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## Research Article

# EFFICACY OF MULLIGAN TECHNIQUE VERSUS MUSCLE ENERGY TECHNIQUE ON FUNCTIONAL ABILITY IN SUBJECTS WITH ADHESIVE CAPSULITIS

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### ABSTRACT

**Purpose:** - The purpose of this study was to find the efficacy between Mulligan's technique and muscle energy technique in improving pain and functional ability among subjects with adhesive capsulitis. **Methods:** - 80 subjects who were clinically diagnosed adhesive capsulitis of shoulder were recruited who fulfilled inclusion criteria, later were randomly allocated into two groups. In Group A (n=30) subjects were treated with Mulligan technique whereas in Group B (n=30) subjects were treated with muscle energy technique and both groups received exercises thrice a week for 3 weeks. The outcomes used in this study were SPADI and shoulder range of motion these were recorded pre and post completion of intervention. **Results:** - Statistical analysis of the data revealed that within group significance but no between group significance. **Conclusion:** - It was concluded that Mulligan technique and muscle energy technique are equally effective in reducing pain and improving shoulder functional ability in subjects with adhesive capsulitis.

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## INTRODUCTION

Adhesive capsulitis is a self-limited inflammatory process that affects shoulder capsule, characterized with progressive pain and decreased range of motion of the gleno-humeral joint in both active and passive movements (Nevasier 1996, Giovanni Maria D Orsi *et al* 2012).

The prevalence of this condition is around 2-5% and in India it was reported that the incidence is around 17.9% in diabetic and 7% in non diabetic population. Women are more prone to get adhesive capsulitis than men in age group between 40-60 years (Yogesh Vyas 2013, Shawesh A, Nashnoush, 2014)

Based on the aetiology, Reeves (1975) categorised this into three stages which were freezing or painful stage, frozen and thawing (Mohsen KazemiRN 2003). Zuckerman (2011) tabulated this condition into primary and secondary category where primary is idiopathic and secondary occurs after injury, later categorised as systemic, intrinsic and extrinsic (Martin J. Kelly *et al* 2000, Tamai K, *et al* 2014).

For this condition along with medical management, Physiotherapy is employed to treat the disabilities caused by the condition. Though physiotherapy is the first line of Management of adhesive capsulitis, yet to date efficacy

between the techniques were not established (Smith CD 2014, Manske RC 2008, Tracy Brudvig 2011, Israel Dudkiewicz 2004). Two effective techniques used in physiotherapy were Mulligan mobilisation and Muscle energy technique.

Mulligan mobilization was introduced by Bryan mulligan in 1999, this technique incorporated kalternborn's principles of passive mobilization. They are taught to achieve painless movement by restoring the reduced accessory glide. Similar principles can be applied to the treatment of peripheral musculoskeletal disorders and are termed Mobilization with Movement, and also limited painful physiological movement is performed actively while the therapist applies a sustained accessory glide at right angles or parallel to the joint. The accessory movement takes the joint through what would be the normal physiological movement of the joint and it has been found to correct the shoulder mal alignment thus inhibiting pain and this leads to increased ROM(Linda Exelby 1996, Vicenzino B 1995).

Muscle energy technique was developed by Dr. Fred Mitchell. Sr. It is a non-invasive technique which can be used to stretch or lengthen muscle and fascia that lack flexibility. MET targets the soft tissues primarily, but it also makes a major contribution towards joint mobilization which not only increases ROM of joints, but also increases the extensibility of muscle by means

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of a mechanism expressed as “increased tolerance to stretch.” Both studies have proven to be effective in reducing pain and restoring function of shoulder but none of the studies have shown which of these techniques is superior to one another. So this study was proposed to find efficacy between these techniques on adhesive capsulitis (Chaitow L 2001).

## MATERIALS AND METHODS

This work has been conducted in Department of Physiotherapy, GSL hospital campus, Rajanagaram in a 3 month period between April 2016 and June 2016. The study design was experimental and randomisation of the individuals were done by using concealed block randomisation. Total 60 subjects were included in this study. The materials used in this study were universal goniometer, mobilisation belt, stepper, straps and couch.

Group	No of Subjects	Treatment
Group-I	30	Mulligan Technique & Conventional Exercises
Group-II	30	Muscle Energy Technique & Conventional Exercises

### Mesasurement of rom

Shoulder ROM was measured with goniometer; patient was positioned in supine lying with shoulder neutral. The fulcrum of the goniometer placed anterior to acromion process, stationary arm parallel to midline of sternum and movable arm placed at the midline of humerus. The patient was asked to abduct the arm as much as possible and the reading of the goniometer was noted.

For external rotation of the shoulder, patient was positioned in supine lying and arm abducted to 90 degree and elbow at 90 degree. Fulcrum of goniometry over olecranon and stationary arm perpendicular to floor, moving arm is aligned parallel to the ulna. The patient is asked to rotate externally as much as possible.<sup>15</sup>

Disability evaluation: SPADI scale was used an outcome measure for disability evaluation of shoulder.

### Intervention

#### Mulligan technique

Group I received mulligan mobilization, the position of the patient was seated and the therapist stood facing the patient. The therapist hands were placed one stabilising the scapula and the other over the head of the humerus. A posterolateral glide was applied and the patient was asked to abduct his/her shoulder as much as they can and over pressure was applied at the end range. With mobilisation belt the therapist position was standing at the back of the patient and the belt was placed over the shoulder and a posterolateral glide was applied while the therapist stabilised the belt with one hand (Norkin c *et al* 2003) For external rotation of the shoulder, patient was positioned in supine lying and the arm is abducted to 90 degree and elbow flexed to 90 degree and forearm in neutral. The therapist used mobilisation belt in a figure of 8, such a way that the shaft of the humerus came near the hands of the therapist. The subject was instructed to rotate the arm as much as he can while the therapist applied passive overpressure at the end range of the movement. This procedure was performed 3 sets of 10

repetitions with 30 sec rest between sets. The treatment procedure was performed 3 sessions in a week for 3 weeks (Mulligan BR).

#### Muscle energy technique

A single application of MET was applied to the glenohumeral joint for horizontal abduction, the subject was positioned in supine lying with shoulder flexed to 90 degree. The therapist stabilised the lateral border of scapula and the subject was asked to horizontally adduct the shoulder against the therapist resistance. The subject was asked to perform a 5 isometric contraction at 25% maximal effort. Following the contraction the patient arm was moved into horizontal abduction passively and a 30 second stretched was applied, then the subject was instructed to relax and a new movement barrier was then engaged by the therapist.

For GHJ external rotation the subject was positioned in supine lying and arm adjusted to 90 degree and elbow flexed to 90 degree. The subject shoulder was internal rotated until the fist barrier of movement is encountered. Then the subject was asked to perform a 5 second isometric hold at 25% of his/her maximal voluntary contraction against therapist resistance directed towards internal rotation of shoulder. Following the contraction the subject was instructed to relax and the therapist took the shoulder to new internal rotation range and the stretch was applied for 30 seconds and the same method is performed again. The MET to shoulder was given for 5 repetitions per set for 3 sets and the treatment procedure performed 3 sessions in a week for 3 weeks (Stephanie D Moore 2011).

#### Statistical analysis

Statistical analysis of the present study was done by using SPSS software version 20.0 and manually. Student t test (independent) were used to find out the significance in between groups and student t test (paired) were used to find out the significance within the group.

## RESULTS

The results of this study were analyzed in terms of pain relief and improved function on SPADI, increased shoulder abduction and external rotation range of motion on universal goniometer.

Comparison was done both within each group as well as in between the two groups. So as to evaluate the intra group and inter group effectiveness of mulligan’s technique and muscle energy technique which are under considerations in the present study.

**Table1** mean changes in SPADI pain component (with in groups)

Group	Pre treatment		Post treatment		p value
	mean	SD	mean	SD	
Group-I	34.13	4.006	22.20	3.986	0.00
Group-II	33.73	2.625	22.50	3.812	0.00

The average SPADI pain score in group II on first day was 33.73, which were reduced to an average of 22.50 on last day (after 3 weeks) of the treatment.

**Table 2** mean changes in SPADI pain component (between group I&II)

Group	Post treatment mean	SD	p-value
Group-I	22.20	3.986	0.767
Group-II	22.50	3.812	0.767

**Table 3** mean changes in SPADI disability component (with in groups)

Group	Pre treatment		Post treatment		p-value
	mean	SD	mean	SD	
Group I	56.17	5.52	39.33	6.73	0.00
Group II	53.57	5.32	39.5	6.90	0.00

Improved shoulder function was recognized by reduction in SPADI disability score. For this SPADI disability score was noted on the first day and the last day (after 3 weeks) of the treatment for all the subjects.

**Table 4** mean changes in SPADI disability component (between group I&II)

Group	Post treatment mean	SD	p-value
Group-I	39.33	6.738	0.925
Group-II	39.50	6.902	0.925

There was no significant difference between the SPADI scores in the Mulligan’s group and MET group (p=0.925).

**Table 5** mean changes in shoulder abduction range of motion- universal goniometer index:

Group	Pre treatment ROM		Post treatment ROM		p-value
	mean	SD	mean	SD	
Group I	75.43	13.88	99.93	14.46	0.00
Group II	75.70	11.38	94.23	10.59	0.00

Improvement in shoulder abduction ROM was indicated in terms of improvement in universal goniometer score in degrees. For that initial and final score was noted on first day and last day (after 3 weeks) of the treatment in all the subjects. However the difference between two scores was considered for analysis of the difference between the two groups.

**Table 6** mean changes in shoulder abduction ROM- universal goniometer index (between group I&II)

Group	Post treatment mean	SD	p-value
Group-I	99.93	14.46	0.087
Group-II	94.23	10.598	0.087

**Table 7** mean changes in shoulder external rotation ROM- universal goniometer index.

Group	Pre treatment ROM		Post treatment ROM		p-value
	Mean	SD	mean	SD	
Group-1	29.17	8.313	43.83	7.273	0.00
Group-2	29.50	7.917	43.00	7.724	0.00

There was highly significant difference between the RPM scores in the subjects in MET group i.e. p<0.00.

**Table 8** mean changes in shoulder external rotation ROM- universal goniometer index (between group I&II).

Group	Post treatment mean	SD	p-value
Group-I	43.83	7.273	0.669
Group-II	43.00	7.724	0.669

There was no significant difference between the external rotation ROM scores in the Mulligan’s group and MET group p=0.669.

**DISCUSSION**

Group which received mulligan’s technique had a significant change in ROM and SPADI with a p value of 0.00 and the result of this study is similar to the study conducted by Pamela Teys *et al* (2006) who concluded that this specific manual therapy treatment has an immediate positive effect on both ROM and pain in subjects with painful limitation of shoulder movement (Teys P 2008).

Due to changes in the shape of articular surfaces, thickness of cartilage, orientation of fibers of ligaments& capsules or the direction of and pull of muscles & tendons lead to positional faults in frozen shoulder. The biomechanical effect of MWM is to correct this by repositioning the joint, causing it to track normally. The mechanical benefits may include breaking up of adhesions, realigning collagen, or increasing fiber glide when specific movements stress the specific parts of the capsular tissue.

Other beneficial effects of mulligan technique was improved the normal extensibility of the shoulder capsule and stretch the tightened soft tissue and normalization of scapulohumeralrhythm. The similar changes showed in a study conducted by Mehta Bryna Pankaj, Vinod Babu *et al* (2013) they concluded that MWM with conventional exercise found statistically and clinically significant effect on improving pain, active and passive shoulder abduction ROM in subjects with frozen shoulder (Mehta Bryna Pankaj 2013).

Jin-Ian Yan *et al* (2007) found that Mulligan mobilization with movement and end range mobilization were more effective than mid-range mobilization in increasing range of motion and functional ability in adhesive capsulitis. Pamela Teys *et al* (2008) indicated that MWM has an immediate positive effect on both ROM and pain in subjects with painful limitation of shoulder movement (Yang J 2007).

Group which received muscle energy technique has a significant change with a p value of 0.00, and the results of this study is similar to the study conducted by Narayana *et al* (2014) who concluded that Muscle energy technique is very much effective on functional ability of shoulder in adhesive Capsulitis (Narayana, Anupama *et al* 2014).

Stephanie D. Moore (2011), Santosh Metgud (2014) showed that pain reduction by MET was due to 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 (Chakradhar Reddy B 2014, Stephanie D Moore 2011).

The increased active range of motion following MET may be due to various factors like neural, viscoelastic and thixotropic properties. After application of MET, musculo-tendinous junction acts in a viscoelastic manner and lead to the properties of creep and stress relaxation.

Yuvarani. G *et al* (2015) found that the application of MET relaxes and improve biomechanics and result in improving functional ability. It has an effect in reducing pain and increase ROM in patients with adhesive capsulitis (Yuvarani G 2015). GokhanDoner *et al* (2013) showed that pain relief in mulligan group by neuro physiological mechanism of production of initial hypoalgesia based on stimulation of peripheral mechanoreceptors and the inhibition of nociceptors. The activation of apical spinal neurons as a result of peripheral mechanoreceptor by the joint mobilization produces presynaptic inhibition of nociceptive afferent activity. During 4 sessions of interventions there is no reduction of pain is showed in diabetic individuals. From 5<sup>th</sup> session onwards improved in pain and ROM is evaluated. This explanation is consistent with the current literature, which suggests that excessive non enzymatic glycosylation, because of the hyper glycemc state in patients with diabetes mellitus. So, diabetic individuals need long term treatment for significant reduction in pain and ROM. Same result is found in the study “Limited joint mobility in adults with diabetes mellitus” conducted by Nancy Ingersoll Shinabarger.<sup>38</sup>

Based on the analysis, the present study found that 3 weeks of Mulligan’s technique and MET found statistically and clinically no significant difference on improvement of pain, shoulder range and functional ability in subjects with adhesive capsulitis.

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