Effect of Spencer Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation in Adhesive Capsulitis

Deepika B¹, Jagatheesan Alagesan², Buvanesh A³, Anandbabu Ramadass⁴

¹Undergraduate, ²Professor, ³Tutor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India, ⁴Physical Therapist/ Clinical Catalyst, Aegis Therapies Inc., VA, USA.

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Abstract

Background: Adhesive Capsulitis in the shoulder characterized as a self-limiting situation that lasts only while it has also been described as a 24 week long-term impairment caused by a chronic condition. SMET is a widely used method to restore normal ROM and reduce pain. PNF aims to improve joint synchronization, movement control, and mobility.

Purpose: This study focuses on the effect of Spencer Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation for reducing pain and disability in Adhesive Capsulitis.

Materials and Methods: A total of 40 participants were selected based on inclusion and exclusion criteria from Eyan Healthcare Foundation during the period of November 2022 to July 2023. They were split into two groups, with 20 Participants receiving Spencer Muscle Energy Technique and 20 Participants receiving Proprioceptive Neuromuscular Facilitation. Subjects with age of 40-70 years, with or without diabetes and pain or stiffness on shoulder were included and Subjects with recent trauma, injury around the shoulder were excluded in the study. All the subjects underwent pre-test measurement with Shoulder Pain and Disability Index (SPADI) and the same repeated for post-test measurement at the end of 4 weeks.

Results: By statistical analysis there is a significant difference between the two groups. The Spencer group displays a greater difference than the PNF group when comparing mean differences of the two groups using SPADI.

Conclusion: The study concluded that subjects who underwent Spencer Muscle Energy Technique are found to be more effective in reducing pain and disability than Proprioceptive Neuromuscular Facilitation in Adhesive Capsulitis.

Key Words: OMT, SPADI, SMET, PNF, Adhesive Capsulitis.

Introduction

A clinical condition known as Adhesive Capsulitis of the shoulder is characterized by a progressive decrease in both active and passive shoulder mobility leading to discomfort and restricted movement along with weakened muscles¹. The rate of prevalence has been reported to be 2-5% for people in the age group 40 to 65 years old. However, it is reported to be more common in women and affects 10-20% of those with
diabetes mellitus and could either be related to an operation, an idiopathic cause (primary), or known root (secondary)².

The Spencer technique, commonly referred to as the Spencer’s seven steps, is an Osteopathic Manipulative Therapy (OMT) that was created in 1915. It combines Spencer’s slowness, slow-motion, and local expansion of the shoulder joint complex performed by a physiotherapist within a comfortable range, followed by isometric contraction of energy producing muscles followed by contraction and relaxation³.

The PNF therapy method was developed by Kabat and Knott in the early 1950s. PNF aims to enhance joint synchronization, movement control, and mobility. This may be done by rotating diagonal patterns due to various boosts and observing advisor’s recommendations⁴.

PNF strategies have been shown to be the most effective for significantly improving ROM in the few research that have been done. SMET primarily targets soft tissues, but it also significantly aids in joint mobilization. Through a mechanism known as “Enhanced Tolerance to Stretch” SMET not only improves muscle extensibility but also increases the range of motion (ROM) of joints. In an effort to determine which of these techniques offers significant advantages in our clinical setting⁵.

**Aim**

The aim is to compare the effect of Spencer Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation for reducing pain and disability in adhesive capsulitis.

**Materials and Methods**

An experimental study was carried out at the Eyan Healthcare Foundation Kumaran Nagar, Tiruvallur, Tamil Nadu, India from November 2022 to July 2023. A total of 40 participants were selected based on inclusion and exclusion criteria. The safety of the treatment and the simplicity of the procedure was explained to the participants, and written informed consent was obtained. They were split into two groups, with 20 Participants receiving Spencer Muscle Energy Technique and 20 participants receiving Proprioceptive Neuromuscular Facilitation.

**Inclusion criteria**
- Subjects with age of 40-70 years.
- Both males and females are included.
- Subjects with or without diabetes mellitus.
- Pain or stiffness over the shoulder region.

**Exclusion criteria**
- Subjects who are not interested in this study.
- Subjects with a recent history of trauma.
- Subjects with rotator cuff lesion and tendon calcification.
- Rheumatoid Arthritis.
- Osteoporosis and Malignancies in the shoulder.
- Neurological deficits affecting the shoulder.
- Pain or disorders of cervical spine, elbow, wrist or hand on affected side.

**Outcome Measure**
- Shoulder Pain and Disability Index (SPADI).

**Procedure**

Participants willing to participate were divided into two groups: Spencer Muscle Energy Technique group and Proprioceptive Neuromuscular Facilitation group. Participants underwent Shoulder Pain and Disability Index (SPADI) measurements prior to testing and were repeated for post-test measurements.

The Treatment includes:

- **Modality:** Interferential Therapy for both the groups.

Participants positioned in sitting with undressed shoulder region, physiotherapist places the electrodes of 2 channels crossover around the affected shoulder, Frequency of 80 – 100 Hz, Duration of 10 minutes and Intensity depends on subject comfortable tolerance level.

- **Exercise:** Spencer Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation.

**Spencer Muscle Energy Technique Group**

Participants treated with Spencer Muscle Energy
Technique, the following movement patterns were performed, and the treatment duration was 30 minutes.

**Spencer Techniques**

**Shoulder Extension**

Participants positioned in side lying with affected shoulder uppermost and physiotherapist stand in front of participant with one hand stabilize the acromioclavicular joint and other hand extend the participant shoulder in horizontal plane with elbow flexed position until end range barrier was felt. Resistance was provided on the elbow joint and participants were instructed to push at a resistance barrier against resistance and maintained in contraction for 8-10 sec. The same procedure is repeated on the new restricted barrier position.

**Shoulder Flexion**

Participants positioned in side lying with affected shoulder uppermost and physiotherapist standing in front of participant with one hand stabilizing the acromioclavicular joint and other hand flexing the participant shoulder in horizontal plane with elbow extended position until end range barrier was felt. Resistance was provided on the elbow joint and participants were instructed to push at a resistance barrier against resistance and maintained in contraction for 8-10 sec. The same procedure is repeated on the new restricted barrier position.

**Shoulder Circumduction**

Participants positioned in side lying with affected shoulder uppermost and physiotherapist standing in front of participant with one hand stabilizing the acromioclavicular joint and other hand abducted the participant shoulder in horizontal plane with elbow in flexed position. Participant elbow joint was used to rotate the humerus clockwise and anticlockwise direction with slight compression on shoulder joint for 15 times each.

**Shoulder Circumduction with Traction**

Participants positioned in side lying with affected shoulder uppermost and physiotherapist standing in front of participant with one hand stabilizing the acromioclavicular joint while participant grabbed on physiotherapist same forearm and other hand provided resistance on elbow joint for abduction force. Participant has to extend upward pressure on the elbow to increase abduction till end range was felt. Participants were instructed to push at a resistance barrier against resistance and maintained in contraction for 8-10 sec. The same procedure is repeated on the new restricted barrier position.

**Shoulder Abduction and Shoulder Abduction with External Rotation**

Participants positioned in side lying with affected shoulder uppermost with elbow flexed and hand positioned on the back within the available range and physiotherapist standing in front of participant with one hand stabilize the acromioclavicular joint while the other hand applied resistance on elbow joint where the arm was internally rotated position. Participant has to exert forward pressure to the elbow to internally rotate until the end range is felt. Participants were instructed to push at a resistance barrier against resistance and maintained in contraction for 8-10 sec. The same procedure is repeated on the new restricted barrier position.

**Shoulder Adduction with Distraction**

Participant positioned in side lying with affected shoulder uppermost with shoulder and elbow extended and rested on therapist shoulder and physiotherapist standing in front of participant with clasped his hand around participant shoulder and provide downward and upward motion on the deltoid muscle to increase soft tissue motion of deltoid as well as ligament on shoulder joints. It was continued for 30 sec and repeated.

**Proprioceptive Neuromuscular Facilitation group**
Participants treated with Proprioceptive Neuromuscular Facilitation, the following movement patterns were performed and the treatment duration was 20 minutes.

**PNF Techniques**

**Diagonal 1(D1) Flexion Pattern of Proprioceptive Neuromuscular Facilitation**

Shoulder Flexion, Adduction and External Rotation, Elbow Flexed, Forearm Supinated, Wrist Flexed and Radial Deviated with Fingers Flexed. Participants positioned in supine lying and Physiotherapist in Walk stand on the affected shoulder and place one hand over the arm and other over the hand. As the participant starts moving the extremity, the physiotherapist applies resistance.

**Diagonal 1(D1) Extension Pattern of Proprioceptive Neuromuscular Facilitation**

Shoulder Extension, Abduction and Internal Rotation, Elbow Extended, Forearm Pronated, Wrist Extended and Ulnar Deviated with Fingers Extended and Abducted. Participant positioned in supine lying and Physiotherapist in walk stand position on the affected shoulder and places both the hands at the agonist muscles at the elbow and dorsal aspect of wrist. Participant is instructed to move the limb to the opposite hip joint diagonally. The resistance is applied by the physiotherapist.

**Diagonal 2(D2) Flexion Pattern of Proprioceptive Neuromuscular Facilitation**

Shoulder Flexion, Abduction and External Rotation, Elbow Extended, Forearm Supinated Wrist Flexed and Ulnar Deviated with Fingers in Extended and Abducted. Participants positioned in supine lying and Physiotherapist in walk stand on the affected shoulder and place one hand over the elbow joint and other over the palmar surface of the hand. The resistance is applied by the physiotherapist.

**Data Analysis**

For this study, 40 participants with adhesive capsulitis of male 18 and female 22 between the ages of 40 to 70 years were selected. The participants with pain and disability measured by SPADI before and after the treatment to provide pre-test and post-test values respectively.

![Fig - 1: Analysis of pre-test and post-test values of SMET group.](image)

![Fig - 2: Analysis of pre-test and post-test values of PNF group.](image)
Fig - 3: Comparison of post-test values of SMET and PNF groups.

**Result**

In this present study the pre-test and post-test values of SPADI score analyzed between the both groups using a t-test in which Spencer group pre-intervention was 88.29(±8.08) and post-intervention was decreased to 33.14(±6.99) whereas in PNF group the pre-intervention was 88.86(±7.60) and post-intervention was decreased to 40.71(±4.15).

According to the statistical analysis, the outcome of the current study demonstrates that both the groups significantly improved as a result of treatment. The Spencer group displays a greater difference than the PNF group when comparing the mean differences of the two groups. Therefore, it can be said that Spencer Muscle Energy Technique reduces pain and disability in Adhesive Capsulitis more effectively than Proprioceptive Neuromuscular Facilitation.

**Discussion**

The purpose of the current study is to compare the efficacy of Spencer Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation in Adhesive Capsulitis. Paired and Unpaired t-tests with a baseline of significance of 0.05 were used to statistically evaluate pre-test and post-test data of parameter SPADI. Both Spencer group and PNF group individuals got treatment for a total of 4 weeks.

The SPADI pre-test is measured prior to therapy and post-test is measured after 4 weeks. Both the groups received Interferential Therapy before the treatment and Spencer group received treatment for 30 min and PNF group received treatment for 20 min. Based on statistical analysis, the findings of the current study indicate that there is a significant improvement in both Spencer group and PNF group after the effect of treatment.

An articulatory approach with seven distinct steps is the Spencer Muscle Energy Technique which is used to relieve shoulder pain brought by adhesion of the capsule. By using this method passive movement by regular, smooth motion is intended to stretch muscle, ligament and capsule contractions. Contractor ES et al., concluded that Spencer Muscle Energy Technique is more efficient in lowering functional disability. Chavan SE et al., concluded that combining the Spencer Muscle Energy Technique with traditional treatment improved shoulder range of motion. Mushyyaida Iqbal et al., concluded that for reducing pain and enhancing joint ROM and function in Adhesive Capsulitis where the Spencer’s joint mobility and Muscle Energy approach was proven to be more effective.

The PNF is the best stretching approach where the goal is to enhance ROM, particularly in short-term alterations. It is used to develop muscle strength and endurance, facilitate stability and mobility, and restoration of movement. Lin P et al., concluded that the PNF approach was more effective than conventional manual therapy at restoring the joint structure. Kalyani Malpani et al., concluded that for subjects with adhesive capsulitis the Proprioceptive Neuromuscular Facilitation found to be effective.

Mubarka Saeed et al., concluded that Proprioceptive Neuromuscular Facilitation technique shows more significance in improving pain in Adhesive Capsulitis. Based on the statistical analysis, both groups showed improvement in SPADI score. However, Participants in the Spencer Muscle Energy Technique group improved better on SPADI score than Participants in the Proprioceptive Neuromuscular Facilitation group. The limitation of this study is participant’s daily activities are not observed, which could have influenced the research and during
treatment some participant’s active participation at the initial stage has been challenging. Further study on PNF needed to investigate long term effects and to improve the quality of research, randomized and standardized blinding approaches are recommended.

**Conclusion**

This study found that both the strategies utilized in the current Spencer Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation are helpful in lowering pain and disability in adhesive capsulitis. However, Spencer Muscle Energy Technique is more effective than Proprioceptive Neuromuscular Facilitation.

**Ethical clearance:** Taken from the institutional ethical committee. ISRB number - 03 /017/ 2022/ ISRB/ SR/ SCPT

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**Conflict of Interest:** Nil.

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