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MS Perilesional White Matter Abnormalities detected on MRI may largely represent Residual Damage from the Acute Stage of Lesion Formation

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Introduction:

Perilesional white matter (WM) has been shown to be more abnormal than overall WM on MRI. It is unclear whether this is largely a result of ongoing chronic inflammation or partial resolution of damage from the acute stage of lesion formation.

Objectives/Aims:

To quantify perilesional WM damage due to residual damage stemming from acute lesion formation versus accrual of perilesional tissue damage over time surrounding chronic T2-lesions.

Methods:

T2-lesions were identified on week 72 scans of 332 people with multiple sclerosis (PwMS) from a phase II clinical trial data set (NCT01864148). T2-lesions at week 72 were subdivided into those already present on the baseline scan (chronic lesions at least 72 weeks old) and those that appeared since baseline (new on study, less than 72 weeks old). Perilesional WM was identified at week 72 and separated into bands based on minimum distance from T2-lesion. MRI measures were quantified in perilesional WM bands at week 72, as were changes in MRI measures from baseline to week 72, for a) chronic lesions and b) lesions new on study. MTR, RD, FA, normalized T2 intensity (nT2) and normalized T1 intensity (nT1) were used to quantify tissue integrity.

Results:

Perilesional WM showed a gradient of abnormality based on distance from T2-lesion, as characterized by lower MTR, nT1, and FA, and higher nT2 and RD closer to T2-lesions. Cross-sectionally at week 72, WM perilesional to chronic lesions (> 72 weeks old) was not more abnormal, on average, than WM perilesional to lesions new on study (< 72 weeks old). WM perilesional to lesions that formed on study showed much greater accumulation of tissue damage from baseline to week 72 weeks as compared to WM perilesional to chronic lesions pre-existing at study baseline, on all MRI measures except for nT1 (mean change over 72 weeks in first 3mm of perilesional WM for lesions new on study vs. chronic: MTR: -0.26 vs. -0.02 normalized MTR units, RD: 0.055 vs. 0.008 mm^2/s, FA: -0.14 vs. -0.11, nT2: 0.684 vs. 0.104 normalized T2 units).

Conclusion:

Abnormalities in perilesional WM may largely represent residual tissue damage stemming from the acute stage of lesion formation. Perilesional WM surrounding chronic lesions is relatively stable over time, on average. Care must be taken when inferring the origin of perilesional tissue damage based on cross-sectional observations.

Disclosures:

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