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Immediate Effect of Muscle Energy Technique and Trigger Point Release with Phonophoresis on Myofascial Trigger Point of Upper Trapezius

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Abstract

Background: Myofascial trigger point is a small hypersensitive area in skeletal muscles that becomes painful under compression or stimulation. Myofascial Trigger Points are relevant for various musculoskeletal disorders. Although several treatments have been introduced to treat them, the most efficient one is yet to be found.

Objectives: The aim of this study was to investigate the immediate effect of muscle energy technique (MET) and trigger point pressure release with phonophoresis on myofascial trigger point (MTrPs) of the upper trapezius muscle.

Methods: Fourty female volunteers participated in this study. Subjects were divided randomly into 2 groups: MET and trigger point pressure release with phonophoresis groups. Outcomes measures were pressure pain thresholds (PPTs) and pain intensity (visual analogue scale, VAS).

Results: The results revealed an immediate decrease in pain sensitivity in the upper trapezius muscle and visual analogue scale scoring following intervention of trigger point pressure release with phonophoresis.

Conclusion: This study concluded that trigger point release therapy with phonophoresis induced changes in pressure pain sensitivity in myofascial trigger points in the upper trapezius muscle.

Keywords: Phonophoresis, Trigger Point Pressure Release, Myofascial Trigger Points, Muscle Energy Technique, Upper Trapezius

Introduction

Myofascial trigger point is defined as a nodule of spot tenderness which is hyperirritable in nature and located on the taut band of skeletal muscles which can be easily palpated. The myofascial trigger point is also known as MTP. MTP's can refer pain to a different location and can cause both autonomic and motor effects [1, 2]. It has an varied range of prevalence starting from 21% from a general orthopaedic clinic to 93% in specialised pain management centres [3]. Although the MTP's are idiopathic in nature but they may occur due to shortening of some muscular fibres and consequently formation of taut bands resulting from excessive flow of calcium ions from the affected muscular fibers and acetylcholine from the motor end plate [2]. The most commonly affected muscle from MTP is upper trapezius [4, 5], because it is most sensitive amongst the eight different muscles namely paraspinalis, infraspinatus, levator scapulae, gluteus medius, pectoralis major, upper trapezius, teres major and supraspinatus with respect to the pressure from an algometer; as reported by Fischer [6]. There are two types of MTP's namely active and latent [7, 9]. Active and latent MTP's can be differentiated from each other by the pattern of referred pain either by the clinician or the patient [2, 10]. Activity pattern disorder is marked feature of latent MTP's [11, 13]. Management of MTP's include invasive and non- invasive methods. Invasive methods include dry needling and injection therapy, on the other hand non-invasive methods include ultrasonic therapy, massage and stretching [2, 3, 14-18].

"Phonophoresis" is an intervention method that may be effective in treating MTP affected individuals. But there is scarcity of researches evaluating the effectiveness of this technique [19]. As a non-invasive, painless method, phonophoresis is the use of ultrasound to increase skin absorption and penetration of topically applied drugs to deep tissues [43]. For patients with musculoskeletal conditions, phonophoresis is used with topical anti-inflammatory drugs to reduce pain and inflammation [44]. However, trigger point release or pressure release (PR) is studied in numerous researches [7, 15, 20-24].

Muscle Energy Technique (MET) is defined as the manual therapy procedure that involves voluntary contractions of the targeted muscle groups that are controlled and voluntary. MET has many benefits including increasing joint range of motion,

stretching of shortened muscles and aids in lymphatic drainage [25]. The extensibility of shortened muscles can be improved by muscle energy techniques and associated post-isometric procedures like Proprioceptive Neuromuscular Facilitation (PNF) as compared to static stretching [26, 27, 28]. MET is an effective, safe, easy to perform and easy to educate to the patients for home programmes [29]. There are many studies demonstrating the effectiveness of MET in increasing the extensibility of muscles [30-35] and spinal range of motion [36-40] but researches involving clinical outcome are less. There is one case series [41] and one randomized controlled trial [42] that examined the effectiveness of MET in the management of low back pain (LBP), both reporting decreased pain following intervention. There are lack of researches evaluating the effectiveness of muscle energy technique on the upper trapezius myofascial trigger point.

There is scarcity of the researches evaluating the effectiveness of muscle energy technique and combined effect of trigger point release and phonophoresis on the parameters of recovery amongst the individuals suffering from myofascial trigger point on the upper trapezius muscle. As upper trapezius muscles is more prone to the formation of myofascial trigger points.

The main aim of the study was to evaluate the effect of muscle energy technique and combined effect of trigger point release and phonophoresis on the myofascial trigger point of upper trapezius muscle.

Methodology

Research Design

Experimental Study.

Variables under study

Dependent variables used in the study:

- ✓ PPT (Pain Pressure Threshold)
- ✓ VAS (Visual Analogue Scale).

Independent Variables used in the study:

- ✓ Age

Study Setting

Various clinics / hospitals in Delhi and National Capital Region

Target Population

Inclusion Criteria:

- Participants having age group of 18—35 years.
- Participants having mechanical neck pain for less than 3 months.
- Participants having an active upper trapezius TrP (an active upper trapezius TrP was defined as a tender nodule in a taut band that referred pain in a pattern specific for upper trapezius TrP1 or TrP2).
- Participants having pain of at least 30 mm on a visual analogue scale (VAS).
- Participants having decreased cervical lateral flexion to the opposite side of the active upper trapezius TrP.

Exclusion Criteria:

- Participants taking anticoagulants.
- Participants who were using long-term corticosteroid therapy.
- Participants with specific causes for their neck pain.
- Participants having diagnosis of fibromyalgia syndrome.
- Participants having a history of a whiplash injury.
- Participants having a history of cervical spine surgery.
- Participants having a diagnosis of cervical radiculopathy or myelopathy determined by their primary care physician.
- Participants having undergone myofascial pain therapy within the past month before the study.

Sample Size

A total of 40 participants participated in this study.

Sample Techniques

To ensure equal numbers in the groups, subjects were randomised in blocks of three. Sealed opaque envelopes were prepared containing the assigned treatment and numbered consecutively. Subjects were allocated to the next available envelope number.

Sample Size Calculation

The calculations were based on detecting a 20% difference in pressure pain threshold at post intervention data, assuming SD of 10%, an a level of .05, and a desired power of 80%. These assumptions generated a sample size of at least 20 subjects per group.

Description of Tools

[1] Algometer
[2] Ultrasound Machine
[3] Diclofenac Gel
[4] Cotton.

Data collection procedure

Trigger Point Assessment of Myofascial in Upper Trapezius: The participant entered the treatment room and filled out the pain scale. If the pain level was at least 30 mm, the examiner then took the other baseline measurements. The TrP located in the area of TrP1 or TrP2, on the same side as the neck pain, was marked with a cross using a skin-pencil. If both trigger points were involved, the most tender TrP was used. If the subject had bilateral neck pain, the upper trapezius with the most tender TrP was used. To measure PPT, the rubber tip of the PA was placed over the cross signifying the TrP location and the patient was instructed to indicate when the sensation changed from pressure to pain. The pressure was steadily increased at a rate of 1 kg/cm2/s. The examiner then left the room and the treating clinician entered. The clinician opened the next consecutively numbered envelope and delivered the assigned treatment. To mask the examiner to treatment assignment, the clinician set the timer on the ultrasound machine for each subject, placed ultrasound lotion over the trigger point and then wiped it off for each subject, and kept each subject in the treatment room for 3 min. The clinician advised each subject not to discuss anything about the treatment with the examiner. The clinician then left the room and the examiner entered and conducted the post-tests within 5 min of treatment.

Muscle Energy Technique

For MET technique as advocated by Chaitow: The sitting subject's neck was passively side flexed and opposite side rotated until tension was sensed by the researcher and the subject reported a moderate stretching sensation. The participant provided a moderate (approximately 40% of maximal contraction) neck opposite side flexion and rotation isometric contraction, against the researcher's hand for 7—10 s. This was followed by 2—3 s of relaxation, and then the neck was passively stretched to the palpated barrier and/or tolerance to stretch and held for 30 s. The neck was

then relaxed on neutral position for a short resting period (approximately 10 s). Subjects lay supine on a treatment table, with the practitioner present at the head of the table. If the direction of restriction was labelled as right the therapist passively flexed the subjects head and neck to approximately 458 until a sense of resistance was palpated (to relatively lock the mid and lower cervical segments), and then rotated the head to the right until a restrictive barrier was palpated. The subject was then instructed to gently push into the practitioner's hand (rotate to the left) approximately 40% of maximal contraction for 7—10 s, followed by 2—3 s of relaxation, and then the neck was passively stretched to the palpated barrier and/or tolerance to stretch and held for 30 s. The neck was then relaxed on neutral position for a short resting period (approximately 10 s). This procedure was performed three times. On the final relaxation phase, the subject was instructed to breath in and out assist relaxation.

Trigger point pressure release

The clinician applied non-painful slowly increasing pressure with the thumb over the TrP until a tissue resistance barrier was felt. This level of pressure was maintained until release of the tissue barrier was felt, at which time pressure was increased until a new barrier was reached. This process was repeated until there was no TrP tension/tenderness or 90 s had elapsed, whichever occurred first.

Phonophoresis

Diclofenac cream was rubbed on the Myofascial Trigger Point cleaned by alcohol. Ultrasound waves with 1.2 w/cm intensity and 60 percent duty cycle were applied by a Pulsed 1 MHz ultrasound unit for five minutes on the identified Myofascial Trigger Point region. During treatment, the ultrasound applicator (with a 1 cm^2 effective ratio area) was moved rotationally on the Myofascial Trigger Point with similar speed, pressure and full contact with the skin amongst the participants.

Results

Statistical analysis was done by the calculation of Mean and Standard Deviation.

Table 1: Participant's characteristics included in this study

Variable	Muscle Energy Technique (Group A)	Trigger Point Pressure Release with Phonophoresis (Group B)
Age (in years)	30.3±2.82	30.7±9.19

Table 1 summarizes the participant's characteristics included in this study. The mean and standard deviation of age (in years) of muscle energy technique (Group A) was 30.3±2.82 while the mean and standard deviation of age (in years) of trigger point pressure release with phonophoresis (Group B) was 30.7±9.

Graph1: Group A Graph 2: Group B

Table 2: Pre- post intervention values for each group

Variable	Muscle Energy Technique (Group A)	Trigger Point Pressure Release with Phonophoresis (Group B)
VAS (SD) (in cm)	5.25±0; 2.7±0	5.8±0.70; 1.65±0.70
PPT (SD) (in Kg/ cm^2)	1.4±0.70; 1.5±0	1.35±0.70; 1.85±0

Table 2 summarizes the pre- post values of the outcome variables included in this study. The pre intervention values of mean and standard deviation of Visual Analogue Scale (VAS) score in muscle energy technique (Group A) was 5.25±0 and post intervention values of mean and standard deviation of Visual Analogue Scale (VAS) score in muscle energy technique (Group A) was 2.7±0. The pre intervention values of mean and standard deviation of Visual Analogue Scale (VAS) score in trigger point pressure release with phonophoresis (Group B) was 5.8±0.70 and post intervention values of mean and standard deviation of Visual Analogue Scale (VAS) score in trigger point pressure release with phonophoresis (Group B) was 1.65±0.70.The pre intervention values of mean and standard deviation of Pain pressure threshold (PPT) in muscle energy technique (Group A) was 1.4±0.70 and post intervention values of mean and standard deviation of Pain Pressure Threshold (PPT) score in muscle energy technique (Group A) was 1.5±0. The pre intervention values of mean and standard deviation of Pain pressure threshold (PPT) in trigger point pressure release with phonophoresis (Group B) was 1.35±0.70 and post intervention values of mean and standard deviation of Pain Pressure Threshold (PPT) score in trigger point pressure release with phonophoresis (Group B) was 1.85±0.

Graph 3: Group A Group 4: Group B

Discussion

The main objective of this study was to investigate the immediate effects of two intervention methods namely, muscle energy technique and trigger point pressure release on the myofascial trigger points of the upper trapezius muscle. The results revealed that muscle energy technique was less effective than trigger point pressure release with phonophoresis. The results contradicts with the findings of Mehdikhani *et al*., 2012 who done an randomized controlled trial to find out the Immediate effect of muscle energy technique on latent trigger point of upper trapezius muscle. In this study they included Thirty-six female volunteers who were divided randomly into 2 groups: MET and control groups. Outcomes measures were pressure pain thresholds (PPTs), and pain intensity (visual analog scale, VAS) and cervical contra lateral flexion (CLF). Within-group effect sizes were large (d > 1) in the intervention group; but small to medium for the control group in all outcomes. They founded that an immediate decrease in pain sensitivity in the upper trapezius muscle and increase in cervical contralateral flexion. There were significant changes between groups, MET group was effectiveness than control group. They concluded that muscle energy technique induced changes in pressure pain sensitivity in latent MTrPs in the upper trapezius muscle. In another reaserch conducted by Tabatabaiee *et al*., 2018 to compare pressure release, phonophoresis of betamethasone and dry needling on the upper trapezius latent myofascial trigger point. In this study sixty participants, with at least one latent myofascial trigger point in the upper trapezius muscle, participated in this study. Subjects were randomly divided into three groups (pressure release, phonophoresis with betamethasone and dry needling groups) for two weeks. Pain intensity, pain pressure threshold and active cervical range of motion were assessed. They founded that there was significant pain decrease, active cervical range of motion and pain pressure

threshold increase were observed in the three groups ($p < 0.001$). The dry needling and phonophoresis groups reported more significant improvement compared to the pressure release group ($p < 0.001$). There was no difference between the dry needling and phonophoresis groups. They concluded that the significant, positive effects of all three methods, dry needling and phonophoresis seem to be more effective than pressure release.

Limitations of the study

- Small sample size was the main limitation of this study.
- More efficient statistical test could be used.
- The study investigated only immediate effects of the intervention methods. Therefore, follow- up of the participants could not be done.
- Only female participants were included in the study.

Implications and Recommendations

This study highlights the beneficial effect of combination of phonophoresis and trigger point pressure release. This intervention methods can be utilized to manage the myofascial trigger points in the upper trapezius muscle. Future, randomized controlled trials can be performed to confirm the existing findings.

Conclusion

The present study concludes that trigger point pressure release with phonophoresis was found more effective than muscle energy technique in the management of myofascial trigger points in upper trapezius muscle.

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