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# Comparative Study on Effectiveness of Muscle Energy Technique along with Ultrasound Therapy Versus Active Exercise Along with Ultrasound Therapy in the Management of Myofascial Trigger Point in Trapezius Muscle

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**Abstract:** ***This comparative experimental study examined the effectiveness of muscle energy technique combined with therapeutic ultrasound versus active exercise combined with therapeutic ultrasound in managing trapezius myofascial trigger points. Myofascial trigger points are a common source of musculoskeletal pain, often associated with muscle stiffness, reduced flexibility, tenderness, referred pain, and limited range of motion. Thirty participants aged 20 to 40 years with clinically identified trapezius trigger points were randomly assigned into two equal groups. One group received muscle energy technique with ultrasound therapy, while the other received active exercise with ultrasound therapy over a structured treatment period. Pain intensity was assessed using the Visual Analogue Scale, and cervical range of motion was measured with a universal goniometer before and after intervention. Both treatment approaches showed meaningful improvement in pain reduction and mobility. However, the group treated with muscle energy technique alongside ultrasound demonstrated greater clinical improvement compared to the active exercise group. The findings support the use of manual therapeutic intervention combined with ultrasound as an effective option for reducing pain and improving functional movement in individuals with trapezius myofascial trigger points.***

**Keywords:** Myofascial trigger points, trapezius pain, muscle energy technique, ultrasound therapy, active exercise

## 1. Introduction

Skeletal muscle is the largest single organ of the human body and accounts for 40% or more of body weight. Myofascial trigger points have been termed as muscular Trigger point, myalgia, and myofibrositis.4 Myofascial trigger points is one of the common causes of pain which is associated with hyperirritable point within a taut band of skeletal muscle located in the muscular tissue and or its associated fascia. Myofascial trigger point shows diagnostic criteria as: Hyperirritable spot, Taut band, Tenderness, Referred pain and limited painful range of motion.5

Main pathogenic factors that can lead to Myofascial syndrome are gross trauma, chilling, emotional distress, joint or neck damage and visceral disturbance. The prevalence of Myofascial trigger points is extremely common and becomes a painful part of nearly everyone's life at one time or. Trigger points in the shoulder girdle muscle of 54% of the females and 45% of the male subjects.5 As activity become less in later years, individuals tend to exhibit chiefly the stiffness and restricted motion of latent trigger points.7

Muscle and fascia have limited flexibility, lack compliance and residency. Non –compliant muscle are more susceptible to injury and pain. Myofascial Trigger Points are a major factor in non - compliant muscles. Trigger Points cause stiffness and restricted range of motion, and are more common than painful active Trigger Points.

Pain does not have a purpose; it warms us that there is something wrong and provokes a withdrawal response to avoid further injury. The international association for the study of pain define as "An unpleasant sensory and emotional experience associated with actual or potential damage or as activity become less in later years, individuals tend to exhibit chiefly the stiffness and restricted motion of latent trigger 3 points." There are many recent researches published about different approaches and modalities and practiced to relieve the problem associated with Myofascial trigger points. Common approaches and modalities used to relief the pain is, Trigger Point Pressure Relief, Deep massage, Friction massage, Myofascial release, Ice massage, spray and stretch, Modalities – Therapeutic ultrasound, Muscle energy technique, Active exercise etc.6 The technique of Myofascial release is applied to decrease the fascial restriction and restore motion, ease the physical functioning.

Trigger points cause stiffness and restricted range of motion.14 According to Travel "Normal muscle does not contain Trigger Points, is not tender to ordinary pressure, and does not give a jump sign."

The jump sing is described as a general pain response of the patient, who may cry out and withdraw in response to pressure applied on a Trigger point. On the other hand, non - compliant tissue is stiff, tender and sore with a feeling of painful knots or tight bands in the muscle. It exhibits poor circulation, reduced flexibility, weakness and easily fatigue. The stiff non - compliant muscles lack strength and endurance. Muscle endurance is profoundly

affected by reduced blood flow and the reduction in tissue oxygen.

In this study Visual Analog Scale score is used to assess the relief of pain in Myofascial Trigger Point after application of Ultrasound Therapy & Muscle Energy Technique Versus Ultrasound Therapy & Active Exercise.

**Myofascial Pain**

1) Pain is regional, acute or chronic.
2) Physical findings -Tigger points with associated dysfunction.
3) Myofascial trigger point -hyperirritable focus within a taught band of skeletal muscles, located in the muscular tissues or it's associated fascia.

**Type**

1) Fibrocytis -A non - specific condition where there is pain in certain muscles with tenderness when they are gripped.
2) Fibromyalgia -A widespread disease of unknown pathology characterized by multiple tender points and lasting more than 3 months.
3) Myofascial Trigger Points -Term coined by Dr. Janet Travell in 1942. It's a hyperirritable spot in skeletal muscles. It's associated with palpable nodules in taught band of muscle fibers. They produce pain locally and in a referred pattern.

**Muscle Energy Technique (MET)**

Muscle Energy Technique is a form of a manual therapy which uses a muscle's own energy in the form of gentle isometric contractions to relax muscle.

Muscle Energy Technique is an active technique in which patient is also an active participant.

Type of Muscle Energy Technique -

1) Autogenic Inhibition Muscle Energy Technique
2) Isometric Relaxation
3) Facilitation Stretching
4) Reciprocal Inhibition Muscle Energy Technique

Indication -

- Relaxation
- Lengthening of muscle
- Improve Range of Motion

**Ultrasound Therapy -**

In ultrasound therapy, ultrasound energy is used to treat human tissue. The energy is used to treat human tissue. The energy is applied through a transducer head which consists of crystal that vibrates to produce energy.13

Ultrasound refers to mechanical vibrations which are essentially the same as sound waves, but of a higher frequency. When the electrical potential is applied on the Quartz or Barium Titanate or Zirconate Titanate crystal of a specific size, it starts vibrating and produce sound. The sound cannot be heard which is produce by Ultrasound's transducer hear. This is called Piezoelectric phenomena. Piezoelectric transducers are used to achieve the high frequency ultrasound energy needed for imaging the therapy.12

**Active Exercise -**

Movement performed or controlled by the voluntary action of muscle, working in opposition to an external force.

**Type of Active Exercise**

1) Free Exercise -The working muscle are subject only to the forces of gravity acting upon the part moved or stabilized.
2) Assisted Exercise -When muscle strength or co - ordination is inadequate to perform a movement an external force is applied to compensate for deficiency.
3) Assisted -Resisted Exercise -Muscles may be strong enough to work against resistance in part the range. This type of exercise ensure that the external forces applied are adopted in very part of the range to the abilities of the muscles.
4) Resisted Exercise -The force of resistance offered to action of the working muscles are increased to develop the power and endurance of the muscles.8, 9
5) Active Exercise - Active exercises can be done sitting with upright posture, perform 15 - 20 reps an hour for cervical neck flexion (lateral flexion), shoulder abduction, shoulder shrugs, shoulder retraction to develop better posture and to move out of these positions intermittently throughout the workday will place the muscles back at their optimal length while promoting blood flow and oxygen delivery to the muscles.

**Aim & Objective**

1) To assess effectiveness of Muscle energy techniques with Ultrasound therapy on increasing range of motion of Trapezius myofascial trigger points.
2) To assess the effect of active exercise along with Ultrasound Therapy on the reduction of pain in myofascial trigger points of Trapezius muscle.
3) To compare the effectiveness of Active exercise along with Ultrasound Therapy versus Muscle Energy Technique along with Ultrasound Therapy in reducing pain in patients with myofascial trigger points of Trapezius muscle.

**Hypothesis**

To reduce pain and improve Range of Motion of Trapezius myofascial trigger pain following Muscle energy technique along with Ultrasound Therapy and Active exercise along with Ultrasound Therapy.10

**Statement of the Problem**

A comparative study on effectiveness of muscle energy technique along with Ultrasound Therapy versus active exercise along with Ultrasound Therapy in the management of subjects with trapezius myofascial trigger points.

## 2. Operational Definitions

**Pain:**
The pain of Myofascial trigger points involves muscles, fascia and surrounding tissue. Referred pain, also called reflective pain, is pain perceived at a location other than the site of the painful stimulus. The pain attributable to Myofascial trigger point is poorly localized, difficult to ignore, referred pain is a specific character of it and associated with reduction in the capacity to fulfill roles and responsibilities.

**Visual Analog Scale:**
Pain intensity can be measured by VAS. A 10 cm line marked with numbers 0 to 10 can be used where 0 symbolizes no pain and 10 is maximum pain. Subject is asked to mark his / her pain on this line as per the severity. Clinical application of Visual Analog Scale (VAS) provides a simple technique for measuring subjective experience and it has been established as valid and reliable in a range of clinic and research application and Visual Analog Scale (VAS) are one of the most frequent used measurement scales of pain in health care research and practice.

**Range of Motion:**
The most common instruments to use to measure joint position and motion in the clinical setting are the universal Goniometer. Typically, the design includes a body and two thin extensions called arms-a stationary arm and a moving arm.

**Need of Study**
This study aims to evaluate the benefits of two Muscle Energy Technique with Ultrasound Technique and Active exercise with Ultrasound Technique. It was beneficial if comparison will be made between effectiveness of two so to analyze which technique can be better for the pain relief in Myofascial trigger points of Trapezius muscle in future.

## 3. Review of Literature

Myofascial trigger points are major cause of sustained pain and dysfunction that leads to chronic pain conditions. These are hyperirritable spots, which usually appear in the taut band of skeletal muscle or in the muscle fascia that are painful on compression and give rise to a characteristic referred pain, tenderness and autonomic phenomenon.

1) Literature related to management of Myofascial Trigger point.
2) Literature regarding general aspects of Active exercise.
3) Literature regarding the influence of Ultrasound Therapy.
4) Literature regarding the reliability of Visual Analogue Scale.
5) Literature regarding the reliability of Universal Goniometer.

Lewit K, Simons DG, (1984), Stated that the increased tension of the affected muscle and there sulting pain and dysfunction are both relieved by restoring the full stretch length of the muscle.

(Literature related to the management of Myofascial trigger points)

Chang – Zern Hong (1996), Found in his study that application of 0.5% of xylocaine injection showed significant improvement for patient with myofascial trigger points. Gam A. N. et. al., (1998), Concluded in his study to compare the effectiveness of various physical modalities in the treatment of Myofascial trigger points that the ultrasound did not give any pain reduction, but apparently massage and exercise reduced the trigger point pain.

Husueh T. C. et. al., (1997), Found Electrical Muscle Stimulator was better than Electrical Nerve Stimulator in relieving the pain of subjects with myofascial trigger points.14

Catherine logan (2006) stated that, free neck exercises can be done sitting with upright posture, perform 15 - 20 reps an hour for upper trapezius - neck bending, neck rotation, shoulder shrugs to develop better posture and to move out of these positions intermittently throughout the workday will place the muscles back at their optimal length while promoting blood flow and oxygen delivery to the muscles. Robbins (1994) concluded that, free neck exercises are the most potent procedure available for stopping pain and other symptoms mediated by trigger points.

(Literature regarding general aspects of Active exercise.)

Jarmin et al. (2010) concluded that, thermal ultrasound might be a comfortable procedure used to soften trigger points in upper trapezius muscle. Beggs (2003) stated that, ultrasound therapy can be a very effective way to manage the pain of myofascial trigger point.

(Literature regarding the influence of ultrasound therapy)

Husskisson (1974) stated that, pain intensity can be measured by Visual Analogue Scale. A 10 cm line marked with numbers 0 to 10 can be used where 0 symbolizes no pain and 10 is maximum pain. Subject is asked to mark his / her pain on this line as per the severity.

(Literature regarding the reliability of Visual Analogue Scale)

Norkin and White (1998) stated that, the most common instruments to use to measure joint position and motion in the clinical setting are the universal goniometer. Typically, the design includes a body and two thin extensions called arms - a stationary and moving.

(Literature regarding the reliability of Universal Goniometer)

**Study Design**
This research design approach for this study is experimental comparative design (Muscle Energy Therapy

& Ultrasound Therapy versus Active exercise & Ultrasound Therapy).

**Sampling Design**

Randomize sampling is choosing for this study.30 patients with Trapezius myofascial trigger points was distributed into two equal groups that is GROUP A & GROUP B. Each group was consists of 15 patients.

Group A: was treated with MET along with UST.

Group B: was treated with Active exercise along with UST.

**Study Setting and Duration**
- Apex College, BLW, Varanasi.
- Frequency: 5 days per week for 2 weeks.

**Study Population**
- N=30 (15 subjects in experimental group A & 15 subjects in group B)

**Selection Criteria**

**Inclusion criteria**
- Age group: 20 - 40 years
- Both males & females
- Palpable taut band in muscle
- Palpable nodule

**Exclusion criteria**
- Torticollis
- Cervical rib
- Brachial neuritis
- Traumatic pain
- Calcification of soft tissue
- Nervous and vascular disorder

**Variables**

Dependent variable
- Pain

Independent variable
- Muscle energy technique and Ultrasound therapy
- Active exercise and Ultrasound therapy

**Assessment Tool**
- Universal Goniometer.
- Visual Analogue scale.

**Procedure**
In the study the subject having myofascial trigger points was select. Here the 30 subjects were randomly allotted for Group A and Group B with 15 in each group. The subjects in Group A were treated with Muscle energy technique along with Ultrasound therapy. The subjects in Group B were treated with Active exercise along with Ultrasound therapy.

Both groups were assessed for pain by Visual Analogue Scale and Range of motion by Goniometer.

The data was collected by using Visual Analogue Scale as measurement tool. A pretreatment Visual analogue scale was use.

1) Measurement procedure
2) Treatment procedure

Measurement procedure

- Pain by Visual Analogue Scale
- Cervical neck flexion by universal Goniometer

**Visual Analogue Scale**
Use of Visual Analogue Scale (VAS) is an effective tool to obtain the subjective intensity rating of pain. The patient is asked about the intensity of pain and asked to mark on the scale where his/her symptom exists at that movement. The line is then measure and a quantified value is obtained.20

The data was collected by using VAS as a measurement tool. A pretreatment Visual Analogue Scale score and post treatment Visual Analogue Scale score was taken for this study.

The Visual Analogue Scale (VAS) is designed to present to the respondent a rating scale with minimum constraints. Respondents mark the location on the 10 - centimeter line corresponding to the amount of pain they experienced. This gives them the greatest freedom to choose their pain with exact intensity. It also gives the maximum opportunity for each respondent to express a personal response style. VAS data of this type is recorded as the number of millimeters from the left of the line with the range of 0 – 100

Treatment procedure

- Muscle energy technique
- Active exercise
- Ultrasound therapy

**Muscle Energy Technique**

For the TRAPEZIUS (on both sides), the contrast–relax–agonist–contract (CRAC) technique was use. During therapy, the participant was lying on his back. The therapist positions the cervical spine in the lateral flexion (in the opposite direction to the relaxed muscle) until a slight tension of the soft tissues was felt.

If the participant does not experience any pain, the therapist starts the technique. It consisted of two stages. The first phase was to activate the TRAPEZIUS for 10 s. This was achieved by isometric contraction towards the elevation of the shoulder girdle. The therapist applied resistance with his hand in the direction perpendicular to the upper side of the participant's shoulder. During this phase, the participant cannot experience any muscle vibrations that was indicate too much resistance. The participant then relaxed their muscles while breathing in and out deeply. This was followed by a 10 s contraction of the antagonist muscle group (lowering of the shoulder

girdle). Then, the therapist slightly positioned the subject's shoulder girdle towards depression. The whole procedure was performed gently and slowly so as not to cause discomfort. This was following by the second stage (relaxation phase). It consisted of passive lying on the back for 30 s. The therapist held this new shoulder girdle position. One treatment cycle consists of both phases (contraction and relaxation). Five cycles were performed during the MET therapy use. This was done on the right and left TRAPEZIUS muscles.

**Active Exercise**

Movement performed or controlled by the voluntary action of muscle, working in opposition to an external force.

- Neck flexion: Neck flexion: Patient should be seated erect on chair/couch. Low bend the neck forward.
- Neck extension: Patient should sit erect on chair/couch and slowly bend the neck backward.
- Neck rotation: slowly rotate the neck either side of body sitting erect.
- Shoulder shrug: Slowly elevate the shoulder while arms are hanging relaxed.
- Neck lateral flexion: Slowly bend the neck to the side while sitting erect on chair/couch

**Therapeutic Ultrasound**

An ultrasound therapy unit with the frequency of 3 MHz is used. First patient should be seated comfortable on a chair with back rest. Only treatment area should be exposed and rest of the body should be covered with a towel.

Then apply some gel on the area to be treated. Put the transducer head of Ultrasound machine and move with circular motion on the treatment area while switch on the machine. Increase the intensity to 1.4 W/cm2 for duration of 5 minutes.

The machine should be kept on continuous mode, because Ultrasound is the most potent procedure available for stopping pain in the Trigger Points.

**Data Analysis**
The data collected from 30 subjects were evaluated statistically. Descriptive analytical study was done by using

**Mean**: This process is conveniently expressed by the following symbols: (Pronounced "X bar") signifies the mean; X is each of the value; is the number of these values; and Σ, the Greek capital sigma (our "S") denotes "sum of "".

Standard Deviation: The sum of the squares of differences (or deviations) from the mean, divided be the total number of observations minus one, to give the variance.

Thus,

¯2/ (N - 1)

Finally, the square root of the variance provides the standard deviation:

SD=¯2/ (N - 1) 27 0123456 pre post difference

## 4. Result

The number of subjects for study was 30 (n=30). The subjects were divided into two group, Group "A" and Group "B", each group consisting of 15 subjects. Total treatment program was for a period of 3 weeks. Before the treatment started Group A and Group B were involved for Pre - test assessment by Visual Analogue Scale (VAS) for pain and universal Goniometer for Range of Motion of shoulder and neck. Post - test assessment was repeated after the treatment for both Group. Group "A" was treated with Muscle Energy Technique with Therapeutic Ultrasound and Group "B" was treated with Active Exercise with Therapeutic Ultrasound.

The comparative analysis of data on level of pain was done for the groups. Pre and Post treatment VAS comparison between 1st day of week and 5th day of week for 3 week was done for both Group.

The aim of the study was to find the effectiveness and also to compare the effect of two different techniques administration in to the randomly assigned subjects.

The calculated paired "t" value of upper back pain in Group "A" is 5.8479 and Group "B" is 6.4813. There is significant reduction of pain following Muscle Energy Technique along with Therapeutic Ultrasound and Active Exercise along with Therapeutic Ultrasound among in subjects with Myofascial Trigger Points.

The statistical software namely MINITAB was used for the analysis of data and Microsoft Word and Excel have been used to generate graphs, table.32 0123456789 10 WEEK 1st

## 5. Discussion

Myofascial pain is generalized by Myofascial trigger points in muscle tissue Trigger points are thought to form in response to increase or altered muscle demands include prolong muscle contraction, such as in workplace posture errors, proximal nerve compression and resultant muscle spasm and post - trauma. Latent trigger points are thought to become activated in response to the same condition that cause trigger point formation, that is muscle overload, prolonged muscle contraction or nerve compression.

The prevalence of Myofascial musculoskeletan pain disorder has been increasing dramatically in recent years. There are various studies conducted on the efficacy of physiotherapeutic modalities and manual techniques to relieve pain in Myosacial trigger points.

The present study suggested that Muscle energy technique along with Therapeutic Ultrasound and Active exercise along with Therapeutic Ultrasound reduce pain level when tested before and after the treatment significantly. Robbins (1994) concluded that, Active neck exercises are the most potent procedure available for stopping pain and other symptoms mediated by trigger points. Husskisson (1974) stated that, pain intensity can be measured by Visual Analogue Scale. A 10 cm line marked with numbers 0 to 10 can be used where 0 symbolizes no pain and 10 is maximum pain. Subject is asked to mark his / her pain on this line as per the severity.

Comparison of inter group i. e. Muscle energy technique along with Therapeutic Ultrasound (Group - A) and Active exercise along with Therapeutic Ultrasound (Group - B) shows that there was a pain reduction in both the groups which is significant. This study was undertaken to determine the effect of Muscle energy technique along with Therapeutic Ultrasound and Active exercise along with Therapeutic Ultrasound in the treatment of myofascial trigger points of trapezius muscle for reducing pain with the help Visual Analogue Scale and Range of motion with the help of Universal goniometer.

In the intra group analysis, there was reduction of the pain level in both the group. Which was highly significant. Whereas the inter group analysis shows the Group A is more effective than Group B in reducing the pain level and which is significant, thus the alternate hypothesis can retain.

The subjects treated with Muscle Energy Technique along with Ultrasound therapy showed greater reducing in pain through VAS and more increase in ROM through Universal goniometer respectively compared to subjects being treated with Active Exercise along with Ultrasound therapy.

## 6. Conclusion

The purpose of this study is “to compare the effectiveness of Muscle Energy Technique along with Ultrasound Therapy and Active exercise along with Ultrasound therapy in Myofascial Trigger Points in Trapezius muscle by using Visual Analogue Scale for pain and Universal goniometer to measure Range of Motion.

The principal conclusion of this study is that in comparison to Active Exercise along with Ultrasound Therapy Muscle Energy Technique along with Ultrasound Therapy is more effective in reduction of pain of myofascial trigger point. Muscle Energy technique along with Ultrasound Therapy as an effective treatment for myofascial Trigger Points.

Subjects (n=30) included in the study were given Muscle Energy Technique along with Ultrasound Therapy and Active exercise along with Ultrasound therapy for 5 days for 2 weeks.40 subjects were divided into 2 groups.

Group “A”: subjects treated with Muscle Energy Technique along with Ultrasound therapy.

Group “B”: Subjects treated with Active exercise along with Ultrasound therapy.

Prior to treatment, on the first day VAS and ROM is documented. Post treatment VAS and ROM is document 10th day

## 7. Summary

An alternate hypothesis was saying there would will be a significant reduction of pain in subjects treated with Muscle Energy Technique along with Therapeutic Ultrasound and Active Exercise along with Therapeutic Ultrasound and Subjects treated with Active Exercise along with Therapeutic Ultrasound may show better effect than with Muscle Energy Technique along with Therapeutic Ultrasound in reducing.

The related literature was reviewed and organized under few headings.

Section I-the management of Myofascial trigger points.
Section II-regarding general aspects of Active exercise.
Section III-regarding the influence of Ultrasound Therapy.
Section IV-regarding the reliability of Visual Analogue Scale.
Section V-regarding the reliability of Universal Goniometer.
Simple random sampling was used for selecting the sample that comprised of 15 subjects in Group A and 15 subjects in Group B, giving a total sample size of 30

A standardized tool of visual analogue scale was utilized for assessing the pain level of the subjects. Muscle Energy Technique along with Therapeutic Ultrasound and Active Exercise along with Therapeutic Ultrasound were given to the Group A and Group B. Pain level was assessed before and after the treatment and compared 1st day and last day.

## 8. Limitation of Research

- The sample size is too small
- Limited age group is taken
- Protocol was of short duration.

## 9. Future Research

- Future studies can be done using large sample size.
- Duration of the study can be done more than 2 weeks.
- Further studies are required to find the mechanism by which the pain reduces in case of myofascial trigger points.
- Further studies can be done including other Physiotherapy treatment modalities and exercises.

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