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**Program#/Poster#:** 1344/B440

**Abstract Title:** **Corneal Thickness Measurement With the ConfoScan 4 Confocal Microscope and Z-Ring Adapter, and the Tandem Scanning Confocal Microscope**

**Presentation Start/End Time:** Monday, May 01, 2006, 8:30 AM -10:15 AM

**Location:** Hall B/C

**Reviewing Code:** 198 imaging techniques - CO

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**Keywords:** 587 microscopy: confocal/tunneling, 474 cornea: clinical science, 542 imaging/image analysis: clinical

**Purpose:** We compared corneal thickness measured by using a ConfoScan 4 confocal microscope, a Tandem Scanning confocal microscope, and an ultrasonic pachymeter.

**Methods:** Thirty corneas of 15 volunteers were scanned twice (two passes each) with a ConfoScan 4 confocal microscope equipped with a z-ring adapter (Nidek, Greensboro, NC), and with a Tandem Scanning confocal microscope (Tandem Scanning Corporation, Reston, VA). Corneal thickness was determined from the distance between frames that contained the image of the epithelial surface and the endothelium. Distances measured by both instruments were calibrated from scans of a set of PMMA contact lenses with known thickness between 400  $\mu\text{m}$  and 650  $\mu\text{m}$ . Corneal thickness was also measured by using ultrasonic pachymetry (DGH Technologies, Inc., Exton, PA). Mean corneal thicknesses of two scans were compared between methods by using Generalized Estimating Equation models.

**Results:** Corneal thickness measured by using the ConfoScan 4 ( $537 \pm 63 \mu\text{m}$ ; mean  $\pm$  SD) was not significantly different from thickness measured by using the Tandem Scanning confocal microscope ( $529 \pm 35 \mu\text{m}$ ;  $p > 0.35$ ). The minimum detectable difference was 19  $\mu\text{m}$  ( $\alpha = 0.05$ ,  $\beta = 0.2$ , paired t-test). Both confocal microscopes indicated thinner corneas than ultrasonic pachymetry did ( $562 \pm 35 \mu\text{m}$ ;  $p = 0.002$ , ConfoScan 4;  $p < 0.001$ , Tandem). The mean difference between the first and second scans with the ConfoScan 4 was  $-4 \pm 44 \mu\text{m}$  while the mean difference between the first and second scans with the Tandem Scanning microscope was  $0 \pm 15 \mu\text{m}$  (difference in standard deviations:  $p < 0.001$ , F-distribution).

**Conclusions:** Mean corneal thickness measured by using the z-ring adapter with the ConfoScan 4 agrees with mean corneal thickness measured by using the Tandem Scanning confocal microscope when both instruments are properly calibrated. Both confocal microscopes indicate mean thicknesses that are approximately 29  $\mu\text{m}$  less than those indicated by ultrasonic pachymetry. Precision of individual scans is lower with the ConfoScan 4 than with the Tandem Scanning microscope, as manifest by the higher standard deviation of differences between repeat measurements of the same corneas.

**Commercial Relationship:** **J.W. McLaren**, None; **C.B. Nau**, None; **S.V. Patel**, None; **W.M. Bourne**, None.

**Support:** NIH Grant EY02037, Research to Prevent Blindness, Inc., and Mayo Foundation

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