

HOW TO MANAGE MYOFASCIAL PAIN SYNDROMES. Review Article

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INTRODUCTION

Myofascial pain syndrome (MPS) is a prevalent and frequent cause of visits to primary care physicians and pain clinics.

Muscle pain as a result of trauma, injury, overuse, or strain, frequently resolves in a few weeks with or without medical treatment. In some cases, however, it persists long after resolution of the injury and it may even refer to other parts of the body, usually contiguous or adjacent rather than remote. This heralds the sensitized state, one of the features of a chronic pain disorder, in which the pain itself is the pathology and requires medical intervention for its resolution.

The term “myofascial” indicates that both muscle and fascia are likely to be contributors to the symptoms¹.

For many clinicians and investigators, the finding of myofascial trigger points (MTrPs) is required to assure the diagnosis of (MPS).

MTrPs are hyperirritable areas in a taut band of muscle tissue or fascia that are tender when compressed, and give rise to referred pain. They are commonly associated with limited range of motion, fatigue, impaired muscle coordination, and vegetative phenomena².

ETIOLOGIE

Common etiologies of myofascial pain may be from direct or indirect trauma, spine pathology, exposure to cumulative and repetitive strain, postural dysfunction, vitamin deficiencies, sleep disturbances, joint problems and physical deconditioning².

Different studies have demonstrated that MTrPs are associated with several pain conditions, including radiculopathies, disk pathology, tendonitis, craniomandibular dysfunction, migraines, tension type headaches, carpal tunnel syndrome, computer-related disorders, whiplash-associated disorders, spinal dysfunction, post-herpetic neuralgia, complex regional pain syndrome etc...

Lately there are studies that shown the relationship between the presence of MTrPs and their relationship with widespread pressure hypersensitivity and hyperalgesia in survivors of head and neck cancer³

PATHOPHYSIOLOGY

The pathophysiology of MTrPs is incompletely understood, and a number of morphological changes, neurotransmitters, neurosensory features, electrophysiological features, and motor impairments have been implicated in its pathogenesis:

- *Morphological changes:* A significant increase in stiffness has been found within the taut band of MtrPs.
- *Neurotransmitters:* Higher levels of neuropeptides (e.g., substance P or calcitonin gene-related peptide), catecholamines (e.g., norepinephrine), and proinflammatory cytokines (e.g., tumor necrosis factor alpha, interleukin 1-beta,

interleukin 6, and interleukin 8) have been found in active trigger points (Figure 1)

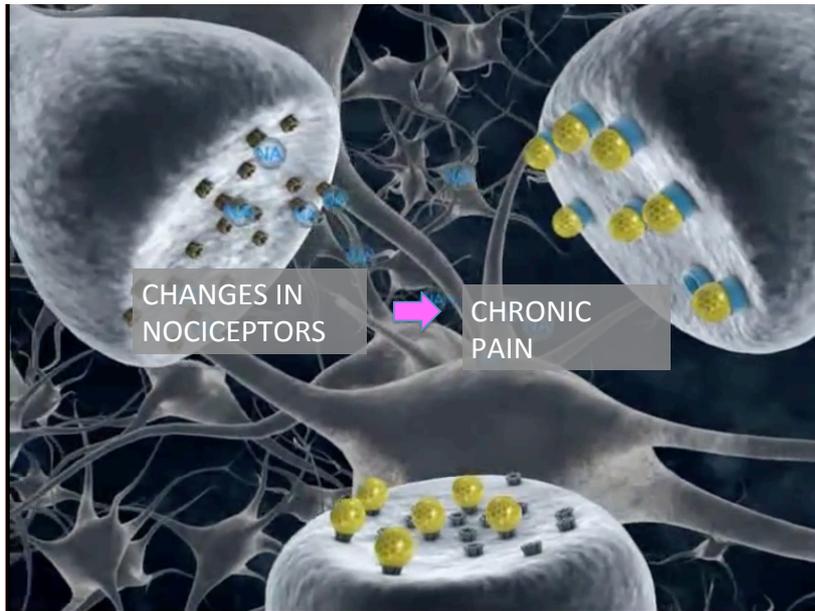


Figure 1: In trigger points substance P, acetylcholine, bradykinin, serotonin and prostaglandin are increased. ATP and glycogen are decreased.

- *Neurosensory features*: Spreading referred pain, hypersensitivity to nociceptive stimuli (hyperalgesia) and non-nociceptive stimuli (allodynia), mechanical pain sensitivity, sympathetic facilitation of mechanical sensitization, facilitation of local and referred pains, and attenuated cutaneous blood flow responses.
- *Electrophysiology*: Some studies have found spontaneous electrical activity, attributed to an increase in miniature endplate potentials and excessive acetylcholine release in MTrPs, although future studies are needed to confirm these findings (Figure 2).

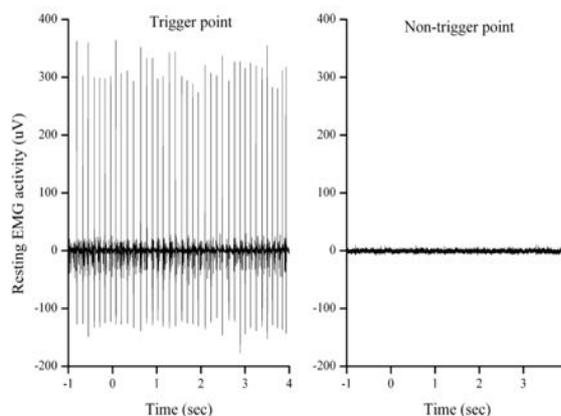


Figure 2: Spontaneous electrical activity. Dysfunctional motor endplate potential at rest.

- *Motor impairments:* MTrPs can induce changes in normal muscle activation patterns and result in motor dysfunction. A recent hypothesis proposes that central nervous system-maintained global changes in α -motor neuron function, resulting from sustained plateau depolarization, underlie the pathogenesis of MTrPs. A continuum of muscle nociceptor sensitization between active trigger points (spontaneously painful) and latent trigger points (painful only after evoked stimulus) may explain its different behavior⁴.

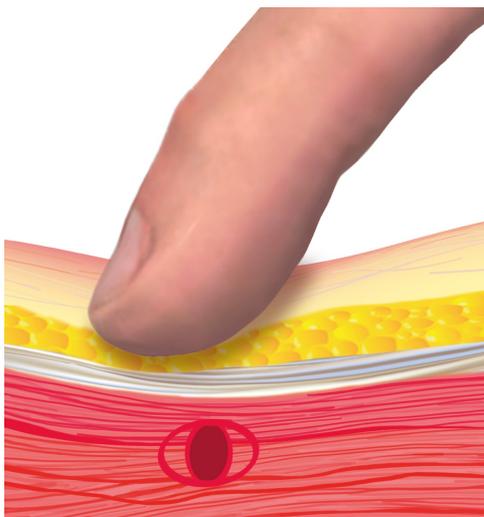
Kumbare et al⁵ have described that once a trigger point has developed, decreased ATP and glycogen concentration, increased release of substance P, acetylcholine, bradykinin, serotonin, and prostaglandin occur within the MTrPs.

Besides, these are associated with increased receptor sensitivity that may overstimulate local afferent sensory nerves causing the perception of pain in a trigger point^{6,7,8}. These latter issues are part of central sensitization and neurogenic inflammation.

CLINICAL FEATURES

David Simons was the first one to describe the criteria for the identification of MTrPs by palpation such as a taut band, local tenderness, pain recognition, referred pain, a local twitch response and the “jump sign.” (Figure 3).

MTrPs characteristically elicit referred pain when stimulated. The duration of this pain is variable (second, hours, or days). It is perceived as a deep, aching, and burning pain, although sometimes it may be noticed as superficial pain. The referred pain may spread caudally or cranially and the intensity and expanded area are positively correlated with the degree of the trigger point activity. There has been described different types of MTrPs according to location, tenderness, and chronicity as central (or primary), satellite (or secondary), attachment, diffuse, active (spontaneously painful) and inactive or latent (painful only after evoked stimulus).



- Figure 3: Hyperirritable areas in a taut band of muscle tissue/fascia
- Tender when compressed
- Give rise to referred pain
- Limited range of motion
- Fatigue, impaired muscle coordination

DIAGNOSTIC CRITERIA

The diagnostic of MPS is still based on clinical criteria. However, because many of these criteria are nonspecific and overlap with other causes of regional pain, diagnosis can be difficult.

Recent studies have agreed that point tenderness and reproduction of pain are key to diagnosis, while autonomic symptoms are unnecessary.

Rivers et al^{9,5} used the results of their survey and proposed the following diagnostic criteria based on physician consensus:

1. A tender spot is found with palpation, with or without referral of pain (“trigger point”) and;
2. Recognition of symptoms by patient during palpation of tender spot and;
3. At least three of the following:
 - a. Muscle stiffness or spasm.
 - b. Limited range of motion of an associated joint.
 - c. Pain worsens with stress.
 - d. Palpation of taut band and/or nodule associated with a tender spot.

There are some tools that can help us with the diagnosis:

- Electromyographic studies have revealed spontaneous electrical activity generated at MTrPs loci that was not seen in surrounding tissue. Using a needle with a monopolar electrode connected to a device that amplifies electromyographic signals from the muscle and transforms them into sounds can provide us an acoustic feedback in order to help physicians locate areas of muscle activity (Figure 4) .

However, there is disagreement in electromyography and physiology literature on the significance of abnormal motor endplate potentials and endplate noise.



Figure 4: puncture of trigger points.

- In the last years Ultrasound has been used to identify MTrPs. Trigger points have been shown to be mainly hypoechogenic but also hyperechogenic spots with fusiform or elliptical shape. Furthermore, normal patients and patients with tender points without fibromyalgia syndrome, also exhibited similar hypoechogenic spots as seen in MTrPs. This, together with the interrater variability, muscle, fasciae anisotropy, and the difficulty in the visualization of deep structures, has made researchers look for additional tools to improve the diagnostic accuracy. Blood flow in the neighborhood of MTrPs has been assessed using Doppler imaging and a grading scale has been proposed. Preliminary findings show that active MTrPs have significantly higher peak systolic velocities and negative diastolic velocities compared with latent MTrPs and normal muscle sites when measured in the vicinity.

- Ultrasound Elastography in its different modalities, vibration sonoelastography, strain elastography and the new shear-wave sonoelastography, may evaluate regional stiffness and it is a useful tool that can help us with the diagnosis and treatment of MTrPs. The gray-or color-scale encoding is adjustable by the user. Typically, red is used to represent softer tissues, blue represents harder tissues, and yellow or green represent tissues of intermediate elasticity. (Figure 5).

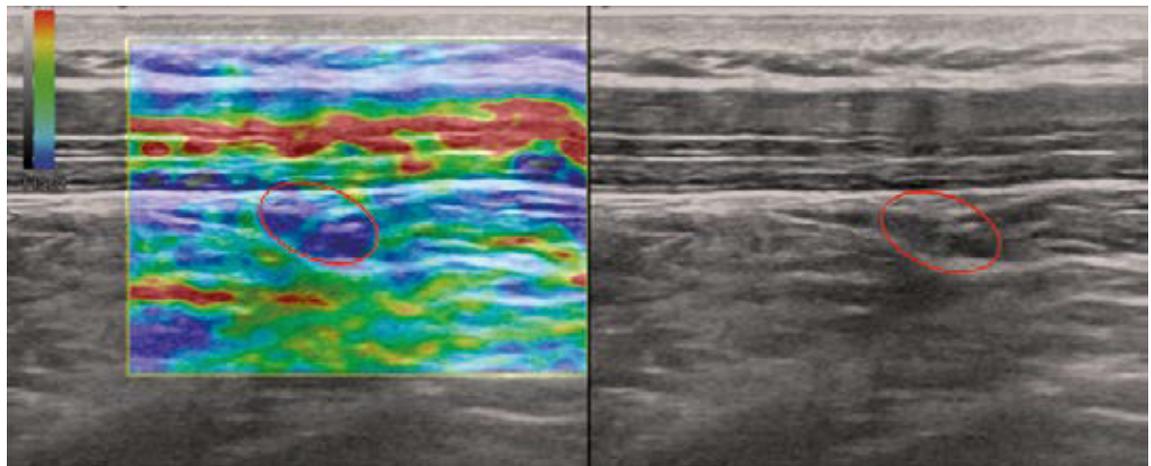


Figure 5: sonoelastography of trigger point which appears in blue. surrounded by a red circle.

TREATMENT

Management of MTrPs is multimodal.

Travell and Simons were not the first to identify and develop a treatment for MTrPs, but they were among the first ones to recognize the relationship of the trigger points to MPS. They proposed that deactivating MTrPs was an essential component to successfully treating MPS.

The most commonly used interventions are as follows:

Among the invasive therapies, scientific articles report mixed results. Generally, dry needling, anesthetic injection, steroids, and botulinum toxin-A of the MTrPs, have all been shown to provide pain relief.

While the etiology of MPS and the pathophysiology of MTrPs are not yet fully understood, some investigators are suggesting that treatments should focus not only

on the MTrPs, but also on the surrounding environment (e.g., fasciae, connective tissue, etc.).

In this sense ultrasound-guided interfascial block, a known regional anesthetic technique, is an approach in myofascial pain with minimum traumatic damage to the muscles. Local anesthetics injected in the interfascial planes provide direct blockade of somatic nerve endings and perhaps sympathetic nervous fibers, both also piercing each fascia and giving profound long-lasting muscle relaxation and pain relief^{10,11}. The technique requires the aid of ultrasound imaging and a short bevel needle to be accurate enough, as the pop-up feeling of the needle crossing the fascia is not reliable (Figure 6).

Cho et al have combined interfascial block with pulsed radiofrequency with good results¹².

Other treatments are: massage, ischemic compression, pressure release, and other soft tissue interventions.

MTrPs injections are usually safe and effective. However, although very rare, there have been reported some complications resulting in pneumothorax, epidural abscess, skeletal muscle toxicity, and intrathecal injection¹³. Two reviews of the American Society of Anesthesiologists closed claims analysis have shown increasing number of complications related to interventional long-term pain management, with MTrPs injections being associated mainly with pneumothorax¹⁴.

Ultrasound may, in theory, reduce the risk of complications by identifying potentially hazardous structures in the path of the needle, especially in cases where the MTrPs are in deep fasciae or muscular layers.

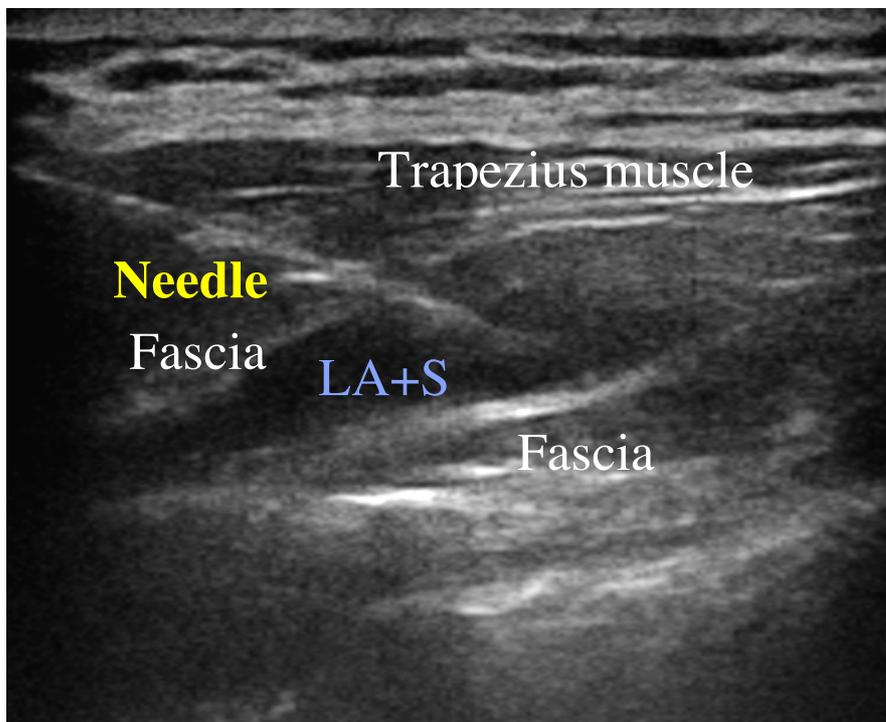


Figure 6: Interfascial block. LA: local anesthetic, S: steroids

CONCLUSION

MPS is a common musculoskeletal pain disorder. It is characterized by local and referred pain, perceived as deep and aching, and by the presence of MTrPs in any part of the body. MTrPs are hyperirritable areas of muscle tissue or fascia that are tender when compressed and give rise to referred pain.

The diagnostic of MPS is still based on clinical criteria. However, because many of these criteria are nonspecific and overlap with other causes of regional pain, diagnosis can be difficult.

The clinical utility of ultrasound guidance lies in its potential to increase the safety and efficacy of needling procedures. Compared with landmark-based techniques, ultrasound guided procedures can ensure accurate needle placement within a specific muscle group, which may be particularly advantageous for deeper target. It also decreases adverse events while offering the maximum benefit to the patient.

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