



Subscapularis Trigger Points as a Predictor for Frozen Shoulder Syndrome: Correlation Study

Huda B. Abd Elhamed*, Ebtessam Fawzy Goma, Alaa El-din Abd El Hakem Balbaa

Department of Musculoskeletal Disorders and its Surgery Faculty of Physical Therapy, Cairo University, Egypt

Received: 06/06/2020

Accepted: 08/09/2020

Published: 20/12/2020

Abstract

Trigger points in the shoulder region muscles restrict movement of shoulder and create pain on movement and at rest. The key muscle that must be examined is the subscapularis muscle. The aim of this study is to investigate the relationship between subscapularis trigger with shoulder pain, shoulder abduction and shoulder external rotation. 50 patients diagnosed with frozen shoulder. Data obtained regarding pressure pain threshold (PPT) using pressure algometry, shoulder pain and disability index (SPADI) using questionnaire, shoulder abduction and external rotation ROM using digital inclinometer were statistically analysed and compared. Strong negative significant correlation between PPT with SPADI, strong positive significant correlation between PPT with shoulder abduction and external rotation. Subscapularis trigger points in patients with frozen shoulder affect shoulder pain, shoulder abduction, and external rotation.

Keywords: Frozen shoulder, SPADI, Subscapularis, Trigger points, Pressure pain threshold

1 Introduction

Frozen shoulder syndrome (FSS) is a condition characterized by a painful, progressive loss of both active and passive shoulder motion resulting from progressive fibrosis and ultimate contracture of the glenohumeral joint capsule (1). The most commonly affected movements were external rotation and abduction of the gleno-humeral joint (2). Frozen shoulder is very a common musculoskeletal pain condition that is generally poorly identified and treated because the cause is usually myofascial trigger points that are overlooked in most practitioners' initial education and training (3). Patients who have trigger points often reports regional, persistent pain that usually result in decreased range of motion of the muscle in question (4). Trigger Points shorten muscles and actively prevent them from lengthening, causing muscle weakness (3). Trigger Points often are painful and this pain makes muscles stay tense and this constant tension in the muscle will make the trigger point worse, thus completing a continually worsening cycle (3). The subscapularis is often at the very heart of the problem with frozen shoulder (3). Trigger points keep the subscapularis from lengthening, which it must do to allow any movement involving outward rotation of the arm, including raising the arm overhead. With a frozen shoulder, knowing how to treat subscapularis trigger points is the key to recovery (3). The actin and myosin myofilaments stop sliding over one another. As a result, the sarcomere becomes turned to the permanently 'switched-on' position, leading to a contraction. This sustained dysfunction and sarcomere contraction leads to local intracellular chemical changes including, Localized ischemia, Increased metabolism needs, Increased energy required to sustain contraction, failed re-uptake of calcium ions into the sarcoplasmic reticulum, Localized inflammation (to facilitate repair), Compression or

watershed effect on local vessels, Energy crisis, Production of inflammatory agents, which sensitize local autonomic and nociceptive (pain) fibers (5), the aim of the study is to investigate the relationship between subscapularis trigger with shoulder pain, shoulder abduction and shoulder external rotation.

1.1 Study Design

The study was designed as a correlation.

1.2 Study participants

Fifty-six patients diagnosed with frozen shoulder referred to the out-clinic of the Faculty of physical therapy, Cairo University, were enrolled and assessed for their eligibility to participate in the study, their age ranged from 40 to 60 years. Exclusion criteria were Presence of polyarthritis or neurological diseases or cervical neuropathy. Previous Intra-articular cortisone injection for 6 months ago. Written informed consent was obtained from all subjects before the baseline evaluation. Ethical approval was obtained from the institutional review board at Faculty of physical therapy, Cairo University before study commencement. The study followed the Guidelines of Declaration of Helsinki on conduction of human research (6). The inclusion criteria were patients who had Patients diagnosed with idiopathic or secondary frozen shoulder. Patients had subscapularis trigger points. Have a painful and stiff shoulder for at least 3 months (stage two) Loss of active and passive abduction shoulder and external rotation range of motion.

1.3 Outcome measures

Trigger points were measured using pressure algometry consisting of a 1-cm diameter hard wide disk connected to a dial gauge calibrated in kg/cm². Algometry is an objective

*Corresponding author: Huda B. Abd Elhamed, Department of Musculoskeletal Disorders and its Surgery Faculty of Physical Therapy, Cairo University, Egypt. E-mail: dr_huda_bader@yahoo.com

method of quantifying soft tissue tenderness and has been shown to be a useful tool in the assessment of TrPs (7, 8). Inter-examiner reliability of the pressure algometry is good to excellent (interclass correlation (ICC) = 0.75- 0.89) Also, reliability may be enhanced when one examiner takes all measurements (7, 8). Shoulder pain and disability index has been shown to be responsive to change over time, in a variety of patient populations and is able to discriminate adequately between patients with improving and deteriorating conditions (10). Digital inclinometer professional 9 inches' multi-function HUSKY digital level used to measure shoulder abduction and external rotation. This is a digital level used to measure the horizontal and vertical alignment of objects, with a measuring range of 360 degrees the accuracy of digital display is $\pm 0.1^\circ$ for level and $\pm 0.2^\circ$ for all angles (11).

2 Procedures

Localization of a trigger points detection of trigger point by palpation have obtained an intra- examiner reliability (12); good inter- examiner reliability ranging from 0.84 to 0.88 and high Chen et al., (13) supported that the location of the taut band as identified by the physician in his examination was the same as that identified in the Magnetic Resonance Elastography images. The patient was asked to assume supine position with the arm supported by the plinth. The Subscapularis trigger points located in the tenderest area in the posterior axillary wall, which is often located near the most superomedial aspect of the scapula (14).

A *mechanical pressure algometer* was used steady and perpendicular to the identified TrPs. Subjects were instructed to say "now" when felt discomfort or pain. The mean of 3 trials was calculated, a 10-s resting period was being allowed between each trial (15). Pressure thresholds lower than 3 kg are considered to be abnormally low (16).

Shoulder pain and disability index (SPADIA) used to assess the shoulder pain and function, it consists of 13 closed questions (answered with Yes or No). The ratio of the affirmative answers to the number of applicable items is multiplied by 100(10). The SPADI demonstrates good construct validity (17). Higher score means higher pain and disability (10).

Abduction-AROM was measured in the seated position, with the trunk upright. The patient was asked to abduct the arm with the thumb pointed up toward the ceiling and the elbow extended (18).

Shoulder external rotation was measured in supine position with the shoulder adducted and the elbow flexed to 90 degrees, the wrist in neutral position, the patient was asked to rotate his or her arm outward into external rotation, external rotation was measured by placing the digital level to the forearm, parallel with the midline of the ulna (18).

3 Statistical analysis

Descriptive statistics of the general characteristics of the subjects table (1). The frequency distribution of gender of the study group table (2).data obtained regarding pressure pain threshold (PPT), shoulder pain and disability index (SPADI), shoulder abduction and external rotation ROM were statistically analysed and compared using pearson correlation coefficient. The statistician conducted the statistical analysis was blind to group allocation until the analysis were completed. The correlation between PPT and SPADI was strong negative significant correlation ($r = -0.93$, $p = 0.0001$), while the correlation between PPT with active shoulder abduction ROM ($r = 0.91$, $p = 0.0001$), with passive shoulder abduction ROM ($r = 0.8$, $p = 0.0001$), with active shoulder external rotation ROM ($r = 0.92$, $p = 0.0001$) and with passive shoulder external rotation ROM ($r = 0.94$, $p = 0.0001$) which is strong positive significant correlation table (3).

4 Discussion

The results revealed that there is correlation between subscapularis trigger point with shoulder function, shoulder external rotation and abduction in frozen shoulder patients. The results of present study agreed with Hidalgo-Lozano (19) who compared 12 patients with unilateral shoulder impingement and pain in the anterior and posterior aspects of the shoulder with 10 matched controls were evaluated by an experienced examiner for the presence of trigger points [TrPs] in the levator scapulae, supraspinatus, infraspinatus, subscapularis, pectoralis major, and biceps brachii muscles and compared with 10 matched controls.

Table 1: Descriptive statistics for the age and BMI of the study group

	$\bar{X} \pm SD$	Maximum	Minimum
Age (years)	44.74 $\pm$ 6.21	60	40
BMI (kg/m ²)	24.57 $\pm$ 2.36	30.82	19.94

Table 2: The frequency distribution of gender of the study group:

	Gender distribution	
	Females	Males
No. (%)	38 (76%)	12 (24%)
Total	50 (100%)	

Table 3: Correlation between PPT and all tested variables of the study group

PPT	r value	p value	Sig
SPADI	-0.93	0.0001	S
Active abduction ROM	0.91	0.0001	S
Passive abduction ROM	0.8	0.0001	S
Active External rotation	0.92	0.0001	S
Passive External rotation	0.94	0.0001	S

Not surprisingly, patients presented with a significantly greater number of TrPs, particularly in the supraspinatus, infraspinatus, and subscapularis muscles, a lower PPT, and greater pain intensity in several muscles compared with control subjects. The authors suggested peripheral and central sensitization mechanisms. The results of present study agreed with Perez-Palomares et al (20) who made a descriptive study to find the correlation between the diagnosis of sub acromial impingement syndrome, rotator cuff tendonitis, positive provocation test responses, the existence of active MTrPs and the results obtained with ultrasonography (US) and Magnetic Resonance Imaging (MRI). Kuan et al (21) have investigated the relationship between the presence of muscle TrPs and joint hypomobility in patients with neck pain, they reported that all patients exhibited segmental hypo-mobility at C3-C4 zygapophyseal joint and TrPs in the upper trapezius, sternocleidomastoid, or levator scapulae muscles. There are several theories that have discussed the relationship between TrP and joint hypomobility. First, increased tension of the taut muscular bands associated with a TrP and facilitation of motor activity can maintain displacement stress on the joint. Alternatively, it may be that the abnormal sensory input from the joint hypomobility may reflexively activate TrPs (22).

5 Conclusion

Subscapularis trigger points in patients with frozen shoulder effects shoulder pain, shoulder abduction, and external rotation.

Ethical issue

Authors are aware of, and comply with, best practice in publication ethics specifically with regard to authorship (avoidance of guest authorship), dual submission, manipulation of figures, competing interests and compliance with policies on research ethics. Authors adhere to publication requirements that submitted work is original and has not been published elsewhere in any language.

Competing interests

The authors declare that there is no conflict of interest that would prejudice the impartiality of this scientific work.

Authors' contribution

All authors of this study have a complete contribution for data collection, data analyses and manuscript writing.

References

- Zuckerman, J. D., & Rokito, A. Frozen shoulder: a consensus definition. *Journal of shoulder and elbow surgery / American Shoulder and Elbow Surgeons*. 2011; 20(2): 322–5.
- Nambi, G., & Kamal, W. Additional effect of Trigger point therapy and Myo fascial release on second stage Frozen Shoulder among industrial workers. *Sanamed*.2017;12(2),93.
- David G,Simmons:frozen shoulder workbook ;trigger point therapy for overcoming pain and regaining range of motion .2016;8-25.
- Alvarez, D. J., & Rockwell, P. G. Trigger Points: Diagnosis and Management. 2012.
- Niel-Asher, S. The Concise Book of Trigger Points (Revised Edition). In *The Concise Book of Trigger Points*. 2008.
- World Medical Association. WMA Declaration of Helsinkiethical principles for medical research involving human subjects 2015.
- Antonaci F, Sand T, Lucas GA. Pressure algometry in healthy subjects: inter-examiner variability. *Scand J Rehabil Med*.1998; 30:3-
- Nussbaum EL, Downes L .Reliability of clinical pressure-pain algometric measurements obtained on consecutive days, *Phys Ther*.1998; 78: 160-9.
- Dawson, J., Harris, K. K., Doll, H., Fitzpatrick, R., & Carr, A. A comparison of the Oxford shoulder score and shoulder pain and disability index: factor structure in the context of a large randomized controlled trial. *Patient related outcome measures*.2016;7, 195–203.
- Roy JS et al. *Arthritis Rheum* .2009,61: 623–632.
- Michael J, Malachy P, Christopher P and Tyler F (); Reliability of shoulder range of motion comparing a goniometer to a digital level; *Physiotherapy Theory and Practice*, 2010;18:23-33.
- Shultz SP, Driban JB, Swanik CB. The Evaluation of Electro-dermal Properties in the Identification of Myofascial Trigger Points. *Arch Phys Med Rehabil*;2007; 88:780-4.
- Chen Q, Bensamoun S, Basford JR, Thompson JM, An K. Identification and Quantification of Myofascial Taut Bands with Magnetic Resonance Elastography. *Arch Phys Med Rehabil*.2007;88: 1658-61.
- Ingber RS. Shoulder impingement syndrome in tennis racquetball players treated with subscapularis myofascial treatment. *Arch Phys Med Reh*.2000; 81: 679-82.
- Fernández-de-las-Peñas C, Alonso-Blanco C, Fernández-Carnero J, Miangolarra JC. The immediate effect of ischemic compression technique and transverse friction massage on tenderness of active and latent myofascial trigger points: a pilot study. *J Bodyw Mov Ther*. 2006; 10:3-9.
- Fischer, A.A., Algometry in diagnosis of musculoskeletal pain and evaluation of treatment outcome: an update. *J Musculoskeletal Pain* 1996;6, 5–33.
- Breckenridge, J. D., & Mcauley, J. H. Shoulder Pain and Disability Index (SPADI). *Journal of Physiotherapy*.2011, 57(3), 197.
- Kolber, M. J., & Mdt, C. Original research the reliability and concurrent validity of shoulder mobility measurements using adigital inclinometer and goniometer.2012; 7(3): 306–313.
- Hidalgo-Lozano A, Fernández-de-las-Peñas C, Alonso-Blanco C, Ge H-Y, Arendt-Nielsen L, Arroyo-Morales M: Muscle trigger points and pressure pain hyperalgesia in the shoulder muscles in patients with unilateral shoulder impingement: a blinded, controlled study. *Exp Brain Res*. 010;202(4): 915–925 .
- Perez-Palomares, S., Oliván-Blázquez, B., Arnal-Burró, A. M., Mayoral-Del Moral, O., Gaspar-Calvo, E., De-La-Torre-Beldarraín, M. L., Romo-Calvo, L.Contributions of myofascial pain in diagnosis and treatment of shoulder pain. A randomized control trial. *BMC Musculoskeletal Disorders*.2009, 10(1), 1–7.
- Kuan TS, Wu CT, Chen S, Chen JT, Hong CZ. Manipulation of the cervical spine to release pain and tightness caused by myofascial trigger points [Abstract] *Arch Phys Med Rehabil*. 1997;78:1042.
- Fernández-de-las-Peñas Interaction between Trigger Points and Joint Hypomobility : A Clinical Perspective. 17(2), 74–77.