Given its propensity to induce intraoperative complications, the morgagnian or hypermature cataract remains a challenge for any surgeon. This type of cataract incorporates a number of ominous morphologic conditions, including a fibrous and rigid anterior capsule, lack of cortical support, zonular weakness, a rock-hard nucleus, and vitreous syneresis.

**DANGEROUS CONDITIONS**

Before detailing our case presentation and surgical intervention for a woman with a hypermature morgagnian cataract (video available at eyetube.net/?v=fivil), let us first review the undesirable morphologic conditions the surgeon faces with this type of cataract:

- **Fibrous, rigid anterior capsule.** It is difficult to obtain a good, round capsulorrhexis in these eyes. The fear of losing the tear into the periphery sometimes leads to creation of a small, less ideal capsular opening.

- **Lack of cortical support.** With the entire cortex liquefied, the nucleus moves freely within the capsular bag. In these cases, the posterior capsule is prone to engagement with the phaco tip as soon as a pressure imbalance occurs in the anterior chamber.

- **Zonular weakness.** Weak zonules, always present in these cases, can sometimes be observed clinically preoperatively by signs of iridodonesis or phacodonesis. Zonular weakness can easily transform into zonular dehiscence, even with the minimal mechanical traction inherent in any phacoemulsification procedure. Once the mechanism is initiated, unzippering of the nearby zonular fibers can expand the defect to such proportion that the entire lens balance is compromised.

- **Rock-hard nucleus.** Difficult to crack, no matter which technique you employ—divide-and-conquer, debulking with deep grooves, or vertical or horizontal chopping, to name a few—the posterior nuclear plate will resist almost any maneuver because of its sticky, fibrous nature.

- **Vitreous syneresis.** In less mature eyes, the vitreous gel acts as a mechanical buffer against trampolining of the posterior capsule and large excursions in anterior chamber depth. In the morgagnian cataract, vitreous syneresis or shrinkage is almost always present, making the operation even more difficult.

**TROUBLE FROM THE START**

A 90-year-old white woman presented with a fibrous anterior capsule; extreme zonular weakness; and a hard, brown nucleus observed to be moving freely in the capsular bag.

In surgery, the anterior capsule was stained with trypan blue dye, and a 5-mm capsulorrhexis was attempted. Difficulties were encountered from the beginning: After puncturing the anterior capsule, visualization immediately decreased, as liquefied cortex poured into the anterior chamber (Figure 1A) and mixed with the ophthalmic viscosurgical device (OVD).

The anterior capsule in these types of eyes is a mixture of brittle areas that can tear uncontrollably and calcic plates that should be avoided by tearing around them (Figure 1B). General zonular weakness was noted by the presence of traction folds in the peripheral anterior capsule induced during the capsulorrhexis (Figure 2). The nucleus moved freely inside the capsular bag, offering little to no support for capsulorrhexis creation. I refilled the bag frequently with a highly dispersive OVD. Applying slight pressure with the OVD cannula to reposition the lens more centrally revealed an area of absent zonular support at the 5-o’clock position; unfortunately this ominous sign passed unnoticed at the time (Figure 3). The final resulting capsulorrhexis was small: less than 4 mm in diameter.

**ZONULAR RUPTURE AND CAPSULAR TEAR**

Standard horizontal chop phacoemulsification was initiated; however, from the first chops, while attempting...
to crack a resilient posterior nuclear plate, the zonular fibers started to unzip (Figure 4A) and the initially small dehiscence evolved quickly into a full-blown rupture of more than 180° (Figures 4B and 4C). Happily, no vitreous presented in the posterior or anterior chambers, and I was able to take a minute to devise a plan to address this dramatic situation.

I decided that the best course was to implant a capsular tension ring (CTR), but first I had to deal with the real emergency: reinflating the lens bag and reexpanding its equator to reinstate the anatomic barrier between the anterior and posterior poles. A dispersive OVD was used to achieve this goal (Figure 5). Afterward, two stab incisions were made, and iris hooks were anchored on the capsulorrhexis margin to provide vertical support to the capsular bag and maintain it in the horizontal plane (Figure 6).

Insertion of the CTR into the capsular bag was uneventful, and the outcome was horizontal support to the equator and adequate bag expansion during phacoemulsification. I used a Sinskey hook to provide counterforce and orient the CTR on a slightly centripetal pathway, preventing it from becoming entrapped in the equatorial folds (Figure 7). Having obtained a stable lens-bag system, care was taken to proceed with slow, controlled phacoemulsification so that no more unnecessary stress would be inflicted on the remaining zonules.

At the end of phacoemulsification, a small posterior capsular tear was noticed. Prolapse of vitreous was blocked by injecting a highly dispersive OVD, both inside

WATCH IT NOW AT WWW.EYETUBE.NET

Using your smartphone, photograph the QR code to watch the video on Eyetube. If you do not have a QR reader on your phone, you can download one at www.getscanlife.com.

direct link to video: http://eyetube.net/?v=fivil
the bag and posterior to the capsule in the Berger space, and intraocular forceps were used to turn the tear into a posterior capsulorrhexis (Figure 8). No vitreous loss occurred, and a foldable lens was implanted in the sulcus, as this position offers the best long-term stability in this situation.

The patient’s visual recovery was excellent, with a clear cornea and 20/30 visual acuity on postoperative day 1.

**PREEMPTIVE MEASURES**

Upon retrospective analysis, several preemptive measures should have been taken to avoid the surgical complications we encountered. First, a larger capsulorrhexis is beneficial in such cases, as it allows greater space to maneuver instruments. This can ease the mechanical stress on the zonules. If the capsulorrhexis is too small, a new tear should be initiated to enlarge it.

Second, small zonular dehiscences should be readily recognized and specific countermeasures employed as early as possible. Of these devices, capsular support hooks are probably the most comfortable for the patient and safest to use, as they provide simultaneous vertical and horizontal support to the capsular bag.

Third, one should be aware of the significant risk of vitreous prolapse through the zonular defect. Dealing with the vitreous is a delicate issue; it is an enemy as well as an ally when trying to save an unstable lens. If too small a vitrectomy is performed, traction over the remaining

---

**TAKE-HOME MESSAGE**

- In surgery for morgagnian cataract, the surgeon must remember that a number of ominous morphologic conditions are present, including fibrous and rigid anterior capsule, lack of cortical support, zonular weakness, a rock-hard nucleus, and vitreous syneresis.
- In cases such as this, a larger capsulorrhexis allows greater space to maneuver instruments and can partially or fully spare the mechanical stress on the zonules.
- Zonular dehiscences should be readily recognized and specific countermeasures employed as early as possible.
vitreous threads can induce peripheral retinal tears and subsequent detachment. Too large a vitrectomy, and the already delicate balance of the capsular bag may be altogether lost. Do not forget that, when zonular support is absent, the only anatomic structure that keeps the lens floating at the level of the anterior pole is the vitreous.

CONCLUSION

When zonular weakness and hard nuclei are faced on a regular basis, it is just a question of time until complications occur. No matter how careful you are, one day your luck will run out, and that day you must be prepared to use one or more of the available capsular support devices described above.

Alin Stefanescu-Dima, MD, PhD, is an Assistant Professor of Ophthalmology at Craiova County Emergency Hospital, Ophthalmology Clinic, Romania. Dr. Stefanescu-Dima states that he has no financial interest in the products or companies mentioned. He may be reached at e-mail: stefanescu.alin@gmail.com.