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EDITORIAL (BY INVITATION) - SPINE - OTHER

Early cervical spondylotic myelopathy and longitudinal brain activation changes

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The article by Hrabálek et al. [1] investigated longitudinal brain activation changes related to electrophysiological findings in patients with cervical spondylotic myelopathy (CSM) before and after spinal cord decompression, utilising fMRI technology.

The authors claim that, to their knowledge, there has been no study evaluating brain activation changes in CSM patients over at least 12 months after surgical decompression with respect to the presence of abnormal preoperative electrophysiological findings.

They evaluated motor evoked potentials (MEP) and fMRI before and 6 and 12 months (only fMRI) after decompressive surgery in 20 patients with mild CSM.

Their aims were twofold:

(a) to assess whether the presence of abnormal electrophysiological findings is accompanied by changes in task-related fMRI activation in the sensorimotor system as compared to patients with normal findings and
(b) to assess whether surgical decompression is associated with a differential evolution of the fMRI activation at 6-month and 12-month follow-ups.

Before surgery, abnormal MEPs were associated with hyperactivation in the cerebellum. Six and 12 months after surgery, they observed fMRI hyperactivation in the contralateral sensorimotor cortices. However, if MEPs were normal at baseline, fMRI activation decreased in the ipsilateral sensorimotor cortex. The authors conclude that abnormal preoperative corticospinal MEP findings were associated with increased brain activation. And that recovery after decompressive surgery in these patients leads to further brain activation on fMRI. In effect, the authors surmise that even in mild CSM, the potential for full recovery is not obvious if there are already abnormal electrophysiology findings. They suggest that positive neuronal plasticity is happening, but unable to suggest at which time-point intervention would be optimal.

The inclusion/exclusion criteria are of interest. The study looked at mild CSM and therefore included only people with symptoms up to 6 months, as it aimed at assuring study group homogeneity and at limiting CNS adaptive mechanisms, which can vary in early and chronic disease states, or with mild or severe deficits. The investigators were, thus, mindful that fMRI brain activation may be affected by the altered motor performance, prolonged limb inactivity or diverse pathological changes. Nonetheless, it is unclear if the same study in longer symptomatic states could provide any further data consistency to further facilitate data interpretation, or whether it would instead complicate the picture even more. The authors also excluded myelopathy due to posterior compression or mixed anterior and posterior compression. This was again for homogeneity of fMRI activation patterns; anterior compression affects the efferent pathways in the anterior columns and anterior horns; posterior compression affects sensory afferent pathways in the posterior columns and posterior horns.

Overall, this is a very interesting study trying to correlate MEP findings with fMRI changes.

It provides supportive evidence that persisting neurophysiological abnormalities (both MEP and fMRI changes persisted at 1-year follow-up) may be present even very early after symptom onset despite minimal disability.

It remains unclear, of course, whether CSM per se is causing the fMRI activation patterns, be it either hyperactivation or hypoactivation, or both. It is also still unclear which is the right time to intervene.

Equally unclear is whether an abnormal MEP result in early CSM should be perceived as potentially irreversible.

Nevertheless, it may be that this data provides the incentive for a larger and longer study with stratification of symptom severity and correlation to a defined interval between first onset of symptoms and surgery.

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Reference

1. Hrabálek L, Hok P, Hluštík P et al (2018) Longitudinal brain activation changes related to electrophysiological findings in patients with cervical spondylotic myelopathy before and after spinal cord decompression: an fMRI study. Acta Neurochir. https://doi.org/10.1007/s00701-018-3520-1