The Super Dense, Leathery Cataract

Approaching 4+ and beyond with confidence.

BY TAL RAVIV, MD

Depending on the demographics and location of your practice, the frequency with which you encounter a 4+ to 5+ brown or red lens can vary greatly from daily to less than once a year. These most advanced cataracts are typical in developing countries, where the population's lack of access to health care and poor nutrition combined with environmental exposure and other comorbidities can make dense nuclei commonplace. In the United States, dense cataracts are most often seen in patients who, for a variety of reasons, have put off cataract surgery for far too long.

Through my volunteer work on cataract mission trips and my referral practice for complex cataracts, I have been exposed to nuclei of extreme density and complexity. This article discusses my approach to these cases.

SCHEDULING

Because complex surgeries take more time, it is prudent to schedule dense cataracts after routine cases. I also like to have on standby or in the OR all of the extra instruments I may need, including small-gauge microscissors (in case of an errant capsulorhexis), pupil hooks/expansion ring, split I/A handpieces, IOL-suturing supplies, and capsular support devices. Likewise, extracapsular conversion instruments should be available.

I am a strong advocate of phacoemulsification on hyperdense cataracts in the United States, but studies have shown that expertly performed, manual, small-incision cataract surgery can be comparable in terms of efficacy.[1]

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ACCESS TO THE LENS

Before surgery, I gauge the depth of the anterior chamber and the size of the pupil. Dense lenses—especially in hyperopic eyes—tend to be thick and to crowd the anterior chamber. Although I use topical anesthesia in almost all instances, I do employ a peribulbar and lid block if I anticipate extra steps and time for these most advanced cases. Although an ophthalmic viscosurgical device can sufficiently deepen some chambers, when the anterior chamber is very shallow, I plan a 25-gauge pars plana vitrectomy. If you are comfortable with this approach, it can be accomplished with a single pars plana trocar entry transconjunctivally.

First, set up an anterior chamber infusion through a paracentesis. Then, if sitting temporally, position the pars plana entrance infero- or superonasally. Place the 25-gauge cutter in the central vitreous behind the lens, and deliver a few seconds of vitrectomy using a high cutting rate. Keep in mind that you may not be able to see the vitrector's tip through the cataract and that the endpoint is deepening of the chamber. Alternatively, you can prearrange for a retina colleague to perform the pars plana vitrectomy. Either way, by increasing the

space in which to work, this step can greatly facilitate phacoemulsification.[2]

The pupil should be of adequate size to permit a large capsulorhexis, because hypermature lenses demand clear visibility. Stretching the pupil with two Kuglen hooks may work if synechiae are present or if the pupil is atonic or atrophic. Iris hooks, however, are go-to devices for a hypermature lens. They take up the least amount of space and can also be used to temporarily support the capsule if necessary. Pupillary expansion devices such as the Malyugin Ring (MicroSurgical Technology) are options, but they are more difficult to maneuver in these crowded eyes. I typically place five hooks to create an adequate working area, with the fifth placed inside the main corneal wound.

A VERY LARGE CAPSULORHEXIS

In my experience, the capsulorhexis is the key to success with hyperdense lenses. I make every effort to create a capsulorhexis of 6 mm or larger. Although 5.5 mm is the size I usually target for a capsulotomy,[3] the larger diameters of these nuclei demand a larger opening. A bigger capsulorhexis facilitates the removal of nuclear segments without placing stress on the capsule. The nuclear pieces are dense and somewhat inflexible, so they are likely to be trapped by a small opening. Of greater importance, a large capsulotomy allows me to prolapse the lens anteriorly if the need arises or as part of a stepped approach to nuclear disassembly.

After deepening the chamber, staining the capsule with trypan blue, and expanding the pupil, carefully undertake creating the capsulorhexis. The capsule may be brittle or, if lacking zonular support, may be flaccid with folds. I typically start with a small capsulorhexis so that I may gauge the zonular and capsular properties. Then, I spiral around a second time for a large, controlled capsulotomy. This staged technique minimizes unexpected radial tears.[4]

Capsular fibrosis is not uncommon in these cases. Identify such adhesions between the anterior capsule and lens before and after applying trypan blue. If they are focal, engineer the capsulorhexis to avoid and encompass them. If, during a capsular tear, you hit an area of fibrosis, either the capsulotomy will stop, or with enough force applied, it will tear irregularly to the area where the adhesion ends and beyond. In some cases, most of the anterior capsule will be fibrotic. This situation may be difficult to visualize but can sometimes lead to a false capsular tear that appears to be a capsulorhexis but is only of partial thickness. In these situations, I find sharp microcutting scissors (MicroSurgical Technology) invaluable for initiating and sometimes performing the entire capsulorhexis directly through areas of thick capsular plaque.

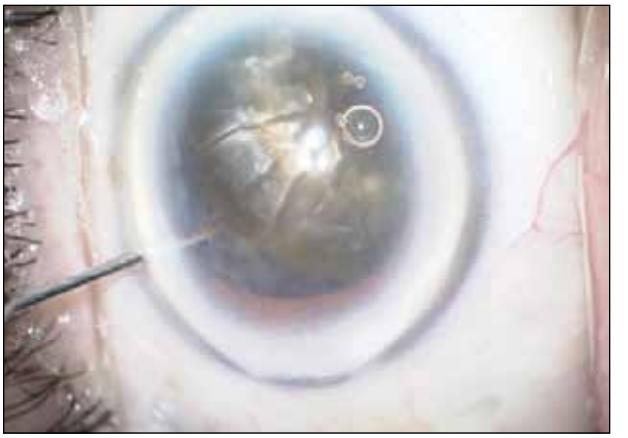

Figure. After debulking, the lens is visco-elevated out of the capsular bag and slowly "carouseled" by the phaco tip.

DISASSEMBLY OF THE LENS

For a dense lens, I favor a vertical quick chop technique, which I find works extremely well for nuclear sclerosis of 2.5+ to 4+. Thicker lenses are more difficult to fracture and more leathery. A divide and conquer technique is an option, but it requires a tremendous amount of phaco energy during grooving, which can increase the chance of thermal injury to the incision, even with the latest nonlongitudinal phaco technology. Moreover, the posterior leathery plate often requires very deep grooving using high phaco power, which risks early capsular rupture.

For a hypermature lens, I employ a combination of chopping and a supracapsular carousel. I begin with a central quick chop. Sometimes, this propagates all the way posteriorly, and the disassembly proceeds rapidly. Many times, however, the chop will not penetrate the stretchy posterior plate. In that case, I will continue to chop the lens into many small (still posteriorly connected) pieces. The segments can be debulked both anteriorly and centrally with phacoemulsification, but I am careful to avoid the anterior capsular rim or performing phacoemulsification too deeply. In general, a cauliflower-like nuclear posterior shell remains. At this point, it is too dangerous to continue whittling with a sharp-tipped phaco handpiece, so I prolapse a portion of the lens above the anterior capsule. This maneuver can be accomplished with hydrodissection or visco-elevation (Figure) or by using the high vacuum of the phaco tip to hold and then lift forward a nuclear pole.

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Next, I place a generous amount of Viscoat (Alcon Laboratories, Inc.) around the lens and perform a "carouseling" maneuver to emulsify the remaining lens plate from underneath. A back-cracking technique from below is an alternative to free the partially subdivided segments. The key is to attack the edges of the lens (as opposed to burying the tip in the center) and to perform phacoemulsification from its underside, with the bevel of the phaco tip under and facing the lens—and hence away from the cornea.

This prolapsing technique can be used even earlier in a case if need be (eg, in an eye with loose zonules or when you cannot chop at all). In essence, after bringing the lens out of the capsular bag, you have achieved an intraocular "extracap." With today's phaco technology and protective retentive viscoelastics, you can then choose to continue emulsifying the lens without enlarging the incision.

CONCLUSION

The densest cataracts can be safely emulsified when the surgeon prepares a thorough surgical plan and has available on standby contingency instrumentation. A stepwise progression—from deepening of the anterior chamber and pupillary management to capsular staining and capsulotomy sizing through nuclear disassembly with both chopping and supracapsular techniques—has worked for me in these challenging cases. ■

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