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Retinal Measurements with 3D-OCT

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PURPOSE
The improved data acquisition speed and axial resolution of Fourier domain OCT (FD OCT) devices enable comprehensive 3D retinal reconstructions (3DOCT) and feature delineation. The goal of this study is to analyze differences between conventional OCT images and 3D-OCT data and to compare results from an automated OCT analysis engine (OCTANE) to those from trained reading center graders.

METHODS
An investigational FD OCT device integrated into a nonmydriatic fundus camera (Topcon, Japan) was used to collect 3D-OCT data from normal subjects and patients undergoing conventional OCT. Two reading center graders used custom software to outline the inner and outer retinal boundaries in all normal 3D-OCT scans with a computer mouse. Results were compared with kappa coefficients to determine intergrader variability. Retinal boundaries from their evaluations were used as the gold standard for comparison to results from an automated 3D-OCT analysis system called OCTANE. Results from this analysis in patients with retinal disease were compared to results from conventional OCT.

RESULTS
3D-OCT data were collected from 20 eyes of 10 normal subjects and 10 eyes of patients with retinal diseases including central serous chorioretinopathy (CSCR), diabetic macular edema (DME) and age-related macular degeneration (AMD). Intergrader agreement for reading center assessments of all points in the 3D-OCT scans was excellent with an average difference between graders of less than 6 microns (the resolution of the FD OCT machine). OCTANE retinal thickness measurements correlated well with reading center measurements ($p<.001$). On average, the position of the inner and outer retinal boundaries determined by OCTANE deviated less than 10 microns from the reading center standard. Findings present on 3D-OCT that were not evident with conventional OCT include a small PED in CSCR, numerous soft drusen in AMD (Figure 1), and many intraretinal features in DME.

CONCLUSION
3D-OCT may detect disease features that are not evident using conventional OCT. OCTANE analysis of 3D-OCT data provides an accurate measure of retinal thickness in normal patients when compared to a reading center gold standard. The increased speed and segmentation accuracy of 3D-OCT with OCTANE may be useful in the detection of clinically-relevant features in patients with retinal diseases.