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THE EFFECT OF MAITLAND MOBILIZATION AND ACTIVE RELEASE TECHNIQUEON RANGE OF MOTION AND DISABILITY IN SUBJECT WITH FROZEN SHOULDER: AN EXPERIMENTAL STUDY

Orthopaedics

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ABSTRACT

Background: Frozen shoulder (FS), is a disease that causes tissue degeneration, joint capsule thickening, and diminished glenoid cavity volume. Previous studies reported that Maitland mobilization was an effective treatment for the management of Frozen Shoulder. Recently Active Release Technique also shown in the effectiveness in the management of the same. However, no studies have directly compared the effects of Maitland's mobilization versus Active release technique in patients with Frozen Shoulder. Present study compares the Active release technique and Maitland's joint mobilization in subjects of frozen shoulder. **Methodology:** Subjects with Grade II frozen shoulder were selected according to the inclusion and exclusion criteria and divided into 2 groups via simple random sampling. Subjects in Group A received Maitland's mobilization and Group B received active release technique with conventional physiotherapy. Both the groups were treated for 4 weeks and outcome measure was Shoulder ROM and Disability Index. **Result & Conclusions:** In conclusion the treatment program consisting of Active release technique with conventional physiotherapy is more effective in frozen shoulder to reduce shoulder disability and improve shoulder ROM.

KEYWORDS

Active release technique, Maitland's mobilization and Activities of daily living, Frozen shoulder

INTRODUCTION

Frozen shoulder (FS), first termed by Codman in 1934, is a painful shoulder condition with insidious onset, stiffness in forward elevation, external rotation, and difficulty sleeping on the affected side. In 1945, Naviesar introduced the term "adhesive capsulitis." FS involves tissue degeneration, joint capsule thickening, and reduced glenoid cavity volume, making it a common shoulder disorder in clinical practice. (1,2)

Risk factors for adhesive capsulitis include female sex, age over 40, prior trauma, HLA- B27 positivity, and prolonged shoulder immobilization. Most cases (84.4%) occur between ages 40-59. It is associated with diabetes, thyroid disease, cerebrovascular and coronary artery diseases, autoimmune conditions, and Dupuytren's disease.(2,3) Freezing Stage (Painful Stage) (2–9 months) Gradual onset of shoulder pain, worsening over time, Increasing stiffness and difficulty moving the shoulder. Frozen Stage (Stiffness Stage) (4–12 months) ;Pain may reduce, but stiffness becomes severe, Limited range of motion affects daily activities.Thawing Stage (Recovery Stage) (6 months–2 years) ;Shoulder mobility gradually improves, Pain continues to decrease, and normal function returns.(4)

An area most often involved in the cases of shoulder pain is the subacromial space, which includes the theoretical space between the coracoacromial arch and the head of the humerus.[4][5] More specifically, the subacromial canal lies underneath the acromion, the coracoid process, the AC joint, and the coracoacromial ligament.[6, 7] The space contains a bursa for RC tendon lubrication, the long head of the biceps tendon insertion, and the RC tendons. GH joint arthrokinematics enable multidirectional humeral head glides within the glenoid fossa during open-chain movement. [8,9]

Del Maso et al. estimated up to 7.5 mm of upward humeral head translation during movement, a significant shift in a compact space. Abnormal glenohumeral translation is linked to shoulder pathology, contributing to pain and potential structural damage.(10)

Active Release Techniques (ART) is a soft tissue therapy designed to relieve tension by breaking down fibrosis and adhesions caused by repetitive strain. Developed by Dr. P. Michael Leahy, ART has shown effectiveness in treating adductor strain, improving hamstring flexibility, and reducing quadriceps inhibition in various studies.(11)

Mobilization is a passive, skilled manual therapy technique applied to joints and soft tissues at varying speeds and amplitudes for therapeutic purposes. It ranges from small, fast forces to large, slow forces. Contraindications include hypermobility, joint effusion, and inflammation.(12)

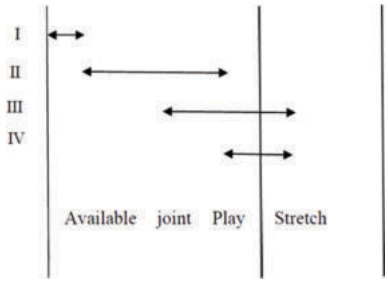


Figure 1: Grades Of Maitland's Joint Mobilization (12)

METHODOLOGY

Study Design: Experimental Study
Study Setting: Swarrnim startup and Innovation University, Gandhinagar Study Duration: 4 weeks (3 sessions/week, 12 sessions)
Sampling Technique: Simple Random Sampling
Study Population: Subjects diagnosed with Frozen Shoulder Grade II by orthopedic

Selection Criteria
Inclusive Criteria:
- Patients willing to participate
- Both Male and Female Subjects
- Patient Diagnosed with Frozen Shoulder Grade II by orthopedic
- Age between 40-60 Years

Exclusive Criteria:
- Subjects with other types of shoulder injuries such as dislocation as well as
- Recent surgery around joint
- Subjects with osteoporosis and steroid use
- Subjects with Neurological signs and symptoms (Loss of sensation and weak muscle as well diminished reflexes in upper limbs)
- Uncooperative patient

OUTCOME MEASURES: Shoulder Range of Motion (ROM) and SPADI (Shoulder Pain and Disability Scale) was taken. SPADI) is a 13-item self-reported questionnaire assessing shoulder pain and functional disability in daily activities. It consists of two subscales: pain (5 items) and disability (8 items). SPADI has high reliability (ICC > 0.89) across various patient populations and demonstrates strong

construct validity, correlating well with other shoulder-specific measures. [12,13]

Procedure

After explaining the study, informed consent was obtained from participants willing to join. All subjects signed the consent form before participating. Detailed anamnesis and demographic characteristics were recorded. Shoulder joint ROM and SPADI were assessed. Subjects were assigned into two groups based on Convenient Sampling followed by Systematic Allocation.

Outcome measures were taken at Baseline and after 4 weeks of treatment. Result was compared and analyzed statistically using SPSS 25.0 software. P value less than 0.05 was considered as statistically significant.

Figure 2 : Flow Chart Of The Study Procedure

- Group A received Deep Transverse Friction Massage (DTFM) on the upper trapezius muscle. Tender points were located through palpation of specific tendons, ligaments, and muscles. The subject, in a prone position, received the massage using the forefinger, reinforced with the middle finger, with the muscle relaxed. The technique was applied for 3 minutes with slow, slightly painful pressure, following James Cyrix's recommendation. This intervention was given for 5 days per week for 2 weeks. After 2 weeks the outcome measure was taken.(13)

Figure 3: Deep Transverse Friction Massage

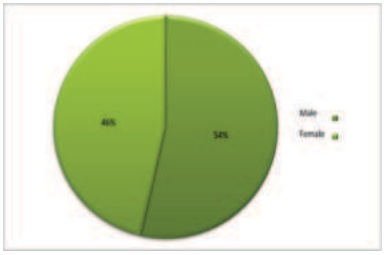
Group B received Active Release Technique (ART) involves applying deep tension to specific muscles and guiding the patient through active movements to stretch the tissue. For the pectoralis major, the patient abducts the arm, elbow at 90°, and flexes the shoulder to its shortest position, followed by cross-extension. For pectoralis minor, the patient externally rotates the shoulder and moves it overhead. For subscapularis, internal rotation is done to shorten, followed by external rotation towards overhead. Pain intensity is measured using the Visual Analog Scale (VAS), and range of motion (ROM) is assessed with a goniometer before and after the technique. [12,14]

Figure 4: Active Release Technique

Both the group received conventional therapy which include passive stretching for the posterior capsule and capsular stretch of the shoulder joint, performed 3 times with 30- second holds and 10-second rest between repetitions. Additionally, general shoulder stretching was done for 20 minutes, along with active assisted and active range of motion (ROM) exercises (10 reps, 3 sets), wand exercises (10 reps), and shoulder wheel exercises (10reps).

RESULT

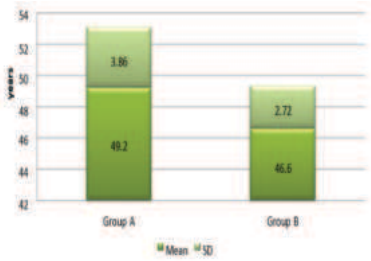
All statistical analysis was done using SPSS 25.0 software for windows. The purpose of this comparison analysis was to see how successful the Maitland Mobilization and ART therapy for Frozen shoulder. There were a total of 30 subjects in this study, with 15 subjects in each group meeting the inclusion criteria. According to Table 1 and Graph 1, 54% were male subjects and 46% were female subjects.



Graph 1: Graph Of Gender Distribution

Table 1: Demographic Details (Age Distribution)

DEMOGRAPHIC DETAILS	GROUP A	GROUP B	P value	
AGE	Mean	49.2	46.6	0.732
	SD	3.86	2.72	

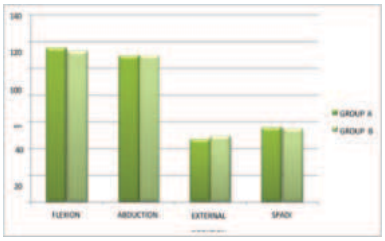


Graph 2: Age Distribution

Table 2 and Graph 2 show the mean age of the subjects in Group A and Group B. No statistically significant difference was found between the ages of the participants in all groups, proving that the groups are homogenous in terms of age.

Table 2: Inter-group Comparison Of Pre-treatment Score Of Roms And SPADI Score

OUTCOME	GROUP A		GROUP B		P VALUE
	Mean	±SD	Mean	±SD	
FLX	115.7	12.09	113.3	9.79	0.52
ABD	109.6	9.21	110.0	10.80	0.93
ER	47.33	5.12	49.66	4.64	0.45
SPADI	56.06	2.23	55.3	3.69	0.53



Graph 3: Inter-group Comparison Of Pre-treatment Score Of Roms And SPADI Score

Table 2 shows the inter-group comparison of pre-treatment scores of range of flexion, abduction and external rotation and total % of score of SPADI for Group A and Group B. The p value is >0.05 that shows there is no statistically significant difference between the pre-treatment score of range of flexion, abduction and external rotation and total % of score of SPADI. Hence it proves the pre-treatment data are homogenous.

Result Analysis Of Flexion ROM

Table 3: Intragroup Comparison Of Mean Of ROM Of Flexion For Group A

Group A	Pre	Post
Mean	115.66	125.66
Standard Deviation	12.09	8.73
p-Value	0.05	

Table 4: Intragroup Comparison Of Mean Of ROM Of Flexion For Group B

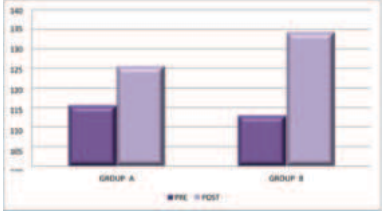
Group B	Pre	Post
Mean	113	134.3
Standard Deviation	9.79	9.46
p-Value	0.04	

Table 6: Intergroup Comparison Of ROM Of Flexion

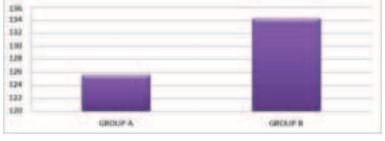
FLEXION	POST VALUES	SD
Group A	125.6	8.7
Group B	134.3	9.46
p-Value	<0.05	

Interpretation of Results:

1) **Intergroup Analysis:** The above table shows the inter group comparison of Flexion ROM of shoulder in Group A & B. This comparison is done through independent T test. At baseline the p value is >0.05. It shows that there is no significant difference between the pre-treatment score of flexion ROM. The p value comparing at post treatment score of Group A and B is <0.05 which is suggestive of significant improvement between groups.
2) **Intragroup Analysis:** The above table also shows the intra group comparison of Flexion ROM of shoulder in group A and B. This comparison is done through paired t- test. The intra group comparison of pain score shows significant difference (p<0.05) in all groups. It shows that treatment of group A and B is effective.



Graph 4: Intra-group Comparison Of Pre And Post Flexion ROM



Graph 5: Intergroup Comparison Of Post Values Of Flexion ROM

Result Analysis Of Abduction ROM

Table 6: Intragroup Comparison Of Abduction Group A

Group A	Pre	Post
Mean	109.6	120.6
Standard Deviation	9.21	7.71
p-Value	<0.05	

Table 7: Intragroup Comparison Of Abduction Group B

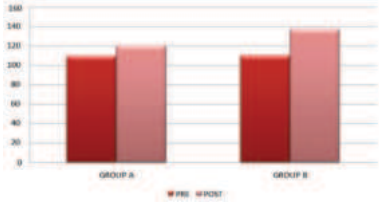
Group B	Pre	Post
Mean	110.0	137.66
Standard Deviation	10.8	13.3
p-Value	<0.05	

Table 8: Intergroup Comparison Of ROM Of Abduction

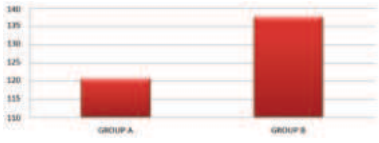
ABDUCTION	Post values	SD
Group A	120.6	7.71
Group B	137.66	13.3
p-Value	<0.05	

Interpretation Of Results:

1) **Intragroup Analysis:** The above table shows the inter group comparison of Abduction ROM of shoulder in Group A & B. This comparison is done through independent T test. At baseline the p value is >0.05. It shows that there is no significant difference between the pre- treatment score of Abduction ROM of shoulder. The p value comparing at post treatment score of Group A and B is <0.05 which is suggestive of significant improvement between groups.
2) **Intragroup Analysis:** The above table also shows the intra group comparison of Abduction ROM of shoulder in group A and B. This comparison is done through paired t - test. The intra group comparison of pain score shows significant difference (p<0.05) in all groups. It shows that treatment of group A and B is effective.



Graph 6: Intra-group Comparison Of Pre And Post Abduction ROM



Graph 7: Intergroup Comparison Of Post Values Of Abduction ROM

Resuly Analysis Of External Rotation

Table 9: Intragroup Comparison Of External Rotation Group A

Group A	Pre	Post
Mean	48.33	55.33
Standard Deviation	4.71	6.44
p-Value	<0.05	

Table 10: Intragroup Comparison Of External Rotation Group B

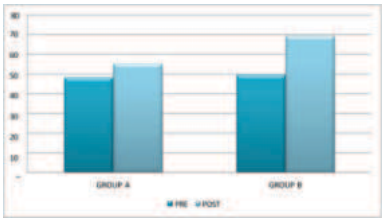
Group B	Pre	Post
Mean	49.66	69.33
Standard Deviation	4.64	5.12
p-Value	<0.05	

Table 11: Intergroup Comparison Of ROM Of External Rotation

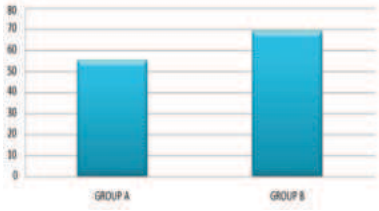
EXTERNAL ROTATION	Post values	SD
Group A	55.33	6.44
Group B	69.33	5.12
p-Value	<0.05	

Interpretation of Results

1) **Intergroup Analysis:** The above table shows the inter group comparison of External ROM of shoulder in Group A & B. This comparison is done through independent T test. At baseline the p value is >0.05. It shows that there is no significant difference between the pre- treatment score of External ROM of shoulder. The p value comparing at post treatment score of Group A and B is <0.05 which is suggestive of significant improvement between groups.
2) **Intragroup Analysis:** The above table also shows the intra group comparison of External ROM of shoulder in group A and B. This comparison is done through paired t - test. The intra group comparison of pain score shows significant difference (p<0.05) in all groups. It shows that treatment of group A and B is effective.



Graph 8: Intra-group Comparison Of Pre And Post External Rotation ROM



Graph 9: Intergroup Comparison Of Post Values Of External Rotation ROM

Result Analysis Of SPADI

Table 12: Intragroup Comparison Of SPADI For Group A

Group A	Pre	Post
Mean	56.06	46.73
Standard Deviation	2.23	1.12
p-Value	<0.05	

Table 13: Intragroup Comparison Of SPADI For Group B

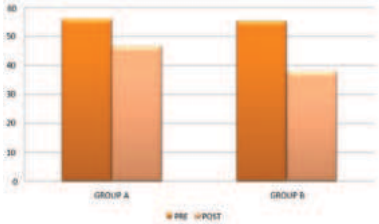
Group B	Pre	Post
Mean	55.33	37.93
Standard Deviation	3.69	2.29
p-Value	<0.05	

Table 14: Intergroup Comparison Of SPADI

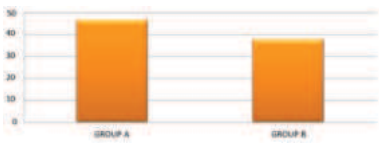
SPADI	Mean	SD
Group A	46.73	1.12
Group B	37.93	2.29
p-Value	<0.05	

Interpretation of Results:

1) **Inter Group Analysis:** The above table shows the inter group comparison of Shoulder disability and pain in Group A & B. This comparison is done through independent T test. At baseline the p value is >0.05. It shows that there is no significant difference between the pre- treatment score of SPADI. The p value comparing at post treatment score of Group A and B is <0.05 which is suggestive of significant improvement between groups.
2) **Intra Group Analysis:** The above table also shows the intra group comparison of Shoulder disability and pain in group A and B. This comparison is done through paired t- test. The intra group comparison of pain score shows significant difference (p<0.05) in all groups. It shows that treatment of group A and B is effective.



Graph 10: Intra-group Comparison Of SPADI Score



Graph 11: Intergroup Comparison Of Post Values Of SPADI Score

DISCUSSION

The study compares the effects of Maitland's mobilization and Active Release Technique (ART) on daily activities in 30 patients with Frozen Shoulder (Adhesive Capsulitis), aged 40-60 (41% female, 59% male). Statistical analysis shows significant improvement within both treatment groups, indicating that both methods are effective for managing Frozen Shoulder. However, between-group comparison reveals no significant difference in effectiveness. Adhesive Capsulitis is marked by painful and progressively restricted shoulder movement due to fibrosis of the glenohumeral joint capsule, causing significant limitation, especially in external rotation.(15) One novel mobilization technique for managing frozen shoulder involves addressing the heightened sensitivity and perceived stretch in various planes of movement. By intentionally slacking the capsule, ligaments, and muscles, clinicians can help decrease sensitivity and improve mobility[16]

The pain relief observed in Maitland's group is linked to mobilization's effects, including local physiological and central mechanisms. According to Gosling A.P., small amplitude oscillatory and distraction movements stimulate mechanoreceptors and proprioceptors, inhibiting pain perception by activating myelinated alpha-beta and alpha-delta fibers at the spinal cord or brainstem level. This non-stretch motion reduces pain and improves range of motion.(17) A study by A. Joseph Threlkeld suggests that oscillatory movements during mobilization may improve mobility by increasing fiber glide, realigning collagen, and breaking up adhesions. Additionally, restoring the interstitial fluid content of connective tissue structures can help re-establish normal frictional resistance, further enhancing mobility.(18)

ART targets small shoulder muscles through their full range of motion. The effectiveness may stem from mechanical stimulation, which induces reactive hyperemia and an analgesiceffect. Digital pressure activates cutaneous and muscular mechanoreceptors, potentially altering nociception and reducing pain.(18,19)

In conclusion the treatment program consisting of Active release technique with conventional physiotherapy is more effective in frozen shoulder to reduce shoulder disability and improve shoulder ROM.

Limitations:

- Sample Size is Small
- Long term effect of these two techniques were not consider. Factor of Dominate side hand was not consider.
- Male and female subjects were not assessed separately.

Future Recommendation:

The Periodic Reassessment can be done for long term effect The Study can be done with Dominate hand oriented.

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