

Trigger Points: Diagnosis and Management

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Trigger points are discrete, focal, hyperirritable spots located in a taut band of skeletal muscle. They produce pain locally and in a referred pattern and often accompany chronic musculoskeletal disorders. Acute trauma or repetitive microtrauma may lead to the development of stress on muscle fibers and the formation of trigger points. Patients may have regional, persistent pain resulting in a decreased range of motion in the affected muscles. These include muscles used to maintain body posture, such as those in the neck, shoulders, and pelvic girdle. Trigger points may also manifest as tension headache, tinnitus, temporomandibular joint pain, decreased range of motion in the legs, and low back pain. Palpation of a hypersensitive bundle or nodule of muscle fiber of harder than normal consistency is the physical finding typically associated with a trigger point. Palpation of the trigger point will elicit pain directly over the affected area and/or cause radiation of pain toward a zone of reference and a local twitch response. Various modalities, such as the Spray and Stretch technique, ultrasonography, manipulative therapy and injection, are used to inactivate trigger points. Trigger-point injection has been shown to be one of the most effective treatment modalities to inactivate trigger points and provide prompt relief of symptoms. (Am Fam Physician 2002;65:653-60. Copyright© 2002 American Academy of Family Physicians.)

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About 23 million persons, or 10 percent of the U.S. population, have one or more chronic disorders of the musculoskeletal system.¹ Musculoskeletal disorders are the main cause of disability in the working-age population and are among the leading causes of disability in other age groups.² Myofascial pain syndrome is a common painful muscle disorder caused by myofascial trigger points.³ This must be differentiated from fibromyalgia syndrome, which involves multiple tender spots or tender points.³ These pain syndromes are often concomitant and may interact with one another.

Trigger points are discrete, focal, hyperirri-

table spots located in a taut band of skeletal muscle. The spots are painful on compression and can produce referred pain, referred tenderness, motor dysfunction, and autonomic phenomena.⁴

Trigger points are classified as being active or latent, depending on their clinical characteristics.⁵ An active trigger point causes pain at rest. It is tender to palpation with a referred pain pattern that is similar to the patient's pain complaint.^{3,5,6} This referred pain is felt not at the site of the trigger-point origin, but remote from it. The pain is often described as spreading or radiating.⁷ Referred pain is an important characteristic of a trigger point. It differentiates a trigger point from a tender point, which is associated with pain at the site of palpation only (*Table 1*).⁸

A latent trigger point does not cause spontaneous pain, but may restrict movement or cause muscle weakness.⁶ The patient presenting with muscle restrictions or weakness may become aware of pain originating from a latent trigger point only when pressure is applied directly over the point.⁹

Moreover, when firm pressure is applied over the trigger point in a snapping fashion perpendicular to the muscle, a "local twitch response" is often elicited.¹⁰ A local twitch response is defined as a transient visible or palpable contraction or dimpling of the mus-

TABLE 1
Trigger Points vs. Tender Points

<i>Trigger points</i>	<i>Tender points</i>
Local tenderness, taut band, local twitch response, jump sign	Local tenderness
Singular or multiple	Multiple
May occur in any skeletal muscle	Occur in specific locations that are symmetrically located
May cause a specific referred pain pattern	Do not cause referred pain, but often cause a total body increase in pain sensitivity

cle and skin as the tense muscle fibers (taut band) of the trigger point contract when pressure is applied. This response is elicited by a sudden change of pressure on the trigger point by needle penetration into the trigger point or by transverse snapping palpation of the trigger point across the direction of the taut band of muscle fibers. Thus, a classic trigger point is defined as the presence of discrete focal tenderness located in a palpable taut band of skeletal muscle, which produces both referred regional pain (zone of reference) and a local twitch response. Trigger points help define myofascial pain syndromes.

Tender points, by comparison, are associated with pain at the site of palpation only, are

not associated with referred pain, and occur in the insertion zone of muscles, not in taut bands in the muscle belly.⁸ Patients with fibromyalgia have tender points by definition. Concomitantly, patients may also have trigger points with myofascial pain syndrome. Thus, these two pain syndromes may overlap in symptoms and be difficult to differentiate without a thorough examination by a skilled physician.

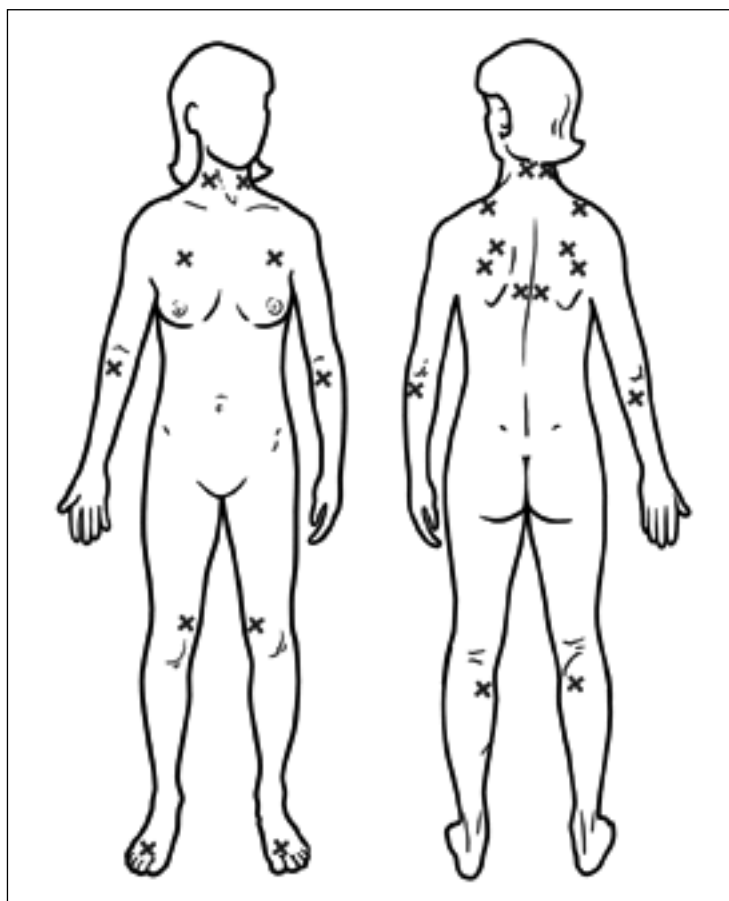
Pathogenesis

There are several proposed histopathologic mechanisms to account for the development of trigger points and subsequent pain patterns, but scientific evidence is lacking. Many researchers agree that acute trauma or repetitive microtrauma may lead to the development of a trigger point. Lack of exercise, prolonged poor posture, vitamin deficiencies, sleep disturbances, and joint problems may all predispose to the development of microtrauma.⁵ Occupational or recreational activities that produce repetitive stress on a specific muscle or muscle group commonly cause chronic stress in muscle fibers, leading to trigger points. Examples of predisposing activities include holding a telephone receiver between the ear and shoulder to free arms; prolonged bending over a table; sitting in chairs with poor back support, improper height of arm rests or none at all; and moving boxes using improper body mechanics.¹¹

Acute sports injuries caused by acute sprain or repetitive stress (e.g., pitcher's or tennis elbow, golf shoulder), surgical scars, and tissues under tension frequently found after spinal surgery and hip replacement may also predispose a patient to the development of trigger points.¹²

Clinical Presentation

Patients who have trigger points often report regional, persistent pain that usually results in a decreased range of motion of the muscle in question. Often, the muscles used to maintain body posture are affected, namely



ILLUSTRATIONS BY RENEE L. CANNON

FIGURE 1. Most frequent locations of myofascial trigger points.

the muscles in the neck, shoulders, and pelvic girdle, including the upper trapezius, scalene, sternocleidomastoid, levator scapulae, and quadratus lumborum.¹³ Although the pain is usually related to muscle activity, it may be constant. It is reproducible and does not follow a dermatomal or nerve root distribution. Patients report few systemic symptoms, and associated signs such as joint swelling and neurologic deficits are generally absent on physical examination.¹⁴

In the head and neck region, myofascial pain syndrome with trigger points can manifest as tension headache, tinnitus, temporomandibular joint pain, eye symptoms, and torticollis.¹⁵ Upper limb pain is often referred and pain in the shoulders may resemble visceral pain or mimic tendonitis and bursitis.^{5,16} In the lower extremities, trigger points may involve pain in the quadriceps and calf muscles and may lead to a limited range of motion in the knee and ankle. Trigger-point

hypersensitivity in the gluteus maximus and gluteus medius often produces intense pain in the low back region.¹⁵ Examples of trigger-point locations are illustrated in *Figure 1*.¹⁶

Evaluation

Palpation of a hypersensitive bundle or nodule of muscle fiber of harder than normal consistency is the physical finding most often associated with a trigger point.¹⁰ Localization of a trigger point is based on the physician's sense of feel, assisted by patient expressions of pain and by visual and palpable observations of local twitch response.¹⁰ This palpation will elicit pain over the palpated muscle and/or cause radiation of pain toward the zone of reference in addition to a twitch response. The commonly encountered locations of trigger points and their pain reference zones are consistent.⁸ Many of these sites and zones of referred pain have been illustrated in *Figure 2*.¹⁰

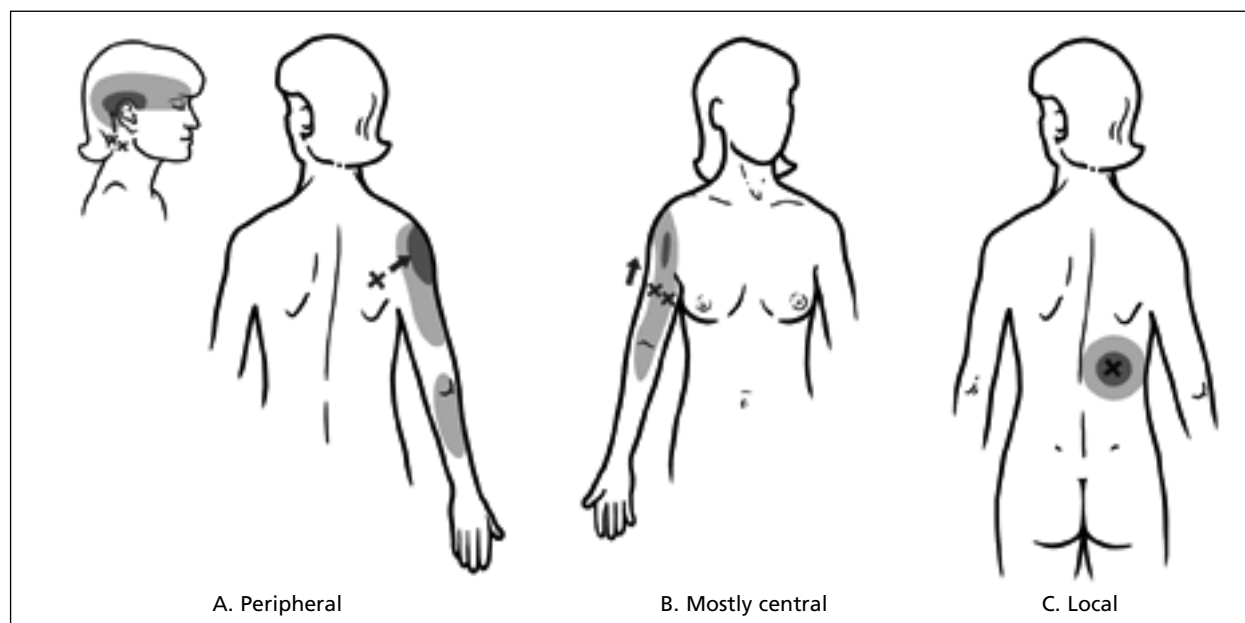


FIGURE 2. Examples of the three directions in which trigger points (Xs) may refer pain (red). (A) Peripheral projection of pain from suboccipital and infraspinatus trigger points. (B) Mostly central projection of pain from biceps brachii trigger points with some pain in the region of the distal tendinous attachment of the muscle. (C) Local pain from a trigger point in the serratus posterior inferior muscle.

No specific laboratory test, imaging study, or interventional modality such as electromyography or muscle biopsy has been established for diagnosing trigger points.

No laboratory test or imaging technique has been established for diagnosing trigger points.⁹ However, the use of ultrasonography, electromyography, thermography, and muscle biopsy has been studied.

Management

Predisposing and perpetuating factors in chronic overuse or stress injury on muscles must be eliminated, if possible. Pharmacologic treatment of patients with chronic musculoskeletal pain includes analgesics and medications to induce sleep and relax muscles. Antidepressants, neuroleptics, or nonsteroidal anti-inflammatory drugs are often prescribed for these patients.¹

Nonpharmacologic treatment modalities include acupuncture, osteopathic manual medicine techniques, massage, acupressure, ultrasonography, application of heat or ice, diathermy, transcutaneous electrical nerve stimulation, ethyl chloride Spray and Stretch technique, dry needling, and trigger-point injections with local anesthetic, saline, or steroid. The long-term clinical efficacy of various therapies is not clear, because data that incorporate pre- and post-treatment assessments with control groups are not available.

The Spray and Stretch technique involves passively stretching the target muscle while simultaneously applying dichlorodifluoromethane-trichloromonofluoromethane (Fluori-Methane) or ethyl chloride spray topically.⁵ The sudden drop in skin temperature is thought to produce temporary anesthesia by blocking the spinal stretch reflex and the sensation of pain at a higher center.^{5,10} The decreased pain sensation allows the muscle to be passively stretched toward normal length,

which then helps to inactivate trigger points, relieve muscle spasm, and reduce referred pain.⁵

Dichlorodifluoromethane-trichloromonofluoromethane is a nontoxic, nonflammable vapor coolant spray that does not irritate the skin but is no longer commercially available for other purposes because of its effect in reducing the ozone layer. However, its use is safer for both patient and physician than the original volatile vapor coolant, ethyl chloride. Ethyl chloride is a rapid-acting general anesthetic that becomes flammable and explosive when 4 to 15 percent of the vapor is mixed with air.¹⁰ Nevertheless, ethyl chloride remains a popular agent because of its local anesthetic action and its greater cooling effect than that of dichlorodifluoromethane-trichloromonofluoromethane.⁵

The decision to treat trigger points by manual methods or by injection depends strongly on the training and skill of the physician as well as the nature of the trigger point itself.¹⁰ For trigger points in the acute stage of formation (before additional pathologic changes develop), effective treatment may be delivered through physical therapy. Furthermore, manual methods are indicated for patients who have an extreme fear of needles or when the trigger point is in the middle of a muscle belly

TABLE 2
**Equipment Needed for
Trigger-Point Injection**

Rubber gloves
Gauze pads
Alcohol pads for cleansing skin
3- or 5-mL syringe
Lidocaine (Xylocaine, 1 percent, without epinephrine) or procaine (Novocain, 1 percent)
22-, 25-, or 27-gauge needles of varying lengths, depending on the site to be injected
Adhesive bandage

Information from references 10 and 18.

TABLE 3
Contraindications to Trigger-Point Injection

Anticoagulation or bleeding disorders
Aspirin ingestion within three days of injection
The presence of local or systemic infection
Allergy to anesthetic agents
Acute muscle trauma
Extreme fear of needles

Information from references 10 and 18.

not easily accessible by injection (i.e., psoas and iliacus muscles).¹⁰ The goal of manual therapy is to train the patient to effectively self-manage the pain and dysfunction. However, manual methods are more likely to require several treatments and the benefits may not be as fully apparent for a day or two when compared with injection.¹⁰

While relatively few controlled studies on trigger-point injection have been conducted, trigger-point injection and dry needling of trigger points have become widely accepted. This therapeutic approach is one of the most effective treatment options available and is cited repeatedly as a way to achieve the best results.⁵

Trigger-point injection is indicated for patients who have symptomatic active trigger points that produce a twitch response to pressure and create a pattern of referred pain. In comparative studies,¹⁷ dry needling was found to be as effective as injecting an anesthetic solution such as procaine (Novocain) or lidocaine (Xylocaine).¹⁰ However, post-injection soreness resulting from dry needling was found to be more intense and of longer duration than the soreness experienced by patients injected with lidocaine.¹⁰

One noncontrolled study¹⁷ comparing the use of dry needling versus injection of lidocaine to treat trigger points showed that 58 percent of patients reported complete relief of pain immediately after trigger-point injection and the remaining 42 per-

Injection with lidocaine has been shown to be effective in patients who have symptomatic active trigger points that produce a twitch response to pressure and create a pattern of referred pain.

cent of patients claimed that their pain was minimal (1-2/10) on the pain scale. Both dry needling and injection with 0.5 percent lidocaine were equally successful in reducing myofascial pain. Postinjection soreness, a different entity than myofascial pain, often developed, especially after use of the dry needling technique.¹⁷ These results support the opinion of most researchers that the critical therapeutic factor in both dry needling and injection is mechanical disruption by the needle.^{1,10}

TECHNIQUE OF TRIGGER-POINT INJECTION

Trigger-point injection can effectively inactivate trigger points and provide prompt, symptomatic relief. *Table 2*^{10,18} outlines the necessary equipment for trigger-point injection. Contraindications to trigger-point injection are listed in *Table 3*^{10,18} and possible complications are outlined in *Table 4*.

Preinjection. Increased bleeding tendencies should be explored before injection. Capillary hemorrhage augments postinjection soreness and leads to unsightly ecchymosis.¹⁰ Patients

TABLE 4
Complications of Trigger-Point Injections

Vasovagal syncope
Skin infection
Pneumothorax; avoid pneumothorax complications by never aiming a needle at an intercostal space.
Needle breakage; avoid by never inserting the needle to its hub.
Hematoma formation; avoid by applying direct pressure for at least two minutes after injection.

should refrain from daily aspirin dosing for at least three days before injection to avoid increased bleeding.

The patient should be placed in a comfortable or recumbent position to produce muscle relaxation. This is best achieved by positioning the patient in the prone or supine position. This positioning may also help the patient to avoid injury if he or she has a vasovagal reaction.¹⁸

Needle Selection. The choice of needle size depends on the location of the muscle being injected. The needle must be long enough to reach the contraction knots in the trigger point to disrupt them. A 22-gauge, 1.5-inch needle is usually adequate to reach most superficial muscles. For thick subcutaneous muscles such as the gluteus maximus or paraspinal muscles in persons who are not obese, a 21-gauge, 2.0-inch needle is usually necessary.¹⁰ A 21-gauge, 2.5-inch needle is required to reach the deepest muscles, such as the gluteus minimus and quadratus lumborum, and is available as a hypodermic needle. Using a needle with a smaller diameter may cause less discomfort; however, it may provide neither the required mechanical disruption of the trigger point nor adequate sensitivity to the physician when penetrating the overlying skin and subcutaneous tissue. A needle with a smaller gauge may also be

deflected away from a very taut muscular band, thus preventing penetration of the trigger point. The needle should be long enough so that it never has to be inserted all the way to its hub, because the hub is the weakest part of the needle and breakage beneath the skin could occur.⁶

Injection Solutions. An injectable solution of 1 percent lidocaine or 1 percent procaine is usually used. Several other substances, including diclofenac (Voltaren), botulinum toxin type A (Botox), and corticosteroids, have been used in trigger-point injections. However, these substances have been associated with significant myotoxicity.^{10,19} Procaine has the distinction of being the least myotoxic of all local injectable anesthetics.¹⁰

Injection Technique. Once a trigger point has been located and the overlying skin has been cleansed with alcohol, the clinician isolates that point with a pinch between the thumb and index finger or between the index and middle finger, whichever is most comfortable (*Figures 3a and 3b*). Using sterile technique, the needle is then inserted 1 to 2 cm away from the trigger point so that the needle may be advanced into the trigger point at an acute angle of 30 degrees to the skin. The stabilizing fingers apply pressure on either side of the injection site, ensuring adequate tension of the muscle fibers to allow penetration of the trigger point but preventing it from rolling away from the advancing needle.¹⁰ The application of pressure also helps to prevent bleeding within the subcutaneous tissues and the subsequent irritation to the muscle that the bleeding may produce. The serious complication of pneumothorax can be avoided by refraining from aiming the needle at an intercostal space.

Before advancing the needle into the trigger point, the physician should warn the patient of the possibility of sharp pain, muscle twitching, or an unpleasant sensation as the needle contacts the taut muscular band.¹⁷ To ensure that the needle is not within a blood vessel, the plunger should be withdrawn before

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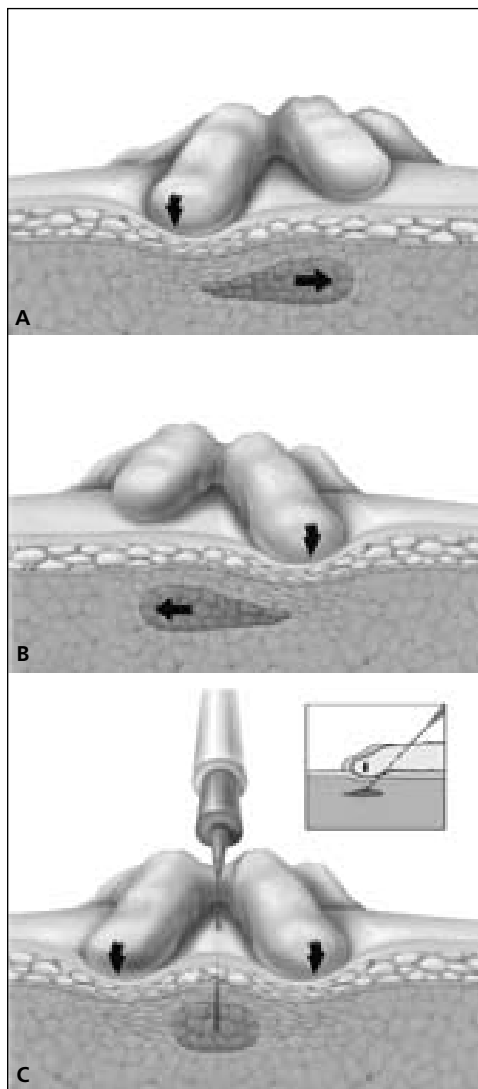


FIGURE 3. Cross-sectional schematic drawing of flat palpation to localize and hold the trigger point (dark red spot) for injection. (A, B) Use of alternating pressure between two fingers to confirm the location of the palpable nodule of the trigger point. (C) Positioning of the trigger point halfway between the fingers to keep it from sliding to one side during the injection. Injection is away from fingers, which have pinned down the trigger point so that it cannot slide away from the needle. Dotted outline indicates additional probing to explore for additional adjacent trigger points. The fingers are pressing downward and apart to maintain pressure for hemostasis.

The needle should be inserted 1 to 2 cm away from the trigger point and slowly advanced at a 30-degree angle to the skin into the area of pain.

injection. A small amount (0.2 mL) of anesthetic should be injected once the needle is inside the trigger point. The needle is then withdrawn to the level of the subcutaneous tissue, then redirected superiorly, inferiorly, laterally and medially, repeating the needling and injection process in each direction until the local twitch response is no longer elicited or resisting muscle tautness is no longer perceived (Figure 3c).¹⁰

Post-injection Management. After injection, the area should be palpated to ensure that no other tender points exist. If additional tender points are palpable, they should be isolated, needled and injected. Pressure is then applied to the injected area for two minutes to promote hemostasis.¹⁰ A simple adhesive bandage is usually adequate for skin coverage.

One study²⁰ emphasizes that stretching the affected muscle group immediately after injection further increases the efficacy of trigger point therapy. Travell recommends that this is best performed by immediately having the patient actively move each injected muscle through its full range of motion three times, reaching its fully shortened and its fully lengthened position during each cycle.¹⁰

Postinjection soreness is to be expected in most cases, and the patient's stated relief of the referred pain pattern notes the success of the injection. Re-evaluation of the injected areas may be necessary, but reinjection of the trigger points is not recommended until the postinjection soreness resolves, usually after three to four days. Repeated injections in a particular muscle are not recommended if two or three previous attempts have been unsuccessful. Patients are encouraged to remain active, putting muscles through their full range of motion in the week following

trigger-point injections, but are advised to avoid strenuous activity, especially in the first three to four days after injection.¹⁰

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