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Effects of soft tissue mobilization on patients with a restricted glenohumeral range of motion

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ABSTRACT

This Experimental study designed to employed a pre-test/post-test design to find the effects of soft tissue mobilization Pain, Range of Motion and Functional Activity on population having with restricted glenohumeral range of motion and pain. Therapeutic intervention has recently become popular, but there is little evidence to prove it works. In this study, 60 individuals restricted shoulder range of motion and pain were included allocated to three different groups. Group A was the Experimental group, Group B was Control. After six-week course the experimental group showed a significant improvement in shoulder range of motion and reducing the pain on VAS.

Keywords: *Gleno-humeral, Cadaver, Hypertonicity, Musculofascial, Proprioceptive.*

1. INTRODUCTION

The shoulder complex is the functional unit that results in movements of the arm with respect to trunk. As a result of this hand can be placed anywhere within the sphere of movement being limited primarily by the length of the arm and space taken up by the body **(oatis et al).**

Rotator cuff muscles and soft tissue structures are more susceptible to injury because of typical anatomic structures and biomechanical arrangement of shoulder **(Dr .Ahana Chatteraje et al, 2008).** Most commonly injured muscle of rotator cuff is supraspinatus with 32% incidence of partial thickness tear and 19% of full thickness tears. This is followed by subscapularis muscle with 30.4% incidence of partial thickness tear along with concomitant lesion of the long head of biceps **(Matava M. J. et al, 2005**). Such pathologic condition affects components of shoulder function which include stability, strength, and mobility. Limitation of the external rotation range of motion is commonly seen in shoulder pathologic conditions.

The common limiters of external rotation of glenohumeral joint are glenohumeral capsule and internal rotators (). Gross et al. in his clinical study of musculoskeletal examination and Ovesen J at al. in his cadaver study of stabilizing structures around shoulder joint suggest that limitation of external rotation at 90 degrees of abduction is due to the involvement of joint capsule. Cadaver studies and outcomes of subscapularis surgical release suggest that subscapularis muscle flexibility deficits are responsible for gleno-humeral external rotation at lower ranges of gleno-humeral abduction (Joseph J. Godges et al 2003).

2. AIM AND OBJECTIVE

To study the effects of a single session of soft tissue mobilization to subscapularis muscle with proprioceptive neuromuscular facilitation(contact-relax, D2 flexion pattern) on limited glenohumeral external rotation at 45 degrees of abduction and overhead reach activity in patients with restricted glenohumeral range of motion.

Objective:

1) To assess the effect of soft tissue mobilization Pain, Range of Motion and Functional Activity

3. MATERIAL AND METHOD

Permission and approval to carry out the research work were obtained from the head of the institute and institutional ethical committee.

Research design : Interventional Study

Place of study : The study was conducted at outpatient physiotherapy set up.

Population : Patients with shoulder pain referred to outpatient physiotherapy department were included in the study.

Sample size : Patients who were referred to physiotherapy setup from orthopaedic department constituted the population of study. Total patients were screened using proforma. 60 patients (38 male, 22 female) who met the inclusion criteria and accepted to participate were included in the study.

Inclusion criteria : Age group 21-80 years, Males and female, Restricted glenohumeral external rotation at 45 degrees of abduction and overhead reach, Shoulder pathology of 1 year or less.

Exclusion criteria : Post-operative cases of shoulder less than 4 weeks, Shoulder pathology of more than 1 year, Total shoulder arthroplasty, Reflex sympathetic dystrophy, Rheumatoid arthritis, Adhesive capsulitis, Neurological disorders involving glenohumeral joint.

Materials used for the study:

Half circle metal goniometer, Measuring tape, Treatment table/couch, Pillow, Chalk, Black marker, Towel roll, Stopwatch

Outcome measures:

- Pain on VAS, Range of Motion, Functional Activity Scale

PROCEDURE

Patients were assessed pre-treatment and post-treatment on the following outcome measures:

I. Overhead Reach

- It was measured with patients in standing position facing a wall, with tips of their toes aligned with a premarked line on the floor 30.5cm from the wall.
- Patients were asked to actively walk/climb up their fingers up the wall to reach as far as they could.
- Instructions were imparted to avoid tick movements (extension at spine, side bending to opposite side and heel raise) so as to get measurements as accurate as possible.
- A distance was measured from tip of middle finger to the floor in inches using a measuring tape.

II. External rotation at 45^0 of abduction

- Patients were in supine lying position with a pillow under knees.
- Reference lines and points for measurements of abduction and external rotation were drawn on patient's skin by using black marker pain.
- For abduction axis of goniometer was placed over the anterior aspect of acromion process.
- The stationary arm was aligned parallel to the midline of the anterior aspect of sternum and movable arm was aligned with the anterior midline of the humerus.
- Glenohumeral joint was moved to 45^0 of abduction.
- While glenohumeral joint was maintained at 45^0 of abduction, and elbow in 90^o of flexion with the forearm in mid prone position external rotation is measured.
- A towel roll is placed under lower one-third of arm/humerus.
- For external rotation axis is placed over olecranon process.
- Stationary arm aligned perpendicular to the floor, and movable arm is aligned with the ulna.
- The ulnar styloid process is used as reference point.
- Patients arm was passively externally rotated through an available pain-free range of motion.

Procedures for Data collection:

The procedure used in the study was explained to all the patients in detail, in a language they understood. All patients acknowledge their understanding of the study and their willingness to participate by providing a signed consent (Annexure II and III). Patients were evaluated according to the proforma (Annexure I).

The demographic data like age, gender, occupation, contact number and address was collected. A brief history of origin and duration of shoulder pain and any associated problems were recorded.

Initial evaluation of overhead reach and external range of motion at 45^0 of abduction were recorded. After initial evaluation following interventions was performed:

Soft tissue mobilization:

A. Patient's position:

- The patient was in supine lying position with a pillow under knees.
- The arm was abducted to 45^o of abduction, externally rotated to 20^0-25^0 with elbow flexed to 90^0.

B. Therapist position:

- Therapist stood on the side of patient's affected shoulder in stride standing position.
- The heel of one hand was placed just above the lateral border of the scapula in the axillary region.
- Another hand was used to stabilize the patient's arm in above-mentioned position.

C. Palpation of subscapularis:

- The heel of hand was placed above the lateral border of scapula and subscapularis was palpated by going deep and reaching till anterior aspect of the shoulder.
- The muscle was palpated by feeling the contraction of a muscle when patient internally rotates the shoulder.

D. Application of soft tissue mobilization:

- On palpation of subscapularis muscle, trigger points or taut bands were located.
- Trigger points were treated with soft tissue mobilization using sustained pressure and slow deep strokes.
- With the heel of hand moderate sustained pressure was applied to subscapularis.
- Slow deep strokes were applied in caudal direction with the palm.
- Sustained pressure and slow deep strokes were applied alternatively for 7 minutes.

❖ Contract-relax proprioceptive neuromuscular facilitation :

A. Patient position:

- Same as that used for soft-tissue mobilization.

B. Therapist position:

- Same as that used for soft-tissue mobilization.

C. Technique:

- Patients were instructed to perform internal rotation of shoulder against manual resistance provided by the therapist so as to produce isometric contraction of the subscapularis and other internal rotators.
- This isometric contraction was maintained for 7sec.
- This contraction was followed by relaxation and patient performed active external rotation.
- External rotation was maintained for 15sec.
- 5 techniques of contract-relax were performed.

❖ D_2 flexion pattern:
(Flexion-abduction-external rotation with elbow straight)
D2 flexion pattern was practiced on the unaffected side first and then carried out on the affected side.

A. Patient's position:

- Supine lying with a pillow under knees.
- Upper extremity was placed in extension-adduction-internal-rotation.

B. Therapist position:

- At the side of the patient in stride standing position.

C. Hand placement:

- One hand placed over a dorsal-radial aspect of fingers and wrist of patient's affected extremity.
- Other hand placed over a dorsal-radial aspect of patient's forearm.

D. Instructions to the patient:

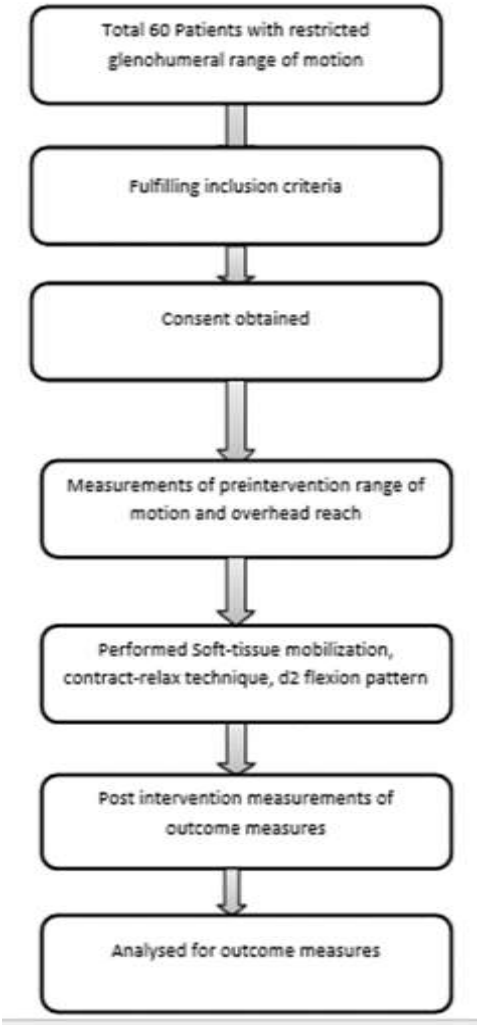
Patients were instructed as follow:-

- 'Open your hand, turn it toward the ceiling and lift it up and toward me, keeping your elbow straight.'
- 5 repetitions of D2 flexion pattern were performed.

On completion of the treatment range of motion and overhead reach described earlier were reassessed in the same manner.

Pre and post intervention data was then subjected to statistical analysis.

Test protocol:



4. DATA ANALYSIS

Three dependent variables used for statistical analysis: 1.external rotation range of motion at 45^0 of abduction2. Overhead reach in inches 3.pain on VAS

Data collected for a range of motion and overhead reach were analyzed using SPSS 15 software for windows.

Various statistical measures such as mean, standard deviation (SD), range, a test of significance students paired t-test and 95% CI were used for this purpose.

The paired t-test was utilized to determine the significance of the difference in terms of the external range of motion at 45^0 of abduction and overhead reach before and after the single session of soft tissue mobilization to subscapularis and proprioceptive neuromuscular facilitation.

Comparison of pre and post-intervention outcome measures of external range of motion and overhead reach was done.$P<0.01$ was considered as statistical significance.

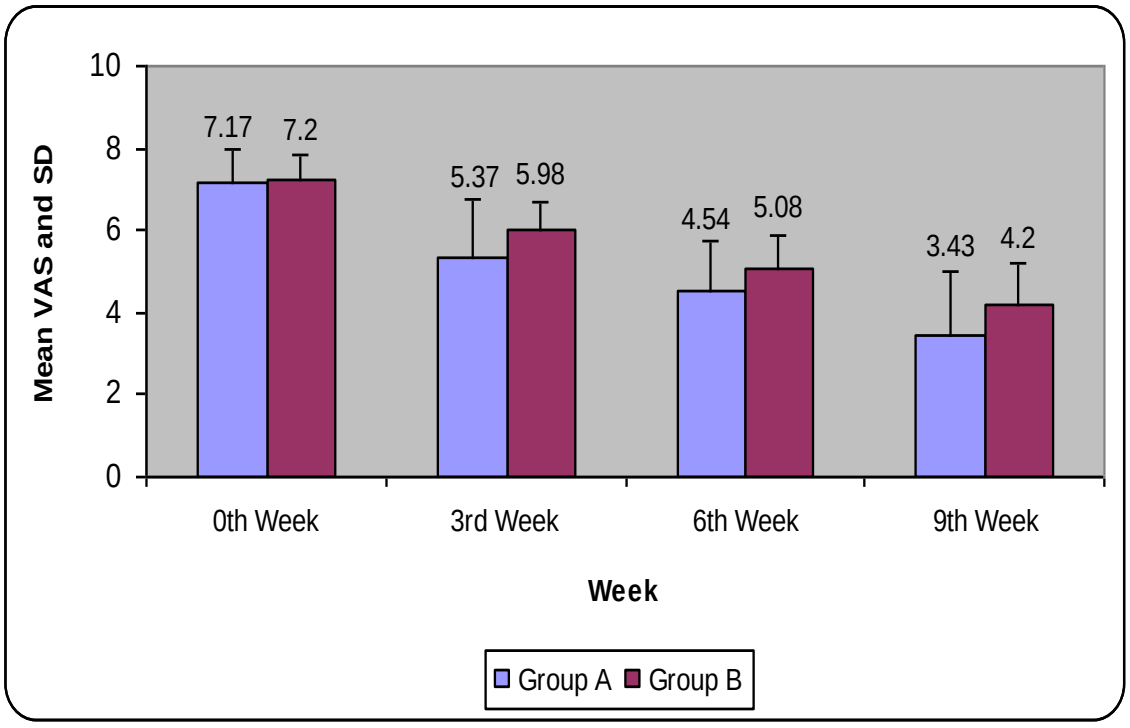
The mean age of the subjects in group A was 38.16 ± 3.87 and in group B it was 38.10 ± 3.65 (Table 1). There was no significant difference is found between the ages of both the group.

Table 1: Age wise distribution of subjects

Age Group	Group A	Group B	χ^2-value
30-40	23 (76.66%)	25 (83.33%)	0.08 Not-significant
41-50	7 (23.34%)	5 (16.67%)	0.33 Not-significant
Total	30 (100%)	30 (100%)	
Mean ± SD	38.16±3.87	38.10±3.65	

Table 2: Comparison of pain on VAS (in cms) in group A and B - Students unpaired t-test

	t-test for Equality of Means						
	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
0th Week	0.176	58	0.861 NS,p>0.05	-0.03	0.18	-0.41	0.34
3rd Week	2.142	58	0.036 S,p<0.05	-0.6	0.28	-1.17	-0.03
6th Week	2.021	58	0.048 S,p<0.05	-0.54	0.27	-1.08	-0.005
9th Week	2.237	58	0.029 S,p<0.05	-0.76	0.34	-1.45	-0.08



Graph 1: Comparison of pain on VAS (in cms) in group A and B - at 0th, 3rd, 6th and 9th week

Comparison of pain on VAS in group A and B at 0,3,6 and 9th week. Mean pain on VAS at 0th week in group A was 7.17± 0.82 and in group B, 7.20±0.62, and at 9th week in group A it was 3.43 ± 1.58 and in group B it was 4.20±1.01. By using students unpaired t-test no significant change in pain on VAS is found at 0th week (t=0.176, p=0.861) and significant change is found at 3rd, 6th week (t =2.021, p=0.048) and at 9th week (t=2.237, p=0.029). Mean decrease in pain on VAS in group A was more as compared to group B.

HYPOTHESIS:

It is hypothesized that there would be a significant immediate improvement in the glenohumeral external rotation and overhead reach activity after Soft tissue mobilization to subscapularis muscle and Proprioceptive neuromuscular facilitation in patients with a restricted glenohumeral range of motion.

NULL-HYPOTHESIS:

It is hypothesized that there would be no immediate significant improvement in the glenohumeral external rotation and overhead reach activity after Soft tissue mobilizationsubscapularis and Proprioceptive neuromuscular facilitation in patients with a restricted glenohumeral range of motion.

5. CLINICAL IMPLICATION

Shoulder pain is most common extra spinal complaint encountered in the primary clinic. External rotation of shoulder joint and overhead reach are required for various functional activities Researches have shown that subscapularis plays an important role in restricting external rotation. The present study was an attempt to target subscapularis muscle in order to improve the external rotation and overhead reach. Soft tissue mobilization and proprioceptive neuromuscular facilitation showed improvement in range of motion. This combination of treatment can be used as a part of the multimodal approach in patients with restricted glenohumeralnge of motion. The approach of treatment helps to achieve external rotation at 45^0 of abduction. So it can be used to improve external rotation even though available abduction is less than 90^0. So it can be used as a treatment protocol in the early phase of rehabilitation.D2 flexion movement pattern can be transferred to the home programme for further training and strengthening.

6. DISCUSSION

Involvement of right side of the shoulder was found to be 66.7% as compared to left side 33.3%.study conducted by Dr.AhanaChatterje et al reported that right side involvement was more common in males, while females show the involvement of left side. In case of soft tissue pathology more commonly involved muscle was supraspinatus. This in accordance with the study by Dr.AhanaChatterje et al.All the patients were initially assessed which was regarded as a baseline assessment, and were then reassessed after the intervention on the outcome measure of external rotation at $45^0$of abduction and overhead reach. The results of the present study support the hypothesis that there would be a significant immediate improvement in the glenohumeral external rotation and overhead activity after Soft tissue mobilization to subscapularis and Proprioceptive neuromuscular facilitation. The comparison between pre and post intervention outcome measures showed the significant mean difference in external rotation at 45^0 abductions (7.4^0+/-2.92^0) resulting in a statistically significant improvement in range of motion at $p<0.01$(95% CI, -6-64^0-8.155^0) as measured by applying students paired t-test.
Similarly, the significant mean difference in overhead reach (1.45 +/-0.687 inches) resulting in a statistically significant improvement in overhead reach at $p<0.01$(95% CI, -1.27-1.63 inches).

The findings of our study are consistent with the study done by

Godges J J (2003), who stated that soft tissue mobilization, contract-relax to shoulder internal rotation, followed by proprioceptive neuromuscular facilitation was effective in gaining glenohumeral external rotation and ability to reach overhead during single intervention session I patients with shoulder pathology. Hunten W P et al. (1994), who concluded that contract-relax and myofascial release leg pull techniques can significantly improve hip range of motion in normal subjects. Godges J et al(1989), reported that single bout of static stretching or soft tissue mobilization and proprioceptive neuromuscular facilitation was effective in improving hip range of motion in young, asymptomatic males. The ability of the body to move freely without restrictions and with control during functional activities is dependent on the passive mobility of soft tissues as well as active neuromuscular control(kisner 69).
Grieve stated that' the nerve, connective tissue, muscle and articular complex produces multiple and varied arthrokinematic systems which are functionally interdependent upon each other. Many authorities stated that dysfunctions of the soft tissue system play a role in onset and perpetuation of musculoskeletal symptoms and subcutaneous fat in muscle that occurs with immobilization contributes to the decreased extensibility of the shortened muscle.

7. CONCLUSION

The present study was attempted to find out immediate effects of soft tissue mobilization to subscapularis and proprioceptive neuromuscular facilitation on external rotation and overhead reach in patients with a restricted glenohumeral range of motion and pain on VAS.

A single session of soft tissue mobilization to subscaspulris and proprioceptive neuromuscular facilitation were found to be effective in improving the external rotation and overhead reach activity and pain on VAS in patients with a restricted glenohumeral range of motion.

8. RECOMMENDATIONS

- The study should be carried out on a larger sample size to review immediate effects of soft tissue mobilization and proprioceptive neuromuscular facilitation in patients with a restricted glenohumeral range of motion.
- The study should be conducted to determine the long-term effects of this intervention.
- Effect of intervention should be compared with the conventional approach to shoulder rehabilitation.
- Control group should be used.
- Additional outcome measures are needed to determine the long-term efficacy of the intervention.

9. REFERENCES

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