Perfect Pachymetry with Dual Scheimpflug Technology

Dual vs. Single Scheimpflug
The principal advantage of Dual Scheimpflug over Single Scheimpflug is the compensation of misalignment or decentration which can occur when performing pachymetry or measuring posterior heights. The GALILEI device employs 2 opposing Scheimpflug cameras, each rotating 180 degrees, which compensate for the effect of x–y decentration in the pachymetry measurement. With Dual Scheimpflug imaging, corresponding corneal thickness data from each view are simply averaged to compensate for unintentional misalignment which results in a corrected measurement value at the corresponding location (figure 1). The software interface allows the user to view the acquired Placido or Top View image and simultaneously acquired Scheimpflug images, either left or right. Averaging the corresponding thickness values reduces the deviation by a factor of ten without needing to correct for decentration (figure 2). The Dual Scheimpflug imaging principle is independent of inclined surfaces giving it the possibility to produce repeatable measurements without knowledge of the actual decentration of the slit from the apex. This is an important feature, particularly as eyes are always in motion.

Fig 1. A: In the centered instrument condition, the apparent slit images in both Scheimpflug views are identical. The slit light is perpendicular to the spherical surface, therefore the viewing angles for both cameras are equal. B: In the decentered condition, either left or right, the apparent slit images are no longer identical. The slit light is not perpendicular to the surface. Therefore, the apparent slit image is thicker in the left view and thinner in the right view, or vice versa, depending on the direction of decentration.

Fig 2. This graphic simulates the apparent thickness deviation of a spherical cornea with a thickness of 500 μm and a decentration of up to ±1 mm. The thickness deviations from the true value are represented in red and blue, as seen from the left view and from the right view, respectively.

Summary
- Dual Scheimpflug compensates for decentered eyes and delivers precise pachymetry data – even with the eye decentered.
- Simple averaging of the thicknesses in the two corresponding Scheimpflug views reduces error by a factor of 10 without the need for correcting the misalignment.
- Using Placido topography with Scheimpflug imaging improves the accuracy of the central anterior corneal curvature calculation.

References: