Saudi Journal of Ophthalmology (2011) **25**, 295–299

King Saud University

Saudi Journal of Ophthalmology

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ORIGINAL ARTICLE

The outcome of congenital cataract surgery in Kuwait

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Received 26 October 2010; revised 2 January 2011; accepted 7 January 2011
Available online 14 January 2011

KEYWORDS

Congenital cataract;
Children;
Visual function;
Kuwait

Abstract *Aim:* Congenital cataract is the most common cause of treatable blindness in children and the outcome of congenital cataract surgery has not been studied in Kuwait, so the purpose of this study is to evaluate the visual outcome and the postoperative complications.
Methods: Medical records of children who underwent congenital cataract surgery between September 2000 and December 2008 at Al-Bahar Eye Center, Ministry of Health of Kuwait were retrospectively reviewed. In 100 eyes that fill the inclusion criteria visual acuity and postoperative complications were recorded. The mean follow up was 3.9 ± 1.7 years with range from 3 to 6 years.
Results: The mean age of congenital/developmental cataract surgery is 8.9 ± 8.7 months for bilateral cases and it was 5.75 ± 4.61 months for unilateral cases. The mean final postoperative BCVA in unilateral cases was 1.0 (20/200) log MAR unit and it was 0.3 (20/40) log MAR unit for the

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Peer review under responsibility of King Saud University.
doi:10.1016/j.sjopt.2011.01.002

Production and hosting by Elsevier

bilateral cases. Four percent of the cases developed postoperative glaucoma and 2% of them developed significant opacification of the posterior capsule.

Conclusion: Our findings provide evidence of recent improvement over time in the visual prognosis in bilateral, and to a lesser degree, unilateral cataract, in children in Kuwait.

1. Introduction

Congenital cataract has a low incidence compared with adult cataract. The estimated incidence is about 1 to 6/10,000 births (Abrahamsson et al., 1999). Congenital cataract is the most common cause of treatable blindness in children (Foster et al., 1997). It is reported that infants with bilateral congenital cataract who underwent early surgery (performed within 1 month of age) and received appropriate optical rehabilitation could obtain visual acuity of better than 0.4 and could even achieve stereopsis (Lundvall and Kugelberg, 2002). The management of this disorder has long challenged clinicians, but the past few decades have seen the most significant changes in approaches to management, informed by basic scientific and clinical research (Daw, 1994; Taylor, 1998). Visual loss is mainly attributable to amblyopia, most important, to stimulus-form deprivation amblyopia with the additional factor of ocular rivalry in unilateral disease. Thus, enhanced understanding of critical periods of visual development has led to surgical intervention for congenital cataract being deemed necessary within the first 3 months of life, possibly as early as the first 6 weeks in unilateral disease (Daw, 1994; Taylor, 1998). The need to ensure early detection, to allow prompt treatment, has resulted in implementation of various strategies—in particular, whole population screening examinations of newborns in many countries. Concurrently, there have been improvements in methods for the assessment of visual acuity in preverbal children. Together, these advances have led to a shift in emphasis to the management of amblyopia through calibrated occlusion regimens (Ledoux et al., 2007). Equally important, there have also been major advances in microsurgical techniques and instrumentation matched by developments in contact lens and intraocular lens (IOL) technology (Lewis and Maurer, 2005). Improvements in all these aspects have together underpinned the better visual outcomes more recently reported in young children who undergo cataract extraction (Ledoux et al., 2007; Lewis and Maurer, 2005). To our knowledge, the results of long-term follow-up of congenital cataract in Kuwait have not been well documented.

2. Aim of the study

The purpose of this study was to evaluate the visual function results and postoperative complications of congenital cataract at a major tertiary referral center for ophthalmology in Kuwait.

3. Materials and methods

This is a retrospective study approved by the Al-Bahar Eye Center ethical committee in Kuwait. This center serves as the only referral tertiary eye center in Kuwait so that patients attending this hospital are representative of various Kuwaiti tribes and districts. All children diagnosed as congenital/developmental cataract in the period between September 2000 and December 2008 and fulfilling the inclusion criteria are enrolled in the study. The inclusion criteria were:

1. Children aged less than 2 years, with congenital/developmental cataract, no history of trauma and no associated ocular abnormality such as aniridia, microcornea, microphthalmia, glaucoma, any corneal abnormality or retinal detachment.
2. Eyes with axial length more than 17.50 mm.
3. Children completing a minimum of 2 years postoperative follow-up.
4. Children with no associated systemic congenital anomalies.

Detailed history was obtained from the parents of each child, age at presentation, time since presentation, age at cataract surgery, time since cataract surgery and compliance with occlusion regimen were recorded. All children underwent complete ocular evaluation and wherever necessary, examination under sedation with chloralhydrate was performed. Light fixation was recorded in each child. Pupillary reactions were carefully noted and whenever possible, slit-lamp biomicroscopy of anterior segment and intraocular pressure (IOP) measurement were done. Dilated fundus examination was performed in each child if possible. B-scan ultrasonography was performed to rule out any posterior segment abnormality in children where media were obscured due to cataract. Keratometry, axial length of each eye was measured and IOL power was calculated based SRK II formula; slight hypermetropia was targeted in accordance with age (Dahan and Drusedau, 1997). Before 2002, PMMA IOLs were used. More recently, three-piece acrylic foldable IOLs were implanted. IOLs were placed in the bag. Informed consent was obtained from the parents of all children explaining the risks of the surgical procedure and the need for repeated follow-up visits.

All children were done as a day case surgery. Two hours prior to surgery, pupil was dilated with tropicamide 1% and cyclopentolate 1% applied three times at 15 min intervals in each case. All surgical procedures were performed by the senior pediatric ophthalmology surgeons under general anesthesia. A small clear corneal incision was followed by entry into the anterior chamber using 2.8 mm keratome. Capsulotomy was done with capsulotomy cautery after injecting sodium hyaluronate 14 mg/ml (Healon GV®, Advanced Medical Optics Inc., Santa Ana, CA, USA) into the anterior chamber. Multiple quadrant hydrodissection was performed by injecting balanced salt solution plus under the capsulorrhexis margin (Vasavada et al., 2003). Nucleus and cortical aspiration was done using automated bimanual irrigation–aspiration. Primary posterior capsulotomy (PPC) was initiated with the capsulotomy cautery under high magnification. Anterior vitrectomy was done using automated vitreous cutter. An attempt was made to keep the size of anterior capsulorrhexis between 4.5 and 5 mm and that of PPC between 3.5 and

4 mm. The IOL was placed in the capsular bag. The corneal wound was closed with interrupted 10-0 nylon sutures. At the end of the surgical procedure, ceftazidime (25 mg) and dexamethasone sodium phosphate (2 mg) were given subconjunctivally. In cases of bilateral cataract the other eye was operated within 1 week. Each eye was separately analyzed.

Postoperatively topical ofloxacin 0.3% was used 4 times/day along with prednisolone acetate 1% every hourly in the first week. Topical drops were tapered over the next 6–8 weeks according to ocular inflammatory response. The children were followed up on day 1, day 5, at 2 weeks, 4 weeks, 8 weeks and then at 3-monthly intervals. At each follow-up visit, complete ocular examination including slit-lamp biomicroscopy was performed under chloralhydrate to note corneal clarity, IOL positioning and central media clarity and IOP measurement was done in all children. IOP was recorded by Perkins applanation tonometer. Secondary outcome measures assessed were fixation preference, steadiness, ocular alignment and retinoscopy. The cover test observations were carefully noted for fixation preference and steadiness. Any deviation of eye was recorded and thereafter dilated examination of retina was performed. Best corrected visual acuity (BCVA) was assessed at the age of 2 years with Kay single picture test and multiple tests. At the age of 3 years with the Sheridan-Gardiner test and after the age of 5 years VA was tested with Snellen's E-chart. The logarithm of the minimal angle of resolution (log MAR) was used for analysis. Vigorous amblyopia therapy was initiated within 1 week of surgery after retinoscopy and proper refractive correction with glasses aimed for near vision (2.5–3D were added for near correction). Retinoscopy was done by a single optometrist to avoid any subjective variation. Initial retinoscopy was done 1 week after surgery and then at every follow-up visit. Spectacle prescription was modified after refraction. All children included in the analysis adhered to subsequent follow-up schedule. The missed visit findings were adjusted to the nearest scheduled follow-up.

4. Results

The study included 100 eyes of 56 cases (12 cases were unilateral cataract) with congenital/developmental cataract. Age of surgery ranged from 18 days to 24 months. The mean age of surgery for bilateral cases was 8.9 ± 8.7 months 40% was operated upon by age of 3 months. The mean age of surgery for unilateral cases is 5.75 ± 4.61 months and 50% of them was operated upon by age of 3 months. Six (50%) eyes of the unilateral cases had 1ry IOL and 36 (41%) eyes of the bilateral cases had 1ry IOL.

Fifty-eight (58%) eyes were females. There are 82 eyes of 42 cases at age less than or equal to 1 year and 18 eyes of 14 cases were at age more than 1 year. The range of follow up is from 3 to 6 years with the mean of 3.9 ± 1.7 years. The mean final postoperative BCVA in unilateral cases was 1.0 (20/200) log - MAR unit and it was 0.3 (20/40) log MAR unit for the bilateral cases. 2ry IOL was performed between 3 and 5 years.

All (100%) the unilateral cases developed irreversible amblyopia which did not respond to vigorous amblyopia therapy. Thirty-six (41%) eyes of the bilateral cases develop irreversible amblyopia (Table 1).

The mean postoperative hypermetropia at 1 week in children less than 1 year was 6.45D ± 2.40D, whereas in children between 1 and 2 years it was 4.32D ± 1.56D.

4/100 (4%) eyes developed 2ry aphakic glaucoma, occurred 6 months postoperatively two of them respond to anti-glaucoma medications and the others did not, so glaucoma filtering procedure was done. Opacification of the periphery of the anterior and posterior capsule occurred in all the cases but only two cases (2%) showed central visually significant re-opacification and surgical membranectomy was done through anterior approach. One case (1%) developed aphakic retinal detachment after 1 year of surgery. No single case of endophthalmitis was seen in our study (Table 2).

5. Discussion

Congenital cataracts often cause severe visual impairment because of form deprivation during the sensitive period of visual development. In the present study, 40% of bilateral cases and 50% of unilateral ones were operated upon by age of 3 months. The mean BCVA of the bilateral cases was 20/40 and it was 20/200 in unilateral cases. These results are similar to those found in previous studies (Foster et al., 1997; Taylor, 1998; Ledoux et al., 2007), suggest that the timing of congenital cataract surgery is the most important factor for visual prognosis, with earlier cataract extraction having a better visual outcome. Patients with monocular cataracts have 2 predisposing factors for the development of amblyopia: binocular rivalry and visual deprivation (Drummond et al., 1989); and this can explain the difference of visual outcome between the bilateral and the unilateral cases despite vigorous amblyopia treatment.

Studies have shown that focused images on the immature retina in infancy during the critical period, which extends from 4 weeks to 4 months, are essential for adequate visual development (Lewis and Maurer, 2005; Dahan and Drusedau, 1997; Vasavada et al., 2003). The most critical period of motor fusion development is probably the first 2–4 months of life (Drummond et al., 1989; Vishwanath et al., 2004; Mohindra et al., 1985). To prevent interruption of visual maturation, continuous clarity and optical correction of the visual axis must be maintained. Early cataract extraction with accurate optical correction during the critical period is recommended

Table 1 Comparison between unilateral and bilateral cases.

	Unilateral cases	Bilateral cases
No. of cases	12 (12%)	88 (88%)
Mean age (months)	5.75 ± 4.61	8.9 ± 8.7
The mean final BCVA	20/200	20/40
Irreversible amblyopia	All of them	36 (41%)

BCVA: Best corrected visual acuity.

Table 2 Postoperative complications.

The complication	No.
Aphakic glaucoma	4 (4%)
Central PCO	2 (2%)
Aphakic RD	1 (1%)

PCO: Posterior capsule opacification; RD: retinal detachment.

to avoid irreversible impairment of visual development. It is concluded that good visual outcomes could be achieved in the first 5–8 weeks of life, but the incidence of poor visual outcomes increased if surgery was delayed beyond 10 weeks of age (Mohindra et al., 1985).

On the other hand, the advantages of early surgical intervention must be weighed against a higher rate of complications, especially glaucoma, the most serious threat. It is observed that glaucoma was more common in eyes that underwent cataract surgery during the first 4 weeks of life than in those that had surgery later. It is reported that the 5-year risk of glaucoma in at least one eye was 50% in children undergoing bilateral lensectomies within the first month of life compared with 14.9% in children whose surgery was performed later (Vishwanath et al., 2004). In our current study, only 4 eyes (4%) developed glaucoma, all of them had cataract surgery beyond the age of 1 month and they were aphakic. A more recent study reported a decreased incidence of open-angle glaucoma (2.5%) in pseudophakic eyes (Hussin and Markham, 2009). The authors proposed that the IOL acts as a barrier between the vitreous and trabeculum, preventing a vitreous chemical component from acting on the trabeculum, and this may explain the low incidence of glaucoma in our study as 50% of the unilateral cases and 41% of the bilateral cases had 1ry IOL under the age of 2 years and 2ry IOL is implanted within 3–5 years of age.

The standard surgery for infants less than 6 months old is lens aspiration with primary posterior capsulotomy and anterior vitrectomy (Lambert and Drack, 1996). Whether IOL should be implanted in infants less than 6 months old is still controversial, although there are increasing numbers of surgeons opting for intraocular lens (IOL) implantation for patients less than 6 months old (Lambert et al., 2003). The ongoing USA multicentre trial – Infant Aphakia Treatment Trial – may provide an answer to this issue. There is increasing evidence that IOL implantation is safe for patients under 2 years old (O'Keefe et al., 2001; Hutchinson et al., 1998). In our study 50% of the unilateral cases and 41% of the bilateral cases had 1ry IOL under the age of 2 years. Recently it is reported that primary implantation of IOL is safe for infantile cataract from 6 to 12 months of age (Lu et al., 2010).

In children less than 2 years, the axial length changes rapidly in contrast to those more than 2 years old, where these changes are slower. Therefore it has been found practical to rely on the axial length alone when the IOL dioptric power is chosen for infants (Dahan and Drusedau, 1997). A large myopic shift is to be expected and it is recommend to undercorrect these children with IOLs, so that they can grow into emmetropia/mild myopia in adult life (Dahan and Drusedau, 1997). Our study showed no major refractive surprises while adopting this strategy for IOL power calculation. It is also likely that the children would be emmetropic or slightly myopic by the time they would be school going, which is the desirable outcome we aimed for. Determining the appropriate IOL power for an infant eye poses a unique challenge. The major changes in axial length occur in the first 2 years of life (Gordon and Donzis, 1985). This makes IOL implantation in these infants more unpredictable and significant under-correction must be done to achieve a near normal refractive status in adult life. The issues to be considered are increase in the axial length and refractive change in the developing eye and special consideration has to be given to the reliability of IOL formulae in predicting postoperative refraction. Griener et al. reported a reduction in axial growth in infantile eyes following IOL implantation and concluded that this probably reduces the magnitude of the myopic shift in these eyes (Griener et al., 1999). O'Keefe et al. reported a mean myopic shift of 6.0D after a mean follow-up of 41 months (O'Keefe et al., 2000). The major drawback of under-correcting an infant eye is that the eye becomes hypermetropic and needs repeated spectacle correction. in our study we depend on Awner et al. (1996) and Buckley et al. (1993) who advocated a postoperative refraction of +4.0D for children under 2 years, +3.0D for those 2–4 years old, +2.0D for children 4–6 years old, +1.0D for those 6–8 years old, and emmetropia in children over 8 years old, adjusting for the fellow eye to avoid anisometropia greater than 3.00D.

The surgical approach to cataract extraction and IOL implantation in younger children require careful consideration of posterior capsule management. Opacified posterior capsule (PCO) is very common after cataract extraction in children, which can present an amblyogenic hazard. Strategies to maintain a clear visual axis are therefore necessary to achieve visual rehabilitation in such cases. Trivedi et al. reported visual axis opacification in 37.9% of children less than 1 year of age even though a PPC with anterior vitrectomy had been performed (Trivedi et al., 2004). It is found that the anterior vitreous face is more reactive in infants and can act as a scaffold not only for lens epithelial cell proliferation but also pigment epithelial cells, fibrinous exudates and cells that result from the breakdown of the blood aqueous barrier (Vasavada and Desai, 1997). In their series, opacification of the visual axis was found in 62.5% of cases where anterior vitrectomy was not performed along with PPC, whereas PPC coupled with anterior vitrectomy ensured that no eye had PCO. In our series, we noted re-opacification of the visual axis in 2% of the eyes despite PPC and anterior vitrectomy.

The occurrence of rhegmatogenous retinal detachment after paediatric cataract surgery is one of the late complications. There is scant literature regarding this issue. The reported average interval between lens operation and retinal detachment is 23–34 years (Yorston et al., 2005). Seventy-two percent of the detachments occurred after more than 10 years (Yorston et al., 2005). It has been suggested that the detachment rate in children after cataract surgery is similar to that in adults, but the incidence of this complication in childhood is likely to be underestimated, given the relatively short follow-up periods of most studies. In our study 1% of the cases developed aphakic retinal detachment and retinal reattachment surgery was done.

6. Conclusion

Our findings provide evidence of recent improvement over time in the visual prognosis in bilateral, and to a lesser degree, unilateral cataract, in children in Kuwait. This improvement has been achieved through earlier detection and referral of affected children for appropriate surgical, medical, and optical treatment. Nevertheless, there is room for further improvement, which will necessitate continued implementation of existing effective screening and treatment strategies together with research-based innovation in these

areas, to achieve the international goal of reducing the burden of avoidable childhood visual impairment due to congenital cataract.

References

Abrahamsson, M., Magnusson, G., Sjostrom, A., Popovic, Z., Sjostrand, J., 1999. The occurrence of congenital cataract in western Sweden. Acta Ophthalmol. Scand. 77, 578–580.

Awner, S., Buckley, E.G., DeVaro, J.M., Seaber, J.H., 1996. Unilateral pseudophakia in children under 4 years. J. Pediatr. Ophthalmol. Strabismus 33, 230–236.

Buckley, E.G., Klomberg, L.A., Seaber, J.H., Scalise-Gordy, A., Minzter, R., 1993. Management of the posterior capsule during pediatric intraocular lens implantation. Am. J. Ophthalmol. 115, 722–728.

Dahan, E., Drusedau, M.U., 1997. Choice of lens and dioptric power in pediatric pseudophakia. J. Cataract Refract. Surg. 23 (Suppl. 1), 618–623.

Daw, N., 1994. Mechanisms of plasticity in the visual cortex. The Friedenwald Lecture. Invest. Ophthalmol. Vis. Sci. 35, 4168–4179.

Drummond, G.T., Scott, W.E., Keech, R.V., 1989. Management of monocular congenital cataracts. Arch. Ophthalmol. 107, 45–51.

Foster, A., Gilbert, C., Rahi, J., 1997. Epidemiology of cataract in childhood: a global perspective. J. Cataract Refract. 23 (1), 601–604.

Gordon, R.A., Donzis, P.B., 1985. Refractive development of the human eye. Arch. Ophthalmol. 103, 785–789.

Griener, E.D., Dahan, E., Lambert, S.R., 1999. Effect of age at time of cataract surgery on subsequent axial length growth in infant eyes. J. Cataract Refract. Surg. 25, 1209–1213.

Hussin, H.M., Markham, R., 2009. Long-term visual function outcomes of congenital cataract surgery with intraocular lens implantation in children under 5 years of age. Eur. J. Ophthalmol. 19 (5), 754–761.

Hutchinson, A.K., Wilson, M.E., Saunders, R.A., 1998. Outcomes and ocular growth rates after intraocular lens implantation in the first 2 years of life. J. Cataract Refract. Surg. 24, 846–852.

Lambert, S.R., Drack, A.V., 1996. Infantile cataracts. Surv. Ophthalmol. 40, 427–458.

Lambert, S.R., Lynn, M., Drews-Botsch, C., DuBois, L., Wilson, M.E., Plager, D.A., et al., 2003. Intraocular lens implantation during infancy: perceptions of parents and the American Association for Pediatric Ophthalmology and Strabismus members. J. AAPOS 7, 400–405.

Ledoux, D.M., Trivedi, R.H., Wilson Jr., M.E., Payne, J.F., 2007. Pediatric cataract extraction with intraocular lens implantation: visual outcome when measured at age four years and older. J. AAPOS 11, 18–224.

Lewis, T.L., Maurer, D., 2005. Multiple sensitive periods in human visual development: evidence from visually deprived children. Dev. Psychobiol. 46, 163–183.

Lu, Yi, Ji, Ying-Hong, Luo, Yi, Jiang, Young-Xiang, Wang, Man, Chen, Xu, 2010. Visual results and complications of primary intraocular lens implantation in infants aged 6 to 12 months. Grafes Arch. Clin. Exp. Ophthalmol. 248, 681–686.

Lundvall, A., Kugelberg, U., 2002. Outcome after treatment of congenital bilateral cataract. Acta Ophthalmol. Scand. 80, 593–597.

Mohindra, I., Zwaan, J., Held, R., Brill, S., Zwaan, F., 1985. Development of acuity and stereopsis in infants with esotropia. Ophthalmology 92, 691–697.

O'Keefe, M., Mulvihill, A., Yeoh, P.L., 2000. Visual outcome and complications of bilateral intraocular lens implantation in children. J. Cataract Refract. Surg. 26, 1758–1764.

O'Keefe, M., Fenton, S., Lanigan, B., 2001. Visual outcomes and complications of posterior chamber intraocular lens implantation in the first year of life. J. Cataract Refract. Surg. 27, 2006–2011.

Taylor, D., 1998. Congenital cataract: the history, the nature and the practice: The Doyne Lecture. Eye 12, 9–36.

Trivedi, R.H., Wilson Jr., M.E., Bartholomew, L.R., Lal, G., Peterseim, M.M., 2004. Opacification of the visual axis after cataract surgery and single acrylic intraocular lens implantation in the first year of life. J. AAPOS 8, 156–164.

Vasavada, A., Desai, J., 1997. Primary posterior capsulorrhexis with and without anterior vitrectomy in congenital cataracts. J. Cataract Refract. Surg. 23, 645–651.

Vasavada, A.R., Trivedi, R.H., Apple, D.J., Ram, J., Werner, L., 2003. Randomized, clinical trial of multiquadrant hydrodissection in pediatric cataract surgery. Am. J. Ophthalmol. 135, 84–88.

Vishwanath, M., Cheong-Leen, R., Taylor, D., Russell-Eggitt, I., Rahi, J., 2004. Is early surgery for congenital cataract a risk factor for glaucoma? Br. J. Ophthalmol. 88, 905–910.

Yorston, D., Yang, Y.F., Sullivan, P.M., 2005. Retinal detachment following surgery for congenital cataract: presentation and outcomes. Eye 19, 317–321.