FASCIA SCIENCE AND CLINICAL APPLICATIONS: CLINICAL STUDY

Influence of instrument assisted soft tissue treatment techniques on myofascial trigger points

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IASTT; MTrP; Trigger point pain

Summary Objective: The purpose of this study was to examine the influence of instrument assisted soft tissue techniques (IASTT) on myofascial trigger points (MTrP).

Design: Randomized, controlled study with the researcher assessing the MTrP sensitivity blinded to the treatment rendered.

Participants: Phase 1 = 27; Phase 2 = 22.

Intervention: MTrPs were identified in the upper back. In phase 1, two MTrPs (right & left) were identified. One was treated with IASTT, the other was a control. In phase 2, one MTrP was identified in a treatment and a control group. In each phase, the treatment groups received six treatments of IASTT.

Outcome measures: Sensitivity threshold of the MTrP was assessed with a dolorimeter.

Results: There was a significant improvement in both groups over time but there was no difference between the treatment and control groups.

Conclusions: The use of a pressure dolorimeter may have served as a form of ischemic compression treatment. This assessment tool may have been a mitigating factor in the overshadowing any potential influence of the IASTT on the MTrP. Thus, another assessment tool needs to be identified for MTrP assessment. Until that technique is identified, the effect of IASTT on MTrPs is inconclusive.

Introduction

A myofascial trigger point (MTrP) is a palpable, hypersensitive, nodule within a taut band of skeletal muscle (Travell and Simons, 1989; Alverez and Rockwell, 2002). MTrPs can develop from strenuous or unaccustomed activity as well as poor posture (Cheng, 1987). MTrPs can result for any form
of stress: mental or physical. Trigger points may develop from acute injury or by cumulative microtrauma (Travell and Simons, 1989). MTrPs can be active or latent. Active trigger points may be painful at the site of the trigger point or may refer pain to an adjacent location. Whereas latent trigger points tend to exist in a dormant state and do not produce discomfort until the area is stressed. This stress may manifest in the form of a forceful muscle contraction or a firm palpation. A local twitch response may occur via an involuntary spinal cord reflex when there is a contraction of the taut band. Whereas, pressure on the MTrP may result in a “jump sign” that radiates to a zone of reference (Alvarez and Rockwell, 2002).

Chen et al. (2007) has shown that stiffness of the taut bands may be 50% greater than that of the surrounding muscle tissue. This stiffness has been correlated with muscle pain, weakness, and limitations in motion (Graven-Nielsen et al., 1991; Hong and Simons, 1998; Mense, 1996, 1991, 1993; Simons et al., 1995a, 1995b; Simons, 1996; Travell and Simons, 1989).

There are a variety of modalities purported to relieve or diminish the symptoms associated with MTrPs. Massage (Cantu and Grodin, 1992; Ebel and Wisham, 1952; Pemberton, 1939; Travell and Simons, 1989), needling (Hammeroff et al., 1981; Hong and Simons, 1998; Jaeger and Skoottsky, 1987; Lewit, 1997; Melzack, 1981; Melzack et al., 1988; Travell and Simons, 1989), vapocoolant spray and stretch (Simons, 1996; Travell and Simons, 1989), electrical stimulation (Hooker, 1998), laser therapy (Cheng, 1987; Laakson et al., 1967), ultrasound (Draper and Prentice, 1998; Draper et al., 1995; Draper, 1996; Gam et al., 1998; Gulick et al., 1996; Srbely et al., 2008; Williams et al., 1987) and ischemic pressure (Gulick et al., 2001, 2011) have all had varying degrees of success.

Instrument Assisted Soft Tissue Techniques (IASTT) use special stainless steel instruments with beveled edges to assist the clinician in the evaluation and mobilization of soft tissue (Looney et al., 2011). Instruments are used in a multidirectional stroking fashion applied to the skin at 30°–60° angles to detect soft tissue irregularities via the undulation of the tools (Howitt et al., 2006; Sevier et al., 1995). In addition, IASTT has been purported to enhance proliferation of extracellular matrix fibroblasts, improve ion transport, and decrease cell matrix adhesions (Gehlsen et al., 1999; Hammer and Pfefer, 2005; Howitt et al., 2006; Loghmani and Warden, 2009). IASTT has been suggested to be useful in the treatment of chronic fibrosis, lateral epicondylitis, carpal tunnel syndrome, trigger thumb, and plantar fascitis (Howitt et al., 2006; Leahy, 1995; Melham et al., 1998; Sevier et al., 1995). However, the effects of the IASTT on MTrPs have not been explored. This study was intended to be the first randomized, controlled, IASTT study using a previously developed protocol (Gulick et al., 2011) to examine the influence on MTrPs.

Methods

The investigator of this study is a Graston Technique (GT) trained clinician and educator with approximately 1.5 years of IASTT experience. The methodology of this study was developed in consultation with the GT clinical advisor. She not only recommended the strokes, treatment duration, and specific instruments to be used, but she provided a video demonstration of the way GT teaches the skills. This was helpful in the establishment of a standardized treatment protocol.

As a result of the initial data collected in phase one, this study evolved into a two phase methodology. When the potential participants responded to a posted flyer, the research assistant inquired about the presence of "knots" (i.e. MTrP) in the neck and upper back region. If the potential participant had knot(s) and was not receiving any treatment to this area, he/she was asked to sign a consent form approved by the University Institutional Review Board. To satisfy the exclusion criteria, each participant was screened for sensory problems in the upper or midback regions, heart/circulation problems, cancer, diabetes mellitus, tuberculosis, and shoulder, neck, or upper/midback surgeries. The upper/midback region was inspected for wounds, lesions, and infections. The participants were seated in a chair with his/her forearms resting on a treatment table and forehead on the forearms. MTrPs were identified by manual palpation of taut muscle bands in the upper back with the presence of a “jump sign” and referred pain when pressure was applied. This task was performed by a licensed clinician (DTG) with 30 years of clinical experience. An algometer/dolorimeter (JTECH Company, Salt Lake City, UT) with a 1-cm diameter tip was used to measure pressure sensitivity (in grams) of the MTrPs. Test-retest reliability of this instrument in assessing muscle soreness is reported to be $r = 0.91–0.95$ (Gulick et al., 1996; McCarty et al., 1965).

Phase 1

Phase 1 included healthy participants ($n = 27$; 13 male, 14 female; age $= 23.88 \pm 1.13$; ht $= 167.98 \pm 10.13$ cm; Wt $= 69.26 \pm 14.19$ kg) recruited by a flyer. Phase 1 used two MTrPs in the upper back. When possible, MTrPs were...
selected in a corresponding muscle group on both the right and left sides, e.g. right and left upper trapezius muscles. If this was not possible, an adjacent muscle on the contralateral side was used, e.g. right upper trapezius and left levator scapula muscle. The dolorimeter was placed on each MTrP and pressure was slowly applied by the investigator (Figure 1) until the participant reported that the pressure reached the threshold of discomfort (pre-treatment). The measurements were recorded by a research assistant so that the tester was blinded to the measurements. The MTrPs were then marked with a Sharpie® for subsequent re-tests.

Participants were assigned a number for data collection purposes. Participants with an odd number had the right MTrP treated and those assigned an even number had the left MTrP treated. The contralateral MTrP served as the control. On Day 1, treatment rendered via the Graston Technique involved 1-min of sweeping the upper back region (GT-1), 1-min of swiveling directly over the MTrP (GT-1), then 2-min of fanning the MTrP and surrounding tissues in all directions (GT-4) and finally 1-min of sweeping (GT-1) of the upper back region. Sweeping (Fig. 2) is a longitudinal stroke performed parallel to the muscle fibers. Swiveling (Fig. 3) is a technique in which the knob of the GT-1 instrument is placed directly on the MTrP and pivoted/rotated back and forth. Finally, fanning (Fig. 4) is a stroke in which one end of the GT-4 instrument is held in place and the other end is moved in a circular pattern in the shape of a fan.

Thus, in keeping with the GT recommendation, a total of 5-min of treatment were provided to the overall region. The instruments were maintained at a 30–60° angle throughout the sweeping and fanning techniques. Six treatments (two-times per week) were performed over a three week period with at least two days between treatments. Almost all treatments were rendered on a Monday (AM)/Thursday (PM) or Tuesday (AM)/Friday (PM) schedule. This treatment interval was the recommendation of the GT. On two occasions, a scheduling conflict resulted in a participant scheduled on a Monday being treated on Tuesday so they stayed on the Tuesday/Friday schedule to maintain the appropriate treatment spacing. Retesting using the dolorimeter was completed after treatment #6 (post-treatment) as well as 3–4 days after treatment concluded (follow-up).

Phase 2

Phase 2 included healthy participants (n = 22; 5 male, 17 female; age = 24.82 ± 3.19; ht = 164.33 ± 9.55 cm; Wt = 64.55 ± 11.37 kg). The primary difference in phase 2 was the use of only one MTrP per participant. Thus, there was a treatment (n = 14) and a control (n = 8) group (A-B-A design). Dolorimeter measures were taken every other day for 5 baseline values. The same IASTT described in phase 1 was rendered to the treatment group over three weeks (two times per week × 3 weeks = 6 treatments). The control group did not receive any intervention. The MTrPs of both groups were assessed each session through the treatment phase, and then assessed five times (every other day) during the post-treatment phase. The MTrPs were marked with a Sharpie® to confirm the location of subsequent re-tests.

Under most clinical conditions, additional interventions would most likely be employed. However, performing any additional interventions could make generalizations about
the effectiveness of IASTT difficult. So, throughout both phases of the study, participants were instructed not to render any other treatment to the upper back region. Participants were questioned at each treatment session to confirm compliance.

**Results**

For phase 1, a repeated measures ANOVA revealed no significant difference between the groups ($p = 0.497$), but there was a significant difference over time ($p < 0.001$). Control MTrPs increased pressure tolerance by 3.7 g from pre-treatment to post-treatment and 0.9 g from post-treatment to follow-up. Experimental MTrPs improved 6.2 g from pre-treatment to post-treatment and 0.1 g from post-treatment to follow-up (Fig. 5).

For phase 2, there was a similar trend in the pressure tolerance of the treatment and the control groups (Fig. 6).

**Discussion**

Pain and dysfunction associated with a MTrPs can significantly affect quality of life (Graven-Nielson et al., 1991; Hong and Simon, 1998; Mense, 1991, 1993, 1996; Simons, Hong, & Simons, 1995; Simons, 1996; Travell and Simons, 1989). Despite the results of this study, IASTT may be an effective treatment for MTrPs. In phase 1, improvement of both groups may have been due to a systemic response with the treated MTrP carrying-over to the contralateral side. Perhaps the IASTT facilitated the release of neurotransmitters to abate the discomfort bilaterally. Or perhaps the linkages of the muscular and fascial systems not only decreased the sensitivity on the treated side, but also contributed to the reduction of discomfort on the contralateral side.

Seeing this weakness in the methodology of phase 1, the investigator embarked on phase 2. The second phase employed a randomized control with an A-B-A design. Baseline measurements (A) of MTrP discomfort were obtained prior to rendering six treatments (B). The follow-up (A) was performed to investigate the potential carry-over of the treatment. Phase 2 was intended to eliminate the issue of a cross-over effect of IASTT which may have been a mitigating factor in phase 1. However, the similar slope (Fig. 6) of the treatment and control groups was not expected. The one item both groups had in common was the testing technique with the dolorimeter. It appears that the testing technique used to assess MTrP discomfort may have influenced the control group, as well as the experimental group to improve the pain threshold of the MTrP. This data is consistent with a prior study by Gulick et al. (2011) where ischemic pressure with a Backnobber II proved to decrease MTrP sensitivity with six 30-s compressions delivered every other day for a week (4 treatment sessions). In the present study, the use of the dolorimeter to assess MTrP sensitivity involved three compression motions of approximately 3–5 s.
each. Similar to the prior study where improvement was noted after four treatments, the upward trajectory of the trigger point sensitivity occurred by the 5th (control) and 6th (treatment) measurements. This supports the hypothesis by Simons (1995a, 1995b, 1996) that MTrPs are in an "energy crisis" and ischemic compression may interrupt the cyclic pathology of the MTrP with a reactive hyperemia (Kostopoulos et al., 2008). Perhaps the frequency of the assessment of the MTrP should have been less frequent. Once baseline was established, pre-treatment, post-treatment, and one follow-up two weeks later may have been sufficient. The intent of the multiple measures was to not only see if an effect occurs but when it occurred.

Even with this confounding influence, the experimental group did improve a bit more than the control but the effect size was not enough to yield statistical significance. Despite the recommendations of GT on the protocol of this study, there is no "proven" IASTT for MTrPs. Perhaps different strokes using different instruments for difference periods of time may be in order. Finally, although MTrPs have a propensity to reoccur, it is beyond the scope of this study to comment on long term effects.

Conclusions

The current study was intended to be the first randomized, controlled study to examine the effect of IASTT on MTrPs. Despite a methodological change to address one concern, the dolorimeter technique (frequency of measures) may have been the mitigating factor in the assessment of the IASTT. There needs to be further exploration into another examination technique of a MTrP response to treatment. Perhaps range of motion or strength testing of the muscle in which the MTrP is located would provide information about the response to treatment without directly touching the MTrP. In addition, thermography may provide an indirect measure of blood flow to the area. Until such a technique is identified, the effect of IASTT on MTrPs is inconclusive.

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