Myofascial pain syndrome (MPS) is a musculoskeletal pain disorder with a high prevalence in low back pain complaints. However, because of its complex and confusing nature, MPS is commonly misdiagnosed and overlooked by clinicians who are unfamiliar with this pain syndrome. However, with proper knowledge, MPS can be identified and effectively treated. This article discusses the current diagnostic and treatment modalities regarding MPS in the low back.

**Keywords** myofascial pain syndrome, low back pain, diagnosis, evaluation, multidisciplinary treatment

Before discussing the diagnosis and treatment of myofascial pain syndrome (MPS) in the low back, it is important to define a pain syndrome in general. A pain syndrome can be defined as neurogenic, musculoskeletal, sympathetic, visceral, or psychogenic in origin. Pain can be acute (having been present for only a short time) or chronic (having been present for a month or more). Treatment and outcome vary between acute and chronic pain. Most of the literature on MPS in the lower back focuses on chronic pain conditions; however, if the syndrome is diagnosed early and is treated properly, it can be reversible.

**Myofascial Pain Syndrome (MPS)**

MPS is defined as a musculoskeletal pain disorder caused by one or more myofascial trigger points (TPs) and their associated reflexes. MPS typically involves myofascial TPs found within the belly muscle of 1 or more muscles or muscle groups but also can be found in ligaments, peristium, sar tissue, skin, and tendons. MPS may be the most common cause of persistent musculoskeletal pain, including chronic low-back, head, neck, and shoulder pain. This syndrome also is associated with other chronic pain conditions, such as osteoarthritis, rheumatoid arthritis, migraine and tension-type headaches, complex regional pain syndrome, and whip-lash-associated disorders. MPS can be primary (unrelated to medical condition) or secondary (related to other medical conditions) in origin, and determining which type is occurring is vital to proper treatment.

Trauma (direct and indirect) and repetitive muscle strain are common causes of MPS. An estimated 44 million Americans suffer from myofascial pain, and MPS may account for 30% to 93% of the patients presenting with musculoskeletal pain at general medical clinics and specialty pain management centers. Despite the prevalence of MPS, debate and controversy continue to surround its "validity" as a pain syndrome. This debate has, to some extent, hindered the development of clinical diagnostic criteria for MPS. However, pain specialties continue to widely recognize MPS as being clinically useful.

Unfortunately, the subtle complexities and indefinite pathologic criteria of MPS have led to some confusion and misinterpretation in the clinical setting. The term "myofascial pain syndrome" has been used mistakenly to refer to any regional muscle pain syndrome originating in soft tissue. MPS also has been confused for and misdiagnosed as fibromyalgia, another common pain syndrome. Despite sharing some similarities, it is generally agreed that MPS and fibromyalgia are distinctly different pain syndromes. The 2 pain syndromes may be differentiated by several criteria (see Table 1). However, the notable difference between the 2 is with regard to regional pain (MPS) and generalized pain (fibromyalgia), as well as trigger points (MPS) and tender points (fibromyalgia). Indeed, the presence of myofascial TPs is characteristic to the identification of
Palpation of myofascial TPs will produce or cle that are detectable through palpatory examina-sensitivity located in taut, “rope-like” bands of skeletal mus-

Myofascial TPs are small (2 mm to 5 mm in diameter) nodules of hyper-
can be made if only a few of the characteristics are present.

Skin. More commonly, the patient will flinch away from the may provoke an involuntary twitch in the muscle and/or

tationally, “snapping” palpation or needling of a myofascial TP

patient. Pain will be referred to distal or proximal
referred pain, will experience deep pain ranging in intensity
as “spreading” or “radiating” and reproduces the patient’s
pain complaint.24 Jump sign and local twitch response will
also be present.3,6,24,30 There can be a reduction in range of
motion (ROM) and strength, as well as autonomic phenom-
ena.3,6,15 Latent myofascial trigger points are not associated
with spontaneous pain but are tender to palpation.1,24,30 They
can be inactive for years, precipitated by previous muscular
injury.8 Muscle shortening and weakness, stiffness, and re-
stricted ROM are present with latent TPs.24,30 Unlike active
TPs, latent TPs usually do not require treatment unless acti-
vated by mechanical overload, stress, and prolonged muscle
shortening.30

Three other classifications are used to define myofascial

<table>
<thead>
<tr>
<th>Major Criteria (requires all five be present)</th>
<th>Minor Criteria (requires one of five be present)</th>
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<tr>
<td>a. Regional pain complaint</td>
<td>a. Reproducibility of clinical pain complaint through pressure on tender spot (trigger point)</td>
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<tr>
<td>b. Pain complaint or altered sensation in the</td>
<td>b. Elicitation of a local twitch response by transverse snapping palpation at tender spot or by needle insertion into the tender spot in the taut band</td>
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<td>expected distribution of a referred pain from a myofascial trigger point</td>
<td>c. Pain alleviated by stretching (elongating) the muscle or through injection at the tender spot</td>
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<td>c. Taut band present in a palpable band of accessible muscle</td>
<td>d. Patient exhibits “jump” sign when pressure is applied to the tender spot</td>
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<tr>
<td>d. Exquisite point of tenderness at one or more points in the taut band</td>
<td>e. Trigger point occurs in a classic location</td>
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TPs: primary, secondary, and satellite. Primary myofascial TPs develop independently through acute or chronic overload or repetitive overuse of the muscle in which it occurs but not as the result of trigger-point activity in another muscle. Secondary myofascial TPs develop in antagonist or synergist muscle or fascia because of overloading and stress caused by the muscle containing the primary TP. Patients commonly develop secondary TPs after the primary TP is eliminated. Satellite myofascial TP can develop in muscles or fascia located in the area of referred pain. They are activated mechanically or neurogenically by activity of a key myofascial TP. Multiple myofascial TPs may result from the development of secondary and satellite TPs. Recent research may indicate that secondary and satellite myofascial TPs may be synonymous, with “satellite” currently being the prefer terminology. Understanding of the different classifications for myofascial TPs, particularly primary TPs, is necessary for proper diagnosis and treatment.

**Pathogenesis**

With little available scientific research to support a proper determination, the exact pathogenesis of active and latent myofascial TPs remains unclear. However, several histopathologic mechanisms to TP development have been suggested. Muscle overload, acute trauma, and microtrauma generally are agreed to be the most likely causes of myofascial TP development. Other causes may include muscle deficiency, joint dysfunction, sleep disorders, postural dysfunction, systemic influences, and neurologic influences. The most common cause of TP formation is occupational and recreational activity that produce repetitive stress on 1 or muscles or muscle groups. In the low back, myofascial TP formation may occur because of “structural inadequacies,” such as small hemipelvis, short leg or arm, and short first and long second metatarsal bones.

Women are significantly more likely to suffer from myofascial TPs as compared with men; the ratio is possibly as high as 3:1. Epidemiologic studies have shown that women ages 30 to 49 are more likely to exhibit myofascial TPs than laborers. Studies suggest that MPS is the most common cause of chronic low back pain, with 60% to 97% of patients examined exhibiting myofascial abnormalities. This high prevalence of MPS indicates the need for a proper diagnostic approach when examining a patient suffering from low back pain with no identifiable organic cause to avoid misdiagnosis.

**Clinical Evaluation of MPS in the Low Back**

Low back pain is one of the most common pain syndromes, ranking just below headache in prevalence. Despite its common occurrence, low back pain frequently is misdiagnosed in the clinical setting. A serious problem clinicians face in treating this pain syndrome is that many patients suffering low back pain do not exhibit readily apparent neurologic dysfunction despite the obvious presence of persistent regional pain. Laboratory testing, such as x-ray and magnetic resonance imaging, will reveal little, which may further the confusion if the diagnosis is being made by a clinician other than a pain specialist. Low back pain of ambiguous nature may be MPS. However, physicians commonly ignore or miss significant diagnostic criteria attributable to myofascial TPs, such as restricted ROM and spots of hyperirritability. For this reason, physicians should perform a soft tissue examination, specifically geared to the assessment of MPS, for all patients with persistent pain to properly identify possible myofascial and musculoskeletal abnormalities. Undiagnosed MPS may also lead to further pain complications, including the formation of other secondary myofascial TPs and fibrotic changes within the TP.

**Diagnosis**

A proper clinical diagnosis of the MPS patient with low back pain should consist of 3 key elements: history, physical examination, and diagnostic study of perpetuating factors. Of importance is the determination if the MPS is
primary (not related to other medical conditions) or secondary (related to other medical conditions) in nature. These findings will dictate subsequent treatment and the possible need for additional modalities.

**History**

An evaluation should begin with the patient’s complete personal and family history, including medical and surgical history. This is followed by a detailed history of the current low back pain complaint. The practitioner should focus the inquiries around 3 key points: characteristics of pain, history of onset, and possible contributing causes. The patient should indicate where the area of pain is located, as well as its severity rating on a scale of 0 to 10 or by grade of severity from mild to severe. Patients also should describe the pain’s nature (constancy, type, sources of relief, reaction to activity and rest). Illustrating the patient’s pain pattern(s) is vital to proper diagnosis of MPS and, therefore, it is strongly indicated that the patient draw their pain pattern on a body form (see Fig. 2). This illustration should also show the location of different sensations, such as ache, needles, and numbness. In this fashion, the practitioner will be able to track referred pain patterns more precisely and compare them to MPS pain patterns associated with specific muscles and muscle groups.

The clinical review should conclude with a history of onset and review of contributing causes. The patient may be vague or confused with regard to the pain’s onset. Many patients do not understand the nature of referred pain and myofascial TPs and may not associate seemingly unrelated events or trauma with the development of a pain complaint. Indeed, many will actually find it hard to believe that pain can be referred from a source 1 to 3 feet away from the complaint. Myofascial TPs may develop over a prolonged period of time, adding to further confusion. For this reason, it is important for the practitioner to explain the nature of referred pain to the patient, as well as conduct a detailed history of their recreational and occupational activities. The clinical review can determine contributing causes of myofascial TPs, such as microtrauma from athletic and occupational activities. Microtraumas are commonly caused by stress on the muscle from high-velocity and repetitive movements or by maintaining stress positions (poor posture). Emotional stress and tension, trauma and surgical procedures, and sleep disorders are other contributing causes. The data collected can be used by the practitioner during the physical examination.

**Physical Examination**

The physical examination for myofascial TPs is conducted to ascertain the clinical criteria of MPS (see Table 2). Proper training and/or supervision by an MPS expert are essential during this time to achieve proper evaluation of the outlined criteria. For a clinical diagnosis of MPS, the patient must exhibit all 5 major criteria and at least 1 minor criteria. The clinical criteria for myofascial TPs detailed in Table 3 also can be used for confirmatory purposes.

The physical examination should begin with a general observation of the patient to determine any abnormalities in algometry, gait, muscles strength, muscle tension, posture, or ROM, specifically in the trunk, thighs, and legs. Denervation, muscle weakness, and restricted ROM may indicate the presence of myofascial TPs in affected muscles or muscle groups.

This visual evaluation is then followed by a physical and systematic search for myofascial TPs through palpation.
Myofascial pain syndrome and low back pain

Table 3 Clinical Characteristics of Myofascial Trigger Points

- Taut band palpable (if muscle accessible)
- Focal exquisite spot tenderness of a nodule in a taut band
- Painful exquisite spot tenderness of a nodule in a taut band
- Patient’s recognition of current pain complaint by pressure on the tender nodule (identifies as a trigger point)
- Referred pain to a regional site upon trigger point activation
- Reproducibility of pain complaints
- Presence of taut band
- Visual or tactile identification of local twitch response on trigger point activation
- Pain or altered sensation on compression of tender nodule
- Muscle weakness without muscle atrophy
- Jump sign
- Symptoms of autonomic dysfunction (eg, sweating, localized vasoconstriction, pilomotor activity, etc)

Previously acquired information of the patient’s pain patterns will help in this search by determining which muscles and muscle groups should be examined. Myofascial TPs commonly appear in muscular structures used for posture maintenance. In the instance of low back pain, specific muscles have been identified as containing myofascial TPs (see Table 4). Each exhibiting common pain patterns. Of these, quadratus lumborum, used for trunk stabilization and posture, is most common source of myofascial pain but also is the most overlooked. Myofascial TPs involving the piriformis, the posterior superior iliac spine, the iliac crest, and the posterior sacroiliac line are other common sources of low back pain.

The patient should be positioned so that the back, buttocks, and thigh muscles are relaxed. If the muscle is tense or in spasm, the physician must wait before proceeding as myofascial TPs cannot be detected during this time. Palpation should begin in the region of suspected TPs, using either the flat, pincer, or deep (probing) techniques. Probing palpation is indicated for the evaluation of myofascial low back pain due to the deep nature of the muscles typically involved (eg, piriformis and quadratus lumborum). Flat palpation may be used for more superficial muscles. The physician should forcefully and deeply palpate the muscle and surrounding area with his or her fingertip, thumb tip, or a blunt object (3 mm to 5 mm in diameter) and compare it with the contralateral muscle. He or she should also take notice of any autonomic and/or proprioceptive symptoms, such as sweating and temperature variance, in these areas. Affected muscles will contain taut fibers formed in a band among normally pliable fibers. Further palpation is then conducted along the length of the taut band(s) to locate the active myofascial TPs, which are tiny, hyperirritable knots or nodules. The patient will report pain when the myofascial TP is touched and possibly react physically and/or verbally (jump sign). The local twitch response in the muscle or skin may be elicited by briskly rolling the taut band beneath the finger to cause a sudden pressure change. The recognizable pain will local and/or referred to another location, and reproduce the original pain complaint. The physician should then repeat this process until they have examined the patient thoroughly to determine whether the low back pain MPS is simple (single muscle involvement) or complex (multi-muscle involvement) in origin. It is important to remember that different muscles overlap and, therefore, must be examined to obtain a proper diagnosis of MPS.

Additionally, it is not uncommon that the physician may unintentionally locate latent myofascial TPs during a palpatory examination. Latent myofascial TPs can exhibit tenderness, as well as demonstrate local twitch response. The patient may be unaware of their existence, despite muscle shortening and weakness. The location of all latent myofascial TPs should be noted for later treatment.

The suspected myofascial TPs, active and latent, are marked with a skin pencil for subsequent quantification. Quantification of the myofascial TPs is conducted with a pressure threshold measurement gauge and/or thermography. This will allow the physician to locate the exact location of the point of greatest sensitivity (ie, the myofascial TP). This will provide the physician with an objective measure for diagnostic, treatment, and medicolegal purposes. It should be noted that latent myofascial TPs will exhibit a lower pressure pain threshold than active TPs.

Diagnostic Study of Perpetuating Factors

Once the history and physical examination are completed, the physician should also conduct detailed evaluation of possible perpetuating factors of the MPS. Undetected, these factors can complicate treatment and/or prolong the duration of the MPS. Known perpetuating factors include biochemical, mechanical, metabolic, physiological, psychological, and infection problems. Such an evaluation is strongly indicated if appropriate treatment provides little or no pain relief from the MPS. Laboratory testing, physical examination, and personal communication with the patient are important for the detection of perpetuating factors.

Treatment

Effective treatment and management of primary and secondary MPS in the low back should (1) strive to relieve pain, (2)
return normal muscular function and range of motion, and (3) eliminate perpetuating factors.\textsuperscript{32,42} This can be accomplished through a multidisciplinary approach to pain management, especially if the myofascial pain is chronic in nature.\textsuperscript{5,8} For this reason, the physician should maintain constant contact with other specialists throughout the management process, such as anesthesiologists, physical therapists, and clinical psychologists.\textsuperscript{42} Initial pain treatment, however, should focus on interrupting the reflexive pain cycle created by myofascial TPs.\textsuperscript{8,32,42} This is accomplished by eliminating the myofascial TPs through one of several modalities, including trigger-point injection, “stretch and spray,” dry needling (acupuncture), massage/trigger-point pressure release, exercise, and pharmacologic agents.\textsuperscript{3,5,8,24,27,37,41-48}

**TP Injection**

TP injection is considered to be the most effective modality for the immediate alleviation of MPS by most clinicians.\textsuperscript{5,23,42} Myofascial TPs are eliminated by infiltration with a local anesthetic, which in turns blocks the reflex mechanisms perpetuating the syndrome and allowing the taut muscle fibers to relax. This action provides relief of the referred pain syndrome.\textsuperscript{5,24,46} For similar reasons, nerve blocks of the sensory and sympathetic fibers also can produce pain relief.\textsuperscript{46} However, the TP injection technique requires dexterity and knowledge of the patterns of myofascial pain to be successful,\textsuperscript{5,8} although the TP injection technique requires dexterity and knowledge of the patterns of myofascial pain to be successful,\textsuperscript{5,8} because “near misses” can aggravate the pain syndrome.\textsuperscript{5,32,42} TP injection is contraindicated for patients with a fear of needles, as well as for patients that are pregnant, that exhibit signs of infection, that have bleeding disorders, or that are allergic to anesthetic agents.\textsuperscript{24,44} Aspirin-like pharmaceuticals should be avoided 1 week before TP injection.\textsuperscript{5,44} Although TP injections elicit almost immediate pain relief, they should be supplemented with physical therapy and/or other modalities for long-term relief.\textsuperscript{44}

The specific procedures and requirements for trigger-point injection will depend on the low-back muscle group affected by the MPS (see Table 4). However, clinicians may use the following common methodology in each case. First, the patient must be placed in a recumbent position that also provides the clinician access to the affected muscle.\textsuperscript{42,45} The patient should be reassured and communicated with throughout the procedure to promote relaxation.\textsuperscript{44} The clinician will already have located the myofascial TPs during the diagnostic phase and marked them with a skin pencil.\textsuperscript{30,42,44} The presence of multiple myofascial TPs is common, and the physician should inject them in order, beginning with the most symptomatic.\textsuperscript{44} The skin around each insertion site is washed and sterilized to avoid infection.\textsuperscript{32,42} The myofascial TP is then confirmed through one of the 3 palpation techniques, while wearing surgical gloves to retain sterility.\textsuperscript{8,32,42} For flat palpation, the myofascial TP can be pinned for injection midway down the fingertips to prevent movement during the injection.\textsuperscript{8} Deep palpation, commonly used for identifying myofascial TPs in low back muscle (eg, quadratus lumborum), is used to identify and note the area of maximum tenderness. The injection will take place in the exact location of finger placement and directed to the point of maximum tenderness.\textsuperscript{8} The injection site may be anesthetized with vapocoolant or a preinjection block to prevent discomfort and muscle tension.\textsuperscript{44} The needle is then inserted until it encounters the myofascial TP.\textsuperscript{8,42,44} Local and/or referred pain may be experienced, in addition to a local twitch response.\textsuperscript{44} Once located, the myofascial TP is then injected with anesthetic (not beforehand).\textsuperscript{8,42,44} Injections should consist of either 0.5% procaine, 0.25% to 0.5% lidocaine, or 0.125% to 0.25% bupivacaine.\textsuperscript{44} Epinephrine should never be used to treat myofascial TPs.\textsuperscript{8,43} This technique is repeated until all identified myofascial TPs in the affect muscle have been treated.\textsuperscript{44}

**Stretch and Spray**

The “stretch and spray” technique is an noninvasive modality that requires passive stretching of the target muscle to eliminate myofascial TPs within it.\textsuperscript{5,2} The simplicity, effectiveness, and relative painlessness of this technique have led to its popularity in the clinical setting.\textsuperscript{8,32,42} The stretching motion inactivates the myofascial TPs by releasing muscle tension in the taut fibers and restoring muscle length.\textsuperscript{5,32,42,44} This reduction in muscle tension also will eliminate or reduce muscle spasm, sensitive points, and referred pain.\textsuperscript{5,44} An additional benefit is the elimination of acute and latent myofascial TPs not discovered during diagnostic palpation.\textsuperscript{5,2} For this reason, many physicians use the stretch and spray method in conjunction with trigger-point injections.\textsuperscript{8,42}

The stretch and spray technique begins by placing the patient in a relaxed and supported position.\textsuperscript{8} The target muscle, having been identified in the diagnosis phase, is anchored and then prepared for stretch.\textsuperscript{44} A stream of vapocoolant spray (eg, Fluori-Methane) is applied to the skin overlying the myofascial TP and then moved in a direction appropriate to the referred pain pattern, finally including the area of reference.\textsuperscript{8,32,42} This cold application produces a temporary anesthetic effect, allowing the muscle to be passively stretched through its range of movement. Further parallel applications of vapocoolant are applied as are required to achieve a complete stretch.\textsuperscript{8,32,42} This process is repeated 2 to 3 times until the skin becomes cold.\textsuperscript{8,42} Moist heat is subsequently applied and the muscle moved through its full, active range of motion.\textsuperscript{8} The stretch and spray technique may be repeated as required.

**Dry Needling**

Similar to trigger-point injection, dry needling and acupuncture can provide pain relief through the mechanical disruption or needle stimulation of myofascial TPs.\textsuperscript{3,8,44} An immediate anesthetic effect can be elicited through proper dry needling, also known as the needle effect.\textsuperscript{5,44} Clinical evidence shows that this effect can be as effective as TP injection with medication.\textsuperscript{5} Effective treatment requires a fine needle be precisely inserted into the myofascial TP at the point of maximum tenderness.\textsuperscript{5,8,44} This requires identification of the myofascial TP through palpation techniques similar to trigger-point injection.\textsuperscript{8}
Massage/TP Pressure Release

Myofascial TPs may form as the result of muscle fatigue, shortening, and stress caused by mechanical and psychological factors. Similar to stretching, massage therapy can release tension within the muscle fibers and break down the taut “knots” associated with myofascial TPs. This is accomplished through relaxation, endorphin release, and increasing blood flow. Typical massage techniques include stroking, kneading, and compression. Clinicians must pay special attention to the muscle groups treated with massage therapy as improper techniques can exacerbate the pain syndrome.

The TP pressure release is based on the technique of ischemic compression and can provide effective pain relief. The clinician uses palpatory pressure on each myofascial TP until a state of tension relief and, thus, inactivates the TP. Unlike ischemic compression, less pressure is used to elicit tension release, thus avoiding further complications. Both of these techniques should be used in conjunction with other modalities to effectively deactivate myofascial TPs, specifically trigger-point injection or stretch and spray.

Exercise Therapy

Myofascial stretching exercises are a vital element of any multidisciplinary, pain management regimen. There are several techniques used to treat low back pain, each designed to increase the range of motion and reduce muscle shortening in the affected muscle groups. Normal muscular activity and strength can be restored in this manner. Once normal muscular activity has been restored, a regimen of low-impact aerobic exercise (3 to 4 times per week) should be introduced into the patient’s daily life to prevent reoccurrence of the MPS and promote health. However, strenuous activity and exercise is contraindicated in the initial treatment phase of MPS.

Pharmacologic Management

Perpetuating factors, such as sleep disturbance and inadequate analgesia, may prolong the treatment of MPS. As such, the use of medications in association with other modalities is indicated for any MPS treatment regimen. Four classifications of medication are typically used in the treatment of MPS: antidepressants, nonsteroidal antiinflammatory drugs, muscle relaxants, and antiepileptic drugs. The alleviation or suppression of perpetuating factors through the administration of medications will increase the efficacy of other modalities and speed the recovery process.

Conclusion

Low back pain caused by myofascial TPs has become an increasingly common problem exhibited by patients in the clinical setting. However, properly recognized, this complex pain syndrome may be effectively and readily treated. The key to this effective treatment lies on the clinician’s understanding of the referred pain patterns caused by myofascial TPs and how they are deactivated. Eleven muscles have known involvement in low back pain, with the quadratus lumborum being the most common in all pain complaints. Diagnosis and treatment should focus on these muscular regions. Trigger-point injection and stretch and spray techniques are the most effective methods to deactivate and, thus, treat myofascial TPs. Other modalities with accelerate pain relief.

References