Treating Pain with Trigger Point Techniques
"Critical Thinking" (Module 1)

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Current Information "What are Trigger Points?"

There are approximately four hundred muscles in the human body, but a few muscles may or may not be present in some people. Any muscle can develop trigger points, potentially causing referred pain and other symptoms. There are also individual variations in fiber or tendon arrangement, so trigger points may be located in different places for different people.

Muscle Anatomy & Physiology

Muscles consist of many muscle cells, or *fibers* bundled together by connective tissue. Each fiber contains numerous *myofibrils*, and most skeletal muscles contain approximately one thousand to two thousand myofibrils. Each myofibril consists of a chain of *sarcomeres* connected end-to-end. Muscular contractions take place in the sarcomere.

A *muscle spindle* is a sensory receptor found within the belly of a muscle. Muscle spindles are concentrated where a nerve enters a muscle, and around nerves inside the muscles. Each spindle is composed of three to twelve *intrafusal muscle fibers*, which detect changes in the length of a muscle. As the body's position changes, information is conveyed to the central nervous system via sensory neurons, and is processed in the brain. As needed, the *motor end plate* (a type of nerve ending) releases *acetylcholine*, a neurotransmitter that tells the *sarcoplasmic reticulum* (part of each cell) to release ionized calcium. The *extrafusal muscle fibers* then contract. When contraction of the muscle fibers are no longer needed, the nerve ending stops releasing acetylcholine and the calcium pump within the sarcoplasmic reticulum re-uptakes calcium.

Trigger Point Physiology: Contractions and Inflammation

One of the current theories about the mechanism responsible for the formation of trigger points is the "Integrated Trigger Point Hypothesis." If a trauma occurs or there is a large increase in the motor end plate's release of acetylcholine, an excessive amount of calcium can be released by the sarcoplasmic reticulum. This causes a maximal contracture of a segment of muscle, leading to a maximal demand for energy and impairment of local circulation. If circulation is impaired, the calcium pump doesn't get the fuel and oxygen it needs to pump calcium back into the sarcoplasmic reticulum, so the muscle fiber stays contracted. Sensitizing substances are released, causing pain and stimulation of the autonomic nervous system, resulting in a positive feedback system with the motor nerve terminal releasing excessive acetylcholine…and so the sarcomere stays contracted.

Another current theory is the "Muscle Spindle" hypothesis, which proposes that the main cause of a trigger point is an inflamed muscle spindle (Partanen, Ojala, and Arokoski, 2010). Pain receptors activate skeletofusimotor units during sustained overload of muscles via a spinal reflex pathway which connect to the muscle spindles. As pain continues, sustained contraction and fatigue drive the skeletofusimotor units to exhaustion, and cause rigor (silent spasm) of the extrafusal muscle fibers, forming the "taut band" we feel as trigger points. Because the muscle spindle itself has a poor blood supply, the contraction and inflammatory metabolites released will be concentrated inside the spindle and lead to sustained inflammation.

A ground-breaking 2008 study (Shah et al.) was able to measure eleven elevated biochemicals in and surrounding active trigger points, including inflammatory mediators, neuropeptides, catecholamines, and cytokines (primarily sensitizing substances and immune system biochemicals). In addition, the pH of the samples was strongly acidic compared to other areas of the body. A 1996 study by Issbener, Reeh, and Steen found that a localized acidic pH lowers the pain threshold sensitivity level of sensory receptors (part of the nervous system), even without acute damage to the muscle. This means the more acidic your pH level in a given area, the more easily you will experience pain compared to someone else. Further studies are needed to discover whether body-wide elevations in pH acidity and the substances mentioned above predispose people to develop trigger points.

More studies are needed to determine the exact mechanisms of trigger point formation and physiology.

Central Sensitization, Trigger Points, and Chronic Pain

The *autonomic nervous system* controls the release of acetylcholine, along with involuntary functions of blood vessels and glands. Anxiety and nervous tension increase autonomic nervous system activity, which commonly aggravates trigger points and their associated symptoms.

The *central nervous system* includes the brain and spinal cord, and its function is to integrate and coordinate all activities and responses of the body. The purpose of the *acute* stress responses of our bodies is to protect us by telling us to pull away from a hot stove burner, flee from a dangerous situation, or rest an injured body part due to pain. But when emotional or physical stress is prolonged, even just for days, there is a maladaptive response: damage to the central nervous system, particularly to the sympathetic nervous system and the hypothalamus-pituitary-adrenal (HPA) systems. This is called *central nervous system sensitization.*

Pain causes certain types of nerve receptors in muscles to relay information to *neurons* located within part of the gray matter of the spinal cord and the brain stem. Pain is amplified there and then is relayed to other muscles, thereby expanding the region of pain beyond the initially affected area. Persistent pain leads to long-term or possibly permanent changes in these neurons, which affect adjacent neurons through *neurotransmitters*.

Various substances are released: *histamine* (a compound that causes dilation and permeability of blood vessels), *serotonin* (a neurotransmitter that constricts blood vessels), *bradykinin* (a hormone that dilates peripheral blood vessels and increases small blood vessel permeability), and *substance P* (a compound involved in the regulation of the pain threshold). These substances stimulate the nervous system to release even more acetylcholine locally, adding to the perpetuation of trigger points.

Central sensitization may cause the part of the nervous system that would normally counteract pain to malfunction and fail to do its job. As a result, pain can both be more easily triggered by lower levels of physical and emotional stressors, and also be more intense and last longer. Prolonged pain caused by central nervous system sensitization can lead to emotional and physical stress. Conversely, prolonged exposure to both

emotional and physical stressors can lead to central nervous system sensitization and subsequently cause pain. Just the central nervous system maladaptive changes alone can be self-perpetuating and cause pain, even without the presence of either the original or any additional stressors, creating a vicious cycle of pain and trigger point formation.

Once the central nervous system is involved, because of central sensitization, even if the original perpetuating factor causing trigger points are resolved, trigger points can continue being formed and reactivated. So the longer pain goes untreated, the greater the number of neurons that get involved and the more muscles they affect, causing pain in new areas, in turn causing more neurons to get involved…the bigger the problem becomes, leading to the likelihood that pain will become chronic. The problem gets more complex, more painful, more debilitating, more frustrating, and more time-consuming and expensive to treat. The longer your client waits, the less likely they are to get complete relief, and the more likely it is that their trigger points will be reactivated chronically and periodically. The sooner pain is treated, including addressing the initiating stressors and perpetuating factors, the less likely it will become a permanent problem with widespread muscle involvement and central nervous system changes.

Characteristics of Trigger Points

The two most important characteristics of trigger points that your client will notice are tender knots or tight bands in the muscles, and referred pain. They may also notice weakness, lack of range-of-motion, or other symptoms you would not normally associate with muscular problems.

Tenderness, "Knots," and Tight Bands in the Muscle

When pressed, trigger points are usually very tender. This is because the sustained contraction of the myofibril leads to the release of sensitizing neurotransmitters via a cascade effect: the sustained contraction elevates metabolites such as potassium ions and lactic acid, which leads to the elevated levels of inflammatory agents such as bradykinin and histamine, which activates pain nerve fibers, which leads to the excretion of pain transmitters, such as substance P.

Pain intensity levels can vary depending on the amount of stress placed on the muscles. The intensity of pain can also vary in response to flare-ups of any of the perpetuating factors addressed in part II, and the presence of central sensitization (see above). The areas at the ends of the muscle fibers also become tender, either at the bone or where the muscle attaches to a tendon.

Healthy muscles usually do not contain knots or tight bands, are not tender to pressure, and, when not in use, feel soft and pliable to the touch, not like the hard and dense muscles found in people with chronic pain. People often tell me their muscles feel hard and dense because they work out and do strengthening exercises, but healthy muscles feel soft and pliable when not being used, even if they work out. Muscles with trigger points may also be relaxed, so don't assume your client does not have trigger points just because the muscle is *not* hard and dense.

Referred Pain

Trigger points may refer pain both in the area in which the trigger point is located, and/or to other areas of the body. These are called *referral patterns*. About 74% of commonly found trigger points are not located within their area of referred pain. The most common referral patterns have been well documented

and diagramed, and are found in the muscle chapters. Sometimes you can reproduce the referral with pressure on the trigger point, but not being able to reproduce the referral does not rule out the trigger point.

Unless you know where to search for trigger points, and you only work on the areas where your client feels pain, they probably won't get relief. For example, trigger points in the iliopsoas muscle (deep in the abdomen) can cause pain in the lumbar area. If you don't check the iliopsoas muscle for trigger points, and only work on the quadratus lumborum muscle in the lumbar area, your client will not get relief. The muscle chapters in *Pain Relief with Trigger Point Self-Help* teach you where to look for trigger points to resolve your client's pain, and gives them self-help techniques to work on in-between appointments.

Weakness and Muscle Fatigue

Trigger points can cause weakness and loss of coordination, along with an inability to use the muscle. Many people take this as a sign that they need to strengthen the weak muscles, but you can't condition (strengthen) a muscle that contains trigger points -- these muscle fibers are not available for use because they are already contracted. If trigger points aren't inactivated first, strengthening (*conditioning*) exercises will likely encourage the surrounding muscles to do the work instead of the muscle containing the trigger point, further weakening and deconditioning the muscle containing trigger points.

Muscles containing trigger points are fatigued more easily and don't return to a relaxed state as quickly when you stop using the muscle. Trigger points may cause other muscles to tighten up and become weak and fatigued in the areas where you experience the referred pain, and also cause a generalized tightening of an area as a response to pain.

Other Symptoms

Trigger points can cause symptoms that most people would not normally associate with muscular problems. For example, trigger points in the abdominal muscles can cause urinary frequency and bladder spasms, bed-wetting, chronic diarrhea, frequent belching and gas, nausea, loss of appetite, heartburn, food intolerance, painful menses, projectile vomiting, testicular pain, and pain that feels like it is in an organ, in addition to causing referred pain in the abdominal, mid-back, and lumbar areas.

Trigger points may also cause stiff joints, generalized weakness or fatigue, twitching, trembling, and areas of numbness or other odd sensations. It probably wouldn't occur to most health care providers that these symptoms could be caused by a trigger point in a muscle.

Sensitization of the Opposite Side of the Body

For any long-term pain, it's not unusual for both sides of the body to eventually be affected; for example, if the right lumbar area is painful, there may be tender points in the left lumbar area. Often the opposite side is actually *more* tender with pressure. This is because whatever is affecting one side is likely affecting the other: poor body mechanics, poor footwear, overuse injuries, chronic degenerative or inflammatory conditions, chronic disease, or central sensitization. For that reason, I almost always treat both sides on patients, and I recommend that you do treatments on both sides. You may find that your client has trigger points only on one side for any given muscle, but always check both sides before making that assumption.

Active Trigger Points vs. Latent Trigger Points

If a trigger point is *active*, it will refer pain or other sensations and limit range of motion. If a trigger point is *latent*, it may cause a decreased range of motion and weakness, but not pain. The more frequent and intense your client's pain, the greater the number of active trigger points they likely have.

Trigger points that start with some impact to the muscle, such as an injury, are usually active initially. Poor posture or poor body mechanics, repetitive use, a nerve root irritation, or any of the other perpetuating factors addressed in that chapter can also form active trigger points. Latent trigger points can develop gradually without being active first, and your client doesn't even know they are there. Most people have at least some latent trigger points, which can easily be converted to active trigger points.

Active trigger points may at some point stop referring pain and become latent. However, these latent trigger points can easily become active again, which may lead your client to believe they're experiencing a new problem when in fact an old problem—perhaps even something they've forgotten about—is being reaggravated. Any of the perpetuating factors can activate previously latent trigger points and make your client more prone to developing new trigger points initiated by impacts to muscles.

What Initiates and Perpetuates Trigger Points?

Trigger points may form after a sudden trauma or injury, or they may develop gradually. Common initiating and perpetuating factors are mechanical stresses, injuries, nutritional problems, emotional factors, sleep problems, acute or chronic infections, organ dysfunction and disease, and other medical conditions; these are discussed in the perpetuating factors chapter.

Your clients will have more control over some perpetuating factors than others. Addressing any pertinent perpetuating factors is so important that they may obtain either a great amount or complete relief from pain without any additional treatment. If you don't help your clients eliminate perpetuating factors to the extent possible, they may not get more than temporary relief from self-help pressure techniques or your treatments.

Your clients cannot realistically make all of the changes to their perpetuating factors all at once, but have them make a list of the perpetuating factors that might apply to them. Help them prioritize and work on resolving those you think might be most important.

Additional Practitioner Information

Medical History Form

The medical history form (see http://triggerpointrelief.com/workshop_materials.html) includes questions that will help you identify trigger point perpetuating factors. You may find you don't need all the information on this form, so modify it to fit your requirements. It is important to get a complete medical history. If a patient doesn't do a thorough job of filling out a medical history form, explain that you need the information to do a thorough diagnosis and treatment, and they will get more value for their money.

Trigger Point Palpation and Treatment

Be sure to explain trigger points and referral patterns to your patients. Tell them why you are working on an area that is different than where they've indicated they feel symptoms. If a patient has pain in many areas, find out what their two areas of most concern are, because if you treat too many areas you will not know which trigger point(s) is causing their pain, and you will not treat any one symptom very well.

At the beginning of every visit, have your patients color in a body chart to show their symptoms and intensity (see either the book/CD ROM or http://triggerpointrelief.com/workshop_materials.html for a blank body chart). Some will be resistant to doing this, saying "It's just the same." Since many patients improve slowly, their perception may be that their symptoms are the same when in fact the area affected is smaller or the pain is less intense and/or less frequent. And if indeed their symptoms haven't changed, then you know that you are either missing the trigger points, that the patient is missing the trigger points when doing self-treatments, or that perpetuating factors need to be addressed. Also, sometimes patients will announce that they have a new problem when in fact it's an old problem that they've just forgotten about. It is important to have a historical record. If they resist filling it out, tell them how it helps you to help them, or fill it out yourself, taking up their time. They will catch on.

If you have read about or have been trained in trigger point therapy, you've probably heard about eliciting the twitch response and jump sign as a diagnostic criterion. It is questionable whether the absence of these signs or the inability of the practitioner to invoke them rules out the diagnosis of a trigger point. Since eliciting a twitch response and a jump sign can cause a great deal of pain, this can cause the patient to tense up and stay tense in anticipation of further unexpected pain-inducing moves on your part. Skilled therapists can locate trigger points without these diagnostic criteria. When you learn to palpate trigger points and gather the right information from the patient, you can locate trigger points without causing more discomfort than the patient can easily tolerate.

While you are palpating for trigger points, ask them about their pain with questions such as these: "Is this less tender than last time?" "Are you feeling better, the same, or worse?" Sometimes when they fill out body charts, they'll mark the same area with the same intensity and frequency of pain but actually report feeling much better, so you can't go strictly by the numbers.

Are there perpetuating factors that need to be eliminated before the patient can get better? When patients ask: "What's causing this?": Turn the question around - they usually have some pretty good ideas. If they don't, refer to their medical history form for review of potential perpetuating factors. Ask them if they have followed your suggestions (be specific i.e. did you try increasing your water?)

Trigger point chain-reactions - what needs to be treated first?

If trigger point symptoms keep returning, you may need to consider that you have only been treating the satellite trigger point(s), rather than the primary trigger points. For example, if you keep treating the masseter and the facial pain keeps coming back, there are two possibilities: one is that there are unresolved perpetuating factors, the other is that referred pain from another muscle, such as the upper trapezius or the sternocleidomastoid, are activating satellite trigger points in the masseter muscle. Try treating the possible primary trigger point, in addition to investigating perpetuating factors.

Involve Your Patients in Self-Care

Ask patients if they'd like to learn self-help techniques. Explain that people who comply with your suggestions for treating the perpetuating factors get better much faster. Only give your patients two new self-help techniques per visit, prioritizing your selection depending on what the patient needs to work on; any more than two is probably too much for patients to remember. Giving them something in writing and with pictures will help them follow your suggestions, as opposed to just giving them verbal suggestions. If you walk them through the self-help techniques, they are also much more likely to comply since they will not only remember it more easily, they also will be able to *feel* that it helps, and will look forward to being able to manage and treat their symptoms on their own schedule.

On subsequent visits, find out if the patient is following your suggestions, whether there were any problems, and so on. You may need to review the suggestions with them again. It's a lot of information, and the suggestions will be new to most people. If they aren't following your suggestions, find out why, and figure out if there is a way that they can follow your suggestions, perhaps with modifications.

Charts & Books

I recommend having a set of trigger point referral charts on your walls for easy reference. I find the Simon & Simon charts the easiest to read from a distance because they are color-coded, and there are only two charts. The Travell & Simons charts are more complete, however. When you have time, use the CD ROM for more thorough information, but it's great to have charts where you can look at them "on the fly" while treating a patient. Remember that charts only show the common patterns, not the end-all of possibilities for pain referrals. They are just a good *starting place* of where to search for trigger points.