

# TO COMPARE EFFECTS OF MAITLAND AND MULLIGAN'S MOBILIZATION TECHNIQUES IN THE TREATMENT OF FROZEN SHOULDER

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## Abstract

**Objective:** To compare the role of Maitland mobilization and Mulligan's mobilization techniques in treatment of frozen shoulder and its possible effect in early gaining of ROM and Pain management.

**Methods:** This was a randomized control trial conducted at Department of Physiotherapy and Orthopedics unit I, KEMU / Mayo Hospital, Lahore. There were two group of patients each group contained 30 patients. Patients were treated with Mulligan's technique in Group – A and with Maitland manual therapy technique in Group – B. Patients in both treatment groups were followed till 6 weeks and improvement in range of motion parameters were recorded at every

follow up visit of the patients. SPSS was used for data entry and analysis.

**Results:** In the study 60 patients were enrolled. Mean age of Group – A patients was  $46.23 \pm 9.71$  years, and mean age of Group – B patients was  $47 \pm 9.21$  years. In Group – A 14 patients duration of onset was 8 weeks, 4 patients duration of onset was 10 weeks and 12 patients duration of onset was 12 weeks. In Group – B 14 patients duration of onset was 8 weeks, 8 patients duration of onset was 10 weeks and 12 weeks each respectively. It was observed that patients who were treated with Mulligan technique their abduction and flexion was improved greatly as compared to those who were treated with Maitland technique. Patients who were treated with Mulligan technique their flexion was improved greatly as compared to those who were treated with Maitland technique. At 6<sup>th</sup> week mean extension in Maitland's treatment group was  $52.50 \pm 8.66$  where as that Mulligan's treatment group was  $52.00 \pm 7.58$ . It was observed that patients in both treatment groups had same improvement in extension and it was statistically same. In both treatment groups patients had same improvement in medial rotation and it was statistically same. At 6<sup>th</sup> week mean lateral rotation in both treatment groups was  $42.65 \pm 24.47$  and  $53.50 \pm 23.03$ . It was observed that patients in both treatment groups had same improvement in lateral rotation and it was statistically same.

**Conclusion:** Mulligan's technique is more effective in treating frozen shoulder as compared to Maitland technique.

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**Key Words:** Frozen shoulder, Mulligan's, Maitland, Manual therapy, Range of parameters.

## Introduction

There is 2 – 5% of the population that is affected by Frozen shoulder (FS) or adhesive capsulitis or shoulder peri-arthritis it is most frequent in the age group of forty to sixty years old. In Frozen Shoulder patients have an insidious and gradual damage to active and passive movement in the glenohumeral joint apparently due to capsular contracture.<sup>1</sup> The causes and pathology of Frozen Shoulder remain enigmatic Irrespective of intensive measurements.<sup>2</sup> Repeated shoulder elevation at or beyond 60 degree in any plane during work-related tasks has been recognized as a risk factor for the development of shoulder distressing harms, shoulder pain with no specific cause Frozen Shoulder.<sup>3</sup> In Frozen Shoulder the patients with shoulder pain are not able to perform routine activity and because of this there is decrease in the shoulder muscle strength and endurance.<sup>4</sup> The patients try to manage the rate of movement (ROM) loss by using other muscles and raised scapular rotation to complete numerous activities. Because of this there is additional strain on the other muscle groups, leaving them overloaded and tender<sup>(5)</sup>. Sleeping disorders are common among Frozen Shoulder patients due to the pain and they are not able to lie shoulder that is affected.<sup>6</sup> There is gradual loss of shoulder range of motion (ROM) and strength of surrounding muscles due to frozen shoulder.<sup>7</sup> Important components for reduction of physical disability and improvement of the shoulder function in FS patients are the raise in the shoulder active ROM, the strength of the shoulder muscles and decrease in the pain.<sup>8</sup> It can be observed that recovery of Frozen Shoulder patients is commonly prolonged in spite of various treatment methods.<sup>9</sup> Rehabilitation process of Frozen Shoulder patients usually comprises exercises aimed to restore regular shoulder kinematics or shoulder muscle movement.<sup>10</sup> For frozen shoulder patients the studies determine outcome of active and passive ROM for shoulder.<sup>11</sup> Visual analogue scale (VAS)<sup>12</sup> was used to quantify the strength of pain among patients. Muscle strength of the shoulder was measured.<sup>13</sup> Though, there is no evidence to determine whether rehabilitation can change pattern of shoulder muscle endurance in Frozen Shoulder patients. Whereas, the study focused on examining the shoulder active and passive ROMs and pain reduction before and after the treatment. All mea-

sured characteristics of Frozen Shoulder patients were compared in both groups to find out the most effective method in the treatment of frozen shoulder.

## Material and Methods

### Study Design

It was a randomized control trial.

### Setting

Study was conducted at the Department of Physiotherapy and Orthopedics unit I, King Edward Medical University / Mayo Hospital, Lahore.

### Study Duration

Study was completed in eight months.

### Study Groups

Subjects were divided into 2 groups randomly, each group contained 30 patients.

**Group – A:** In this group patients were treated with using Maitland mobilization techniques only. This group of patients was taken from Out Patient Door Department of Physiotherapy Mayo Hospital, Lahore or referred from Orthopedic Unit I.

**Group – B:** In this group patients were treated with using Mulligan's mobilization techniques. This group was also taken from Out Patient Door Department of Physiotherapy Mayo Hospital, Lahore or referred from Orthopedic Unit I.

### Sample Size

Total 60 patients were included in the study. The 6% level of prevalence, 0.05 level of significance and 6% level of precision was used to calculate sample size.

### Sampling Technique

Simple random sampling technique was used.

### Sample Selection

#### Inclusion Criteria

Those patients which were diagnosed to suffer from

Frozen Shoulder and their ROM Flexion were fewer than ninety five degree Abduction less than ninety five degree, Extension less than twenty five degree and Lateral rotation less than fifty degree.

### Exclusion Criteria

Those patients were excluded from study which were Diabetic, Lean BMI less than 18.5, Diagnosed severely osteoporotic, Diagnosed Rheumatoid Arthritis, Diagnosed Osteoarthritis, Prolonged immobilization, Neurological / Hemiplegics, Patients having MUA, Bilateral Frozen Shoulder, Those patients were also excluded from the study whose ROM; Flexion was more than 90°, Abduction more than 90°, Extension more than 25°, Lateral rotation more than 15.

### Methodology

All the patients were selected after informed consent. In the Group-A Patients were treated with Maitland's technique these patients were interviewed by direct method and were reassessed after every two weeks up to six weeks. After every two weeks ROM was recorded. In group B Patients were treated with Mulligan's mobilization technique. These patients were also reassessed after every two weeks up to six weeks. The increase in ROM was recorded after every two weeks. Treatment was given for 30 minutes in one treatment session on presentation and all the three follow ups. The results were compared after 6 weeks.

### Data Collection Procedure

#### Data Collection Tools

A well designed and detailed Questionnaire/Performa was used to collect the relevant information from the subjects.

### Data Analysis

SPSS 20.0 statistical software was used to analyze the data. Variables which were in Quantitative form was presented with mean  $\pm$  SD Whereas those in Qualitative form were presented with the percentages and frequency tables. Association between qualitative data was found by using Chi-Square test. Repeated measure analysis was used to see the improvement in ROM parameters in both treatment groups at different time

intervals. The statistical significance was set at 5% level.

**Follow Up:** Patients were treated after every 2 weeks and followed up for 6 weeks.

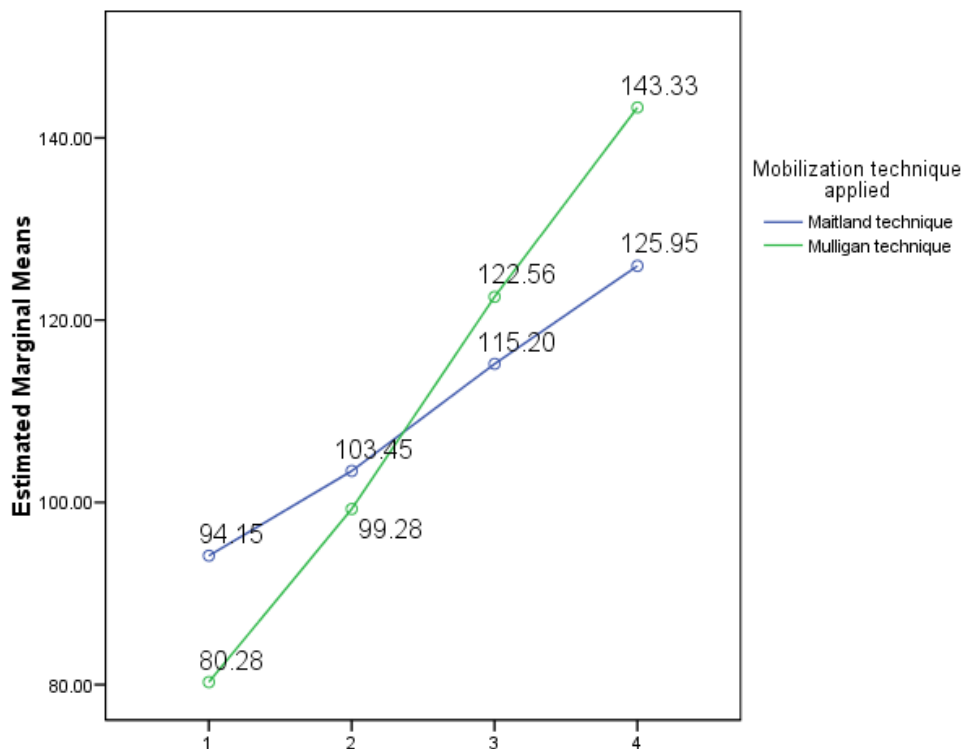
### Results

There were 60 patients in this study. Mean age of the patients in Group – A was  $46.23 \pm 9.71$  years, and mean age of patients in Group-B was  $47 \pm 9.21$  years. Out of 30 patients in Group – A, 7 (23.3%) patients were male and 23 (76.7%) were female. In Group B 10 (33.3%) patients were male and 20 (66.7%) patients were female. In Group – A, 4 (13.3%) patients were single while 26 (86.7%) were married and in Group – B, 2 (6.7%) patients were single and 28 (93.3%) were married. In Group – A 6 patients were illiterate, 4 had primary education, 9 had secondary, 4 were graduate and 7 patients were post graduate. In Group – B 6 patients were illiterate, 4 had primary, 10 had secondary education, 5 patients were graduates and 5 were post graduate. In Group – A 6 patients were from upper, 6 were from lower and 18 patients were from middle class. In Group – B 6 patients were from upper class, 10 were from lower class and 14 patients were from middle class. In Group – A 14 patients duration of onset was 8 weeks, 4 patients duration of onset was 10 weeks and 12 patients duration of onset was 12 weeks. In Group – B 14 patients duration of onset was 8 weeks, 8 patients duration of onset was 10 weeks and 12 weeks each respectively. In Group – A 10 patients told that they felt pain at night, 6 patients told that they felt pain during rest and 14 patients told that they felt pain while motion. In Group – B 15 patients told that they felt pain at night, 5 patients told that they felt pain during rest and 10 patients told that they had pain on motion. In Group – A 3 patients had mild, 8 patients had moderate and 19 patients had severe pain. In Group –

#### Severity of Pain in Treatment Groups

		Group – A	Group – B
Severity of Pain	Mild	3 (10%)	0 (0%)
	Moderate	8 (26.7%)	8 (26.7%)
	Severe	19 (63.3%)	22 (73.3%)
Total		30 (100%)	30 (100%)

**Figure 1:** Abduction in Treatment Groups at Different Intervals



Group – A = Maitland Technique, Group – B= Mulligan Technique

**Table 2:** Flexion in Treatment Groups.

		Mobilization Technique	Mean	Std. Deviation
Flexion	Before Treatment	Maitland technique	89.95	12.38
		Mulligan technique	79.27	20.98
		Total	84.89	17.61
	After 2 weeks	Maitland technique	100.05	11.93
		Mulligan technique	100.50	18.07
		Total	100.26	14.94
	After 4 weeks	Maitland technique	115.50	17.79
		Mulligan technique	121.61	17.15
		Total	118.39	17.53
	After 6 weeks	Maitland technique	132.20	24.31
		Mulligan technique	147.61	20.35
		Total	139.50	23.55

p-value (Flexion) = 0.000

p-value (Flexion\*Treatment Group) = 0.018

**Table 3:** Soft Tissue Pathology with Respect to Treatment Groups.

Group – A = Maitland Technique  
 Group – B = Mulligan Technique  
 p-value = 0.371

		Group – A	Group – B
Scapulothoracis Mobility Normal	Yes	24 (80%)	21(70%)
	No	6 (20%)	9 (30%)
Total		30 (100%)	30 (100%)

B none of the patients had mild, 8 patients had moderate and 22 patients had severe pain.

At 6<sup>th</sup> week mean abduction in both treatment groups was  $125.95 \pm 15.45$  and  $143.33 \pm 9.06$ . It was observed that patients who were treated with Mulligan technique their abduction was improved greatly as compared to those who were treated with Maitland technique. (p-value Abduction= 0.000, p-value Abduction \*Group = 0.000).

At 6<sup>th</sup> week mean flexion in both treatment groups was  $132.20 \pm 20.35$  and  $147.61 \pm 20.35$ . It was observed that patients who were treated with Mulligan technique their flexion was improved greatly as compared to those who were treated with Maitland technique. (p-value Flexion = 0.000, p-value Flexion \*Treatment Group = 0.018).

At 6<sup>th</sup> week mean extension in both treatment groups was  $52.50 \pm 8.66$  and  $52.00 \pm 7.58$ . It was observed that patients in both treatment groups had same improvement in extension and it was statistically same (p-value extension= 0.000, p-value Extension \*Group = 0.165). At 6<sup>th</sup> week mean medial rotation in both treatment groups was  $29.40 \pm 27.97$  and  $38.22 \pm 27.84$ . It was observed that patients in both treatment groups had same improvement in medial rotation and it was statistically same. (p-value Medial Rotation = 0.000 p-value Medial Rotation \*Group = 0.518). At 6<sup>th</sup> week mean lateral rotation in both treatment groups was  $42.65 \pm 24.47$  and  $53.50 \pm 23.03$ . It was observed that patients in both treatment groups had same improvement in lateral rotation and it was statistically same. (p-value Lateral Rotation = 0.000, p-value Lateral Rotation \*Group = 0.190). In Group – A 24 patients and in Group – B 21 patients had normal Scapulothoracis mobility. According to p-value no significant association was present between treatment group and Scapulothoracis Mobility (p-value= 0.371).

In Group – A 24 patients and in Group – B 21 patients had normal Scapulothoracis mobility. According to p-value no significant association was present between treatment group and Scapulothoracis Mobility.

## Discussion

The term “capsulitis” or “frozen shoulder” refers to a common shoulder condition characterized by the global restriction in the shoulder range of motion in a capsular pattern. The capsular pattern in the shoulder is characterized by most limitation of passive lateral rotation and abduction.<sup>14</sup> The presence of capsular pattern is necessary to give a diagnosis of shoulder Capsulitis.<sup>15</sup> Codman first introduced the term “frozen shoulder” and described it as a “class of cases which are difficult to define, difficult to treat and difficult to explain from the point of view of pathology”. Neviaser called it adhesive capsulitis, as he, under arthroscopy, observed that the capsule looked thickened and adhered to underlying bone and could be peeled off from the bone. In an idiopathic capsulitis there is no apparent cause. The shoulder gradually becomes painful and stiff. Some authors have divided frozen shoulder in primary frozen shoulder, which corresponds to idiopathic. The secondary corresponds to traumatic capsulitis or if some other medical condition is present alongside.<sup>16,17</sup>

The natural course of the condition is longer than generally stated and not always complete, that is, not all get full recovery. The present study was designed to compare the effectiveness of Maitland and Mulligan’s mobilization techniques in the treatment of idiopathic shoulder adhesive capsulitis. While analyzing the outcome measures of this study, it was observed that both the groups have shown significant improvement over time. Statistical analysis of the data in pre and post intervention score regarding range of motion parameters show decreasing trends in both groups. Though both groups have significantly improved the range of parameters, the difference was found in favor of Group B in between-group comparison. Both the groups show reduction in pain scores, and this is in agreement with previous study suggesting that mobilization reduces pain due to neurophysiologic effects on the stimulation of peripheral mechanoreceptors and the inhibition of nociceptors. The activation of apical spinal neurons as a result of peripheral mechano-

receptor by the joint mobilization produces presynaptic inhibition of nociceptive afferent activity.<sup>18-20</sup>

Mechanical force during mobilization may include breaking up of adhesions, realigning collagen, or increasing fibre glide when specific movements stress the specific parts of the capsule. Further more mobilization techniques are supposed to increase or maintain joint mobility by inducing biological changes in synovial fluid, enhanced exchange. Maitland's mobilization mainly consists of rhythmic oscillatory movements which stimulate the type – 2 dynamic mechanoreceptors and by this way can inhibit the type – 4 nociceptive receptors. Maitland's rhythmic oscillations also have an effect on circulatory perfusion. The ongoing circulatory stasis may lead to ischemia and the potential for intra neural oedema, inflammation, and fibrosis. Mobilization has an effect on fluid flow as blood flow in the vessels supplying the nerve fibres and synovial fluid flow surrounding the avascular articular cartilage. This, by a pressure gradient, is generated which helps in facilitating exchange of fluid, that is, increased venous drainage and dispersing the chemical irritants. This causes a reversal of the ischemia, edema, and inflammation cycle and reduces joint effusion and relieves pain by reducing the pressure over the nerve endings.<sup>21,22</sup>

Mulligan Mobilization with movement (MWM) is a class of manual therapy techniques that is widely used in the management of musculoskeletal pain. It involves the manual application of a sustained glide by a therapist to a joint while a concurrent movement of the joint is actively performed by the patient.<sup>23</sup> Studies using MWM techniques on the elbow and ankle have shown them to be effective in reducing pain as measured by visual analogue scale (VAS) and pressure pain threshold (PPT) and increasing joint range of movement (ROM).<sup>24-28</sup>

It has been suggested that the application of a posterior glide MWM to the shoulder may correct this fault and allow optimal pain – free motion to occur.<sup>29</sup> Hsu et al.<sup>30</sup> in a study of 11 cadavers, found the application of an anterior – posterior glide towards the end of range of abduction was effective in improving the range of glenohumeral abduction. To date, no studies have investigated the effects of the MWM in people with shoulder pain and reduced ROM. The aim of our study was to evaluate the effect of a MWM on shoulder ROM and PPT. This study demonstrated that the application of the Mulligan's MWM technique to participants with a painful restriction of shoulder movement produced an immediate and significant improve-

ment in ROM and PPT pre- to post-intervention when compared to sham or control conditions. There are no other published studies of the effects of this technique on participants with shoulder pain. However, these findings are consistent with studies conducted in other joints of the body that have shown similar effects with the MWM techniques.<sup>25,26,28,31</sup>

The clinical relevance of the magnitude of improvement in ROM gained following the MWM compared to the Sham (101) after only one treatment session is arguably comparable to 421 improvement in abduction following four sessions of intensive massage and 221 improvement after 4 – 10 sessions of individualized shoulder treatment (mainly exercises) over a month.<sup>32</sup> Wright<sup>33</sup> has postulated that the mechanisms responsible for manual therapy treatment effects (e.g. as in the increases in ROM and PPT in our study) may feasibly involve changes in the joint, muscle, pain and motor control systems. In our study the standardized mean difference (SMD) for ROM (1.2) was greater than the SMD for PPT (0.9). The change in ROM was not related to the change in PPT (Pearson's correlation coefficient  $R \frac{1}{4} 0:29$   $P \frac{1}{4} 0:17$ ) possibly indicating that the underlying mechanisms of the MWM may be related to local joint or muscle structures rather than the pain system. According to the results of a study conducted in India shows that both the treatment techniques i.e. Maitland and Mulligan improve the pain VAS score, but response to Mulligan's was better. Mulligan mobilization technique is better than Maitland in terms of improvement in the range of extension while remaining ranges were similarly improved by both techniques.<sup>34</sup> Studies of larger sample size, with a longer intervention period are needed to confirm our findings. Results of our study are consistent with this study regarding the range of motion parameters. Abduction and flexion improvement was significantly higher in patients who were treated with Mulligan's but improvement in extension, medial rotation and external rotation both the techniques given similar results. Very few studies have compared both these two techniques for treating frozen shoulder but in literature both techniques were found alone or in combination with other physical treatment modalities for their effectiveness.

## Conclusion

Mulligan's technique is more effective in treating frozen shoulder as compared to Maitland technique. Abduction and flexion improvement was significantly

higher in patients who were treated with mulligan's technique where as improvement in extension, medial rotation and lateral rotation was statistically same in both treatment groups.

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