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Original Research Article

IMMEDIATE EFFECT ON EXTERNAL ROTATION AND OVERHEAD REACH IN PATIENTS WITH SHOULDER PATHOLOGY USING PROPRIOCEPTIVE NEUROMUSCULAR FASCILITATION AND SOFT TISSUE MOBILIZATION

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ABSTRACT

Background: It is postulated that restriction in glenohumeral external rotation when measured at 45 degree of abduction represent subscapularis muscle flexibility deficits as compared to when it is measured at 90 degrees of abduction which indicates capsular restriction. Adequate glenohumeral external rotation is believed to be essential for the ability to reach overhead . Patients coming to physiotherapy department with shoulder pathology often have to attend various sessions of therapy to get free range of motion of the joint. Thus the aim of this study was to find out whether a single session of soft tissue mobilization and proprioceptive neuromuscular fascilitation improves the range of shoulder abduction and thus the ability to reach overhead.

Materials and Methods: **Present study conducted with** 20 subjects between the age group of 40 and 60 as per the inclusion and exclusion criterion and study designed as a Randomized control trail. All those individuals who exhibited limitation in glenohumeral external rotation at 45 degrees of abduction in supine were supposed to have shoulder internal rotator (subscapularis) inflexibility and those who had restriction in overhead reach were included in the study. All included subjects were given soft tissue mobilization to the restricted mobility area for 5 minutes followed by 5 repetitions of contract relax to shoulder internal rotators and 5 repetitions of proprioceptive neuromuscular fascilitation pattern of flexion abduction external rotation. External rotation and overhead reach was measured pre and Immediately post intervention .

Result: SPSS v 16.0 was used for analysis. Descriptive & inferential statistics was calculated. Paired t test was used to compare External Rotation & Overhead Reach before & after treatment. Statistical significance was kept at p value less than 0.05. The results obtained in the study, showed 'p value'< 0.05 , indicating that there was statistically significant improvement in external rotation and overhead reach following the single intervention session.

Conclusion: A single session of soft tissue mobilization with proprioceptive neuromuscular fascilitation showed immediate improvement in glenohumeral external rotation and overhead reach.

KEY WORDS: Proprioceptive neuromuscular fascilitation, Soft tissue mobilization, Subscapularis.

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INTRODUCTION

Compromised shoulder movement due to pain, stiffness, or weakness can cause substantial disability and affect a person's ability to carry out daily activities and it is estimated to be the third most common cause of musculoskeletal

consultation in primary care [1]. Patients frequently present or are referred to physical therapy with a non specific diagnosis relating to shoulder 'pain' and stiffness. Any patient presenting with shoulder pathology may present with some or all of the signs and symptoms that implicate subscapularis muscle as a part of the dysfunction**.** The subscapularis originates in the subscapular fossa on the costal surface of the scapula and courses anterior and laterally to insert on the lesser tuberosity of the humerus [2,3,4] . This is the largest of the four rotator cuff muscles with nearly three times the physiological cross sectional area as the remaining three posterior cuff muscles combined. The subscapularis muscle primarily functions as a medial rotator and adductor of arm [5] **.** Various authors have justified the involvement of subscapularis in different shoulder pathologies. Turkel et al [6] and, Hawkins et al, [7] have documented in their study that the symptoms of subscapularis pathology are in concordant with subacromial impingement syndrome.

In Travel and Simons' classic textbook, the authors have referred subscapularis as the "Frozen Shoulder" muscle because trigger points in the subscapularis cause limitations in shoulder elevation and external rotation [8].

A shortened subscapularis muscle has been implicated as a cause of limited motion in patient diagnosed with adhesive capsulitis [9]. Subscapularis contracture may prevent a functional rotator cuff from acting normally to produce optimal active shoulder abduction and external rotation, and releasing it may eliminate an obstacle to such shoulder function [10,11,12] .Several surgical techniques including open or arthroscopic subscapularis release are reported to improve shoulder abduction and external rotation [13]. Shoulder capsule and the tightness of shoulder internal rotators are the two main limiters of shoulder external rotation. It is postulated that restriction in glenohumeral external rotation when measured at 45 degree of abduction represent subscapularis muscle flexibility deficits as compared to when it is measured at 90 degrees of abduction which indicates capsular restriction. Adequate glenohumeral external rotation is believed to be essential for the ability to reach overhead [14].

Multiple shoulder pathologies may eventually lead to the pathology of the muscle tendon complex resulting in fatty infiltration of muscle belly and/or degenerative scarring of the tendon. Fibrosis or scarring of the subscapularis may present clinically as trigger points to palpation and adaptive shortening of the muscle belly and/or tendon, thus limiting shoulder external rotation in the adducted position [15,16].

Clinical, histological, biochemical and electrophysiological research has provided biological possibility for the existence of Myofasial trigger points. As a result, the role of Myofasial trigger points in musculoskeletal pain is increasingly accepted in the medical literature. Myofasial trigger points are defined as exquisitely tender spots in discrete taut bands of hardened muscle that produce symptoms known as myofascial pain [17,18,19]. An alternative approach to the management of persons with shoulder problems consists of a treatment aimed at inactivating Myofasial trigger points and eliminating factors that perpetuate them. Myofasial trigger points may be inactivated by manual techniques such as compression on the trigger point or other massage techniques [20]. Myofacial release is the application of specific and progressive manual forces with the intent of promoting changes in the myofascia, allowing for elongation of shortened structures. Myofascial release procedures are often combined with proprioceptive neuromuscular fascilitation procedures because they are both used to effect changes in myofascial length [15]. Proprioceptive Neuromuscular Facilitation (PNF) developed by Knott and Kabat is a stretching technique utilized to improve muscle elasticity and has been shown to have a positive effect on active and passive range of motions. Contract-relax PNF procedures have been shown to be effective in increasing range of motion of the joint [21,14,22,23] . Patients coming to physiotherapy department with shoulder pathology often have to attend various sessions of therapy to get free range of motion of the joint. Thus the aim of this study was to find out whether a single session of soft tissue mobilization and proprioceptive neuromuscular fascilitation improves the range of shoulder abduction and thus the ability to reach overhead.

MATERIALS AND METHODS

Subjets: 20 subjects between the age group of 40 and 60 years, with shoulder pathology of 1 year or less, participated in the study. Subjects were patients referred to an outpatient physical therapy department for evaluation and interventions for the functional losses related to their shoulder pathology. The subjects who exhibited restricted external rotation range of motion at 45 degrees of shoulder abduction were asume to have subscapularis inflexibility and were included in the study. The same subjects if were unable to walk their fingers on the wall as high as the opposite (nonpathological) side were defined to have limitations in overhead reach and were included in the study. All those subjects in which external rotation range of motion was restricted at 90 degrees of abduction were asume to have capsular restriction and were excluded from the study. Patients were also excluded if they had surgical procedure to the shoulder less than 4 weeks prior to study enrollment, total shoulder arthroplasty, reflex sympathetic dystrophy and related syndromes, or rheumatoid arthritis.

Procedure:

Measurment of glenohumeral external rotation: Glenohumeral external rotation was measured with the subjects lying supine on a treatment table with a pillow under their knees. Stabilization of the scapula was achieved by depressing the shoulder girdle. Reference line for abduction was drawn on the anterior aspect of the midline of the humerus. A reference point was also drawn on the skin over the anterior aspect of the acromion. In addition, a reference line was drawn on the skin over the ulnar aspect of the forearm, with a reference point on the olecranon process. Using the line over the humerus and an imaginary line parallel to the sternum as references, the shoulder was abducted to 45°.

Maintaining 45° of shoulder abduction and 90° of elbow flexion, the patient's arm was passively externally rotated through the available pain-free ROM. External rotation was measured with the stationary arm of the goniometer perpendicular to the ground and the moving arm in line with the reference line on the forearm.

Measurement of overhead reach: Overhead reach was measured with the subject standing 30 cm away from the wall and facing it. They were asked to walk their fingers on the wall till the height they could without bending their trunk forward. The distance between the tip of the middle finger till the ground was then measured with a tape measure in centimeter.

Intervention: The subjects were positioned with the humerus abducted to 45°. With the elbow flexed to 90°, the humerus was externally rotated to typically about 20° to 25° of external rotation. The subscapularis was palpated in the axilla to identify areas of myofascial mobility restrictions, taut bands, or trigger points. Identified restrictions were treated with soft tissue mobilization [STM] in the form of sustained manual pressure to the subscapularis myofascia for 5 minutes. The STM was followed by contract-relax proprioceptive neuromuscular fascilitation [PNF] to the subscapularis and other glenohumeral medial rotators, beginning in the same position used for the STM. The patients were instructed to perform glenohumeral internal rotation against an opposing, isometric, manual resistance applied by the treating physical therapist for 7 seconds. Afterwards, the patient actively moved the humerus into full available external rotation. This position was maintained for 15 seconds. This 7-second internal rotation contraction against resistance followed by full active external rotation was repeated 5 times. Subjects were then instructed to actively move through the PNF flexion-abduction external-rotation diagonal pattern for 5 repetitions with manual facilitation . The same physical therapist performed all of the STM and contract-relax PNF procedures. Post intervention, external rotation and overhead reach was measured again.

RESULTS

Data analysis: SPSS v 16.0 was used for analysis. Descriptive & inferential statistics was calculated. Paired t test was used to compare External Rotation & Overhead Reach before & after treatment. Statistical significance was kept at p value less than 0.05

For both the parameters p value was <0.005, which showed the highly significant improvement in the post treatment values, the graph of

which is shown as below.

Graph 1: Showing the comparison of parameters before and after treatment.

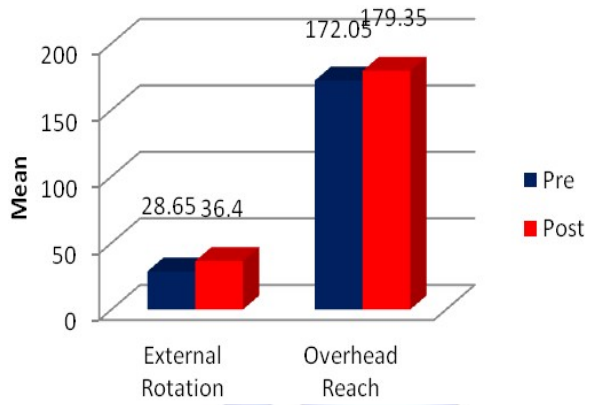

Table 1: Baseline characteristics of participants.

		Mean or Frequency	SD or Percentage
Age		50.45	6.27
Sex	**Male**	12	60
	Female	8	40
Total		20	100

Table 2: Comparison of parameters before & after treatment.

		Mean	N	SD	P* Value
External Rotation	**Pre**	28.65	20	5.62209	<0.001
	Post	36.4	20	5.48107	
Overhead Reach	**Pre**	172.05	20	14.58722	<0.001
	Post	179.35	20	15.4077	

DISCUSSION

The aim of our study was to evaluate weather soft tissue mobilization along with proprioceptive neuromuscular fascilitation immediately improves external rotation and overhead reach in patients with shoulder pathologies. The results of the study proved that the soft tissue mobilization along with proprioceptive neuromuscular fascilitation immediately improves external rotation and overhead reach in patients with shoulder pathologies.

PNF is frequently used as a treatment method to treat physical dysfunction resulting from damage or disease [24].

Decicco and Fisher in 2005, have compared the effects of the contract-relax-contract (CRC) and hold-relax-contract (HRC) proprioceptive neuromuscular facilitation (PNF) stretching programs against a control group, on external rotation range of motion (ROM) of the shoulder in apparently healthy athletes. The results of their study suggested that The CRC and HRC PNF stretching techniques were equally effective at increasing shoulder external rotation range of motion when consistently performed 2 times a week for 6 weeks [25].

Weon-Sik et al, investigated the effects of scapular pattern and hold-relax technique of PNF on flexion abduction and external rotation ROM and pain in 30 patients with Adhesive Capsulities. They treated the patients for 4 weeks and found that PNF was effective for improving range of motion and reducing pain. In that of shoulder external rotation, there was statistical significance between the values of pre treatment and treatment after one week . As the result of this statistical significance of shoulder external rotation, the early treatment was thought to be more effective [26].

The authors of the above mentioned studies have found the improvement in external rotation range of motion of shoulder, but only after giving the multiple sessions of the therapy. In our study, we have found the similar improvement after single session only .The immediate improvement in range of motion can be attributed to the phenomenon of autogenic inhibition. Autogenic Inhibition is what occurs in a contracted or stretched muscle in the form of a decrease in the excitability because of inhibitory signals sent from the golgi tendon organs [GTOs] of the same muscle which causes activation of Ib afferent fibers within the GTOs. Afferent fibers send signals to the spinal cord where the stimulus causes the activation of inhibitory interneurons within the spinal cord which results in inhibitory stimulus upon the alpha motoneuron, decreasing the excitability of the nerves and efferent motor drive of muscles. This chain reaction causes the target muscle to relax, which is one of the driving theories behind the increased elongation of the muscle fibers during the CR method of PNF stretching [27].

Simons et al, have hypothesized that the formation of Myofasial trigger points result from injured or overstressed muscle fibers, leading to involuntary shortening of muscle and loss of oxygen and nutrient supply, with increased metabolic demand on local tissues [28]. Ischemic

compression is one of those techniques used in the physical therapy to release myofasial trigger points and improving range of motion.

Chuen -Ru Hou et al, in their study have found the immediate effects of various physical therapeutic modalities along with ischemic compression on increasing cervical range of motion and releasing myofasial trigger point [29]. Hanten WP et al, have examined the effect of single ischemic compression or a combination of ischemic compression and stretching and concluded that both interventions had positive effects on patients' recovery [30]. Hong et al, in their paper have hypothesized that deep massage can offer effective stretching and mobilization of taut bands [31]. It is believed that the physiological effects of ischemic compression are due to the hyperemic response after a period of compression, which restores blood flow to the tissue by supplying oxygen and the desensitization of afferent fibers [32].

Limitations of the study: Lack of control group, Small sample size and the design of the study does not allow for drawing conclusion regarding the effect of the intervention beyond a single visit.

CONCLUSION

From the present study we have concluded that, a single session of soft tissue mobilization of the subscapularis for 5 minutes and 5 repetitions of contract-relax to the shoulder internal rotators, followed by 5 repetitions of PNF pattern of flexion, abduction, and external rotation , was found to be effective in increasing glenohumeral external rotation in patients with shoulder dysfunction. Additionally, patients treated with STM and PNF improved their ability to reach overhead.

ABBREVATIONS

PNF- Proprioceptive neuromuscular fascilitation
STM- Soft tissue mobilization
CR- Contract relax
GTO- Golgi tendon organ

Conflicts of interest: None

REFERENCES

[1]. Urwin M, Symmons D, Allison T, Brammah T, Busby H, Roxby M, et al. Estimating the burden of musculoskeletal disorders in the community: the comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. Ann Rheum Dis .1998 Nov ;57(11): 649-55.

[2]. Cleeman E, Brunelli M, Gothelf T, et al. Releases of subscapularis contracture: an anatomic and clinical study. J Shoulder Elbow Surg. 2003;12:231 6.

[3]. Warwick R, Williams P, Gray H. Gray's Anatomy (35 ed). Philadelphia: Saunders Company; 1973;532 540.

[4]. Ward S, Hentzen E, Smallwood L, et al. Rotator cuff muscle architecture: implications for glenohumeral stability. Clin Orthop Relat Res. 2006 jul ;448:157 163.

[5]. B.D. Chaurasia'S human anatomy..Regional and applied dissection and clinical. vollume 1. upper limb and thorax. 4th edition, 2004; 76.

[6]. Turkel S, Panio M, Marshall J, Girgis F. Stabilizing Mechanisms Preventing Anterior Dislocation of the Glenohumeral Joint. J Bone Joint Surg Am. 1981 Oct;63(8):1208-17.

[7]. Hawkins RJ, Hobieka PE. Impingement syndrome in the athletic shoulder. Clin Sports Med. 1983 Jul;2(2):391-405.

[8]. Simons D. G., Travell J. G., . Travell & Simons' myofascial pain and dysfunction: the trigger point manual. Volume 1. The upper body. 2nd ed, 1999;596–612.

[9]. Greenfield BH, Tovin BJ. Evaluation and treatment of the Shoulder. An integration of the guide to physical therapist practice. Philadelphia F.A.Davis ;2001.

[10]. Pichon F, Carlioz H . Disinsertion of the subscapularis muscle in the treatment of obstetric paralysis of the upper limb. Chir Pediatr. 1979;20[2]:135-41.

[11]. Carlioz H, Brahimi L . Place of internal disinsertion of the subscapularis muscle in the treatment of obstetric paralysis of the upper limb in children. Ann chir infant.1971 mar-apr;12[2] :159-67.

[12]. Pearl ML . Arthroscopic release of shoulder contracture secondary to birth palsy: an early report on findings and surgical technique. arthroscopy 2003 Jul-Aug;19(6):577-82.

[13]. MacDonald PB, Hawkins RJ, Fowler PJ, Miniaci A. Release of the subscapularis for internal rotation contracture and pain after anterior repair for recurrent anterior dislocation of the shoulder. J Bone Joint Surg Am. 1992 Jun;74(5):734-7.

[14]. Godges JJ., Mattson-Bell M ., Thorpe D. , Shah D. The immediate effects of soft tissue mobilization with proprioceptive neuromuscular facilitation on glenohumeral external rotation and overhead reach. Journal of Orthopaedic & Sports Physical Therapy. 2003; 33(12):713-8.

[15]. Travell J, Simons D. Myofascial pain and dysfunction: the trigger point manual. Baltimore: Williams & Wilkins; 1983:410 424.

[16]. Turkel S, Panio M, Marshall J, Girgis F. Stabilizing Mechanisms Preventing Anterior Dislocation of the Glenohumeral Joint. J Bone Joint Surg Am. 1981 oct;63(8):1208-17.

[17]. Gerwin RD, Dommerholt J, Shah JP. An expansion of Simons' integrated hypothesis of trigger point formation. Curr Pain Headache Rep. 2004;8:468–475.

[18]. Hong CZ, Simons DG. Pathophysiologic and electrophysiologic mechanisms of myofascial trigger points. Arch Phys Med Rehabil. 1998;79:863–872.

[19]. Chang CW, Chen YR, Chang KF. Evidence of neuroaxonal degeneration in myofascial pain syndrome: a study of neuromuscular jitter by axonal microstimulation. Eur J Pain. 2008;12:1026–1030.

[20]. Carel BrHYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Bron C[Author] & c author = true & cauthor_uid=17983467"on, Michel Wensing, Jo LM Franssen, Rob AB Oostendorp. Treatment of myofascial trigger points in common shoulder disorders by physical therapy: A randomized controlled trial ·BMC Musculoskelet Disord .2007; 8: 107.

[21]. Funk D, Swank AM, Adams KJ, et al. Efficacy of moist heat pack application over static stretching on hamstring flexibility. J Strength Cond Res, 2001; 15: 123–126.

[22]. Sharman MJ., Cresswell AG., Riek S. Proprioceptive neuromuscular facilitation stretching : mechanisms and clinical implications. Sports Med.2006;36(11), 929-39.

[23]. Bron C., Wensing M., Franssen JL., Oostendorp RA. Treatment of myofascial trigger points in common shoulder disorders by physical therapy: a randomized controlled trial.BMC Musculoskeletal Disord,2007;107-26.

[24]. Ji SK, Lee MH, Kim MK, et al. The effects of CI technique in PNF on the muscle activity, fatigue, and balance in hemiplegic patients. J Korean Soc Phys Ther, 2009;21:17–24.

[25]. Decicco PV, Fisher MM. The effects of proprioceptive neuromuscular facilitation stretching on shoulder range of motion in overhand athletes. J Sports Med Phys Fitness. 2005; 45: 183–187.

[26]. Weon-Sik L, Hyung-Soo S, In-Sup K, et al. The effects of scapular pattern and hold-relax technique of PNF on the ROM and VAS in frozen shoulder patients. J Kor Soc Phys Ther. 2002;14(1):15-26.

[27]. Sharman M, Cresswell A, Riek S. Proprioceptive Neuromuscular Facilitation Stretching: Mechanisms and Clinical Implications. Sport Med. 2006;36(11):929–939.

[28]. Simons DG, Travell JG, Simons LS, Travell JG. Travell & Simons' myofascial pain and dysfunction The trigger point manual. Volume 1, 2nd edition.upper half of body 1999;668-694.

[29]. Chuen-Ru Hou, et al. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. Archives of Physical Medicine and Rehabilitation. Volume 83, Issue 10, October 2002; 1406–1414.

[30]. Hanten WP, Olson SL, Butts NL, Nowicki AL. Effectiveness of a home program of ischemic pressure followed by sustained stretch for treatment of myofascial trigger points. Phys Ther. 2000 oct;80(10):997–1003.

[31]. Hong, C.Z., Chen, Y.C., Pon, C.H., Yu, J. Immediate effects of various physical medicine modalities on pain threshold of an active myofascial trigger point. Journal of Musculoskeletal Pain. 1993; volume 1 ,issue 2: 37–53.

[32]. Hou CR, Tsai LC, Cheng KF, Chung KC, Hong CZ. Immediate effects of various physical therapeutic modalities on cervical myofasical pain and trigger point sensitivity. Arch Phys Med Rehabil. 2002;83:1406–14.

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