International Journal of Science and Healthcare Research
[Indexed, Peer-Reviewed Journal]
Vol. 10; Issue: 2; April-June 2025
Website: ijshr.com
Original Research Article *ISSN: 2455-7587*

Effectiveness of Positional Release Technique Versus Spencer Muscle Energy Technique in Management of Chronic Frozen Shoulder

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DOI: https://doi.org/10.52403/ijshr.20250211

ABSTRACT

Background and Objective: Frozen shoulder or adhesive capsulitis, is a common condition characterized by pain and stiffness in the shoulder joint, most commonly affecting individuals aged 40–60 years, particularly women and those with diabetes. Frozen shoulder significantly limits daily activities and reduces quality of life. Despite its prevalence, there is limited evidence comparing specific techniques. This study aims to fill this gap by evaluating the effectiveness of two manual therapy techniques: Spencer Muscle Energy Technique (SMET) and Positional Release Technique (PRT). The objective of the study was to evaluate and compare the effectiveness of SMET and PRT in reducing pain and improving quality of life in patients with chronic frozen shoulder.
Method: A prospective experimental study was conducted on 30 participants diagnosed with chronic frozen shoulder. Subjects were selected through simple random sampling and divided into two groups of 15. Group A received SMET and Group B received PRT, alongside interventions both groups received conventional therapy, 3 times a week for 4weeks. Outcome measures Visual Analog Scale (VAS) and Shoulder Pain and Disability Index (SPADI) scores were noted down both before and after the intervention.
Results: Baseline characteristics including age, gender, and BMI were comparable between the groups. Pre-treatment VAS and SPADI scores showed no significant differences, indicating similar symptom severity. Post-treatment, Group A (SMET) showed a significant improvement compared to Group B (PRT). The significance level was set at $p<0.05$ for all tests.
Conclusion: The present study indicates that Spencer Muscle Energy Technique proved to be more effective than Positional Release Technique in reducing pain and improving quality of life in individuals with chronic frozen shoulder, as measured by VAS and SPADI scores.

Key Words: Frozen shoulder, Spencer muscle energy technique, Positional release technique, Pain, Quality of life, VAS, SPADI.

INTRODUCTION

Frozen shoulder, also known as adhesive capsulitis or periarthritis of the shoulder, is a condition characterized by pain and stiffness in the shoulder joint. The term "frozen shoulder" was first introduced by Dr. Codman in 1934 to describe this shoulder problem, noting its gradual onset, stiffness, and the associated difficulty in sleeping on the affected side. Codman observed significant limitations in shoulder movement, particularly in forward elevation and external rotation, which are key features of frozen shoulder. Prior to Codman's observations, the condition was recognized and termed "Periarthritis" by Duplay in 1872. Later, in 1945, Naviesar coined the term "Frozen shoulder" to further describe this condition.[1] Research studies have revealed a prevalence rate of frozen shoulder ranging from 2% to 5% in the general population. This condition tends to be more common in individuals over the age of 40, and notably, about 70% of patients diagnosed with frozen shoulder are women.[2]

Furthermore, frozen shoulder is observed more frequently among individuals with diabetes, particularly type 1 diabetes. In this population, the prevalence of frozen shoulder is nearly 11%, which is significantly higher compared to individuals without diabetes. Epidemiologically, frozen shoulder affects approximately 8.2% of men and 10.1% of women of working age. The condition is most prevalent in individuals aged in their fifth and sixth decades of life, with the peak occurrence in the mid-50s. Onset before the age of 40 is uncommon, and women are more frequently affected than men. Frozen shoulder typically occurs unilaterally and tends to be self-limiting, although the prognosis varies, and the course can be prolonged, lasting over two to three years in some cases. Additionally, in 6 to 17% of patients, the condition can affect the other shoulder within five years.[3]

The defining feature of frozen shoulder is the contracture of the glenohumeral capsule. Findings include loss of the synovial layer of the capsule, adhesions of the axillary to itself and to the anatomical neck of the humerus, and overall decreased capsular volume particularly, in frozen shoulder, the rotator interval, a structure for glenohumeral joint stability, becomes thickened and fibrotic. This interval is bordered by the supraspinatus tendon above, subscapularis tendon below, trans humeral ligament laterally, and coracoid process medially, and it contains the coracohumeral ligament (CHL), biceps tendon, and glenohumeral capsule.[4]

The underlying pathology involves fibroproliferative tissue fibrosis, where fibroblasts produce predominantly type I and type III collagen and transform into myofibroblasts, which exhibit a smooth muscle phenotype. This process is accompanied by inflammation, new blood vessel formation (neoangiogenesis), and new nerve growth (neoinnervation) within the shoulder joint capsule. These changes lead to fibrotic contractures of the shoulder capsule, resulting in clinical stiffness.[5] The underlying pathophysiology begins with the involvement of the coracohumeral ligament, which forms the roof of the rotator cuff interval. This ligament contraction is the initial factor that restricts external rotation of the arm, typically the first motion affected in the early stages of the condition. As frozen shoulder improves, the glenohumeral joint capsule undergoes thickening and contraction. This progression further restricts movement in all directions, leading to significant stiffness and reduced shoulder mobility. Histopathological studies of the glenohumeral capsule in cases of frozen shoulder have demonstrated a significant rise in the number of fibroblasts, myofibroblasts, and inflammatory cells such as B-lymphocytes, mast cells, and macrophages. These increases contribute to the thickening and tightening of the joint capsule, which result in the limited mobility and stiffness characteristic of frozen shoulder.[6]

In frozen shoulder, movement restriction follows a specific pattern due to thickening and shrinking of the shoulder joint capsule. Initially, external rotation range of motion (ROM) is restricted, followed by limitations in shoulder abduction and internal rotation. Shoulder flexion and extension are typically less affected because the primary thickening and contracture of the capsule occur on the inferior (lower) and anterior (front) aspects of the shoulder joint. A capsular pattern of restriction refers to a joint's pain and movement limitations in a specific ratio, typically seen in conditions like arthritis or after prolonged immobilization. In Frozen shoulder, Understanding the differences between capsular and non-capsular movement restrictions is vital for diagnosing and managing frozen shoulder. In a capsular pattern, the entire joint capsule is affected, and in the shoulder, this typically presents as the most limited external rotation, moderately limited abduction, and limited internal rotation. This pattern reflects the progression of frozen shoulder due to inflammation and fibrosis causing uniform tightening of the joint capsule and ligaments. Conversely, a non-capsular pattern does not follow this sequence and involves movement restrictions that may result from ligament or tendon injuries, muscle imbalances, or joint pathologies like arthritis, bursitis, or labral tears.[7]

Frozen shoulder is classified into two main categories based on its pathophysiology

1. **Idiopathic or Primary Frozen Shoulder**

This type of frozen shoulder occurs spontaneously without an apparent cause. It progresses through four distinct clinical stages, providing a useful framework for monitoring and assessing the condition:

Painful Phase: Characterized by moderate pain and progressive movement restriction. Histologically, there is hypertrophic synovitis with increased blood vessel formation (hypervascularity), but the appearance of the capsular tissue remains normal. Symptoms typically last less than 3 months.

Freezing Stage: Symptoms gradually worsen over 3-9 months. Histologically, there is perivascular synovitis and deposition of collagen leading to scarring.

Frozen Stage: Predominantly characterized by stiffness. Symptoms persist for 10-14 months. Histologically, there is dense and hypercellular collagenous tissue formation within the capsule.

Thawing Stage: Symptoms involve minimal pain with gradual improvement in movement. Duration of symptoms lasts 14-24 months. Histologically, there is further formation of dense collagenous tissue associated with scar formation in the capsule.[8]

2. **Trauma/Immobilized or Secondary Frozen Shoulder**

This type of frozen shoulder is associated with trauma, cardiovascular disease, diabetes, hemiparesis, or shoulder surgery that results in prolonged immobilization of the shoulder joint. Prolonged immobilization leads to pain, stiffness, muscle spasm, and muscle atrophy, culminating in a frozen shoulder. Unlike primary frozen shoulder, there is no distinct phase development observed in secondary frozen shoulder.[7]

The etiology of frozen shoulder is not completely understood, but several possible risk factors have been identified: Diabetes mellitus (with prevalence up to 20%), Stroke, Thyroid disorder, Shoulder injury, Cancer.[9]

Frozen shoulder involves an interaction between the neuroendocrine and neuroimmune systems, with critical roles played by hormonal influences, sympathetic nervous system activity, cytokines, and neurogenic inflammation. The neuroendocrine system, which integrates the functions of the nervous and endocrine systems, significantly affects the inflammatory and fibrotic processes in the shoulder joint. Hormones such as cortisol, released in response to stress, can modulate inflammatory responses, and dysregulation of cortisol and other stress-related hormones may contribute to the chronic inflammation seen in frozen shoulder.[10]

Several treatment approaches for frozen shoulder have been documented in the literature which includes oral medicine, corticosteroid injections, exercises, joint mobilization, acupuncture, manipulation, nerve blocks, and surgery. In addition, physiotherapy interventions such as thermal therapy, therapeutic modalities such as interferential therapy, ultrasound therapy, therapeutic exercises, stretching, graded mobilization, and manipulative techniques such as high thrust velocity, low amplitude, end-range-mid-range mobilization, Spencer muscle energy technique, mobilization with movement in the shoulder, and positional release technique are used to treat frozen shoulder.[2]

Muscle Energy Technique (MET) is a commonly used manual therapy procedure aimed at reducing pain and increasing joint Range of Motion (ROM) by breaking joint adhesions, releasing muscle tone, stretching tight muscles and fascia. During MET, the therapist applies resistance at the pain-free physiological barrier, and the patient performs a controlled isometric contraction, holding it for few seconds in a specific direction. This process helps in breaking adhesions within joints, releasing muscle tension, and facilitating improved muscle function and ROM.[7]

The Spencer Muscle Energy Technique (MET) is a standardized series of shoulder treatments commonly utilized in osteopathic manipulative therapy. It focuses on mobilizing and improving the function of the glenohumeral (shoulder) and scapulothoracic (shoulder blade to rib cage) joints, it aids in the improvement of restricted joint's function while also having a good impact on other emotional, social, and cognitive domains. The Spencer Muscle Energy technique is an articulatory method consisting of seven steps used to treat shoulder limitations associated with frozen shoulder. This technique involves specific procedures aimed at stretching contracted muscles, ligaments, and joint capsules using passive, smooth, and rhythmic motions. The force is typically applied at the end range of motion to effectively stretch tissues and promote joint circulation and lymphatic flow.[2]

Dr. Lawrence H. Jones, an osteopathic physician, was the first to publish a map of tender points locations and treatment positions. Jones1964, proposed that when a muscle is strained by a sudden unexpected force, its antagonist attempts to stabilize the joint, resulting in a counter strain of the muscle in a resting or shortened position. The Positional Release Technique (PRT), originally known as strain-counter strain, is an indirect osteopathic manipulative technique is used to address dysfunction by identifying tender points (TPs) and placing the body in a position of comfort (POC). SCS is a soft tissue technique that passively treats musculoskeletal pain, impaired range of motion, and somatic dysfunction by influencing the cellular function of the tissues being treated. [11]

Even though both Positional Release Technique and Spencer Muscle Energy Technique give better effectiveness in treating patients with chronic Frozen shoulder, there is no much relevant studies has been conducted which compares both the techniques. Thus, the aim of the study was to compare between the efficacy of Spencer muscle energy technique and positional release technique on pain and quality of life in patients with chronic Frozen shoulder.

METHODOLOGY

A prospective experimental study was conducted to evaluate and compare the effectiveness of Spencer Muscle Energy Technique (SMET) and Positional Release Technique (PRT) in the management of chronic frozen shoulder among adults aged 40–60 years, including both male and female subjects. A total of 30 subjects diagnosed with chronic frozen shoulder of at least three months' duration were selected using simple random sampling and allocated into two equal groups (Group A and Group B, n=15 each). Group A received Spencer MET while Group B received Positional release technique, with interventions administered three times per week over a period of four weeks.

The inclusion criteria include adults aged 40–60 years with shoulder ROM restrictions, painful active and passive movements, primary or secondary frozen shoulder, pain at night, and sleep disturbances.[12,13] Exclusion criteria included a history of trauma, systemic inflammatory conditions, prior shoulder surgeries, dislocations, fractures, neurological disorders, joint hypermobility, complications like, osteoporosis, malignancies, rotator cuff injuries, tendon calcification, and any pain or disorder involving the cervical spine or upper limb joints on the affected side.[7,14,15] Procedure of Randomization was performed using a chit method, with each participant selecting from 30 identical folded slips marked "Group A" or "Group B," ensuring unbiased group allocation. Both groups were also prescribed standardized home exercise programs during the intervention period. As the study includes human subjects Ethical Clearance is obtained from the Ethical Committee of KTG College of Physiotherapy and KTG hospital, Bangalore as per the ethical guidelines for Bio-medical research on human subjects, 2000 ICMR, New Delhi.

The materials used in the study included a consent form, pen, pillow, examination table, Visual Analog Scale chart, Shoulder Pain and Disability Index chart, and gloves.

Procedure of Pre-Intervention:

Group A (n=15)

The subjects in the group A were explained about the Spencer muscle energy technique and its effect, before applying the technique the outcome measure Visual Analog Scale (VAS), Shoulder pain and Disability Index (SPADI) was taken.

Spencer Muscle Energy Technique: In this group subjects were treated with Spencer Muscle Energy Technique and Conventional Exercises.

Position of the patient: Side-lying position with affected shoulder uppermost.

Position of the therapist: Standing in front of the patient stabilizing the superior aspect of the shoulder girdle, the fixed shoulder girdle provided a resistant structure against which to stretch the soft tissues around the glenohumeral articulation as the arm was used as a long lever. The therapist then supports the wrist and forearm of the patient and does passive, smooth, rhythmic back and forth motion of arm and is carried to the extreme limit permitted by the contracted muscles, ligaments, and the capsule of the shoulder.[16]

Procedure: There are 7 steps in Spencer Muscle Energy Technique

1) **SHOULDER EXTENSION:**

Therapist one hand stabilizes the acromioclavicular joint and other hand extend the patient shoulder in a horizontal plane with the elbow flexed position until you reach the end range where resistance was felt. Resistance was provided on elbow joint and ask the patient to push against the resistance of their maximum effort (50 % of maximum contraction) and should maintain the contraction for 10 sec. The shoulder joint was returned to the neutral position. The same procedure was repeated on new restricted barrier position for 10 times.[7]

2) **SHOULDER FLEXION:**

Therapist one hand stabilized the acromioclavicular joint and other hand flexed the patient shoulder in a horizontal plane with the elbow extended until end range where resistance was felt. Apply resistance to the distal forearm and patient was instructed to push (50 % of maximum contraction) against the resistance and should maintain the contraction for 10 sec. The shoulder joint was returned to neutral position. The same procedure was repeated on new restricted barrier position for 10 times.[7]

3) **SHOULDER CIRCUMDUCTION WITH COMPRESSION:**

Therapist one hand stabilized the acromioclavicular joint and other hand abducted the patient shoulder in horizontal plane with elbow on flexed position. Use the Patient elbow joint to gently rotate the humerus in both clockwise and anticlockwise directions with slight compression on shoulder joint for 15 times each. Gradually increase the size of the circular motion with each rotation.[7]

4) **SHOULDER CIRCUMDUCTION WITH TRACTION:**

Therapist one hand stabilized the acromioclavicular joint and other hand abducted the patient shoulder in horizontal plane with elbow on extended position. Traction force was applied on glenohumeral joint while rotating the humerus in clockwise and anticlockwise direction for 15 times each. Gradually increase the size of the circular motion with each rotation.[7]

5) A) SHOULDER ABDUCTION WITH EXTERNAL ROTATION:

Therapist one hand stabilized the acromioclavicular joint and the other hand is placed on the patient elbow joint to provide resistance. The patient grasps the therapist forearm that is stabilizing the AC joint. Patient must exert upward (cephalad) pressure on elbow to increase abduction till end range was felt. The patient was instructed to push (50% of maximum contraction) against the therapist’s resistance at the restricted barrier and maintain the contraction for 10seconds. The shoulder joint was returned to neutral position. The same procedure was repeated on new restricted barrier position for 10times.[17]

B) SHOULDER ADDUCTION WITH EXTENAL ROTATION:

Therapist one hand stabilized the acromioclavicular joint while patient grabbed on therapist same forearm and other hand abduct the arm on 90 degrees in horizontal plane and provided resistance on elbow joint for adduction force. The patient was instructed to push (50% of maximum contraction) against the therapist’s resistance at the restricted barrier and maintain the contraction for 10seconds. The shoulder joint was returned to neutral position. The same procedure was repeated on new restricted barrier position for 10times.[17]

6) SHOULDER INTERNAL ROTATION:

The patient elbow was flexed, and the hand was positioned on the lower back within the available range of motion. The therapists one hand stabilizes the AC joint and the other hand or two fingers apply resistance on the elbow joint while the arm was in internally rotated position. Now tell the patient to exert forward (anterior) pressure on the elbow to increase internal rotation until the end range was felt. Now instruct the patient to push against the therapist resistance at the restricted barrier and maintain the contraction for 10seconds. The shoulder joint was returned to the neutral position after each contraction. The procedure was repeated for 10times.[17]

7) SHOULDER DISTRACTION:

Patient lies with their shoulder and elbow extended, resting on the therapist's shoulder. The therapist clasps their hands around the patient’s shoulder, now the therapist applies gentle downward and upward motions on the deltoid muscles. These movements help to enhance the mobility of the deltoid muscles and the shoulder ligaments. It was continued for 30 sec and repeated for 10times.[17]

Group B (n=15)

The subjects in the group B was explained about the Positional release technique and its effect, before applying the technique the outcome measure Visual Analog Scale (VAS), Shoulder pain and Disability Index (SPADI) was taken.

Positional Release Technique: In this group subjects were treated with Positional Release Technique and Conventional Exercises.

Position of the patient:

(a) - Supine lying with shoulder abduction and elbow in 90^0 positions.

(b) – Supine lying with shoulder extension an internal rotation.

Position of the therapist: Standing or sitting beside the patient.

Procedure: As a therapist should begin the intervention by palpating the shoulder, mainly concentrating on the tissues involved in abduction, internal and external rotation. Now the therapist must use two finger pads to locate tender points and monitor fasciculation. Positioning is very important, hence, move the shoulder with gentle rotation to find the position of comfort (POC). The POC is the position where the patient experiences the least pain. Once found the POC the therapist must maintain the position until fasciculation decreases significantly or stops, usually for 90 seconds. Now slowly release the tissue or joint, noting any sensations like tingling or numbness, Continue this treatment with three sessions per week for 4 weeks.[11]

Conventional Therapy:

Conventional Therapy will also be given as common intervention for both Groups A and

B. It includes;

Codman's Pendular Exercises: Patient were asked to bend forward with unaffected forearm on a table or bench, shoulder should be relaxed, then gently swings affected side arm forwards, and backwards continue this motion until patient feel a mild to moderate stretch. Patients were asked to perform this exercise for 10 times. Ensure that the exercise remains pain free throughout the movements.[18]

Finger ladder Exercises: Patient standing facing wall ladder or finger ladder attached to it. Patients were asked to place the affected hand over the ladder at a low level. Then slowly climb upward on the ladder using fingers, moving hand up until it reached the top and then slowly down back to the starting position. Repeat this exercise for 10 times.[18]

Stretching exercises: External rotators and flexors were stretched by stretching in hand-behind the-back. Patients were asked to maintain each stretch for 30 seconds, with 10 sec rest in between and repeat these stretches for 10 times. Self-stretching exercises was given for improving abduction, flexion, external rotation, internal rotation, and horizontal adduction.[18]

Wall Exercises for Scapular Stabilization:

Wall Press Ups: Stand facing a wall and lift your arms forwards, elbows straight, so your hands just reach the wall. Draw your shoulder blades back and down to set the scapula. Bend your elbows slowly to bring your chest towards the wall, like you are doing a press up. Then push back through your hands to come back up, maintaining the scapular squeeze throughout. Repeated for 10 times.[19]

Pulley Exercise:

Patient standing holding a rope, ask the patient to swing the rope alternatively up and down, tell the patient to maintain straight posture, lightweight rope should be used to avoid putting too much pressure on shoulder. This exercise helps to improve flexion and extension movements of shoulder. Patient were asked to perform this exercise for 5 minutes every day.[18]

GROUP A Intervention -Spencer Muscle Energy Technique

Fig 1: Step 1- Shoulder Extension

Fig 2: Step 2 - Shoulder Flexion

Fig 3: Step 3 - Shoulder Circumduction with Compression

Fig 4: Step 4- Shoulder Circumduction with Traction

Fig 5: Step 5 (A)- Shoulder Abduction with External Rotation

Fig 6: Step 5 (B)- Shoulder Adduction with External Rotation

Fig 7: Step 6- Shoulder Internal Rotation

Fig 8: Step 7 -Shoulder Distraction

GROUP B Intervention – Positional Release Technique

Fig 9: (a) - Supine lying with shoulder abduction and elbow in 90^0 position

Fig 10:(b) – Supine lying with shoulder extension and internal rotation.

Outcome Measures:

Pre and post scores of all the patients was assessed using following outcome measures:

Visual Analog Scale (VAS):

The Visual Analog Scale (VAS) is a widely used tool for assessing pain intensity, first introduced by Hayes and Patterson in 1921.Pain was measured by using VAS scale in cm. VAS is a tool with a 10-cm ruler and a marker that the patient indicates their pain level by placing a marker on the line which ranges from "no pain" to "worst pain" at the other. While zero means 'no pain' and ten means 'worst pain or severe pain.' VAS is a valid and reliable method for measuring both chronic pain and acute pain intensity. VAS provides a simple yet effective means of measuring subjective experience of pain and has been established as a valid and reliable tool in a range of clinic and research applications.[20]

The Shoulder Pain and Disability Index (SPADI):

The Shoulder Pain and Disability Index (SPADI) was developed to measure current shoulder pain and disability in an outpatient setting. The SPADI contains 13 items that assess two domains, a 5-item subscale that measures pain and an 8-item subscale that measures disability. The pain dimension consists of five questions regarding the severity of an individual's pain Each item is scored 0 to 10 in which zero means 'No pain' and 10 means 'Worst imaginable pain' with the total reported as either a raw score (0–50) or as a percent- age score. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper- extremity use. Each item is scored 0 to 10 in which zero means 'No difficulty' and 10 means 'so difficult it requires help' with the total reported as either a raw score (0–80) or as a percent- age score. Originally the sum of marked items or maximal possible score X100 with atleast 11 of 13 completed items necessary for the total score (30). 0 best and 100 worst.[13]

RESULTS AND INTERPRETATION

Data analysis was performed using SPSS software version 26.0, with descriptive statistics to calculate the mean and standard deviation for each group. The normality of the data was assessed using the Shapiro-Wilk test. For between-group and within-group comparisons, inferential statistics including the Mann-Whitney U test, Wilcoxon Matched Pair Test, and Chi-Square test were applied. Tables and graphs were generated using MS-Excel and MS-Word software, with a significance level set at $p<0.05$ for all tests.

Table 1: Patient's Baseline characteristics compared for homogeneity by unpaired t test

	GROUP A	GROUP B	P VALUE
	Mean ± SD	Mean ± SD	
AGE (Years)	54.00±6.25	52.34±7.57	0.224
BMI (kg/m^2)	24.90±3.95	24.86±4.76	0.976
GENDER (%)	M:48.3% F:51.7%	M:51.7% F:48.3%	
PRE-VAS (Cm)	5.48±1.24	5.63±0.97	0.615
PRE SPADI (%)	54.00±13.99	53.086±13.34	0.798

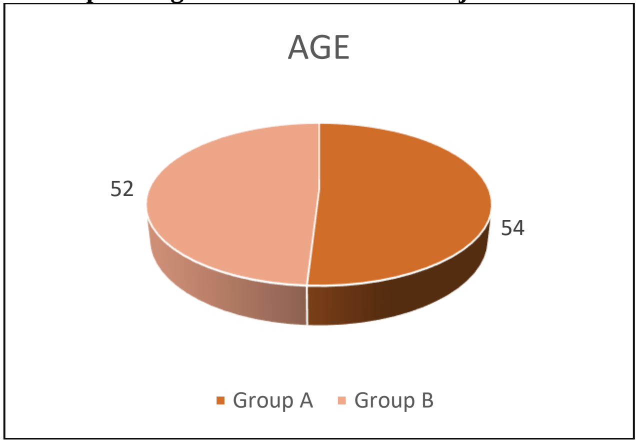
P<0.05 is statistically significant (Shapiro Wilkinson test, p<0.05)

Mann Whitney U test did not report statistically significant difference in mean age between the groups (p>0.05).

Mann Whitney U test did not report statistically significant difference in mean BMI between the groups (p>0.05).

CHI SQUARE test did not report statistically significant difference in frequency in gender between the groups(p>0.05)

Graph 1: Age Distribution of the subjects studied



Graph 2: Gender distribution of the subjects studied

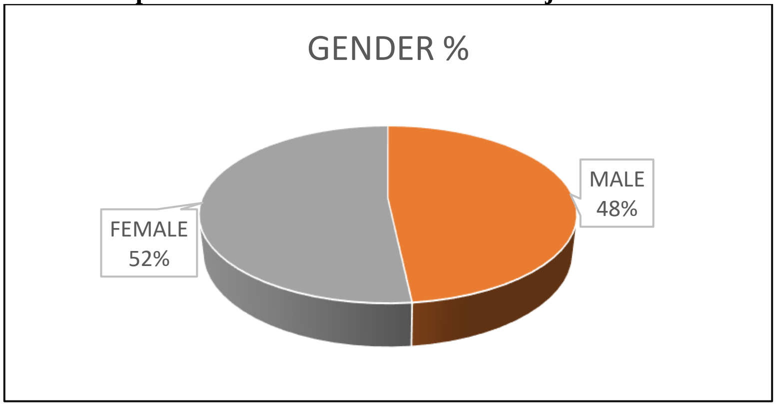


TABLE 2 & 3: INTERGROUP COMPARISON OF OUTCOME MEASURES BETWEENTHE GROUPS

Group A: Spencer Muscle Energy Technique

	Age	WT	VAS Pre Post		SPADI PainPRE POST		SPADI Dis PRE POST		SPADI Total PRE POST	
Mean	54.00	51.4	5.48	1.27	54.93	26.40	75.33	52.40	121.27	78.80
SD	6.25	9.07	1.24	0.88	13.99	5.53	3.19	3.01	4.05	6.23

Group B: Positional Release Technique

	Age	WT	VAS PRE POST		SPADI Pain PRE POST		SPADI Dis PRE POST		SPADI Total PRE POST	
Mean	52.34	68.07	5.63	3.67	53.86	39.07	73.33	70.13	117.20	109.20
SD	7.57	6.71	0.97	0.64	13.34	4.36	4.57	4.08	6.57	6.57

Interpretation: Age Group A has a slightly lower mean age (54 years) compared to Group B (52.34 years), but the standard deviation is higher in Group A, indicating more variability. Weight Group B participants have a higher mean weight (68.07 kg) compared to Group A (54.47kg). VAS Scores Group A shows a significant reduction in VAS scores from a mean of 5.48 (pre-treatment) to 1.27 (post-treatment), indicating a substantial decrease in perceived pain. Group B also shows a reduction in VAS scores, but the decrease is less pronounced, from a meanof 5.63 (pre-treatment) to 3.67 (post-treatment). SPADI Pain Component Group A: The mean SPADI pain score decreased from 54.93 to 26.40. Group B: The mean SPADI pain score decreased from 53.87 to 39.07. SPADI Disability Component Group A the mean SPADI

disability score decreased from 75.33 to 52.40. Group B The mean SPADI disability score decreased from 73.33 to 70.13. SPADI Total Group A shows a substantial reduction in the total SPADI score from 121.27 to 78.80. Group B shows a smaller reduction in the total SPADI score from 117.20 to 109.20. Summary Group-A Spencer Muscle Energy Technique demonstrated a significant reduction in pain and disability scores post-treatment, with higher overall effectiveness compared to Group B.
Group B Positional Release Technique also showed improvements, but to a lesser extent compared to Group A.

TABLE 4: INTRAGROUP COMPARISON OF VAS, SPADI BY USING PAIRED T-TEST.

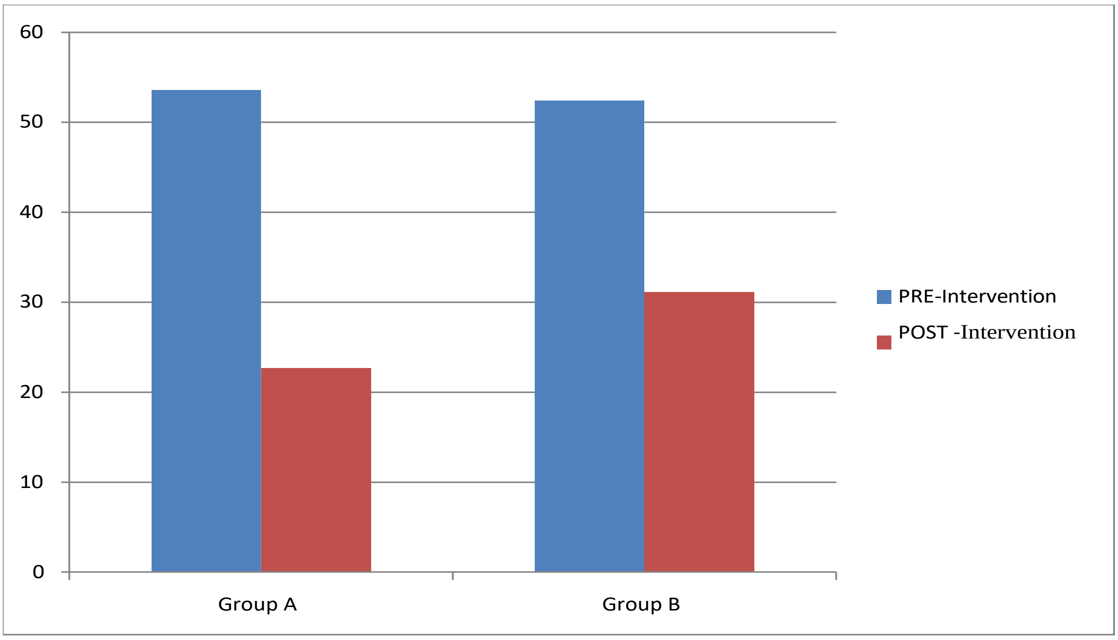
	Group A			Group B		
	Pre	Post	P value	Pre	Post	P value
	(Mean ± SD)	(Mean ± SD)		(Mean ± SD)	(Mean ± SD)	
VAS	5.48±1.28	3.16±1.05	0	5.61±1.01	4.06±1.07	0
SPADI	53.62±14.41	22.67±9.96	0	52.43±13.92	31.14±12.00	0

TABLE 5: INTER GROUP COMPARISON OF VAS & SPADI

Variable	Group A Pre-post diff	Group B Pre-post diff	P value
	Mean ± SD	Mean ± SD	
VAS	2.315±0.99	1.55±0.72	0.002
SPADI	30.95±8.71	21.28±7.43	0

The results indicate that Group A (Spencer Muscle Energy Technique) demonstrated significantly greater improvements compared to Group B (Positional Release Technique). The pre-post difference in VAS scores was 2.315 (SD = 0.99) for Group A, compared to 1.55 (SD = 0.72) for Group B, with a p-value of 0.002, indicating a statistically significant reduction in pain for Group A. Similarly, the SPADI scores showed a pre-post difference of 30.95 (SD = 8.71) for Group A, compared to 21.28 (SD = 7.43) for Group B, with a p-value of 0, also indicating a statistically significant greater reduction in shoulder pain and disability for Group A. These findings suggest that the Spencer Muscle Energy Technique is more effective in reducing pain and disability than the Positional Release Technique.

GRAPH 3: INTRA & INTER GROUP COMPARISON OF SPADI



GRAPH 4: INTRA & INTER GROUP COMPARISON OF VAS BY USING PAIRED T-TEST.

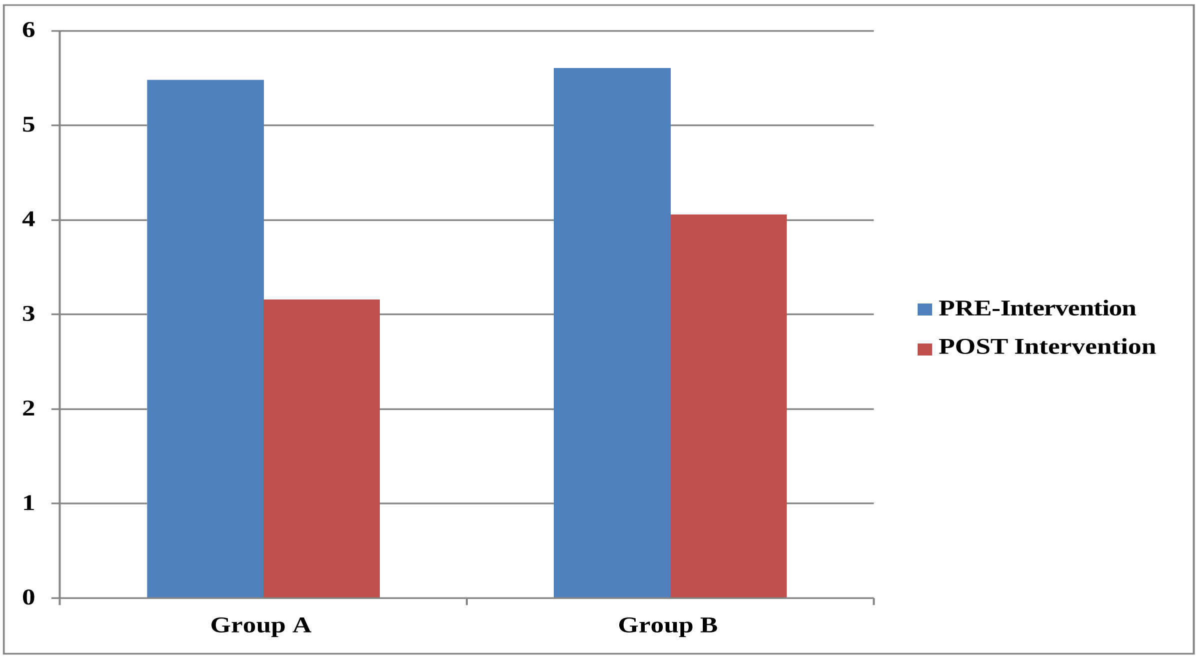


TABLE 5: COMPARISON OF SPENCER MUSCLE ENERGY TECHNIQUE AND POSITIONAL RELEASETECHNIQUE

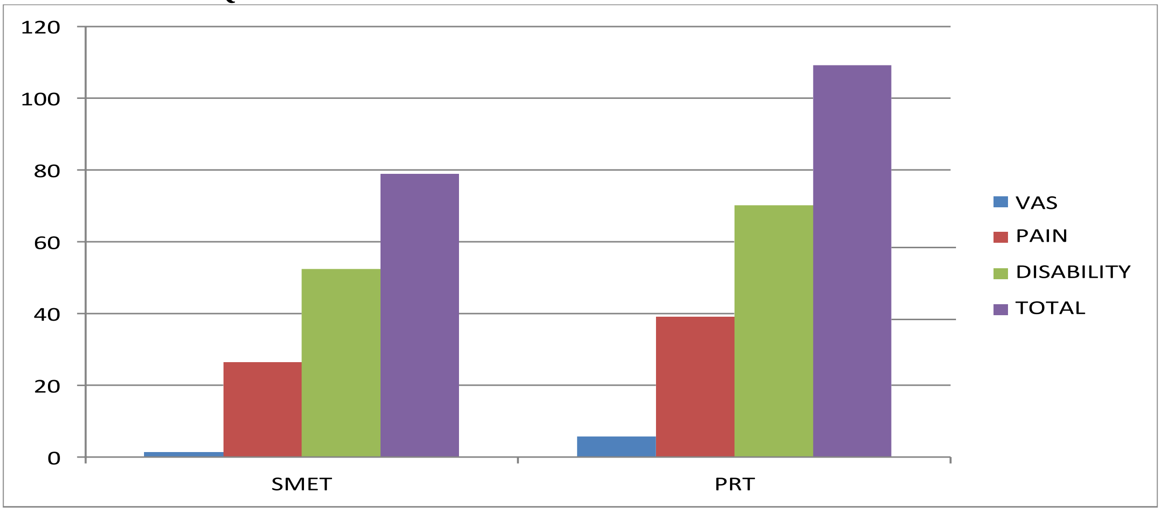
	VAS		SPADI Pain		SPADI Disability		SPADI Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
SMET	1.27	0.88	26.40	5.53	52.40	3.75	78.80	6.23
PRT	5.67	1.84	39.07	4.36	70.13	4.08	109.20	6.57

This table provides a concise comparison of the mean and standard deviation values for post- treatment VAS, SPADI Pain Component, SPADI Disability Component, and SPADI Total for both the Spencer Muscle Energy Technique group and the Positional Release Technique group.

VAS (Post-Treatment) Mean Group A (Spencer Muscle Energy Technique) has a significantly lower mean (1.27) compared to Group B (Positional Release Technique) (5.67). Standard Deviation Group A has a lower variability (0.88) compared to Group B (1.84). SPADI Pain Component (Post-Treatment) Mean: Group A shows a lower mean (26.40) compared to Group B(39.07). Standard Deviation: Group A has a higher variability (5.53) compared to Group B (4.36). SPADI Disability Component (Post-Treatment) Mean: Group A has a lower mean (52.40) compared to Group B (70.13). Standard Deviation: Group A has slightly lower variability (3.75) compared to Group B (4.08). SPADI Total (Post-Treatment) Mean: Group A has a lower mean (78.80) compared to Group B (109.20). Standard Deviation Group A has slightly lower variability (6.23) compared to Group B (6.57).

The descriptive statistics show that the Spencer Muscle Energy Technique (Group A) is more effective in reducing pain and disability post-treatment compared to the Positional Release Technique (Group B). Group A consistently has lower mean values and, in most cases, lower standard deviations for post-treatment measures, indicating greater effectiveness and less variability in outcomes.

GRAPH 5: COMPARISON OF SPENCER MUSCLE ENERGY TECHNIQUE AND POSITIONAL RELEASE TECHNIQUE



RESULTS

The study compared the effectiveness of Spencer Muscle Energy Technique (Group A) and Positional Release Technique (Group B) using various measures. Baseline characteristics, including age, BMI, and gender distribution, showed no significant differences between the groups ($p > .05$). Group A had a mean age of 54.00 years (SD = 6.25) and BMI of 24.90 (SD = 3.95), while Group B had a mean age of 52.34 years (SD = 7.57) and BMI of 24.86 (SD = 4.76). Pre-treatment VAS scores were similar between groups, with Group A at 5.48 (SD = 1.24) and Group B at 5.63 (SD = 0.97). Post-treatment, Group A showed significantly greater improvements: VAS scores decreased to 1.27 (SD = 0.88) compared to 5.67 (SD = 1.84) in Group B; SPADI Pain Component decreased to 26.40 (SD = 5.53) from 54.93 (SD = 13.99) in Group A, while Group B decreased to 39.07 (SD = 4.36) from 53.87 (SD = 13.34); SPADI Disability Component dropped to 52.40 (SD = 3.75) from 75.33 (SD = 3.19) in Group A, compared to a decrease to 70.13 (SD = 4.08) from 73.33 (SD = 4.57) in Group B; and SPADI Total scores fell to 78.80 (SD = 6.23) from 121.27 (SD = 4.05) in Group A, versus a reduction to 109.20 (SD = 6.57) from 117.20 (SD = 6.57) in Group B. The results indicate that the Spencer Muscle Energy Technique is significantly more effective in reducing pain and disability than the Positional Release Technique. Statistical analyses, including the paired t-test and Mann-Whitney U test, confirmed the significance of these findings ($p < .05$).

DISCUSSION

The present study aimed to compare the effectiveness of the Spencer Muscle Energy Technique and the Positional Release Technique in the management of chronic frozen shoulder. Chronic frozen shoulder is a condition characterized by pain and restriction in the range of motion, severely impacting patients' quality of life. It predominantly impacts individuals aged 40-60, especially women and those with comorbidities like diabetes. While SMET involves active muscle contractions and targeted movements to enhance shoulder mobility and reduce pain, PRT focuses on placing the affected muscles or joints in a position of comfort to relieve pain and improve function. Despite the widespread of both techniques there is limited comparative research evaluating their effectiveness. This study addresses this gap by providing a comparative analysis, thereby offering valuable insights to clinicians for decision making in managing chronic frozen shoulder. The systematic reviews and studies discussed provide a comprehensive overview of the efficacy of various physiotherapy interventions for managing frozen shoulder, highlighting the effectiveness of techniques like joint mobilization, muscle energy techniques (MET), proprioceptive neuromuscular facilitation (PNF), and specific approaches such as the SMET.

The systematic review by Shinde et al. (2023) provides evidence supporting the effectiveness of physiotherapy in managing frozen shoulder. The review highlighted that physiotherapy interventions improve quality of life and reduce pain, in patients with frozen shoulder.[21] Nakandala et al. (2021) further corroborated the importance of physiotherapy in managing frozen shoulder, that certain techniques and modalities significantly alleviate pain, improve ROM, and enhance functional status. Their comprehensive review of 33 studies provides a perspective on the efficacy of physiotherapy interventions.[22] Cavalleri et al. (2020) emphasize the necessity of therapeutic approaches based on the patient's symptoms, the stage of the condition, and specific treatment targets. Their recommendation of a comprehensive approach combining mobilization techniques at the end-range of motion with therapeutic exercises is particularly effective.[23] Krishnapandian et al. (2023) compared the Niel-Asher Technique with PRT, finding both effective in reducing pain and enhancing ROM and functional ability in patients with frozen shoulder. However, the Niel-Asher Technique showed superior results in pain relief and functional improvement.[24] Chandrasekaran et al. (2021) found that Mulligan mobilization technique outperformed PRT in improving shoulder ROM and functional ability, suggesting the need for selection of manual therapy techniques based on individual patient needs.[25] Deepika et al. (2024) demonstrated that the SMET was more effective than PNF in reducing pain and disability.[17] Phansopkar and Qureshi (2024) confirmed the effectiveness of the SMET in improving pain, ROM, and functional disability.[26] Gries et al. (2018) and Lee (2015) validated the use of the VAS as a reliable and sensitive tool for measuring pain levels in clinicals, particularly for conditions like frozen shoulder. VAS demonstrates better sensitivity and specificity compared to other scales, preferred choice for assessing pain intensity.[27,28] Venturin et al. (2023) and Breckenridge and McAuley (2011) highlighted the SPADI as a reliable and valid tool for assessing shoulder pain and disability. [12,13]

The study results demonstrate that the SMET was more effective than the PRT in reducing shoulder pain and disability. Both techniques, when combined with conventional exercises, improved the VAS and SPADI scores, but SMET showed significantly greater improvements. The baseline characteristics of the participants in both groups were comparable, ensuring the necessary for a fair comparison. The mean age of participants in Group A (SMET) was slightly higher (54.00 years) than in Group B (PRT) (52.34 years), but the difference was not statistically significant (p=0.224). Similarly, the Body Mass Index (BMI) was almost identical between the groups (p=0.976). Gender distribution was balanced, and pre-treatment VAS and SPADI scores showed no significant differences, indicating that both groups started with a similar level of severity in symptoms. Group A (SMET) exhibited a reduction in post-treatment VAS scores from 5.48 to 1.27 and SPADI scores, in pain from 54.93 to 26.40 and disability components from 75.33 to 52.40, compared to Group B (PRT), which saw less reductions in VAS from 5.63 to 3.67 and SPADI scores, particularly in pain from 53.87 to 39.07 and disability components from 73.33 to 70.13. The significance level was set at $p<0.05$ for all tests. Descriptive statistics were calculated to determine the mean and standard deviation within each group. The normality of the data was assessed using the Shapiro- Wilkinson test. Inferential statistics, including the Mann-Whitney U test, Wilcoxon Matched PairTest, and Chi-Square test, were used for between-group and within-group comparisons. These findings suggest that both techniques Group A and Group B are beneficial in managing in chronic frozen shoulder, but the superior outcomes in Group A indicate that SMET was more beneficial in clinical settings for patients experiencing shoulder pain and disability.

CONCLUSION

The study concluded that the Spencer Muscle Energy Technique (SMET) is more effective than the Positional Release Technique (PRT) in treating chronic frozen shoulder, as evidenced by significantly greater reductions in pain and disability scores. Both groups had comparable baseline characteristics, including age, BMI, and gender, which ensured that the differences in outcomes could be attributed to the treatments themselves. While both interventions led to improvements, SMET resulted in more pronounced and statistically significant reductions in VAS) scores. Additionally, significant improvements were observed in the SPADI scores, specifically in the Pain, Disability, and Total scores, for the SMET group compared to the PRT group. This suggests that SMET offers superior pain relief and functional improvement, making it as an effective treatment for enhancing the quality of life compared to PRT in patients with chronic frozen shoulder. While both techniques are beneficial in managing chronic frozen shoulder. SMET was found to be particularly effective in reducing pain and improving patients' quality of life in patients with chronic frozen shoulder.

LIMITATIONS OF THE STUDY

- The study included a relatively small sample size of 30 subjects which may limit the generalizability of the results.
- Less duration of the study.
- There is lack of control group.
- The effectiveness of the Positional Release Technique and Spencer Muscle Energy Technique may depend significantly on the therapist's expertise and consistency in application. Variability in technique execution could affect the results.
- Subjective outcome measures.

Recommendation for future research

- Further study should aim to include a larger and more diverse sample size to improve the generalizability of the findings.
- Conducting studies with a longer follow-up period would allow for a more comprehensive assessment of treatment outcomes over time.
- Further study should consider standardizing the application of the techniques to minimize variability in treatment execution.
- Further study is needed to be done to measure the effectiveness of these treatment approaches on other outcome measures.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Likhitha S R, Syed Rais Akhter Rizvi. Effectiveness of positional release technique versus spencer muscle energy technique in management of chronic frozen shoulder. *International Journal of Science & Healthcare Research.* 2025; 10(2): 87-102. DOI: *https://doi.org/10.52403/ijshr.20250211*

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