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The Management for Myofascial Trigger Points

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Myofascial pain syndrome is very common in clinical practice. It is characterized by the existence of myofascial trigger points (MTrPs), which is a hypersensitive spot in a taut band of skeletal muscle fibers. In general, active MTrPs should be treated conservatively (non-invasive treatments including physical therapy) prior to the consideration of aggressive therapy (invasive treatments including injection and surgery). The most important strategy of MTrP therapy is to find out the etiological lesion that causes the activation of MTrPs and to treat the underlying pathology. If the treatment of underlying etiological lesion is not appropriate, the MTrP cannot be inactivated completely, or can only be temporarily inactivated. In this article, we reviewed various methods of physical therapy for MTrPs based on the literature and our clinical experiences. These treatments included mechanical approach (manual therapy, spray and stretch, massage, manipulation, dry needling, therapeutic exercise, etc.), thermotherapy, cryotherapy, electrotherapy, and laser therapy. Combination of two or more methods listed above is commonly used in clinical practice. The basic principle and clinical application for each treatment were also discussed. (J Rehab Med Assoc ROC 2003; 31(2): 67 - 77)

Key words: myofascial pain syndrome, myofascial trigger point, physical therapy, manual therapy, massage, stretch

INTRODUCTION

Pain in the soft tissue, including myofascial pain, is very common in clinical practice. One of the most important treatment programs in pain control is inactivation of the active myofascial trigger points (MTrPs), since MTrPs are the major source of chronic muscle pain. An MTrP is a hypersensitive spot in a taut band of skeletal

muscle fibers. An MTrP can be found in any normal skeletal muscle which is tender without spontaneous pain; it is an latent MTrP. MTrP is always found in the endplate zone.^[1-15] There are multiple active MTrP loci in an MTrP region. An MTrP locus consists of two components: the sensitive locus and the active locus.^[4-8,10] A sensitive locus is a sensitized nerve ending, while an active locus is a dysfunctional endplate with excessive acetylcholine leakage.^[4-6,8,10,16,17] The excessive acetylcholine leakage

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would cause contracture of muscle fibers, and subsequently becomes a taut band.^[14] Clinically, compression on the MTrP can cause pain. If the pressure is increased, it may also elicit referred pain. If the pressure is applied rapidly on the MTrP and across the muscle fibers in a perpendicular direction, a brisk rapid contraction of muscle fibers, local twitch response (LTR) in the taut band may be elicited.^[7]

Active MTrPs (MTrPs with spontaneous pain) are activated from latent MTrPs secondary to neuromusculoskeletal lesions. It rarely occurs as a consequence of primary muscle lesion.^[3,6-8] Active MTrPs are painful to avoid movements that may interfere with the healing process of the primary lesion.^[18,19] This is an important defense mechanism. Therefore, it is most important to identify the pathological lesion that causes the activation of MTrPs. The treatment of underlying pathology is the fundamental approach in the management of MTrPs.

In this review article, we describe the clinical approach in the management of MTrPs based on the literature and our clinical experiences.

BASIC PRINCIPLE IN TREATING MYOFASCIAL TRIGGER POINTS

1. General Consideration

(1) Identification of Underlying Pathological Lesion that Elicited MTrPs

Active MTrPs are always secondary to the lesions other than the muscle problem at the site of MTrP location. If the treatment of underlying etiological lesion is not appropriate, the MTrP cannot be inactivated completely, or can only be temporarily inactivated.^[6-8]

(2) Conservative VS Aggressive Treatment

In general, active MTrPs should be treated conservatively (non-invasive treatments including physical therapy) prior to the consideration of aggressive therapy (invasive treatments including injection and surgery). This principle is similarly applied on the treatment of the underlying etiological lesions. However, in some cases, MTrPs are deeply seated, chronic in nature, or very active, conservative treatments may not be effectively inactivate MTrPs, and more aggressive treat-

ments such as MTrP injection would be required.^[20,21]

(3) Acute VS Chronic MTrPs

In acute stage, acute or active MTrPs are usually related to the defense mechanism to protect the acute traumatic lesion. In most cases, the pain from MTrPs occurs only during movement from the contraction of the involved muscles. Unless the MTrP pain is intolerable, the active MTrPs should not be inactivated in the acute stage. Appropriate physical therapy to the acute primary lesion is necessary. When the acute lesion is adequately treated, the trauma-induced active MTrPs would disappear without treatment on the MTrP itself in most cases.^[21,22] However, in some cases, MTrPs may remain active even the etiological lesion is cured. For such chronic MTrPs, inactivation of these MTrPs is absolutely necessary.

Chronic or recurrent MTrPs are usually due to the persistent existence of inflammation in the active etiological lesion. In some cases, the pain is so severe and the MTrPs are so widely spread that it is intolerable and very annoying to interfere daily livings. These hyperactive MTrPs should be controlled even the underlying etiological lesion is still uncured or unidentified.

(4) Mild VS Severe MTrPs

In general, mildly active MTrPs can be controlled much easily than the highly active ones. Highly irritable MTrPs usually require MTrP injection for a fast and complete pain control.

(5) Superficial VS Deep MTrPs

One of the most effective methods to control MTrP pain is deep pressure massage. This technique can be easily applied on the superficial MTrPs, but not the deep ones. The deep MTrPs should be treated with stretch or other methods such as ultrasound, laser, acupressure, acupuncture, or local injection. Local MTrP injection to a superficial MTrP is much easier than the deep ones, since the taut band and focal tenderness (with pain recognition) can be palpated easily.

(6) Individual Preference (Patients and Clinicians)

A patient who has needle-phobia may not accept MTrP injection therapy, even it is indicated. On the other hand, a patient who has busy schedule prefers to accept MTrP injection, even conservative physical therapy may be effective to control the pain. A physician who is not familiar with a special method (such as

MTrP injection) would not give such therapy.

(7) Others

The availability of equipment or device for a special treatment is another factor to influence the choice of therapy by a physician. The physician should also consider the cost effective principle. If a chronic pain patient feels better after physical therapy but the effectiveness lasts for only a short period and requires long-term therapy, the physician should try MTrP injection since the effectiveness may last longer, and thus less expensive than physical therapy.

2. Treatment of Etiological Lesions – to avoid recurrence of MTrPs

The most important strategy of MTrP therapy is to find out the etiological lesion that causes the activation of MTrPs and to treat the underlying pathology. It can be a soft tissue lesion, arthropathy, or neuropathy. It is most important to make an accurate diagnosis and then to give an appropriate treatment. The possible methods of treatment are described briefly as below:

- (1) **Medication:** A course (2-3 weeks) of non-steroid anti-inflammatory drug (NSAID) is usually required immediately after an acute trauma. Stronger analgesic medicine is given only if the pain is intolerable. In chronic cases, the scar tissues may interfere the local circulation in the chronic inflammatory site. Therefore, systemic NSAID may not be very effective on the chronic inflammatory site due to poor absorption in the sites with poor circulation. In such case, systemic NSAID may have effectiveness for pain relief only, but not for chronic inflammation. Therefore, local injection with steroid may be more effective to eliminate the chronic inflammatory lesion.
- (2) **Immobilization:** For a severe acute lesion involving tendon, ligament, joint, or bone, a certain period of immobilization such as elastic bandage, splinting, or casting, is required. Avoidance of over-movement for a certain period to provide adequate time for complete healing is absolutely necessary. Muscle relaxant is not frequently necessary, since the sedative effect, or other side effects, may be harmful. Muscle relaxation is not equal to immobilization. During immobilization, rhythmic isometric muscle contraction is encouraged since it may improve local circulation, and thus, to

facilitate the healing process (if it is not very painful).

- (3) **Physical Therapy: Cold** therapy should be used only for bleeding control in acute injury or in an extremely severe active inflammation that is very uncomfortable during acute stage. Cold therapy can cause vasoconstriction and impaired circulation that may interfere the healing process of tissues. **Heat** (thermotherapy) can cause vasodilatation and improvement of local circulation. It can also provide adequate relaxation. Thermotherapy can apply on almost all kinds of lesions except for active bleeding, severe active inflammation, infection, or malignancy. **Massage** therapy is frequently used for soft tissue lesions since it may improve local circulation and provide muscle relaxation. Other manual therapy including **stretch, mobilization and manipulation** may also be very useful for the improvement of local circulation and relaxation, and other therapeutic effects. **Mechanical traction** to cervical or lumbar spine is also frequently applied to treat the facet joint lesion, disc lesion, or paraspinal muscle spasm. **Electrotherapy** is effective for pain control (nerve stimulation) and muscle relaxation (muscle stimulation). **Exercise therapy** is frequently prescribed for muscle strengthening, increase of circulation, and relaxation.
- (4) **Acupuncture:** The effectiveness of acupuncture on pain control or muscle relaxation has been well documented in the literature.^[2,6,23,24] Other effects such as facilitation of healing process, improvement of cardiopulmonary function are still uncertain, but not unlikely.
- (5) **Manipulation:** The immediate pain relief after manipulation therapy has been widely accepted in USA. Many Americans would visit chiropractors before consulting medical doctors when they have soft tissue lesions. The mechanism of pain control is still unclear. It is probably that the pain relief effect is a result of re-arrangement of neural connections in a “pain circuit” from the mechanical stimulation to the facet nociceptors in the trigger points similar to the local injection to an MTrP.
- (6) **Injection: Local steroid injection** can be used for anti-inflammation in chronic cases, but should be avoid for an acute injury. **MTrP injection** is very effective for immediate pain control and muscle relaxation, if the case is selected appropriately. The detail

will be described later.

(7) **Others:** Many other methods can be applied for the management of soft tissue lesions, including laser therapy, ionophoresis, biofeedback, acupressure, etc.

3. Inactivation of Active Myofascial Trigger Points

When the underlying etiological lesion(s) is (are) appropriately treated, the residual MTrP pain should also be treated in order to have complete relief of pain. In some cases, the etiological lesion is unable to be accurately identified or adequately treated, MTrP therapy is still required to control the severe pain. The most commonly used methods for MTrP therapy include the following items:

- (1) **Physical Therapy** – The commonly used methods include stretch with intermittent cold, massage, thermotherapy, and electrotherapy.
- (2) **Needling** – MTrP Injection or acupuncture is very effective for immediate relief of pain if the technique is applied correctly and the MTrP is identified accurately.
- (3) **Others** – Isometric relaxation (combined with stretch with cold), manipulation, trigger point pressure release, and laser therapy, are also effective in some cases.

4. Elimination or Treatment of Perpetuating Factors – to avoid recurrence of MTrPs

Perpetuation factors are those may aggravate MTrP pain. There are two types of perpetuating factors: ^[14,18]

(1) **Mechanical perpetuating factors:** Persistent or repetitive abnormal postures or activities, leg discrepancy, or scoliosis, etc, can induce or aggravate symptoms from MTrPs. These factors should be avoided or eliminated to obtain an optimal treatment on MTrPs.

(2) **Systemic perpetuating factors:** The MTrP symptoms may persist or recur in spite of intensive treatment if the patient has other medical problem such as nutritional deficiency, vitamin deficiency, anemia, endocrine disorders, etc. These factors should be corrected in addition to MTrP therapy.

5. Patient Educations and Home Program

(1) **Explanation to patients:** The causes, pathophysiology, principle of treatment and prevention, and possible

complications of treatment should be explained to patients clearly and carefully before treating patients.

(2) **Demonstration to patients:** The self-care technique and home program including stretch, focal massage, local heat application, and therapeutic exercise should be demonstrated to patients and/or family members.

MECHANICAL APPROACH

1. Manual Therapy

(1) Stretching with Intermittent Cold Application:

This technique is strongly recommended for MTrP therapy.

① Basic Principle:

The basic mechanism is to stretch the tight muscle fibers (taut band) for the release of muscle tension and the improvement of local circulation. Therefore the energy crisis vicious cycle^[14,18,25] can be interrupted. However, when the muscle fiber is stretched, there is strong reflex contraction due to increase of motor neuron excitability as a consequence of peripheral reflex from nociceptors and other intramuscular receptors (as a defense mechanism to avoid over stretch). Application of cold can inhibit the inputs from peripheral receptors and, subsequently, reduce the motor neuron excitability to avoid reflex muscle spasm and to facilitate the effectiveness of stretch.

② Clinical Application:

a. Traditional Method: Spray and Stretch

This technique was initially described by Travell and Simons.^[14,18,19] The agents used for vapocoolant spray include Ethylchloride and Fluori-Methane. However, Ethylchloride is too cold and may be toxic, and Fluori-Methane is a product of chlorofluorocarbene which may cause damage of the ozone layer. Some new products have been available but are still not as effective as the old products.

The recommended technique of cold spray is to hold the bottle of vapocoolant at a distance of 45 cm from the skin surface and to spray the vapocoolant at a 30-degree angle in parallel to the direction of muscle fibers at a speed of 10

cm per second.^[14,18] The focus of spray is initially at the MTrP region, moving toward the referred pain zone. Moist heat such as hydrocollator hot pack should be applied for at least 10 minutes on the stretched muscle immediately after stretch.

(b) Intermittent Ice Massage and Stretch

Considering the undesired effects of the current vapocoolant, the intermittent ice massage during the stretch of muscle is a simple and effective technique. However, it is inconvenient when the stretch would be performed in the place other than a medical facility or at home.

The ice should be warped with a plastic bag covered by a layer of cloth to avoid leakage of water and overcooling. During muscle stretch, the ice pack can be moved back and forth along the MTrP and its referred pain zone in a direction parallel to the direction of muscle fibers.

(2) Deep Pressure Massage: This technique is also strongly recommended for MTrP therapy.

① Basic Principle:

Compression of the MTrP can provide the effectiveness of counter-irritation (a stimulation to the nociceptors to cause reflex inhibition of pain-fiber conduction)^[24] and/or inhibition of MTrP circuit in the spinal cord.^[7] The squeeze of muscle fibers from the MTrP toward the two ends of muscle fibers (the tendon origin and insertion sites) provides the effects of stretch. The local circulation can be im-

proved from this milking effect and the relaxation of muscle fibers (taut band). A clinical study comparing various therapeutic modalities confirm that this technique is the most effective method for the immediate relief of pain from MTrP.^[26]

② Clinical Application: (Figure 1)

This technique was originally described by Hong et al.^[26] The MTrP is compressed firmly by two thumb or fingers (in two separate hands). The two fingers then moved toward two ends of the muscle (in the direction of muscle fibers) with the muscle remains firmly compressed through the whole course. The muscle fibers can be stretched in this way. The intensity of pressure should be maintained maximal but tolerable. It should be adjusted case by case. An experienced therapist can adjust the pressure to the optimal point based on the feeling from patient's reaction during pressure application.

This technique is quite different from acupuncture (Shiatzu) which is basically a technique of ischemic compression of the MTrP. Travell and Simons did not recommended this technique for MTrP therapy since the muscle fibers may be damaged from focal hypoxia.^[18]

(3) Manipulation: (Recommended as an adjunct MTrP therapy)

① Basic Principle:

The mechanism of manipulation in treating soft tissue lesions is still unclear, although the effec-

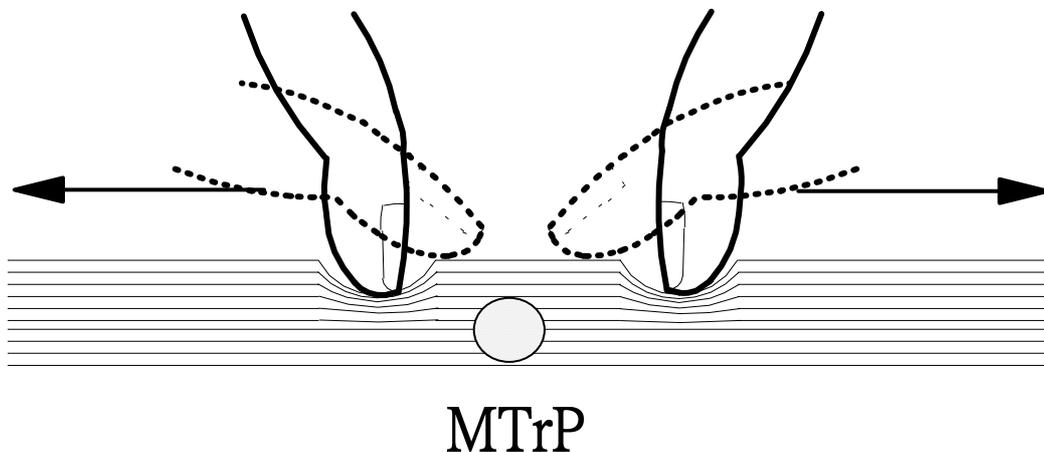


Figure 1. Deep pressure massage of an MTrP

tiveness is quite obvious. In a clinical report by Lee et al,^[27] an local steroid injection to the inflamed cervical facet joint permanently relieve the recurrent MTrPs in the shoulder-scapular area. It is likely that some MTrPs in the shoulder and upper back region are not primary local lesions, but secondary to cervical facet lesions. Bogduk and Simons^[28] also reported the close relationship between facet joints and MTrPs. It is possible that there are connections between the facet nociceptive pathway and MTrP nociceptive pathway in the spinal cord, similar to the connections of MTrP circuits in the spinal cord. The therapeutic effectiveness of manipulation is similar to the MTrP injection via spinal cord reflex mechanism, i.e. high-pressure stimulation to the facet nociceptors (facet trigger points) to induce a strong spinal reflex and thus to inhibit the vicious cycle of MTrP circuits in the spinal cord.

② Clinical Application:

Various techniques of manipulation have been described elsewhere and will not be described in detail in this review. In our experience, the most important stratagem to obtain an effective treatment of MTrPs with manipulation is to identify the exact level of facet joints that causes MTrPs. A simple test of facet sign (extension with rotation of the spine to the affected side to reproduce MTrP pain) can usually confirm the pathologic facet joints. Segmental manipulation is recommended to treat the involved facet joints. Significant relief of MTrP pain after spinal manipulation therapy have been demonstrated.^[29-31]

(4) Other Manual Therapy Techniques:

There are numerous manual techniques described by different authorities. However, the scientific basis is still inadequate. One of the most popular methods is the “**trigger point pressure release (modified myotherapy)**”. This method is also recommended for MTrP therapy by Simons.^[14] It is based on the barrier release concept.^[31] The therapist should apply a sub-maximal pressure on the trigger point with gradual compression gently to engage the barrier. The pressure applied is non-painful but discomfort so that the barrier is released gradually.

Several methods of “**voluntary contraction and**

relaxation” have been recommended for MTrP therapy. The tension from the tightness in the muscle with MTrPs can be reduced much easily after a maximal voluntary contraction. The “**muscle energy technique**” is highly regarded by osteopathic physicians. At first, the patient should do a maximal contraction of the involved muscle in a pattern movement followed by a relaxation (muscle energy technique). The muscle tightness can also be released easily by applying the technique of **reciprocal inhibition** via spinal reflex mechanism. Muscles that oppose the muscle being stretched are voluntarily contracted to actively assist the stretching movement. **Post-isometric relaxation**^[32,33] is very effective and is also recommended for MTrP therapy by Simons.^[14] The patient is asked to do *10-25% of maximal contraction* of the involved muscle, followed by *relaxation and stretch* of the tight muscle (Figure 2). This method can be reinforced by controlled *respiration* and directed *eye movement*.^[33]

2. Dry Needling

The therapeutic effectiveness of dry needling on MTrP inhibition has been demonstrated.^[2,22,34-37] It is essential to elicit local twitch responses (LTRs) (similar to 得氣 in acupuncture) during needling to obtain an immediate and complete pain relief.^[6,7,20-22] The mechanism for pain control is still unclear. It is possible that the strong pressure stimulation to the MTrP units can provide very strong neural impulses to the dorsal horn cells in the spinal cord to break the vicious cycle of MTrP circuit.^[7] Melzack suggested that 80% of MTrPs are actually acupuncture point.^[24,38]

3. Therapeutic Exercise (Home Program)

- (1) Self-application of “post-isometric relaxation” (described above) on some muscle groups can be instructed to patient. MTrPs in the neck muscles can be effectively released by doing self-application of this technique.
- (2) Conditioning exercise should be performed by patients who have clinical evidence of fibromyalgia.^[39] There is evidence that generalized conditioning exercise can activate the endogenous opioid system.^[40]
- (3) **Principles of Exercise for Degenerative lesions:**
 - ① Avoid *heavy* exercise to the involved site (勿重): Strong muscle contraction may cause further injury

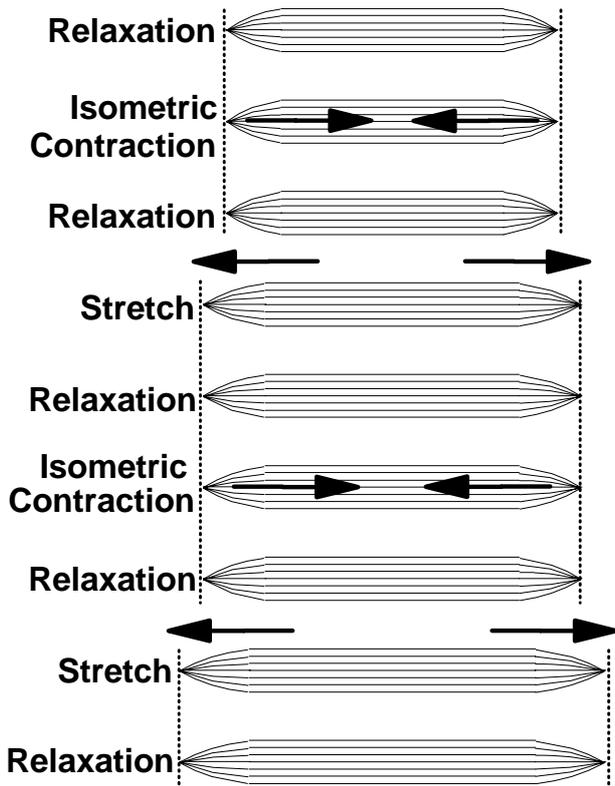


Figure 2. Post-isometric relaxation. The patient is asked to do 10-25% of maximal contraction of the involved muscle, followed by relaxation and stretch of the tight muscle.

to degenerative tissues of tendon and its insertion site (enthesis), ligament of the moving joint, surrounding bursa, and the moving joint itself. Heavy exercise also can cause fatigue and subsequent muscle spasm. Sustained muscle spasm can impair the local circulation.

- ② Avoid *rapid* exercise of the involved site (勿快): Most of traumas are induced by rapid motion since unexpected force may develop to damage the soft tissues. Rapid muscle contraction can also cause muscle spasm much easier than slow activity.
- ③ Avoid *prolonged* exercise (勿久): Repetitive muscle contraction for a long period not only can cause direct damage to the involved soft tissue, but also can cause muscle spasm.

THERMOTHERAPY

Heat is the most important modality to treat the soft tissue lesion, although it is not the most effective one. The reason is that the heat can improve focal circulation to facilitate the healing process. It is strongly recommended as an adjunct MTrP therapy for any kind of lesion. The only absolute contraindications are active inflammation (with local heat and redness) and existing malignant mass. Local swelling without local heat or redness is not a contraindication to apply thermotherapy. It is strongly suggested to apply heat before and after any treatment (including manual therapy, mechanical traction, electrotherapy, etc.).

For the purpose of improving focal circulation, superficial heat is adequate to cause vasodilatation in both superficial and deep tissues (via reflex). However, if this is a chronic inflammatory lesion in the deep tissue (esp. with contracture), deep heat is preferred. Therapeutic ultrasound may also provide mechanical energy directly to the MTrPs in addition to the deep heat effect.

CRYOTHERAPY

Although cold application can cause temporary pain relief (hyperstimulation analgesia), it usually induces vasoconstriction and impaired focal circulation. Therefore the application of cryotherapy is only for active inflammation or during stretch of the tight muscles (see above - stretching with intermittent cold application). Cold can relieve muscle spasm (decrease of peripheral sensory inputs to the motor neurons) but not effective to control the MTrP pain.

ELECTROTHERAPY

In clinical practice, a vast majority of patients with soft tissue lesion appreciate the treatment with electrical currents. However, the effectiveness is usually temporary. For temporary pain relief, *nerve* stimulation (such as transcutaneous electrical nerve stimulation [TENS]) can be used. For MTrP therapy, *muscle* stimulation is recommended, since the muscle contraction caused by the electrical stimulation is similar to focal massage.

There are many different types of electrotherapy device. In the literature, the studies demonstrated the superiority of a certain type of device are not convincing.

Some expensive machines may not provide better effects but just make patients feel more comfortable. It should be carefully explained to patients that the therapeutic effectiveness of electrical stimulation is often temporary, since the electrotherapy is over used in Asia.

Therapeutic effectiveness of electrotherapy on MTrPs has been well documented.^[41-45] A study on MTrP treatment by Graff-Radford^[42] suggested that low frequency electrical stimulation was not effective, and high frequency therapy is effective for MTrP pain relief but not effective to change the MTrP sensitivity (threshold). Combined therapy with electrotherapy and ultrasound may have better results than single therapy.^[45] A more recent study by Hsueh et al^[43] indicated that electrical *nerve* stimulation is better than electrical muscle stimulation for pain relief, but electrical *muscle* stimulation is better than electrical nerve stimulation for relief of muscle tightness.

LASER THERAPY (Light Amplification by Stimulated emission of Radiation)

The mechanism of laser therapy on MTrP is still unknown. It has been suggested that laser is a needless (painless) acupuncture.^[46] The electromagnetic energy form laser may penetrate the MTrP and cause stimulation similar to dry needling. Another study by Snyder-Mackler et al^[47] found an increase in skin resistance after laser therapy and suggested that it was a sympathetically mediated effectiveness. Some studies demonstrated the effectiveness of laser on MTrP pain,^[47-49] but some did not.^[50]

OTHERS

Other methods for MTrP therapy include iontophoresis, phonophoresis, traction device, vibration, movement therapy, biofeedback, etc.^[14] However, the real therapeutic effectiveness is questionable.

COMBINATION THERAPY

In clinical practice, MTrP is usually treated with a combination of different methods (such as thermotherapy

+ manual therapy + electrotherapy). A physician can make choice of any combination based on his own preference or patient's preference. However, it should be based on a founded scientific wisdom.

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肌筋膜激痛點的處置

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肌筋膜疼痛症候群是臨床診療當中相當常見的病況，它是以肌筋膜激痛點的存在為特徵。激痛點是存在於骨骼肌肉纖維裡之緊繃肌帶上的過度敏感小點。一般而言，在考量以較為侵襲性的方式(如注射或手術)來治療活動性激痛點之前，應該先以較為保守性的方式(非侵襲性的物理治療)來做治療。肌筋膜激痛點之最為重要的治療策略，是找出造成活化出激痛點的致病因子，並且治療其潛在的病理學變化。如果潛在的病因性損傷沒有被適當地予以治療，那麼肌筋膜激痛點就沒有辦法被充分地去活化，或是只能暫時性地被去活化。在這篇文獻裡，我們基於文獻的回顧與臨床的經驗，回顧了對於肌筋膜激痛點之各種不同的物理治療方式。這些治療的方式，包括：機械性的方式(如徒手治療、噴療與牽拉、按摩、鬆動術、空針穿刺、治療性運動...等)，溫熱療法，冰冷療法，電治療法，與雷射療法。臨床實務中常見到的，是同時結合使用上述兩種或是更多種的治療方式。本文對於每一種治療方式的基本原理、與其臨床上的應用，都做了討論。(中華復健醫誌 2003; 31(2): 67 - 77)

關鍵詞：肌筋膜疼痛症候群(myofascial pain syndrome)，肌筋膜激痛點(myofascial trigger point)，物理治療(physical therapy)，徒手治療(manual therapy)，按摩(massage)，牽拉(stretch)

