A SYSTEMIC APPROACH TO MUSCULOSKELETAL (MSK) PAIN: SCIENCE & ART

For the purpose of practicality, I have concentrated on the most frequent MSK pain processes I meet in my practice.

INTRODUCTION:

I have developed my art from a passion for relieving human suffering. I am a family physician with an expertise of 25 years in emergency medicine and 15 years in pain management.

Early in my practice I was confronted with a multitude of painful medical conditions for which I had little to offer. Medical faculties offer an average of 20–40 hours of academic teaching on pain control despite the fact that 30% of the population suffers from chronic pain.

I was fortunately introduced early in my career to trigger point infiltrations by a colleague. He taught me the principles of Travell’s myofascial trigger point infiltrations. This technique exploits relaxation of tight painful myofascial bands by the distensive and pharmacologic action of xylocaine infiltrations. This is explained by a reflex mechanism that is not well understood but can last a month and sometimes even be permanent.

As I gained experience in my practice, I was exposed to the more mainstream infiltrations of joints, tendons and ligaments. I have also developed an expertise in prolotherapy but have stopped practicing it because of the CMQ’s position. Interestingly, prolotherapy has permitted me to develop an interest and expertise for enthesopathic pain, which has become a cornerstone of my art. The sanction of prolotherapy, has forced me to use cortisone infiltrations and xylo trigger points for enthesopathic pain with a surprising success. It has brought me to realize that contrary to the purist prolotherapist’s position against cortisone or NSAID use, enthesopathic pain should be addressed by both anti-inflammatory infiltrations (to address pathological inflammatory processes) followed by, when necessary, acute inflammatory provoking healing process infiltrations.
After 15 years of refinement, I have developed a very distinctive expertise in infiltrations with cortisone, xylocaine, botulinic agents and viscosuppleance agents, for the great majority of anatomical sites that can cause pain. I am planning to add to this arsenal PRP/platelet rich plasma therapy.

I am referred patients from family doctors, specialists, physiotherapists, and chiropractors for infiltrations whenever needed. The opposite is also true since I encourage combining my own interventional therapies with non-medical approaches therapies. Combining therapies is usually much more efficient. In my practice, I see 50–70% of my patients relieved of 50–70% of their chronic pain.

As you know, every physician has his own style in infiltration techniques as well as in everything else he does as a doctor and as a person. That is why art and science are not dissociable in medicine. Clearly interventionist pain medicine is a science and an art.

That is what makes evidence based pain intervention medicine very difficult to establish. The technician bias is immense. One can practically only measure "individual" evidence based success rates in pain control. What makes my approach relatively unique is that I have developed my expertise outside the university third line environment.

MY BASIC TRUTHS, PRINCIPLES & THEORIES:

- First, second and third line medical settings tend to ignore important office accessible interventions which can alleviate pain in a great deal of chronic pain patients.

- Pain is a process that can attack the person on all levels of his human structure. That is why science calls it a bio-psycho-social process. It is clear that pain processes can be initiated from either structure to express itself on either structure.

- One infiltrates effectively only the anatomy he knows perfectly.

- A good infiltration is never blind. If competent, there is more blindness in echo-guided infiltrations because of that momentary blind window with US. I have had a two day echo-guided infiltration training in Toronto, which convinced me that my expertise was superior to the echo-guided infiltrations I have witnessed.

- Also, there is more profit in spreading a simple potentially moderately less effective approach to the multitude of primary care providers than to propose a very effective hardly accessible approach such as fluoroscopic or echo guided infiltrations. There will be a great economy of pain and investigation when the knowledge of myofascial and enthesopathic pain treatments is known of primary care doctors.

- I believe most pain processes originate from the entheses (tendon, ligament, cartilage and synovia). They most often secondarily spread to myofascial pain which can
become more painful than it’s enthesopathic source. Primary myofascial pain is obviously possible.

- The myofascial and enthesopathic pain often spreads to neuropathic pain (peripheral and central) when chronicity develops (if one's bio-psycho-social structure permits it).
- A primary lesion if not healed/treated early can chronitize itself with pathological inflammation, peripheral and central neuropathic processes.
- A primary lesion if not treated early will also develop secondary anatomical lesions/pain processes.
- Osteo-arthritis pain processes are often accompanied by enthesopathic and myofascial pain syndromes which are often cause of therapeutic failure when ignored.
- Prolotherapy claims enthesopathic processes precede arthrosis. They claim it is the degenerative stretching of ligaments that favoir arthrosis. This is probably often true.
- It is frequent to find 3 to 5 anatomical pain processes in a chronic shoulder pain, justifying as many infiltrations.
- Chronic pain processes almost always develop a neuropathic component which must often be addressed with anti-epileptics and/or TCCs.
- Physiotherapy, osteopathy, chiropractic and other manipulation techniques are excellent adjuncts to infiltrations and vice-versa.
- Prevention of chronic pain is most assuredly best obtained by aggressive treatment of acute pain by primary care physicians.

- To prescribe tests over many months to establish a diagnosis before attempting any pain management is very detrimental to patients, and that is often what happens in our actual medical setting.
- Degenerative tendinopathies/enthesopathies are prevented and/or treated by healthy inflammatory processes that should to be stimulated; exercise being the most important (prolotherapy and PRP being others).
- Multimodal pain processes often require multimodal therapies such as infiltrative therapy, pharmacology, physiotherapy, osteopathy, chiropracty, etc.
MY PEARLS:

- Close to 75% of chronic MSK pain processes start on the entheses of 4 flat bones (scapulae, occiput, iliac and sacrum). The larger the enthesis, the more symptomatic it will be. The deeper the muscle, greater its enthesis, more symptomatic the muscle.

- A handful of muscles are responsible for a majority of the MSK pain processes.

- Most chronic pain syndromes are the result of one (or more) primary lesions and often secondary lesions, all requiring infiltrative attention.

- **The osteo-arthritic joint and spine:**
  Osteoarthritic processes are often primary lesions to secondary myo-enthesopathic processes.
  - When ignored, the myo-enthesopathy often cancels the therapeutic benefit of intra-articular infiltrations.
  - This symbiosis between joint and peri-joint pathology applies to the spine.
  - I have often found useless to do an epidural on a patient with spinal stenosis/discopathy who also presents significant sacro-iliac pathology or gluteal myo-enthesopathy or para-lumbar myo-enthesopathy. I therefore address the periphery before I do an epidural.

- I have also found that if primary lesions are ignored even if barely symptomatic compared to the secondary lesions, they sometimes shorten significantly the effect of the intervention.

- I use the word enthesis (singular) and entheses (plural) for all bone attachments.

- The enthesopathy is often primary to myofascial damage, sometimes secondary.

- Surgical dissection shows that tendon and ligament entheses of a joint form a huge amalgam that should often be treated as a whole. For example the anserine tendons of the knee are an extension of the internal collateral ligament. That explains why they are often symptomatic together.

**The pseudo-radiculopathy**

A few myo-enthesopathic pain processes mimic radicular pain. These few are responsible for a majority of the radicular pain patterns. For every true radicular pain
process, there must be as many as 50 pseudo-radicular myo-enthesopathic referred pain processes. Most doctors refer these patients for MRIs, EMGs and neuro-surgery consults even if this process will knowingly take up to 6-12 months while their patient suffer unduly because myo-enthesopathic pain processes are ignored. This gives time for chronic pain processes to establish themselves.

The needle and its aim:

- A TRP (trigger point) infiltration is more effective when performed deep in the muscle, starting on the enthesis.
- One is never sure of his needle position if he hasn't identified a bony reference point with his needle.
- The variations in the shapes of iliac and sacral bones are phenomenal. This fact is sufficient to change needle aim in many patients. This is less true of the scapulae but there are still surprising differences.
- I use 2" needles for most gluteal and sacral entheses infiltrations. I sometimes need to use 3.5" needles for gluteal infiltrations.

Same needle, different substance, different theory; similar results

- 70% of trigger points are common to acupuncture sites.
- Perifacettal prolotherapy infiltration sites share medial branch blocks sites.
- Prolotherapy of SI joint area and cortisone infiltrations of same site often have similar results.
- I believe that trigger point and enthesis infiltrations work partially independently of the substance used for some of its actions.
- The dry needle effect is in my opinion, ultimately bifold:
  1. Micro-trauma causing an acute inflammatory healing process.
  2. Reflex relaxation (enhanced when needle is “wet”)
- I believe this reflex relaxation is obtained in TRP, acupuncture, and all needling techniques.
- *Same needle, different substance, different theory; similar results but not always.* The exception to this rule is that I have found that entheses often require more than a TRP action. They respond significantly better with cortisone.
- This reflex relaxation is also obtained in all manipulative techniques that apply the “stretch and press” principles. I find that ultimately, a good physiotherapist, chiropractor or osteopath all exploit techniques that “contract-press-stretch” the entheso-myofascia to obtain this reflex relaxation. I find however that needles do it quicker, longer and cheaper.
- I have interestingly found chiropractic techniques that exploit micro-traumatic manipulations that mimic prolotherapy theories.
- The reason why “wet” trigger point infiltrations are more effective is, in my opinion, the tissue distension effect from the liquid injected in TRPs provoking a greater, quicker, longer, cheaper reflex relaxation than dry needling or manipulative techniques.
- This reflex effect clearly outlasts the pharmacologic action of the xylocaine (30 minutes half-life).
- Cortisone or a botulinic agent often add a multimodal effect to the TRP therapy.
The substance used, if in sufficient amount, can have a systemic anti-inflammatory effect (cortisone) or a systemic neuropathic effect (xylocaine).

When performing an epidural with 120mg of kenalog, it is not rare to have patients say it has had an effect on a painful joint.

When infiltrating trigger points with 30cc of xylo1%, one injects 300mg in a patient occasionally weighing 60kg, bringing the dose to 5mg/kg corresponding to the IV xylocaine treatments. I find a significant difference in some patients when I inject 20 vs 30cc of xylocaine.

The physical exam

It is impossible to correctly establish myofascial or enthesopathic pain without completely relaxing the patient's body. I cannot do a good shoulder/cervical exam if I do not finish with my patient lying on his front side. The same obviously applies to any spine, or buttock pain. Most physicians proceed to detailed movement testing prior to an often absent palpatory exam. I do the opposite.

Personally:
1. I ask the patient to identify and show the painful movements.
2. I complete this by guiding him through different movement axes.
3. I ask him to show me the pain pattern on his body.
4. I palpate. The palpation gives me 75% of the diagnostic information.

Evidence-based medicine

It is very difficult to establish evidenced-based medicine when interventional medicine is concerned. The main reason is its technician dependency. You cannot study two elements at the same time and get a correct analysis. It is very delicatet to interprete data when testing many interventionists at the same time. There is also tremendous technical bias in the physical exam when dealing with MSK problems. This causes extreme variations in diagnosis, treatment and success rate.
THE ESSENTIAL MUSCLES & THEIR 4 FLAT BONES

I will present on the handful of muscles involved in the majority of chronic MSK pain processes that I meet. Interestingly, they all have their entheses on 4 flat bones of the human body.

They are the scapulae, occiput, iliac and sacral bones. Their muscles are:

**Scapulae:** trapezius, infraspinatus, supraspinatus and to a lesser extent, the levator scapulae. Its other muscles are less expressive although I have had to infiltrate all of them.

The **infraspinatus** is the most expressive muscle of the superior limb.

- It very often mimics cervical radicular pain.
- It will produce a pain radiating as far as the fingers.
- Its enthesis is one of the biggest and most expressive of the human body.
- It will rarely (but will occasionally) express itself without its functional partners supraspinatus and trapezius.
- The infraspinatus expresses itself more at its enthesis than at its myofascia.
- It will respond less to trigger points not involving the enthesis and often requires cortisone or prolotherapy (although both approaches are theoretical opposites).
The supraspinatus and trapezius: mimic radicular pain towards the deltoid and as far as the mid arm.

The trapezius:
- It is the most frequently expressed muscle of the superior limb.
- It is a big superficial muscle with a narrow enthesis and expresses itself mostly myofascially at its suprascapular border.
- However, at the occipital level it is responsible enthesopathically for most tensional headaches which I will discuss later.

In supraspinatus cuff tears, the myofascial pain syndrome involving the supraspinatus, trapezius and infraspinatus is more symptomatic than the tear itself and can remain after surgical repair causing post-acromioplasty chronic shoulder pain if ignored.

In osteo-arthritis shoulder pain, the myofascial and enthesopathic pain are often secondary lesions requiring attention and explain the failure of many intra-articular infiltrations.

The trapezius is notably vulnerable to central psychogenic neuropathic irritation (psychosocial chronic stress).

The occiput:
- Its most symptomatic muscles are the trapezius, the sterno-cleido-mastoid, splenius capitis, semispinalis capitis and much less often the scalene.
- They are all involved in many of the so-called tensional headaches and Arnold neuralgia/cephalalgia.
- These headache pain processes are more enthesopathic than myofascial.
Facial pain:

- Three muscles are involved in most facial pains: the SCM, the masseter/pterigoid and the temporalis.
- More rarely do we find 5th nerve neuralgia mimickers in the zygomaticus minor/major and the levator labi.
- When the SCM is involved, it often secondarily implicates by neighboring cascade, the masseter which in turn involves the temporalis.

Sacro-iliac pain:

Mastering the sacro-iliac pain processes has been for me the most challenging of all bodily pain processes. It was a priority since it is responsible, according to litterature, to 40% of low back pains, who are themselves the most important of all bodily pain processes. It is only once I was forced to stop prolotherapy that I finally understood the SI pathology. Mainstream prolotherapy concentrates more on the spina iliaca posterior and sacral ligament enthesopathies in SI pathology. Its textbooks will show diagrams of SI ligaments ignoring all tendinous entheses of the iliac and sacral bone. My success rate exploded once my infiltrations concentrated not on ligament entheses but on tendinous entheses of the sacrum and iliac bone.

The sacrum:

- Some literature says that over 50% of lumbagos are non specific.
- Some litterature says that sacro-iliac pain is the cause of 40% of lumbagos.
- I prefer the second and will suggest that sacro-iliac bone entheses are responsible for over 50% of lumbagos.

The most important enthesis for lumbagos is by far the sacral enthesis of the multifidi. It is the most expressive enthesopathic source of chronic pain in lumbago. It's distal enthesis covers the superior part of the sacrum.
It is occasionnaly expresses itself with the longissimus thoracis which ties to the lower part of the sacrum.

The longissimus is much more myofascial than enthesopathic and almost always expresses itself with the multifidi. They are followed (myofascially) by the iliocostalis lumbar which ties onto the longissimus and multifidi entheses. The iliocostalis has the particularity of occasionally radiating pain to the abdomen.

**The iliac bone:**

The most expressive muscle of the iliac bone is the gluteus minimus.

It is followed very closely by the gluteus medius.
They are both very important radicular mimickers.
The **gluteus minimus** mimics L3-L4 and a partial S1.
The **gluteus medius** mimics L4-L5 and a partial S2.
Countless are the patients with these pain patterns awaiting negative or non specific scan/MRIs and EMGs to be said nothing can be done.

**Pseudo-radiculopathies:**

I have mentioned already the clinical importance of this TRP phenomena but need to reiterate because of the great consequence it has on the human being. The main myofascial pain syndromes to mimic radiculopathy are the infraspinatus and the gluteus minimus with secondarily their functional partners mentioned earlier. Another very expressive pseudo-radiculopathy is the scalene but is not seen as often as...

**Anatomical trivia:**

For the purpose of anatomical trivia, it is interesting to see the similarities between:
1. The **scapulae and iliac bone**.
2. The **infraspinatus and the gluteus minimus**:
   Their very large enthesis and their pseudo-radicular pains make them the 2 most important anatomical pain processes of the human body.
3. The **gluteus medius and the supraspinatus/trapezius**: The main functional partners of point 2.
4. The **trapezius** and the **gluteus maximus** are the two superficial thin esthetical covers, respectively of the posterior shoulder and buttock. They are barely symptomatic in their thin portion.
Their thick portion is narrow and very frequently symptomatic for the trapezius, less often for the gluteus maximus.

The piriformis syndrome described in literature is often mistaken for the gluteus maximus TRP that I see more often than the piriformis TRP.

The gluteus maximus’ thick portion is parallel to the piriformis. The piriformis starts on the sacrum just below the gluteus maximus’ proximal enthesis sitting on the inferior portion of the spina iliaca posterior.

- It is amazing to see how most MSK pain processes of the human body are posterior, while most visceral pains are anterior.
- The abdomen would be an exception to the TRP rule of deeper muscles being more symptomatic.
- Another exception to the rules of TRPs is the brachialis who refers pain proximally instead of distally, but that is easily explained by its anatomy.

**Greater trochanter:**

Another very important site of enthesopathic pain is the greater trochanter. If there are five documented bursaes of the hip, it’s because more importantly there are, at the greater trochanter, the enthesis of the three gluteus, the piriformis (a sacral muscle), the obturator internus and externus, the gemellus sup and inf, quadratus femoris and vastus lateralis. I personally do not believe in the isolated bursitis as a pain process. A bursitis is a secondary condition to a tendinopathy or enthesopathy.

**Perineal pain:**

Perineal pain is a challenge. The perineal pain processes I have encountered are mostly the expression of 3 muscles: the coccygeus, levator ani and to a lesser extent, the obturator internus.

A lot of central psychogenic pain processes expresses itself through the perineum.
Abdominal Pain:

I have encountered a few interesting cases of chronic abdominal pain processes, extensively investigated, and expressing itself mostly through the external abdominal oblique and ilio-psoas.

The ilio-psoas is by far the most expressive of the abdomen and one of the most expressive of the body; however not a frequent expresser. It has taken me many years to find the courage to infiltrate it because of its difficult access. It is to be suspected when a lumbago patient walks in flexion or when a chronic abdominal pain patient has lumbago. The psoas is the “filet mignon” of the beef. It is a tender piece of meat because it is the sexual pelvic flexor which doesn’t get to work much. It expresses itself as much at the lumbar level as it does abdominally and at the anterior thigh.

The abdominal oblique externalis expresses itself 1. myofascially, 2. at its rib enthesis and 3. more importantly at its pubic enthesis.

I have also encountered rectus abdominus TRPs.

Pubic pain:
I also have encountered some interesting pain processes to the genitals referred from pubic enthesopathies; mostly the abdominal external obliques and rectus abdominus. They were all post traumatic.
It is as if, when the trauma is initially myofascial, it expresses itself on the abdomen and when it is initially enthesopathic, it expresses itself on the genitals.
(It was always the superior portion of the pubis that was tender...)

**The knee:**

My experience with the knee is the following: prior to my initiation to prolotherapy, my intervention with knees was limited to the usual intra-articular corticoid infiltration, followed by the occasional “viscosuppleance” infiltration.
With prolotherapy (the theory of provoking acute inflammatory healing processes with slightly irritative dextrose 12-25% trigger points to ligaments), I had added to my protocol, infiltrations of collateral internal/external ligaments and anserine tendons when intra-articular infiltrations were ineffective and tenderness was found on the collateral ligaments.

This had added a great deal to my success rate regarding knee pain.
The ICL and anserine tendons are a same anatomical macroscopic fibrous tissue on dissection. (The ICL is not show on this diagram.)

Internal collateral ligaments (ICL) are much more involved in pain processes than the external collateral ligaments.

After ending my prolotherapy practice, I began doing cortisone infiltrations to the frequent painful ICL and anserine tendons of non responding intra-articular infiltrations.
The success rate was and is impressive. Same needle, different substance, different theory, similar result (!)

**Tarsal and metatarsal pain processes:**
They remain for me the most rebellious pain processes to deal with in infiltration therapy. My successes remain mostly with the classical plantar fasciitis and toe osteo-arthritis which I infiltrate with ease and success with cortisone.
I also infiltrate less common plantar fasciitis whose entheses are on the lateral portions of the calcaneum.
I however have success in foot pain syndromes which originate from referred pain patterns of the tibialis anterior and extensor/flexor digitalis.

I have little success with pain syndromes involving directly the tarsus and its myofascial enthesopathies or osteo-articular pains.
Even when success occurs, patients resent very much the pain involved in these infiltrations due to the important nociceptive innervation of the foot. They rarely come for consecutive visits.

**Botulinic agent infiltrations:**
I consider botulinic agent TRP infiltrations exclusively when xylocaine TRP’s beneficial effects lasts less than 3 weeks.

**Pharmacology:**
The classic global triangular approach to pain control, as presented in pain conferences and courses are always presented as pharmacologic, psychological and physical interventions. Unfortunately 98% of the conference and course contents are pharmacologic.
The purpose of my writing does not concern my pharmacologic approach but let it be written that I use the same multimodal pharmacology as used by the mainstream medical field.

I especially appreciate antiepileptics in myofascial syndromes although they have their toll in cognitive, emotional and sexual side effects, weight gain and water retention (with the exception of topiramate which occasionally permits surprising weight losses).

I have learned to become rather conservative with narcotherapy.
I am generous with narcotics in acute syndromes in order to help reduce the risk of central processes of chronicity.
I am generous with narcotics for short to moderate term therapy.
I am much more conservative in long term therapy, not much because of dependency issues but because of cognitive, emotional and sexual issues.
I have been surprised on many occasions to be able to wean off narcotics chronically narcodependent patients without changing significantly their pain levels; while improving their quality of life.