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PROSPECTIVE REPEATED-MEASURES STUDY

Effect of cervical mobilization and ischemic compression therapy on contralateral cervical side flexion and pressure pain threshold in latent upper trapezius trigger points

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Summary Studies have shown a clinical relationship between trigger points and joint impairments. However the cause-and effect relationship between muscle and joint dysfunctions in trigger points could not be established. The purpose of this study was to investigate effects of mobilization and ischemic compression therapy on cervical range of motion and pressure pain sensitivity in participants with latent trigger point in the upper trapezius muscle. Ninety asymptomatic participants with upper trapezius latent trigger point were randomized in to 3 groups: mobilization, ischemic compression and a control. The outcomes were measured over a 2 week period. Repeated measures ANOVA showed statistically and clinically significant pre to post improvement in both the interventional groups compared to control ($p < 0.05$). However the effect sizes between the intervention groups were small (<0.3) revealing minimal clinical detectable difference.

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Introduction

Myofascial pain syndrome (MPS) is a common non-articular type of chronic pain, affecting 85% of the general population sometime in their lifetime (Simons, 1996) leading to disability and inability to work (Henriksson et al., 1996). MPS is characterized by pain originating from hyper irritable spots located within taut bands of skeletal muscle, known as myofascial trigger points (MTrPs) (Leite et al., 2009). Simons (1996) defined MTrPs as a tender point within a taut band of a skeletal muscle that is painful upon compression, contraction, or stretch and usually responds with a referred pain pattern distant from the point. The most commonly identified MTrPs in the body are located in the upper trapezius. Upper trapezius muscle is also the most sensitive muscle in the body with the lowest pressure pain threshold (PPT) to the pressure of an algometer (Fischer, 1987). This may be attributed to the constant work of the upper trapezius muscle against gravity to keep the head and neck vertical and eyes level in the erect position (Simons et al., 1999a,b). The levels of adenosine triphospate, adenosine biphospate and phospocreatine are found to be lower along with larger type-I fibers and altered distribution of mitochondria and sarcotubular system, in persons suffering from chronic upper trapezius myalgia (Larsson et al., 1990). These changes produce temporary hypoxia leading to limited energy crisis, which has been shown to be associated with TrPs (Larsson et al., 1990; Simons et al., 1999a,b).

MTrPs are clinically classified as active and latent. Active trigger points (TrPs) cause local and referred pain symptoms that are familiar to the patients. Latent TrPs evoke similar clinical features (tender spot within a taut band, local twitch response) as active MTrPs, but they are not responsible for pain symptoms or they produce symptoms that are unfamiliar to the patient. Latent MTrPs are also a concern to patients as their presence results in significant restriction in range of motion, muscle fatigue and muscle weakness (Ge et al., 2006, 2011, 2012; Xu et al., 2010; Lucas et al., 2004, 2008; Li et al., 2009).

The cause of MTrPs activation may be attributed to a variety of factors such as muscle overuse, mechanical overload, or psychological stress (Fernández-de-Las-Peñas, 2009). Injury, overuse or overload of muscle fibers leads to involuntary shortening of these muscles. This in turn results in lack of oxygen and nutrient supply and an increase in metabolic demand in the local tissues (Gerwin et al., 2004). The integrated hypothesis theory proposes that the abnormal depolarization of muscle motor endplates and sustained muscular contraction results in localized "ATP energy crisis" (McPartland and Simons, 2006).

Researchers have found clinical relationship between MTrPs and joint impairments (Simons et al., 1999a,b; Maitland et al., 2000; Fernández-de-las-Peñas et al., 2005). It has been hypothesized that the tension of taut bands within a muscle can result in joint hypomobility or the joint dysfunction may activate TrPs by abnormal input (Dommerholt et al., 2005; Fernández de lasPeñas et al., 2006a,b). Clinical studies have reported that MTrPs in upper trapezius is associated with segmental hypomobility at the C3–C4 zygapophyseal joint in patients with neck pain (Fernández-de-las-Peñas et al., 2005, 2006a,b).

Researchers have studied the effectiveness of variety of interventions directed at both muscle and joint impairments on latent TrPs. Ruiz-Sáez et al., (2007) observed an immediate change in pressure pain sensitivity in latent MTrPs in the upper trapezius muscle after a single cervical spine manipulation directed at the C3 through C4 level. Aguilera et al., (2009) compared the immediate effects of ischemic compression and ultrasound for the treatment of latent MTrPs in the trapezius muscle. Though the results showed an immediate decrease in basal electrical activity of the trapezius muscle and a reduction of MTrPs sensitivity after treatment in both the groups, improvement in the active cervical range of motion (ROM) was noted in the ischemic compression group only. Oliveira-Campelo et al., (2013) investigated the effects of different manual techniques on cervical ROM and PPT in 117 volunteers with latent TrPs in their upper trapezius muscle. The results of the study showed that though all interventions (ischemic compression, passive stretching group, and muscle energy technique) provided an immediate relief in symptoms, only the ischemic compression group provided sustained relief after a week. However, Majority of studies on MTrPs have concentrated on the immediate effects of manual therapy on outcome parameters. The immediate effects of manual therapy is small and if or not they lead to long-term clinical benefits are unknown (Cook, 2011).

With the exception of a few studies, most investigations of TrPs have been in pain populations with the focus on the sensory components of TrPs (tenderness, local and referred pain). Pain associated with movement and motor adaptation has made it difficult to establish any cause-and effect relationship between motor effects and TrPs in patients with active TrPs. Therefore, investigation of the potential motor effects of TrPs will likely be facilitated by studying pain-free participants with latent TrPs. Though the relationship between muscles and joint dysfunctions is well recognized in neck pain, not many studies have analyzed this clinical association in latent TrPs. Further, it's worthwhile to investigate the effects of intervention by focusing on articular and non articular structures, as Fernandez-de-las-Penas has pointed that the order in which these muscle and joint impairments should be treated requires further investigation. We hypothesized that intervention aimed separately at muscle and joint impairments in latent TrPs would help provide an insight. This formed the focus of our work and the aim of our study was to evaluate the effect of cervical mobilization and ischemic compression on cervical passive ROM and PPT in latent MTrPs of the upper trapezius muscle in asymptomatic participants.

Materials and methods

A prospective repeated-measures design was used to determine the effectiveness of two interventions during a five-day program. The sample size was calculated and determined at 69 participants (23 in each group) to find a between-group significant clinical difference of 1 kg/cm^2 (>30%) on PPT levels with power established at 90% and significance level at 0.05.