Literature Review

Evaluation of Myofascial Trigger Points Using Infrared Thermography: A Critical Review of the Literature

Almir Vieira Dibai-Filho, PT,[a] and Rinaldo Roberto de Jesus Guirro, PT, PhD[b]

Abstract

Objective: The aim of this study was to review recent studies published on the use of infrared thermography for the assessment of myofascial trigger points (MTrPs).

Methods: A search of the MEDLINE, CINAHL, PEDro, and SciELO databases was carried out between November 2012 and January 2013 for articles published in English, Portuguese, or Spanish from the year 2000 to 2012. Because of the nature of the included studies and the purpose of this review, the analysis of methodological quality was assessed using the Quality Assessment of Diagnostic Accuracy Studies tool.

Results: The search retrieved 11 articles, 2 of which were excluded based on language (German and Chinese). Three were duplicated in different databases, 1 did not use infrared thermography for diagnostic purposes, and the other did not use infrared thermography to measure the skin temperature. Thus, the final sample was made up of 4 observational investigations: 3 comparative studies and 1 accuracy study.

Conclusion: At present, there are few studies evaluating the accuracy and reliability of infrared thermography for the diagnosis and assessment of MTrPs. Of the few studies present, there is no agreement on skin temperature patterns in the presence of MTrPs. (J Manipulative Physiol Ther 2015;38:86-92)

Key Indexing Terms: *Myofascial Pain Syndromes; Muscle; Skeletal; Skin Temperature; Thermography*

Infrared thermography is a widely used assessment tool for the measurement of skin temperature. Recent studies have addressed the use of infrared thermography in the health sciences.[1-3] This noninvasive, nonionizing evaluation method is based on the infrared radiation emitted by the surface of the skin and offers both safety and comfort to the patient.[1,4-6]

The literature reports that infrared thermography is an accurate method for the diagnosis of different diseases, such as breast cancer,[7] type 2 diabetes mellitus,[8] occlusal caries,[9] dry eye syndrome[10] and acute complex regional pain syndrome.[11] Another possible use of infrared thermography is the evaluation of the effects of therapeutic resources on skin temperature.[12-18]

With regard to musculoskeletal disorders, a number of authors have analyzed skin temperature patterns. Dibai Filho et al[19] investigated skin temperature over the center of the upper trapezius muscle in individuals with neck pain but found no significant difference in comparison with the control group. Kanai et al[17] carried out a clinical trial to assess the effects of a magnetotherapeutic device on pain associated with neck and shoulder stiffness and found an increase in skin temperature after treatment. Barão et al[20] found an increase in skin temperature over the masticatory muscles after splint therapy for the treatment of temporomandibular disorder (TMD). Rodrigues-Bigaton et al[21] found a significant reduction in skin temperature over the anterior temporalis muscle in subjects with TMD in comparison with a control group.

There is a need for assessment tools that can be administered to individuals with myofascial trigger points (MTrPs), which are defined as exquisitely tender spots in discrete taut bands of hardened muscle that produce local and referred pain, among other symptoms. Myofascial trigger points may be either active or latent and are closely related to alterations in autonomic and metabolic activity.[22,23] Thus, the fact that skin temperature is

[a] Doctoral Student, Laboratory of Physiotherapeutic Resources, Postgraduate Program in Rehabilitation and Functional Performance, University of São Paulo, Ribeirão Preto, SP, Brazil.

[b] Professor, Laboratory of Physiotherapeutic Resources, Postgraduate Program in Rehabilitation and Functional Performance, University of São Paulo, Ribeirão Preto, SP, Brazil.

Submit requests for reprints to: Rinaldo Roberto de Jesus Guirro, PT, PhD, Professor, School of Medicine of Ribeirão Preto, University of São Paulo, Course of Physiotherapy, Avenida Bandeirantes, 3900, Ribeirão Preto, São Paulo, Brasil, CEP: 14049-900. (e-mail: *rguirro@fmrp.usp.br*).

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conditioned by local microcirculation and sympathetic activity allows the possibility of using infrared thermography in the analysis of MTrPs.[6,16]

Currently, the criteria defined by Simons et al[24] are commonly used in research[25-28] and clinical practice for the identification of MTrPs: (1) presence of a palpable taut band in a skeletal muscle, (2) presence of a hypersensitive tender spot within the taut band, (3) local twitch response elicited by the snapping palpation of the taut band, and (4) reproduction of referred pain in response to MTrPs compression.

The literature reports a number of treatment modalities for MTrPs, especially physiotherapeutic resources, such as dry needling,[25] spinal manipulation,[26] ischemic compression,[27] ultrasound,[29] laser therapy,[30] and transcutaneous electrical nerve stimulation.[31] In this context, a review of the literature on this topic is justified because infrared thermography may be a particularly useful assessment tool for clinicians managing musculoskeletal disorders (ie, physical therapists, physiatrists, and doctors of chiropractic) who work with patients exhibiting myofascial pain syndrome. At present, the scientific literature lacks review studies involving MTrPs and infrared thermography. Thus, the aim of the present study was to perform a review of recent studies published on the use of infrared thermography for the evaluation of MTrPs.

Methods

A search was carried out of the MEDLINE, CINAHL, PEDro, and SciELO databanks between November 2012 and January 2013 by 2 researchers familiarized with the use of infrared thermography. Combinations of descriptors found in the medical subject headings were used to ensure that one of the terms was related to temperature and the other was related to the condition of interest: *trigger points* AND *thermography*; *trigger points* AND *skin temperature*; *myofascial pain syndromes* AND *thermography*; *myofascial pain syndromes* AND *skin temperature*.

Assessment studies published in English, Portuguese, or Spanish between 2000 and 2012, assessing the skin temperature or investigating either reliability or other properties of the infrared thermography in subjects with MTrPs, were included in the present review. The exclusion criteria were review studies, clinical trials, comments, or opinion papers by specialists and studies involving animals. Each of the 2 evaluators independently determined the eligibility of articles based on a reading of the title and abstract. There were no cases of divergence between evaluators. To extract data from the studies included, it was used a standardized form containing the following information: first author, publication year, study design, number of subjects, characteristics of the sample, thermographic examination, methodology, results, and conclusions. The resulting data were entered into the database after agreement by the 2 researchers.

In addition to the search mechanism used in the present study, the references of the articles included in the present review were also checked, and no additional study was found. The authors of the articles were not contacted because all the information to be extracted was present in their studies.

Because of the nature of the included studies and the purpose of this review, the analysis of methodological quality was assessed using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool.[32,33] This is a tool to assess the methodological quality of the studies of diagnostic accuracy, consisting of 14 items, which focus mainly on internal and external validity of studies. For each item, it is mark "yes", "no," or "unclear." In the present study, some investigations did not show clearly the diagnostic approach and, therefore, were established to "inapplicable" option as a possible answer.

Results

The search retrieved 11 articles, 2 of which were excluded based on language (German and Chinese). Three were duplicated in different databases, 1 did not use infrared thermography for diagnostic purposes, and the other did not use infrared thermography to measure the skin temperature. Thus, the final sample was made up of 4 studies (Fig 1).[34-37]

With regard to methodological quality of the studies included in this review, it was observed that 2 studies covered 64.28%[34] and 78.57%[37] of the items of QUADAS questionnaire, as shown in Table 1. Furthermore, it is possible that investigations assess only the behavior of skin temperature on a region without performing inferences about the diagnosis. In this regard, 2 studies[35,36] were not assessed by the QUADAS because they presented experimental design of inducing the formation of MTrPs, besides to objectify the behavior of skin temperature on these MTrPs induced.

With regard to included studies, Merla et al[34] sought to discriminate patients from healthy subjects through an analysis of the distribution of skin temperature and its change during clenching. The Mann-Whitney *U* test for independent samples was used for the intergroup comparisons. The authors found that individuals with myofascial pain exhibited greater asymmetry (difference between right and left sides) in skin temperature over the masseter and sternocleidomastoid muscles in comparison with healthy volunteers both before and after maximal voluntary clenching ($P < .05$). Moreover, individuals with myofascial pain exhibited a greater temperature change over the masseter, sternocleidomastoid, cervical, and upper trapezius muscles on both the right and left sides after maximum voluntary clenching ($P < .05$).

Kimura et al[35] evaluated the magnitude of the vasoconstrictor response after nociceptive stimulation (intramuscular