



Abstracts

Articles appearing in the March 2018 issue

Quantitative spinal cord MRI in radiologically isolated syndrome

Objectives To assess whether quantitative spinal cord MRI (SC-MRI) measures, including atrophy, and diffusion tensor imaging (DTI) and magnetization transfer imaging metrics were different in radiologically isolated syndrome (RIS) vs healthy controls (HCs).

Methods Twenty-four participants with RIS and 14 HCs underwent cervical SC-MRI on a 3T magnet. Manually segmented regions of interest circumscribing the spinal cord cross-sectional area (SC-CSA) between C3 and C4 were used to extract SC-CSA, fractional anisotropy, mean, perpendicular, and parallel diffusivity (MD , λ_{\perp} , and λ_{\parallel}) and magnetization transfer ratio (MTR). Spinal cord (SC) lesions, SC gray matter (GM), and SC white matter (WM) areas were also manually segmented. Multivariable linear regression was performed to evaluate differences in SC-MRI measures in RIS vs HCs, while controlling for age and sex.

Results In this cross-sectional study of participants with RIS, 71% had lesions in the cervical SC. Of quantitative SC-MRI metrics, spinal cord MTR showed a trend toward being lower in RIS vs HCs ($p = 0.06$), and there was already evidence of brain atrophy ($p = 0.05$). There were no significant differences in SC-DTI metrics, GM, WM, or CSA between RIS and HCs.

Conclusion The SC demonstrates minimal microstructural changes suggestive of demyelination and inflammation in RIS. These findings are in contrast to established MS and raise the possibility that the SC may play an important role in triggering clinical symptomatology in MS. Prospective follow-up of this cohort will provide additional insights into the role the SC plays in the complex sequence of events related to MS disease initiation and progression.

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Cervical spinal cord atrophy: An early marker of progressive MS onset

Objective To assess whether cervical spinal cord atrophy heralds the onset of progressive multiple sclerosis (MS).

Methods We studied 34 individuals with radiologically isolated syndrome (RIS) and 31 patients with relapsing-remitting MS (RRMS) age-matched to 25 patients within a year of onset of secondary progressive MS (SPMS). Two raters independently measured (twice per rater) the cervical spinal cord average segmental area (CASA) (mm^2) of axial T2-weighted images between C2 and C7 landmarks. The midsagittal T2-weighted image from the end of C2 to the end of C7 vertebra was used to measure the cervical spine (c-spine) length (mm). Sex, age at cervical MRI, number and location of cervical spinal cord lesions, c-spine length, and diagnoses were analyzed against the outcome measures of CASA and C2 and C7 slice segmental areas.

Results Intrarater and interrater agreement was excellent (intraclass correlation coefficient > 0.97). The CASA area ($p = 0.03$) and C7 area ($p = 0.002$) were smaller in SPMS compared with RRMS. The C2 area ($p = 0.027$), CASA ($p = 0.004$), and C7 area ($p = 0.003$) were smaller in SPMS compared with RIS. The C2 area did not differ between SPMS and RRMS ($p = 0.09$). The C2 area ($p = 0.349$), CASA ($p = 0.136$), and C7 area ($p = 0.228$) did not differ between RIS and MS (SPMS and RRMS combined). In the multivariable model, ≥ 2 cervical spinal cord lesions were associated with the C2 area ($p = 0.008$), CASA ($p = 0.009$), and C7 area independent of disease course ($p = 0.017$). Progressive disease course was associated with the C7 area independent of the cervical spinal cord lesion number ($p = 0.004$).

Conclusion Cervical spinal cord atrophy is evident at the onset of progressive MS and seems partially independent of the number of cervical spinal cord lesions.

Classification of evidence This study provides Class III evidence that MRI cervical spinal cord atrophy distinguishes patients at the onset of progressive MS from those with RIS and RRMS.

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