

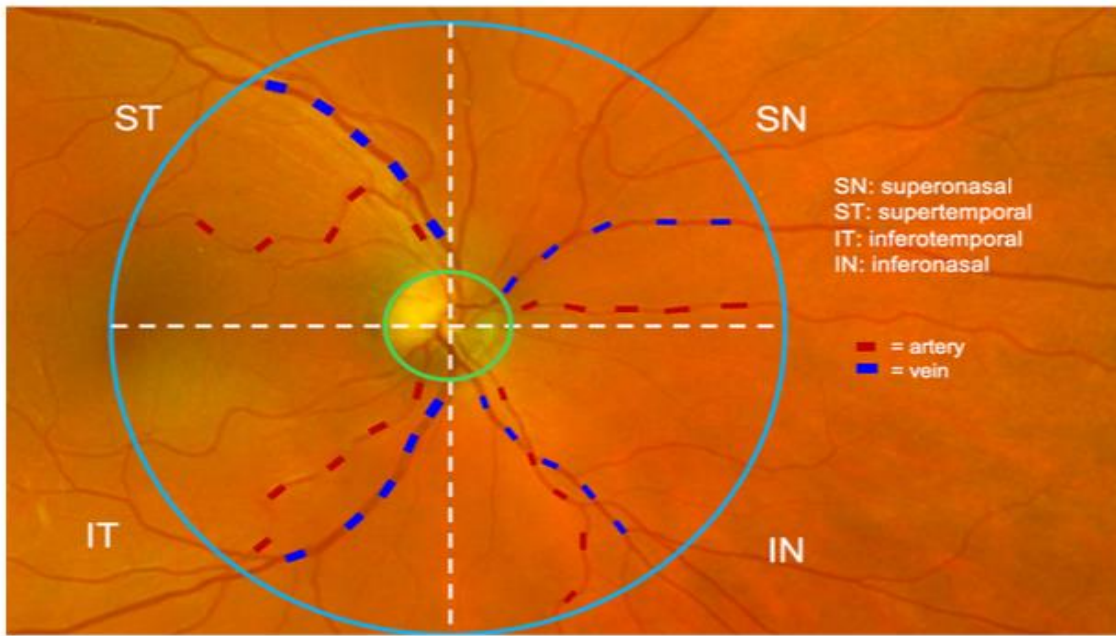
Retinal Vascularity Index in Alzheimer's Disease

P1-001

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RVI was significantly lower in AD across the entire 47° ROI (p < 0.001) compared to controls. This remained consistent across each of the four quadrants (SN, ST, IN, IT) within the 47° ROI.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS	REFERENCES
- Many diagnostic tools for Alzheimer's disease (AD) are costly and invasive.^{1,2} - Microvascular dysfunction may play a key role in AD pathogenesis.^{3,4} - The retina provides a noninvasive window into cerebral vasculature.⁵ - Prior retinal metrics remain heterogeneous across studies (e.g., tortuosity, density, fractal dimension)⁶⁻⁸ - No standardized retinal vascular biomarker has been established for AD. PURPOSE: - In this study, we investigate retinal vascularity index (RVI) in AD and controls to evaluate its potential as a noninvasive biomarker for AD.	Study Design: Cross-sectional case control study. - Undilated ultra-widefield (UWF) color fundus images (California, Optos) from AD and control eyes. - Images uploaded to Comprehensive Ocular Imaging (COIN); Segmentation performed by trained graders - Network (COIN; https://ocularimaging.net/project-rvi/hihg9/show) for semi-automatic image segmentation.⁹ 47° region of interest (ROI) equal to 5 disc diameters (DD) centered on the optic disc. - Quadrant-based analysis was performed via COIN (superonasal (SN), superotemporal (ST), inferonasal (IN), inferotemporal (IT)).  Figure 1. COIN topographical map overlaid on top of UWF image showing 5 DD boundary (blue circle) and optic disc (green circle). Dotted lines highlight four quadrants within the ROI (SN, ST, IT, IN). Arteries segmented in red and veins segmented in blue. Graders segmented five annotations per vessel.	83 eyes from 58 individuals with AD and 89 eyes from 55 cognitively normal controls. - The AD cohort was older (p = 0.042), had lower Mini-Mental State Exam scores (p < 0.001). Individuals in the AD cohort had a lower RVI across the entire 47° ROI and within each quadrant (SN, ST, IN, IT). - Receiver operating characteristic (AUC = 0.78) indicating moderate discrimination. (sensitivity 0.67, specificity 0.81) - Intraclass correlation coefficient (ICC = .803)	- We observed a decreased RVI in AD compared to cognitively normal controls. - As RVI represents cross-sectional area of an artery to that of a vein, a low RVI indicates narrower arteries, wider veins or a combination of both. - RVI represents a potential noninvasive marker to assess retinal vessel caliber on UWF images. - Prospective studies may further assess the potential clinical utility of RVI as a biomarker in AD. - RVI is unlikely to serve as a standalone diagnostic metric at this time and may be better suited as a complementary tool within a multimodal imaging framework.	- Lane CA, Hardy J, Schott JM. Alzheimer's disease. <i>Euro J of Neurology</i>. 2018;25(1):59-70. doi:10.1111/ene.13439 - McKhann GM, Knopman DS, Chertkow H, et al. The diagnosis of dementia due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. <i>Alzheimer's & Dementia</i>. 2011;7(3):263-269. doi:10.1016/j.jalz.2011.03.005 - Tarawneh R. Microvascular Contributions to Alzheimer Disease Pathogenesis: Is Alzheimer Disease Primarily an Endotheliopathy? <i>Biomolecules</i>. 2023;13(5):830. doi:10.3390/biom13050830 - Cortes-Canteli M, Iadecola C. Alzheimers disease and vascular aging. <i>J Am Coll Cardiol</i>. 2020;75(8):942-951. doi:10.1016/j.jacc.2019.10.062 - London A, Benhar I, Schwartz M. The retina as a window to the brain-from eye research to CNS disorders. <i>Nat Rev Neurol</i>. 2013;9(1):44-53. doi:10.1038/nrneurol.2012.227 - Cheung CY, Ong YT, Ikram MK, et al. Microvascular network alterations in the retina of patients with Alzheimer's disease. <i>Alzheimer's & Dementia</i>. 2014;10(2):135-142. doi:10.1016/j.jalz.2013.06.009 - Berisha F, Fekke GT, Trempe CL, McMeel JW, Schepens CL. Retinal Abnormalities in Early Alzheimer's Disease. <i>Invest Ophthalmol Vis Sci</i>. 2007;48(5):2285. doi:10.1167/iovs.06-1029 - Pead E, Thompson AC, Grewal DS, et al. Retinal Vascular Changes in Alzheimer's Dementia and Mild Cognitive Impairment: A Pilot Study Using Ultra-Widefield Imaging. <i>Trans Vis Sci Tech</i>. 2023;12(1):13. doi:10.1167/tvst.12.1.13 - Betzler BK, Ding J, Wei X, et al. Choroidal vascularity index: a step towards software as a medical device.Br J Ophthalmol. 2022;106(2):149-155. doi:10.1136/bjophthalmol-2021-318782
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