

Traumatic cataract in a child

Comments by:

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Case history

A 3-year-old girl experienced a penetrating injury in the right eye from a pair of scissors 8 months previously. Traumatic cataract and corneal laceration with iris prolapse were noted at presentation. Primary repair of the corneal laceration and repositioning of the prolapsed iris were done within a few hours of presentation. The corneal laceration extended for 4 mm from the 6 o'clock limbus obliquely upwards to the mid-peripheral cornea at 3 o'clock. The anterior capsule was found to be torn for 1 mm behind the pupil margin at 6 o'clock.

The cataract progressed after operation with a moderate cellular reaction in the anterior chamber with posterior synechiae (PS) formation. Lens aspiration and synchiolysis were performed 1 month after the injury. A very thick posterior capsule with blood vessels on the surface was noted. Only a small posterior capsulorrhexis could be accomplished because of the posterior capsular fibrosis. Anterior vitrectomy was done and a heparin-coated polymethyl methacrylate posterior chamber lens was placed in the sulcus. The fundus was noted to be flat. Subconjunctival dexamethasone was given and topical steroid was administered hourly after the operation. Atropine and antibiotic eye drops were also given.

However, the PS recurred on the intraocular lens 1 month after the operation and the pupil was very constricted. Anterior chamber reaction was moderate. Refraction was impossible via the pupil and the unaided visual acuity was

3/60. Red reflex was present initially but later became obscured. The posterior capsulorrhexis also closed, with posterior capsular fibrosis covering the pupillary axis. The intraocular pressure (IOP) remained normal.

Posterior capsulotomy through a pars plana approach was performed 4 months after the cataract surgery. The postoperative anterior chamber reaction was more severe this time and a fibrinoid membrane developed over the pupil with recurrence of PS. The pupil was slit-like measuring 1 x 2 mm and the central cornea was slightly hazy (**Figure 1**). Refraction was impossible and the unaided visual acuity was 5/60. Occlusion was not possible and the patient had a strong objection to the procedure.

What are the comments on the initial management of this child? How can postoperative reaction be minimized in such a case? What should be the present management plan?

Comments

by Dr Srinivas K. Rao, Consultant, Cornea Service, Sankara Nethralaya, 18 College road, Chennai 600 006, Tamil Nadu, India

A 3-year-old girl suffered penetrating anterior segment trauma in her right eye and underwent primary repair of the corneal laceration with repositioning of the prolapsed iris. Although a tear in the anterior capsule of the crystalline lens was noted, cataract surgery was performed 1 month after primary repair. During surgery, vessels were noted on the posterior capsule and a small posterior capsulorrhexis and anterior vitrectomy were performed before implanting a heparin surface modified (HSM) intraocular lens (IOL) in the posterior chamber. Closure of the posterior capsule opening and posterior synechiae formation necessitated pars plana membranectomy 4 months after the cataract surgery. Recurrence of severe anterior chamber inflammation in the postoperative period resulted in inflammatory membrane formation at the pupil. Three months after the last surgical intervention, the vision was 5/60 and the central cornea was hazy. Estimation of the refractive error was not possible and IOP recordings were not available.

For the initial management of this child, I agree that it was unwise to tackle the cataract during the primary wound

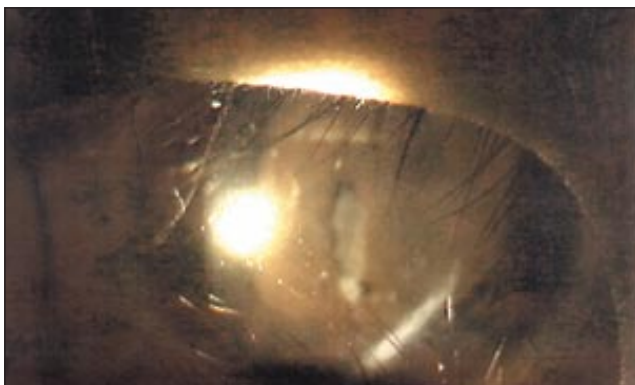


Figure 1. Slit lamp photo of the right eye.

repair. The reasons are increased inflammation, possibility of infection from the external wound, unstable anterior chamber, and difficulty in tackling the posterior capsule during the primary surgery. However, once the anterior chamber inflammation subsides, cataract surgery should be performed. The presence of vessels on the posterior capsule during cataract surgery in this child suggests a partially absorbed cataract with vessels from the iris on the posterior capsule. During surgery it is best to attempt IOL implantation within the residual leaves of the anterior and posterior capsule (assuming that a small central capsulorrhexis in the anterior capsule above the site of penetration is not possible).

The use of heparin in the irrigating fluid (5 to 10 mg/ml) would help in reducing the postoperative inflammatory response.¹ However, care should be taken to ensure that there are no capillaries oozing at the conclusion of surgery, as the heparin can then precipitate a postoperative hyphema. After surgery, care should be taken to keep the pupil mobile using an intermediate acting cycloplegic such as tropicamide. The use of oral steroids (0.75-1 mg/kg body weight) started 3 days preoperatively and continued for 2 to 3 weeks post-surgery in tapering doses could help in decreasing the postoperative inflammatory response in these traumatized eyes. The use of postoperative non-steroidal anti-inflammatory agents such as diclofenac would also help in reducing inflammation, and may also reduce the chance of postoperative cystoid macular edema.

Further management of the eye should be undertaken after ensuring that the anterior chamber inflammation has subsided. It may not always be possible to eliminate anterior chamber flare in such eyes, but there should be no cellular reaction in the anterior chamber prior to further surgery. Preoperative evaluation should include pachymetry and endothelial cell count to assess the health of the corneal endothelium, automated keratometry to detect the presence of significant corneal astigmatism, IOP estimation, ultrasound biometry to evaluate the relationship of the anterior segment structures, including the integrity of the zonular apparatus, IOL power calculations in the affected eye (using the pseudophakic mode of the biometer), and B-scan ultrasonography to evaluate the posterior segment of the eye. An examination under general anesthesia would be required for these tests.

During surgery, the measures described earlier would help to decrease the incidence of postoperative fibrin. The site of the incision is planned according to the preoperative keratometry. If there is less than one diopter of astigmatism, a superior scleral tunnel approach is required and this is closed after surgery with an infinity suture. If the astigmatism is greater than 1 diopter, a limbal incision is made in the flatter meridian and is sutured at the conclusion of surgery using a 10-0 nylon shoelace suture. Since adequate visualization is critical, iris hooks can be used to retract the iris, after releasing posterior synechiae with an iris spatula and/or sharp dissection as necessary. The existing IOL should be explanted and a good cleavage plane should be obtained in the posterior chamber. The opening in the posterior

capsule is enlarged to about 4 to 5 mm in diameter. Any peripheral Elschnig pearls are thoroughly cleaned and the new HSM IOL (aiming for about 1 diopter of hyperopia) is then securely positioned in the sulcus using the remaining posterior capsule for support. The hooks are removed and intracameral pilocarpine is used to decrease the pupil size to less than that of the IOL optic. If the pupillary sphincter is damaged and the iris is very floppy, 10-0 prolene sutures can be used to tighten the flaccid iris diaphragm to decrease the possibility of postoperative iris retraction, peripheral posterior synechiae formation, and IOL capture. A peripheral iridectomy should be performed (if this has not been performed earlier). A recently described method of intraocular drug delivery for dexamethasone — the surdex implant, can be considered since studies have shown this to be an effective dexamethasone delivery system for the first 7 to 10 postoperative days.² Postoperative treatment would be along the lines discussed earlier. Postoperative fibrin can also be surgically lysed using tissue plasminogen activator.³ Once the postoperative reaction is controlled and a clear visual pathway is established, visual acuity is estimated in the operated eye. In the event of a healthy macula and subnormal vision, atropinization of the fellow eye can be considered to combat amblyopia since the child will not tolerate occlusion of the fellow eye.

If, during surgery, it is felt that the adhesion of the iris and the posterior capsule is difficult to release, or if there is extensive zonule loss during the surgical manipulations, pars plana membranectomy can be performed. The goal of surgery would be to remove all capsular remnants, which could serve as a scaffold for further inflammation. The iris at the pupillary margin is also cut and removed with the vitrector to enlarge the pupil to about 4 mm in order to decrease the possibility of further postoperative closure due to inflammation. Since the patient is 3 years old, a scleral fixated IOL during surgery would not be desirable in this situation. Based on preoperative discussions with the parents, the eye can be left aphakic and rehabilitated with contact lens use, or an iris claw lens can be used during surgery. In the first instance, a scleral fixated IOL can be considered at a later date when the child is aged 11 to 12 years. If an iris claw lens is used, sequential monitoring of the endothelial cell counts are performed. If there is accelerated cell loss, scleral fixated IOL implantation can be considered at a later date.

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Comments

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This patient poses a very challenging surgical problem for which there is probably no universally accepted treatment. While repairing the corneal laceration and preventing intraocular infection is the primary goal of the initial surgery, a broken anterior lens capsule evidenced at the time of injury should be addressed as well. If not removed at an early stage, such a form of traumatic cataract is likely to be progressive, inducing more uveal inflammation and vascular engorgement, making subsequent surgeries more risky.¹ In a case series of traumatic rupture of the anterior lens capsule and delayed lens extraction, fibrinous uveitis, posterior synechiae formation, and postoperative membrane formations were universal in all eyes.² This inflammation seems to be more serious in deeply pigmented eyes and when the children are younger than 6 years.³ It is already well known that postoperative inflammation is more serious in all forms of pediatric cataract and all measures should be directed to preventing inflammation. Taking these factors into account, if the corneal wound was relatively clean on initial presentation, a combined wound repair and cataract aspiration could be considered. Otherwise, the wound could be repaired first with early aspiration of the lens once the wound has settled. Posterior capsular opacification (PCO) is another common complication of pediatric cataract. This is especially true for the post-traumatic type, with a reported incidence ranging from 40% to 57%.²⁻⁵ The finding of PCO as well as blood vessels on the capsular surface at the time of lens aspiration may suggest severe inflammation is already present. Under such circumstances, a larger size posterior capsulorrhexis or capsulotomy may be indicated to prevent future closing down of the opening. The fibrotic capsular rim usually offers enough support for the IOL in the bag.

Placing the IOL in the capsular bag offers several advantages such as reduced inflammation and PCO as well as better centration. Pandey *et al.* reported reduced inflammation and pupillary capture of the IOL when it was placed in the capsular bag than from those placed in the ciliary sulcus.⁶ Implanting an IOL at the time of traumatic cataract extraction in children is becoming more popular and various studies have reported satisfactory results in terms of rapid recovery of unaided vision provided there were no other concomitant ocular injuries.²⁻⁶ However, only when the above considerations have been addressed can one safely make the procedure routine.

A realistic approach is important for the current management of this patient. Further surgery would involve meticulous dissection of fibrotic membranes from the iris and IOL, which would certainly excite more inflammation. Intensive topical or even systemic steroids will be required during the postoperative period and these are not without risks. The effect of the central corneal scar must be addressed. If a rigid gas permeable lens is not fitted or penetrating keratoplasty

performed on this eye, both of which are hazardous for this young patient, further intraocular surgery in the anterior segment may not turn out to be beneficial.

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Comments

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In short, this is a case of retrolental membrane formation following cataract surgery and IOL implantation in a 3-year-old child with uveitis secondary to a penetrating eye injury. Uveitis in children is considered to be a contraindication to IOL implantation by many experienced pediatric cataract surgeons.^{1,2} Even the most aggressive pediatric cataract surgeon would warn against IOL implantation in children younger than 5 years and in the presence of active intraocular inflammation. The reason is that posterior capsulectomy combined with anterior vitrectomy does not prevent the secondary fibrosis and retrolental membrane proliferation in such patients.³

Comments on the initial management

In the initial planning for this patient, early optical correction of aphakia is definitely a concern since children up to the age of 5 years may develop amblyopia from visual deprivation.⁴ In view of the presence of inflammation at the time of cataract extraction, and the fact that the child's visual system should have passed the most sensitive period for amblyopia at the time of injury, IOL implantation should be considered as a secondary procedure.

Methods to decrease postoperative inflammation

Meticulous clearing of cortical materials is mandatory for every pediatric patient undergoing ocular surgery.

Intraocular surodex offers no added advantage if the child is compliant with eye drops. In the early fibrinous phase, intracamerular tissue plasminogen activator may be useful but is prohibitively expensive. Nevertheless, operating on a quiet eye is the best way to prevent postoperative inflammation.

Future management

Intraocular pressure monitoring

Glaucoma occurs in 24% of eyes with cataracts that are treated with a lensectomy-vitreotomy procedure.⁵ In view of the complicated course for this child, development of glaucoma as a result of pupillary block or extensive peripheral anterior synechiae is a constant threat. IOP monitoring is the highest priority for the future management of this child.

Several years ago, I had operated on a child with cataract and persistent hyperplastic primary vitreous who was left aphakic with an intact capsule. The postoperative course was uneventful for 2 years and her IOP was 16 mm Hg the last time I saw her. Secondary IOL surgery was performed later by a colleague. Unfortunately, she developed end-stage glaucoma in less than 2 years.

Preserving the eye and vision

The only way to restore vision is by clearing the visual axis by peeling off the retrolental membrane. Removal of the IOL is the final resort. Endoscopic assessment of the ciliary region may be helpful for making the final decision intraoperatively. Both procedures are bound to be extremely difficult and aggressive. Since the eye has already suffered repeated surgical insult already, every other surgical attempt should be considered as a last chance. It is advisable to wait until the inflammation completely subsides before performing further surgery.

Conclusion

In summary, we can all learn from this case that careful timing plays a decisive role in the surgical outcome.

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Comments

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This 3-year-old girl suffered a traumatic corneal laceration and cataract. After undergoing laceration repair, her cataract advanced requiring removal and intraocular lens placement. She experienced a severe inflammatory reaction which caused so much capsule opacification and membrane formation that her visual axis is now compromised. With the benefit of hindsight, I will comment on the initial and subsequent management of the child, and recommend a treatment plan for her current problem.

When she first underwent operation following the injury, a 1 mm break in the anterior capsule was found. The surgeons decided to leave the lens in place, but a cataract formed. In general, it is better to try to leave the lens in place if there is any hope that the capsule will seal without lens opacification. However, my experience with obvious capsular rents has been that cataracts always form. Early removal of the lens (i.e. at the time of primary closure of the corneal laceration) might have helped to reduce the amount of inflammation that later occurred.

The decision to use an intraocular lens can be debated. The patient must have had considerable irregular astigmatism after the scissors injury. In this case, a hard contact lens would have been mandatory for visual rehabilitation, even with implantation of a successful and uncomplicated IOL. In other words, the lens implant did not eliminate the need for contact lens, so its placement in this case was unnecessary. Use of an artificial lens in an eye with inflammation is risky. Even in completely quiet eyes, postoperative inflammation is very common in children. I agree with the use of a heparin-coated lens. In my experience, this type of lens minimizes the risk of inflammation. In this case, inflammation occurred anyway. The decision to perform a posterior capsulectomy was reasonable but failed. Now this patient's doctors have a difficult decision. The iris has synechiae to the lens implant, and the child has very poor vision from media opacity and, undoubtedly, amblyopia. Timing is important due to the risk of amblyopia. Clearing the visual axis should be accomplished as soon as possible.

I would recommend removing the lens implant and performing an anterior vitrectomy. Every effort should be made to clear a wide area in the pupil, including enlarging the pupil, if necessary. Antifibrinolytics should be given at the time of surgery, including aggressive steroid use. Postoperatively, the child will fail to develop good vision unless an amblyopia treatment plan can be followed.

Postoperative reactions can be minimized in cases such as this by not using a lens implant, or by using a heparin-coated lens. Preoperative topical steroids and hourly postoperative steroids are also useful. Penetrating eye injuries in children are serious and carry a worse visual prognosis than for adults.