New software for calculating intraocular lens power using corneal topography and wavefront data and multiple power calculation formulae can reduce residual total spherical aberrations after cataract surgery. The system allows surgeons to more accurately determine IOL power, asphericity and axis alignment, particularly for patients with irregular corneas or who have undergone previous corneal refractive surgery, Paolo Vinciguerra MD, Milan, Italy, told an ESCRS-sponsored symposium at the American Academy of Ophthalmology (AAO) annual meeting.

Getting an accurate read on corneal power is particularly important for IOL selection, Dr Vinciguerra said. “If you explode an IOL formula you will find that K values are more important than anything.”

But K values can vary considerably in aberrated or post-refractive surgery eyes, and identifying the correct value to optimise post-implant vision can be especially challenging, he added.

Traditional keratometry determines corneal power by averaging K1 and K2 values derived from only four measurement points, two of which may not even be in the pupil area, particularly if the pupil is decentred or if the patient has a wide-angle cataract, Dr Vinciguerra noted. As a result, the corneal power at the pupil centre and the visual axis is not measured. In cases of wide pupils, the measurement also may not take into account the power change at the periphery.

For normal, regular corneas, the power differences may be negligible and this method works well, Dr Vinciguerra said. But in aberrated corneas the power differences can be substantial. For example, in post-refractive eyes treated for myopia, the traditional method misses the reduced power of the central cornea, leading to a selection of a too-powerful IOL and a hyperopic shift. The reverse is often true for eyes that have been treated for hyperopia.

The IOL-Station software, developed by Nidek in collaboration with Dr Vinciguerra, calculates corneal power more broadly and precisely. It determines an average corneal power based on 1,000 measurement points derived from topographical scans and biometric data, including pupil size and location. This enables differing corneal power at the pupil centre and visual axis, which are more important to visual outcomes, and across the entire pupil to be taken into account and appropriately weighted for proper IOL power selection, Dr Vinciguerra said.

The software offers several IOL calculation formulae, including Binkhorst, Holladay and Hoffer Q, and can average the results of multiple calculations. Using wavefront and biometric data, it allows calculation of total spherical aberrations and a target residual aberration, which enables matching lens asphericity and toricity to optimise outcomes.

The software generates simulated visual outcomes based on the asphericity of different lens designs, allowing patients to see how they will affect visual quality after surgery. The system also identifies pupil landmarks that can be used in surgery to align toric axes, and prints out guides for use in surgery. Data on axial length, anterior chamber depth, white-to-white measurements, lens hardness and intraocular pressure can be imported from compatible diagnostic and biometric devices or entered manually, and included in a surgical guide.

If you explode an IOL formula you will find that K values are more important than anything

Paolo Vinciguerra MD

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