Mastering the IOLMaster

Sean Henahan
in Barcelona

WHILE the IOLMaster has become an indispensable tool for pre-operative assessment of cataract patients, it is important to understand its limitations, reported British researchers at the 8th ESCRS Winter Refractive Surgery meeting.

"Accurate and precise biometry is one of the key factors in obtaining a good refractive outcome after cataract surgery. An error of only 1.0 mm in axial length will results in a post-operative refractive error of three dioptres," noted consultant ophthalmologist Andrea Kerr MD.

She commented that the advent of the IOLMaster (Humphrey Zeiss), which uses partial coherence interferometry technology, has mostly eliminated operator error, and proven to be a boon for biometric assessment. But she cautioned that the IOLMaster is not accurate in certain eyes, such as those with very dense cataracts. Ultrasound biometry still has an important role to play in this regard.

Dr Kerr and colleagues at Northampton General Hospital in England compared the accuracy of measurements obtained with the Storz Compuscan A/B ultrasound biometry instrument and those obtained with the IOL Master. They compared axial length measurements and predicted intraocular lens implant power in 93 eyes of 93 patients undergoing preoperative assessment for cataract surgery.

Dr Kerr performed sutureless phacoemulsification, scleral tunnel incision, and in-the-bag IOL placement in all eyes. Patients received the Akreos fit foldable lens (Bausch and Lomb). Emmetropia was the target postoperative refraction in all eyes.

The researchers used the Hoffer Q and SRKT formulae to calculate emmetropia according to guidelines established by the Royal College of Ophthalmology. A single examiner performed subjective refractions on all eyes two weeks after surgery.

The axial length measurements obtained with the IOLMaster were significantly longer than with the Compuscan technique. Indeed, the IOLMaster axial length measurements were longer than the Compuscan measurements in 98% of cases. The mean deviation in axial lengths obtained by the two systems was 0.637 mm, with a range of deviation between –02.2 mm and +2.14 mm. The differences were highly statistically significant.

"The correlation value between the A scan and IOL Master was 0.17. This indicates that there is no linear relationship between the two machines. The mean error in axial length measurements was 0.55 mm. IOL implant power determined by the IOL Master compared to that suggested by the A scan showed a mean difference of +2.4D," Dr Kerr reported.

She noted that there was also a large discrepancy between the machines in terms of the power of the predicted intraocular lens. The difference ranged from –0.5 D to +6.0 D.

Subjective refractive measurements obtained post-operatively showed that 55% of the eyes were within 0.5 D of the spherical equivalent predicted by the IOLMaster and 80% were within one dioptre.

The current prospective clinical study confirms that the IOLMaster provides longer axial length measurements than the A scan Compuscan machine. Other research groups have reported this previously. In this study, the mean difference between the two axial lengths was 0.637 mm, a larger mean difference in axial length than quoted in previous studies. This might be attributable to refractive instability during the two-week post-operative period in which the measurements were taken.

Unlike the IOLMaster, A scan ultrasound biometry is a contact method and is operator dependent. Experience has shown that excessive corneal indentation compresses the eye, in the anterior-to-posterior direction. This produces an artificially short eye, producing the kind of myopic refractive results seen in this and earlier studies.

"Our study showed that this myopic error could have been as large as 3.68D in some cases, which would have resulted in an entirely unsatisfactory refractive outcome," Dr Kerr said.

She stressed that the inability to standardise corneal indentation is a major failing with applanation ultrasound biometry. The error associated with corneal indentation in applanation biometry is not predictable, as it depends in large part on the experience of the operator.

"Despite these failings, the contact method still has a place in current ophthalmic practice. The IOLMaster is unable to determine axial length in up to ten percent of cataract patients. This could include patients with dense cataracts or corneal opacification. In addition, patients with age-related macular degeneration or mental handicap might be unable to fixate, making them candidates for the A scan method."

The IOLMaster can measure axial length, corneal radii and anterior-chamber depth. The onboard software incorporates all operating processes from the measurement of the parameters to the computation of the IOL through the integrated biometric formulas and lens database. Because it is a non-contact technique local anaesthesia is not required and there and no risk of infection.

Dr Kerr told *EuroTimes* that in her clinic the A-scan still had an important place, noting that several of her senior nursing staff had gained considerable expertise with the ultrasound technique.

She noted that it was useful as a comparative tool for measuring the accuracy and consistency of the IOL master. It is also useful in difficult cases where the IOLMaster does not give a result and in difficult and uncooperative patients.

Dr Kerr emphasised the value of using computer database programmes for storing all pre-operative and post-operative biometry data. This greatly assists statistical analysis.

Over time, and with regular audit of post-operative refraction results, a nomogram can be obtained for each nurse/technician's A-scan results, which allow the correct lens to be chosen if the IOL Master cannot be used.

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