

## Effect of Muscle Energy Technique versus Maitland Mobilization with Iastm on Pain and Disability in Shoulder Periarthritis: A Randomized Controlled Trial

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### Introduction

The shoulder joint (glenohumeral joint) is a ball and socket joint between the scapula and humerus. It is the major joint connecting the upper limb to the trunk. It is one of the most mobile joints in the human body, at the cost of joint stability. The shoulder joint is formed by the articulation of the head of the humerus with the glenoid cavity of the scapula. This gives rise to the alternate name for the shoulder joint. Like most synovial joints, the articulating surfaces are covered with hyaline cartilage. The head of the humerus is much larger than the glenoid fossa, giving the joint a wide range of movement at the cost of inherent instability. To reduce the disproportion in surfaces, the glenoid fossa is deepened by a fibrocartilage rim, called the glenoid labrum. As a ball and socket synovial joint, there is a wide range of movement permitted: Flexion, Extension, Abduction, Adduction, Internal rotation, External rotation.

Shoulder joint is one of the most rewarding and functional joints involved in daily routines including performances, occupational and recreational activities. Operation of this joint facilitates stability and mobility which often mutually co-exist between the upper and lower limb movements during skilled and powerful activities of the hands. The joints in human body get affected by different disabilities, of which arthritis represents a major one.

Arthritis of the shoulder joint is reported since 1872, described as 'Humero Scapular Periarthritis'. The ailment was renamed as 'Frozen Shoulder' in 1934 by Codman and later described as 'Adhesive Capsulitis', by Neviarer in 1945, who reported the occurrence of this ailment amongst 7% -21% of the population. The condition is characterized by painful stiff shoulder.

Shoulder pain is a commonly encountered problem, with prevalence studies indicating a frequency of 7-20% among the

adult general population. Frozen shoulder, also called adhesive capsulitis, is one of the diseases that cause shoulder pain. The incidence of this condition in the general population is between 2% and 5%. It is more common among women aged 40-60 years. The disease is characterized by pain, loss of function, and loss of joint range of motion (ROM). Its etiology is incompletely elucidated. The pathologic anatomy of frozen shoulder includes synovial inflammation, joint capsule hypertrophy, and a resulting development of fibrous structures. The condition occurs bilaterally in 20-30% of cases. Awareness of the disease generally, starts with a sensation of strain while performing critical movements and joint pain when moving in any direction.

One of the main complaints in patients with shoulder pain is functional disability. Treatment of shoulder pain is usually aimed at pain reduction and improvement of functional disabilities. Consequently, outcome measurements should include an instrument (e.g., questionnaire) for the evaluation of functional disabilities. There are several self-administered shoulder pain and disability questionnaires. Patients ranked the Shoulder Disability Questionnaire (SDQ) and the Shoulder Pain and Disability Index (SPADI) as the most relevant questionnaires. The SPADI was the least time consuming, both the SDQ and the SPADI appear to be convenient and easy to complete. The SPADI was originally developed in English. It has been translated and validated in several languages and showed excellent reliability and responsiveness.

The cases of chronic adhesive capsulitis are reported to be responding well to therapeutic massage with muscle energy technique (MET), leading to decreases in pain and increase in functional quality. MET is generally classified as a direct technique against other methods, because the muscular effort is in the form of controlled position at specific direction against its counterforce. However, the key exercise of this method is to normalize the joint

range, rather than improving joint flexibility. These techniques have been recommended for all joints with restricted Range of Motion (ROM) identified during the passive assessment.

The correlation between the tightness in a joint capsule and pattern of motion restriction in a joint was revealed by Hannafin et al. Agonizing shoulder, freezing stage with chronic pain, frozen stage with significant limitation of ROM and thawing phase with progressive improvement in ROM have been identified as the major phases of frozen shoulder. End range mobilization of the shoulder joint and intensive mobilization techniques [MT] have been identified as useful approaches for reducing the risk of stiffness or joint contracture progression in patient with adhesive capsulitis. However, MET has been reported to be facilitating release of muscles and promoting body healing mechanisms and improving shoulder ROM.

Three phases of clinical presentation Painful freezing phase Duration 10-36 weeks, Pain and stiffness around the Shoulder with no history of injury. A nagging constant Pain is worse at night, with little response to non-steroidal anti-inflammatory drugs.

**Adhesive Phase:** Occurs at 4-12 months. The pain gradually subsides but stiffness remains. Pain is apparent only at the extremes of movement. Gross reduction of glenohumeral movements, with near total obliteration of external rotation.

**Resolution Phase:** Takes 12-42 months. Follows the adhesive phase with spontaneous improvement in the range of movement. Mean duration from onset of frozen shoulder to the greatest resolution is over 30 months.

MET is a unique technique in which the patient provides the corrective force rather than the care provider. MET is defined as the procedure that provides voluntary contraction of the muscle at varying levels of intensity, in a very controlled direction, against a force applied by the care provider. The potential applications of MET include lengthening and strengthening of muscles, increasing fluid flow, and decreasing local edema.

Application of IASTM as a therapeutic modality has been in practice since the 1940's. Potential heating effect, promotion of tissue relaxation, easing local blood flow, and breaking down of the scar tissue achieved through ultrasound therapy makes it a highly useful treatment mode in physiotherapy.

This therapy is used in the treatment of frozen shoulder as well. Availability of the portable IASTM device makes it a convenient mode, followed at homes also. Visual Analog Scale (VAS) and Shoulder Pain and Disability Index (SPADI) are standard measurement tools in clinical practices comparing the pain and physical functional scores in a linear scale from mild to severe pain pre and post treatments.

Although, MET coupled with IASTM therapy and joint mobilization technique coupled with ultra sound technique are effective in treating periarthritic shoulder, it would be interesting to determine the technique which is more effective in treating periarthritic shoulder. The present study intends to compare the effectiveness of MET coupled with IASTM therapy and joint mobilization coupled with IASTM therapy in patients with periarthritic shoulder.

The term "Muscle Energy" suggests that effort and energy of person or patient performing movements provide the primary force

involved in process. It is used to help mobilize restricted joints by stretching hypertonic muscles, capsules, ligaments, and fascia. This leads to improved postural alignment and the restoration of proper joint biomechanics and functional movement.

### **Aim of the Study**

The Aim of the study is to compare the effectiveness of Muscle energy technique and Maitland Mobilization coupled with IASTM in improving shoulder function on patients among periarthritic shoulder subjects.

### **Objectives of the Study**

- To evaluate the effectiveness of IASTM coupled with Muscle energy technique to improve the shoulder function on patients among periarthritic shoulder subjects.
- To evaluate the effectiveness of IASTM coupled with Maitland Mobilization to improve the shoulder function on patients among periarthritic shoulder subjects.
- To compare the effectiveness of Muscle energy technique and Maitland Mobilization to improve the shoulder function on patients among periarthritic shoulder subjects.
- To compare the effectiveness of Muscle energy technique and Maitland Mobilization coupled with IASTM to improve the shoulder function on patients among periarthritic shoulder subjects.

### **Need of the Study**

Frozen shoulder can be a primary or idiopathic problem or it may be associated with another systemic illness. By far the most common association of a secondary frozen shoulder is diabetes mellitus. The incidence of frozen shoulder in diabetes patients is reported to be 10%-36%.

The prevalence of shoulder pain throughout the whole lifetime is estimated to be approximately 35% (Guerra de Hoyos et al, 2004). Shoulder problems were believed to be connected with abnormal scapular dyskinesia and shoulder muscle tension, spasms, and inflammation in the shoulder region like the rotator cuff syndrome as well as associated joints such as glenohumeral, scapulothoracic, sternoclavicular and acromioclavicular (Ratcliffe et al, 2014)

A variety of shoulder functional enhancement including muscle energy technique and Maitland mobilization coupled with IASTM are used, to provide clinical evidence in the management of individuals with shoulder pain to improve shoulder function.

### **Hypothesis**

#### **Null Hypothesis (Ho)**

There is no significant improvement in shoulder function following IASTM coupled with Muscle energy technique among periarthritic shoulder subjects.

There is no significant improvement in shoulder function following IASTM coupled with Maitland Mobilization among periarthritic shoulder subjects.

There is no significant improvement in shoulder function following IASTM coupled with Muscle Energy Technique and Maitland Mobilization among periarthritic shoulder subjects.

#### **Alternate Hypothesis (Ao)**

There is significant improvement in shoulder function following IASTM coupled with Muscle energy technique among periarthritic shoulder subjects.

There is significant improvement in shoulder function following IASTM coupled with Maitland Mobilization among periarthritic shoulder subjects.

There is significant improvement in shoulder function following IASTM coupled with Muscle Energy Technique and Maitland Mobilization among periarthritic shoulder subjects.

## Methodology

### Study Design

- Experimental study comparative in nature.

### Study Setting

- OPD of Cherran's College of Physiotherapy.

### Subjects

- 20 subjects were included in the study.

### Project Duration

- 2 Months

### Study Duration

- 45 days.

### Treatment Duration

- 45 minutes

### Sampling Method

- Convenient sampling method.

### Inclusion Criteria

- Age between 35-50 years.
- Only males were included.
- Subjects with Chronic periarthritic shoulder

### Exclusion Criteria

- Malignancy in area of treatment
- Infectious Arthritis
- Metabolic Bone Disease
- Neoplastic Disease
- Fusion or Ankylosis
- Osteomyelitis
- Fracture or Ligament Rupture
- Arthroplasty
- Hypermobility

### Materials and Measurement Tool

- Informed consent
- Patient information sheet
- Shoulder pain and disability index chart
- Couch with bed
- IASTM

### Variables

#### Independent Variables

- Maitland Mobilization
- Muscle Energy Technique
- IASTM

#### Dependent Variables

- Shoulder joint pain and Function

## Procedures

The subjects were screened based on the inclusion and exclusion criteria. The subjects were explained about the IASTM coupled with Muscle Energy Technique and Maitland Mobilization. The purpose of study was explained to them and informed consent was obtained. The subjects were randomly assigned into Group I and Group II. The subjects in Group I were treated with IASTM coupled with Muscle Energy Technique, the subjects in group II were treated with IASTM coupled with Maitland mobilization

The treatment was given for the total time period of 45 minutes.

### Muscle Energy Technique Coupled with IASTM

The subjects of Group A received Muscle energy technique coupled with IASTM therapy (called as METU here- after) for Glenohumeral joint restricted flexion, joint restricted abduction, and joint restricted external rotation.

For flexion, the therapist placed one hand at the subject's superior part of the scapula and glenohumeral joint to examine for motion. The other hand of the therapist supported the subject's flexed elbow and stretched the humerus bone at the glenohumeral joint in the sagittal plane to the initial point of resistance. The subject was subsequently instructed to extend his elbow against the therapist's counterforce. The force was maintained for 5s and let to relax for 2 s. For abduction, the therapist placed hand to cup the glenohumeral joint to examine for motion. The subject was directed to press his elbow towards the body.

### Maitland Mobilization Coupled with IASTM

The subject is advised to rest in one end of the couch in supine position, Joint mobility is tested according to ordinal scale (joint mobility), subjects satisfying grade 2 of ordinal scale were selected for mobilisation.

Applying translatory glide thrust mobilization grade V to the affected shoulder joint (concave surface: glenoid fossa and convex surface: humerus head).

- Grade I-small amplitude movement at the beginning of the available ROM
- Grade II - large amplitude movement at within the available ROM.
- Grade III-large amplitude movement that reaches the end ROM Grade
- IV-small amplitude movement at the very end range of motion Grade
- V - High velocity thrust of small amplitude at the end of the available range and within its anatomical range (manipulation).

The Group B patients received Mobilization technique (general) coupled with IASTM therapy (called as MTU hereafter) for glenohumeral joint abduction, joint external rotation, joint forward flexion. For flexion, the subject was allowed to lie in a supine position and the affected arm was made to rest on the edge of the resting table and the upper limb was brought forward to flexion. The arm of the subject was supported against the therapist's trunk; the distal humerus of the subject was grasped by the therapist's lateral hand. The lateral border of the therapist's top hand was placed in a distal position to the anterior margin of the joint, with the fingers positioned in a superior position. Caudal glide was performed to improve rotation and range beyond 90 degrees.

For abduction, the subject was made to lie in a supine position with the arm in resting position. The forearm of the subject was supported between the therapist's trunk and elbow. The therapist stood on the affected side of the subject facing toward the cephalic end. The therapist subsequently placed one hand on the subject's axilla thereby providing grade 1 distraction. The web space of the therapist's other hand was placed distally to the acromion and subsequently caudal glides were provided.

**Data Analysis**

**Technique of Data Analysis**

The improvement in the reduction of pain and disability was calculated using the pre-test and post-test taken before and after treatment.

The data obtained are analyzed using paired “t” test.

- MEAN:  $d = \sum_n d$
- STANDARD DEVIATION:  $S.D = \sqrt{\sum \frac{(d-d)^2}{n-1}}$
- PAIRED “t” TEST:  $t = \frac{d\sqrt{n}}{S.D}$

Where,

d= calculated mean difference pre-test and post-test

n= sample size

S.D= standard deviation

d= difference between pre and post-test

**Table 1: Shows the Comparative Mean Value, Mean Difference, Standard Deviation & SEM between pre and Post-Test of Group I.**

S.No	Variables	N	Improvement		Standard Deviation	Standard error mean
			Mean	Mean Difference		
1	Pre-test	10	63	34.4	5.6316	1.7074
2	Post-test	10	28.8			

Above values shows that there is significant improvement in shoulder function among pre & post-test values.

**Table 2: Shows the Comparative Mean Value, Mean Difference, Standard Deviation & SEM Between Pre & Post-Test in group II.**

S.No	Variables	N	Improvement		Standard deviation	Standard Error Mean
			Mean	Mean Difference		
1	Pre-test	10	65.6	30.2	3.569	1.0934
2	Post-test	10	35.4			

Above values shows that there is significant improvement in shoulder function among pre & post-test values.

**Table 3: Shows the Comparative Mean Value, Mean Difference, Standard Deviation & Paired Value between Pre & Post-Test of Shoulder Function in Group I and Group II.**

S.No	Variables	N	Improvement		P Value	Paired t value
			Mean Difference	Standard deviation Mean		
1	Group I	10	34.4	4.71144	0.0811	1.9639
2	Group II	10	30.2			

In paired test the calculated value is 1.9908. Above values shows that there is significant difference in improving shoulder function among Group I and Group II.

**Unpaired “T” Test**

The unpaired “t” test was used to compare the statistical significant difference between Group A and Group B.

**Formula**

$$S = \sqrt{\frac{(n_{1-1})^s 1^2 + (n_{2-1})^s 2^2}{n1 + n2 - 2}}$$

$$t = \frac{x_1 - x_2}{s \sqrt{\frac{1}{n1} + \frac{1}{n2}}}$$

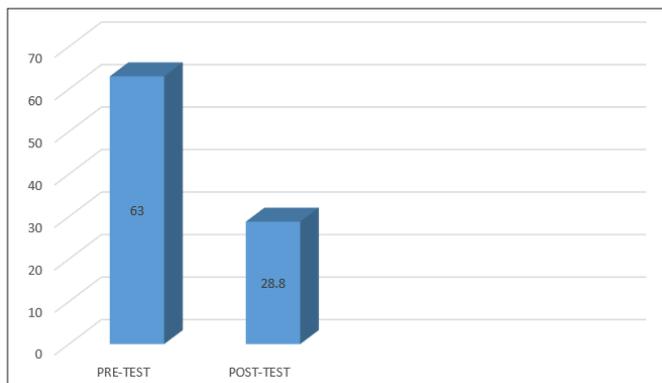
n<sub>1</sub> – Total number of subjects in Group I

n<sub>2</sub> - Total number of subjects in Group II

x<sub>1</sub> – Difference between pre-test and post-test values of Group I, Difference between pre-test and post-test values of Group II

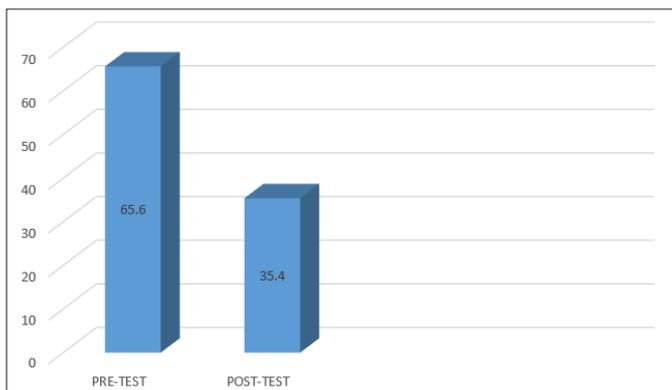
1= Mean difference between pre-test and post-test values of Group I

2= Mean difference between pre-test and post-test values of Group II

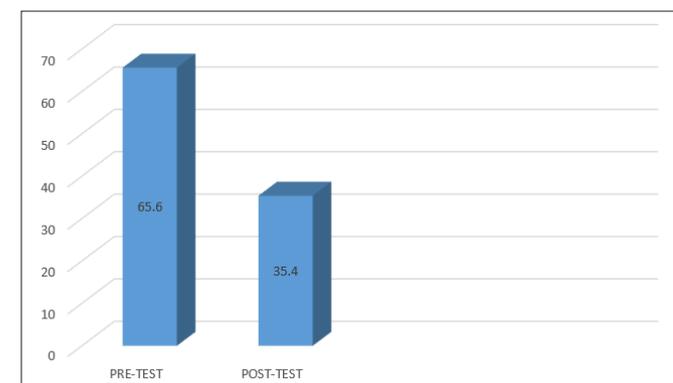


**Figure 1:** Comparison between Pre-Test and Post-Test Means in (Bar diagram shows pre-test and post-test mean values of Group)

Pre-test and post-test values are 63 and 28.6 respectively. This shows that there is improvement of mean value of pre and post-test of Group I.



**Figure 2:** Comparison between Pre-Test and Post-Test Means in (Bar diagram shows pre-test and post-test mean values of Group)



Pre-test and post-test values are 65.6 and 35.4 respectively. This shows that there is improvement of mean value of pre and post-test of Group II.

**Figure 3:** Comparison of Two

Comparison of Group I (Muscle Energy Technique with IASTM) and Group II (Maitland Mobilization with IASTM).

**Results**

The number of subjects for the study was 20 (n=10). The subjects were divided into two groups (group I & group II). For group I IASTM coupled Muscle Energy Technique was given. The group II received IASTM coupled with Maitland Mobilization. Readings

of pre and post-test values of shoulder pain and disability of Group I and II given in table 1 & 2 respectively. The result showed that for IASTM coupled with Muscle Energy technique, group I the mean values of pre-test and post-test values were 63 and 28.6 respectively, and the mean difference is 34.4, standard deviation is 5.6316 with SEM 1.7074.

The result showed that for IASTM coupled with Maitland Mobilization, group II the mean values of pre- test and post-test values were 65.6 and 35.4 respectively, and the mean difference is 30.2, standard deviation is 3.569 with SEM 1.0934. The paired 't' value for comparative analysis is 1.9639 at 0.005 levels, and p value is 0.0811. Thereby the null hypothesis is rejected and alternative hypothesis is accepted.

Hence this study concludes that group I shows difference in significant improvement of shoulder function than group II. We concluded that group I received IASTM coupled with Muscle Energy Technique will be more effective than group II which received IASTM coupled with Maitland Mobilization.

**Discussion**

Shoulder pain and disability are the major common cause for shoulder dysfunction in shoulder complex abnormalities. Scapula plays a major role in shoulder kinematics. Scapular dysfunction may occur due to muscle weakness or injury to the shoulder complex.

In this study the effect of scapular stabilization exercise in enhancing shoulder function is measured through shoulder pain and disability scale. After 45 days of experimentation, the results show that there is significant improvement in shoulder function.

This study provides evidence that IASTM coupled with Muscle Energy Technique was effective in improving shoulder function through SPADI scores from 63 to 28.8 with the mean difference of 34.4. And the IASTM coupled with Maitland Mobilization were from 65.6 to 35.4 with the mean difference of 30.2. Hence IASTM coupled with Muscle Energy Technique improved in SPADI than IASTM coupled with Maitland Mobilization. There was a significant difference between the US coupled with MET and MM.

**Conclusion**

The study aims at exploring the effectiveness of IASTM coupled with Muscle Energy Technique in the treatment of periarthritis shoulder to enhance shoulder function by reducing shoulder pain and disability. In this study we used IASTM coupled with Muscle Energy Technique and Maitland Mobilization, the aim of the study is to find effectiveness of IASTM with Muscle Energy Technique to enhance shoulder function among periarthritic shoulder.

This study concluded that the IASTM with Muscle Energy Technique in periarthritic shoulder is more effective than IASTM with Maitland Mobilization in Periarthritic shoulder condition [1-23].

**Limitations and Future Recommendations**

**Limitations**

- This study was limited to small sample size of 20 subjects
- Study researches concentrated only in improving shoulder function.
- Short duration of study
- The long-term retention of training was not studied
- Only one measurement tool (SPADI) was used for shoulder pain and disability.

### Future Recommendations

- Sample size can be increased
- Studies can be done with various duration
- Studies can be done with larger samples
- Further studies can include other measuring tools

It is recommended to do the studies with specific age and gender

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