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REFRACTIVE SURGERY

Unexpected refractive surprises

by Michelle Dalton EyeWorld Contributing Writer

Using biometry to predict IOL powers can be incredibly helpful. But one clinician warns certain readings should have you question the suggestions

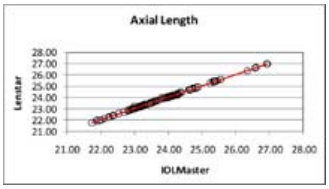

Figure 1: Scattergram showing high correlation in axial length between Lenstar and IOLMaster 500. Axial length mean difference was 0.02.
Source: Alice T. Epitropoulos, M.D.

Precise biometry is essential for accurate outcomes in cataract and refractive surgeries. Few would argue that the introduction of optical biometry and automated keratometry measurements has been a very important step in helping surgeons achieve more precise outcomes. Two of the devices on the market—the IOLMaster 500 (Carl Zeiss Meditec, Jena, Germany) and the Lenstar (Haag-Streit, Koeniz, Switzerland)—process data somewhat differently. The IOLMaster uses partial coherence interferometry and has been widely accepted into clinical practice. The Lenstar uses optical low-coherence reflectometry, which has been shown to have similar measurement results to partial coherence interferometry. Ultrasound biometry—still used in clinical practice—uses an echo delay to measure intraocular distances, and is five times less accurate than partial coherence interferometry, which uses a 780 nm laser diode to measure axial length. (The Lenstar uses an 820 nm super luminescent diode to measure axial length.) With today's emphasis on premium lenses, ensuring the correct axial length measurement (and, therefore, the correct IOL power) is essential, said Alice T. Epitropoulos, M.D., clinical assistant professor, The Ohio State University, Columbus, and in private practice, The Eye Center of Columbus. "Today, selecting the right IOL to meet individual patient expectations is more crucial than ever. Patients judge the quality of surgery by their refractive outcomes, and anything we can do to improve that is a win-win for the physician and the patient," she said. But like all technologies, optical biometry can still be challenging and no single device is perfect, she warned. "I still think there's a place for ultrasound, especially in those patients who have dense cataracts," she said. "Past literature has suggested that about 17-22% of all cataracts measured with the IOLMaster are not able to measure an axial length." To confirm, Dr. Epitropoulos compared the two biometers in their ability to acquire axial length. "In our study, the IOLMaster 500 was able to read 90% of the dense cataracts with posterior subcapsular cataract (PSC) grades between 4.0 and 4.9, and the Lenstar was able to read 60% of those same dense cataracts. Of the densest PSC cataracts, grade 5.0-5.9, IOLMaster 500 measured 67% compared to 48% with Lenstar," she said.

Out of the 125 eyes (63 patients), axial length measurements were comparable in terms of clinical accuracy with both devices (Figure 1). She did add that measurements could not be obtained on 16 eyes (13%) with the Lenstar device and eight eyes (6%) with the IOLMaster 500.

"Interestingly, however, one biometer was able to measure the axial length but was off by 2 diopters in reality in one of the subjects; the other biometer was unable to measure the axial length and recommended immersion biometry," she said.

Case study

In this patient, a 62-year-old white male, an initial cataract exam demonstrated dense, visually significant nuclear sclerotic and posterior subcapsular cataract. Optical biometry was obtained using the IOLMaster 500 (version 7.1 software) and the Lenstar. The axial length was unobtainable using the IOLMaster 500, which recommended "evaluation." "The Lenstar was able to successfully measure an axial length of 21.47 mm in this patient," Dr. Epitropoulos said. An immersion scan was obtained per study protocol and resulted in an axial length reading of 21.98 mm. Average Ks were identical between the two biometers (42.9 D).

"We opted to use the immersion ultrasound value for the IOL calculations recommending a 26.5 D implant targeting a plano goal," she said. "At one month the patient had a manifest refraction of –0.25 +0.50 x95." The Lenstar's recommendation was a 28.5 D IOL, "which would have resulted in a –2.00 myopic surprise," she said.

Dr. Epitropoulos believes the disparity between the two biometer readings "is likely due to different

mathematical approaches used by the two devices in generating the measurements," she said. "The IOLMaster 500 forms a composite based on software that automatically excludes inaccurate readings (digital signal processing), and the Lenstar device uses an arithmetic mean of measurements and includes outlier readings in its calculations."
The Lenstar and IOLMaster are "both major advances over what we've had in the past, and they help us get to our refractive target. Both devices are efficient and easy to use, but we still find that multiple measurements are often needed to achieve the best outcomes," she said.
As Wolfgang Haigis, M.D., once said, "Trust automatic measurements only after having made sure they can be trusted." Dr. Epitropoulos said, "In reality, we should always double check our measurements and make sure they make sense. There is still room for improvement in biometry, and as we get better at estimating effective lens position and developing intraoperative aberrometry, our final outcomes will become even more precise."

***Editors' note**: Dr. Epitropoulos is a consultant for Carl Zeiss Meditec, but has no personal financial interests related to her comments.*

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