Supplement to

September/October 2021

CRST MILLENNIALEYE

Cataract & Refractive Surgery Today

KOL KNOCKOUT™ CATARACT EDITION:

Surgeons Battling for the Best Outcomes

FACULTY:

Uday Devgan, MD, FACS, FRCS

Zaina Al-Mohtaseb, MD

Ravi D. Goel, MD

David A. Goldman, MD

Himani Goyal, MD

John A. Hovanesian, MD

Robert F. Melendez, MD, MBA

Denise M. Visco, MD, MBA

A continuing medical education activity provided by Evolve Medical Education LLC.

This activity is supported by an unrestricted educational grant from Alcon Vision.

Provided by

evolve medical education

KOL Knockout™ — Cataract Edition: Surgeons Battling for the Best Outcomes

Release Date: September 2021
Expiration Date: October 2022

FACULTY MEMBERS

UDAY DEVGAN, MD, FACS, FRCS
Program Chair
Devgan Eye Surgery
Professor of Ophthalmology
Jules Stein Eye Institute
Chief of Ophthalmology
Olive View-UCLA Med Center
Los Angeles, CA

ZAINA AL-MOHTASEB, MD
Associate Professor of Ophthalmology
Associate Residency Program Director
Baylor College of Medicine
Houston, TX

RAVI D. GOEL, MD
Comprehensive Ophthalmologist
Regional Eye Associates
Cherry Hill, NJ
Instructor
Wills Eye Hospital
Philadelphia, PA

DAVID A. GOLDMAN, MD
Goldman Eye
Palm Beach Gardens, FL

HIMANI GOYAL, MD
Clinical Assistant Professor
New York University
Grossman School of Medicine
New York, NY

JOHN A. HOVANESIAN, MD
Clinical Faculty
Jules Stein Eye Institute
University of California Los Angeles
Harvard Eye Associates
Laguna Hills, CA

ROBERT F. MELENDEZ, MD, MBA
Founder and CEO
Juliette Eye Institute
Clinical Associate Professor
University of New Mexico
Albuquerque, NM

DENISE M. VISCO, MD, MBA
Medical Director and Founder
Eyes of York
York, PA

CONTENT SOURCE

This continuing medical education (CME) activity captures content from a three live virtual symposia.

ACTIVITY DESCRIPTION

This supplement summarizes content from a series of three unique, live virtual symposia hosted by Uday Devgan, MD, FACS, FRCS. The game show-style quiz competition with real-time audience voting featured cataract-focused case studies and discussions regarding patient care and surgical approaches among seven key opinion leaders/contestants. The archived video series can be viewed here: *https://evolvemeded.com/course-group/kol-knockout-cataract-edition-aberrometry-femtosecond-lasers-advanced-iols.*

TARGET AUDIENCE

This certified CME activity is designed for ophthalmologists.

LEARNING OBJECTIVES

Upon completion of this activity, the participant should be able to:

- **Summarize** the technology of femtosecond laser-assisted cataract surgery
- **Explain** how to incorporate femtosecond laser technology into cataract surgery techniques
- **Establish** when to incorporate intraoperative aberrometry to provide better refractive outcomes for cataract patients
- **Evaluate** patient lifestyles and expectations to improve intraocular lens choice
- **Compare** current and emerging technologies in advanced technology intraocular lenses

GRANTOR STATEMENT

This activity is supported by an unrestricted educational grant from Alcon Vision.

ACCREDITATION STATEMENT

Evolve Medical Education LLC (Evolve) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

CREDIT DESIGNATION STATEMENT

Evolve Medical Education designates this enduring material for a maximum of 1.5 *AMA PRA Category 1 Credit*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

TO OBTAIN CREDIT

To obtain credit for this activity, you must read the activity in its entirety and complete the Pretest/Posttest/Activity Evaluation/Satisfaction Measures Form, which consists of a series of multiple-choice questions. To answer these questions online and receive real-time results, please go to https://evolvemeded.com/course/2039-supp. Upon completing the activity and self-assessment test, you may print a CME credit letter awarding 1.5 *AMA PRA Category 1 Credits*™. Alternatively, please complete the Posttest/Activity Evaluation/Satisfaction Form and mail or fax to Evolve Medical Education LLC, 353 West Lancaster Avenue, Second Floor, Wayne, PA 19087; Fax: (215) 933-3950.

DISCLOSURE POLICY

It is the policy of Evolve that faculty and other individuals who are in the position to control the content of this activity disclose any real or apparent conflicts of interest relating to the topics of this educational activity. Evolve has full policies in place that will identify and resolve all conflicts of interest prior to this educational activity.

The following faculty/staff members have the following financial relationships with commercial interests:

Uday Devgan, MD, FACS, FRCS, has had a financial agreement or affiliation during the past year with the following commercial interests in the form of *Speaker's Bureau:* Bausch + Lomb and Novartis. *Shareholder*: Advanced Euclidean Solutions, CataractCoach.com, and LensGen.

Zaina Al-Mohtaseb, MD, has had a financial agreement or affiliation during the past year with the following commercial interests in the form of *Consultant*: Alcon Vision, Bausch + Lomb, CorneaGen, and Ocular Therapeutix.

Ravi D. Goel, MD, has had no financial agreement or affiliation during the past year.

David A. Goldman, MD, has had a financial agreement or affiliation during the past year with the following commercial interests in the form of *Consultant*: Alcon Vision, Allergan, Bausch + Lomb, and Novartis. *Speaker's Bureau:* Allergan and Eyevance. *Stock/Shareholder:* Alcon Vision, Allergan, Johnson & Johnson Vision, Kala Pharmaceuticals, Ocular Therapeutix, Stroma, and Tarsus.

Himani Goyal, MD, has had a financial agreement or affiliation during the past year with the following commercial interests in the form of *Consultant*: Carl Zeiss Meditec. *Grant/Research Support:* Research to Prevent Blindness.

John A. Hovanesian, MD, has had a financial agreement or affiliation during the past year with the following commercial interests in the form of *Advisory Board:* 1-800-Doctors, Aerie Pharmaceuticals, Abbott Medical Optics, Blephex, Cord, Eyedetec, Glaukos, Guardian Health Sciences, Ingenoeye, IOP/Katena, Ivantis, Kala Pharmaceuticals, MDBackline, Ocular Therapeutix, Omeros, ReVision Optics, Shire, Sight Sciences, TearLab, Tearfilm Innovations, Valeant, and Veracity. Consultant: 1-800-Doctors, Acufocus, Aerie Pharmaceuticals, Alcon Vision, Allegro Ophthalmics, Allergan, Abbott Medical Optics, BlephEx, Eyedetec, Glaukos, Guardian Health Sciences, IOP/Katena, Ivantis, Kala Pharmaceuticals, Novartis, Ocular Therapeutix, Omeros, ReVision Optics, Sarentis Ophthalmics, Sensimed, Shire, TearLab, Tearfilm Innovations, Valeant, and Veracity. *Grant/Research:* Aerie Pharmaceuticals, Abbott Medical Optics, Alcon Vision, Allergan, Cloudbreak Therapeutics, Cord, Eydetec, Glaukos, Ingenoeye, IOP/Katena, Novartis, Ocular Therapeutix, Omeros, ReVision Optics, Shire, Tearfilm Innovations, and Valeant. *Stock/Shareholder/Equity:* Alcon Vision, Alicia Surgery Center, Allegro Ophthalmics, Allergan, BlephEx, Eyedetec, Glaukos, Guardian Health Sciences, Harvard Eye Associates, Harvard Hearing, Ingenoeye, MDBackline, Novartis, Ocular Therapeutix, RxSight, Sarentis Ophthalmics, Sight Sciences, and Tearfilm Innovations. *Royalties*: SlackBooks and TLC: The Laser Center.

Robert F. Melendez, MD, MBA, has had a financial agreement or affiliation during the past year with the following commercial interests in the form of *Speaker*: Alcon Vision.

Denise M. Visco, MD, MBA, has had a financial agreement or affiliation during the past year with the following commercial interests in the form of *Consultant*: Bruder, Carl Ziess Meditec, Cassini, Lensar, Omeros, and Sun Pharmaceutical Industries. *Grant/Research Support:* Carl Ziess Meditec, Lensar, Omeros, Oyster Point Pharma, and Sun Pharmaceutical Industries. *Speaker's Bureau:* Carl Ziess Meditec, Lensar, Omeros, and Sun Pharmaceutical Industries. *Stock/Shareholder:* Eyevance.

EDITORIAL SUPPORT DISCLOSURES

The Evolve staff and planners have no financial relationships with commercial interests. Michelle Dalton, writer, and Nisha Mukherjee, MD, peer reviewer, have no financial relationships with commercial interests.

OFF-LABEL STATEMENT

This educational activity may contain discussion of published and/or investigational uses of agents that are not indicated by the FDA. The opinions expressed in the educational activity are those of the faculty. Please refer to the official prescribing information for each product for discussion of approved indications, contraindications, and warnings.

DISCLAIMER

The views and opinions expressed in this educational activity are those of the faculty and do not necessarily represent the views of Evolve, *Cataract & Refractive Surgery Today*, *MillennialEYE*, or Alcon Vision.

DIGITAL EDITION

This supplement is part of a larger curriculum that includes archived versions of three live virtual symposia. Go to https://evolvemeded.com/course-group/kol-knockout-cataract-edition-aberrometry-femtosecond-lasers-advanced-iols to view the full series.

To view the online version of the supplement, please go to https://evolvemeded.com/course/2039-supp.

PRETEST QUESTIONS

PLEASE COMPLETE PRIOR TO ACCESSING THE MATERIAL AND SUBMIT WITH POSTTEST/ ACTIVITY EVALUATION/SATISFACTION MEASURES FOR CME CREDIT.

1. Please rate your confidence in your ability to incorporate intraoperative aberrometry to provide better refractive outcomes for cataract patients (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).

a. 1
b. 2
c. 3
d. 4
e. 5

2. Which of the following is an important step in approaching an intumescent white cataract?

a. Needle decompression of liquefied cortical material prior to starting the capsulorhexis
b. Underfilling the anterior chamber with viscoelastic
c. Performing the capsulorhexis prior to filling the anterior chamber with viscoelastic
d. Performing the capsulorhexis with only forceps

3. Which of the following steps is an important when posterior capsular rupture is suspected?

a. Turning off irrigation
b. Filling the anterior chamber with viscoelastic while maintaining irrigation
c. Switching to the irrigation/aspiration device
d. Enlarging the incision to 3 mm

4. An 81-year-old male presents to your clinic with hand motion vision. On exam, you notice a milky white intumescent cataract. You schedule him for cataract surgery the next day. You pierce the center of the anterior capsule with a needle and decompress some liquefied cortex. What is a method you can use to ensure the posterior liquefied cortex is decompressed prior to initiating the capsulorhexis?

a. Pierce the lens again with the needle and continue advancing the needle posteriorly through the lens.
b. Use the irrigation aspiration device to aspirate more cortex
c. Rock the nucleus back and forth with your needle and reaspirate with your needle
d. Hydrodissect with balanced salt solution prior to initiating the capsulorhexis

5. A patient with a history of frequent intravitreal injections presents to your clinic for preoperative cataract surgery screening. You notice a focal opacity in the inferotemporal quadrant of the lens. You suspect posterior capsular compromise. During cataract surgery, what step would most likely lead to further compromise of the posterior capsule?

a. Clear corneal incision
b. Hydrodissection
c. Phacoemulsification of the lens
d. Irrigation/aspiration of nuclear material

6. A 55-year-old high hyperope presents to your cataract surgery clinic for evaluation. She has been reliant on +8.50 D glasses for distance and +11.00 D glasses for reading for the past 10 years. She now desires spectacle independence. Which of the following statement about her postoperative vision is TRUE?

a. She may notice more image magnification after surgery, so objects may seem larger after surgery.
b. She may notice less image magnification after surgery, so objects may seem smaller than before surgery.
c. Image magnification after surgery will not change.
d. She may notice fluctuating image magnification after surgery.

7. Which of the following statements about astigmatic correction after cataract surgery is TRUE?

a. The presence of astigmatism can increase depth of focus, and fully correcting astigmatism may collapse the depth of field after surgery.
b. The presence of astigmatism can reduce depth of focus, and fully correcting astigmatism may increase the depth of field after surgery.
c. The presence of astigmatism can increase depth of focus, and fully correcting astigmatism may further increase depth of field after surgery.
d. The presence of astigmatism can reduce depth of focus, and fully correcting astigmatism may further reduce the depth of field after surgery.

8. Which of the following patients would benefit most from an intraocular lens (IOL) with diffractive rings, such as trifocal, bifocal, multifocal, and some extended depth of field designs?

a. A patient with low-angle alpha and low-angle kappa
b. A patient with high-angle alpha and low-angle kappa
c. A patient with low-angle alpha and high-angle kappa
d. A patient with high-angle alpha and high-angle kappa

9. Which patient would be the most appropriate to receive multifocal IOL surgery?

a. A 30-year-old -2.00 D patient with a clear lens
b. A 50-year-old -1.50 D patient with 1+ NS
c. A 70-year-old patient with refractive error of +5.00 D -2.00 x 180 with 2+ NS
d. A 30-year-old +1.00 D patient with a clear lens

10. Which of the following patient(s) is/are an ideal trifocal IOL candidate? Select all that apply.

a. Emmetropic patient with a clear lens
b. Emmetropic patient with a cataract
c. Hyperopic patient with a clear lens
d. Hyperopic patient with a cataract

KOL Knockout™ — Cataract Edition:
Surgeons Battling for the Best Outcomes

Cataract surgery is one of the most commonly performed surgeries worldwide, and by 2050, the number of people in the United States with cataracts is expected to reach 50 million (up from 24.4 million in 2010).[1] The rapidly evolving field has seen substantial improvements in preoperative biometry, intraoperative aberrometry, enhanced or extended depth of focus (EDOF) intraocular lenses (IOLs), new IOL calculators, femtosecond lasers, presbyopia-correcting IOLs and corneal inlays.

Captured from a series of three live, virtual "knock out rounds," we've put together case studies to evaluate some of these innovations, but more importantly, to determine what steps we would take in real-world, real-time scenarios. We hope you not only enjoy these case presentations, but can put our discussion into use in your clinics tomorrow.

— Uday Devgan, MD, FACS, FRCS, Program Chair

ROUND 1 | CASE 1: ARGENTINIAN FLAG AND LENS CHOICES

Uday Devgan, MD, FACS, FRCS: Our first case is an intumescent white cataract. We know these types of cataracts tend to present with a thin and fragile anterior capsule that makes performing phacoemulsification tricky.[2] This is particularly true when we're creating the continuous circular capsulorhexis (CCC), because puncturing the anterior capsule results in a decrease in anterior capsular chamber pressure, which then causes the remaining intralenticular to anteriorly displace the lens, leading to a radial extension of the capsular tear; this is otherwise known as the Argentinian flag sign for the blue/white/blue color pattern.[2-5]

In our case, we used a 27-gauge needle to decompress the cataract. We used trypan blue dye to stain the capsule. After using ophthalmic viscoelastic (OVD) to pressurize the anterior chamber, we can tell the bag is also pressurized with intumescent fluid. See Figure 1.

What's important to note here is that we have not yet created the main incision. In Figure 1, we've gone right to the center of the capsule to try to aspirate and release some of the fluid. Once we can ascertain the capsule has been decompressed, the next step is to make the incision and complete the rhexis. This is my approach to minimize the risk of that Argentinian flag sign.

Q | DR. DEVGAN: What are your approaches? What instruments or tools you'd use to do a capsulorhexis in an intumescent white cataract to prevent Argentinian flag sign?

Ravi Goel, MD: I like your approach, but in these cases I prefer to make two side port incisions and ensure the intraocular pressure in the eye is above 30 mm Hg. Next, I stain with trypan blue 0.06%. Next, I use the Seibel capsulorhexis forceps to do the rhexis under high pressure through two side port incisions. I can make a small capsulorhexis initially, and then perform the double capsulorhexis technique.[6,7] I love that I don't have a main incision until I finish the capsulorhexis. That allows me to rock the nucleus a bit, which can help remove some of the cortex and that milky substance.

Dr. Devgan: Great technique. Figure 2 illustrates what you mean by rocking the nucleus to release more of the liquefied cortex. Dr. Goel, do you use two port incisions and then a 25-gauge forceps?

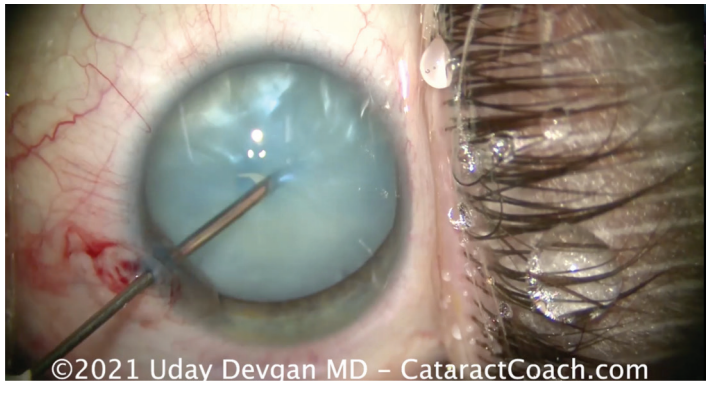

Figure 1. An intumescent cataract with needle insertion to decompress.

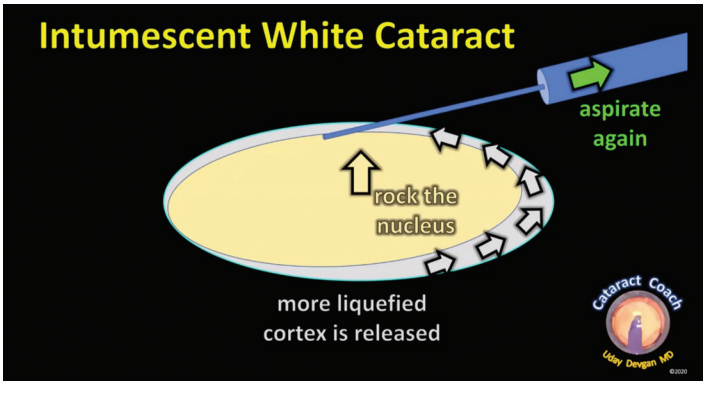

Figure 2. Intumescent white cataract and rocking the nucleus.

Dr. Goel: Yes, the specialized microcapsulorhexis forceps.

Dr. Devgan: Dr. Al-Mohtaseb, what's your approach in these cases?

Zaina Al-Mohtaseb, MD: I definitely like using a 27- or 25-gauge half-inch needle to decompress prior to creating the main wound. I like putting in a Healon5 viscoadaptive (Johnson & Johnson Vision), which also helps with performing the rhexis. Once I decompress, I create my main wound. The key for me is to ensure you've removed not just the central liquefied cortex, but also the cortex that might be in the periphery of the lens. You must be very careful during this step. I remove a good amount and then press down on the lens nucleus to make sure the fluid drains. It is important to remember the rhexis will tend to run out because of the liquefied cortex in the periphery or behind the lens that is not removed with decompression. If it's a soft cataract instead of a dense white cataract, I use bimanual irrigation aspiration[8-10] to remove all the cortical material.

Dr. Devgan: That's another great technique.
Dr. Melendez, what is your approach for these intumescent white cataracts?

Robert Melendez, MD, MBA: With the case you have presented so far, there is only one difficult step. Overall, the case itself is not difficult. It is important, however, that you keep positive pressure on that anterior capsule. I stain the anterior capsule with trypan blue, then I use OVD. Once there is an adequate amount of OVD in the eye to keep positive pressure on the anterior capsule, I'll puncture the anterior capsule with a cystotome. I also make two side port incisions. I initially make a tiny puncture, but I keep it very small and circular. In my experience, I've found by doing that, if it does tear, it will do so circumferentially as opposed to tearing straight out in most cases.

Then, I'll go in with the 27-gauge cannula through another side port and start to evacuate more of the liquefied cortex. Oftentimes, you'll see it ooze and go to one of the paracentesis ports. At that point, I'll usually add more OVD, and go back in with the 27-gauge to aspirate more for the liquefied cortex.

Dr. Al-Mohtaseb made a good point about removing some of the peripheral liquefied cortex to decompress that high pressurized lens before adding more viscoelastic. Then, we move forward with the capsulotomy.

Dr. Devgan: In these cases, would you consider using a femtosecond laser to create the rhexis before you even enter the eye?

Dr. Melendez: I have a case coming up that is very similar—an intumescent cataract. Patients at a higher risk for intumescent cataracts are those with a 4+ white to posterior subcapsular cataract, as those can progress very rapidly to an intumescent stage, sometimes within 30 days. I've planned on using the femtosecond laser on this patient, as colleagues have told me they've had success using the laser for these cases. There is also support in the literature.[3,11,12]

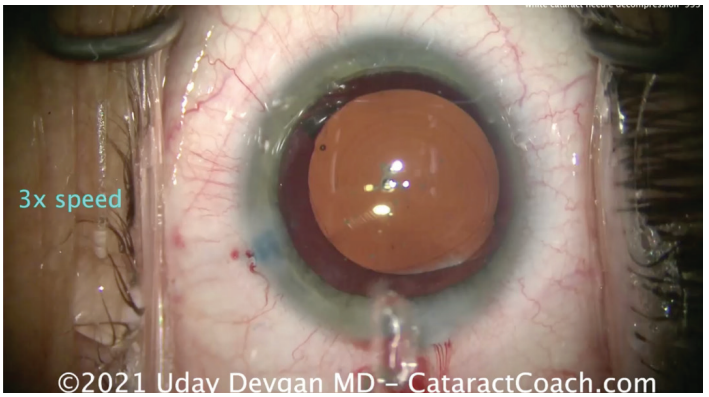

Figure 3. Trifocal lens implantation in a patient with white cataract.

Dr. Al-Mohtaseb: It's reasonable to use the femtosecond laser in these cases. I've had cases in which the lens is too intumescent and liquefied cortex comes out, which can happen if the laser takes a little longer to perform the capsulorhexis. You just need to remember it won't be continuous; you'll need to remove the capsule with care and assume there will be tags. Still, I think it's a very reasonable approach.

Dr. Goel: I think using a femtosecond laser is a reasonable option. I recall a case you recently posted, Dr. Devgan, in which you went in with a needle and it went immediately to the Argentinian Flag sign. I think you could still have the potential of that occurring, even with a femtosecond laser, but I believe using a femtosecond laser to control the situation is a reasonable approach.

Dr. Devgan: My advice for those of us who want to use the femtosecond laser is to still stain with trypan blue. Once you're in the eye, don't presume the capsule is (essentially) free-floating. You'll need to grab the capsule and make the tearing motions because there may still be a few attachments that you'll then be able to complete.

Continuing with the case, the rest of which is fairly straightforward and uneventful. The nucleus can be chopped and aspirated rather quickly. What does make this case a bit more interesting is the choice of lens. We opted to insert a trifocal IOL in this patient. I added triamcinolone in the anterior chamber to quiet any inflammation. The patient had about 0.50 D of astigmatism, so we also performed limbal relaxing incisions (LRIs). The literature shows that newer trifocal lenses reduce photic phenomenon compared to the previous bifocal designs, and they deliver high levels of patient satisfaction.[13-19] Figure 3 shows the end of the procedure.

Q | DR. DEVGAN: What are your thoughts about implanting a premium lens in these patients? Can these patients achieve an accurate refractive outcome even if they've started off with white cataracts? How do you do the lens calculations?

Dr. Al-Mohtaseb: Those are all very good questions. If there are no issues with the patient's ocular surface, and we have good axial length measurements, I think a premium lens is a viable option. The newer optical biometers, such as the IOLMaster 700 (Carl Zeiss Meditec) or the Lenstar 900 (Haag-Streit) can image very dense lenses much better than earlier iterations. White cataracts are still very difficult to predict and plan for. I definitely recommend doing an A-scan immersion, making sure your gates are correct on the immersion, and that you're comfortable with the axial length measurement. Compare it to the other eye to reconfirm.

It's also about managing expectations. I tell these patients we may be off our refractive mark, but we can rectify it with refractive surgery if necessary. So, yes, I think premium lenses are something to consider even in white cataracts.

Dr. Devgan: Dr. Melendez, how do you do your IOL calculations in these patients?

Dr. Melendez: First and foremost, there must be a careful consent with the patient so they understand the potential risk of a tear that may lead to having a different lens implanted. We're doing an internal study at our clinic comparing the IOLMaster 700 with the Argos Swept-source Optical Coherence Tomography Biometer (Alcon) in measuring dense cataracts like this one.

I recently had a white intumescent cataract, very similar to this case. The IOLMaster 700 could not capture the image, but the Argos with ERV setting was able to capture the measurements. I also have the intraoperative ORA System (Alcon). This system uses preoperative biometry measurements and intraoperative interferometry to measure an aphakic eye's refractive power for appropriate IOL selection,[20,21] which I've found particularly useful in these types of surgeries.

But to Dr. Al-Mohtaseb's point, using the contralateral eye as a base can work, presuming the second eye is very close in measurement, and you can confirm that with axial length measurements. With the ORA, you have measurements intraoperatively as well to help with the best IOL calculation.

Dr. Goel: I would start by looking for an older spectacle prescription before the patient developed the intumescent cataract. I'd compare the refractions in both eyes. Then, I would do axial length measurements as best I could. At our clinic, we have the choice of an IOLMaster 700, a Lenstar, or an A-scan.

For me, this is a case in which I'd use the ORA intraoperatively, because you noted there was a small amount of astigmatism as well. The literature has shown using intraoperative aberrometry increased the proportion of eyes with postoperative refractive astigmatism of less than 0.50 D and reduced the mean postoperative refractive astigmatism at 1 month.[22]

I think you have to make sure the ocular surface and the rest of the ophthalmic exam is normal, especially in the contralateral eye. This patient probably should have a B-scan before surgery to ensure nothing else was going on.

I rely on ORA in these types of cases, also in postrefractive cases, as the literature also supports that.[21]

Dr. Devgan: In this case, the patient was thrilled. She ended up just about plano—to go from a white cataract to clean and crisp vision with a trifocal lens and with minimal complaints about nighttime glare or halos made this one of my favorite cases.

ROUND 1 | CASE 2: TREATING PATIENTS WITH ZONULAR LAXITY

Dr. Devgan: Our next case is a patient with severe zonular laxity. Figure 4 shows the preoperative images, which again reinforces Dr. Al-Mohtaseb's point about why the preoperative exam is so crucial.

In this patient, there was a very shallow anterior chamber and very small pupil (visible on the left side of Figure 4). This is a very tiny eye; the IOL power for postoperative emmetropia was +34 D. The right side of Figure 4 shows that same eye under maximum pharmacologic dilation.

The capsulorhexis was a little difficult, a little tough. There was a little laxity on the lens capsule and it was difficult to get started; I was unable to poke it with forceps and had to use a sharp needle instead. I was able to make a 5-mm capsulorhexis; my forceps have marks so I can measure it directly. The capsulorhexis is nice and round and centered. For the time being, there was enough capsular support or zonular support to hold the capsule. But I could rock the entire nucleus and have the capsulorhexis shift.

Q | DR. DEVGAN: How would you handle this case with very weak zonules?

Dr. Goel: I tend to make the capsulorhexis the same way as I would with a white cataract—two paracenteses in the high

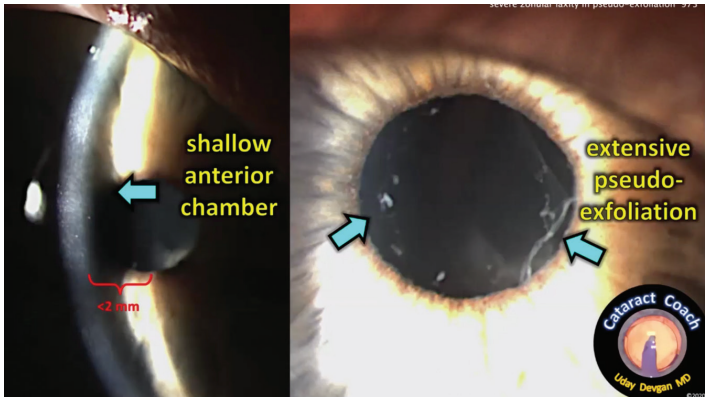

Figure 4. Preoperative images of a shallow anterior chamber.

hyperopes. I do this because I'm afraid when the anterior chamber depth is 2.5 mm or less that it may be too shallow. Having the two side port incisions and making the capsulorhexis with the MSC forceps has worked for me.

I also consider using Mackool hooks with a Chang Modified Retractor, which is a capsular tension retractor. I would also use a capsular tension ring (CTR) as late as possible in the procedure, but as soon as you need it. In this case, I would have tried to insert the ring as soon as I saw the jiggling.

Dr. Melendez: Knowing the patient has pseudoexfoliation should raise your suspicion that you're going to have a loose bag. We already know that pseudoexfoliation and zonular laxity are associated with an increased risk of vitreous loss[23] and with late IOL dislocation.[24] In this case, when you tried to puncture the lens, there was a good amount of wrinkling which increased when you did puncture it. To me, that implies the bag was already very loose right out of the gate. Based on your description, it seems as though the zonular laxity may have been limited to one area. In these cases, I use the Mackool hooks, but I also believe exposure is key. We should not be afraid to insert a couple of iris hooks if that pupil comes down. You really want good exposure to observe the edge of the bag in the event that there is any disinsertion of the bag.

Dr. Al-Mohtaseb: First, I ensure the pupil is well dilated. Then, to perform the capsulorhexis, I either use capsular hooks or I place capsular tension ring segments and hook the eyelit with an iris hook. I believe there is more stability when I use the CTR segments than when I use four large capsular hooks. This is particularly true in cases of really dense lenses. Avoiding further zonular loss by being careful with rotation and hydrodissection is important and so is chopping the lens.

Dr. Devgan: Another suggestion is to use iris hooks to stabilize the capsule procedure once you debulk as much of the lens as possible, just like Dr. Goel mentioned.

Preoperative discussions with these patients is of the upmost importance. I may joke with them that their surgery is going to take a week off my life and they should be really sweet to me no matter the outcome. But in all seriousness, it is important to convey to the patient this is a very difficult surgical procedure and there are no guarantees of the outcome.

Returning to the case: I almost never do stop and chop, but I did a groove to debulk the lens centrally in this case because there was so little working room. In my hands, this is easier than having two chopped halves; with a groove, each half is more like 40 to 45% due to the removed lens material from grooving, so it's just smaller. The nucleus comes out fairly easily, and I move to cortex removal. At this point, I've decided to insert a CTR.

Q | DR. DEVGAN: In your hands, when would you place a CTR and how do you place one (manually, with an injector)?

Dr. Melendez: I typically don't use CTRs. I try to locate the area of zonular weakness. I like to use Mackool hooks overlying this area. In these cases, usually the pupils are small; so I usually use iris hooks to do the iris retraction, a little bit farther out in that area of zonular weakness. I use Mackool hooks and go in with a manual reverse cannula. I'll basically hold circumferentially as opposed to just tangentially because that can disinsert the bag even more if you pull directly to the center. Circumferentially is key in a circular fashion.

Dr. Devgan: I absolutely agree. Dr. Al-Mohtaseb, please share your thoughts.

Dr. Al-Mohtaseb: I like to insert CTRs manually, but taking out the cortex can be difficult after putting a CTR in these cases. Prior to placing my CTR, I go in with OVD and viscodissect the cortex. To place the CTR, I go in through a paracentesis so there's less movement than going in from the wound. I use a Sinskey hook through the wound to hold the CTR as I'm threading it in, so it doesn't push against the anterior capsule. I don't put the Sinskey hook in the eyelit. Once the CTR is in, I rotate my hand clockwise to allow for the CTR to be fully placed in the bag. I feel I have more control when I do this manually.

Dr. Goel: I've used an injector, but I agree with Dr. Al-Mohtaseb. I have seen videos of using the Sinskey hook in the eyelid to introduce the CTR in a controlled fashion. I absolutely agree that the irrigation/aspiration (I/A) has to be super delicate because of the zonular weakness. For maximum stability, I also go circumferentially.

Dr. Devgan: Fantastic pearls. I agree with your advice, and I placed the CTR with an injector and went circumferentially. We switched to a bimanual approach for the I/A, which made clean up much easier. But this patient is also 87. What's your lens choice in these cases? Single-piece IOL in the bag? In the sulcus?

Dr. Melendez: We have numerous options. I'll use a single piece if there is less than 3 clock hours of zonular weakness. Your case may have up to 4 clock hours, and I would recommend using a three-piece IOL, doing a reverse capture and putting the haptics in the sulcus. Then, I would push the lens in the bag.

Dr. Devgan: Fantastic pearl. Dr. Goel, what do you think?

Dr. Goel: No one would fault you in this case if you used either a single-piece or a three-piece IOL. I think with a CTR you could use a single-piece. A CTR could help you very carefully place a three-piece IOL into the sulcus, as Dr. Melendez described, with the haptics and the sulcus and the optic captured in the bag. Certainly, I would calculate for both. I'd calculate an AC IOL, too, but you have to take each of these cases as they come. I don't know that I'd generalize or exclude one type of lens or where to place it.

Dr. Al-Mohtaseb: I would use a single-piece IOL with the CTR. I would put it in the bag. If I feel there is a lot of zonular loss or if it was a much younger patient, then I would suture CTR Ahmed segments to the sclera. Otherwise, I can always hook the CTR if it does dislocate later. I like putting in the one-piece IOL with a CTR.

Dr. Devgan: To continue with our case, I chose a three-piece lens. I inserted the haptics into the sulcus and captured the optic by button-holing it behind the capsulorhexis. Hopefully, that will give this patient good long-term stability. I'm happy to tell you the patient did pretty well. But this was a very stressful case. I really cannot emphasize enough how important it is to talk with the patient in the preoperative period.

I do want to reiterate that these are not hypothetical cases—they are from my own clinic and certainly stressful. I think the patients appreciate it when you tell them ahead of time how difficult it's going to be. Then, they're more accepting of a wider outcome range.

ROUND 2 | CASE 3: HIGH MYOPE

Dr. Devgan: Our next case is a high myope. This 60-year-old patient has an axial length of greater than 30 mm, he's -15.00 D and after a nuclear sclerotic shift, he's -20.00 D in his refraction. These cases present with several issues; among them is lens calculations. Figure 5 shows how I'm "cheating" when I'm making the capsulorhexis. I'm using forceps that are marked on the tip so I can actually measure out 5 mm. This patient has a huge eye—13 mm white-to-white and a large, dilated pupil.

One pearl here: Don't use the pupil as guidance in creating the capsulorhexis in these cases, otherwise you'll end up with an oversized rhexis that won't hold the IOL in place.

Another issue that can present itself intraoperatively with highly myopic eyes and long axial lengths is reverse pupillary block.

Q | DR. DEVGAN: In these cases of high myopes and long axial lengths, what do you do differently intraoperatively?

Dr. Al-Mohtaseb: In these cases, the first thing to remember is that you're going to be much deeper in the eye. You must hold your hand position very differently. You're almost operating like a retina surgeon. You have to be very careful when you're doing your rhexis, for all the reasons Dr. Devgan explained.

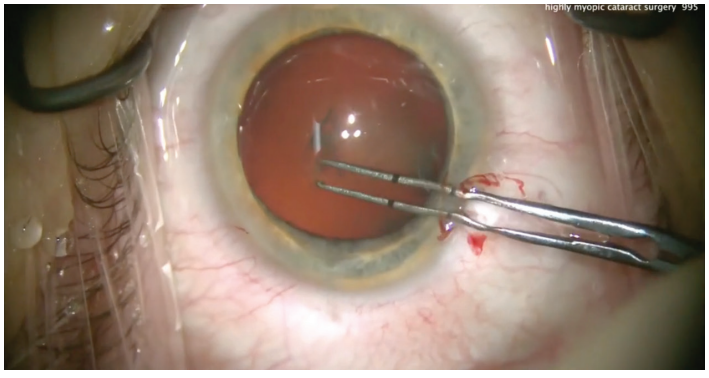

Figure 5. Marked forceps help with capsulorhexis planning.

Second, I also recommend looking for zonular loss, which can happen in these eyes more frequently than we might think. Zonular weakness coupled with high myopia can lead to late IOL dislocation.[25]

Third, as soon as you enter with the phacoemulsification, reverse pupillary block is very uncomfortable for the patient and it deepens everything into the eye. I prefer to go in with a second instrument, lift up the iris and then go in with my phaco. In my hands, that helps reduce the risk of reverse pupillary block from occurring. We need to remember that reverse pupillary block can occur even during I/A. That is a good enough reason to change how I approach these cases.

Finally (as I do in all cases), I try to avoid a posterior capsule tear because of the known risk of retinal detachment being so much higher in highly myopic cases.[26-28]

David A. Goldman, MD: I agree with Dr. Al-Mohtaseb's comments. I will add that if you get a reverse block, one option is to lift the iris, or lower the bottle height. If possible, I recommend using an acrylic lens because these patients are at a higher risk for retinal pathologies.[27,29]

When you're counseling these patients, explain that the risk of retinal detachment is influenced by the patient's posterior vitreous detachment (PVD) status, gender, and age. There is a significant year-over-year risk of retinal detachment and risk with cataract surgery. I tell these patients they must follow-up with a retinal specialist for the rest of their lives.

Dr. Devgan: Dr. Goyal, are you sending these cases to your retina specialist before surgery?

Himani Goyal, MD: I definitely do. I want to make sure there are no retinal issues to consider. I'm not good at scleral depression, and I can't see everything that's there. With these cases, I feel the retina specialist brings more to the table than I can alone. The retina specialist will let me know if there is anything we need to do prophylactically to the eye, but it also allows the patient to meet the retina specialist who will likely be treating them if something does happen down the road.

Dr. Devgan: Do you send them back to the retina specialist a month later for a postoperative evaluation?

Dr. Goyal: Generally I do. Obviously, if something happened intraoperatively, I'd refer right away.

In terms of what I do differently intraoperatively, Drs. Goldman and Al-Mohtaseb covered the topic eloquently. You need to decrease the pressure if you're using a phaco device with that, or decreasing the bottle height can achieve the same thing, which is bringing things a little closer to you. I wasn't aware that could also help stop the reverse pupillary block. That's a really good pearl I'm going to try with my next few cases with my resident.

Dr. Devgan: If you use your chopper to barely tent the iris, that helps break the pressure from the anterior chamber and posterior chamber—not the vitreous cavity, but the two chambers. This is also called lens-iris diaphragm retropulsion syndrome (LIDRS), which Dr. Robert Osher first described nearly 20 years ago.[30]

Returning to the case, it was easy to remove the cataract. I try to avoid barotrauma (or pressure trauma), as I do not want the anterior chamber to collapse and then deepen. To minimize that risk, I will very carefully come out of the eye, switch to the I/A probe to keep the entire anterior chamber inflated and avoid putting traction on the vitreous base.

Q | DR. DEVGAN: Is there a role here for intraoperative aberrometry? And what do you aim for postoperatively? How does that change (or does it?) if the patient wants to be plano, or expects to be 20/20?

Dr. Al-Mohtaseb: It's reasonable to not aim exactly plano but a little minus. The key is you definitely don't want to make the patient hyperopic because they're going to be miserable. Someone with that level of myopia is probably not removing their glasses to read, which is another factor to consider. I aim for close to plano but on the myopic side. I do think aberrometry is helpful in the extremes of these axial lengths. It's another data point to help with your preoperative measurements that you've taken. In addition, if you are using the Holladay formula, you want to make sure to adjust your axial length.[31]

Dr. Devgan: Dr. Goldman, how important is effective length position (ELP)? If the lens power is zero, what role does ELP play?

Dr. Goldman: It's not as crucial a factor as having a hyperope with those higher-powered lenses. But it's still a factor. As Dr. Al-Mohtaseb has said, you want to aim to err on the myopic side. I don't do intraoperative aberrometry for these kinds of cases. For someone who needs a toric lens, I'll use intraoperative aberrometry to ensure everything is aligned along the right axis. But because the ELP is so dynamic during ORA measurements, I don't rely on the sphere measurements as much post-implantation of the lens.

Dr. Devgan: Dr. Goyal, what are your thoughts and thought process for choosing a postoperative refractive target. Do you like aberrometry in these eyes?

Dr. Goyal: It's a mix of what everyone else has said. First, it will depend on patient age. Equally important is what the patient does, if they're currently using bifocals or progressives, and if they're looking to have their presbyopia addressed as well. Usually, these patients are taking off their glasses to read or they're happy with bifocals. I tell them if they're really after plano, they're not ever going to be able to "take out" their contact lenses and will likely always need a pair of readers.

In my hands, over time I've realized highly myopic eyes remain more myopia. Even though I'm aiming for that same target refraction and using Barrett or SRK/T IOL formulas, these patients end up remaining myopic. I don't want to adjust for that because myopic eyes like to be myopic.

Dr. Devgan: Good points. Patients with those much higher myopic levels may not be able to achieve 20/20 VA.

In this case, we used a three-piece IOL, and I agree with Dr. Goyal that the Barrett formula and Ladas Superformula AI are particularly useful for these eyes. You may find the capsular bag to be large enough that you end up with a wrinkle on the posterior capsule. My advice is to ensure you inflate it enough so the lens can be inserted and positioned without that wrinkle.

Q | DR. DEVGAN: How do you handle patient expectations? Particularly if they wanted to have 20/20 VA?

Dr. Goldman: It's no different with these patients than high hyperopes or post-LASIK. We talk to them a bit more extensively beforehand to explain why their surgery is more difficult. I've found doing that changes it from a complication to an expectation. But if they're really unhappy at -1.00 D from their -20.00 D, we can correct it with PRK.

Dr. Al-Mohtaseb: You have to listen to the patient, regardless of how much we realize going from a -20.00 D to -1.00 D is a difficult surgery. It goes back to what Dr. Goldman said–proper preoperative counseling will help manage postoperative expectations. I advise these patients to give it some time, but I will refer them to the optometrist or contact lens specialist for a trial before I do refractive surgery to make sure there potential VA is 20/20 with refraction.

ROUND 2 | CASE 4: UNDERCORRECTION IN CONTACT LENS PATIENTS

Dr. Devgan: Our next case is also a high myope (see Figure 6 for the preoperative imaging). The surgery itself was uneventful, and the patient had toric lenses implanted. At slit lamp there was nothing unusual. He's is truly plano in both eyes. But he's unhappy, and here's why: he had been undercorrected in contact lenses and had been -1.00 D OU while using them. He's on the computer all day for work, and he's used to being -1.00 D, and now I've made him plano (see Figure 7 for postoperative outcomes).

Q | DR. DEVGAN: Dr. Goyal, how would you handle this case? Do you perform hyperopic LASIK?

Dr. Goyal: This is a case in which you must have specific patient input: When is his vision good for him? When is he not happy with it? If he reads and does a lot of near work, this outcome should be good, and he will only need glasses for distance. So, no, I would not go back in.

Dr. Goldman: I'd let it settle and see if he adapts. If he continues to complain, I might consider a piggyback lens. They're really easy to implant, and you can add a three-piece IOL in the sulcus; it's

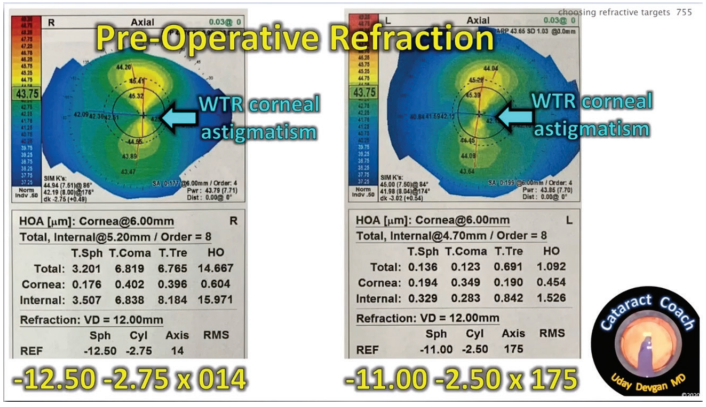

Figure 6. Preoperative imaging.

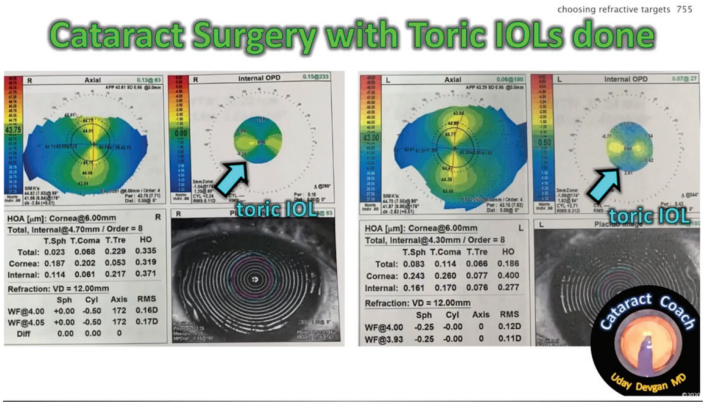

Figure 7. Postoperative outcomes.

a very quick and easy procedure. These are probably the hardest patients to treat. I've had multiple patients complain that they want distance vision with their cataract surgery and when I give them that, they're upset because they could "already see up close." We now include a statement on our informed consent that acknowledges the need for reading glasses.

With this case, you could do hyperopic LASIK, but I'd lean more toward a piggyback lens.

Dr. Al-Mohtaseb: These patients assume they can read without correction. You need to make this part of the preoperative conversation to determine what type of reading they do and how often.

For this case, I'd be very conservative and would try to avoid performing hyperopic LASIK or go back in for an IOL exchange. I'd try to talk him into wearing a pair of glasses or contacts for reading, as he may be more comfortable with that.

Dr. Devgan: We suggested wearing contact lenses again for his computer work, and he told us he was fine wearing +1 readers. So in this case, we had a good outcome and played it conservatively without performing any kind of enhancement.

ROUND 3 | CASE 5: IDENTIFYING THE IDEAL TRIFOCAL CANDIDATE

Dr. Devgan: In this case, we had already removed the cataract and we were left with a nice looking rhexis. The lens was a 27.50 D PanOptix toric lens. I'm really happy the manufacturers are now giving us all the new technology in a toric platform as well. Figure 8 shows a PanOptix toric lens in the bag with a nice red reflex. That's been a huge help to me to be able to hit the refractive targets.

Q | DR. DEVGAN: Who is your ideal trifocal or multifocal patient?

John A. Hovanesian, MD: Trifocal lenses really have been a game-changing technology because of the additional spectacle independence. Fully 83% of my patients are completely spectacle-free with bilateral PanOptix. But there are caveats: patients must have healthy eyes without any significant comorbidities such as dry eye.[32-34] Prior refractive surgery is a soft contraindication.

Denise Visco, MD, MBA: The first red flag for me is the patient's personality. As the surgeon, we need to ensure the patient can handle the side effects of the multifocal IOLs. Dr. Hovanesian alluded to some of the other factors I consider, which I lump into three categories. There's the optics of the eye (cornea and retina). What's the angle kappa? Have they undergone previous laser vision correction? Then the cornea itself, is it healthy? Is the eye dry? Do they have a pterygium? Do they have a Salzmann's nodule? Then I consider the retina: whether they have macular degeneration, or an epiretinal membrane. The healthier the eye, the better the end result after cataract surgery. But if their personality suggests they're not going to be able to tolerate some dysphotopsias, then they're not going to be a good candidate, no matter how healthy their eye may be.

Q | DR. DEVGAN: How important is it that you nail your refractive target and how do you ensure that?

Dr. Goldman: It's particularly crucial to nail the target with the multifocal lenses because the patient is expecting spectacle

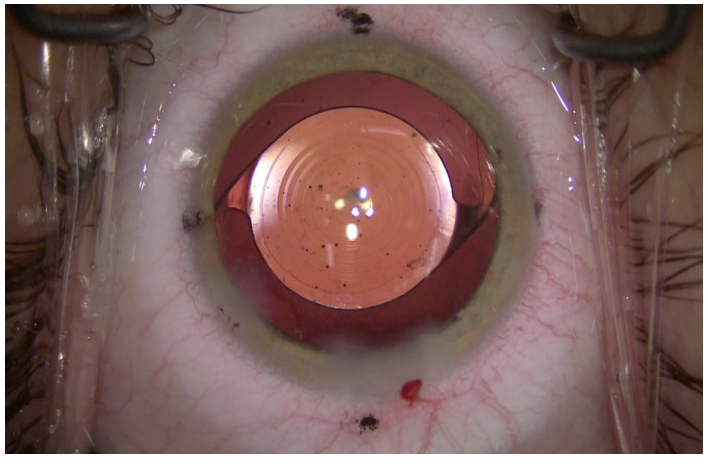

Figure 8. PanOptix toric lens in the capsular bag.

independence. I prefer to read the biometry scans myself, to ensure they look appropriate and then I compare the two eyes. Prior LASIK does not necessarily make the patient contraindicated, because those are also the patients who are more motivated to have the technologically advanced lenses. They've been without glasses and they want to stay that way. I do discuss the possibility of a second surgery if there are any refractive surprises, but we have access to excimer lasers in our offices, so I can do a PRK enhancement if necessary.

In healthy eyes, the significant contraindication for me is a patient who voices concerns about any kind of halo. When PanOptix was first introduced, I was concerned about halos, but no one was developing them or complaining, so I stopped discussing it. Once in a rare blue moon, a patient will mention rings. My discussion now sounds something like, "You may see some rings around lights with this lens, if that's going to be a problem, let's try a different technology." To your original point though, hitting the target is critical. If cataract surgeons want to use these lenses, they must have the most upgraded biometry.

Dr. Devgan: Let's continue with the case. I like to aim for plano if I can, but if there's any doubt, I'd rather err on the side of slightly plus than slightly minus. In this case, the iris prolapsed out of the eye, despite having a good incision. So that was a brief complication. The other thing to remember about these cases is the lens has to be dialed into the proper toric axis.

Q | DR. DEVGAN: What techniques do you employ to line up these lenses? How important is it to have those rings in the patient's visual axis? How does your technique change if there's a large angle alpha or kappa? Does anyone use Purkinje images?

Dr. Visco: I'm fortunate that I have a Lensar (Lensar), so I use the IntelliAxis-L. My capsulorhexis is created with a femtosecond laser that corrects for cyclotorsion, so I don't need to mark the patient. And I also have Callisto (Carl Zeiss Meditec) to double-check the axis. Any amount of astigmatism should be corrected. Patients with multifocals are very exquisitely sensitive to residual cylinder—it affects their result and will need to be corrected if it's not corrected at the time of the initial surgery. If they have a large angle kappa, I avoid the lens. Pushing the lens to the nasal side of the bag doesn't work. We need to deliver results for our patients, not merely so-so outcomes.

Dr. Goldman: In the video of this case, there was a bit of an iris prolapse, but Dr. Devgan immediately "burped" out some of the viscoelastic while the iris was back inside the eye. For less experienced surgeons, that's a key point to remember. If you don't perform that step to remove some of the viscoelastic, the iris is going to keep coming back out your wound. Decompressing the chamber is going to save you from having that recurrent iris prolapse.

Because the lens can still rotate after it's been implanted, the ability to touch up patients in your office with an LRI is something I advocate becoming adept in. If you have good blades, an LRI can be done right at the slit lamp. Numerous studies have found that for each degree of rotation, there's a 3.3% loss of efficacy with a toric lens. So, 30° of misalignment neutralized the effect altogether.[35-39]

I agree with Dr. Visco's point that you need to pick the right candidates, although the newest generation lenses have larger central optics so they can be a bit more forgiving for things like angle alpha and angle kappa.

Dr. Hovanesian: We use ORA and we recently showed that when we use intraoperative aberrometry, about 60% of the time we actually increase the toric correction we're using because the ORA indicates there's more astigmatism intraoperatively than preoperatively.[40] When we've used the higher toric correction, our end results have been closer to sphere, so I put a real value in ORA for toric cases. Purkinje images are useful to ensure alignment as well.

As far as angle kappa, some recent studies suggest that angle kappa or angle alpha may not be as important as higher order aberrations in screening patients.[41-44] If higher order aberrations (HOAs) are greater than 0.5 µm in the central 6 mm of the cornea, that is a concern for any of the multifocal lenses. My advice is to be sure to know how to look for HOAs in the central 6 mm of the cornea.

ROUND 3 | CASE 6: WHEN TO OPERATE … OR NOT

Q | DR. DEVGAN: The next case features are preoperative refraction is +5.00 -2.00 x 175°. How does your treatment regimen differ if the patient is 30 or 50 or 70 years old? Would LASIK be an option here for the 30-year-old?

Dr. Visco: I would try to avoid surgery in the 30-year-old, as I think they're a bit young. If the 30-year-old has a healthy cornea and they're contact lens intolerant, I'd do a refractive lensectomy, but I'd prefer not to do LASIK. Of course, there's no question I'd do surgery for the 50-year-old and 70-year-old.

Dr. Hovanesian: For the 30-year-old, I'd recommend toric contacts lenses. There's no conversation I've ever had with a 30-year-old that helped them to understand what losing accommodation means. At some level, I've always been underwhelmed with refractive lens exchanges (RLE) on patients that young. Unfortunately, we don't have good hyperopic phakic lenses.

For the 50-year-old, it's a very reasonable option, although they, too, need a discussion because they have reasonable accommodation, even at age 50. They've begun to lose it but usually there's some cataract and that's a trade-off worth making.

And in the 70-year-old, I wouldn't think twice about proceeding.

Dr. Goldman: I'd consider laser vision correction in the 30-year-old if their cycloplegic is equal to the manifest and they have thick corneas and everything else looks normal. They'd need to be counseled that there is going to be some regression

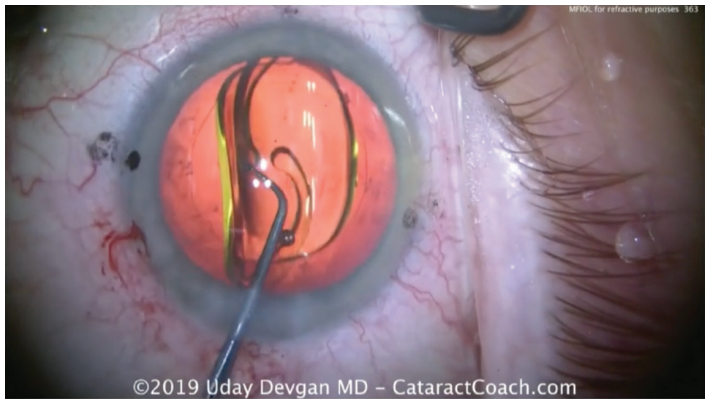

Figure 9. Lens implanted in a 70-year-old.

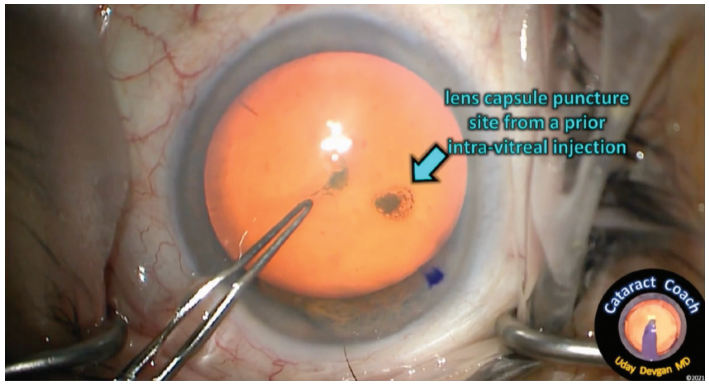

Figure 10. Lens capsule punctured from previous intravitreal injection.

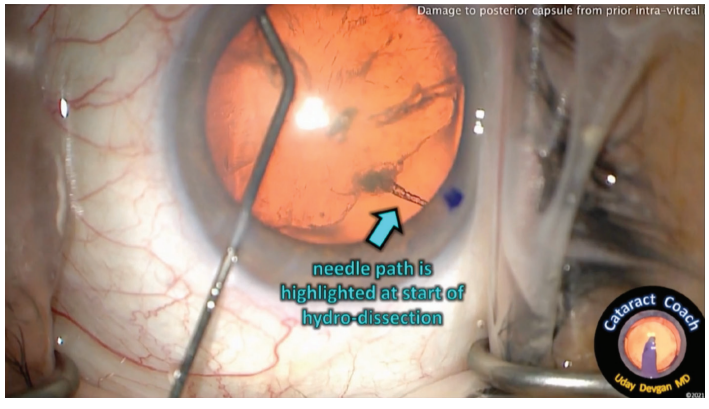

Figure 11. Needle path at start of hydrodissection.

over time. We explain that's just what happens with hyperopia and astigmatism. But living in a world with both hyperopia and astigmatism can be pretty miserable. Hyperopes in general are happier with most things we can do for them.

I've become more bullish on RLE on 50-year-olds. In fact, a colleague recently had a similar patient, 50-year-old who had RLE with PanOptix, who's a -2.00 sphere preoperative. That's probably the worst patient to do it on and she was outstandingly satisfied with the outcome. Compared to the multifocals we had a generation ago, we've really come along way and I'm a lot more comfortable and I've lowered the age at which I'll recommend RLE.

Dr. Hovanesian: There's an expectation on the part of some 50-year-olds that they're going to be 22 again. So be overly careful about managing patient expectations. None of the multifocals are perfect, and the Vivity lens (Alcon), while probably the safest multifocal we've ever had, may not provide a greater range of vision than a phakic 50-year-old already has naturally. The range of the Vivity may be about 1.50 D, which is likely about the natural level of accommodation in that patient.

Dr. Devgan: Great advice. Figure 9 shows the +5.00 -2.00 x 175° 70-year-old having a Vivity lens implanted.

Dr. Visco: One thing I think is important is the quality of the lens material in RLE in younger patients. Alcon has been introducing lenses on the Clareon platform, which does not produce glistenings. That's an important aspect to consider with these lenses. Other lenses that are really great for RLE include the Tecnis Synergy (Johnson & Johnson Vision) and the ZKB00 (Johnson & Johnson Vision), which is an intermediate reading lens. In my hands, I can get J2 vision with minimal (if any) glare or halos with the ZKB00. Again, you need to set the expectation with these patients: They won't be able to thread a needle, but they will be able to read large newsprint.

ROUND 3 | CASE 7: DAMAGED LENS CAPSULE FOLLOWING INTRAVITREAL INJECTION

Dr. Devgan: In this case, the lens capsule has been punctured from a previous intravitreal injection. Figure 10 shows the puncture. The needle path is clear, but this was a resident case and they didn't see it. Figure 11 shows the needle path at the start of the hydrodissection. The resident thinks there's just a little defect.

Dr. Visco: I thought the capsulorhexis was so nice and it was just about 5 mm. I thought the surgeon must have had a premonition for the reverse optic capture that they were going to have to put through the capsule.

Q | DR. DEVGAN: Absolutely. With the increasing numbers of patients with retinal diseases who are receiving intravitreal injections, we're going to be seeing more of these cases with capsule puncture. If you see this, what are your suggestions? How do you treat this patient differently?

Dr. Goldman: There's a really good chance there's going to be no capsule behind there or it's going to open up. For these cases, I like to viscodissect the entire nucleus out of the bag with low-flow settings; I'll lower the bottle height. I'll take the lens out of the anterior chamber—I've found these tend to be soft lenses, so you're not using a lot of big emulsification energy. I'll keep applying viscoelastic as needed, to keep that vitreous back. But the key with these cases is to ensure you've removed the whole nucleus. If you end up having to do a little vitrectomy in order to remove the cortex once the nucleus is out, that's fine. You've left

a really nice rhexis for reverse optic capture with a three-piece lens. Another option would be to do a scleral fixation with the Yamane technique but for this case I would recommend a three-piece in the sulcus.

Dr. Hovanesian: We need to counsel every patient who's having intravitreal injections of this possibility because many cases are not as obvious as this posterior capsular defect.

In some cases of a posterior capsule rent, if you can remove the lens, you might be able to perform a posterior capsulorhexis and control the size of that capsular defect. In this case, however, because the defect is caused by the intravitreal injection, they've likely broken the posterior hyaloid face. In these cases, be prepared for a bit of vitreous prolapse. Lastly, go slowly. It's very unlikely any surgeon will get through these cases without losing some lens material into the back of the eye. Minimizing the amount and placing a good IOL is in the patient's best interests.

Dr. Devgan: In this case, the lens proceeded to fall into the macula with pretty good speed. We told the staff to open the three-piece lens, and the reaction is usually something like "Wow—so you're done with the phaco already?" to which we smirked and replied, "Yes, we are really good today!" These cases can go south really quickly if you're not careful.

Dr. Hovanesian: When a lens is really likely to drop or has dropped, Dr. Devgan's point is well taken. You need to know when to stop because we have a tendency to want to solve our own problems. The patient is going to do far better with a well performed pars plana vitrectomy by a retina specialist, picking up that lens and using a phaco fragmentation vitrectomy tip. Meanwhile, as the cataract surgeon, if you can get in an IOL, that is the best way to leave the patient and just refer to the retina specialist.

Dr. Devgan: Every one of us has dropped at least one nucleus—and we've each probably performed more than 10,000 surgeries. All of us have dropped the nucleus at least a couple of times and that is normal.

I want to thank the esteemed panelists for joining us throughout this KOL Knockout™ series. ■

1. Cataract Data and Statistics. Available at: www.nei.nih.gov/learn-about-eye-health/resources-for-health-educators/eye-health-data-and-statistics/cataract-data-and-statistics. Accessed September 17, 2020. (National Institutes of Health) (2020).
2. Blanco A, Rocha-de-Lossada C, Navarro P, Lerner SF, Perrone L, Soler Ferrandez FL. "White-puncture": A simple technique to prevent tearing of the anterior capsule during capsulorhexis in intumescent white cataracts. *Arch Soc Esp Oftalmol (Engl Ed)*. 2021;96(2):97-101.
3. Adams ML, Diakonis VF, Weinstock RJ. Argentinian Flag sign and its management during femtosecond laser-assisted cataract surgery in a case with intumescent cataracts. *Case Rep Ophthalmol*. 2021;12(1):129-133.
4. Prinzi RA, Alapati NM, Gappy SS, Dilly JS. Inadvertent trypan blue staining of posterior capsule during cataract surgery associated with "Argentinian Flag" event. *Case Rep Ophthalmol Med*. 2016;2016:9025063.
5. Jacob S, Agarwal A, Agarwal A, et al. Trypan blue as an adjunct for safe phacoemulsification in eyes with white cataract. *J Cataract Refract Surg*. 2002;28(10):1819-1825.
6. Vasavada A, Singh R. Surgical techniques for difficult cataracts. *Curr Opin Ophthalmol*. 1999;10(1):46-52.
7. Albinet P. [Original technique of double capsulorhexis]. *J Fr Ophtalmol*. 1994;17(2):124-128.
8. Brazitikos PD, Androudi S, Alexandridis A, Ekonomidis P, Papadopoulos NT. Up-irrigation of dropped nuclear fragments during phaco-emulsification with the bimanual irrigation-aspiration system. *Acta Ophthalmol Scand*. 2003;81(1):76-77.
9. Cernak A, Cuvala J, Trnavec B, Cernak M. [Bimanual irrigation/aspiration]. Cesk Slov Oftalmol. 1999;55(1):21-23.
10. Colvard MD. Bimanual technique to manage subincisional cortical material. *J Cataract Refract Surg*. 1997;23(5):707-709.
11. Chee SP, Chan NS, Yang Y, Ti SE. Femtosecond laser-assisted cataract surgery for the white cataract. *Br J Ophthalmol*. 2019;103(4):544-550.
12. Schultz T, Dick HB. Laser-assisted mini-capsulotomy: a new technique for intumescent white cataracts. *J Refract Surg*. 2014;30(11):742-745.
13. Kretz FT, Breyer D, Klabe K, et al. Clinical Outcomes After Implantation of a Trifocal Toric Intraocular Lens. *J Refract Surg*. 2015;31(8):504-510.
14. Sheppard AL, Shah S, Bhatt U, Bhogal G, Wolffsohn JS. Visual outcomes and subjective experience after bilateral implantation of a new diffractive trifocal intraocular lens. *J Cataract Refract Surg*. 2013;39(3):343-349.
15. Vilar C, Hida WT, de Medeiros AL, et al. Comparison between bilateral implantation of a trifocal intraocular lens and blended implantation of two bifocal intraocular lenses. *Clin Ophthalmol*. 2017;11:1393-1397.
16. Akman A, Asena L, Ozturk C, Gur Gungor S. Evaluation of quality of life after implantation of a new trifocal intraocular lens. *J Cataract Refract Surg*. 2019;45(2):130-134.
17. Gyory JF, Madar E, Srinivasan S. Implantation of a diffractive-refractive trifocal intraocular lens with centralized diffractive rings: Two-year results. *J Cataract Refract Surg*. 2019;45(5):639-646.
18. Hohn F, Tandogan T, Breyer DR, et al. [Functional results one year after implantation of a bitoric, trifocal intraocular lens]. *Klin Monbl Augenheilkd*. 2015;232(8):957-961.
19. Vryghem JC, Heireman S. Visual performance after the implantation of a new trifocal intraocular lens. *Clin Ophthalmol*. 2013;7:1957-1965.
20. Cionni RJ, Dimalanta R, Breen M, Hamilton C. A large retrospective database analysis comparing outcomes of intraoperative aberrometry with conventional preoperative planning. *J Cataract Refract Surg*. 2018;44(10):1230-1235.
21. Sudhakar S, Hill DC, King TS, et al. Intraoperative aberrometry versus preoperative biometry for intraocular lens power selection in short eyes. *J Cataract Refract Surg*. 2019;45(6):719-724.
22. Woodcock MG, Lehmann R, Cionni RJ, Breen M, Scott MC. Intraoperative aberrometry versus standard preoperative biometry and a toric IOL calculator for bilateral toric IOL implantation with a femtosecond laser: One-month results. *J Cataract Refract Surg*. 2016;42(6):817-825.
23. Fontana L, Coassin M, Iovieno A, Moramarco A, Cimino L. Cataract surgery in patients with pseudoex-foliation syndrome: current updates. *Clin Ophthalmol*. 2017;11:1377-1383.
24. Pueringer SL, Hodge DO, Erie JC. Risk of late intraocular lens dislocation after cataract surgery, 1980-2009: a population-based study. *Am J Ophthalmol*. 2011;152(4):618-623.
25. Ascaso FJ, Huerva V, Grzybowski A. Epidemiology, etiology, and prevention of late iol-capsular bag complex dislocation: review of the literature. *J Ophthalmol*. 2015;2015:805706.
26. Williams K, Hammond C. High myopia and its risks. *Community Eye Health*. 2019;32(105):5-6.
27. Ikuno Y. Overview of the complications of high myopia. *Retina*. 2017;37(12):2347-2351.
28. Han X, Ong JS, An J, et al. Association of myopia and intraocular pressure with retinal detachment in european descent participants of the uk biobank cohort: a mendelian randomization study. *JAMA Ophthalmol*. 2020;138(6):671-678.
29. Wu Q, Chen Q, Lin B, et al. Relationships among retinal/choroidal thickness, retinal microvascular network and visual field in high myopia. *Acta Ophthalmol*. 2020;98(6):e709-e714.
30. Cionni RJ, Barros MG, Osher RH. Management of lens-iris diaphragm retropulsion syndrome during phacoemulsification. *J Cataract Refract Surg*. 2004;30(5):953-956.
31. Wang L, Holladay JT, Koch DD. Wang-Koch axial length adjustment for the Holladay 2 formula in long eyes. *J Cataract Refract Surg*. 2018;44(10):1291-1292.
32. Trattler WB, Majmudar PA, Donnenfeld ED, McDonald MB, Stonecipher KG, Goldberg DF. The Prospective Health Assessment of Cataract Patients' Ocular Surface (PHACO) study: the effect of dry eye. poster. *Clin Ophthalmol*. 2017;11:1423-1430.
33. Yu Y, Hua H, Wu M, et al. Evaluation of dry eye after femtosecond laser-assisted cataract surgery. *J Cataract Refract Surg*. 2015;41(12):2614-2623.
34. Lundstrom M, Dickman M, Henry Y, et al. Risk factors for refractive error after cataract surgery: Analysis of 282 811 cataract extractions reported to the European Registry of Quality Outcomes for cataract and refractive surgery. *J Cataract Refract Surg*. 2018;44(4):447-452.
35. Novis C. Astigmatism and toric intraocular lenses. *Curr Opin Ophthalmol*. 2000;11(1):47-50.
36. Ahmed, II, Rocha G, Slomovic AR, et al. Visual function and patient experience after bilateral implantation of toric intraocular lenses. Research Support, Non-U.S. Gov't. *J Cataract Refract Surg*. 2010;36(4):609-616.
37. Shimizu K, Misawa A, Suzuki Y. Toric intraocular lenses: correcting astigmatism while controlling axis shift. *J Cataract Refract Surg*. 1994;20(5):523-526.
38. Ma JJ, Tseng SS. Simple method for accurate alignment in toric phakic and aphakic intraocular lens implantation. *J Cataract Refract Surg*. 2008;34(10):1631-1636.
39. Tseng SS, Ma JJ. Calculating the optimal rotation of a misaligned toric intraocular lens. Research Support, Non-U.S. Gov't. *J Cataract Refract Surg*. 2008;34(10):1767-1772.
40. Hovanesian JA. Comparison of Preoperative Measurements with Intraoperative Aberrometry in Predicting Need for Correction in Eyes with Low Astigmatism Undergoing Cataract Surgery. *Clin Ophthalmol*. 2021;15:2189-2196.
41. Bonaque-Gonzalez S, Jaskulski MT, Carmona-Ballester D, Pareja-Rios A, Trujillo-Sevilla JM. Influence of angle Kappa on the optimal intraocular orientation of asymmetric multifocal intraocular lenses. *J Optom*. 2021;14(1):78-85.

KOL KNOCKOUT™ — CATARACT EDITION: SURGEONS BATTLING FOR THE BEST OUTCOMES

Release Date: September 2021
Expiration Date: October 2022

INSTRUCTIONS FOR CME CREDIT

To receive credit, you must complete the attached Pretest/Posttest/Activity Evaluation/Satisfaction Measures Form and mail or fax to Evolve Medical Education LLC; 353 West Lancaster Avenue, Second Floor, Wayne, PA 19087; Fax: (215) 933-3950. To answer these questions online and receive real-time results, please visit https://evolvemeded.com/course/2039-supp. If you experience problems with the online test, please email us at info@evolvemeded.com. Certificates are issued electronically; please be certain to provide your email address below.

Please type or print clearly, or we will be unable to issue your certificate.

Full Name_____ ❑ MD/DO ❑ OD ❑ NP ❑ Nurse/APN ❑ PA ❑ Other

Phone (required) _____ ❑ Email (required) _____

Address/P.O. Box _____

City _____ State/Country____ Zip/Postal Code_____

License Number _____ OE Tracker Number _____

DEMOGRAPHIC INFORMATION

Profession
___ MD/DO
___ OD
___ NP
___ Nurse/APN
___ PA
___ Other

Years in Practice
___ >20
___ 11-20
___ 6-10
___ 1-5
___ <1

Patients Seen Per Week (with the disease targeted in this activity)
___ 0
___ 1-15
___ 16-30
___ 31-50
___ >50

Region
___ Northeast
___ Northwest
___ Midwest
___ Southeast
___ Southwest

Setting
___ Solo Practice
___ Community Hospital
___ Government or VA
___ Group Practice
___ Other
___ I do not actively practice

Models of Care
___ Fee for Service
___ ACO
___ Patient-Centered Medical Home
___ Capitation
___ Bundled Payments
___ Other

LEARNING OBJECTIVES

Did the program meet the following educational objectives?	Agree	Neutral	Disagree
Summarize the technology of femtosecond laser-assisted cataract surgery	_____	_____	_____
Explain how to incorporate femtosecond laser technology into cataract surgery techniques	_____	_____	_____
Establish when to incorporate intraoperative aberrometry to provide better refractive outcomes for cataract patients	_____	_____	_____
Evaluate patient lifestyles and expectations to improve intraocular lens choice	_____	_____	_____
Compare current and emerging technologies in advanced technology intraocular lenses	_____	_____	_____

PLEASE COMPLETE AT THE CONCLUSION OF THE PROGRAM.

1. Based on this activity, please rate your confidence in your ability to incorporate intraoperative aberrometry to provide better refractive outcomes for cataract patients (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).

a. 1
b. 2
c. 3
d. 4
e. 5

2. Which of the following is an important step in approaching an intumescent white cataract

a. Needle decompression of liquefied cortical material prior to starting the capsulorhexis
b. Underfilling the anterior chamber with viscoelastic
c. Performing the capsulorhexis prior to filling the anterior chamber with viscoelastic
d. Performing the capsulorhexis with only forceps

3. Which of the following steps is an important when posterior capsular rupture is suspected?

a. Turning off irrigation
b. Filling the anterior chamber with viscoelastic while maintaining irrigation
c. Switching to the irrigation/aspiration device
d. Enlarging the incision to 3 mm

4. An 81-year-old male presents to your clinic with hand motion vision. On exam, you notice a milky white intumescent cataract. You schedule him for cataract surgery the next day. You pierce the center of the anterior capsule with a needle and decompress some liquefied cortex. What is a method you can use to ensure the posterior liquefied cortex is decompressed prior to initiating the capsulorhexis?

a. Pierce the lens again with the needle and continue advancing the needle posteriorly through the lens.
b. Use the irrigation aspiration device to aspirate more cortex
c. Rock the nucleus back and forth with your needle and reaspirate with your needle
d. Hydrodissect with balanced salt solution prior to initiating the capsulorhexis

5. A patient with a history of frequent intravitreal injections presents to your clinic for preoperative cataract surgery screening. You notice a focal opacity in the inferotemporal quadrant of the lens. You suspect posterior capsular compromise. During cataract surgery, what step would most likely lead to further compromise of the posterior capsule?

a. Clear corneal incision
b. Hydrodissection
c. Phacoemulsification of the lens
d. Irrigation/aspiration of nuclear material

6. A 55-year-old high hyperope presents to your cataract surgery clinic for evaluation. She has been reliant on +8.50 D glasses for distance and +11.00 D glasses for reading for the past 10 years. She now desires spectacle independence. Which of the following statement about her postoperative vision is TRUE?

a. She may notice more image magnification after surgery, so objects may seem larger after surgery.
b. She may notice less image magnification after surgery, so objects may seem smaller than before surgery.
c. Image magnification after surgery will not change.
d. She may notice fluctuating image magnification after surgery.

7. Which of the following statements about astigmatic correction after cataract surgery is TRUE?

a. The presence of astigmatism can increase depth of focus, and fully correcting astigmatism may collapse the depth of field after surgery.
b. The presence of astigmatism can reduce depth of focus, and fully correcting astigmatism may increase the depth of field after surgery.
c. The presence of astigmatism can increase depth of focus, and fully correcting astigmatism may further increase depth of field after surgery.
d. The presence of astigmatism can reduce depth of focus, and fully correcting astigmatism may further reduce the depth of field after surgery.

8. Which of the following patients would benefit most from an intraocular lens (IOL) with diffractive rings, such as trifocal, bifocal, multifocal, and some extended depth of field designs?

a. A patient with low-angle alpha and low-angle kappa
b. A patient with high-angle alpha and low-angle kappa
c. A patient with low-angle alpha and high-angle kappa
d. A patient with high-angle alpha and high-angle kappa

9. Which patient would be the most appropriate to receive multifocal IOL surgery?

a. A 30-year-old -2.00 D patient with a clear lens
b. A 50-year-old -1.50 D patient with 1+ NS
c. A 70-year-old patient with refractive error of +5.00 D -2.00 x 180 with 2+ NS
d. A 30-year-old +1.00 D patient with a clear lens

10. Which of the following patient(s) is/are an ideal trifocal IOL candidate? Select all that apply.

a. Emmetropic patient with a clear lens
b. Emmetropic patient with a cataract
c. Hyperopic patient with a clear lens
d. Hyperopic patient with a cataract

ACTIVITY EVALUATION/SATISFACTION MEASURES

Your responses to the questions below will help us evaluate this CME activity. They will provide us with evidence that improvements were made in patient care as a result of this activity.

Rate your knowledge/skill level prior to participating in this course: 5 = High, 1 = Low _____

Rate your knowledge/skill level after participating in this course: 5 = High, 1 = Low _____

This activity improved my competence in managing patients with this disease/condition/symptom _____ Yes _____ No

Probability of changing practice behavior based on this activity: _____ Yes _____ No _____No change needed

If you plan to change your practice behavior, what type of changes do you plan to implement? (check all that apply)

_____ Change in pharmaceutical therapy
_____ Change in diagnostic testing
_____ Change in current practice for referral
_____ My practice has been reinforced
_____ Change in nonpharmaceutical therapy
_____ Choice of treatment/management approach
_____ Change in differential diagnosis
_____ I do not plan to implement any new changes in practice

Please identify any barriers to change (check all that apply):

_____ Cost
_____ Lack of consensus or professional guidelines
_____ Lack of administrative support
_____ Lack of experience
_____ Lack of time to assess/counsel patients
_____ Lack of opportunity (patients)
_____ Reimbursement/insurance issues
_____ Lack of resources (equipment)
_____ Patient compliance issues
_____ No barriers
_____ Other. Please specify: _____
_____

The design of the program was effective for the content conveyed. ___ Yes ___ No

The content supported the identified learning objectives. ___ Yes ___ No

The content was free of commercial bias. ___ Yes ___ No

The content was relative to your practice. ___ Yes ___ No

The faculty was effective. ___ Yes ___ No

You were satisfied overall with the activity. ___ Yes ___ No

Would you recommend this program to your colleagues? ___ Yes ___ No

Please check the Core Competencies (as defined by the Accreditation Council for Graduate Medical Education) that were enhanced through your participation in this activity:

_____ Patient Care
_____ Practice-Based Learning and Improvement
_____ Professionalism
_____ Medical Knowledge
_____ Interpersonal and Communication Skills
_____ System-Based Practice

Additional comments:
_____

_____ I certify that I have participated in this entire activity.

This information will help evaluate this CME activity; may we contact you by email in 3 months to see if you have made this change? If so, please provide your email address _____

CRST
Cataract & Refractive Surgery Today

MILLENNIALEYE

evolve
medical education