Intracranial Arterial Health and Cardiovascular Risk Across the Alzheimer's Disease Spectrum

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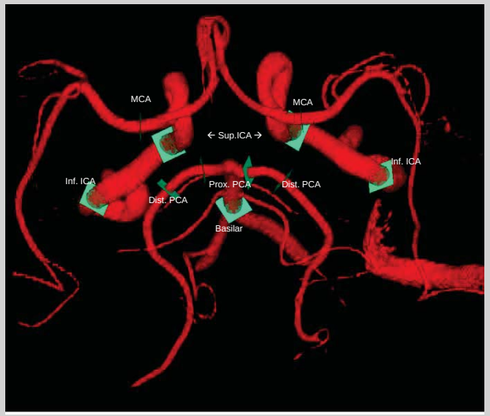
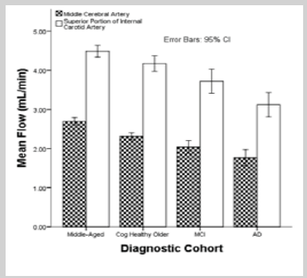
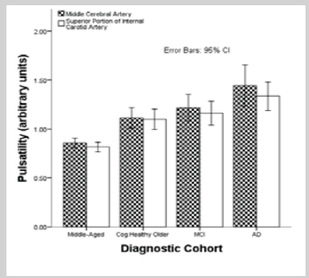
BACKGROUND

- Recent histological studies have shown compromise in large cerebral vessels in people with Alzheimer's disease (AD); there may be a more substantial cardiovascular contribution to cognitive deficits and brain changes than current models of AD suggest.
- A phase contrast 4D Flow MRI technique (PC VIPR) was used to evaluate flow and pulsatility in people along the AD continuum.
- Flow and pulsatility are metrics representative of vascular health; lower mean flow and higher pulsatility (increased vessel stiffness) suggest pathological changes.



Adapted from Rivera-Rivera et al. 2015, under review





METHODS

- N = 312 subjects (average age 64.85, SD 10.26) across the Alzheimer's disease (AD) spectrum (middle-aged, cognitively healthy older adults, Mild Cognitive Impairment (MCI patients) and AD patients) underwent comprehensive imaging and medical examinations.
- The Atherosclerotic Cardiovascular Disease Risk Score (ASCVD) is a newly implemented method of assessing a patient's risk of having a major cardiac event (myocardial infarction, stroke, etc.) in the next 10 years.
- It is an updated version of the more widely used Framigham Risk Score.
- In order to calculate a patient's ASCVD risk percentage, the following variables are needed: age, sex, race, total cholesterol, HDL cholesterol, systolic blood pressure, smoking status (yes/no), diabetes (yes/no), medical treatment for HTN (yes/no)

EXAMPLE 1: ***Patient with Low Cardiovascular Risk***

55 year-old African American female, with total cholesterol 185 and HDL cholesterol 64. Systolic blood pressure was 127 mmHg. She did not smoke, take medication for hypertension, nor did she have diabetes.

10 Year ASCVD Risk of a Major Cardiac Event: ***2.58%***

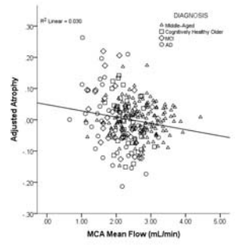
EXAMPLE 2: ***Patient with High Cardiovascular Risk***

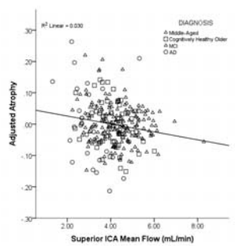
76 year-old Caucasian male, with total cholesterol 240 and HDL cholesterol 44. Systolic blood pressure was 198 mmHg. He was undergoing medical management for hypertension. He was a non-smoker and did not have diabetes.

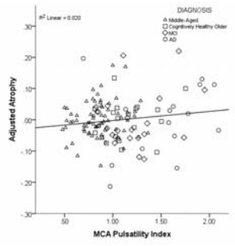
10 Year ASCVD Risk of a Major Cardiac Event: ***59.39%***

RESULTS

Mean Flow, Pulsatility and Brain Atrophy



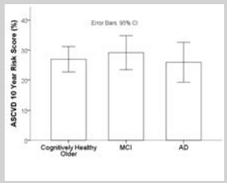


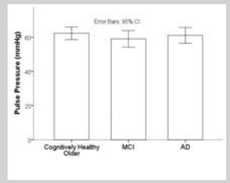


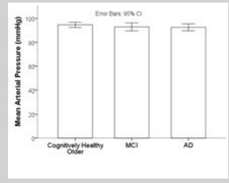
RESULTS

	Total Sample (N=312)	Middle-Aged (N=172)	Cognitively Healthy Older (N=60)	MCI (N=44)	AD (N=36)
ASCVD 10 Year Risk Score % (mean, SD)	14.76% (SD: 16.81)	4.59% (SD: 4.43)	26.92% (SD: 16.34)	29.12 % (SD: 18.72)	25.90 % (SD: 19.74)

No significant differences in **ASCVD 10 year risk score**, **Mean Arterial Pressure**, or **Pulse Pressure** between the three older age-matched cohorts.







CONCLUSIONS

- PC VIPR 4D-Flow is a new methodology that does not limit vascular analysis to the heart/periphery; allows direct measurements of brain arterial health.
- Intracranial 4D-flow metrics of vascular health, including mean flow and pulsatility, may be more direct predictors of AD pathology than the ASCVD risk score, peripheral pulse pressure, and mean arterial pressure.
- 4D-Flow metrics may have greater utility in the prediction of AD pathology than more peripheral cardiovascular health measures.

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