

## ORIGINAL ARTICLE

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## COMPARATIVE EFFECTIVENESS OF SLEEPER STRETCH AND CROSS-BODY STRETCH FOR IMPROVING POSTERIOR SHOULDER TIGHTNESS, PAIN AND FUNCTION IN PATIENTS WITH ADHESIVE CAPSULITIS – A RANDOMIZED CONTROLLED TRIAL

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## ABSTRACT

**Background:** Adhesive Capsulitis usually involves the posterior capsule tightness, which can be stretched either by sleepers or cross-body stretch techniques. The present study aimed to compare and see the effectiveness of two stretching techniques on horizontal adduction and internal rotation range of motion along with pain and disability.

**Methodology:** The study was conducted on 30 subjects diagnosed with adhesive capsulitis (12 females and 18 males) of age group 40-65 years and meeting the inclusion as well as the exclusion criteria. Subjects were divided into three groups- Cross body stretch group (Group 1), Sleeper Stretch group (Group 2), and Control group (Group 3) randomly. Both groups 1 & 2 received the intervention given to group 3 along with the different stretching techniques three times a week for four weeks. Clinical outcome measures were horizontal adduction and internal rotation as measured with a goniometer, pain intensity on a numeric pain rating scale, and shoulder disability with the help of shoulder pain and disability index.

**Result:** Data was collected at baseline and after four weeks of intervention in all three groups. Data were checked for normal distribution. For non-normally distributed data, Kruskal Wallis test-Pain (p-value> 0.419) and Function (p-value>0.665) and for normally distributed data, one-way repeated measure ANOVA-Shoulder Horizontal Adduction (p-value>0.284) and Internal Rotation (p-value>0.334) was used and the p-value was fixed to < 0.05.

**Conclusion:** Both the type of stretches were equally effective for four weeks.

**Keywords:** Adhesive Capsulitis, Posterior Shoulder Tightness, Cross-Body Stretch, Sleeper Stretch, Shoulder Horizontal Adduction.

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## INTRODUCTION

Shoulder pain has a prevalence of between 2.4% to 26%. Amongst shoulder conditions, adhesive capsulitis (AC) is very common, the prevalence of primary AC is reported to be between 2%-5.3%, and that of secondary AC owing to other diseases such as diabetes mellitus or thyroid is reported to be between 4.3%-38% [1].

AC is commonly known as a frozen shoulder. It is frequently seen in the age group of 40-65 years of age [1]. Its pathology involves contracture of the glenohumeral capsule, along with thickening and fibrosis of rotator cuff interval [2]. It leads to pain along with the stiffness in the shoulder, which may persist for more than three months [3].

Duplay described this condition as the pain of slow onset, along with difficulty in sleeping on the affected shoulder and restriction in both active as well as passive range of motion, mainly affecting elevation and external rotation. [3] The radiographic changes are usually normal in appearance [4]. The symptoms develop suddenly and have a slow recovery phase, taking up to 2-3 years [2, 4].

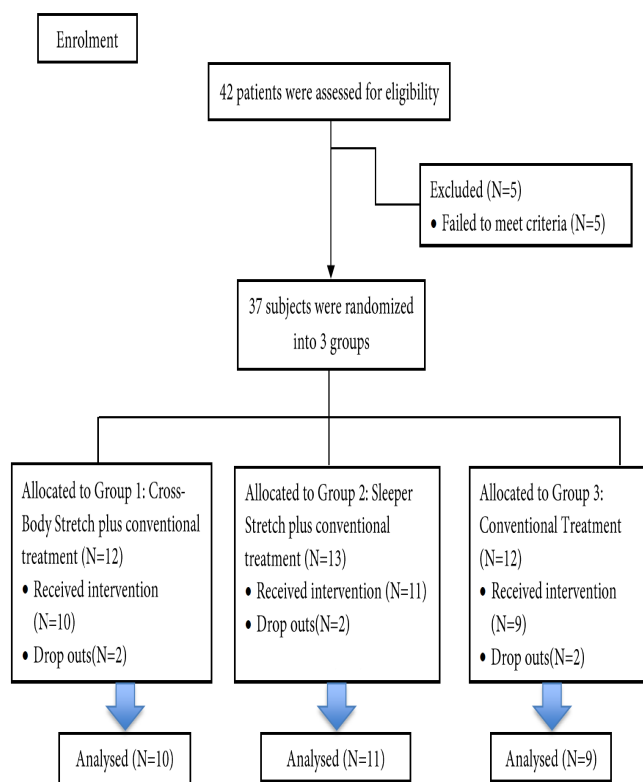
There have been multiple options for the treatment of AC, such as corticosteroid injections, modalities, active exercises, stretching exercises, joint mobilization, and surgery in the cases which do not respond to conservative management [1]. As the pathology involves capsular fibrosis stretching plays a significant role in the physiotherapeutic management of AC. Also, there is limited evidence on the use of NSAIDs for the administration, but it is generally prescribed for providing relief from pain on a short term basis [5]. Evidence suggests that the adequate flexibility of the capsule must be restored before starting a strengthening program. Capsular stretching should include all parts of capsules (anterior, inferior, and posterior). For posterior capsule stretching, different positions are adopted; however, there is a dearth of evidence concerning the effectiveness of different positions. The present study intends to compare the two most commonly used posterior capsular stretches namely "cross-body stretch" and "sleepers stretch" for improving the posterior shoulder tightness, pain as well as function in subjects diagnosed with AC.

## METHODS

The study conducted was a randomized controlled trial in which 42 patients were screened according to the inclusion as well as exclusion criteria. Thirty-seven patients met the inclusion criteria, and they were randomly allocated into group 1: cross-body stretch, group 2: sleeper stretch, and group 3: conventional treatment [Fig-1]. The randomization was done with the help of research randomizer software. Only 30 patients completed the study, and 7 were drop-outs.

The inclusion criteria of the subjects was age between 40-65 years of age, diagnosed with AC by the orthopedic surgeon, involving the gradual onset of pain, stiffness, and limiting ADLs such as sleep, grooming, dressing, and reaching activities. There is a global restriction in the glenohumeral passive ROM (~25%) in at least two planes of movement

with external rotation most limited [1]. The subjects were excluded if the passive ROM were within normal limits and passive rotations of the shoulder increases as the humerus is abducted from 45 to 90 degrees, or there is presence of radiographic glenohumeral arthritis, neurological involvement, uncontrolled diabetes and any trauma or surgery on the shoulder [6].



**Figure 1:** CONSORT Flow chart

For the measurement of pain, NPRS was used, which is an 11-point scale, ranged from 0-10. 0 is indicating "No Pain," and 10 is indicating "the worst pain imaginable." The NPRS can be graphically or verbally delivered. A value is selected by the patient itself that mostly describes the pain he/she has experienced over the past 24 hours [7]. Paul et al. (2009) concluded NPRS to be a valid, reliable, responsive outcome measure in patients with a primary complaint of shoulder pain [8].

For ROM assessment of Horizontal Adduction, the patient was in supine lying. The tested shoulder was kept in 90-degree of elevation with the elbow flexed to 90 degrees. The fulcrum of the goniometer was placed at the acromion process. At the same time, the stationary arm was kept perpendicular to the floor, and the moving arm was held parallel to the midline of the shaft of the humerus. The moving arm was taken passively into horizontal adduction until the lateral border of scapula clears off the plinth [9].

For the ROM assessment of Internal Rotation, the patient was in a supine lying position. The tested shoulder was kept into 90 degrees of abduction with the elbow flexed to 90 degrees. The fulcrum of the goniometer was placed at the olecranon process. At the same time, the stationary arm was kept perpendicular to the floor, the moving arm was aligned with distal ulna using the ulnar styloid process as a reference point, and the shoulder was internally rotated

with the palm facing the plinth [10].

For disability, SPADI was used, which is a 13-item self-reported questionnaire; it is divided into two parts: PAIN and DISABILITY. (0 indicates “No pain or No disability” and 10 indicates “Worst pain imaginable” or “so difficult that it required help”) and then the total score is calculated by averaging the pain and disability sub-scale scores. Higher the score means higher the disability [11]. Bot et al. (2004) confirmed the high validity of the SPADI and have been recommended to use in a clinical setting [12].

All the measurement of Pain, ROM, and SPADI was done by a blinded assessor who was unaware of the group allocation at 0 and 4<sup>th</sup> week. Posterior shoulder tightness was checked with the help of measuring range of horizontal adduction and internal rotation using the goniometer.

### Procedure

Group 1 Cross-body stretch was given to the patients allocated to this group along with conventional treatment. The stretch was performed by passively pulling the affected arm over to the opposite shoulder in sitting position in horizontal adduction [13]. The stretch was given for 30 seconds for 5 repetition per day.

Group 2: Sleeper stretch was given to the patients allocated to this group along with conventional treatment. The patient was in a side-lying position- lying on the affected side and does the passive internal rotation with the shoulder in abduction position with the help of the opposite arm [13]. The stretch was given for 30 seconds for 5 repetition per day.

Group 3: Conventional treatment included active-assisted ROM exercises (exercises with a wand, pendular movements, and finger ladder), dosage of these exercises was 3 sets of 10 repetitions, 3 times a day. Progression of these exercises was made with increasing range, adding weights and increasing hold time for exercises, capsular stretches, Grade 3 and 4 Maitland joint mobilization, closed kinetic chain scapular exercises, shoulder muscle strengthening and hot pack (15 minutes) [4,14,15].

All groups received intervention three times a week for a total of four weeks.

### DATA ANALYSIS

The Statistical Package of Social Science (SPSS) for Windows version 20.0 was being used for data analysis. The Shapiro-Wilk (SW) test was used to determine the normality distribution of data. The significance value of the SW test was set at ( $p < 0.05$ ), the p-value of 2 variable (Shoulder Horizontal Adduction and Shoulder Internal Rotation) came out to be less than 0.05, so they were normally distributed, and the value of the other two variables (Pain and Function) were more than 0.05. Hence, the data was not normally distributed. The analysis was done for 30 subjects. For normally distributed data, a parametric test of one-way ANOVA was used to determine the statistically significant difference between the groups, and the non-parametric Kruskal-Wallis test was used for non-normal distributed data to determine the statistically significant difference be-

tween the groups.

### RESULTS

Outcome measures were horizontal shoulder adduction, internal shoulder rotation, pain, and function. The pain was measured by NPRS, and function was measured by SPADI. No significant difference was found for age and body-mass index (BMI) between groups [Table 1].

One-way repeated measure ANOVA was being used for horizontal adduction and internal rotation ROM, and it was found out that there was no statistically significant difference between two types of stretches being used [Table 2]. However, there was an overall increase of 23.45% in the range of horizontal adduction and 23.27% in the range of internal rotation 0 weeks to 4<sup>th</sup> week.

Kruskal Wallis test was used for NPRS and SPADI, and it was found out that there was no significant difference [Table 3]. However, there was an overall improvement of 88.65% in the pain level from 0 weeks to 4<sup>th</sup> week and improvement of 84% in the functional level of the individual from 0 weeks to 4<sup>th</sup> week.

**Table 1:** Demographic Details- Mean and Standard Deviation

| Demogr-aphic Details     | Group 1 (N= 10) | Group 2 (N= 11) | Group 3 (N= 9) |
|--------------------------|-----------------|-----------------|----------------|
| Age (years)              | 54.40 ± 4.88    | 48.50 ± 6.41    | 56.11 ± 13.47  |
| BMI (kg/m <sup>2</sup> ) | 27.92 ± 4.77    | 24.83 ± 3.28    | 24.4 ± 3.24    |

**Table 2:** One-way ANOVA for Shoulder Horizontal Adduction and Shoulder Internal Rotation

| Variables                      | Significance value(p-value) |
|--------------------------------|-----------------------------|
| Change in Horizontal Adduction | 0.284 <sup>NS</sup>         |
| Change in Internal Rotation    | 0.334 <sup>NS</sup>         |

NS- non-significant

**Table 3:** Kruskal Wallis for Pain and Function

| Variables          | Significance value(p-value) |
|--------------------|-----------------------------|
| Change in Pain     | 0.419 <sup>NS</sup>         |
| Change in Function | 0.665 <sup>NS</sup>         |

NS- non-significant

### DISCUSSION

Both the stretches- cross body and sleeper stretch showed an improvement in the shoulder ROM. Though there was no statistically significant difference among the groups for all the outcome variables, but there was an improvement in all the variables from baseline as measured clinically.

There was a similar study by Cools et al. in 2012 [16] who gave cross body and sleeper stretch to one group and compared them with conventional treatment in write overhead athletes. The result was that though there was an increase in the ROM among the patients, but there was no significant difference between both the techniques and the results were also insignificant for the pain levels. The result of our study was also supported by Guney et al. (2012), who

also did not get the significant changes in the ROM in the non-athletic population with GIRD. The subjects received the intervention for one week. In our study, we gave the intervention for four weeks. Still, due to pathological changes like chronic inflammation of synovial membrane and capsular fibrosis, the change in the outcome was not observed. It appears that a longer intervention might have brought about some significant changes in outcome measures.

There has been a similar study by Johnson et al. in 2007 [17] on anterior versus posterior mobilization along with the conventional treatment, the pain scores were not statistically significant between both the groups.

The function level could not bring in a significant change in the patients because the functions of an individual depend on several factors such as pain, ROM, psychological, and different functional demands of the individual, and it varies with every individual.

The potential reason for our non-significant difference of the data could be either because it does not matter in which position we stretch the posterior capsule or may be due to the period of the intervention as four weeks' intervention was not enough to produce significant results. Moreover, due to the time constraints, the number of patients was less in the present study.

This study has been beneficial in improving the shoulder ROM, reducing pain, and improving the function in patients with AC. However, it did not prove the effectiveness of either type of stretch over another.

## CONCLUSION

This study demonstrated a positive outcome of both the types of stretches for improving the posterior shoulder tightness by enhancing the range and functional level and reducing the pain level of the patients with AC. However, there was no significant difference among the groups.

## Limitations of this study

1. A limited number of subjects in the study.
2. The duration of intervention was four weeks only.
3. No long term follow up was done.

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