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Effect of Scapular Mobilization with or without Isometric Exercise of Serratus Anterior in Type I Scapular Dysfunction. A Randomized Control Trial

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Abstract

Objective: To determine the effectiveness of Scapular mobilization with isometric exercise of serratus anterior and scapular mobilization alone in scapular dysfunction of type I.

Methodology: It was randomized control trial and conducted from April to September 2016. A sample of 40 patients were collected through non probability purposive sampling techniques and randomly divided into two groups (Group A and experimental group). Visual Analogue Scale/numeric pain scale was used for the Assessment of pain and hand held inclinometer/goniometer used for range of movement measurement.

Results: The p-value of shoulder internal rotation and pain is less than 0.05 means there is significant difference in both group i.e. experimental group show improvements in pain and range of motion. While the p-value of shoulder abduction and flexion is more than 0.05 means there is no significant difference in both.

Conclusion: There is effect of scapular mobilization and isometric exercises of serratus anterior on pain and shoulder ranges, and experimental group maintain the shoulder ranges for prolonged period of time as compare to the control group. In future effects of two sessions per week should be evaluated.

Keywords: Scapular dyskinesia, Isometric exercises, Scapular mobilization

Introduction

Different physiotherapy techniques have been proposed for shoulder dysfunction, including Manual Technique (MT), electrotherapy, dry needling therapy and therapeutic exercises [1]. Manual therapy, including massage therapy, manipulation mobilization and of shoulder joint, i.e. Maitland technique, might be used of decreasing pain and improving the Range of Motion (ROM), thereby enhancing the capacity of ADLs. Modification in static position of scapula and dynamic scapular motion, defined as scapular dyskinesis, have occurred in patients in different shoulder joint pathologies including rotator cuff syndrome, labral tear, instability and shoulder impingement [2,3]. It is not unknown that these modifications may influence shoulder arthrokinematics and normal Scapulohumeral Rhythm (SHR), hence after play an important role in making the shoulder dysfunction related with these pathologies.

Scapulohumeral rhythm (also referred to as glenohumeral rhythm) is the movement interaction between the humerus and scapula [4]. This communication is important for the normal function of the shoulder [5]. When the normal position of scapula is disturbed relative to humerus, then there is a dysfunction of scapulohumeral rhythm. The disturbance of the normal position is called scapular dyskinesia. Glenohumeral rhythm or ratio is significantly greater (less motion of the scapula and more motion of the humerus) in the sagittal plane than other planes. In coronal and scapular planes only, dominant side showed significantly higher values for glenohumeral rhythm than the non-dominant side [6]. The definition of scapulohumeral rhythm is it is the ratio of the glenohumeral movement to the scapulothoracic movement during elevation of arm. It is often calculated by dividing the total amount of shoulder elevation (humerothoracic) by the upward rotation of the scapula in the scapulothoracic joint [7].

An alteration of the typical position or movement of the scapula during coupled movement of scapula & humerus (scapulohumeral rhythm) is known as Scapular dyskinesis. It happens after a number of injuries that include glenohumeral joint and is the main cause of pain in shoulder Joint [8]. Warner et al. 11 analyzed that 68%–100% of patients having a past history of shoulder injury found changed position and movement of scapula [9].

The kinematics of scapulothoracic joint plays an important role in the functional activity of upper limb since it influences the stability of shoulder, the superior labrum of glenoid cavity, the function of rotator cuff and the movement takes place in acromioclavicular space, additionally the movement of acromioclavicular and sternoclavicular joints [10]. In overhead activities, the movements and forces transmitted to the upper limb with trunk and to the lower limbs are influenced by the function of scapulothoracic joint and strength and movement of glenohumeral joint [11]. During overhead activities of shoulder joint, the scapulothoracic joint motion involves rotation of scapula upward, first medially and then it moves to a larger degree in external rotation, and backward tilting of scapula, as well as upward and medial movement of the clavicle [12]. The upper and lower fibers of trapezius and the Serratus Anterior (SA) are the muscles inserted on

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the scapula plays an important role in the kinematics of scapulothoracic joint [13]. The activation and coupled movement of these muscles on scapulothoracic joint are responsible for upward movement of scapula, lateral rotation and retraction. Patients with shoulder pain and in various types of overhead sports such as base-ball, tennis, badminton, rubgy, water polo, volley ball, swimming and patients of clavicular fracture and acromioclavicular joint injuries are commonly associated with scapular dyskinesia [14].

As of late, Burkhart et al. [3] have used the acronym SICK to mention to the dysfunctioning related with scapular dyskinesia "the SICK scapula." The acronym SICK stands for Scapular malposition, Inferior vertebral border elevation, Coracoid pain, malposition and dyskinesis of movement of scapula. The main characteristic of this disorder is the malpositioning of the scapula in the prevailing throwing shoulder, which gives off an impression of being more malpositioning than the opposite shoulder. The tightness of the pectoralis minor muscle or at the insertion of short head of the biceps brachii muscle (at coracoid process) is secondary cause of protraction and ventral tilting position of scapula. An important indication of dysfunction of scapula is tenderness of coracoid process, which is consider as the second cause of tightness of continuous traction at the insertion of tendon. Pain in anterior shoulder region especially in coracoid region, dorso-cranial scapular pain with or without radiation to cervical region i.e. para spinous muscles or proximal lateral arm, acromioclavicular joint may always be present in symptomatic patients.

Objectives

1) The aim of the study is to find the effectiveness of combination of scapular mobilization with isometric exercises of scapular muscles in scapular dyskinesis I or

2) To find the effect of scapular mobilization in scapular dyskinesis. (without any therapeutic exercises)

Hypothesis

Null hypothesis: (H0)

There is no effect of scapular mobilization in type 1 shoulder dyskinesis.

Alternative hypothesis: (H1)

There is effect of scapular mobilization in type 1shoulder dyskinesis.

Null hypothesis: (H0)

There is no effect of isometric exercises of serratus anterior in type 1 shoulder dyskinesia.

Alternative hypothesis: (H1)

There is effect of isometric exercises of serratus anterior in type 1 shoulder dyskinesia.

Methodology

This was a Randomized clinical trial. Non probability purposive sampling technique was used. The sample size was calculated through standard formula for RCT sample calculator.

With 95% Confidence interval, 80% power of study was found, Ratio of sample size B: A=1

Proportion of patient (Group A) = 0.50

Proportion of patient (Group B) = 0.10.

Required sample: Total 40 (20 in A, 20 in B).

Patients were randomly divided into 2 groups. There were twenty patients in each group.

Group A: Patients in this group were treated with Scapular mobilization and isometric exercises of serratus anterior muscle. Group B: Patients were treated with scapular mobilization alone.

Patients having Age 20-69 of both gender, weakness of abduction of shoulder and having difficulty in overhead activities are included (type I dyskinesia). Numeric pain scale/Visual analogue scale was used for the pain Assessment and hand held digital inclinometer/ goniometer used for range of movement measurement. Data was obtained by the therapist/researcher before and after the treatment sessions (total 3 sessions, 1 in every week). Data entry and analysis was done by using SPSS 18. Quantitative variables were presented by using mean ± SD. Qualitative variables were presented by using frequency table and appropriate graphs where applicable. Paired t test is used to determine the difference with in the group. Independent sample t Test was used to determine any significant difference between the two groups. A p-value≤ to 0.05 was taken as significant.

Results

Socio-demographic characteristics of observations are summarized in Table 1. A total of 40 subjects were included in the study, who were divided equally into two groups i.e. Group A and Group B. Out of 20 patients in Group A 13 (65%) were male and 7 (35%) were females whereas in Group B, 14 (70%) subjects were male and 10 (30%) were females . Mean age of subjects in Group A was 36.70 ± 12.14 and in Group B was 42.12 ± 8.76 (P=0.12). Subjects in both groups were also comparable in terms of hand dominancy, scapular tests, scapular position and painful activity. (Table 2)

Comparison of mean difference of pre-treatment and post treatment observations between groups is summarized in Table 3. Mean difference of pre-treatment post treatment score in Group A was 6.25 ± 1.02 and in Group B was 3.95 ± 0.22 (P=0.000) showing there is significant difference between mean scores of both groups. (Figure 1) (Table 3)

Comparison of pre-treatment and post treatment observations for shoulder abduction, within groups is summarized in Table 4. Mean score of Group A in pre-treatment measurements was 157.55 ± 6.71 and after treatment was 165.95 ± 8.20 (<0.005*) showing significant improvement with intervention of Group A. Mean range of shoulder abduction score in Group B for pre-treatment readings was 147.90 ± 9.11 and in post treatment reading was 158.00 ± 9.12 (<0.001*) showing significant improvement with the interventions of Group B. (Table 4)

Comparison of pre-treatment and post treatment observations for shoulder internal rotation, within groups is summarized in Table 4.Mean score of Group A in pre-treatment measurements was 49.68 ± 5.94 90 and after treatment was 352.76 ± 5.88 (<0.001*) showing significant improvement with intervention of Group A. shoulder internal rotation range in Group B for pre-treatment readings was 49.57 ± 6.99 and in post treatment reading was 55.06 ± 7.47 (<0.001*) showing significant improvement with the interventions of Group B.

		Group A n=20 (Scapular mobilization without Isometric)	Group B n=20 (Scapular Mobilization with Isometric)	p-Value
Age(Years)^		36.70 ± 12.14	42.12 ± 8.76	0.12
Gender	Male	13	14	0.74
	Female	7	6	
Effected Shoulder	Left	5	4	0.49
	Right	12	15	
	Both	3	1	
Dominant Hand	Left	2	3	0.63
	Right	18	17	
Scapular Assistance Test	Positive	13	12	0.74
	Negative	7	8	
Scapular Retraction Test	Positive	15	14	0.72
	Negative	5	6	
Scapular Winging (without weight holding)	Medial	11	15	0.18
	Inferior	9	5	
Scapular Winging (With weight holding)	Medial	11	14	0.33
	Inferior	9	6	
Scapular Position	Normal	1	0	0.31
	Elevation	3	2	
	Depression	1	0	
	protraction	5	2	
	combination EP	10	16	
Painful Activity	Lying Effected Side	5	2	0.17
	Over Head	3	1	
	Approaching same Side	2	1	
	Arm to Back	7	6	
	Throwing	3	10	

Table 1: Socio-demographic characteristics.

	Group A	Experiment Group	p-Value
Mean difference	6.25 ± 1.02	3.95 ± 0.22	0
* p-valve significant<0.005			

Table 2: Between group comparison (Visual Analog Scale).

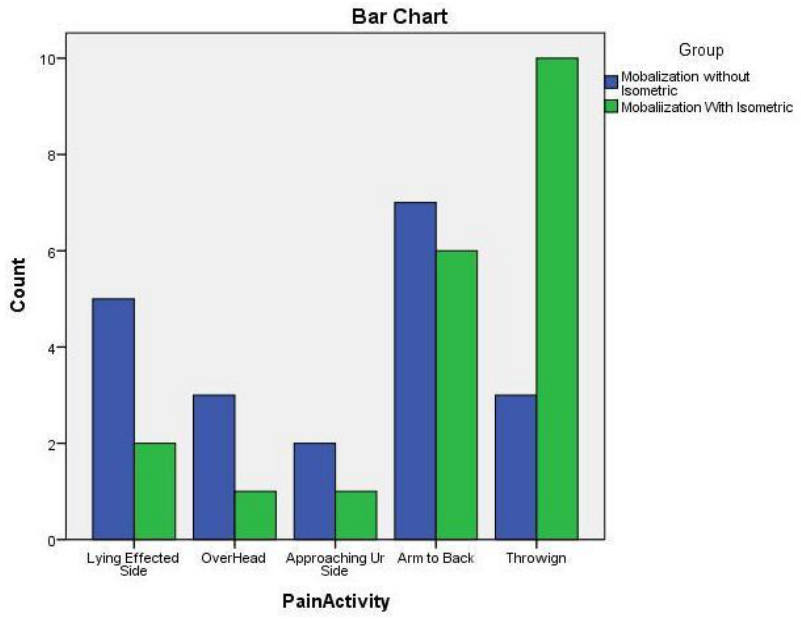

Figure1: Graph showing different activities that enhances the pain in shoulder girdle. Most alleviating factor is taking arm to back and throwing activities.

Groups	Pre-treatment (Baseline)	After treatment (3 week)	p-Value
Group A	157.55±6.71	165.95±8.20	0.005
Group B	147.90±9.11	158.00±9.12	0
*p-valve significant<0.005			

Table 3: Within Group comparison (Shoulder Abduction).

Groups	Pre-treatment (Baseline)	After treatment (3 week)	p-Value
Group A	49.68 ± 5.94	52.76 ± 5.88	0
Group B	49.57 ± 6.99	55.06 ± 7.47	0
*p-valve significant<0.005			

Table 4: Within Group comparison (Shoulder Internal Rotation).

Discussion

This study demonstrated that an immediate and significant improvement in shoulder movements, scapular upward rotation and elevation, and pain might be gained after application of the SM technique to patients with painful restriction of the shoulder. There are no other published studies from the literature on the effects of this technique on participants with scapular dysfunction [8,1].

Joint-mobilization techniques are assumed to induce various beneficial effects. The mechanical changes may include breaking up adhesions, realigning collagen, or increasing fiber glide [15]. We found that scapular movement was increased and shoulder flexion and abduction were not increased but shoulder internal rotation was increased, respectively, after SM, compared with the Group A and experimental Group [16]. In our opinion the tightness of inferior shoulder capsule might affect abduction of shoulder joint because the scapulothoracic joint is composed by muscles, not like synovial joints. SM may break up adhesions and release these muscles; hence, scapular movement may be increased. The improvement of shoulder movement might also be related to increased scapular movement.

In this study, shoulder-related dysfunction was assessed with the scapular assistance test and scapular retraction test, scapular position, shoulder ROM,VAS and shoulder function before and after the application of scapular mobilization alone and scapular mobilization with isometric exercises of serratus anterior. Our primary interest was to assess SM alone and SM with isometric exercise of serratus anterior related to scapular winging and shoulder related disabilities.

Joint-mobilization techniques also have neurophysiological effects, which are based on the stimulation of peripheral mechanoreceptors and the inhibition of nociceptors [17,18]. These mechanoreceptors are present mostly around the synovial joint. In our study, VAS score changes after SM. Hence, we suggest that SM may be related to muscle structures rather than synovial joint, which is rich in mechanoreceptors. In the current study, VAS scores were assessed before treatment (baseline) and after treatment (3 weeks) of SM.

Conclusion

Results shows that there is effect of scapular mobilization and isometric exercises of serratus anterior on pain and shoulder ranges as shown by the results, and experimental group maintain the shoulder ranges for prolonged period of time. In future the effects of two sessions per week should be evaluated and more treatment options should also be considered.

Recommendations

Two sessions per week will be given to the patients according to Maitland concept. Shoulder girdle joint should also be included in the study.

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