Biometry in Normal and Difficult Eyes

Clinical experience and case presentations. | KJELL GUNNAR GUNDERSEN, MD, PHD

Modern lens surgery is now considered to be a refractive procedure. Accurate biometry therefore is a prerequisite for good postoperative outcomes, both for normal and difficult eyes. In my clinical experience, swept-source anterior segment OCT (Figure 2) is the optimal way to achieve accurate and reproducible biometric measurements in all eyes.

NORMAL EYES

My colleagues and I are conducting a pilot study of 41 eyes of 21 patients to compare the ocular biometry measurements taken with two swept-source OCT devices, the ANTERION (Heidelberg Engineering) and Argos (Alcon), and the Lenstar LS 900 (Haag-Streit). At baseline, the mean age of patients in this ongoing study was 76.0 ±6.1 years (range, 62–91 years), the mean preoperative keratometry (K) was 43.70 ±1.95 D (range, 38.80–48.60 D), and the mean preoperative keratometric astigmatism was 0.95 ±0.57 D (range, 0.20–2.17 D). The mean IOL power implanted in eyes was 20.30 ±3.10 D (range, 12.50–24.50 D). A toric IOL was implanted in 78% of patients.

Thus far, we have analyzed our results from the 5- to 6-week follow-up visit. Mean uncorrected and corrected distance visual acuity were 0.07 ±0.1 (range, 0.5–1.2) and -0.02 ±0.05 (range, 0.9–1.5), respectively. The mean spherical equivalent was 0.21 ±0.35 (range, -0.63 to 0.88), and the mean postoperative cylinder was -0.52 ±0.34 (range, -1.75 to 0.00 D). About 40% and 63% of eyes were within ±0.25 and ±0.50 D of the target refraction, respectively.

Most impressively, the mean refractive prediction error (ie, the difference between the calculated and actual postoperative refractive error) with the Barrett True K formula was lowest on the ANTERION. The largest predictive errors, both arithmetic and absolute, were with the combination of Argos and Barrett True K, followed by the Lenstar and Barrett. This difference is not significant in such a small cohort. It is, however, a clear trend. We also looked at the results in eyes that received a low-powered toric IOL. Both the postoperative refractive cylinder and the uncorrected contrast sensitivity were significantly better with toric IOLs when swept-source OCT was used for optical biometry measurements.

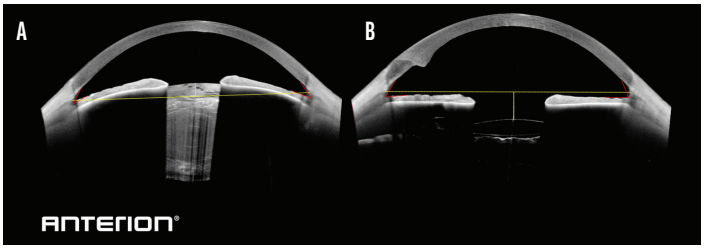

Figure 2. OCT images of an eye before (A) and after (B) cataract surgery, including selected measurement overlays for anterior chamber angle, spur-to-spur distance, and lens vault.

BIOMETRY IN DIFFICULT EYES

Some of the most difficult eyes to achieve accurate biometry for are post-LASIK eyes, short and long eyes, eyes with an irregular cornea (eg, keratoconus, prior corneal graft, and removed LASIK flap), and eyes with advanced cataracts. In these cases, a ray-tracing method can provide accurate measurements (for more on this topic, see the next article, "Ray Tracing for Post-LASIK Patients"). Below is a case example in which the OKULIX IOL calculation method was used.

A 63-year-old man presented with stable keratoconus OU. At the precataract evaluation, refraction was -4.00 -2.50 x 45° with a visual acuity of 0.7 OD and -1.25 -0.50 x 45° with a visual acuity of 0.6 OS. Mean preoperative keratometry was 41.85 and 46.32 D OD and OS, respectively, and there was 5.98 D astigmatism at 137° OD and 9.61 D @ 39° OS. The axial length in the eyes was 24.82 and 24.60 mm, respectively.

Using the data from the OKULIX software, a 15.00 D IOL with 7.50 D of toricity was implanted OD and a 14.00 D IOL with 10.00 D of toricity was implanted OS. The postoperative refraction was similar in both eyes, and at 5-weeks postoperative the patient reported never seeing better uncorrected in bright light and reading well with only simple plus lenses.

CONCLUSION

Optical biometry with the ANTERION is reliable both clinically and scientifically. Furthermore, this device has future potential to be used with epithelial mapping. ■

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