Dry Needling Treatments for Myofascial Trigger Points.

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Introduction.

Myofascial Pain Syndrome [MPS] can be defined as the set of sensory, motor and autonomic signs and symptoms caused by myofascial trigger points [MTPs] (1, 2). These signs and symptoms include pain (often experienced as a telalgia, outside the responsible MTP), muscle weakness, restricted range of motion, des-coordination, increased fatigability, delayed recovery and delayed relaxation after exercising, muscle spasm observed by electromyography [EMG] at the zone of pain referral (1), alterations in motor activation patterns (3), etc. All this means that the clinical manifestation of the MPS and the way the patient is affected by it will be variable depending on the muscle or group of muscles involved.

According to the *integrated hypothesis* (4-6), the most widely accepted etiological theory, MTPs are small muscular contractures caused by dysfunctional motor endplates. (7-14). These muscle contractures give rise to taut bands of muscle fibers that are identifiable by means of palpation (15-17), ultrasound imaging (18, 19) and magnetic resonance elastography imaging (20). The MTP can be subjectively identified by palpation (15-17, 21), and objectively identified by specific microanalytical techniques (22), by the combination of three different ultrasound imaging techniques (19) and by needle EMG (7-14). Both, specific microanalytical techniques and ultrasound imaging (by measuring the blood flow

waveform with Doppler imaging) can reliably distinguish between active (symptom producing) and latent (not spontaneously pain generating) MTPs. When properly used, needle EMG can show an anomalous spontaneous electrical activity, recognised as endplate noise (7-11, 13, 23). Some authors consider this anomalous EMG activity the gold standard for the objective diagnosis of MTPs (13, 24) and its prevalence a clear indication of their degree of clinical activity (25).

The treatment of MPS can be divided in two phases (26, 27). A first pain-control phase in which MTPs are identified and treated in order to eliminate pain, and a second phase in which etiological and perpetuating factors are identified and addressed, in order to prevent recurrences. Since, most of the times, perpetuating factors also increase the clinical activity of MTPs and make them more refractory to treatment (1), in the clinical setting both phases must usually overlap. Techniques used to treat MTPs are mostly employed in the first phase of pain control.

Dry needling treatments

The many different ways for treating MTPs can be classified into two categories:

- Conservative therapy: therapeutic agents do not pass through the skin.
- Invasive therapy: the therapeutic agents are applied percutaneously.

Invasive therapy includes many different techniques ranging from needling with different tools, mostly needles, till surgery (28, 29). The invasive therapy most widely used in the treatment of MPS is needling. In this context, needling

techniques can be divided into dry needling [DN] techniques and injection techniques. In this paper, we will specifically deal with DN techniques.

Dry needling techniques are considered physical therapy techniques since they use the mechanical stimulation of the needles as the physical agent to treat a condition, a muscle contracture, which falls within the scope of physical therapy (30-33). Nevertheless, any officially recognized healthcare professional with the adequate training in the diagnosis and in the needling treatment of this condition could use it (34).

There are many different DN techniques for the treatment of MTPs and they can be classified attending to different criteria: the tool used, the kind of stimulation employed, the depth to which the DN tool is inserted, the concept in which the DN technique developed (32, 33), or the healthcare practitioner using it.

The classification criterion most widely used is the depth. According to this criterion, DN technique should be classified as:

- Superficial DN (SDN), when the tool doesn't reach the MTP and stays in overlying tissues.
- Deep DN (DDN), when the tool reaches the MTP and passes through it.

Previous classifications according to depth defined SDN when the tool didn't reach the muscle and DDN when the needle reached the MTP (30). These definitions left an ambiguous gap in those cases in which the needle entered the muscle without reaching the MTP. For instance, in our experience, using a 50 mm long needle for DN of gluteal muscles could result in DDN for gluteus medium's

MTPs but in SDN for the deeper gluteus minimum's MTPs, since the needle will not be long enough to reach them in most adults.

Examples of SDN are Peter Baldry's technique, Fu's subcutaneous needling technique and Neuro-reflexotherapy.

In Baldry's technique (35, 36), a small acupuncture needle is employed and it is inserted to a depth of 5 to 10 mm. Depending on the patient responsiveness to treatment the needle is left in place during different times, from just a few seconds to several minutes, and applying a variable neurological stimulation of the needle, through mechanical (manually applied) or electrical stimuli.

In Fu's subcutaneous needling technique (37, 38) a needle with a catheter, as those employed for intravenous injections, is inserted below the skin, almost parallel to it. The needle is then manipulated through the handle from side to side 200 times during 2 minutes. The needle is withdrawn and the catheter is left in place from 2 hours, in acute cases, till 24 hours in chronic cases.

In neuro-reflexotherapy (39, 40), surgical staples are inserted in subcutaneous tissues overlying trigger points for a prolonged length of time (several weeks or even several months). Published papers regarding this technique don't leave it clear whether the staples are inserted in previously diagnosed MTPs or in any other kind of trigger points, since diagnostic criteria for the selected trigger points were not clearly stated.

Examples of DDN techniques are Hong's fast-in and fast-out technique, Chow's screw-in and screw-out technique, Gunn's intramuscular stimulation technique, or miniscalpel-needle release technique.

Hong's fast-in and fast-out technique was initially described as an injection technique (1, 41), but many therapists use it as a DDN technique. In this modality, the needle is repeatedly inserted into the MTP trying to get as many local twitch responses [LTRs] as possible within patient's tolerance. Chow's screw-in and screw-out technique (42) is a modification of Hong's technique especially adapted for its use with small acupuncture needles. In this technique the needle is inserted and withdrawn by means of a rotational movement of the needle.

Gun's intramuscular stimulation therapy (43-45) employs a plunger to insert and manipulate an acupuncture needle inside the muscle, within the frame of a radiculopathic pain concept (32, 33, 43, 44) and using a therapeutic protocol specially design to treat chronic pain patients.

Minisclapel-needle release technique (46, 47) uses two or three insertions of a specially designed needle with a cutting edge in the tip and with a much thicker shaft (1 mm) than the conventional acupuncture needles commonly employed in DDN.

Dry needling sometimes combines with other therapeutic agents, such us different substances (1, 41, 48) or electricity (30, 31, 33, 49) in the treatment of MTPs, or with autologous blood in other contexts (50-52). The combination of DN with electrical stimulation receives many different names (30, 33) but, probably,

the better suited term for this combination within the frame of MPS treatment is "percutaneous electrical stimulation of MTPs" (31).

Effectiveness of myofascial trigger point dry needling.

Besides the initial remark by Steinbrocker (53) about the effectiveness of the mere insertion of the needle to treat musculoskeletal pain, several studies by different authors show that DDN is as effective as injection of diverse substances (48, 54-57) in the treatment of MTPs.

The available reviews about effectiveness of dry needling always reach similar conclusions. Cummings and White (58) in their 2001 systematic review conclude: "Direct needling of MTPs appears to be an effective treatment, but the hypothesis that needling therapies have efficacy beyond placebo is neither supported nor refuted by the evidence from clinical trials. (…) Controlled trials are needed to investigate whether needling has an effect beyond placebo on MTP pain." Similar conclusions were drawn from two more recent systematic reviews about dry needling (59, 60). Due to the invasive nature of DN it is rather difficult to design double-blind placebo–controlled studies (33). Different placebo needles or sham needling procedures are questioned for considering that all of them involve some kind of physiological stimulation which disqualify them as a true placebo intervention (61). To avoid this bias we recently conducted a randomized, double blind, placebo-controlled clinical trial about the effectiveness of MTP-DN in the prevention of myofascial pain after total knee replacement (Mayoral O, et al., unpublished data). In our study 40 subjects were

examined for MTPs by an experienced examiner several hours before the knee replacement surgery. Subjects were then assigned either to a true DN group or to a sham DN group. Right after anesthesia and right before surgery started, subjects in true DN group were dry needled of all previously diagnosed MTPs, while subjects in sham DN group received no treatment of their MTPs, although the physical therapist applying DN was in the surgery room with the subjects during anesthesia procedure and simulated the needling right afterwards. Since subjects were not able to feel anything, they were completely blinded to group allocation, as well as the MTP examiner in all pre-surgical and follow-up examinations. Subjects in the true DN group had less pain after surgery, with statistically significant differences in post-surgery analgesics demand (P=0.02) and in the rate of change of different VAS measurements one month after surgery (VAS>4, P=0.03; VAS=0, P=0.04). The results of this study show a superiority of DN *versus* placebo and present an interesting novel placebo methodology for DN.

Indications of dry needling treatments

Besides the obvious indication of MTPs, nowadays some other possible indications of DN are emerging within the context of MPS.

Most of the time, when we talk about MTPs, we are implicitly referring to central MTPs [cMTPs]. It is not clear whether DN could be used in attachment MTPs [aMTPs]. Since David G. Simons introduced the concept of aMTP (1, 62) no published study has included this distinction between cMTPs and aMTPs.

According to Simons, an aMTP is an enthesopathy caused by a cMTP. The tension generated in the muscle fibers by the contractured sarcomeres of the cMTP would propagate to the myotendinous or bone attachments of the taut band, giving rise to enthesopathic changes. According to this definition, the obvious treatment for an aMTP is the elimination of its cause, the cMTP. Nevertheless, from a clinical perspective, when enthesopathy has developed, it usually needs to be also addressed and the sole treatment of the cMTP will not suffice. Some authors consider that there is a close relationship between cMTPs and aMTPs and that the treatment of either of them would be beneficial for the other (1). Clinical experience and some papers (50-52) suggest that DN could also be successfully used in aMTPs. Studies are needed to unequivocally establish this indication of DN.

Some reports seem to show some effectiveness of DN of MTPs in the control of spasticity in neurological patients (63, 64). Clinical trials should investigate this possibility.

The use of DN for non-myofascial trigger points, such as ligamentous trigger points has never been established although clinical experience and some reports (Fischer A, personal communication) (65, 66) suggest this possibility that should be seriously explored.

Conclusions

Dry needling includes a set of techniques that are being widely used by different healthcare professionals. There is increasing clinical and scientific evidence that

DN is an effective and efficient procedure for the treatment of MTPs. Research is needed to better know its mechanisms so that indications can be properly defined and treatment protocols can be reliably established to achieve better results and to improve the patients' tolerance to these techniques.

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