SUPPLEMENTARY DATA

ANALYSIS OF NON-PROGRESSIVE & PROGRESSIVE PATIENT SUB-GROUPS

METHODS

Data Analysis

Subjects with relapsing-remitting (RR) MS were categorized as non-progressive MS whereas those with relapsing and non-relapsing forms of secondary progressive (SP) and primary-progressive (PP) MS were categorized as progressive MS [1].

SPSS (IBM Inc., Armonk, NY, version 19.0) statistical program was used for all statistical analyses. Linear regression was used for analysis of the normalized whole brain volume (WBV) and gray matter volume (GMV) MRI measures of MS patients. The sub-groups with progressive and non-progressive MS were analyzed separately. The MRI variable of interest was the dependent variable with age, sex, EDSS quartiles and the summer sun exposure quartiles as predictors. In follow-up analyses, 25 hydroxy-vitamin D3 levels were included as an additional predictor.

MRI Acquisition and Analysis

Image Acquisition: Patients underwent brain MRI on a 3-T General Electric Signa 4x/Lx, scanner. Axial dual fast spin-echo (FSE) T2/PD-weighted image (WI), 3D-spoiled-gradient recalled (SPGR) T1-WI, spin echo (SE) T1-WI with and without gadolinium (Gd) contrast, fast attenuated inversion recovery (FLAIR) scans were acquired.

Image Analysis: The MRI analysts were blinded to patients' clinical characteristics and clinical status. The following MRI measures were computed: T1-, T2- and gadolinium (Gd) contrast-enhancing (CE) lesion volumes (LV), measures of central, global and tissue specific brain atrophy.

Lesion Measures: T2- and T1-LVs were obtained with a semi-automated edge detection contouring-thresholding technique previously described [2].

Global and Central Atrophy Measures: The SIENAX cross-sectional software tool was used, with correction for T1-hypointensity misclassification, for brain extraction and tissue segmentation [3]. We acquired and used normalized volume measures of the whole brain (WBV), GM (GMV), white matter (WMV), and lateral ventricles (LVV), as described previously [4].

RESULTS

Supplementary Figure 1 summarizes the WBV and GMV results for the non-progressive and non-progressive sub-groups.

In the non-progressive MS group, increased summer sun exposure (p = 0.021) was associated with increased WBV after correcting for EDSS. A trend was found for GMV (p = 0.11). The overall dependence on sun exposure was not affected upon correction for 25 hydroxy-vitamin D3 levels (p = 0.013 for WBV and p = 0.11 for GMV).

In the progressive MS group, increased summer sun exposure was associated with a trend toward increased WBV (p = 0.11) and trend toward increased GMV (p = 0.088) after correcting for EDSS.

REFERENCES

1. Lublin FD, Reingold SC. Defining the clinical course of multiple sclerosis: results

of an international survey. National Multiple Sclerosis Society (USA) Advisory Committee on Clinical Trials of New Agents in Multiple Sclerosis. Neurology 1996;46:907-911.

2. Zivadinov R, Rudick RA, De Masi R, et al. Effects of IV methylprednisolone on brain atrophy in relapsing-remitting MS. Neurology 2001;57:1239-1247.

3. Smith SM, Zhang Y, Jenkinson M, et al. Accurate, robust, and automated longitudinal and cross-sectional brain change analysis. Neuroimage 2002;17:479-489.

4. Zivadinov R, Weinstock-Guttman B, Benedict R, et al. Preservation of gray matter volume in multiple sclerosis patients with the Met allele of the rs6265 (Val66Met) SNP of brain-derived neurotrophic factor. Hum Mol Genet 2007;16:2659-2668.

SUPPLEMENTARY FIGURE 1 LEGEND

Dependence of normalized gray matter volume (GMV, Figure 1A) and normalized whole brain volume (WBV, Figure 1B) results for the non-progressive (blue bars) and progressive MS (green bars) sub-groups on the quartile of summer sun exposure in the preceding 2-years. The bars represent the mean values and error bars are standard errors.

SUPPLEMENTARY FIGURE 1