Impaired functional connectivity

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Impaired functional connectivity is always correlated with abnormal white matter fibers.

Hu et al. used multimodal imaging techniques to explore the changes in brain functional and structural connectivity in moyamoya disease (MMD) patients.

They collected structural images, resting-state functional magnetic resonance imaging (rs-fMRI), and diffusion tensor imaging for each subject. Cognitive functions of MMD patients were evaluated using the Mini-Mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), and Trail Making Test parts A and B (TMT-A/-B). They calculated the functional connectivity for every paired region using 90 regions of interest from the Anatomical Automatic Labeling Atlas and then determined the differences between MMD patients and HCs. They extracted the functional connectivity of paired brain regions with significant differences between the two groups. Correlation analyses were then performed between the functional connectivity and variable cognitive functions. To explore whether the impaired functional connectivity and cognitive performances were attributed to the destruction of white matter fibers, they further analyzed fiber integrity using tractography between paired regions that were correlated with cognition.

There was lower functional connectivity in MMD patients as compared to HCs between the bilateral inferior frontal gyrus, the bilateral supramarginal gyrus, the left supplementary motor area (SMA), and the left orbital part of the inferior frontal gyrus (IFGorb), and between the left SMA and the left middle temporal gyrus (P < 0.01, FDR corrected). The decreased functional connectivity between the left SMA and the left IFGorb was significantly correlated with the MMSE (r = 0.52, P = 0.024), MoCA (r =0.60, P = 0.006), and TMT-B (r = -0.54, P = 0.048) in MMD patients. White matter fibers were also injured between the SMA and IFGorb in the left hemisphere and were positively correlated with reduced functional connectivity.

Brain functional and structural connectivity between the supplementary motor area and inferior frontal gyrus in the left hemisphere are damaged in moyamoya disease (MMD). These findings could be useful in the evaluation of disease progression and prognosis of MMD¹⁾.

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Hu J, Li Y, Li Z, Chen J, Cao Y, Xu D, Zheng L, Bai R, Wang L. Abnormal brain functional and structural connectivity between the left supplementary motor area and inferior frontal gyrus in moyamoya disease. BMC Neurol. 2022 May 16;22(1):179. doi: 10.1186/s12883-022-02705-2. PMID: 35578209.

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