

## **LASER SPECKLE MEASUREMENTS OF RETINAL BLOOD VELOCITY**

Nee-Yin Chou, Leonard Winchester, and Ali Mohammed  
CW Optics, Inc., Yorktown, VA.

**Background and Objectives:** Changes in retinal hemodynamics provide important information on serious pathologies such as macular degeneration and diabetic retinopathy. The laser speckle imaging method was used to obtain retinal blood velocities of 30 subjects. The objectives are to develop a normative database and evaluate measurement reproducibility.

**Study Design/Materials and Methods:** A nonmydriatic camera was modified for laser speckle imaging. Design changes include the replacement of the flashlamp with a 630-nm, cw diode laser, addition of a shutter for blocking the laser radiation during alignment, use of white LEDs for focusing, and image acquisition using a CCD camera. The test eye was dilated and baseline retinal blood velocities were measured to establish inter- and intra-operator reproducibility. The measurements were repeated after the subject had breathed pure oxygen for five minutes.

**Results:** The measurements were conducted at Scheie Eye Institute (UPenn) and were concluded in late January, 2007. Preliminary analysis reveals that blood velocity is about 0.3 to 0.8 cm/s, 1.4 cm/s, and 2.7 cm/s in retinal capillaries, veins, and arteries, respectively. The reproducibility of intra- and inter-operator measurements is about 95% and 94%, respectively. Blood velocity for subjects breathing pure oxygen was reduced by approximately 5% and 13% in retinal veins and arteries, respectively.

**Conclusion:** The laser speckle imaging technique is a powerful tool for noninvasive, qualitative measurements of retinal blood velocities.