Accelerated Cord Atrophy Precedes Conversion to Secondary Progressive Disease in Relapsing Multiple Sclerosis
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Objective:
To longitudinally evaluate the utility of spinal cord atrophy measured from brain scans as a surrogate marker for impending conversion to secondary progressive MS (SPMS), in addition to brain measures.

Background:
A major challenge in multiple sclerosis (MS) research is the understanding of progressive disease. Magnetic resonance imaging (MRI) measures might provide useful surrogates of disease progression and disability. Among all radiographic measures, spinal cord area shows the strongest correlations with MS disability and discriminates progressive from relapsing-remitting (RR) disease subtypes.

Design/Methods:
In a single center observational study, 57 of 507 RRMS subjects converted to SPMS during the 12-year observation period. Using demographic and clinical criteria, we matched them to 57 RRMS subjects who remained RRMS during the observation period. From brain MRI, we analyzed brain volumetrics and spinal cord area at C1 level over 12 years to evaluate their potential to discriminate between the two matched groups during the pre-conversion period.

Results:
Subjects who developed SPMS showed accelerated rates of spinal cord atrophy (-2.28 mm²/year, standard error (SE) 0.21) before conversion to a SP course compared to their RRMS matches who did not convert to SPMS (-0.74 mm²/year, SE 0.21, p<0.0001), with men demonstrating a more rapid decline. Our data suggest that this difference exists at least four years before conversion to SPMS. Measures of brain atrophy and white matter lesions did not discriminate between the groups.

Conclusions:
Upper cervical cord atrophy, as obtained from routine T1-weighted brain MRI, is a strong indicator of impending conversion to SPMS. As cervical atrophy likely reflects neurodegenerative processes, it could be used to identify RRMS patients at risk for secondary progression, assess the role of genetic, epidemiologic and immune variables on MS, and measure the long-term impact of treatment in clinical trials.