Value of Volumetric and diffusion tensor MRI in differetiation of early-stage MSA-P and Idiopathic Parkinson¡¯s disease

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Objective:

The differential diagnosis between typical idiopathic Parkinson's disease (PD) and the striatonigral variant of multiple system atrophy (MSA-P) is often difficult because of the presence of signs and symptoms common to both forms of parkinsonism, particularly at symptom onset. To find the correct diagnosis early in the course of the disorders is, however, of major importance with respect to prognostic aspects and therapeutic strategies.

This study investigated striatal, midbrain and cerebellar findings in MSA-P and PD patients in comparison with normal controls with three dimensional magnetic resonance imaging (3D MRI) based volumetry, together with the DTI quantitation in the nigrostriatal projection to increase the differential diagnostic accuracy between both disease entities.

Methods:

11 patients with MSA-P within 5 year's from symptom onset, 12 patients with PD of similar duration were studied by 3D based MRI volumetrics and diffusion tensor imaging(DTI) using GE excite II MR machine. 10 age- matched healthy controls were also studied. Direct measurement of the striatum, midbrain and cerebrellum were made and data were normalized by 3D brain volumetry. The fractional anisotropy (FA) values of magnetic resonance diffusion tensor imaging in the extrapyramidal system were compared among the groups.

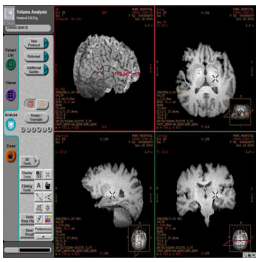
Results:

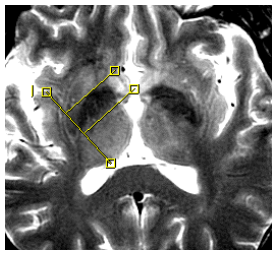
MSA-P differed significantly from PD patients in terms of decreased putaminal and cerebellar volume. The FA significantly decreased in the region of interest along a line between the substantia nigra and the lower part of the putamen/caudate complex in both MSA-P and PD groups, compared with control, and the decrease was more prominent in MSA-P patients than in PD patients. MRI volumetry of the midbrain region did not contribute to the differential diagnosis between PD and MSA-P.

Conclusions:

The extent and spatial distribution of morphological changes in the striatum and cerebellum permit the differentiation of MSA-P from PD. Assuming that the loss of FA parallels the neuronal change in the brain, the results indicates that neuronal loss in nigrostriatal projection is more severe in MSA-P patients than Idiopathic Parkinson's disease in early stage. Close comparison of striatal and cerebellar volume in addition to FA in the nigrostriatal projection may contribute to the early differential diagnosis of MSA-P and Idiopathic Parkinson's disease.

Keywords: Parkinson's disease; multiple system atrophy; diffusion tensor imaging; fractional anisotropy; volumetry





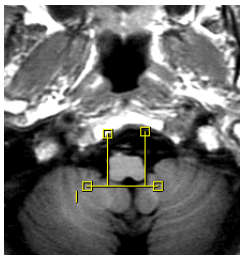
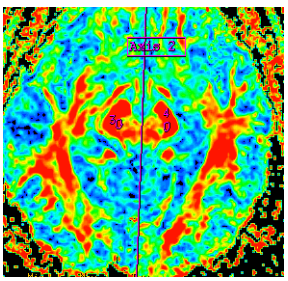
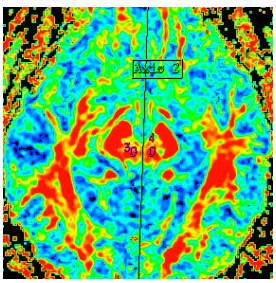
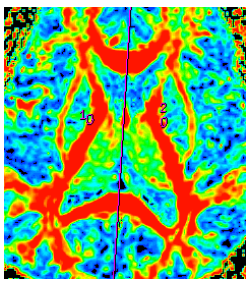


Fig1: examples of volumetric study normalized by 3D brain volume.







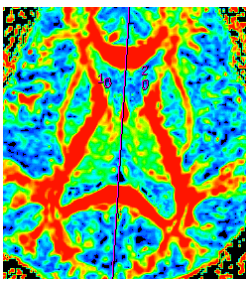


Fig2: FA image and ROI measurements at different levels of nigrostriatal projection.