Effect of Stretching and Strengthening Shoulder Muscles in Protracted Shoulder in Healthy Individuals

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ABSTRACT

Aim:
To study the effect of stretching and strengthening shoulder muscles in protracted shoulder in healthy individuals.

Objective: To determine the effectiveness of stretching and strengthening exercises in reduction of protracted shoulder in healthy individuals.

Background: Many researchers have reported that protracted shoulder might lead to shoulder malposition , which may increase the subacromial impingement. In this study stretching of shoulder protractors and strengthening of shoulder retractors and external rotators has been done to reduce shoulder protraction and their by prevent shoulder pathologies.

Study Design: Experimental study design.

Study Setting: Outpatient Department, Saveetha College of Physiotherapy, Saveetha University, Thandalam, Chennai – 602105.

Methods And Measures: 30 individuals were selected based on the inclusion and exclusion criteria. All the subjects were asked to sign consent form and brief explanation about the protocol was given. After signing the consent form eligible subjects were participated in the study.

Outcome Measures: Lateral scapula slide test using vernier caliper (in centimeters) is used for measuring pre-test and post-test.

Results: The study was significant in reducing the level of shoulder protraction with the pre-test mean and SD was 9.760cms and 0.338 respectively and the post-test mean and SD was 8.860cms and 0.338 respectively and p-value < 0.0001.

Conclusion: The study showed that the stretching and strengthening exercises are effective in reducing the protracted shoulder.

Key Words: Protracted shoulder, stretching, and strengthening exercises

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INTRODUCTION

The Scapulothoracic joint is one of the least congruent joints in the body. No actual bony articulation exists between the scapula and the thorax, which allows tremendous mobility in many directions, including protraction, retraction, elevation, depression and rotation. The lack of bony attachment predisposes this joint to pathologic movement and consequently makes the glenohumeral joint highly dependent on the surrounding musculature for stability and normal motion[28,4,15,29].

The prevalence of right rounded shoulder is 73% and left rounded shoulder is 66%[10]. Scapula Protraction is an abnormal position which has been defined as an increased distance between the inferior angle of scapula and the spinous process of the vertebra[6]. Previous authors have suggested that strength imbalance of the anterior shoulder muscles can pull the shoulder forward producing a protracted posture which predisposes to subacromial impingement due to decrease in subacromial space[32].

"Morttarm emphasized on the importance of muscular ability to achieve stable scapula and prevent the development of shoulder dysfunction". The findings of other investigators indicated that alterations in scapular positioning can have an effect on shoulder function[21].
The importance of normal upright posture has been proposed since the early 1900s when it was described as a state of balance requiring minimal muscular effort to maintain[8,34].

The scapula plays several roles in facilitating optimal shoulder function when scapular anatomy and biomechanics interact to produce efficient movement[27]. Dynamic stability at the scapulathoracic joint depends on the surrounding musculature[27]. While maintaining dynamic stability the scapular musculature must at the same time provide controlled mobility. During throwing motions, as the arm begins to accelerate, the scapula must be protracted in a smooth fashion laterally and then anteriorly around the thoracic wall to allow the scapula to maintain a normal positional relationship with the humerus. This motion is controlled through eccentric contraction of the medial stabilizing musculature. Thus facilitating the dissipation of some of the deceleration forces that occur in the follow through phase[30]

The muscles that stabilise the scapula attach to the medial border of the scapula, The muscles are the Levator scapulae, Rhomboids major and minor, serratus anterior and trapezius. These muscles controls scapular motion mainly through synergistic co-contraction and force couples which are paired muscles that control the movement or position of a joint [1,8,7,22,14,30]

The appropriate force couples for scapular stabilisation include the upper and lower portions of the trapezius muscle working together with the rhomboids muscles, paired with the serratus anterior muscle. The appropriate force couples for acromial elevation are the lower trapezius and the serratus anterior working together, paired with the upper trapezius and rhomboid muscles[28,16]. The main functions of these force couples are to obtain maximal congruency between the glenoid fossa and the humeral head , to provide dynamic glenohumeral stability , and to maintain optimal length- tension relationship[15,29,16].

When the muscles are weak or fatigued scapulohumeral rhythm is compromised and shoulder dysfunction results[15,29,16,6]. This dysfunction can cause microtrauma in the shoulder muscles, capsule, and ligamentous tissue and lead to impingement[4,15,29].
Therefore the study was designed to examine the effect of an exercise program on the position of scapula in protracted individuals.

Methodology

Inclusion criteria

Male and female individuals with protracted shoulder posture with age group of 20 to 30 years.

Exclusion Criteria:

- Any shoulder instability.
- Any fractures related to shoulder.
- Any nerve lesions
- Any recent injuries in the shoulder

Procedure:

30 Individuals are selected based on a length test for pectoralis minor , as a tightened pectoralis minor tilts the scapula anteriorly pulling the shoulder girdle down and forward[18].

Patient position: supine, arms at sides, elbows extended, palms upward , knees bent , and low back flat on table.

Test: Examiner stands at head of table and observes the position of the shoulder girdle. The amount of tightness is measured by the extent to which the shoulder is raised from the table, and by the amount of resistance to downward pressure on the shoulder. Tightness may be recorded as slight, moderate [18].

The level of shoulder protraction was measured with a vernier caliper using lateral scapula slide test with a subject standing at rest, were lateral arm of vernier caliper at the tip of the inferior angle of scapula and medial arm of vernier caliper at the corresponding spinous process was measured .

Mean of the 3 pre-test measurements are used for the statistical analysis and the Mean of 3 Post-Test measurements were taken following the 6 weeks exercise program given 3 times a week and the mean values are used for data analysis.

EXERCISE PROTOCOL:

Exercise group:

STRETCHING exercises are given passively for the following muscles for 3 times/ 30 seconds hold.

1. **PECTORALIS MINOR** :

Patient position: In supine lying.

Physiotherapist : Retracts the patient shoulder and depresses the shoulder. Hand should be " Cupped " around shoulder to allow firm, uniform pressure that helps to rotate the shoulder girdle back.

2. PECTORALIS MAJOR:

Patient position: In lying

Physiotherapist: abduct the patients arm to 90 degree and flex the elbow to 90 degree and the therapist will extend the shoulder and externally rotate the shoulder.

STRENGTHENING exercises are given for the following group of muscles using Theraband for 3 sets/10 repetitions.

1. **SCAPULAR RETRACTION:**

Patient position: In standing, shoulder abducted to 90 degree in the scapular plane, the elbows flexed to 90 degree, and the forearms horizontal, the subject holds a section of exercise band on the protracted side , and the scapulae are retracted stretching the band. The subject must maintain the original 90 degree position of the shoulders and elbows and then execute a controlled return to the starting position.

2. SHOULDER EXTERNAL ROTATION:

Patient position: The upper arm is positioned at 90 degree of shoulder abduction and 90 degree of elbow flexion. The forearm begins in a horizontal position and externally rotates into a vertical position. The subject then executes a controlled return to the starting position the exercise band is fixed in front of the subject at approximately waist height at the beggining of the exercise.

3. SHOULDER FLEXION FOR LOWER TRAPEZIUS:

Patient position: with arms flexed to 90 degree, elbows fully extended, and palms down , the subject flexes the shoulders to 180 degree against the exercise band resistance and then executes a controlled return to the starting position. The exercise band is again fixed in front of the subject at approximately waist height for the beginning of this exercise[35].

Progression of strengthening exercises is given for 3 sets/ 15 repetitions

Subjects practiced each exercises to familiarize themselves with each task until they demonstrated proficiency. Subjects generally required 8 to 10 practice repetitions for exercise.

Data Analysis and Results

The collected data were tabulated and analysed satistically with the paired 't' test. The

TEST	Mean (cms)	S.D. (cms)	Std.Mean (cms)	Paired t-values	P values
Pre -test	9.760	0.338	0.062	610490	p<0.0001
Post-test	8.860	0.338	0.062		

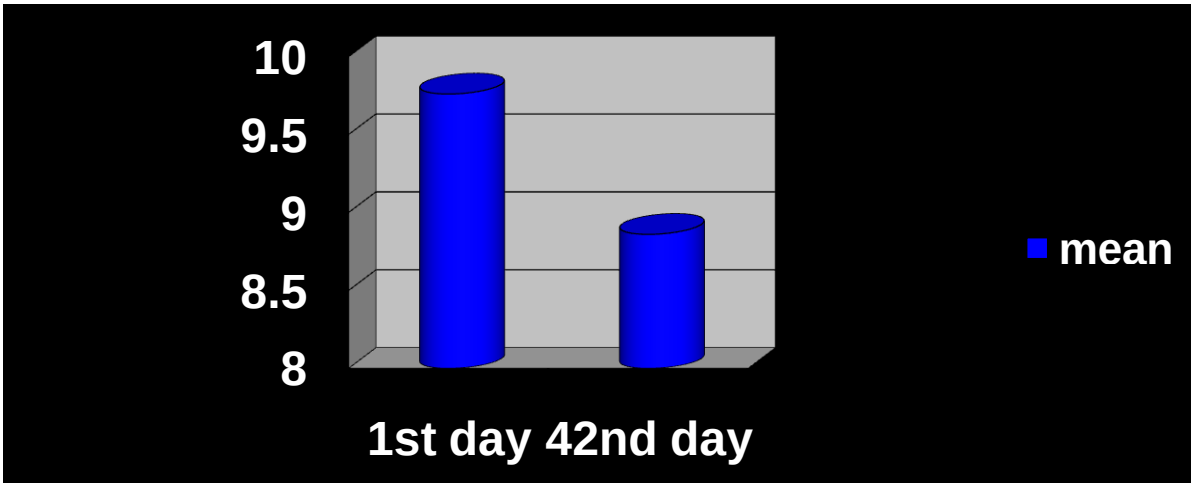
pre-test mean of 9.760 cms with the SD of 0.338 and the post-test value of 8.860 cms with SD of 0.338. The value was gradually decreased with the mean difference of 0.900cms and p value < 0.0001. Hence, the study is statistically significant. Stretching and strengthening exercises demonstrated a greater improvement in reduction of protracted shoulder.

Testing the Effectiveness of Stretching and Strengthening Exercises in reducing The Protracted Shoulder Posture By Using Paired T –Test

Comparison of pre-test and post test values (paired t-test)

The above table reveals that pre-test mean 9.760cms and SD 0.338, post-test values with mean 8.860cms and SD 0.338, the post test values gradually decreases with mean difference 0.900 cms. The paired-t test value 610490 and the p-value less than 0.0001 shows that the study is statistically significant.

Graphical representation of pre-test and post-test values



DISCUSSION:

Scapula Protraction is an abnormal position which has been defined as an increased distance between the inferior angle of scapula and the spinous process of the vertebra[6].

The muscles that stabilize the scapula attach to the medial border of the scapula, thereby controlling its position. This musculature controls scapular motion mainly through synergistic co-contractions and force couples, which are paired muscles that control the movement or position of a joint or a body part[1,8,7,22,14,30].

The main functions of these force couples are to obtain maximal congruency between the glenoid fossa and the humeral head, to provide dynamic glenohumeral stability, and to maintain optimal length-tension relationships[15,29,16]. The appropriate force couples for scapular stabilization include the upper and lower portions of the trapezius muscle working together with the rhomboid muscles, paired with the serratus anterior muscle. The appropriate force couples for acromial elevation are the lower trapezius and the serratus anterior working together, paired with the upper trapezius and rhomboids muscle[28,16].

Authors have suggested that strength imbalance of the anterior shoulder muscles can pull the shoulder forward producing a protracted posture which predisposes to subacromial impingement due to decrease in subacromial space[32]. When weakness or dysfunction is present in the scapular musculature, normal scapular positioning and mechanics may become altered[27].

The alteration of scapula position not only may have an effect on shoulder muscles performance but also it may predispose the protracted individuals to injuries because of weaker muscles performance and poor posture.

A 6 weeks of exercise program aimed at stretching the tight muscles such as pectoralis major and minor muscles and strengthening the weak muscles such as shoulder flexors for trapezius , shoulder external rotators and shoulder retractors[37] . This program increases the performance of a muscle and their by it helps in reduction of protracted posture in healthy individuals and thus maintains the normal scapular position. This protocol can also be used in similar condition like upper cross syndrome.

CONCLUSION:

This study has demonstrated that stretching the tight muscle and strengthening the antagonist muscle is the appropriate intervention for correcting the postural fault caused by muscle imbalance[17,32]. Hence this study has helped in the reduction of protracted shoulder in healthy individuals. So, clinically this program can be used for treating the protracted shoulder conditions

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