ORIGINAL RESEARCH

IJPHY

EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE ON PAIN & CERVICAL RANGE OF MOTION IN PATIENTS WITH MYOFASCIAL PAIN IN UPPER TRAPEZIUS

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ABSTRACT

Back ground: Myofascial trigger point (MTPt) can be defined as a hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band. MTPt is associated with pain on compression, the pain is typically of a referred type. MTPt symptoms, cause severe discomfort and inability to work. The pain is aggravated with activity or stress. Untreated, chronic cases might lead to symptoms like depression, fatigue and behavioural disturbances. The objective of the study is to examine the effectiveness of MET on pain with VAS and cervical ROM with inch tape method in patients with myofascial pain in upper trapezius.

Methods: participants were randomized into intervention group (n =15) and control group (n = 15).The intervention group was given muscle energy technique, ischemic compression and ultrasound. The control group was given only ischemic compression and ultrasound. Ultrasound 1 MHz continuous mode, intensity 1.5W/cm^2 for 5 minutes. Home exercises taught to both the groups. This program designed for daily for 1 week. Outcome measures: Pain-VAS, ROM-Inch tape method (cervical lateral flexion).

Results: values within the groups were compared by using paired `t` test. According to obtained values, the pre & posttest values of pain and ROM had an significant effect on p-values 0.00 in experimental group. The difference between the pretest and posttest scores of 95% confidence intervals for each outcome variable was reported.

Conclusion: After 1 week of intervention protocol, the present study concludes that MET has significant improvement in pain, ROM in intervention group.

Keywords: MET, Ultrasound, ischemic compression, myofascial trigger point, trapezius.

Received 03rd January 2015, revised 20th January 2015, accepted 28th January 2015

www.ijphy.org

DOI: 10.15621/ijphy/2015/v2i1/60040

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INTRODUCTION

Although Myofascial trigger point (MTPt) are widely recognised phenomenon in clinical practice, there remains much to be elucidated with regards to their pathophysiology, mechanics of pain referral and treatment of choice, from the outset, it must be noted that must of the early literature on trigger points, myofascial pain and fibromyalgia was based on one total reports and the clinical experiences of those using this form of treated. Most popular beliefs are based on theories generated on their basis and it is only in recent times that a more scientific approach to defining and treating the phenomenon of myofascial trigger point has developed. Despite this increasing interest much of fundamental understanding remains based in the theories of early clinicians and still requires experimental verification.

Trigger points are most often discussed in the setting of myofascial pain syndrome on which widespread or regional muscular pain is associated with hyperalgesia, psychological disturbance and significant restriction of daily functioning. Most patients with these syndromes recall an inciting factor for their pain, however some may not. Inciting factors may often seen quite trivial when assessed. It is not clear whether the psychological disturbance seen in these patients is a part of the pathology or merely reactive to the chronic pain state. Importantly, psychological disturbances from whatever cause will impact on a patient's interpretation of pain and potentially their response to treatment.

Myofascial trigger points are quite common in the cervical musculature and are most often found in patient 31 to 50 years of age with a greater incidence in women than men. several studies have even reported that upto 85% of backpain and 54% of neckpain accompanied by headaches are caused by myofacial discomfort. Developing most frequently in the axial musculature (neck and back) MTPt are associated with poor posture and can develop insidiously from occupational activities such as cradling the telescope handset between the head and shoulder, slightly in an awkward position infront of a computer or non-vocational activities such as bending one`s head for prolonged period of time while knitting or reading.

The causes of myofascial pain are structural inadequacies, tight constructive clothing, systemic, alcohol toxicity, inflammatory disease and relative growth hormone deficiency. Here are various treatment modalities used for treating myofacial pain which includes individual treatment techniques under manual therapy, acupuncture, stress reduction, electrotherapy, body mechanics and ergonomics training, nutritional counselling and a wide range of pharmacological management.[1]

Ultrasound (US) treatment is one of the most important physical treatment modalities in MTPt treatment which is used for heating deep tissues. It is a noninvasive method which consists of piezoelectric crystals that convert the electrical energy to mechanical oscillation energy using high-frequency alternating current.[2] US increase local metabolism, circulation, regeneration and extensibility of connective tissue with its assuming thermal and mechanical effects. However, results in the studies related to its efficacy in the musculoskeletal system problems are conflicting.[3]

Muscle energy technique: use of voluntary contraction alternated with passive stretch for releasing tight muscles has been identified by many names physical therapists frequently refer to contract-relax or rhythmic stabilization. Osteopathic physicians are likely to speak of muscle energy techniques and myofascial release.[4]

Post –isometric muscular relaxation as described by Lewit and Simons is simple and effective. It combines nicely with the stretch and spray technique and is most valuable when used by the patient for self-treatment at home. The muscle is gently stretched to the onset of resistance and held there isometrically for the next 3-7 seconds, either the operator or the patient exerts fixed resistance against which the muscle gently contracts in that position at approximately 25% of maximal effort. While the same position is passively maintained, the patient "let's go" (relaxes the contracting muscle) only after patient has thoroughly relaxed is the muscle slowly, gently and passively extended, taking up the slack that developed. This contract-relax cycle is repeated three to five times full release of tension may not occur untill after the 2nd and 3rd cycle. Relaxation is facilitated by having the patient slowly take a full (complete) breath and then slowly exhale through pursed lips, emptying the lungs to maximal exhalation. During exhalation, the patient concentrates on total relaxation of the muscle to be stretched. Additional relaxation and release may be achieved by downward gaze during exhalation.

MTPt is treated with "ischemic compression" by applying heavy thumb pressure on painful spot, sufficient to produce skin blanching[5]. They can also be treated by applying gentle digital pressure to the area. This fundamental change is anchored in Travel's ATP energy crisis model, which characterizes MTPt as centers of tissue hypoxia.

Thus, deep tissue pressure that produces additional ischemia is not beneficial. Alternatively a "press and stretch" method restores the normal resting length of the sarcomere through barrier release concept where the finger follows the releasing tissue.

There seems to be a lack in the literature to establish the effectiveness of MET when compared to ischemic compression and therapeutic ultrasound in the treatment of MTPt of upper trapezius muscle. There is a need for a comparative study on the effect of the above mentioned therapeutic modalities. Thus the current study is aimed at evaluating:

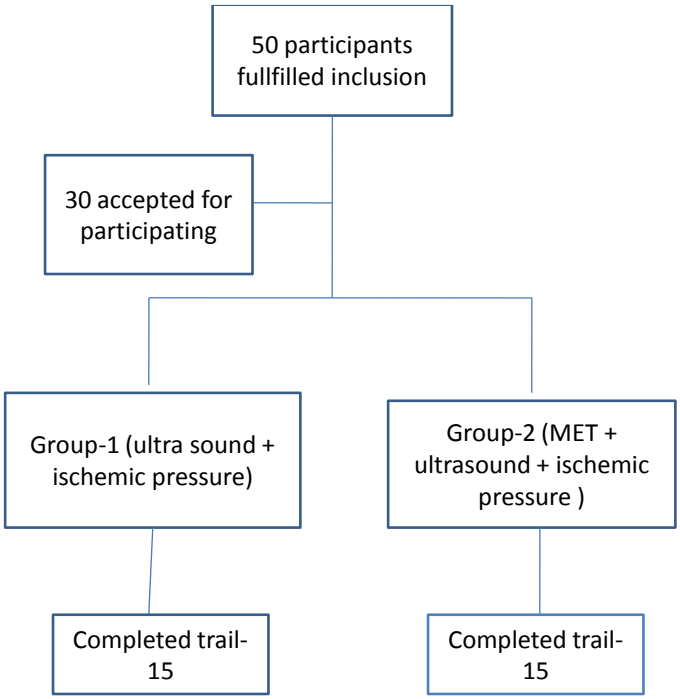
- The pain relief produced by MET, therapeutic ultrasound and ischemic compression in treatment of MTPt's.
- The effect of MET, therapeutic ultrasound and ischemic compression on the lateral flexion of the neck.
- The effect of MET, therapeutic ultrasound and ischemic compression on the tenderness due to MTPt.

MATERIALS AND METHODS

Patients with cervical and upper trapezius myofascial pain were recruited from outpatient service, Sri Venkateswara Institute of Medical Sciences (SVIMS), tirupati.

Patient selection:
Participants were recruited from outpatient's physiotherapy department in SVIMS hospital. All potential participants were first screened based on following:
Inclusion criteria: palpable myofascial trigger point on one side or both sides of upper trapezius. Tenderness grading scale 2-4.
Exclusion criteria: (i) patients with CNS deficits, (ii) patients with cognitive deficits, (iii) patients receiving treatment by other methods like vapocoolants, dry needling, acupuncture injections etc, (iv) patients with MTPt in muscles other than trapezius and (v) patients with hypermobile joints.A total of 50 patients fell under inclusion criteria, 30 consented for participation. 15 subjects were allotted into each group randomly and all the subjects were available for the post
Test assessment as shown in Figure 1.

Figure-1 Study flow chart



Study design: This quantitative research analysis was designed as a 7 days trial, a multi group pretest posttest design was considered.

Outcome measure: Measurement of subjective pain was assessed using a visual analog scale (VAS), provocative pain test using "soft tissue tenderness grading scheme" and active lateral bending of the cervical spine using inch tape were done before the first sessions and after five consecutive sessions of therapy.

VAS was used to evaluate and quantify the perceived pain by the subjects. Origin of the scale is indicated as "NO PAIN" and the terminal end as "MOST SEVERE PAIN". The patient was instructed to move the indicator to represent his/her pain perceived. At the back of the scale 0 to 10 numerical with a distance of 1cm between them

were marked. The linear analogue rating of the constant pain stimulus is reproducible and changes in rating are likely to be real change in opinion

The "Tenderness grading scale" is a proposed grading system for the soft tissue tenderness. It is also a method for documenting patient responses to "provocative" tests, such as orthopedic tests or the McKenzie analysis.[6]
Tenderness grading is as follows:
0- No tenderness
1- Tenderness to palpation without grimace or flinch
2- Tenderness with grimace & or flinch to palpation
3- Tenderness with withdrawal (+ " Jump sign")
4- Withdrawal (+ "Jump sign") to non-noxious stimuli (i.e. superficial palpation, pin prick, gentle percussion)

Tape measurement: tool used is a simple inch tape. Patient was positioned in relaxed high sitting with backrest, head and neck in neutral position arms resting on the thigh or a pillow on the lap, measurement was taken from the mastoid process to the same side acromion process and the initial reading was recorded. Then the patient was asked to laterally flex his/her neck to the opposite side as far as possible with the therapist holding the inch tape fixed to the mastoid process end fixed and allowing the acromion end to move freely. At the end of maximum lateral flexion the final reading was recorded. The range of motion was calculated as the difference between the neutral reading and the reading in maximum lateral flexion.[7]

Procedure: patients were divided into 2 groups according to a simple randomization scheme. The first group (Gr-1) was treated using therapeutic ultrasound treatment given over the most tender spot, second (Gr-2) with MET with ischemic compression. Upper trapezius stretch was advised as home programme for patient of all 2 groups. The treatment was given for 7 consecutive days: initial assessment was done on day 7 prior to the therapy and the final assessment on day 7. Patients were informed that they would be subject one of 3 possible different procedures in order to evaluate the most effective treatment for pain. All patients were evaluated by the same examiner who was blinded regarding the treatment. A written consent was obtained before the start of the trail. The treatments were performed by the principal examiner. The values obtained were compared and analyzed to study the pain relief produced by ischemic compression, therapeutic laser and therapeutic high power ultrasound.

Treatment parameter: Therapeutic ultrasound: U/S head size- 1cm, mode- continuous, Intensity- variable according to pain threshold but within 1.5 watts/cm2, Range- 0.1 to 1.5 watts/ cm2, Treatment time- 5 minutes and patient position- high sitting with back rest.[8]

MET: It is presents schematically the essence of post isometric relaxation or contract-relax. Contraction alone is not adequate treatment. The gentle (approximately 10% of maximum) contraction is immediately followed by relaxation and movement to take up slack that develops in the muscle. Better terminology might be `post isometric relaxation and release` or `contract-release`. The term `stretch` could be used in place of `relax` or `release` but that term has been avoided because it is so commonly associated with forceful movement and this technique should be painless, gentle one.

Methods of release: the relaxation and release phase can be accomplished in a number of ways. Immediate elongation of the muscle encourages equalization of sarcomere lengths throughout the length of affected muscle fibers and when done slowly helps that way. The principle for effectively releasing muscle tension (and for release of restricted joint movement that is often caused by muscle tightness) has been recommended by various schools of thought with many names, such as `contact-relax`, `post isometric relaxation` and `muscle energy technique`. In any case, full relaxation of the patient is an essential prerequisite to effective release.

Release of muscle tension can be achieved passively or actively. In passive release, the movement is done for the patient, in active release it is done primarily by the patient, emphasizes the advantage of using gravity for passive release. When properly positioned for appropriate muscles, gravity is gentle and helps the patient relax more completely. Much operator skill is required to sense the tissue resistance that indicates how much movement is optimal. Too little movement is ineffective and too much movement, too fast causes pain that inhibits release.
With active release, the patient extends the muscle to take up the slack by actively contracting its antagonist muscles. This has the advantages of adding the effect of reciprocal inhibition to facilitate release of muscle being elongated. Many patients can learn quickly to optimize the effort, but must understand what to do, why to do it and have the innate capacity to learn to do it effectively. It can be a powerful tool for a patient's home program. This technique is particularly useful for clinicians to treat their own MTPts and combines nicely with contract release.

Ischemic compression: manual digital pressure, treatment time- 5mins, patient position- supine lying with small pillow or towel roll to support the neck. Treatment technique- Initially thumb (or strong finger) was pressed directly on the trigger point to create tolerable painful, sustained pressure. Pressure was gradually increased by adding a thumb or finger from the other hand as necessary for reinforcement. This pressure was continued up to one and a half minute with as much as 20 to 30 lb of pressure. If the trigger point tenderness persisted, the procedure was repeated. Treatment was considered useless if the patient tend to abate.

Statistical Analysis: Variables within the groups were compared by using paired `t` test and between the groups by using independent t-test. The difference between the pretest and posttest scores and 95% confidence intervals for each outcome variable was reported. All the statistical analysis were performed by using SPSS 20.0 software.

RESULTS AND DISCUSSION

There were no dropouts from the study. No differences existed between the groups in terms of age and gender shown in tables.

Table-1 Showing mean change of VAS score and cervical ROM of control group

	Mean	N	Std. Deviation	Std. Error Mean
VAS Pre	6.40	15	1.056	.273
VAS Post	4.13	15	.915	.236
ROM(R)Pre	5.53	15	.516	.133
ROM(R) Post	6.27	15	.530	.137
ROM(L) Pre	5.27	15	.594	.153
ROM(L) Post	6.300	15	.4551	.1175

Table-2 Showing mean change of VAS score and cervical ROM of experimental group

	Mean	N	Std. Deviation	Std. Error Mean
VAS Pre	6.20	15	.941	.243
VAS Post	1.60	15	.632	.163
ROM(R) Pre	5.13	15	.834	.215
ROM(R) Post	7.27	15	.623	.161
ROM(L) Pre	5.33	15	.816	.211
ROM(L) Post	7.433	15	.4577	.1182

Table-3 Showing mean change of VAS score and cervical ROM of between control group and experimental group.

Group		N	Mean	Std. Deviation	Std. Error Mean
VAS Diff	EXPT	15	4.60	.828	.214
	CONT	15	2.27	.458	.118
ROM(R) Diff	EXPT	15	2.13	.481	.124
	CONT	15	.73	.258	.067
ROM(L) Diff	EXPT	15	2.100	.7368	.1902
	CONT	15	1.033	.3994	.1031

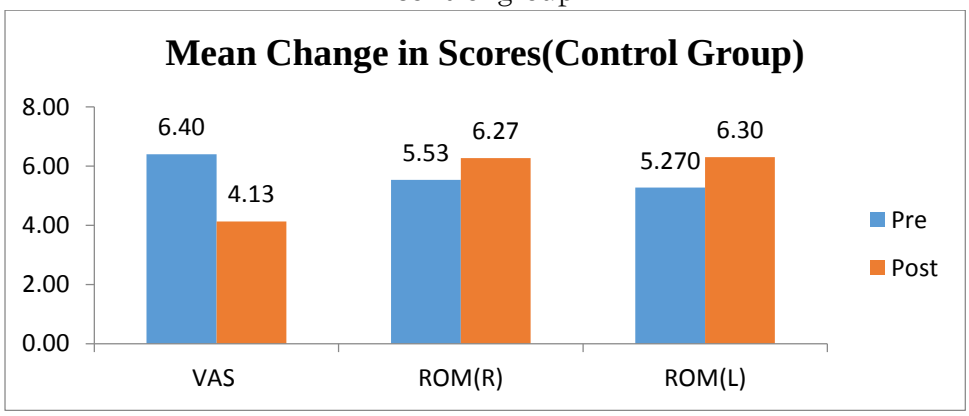
Table-4 Showing the mean differences of VAS score & cervical ROM in control group

	Mean	Std. Deviation	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
			Lower	Upper			
VAS Pre - VAS Post	2.267	.458	2.013	2.520	19.179	14	.000
ROM(R)Pre - ROM(R) Post	.733	.258	.590	.876	11.000	14	.000
ROM(L) Pre - ROM(L) Post	1.0333	.3994	.8122	1.2545	10.020	14	.000

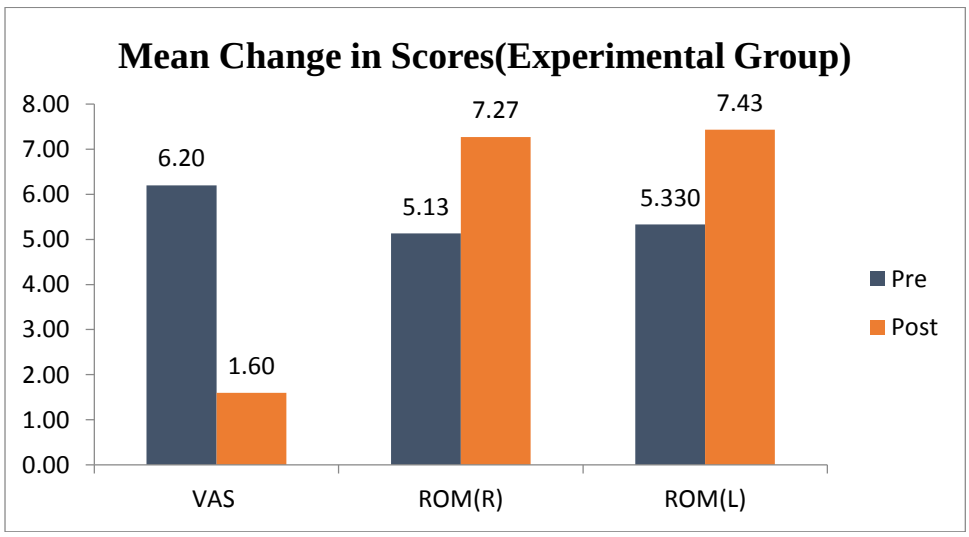
Table-5 Showing the mean differences of VAS score & cervical ROM in experimental group

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
VAS Pre - VAS Post	4.600	.828	.214	4.141	5.059	21.515	14	.000
ROM(R) Pre - ROM(R) Post	2.133	.481	.124	1.867	2.399	17.193	14	.000
ROM(L) Pre - ROM(L) Post	2.1000	.7368	.1902	1.6920	2.5080	11.039	14	.000

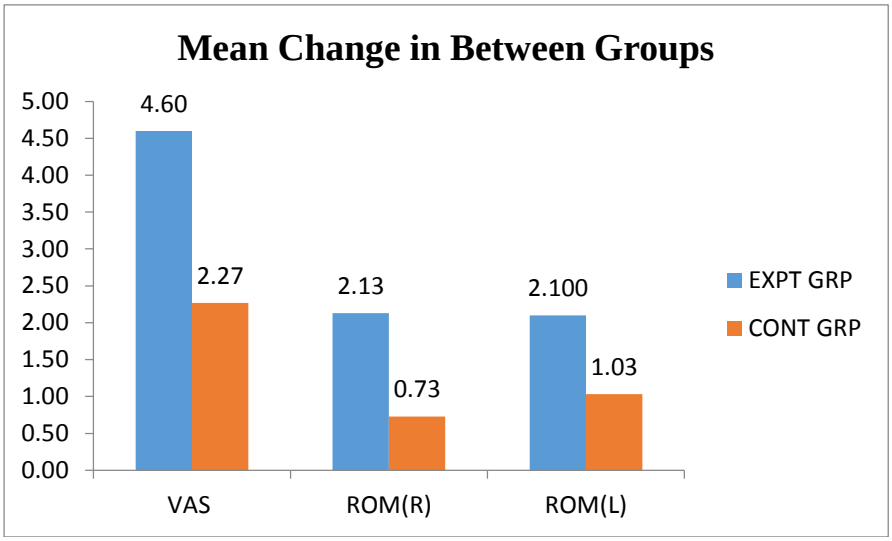
Graph-1 Graphical representation showing the mean change in VAS score pre and post test values in control group



Graph-2 Graphical representation showing the mean change in VAS score pre and post test values in experimental group



Graph-3 Graphical representation showing the mean difference between pre & post intervention of control group and experimental group.



According to obtain values, the pre and post test values of VAS, Right and Left lateral flexion had a statistically significant effect in both control and experimental group but when compared both the groups, more statistically significance i.e., 0.000 is found in intervention group than control group as shown in graph-1 .

Ultrasound is a non-invasive method which consists of piezoelectric crystals that convert the electrical energy to mechanical oscillation energy using high frequency alternating current. Ultrasound increases local metabolism, circulation regeneration and extensibility of connective tissue with its assuming thermal and mechanical effects. However, results in the studies related to its efficacy in the musculoskeletal system problems are conflicting.

MTPt is treated with `ischemic compression` by applying heavy thumb pressure on painful spot, deep tissue pressure that produces additional ischemia is not beneficial. Recent studies shown that, manual muscle energy technique is more effective in treating MTPt. Two forms of isometric MET i.e.; post isometric relaxation (PIR) and reciprocal inhibition (RI) are used.

Post isometric relaxation refers to the subsequent reduction in tone of the agonist muscle after isometric contraction. This occurs due to stimulation stretch receptors called Golgi tendon organs that are located in the tendon of the agonist muscle strong muscle contraction against equal counter force triggers the Golgi tendon organ.

The afferent nerve impulse from the Golgi tendon organ enters the dorsal root of the spinal cord and meets with an inhibitory motor neuron. This stops the discharge of the efferent motor neurons impulses and therefore prevents further contraction, the muscle tone decreases. Reciprocal inhibition of the agonist. This happens due to stretch receptors within the agonist muscle fibers, muscle spindles.

In response to begin stretched, muscle spindles discharge nerve impulses, which increase contraction, thus preventing over-stretching. The spindles discharge impulses which excite the afferent nerve fibers or the agonist muscle; they meet within excitatory motor neuron of the agonist muscle (in the spinal cord) and at the same time inhibit the motor neuron of the antagonist muscle which prevents it from contracting. This results in the relaxation of the antagonist.

CONCLUSION

Perceived pain showed a statistical significant and cervical ROM has showed a consistent rise on the subject who were treated using MET. This is an apparent indication for pain relief caused in the management of MTPt treatment efficiency and ease of administration of this technique ensures its frequent usage by clinical practitioners. Thus we conclude stating MET can be used an effective treatment regimen in the management of myofascial trigger points thereby reducing disability caused due to musculoskeletal pathology.

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Citation
M. Srikanth, Dr. V. Srikumari, Dr. K. Madhavi. (2015). EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE ON PAIN & CERVICAL RANGE OF MOTION IN PATIENTS WITH MYOFASCIAL PAIN IN UPPER TRAPEZIUS. *International Journal of Physiotherapy,* 2(1), 333-340.