

Diffusion tensor imaging of ALS: Semi-automatic ROI analysis using fiber tractography

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Purpose

The purpose of this study is to assess the clinical feasibility of semi-automatic ROI analysis using the diffusion tensor tractography in the patients with amyotrophic lateral sclerosis (ALS).

Patients and Methods

16 patients with ALS (9 limb-onset type, 7 bulbar-onset type) and age-matched 9 volunteers were studied. Diffusion tensor imaging (TR/TE 6000/78ms, MPG 13axes \square b-value 1000s/mm², 128x128 Matrix, 2NEX, 5mm thickness/interleave, total acquisition time 5.5 min) was performed by 1.5 T MR imager (Signa Lx ver9.0). Diffusion tensor tractography (DTT) of corticobulbar tract, corticospinal tract (CST) (Figs) and fibers through the splenium of the corpus callosum (SCC) was visualized by the vizDT and Volume-one software (original software by Masutani Y). ROIs(Figs) were semi-automatically placed on the tracts and FA values within the ROI were calculated.

Results

Mean FAs of ALS patients in the ROIs along the CST (bulbar-onset: 0.595, limb-onset: 0.587) were significantly lower than that of controls (CST: 0.639)($p < 0.05$). Mean FA of CBT of bulbar-onset type (0.509) was significantly lower than that of limb-onset type (0.549) and that of volunteers (0.552).

Conclusions

Diffusion tensor tractography could be used for segmentation of the white matter tracts. Mean FA values of the ROIs on the tracts could be differentiate the subtle changes between bulbar-onset type and limb-onset type of ALS patients as well as the changes between the patients and the volunteers. The semi-automatic placement of ROIs within the tracts might be more objective methods than manual ROI placement.

