Review Article

Needling procedures of trigger point injections in the management of myofascial pain syndrome: a narrative review

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Background and Objective: Orofacial pain can be complex to identify and treat. Myofascial pain is the most prevalent cause of non-odontogenic pain in the facial region. Treatment options can vary and trigger point (TrP) injections are often used to provide pain relief and restoration of function. The present narrative review aims to compare the efficacy of dry needling versus lidocaine injections on the reduction of pain in the management of myofascial pain syndrome.

Methods: Electronic databases PubMed, EMBASE, Scopus, ISI Web of Knowledge, and Cochrane Library were searched without time restrictions up to and including Sep 2022. Fifty manuscripts were included in the review focusing on needling in TrP injections.

Key Content and Findings: Both techniques showed advantages and disadvantages regarding clinical efficacy and post-needling soreness. However, no difference was found between the dry needling and lidocaine injection techniques. The training and comfort level of the provider can dictate the injection protocol utilized.

Conclusions: Insufficient evidence suggests that TrP injection (wet needling) significantly reduces pain in a patient with myofascial pain syndrome in the short term compared to dry needling. Further studies are required to investigate injection techniques and efficacy in the management of myofascial pain with TrP patients.

Keywords: Injections; myofascial pain; dry needling; trigger points injections (TrP injections); lidocaine anesthesia trigger point injection (lidocaine anesthesia TrP injection)

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Introduction

Myofascial pain syndrome is a regional muscular pain characterized by localized deep tender areas within a taut band of skeletal muscle, tendon, or ligament, called trigger points (TrPs) (1). The presence of myofascial trigger points (MTrPs) is often the key to diagnosis, though some additional testing may provide supportive evidence. The myofascial system can be a source of pain and functional disability by creating symptomatic pain localized or referred to adjacent structures in an unclear way. Several theories have been proposed about TrP formation, such as the excessive activity of acetylcholine (ACh) and formation of taut bands, local hypoxia, and energy crisis (2-5), the role of peripheral and central sensitization (6,7), Cinderella

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theory (8), shift theory (9), as well as a possible role for descending modulation in myofascial pain (10,11). Pain arises from one or more MTrPs which are aggravated by physical palpation and increased functional demands.

A MTrPs can cause localized pain in that area and refer pain to another region known as a zone of reference. The zone of reference can be distant from the involved muscle and may not be within the same dermatome, meaning that the site and the source of pain are different (referred pain). As a result, TrPs are a common cause of headaches and persistent pain in the face and neck (12). Due to the low density of sensory afferents in muscle, muscle pain is diffuse and poorly localized (13). The convergence-projection theory further explains the possible mechanism behind referred pain, where afferent neurons from separate innervation areas converge onto the same second-order neuron in the central nervous system (CNS) resulting in the inability of the brain to accurately identify the actual source of the pain (12). With sensory involvement, the patient often experiences this referred pain (14). When the autonomic nervous system is affected, nasal congestion, blurring of vision, or excessive lacrimation may be evident (12). Therefore, various therapeutic approaches have been recommended for the management of skeletal muscle disorders such as patient education and self-care (15), physical medicine (16,17), injection techniques (18), pharmacotherapy (19), and behavioral modification (12,15,20,21).

Therapeutic injection techniques are mostly used in managing muscle pain, particularly pain originating from MTrPs. Two needling procedures are often used to manage TrPs: wet and dry needling. Wet needling refers to procedures that include the injection of a substance (usually a local anesthetic) into a TrP through a hypodermic, beveled-cutting-edge needle (22-29). In contrast, dry needling uses a thin filiform needle that penetrates the skin and disrupts the fibrous bands in the muscle by the repetition of the movement of the needle around the TrP (1,26). Various studies have been performed on patients with myofascial pain with TrPs, demonstrating the different types of TrP management. A study by Anjana G. *et al.* evaluated the effectiveness of dry needling and transcutaneous electrical nerve stimulation (TENS) in cervical pain intensity reduction and cervical range of motion improvement in patients who complained of neck pain due to MTrPs. The visual analog scale (VAS), neck disability index (NDI), and cervical range of motion (CROM) were used before, on days 14 and 28 days after the treatment. Moreover, they concluded that both treatments effectively reduced pain and improved the NDI and CROM. However, the study showed that a single session of dry needling is more advantageous and cost-effective than numerous TENS sessions (30). Another study compared the effectiveness of immediate and delayed superficial dry needling (SDN) and deep dry needling (DDN) on the function of the upper trapezius muscle and evaluated the patient's pain and disability. Moreover, the study showed that both SDN and DDN could effectively reduce pain and disability in patients with active MTrPs of the upper trapezius muscle (31). A systematic review and meta-analysis reported low evidence suggesting a superior effect of TrP injection (wet needling) for decreasing pain in the short term as compared with dry needling for cervical muscle TrPs (32). Therefore, the present manuscript explores the methodology and evidence in the literature of needling techniques for myofascial pain patients, dry needling, and lidocaine TrP injections. We present this article in accordance with the Narrative Review reporting checklist (available at https://joma.amegroups.com/article/view/10.21037/joma-22-41/rc).

Methods

Electronic databases PubMed, EMBASE, Scopus, ISI Web of Knowledge, and Cochrane Library were searched without time restrictions up to and including May 2023. Keywords are combined using the Boolean operators (AND, OR) for the identification of relevant studies. Titles abstracts and full texts were screened as well as the reference lists of pertinent original studies were reviewed and screened for eligibility (*Table 1*).

Study selection and literature search protocol

Electronic databases PubMed, EMBASE, Scopus, ISI Web of Knowledge, and Cochrane Library were searched without time restrictions up to and including May 2023. Disagreements were resolved through discussion and consultation with a third researcher (J.K.). The following keywords were used: (I) dry needle trigger point; (II) trigger point injection; (III) myofascial pain with trigger point; (IV) lidocaine local anesthesia trigger point injection; (V) lidocaine trigger point injection; (VI) myofascial pain in neck and shoulder; (VII) muscles pain; and (VIII) trigger points in musculoskeletal muscles. These keywords were combined using Boolean operators (OR, AND) to expand

Table 1 The search strategy summary

Items	Specification
Date of search	9/10/2022
Databases and other sources searched	PubMed, EMBASE, Scopus, ISI Web of Knowledge, and Cochrane Library
Search terms used	(I) Dry needle trigger point; (II) trigger point injection; (III) myofascial pain with trigger point; (IV) lidocaine local anesthesia trigger point injection; (V) lidocaine trigger point injection; (VI) myofascial pain in neck and shoulder; (VII) muscles pain; and (VIII) trigger points in musculoskeletal muscles
Timeframe	Until and up to May 2023
Inclusion criteria	Keywords are combined using the Boolean operators (AND, OR) to identify relevant studies. Titles abstracts and full texts were screened as well as the reference lists of pertinent original studies were reviewed and screened for the review. English language reviews, editorials, correspondences about trigger point injections
Selection process	Two authors (Z.A. and M.A.) screened the titles and abstracts of studies identified with the protocol mentioned above, and full texts of relevant studies were read independently. Hand-searching the reference lists of relevant original studies and review articles was also performed to identify studies that might have been missed in the previous step

the search results. Two authors (Z.A. and M.A.) screened the titles and abstracts of studies identified with the above-mentioned protocol, and full texts of relevant studies were read independently. Hand-searching the reference lists of relevant original studies and review articles was also performed to identify studies that might have been missed in the previous step.

TrPs

TrPs are tender taut bands in skeletal muscles that range from 2 to 5 in diameter and can be palpated using continuous, deep, single fingertip pressure of 2 kg for 6 to 10 seconds (12). The palpation might increase or decrease the pain, and the response may happen immediately or after several seconds (32). Moreover, palpation of TrPs might show as a jump sign or local twitch response (33). The jump sign is a spontaneous reaction that can manifest as a verbal response or withdrawal of the patient's head (34). In contrast, local twitch response is a rapid, transient muscle contraction elicited by "snapping palpation" of the taut band at the location of the TrP (35). Snapping palpation is performed by grasping the muscle (e.g., upper trapezius, sternocleidomastoid) between the forefinger and thumb and then rolling the muscle under the fingers (12,14,36). There are two types of TrPs, active and latent; usually, TrPs cycle between an active and latent state (11,12). An active TrP is tender to palpation and might cause spontaneous referred pain during regular muscle use (37). While, a latent TrP is more tender than normal muscle tissue but not like an active TrP and does not cause referred pain during normal daily activities but will elicit referred pain symptoms when palpated (11,29). The management of MTrP pain might be achieved by TrP injection (38). There are two types of injections, diagnostic and therapeutic injections (39). Diagnostic injections differentiate between the site and the source of pain. In comparison, therapeutic injection aims to relieve tightness and pain by inactivating the involved muscle's TrPs (40).

TrP injections are not only effective in the head and neck region but other parts of the body including trunk, shoulder, glutes, and legs (41-43). Piriformis syndrome causes lower back pain and numbness of the lower limbs because of the pressure exerted on the sciatic nerve, abnormalities of the sciatic nerve and piriformis muscle, piriformis muscle injury, hypertrophy, and muscle spasms. Piriformis syndrome has a negative impact on most patients' daily lives making it difficult walking and the inability to maintain a sitting or supine posture. Different types of treatment methods have been used to treat PS patients, such as local anesthetic injection, steroid injection, and local botulinum toxin injection. Hydro-dissection by ultrasound-guided injection of a very low concentration of local anesthetic is effective and has a lower risk of adverse effects, thus making it more convenient for the treatment of piriformis syndrome than conventional treatments, such as local anesthetics, steroids,

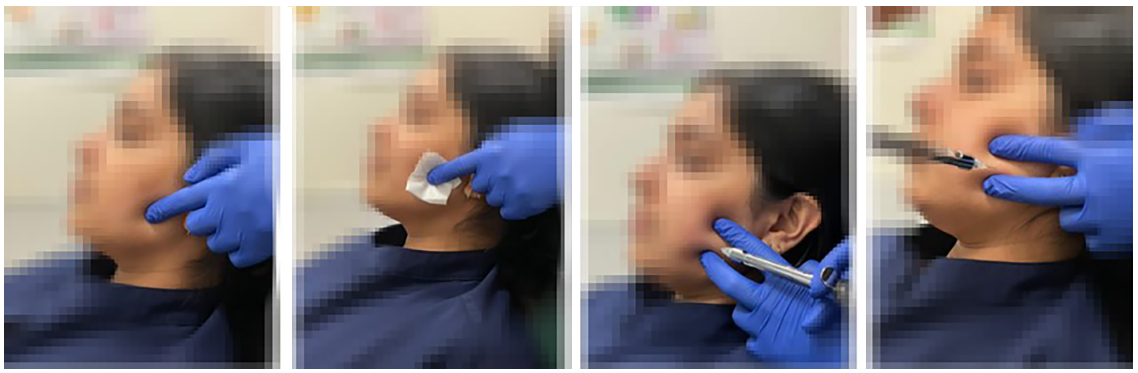

Figure 1 Once the trigger point is located and area sterilized, insert the needle tip superficially and then in depth of the tight muscle band. Aspiration is important to ensure no entry in a blood vessel. Once a small amount of anesthetic is initially deposited, the needle is withdrawn and anesthetic is deposited in a fan like shape with repeated insertions and withdrawals of the needle. Once the procedure is complete, pressure should be applied in the area of insertion. These images are published with the participant's consent.

and botulinum toxin injection (44).

TrP injections

TrP injections have used throughout the body for managing pain and discomfort. These can include anesthetics, Botox or corticosteroids in some cases. Prior studies do not indicate any technique being superior, but wet needling does provide an immediate and, in some cases, a sustained analgesic effect that can last for a few weeks (45). However, larger sample sized studies are required. Injection techniques are commonly used for muscle pain, particularly MTrP pain, they aim to inactivate TrP and relieve pain and tightness in the affected muscle (46). It includes "dry needling" (no pharmacologic agent used) or injection with a pharmacologic agent such as a local anesthetic (47). Dry needling is performed by repeatedly moving a needle around the TrP to disrupt the fibrous bands mechanically (48). The local anesthetic injection may help reduce muscle pain by disrupting the taut bands of tissue via hydrostatic pressure of the solution and blocking pain input to encourage normal muscle movement (49). The combination of Dry needling and local anesthetic might reduce post-injection soreness (50,51). Therefore, providing a TrP injection with local anesthesia is recommended (52). Previous studies have looked at the effect of needle size on TrP injections and found no differences (53). However, the length of a needle should not need full length insertion. A 21–25-gauge needle is the most often reported for the injections.

The local anesthetic (lidocaine) TrP injection

Lidocaine local anesthesia potentially exhibits pain reduction properties in various painful situations by blocking the voltage-gated sodium channels, resulting in a reversible block of action potential propagation (54). When the local anesthetic is tied up to the sodium channel, the flow of Na^+ is discontinued, and action potential generation and propagation are inhibited (55). However, there are several contraindications to the injection therapy, such as allergy to the local anesthetic, inflammation of infection in the muscle (myositis), acute muscle injury or trauma, and prolonged bleeding tendency or use of anticoagulant medications (56). A clinical protocol and technique have been elicited in *Figures 1*,*2*.

Dry needling TrP injection

Dry needling is an acupuncture-like needle that penetrates the skin and disrupts the tout bands by repeating the movement of the needle around the TrP in the skeletal muscle (57). Determining the puncture spot relies on manually palpating the muscles' bellies or digitally using a digital algometer (58). It allows for defining the localization of the TrP and evaluation of the accurate reach of the muscles (59). It has been suggested that dry needling might activate the enkephalinergic inhibitory dorsal horn interneurons through stimulation of alpha-delta nerve fibers, causing opioid-mediated pain suppression (29,60).

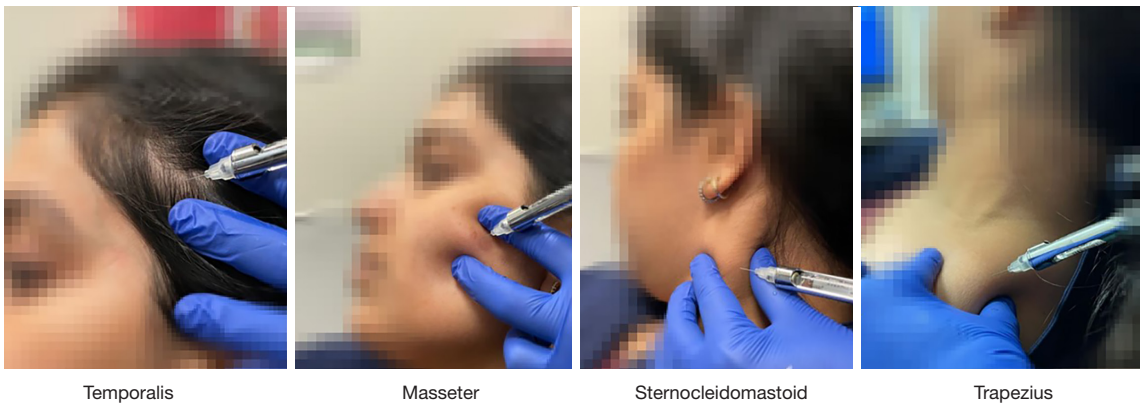

Figure 2 The muscle to be injected should be grasped using the pincer or pincher technique. An understanding of the anatomy is important to avoid damage and insertion in unwanted regions. An aspirating syringe using a 25- or 27-gauge needle is suggested. Hemostasis with pressure is important post injection along with thermal compress. These images are published with the participant's consent.

However, the dry-needling mechanical effect is still being debated. Some studies have suggested that when a localized twitch response is elicited during dry needling, it will show a better result in pain reduction and increase the range of motion (6,61,62). Additionally, in the same study, it has been suggested that the gate control theory of pain may play a role in pain reduction (63).

Decisions about site localizations are based on the anatomy of the muscle. Approaches suggested in the analyzed material include injections as follows:

- ❖ Ask the patient to clench, over the most prominent area of the muscle, across 2 cm of skin surface (64).
- ❖ Regularly across the muscle mass (65) into the area over the greatest cross-section surface of both masseter bellies (66) along the long axis lower part of the masseter muscle (67,68).

Moreover, most of the analyzed clinical trials described a specific number of injection sites per muscle, although it differed from 2 to 5 for the masseter and from 2 to 3 for the temporalis (69). This discrepancy is due to the difference in volume, mass, and surface of these muscles. Placing a few injection spots, usually about 1 cm apart, also finds its justification. The administered substances could infiltrate the surrounding tissues (70). However, dry needling should not be administered in the following patient scenarios: a patient with needle phobia, an unwilling patient, a patient who is unable or unwilling to give consent, a patient with a history of an abnormal reaction to needling or injection. In a medical emergency, a patient who is on anticoagulant therapy, or who has thrombocytopenia, and into an area or limb with lymphoedema (71).

Wet versus dry needling

Injection techniques are commonly used for muscle pain, particularly MTrP pain, they aim to inactivate TrP and relieve pain and tightness in the affected muscle (46). It includes "dry needling" (no pharmacologic agent used) or injection with a pharmacologic agent such as a local anesthetic (47). Dry needling is performed by repeatedly moving a needle around the TrP to disrupt the fibrous bands mechanically (48). The local anesthetic injection may help reduce muscle pain by disrupting the taut bands of tissue via hydrostatic pressure of the solution and blocking pain input to encourage normal muscle movement (49). The combination of dry needling and local anesthetic might reduce post-injection soreness (50,51). Therefore, providing a TrP injection with local anesthesia is recommended (52). Previous studies have assessed the efficacy of acupuncture/dry needling in the management of TrPs in various body regions (72). Areas studied include the upper quarter, lower back, and lower extremities. Overall results indicate limited evidence that dry needling has an overall effect when compared to standardized care (73). Another meta-analysis (66) that included 4 studies compared the efficacy of dry needling versus sham (placebo), reported no statistical significance between both interventions. However, the results suggested that dry needling had an overall positive treatment effect on TrP pain (66). Moreover, studies conducted by the American Physical Therapy Association reported that the discomfort during and after lidocaine anesthetic injections was found to be significantly low (74). The pain was reported only by 20% of the patients in the

injection groups (74). Utilization of the local anesthetic in the TrP injections could be the reason behind the decreased sensation of discomfort reported by the patients (75). This can be explained by the effect of the local anesthetics on the relative refractory period of the peripheral nerves by lengthening it and limiting the impulse conduction's maximum frequency (56). Additionally, utilizing local anesthetics in TrP injections can lead to a reduction in pain initially, hence increasing the patient's confidence in the physician as well as their compliance with exercise program post injections (76). Safety is a favorable outcome that is highly relevant when it comes to the application of needling intervention (76). Most studies (77-79) have reported an adverse effect of post-needling soreness after either dry needling or TrP injections. Boyce *et al.* (80) reported that minor adverse events post dry needling can be seen in up to 37% of the patients, with bleeding (16%), bruising (7.7%), and pain during dry needling (5.9%) being the most frequent (81). Post-needling soreness is due to tissue damage during the insertion of the needle (82). A study by Nowak and Chęciński (59) showed that needling therapies for masticatory muscle pain provide a satisfactory effect in pain reduction.

Conclusions

TrP injections are a minimally invasive and targeted approach that can be used as a diagnostic and therapeutic tool in management of myofascial pain. Both techniques have shown advantages and disadvantages regarding clinical efficacy and post needling soreness. However, regardless of the technique used it is beneficial in immediate and gradual relief of pain. TrP injections with lidocaine do indicate a slight advantage over dry needling due to its immediate analgesic effect but side effects reported are same. Future studies are required to investigate the management and efficacy of TrPs injections.

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Footnote

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