Pentacam compares well with Orbscan

By Stefanie Petrou Binder MD

THE Pentacam rotating Scheimpflug camera (Oculus) appears to compare favourably to the Orbscan II scanning slit system (Bausch & Lomb) when used to measure posterior corneal surface topography, reported researchers at the 20th Congress of the DGI'I (Deutschsprachige Gesellschaft für Intraokularlinsen Implantation und refraktive Chirurgie).

"There are no reliability studies dedicated to the modalities used to measure the posterior corneal surface. Our comparison of corneal posterior surface measurements for reliability, ie, precision, showed significant differences between the topography maps made by these two different systems," said Dr Reuland, MD, Heidelberg University Eye Clinic, Heidelberg, Germany.

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Dr Reuland performed a prospective study on 63 eyes of 32 healthy, phakic patients (20 female and 12 male patients). She performed three consecutive measurements per eye with each of the two topography systems. The elevation of the corneal posterior surface was measured in relation to a solid sphere of 6.5mm from the apex, with like settings in both instruments.

She chose 16 data points, four in each direction from the apex at 1.0mm, 2.0mm, 3.0mm and 4.0mm from the apex (the 1.0-4.0mm zones) in each study eye, and calculated the intrasystem reliability for both the Pentacam and the Orbscan.

The average study participant's age was 31 years (ranging from 23 to 70 years). The mean spherical equivalent of the study cohort was -1 D, ranging from -6.0 to +2.0 D.

The average refraction measured by the Pentacam was -5.2 D while the Orbscan measured -6.4 D. Dr Reuland overlaid the resulting 3-D topography maps with a 16-point star grid, representing the 16 data points. She observed that the average of the 16 data point measurements resulted in positive horizontal values within the 0.5mm sphere with the Pentacam, while the average of the 16 Orbscan data points showed negative values in the vertical axis.

These both indicate astigmatism, Dr Reuland said.

Pentacam more reliable

Intrasystem reliability showed the difference between two consecutive measurements taken by the same machine. With the Pentacam, the results showed overall good reproducibility in all four zones, indicated by the relatively flat graph. The Orbscan was less reliable in the four zones. In the horizontal plane, the Orbscan measurements showed a zone with particularly low reproducibility, within the 2-3mm zone, she said.

Repeatability of corneal elevations was 1.3µm (1mm zone) and 7µm (4mm zone) for the Pentacam, and 5.1µm (1mm zone) and 9µm (4mm zone) for the Orbscan (p < 0.001).

Dr Reuland observed a nearly 20µm reduction in the upper lid of the posterior cornea in measurements made by both instruments, as expected.

"Box-and-whisker" statistical representations of both systems revealed that the Pentacam had better reproducibility (reliability) in each zone than the Orbscan.

Dr Reuland compared the shape of the cornea as measured by each instrument in three successive measurements, noting that the Pentacam offered good reliability in reproducing the overall corneal shape. She noted no difference in the shape of the posterior cornea in 97 per cent of cases. The Pentacam imaged two different posterior corneal shapes in one of 63 cases. The Pentacam imaged two different posterior corneal shapes in one of 63 cases and three different shapes in one of 63 cases.

Reproducibility was more limited with the Orbscan when comparing the overall mean elevation shape. Dr Reuland observed no difference in the shape of the cornea in 73 per cent of study eyes. By contrast, 27 per cent of the eyes revealed two differing shapes and two showed three varying shapes in three consecutive measurements.

When comparing topographic contours of the same eye imaged by the two different systems, Dr Reuland observed that 29 of 62 had the same shape representations while 33 of 62 were different.

Dr Reuland explained that the reproducibility of the rotating Scheimpflug system was a result of the measuring principle in which highly precise measurements are obtained through many repeated, mostly central, corneal measurements. The topographic analysis of both the corneal front and back surfaces is based on the true elevation measurement from limbus to limbus, she noted.

The rotating camera supplies anterior segment images in three dimensions. The centre of the cornea is measured very precisely because of this rotating imaging process, which takes less than two seconds and corrects for the slightest eye movements. By measuring 25,000 true elevation points the Scheimpflug system offers precise representation and repeatability, she emphasised.

With the Orbscan, by contrast, there are only two central measurements, she said. Also, contour resolution is much higher using the Scheimpflug system, making automatic detection easier.

Dr Reuland said that two light reflexes that appeared on the Orbscan images made correct measurements more difficult. In a 3-D representation showing

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