Diffusion tensor MR imaging of the spinal cord in patients with multiple sclerosis.

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PURPOSE: To determine whether normal-appearing white matter (NAWM) in patients with multiple sclerosis (MS) plaques in the spinal cord have abnormal diffusion anisotropy and apparent diffusion coefficient (ADC) values when compared with fractional anisotropy (FA) and ADC of the spinal cord in control subjects.

MATERIALS AND METHODS: Conventional and diffusion tensor MR images were obtained in 21 patients with MS and in 21 control subjects. FA and ADC maps were generated and coregistered with T2-weighted MR images. Regions of interest (ROI) were placed in plaques, periplaque white matter (PWM), NAWM and white matter (WM) in control subjects to measure FA and ADC values.

RESULTS: The mean FA was 0.441 for plaques, 0.495 for PWM, 0.542 for NAWM, and 0.757 for WM in control subjects. The mean ADC was 0.810 x 10^{-3} mm^2/sec for plaques, 0.746 x 10^{-3} mm^2/sec for PWM, 0.722 x 10^{-3} mm^2/sec for NAWM, and 0.661 x 10^{-3} mm^2/sec for WM in control subjects. Significant differences in FA values were observed in all WM regions examined (P <0.001, Student t-tests). ADC values in MS patients (plaques, PWM, and NAWM) were significantly different when compared with values in control subjects (P <0.05 Student t-tests).

CONCLUSION: Diffusion tensor MR imaging could detect spinal cord abnormalities more accurately than T2-weighted MR imaging. The differences in FA when comparing plaques, PWM, NAWM and WM of control subjects were greater than changes in ADC of the same regions.

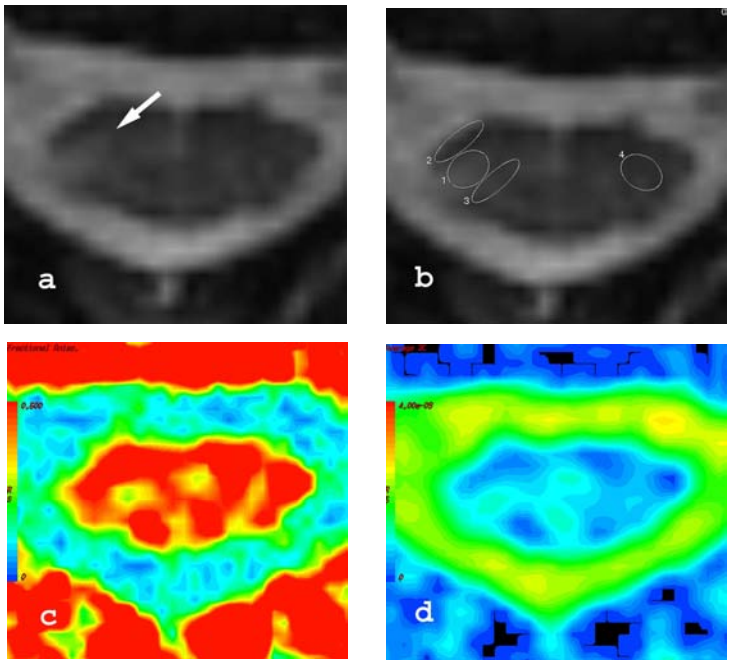

Figure 1. MR images of forty-nine-year-old man with MS show the ROIs used in the study. (a) Transverse T2-weighted MR image (4000/102) shows a plaque (arrow) in the right lateral white matter. (b) Same T2-weighted image as in a, but with placement of ROIs on the plaque (region 1), on PWM regions (region 2 and 3), and matched contralateral NAWM region (region 4). (c) FA map derived from transverse echo-planar spin-echo diffusion tensor MR imaging (12000/107, *b* = 1000 sec/mm^2 x 25 directions and *b* = 0 x 3). (d) ADC map transverse echo-planar spin-echo diffusion tensor MR imaging.