

## Benign Multiple Sclerosis: Less Tissue Injury on Diffusion Tensor Imaging

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### Purpose

Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease that is heterogeneous in terms of clinical course (1). This study is performed to characterize a specific group of patients who were diagnosed with clinically definite MS, but have experienced a benign course for over 10 years. We examined the normal appearing corpus callosum region in these patients using diffusion tensor imaging (DTI). Our hypothesis is that benign MS has less microscopic tissue injury on MRI than patients who have a typical relapsing-remitting course of MS.

### Methods and Materials:

Nine patients with clinically definite MS (8 female and 1 male; mean age:  $46.5 \pm 5.6$  years) who have a benign course without relapse of disease for over 10 years (mean disease duration: 14.6 years) were included for this study. They have relatively lower disability (Expanded Disability Status Scale score  $< 2.0$ ). For comparison, 10 MS patients with classic relapsing-remitting course (8 female and 2 male; mean age:  $45.1 \pm 6.3$  years) with mean disease duration of 7.8 years and 9 age-matched healthy controls (6 female and 3 male; mean age:  $44.9 \pm 6.8$  years) were also recruited. DTI (TR/TE: 6100/82; FOV 220mm<sup>2</sup>; matrix 128x128; 3 mm thickness) was performed on 3T for each subject after conventional T1- and T2-weighted imaging. The fractional anisotropy (FA) and apparent diffusion coefficient (ADC) values were calculated from regions of interest (ROIs) placed in three subregions of corpus callosum (CC), including anterior CC (genu), middle CC (body), and posterior CC (splenium) on the raw images with  $b = 0$ . Each subregion of CC may contain four to six ROIs on three contiguous slices, which covered the genu, body, and splenic CC in each subject in all three groups. The ROIs in patients were obtained in normal-appearing CC tissues and excluded lesions.

### Results:

Across all the regions of normal appearing CC, benign patient group had significantly lower ADC (mean:  $0.88 \pm 0.06$ ) and higher FA (mean:  $0.71 \pm 0.04$ ) when compared with patient group with RRMS (mean ADC:  $0.93 \pm 0.07$ , mean FA:  $0.67 \pm 0.05$ ; respectively) ( $p < 0.01$ ). Both patient groups showed significant differences of ADC or FA with control group across all the regions ( $p \leq 0.007$ ); however, no statistically significant difference of ADC was found in anterior CC region (genu) between benign MS and control group.

### Conclusions:

Since CC is commonly involved in MS disease (2, 3), the DTI measurements in this study indicate less tissue injury in areas of normal appearing CC in patients with benign MS. These findings are in accordance with our hypothesis and support the stable and benign clinical observations in these patients. DTI may have potential in characterizing and monitoring the benign course of MS by quantifying the benign disease burden of tissue micro-structural injury.

### References

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