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Original Research Article

Identification of Myofascial Trigger Points in Breast Cancer Survivors with Upper Limb Pain: Interrater Reliability

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Abstract

Objective. Despite the increasing awareness of the contribution of myofascial dysfunctions to upper limb pain in breast cancer survivors, reliability of the identification of myofascial trigger points (MTPs) in this population has not yet been investigated. Therefore, the aim of the present study was to investigate the interrater reliability of the identification of MTPs by palpation at the upper limb region in breast cancer survivors with upper limb pain.

Design. Interrater reliability study.

Setting. University Hospitals Leuven, Belgium.

Subjects. Thirty breast cancer survivors with pain at the upper limb region.

Methods. Nine muscles (upper trapezius, levator scapulae, infraspinatus, supraspinatus, teres major and minor, subscapularis, pectoralis major, and scalene muscles) at the operated side were examined. The weighted kappa (WK) coefficient and Absolute Agreement with 95% confidence intervals were calculated.

Results. Moderate agreement was found for all examined upper limb muscles (WK = 0.41–0.60), except for the trapezius muscle, for which the agreement was almost perfect (WK = 0.83), and the supraspinatus muscle (WK = 0.23), for which the agreement was only fair.

Conclusions. For most muscles, moderate interrater reliability for the identification of MTPs by palpation in breast cancer survivors with upper limb pain was found. Therefore, we concluded that the identification of MTPs by palpation may add to the diagnosis of the myofascial pain syndrome in breast cancer survivors.

Key Words. Myofascial Pain Syndromes; Breast Neoplasms; Validation Studies

Introduction

After breast cancer treatment, several complications may occur. Pain prevalence rates of 27–79% have been reported one month after surgery and 12–82% up to one year after surgery [1–3]. Among other things, the underlying causes of upper limb pain after breast cancer can be myofascial dysfunctions or the myofascial pain syndrome [4–7]. Lacomba et al. [7] reported a prevalence rate of the myofascial pain syndrome of 45% one year after breast cancer surgery.

Myofascial pain syndrome is characterized by the presence of active myofascial trigger points (MTPs) [8]. A MTP is defined as a hyperirritable nodule or a spot in a palpable taut band of a skeletal muscle. The spot is a site of exquisite tenderness to palpation that refers pain

to a distance and that can cause distant motor and autonomic effects [7,9]. Differentiation between active (symptomatic) and latent (asymptomatic) MTPs can be made and is important for treatment implications [10].

For the identification of MTPs, several objective methods such as, for example, (vibration) elastography, ultrasound technology, and specific electromyographic (EMG) examination are suggested [9,11,12]. However, in physical therapy practice, these methods are not available, nor are they practical, and they're too expensive. In daily clinical practice, the presence of active MTPs is defined by palpation during the clinical examination [10].

Previous studies have investigated the reliability of MTP identification by palpation in several populations [10]. Five studies included both symptomatic and asymptomatic subjects [13–16]. The reliability estimates were based on the ability of the raters to agree upon the presence or absence of a physical sign in a particular muscle at the upper limb region [13,14] and low back [15,16]. Despite the overall poor to good reliability, the results of these reliability studies are conflicting, as confirmed by the review article of Lucas et al. [10]. They concluded that reliability estimates differed widely for each clinical criterion of the MTPs, for each muscle, and across each study [10]. Additionally, they used different criteria, and none of the studies made a difference between asymptomatic and symptomatic groups, nor between active or latent MTPs [10]. Two studies only included asymptomatic subjects [17,18]. They both found poor interrater reliability for the identification of latent MTPs in the upper trapezius muscles. Since these studies used asymptomatic subjects and focused on latent MTPs, the applicability of these results in daily clinical practice is questionable. To our knowledge, only one study investigated the interrater reliability of MTP palpation in a solely symptomatic population [19]. They found acceptable interrater agreement for three ankle muscles in patients with chronic ankle pain. However, reliability differed among the examined muscles [19].

The awareness of the contribution of MTPs to upper limb pain in breast cancer survivors and the number of clinical trials on myofascial therapy in this population are increasing [20,21]. Pivotal to the application of myofascial therapy is accurate diagnosis of myofascial pain syndrome. However, interrater reliability of MTPs palpation has not yet been investigated in a sample consisting of solely symptomatic breast cancer patients. Further, previous studies on the reliability of MTP palpation in other populations have reported conflicting results. Therefore, the aim of the present study is to investigate the interrater reliability of the identification of latent and active MTPs by palpation in breast cancer survivors with upper limb pain.

Methods

The Guidelines for Reporting Reliability and Agreement Studies (GRASS) are used as a basis to report this reliability study [22]. This study was approved by the Ethical Committee of the University Hospitals Leuven (ref. number: s54579).

Subjects

A convenient sample of 30 women with a unilateral breast cancer and upper limb pain was recruited at the Multidisciplinary Breast Center and the Department of Physical Medicine and Rehabilitation of the University Hospitals of Leuven between October 2014 and January 2015. Inclusion criteria were unilateral surgery (mastectomy/breast-conserving and/or axillary lymph node dissection/sentinel node biopsy) for breast cancer and pain at the upper limb region (visual analog scale $>$ 40/100) during the past week. Patients with 1) a secondary breast cancer and/or metastasis and/or 2) presence of shoulder pathologies for which surgical indications exist (defined by ultrasound investigation) were excluded.

Procedure

Measurements were done independently by three raters (Masters in Physical Therapy and Rehabilitation Sciences). In addition to the already acquired overall experience in treatment of MTPs, the raters underwent two types of training prior to the reliability testing. First, a two-hour training session was held for accuracy of the measurements. During this first training, all therapists exercised together on the same patient at the same moment on the palpation techniques for the different muscles and the similarity in the evaluation of the different criteria for MTPs. Second, training was performed in 20 breast cancer patients. Inclusion and exclusion criteria for these training patients were the same as in the reliability study. During this second training, all therapists exercised independently on the same patients. Results were compared and discussed afterwards. For the reliability testing, two out of three raters were chosen based on their presence. Measurements took place within a single testing session, and within this session the order of the different raters was randomly chosen. Both raters were blinded to the results of each other's measurements. The possibility of a Hawthorne effect was avoided by making sure the rater was alone in the room during the measurement. Since the patients were recruited in the clinical practice of the raters, it was not possible to blind the raters to the medical history and clinical information of the subjects.

Interrater reliability of the identification of the absence of MTPs and latent or active MTPs by palpation was examined at the upper quadrant at the operated side. The following muscles were palpated for the presence of MTPs: 1) in prone position: m. upper trapezius, m. levator scapulae, m. supraspinatus, m. infraspinatus, m. teres major, m. teres minor, m. subscapularis; and 2) in supine position: m. pectoralis major and minor, m. serratus anterior and mm. scalene. An overview of the muscles and respective locations for palpation is

Table 1 Overview of the locations palpated for myofascial trigger points

Prone Position	
Upper trapezius muscle	Between C7 spinous process and acromion
Levator scapulae muscle	Between transverse processes of upper cervical vertebrae and the medial superior angle of the scapula
Supraspinatus muscle	Superior to the spine of the scapula in the supraspinous fossa
Infraspinatus muscle	Muscle belly under the spine of the scapula in the infraspinous fossa
Teres major muscle	Lateral to the lower aspect of the scapula; differentiation from teres minor muscle by active medial rotation of the arm
Teres minor muscle	Lateral to the superior aspect of the scapula; differentiation from teres major muscle by active lateral rotation of the arm
Subscapularis muscle	Below the axilla, in medial direction on the anterior surface of the scapula
Supine Position	
Pectoralis major muscle	Under the clavicle, between the humeral head and insertion on ribs 1 to 7
Serratus anterior muscle	Below the axilla, on the muscle belly, which branches to the ribs
Scalene muscles	Lateral to the lateral border of the clavicular head of the sternocleidomastoid and just superior to the clavicle

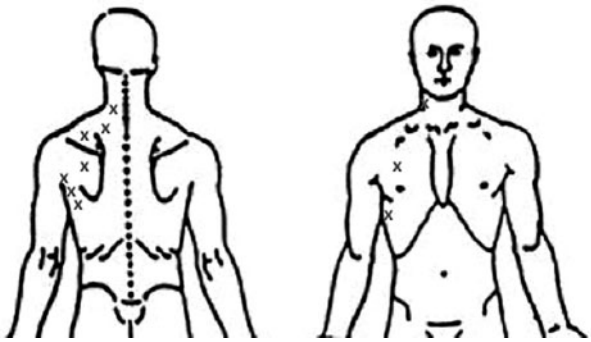

Figure 1 Locations (x) for palpation for myofascial trigger points. In prone position (left), from top to bottom: upper trapezius, levator scapulae, supraspinatus, infraspinatus, subscapularis, teres minor, teres major muscle. In supine position (right), from top to bottom: scalene muscles, pectoralis major, and serratus anterior.

described in Table 1 and Figure 1. To confirm the location of palpation, an active muscle contraction was requested of the patient. Several criteria for the presence of MTPs have been proposed in literature. Based on the systematic review of Tough et al. [23] and in line with the original research of Simons et al. [8], the following criteria were used in the present study: A MTP was scored as latent when it met the following criteria: 1) palpation of a taut band, 2) palpation of a tender point on the taut band, and 3) local pressure pain [8]. In addition to these three criteria, recognizable referred pain has to be present to categorize a MTP as active [23]. These criteria have been found to be of the most value in establishing a clinical diagnosis. Despite its common use, the criterion "local twitch response on muscle palpation" was not chosen because it is often difficult to evoke by palpation and has poor reliability [23]. The muscle was scored 0 when no MTP was found, 1 when a latent MTP was found, and 2 when an active MTP was found.

Statistics

For the interrater reliability of the palpation of MTPs, the weighted kappa (WK) coefficient with a 95% confidence interval was calculated. A WK between 0.00 and 0.20 indicates only slight reliability, between 0.21 and 0.40 indicates fair reliability, between 0.41 and 0.60 indicates moderate reliability, between 0.61 and 0.80 indicates substantial reliability, and between 0.81 and 1.00 indicates almost perfect reliability [24]. Additionally, absolute agreement is reported (with 95% confidence interval) as the proportion of cases in which both raters give exactly the same rating. Analyses have been performed using SAS software (version 9.4 of the SAS system for Windows).

Results

Thirty women with unilateral surgery for breast cancer were available for reliability analysis. Patient characteristics are described in Table 2.

Interrater reliability (WK) and percentage of absolute agreement are given in Table 3. Additionally, the numbers of active and latent MTPs palpated by each rater in each muscle are given in Table 3 as well. An almost perfect agreement (WK = 0.830, 95% confidence interval [CI] = 0.640–1.000) was found for MTPs in the upper trapezius muscle. The WK values in the levator scapula, infraspinatus, teres major, teres minor, subscapularis, pectoralis major, serratus anterior, and scalene muscles are all situated between 0.407–0.588, which indicates moderate agreement. For the supraspinatus

Table 2 Patient characteristics (N = 30)

Mean (SD) age, y		52.4 (9.4)
Mean (SD) BMI, kg/m^2		24.5 (4.0)
Mean time (SD) since surgery, mo		9 (6.2)
Type of operation	Mastectomy, No. (%)	19 (63)
	Breast-conserving, No. (%)	11 (37)
Operation side	Dominant, No. (%)	15 (50)
	Nondominant, No. (%)	15 (50)
Radiotherapy, No. (%)		30 (100)
Chemotherapy, No. (%)		18 (60)

BMI = body mass index.

muscle, only fair agreement was found, with a low WK value of 0.234 (95% CI = 0.109–0.576). The results for the absolute agreement were generally higher than the WK values. The highest value was again found for the upper trapezius muscle, with an almost perfect agreement of 90%. The lowest absolute agreement was again found in the supraspinatus muscle, as well as in the subscapularis muscle, both with a moderate agreement of 57%.

Discussion

The aim of the present study was to investigate the interrater reliability of the identification of no, latent, or active MTPs by palpation in breast cancer survivors with upper limb pain. Moderate agreement between two raters was found for all examined upper limb muscles, except for the trapezius muscle, for which the agreement was almost perfect, and the supraspinatus muscle, for which the agreement was only fair.

Excellent results for the palpation of MTPs in the upper trapezius are in line with previous studies [10]. The upper trapezius muscle region has already been described as one of the most sensitive areas in breast cancer patients, so high prevalence rates of active and latent MTPs were expected [25]. Additionally, as the trapezius muscle is a superficial muscle, palpation is easier compared with deeper muscles, probably resulting in better agreement. Two explanations for the only fair agreement for the palpation of MTPs in the supraspinatus muscle are proposed. First, pain caused by palpation of the supraspinatus muscle may be due to MTPs in the overlying upper trapezius muscle. Second, a firm palpation of the lateral trigger area of the supraspinatus muscle is needed to reveal the presence of MTPs because of the deep location of the muscle near the acromion [8]. This might lead to an over- or underestimation of the presence of MTPs in the supraspinatus muscle and a disagreement on latent or active MTPs.

For all other muscles, moderate agreement was found between raters. Possible explanations for the only moderate interrater agreement are the following. First, the muscle was explored in a predetermined area (see Table 1 and Figure 1) for the presence or absence of a trigger point, and the distinction between an active or latent MTP was made, both characterized by specific criteria. The raters did not explicitly have to report the location of the MTP within the muscle, which shows that there is no evidence for two raters to identify the exact same anomaly. This might compromise the accuracy of the identification of the MTPs, and thus the interrater reliability. Second, patients were examined twice by two raters in one single session. Due to palpation for MTPs by the first rater, local pressure hypersensitivity may have increased in the palpated region, resulting in higher levels of sensitivity to pressure and a disagreement in the differenct criteria between raters. However, a pause of 15 minutes on average between raters was implemented.

In general, findings regarding previous reliability studies on MTP palpation are conflicting, which makes it difficult to interpret the findings of this study in relation to the existing literature [10]. In addition, the majority of the previous studies include the scoring of the various features of MTPs such as tenderness, pain recognition, referred pain, and jump sign, while the present study scored for the absence of MTPs or the presence of latent or active MTPs in a certain muscle [10]. One study investigated interrater agreement on the presence or absence of MTPs in a heterogenetic group of symptomatic and asymptomatic men and women [14]. Depending on the upper body muscle examined, reliability ranged between 0.66 and 0.95 (kappa statistics). Another study also investigated the interrater reliability of the identification of the presence of MTPs at the ankle region in a symptomatic group [19]. They found similar moderate results for reliability and noticed as well that reliability differs among muscles. However, in both studies with symptomatic subjects, different criteria for MTPs were used, so results are difficult to compare.

The present studies had several strengths. First, this is the first study that examined the interrater reliability of the identification of latent and active MTPs in symptomatic breast cancer patients. Second, guidelines for reporting reliability studies (GRRAS) were taking into account. Third, as recommended by Lucas et al., the subjects were representative of those who would normally undergo the test, and the raters represented those who would normally perform the examination in practice. Fourth, the measurements were performed in the "field" with the same disadvantages as when performed for clinical purposes, such as time limitations and physical limitations of the patient. The study has also few limitations. First, only interrater reliability was investigated.

Table 3 Prevalence rate of active and latent MTPs and interrater agreement on the palpation of no, latent, or active MTPs in breast cancer patients, given by the weighed kappa (95% CI) and absolute agreement (95% CI)

Muscle	Prevalence Rate, No. (%) Active MTP RATER 1	Prevalence Rate, No. (%) Active MTP RATER 1	Prevalence Rate, No. (%) Latent MTP RATER 1	Prevalence Rate, No. (%) Latent MTP RATER 2	Weighted Kappa (95% CI)	Absolute Agreement (95% CI)
Upper trapezius	9 (30)	8 (27)	17 (57)	18 (60)	0.830 (0.640–1.000)	90 (74–97)
Levator scapulae	4 (13)	6 (20)	22 (73)	15 (50)	0.453 (0.172–0.733)	66 (49–81)
Supraspinatus	3 (10)	1 (3)	10 (33)	10 (33)	0.234 (0.109–0.576)	57 (39–73)
Infraspinatus	6 (20)	5 (17)	9 (30)	9 (30)	0.500 (0.214–0.786)	67 (49–81)
Teres major	6 (20)	6 (20)	11 (37)	10 (33)	0.550 (0.288–0.813)	67 (49–81)
Teres minor	4 (13)	4 (13)	15 (50)	10 (33)	0.407 (0.135–0.680)	60 (42–75)
Subscapularis	6 (20)	6 (20)	12 (40)	11 (37)	0.417 (0.128–0.705)	57 (39–73)
Pectoralis major	5 (17)	5 (17)	19 (63)	20 (67)	0.563 (0.275–0.850)	77 (59–88)
Serratus anterior	5 (17)	4 (13)	16 (53)	22 (73)	0.588 (0.322–0.855)	73 (56–86)
Scalene	3 (10)	44 (13)	7 (23)	8 (27)	0.455 (0.141–0.769)	63 (46–78)

CI = confidence interval; MTP = myofascial trigger point.

Intrarater reliability was not tested as it was assumed that intrarater reliability would be as good as or even better than interrater reliability. Second, raters were not blinded to clinical information on the subjects, which may have led to certain bias. Third, as mentioned above, raters examined a certain area for the presence of MTPs and were not asked to identify the exact location of the MTP.

For clinical practice, both the present study and the study of Sanz et al. indicate that only moderate agreement between raters is reached for the identification of MTPs when based on clinical criteria, in particular for deep muscles. The question arises of whether this overall moderate degree of interrater reliability is sufficient to consider the palpation of MTPs reliable for use in a clinical setting and for, for example, decision-making on the treatment strategy of a patient. The authors contend that the palpation of MTPs as proposed in the present study may add to the diagnosis of the myofascial pain syndrome in breast cancer survivors. However, other evaluation methods for MTPs that may be more reliable should be considered. For example, algometry has good interrater reliability in middle-aged women for measuring pressure hypersensitivity, one of the criteria of MTPs [26]. Additionally, a good correlation between the presence of MTPs and pressure hypersensitivity has been found in patients with chronic myofascial pain [11]. Ultrasound measurements have become more and more established in daily clinical practice and may be suitable as a more objective, still feasible, diagnostic method for MTPs as well. Several studies showed that MTPs present as hypoechoic areas on ultrasound [11,27]. At last, it is important to notice that the reliability of MTP palpation depends on the location and depth of the muscle [19].

Further research in the field of MTP diagnosis is warranted. First, currently no consensus on the criteria for MTPs is available. The systematic review of Tough et al. [23] reported the use of 19 different diagnostic criteria in clinical practice. Further research should examine the reliability of the different criteria for latent and active MTPs in order to define which criteria are the most useful in clinical practice. However, as the exact pathophysiology of MTPs is not fully understood, the validity of different examination methods and clinical criteria of MTPs can be questioned. Therefore, the reliability of more objective diagnostic methods such as pressure algometry and ultrasound should also be explored. Besides the classic ultrasound method, ultrasound elastography can be valuable as well [12,27]. Previous studies demonstrated that this ultrasound technology can be used to make a distinction between tissue containing myofascial trigger points and healthy myofascial tissue without trigger points [12,27]. The use of such objective evaluation methods of MTPs may provide better insight in the etiology and pathophysiology of MTPs, resulting in better recommendations for the clinical examination of MTPs. Third, to increase the reliability of MTP palpation, the authors recommend investigation of the reliability of the identification of MTPs at the exact same location in the muscle by, for example, a body diagram. And last, the exact amount of training and experience needed for a reliable examination of MTPs should be defined.

Conclusion

The present study found overall moderate agreement between two raters for the identification of no, latent, or active MTPs in upper limb muscles in breast cancer survivors with upper limb pain. Identification of active MTPs

in a certain muscle may be an indication for the diagnosis of myofascial pain syndrome, and thus for the application of myofascial therapy. However, investigating the reliability of identifying the exact same location of active MTPs and the validity of the clinical examination methods for MTPs is needed.

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