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Neurophysiological Evaluation of Cervical Spondylotic Myelopathy and Radiculopathy



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Abstract

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Introduction

Cervical spondylotic myelopathy (CSM) and radiculopathy are relatively common neurological disorders of the cervical spine. The two main modalities of investigations available to evaluate these patients are radiology (neuroimaging) and neurophysiology. The role of neurophysiological techniques in the evaluation of these patients is not clearly established.

Objectives

The aim of this study was to study the changes of neurophysiological parameters in patients with CSM and radiculopathy, with a view of identifying the role of each neurophysiological investigation in the evaluation of these patients. The main objectives were

1. To compare the needle EMG findings with parameters of median nerve somatosensory evoked potentials (SEPs) and magnetically evoked motor evoked potentials (MEPs) of upper limbs in patients with clinical features of cervical radiculopathy.
2. To compare the parameters of MEPs of abductor digiti minimi muscle in patients with clinical features of CSM with a control group.

3. To correlate clinical and MRI features with MEP and posterior tibial SEP parameters in patients with CSM with regard to the presence of spinal cord compression and localization of the rostral-most level of compression.

Methodology

This was a cross-sectional observational study. The test group comprised patients with clinical features of spondylotic cervical radiculopathy or myelopathy. A control group comprising healthy volunteers was employed to generate normative data for the neurophysiological investigations. In the first study 35 patients with clinical features of cervical radiculopathy were studied using needle EMG, median nerve SEPs and MEPs of upper limb muscles.

In the second study, the test group comprised 21 patients with clinical features of cervical myelopathy. The MEPs of ADM muscles were compared with the findings of an age and height matched control group (n=17).

In the third study 33 patients with clinical features of cervical myelopathy were studied using upper and lower limb MEPs posterior tibial SEPs and magnetic resonance imaging (MRI).

Results

In the first study, when needle EMG was kept as the proxy gold standard for the diagnosis of cervical radiculopathy, the sensitivity and specificity of upper limb MEPs were 85% and 87.5% respectively. The sensitivity and specificity of median nerve SEPs were 44% and 87.5% respectively.

In the second study, when the parameters of MEPs of ADM muscles were compared with the control group, the total motor conduction time and the central motor conduction time were prolonged in the myelopathy group whereas the duration of the MEPs was shorter in the myelopathy group. All the differences were statistically very highly significant ($P < 0.001$).

In the third study, when the presence of cord compression was considered, of the MRI positive patients, 93% and 75% were positive for MEPs and SEPs respectively. When the rostral-most level of spinal cord compression was considered, MEPs correlated better with clinical features than MRI (95% versus 84%).

Conclusions

1. The study of MEPs of upper limb muscles appears to be a useful test for the prediction of the presence of cervical radiculopathy, while median nerve SEPs do not appear to be useful for it.
2. In addition to the well-established abnormalities of central motor conduction times, the duration of MEPs also appear to be of value as an abnormal parameter in the evaluation of cervical myelopathy.
3. The study of MEPs of upper and lower limb muscles appear to be a useful method for the prediction of the presence of cervical myelopathy while the use of posterior tibial SEPs alone seems to be insufficient for it. Upper limb MEPs appear to localize the rostral-most level of spinal cord compression better than MRI.