

Experts Tackle Cataract Complications

At last November's Spotlight Session, audience members voted on video case studies highlighting myriad clinical challenges, including IOL exchanges, traumatic cataracts, and surgery in patients with chronic uveitis. Here, the experts weigh in with additional perspectives.

This past November, the 11th annual Spotlight on Cataract Surgery Session at the Academy's Joint Meeting was entitled "Clinical Decision-Making With Cataract Complications: You Make the Call." Cochaired by William J. Fishkind, MD, and myself, this four-hour symposium was organized around seven video cases that presented a range of cataract surgical challenges and complications.

The cases were selected from my own practice. As I presented the videos, I would pause at the point of a management decision or complication. The attendees were then asked to make clinical decisions using their electronic audience response keypads. This was followed by several rapid-fire didactic presentations on topics of relevance to the case. Next, a rotating panel of two discussants (who had never viewed the case) was asked to make a management recommendation before the video of the outcome was shown. Following additional audience polling about preferences and practices, the two panelists summarized their own opinions.

In all, nearly 40 presenters and panelists spoke about managing a refractive power surprise; unhappy multifocal patients; intraoperative floppy iris syndrome; mature white,

brunescient, and traumatic cataracts; capsulorrhexis and posterior capsular tears; zonular weakness; and how to address pupil defects.

Jack T. Holladay, MD, concluded the symposium by delivering the Academy's eighth annual Charles Kelman Lecture, titled "The Perfect IOL Calculation." The entire symposium, including videos and PowerPoint, is available for purchase at www.aao.org/ondemand.

This *EyeNet* article reports the results of the 32 audience response questions, along with written commentary from symposium speakers and panelists. Because of the anonymous nature of this polling method, the audience opinions are always interesting. To complement this article, *EyeNet* online offers all seven case videos; look for this article at www.eyenet.org.

The Academy's meeting features a daylong, continuous series of cataract symposia that constitute Cataract Monday. In the afternoon, the ASCRS-cosponsored symposium (Femto Forum: Cataract, Cornea, Refractive, and Beyond) was followed by a special spotlight symposium on pseudo-exfoliation.

—David F. Chang, MD
Cataract Spotlight Program Cochairman



Case 1: IOL Power Surprises After LASIK

Q In your experience, what is the single best method for determining the IOL power in post-myopic LASIK eyes?

| | |
|---|-------|
| Clinical history method | 17.1% |
| Masked formula | 5.9% |
| Haigis-L formula | 29.6% |
| Topography extrapolations | 19.7% |
| Intraoperative wavefront refraction | 11.2% |
| No opinion | 16.4% |

Doug Koch It is interesting to see the disparity of responses. There is no one approach that is preferred by the audience. I think that this nicely reflects the complexity and ambiguity we face in doing these calculations. A formula may work well in one eye and then underperform, compared to other formulas, in the next eye.

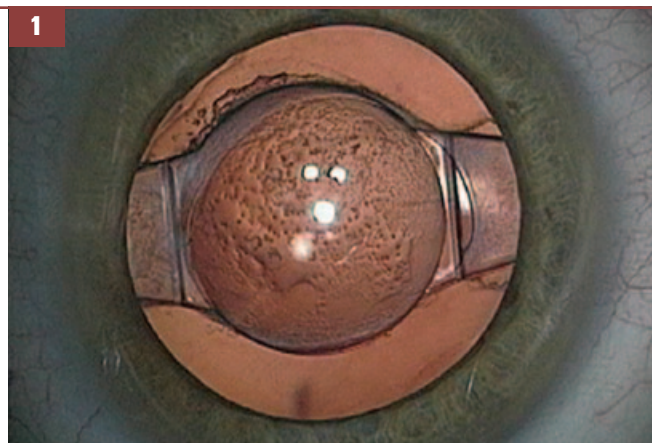
This is the reason we created the ASCRS online calculator (<http://iolcalc.org>). While it enables clinicians to use the formula of their choice, it also provides an average value, which is sometimes the best approach of all. It also provides a printout that can be shown to the patient to underscore the range of lens powers from which the surgeon must choose.

Mark Packer The somewhat diffuse audience response underlines a vast uncertainty about how to best deal with post-LASIK eyes. Incorporating intraoperative wavefront measurement into my approach has demonstrably improved the refractive outcome of IOL implantation in these cases. Pooled data from surgeons employing this technique verify these results. Employing the ASCRS calculator provides useful brackets for the IOL power; performing the aphakic refraction during surgery establishes the optimal choice. By utilizing this two-part method in my practice, I have been able to achieve 20/40 or better uncorrected acuity 100 percent of the time.

Q This unhappy 57-year-old patient is 10 years out from LASIK for myopia and five years out from having a Crystalens implanted in her left eye. The phakic right eye is -2.50 . The left eye is $-7.50 + 2.50 \times 150$, with a large myopic power surprise and a secondary membrane. How would you manage her?

| | |
|--|-------|
| Nd:YAG capsulotomy and prescribe glasses . . | 16.0% |
| Nd:YAG capsulotomy—then piggyback IOL . . | 12.7% |
| Piggyback IOL—then Nd:YAG capsulotomy . . | 13.8% |
| IOL exchange with monofocal IOL | 16.6% |
| IOL exchange with toric IOL | 27.1% |
| Refer elsewhere | 13.8% |

Warren Hill I find it interesting that the most popular response was to opt for an IOL exchange in favor of a toric



CASE 1. Preop.

lens. It should be remembered that a toric IOL requires implantation completely within the capsular bag and long-term stable alignment. This portion of the audience may have never attempted to reopen the capsular bag five years after a Crystalens implantation. Those familiar with this IOL know that the distal portion of the haptics can be exceptionally difficult to mobilize, and they are frequently left in place following amputation. In my opinion, five years after the original surgery, this option is the least likely to have the potential for a successful outcome.

An IOL exchange in favor of a monofocal IOL has the advantage in that the capsular bag does not need to be completely reopened, and the exchange lens can be placed in the ciliary sulcus. For those comfortable with a potentially complex IOL exchange, this is a reasonable option.

With 3.75 D of anisometropia, glasses may be tolerated, but not by all, and a slab-off lens would be required to prevent diplopia in downgaze.

For a spherical equivalent of -6.25 D, I would not recommend myopic LASIK. Additional central corneal flattening would only increase an already elevated spherical aberration value. And if the ablation was in any way off center, such an approach would also add coma. In my opinion, this patient would be a poor candidate for additional refractive surgery.

Because a lens exchange would be challenging, and provided there is adequate space between the posterior iris and the anterior surface of the Crystalens, I would opt for the placement of a piggyback IOL followed by an Nd:YAG laser capsulotomy. For this scenario, the astigmatism could also be reduced, but not eliminated, by limbal relaxing incisions. For a minus-power piggyback IOL, when the spherical equivalent to be corrected is less than -7 D, the power change required at the spectacle plane is simply multiplied by 1.3 to give the power of the piggyback IOL. Three-piece, foldable, minus-power IOLs are available in a range that could be used for this purpose.

José Güell It is impossible to properly correct this scenario at the corneal level; thus, an intraocular approach is much better and more appropriate. It is also more appropri-

ate and safer to delay Nd:YAG capsulotomy until the refractive problem is solved. A toric piggyback IOL, such as the Sulcoflex, would be an option, but visual quality is always superior with one optic, so I would try an exchange.

Once the capsular bag has been viscodissected and re-opened, if the haptics are very difficult to remove, they might be cut. Usually, however, with slow maneuvers, you can dissect and extract the IOL in one piece (or in several pieces) through a small incision, around 2 mm. Once the first IOL is extracted (complete or not), a toric in-the-bag IOL can be introduced, following your standard for proper orientation. Calculating the power, based on the power of the previous IOL, is quite simple in pseudophakic post-LASIK eyes.

In any circumstance in which you do not obtain an adequate dissection of the capsular bag, a spheric IOL should be implanted, leaving correction of the astigmatism (either with laser or incisional corneal surgery) for later.

Q During the IOL exchange attempt, one of the Crystalens haptics is found to be fibrosed within the capsular bag equator. What would you do now?

| | |
|---|-------|
| Use instruments to dissect the haptic free. | 0.0% |
| Viscodissect the haptic free | 13.1% |
| Amputate the haptic. | 80.0% |
| Abort the IOL exchange and implant a piggyback IOL | 1.3% |
| Would refer elsewhere | 5.6% |

Bonnie Henderson The most difficult parts of an IOL exchange are mobilizing and removing fibrosed haptics. These can be a challenge with any type of IOL, but the challenge is even bigger with the Crystalens, due to the design of the distal haptics. These haptics tend to fibrose into place sooner than those of traditional three- or single-piece IOLs. If the haptics are securely fibrosed, aggressive attempts to extract them should be curtailed to prevent zonular dialysis. Instead, the haptics can be truncated and left in place. The majority of the audience agreed with this approach.

However, this can sometimes be easier said than done. Care should be taken to avoid pulling on the IOL when attempting to amputate the haptic. It is easy to break zonules while positioning the scissors to cut the haptics. To prevent this from happening, cut the optic in half first. Then only half the IOL is being manipulated while you attempt to cut the haptic, thus avoiding the risk of pulling on the other haptic/bag junction 180 degrees away. An additional benefit of bisecting the optic is that it allows for the removal of the optic through a small incision. Lastly, it is important to have the right tools for the IOL exchange. Having microforceps and microscissors at hand is paramount when IOL manipulation is warranted.

Q If you were a 60-year-old patient undergoing cataract surgery with a monofocal IOL, what would you elect if you had +1.00 D x 165 of astigmatism?

| | |
|--|-------|
| Manual astigmatic keratotomy | 2.2% |
| Femtosecond laser astigmatic keratotomy. | 5.8% |
| Toric IOL | 42.3% |
| Incision on axis | 19.7% |
| Would not treat | 29.9% |

Stephen Lane Interestingly, roughly 25 percent of the audience would treat 1 D of against-the-rule (ATR) astigmatism with corneal incisional techniques, approximately 45 percent would use a toric IOL, and, remarkably, 30 percent would not treat it at all! I would be curious if these same audience members would not include the astigmatism component of a spectacle prescription.

Granted, ATR astigmatism will give some increased depth of focus and possibly aid in near vision. However, we have recently been reminded by Doug Koch that the posterior cornea possesses ATR cylinder, which may be as much as 0.5 to 0.75 D in addition to any measured anterior corneal cylinder.¹ If I were undergoing cataract surgery today, I would certainly desire my cylinder fully corrected; in this case, full correction would be most predictably achieved (given the total of roughly 1.5 to 1.75 D) with a toric IOL.

When discussing cataract surgery, I believe it is in the best interest of our patients to include a thorough discussion of astigmatism correction—and to consider this discussion in the same light as we have always considered full astigmatic correction in our patients' spectacles.

1 Koch DD et al. *J Cataract Refract Surg*. 2012;38(12):2080-2087.

IMPROVING OUTCOMES. Jack T. Holladay, MD, giving the eighth annual Kelman Lecture, on "The Perfect IOL Calculation."



Case 2: Unhappy Multifocal IOL Patient

Q How long postoperatively are you generally willing to perform a multifocal IOL exchange?

| | |
|------------------------------|-------|
| Three months | 11.2% |
| Four to six months | 14.6% |
| One year | 11.2% |
| No time limit | 44.7% |
| Would refer | 18.4% |

Thomas Kohnen In general, a multifocal IOL exchange can be performed at any time. However, the further you are from the primary implantation, the more complicated such an IOL exchange can be.

Before exchanging a multifocal IOL, I would try to detect any underlying problems. Dry eye is common, as are residual refractive errors. Both entities can be treated—with medication for dry eye or, in the case of refractive errors, with glasses, excimer laser surgery, or supplementary IOL implantation into the sulcus. With the treatment of these two complications, most of my patients have been able to tolerate multifocal IOLs, and an IOL exchange became unnecessary. Other potential complications include cystoid macular edema (CME) or low endothelial cell count, which also should be detected before implanting a multifocal IOL.

If one has a major concern about the acceptance of a multifocal IOL in a patient, I would recommend waiting before performing Nd:YAG laser capsulotomy because this will make IOL exchange more complicated and challenging. However, in some cases, the treatment of an opaque capsule (sometimes not even seen at the slit lamp) can tremendously improve the outcome after implantation of a multifocal IOL.

In summary, IOL exchange of a multifocal IOL is always possible; however, the later it occurs, the more complicated the exchange may be! On the other hand, all complications—such as dry eye, residual refractive errors, endothelial damage, or macular problems—should be detected and treated before an IOL exchange is even considered. With this strategy, in my experience, most patients can in general tolerate and enjoy multifocal IOLs.

Q This 73-year-old patient is four years out from a combined phaco-trabeculectomy procedure with bilateral ReStor IOLs. She has a long list of complaints, including poor spectacle-corrected acuity in her right eye, in which she has had an Nd:YAG capsulotomy. Both eyes have BCVA of 20/30, but the right eye has higher-order aberrations. What option would you offer her?

| | |
|--|-------|
| Reassurance and more time for adaptation . . . | 16.5% |
| Keratorefractive laser enhancement | 46.8% |
| IOL exchange | 19.0% |
| Referral to another ophthalmologist | 15.2% |
| Referral to a psychiatrist | 2.5% |

Eric Donnenfeld Managing the unhappy presbyopic IOL patient begins with evaluation of the five C's: cornea and ocular surface, cylinder and refractive error, capsule opacification, CME and retinal issues, and centration of the IOL on the pupil.

In this case, assuming the ocular surface was healthy, a careful refraction would be in order, especially following a phaco-trabeculectomy, in which cylinder is often induced. Optical coherence tomography of the macula and optic nerve would also be in order to rule out macular pathology and optic nerve damage from the glaucoma. Despite the four-year history and the open posterior capsule, an IOL exchange would be in order, because the right eye has a BCVA of 20/30 with high-order aberrations and poor quality of vision.

I would replace the multifocal IOL with a three-piece monofocal IOL that optimizes the reduction of high-order aberrations. Finally, I would not consider treating the left eye until the right one was stable. Often, unhappy patients with multifocal IOLs do extremely well with a monofocal IOL in their dominant eye while maintaining the multifocal IOL in their nondominant eye.

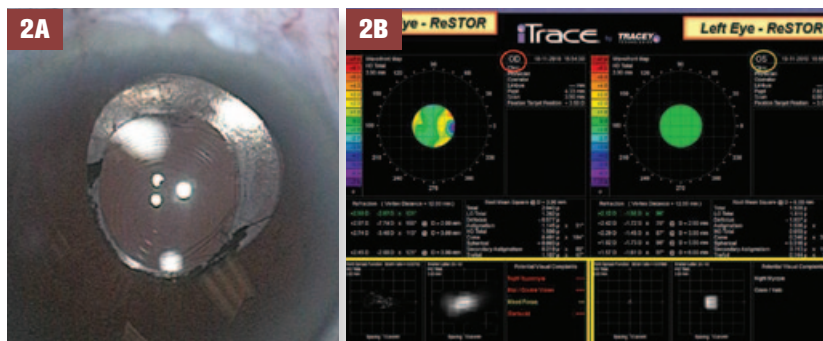
Q During attempted IOL exchange, one of the ReStor haptics is found to be fibrosed within the capsular bag equator. What would you do now?

| | |
|---|-------|
| Use instruments to dissect the haptic free. . . . | 5.3% |
| Viscodissect the haptic free | 10.3% |
| Amputate the haptic. | 73.4% |
| Abort the IOL exchange. | 6.4% |
| Would refer elsewhere | 4.6% |

Kerry Solomon It is not uncommon for the peripheral terminal bulb of a ReStor lens to become fibrosed within the capsular bag. This can occur early or later in the postoperative time period. Surgeons should be aware of this potential issue and avoid stressing the capsular bag or the zonular supporting system. Careful attention can often avoid a zonular dehiscence or a capsular tear.

When a surgeon finds one or both of the ReStor haptics to be fibrosed in the capsular bag, the majority of the attendees in the audience (73 percent) would elect to amputate the haptic. This is certainly a reasonable strategy and one that permits a new lens to be reinserted into the capsular bag. The haptics of the new lens should be oriented 90 degrees away from an amputated haptic to permit the lens to center properly and for the new haptics to rest in the capsular equator.

Another successful strategy is to viscodissect the fibrosed haptic(s) free. I have found that the dispersive viscoelastic Viscoat works quite well for this purpose. The key is the positioning of the Viscoat cannula. Even in the presence of an



CASE 2. (A) Preop. (B) Ocular wavefront both eyes preop.

Rich Tipperman It is not surprising that the majority of surgeons (73 percent) have not explanted a presbyopia-correcting IOL, as this is still an uncommon procedure. Nonetheless, despite the best available technologies, preoperative evaluations, and efforts on behalf of both the patient and the surgeon, there will be rare patients who are

apparently successful capsular expansion using Viscoat, the peripheral haptic(s) can still be persistently fibrosed. In my experience, performing a viscodissection directly down the peripheral haptic will often free the terminal bulb from its encased fibrotic complex. This permits complete removal of the ReStor lens.

Q Do you have personal experience with explanting presbyopia-correcting IOLs?

- Yes—but only multifocal IOLs 15.1%
- Yes—but only accommodating IOLs 3.6%
- Yes—both multifocal and accommodating IOLs . . 8.3%
- I use them, but have never explanted one 36.1%
- I don't use these IOLs. 36.9%

dissatisfied enough with their visual function from a presbyopic IOL that they will require exchange for a monofocal IOL. In the hands of an experienced surgeon, this procedure is remarkably safe and effective and will typically provide complete resolution of any visual symptomatology the patient was experiencing referable to the presbyopic IOL.

Of course, no surgeon would ever want to create a scenario in which he or she has to perform an IOL exchange. But the procedure should be seen for what it is clinically: a way to make the refractive component of presbyopic IOL surgery 100 percent reversible. When viewed in this fashion, the ability to reverse the refractive effect becomes a positive feature rather than a negative one. Not even laser vision correction enjoys this 100 percent reversibility.

Case 3: White Lens Plus Uveitis

Q This 16-year-old patient has a three-year history of chronic iridocyclitis. What is your preferred capsulotomy method in a young patient with a white lens?

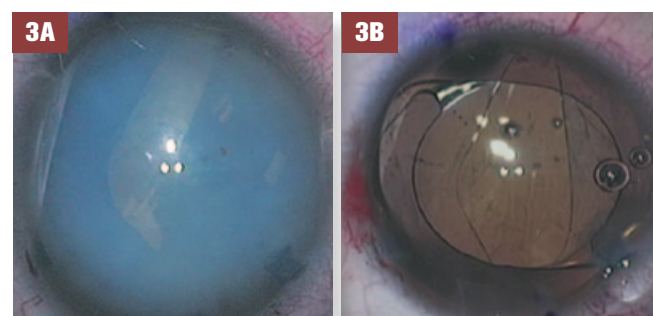
- Retentive ophthalmic viscosurgical device (OVD) and forceps 49.6%
- Irrigating cystotome 4.0%
- I use a sharp needle to first aspirate cortex . . . 41.6%
- Femtosecond laser 3.2%
- I would refer this patient 1.6%

Bob Osher There are different types of white lenses. Although they share in common poor visibility of the anterior capsule requiring staining, each calls for a different approach.

Either a needle or a forceps will work fine with a hard white cataract, while a morgagnian cataract requires a puncture followed by refilling the bag with retentive OVD and the use of a forceps. It is the intumescent cataract in the younger patient that is at great risk for the “Argentinean Flag.” Carlos G. Figueiredo recently published the ideal approach to managing this cataract,¹ which is characterized

by a nuclear block within the lens, whereby liquefaction has raised the pressure within both the anterior and posterior cortical compartments. Simply decompressing the anterior compartment with a needle does nothing for the posterior compartment, and spontaneous extension of the anterior capsular tear may occur.

After the anterior capsule has been stained and a retentive OVD (such as Healon 5) compresses the lens, a small capsulorrhexis is initiated by a puncture followed by downward force (ballotting) on the lens. This breaks the nuclear block, allowing the posterior cortical compartment to decompress. Once this occurs, the risk of capsular extension diminishes, and the surgeon may proceed with his or her preferred needle or forceps technique. A safer strategy is to



CASE 3. (A) Radial anterior capsule tear. (B) Toric IOL implanted.

plan a small rhexis, which can then be enlarged. By combining these measures, the rhexis can be safely accomplished.

Remember that the capsulorrhexis is like the alphabet: If A goes Awry, then B is Bad, C is Catastrophic, and D is a Disaster!

1 Figueiredo CG et al. *J Cataract Refract Surg*. 2012;38(9):1531-1536.

Q Which IOL material is your preference for eyes with chronic uveitis?

| | |
|-------------------------------|-------|
| Hydrophobic acrylic | 64.8% |
| Hydrophilic acrylic | 21.6% |
| Silicone | 6.0% |
| Collamer | 2.4% |
| PMMA | 5.2% |

Randy Olson The audience response is about what I would expect and follows the generally held concept that silicone is bad and hydrophobic acrylic is the lens of choice. While earlier plate-haptic silicone and PMMA IOLs did have a marked increase in signs of inflammation (giant cell deposits and synechiae), later-generation silicone IOLs did not show this. Thus, PMMA and plate-haptic silicone IOLs are contraindicated, but all the other IOLs listed in the survey do not have peer-reviewed evidence that they are contraindicated.

Theoretically, the greatest uveal biocompatibility would be with hydrophilic IOLs (hydrophilic acrylic and collamer). However, in the capsular bag in uncomplicated surgery, the two hydrophobic alternatives (hydrophobic acrylic and later-generation silicone IOLs) have stood the test of time and do fine.

Q During the capsulotomy, one side of the tear abruptly splits radially. What would you do next?

| | |
|---|-------|
| Initiate phaco and/or I&A | 12.1% |
| Attempt to rescue one side of the capsulotomy | 29.5% |
| Convert to a can-opener capsulotomy | 42.1% |
| Make radial relaxing incisions in the two edges | 15.3% |
| I would refer this patient elsewhere | 1.1% |

Bob Cionni The intumescent cataract is more likely to develop a radial tear in the anterior capsule during capsulorrhexis due to the inherent intralenticular pressure. The best way to manage this occurrence is to prevent it. Use of the femtosecond laser to perform the capsulotomy has been quite successful.

If performing the capsulotomy manually, one should stain the capsule with trypan blue and then, using a highly retentive OVD, deepen the anterior chamber until the anterior capsule flattens. The capsulotomy should be initiated more centrally than is typical; and, using a 27-gauge cannula, the surgeon should aspirate the liquefied cortex to decompress the lens and prevent the intralenticular pressure

from pushing the tear peripherally. These steps will usually prevent a radial tear.

However, if a radial tear develops, the case can still be saved. To begin, deepen the chamber with a highly retentive OVD. If the edge of the tear can still be seen, one can rescue the tear as described by Brian Little: The edge is folded under and redirected by pulling centrally. The tear should move centrally instead of continuing peripherally. If the tear has extended beyond the pupil margin, inject a highly retentive OVD, make an incision circumferentially in the edge of the radial tear, and, using capsulotomy forceps, restart a new tear, basically ignoring the radial extension.

Whenever the capsulotomy is not continuous, one must be extremely careful and gentle for the remainder of the case. Do not hydrodissect, as doing so would only encourage the tear to extend further, perhaps all the way to the posterior capsule. Instead, begin phacoemulsification; the intumescent lens should be removable without issues. Careful cortical aspiration begins away from the radial tear, and great care should be taken when removing cortex from the area near the tear. The bag is then filled, but not overfilled, with a cohesive OVD before implanting the IOL. A single-piece acrylic IOL with low expansile force haptics, such as the AcrySof IOL (Alcon), is placed with the haptics oriented perpendicular to the tear to decrease the risk of tear extension (versus a three-piece IOL with more rigid haptics). The OVD can be removed as usual; to prevent the chamber from collapsing, inject balanced salt solution (BSS) when withdrawing the I&A tip.

Q Preoperatively, this uveitis patient had decided on a toric IOL for 1.5 D astigmatism. With a single radial capsulorrhexis tear, what IOL would you implant?

| | |
|---|-------|
| Single-piece acrylic monofocal IOL in bag . . . | 19.8% |
| Single-piece acrylic toric IOL in bag | 45.0% |
| Three-piece IOL in bag | 14.9% |
| Three-piece IOL in sulcus | 19.0% |
| I would refer him elsewhere | 1.2% |

Q The toric IOL is implanted into the capsular bag. How would you try to prevent posterior synechiae from forming to the anterior capsule in this eye?

| | |
|---|-------|
| Topical atropine postoperatively | 16.4% |
| Topical pilocarpine postoperatively | 1.8% |
| Make a can-opener capsulotomy or radial capsulorrhexis cuts | 11.9% |
| Secondary enlargement of the capsulorrhexis . . | 30.5% |
| I would not change my routine | 39.4% |

J.P. Dunn In the first scenario, assuming that the nucleus and cortex have been successfully removed so that the only issue is the IOL, the first step is to determine the extent of the capsulorrhexis tear. The eye should be gently filled with a dispersive viscoelastic, and the iris manipulated peripherally with a Lester IOL Manipulator (Katena) or a similar instrument to see if the tear has extended to the equator or

beyond. (Many such anterior radial tears do not continue past the equator.)

It is not usually a problem to place a toric IOL in the capsular bag in these situations unless the tear extends posteriorly; however, it is very important that the haptics are well seated in the capsular bag. Moreover, if the axis of the tear is in the same meridian as the desired axis of the toric IOL, it becomes much more likely that the haptic will push through the capsular tear, thereby causing significant IOL decentration. In this situation, it may be safer to implant either a single-piece or a three-piece IOL in the bag and deal with the astigmatism later with astigmatic keratotomy. One time-consuming but generally safe method to test these options is to place the toric IOL, gently remove the viscoelastic, and check the alignment of the IOL. If it is properly positioned at this point, it is unlikely to move significantly in the postoperative period. If the alignment is unstable, the toric IOL should be removed and a monofocal IOL placed.

In the second scenario, the most important means of preventing posterior synechiae (iridocapsular adhesions) from forming is to aggressively control postoperative inflammation with potent topical corticosteroids, especially

if some residual cortex was left behind at the end of surgery. Occasionally, it is necessary to employ a periocular corticosteroid injection and/or a short course of oral corticosteroids. Posterior synechiae will often form following cataract surgery as long as the uveitis is active, regardless of whether the capsular opening is intact (continuous capsulorrhexis) or has been modified with radial cuts or converted to a can-opener type. Pilocarpine is proinflammatory and should not be used in patients with uveitis either to induce miosis or decrease IOP. In addition to aggressive control of the uveitis, dilating drops can be helpful, but the goal is to keep the iris moving, rather than keeping it fully dilated. Use of atropine once or twice a day at the most will usually allow movement of the pupil on a diurnal basis (dilation followed by slow return to normal size) and prevent or minimize synechiae formation. More frequent dilation will simply cause the synechiae to form with a dilated pupil to the edge of the rhexis, especially if it has been enlarged. Be aware that it is now difficult to obtain homatropine, so if a shorter-acting cycloplegic agent is desired, cyclopentolate 1 percent is a reasonable choice, although it stings much more than either homatropine or atropine.

Case 4: Rock-Hard Nucleus Plus Fixed Small Pupil

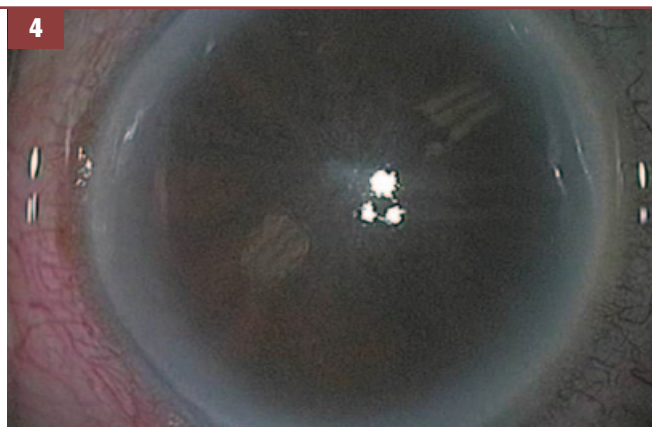
Q What is your usual approach for an ultrabrunescent cataract in a 90-year-old patient?

| | |
|---|-------|
| Phaco | 53.0% |
| Manual ECCE (large incision) | 19.7% |
| Manual ECCE (small incision) | 7.7% |
| Comfortable with either phaco or ECCE—it depends on the patient | 15.8% |
| I would refer this patient. | 3.8% |

Dick Lindstrom For me, as a 65-year-old ophthalmologist who has done several thousand planned ECCE procedures, this patient is best managed with manual large-incision ECCE. The nucleus will be very dense, the endothelial cell count low from natural aging, the capsule weak, and the zonules less resilient than in a younger patient.

If the patient is not on anticoagulants, I do a peribulbar block, use a large continuous tear anterior capsulotomy, hydrodissect the nucleus until it tilts out of the bag, and remove it with an irrigating vectis. I like to preplace three sutures and tie the central one with a temporary bow. I&A is routine, and a 6.5- to 7-mm all-PMMA aspheric monofocal IOL is my implant lens preference. The patient with this approach will have a crystal-clear cornea and good vision on day one.

If I believe a small-incision procedure is indicated—for example, with a patient who is on anticoagulants and has a history of a choroidal hemorrhage in the other eye—then I make a few adjustments to my phaco technique. If the pa-



CASE 4. Preop.

tient is not on anticoagulants, I will consider a peribulbar block in case conversion to an unplanned ECCE or even ICCE is required. I use a dispersive and cohesive viscoelastic in the Arshinoff soft-shell technique, make a larger continuous tear anterior capsulotomy, and hydrodissect the nucleus until it is freely mobile. I then also place some dispersive viscoelastic under the nucleus. Next, I debulk the nucleus with phacoemulsification, using a duty cycle in pulse or ultrapulse and energy level that is low enough to avoid a wound burn, in the posterior chamber, removing as much material as possible. I do not hesitate to place extra dispersive viscoelastic two or three times during the nuclear removal. While chopping and divide and conquer work well, I like a modified supracapsular phaco technique called tilt and tumble. Once the nucleus is just a thin shell, I hydrodissect or viscodissect it out of the bag and remove the

final nuclear remnants using a bevel-down technique. This eliminates any problem with a leathery posterior plate, and keeps the posterior capsule well protected.

In countries where manual ECCE skills are high, almost no surgeon would elect phacoemulsification in a 90-year-old with an ultrabrunescent cataract. In the United States, where most younger surgeons are far more comfortable with phaco than any form of ECCE, it is not surprising that 53 percent preferred this approach. With a high skill level and careful surgery, phaco can be done safely in these eyes, but for those skilled in the art, ECCE is a nice alternative.

R.D. Ravindran It is interesting to see that nearly 70 percent of the audience members would consider phacoemulsification. This shows the level of competence and the confidence of the members in the reliability of technology. With phaco, vertical or direct chop is the preferred technique. With any phaco technique, using a dispersive viscoelastic to coat the corneal endothelium is critical, as the emulsification process tends to be longer in these cases, generating significant levels of heat. Using a chopper tip that is long and pointed is important to create the division in the posterior plates of the hard cataract. Creating a complete initial crack with breakage of the posterior plate and bisecting the nucleus completely is the most important step. Creating at least six to eight fragments before removing each of these fragments is preferred. Extra caution should be taken while emulsifying the fragments, especially the last few, as these cases will not have any protective epinuclear cushion.

Given this patient's history [see below], large-incision ECCE should be done with all precautions. If ECCE is planned, doing it with preplaced sutures is preferred.

Even though it is preferred by only a small percentage of the audience, manual small-incision ECCE is an ideal technique in such cases, performed through a 6.5-mm to 7-mm incision. A large rhexis of 5.5 to 6 mm is essential with the nucleus delivered from the bag using a Sinsky hook. Here again, good use of a dispersive OVD is required. With this technique, the surgical complications are fewer compared with phaco, and the corneal clarity is much better on day one. Placing the incision on the steep axis will help in achieving better uncorrected visual acuity.

Q Two years ago, this 90-year-old patient lost her right eye due to a suprachoroidal hemorrhage during phaco. Her left eye is bare hand motions with an ultrabrunescent cataract and fixed secluded pupil. She is very scared about the possibility of surgical complications in this eye. What would you advise?

- I would discourage surgery or tell her to postpone it as long as possible 1.1%
- I would encourage surgery and perform it for her 44.6%
- I would encourage surgery but refer her 11.4%
- I would be neutral and totally leave it up to her. 35.4%
- I would refer her for a second opinion 7.4%

Kevin Miller With a bare hand-motions cataract, this patient has little to lose. She is already bilaterally blind. Under the worst of circumstances, she might wind up with a blind and painful left eye instead of just a blind eye. It is heartening to see that only 1.1 percent of the audience members would discourage her from undergoing cataract surgery.

Most patients who experience bad outcomes in one eye are reluctant to undergo surgery in the second eye. This is understandable. These patients appreciate that, while you are well intentioned and well trained, you cannot control everything that happens in the operating room. You cannot guarantee an uncomplicated outcome.

It is under these circumstances that a second opinion is very helpful. You can almost never go wrong by recommending that a patient obtain a second opinion, as long as the person rendering it is competent. Whenever you refer a patient for a second opinion, you take the ego risk that the patient will decide to have their surgery performed by the other ophthalmologist, but that is life. We are here to serve our patients.

I would not be neutral and leave it completely to the patient to decide, as was the response of 35.4 percent of the audience. This patient needs a paternalistic approach. Gentle and reassuring but firm pressure should be applied to get the patient to look at the situation less emotionally. Let's imagine a related scenario. Wouldn't a cardiologist who is caring for an asymptomatic patient with 95 percent blockages of the left circumflex, left anterior descending, and right coronary arteries be ethically obliged to strongly recommend immediate surgical intervention? Would it not be inappropriate for the cardiologist to follow the patient's inclination for continued observation? Neither would it be appropriate, in my opinion, for this blind patient to choose continued blindness without significant resistance from the ophthalmologist. She is understandably scared, but she also wants to see. She is reaching out for reassurance. While, ultimately, the decision rests with her, the ophthalmologist has the ethical obligation to encourage surgery and make sure it is done in a way that will ensure the best odds of a successful outcome.

This will be a difficult case, even without her history of suprachoroidal hemorrhage in the fellow eye. Ophthalmologists who do not routinely perform surgery on dense brunescent cataracts would appropriately refer this patient to someone with more experience. This was the response of 11.4 percent in the audience.

A little less than half of the audience would have encouraged this patient to undergo cataract surgery, and they would have performed it themselves. I belong to this group. If we look at the published literature, we find that complications following cataract surgery on monocularly sighted patients are acceptably low, and visual outcomes are almost uniformly good.^{1,2} We would expect the same for this patient.

1 Bergwerk KL, Miller KM. *J Cataract Refract Surg*. 2000;26(11):1631-1637.
2 Trotter WL, Miller KM. *J Cataract Refract Surg*. 2002;28(8):1348-1354.

Q After dissecting free the pupil margin and inserting a Malyugin ring, you notice a large tear in the dye-stained anterior capsule. What would you do next?

- Convert to a can-opener capsulotomy, then commence phaco 10.9%
- Try to tear a partial continuous curvilinear capsulotomy (CCC), then phaco 52.5%
- Convert to a can-opener capsulotomy and an ECCE 34.9%
- Abort surgery and refer the patient. 0.0%
- I would refer her elsewhere for surgery 1.7%

Steve Arshinoff It always adds a bit of humor to note that a small percentage of the audience says that the patient should have been referred elsewhere, thus allowing them to avoid the problem and the patient and get to the golf course earlier.

It is, however, interesting to note that one-third of the audience would have simply given up and converted to ECCE and a can-opener capsulotomy. I think that before we do that we should recall the potential complications of such actions. A ragged capsulotomy often leads to a piece of inverted capsule adhering to the posterior aspect of the iris, causing a bound-down decentered pupil and chronic inflammation. Furthermore, there is a high likelihood of having only one foot of the IOL in the bag and one in the sulcus, no matter where you intend to place them. If a single-piece acrylic had been chosen, chronic inflammation and uveitis-glaucoma-hyphema syndrome may result. Even with a three-piece IOL, the IOL may be decentered. Long-term inflammation and glaucoma are much more likely in these cases. So, perhaps bailing out to a can-opener capsulotomy and ECCE should not be the next step.

I tend to agree with the majority, over half of the audience, who proposed to attempt to make the capsulotomy as good as possible and to try to complete the phaco. As a first step, I would add a viscous OVD to increase the pressurization of the anterior chamber. This tends to make the capsule want to tear inward rather than outward. I would place an aliquot of a combination of intracameral xylocaine and phenylephrine below the OVD to get maximal pupil dilation to enhance visualization. Then I would try either to continue the capsulorhexis in the direction opposite to where the tear occurred, or to pull the tear back inward using the Little tear-out rescue technique, if the tear and its termination can be visualized. The fact that the capsule has been stained here with trypan blue aids in the rescue of the capsulorhexis, as trypan blue decreases the elasticity of the capsule, thus making tearing in the desired direction in a pressured anterior chamber much easier.

Usually, a surprisingly good rhexis can be fashioned and the phaco can be completed. I would use lower flow and turbulence techniques to keep everything stable as the case progressed. It may take a little longer, but the result is better. Sometimes, if the rhexis is not completely intact but is large, the nucleus will prolapse into the anterior chamber,



RAPID RESPONSE. Thanks to the use of electronic keypads, audience feedback was immediate and candid.

thus making phaco safe with respect to the capsule. A slow, gentle phaco is still advised. I&A is routine, leaving the area of the tear for last. I would prefer a single-piece acrylic IOL in this case, if a reasonable rhexis to contain it is present at the end of I&A. I would also place the haptics 90 degrees away from the tear because the gentle unfolding of single-piece acrylic IOLs makes their positioning in a potentially unstable capsular bag less risky.

Terry Kim First of all, I'm very pleased with the low number of responders who would either abort surgery or refer the patient. To me, this response reflects how valuable teaching efforts like this session have proved in instructing the audience how to handle these complications.

Otherwise, the majority of the audience decided to either perform a partial CCC (then commence with phaco) or convert to a can-opener capsulotomy (with greater preference to then commence with ECCE rather than phaco). In this particular case, based on the size, shape, and location of the anterior capsular tear, I would agree with the majority response and attempt a partial CCC and then, presuming successful completion of the CCC and adequate access to the lens, commence with phaco. To me, this approach would avoid the sometimes unexpected behavior of a can-opener capsulotomy as well as the much larger incision required for an ECCE.

I would use a dispersive viscoelastic to flatten the anterior capsule during the partial CCC to prevent further radialization of the current capsular tear as well as to prevent the partial CCC from heading out peripherally. I would then recommend removing this dense lens with a vertical or horizontal phaco chop technique to minimize stress to the capsule and zonules. During I&A of the cortex, I try to remove as much of the cortex as possible, saving the cortex near the anterior capsular tear for last. Finally, if the anterior capsular tear has not extended to the posterior capsule, it is reasonable to place a single-piece acrylic IOL in the bag or a three-piece acrylic IOL in the sulcus, with the haptics

oriented away from the area of the anterior capsular tear.

Despite all of these potential bumps in the road, many of these patients can achieve an excellent anatomic and visual outcome.

Q With a large radial anterior capsular tear, what IOL would you implant?

| | |
|--|-------|
| Single-piece acrylic IOL in bag | 55.9% |
| Single-piece acrylic IOL in sulcus | 5.0% |
| Three-piece IOL in bag | 16.8% |
| Three-piece IOL in sulcus. | 21.7% |
| Would refer elsewhere for surgery | 0.6% |

Walter Stark With a large radial tear in the capsule, the main considerations are to avoid having the tear extend posteriorly and to prevent decentration or dislocation of the

IOL. My favorite lens to use in these cases is the MA50BM acrylic (Alcon), which is a three-piece IOL. This lens has a 6.5-mm optic diameter and can be placed in the bag or the sulcus, whereas a single-piece acrylic IOL should never be placed in the ciliary sulcus. Also, this lens is not aspheric. Slight decentration of an aspheric lens causes more visual aberrations than a nonaspheric IOL.

If the tear does not extend posteriorly—past the equator of the nucleus—I would gently place the IOL loops in the bag. If the tear extends posterior to the equator, I would place the three-piece IOL loops in the ciliary sulcus. If the lens was not stable, I would constrict the pupil, obtain optic capture by the iris, and perform a modified McCannel suture of the IOL loop to the iris superiorly and possibly inferiorly using a 10-0 Prolene suture on a CTC-6 needle (Ethicon).

Case 5: Posterior Capsule Rupture With Descending Nucleus

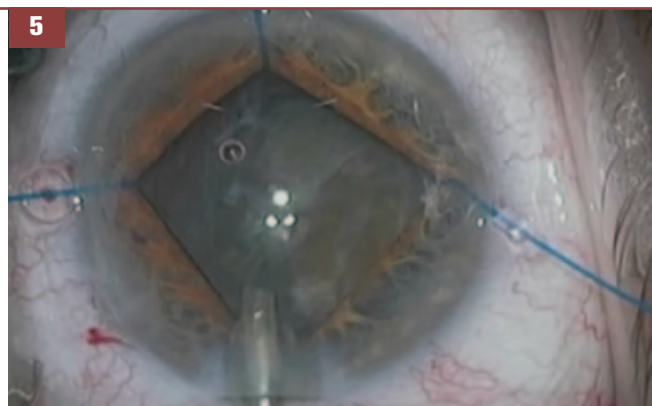
Q After you initiate chopping and rotation, the entire nucleus appears to partially descend in this elderly woman with pseudoexfoliation. What would you do next?

| | |
|---|-------|
| Cautiously continue to phaco. | 12.8% |
| Advance the iris retractors around the capsulorrhexis edge and resume phaco. | 31.8% |
| Levitate the nucleus with a posterior assisted levitation (PAL) technique and convert to manual ECCE. | 35.1% |
| Levitate the nucleus with a PAL technique and continue phaco. | 13.5% |
| Abort the case and refer the patient | 6.8% |

Lisa Arbisser The audience chose the two safest options depending on the capsule's condition. The video view fails to clarify whether the entire bag with intact posterior capsule appears to be descending in this pseudoexfoliation eye due to zonular incompetence or whether the nucleus is sinking outside a torn bag.

If the rhexis and posterior capsule are intact and still contain the nucleus, then advancing the iris hooks onto the rhexis edge will permit a virtually routine phaco, assuming there is no vitreous forward of the bag. Sparingly painting trypan blue over the edge of the rhexis can facilitate this maneuver. Once the lens material is removed, if it is possible to place a Cionni capsular tension ring (CTR) or Ahmed capsular tension segment (CTS), the surgeon will be able to suture the bag to the sclera, maintaining a two-chambered eye with an in-the-bag lens implantation.

If the capsule is broken and the nucleus is sinking, elevating the nucleus into the anterior chamber is required. This



CASE 5. Sudden descent of nucleus.

can be accomplished, as the audience agrees, either by a PAL technique or, anteriorly, via Arbisser Nuclear Spears (Epsilon EyeCare). The latter is my preference. These two small, precise, sharp spears are deployed through clear corneal paracenteses 180 degrees apart to skewer and elevate the lens. The opposing vector forces minimize downward pressure and can levitate the nucleus without invading the pars plana and vitreous cavity, where we risk traction. Once the nucleus is above the iris, one of the spears is exchanged for a dispersive viscoelastic cannula while the other spear holds the nucleus stable. OVD is irrigated beneath the nucleus to trap it and compartmentalize any prolapsed vitreous backward.

Given the density of the lens in the video, conversion to ECCE is reasonable, especially if the surgeon suspects vitreous around the nucleus. In the absence of prolapsed vitreous, Miochol-E (acetylcholine) for temporary miosis minimizes the chance of losing fragments during slow-motion phacoemulsification. If the chamber is sufficiently deep, the Agarwal IOL scaffold technique can be employed. Appropriate vitrectomy and the surgeon's favored method of IOL fixation without bag support complete the case.

Amar Agarwal In this particular case, iris retractors are already placed, and the nucleus in the middle of surgery

appears to be descending. The audience response—trying to first elevate the nucleus and then extend the incision—is very good. One can use the Arbisser Nuclear Spears, which can spear the nucleus and levitate it, or use a cannula to bring the nucleus anteriorly above the iris. Alternatively, one can go via the pars plana and levitate the nucleus.

Once the nucleus is above the iris, I would not extend the incision, as the nucleus was neither a hard brown nor a black cataract. I would release the iris retractors, as that would help constrict the pupil, and then inject some viscoelastic to protect the endothelium. Take a three-piece foldable IOL and inject it above the iris but below the nucleus. Both haptics could be placed above the iris or even into the sulcus. Once this is done, the IOL would act like a scaffold or an artificial posterior capsule. Now I would emulsify the nucleus with the phaco handpiece without the fear of the nuclear pieces falling into the vitreous cavity. I would then refit the iris retractors, do the vitrectomy, remove the cortex, and assess if enough anterior capsular support is there for either a sulcus implantation or a glued fixation of the same three-piece IOL. All this I would do with the help of an AC maintainer so that infusion is always on.

When we extend the incision, the eye is open—and once nuclear delivery is done, we have to again suture, then do the vitrectomy, then reopen the sutures and implant the IOL. Creating scleral flaps once again in an open eye is tough if one decides to do a glued IOL. The odds of expulsive hemorrhage and endophthalmitis also increase with the eye open. The IOL scaffold technique solves a lot of issues in this case.

Q What is your personal experience with PAL?

| | |
|--|-------|
| Have tried and it is my preference | 18.5% |
| Have tried—bad idea/not comfortable | 12.0% |
| Have never tried—would consider trying | 41.5% |
| Have never tried—wouldn't ever do it | 28.0% |

Suber Huang The ability to rescue dislocated lens nuclei using PAL is a useful addition to the cataract surgeon's skill set. Performed properly, it completes the surgery with minimal loss of efficiency, fewer complications, and no loss of confidence by the patient. Unfortunately, vitreous base traction resulting in retinal tear/detachment is a potentially blinding complication, and the response of the audience may reflect this concern. Being known as the "master of disaster" can be a compliment or an unwelcome statement of fact. Do no harm, involve your retina colleagues, and let good surgical judgment be your guide.

Q What is your personal experience with manual large-incision ECCE?

| | |
|---|-------|
| Very experienced | 45.5% |
| Some experience—and comfortable with. | 23.6% |
| Some experience—not that comfortable with | 17.0% |
| Very limited (or no) experience | 8.4% |
| Experienced and also comfortable with sutureless manual ECCE. | 5.5% |

Louis D. "Skip" Nichamin This is an important question, as an ever-growing percentage of ophthalmologists are graduating from training programs with little if any experience in performing manual ECCE. Roughly 70 percent of attendees stated that they are comfortable with performing a manual extraction, and one-quarter are uncomfortable with the technique and/or have little experience with it.

As the case presented illustrates, conversion to a manual expression may (and eventually will) be required in some complex cases. Residency program directors are faced with the challenge of preparing their trainees to handle this situation in an age in which phacoemulsification has all but replaced manual surgery. Perhaps the growing awareness and proven safety of small-incision, manual, and often sutureless surgery in developing countries will promote the training for and familiarity with this important technique, at least as a backup strategy.

Q What is your personal experience with pars plana anterior vitrectomy?

| | |
|---|-------|
| Have tried and it is my preference | 36.8% |
| Have tried—bad idea/not comfortable | 4.4% |
| Have never tried—would consider trying it | 43.2% |
| Have never tried—wouldn't ever do it | 15.6% |

Steve Charles Clearly, the trend is moving from limbal to pars plana vitrectomy. The key advantage is elimination of cellulose sponges and wound sweeping, both of which produce acute vitreoretinal traction, which can result in retinal breaks and detachment.

In addition, the pars plana approach eliminates iris trauma from cellulose sponges, which is a major cause of postvitrectomy inflammation and CME.

Crucial safety points for the pars plana approach: Use the highest possible cutting rate, never withdraw the cutter while suction is applied, use the lowest effective flow rate or vacuum, and lower the infusion.

Q In the absence of any capsular fixation, what IOL and fixation method would you choose?

| | |
|---|-------|
| ACIOL | 62.9% |
| Iris-sutured PCIOL | 10.0% |
| Scleral-sutured PCIOL | 13.5% |
| Glued PCIOL | 7.2% |
| Leave the eye aphakic and refer | 6.4% |

Roger Steinert All of these options have merits and drawbacks, and each technique has a place. Consistently, the majority of surgeons choose ACIOL implantation as the procedure of choice. However, this year's survey shows an increasing number of surgeons who indicate a comfort level with one of the options for PCIOL fixation. And, most interestingly, the scleral tunnel/glue technique recently developed by Amar Agarwal has rapidly gained a foothold. Further experience with this technique may see more widespread adoption.

Case 6: Traumatic Cataract and Mydriasis

Q This 69-year-old patient has a 20/200 cataract, eight months after blunt trauma from a handball. An initial vitreous hemorrhage has cleared. There is a traumatic iris sphincter rupture temporally. Although no vitreous was noted in the anterior chamber preoperatively, vitreous immediately prolapses to the paracentesis through a temporal zonular dialysis as soon as intracameral lidocaine is injected. How would you address this vitreous prolapse?

- Perform an anterior vitrectomy via
 - a limbal incision 19.6%
- Perform an anterior vitrectomy via
 - a pars plana sclerotomy 15.8%
- Proceed with phaco after partitioning off
 - the vitreous with OVD in the AC 53.8%
- Convert to a manual ECCE. 5.4%
- Abort surgery and refer the patient. 5.4%

Alan Crandall The problem of vitreous prolapsing through a zonular dialysis can lead to a number of maneuvers. A stepwise approach to minimize complications is needed.

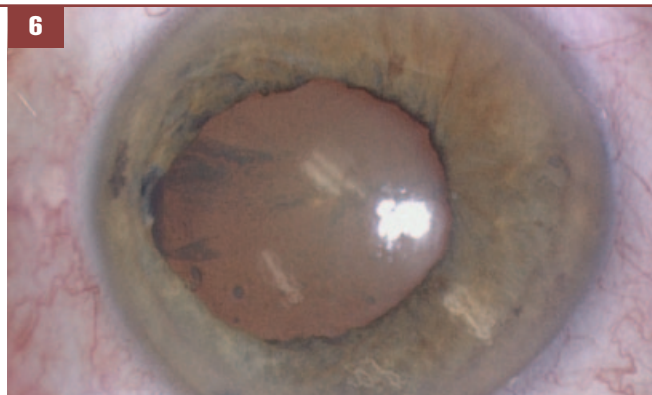
Performing an anterior vitrectomy may seem logical—and, sometimes, it must be done, particularly if there is a tremendous amount of vitreous. Usually, however, more vitreous will follow, and it may increase the dialysis. If I can, I will partition off the vitreous with either Healon 5 or DiscoVisc. If the lens is stable, then I would use low-flow, slow-motion phaco. One can also use a CTR, which will expand the bag and may keep vitreous back. If the bag is not completely stable, I may add capsular support with either the MST or Mackool hooks.

I prefer to wait for the vitrectomy, which I do through the pars plana. The advantage of the posterior approach is to bring vitreous backward instead of forward. If possible, I also prefer to wait until the lens is stable, because removing the vitreous can lead to the lens becoming more mobile with less support. With these steps, it is usually possible to complete the case with minimal trauma.

Q If you encounter a significant zonular dialysis intraoperatively, what should you do next?

- Continue to cautiously phaco. 11.5%
- Implant a CTR before resuming phaco. 36.3%
- Insert capsular retractors before
 - resuming phaco. 17.6%
- Combine options two and three 28.6%
- Convert to a manual ECCE. 3.8%
- Abort surgery and refer the patient. 2.2%

Boris Malyugin A CTR and capsular retractors are the first tools to consider when the surgeon faces zonular dialysis at



CASE 6. Preop (undilated).

the time of the surgery. The decision whether to use one or both of them depends on the extent of the area of missed zonules and the condition of the remaining intact zonular fibers. If the defect does not exceed three clock-hours and the remaining zonules are in good condition, it is possible to place a conventional CTR and proceed with the surgery.

A conventional CTR restores the shape of the capsular bag equator and evenly distributes the centripetal forces caused by the remaining zonules. The only downside of the CTR is that it makes lens cortex aspiration more complex. This is because the cortical material is entrapped at the equator of the capsular bag. The problem can be overcome by using bimanual I&A and stripping the cortex in the tangential direction.

When the defect is larger and/or it is associated with significant zonular weakness, then capsular hooks will help to temporarily support the lens and sustain the pupil in the dilated state. The latter is very important, in that zonular weakness is commonly associated with compromised iris sphincter function, as seen with glaucoma and pseudoexfoliation syndrome.

Obviously, implanting capsular retractors is a temporary measure, and they should be removed at the completion of the surgical procedure. To stabilize the capsular bag in the presence of extensive zonular defects, it is necessary to create permanent synthetic zonular support by suturing the capsular bag to the sclera, utilizing some specially designed devices. Several are available, including the Cionni CTR and Ahmed CTS. My personal preference is the Malyugin ring (Morcher), which is the Cionni CTR modification based on the fixation element placement at the very end of the ring. This design improvement allows the whole ring to be inserted into the injector tube. As a result, the surgeon's control during implantation is significantly improved. The curved tip of the ring slides easily along the capsular bag equator without any risk of damaging the capsule. In addition, this ring can be used through a 2.2-mm microincision. In my experience, the Malyugin ring provides favorable functional and anatomic results in patients with acquired and congenital zonular pathology.

Q How would you fixate a posterior chamber IOL with a significant zonular dialysis?

| | |
|---|-------|
| Place in the bag without a CTR (but direct haptic toward dialysis) | 10.4% |
| Place in the bag with a CTR | 59.0% |
| Place in the bag with a Cionni CTR or CTS | 8.5% |
| Place in the sulcus without suturing | 14.6% |
| Place in the sulcus with suture fixation of haptic(s) | 4.2% |
| Implant an ACIOL | 3.3% |

Ike Ahmed In a well-supported intact capsular bag, there's little doubt that the best location for an IOL is in the bag. In this case, it is important to support the zonular weakness with appropriate capsular tension devices. In mild zonular insufficiency, a CTR alone is usually enough. In cases of more profound zonular dialysis, a CTS or Cionni CTR is required for suture fixation (with either a 9-0 polypropylene or a 7-0 Gore-Tex suture) to the sclera. Placing an IOL in the sulcus in the presence of zonular dialysis increases the risk of dislocation, as zonules are typically required for sulcus support. In addition, if one is already suturing, it's best to suture a device that would be used to support the capsular bag to enable endocapsular IOL fixation.

Q In this case of vitreous prolapsing through a zonular dialysis, through what incision would you perform the anterior vitrectomy?

| | |
|--|-------|
| Phaco incision (coaxial infusion) | 7.6% |
| Phaco incision (split infusion) | 29.7% |
| New corneal incision (split infusion) | 39.2% |
| Pars plana sclerotomy (split infusion) | 23.4% |

Bill Fishkind The audience response is surprising! Not in the divide between the anterior approach and the pars plana approach, but in the number who would use the phaco incision. This has been shown to be unsatisfactory, as the larger incision does not satisfactorily restore a closed system. Therefore, vitreous is both washed out and pushed out through the large incision, thus increasing the volume of the vitrectomy and often resulting in vitreous strands to the wound.

Depending on surgeon expertise and confidence, a split

I&A system, with irrigation supplied anteriorly, and vitrectomy through a separate new, small vitrectomy incision—or through the pars plana—is correct.

Q There is a torn iris sphincter on the temporal side. How would you address this partial traumatic mydriasis?

| | |
|---|-------|
| Use topical miotic and sunglasses | 27.1% |
| Prescribe a painted soft contact lens | 4.2% |
| Perform iris cerclage suturing | 50.8% |
| Implant an artificial iris prosthesis | 5.9% |
| Refer the patient. | 11.9% |

Ken Rosenthal In my experience, miotics and sunglasses have helped only a minority of patients with significant iris defects, particularly when the defect is located temporally. In fact, miotics can decenter the pupil because the tonic part of the damaged sphincter muscle will not react to pharmacological stimulation. And while sunglasses reduce the light entering the eye, they do not address the increase in higher-order aberrations caused by the projection of light entering the peripheral cornea and lens onto the retina.

A contact lens can provide temporary relief from the visual symptoms. However, they are expensive, and the majority of patients find them uncomfortable or impractical.

Iris cerclage will be helpful because it will bring the pupil to a more normal diameter; however, the pupil will no longer dilate. Also, because the suture is under constant tension, there is a significant likelihood of sequential cheese-wiring through the fragile iris border. Because the majority of the iris is intact, I would favor a sector closure of the affected iris using a modified McCannel suture technique, which would preserve the ability of the pupil to dilate. Several radially spaced sutures may be needed for satisfactory closure, so the use of a Siepser knot would be advantageous.

Ideally, one would like to consider using a sector iris prosthetic implant, but these are not FDA approved and would therefore require a second intervention or referral to a center where FDA clinical trials are being conducted. Nonetheless, this method of reconstruction would most likely result in a more permanent and stable repair that retains full function of the remaining iris structure.

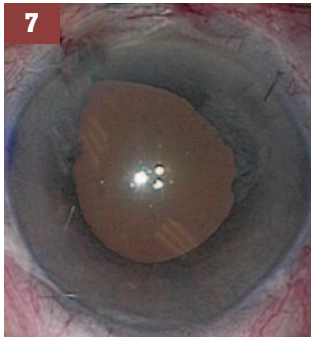
Case 7: Severe IFIS

Q What is your favored initial strategy for patients showing signs of intraoperative floppy iris syndrome (IFIS)?

| | |
|---|-------|
| Retentive OVD plus lowered fluidics | 16.8% |
| Intracameral epinephrine or phenylephrine | 36.1% |
| Iris retractors. | 25.7% |
| Pupil expansion ring. | 20.9% |
| Other. | 0.5% |
| Refer them | 0.0% |

Peter Barry My first priority is to create meticulous incisions, ensuring they do not exceed the size of the instruments and thus avoiding any tendency to leakage and floppy iris incarceration. Secondly, I favor the use of intracameral phenylephrine 2.5 percent, which is readily available in Europe. Next, I would use a retentive OVD and, during I&A, ensure infusion is in front of the iris to minimize prolapse. I would use iris hooks or a pupil expansion ring as a last resort lest the iris disintegrate.

Nick Mamalis IFIS occurs secondary to use of α_1 adrenergic receptor antagonists, which affect the iris dilator mus-



CASE 7. One day after aborted phaco.

cle as well as iris tone. IFIS is characterized by a poor dilation with progressive pupillary miosis, iris billowing and undulation, and iris prolapse to the wound.

Chronic α_{1a} antagonist use can cause loss of iris dilator thickness as well as iris smooth-muscle atrophy. This is believed to represent a possible disuse atrophy of the iris dilator muscle. These findings lead to potential increased risk of surgical complications in patients with IFIS, including posterior capsule rupture, vitreous loss, and iris prolapse or damage.

Several strategies can be used in patients with IFIS. The survey results show that 16.8 percent of respondents favor a retentive OVD with lowered fluidics. In addition, 36.1 percent used either intracameral epinephrine or phenylephrine. Unfortunately, preservative-free, bisulfate-free epinephrine is no longer being manufactured in the United States, and it is critical to properly dilute epinephrine that contains bisulfate prior to intracameral use in these patients.

Intracameral phenylephrine 1.5 percent has shown promising results in Europe for the prophylaxis of IFIS. However, this is not commercially available in the United States and requires a compounding pharmacy or custom mixing. The use of iris retractors or pupil expansion rings was favored by almost 47 percent of respondents. These devices help prevent the progressive miosis of the pupil as well as the tendency of the floppy iris to prolapse into the wound and into any stab incisions.

The Malyugin ring is particularly helpful in the prevention of surgical complications in patients with IFIS. The use of this pupil expansion ring has proved invaluable in the prevention of IFIS-related complications in patients undergoing surgery by ophthalmology residents or trainees.

A combination of all of these strategies is often necessary when performing cataract surgery in patients with IFIS.

Q The referring surgeon aborted cataract surgery on this 83-year-old male Flomax patient yesterday because of severe iris prolapse prior to initiating the capsulotomy. What would be your initial surgical approach?

- Intracameral epinephrine or phenylephrine only 27.1%
- Iris retractors. 34.3%
- Malyugin or other pupil expansion ring. 38.1%
- Refer the patient elsewhere. 0.6%

Sam Masket Although there is a history of the use of Flomax (tamsulosin), iris prolapse is uncommon at the very outset of surgery in cases of IFIS. More typically, iris floppi-

ness is noted with infusion of BSS, particularly if the fluid is directed behind the iris. So in this case, one must also be concerned about a crowded anterior segment, as iris prolapse was noted before any BSS was infused.

If the prolapsed iris tissue remains exposed to the environment via the paracentesis, surgery must be expedited, and the exposed iris tissue should be excised. Absent iris prolapse, surgery is not emergent.

Given that IFIS and crowded anterior segment syndrome share certain clinical characteristics, it would be prudent to prepare for both. I prefer to use atropine in the dilating regimen, although it requires two to three days for maximum action. Unless it is contraindicated, I would administer intravenous mannitol preoperatively to reduce vitreous volume and soften the eye. If, despite this, the chamber was very shallow, I would also consider a small single-port pars plana vitrectomy to further reduce vitreous volume and allow the OVD to deepen the chamber. The OVD should be supercohesive in rheology. Incisions should be constructed to have long tracts to help guard against iris prolapse and, without hesitation, pupil mechanical dilating tools should be used. I prefer the Malyugin ring, although similar devices and iris hooks are very usable.

During nuclear emulsification it is best to have the BSS infusion directed in front of rather than behind the iris to prevent iris billowing and prolapse. I prefer to chop the nucleus into pieces and then elevate them to the iris plane before emulsification and aspiration. Additional OVD may be instilled during emulsification and cortical aspiration, should the iris behavior mandate.

Q After IOL implantation, how would you manage this patient's mangled iris caused by the iris prolapse and incarceration?

- Would not treat it 36.2%
- Prescribe topical miotic. 19.7%
- Iris suture cerclage 37.8%
- Artificial iris implant 3.2%
- Refer the patient. 3.2%

Tom Oetting I agree with the audience that suturing the iris is probably the best option, but there is no hurry. You can easily reposition the iris and see if the patient is symptomatic, as another large group of audience members suggested.

If the patient is symptomatic, sutures would likely help to re-form the pupil and block light. I really like to use one or two interrupted sliding sutures rather than a cerclage suture. The cerclage suture, in my hands, is a tricky technique, and it is more difficult—for me, at least—to control the ultimate size of the pupil. Usually, patients with iatrogenic trauma from iris prolapse will have a section of iris atrophy just under the wound. Often, a single suture in this area will bring the pupil back to a reasonable size. I usually use 10-0 Prolene with a long curved needle (CTC-6L). Often I will use microforceps, such as the Duet (MST), to position the iris for the suture passes. The suture is retrieved through a

paracentesis as described by McCannel¹ and tied with a sliding knot as described by Siepser.²

1 McCannel MA. *Ophthalmic Surg.* 1976;7(2):98-103.

2 Siepser SB. *Ann Ophthalmol.* 1994;26(3):71-72.

Q For patients listing drug brand names on their medication list, which of these is least likely to cause severe IFIS?

| | |
|---------------------|-------|
| Flomax | 19.0% |
| Uroxatral | 20.3% |
| Jalyn | 50.6% |
| Rapaflo | 10.1% |

David Chang Interestingly, 80 percent of the respondents got this question wrong. A number of published retrospec-

tive and prospective studies show that the incidence and severity of IFIS is greater with the α_{1a} -selective antagonist tamsulosin (Flomax) than it is with alfuzosin (Uroxatral). The latter is a nonselective α blocker.

The newest α antagonist to be approved for benign prostatic hyperplasia (BPH) in the United States is silodosin (Rapaflo). Like tamsulosin, it is selective for the α_{1a} subtype and is associated with severe IFIS.

Jalyn was approved in 2010, and it is the brand name for a combination of tamsulosin and dutasteride. Dutasteride (Avodart) is a 5 α -reductase inhibitor and does not cause IFIS. However, the combination of these two agents was shown in a large prospective 2010 clinical trial to be more effective at reducing the progression of BPH compared with either drug alone, and ophthalmologists will therefore be seeing increasing numbers of patients on this drug.

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Financial interests are designated by C, E, L, O, P, or S:

C = CONSULTANT/ADVISOR

E = EMPLOYEE

L = LECTURE FEES

O = EQUITY OWNER

P = PATENTS/ROYALTY

S = GRANT SUPPORT

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