

Cataract Surgery in the High Hyperope

Glaucoma Today asked these experts to share their advice.

**BY REAY H. BROWN, MD; GARRY P. CONDON, MD; ALAN S. CRANDALL, MD;
AND ERIC D. DONNENFELD, MD**

REAY H. BROWN, MD

When I confront cataract surgery in a short eye with a shallow chamber, I think about the degree of adversity in the case. First, how shallow is the chamber? If it is very shallow, what other problems are there? Is the pupil small, are there posterior synechiae, and is the lens very dense and brunescent? Also, what is the status of the endothelium?

In highly difficult cases, many techniques can help. These include preoperatively administering mannitol, reinserting viscoelastic throughout the surgery, and ensuring that the incisions are properly shelved and extended a bit more anteriorly to discourage iris prolapse. In short eyes with small pupils for which stretching is not sufficient, sometimes, iris hooks may be easier to use and less traumatic to the endothelium than a Malyugin Ring (MicroSurgical Technology).

If the chamber is extremely shallow, a small pars plana vitrectomy (PPV) is a great option. I make a conjunctival incision in the quadrant inferior or superior to the clear corneal incision. Next, I use a microvitrectoretinal blade to create an incision 3.5 mm behind the limbus, although I may reduce the length proportionally in very short eyes. The blade is aimed at the center of the eye. The vitrector is passed into the vitreous cavity, again with a central aim. I usually mark the shaft at 10 mm so that I do not pass it too far into the eye. With a small pupil and dense lens, it is common not to be able to see the vitrector, so positioning is key. Only a brief vitrectomy is needed. No infusion is required. I usually perform the vitrectomy after making the paracentesis and instilling viscoelastic. The softness of the eye and increased chamber depth signal when the vitrectomy is sufficient. I place additional viscoelastic in the anterior chamber to maintain pressure and reveal the deeper chamber. A PPV can transform a seemingly impossibly shallow chamber into one that is nearly normal.

GARRY P. CONDON, MD

When performing cataract surgery on highly hyperopic patients, potential challenges involve the preoperative



Figure. The surgeon inserts the trochar to perform a sutureless PPV in a highly hyperopic eye.

(Courtesy of Eric D. Donnfeld, MD.)

selection of IOLs, intraoperative maneuvers, and unique postoperative complications. Fortunately, today's surgeons have techniques and instrumentation that provide excellent preoperative biometry in these cases in which calculating IOL power can be more challenging than in an eye with an average axial length. The Hoffer Q and the Holladay II formulas are the main ones on which I rely when the axial length is less than 22 mm. These patients can require an overall IOL power in the upper 30s or higher. When an eye requires two IOLs, I will typically put the vast majority of the lens power in the capsular bag and implant a piggyback IOL of a more minimal power in the sulcus outside the capsular bag. Interlenticular fibrosis precludes placing more than one IOL in the capsular bag.

A major intraoperative challenge in these patients is the creation of working space in the anterior chamber and staying in control of that space during the initial phases of the surgery. Iris prolapse can be more common but can be alleviated to some degree through the creation of a long clear corneal tunnel to get well beyond the peripheral iris. Highly retentive viscoelastic agents such as Viscoat (Alcon Laboratories, Inc.) and Healon5 (Abbott Medical Optics Inc.) can be advantageous for

maintaining space. In cases where working space just does not seem to be available, a limited, dry, small-gauge PPV can favorably change the entire game in a matter of seconds. Removing just a small portion of the vitreous, with the vitrectomy's lasting only seconds, can create tremendous working space in the anterior chamber.

If the crystalline lens is positioned in a markedly anterior location, it can be very difficult to control the capsulorhexis. I have had a capsular flap prolapse out through the corneal incision, as the chamber became shallow during the capsulorhexis maneuver. Such a loss of control dictates, at a minimum, the use of a more retentive viscoelastic or intervention at that point with a dry PPV. I have a lower threshold for the dry vitrectomy nowadays due to the availability of smaller-gauged instrumentation that can provide for self-sealing pars plana incisions.

In my experience, inadvertent hydration of the vitreous during choroidal hydrodissection is more common in highly hyperopic eyes. Gentle, gradual hydrodissection should be performed to avoid this problem. After a successful capsulorhexis and mobilization of the lens, the remaining portion of the procedure is generally straightforward, with space increasing as the lenticular material is removed.

Despite uneventful surgery, these patients are at increased risk of developing so-called aqueous misdirection postoperatively. This complication may not be evident on the first postoperative day, so I ask patients to call me if they experience a progressively myopic change in their focus during the early postoperative period. The initial treatment would include topical and oral aqueous suppressants and cycloplegia.

ALAN S. CRANDALL, MD

Cataract surgery in an eye with a narrow anterior segment can be quite difficult. It is important first to define the cause of the shallow chamber, because the surgical approach will differ depending on the pathology.

A narrow anterior segment can be caused by a congenital problem such as nanophthalmos or microphthalmos in which the axial length is less than 19.5 mm. It could be narrow-angle glaucoma with peripheral anterior synechiae and/or posterior synechiae. Alternatively, the lens may have been displaced by trauma or diffuse zonulopathy, as occasionally seen in pseudoexfoliation.

The overall approach, however, uses principles as well as necessary individual adaptations. Preoperatively, the clinician should perform gonioscopy and obtain anterior segment ultrasound biomicroscopy. He or she should also control the IOP, which may include intravenous mannitol on the day of surgery.

I prefer topical anesthesia. Normally, I do not dilate pupils preoperatively, but I will use intracameral lidocaine and epinephrine, especially in eyes like these. It is important

to protect the endothelium with a dispersive viscoelastic.

I design the clear corneal incision to prevent iris prolapse (2.2 mm with 1.8 mm anterior). To deepen the chamber, I instill an adaptive viscoelastic such as Healon5 or Discovisc (Alcon Laboratories, Inc.). If the chamber deepens immediately, then I know the narrow angle is lens induced with weakened zonules. If the chamber remains shallow, it is important not to inject too much viscoelastic, which will increase the IOP and can cause the iris to prolapse.

If synechiae are present, they must be dissected. Moreover, it is important to realize that synechiae often extend peripherally, in which case a cyclodialysis spatula can be helpful. I use a Kelman curved tip (I prefer a reverse Kelman) to further reduce endothelial trauma.

If the anterior chamber is still very small, then I usually perform a deep, small anterior vitrectomy. In a nanophthalmic eye, the pars plana may be a shorter distance from the limbus. In an eye of standard length, I use a 23-gauge microvitrectoretinal blade 3.5 mm posterior to the limbus. Then, I perform the anterior vitrectomy or cut I/A at the rate of 2,500 cuts per minute. I remove only a small amount of vitreous, just enough to deepen the anterior chamber. In a microphthalmic eye, the intracapsular lens power may be quite high (≥ 30.00 D).

ERIC D. DONNENFELD, MD

The highly hyperopic patient presents many unique challenges for cataract surgery. They include a shallow anterior chamber, the risk of corneal decompensation, positive pressure, small pupils, an increased risk of vitreous loss, choroidal effusion, and the risk of an expulsive hemorrhage. Prevention is important in these cases, and I always discuss with these patients the advantage of earlier surgery prior to worsening of the phacomorphic component of their cataract procedure.

Surgical tips include the preoperative use of mannitol to reduce vitreous volume and placing the patient in Fowler position with his or her head elevated. Intraoperatively, simple techniques like a good self-sealing cataract incision are important to prevent iris prolapse. When the anterior chamber is shallow, I fill the eye with a dispersive viscoelastic like Viscoat or Healon EndoCoat (Abbott Medical Optics Inc.), which provides optimal protection of the endothelium. I perform the capsulorhexis under a significant amount of viscoelastic to prevent positive pressure and radial tears of the capsule. If needed, I will release the self-spreading lid speculum. For small pupils, I use iris hooks or the Malyugin Ring, and I perform the phacoemulsification in the capsular bag to maximize the distance of the phacoemulsification from the corneal endothelium. With dense lenses, I replace the dispersive viscoelastic during the course of the surgery.

In patients with high hyperopia and microphthalmos,

there are times when the anterior chamber is too shallow to permit standard cataract surgery. In these cases, I perform a sutureless 25-gauge PPV without irrigation to deepen the anterior chamber (Figure). I find this technique invaluable for converting the most difficult hyperopic surgeries to a more standard technique. From a refractive perspective, these cases are very challenging, and I have found the use of intraoperative aberrometry (ORA System; WaveTec Vision) to be invaluable for finding the correct IOL power.

Although highly hyperopic cataract patients present unique challenges, meeting these challenges achieves life-changing visual results for these extraordinarily grateful patients. ■

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