Test-retest reliability of myofascial trigger point detection in patients with rotator cuff tendonitis

Abdullah M Al-Shenqiti and Jacquelline A Oldham

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Abdullah M Al-Shenqiti Centre for Rehabilitation Science, University of Manchester, now at King Fahad Hospital, Madina Al-Munawarah, Saudi Arabia and **Jacquelline A Oldham** Centre for Rehabilitation Science, University of Manchester, Manchester, UK

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Objectives: To investigate the test–retest reliability of the following clinical diagnostic characteristics of myofascial trigger points: taut band, spot tenderness, jump sign, pain recognition, referred pain and local twitch responses (LTRs).
Design: Test–retest reliability study.
Setting: This study was undertaken in an outpatient physiotherapy department.
Subjects: Fifty-eight patients (31 males and 27 females) with rotator cuff tendonitis were recruited into this study.
Intervention: Rotator cuff muscles were assessed by an expert for the presence or absence of the main clinical diagnostic characteristics of trigger point assessment. The process was then repeated three days later by the same expert.
Main measures: Outcomes included the presence or absence of: a taut band, spot tenderness, jump sign, pain recognition, referred pain and LTRs.
Results: Kappa values between testing situations for the taut band, spot tenderness, jump sign and pain recognition were 1. Kappa scores for referred pain ranged between 0.79 and 0.88 and for the local twitch response between 0.75 and 1 depending on the muscles under investigation.
Conclusions: The presence or absence of the taut band, spot tenderness, jump sign and pain recognition was highly reliable between sessions. Referred pain and local twitch response reliability varied depending on the muscle being studied.

Introduction

Myofascial pain syndromes are common conditions that, by definition, result from trigger points.[1,2] Unfortunately, practitioners may not recognize this syndrome.[3,4] Differences in use of terminology and definition of terms such as muscular rheumatism or fibrositis often occur between different investigators.[5–9] Added to that, a lack of agreement regarding appropriate diagnostic criteria for examining trigger points has been a serious obstacle to a more widespread recognition of trigger points.[10] There are certain clinical diagnostic characteristics that should be looked for during examination in order to confirm the presence of myofacial trigger points. These include: the taut band, spot tenderness or jump sign, pain recognition, referred pain, and local twitch response (LTR).[10]

Reliability of trigger point identification has been seriously criticized by Bohr,[11] but the reliability of physical signs is extremely important to obtain meaningful clinical information. The three major reliability studies to date have focused on intertester reliability with somewhat conflicting

Address for correspondence: Professor JA Oldham, Centre for Rehabilitation Science, University of Manchester, Manchester Royal Infirmary, Oxford Road, Manchester M13 9WL, UK. e-mail: jackie.oldham@man.ac.uk

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results. Nice *et al.*[12] demonstrated poor reliability (low kappa scores) when detecting trigger points by evoking tenderness and pain referral. Njoo and Van der Does[13] demonstrated reliable detection of tenderness, jump sign and pain recognition but not in the local twitch response and referred pain. One of the best intertester reliability studies to date was undertaken by Gerwin *et al.*[14] They showed various degrees of agreement (ranging through moderate, good and excellent) for the majority of examined muscles regarding local twitch response tenderness, taut band, reproduced pain and referred pain. however, the local twitch response was less reliable than any other characteristic of the trigger point.

There are a number of factors that may have contributed to the varying reliability of the results from different studies. These include: lack of identification of a taut band which is one of the minimum acceptable diagnostic criteria of the trigger point[15]; inexperience of the examiners in assessing trigger points[12,13]; restriction in the area of examination[12]; incorrect positioning of the patient[12]; incorrect palpation techniques[12]; variation in the amount of force exerted on the palpated point and the duration of force applied.[12–14] Furthermore, whilst these studies provide some indication regarding the intertester reliability of trigger point detection, they did not consider intratester reliability, which is probably more important when considering the effects of intervention that are usually assessed by the same person. For this reason the specific aims of this study were to address some of the limitations identified above and investigate the intratester reliability of trigger point detection using rotator cuff tendonitis as the model for investigation.

Methods

Fifty-eight subjects (31 males and 27 females) were recruited by referral from GPs and consultants from different NHS Health Care Trusts throughout Greater Manchester and consented to participate in the study. The ages of the subjects ranged from 19 to 65 years with a mean age of 48.4 years. Patients were recruited if they had a diagnosis of rotator cuff tendonitis of not less than six weeks duration and not more than 18 months made by the referring consultant or GP and confirmed by the examiner (a qualified physiotherapist who had 11 years clinical experience and extensive training in trigger point examination). This required a painful resisted movement in at least one of the ranges of abduction, external or internal rotation with or without a painful arc.[16] Full passive range of motion but impingement on full elevation was acceptable. Exclusion criteria included: arthritis or capsulitis; acromioclavicular arthritis; rotator cuff tear; bicipital tendonitis; cervical syndrome; systemic disease (e.g. rheumatoid arthritis); shoulder pain due to neurological or vascular disorders; history of intra-articular or subacromial corticosteroid injections.

The examiner asked the patient to locate the pain on their shoulder with one finger. The examiner then drew the pain pattern on a blank body form. The accuracy of this was then checked with the patient.

The rotator cuff muscles of each subject were then examined using a flat palpation technique to identify the following diagnostic characteristics of trigger points:

- Spot tenderness identified when the patient complained of pain during palpation.
- A palpable taut band identified when a taut cord-like band could be observed or found during palpation.
- The jump sign, which is a characteristic behavioural response to pressure on a trigger point and identified when patients withdrew from digital pressure.
- The local twitch response, which is a transient contraction of the palpable taut band and can be visualized or palpated through the skin of the patient. This was identified when elicited by a vigorous snapping palpation.
- Pain recognition identified when application of digital pressure on a trigger point elicited a referred pain pattern characteristic of that muscle and the patient 'recognized' the elicited sensation as a familiar experience.
- Referred pain identified when the pain was felt at distance from the trigger point either spontaneously or through flat palpation. Each muscle has a specific pattern as follow:

- *Supraspinatus* – a deep ache referred to the mid-deltoid region and sometimes extends to the arm and forearm.
- *Infraspinatus* – intensely deep pain inside the front of the shoulder. The pain may also radiate down to the anteriolateral aspect of the arm and forearm or the radial aspect of the hand.
- *Teres minor* – a referred pain located over the posterior aspect of the shoulder.
- *Subscapularis* – referred pain located over the posterior aspect of the shoulder extending upwards towards the scapula and downwards in the posterior aspect of the arm to the elbow.

The muscles were examined in the following order: supraspinatus, infraspinatus, teres minor and then subscapularis in standardized positions:

- Supraspinatus – sitting in a comfortable position with the muscle stretched by placing the forearm of the patient behind the back at the waist level.
- Infraspinatus and teres minor – sitting in a comfortable position with the muscle stretched by placing the hand and the arm of the patient across the front of the chest to grasp the far armrest of the chair.
- Subscapularis – in a supine position with the arm abducted to 90° at about 45° short of full lateral rotation.

Findings were graded simply on the basis of whether each diagnostic characteristic was present or absent. Each subject was examined in approximately 8 min. Trigger points identified during the examination were marked on acetate with the sternoclavicular joint and the anterior edge of the acromion used as a landmarks. The process was then repeated three days later by the same examiner who was blind during this assessment to the previous examination findings. On completion the results from the two assessments were compared.

Data analysis

Descriptive statistics were used to investigate the frequency of detection of the trigger points in each rotator cuff muscle. The present/absent method of assessing trigger points utilized a nominal level of measurement, thus a kappa statistic was used to describe the degree of agreement between assessments for each of the trigger points.[17]

Results

Descriptive statistics are summarized in Table 1. With regard to the frequency of trigger points, the muscle most affected by trigger points was the supraspinatus. The subscapularis was the least affected.

Table 2 shows the results of the kappa statistics revealing a number of trigger point-specific features or diagnostic characteristics in all examined muscles that were in perfect agreement (a kappa value of 1) between testing situations. These characteristics included the palpable taut band, spot tenderness, jump sign and pain recognition. The detection of the local twitch response (LTR) and referred pain was not as reliable and, whilst the kappa value of teres minor for the local twitch response was 1, which indicated perfect agreement, the kappa value of the infraspinatus local twitch response was 0.75, which indicated substantial agreement.

The kappa values of supraspinatus, infraspinatus and teres minor referred pain were 0.85, 0.86 and 0.88 respectively, which indicated almost perfect agreement, but the kappa value of subscapularis referred pain was 0.79, which indicated substantial agreement. Kappa values for local twitch responses of supraspinatus and subscapularis could not be calculated as this sign was absent in all patients.

Table 1 Frequency of trigger points in the patients (for test 1 only)

Muscle	Absent	%	Present	%	Total
Subscapularis	55	94.8	3	5.2	58
Teres minor	46	79.3	12	20.7	58
Supraspinatus	7	12.1	51	87.9	58
Infraspinatus	22	37.9	36	62.1	58

Table 2 Results of the test–retest reliability of the trigger point diagnostic characteristics

Muscle	Assessment	Absent		Present		Kappa value
		Test 1	Test 2	Test 1	Test 2	
Supraspinatus	ST	7	7	51	51	1
	PTB	7	7	51	51	1
	JS	7	7	51	51	1
	LTR	58	58	0	0	–
	PR	7	7	51	51	1
	RP	7	9	51	49	0.85
Infraspinatus	ST	22	22	36	36	1
	PTB	22	22	36	36	1
	JS	22	22	36	36	1
	LTR	44	47	14	11	0.75
	PR	22	22	36	36	1
	RP	22	26	36	32	0.86
Teres minor	ST	46	46	12	12	1
	PTB	46	46	12	12	1
	JS	46	46	12	12	1
	LTR	56	56	2	2	1
	PR	46	46	12	12	1
	RP	46	48	12	10	0.88
Subscapularis	ST	55	55	3	3	1
	PTB	55	55	3	3	1
	JS	55	55	3	3	1
	LTR	58	58	0	0	–
	PR	55	55	3	3	1
	RP	55	56	3	2	0.79

ST, spot tenderness; PTB, palpable taut band; JS, jump sign; LTR, local twitch response; PR, pain recognition.

Discussion

The results of the present study show that the palpable taut band, spot tenderness, jump sign and pain recognition were the most reliable of the trigger point's diagnostic characteristics. These criteria are considered to be the essential components of trigger point assessment[15] and are in agreement with the study conducted by Gerwin *et al.*[14] Despite the extremely high agreement found in the present study with the local twitch responses in supraspinatus, teres minor and subscapularis muscles, the results reflect the difficulty of detecting this characteristic. In the majority of patients this characteristic was absent, and where it was described, the results were not as reliable as for the other assessments. For example, local twitch response detection in the infraspinatus muscle was seen in some of the initial examinations, but not in the final examinations and vice versa. These results repeat the observations of other authors. Simons *et al.*[15] found the local twitch response difficult to detect in the infraspinatus muscle, and it was the only trigger point characteristic with low reliability for the same muscle in a study carried out by Gerwin *et al.*[14]

Referred pain was reliably detected in supraspinatus, infraspinatus and teres minor with high kappa values, indicating perfect agreement. However, referred pain in subscapularis was less reliable (substantial agreement). This was probably due to the limited numbers of trigger points found in this muscle.

While trigger points usually most commonly affect the infraspinatus muscle and least commonly the teres minor,[15] the present study shows supraspinatus muscle to be the most commonly affected muscle and the subscapularis muscle least likely to be affected. However, the results of this study cannot be generalized, as patients were selected on the basis of criteria relating to rotator cuff tendonitis. This study therefore confirms what

Clinical messages

- The presence or absence of some myofascial trigger point signs (the taut band, spot tenderness, jump sign and pain recognition) can be reliable between sessions using the same experienced examiner.
- The reliability of referred pain and local twitch response varied depending on the muscle being studied.

has been found by Gerwin *et al.*,[14] who showed that the incidence of trigger point detection depends on the specific characteristic and the specific muscle being examined.

It is believed that the excellent reliability statistics observed in this study were due to the methodological rigor adopted for the trigger point assessments, i.e., a good palpation technique, standardized and proper positioning of the patients during examination and allocation of sufficient time for examination.[18] In addition, the expertise of the examiner may have played an important role, though this may be a limitation to the generalizability of the findings as they may not be transferable to other examiners, particularly those with less experience. Coupled with the accepted validity of these methods of trigger point assessment,[10] these reliability statistics provide confirmatory evidence that used under controlled conditions and with an experienced examiner, changes in trigger point activity can be reliably monitored over time. As one final note of caution the time between assessment intervals was only three days, and whilst the examiner felt they could not remember the previous assessment results, the possibility that they may have subconscious recall of these cannot be entirely ruled out.

Conclusions

This study has demonstrated that it is possible to demostrate the presence of the taut band, spot tenderness, jump sign and pain recognition relaibly between sessions using the same examiner. Referred pain and LTR reliability varied depending on the muscle being studied.

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