No differences in spinal cord DTI abnormalities between neuromyelitis optica spectrum disorder and multiple sclerosis

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Background: It has been suggested that neuromyelitis optica spectrum disorders (NMOSD) shows more spinal cord (SC) atrophy than brain atrophy, while multiple sclerosis (MS) shows more brain atrophy. Diffusion tensor imaging (DTI) has demonstrated the pathological involvement of the white matter (WM) and grey matter (GM) of the SC in MS.

Objectives: (i) To calculate DTI measures in the GM and WM of SC, and brain and SC atrophy in patients with NMOSD; (ii) to compare them to MS; (iii) to explore their relationship with clinical disability.

Methods: 18 NMOSD (16 with LETM involving the cervical cord, 14F, mean age 52yrs[SD11]), 19 relapsing-remitting MS patients (5 with cervical cord lesions, 15F, mean age 42yrs[SD10]) and 25 HC (18F, mean age 37yrs[SD13]) were scanned at 3T. Brain parenchymal fraction (BPF), grey matter fraction (GMF), white matter fraction, cord cross-sectional area (CSA) and SC DTI metrics (fractional anisotropy, mean diffusivity, radial diffusivity, axial diffusivity) in the GM and WM columns were measured and compared among groups. Physical disability was assessed using the expanded disability status scale (EDSS), 9 hole peg test and timed 25 foot walk test (TWT). We used multiple regressions to compare imaging measures between groups and Spearman-correlation to explore the relationship between MRI parameters and clinical measures.

Results: There were no differences in SC DTI metrics in the GM and WM between NMOSD and HC, MS and HC, and patient groups. NMOSD patients showed a borderline significant smaller CSA than HC (mean[SD] 77.65 mm^2[2.40] vs 83.74 mm^2[1.98]; p:0.069); MS patients had a smaller CSA (mean 76.24 mm^2[2.16]) than HC (p:0.013), with no difference between patient groups. MS patients had lower BPF than NMOSD (mean[SD] 0.75[0.003] vs 0.76[0.003]; p:0.04) and HC (mean 0.75[0.003] vs 0.76[0.003]; p<0.01) and lower GMF than HC (mean 0.44[0.002] vs 0.45[0.002]; p:0.03)**.** In NMOSD, CSA correlated with EDSS [$r_{s:}$-0.46, p:0.05], and TWT [$r_{s:}$-0.5, p:0.039).

Conclusion: Pathological involvement of SC, as reflected by DTI, does not differ between NMOSD and MS, despite a different pattern and extent of SC lesions between the two diseases. However the sample size was small. Our study confirms that brain atrophy is greater in MS than NMOSD and that in NMOSD, CSA is the best correlates of clinical disability.