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Original Research Article

Myofascial Trigger Points in the Shoulder Girdle Muscles in Subjects With and Without Periarthritis Shoulder - A Comparative Study

Papia Paul[1], Shaswat Verma[2]

[1]Consultant Physiotherapist, Bangalore, India,
[2]Assistant Professor, Department of Physiotherapy, Ramaiah Medical College and Hospitals, Bangalore, India,

Corresponding Author: Shaswat Verma

ABSTRACT

Introduction: Periarthritis Shoulder is a common condition characterized by the spontaneous onset of pain, progressive restriction of movement of the shoulder and disability. These individuals with PA shoulder tend to have altered postural mechanism and to overcome this improper posture they use accessory muscles which lead to pain and development of trigger points. MTrPs in subscapularis and other shoulder musculature could be responsible for the restriction in ROM and pain in the individuals with PA shoulder. Therefore the aim of the study is to determine the presence of MTrPs in the various shoulder and scapular muscles in the patients diagnosed with unilateral PA shoulder.
Method: 23 subjects in each group of PA shoulder and Non-PA shoulder were recruited. Seven muscles around the shoulder girdle were palpated in specific position for MTrPs. Pressure algometer was used to quantify the pain pressure in these muscles and was compared with the contralateral/unaffected side.
Results: The median of the total number of MTrPs in the subjects with PA shoulder and without PA shoulder was 6 and 4 respectively. The MTrPs in deltoid and subscapularis muscles were found to be significant with $p \leq 0.01$ and 0.006 respectively.
Conclusion: The presence of MTrPs is frequent in the individuals with or without PA shoulder but the total numbers was significantly high in the individuals with PA shoulder when compared to Non-PA. MTrPs in deltoid and subscapularis muscles are more prevalent than all other muscles.
Keywords: Periarthritis shoulder, Myofascial trigger points, Manual palpation, Pain pressure threshold, Pressure algometer

INTRODUCTION

Periarthritis (PA) Shoulder also termed as *frozen shoulder, painful stiff shoulder* or Adhesive Capsulitis is a common condition characterized by the spontaneous onset of pain, progressive restriction of movement of the shoulder and disability with the prevalence rate of 10% to 36% in the individuals with diabetes. [1] American Academy of Orthopaedic Surgeons defined PA shoulder as: "A condition of varying severity characterized by the gradual development of global limitation of active and passive shoulder motion where radiographic findings other than osteopenia are absent". [2] It is common in females between the ages of 40-60 years. It is a self-limiting condition and can be categorized into 3 stages: [3]

Stage1: Freezing stage. During this stage, the patient starts noticing the pain followed by limitation in the passive ROM which includes the initial 3months of starting of symptoms.

Stage2: Frozen stage. This stage is characterized by improvement in the pain

and inflammation but worsening in the ROM and it lasts from 3 to 9 months

Stage3: Thawing stage. During this stage, there is decrease in pain as well as improvement in ROM which extends from 9 to 18 months

On physical examination, these individuals demonstrate active and passive restriction of range of motion as well as pain. [4] Limitation in lateral rotation, abduction, and medial rotation is characterized by a classical capsular pattern and is prominent in the individuals with PA shoulder. It can be differentiated from Rotator cuff (RC) tendinitis, which has similar signs and symptoms by applying resistance in the mid-range of movement. The patients with PA shoulder will not complain of an increase in symptom whereas in RC tendinitis this test will lead to increase in pain. [5] Individuals with PA shoulder tend to have altered postural mechanism such as stooped posture, rounded shoulder, increased thoracic kyphosis etc. and to overcome this improper posture they build up the tendency to use accessory muscles which lead to pain and development of trigger points. [6] The reduction in the pain and ROM in these patients is not only due to the tightness of capsule and ligaments but can also be due to fascial restrictions, tightness of muscle and Myofascial Trigger Points (MTrPs) within the muscle. [4] According to Simons, MTrPs in Subscapularis and other surrounding shoulder musculature could be responsible for the restriction in range of motion and pain. [7]

Myofascial trigger points are "hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in taut band". [7] Taut band is a nodule felt at the TrPs which is one of the important clinical features; it is a rope-like structure extending from the noduleto the attachment of the muscle fiber and can be felt in superficial muscles by the examiner along the direction of the muscles. Local twitch response (LTR) is a sharp contraction of the taut band which is mediated by spinal reflexes and is obtained by strumming the taut band by hand or by inserting a needle to the trigger point. [8]

According to integrated TrP hypothesis, motor endplates release excessive acetylcholine in myofascial pain, which is evident by the presence of sarcomere shortening histopathologically. Various potential mechanisms such as Dynamic Concentric Contractions, Sustained Low-LevelContractions, and Intramuscular Pressure, Maximal or Sub-maximal Concentric Contractions and Eccentric Contractions play an important role in the development of MTrPs. [9] Trigger points can be active and latent. An active trigger point leads to clinical pain complaints i.e. the pain which the individual complains about. These TrPs when compressed produces a referred motor phenomenon, responsible for the reductionin length and weakness of muscle. [10] Simon defined Latent trigger points as "clinically quiescent with respect to spontaneous pain, it is painful when palpated". [7]

There is a lack of specific criteria for the diagnosis of MTrPs. Electro-diagnostic and morphological findings have been identified; however, they cannot be practically applied in the clinical setting due to cost and time constraints. [11] The only reliable method of diagnosis of MTrP is manual palpation. [12] There is no single diagnostic examination which alone is a satisfactory criterion for clinical identification of a trigger point, but based on experimental studies "the combination of spot tenderness in a palpable band and subject recognition of the pain are minimum acceptable criteria". Measurement of muscle tenderness is very important to accurately diagnose MTrPs. Pressure algometers are used to precisely measure tenderness and deep Pain Pressure Threshold (PPT). [13] The reliability of PPT according to raters or measurement frequencies is relatively high. The device displays pressure when a particular area of the muscle is pressed with a rubber disk involving an area of 1 cm^2. [14]

There are very fewer prevalence studies in MTrPs but based on clinical experiences MTrPs is likely to be associated with pain, disability, and dysfunction. [9] Prolonged persistence of MTrPs in neck and shoulder muscles may result in a headache, dizziness or vertigo, abnormal sensation, autonomic dysfunction, and disability. [15] It may also lead to motor function disturbances such as muscle spasm, loss of coordination of the muscle, reduction in work tolerance and weakness of the muscle. [7] MTrPs can increase fatigability of the involved muscle which may lead to alteration in the activation pattern during shoulder movements. [16]

Therefore, this study aims to determine the presence of MTrPs in various shoulder and scapular muscles in the patients diagnosed with unilateral PA shoulder. The objectives of the study are to assess for MTrPs over scapular and shoulder muscles in subjects with PA shoulder, to assess for MTrPs over scapular and shoulder muscles in subjects without PA shoulder and to compare the number of MTrPs present in subjects with PA shoulder and without PA shoulder.

MATERIALS AND METHODS

46 subjects of age group 40-65 years were included in the study and were divided into two groups of 23 in each group of subjects with and without PA. A cross sectional research study design was chosen to assess the MtrPs over scapula and shoulder muscles in subjects in both the groups. The subjects were recruited based on convenience sampling.

The exclusion criteria were:

- Known case of rheumatological disease
- Known case of neurological disease
- History of shoulder or neck trauma
- Rotator cuff tear or impingement
- Recent joint infection
- History of shoulder injury and surgery

Procedure

The participants were asked to acquire specific position so that desired muscles could be palpated. The MTrPs were diagnosed by Manual Palpation method. The table (Table 1) describes the various positions and the methods of palpation of each muscle. Pressure algometer was used to quantify the Pain Pressure Threshold (PPT) in the following muscle and was compared with the contralateral/unaffected side. For measurement of PPT, the algometer was placed at right angles to the skin surface and the pressure applied was gradually increased. The first point at which the subject appreciated the pressure as the pain was regarded as the pain pressure threshold and the same pressure was applied to the unaffected side to verify the threshold of pain.

Table 1: Table showing appropriate position and method of palpation of individual muscles

Muscle	Position	Palpation
Deltoid	Supine with arm resting at the side(Anterior) Prone or sitting(posterior)	Patient was asked to lift the arm between flexion and abduction, palpate from lateral clavicle to deltoid tuberosity (anterior) Patient was asked to perform horizontal, extension, palpate from spine of scapula to deltoid tuberosity (posterior).
Subscapularis	Supine with arm resting on the trunk	Scapula was pulled laterally with supporting hand, the finger pads of dominant hand firmly pressed against the anterior surface of the scapula, the patient was asked to do a medial rotation.
Pectoralis Major	Supine with arm resting at the side	Patient was asked to adduct the arm against resistance
Supraspinatus	Prone with arm resting at the side	Patient was asked to perform abduction, contraction of the muscle can be felt in supraspinous fossa
Infraspinatus and Teres Minor	Prone with arm resting on the table and forearm hanging off the table	The Patient was asked to lateral rotate the arm against resistance. Contraction of Infraspinatus was felt on infraspinous fossa and teres minor on superolateral border of scapula
Teres Major	Prone with arm resting on the table and forearm hanging off the table	Patient was asked to do medial rotation of arm against resistance

Figure 1: Palpation of trigger point in Supraspinatus muscle

Figure 2: Palpation of trigger point on Pectoralis major muscle

Figure 3: Palpation of trigger point on Deltoid muscle

Figure 4: Palpation of trigger point on Infraspinatus muscle

Statistical analysis:

Descriptive statistics was used to analyze the side of examination, gender, and age. Measures of central tendency were used to describe the number of MTrPs in individual muscles. Normality of the data was checked using Shapiro- Wilk test. All the data were not distributed under normal distribution curve, therefore,Mann-Whitney U Test was used to determine the significant difference between the total numbers of MTrPs between the PA shoulder and non-PA shoulder group. In the study, 'p' value of less than 0.05 was accepted as indicating statistically significant. The statistical software for Social Science (SPSS) version 20 package was used for the computation and analysis of data. And Microsoft Word and Excel were used to generate graphs and tables.

RESULTS

The demographic data of the study sample in terms of age, percentage of side involved and duration of symptoms are shown in table 2, table 3 and table 4 respectively.

Table 2: Table showing the demographic data (age) in the two groups

	PA Shoulder	Non-PA Shoulder
N	23	23
Mean	57	56.3
Median	56	56
Std. Deviation	5.4	5.6
Maximum	65	65
Minimum	48	46

Table – 3: Percentage of side involved in the study

	PA Shoulder		Non – PA Shoulder	
Side	Frequency	Percent	Frequency	Percent
Right	12	52.2	11	47.8
Left	11	47.8	12	52.2
Total	23	100	23	100

Table – 4: Table showing the duration of symptoms

MONTHS	PA Shoulder	Non-PA Shoulder
Mean	4.52	3.52
Median	4	3
Std.Deviation	1.9	1.9
Maximum	8	7
Minimum	1	1

The muscles containing MTrPs were found in all the 23 subjects with PA shoulder and 21 subjects out of 23 without PA shoulder. The median of the total number of MTrPs in the subjects with PA shoulder and without PA shoulder was 6 (range 5 to 7) and 4 (range 3 to 5) respectively. Supraspinatus, Pectoralis major, Infraspinatus, Deltoid and Subscapularis had MTrPs with a median value of 1 and range of 0 to 2 in the subjects with PA shoulder depicted in figure 1. In the subjects without PA shoulder, Supraspinatus more number of MTrPs with a median value of 1 and range of 0 to 2 depicted in figure 5.

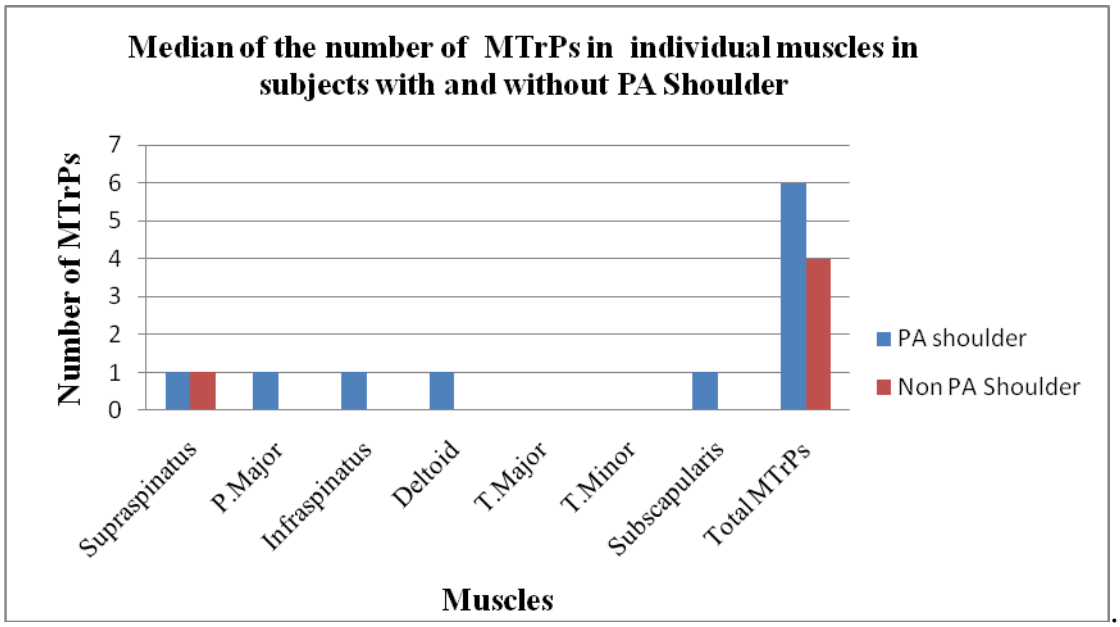

Figure 5: Graphical representation of Median of the number of MTrPs in individual muscles in subjects with and without PA Shoulder

Shapiro-Wilk Test, $W = 0.180$; $p<0.05$, therefore the difference between total numbers of MTrPs in individual muscles among both the groups was compared using Mann-Whitney U test. The MTrPs in Deltoid and Subscapularis muscles were found to be significant with $p \leq 0.01$ and 0.006 respectively. There was significant difference in the total number of MTrPs with p-value ≤ 0.001.

Table 5: Table showing the level of significance of MTrPs in individual muscles

Muscles	Significance (p value)
Supraspinatus	0.85
Pect.Major	0.13
Infraspinatus	0.31
Deltoid	0.01
T.Major	0.17
T.minor	0.66
Subscapularis	0.006
Total	0.001

Other findings of the study include the difference of MTrPs based on the stages of PA shoulder. The median of the total number of MTrPs during the Freezing stage

(1 to 3 months) and Frozen stage (3 to 9 months) was 7 (range 6 to 8) and 5 (range 4 to 6) respectively. Therefore it signifies that the subjects with acute stage of symptoms have more number of MTrPs than those of subacute stage.

DISCUSSION

The objective of the study was to determine the number of trigger points in the 7 scapular and shoulder girdle muscles in the patients with and without PA shoulder and compare the total number of trigger points between both the groups. Detailed history and physical assessment was done prior to the commencement of the procedure. Identification of trigger points was done by manual palpation method in specific position. The result obtained in the study shows that all the subjects with PA shoulder and those without PA shoulder presented with multiple shoulder muscles MTrPs. However the number of MTrPs in the muscles varies in each individual. In particular, MTrPs in Deltoid and Subscapularis were more common in the individuals with PA shoulder and in the subjects without PA shoulder it was frequently present over Supraspinatus. According to Travel and Simons, multiple MTrPs in rotator cuff muscles especially in Subscapularis may imitate the same symptoms as that of PA shoulder such as pain in shoulder region and restriction in ROM which is usually overlooked during the diagnosis by the examiner. [7] The presence of trigger point in Subscapularis in these individuals aggravates the symptoms which activates the pain pattern in other surrounding muscles. The MTrPs in other muscles are easier to identify than that of Subscapularis and are often inactivated but until the primary cause; Subscapularis MTrP is identified and corrected, symptoms will persist. Nathaniel Grubbs mentioned in a study that physical sign of PA shoulder involved muscle spasm and MTrPs of shoulder and scapular muscles especially Pectoralis major. [6] MTrPs in Deltoid muscle can also mimic pain arising in the glenohumeral joint which is then misdiagnosed as arthritis of the joint whereas MTrPs within the Infraspinatus may also lead to development of satellite trigger point in anterior and middle deltoid which causes referred pain to wrist and hand in the individuals with PA shoulder.

The result of the study shows that the total number of MTrPs in the individuals with PA shoulder was significantly high than the individuals without PA shoulder which signifies that presence of MTrPs can be one of the primary causes of pain and limitation in ROM in PA shoulder.

Clinical implications

PA shoulder has mainly been proposed to be caused due to capsular or synovial involvement of the glenohumeral joint, but MTrPs, which are painful spots that also produces recognizable shoulder pain during contraction, stretching or compressing, may provide an alternative explanation for pain. Therefore, identification and treatment of MTrPs may lead to normalization of motor activation patterns and may facilitate spontaneous recovery of pain and ROM by making exercise more effective. Based on the result of the study, it can be proposed that alternative approach can be indicated to address the pain and restricted ROM in PA shoulder. Inactivation of the MTrPs should be one of the primary goals of treatment protocol.

Limitations

One of the limitation of the study was only 7 muscles around the shoulder girdle was taken into consideration as they are the most common muscles to be involved during shoulder pain. Further study should be done including the various other shoulder and scapular muscle which could also have an impact in pain and limitation in ROM. Small sample size is one more limitation of the study. Sample size of 23 was calculated by assuming the mean difference of 3 MTrPs and a standard deviation of 4, based on the effect size of

0.75 which is a large effect size. [17] In future projects, researchers can conduct the study including larger population.

CONCLUSION

The present study reveals that the presence of MTrPs is frequent in scapular and shoulder girdle muscles in the individuals with or without PA shoulder but the total numbers of MTrPs are significantly high in the individuals with PA shoulder when compared to Non-PA shoulder. MTrPs in Deltoid and Subscapularis muscles are more prevalent than all other muscles, therefore, it is necessary to look for the presence of MTrPs in these muscles as well as other scapular and shoulder muscle and proper intervention to these trigger points can help in the faster recovery of the patients with PA shoulder.

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