Successful Implantation of Toric Multifocal IOLs

Respecting patients' visual demands and applying precise preoperative diagnostics are key.

BY DETLEV R.H. BREYER, MD

It surprises me to realize it has been a decade since we started implanting toric IOLs at Breyer Eye Surgery. The first model we implanted was the bitoric AcriSmart IOL by AcriTec (now the AT Torbi by Carl Zeiss Meditec). I was so fascinated by the excellent results we achieved that I asked the owner of AcriTec, Christine Kreiner, PhD, if she could produce a toric multifocal IOL. Obviously, I was not the only surgeon to make this request, as just a few months later I implanted the first toric Acri.LISA multifocal IOL (now the AT LISA by Carl Zeiss Meditec). My first first two patients to receive this lens were a journalist and a lawyer. Nevertheless, I am still practicing as an ophthalmic surgeon, and my patients and I are happy that the industry supplies us with these outstanding products.

For the past 2 years, I have organized instructional courses on toric multifocal IOLs at the European Society of Cataract and Refractive Surgeons (ESCRS) and Congress of German Ophthalmologic Surgeons (DOC) meetings. From discussions held there with my respected colleagues and audience members and from my own clinical experience, I have acquired several pearls for successful implantation of these lenses, as detailed below.

MATERIAL AND METHODS

Performing preoperative diagnostics and decision-making. Successful toric multifocal IOL implantation starts with a thorough examination of the eye and a precise preoperative diagnostic evaluation of the amount and axis of astigmatism. We perform videokeratoscopy, Scheimpflug measurement, keratometry, biometry, pupillometry, and aberrometry. We strongly believe that none of these measurements is unnecessary and that they all work together to yield good visual outcomes.

In retrospective analyses, we found that aberrometry with the KR-1W (Topcon) is our best and most reliable tool for assessing the axis of astigmatism, whereas the amount of astigmatism is better measured with the Pentacam (Oculus Optikgeräte), which measures the total corneal refractive true net power of the anterior and posterior surfaces.

For biometry, we rely on two systems that seem to be equally precise: the IOLMaster (Carl Zeiss Meditec) and the Aladdin (Topcon), which also performs pupillometry. The Oculus videokeratoscope informs us of the tear film break-up time, which is important in eyes receiving multifocal IOLs. Surgeons must also make sure not to overlook pellucid marginal degeneration or keratoconus. IOL power is then calculated using online calculators.

Figure 1. Ocular for the Carl Zeiss Meditec Nd:YAG laser with TABO schema to mark the astigmatic axis on the cornea.

Marking the reference and target axis. In earlier days, I marked the horizontal axis at the slit lamp and oriented the toric multifocal IOL intraoperatively with the help of a Mendez ring (Mastel Precision); we now know that was a naive and insufficient approach, but, at that time, it worked astonishingly well. We first used the Gerten Pendulum Marker (Geuder) but were not happy with the precision

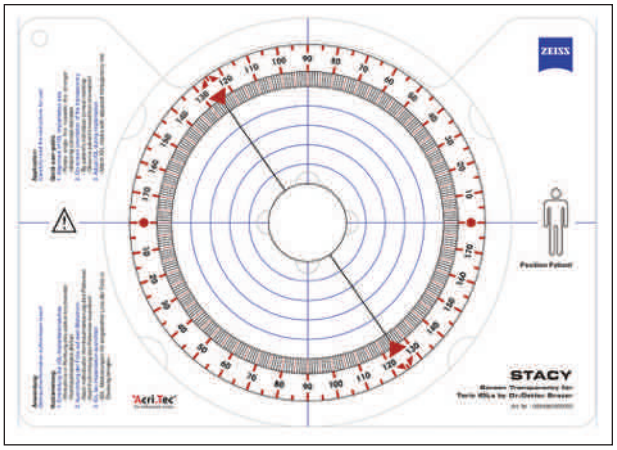


Figure 2. A screen transparency for toric IOLs, or STACY, may be used to double-check the position of the IOL after implantation.

and repeatability achieved, which is a problem with all handheld markers: The marks are too big and may be washed out, and few patients are relaxed enough to hold still while an instrument approaches the eye.

Therefore, we adopted a simple but brilliant idea conceived by Wolfram Wehner, MD, of Nuremberg, Germany. With this technique, the reference and the target axis are marked using a Carl Zeiss Meditec Nd:YAG laser with a special ocular with degree marks around its periphery, known in German as a *TABO schema* (Figure 1). These epithelial limbal laser marks are small and precise, and they last for hours. Further, the procedure is well tolerated by patients.

To double-check the IOL position after implantation, we use the screen transparency for toric IOLs, or STACY (Carl Zeiss Meditec; Figure 2), which we developed and introduced at the DOC and ESCRS meetings in 2005. The magnification effect of the video monitor guarantees near-perfect positioning of toric multifocal IOLs. We do not use intraoperative aberrometry or microscope-assisted systems, as we are not yet convinced that they produce better results.

Choosing the incision size. After one has devoted the requisite time and skills to calculate the most suitable toric multifocal IOL, one wants to avoid surgically induced astigmatism as much as possible. Foldable IOLs with four-point haptics can be implanted through a 1.8-mm incision, which induces no astigmatism (Figures 3 and 4). If an incision of 2 mm or more is required, take a close look at the incision site, and if corneal degeneration is evident, position the incision further toward the sclera.

Choosing the amount of near addition. The AT LISA tri toric 939MP (Carl Zeiss Meditec) and the segmental Lentis Mplus X (Oculentis) are our most frequently implanted (and, in our experience, most forgiving) toric multifocal IOLs. We have found that using these lenses is the easiest way to make our patients happy (Figure 5A).

Figure 3. A 1.8-mm incision is astigmatism-neutral.

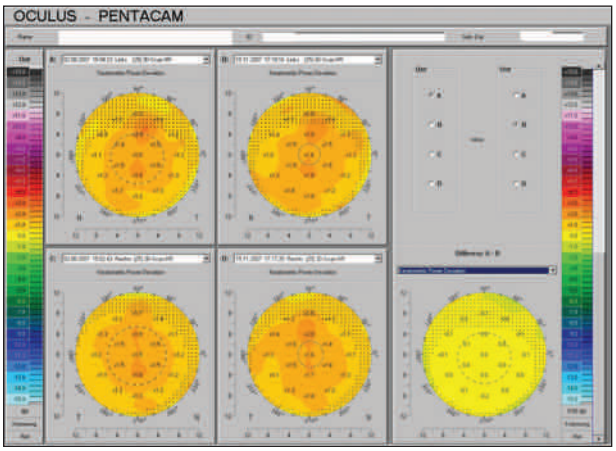


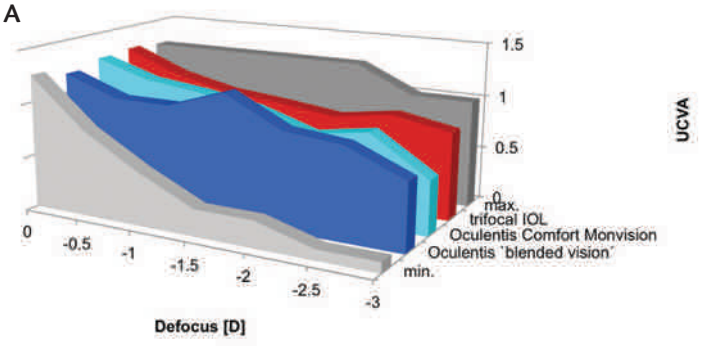
Figure 4. No surgically induced astigmatism is produced with an 1.8-mm incision.

In contrast with trifocal IOLs, bifocal multifocal IOLs are able to achieve a comparably large defocus capacity and comparably minor halos and glare only when used in a blended vision model. Therefore, when bifocal lenses are used instead of trifocal IOLs, we combine different near additions after asking the patient extensively what he or she wants to do and see after surgery without glasses. With this information on patient preferences, we can choose from the variety of multifocal IOL near additions (AcrySof Restor +2.50 D and +3.00 D IOLs [Alcon], Tecnis +2.75 D

TAKE-HOME MESSAGE

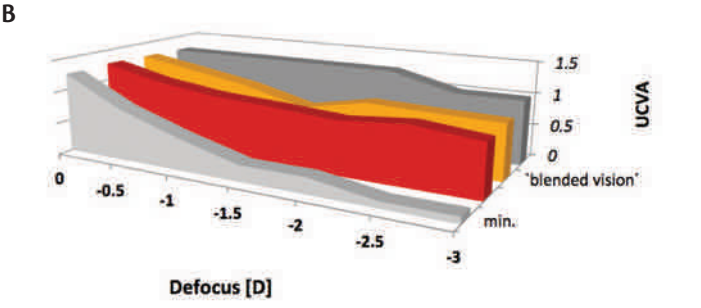
- Successful toric multifocal IOL implantation starts with a precise preoperative diagnostic evaluation of the amount and axis of astigmatism and of the eye.
- The four-point haptics design may be easily rotated in both directions, implanted without OVD under irrigation, and unfolded quickly.
- Less than one of 100 patients in the author's toric multifocal IOL population needed a postsurgical correction or touch-up corneal procedure.

A



IOL type	Monofocal IOL	myLentis in one eye	Comfort with monovision	Mplus X + Comfort (blended vision)	Trifocal IOL
Defocus Capacity	46%	60%	76%	84%	82%

B



IOL type	Monofocal IOL	Trifocal IOL	Blended vision
% of area of phakic eyes	46%	82%	81%

Figure 5. Defocus capacity (depth of field) of different multifocal IOL combinations. Blue = Oculentis blended vision, teal = Comfort with monovision, red = AT LISA tri toric 939MP (A); Red = AT LISA tri toric 939MP, orange = Restor +2.50 D and +3.00 D blended vision (B).

and +4.00 D IOLs [Abbott Medical Optics]) to meet the patient's needs (Figure 5B). We never blend multifocal IOLs from different manufacturers. If a patient is not irritated by photic phenomena, and his or her desired goal is to read books for extended periods without glasses, we have had good experiences with the Tecnis +4.00 D near addition.

Choosing an IOL design. We prefer the four-point haptic design, as these IOLs are much easier to rotate, in both directions; can be implanted under irrigation without use of an ophthalmic viscosurgical device (OVD); and unfold quickly. The fact that four-point haptic designs may lead to earlier posterior capsular opacification (PCO) is of negligible significance because PCO must be removed earlier with multifocal IOLs than with monofocals. In a retrospective study, we disproved the idea that four-point haptics are not rotationally stable (Figure 6).[1]

The AT LISA tri 839MP has a bitoric design that allows a wide range of dioptric correction and produces a better point spread function at different pupil sizes than monotoric designs (Figure 7).[2]

The toric MPlus X makes marking and implantation even easier, as the toric correction is individually customized; in other words, the orientation of the IOL is always vertical at 90° or 270° (Figure 8).

Assessing segmental versus rotationally symmetric optics. When the segmental Lentis Mplus appeared on the market 4 years ago, we implanted many of these lenses before realizing that the results were inconsistent. Some patients could see 20/20 near and far with good intermediate vision, and others could not. The ophthalmic community did not understand the concept of this new IOL design, and we paid our dues.[3]

This scenario changed with the introduction of the Lentis Mplus X, which provides more consistent results, especially in regard to near vision. To me, the biggest advantage of the segmental design compared with the rotationally symmetric design is that fewer patients report photic phenomena. Nevertheless, the trifocal design has been a big step forward from the bifocal design in regard to halos and glare.

Implanting the IOL. I prefer injector systems with a silicone plunger at the tip to push the IOL forward in the cartridge because there is no risk of incarceration of the IOL in the cartridge. Any surgeon who has experienced ejecting an IOL from the cartridge into the anterior chamber in pieces knows what I am talking about. Why take the risk?

An advantageous development from a hygienic standpoint is the preloaded injector system, such as the one designed for the toric trifocal IOL. The mechanical push dynamics, however, must still be improved.

Ensuring stability. We prefer to implant premium IOLs with a capsular tension ring (CTR), as this approach results in no capsular bag folds; almost no possibility of rotation of a toric IOL; and earlier refractive stability and more precise biometry (unproven).[4] We share this suggestion with many high-volume refractive surgeons, but more valid data are needed to establish the criteria and justification for CTR use.

Implanting with or without OVD. Our standard procedure with all IOLs is implantation under irrigation without an OVD. I learned this technique from Tobias H. Neuhann, MD, and have found it is especially useful for implanting toric IOLs. Once the IOL is implanted, the surgeon only has to rotate the lens into the right

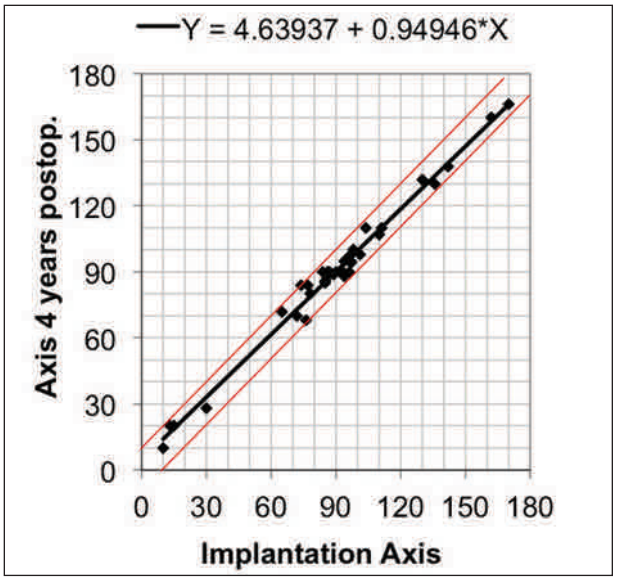


Figure 6. The 4-year rotational stability of a four-point haptic IOL design (AT Torbi).

position. He or she does not have to remove any OVD, which, again, could rotate the IOL.

On-axis implantation of the lens. We sit at the 12-o'clock position and perform phacoemulsification with either the right or the left hand, depending on the incision location. Once the toric multifocal IOL is implanted on the target axis, we have to rotate the IOL only minimally, which reduces zonular stress.

RESULTS

As part of our practice's quality management efforts, we retrospectively analyze our results after receiving informed consent from patients to publish the data anonymously. Our longest investigated experience is on the four-point haptic platform (Carl Zeiss Meditec), with which we have seen absolute rotational stability and excellent visual outcomes over a period of 4 years (Figure 6). Short-term results (due to later availability) are the same with all the other aforementioned toric multifocal IOLs.

Less than one of 100 patients in our toric multifocal IOL population has needed a postsurgical correction or touch-up corneal procedure. In the case that enhancement is needed, we prefer to use add-on IOLs, as they induce fewer aberrations than corneal refractive surgical procedures. However, I know many well-regarded colleagues who use excimer laser procedures to address refractive surprises.

CONCLUSION

From the first implantation on, we have enjoyed using toric multifocal IOLs at our clinic. If one respects

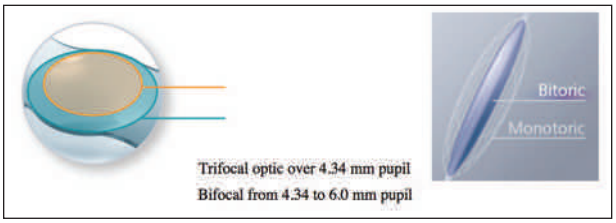


Figure 7. The bifocal design of the AT LISA tri 839MP allows a wide range of dioptric correction.

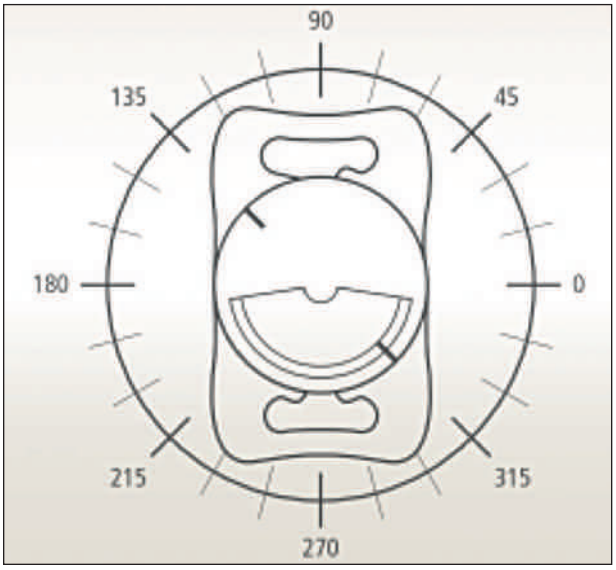


Figure 8. A segmental, rotationally assymmetric toric multifocal IOL design.

patients' visual demands and applies precise preoperative diagnostics, the quality of surgical outcomes and patient satisfaction will be rewarding. The truly challenging cases are patients with 1.50 D of astigmatism or less. Because these cases require more experience than patients with higher astigmatism, it is advisable to start implanting toric multifocal IOLs in eyes with higher degrees of astigmatism. ■

Detlev R.H. Breyer, MD, is Head of Breyer Eye Surgery, a private practice and day clinic in Düsseldorf, Germany, and is a Senior Consultant to Marien Hospital in Düsseldorf, Germany. Dr. Breyer states that he is a paid consultant to Carl Zeiss Meditec and Oertli Instrumente. He may be reached at tel: +49 211 5867 5726; e-mail: d.breyer@breyeraugenchirurgie.de.

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