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An overview of myofascial pain syndrome with a focus on trigger point injection

By Nicole Bodine, MSN, FNP-C

Abstract: *Myofascial pain syndrome (MPS) is a very common condition, with an estimated lifetime prevalence of 85% in the general population. MPS is commonly underdiagnosed or misdiagnosed due to the lack of standardized diagnostic criteria and the symptoms' overlap with those of other musculoskeletal pain conditions. The most notable and bothersome feature of MPS is the presence of myofascial trigger points (MTrPs), hypersensitive areas of muscle commonly characterized as knots, nodules, or bumps that cause strain and pain with and oftentimes without stimulation. A low-risk, low-cost procedure, trigger point injection (TPI) is the gold standard for MPS treatment, and NPs can perform the procedure in an outpatient practice setting. Through administration of TPIs and use of other treatment modalities, primary care NPs can significantly impact the quality of life for those patients affected by acute and chronic MPS. This article aims to educate primary care NPs on MPS diagnosis and provide an overview of treatment options, with a focus on TPI use and administration for MPS relief.*

Myofascial pain syndrome (MPS) is defined as a regional pain syndrome that is estimated to affect nearly 44 million US residents.[1] The prevalence of MPS in adults ages 30 to 60 years is approximately 37% among men and 65% among women, with estimates reaching 85% in the older adult population.[2] MPS is characterized by its most notable feature, the presence of myofascial trigger points (MTrPs).[3] Travell, Simons, and Simons defined MTrPs as hyperirritable spots, usually within taut bands of skeletal muscle or in the muscle fascia, which are painful on compression and can lead to referred pain, motor dysfunction, and autonomic phenomena.[4] Referred pain from a trigger point rarely follows a specific nerve distribution but generally follows a consistent pattern that can be reproduced with palpation.[5] Motor dysfunction symptoms include muscle weakness, fatiguability, and spasm. Autonomic dysfunction in MPS may include such symptoms as salivation, excessive lacrimation, abnormal sweating, and pilomotor disturbance as well as potential proprioceptive symptoms of imbalance, dizziness, and tinnitus.[6,7]

The presence of MTrPs is the central component of MPS. Approximately 10% to 20% of the general population is thought to be affected by MTrPs, and research has shown a high prevalence of active MTrPs among certain clinical populations, from 46% (estimated by physicians working in pain therapy, rheumatology, or orthopedics) to 90% (patients in specialty pain clinics).[7,8] The most frequently affected muscles in MPS include the trapezius, iliocostalis thoracis, iliocostalis lumborum, quadratus lumborum, gluteus medius, and gluteus minimus (*Figure 1*).[1] MTrPs can be classified as active or latent. Palpation of an active trigger point typically reproduces the patient's symptoms, whereas latent trigger points may not be noted by the patient until direct palpation, although they still contribute to decreased range of motion and stiffness of the affected muscle.[7] Some studies estimate that latent MTrPs are present in the shoulder muscles of about half of asymptomatic young adults and in lumbogluteal muscles in up to 45%.[9] The most commonly cited etiologies for MPS and MTrPs are trauma, overuse, repetitive microtrauma, and joint dysfunction.[3] A multitude of potential causes also may underpin progression to chronic MPS; these include poor posture, nutritional deficiency, skeletal asymmetry (for example, scoliosis), poor sleep, aging, fractures, depression, and hypothyroidism, among others.[4,10]

Diagnosis

Diagnosis of MPS starts with a thorough history. As part of this history, providers should attempt to identify any potential trauma or other inciting event that occurred around the time of symptom onset. After obtaining a complete history, providers should perform a thorough physical exam. Asking the patient to point, with one finger, to the location of maximal tenderness may be a good starting point for the exam. The clinician should

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then examine and palpate all the affected musculature, including any muscles that are innervated by the same spinal segment.[7] Identification of an MTrP that reproduces the pain in a pain referral pattern that is characteristic of MPS as compared with other underlying conditions may be sufficient for MPS diagnosis.

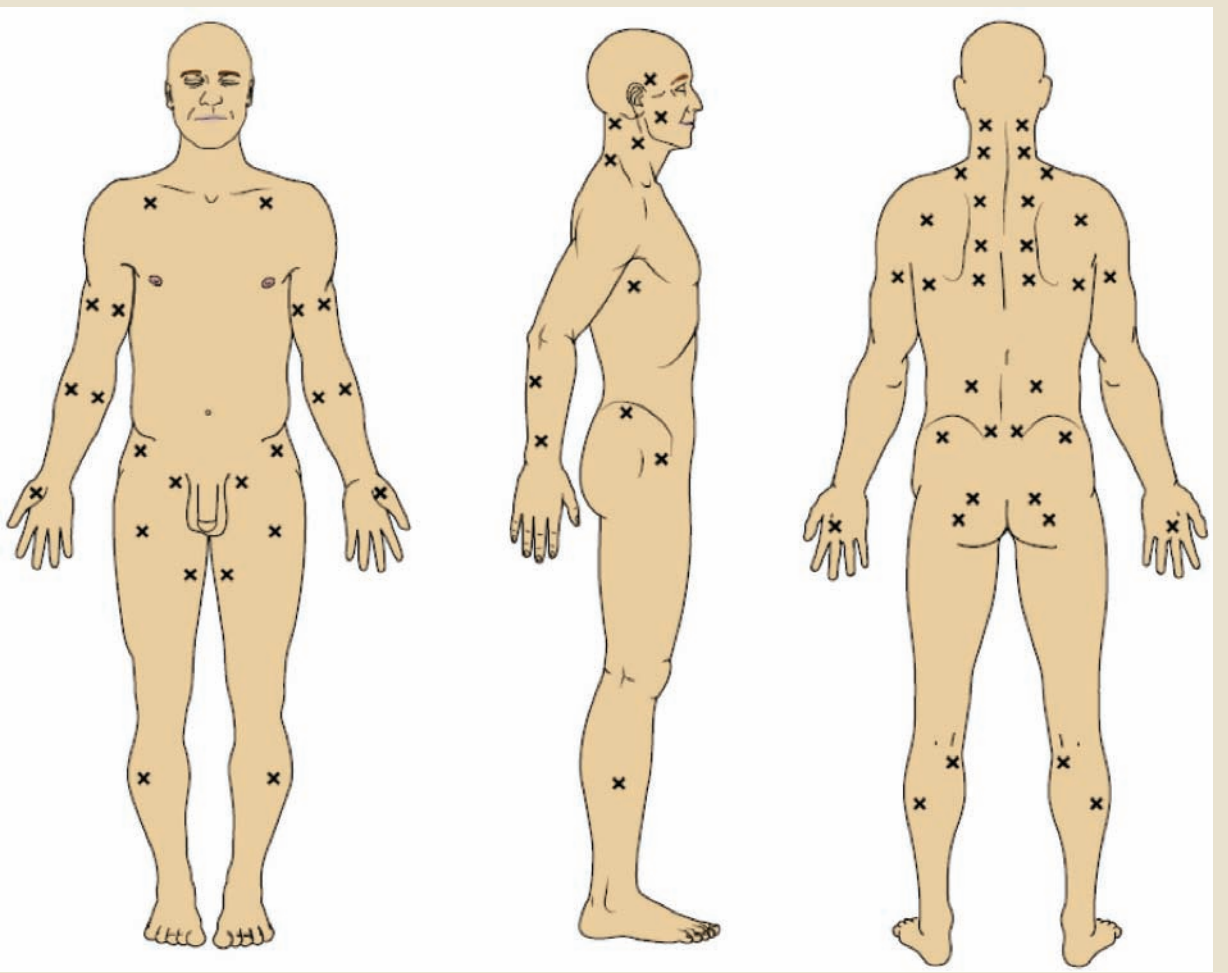
MTrP detection

MTrPs can be detected through three different methods: flat palpation, pincer palpation, and deep palpation. Flat palpation involves sliding one finger back and forth across the affected musculature and feeling for a taut band rolling beneath the skin. Pincer palpation is performed by gripping the area of concern between the thumb and fingers and rolling it back and forth to feel for a taut band; this technique can only be performed on a muscle that is accessible from two sides (*Figures 2* and *3*). With the deep palpation technique, the clinician identifies the muscle that they believe contains the trigger point and then applies pressure to the muscle attachment to see if symptoms are reproduced. This technique is useful in cases in which the MTrP may be obscured by superficial tissue.[5,7] Direct palpation of a trigger point should reproduce the patient's symptoms and referral pattern. Snapping palpation may also elicit a muscle fasciculation called a local twitch response.[11]

Differential diagnosis

In a patient presenting with myofascial pain, other possible diagnoses to consider include, but are not limited to, fibromyalgia, arthritis, tendinopathy, bursitis, nerve entrapment, radiculopathy, and degenerative disc

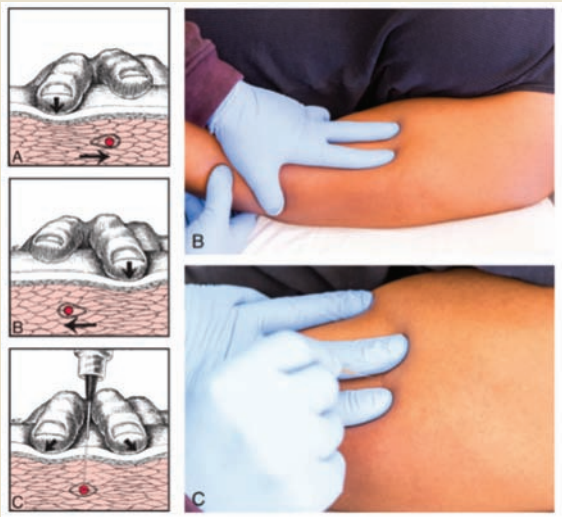
Figure 1. Location of common trigger points



Source: Christiani A. Trigger-Point Injection. In: Fowler GC, ed. *Pfenninger & Fowler's Procedures for Primary Care.* 4th ed. Elsevier; 2020:1241. (Adapted from Simons DG, Travell JG, Simons LS. *Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual.* 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 1999.)

Figure 2. Flat palpation

Cross-sectional schematic drawing of flat palpation to localize and hold the TrP (dark red spot) for TrP injections or dry needle. **A** and **B**, Use of alternating pressure between two fingers to confirm the location of the palpable TrP. **C**, Positioning of the TrP halfway between the fingers to keep it from sliding to one side during the needling.

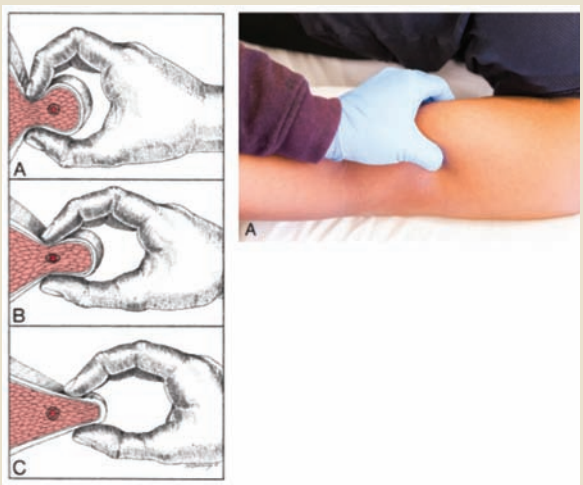


Abbreviation: TrP, trigger point.

Source: Donnelly JM, Fries LM, Cicchetti CS, Fernández de las Peñas C. Trigger Point Injection and Dry Needling. In: Donnelly JM, Fernández de las Peñas C, Finnegan M, Freeman JL, eds. *Travell, Simons & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual*. 3rd ed. Philadelphia, PA: Wolters Kluwer; 2019:760.

Figure 3. Pincer palpation

Cross-sectional schematic drawing showing cross-fiber pincer palpation of a taut band (black ring) at a TrP (dark red spot). Cross-fiber pincer palpation is used for muscles (light red) that can be picked up between the digits, such as the sternocleidomastoid, pectoralis major, and latissimus dorsi muscles. **A**, Muscle fibers surrounded by the thumb and fingers in a pincer grip. **B**, Hardness of the taut band felt clearly as it is rolled between the digits. The change in the angle of the distal phalanges produces a rocking motion that improves discrimination of fine detail. **C**, The palpable edge of the taut band is sharply defined, as it escapes from between the fingertips, often with a local twitch response.



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disease.[12] Although fibromyalgia is characterized by widespread musculoskeletal pain, referred pain does not occur with palpation, as is the case for MTrPs in MPS.[5] If an underlying neurologic or rheumatologic condition is suspected in connection with a patient's pain, referral to the appropriate specialist may be warranted (for example, rheumatology, neurology, or pain management).

Treatment options

Possible treatments for MPS and MTrPs include both noninvasive and invasive options. Noninvasive treatments include use of manual techniques such as ischemic compression, spray and stretch with a freeze spray, and strain-counterstrain. Additional noninvasive options include management through massage, physical therapy, stretching, transcutaneous electrical nerve stimulation, ultrasound, and dry cupping. Several medications, including nonsteroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, antidepressants, and antiepileptics, may also be used for the treatment of MPS; however, some have been shown to have limited benefit. Finally, invasive treatment options are dry needling, trigger point injections (TPIs), and acupuncture.[3,5] Because no clinical guidelines currently exist for management of MPS and MTrPs, clinicians should base treatment plans on currently available evidence, their clinical experience, and their patients' preferences through use of a shared decision-making model.[2] An overview of selected treatment options follows.

Stretching

The primary care NP should emphasize the importance of a stretching exercise program, as stretching has been found to be a critical component of the management and rehabilitation of MPS. Stretching lengthens the tight

bands of the skeletal muscle, which leads to improved joint range of motion, increased mobility, and ultimately a reduction in pain. NPs can refer patients to physical therapists for assistance with stretching, strengthening, and posture/ergonomic corrections to reduce the risk of developing chronic or recurrent MPS.[5,12]

Medications

NSAIDs. Some studies show benefit with NSAID use; however, for the best possible outcomes, NSAIDs should be used as adjuncts to manual therapies.[4] Topical NSAIDs (such as diclofenac) have been shown to be useful in MPS and have a lower adverse event profile in comparison with their oral counterparts.[12]

Antidepressants and antiepileptics. Studies on the use of antidepressants and antiepileptics in MPS are limited; however, available data reflect an overall limited effectiveness of these drugs in treatment for this condition.[13]

Although an increasing number of studies has focused on the benefits of using selective serotonin reuptake inhibitors (SSRIs) and serotonin and norepinephrine reuptake inhibitors (SNRIs) specifically in the treatment of fibromyalgia and other pain disorders, research specifically on their efficacy in MPS is lacking.[9] In a patient with MPS in the setting of uncontrolled depression or anxiety, it is posited that an SSRI or SNRI may be beneficial, but studies are needed to support this theory. Tricyclic antidepressants, specifically amitriptyline, have been studied in a wide variety of pain-causing conditions, including MPS. To date, two randomized controlled trials have evaluated the efficacy of amitriptyline in MPS treatment, with results showing an overall benefit and reduction in pain; however, these studies were limited to MPS secondary to chronic tension headache and temporomandibular joint disorders, respectively. Research outside of these conditions is limited.[14]

Antiepileptic drugs such as gabapentin and pregabalin have been researched and recommended in treatment of neuropathic pain. Additionally, pregabalin has been indicated as a first-line treatment option for fibromyalgia. Unfortunately, in relation to MPS, the research is lacking, with only weak evidence to support the use of gabapentinoids in this condition.[9,14]

Muscle relaxants. Muscle relaxants such as cyclobenzaprine and tizanidine have been studied for the treatment of MPS. Cyclobenzaprine seems to provide some benefit for analgesia and sleep promotion due to its sedating effect, but a Cochrane Review in 2009 found a lack of support for MPS treatment due to insufficient evidence.[15] A small study conducted on tizanidine reported that this agent is effective in reducing pain, disability, and muscle tenderness as well as improving sleep in those with MPS. Although no serious adverse events occurred during the study, it is important to note that somnolence and dizziness are common adverse reactions; therefore, dosing should be titrated slowly.[12,16]

Dry needling

Dry needling has been found to be effective in MPS treatment; the mechanism by which it works is theorized to entail deactivation of the MTrP through mechanical disruption.[9,17] Although acupuncture is technically a form of dry needling, the technique for and theory behind needle placement differ greatly from those employed in dry needling. Acupuncture is based on traditional Chinese medicine, with acupuncture needles placed along the body's meridian lines in an effort to improve energy flow or "Qi." Dry needling typically involves a solid-bore acupuncture needle that is inserted into a muscle, tendon, or trigger point multiple times with the intention of creating multiple fenestrations in the pain-generating structure.[18] Dry needling has been best studied in chronic tendinopathies, but emerging evidence also points to benefits in MTrPs, especially in those that have persisted for 6 to 8 weeks despite conservative treatment.[18] A systematic review and meta-analysis performed in 2017 found that dry needling was more effective than no treatment or sham dry needling treatment (in which the needle does not pierce the skin) at 12 weeks postprocedure.[19] Data on outcomes and potential benefits beyond the 12-week mark are limited; more research is needed.

TPIs

TPIs are considered the gold standard for treatment of MPS and MTrPs, as they have been shown to be effective in deactivating MTrPs (through the same mechanism as dry needling) and providing quick pain relief.[2] TPI should be performed as part of a multimodal treatment approach that incorporates muscle stretching, physical therapy, and/or other therapies. In patients with increased pain that is inhibiting their ability to fully participate in a prescribed therapy program, TPIs may help to reduce pain to the point that their tolerance of therapy and stretching is improved.[20]

Although TPIs are generally considered low risk, the primary care NP should be fully aware of possible contraindications and adverse reactions prior to performing this

procedure. Absolute contraindications include cellulitis at the injection site or inaccessibility of the MTrP by needle. Relative contraindications to screen for include bleeding disorders or anticoagulant use, history of keloid formation, poorly controlled psychiatric disorder, trypanophobia (a fear of needles), or systemic illness that may predispose the patient to poor healing or infection; the presence of any such factor should be carefully considered.[5,7] Possible adverse reactions or complications of TPI include vasovagal symptoms, skin infection, rebound pain, reaction to local anesthetic, injury to nerves/vasculature/nearby structures, bleeding or hematoma formation, and pneumothorax (which is rare, but special attention should be paid to injection technique when treating muscles in the thorax to prevent this complication).[7]

Traditionally, TPIs have been performed using a local anesthetic with or without a steroid. The use of steroids in TPIs has been viewed less favorably in recent years due to risks of muscle atrophy, local skin thinning, and systemic effects such as acne, purpura, and hirsutism.[1,17] Lidocaine is the most widely used injectate for TPIs, although several studies have concluded that benefit from TPI may be more related to the mechanical effect of the needle than the pharmacologic effects of the injectate.[1] Regardless, lidocaine use is often preferred by clinicians because it prevents local soreness from the procedure. In one study, patients who presented to the ED with lumbar myofascial pain were randomly assigned to either receive an I.V. NSAID or TPI with 1% lidocaine. Those who received lidocaine TPIs were found to experience superior pain relief compared with the group receiving I.V. NSAIDs.[21] The volume of required anesthetic in TPI has also been investigated. Only small volumes (less than 1 mL) should be injected into any single MTrP, as use of this amount has been shown to be effective while reducing risk of adverse events.[5]

Another injectate that has been studied is botulinum toxin A. Botulinum toxin A is a "purified neurotoxin complex produced from the fermentation of *Clostridium botulinum* type A that inhibits acetylcholine release into the neuromuscular junction, resulting in reduced muscular contraction."[9] Several studies have been performed to evaluate the role and efficacy of botulinum toxin A in MPS and MTrPs. One study evaluated the outcomes of botulinum toxin A versus placebo on chronic low back pain when injected into paravertebral muscles; the results showed that the botulinum toxin A group had superior pain relief and improved function in more than half of the participants at 8 weeks, but the benefits waned after 3 to 4 months.[22] Conversely, data suggest that TPIs with botulinum toxin A provide no further benefit than a less costly alternative, such as lidocaine or 0.9% sodium chloride solution (normal saline [NS]). A large review was conducted in 2014, and due to conflicting data found across several studies, the review concluded that the currently available evidence to support use of botulinum toxin A in MPS is inconclusive.[23] Given the limited and conflicting evidence, botulinum toxin A is not considered a first-line therapy for MPS; however, further research is needed in this area. Additionally, of note, botulinum toxin A use is off label in MTrPs.

NS, which carries the lowest cost and adverse reaction profile, has also been utilized in TPIs. One study found a similar efficacy in pain relief between patients who received NS TPI and those who received a conventional active drug mix (lidocaine with steroid) TPI, both immediately after injection and at 2-week follow-up.[1] A study that compared botulinum toxin A TPI with NS TPI for treatment of cervical and/or shoulder MPS revealed no statistically significant difference in outcomes and concluded that botulinum toxin A was not superior to placebo (NS).[24] Several studies have suggested that no one injectate has advantages over others and that the benefit received is from the action of the needle itself. In consideration of this information, NS is a great low-cost and -risk option for TPI use in primary care NP practice.

TPI administration

Informed consent

After completing a thorough history and physical exam with identification of MTrPs, informed consent should be obtained. The procedure details, including risks, benefits, alternative treatment options, and expected outcomes, should be explained to the patient.

Patient and equipment preparation

TPIs can generally be performed with the patient lying in a prone position. This position is also conducive to patient comfort and may reduce the chance of a vasovagal response.

Required equipment includes alcohol swabs; gloves; a 22- to 25-gauge, 1.5-inch needle; a 3 to 10 mL syringe (depending on how many MTrPs are being treated); and lidocaine 1% to 2% without epinephrine. A 1.5-inch needle should be sufficient for treatment of most upper torso injection sites; a longer needle (2 to 2.5 inches)

can be considered for deeper muscles, such as the lumbar spine muscles, glutes, or muscles of the legs.[7]

Technique

A step-by-step guide to TPI administration follows.

1. Apply gloves and cleanse the treatment area with alcohol.
2. Pinch or immobilize the MTrP with your nondominant hand. If pinching is not an option, the MTrP can be stabilized by putting one finger on either side and applying gentle downward pressure.
3. With consideration for the surrounding structures and for avoidance of any nearby organs (for example, lungs if injecting upper back), insert the needle at a 30- to 45-degree angle, advance to the depth of the MTrP, aspirate to confirm no vascularity, and then inject a small amount of lidocaine.
4. Withdraw the needle slightly and redirect it following a fan-like pattern, injecting lidocaine into each quadrant of the MTrP, totaling 1 mL or less per MTrP.
5. Once complete, withdraw the needle and apply an adhesive bandage as needed.

Postprocedure care

Patients should be instructed to avoid direct massage and strenuous exercises involving the treated muscles for 24 to 48 hours; however, active full range of motion stretching of the treated muscles is encouraged. Patients should be informed that they may have some postinjection soreness and can apply ice to the affected area(s) if needed. Educate patients on signs and symptoms of infection such as redness, swelling, fever, or chills, and advise them to seek medical reevaluation if these symptoms occur.

Repeat procedures

MTrPs may need more than one injection for resolution. TPIs can be repeated as often as every 3 to 4 days for a series of treatments.[7] The retreatment timeline can be adjusted depending on patient response. For example, after a series of treatments every 3 to 4 days, if the patient is achieving sustained relief but symptoms are returning after 1 to 2 weeks, then the next treatment could be extended to 1 or 2 weeks rather than 3 to 4 days later. If the patient is not achieving sustained relief after several treatments, alternative or additional treatment strategies may need to be considered.

Applicable ICD-10-CM and CPT codes

Applicable International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnostic codes include M79.1 (myalgia), M54.2 (cervicalgia), M54.5 (low back pain), and M54.6 (pain in thoracic spine). Applicable Current Procedural Terminology (CPT) codes include 20552 (TPI, 1 or 2 muscles) and 20553 (TPI, 3 or more muscles).

Clinician resources

For additional training and continuing education on TPIs, resources for NPs are available from several organizations, including the American Academy of Procedural Medicine, American College of Emergency Physicians, American Society for Pain Management Nursing, and American Association of Nurse Practitioners.

Implications for practice

MPS is a common cause of both acute and chronic musculoskeletal pain. Pain accounts for nearly 78% of visits to the ED, and of these visits, it is unknown how many are secondary to MPS because the condition is commonly misdiagnosed or underdiagnosed.[25] It is theorized that one reason MPS is underdiagnosed is due to the lack of established diagnostic criteria.

In existing studies of dry needling and/or TPI in the presence of MPS, a common theme centers on the difficulty providers face in detecting MTrPs successfully and consistently. Lew and colleagues found interexaminer agreement on the location of MTrPs in only 21% of cases.[26] Additional research found that providers mislocated MTrPs in the upper trapezius by an average of 3.3 to 3.6 cm.[3] This variability proves that NPs and other healthcare providers need additional training and education on diagnosing MPS and on locating and effectively injecting an MTrP.

Conclusion

Primary care NPs, with proper education and training, can successfully treat MPS and MTrPs in their practice without the need for specialty referral or transfer to the ED. This article is intended to provide guidance for primary care providers in diagnosing MPS, treating MTrPs, and locating additional resources and tools for use in establishing these services within their practice. It also offers an overview of noninvasive and invasive treatment options available to NPs in managing patients with MPS, with a more in-depth review of TPI as the current gold standard for treatment.

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