Surgical Technique and Postoperative Complications in Pediatric Cataract Surgery: Retrospective Analysis of 21 Cases

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Aim. To evaluate postoperative complications of different surgical techniques for cataract treatment in children.

Methods. We reviewed clinical records of 21 children (33 eyes) who underwent cataract surgery between January 1998 and December 2002. The median age of children at the time of cataract surgery was 39 months (range, 4-115 months). The median follow up was 26 months (range, 6-58 months). A posterior continuous curvilinear capsulorhexis with anterior vitrectomy was performed in 24 eyes, and posterior continuous curvilinear capsulorhexis without anterior vitrectomy in 9 eyes (children older than 7 years). Nine eyes were left aphakic and intraocular lens was implanted in 24 eyes.

Results. Opacification of the visual axis was the most frequent complication. One of nine eyes in the group of children undergoing posterior continuous curvilinear capsulorhexis developed posterior capsule opacification. This also occurred in 6 out of 24 eyes with posterior continuous curvilinear capsulorhexis and anterior vitrectomy. In 5 eyes with secondary opacification Nd:YAG laser capsulotomy was performed as a secondary procedure. In uncooperative children (2 eyes) more extensive anterior vitrectomy was repeated. Other postoperative complications included aphakic glaucoma (n=1), synechia formation (n=4), intraocular lens deposits (n=2), and pupil capture (n=1).

Conclusions. The main complication in the pediatric cataract surgery was posterior capsule opacification, and the management of posterior capsule seems to be a very important factor. In younger children, cataract surgery with posterior capsulorhexis and anterior vitrectomy was advantageous, whereas in older children a clear visual axis was achieved without vitrectomy.

Key words: capsulorhexis; cataract; cataract extraction; child; complications; infant; vitrectomy
capsule intact in children predisposes to an unacceptably high rate of capsule opacification (11-13). Many surgical maneuvers and tools have been used to minimize or eliminate visual axis opacification. Removal of the posterior capsule, ie, posterior continuous curvilinear capsulorhexis with anterior vitrectomy, has been the gold standard in the treatment of children. Long-term complications such as retinal detachment and cystoid macular edema after anterior vitrectomy have not been studied extensively. Many surgeons do not perform anterior vitrectomy in older children (12-15).

We evaluated postoperative complications in children who had cataract surgery with and without anterior vitrectomy. In children younger than 7 years, we performed cataract surgery using posterior continuous curvilinear capsulorhexis with anterior vitrectomy, whereas in children older than 7 years we performed posterior continuous curvilinear capsulorhexis without vitrectomy.

Patients and Methods

Patients

Between 1998 and 2002, 11 boys and 10 girls (33 eyes) were surgically treated for congenital cataract at Department of Ophthalmology, Sisters of Mercy University Hospital. Eyes with a traumatic cataract or ocular abnormality (e.g., microphthalmos, coloboma, glaucoma, and uveal inflammation) were excluded from the study. Median age of the children was 30 months (range, 4-115 months). Complete ocular examination and slit lamp biomicroscopy were performed in all cases. In young or uncooperative children, the ocular examination was performed under general anesthesia. Nine eyes were left aphakic because of the patient age (1-2 years) and in 24 eyes intraocular lens was implanted (pseudophakia) in the capsular bag (AcrySof or HSM PMMA intraocular lens); median age of these children at cataract surgery was 47 months (range, 15-115).

Surgical Technique

All operations were performed by a single surgeon (ZM). General anesthesia was used in all patients. The initial approach was a 3.2-mm scleral tunnel 2 mm posterior to the limbus. Sodium hyaluronate 1.4% (Healon GV®, Pharmacia & Upjohn) was used as an initial viscoelastic. The capsular bag was then filled with a viscoelastic material Healon GV® and a posterior continuous curvilinear capsulorhexis with anterior vitrectomy. Posterior continuous curvilinear capsulorhexis was created with a diathermy needle in all eyes, and the size of posterior capsulorhexis was between 3.5 and 4.0 mm. Anterior vitrectomy was performed in 22 eyes (Fig. 1), and posterior continuous curvilinear capsulorhexis without anterior vitrectomy was performed in 9 eyes. In children aged 4-16 months (median, 12 months), ie, 11 eyes, an intraocular lens was not implanted (aphakia). In 22 eyes, an intraocular lens was implanted (pseudophakia) in the capsular bag (AcrySof or HSM PMMA intraocular lens); median age of these children at cataract surgery was 47 months (range, 15-115).

The median age at cataract surgery (Table 1) in the group of children undergoing only capsulorhexis was 82 months (range, 34-115), and in group undergoing anterior vitrectomy it was 18 months (range, 4-55). There was statistically significant difference in age between these two groups (p < 0.001).

Postoperative Evaluation

Postoperatively, all patients received topical dexamethasone 4 times a day tapered over 2 months, and cyclopentolate 1% once a day for 2 weeks. Postoperative examinations were performed at the Sisters of Mercy University Hospital. Patients were followed daily for 2 days postoperatively, once a week for the next 4 weeks, every 2 months for 6 months, and later every 6 months.

Ocular examination and slit lamp biomicroscopy were done in all cases. Fundus examination by direct and indirect ophthalmoscopy was used in young children to ensure clarity of the visual axis. In younger children and in the suspected presence of any postoperative complication, an examination with an operating microscope under general anesthesia was performed. All postoperative complications were noted (posterior capsule opacification, glaucoma, synechia formation, and intraocular lens deposits).

In cooperative children with posterior capsule opacification, neodymium:YAG (Nd:YAG) laser capsulotomy was performed. In young or uncooperative children, surgical procedure (repeated anterior vitrectomy and membranectomy) was done under general anesthesia.

Statistical Analysis

Data were presented as median with range. Differences between age groups were tested by the Mann-Whitney U-test. Statistical significance level was set at p < 0.001. The difference in the most frequent postoperative complication (posterior capsule opacification) was tested with the Fisher’s exact test.

Results

Demographic Characteristics

The cataracts were bilateral in 12 children and unilateral in 9 children. A posterior continuous curvilinear capsulorhexis with anterior vitrectomy was performed in 24 eyes (Fig. 1), and posterior continuous curvilinear capsulorhexis without anterior vitrectomy was performed in 9 eyes. In children aged 4-16 months (median, 12 months), ie, 11 eyes, an intraocular lens was not implanted (aphakia). In 22 eyes, an intraocular lens was implanted (pseudophakia) in the capsular bag (AcrySof or HSM PMMA intraocular lens); median age of these children at cataract surgery was 47 months (range, 15-115).

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Postoperative Complications

Postoperative capsule opacification was the most frequent complication (Table 2). One out of 9 eyes in children that had posterior capsulorhexis without vitrectomy developed posterior capsule opacification, compared with 6 out of 24 eyes in children with anterior vitrectomy. There was no statistically significant difference in the incidence of posterior capsule opacification between these two groups (p = 0.642).

In cooperative children (5 eyes) with posterior capsule opacification Nd:YAG capsulotomy was performed as a secondary procedure, and in one case the procedure was repeated. In 2 out of 24 eyes a more extensive anterior vitrectomy was repeated and capsulorhexis with vitrectomy performed. Aphakic glaucoma developed in one eye 8 months postoperatively. Synechiae formation was detected in one out of 9 eyes with posterior capsulorhexis and without vitrectomy, and in 3 out of 24 eyes with posterior capsulorhexis and anterior vitrectomy. In one pseudophakic eye that had posterior capsulorhexis and anterior vitrectomy, a pupil capture occurred (Fig. 2). Giant inflammatory cell deposits were detected in 2 eyes, one with an implanted HSM PMMA (Fig. 3) and one with AcrySof intraocular lens. We found no postoperative complications attributed to the anterior vitrectomy, such as retinal detachment and cystoid macular edema.

Discussion

Our results showed that posterior capsule opacification was the major complication of the pediatric cataract surgery. It developed in one out of 9 eyes where posterior capsulorhexis with no vitrectomy was done, and children were older than 7 years. In 6 out of 24 eyes, posterior capsule opacification developed although the surgery was performed with anterior vitrectomy. Despite improvements in surgical techniques, children that undergo cataract surgery still have a high incidence of posterior capsule opacification. Due to the shallow anterior vitrectomy, lens epithelial cells grew over the anterior vitreous face. Additionally, more aggressive anterior vitrectomy was performed. The extent of the vitrectomy, as well as the size of capsulorhexis may be associated with the proliferation of lens epithelial cells. Higher incidence of posterior capsule opacification in this group may be explained with significantly younger age of patients, where lens epithelial cells show more aggressive behavior. As this was a retrospective study, the amount of anterior vitrectomy could not be analyzed.

Posterior synechias occurred in 4 eyes in our series, and deposits on anterior intraocular lens surface (giant cells) in 2 eyes. Higher incidence of uveal inflammatory reaction was noted in the group with posterior capsule opacification and vitrectomy, which can be attributed to the age of our patients. This group was significantly younger, and immature trabecular meshwork with decreased fibrinolytic activity as well
as breakdown of the blood aqueous barrier might be associated with a higher inflammatory reaction.

There are different opinions on the management of the posterior capsule during pediatric cataract surgery. The reported incidence of posterior capsular opacification when the posterior capsule is left intact is 43.5-100% (11-17). Primary posterior capsulorhexis alone does not guarantee a permanently clear visual axis because anterior surface of the vitreous serves as a scaffold for the lens epithelial cells to migrate into the pupillary axis. Also, children capsule is highly elastic, allowing us to use diathermy as the technique for performing controlled anterior and posterior continuous curvilinear capsulorhexes. All capsules in our series were with no radial tears or vitreous hemaion.

In younger children, anterior vitrectomy with posterior continuous curvilinear capsulorhexis reduces the opacification of the visual axis. However, it is impossible to say exactly at what age anterior vitrectomy should be performed, and many studies report different results. Basti et al (13) performed primary posterior capsulotomy with anterior vitrectomy in children younger than 8 years. Vasavada and Desai (18) suggested that anterior vitrectomy with posterior continuous curvilinear capsulorhexis was desirable in children with congenital cataracts younger than 5 years. In 5 out of 8 eyes in which posterior continuous curvilinear capsulorhexis with no vitrectomy was performed, visual axis was obscured and secondary procedure was needed. Koch and Kohnen (12) reported 20 eyes that underwent various methods of managing the posterior capsule and anterior vitreous. No eye having a posterior continuous curvilinear capsulorhexis with anterior vitrectomy developed visually significant secondary cataract. The study included only children older than 1.5 years (1.5-12 years) and 6 eyes that underwent posterior continuous curvilinear capsulorhexis with anterior vitrectomy. Kugelberg and Zetterström (19) reported secondary cataract formation in 85 eyes undergoing cataract surgery with or without anterior vitrectomy according to age (patients aged 0-15 years). They suggested that cataract surgery with anterior vitrectomy should be performed in younger children. Dahan and Salmenson (20) recommended posterior capsulorhexis and anterior vitrectomy in children younger than 8 years. Fenton and O’Keefe (21) reported an opacification rate of 15.6% after performing posterior capsulorhexis with no anterior vitrectomy over a mean follow up of 19 months.

The reported incidence of open angle glaucoma following pediatric cataract surgery ranges from 3-41% (22-24). The pathogenesis of aphakic glaucoma after pediatric cataract surgery is unknown. Some theories include increased inflammation, residual lens material, and a chemical vitreous component. Aphakic glaucoma presents a long-term complication that requires a longer follow up. Asrani (25) reported a decreased incidence of open angle glaucoma in primary pseudophakic eye, with only a single case of glaucoma among 377 pseudophakic eyes, and 14 eyes with glaucoma among 124 aphakic eyes.

Other postoperative complications, such as inflammatory response, may contribute to visual axis obstruction. Pediatric cataract surgery is associated with a higher incidence of uveal inflammatory reaction. Intense topical steroid and cycloplegics are beneficial in increased reactivity postoperatively, but fibrinoid uveitis may result in the formation of posterior synechias and deposits on the intraocular lens. Vasavada et al (26) reported posterior synechia formation in 34.6% of eyes where posterior capsulorhexis with anterior vitrectomy was done. Zetterström et al (27) reported posterior synechia formation in one eye with implanted HSM PMMA intraocular lens in a series of 21 eyes. Sharma (28) reported the sequelae of uveitis (posterior synechia and intraocular lens deposits) in one-third of the eyes in a study that included traumatic pediatric cataract and implanted PMMA intraocular lens. Satisfactory biocompatibility of AcrySof intraocular lens was reported by Wilson (29), who found intraocular lens deposits and posterior synechias in a very small percentage of patients.

Secondary opacification of a visual axis still remains a major complication of pediatric cataract surgery. A clear visual axis must be maintained to allow vision to develop and to avoid amblyopia. To maintain a clear visual axis, posterior capsulotomy with anterior vitrectomy is needed in younger children, while vitrectomy is not necessary in older children.

Pediatric cataract is an important cause of visual loss. The disease is rare, and large series of patients are hard to obtain. Despite the small number of patients and retrospective design of our study, the results gave us valuable information. The advantage of our study was relatively long follow-up period. However, even longer follow up and a prospective randomized study would be needed to answer many surgical dilemmas, especially the question of the timing of anterior vitrectomy. Thus, the treatment of patients with pediatric cataract still remains a challenge.

References


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