OBJECTIVES: Recent studies have indicated that brain atrophy is more closely associated with cognitive impairment in multiple sclerosis (MS) than are conventional MRI lesion measures. Enlargement of the third ventricle shows a particularly strong correlation with cognitive impairment, suggesting clinical relevance of damage to surrounding structures, such as the thalamus. Previous imaging and pathology studies have demonstrated thalamic involvement in MS. In this study, we tested the hypothesis that thalamic volume is lower in MS than in normal subjects, and that thalamic atrophy in MS correlates with cognitive function.

METHODS: We studied 79 patients with MS and 16 normal subjects. A subgroup of 31 MS subjects underwent cognitive testing. The thalamus was segmented in whole from three-dimensional MRI scans. We also determined whole brain atrophy (brain parenchymal fraction), third ventricular width, and whole brain T2-weighted (fluid-attenuated inversion recovery) hyperintense, T1 hypointense, and gadolinium-enhanced lesion volumes.

RESULTS: Normalized thalamic volume was 16.8% lower in the MS group (p < 0.0001) vs controls. Cognitive performance in all domains was moderately to strongly related to thalamic volume in the MS group (r = 0.506 to 0.724, p < 0.005), and thalamic volume entered and remained in all regression models predicting cognitive performance. Thalamic volume showed a weak relationship to physical disability score (r = -0.316, p = 0.005).

CONCLUSION: These findings suggest that thalamic atrophy is a clinically relevant biomarker of the neurodegenerative disease process in multiple sclerosis.

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