

## ORIGINAL ARTICLE

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## EFFICACY OF MUSCLE ENERGY TECHNIQUES AS AN ADJUNCT WITH MULLIGAN'S MOBILIZATION IN ADHESIVE CAPSULITIS OF SHOULDER

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## ABSTRACT

**Background:** Adhesive Capsulitis most commonly referred to as "Frozen Shoulder" is an insidious Painful Condition with progressive and gradual restriction of all planes of movement in the glenohumeral joint. Evidence shows Mulligan's mobilization with movement (MWM) mobilization technique is more effective than muscle energy techniques (MET) and conventional therapy in improving shoulder function. Therefore the present study intends to determine the efficacy of muscle energy techniques along with Mulligan's mobilization with movement, in adhesive capsulitis of the shoulder joint.

**Methods:** The present randomized controlled trial was conducted among 30 subjects including both sex groups aged between 40-60 years diagnosed with adhesive capsulitis of the shoulder. They were randomly assigned into two groups with 15 subjects each. Group A received Mulligan's mobilization alone, and Group B received Mulligan's mobilization along with MET. Both the groups received the treatment protocol six times a week for three weeks. Pre and post evaluation of pain was done by using the short-form McGill pain questionnaire, range of motion by the Universal Goniometer and the functional disability by using Shoulder Pain and Disability Index (SPADI).

**Result:** There was a significant improvement ( $P < 0.05$ ) in pre and post-intervention levels in both groups. Between groups analysis, the results are: a range of motion improved 30%, and the values are flexion with a p-value of 0.010, for abduction, internal and external rotations with a p-value of 0.000 except for extension with a p-value of 0.109. On comparison of SPADI using Mann Whitney U test, it showed 50% improvement with a significant difference with a p-value of 0.001 and McGill improved for more than 70% with a p-value of 0.000.

**Conclusion:** Mulligan's mobilization along with Muscle Energy Technique is found to be more effective in improving quality of life among subjects with adhesive capsulitis of shoulder than Mulligan's mobilization alone.

**Keywords:** Adhesive Capsulitis, MET (Muscle energy technique), Mulligan's mobilization, Range of motion, Pain.

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## INTRODUCTION

The shoulder is a complex joint that permits a full range of movements which are crucial for many activities of daily living. The intricate structural design is responsible for the multi-plane wide arcs of movements. Adhesive capsulitis also known as frozen shoulder is a painful condition associated with synovitis and capsular restriction causing a reduced range of active and passive motion [1-4]. Loyd and Loyd (1983) suggested that a secondary frozen shoulder develops when painful spasm limits activity and creates dependency on the arm [5]. The estimated prevalence of adhesive capsulitis is 11-30% in diabetic patients, which is considerably higher than non-diabetic patients [6].

Adhesive capsulitis, an idiopathic disease tends to be a self-limiting with spontaneous complete or near complete recovery over a varied period. Cyriax recommended the idea of capsular examination and this pattern could be a result of joint reaction with a muscle spasm that prompts capsular constriction [7]. This clinical entity progresses through overlapping stages of freezing, frozen and thawing stages.

Evidence suggests that manual therapy with mobilizations including high-velocity, low amplitude manipulation, end-range mobilization, mid-range mobilization, and mobilization with movement has a more significant effect on improving range of motion in Adhesive capsulitis [8]. Evidence shows that Mulligan's MWM technique is more effective than muscle energy techniques and conventional therapy [9]. Whereas, another Cochrane review for shoulder pain found no benefit of any particular physiotherapy technique over other [10,11].

Mulligan's technique performed actively or passively aims at correcting positional fault by producing synchronized hypoalgesic effects during and following its application, as well as altering sympathetic nervous system function [12]. Authors like Leon Chaitow (2006) [13] and other studies have shown that the MET is a soft tissue manipulation method that incorporates precisely directed and controlled, patient initiated, isometric and isotonic contraction. The effect of MET is to improve function by stimulation of Golgi tendon organ that results in direct inhibition of agonist's muscles and reflexive inhibition at the antagonistic muscles allowing the joint to be moved further into the restricted ROM [14-15].

Therefore the present study intends to determine the efficacy of muscle energy techniques along with Mulligan's mobilization with movement, in adhesive capsulitis of the shoulder joint.

## MATERIALS AND METHODS

An Interventional study was conducted at Out Patient Department of Apollo College of physiotherapy. The current study includes 30 subjects who have adhesive capsulitis of the shoulder. They are selected based on inclusion and exclusion criteria and are divided into two groups- Group A and Group B by convenient sampling. Thirty subjects including 17 male and 13 female were

selected and allotted to two groups. The purpose of the study was explained to each one of them. The duration of intervention was three weeks, i.e., 6 sessions per week so a total of 18 sessions. Ethical clearances were obtained from the ethical committee of the institute, and written consent forms from all the participants were collected.

Group A: Brief demonstration of Mulligan's movement with mobilization is given to the patients and is then taken for the treatment for day 1.

Group B: Brief demonstrations of Mulligan's movement with mobilization and muscle energy techniques are given to the patients and then are taken for the treatment for day one.

Mulligan's movement with mobilization:

Technique: The subject is placed in the supine position, and the therapist is standing lateral to the affected joint to perform the shoulder distraction, flexion, extension, abduction, internal and external rotation. The scapula is stabilized to prevent accessory movements. The mobilizing belt is placed close to the joint and the movement is performed. Therapist shifts the weight to distract the joint and the subject is asked to perform the affected movement to a pain-free range and applies passive overpressure to achieve a new range [12].

Muscle energy technique

Technique: The subject is in a side-lying position for application of the method for shoulder flexion, abduction and the supine position for shoulder internal and external rotation. The therapist stands by the side of the subject. The therapist performs the movement. When the first physiological barrier is reached, the subject is asked to oppose the movement utilizing no more than 20% of available strength, building up force slowly. This effort is firmly resisted, and after 7-10 seconds the subject is instructed to cease the effort simultaneously with the therapist gradually. After complete relaxation, the shoulder is moved to the next restriction bar [13].

All the subjects of both groups are treated with ultrasound for pain relief.

The subjects wore loose-fitting clothes or minimal clothing for easy mobilization of the shoulder.

Outcome measures: Before the treatment, pre-test evaluation and post-intervention post-test evaluation was conducted for both the groups. The intensity of pain by short form Mc Gill pain questionnaire [16-17], range of motion of shoulder by universal goniometer [18] and functional disability with Shoulder Pain And Disability Index [19].

## STATISTICAL ANALYSIS AND RESULTS:

Statistical analysis was carried out using Microsoft Excel 2007 and statistical package for social sciences (SPSS 12.5v) For within the group analysis, Paired t-test and Wilcoxon test were used. For between the group analysis, Independent t-test and Mann Whitney U Test were used.

**Table 1:** Demographic data for age and sex

| Parameter | Group A(MWM) | Group B(MWM+MET) |
|-----------|--------------|------------------|
| Age       | 46 ± 10      | 44± 9            |
| Sex (M/F) | 7/8          | 6/9              |

The study included a total of 30 patients with 15 in each group. Mean age of patients in experimental group was 46.6 and in control were 49.4. In Group A (Mulligan’s MWM alone) there were 7 females and 8 males while in Group B (Mulligan’s MWM along with MET) there were 6 females and 9 males.

**Table 2:** Within the Group Analysis of Group A- Mulligan’s MWM

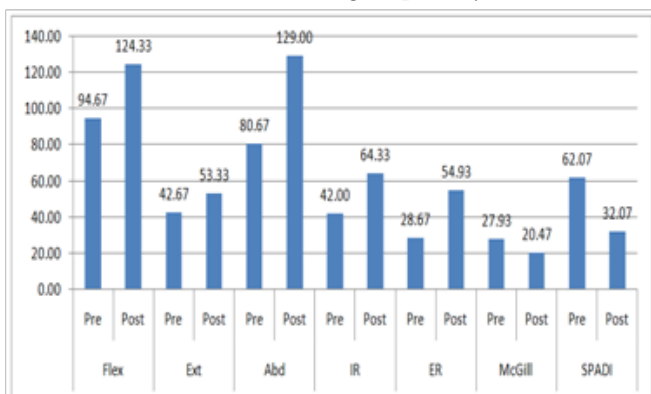
Paired statistics

| Range of movement |      | Mean     | N  | Std. Deviation | Sig. (2-tailed) |
|-------------------|------|----------|----|----------------|-----------------|
| Flexion           | Pre  | 94.6667  | 15 | 15.52264       | .010            |
|                   | Post | 124.3333 | 15 | 40.39389       |                 |
| Extension         | Pre  | 42.6667  | 15 | 9.03696        | .010            |
|                   | Post | 53.3333  | 15 | 4.87950        |                 |
| Abduction         | Pre  | 80.6667  | 15 | 4.57738        | .010            |
|                   | Post | 129.0000 | 15 | 14.41724       |                 |
| IR                | Pre  | 42.0000  | 15 | 9.78337        | .000            |
|                   | Post | 64.3333  | 15 | 5.62731        |                 |
| ER                | Pre  | 28.6667  | 15 | 8.54958        | .000            |
|                   | Post | 54.9333  | 15 | 7.79621        |                 |
| McGill            | Pre  | 27.9333  | 15 | 4.25049        | .000            |
|                   | Post | 20.4667  | 15 | 1.45733        |                 |
| Spadi             | Pre  | 62.0667  | 15 | 2.34419        | .000            |
|                   | Post | 32.0667  | 15 | 4.19977        |                 |

In Mulligan’s group (Group A), there is a significant difference between the comparison of pre and post values of flexion, extension, and abduction which was derived by a paired t-test. The p-value is 0.010 which is less than 0.05. In internal and external rotation there is a significant difference between the comparison of pre and post values which was derived by a paired t-test. The p-value is 0.000 which is less than 0.05.

Comparison of pre and post values of McGill and SPADI shows a significant difference between which was derived by the Wilcoxon test. The p-value is 0.000 which is less than 0.05.

**Graph 1:** Group A: Mulligan’s MWM graphical representation within the group analysis



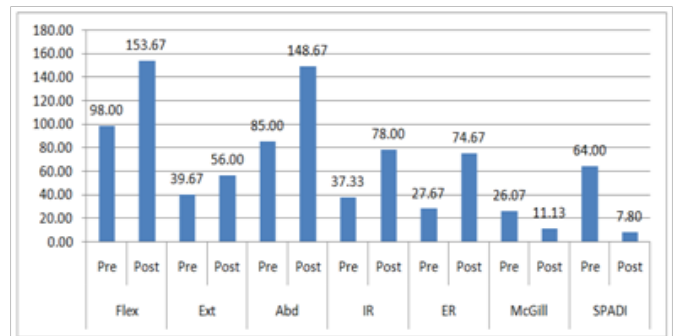
**Table 3:** Within the Group Analysis of Group B- Mulligan’s MWM along with Muscle Energy technique

| Range of movement |      | Mean     | N  | Std. Deviation | Sig. (2-tailed) |
|-------------------|------|----------|----|----------------|-----------------|
| Flexion           | Pre  | 98.0000  | 15 | 17.19635       | .000            |
|                   | Post | 153.6667 | 15 | 6.93507        |                 |
| Extension         | Pre  | 39.6667  | 15 | 4.80575        | .000            |
|                   | Post | 56.0000  | 15 | 3.87298        |                 |
| Abduction         | Pre  | 85.0000  | 15 | 17.21710       | .000            |
|                   | Post | 148.6667 | 15 | 9.90430        |                 |
| IR                | Pre  | 37.3333  | 15 | 8.20859        | .000            |
|                   | Post | 78.0000  | 15 | 5.60612        |                 |
| ER                | Pre  | 27.6667  | 15 | 10.66815       | .000            |
|                   | Post | 74.6667  | 15 | 7.89816        |                 |
| McGill            | Pre  | 26.0667  | 15 | 1.66762        | .010            |
|                   | Post | 11.1333  | 15 | 1.84649        |                 |
| Spadi             | Pre  | 64.0000  | 15 | 9.34268        | .010            |
|                   | Post | 7.8000   | 15 | 3.32093        |                 |

In Mulligan’s and MET’s group (Group B), there is a significant difference between the comparison of pre and post values of all the ranges which were derived by a paired t-test. The p-value is 0.000 which is less than 0.05.

Comparison of pre and post values of McGill and SPADI shows a significant difference between which was derived by the Wilcoxon test. The p-value is 0.001 which is less than 0.05.

**Graph 2:** Within the group analysis: Group B Mulligan’s MWM along with Muscle energy technique



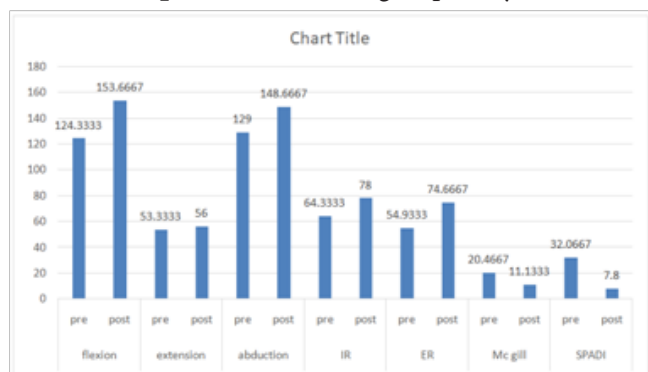
**Table 4:** Between the group analysis

| Parameter | Group        | Mean     | Std. Dev | P value |
|-----------|--------------|----------|----------|---------|
| Flexion   | Mulligan     | 124.3333 | 40.39389 | .010    |
|           | Mulligan+MET | 153.6667 | 6.93607  |         |
| Extension | Mulligan     | 53.3333  | 4.87960  | .109    |
|           | Mulligan+MET | 56.0000  | 3.87298  |         |
| Abduction | Mulligan     | 129.0000 | 14.41725 | .000    |
|           | Mulligan+MET | 148.6667 | 9.90430  |         |
| IR        | Mulligan     | 64.3333  | 5.62731  | .000    |
|           | Mulligan+MET | 78.0000  | 5.60612  |         |
| ER        | Mulligan     | 54.9333  | 7.79621  | .000    |
|           | Mulligan+MET | 74.6667  | 7.89816  |         |
| McGill    | Mulligan     | 20.4667  | 1.45733  | .000    |
|           | Mulligan+MET | 11.1333  | 1.84649  |         |
| SPADI     | Mulligan     | 32.0667  | 4.19977  | .000    |
|           | Mulligan+MET | 7.8000   | 3.32093  |         |

Between the group analysis, there was a significant improvement in flexion, abduction, internal and external rotations ( $p < 0.05$ ). The only extension showed ( $p > 0.05$ )

On Comparison of McGill and SPADI score using shows Wilcoxon test a significant difference was observed with a p-value of 0.000 which is less than 0.05

**Graph 3: Between the group analysis**



Between the group's analysis for these two groups also showed significant differences for flexion with a p-value of 0.010, for abduction, internal and external rotations with a p-value of 0.000 except for extension with a p-value of 0.109. On comparison of SPADI using Mann Whitney U test, it showed a significant difference with a p-value of 0.001 and McGill with a p-value of 0.000.

This shows that there is a much more significant improvement in the range of motion, reduction in pain and improvement in functional disability in Group receiving Mulligan's MWM along with MET as compared to the group receiving Mulligan's MWM alone.

## DISCUSSION

The present study was undertaken to evaluate the efficacy of muscle energy technique as an adjunct with Mulligan's movement with mobilization in the treatment of adhesive capsulitis of shoulder and to compare the effectiveness of the techniques in terms of improving joint mobility, reducing pain and improving the functional activity.

The intervention (group A- MWM & Group B: MWM and MET) along with ultrasound therapy was given for three weeks for both the groups and the results were significant in group B when compared with group A on follow up. The effect of both the interventions on pain, range of motion and shoulder function was positive, i.e. they both were effective.

There is an improvement in range of motion in Group A (Mulligan Group) due to the corrective glide which is given to achieve optimal alignment of articular surfaces and its maintenance by appropriate recruitment of muscles with patient's active efforts. This goes by Mulligan's concept of positional fault. Many previous reports explained the background of MWM to have a neurophysiological mechanism of production of initial hypoalgesia based on stimulation of peripheral mechanoreceptors and inhibition of nociceptors, altering the sympathetic nervous system. This treatment technique produces a total, immediate pain relief during the technique application. It corrects

the positional faults, and there is a quick change in bony position during the application of MWM. Albert Zaky et al. (2012) in his study "End-range mobilization (ERM) versus mobilization with movement (MWM) in the treatment of adhesive capsulitis" found that MWM was very effective in improving external rotation and abduction by mulligan therapy [20]. Also, Shruti Patelet et al. (2015) conducted a study on the effect of mulligan mobilization of movement technique on internal rotation range of motion of the glenohumeral joint in a patient with adhesive capsulitis and found that internal rotation was improved significantly [21].

The alteration of the shoulder biomechanics can be due to scapular tightness in adhesive capsulitis. This capsular tightness pulls the head of the humerus towards the glenoid fossa altering humeral head excursion in glenoid fossa [22]. This alteration leads to alteration in mechanism in the scapulohumeral and acromioclavicular joint. This further leads to positional faults also. One of the staples of physical therapy and kinesiology foundations includes the convex-concave rules of joint motion [16]. It states that when a convex surface moves on a concave surface, the convex surface rolls in one direction and glides in the opposite direction. If a concave surface moves on a convex surface, the concave surface rolls and glides in the same direction, this can be crucial for understanding of joint mobility and forms the integral or fundamental part of the application of mobilizations. So if the glide is given according to the roll, slide, and glide, there will be a significant improvement in range of motion which is proved in our study.

When the responses were compared between the groups, the results showed a significant difference at follow up which means Muscle energy technique as an adjunct with Mulligan's movement with mobilization is better than Mulligan's alone. Abundant literature is available for MET as an effective technique in reducing pain and improving function [23,26,27]. Muscle energy technique is classified as a direct technique in which the restrictive barrier is actively engaged to contract a muscle in a precisely controlled fashion against a direct counterforce<sup>24</sup>. It can be used to stretch over tight muscles and fascia and also to mobilize a restricted joint. Engaging restrictive barriers and then using an isometric contraction causes inhibition of agonist's muscle through Golgi tendon organ [13]. By action on Golgi tendon organ and muscle spindle, MET is expected to reduce the tone of hypertonic muscles and re-established normal muscle resting length along with correction of postural and movement asymmetries stretching muscles and thus reducing the pain. Many researchers explained this concept of MET Edrish Saifee Contractor et al. (2016) conducted a study on the effect of muscle energy technique on a range of motion in patients with adhesive capsulitis and found to be an effective technique [28,31,32].

Hence when MWM and MET are given together for subjects, there was a significant improvement. This can be justified as MWM is correcting the positional fault [29]

and MET the effect is on restoring the muscle length [33]. Active movement is more emphasized in our treatment protocol which helps in restoring the range of motion with consideration towards pain. Therefore, the present study has found that Muscle energy technique as an adjunct to Mulligan's movement with mobilization is better in the reduction of pain, improvement in range of motion and functional disability than Mulligan's alone.

## CONCLUSION

The present study concluded that both Mulligan's movement with mobilization (MWM) alone and Mulligan's movement with mobilization (MWM) along with muscle energy technique (MET) have shown to have an effect on reduction in pain, improvement in shoulder mobility and functional ability.

However, Mulligan's movement with mobilization (MWM) along with muscle energy technique (MET) is found to be more effective in improving quality of life among subjects with adhesive capsulitis than Mulligan's movement with mobilization (MWM) alone. The limitations of the study were smaller sample size; gender variations were not considered, and also muscle strength evaluations were not done.

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#### **Citation**

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