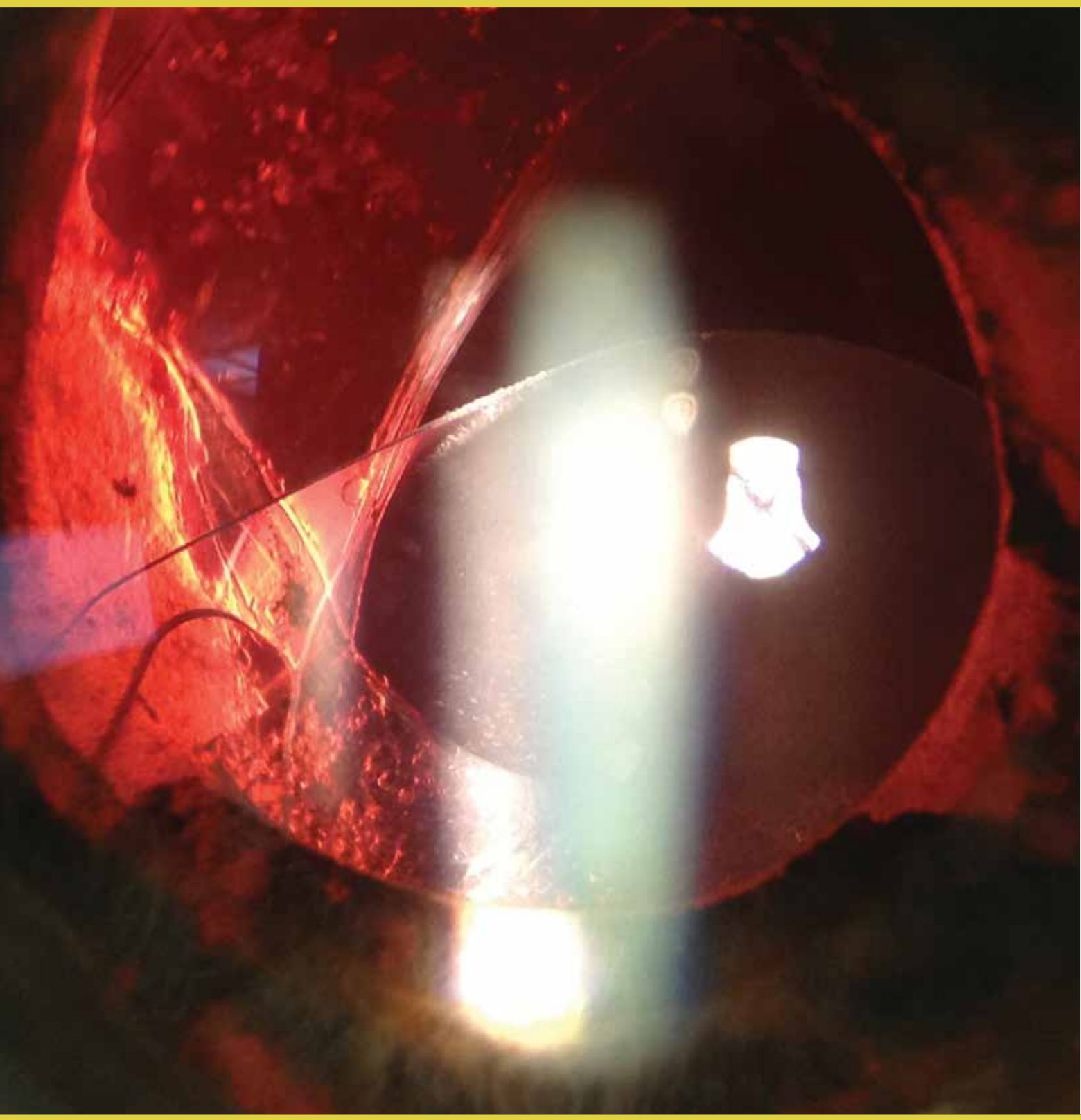


Cataract Decisions

From malpositioned lenses to zonule defects and mature cataracts, cataract surgeons weigh in on seven difficult cases.

VIDEO & ADDITIONAL CONTENT AVAILABLE

This past October, the 13th annual Spotlight on Cataract Surgery Symposium at the Academy's annual 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 featured different cataract surgical challenges or complications.

The cases were selected from my own surgical practice. As I presented the videos, I would pause at selected points because of a complication or the need for a management decision. The attendees were then tasked with making clinical decisions using their electronic audience response keypads. This was followed by several rapid-fire didactic presentations by invited experts 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 would provide their own opinions and pearls.

In all, nearly 40 presenters and panelists spoke about managing unhappy multifocal patients; mature white, brunescent, and traumatic cataracts; postvitrectomy posterior capsular tears; zonular weakness; and malpositioned toric and spherical intraocular lenses (IOLs). Randall J. Olson, MD, concluded the symposium by delivering the 10th annual AAO Charles D. Kelman Lecture, entitled "Entrepreneurship in Clinical Research." The entire symposium, with videos and PowerPoint, was captured for online viewing (go to www.aao.org/store and search for "AAO Meetings on Demand").

This *EyeNet* article reports the results of the 30 audience response questions and presents written commentary about their answers from the symposium speakers and panelists. The polled respondents included both the live and virtual meeting audiences. Because of the anonymous nature of this polling method, the audience opinions are always interesting and were discussed in real time during the symposium by our panelists.

The Academy's annual meeting continues to feature a daylong, continuous series of cataract symposia that constitute Cataract Monday. The day ended with the ASCRS-sponsored symposium, "Challenges in Cataract Surgery—Gems to Take Home and Treasure."

—David F. Chang, MD
Cataract Spotlight Program Cochairman

DAVID F. CHANG, MD

Case 1: Unhappy Multifocal IOL Patient

Q1 What is your general time limit for exchanging a multifocal intraocular lens (IOL)?

Wait up to three months	23.2%
Up to six months	18.1%
Up to one year	10.7%
No limit	24.9%
Would refer	23.2%

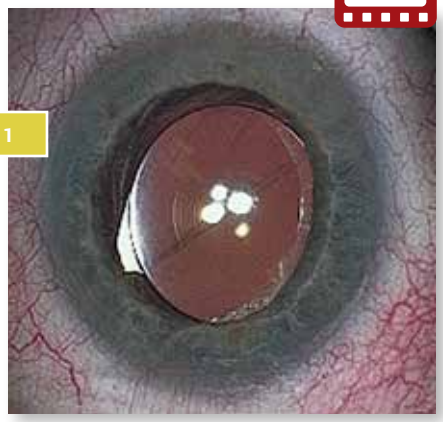
Jorge Alió The audience favors either no time limit for multifocal IOL exchange in a patient with neuroadaptation failure or waiting up to three months. The real problem is that, in my experience, neuroadaptation takes no longer than six months. I prefer explantation before three months in cases of frank and evident patient dissatisfaction. These patients are not going to neuroadapt because they are negative about the outcome, and they seldom find any satisfaction with their status during the neuroadaptation process.

My policy is for late explantation if a patient has moderate symptoms and is more tolerant and positive. In these cases, my advice is to wait for six months after talking extensively to the patient, as these patients have a real potential for neuroadaptation. Most of the time, they find the advantages of near-vision spectacle independence more positive than either the dysphotopsia or the feeling that their vision isn't as good as it could be. Many of them—and I have to say about 90 percent—finally neuroadapt if they have this positive personality.

Meanwhile, it is mandatory to treat any residual refractive error of more than 0.5 D during the second or third month, which is when I make any touch-ups. One factor in favor of early removal (before three months) is that surgery is uneventful in most cases. More than six months (or even six months) can make it difficult for some IOL models to be extracted. Nd:YAG laser capsulotomy must not be performed in any case involving neuroadaptation failure because it will complicate the IOL exchange.

Q2 This 71-year-old is two years out from implantation of a ReStor multifocal IOL in his right eye, which is 20/20 without correction and 20/20 with a −0.25 + 1.00 × 10. The left eye has a cataract and is 20/25− with −3.75 + 1.50 × 165. He cannot tolerate the anisometropia but feels that his multifocal eye is "not clear." There is a wraparound posterior capsular tear in the right eye with one haptic in the sulcus and one in the bag (Fig. 1). I'd next recommend:

LASIK or PRK in the eye with the multifocal IOL	10.6%
Exchange the multifocal IOL	40.9%
Multifocal IOL in the second eye	15.5%
Monofocal IOL (e.g., toric) in the second eye	25.0%
Other	8.0%



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CASE 1: *The right eye has a wraparound posterior capsular tear, with the nasal haptic in the bag and the temporal haptic in the sulcus.*

Scott MacRae and Stephen Slade Implant exchange is typically our last option in these cases. In two relatively large studies of dissatisfied patients, less than 10 percent of patients required an exchange, and the exchanges took place only after all other options were exhausted.[1,2]

It's first important to determine what is causing the patient's symptoms. Ask if the patient's vision was initially good but deteriorated; this might suggest that dry eye or posterior capsular opacification (PCO) is the problem. One should also preoperatively rule out occult endothelial and macular disease. Even modest amounts of astigmatism, dryness, or PCO can cause marked reduction in image quality in an eye with multifocal optics, since these eyes are more susceptible to subtle changes than are monofocal eyes. In this case, the 1 D of mixed astigmatism is not trivial. We have noted a marked reduction in image quality and depth of focus with even 0.75 D of astigmatism with multifocals.

After ruling out other causes, try putting the refraction of the multifocal eye into a trial frame or contact lens, covering the other eye, and asking the patient if this improves the blur. The patient should also be shown the expected loss of near vision if the multifocal is exchanged for a monofocal. If the patient notes marked improvement with the astigmatism correction, consider prescribing the manifest in a spectacle prescription or performing either PRK or LASIK to treat the mixed astigmatism.

We typically recommend correcting the multifocal eye first before moving on to the second eye. However, in this case, that approach is complicated by the anisometropia. The surgeon needs to sort out whether correcting the astigmatism solves the lack of clarity in the right eye. If the patient is satisfied with the image quality of the right eye after the astigmatism correction, one could consider implanting a multifocal lens. If the patient is not satisfied, we recommend implanting a monofocal IOL in the left eye and considering an exchange for the right eye at a later time.

Once the other factors noted above are ruled out, most patients' complaints can be eliminated or mitigated, and they will be satisfied with their multifocal outcomes.

1 Woodward MA et al. *J Cataract Refract Surg.* 2009;35(6):992-997.
2 de Vries NE et al. *J Cataract Refract Surg.* 2011;37(5):859-865.

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Q3 The patient had cataract surgery in his left eye with a toric IOL and is now 20/20 uncorrected in both eyes (no anisometropia). He still is bothered by blur in the right multifocal eye. I would:

- Discourage IOL exchange due to the posterior capsular defect 11.2%
- Exchange the multifocal IOL if the patient prefers. 36.4%
- Refer elsewhere for IOL multifocal exchange . . . 17.3%
- Recommend taking more time to adapt (he may be better able to suppress the multifocal blur with a monofocal IOL in the opposite eye) . . 32.2%
- Other. 2.8%

Jack Holladay This patient is in the early postoperative period with a toric monofocal IOL in his left eye and must be given more time (at least three months) to see if he can neuroadapt and suppress the multifocal blur in the right eye. In addition, 20/20 vision and a wraparound posterior capsular tear with one haptic in the sulcus and one in the bag of the right eye adds risk and difficulty to the multifocal IOL exchange.

The surgeon and patient must both be absolutely sure that adequate time has elapsed with no improvement before an exchange is contemplated. Nevertheless, it is highly unlikely that this patient will ever be satisfied with the multifocal IOL in the right eye: After two years with 20/25– vision in the left eye (with a mild cataract), he is not happy, and a new toric monofocal IOL with 20/20 uncorrected vision will only exaggerate the problem.

Finally, the lens exchange should only be performed by a surgeon who has exchanged many malpositioned IOLs with capsular tears, so a referral may be indicated.

Q4 During surgery to explant the multifocal IOL, one haptic is fibrosed within the capsular bag equator. What now?

- Instrument dissect the haptic free 5.4%
- Viscodissect the haptic free 25.6%
- Amputate the haptic. 63.8%
- Abort the IOL exchange 0.8%
- Would have referred this patient elsewhere 4.4%

Eric Donnenfeld Explanting an IOL requires a comprehensive game plan, and the surgeon should be prepared to encounter a fibrosed haptic. The first step is to try to viscodissect the haptic from the capsular bag. I prefer a dispersive viscoelastic; it should be injected into the capsule in the area of the terminal haptic. This is particularly important if the IOL has an end bulb.

However, if this maneuver is not successful, then I agree with the 63 percent of responders who suggested that the haptic be amputated. Becoming overly aggressive in attempting to remove a fibrosed haptic can lead to complications, and amputating the haptic is both well tolerated and dramatically safer under these circumstances.

Q5 In the presence of tears in the anterior and posterior capsule, what replacement IOL would you implant?

- Sulcus posterior chamber IOL (PCIOL) only (no other fixation) 74.1%
- Sulcus PCIOL plus iris fixation. 9.9%
- Sulcus PCIOL plus scleral fixation. 9.9%
- Anterior chamber IOL (ACIOL). 5.1%
- Other. 1.1%

Steve Lane An unstable capsule due to a posterior capsular tear (with or without an anterior capsular tear) can lead to IOL dislocation either early or late in the postoperative course. The surgeon should always attempt to place the IOL at the time of surgery in a position that is most stable and least likely to lead to postoperative lens dislocation. It is therefore not surprising that the audience would choose a sulcus PCIOL alone, without other fixation, the majority of the time. This is logical, as there is more surface area upon which the IOL can rest, and secondary steps that may be fraught with complications (such as suturing) are not required. However, enough capsule is often present that reverse anterior or posterior capsular fixation—or even in-the-bag fixation—is possible. Importantly, a three-piece IOL should be used in these circumstances.

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CASE 2: *After the capsulorrhexis is performed in this white lens, trypan blue–stained vitreous prolapsing through an occult nasal zonular dialysis becomes apparent.*

Case 2: White Lens

Q6 What is your principal capsulotomy method with a mature white intumescent lens?

- Viscoelastic plus capsule forceps 36.6%
- Irrigating cystotome 5.5%
- Aspirate cortex with a needle prior to initiating the capsulorrhexis 49.3%
- Femtosecond laser capsulotomy. 8.0%
- Would refer this patient. 0.6%

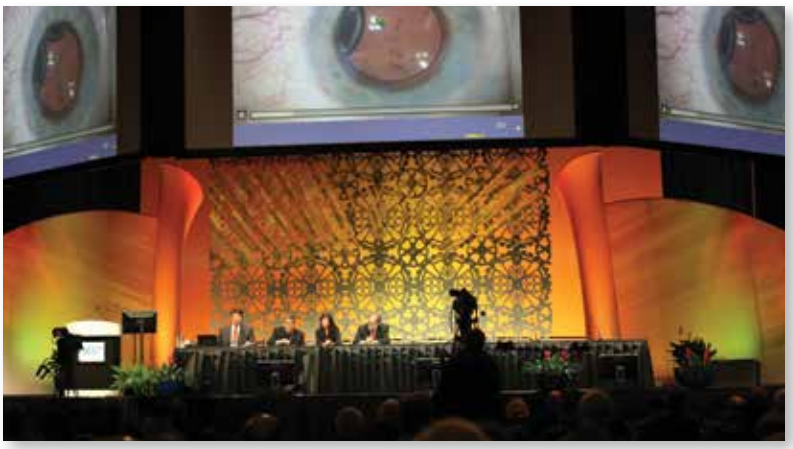
Brock Bakewell The most reliable method for creating a capsulotomy in a mature white intumescent cataract is to begin by making a central anterior capsular puncture with a 30-gauge needle introduced through a side-port incision, after first staining the anterior capsule with trypan blue dye and pressurizing the anterior chamber with an ophthalmic viscoelastic device (OVD). Dispersive OVD is preferable, since it will allow the liquid white cortex to seep into the anterior chamber. The cohesive Healon5 is so heavy that it prevents any significant cortical seepage; therefore, surgeons using this OVD should aspirate liquefied cortex within the bag with a needle before proceeding with a capsulorrhexis.

If there is no seepage of cortex into the anterior chamber after capsular puncture using a dispersive OVD, then the lens is not pressurized and a standard capsulorrhexis may be performed with either a needle or forceps through the main cataract incision, without concern for development of the "Argentinean flag" sign.

If liquid cortex does seep into the anterior chamber while dispersive OVD is being used, the lens is pressurized, indicating either a morgagnian or an intumescent cataract. A morgagnian lens will seep copious liquefied cortex into the anterior chamber, frequently collapsing the bag to such a degree that refilling the bag with a dispersive OVD is necessary to complete a capsulorrhexis.

If the anterior chamber cortical seepage is mild to moderate, the lens is most likely intumescent. In a seminal paper on this topic, Figueiredo et al. illustrated the concept that this type of cataract has both an anterior and a posterior liquefied cortical compartment under pressure and that the two compartments do not connect due to nuclear block.[1] Consequently, after anterior capsular puncture with a needle, only the anterior compartment decompresses, and the posterior pressurized compartment can still push the nucleus anteriorly during capsulorrhexis creation, causing an Argentinean flag. Although gentle retropulsion of the nucleus with a 30-gauge needle may break the nuclear block and decompress the posterior compartment, this may not always work. Therefore, after first clearing the turbid anterior chamber by injecting additional OVD through the cataract incision into the angle opposite the incision, it is wise to create a 3-mm capsulorrhexis with a coaxial forceps through a side-port incision. Bimanual irrigation and aspiration (I&A) may then be used in the bag to definitively decompress the posterior compartment, after which the rhexis may be enlarged to 5 mm before proceeding with phacoemulsification.

Femtosecond laser capsulotomy in intumescent white cataracts has been recently reported.[2] This prospective study involved 25 eyes. Although the surgeons were able to create a capsulotomy with the laser in all eyes, two eyes developed anterior capsular tears during phacoemulsification, nine had an adherent tongue-like capsular adhesion, and three had an incomplete capsulotomy button. A PCIOL was successfully placed into the capsular bag in all eyes. As the laser algorithm is refined, femtosecond laser may become as safe as Figueiredo's technique for capsulotomy creation in intumescent white cataracts.



NEAR AND FAR. *Virtual audience members were able to participate along with those who attended the session.*

OSCAR EINZIG

1 Figueiredo CG et al. *J Cataract Refract Surg.* 2012;38(9):1531-1536.
2 Conrad-Hengerer I et al. *J Cataract Refract Surg.* 2014;40(1):44-50.

Q7 After discovering vitreous prolapsing through a zonular dialysis in this traumatic cataract (Fig. 2), I would:

Perform limbal anterior vitrectomy, then phaco	42.3%
Perform pars plana anterior vitrectomy, then phaco	23.5%
Partition the dialysis with viscoelastic, then initiate phaco	29.9%
Convert to manual ECCE	3.5%
Abort and refer elsewhere	0.8%

Carl Awh The answer that got the most votes was limbal anterior vitrectomy followed by phaco, which I think is appropriate. This approach allows the surgeon to quickly assess the stability of the lens, and localized zonular defects can be effectively addressed in many ways by skilled anterior segment surgeons.

Be patient and methodical during the anterior vitrectomy. A secondary infusion port can make it easier to engage the vitreous, as coaxial infusion can push vitreous away from the cutter port. Use a high cut rate and low vacuum to minimize vitreoretinal traction. Triamcinolone can make it easier to identify vitreous strands.

After successful phaco and implantation of the IOL, carefully inspect for residual vitreous. If vitreous continues to prolapse anteriorly, a pars plana vitrectomy may be indicated. However, as long as there is no vitreous tracking to the wound, consider ending the case and observing. There's no harm in delaying the pars plana vitrectomy for another day.

Q8 After removing the nucleus and then discovering more vitreous prolapse, I would:

Perform limbal anterior vitrectomy, then I&A and implant IOL 50.8%
Perform pars plana anterior vitrectomy, then I&A and implant IOL 26.4%
Partition with OVD, then initiate I&A and implant IOL 3.3%
Implant IOL, then perform limbal vitrectomy 13.1%
Implant IOL, then perform pars plana vitrectomy . . 6.4%

Abhay Vasavada In this scenario, the nucleus has been removed and vitreous is seen prolapsing through the zonular dialysis; the posterior capsule is intact. First, I would implant a capsular tension ring (CTR) with 10-0 nylon suture passed through one eyelet. This thread can be used to retract the ring in case posterior capsular rupture develops during the vitrectomy.

I would perform pars plana vitrectomy to drain the prolapsed vitreous from the front of the capsular-zonular diaphragm into the cutter. As the small quantity of prolapsed anterior vitreous is drained through the area of dialysis, the chances of extending the defect are minimized. The irrigation typically is placed through a limbal paracentesis. The surgeon should not perform the vitrectomy from the limbal approach; this "top-down" approach increases the possibility of extending the zonular dialysis as the result of a drag on the main vitreous body. This could occur even when the vitrector is placed below the area of dialysis.

Q9 With the zonular dialysis and a small circular posterior capsular rent, would you suggest additional capsular support?

CTR 34.7%
Sutured CTR (e.g., Malyugin, Cionni) 9.5%
Capsular tension segment (CTS) 7.3%
No capsular support element. 47.6%
Other. 0.9%

Kerry Solomon Many of the attendees feel that in the setting of a zonular dialysis and a small circular posterior capsular rent, they would use no capsular supporting devices at all. This is not unreasonable. The presence of a small circular posterior capsular rent indicates that, in all likelihood, successful capsular fixation can be achieved. Vitreous, if present, may need to be managed in the usual fashion. My preference is typically a pars plana approach, to bring the vitreous back into the posterior segment.

The use of a CTR in the setting of a small circular posterior capsular rent is, however, a reasonable option. If the posterior capsular rent is small and circular, it should resist any stress that may be created during ring implantation. The advantage of the CTR is to help provide some stabilization in the area of zonular dialysis. This should provide better short- and long-term centration of an IOL.

In summary, the treatment for zonular dialysis typically would be, when appropriate, a CTR. The rings are readily available, and they do help provide stabilization. In the setting of a small circular posterior capsular rent, the choice of a CTR is not contraindicated and, in fact, is a reasonable suggestion if the surgeon has comfort and experience with the rings.

KELMAN LECTURE. *Randall J. Olson, MD, was this year's lecturer. He is shown here with Drs. Chang (left) and Fishkind (right).*

Q10 Given the zonular dialysis and a small circular posterior capsular rent, what IOL would you implant?

Single-piece acrylic IOL in the bag 44%
Sulcus PCIOL (no other fixation). 20.6%
Sulcus PCIOL plus capsulorrhexis/optic capture 30.9%
Sulcus PCIOL plus iris/scleral fixation. 1.2%
ACIOL 1.4%
Other. 1.9%

Doug Koch This response indicates a fairly even split among three reasonable options. An important clue here is the nature of the tear: small and circular. Such a tear will likely act like a posterior capsulorrhexis; barring direct trauma to that region of the capsule, it has a low probability of extending. In the past, it was felt that any form of capsular tear was a contraindication to insertion of an IOL into the bag. However, with the advent of one-piece acrylic lenses that can be inserted gently and precisely so as to minimize capsular stress during or after insertion, many surgeons chose capsular fixation. This would be my choice.

The first two sulcus options are also reasonable, particularly if posterior optic capture in the capsulorrhexis can be achieved. This form of IOL fixation is remarkably stable and, in my experience, provides results similar to bag fixation. Sulcus fixation without optic capture may also work well, assuming that the sulcus diameter is not so large as to preclude secure haptic fixation. For both of these options, obviously, three-piece IOL designs should be used.

Iris/scleral suturing or an ACIOL could be considered if the capsular tear extends and there is zonular compromise, a large or eccentric capsulorrhexis (preventing optic capture), or an excessively large sulcus diameter.

OSCAR EINZIG

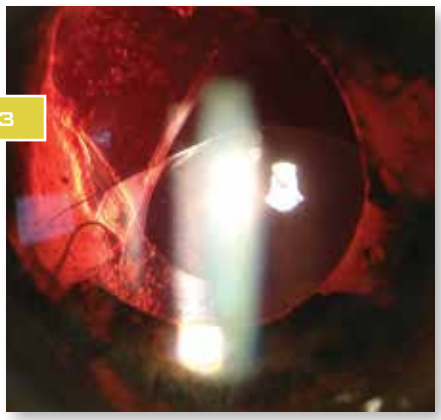
Case 3: Recurrent Microhyphema

EXTRA

Q11 This 69-year-old patient has a single-piece acrylic IOL with at least one haptic in the sulcus in her better-seeing eye. Given her 20/20 acuity, but monthly recurrent microhemorrhages (Fig. 3), what would you advise?

Observe and do nothing unless there are worsening complications	45.6%
Immobilize the pupil with pilocarpine	5.7%
Attempt surgical amputation of one haptic	5.1%
Explant and exchange the single-piece acrylic IOL	26.4%
Refer elsewhere	17.3%

Nick Mamalis This one-piece hydrophobic IOL has been designed to go within the capsular bag and can cause problems when one or both haptics become located in the ciliary sulcus. The microhyphemas are the result of this lens design (a square-edged optic, relatively thick haptics, and relatively unpolished sidewalls). This lens in the sulcus tends to cause friction from the haptic and the edge of the optic against the posterior iris surface, which can lead to recurrent microhyphemas. In addition, if this lens is left in its present position, the patient could begin to suffer from pigment dispersion syndrome due to the bulky haptics scraping on the posterior surface of the iris, as well as eventual uveitis-glaucoma-hyphema (UGH) syndrome with chronic inflammation and pigment dispersion–type glaucoma in addition to the recurrent microhyphemas.



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CASE 3: *Dilated view of a 20/20 eye with monthly recurrent microhemorrhages associated with a single-piece acrylic IOL in the sulcus. Transillumination defects and a large posterior capsular defect are visible.*

Just over 45 percent of the audience members stated that the best advice for this patient would be to observe and do nothing unless there are worsening complications. Only 26.4 percent stated that the IOL should be explanted and exchanged. These findings reflect reluctance to operate on an eye with 20/20 visual acuity and compromised vision in the other eye. However, a one-piece hydrophobic acrylic lens in the sulcus with recurrent microhyphemas is a ticking time bomb and has the potential to create much worse complications than the microhyphemas. Rather than waiting, it is important to explant the single-piece acrylic lens and exchange it for a lens that is more appropriate for the ciliary sulcus. If it is not possible to reopen the capsular bag, then another surgical option would be to dial the present implant back into the capsular bag, which would also alleviate the microhyphemas secondary to the haptic in the ciliary sulcus. In any event, it is important to resolve this issue before the complications worsen.

Q12 After surgically explanting the IOL, what replacement IOL would you implant in light of the defect in the posterior capsule?

Sulcus PCIOL without any suture fixation	72.3%
Sulcus PCIOL with iris suture fixation	6.1%
Sulcus PCIOL with scleral suture fixation	10.9%
Sulcus PCIOL with glued/scleral tunnel fixation	5.0%
ACIOL	4.7%
Other	0.8%

Walter Stark I agree with the audience response. I would place the 6.5-mm diameter MA50BM IOL (Alcon) in the sulcus. The optic of this IOL is 18 percent larger than a 6-mm IOL. Also, this lens is posteriorly angulated 10 degrees, which reduces the chances of iris erosion or UGH syndrome. If the IOL centers well and is stable, no suture is needed. If it does not center well, then pupillary capture of the optic could be obtained and a modified McCannel suture placed through the iris superiorly and, if necessary, inferiorly. Vitreous in the anterior chamber can be managed by a limited anterior vitrectomy either prior to or after IOL placement. I would then fill the anterior chamber with air and sweep the wound with a Maumenee-Barraquer sweep spatula (Storz) to make certain there was no vitreous adjacent to the wound.

Q13 Assuming that you plan to use a single-piece acrylic IOL, what is your backup PCIOL for sulcus implantation?

No backup	1.5%
Alcon three-piece acrylic	63.8%
AMO three-piece acrylic	20.2%
AMO or Bausch three-piece silicone	8.0%
Staar three-piece silicone (AQ 2010)	3.7%
Other	2.8%

Liliana Werner Ideally, an IOL that is to be fixated in the ciliary sulcus should present the following characteristics: 1) The lens should provide posterior iris clearance, with the loops angulated posteriorly. 2) The loops should be thin and smooth. 3) The anterior surface of the lens should be smooth, with round and smooth anterior optic edges.

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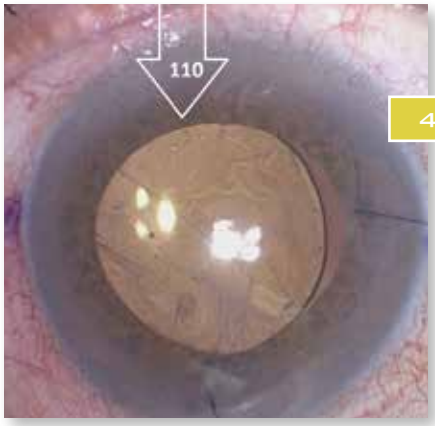
4) The lens should provide secure fixation in the sulcus, with a large diameter (minimum optic diameter of 6.0 mm; minimum overall diameter of 13.0 mm). Therefore, three-piece lenses with a large diameter and angulated thin loops appear ideal.

The Alcon three-piece acrylic lens has square edges on the anterior surface, and the lateral optic wall is not smooth. It appears that the maximum diameter of this design is 13.0 mm. The AMO three-piece acrylic lens and the AMO or Bausch + Lomb three-piece silicone lenses have round and smooth anterior optic edges; however, to the best of my knowledge, the maximum diameter of those designs is also 13.0 mm. The Staar three-piece silicone (AQ 2010) lens has a 13.5-mm long haptic-to-haptic length in the 5- to 30-D power range, a 6.3-mm optic diameter, a rounded and smooth anterior edge, and a 10-degree haptic angulation. This design appears to be the best candidate according to the characteristics described above.

However, if performance of a well-centered capsulorrhexis with a diameter slightly smaller than the IOL optic were possible, the surgeon could perform an optic capture through the capsulorrhexis opening, so the optic would actually be inside of the capsular bag. In this scenario, the lack of a very large overall diameter—or even the presence of a square edge on the anterior optic surface—becomes less of a problem, so the IOL options are expanded.



CASE 4: *Misaligned T5 toric IOL in the left eye. The current axis is 110. There is a posterior capsular tear and vitreous prolapsing into the anterior chamber, with some incarceration in the inferior incision.*

Case 4: Misaligned Toric IOL

Q14 For a high-powered toric IOL (e.g., Alcon T5) what is your misalignment threshold for surgically realigning the IOL?

≥ 5 degrees	6.0%
≥ 10 degrees	34.8%
≥ 15 degrees	31.0%
≥ 20 degrees	10.8%
≥ 30 degrees	3.8%
I don't implant toric IOLs	13.6%

Edward Holland Ideally, a toric IOL would be placed on the exact axis of astigmatism, thus correcting the maximum corneal cylinder. For every 1 degree of misalignment of a toric IOL there is a corresponding 3.3 percent loss of astigmatic correction.

Surprisingly, 80 percent of the respondents feel that 10 degrees or more misalignment is acceptable, and more than 45 percent stated that 15 degrees or more misalignment is within their threshold. These patients will, in most cases, have significant residual astigmatism and may not achieve the desired goal of distance spectacle independence. I believe all surgeons should strive for 5 degrees or less. (Of note: In the 2014 ASCRS Clinical Survey, which involved more than 1,500 respondents, 70 percent felt that 10 degrees or more of postoperative rotational error will lead to a significant decrease in visual quality and visual acuity.[1])

The most common technique for marking of the astigmatism axis is freehand marking of the eye. This technique is a main source of toric IOL misalignment as the marks are, at best, an estimate of the correct axis. In addition, the ink can run or fade.

New technologies to more accurately mark the axis of astigmatism will result in significant improvements in toric IOL alignment and surgical outcomes. Preoperative ocular registration of anterior segment anatomy will accurately locate the axis of astigmatism. Having this information transferred to the operating room as a visual overlay will be much more precise than freehand marking. Intraoperative aberrometry is another way to check the axis and measure residual astigmatism. This technology will guide the rotation of the toric IOL if the axis of placement is not acceptable. I feel these new options will result in better surgical outcomes and thus become preferred methods for toric IOL positioning.

1 See www.globaltrendsinophthalmology.com/ASCRS-2014-clinical-survey.

Q15 This 73-year-old is four weeks postop with a misaligned T5 IOL in the left eye. The intended axis was 175, but after injection of the IOL, a large posterior capsular tear was noted. The IOL was not rotated for fear of destabilizing it and was left with the axis oriented at 110 degrees (Fig. 4). The eye refracts to 20/25 with a −2.50 + 3.75 × 5. There is vitreous prolapsed into the anterior chamber, with some incarceration in the inferior incision. The right eye is 20/20 with a toric IOL and refracts to plano + 1.00 × 170. The patient is unhappy with the uncorrected left eye acuity. What would you advise?

Leave the IOL alone and encourage spectacle correction	4.7%
Leave the IOL alone and encourage wearing a rigid contact lens.	0.2%

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Leave the IOL alone and encourage wearing a toric contact lens. 1.6%
Leave the IOL alone and perform LASIK or PRK . . 15.1%
Perform an anterior vitrectomy and then attempt to rotate/align the toric IOL. 66.0%
Perform an anterior vitrectomy and then exchange with a spherical monofocal IOL 12.3%

Warren Hill This case nicely illustrates what happens when a toric IOL ends up misaligned, for whatever reason. Because astigmatism is a vector, the magnitude (how much) and the direction (which meridian) can play equally important roles in the final refractive outcome. The audience response most likely represents individual experience, with most cases of toric misalignment being 20 degrees or less.

When a toric IOL is 20 degrees away from the optimal meridian of alignment, the astigmatic correction is reduced by approximately 68 percent. Being 30 degrees misaligned will completely nullify any astigmatic correction, with the same refractive result as a nontoric IOL. Beyond 30 degrees, a toric IOL will actually increase the refractive astigmatism.

This case was 65 degrees away from an optimal alignment, which predictably increased the original refractive astigmatism by 182 percent. At 90 degrees away from the correct meridian of alignment, the refractive astigmatism is doubled. Performing an anterior vitrectomy, carefully viscodissecting the capsular bag open, and performing reverse optic capture with the haptics remaining within the capsular bag would allow for a stable reorientation with a single-piece acrylic toric IOL. It was nice to see that the majority of respondents opted for this approach.

For any case where an unanticipated refractive outcome may occur with a toric IOL, the online tool at www.astigmatismfix.com can be used to calculate the optimal meridian of alignment and the resulting refractive result.

Dick Lindstrom I agree with the majority of the audience that doing nothing for this patient other than recommending spectacles or a contact lens is unlikely to be accepted. The majority of the audience recommended surgical repair with vitrectomy and IOL rotation. This was the approach utilized by Dr. Chang with an excellent outcome.

Surgical pearls include using the www.astigmatismfix.com website to assist in planning the IOL rotation, performing the vitrectomy with a high cutting rate and low suction through the pars plana with infusion into the anterior chamber, using triamcinolone to help visualize the prolapsing vitreous, and copious use of a dispersive viscoelastic to free the IOL for rotation.

In some patients, an IOL optic capture, suture to the iris, or transscleral fixation may be necessary to assure IOL stability once rotated. The risk of cystoid macular edema (CME) can be reduced with intraocular steroids and a more-extended course of steroid and NSAID topically for three to seven days preoperatively and two months postoperatively. I would recommend preoperative optical coherence tomography of the macula and a recheck at two to four weeks after surgery looking for CME as well as a careful check of the retinal periphery for a tear.

The next most popular option was to perform corneal refractive surgery using PRK or LASIK. As a corneal refractive surgeon, this is an attractive option to me. The residual refractive error is very treatable with the excimer laser, and I have used this approach in several cases with good results. One could argue that this is a less invasive approach, but it does require skills in corneal refractive surgery.

Q16 Assuming that you are performing surgery, what anterior vitrectomy approach would you use?

Pars plana anterior vitrectomy before IOL exchange/reposition 35.1%
Limbal anterior vitrectomy before IOL exchange/reposition 50.3%
Pars plana anterior vitrectomy after IOL exchange/reposition 5.4%
Limbal anterior vitrectomy after IOL exchange/reposition 5.1%
Anterior vitrectomy, but leave the original IOL alone 4.0%

Roger Steinert A vitrectomy must be performed prior to any IOL repositioning. This is necessary to avoid traction that can trigger a retinal detachment.

In my opinion, a single-port pars plana vitrectomy affords the best opportunity for a thorough vitrectomy. The surgeon still needs to address the toric IOL malposition. To rotate the IOL after vitrectomy, unless there is substantial residual posterior capsular support, stability of a one-piece toric IOL requires anterior capture of the IOL optic through a capsulorrhexis that is smaller than the optic diameter. The haptics of a one-piece IOL must remain posterior to the anterior capsule in order to avoid potential UGH syndrome. Alternatively, the IOL could be exchanged for a monofocal three-piece IOL placed in the sulcus, followed by either astigmatic keratotomy or LASIK.

Q17 After the surgeon performs the anterior vitrectomy, there is a large zonular dialysis and a central posterior capsular defect. What IOL would you implant?

ACIOL 5.4%
Three-piece PCIOL in the sulcus, with continuous curvilinear capsulotomy (CCC) capture. . . . 63.5%
Three-piece PCIOL in the sulcus, with iris suture fixation 13.8%
Three-piece PCIOL in the sulcus, with scleral fixation 7.3%
Reposition the original toric IOL (e.g., with reverse optic capture) 10.0%

Rich Hoffman All of these options are viable; however, with

most of the capsular support still present, it is probably best to try to get an IOL behind the iris. Single-piece PCIOLs should not be placed in the sulcus due to the high incidence of UGH syndrome. A three-piece IOL in the sulcus is a good option; however, without some form of fixation, there is a chance for subluxation through the large dialysis. Placing the IOL in the sulcus with the haptics oriented 90 degrees away from the dialysis and capturing the optic through an intact anterior rhexis should ensure centration and avoid the possibility of rotation of the IOL and subluxation through the dialysis. Optic capture may not be possible or advisable in the presence of an unstable anterior capsule resulting from a large dialysis that cannot be stabilized with a capsular tension ring (posterior capsular tear = no CTR).

Iris fixation is a nice option for an eye that has excessive capsular bag compromise precluding safe optic capture. It can be performed quicker than sulcus fixation of a PCIOL without the need for scleral dissection that might be problematic and uncomfortable in an eye undergoing topical anesthesia.

With any of the above options, exchange of the toric IOL with a monofocal IOL can be combined with limbal relaxing incisions in order to get the patient as close as possible to an emmetropic result.

Repositioning the original toric IOL is a tricky maneuver but offers the least invasive means of rescuing this case. To date, I am not aware of any UGH issues with reverse capture of a single-piece IOL optic anterior to the capsulorrhexis. This may be due to the lack of sharp haptics in the sulcus and stabilization of the IOL optic. Before the surgeon performs reverse optic capture of a toric IOL, it should be rotated to the proper meridian, within the capsular bag, after OVD is placed behind the lens. Once oriented correctly, the optic can then be prolapsed anterior to the rhexis with the OVD cannula. Once it is captured, it is very difficult if not impossible to rotate the IOL, especially in the presence of a large zonular dialysis—thus, the rationale for orienting before capturing. The myopic shift from this maneuver should be negligible.

Q18 Describe your experience with reverse optic capture (e.g., with a single-piece acrylic IOL)?

Have tried it with good results	18.4%
Have tried it, but decided that this was a bad idea, or was not comfortable	2.3%
Have never tried it, but would consider trying	70.4%
Have never tried it; not something I would ever do.	8.9%

Tom Oetting Jason Jones led our retrospective look at the safety and effectiveness of reverse optic capture to stabilize single-piece acrylic IOLs in the setting of posterior capsular damage.[1] In this study, we reviewed 16 cases in which the posterior capsule would not support secure placement of a single-piece acrylic IOL. In each case, the IOL was placed such that the haptics were in the bag and the optic was prolapsed anteriorly and captured by a centered anterior capsulotomy. The IOLs all remained secure in this position for an average follow-up period of 19 months. When compared with a control group, the eyes in the reverse optic capture group were only slightly more myopic than expected assuming the same effective IOL position. No cases of uveitis or glaucoma were noted in the series. It was nice to see during the Spotlight Session that over two-thirds of surgeons would like to try this technique.

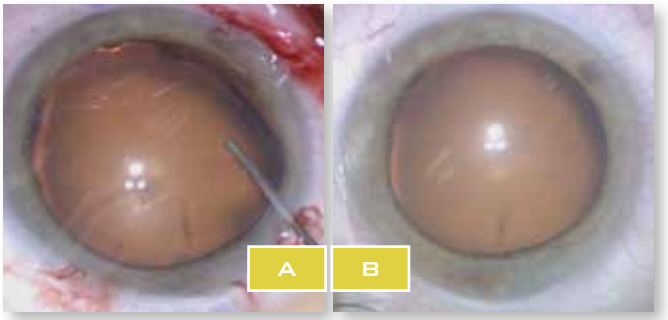
1 Jones JJ et al. *Ophthalmic Surg Lasers Imaging.* 2012;43(6):480-488.

Case 5: Diffuse Zonulopathy

Q19 This 63-year-old writer with Marfan syndrome is blind in her right eye. The left eye has a cataract with a superotemporal zonular dialysis. Given her interest in spectacle reduction following her upcoming cataract surgery, how would you manage her 2 D of corneal astigmatism?

Spectacles or contact lens following phaco plus a spherical IOL.	26.2%
Postop LASIK/PRK following phaco plus a spherical IOL	26.7%
Toric IOL.	30.9%
Manual astigmatic keratotomy	8.7%
Femtosecond laser astigmatic keratotomy.	7.4%

Bob Cionni This scenario is one that I am faced with almost weekly. My approach is to explain all the challenges and options, including the potential need for postoperative spectacle or contact lens wear. Twenty-six percent of respondents chose this option, and it certainly is not a bad one. However, today's patients, even those with challenging situations,



CASE 5: *(A) Following viscodilation, the superotemporal zonular defect is seen to be much larger than expected in this left eye of a patient with Marfan syndrome. (B) View prior to viscodilation.*

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expect excellent refractive outcomes. Fortunately, we are armed with wonderful technologies that, if the patient is managed properly, can result in outstanding refractive outcomes. Thus, I would explain to the patient that as long as I can achieve a centered and stable capsular bag, my plan is to place a toric IOL, guided by intraoperative aberrometry, in order to provide the possibility of reduced spectacle dependence. I firmly believe results are better with placement of a toric IOL as opposed to management of astigmatism using corneal incisions. The use of glasses or contact lenses would be reserved as a fallback option if the case does not go as planned.

I would prefer to use the femtosecond laser to assure a successful and intact capsulotomy. However, the capsulotomy can be performed manually, as well. The procedure involves prevention of vitreous prolapse and manipulation of nuclear and cortical material with generous amounts of a dispersive OVD. Capsular retention hooks or an Ahmed segment will be used for capsular bag stabilization during lens removal. A Cionni-style modified CTR or a standard CTR plus an Ahmed segment will be placed after lens removal and sutured to the scleral wall with Gore-Tex suture (this is an off-label use of this suture material), burying the knot through one of the sclerotomy sites. Aberrometry will then guide me to the best toric IOL in terms of spherical power, toric magnitude, and alignment axis.

If the integrity of the capsular bag is not maintained, a spherical IOL would be sutured to the iris, and paired manual arcuate incisions would be made, guided again by aberrometry.

Our success rate for placement of a toric IOL in these cases has been phenomenal, and patient appreciation of improved vision along with reduced spectacle dependence is heartwarming. Thirty percent of the respondents chose this option, which reflects an increased awareness of what can be accomplished, given advancements in techniques and technology.

Q20 Upon viscodilation, the zonular defect is seen to be much larger than expected (Figs. 5A, 5B). How would you proceed?

Abort surgery and refer her elsewhere.	7.5%
Proceed with cautious phaco	7.3%
Insert a CTR, then proceed with phaco	15.1%
Insert capsule retractor, then proceed with phaco.	36.1%
Insert a CTS (e.g., Ahmed, Assia), then proceed with phaco	5.7%
Insert CTR plus capsule retractors, then proceed with phaco	28.3%

Bob Osher and Dick Mackool The insertion of capsule retractors will stabilize the lens capsule and contents during phacoemulsification. Assuming that the capsule remains intact, insertion of a CTR, a CTS, or another stabilizing device can then be performed prior to the IOL insertion. While ring insertion prior to phacoemulsification is not contraindicated, the use of retractors without a ring will provide stabilization supplemented by the injection of OVD to expand the bag and protect the loose capsule from inadvertent rupture.

It should be emphasized that the insertion of only a CTR when there is extensive zonular dialysis may not be sufficient to stabilize and center the bag. It may be necessary to use a sutured device, to suture or scleral fixate the IOL haptics, or to implant an iris-fixated or anterior chamber lens.

Q21 Following phaco and I&A, the capsular bag is intact. With the large zonular dialysis, what additional capsular support would you employ?

No additional capsular support element	6.2%
CTR	56.0%
Sutured CTR (Cionni)	26.1%
Sutured CTR (Malyugin)	5.0%
Sutured CTS (Ahmed)	6.2%
Other.	0.4%

Michael Snyder This case elegantly achieves the first crucial requirement for CTR placement: removal of the cataract without damage to the capsular bag. Augmenting the significantly damaged zonular support becomes the next vital step toward long-term success in the presence of this large zonular dialysis.

A healthy majority of the respondents would place a standard CTR. While this would expand the bag for in-the-bag placement of a PCIOL—and while these are noble and appropriate goals—a standard CTR alone may not prevent decentration of the capsular bag–CTR–IOL complex, and there may still be pseudophacodonesis of the complex even if decentration does not occur. Of course, with a CTR in place, even if the complex does decenter later, after the anterior and posterior capsules have fused, the CTR backbone can hold a suture for subsequent repositioning surgery if needed.

A large plurality of the audience would place additional fixation elements in the form of a Cionni ring, an Ahmed segment, or a Malyugin CTR, all of which would provide desired suture stabilization and recentration of the IOL-bag complex.

In this case, the Malyugin CTR was used. This CTR can be placed using an injector system, while the Cionni ring and Ahmed segment require manual fixation. The Cionni ring has a broader base of support to either side of the fixation element, although this stiffer trailing piece of the ring must be manually placed into the bag fornix.

Some surgeons find the smaller Ahmed segments easier to place, while both the Malyugin and Cionni CTRs require rotation of the fixation element into the meridian of zonular weakness. Notwithstanding, a potential pitfall of an Ahmed segment is that in the setting of a narrow rim of anterior capsule peripheral to the capsulorrhexis, the segment

may torque anteriorly with suture tightening and sometimes pop out of the bag. In such capsular bags, the circumferentially complete Cionni and Malyugin CTRs provide greater stability without torque.

Q22 Assuming that a sutured CTR has been implanted, what IOL would you use?

Single-piece acrylic IOL in the bag	59.9%
Three-piece IOL in the bag	28.2%
Sulcus PCIOL, with no other fixation	5.1%
Sulcus PCIOL plus capsulorrhexis/optic capture	4.3%
Sulcus PCIOL plus iris/scleral fixation	2.5%
Other	0.0%

Boris Malyugin In this particular case, after CTR scleral fixation, the patient's capsular bag was well centered and stable.

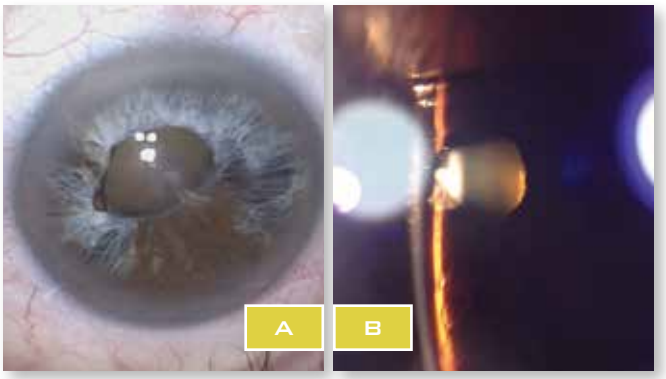
I am convinced that IOL implantation into the capsular bag is the best option for this patient. Not surprisingly, most of the respondents polled mentioned it as their preferred technique. I will leave the choice of the specific IOL (single- or three-piece) to the personal expertise and preference of the individual surgeon.

Also, more than 9 percent of surgeons would prefer using sulcus PCIOL fixation with or without capsulorrhexis optic capture. Although this technique is not yet clinically proven by long-term results, it may help to decrease the stress on residual zonules during eye movements and subsequently reduce the risk of late dislocation of the capsular bag–IOL complex.

Case 6: Cata-Rock and Crowded Anterior Chamber

Q23 This 67-year-old patient has counting fingers (CF) vision in his left eye, which previously suffered an acute attack of angle-closure glaucoma. Because of presumed optic neuropathy, no surgery has been recommended for his rock-hard, ultra-brunescent cataract. The left eye also has an unusually shallow anterior chamber, with the iris extremely close to the central cornea (Figs. 6A, 6B). The right eye is 20/40. Would you operate on the left cataract, and with what method?

No, I would advise against surgery	1.9%
I would perform phaco	38.1%
I would perform phaco following a pars plana vitreous tap	39.3%
I would perform manual ECCE (large incision)	5.3%
I would perform manual ECCE (small incision)	4.7%
I'd refer him elsewhere for surgery	10.7%



CASE 6: *(A) Ultra-brunescent cataract, fixed pupil, stromal iris atrophy, and extremely crowded chamber in a patient with a prior history of acute angle-closure glaucoma. (B) Slit-lamp view of fellow eye showing the unusually shallow anterior chamber.*

RJ Mackool Let's address the question in its component parts. First, how relevant is the patient's optic neuropathy? In this case, the patient is CF with a dense cataract. Removing the cataract will preserve the minimum of CF vision and possibly provide better vision. As CF vision is certainly worth preserving, we should eliminate the first choice (advise against surgery), as it will not help the patient. (Of note, if one is in doubt about visual potential in cases like these, answers can usually be found in old records, and patient expectations can be better addressed.)

Second, is a rock-hard brunescent cataract with a shallow anterior chamber a contraindication to phaco? The answer is no, as long as a one-port pars plana vitrectomy (PPV) is performed to deepen the chamber prior to phacoemulsification. While ECCE will get the job done, it is not necessary to create the larger incision and prolong the recovery period for the patient. Thus, we can eliminate options 4 and 5.

So we are left with two choices: refer the patient out or perform a one-port PPV and phaco. When performing one-port vitrectomy, no chamber maintainer is needed. A pars plana incision is created, and the vitrector is placed into the eye heading toward the optic nerve until it comes into view. If the view is limited by the cataract, just score the vitrector at 10 mm from the tip, enter the eye heading toward the optic nerve, stop at the scored mark, then vitrect. Proceed until the eye is soft by finger touch, re-form the anterior chamber, close the PPV wound, and proceed with phaco.

There is one important caveat, however: Be prepared for zonular laxity in these cases. In our retrospective review of eyes that required simultaneous one-port PPV and phaco, 54 percent of eyes had enough zonular laxity to require capsular retractors and/or a CTR, and an additional 5 percent of patients had no zonular support, which required ACIOL placement.

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Q24 How would you surgically manage his small pupil prior to phaco?

- Intracameral epinephrine or phenylephrine 4.3%
- Stretch the pupil with or without partial sphincterotomies 9.0%
- Iris retractors 39.8%
- Malyugin ring 45.8%
- Other pupil expansion ring 1.1%

Rosa Braga-Mele It is interesting to see that the audience was divided on the issue of which device to use to manage this patient's small pupil. About half the audience would have used a Malyugin ring, which would have dilated and stretched the pupil to about 5.5 mm. The other half would have used iris retractors, manual stretch, or an intracameral dilating pharmaceutical.

In cases where the iris could potentially be friable, such as chronic glaucoma or uveitis, I prefer to gently dilate the iris to a smaller [than 5.5 mm] diameter so as to avoid overstretching. This is because of the nature of these irides: They sometimes do not reconstrict after overdilation and can even become somewhat floppy during the surgical procedure. I prefer to use iris retractors or hooks in a diamond configuration (as first described by Tom Oetting[1]), whereby the amount of dilation of the iris can be controlled by the surgeon. This helps prevent the overstretching and any microhemorrhages that can occur with these friable irides.

Another good adjuvant to these cases is to use a viscoadaptive agent, such as Healon5, or a viscodispersive agent, such as Viscoat or EndoCoat, to lay over the iris and keep it dilated and controlled.

However, the most important strategy is, in fact, to dilate this pupil so that visibility is adequate and controlled throughout the procedure.

1 Oetting TA, Omphroy LC. *J Cataract Refract Surg.* 2002;28(4):596-598.

Q25 Following hydrodissection, the nucleus won't rotate. What would be your next step?

- Repeat hydrosteps 33.8%
- Attempt rotation with two instruments 11.3%
- Initiate phaco, then attempt to rotate the nucleus later 46.2%
- Insert capsule retractors and attempt rotation . . . 4.2%
- Convert to manual ECCE. 4.5%

Terry Kim The primary goal with hydrodissection in a rock-hard, ultra-brunescent cataract is to provide enough hydrodissection to rotate the nucleus without over-hydrodissection, which can potentially result in blowout of the posterior capsule. In this particular case, the surgeon is faced with the difficult decision of the next steps. Based on the audience polling, the majority chose to initiate phaco and then attempt nucleus rotation at a later time or to repeat hydrodissection. I believe either one of these options is reasonable.

After debulking and/or cracking the lens with a sculpt/groove or a chop technique, the surgeon could perform a repeat hydrodissection or viscodissection to facilitate nucleus rotation.

If a repeat hydrodissection is to be performed, the surgeon must be careful to release some of the OVD (typically used in excess to deepen the anterior chamber in these cases with shallow chambers) from the anterior chamber to avoid excessive positive pressure during this maneuver.

A smaller minority of the audience voted either to attempt rotation with two instruments, insert capsule retractors and attempt rotation, or convert to manual ECCE. In my experience, rotating the nucleus with two instruments can be effective as long as there is good zonular support. Inserting capsule retractors alone does not tend to facilitate nucleus rotation but can be helpful in the setting of compromised zonules. Although our tendency is to approach all of these cases with phacoemulsification, converting dense lenses such as these to manual ECCE and using a small-incision manual technique can result in excellent anatomic and visual outcomes.[1,2]

1 Ruit S et al. *Am J Ophthalmol.* 2007;143(1):32-38.
2 Haripriya A et al. *J Cataract Refract Surg.* 2012;38(8):1360-1369.

Q26 Following phaco, the capsular bag is intact but is somewhat floppy. What IOL and capsular support would you employ?

- Single-piece IOL in the bag 32.9%
- Three-piece IOL in the bag 12.0%
- CTR plus single-piece IOL in the bag 36.1%
- CTR plus three-piece IOL in the bag 7.6%
- Three-piece IOL in the sulcus 11.2%

Alan Crandall This question refers to a relatively common experience, as this scenario is seen in eyes with pseudoexfoliation, uveitis, traumatic cataracts, and narrow-angle glaucoma as well as in eyes that have undergone PPV.

The audience response shows that no single procedure dominates the surgical approach to this dilemma. It's interesting that a single-piece IOL plus a CTR had the highest level of support, while the choice of a three-piece IOL plus a CTR had the lowest. I would assume that this is related to the perception that a single-piece IOL is easier to implant—and that since the CTR is in the bag, there would be no advantage to a three-piece IOL. As for a three-piece IOL in the sulcus, those in support of that option must feel that sulcus placement would protect against late dislocation. On one hand, there are no studies to verify this; on the other, there are none to refute it. Unfortunately, not many lenses are designed for sulcus placement; I use the AQ 2010 (Staar) in these instances.

It's also interesting that nearly half of the audience is comfortable with no CTR. Most would use a single-piece IOL; this probably reflects the fact that these are now the

most commonly used IOLs. The level of support for a three-piece IOL could be related to the fact that if the IOL-bag complex dislocates, a three-piece lens can be iris-, sulcus-, or scleral-fixated, while a single-piece IOL should not be fixated to the iris or placed in the sulcus due to the risk for pigment dispersion and secondary glaucoma.

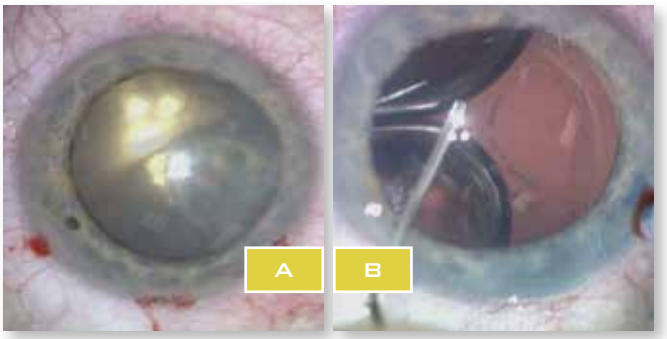
Overall, the choice of a CTR plus a single-piece IOL received the most support. The rationale behind this choice would be that the single-piece lens is easier to implant into the bag, which causes less stress on the zonules and reduces further dehiscence. A hydrophobic acrylic lens can have a tacky surface that quickly adheres to the capsule, and if IOL-bag dislocation occurs, the CTR allows for scleral fixation.

I usually fall into this last category for the same reasons: I prefer the ease of implantation and the lessened amount of zonular stress, as late subluxation may not occur, and, if it does, it can be fixed without major surgical intervention.

Case 7: Rapid Postvitrectomy Cataract

Q27 This 60-year-old is examined four weeks postvitrectomy with a 95 percent gas bubble (C_3F_8) for persistent vitreous hemorrhage. Vision has dropped to 20/200 due to a rapid-onset posterior subcapsular cataract. At the urging of the patient, cataract surgery is scheduled three weeks later. Once the operating microscope is positioned with the patient lying supine, a large persistent gas bubble becomes visible and impairs the red reflex (Figs. 7A, 7B). How would you proceed?

- Abort and postpone cataract surgery 32.1%
- Proceed with phaco using trypan blue dye to visualize the anterior capsule 17.0%
- Perform a pars plana tap to remove the gas bubble prior to commencing phaco 12.8%
- I would have been careful not to schedule surgery until confirming that the bubble was gone . . 35.3%
- I would not have attempted this case 2.9%



CASE 7: Seven weeks after vitrectomy, this eye has developed a rapid-onset posterior subcapsular cataract. (A) Once the operating microscope is positioned with the patient lying supine, a large persistent gas bubble becomes visible and impairs the red reflex. (B) Posterior capsule sector defect caused by vitrector is visible behind the capsulorrhexis edge.

Bonnie An Henderson This case highlights the unpredictability that is inherent in surgery. Since patients are examined at a slit lamp while upright, a residual gas bubble may be easily missed. Nearly 70 percent of the respondents would either abort the case or would not have scheduled the surgery in the first place. This speaks to the importance of visualization. Whether the impairment is due to a gas bubble or other causes, most agree that a clear view is paramount to a safe outcome. Removing the gas prematurely may lead to a redetachment of the retina.

Thus, the decision to remove gas early should probably be left to the retina specialist. Fortunately, most cataract surgeries are elective in nature and can be rescheduled to a later and more appropriate time. Unless medically necessary, I agree with the respondents that postponing this case would be the prudent choice.

Q28 With a large peripheral rent in the posterior capsule, what IOL would you implant?

- A single-piece acrylic IOL in the bag 9.6%
- Three-piece acrylic IOL in sulcus with capsulorrhexis/optic capture 65.8%
- Three-piece acrylic IOL in sulcus (no optic capture) 14.3%
- Three-piece silicone IOL in sulcus with or without capsulorrhexis/optic capture 8.0%
- ACIOL 1.4%
- Other. 0.8%

Sam Masket A large peripheral rent in the posterior capsule precludes a posterior capsulorrhexis. The latter affords the surgeon the chance to place any lens of choice in the capsular bag. A single-piece acrylic IOL can be used in cases such as this one, as the slow and gentle dynamics of lens implant unfolding tend to prevent extension of the tear, and the haptics may be positioned 90 degrees from the defect, leaving them supported by the remaining posterior capsule. Although this method risks an unstable outcome, nearly 10 percent of the respondents were comfortable with the concept.

The great majority (65.8 percent) of those responding preferred to implant a three-piece acrylic IOL in the sulcus and prolapse the optic behind the anterior capsulotomy, creating stable optic capture. Only a small number (8 per-

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cent) would consider the same option with a silicone optic, presumably because the patient's history of vitreoretinal surgery places him at risk of needing intravitreal silicone oil in the future.

A very few (1.4 percent) would prefer an ACIOL. Although the literature supports ACIOLs as being equal to PCIOLs in complex and complicated situations, current trends have moved away from ACIOLs as concerns related to sizing, corneal decompensation, CME, and "tenderness to touch" still exist.

It is clear that complex and complicated cases require an individual approach, but optic capture has been established as a stable and highly satisfactory method for PCIOL fixation in the setting of an unmanageable defect in the posterior capsule. This scenario underscores the need for a well-sized and well-positioned anterior capsulotomy in all cases.

Q29 Would you remove the gas bubble through the posterior capsular defect prior to IOL implantation in the sulcus or bag?

Yes—through the limbal incision with a cannula or an I&A tip	39.1%
Yes—through the limbal incision with a vitrector	10.2%
Yes—through a pars plana sclerotomy with a vitrector	16.9%
No	33.8%

FINANCIAL DISCLOSURES

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
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DR. AGARWAL: Abbott Medical Optics, Bausch + Lomb, Staar Surgical, C; Dr. Agarwal's Pharma, O; Slack, Thieme Medical Publishers, P. **DR. ALIÓ:** CSO, Hanita Lenses, Mediphacos, Presbia, Santen, Slack, Topcon, C; AkkoLens, Bausch + Lomb, Oculentis, C S; Vissum, E O; Schwind, L S; Jaypee Brothers, Springer Verlag, Tekia, P; Abbott Medical Optics, Carl Zeiss Meditec, Dompé, Novagali, Thea, S. **DR. AWH:** Bausch + Lomb, Janssen Pharmaceuticals, Volk Optical, C; ArcticDx, Katalyst Surgical, C O; Synergetics, C O P; Genentech, Regeneron, C S; GlaxoSmithKline, S. **DR. BAKEWELL:** Abbott Medical Optics, C. **DR. BOYER:** Alimera Sciences, Bausch + Lomb, Bayer Healthcare Pharmaceuticals, Glaukos, GlaxoSmithKline, Merck, Neurotech, Notal Vision, Pfizer, Quantel Medical, Regeneron, Santen, C; Alcon, Allergan, Genentech, C L; Allegro, C O. **DR. BRAGA-MELE:** Alcon, C L; Allergan, L. **DR. 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David Boyer I would first try to determine if a gas bubble is present by having the patient lie on his or her back prior to cataract surgery. If a gas bubble is still present, I would evaluate to see if it is pushing the capsular bag forward, which can make insertion of the IOL difficult. If not, I would continue and implant the lens and leave the gas bubble. If the bubble is interfering with IOL placement, I would remove the bubble through the limbal incision and would favor a small-gauge (25- or 23-gauge) vitrector, as there may be residual vitreous behind the lens. If no vitreous is seen, the I&A tip would be fine. Care must be taken to have an infusion present to avoid collapsing the globe. Pars plana incisions are difficult to make in a soft eye.

Q30 Describe your experience with performing phaco over an IOL (or Sheets glide) scaffold?

Have tried it and it is now my preference	14.6%
Have tried it but decided that this was a bad idea, or was not comfortable	2.7%
Have never tried it but would consider trying	71.4%
Have never tried it; it's not something I would ever do.	11.4%

Amar Agarwal When we have a posterior capsular rupture and nuclear fragments are still present, the dilemma is how to remove the nuclear pieces. In the IOL scaffold technique, a foldable IOL is used to prevent the nucleus fragment from descending into the vitreous in cases of posterior capsular rupture. After removing the vitreous in the anterior chamber by anterior vitrectomy, the surgeon injects a three-piece foldable IOL via the existing corneal incision with one haptic above the iris and the other extending outside the incision. The IOL can, alternatively, be placed into the sulcus; or, if the iris is not floppy, both haptics can be implanted above the iris.

The nucleus is emulsified with the phaco probe above the IOL optic. Cortical cleaning is done once the nucleus is removed, with iris hooks used to help in visualization. The surgeon then places the IOL over the remnants of the capsule in the ciliary sulcus, or the same IOL is glued in place if there is no capsule. This can be performed in eyes with moderate to soft cataracts. It avoids corneal incision extension, thereby limiting induced astigmatism.

In cases in which there is insufficient iris and anterior capsular support for IOL scaffolding, it may not be prudent to use the IOL scaffold technique because of the risk of the IOL dropping into the vitreous cavity. In this instance, I use the glued IOL scaffold approach. This combined technique (glued IOL and IOL scaffold) is helpful when one has an aphakic eye with Soemmerring rings with no capsule. If left behind, Soemmerring rings can drop down into the vitreous cavity and produce inflammation and/or IOL tilt. ■

EXTRA *MORE ONLINE. For an additional comment on Case #3, see the Web Extra that accompanies this article at www.eyenet.org.*