

Retinal microvascular changes are associated with amyloid burden and white matter damage in Alzheimer's Disease

INTRODUCTION: Retinal microvascular changes may reflect cerebral pathology in Alzheimer's disease (AD), but their relationships with plasma biomarkers and neuroimaging remain underexplored.

METHODS: In this cross-sectional study, 55 AD and 55 controls underwent retinal imaging (color fundus photography [CFP] and optical coherence tomography angiography [OCTA]), brain MRI, amyloid PET, and plasma biomarker analysis. Associations between retinal metrics, plasma biomarkers ($A\beta_{42}/40$, p-tau181, p-tau217, GFAP), neuroimaging (SUVR, centiloid, peak-width of skeletonized mean diffusivity (PSMD), White matter (WM)-free water), and cognitive performance were assessed.

RESULTS: Retinal changes in AD correlated with elevated amyloid (centiloid and SUVR, $p < 0.05$), plasma biomarkers (p-tau 181, p-tau 217, p-tau 217/ $A\beta_{42}$), white matter damage (PSMD and WM-free water, $p < 0.01$), and poorer cognition ($p < 0.001$). Mediation analysis revealed centiloid and WM-free water partially mediated the retinal-cognitive relationship.

CONCLUSIONS: Retinal microvascular alterations are linked to AD pathology and cognitive decline, supporting their potential as non-invasive biomarkers.