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# " Effectiveness of Spencer Technique and Scapular Stabilization Exercises to improve pain and ROM in patients with Frozen Shoulder – A Comparative Study "

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## ABSTRACT

**Background** : Frozen shoulder also known as adhesive capsulitis is identified by initially painful and progresses to stiffness and decreased range of motion in the shoulder joint. The individuals gets usually affected in their mid-life which leads to difficulty in daily living activities. While various physiotherapy treatments are utilised for frozen shoulder, the comparative effect of Spencer and scapular stabilization exercises remains unknown.

**Aim** : This study aims to evaluate and compare the outcomes of these two therapeutic approaches in managing frozen shoulder.

**Methods** : A total of 40 subjects diagnosed with frozen shoulder were randomly assigned into two groups. Group A (n=20) received the Spencer technique, while Group B (n=20) underwent scapular stabilization exercises. Outcome measures included the Shoulder Pain and Disability index (SPADI), Numeric Pain and Rating scale (NPRS) and goniometric range of motion measurements. Pre and post post treatment values were statistically analyzed within and between groups, and evaluated before and after 6 weeks study period.

**Results** : Both groups reveal changes in SPADI scores, NPRS scores and range of motion after six weeks. Their performance was calculated using independent t-test (between group comparison) and paired t-test (within group comparison). An independent t-test showed significant difference between the post-test results in two groups with $P<0.05$ and a paired t-test also showed larger mean improvement in Group A > Group B. However, Group A demonstrated greater improvements in flexion, extension, abduction, internal and external rotation range, along with greater reduction in pain and disability scores, compared to Group B.

**Conclusion** : The Spencer technique was more effective than scapular stabilization exercises in enhancing clinical outcomes in frozen shoulder patients.

**Keywords**: Frozen shoulder, Spencer technique, SPADI, NPRS, ROM, Scapular stabilization exercises

## 1. INTRODUCTION

Frozen shoulder is a condition that causes pain and notable limitations in shoulder joint with unknown issue present inside the shoulder. [1] The term “frozen shoulder” was first included by Codman in 1934. He also identified noticeable reduction in forward elevation and external rotation that are the characteristics of the disease. [2] Frozen shoulder primarily influences GH joint resulting in restriction of mobility and stiffness. It develops from fibrous tissue changes and adhesions in the capsule of the joint which was initially believed to be caused by inflammation of surrounding soft tissues. [3] The progression of fibrosis leads to thicker and shortened structure of joint capsule. Simultaneously, the alterations are seen in the mechanical effects of joint capsule and ligaments. Besides this, the extrinsic muscles such as the anterior deltoid and latissimus dorsi appeared to be stiffer on an involved side than uninvolved side in patients with FS. This stiffness can increase the range of motion restriction. [4] This condition includes 2 types : primary, which is associated to diabetes and systemic condition, and secondary which can emerge after immobility or injury to the shoulder. Risk factors involves immovability and specific medical conditions, such as arthritis and diabetes. [1,3] About 2%-5% of individuals present with frozen shoulder , with a high incidence in women and middle-aged people. [1,5]. FS develops through 3 stages: the freezing phase (painful) which lasts for 2-9 months; frozen phase where stiffness is dominant, lasting around 4-12 months and the thawing phase where function slowly gets better. [6] Nevertheless, few people may present with symptoms for upto 3 years and about 15% may go through constant pain and disability. For better quality of life and to decrease symptoms, efficient treatment can be helpful. The primary symptoms involves pain during night, stiff shoulder and almost total loss of shoulder rotation movement. [1]

For managing Frozen shoulder, pain relief and restoration of function and mobility are the principal goals. The conservative management methods involves NSAIDs and analgesics which are frequently utilized during painful stage for 2-3 weeks to reduce severe pain, corticosteroids are used that aids in decreasing discomfort and inflammation through oral medications and injections mainly in the initial stages (7) and physical therapy which is essential in preventing and treating frozen shoulder.

Early manipulation or mobilization and particular exercises can reduce pain, improve extensibility of the shoulder capsule, strength of the muscles and overall mobility. [3,8]. In its management, several manual therapy techniques are utilised. Spencer approach is a seven-step method which focuses on assisting patients of frozen shoulder in reducing symptoms and enhancing their movement. This technique 's goal of relieving pain is achieved by improving blood circulation and recovering joint mobility, which allows pain- free movement. It also implies passive motions to nourish the joint and it's structures. Other associated motions like gliding helps to recover overall mobility along with improvement in shoulder mobility. Muscle spasm and pain in adjoining tissues also decreases by this manual therapy. [3] For managing frozen shoulder, scapular stabilization exercises are also important as they enhance shoulder movement by reforming scapula's control and position. While engaging in upper body activities, scapula stability is crucial for ideal shoulder functions. Weak scapula can result in shoulder issues, including impingement and tears. Therefore, during frozen shoulder rehabilitation, focus on engaging scapular muscle is also an essential part. For effective shoulder care, proper scapular positioning and control is required to maintain normal function and prevent injuries, making these exercises key to recovery. [9,10]

The patients symptoms and stage of the disease should be considered while choosing physical therapy. Surgical treatment is generally advised during "Frozen" stage. The aim of surgery is to stretch and release the tight joint capsule, using techniques like manipulation under anaesthesia or shoulder arthroscopy. [11] After a coordinated effort at conservative management fails, the surgical treatment is usually taken into consideration. There is no distinct time frame to begin the surgical process. As a basic rule, patients should have engaged in some type of physical therapy for atleast 4 to 6 months and shown little or no progress. [12]

This manuscript compares the effects of Spencer technique and Scapular stabilization exercises in improving pain and ROM among FS patients. There are several studies that displays the effect of Spencer approach and scapular stabilization exercises on pain, ROM and disability in patients with FS. However, there is no research found in the literature which compare the effects of both.

## 2. MATERIALS AND METHODS

The participants were selected based on inclusion and exclusion criteria. Forty subjects were randomly divided into Group A and Group B. Group A received Spencer technique while Group B received scapular stabilization exercises with a duration of 5times a week for 6 weeks. For comparison of results, 3 assessment tools were used before and after the treatment, SPADI for pain & disability [13], NPRS for pain and Goniometer for ROM. The shift In score between pre and post treatment in two groups was evaluated by comparing using an independent t-test . The paired t-test was performed to analyze the group’s pre and post differences. For a two-tailed (alpha2) probability (p) value, $P<0.05$ was deemed statistically significant. The study conducted in Pacific College of Physiotherapy, Pacific University after obtaining ethical approval dated 23/2/24, PMU/PMCH/IEC/2024/263.

**Procedure**

**Group A** : Spencer technique

Moist heat pack was given for 10 minutes before administering this technique. There are 7 stages of this technique. Each stage of movement was repeated for 5-7 times or until a particular movement was no longer improving. This mobilization technique was performed in a pain-free range with the patient in side-lying position.

Following are the stages that were performed :

Shoulder extension with elbow flexed – increases extension range of motion

Shoulder flexion with elbow extended while stabilizing scapula – increases flexion range of motion

Circumduction with compression – circular motion is induced with axial compression into the joint which improves 3-dimensional mobility and stability of shoulder joint.

Circumduction with traction – traction movement is induced with the clockwise and anti-clockwise circumductory movements which improves the mobility of the joint.

Shoulder abduction and internal rotation with elbow flexion – improves internal rotation range of motion.

Shoulder abduction & adduction and external rotation with elbow flexion – increases abduction, adduction and external rotation range of motion

Stretching tissue and pumping fluids – Gentle oscillatory mobilization is induced which improves accessory movements and enhance fluid exchange.

This was performed over a period of 6 weeks for 5 days a week. At the end of 6$^{th}$ week, patients were re-evaluated to determine their pain and disability level using SPADI & NPRS scale and range of motion (ROM) of each shoulder movement affected using a goniometer.

**Group B** : Scapular stabilization exercises

Moist heat pack was given for 10 minutes before administering this technique. These exercises were performed after evaluating the patient's stage of frozen shoulder i.e. freezing (painful), frozen (stiffness) and thawing (recovery stage).

Stage 1 : Freezing (Painful Stage)

Gentle, pain-free movements with emphasis on scapular positioning.

Exercises : Scapular sueezes, pendulum exercise, shoulder blade depression, wall slides, table slides

Stage 2 : Frozen (Stiffness Stage)

Controlled movements, isometric exercises, and gradual strengthening.

Exercises : Prone scapular retraction, resistance band rows, serratus anterior punches, isometric shoulder external rotation, W exercise with resistance band

Stage 3 : Thawing (Recovery Stage)

Controlled movements with increased resistance.

Exercises : Wall angels, scapular push-ups, external rotation with resistance band, Y-T-W exercise, medicine ball wall circles.

According to the inclusion criteria, the patients were selected that presented with symptoms for atleast 3 months. So, after evaluation, almost all patients exhibited stage 2 (frozen stage).

These exercises were performed 5 times a week for 6 weeks duration, about 10-15 repititions per exercise and 2-3 sets per session. At the end of 6th week, patients were re-evaluated to determine their pain and disability level using SPADI & NPRS scale and range of motion (ROM) of each shoulder movement affected using a goniometer.

**Statistical Analysis and Results**

**Table 1 : Demographic Data in Groups**

| | | **Group A** | | **Group B** | |
|---|---|---|---|---|---|
| 1. | Gender | Male | Female | Male | Female |
| 2. | Number | 8 | 12 | 10 | 10 |

| | | | |
|---|---|---|---|
| 3. | Mean Age ( Years) | 47.8 ± 5.05 | 49.85 ± 4.60 |
| 4. | Total No. | 20 | 20 |

This table shows demographic data of participants, including gender (male:female ratio) and their mean age.

**Table 2 : Analysis of Independent t-test in pre and post data interventions values of SPADI scale and NPRS between inter Group A and B**

**Table 3: Analysis of Independent t-test in pre and post data interventions values of Goniometer scale between inter group A and B**

| **Outcome Measure** | | **Mean & SD** | | **p-value** | |
|---|---|---|---|---|---|
| | | **Pre** | **Post** | **Pre** | **Post** |
| SPADI Total | Group A | 55.73 ± 4 | 37.22 ± 4.06 | 0.0461 | < 0.0001 |
| | Group B | 52.913 ± 4.62 | 44.38 ± 4.69 | | |
| NPRS | Group A | 6.3 ± 0.73 | 3.45 ± 0.51 | 0.0232 | 0.0066 |
| | Group B | 6.85 ± 0.74 | 4.2 ± 1.05 | | |

| **S.No.** | **Sample Group N = 20** | **Measuring Scale (Goniometer)** | **Mean** | | **t - value** | | **P value** | |
|---|---|---|---|---|---|---|---|---|
| | | | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| 1. | Group A | Flexion | 94.15 ± 7.66 | 116.65 ± 8.71 | 1.337 | 2.87 | 0.189 | 0.0067 |
| | Group B | | 97.85 ± 9.72 | 108.25 ± 9.77 | | | | |
| 2. | Group A | Extension | 32.5 ± 6.23 | 44.3 ± 6.09 | 0.796 | 1.36 | 0.43 | 0.181 |
| | Group B | | 34.15 ± 6.85 | 41.55 ± 6.66 | | | | |
| 3. | Group A | Abduction | 86.65 ± 7.41 | 110.65 ± 7.32 | 1.594 | 4.816 | 0.119 | <0.0001 |
| | Group B | | 82.65 ± 8.42 | 98.65 ± 8.40 | | | | |
| 4. | Group A | Internal Rotation | 45.6 ± 5.91 | 63.95 ± 7.08 | 1.79 | 5.48 | 0.081 | <0.0001 |
| | Group B | | 41.65 ± 7.89 | 51.15 ± 7.67 | | | | |
| 5. | Group A | External Rotation | 33.75 ± 5.38 | 55.05 ± 5.7 | 0.397 | 4.595 | 0.69 | <0.0001 |
| | Group B | | 34.5 ± 6.50 | 46.65 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | ± 5.86 | | | | |

Table 2,3 presents the comparison of pre and post test values of SPADI scale, NPRS and goniometer (specifically of flexion, extension, abduction, internal rotation and external rotation) between inter Group A & B, showing the mean, standard deviation, t-value and p-value.

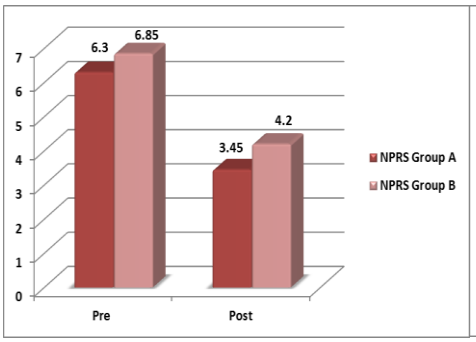
**Table 4 : Analysis of Paired t-test in between pre and post data intervention values of SPADI scale and NPRS within Group A & Group B**

| Subscale Descriptive Data | **Paired t-test (Group A)** | | | | **Paired t-test (Group B)** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (%)** | **Mean Diff.** | **t-value** | **P-value** | **Mean (%)** | **Mean Diff.** | **t-value** | **P-value** |
| **SPADI** | | | | | | | | |
| Pre SPADI Total | 55.73 | 18.51 | 58.906 | < 0.0001 | 52.91 | 8.53 | 42.658 | < 0.0001 |
| Post SPADI Total | 37.22 | | | | 44.38 | | | |
| Pre NPRS | 6.3 | 2.85 | 26.045 | < 0.0001 | 6.85 | 2.65 | 24.217 | < 0.0001 |
| Post NPRS | 3.45 | | | | 4.2 | | | |

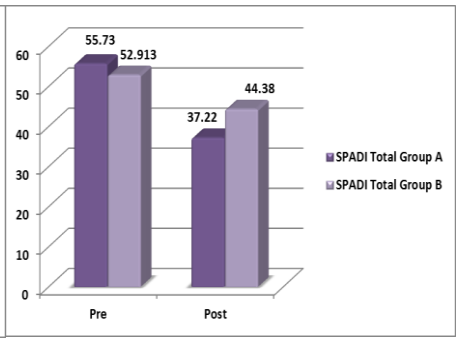
**Table 5 : Analysis of Paired t-test in between pre and post intervention values of Goniometer scale within Group A & Group B**

| **Subscale Descriptive Data** | **Paired t-test (Group A)** | | | | **Paired t-test (Group B)** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mean** | **Mean Diff.** | **t-value** | **P-value** | **Mean** | **Mean Diff.** | **t-value** | **P-value** |
| Pre Flexion | 94.15 | -22.5 | -44.533 | < 0.0001 | 97.85 | -10.4 | -36.53 | < 0.0001 |
| Post Flexion | 116.65 | | | | 108.25 | | | |
| Pre Extension | 32.5 | -11.8 | -25.526 | < 0.0001 | 34.15 | -7.4 | -14.815 | < 0.0001 |
| Post Extension | 44.3 | | | | 41.55 | | | |
| Pre Abduction | 86.65 | -24 | -52.973 | < 0.0001 | 82.65 | -16 | -33.248 | < 0.0001 |
| Post Abduction | 110.65 | | | | 98.65 | | | |
| Pre Internal Rotation | 45.6 | -18.35 | -38.901 | < 0.0001 | 41.65 | -9.5 | -40.412 | < 0.0001 |
| Post Internal Rotation | 63.95 | | | | 51.15 | | | |
| Pre External Rotation | 33.75 | -21.3 | - 67.18 | < 0.0001 | 34.5 | -12.15 | -22.13 | < 0.0001 |
| Post External Rotation | 55.05 | | | | 46.65 | | | |

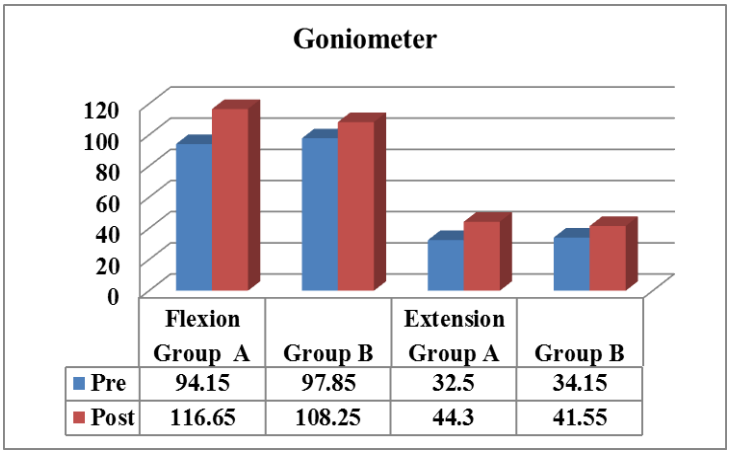
Table 4,5 shows the paired t-test data of SPADI, NPRS and Goniometer scale in between pre and post intervention values within Group A & Group B, including mean, mean difference, t-value and p-value.




Graph 1

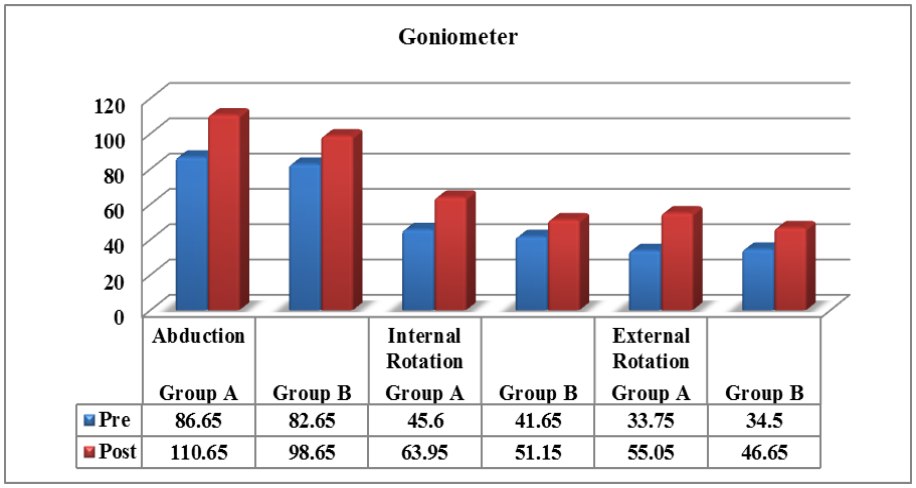



Graph 2




| | Flexion Group A | Group B | Extension Group A | Group B |
|---|---|---|---|---|
| Pre | 94.15 | 97.85 | 32.5 | 34.15 |
| Post | 116.65 | 108.25 | 44.3 | 41.55 |

Graph 3




| | Abduction Group A | Group B | Internal Rotation Group A | Group B | External Rotation Group A | Group B |
|---|---|---|---|---|---|---|
| Pre | 86.65 | 82.65 | 45.6 | 41.65 | 33.75 | 34.5 |
| Post | 110.65 | 98.65 | 63.95 | 51.15 | 55.05 | 46.65 |

Graph 4

**Discussion :** Many of times restricted shoulder mobility, reduced functional ability and pain are the results of frozen shoulder. This study looked at the effects of these two approaches- scapular stabilization exercises (SSE) and the spencer technique. Both mobilization techniques results in observable improvements in shoulder function and in relieving pain.

At the same time, the greater improvement and pain relief is produced by the Spencer Technique. This happens because the Spencer Technique directly aims on providing effects on joint structure and nearby soft tissues. On the other hand, the SSEs chiefly acts on promoting neuromuscular control and proper alignment of posture, this takes longer time to give mobility results.

Studies that has been done prior strengthen these observations. Phansopkar et al. (2023) laid a groundwork for significantly

improving ROM and reduction in pain and disability over many times. (3) Also Jivani et al. (2021) found that Spencer Technique was more effective than maitland mobilization. (14) At the same time, Gulwani (2020) emphasized that SSEs helped in improving daily function and shoulder movement when incorporated with physiotherapy. (15) Karnawat et al. (2023) also showed that SSEs helps in pain reduction and improved external rotation of shoulder. (16) The accumulated evidence shows that the impact of SSEs are beneficial when incorporated with other joint mobilization or strengthening regimes. On the contrary, the independent use of spencer technique gives faster and significant improvements.

Therefore there is a need of more research and studies to assess the continue independent effectiveness of SSEs in FS.

## 3. CONCLUSION :

The study revealed that both the Spencer technique and scapular stabilization exercises contributed significantly to enhancing shoulder mobility and alleviating pain. When comparing the two, the Spencer technique yielded marginally superior results in terms of improving joint range of motion and reducing pain levels. In contrast, scapular stabilization exercises proved to be more effective in enhancing overall functional stability of the shoulder. Based on the outcome measures assessed, participants in Group A achieved better overall results compared to those in Group B.

## 4. LIMITATIONS

Small sample size

Short duration of study

Absence of follow-up assessments.

## 5. RECOMMENDATIONS

Larger sample size should be included.

The time duration can be increased

Follow-up assessments could be incorporated.

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