

NEW BIOMETRY TOOLS

Aberrometers are becoming increasingly useful tools in the preoperative assessment of cataract patients

by Roibeard O'hEineachain in Milan

There is a growing range of biometry tools and instruments with innovative features designed to allow reliable IOL power calculation in a wide variety of patients, said Claudio Carbonara MD at the XXX Congress of the ESCRS.

"In the early 1980s we used only K readings and the axial length but now we have a lot of instruments. We have at least five or six new optical biometers, the aberrometers, the Pentacam and some new standalone software," said Dr Carbonara who is in private practice in Rome, Italy.

One of the most recent additions to the cataract surgeon's diagnostic armamentarium is the Nidek AL-Scan, a new optical biometer which comes with the option of customisation with a built-in ultrasound biometer and/or an ultrasound pachymeter.

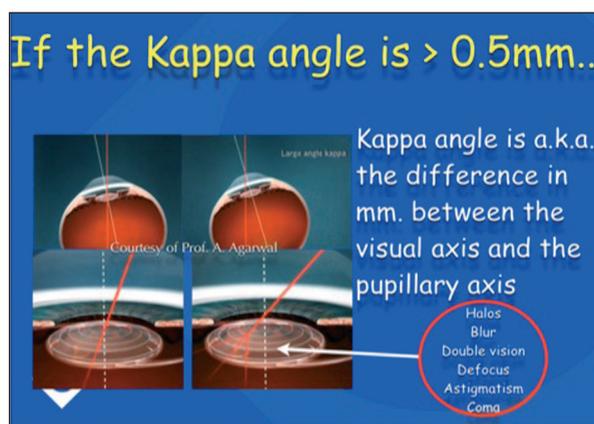
Dr Carbonara reported that the device is very fast. It performs six different types of measurements in 10 seconds, namely the axial length, the corneal curvature radius, anterior chamber depth, central corneal thickness, white-to-white distance and pupil size.

It also has a signal booster and a signal-to-noise ratio enhancer, which allows it to measure axial length even in eyes with very dense cataracts. For the densest cataracts it has the ultrasound option. Moreover, it has a measurement range of 14mm to 40mm, compared to the 32mm limit of the Lenstar. In addition, unlike the IOL master, its findings are little affected by poor tear film quality. It also has a digital protractor to help with the alignment of toric IOLs.

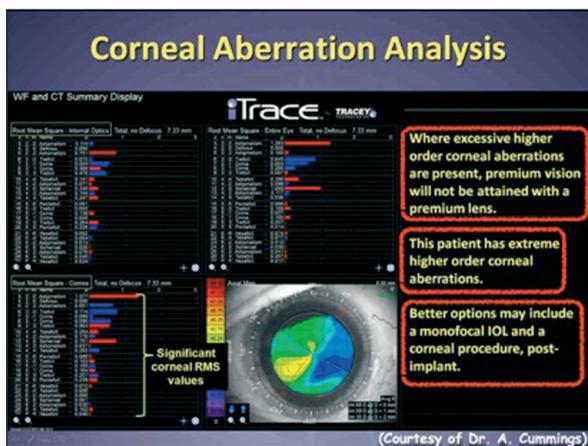
In a series of 109 eyes of 58 patients, including 12 eyes that had undergone previous refractive surgery for myopia or hyperopia, the instrument produced findings very similar to those of an IOLMaster, Dr Carbonara said. The average difference between the Nidek-AL Scan and the IOLMaster measurements was only 0.005mm for axial length with SD 0.039mm and 0.031 mm for anterior chamber depth with an SD of up to 0.125mm. In addition the average differences between the K readings were -0.027 D for the K1 with SD 0.408 D, and -0.180 D for the K2 with SD 0.295 D. The average difference between the axis of astigmatism was 1.524° with an SD of up to 74.316°, Dr Carbonara said.

Another new biometry tool is the Topcon Aladdin, which is an optical biometer and topography instrument. Of all its competitors it is the only one that includes a topographer. It provides complete corneal topography, pupillometry, corneal spherical aberration and axial length measurements in a few seconds: it must be said, however, that the latest version takes a bit more time than the previous one to obtain the same results, leaving the Nidek in first place as the fastest machine (it's also important to know that Nidek is NOT Windows-based, as opposed to the Topcon Aladdin, which is), he added.

The new device's keratoscope cone has 24 rings and it can measure axial lengths ranging from 15mm to 38mm. In addition, it has very user-friendly software; it includes the Oculentis formula for toric IOL calculation and includes the SRK/T, Holladay, Hoffer Q and the Haigis formula for the



Courtesy of Claudio Carbonara MD



(Courtesy of Dr. A. Cummings)

standard IOL power calculation, as well as the Camellin/Calossi formula for eyes that have undergone refractive surgery.

In a series of 99 eyes of 53 patients, including eight eyes that had undergone previous refractive surgery, the average difference between the Aladdin and the IOLMaster measurements was only 0.016mm for axial length with SD of 0.048mm and -0.028mm for anterior chamber depth with SD of 0.329mm; as for the K readings, the average differences were between 0.006 D and -0.104 D with SD 0.323 D for K1 and SD 0.301 D for K2. The average difference between the axis of astigmatism was -1.713° with SD of up to 51.042°, Dr Carbonara added.

New aberrometers Aberrometers are also becoming increasingly useful tools in the preoperative assessment of cataract patients. Among the newer devices is Nidek OPD scan, Dr Carbonara said. It combines aberrometry with a wide range of measurements, including topography, autorefractometry, keratometry and pupillometry. It also provides a measurement of the angle kappa, which is the difference expressed in millimetres between the visual axis and the pupillary axis.

"In a patient who has a high angle kappa, implanting a multifocal IOL will increase the risk of postoperative phenomena such as blur, astigmatism, double vision, defocus and coma."

The device provides a predefined clinical summary, depending on the procedure that the surgeon is planning to perform. For example, in the case of cataract surgeries the summary includes the refraction, topography, the pupil size, the pupil position, the degree of astigmatism, the higher order aberrations and the Kappa angle. If the surgeon needs to implant a Premium IOL it can be useful also to check the Wavefront summary and at the Optical Quality summary.

Another aberrometer that can prove useful in cataract surgery patients is the iTrace aberrometer (Tracey), which uses ray-tracing technology. The iTrace has a toric IOL calculator that makes its calculation based on the size and position of the incision and the type of IOL to be implanted. Another of its helpful features is its "Chang Analysis" software, which identifies the source and quantifies the magnitude of the aberrations.

"Knowing the amount of corneal aberrations helps determine whether or not a cataract patient is a good candidate for a premium IOL," Dr Carbonara commented.

New software Finally, there are many new types of standalone software programs, such as the Holladay IOL Consultant – Surgical Outcomes Assessment Program, which performs calculations for a wide range of clinical situations including toric IOLs, post refractive surgery eyes, silicone oil-filled eyes. Furthermore, it has a complete database of all types of IOL.

"This software has a fast and easy connection to both the IOLMaster and the H-S Lenstar LS 900. It extracts the complete patient and IOL information from the IOLMaster database. You have to remember that the IOLMaster does not make a complete backup of its database," Dr Carbonara said.

"If you click on the backup button of the IOLMaster it will back up only the patient and IOL data used for the personalisation of the constants. No other data are saved. Instead, if you extract the database using the HIC-SOAP software you will be able to access all the data in Excel format as well."

The Nidek IOLStation is another new suite of programs for IOL calculation. Developed by Nidek and Paolo Vinciguerra MD, it has the distinction of being the only software that provides calculations based on the residual spherical aberration desired, using topography and keratometry and internal eye measurements. It also provides a simulation of the quality of vision likely to be achieved postoperatively.

In addition, there is the Eye Pro software for the iPhone and iPad available online at the App Store. It provides IOL calculations using the SRK and Hoffer Q formulas as well as Double K formulas and the Borasio IOLMaster regression formula for eyes that have undergone previous refractive surgery. The software also includes the BESSt 2.0 formula, based on Pentacam measurements for patients who have undergone either refractive hyperopic or myopic surgery, and a lot of other useful features, such as a toric calculator, a toric misalignment calculator and a corneal-to-spectacle plane converter.

Dr Carbonara also recommended that cataract surgeons occasionally review what he considers to be the "Bible of Biometry" at www.doctor-hill.com, which provides thorough explanations regarding biometry instruments, IOL power calculation formulas and all the information needed to obtain perfect surgical and biometric results.