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Cataract & Refractive Surgery TODAY

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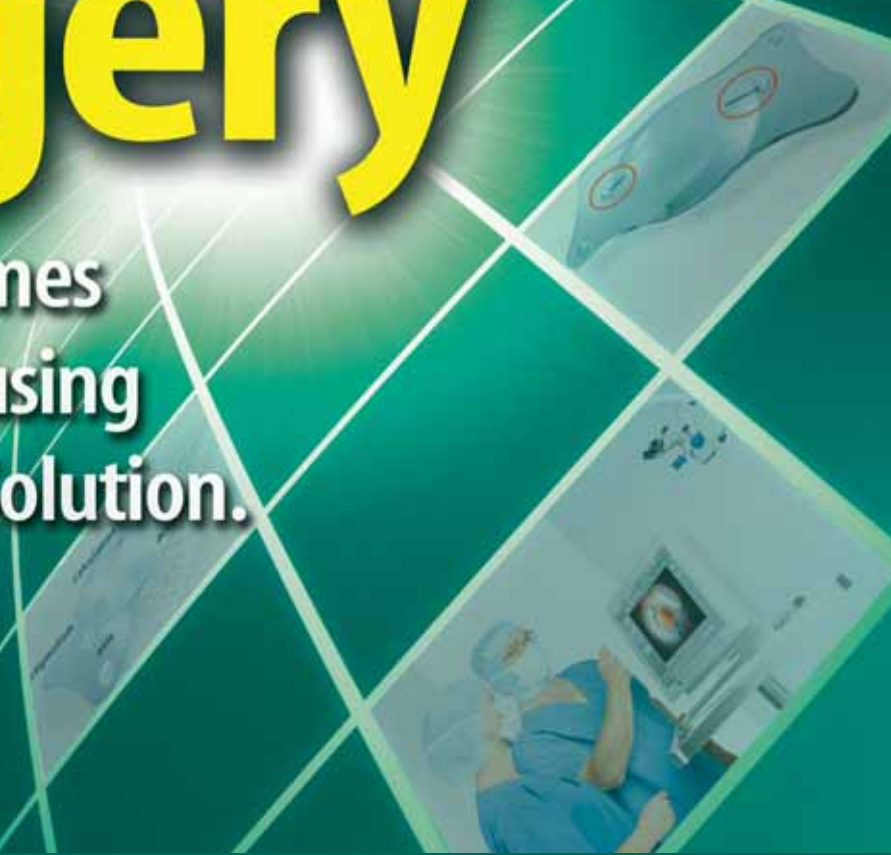
Redefining Cataract Surgery

Precision outcomes with toric IOLs using the ZEISS Toric Solution.



Sponsored by an unrestricted educational grant from Carl Zeiss Meditec

Redefining Cataract Surgery

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Maximize Your Outcomes After Toric IOL Implantation

Toric IOLs vastly improve outcomes in the majority of patients.

BY PETER HOFFMANN, MD

Toric IOLs are gaining popularity, especially after Carl Zeiss Meditec (Jena, Germany) introduced its line of microincision cataract surgery (MICS) IOLs into the market. These lenses have great predictability, and this is important considering patients now expect excellent visual outcomes after cataract surgery. Carl Zeiss Meditec's MICS line of IOLs can fit through incisions as small as 1.6 mm, which does not induce any astigmatism. On the other hand, a surgeon's workstation, his IOL calculation methods, and clinical experience are also important factors in achieving excellent results. After 11 years of experience with toric IOLs, I have streamlined my pre- and postoperative processes using the IOLMaster (Carl Zeiss Meditec) to achieve optimal results.

HOW FREQUENT IS ASTIGMATISM?

With one other cataract surgeon at my practice, we perform approximately 4,000 cataract surgery cases per year and have implanted more than 400 toric IOLs since 1998. The most important question we always seem to ask is: How frequent is astigmatism in our cataract population? To answer this, we examined a population of 23,239 eyes treated at our clinic, for which approximately 16% had astigmatism of 1.50 D or more; 8% had 2.00 D or more, and 2.6% had 3.00 D or more.

We also looked at the prevalence of astigmatism compared with spectacle prescriptions. In the lower cylinders, the effect of astigmatism was more frequent, which indicates that astigmatism counteracts keratometric astigmatism and lower amounts of cylinder. However, in the presence of higher amounts of cylinder (ie, more than 2.00 D), the rate of cylinder was almost exclusively determined by corneal cylinder.

With effective cylinder, there was a tendency for more frequent astigmatism after the age of 60 years old due to cataract formation and cataract surgery. Central corneal astigmatism was not as dependent on age; however, younger patients tended to have with-the-rule astigmatism whereas older patients were more likely to have against-the-rule astigmatism. The amount of corneal astigmatism was not dependent on age but the axis was.

THREE-STEP SYSTEM

After analyzing our results, I would suggest a three-step system to ensure the lowest amount of postoperative astigmatism possible. Many surgeons do not complete these three steps on a regular basis; however, doing so should improve the overall outcomes. First, we optimize corneal measurements as well as toric IOL calculations. Second, we optimize IOL alignment intraoperatively to ensure proper placement of the lens and incisions and avoid surgically induced astigmatism. Third, we check the postoperative refraction. Postoperative analysis should consist of checking IOL alignment, rotation, and keratometry to determine any surgically induced astigmatism.

A DEEPER LOOK

Corneal measurements and IOL calculations. There are many ways to calculate power of a toric lens; however, the IOLMaster is the gold standard for all IOL calculations, especially when it comes to the optical measurement of axial length and keratometry. For many years, we preferred to calculate two lenses for the main meridians. Thus, with corneal radii of 7.89 and 7.52, we used the difference between the two lens calculations to determine the necessary toricity. Another way of determining toricity is with wavefront and software packages; however, you must use a second device to automatically export the data into the software.

With the IOLMaster, you can select what formula you would like to use. No formula is completely independent from axial length, corneal radius, anterior chamber depth, and white-to-white, but the Haigis formula seems to be the most robust and least prone to systematic errors. I strongly suggest this formula to calculate toric lens power because it has the least dependence on the input parameters.

IOL alignment. The second step is the surgeon's intraocular technique, with perhaps the most important factor to success being perfect lens alignment. Our technique has evolved over the past couple of years, and I currently prefer the Pendulum Marker (Geuder AG, Heidelberg, Germany). Some surgeons prefer marking at the slit lamp with a Nd:YAG laser. There is a completely

new method from Carl Zeiss Meditec, the Z ALIGN, which uses an eye tracker to compensate for any unintentional movement.

I always use coaxial microphaco with a posterior limbal incision to reduce the amount of induced astigmatism. After lens implantation, I mark the cornea with a Neuhann marker—it has 36 lines, one placed every 10°—to position the IOL. If the axis of cornea and IOL are not perfectly aligned, you will notice a large movement of the lens when you do a retinoscopy. This is an easy and convenient way to check the alignment.

Postoperative refraction. Always check the patient's refraction and lens alignment. The most precise way of determining postoperative alignment is with retinal illumination.

STUDY RESULTS

In a series of 100 patients, cylinder ranged from 1.50 to 3.00 D, with only a 1.00 D difference between UCVA and BCVA. Postoperatively, the bulk of patients did not require glasses for distance vision. For spherical prediction error, there was a slightly hyperopic prediction error, indicating that the spherical lens constants were not completely correct for the toric version of the lens. The surgeon must tweak to compensate for this error. The median cylinder reduction was approximately 1.50 D (0.50 D to 2.00 D).

A majority of astigmatism occured in the 0° meridian, which coincides to with-the-rule astigmatism. Every lens was within ±1.00 D of cylindrical predictability, and the amount of over- and under-correction was equal; however, in the real world, we don't have perfect alignment in every case. In our practice, the trend is that alignment shifts slightly toward under correction.

CONCLUSION

Even experienced surgeons have implanted toric IOLs that malposition intra- or postoperatively. If you are correcting low cylinder, slight misalignment is acceptable; however, with high cylinder, even 10° should be corrected. In our initial series, one IOL was malpositioned by 18°, which we corrected.

In one out of six patients, the outcome is vastly improved by means of a toric IOL. A stringent approach pre- and postoperatively using the IOLMaster will help you to ensure optimal results. It is crucial to check your own results and perform adjustments if necessary. ■

Peter Hoffmann, MD, is an ophthalmic surgeon at the Eye Hospital, Castrop-Rauxel, Germany. Dr. Hoffmann states that he has no financial interest in the products or companies mentioned. He may be reached at e-mail: ph@augenklinik-castrop-rauxel.de.

THE BOTTOM LINE: POINTS TO REMEMBER

- A three-step system should optimize corneal measurements and toric IOL calculations, optimize intraoperative IOL alignment, and check postoperative refraction.
- When calculating toric IOL power, the Haigis formula is the least dependent on the input parameters.
- If the axis of cornea and IOL are not aligned perfectly, the lens will decenter.

Improve Toric IOL Implantation With Z CALC and Z ALIGN

The combination of these tools effectively calculates IOL power and allows lens implantation into the correct axis.

BY DETLEV R.H. BREYER, MD

The use of toric IOLs is a science—it is the culmination of the proper procedure, the right IOL choice, and the best objective measurements. I prefer using coaxial microincision cataract surgery (CO-MICS) with the AT LISA 909M (previously called Acri.LISAtoric; Carl Zeiss Meditec, Jena, Germany). In our opinion, no modern phacorefractive surgery procedure is as precise and effective as when using a toric MICS IOL.

Coaxial MICS and the AT LISA toric 909M are a perfect match. The coaxial nature of the procedure allows quiet fluidics and phacodynamics; the 1.6-mm incision avoids any surgically induced astigmatism, and the toricity of the lens allows me to avoid bioptic procedures in patients with higher astigmatism. I have excellent results and high patient satisfaction using this combination of products, and two recent introductions have further improved my results and quality management. The first is the Z CALC, an online toric IOL calculator, and the second is Z ALIGN, a high-tech tool for toric IOL alignment (both by Carl Zeiss Meditec).

Z CALC

The Z CALC software, which targets emmetropia, allows the surgeon to calculate IOL power in either a single eye or both eyes. It is important to remember that this software is not approved for post-corneal refractive lens power calculations, phakic IOL calculations, or lens models that are implanted in the sulcus or anterior chamber. It should also not be used to calculate IOL power for patients with corneal degeneration or trauma.

The display on the Z CALC uses color-coded calculations. If the value entered is displayed in orange, it indicates that the eye is irregular. In these cases, the data is still used to calculate the IOL power, but the orange indicates a physical warning that the eye is close to the specified border of correction. A red value indicates that the calculation is beyond the limits of a regular case. There is also a calculation summary screen that displays the biometry data and IOL calculation results. This display also

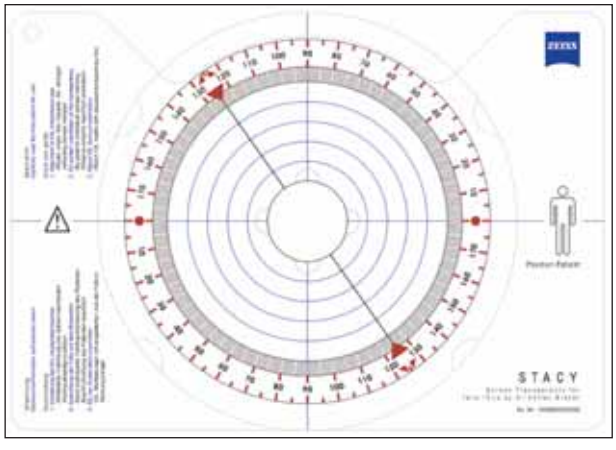

Figure 1. Screen transparency for toric IOLs, or STACY.

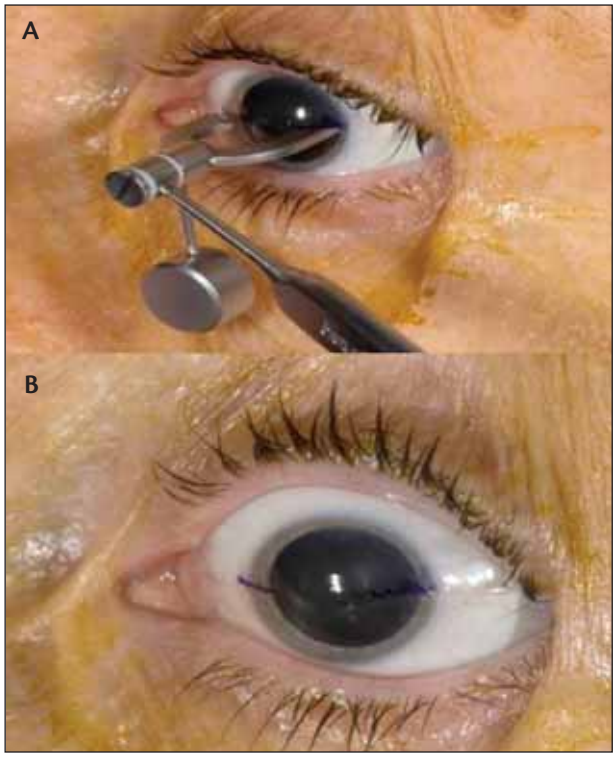

Figure 2. (A) The surgeon marks the reference axis (B) on the patient's eye.

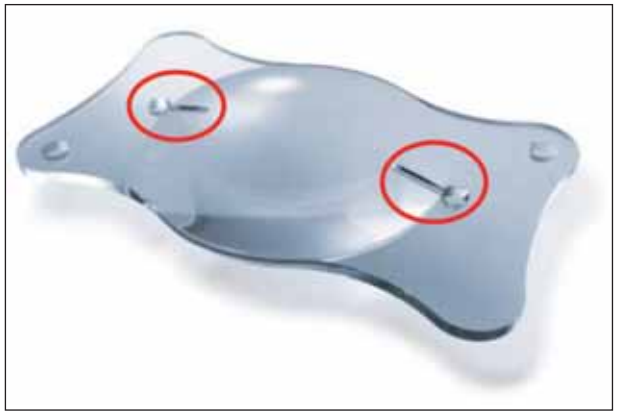

Figure 3. Markers are seen on the toric IOL.

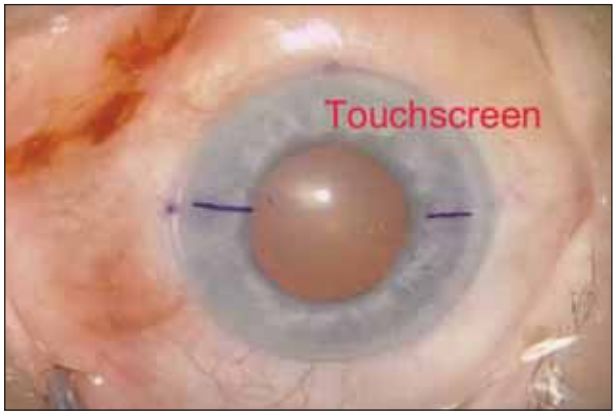

Figure 4. The image is seen on the Z ALIGN software.

features an image with the lens rotated to the correct degree. I use this image as a guide for lens orientation.

I also recommend using screen transparency (first published by the author in 2005) for toric IOLs (STACY; Figure 1). This tool is used for the following: (1) alignment of IOL implantation axis, (2) on-screen orientation of the transparency, and (3) adjustments during IOL implantation. During IOL alignment, use STACY by rotating the angle line toward the stronger refracting corneal meridian. For on-screen orientation, observe the patient's head-foot orientation and align it using the patient's individual corneal marking. When used during implantation, match the IOL marks with the adjusted transparency line.

Z ALIGN

When inserted into the patient's eye, the toric IOL must be individually rotated to correct for the patient's specific level of astigmatism. Recently, the Z ALIGN was tested during five live procedures in October 2009. To use the software, you must first determine the target angle (axis of the steep corneal meridian) using the IOLMaster (Carl Zeiss Meditec) or another diagnostic tool such as keratometry and best videokeratoscopy.

Before surgery, the reference axis for the target angle should be marked on the patient's eye (Figure 2). Then, the markers located on the IOL must be aligned with the target axis, which is defined as the target angle and reference axis (Figure 3). Using the live video image of the Z ALIGN software (Figure 4), the surgeon can superimpose the reference and target axis and then align the toric IOL with the target axis under visual control. In manual mode, the Z ALIGN software uses an eye tracker to continually track the limbus, with the reference and target lines visible and easily adjustable.

CONCLUSION

Coaxial MICS and the AT LISA toric 909M are a winning combination. With the addition of Z CALC and Z ALIGN, it is easier than ever to efficiently calculate IOL power and implant the toric IOL into the correct axis. These tools are sophisticated devices that represent scientific steps toward standardizing surgery, managing quality, and improving the surgical workflow. ■

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THE BOTTOM LINE: POINTS TO REMEMBER

- The Z CALC display uses color-coded calculations to indicate regular and irregular cases.
- Toric IOL alignment is made easier with Z ALIGN software.
- Coaxial microincision cataract surgery and the AT LISA toric 909M are a winning combination.

AT LISA toric: The Only Multifocal Toric MICS IOL for Presbyopia Correction

Patient satisfaction is high, with outstanding near and far visual acuity.

BY PETER MOJZIS, MD, PhD, FEBO

Patient expectations are increasingly demanding, and one way to ensure that I can deliver excellent results is with multifocal toric IOLs. Today, my one and only choice is the AT LISA toric (Carl Zeiss Meditec, Jena, Germany). This lens provides predictable results, excellent rotational stability and intraocular optical quality, and outstanding near and far visual acuity. I have used it bilaterally as well as unilaterally, with high patient satisfaction in both types of situations.

Recently, I conducted a study including 22 AT LISA toric IOL implantations, 10 of which were bilateral and two unilateral. With a follow-up of 6 months, specific pre- and postoperative parameters included cylinder, spherical equivalent, distance and near UCVA and BCVA, rotational stability, intraocular aberrations, optical visual symptoms, and patient satisfaction.

Preoperatively, the greatest percentage of patients (32%) required between 15.50 and 20.00 D of spherical correction, with the next largest group (28%) requiring 25.50 to 30.00 D of spherical correction. Correction of cylinder ranged from less than 1.75 D (28%) to more than 5.25 D (8%); however, the largest groups of patients (32%) required 2.00 to 3.00 D of cylindrical correction.

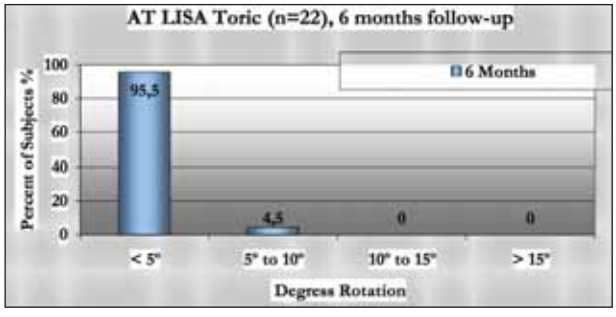

Figure 1. Rotational stability at 6 months.

All 12 patients were available for 6-month follow-up. The target spherical equivalent for nearly 73% of patients was -0.50 to 0.00 D, with 36.4% reaching the target at 6 months. At 1, 3, and 6 months, the distance UCVA for all patients was 20/40 or better and 20/30 or better for 95.4% of patients (one eye was amblyopic). There was a slight variance for monocular 20/20

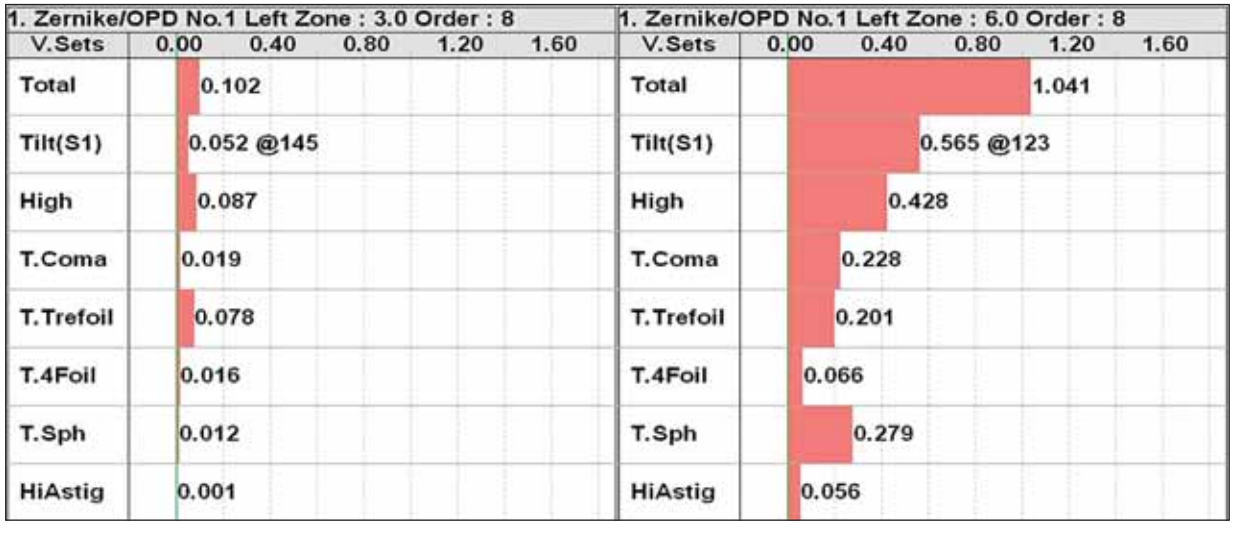

Figure 2. Intraocular aberrations.

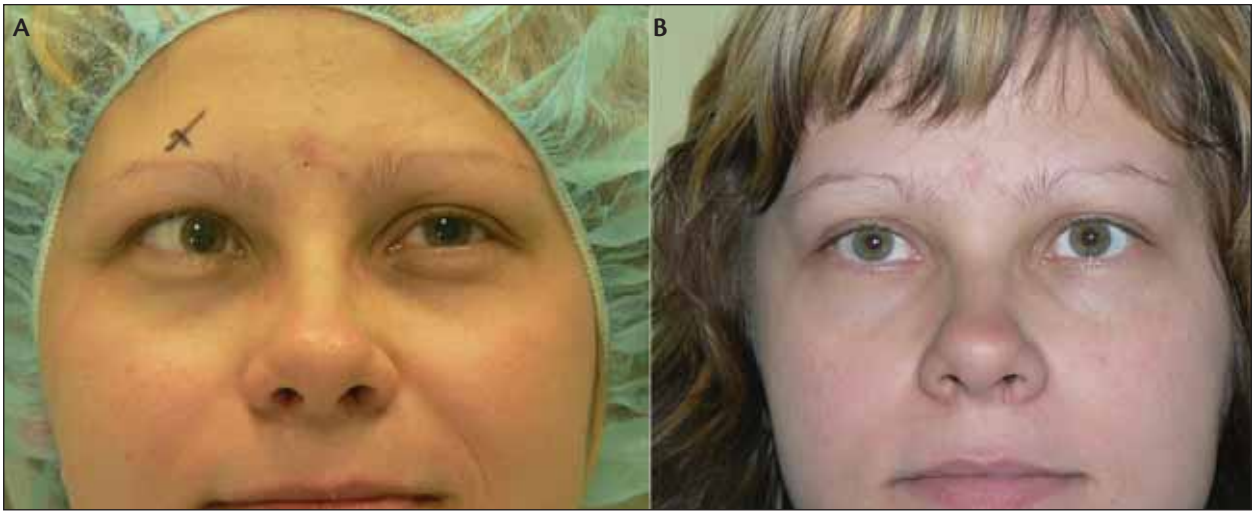

Figure 3. Bilateral AT LISA toric implantation in a female with strabismus in the right eye. (A) Preoperative objective was RE: +4.50 +2.50 D of cylinder UCVA: 0.4, BCVA: 0.9; LE: +4.75 +3.00 D of cylinder, UCVA: 0.3, BCVA: 1.0. (B) Postoperatively, the patient's UCVA was 0.9 in her right eye and 1.0 in her left.

distance UCVA at 1, 3, and 6 months, with 41.2% of patients reaching this point at 1 and 3 months and 54.5% at 6 months. Binocular distance UCVA was similar, with all patients at 20/30 or better at all check-ups, and 41.6%, 66.7%, and 75% at 20/20 or better at 1, 3, and 6 months, respectively.

Monocular near UCVA was more varied, with 4.5% and 5.9% of patients reaching J1 or better at 1 and 3 months, respectively. At 6 months, 91% of patients were J4 or better, 81.9% were J3 or better, 54.6% were J2 or better, and 22.7% were J1 or better. For binocular near UCVA, all patients were J4 or better at 6 months. Although only 85% were J3 or better at 6 months, 75% were J2 or better and 41.7% were J1 or better.

Regarding rotational stability (Figure 1), the overwhelming majority of patients (95.5%) experienced less than 5° of rotation at 6 months. Rotation was between 5° and 10° in all of the remaining patients. No patient reported severe visual phenomena. Only 9.9% of eyes noted mild and 4.5% noted moderate optical visual symptoms 6 months after surgery.

Stabilization and centration of implanted AT LISA toric is crucial. Therefore, we implanted the TENSIOBAG square 11 (formerly known as Acri.Ring KR11) capsular tension ring (Carl Zeiss Meditec) along with the multifocal toric in all cases. This type of ring also has a square edge to prevent posterior capsular opacification. Measured values of intraocular aberrations for 3- and 6-mm pupils were very good (Figure 2). At present, patients with higher astigmatism, unilateral cataract, strabismus (Figure 3), or amblyopia are indicated for multifocal toric lenses.

Lastly, on a 10-point satisfaction scale, patients rated their satisfaction a 6.4 at 1-month, 7.6 at 3 months, and 8.9 at 6 months.

CONCLUSION

To solve the great puzzle of presbyopic correction in patients with astigmatism, I believe the winning combination is microincision cataract surgery with a toric multifocal IOL. For these reasons, and because of the predictable and outstanding results and high level of patient satisfaction at 6 months, my choice of IOL remains the AT LISA toric lens. ■

Peter Mojzis, MD, PhD, FEBO, practices at NeoVize, Zidenice, Czech Republic. Professor Mjozis states that he has no financial interest in the products or companies mentioned. He may be reached at e-mail: mojzispeter@hotmail.com.

THE BOTTOM LINE: POINTS TO REMEMBER

- The overwhelming majority of patients experienced less than 5° of rotation of the AT LISA toric at 6 months. The remainder experienced between 5° and 10° of rotation.
- Patients with higher astigmatism, unilateral cataract, strabismus, or amblyopia are indicated for multifocal toric lenses.
- At 6 months, patient satisfaction was as high as 8.9 on a scale of 10.

Z ALIGN Reliably Positions the IOL on the Toric Axis

Available in the CALLISTO eye OR Cockpit, this system is a video-supported alignment tool.

BY LENA SCHUBERT, DIPL.-WIRTSCHAFTS-ING.

By combining three components—an online calculator, microincision cataract surgery (MICS) toric IOLs, and Z ALIGN, an intraoperative alignment tool—Carl Zeiss Meditec (Jena, Germany) offers a complete toric solution to the cataract surgeon (Figure 1). This coalesce provides high predictability, excellent rotational stability, and intraocular optical quality.

Figure 1. Carl Zeiss Meditec offers Z CALC and Z ALIGN to support implantation of its line of toric IOLs.

Figure 2. A display from the CALLISTO eye OR Cockpit.

THE THREE COMPONENTS OF THE ZEISS TORIC SOLUTION

The following is a brief description of the three components of the ZEISS Toric Solution, followed by a focus on Z ALIGN.

Z CALC. This online calculator can be used for all toric IOLs by Carl Zeiss Meditec. It provides instant calculations with a state-of-the-art algorithm and graphical user interface that is adapted to fit the surgeon's workflow.

Using Z CALC, customized calculation of the toric IOL is easy because cylinder and sphere of the recommend toric IOL can be changed individually and adapted to the patient needs.

Toric IOLs. Carl Zeiss Meditec provides two of the most unique toric IOLs on today's market. The AT LISA toric combines the principles of the AT LISA multifocal IOL, the AT TORBI toric IOL, and the ZEISS MICS IOL platform. The AT LISA toric is implantable through a sub–2-mm incision; it is the only MICS IOL that simultaneously corrects sphere, cylinder, and associated presbyopia.[1,2] The second IOL, the AT TORBI, is the world's first monofocal toric IOL to combine bitoricity (to provide excellent image quality), qualities for MICS (to create an astigmatically neutral incision), and an extended patient base (to correct astigmatism up to 12.00 D).

Z ALIGN. Available for use with the CALLISTO eye OR Cockpit (Carl Zeiss Meditec; Figure 2), Z ALIGN is a new and innovative video-supported software that allows fast and reliable intraoperative toric IOL alignment. The user confirms the two reference marks on the CALLISTO eye OR Cockpit to define the horizontal reference axis. Next, Z ALIGN is used to provide reliable, real-time eye tracking using a S-video signal and a touchscreen. This solution is independent from the microscope vendor. The reference axis is then aligned with the notches on the toric IOL to create perfect centration.

EXPERIENCE

Z ALIGN is not only easy to use, but the surgeon is also able to create video documentation (Figure 3) of his procedures. Users have noticed that by using Z ALIGN, axis confirmation is not only reliable but convenient because the markers are confirmed on the touchscreen. The user only has to touch the screen two times to mark the axis, and it is easy to select the target angle on the touchscreen. The reference and target

Figure 3. Video documentation is easy with the Z ALIGN software.

axes are displayed simultaneously. Once the angle is set the system is following the movement of the eye, so the IOL can easily be aligned with the target axis.

CONCLUSION

Without Z ALIGN, the results with toric IOLs would not be as reliable. I recommend incorporating this software into your practice. It completes the toric solution for any cataract surgeon. ■

THE BOTTOM LINE: POINTS TO REMEMBER

- Z ALIGN software completes the toric solution for any cataract surgery.
- With Z ALIGN, surgeons can create video documentation of procedures.

Lena Schubert, Dipl.-Wirtschafts-Ing., is a Product Manager at Carl Zeiss Surgical GmbH, Oberkochen, Germany. Ms. Schubert may be reached at e-mail: schubert@meditec.zeiss.com.

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