INTRODUCTION and OBJECTIVES

- The spinal cord is an eloquent site of the central nervous system (CNS) that is frequently involved in multiple sclerosis (MS).
- Cervical cord lesions are more frequent in MS compared to other neurological disorders, and are more specific for MS compared to brain lesions (Bot et al., 2002).
- Cord lesions can be found early in the course of the disease and contribute to the diagnostic process (Filippi et al., 2016).
- Progressive MS patients show relatively higher cervical cord lesion burden, which, however, is not correlated to disability or disease progression.
- MR imaging of the spinal cord presents inherent difficulties that make acquisition technically challenging. Such challenges include the spatially non-uniform magnetic field environment of the spinal cord, the small physical dimension of the cord cross-section, and the physiological motion related to the pulsating CSF flow, heartbeat and breathing (Stroiman et al., 2014).
- In the clinical practice, cord lesions are detected on proton density or T2-weighted sagittal scans.
- The introduction of high-field scanners that used the use of T1-weighted high-resolution cord sequences may improve the ability of cord lesion detection (Nair et al., 2015).
- Aim of this study was to evaluate lesion visualization in the cervical cord on 3D T1-weighted scans vs T2-weighted (or short-tau inversion recovery) MRI in a large, multicenter dataset of MS patients acquired at 6 European sites.

METHODS

Subjects. Patients were enrolled at six European centers part of the MAGNIMS network (www.magnims.eu):
- a) Hospital Universitari Vall d’Hebron, Barcelona, Spain (26 patients);
- b) St. Josef Hospital Ruhr University Bochum (Germany) (12 patients);
- c) Queen Square MS Centre, UCL Institute of Neurology, London, UK (20 patients);
- d) Neuroimaging Research Unit, San Raffaele Scientific Institute, Milan (Italy) (115 patients);
- e) The MRI Center “Sun-FISM”. Second University of Naples, Naples (Italy) (15 patients);

During the same scanning session, the following cervical cord sequences were obtained:
- sagittal dual-echo turbo-spoijd-echo (TSE) (London, Oxford);
- sagittal short tau inversion recovery (STIR) (Bochum, Barcelona, Milan, Napoli); and
- sagittal 3D T1-weighted magnetization-prepared rapid acquisition gradient echo (MP-RAGE) scan (all sites).

MRR Acquisition

Cervical cord MRI scans were obtained using scanners operating at 3.0 Tesla at all sites (Barcelona: Siemens Trio; Oxford: Siemens Prisma; Bochum, London and Milan: Philips Achieva; Naples: GE Signa).

RESULTS

- Two raters blindly evaluated cord lesions, using STIR/DE only, 3D T1 only, and then STIR/DE and 3D T1 together. A final consensus agreement on lesion count and location was made.

- Inter-rater concordance on the number of detected lesions was high when using STIR/DE alone (CCC=0.888), 3D T1 alone (CCC=0.90) and the two sequences together (CCC=0.909).

CONCLUSIONS

- In MS patients, total lesion count correlated significantly with the EDSS and disease duration (p<0.39 and 0.44, respectively, p<0.01). The number of lesions located in the lateral, posterior and anterior columns also showed a significant correlation with clinical variables; the highest correlation shown for lateral cord lesions (r=0.43 and 0.42, p<0.01 for EDSS and disease duration, respectively).
- In RRMS, total cord lesions, lateral cord lesions and posterior cord lesions were correlated with EDSS and disease duration ( EDSS: r=range 0.30 - 0.26, p=range 0.003-0.014, disease duration: r=range 0.39 - 0.37, p=range 0.001 - 0.002).
- In PPMS, there was a trend toward a correlation between lesion counts and clinical variables (p=0.08).

REFERENCES


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