INTUMESCENCE

What's your paradigm?

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CASE PRESENTATION

A 55-year-old White woman with a long-standing history of vision loss in the right eye only is referred for cataract surgery. The patient underwent cataract surgery on the left eye years ago, and visual acuity is good in this eye. She states that visual acuity in the right eye has been poor for many years but worsened dramatically over the past few months, and she says that she can no longer ignore it. She states that she has no history of trauma or steroid use.

On examination, a posterior chamber IOL is well centered in the bag in the left eye after an Nd:YAG laser posterior capsulotomy; the findings are otherwise entirely normal. A milky white cataract is well centered in the right eye and obscures the view of the posterior segment. Gonioscopy shows an open angle without pigment. There is no phacodonesis and no evidence of uveitis, a corneal puncture wound, or corneal decompensation.

Her VA is 20/20 OS with a minimal prescription and light perception OD with good projection. IOP is symmetric bilaterally, and the pupils dilate symmetrically. No relative afferent pupillary defect or sensory exotropia is apparent. Biometry is symmetric except for anterior chamber depth, which, not unexpectedly, is deeper in the pseudophakic eye. The amount of astigmatism is not significant in either eye.

After an explanation to the patient of the nature of an intumescent cataract and its attendant risks, surgery is scheduled with a goal of emmetropia to match the fellow eye. The patient declines all options requiring an out-of-pocket expense.

What is your paradigm for dealing with an intumescent cataract? Please describe your technique in detail.

How would you address the dislocated IOL?

–Case prepared by Lisa Brothers Arbisser, MD

SURESH K. PANDEY, MD

One pearl for surgery on an eye with an intumescent cataract is to use the soft-shell or ultimate soft-shell technique described by Steve A. Arshinoff, MD, FRCSC, to flatten the anterior capsule.[1,2] I stain the anterior capsule with trypan blue dye to maximize visualization during the continuous curvilinear capsulorhexis (CCC). The dye can be injected under an air bubble or using the ultimate soft-shell technique. After the capsule is stained, it is nicked with a straight 26-gauge needle and elevated, and the cortical milk is aspirated to decrease intralenticular pressure.

At this point, the CCC can be initiated with Utrata or microcapsulorhexis forceps. Before this step, it is important to flatten the anterior capsule with a cohesive OVD such as Healon GV (Johnson & Johnson Vision). Vigilance is required to avoid a runaway CCC leading to the presentation known as the Argentinian flag sign. A complete CCC facilitates phacoemulsification. Caution must be exercised to minimize the risk of a posterior capsular tear and zonular dehiscence as the last nuclear fragment is removed. Ideally, the IOL is implanted in the capsular bag.

I recently used the Zepto Capsulotomy System (Centricity Vision) to create a capsulotomy in a few eyes with intumescent cataracts (scan the QR code to watch a related video). This disposable device uses low-energy pulses to create a precisely centered capsulotomy independent of pupil size, corneal clarity, and lens density. In my experience, the Zepto can simultaneously cleave all 360° of the apposed capsule without cauterizing it to create a capsulotomy with a diameter of 5.2 mm.

Watch It Now

PAVEL STODULKA, MD, PHD

B-scan ultrasonography would be performed to rule out an intraocular tumor. The CapsuLaser (Excel-Lens) would be used to create the capsulotomy. I would use this technology

even if the patient declines out-of-pocket options because I find that this laser can perform the capsulotomy reliably even in eyes with a white cataract and positive pressure. It is therefore unnecessary to create a central capsular opening to release intralenticular pressure.

The CapsuLaser can create a capsulotomy with a diameter of 4.0 to 5.5 mm in 0.1-mm steps in 0.25 seconds. I find that the latest version of the system with no optical patient interface makes the procedure easier and more straightforward. The central capsular disc is removed from the eye with endoforceps or directly aspirated by the phaco tip. Phacoemulsification is then performed, and the IOL is implanted. (Scan the QR code to watch a video of capsulotomy creation in an eye with a white cataract.)

Watch It Now


TIM SCHULTZ, MD, FEBO, AND H. BURKHARD DICK, MD, PHD, FEBOS-CR

An intumescent white cataract can be difficult to manage manually, especially if intracapsular pressure is elevated. Hopes were high that laser cataract surgery would offer advantages for these eyes, but anterior capsular tears still occurred in the first trials with regular setups and laser settings.[3] Light and scanning electron microscopy uncovered the underlying problem. Due to high intracapsular pressure, liquefied lens material exploded into the anterior chamber, and the capsule changed its position in different dimensions.[4] Several rows of laser spots were misplaced as a result, increasing the risk of radial tears. We expect that the same problem could occur with the CapsuLaser in a pressurized eye with a white cataract.

Because liquefied lens material can block the creation of a standard laser capsulotomy and the capsule can move during laser ablation, we developed the laser-assisted mini-capsulotomy.[5] This technique entails the ultrafast creation of a capsulotomy with the smallest possible diameter (eg, 2-mm diameter, 15-µm vertical spot spacing, and 5-µm horizontal spot spacing using a Catalys Precision Laser System [Johnson & Johnson Vision]). Next, the milky fluid is carefully removed from the anterior chamber using bimanual irrigation and aspiration without touching the capsulotomy. After hydration of the paracentesis is performed, sterile docking of the eye to the laser system is repeated, and a regular laser capsulotomy is executed (scan the QR code to watch a related video).

Watch It Now

Over the past several years, we have not encountered radial tears when using this technique, so we would use it in this case. A significant drawback of this approach, however, is the cost of the two laser procedures—something we hope will be addressed by laser manufacturers in the future.

WHAT I DID: LISA BROTHERS ARBISSER, MD

Many surgeons turn to femtosecond laser technology when faced with a white cataract. I have experience with this technology, but my preference in this situation is a manual technique. One reason is that the chances of an incomplete laser capsulotomy increase dramatically with an intumescent cataract because lens milk can leak during capsulotomy creation, as described earlier by Dr. Schultz and Professor Dick, and attenuate laser energy. Moreover, all detail can be obscured by lens milk when these eyes are first visualized under the microscope after the laser procedure. In this situation, the use of a central dimple down technique that Dr. Schultz, Professor Dick, and I developed can mitigate the risk of a radializing capsulotomy tag.[6]

The Zepto Capsulotomy System mentioned by Dr. Pandey has been shown to be a viable option in an eye with an intumescent cataract because the nearly instantaneous 360° application of energy is not affected by the emergence of liquid cortex. This device, however, was not available at the time of this case.

Instead, I used a manual technique that I developed and have used for decades without once encountering the Argentinian flag sign. A detailed description of this technique follows.

If the patient can reliably fixate on a muscle light preoperatively in the exam room, topical and intracameral anesthesia is sufficient. Mannitol 0.25 g/kg is administered as a bolus intravenous push 20 minutes before the eye is opened. In lieu of my standard cohesive OVD, a more retentive OVD such as Healon GV or a viscoadaptive OVD such as Healon5 (Johnson & Johnson Vision) is instilled to iron out the dispersive OVD under the endothelium in Dr. Arshinoff's standard soft-shell technique. I have found that these modifications help to mitigate the intralenticular pressure that is typically encountered in eyes with an intumescent lens.

With the soft shell in place, trypan blue dye is painted under the OVD with an Osher dye cannula (Bausch + Lomb Storz). At least 1 minute should elapse to achieve adequate staining before an additional amount of OVD is instilled for visualization. Once the chamber is controlled and the anterior lens profile is fairly flat, the CCC—the most difficult part of surgery in these eyes—may begin.

I do not aspirate lens milk upon puncturing the capsule with a 27-gauge needle, as many of my colleagues prefer to do. This maneuver decompresses

only the anterior portion of liquid cortex but does not address the possibly loculated high-pressure fluid trapped behind a large nucleus, which can force the nucleus forward and cause the capsule to split. Instead, I create a small curvilinear flap in the usual manner with a bent cystotome. The capsule is punctured by pushing it sideways and then away with the cystotome to create a curve. At this point, were the opening to extend, it would not radialize.

When punctured, the capsule immediately exudes lens milk under the OVD. A dispersive OVD is injected to push the lens milk out of the way and permit visualization of the flap, which is grasped with capsulorhexis forceps. I execute this maneuver through the main incision because it is the angle with which I have the most experience and because the retentive OVD prevents the chamber from shallowing by flowing out of the incision. Adding volume to the chamber maintains equilibrium. My aim is to make a CCC that is slightly smaller than my usual tear. The flap is regrasped as necessary, and the chamber is refilled with an OVD as required to improve the view or vector.

What I like about this technique is that it prevents the nucleus from moving forward and the chamber from being lost even momentarily. I have never seen a CCC radialize when this technique has been used.

The CCC need only be big enough to allow phacoemulsification to be performed safely. If necessary, the CCC can be enlarged in the standard fashion with a tangential cut using Vannas scissors and spiraled around with capsulorhexis forceps after the pressurized lens milk has been debulked. If the size of the CCC is adequate, it can be enlarged to the optimal size after the IOL is in place, which provides the perfect template.

Some intumescent lenses are soft, and some are hard. This patient had a tan nucleus with densely interdigitated leathery posterior fibers, prompting me to use my circumferential disassembly vertical chop technique.[7,8] Burst mode was used for lens disassembly, which allowed me to set ultrasound power at the right percentage for the nuclear density with linearity of burst frequency. Establishing flow before foot position 3 is entered in an OVD-filled chamber helps to prevent wound burn. My goal is to debulk the nucleus from the inside out by thinning the lens material sequentially as it is rotated until the rigid, leathery epinuclear shell is reached and can be removed easily. All ultrasound energy is applied at or below the iris plane. The video includes ambient sound, making it evident that ultrasound energy is used sparingly (scan the QR code to watch).

With this technique, the outer shell of epinucleus is preserved, keeping the bag expanded and protecting the thin, diaphanous posterior and equatorial capsule until the last nuclear fragment is removed. By creating a 0.5-mm paracentesis and using a chopper that is not sharp—my preference is a Rosen splitter (Bausch + Lomb Storz)—I need only a minimal amount of balanced salt solution, and the chamber remains controlled and stable. The splitter is placed behind the phaco tip to hold back the often floppy posterior capsule while the final fragments are removed.

Mature lenses rarely have any posterior cortex, but ample peripheral cortex is often present. I use a 45° bent I/A tip and begin cortical removal subincisionally. An organized and sequential approach can help avoid leaving behind invisible peripheral cortical remnants.

The rest of surgery is typically routine. A postoperative IOP spike is not unusual in this situation, so I prescribe prophylaxis with an acetazolamide sequel (Diamox, Wyeth Pharmaceuticals) when these patients are discharged, provided there is no history of a sulfa allergy.

This patient's VA was 20/25 on postoperative day 1, correcting to 20/20 by 1 week. It was never discovered why the lens had become intumescent. ■

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