

Retinal Vessel Width in Patients with Confluent Periventricular White Matter Hyperintensities and Alzheimer's Disease

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Introduction

- Periventricular white matter hyperintensities (pv WMH) appear as either focal or confluent on PD/T2 or FLAIR MRI. WMH are associated with an increased risk of stroke, impaired cognition and gait.^{1,2}
- Patients with Alzheimer's disease (AD) and pvWMH reportedly perform significantly worse on neuropsychological testing than those without pvWMH.³
- Periventricular venulopathy has been shown to play a role in development of confluent pvWMH.^{4,5,6}
- Retinal venular widening was associated with increased risk of lacunar infarcts and progression of pvWMH.⁷
- Retinal and cerebral small vessels are developmentally related and share physiologic characteristics. Studying of the retinal vascular caliber may provide insight into vascular pathology in the brain.⁸

Purpose

- To examine retinal vessel width in patients with AD + pvWMH

Subjects

- 31 patients with AD+ pvWMH (age 74±8) from the Cognitive Behavioral Neurology Clinic
- 10 controls with AD without pvWMH (age 68±12)
- 20 normal controls (NC) (age 73±8)

Methods

- MRI (FLAIR) scans were rated blind to retinal findings using Age-Related White Matter Changes score (ARWMC)⁹ (Fig.1)

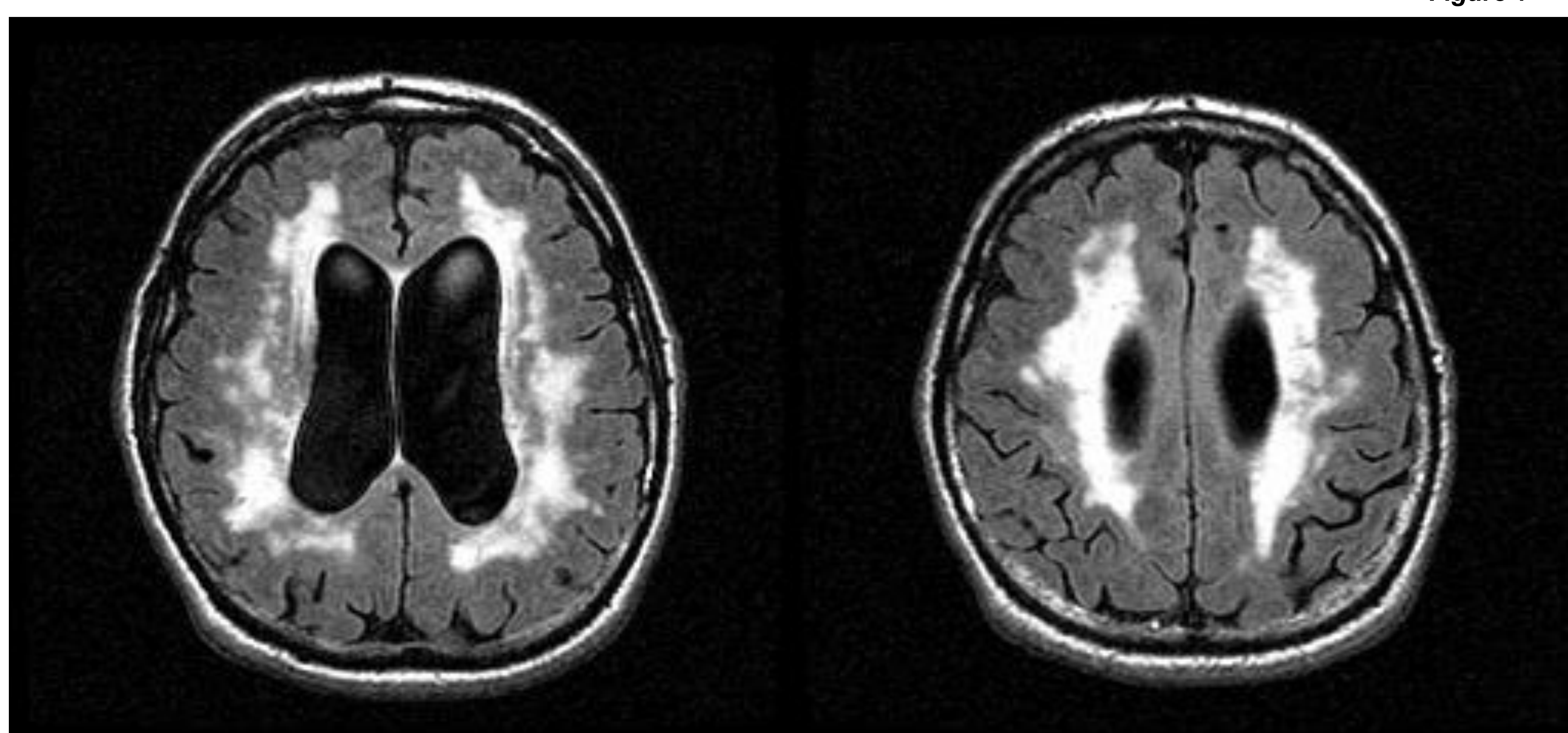


Figure 1

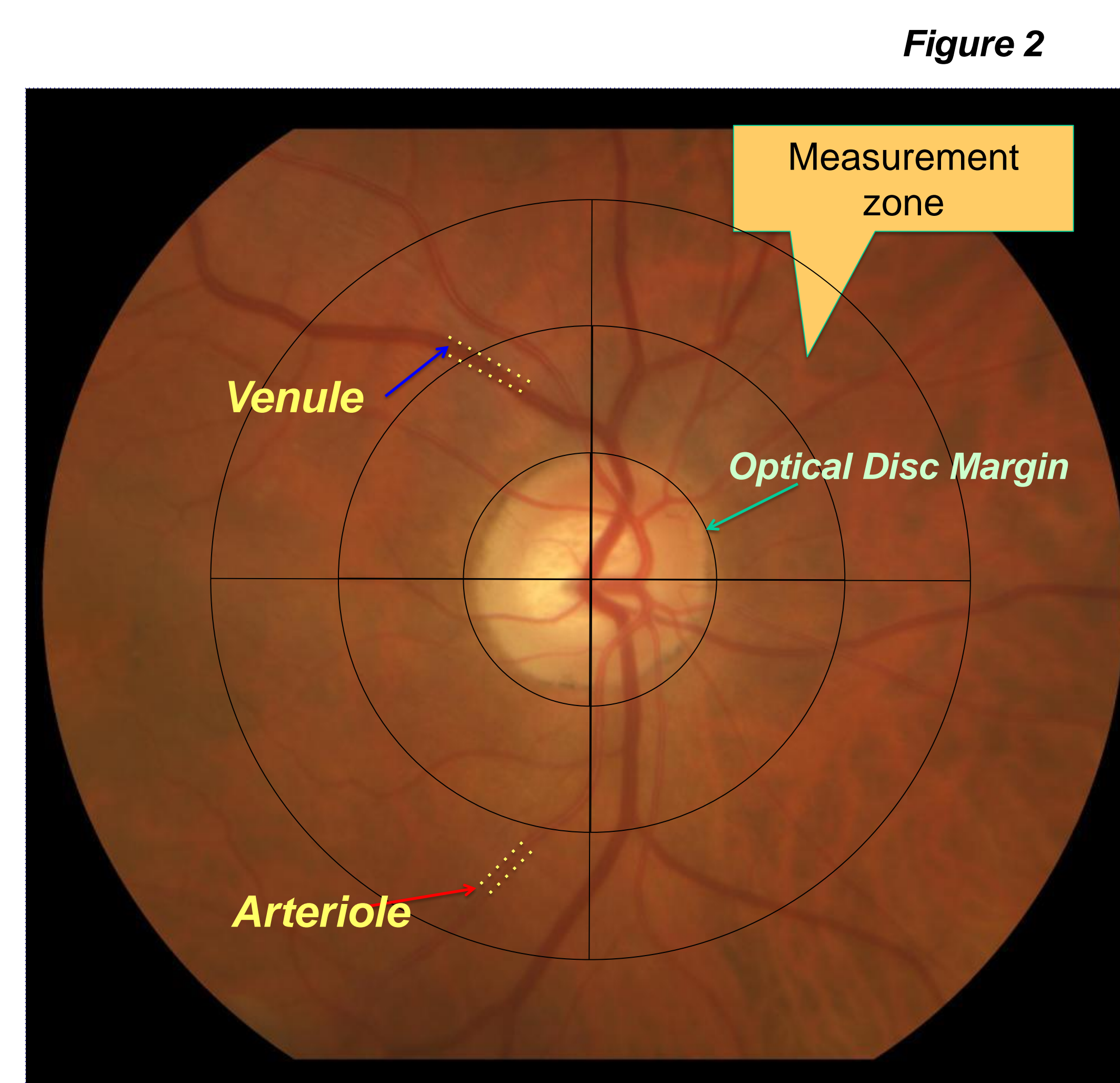


Figure 2

Photographs were analyzed using ANALYZE 6.0 software (Biomedical Imaging Resource, Mayo Foundation; Robb et al, 1989)

- All subjects underwent digital color fundus photography centered on the optic disc of both eyes using a fundus camera (pharmacological mydriasis, 35° field)
- Vessel diameters were measured on their course through a zone between half and one disk diameter away from the disc margin (Fig. 2 above)
- The width of six major arterioles and venules in one eye was summarized as central retinal arteriolar and venular equivalents (CRAE and CRVE, respectively), and arteriolar-to-venular ratio (AVR) was calculated as per previous methodologies^{10,11}
- Statistical data analysis was performed using P.A.S.W. Statistics 18.0 (SPSS Inc., IL, USA)

Results

- Venular diameters were significantly larger in subjects with AD+pvWMH in comparison to AD controls ($p < .01$) and NC ($p < .001$) (Fig. 3)
- Arteriolar diameters were significantly larger in AD+pvWMH group in comparison to the other groups ($p=.002$ and $p=.03$). (Fig. 4)
- Vessel diameter and ARWMC score were not correlated.

Figure 3

Retinal Venular Width (CRVE) in each group

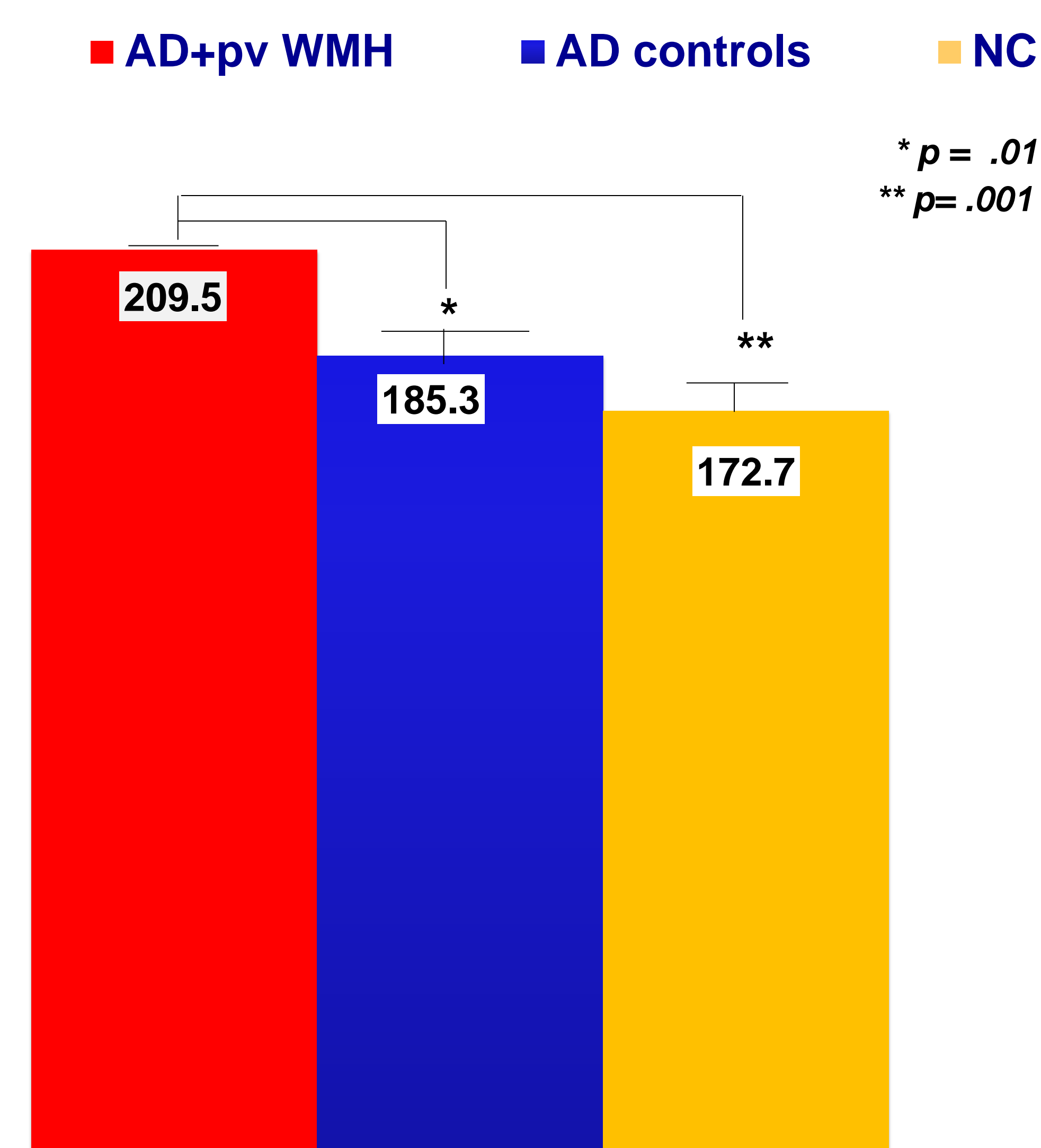
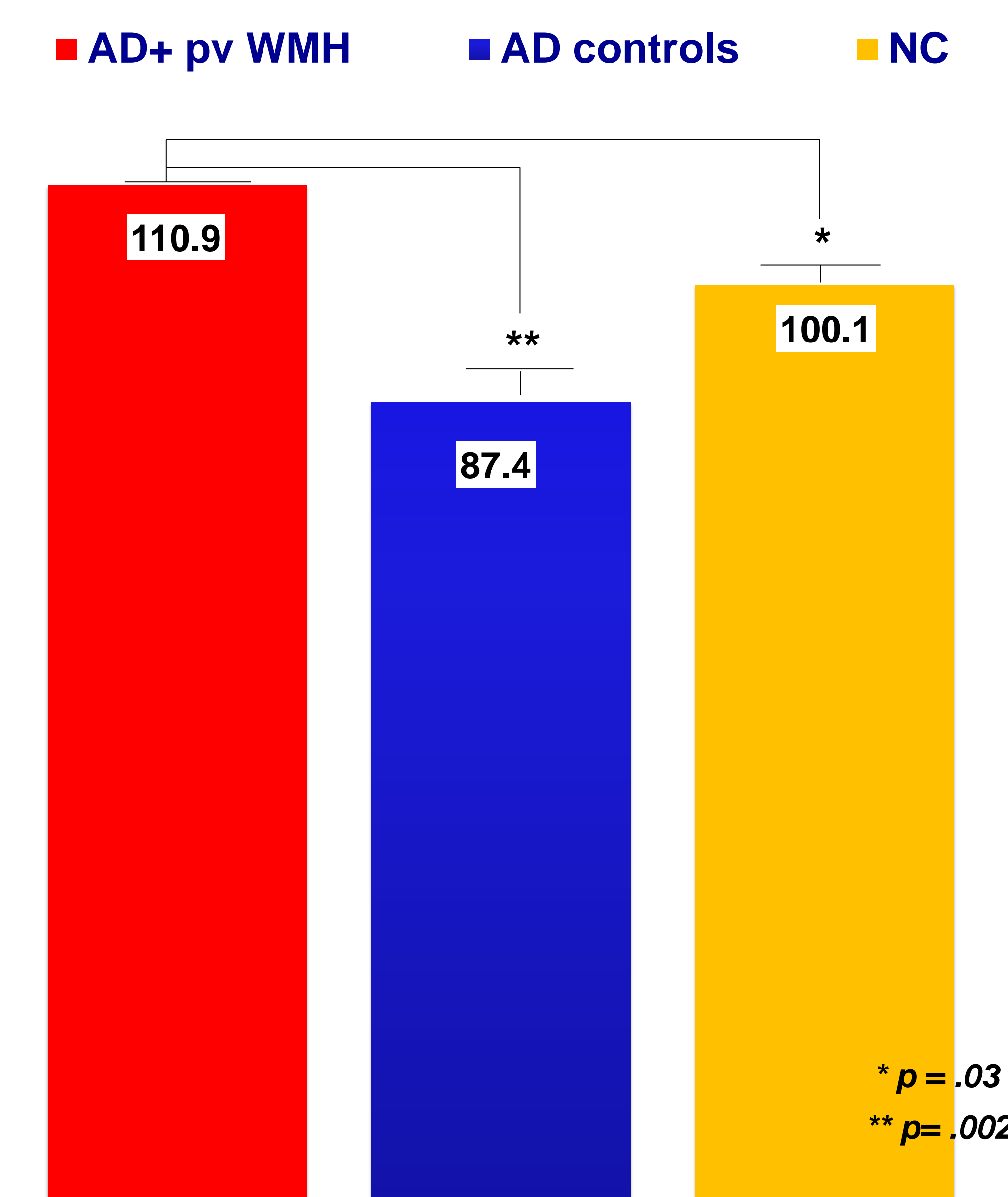


Figure 4

Retinal Arteriolar Width (CRAE) in each group



Conclusions

- AD+pvWMH subjects had larger venular and arteriolar widths than AD controls and NC. Further analysis of potential confounding vascular risk factors and volumetric WMH measures¹² are underway.
- Relative venular dilatation in the brain reflects collagenosis of deep venous medullary system shown in autopsy studies of periventricular white matter disease and may represent perivenous edema^{4,5}.
- Whether enlarged retinal vessel diameters in patients with AD+pv WMH and AD without WMH represent widened perivascular channels is unclear. Further subjects are currently being recruited to increase the sample size.

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