

Comparison of vessel density and vessel perfusion measurements in SD-OCT and SS-OCT devices



Thomas Callan, OD¹; Luis de Sisternes, PhD¹; Warren Lewis, MS²; Sophie Bonnin, MD³; Torcato Santos, BSc⁴; José G. Cunha-Vaz, MD, PhD⁴; Sophie Kubach, MS¹

¹Carl Zeiss Meditec, Inc., Dublin, CA, USA; ²Bayside Photonics, Inc., Yellow Springs, OH, USA; ³Université de Paris AP-HP Nord, Lariboisière & Saint Louis Hospitals, Paris, France;

⁴AIBILI – Association for Innovation and Biomedical Research on Light and Image, Coimbra, Portugal

Poster #2949 – F0102

PURPOSE

Optical coherence tomography angiography (OCTA) has expanded the ability to detect and monitor retinal vascular changes. Both vascular density (VD) and perfusion density (PD) are vascular parameters that can be quantified from OCTA en face images. This study looks at these two parameters and compares the results generated by both a spectral domain (SD) and a swept-source (SS) OCT system.

METHODS

- Subjects were scanned multiple times with the PLEX[®] Elite 9000 (ZEISS, Dublin, CA) SS-OCT device and the CIRRUS[™] HD-OCT 5000 (ZEISS, Dublin, CA), a spectral domain OCT.
- Three groups of eyes were evaluated and pooled in this study comprising 41 eyes total:
 - 30 diseased eyes of 15 patients with varying diabetic retinopathy severity were imaged on PLEX Elite with the Angio 6x6 mm at 100 kHz scan and on CIRRUS using the 3x3 mm Angiography scan.
 - 6 healthy eyes were imaged 3 times on PLEX Elite and on CIRRUS.
 - 5 diseased eyes were imaged 3 times on PLEX Elite and on CIRRUS.
- Vessel Density** is defined as the total length of perfused vasculature per unit area in a region of measurement.
- Perfusion Density** is defined as the total area of perfused vasculature per unit area in a region of measurement.
- The inner ETDRS sectors (1-5) that these scans have in common were used for comparison (Fig. 1).
- The intra-device coefficient of variation (COV), defined as the ratio of the standard deviation to the mean, was calculated for each device. In addition, the relative mean difference in measurement between the 2 devices was determined.

CONCLUSIONS

The relative differences in measurement between PLEX Elite and CIRRUS for vessel density and perfusion density are much smaller than the intra-device variability. This indicates the measurement between the SS-OCT and SD-OCT devices can be deemed substantially similar when comparing these OCT vascular parameters.

Email: tom.callan@zeiss.com

Disclosures: TC (E), SK (E), LdS (E), WL (C), SB (C), JC-V (C, F): Carl Zeiss Meditec, Inc.



RESULTS

Data analysis of these combined cohorts of repeated scans (Fig. 2) showed a similar intra-device coefficient of variation between PLEX Elite and CIRRUS.

- The COV for vessel density was 3.4% for PLEX Elite and 4.7% for CIRRUS.
- The COV for perfusion density was 3.8% for PLEX Elite and 5.4% for CIRRUS.
- The relative mean difference in vessel density between CIRRUS and PLEX Elite was 0.02%.
- The relative mean difference in perfusion density between CIRRUS and PLEX Elite was 1.3%.

Both values are smaller than the combined intra-device COVs for the two quantities.

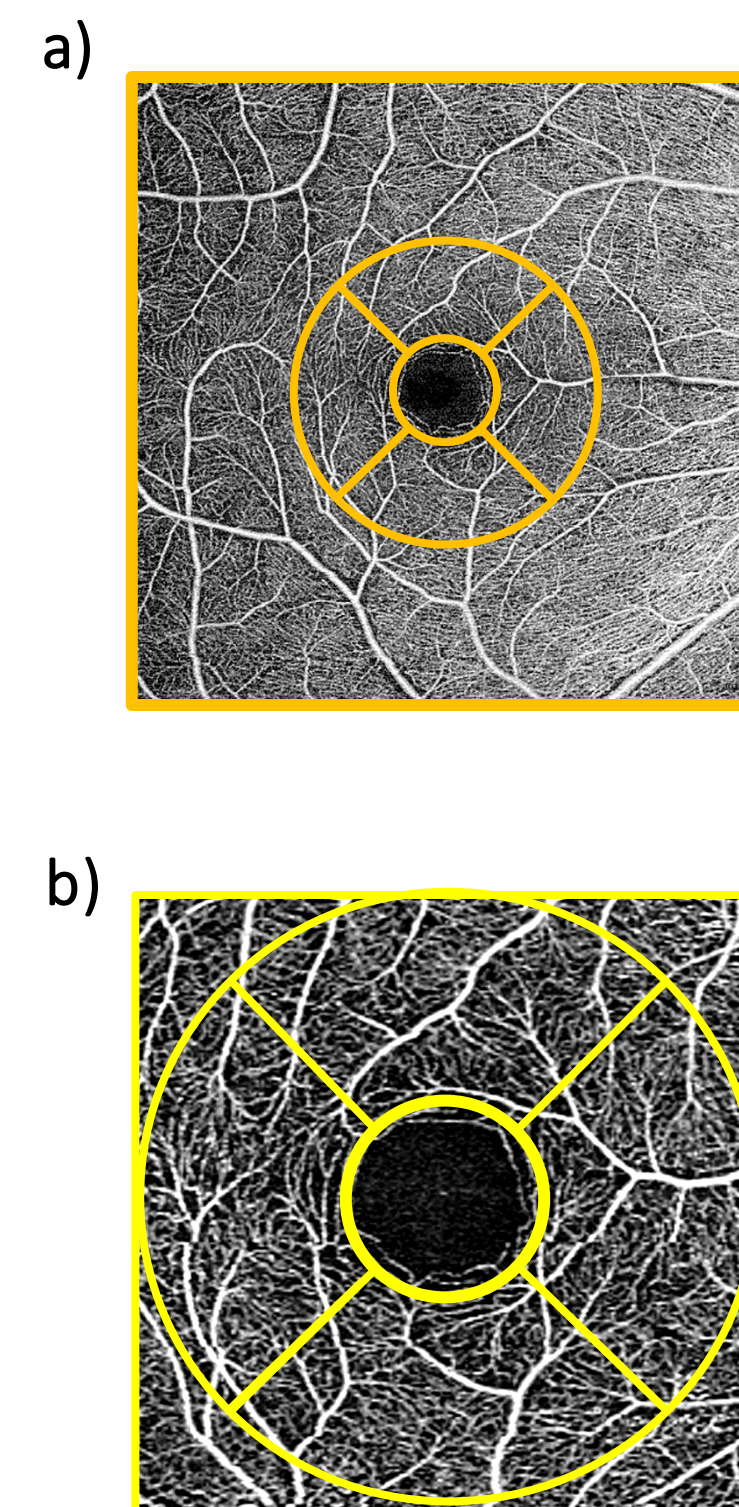


Figure 1: a) PLEX Elite Angio 6x6 mm superficial en face image and b) CIRRUS 3x3 Angiography image with ETDRS grids.

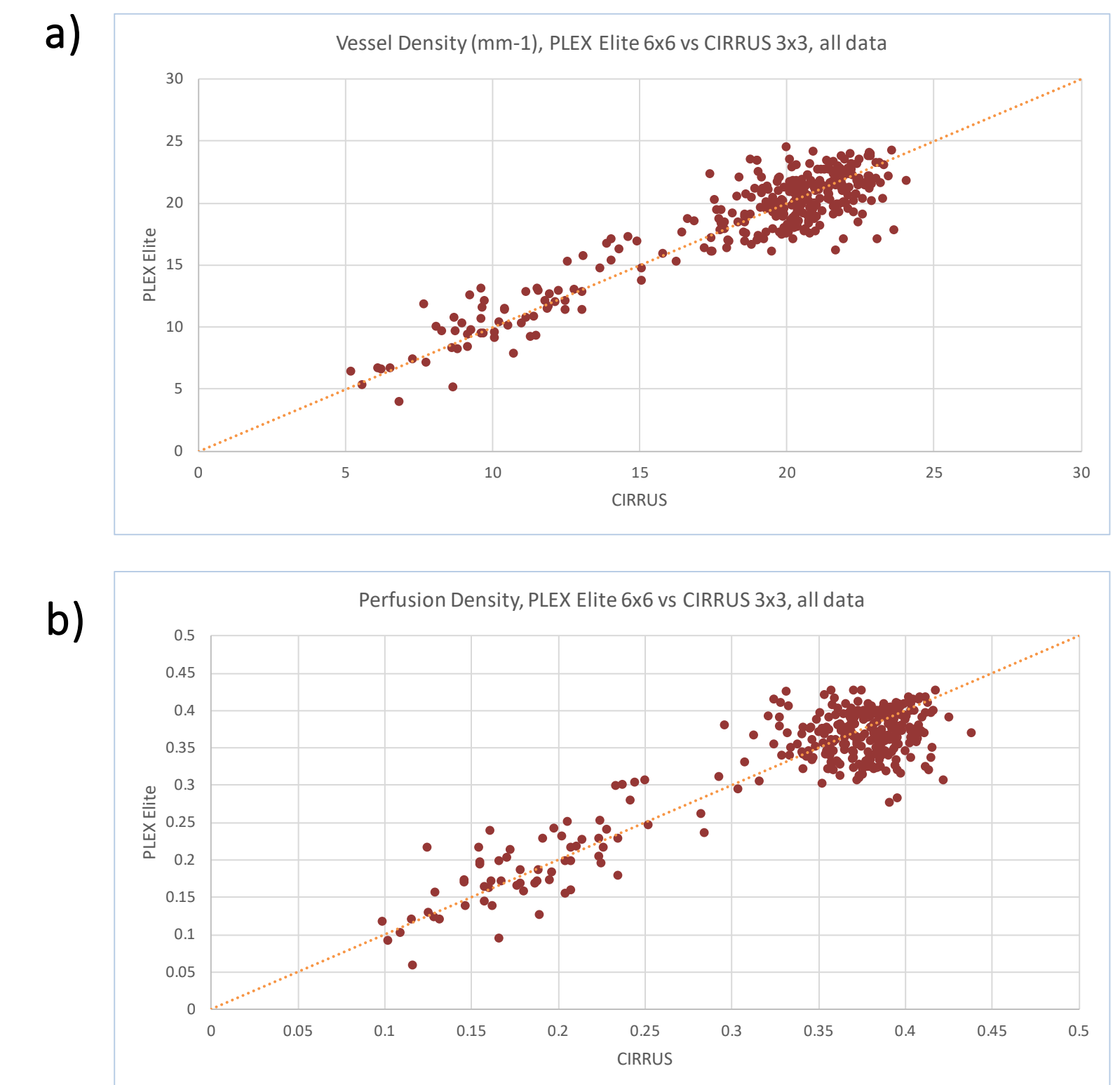


Figure 2: Plots showing similar values between PLEX Elite and CIRRUS for a) VD and b) PD. Each point indicates a measured value from one of the ETDRS sectors (1-5).