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ORIGINAL RESEARCH STUDY

Is pressure pain sensitivity over the cervical musculature associated with neck disability in individuals with migraine?

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Summary The objective was to determine if disability due to neck pain is correlated with pressure pain sensitivity in the cervical muscles in patients with migraine. Thirty-two volunteers with migraine completed the *Neck Disability Index* (NDI). Pressure pain thresholds (PPT) over the sternocleidomastoid, upper trapezius and suboccipital muscles were also assessed. Data were analyzed using the Spearman correlation coefficient (r_s) and linear regression models ($\alpha < 0.05$). Moderate negative correlations between NDI and PPT were obtained for the sternocleidomastoid ($r_s = -0.42$; $p = 0.001$), upper trapezius ($r_s = -0.33$; $p = 0.001$) and suboccipital muscles ($r_s = -0.41$; $p = 0.001$). The linear regression revealed no association between NDI and PPT of sternocleidomastoid ($\beta = 0.01$; $R^2 = 0.17$), upper trapezius ($\beta = 0.01$; $R^2 = 0.11$) and suboccipital muscles ($\beta = 0.02$; $R^2 = 0.17$). NDI scores and PPT of the cervical muscles correlated moderately and was inversely proportional in patients with migraine, but the association was not linear, so both outcomes should be considered in the assessment of this population.

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Introduction

Migraine is a primary headache disorder with a prevalence of 18% in the general population (Stovner et al., 2007). It represents a significant economic, social and personal burden due a high incidence during the most productive age, between 25 and 55 years (Lipton et al., 2001). The Global Burden of Disease ranks migraine as the eighth most burdensome disease and as the first among neurological conditions (Leonardi and Raggi, 2013).

It has been reported that the presence of neck pain is more prevalent than complaints of nausea in patients with migraine (Calhoun et al., 2010) and it may precede the attack of the headache (Calhoun et al., 2011). Additionally neck pain can reduce the response of the treatment in this population and it can be a predictor of disability independent of the frequency and severity of migraine (Ford et al., 2007).

Several authors have demonstrated the presence of pressure pain hypersensitivity over the cranio-cervical musculature in patients with migraine (Fernández-de-las-Peñas et al., 2009; Grossi et al., 2011) related to or not with migraine laterality (Fernández-de-las-Peñas et al., 2008; Fernández-de-las-Peñas et al., 2010). Despite the presence of reduced pressure pain thresholds (PPT) over the cervical muscles, the presence of disability due to neck pain has not been studied in these patients, particularly using the Neck Disability Index (NDI) (Vernon, 2008).

The NDI has frequently been used in the assessment of patients with neck pain (Pereira et al., 2008; Johnston et al., 2009; Howell, 2011) and is correlated with other assessment instruments such as the visual analog scale, cervical range of motion and PPT (Marchiori and Henderson, 1996; Hagen et al., 1997; Riddle and Stratford, 1998; Rivest et al., 2010). To the best of our knowledge, it has not been investigated if there is correlation between self-reported disability due to neck pain and pressure pain sensitivity over the cranio-cervical muscles in patients with migraine. Therefore, the aim of this study was to determine if disability due to neck pain is related to cervical musculature PPT in patients with migraine. The hypothesis was that the increased muscle hypersensitivity leads to disability related to neck pain in patients with migraine consequently an inverse relation between these two variables should be expected.

Methods

Overview and participants

This cross-sectional study was approved by the Ethics in Research Committee of an Academically-affiliated University Hospital (process n° 14027/2010) and participants agreed to participate and signed consent forms.

Participants were recruited by written announcements displaced at secondary level health-care units and inclusion criteria were women with migraine and age ranging from 18 to 55 years old. Around 100 women from the community volunteered for the study and were screened for eligibility criteria. Finally, 32 qualified as per the inclusion and exclusion criteria.

Migraine was diagnosed by an expert neurologist following the criteria proposed by the International Classification of Headache Disorders, second edition (ICHD, 2004). Exclusion criteria were other headache diagnosis; use of analgesics in the preceding 24 h; PPT higher than 10 kg/cm^2 during assessment of the thenar region (Chaves et al., 2007); presence of chronic diseases such as diabetes, uncontrolled hypertension, rheumatoid arthritis; previous history of neck trauma or other chronic pain syndromes.

Procedures

PPT was obtained using an algometer Kratos, model DDK-10. The algometer scale ranged from 0 to 10 kg, with a precision of 0.001 kg. A rubber disk with an area of 1.0 cm^2 was placed in the metallic extremity of the equipment, in order to avoid unnecessary pain to the participants. The extremity of the device was placed perpendicularly to the assessed regions (Chaves et al., 2007).

Examiners were previously trained in order to constantly increase the pressure at an approximate rate of 0.5 kg/cm^2/s. A digital metronome (Korg model A-30) with pre-established frequency of 1 Hz was used to provide auditory feedback, to facilitate the maintenance of this velocity (Chaves et al., 2007).

Participants were informed that the objective of the assessment was to define pain threshold, not tolerance to pain. As a training session, PPTs were obtained first on the thenar regions of the right hand of the volunteers (Chaves et al., 2007). Then, the following anatomical points were assessed: medial point of the superior fibers of the trapezius muscle (mid-point between the spinous process of C7 vertebra and the acromion), sternocleidomastoid muscle (upper portion: fibers below the mastoid process), suboccipital region (immediately below the occipital bone) (Chaves et al., 2007) (Fig. 1). PPTs were obtained bilaterally, twice for each reference point in a random fashion (Fischer, 1987) and the means were calculated.

The NDI was self-administered. The clinician helps any question that the patients had. The NDI contains 10 items focusing on specific tasks or activities such as personal care, sleeping and reading; there are 6 or 7 response options, depending on the question, with progressive levels of functional disability. NDI score ranges from 0 to 50, with the rank of no disability (0—4 points), mild disability (5—14 points), moderate disability (15—24 points), severe disability (25—35 points) and complete disability (36 or more) (Vernon, 2008).

Statistical analysis

The Spearman Correlation Coefficient (r_s) was used to test the correlation between PPT and NDI. This test measures the linear association between two variables, and scores range from −1 to 1. Values <0.3 represent weak correlation; 0.3 to 0.7 moderate correlations; and >0.7 strong correlation (Bland and Altman, 1995).

Linear regression was used to measure the association of PPT to the NDI using the PPT as independent variable and percentage score of NDI as dependent variable. The linear regression analysis provided the following outputs: linear