Choroidal thickness derived from full-volume segmentation: Comparison of SD-OCT using Enhanced Depth Imaging versus 1050nm swept source OCT

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Background

Two main approaches are available to image the choroid and adjacent deep structures with optical coherence tomography (OCT):

1) “Enhanced depth imaging” (EDI) by positioning the zero delay line close to the choroidal border;

2) Use of a longer wavelength lightsource.

The aim of this study was to compare these two techniques by subfoveal and global choroidal thickness measurements in healthy volunteers using EDI in spectral-domain (SD-) OCT and long-wavelength swept-source (SS)-OCT.

Methods

Healthy subjects were imaged within one hour with both spectral-domain (SD)-OCT (Spectralis OCT, Heidelberg Engineering) with a light source of 840nm wavelength, and swept-source (SS)-OCT (DRI OCT-1, Topcon) with a light source of 1050nm wavelength.

Scanning patterns of 6mm by 6mm area with 97 B-scans (Spectralis, Heidelberg Engineering) using EDI mode and automated real-time averaging at 50 frames, and 256 B-scans (DRI OCT-1, Topcon) using single frames were employed. The retinal pigment epithelium (RPE)-Bruch’s membrane complex was automatically segmented using the Iowa Reference Algorithm. Masked readers manually segmented the choroidal-scleral interface in all B-scans.

The distance between these two segmentation lines was compared globally (mean) and at the position of the fovea between the two devices.

Results

23 eyes of 12 subjects with a mean ± standard deviation (SD) age of 23.8 ± 1.8 were included.

Mean choroidal thickness (CT) was 340.4 µm ± 62.13 µm (range, 142.9 – 478.3) with Spectralis OCT and 324.95 µm ± 62.68 µm (range, 129.4 – 455.4) with DRI OCT-1. The intraclass correlation coefficient (ICC) was 0.966 (p<0.001).

Mean subfoveal CT was 363.3 µm ± 51.76 µm (range, 251.7 – 433.7) with Spectralis OCT and 345.6 µm ± 53.5 µm (range, 231.4 – 431.6) with DRI OCT-1. ICC was 0.925 (p<0.001).

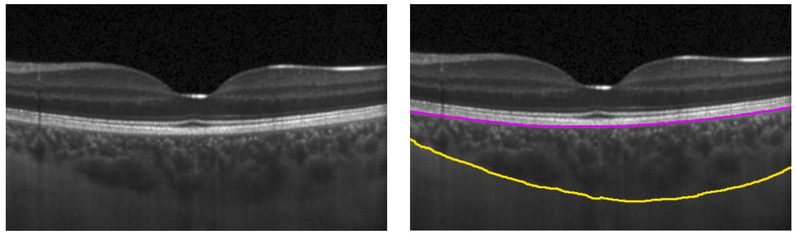

Fig. 1: B-scan of Spectralis OCT before and after segmentation

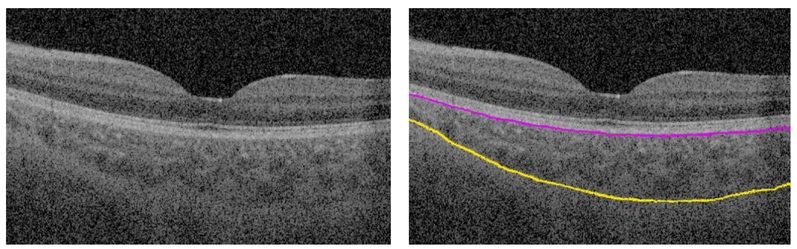

Fig. 2: B-scan of DRI OCT-1 before and after segmentation

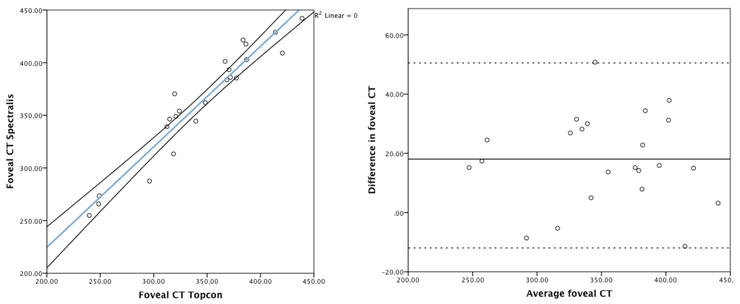

Fig. 3: Correlation and Bland-Altman plots for mean CT.

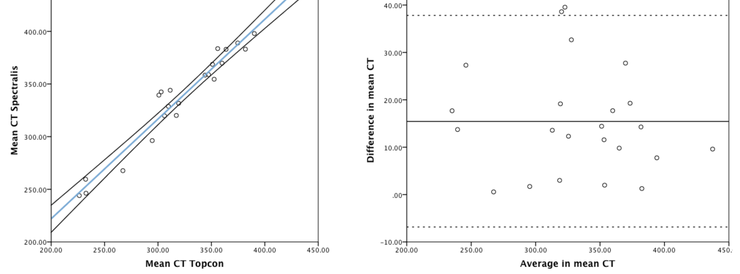

Fig. 4: Correlation and Bland-Altman plots for foveal CT.

Conclusion

Excellent reproducibility was demonstrated for manual CT measurement between SD-OCT using EDI mode and SS-OCT with 1050nm wavelength, with approximately 5% thinner values in DRI-OCT.

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