

Rotating Scheimpflug camera provides accurate corneal thickness measurements

Cheryl Guttman
in Rome

THE novel rotating Scheimpflug camera system (Pentacam, Oculus) is a valid method for measuring central corneal thickness in normal eyes, according to the results of a comparison study reported by Birgit Lackner MD, Medical University of Vienna, Austria, at the 9th ESCRS Winter Refractive Surgery Meeting.

The investigators measured central corneal thickness in healthy eyes using the rotating Scheimpflug camera, a scanning slit topographer (Orbscan, Orbtex), and ultrasound pachymetry (SP-2000, Tomey). They then calculated differences in central corneal thickness values measured with the Pentacam and Orbscan, and assessed the variability between measurements, between observers, and between the devices. Two independent observers measured each eye twice with each modality in random order.

The comparisons between instruments showed that there was better agreement in central corneal thickness values measured with the Pentacam and with ultrasound than between the Orbscan and ultrasound. In addition, intra- and inter-observer variability was lowest with the Pentacam. The limits of agreement for within- and between-observer effects were comparable for the Pentacam and the Orbscan, and within clinically acceptable error

levels, said Birgit Lackner MD.

“The Pentacam system is a relatively new diagnostic imaging tool that in a two-second, non-contact exam provides a comprehensive, three-dimensional scan of the anterior chamber. This technology has multiple applications, but we were interested in seeing how reliably it performed in measuring central corneal thickness, which is a very important measurement for planning keratorefractive procedures, diagnosing corneal pathology, and in the evaluation of eyes with elevated IOP,” she explained.

“Our results show that the Pentacam offers an acceptable method for evaluating corneal pachymetry. However, this device also has multiple other applications, and in particular we have found that the extremely sharp anterior segment images it generates are very useful for assessing intraocular anatomy.”

Acoustic correction factor

The Orbscan data were analysed with and without application of the acoustic correction factor (ACF), which has previously been suggested in the literature to compensate for the known systematic differences in measurements between these modalities. In addition, the data obtained with all instruments was analysed for inter- and intra-observer reproducibility.

Review of the central corneal thickness data showed that with very few exceptions, the Orbscan measured thicker than ultrasound while the corrected Orbscan values and the Pentacam values were thinner than those measured with ultrasound.

Evaluations of intra-observer variability showed the best agreement was achieved using the Pentacam followed by ultrasound pachymetry and then the Orbscan. For the Pentacam, more than 90% of the repeated measurement pairs carried out by a single observer agreed by ± 10 microns as compared to less than 80% for the Orbscan.

“A potential reason for the lower variability we observed with the Pentacam might be a better edge detection of the corneal anterior and posterior surfaces, which may explain the better reproducibility of the measurements obtained with the Pentacam,” commented Dr. Lackner.

Three-dimensional scan

The Pentacam system uses a rotating Scheimpflug camera and an ultra fast processor to obtain 50 slit images and provide a comprehensive, three-dimensional scan of the anterior chamber from the anterior surface of the cornea up to the posterior surface of the crystalline lens. The examination is comfortable, rapid, and accurate. It is a non-contact procedure and takes less than two seconds to complete. During the scan, fixation control is

achieved via a second camera focused on the pupil that monitors size and orientation; detected eye movements are corrected for automatically after the scan is completed.

The Pentacam system is a powerful, multifunctional tool for cornea and anterior chamber imaging that can be used in a broad range of clinical applications while offering the potential to overcome the shortcomings of existing technologies.

For example, it is now being used in LASIK screening for diagnosing corneal anomalies that would exclude patients from surgery. It is also proving to be a useful tool in the evaluation of patients seeking retreatment for determining if there is sufficient residual stromal tissue to allow a safe enhancement procedure. The optical and topographical analyses features of the Pentacam have been applied for the evaluation of corneal striae in post-LASIK eyes.

Researchers also report a number of applications for surgical planning and follow-up in cases of phakic IOL implantation. Anterior chamber depth, which is one of the criteria for selecting candidates for implantation of the iris-fixated Artisan phakic IOL, can be accurately measured with the Pentacam.

The Pentacam can also be used for characterising defects in the



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cornea after foreign body removal and keratoplasty quality. In addition, the Pentacam can be used in serial studies to evaluate the results of arcuate keratotomy performed to correct astigmatism during cataract surgery.

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