techniques

Management of posterior polar cataract

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In this technique for managing posterior polar cataract, extreme care is taken not to overpressurize the anterior chamber or capsular bag to prevent posterior capsule rupture. Minimal hydrodissection and hydrodelineation are performed. The nucleus is extracted using minimal ultrasound energy. Viscodissection is used as a primary technique to mobilize the epinucleus and cortex. A protective layer is preserved over the posterior polar region until the conclusion of the extraction procedure to minimize the risk of loss of lens material into the vitreous cavity in the case of a capsule defect.

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The posterior polar cataract is one of the most difficult challenges for cataract surgeons because of the high likelihood of posterior capsule rupture. Osher and coauthors[1] report a 26% incidence of capsule rupture in a series of 31 cases and Vasavada and Singh,[2] a 36% incidence in a series of 22 cases.

Both stationary and progressive posterior polar cataracts may become symptomatic. Frequently, this condition does not become a problem for patients until they are entering young adulthood and become troubled by glare and other disturbing visual images, especially when driving at night. The indication for surgery consists of visually significant cataract impairing the patient's quality of life and activities of daily living. In general, we have found that these patients come to attention before the development of nuclear sclerosis so that the surgical challenge includes effective removal of a soft nucleus as well as successful protection of the posterior capsule.

Our technique uses minimal hydrodissection and hydrodelineation, nuclear aspiration from within the epinuclear shell, and gentle viscodissection of the epinucleus and cortex to avoid unnecessary pressure on the posterior capsule and protect the region of greatest potential weakness throughout the procedure. Viscodissection of epinuclear and cortical material involves peeling away layers with a cushion of dispersive viscoelastic material that partitions the lens capsule from the activity inside.

Surgical Technique

Incision and Capsulorhexis

After topical anesthesia is administered, a side-port incision is created. Intracameral lidocaine is instilled, and sodium hyaluronate 3.0%–chondroitin sulfate 4.0% (Viscoat®), a dispersive viscoelastic agent, is injected into the anterior chamber, taking care not to increase the pressure in the anterior chamber. In a modification of Arshinoff's soft-shell technique,[3] a small amount of sodium hyaluronate 1.0% (Provisc®), a cohesive viscoelastic agent, is placed on top of the lens capsule in the subincisional area only, with care taken not to overpressurize the chamber. A standard temporal single-plane clear corneal incision is made, and a capsulorhexis is created with a capsulorhexis forceps. Using a pinch-type capsulorhexis forceps avoids downward pressure on the lens, which may occur during initiation with a needle. An attempt is made to make the continuous curvilinear capsulorhexis diameter no larger than 5.0 mm so that if the posterior capsule is compro-

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mised during the procedure, an intraocular lens (IOL) can be implanted in the ciliary sulcus with capture of the optic though the capsulorhexis. This provides IOL stability and centration in the short and long term.

Hydrodissection and Hydrodelineation

After the capsulorhexis is made, hydrodissection in the layer of the cortex is gently performed in multiple quadrants with tiny amounts of fluid. A fluid wave is not allowed to transmit across the posterior capsule and reach the area of the potential defect surrounding the posterior polar cataract. The lens capsule is not decompressed as in cortical-cleaving hydrodissection. Hydrodelineation is also performed with a small amount of fluid. Approximately 0.2 cc of a balanced salt solution is used for the entire hydrodissection and hydrodelineation procedures. The nucleus is rocked to further delineate the endonucleus from the epinucleus (Figure 1). The soft cushion of the epinucleus against the posterior capsule protects the posterior capsule during this maneuver.

Endonucleus Management

A Fine-Nagahara chopper is used to incise the soft endonucleus in perpendicular meridians, dividing the nucleus into quadrants without using counter traction or embedding the phacoemulsification tip. With the infusion bottle lowered, the 30-degree bevel-down tip effectively aspirates the quadrants, leaving an epinuclear shell. Vacuum alone or extremely low powers of phacoemulsification using power modulations can be used.

Epinucleus Viscodissection

After the removal of the endonucleus, Viscoat is carefully injected under the capsular edge in aliquots in 1 quadrant only (Figure 2), with care taken not to pressurize the anterior chamber. The epinucleus is partially elevated with Viscoat, and the epinucleus rim is removed with an irrigation/aspiration (I/A) handpiece starting in the temporal subincisional area and moving inferiorly and superiorly, leaving the distal or the nasal portion for last.

Once the rim of the epinuclear bowl is mobilized, a small amount of additional Viscoat can be placed under the floor of the epinucleus. The central portion of the epinucleus is elevated, and a viscoelastic covering is placed over the fragile central portion of the posterior capsule.

Cortex Mobilization

After mobilization and removal of the residual epinuclear floor, the peripheral cortex is mobilized circumferentially by moving the I/A handpiece tangential to the capsulorhexis. An attempt is made to keep the tip occluded at all times to avoid fluctuations in chamber depth. The central portion of the posterior capsule is not uncovered until all the peripheral cortex is mobilized.

Once the entire peripheral cortex is mobilized, the posterior central portion of the cortical envelope is elevated with small amounts of viscoelastic material (Figure 3). Care is taken to avoid pressurizing the eye to prevent blow out or compromising the fragile central portion of the posterior capsule. A ring of cortex remains in the midperiphery of the capsule, which can then be evacuated. If it is evident that the capsular bag is not open, the peripheral portions of the posterior capsule can be carefully polished using the silicone I/A tip. Polishing the central portion of the posterior capsule is avoided even if it is not open because of its potential fragility.

Implantation of the IOL

A cohesive viscoelastic such as Provisc is injected into the capsular bag to expand it adequately for implantation of a foldable IOL. Again, it is important not to overpressurize the eye even if this means enlarging the incision a bit over what is customarily used for the injection of the foldable IOLs so that full pressurization of the eye is not required. The IOL is carefully injected, taking care to avoid contact with the posterior capsule during the implantation. Residual viscoelastic material is removed from above and below the IOL. With this method, in-the-bag implantation can often be achieved even in the presence of a posterior capsule opening. If necessary, however, an attempt can be made to convert the posterior defect into a posterior capsulorhexis,[4] perform a central vitrectomy, implant the IOL in the ciliary sulcus, and capture the optic in the bag (Thomas Neuhann, MD, Tobias Neuhann, MD, "The Rhexis-Fixated Lens," film presented at the Symposium on Cataract, IOL and Refractive Surgery, Boston, Massachusetts, USA, April 1991).

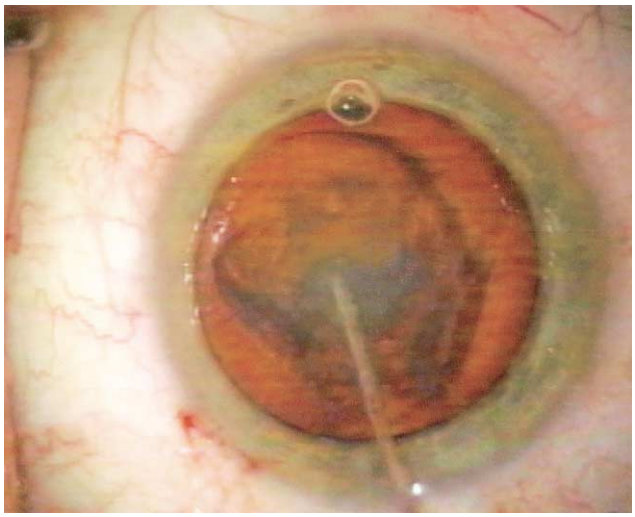

Figure 1. (Fine) After hydrodissection and hydrodelineation, the nucleus is gently rocked to further separate the nucleus from the epinucleus.

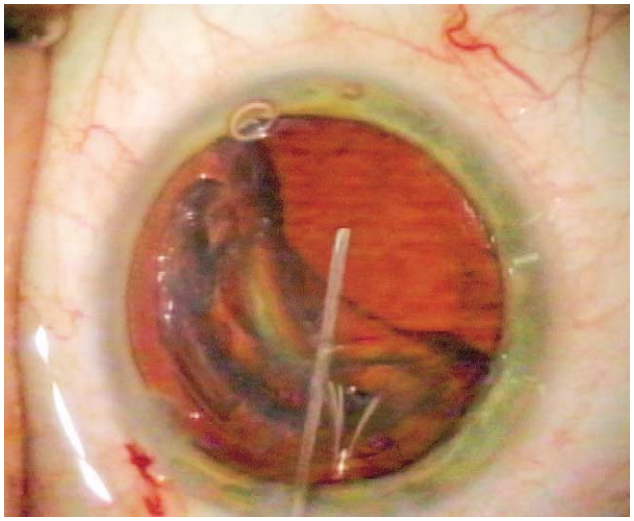

Figure 2. (Fine) The epinucleus is viscodissected in 1 quadrant only.

Discussion

Extraction of a posterior polar cataract should be performed in a way that minimizes the risks of posterior segment complications and maximizes the benefits of capsular IOL fixation. The technique we present will help the surgeon achieve these goals by avoiding pressure on the posterior capsule, removing the nucleus from within the epinuclear cushion, and protecting the posterior capsule with viscoelastic material during cortex aspiration.

Many steps of the procedure limit downward pressure on the capsule. The initial injection of viscoelastic material is modified to avoid increased pressure in the anterior chamber. Overfilling, with concomitant viscomydriasis and flattening of the anterior lens capsule, is undesirable in these cases. The capsulorhexis is initiated with a horizontal pinch rather than a posterior prick to avoid downward pressure on the lens. Hydrodissection is modified so that the fluid wave does not dissect posteriorly and the intracapsular retrolenticular space is not violated. Therefore, decompression of the capsular bag is not required or performed. The nucleus is divided into quadrants with horizontal forces alone.

The endonucleus is removed from within the epinuclear cushion, protecting the capsule from the forces of flow and vacuum. Surge is strictly limited by lowering the bottle height and decreasing the flow rate, if necessary. This decreases the vacuum rise time when occlusion of the tip occurs. A slower rise time, in turn, improves surgeon control of evacuation.

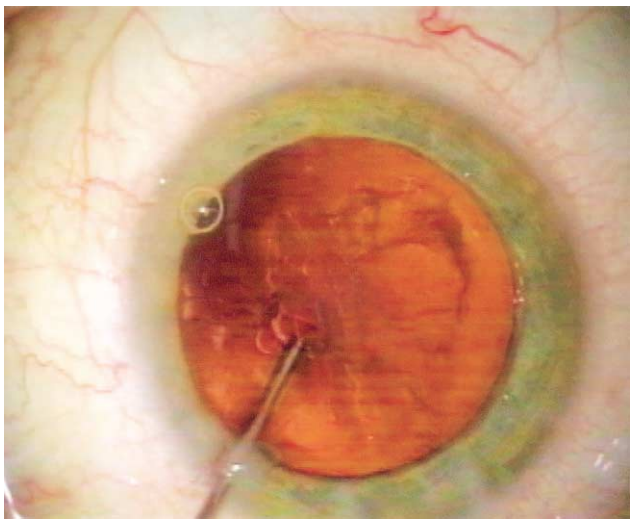

Figure 3. (Fine) Posterior cortex remains covering the site of potential capsule incompetence. The cortex is about to be gently viscodissected.

The area of greatest weakness, the central posterior capsule, is protected by the use of centripetal viscodissection to peel the epinucleus from the cortex and, subsequently, the cortex from the capsule. The peripheral lens material is viscodissected and extracted first, leaving the central posterior material until last. In this way, the region of the suspected defect is always covered until the final removal of cortex. Not

only does this prevent capsule rupture, it also minimizes the amount of lens material at risk in case of a capsule rupture. If a defect in the capsule is uncovered at the last moment, little lens material remains in the bag. If a posterior plaque that is firmly adherent to the capsule is uncovered, it is left behind for eventual neodymium:YAG laser capsulotomy. Thus, the amount of lens material that can enter the vitreous is reduced.

The management of posterior polar cataract remains a challenge for the skilled cataract surgeon. Meticulous attention to technique, avoiding overpressurization of the anterior chamber, and careful viscodissection of lens material will help the surgeon successfully meet the challenge.

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