



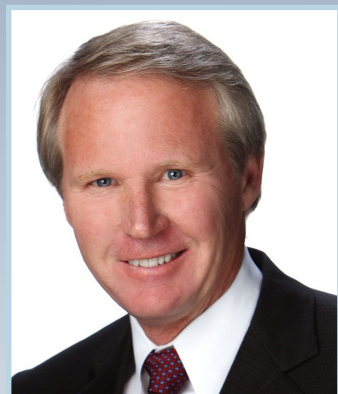
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John Hovanesian, MD, is clinical faculty at University of California, Los Angeles, Jules Stein Eye Institute; in private practice at Harvard Eye Associates; and a member of the ASCRS Cornea Clinical Committee.



Mark Kontos, MD, is a senior partner at Empire Eye Physicians, Spokane, Wash.



Francis Mah, MD, is director of the cornea service, and co-director of the refractive surgery service, Scripps Clinic, La Jolla, Calif.; a member of the ASCRS Cornea Clinical Committee, Food and Drug Administration Committee, and Infectious Disease Task Force.



John Vukich, MD, is in private practice, Madison, Wis.; and chair of the ASCRS Refractive Surgery Clinical Committee.

During Hawaiian Eye 2015, held from January 17–23, a distinguished panel shared insights on achieving optimal outcomes with toric intraocular lenses (IOLs). Members discussed treatment options for astigmatism, the significance of toric IOLs, tips for success, intraoperative alignment and locking, error avoidance, and postoperative management when using toric IOLs.

Dr. Donnenfeld: In the ASCRS Clinical Survey of more than 1,500 ophthalmologists, 33% of respondents believed 0.75 D or more cylinder had no significant impact on visual quality in postoperative cataract patients. What level of astigmatism do you believe has a significant impact on vision quality?

Dr. Vukich: If we were prescribing glasses it would be unlikely that we would ignore 0.75 D of astigmatism. The same standard holds true for our cataract patients, who are seeking a refractive outcome. Patients have become increasingly savvy about the ability to have uncorrected distance acuity after cataract surgery.

Dr. Hovanesian: In our study of about 200 patients, approximately 80% of patients with 0.5 D of astigmatism or less were extremely satisfied after cataract surgery (Figure 1). When you correct to less than 0.5 D of astigmatism, patients are more likely to recommend the procedure to their friends.

Dr. Donnenfeld: Our goal is to exceed patient expectations. Even 0.5 D of cylinder is sometimes an issue,

and our goal should be to maximize every patient's visual potential.

How do you choose between treatment options, such as on-axis incisions, limbal relaxing incisions (LRIs), laser vision correction, and toric IOLs for a patient with 1.25 D of cylinder?

Dr. Mah: You need to determine whether the patient has corneal astigmatism versus lenticular astigmatism and whether it's against-the-rule or with-the-rule. **Douglas Koch, MD**, recently highlighted the existence of posterior corneal astigmatism.

First, we perform keratometry and make sure there is corneal astigmatism. Then we perform topography to make sure the astigmatism is regular and can be corrected with a corneal incision or toric IOL. Next, we perform a posterior corneal measurement with the Pentacam (Oculus, Arlington, Wash.). If the 1.25 D of astigmatism is with-the-rule, we may use on-axis incisions rather than a toric IOL.

Dr. Kontos: We perform topography on all our cataract surgery patients, then discuss our goals regarding

Residual cylinder	Percentage "extremely satisfied"
≤0.5 D	80%
>0.5 D	56%

Figure 1. Patient satisfaction after cataract surgery. Data in press, John Hovanesian, MD, 2014.

“When you correct to less than 0.5 D of astigmatism, patients are more likely to recommend the procedure to their friends.”

John Hovanesian, MD

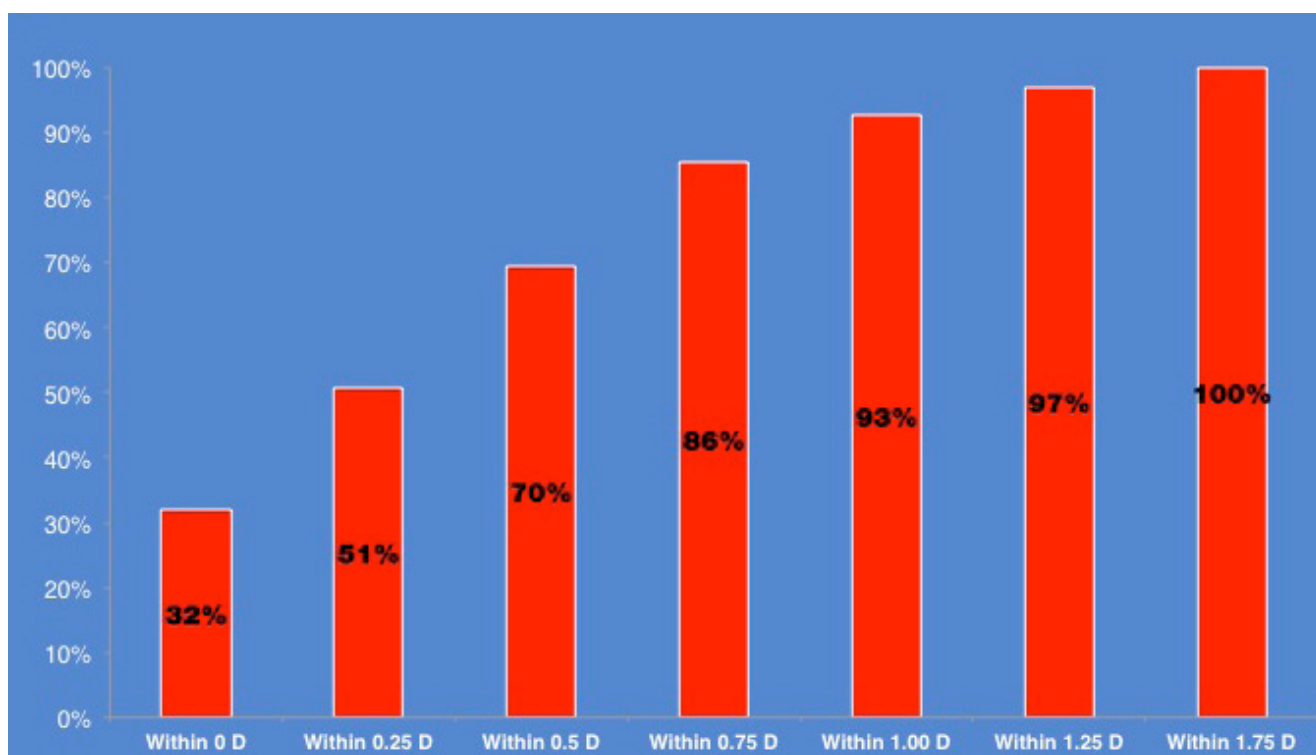


Figure 2. Accuracy of limbal relaxing incisions (N=69 eyes); 51% of patients have ≤ 0.25 D of cylinder, and 70% have ≤ 0.50 D. Data in press, John Hovanesian, MD, 2014.

astigmatism. If the goal is clear distance vision only, I use a toric IOL when addressing most cases of against-the-rule astigmatism with the goal of shifting to a slight degree of with-the-rule astigmatism. For low degrees of with-the-rule astigmatism, I will do laser astigmatic keratotomy in combination with the cataract surgery and toric lenses for larger degrees of astigmatism.

Dr. Vukich: I consider LRIs for up to 1.00 D of astigmatism. For higher amounts of astigmatism, the visual quality from a toric lens is hard to beat. They don't require a healing response or biomechanical coupling. Regardless of the astigmatism level, the implantation technique is the same. In this regard, toric IOLs are not dose dependent. You do not need larger incisions or a more aggressive procedure to treat higher amounts of astigmatism.

Dr. Donnenfeld: It's also the safest procedure and doesn't induce dry eye the way astigmatic keratotomy does. What is your threshold for implanting a toric IOL?

Dr. Hovanesian: LRIs can be precise, but this accuracy drops off after 1 D of astigmatism (Figure 2). Therefore, I begin considering a toric IOL at 1.25 D of astigmatism.

Dr. Garg: My threshold for considering a toric lens is 1 D or 1.25 D, depending on the axis of astigmatism. For against-the-rule astigmatism, I try to overcorrect it a bit. For with-the-rule, I undercorrect a little.

Dr. Mah: If a patient has 0.75 D against-the-rule astigmatism, I consider a toric IOL versus 1.25 D if the patient has with-the-rule astigmatism.

Dr. Donnenfeld: I predict LRIs will become less important. I perform more and more intrastromal ablations using the Catalys femtosecond laser (Abbott Medical Optics, Abbott Park, Ill.), which result in less dry eye, less wound gape, and greater predictability. However, they only treat very small amounts of cylinder. I use them increasingly for 0.75 D and less cylinder, and I use more toric lenses for higher cylinder. I rely on toric IOLs almost uniformly after a cutoff of 1.25 D.

Are there any patients who are not candidates for toric IOLs who have cylinder?

Dr. Mah: Topography and tomography are critical preoperative tests. In patients with a moderate or high degree of cylinder, you want to make sure the corneas have regular astigmatism. Even patients with small amounts of irregular astigmatism

that can be corrected with a refraction of 20/20 may be candidates.

Dr. Garg: Many patients have forme fruste or very subtle ectasias. If astigmatism is very symmetric you can consider toric IOLs in those patients with the proper informed consent.

Dr. Donnenfeld: What if the patient wears a gas permeable contact lens?

Dr. Garg: In patients with possible ectasia or who wear contact lenses, make sure their ocular surface and cornea are stable without contact lenses for a while. It may take some time, depending on how long they've been in contact lenses. You may have to check their measurements several times to verify stability.

Dr. Donnenfeld: How would you manage a patient with irregular corneas and epithelial basement membrane dystrophy?

Dr. Hovanesian: For unusual corneas, consider consulting a cornea specialist. If the epithelial basement membrane dystrophy affects the visual axis, removal with debridement of the epithelium and often a light lamellar keratectomy with excimer laser phototherapeutic keratectomy will be curative. A couple of months later we usually can obtain stable

keratometry or biometry readings so we can perform an appropriate procedure.

Dr. Donnenfeld: The only time I will not place a toric lens is in a patient with an irregular cornea where I can't determine the right axis or a patient who wants to wear a gas permeable contact lens postoperatively.

What attributes do you seek in a quality toric lens?

Dr. Hovanesian: I want a lens that is easy to implant through a reasonable-sized incision and stable after implantation but can be moved in either direction. I like being able to rotate the Tecnis Toric lens (Abbott Medical Optics) at least a few degrees counterclockwise.

Dr. Garg: I also like the clear acrylic of Tecnis IOLs, which have no glistenings and low chromatic aberration.

Dr. Vukich: The Tecnis Toric is the only available lens meeting American National Standards Institute criteria for stability over time.

Dr. Donnenfeld: The Tecnis Toric lens has the highest negative spherical aberration and lowest chromatic aberration of any toric IOL available. This provides the highest quality of vision.

Dr. Kontos: Additionally, I rarely hear patients complain of a dysphopsia-type phenomenon with the Tecnis lens and when they do, it resolves spontaneously over time.

Setup for success: Preoperative diagnostics

Dr. Donnenfeld: For physicians just getting started with toric IOLs, what key diagnostic steps do you use to drive your toric IOL decision making?

Dr. Kontos: It's important to perform a comprehensive evaluation of their optical system and corneal surface, looking at the tear film quality and discontinuing contact lens wear before making measurements. Surgeons must consider the effects of prolonged contact lens use on topography and corneal astigmatism just as we do for LASIK surgery.

A topography device is critical. You cannot rely only on Ks from

your manual keratometry or A scan. I also perform several biometry measurements and examine them closely. I sometimes use my wavefront analyzer to look at some refractions because it can nail down cylinder much better than manual refraction.

Dr. Hovanesian: To evaluate keratometry, no single instrument always provides the answer, and confidence comes with time. Beginning surgeons should track their outcomes and compare them with preoperative measurements.

A good tear film is essential in obtaining accurate measurements. If your measurements are variable, chances are you don't have a good tear film. Topography is critical in ruling out forme fruste keratoconus or other ectatic disorders.

Dr. Donnenfeld: I employ all of these measurements and ensure they support each other. When they don't, I use the topography and draw a straight line through the bowtie cylinder and use that as the axis of the cylinder.

I usually rely on manual Ks or the IOLMaster (Carl Zeiss Meditec, Jena, Germany) for magnitude of cylinder. Peer-review research shows that an IOLMaster or LENSTAR (Haag-Streit USA, Mason, Ohio) is probably as accurate as anything else we use, but we must confirm it with multiple measurements using different technology.

Dr. Garg: If there is disagreement with the various modalities, I suggest that surgeons ask the patient to return a couple weeks later to check them again.

Dr. Mah: It's also important to look at corneal issues such as Salzmann's nodules and especially anterior basement membrane dystrophy. Surgeons often obtain irregular measurements and implant a toric IOL using a best guess, leaving the patient unhappy afterward if something like anterior basement membrane dystrophy was not treated.

Dr. Donnenfeld: When measurements are not uniform, my first thought is ocular surface disease. I manage the ocular surface and repeat the testing in 2 weeks, which overwhelmingly resolves the problems.

According to the 2014 ASCRS Clinical Survey, some ophthalmologists still use manual and auto Ks to drive their decisions. While this is reasonable, optical biometry devices such as the IOLMaster and LENSTAR provide very accurate keratometry.

Dr. Kontos: If you decide to provide toric IOLs, you need to commit to having the equipment you need to provide that service properly. Some things like intraoperative aberrometry are not needed to get great results, but I think a topographer is an important tool to have.

Dr. Donnenfeld: How important is it for surgeons to measure their SIA at the time of cataract surgery to optimize toric IOL results?

Dr. Mah: I think it's important, and you can use your past 10 or 20 cases to determine your SIA. It helps surgeons make decisions and achieve better outcomes.

Dr. Donnenfeld: It's very important to enter your SIA into the toric IOL calculation because it can be very variable and affect the magnitude of the cylinder being corrected. More importantly, with vector analysis it can throw off the axis of your toric IOL by as much as 15 degrees.

Dr. Hovanesian: When you're refining your results, this makes all the difference. **Warren Hill, MD's** free online tool allows you to place your incision anywhere you like and calculates the SIA at any axis.

Dr. Donnenfeld: Because of posterior corneal cylinder, most patients have less with-the-rule and more against-the-rule astigmatism than we measure. That allowed us to change our toric IOL calculations. Do you calculate this with a device or estimate it based on Dr. Koch's work?

Dr. Mah: A number of tomography units help analyze posterior corneal and total corneal astigmatism. However, Dr. Koch's nomogram is helpful for those who don't have a tomographer and only have a topographer. Also, newer calculators like the Barrett IOL calculator, which is available on the ASCRS website, incorporate that information.

“Surgeons often obtain irregular measurements and implant a toric IOL using a best guess, leaving the patient unhappy afterward if something like anterior basement membrane dystrophy was not treated.”

Francis Mah, MD

“I use calculators as a guide to where I want the lens orientation to be and to help determine the toric power. I also employ intraoperative aberrometry to orient the lens and toricity.”

Sumit “Sam” Garg, MD

TECNIS TORIC

Surgeon and Patient Information(i)

Surgeon Name: mah Date: 01/08/2015

Patient Information: 3/17/37 Patient Age: 77

Eye Selection: ☒ OD (Right) ☐ OS (Left)

K Notation: ☒ D ☐ mm

Keratometry(i)

Surgically Induced Astigmatism (SIA): .3 D @ Axis (Incision Location): 200°

Flat K1: 45.37 D Flat K1 @ Axis: 94°

Steep K2: 46.75 D Steep K2 @ Axis: 4°

Preop Corneal Astigmatism: 1.38 D

Biometry(i)

Axial Length: 23.53 mm

Method: Optical or Immersion

A-constant: 119.30

Calculation Preferences(i)

SE IOL power: 19.5 D

K Index: 1.3375

Refractive Cylinder Convention: ☒ Plus ☐ Minus

Final Results (i)

IOL Details		Residual Astigmatism	
IOL Model	Orientation	Cylinder	Axis
C ZC800	0°	+1.14 D	180°
C ZCT150	0°	+0.17 D	180°
C ZCT225	0°	+0.31 D	90°

Buttons: Calculate Results, Clear Entries, Print Results, Order Selected Lens

Version: V1.3.9

Figure 3. Tecnis Toric calculator with data input. All data including Ks were from IOLMaster, axis from the topographer.

Dr. Vukich: Posterior astigmatism doesn't have to be part of your routine calculation, but it's another influence that can make a difference in some patients.

Dr. Hovanesian: Dr. Koch's guidelines for 0.5 D or more against-the-rule astigmatism work best for patients who have with-the-rule or against-the-rule astigmatism. It doesn't apply as nicely for oblique astigmatism. In addition, many patients have about 0.5 D or more drift toward against-the-rule during a period of 10 years.

Dr. Donnenfeld: I have a simple way to incorporate posterior corneal cylinder into my calculation. When operating temporally, you flatten and reduce against-the-rule cylinder. With posterior cylinder you have more against-the-rule cylinder, so I enter zero for my surgically induced cylinder on my Abbott Medical Optics toric IOL calculator, which, when you operate temporally, takes into account posterior corneal cylinder effectively.

Dr. Hovanesian: That's exactly right. If your usual SIA is 0.5 D of flattening at 180 degrees, then the average

patient's posterior corneal astigmatism essentially negates your SIA.

Dr. Donnenfeld: What would you do if you are operating superiorly?

Dr. Hovanesian: When operating superiorly, you're adding your SIA at 12 o'clock to that 0.5 D against-the-rule, so add the two together rather than considering them canceled out.

Dr. Donnenfeld: Does it matter if you leave the patient with a little with-the-rule or against-the-rule cylinder? Do you worry about flipping axes when implanting toric IOLs?

Dr. Hovanesian: My goal is to obtain the lowest amount of cylinder, generally at the same axis. You have to factor in posterior corneal astigmatism and SIA, and all calculators do not do that for you. Sometimes you have to adjust for what you expect the posterior corneal astigmatism to be.

Dr. Garg: If astigmatism is against-the-rule, I have less problem flipping the axis. I think these patients tolerate a little with-the-rule residual astigmatism, depending on their

age. Younger patients probably will drift against-the-rule with time. If they're with-the-rule, I try to leave them with-the-rule for the same reason.

I use calculators as a guide to where I want the lens orientation to be and to help determine the toric power. I also employ intraoperative aberrometry to orient the lens and toricity. The effective toric power of an IOL is influenced by the spherical power. The classic 3:2 ratio of IOL power to refractive power does not hold true for IOLs outside the normal range. To the best of my knowledge, the only free commercial calculator that takes this into account is the Abbott Medical Optics toric IOL calculator (www.amoeasy.com/toric).

Dr. Vukich: Minimizing the amount of residual astigmatism provides the best visual quality. You can reach a point where you are technically flipping the axis, but this small amount of residual refractive error is negligible.

Dr. Donnenfeld: Because of posterior cylinder and latent wound drift, I leave a little with-the-rule cylinder.

TECNIS TORIC

Surgeon and Patient Information(i)

Surgeon Name: mah Date: 01/08/2015

Patient Information: 3/17/37 Patient Age: 77

Eye Selection: ☒ OD (Right) ☐ OS (Left)

K Notation: ☒ D ☐ mm

Keratometry(i)

Surgically Induced Astigmatism (SIA): 3 D @ Axis (Incision Location): 200°

Flat K1: 45.37 D Flat K1 @ Axis: 94°

Steep K2: 47.45 D Steep K2 @ Axis: 4°

Preop Corneal Astigmatism: 2.08 D

Biometry(i)

Axial Length: 23.53 mm

Method: Optical or Immersion

A-constant: 119.30

Calculation Preferences(i)

SE IOL power: 19.5 D

K Index: 1.3375

Refractive Cylinder Convention: ☒ Plus ☐ Minus

Final Results (i)

IOL Details		Residual Astigmatism	
IOL Model	Orientation	Cylinder	Axis
☐ ZCT225	2°	+0.40 D	2°
☒ ZCT300	2°	+0.09 D	92°
☐ ZCT400	2°	+0.74 D	92°

Buttons: Calculate Results, Clear Entries, Print Results, Order Selected Lens

Diagram: Eye diagram showing lens axis orientation at 2°.

Figure 4. Tecnis Toric calculator, adding 0.7 to the against-the-rule astigmatism in the patient. This is based on the published findings of Douglas Koch, MD, et al. Note a significantly different powered toric IOL.

Source: Francis Mah, MD

Dr. Mah: I like this, and I also use the Barrett calculator on the ASCRS website to ensure my choices align with newer, better calculators regarding toric IOLs (Figures 3 and 4).

Intraoperative alignment and “locking”

Dr. Donnenfeld: How do you align your preoperative axis with your intraoperative axis? How important are the tools in translating your preoperative readings to surgical results?

Dr. Hovanesian: As little as 15 degrees of cyclorotation in the eye can result in a 50% reduction in the astigmatic correction provided by the lens. Five to 10 degrees of rotation is extremely common when patients move from a standing or sitting position to the supine position.

Intraoperative aberrometry probably would confirm our alignment; however, marking the horizontal and vertical meridians with a pen as the patient sits upright works well for us. We do this before the pupil is dilated.

Dr. Garg: We recently upgraded our IOLMaster to the Callisto Eye (Carl Zeiss Meditec) markerless system, so

we align these with a preoperative reference image and the Callisto Eye provides intraoperative guidance. It is an effective way to orient the lens.

Dr. Donnenfeld: Preoperative marking is very important when you don't have advanced technology, but it's a step where you can advance outcomes from good to great. The IOLMaster 500 finds reference marks seamlessly on the patient's eye and translates them through the Lumera microscope when using the Callisto Eye. It lays out exactly where the patient's preoperative cylinder is at the time of surgery and allows you to place the toric IOL in exactly that location.

A new Catalys software development will automatically determine the steep axis of the cylinder during the femtosecond laser ablation, so surgeons can mark that axis using the Catalys femtosecond laser system. In the operating room, they can find that axis so the toric IOL is placed in exactly the right location, eliminating the need to mark the eye.

Dr. Garg: The iHandy, a smartphone carpenter app, has been discussed by **Roger Steinert, MD**. You can use it postoperatively to determine where

the axis actually is by rotating your phone parallel to your slit lamp (which you orient to the marks on the toric IOL). This helps surgeons accurately identify the orientation of the lens.

Preoperatively, surgeons can use markerless systems that employ reference images, or they can mark manually. When you begin this, it's important to make marks lightly or use a fine-tip marker. The more heavy-handed you are, the wider that mark becomes, creating more room for error.

Dr. Donnenfeld: More than 37% of respondents to the 2014 ASCRS Clinical Survey do not use marking during surgery. Is this a reasonable surgical technique?

Dr. Kontos: For this type of surgery, you must be able to mark the cornea accurately preoperatively so you know where the lens axis needs to be placed. There are different ways each of us do this, but it must be done if you are going to do toric lens surgery.

Dr. Donnenfeld: Do you remove your viscoelastic at the conclusion of your case to make certain the lens stays in the right place, and

“For this type of surgery, you must be able to mark the cornea accurately preoperatively so you know where the lens axis needs to be placed. There are different ways each of us do this, but it must be done if you are going to do toric lens surgery.”

Mark Kontos, MD

“For many patients, a toric IOL is going to be the best option for visual rehabilitation. Adding toric IOLs to your surgical armamentarium is the most effective way to enter refractive cataract surgery.”

Eric Donnenfeld, MD

what special steps do you take to be certain the viscoelastic is removed appropriately?

Dr. Vukich: Your management of retained viscoelastic at the conclusion of the case is important. You need to be sure the lens doesn't rest on a bed of viscoelastic. You want some appositional touch of the posterior surface of the lens to the posterior capsule, which helps to lock it in place. Going beneath the lens with the I/A tip often moves the lens slightly. I prefer to tap the anterior surface of the lens to dislodge trapped viscoelastic.

Dr. Garg: With venturi fluidics you don't necessarily have to go behind the lens if you don't need to, so tapping the lens works well.

Dr. Hovanesian: I always obtain the best removal by going behind the lens with the I/A tip and flushing it out. This is important because retained viscoelastic can cause vaulting or tilting of any IOL and irregular outcomes.

Dr. Donnenfeld: How do you check your final alignment before ending the case?

Dr. Garg: Before we had the Callisto Eye, I marked the cornea after using the intraoperative aberrometer to know where I wanted to leave the lens.

Dr. Donnenfeld: What is your surgical technique to ensure the best chance of proper lens alignment?

Dr. Garg: The capsulorhexis should be small enough so that it covers the edge of the optic 360 degrees. I leave the lens 10–15 degrees short of where I want it to finally rest. Using my I/A probe, I remove the viscoelastic. Using my viscoelastic cannula or I/A probe, I rotate the lens into position (Figures 5–8).

Dr. Vukich: I've become more conscious of the potential error induced by parallax. We're marking the cornea but rotating the lens in the capsular bag, and you can have a 2-mm or 3-mm difference between your marking at the periphery and the actual marks on the lens. If you're looking at it at an angle, it's possible to introduce error. If you're working with topical anesthesia, direct the patient to look into the center of the

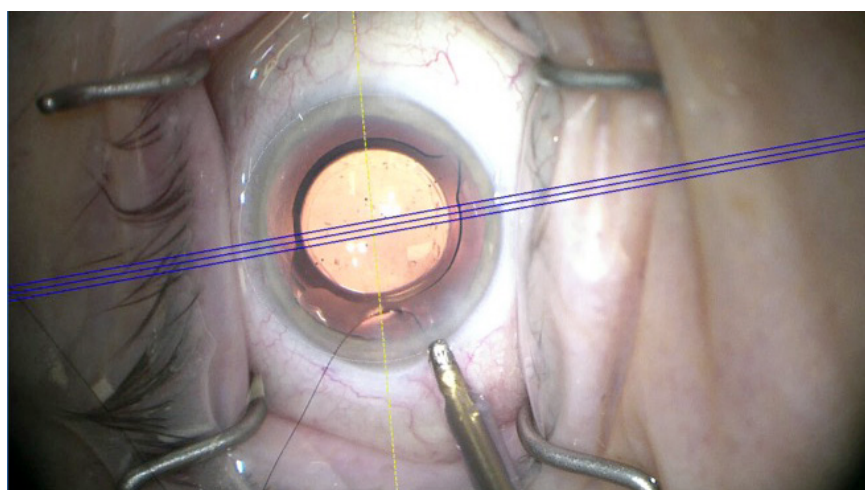


Figure 5. Leave the toric IOL about 15 degrees shy of target orientation prior to removal of viscoelastic.

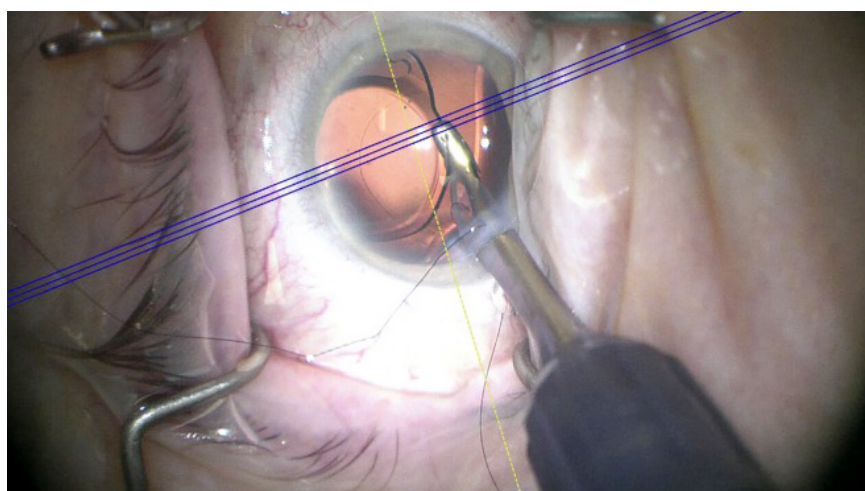


Figure 6. If needed, go behind the IOL to remove any residual viscoelastic. It is very important to ensure complete removal of viscoelastic in toric IOL cases.

microscope, which will help eliminate parallax. If you're using a block, manually make sure the eye looks as on-axis as possible.

Sources of error and postoperative management

Dr. Donnenfeld: In the 2014 ASCRS Clinical Survey, more than 30% of respondents believed 10 degrees of postoperative rotational error does not have a significant effect on visual quality in a normal toric IOL patient. What are your thoughts?

Dr. Mah: With each diopter you lose about 3% of your correction, so with 10 degrees you lose about one-third of your correction.

Dr. Kontos: As you increase the cylindrical power of the lens, the cylinder correction and axis placement are even less forgiving, so it is important for surgeons to understand that 10 degrees is too great an error.

Dr. Donnenfeld: When you see a patient postoperatively and a lens is not in the right location, what is the most common reason and how do you manage this problem?

Dr. Hovanesian: Guy Kezirian, MD, once told me that almost 5% of toric lenses are implanted 90 degrees off axis in the United States. Usually this happens because of confusion between the steep and the flat axis. More common is an error in placing the lens or marking by a few degrees. When it exceeds that, postoperative rotation may have occurred.

Dr. Donnenfeld: In most cases I've seen, the toric IOL was placed in the wrong position. However, lenses are unstable in very high myopes and large eyes with large capsular bags. I sometimes use a capsule tension ring in these patients. If the lens is in the wrong position, I generally reposition it.

Dr. Garg: When rotating the lens postoperatively, it's important that

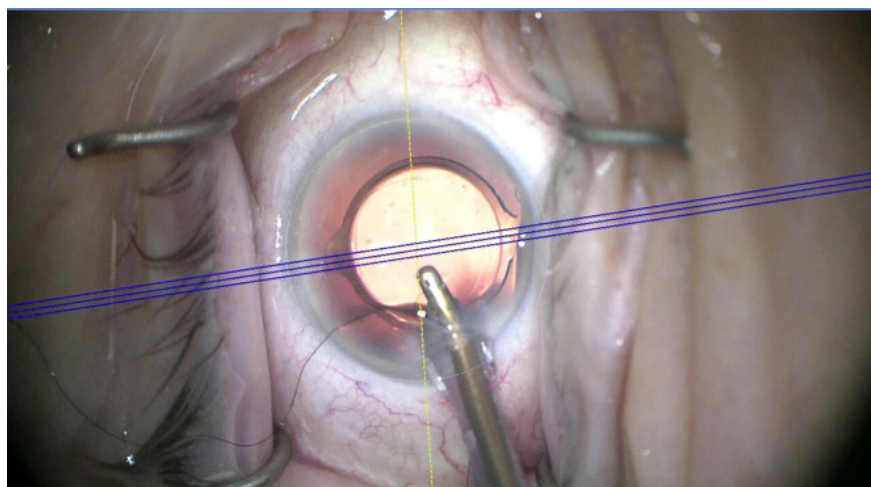


Figure 7. Use the I/A probe to orient the toric IOL to target axis. In this case the Zeiss Callisto system aids the surgeon intraoperatively.

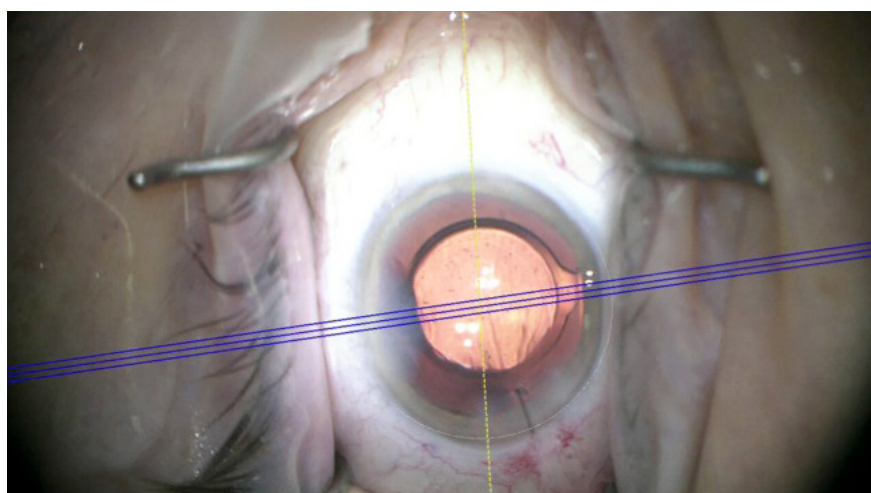


Figure 8. Final orientation of toric IOL on target as verified by the Zeiss Callisto system

Source: Sumit "Sam" Garg, MD

the refraction and ocular surface are stable. If you go in too early, you may not have accurately determined where the astigmatism actually is. Additionally, postoperatively you need to focus on the refractive astigmatism as opposed to corneal astigmatism. An online calculator published by **John Berdahl, MD**, and **Dave Hardten, MD** (www.astigmatismfix.com) can help you determine where you want to rotate that lens.

Dr. Kontos: In addition, incorrect data entry into an IOL calculator can produce errors. As a check, we keep the topography in the operating room and match the orientation of the lens on the calculator picture with the orientation on the topography during our time-out.

Dr. Mah: Another tip is to bring the printout from the IOL calculator to the operating room. In addition, in larger eyes it's important to remember that sometimes IOLs placed with-the-rule tilt one way or another.

Dr. Vukich: It's easy to prevent some of these problems with the pre-flight checklist. Make sure that you have the proper axis where you can double check it quickly during surgery.

Dr. Garg: Many of these errors are avoided with newer technologies such as the Callisto Eye because the information travels seamlessly from the IOLMaster to the Callisto Eye and then into your scope without transcription.

Dr. Donnenfeld: How do you correct residual refractive error after implantation of a toric IOL?

Dr. Hovanesian: It depends on the source of the residual refractive error. Typically it's a small amount of sphere or cylinder. If the patient is symptomatic and we are so inclined, it's reasonable to perform a laser refraction procedure. Rotating the lens is another option if you suspect the lens is off-axis.

Dr. Garg: If the spherical equivalent is close to zero, and depending on how much cylinder is left, you could consider LRIs. For spherical and larger astigmatic errors, you could consider laser vision correction. If they're hyperopic, you could use piggyback lenses or an IOL exchange.

Dr. Donnenfeld: Once you've placed a toric IOL, you can't base your astigmatic surgery on the keratometry; you base it on the refraction. In patients with small amounts of cylinder, we perform an LRI. For large astigmatic errors we rotate the IOL when it is displaced, and for combined spherical and astigmatic errors, we most commonly perform laser vision correction.

What would you say to surgeons who have not adopted toric IOLs about entering the field of refractive cataract surgery?

Dr. Garg: With increasing patient expectations, you're doing your patients a disservice if you don't perform refractive cataract surgery. We can improve their vision significantly by offering toric IOLs.

Dr. Kontos: Cataract surgery for most people is already a refractive surgery procedure. Astigmatism is a major component of refractive surgery procedures, and toric lenses allow you to manage that. If you want to have a vibrant practice in the future, you need to embrace this technology.

Dr. Donnenfeld: It's our obligation as ophthalmologists and physicians to provide patients with an informed consent process that considers what the patient wants and allows us to offer patients what meets their needs. It's also our obligation to recommend what is in the patient's best interest. For many patients, a toric IOL is going to be the best option for visual rehabilitation. Adding toric IOLs to your surgical armamentarium is the most effective way to enter refractive cataract surgery.

7 pearls for technique with toric IOLs

1. Corneal marking
2. Capsulorhexis size
3. Assistance with IOL unfolding and positioning
4. OVD removal under the IOL
5. Fixation of the IOL to the capsular bag
6. Final IOP in low to mid teen range
7. Final check of lens position



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