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Integrating Laser and Manipulative Therapy

Mention lower back pain, the images of disc herniation, nerve impingement and muscle spasm come into mind. These are all known pain producers or are they?

Physiologically, pain is a nociceptive message that travels up the spinothalamic tract to the thalamus. From there, part of it branches off to the Primary Sensory Cortex to register as pain sensation while the rest go to the reticular formation and the hypothalamus.

The spinal nociceptive messages are initiated by a number of chemicals that stimulate the nociceptors to fire. These chemicals are produced during the inflammatory processes. Interestingly enough, spinal nociceptors are mostly chemosensitive ones.

INFLAMMATION is the very first biological response to any injury, trauma, sprain or strain. It is there within the first few seconds of the incident. Though part of it will be gone in a few minutes; most of the responses will stay. How long it stays largely depends on the condition and the mode of treatment available.

Acute inflammation is well known for its 5 characteristics; Redness, Heat, Pain, Swelling and Loss of function. This is not a bad thing because at this stage, soluble mediators and growth factors are released to promote healing.

In practice, most cases of lower back pain and its inflammatory status are either Sub-acute or Chronic in nature. Patients usually have the problems for a number of weeks, months or even years. Hence, there are no growth factors to help them heal.

Spinal manipulative therapy is known to be effective in pain control and restoration of joint functions. The mechanism behind this successful procedure lies in the activation of mechanoreceptors which inhibit the nociceptive transmission, thus modulates the pain perception.

Mechanoreceptors exist in all articulations of the body. In the lumbar spine, they are found in the facet joint capsules, spinal ligaments, disc, paraspinal muscles and more.

Within the frame work of lower back pain, the chiropractic profession advocates the five components-Subluxation Complex Theory. (1, 2, 3)

1. **Kinesiopathology** – loss of normal vertebral alignment and motion in relation to the adjacent segments.
2. **Myopathology** – abnormal muscle tonicity, spasm, weakness, fibrosis and loss of normal functions.
3. **Neuropathology** – damages or irritation to the spinal nerves due to compression, stretch or chemical irritation.
4. **Histopathology** – osteophytes, disc dehydration or degeneration, adhesions of spinal ligaments

etc.

5. **Pathophysiology** – inflammation and other abnormal biochemical changes in the injured spinal areas and nearby structures.

According to this concept, the key issues are the correction of kinesiopathology to restore normal joint functions and the release of nerve compression to reduce pain through activation of the mechanoreceptors. For decades, spinal manipulation has been held as the champion in correcting these five pathologies with many positive results to back up the claim.

Meanwhile, advances on researches in injury and inflammation shed new light on the pathophysiology of lower back pain. This is of particular interest to the chiropractors and practitioners of manual therapy. As far as inflammation is concerned, the clinical evidence to support the idea that inflammatory back pain can be eliminated by the use of spinal manipulation is woefully lacking. According to evidence-based practice guidelines, in the presence of inflammation, spinal manipulation is contra-indicated!

As pain is experienced within the Central Nervous System via chemical changes; intracellularly and extracellularly with the aid of a number of neurotransmittors such as Substance P, this means inflammation is the fountain head and originator of all pain sensation.

Without inflammation, there may not even be any back pain.

This is a statement that is not often mentioned amongst manipulative therapy practitioners. Hence, this issue deserves a closer examination.

First, let us look at some basic facts and sequence of events in lower back pain.

- Whether it is trauma, sprain, strain, repetitive strain injury, infection or auto-immune related back pain, cellular damage to spinal tissue is the first event that takes place.
- The release of intracellular contents and fluid into the extracellular space initiates a decrease of PH; this triggers the release of Bradykinin which causes the cells next to the capillary walls to open their intercellular junctions. That allows the neutrophils, lymphocytes and macrophages to emerge and start removing damaged tissue and debris.
- Bradykinin also binds to Mast cells in the tissue and causes the release of pain inducing inflammatory chemicals such as tumour necrosis factors (TNF), and prostaglandins into the injured area.
- Mast cells are the major producers of inflammatory chemicals.
- Chemosensitive nociceptors (C-fibres) are the primary nociceptors of the spine.
- 70% of dorsal horn afferents are C-fibres (specialize in chronic pain).
- Nociceptors far outnumber mechanoreceptors in all spinal articulations.
- Sympathetic Nervous System directly innervates Mast cells. This is also known as 'Cross Talk' with the Autonomic Nervous System (A.N.S.).
- Nociceptive messages travel up the spinothalamic tract to the thalamus and from there, 10% goes to the Primary Sensory Cortex and 90% goes to the reticular formation and hypothalamus.
- The Primary Sensory Cortex is the site where pain is felt.
- The reticular formation and hypothalamus are part of the control centres for the Autonomic Nervous System especially the Sympathetic system.

So what have we here?

1. Injury causes Mast cells to produce painful inflammatory chemicals.
2. Most spinal nociceptors specialize in sensing these chemicals.
3. Mast cells receive direct innervations from the A.N.S. (Sympathetic).
4. Only 10% of the nociceptive signals go to the cortex to be noted as pain, 90% of the nociceptive messages go to stimulate the Sympathetic Nervous System.
5. Excited Sympathetic System stimulates Mast cells to produce even more inflammatory chemicals and other symptoms.
6. That leads to more inflammation and back pain.

In other words, inflammation drives the Sympathetic Nervous System to produce more inflammatory products and pain 90% of the time.

Clearly, in order to stop 90% of the nociceptive messages, we have to stop the inflammatory sequence that causes pain while at the same time stimulates the production of soluble mediators and growth factors to promote healing.

Therefore, it makes good sense to first control the inflammation followed by activation of the mechanoreceptors to bring the inhibitory effects to the remaining 10% of the nociceptive messages.

This is especially true in chronic lower back pain, where inflammation and the fibrosis can destroy mechanoreceptors and the resultant scars distort normal functions. This leads to biomechanical dysfunction of the spine and tissue stress; the vicious cycle of inflammation begins all over again.

Other examples of this phenomenon are ankylosing spondylitis, rheumatoid arthritis, psoriatic arthritis, traumatized Grade I & II spondylolisthesis, final stages of degenerative disc disease and degenerative facet joint disease where spinal manipulation is either contra-indicated or has very poor result.

There is little question that spinal manipulative therapy helps control lower back pain quite effectively most of the time. To explain that clinical effect, the chiropractic profession has focused on the Subluxation Complex and nerve impingement concepts. It maintains that lower back pain is due largely to aberrant kinesiopathology and neuropathology within the lumbar spine.

Though the presence of inflammation is mentioned in the Subluxation Complex Theory, it never gets centre stage. Reason being, there is little evidence to support the idea that manipulating an inflamed joint is a sound clinical practice. For the most part, it is contra-indicated.

Study has shown that facet joint inflammation will induce radiculopathy without nerve impingement.
(4) Similarly, spinal ligament inflammation can give rise to pain distal from the point of involvement.
(5) Lower back pain may be neuromuscular in appearance but the real driving forces underneath are the inflammatory processes that can undermine the effectiveness of spinal manipulation. Little wonder why a number of back pain cases respond poorly to lumbar manipulation or traction.

It behooves us to take another look at the causative agents of back pain and our treatment approaches. Aberrant spinal biomechanics, disc protrusion, spondylolisthesis, severe disc degeneration and compression fractures do not always result in pain. We have seen many examples of that in M.R.I., CT scan and physical examination of our patients.

What produces the pain signal is **inflammation**. It is from that point onward, the neuromuscular events become significant. It makes sense to first control the inflammation then follows up with spinal manipulation and soft tissue therapy to restore spinal health.

The use of Low Intensity Laser Therapy not only eliminates inflammation effectively, it also promotes regeneration of damaged tissue. When properly integrated with spinal manipulative therapy, it will enable the practitioners to treat an even greater variety of lower back pain successfully. In cases where manipulation has been beneficial, the prompt removal of inflammation can stop pain sooner and significantly speed up recovery.

The time has come for all practitioners who treat back pain to take a look at their old paradigm. The concept of biomechanical dysfunction and nerve root compression as reasons for back pain is no longer adequate. The notion that spinal manipulation stimulates mechanoreceptors to inhibit pain is not always applicable in practice.

As nociceptors are sensitized during inflammation either by heat or mechanical movements such as in cases of burns and knee injury, the increased temperature or moderate bending of the knee causes more pain. Hence the motion that stimulates the mechanoreceptor can also increase nociceptors activities. Therefore the continual stimulation of mechanoreceptors can either inhibit nociceptors or cause allodynia.

To successfully treat lower back pain, we must first resolve the issues of inflammation. Otherwise, it would be hard to argue the validity of spinal manipulation of an inflamed joint.

A properly integrated laser therapy within the spinal manipulative practice is the most advance and effective regime in treating acute and chronic lower back pain. Clinical success is what brings recognition. Therapeutically speaking, a shift to the **LIGHT** is in order.

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Bio

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