GLAUCOMA

IOP CONTROL
Goldmann under pressure as new tonometers come on stream

by Dermot McGrath in Paris

Goldmann Applanation Tonometer (GAT) has long been considered the gold standard for IOP measurement in glaucoma management, but that privileged status is under threat thanks to a new generation of tonometric devices on the market, according to a number of presentations at the World Glaucoma Congress.

“Goldmann tonometry provided repeatable measurements that were less dependent on scleral rigidity and therefore more accurate than the Schiotz tonometer that preceded it,” said Robert L. Stamper MD. “This allowed it to become the most commonly used tonometric technique in the world, and allowed comparability of readings.

However, as several studies have now shown, the accuracy of Goldmann tonometry is seriously affected by factors such as corneal thickness, irregularity of the cornea and high astigmatism,” he said.

Dr Stamper, professor of clinical ophthalmology at the University of California, San Francisco, US, said that it is important to bear in mind that tonometry has limited use as a diagnostic tool given that only about 25 per cent of the population with glaucoma actually have glaucoma. And false negatives are also frequent with somewhere per year actually developing glaucoma.

Goldmann tonometer’s accuracy including corneal thickness, corneal irregularity, astigmatism, excess or inadequate fluorescein, calibration errors, and observer bias, among others, he said.

Dynamic contour tonometry (PASCAL, Ziemer Group), which works on the basis of contour matching instead of applanation, represents an interesting alternative to GAT, said Dr Stamper.

“Dynamic contour tonometry is less dependent on corneal thickness than Goldmann devices and therefore provides more accurate readings in real-time. It can also calculate ophthalmic pulse amplitude, and no fluorescein is needed,” he said.

Dr Stamper said that studies conducted by Dr Kniest et and colleagues at the University of California have shown that dynamic contour tonometer readings are relatively independent of corneal thickness and provides the most accurate tonometric measurements in thin corneas. The device also provides accurate IOP in oedematous corneas, is relatively accurate after LASIK, and is also independent of corneal radius of curvature, he added.

The enhanced accuracy and precision of dynamic contour tonometry compared to Goldmann tonometry was also stressed in another recent study carried out by Aachal Kotecha et al at Moorfields Eye Hospital, the Pascal DCT showed excellent measurement precision and displayed better repeatability and reproducibility compared to the Goldmann tonometer and also the Ocular Response Analyzer (Reichert Ophthalmic Instruments), said Dr Garway-Heath.

Tests of another tonometric device, the Icare rebound tonometer (Icare Finland Oy), carried out by Martinez de la Casa et al, found that it tended to overestimate IOP compared with Goldmann tonometer tonometry. Another study by Nakamura et al also demonstrated that the Icare tonometer was also significantly more affected by corneal thickness than Goldmann tonometry. Summing up, Dr Garway-Heath said that overall Pascal DCT and ORA measurements are less affected than Goldmann tonometry by central corneal thickness, while I-care measurements are more affected than Goldmann by corneal thickness. With respect to reproducibility, Pascal DCT measurements are as repeatable as, and more reproducible than GAT IOP measurements, while the Ocular Response Analyzer IOP measurements are less repeatable and reproducible than Goldmann IOP measurements.