

Four-incision capsulorhexis in pediatric cataract surgery

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Pediatric cataract surgery is challenging, with multiple differences from cataract surgery in adults; however, an ideal capsulorhexis is the major prerequisite for both. Capsulorhexis in children is more difficult due to the more elastic nature of the anterior capsule. I describe a technique for anterior and posterior continuous curvilinear capsulorhexes in pediatric cataract surgery using 4 arcuate incisions. The results in 10 eyes of 10 children are presented.

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Pediatric cataract surgery is a challenging procedure, with multiple differences from cataract surgery in adults. However, it is well established that anterior and posterior continuous curvilinear capsulorhexes (CCCs) are the major prerequisites for successful cataract extraction and intraocular lens (IOL) implantation in children. In the case of primary IOL implantation in the capsular bag, a well-centered, optimum size, regular CCC that is resistant to peripheral extension is the cornerstone of surgical success.^{1–6}

Various methods are used for CCC in pediatric cataract surgery including vitrectorhexis (CCC with vitrectomy probe), use of a cystotome and a capsule forceps, CCC with a 27-gauge needle, and, recently, the 2-incision push-pull (TIPP) technique.^{7,8} Using the vitrectomy probe for CCC is simple for surgeons with limited surgical experience, but the borders of the capsulorhexis are most susceptible to radial tear from initiation of the CCC to implantation of the IOL.⁵

Continuous curvilinear capsulorhexis with a 27-gauge needle or a capsule forceps is somewhat difficult in children due to the elastic nature of the anterior capsule in the pediatric age group and the high probability of radial extension. The capsulorhexis size is usually unpredictable due to incomplete control of

the capsulorhexis edge. Other techniques such as electrocatheterization and Fugo plasma blade capsulotomy⁵ are not as resistant as manual CCC to radial tears. The TIPP technique, first introduced by Nischal⁷ and later by Hamada et al.,⁸ is a good approach; however, the size and shape of the CCC are not always predictable; in my practice, the technique usually resulted in an oval capsulorhexis. I introduce a 4-incision CCC technique for a well-centered capsulorhexis with the desired size and shape.

SURGICAL TECHNIQUE

After the anterior capsule is stained by trypan blue and the anterior chamber filled with a cohesive ophthalmic viscosurgical device (OVD) (sodium hyaluronate 1%, Healon), 4 arcuate incisions, each 1.0 to 2.0 mm, are made in the anterior capsule with a bent 27-gauge needle (Figure 1). The distance between 2 opposite incisions is the intended capsulorhexis diameter (5.0 mm). The next step is to grasp the center of each incision by a capsule forceps and pull it to the center of the capsulorhexis (Figure 2). The flaps are joined to form a complete 5.0 mm CCC (Figure 3).

After adequate hydrodissection, the lens material is extracted from the eye by a bicanular irrigation/aspiration probe. In the case of a hard fetal nuclear cataract, the nucleus is removed with the help of a vitrectomy probe.

The anterior chamber is then filled with a cohesive OVD, and 4 arcuate incisions are made in the posterior capsule. A posterior capsulorhexis is made in the same way as anterior capsulorhexis. After an adequate anterior vitrectomy is performed using the vitrectomy probe, the capsular bag is filled with the OVD and the corneal incision enlarged to 3.0 mm. A 3-piece, foldable acrylic hydrophobic IOL with a 6.0 mm optic

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Figure 1. Four arcuate incisions, each 1.0 to 2.0 mm, are made in the anterior capsule by a bent 27-gauge needle.

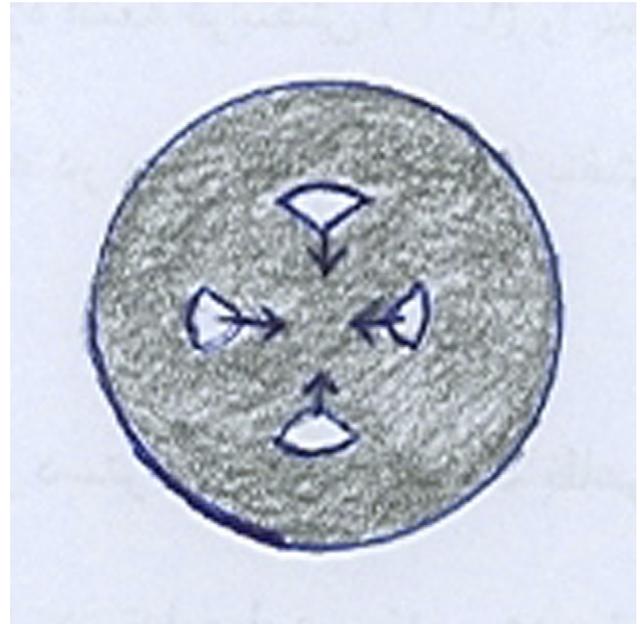


Figure 2. The center of each incision is grasped by a capsule forceps and pulled toward the center of the rhexis.

and an overall diameter of 13.0 mm (AcrySof MA60BM, Alcon) is implanted in the capsular bag using an injector and cartridge, and then a peripheral iridectomy is performed.

The wound is sutured with an Infiniti suture. Subconjunctival injections of 50 mg cefazolin and 4 mg betamethasone and a sub-Tenon's injection of 20 mg methylprednisolone are given, and the eye is patched.

RESULTS

The technique was performed by me in 10 eyes of 10 children aged 1 to 12 years who had anterior lensectomy with primary posterior capsulotomy, anterior vitrectomy, and IOL implantation from August to November 2006 at the Labbafinejad Medical Center. No radial tear occurred during the anterior or posterior CCC or during IOL implantation in any eye. The follow-up was uneventful in all patients (10 eyes). There was no significant postoperative inflammation, fibrin deposition, or synechial formation after surgery.

DISCUSSION

All the techniques for anterior CCC in children, including radiofrequency, diathermy, vitrectorhexis, and Fugo plasma blade, are mechanically less robust than manual CCC.^{5,6} Manual CCC can be performed with a bent needle and capsulorhexis forceps, as done in adults, by creating an initial flap and rotating it

clockwise or counterclockwise depending on the surgeon's preference and experience. However, because of the more elastic nature of the anterior capsule in children, the CCC is more susceptible to peripheral tear than the capsule in adults and it needs a smaller flap initially and frequent grasping of the edge of the rotating edge of the anterior capsule.

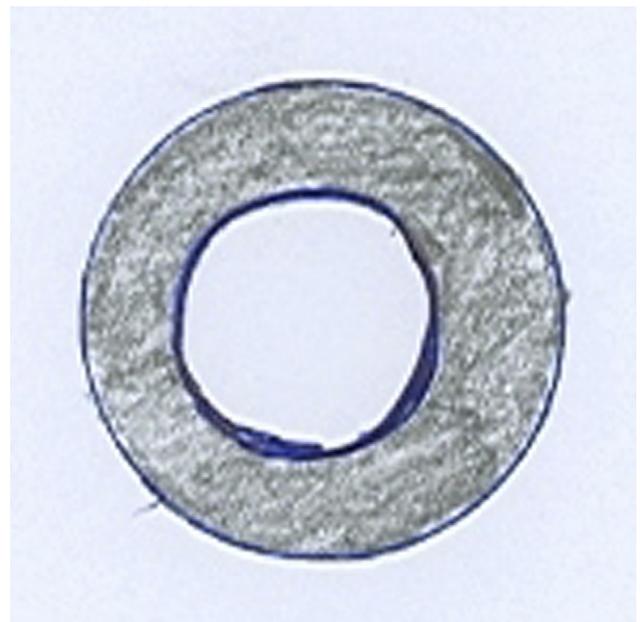


Figure 3. A completed 4-incision 5.0 mm CCC.

In 2002, Nischal⁷ reported the TIPP capsulorhexis for pediatric cataract surgery. More recently, Hamada et al.⁸ described their 5-year experience with the TIPP technique for anterior and posterior CCCs in children. However, in my practice, I realized there was a chance of peripheral extension of the anterior CCC with this technique, especially in cases of hypermature cataracts. Another problem was that the capsulorhexis was usually oval and did not have the intended diameter. Hence, I decided to modify the technique and perform 4 incisions to ensure the CCC integrity and achieve the intended size. If there were an additional 2 incisions in the horizontal plane, the capsulorhexis would be unable to extend and the size would be as the surgeon planned. Because I use a 6.0 mm optic, foldable acrylic hydrophobic IOL, I prefer a central CCC with a 5.0 mm diameter. Therefore, the haptic of the IOL is overlapped by the anterior capsule 0.5 mm on each side. This will prevent pupillary capture of the optic or IOL decentration and may decrease the chance for postoperative inflammation and synechial formation, which are common after cataract surgery in children.

In conclusion, 4-incision capsulorhexis is a safe, effective, and easy technique for anterior and posterior capsulorhexes in children, especially in cases of hypermature cataracts. The technique produces a well-centered, round, and mechanically stable capsulorhexis in the desired size and shape.

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