

# **SUBSCAPULARIS TRIGGER RELEASE AND CONTRACT RELAX TECHNIQUE IN PATIENTS WITH SHOULDER IMPINGEMENT SYNDROME**

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## **Abstract**

**Objectives:** The aim of this study is to evaluate the effect of subscapularis trigger release and contract relax technique in minimizing pain, improving glenohumeral external rotation and overhead reach of patients with shoulder impingement.

**Method:** Thirty patients with shoulder impingement syndrome were randomly assigned into two groups; Group (A) and Group (B). Group (A) received subscapularis trigger release and contract relaxes technique to the shoulder, while the control group (B) received range of motion exercise and 0.5 W/cm<sup>2</sup> Ultrasound to the shoulder. External rotation and overhead reach were taken before and after intervention for both groups.

**Results:** Subjects in group (A) showed a significant reduction in pain with a VAS score of Mean 3.8 Cm, and Group (B) 5.33 Cm with  $P < 0.283$ . Shoulder external rotation showed a significant improvement from 36.60° to 52.33° with  $P < 0.283$  among Group A patients. Also, the mean value of overhead reach among Group (A) increased from 163.613 to 172.67 which show significance at  $P < 0.286$ .

**Conclusions:** Seven minutes trigger release and 5 repetitions of the contract relax technique to the shoulder internal rotators was found to be effective in reducing pain , gaining glenohumeral external rotation and overhead reach during a single intervention session.

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**Keywords:** Functional ability, shoulder impingement, subscapularis trigger release, PNF

## Introduction

Impingement syndrome in the shoulder is characterized by pain in the shoulder due to inflammation of the tendons of the rotator cuff or the subacromial bursa (Cohen & Williams GR, 1998). Pain may radiate to the area around the shoulder and can possibly restrict normal daily activity (Emily et al., 2014). However, tightness of the muscles around the joints which is common in the typical and atypical shoulder impingement syndrome, may restrict the blood flow, lymph drainage and nerve signals in the area (Buss , Freehill , Marra, et al., 2009). The symptoms of subscapularis pathology are in concordant with subacromial impingement syndrome. Thus, it provides a clinical rationale for treatment (Hawkins, & Hobioka, 1983). Thurner, Donatelli & Bascharon (2013) in a case report expressed the importance of subscapularis muscle dysfunction when evaluating and treating patients with subacromial impingement pathology. Rotator cuff muscles have a major role in shoulder abduction. They pull the humerus head downward during early abduction to create a space for rotation (Donatelli &Greenfield. 1984, Karas , Cole & Wang , 2012,).

Consequently, many treatment methods are practiced clinically in managing shoulder impingement syndrome. In addition, manual therapy was used to promote proper restoration of joint function after shoulder injury (Bron C, Wensing , Franssen & Oostendorp, 2007, Brantingham, et al., 2011, Azevedo , Melo , Alves -Corrêa & ChalmersG 2011). Subscapularis trigger release is often combined with PNF procedures because they are both used to induce changes in myofascial length (Travell & Simons.1983). Contract-relax PNF procedures have been shown to be effective in increasing range of motion (ROM) (Godges, Mattson-Bell, Thorpe & Shah, 2003), (Sharman, Cresswell & Riek, 2006). The changes in ROM that induced PNF stretching has been attributed to reciprocal inhibition, and that PNF stretching influences the point at which the stretch is perceived The mechanism(s) underpinning the change in stretch perception or tolerance are not known, although pain modulation has been suggested. The hold-relax technique, stretches the muscle and isometrically are in contract only for a short time (seconds). After which the muscle is briefly relaxed for seconds, and then immediately subjected to a passive stretch which stretches the muscle even further than the initial passive stretch. The muscle is then relaxed for seconds before performing another round of PNF technique (Bron C, Wensing , Franssen & Oostendorp, 2007). Few studies exists proving the best exercise method which produce immediate effect in minimizing pain on glenohumeral external rotation and overhead reach in patients with shoulder impingement syndrome.

Other therapeutic approach used by clinician to manage shoulder impingement to the anterior superior area of the shoulder includes ultrasound

(US) and ROM. This approach usually used for many sessions (Johansson, Oberg, Adolfsson & Foldevi, 2002). Yildirim, Ones & Celik (2013) employed Ultrasound (US) on patients with shoulder impingement for 15 sessions to reach acceptable improvement.

Therefore, the aim of this study was to evaluate the effect of subscapularis manual manipulation (trigger release) and contract relax PNF technique in minimizing pain , improving glenohumeral external rotation at 45<sup>0</sup> of abduction and overhead reach activity in patients with shoulder impingement syndrome .

## **METHOD:**

The study is an experimental study and was designed as a Randomized controlled trials. The sample size was N=32 for both sexes, both upper extremity sides. The subjects were assigned randomly into two groups by lot method, Group A (n=17) and Group B (n= 15). The study was carried out with subjects of the physiotherapy outpatient department at the Best Hospitals Privet Limited (BHPVT Ltd), Chennai, India. The inclusion criteria was that subject should be referred from orthopedics department with diagnosis of shoulder impingement syndrome, Age group 40 – 60 years, a negative capsule stretch test, VAS  $\geq 5$ , and External rotation = 35<sup>0</sup>  $\pm$  5<sup>0</sup>. Also, overhead reach should be 155cm  $\pm$ 10cm, No analgesics, anti-inflammatory drugs and muscle relaxants should be taken by the subjects 24 hours before participation in the study. Furthermore, upraspinatus tendonitis, and Neer impingement test should be positive. Thus, the subjects with the following problems are excluded: open wounds, any infection, Recent injuries and fractures, Recent surgeries, Swelling, Uncooperative patient, Rheumatoid arthritis, Reflex sympathetic syndrome, Total shoulder arthroplasty or adhesive capsulitis.

Patients are assessed for pain by VAS, range of motion by Goniometer, and overhead reach by inch tape. Measurements of pain, external rotation and overhead reach were made on all subjects before and after receiving either intervention. Pain was measured using visual analog scale (VAS). 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 lines for abduction were drawn on the skin over the midline of the sternum and 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 .Overhead reach was measured with the subjects in standing position facing a wall, with the tips of their toes aligned with a pre marked line on the floor 30.5cm from the wall. The subjects were asked to actively walk their

fingers up the wall to reach as far as they could. Overhead reach was measured as the distance in cm from the floor to the tip of the middle finger using a tape measure.

### **GROUP A (Experimental Group)**

Subjects in the treatment group received manual mobilization to the subscapularis, followed by PNF. The subjects were positioned with the humerus abducted to 45°, with elbow flexed to 90°. Also, the humerus was externally rotated to a midrange position, 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 manual mobilization utilizing a combination of sustained manual pressure, and slow deep strokes to the subscapularis myofascia for 7 minutes. Then, it was followed by contract-relax PNF to the subscapularis. Then patients were instructed to perform maximal 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 a full available external rotation. This position was maintained for 15 seconds. This procedure 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. However, the total time for the described intervention was approximately 10 minutes.

### **Group B (Control Group)**

Subjects were made to sit in a comfortable position with back support. The arm was abducted to 45° and the forearm was rested on a pillow for support. The ultrasound therapy was given to the external rotators of shoulder region. The intensity used is 0.5 watt/ cm<sup>2</sup>, frequency used is 3MHz, and the time of the treatment was 10 minutes. Immediately after the treatment, post reading for pain, external rotation of shoulder and overhead reach were recorded.

### **Results**

The data are expressed as Mean $\pm$  SD. The probability value less than 0.05 was considered significant using SPSS software (V.18.0). Paired t test and Independent t test was used for variables which are normally distributed.

The mean value of pre- test VAS score in Group A is 6.20 and the mean value of post – test VAS score in Group A is 3.80 (Table 1).

The mean value of pre – test VAS score in Group B is 6.07 and the mean value of post – test VAS score in Group B is 5.33 with the significance of  $P \leq 0.283$ .

The mean value of pre – test glenohumeral external rotation at 45° of shoulder abduction in Group A is 36.60, and the mean value of post – test glenohumeral external rotation at 45° of shoulder abduction in Group A is 52.33. The mean value of pre – test glenohumeral external rotation at 45° of shoulder abduction in Group B is 36.47, and the mean value of post – test glenohumeral external rotation at 45° of shoulder abduction in Group B is 40.83 with a mean significance of  $P \leq 0.195$ .

The mean value of pre – test overhead reach in Group A is 163.613, and the mean value of post – test overhead reach in Group A is 172.67. The mean value of pre – test overhead reach in Group B is 163.633, and the mean value of post – test overhead reach in Group B is 165.37 with a mean significance of  $P \leq 0.286$  (Table 3).

## **Discussion**

The purpose of this study was to determine whether subscapularis trigger release with proprioceptive neuromuscular facilitations (PNF) are effective in producing an immediate improvement in glenohumeral external rotation at 45° of shoulder abduction and overhead reach in patients with shoulder impingement syndrome.

The results of this study proved that the subscapularis trigger release with PNF is more effective in improving the glenohumeral external rotation and overhead reach. The subjects of Group A who received these treatments were assessed for immediate changes in pain, glenohumeral external rotation and overhead reach. Thus, the study shows significant improvement in pain up to 15° and overhead reaches up to 10 cm when compared with Group B, who underwent the treatment of ultrasound therapy.

Our results were in agreement with the research work done by Godges, Mattson-Bell, Thorpe & Shah. (2003). The main reason for the increase in the range of motion and the overhead reach is that the trigger release helps in reducing the tightness, and it promotes changes in myofascia allowing the elongation of the shortened structures.

PNF (contract relax technique) is effective in increasing the range of motion and its reciprocal activation of agonist and antagonist provides the greatest potential for muscle tendon as it lengthens the Golgi organ (GOT) (Levangie & Norkin, 2011). When PNF (contract relax technique) is applied, the patient is told to contract the muscle in internal rotation against the resistance. Therefore, as the muscle tension develops, the GTO fibers inhibit alpha motor neurons activity and decreases tension in the muscle tendon. So for the neuromuscular system, inhibition is the state of decreased neuronal activity and altered synaptic potential which reflexively diminishes the capacity of a muscle to contract. As the capacity of muscle to contract decreases, the arm is moved to external rotation. Likewise, the antagonists

are contracted and agonists are relaxed and again, tension is developed. This GTO monitors the excessive tension during muscle contraction and thus inhibits the excessive contractions (Decicco & Fisher, 2005)

The position of 45<sup>0</sup> of abduction was adopted for glenohumeral external rotation mobilization and Proprioceptive neuromuscular facilitation. This is because at this position, subscapularis muscle flexibility deficit is the major cause than any capsular restrictions which is mainly the cause of restriction at 90<sup>0</sup> of glenohumeral external rotation. While performing the trigger release of the subscapularis therapist palpated in the axilla to identify the areas of myofascia mobility restrictions, taut bands or trigger points identified restrictions were treated by utilizing a combination of sustained manual pressure and slow deep strokes to the subscapularis myofascia for 7 minutes.

Many studies like Yildirim, Ones & Celik (2013) have concluded that ultrasound therapy reduces pain and increases the mobility and functional status. Nevertheless, their results show statistically less significance in pain reduction, glenohumeral external reduction and overhead reach. It requires many sessions to reach some improvement. It is a target goal for physical therapy to relieve pain and regain movement at a shorter time, which will save time and efforts for patient and therapist. Thus, the results of this study give a choice for another approach to manage shoulder impingement syndrome.

## CONCLUSION

Trigger release of the subscapularis for 7 minutes and 5 repetitions of the contract relax PNF technique to the shoulder internal rotators followed by 5 repetitions of PNF facilitating the flexion, abduction and external rotation diagonal pattern was found to be effective in reducing pain and gaining glenohumeral external rotation and overhead reach during a single intervention session. Thus, the hands on technique such PNF together with trigger release has been proven to be a useful treatment technique by physiotherapist to manage subjects with shoulder impingement syndrome.

## References:

- Azevedo DC., Melo RM., Alves Corrêa RV.,& Chalmers G. (2011). Uninvolved versus target muscle contraction during contract: relax proprioceptive neuromuscular facilitation stretching. *Phys Ther Sport*. 12(3), 117-21.
- Brantingham JW, Cassa TK, Bonnefin D, Jensen M, Globe G, Hicks M, Korporaal C. (2011). Manipulative therapy for shoulder pain and disorders: expansion of a systematic review. *J Manipulative Physiol Ther*, 34(5), 314-46.

- Bron C., Wensing M., Franssen JL., & Oostendorp RA. (2007). Treatment of myofascial trigger points in common shoulder disorders by physical therapy: a randomized controlled trial [ISRCTN75722066]. *BMC Musculoskelet Disord*, 5 (8), 107-26
- Buss DD., Freehill MQ., & Marra G (2009). Typical and atypical shoulder impingement syndrome: diagnosis, treatment, and pitfalls. *Instr Course Lect*, 58, 447-57
- Cohen RB., & Williams GR Jr. (1998). Impingement syndrome and rotator cuff disease as repetitive motion disorders. *Clin Orthop Relat Res*. 351, 95-101
- Decicco PV.,& Fisher MM. (2005).The effects of proprioceptive neuromuscular facilitation stretching on shoulder range of motion in overhand athletes. *J Sports Med Phys Fitness*, 45(2),183-7.
- Donatelli R., & Greenfield B. (1984). Rehabilitation of a stiff and painful shoulder: a biomechanical approach. *J Orthop Sports Phys Ther*,9,1180-11264.
- Emily D., Sophia M., & Simon R. (2014). Eccentric exercise therapy in the treatment of subacromial impingement syndrome: A critical review. *IJTR*, 21(7), 338-44
- Godges JJ., Mattson-Bell M ., Thorpe D. ,& Shah D. (2003). The immediate effects of soft tissue mobilization with proprioceptive neuromuscular facilitation on glenohumeral external rotation and overhead reach. *Journal of Orthopaedic & Sports Physical Therapy*, 33(12), 713-8
- Hawkins RJ., & Hobioka PE. (1983). Impingement syndrome in the athletic shoulder. *Clin Sports Med*. 2(2),391-405
- Johansson K., Oberg B ., Adolfsson L., & Foldevi MA. (2002). Combination of systematic review and clinicians' beliefs in interventions for subacromial pain. *Br J Gen Pract*. 52(475), 145-52.
- Karas V., Cole BJ., & Wang VM. (2012). Role of biomechanics in rotator cuff pathology: North American perspective. *Med Sport Sc*, 57, 18-26
- Levangie PK., & Norkin CC. (2011). *Joint structure and function. A comprehensive Analysis*. 5<sup>th</sup> ed, Philadelphia: F. A. Davis.
- O'Hora J., Cartwright A., Wade CD., Hough AD., &Shum GL.( 2011). Efficacy of static stretching and proprioceptive neuromuscular facilitation stretch on hamstrings length after a single session. *J Strength Cond Res*.25(6),1586-91
- Paternostro-Sluga T ., & Zöch C. (2004). Conservative treatment and rehabilitation of shoulder problems. *Radiologe*. 44(6),597-603.
- Sharman MJ., Cresswell AG., & Riek S. (2006). Proprioceptive neuromuscular facilitation stretching : mechanisms and clinical implications. *Sports Med*. 36(11), 929-39.

Travell J., & Simons D. (1983). *Myofascial Pain and Dysfunction: The Trigger Point Manual*. Baltimore: Williams and Wilkins

Thurner MS., Donatelli RA., & Bascharon R. (2013) Subscapularis syndrome: a case report. *Int J Sports Phys Ther.* 8(6),871-82.

Valenza MC., Torres-Sánchez I., Cabrera-Martos I., Valenza-Demet G., Cano-Cappellacci M. (2013).

Acute Effects of contract-relax stretching vs. TENS in young subjects with anterior knee pain: a randomized controlled trial. *J Strength Cond Res.* Nov 20. [Epub ahead of print]

Yildirim MA., Ones K., & Celik EC. ( 2013). Comparision of ultrasound therapy of various durations in the treatment of subacromial impingement syndrome. *J Phys Ther Sci.* 25(9),1151-4. doi: 10.1589/jpts.25.1151. Epub 2013 Oct 20.

**Tables and figures**

**Table: 1 Comparison of Pre -test and Post- test values of Group –A**

Parameters	Pre- test values		Post- test values		t-value	P-value
	Mean	S.D	Mean	S.D		
VAS	6.2	.676	3.8	0.799	14.697	≤0.000
External rotation	36.6	4.911	52.33	4.577	25.036	≤0.000
Overhead reach	163.61	9.0732	172.67	9.5	19.403	≤0.000

**Table: 2 Comparison of Pre - and Post -test values of Group –B**

Parameters	Pre -test values		Post -test values		t-value	P-value
	Mean	S.D	Mean	S.D		
VAS	6.07	.799	5.33	.724	6.205	≤0.000
External rotation	36.47	5.68	40.83	5.948	16.358	≤0.000
Overhead reach	163.63	8.4631	165.37	8.486	10.438	≤0.000

**Table: 3 Comparison of Post -test values between Group A &Group B**

Parameters	Post-test Group A		Post-test Group B		t-value	P-value
	Mean	S.D	Mean	S.D		
VAS	3.8	0.799	5.33	.724	6.481	≤0.283
External rotation	52.33	4.577	40.83	5.948	6.192	≤0.195
Overhead reach	172.67	9.5	165.37	8.486	2.215	≤0.286



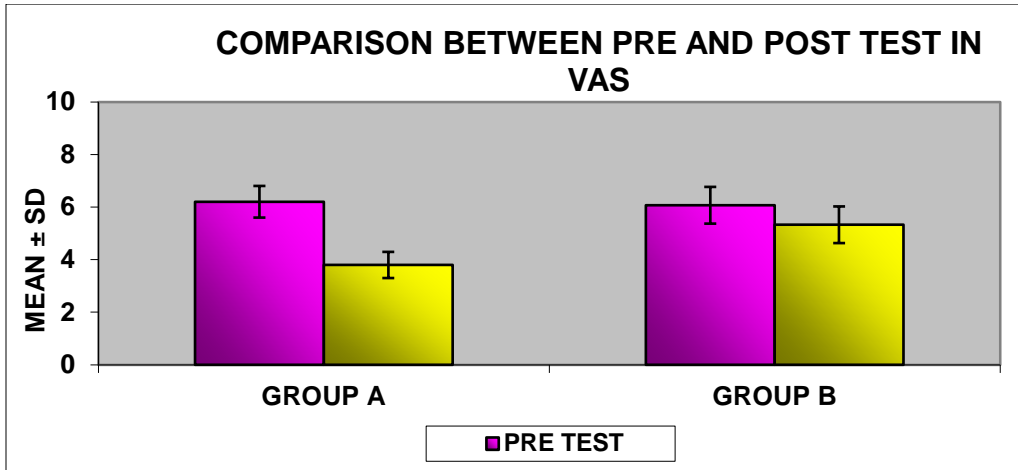


Figure 1: Comparison between pre – test and post – test VAS in Group A and Group B