Movement and pain in fibromyalgia: a co-registration by fNIRS and LEPs

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Recent studies by non-invasive stimulation techniques suggested a possible alteration in cortical excitability of motor area in chronic pain patients. However, physical exercise is indicated in the treatment of pain [1]. The complex mechanism of interaction between the motor cortex and pain matrix is not completely clear. Functional Near-Infrared Spectroscopy (fNIRS) is an optical and non-invasive method to monitor brain activity. FNIRS is suitable to measure variations in hemoglobin concentration. The present study aimed to investigate the hemodynamic activity and laser evoked potentials (LEPs) variations during both slow and fast finger tapping task and concomitant painful stimulation on the right and left back hand. We recruited 20 healthy subjects and 35 fibromyalgia patients. A co-registration by fNIRS and LEPs was used to explore motor cortex activation and nociceptive pathways. FNIRS data showed a reduction in motor cortical activation both in movement condition than during concomitant laser stimulation in both hands in FM group compared to controls. There was a slight reduction in N1 amplitude during movement in both groups. Patients presented a strengthening of N2P2 vertex complex during motion unlike the controls. We suggested a possible abnormal interference circuit between motor and pain systems in FM patients.

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Cephalic and extracephalic neurophysiological effects of botulinum toxin type A in chronic migraine

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The neurophysiological mechanisms underlying clinical efficacy of botulinum toxin type A (BTX-A) treatment of chronic migraine (CM) are still debated widely. We assessed the cephalic, and extracephalic effects of BTX-A injection in a group of 13 CM patients, by simultaneously recording the blink reflex (nBR), the trigeminocervical reflex (nTCR), and the pain-related evoked potential (PREP) following stimulation of the right supraorbital nerve, and by recording the non-noxious somatosensory evoked potentials (SSEPs). Neurophysiological measurements were recorded before, and 1 month and 3 months after BTX-A. At month 3, BTX-A significantly reduced the mean headache days, severity of headache, and tablet intake. A significant increase in pain threshold was noted 3 months after treatment compared to baseline. We found that the initial nBR and nTCR lack of habituation was replaced by normal habituating response at 3 months. There were no variations in the initial PREP and SSEP after BTX-A, despite a trend for an increased habituation for PREP and lack of SSEP amplitudes. Our findings suggest that the responsiveness to a single session of BTX-A may be related to the blockage of sensitization of the nociceptive neurons in the dorsal horn, without an evident involvement of cortical circuitries.

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The neurophysiological basis of balance impairment in multiple sclerosis patients

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Balance impairment is very common in multiple sclerosis (MS). The main mechanism could be a dysfunction in the lower limbs sensorimotor control. Aim of this study is to evaluate, by evoked potentials (EP), the contribution of motor and somatosensory pathways on balance performance in MS patients. All patients underwent brain and spine MRI, somatosensory (SEP) and motor (MEP) evoked potentials, and clinical evaluation. Balance performance was assessed by the Tinetti Scale. Disease severity was measured by EDSS. OLS regression with robust standard errors of Tinetti on SEP and MEP was employed, controlling for gender, age, MS type, EDSS, and spinal MRI findings. 40 patients were included. 47.5% had balance impairment. SEP were abnormal in 45% and MEP in 35%. 67.5% had spinal cord lesions. Linear regression model revealed negative significant correlations between Tinetti and EDSS scores ($p < 0.01$) and between Tinetti score and central somatosensory conduction time at SEP ($p < 0.05$). In MS, balance impairment is related to a dysfunction of lower limbs somatosensory ascending pathways conveying proprioceptive and somatosensory information. EP are useful in the study of pathophysiology of unbalance and seem to be more sensitive than MRI in assessing sensorimotor pathways functionality.

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Botulinum Toxin A and physiotherapy in multiple sclerosis spasticity: Patient-tailored goal setting and the measurement of its achievement

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Botulinum toxin type A (BT-A) is known to be effective in improving focal spasticity; a few data are available on BT-A efficacy in improving function and quality of life in Multiple Sclerosis (MS). To evaluate in MS patients presenting with focal spasticity the grade of achievement of the predefined goals through the treatment with BT-A and physiotherapy a longitudinal prospective study was drawn in 11 patients; for each patient it was fixed an individualized rehabilitative program and BT-A was administered depending on spasticity pattern. The evaluation of the adequate achievement of the target was done at week 4 using the Goal Attainment Scale (GAS). Specific scales were applied depending on the function or disability domain involved. All of them had a progressive form of MS; EDSS was 6.5 mean (4–8). 8 patients had as target gait improvement, 2 postural changes and 1 posture improving. 9 out of 11 reached the fixed target, 6 of them with gait improvement as target. Our data suggest that an integrated, multidisciplinary approach in treating focal spasticity is effective for reaching the individualized objective targeted on actual needs of single patient. This is the first step for a subsequent evaluation of a real impact of our intervention in reducing global disability of MS patients.

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