

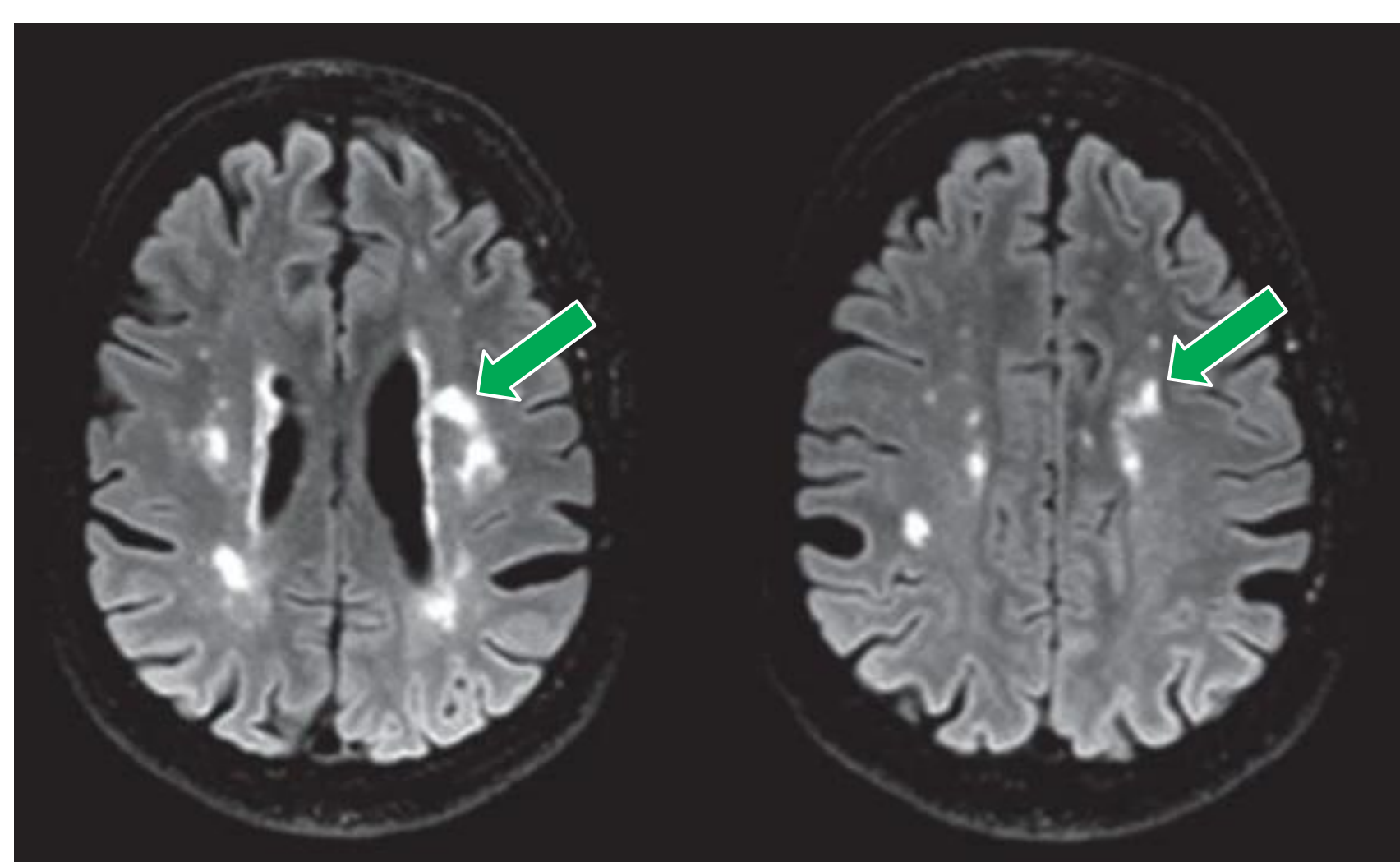
ENLARGED INTRACRANIAL ARTERIES ARE ASSOCIATED WITH INCREASED BURDEN OF WHITE MATTER HYPERINTENSITIES: THE TROMSØ STUDY

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INTRODUCTION

White matter hyperintensities (WMH) are lesions visible in magnetic resonance imaging (MRI) associated with an increased risk of stroke and cognitive impairment. Considered an imaging marker of small vessel disease, the etiology of WMH has been extensively attributed to damage to arterioles, capillaries and venules. However, we still lack a full understanding of how the integrity of cerebral small vessels can be compromised.



Arterial caliber is an important determinant of brain health and cognition. While luminal narrowing due to atherosclerosis is associated with hypoperfusion and structural changes, there are also evidence that wider arteries can have a detrimental effect on the brain. For now, the association between WMH and arterial caliber is still unclear. Previous studies^{1,2} have reported conflicting results and have been limited by small sample size, assessment of a single artery and/or no correction for intracranial volume.

OBJECTIVE

Assess the relationship between the diameter of intracranial arteries and WMH volume

- In a large community-dwelling cohort
- With measurements of the main cerebral arteries
- Correcting for intracranial volume

METHODS

Imaging cohort of 7th Tromsø Study

1864 participants aged 40 and older

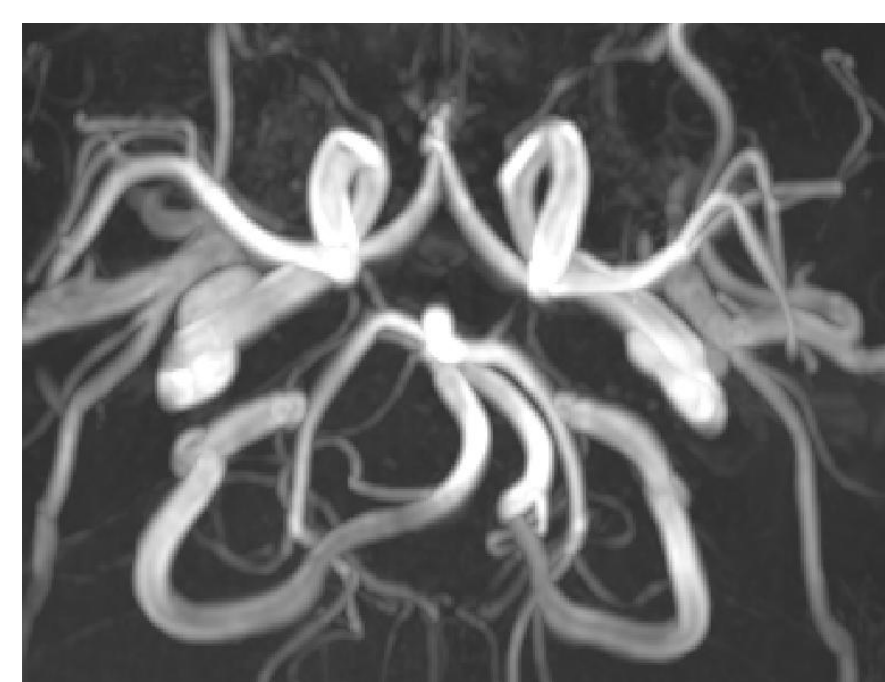
Exclusion criteria:

- History of stroke
- Imaging artifacts
- Faulty segmentation
- Missing health-related information

1694 participants included in the final analysis

Image processing

Automatic segmentation and measurement of circle of Willis arteries from MR angiography as well as WMH segmentation was done using open-source algorithms.^{3,4,5}



Raw MRA image



Automatic segmentation

Tested arteries:

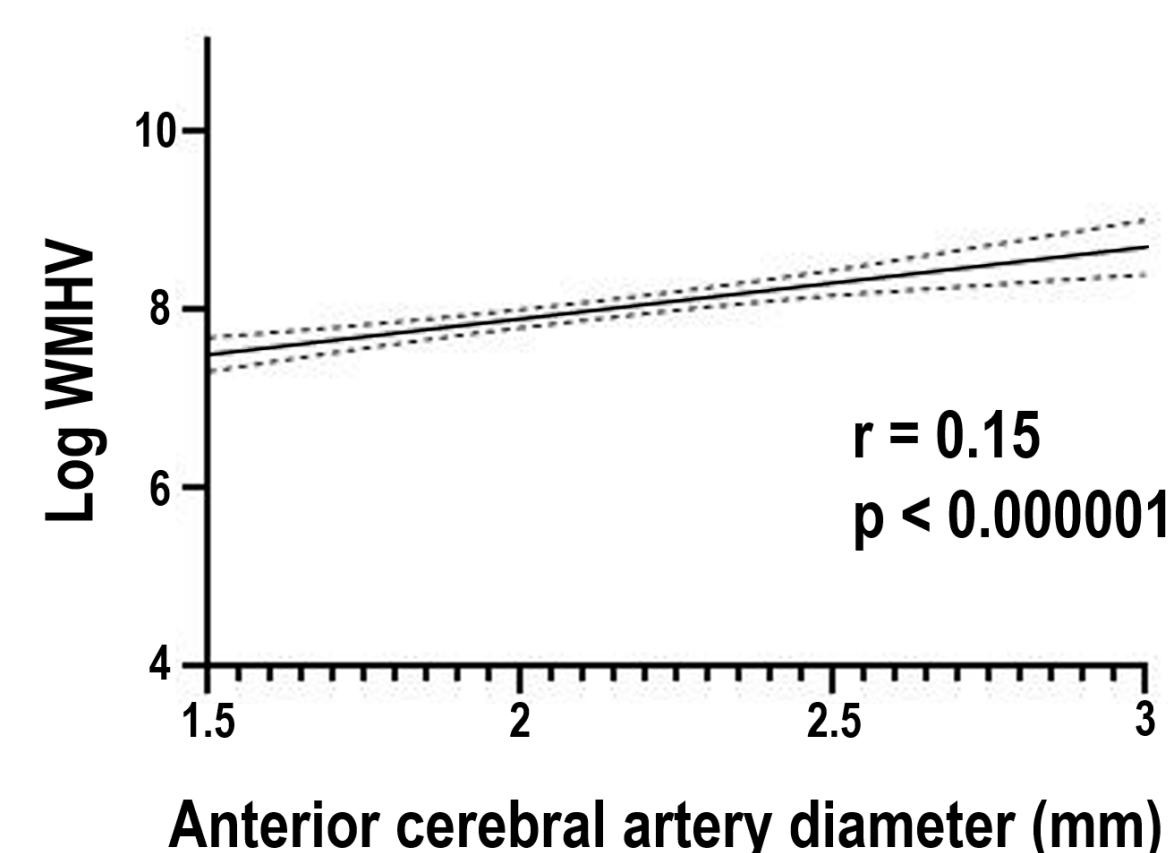
- Internal carotid arteries (ICA)
- Basilar artery (BA)
- Anterior cerebral arteries (ACA)
- Middle cerebral arteries (MCA)
- Posterior cerebral arteries (PCA)

Co-variables corrected for:

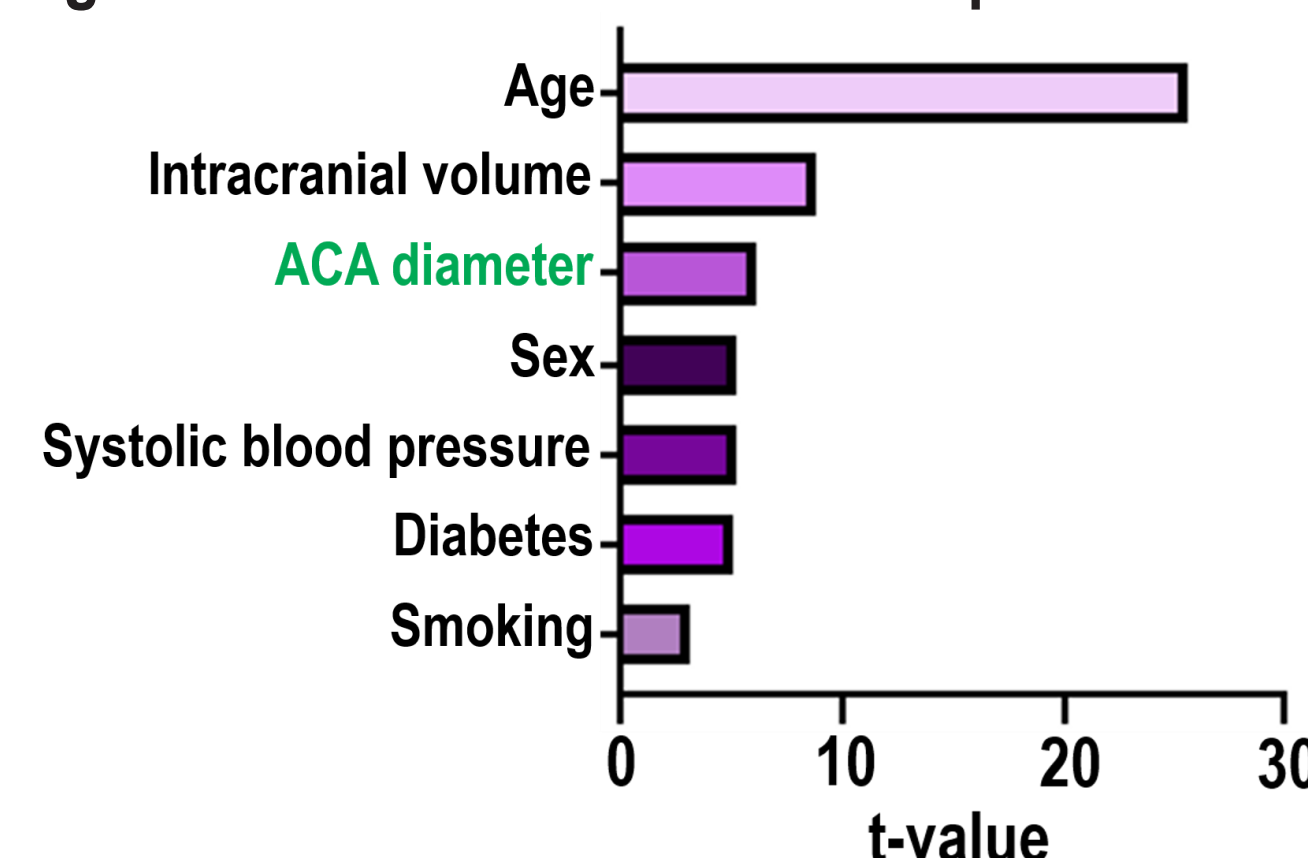
- Age
- Sex
- Intracranial volume
- Diabetes
- Smoking
- Systolic blood pressure

RESULTS

Example with the anterior cerebral arteries



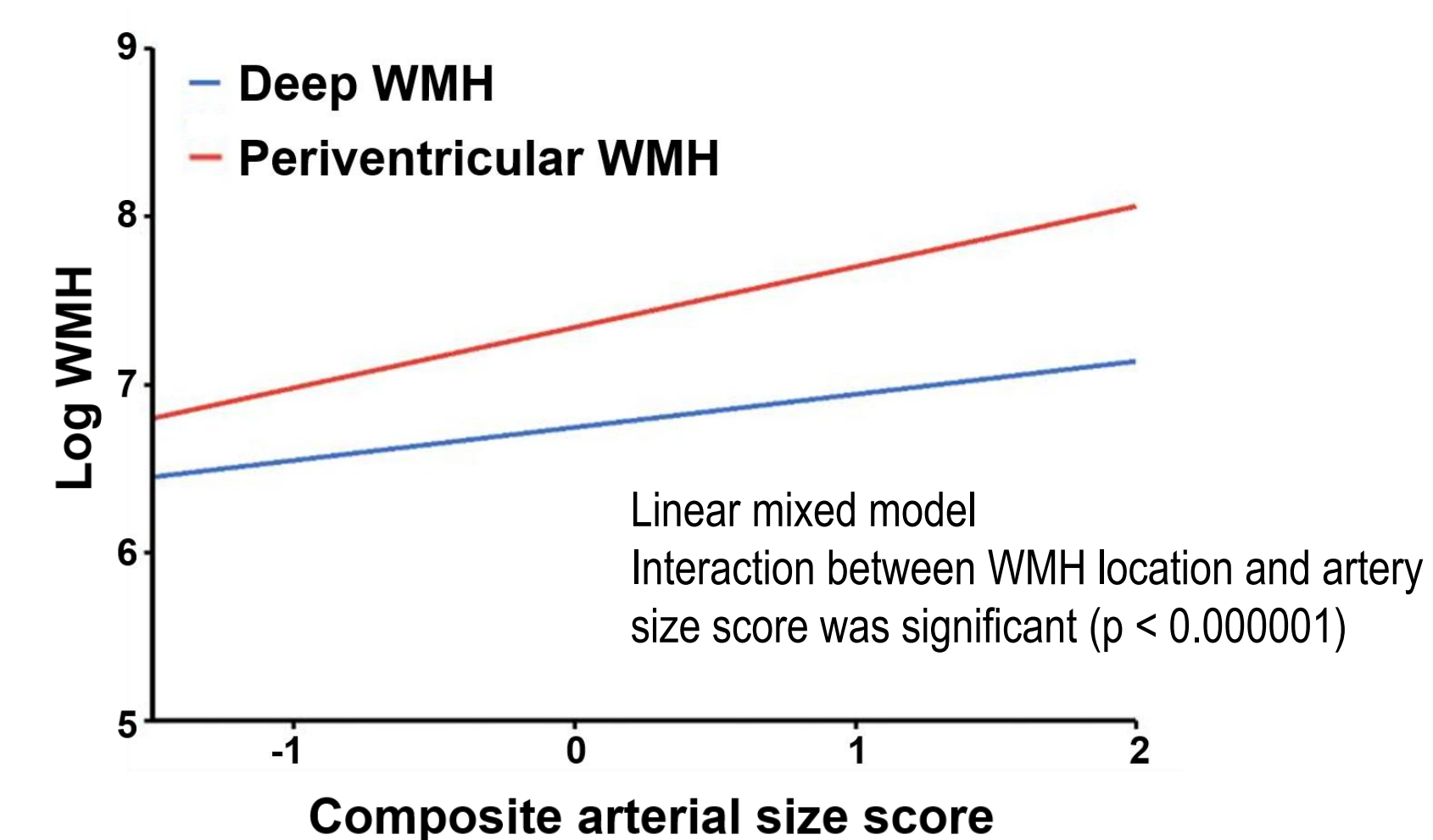
Strength of the association between predictors and WMHV



Arteries	Correlation (r)	-value
ICA	0.08	0.0006
BA	0.15	< 0.000001
MCA	0.15	< 0.000001
PCA	0.15	< 0.000001

- ✓ Artery caliber is relatively strongly associated with WMHV for all major intracranial arteries

Is artery size linked to periventricular or deep WMH?



- ✓ The impact of artery caliber on WMH is stronger in the periventricular region

DISCUSSION

What is the link between artery caliber and WMH?

1. Artery dilation → Small vessel damage → WMH
Artery dilation as a marker of stiffness
2. Small vessel damage → Artery dilation
Small vessel damage → WMH
Increased distal resistance leads to more pressure on large arteries
3. Vascular risk factors → Artery dilation
Vascular risk factors → Small vessel damage → WMH
Common causal mechanisms

CONCLUSION

Enlarged intracranial arteries are linked to greater burden of WMH, especially in the periventricular region. Further analyses will be undertaken to assess the relationship between individual artery size and location of WMH, which will help establish the mechanisms linking large intracranial arteries and WMH.

Acknowledgments



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