

"Fascia contains mechanoreceptors and proprioceptors. In other words, every time we use a muscle, we stretch fascia that is connected to spindle cells, Ruffini and Paccini corpuscles and Golgi organs. The normal stretching of fascia thus communicates the force of the muscle contraction and the status of the muscle regarding its tone, movement, rate of change in muscle length, and position of the associated body part to the central nervous system." **From Dr. Warren Hammer, the chiropractic profession's leading expert in soft tissues and fascia (*The Fascial System is a Sensory Organ*). Dr. Hammer went on to say in another article (*Why We Need to Fix the Mechanoreceptors*) that, "One of the most relevant discoveries in the world of anatomy over these many years is that muscle spindles, the chief proprioceptive cell affecting our muscles, are not in the muscle, but in the fascia surrounding the muscle and its muscle bundles. A mechanoreceptor is stimulated when it is deformed, but when it is restricted in fascia that is unable to glide... it is unable to stretch, which is critical for the function of the spindle cell."**

"This study demonstrated an abundant innervation of the fascia consisting in both free nerve endings and encapsulated receptors, in particular, Ruffini and Pacini corpuscles. The hypothesis that the fascia plays an important role in proprioception, especially dynamic proprioception, is therefore advanced. In fact, the fascia is a membrane that extends throughout the whole body and numerous muscular expansions maintain it in a basal tension. During a muscular contraction these expansions could also transmit the effect of the stretch to a specific area of the fascia, stimulating the proprioceptors in that

area." From a 2007 study from the journal *Morphologie (Anatomy of the Deep Fascia of the Upper Limb)*

"It is now recognized that fascial network is one of our richest sensory organs. The surface area of this network is endowed with millions of endomysial sacs and other membranous pockets with a total surface area that by far surpasses that of the skin or any other body tissues. A myriad of tiny unmyelinated 'free' nerve endings are found almost everywhere in fascial tissues, but particularly in periosteum, in endomysial and perimysial layers, and in visceral connective tissues. If we include these smaller fascial nerve endings in our calculation, then the amount of fascial receptors may possibly be equal or even superior to that of the retina, so far considered as the richest sensory human organ. However, for the sensorial relationship with our own body - whether it consists of pure proprioception, nociception or the more visceral interoception – fascia provides definitely our most important perceptual organ."
Dr. Robert Schleip from

"There really is a sixth sense: it's called proprioception. It is the sense of position and movement. It is produced by nerves in our connective tissues (ligaments, bone, fascia) and our 300-or-so muscles. Without proprioception, you couldn't stand up (standing up is actually shockingly complicated). You couldn't so much as scratch your nose, because you wouldn't be able to find it." Paul Ingraham from his article,

***Proprioception, The True Sixth Sense.* I included Ingraham's article only because he was a previous editor of Gorski & Novella's [SCIENCE-BASED MEDICINE](#) and has written a large article decrying fascia as being an important target of manual therapies.**

When we think of the nervous system, most of us automatically think of its sensory side --- things we feel. While the sensory side is certainly important, even more important is the motor side of the nervous system --- the part of the nervous system that makes things work; that makes muscles and organs function. There is, however, another side of the nervous system; a part of the sensory system that's critically important, yet hardly ever discussed by lay persons --- mechanoreception, aka proprioception.

First off, don't confuse these two terms with nociception; something completely different. Nociception (certain nerve endings are called nociceptors) is associated with things like pain, constricted blood vessels (vasoconstriction), [MUSCLE SPASM](#) (this and the previous can cause hypoxia or lack of [TISSUE OXYGENATION](#)) as well as various deficits in the autonomic nervous system (can anyone say [SYMPATHETIC DOMINANCE?](#)). Functional neurologist [DR. DAVID SEAMAN](#) puts it this way.....

"Nociception and pain are two completely different animals. However, a devastating consequence of both pain and nociceptive stimulation of the hypothalamus, is the release of cortisol by the adrenal glands. Over time,

elevated levels of cortisol will promote glucose intolerance, inhibit collagen formation, increase protein breakdown, inhibit secretory IgA output, and inhibit white blood cell function."

In other words, proprioceptive loss means that you are far more likely to end up with **ADRENAL FATIGUE**, **BLOOD SUGAR ISSUES**, **PROBLEMS HEALING**, various sorts of **IMMUNE SYSTEM PROBLEMS**, not to mention **CHRONIC PAIN**. Mechanoreceptors are the numerous and various nerve endings (mostly "encapsulated" --- Ruffinis, Pacinis, Golgis, etc) that are greatly responsible for proprioception. What is proprioception?

When mechanoreceptors are stretched, compressed, or sense almost any sort of movement or vibration, they fire off input into your nervous system to give a person what is called "kinesthetic awareness" (kinesthesia). In other words, along with mechanoreception; inner ear function and visual input allow for balance and an awareness of where your whole body, as well as the various parts of your body, are in space. It is thought that of the three, mechanoreception is the most important. Together, this kinesthetic integration of the musculoskeletal and nervous systems is known as proprioception.

When joints and tissues are being moved through normal ranges of motion on a regular basis (**EXERCISE**, **PERIODIC ADJUSTMENTS**, **STRETCHING**, **YOGA**, etc, etc, etc), mechanoreceptors of all kinds are being fired. This is important on many levels. Although I cannot find the study he was referring to, I attended a **WHIPLASH** seminar in Little Rock 25 years ago where the instructor

(the brilliant Dan Murphy) said that for every proprioceptive impulse not fired off due to loss of or abnormal mechanoreception, thirty responses are inhibited on the motor side. It's likely what caused the father of **FUNCTIONAL NEUROLOGY**, Ted Carrick, to say (I am loosely quoting here), "***chiropractors don't move bones off nerves, they put pressure on mechanoreceptors***" and helps explain some of the **CRAZY MIRACLES** that occur in my clinic from time to time (the link deals with an individual getting his hearing back after one adjustment after 42 years of deafness).

A majorly important thing to remember about mechanoreception is that it has the potential to inhibit nociception. In other words, when joints are moving through normal ranges of motion *and* being moved on a regular basis (trust me when I say that people are often fooled -- **HERE** --- I was totally fooled by a 26 year old female yesterday), it has a pain-inhibiting / spasm-inhibiting effect, that tends to push the body away from **SYMPATHETIC DOMINANCE** and towards the parasympathetic side of the nervous system, meaning the body has a better ability to both relax and digest. It's also why having joints --- particularly joints of the spine --- that do not move through normal ranges of motion, even in the absence of pain, is never a good thing.

FASCIA, MECHANORECEPTION AND PAIN

FASCIA is the thin, cellophane-like membrane that covers and clings to numerous anatomical structures / tissues, including muscles. Not only is fascia the most abundant connective tissue in the body, it is known to be loaded with mechanoreceptors of various sorts. Why is

this a big deal? It's a big deal for a couple of reasons. Firstly, remember that when fascia and other connective tissues (**TENDONS, LIGAMENTS**, etc) are injured (**TRAUMATICALLY, REPETITIVELY, OR OTHER**), it creates what the medical community calls **FIBROSIS**. In my clinic, I call it **SCAR TISSUE** because it's a simpler concept for most people to grasp, and despite those who want to debate the matter, are essentially the **SAME THING**.

Adhesed fascia can cause perpetual subluxation, or at the very least, an inability to reduce subluxation (**SUBLUXATION** is defined as a loss of normal alignment or motion of joints --- usually vertebrae). This is why there are so many people **CANNOT HOLD AN ADJUSTMENT**. They often do amazingly well with Chiropractic Adjustments for a little while, but no matter what they do, they cannot seem to hold adjustment more than a few days, or in some cases, just a few hours.

How long have we known that fascia is loaded with mechanoreceptive abilities? For instance, in 1974 the *Bulletin of Tokyo Medical and Dental University* published a study called *Mechanoreceptors in Fascia, Periosteum and Periodontal Ligament* (for the record, **PERIOSTEUM** is the membranous fascia that covers bones). But there are many others. Thus, after realizing the intimate relationship between pain and abnormal proprioception, it should make you stop and think yet again about fascia as a potential generator of chronic pain. Let's briefly look at some of the research.

A 1992 study on the **THORACOLUMBAR FASCIA** (*Sensory Innervation of Human Thoracolumbar Fascia*)

from *Acta Orthopaedica Scandinavica*) takes us back even further, when the authors state, "**Recent studies have proclaimed a significant role for the thoracolumbar fascia in the biomechanics of the lumbar spine. To our knowledge, there are only two histologic studies on the human thoracolumbar fascia (Stilwell, 1957, Hirsch 1963). Methylene-blue positive elements were found by Stilwell in the thoracolumbar fascia, such as numerous free nerve endings and large pacinian corpuscles. Hirsch spoke of 'complex unencapsulated endings.'**" The thing is folks, this study was 25 years ago, and dealt with a study that is now sixty years old. There are many such studies on fascia and it's proprioceptive abilities now.

For instance, take a look at what our own government said of fascia in this cherry-picked quote from a 2014 issue of one of the journals published by the Veterans Administration ---- the *Journal of Rehabilitation, Research, and Development (Fascia—Current Knowledge and Future Directions in Physiatry: Narrative Review)*. For the record, physiatrists are medical doctors who, although they do use drugs to treat patients, sometimes treat in similar fashion to chiro's or the old fashioned DO's. "**Fascia can be considered part of the connective tissues that permeate the human body. In medical education, trainees are taught about various organ systems, including the cardiovascular, respiratory, gastrointestinal, musculoskeletal, and neurological systems. Fascia is part of all of these systems....**" So, why isn't mainstream getting this message? One of the biggest is imaging. It takes **VERY SPECIAL IMAGING TECHNIQUES** to actually see fascia (**MRI** will not). But

the lack of understanding starts long before that. The authors go on to explain why most physicians (and yes, even chiro's) don't have much of a grasp of the importance of fascia when coming out of professional school.

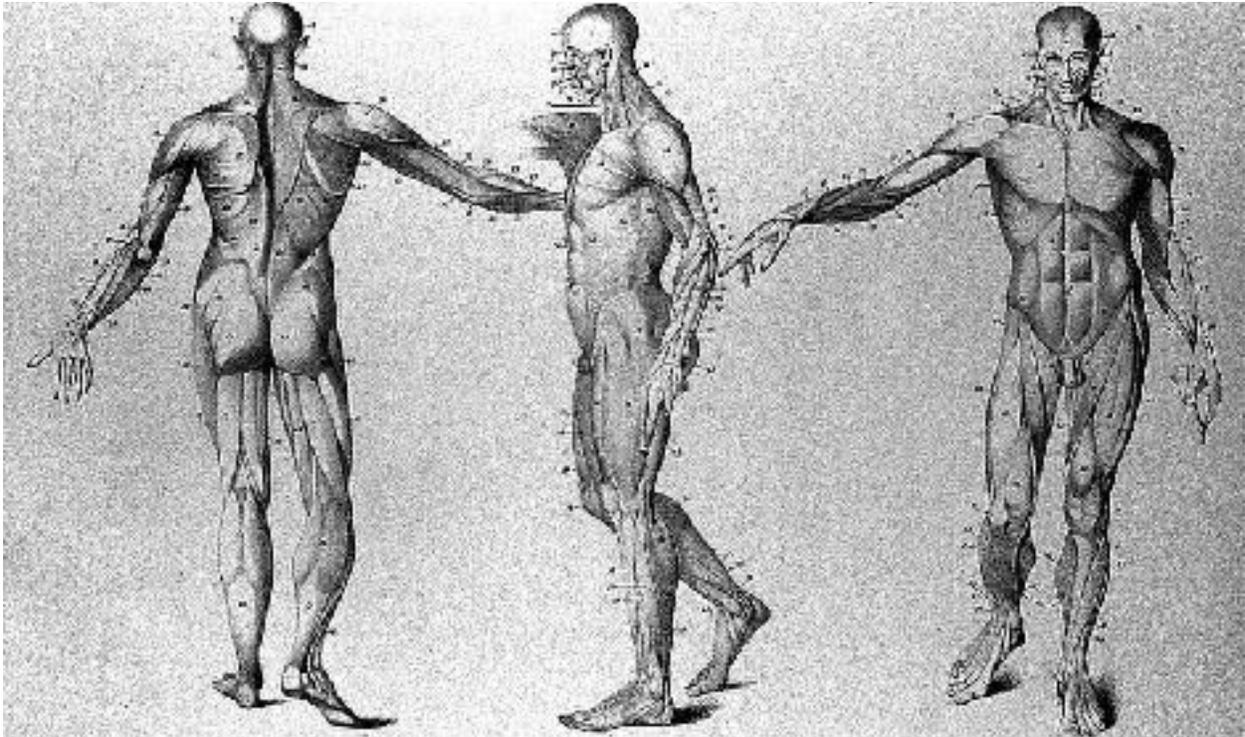
"With embalmed cadaveric specimens, the majority of fascial tissues are either ignored or difficult to discern during a dissection. However, if unembalmed cadavers are dissected using 'fascia-sparing' techniques, much more may be garnered regarding the structure and function of the musculoskeletal system. These 'fascia-sparing' dissections demonstrate functional connections and emphasize the continuity of fascia throughout the human body. Fascia is more evident in living bodies. When defining fascial tissue via anatomical dissections, it may be difficult to define it only structurally, especially if fascial tissue has a dynamic and widespread role. For example, functions such as force transmission and sliding are not easily demonstrated in static specimens."

I had intense cadaver-based anatomy / physiology courses both at Kansas State University and at Logan College of Chiropractic, and in neither case was fascia ever as much as mentioned let alone studying or even discussing its astounding properties. The cool thing though, is that this is changing. There are now "Functional Anatomists" that are doing special dissection seminars. I believe that Tom Meyer's of [ANATOMY TRAINS](#) is doing this as is [GIL HEADLY](#), [JAAP VAN DER WAL](#), [SCHLEIP & BAKER](#), [JOHN SHARKEY](#) (or [HERE](#) with Dr. Stecco), and any number of others. Thanks to new research and new dissection methods, things are starting to change and this information is

slowly filtering down to practicing physicians.

Some of this new research includes studies on the relationship between fascia and proprioception not just in an anatomical sense, but in a functional sense as well. For instance, a handful of studies from the March 2014 issue of the *Journal of Motor Behavior* (including *The Medium of Haptic Perception: A Tensegrity Hypothesis*, *The Stresses and Strains of Tensegrity & Proprioception*, *Tensegrity, and Motor Control*) each deal with proprioception as related to **TENSEGRITY**, which is the molecular and microscopic shape / structure that fascia uses to be both firm (strong) and springy (elastic). In other words, tensegrity allows fascia to resist not only mechanical loads that pull on it, but loads that compress it as well.

**WHAT HAPPENS WHEN FASCIA'S
PROPRIOCEPTIVE ABILITY IS FOULED UP?**



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"It is critical to understand that fascia is what gives our soft tissues structural support. We now know that there exists a state of structural and functional continuity between all of the body's hard and soft tissues, with fascia being the ubiquitous elastic-plastic, gluey, component that invests, supports and separates, connects and divides, wraps and gives cohesion, to the rest of the body – the fascial, connective tissue network. Without fascia, our muscles would be like a jelly substance without much form at all. The fascia contains sensitive nerves that convey proprioception (joint position sense) as well as pain nerve fibers. Fascia, when healthy, forms a gliding interface with underlying muscle allowing free excursion of the muscle under the relatively immobile skin. When fascia gets mechanically loaded, injury can occur resulting in fibrosis and adhesion formation. This adhesion formation disrupts the normal 'sliding and gliding' of the tissues. As the fascia thickens,

it can disrupt balance and proprioception. This can result in binding up tissues that should slide and or stretch and thus disrupting motor patterns. This can lead to chronic tissue loading, further injury, and global soft tissue holding patterns". **Matt Fontaine of Potomac Physical Medicine discussing a video by Dr. C (Leon Chaitow Talks About the Explosion of Fascia Research), much of it being transcribed word for word Dr. Leon Chaitow is a British osteopath, naturopath, author, researcher, and university professor.**

So, what happens when we lose proprioceptive abilities --- when mechanoreception is fouled up? One of the biggies (I wrote about it [HERE](#) years ago) is degenerative arthritis. Joints that don't work properly wear, and wear causes joints not to work properly. Actually, we need to throw inflammation into this loop as related to fibrosis and Scar Tissue ([HERE](#)). I've already shown you how fouled fascia is related to dysfunctional mechanoreception, and that dysfunctional mechanoreception leads to dysfunctional nociception, which leads to pain. This has become common knowledge as seen in the October 2015 issue of the medical journal *Biomed Central (Fascia as a Proprioceptive Organ and its Role in Chronic Pain - a Review of Current Literature)*.

"Latest research shows that the fascia is highly innervated. Especially the thoracolumbar fascia exhibits a high density of mechanoreceptors. They are responsible for proprioceptive information, i.e. implicit information about joint position and movement. In chronic pain patients, proprioception is impaired and studies indicate that connective tissue structures in painful body parts

exhibit pathological changes. Fascia should therefore be considered a cause of pain and proprioceptive deficits and treatment should be applied accordingly."

We'll get to treating proprioceptive deficits of fascia in part II of this shindig, but for now, lets take a look at a couple of real life applications of this that are not related to **DEGENERATIVE OSTEOARTHRITIS**. What happens when you have a **WEAK CORE**, lose **THORACOLUMBAR INTEGRITY**, or find yourself locked into **LOWER CROSSED SYNDROME**? Take a look at the conclusions of this amazing study that was done by three medical doctors and published almost two decades ago in a 1999 issue of the journal *Spine (The Effect of Lumbar Fatigue on the Ability to Sense a Change in Lumbar Position: A Controlled Study)*. After comparing the backs of those with back pain to the backs of those without, the researchers determined that.....

"Protection against spinal injury requires proper anticipation of events, appropriate sensation of body position, and reasonable muscular responses. Lumbar fatigue is known to delay lumbar muscle responses to sudden loads. Patients with chronic low back trouble had significantly poorer ability than control subjects on the average to sense a change in lumbar position, which was noticed before and after the fatiguing procedure. This feature was found in patients and control subjects, but patients with low back trouble had poorer ability to sense a change in lumbar position than control subjects even when they were not fatigued."

Why does this matter? Only because one's ability to sense joint position is one of the many functions of

proprioception. When proprioception goes bye-bye, sooner or later (probably sooner) you *will* end up with pain. It really is that simple. But it's also far more complex. Remember a few paragraphs ago when **FUNCTIONAL NEUROLOGIST** David Seaman was discussing proprioceptive dysfunction as related to Adrenal Fatigue (**FIBROMYALGIA**)? **CHRONIC FATIGUE SYNDROME** is intimately related to both Fibro and Adrenal Fatigue. Listen to what the May 2013 issue of *Frontiers in Physiology* had to say in a study titled *Neuromuscular Strain as a Contributor to Cognitive and Other Symptoms in Chronic Fatigue Syndrome*.

"Individuals with chronic fatigue syndrome (CFS) have heightened sensitivity and increased symptoms following various physiologic challenges, such as orthostatic stress [changing position], *physical exercise, and cognitive challenges. Similar heightened sensitivity to the same stressors in fibromyalgia has led investigators to propose that these findings reflect a state of central sensitivity. Work by Brieg, Sunderland, and others has emphasized the ability of the nervous system to undergo accommodative changes in length in response to the range of limb and trunk movements carried out during daily activity. If that ability to elongate is impaired-due to movement restrictions in muscles, fascia, and other soft tissues adjacent to nerves, or due to swelling or adhesions within the nerve itself, the result is an increase in mechanical tension within the nerve. This adverse neural tension, also termed neurodynamic dysfunction, is thought to contribute to pain and other symptoms through a variety of mechanisms. These include mechanical sensitization and altered nociceptive signaling, altered proprioception, adverse patterns of*

Dr. Schleip, DC

muscle recruitment and force of muscle contraction, reduced intra-neural blood flow, and release of inflammatory neuropeptides."

*They use a lot of big words, but here's the thing folks. Although he used different descriptive language than we are used to today, [DR AT STILL](#) --- the founder of osteopathic medicine --- was talking about this phenomenon back in the 1800's ([HERE](#)) as was the developer of chiropractic, [DR BJ PALMER](#). It also happens to be why you have extremely educated people today (for instance, [DR INGBER](#) and [DR LANGEVIN](#) of Harvard) who believe that problems in the fascia are the root cause of all sickness, pain, and disease. That was not a misprint folks. That would be all as in *all*.*

If you are looking for more detail on this subject (including information on the various types of mechanoreceptors found in fascia as well as what they do), I would suggest you try Dr. Robert Schleip's *Fascial Mechanoreceptors and Their Potential Role in Deep Tissue Manipulation* ([HERE](#)). Oh, and make sure to check back in a week or so for Part II of this post -- [WHAT IT TAKES TO SOLVE PROPRIOCEPTIVE DYSFUNCTION IN FASCIA](#).