

Influence of depression and fatigue on the regional distribution of brain damage in patients with multiple sclerosis

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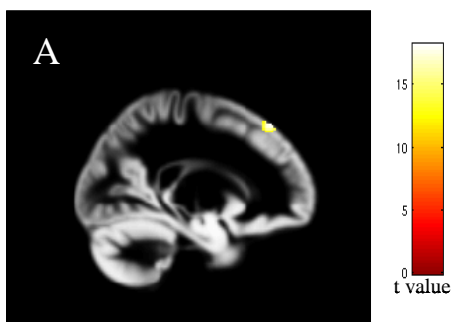
Target audience. Neurologists and neuroradiologists.

Purpose. To investigate whether depression in multiple sclerosis (MS) is associated to specific patterns of lesion distribution and regional atrophy in the gray matter (GM) and white matter (WM) and their modulation by the presence of fatigue.

Methods. Using a 3.0 Tesla scanner, brain dual-echo and T₁-weighted images were acquired from 123 MS patients (77 mildly/moderately depressed [D], 46 non-depressed [nD] according to the Montgomery-Asberg Depression Rating Scale) and 90 gender- and age-matched healthy controls (HC). In all the patients, fatigue was also assessed using the fatigue severity scale (FSS). T2 lesion distribution, GM and WM atrophy were assessed using voxel-based morphometry (1) and DARTEL (2) in SPM8. A two-way ANOVA full factorial analysis was performed to test for main effects and interactions of depression and fatigue in MS patients. In addition, to assess the isolated effect of depression and fatigue on lesions and regional atrophy, the depression effect was exclusively masked for fatigue and vice versa.

Results. Apart fatigue, which was more severe in D-MS patients, demographics, clinical and conventional MRI characteristics did not differ between D-MS and nD-MS patients. As expected, MS patients experienced atrophy of the deep GM nuclei, and several cortical regions mainly located in the fronto-parietal lobes. WM atrophy involved both infra and supratentorial regions. T2 lesion distribution, regional GM and WM atrophy did not differ between D-MS and nD-MS patients. The analysis of the combined and isolated effects of depression and fatigue on the previous findings showed a positive interaction between depression and fatigue at the level of the right superior frontal gyrus (SFG). Depression had a selective effect, when exclusively masked for fatigue, on atrophy of the left precentral gyrus and right inferior frontal opercular region. No specific pattern of GM/WM atrophy related to fatigue, when masked for depression, was found.

Interaction between depression and fatigue



Effect of depression on gray matter structures

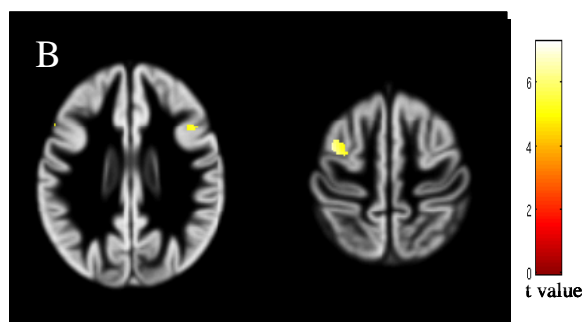


Figure 1. Common clusters of significant GM atrophy for depression and fatigue (A), and clusters of significant GM atrophy for depression (B) in MS patients.

Discussion. Depression in MS is linked to GM atrophy of regions located in the bilateral frontal lobes. The concomitant presence of depression and fatigue is associated to atrophy of the right SFG.

Conclusions. Our results showed an association between depression and fatigue and atrophy of specific GM regions located in the frontal lobes in patients with MS, while no influence on these symptoms was found for T2 lesions and WM atrophy. Future studies should try to combine measures of GM volume with measures of WM structural integrity (e.g., diffusion tensor MR tractography) to further improve the understanding of the substrates of fatigue and depression.

References.

1. Ashburner J. Neuroimage 2007;38:95-113. 2. Ashburner J. Magn Reson Imaging. 2009;27:1163-74.

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