

**TABLE 9-1. CURRENT FOOD AND DRUG ADMINISTRATION-APPROVED TORIC INTRAOCULAR LENSES**

LENS TYPE	DESIGN	CYLINDRICAL POWERS	NOTABLE FEATURES
STAAR Toric	Silicone plate haptic	+1.00, +1.50, +2.00, +2.75	Easy bi-directional rotation for intraoperative positioning. Two lengths available.
Alcon AcrySof IQ Toric	Single-piece acrylic	+1.50, +2.25, +3.00, +3.75, +4.50, +5.25, +6.00	Widest range of powers
Abbott Medical Optics Tecnis Toric	Single-piece acrylic	+1.00, +1.50, +2.25, +3.00, +4.00	Aspheric, frosted square-edge design
Bausch + Lomb Envista Toric	Single-piece acrylic	+1.25, +2.00, +2.75, +3.50, +4.25, +5.00, +5.75	Modified fenestrated C-loop haptics with step vaulted design. Glistening-free optic. Not available in the United States
Bausch + Lomb Trulign Toric	Accommodating silicone	+1.25, +2.00, +2.75	Only approved presbyopic toric lens at present

prospective study of 44 eyes implanted with the AcrySof Toric, the mean absolute postoperative rotation was 2.2 +/- 2.2 degrees, with 95% of eyes remaining within 5 degrees of the intended axis at the conclusion of the 3-month follow-up period. The wide range of powers allows surgeons to treat up to 4.11 D in the corneal plane with the highest power toric lens in the series.

### *Tecnis Toric*

The Tecnis Toric Lens (Abbott Medical Optics), a more recent addition to the menu of toric IOLs available in the United States, is a single-piece acrylic lens with aspheric optics. The lens has been deliberately designed to have 3-point fixation with the capsular bag (via the two 5-degree offset haptics and the vaulted posterior surface of the lens that adheres to the posterior capsule) to prevent lens epithelial growth and postoperative rotation. In clinical trials, the lens achieved 94% stability to within 5 degrees of the intended axis when measured 6 months postoperatively, with a mean absolute rotation of 2.74 degrees over the same period.

### *Trulign Toric*

Since the dawn of the refractive cataract surgery and RLE era, United States surgeons were forced to decide between lens-based astigmatism correction and presbyopia correction with corneal relaxing incisions. With the approval of the Trulign Toric IOL (Bausch + Lomb) in the United States in 2013, surgeons can now offer patients broader range of vision and astigmatism correction with one lens. The Trulign is based on the silicone hinged-haptic platform of the Crystalens accommodating IOL and is available in

toric powers that cover 90% of astigmatic patients. The broad contact between the unique haptic design and the capsular bag ensures rotational stability, but allows ease of exact placement intraoperatively. In clinical trials, 96% of patients retained rotational stability to within 5 degrees of the intended axis 6 months after surgery. The accommodating effect also has the added benefit of improved range of vision, especially at intermediate range. In clinical trials, 97.8% of patients could see 20/40 or better at distance and 70% had at least 20/40 uncorrected vision at near.<sup>7</sup>

## THE IMPORTANCE OF PRECISION ALIGNMENT AND SURGERY

Other chapters in this text have comprehensively reviewed the critical nature of, and available technologies for, preoperative biometric analysis of astigmatism prior to RLE. However, emphasis must be placed on accurate quantification of astigmatism and precision alignment of the toric IOL of choice to that intended axis. It is well known that a toric lens placed just 15 degrees off axis will result in a 45% reduction in astigmatism correction; a lens placed 30 degrees off axis provides virtually no astigmatism correction at all. It is entirely conceivable that cyclotorsion of an eye from upright to supine positioning could account for 15 to 20 degrees of error and the conventional ink marks can often span 10 degrees with diffusion of the ink. As such, several guidance systems have been developed to aid in more precise alignment of these lenses.

As discussed, guidance and imaging systems used pre- and intraoperatively can significantly improve accuracy