

Effects of Dry Needling on Myofascial Pain Syndrome and Movement Control Dysfunction

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From a clinical perspective, certain alterations of the somatosensory system, such as local and referred pain, motor system and vegetative nervous system may be caused by Myofascial Trigger Points (MTrPs). Regarding the alterations of the motor system, the presence of MTrPs could be accompanied by:

- Dysfunction of neuromuscular activation patterns, which would not only affect the muscle harboring the MTrP, but also the ones functionally related to it (i.e. the muscles of the shoulder girdle while doing an upper limb elevation) (1, 2).
- Increased activity in the antagonist muscles of the muscle harboring the MTrP and reduced efficiency of reciprocal inhibition phenomenon (3).
- Increased excitability on the agonist muscles of the muscle with the MTrP (4).
- Local inhibition (of the muscle harboring the MTrP) and referred inhibition (of the muscles located on the referred pain area and/or functionally related) (1, 5).
- Increased fatigability of the muscle with the MTrP (6, 7).
- Delayed relaxation of the muscle that harbors the MTrP after a muscular contraction (5).
- Occurrence of tonic spasms (involuntary contractions that persist in time) and muscle cramps (painful and temporary involuntary contractions) (8).

As suggested on the so-called kinesiopathological model, any movement carried out in an imprecise, excessive or insufficient manner could increase the mechanical stress of the musculoskeletal tissues and contribute to pain development (9). Therefore, previously described motor dysfunctions could contribute to the appearance and maintenance of musculoskeletal pain patterns.

Several studies have shown in what way treatment techniques of MTrPs are able to improve issues related to their sensory component, such as pain or pressure sensitivity of the MTrP. However, the effects of the motor component resulting from the treatment of MTrPs have been much less researched. In fact, the theories that have tried to explain the alterations produced on the muscular system in the presence of musculoskeletal pain (10) have not considered the MTrP to be a causing and/or contributing factor to the diverse motor dysfunctions observed on patients suffering from musculoskeletal pain. One of the factors that may have contributed to the lack of consideration of MTrPs in this field would be the difficulty to detect MTrPs on muscles that are considered important for the motor alterations previously described, as, for example, the lumbar multifidus or the longus colli. In this sense, some of the considered diagnostic criteria for detecting MTrPs, such as palpation of a taut band, or the presence of a hypersensitive point inside the taut band, are impossible to identify on deep muscles. Some authors have questioned the utility of palpation on muscles such as, for instance, the lumbar multifidus, to assess the presence of increased tone or increased

segmentary hyperactivity, which could be related to the presence of a MTrP (11). These authors consider there is little evidence to support the nature or existence of the texture changes of paraspinal deep muscles (higher activity on the deep segmental muscles) that is claimed to be detected through palpation. Nowadays, as a conclusion, the increased activity, decreased activity, or both, of deep paraspinal muscles, could be responsible for the abnormal alterations found on them through palpation.

Regarding the neurophysiological mechanisms that could explain the effects obtained with the treatment techniques of MTrPs, few researchers have shown an interest to assess the plausible effect that treating MTrPs could have on the motor dysfunctions described at the beginning of this text. Therefore, Lucas et al (2) determined that the presence of latent MTrPs on the upward scapular rotators (i.e. serratus anterior or lower trapezius), could alter the movement activation patterns during arm elevation, thus influencing the developing of symptoms related to rotator cuff pathology. On such muscles, dry needling proved to be effective in reestablishing more adequate motor activation patterns (1). Recent studies have shown how dry needling of muscles with a relevant function regarding motor control, such as lumbar multifidus, can improve muscular activation (12, 13). These changes on muscular function have also been associated with changes in the patient's pain and disability (12), which would suggest that alterations on muscular function could explain, at least partially, the neurophysiological action mechanisms of dry needling on the decreasing of pain and disability. For a more thorough revision on the action mechanisms of dry needling, we recommend reading the work by Cagnie et al. (14). Other case studies point towards a normalization of altered movement patterns on patients suffering from musculoskeletal pain after the application of dry needling on MTrPs (15-17).

Having reached this point, there is another question we could ask ourselves: Through which mechanism is dry needling on the MTrPs able to normalize the motor function as shown on these works? The answer is simple: We cannot know for sure. A list of possible mechanisms would be (12, 18):

- Elimination of the nociceptive source.
- Direct facilitation of muscle contraction.
- Inhibition of excessive muscular activity in relaxation (relief of muscle spasms).
- Changes on motor excitability at cord or at cortical level.
- Changes on excitability of the sympathetic nervous system.

So far, we have seen how treating a MTrP could be useful to normalize the functioning of the harboring muscle and the functionally related muscles, but we could modify the question: Could the normalization of movement through, for instance, exercise, be beneficial for MTrPs? Would treatment through the exercising of, for instance, lumbar multifidus, be useful to eliminate its MTrPs or the MTrPs of functionally related muscles, like the erector spinae muscles? Actually, there is little research able to answer this. To this author's knowledge, the two studies that have explored this issue have observed that the training with exercises of muscles with stability function does not guarantee the improvement of MTrPs activity located on superficial muscles functionally related (19-21).

That said, we could extract the following conclusions with the information to date:

- Dry needling of MTrPs can be useful on some patients to improve the activation of the muscle harboring the MTrP and the altered movement patterns. On this matter, the application of a passive technique such as dry needling could pave the way for the application of active techniques, such as physical exercise.
- The physical therapist cannot guarantee the decreased activity of the MTrP after the exercise or, at least, the literature has not proven it to be possible.

As usual, further research would be required in order to determine the long-term effects of dry needling on muscular activation, the additive effects of dry needling on exercise, etc.

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