The BAD may be better for detecting ectatic disease and its susceptibility

Roibeard O'hEineachain
in Barcelona

Dr Ambrósio illustrated with case studies of patients which demonstrated the increased sensitivity of the new technologies for detecting subclinical keratoconus in contralateral unoperated eyes of patients with unexplained LASIK ectasia, and other cases where it showed increased specificity in distinguishing cases of true ectasia from those with non-ectatic asymmetric bow-tie astigmatism with inferior steepening and those with normal thin corneas.

“The parameters of the Ambrósio Pachymetric Profiles are corneal thickness spatial profile and the percentage increase in thickness from the centre to the periphery (CTSP and PTI). They are based on the physiologic concept that the cornea is a meniscus, which is thinner in the centre and thicker in the periphery. The idea is to detect the thinnest point and calculate the rate of increase in thickness from this point outwards to the periphery,” Dr Ambrósio said.

The software analyses a range of factors and yields a value for the cornea’s degree of risk for ectasia. The values assessed include the deviations from the mean of the front and the back surface, the pachymetric progression, the thinnest point, and the displacement from the centre of the thinnest point. A sixth term is the final overall map reading taking each of the five parameters into account (Figure BAD).

The software also uses anterior and posterior corneal elevation data to detect irregularities relative to both a standard best-fit-sphere, calculated at a fixed optical zone of 8.0mm, and relative to an enhanced best-fit-sphere, also calculated for an optical zone of 8.0mm, but excluding a 3.5mm zone centred on the thinnest point of the cornea (enhanced reference surface) leaving out the central 3.5mm of elevation data. In eyes with keratoconus or related conditions the steepened cone can have the effect of steepening the best fit sphere, making the early stages of the condition less obvious. Eliminating the central cone from the BFS computation prevents the steepening of the best-fit sphere and increases its sensitivity, said Michael Belin MD, Tucson, Arizona PhD, Albany Medical Center, Albany, New York, who developed the enhanced best-fit sphere for the BAD display.

“The best analogy is a topographic map of the earth, where we use sea-level as a reference surface for elevation. If we were to use an average of all the elevation data, as we do in corneal topography, the reference surface would get higher and the mountains would get lower. By, in effect, eliminating the mountains from the best fit sphere calculation, we mimic sea level in our enhanced best-fit sphere, making the cones easier to see,” Dr Belin explained.

He noted that in Dr Salomão’s study the pachymetric profiles of topographically normal contralateral eyes of keratoconus patients on their own detected keratoconic abnormalities in 89 per cent of cases. Elevation based on the enhanced best-fit-sphere detected anterior abnormalities in 16 per cent and posterior abnormalities in 79 per cent, raising the overall finding of keratoconic abnormalities to 98 per cent.

“In almost every case Dr Ambrósio and I have looked at – and we are talking about databases of thousands – changes were either greater on the posterior surface or only present on the posterior surface so the posterior surface is a much more sensitive indicator than the anterior surface,” Dr Belin said.

renatoambrosiojr@terra.com.br
MWBelin@aol.com