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Reproducibility of vessel density, fractal dimension and foveal avascular zone using 7 different optical coherence tomography angiography devices

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Abstract

Purpose: To evaluate the reproducibility of parafoveal microvascular anatomy of 7 different optical coherence tomography angiography (OCT-A) devices by comparing vessels density (VD), fractal dimension (FD) and foveal avascular zone (FAZ) of superficial and deep capillary plexus in healthy volunteers.

Design: Reliability analysis.

Methods: Consecutive healthy volunteers presenting at the Eye Clinic, Department of Biomedical and Clinical Sciences, Luigi Sacco Hospital, University of Milan in the same clinic visit were imaged by 7 different OCT-A devices: Optovue RTVue XR Avanti (Optovue, Inc, Fremont, CA), prototype Spectralis OCT-A (Spectralis Heidelberg Engineering, Heidelberg, Germany), AngioPlex (Cirrus 5000 HD-OCT, Carl Zeiss Meditec, Inc), prototype PlexElite (Carl Zeiss Meditec, Dublin, CA), RS-3000 Advance (Nidek, Gamagori, Japan), OCT-HS100 (Canon, Tokyo, Japan) and Revo NX (Optopol technology SA, Zawiercie, Poland). OCT-A examinations were performed using a 3 mm x 3 mm volume scan pattern centered on the fovea. Mean VD, FD and FAZ values between the instruments were compared.

Results: The 7 different devices presented measurements with different mean values, with only a limited number of comparisons not significantly different between the instruments. Moreover, Bland-Altman analysis revealed that the limits of agreement for all the comparisons were not acceptable. Regression analysis was used in the development of tables to compare various devices, despite large standard errors were found for both intercepts and slope conversion values.

Conclusions: Our results suggest that the comparison between instruments is nearly impossible and the set of measurements from the various instruments are not interchangeable about VD, FD and FAZ for both the superficial and deep capillary plexus.