Functional connectivity density changes in patients with ischemic white matter lesions

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Background: White matter lesions (WMLs) are frequently detected in elderly people. Previous structural and functional studies have demonstrated that WMLs are associated with cognitive and motor decline. However, the underlying mechanism of how WMLs lead to cognitive decline and motor disturbance remains unclear.

Methods: We used functional connectivity density mapping (FCDM) to investigate changes in brain functional connectivity in 16 elderly patients with ischemic WMLs and 13 elderly healthy controls. Both Short-range and long-range FCD maps were computed and group comparisons were performed between the two groups. A correlation analysis was further performed between regions with altered FCD and cognitive test scores (Mini-Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA)) in the patient group.

Results: Compared with healthy controls, patients with ischemic WMLs showed altered FCD mainly in the temporal cortex, primary motor cortex, subcortical region, inferior parietal cortex and prefrontal cortex. Moreover, the primary motor and prefrontal cortex showed significant correlations with MoCA scores [Fig. 1].

Conclusions: We speculate that the reduced FCD may account for inadequate top-down attention, impaired motor, memory and executive function associated with WMLs, while the increased FCD may suggest a strategy of cortical functional reorganization to compensate for motor and executive deficits. The correlations of the primary motor and prefrontal cortex with MoCA scores further support our speculation. Our findings provide new insights into how WMLs cause cognitive and motor decline from cortical functional connectivity perspective.

Fig. 1. Altered short- and long-range FCD and correlations with MoCA scores in patients with ischemic WMLs.