

Comparative study shows instrument discrepancies in K values

Cheryl Guttman
in Paris

KERATOMETRY data obtained with different instruments may not be interchangeable, a fact that has important implications for cataract surgeons with respect to both surgical planning and outcomes auditing, according to a study presented at the XXII Congress of the ESCRS by Rakesh Jayaswal FRCS(Ed) and Andrea Kerr FRCS(Ed).

“We use all three machines in our department in different situations pre- and postoperatively, and so we wanted to assess the comparability of their readings.”

Dr Jayaswal and his associates conducted a comparison of pre-operative keratometry readings obtained with partial coherence interferometry (IOLMaster), a handheld keratometer (Nidek KM500), and an autorefractor (Humphrey Acuitus 5015). They analysed data collected prospectively over a two-month period in a series of 122 eyes of 68 patients presenting for routine cataract surgery at the ophthalmology department of Northampton General Hospital.

“There is a small minority of patients who are evaluated with a portable, handheld instrument because they are unable to sit at the IOLMaster.”

Using the IOLMaster as the comparative reference standard, both the handheld keratometer and autorefractor were found to

significantly underestimate keratometry and significantly overestimate corneal astigmatism (delta K). However, there was good agreement between the instruments regarding the axis of astigmatism readings (axis of delta K).

“We use the IOLMaster to obtain keratometry measurements in the majority of patients who are undergoing cataract surgery. However, we use all three machines in our department in different

situations pre- and postoperatively, and so we wanted to assess the comparability of their readings,” said Dr Jayaswal FRCS(Ed).

“For example, there is a small minority of patients who are evaluated with a portable, handheld instrument because they are unable to sit at the IOLMaster. In addition, we often use a handheld autorefractor or the Humphrey autorefractor to obtain a rough estimate of the postoperative refraction, and those instruments also give a keratometry reading. As modern day medicine demands the regular audit of our results, we were looking for any discrepancy between the keratometry data obtained with various machines as it might alter our apparent outcomes in future audits.”

Keratometric power underestimated

The mean K values for the 122 eyes were 43.95 ± 0.86 D for the IOLMaster, 43.37 ± 0.77 D for the autorefractor, and 43.68 ± 0.84 D for the handheld keratometers. These differences were statistically significant, $p < 0.01$ versus the IOLMaster for both instruments.

“The handheld keratometer and the autorefractor

underestimated the overall keratometric power of the cornea by up to 0.58D. That difference is significant because use of the measurements from the former two instruments in the SRK-T formula for IOL estimation could alter the calculated IOL power by up to 0.5 D,” Dr Jayaswal said.

Values of mean corneal astigmatism, measured as delta K, were 1.08 ± 0.96 D for the IOLMaster and 1.19 ± 1.04 D ($p = 0.03$) for the autorefractor. The overestimation was even greater using the handheld instrument, which gave an average reading of 1.22 ± 0.96 D ($p = 0.02$).

“The overestimation of corneal astigmatism from measurements taken by the Nidek KM500 handheld autokeratometer can have two possible effects. First, it may cause us to overestimate the astigmatism and induce us to try limbal relaxing incisions at the time of surgery when they may not be needed. Second, if we use the postoperative measurements from this instrument in our analysis of our data when the IOLMaster was used for preoperative keratometric measurements, then it may give us an inaccurate measurement of the wound construction and incision effect on the corneal astigmatism,” Dr Jayaswal observed.

The comparisons of the axis of astigmatism showed overall average differences of less than three degrees in the readings obtained with the handheld keratometer and autorefractor when each was compared with the IOLMaster.

Whereas there was no significance between the instruments in axis determination, (and any of the three instruments could be used to determine where the LRI should be placed), it must be emphasised that there must be consistency in the use of instrumentation when assessing the magnitude of limbal relaxing incisions on pre-operative astigmatism with the post-operative outcome.

“That magnitude of difference is not clinically relevant, and so it appears we can use the data

Results

Keratometry	IOL Master	Autorefractor	Nidek KM 500
Average K	43.95 (0.86)	43.37 (0.77) $p < 0.01$	43.68 (0.84) $p < 0.01$
Delta K	1.08 (0.96)	1.19 (1.04) $p = 0.03$	1.22 (0.96) $p = 0.02$
Fs	43.13	42.55	42.59
Fc	1.31	1.28	1.65
Angle	138.27	137.08	135.72
Incompatibility Magnitude	0 (0)	1.6 (1.2)	1.69 (1.39)

confidently from any of the three instruments to place corneal or limbal relaxing

“We can use the data confidently from any of the three instruments to place corneal or limbal relaxing incisions for astigmatic corrective surgery,”

incisions for astigmatic corrective surgery,” said Dr Jayaswal.

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