

# Effect of Scapular Clock Exercise Versus Scapular PNF Exercise on Pain and ROM for Anterior Capsular Stiffness of Shoulder Joint

Ragapriyaa R<sup>1</sup>, Kamalakannan M<sup>2</sup>, Anitha A<sup>3</sup>, Ramana K<sup>4</sup>

<sup>1</sup>Undergraduate Student, <sup>2</sup>Associate Professor, <sup>3</sup>Associate Professor, <sup>4</sup>Assistant Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical & Technical Science, Thandalam.

**How to cite this article:** Ragapriyaa R, Kamalakannan M, Anitha A et al. Effect of Scapular Clock Exercise Versus Scapular PNF Exercise on Pain and ROM for Anterior Capsular Stiffness of Shoulder Joint. Indian Journal of Physiotherapy and Occupational Therapy / Volume 18, Year 2024.

## Abstract

**Background:** Adhesive capsulitis is also known as frozen shoulder. Adhesive Capsulitis is a condition that causes stiffness around the shoulder joint, excruciating agony, and limited shoulder range of motion. The onset of this sickness is extremely slow, and the process of regaining pain-free shoulder function is likewise gradual. Most diabetes patients are affected by it. For participants with anterior capsular stiffness, the goal of this study is to examine the effects of scapular PNF exercise with scapular clock exercise on pain and range of motion.

**Purpose:** The Purpose of the study is to determine the effectiveness of scapular clock exercise versus scapular PNF exercise in reducing pain and ROM for anterior capsular stiffness of shoulder joint.

**Materials and Methods:** A sample of 20 were taken according to selection criteria for this experimental study which was divided into two groups, scapular clock exercise with IFT (n=10) and scapular PNF exercise with IFT (n=10) were given. Interventions were given as 6 sessions a week is given and continued for 4 weeks. The pre-test and post-test values were taken. The values were tabulated and statistically evaluated. Study period: November 2022 to April 2023

**Result:** The result revealed that the mean of scapular PNF exercise at the post-test was found to be higher than the mean value of scapular clock exercise with a p-value of <0.0001.

**Conclusion:** The study shows that scapular PNF exercise with IFT had shown higher positive outcome in managing anterior capsular stiffness of shoulder joint.

**Keywords:** Adhesive capsulitis, shoulder restriction, anterior capsular stiffness, scapular PNF exercise, scapular clock exercise, NPRS, ROM.

## Introduction

A musculoskeletal condition known as frozen shoulder, or shoulder adhesive capsulitis, causes pain and functional impairment<sup>1</sup>, especially in external rotation.<sup>2</sup>

The subscapularis muscle is directly underneath the thickest part of the anterior glenohumeral joint capsule, which was measured for thickness and aberrant signal intensity.<sup>3</sup> One of the most important morphological indicators of adhesive capsulitis is a thickened inferior glenohumeral ligament (IGHL)

**Corresponding Author:** Kamalakannan M, Associate Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India.

**E-Mail:** kamalakannan.scpt@saveetha.com

(AC). According to earlier research, the anterior band of inferior glenohumeral ligament thickness (AIGHLT) and shoulder capsular contracture, luxio erecta humeri, and AC.<sup>4</sup>

The shoulder's capsular scar tissue identifies its etiology. Similar to other fibrotic musculoskeletal conditions, such as Dupuytren's contracture<sup>5</sup>, Hyperthyroidism, diabetes, and prior cervical spine surgery<sup>6</sup>, trauma, thyroid disease and female sex are risk factor.<sup>7</sup>

There is no impingement test has a 100% sensitivity or specificity.<sup>8</sup>

The inflammatory, freezing, frozen, and thawing phases of adhesive capsulitis development are the four distinct phases. The patient may experience sudden, intense pain at the end of their range of motion as well as while at rest during Stage 1, last for around three months.

Sleep disturbances occur during this stage. The second phase, or freezing period, might continue from three to nine months. When their range of motion in the forward, internal, and exterior rotation planes is restricted, they may experience discomfort more frequently at night. The third stage, often referred to as the frozen period, might go on for nine to fifteen months. The patient may still experience discomfort at their limits and may have a limited ROM. Stage 4, the discomfort may lessen as movement quality gradually improves.<sup>9</sup>

Adhesive capsulitis is a debilitating condition which causes the capsule of the gleno humeral joint to thicken and contract progressively. Adhesive capsulitis is the leading cause of pain at the shoulder joint in middle aged and elderly persons. It is also more prevalent in the 40-70 years age group and it is estimated that 2-3% of the general population affected with this pathology (19) 3% of the general population is affected with this pathology.<sup>10</sup>

### Aim

The Aim of the study is to determine the effectiveness of scapular clock exercise versus scapular PNF exercise in reducing pain and ROM for

anterior capsular stiffness of shoulder joint.

### Material and Method

It was an experimental study conducted on 20 subjects with anterior capsular stiffness of shoulder joint, aged between 40-59 years of both genders was taken from Dynamics physio rehab centre, Chennai. Convenient sampling with random allocation was used in this study.

#### Inclusion criteria:

- Patient who referred by orthopedician,
- PA shoulder (stage 2), Patient with unilateral involvement
- Both genders of age between 40-59 yrs,
- Subjects with positive Dugas test.

#### Exclusion criteria:

- Previous history of shoulder manipulation under anesthesia, diabetic patient.
- Diabetic patient
- OA of shoulder or acromioclavicular joint,
- Metastasis or post traumatic shoulder or shoulder dislocation patient in past 3months, recent fracture.
- Intraarticular cortico-steroid injection in affected limb.

#### Outcome measures:

Assessment was performed at baseline (before starting of treatment) and after four weeks of study.

Numeric Pain Rating Scale (NPRS).<sup>17</sup>

Shoulder range of motion<sup>18</sup>

#### Procedure

Participants were included considering the inclusion and exclusion criteria. Procedure was explained to the participant & participants were then asked to sign the consent form. Assessment of all the included participants was done according to the assessment form. Participants were randomly divided into two groups i.e group 'A' and 'B'. Assessment was performed at baseline and after 4 weeks of study for both (GROUP -A&B) IFT is used.

Study period: November 2022 to april 2023

### Interferential therapy procedure:

This program was prescribed for all subjects. patient in a comfortable position.

During the placement, a gel was used for the vibrations to transfer to the subject's surface area. Pad electrodes are placed accurately at the treatment area and two pairs of electrodes are positioned alternately so, that the crossing point of two currents is over or within the treatment area. (Frequency=90, Spectrum frequency=50, Duration= 15 minutes, 5 sessions per week)

### Group A: scapular clock exercise:

Scapular clock exercise

- 3' o clock position
- 6' o clock position
- 9' o clock position
- 12' o clock position

Kneeling on a Swiss ball with the elbow fully extended and pointed at the 3, 6, 9 and 12 o'clock positions are among the scapular clock exercises, in all mentioned positions. 3'o clock scapula is protracted, 6'o clock-the scapula is depressed & 9'o clock-the scapula is retracted, 12' o clock-shoulder is elevated.

The stretch was maintained for 15 secs.

Repetition:3set\*10reps,Duration:6session/week for 4 weeks)

### Group-B: scapular PNF exercise:

- flexion-abduction-internal rotation
- extension-adduction-external rotation
- anterior depression and posterior elevation.

Positioning: Start by positioning the person in a comfortable and relaxed sitting position. Make sure their shoulders are relaxed and their back is straight.

### Flexion -abduction-internal rotation:

Position: Flexion, abduction and internal rotation. Instruct the patient to elevate the hand in flexion-aduction-internal rotation, meanwhile motion resistant has to be given in downward direction. The stretch was maintained for 15 secs.

Repetition:3set\*10reps,Duration:6session/week for 4 weeks)

### Extension-adduction-external rotation:

Position: Extension, adduction, external rotation. In this position, Patient has to lift the affected hand at the back in extension- adduction-external rotation, meanwhile motion resistance has to be given against the patient stretch. The stretch was maintained for 15 secs.

Repetition:3set\*10reps,Duration:6session/week for 4 weeks)

### Anterior depression:

Position: Side lying with involved side up.

While Patient raise their scapula, restrict the movement by giving resistance in opposing direction. The stretch was maintained for 15 secs.

Repetition:3set\*10reps,Duration:6session/week for 4 weeks)

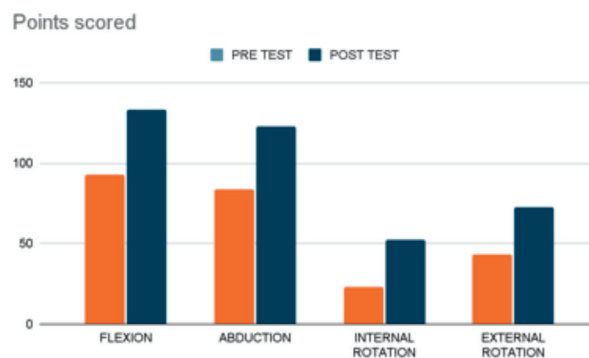
### Posterior elevation:

Position: Side lying with involved side up.

While Patient depresses, their scapula restricts the movement by giving resistance in opposing direction. The stretch was maintained for 15 secs.

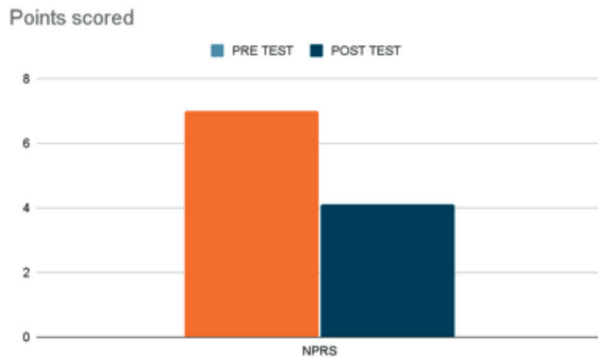
Repetition:3set\*10reps,Duration:6 session/week for 4 weeks)

### Data analysis



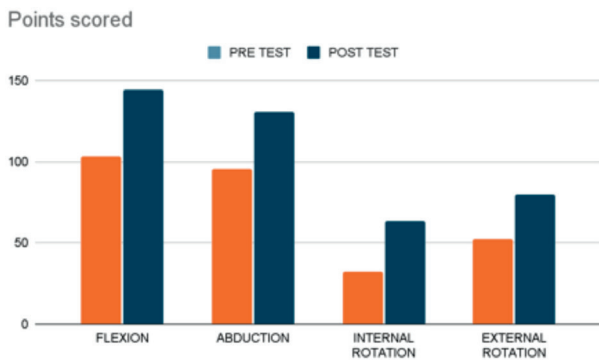
GRAPH-1 Comparison of pre and post-test values of Group-A using ROM.

INTERPRETATION: Graph No.1 shows that the values are extremely statistically significant.



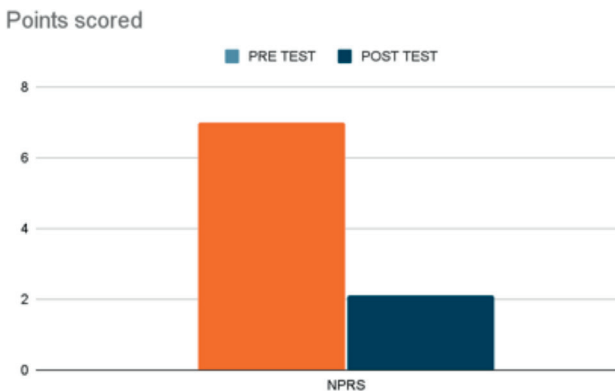
**GRAPH-2 Comparison of pre and post-test values of Group-A using NPRS.**

INTERPRETATION: Graph No.2 shows that the values are extremely statistically significant.



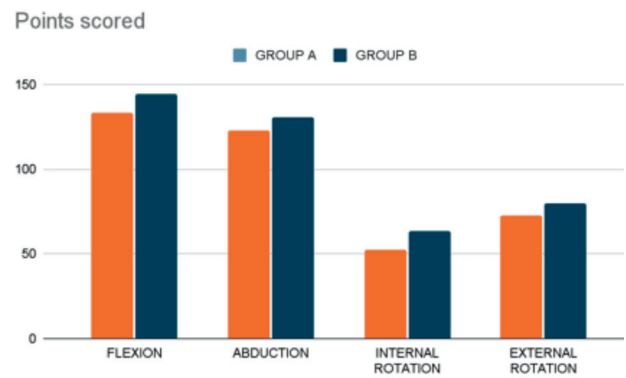
**GRAPH-3 Comparison of pre and post-test values of Group-B using ROM**

INTERPRETATION: Graph No.3 shows that the values are extremely statistically significant.



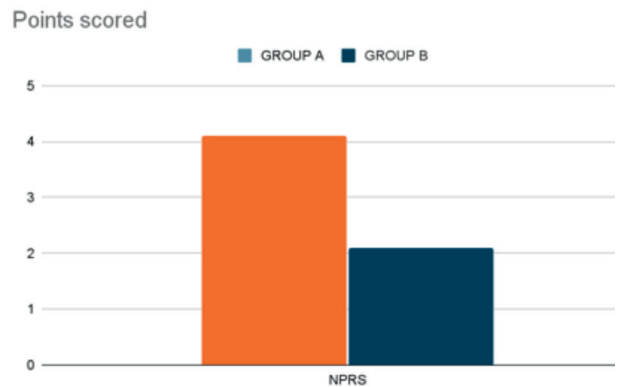
**GRAPH-4 Comparison of pre and post-test values of Group-B using NPRS.**

INTERPRETATION: Graph No.4 shows that the values are extremely statistically significant.



**GRAPH-5 Comparison of pre and post-test values of Group-A and B using ROM.**

INTERPRETATION: Graph No.5 shows that the values are extremely statistically significant.



**GRAPH-6 Comparison of pre and post-test values of Group-A and B using NPRS.**

INTERPRETATION: Graph No.1 shows that the values are extremely statistically significant.

**Result**

In result, significant improvement in both ROM and NPRS of post-test values for both groups. The Values of ROM of Group-A were flexion 133.10(+2.60), abduction 123.10(+3.00), internal rotation 52.60(+0.67), external rotation 72.80(+1.99) whereas values ROM of Group-B were flexion 144.10(+6.14), abduction 130.40(+4.55), internal rotation 63.20(+2.39), external rotation 79.50(+2.64), and NPRS values of Group-A were 4.10(+0.88) and value of Group-B were 2.10(+0.88).

According to GRAPH-1 shows, comparison of pre-test and post-test of ROM in Group A (Scapular clock exercise) the values of ROM significantly increased

from flexion 93.00(+2.71), abduction 83.80(+2.53), internal rotation 23.40(+0.69), external rotation 43.00(+2.21) to flexion 133.10(+2.60), abduction 123.10(+3.00), internal rotation 52.60(+0.67), external rotation 72.80(+1.99).

According to GRAPH-2 shows, comparison of pre-test and post-test of NPRS values significantly decreased from 7.00(+1.49) to 4.10(+0.88) in Group-A.

According to GRAPH-3 shows, comparison of pre-test and post-test of ROM in Group-B, the values of ROM significantly increased from flexion 103.50(+3.03), abduction 95.50(+2.8), internal rotation 32.20(+2.15) external rotation 52.40(+1.51) to in flexion 144.10(+0.14), abduction 130.40(+4.55), internal rotation 63.20(+2.39), external rotation 79.50(+2.64)

According to GRAPH-4 shows, comparison of pre-test and post-test of NPRS in Group-B, values were decreased from 7.00(+7.40) to 2.10(+1.17)

According to GRAPH-5 shows, comparison of post-test of ROM in Group-A and B, the values of ROM of Group-A were flexion 133.10(+2.60), abduction 123.10(+3.00), internal rotation 52.60(+0.67), external rotation 72.80(+1.99) whereas values ROM of Group-B were flexion 144.10(+6.14), abduction 130.40(+4.55), internal rotation 63.20(+2.39), external rotation 79.50(+2.64).

According to GRAPH-6 shows, comparison of post-test of NPRS in Group-A and B, values of Group-A were 4.10(+0.88) and value of Group-B were 2.10(+0.88).

As a result of both groups, the results are statistically significant with a p value of 0.0001

This suggests that group B (scapular PNF exercise) performed considerably better than group A (Scapular clock exercise). This strongly suggests that scapular PNF exercise has a positive effect on reducing pain and improvement in shoulder ROM.

## Discussion

The purpose of the study is to find the effects of Scapular PNF along with IFT in subjects with anterior capsular stiffness. Research studies also state that scapular PNF exercise has significant improvements in patients with adhesive capsulitis.

In this study, 20 subjects were assigned, 10 were in Group A and 10 in Group B. Group A received scapular clock exercise along with IFT 6 sessions/week and Group B received Scapular PNF exercise 6 sessions/week for a duration of 4 weeks. The outcome measures were NPRS and ROM performed at baseline and after 4 weeks of study. According to Graph no. 1 and 2, scapular clock exercise is effective in reducing the pain and improving ROM. According to Graph no.3 and 4 scapular PNF exercise is effective in reducing the pain and improving ROM the present study shows improvement. According to Graph no.5 and 6, comparison of post-test values of both groups the present study shows improvement in both the groups i.e., scapular PNF exercise is more effective in reducing the pain and improving ROM than scapular clock exercise.

Joshi YS, Shridhar S, (2020) had concluded that participants with adhesive capsulitis, in terms of lowering pain, abduction, flexion, external and internal rotation ROM, LSST, and SPADI, scapular PNF and Maitland glenohumeral mobilization were more effective treatments (p 0.05).<sup>11</sup>

Tedla JS, Sangadala DR (2019) had concluded that PNF group outperforms in terms of lowering pain and disability, boosting ROM, and enhancing function. The meta-analysis also revealed a substantial impact size, demonstrating that the PNF outperforms traditional physical therapy in terms of reducing pain, boosting external rotation, and improving range of motion (ROM) in abduction.<sup>12</sup>

Mogahed HG, Mohamed NA (2020) had concluded that Increasing shoulder flexion and abduction range of motion, improving shoulder function, and reducing discomfort in post-mastectomy adhesive capsulitis were all achieved with the combination of cyriax soft tissue release and scapular proprioceptive neuromuscular facilitation, which were both important, efficient, and affordable techniques.<sup>13</sup>

When compared to the posterior capsule, the anterior capsule in patients with shoulder stiffness exhibits higher fibrogenic processes, according to genetic study of the shoulder capsule.<sup>14</sup>

A patient with adhesive capsulitis was found to benefit from Proprioceptive Neuromuscular Facilitation together with scapular stability exercises.<sup>15</sup>

The scapular PNF approach was found to be more effective than traditional physiotherapy alone with exercises in lowering pain and enhancing dynamic scapular stability in participants with adhesive capsulitis.<sup>16</sup>

On the basis of the study's findings, suggestions can be made for the clinical care of anterior capsular stiffness of shoulder joint. Clinicians should think about including scapular PNF exercise along with IFT in the treatment plan for patients with anterior capsular stiffness of shoulder joint if it is discovered that they are more helpful at reducing pain and improving ROM than scapular clock exercise. In order to ascertain these interventions' long-term effects on pain management and functional improvement in people with anterior capsular stiffness of shoulder joint, future research should examine the long-term effects of these interventions beyond the 3-month follow-up period.

### Conclusion

In conclusion, this study provides evidence supporting the effectiveness of scapular PNF exercise as a management strategy for anterior capsular stiffness of Shoulder joint. The findings demonstrate significant improvements in shoulder ROM, pain levels following the intervention. These positive outcomes align with recent research emphasizing the benefits of ROM on shoulder function. Scapular PNF exercises show potential for strengthening of shoulder muscles and improves range of motion. Further research and long-term follow-up studies are necessary to validate these results and assess the long-lasting effects of scapular PNF exercise in the management of anterior capsular stiffness of Shoulder joint.

**Ethical Clearance:** Taken from institutional ethical committee. ISRB number-03/ 064/ 2022/ ISRB/ SR / SCPT

**Funding:** Self-funding

**Conflict of Interest:** No conflict of interest during this research.

### References

- Elnady B, Rageh EM, Hussein MS, Abu-Zaid MH, Desouky DE, Ekhoully T, Rasker JJ. In shoulder adhesive capsulitis, ultrasound-guided anterior hydrodilatation in rotator interval is more effective than posterior approach: a randomized controlled study. *Clinical rheumatology*. 2020 Dec;39(12):3805-14.
- Ramirez J. Adhesive capsulitis: diagnosis and management. *American family physician*. 2019 Mar 1;99(5):297-300.
- Park J, Choi YH, Chai JW, Cha SW, Lim JH, Jo CH, Kim DH. Anterior capsular abnormality: another important MRI finding for the diagnosis of adhesive capsulitis of the shoulder. *Skeletal Radiology*. 2019 Apr;48(4):543-52.
- Bang YS, Park J, Lee SY, Park J, Park S, Joo Y, Kim YU, Lee YK. Value of anterior band of the inferior glenohumeral ligament area as a morphological parameter of adhesive capsulitis. *Pain Research and Management*. 2019 May 7;2019.
- Bunker TD, Anthony PP. The pathology of frozen shoulder. A Dupuytren-like disease. *The Journal of bone and joint surgery. British volume*. 1995 Sep;77(5):677-83.
- Erdogan S, Sakha S, Shanmugaraj A, Prada C, Frank RM, Leroux T, Khan M. Comparing surgical outcomes of anterior capsular release vs circumferential release for persistent capsular stiffness. *Shoulder & Elbow*. 2022;17585732221092016.
- Sheridan MA, Hannafin JA. Upper extremity: emphasis on frozen shoulder. *Orthopedic Clinics*. 2006 Oct 1;37(4):531-9.
- Sudah SY, Menendez ME, Moverman MA, Puzitiello RN, Little D, Nicholson AD, Garrigues GE. The role of the anterior shoulder joint capsule in primary glenohumeral osteoarthritis. *JSES Reviews, Reports, and Techniques*. 2022 Oct 18.
- Baslund B, Thomsen BS, Jensen EM. Frozen shoulder: current concepts. *Scandinavian journal of rheumatology*. 1990 Jan 1;19(5):321-5.
- Warner JJ. Frozen shoulder: diagnosis and management. *JAAOS-- 205. Journal of the American Academy of Orthopaedic Surgeons*. 1997 May 1;5(3):130-20)Baslund 40.
- Joshi YS, Shridhar S, Jayaram M, Sharath UR. A Comparative Study on the Effect of Scapular Proprioceptive Neuromuscular Facilitation and Maitland Glenohumeral Mobilization Versus Scapular Mobilization and Maitland Glenohumeral Mobilization in Adhesive Capsulitis. *International Journal of Health Sciences and Research* Nov. 2020;10(11):135-43.

12. Tedla JS, Sangadala DR. Proprioceptive neuromuscular facilitation techniques in adhesive capsulitis: a systematic review and meta-analysis. *Journal of musculoskeletal & neuronal interactions*. 2019;19(4):482.
13. Mogahed HG, Mohamed NA, Wahed MH. Impact of 8-weeks combined cyriax soft tissue release and proprioceptive neuromuscular facilitation on glenohumeral rhythm in post mastectomy adhesive capsulitis. *Research Journal of Pharmacy and Technology*. 2020;13(10):4903-8.
14. Ciğercioğlu NB, Ünüvar E, Hazimlioglu P, Fırat TA, Kilinc HE, Deniz HG. Proprioceptive Neuromuscular Facilitation Training Improves Scapular Muscle Strength and Pectoralis Minor Length in Individuals with Scapular Dyskinesis. *Journal of Basic and Clinical Health Sciences*. 2022 Jan 1;6(1):238-46.
15. Balcı NC, Yuruk ZO, Zeybek A, Gulsen M, Tekindal MA. Acute effect of scapular proprioceptive neuromuscular facilitation (PNF) techniques and classic exercises in adhesive capsulitis: a randomized controlled trial. *Journal of physical therapy science*. 2016;28(4):1219-27.
16. Mishra N, Mishra A, Charaniya P. Effect of scapular proprioceptive neuromuscular facilitation on pain and disability in patients with adhesive capsulitis. *Int J Yogic Hum Mov Sports Sciences*. 2019 Jan;4(1):995-1000.
17. Yeole UL, Dighe PD, Gharote GM, Panse RS, Shweta A, Pawar PA. Effectiveness of movement with mobilization in adhesive capsulitis of shoulder: Randomized controlled trial. *Indian Journal of Medical Research and Pharmaceutical Sciences*. 2017 Feb;4(2):1-8.
18. Lee SH, Yoon C, Chung SG, Kim HC, Kwak Y, Park HW, Kim K. Measurement of shoulder range of motion in patients with adhesive capsulitis using a Kinect. *PloS one*. 2015 Jun 24;10(6):e0129398.