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EFFECTIVENESS OF SCAPULAR STABILIZATION EXERCISES IN SUBJECTS WITH SCAPULAR DYSKINESIA

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ABSTRACT

BACKGROUND AND OBJECTIVES: Scapular Dyskinesia is Scapular Dyskinesis is an alteration or deviation in the normal resting or active position of scapula during coupled scapulohumeral movements. In Scapular Dyskinesis 'Dys' indicates 'alteration' and 'kinesis' indicates 'Motion' There are very limited studies done on comparing scapular dyskinesia and conventional therapy. So, this study EFFECTIVENESS OF SCAPULAR STABILIZATION EXERCISES IN SUBJECTS WITH SCAPULAR DYSKINESIA was proposed to determine the effectiveness between the scapular stabilization exercises and conventional physiotherapy in scapular dyskinesia. The purpose of the study is to find the effectiveness of scapular stabilization exercises in improving pain, shoulder disability and scapular angle in scapular dyskinesia.

METHODS: 80 subjects who were clinically diagnosed of scapular dyskinesia were assessed and only 64 were recruited who are willing to be in the study and they were randomly allocated into two groups. In Group I (n=32) subjects were treated with scapular stabilization exercises for 6 weeks and Group II (N=32) subjects were treated with conventional therapy for 6 weeks. Both the groups are given with conservation management. The outcome of this intervention was pain (VAS), disability (SPADI) and scapular angle (LSST)

RESULTS: Statistical analysis of the data revealed that in between group comparison showed there is a statistical significant difference in VAS, SPADI, LSST (0^0,45^0,90^0).

CONCLUSION: The present study concluded that six weeks of interventions of scapular stabilization exercises were shown statistically significant in pre- test and post-test values in improving pain, disability and scapular angle. However scapular stabilization exercises are more effective in improving pain, disability and scapular angle when compared to conventional therapy. Then we can conclude that scapular stabilization exercises is a suitable adjunct to physiotherapy rehabilitation in subjects with Scapular Dyskinesia

KEYWORDS : Scapular dyskinesia, SPADI, LSST, Scapular stabilization exercises, conventional therapy.

INTRODUCTION

Scapular Dyskinesis is an alteration or deviation in the normal resting or active position of scapula during coupled scapulohumeral movements[1]. In Scapular Dyskinesis 'Dys' indicates 'alteration' and 'kinesis' indicates 'Motion'[2]. It is seen in both athelets and healthy individuals. In healthy individuals it is common due to changes in scapular stabilizing muscles and most common in overhead athelets such as volley ball players, basketball players,etc,,. Prevalance is found to be 61% in overhead athelets and 33% in non overhead athelets[3]. 67-100% is seen in shoulder injuries, 68% seen in rotator cuff problems and 100% in glenohumeral instability[4]. Common muscles affected are serratus anterior, upper and lower trapezius, pectoralis.

Scapulothoracic joint is not a true anatomical joint it contributes to 60^0 of the shoulder joint movements. 90^0-120^0 abduction is contributed by the glenohumeral joint and 100^0-120^0 of flexion is contributed by scapulohumeral joint in overall ratio of arm elevation 2^0 by glenohumeral to 1^0 by scapulothoracic motion. This combination of motions is referred to as 'scapulohumeral rhythm'. In some conditions such as frozen shoulder the movement of scapula is more than that of humerus this is referred to as 'reverse scapulohumeral rhythm'[5][6]

KIBLER et.al., classified Dyskinesis into different types :

TYPE I is seen by the prominence of the inferomedial border of the scapula due to abnormal posterior tilt around a horizontal axis in the plane of the scapula, in this type the affected is seen to be lower than the opposite side.

TYPE II is characterized by the prominence of its entire medial border due to excessive external rotation around a vertical axis through the plane of the scapula, this type can be commonly seen in superior labrum injuries.

TYPE III is characterized by the prominence of the superior border of the scapula due to upward rotation of the superiomedial border around a horizontal axis perpendicular to the plane, this type is common when there is decrease in the size of the acromiohumeral space and potential rotator cuff injuries[7].

Causes for scapular dyskinesis are described in different categories such as bone causes are fracture of clavicle, nonunion and shortened malunion, khyphosis and bone tumors. Joint causes are the osteoarthritis of acromioclavicular joint, internal derangement of glenohumeral joint and instability of acromioclavicular joint. Neurological causes are the palsy of the long thoracic or spinal accessory nerve, cervical radiculopathy, entrapement of the suprascapular nerve. Soft tissue causes are injury to rotator cuff, inflexibility or stiffness of pectoralis minor and short head of the biceps, infraspinatus flexibility and posterior capsule tightness[8].

In scapular dyskinesis common signs and symptoms are pain and tenderness around the scapula, snapping and popping sensation around the scapula with shoulder movement, loss of strength with shoulder and arm use, asymmetric posture, winging of scapula, instability of the shoulder. Complications due to dyskinesis are chronic inflammation or impingement of rotator cuff muscles, shoulder stiffness or loss of motion, rotator cuff tendon tears.

Tests performed for assessing scapular dyskinesis are Scapular assistance test, Scapular retraction test, Lateral scapular slide test, Isometric scapular pinch test and wall push up test.

Need of the study is Scapular Dyskinesia is the observable alteration in the position of scapula and pattern of scapula motion in relation to

thoracic cage during static or dynamic movement of scapula. The scapula instability is found in 61% of overhead athelets and 33% in non overhead atheletes. Scapular alteration is seen in 67-100% is seen in shoulder injuries and 100% in glenohumeral instability. In shoulder rehabilitation only glenohumeral joint is more concentrated than the scapulothoracic joint. During shoulder joint pathology muscles around the shoulder joint gets weakened and results in muscle imbalance around the shoulder which leads to scapular dyskinesia. Due to lack of treatment of scapular muscles in shoulder rehabilitation the stabilizer of the scapula need to be strengthen. Hence the need of the study arises.

MATERIALS AND METHODS

Study Design- Prospective study

Ethical clearance and informed consent- The study protocol was approved by the ethical committee of GSL Medical College, the principal investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participation in the study. All the participants signed the informed consent and the rights of the included participants have been secured.

Study Population- Subjects diagnosed with scapular dyskinesia by an orthopaedician.

Study Setting- The study was conducted at out patient department of physiotherapy, GSL Medical college and General Hospital, Rajamahendravaram, Andhra Pradesh, India.

Study Duration- The study was conducted during the period between July 2018 to June 2019.

Intervention Duration- 6 week of training programme which include scapular stabilization exercises to experimental group and conventional therapy to control group[12].

Sample Size- A total number of 80 with shoulder pathology were screened of in which 64 subjects presented with scapular dyskinesia were recruited who are willing to participate in this study, obtaining the consent form from the patients who met the inclusion criteria. These 64 subjects were randomized into two groups 32 in each group.

Sampling Method- Systemic random sampling

GROUP	NO.OF SUBJECTS	TREATMENT
GROUP – I	32	Scapular stabilization exercises
GROUP – II	32	Conventional therapy

INCLUSION CRITERIA

- Age group of 20-60 years
- Genders- male and female
- Scapular Assistance Test (SAT) positive
- Scapular Retraction Test (SRT) positive
- Lateral Scapular Slide Test (LSST) positive
- Difficulty in performing daily activities

EXCLUSION CRITERIA

- History of cervical and/or thoracic pathology
- Pervious neck or shoulder surgeries
- History of spinal or upper extremities fracture
- Pregnancy
- Neurological deficits in upper extremity
- Musculoskeletal and cardiovascular pathologies limiting rehabilitation

OUTCOMES MEASURES

Measurement of pain severity (VAS): VAS scores evaluated the severity of shoulder pain. The Scale used consisted of horizontal lines 10cm long with anchor points of 0 (no pain) and 10 (pain as bad as it could possibly be)

Measurement of disability (SPADI): The SPADI is a 10 item self-reported pain and disability which comprises two subscales: Pain (five items), Disability (eight items). Each item is scored from 0 (no problem) to 10 (worst pain). For each subscale, the score was normalized to a 130 scale with higher score indicating better status.

Measurement of Scapular Angle (LSST): Scapular angle is measured by measuring the distance between the 12th spinous process of the thoracic spine to the inferior angle of the scapula by using a measuring tape in three different angles that is arms in the resting position, arms in 45^0 abduction (on the waist) and arms in 90^0 abduction.

INTERVENTIONS

Subjects in both the groups are given with Transcutaneous Electrical Nerve Stimulation (TENS) and HydroCollateral Packs (HCP) before to the exercise protocol.

Transcutaneous Electrical Nerve Stimulator (TENS): Subjects in sitting position and pads are placed on the anterior and posterior aspect of the shoulder and on the medial border of the scapula for 10 minutes. TENS used Technomed electronics, Acu Tens, SL.NO-1260 with frequency of 40 – 50Hz.

Hydro Collateral Packs (HCP): Subjects in sitting postion, the hydrocollateral pack is wrapped in towel and placed on the shoulder and the on the scapular muscles for 10 minutes at appropriate temperature.

Group-I:

Subjects in group I received the scapular stabilization exercises. The subjects were asked to perform the following exercises for 10 repetitions 1 set thrice a day 3 times per week for 6 weeks. Scapular proprioceptive neuromuscular facilitation exercises (PNF), Scapular clock exercises, Wall pushups, Towel sliding exercise Horizontal prone abduction.

Group-II:

This group was given with flexibility, strengthening and codman exercises.

Flexibility exercises consisted of anterior, posterior and inferior capsule stretching, forward flexion range of motion, abduction range of motion, internal rotation stretching with towel. Strengthening exercises consisted of subscapularis, infraspinatus, supraspinatus and anterior part of deltoid and posterior part of deltoid.

STATISTICAL ANALYSIS

Statistical analysis was performed using MS Excel 2007 and SPSS software version 20.0. Descriptive statistical data has presented in the form of mean ± Standard deviation and mean difference percentage were calculated and presented.

Between the Groups: Independent student "t" test was performed to assess the statistical significant difference in mean value between the groups for VAS, SPADI and LSST.

Within the Groups: Paired student "t" test was performed to assess the statistical difference with in the groups for VAS, SPADI and LSST 0,45,90 from pretest and post test values.
The statistical significant was set at $p < 0.05$ with 95% confidence intervals.

RESULTS

The below tables shows VAS,SPADI,LSSTOf scapular dyskinesia in between the groups from post test in Group A and Group B were found to be statically significant (*p<0.0005)*

DISCUSSION

This study deals to know the effectiveness of scapular stabilization

	VAS	SPADI	LSST		
			0^0	45^0	90^0
GROUP- I	4.1	45.26	0.741	0.729	0.619
GROUP-II	4.5	50.73	0.779	0.805	0.636
P VALUE	0.0000005	0.0000005	0.0000008	0.00000007	0.00000008
INFERENCE	Significant	Significant	Significant	Significant	Significant

exercises in subjects with scapular dyskinesis. Scapular dyskinesis is observed in shoulder injuries. The scapula plays several roles in facilitating optimal shoulder function when scapular anatomy and biomechanics interact to produce efficient movement.

In this study we have recruited the patients with scapular dyskinesis along with the shoulder pathology. Interventions used in this study are scapular stabilization exercises to one group and the other group was given with conventional therapy. Both the groups are given with high TENS and hydro collateral packs. This study deals with scapular positioning which is measured by using the Lateral Scapular Slide Test (LSST) which is tested in three positions with arms in resting position, arms on waist and arms abducted. Shoulder disability is measured by using Shoulder Pain And Disability Index (SPADI) questionnaire and pain is measured by using Visual Analogue Scale (VAS). The outcomes are taken before starting the treatment and at the end of the 6 weeks. Treatment is carried out for 6 weeks 3 days a week and 3 times a week[13].

The statistical results show that there is significant difference in between the groups, VAS and LSST has shown superior effect in scapular stabilization group than in conventional therapy group. SPADI has shown increased effect in conventional therapy group than scapular stabilization group. Above results showed in this study may be due to shoulder exercises given in conventional therapy group which decreases shoulder disability.

Previous researches have shown that strengthening of rotator cuff and scapulothoracic muscles is important in rehabilitation of shoulder pathologies because the position of humeral head and of scapula is believed to impact the width of subacromial space. Studies have also recommended that shoulder rehabilitation must include strengthening exercises for the depressor muscles such as subscapularis, infraspinatus and tereminor without shoulder pain[14]. Micheal L. Voight and Brain C. Thomson discussed that stability at the scapulothoracic joint depends on the surrounding musculature. The scapular muscles must dynamically position the glenoid so that efficient glenohumeral movement can occur. When weakness or dysfunction is present in the scapular musculature, normal scapular positioning and mechanics may become altered. When scapula fails to perform its stabilization role, shoulder function is inefficient which can result in decreased neuromuscular performance.

Impingement and injury to the rotator cuff muscles could result into damage to the neural mechanoreceptors that mediate normal proprioceptive sensation of the shoulder. This deficit could lead to slow protective reflexes, where contraction of the muscles occurs too late to protect the joint. Thus the resultant proprioceptive deficit could contribute to further deterioration of the condition. Lawnmower exercise, alternative weight shifting and scapular PNF are responsible for improved proprioception and better strength of scapular stabilizer with improved efficiency of the rotator cuff in elevating the arm[15].

Weakness of the scapulothoracic muscles potentially leads to abnormal positioning of the scapula disturbances in scapulohumeral rhythm and generalized shoulder complex dysfunction. The serratus anterior and lower trapezius are commonly weak or inhibited muscles of the scapulothoracic joint that may lead to abnormal movement. The serratus anterior and lower trapezius contributes to the acromial elevation. When the force couple is altered, movement becomes abnormal[16].

Application of high TENS will result into relief of the pain and associated spasm of the shoulder girdle muscles. This relief of pain and spasm is associated with the peripheral blocking of nociception by high frequency of the TENS that blocks the traffic in both A Delta (fast) and C (slow) pain fibers in the posterior horn due to stimulation of mechanoreceptors (A beta) fibers by high frequency, low intensity electric pulses[17].

Application of hydro collateral packs results in pain relief, increase in blood flow and metabolism and increase in elasticity of connective tissue. TRP Vanilloid 1 receptors, which are ion channels activated by noxious heat mediates neural transduction of heat. The TRPV1 receptors are present in primary afferent neurons, the spinal cord and throughout the brain. Activation of TRPV1 receptors within the brain may modulate antinociceptive descending pathways. Increasing tissue temperature stimulates vasodilation and increases tissue blood flow, which is through to promote healing by increasing the supply for nutrients and oxygen to the site of injury. Warming which may further promote healing also increases the rate of local tissue metabolism. Heat induced changes in the viscoelastic properties of collagenous tissues may underlie the demonstrated efficacy of heat therapy for improving range of motion[18].

LIMITATIONS

- Small sample size
- Lack of follow up in the present study
- Medications and activities of daily living were not taken into account
- Home exercises were not monitored

RECOMMENDATIONS FOR FURTHER RESEARCH

- Sample size can be increased with inclusion of more number of subjects to generalize the effects of these techniques in larger population.

CONCLUSION

The present study concluded that six weeks of interventions of scapular stabilization exercises were shown statistically significant in pre- test and post-test values in improving pain, disability and scapular angle. However scapular stabilization exercises are more effective in improving pain, disability and scapular angle when compared to conventional therapy. Then we can conclude that scapular stabilization exercises is a suitable adjunct to physiotherapy rehabilitation in subjects with Scapular Dyskinesia

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