Getting to grips with corneal power changes after PRK

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in Rome

THE IOLMaster (Carl Zeiss Meditec) has a sufficient level of precision to detect corneal power changes in patients who have undergone hyperopic photorefractive keratectomy (PRK), according to an Italian investigator who presented his results to the 9th Winter Refractive Surgery meeting of the ESCRS.

“When we want to calculate the IOL power in eyes that need to be implanted after cataract surgery it is vital to have a precise measurement of the anterior corneal power.”

In his prospective study, Nicola Rosa MD from the Department of Ophthalmology, University of Naples, set out to assess the reliability of the IOLMaster in measuring corneal power changes after hyperopic photorefractive keratectomy (PRK).

Dr Rosa noted the importance of obtaining accurate corneal power readings and warned that while detection methods had improved in recent years the technology should not be presumed to be foolproof.

“When we want to calculate the IOL power in eyes that need to be implanted after cataract surgery it is vital to have a precise measurement of the anterior corneal power. But we all know that after myopic PRK, all the methods that we normally use to measure the corneal power such as video-keratography, manual or automated keratometry, are not fully reliable,” he said.

Dr Rosa explained that this lack of precision typically translates in an overestimation of corneal power after performing myopic PRK.

“This means that when we proceed to calculate the IOL power, we will end up with an IOL power underestimation. The result is that after surgery most of these eyes will end up hyperopic and you can appreciate how difficult it is to be hyperopic for a pseudophakic patient,” he said.

Highlighting some of the technical features of the IOLMaster, Dr Rosa said that the system could calculate the anterior axial length, anterior chamber depth, white-to-white measurements as well as automated keratometry.

New formula improves accuracy of corneal power measurements

While acknowledging that the device is easy to use and enjoys a high level of accuracy, Dr Rosa cited his own recently published study that found that the IOLMaster consistently underestimated the corneal power change after myopic PRK to a clinically significant degree. In response to this deficiency, Dr Rosa and his team formulated a regression formula that factored this underestimation into the final corneal power calculation.

In the latest study, the corneal power of 28 consecutive eyes (11 male, 8 female; age range 18-55) that underwent hyperopic PRK treatment ranging from +1.0 D to +7.0 D was measured with the IOLMaster before and one, three and six months after surgery. The correlation among these data was tested with a Pearson correlation index.

Dr Rosa said that all treatments were performed using the Esiris Schwind excimer laser using the so-called crossing technique. All patients were treated postoperatively with antibiotic eye drops until re-epithelialisation and subsequently with preservative free steroid eye drops in tapering doses for one month, together with preservative free artificial tears.

The results after one month showed a slight overestimation in dioptric power at the corneal plane in patients that underwent a PRK for up to +3.0 D and an underestimation in cases that underwent PRK for more than +6.0 D. Dr Rosa noted that the underestimation was not clinically significant at this stage of the follow-up period.

However, after three and six months, the researchers reported a significant difference, with a clear-cut underestimation of the IOLMaster data compared to the actual refractive change.

“These data were tested with a Pearson correlation index. We concluded that the problem should not be so severe as happens in cases of myopic PRK. In cases of hyperopic PRK there is the risk of some myopic shift, which is not really a serious problem.”

However, after three and six months, the researchers reported a significant difference, with a clear-cut underestimation of the IOLMaster data compared to the actual refractive change.

“This means that after hyperopic PRK we have an underestimation of the corneal power change. So if we implant an eye with this measurement, we will have an IOL power overestimation and will end up with a patient with postoperative myopia,” said Dr Rosa.

Dr Rosa said that surgeons could also use an adapted regression formula as outlined in his myopic study if they wanted to obtain greater precision with their hyperopic PRK patients, but emphasised that the possibility of myopic shift was less clinically significant for hyperopic patients.

“We concluded that the problem should not be so severe as happens in cases of myopic PRK. In cases of hyperopic PRK there is the risk of some myopic shift, which is not really a serious problem. We can therefore avoid making difficult calculations or use the regression formula if we want our patients to be closer to emmetropia,” he said.

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