



The Effect Of Shoulder Proprioceptive Neuromuscular Facilitation With Scapular Stability Exercises On Pain, Range Of Motion And Function In Adhesive Capsulitis –A Case Study

Authors: Dr.Kalyani Malpani¹, Dr.Mayuri Zanwar²

- 1- Dr.Kalyani Malpani(PT),Assistant Professor ,Department of Musculoskeletal Physiotherapy, Laxmibai Gorule College of Physiotherapy,Washim,Maharashtra .
- 2- Dr.Mayuri Zanwar, Assistant Professor, Department of Community Physiotherapy, Laxmibai Gorule College of Physiotherapy, Washim, Maharashtra.

Abstract

Background:-Adhesive capsulitis is a nonspecific chronic inflammatory reaction of tissues in the Glenohumeral joint which causes synovial thickening. This Thickening results in limited range of motion (ROM) most commonly seen in Shoulder abduction and external rotation. The onset can be insidious or occur after an injury. **Aim:-**The purpose of this case report is to describe proprioceptive neuromuscular facilitation with scapular stabilization exercise Interventions on pain, range and function for a patient with adhesive capsulitis. **CaseDescription:-**The patient was a 50-year-old right-handed male who presented with left Shoulder pain and limited range of motion (ROM) The diagnosis of adhesive capsulitis was determined following mechanism of Injury, past medical history, and physical therapy examination and evaluation. **Intervention:-**The patient was seen for a total of 12 physical therapy sessions over the Span of 3 weeks. Interventions included a proprioceptive neuromuscular facilitation, Scapular stabilization exercise including Scapular clock exercise,shoulder sling exercise and Lawnmower exercise .Outcome measures included ROM measurements, pain Ratings, the Shoulder Pain and Disability Index (SPADI)**Conclusion:-**ProprioceptiveNeuromuscular Facilitation with Scapular stability exercise were found to be effective interventions for a patient with adhesive capsulitis.

Keywords:- Adhesive capsulitis, Scapular stability, Proprioceptive Neuromuscular facilitation

Introduction

Adhesive capsulitis (AC) of the shoulder is a common clinical illness characterised by gradual and progressive discomfort as well as a loss of active and passive range of motion (ROM) in the Glenohumeral (GH) joint^{1,2}. AC affects 2% to 5% of the General population and 10% to 38% of patients with trauma, diabetes and thyroid disease. Its peak incidence is in people between 40 and 60 years of age, and it is slightly more common in women^{2,3}.

Adhesive capsulitis can be described as passing through three stages (i) frozen or pain, (ii) freezing or stiffness and (iii) thawing or recovery phase⁴. The first two stages, pain is the predominant problem, and in the third and fourth stages, stiffness is the major problem. Stiff means reduction in passive and active glenohumeral joint movement. The hallmark of stage 3 and 4 is restricted ROM or stiff shoulder means limited range due to pain in all the direction due to inflammation or adhesion across the joint⁵.

The authors considered subscapularis trigger point therapy as treatment options⁶, subscapularis trigger point therapy⁶ and low load prolonged stretch should be addressed in the management of adhesive capsulitis⁷. This is based on the knowledge that restricted range of motion (ROM) is characteristic of adhesive capsulitis, with external rotation typically being the most restricted physiologic movement, and that fibrosis or scarring of the subscapularis may be present clinically, limiting shoulder external rotation in the adducted position.

Sahrmann's theory that rotator cuff muscle weakness is often seen in patients with adhesive capsulitis. Strengthening of the rotator cuff muscles can restore proper alignment which can decrease pain and improve movement strategies of the shoulder joint⁸.

Kabat and Knott developed PNF treatment method in early 1950s⁹. The general exercises are performed as normal physiological joint movements in a single plane such as flexion (or) abduction (or) rotation^{9,10}. **Proprioceptive Neuromuscular techniques help in improving range of motion**. The concept of PNF is to enhance mobility, movement control, and joint coordination. This can be achieved by rotational diagonal patterns of movement through several stimuli and guidance provided by the therapist¹⁰. Scapular stabilization techniques Also help to maintain the length – tension relationship of the scapular muscles thereby providing scapular stabilization Which effectively reduces the time taken for the rehabilitation of the patient with adhesive capsulitis of the shoulder joint¹⁰.

When we look at the literature, it is seen that traditional rehabilitation practices aim to improve range of motion and reduce pain caused by capsular contracture. In this context, classical therapeutic exercises consisting of stretching and strengthening, joint mobilization methods, proprioceptive neuromuscular facilitation methods are applied. Previous studies suggested the effect of combining scapular stabilization techniques with conventional physiotherapy seemed to be beneficial in improving range and activities of daily living in patients with adhesive capsulitis. In previous studies scapular alterations have been assessed in patients with frozen shoulder but treatment program was mainly focused on pain relief and improvement in ROM, F et al. (2008) in his study of three dimensional scapular kinematics told that scapulohumeral rhythm of the affected shoulder is inversely related to severity of shoulder range of motion, increased scapular rotation is seen in frozen shoulder as a compensatory pattern. The initial 30 degrees of arm abduction were essentially the result of Glenohumeral motion. From 30 degrees to full arm abduction, movement occurs at the scapulothoracic and Glenohumeral joints¹¹. Proprioceptive Neuromuscular techniques help in improving range of as it elongates the Golgi tendon organ that facilitates relaxation of the antagonist muscles. A study conducted by Gonzalez Rave et al., stated that after the application of PNF techniques there is an improvement in shoulder and hip joint range of motion¹². However, there are limited number of studies investigating the effects of PNF techniques on pain, function and activity limitation. The purpose of this case report is to describe the proprioceptive neuromuscular facilitation with scapular stabilization exercise interventions on pain, range and function for a patient with adhesive capsulitis.

Patient Information

A 50-year-old right-handed male patient was visited in physiotherapy department 3 months after hit of buffalo. He presented with right shoulder pain and limited range of motion during the initial evaluation. The patient had no past medical history of type II diabetes mellitus, hyperlipidemia, hypertension, and obesity but had history of trauma. The patient's chief complaints were decreased ROM, pain, and finds difficulty to do overhead activities like combing, dressing and undressing, reaching the back pocket. His goals for therapy were to decrease pain and improve movement of his arm.

Clinical findings

The patient was quite definite about the factors which aggravated his pain by some movements of the right arm, lying on the right arm and he was awakened at night when he rolled onto the affected arm. His pain level is 6 on Numerical Pain Rating Scale (NPRS) and intermittent in nature. Upon palpation, patient had tenderness grade 1 i.e. patient complains of pain on palpation along the right biceps tendon and coracoid process. Upon observation, patient had a forward head and rounded shoulders. The Patient's cervical range of motion was within normal limits and pain free. The Initial evaluation included shoulder ROM into 135° flexion, 120° abduction, 40° internal rotation and 35° external rotation given in the table 1. The main limitations in range of motion included abduction and external rotation, which is consistent with the typical presentation of adhesive capsulitis. In the right shoulder the patient tested positive on the empty can test for integrity of supraspinatus tendon and the belly test for the integrity of subscapularis tendon. Shoulder external rotation was restricted followed by abduction and then internal rotation. Besides the pain (7/10) on NPRS, specially referred to the insertion of the deltoid, the deltoid muscle region and the bicipital tendon, prominent weakness (3/5) were noted during manual muscle testing of the supraspinatus in the empty can position and the subscapularis while performing the belly test to assess rotator cuff muscles, lower trapezius weakness (3/5) was also noted. Mild deficits were also noted during testing of the infraspinatus and teres minor (4/5).

Outcomes measures

NPRS scale to assess pain, Tenderness grading to describe and detect pain which helps in diagnostic process according to the grades, Goniometry for shoulder range of motion, and Shoulder pain and disability index (SPDI) used to assess pain level and extent of difficulties in ADL's, the higher the score higher is disability.

Diagnosis

There was no radiological diagnostic testing. As the patient had no radiological finding, he didn't face any diagnostic challenges. Orthopedic test for rotator cuff was done to assess the integrity of rotator cuff muscles, Capsular pattern was examined for the pain and limitation in movement which was evident in the patient. Diagnosis was done on the basis of subjective and objective examination of the patient for Right Shoulder Adhesive capsulitis with mild weakness of rotator cuff muscle.

Treatment:

Proprioceptive Neuromuscular Facilitation

Diagonal 2 (D2) PNF (Proprioceptive Neuromuscular Facilitation) flexion was performed with elastic resistance to activate scapular muscles to reduce pain and improve range of motion. Components for D2 flexion are shoulder flexion, elbow extension, forearm supination, wrist extension and finger extension. The pattern of D2 flexion was performed with the subject starting with their arm on the contralateral side of their waist and bringing arm up above the ipsilateral side of the head, a movement which consisted of glenohumeral flexion, abduction, and external rotation. One end of the elastic resistance was anchored to the floor by a

research assistant and the other end held by the subject. D2 pattern performed at self selected speed with the rest of 20 second between each repetition¹³.

Dosage –Applied for 8 repetition 2 sets per week ,1 session per day 4 days per week for 3 weeks with each repetition maintained for 5 – 10 sec.

Scapular stabilization exercise

Shoulder sling exercise:-Place an elastic loop under the elbow and around the neck and opposite shoulder. Simultaneously depress your shoulder and initiate abduction against the band resistance, pushing your elbow in a “down and out” motion. Do not actually move the arm away from the body¹⁴.

Scapular-clock exercise- patient in standing position with arm placed on a wall with elbow fully extended, places the finger pointed towards the 12’o clock, 3’o clock, 6’o clock & 9’o clock positions. (During 12 & 6’o clock the shoulder is elevated and depressed, 3 and 9’o clock the shoulder is protracted and retracted)¹⁵

Lawnmower exercise: The patient stands in an abducted position of the leg. The patient pulls using a large amount Of trunk rotation and lower extremity to guide shoulder motion¹⁴.

External rotation -Sitting or standing, using elastic resistance (Theraband) in front of the body at elbow level. Instruct thepatient to grasp the elastic material and rotate his or her arm outward¹⁴.

Internal Rotation -Sitting or standing using an elastic material (Theraband) with the line of force out to the side and at the level of elbow. Have the patient pull across the front of the trunk into internal rotation¹⁴.

Dosage –These exercises are performed 8 to 12 repetition for four times per week for 3 weeks

Results

According to our result we have found less effect on outcome after 1 week of intervention but there was considerable improvement in all the outcome parameters post 2 and 3 weeks of treatment

Outcomes measures	Pre-treatment	After 1 week	After 2 week	After 3 week
Pain on NPRS	7 on NPRS	6 on NPRS	5 on NPRS	3 on NPRS
Shoulder flexion	135°	135°	145°	150°
Shoulder Abduction	120°	125°	150°	160°
Shoulder Internal rotation	40°	45°	50°	60°
Shoulder external rotation	35°	40°	55°	60°
SPADI score	65%	60%	55%	43%

Table 1. Pre- post treatment result of outcome measures

Discussion

The results of this study supported that PNF technique with scapular stabilization exercise are effective in improving the shoulder ROM in subject with adhesive capsulitis. Further investigation revealed that there is a considerable difference in effectiveness between the PNF approach and the Scapular stabilization exercise. Pain relief, ROM restoration, and early return to ADL were all significant improvements in those treated with proprioceptive neuromuscular facilitation and scapular stabilization method. Pain intensity was improved 40% post 3 weeks which was initially 70%. Shoulder flexion, abduction, internal and external rotation found to be significantly improved. SPADI score improves with the 22% of reduction in the disability after the treatment of 3 weeks. The mechanism by which proprioceptive neuromuscular technique caused improvement in shoulder ROM and function could be elongation of tissues, which could be the probable reason helping to improve ROM and function. Panjabi explains that every movement segment depends on three subsystems; the passive, the active and the neural subsystem, which stresses the diagonal pattern of movement in PNF technique¹⁶.

The rotator cuff muscles stabilise the humeral head in the glenoid, allowing the humerus to rotate outside while keeping the distance protected between the large tubercle and the acromion avoiding compression that was the reason resistance training (Theraband) employed in the scapular stabilization exercises. This study was successful in reducing pain and improving range of motion¹⁵. The weakness of the muscles around the scapula leads to scapular instability. When the scapula is not stable it may cause adhesive capsulitis. The scapular stabilization exercises were given to strengthen the muscles such as (pectoralis major, latissimus dorsi and teres major, trapezius, rhomboids major and minor muscles¹⁷.

During overhead activities, scapula must rotate upwards, tilted posteriorly & rotated externally. Weakness of the scapular stabilizers leads to imbalance of the force couples between the trapezi, serratus anterior & rhomboids that may result in to downward rotation, anterior tilting & internal rotation of the scapula during the abduction of the arm. This fatigue induced strength deficit may result into the adverse effect on scapular position & allowing more lateral gliding of the scapula during functional activities.

The present study gives similar result as a study conducted by Yatheendra Kumar G et al., (2015) suggesting that Scapular stabilization exercises are effective in decreasing pain and increasing ROM and functional ability by restoring scapula humeral rhythm in frozen shoulder. Michel L Voight, et al., (2000) also suggested that while caring Glenohumeral (GH) joint, scapular stability is also important in adhesive capsulitis for the faster recovery^{11,18}.

Conclusion

The outcomes of the case report suggested that the use of PNF with scapular stability exercises can be effective in shoulder adhesive capsulitis. In this case report patient reacted positively to Proprioceptive Neuromuscular Facilitation with scapular stability exercise results in effective reduction of Pain, improving range of motion and activities of daily living in patient with adhesive capsulitis. Limitation of the case report is short term followup and Manual muscle testing can be used as further outcome.

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DECLARATIONS**Acknowledgment:**

The authors thank the participant of the study for his co-operation.

Conflicts of Interest

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Patient Perspective

The patient shared his perspective that compared to day one he found significant changes in his pain, range and function hence, improvement in quality of life.

Consent

As per international standard or university standard patients' written and informed consent has been collected and preserved by the authors.

Treatment Protocol



Fig 1 : D2 flexion PNF pattern



Fig 2 : Shoulder sling exercise



The patient pulls using a large amount of trunk rotation and lower extremity to guide shoulder motion

Fig 3: Lawnmower Exercise

