Original Research Paper

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A CASE REPORT ON IMPORTANCE OF SHOULDER PROPRIOCEPTIVE TRAINING AND PNF TECHNIQUES ALONG WITH CONVENTIONAL EXERCISES IN FUNCTIONAL RECOVERY OF THE INDIVIDUAL WITH ADHESIVE CAPSULITIS SECONDARY TO ROTATOR CUFF TENDINOSIS.

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ABSTRACT

BACKGROUND AND PURPOSE Adhesive capsulitis is a condition where there is inflammation of shoulder capsule (capsulitis) which in turn causes bands of sticky connective tissue (adhesions) between the joint's surfaces. Due to this shoulder movement becomes painful and often completely restricted [1] .The purpose of this case report is to highlight Importance of Shoulder Proprioceptive training and shoulder PNF techniques using theraband and inflatable ball (30 cm) along with Conventional exercises in Functional Recovery of the patient with adhesive capsulitis secondary to rotator cuff tendinosis.

CASE DESCRIPTION A 66-year-old female who presented with right shoulder pain and neck pain and limited range of motion (ROM) since 1 month with a past medical history of type II diabetes mellitus, hypertension and hypothyroidism on medication was diagnosed with adhesive capsulitis secondary to rotator cuff tendinosis based on clinical examination, ROM assessment, Radiographical investigations-MRI and past medical history.

INTERVENTION The patient was treated for a total of 10 physical therapy sessions over the span of 2 weeks. Interventions included were incorporating shoulder proprioceptive exercises with a help of inflatable ball and textured towel, shoulder PNF patterns using Red theraband along with cryotherapy(icepacks),mobilizations (Maitland grade 2) with oscillatory techniques, therapeutic exercises, Active assisted ROM exercises with the help of a wooden wand, capsular stretching, myofascial trigger point release, postural correction exercises, strengthening and home exercise program.

Outcome measures included ROM goniometric measurements, pain rating scale, Angle reproduction test for proprioception, Manual muscle testing and the Disabilities of the Arm, Shoulder and Hand (DASH) Score.

DISCUSSION AND CONCLUSION This case report conclude that appropriate combinations of interventions including shoulder proprioceptive exercises with an inflatable ball, shoulder pnf patterns(D1-D2) , stretching, mobilisations, MFR and strengthening exercises resulted in an improvement in overall functional performance of the patient with adhesive capsulitis secondary to rotator cuff tendinosis .An improvement in post-test scores of Manual Muscle Testing (MMT) , ROM , DASH scores was observed after 10 sessions. Rationale for treatment was based on various research articles. The treatment was altered based on patient's need and response.

KEYWORDS : Adhesive capsulitis , PNF , proprioceptive exercises, DASH score

INTRODUCTION

Adhesive capsulitis is a condition causing pain and restriction in range of motion (ROM) most commonly seen in shoulder abduction and external rotation due to contractures in capsule caused by chronic inflammatory reaction of tissues in the glenohumeral joint.[1] Secondary adhesive capsulitis can be the result of an existing shoulder pathology such as a dislocation, fracture, osteoarthritis, or a neurological condition leading to muscular imbalances. Risk factors include diabetes, trauma, hypertriglyceridemia, and thyroid disease. [1] Recently, the link between rotator cuff disease and glenohumeral joint pathology has been investigated. [2] Adhesive capsulitis affects 20% of people with diabetes as Diabetes can alter the collagen formation and delay the healing process following traumatic events or surgery[1]

The rotator cuff is separated from the bone, ligament and muscle overlying it by a bursa which prevents friction between the rotator cuff and its adjacent structures. Incompetency of this bursa causes painful pinching of the soft tissues between humeral tuberosities and the arch of bone and the acromion process and the coraco-acromial ligament. This is subacromial impingement, which can cause erosion and inflammation of the rotator cuff. [3]

Evidence also suggested that myofascial trigger points in the supraspinatus, infraspinatus, teres minor and subscapularis and other scapular muscles play a role in restricted range of motion. [4]

Proprioceptive neuromuscular facilitation (PNF) is a treatment approach in which the neuromuscular receptors are activated or channelised to detect joint positional changes , to improve range of motion and to increase muscle activity with incorporation of PNF techniques such as rhythmic initiation, repeated contractions, rhythmic stabilization, combination of isotonics, dynamic reversals, hold relax and contract relax are applied to improve muscle strength, endurance, mobility, stability, coordination and neuromuscular control and can be easily adapted to activities of daily living. [5]

Proprioception is termed as"our perception of joint movement and positioning in space in absence of visual feedback".It encompasses the submodalities of joint position sense,kinesthesia,sense of force and velocity. Owing to the vast mobility of the shoulder, it heavily relies on an intact sense of proprioception for stability. Moreover shoulder injuries are associated with a decreased sense of proprioception. The role of proprioception in allowing a feedback mechanism to work,which in turn allows a synergistic contraction of muscle groups of shoulder joint and in protecting the shoulder against potential instability.

Here in case of adhesive capsulitis the changes in passive restraints caused by inflammatory reactions, structural and functional changes within both anterior and posterior shoulder passive stabilizers results in deterioration of proprioception.

The purpose of this case report is to highlight Importance of Shoulder Proprioceptive training and shoulder PNF using theraband along with Conventional exercises like stretching, mobilizations, MFR and strengthening in Functional Recovery of the patient with adhesive capsulitis secondary to rotator cuff tendinosis.

CASE PRESENTATION

HISTORY

A 66 year old right handed female presented in the physiotherapy department. She presented with right shoulder pain and limited range of motion and night pain .Patient complained of difficulty in overhead activities. Functional restriction observed in difficulty in wearing clothes(shirt), doing in household chores. The patient had a past medical history of type II diabetes mellitus, hypertension, and hypothyroidism. The diagnosis of adhesive capsulitis secondary to rotator cuff tendinosis was determined following Xray and MRI investigations, past medical history, and physical therapy examination and evaluation.

PHYSICAL THERAPY ASSESSMENT AND DIAGNOSIS

According to initial pain evaluation, pain was gradual in onset and over anterior aspect of right shoulder, insertion of deltoid muscle, neck, right trapezius and medial border of scapula. Pain NRS on rest was 7/10 and 9/10 on activity. On palpation pain was felt over coracoid process, right trapezius and over the bicipital tendon. Myofascial trigger points were palpated in trapezius, supraspinatus, infraspinatus, rhomboids and subscapularis muscles.

The ROM restriction was seen typically in capsular pattern. Abduction and external rotation restricted the most followed by internal rotation and flexion. Anterior, posterior and inferior capsular tightness was present. Posture evaluation revealed forward head and rounded shoulder along with slight elevation of right shoulder. End Feel was seen as hard capsular for shoulder movements.

Scapular dyskinesia was observed. Scapula is positioned in protraction, elevation and external rotation. Scapulohumeral rhythm was altered in setting phase. Spino-scapular distance increased on the right side.

Functional restriction is seen in the form of difficulty in clothing, grooming, self care, household overhead activities, wearing a jacket, etc.

Range of motion (ROM)

Range of motion(ROM) on right side for shoulder flexion was 0-90, extension 0-20, abduction 0-70, internal rotation 0-20, external rotation 0-30.

Cervical ROM was affected. Mild reduction in ranges of cervical side flexion and rotation on left side.

Shoulder strength (MMT) : The strength of shoulder flexors, extensors was 3+/5, abductors was 3/5, internal rotators was 4/5 and external rotators 3+/5.

cervical side flexion and rotations painful on left side.

Special tests

Positive special tests included Neer's Impingement, Speeds, and empty can tests. **Negative tests** included Hawkin's Kennedy, coracoid impingement, crossarm and apprehension tests. But it did not clearly indicate what was causing the pain and limited ROM

MRI investigation of right shoulder was done which revealed rotator cuff tendinosis, mild osteoarthritic changes , effusion and calcification at the insertion of infraspinatus along with Adhesive capsulitis changes in shoulder capsule.

THERAPEUTIC INTERVENTION

1. The physiotherapy interventions aimed at reducing pain, improving ROM , postural correction and functional recovery. The PT sessions were spread across 2 weeks, with 5 sessions of 45 mins duration each, per week which was over 10 therapist controlled sessions. Patient was given home exercise protocol comprising of stretching and strengthening exercises after a discharge from

2. In **First and second Session** active assisted shoulder mobility exercises with the help of wand was initiated. Codman's exercises were given 10 repetitions in each direction(flexion,extension,abduction and rotations), wall assisted shoulder flexion and abduction. Myofascial trigger point release was given to the trigger points in trapezius, supraspinatus, subscapularis, rhomboids. Myofascial release was given to anterior deltoid bulk. This included Frictional massage -in parallel direction to fiber orientation for 5-10 minutes was given to free up physiotherapy treatment at hospital for 2 weeks and was reviewed again. Patient was advised to do ice fomentation every 4 hours.

3. In the **third session** specific shoulder proprioceptive exercises were included like table top circles and making circles with the ball by placing the ball against the wall for about 1 minute, tapping with the ball on the wall for 30 seconds. Shoulder shrugging and retractions done 10 repetitions each. scapular sets started 10 repetitions each.

4. In the **fourth session** Mobilizations are done. Mobilizations included glenohumeral distraction grade I and II, glenohumeral inferior glide grade II-IV, glenohumeral posterior glide grade II-IV. Wall pushups were initiated 10 repetitions. MFR and gentle trigger release were repeated.

5. In the **fifth session** Mulligan mobilization The MWM (movement with mobilization) technique was given for rotations. Passive glide done by physiotherapist at peripheral joint while patient performs pain free physiologic movement. The glenohumeral distraction, inferior glide, and posterior glide were done. AROM movements continued.

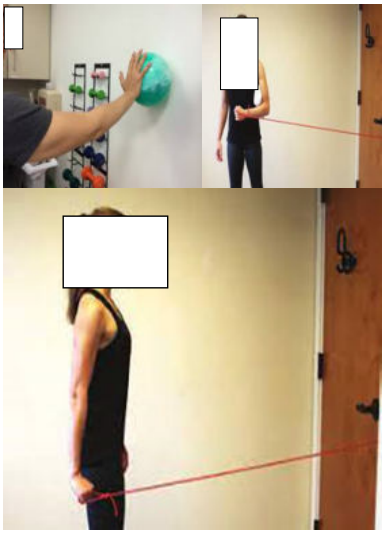
6. In the **sixth session** Exercises with yellow theraband were started. Shoulder PNF diagonal patterns given using theraband. Rotator cuff strengthening with theraband. PNF techniques for upper extremity "flexion-abduction-external rotation" pattern . PNF stretching given.

7. In **seventh session** MFR was repeated to trapezius, subscapularis and supraspinatus. Mobilizations for glenohumeral and scapulothoracic joints performed. Shoulder ROM exercises, scapular sets, theraband strengthening were performed. Capsular stretches given.

8. In the **eighth session** All previous exercises continued. shoulder proprioceptive exercises progressed in repetitions. In addition to these exercises, functional activities in the flexion-abduction-external rotation pattern such as hair combing, wearing a jacket, reaching on the shelf were performed

9. In the **ninth session** Theraband progressed to red colour. strengthening started with a half kg dumbell. Shoulder PNF patterns and proprioceptive exercises continued along with other stretching and strengthening protocol given.

In the **tenth session** Home exercise protocol given to the patient which included self stretching techniques, shoulder PNF patterns, AROM exercises, strengthening and reassessment was done.



OUTCOMES AND ANALYSIS

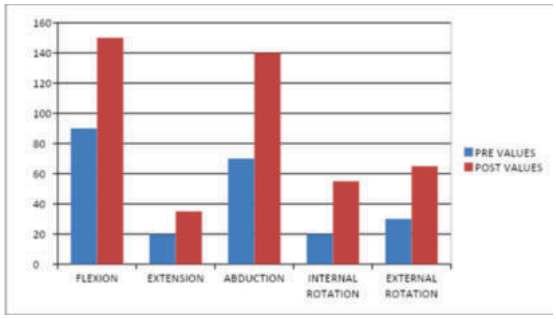
Outcome measures were assessed and reassessed on first day and last day(2 weeks) of physiotherapy sessions. Patient reported significantly reduced night pain. Pain NRS reduced to 1/10 at rest and 2/10 on activity from 7/10 on rest and 9/10 on activity. Functional improvement was seen in activities of daily living such as wearing blouse/jacket, reaching at an overhead shelf, reaching out to the back of pocket.

Graphs:

Table 1 shows ROM at discharge and and graph 1 shows the increase in post intervention ROM :

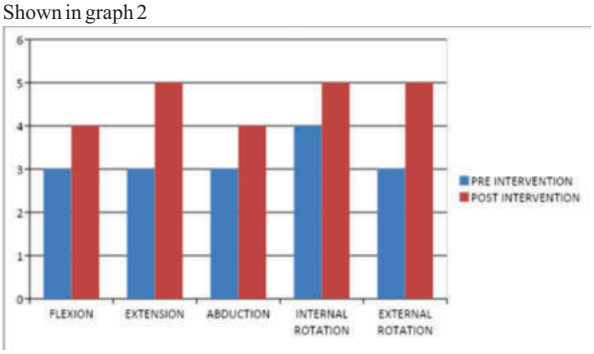
Shoulder	Left	Right
Flexion	0-170	0-150
Extension	0-40	0-35
Abuction	0-165	0-140
Internal Rotation	0-75	0-55
External Rotation	0-80	0-65

Table 1



Graph 1

MMT on discharge(post 10 sessions) : MMT for flexion improved to 4+/5 , abduction 4/5 , extension, internal and external rotations 5/5. Shown in graph 2



Graph 2

The DASH scale includes 30 items each scoring 1-5 based on no difficulty to unable to perform. The score initially was 88/150 . Higher the score indicate greater disability and severity. After the intervention the score reduced to 23/150 which indicated reduction in disability and severity.

DISCUSSION

- This case study suggests effect of Proprioceptive exercises and shoulder PNF effect on pain relief, improved ROM, and strength in individuals with adhesive capsulitis secondary to rotator cuff tendinosis. Meltem Melda Taşkın, Istanbul University has stated in his study that "PNF techniques have proves to improve muscle strength, endurance, mobility, stability, coordination and neuromuscular control and by maing the use of proprioceptors to increase responses of the neuromuscular mechanism, range of motion and muscle activation It is aimed to increase the glenohumeral joint movements and regulate the scapulothoracic rhythm in the rehabilitation of adhesive capsulitis." [5]
- While performing PNF techniques the process of autogenic inhibition stimulates the golgi tendon organs,when targeted muscle is maximally contracted wich inturn sends inhibitory impulse wich inturn relaxes the muscle.The pain is reduced due to afferent inputs which inhibits the pain transmission at dorsal horn as proposed by pain gate theory. In this study another intervention which relieved pain was the trigger point release. Trigger points develop within the muscle sarcomeres which become overactive; the actin and myosin myofilaments stop sliding over one another due to which sarcomere goes into permanent state of contraction which causes increased muscle tone, weakness, shortening, and muscle stiffness/fibrosis.Michael Kaprail, Shilpy Jetly et Al, proved the effectiveness of a 14 day comprehensive MTrP physical therapy treatment program in patients with chronic,nontraumatic, unilateral shoulder pain and associated neck disability and restricted cervical and shoulder ROM [4]
- Grade I and II mobilizations are also used to relieve the pain. The oscillations inhibit the perception of painful stimuli by repetitively stimulating mechanoceptors that block nociceptive pathways at the spinal cord or brain stem levels. The pain caused by circulatory statis causing inflammation and fibrosis is also relieved by mobilizations by reversing the ischaemia, inflammatory cycle and also by relieving pressure on nerve endings.
- The ROM in shoulder abduction, external rotation, flexion improved significantly with the use of capsular stretches to break the adhesions in the glenohumeral joint capsule. Also, use of PNF stretching techniques and mobilizations helped to improve the ROM. Harshit Mehta, Paras Joshi et Al explained in their study that : PNF stretching and soft tissue mobilization is the application of progressive forces effective in promoting changes in the myofascia, allowing for elongation of shortened structures. PNF stretching combined with soft tissue mobilization and both are used to effect changes in myofascial length and are effective in increasing ROM[6] . The ROM is improved by grade II Anterio-posterior and Inferior glides by giving end range tissue stretch. In mulligan, individual is asked to do movement in the newly gained pain free ROM thus maintaining the motion.
- The strength is improved by performing the free ROM against gravity and with the use of theraband progressively. The D2 flexion pattern activates maximally the middle and lower trapezius and scapular muscles. Strengthening increases actin and myosin concentrations hence increasing the total force of contraction. Practicing diagonal patterns using theraband proved effective in functional improvement by ease in wearing a jacket, doing overhead activities and combing hair. Patient sticking to the home exercise program gave the expected results.

CONCLUSION

The findings of the study provide evidence to suggest that shoulder proprioceptive exercises and shoulder PNFpatterns along with stretching, mobilizations, MFR and strengthening resulted in an improvement in overall functional performance of the patient with adhesive capsulitis secondary to rotator cuff tendinosis.

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