

Multifocal and Toric IOLs Expand Cataract Surgeons' Armamentarium

Just as surgical technique continues to evolve, so do surgeons' options for treating presbyopia and astigmatism with lens implants.

BY WILLIAM K. CHRISTIAN, MD

It is a very exciting time in cataract surgery. We have access to a wonderful array of IOLs that enable us to restore patients' high-quality vision while minimizing or even eliminating their dependence on spectacles. The diversity of these new IOLs also promotes customized solutions. Presbyopia-correcting lenses significantly improve our ability to help patients seeking spectacle independence at all distances without a compromise in their distance vision. Toric IOLs offer spectacle independence for distance to patients who are not optimal candidates for a multifocal IOL because of high amounts of corneal astigmatism or macular pathology. The FDA recently approved the Tecnis Toric IOL (Abbott Medical Optics Inc.). It combines the stability and precision of astigmatic correction with the proven platform of the wavefront-designed Tecnis aspheric IOL (Figure). Like other IOLs in the Tecnis family, the toric version reduces spherical aberration to near zero, which has been shown to improve functional vision most notably by speeding up drivers' reaction time in a night-driving simulation.¹ This hydrophobic acrylic lens has the lowest chromatic aberration of IOLs tested,² and its clear optic allows full transmission of healthy blue light to the retina.

The IOL's offset, forward-mounted haptics contact the capsular bag at three points, which should augment its long-term stability, refractive predictability, and centration. The square posterior optic edge of the lens provides uninterrupted contact between the posterior surface of the optic and the anterior surface of the posterior capsule.



Figure. The FDA has approved the Tecnis Toric IOL.

ASTIGMATIC CORRECTION AND STABILITY

The Tecnis Toric lens allows precise astigmatic correction while its correction of spherical aberration provides sharper quality of vision than IOLs with less compensation for spherical aberration.³ The IOL's design also limits lens epithelial cell migration,^{4,5} which reduces the chance of posterior capsular opacification.

This toric lens is available in a wide spectrum of cylindrical powers (1.50, 2.25, 3.00 D; 4.00 D of cylindrical power at the IOL plane and spherical powers of +5.00 to +34.00 D in 0.50 D increments) to address preexist-

ing corneal astigmatism of at least 1.00 D in adults who have undergone cataract extraction. Selecting the correct lens model and axial placement is made quite simple by the manufacturer's IOL calculator (www.tecnistoriccalc.com).

MULTIFOCAL AND TORIC IOLS IN PRACTICE

In my practice, every initial workup of a cataract patient is the same. It includes corneal topography so that I may intelligently discuss lens options during the consultation. If the patient is interested in maximizing

ANSI STANDARDS FOR TORIC IOLS

By Daniel H. Chang, MD

National and international standards help to ensure the safety, reliability, and quality of products and services. Although adherence to consensus-based standards is completely voluntary, it promotes a fair commercial environment and greater confidence in the products we use, particularly when they are precise medical devices.

For nearly a century, the American National Standards Institute (ANSI) has sought to enhance the global competitiveness of US businesses by promoting the development of standards. Contrary to popular belief, ANSI is not a governmental body but rather a nonprofit organization consisting of companies, institutions, governmental agencies, and other members. It is the United States' representative to the International Organization for Standardization, which fulfills a similar role globally.

ANSI does not develop standards itself but rather accredits Standards Developing Organizations (SDOs) to ensure openness, balance, consensus, and due process. The ANSI-accredited SDOs, in turn, conduct the laborious process of creating individual American National Standards. Of more than 200 ANSI-accredited SDOs, the one with greatest relevance to ophthalmology is the Z80 committee, which establishes standards for glasses, contact lenses, IOLs, viscoelastics, corneal lasers, and many other ophthalmic products. Eighteen organizations are represented on this committee, including the American Academy of Ophthalmology, the American Society of Cataract and Refractive Surgery, the American Optometric Association, and the FDA.

TORIC IOL STANDARDS

The current American National Standard for toric IOLs, approved in March 2010, is known as ANSI Z80.30-2010. It provides guidance on optical and mechanical properties, labeling, biocompatibility, sterility, shelf life, and clinical investigation standards for toric IOLs.

Two important guidelines specified by the ANSI standard are (1) recommended tolerances for the spherical and cylindrical power and (2) rotational orientation and stability. Without tight power tolerances, accurate refractive outcomes would be impossible. Because a rotational error of just 5° results in a 17% loss of cylindrical power, rotational orientation and stability are critical as well.

For toric IOLs, total dioptric spherical power and cylindrical power error should be less than or equal to 0.30 to 0.50 D for most power ranges. Additionally, the combined angular error of the toric marks and the orthogonality between meridians of toricity should be 5° or less.

The ANSI standard also defines the rotational stability for toric IOLs to be a change of 5° or less in rotation for at least 90% of eyes on consecutive visits spaced at least 3 months apart. Stability should be reported for both a consistent cohort (eyes with every follow-up examination) and a consecutive cohort (eyes with two consecutive examinations).

This is an important and high standard to meet, as surgeons who implant toric lenses know. Of the current toric IOLs on the market, toric plate lenses (STAAR Surgical) have had some challenges in terms of stability.¹ Acrysof Toric lenses (Alcon Laboratories, Inc.) are generally considered stable, but because they were released prior to the ANSI Z80.30-2010 standard, their labeling data do not follow the ANSI reporting standard. Rotation of 5° or less was reached for only 77% to 88% of eyes, but the data were reported for longer intervals of nonconsecutive visits.² According to its labeling, only the Tecnis Toric (Abbott Medical Optics Inc.) currently meets ANSI standards for rotational stability, with 94% of eyes experiencing a rotation of 5° or less between the 3- and 6-month visits.³

CONCLUSION

The ANSI standard for toric IOLs was developed through a process of openness, balance, consensus, and due process. It functions as an important guideline for the evaluation of toric IOLs' safety and effectiveness.

Daniel H. Chang, MD, is in private practice at Empire Eye and Laser Center in Bakersfield, California. He is a consultant to Abbott Medical Optics Inc. Dr. Chang may be reached at (661) 325-3937; dchang@empireeyelandlaser.com.



1. Chang DF. Comparative rotational stability of single-piece open-loop acrylic and plate-haptic silicone toric intraocular lenses. *J Cataract Refract Surg.* 2008;34:1842-1847.

2. Acrysof Toric IOL [package insert]. Fort Worth, TX: Alcon Laboratories, Inc.; 2009.

3. Tecnis Toric IOL [package insert]. Santa Ana, CA: Abbott Medical Optics Inc.; 2013.

his or her spectacle independence and has no ocular pathology that will prevent optimal results, then I will recommend the Tecnis Multifocal (Abbott Medical Optics Inc.). Its fully diffractive posterior surface makes the optic less pupil dependent, which is especially important for mesopic reading conditions. In my experience, the Tecnis Multifocal's optics provide patients with very good near and distance vision across a range of lighting conditions.

When patients have relatively low but still visually significant astigmatism, I implant the multifocal IOL and perform limbal relaxing incisions to address the cylinder. I can confidently treat up to 2.00 D of astigmatism with this approach. When patients with greater than 2.00 D of astigmatism desire spectacle-free distance and near vision, I will still offer a Tecnis Multifocal lens, but I educate them about their expected suboptimal results in the immediate postoperative period (secondary to residual astigmatism) and their need for LASIK or PRK about 3 to 4 months postoperatively when their residual refractive error stabilizes. For many patients, this path is acceptable, because it can ultimately lead to spectacle-free near and distance vision for the rest of their lives once they reach postoperative month 4. To others (a minority), this course sounds too prolonged or involved. They opt for the toric IOL in order to obtain optimal spectacle-free distance vision right away, and they understand that they will remain dependent on reading glasses for the rest of their lives.

CONCLUSION

In my experience, for patients who are not ideal candidates for a multifocal lens and who have a visually significant amount of corneal astigmatism, the Tecnis Toric lens represents an option that will optimize their distance vision without spectacles in a precise and reproducible manner. ■

William K. Christian, MD, is in private practice at the Assil Eye Institute in Beverly Hills, California. He is a consultant to Abbott Medical Optics Inc. Dr. Christian may be reached at (310) 651-2300; willchristianmd@gmail.com.



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