



EFFECT OF SPENCER MUSCLE ENERGY TECHNIQUE ON PAIN, RANGE OF MOTION AND SHOULDER DISABILITY AMONG SUBJECTS WITH GRADE II PERI ARTHRITIS SHOULDER - RANDOMIZED CONTROL STUDY

Physiotherapy

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ABSTRACT

Introduction: Peri-arthritis shoulder (PA shoulder) is a common condition characterized by pain, stiffness, and reduced ROM in the shoulder without internal pathology. **Aim & Objective:** This study aimed to assess the effect of Spencer Muscle Energy Technique (SMET) on pain, ROM, and shoulder disability in individuals with grade II PA shoulder. **Methodology:** A randomized controlled trial was conducted with 30 participants who were divided into control and experimental groups. The control group received conventional physiotherapy, while the experimental group received SMET in addition to conventional physiotherapy over six weeks. ROM was measured with a goniometer, and pain/disability was measured using the Shoulder Pain and Disability Index (SPADI). **Results:** Both groups showed significant improvements ($p < 0.05$), with the experimental group demonstrating more significant improvements. **Conclusion:** The study concludes that SMET combined with conventional physiotherapy is more effective in reducing pain and improving shoulder function in grade II PA shoulder patients.

KEYWORDS

Spencer Muscle Energy Technique, peri-arthritis shoulder, conventional physiotherapy, Shoulder Pain and Disability Index.

INTRODUCTION:

Peri-arthritis shoulder (PA shoulder), also known as adhesive capsulitis or "frozen shoulder," is a condition characterized by progressive pain, stiffness, and limited shoulder movement. It typically develops without any internal shoulder pathology^[1]. Initially described by Duplay and later termed "frozen shoulder" by Codman, it involves the thickening and tightening of the shoulder capsule, which adheres to the bone a phenomenon described as adhesive capsulitis by Neviaser^[2]. The condition is classified into primary (idiopathic) and secondary types, with the primary type having an unclear cause and a four-stage progression (pre-adhesive, freezing, frozen, thawing)^[3] and the secondary type caused by trauma, immobilization, or diseases like diabetes^[4].

PA shoulder affects 2-5% of the general population and up to 30% of individuals with diabetes. It primarily affects women, particularly those aged 40 and above. External rotation is the most restricted movement, followed by abduction and internal rotation, while flexion and extension are typically less affected. Risk factors include age, diabetes, trauma, immobilization, and thyroid disorders^{[5],[6]}.

Treatment includes both surgical (e.g. capsular release, nerve blocks) and non-surgical methods (e.g., physiotherapy, medications, injections) to alleviate pain and improve ROM.^[7]

Physiotherapy modalities, including cryotherapy, thermal therapies, TENS, IFT, ultrasound, LASER therapy, pulsed electromagnetic field therapy, and acupuncture, are commonly used to alleviate pain and stiffness in PA shoulder^[8]. Treatment often includes active and passive ROM exercises, capsular stretching, Codman exercises, strengthening techniques, muscle energy technique for shoulder girdle, and PNF techniques, with patient education and home exercises^[9].

Muscle energy techniques (MET), including Spencer Muscle Energy Technique (SMET), are manual therapies that use voluntary isometric contractions to promote muscle relaxation and improve flexibility^[10]. SMET is a seven-stage osteopathic technique designed to enhance shoulder joint mobility and function, reduce inflammation, and promote tissue healing.^[11]

METHODOLOGY

Materials:

Universal goniometer, hydrocollator packs, SPADI questionnaire, treatment couch.

Methods:

This randomized controlled study was conducted at SVIMS College of Physiotherapy and BIRRD Hospital, Tirupati, over a six-month period. Thirty participants were selected through simple random sampling and divided into two groups: control group (Group A) and experimental group (Group B). The study duration was six weeks.

Inclusion Criteria:

Participants aged 45-60 years, with unilateral dominant side PA shoulder of grade II and who are willing to participate in the study.

Exclusion Criteria:

Subjects with shoulder infections, osteoporosis, malignancies, h/o shoulder injuries or surgeries, structural deformities, neurological changes, rotator cuff injuries, shoulder dislocation, subluxation, osteoarthritis and rheumatoid arthritis.

Study Procedure:

Subjects who met inclusion and exclusion criteria were enrolled after providing informed consent, as approved by institutional ethics board. Clinical examination was conducted, and demographic data (age, gender, marital status, education, occupation, problem duration, site, diabetes, and surgical history) was collected. Thirty subjects were randomly divided into two groups: control (Group A) and experimental (Group B).

Pre-test measurements in both groups included shoulder flexion, abduction, and external rotation ROM with goniometer in supine position, and shoulder pain intensity and disability using the SPADI are measured.

Both groups received 20 minutes of moist heat therapy with conventional physiotherapy, while Group B received glenohumeral joint movements via SMET along with conventional physiotherapy.

Group A (control group):**Conventional physiotherapy treatment:**

Group A received 20 minutes of moist heat and was advised to do Codman's pendular exercise, shoulder wheel exercise, wall slider exercise, finger ladder exercise, stick/ wand exercise, rope or pulley exercises, scapular stabilization exercises under supervision after demonstrations. Exercise prescription: 10 repetitions per set, 3 sets per session, 2 sessions per day, 3 days a week for 6 weeks with 2 minutes rest interval in between in each set.

Group B (experimental group):

Group B subjects were given 20 minutes of moist heat application by hydrocollator packs and were done with conventional physiotherapy protocol.

SMET Procedure:

Subject lies on non-affected side, with the affected shoulder elevated. The therapist stabilizes the shoulder girdle with the proximal hand and applies force to shoulder's barrier in 7 distinct movements with the distal hand. Shoulder extension with elbow flexion, Shoulder flexion with elbow extension, circumduction with compression, circumduction with distraction, abduction with internal rotation, adduction with external rotation and glenohumeral pump are done with the subject employ their muscle energy technique against small resistance provide by the therapist for 3-5 seconds throughout each movement. Each exercise is done for 3-5 times with rest periods for 3 weekly sessions on alternate days for 6 weeks.

OUTCOME MEASURES:

Shoulder flexion, abduction and external rotation ROM measured by Universal goniometer. Shoulder pain and disability was scored using SPADI questionnaire.

After completing 6 weeks of treatment post-test measurements of shoulder ROM and SPADI score were taken and sent for statistical analysis.



Figure 1- SMET for GH distraction in abduction (GH pump)

RESULTS

The data were analysed using SPSS 25.0. The paired sample t-test was applied to compare pre- and post-test values. A p-value of <0.01 was considered statistically significant.

Demographic Distribution:

Age: The mean age of Group A was 52.8±3.75 years, while Group B had a mean age of 53.7±4.75 years.

Gender: Group A had 60% females and 40% males, while Group B had 53.34% females and 46.66% males.

Results for ROM & SPADI:

Table 1: Pre And Post-test Mean And Standard Deviation Values For Shoulder ROM (Flexion, Abduction, External Rotation) and SPADI For Both Groups

PARAMETER	GROUP	N	PRE-TEST (Mean ± S.D.)	POST-TEST (Mean ± S.D.)	MEAN DIFFERENCE	t-VALUE (P-VALUE)
SHOULDER FLEXION	GROUP A	15	108 ± 17.40	125.3 ± 17.3	-16.67	0.010031 (0.000)
	GROUP B	15	108 ± 17.40	144 ± 17.64	-36	5.03624 (0.000)

SHOULDER ABDUCTION	GROUP A	15	98 ± 21.36	114.6 ± 21.6	-16.67	0.042884 (0.000)
	GROUP B	15	97.6 ± 18.59	138.6 ± 19.5	-41	2.44442 (0.000)
SHOULDER EXTERNAL ROTATION	GROUP A	15	37 ± 11.14	47 ± 11.77	-10	0.023882 (0.000)
	GROUP B	15	38 ± 10.14	56.33 ± 9.90	-18.33	2.707 (0.000)
SPADI	GROUP A	15	74.04 ± 3.94	57.99 ± 2.87	16.05	3.676 (0.000)
	GROUP B	15	72.93 ± 2.86	47.84 ± 4.03	25.10	6.316 (0.000)

Table 2: Comparison Of Post-test Mean Values Of Shoulder ROM & Pain And Disability Between The Groups.

Parameter	GROUP	Mean	SD	Mean Difference	t-value	P-value
Shoulder Flexion	Group A	125.33	17.368	18.67	0.0185	(0.000)
	Group B	144.00	17.647			
Shoulder Abduction	Group A	114.6	21.66	24.07	0.0086	(0.000)
	Group B	138.67	10.14			
External Rotation	Group A	47	11.77	9.33	0.0479	(0.000)
	Group B	56.33	9.904			
SPADI	Group A	57.994	2.8759	10.1534	5.626	(0.000)
	Group B	47.8406	4.0309			

Shoulder Flexion:

Table-1 shows changes in shoulder flexion before and after treatment in both groups. In Group A, the pre-test mean of 108 ± 17.40 increased to 125.3 ± 17.3, with a mean difference of -16.67. In Group B, the pre-test mean of 108 ± 17.40 increased to 144 ± 17.64, with a mean difference of -36. Both groups showed statistically significant improvements, with Group B demonstrating a more significant change. The t-value of 0.0185 and p-value of 0.00 indicate a statistically significant difference (p < 0.001) between the groups at a 99% confidence level.

Shoulder Abduction:

In Group A, the pre-test mean of 98 ± 21.36 increased to 114.6 ± 21.6, with a mean difference of -16.67. In Group B, the pre-test mean of 97.6 ± 18.59 increased to 138.6 ± 19.5, with a mean difference of -41. Both groups showed significant improvements, with Group B showing a larger change. A t-value of 0.0086 and p-value of 0.00 indicate statistical significance (p < 0.001) between the groups.

Shoulder External Rotation:

In Group A, the pre-test mean of 37 ± 11.14 increased to 47 ± 11.77, with a mean difference of -10. In Group B, the pre-test mean of 38 ± 10.14 increased to 56.33 ± 9.90, with a mean difference of -18.33. Both groups showed significant improvements, with Group B showing a larger change. A t-value of 0.0479 and p-value of 0.00 indicate statistical significance (p < 0.001) between the groups.

Results For Pain And Disability (SPADI):

In Group A, the pre-test mean of 74.04 ± 3.94 decreased to 57.99 ± 2.87, with a mean difference of 16.054. In Group B, the pre-test mean of 72.93 ± 2.86 decreased to 47.84 ± 4.03, with a mean difference of 25.097. Both groups showed significant improvements, with Group B showing a larger change. A t-value of 5.626 and p-value of 0.00 indicate statistical significance (p < 0.001) between the groups.

DISCUSSION:

This study assessed the effect of SMET combined with conventional physiotherapy on shoulder ROM, pain, and disability in grade II PA shoulder patients. The results showed that both groups demonstrated improvements, but Group B (SMET + conventional physiotherapy) exhibited greater improvements in all measured parameters, including ROM and SPADI scores.

The mechanism behind SMET's effectiveness lies in its ability to stimulate low-threshold mechanoreceptors, which activates the sympathetic nervous system and modulates pain through the gate control theory. The improvement in ROM can be attributed to muscle relaxation via reflex mechanisms, such as the Golgi tendon organ's inhibitory effect on motor neurons. This results in decreased muscle tone and greater flexibility.

CONCLUSION:

The present study concluded that the subjects who received SMET along with conventional physiotherapy protocol (Group B) had shown more improvement in terms of shoulder ROM, shoulder pain, and disability than the subjects who received conventional physiotherapy alone (Group A). So, our study found that SMET along with conventional physiotherapy protocol is recommended for improving ROM, shoulder pain, and disability.

LIMITATIONS

The small sample size in both groups limit the ability to generalize the results. No long-term follow-up was conducted, so the lasting effects of SMET were not explored. The study focused on subjects aged 40-65; future research could include other age groups.

Future Recommendations

Future studies could use a larger sample size with long-term follow-up is recommended to assess the lasting effects of SMET and could include other age groups.

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