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MYOFASCIAL PAIN AND TREATMENT: NARRATIVE REVIEW

The local twitch response during trigger point dry needling: Is it necessary for successful outcomes?

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ABSTRACT

Background: Myofascial trigger point (MTrP) injection and trigger point dry needling (TrPDN) are widely accepted therapies for myofascial pain syndrome (MPS). Empirical evidence suggests eliciting a local twitch response (LTR) during needling is essential.
Objective: This is the first review exploring the available literature, regardless of study design, on the neurophysiological effects and clinical significance of the LTR as it relates to reductions in pain and disability secondary to MTrP needling.
Methods: PubMed, MEDLINE, Science Direct and Google Scholar were searched up until October 2016 using terms related to trigger point needling and the LTR.
Results: and Discussion: Several studies show that eliciting a LTR does not correlate with changes in pain and disability, and multiple systematic reviews have failed to conclude whether the LTR is relevant to the outcome of TrPDN. Post needling soreness is consistently reported in studies using repeated in and out needling to elicit LTRs and increases in proportion to the number of needle insertions. In contrast, needle winding without LTRs to MTrPs and connective tissue is well supported in the literature, as it is linked to anti-nociception and factors related to tissue repair and remodeling. Additionally, the positive biochemical changes in the MTrP after needling may simply be a wash out effect related to local vasodilation. While the LTR during TrPDN appears unnecessary for managing myofascial pain and unrelated to many of the positive effects of TrPDN, further investigation is required.

1. Introduction

Myofascial pain syndrome (MPS) is a highly prevalent condition without clear evidence-based clinical guidelines for optimal management (Fleckenstein et al., 2010). According to a recent international survey, pain specialists consider MPS to be a readily distinguishable condition involving local muscle pain and the presence of tender spots that reproduce symptoms when pressure is applied (Rivers et al., 2015). Clinically, MPS is associated with the presence of myofascial trigger points (MTrPs), which are often the focus of examination and treatment (Shah et al., 2015). A MTrP is a palpable, hyperirritable nodule located within a taut band of skeletal muscle fibers that is classified into an active (A-MTrP) or latent (L-MTrP) myofascial trigger point (Ge et al., 2011). A-MTrPs are associated with pain recognition when manually stimulated, and often present with predictable pain referral patterns (Myburgh et al., 2008); furthermore, A-MTrPs have the potential to cause both peripheral and central sensitization (Fernandez-de-las-Penas and Dommerholt, 2014; Hsieh et al., 2007). L-MTrPs are only painful with compression or palpation (Bron et al., 2011), however, they may predispose patients to altered movement patterns (Ge et al., 2012, 2014; Ibarra et al., 2011; Lucas et al., 2010; Sergienko and Kalichman, 2015) and/or be converted to A-MTrPs when perpetuating factors are present (Ge and Arendt-Nielsen, 2011). Importantly, MTrPs are prevalent in patients with musculoskeletal pain (Alburquerque-García et al., 2015; Arendt-Nielsen, 2015; Bron et al., 2011; Castaldo et al., 2014; Fernandez-Carnero et al., 2007;

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Fernández-de-las-Peñas et al., 2005; Sergienko and Kalichman, 2015) and a multitude of causes for MTrP development have been suggested (Campa-Moran et al., 2015; Huang et al., 2014; Itoh et al., 2004; Lin et al., 2011; Ruiz-Saez et al., 2007; Treaster et al., 2006; Tsai et al., 2009). MTrP injection and trigger point dry needling (TrPDN) are commonly applied interventions for MTrP pain (Kuan, 2009). Several studies suggest the effects of injection therapy are largely due to mechanical disruption of muscle fibers and nerve endings from the prick of the needle, not solely from the infiltration of a local anesthetic (Ay et al., 2010; Cummings and White, 2001; Venancio Rde et al., 2008). Thus, TrPDN—i.e. without injectate—is becoming a popular therapeutic intervention among health professionals (Rodriguez-Mansilla et al., 2016) and involves the insertion of thin monofilament (Cerezo-Tellez et al., 2016a) or hollow bore needles (Kamanli et al., 2005) without delivery of any drug into a MTrP region. Current systematic reviews report that direct MTrP needling is superior only to placebo for reducing pain (Tough and White, 2011) at immediate (Kietrys et al., 2013), short-term (Boyles et al., 2015; Kietrys et al., 2013; Liu et al., 2015) and medium-term (Liu et al., 2015) follow up. However, the effectiveness of TrPDN over placebo for pain reduction in the long-term remains unknown (Kietrys et al., 2013; Ong and Claydon, 2014). A recent systematic review of 19 randomized controlled trials (RCTs) concluded that TrPDN may be effective for MTrP pain reduction across multiple body regions and conditions, but no consensus was determined about the most effective needling techniques for pain relief (Boyles et al., 2015). More specifically, some authors suggest that TrPDN is most effective if a local twitch response (LTR) is elicited during the procedure (Hong, 1994b; Tekin et al., 2013). The LTR is characterized by a visible contraction of part of the taut band in the involved muscle upon mechanical stimulation with needling or palpation to a sensitive site in a MTrP region (Simons and Dexter, 1995). To elicit LTRs, many clinicians use a fast-in and fast-out needling technique often referred to as “pistoning” in a fan or cone shape, for the deactivation of MTrPs (Calvo-Lobo et al., 2015, 2016; Tellez-Garcia et al., 2015). Notably, the use of needle pistoning, with the goal of eliciting single or multiple LTRs in the muscle belly, was a dominant theme in the methodology of the majority of studies included in a recent systematic review that investigated the effectiveness of dry needling on MTrP related pain (Morihisa et al., 2016). However, although needling (dry or wet) with the production of LTRs has been shown to reduce MTrP related pain in the immediate, short, and medium term, the long-term outcomes remain unknown. Furthermore, and more importantly, whether needling with the elicitation of the LTR leads to superior outcomes for the reduction of pain and disability when compared to needling interventions without the LTR remains largely unexplored (Boyles et al., 2015; Gerber et al., 2015; Hong, 1994b; Kuan et al., 2012; Rha et al., 2011; Tekin et al., 2013). In addition, the physiologic importance of the LTR during TrPDN remains to be elucidated (Kuan et al., 2012), and no systematic reviews to date have provided firm conclusions linking the LTR phenomenon directly to the positive clinical outcomes experienced by patients with MPS following the use of TrPDN (Boyles et al., 2015; Cagnie et al., 2015; Cummings and White, 2001; Kietrys et al., 2013). Given that other needling techniques and manual therapies have shown efficacy in the management of myofascial pain and do not rely on eliciting the LTR (Cagnie et al., 2012, 2015; Kostopoulos et al., 2008; Takano et al., 2012), a more detailed investigation of the clinical relevance of the LTR seems appropriate. Therefore, the purpose of this narrative review is to comprehensively investigate the available literature to determine whether or not elicitation of the LTR is a necessary event during dry or wet needling for the optimal short and/or long-term reduction of pain and disability in patients with MPS.

2. Materials and methods

Literature for this narrative review was sought that investigated the LTR phenomenon during MTrP needling. Articles that provided insight on the neurophysiological mechanisms of MTrP needling and the LTR were included, along with studies that assessed the clinical relevance of the LTR. The reference lists of these studies were also hand searched to identify other articles relevant to the topic of the LTR. Importantly, individual studies that investigated the role of the LTR as it pertains to the outcome of pain intensity with TrPDN or MTrP injection in human subjects with MPS or other painful musculoskeletal conditions were included and listed in Table 1. Consistent with our intent of performing a narrative review, the search was not limited to randomized controlled trials, systematic reviews or meta-analyses. In addition, no restrictions were placed on the date of article publication and only articles written in English were reviewed. An electronic database search of PubMed, MEDLINE, Science Direct and Google Scholar were searched up until October 2016 using the following terms; dry needling, injection, acupuncture AND local twitch response, twitch response, myofascial pain, trigger point, mechanisms. All articles that did not meet the above criteria were discarded.

3. Results and discussion

In this narrative review, 6 studies were identified that all investigated the clinical importance of eliciting the LTR with MTrP injection or TrPDN as it pertains to the outcome of pain intensity and they are summarized in Table 1. The studies included two randomized controlled trials (Hong, 1994b; Tekin et al., 2013), one prospective, non-randomized, controlled, interventional clinical study (Gerber et al., 2015), one case control study (Rha et al., 2011), one single-arm cohort study (Kuan et al., 2012) and one quasi-experimental study (Koppenhaver et al., 2016). Importantly, only a single study assessed the influence of eliciting the LTR on changes in disability in addition to pain intensity (Koppenhaver et al., 2016). All other studies referenced in this review have relevance to the topic of MTrP injection or TrPDN for the management of MPS.

3.1. Dry needling technique and the localized twitch response

Empirical evidence suggests that eliciting multiple LTRs through mechanical stimulation of a MTrP within a taut band is the most important factor for pain relief (Chou et al., 2014; Hong and Simons, 1998; Hsieh et al., 2007). Some authors have suggested that the LTR during TrPDN is a sensitive measure (Ge et al., 2008) and an objective confirmation (Simons and Travell, 1999) of needle insertion into a trigger point, the location thought to have the greatest therapeutic effect (Hong, 1994a). Developed by Hong (Hong, 1994a, 2013; Hong and Simons, 1998) and now broadly used by practitioners for MTrP injection and TrPDN, the “multiple rapid insertion technique” in a fan or cone shape is intended to provide high-pressure mechanical stimulation to “sensitive loci”—i.e. sensitized afferent fibers—stimulating a subset of the α-motor neurons in the spinal cord. The LTR is thought to subsequently break the vicious cycle of the MTrP circuit, decreasing pain and disability (Audette et al., 2004; Chou et al., 2014; Hong and Simons, 1998; Kuan et al., 2012). Importantly, the sensitive afferents that proliferate in the MTrP region (Hong et al., 1997a; Meng et al., 2015b), mediate both the noxious input to the spinal cord (Meng et al., 2015a) and the LTR induced through needling precise MTrP locations (Hong and Torigoe, 1994; Simons et al., 1995). Resting pain intensity of the MTrP before injection has been found to be highly correlated with LTR prevalence during injection (i.e. the higher the baseline pain intensity, the more LTRs that were elicited), suggesting that