

A One Year follow-up Study of the Spinal Cord with Biplanar MRI in Multiple Sclerosis – Clinical and MR aspects

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Introduction: Although the spinal cord (SC) is frequently and often extensively involved in MS so far relatively few studies have evaluated the SC in MS patients serially in smaller cohorts. One reason might be that relative to brain imaging, spinal cord imaging is technically more challenging. We applied a new approach imaging the whole cord in sagittal and transverse planes with multi-array coils and parallel imaging. In addition to a standardized clinical assessment, both brain and whole SC MRI were performed at baseline and after 1 year. We were interested in the sensitivity and potential advantages of f/u studies of the SC with this approach.

Methods: 183 MS patients from the outpatient clinic (108 women, 46 men, mean age at baseline: 44 y (range 24-74), mean EDSS: 3.5 (range 0-7.0) and a mean disease duration of 14.5 y) with different MS subtypes (CIS, RRMS, SPMS and PPMS) were prospectively investigated clinically and with MRI over 1 year. The patients had best possible treatment at the discretion of the responsible neurologist. Examinations were performed on a 1.5T SIEMENS Avanto system, that offers multi-array-coils (Siemens acronym: TIM technology) and parallel imaging techniques, both essential for the fast and complete assessment of the whole neuro-axis. The standardized brain MRI protocol included transverse, coronal and sagittal localizers; transverse 3mm proton density, T2- and before and after gadolinium T1-weighted spin-echo and turbo-spin-echo sequences. For spinal cord MRI, sagittal and transverse Proton Density and T2-weighted turbo-spin-echo sequences were included. A standardized qualitative reporting scheme for the presence and location of lesions and diffuse spinal cord signal change was employed by a consensus reading of 2 experienced raters.

Results: Clinical: Between baseline and year 1 a total of 64 relapses were documented in 43 patients. Of those 49/64 relapses in 30/43 patients possibly involved the SC in 33/43 patients (sensory and/or pyramidal functional systems). Brain MRI: On follow-up new brain lesions were demonstrated in 38/183 (20%) of patients.

Spinal cord MRI: Definite SC changes were noted in 21/183 patients (11.5%). In 14/21 new focal lesions were noted. Furthermore in 4/21 patients we detected increases of the size of individual lesions or confluence of originally closely located small lesions. In 3/21 focal atrophy of the cord at the site of a lesion became more prominent on follow-up. Transverse MRI was useful to confirm or suspect changes compared to the previous examination, particularly as exact repositioning and identical slice positioning on sagittal images is extremely difficult (Fig. 1). In 5/183 patients the comparison of baseline to f/u was unrevealing due to images artefact. In 4/21 patients with new SC pathology on MRI clinical relapses possibly originating from a cord lesion were recorded, i.e. affecting the pyramidal and sensory functional systems, while 17/21 patients had no clinical relapse (Fig.2).

Conclusion/Discussion: Follow-up MRI of the entire cord and brain is feasible in a single examination, but despite technological progress still challenging. Important points in this regard are exact repositioning of the patient and identical slice positioning on sagittal images. Furthermore as noted before the occasionally small contrast between healthy and affected tissue may cause difficulties to ascertain pathology. Additional transverse scans are of great help in this respect in order to confirm or reject information compared to the previous examination. This cohort of treated MS patients had relatively little inflammatory disease activity (20%). On SC MRI interestingly in 17 (9%) patients new lesions were seen in the absence of a clinical relapse, which contrasts with previous studies and may indicate that sensitivity to new pathology is increased with biplanar MRI.

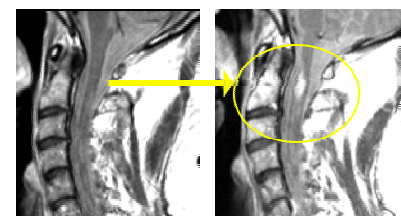
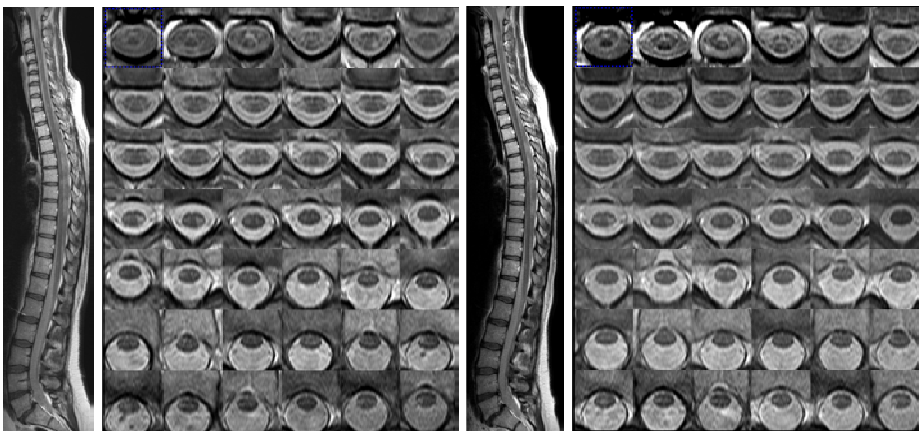


Fig. 2: A new, surprisingly asymptomatic, lesion is detected on the 1 Year follow-up MRI (right).

Fig. 1 : Spinal Cord follow-up examination over 1 year (right). Sagittal slices demonstrate lesions, but in slightly different position despite best possible repositioning attempts. The transverse perspective demonstrates on 6 mm images, that no new lesions are seen, while even subtle pathology is recognized in the cross-sectional images.