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Immediate Effect of Scapular Proprioceptive Neuromuscular Facilitation Versus Capsular Stretch Combined with Positional Release on Pain, Range of Motion and Shoulder Function in Patients with Frozen Shoulder: A Comparative Study

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ABSTRACT

Background: Frozen shoulder is a common musculoskeletal condition characterized by pain and progressive restriction in the shoulder's range of motion, significantly impacting daily activities and functional independence. Physical therapy, including Proprioceptive Neuromuscular Facilitation (PNF), Positional Release Therapy (PRT), and capsular stretching, is frequently employed to address this condition.
Objective: This study aimed to compare the immediate effects of scapular PNF combined with PRT versus capsular stretching combined with PRT on pain, range of motion (ROM), and shoulder function in patients with frozen shoulder.
Methods: A clinical study was conducted with frozen shoulder patients. Participants were assigned to two groups: Group A received scapular PNF with PRT, and Group B received capsular stretching with PRT. Pain was assessed using the Visual Analog Scale (VAS), ROM was measured with a goniometer, and shoulder function was evaluated using the Shoulder Pain and Disability Index (SPADI) before and after the intervention.
Results: Both groups demonstrated significant improvements in pain reduction, ROM, and shoulder function. However, Group B, treated with capsular stretching and PRT, showed greater improvements in pain reduction and shoulder function**.**
Conclusion: Both treatment approaches are effective in managing frozen shoulder, but capsular stretching combined with PRT may provide more significant benefits in reducing pain and improving shoulder function.

Introduction

Frozen shoulder, also known as adhesive capsulitis, is a common musculoskeletal disorder characterized by progressive shoulder pain and marked restriction of both active and passive range of motion (ROM) of the glenohumeral joint. The condition significantly affects functional independence and the ability to perform activities of daily living such as reaching, dressing, and grooming. It is estimated to

affect approximately 2–5% of the general population, with a higher prevalence among individuals aged 40–65 years and particularly among women.[1]

The pathophysiology of frozen shoulder involves inflammation followed by fibrosis and contracture of the glenohumeral joint capsule, particularly in the axillary recess. This capsular thickening and adhesions result in progressive restriction of movement, especially external rotation, abduction, and forward flexion.[2] As the joint capsule becomes stiff and painful, patients often develop compensatory movement patterns involving the scapulothoracic joint, which further alters normal shoulder biomechanics.[3]

Conservative management is considered the first line of treatment for frozen shoulder. Physiotherapy interventions such as stretching, manual therapy, strengthening exercises, and neuromuscular facilitation techniques are commonly used to restore joint mobility, reduce pain, and improve functional outcomes.[4] Among these interventions, Proprioceptive Neuromuscular Facilitation (PNF) techniques have gained attention due to their ability to enhance neuromuscular coordination, increase flexibility, and improve joint stability through stimulation of proprioceptors.[5] Scapular PNF patterns are particularly useful in improving scapulothoracic rhythm, which plays an essential role in normal shoulder movement.

Another commonly used intervention is capsular stretching, which directly targets the contracted joint capsule responsible for restricted movement in frozen shoulder. Capsular stretching aims to restore the extensibility of the capsule and improve joint mobility, leading to enhanced functional performance.[6] Studies have reported that joint-specific capsular stretching can significantly improve ROM and reduce pain in patients with adhesive capsulitis.[7]

In addition, Positional Release Therapy (PRT) is a gentle manual therapy technique that places the affected tissues in a position of comfort to reduce muscle spasm and pain. This technique works by decreasing abnormal proprioceptive activity from muscle spindles, allowing the tissues to relax and restoring normal movement patterns.[8]

Although these interventions have individually demonstrated effectiveness in managing frozen shoulder, limited research has compared the immediate effects of scapular PNF combined with positional release therapy and capsular stretching combined with positional release therapy. Understanding their immediate effects could help clinicians select the most appropriate intervention to provide rapid pain relief and improve mobility in patients with frozen shoulder.

Therefore, the present study aimed to compare the immediate effects of scapular PNF with positional release therapy and capsular stretching with positional release therapy on pain, range of motion, and shoulder function in patients with frozen shoulder.

Materials and Methods

Study Design

A clinical comparative study was conducted to evaluate the immediate effects of two physiotherapy interventions in patients with frozen shoulder.

Study Duration

The study was carried out over a period of six months.

Study Setting

Participants were recruited from the outpatient department of Parul Sevashram Hospital, Vadodara.

Study Population

Patients diagnosed with stage II or stage III frozen shoulder by an orthopaedic specialist were considered for inclusion.

Sample Size

A total of 42 participants were screened based on the inclusion and exclusion criteria. After screening, participants were allocated into two groups:

- Group A (n = 21): Scapular PNF + Positional Release Therapy
- Group B (n = 21): Capsular Stretch + Positional Release Therapy

Inclusion Criteria

- Male and female patients aged 40–65 years
- Diagnosed with stage II or III frozen shoulder
- Pain duration of at least 3 months
- Passive shoulder ROM restricted to 50–75% of normal range

Exclusion Criteria

- History of upper limb injury in the previous 6 months
- Presence of neurological disorders
- Other musculoskeletal conditions of the upper limb
- Radiographic evidence of osteoarthritis or other structural lesions
- Systemic diseases affecting joint mobility

Outcome Measures

Pain

Pain intensity was measured using the Visual Analog Scale (VAS). The scale ranges from 0 (no pain) to 10 (worst imaginable pain).

Range of Motion

Shoulder ROM was measured using a universal goniometer for the following movements:

- Flexion
- Extension
- Abduction
- Adduction
- Internal rotation
- External rotation

Shoulder Function

Functional disability was assessed using the Shoulder Pain and Disability Index (SPADI). The SPADI includes:

- Pain subscale (5 items)
- Disability subscale (8 items)

Scores range from 0 to 100, with higher scores indicating greater disability.

Intervention

Group A: Scapular PNF + Positional Release Therapy

Participants received scapular PNF patterns including:

- D1 Flexion pattern
- D2 Flexion pattern

Each movement was performed with manual resistance and repeated 5–10 repetitions, held for approximately 5 seconds.

Following PNF, Positional Release Therapy was applied by positioning the shoulder in a comfortable and pain-free position for 60–90 seconds to reduce muscle tension and pain.

Group B: Capsular Stretch + Positional Release Therapy

Participants in Group B received capsular stretching techniques targeting the shoulder joint capsule:

- External rotation stretch
- Forward flexion stretch

Each stretch was held for 30–45 seconds and repeated 5–10 times.

After stretching, Positional Release Therapy was applied for 30–60 seconds to promote muscle relaxation.

Statistical Analysis

Data were analysed using IBM SPSS version 27.0. Descriptive statistics were used to summarize demographic data.

The Shapiro-Wilk test was used to assess normality. Since the data were not normally distributed, non-parametric tests were applied:

- Wilcoxon Signed Rank Test for within-group comparison
- Mann-Whitney U Test for between-group comparison

The level of significance was set at $p < 0.05$.

Results

A total of 42 participants completed the study. Both groups consisted of male and female participants with a balanced gender distribution.

Normality testing indicated that the data were not normally distributed; therefore, non-parametric statistical tests were used.

Within-Group Analysis

Both Group A (Scapular PNF + PRT) and Group B (Capsular Stretch + PRT) demonstrated statistically significant improvements in:

- Pain (VAS scores)
- Shoulder ROM (flexion, extension, abduction, internal rotation, and external rotation)
- Shoulder function (SPADI scores)

The Wilcoxon signed-rank test showed significant pre- to post-treatment improvements in both groups ($p < 0.05$).

Between-Group Analysis

Between-group comparison using the Mann-Whitney U test revealed that Group B demonstrated greater improvement in pain reduction and shoulder function compared to Group A.

However, improvements in ROM were observed in both groups without statistically significant differences between the groups for all movements.

Discussion

The present study aimed to compare the immediate effects of scapular PNF combined with positional release therapy and capsular stretching combined with positional release therapy in patients with frozen shoulder.

The findings demonstrated that both interventions significantly reduced pain and improved shoulder ROM and functional ability. These findings are consistent with previous studies that reported beneficial effects of physiotherapy interventions in managing adhesive capsulitis.[9]

Scapular PNF techniques are known to facilitate neuromuscular control and improve scapulothoracic coordination. By activating proprioceptors and enhancing muscle recruitment patterns, PNF techniques help restore normal movement patterns and reduce joint stiffness.[10] In the present study, patients receiving scapular PNF showed improvements in shoulder mobility and pain reduction, indicating the effectiveness of neuromuscular facilitation techniques in frozen shoulder rehabilitation.

Capsular stretching, on the other hand, directly targets the contracted joint capsule responsible for movement restriction in adhesive capsulitis. Previous research has demonstrated that joint-specific capsular stretching can improve shoulder mobility by increasing capsular extensibility and reducing intra-articular stiffness.[11] The results of the present study showed greater improvements in pain and shoulder function in the capsular stretching group compared to the scapular PNF group.

Positional Release Therapy was applied in both groups to reduce muscle tension and pain. This technique promotes relaxation of hypertonic muscles and decreases abnormal proprioceptive activity, which may contribute to the immediate improvement observed after treatment.[12]

The combined use of stretching or neuromuscular facilitation techniques with positional release therapy may therefore provide both mechanical and neurophysiological benefits, contributing to improved clinical outcomes.

Overall, the results suggest that although both interventions are effective in improving pain and mobility, capsular stretching combined with positional release therapy may produce greater immediate improvements in pain reduction and functional ability in patients with frozen shoulder.

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Ethical Approval

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CTRI Registration

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