



Visual Difficulties And Cerebrovascular Biomarkers

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BACKGROUND

Increasing evidence supports an association between untreated vision loss and dementia risk and potential modification by treatment. (1)

The study aimed to investigate the cross-sectional association of visual difficulties and MRI imaging biomarkers in the population-based Mayo Clinic Study of Aging.

METHODS

MCSA is a population-based cohort study of cognitive aging and impairment. (2)

Visual difficulties were assessed by the study informant's response to the question of whether the participant had "significant visual difficulties that interfere with daily activities".

All MRI was acquired on 3T MRI imagers (GE Healthcare). WMH images on standard two-dimensional T2 FLAIR were segmented and edited by a trained imaging analyst with use of a semi-automated method. (3)

Logistic and linear regression models were employed to examine the association between visual difficulties and hippocampal volume [HVadjTIV; adjusted for total intracranial volume (TIV)], white matter hyperintensity volume (WMH%TIV; as percent of TIV) and infarctions.

Models were adjusted for age, sex and education.

STUDY POPULATION

There were 3835 Mayo Clinic Study of Aging participants without dementia, aged greater than or equal to 50 years at baseline, who underwent brain MRI scan to assess cerebrovascular and aging biomarkers; participants had at least one biomarker measure available.

RESULTS

Participants had a mean age (SD) of 72.6 (10.0) years, 51.6% were male, and 7.1% had visual difficulties.

Participants with visual difficulties were, on average, older, had fewer years of education, lower HVadjTIV and higher WMH%TIV.

Having visual difficulties was associated with higher WMH%TIV burden, with higher odds of having abnormal WMH [WMH%TIV $\geq$ 1.7%; and abnormal CVD biomarkers (presence of either abnormal WMH burden or infarctions).

Visual difficulties were not associated with hippocampal volume.

Table 1. Participants' Characteristics by Visual Difficulties Status at Study Baseline.

Characteristic*	With VD (N=273)	No VD (N=3562)	p value
Age at MRI	76.3 (9.9)	72.4 (9.9)	<0.001
Male sex	135 (49.5%)	1844 (51.8%)	0.46
Education, years	14.2 (2.7)	14.7 (2.7)	0.009
APOE ϵ 4 positive	80 (32.5%)	867 (27.1%)	0.067
MCI	47 (17.2%)	373 (10.5%)	
Global z-score^	-0.5 (1.3)	-0.1 (1.2)	<0.001
HVadjTIV	-0.5 (0.7)	-0.4 (0.7)	0.019
WMH%TIV	1.2 (1.2)	0.7 (0.8)	<0.001
Abn. WMH%TIV	112 (42.3%)	864 (24.9%)	<0.001
Any cortical infarct~	10 (11.8%)	70 (4.8%)	0.005
Abnormal CVD	117 (70.5%)	995 (49.0%)	<0.001

*(mean $\pm$ SD) or n (%); ^Global cognitive z-score; ~ (n=1531).
CU: cognitively unimpaired; MCI: mild cognitive impairment; VD : Visual Difficulties; NSI: No sensory Difficulties; HVadjTIV : Hippocampal volume adjusted for total intracranial volume (TIV); WMH%TIV: white matter hyperintensity as a percent of TIV; Abn. WMH%TIV: Abnormal WMH defined as WMH % of TIV $\geq$ 0.98; Abnormal CVD: presence of either abnormal WMH burden or infarctions.

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TABLE 2: Associations between visual difficulties and cerebrovascular MRI biomarkers..

Outcome	OR (95% CI) ^a	p-value
Abn. WMH%TIV	1.62 (1.19, 2.19)	0.002
Abnormal CVD	1.75 (1.10, 2.80)	0.02
Abn. HVadjTIV	1.00 (0.73, 1.36)	0.99
	b (95% CI) ^b	
WMH%TIV	0.26 (0.17, 0.36)	<0.001
HVadjTIV	-0.025 (-0.102, 0.052)	0.522

HVadjTIV: Hippocampal volume adjusted for total intracranial volume (TIV); WMH%TIV: white matter hyperintensity as a percent of TIV; Abn. WMH%TIV: Abnormal WMH defined as WMH % of TIV $\geq$ 0.98; Abnormal CVD: presence of either abnormal WMH burden or infarctions.

^a OR (95%) retained from logistic regression models adjusted for age, sex, education. ^b b (95% CI) retained from linear regression model adjusted for age, sex, education.

CONCLUSIONS

- Visual difficulties reported by the informant were associated with a greater burden of white matter hyperintensities.
- Further research is needed as visual difficulties may provide clinically meaningful information, help to identify individuals with underlying vascular brain changes, and guide targeted prevention interventions to reduce dementia risk.

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