

Publication

Association of regional gray matter volume loss and progression of white matter lesions in multiple sclerosis : alongitudinal voxel-based morphometry study

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Previous studies have established regional gray matter (GM) volume loss in multiple sclerosis (MS) but the relationship between development of white matter (WM) lesions and changes of regional GM volumes is unclear. The present study addresses this issue by means of voxel-based morphometry (VBM). T1-weighted three-dimensional magnetic resonance imaging (MRI) data from MS patients followed up for 12 months were analyzed using VBM. An analysis of covariance model assessed with cluster size inference (all corrected for multiple comparisons, $p < 0.01$) was used to compare GM volumes between baseline and follow-up while controlling for age, gender, and disease duration. Lesion burden, i.e. volumes of T1 hypointense and T2 hyperintense lesions and the number of new T2 lesions at year one, was also determined. Comparing all MS patients ($n=211$) longitudinally, GM volume remained unchanged during one year-follow-up. Focusing on patients with relapsing remitting MS (RRMS) ($n=151$), significant cortical GM volume reductions between baseline and follow-up scans were found in the anterior and posterior cingulate, the temporal cortex, and cerebellum. Within the RRMS group, those patients with increasing T2 and T1 lesion burden ($n=45$) showed additional GM volume loss during follow-up in the frontal and parietal cortex, and precuneus. In contrast, patients lacking an increase in WM lesion burden ($n=44$) did not show any significant GM changes. The present study suggests that the progression of regional GM volume reductions is associated with WM lesion progression and occurs predominantly in fronto-temporal cortical areas.

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