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RESEARCH ARTICLE

EFFECT OF TREATING TIGHT SUBSCAPULARIS IN ADHESIVE CAPSULITIS

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ABSTRACT

The aim of the study was to find out the additional effect of soft tissue mobilisation to subscapularis when given with Maitland mobilisation in adhesive capsulitis patient with subscapularis muscle tightness.

Study Design: Experimental pre and post test design between group comparisons.

Methodology: A total of 30 subjects, who fulfilled the inclusion and exclusion criteria, were randomly divided into two groups from outpatient department of SVNIRTAR after getting their consent. Group 1- Maitland mobilization and active exercises. Group 2- Maitland mobilization with soft tissue mobilization, stretching of subscapularis and active exercise. The intervention was for 3 weeks, treatment was given 5 day/ week. The dependant variables are Range of motion of glenohumeral joint and Shoulder pain and disability index (SPADI).

Conclusion: Patient with primary adhesive capsulitis are benefited by end range rhythmic oscillatory Maitland's mobilisation techniques. However addition of soft tissue mobilisation to subscapularis improves glenohumeral external rotation range of motion and function to a greater extent than only Maitland's mobilisation technique.

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INTRODUCTION

Adhesive capsulitis is a painful condition of the gleno-humeral joint with gradual restriction of all planes of movement. It is the main cause of shoulder pain and dysfunction in middle aged and elderly populations. (Mao *et al*., 1997; Hannafin and Chiaia, 2000) Approximately 70% of frozen shoulder patients are women; however**,** males with frozen shoulder are at greater risk for longer recovery and greater disability. (Sheridan and Hannafin, 2006; Griggs *et al*., 2000) Although the exact pathophysiologic cause of this pathology remains elusive, there are two types identified in the literature: idiopathic and secondary adhesive capsulitis. (Lundberg, 1969) Idiopathic ("primary") adhesive capsulitis occurs spontaneously without a specific precipitating event. (Hand *et al*., 2007) Secondary adhesive capsulitis occurs after a shoulder injury or surgery, or may be associated with another condition such as diabetes, rotator cuff injury, cerebrovascular accident (CVA) or cardiovascular disease, which may prolong recovery and limit outcomes. (Wolf and Green, 2002) Stabilization of the humeral head is provided through muscular support by supraspinatus, infraspinatus, teres minor and subscapularis, which are commonly called the rotator cuff or SITS muscles. The fibers of the SITS tendons blend with the joint capsule, which makes them especially vulnerable to injury since they are so closely approximated to the joint. (DeLany, 2002) Subscapularis, a particularly important muscle when considering shoulder dysfunctions, is almost hidden from palpation. It has a broad attachment to the subscapular fossa and spans the glenohumeral joint to attach to the lesser tubercle of the humerus and the articular capsule. It passes over the anterior joint capsule and lies horizontally between the two almost vertical tendons of biceps brachii. Although it is a large, thick muscle, only a small portion of its belly can be palpated. A primary indication for treatment of subscapularis is loss of lateral rotation and/or abduction of the humerus, common symptoms of 'frozen shoulder' syndrome. (DeLany, 2002) A shortened subscapularis muscle has been implicated as cause of limited motion in patient diagnosed with adhesive capsulitis. (Greenfield and Tovin, 2001) Subscapularis with other muscles produces an inferior directed translation force on the humerus head and it is the primary muscle that internally rotates the gleno humeral joint. (Neumann) Analysis of momemt arm of subscapularis may suggest that it may abduct when the shoulder is in neutral or laterally rotated and adduct when the shoulder internally rotated. (Otis, 2002) Subscapularis muscle tightness results in a greater limitation of gleno humeral external rotation in lower range of abduction than in 90 degree of abduction. (Donatelli, 1997) Fassbender described

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mesnchymoid transformation, a focal proliferation of fibrous tissue, in connective tissue structures adjacent to muscles afflicted with non articular rheumatism (myofascial TPs). The transformation was ascribed to hypoxia caused by vasoconstriction. The same process, initiated by TPs in the subscapularis, may induce fibrotic changes in the adjacent glenohumeral joint capsule that lead to adhesive capsulitis when combined with severely limited joint movement. (Simons *et al*., 1999) When hypertonicity or trigger points in the subscapularis cause excessive tension within the muscle, it holds the humeral head fast to the glenoid fossa creating the pseudo frozen shoulder (Simons *et al*., 1999) that is humeral head appears immobile, as in true frozen shoulder syndrome but without associated intra joint adhesions. (Chaitow, 2000) Ultimately however long term reduced mobility and capsular irritation from subscapularis dysfunction may result in adhesive capsulitis. (Calliet, 1991) When the initial action of abduction forces the humerus cephaladly, toward the overhanging acromion process, subscapularis provides downward tension on the head, thereby preventing bony impaction and entrapment of soft tissues. (Simons *et al*., 1999) Additionally, the subscapularis lies in direct relationship with serratus anterior within the scapulothoracic joint space. Myofascial adhesions of these tissues to each other may contribute to full or partial loss of scapular mobility. (DeLany, 2002) The pain and restricted range of motion of a "frozen shoulder" and of the shoulder of a patient with hemiplegia are frequently caused by subscapularis TrPs that have been overlooked. (Simons *et al*., 1999) Reason the shoulder became so painful and frozen when a patient develops subscapularis TrPs is that so many other girdle muscles also became involved adding their pain pattern and restriction of movement. The other TrPs are easier to identify than subscapularis TrPs, and other often inactivated with at least temporary improvement but until primary cause (the subscapularis TrPs involvement) is identified and corrected symptoms will persist. Specific identification of subscapularis TrPs as a focus of therapeutic attention is rarely mentioned in literature and no controlled research studies could be found that specially address the TrPs components of "frozen shoulder". Many clinician aggress the subscapularis TrPs can be responsible for the symptoms of frozen shoulder and can be simply and effectively treated .however in the current climate of managed health care, clinical success is not sufficient; competent research substantiation is essential. (Simons *et al*., 1999)

Cadaver studies and outcomes of subscapular surgical releases suggest that subscapularis muscle flexibility deficits are responsible for glenohumeral external rotation limitations in the lower ranges of abduction. A contrasting clinical and cadaver finding is where glenohumeral external rotation becomes more limited as the humerus moves toward 90° of abduction, suggestive of glenohumeral capsular restrictions. (MacDonald *et al*., 1992) Thus, a patient who has greater limitation of glenohumeral external rotation at 45° of abduction, when compared to the available external rotation at 90° of abduction, may have a subscapularis muscle flexibility deficit rather than a glenohumeral capsular restriction. The results of subscapular nerve block in various painful situations of the shoulder region suggest the importance of subscapularis muscle in the etiology of the frozen shoulder. (The Frozen Shoulder Syndrome Description of a new technique and five case reports using the subscapular nerve block and subscapularis trigger point infiltration, 2006) It has been shown that subscapularis ischemic compression improves external rotation range of motion and inturn improves functional performance. But no study has been done to compare the effect of Maitland joint mobilisation with soft tissue mobilisation to subscapularis for improvement of external rotation range of motion and improvement in functional performance in Adhesive capsulitis patient. Therefore the aim of the study was to find out the additional effect of soft tissue mobilisation to subscapularis when given with Maitland mobilisation in adhesive capsulitis patient with subscapularis muscle tightness.

MATERIALS AND METHDOS

Study design: Experimental pre and post test design between group comparisons. A total of 30 subjects, who fulfilled the inclusion and exclusion criteria, were randomly divided into two groups from outpatient department of SVNIRTAR after getting their consent.

Group 1- Maitland mobilization, 2 minutes of continous end range mobilisation with discomfort was given and active exercises.

Group 2- Maitland mobilization with soft tissue mobilization, stretching of subscapularis and active exercise.

Inclusion criteria: Patients diagnosed with idiopathic adhesive capsulitis shoulder, Pain in the shoulder joint with restriction of glenohumeral external rotation is more in the lower ranges of abduction i.e. $\leq 45°$ of abduction, Age group between 40-60 years and duration of symptoms more than 4 months.

Exclusion criteria: Secondary adhesive capsulitis occurs after a shoulder injury or surgery, or may be associated with another condition such as diabetes, rotator cuff injury, cerebrovascular accident (CVA) or cardiovascular disease, which may prolong recovery and limit outcomes, Total shoulder arthroplasty, Reflex sympathetic dystrophy, Rheumatoid arthritis, Any trauma to the shoulder and post immobilization, Acute painful stage of adhesive capsulitis shoulder joint etc. Each subject underwent an initial baseline assessment where Range of motion of glenohumeral joint flexion, abduction, medial rotation and lateral rotation had been measured with the help of universal goniometer and Shoulder pain and disability index (SPADI). Then the ROM of external rotation also had taken at 3 angles (30^0,45^0,60^0) of abduction where 2 universal goniometer had been used, 1 to maintain the shoulder in abduction (with the help of other therapist) so that there is no change in the abduction angle. 2nd goniometer was placed over the tip of olecranon process of ulna to measure lateral rotation. The SPADI consists of 13 items in two subscales: pain (5 items) and disability (8 items); originally items were presented in a visual analogue format. Patient was explained about the scale. It was taken before and after the completion of treatment session. End range (G IV) Longitudinal Movement (Caudal), Postero Anterior Movement and Antero Posterior Movement were applied to improve shoulder abduction, external rotation and internal rotation range of motion respectively for about 2 minutes each in continuous rhythm. Two opposite techniques were not given on the same day.

Stretching of subscapularis muscle: The arm was abducted in supine lying position away from the chest wall to adequately expose the ventral surface of the scapula and subscapularis for palpation. Next the examiner grasps the latissmus dorsi and teres major muscle in a pincer grip and locates the hard edge of scapula with the tips of the digits. The pressure is directed cephalad and towards the spine of scapula to locate firm band of muscle fibre in the TPs area. (Greenfield and Tovin, 2001) Having confirmed the trigger points by "Jump sign "or characteristic pattern of referred pain distant from the point of contact, the applied pressure was increased till pain occurs (pain threshold) and this was maintained for 90 seconds, (Chueu-Ru and Li-Chen, 2002) followed by stretching. (Ylinen and Chaitow 1st edition) Active exercises include towel exercise to improve medial and lateral rotation range of motion was practiced by both the groups.

Data collection: Measurements were taken one day before the treatment started for all the subjects. The intervention was for 3 weeks, treatment was given 5 day/ week. After 3 weeks of therapy post test measurements were taken for all the dependent variables in each subject.

Data analysis: The data was analysed with SPSS (Statistical Package for Social Sciences)16 .0 version for windows 7. The dependent variable were analysed using a mixed design 2x2ANOVA, with repeated measurement in second factor. There was one between factor (group) with two levels (Maitland mobilisation group and Group 2- Maitland mobilisationand soft tissue mobilisation group) and one within factor (Time) with two levels (pre and post treatment measure). Pair wise post hoc comparison was done using a 0.05 level of significance.

RESULTS

Range of motion

There was improvement in active range of shoulder lateral rotation in both groups 1 and 2 from pre to post measurement. However group 2 improved a greater extent than group 1. There was main effect for time F (1,28,0.05)=983.150 p=0.000. There was main effect for group F (1,28,0.05)=11.158 p=0.000. The main effects qualified to time x group interaction F (1,28,0.05)=28.350 p=0.000. Tukeys SD showed both group 1 and 2 improved significantly in active range of shoulder lateral rotation with treatment. However group 2 improved to a significantly greater extent than group 1.

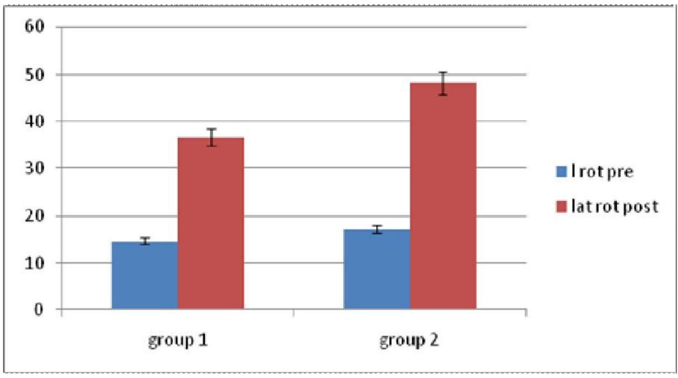

Figure 1. Shoulder lateral rotation

There was improvement in active range of shoulder lateral rotation at 30 deg of abduction in both groups 1 and 2 from pre to post measurement. However group 2 improved a greater extent than group 1. There was main effect for time F (1,28,0.05)=279.022 p=0.000. There was main effect for group F (1,28,0.05)=26.556 p=0.000.

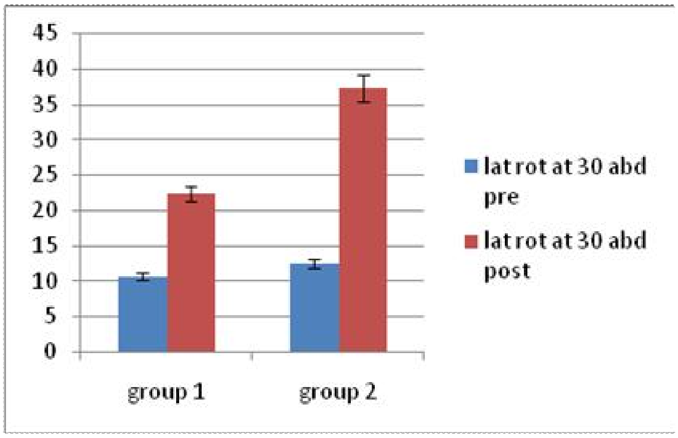

Figure 2. Shoulder lateral rotation at 30 deg of abduction

There was main effect for time x group interaction F (1,28,0.05)=36.161 p=0.000. Tukeys HSD showed both group 1 and 2 improved significantly in active range of shoulder lateral rotation at 30 deg of abduction with treatment however group 2 improved to a significantly greater extent than group 1.

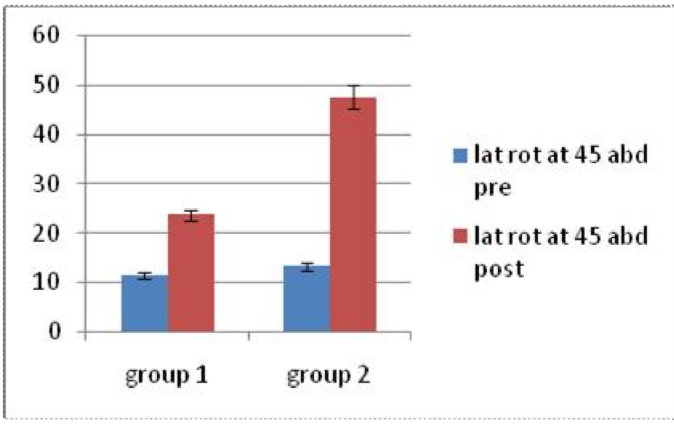

Figure 3. Shoulder lateral rotation at 45 deg of abduction

There was improvement in active range of shoulder lateral rotation at 45 deg of abduction in both groups 1 and 2 from pre to post measurement. However group 2 improved a greater extent than group 1. There was main effect for time F (1,28,0.05)=863.689 p=0.000. There was main effect for group F (1,28,0.05)=50.967 p=0.000. There was main effect for time x group F (1,28,0.05)=196.016 p=0.000. Tukeys HSD showed both group 1 and 2 improved significantly in active range of shoulder lateral rotation at 45 deg of abduction with treatment however group 2 improved to a significantly greater extent than group 1. There was improvement in active range of shoulder lateral rotation at 60 deg of abduction in both groups 1 and 2 from pre to post measurement. However group 2 improved a greater extent than group 1. There was main effect for time F (1,28,0.05)=763.625 p=0.000. There was main effect for group F (1,28,0.05)=8.580 p=0.007. There was main effect for time x group interaction F (1,28,0.05)=28.979 p=0.000. Tukeys HSD showed both group 1 and 2 improved significantly in active range of shoulder lateral rotation at 60 deg of abduction with treatment however group 2 improved to a significantly greater extent than group 1.

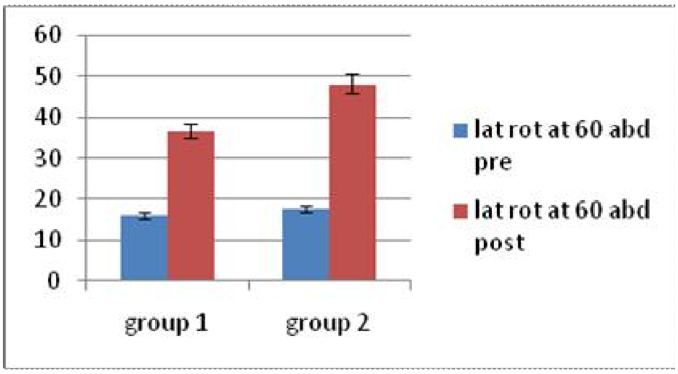

Figure 4. Shoulder lateral rotation at 60 deg of abduction

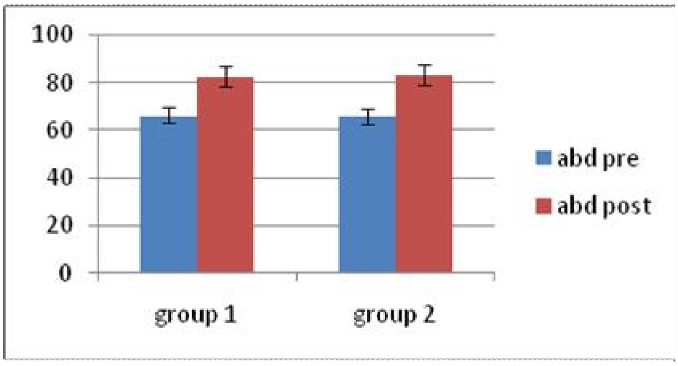

Figure 5. Shoulder abduction

There was improvement in active range of shoulder abduction in both groups 1 and 2 from pre to post measurement. There was main effect for time F (1,28,0.05)=766.611 p=0.000. There was no main effect for group F (1,28,0.05)=.025 p=0.876. There was no main effect for time x group interaction F (1,28,0.05)=1.179 p=0.287.

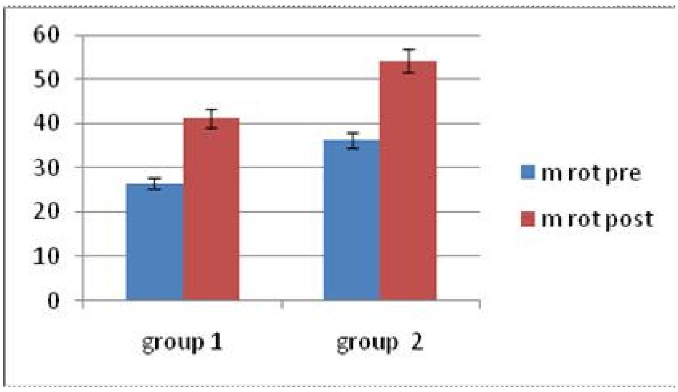

Figure 6. Shoulder medial rotation

There was improvement in active range of shoulder medial rotation in both groups 1 and 2 from pre to post measurement.

- There was main effect for time F (1,28,0.05)=365.370 p=0.000
- There was main effect for group F (1,28,0.05)=32.368 p=0.000
- There was main effect for time x group interaction F (1,28,0.05)=3.804 p=0.061

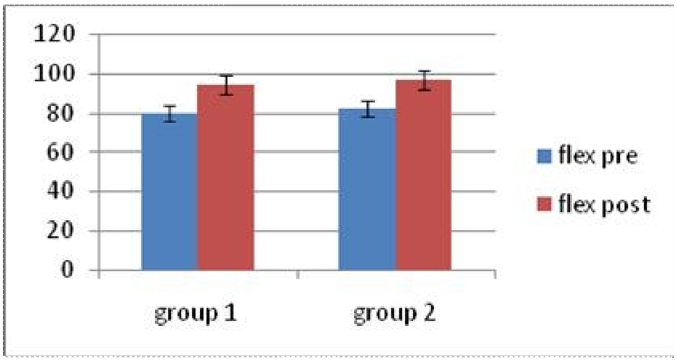

Figure 7. Shoulder flexion

There was improvement in active range of shoulder flexion in both groups 1 and 2 from pre to post measurement. There was main effect for time F (1,28,0.05)=238.996 p=0.000. There was main effect for group F (1,28,0.05)=1.155 p=0.000. There was main effect for time x group interaction F (1,28,0.05) = 0-030 p=0.863.

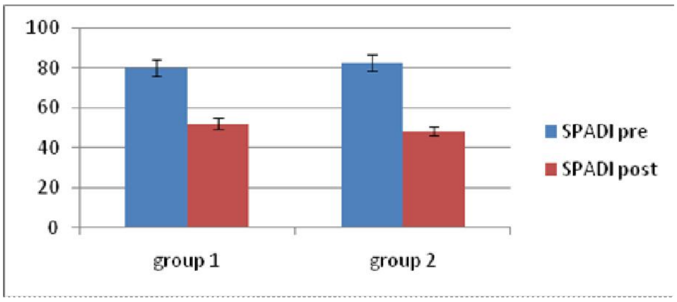

Figure 8. Shoulder function (Spadi)

There was improvement in function in both groups 1 and 2 from pre to post measurement. However group 2 improved a greater extent than group 1. There was main effect for time F (1,28,0.05)=1.631 p=0.000. There was no main effect for group F (1,28,0.05)=0.360 p=0.553. There was main effect for time x group interaction F (1,28,0.05)=16.97 p=0.000. Tukeys HSD showed statistically difference in shoulder pain and disability index (SPADI) from pre and post measurement in both group 1 and 2.

DISCUSSION

The objective of this study was based on the research problem" glenohumeral external rotation loss is more below 90 degree of glenohumeral abduction when the cause of restriction is subscapularis tightness" in adhesive capsulitis patients. Additional subscapularis mobilisation was given to the experimental group along with Maitland joint mobilisation to investigate the improvement. Overall both the groups who received Maitland mobilisation improved in range of motion (flexion, abduction, internal rotation and external rotation). The result also shows that the group which took subscapularis mobilisation along with Maitland mobilsation gained statistically as well as clinically more external rotation below 90 degree of abduction i.e. at 30,45,60 degree and it was 20 degree more improvement in 45 degree of abduction and 10 - 12 degree in 30 and 60 degree of abduction than control group. The Shoulder pain and disability index (SPADI) scores were significantly reduced for both the groups with time but for the experimental group the improvement was significantly more than control group.

Range of motion

From the comparison of Group 1 and Group 2 it is evident that there is an increase in the mean scores (pre to post) of both groups in all the range of motion of glenohumeral joint (flexion, abduction, external and internal rotation) after 2 weeks of Maitland mobilisation in adhesive capsulitis patient.
In Adhesive capsulitis, the structure to be treated presumably is the shoulder capsule. To regain the normal extensibility of the shoulder capsule, passive stretching of the shoulder capsule in all planes of motion by means of end-range mobilization techniques (EMTs) has been recommended. (Maitland's Peripheral Manipulation 4th edition) The predominant adhesive capsulitis and associated soft tissue tightness of frozen shoulder have been commonly addressed in clinical treatment by mobilisation techniques. Mobilisation technique improves the normal extensibility of the shoulder capsule and stretches the tightened soft tissues to induce beneficial effects. Thus the group 1 and group 2 treated by Maitland mobilisation (ERM) for improving shoulder range of motion is not only to restore the joint arthrokinematics but also to stretch contracted peri articular structures. Thus improvement in range of motion had been increased in both groups. The biomechanical effect manifests itself when forces are directed towards resistance but within limits of subject tolerance. The mechanical changes may include breaking up of adhesions, realigning collagen or increasing fibre glide when specific movement stress the specific parts of the capsule, furthermore mobilisation technique are supposed to increase or maintain joint mobility by inducing rheological changes in synovial fluid and cartilage matrix and increase synovial fluid turn over. Jing lan yang *et al.* concluded that in subjects with adhesive capsulitis, ERM and MWM were more effective than MRM in increasing mobility and functional ability. (Jing-lan Yang *et al*., 2007) Vermulan *et al.* in his study concluded that after 3 month of end range mobilisation (ERM) treatment, there was increases in active and passive range of motion in adhesive capsulitis patients. (Vermeulen *et al*., 2000)) Hsu *et al.* concluded that caudal glide translational mobilization at the end range (ERM) using cadaver models improved ROM but was ineffective when performed with the shoulder placed in a resting position. (Hsu, 2000)

External rotation

Gain in external rotation range of motion in control group: From the comparison of both groups it is evident that there is an increase in the mean scores of external rotation in control group after giving Maitland mobilisation. The posterior translation of the head of the humerus can be affected by the length and tension of the anterior capsule during lateral rotation movement.

According to concave convex rule, when a convex surface (humeral head) moves on a fixed concave surface (glenoid fossa), rolling and gliding movements of the joint surfaces occur in opposite directions. With this technique, a joint mobilization was performed to force or glide in a ventral direction which addresses the hypo mobility of the anterior shoulder. Lengthening of the anterior shoulder structures via anterior shoulder joint mobilization techniques will allow the humeral head to glide in the appropriate direction, allowing normal glenohumeral arthrokinematics and increase the extensibility of anterior structures. Because of the capsular constraint mechanism, in our view, it appears that a longer anterior capsule will lead to a greater ROM in lateral rotation. Thus, we believe that the anterior joint mobilisation procedure would stretch the anterior structure and could increase the lateral rotation ROM.

The result of this study supports the findings of previous study

Vermulan *et al.* in his study, statistically significant greater change were found in the HGMT group for active and passive external rotation (at 12 months) in adhesive capsulitis patients after Maitland mobilisation (anterior glide). (Vermeulen *et al*., 2006) Vermulan *et al.* in his study concluded that after 3 month of end range mobilisation (ERM) towards anterior direction increases in active range of motion of lateral rotation in adhesive capsulitis. (Vermeulen *et al*., 2000)

Gain in external rotation range of motion in experimental group

There is an increase in the mean scores of external rotation in both groups, however Group 2 showed a significantly more in the mean scores of ROM of shoulder external rotation at all 3 angles (30°, 45°, 60°) of abduction and external rotation. Simons *et al.* described mesnchymoid transformation, a focal proliferation of fibrous tissue, in connective tissue structures adjacent to muscles afflicted with non articular rheumatism (myofascial TPs). (Simons *et al*., 1999) The transformation was ascribed to hypoxia caused by vasoconstriction. The same process, initiated by TPs in the subscapularis, may induce fibrotic changes in the adjacent glenohumeral joint capsule that lead to adhesive capsulitis. The method of release was by applying "Ischemic compression" to subscapularis muscle which reduces their height, it become longer, tending to normalize the length of all sarcomeres in that muscle fiber. Again, if compression is applied for only a short period of time and then released, the shortened sarcomeres tend to return immediately to their previous state and little has been gained. However, if gentle compression is sustained until the release of tension, this corresponds to a degree of equalization of sarcomere length that demonstrates as reduced muscle tension in subscapularis muscle and inturn increase external rotation range of motion. According to Donatelli subscapularis muscle tightness results in a greater limitation of gleno humeral external rotation in lower range of abduction than in 90 degree of abduction. (Donatelli, 1997) According to Joseph J godges STM (sustained manual pressure and slow deep strokes) to subscapularis and PNF were found to be effective in gaining glenohumeral external rotation. (Joseph *et al*., 2003) According to carel bron concluded that 12 weeks of comprehensive treatment of MTrPs (manual compression), manual stretching of the muscle was effective in reducing symptoms and improving shoulder function. (Carel Bron *et al*., 2007) Maitland mobilisation (anterior pressure) and Ischemic compression (subscapularis) followed by stretching of subscapularis muscle shows significant increases in the external rotation range of motion in the experimental group than in control group. The effect of stretching of subscapularis muscle is related to the viscoelastic properties of the muscle-tendon unit. The elastic element refers to the spring-like element of tissue where the elongation produced by tensile loading is recovered after the load is removed, thereby creating a temporary or recoverable elongation. The viscous properties allow permanent deformation and are considered time-dependent and rate change-dependent. The rate of deformation is directly proportional to the force applied. According to leon chaitow there should be only slight abduction of the arm, because abduction will cause the pectorals major to tense preventing the manual stretch from reaching the subscapular muscle. (Ylinen and Chaitow 1st edition) Carel bron *et al*. concluded that manual compression of the MTrPs and manual stretching of the muscle showed significant improvement in shoulder ROM. (Carel Bron *et al*., 2007)) According to Chauhan *et al*. Cyriax approach of capsular stretching and deep friction massage together on subscapularis muscle and supraspinatus muscle showed improvement in the shoulder ROM. (Chauhan *et al*., 2011)

Internal rotation

There is an increase in the mean scores of internal rotation (pre -post) in both groups after giving Maitland mobilisation. The anterior translation of the head of the humerus can be affected by the length and tension of the posterior capsule in medial rotation movement.Proponents for joint mobilization techniques believe that by gliding the joint according to the convex concave rule, patients can gain mobility. Glide in a dorsal direction addresses hypomobility of the posterior shoulder.Lengthening of the posterior shoulder structures via posterior shoulder joint mobilization techniques will allow the humeral head to glide in the appropriate direction, allowing normal glenohumeral arthrokinematics and increase the extensibility of posterior structures. Robert *et al*. found the overall means for internal rotation of shoulders significantly increased at 4 weeks post intervention by Maitland joint mobilisation (posterior glide). (Robert *et al*., 2010) Roubal *et al.* and Placzek *et al* found marked increases in external rotation as well as internal rotation ROM with posterior gliding manipulation. (Roubal *et al*., 1996; Placzek *et al*., 1998)

Abduction

There is an increase in the mean scores of abduction (pre -post) in both groups after giving Maitland mobilisation. The caudal translation of the head of the humerus can be affected by the length and tension of the inferior capsule in abduction movement. According to concave convex rule, a joint mobilization was applied to force or glide in a caudal direction to addresses hypo mobility of the inferior capsule. Lengthening of the inferior shoulder capsule via caudal shoulder joint mobilization techniques allow the humeral head to glide in the appropriate direction, allowing normal glenohumeral arthrokinematics and increase the extensibility of inferior structures. Maricar *et al*. suggested that longitudinal caudad mobilisation improves in shoulder abduction range of motion in the mobilisation group. (Maricar *et al*., 2009) Hsu *et al*. simulation of caudal glide translational mobilization at the end range using cadaver models improved passive glenohumeral abduction ROM. (Hsu, 2000) Nicholson in his study found passive abduction improved significantly more in the Maitland mobilization group than in the control group. (Nicholson, 1985)

Shoulder Pain and Disability Index (SPADI)

The impaired function of shoulder may be due to pain in the shoulder and which in turn may lead to disability.The shoulder pain and disability index (SPADI) is a self-report questionnaire developed to measure the pain and disability associated with shoulder pathology.In this study the Shoulder pain and disability index (SPADI) scores were significantly reduced for both the groups with time but for the experimental group the improvement was significantly more than control group. Based on the pathology of the underlying capsular restrictions, a rehabilitation focus on managing ER and IR as well as abduction is advocated by Maitland mobilisation to both the groups, which increases the arthro kinematics and stretchability of capsule in all direction, inturn increases the functional ability of the patient with adhesive capsulitis and there was increase in SPADI scores in both groups. Additional of ischemic compression to subscapularis followed by sustained stretching in experimental group further increase the external rotation range inturn improves functional ability and there was significant improvement in SPADI Scores. Kingkaew *et al*. in their study comprising a combined technique of PT (Each session comprised, mobilisation and passive glenohumeral joint and short wave diathermy stretching exercises up to the patient's tolerance) and ibuprofen produced improvement in the SPADI score. (Kingkaew *et al*., 2004) Einar Kristian in his study the relationship between changes in shoulder ROM and SPADI suggest that they measure overlapping underlying phenomena. The results in this study support incorporating the SPADI questionnaire in patient evaluation procedures when designing clinical trials where patients with adhesive capsulitis are investigated. (Kingkaew *et al*., 2004) Vermulen *et al*. found significant difference in both groups over the total follow-up period of 12 months where functional outcome score shown greater change in the HGMT group. (Vermeulen *et al*., 2006)

Conclusion

Patient with primary adhesive capsulitis are benefited by end range rhythmic oscillatory Maitland's mobilisation techniques. However addition of soft tissue mobilisation to subscapularis improves glenohumeral external rotation range of motion and function to a greater extent than only Maitland's mobilisation technique.

Limitation

Small sample size and follow up effect was not taken

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