some of these include hypertension, diabetes mellitus, drugs, smoking, UV light exposure, and age.[3] However, cataracts can be congenital as well. Congenital cataract is illustrated by vision impairment with development of amblyopia. It is a vital, curable basis of visually handicapped children all over the world.[4] Global estimates indicate that roughly two hundred thousand children annually are affected by visual impairment that lasts a lifetime due to cataracts.[5]

Even though childhood cataracts are generally congenital, acquired cataracts (for instance subsequent to ocular trauma) are also quite frequent.[6,7] Cause of childhood congenital or acquired cataract involves eye anomalies, orbital injury, and intrauterine fetal infections with related syndromes besides genetic causes.[8] Several factors are involved in pathophysiology of congenital cataract, in which genetic factors are the most common cause, explaining 50% of cases. The infection can be X-linked, autosomal recessive or

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AZR conceptualized the project and performed the statistical analysis. AZR, IAB & FR did the data collection. MFM & SB did the literature search. Drafting, revision & writing of manuscript were done by AZR, IAB & SM.

autosomal dominant; however autosomal dominant seems to be the main mode of disease transmission.[9] Diagnosis of CC early is essential so that early management can commence. The treatment of CC is cataract surgery that is executed to prevent loss of vision in a critical and sensitive phase of vision development.[10] The most frequent surgical approach being a micro-incision aspiration of the cataract with intraocular lens (IOL) implantation.[11] Advancement in cataract surgery has been appreciable; however, IOL calculation remains a difficult feat. Secondary IOL implantation timing is debatable and still, no consensus has been achieved indicating the right time for surgery. However, IOL has been shown to recover visual acuity in cataract patients.[12]

Multiple factors are involved in the long-lasting effect of pediatric cataract surgery for instance, age at initial appearance of cataract and age at surgical procedure, related eye abnormalities, and progression of aphakic glaucoma.[13] Numerous factors establish the probability of victorious functional and morphological results following Pediatric cataract surgery. Wu et al. stated that the management of congenital cataract patients is the most intricate intervention in ophthalmology.[14] Concerning complications, childhood cataract is frequently responsible for the progression of strabismus, nystagmus, and amblyopic.[15] Hence, vigilant postoperative care involves amblyopia therapy and correct optical remedy that reduces the possibility of complications. In follow-up duration, it is decisive to notice postoperative complications. These complications can be severe and frequently appear following the procedure.[16] Most severe complication after pediatric cataract surgery is development of glaucoma [17] that is dependent on age at surgical treatment, existence of related ocular disease, and malpositioning of an intraocular lens.[18]

Even though, there are certain complications after the secondary IOL implant but this is the best way for visual rehabilitation after the resultant aphakia due to cataract surgery. Previously children were prescribed aphakic glasses for the refractive correction which are not only heavy but also cumbersome to wear due to field restriction. The compliance with aphakic glasses being poor often resulted in amblyopia causing poor vision in the long term.

This study was conducted to improve and encourage the secondary IOL implantation by ophthalmologists for better quality, stereopsis and field of vision in young children after congenital cataracts surgery.

Methodology

A cross-sectional retrospective study was designed and performed at the pediatric section of Al-Ibrahim Eye Hospital, Karachi between periods of January 2018 to December 2019. Approval was taken by the respected institutional review board after which 57 files were retrieved based on non-probability convenience sampling technique, in which children had congenital cataract and were aged 1-3 years and had undergone primary cataract surgery were included. All the children with CC had undergone a primary surgery at six months to a year after which a secondary IOL implant had been done on them aged 15-36 months. Following surgery, topical antimicrobial therapy, corticosteroids, and non-steroidal anti-inflammatory drugs were administered to the operated eyes. Children with ocular pathologies like traumatic cataract, congenital glaucoma, premature retinopathy, persistent fetal vasculature, traumatic globe perforation, or retinal detachment before cataract surgical procedure, Marfan's syndrome, microphthalmos, or other posterior or anterior part abnormalities, were not included in the study.

Cardiff cards and K pictures were used to measure visual acuity which was then converted to algorithm of logmar and snellens acuity for better and more standard evaluation prior and subsequent to secondary IOL implantation according to age of patient (Table-1) Visual acuity was measured three months after the IOL implantation using the algorithm of LogMAR.

Demographic, morphological, and functional data (such as age, sexual category, family history, type of cataract, best corrected visual acuity [BCVA], with technique of surgical treatment) were documented at first presentation and final follow up. All the data was documented in frequencies and percentages and analyzed by using the Statistical Package of Social Sciences (SPSS) version 20.0.

The ethical approval was obtained from Research Ethical Committee of Al-Ibrahim Eye Hospital, Karachi vide reference REC/IPIO/2020/023.

Results

A total of I07 eyes of 57 children with CC were selected for the study in which 33 (57.9%) were males and 24 (42.2%) were females.

Distribution of laterality showed most of the children 50 (87.7%) reported bilateral involvement of eye in CC while 7 (12.3%) showed unilateral involvement of eye.

Table 1: Specification of visual acuity levels for the cardiff acuity tests.

		Acuity at 1m			Acuity at 50cm		
Card	*Picture*	*logMAR*	*Metres /6*	*Feet /20*	*logMAR*	*Metres /6*	*Feet /20*
LVA	Apple	1.2	96	320	1.5	192	640
LVB	Sock	1.1	76	253.4	1.4	152	506.6
A	Fish	1.0	60	200	1.3	120	400
B	House	0.9	48	160	1.2	96	320
C	Boat	0.8	38	127	1.1	76	253.3
D	Train	0.7	30	100	1.0	60	200
E	Duck	0.6	24	80	0.9	48	160
F	Car	0.5	19	63	0.8	38	126.7
G	Fish	0.4	15	50	0.7	30	100
H	Train	0.7	12	40	0.6	24	80
I	Boat	0.2	9.5	32	0.5	19	63
J	Car	0.1	7.5	25	0.4	15	50
K	Duck	0	6	20	0.3	12	40
L	House	-0.1	4.8	16	0.2	9.5	32
M	Train	-0.2	3.75	12.5	0.1	7.5	25

The children's best corrected visual acuity (BCVA) scores by Snellen chart presented 23 (40.4%) of children had visual acuity 6/12, 19 (33.3%) of children had visual acuity 6/9.5, 6 (10.5%) had visual acuity 6/15, 3 (5.3%) had visual acuity 6/19, whereas 1 (1.8%) had visual acuity 6/24, 1 (1.8%) had visual acuity 6/30 and 2 (3.5%) had visual acuity 6/38, as shown in Table-2.

Table 2: shows the frequency and percentage of the visual outcomes based on snellen chart.

Visual Acuity Snell's Chart	*n*	*%*
6/12	23	40.4
6/9.5	19	33.3
6/15	6	10.5
6/19	3	5.3
6/24	1	1.8
6/30	1	1.8
6/38	2	3.5
6/60	2	3.5
Total	57	100.0

Final visual outcome through logMAR chart revealed that most of the children improved visual acuity. Of the total, 19 (33.3%) had 0.2 score that is equivalent to 6/9.5 on Snellen chart. Likewise, 23 (40.4%) had 0.3 score that is equivalent to 6/12 on Snellen chart, 6 (10.5%) had 0.4 on LogMAR chart, 3 (5.3%) had 0.5, 1 (1.8%) had 0.6, 1 (1.8%) had 0.7 while 2 (3.5%) had 0.8 on Log MAR chart.

Discussion

Treatment of congenital cataract (CC) is long-lasting, intricate that needs intensive care; it is predicted that enduring visual effects could be achieved at age 7.[19] Although, a number of researches on visual outcomes after surgical procedure of CC have been carried out in the previous years, only some researches had performed on long-standing effects on visual acuity in children with secondary IOL implantation subsequent to CC extraction.[20] The present study explored the long-lasting visual acuity in congenital cataract children who had undergone secondary IOL implantation following extraction of cataract.

One research investigated the laterality of CC in which 61 (55%) were males and 51 (45%) were females with 80.4% had bilateral cataracts and 19.6% unilateral cataract.[21] This male to female ratio revealed similarity to research performed by Mwende J et al, who had 99 (55%) males and 81 (45%) females. Similarly, bilateral cataracts were observed in 66% and unilateral were found in 34% cases in their study.[22] Our study was consistent with the above cited studies and showed the male predilection over female. As far as laterality is concerned, most of the children 50 (87.7%) reported CC in bilateral eyes whereas 7 (12.3%) showed unilateral involvement of eye.

Laterality is one of the most significant parameters regarding management of CC. Poor prognosis is related to unilateral cataracts owing to more chances to form amblyopia than bilateral cataracts. Prediction for visual outcome subsequent to cataract surgery in unilateral cases depends on early correction of visual axis, aphakic improvement, and timely amblyopia management. Preferably, CC should treat surgically prior to 3 months of age.[22] As far as our study is concerned, most of the cases were CC with bilateral involvement of eye improved final visual acuity than unilateral CC. Additionally; the reported operative age for the primary cataract surgery was 6 month to 1 year followed by Secondary IOL implantation performed at 15-36 months.

Another research demonstrated the interval between primary cataract surgery and secondary

IOL implantation. In their research, mean time between Secondary IOL implantation and primary cataract surgery was found 8.7 years[23] that was in agreement with other studies.[24,25] The present study was inconsistent with the above reported studies and revealed that primary cataract surgery was performed at 6 months - 1 year of age followed by secondary IOL implantation that was performed at 15-36 months.

Similarly, one research reported that CC were the major cause for surgical intervention in case of pediatric cataract. Few children (27.65%) manifested unilateral cataracts with no related pathologies.[26] Whereas, bilateral cataract was presented in 72.3% children that was in harmony with earlier studies from different geological regions.[7,27,28] The present study was consistent with the above reported studies and revealed that most of the cases 50 (87.7%) were bilateral CC and only 7 (12.3%) showed unilateral involvement of the eye.

In another study, it was reported that following management of complications after surgery and amblyopia treatment, 51% eyes accomplished good best corrected visual acuity (BCVA). It was ranging from 0.0 to 0.5 on the Log MAR chart. Improvement of vision was not observed in 49% eyes regardless of appropriate treatment of complications and amblyopia management.[29] Good prognosis of visual outcome following CC surgery is unpredictable. Kim et al observed improvement of visual acuity that was found in 51.7% patients.[30] Our study was in accordance with the above reported studies and showed that 23 (40.4%) children had improved visual acuity 6/12 and 19 (33.3%) children had visual acuity 6/9.5, 6 (10.5%) had visual acuity 6/15 and 3 (5.3%) had visual acuity 6/19, thereby, about 51% children improved visual acuity following IOL implantation. It was ranging from 0.0 to 0.5 on Log MAR chart.

Another study performed at Layton Rehmatullah Benevolent Trust Eye Hospital, Karachi, in which 51% patients got a good vision and improved visual outcome.[29] Our study proved that about 51% of children achieved better visual outcomes that range from 0.0 to 0.5 on the Log MAR chart.

We observed improved visual acuity of children with congenital cataract once secondary IOL implantation was done. Improvement in the visual acuity was also seen in another study, which was carried out to see the outcomes in both primary and secondary IOL implantation.[31] This goes to show that IOL implantation is a good treatment method for children with CC and can be routinely performed.

We can decisively conclude that IOL implantation improved visual outcomes. However, further studies are needed to determine its effectiveness in Pakistan. Complications are other parameters that should be studied as there are a lot of studies carried out in which assessment of complications have been carried out.[32-35] Our study strongly sides with the fact that IOL implantation secondary to primary cataract surgery improves visual outcomes, but more parameters such as complications and specific surgical techniques need to be studied.

Additional researches may be needed to evaluate long-lasting effects such as visual acuity, ocular fixation control, and ocular configuration after secondary IOL implantation.

This study concluded that bilateral congenital cataract was more prevalent than unilateral cataract. Overall, improvement in the visual outcome in children with bilateral congenital cataract was seen after secondary Intraocular lens Implantation. Moreover, secondary Intraocular lens implantation in children is a quite harmless procedure related to low rates of postoperative complications.

Conflict of interest: None declared.

References

1. Shiels A, Hejtmancik JF. Mutations and mechanisms in congenital and age-related cataracts. Exp Eye Res 2017; 156: 95-102.
2. Allen D, Vasavada A. Cataract and surgery for cataract. BMJ 2006; 333(7559): 128-32.
3. Chang JR, Koo E, Agrón E, Hallak J, Clemons T, Azar D, et al. Age-Related Eye Disease Study Group. Risk factors associated with incident cataracts and cataract surgery in the Age-related Eye Disease Study (AREDS): AREDS report number 32. Ophthalmology 2011; 118(11): 2113-9.
4. Gogate P, Gilbert C, Zin A. Severe visual impairment and blindness in infants: causes and opportunities for control. Middle East Afr J Ophthalmol 2011; 18(2): 109-14.
5. Sheeladevi S, Lawrenson JG, Fielder AR, Suttle CM. Global prevalence of childhood cataract: a systematic review. Eye (Lond) 2016; 30(9): 1160-9.
6. Song Z, Zhao D, Lv C, Pu W, Xiao W. Ten-year etiologic review of Chinese children hospitalized for pediatric cataracts. Eye Sci2014; 29(3): 138-42.
7. Naz S, Sharif S, Badar H, Rashid F, Kaleem A, Iqtedar M. Incidence of environmental and genetic factors causing congenital cataract in Children of Lahore. J Pak Med Assoc 2016; 66(7): 819-22.
8. Tartarella MB, Britez-Colombi GF, Milhomem S, Lopes MC, Fortes Filho JB. Pediatric cataracts: clinical aspects, frequency of strabismus and chronological, etiological, and morphological features.

Arquivos Brasileiros de Oftalmologia 2014; 77(3): 143-7.
9. Pichi F, Lembo A, Serafino M, Nucci P. Genetics of Congenital Cataract. Dev Ophthalmol 2016; 57: 1-14.
10. Lambert SR, DuBois L, Cotsonis G, Hartmann EE, Drews-Botsch C. Factors associated with stereopsis and a good visual acuity outcome among children in the Infant Aphakia Treatment Study. Eye (Lond) 2016; 30(9): 1221-8.
11. Wang M, Xiao W. Congenital Cataract: Progress in Surgical Treatment and Postoperative Recovery of Visual Function. Eye Sci 2015; 30(1): 38-47.
12. Agresta B, Knorz MC, Donatti C, Jackson D. Visual acuity improvements after implantation of toric intraocular lenses in cataract patients with astigmatism: a systematic review. BMC ophthalmol 2012; 12(1): 41.
13. Memon MN, Bukhari S, Bhutto IA. Corneal approach 20 Guage vitrectomy system for the management of congenital cataract. Pak J Med Sci 2016 ; 32(2): 440-3.
14. Wu X, Long E, Lin H, Liu Y. Prevalence and epidemiological characteristics of congenital cataract: a systematic review and meta-analysis. Scientific Reports 2016; 6(1): 28564.
15. Young MP, Heidary G, VanderVeen DK. Relationship between the timing of cataract surgery and development of nystagmus in patients with bilateral infantile cataracts. J Am Assoc Pediatr Ophthalmol Strabism2012; 16(6): 554-7.
16. Mohammadpour M, Shaabani A, Sahraian A, Momenaei B, Tayebi F, Bayat R, et al. Updates on managements of pediatric cataract. J Curr Ophthalmol 2018; 31(2): 118-26.
17. Lambert SR, Purohit A, Superak HM, Lynn MJ, Beck AD. Long-term risk of glaucoma after congenital cataract surgery. Am J Ophthalmol 2013; 156(2): 355-61.
18. Lambert SR. The timing of surgery for congenital cataracts: minimizing the risk of glaucoma following cataract surgery while optimizing the visual outcome. J Am Assoc Pediatr Ophthalmol Strabism2016; 20(3): 191-2.
19. Sjöstrand J, Magnusson G, Nyström A, Jonsson R. Stability of visual outcome from 7 years in children treated surgically for bilateral dense congenital cataracts before 37 weeks of age. Acta Ophthalmol 2011; 89(1): 30-6.
20. Koch CR, Kara-Junior N, Serra A, Morales M. Long-term results of secondary intraocular lens implantation in children under 30 months of age. Eye (Lond) 2018; 32(12): 1858-63.
21. Rana AM, Raza A, Akhter W. Congenital Cataracts; Its Laterality and Association with Consanguinity. Pak J Ophthalmol 2014; 30(4); 187-92.
22. Mwende J, Bronsard A, Mosha M, Bowman R, Geneau R, Courtright P. Delay in presentation to hospital for surgery for congenital and developmental cataract in Tanzania. Br J Ophthalmol 2005; 89(11): 1478-82.
23. Vounotrypidis E, Schuster I, Mackert MJ, Kook D, Priglinger S, Wolf A. Secondary intraocular lens implantation: a large retrospective analysis. Graefes Arch Clin Exp Ophthalmol 2019; 257(1): 125-34.
24. Davies EC, Pineda R 2nd. Intraocular lens exchange surgery at a tertiary referral center: Indications, complications, and visual outcomes. J Cataract Refract Surg 2016; 42(9): 1262-7.
25. Mamalis N, Brubaker J, Davis D, Espandar L, Werner L. Complications of foldable intraocular lenses requiring explanation or secondary intervention 2007 survey update. J Cataract Refract Surg 2008; 34(9): 1584–1591.
26. Ambroz SC, Töteberg-Harms M, Hanson JVM, Funk J, Barthelmes D, Gerth-Kahlert C. Outcome of Pediatric Cataract Surgeries in a Tertiary Center in Switzerland. J Ophthalmol 2018; 2018(3): 1-10.
27. Rajavi Z, Mokhtari S, Sabbaghi H, Yaseri M. Longterm visual outcome of congenital cataract at a Tertiary Referral Center from 2004 to 2014. J Curr Ophthalmol2015; 27(3-4): 103-9.
28. Nagamoto T, Oshika T, Fujikado T, Ishibashi T, Sato M, Kondo M, et al. Surgical outcomes of congenital and developmental cataracts in Japan. Japanese JOphthalmol2016; 60(3): 127-34.
29. Latif K, Shakir M, Zafar S, Rizvi SF, Naz S. Outcomes of congenital cataract surgery in a tertiary care hospital. Pak J Ophthalmol 2014; 30(1): 28-32.
30. Kim KH, Ahn K, Chung ES, Chung TY. Clinical outcomes of surgical techniques in congenital cataracts. Korean J Ophthalmol 2008; 22(2): 87-91.
31. Magli A, Forte R, Rombetto L. Long-term outcome of primary versus secondary intraocular lens implantation after simultaneous removal of bilateral congenital cataract. Graefe's Arch Clin Experimen Ophthalmol 2013; 251(1): 309-14.
32. Brunin G, Sajjad A, Kim EJ, de Oca IM, Weikert MP, Wang L, et al. Secondary intraocular lens implantation: complication rates, visual acuity, and refractive outcomes. J Cataract Refrac Surg 2017; 43(3): 369-76.
33. Sukhija J, Kaur S, Ram J. Outcome of primary intraocular lens implantation in infants: Complications and rates of additional surgery. J Cataract Refrac Surg 2016; 42(7): 1060-5.
34. Cicik ME, Doğan C, Bölükbaşı S, Cinhüseyinoğlu MN, Arslan OŞ. Comparison of two intraocular lens implantation techniques in pediatric cataract surgery in terms of postoperative complications. Balkan Med J 2018; 35(2): 186.
35. Meier PG, Majo F, Othenin-Girard P, Bergin C, Guber I. Refractive outcomes and complications after combined copolymer phakic intraocular lens explantation and phacoemulsification with intraocular lens implantation. J Cataract Refrac Surg 2017; 43(6): 748-53.