Immediate Effects of Strain–Counterstrain Technique on
Pressure Pain Threshold and Muscle Activity in Male Adults
With Upper Trapezius Latent Trigger Point

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Abstract

The aim of this study was to determine the immediate effects of single treatment of strain-counter strain (SCS) on pressure pain threshold (PPT) and muscle activity during scapular plane abduction with 3% body weight load. Fifteen asymptomatic male adults with upper trapezius latent trigger point (LTrP) (PPT<2.9 kg/cm²) participated in this study. Pressure algometer was used to measure PPT and surface electromyography was used to record upper, middle and lower trapezius, serratus anterior, infraspinatus and middle deltoid muscle activity and relative ratio during scapular plane abduction between pre- and post-intervention. There was a significant increase in upper trapezius PPT after a 90-second SCS (p<.05). The activity of the upper trapezius and middle deltoid was significantly decreased (p=.014, p=.001), coupled with a decreased muscle activity ratio between the upper and lower trapezius (p<.05). These results indicate that the SCS may effectively deactivate upper trapezius activity, thereby alleviating muscle balance and reducing pain sensitivity.

Key Words: Electromyography; Latent trigger point; Muscle activity ratio; Pressure pain threshold; Strain–counterstrain; Upper trapezius.

Introduction

Upper trapezius (UT) trigger points are common soft tissue impairments that often affect neuromotor control in glenohumeral and scapulothoracic movement (Fischer, 1987; Sciotti et al, 2001). Approximately 90% of the healthy population have latent trigger points (LTrP) combined with muscle shortening and decreased pressure pain threshold (PPT) (Fischer, 1987; Simons, 2002; Simons et al, 1999). These trigger point pain syndrome are caused by postural alignment impairments, muscle imbalance, and repetitive overload or cumulative traumatic disorders (Huguenin, 2004). This is often manifested with chronic pain and abnormal motor control patterns, leading to functional movement impairments in the shoulder complex (Lucas et al, 2004; Nagrane, 2010). Previous studies (Lucas et al, 2004; Lucas et al, 2009) have shown that individuals with the UT LTrP demonstrated increased muscle activity and altered activation sequence. Prolonged and dominant spontaneous muscle activity in LTrP compromises normal muscle–tension relationship and in turn changes kinetic chain reaction associated with force coupling mechanism between the lower trapezius (LT), serratus anterior (SA), and deltoid muscles during scapulohumeral movements (Hubbard and Berkoff, 1993; Page et al, 2010). These altered kinesiological movement characteristics predispose to kinesiopathological movement impairments including

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shoulder impingement and rotator cuff tendinitis (Cools et al., 2003; Kibler and Sciascia, 2010; Lucas et al., 2004; Page et al., 2010; Sahrmann, 2002).

Strain-counterstrain (SCS) is a commonly used soft-tissue mobilization technique to alleviate trigger point pain and associated with musculoskeletal dysfunction (Jones, 1981; Lewis, 2001). This technique encompasses two steps: (1) passively holding an involved body segment at a relaxed position for 90 seconds until the desirable level of muscle tension and associated pain reduction are achieved and (2) returning to neutral position slowly. The majority of clinical studies investigating the effect of SCS have specifically focused on pain (Eisenhart et al., 2003; Lewis, 2001; Petowicz, 2005), which is often only a secondary source of the syndrome, rather than the primary cause-neuromuscular dysfunction. For example, recent studies using PPT and pain scale have shown that SCS is effective in relieving pain hypersensitivity (Lewis, 2010; Mesquita et al., 2006; Nagala, 2010). However, SCS can be used in managing muscle imbalance and associated pain because this technique restores optimal movement control by inhibiting overactive muscles and facilitating inhibited muscles (Jelsjensen, 2007). Nevertheless, whether or not SCS has an inhibitory effect on the muscle of the involved muscle fibers is unknown.

Furthermore, there is a dearth of information about the mechanisms underpinning SCS on clinical management of trigger point pain syndrome. Hence, this study aims to determine the immediate effects of SCS at the UT LTrP on PPT and muscle activity patterns during scapular plane abduction with load. Our hypotheses were that (1) the UT pain threshold would be improved and (2) the SCS technique would decrease the UT activity and decrease the associated muscle activity UT/LT ratios during shoulder scapular plane abduction.

Methods

Subjects

Fifteen healthy, young male subjects were recruited from Yonsei University. All subjects signed informed consent form prior to the participation of this study. Inclusion criteria included: (1) a LTrP in the UT muscle and (2) shoulder abduction at least 180° without compensatory motion. In this study, the LTrP was defined as tender point within a palpable taut band and less than 29 kg/cm² PPT. This cutoff pressure was selected because the lowest pressure threshold in the UT of normal male adults was previously identified (Fischer, 1987). Exclusion criteria included: (1) specific neck and shoulder pain such as radiculopathy, (2) systemic pathology, and (3) past or present neurologic or musculoskeletal diseases. The subjects’ demographic and anthropometric data are presented in Table 1.

Instruments

Pressure algometer

The pressure algometer1 comprising a force gauge with a 1 cm² rubber disk, was used to measure PPT. The rubber disk was placed vertically to the UT LTrP. Pressure was then gradually applied on the rubber disk (representing kg/cm²) and recorded when the subjects started to feel pain or discomfort. Measurement was repeated three times before and after SCS. Mean recorded pressure threshold values were averaged and used for further analysis.

<table>
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<th>Table 1. General characteristics of subjects (N=15)</th>
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<td>Variable</td>
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<td>Weight (kg)</td>
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<td>Pain Pressure Threshold (kg/cm²)</td>
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1) FPK 60, Wagner Instruments Inc, Greenwich, CT, U.S.A.