



## Differences in the electrical activity and the clinical performance of superficial neck flexors and extensors during the CCFT in women with migraine

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### Introduction

Musculoskeletal disorders in the cervical spine have been increasingly investigated and observed in patients with migraine. One of them is a poorer cervical muscle performance as assessed by the cranio-cervical flexion test (CCFT). In addition, patients with migraine have alterations in the recruitment of muscle motor units observed by surface electromyography during CCFT.

### Objective

The aim was to verify if there are differences in the electrical activity and the clinical performance of superficial neck flexors and extensors during the CCFT in women with migraine considering the presence or absence of concomitant neck pain symptoms.

### Methods

A total of 100 women were assessed: 25 with migraine without neck pain, 25 with migraine and neck pain, 25 with mechanical neck pain and 25 pain-free control. Clinical and demographic data were collected, The CCFT was performed in all groups. The test assessed the deep flexors muscle by a pressure unit biofeedback placed in the posterior region of the neck and initially inflated to 20 mmHg composed by 5 stages, with increase pressure by 2 mmHg at each stage, reaching 30 mmHg, keeping the pressure for 10 seconds without resorting to compensation. Electromyography data were collected with TrignoTM Wireless System wireless surface sensors. The sensors were firmly attached bilaterally on: sternocleidomastoid (SCM); splenius capitis, anterior scalene and upper trapezius. Electromyographic activity evaluated during the CCFT was normalized by the average the root mean square (RMS) calculated for the reference voluntary contraction and expressed as a percentage. Groups comparisons were performed with non-parametric tests adopting a level of significance of 0.05. To analyze the between-groups differences on the proportion of clinical targeted performance stages reached by each participant within the CCFT, the chi-square (X<sup>2</sup>) test was calculated, and the data were submitted to a post-hoc proportion test. For normalized RMS values between-groups comparisons were calculated by using the Kruskal-Wallis's test. The extensor/flexor muscle electromyographic ratio in stages of the CCFT between-groups was calculated by ANOVA.

### Results

No differences were found for age and body mass index among the groups, nor in headache characteristics between migraine groups (all,  $p > 0.05$ ). A significantly higher proportion of pain-free women (52%) were able to reach the latest target (pressure level of 30 mmHg) of the CCFT as compared to all the patient groups. Between-groups comparisons revealed that migraine groups (with and without neck pain) exhibited higher activation of the SCM muscle during the CCFT than pain-free healthy controls (all,  $p < 0.001$ ). The data were not different at any stage of the CCFT for the normalized RMS of the anterior scalene and found that all pain groups exhibited a normalized RMS significantly greater than the control group at all stages of the CCFT of the splenius capitis muscle (all,  $p < 0.003$ ). Additionally, significantly higher upper trapezius activity was observed in all patient groups when compared to the control group in all stages of CCFT, with no differences between both migraine groups and neck pain. The comparison of the electromyographic extensor/flexor ratio during the CCFT indicated no differences for any stage of the test among the groups.

### Conclusion

There was no difference in clinical performance and neck extensors electromyography activity during CCFT in women with migraine, considering the presence or absence of concomitant symptoms of neck pain. However, significant differences were found between individuals who have some dysfunction (migraine and/or neck pain) and controls. Individuals with dysfunction showed a worse performance on the CCFT and a greater muscle activation of SCM, splenius capitis and upper trapezius when compared to controls.

**Keywords:** Migraine disorders, Neck pain, Neck muscles, Cranio-cervical flexion test, Electromyography.