



## Added effect of muscle energy technique on improving functional ability in frozen shoulder

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### ABSTRACT

#### Background and Objectives

In Frozen Shoulder patients have a painful loss of shoulder motion with development of dense adhesions, capsular thickening and capsular restrictions, especially in the dependent folds of the capsule. Muscle energy technique helps to mobilize restricted joints by stretching hypertonic muscles, capsules, ligaments, and fascia. The aim of the study is to find out the effect of MET with Conventional therapy to improve the shoulder range of motion and function in frozen shoulder.

#### Materials and Method

This experimental study was conducted among 30 participants who included both male and female symptomatic individuals from the age group of 40 to 60 years. Participants were randomly assigned into two groups of 15 each which included Conventional therapy (group A) and MET along with conventional therapy (group B) was given for 15 days. The Outcome measures were recorded pre and post 15<sup>th</sup> day of intervention using universal goniometer for shoulder Range of motion of Abduction, Internal and External Rotation and Shoulder Pain and Function Disability Scale (SPADI).

#### Result

Within group analysis showed that improved range of motion and functional disability was statistically significant in both the groups ( $p < 0.0001$ ) whereas between group analysis revealed that Conventional treatment along with MET (group B) is more effective than conventional treatment in improving range of motion and function in Frozen shoulder.

#### Conclusion

Hence, it can be concluded that MET along with Conventional therapy is more effective in treatment of Frozen Shoulder.

**Keywords:** Muscle Energy Technique, Frozen Shoulder, Conventional Therapy, Shoulder Function, SPADI.

## INTRODUCTION

Codman introduced the term "Frozen Shoulder" in 1934 to describe patients who had a painful loss of shoulder motion. There is development of dense adhesions, capsular thickening, and capsular restrictions, especially in the dependent folds of the capsule. Patients with adhesive capsulitis have a painful restriction of both active and passive GH joint motion in all planes, or a global loss of GH joint motion. This condition most commonly occurs in patients 40 to 60 years of age, with a higher incidence in females. Adhesive capsulitis is classically characterized by three stages. The length of each stage is variable, but typically the first stage lasts for 3 to 6 months, the second stage from 3 to 18 months, and the final stage from 3 to 6 months. [1]

### Stages of Adhesive Capsulitis

- **Freezing** - This stage is characterized by the onset of an aching pain in the shoulder with active and passive range of motion. The pain is usually more severe at night and with activities, and may be associated with a sense of discomfort that radiates down the arm. [1]
- **Frozen** - The second stage is the progressive stiffness or "frozen" phase. Pain at rest usually diminishes during this stage, leaving the patient with a shoulder that has restricted motion in all planes. Activities of daily living become severely restricted. Patients complain about their inability to reach into the back pocket, fasten the bra, comb the hair, or wash the opposite shoulder. When performing these activities, a sharp, acute discomfort can occur as the patient reaches the restraint of the tight capsule. Pain at night is a common complaint and is not easily treated with medications or physical modalities. This stage can last from 3 to 18 months. [1]
- **Thawing** - This stage is characterized by a slow recovery of motion with no pain and no synovitis but significant capsular restrictions from adhesions. There is slow and steady recovery of range of motions resulting from capsular remodelling. [1]

In stage 2 of adhesive capsulitis, range of motion is significantly restricted. Restriction of movement is in the capsular pattern i.e. external

rotation is most limited, followed by limitation in abduction and internal rotation respectively. [2]

## MET

- **Muscle energy techniques (MET)** are a class of soft tissue osteopathic manipulation methods that incorporate precisely directed and controlled, patient initiated, isometric and/or isotonic contractions, designed to improve musculoskeletal function and reduce pain. [3]
- MET is a manual therapy intervention that can be used to stretch or lengthen muscles and fascia that lack flexibility, to reduce tightness, to increase fluid mechanics and decrease local edema, and to mobilize restricted joints. MET requires the patient to create a force by activating the targeted musculotendinous unit against a precisely directed counterforce applied by the clinician, followed by relaxation and a passive stretch applied by the clinician. [4]
- One application of MET may consist of 3 to 5 contractions, held for 5 seconds each, with a stretch following each contraction that ranges from 3 to 5 seconds to 30 to 60 seconds. [5]

Frozen Shoulder is associated with decreased functional movement while attempting movements. MET has been relatively unexplored, with only a few published studies supporting its use for cervical, lumbar, and thoracic motion restrictions. There are hardly any studies done to evaluate and find out the effect of MET combined Conventional Therapy in frozen shoulder. Hence, the purpose of this study is to find out the effect of MET combined with Conventional therapy in improving functional ability in frozen shoulder.

## METHODOLOGY

In this study 30 patients between the age group of 40 to 60 years were randomly divided into 2 equal groups using simple random sampling. The inclusion criteria was (A) Participants diagnosed with Frozen Shoulder, (B) Subjects with limited Range of motion of shoulder abduction, internal and external rotation, (C) Subjects with unilateral Frozen Shoulder, (D) Patients who were willing to take part in the study. The exclusion criteria was (A) subjects with rotator cuff tears and other shoulder ligament injuries, (B) Frozen Shoulder secondary to fracture, dislocation, reflex

sympathetic dystrophy, neurological disorders, (C) Shoulder pain associated with neck pain. The study was conducted at BSTRH (Bahusaheb Sardesai Talegaon Rural Hospital) Talegaon Dabhade Pune. Outcome measures were Range of motion (ROM) for shoulder abduction, internal rotation and external rotation were measured using universal goniometer and functional disability using SPADI (Shoulder pain and disability index). The readings were taken both pre and post 15<sup>th</sup> day of intervention for all the outcome measures.

### Procedure

After taking the patients consent they were randomly allocated into two groups using chit method. Group A (Control group) - 15 patients received conventional treatment which consisted of IFT, Hot pack, shoulder isometrics, wand exercises, Codman's exercises, finger ladder, shoulder shrugs and shoulder retraction exercises. Group B (Experimental group) - 15 patients received MET for shoulder abduction, internal rotation and external rotation along with conventional treatment. The protocol for MET for shoulder joint included 9 repetition per session per movement, one session per day, five times a week for 2 weeks.

**MET for Shoulder Abductors** - The patient was in side-lying. The therapist cups the patient's shoulder and compresses the scapula and clavicle to the thorax with the cephalad hand, while cupping the flexed elbow with the caudad hand. The patient's hand was supported on the therapist's cephalad forearm/wrist to stabilise the arm. The elbow was moved towards the patient's head, to abduct the shoulder, and range of motion was assessed. A degree of internal rotation was involved in this Abduction. At the position of the very first indication of resistance to movement, the patient was instructed to pull the elbow towards the waist, or to push further towards the direction of abduction, utilising no more than 20% of available strength and building up force slowly. This effort was firmly resisted, and after 7-10 seconds the patient was instructed to slowly cease the effort simultaneously with the therapist. After complete relaxation, and on an exhalation, the therapist, using his/her contact on the elbow, moves the shoulder further into abduction, to the next restriction barrier, where the MET procedure was repeated. [3]



**MET for Shoulder Internal Rotators** - The patient was in supine position with the humerus supported and the patient's shoulder and elbow in 90° of abduction and flexion, respectively, the therapist passively moves the humerus into internal rotation until the first barrier of motion was

reached. At the position of first indication of resistance to this movement, the patient is instructed to pull his elbow away from the therapist, either internally, or externally, or both simultaneously utilising no more than 20% of available strength, building up force slowly. This

effort is firmly resisted, and after 7-10 seconds the patient is instructed to slowly cease the effort simultaneously with the therapist. After complete relaxation, and on an exhalation, the elbow is

moved to take the shoulder further to the next restriction barrier, where the MET procedure is repeated. [6]



**MET for Shoulder External Rotators** - The patient was in supine position with the humerus supported and the patient's shoulder and elbow in 90° of abduction and flexion, respectively, the therapist passively moves the humerus into external rotation until the first barrier of motion was reached. At the position of first indication of resistance to this movement, the patient is instructed to pull his elbow away from the therapist, either internally, or externally, or both

simultaneously utilising no more than 20% of available strength, building up force slowly. This effort is firmly resisted, and after 7-10 seconds the patient is instructed to slowly cease the effort simultaneously with the therapist. After complete relaxation, and on an exhalation, the elbow is moved to take the shoulder further to the next restriction barrier, where the MET procedure is repeated. [6]



## Statistical Analysis

Statistical analysis of values, obtained after pre and post parameter measurements were performed using InStat (Version 3.05, created 27 September 2000.) Descriptive statistics including p-value, standard deviation, mean and t-value were calculated. Comparison of range of motion (ROM)

of abduction, internal rotation and external rotation within the group were assessed using paired t-test and comparison between ROM of two groups were done using unpaired t- test. Comparison of SPADI within the group is done using Wilcoxon matched pairs test and comparison between the groups is done using Mann-Whitney U test.

**Table No.1** Showing pre and post values of the shoulder Range of motion of Experimental and Control group calculated using Paired t-test

		EXPERIMENTAL GROUP		CONTROL GROUP	
		PRE	POST	PRE	POST
Abduction	MEAN	99.6	138.2	103.6	116.07
	SD	14.603	12.508	12.827	12.027
	p-value	<0.0001 VERY SIGNIFICANT		<0.0001 EXTREMELY SIGNIFICANT	
Internal Rotation	MEAN	42.067	59.533	29.933	37.933
	SD	9.603	10.232	5.812	5.946
	p-value	<0.0001 EXTREMELY SIGNIFICANT		<0.0001 EXTREMELY SIGNIFICANT	
External Rotation	MEAN	30.867	49	24.667	30.6
	SD	9.672	12.415	5.08	6.512
	p-value	<0.0001 EXTREMELY SIGNIFICANT		<0.0001 EXTREMELY SIGNIFICANT	

The p value for abduction, internal rotation and external rotation is <0.0001 but it is very significant for abduction and extremely significant

for internal and external rotation in experimental group and extremely significant for abduction, internal and external rotation in control group.

**Table No. 2** Showing pre and post values of SPADI of Experimental and Control group

	MEAN		SD		p-value
	PRE	POST	PRE	POST	
EXPERIMENTAL	92	24.667	18.248	14.855	<0.0001 (EXTREMELY SIGNIFICANT)
CONTROL	99.2	55.4	16.099	14.923	<0.0001(EXTREMELY SIGNIFICANT)

The p value for SPADI is <0.0001 and is extremely significant for both control and experimental groups

## DISCUSSION

The current study was undertaken to assess the effectiveness of Muscle Energy Technique (MET) in patients with frozen shoulder. For the purpose of this study, 30 patients were taken and divided into 2 groups. Control group was given supervised exercises, hot pack and IFT while the experimental

group was given same treatment as control group plus MET. The data from this study suggests that MET along with supervised exercises, hot pack and IFT may be superior to supervised exercises, hot pack and IFT alone for treating patients with Frozen shoulder. The changes observed in this study are noteworthy, within the group comparison

showed that there was significant improvement in the range of motion and function in post intervention in the experimental group. In this study, the mean post treatment SPADI score was 24.667% for patients in the experimental group compared to 55.4% in the control group. It should be noted that the control group's supervised exercises intervention produced good outcomes, but the addition of the MET improved the outcomes substantially.

The increase in range of motion due to MET is described by **Chaitow**, in Reciprocal Inhibition (RI), when a muscle is isometrically contracted; its antagonist will be inhibited, and will demonstrate reduced tone immediately following this. Thus, as part of an MET procedure, the antagonist of a shortened muscle, or group of muscles, may be isometrically contracted in order to achieve a degree of ease and additional movement potential in the shortened tissues. [3]

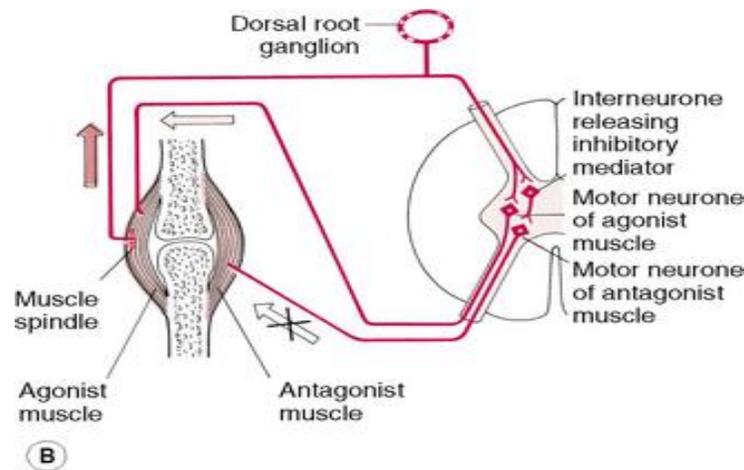
The increased active range of motion and flexibility following MET may be due to various factors like neural, Viscoelastic and thixotropic Properties. After application of MET,

Musculotendinous junction acts in a Viscoelastic manner and leads to the properties of creep and stress relaxation.<sup>7</sup>

The study done by **Freyer** on pain reduction by MET, explained that centrally mediated pain inhibitory mechanism and neuronal mechanism in dorsal horn is by neurological and tissue factors such as stimulation of low threshold mechanoreceptors which leads to possible gating effects and effect of rhythmic muscular contraction on interstitial and tissue fluid flow. [3]

The study done by **Kristinn Heinrichs** explained that sensory receptors of the skin and afferent nerves stimulated by heat may have an analgesic effect which acts on the pain gate control mechanism. She suggested that heating the secondary afferent muscle spindle nerve endings and Golgi tendon endings could be the way in which muscle spasm is reduced by heating. [9]

**Sandra Yale** acknowledged that, reciprocal inhibition with an isometric contraction seems to set the muscle to a new length by inhibiting it via the influence of the golgi tendon organ. [10]



Schematic representation of the reciprocal effect of an isometric contraction of a skeletal muscle, resulting in an inhibitory influence on its antagonist. [11]

## CONCLUSION

The conclusion based on the results, strongly emphasized that MET is more effective in improving shoulder range of motion (ROM) and

function in Frozen Shoulder. Hence, it can be said that MET is an excellent technique which involves lesser time and gives better results for increasing the range of motion (ROM) and function of the patient, so this technique should be incorporated with conventional therapy for the management of Frozen Shoulder.

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