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Author(s)	Hu, Y; Cui, J; Wen, C; Mak, KC; Luk, KDK
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EXPLORATION OF FUNCTIONAL REORGANIZATION IN CERVICAL SPONDYLOSIS MYELOPATHY – A DTI AND FMRI STUDY

Yong HU, Jiao Long CUI, Chun Yi WEN, Kin Cheung MAK, Keith Dip Kei LUK
Department of Orthopaedics and Traumatology, LKS Faculty of Medicine, The University of Hong Kong, (HONG KONG)

Introduction: The morphological and signal change in anatomical magnetic resonance images (MRI) did not necessarily parallel with clinical symptoms in cervical spondylosis myelopathy (CSM), which poses a big challenge to clinician for early diagnosis and precise prognosis. Functional reorganization may play an important role in the pathophysiological mechanism of this chronic degenerative disease. The present study sought to explore the relationship between functional reorganization and structural damage in CSM. Methods: Fourteen healthy subjects (56±13 yrs) and six CSM patients (65±12 yrs) were recruited. Cross-sectional area, compression ratio, T2-weighed signal change, Fractional anisotropy (FA) value and somatosensory stimuli-induced blood-oxygen-level-dependent (BOLD) signal change were quantitatively measured via conventional T2-weighted, diffusion tensor and functional MRI on a 3T MR system. Results: BOLD signal change was significantly higher in myelopathic cord (7.86±0.95%) compared to healthy cord (5.52±0.21%) ($p<0.01$). Significant difference was detected between healthy and myelopathic cord with cross-sectional area, compression ratio and FA value ($p<0.05$). FA value indicated a much stronger correlation with BOLD signal change (Healthy: $r=0.4887$, $p=0.0764$; CSM: $r=-0.8938$, $p=0.0163$) compared to T2-weighted signal change or morphometry data. Conclusion: Greater microstructural damage was found to significantly and linearly correlate with enhanced functional activation in myelopathic cord, which possibly suggests the extent of microstructural damage is a factor relevant to the extent of functional reorganization in CSM. This study demonstrates a quantitative structure-function relationship in healthy and myelopathic cord, which might provide a promising method to gain additional insight into the role of structural damage/functional reorganization in the spinal cord diseases.