

PASSIVE STRETCHING EXERCISES VERSUS MULLIGAN MOBILIZATION WITH MOVEMENT FOR PAIN, RANGE OF MOTION & FUNCTION IN PATIENTS OF ADHESIVE CAPSULITIS : A COMPARATIVE STUDY

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ABSTRACT

Background: Adhesive Capsulitis also named as Periarthritis or Frozen Shoulder is commonly seen in patients of 40 to 60 years of age with a higher incidence in Females. Restricted Gleno-humeral (GH) Joint mobility can be due to micro trauma , osteoarthritis, from prolonged immobilization or from unknown cause (Idiopathic Frozen Shoulder).

These lead to various Functional Limitations /Disabilities like - Inability to reach over head activities, behind the head, out to the side and behind the back , thus limiting the Activities of Daily Living .

Purpose of the Study: There is a need to compare the efficacy of two treatment techniques in improving the ROM and functional status of the patients with Adhesive Capsulitis.

Methodology: 60 patients ,both male and female, of the age group 40-60 years, diagnosed with Adhesive Capsulitis were distributed by Stratified Random Allocation of the Diabetic Patients in 2 groups for a 6 days intervention period. Patients having any recent trauma, injuries, dislocation of shoulder in past 1yr were excluded from the study. The SPADI and ROM were assessed on the first and last day of the intervention. Group A was given Passive Stretching and conventional exercises whereas Group B was given MWM in addition to the conventional exercises.



Results: Marked improvement was seen in both the groups after the completion of the 6 days intervention period as compared with the baseline. The improvement in outcome measures , namely the Pain & Disability Score and Range of Motion, were significantly greater in the group who were given Passive Stretching Exercises , p value being 0.00 for Pain, 0.01 for Disability Score and 0.04 for the Total SPADI Score i.e <0.05 indicating its significance .

Conclusions: Both groups showed a marked reduction in Pain, Level of Disability, and in improving the ROM of the Shoulder Joint and thereby the overall Function level of the patients having Adhesive Capsulitis. But in the comparative study of the two groups Passive Stretching showed more significant results.

KEY WORDS: Adhesive Capsulitis, Frozen Shoulder, Passive Stretching, Mulligan Mobilization Technique, Shoulder Pain and Disability Index, Range of Motion.

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INTRODUCTION

Adhesive Capsulitis causes pain and severe

dysfunction. Grubbs N et al,[1] undertook a literature review and thereby defined frozen

shoulder as “a soft tissue capsular lesion accompanied by painful and restricted active and passive motion of GH joint” in all planes or a global loss of GH Joint motion. Lori B et al,[2] described the stages of the condition and the classical picture seen in each of the stages.

Several physical therapy interventions have been studied for this condition. Passive Stretching of the joint structures have been studied by Ibrahim MI et al[3] in an experimental study on 60 patients of adhesive capsulitis, 30 in the case control group who were given active exercises only and 30 in the experimental group who were given passive stretching only. It was found that the group which was given stretches alone demonstrated a greater improvement of range of motion and function than that group which was given active exercises alone.

Griggs and colleagues[4] found, 4 self-stretches (passive flexion, horizontal adduction, internal rotation behind the back with the unaffected arm, and external rotation at 0° using a cane) performed at least twice a day produced a satisfactory outcome in 90% of stage 2 adhesive capsulitis patients, with significant improvement in pain, ROM and shoulder function. Marshall PW,[5] et al undertook a RCT to study the effect of a 4 week passive stretching program on measures of hamstring extensibility, passive stiffness, strength, and stretch tolerance. 22 healthy participants were randomly assigned to 2 groups- a 4-week stretching program for hamstring and hip stretches performed 5 times per week, or a non-stretching control group.. Passive stiffness was reduced by 31% in the intervention group ($p < 0.05$; $d = 0.89$). Stretch tolerance VAS scores were not different between groups at either time point. Thus it was concluded that Passive stretching increases hamstring extensibility and decreases passive stiffness, with no change in stretch tolerance defined by pain intensity during the stretch.

MWM on the other hand was also found to be effective by Doner G et al,[6] who performed a RCT to evaluate the Mulligan’s technique for relieving pain and improving functional capacity of the shoulder in patients with adhesive capsulitis in the stiffness phase. A total of 40 subjects were randomly allocated into 2 groups:

(i) group 1 (n =20) who were treated with hot pack, transcutaneous electrical nerve stimulation, and passive stretching exercises; (ii) group 2 (n = 20) were treated with hot pack, transcutaneous electrical nerve stimulation and Mulligan’s technique. Outcomes used were visual analogue scales for pain, passive and active range of motion, Constant score, Shoulder Disability Questionnaire, and patient and therapist satisfaction at baseline, after completion of treatment sessions and at the end of 3 months of follow-up. The improvements in outcome measures were significantly greater in subjects in group 2, who were treated with Mulligan’s technique.

Reddy BC et al [7] described Frozen Shoulder as a painful shoulder condition with insidious onset that is associated with stiffness and difficulty sleeping on the affected side. The aim of the study was to find out and compare the effect of MWM and Conventional Therapy in reducing pain, improving the shoulder range of motion and function in 30 participants(both male & female) stage 2 of adhesive capsulitis including the age group of 40 years and above. Participants were randomly assigned into two groups of 15 each. Physical therapy treatment protocol which included Mulligan’s MWM and conventional therapy and conventional therapy alone was given for 15 days. The outcome measures recorded were pre and post 15th day of intervention using visual analogue scale, shoulder range of motion of flexion, abduction, External rotation and functional evaluation by Disability of Arm Shoulder Hand. The results in the study revealed, that Group B (Mulligan’s mobilization) showed better outcomes as compared to Group A (Conventional Therapy) in reducing pain, improving range of motion and function.

Goyal M, et al [8] studied the effect of end range mobilization (ERM), mid range mobilization (MRM) and mobilization with movement (MWM) techniques on range of motion and disability in 28 frozen shoulder patients. The duration of each treatment was 3 weeks, for a total of 12 weeks. There was a statistically significant improvement seen in ERM and MWM groups. Additionally, MWM corrected scapulohumeral rhythm significantly better than ERM did. Therefore it was

concluded that in subjects with FSS, ERM and MWM were more effective than MRM in increasing mobility and functional ability.

Thus, to find whether stretching or MWM is better, the study has been undertaken.

METHODOLOGY

Study Design: Experimental Study

Sample Size: 60 (30 in each group)

Sampling Technique: Stratified random Sampling

Inclusion Criteria: Patients diagnosed with Adhesive Capsulitis. Both Diabetic and non-diabetic patients included. Both Male & Female patients were included. Age group 40-60 years

Exclusion Criteria: Patients having any recent shoulder injury/dislocation/fractures in last one year.

Materials used : Shoulder Pain and Disability Index (SPADI), Mulligan Belt, Goniometer

Procedure: After the ethical committee permission, a 6 day intervention programme was started with a verbal consent taken from the patients.

Stratification was done for Diabetic and Non-diabetic patients so that they would equally fall in 2 groups i.e. Group A and Group B.

The patients were given The Shoulder Pain and Disability Index (SPADI) which is a self-administered questionnaire that consists of two dimensions, one for pain and the other for functional activities [9]. The pain dimension consists of five questions regarding the severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual had with various activities of daily living that require upper-extremity use. The two dimensions were scored using verbal anchors for the pain dimension as 'no pain at all' and 'worst pain imaginable', and those for the functional activities as 'no difficulty' and 'so difficult it required help'. The scores from both dimensions were averaged to derive a total score.

The scores were then interpreted as follows:

Total pain score: / 50 x 100 = %

Total disability score: / 80 x 100 = %

Total Spadi score: / 130 x 100 = %

The means of the two subscales were averaged to produce a total score ranging from 0 (best) to 100 (worst).

The Range of Motion for Flexion, Abduction, Internal Rotation and External Rotation were measured by goniometer on the first day of the intervention period.

The patients in **both the groups** were given:

Ultrasonic Therapy for 6 days on Pulsed Mode for 8 min duration at an intensity of 1.2W/cm² [10].

Scapular Setting Exercises such as Wall pushing exercises for Serratus Anterior, Retraction Exercises for scapula in sitting for lower fibres of Trapezius and in prone for Rhomboids. Each of these exercises were given for 10 repetitions with 5 sec hold.

Codmann's Pendular Exercises for 10 repetitions each in standing [11,12].

Patients were then given Strengthening Exercises with a red theraband in standing from the third day of the treatment for Anterior fibres of Deltoid, Supraspinatus, Infraspinatus and Subscapularis muscles. Each of these exercises were given for 10 repetitions with 5 sec hold [11].

Group A that is of Passive Stretching Exercises were given the low intensity stretches in supine for all the movements i.e. Flexion, Abduction, Internal Rotation and External Rotation for 5 repetitions with 30 sec hold for six days [3,4,5,11].

Group B that is of Mulligan Mobilization with movement were given for the Shoulder Joint for all the movements that is Flexion, Abduction, Internal Rotation and External Rotation which combines the sustained application of a manual gliding force to a joint along with active pain free movement, with the aim of repositioning bone positional faults to enable concurrent physiological (osteo-kinematic) motion of the joint. The dosage for the same was as follows – On the first day -3 repetitions and from the second day to the sixth day 3 sets of 10 repetitions [6,7,8,13].

Techniques of Mulligan Mobilization [13]: (Considering the right shoulder as the affected side.)

For Flexion -With Belt: Patient Position- Stand-

ing with arms placed against the wall Therapist Position-Stands behind the patient with both the hands on the scapula for fixation. The belt is placed around the patient's right shoulder and the therapist's left shoulder. The patient is then asked to perform an anterior pelvic tilt along with the therapist applying a postero-lateral glide to the head of humerus.

For Abduction -Manual Method: Patient Position- Sitting, Therapist Position-Sitting facing on the left side of the patient shoulder with the therapist's right hand over the spine of scapula and left hand over head of humerus. A sustained postero-lateral glide is applied along with the patient taking his shoulder in abduction.

For Internal Rotation-Manual Method: Patient Position-Standing, Therapist Position- Standing on Right side of patient with therapist's left hand under the head of humerus to apply a lateral glide and the right hand over the distal end of humerus for a distractive force.

The starting position of the patients's arm is that of available internal rotation. Along with the application of the glide ,the patient is asked to attempt taking the arm inwards.

For Internal and External Rotation-With Belt (End range): Patient Position- Supine with the arm kept in neutral rotation at right angle to the plinth. Therapist Position- Standing on the Right side of the patient with the belt around the therapists's hips and as close as possible to the head of humerus of the patient.

A distractive force is given by the therapist by bending from trunk(ie relative hip flexion) with the patient taking his arm into internal rotation and external rotation separately with an over pressure applied at the end of range of motion by either with the help of another therapist or by the patient using his other hand.

The results were then analyzed using the Microsoft Excel Software that is a paired and unpaired t test for Parametric outcome measures and the Mann Whitney U test between groups and Wilcoxon Test within groups were used for the Non-Parametric Outcome Measures.

RESULTS

The study involved 36 Females and 14 Males.

There were 38 Diabetic patients and 12 Non- Diabetic patients randomly allocated in the two groups. The mean age of Group A was 54.76 ± 6.96 and Group B was 53.9 ± 6.53 . The Mean Pain Score for the two groups was calculated individually on the first day and the sixth day which showed a significant change in both the groups ,with a higher reduction in the Score for Group A ie from 75.9% to 26.9% and for Group B ie from 64.7% to 34.1%. The Mean Disability Score also showed similar results indicating Passive Stretching being more effective than Mulligan Mobilization. The Mean Disability Score on the first day for Group A was 71.8% and for Group B was 69.5%. At the end of the intervention period the score for Group A was 28.9% and for that of Group B was 40.3%. The study showed a significant improvement in the total Shoulder Pain and Disability Score in both the groups with passive stretching showing more improvement than the Mulligan group, p value being 0.01(ie <0.05)(Fig: 1 and Table: 1). Both groups also showed a considerable improvement in Range of Motion with Passive Stretching showing greater improvement than the other in Flexion, Internal Rotation and External Rotation, p value <0.05 .(Insert Table: 2 here) The Mean Flexion Range of Motion on the first day for Group A was 120.9 degrees and Group B was 122 degrees. The same range was then re evaluated to see the improvement in Group A as 136.1 degrees and in Group B as 129.1 proving stretching exercises being more beneficial for the same, p value 0.01(ie <0.05) (Fig: 2). The improvement in the Abduction Range of Motion could not be commented upon since the baseline parameters were not equivalent ,p value >0.05 . The Mean Internal Rotation Range of Motion when compared before and after the intervention period in Group A was from 42.9 degrees to 52.9 degrees and for that of Group B was 43.2 degrees to 49.4 degrees (Fig: 3). The Mean External Rotation Range of Motion in Group A was 67 degrees to 78.6 degrees and in Group B it was 67.3 degrees to 71.1 degrees (Fig: 4).

Thus for both the groups the Passive Stretching showed significant improvement as compared to Mulligan Mobilization since the p value was <0.05 ie 0.01 for IR and 0.03 for ER respectively.

Table 1: p values for Non Parametric Measures (Mann Whitney-U).

Outcomes	Stretching Vs Mulligan
Pain	0.07
Disability	0
SPADI	0.01

Table 2: p values for Parametric Measures.

Range Of Motion	Paired t test		Unpaired t test	
	PRE & POST Mulligan	PRE& POST Stretching	PRE Mulligan & PRE Stretching	POST Mulligan & POST Stretching
Flexion	0	0	0.4	0.01
Internal Rotation	0	0	0.4	0.01
External Rotation	0	0	0.4	0.03

Fig. 1: Mean Pre & Post SPADI Score of Mulligan and Passive Stretching Group.

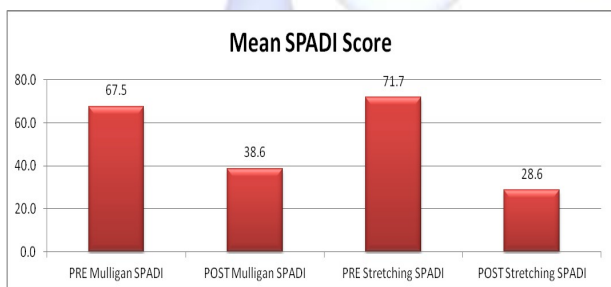


Fig. 2: Mean Pre & Post Flexion ROM in Mulligan and Passive Stretching Group.

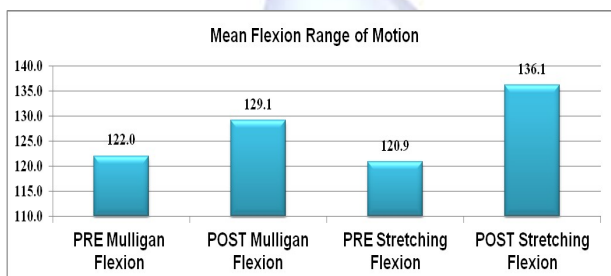


Fig. 3: Mean Pre & Post Internal Rotation ROM in Mulligan and Passive Stretching Group.

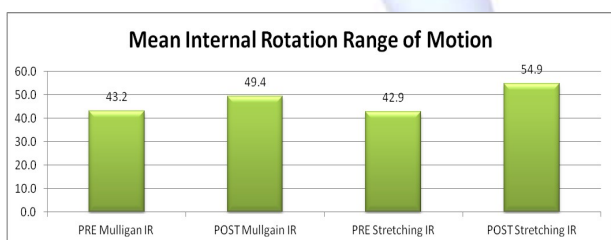
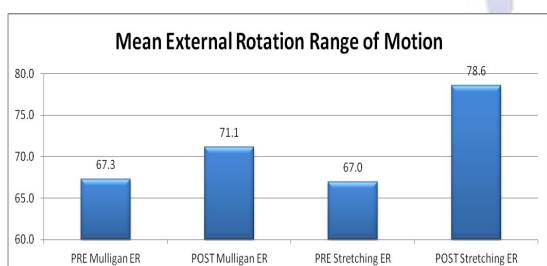


Fig. 4: Mean Pre & Post External Rotation ROM in Mulligan and Passive Stretching Group.



DISCUSSION

Stretching has an effect on both contractile and non-contractile elements of the muscles [11]. The contractile elements of a muscle are mainly the Sarcomere which are composed of overlapping myofilaments of Actin and Myosin that form the cross bridges. These sarcomeres give the muscle the ability to contract and relax [11].

The non-contractile elements of a muscle is the connective tissue composed of three layers from inside out which are Endomysium, Perimysium and Epimysium which have the characteristics of connective tissue that affect the flexibility of the tissues crossing the joints. When these tissues restrict range of motion a low intensity long duration stretch force helps to increase the extensibility of connective tissue [11,14].

During Passive Stretch both longitudinal and Lateral force transduction occurs [11]. Initially lengthening occurs only in the elastic component, tension rises sharply, after which the tissue reaches the plastic range after which irreversible changes occur in the tissue thus causing its elongation.

Passive Stretching attributes to improving the muscle extensibility due to tensile stresses on the viscoelastic, non contractile connective tissue in and around the muscle. Stretching also inhibits the contractile components of muscle by the Golgi Tendon Organ that contributes to reflexively relax the muscle thus enabling the muscle to elongate against less muscle tension [14].

The Passive Stretching Exercises given at a low intensity, long duration and low velocity helps in improving the Range of Motion, Functional Status and reducing the Pain by breaking the bonds in the collagen fibres of the connective tissue and hence improving the flexibility and increasing the Range of Motion [11].

Mulligan states that Pain is due to minor positional faults of the joint resulting in movement restrictions. The Mobilization With Movement (MWM) provide a passive pain free and range corrective joint glide with an active pain free movement [6,7,8,13].

The combination of passive mobilization and active movement is responsible for the rapid

return of pain free movement. The reduction in pain due to Mulligan Mobilization was due to its ability to reduce a positional fault in the bony segment.(Positional Faults Theory)[6,7,8,13]. Mulligan works on the principle of sustained glide that helps to stimulate the mechanoreceptors and thus inhibits pain [6,8,13].

This study had the following shortcomings which included the duration for which the patient was affected by Diabetes Mellitus was not considered, the gender variations were not included, the side involved was not noted irrespective of it being a dominant or non-dominant hand. (This could be variable with respect to the strength of the muscles).

Further research is required to investigate the effect of the same treatment protocol considering the Stages of Adhesive Capsulitis .

CONCLUSION

Passive Stretching Exercises and Mulligan Mobilization Techniques both showed a marked reduction in Pain and Level of Disability in the studied population. Significant change in improving the Range of Motion of the Shoulder Joint and thereby the overall Function level of the patients having Adhesive Capsulitis was observed. In comparison Passive Stretching showed more significant results than the Mulligan Mobilization group.

Clinical Implications: Passive stretching can be used as an adjunct treatment to the conventional protocol used for patients with Adhesive Capsulitis for relieving pain, ROM and overall functions.

ABBREVIATIONS

MWM – Mulligan Mobilization with Movement

ROM – Range of Motion of Shoulder Joint

SPADI – Shoulder Pain and Disability Index

GH Joint- Glenohumeral Joint

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Conflicts of interest: None

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