

Effectiveness of Mulligan Mobilization Versus Scapular Mobilisation technique on Functional Ability in Subjects with Adhesive Capsulitis of Shoulder Joint

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Abstract

Background and aim: Frozen shoulder or Adhesive capsulitis is determined by pain, progressive loss of active and passive shoulder range of motion due to the contracture of the joint capsule and fibrosis. The Mobilizations with movement (MWM) for joints are used separately or along with other hands-on techniques to increase the quality of joint intra articular gliding, neurodynamic and to assist the correct muscle demand. The goal of study is to assess the effectiveness of Mulligan 'MWM' and Scapular mobilization technique on functional ability in subjects with adhesive capsulitis of shoulder joint.

Methods: Total 40 subjects were selected based on the inclusion and exclusion criteria. The detailed procedure was explained to subjects, and Informed consent form was collected before starting the study. The Pre and Post test values were measured using ROM and Shoulder Pain and Disability Index. The subjects were divided into two groups: Mulligan 'MWM' with exercise: (n=20), Scapular mobilization technique with exercise: (n=20). Both groups received Arm Circles, Pendulum stretch, Towel stretch, Wand exercise, wall climbing, upper body stretch for 3 days a week and continued for 6 weeks (2 sets, 10 repetition with 10 seconds hold were given).

Result: The collected data was statistically analyzed using an unpaired t-test. Mulligan 'MWM' indicates significant effects ($p < 0.01$) in reducing pain and improving functional activity when compared to Scapular mobilization technique along with exercise, assessed by ROM and SPADI.

Conclusion: This study concluded that mulligan 'MWM' is more effective than Scapular mobilization technique along with exercises reducing pain and improving functional activity in adhesive capsulitis of shoulder joint.

Keywords: Adhesive capsulitis, ROM, SPADI, Mulligan 'MWM', Scapular mobilization technique.

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Introduction

Frozen shoulder or Adhesive Capsulitis is determined by pain and the progressive loss of active and passive shoulder range of motion due to the contracture of the joint capsule and fibrosis. Mobilizations with movement (MWM) for joints are used separately or along with other hands-on techniques to increase the quality of joint intra-articular gliding, neurodynamics, and to assist the correct muscle demand. It is a combination of active movement along with passive accessory mobilizations to attain painless movement by restoring the reduced accessory glide.^[1] Adhesive capsulitis usually affects females more than males in the age group between 40-70 years. Insulin-dependent diabetes patients have a higher incidence of ACS with bilateral involvement of the shoulder. Adhesive capsulitis of the shoulder (ACS) typically lasts 12 to 18 months with a cycle of three clinical stages.^[2] Frozen shoulder involves structures outside the joint capsule, including the coracohumeral ligament in the rotator interval, the musculotendinous unit, and the subacromial bursa. The primary cause of ACS is due to immunological, biomechanical, and hormonal imbalances. The secondary causes may include recent injuries, lack of use due to pain, recent surgeries, and other medical factors such as diabetes mellitus, inflammatory arthritis, etc.^[3] External rotation is more affected in the diabetic frozen shoulder because the collagen connected to the bone becomes sticky due to high blood sugar levels, resulting in the limitation of movements and stiffness of the joint.^[4] Patients complain of pain over the shoulder while lying on the affected side for more than a few weeks, especially at night, and are unable to perform day-to-day activities, mostly overhead activities such as combing the hair and reaching the back pockets. The patient's non-dominant hand is affected more.^[5] Shoulder pain is the third most common musculoskeletal disorder that affects the general population. Patients often complain of adhesive capsulitis. Pathological changes that affect the joint increase intra-articular pressure and restrict the range of motion. The aim of manual therapy is to improve the range of motion.^[6]

Adhesive capsulitis is characterized by three distinct stages of variable duration. 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. Alternative methods are available to improve the range of motion and function of muscles. These include wax therapy (heating therapy), stretching exercises done by a physiotherapist and self-stretching by the patient, and scapular exercises along with pendular exercises.^[7] From a biomechanical point of view, mobilization of the humerus over the scapula results in unbearable pain and discomfort, prompting the therapist not to apply further mobilization. Rather, the mobilization of the scapula with respect to the humerus, which directly stretches the capsule, should be painless and is a better mobilization technique to be performed.^[10] The combination of capsular distension and subsequent intensive rehabilitation shows a rapid beneficial effect and improvement from the first week itself. It has been reported that steroid injection is superior to physical therapy alone for functional improvement.^[11]

Scapulothoracic joint mobilization, a combination of therapeutic techniques, is used for treating frozen shoulder because it improves the shoulder complex through movement and scapulohumeral rhythm. Scapulothoracic joint mobilization reduces stress on the glenohumeral joint through the correction of the scapula over the thoracic cage.^[12] A frozen shoulder restricts scapular motions, including depression, downward rotation, external rotation, and posterior tilt. With a normal radiological appearance, there is pain along with limited elevation and external rotation, a delayed rise in pain near the deltoid insertion, and difficulty sleeping on the affected side.^[13] The articulation between the scapula and the humerus during shoulder abduction and flexion follows a scapulohumeral rhythm. The GH joint rotates 120 degrees during shoulder abduction, while the scapulothoracic joint rotates 60 degrees, forming a 2:1 ratio. The scapula rotates more in reverse SHR than the humerus.^[14]

Materials and Methods

This study was a randomized clinical trial study design. The study duration was 9 months, from May 2023 to February 2024. The subjects were collected

from the outpatient department at Saveetha Medical College and Hospital. Samples were selected using the simple random sampling technique. A total of 40 subjects were selected based on the inclusion and exclusion criteria. This study was conducted at Saveetha Medical College and Hospital after obtaining Institutional Scientific Review Board (ISRB) approval from Saveetha College of Physiotherapy. Females with a diabetic history, aged between 45-60 years, who had shoulder pain for at least 1 month, painful restriction of active and passive glenohumeral motion, and were in the freezing or frozen stages of ACS were included. Subjects with symptomatic rotator cuff tendinopathy and muscle weakness were also included in this study. Subjects with a recent history of shoulder surgery, a previous history of fracture, myositis ossificans, calcification of tendons, limited shoulder mobility due to neurological deficits, osteoarthritis, rheumatoid arthritis, osteoporosis, osteomalacia, skin deformities/cuts, any bone disease, tumors, or infections were excluded from the study.

Before starting the research study, the researcher explained the study to the subjects. Then, informed consent was collected from all the subjects. The subjects were randomly allotted into two groups using the lottery method, with 20 subjects allocated to each group. The subjects were assessed for shoulder ROM and SPADI. The assessment was conducted after clearly explaining the procedure of the test. Group A (n=20) received Mulligan's 'MWM' with exercise, and Group B (n=20) received the Scapular Mobilization Technique with exercise. Both groups received arm circles, pendulum stretches, towel stretches, wand exercises, wall climbing, and upper body stretches three days a week for six weeks (2 sets of 10 repetitions with a 10-second hold were given).

Group A: Mulligan 'Mwm' Technique

The mobilization with movement (MWM) technique was followed with 3 sets of 10 repetitions and a 2-minute rest in between sets for a period of 3 days per week. The patients were adequately treated with the help of an adjustable couch.

To improve shoulder abduction ROM, the subject was seated comfortably. A belt was fixed around the therapist's hip, and one hand was placed on the humeral head to apply an effective glide. With the other hand, the therapist gently applied counterpressure over the scapula. Slow, active shoulder movements helped maintain the glide until the end of the pain-free range was achieved. At this stage, the glide was released, and the initial position was returned to normal.

To improve shoulder internal rotation ROM, the subject stood with their hand behind their back in an internally rotated position. The affected shoulder was supported by the therapist. To apply a downward traction force on the humerus, the therapist placed one hand on the patient's flexed elbow while the other hand, positioned in the axilla, acted as a fulcrum to stabilize the scapula. The therapist used their abdomen to adduct the patient's upper arm while instructing them to internally rotate the shoulder with the help of the other hand, leading to lateral distraction of the humerus.

To improve shoulder external rotation ROM, the subject was in a supine position. The therapist stood above the plinth on the affected side. One hand was positioned over the humeral head, and a belt was fixed around the bottom of the therapist's foot to provide an inferior glide to the humeral head. The patient attempted to rotate the affected arm to the end of a pain-free range while a downward force was applied to the shaft of the humerus. At this stage, the force was released, and the initial position was returned to normal.

Group B: Scapular Mobilization Technique

Scapular mobilization was performed with 2 sets of repetitions, with a rest interval of 30 seconds between sets.

For scapular superior glide, the patient was positioned lying on the unaffected side. The therapist placed the index finger of one hand beneath the medial scapular border of the affected side while holding the upper border of the scapula with the other hand. The scapula was then shifted upward for a superior glide.

For scapular inferior glide, the patient remained in the same position. The therapist placed the index finger beneath the medial scapular border and held the upper border of the scapula with the other hand, shifting the scapula downward for an inferior glide.

For scapular upward rotation, the patient lay on the unaffected side. The therapist placed one hand's index finger beneath the medial border of the scapula while holding the superior border with the other hand and rotated it upward.

For scapular downward rotation, the patient lay on the unaffected side. The therapist placed one hand's index finger beneath the medial border of the scapula while holding the superior border with the other hand and rotated it downward.

For scapular distraction, the patient lay with the arm at the side. The therapist positioned their ulnar fingers below the medial scapular border to distract the scapula from the thorax.

Exercise Programme

The exercise programme included arm circles, pendulum stretch, towel stretch, wand exercises, wall climbing, and upper body stretches. These exercises were performed 3 days a week and continued for 6 weeks. For each session, 2 sets of 10 repetitions with a 10-second hold were given.

Statistical Analysis

Using descriptive and inferential statistics, the acquired data was tabulated and evaluated. The mean and standard deviation (SD) were applied to all parameters. Significant differences between pre-test and post-test measures were analyzed using a paired t-test. A significance level of $p < 0.01$ was considered statistically significant when using the unpaired t-test to examine changes between the two groups.

Limitations

Smaller sample size was one of the limitation of study, long term effects can be analysed, age category can divide, muscle strength can be assessed using EMG as an outcome measure.

Ethical Considerations: This study was approved by the Institutional Scientific Review Board (ISRB) of Saveetha College of Physiotherapy [01/001/2023/ISRB/PGSR/SCPT].

Research Gap

Frozen shoulder (Adhesive Capsulitis) is a debilitating condition characterized by pain and progressive loss of shoulder mobility due to joint capsule fibrosis. While various physiotherapy techniques, including Mobilizations with Movement (MWM) and scapular mobilization, have been studied for their effectiveness, there remains a lack of comparative studies assessing their impact on functional outcomes in individuals with adhesive capsulitis. Previous research has primarily focused on either MWM or scapular mobilization separately, with limited evidence on their comparative efficacy. Additionally, while both techniques are commonly used in clinical practice, their relative effectiveness in improving shoulder range of motion (ROM) and reducing pain has not been clearly established through randomized clinical trials. Thus, there is a need for more robust evidence to determine the superior technique for optimizing functional recovery in adhesive capsulitis.

Need for the Study

Adhesive capsulitis significantly impairs daily activities, causing pain and restricted movement, particularly in diabetic individuals. Identifying the most effective physiotherapy intervention is essential for improving patient outcomes and enhancing quality of life. This study aims to address the existing research gap by comparing the effectiveness of Mulligan's MWM and scapular mobilization techniques in individuals with adhesive capsulitis. By assessing their impact on pain reduction and functional improvement using ROM and the Shoulder Pain and Disability Index (SPADI), this study provides valuable insights into evidence-based clinical decision-making. The findings can help physiotherapists adopt the most effective rehabilitation approach, ensuring faster recovery and better functional independence for patients suffering from adhesive capsulitis.

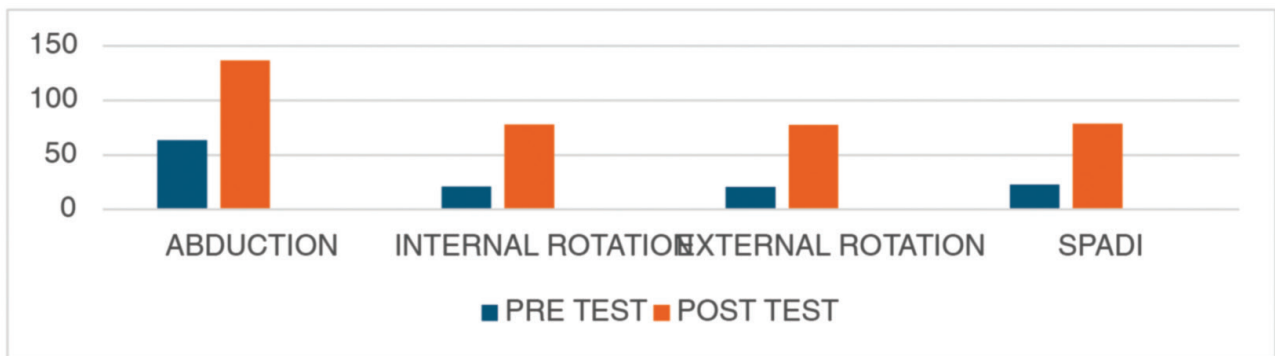
Result

The mean and standard deviation (SD) were applied to all parameters. The significant differences between pre-test and post-test measures were analyzed using the unpaired t-test to examine significant changes between two groups. Subjects of members with the adhesive capsulitis of shoulder joint are assessed for pre-test and post-test using Table 1: compare pre-test values and post-test values of ROM in Mulligan MWM, showing that the pre-test value is 5.80 were decreased to 2.20 in post-test

and SPADI value were decreased from 3.60 to 5.00 with the P value < 0.0001, the finding was statistically significant. Table 2: Compare the pre-test and post-test values of ROM in Scapular mobilization group, showing the pre-test value is 5.80 were decreased to 3.00 in post- test and SPADI values were decreased from 3.60 to 4.80 with the P value of < 0.0001, the finding is statistically significant. Table 3: Compare post-test values of both groups, Mulligan MWM mean was 2.20 for ROM and 5.00 for SPADI and Scapular mobilization technique mean was 3.00 for ROM and 4.80 for SPADI, p value is <0.0001 are statistically significant.

Table 1. Pre and Post test values of mulligan ‘MWM’ by using ROM and SPADI

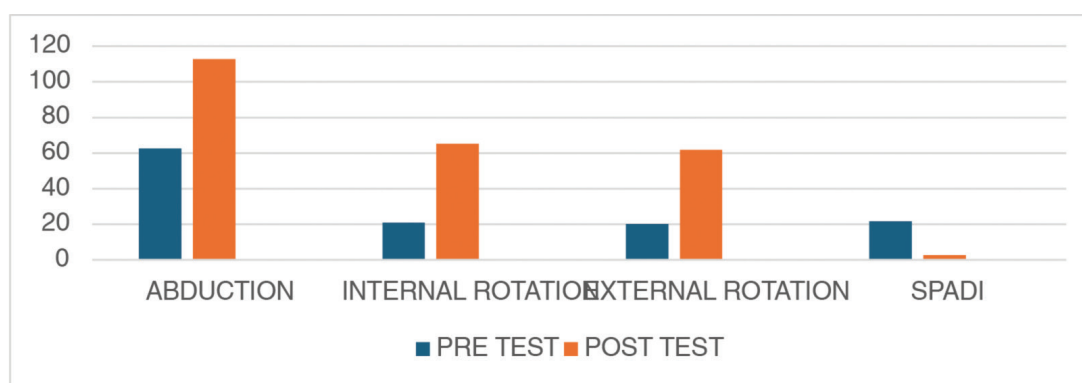
OUTCOME PARAMETER		MULLIGAN ‘MWM’	MEAN	SD	t-value	p-value
RANGE OF MOTION	ABDUCTION	Pre-test	63.70	14.79	15.6925	<0.0001
		Post-test	136.80	20.15		
	INTERNAL ROTATION	Pre-test	21.10	3.91	20.1777	<0.0001
		Post-test	78.00	11.26		
	EXTERNAL ROTATION	Pre-test	20.90	3.60	23.6382	<0.0001
		Post-test	77.80	9.17		
SHOULDER PAIN AND DISABILITY INDEX		Pre-test	22.80	4.44	18.5805	<0.0001
Post-test		78.60	13.76			



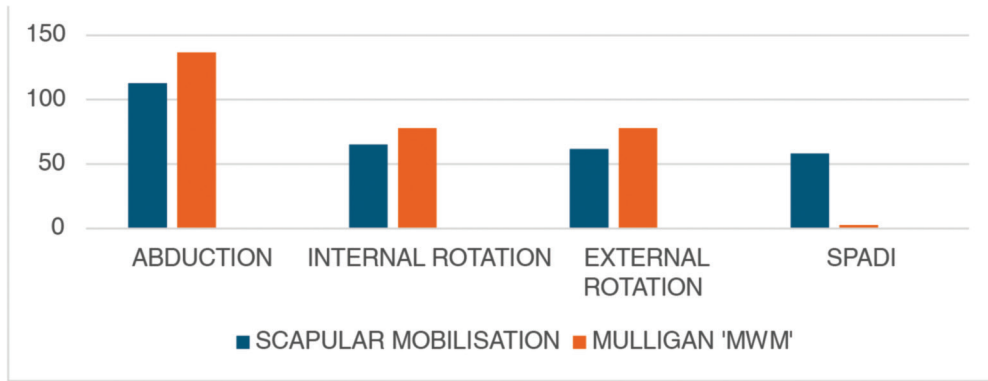
Graph 1: Pre and Post test values of Mulligan ‘MWM’

Table 2. Pre and Post test values of Scapular mobilization by using ROM and SPADI

OUTCOME PARAMETER		SCAPULAR MOBILISATION	MEAN	SD	t-value	p-value
RANGE OF MOTION	ABDUCTION	Pre-test	62.60	13.77	11.7780	<0.0001
		Post-test	112.80	9.61		
	INTERNAL ROTATION	Pre-test	21.00	3.58	22.6804	<0.0001
		Post-test	65.20	6.68		
	EXTERNAL ROTATION	Pre-test	20.30	3.01	38.1783	<0.0001
		Post-test	61.80	5.13		
SHOULDER PAIN AND DISABILITY INDEX Post-test		Pre-test	21.80	4.51	16.6839	<0.0001
		58.20	8.45			

**Graph 2: Pre and Post test values of Scapular mobilization****Table 3. Post test values of both groups by using ROM and SPADI**

OUTCOME PARAMETER		GROUPS	MEAN	SD	t-value	p-value
RANGE OF MOTION	ABDUCTION	Mulligan 'MWM'	136.80	20.15	4.8085	<0.0001
		Scapular mobilization	112.80	9.61		
	INTERNAL ROTATION	Mulligan 'MWM'	78.00	11.26	4.3733	<0.0001
		Scapular mobilization	65.20	6.68		
	EXTERNAL ROTATION	Mulligan 'MWM'	77.80	9.17	6.8088	<0.0001
		Scapular mobilization	61.80	5.13		
SHOULDER PAIN AND DISABILITY INDEX Scapular mobilization		Mulligan 'MWM'	78.60	13.76	5.6511	<0.0001
		58.20	8.45			



Group 3: Post test values of both groups by using ROM and SPADI

Table 4. Demographic breakdown of the samples

Variable	Group A (MWM + Exercise) (n=20)	Group B (Scapular Mobilization + Exercise) (n=20)	Total (N=40)
Age Range (Years)	45-60	45-60	45-60
Mean Age (Mean ± SD)	52.5 ± 5.2	53.0 ± 5.5	52.75 ± 5.35
Gender (%)	100% Female	100% Female	100% Female
Diabetic History (%)	100%	100%	100%
Duration of Symptoms (Months)	≥ 1 month	≥ 1 month	≥ 1 month
Stage of Adhesive Capsulitis	Freezing/Frozen	Freezing/Frozen	Freezing/Frozen
Dominant Side Affected (%)	60% Right, 40% Left	60% Right, 40% Left	60% Right, 40% Left



Figure 1: Mulligan belt

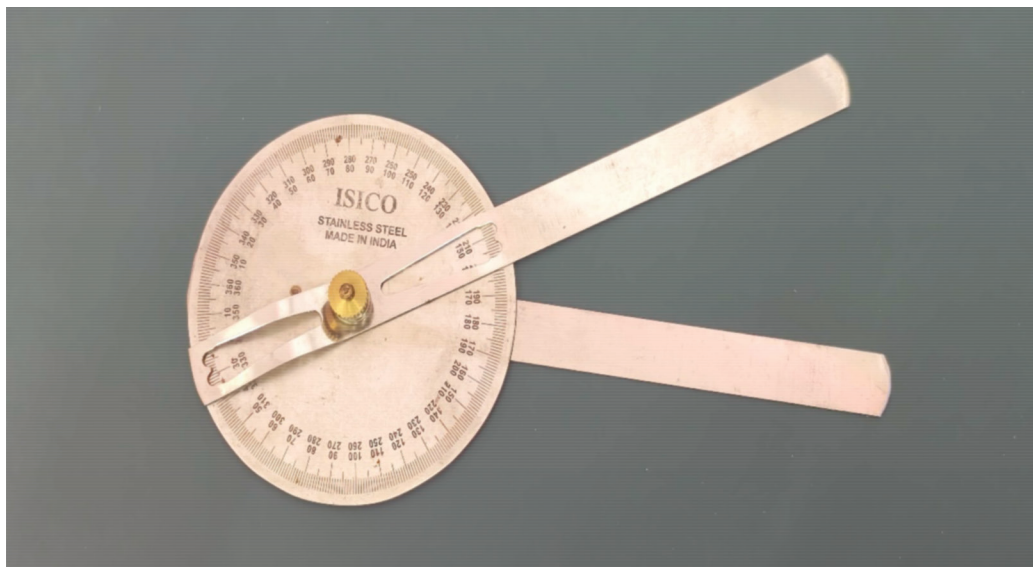


Figure 2: Goniometer

Discussion

Based on the statistical analysis, both groups showed improvement in ROM and SPADI. However, subjects in Mulligan 'MWM' showed better improvement in ROM and SPADI than the subjects in Scapular mobilization group along with exercise. Bhumika Patel, et al., when combined with conventional therapy, 'MWM' helps people with adhesive capsulitis enhance their functional limitations and shoulder range of motion.^[2] RK Minerva, Nityal Kumar Alagingi, et al., according to this study, patients with adhesive capsulitis of the shoulder, Mulligan mobilization is better to Maitland mobilization in the form of pain reduction and improving shoulder function.^[6] Sumaira Nawaz, Samra Anwar, et al., when treating pain, range of motion, and limitation in patients with adhesive capsulitis, Mulligan mobilization has shown greater effects compared to Post Facilitation Stretch, a muscle energy treatment technique.^[8] Hafza Bushra Razaq, Aasma Basharat, et al., according to this study, patients with diabetic adhesive capsulitis recognize improvements in pain, range of motion, and a functional deficit by using both Mulligan's technique and Spencer's muscular energy technique.^[5] Sharick Shamsi et al., according to this study, mulligan mobilisation approach gives superior pain VAS

score improvement than Maitland. Both approaches perform constantly the same for enhancing the functional score in patient with adhesive capsulitis of shoulder joint.^[16] Ujwal L Yeole, Pratiksha D Dighe et al., according to this study, best way for reducing pain and improving range of motion in patients with stiff capsulitis of the shoulder movement paired with mobilisation.^[7] B Haveela, Praveen Dowle et al., according to this study, when combined with exercise and ultrasound therapy, Mulligan's MWM technique enhances patients' pain scores, shoulder range of motion, and daily activities in patients with frozen shoulder.^[3] Jonathan Zavala-González, Francisco Pavez-Baeza et al., according to this study, joint mobilisation appears to enhance range of motion and minimise pain in individuals with primary adhesive shoulder capsulitis when compared to therapies without manual therapy.^[17] K Sreenivasu, VK Paul Daniel et al., according to this study, when assessed to end mobilisation alone, end range mobilisation along with scapular mobilisation enhances range and function effectively.^[15] S Pragassame, VK Mohandas Kurup et al., according to this study, compared with conventional therapy, patients who had scapular mobilisation proved a significantly larger level of improvement.^[14] NK Antari, Gede Parta Kinandana et al., according to this study, scapulothoracic joint mobilization increases the range of motion

and functional ability more when compared to interventions glenohumeral joint mobilization alone.

^[12] Hebatallah Mohamed Said Zaghloul, Hesham Ahamed Ali et al., according to this study, when combined with the indicated method, mobilization and flexibility can greatly lower the pain intensity.^[10] Umair Ur Rehman, Shakil Ur Rehman et al., according to this study, curing of idiopathic adhesive capsulitis of the shoulder, ultrasound along with mobilization and mobility produced better results.^[9] Niraj Kumar, Siddhartha Sen et al., according to this study, people with diabetic frozen shoulder, movement with mobilization (MWM) therapy, strengthening exercises, and moist heat therapy (MHT) greatly improved pain, range of motion, muscle strength, and joint sense.^[4] P Khyathi et al., according to this study, when compared to the Spencer technique, MWM proved to be significantly more effective in improving shoulder abduction, external rotation range of motion, and functional limitation in subjects with frozen shoulder.^[1]

Conclusion

Finding of the study concludes that Mulligan 'MWM' appears to be more effective than Scapular mobilization technique along with exercises reducing pain and improving functional activity in patient with adhesive capsulitis of shoulder joint.

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Conflict of Interest: The authors have no conflict of interest to report.

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