ASYMPTOMATIC CAROTID STENOSIS, WHITE MATTER DISEASE AND COGNITION: CONTRIBUTIONS TO A CLINICAL PROFILE

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Background and Purpose

Patients with carotid stenosis, without history of stroke or transient ischemic attack are considered to be asymptomatic. However, many of those patients might have high burden of white matter hyperintensities (WMH) and cognitive decline that may precede clinical events, suggesting a high risk for stroke. In the present study, we aimed to assess the association between asymptomatic carotid stenosis, WMH and cognitive decline.

Methods

Participants were evaluated with 3T MRI using T2- weighted FLAIR for quantification of WMH and WM volume. Lesion segmentation was performed by the SPM-12 using an automatic algorithm. Continuous variables were tested for normality using Shapiro-Wilk normality test. Unpaired t-test and Mann-Whitney U test were used for to analyze group differences. Pearson correlation coefficient was used to explore associations among scores of neuropsychological tests and burden of WMH between groups. Hemispheric differences in WM and burden of WMH were tested for Paired t-test. A $p < 0.05$ was considered significant. Statistical analyses were performed using Stata 15.

	Patients (n=13)	Controls (n=13)	p value
Age (years)	69,46±7,60	62,23±6,82	0,051
Female: Male (female %)	7:6 (53,84)	6:7 (46,15)	0,708
Education (years)	8,23±6,64	10,76±5,40	0,296
Diagnosis			
Stenotic side (>70%/ n patients)	esquerda:7; direita: 6	N/A	N/A
Stenosis unilateral/ bilateral (n)	7: 6	N/A	N/A
Cognitive Assessment			
Mini Mental Status Examination 1 st ed	25,76±2,83	26,76±3,26	0,412
Symbol Digit (MMSE-2)	6,23±2,16	13,92±5,25	<0,001
Memory/ Visuospatial Perception			
Rey Complex Figure Test (immediate)	-2,00±1,45	-0,75±1,30	0,030
Digit Span (direct order)	-0,45±0,96	0,95±1,50	0,008
Executive Functions			
Stroop Test 2	-3,86±2,58	-1,91±1,72	0,017
Stroop Test 3	-1,52±1,82	-0,30±0,86	0,039
Trail Making Test A	-3,73±2,76	-1,23±1,94	0,013
Digit Span (inverse order)	-0,47±0,73	0,89±1,06	0,015
Verbal Fluency (phonemic)	-0,96±0,56	-0,26±0,91	0,028

Table 1. Basic demographic, diagnosis and cognitive assessment of healthy controls and patients with asymptomatic carotid stenosis

Results

Figure 1. Segmentation of White Matter Hyperintensities mensured by FLAIR in patient with asymptomatic carotid stenosis and control. In both subjects, WMH are countered in green, by using an automatic algorithm.

Figure 2. Box plot showing the significant differences the white matter volume (Panel A) and white matter hyperintensities (Panel B) between groups. Panels C and D show hemispheric differences in WM and burden of WMH for patients with asymptomatic carotid stenosis.

Figure 3. Scatter plot of the correlation analyses between burden of WMH and cognitive performance in Symbol Digit.

Figure 4. Scatter plot of the correlation analyses between burden of WMH and global cognitive performance for clinical group. Dashed line between z-score -1 and -2 indicates mild cognitive impairment and below -2 possible dementia. CI, Cognitive impairments; VCI, Vascular cognitive impairments.

Conclusions

Vascular cognitive decline and high burden of white matter hyperintensities are common in patients with asymptomatic carotid stenosis >70% and should be explored as markers of high risk of stroke in those patients. In addition, the results of the present study, acquired with a carefully selected sample, demonstrated a larger WMH burden in the hemisphere ipsilateral to carotid stenosis, suggesting an important role of hypoperfusion in white matter microstructural damage and small vessel disease.

References

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