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Translational Medicine

Research Article

Effect of Scapular Stabilisation Exercises for Type 2 Scapular Dyskinesis in Subjects with Shoulder Impingement

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ABSTRACT

Background: Altered scapular motion and position have been termed Scapular Dyskinesis. In Type 2 Scapula Dyskinesis, visual prominence of entire medial border of scapula occurs due to weakness of the muscle serratus anterior and tightness of posterior capsule results in reductions in both glenohumeral flexion , abduction, resulting in decreased acromial elevation and Secondary impingement. Rehabilitation generally begins and focused on axio humeral and scapula humeral than axio scapula muscle. Early application of closed kinetic exercise approach on scapular stabilization and its effect of application on scapula dyskinesis type 2 is not know. The study was proposed to find the effect of scapula stabilization exercise for type 2 Scapula Dyskinesis in subjects with shoulder impingement.

Method: An Experimental study design, 7 male patients with mean age 37 years diagnosed with Shoulder impingement associated with Type 2 scapula dyskinesis were taken into the study. Protocol include closed kinematic chain exercise (scapula clock), Black burn exercise, Sleepers stretch, and theraband exercise aim to balance force couple of upper,lower trapezius and serratus anterior. Duration of intervention was 3 sessions per week for 2 weeks. Outcome measurements such as Lateral scapular slide test and SPADI were measured pre and post after 2 weeks of protocol.

Results: Analysis using paired 't' test as a parametric test found that there is statistically significant difference $p<0.000$ when pre to post interventions means were compared within the groups showing significant improvement in post SPADI and lateral scapular slide test.

Conclusion: It is concluded that Scapula stabilization exercise protocol found to be effective in Scapula type 2 Dyskinesis.

Keywords: Impingement syndrome; Scapula dyskinesis; Scapula stabilization; Serratus anterior

INTRODUCTION

'Scapular dyskinesis' is defined as an observable alteration in the position of the scapula and the patters of scapular motion in relation to the thoracic cage [1-3]. Scapular dyskinesis has been associated with shoulder injury, and several groups have found differences in scapular kinematics among people with instability, rotator cuff tears, and impingement syndrome when compared with healthy shoulders, although the magnitude of differences between symptomatic and asymptomatic individuals is typically very small [1-3]. It also occur as a result of changes in activation of the scapular stabilizing muscles; damage to the long thoracic, dorsal scapular, or spinal accessory nerves; or possibly reduced pectoralis minor muscle length [4].

Kibler et al. classification, derived from observing the dynamics of the scapular dyskinesis combined with the rest position of the scapula, resulted in three dysfunctional patterns [5]. Type I was characterized, at rest, by the posteriorly displaced or winging of the inferior medial scapular border, and during arm elevation, by the posterior winging of the inferior angle of the scapula. Type II was characterized by the projection of the entire medial border of the scapula at rest and in motion. Finally, type III was characterized by excessive superior translation, with elevation and some anterior displacement of the superior border of the scapula on the thorax. A symmetrical pattern and the normal scapulothoracic rhythm were classified as type IV (Figure 1).

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Received: February 3, 2021, **Accepted:** February 17, 2021, **Published:** February 24, 2021

Citation: Shankar P, Jayaprakasan P, Devi R (2021) Effect of Scapular Stabilisation Exercises for Type 2 Scapular Dyskinesis in Subjects with Shoulder Impingement. Transl Med. 11: 223.

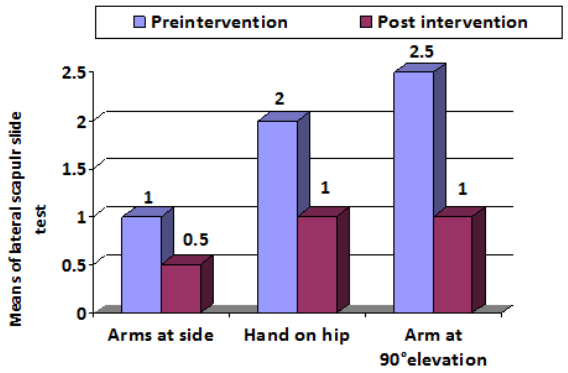

Figure 1: Analysis of Lateral scapular slide test (Pre to post test analysis).

Shoulder impingement has been defined as compression and mechanical abrasion of the rotator cuff structures as they pass beneath the coracoacromial arch during elevation of the arm [3]. Rotator cuff problems are thought to account for nearly one third of physician visits for shoulder pain complaints. Paula M Ludewig stated that Scapular tipping (rotation about a medial to lateral axis) and serratus anterior muscle function are important to consider in the rehabilitation of patients with symptoms of shoulder impingement related to occupational exposure to overhead work. Ludewig and Cook found a decreased scapular upward rotation, increased anterior tipping and increased scapular internal rotation under load conditions in a group with subacromial impingement relative to a group without impingement [6,7].

In Type 2 Scapula Dyskinesis, weakness of the serratus anterior results in reductions in both glenohumeral flexion and abduction. The medial border of the scapula is elevated off the rib cage, resulting in decreased acromial elevation. This problem manifests itself through decreased shoulder abduction and secondary impingement. This lack of acromial elevation and secondary impingement has been seen concomitant with many glenohumeral problems including periarthrities of shoulder [2,8-10].

The scapular instability is found in as many as 68% of rotator cuff problems and 100% of glenohumeral instability problems.8 So Scapula altered kinematic plays a major role in shoulder pathology. Rehabilitation generally begins and focused on axio humeral and scapula humeral than axio scapula muscle. Early application of closed kinetic exercise approach on scapular stabilization and its effect on application of same on scapula dyskinesis type 2 is not know. The purpose of our study is to find the effect of scapula stabilization on type 2 scapula dyskinesis in subjects with shoulder impingement.

METHODOLOGY

An experimental study design. As this study involved human subjects the Approval for the study was taken from institution Ethical Clearance was obtained from the Ethical Committee. 7 male patients of mean age 37 years and mean weight of 65 Kg diagnosed as impingement syndrome of shoulder with scapula dyskinesis type-2, referred from Orthopedicians of LLH/ Medeor 24 x 7 Hospital in Abu Dhabi were taken as subject, pain arc between before 150° of active shoulder elevation in any plane, positive empty can test indicating the possible supraspinatus involvement, 11 positive Hawkins–Kennedy test indicating possible external impingement, Subjective complaint of difficulty performing activities of daily living, a history of proximal anterior or lateral shoulder pain persisted for more then 1 week during the last six month [11]. Each subject Underwent Scapula Dyskinesis Test with 1.5 kg dumbbell for below 68 kg body weight and 2.5 kg for above 68 Kg body weight of person. In this test each subject performed five repetitions of bilateral active weighted shoulder flexion (sagittal plane) and bilateral active weighted shoulder abduction (coronal plane) while they were observed from a posterior for signs of scapula dyskinesis type-2 [4]. Total seven subjects selected as we found obvious abnormality with winging of 1 inch or greater displacement in 3/5 trials. All inclusion subject had characteristic of Glenohumeral Internal Rotation Deficient (GIRD). Subject with post fracture, neurological deficit, scapula dyskinesis test with normal or subtle abnormalities were excluded. Most of the subjects included in the study were with occupation spending more duration of their work in front of computer. Details of the study were explained to the subject and got signed in informed written consent prior to enrollment in trial.

Procedure

Prior to application of intervention measurement parameter such as SPADI and Lateral scapular slide test were taken form each subject. Protocol designed were integrated functional kinetic chain rehabilitation, which assure optimal functioning of each segment. This Protocol divided in to two phase and applied at the frequency 3 session per week for two week .

Scapular Stabilization Exercises include the Kinetic chain concept based on a proximal to distal control sequence. This emphasizes the achievement of full and appropriate scapular motion and the integration of that point into a subsequent, more global, approach including trunk and hip movements (Scapular retraction is facilitated by trunk and hip extension).

1ST Phase protocol

To establish proper postural alignment- considering core, being the most proximal component of the kinetic chain (in relation to the arm) the critical link between the development of and transfer of energy, primarily core stabilization exercise for transverse abdominal and multifidus muscle given.

To establish proper motion at all involved segments- primarily goal to overcome from tightness of pectoralis major for which corner stretch hold 10 sec/ 6 times and for GIRD deficit, sleeper stretch hold applied 10 sec at end soft end feel, progressing further for 6 times facilitate scapular motion via exaggeration of lower extremity- lawn mover and robbery maneuver, exaggerate of scapular retraction in Controlling excessive protraction with the closed chain exercise–Scapula clock exercises, wall wash. Low row exercise maneuver applied.

Scapular stabilization of Black burn exercises, press up, push up with plus given. These exercise were given at the rate of 10 repetition/set holding at end range 10 sec.

Patient been instructed to do same exercises 2 set each twice a day in home.

2nd Phase protocol

Rhythmic stabilization exercises, Theraband exercises (Red Color) and is applied as follows; Scaption, standing boxer punch, standing dynamic hug, Bilateral external rotation with abduction 0 degree, rowing exercises given. At the end of 4 weeks parameter SPADI Index, lateral scapula slide test taken, also GIRD deficit and Scapula dyskinesis test undertaken.

RESULTS

Outcome measurements

Outcome measurements such as Lateral scapular slide test and SPADI were measured before and after 2 weeks of protocol.

Lateral scapular slide test

Quantitative measurement of scapular positioning, as proposed by Kibler, was measured using Lateral Scapular Side Test (LSST) before and after application of protocol. The test was performed by evaluating scapular symmetry as varying loads are placed on the supporting musculature in three positions of the upper extremity: Position-1: The subject's arm is relaxed at the side (0° of humeral elevation); Position-2: The subject places his hand on the lateral iliac crest; Position-3: Corresponds to an internally rotated and abducted arm to 90°. In each position two measurements are performed using a tape in each position (between the inferior angle of the scapula and the closest spinous process) in order to allow calculation of an average value. Test-retest and intertest reliability indicated that the test-retest (intratester) relationship was between 0.84 and 0.88 and that the intertester reliability was between 0.77 and 0.85, depending on the position [2,12,13].

Shoulder pain and disability index: The Shoulder Pain and Disability Index (SPADI) was developed to measure current shoulder pain and disability in an outpatient setting. The SPADI contains 13 items that assess two domains; a 5-item subscale that measures pain and an 8-item subscale that measures disability. The minimal clinically important difference has been reported to be 8 points; this represents the smallest detectable change that is important to the patient (Paul et al). When the SPADI is used more than once on the same subject, eg, at initial consultation and then at discharge, the minimal detectible change (MDC 95%) is 18 points (Angst et al, Schmitt et al). Thus some caution is advised with regard to repeated use of the instrument on the same patient. A change score of less than this value could be attributed to measurement error [14].

Statistical methods: Descriptive statistical analysis was carried out in the present study. Out Come measurements analyzed are presented as mean SD. Significance is assessed at 5% level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. Paired 't' test as a parametric have been used to analysis the variables pre-intervention to post-intervention with calculation of percentage of change. The Statistical software namely SPSS 16.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

The result of the study found significant improvement in reducing pain and disability of SPADI with $p<0.00$, 0.001 respectively and also found reduction in distance in lateral scapula slide test nearing to normal following intervention.

DISCUSSION

The finding from the study found that the Scapula stabilization exercise protocol shown to be effective in improving lateral scapular slide test and SPADI in Scapula type 2 Dyskinesis in subjects with shoulder impingement.

Weakness of the scapulothoracic muscles potentially leads to abnormal positioning of the scapula, disturbances in scapulohumeral rhythm, and generalized shoulder complex dysfunction.2,4 The serratus anterior and lower trapezius are the most commonly weak or inhibited muscles of the scapulothoracic joint that may lead to abnormal movement. The serratus anterior and lower trapezius contributes to the important upward rotation force couple that produces acromial elevation. If part of that force couple is altered, for any reason, movement is abnormal [2,4].

In this present study, the exercise protocol designed [2-5] and applied on the subjects were proposed to facilitate activation of mainly periscapular muscle Serratus Anterior, Lower fibers of trapezius, Rhomboidus major and minor to balance force couple altered due to scapula mal position. The protocol also included stretch of posterior capsule and Pectoralis minor stretch. The rationale behind the closed-chain framework is to maximize the ability of the inhibited muscles to activate. This involves placing the extremity in a closed-chain position, emphasizing normal activation patterns, and focusing on the muscle of interest by deemphasizing compensatory muscle activation. For example, if a patient presents with shrugging during arm elevation, then it can be assumed that the lower trapezius and/or serratus anterior are not working effectively enough during the dynamic task. A closed chain exercise such as the low row should be utilized because the short lever positioning in conjunction with the pelvis and trunk acting as the driver facilitates lower trapezius and serratus anterior co activation which decrease the activation of the upper trapezius. Typically, during soft tissue pathology closed chain exercises are implemented early in the rehabilitation process. There are 3 components which make usage of closed kinetic chain exercise advantageous in early rehabilitation. First, the exercise environment can be controlled. This allows the focus to be taken away from the arm as an integrated unit with high dynamic demands and place it in a stable, axially loaded, and static setting. Second, closed chain exercise is ideal for working "at" specific ranges of motion compared to working "through" a range of motion which helps provide a "snapshot" within the full arc of normal motion. Finally, closed chain exercise allows the rotator cuff and scapular musculature to be unloaded by decreasing the amount of force generated and stress applied to the involved soft tissue. These types of exercises are best suited for reestablishing the proximal stability and control in the links of the kinetic chain such as the pelvis and trunk. Open chain exercises, which generate greater loads in comparison to closed chain activities, should be utilized later in rehabilitation programs due to their increased demand on the soft tissue due to the longer arm levers these exercises required [15]. In Comparison with non-impaired subjects (43.6 ± 9.7°), Lukasiwicz found that the shoulder with subacromial impingement syndrome demonstrated a significantly lower posterior tilting of the scapula in the sagittal plane (25.1 ± 9.1°). Subjects with impingement also demonstrated a higher superior scapular position with arm elevation (5.2 ± 1.6cm blow the first thoracic vertebrae) in comparison with non-impaired subjects (7.5 ± 1.5cm) [15].

Based on the above studies recommendation closed kinematic chain exercises and kinetic chain concept of exercise intervention incorporated in early intervention. This protocol assisted in reducing pain, disability of activities of daily living by maintain force couple of scapula altered due to muscle imbalance and inhibition.

Limitations of the study

Subjects with primary frozen shoulder in the II stage were considered for the study, thus results cannot be generalized. The study was carried for two weeks. Follow-up was not done therefore long term effects were not known. Sample is size is less only study was carried on 7 subjects.

Recommendation for future research

Present study is lacking with control group who received only conventional exercise so further studies with control group suggested. Study on long term effects of scapular stabilization exercises are needed. Effect of scapular stabilization exercises on other shoulder condition with scapular dyskinesis are needed to be found. Further study is needed to compare the effect with other conventional exercises, pain- relieving methods. Further study should needed measuring effect using other outcome measurements.

CONCLUSION

The present study concludes that the Scapular stabilization exercise incorporating early closed kinetic chain exercise are effective in reducing disability and pain in Type 2 Scapula Dyskinesis.

ACKNOWLEDGEMENT

The author would like to Thank Dr. Anbalagan, Medical Director LLH Hospital, Mr. Pieter Slebbert CEO Medeor24x7 Hospital, Dr Maher Eter Head clinical Service Medeor 24x7 Hospital, Staff of Orthopedic and Physiotherapy Department of LLH/Medeor24x7 Hospital Abu Dhabi, UAE, for their assistance support throughout this study. Authors were expressing their sense of gratitude's to the people who helped and encouraged them for the guidance and completion of this study.

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