

Analysis of the retinal and choroidal vasculature using ultra-widefield fundus imaging in mild cognitive impairment and normal cognition

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Abstract

Purpose: To utilize ultra-widefield (UWF) imaging to evaluate retinal and choroidal vasculature and structure in individuals with mild cognitive impairment (MCI) compared to controls with normal cognition.

Design: Prospective cross-sectional study

Participants: One hundred thirty-one eyes of 82 MCI patients and 231 eyes of 133 cognitively normal participants from the Eye Multimodal Imaging in Neurodegenerative Disease (iMIND) Study.

Methods: A scanning laser ophthalmoscope (SLO) (*California*, Optos Inc, Marlborough, MA) was used to obtain UWF fundus color images. Images were analyzed with the Vasculature Assessment Platform for Images of the Retina UWF (VAMPIRE-UWF 2.0, Universities of Edinburgh and Dundee, United Kingdom) software.

Main outcome measures: Imaging parameters included vessel width gradient, vessel width intercept, large vessel choroidal vascular density, vessel tortuosity, and vessel fractal dimension.

Results: Both retinal artery and vein width gradients were less negative in MCI patients compared to controls, demonstrating decreased rates of vessel thinning at the periphery ($p < 0.001$, $p = 0.027$). Retinal artery and vein width intercepts, a metric that extrapolates the width of vessel at the center of the optic disc, were smaller in MCI patients compared to controls ($p < 0.001$, $p = 0.017$). The large vessel choroidal vascular density, which quantifies the vascular area versus total choroidal area, was greater in MCI patients compared to controls ($p = 0.025$).

Conclusions: When compared to controls with normal cognition, MCI patients had thinner retinal vasculature manifested in both the retinal arteries and in the veins. In MCI, these thinner arteries and veins attenuated at a lower rate when traveling towards the periphery. MCI patients also had increased choroidal vascular density.