

Pediatric Cataract Management Guidelines

Proper management is essential to prevent permanent vision loss.

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Cataract surgery in children with congenital cataract is complex and challenging, and proper management is essential to prevent permanent vision loss. The aim of congenital cataract surgery is to provide and maintain a clear visual axis and a focused retinal image. The long-term visual outcome is often negatively affected by the development of amblyopia secondary to the cataract or due to postoperative reopacification of the ocular media. Pediatric cataract management requires the effort of a team consisting of an ophthalmologist, a pediatrician, an anesthetist, and a patient's parents or other family members.

This article highlights surgical pearls for managing congenital cataracts and details our step-by-step approach for congenital cataract surgery under general anesthesia, based on our experience managing these cases at SuVi Eye Institute & LASIK Laser Center in Kota, Rajasthan, India.

INDICATIONS AND SURGICAL TIMING

Surgery is indicated in children who present with visually significant cataracts (Figure 1), with characteristics including lenticular opacity in the central visual axis larger than 3 mm, posterior opacity, opacities with no clear zones in between, retinal details not visible with direct ophthalmoscopy, presence of nystagmus or strabismus, or poor central fixation after 8 weeks of age.

Children with visually significant unilateral cataract can be operated on as early as 4 weeks of age; those with visually significant bilateral cataracts can undergo surgery by 6 weeks of age (Figure 2). In bilateral cases, the surgeries should be scheduled 1 week apart to avoid the development of amblyopia. Children in whom the cataract is not visually significant should be followed regularly.

INCISION CONSTRUCTION

Pediatric cataracts can be removed through a relatively small wound, as the lens has no hard nucleus. Therefore, wounds should be constructed to provide a snug fit for the instruments that pass into the

anterior chamber; these incisions should not be larger than necessary for the instruments being used. Although some surgeons prefer aspiration with a standard phaco handpiece, we prefer a bimanual technique using separate irrigation and aspiration handpieces. Anterior chamber stability is maintained by limiting wound leak and using a high irrigation setting.

When a foldable IOL is to be implanted, as in most cases today, a corneal tunnel is preferred because it leaves the conjunctiva undisturbed. The corneal tunnel should begin near the limbus for optimal healing and be sutured with a synthetic absorbable suture. We prefer using marked calipers to outline the dimensions of the tunnel, and we use an angled crescent blade to make a groove and dissect the tunnel. The blade is turned up on its end to make the groove and is then turned over to continue the tunnel.

Unlike in adults, tunnel incisions are not usually self-sealing in children. We attribute the poor self-sealing to low scleral rigidity, resulting in fish-mouthing of the wound and poor approximation of the internal corneal valve to the overlying stroma. The recommended closure material is a 9-0 or 10-0 synthetic absorbable (polyglactin) suture.

On the rare occasion that a rigid IOL is implanted, a scleral tunnel wound is usually used. A half-thickness scleral incision is made initially, approximately 2 or 2.5 mm from the limbus, and is dissected into clear cornea. The incision is enlarged to the size necessary for IOL insertion. Closure is recommended using a 10-0 synthetic absorbable suture.

ANTERIOR CAPSULOTOMY

eyetube.net/?v=ukade.

The anterior capsule in children is extremely elastic, and, therefore, it may be difficult to perform a controlled manual continuous curvilinear capsulorhexis (CCC). However, the CCC remains a gold standard for resistance to tearing and should be accomplished whenever possible. Difficulty performing manual CCC in infantile eyes has led researchers and surgeons to devise alternate methods to open the anterior capsule in children. Available alternatives to manual CCC include vitrectorhexis, as described by M. Edward Wilson, MD, of Charleston, South Carolina; radiofrequency diathermy with a Fugo plasma blade; the two-incision push-pull technique; and the four-incision technique.

We prefer to use the ultimate soft-shell technique (USST), described by Steve A. Arshinoff, MD, for anterior capsulorrhexis in pediatric white cataracts. First, the corneal endothelium is coated with a dispersive ophthalmic viscosurgical device (OVD; Viscoat; Alcon), then a cohesive viscoadaptive OVD (Healon5; Abbott Medical Optics) is used to fill the anterior chamber. The dual-OVD technique pressurizes the eye and protects the corneal endothelial cells. Balanced saline solution is injected below the OVD, away from the incision, to create a surgical operating space with low viscosity. Anterior capsule staining is achieved by gently painting the anterior capsule with trypan blue dye (Figure 3). This makes capsulorrhexis, hydrodissection, and Healon5 removal at the end of the case much easier. A video demonstration is available at eyetube.net/?v=ukade.

PHACOASPIRATION

Pediatric cataracts are soft, but they may be gummy. Ultrasound power is not needed and may be harmful in the setting of chamber instability. The lens cortex and nucleus can be aspirated in every case with an I/A or vitrectomy handpiece (Figure 4). With the vitrector, intermittent bursts of cutting can be used to facilitate the aspiration of the gummier cortex in a young child. The phacoemulsification handpiece can also be used to aspirate pediatric lens material if the surgeon is more comfortable with this instrument.

Cortical material strips easily from the pediatric lens capsule, even in the absence of hydrodissection. Attempts at hydrodelineation should be discouraged in children because this step does not aid in lens removal and may instead lead to capsular rupture. Posterior polar cataracts in children are contraindicated for hydrodissection because the posterior capsule is fragile.

POSTERIOR CAPSULE MANAGEMENT

Primary posterior capsulectomy and anterior vitrectomy are common practices for management of younger children with cataracts. Anterior segment surgeons are often more accustomed to and more comfortable with a limbal (or anterior) approach. An important question is: When should the posterior capsule be left intact? This can be answered by looking at several factors, including patient age, association of posterior capsular plaque or defect, availability of Nd:YAG laser, and expected cooperation of the child approximately 12 to 24 months after cataract surgery for Nd:YAG capsulotomy.

As a rough guideline, in children younger than 5 years of age, we prefer to perform primary posterior capsulectomy and vitrectomy. In children 5 to 8 years of age, we perform posterior capsulectomy with or without vitrectomy, as needed. In children older than 8 years, we keep the posterior capsule intact more often.

PRIMARY IOL IMPLANTATION

The general consensus is that IOL implantation is appropriate in most older children undergoing cataract surgery. In contrast, the advisability of IOL implantation during the first years of life is still questioned. It is well known that the majority of an eye's axial growth occurs during the first 2 years of life. This rapid growth makes selecting an IOL power for an infant difficult.

When placing an IOL in a child's eye, in-the-bag implantation is strongly recommended. Care should be taken to avoid asymmetrical fixation, with one haptic in the capsular bag and the other in the ciliary sulcus, as this can lead to decentration of the IOL. Unlike in adults, dialing of an IOL into the capsular bag can be difficult in children, and often the IOL will dial out of the capsular bag rather than into it. This tendency can be blunted by the use of highly viscous OVDs.

Foldable hydrophobic acrylic IOLs are increasingly being used in children. We prefer to implant a one-piece IOL such as the Tecnis (Abbott Medical Optics) or AcrySof IQ (Alcon) that is especially suited for small, soft eyes and can be inserted into the capsular bag with ease (Figure 5).

When capsular fixation is not possible, sulcus placement of an IOL is acceptable. To avoid decentration, when a foldable lens such as the three-piece AcrySof (Alcon) or Sensor IOL (Abbott Medical Optics) is used, optic capture through the anterior capsulorhexis or combined anterior and posterior capsulorhexes should be attempted.

We adhere to the following guidelines for IOL power calculation for pediatric congenital cataract surgery:

- For children with congenital cataract younger than 2 years, we prefer to use 80% of the total IOL power (20% undercorrection);
- For children aged 2 to 8 years, we use 90% of the IOL power (10% undercorrection); and
- For children older than 8 years, we implant the total IOL power, providing full correction

(no undercorrection).

PRESERVATIVE-FREE TRIAMCINOLONE ACETONIDE

Anterior vitreous face disturbance may occur when a manual posterior capsulorrhexis is performed in pediatric eyes during congenital cataract surgery. Preservative-free triamcinolone acetonide 0.1 mL suspension (Aurocort; Aurolab) appears to be effective and safe for visualizing vitreous in pediatric eyes during congenital cataract surgery, ensuring a thorough and complete anterior vitrectomy after a manual capsulorrhexis (Figure 6).

Intracameral injection of preservative-free triamcinolone acetonide provides a safe and useful adjunct to topical steroid drops after congenital cataract surgery.

PEDIATRIC TRAUMATIC CATARACTS

eyetube.net/?v=inafe.

Trauma is a common cause of unilateral cataract in children (Figure 7). At the time of presentation after the trauma to the eye, primary repair of a corneal or scleral wound may be needed along with a complete evaluation of damage to the intraocular structures (eg, posterior capsular rupture, vitreous hemorrhage, and retinal detachment). We prefer to defer cataract surgery and IOL implantation in traumatic cataract patients, even when anterior lens capsule has been ruptured. A delay of 1 to 4 weeks may be helpful to allow corneal healing and to reduce the inflammatory response. Longer delays are avoided in children within the amblyopic age range.

IOL implantation is preferred in cases of traumatic cataracts with corneal injuries because contact lenses may be difficult to fit. Placement of the IOL in the capsular bag is preferred when capsular support is available. Ciliary sulcus fixation of the IOL can also be performed in the absence of adequate capsular support for in-the-bag placement, but it may be associated with a greater incidence of uveitis and pupillary capture. For a video demonstration of cataract surgery and IOL implantation in a pediatric patient with cataract, visit: eyetube.net/?v=inafe.

CONCLUSION

Management of pediatric cataract is a complex issue best left to surgeons who are familiar with the associated long-term complications and lengthy follow-up. Pediatric cataract management is often

difficult and tedious and requires a dedicated team effort, the most important members being a patient's relatives.

At one time, lensectomy was the standard treatment used in such cases. However, recently, small incisions, anterior capsulorrhexis, bimanual irrigation/aspiration, and primary posterior capsulectomy and vitrectomy have become acceptable treatment options for the management of pediatric and infantile cataract.

IOL implantation has become the standard of care for the optical rehabilitation of children with cataract who are older than 2 years. With refinements in surgical techniques, availability of microincision foldable IOLs, and better understanding of growth of the pediatric eye, IOL implantation is likely to become an established mode of visual rehabilitation of infants in the coming years. Last but not least, the routine use of highly viscous OVDs, the availability of preservative-free triamcinolone acetonide to stain the vitreous and trypan blue dye to stain the capsule during anterior capsulorrhexis, in-the-bag or bag-in-the-lens implantation, and modern-design foldable hydrophobic acrylic IOLs significantly improve outcomes in pediatric cataract surgery.

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