

Comparison of capsular stretching and passive joint mobilisation in idiopathic adhesive capsulitis of the shoulder: A randomised controlled trial

Maria Safdar¹, Ramsha Tariq², Ayesha Bashir³, Muhammad Affan Iqbal⁴, Nadia Ishtiaq⁵, Nimrah Kanwal⁶

Abstract

Objective: To compare the effects of passive joint mobilisation versus capsular stretching on pain, range of motion and quality of life in patients with stage-II adhesive capsulitis of the shoulder joint.

Method: The randomised control trial was conducted at Lady Reading Hospital and Khyber Teaching Hospital, Peshawar, Pakistan, from February to July 2023, and comprised patients aged 30-50 years diagnosed with idiopathic stage-II adhesive capsulitis of the shoulder joint. The patients were randomised into control group A and experimental group B. Group A was treated with Maitland mobilisation, while group B was treated with capsular stretching. The treatment lasted 12 sessions delivered 3 times a week for four weeks. Pre- and post-intervention assessment was done using a goniometer for shoulder range of motion, Numeric Pain Rating Scale for pain intensity, and the Shoulder Pain and Disability Index to measure disability associated with the affected joint. Data was analysed using SPSS 22.

Results: Of the 38 participants mean age was 45.50±4.14 years. Baseline values showed no significant differences between groups ($p > 0.05$). Both groups demonstrated significant intragroup improvements in shoulder flexion, extension, abduction, internal and external rotation, and SPADI scores following intervention ($p < 0.001$). Post-intervention, the control group showed significantly greater improvements in flexion, extension, abduction, and SPADI scores ($p < 0.001$), while internal rotation improved more in the experimental group ($p = 0.003$). No significant intergroup difference was observed for external rotation ($p = 0.228$). Significant time–group interaction effects were observed for flexion, extension, and SPADI, with the largest effect size for SPADI ($\eta^2 = 0.605$). Pain severity improved in both groups, with a shift from predominantly severe pain at baseline to mainly mild and moderate pain post intervention.

Conclusion: Both interventions significantly improved shoulder range of motion and reduced pain and disability. However, greater improvements were observed in shoulder flexion, extension, abduction, and SPADI scores in the control group, while internal rotation improved more in the experimental group, with similar gains in external rotation.

Randomised Controlled Trial No: NCT05903768

Keywords: Adhesive capsulitis, Range of motion, Shoulder pain and disability index, Numeric pain rating scale.

(JPMA 76: 821; 2026) DOI: <https://doi.org/10.47391/JPMA.21437>

Introduction

Adhesive capsulitis (AC), often called frozen shoulder, is a disorder brought on by damaged soft tissues and the shoulder's articular capsule. Even though the exact cause is still not known, current research has linked the condition to increased serum cytokine levels. It is characterised by a gradual decrease of active and passive movement of the glenohumeral joint that is thought to be caused by capsular contracture. The capsule thickens because of lack of function, making movement even more challenging. As a result, "frozen" is defined by the functional expression of pathology. Insidious and persistent loss of active and passive mobility of the glenohumeral joint, likely caused by

capsular contracture, defines frozen shoulder.¹

The stages of the natural history of frozen shoulder were described in detail by Neviasser et al. Stage 1 is known as the pre-adhesive stage. In the most extreme degrees of movement, it is specified by erythematous joint inflammation and slight pain. Due to the clinical appearance being like rotator cuff impingement, it is frequently misdiagnosed. Stage 2 is an acute adhesive. Patients report excruciating pain that lasts almost to the point where the joint can no longer move. It emphasises an inflammatory process that results in thickening of the synovium and changes to the connective tissue. Stage 3 is Fibrotic or "frozen" stage at which point, the appearance of more developed adhesions is indicative of fibrosis. Joint stiffness increases when the pain lessens in intensity. Stage 4 shows that movement restriction still exists, but synovitis has not developed. It is referred to as the "thawing" phase. Patients complain of painless stiffness, and remodelling usually makes movement better.²

^{1,6}Department of Physiotherapy, Riphah International University, Islamabad, Pakistan; ²⁻⁵Department of Rehabilitation and Allied Health Sciences, Riphah International University, Rawalpindi, Pakistan.

Correspondence: Ramsha Tariq, e-mail: ramsha.tariq@riphah.edu.pk

ORCID ID: 0009-0004-2700-7832

Submission complete: 11-12-2024 **1st Revision received:** 17-06-2025

Acceptance: 24-01-2026

Last Revision received: 23-01-2026

AC patients may have a typical clinical presentation and recovery pattern. Pain, a restricted range of motion (ROM), and muscle weakening due to inactivity are clinical symptoms. Flexion, abduction, internal rotation and external rotation are the four movements that are useful in the assessment. Flexion, abduction and internal rotation are assessed using both active and passive mobilisation, but only passive mobilisation is used to assess exterior rotation.³

In AC of shoulder joint., chronic inflammation in sub-synovial layer of the capsule results in capsular thickening and fibrosis. Shoulder joint ROM, mainly abduction and external rotation, is significantly related to capsular stiffness of glenohumeral joint.⁴

There is frequently no clear reason or trigger. The discomfort is frequently described as dull, deep aching. The biceps region may also experience pain. When reaching overhead, away, or behind the back, patients may experience escalating discomfort and stiffness. Weakness frequently coexists with pain or concurrent tendinopathy. On the affected side, crepitus could be evident. As with many shoulder ailments, pain may make it difficult to sleep.⁵ The disease is more common in females compared to males, more in middle-aged and older population. 82 shows that the change in pattern of scapulohumeral rhythm is also a risk factor for the development of idiopathic frozen shoulder predominantly in thoracic kyphosis. This is one of the reasons why females are more prone to developing frozen shoulder as they have a higher tendency to develop thoracic kyphosis compared to men.⁶

The discomfort typically spreads across the entire shoulder up to the point where the deltoid muscle inserts. The patient reports having trouble moving actively, and having trouble sleeping on the affected side. Clinical examination reveals supinate atrophy, restrictions on passive mobilisation, as well as painful and constrained external rotation and elevation. Localised pain with functional limitations in the deltoid area of the shoulder and occasionally in the arm is also reported. Long-term pain sufferers may exhibit medial to the scapula presentation. This occurs because of improper scapulothoracic movements that are developed to make up for the glenohumeral joint's limitations.⁷

Once diagnosed, patients with frozen shoulder often start a multifaceted, conservative therapeutic plan. One example of a conservative treatment for shoulder pain and inflammation is medication (either orally or injected into the shoulder joint). Additional options include patient education, physiotherapy, various manipulation techniques, massage and electrotherapy.⁸ Joint

mobilisation, which can be divided into the Maitland-recommended oscillatory approach and the Kaltenborn recommended painful stretch technique, is a typical treatment for individuals with frozen shoulders.⁹ Stretching exercises have been shown to increase range of motion and decrease discomfort. The Harvard Special Health Report suggests several stretches for treating AC, including the finger stroll, cross-body reach, armpit stretch, beginning to strengthen, outward rotation and inward rotation. These exercises can be carried out individually, or with the assistance of a physiotherapist.¹⁰

The current study was planned to compare the effects of passive joint mobilisation versus capsular stretching on pain, ROM and quality of life (QOL) in patients with stage-II AC of the shoulder joint.

Patients and Methods

The randomised control trial (RCT) was conducted at Lady Reading Hospital (LRH) and Khyber Teaching Hospital (KTH), Peshawar, Pakistan, from February to July 2023 after approval from Research ethical committee under Ref: Riphah/RCRAHS-ISB/REC/MS-PT/01485. The sample size was calculated using G*Power¹¹ and the sample was raised using purposive sampling technique Those included were patients aged 30-50 years with diagnosed AC of shoulder joint stage-II.e Patients with any intrinsic aetiology, fracture and dislocation, diagnosed pre-diabetics, diabetics and with thyroid dysfunction were excluded.

Baseline and post-intervention assessment was done using goniometer for ROM, Numeric Pain Rating Scale (NPRS)¹² for pain intensity and the Shoulder Pain and Disability Index (SPADI).¹³

To measure disability associated with the shoulder joint. The treatment was delivered over 12 sessions, given 3 times a week for four weeks.

The patients were randomised into control group A and experimental group B using the sealed envelope method. A single blinded study design was used, in which

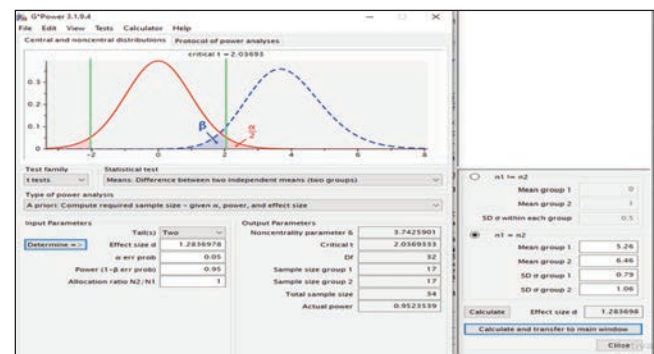


Figure-1: Sample size calculation by G Power.

participants were kept unaware of the intervention group they belonged to. Patients in group A were treated with Maitland mobilisation, including inferior glide (10 reps x 3 sets), posterior glide, (10 x3) and anterior glide (10x3).¹⁴ Those in group B were treated with capsular stretching, including anterior, posterior and inferior capsular stretching. Each stretch was held 15-30 seconds and repeated 2-4 times.¹⁵

Additionally, both the groups received conventional treatment, including hot pack for 5mins, and Active range of motion exercises (10x3). Home plan included wall exercises, wall walking exercises, pendulum exercises, towel stretch exercises, cross-body adduction (10x2, each), while cold pack was given at the end of the session for 5 mins.¹⁶

Data was analysed using SPSS 22. Intergroup comparison was done using independent t test, while paired sample t-test was used for intragroup assessment compared to baseline values. Mixed analysis of variance (ANOVA) was used to calculate the effect size. P<0.05 was considered significant.

Results

Of the 38 patients with mean age 45.50±4.14 years, 31(81.6%) were females and 7(18.4%) were males. Both the groups had 19(50%) patients each. There were 17(89.5%) females and 2(10.5%) males in group A, while group B had 14(73.7%) females and 5(26.3%) males. Figure 2 shows

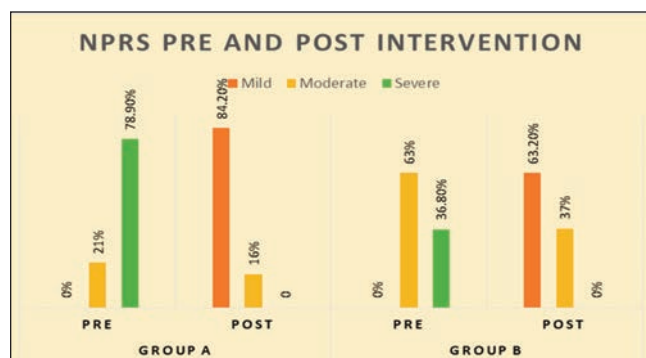


Figure-2: Pre-intervention and post-intervention values of NPRS in both the groups. NPRS: Numeric pain rating scale.

values of NPRS. At baseline, 15(78.90%) patients in group A had severe pain, while post-intervention, 16(84.20%) patients showed mild pain and 3(16%) patients showed moderate pain. In group B, 7(36.80%) patients in group B had severe pain, and post-intervention, 12(63.20%) patients showed mild pain and 7(37%) patients showed moderate pain. Table 1 shows that both groups demonstrated statistically significant improvements from baseline to post-intervention across all ROM parameters and SPADI scores (p< 0.001). In the control group, shoulder flexion increased from 117±21.10° to 161.32±13.10°, extension from 39.74±6.96° to 55.11±4.43°, and abduction from 124.21±13.87° to 159.21±11.62°. Internal rotation improved from 40.00±11.05° to 58.42±6.24°, while external rotation increased from 60.21±18.45° to 77.95±9.36°. SPADI scores showed a marked reduction from 77.43±3.74 to

Table-1: Intragroup and intergroup comparison of ROM and SPADI.

Variables	Control group Mean± SD	Experimental group Mean± SD	p-value
Flexion			
Baseline	117±21.10	108.26±14.89	0.144
Final	161.32±13.10	140.37±13.45	<0.001
p-value	<0.001	<0.001	
Extension			
Baseline	39.74±6.96	36.05±4.88	0.068
Final	55.11±4.43	46.21±5.43	<0.001
p-value	<0.001	<0.001	
Abduction			
Baseline	124.21±13.87	114.32±17.01	0.122
Final	159.21±11.62	140.74±13.08	<0.001
p-value	<0.001	<0.001	
Internal rotation			
Baseline	40.00±11.05	43.42±10.00	0.324
Final	58.42±6.24	64.53±5.29	0.003
p-value	<0.001	<0.001	
External rotation			
Baseline	60.21±18.45	58.42±13.30	0.076
Final	77.95±9.36	73.79±11.42	0.228
p-value	<0.001	<0.001	
SPADI			
Baseline	77.43±3.74	73.46±7.71	0.054
Final	44.02±4.13	56.78±10.51	<0.001
p-value	<0.001	<0.001	

ROM: Range of motion, SPADI: Shoulder pain and disability index.

Table-2: Time interaction and effect size of ROM and SPADI.

Variable	Control Group		Experimental Group		F-value	p-value	Effect size
	Baseline	Final	Baseline	Final			
Flexion	117±21.10	161.32±13.1	108.26±14.89	140.37±13.45	6.151	0.018	0.146
Extension	39.74±6.96	55.11±4.43	36.05±4.88	46.21±5.43	13.96	<0.001	0.279
Abduction	124.2±13.87	159.21±11.62	114.32±17.01	140.74±13.08	0.145	0.706	0.004
Internal rotation	40.0±11.05	58.42±6.24	43.42±10.00	64.53±5.29	0.897	0.350	0.024
External rotation	60.21±18.4	77.95±9.36	58.42±13.30	73.79±11.42	0.459	0.503	0.013
SPADI	77.43±3.74	44.02±4.13	73.46±7.71	56.78±10.51	55.24	<0.001	0.605

ROM: Range of motion, SPADI: Shoulder pain and disability index.

44.02±4.13 ($p < 0.001$). Similarly, the experimental group exhibited significant intragroup improvements, with flexion increasing from 108.26±14.89° to 140.37±13.45°, extension from 36.05±4.88° to 46.21±5.43°, and abduction from 114.32±17.01° to 140.74±13.08°. Internal rotation improved from 43.42±10.00° to 64.53±5.29°, and external rotation from 58.42±13.30° to 73.79±11.42°. SPADI scores significantly decreased from 73.46±7.71 to 56.78±10.51 ($p < 0.001$). While Post-intervention intergroup analysis revealed statistically significant differences favouring the control group for shoulder flexion, extension, abduction, and SPADI scores ($p < 0.001$). Internal rotation showed a significant intergroup difference favouring the experimental group ($p = 0.003$), while no statistically significant difference was observed between groups for external rotation ($p = 0.228$). Repeated-measures analysis demonstrated a significant time-by-group interaction for shoulder flexion ($F = 6.151$, $p = 0.018$) and extension ($F = 13.96$, $p < 0.001$), with small to moderate effect sizes ($\eta^2 = 0.146$ and 0.279 , respectively). A highly significant interaction effect was observed for SPADI scores ($F = 55.24$, $p < 0.001$) with a large effect size ($\eta^2 = 0.605$). Table 2 shows no significant time-by-group interaction was found for abduction, internal rotation, or external rotation ($p > 0.05$), indicating comparable improvements over time in both groups for these variables.

Discussion

The current study showed significant improvement in ROM, pain intensity and disability in patients with stage-II AC.

Ashutosh Satapathy et al. compared the effects of scapulothoracic exercises and capsular stretching in patients of AC of shoulder joint. In the scapulothoracic group, mean post-intervention scores for SPADI, flexion, abduction and external rotation were significantly different ($p < 0.001$) compared to baseline values.¹⁷

A 2023 study showed significant difference post-intervention, concluding that capsular stretching significantly improved pain and ROM.¹⁵ The current findings were in line with these studies.

Samiksha Sathe et al. in 2020 compared the effects of Maitland mobilisation and conventional physiotherapy. The mobilisation group showed more significant improvement in terms of ROM and SPADI score, and significant decrease in NPRS scale compared to the other group.¹⁴ These results were consistent with the current findings.

The limitation of the current study is that the sample had 81.6% female subjects, and that might have affected the results.

Conclusion

Both interventions were effective in improving shoulder range of motion and reducing pain and disability, as significant intragroup improvements were observed in all outcome measures. However, the control group demonstrated superior improvements in shoulder flexion, extension, abduction, and overall shoulder pain and disability, while the experimental group showed greater gains in internal rotation. External rotation improved similarly in both groups. Overall, the findings suggest that while both treatment approaches are beneficial, the intervention applied in the control group resulted in greater functional improvement and pain reduction in most outcome measures.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

References

1. Carmignano MS. Frozen shoulder: symptoms, causes, diagnosis, and treatment. In: Nikolopoulos DD, Safos GK, editors. *Shoulder surgery for RC pathology, arthropathy and tumors*. London: IntechOpen; 2022.
2. Neviasser AS, Neviasser RJ. Adhesive capsulitis of the shoulder. *J Am Acad Orthop Surg*. 2011;19:536-42. doi:10.5435/00124635-201109000-00004
3. Cadogan A, Mohammed KD. Shoulder pain in primary care: frozen shoulder. *J Prim Health Care*. 2016;8:44-51. doi:10.1071/HC15053
4. Lee SY, Lee KJ, Kim W, Chung SG. Relationships between capsular stiffness and clinical features in adhesive capsulitis of the shoulder. *PMR*. 2015;7:1226-34. doi:10.1016/j.pmrj.2015.05.014
5. Ewald A. Adhesive capsulitis: a review. *Am Fam Physician*. 2011;83:417-22. 6.
6. Saste R, Jerome A, Chidambaram R. Prevalence of forward head posture in patients diagnosed clinically with frozen shoulder. *Int J Health Sci Res*. 2024;14:77-83.
7. Hsu JE, Anakwenze OA, Warrender WJ, Abboud JA. Current review of adhesive capsulitis. *J Shoulder Elbow Surg*. 2011;20:502-14. doi:10.1016/j.jse.2010.08.023
8. D'Orsi GM, Via AG, Frizziero A, Oliva F. Treatment of adhesive capsulitis: a review. *Muscles Ligaments Tendons J*. 2012;2:70-8.
9. Do Moon G, Lim JY, Kim DY, Kim TH. Comparison of Maitland and Kaltenborn mobilization techniques for improving shoulder pain and range of motion in frozen shoulders. *J Phys Ther Sci*. 2015;27:1391-5. doi:10.1589/jpts.27.1391
10. Hanchard NC, Goodchild L, Thompson J, O'Brien T, Davison D, Richardson C. Evidence-based clinical guidelines for the diagnosis, assessment and physiotherapy management of contracted (frozen) shoulder: quick reference summary. *Physiotherapy*. 2012;98:117-20. doi:10.1016/j.physio.2011.05.001
11. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods*. 2009;41:1149-60. doi:10.3758/BRM.41.4.1149
12. Rodriguez CS. Pain measurement in the elderly: a review. *Pain Manag Nurs*. 2001;2:38-46. doi:10.1053/jpmn.2001.23750
13. Roy JS, MacDermid JC, Woodhouse LJ. Measuring shoulder function: a systematic review of four questionnaires. *Arthritis Rheum*.

- 2009;61:623-32.
14. Sathe S, Khurana S, Damke U, Agrawal P. To compare the effects of Maitland mobilization with conventional physiotherapy in adhesive capsulitis. *Int J Curr Res Rev.* 2020;12:99-102.
 15. Manohar B, Subramanian S, Pragassame S, Sureshkumar S, Eswaramoorthi V, Kajamohideen S, et al. Effect of capsular stretch on frozen shoulder. *Int J Exp Res Rev.* 2023;30:25-31.
 16. Afzal K, Sajjad AG, Tariq R, Razzaq A. Effect of Cyriax inferior capsule stretching in idiopathic adhesive capsulitis. *Rawal Med J.* 2021;46:331-3.
 17. Satapathy A, Mandla S. A study to compare the effectiveness of capsular stretching versus scapulothoracic exercise in patients with adhesive capsulitis of shoulder. *RJPT.* 2021;1:15-22.
-

Author Contribution:

MS & RT: Concept, design, collection and assembly of data.

AB: Data analysis, interpretation and statistical expertise.

MAI: Drafting and statistical expertise.

NI & NK: Critical revision, final approval and guarantor of article.