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Analysis of choriocapillaris meshwork morphology with OCT angiography at 1.7 MHz imaging rate

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Introduction: OCT Angiography (OCTA) has been successfully used for imaging of the retinal, peri-papillary and optic nerve head vascular capillary networks. Several methods have been introduced for quantification of their morphology. OCTA imaging of the choriocapillaris down to individual vessels has been achieved in the periphery of the eye fundus. Visualization of sub-foveal choriocapillaris and its morphometric analysis was achieved with adaptive optics OCT systems. We have developed a swept-source OCTA setup enabling choriocapillaris meshwork visualization in the macula.

Purpose: Our purpose is to develop methods for its quantitative analysis. We have defined two metrics: mean vessel density and flow fill factor, and evaluated how various OCTA imaging factors influence their values?

Methods: OCTA imaging was performed with a swept-source OCT system operating at 1.7 MHz A-scan rate and emitting light at 1065 nm. Choriocapillaris imaging was performed in a healthy volunteer, at three locations in the eye fundus: fovea, 3.5° and 7° nasal from the fovea, spanning a 4° field of view. Fifty datasets were acquired at each location. OCTA images were obtained using a cmOCA method.

Results: Examples of choriocapillaris imaging will be demonstrated in two healthy volunteers and three subjects with age-related macular degeneration. Evaluation of metrics characterizing the vascular meshwork will be demonstrated in data from one volunteer. We will show how motion artifacts, B-scan repeats and averaging of choriocapillaris images influence the values of metrics?

Conclusions: Imaging of choriocapillaris meshwork down to individual vessels can be achieved with high speed OCT systems without application of adaptive optics techniques. Mean vessel density can be calculated from spatial power spectrum of OCTA images generated from three B scan repeats. However, the performance of quantitative methods relying on image analysis (e.g. estimation of flow fill factor) increases with decreasing noise, which can be achieved with averaging of multiple En face images.

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