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REVIEW: CLINICAL REVIEW

A critical overview of the current myofascial pain literature – June 2017

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A B S T R A C T

We would like to welcome Dr. Li-Wei Chou, MD, PhD as our newly appointed contributing author. Dr. Chou is Assistant Professor at China Medical University in Taichung, Taiwan and he has an impressive publication record with many research studies and book chapters. The current overview includes several articles comparing dry needling (DN) to acupuncture with sharply contrasting points of view. Several basic studies shed further light on the nature of myofascial pain, myalgia, fascia and examination techniques, such as sonoelastography. Neuroimaging studies demonstrated microstructural abnormalities in brain gray matter of chronic myofascial pain patients, which is an important new finding. As usual, many manual TrP papers and DN papers were published in the past several months.

1. Basic research

1.1. Adigozali H, Shadmehr A, Ebrahimi E, Rezasoltani A, Naderi F. 2017. Reliability of assessment of upper trapezius morphology, its mechanical properties and blood flow in female patients with myofascial pain syndrome using ultrasonography. Journal of Bodywork & Movement Therapies, 21(1):35-40

Based on Simons' Integrated Hypothesis (Simons et al., 1999), an "energy crisis" suggests that prolonged sarcomere contraction may result in pressure on capillaries, alteration of local required metabolic products, resulting in tissue damage and local hypoxia (Sikdar et al., 2010). A trigger point (TrP) can be identified by physical examination, which is a subjective method that is influenced by the examiner's level of experience (Myburgh et al., 2011). The application of objective and noninvasive methods in order to obtain accurate, repeatable, and reliable diagnostic indexes to identify TrPs is therefore required. Moreover, it seems that measuring intramuscular blood circulation and muscle stiffness can be useful in the objective evaluating the effectiveness of treatments.

Researchers in Iran investigated the intra-rater reliability of ultrasonographic features of the upper trapezius, including muscle thickness, elasticity and intramuscular blood circulation in females with myofascial pain syndrome (MPS). A total of 37 students and patients with neck pain problem participated in this study. The ultrasonography process was set up in three stages: a) Gray-scale: to measure muscle thickness, size and area of trigger points; b) Ultrasound elastography: to measure muscle stiffness; and c) Doppler imaging: to assess blood flow indices. The results of their study showed that ultrasonography, using the explained method for the detection of active TrPs and assessment of muscle morphology, stiffness and blood flow indexes in the upper trapezius, had excellent intra-rater reliability. The ultrasonography measurement of the upper trapezius features also indicated significant correlations for all variables, including the thickness of the upper trapezium muscle at rest and in a contracted state, the horizontal and vertical dimension and area of TrPs, the peak systolic velocity, the end diastolic velocity, resistance index, and strain ratio at rest and contraction between repetitions of different examinations in the participants. This could be used for objective

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examination and provide a guideline for treatment plans in the clinical settings. Overall, this is an excellent study. Perhaps in future studies, the authors can provide more illustrations of the results. The study included only two images of the setup and the thickness of the muscle.

1.2. Ariji Y, Ariji E. 2017. Magnetic resonance and sonographic imagings of masticatory muscle myalgia in temporomandibular disorder patients. Japanese Dental Science Review, 53(1):11-17

This paper offers a review of the current literature focusing on magnetic resonance imaging (MRI) and the sonographic diagnosis of masticatory muscle myalgia in temporomandibular disorder (TMD) patients. It shows the intramuscular state, blood flow, and muscle hardness. The MRI and sonographic evaluations in relation to the efficacy of various treatments are also discussed. The review provides a summary of the literature published within the last 15 years. Thirty-four studies met the established mesh terms and selection criteria about the MRI and sonographic diagnosis of masticatory muscle myalgia in TMD patients. The most common index for evaluation of masticatory muscles in the sonography studies was muscle thickness. A next focusing index was the appearance of the intramuscular echogenic bands, which correspond to the internal fascia. In recent years, sonoelastography has been used to evaluate the skeletal muscles. The authors of this paper have published several other papers about masseter muscle hardness on strain elastography, which can be expressed as the elasticity index (EI) (Ariji et al., 2013a, 2016, 2013b). The EI ratio of the symptomatic side in TMD patients was greater than that seen in the healthy volunteers. With the recent advances in imaging technology, edematous changes and muscle hardening in patients with masticatory muscle myalgia can be visualized using MRI and sonoelastography.

TMD patients with masticatory muscle myalgia were treated by splint therapy, medication, physical therapy and so on. The authors identified 11 papers examining the results by MRI and sonography. They concluded that the evaluation of therapeutic efficacy should be based not only on the clinical findings, but also on imaging findings. Sonography may enable the clinician to select the appropriate treatment modalities for managing masticatory muscle myalgia.

1.3. Fede C, Albertin G, Petrelli L, Sfriso MM, Biz C, De Caro R, & Stecco C, 2016. Hormone receptor expression in human fascial tissue. European Journal of Histochemistry, 2;60(4):2710

Researchers from Italy conducted a study to investigate the expression and the localization of relaxin receptor 1 (RXFP1) and estrogen receptor-alpha (ERα) in different fascial regions and in isolated fascial fibroblasts of women. This is the first study demonstrating that all fibroblasts from different regions of the muscular fascia express sex hormone receptors. Samples of fascia were collected from three different regions, namely the leg, abdomen, and thigh, of 8 women (average age 56 ± 10, range 42–70). The samples were transported to the laboratory in phosphate buffered saline (PBS) within a few hours of their collection. Each sample was divided into three sections: two were maintained in PBS and used fresh for cell isolation and real-time polymerase chain reaction (PCR), the third one was formalin-fixed for histology.

The researchers found that the typical fascial organization of longitudinally oriented collagen fibers and elongated fibroblasts were evident in all the samples, with different degrees of cellularization depending on the region. For example, few fibroblasts were evident in the crural fascia of the leg, while many and elongated cells were found in the rectus sheath of the abdomen. Real-time PCR uncovered ERα and RXFP1 expression in all analyzed women fascia with a lower gene expression of both investigated receptors in the post-menopausal women with respect to pre-menopausal ones. As expected, expression was lower in the latter, especially with regard to ERα expression, because of the decrease in estrogen hormone levels in postmenopausal women.

In this study, the result showed that, in all the examined samples, the expression of sex hormone receptors was prevalently localized in the fibroblast cells. More specifically, in the tissues, not all the fibroblasts are positive, whereas the isolated and expanded cells showed homogeneous results. This could be explained by the fact that tissue is composed of a pool of different cell types (fibroblasts, vascular cells, mast cells, adipocytes, etc.) with a variability of expressions, while cell cultures isolated from the fascia are made up of a homogeneous type of cell. Relaxin receptors are expressed not only in fibroblast cells, but also in the nerves and in blood vessels. This evidence could help to explain the variability of RXFP1 expression: the expression is dependent on the composition and structure of fascial tissue and on the number of vessel cells in the starting homogenate. This study helps to explain how hormonal factors are linked to myofascial pain. If verified, this new concept may lead the way to novel pharmaceutical or mechanical approaches that could complement existing treatment options of myofascial pain.

1.4. Takla MKN, Razek NMA, Kattabei O and & El-Lythy MAF. 2016. A comparison between different modes of realtime sonoelastography in visualizing myofascial trigger points in low back muscles. Journal of Manual & Manipulative Therapy, 24(5):253-263

There is a lack of objective means in quantifying the core features of myofascial pain syndrome (MPS), such as localized taut bands of increased tone enclosing TrPs. Real-time sonoelastography has been used to assess musculoskeletal disorders, such as traumatic lesions, myositis, neuromuscular disease, inflammatory lesions, and MPS. Methodologies include real-time two-dimensional grayscale ultrasound (2DGSUS) and color-gradient vibration sonoelastography (VSE). In this study, the researchers investigated the ability of a real-time sonoelastographic technique to visualize and image superficially and deeply located active or latent TrPs in low back muscles, and to discriminate them from normal myofascial tissue in the surrounding area. On VSE images, a relaxed muscle structure with normal fascia will appear mostly soft (green, yellow, red), while contracted or degenerated muscle fiber or fascia will appear hard (blue) due to the local decrease in peak vibration amplitude at the lesion. Color-gradient alteration detected by VSE has been used as a quantitative method for assessing muscle and tendon stiffness in numerous musculoskeletal disorders.

Researchers from Egypt conducted a study to compare: (1) TrPs and surrounding myofascial tissue using real-time two-dimensional grayscale ultrasound (2DGSUS) and VSE in the quadratus lumborum, longissimus thoracis, piriformis, and gluteus medius muscles; (2) the accuracy of both modalities in visualizing TrPs; (3) active and latent TrPs using VSE; and (4) the accuracy of both in visualizing deep and superficially located TrPs. They found a significant difference between TrP strain and that of the immediately surrounding myofascial tissue, as measured with VSE. VSE visualized all superficial and deep TrPs with an accuracy of 100% (for both groups); the blinded results obtained using 2DGSUS achieved 33% and 35% accuracy, respectively. Finally, there was no significant difference between the tissue strain ratios of active and latent TrPs.

VSE was an effective method for imaging the relative distribution of vibration amplitude in the normal myofascial tissue and for detecting localized regions of stiffness (where TrPs were