"Myofascial Pain Syndromes That Mimic Visceral Disease"

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Trimester 10
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Abstract:

Chronic pain can often be an exhausting and daunting clinical problem for physician and patients alike. Finding the source of the pain can sometimes be the most difficult task of all. Musculoskeletal or myofascial causes such as trigger points can often times be the source of withstanding pain and can go misdiagnosed or even undiagnosed for years. A myofascial phenomenon occurs in the abdominal musculature that shows a strong reciprocal somato-visceral and viscero-somatic interaction (1). Abdominal trigger points may cause as much distress from induced visceral dysfunction as from referred pain. Symptoms referred from these trigger points commonly confuse the diagnosis by mimicking visceral pathology. This visceral mimickery can often lead to inappropriate and expensive diagnostic testing as well as, inappropriate treatment. Other myofascial syndromes involving the muscles of the thorax, chest wall, and pelvic floor can mimmick visceral pathology as well, for example, an active trigger point in the pectoralis major muscle on the left side can easily be mistaken for episodes of cardiac arrhythmia. Early exclusion of a parietal cause should increase diagnostic accuracy when evaluating patients with chronic abdominal, chest, and groin pain. It is not out of the question that a properly informed physician that makes the proper diagnosis in these instances can refer the patient to the proper discipline to effectively treat the trigger points. The proper discipline in this case, would be any discipline trained to deal with the myofascial component, starting with the most conservative treatment first; such as, ischemic compression, Nimmo™ technique, spray and stretch, acupuncture, cross friction massage, and/or various other soft tissue techniques. If the pain cannot be resolved by conservative methods, then accurately placed anesthetic/corticosteroid
injections can give substantial pain relief. The lack of physician awareness of these conditions, prove to have costly ramifications.

Introduction:

Chronic abdominal pain of uncertain etiology is a common clinical problem that often leads to many diagnostic evaluations and treatment interventions and sometimes multiple surgeries. The prevalence in general medical practice is unknown, although it may account for about 10% of patients with chronic idiopathic abdominal pain. Cyriax in 1919 (2) was the first to report conditions that simulated referred visceral pain from somatic structures by causing intercostal nerve irritation. A few years later, Janowski (3) pointed out that symptoms attributed to visceral disease could arise from the abdominal wall. In 1926 Carnett, a surgeon published an important article (4) recognizing the syndrome that he believed was caused by intercostal neuralgia. A 1991 editorial in The Lancet (5) emphasized that the lack of physician awareness of abdominal wall pain is economically costly. Hershfield (6) reported that 100 patients had previously had 418 diagnostic procedures. In another study (7), 30 patients with chronic abdominal pain, subsequently found to be from the abdominal wall had earlier undergone 67 diagnostic procedures, including 4 laproscopies. The conservatively estimated average cost was $1269 (1993 dollars) per patient, not including blood or urine lab studies. In 2001, Thompson et al (20) noted that an average of $6727 per patient was required for previous diagnostic testing and hospital charges. Hershfield (6) listed preliminary diagnoses of patients referred to him as irritable bowel, spastic colon, gastritis, psychoneurosis, depression, anxiety, hysteria, and malingering. Many of these patients were given a psychiatric
diagnosis when the actual diagnosis may have been of musculoskeletal origin that went undiagnosed.

This review attempts to raise physician awareness of common musculoskeletal causes of chronic pain that is seemingly of visceral origin and the role that alternative health care professionals may play in the treatment of these disorders.

Methods:

Computer literature searches were conducted on Medline citations from 1970 to the October 2005, to determine prevalence, presentation, diagnosis, management, and follow-up care for patients with chronic abdominal pain. Keywords were abdominal pain, nerve entrapment syndromes, abdominal wall, myofascial, myofascial pain, rectus abdominis, viscero-somatic, somato-viscero, and somatic. I also manually retrieved pertinent references cited by articles and books chapters.

Terminology:

In order to move forward to the discussion a few terms must first be defined. The musculoskeletal system can be divided into bones, joints, and supporting soft tissue structures (muscles, ligaments, tendons and bursa). Soft tissue complaints are very common disorders and dwarf those of bone and joints in terms of frequency. Although the terms commonly used for damage or irritation of muscles (fibrositis), ligaments (enthesitis), tendons (tendinitis), and bursa (bursitis) suggests inflammation, in fact these conditions are usually non-inflammatory. Terminology also describes soft tissue complaints involving the muscles and contiguous bony prominences that are either
localized (myofascial pain syndrome) or widespread throughout the body (fibromyalgia syndrome), (19) which will not be discussed in this review.

Muscles contract and relax when instructed by nerves to make various body parts move. A muscle spasm occurs when a muscle is continually contracting due to tension or injury. When a muscle is in constant spasm, there is not enough oxygen and blood moving through it to remove waste products such as lactic acid, which produces pain as it accumulates, causing burning and cramping. (19)

A strain is an abnormal stretch of muscle usually due to fatigue or over-exertion, leading to injury and is less severe than a sprain, which is abnormal stretching (Grade 1), partial tearing (Grade 2), or complete tearing (Grade 3) of ligaments (the tough fibers that hold the bones together at the joints) or tendons. Normally, sprains and strains go away spontaneously in a few days or weeks with proper rest, exercise, medication, and therapy. Unfortunately, with continued pain and spasm, there is not time for healing. The muscle only becomes weaker and shortened, more easily injured and less able to function normally. (19)

The term myofascial pain syndrome refers to a syndrome of musculoskeletal discomfort. Despite research over the last decade providing a framework for this diagnosis, using this terminology is still very controversial and promotes vigorous debate among physicians. The medical literature regarding these disorders does not translate well into clinical practice. The following is an attempt to provide a valid interpretation.

Myofascial Pain Syndrome refers to soft tissue tenderness and pain with a specific zone of discomfort or pain ("trigger point") within the muscle that triggers pain that refers away from the trigger point to contiguous areas.
The examiner can roll the muscle between the thumb and index finger to feel this taut band or trigger point, which then causes pain to be felt in the referral zone. This palpation is typically accompanied by a characteristic localized twitch response of the muscle. The patient’s behavioral reaction to firm palpation of a trigger point is termed a positive jump sign; the patient withdraws ("jumps") or gives a verbal response such as "that’s it" or "that’s the spot."

Trigger points may be characterized as either active or latent. Active trigger points cause spontaneous pain at rest or with motion that stretches or overloads the muscle. There is some restricted motion of the associated muscle. Latent trigger points are quiescent and result primarily in muscle tightness and dysfunction with associated pain upon palpatory pressure.

**Discussion:**

When abdominal pain is chronic and unremitting, with minimal or no relationship to eating or bowel function but often a relationship to posture (i.e., lying, sitting, standing), the abdominal wall should be suspected as the source of pain. Frequently, a localized, tender trigger point can be identified, although the pain may radiate over a diffuse area of the abdomen and can mimic symptoms of more serious diseases. For example, symptoms of abdominal fullness, "heart burn", indigestion, nausea, and even vomiting have been due to paraxiphiod trigger points in the upper rectus abdominis muscle; chest pain from trigger points in the pectoralis or sternalis muscle; periumbilical trigger points may produce symptoms of cramping or intestinal colic; trigger points in the lateral border of the rectus abdominis over Mc Burney’s point can even mimic an acute appendicitis.
(1) However, the pain may also result from structural conditions, such as localized endometriosis or rectus sheath hematoma, or from incisional or other abdominal wall hernias, which must be ruled out. To further differentiate the source of the pain, Carnett's sign should be elicited. With the patient in the supine position with the arms crossed over the chest, the patient should be asked to raise his or her head or feet off the table while the examiner pushes on the tender spot. If splinting the muscles in this manner reduces the amount of pain, the source is probably intra-abdominal. If the pain is in the abdominal wall, splinting the muscles will not reduce the pain and may actually increase it (positive Carnett's sign). Most commonly, abdominal wall pain is related to cutaneous nerve root irritation or myofascial irritation.

Once a tentative diagnosis of abdominal wall pain has been made, it is important to explain the diagnosis to the patient. The patient may be worried about the implications of the pain. Furthermore, having to undergo a long series of diagnostic tests may reinforce the patient's anxiety. In this setting, pain can take on a life of its own.

Patients with chronic abdominal wall pain suffer considerable anxiety and worry that they may have some horrible condition that has yet been discovered. As a result, they may be given a psychiatric diagnosis ("it is all in your head", somatization, or depression) and therefore often take antidepressant drugs, tranquilizers, muscle relaxants, or pain relievers. Such a medical history should raise the question of abdominal wall pain.

If there is evidence of a benign source of abdominal wall pain rather than a serious internal disease, reassurance should be provided. The physician can demonstrate how gentle palpation of the pain trigger point can reproduce the pain and its radiation over a wide area of the abdomen. The physician should explain that idiopathic abdominal wall
pain is similar to idiopathic back or shoulder pain, in that the involved structure cannot be
precisely described and the cause of the pain cannot be exactly identified.

The most common cause of abdominal wall pain is nerve entrapment at the lateral border
of the rectus muscle. Peripheral nerve entrapment occurs at anatomic sites where the
nerve changes direction to enter a fibrous or osseo-fibrous tunnel or where the nerve
passes over a fibrous or muscular band and that entrapment can be at these sites because
mechanically induced irritation is most likely to occur at these locations. Muscle
contraction at these sites may add additional insult by direct compression, although it is
believed that traction on the nerve from muscle activity also is likely. Mechanical
irritation causes localized swelling that may injure the nerve directly or compromise the
nerve's circulation (many athletes or individuals that perform excessive abdominal
crunches or exercises may develop this).

Tenderness of the main nerve trunk may be found proximal or distal to the affected
portion (Valleix phenomenon). Proximal tenderness may result from vascular spasm or
from unnatural traction on the nerve trunk against the point of entrapment.

The thoraco-abdominal nerves, which terminate as the cutaneous nerves, are anchored at
six points 1) the spinal cord; 2) the point at which the posterior branch originates; 3) the
point at which the lateral branch originates; 4) the point at which the anterior branch
makes a nearly 90° turn to enter the rectus channel; 5) the point from which accessory
branches are given off in the rectus channel, and 6) skin.

In the rectus channel, the nerve and its vessels are surrounded by fat and connective
tissue that bind the nerve, artery, and vein into a discrete bundle capable of functioning as
a unit independently from surrounding tissue. At a point located about three quarters of
the way through the rectus muscle (from back to front), there is a fibrous ring that provides a smooth surface through which the bundle can slide. Positioned anterior to the ring, the rectus aponeurosis provides a hiatus for the exiting bundle. The hypothesis that nerve ischemia is caused by localized compression of the nerve at the level of the ring is deduced from juxtaposition of the soft bundle to the hard ring. (18) Herniation of the bundle through the ring due to too much pressure from behind or from pulling from in front will compress the bundle's vessels and the nerve itself. Too much traction on the bundle from behind or from pulling in front will cause the bundle to rub against the ring, which then causes irritation and swelling even before herniation occurs. (18)

Anything that increases pressure behind the abdominal wall can cause the bundle to herniate through the fibrous ring and aponeurotic opening. Use of the abdominal muscles can add additional insult (postural strain or exercise). Enlargement of the abdomen from any cause will put the nerves under greater traction. Scar or suture around the nerve in front of the rectus (8-10) can directly compress the nerve or place it under further traction. Disparate motion between skin and muscle will aggravate this situation. Although any main branch of the nerve may become symptomatic, the anterior branches are most likely to be affected, because stretching of the nerve is greatest at the point most distant from its origin (i.e., the spinal cord). Because the anterior branches enter the back of the muscle at nearly a right angle, they are more susceptible to mechanical irritation than are the posterior and lateral branches, which enter the muscle at a more oblique angle. Lateral branches are affected by lateral bending and twisting of the trunk; posterior branches are affected by bending, lifting, and twisting. Accessory branches perforate the
muscle wall above and below the main branches but also exit from adjacent muscle mass. These branches are difficult to palpate unless symptomatic and tender to touch. The pain is described as localized, dull, or burning, with a sharp component (usually on one side) radiating horizontally in the upper half of the abdomen and obliquely downward in the lower abdomen. The pain may radiate when the patient twists, bends, or sits up. Lying down may help but sometimes worsens the pain. Younger people, who are usually more physically active than older persons, are more often seen for the first episode of acute pain. The pain may have started during the night but did not cause these patients to miss work the next morning. Nonetheless, they come to the evening clinic because the pain persists, worsens, and causes them to be afraid that they won't be able to work the next day. Young women often express concern about their "ovaries," "kidneys" (the bladder is meant), or both. (18)

Concern about their gonads is a major concern of young people who have reached sexual maturity. Because the testicles are located in the externally, men have the advantage of being able to examine their testicles easily, whereas women's ovaries, being located inside the abdomen, are inaccessible to examination except by medical personnel. Consequently, women may attribute any abdominal complaint to an ovarian disorder until a different cause of pain is shown. Given a chief complaint of "pain in the ovary," the examiner should certainly examine the ovaries but should remember that this is often the way Anterior Cutaneous Nerve Entrapment Syndrome (ACNES) clinically manifests itself. (18)

Unfortunately, women are not the only ones to attribute abdominal pain to gynecologic pathology when the source of pain is actually in the abdominal wall. Noting that between
30% and 76% of diagnostic laparoscopic procedures done for pelvic pain show normal tissues, Young men with ACNES are often seen in the daytime for a chief complaint of "hernia" or "ulcer," complaints considered more common in men. (18) Older men and women may express concern about cancer, remember most of these patients have been in chronic pain for quite sometime with no “real diagnosis”.

Other causes of “groin” or “pelvic” complaints are from the effect of tense pelvic-floor holding patterns, trauma, or inflammation that can overload the muscles, stimulating the development of myofascial trigger points and pelvic floor hypertonus. The increased tenderness and tension in these muscles may refer pain into the lower back, abdomen, or perineum, or it may cause urethral, vaginal, or anal symptoms by compression. The noxious stimuli created by this self-perpetuating process can alter the central nervous symptom in a manner that magnifies and spreads the symptoms. (11)

It is not unusual to see regional pain appear to metastasize; what begins as lower abdominal pain, progresses to urethral pain with urinary urgency and frequency, vulvar pain, anal pain and constipation, lower and upper back and neck pain, headache, anxiety, stress and fatigue. The classical analytic process used in medical diagnosis would attempt to implicate one source for these symptoms, not a dozen. The common denominator may be a myofascial trigger point, described as "a hyper-irritable spot, usually within a taut band of skeletal muscle or in the muscle fascia, that is painful on compression and that can give rise to characteristic referred pain, tenderness and autonomic phenomena."

A myofascial trigger point is the end result of muscle injury at the motor end plate by overloading, whether acute, sustained or repetitive (1). The tender trigger point can then refer pain along that muscle or to surrounding and distant muscles, set off autonomic
nervous system symptoms in the reference zone, weaken the muscles so that they cannot
accomplish a full range of motion, and increase their sensitivity. The affected muscles
and fascia contract, establishing a shortened position, then cause surrounding muscle
groups to compensate. These in turn become so overloaded that they too develop trigger
points, thereby spreading the symptoms.
The increased vulnerability of the pelvic floor muscles can be attributed to their
anatomically central location, which transmits forces between the upper and lower body.
Their constant functional activity (supportive, sphincteric and sexual) and their eccentric
or elongating contractions are additional factors making these muscles a major target of
stress. (11)
The most common events that lead to injury are: chronic tense holding patterns that can
develop in childhood as a result of sexual abuse, traumatic toilet training, abnormal
bowel patterns, guilt surrounding sexual feelings, dance training, repetitive minor trauma
or straining with constipation or urinary obstruction, sudden strain sustained in sports,
direct physical trauma from bicycling, childbirth, childbearing, instrumentation, or
surgery, and inflammation of pelvic organs such as prostatitis, cystitis, urethritis, and
lastly; referred pain from other attaching muscle groups or viscera or nerves. (11)
Myofascial trigger points create chronic pain or mimic visceral disease by three
mechanisms: local tension around the penetrating organs and muscle referral patterns;
viscero-somatic and somato-visceral reflexes; and central sensitization.

Local Effect:
Unlike other striated, voluntary muscles, those of the pelvic floor surround and are
intimately attached to visceral structures (urethra, bladder neck, vagina and rectum) for
support and sphincteric control. Because the afferent nerves of viscera and deep muscles (i.e., those of the pelvic floor) go to the medial thalamus, they cannot localize noxious stimuli as well as nerves from the skin, which go from the lateral thalamus to the somatosensory cortex. Therefore, patients with active myofascial trigger points and spasm of the pelvic floor may not perceive their symptoms as originating in the pelvic musculature. Not only can they have urinary urgency and frequency, vaginal or anal pain, referred pain to the low back, suprapubic or perineal areas, they can also experience varying degrees of emotional distress, because of neural pathways to the limbic centers via the medial thalamus.

**Viscero-somatic and Somato-visceral Reflexes:**

The effect of visceral pain on somatic structures was shown by Vecchiet et al. (12) and Giamberardino et al. (13), who found that 30 to 64% of patients who had had repeated episodes of renal colic experienced hyperalgesia in the lumbar muscles years after the original pain. The latter group postulated that the stone pain triggered plastic neuronal changes at the spinal or supraspinal levels that were sustained after visceral input stopped, although they did not rule out tissue alterations in the referred zone. One of the tests, striking the muscle with the ulnar portion of the hand until contact with the tender point prompted the patient to jump, can be compared to the jump sign in the diagnosis of myofascial trigger points. Their study may actually have found myofascial trigger points created by visceral pain via the viscero-somatic reflex.

This model of repeated episodes of renal colic causing chronic muscular flank pain can be applied to recurrent endometriosis or other pelvic organ inflammation causing chronic pelvic myofascial pain. Wessellmann and Lai (14) demonstrated the viscero-somatic
referral pattern from a gynecologic organ by experimentally inducing uterine
inflammation in the rat. Using Evans blue as a plasma marker, they found that neurogenic
inflammation was produced in the trunk, perineum, bilateral thighs, saddle area and
proximal tail.

The pain distribution from this experimental uterine inflammation is similar to that seen
clinically in women. In addition, once myofascial structures become physically involved
in the pain process, they can develop myofascial trigger points that maintain pain, in this
case even after the visceral inflammation has subsided (1).

Central Sensitization:

Myofascial trigger points not only can be a source of pain, but also can sensitize CNS
neurons and thereby lead to the much deeper and treatment-resistant neuropathic pain. A
review of basic pain neurophysiology indicates that an afferent nerve branches in the
spinal cord to synapse with many dorsal horn cells in many spinal cord segments, above,
below (15) or contra laterally (16). In addition, nerves from multiple organs (muscle,
viscera and skin) can converge on a single dorsal horn neuron and affect each other in the
supraspinal levels as the second-order neurons travel in close proximity in the brain stem
and thalamus on the way to the cerebral cortex.

The obvious importance of this intermingling is to enable the organs to communicate for
normal and coordinated body functions. However, since the dorsal horn neurons and
thalamic cells are the heart of the communication system, any damage to them can cause
widespread dysfunction. Their normal activity is most commonly disrupted by a severe or
chronic painful stimulus from the peripheral nerves that synapse with them. This noxious
input can have many causes, e.g. active myofascial trigger points, visceral pain, or skin
inflammation. When these noxious impulses reach the dorsal horn cells in the spinal cord via the C-fibers, neuropeptides are released, initiating physical, chemical and genetic changes that activate low-efficiency synapses or neurons with a wide dynamic range and facilitate abnormal connections. The manner in which pain is processed is thus altered. This increased excitability of the spinal cord, or altered central processing, is termed neuroplasticity to signify a change that lasts longer than the triggering event. (17)

These plastic changes can variously alter the sensation of pain: the threshold may be lowered, whereby a non-painful stimulus will cause pain (allodynia); pain may be spontaneous or intensified (hyperalgesia) or its field may be expanded; or the degree and duration of pain may be enhanced with each repeated painful or non-painful stimulus (windup). (17) These are all of the pain qualities we begin to observe as the CNS becomes unstable and the symptoms escalate—not from worsening of the disease, but rather from its chronicity.

In addition to these generalized phenomena, symptoms specific to the spinal cord segment are involved. Dorsal horn or thalamic cells sensitized by myofascial pain can cause sensitivity in other organs that converge on them, and painful viscera (e.g., kidney and uterus) can cause sensitivity in myofascial structures in their reference zone. What begins as myofascial, visceral or skin pain can, with enough noxious stimuli, become neuropathic pain, affecting a wider area and more organs. (17)

If the dorsal horn cells remain in this sensitized state, the original pain can be reignited by a noxious stimulus that reaches them from any of the converging organs in their shared receptive fields. The studies of Vecchiet and Giamberardino et al. (12,13) indicated that the renal colic left the thoracic dorsal horn cells sensitized after its subsidence, and
therefore pain anywhere within that thoracic receptive field could reproduce the original colic.

The degree of sensitivity in these dorsal horn cells can be influenced by a multitude of changing factors, e.g. depression, hormonal fluctuations during the menstrual cycle, sleep disturbance, or diet. Therefore, the reason the pain experience may fluctuate may be that a summation of these factors, rather than a single factor, is necessary to exceed the threshold for the perception of pain.

**Treatment:**

A stimulus-free period has been shown to reverse central sensitization, and thus all noxious input entering the relevant spinal cord region must be eradicated. Therefore, a comprehensive approach must be followed, with attention paid to the skin, viscera, myofascial structures, bone and joint articulation, body mechanics, the stressed or depressed mind, hormonal imbalances, poor nutrition, and sleep disturbances. (11) Treatment should be well directed and realistic. Expectations and treatment must be tempered by the knowledge that outcome is frequently frustrated by continued symptoms. Biomechanical, joint articular, and segmental dysfunctions should be found and corrected by chiropractic manipulative therapy. Trigger or tender points are then identified and treated directly with a number of different techniques including spray (with a vapo-coolant such as fluro-methane) and stretch, massage, ischemic compression, Nimmo™ technique, and acupressure. Acupuncture may also be beneficial.
A vigorous physical rehabilitation program of stretching, strengthening and conditioning follows these treatments. A TENS (transcutaneous electrical nerve stimulation) unit may be helpful. Ice and/or moist heat application to site of pain may also be helpful. Chronic stress should be addressed, as it is a contributor to neural sensitivity and increased symptoms. Psychotherapy can play an important role in identifying old traumas that sustain muscle hypertonus. In addition to deep-seated psychological problems, day-to-day stress can create or increase muscle tension and decrease the pain threshold. Therefore, the daily practice of a stress-reduction technique (perhaps meditation) is essential to lower the overall muscle tension and keep it below a symptomatic level. Other treatments include gentle aerobic conditioning, psychological conditioning (biofeedback or cognitive-behavioral therapy), and non-narcotic medications (tricyclic antidepressants, muscle relaxants and non-steroidal anti-inflammatory agents) may be helpful in some instances. The last resort is a technique delivered by an anesthesiologist or pain management specialist, known as needling (trigger point injections) of the affected areas either with or without a local anesthetic. Steroid injections may or may not be recommended, that is based on a case-by-case situation.

**Conclusion:**

The failure to use a broad therapeutic approach to search out and eradicate all incoming noxious stimuli that maintain nerve sensitization will result in continued or recurrent pain. Therefore, it seems that the most successful treatment approach would be a holistic and comprehensive one. An informed physician can better recognize these conditions
and refer the patient to a health care provider that may treat these conditions conservatively both economically and without medications. It is the opinion of the author that the health care providers that receive the most education on these syndromes are the Chiropractic Physician.
References:

2. Cyriax EF. On various conditions that may simulate the referred pains of visceral disease, and a consideration of these from the point of view of cause and effect. Practitioner 1919;102:314-22.