Short- and Medium-Term Effects of Manual Therapy on Cervical Active Range of Motion and Pressure Pain Sensitivity in Latent Myofascial Pain of the Upper Trapezius Muscle: A Randomized Controlled Trial

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Abstract

Objective: The purpose of this study was to investigate effects of different manual techniques on cervical ranges of motion and pressure pain sensitivity in subjects with latent trigger point of the upper trapezius muscle.

Methods: One hundred seventeen volunteers, with a unilateral latent trigger point on upper trapezius due to computer work, were randomly divided into 5 groups: ischemic compression (IC) group (n = 24); passive stretching group (n = 23); muscle energy technique group (n = 23); and 2 control groups, wait-and-see group (n = 25) and placebo group (n = 22). Cervical spine range of movement was measured using a cervical range of motion instrument as well as pressure pain sensitivity by means of an algometer and a visual analog scale. Outcomes were assessed pretreatment, immediately, and 24 hours after the intervention and 1 week later by a blind researcher. A 4 × 5 mixed repeated-measures analysis of variance was used to examine the effects of the intervention and Cohen *d* coefficient was used.

Results: A group-by-time interaction was detected in all variables ($P < .01$), except contralateral rotation. The immediate effect sizes of the contralateral flexion, ipsilateral rotation, and pressure pain threshold were large for 3 experimental groups. Nevertheless, after 24 hours and 1 week, only IC group maintained the effect size.

Conclusions: Manual techniques on upper trapezius with latent trigger point seemed to improve the cervical range of motion and the pressure pain sensitivity. These effects persist after 1 week in the IC group. (J Manipulative Physiol Ther 2013;36:300-309)

Key Indexing Terms: *Physical Therapy Modalities; Trigger Points; Range of Motion, Articular; Pain Threshold; Pain Perception*

Myofascial pain syndrome is a common nonarticular musculoskeletal chronic pain.[1] It is one of the main causes of medical consultation, frequently leading to work disability.[2] It is characterized by an intense and deep pain from skeletal muscles and their fascia and by the presence of one or more myofascial trigger points (MTrPs).[1]

An MTrP is described as a hyperirritable spot of a skeletal muscle associated with a hypersensitive palpable nodule of a taut band able to originate specific patterns of pain referral associated with each MTrP, motor dysfunction, restricted range of movement, and producing autonomous phenomena (eg, skin blood flow response).[1,3-5] Myofascial trigger point is clinically classified as active or latent. An active MTrP presents spontaneous pain at rest, during movement and direct compression, whereas latent MTrP, without spontaneous pain, shows only pain and discomfort in response to compression.[1] This clinical distinction has been supported by biochemical data, showing higher levels of nociceptive substances and chemical mediators such as bradykinin, substance P, and serotonin found in active in comparison with latent MTrP or

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regions without MTrP.[5] Nevertheless, there are few data regarding MTrPs physiopathology.[6,7] On the other hand, pressure pain sensitivity is defined as sensitivity to pain's determination using pressure, being extremely used when assessing MTrPs.[1,3-5,8-12] Pressure pain sensitivity can be measured by pressure pain threshold (PPT) or by pressure pain perception (PPP).[8,10-12]

Some studies have demonstrated the potential relevance of latent MTrP. In fact, its presence may cause muscle activation pattern alterations.[13,14] It has been also suggested that latent MTrPs increased nociceptive sensitivity[3,15,16] and sympathetic activity alterations induced by latent MTrP nociceptive stimulation have been investigated.[4,17] However, individuals, even asymptomatic, could have latent MTrP, and high prevalence of MTrPs subsists at cervical and scapular regions.[18]

Furthermore, a diversity of therapeutic interventions consisting of MTrPs inactivation and interruption of the vicious cycle is suggested in literature.[19,20] These interventions are divided into invasive (local injection, acupuncture needles) and noninvasive (manual therapy, electrotherapy, etc).[8,21] Nevertheless, the effectiveness of these different interventions in MTrPs is not yet fully clarified. Acknowledging the diversity of treatment options, this study aimed to determine the short- and medium-term effects of ischemic compression, passive stretching, and muscle energy technique on cervical active range of motion (CAROM) and pressure pain sensitivity in subjects with latent trigger point of the upper trapezius muscle due to computer work.

Methods

This study was a randomized controlled trial using a researcher blinded to group assignment.

Subjects

Volunteer participants were recruited from a university, and the study was advertised via e-mail to the students. At the end, there were 268 positive responses to enter the study. Sample size determination was calculated by the Spanish software (Ene 3.0; Autonoma Barcelona University & Glaxo Smith Kline). The calculations were based on detecting significant clinical differences of 1 kg/cm^2 (>30%) and a SD of 1 kg/cm^2 on PPT levels between groups,[9,22,23] with a level of 0.05 and a desired power of 90%. This generated a sample size of at least 23 participants per group.

Inclusion criteria were 18 years or older, either sex, latent MTrP in the upper trapezius muscle, and average time of computer work of at least 2 hours per day. Exclusion criteria included bilateral MTrPs in the upper trapezius muscle, any pharmacological therapeutic, any treatment at cervical region during the month before this study, any diagnosed health problem, and any history of head and upper trunk surgery or trauma.

From the initial 298 volunteers, 164 were selected after exclusion criteria were applied and selected randomly to 5 groups using closed envelope with the group name: muscle energy technique (MET) group, passive stretching (PS) group, ischemic compression (IC) group, placebo (Pl) control group, and wait-and-see (WS) control group. Only 117 finished the study: 23 in MET group, 23 in PS group, 24 in IC group, 22 in Pl group, and 25 in WS group (Fig 1).

This study is registered with ClinicalTrials.gov number NCT01709357 and was approved by the ethical committee of the University of Porto on March 4, 2010. All subjects signed the informed consent before they were included in the study.

Outcomes

For each subject, the PPT was assessed using an algometer. In a previous study, it was revealed a high algometry's intrarater reliability (intraclass correlation coefficient [ICC $_{2,1}$], 0.91; 95% confidence interval [95% CI, 0.82-0.97]).[24] An electronic pressure algometer FORCE ONE FDIX (Wagner Instruments, Greenwich, CT), a portable equipment with a pointer with a rubber disc extremity, giving a simulation surface of 1 cm^2, was used. Values were displayed in kilograms so measurements were expressed in kilograms per square centimeter.[10] To control the increase of pressure, a standard metronome was used.[11] With the subject seated, the blind researcher placed the pointer on a patterned point of the upper trapezius muscle, at half-away between the midline and lateral border of the acromion[9] with an approximate angle of 90° and an increasing pressure of approximately 1 kg/cm^2 per second.[10] Subjects were told to say "now" whenever the sensation of pressure was replaced by a sensation of pain.[11] The maximum applied pressure was recorded. When PPT increases, the subject tolerates a greater pressure to elicit pain.

For the determination of PPP, the procedure performed was the same as the prior described, but pressure was kept until 2.5 kg/cm^2 and maintained for 5 seconds, whereas the subject had to characterize the level of pain using a 100-mm visual analog scale ruler with 2 extremes: no pain and worst pain ever felt, with no vertical tick marks.[12] In a previous study, it had reported a high visual analog scale's intrarater reliability (ICC, 0.97 [95% CI, 0.96-0.98]).[25] When PPP decreases, the subject felt less pain when using the same pressure.

Moreover, CAROM was also measured: flexion, extension, and ipsilateral and contralateral flexion of latent MTrP as well as ipsilateral and contralateral rotations of latent MTrP with the cervical range of motion instrument (CROM) (OPTP, Plymouth, MN). A previous study had revealed CROM's intrarater reliability with ICC$_{3,1}$ ranging from 0.87 (95% CI, 0.76-0.95) to 0.94 (95% CI, 0.87-0.97).[26] This