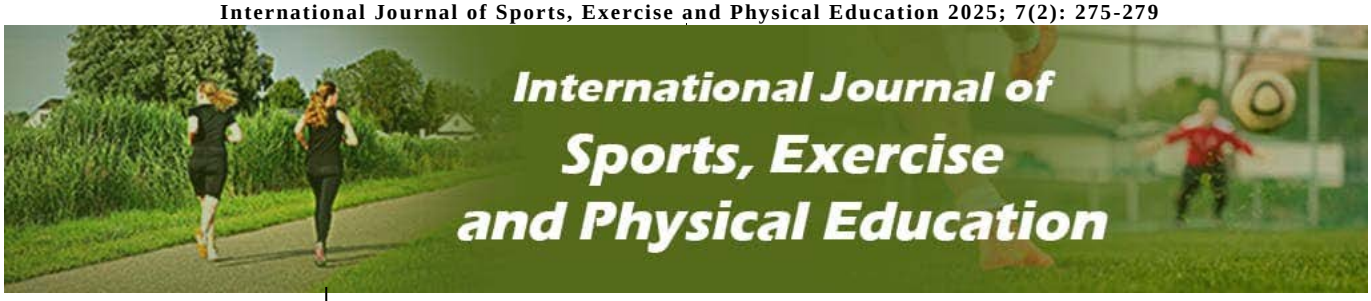

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Effects of passive joint mobilization along with therapeutic exercises in patients with unlilateral adhesive capsulitis of shoulder joint

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Abstract
Introduction: Adhesive capsulitis also referred to as frozen shoulder, involves progressive thickening and shrinkage of the glenohumeral joint capsule. Approximately 2-5% of the world's population experiences it. Adhesive capsulitis occurs more commonly in women aged 40-60yrs and in sedentary workers than in manual workers. Adhesive capsulitis progresses through the pre-adhesion, acute adhesive, maturation, and chronic stage, and symptoms vary according to the stage. In particular, a prolonged period of limited movement of the affected shoulder can cause weakening of muscle, tendon, ligament contraction. By comparing the effects of exercise and exercise with joint mobilization, implication for efficient intervention in the field of exercise prescription can be presented.
Aim: To analyse the effect of passive joint mobilization along with therapeutic exercise in patient with unilateral adhesive capsulitis of shoulder joint.
Objective

- The purpose of the study is to determine the effectiveness of mobilization technique along with exercise on pain on ROM in patient with Adhesive capsulitis of shoulder joint.
- To evaluate the changes in shoulder ROM in patient with AC.
- To compare the pain intensity [visual analogue scale]in patient with AC.

Design: Quadi-experimental study.
Methodology: The comparative study is conducted on 20 patients with Adhesive capsulitis according to inclusion and exclusion criteria. The subacute stage were randomly selected and divided two experimental groups. One group receive therapeutic exercise only and other group receive therapeutic exercise with mobilization alternatively for 4 weeks. The outcome measure depends upon primary and secondary outcome.
Outcome Measures

- Primary outcomes are shoulder ROM and pain intensity.
- Secondary outcome are quality of life and muscle strength**.**

Result and Conclusion: From the statistical analysis done for this study, it could be concluded that, "Passive mobilization with therapeutic exercises is most effective than therapeutic exercises alone in treating patients with unilateral adhesive capsulitis of shoulder.

Keywords: Adhesive capsulitis, frozen shoulder, joint mobilization, therapeutic exercise, shoulder ROM

Introduction

The shoulder joint is a highly mobile and complex articulation essential for daily activities. It is one of the most frequent sites of musculoskeletal pain after the back and neck, and loss of shoulder mobility is a significant clinical problem. Adhesive capsulitis (frozen shoulder), first described by Neviaser in 1945, is characterized by adhesions and contracture of the joint capsule, resulting in progressive pain and stiffness. Its annual incidence ranges from 7–21% in the general population, affecting women more often than men, particularly between 40 and 65 years of age.

The etiology of adhesive capsulitis is multifactorial. It may develop following shoulder injuries such as tendinitis, bursitis, or rotator cuff pathology, and is more common in individuals with diabetes mellitus, inflammatory arthritis, cardiovascular and pulmonary disease, or after chest and breast surgery. Studies from India have documented a higher prevalence in individuals aged 50–70 years, while research in Bangladesh reported

a male-to-female ratio of 1:8, with 11% of cases occurring among patients with rheumatic disease.

Clinically, adhesive capsulitis progresses through three overlapping stages: the freezing stage, marked by pain and mild restriction; the frozen stage, with subsiding pain but severe stiffness; and the thawing stage, where gradual recovery of motion occurs, often lasting over a year. The most characteristic finding is the capsular pattern of movement restriction, with external rotation most limited, followed by abduction and internal rotation. Pathological changes include capsular adhesions, synovial fluid reduction, and impaired joint lubrication.

Management of adhesive capsulitis is challenging and includes both medical and physical interventions. Pharmacological measures involve corticosteroid injections, oral steroids, or surgical procedures in resistant cases. However, physical therapy remains the cornerstone of treatment. Common interventions include thermotherapy, electrotherapy modalities, active and passive range-of-motion (ROM) exercises, proprioceptive neuromuscular facilitation (PNF), and joint mobilization techniques.

Mobilization techniques play a central role due to their combined neurophysiological, biomechanical, and mechanical effects. These include nociceptor inhibition, stimulation of mechanoreceptors, breaking adhesions, collagen realignment, and enhanced synovial fluid turnover. Mobilization may be performed as physiological movements (flexion, abduction, rotation) or accessory movements (gliding, spinning, distraction), and are commonly graded according to Maitland's five-level oscillatory system.

Clinical outcomes are often evaluated using the Visual Analog Scale (VAS) for pain and goniometric ROM assessments for mobility. Therapeutic exercise, as a structured physical intervention, is essential in rehabilitation to improve joint mobility, strength, proprioception, and functional capacity, while reducing pain and disability.

Given its multifactorial etiology, disabling nature, and protracted course, adhesive capsulitis requires comprehensive rehabilitation strategies. Combining mobilization techniques with therapeutic exercise has been widely recognized as an effective approach to restore function and improve quality of life in affected individuals.

Materials and Methods

Material Used

1. Orthopedic evaluation form
2. Goniometer
3. Chair
4. Mat
5. Consent form
6. Stationary tools
7. Pillow
8. Couch
9. Hot pack
10. Towel
11. Covering sheet

Methology

Study design

Quasi- experimental study.

Study Setting

This study was proposed to be carried out on patients in the Physiotherapy Department, Sri Ramakrishna Multi-Specialty Hospital, Coimbatore-641044, under the supervision of staff in charge.

Patient was included after the initial evaluation and informed consent was obtained from the patient.

Study Duration: The study was carried out for 3 months.

Treatment Duration

The treatment was given for a period of 45 minutes,4 times a week for 4 consecutive weeks.

Sampling

The subjects for this study were selected through a convenient sampling technique.

Study Population – 20 Samples.

Selection criteria

Inclusion criteria

1. Unilateral adhesive capsulitis – grade 2.
2. Both male and female were taken for the study.
3. Age group between 40-65 years.
4. Shoulder pain with minimum 4 months duration with no major shoulder trauma.
5. Patient with restriction in abduction.

Exclusion Criteria

1. Disorders of cervical spine, elbow, wrist and hands.
2. Fracture and dislocation in and around shoulder joint.
3. Bicipital tendinitis, rotator cuff tendonitis.
4. Diabetes mellitus.
5. OA of shoulder, acromio-clavicular joint.
6. Polyarthritis, neurological disease.
7. Medical condition such as cardiac condition, infection and coagulation disorders.

Variable

Independent Variable

1. Hot pack
2. Passive stretching
3. Joint Mobilization
4. strengthening

Dependent Variable

1. Pain
2. Range of motion

Statistical Tools: Unpaired T test was used to show the effectiveness of treatment between Group 1 and Group 2

Dependent 't' test

The 't' value was calculated using the formula,

$$s = \sqrt{\frac{\Sigma d^2 - \frac{\Sigma d^2}{n}}{n-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Independent 't' test

The 't' value was calculated using the formula,

$$t = \frac{\overline{x_1} - \overline{x_2}}{s} \frac{n_1 n_2}{n_1 + n_2}$$

$$s = \sqrt{\frac{\sum(x_1 - \overline{x_1})2 + (x_2 - \overline{x_2})2}{n_1 + n_2 - 2}}$$

Were,
S = Combined standard deviation
X_1 = Difference of mean of group A
X_2 = difference of mean of group B
N1 = number of subjects in group A
N2 = number of subjects in group B

Assessment Tool
1. Goniometer
2. Visual analog scale [VAS]

Procedure
10 samples were collected with convenient sample method and joint mobilization with therapeutic exercises is given for the participants for 45 minutes a day, 4 times a week for 4 consecutive weeks and their pre and post- test effect is noted.

Treatement techniques
Maitland mobilization technique
Joint mobilization is a safe and effective means of restoring or maintaining joint play within a joint and can also by used for treating patient.
A passive movement performed by the therapist at a speed slow enough that the patient can stop the movement. This technique may be applied with an oscillatory motion or a sustained stretch to decreases pain and stiffness and improve joint mobility.
This technique may use physiological/accessory movement physiological movement are those movements that can be performed voluntarily by the patient himself. Eg, Flexion, abduction and rotatory movements.
Accessory movement occur as part of any normal joint movement. They consist of gliding or rotational movements which cannot be performed in isolation a voluntary movement but can be isolated by the physiotherapist.

Glenohumeral Joint
A. Joint Traction
Position of the patient
Supine, with arm in resting position, support the forearm between your trunk and elbow.

Hand placement
Use the hand neater the part being treated and place it in the patients axilla with your thumb just distal to the joint margin anteriorly and fingers posteriorly. Your other hand supports the humerus from the lateral surface.

Mobility Force
With the hand in the axilla, move the humerus laterally.

B. Caudal Glide
Positioning of the patient
Supine with arm in resting position, support the forearm between your trunk and elbow.

Hand placement
Place one hand in the patient axilla to provide grade 1 traction and the other hand is place just distal to the acromion. Mobilization force with the superiorly placed hand, glide the humerus in and inferior direction. It facilitates abduction range in shoulder joint.

C. Posterior glide
Position of the patient
Supine, with the arm in resting position.

Position of the therapist and hand placement
Stand with your back to the patient, between the patients trunk and arm, support the arm against your trunk, grasping the distal humerus with your lateral hand.
This provides Grade 1 distraction force.
Place the lateral border of your top hand just distal to the anterior margin of the joint wit your fingers pointing superiorly.

Mobility Force
Glide the humeral head posteriorly by moving the entire arm as you bend your knees. It facilitates flexion and internal rotation.

D. Anterior Glide
Position of the patient
Prone with arm in resting position over the edge of the treatment table, supported on your thigh, stabilizing the acromion with padding.

Position of the therapist and hand placement
Stand facing the top of the table in a forward stride position. Support the patients arm against your thigh with your outside hand. This provide Grade 1 distraction force. Place the ulnar border of your other hand just distal to the posterior angle of the acromion with your fingers pointing superiorly.

Mobilizing force
Apply in an anterior and slightly medial direction. Bend both knees so the entire arm moves anteriorly. It facilitates extension range and external rotation range of motion.

Duration of treatment session
1. The mobilization was held for 1 minute.
2. Each stretch mobilization was repeated so that a total of 10 minutes of sustained stretch was performed at the treatment session.

S. No	Treatment	Subject Position	Duration [10 minutes]
1.	Hot packs	Sitting	10 minutes
2.	Stretching exercise Arm pit stretch Finger walk Crossbody reach Towel stretch Pendulum exercise	Standing Standing Standing Standing Standing Standing	10 minutes
3.	Muscle toning exercise Outward	Sitting	10 minutes

	rotation exercise Inward rotation exercise lifting exercise	Sitting Sitting	

Stretching Exercise

1. Rotator cuff muscles [supraspinatus, infraspinatus, teres minor, subscapularis]
2. Deltoid muscles [anterior, middle, posterior]
3. Scapular stabilizers [trapezius, rhomboids, levator scapulae]
4. Pectoral muscle [major, minor]

Results

In Group A, the mean VAS score decreased from 7.2 to 6.0, while mean abduction improved from 121.5° to 124.9°, showing significant reduction in pain and improvement in shoulder mobility. In Group B, the mean VAS score reduced from 6.9 to 4.7, and abduction improved from 113.0° to 115.3°, indicating greater pain relief compared to Group A. Paired *t*-test analysis confirmed significant pre- to post-test changes in both groups, with Group B showing a larger reduction in pain scores. Unpaired *t*-test analysis revealed significant differences between Group A and B in post-test values for VAS and abduction, suggesting superior effectiveness of therapeutic exercise over mobilization alone.

Graphical comparisons (Figures 1 & 2) clearly demonstrate the reduction in pain scores and the improvement in abduction range of motion across both groups.

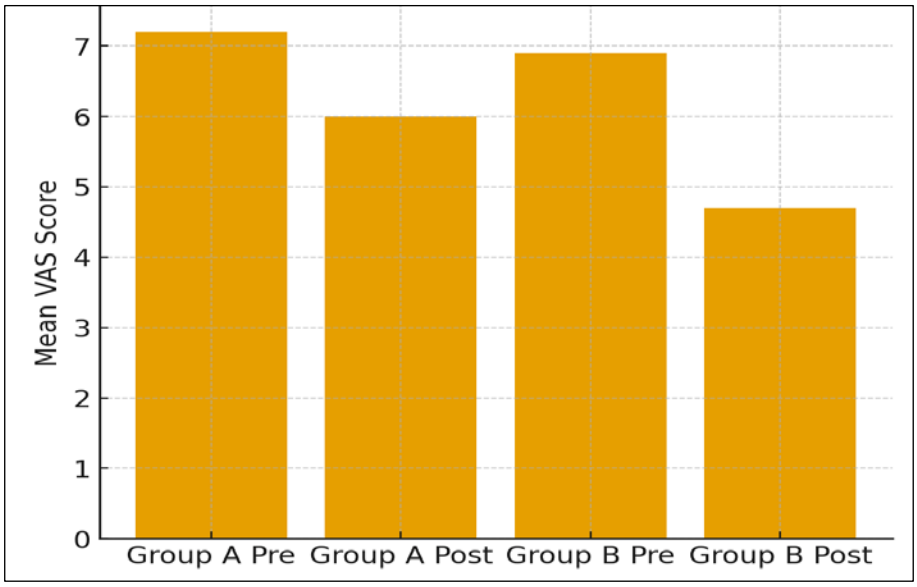

Fig 1: Comparison of VAS (Pain Scores) between Group A and Group B

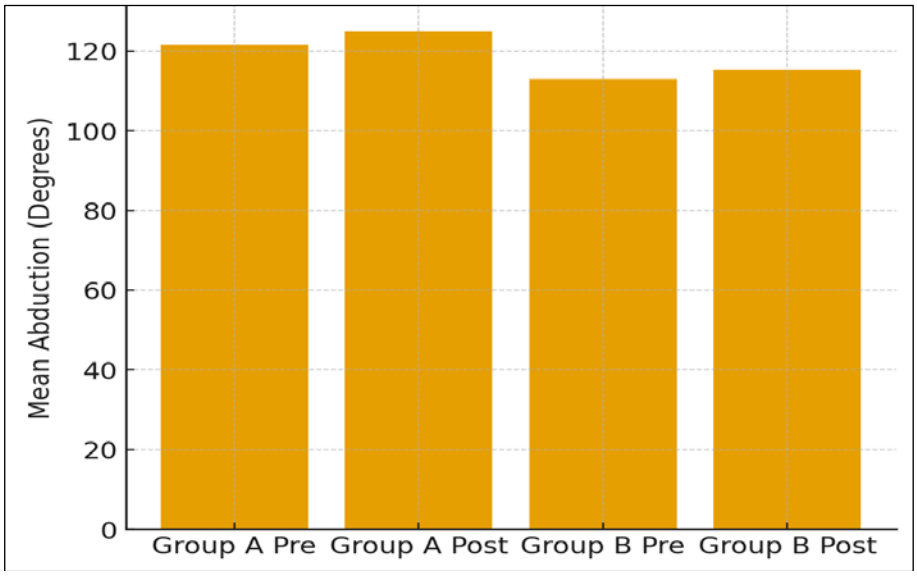

Fig 2: Comparison of Abduction ROM between Group A and Group B

Discussion

This study aimed to suggest an integrated conclusion on the effect of therapeutic exercise and exercise with passive mobilization on patient with unilateral adhesive capsulitis of shoulder.

Both groups were aimed at reducing pain and increasing range of motion of shoulder joint. This study involves the pre test and post test, each study with 10 patients. The variables taken in this study includes.

1. VAS
2. Range Of Motion

This study aimed to create a framework for a protocol that enabled efficient treatment by selective applying exercises and mobilization, which can be used conservatively.

Based on the results of this review, intervention including exercise should be preferentially performed, particularly for pain relief. However, all type of exercise are based on a certain protocol, and a comparative study on the effect according to the stage of frozen shoulder and the presence or absence of comorbidities is required.

Jewell, Riddle, and Thacker reported that the ion transfer-phonophoresis method and ultrasonic therapy massage reduced the improvements in function in 19 – 32% of patient. Therefore, it is suggested that intervention other than exercises and joint mobilization should be included in the rehabilitation of patients with AC.

The T value of shoulder abduction [17.2704], VAS [9.00] is greater than table T value at 18 degree of freedom at 0.05 level of significance.

The results were extrapolated on performing unpaired T test, concludes that T values are more significant and supporting the alternate hypothesis.

From the above results and data analysis it is found that, there were was significant improvement in group 1 who were treated with passive mobilization and therapeutic exercises than in group 2 who were treated with therapeutic exercises alone.

Conclusion

From the statistical analysis done for this study, it could be concluded that,

"Passive mobilization with therapeutic exercises is most effective than therapeutic exercises alone in treating patients with unilateral adhesive capsulitis of shoulder.

Acknowledgments

Ms agrees to take part in the project study conducted on "effects of Passiv joint monilization along with therapeutic exercises in patients with unilateral adhesive capsulitis of shoulder joint". I was explained about the procedure of the study and I clearly understand the requirements and benefits of the study. I understand the at the purpose of the program is to reduce pain and improve functional activities in daily life. I am surely giving my consent for the study. My consent in this study is voluntary and that I am free to withdraw at any time, without any reason. The information obtained for the study will be kept confidentially and will be available only the researcher.

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