Reduced Venous Blood Oxygen Saturation May Associate with Cognitive Decline in Patients with Multiple Sclerosis

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Reduced Venous Blood Oxygen Saturation May Associate with Cognitive Decline in Patients with Multiple Sclerosis

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Introduction: Reduced brain oxygen metabolism may be associated with neuronal activity in individuals with Multiple sclerosis (MS). Quantitative susceptibility mapping (QSM), an advanced MRI technique, can measure venous blood oxygen saturation via deoxyhemoglobin levels. It remains unknown whether QSM-derived venous blood susceptibility can be used as an imaging biomarker of neuronal activity in MS. The objective of this study was to investigate the susceptibility of internal cerebral veins (ICVs) in patients with relapsing-remitting MS (RRMS), and their correlations with clinical measures.

Methods: We recruited 18 patients with RRMS and 10 age-matched healthy controls (HC). Participants were scanned on a 3T MRI, generating QSM data. We performed clinical measures, including the paced auditory serial addition test (PASAT), an index of cognitive function. The total lesion load (TLL) and the susceptibility of the ICVs (χicv) were measured through manually delineated regions-of-interest on clinical MRI and QSM images, respectively. We compared the χicv between cohorts using Wilcoxon rank sum test. Linear regression was used to correlate χicv with clinical scores in MS patients.

Results: There were significantly reduced χicv (p = 0.026) in RRMS patients (212.4 ± 30.1 ppb) compared to HCs (239.4 ± 25.9 ppb). The χicv was moderately correlated with PASAT (r = 0.258, p < 0.031) and TLL (r = -0.256, p < 0.032) in MS patients.

Conclusions: This study provides first-of-its-kind evidence that reduced oxygen consumption in deep cerebral regions draining to the ICVs may be associated with cognitive decline in MS patients.