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Improved Refractive Outcomes With Toric IOLs

Measuring astigmatism and axis location with the Lenstar dual-zone keratometer allows for optimal implant placement.

As cataract surgeons continue to strive for excellent postoperative refractive results, the correction of corneal astigmatism remains one of the challenges in this pursuit.

Since the first reported implantation of a toric IOL in 1994,[1] lens' designs, preoperative assessment, and intraoperative techniques have evolved dramatically. Advanced optics have enhanced visual outcomes, and new IOL materials and designs have largely eliminated the issue of rotational stability. Furthermore, modern computer-guided implantation technologies like the SMI Surgery Guidance (SMI GmbH) and the ORA System (WaveTec Vision, Inc.) reduce the possibility of placement errors during implantation. The final step in achieving the best refractive results with toric IOLs is reliable and accurate preoperative measurement and planning.

DUAL-ZONE KERATOMETRY FOR BEST ASTIGMATISM AND AXIS MEASUREMENT

Two recent publications by Hill et al[2] and Gundersen et al[3] reported on the use of the unique dual-zone keratometry feature of the Lenstar LS 900 optical biometer (Haag-Streit AG) with toric IOLs. Both studies detailed superb refractive results.

The primary goal of these studies was to determine if Lenstar's dual-zone keratometry was equivalent to manual keratometry for identifying astigmatism. Although manual keratometry is the preferred method indicated by manufacturers of toric implants, the process is both time consuming and highly subjective. One of the critical findings in Hill et al was that the reported values for astigmatism and axis obtained with the Lenstar LS 900 were equivalent to manual keratometry.[2]

Lenstar dual-zone keratometry uses 32 measuring points arranged in two concentric rings of 1.65 and 2.30 mm in diameter, with each ring consisting of 16 LEDs. Every K reading recorded by the unit is a composite of the mean of four measurements, which produces a total of 128 measurement points. Haag-Streit recommends performing five scans so that the final keratometry is calculated based on a total of 640 measurement points.

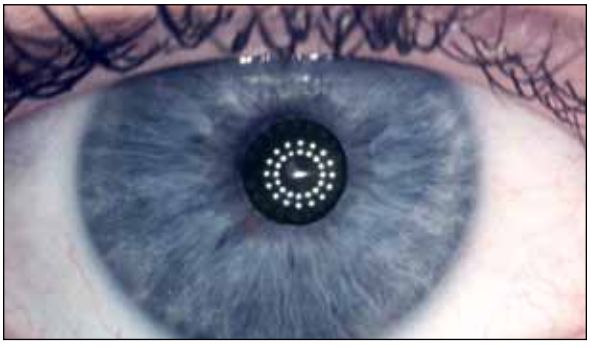
Wth 32 LED measuring points arranged in two concentric rings, Lenstar dual-zone keratometry provides the surgeon with a precise tool to plan toric IOL implantation.

The greatest distance that any meridian can be located from a measurement point is approximately 11º. This means that the Lenstar LS 900 yields K readings that are accurate and useful for determining steep and flat meridians as well as the difference in power between them. This aspect is crucial for success with toric IOLs.[4]

The multiple reflected points in the LS 900's dual-zone keratometry serve to determine the radii of the curvature of the cornea so as to find the best-fit ellipsoid. The results are then presented as radius corneal curvature in millimeters or in diopters. During the measurement process, the device's integrated EyeSuite software checks every image for the quality of marker point representation, and, if necessary, prompts the user on how to improve the measurement's quality. For example, in cases where the eye lashes or lids are interfering with or even blocking markers, the interface will suggest that the user ask the patient to open his or her eyes wide. Meanwhile, the Lenstar EyeSuite software tests the repeatability and plausibility of the measurements on the same eye as well as between the left and the right eye. As a final quality index, the Lenstar EyeSuite software also tallies the standard deviation of all measurements.

The Lenstar LS 900's high number of measurement points and the sophisticated quality-control algorithms combine to provide the user with stable and precise measurement of the corneal curvature for any IOL calculation. These qualities are especially useful

When surgeons perform the recommended five scans with the Lenstar LS 900, the final keratometry is based on 640 total measuring points, providing the most accurate calculation basis for astigmatism and axis measurement.



Dual-zone keratometry with the Lenstar LS 900 improves the refractive outcome by eliminating the variability caused by manual measurements.

in the context of toric IOLs, where knowing the axis location and the amount of astigmatism are crucial for clinical success.

CLINICAL EVIDENCE

Gundersen et al assessed 43 eyes for postoperative refractive error after toric implantation.[3] The same surgeon implanted all eyes with an AcrySof Toric IOL (Alcon Laboratories, Inc.), and all preoperative measurements were performed using Lenstar data only. In the tutorial for using the manufacturer's online toric calculator[5] and in the package insert,[6] it is suggested that manual keratometry be used to plan the surgery.

The study demonstrated that Lenstar K readings can be used to accurately predict toric IOL placement. Postoperative outcomes were equivalent to or better than those achieved when manual K readings are used to plan the procedure. More than 70% of the eyes in the study had a postoperative refractive astigmatism of 0.50 D or less, which compares favorably with the 63% achieved in the manufacturer-sponsored study submitted to the FDA for approval of the toric lens. The overall mean refractive astigmatism in the Gundersen study was -0.44 D. Additionally, the researchers reported that more than 60% of the eyes achieved 20/20 best uncorrected visual acuity[3] as compared to only 40% as reported in the package insert.

The Lenstar's dual-zone keratometry outperforms other automated optical biometry systems. In 2008, Mendicute et al,[7] using a different automated biometer, reported that 67% of eyes in a prospective observational study achieved 20/25 or better best uncorrected visual acuity after toric IOL implantation. In studies using Lenstar, this rate is 90% or better.[3]

Hill et al compared the residual astigmatism after IOL implantation based on Lenstar dual-zone keratometry versus manual K readings.[2] The investigators found no difference between results based on manual K readings and the simulation using Lenstar. To further improve the results, the study authors proposed validation criteria for the standard deviation of the axis and astigmatism measurements with the Lenstar. The proposed values for the standard deviation to achieve superior refractive results are ≤ 0.25 D for the K readings and ≤ 3.5° for the axis.

CONCLUSION

Peer-reviewed data demonstrate that the Lenstar's dual-zone keratometry provides the surgeon with a precise tool to plan toric IOL implantation. The refractive results are equivalent to or better than results obtained in studies using manual K readings, as per manufacturer recommendations, or when other optical biometers are used.

Dual-zone keratometry allows the surgeon to save time and increase patient comfort in the planning phase before toric IOL implantation. Only one measurement procedure is needed to obtain all the information necessary, and refractive outcomes are improved by eliminating the variability caused by manual measurements. ■

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