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Original Article

Pediatric Cataract Surgery Outcomes in Kano, Nigeria

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Abstract

Objective: To report the outcomes of pediatric cataract surgery over a 7-year period in a mission hospital in northern Nigeria. **Patients and Methods:** We retrospectively examined the notes of 230 consecutive children aged 16 years and younger, who underwent bilateral cataract surgery by a single surgeon. The patients' demographic, preoperative, and postoperative clinical details were analyzed. Details regarding the eye with the better postop vision were used in the analysis. **Results:** A total of 230 patients were included, of which 148 (64.4%) were boys. Age at presentation ranged from 1 month to 16 years, with a mean of 4.89 years and standard deviation of 4.21 years. Median delay for presentation was 12 months, with an interquartile range of 4–36 months. Visual acuity at presentation in the selected operative eye was normal in 2 (0.91%) patients and blind in 179 (81.4%) patients. Best-corrected postop vision was normal in 63 (31.5%) patients, visually impaired in 62 (31.0%) patients, severely visually impaired in 23 (11.5%) patients, blind in 52 (26.0%) patients, and not recorded in 30 (13.0%) patients. A total of 114 (49.8%) patients were prescribed glasses. Median follow-up was 1 month (interquartile range 0.5–3 months). **Conclusion:** Although a majority of the children were blind in the operative eye prior to surgery, over a quarter achieved normal vision after surgery. Factors that may improve outcomes in this setting include prescribing glasses to all and facilitating increased follow-up.

Keywords: Pediatric cataract, surgery, visual outcomes

Introduction

Cataracts are an important, treatable cause of childhood blindness worldwide.[1] There are many charities committed to finding and treating children with cataracts in sub-Saharan Africa. The key informant method estimates the prevalence of severe visual impairment or blindness in children in Nigeria as 0.02%, with the primary cause of visual impairment being cataract in 15% of these children.[2] Visual outcomes following surgery are determined by time taken to present for surgery, associated ocular pathologies, surgical technique including biometry and intraocular lens availability, postoperative management including refractive correction, and the uptake of follow-up to treat amblyopia, posterior capsular opacification, glaucoma, and other complications.

Patients and Methods

Our study examines the outcomes of pediatric cataract surgery in a mission hospital in Nigeria. Most children in the study were identified as having cataracts in the Seeing is Believing program funded by the Standard Chartered Bank. The screening program was coordinated by the community-based VISION 2020 support program. It was administered by Christian Blind Mission and the state government-run community program. In addition, a local nongovernmental organization, Maana foundation, contributed to the identification of children and payment for cataract services. Together these programs funded one-third of the bill for the following: preoperative visit, surgery and inpatient stay, postoperative drops, and postoperative visits. Some children were self-referred. Those that could afford it paid the full cost of treatment of 50,000 Naira (US$350) per eye. Those that could not afford treatment were paid for by the hospital. Because the hospital is a not-for-profit organization, monies raised from treating some patients are used to pay for

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treating others. Foldable intraocular lenses were donated. VISION 2020 LINK program focused on training nurses and optometrists to support the surgeon and assess children's visual acuity accurately, perform biometry, refract and prescribe glasses to children, and manage children's general anesthesia safely.

All patients aged 16 and under who had bilateral cataract surgery between 2008 and 2014 identified through the paper records of the operation theatre were included in the study. A total of 230 patients were identified; no patients were excluded. We included those with incomplete data such as no recorded visual acuity and very short follow-up time. All surgeries were performed by one surgeon (SA). Demographic, preoperative, surgical, and postoperative data were collected from the patients' files and entered into an Excel spreadsheet. Data collection was anonymized. We followed the tenets of the Declaration of Helsinki.

Visual acuities were measured by the following age-appropriate test: Snellen, Kay pictures, Cardiff cards, or fixation patterns. We report using the World Health Organizations' classification of vision, that is, normal is ≥6/18, visual impairment is <6/18 to 6/60, severe visual impairment is <6/60 to 3/60, and blind is <3/60. Postoperative vision was recorded with the refractive error corrected in a trial frame at Day 3 postoperatively and on follow-up visits with glasses or the prescription in a trial frame. Children were analyzed according to the postoperative acuity in their better seeing eye.

A-scan and handheld keratometry were performed either preoperatively or after the induction of anesthesia on all patients intended to have an intraocular lens. Children <6 months of age and those with microcorneas were planned to be left aphakic. In those planned to have an intraocular lens, it was placed only if the anterior capsulorrhexis was complete. This was uncommon in children <12 months of age. The power of the lens was calculated using the SRK/T2 formula.[3] A lens was chosen that was 20% less power than required for emmetropia if the child was <24 months old. A 10% reduction was chosen for children aged between 2 and 6 years of age. Emmetropia was aimed for in children over 6 years of age. A variety of intraocular lenses were used, both rigid and foldable; further details on choice of lens are outlined below.

The surgical techniques were as follows:

All patients had one drop of cyclopentolate 1%, phenylephrine 5%, and ofloxacin 0.3% instilled and repeated three times over 30 min. Following the induction of general anesthesia, 10% povidine iodine was applied to the periorbital skin and 1% povidine iodine instilled into the conjunctival sac. A drape was applied. A 4-0 silk bridal suture was placed under the superior rectus. A 5-ml solution of balanced salt solution (BSS) with four drops of phenylephrine 5% added was injected intracamerally. This results in a marked increase in pupil dilatation. A range of different viscoelastics were used.

A nonfoldable intraocular lens insertion was routinely planned for the patients before 2010; in addition, this method was planned for all patients who had had ocular trauma that had disrupted the anterior segment.

A limbal conjunctiva incision was made, and a straight 6.5-mm wide scleral tunnel was prepared. A 9 O'clock corneal incision was made. Thereafter, a capsulotomy was performed. The lens was inserted into either the bag or the sulcus depending on the stability of the bag. If the lens was not known to be in the bag, a peripheral iridectomy was performed. The main wound was closed with two or three interrupted 10-0 nylon sutures, and the side wound closed with one suture.

When a foldable intraocular lens insertion was planned, a two-stepped limbal incision with a keratome 2 mm in width was made at 11 O'clock position. In addition, a 1.5-mm corneal incision at 9 O'clock position was made. Trypan blue was instilled followed by a washout with balanced salt solution; then, the anterior chamber was filled with viscoelastics. A bent 27 G was used to nick the center of the anterior capsule, and a capsulorrhexis forceps was used to make a continuous curvilinear capsulorrhexis. A simcoe cannula was used to aspirate the lens matter through both incision ports. Viscoelastics were instilled and a foldable lens injected into the bag and dialed into position. In children under 6 years of age, more viscoelastics were instilled, and a vitrector was used to go behind the lens and make a posterior capsulotomy and anterior vitrectomy. In children of 6 years and above, the posterior capsule was left intact. Viscoelastics were removed and the two wounds sutured with one 10-0 nylon suture each.

For those planned to be left aphakic, a two-stepped limbal incision with a keratome 2 mm in width was made at 11 O'clock position. A capsulotomy (can opener) was performed with a bent 27G needle. The lens matter was aspirated with a simcoe cannula. Viscoelastics were instilled, and a vitrector was used to make a posterior capsulotomy and an anterior vitrectomy. No peripheral iridectomy was performed. Care was taken that the pupil was round, and there was no vitreous to the wound. The single wound was closed with one 10-0 nylon suture.

In some cases, an intracameral air bubble was placed and left in position thereafter. Intracameral injections of dexamethasone (0.1 mg in 0.5 ml in all patients except those having a nonfoldable intraocular lens (IOL) placed; these patients were given 0.2 mg in 1 ml) and cefuroxime (0.1 mg in 0.1 ml) were given. Subconjunctival injections were given with dexamethasone 0.5 mg in 0.25 ml and gentamicin 15 mg in 0.2 ml. Atropine 1% and ofloxacin were instilled and a pad placed for 24 h. Dexamethasone 1% was prescribed hourly for the first 4 days, then four times a day for 2 weeks, twice a day for 1 week, and once a day for 1 week. If there was a significant anterior chamber reaction postoperatively, the frequency and duration of dexamethasone were increased. Atropine 1% was prescribed once a day for 2 weeks.

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In children <24 months of age, atropine 1% ointment rather than drops were used to reduce the side effect of a raised temperature. Ofloxacin was prescribed four times a day for 4 weeks.

All sutures were not routinely removed. The side port suture in the first eye was removed at the time of the second eye's surgery.

All patients were hospitalized postoperatively for 4 days. During this period, the nurses instilled the drops. They were refracted on Day 3 and their visual acuity recorded with the corrective lenses in the trial frame. They were readmitted 2 weeks later for the second eye. At postoperative visits, visual acuity was recorded. A loupe examination was performed for those not able to be examined at the slit lamp, or else a slit lamp examination was performed. A handheld tonometer was used to measure the intraocular pressure. Refraction was checked and glasses prescribed at follow-up for those that attended. Two hours daily patching was prescribed at the first outpatient visit if the visual acuity was poor. The patients were encouraged to return for follow-up.

Statistical methods

The distributions of the characteristics of the participants were presented as frequency (percentage) for categorical variable and mean (standard deviation) or median (interquartile range) for continuous variable. Linear regression for the effects of potential variables on best-corrected visual acuity after cataract surgery was applied for the following factors: age at surgery, gender, delay in presentation, the presence of nystagmus, associated eye problems, postoperative complications, glasses prescribed, and the length of follow-up. Variables with *P*-value <0.05 in simple regression were included in multiple regression analysis. All statistical analyses were performed using a commercially available software package (Stata 13.1, StataCorp, College Station, TX, USA).

Results

A total of 230 pediatric patients had bilateral cataract surgery during the study period. Among the patients, 148 (64.4%) were boys. Age at presentation ranged from 1 month to 16 years, with a mean of 4.89 years and standard deviation of 4.21 years. Median delay to presentation was 12 months, with an interquartile range of 4–36 months. There were no data on delay to presentation in 38 (16.5%) patients.

Three patients had microcorneas, four had corneal scars, one had an iris coloboma, and fourteen had strabismus. Sixty-four (28.1%) patients had nystagmus.

Preoperatively, two patients had normal vision, and 81.4% were blind. Postoperative vision was recorded with corrective lenses in a trial frame on Day 3 postop or at first postoperative visit. For those attending subsequent follow–up, vision recorded was best corrected. Postoperative vision was normal in 63 (31.5%) patients, visually impaired in 62 (31.0%) patients, severely visually impaired in 23 (11.5%) patients, and blind in 52 (26.0%) patients. There was no quantitative visual acuity recording in 30 (13%) patients postoperatively.

About half of the patients, that is, 114 (49.8%) patients, were prescribed glasses. Median follow-up was 1 month (interquartile range 0.5–3 months).

Complications

Fifteen patients had high intraocular pressure recordings postoperatively; one patient had corneal edema. As the length of follow-up was short, it is not known how many patients had persistent glaucoma findings when postoperative inflammation had settled and topical steroid treatment had been stopped. One patient had corneal edema with no raised intraocular pressure; four had significant posterior capsular opacity, one had posterior synechiae, and one had iris capture.

In multiple regression analysis, better postoperative vision in LogMAR was seen with older age at the time of surgery (coefficient estimate (β): −0.05, 95% confidence interval (CI): −0.07, −0.03, $P < 0.001$). Worse postoperative visual acuity was seen in those with preoperative vision <3/60 β: 0.41, 95% CI: 0.20–0.61, $P < 0.001$ and nystagmus β: 0.23, 95% CI: 0.06–0.40, $P = 0.010$. Postoperative complications had no statistically significant effect on the better postoperative vision β: 0.09, 95% CI: −0.16, 0.33, $P = 0.483$. The length of follow-up did not have a statistically significant effect on visual acuity outcome: A simple regression analysis of this gave a coefficient estimate of −0.0005, 95% CI: −0.01, 0.01, $P = 0.921$ [Table 1].

Discussion

Visual acuity outcomes

Our visual acuity results were comparable with those from Africa,[4-8] but considerably worse than outcomes achieved in developed countries.[9] A report from Kaduna in Nigeria showed an achievement of normal vision in 8/73 (10.96%) eyes with recorded acuities 1 week postoperatively.[4] A study from Calabar detailed that 35/66 (53%) children with congenital or developmental cataract achieved normal vision at 6 weeks of follow-up.[5] Furthermore, a study from Enugu reported normal vision in 5/15 (33%) of post-cataract surgery eyes with 12 weeks of follow-up. [6] In a study from Kenya on children treated for bilateral, nontraumatic cataracts, 37% (44/118) of the children achieved normal vision.[7] A Tanzanian study of children treated for bilateral cataracts reported 50/118 (42%) of first eyes achieving normal vision.[8] A report from Toronto had much better outcomes with the postop visual acuities of ≥6/9 in about 75% of children with bilateral aphakia and pseudophakia.[9]

Vision may have been underestimated in some of our children due to a lack of cooperation and interest in tests, the lack of

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Table 1: Linear regression for the effects of potential factors on best-corrected postoperation visual acuity in the better seeing eye (LogMAR) after cataract surgery ($N = 230$)

Variable	Simple regression		Multiple regression*	
	Coefficient estimates (95% CI)	*P* value	Coefficient estimates (95% CI)	*P* value
Age (year)	–0.07 (–0.09, –0.05)	<0.001	–0.05 (–0.07, –0.03)	**<0.001**
Male sex	–0.004 (–0.18, 0.18)	0.965		
Preoperation visual acuity ≤3/60	0.67 (0.47, 0.88)	<0.001	0.41 (0.20, 0.61)	**<0.001**
Length of symptoms (month)	–0.003 (–0.005, <0.001)	0.052		
Length of follow-up (month)	–0.0005 (–0.01, 0.01)	0.921		
Nystagmus (yes)	0.37 (0.18, 0.55)	<0.001	0.23 (0.06, 0.40)	**0.010**
Glasses worn (yes)	0.16 (–0.008, 0.34)	0.062		
Associated eye problems (yes)	–0.08 (–0.39, 0.22)	0.588		
Postoperation complications (yes)	0.30 (0.02, 0.58)	0.037	0.09 (–0.16, 0.33)	0.485

*Variables with *P*-value <0.05 in simple regressions were included in the multiple regression. Bold characters relate to a P value < 0.05.

availability of tests, and short follow-up times. This may in part account for why older age was associated with better postoperative visions. Cardiff cards (a preferential looking test) and Kay pictures were introduced following a VISION 2020 LINK program activity in 2010. Prior to that, Snellen acuities, fixation patterns, and awareness of light were assessed. Children seeing light and movement were recorded as < 3/60: blind. Wearing glasses did not statistically improve visual outcome, but this was likely due to short follow-up times. Therefore, maximum improvement in deprivation and refractive amblyopia was not recorded.[10] Our follow-up was poor, with 76% not being seen after 1 month. Of note, many of the patients were not brought by their family for surgery but by the individuals from Seeing is Believing program and the Maana foundation. These programs also tried to facilitate postop visits. To improve follow-up, it requires further investment.[11] Mobile phone text reminders may help,[12] but the time and cost needed to travel long distances are prohibitive for many.[13]

The delay in our patients presenting was a median of 12 months. Significant childhood cataracts should be removed as soon as possible to prevent the occurring of intractable deprivation amblyopia. The earlier significant congenital cataracts are removed, the better the potential visual outcome.[14] However, surgery at a very young age increases the risk of general anesthesia and the risk of secondary glaucoma.[14,15] Standard aims in the United Kingdom are to remove dense bilateral congenital cataracts by 8–10 weeks of life[16] and dense unilateral congenital cataracts by 6–8 weeks of life.[17] However, encouragingly for surgeons seeing children with a delay in presentation, a recent Indian study reported good visual acuity outcomes in 53 children with bilateral congenital cataracts who had late surgery. They included only the patients with cataracts noted in the first 6 months of life and removed when the child was over 8 years of age. All patients had preop nystagmus and a preoperative vision of less than finger counting at 1.5 m in both eyes. They found that mean vision improved to 6/60 for distance. 25% (10) of the patients improved achieved normal vision.[10]

We had no patients with endophthalmitis. All patients received preoperative povidine iodine 1% to the conjunctival sac and intracameral cefuroxime and were managed as inpatients for the first four postoperative days. In our study, 15 children developed high intraocular pressure during follow-up, seven of whom had follow-up for 2 months or longer. It is possible that with longer follow-up, more cases of glaucoma would have been diagnosed. An Australian study of 101 patients who had cataract surgery within the first year of life found that 32% of eyes developed glaucoma with a higher incidence in those with earlier surgery and longer follow-up.[15]

A recent study of 66 children with cataracts in Nigeria found that 45.5% clinically had congenital rubella syndrome.[18] It is likely that this diagnosis was overlooked in some of our patients.

Conclusion

Our visual outcomes following pediatric cataract surgery are not as good as those reported in developed countries. Factors associated with poor outcomes in our group—poor presenting visual acuity and the presence of nystagmus—are difficult to modify. Accurate visual acuity assessment, the facilitation of follow-up to enable wearing glasses, and identification and the treatment of complications are key areas that need to be optimized in our population.

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Conflicts of interest

There are no conflicts of interest.

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