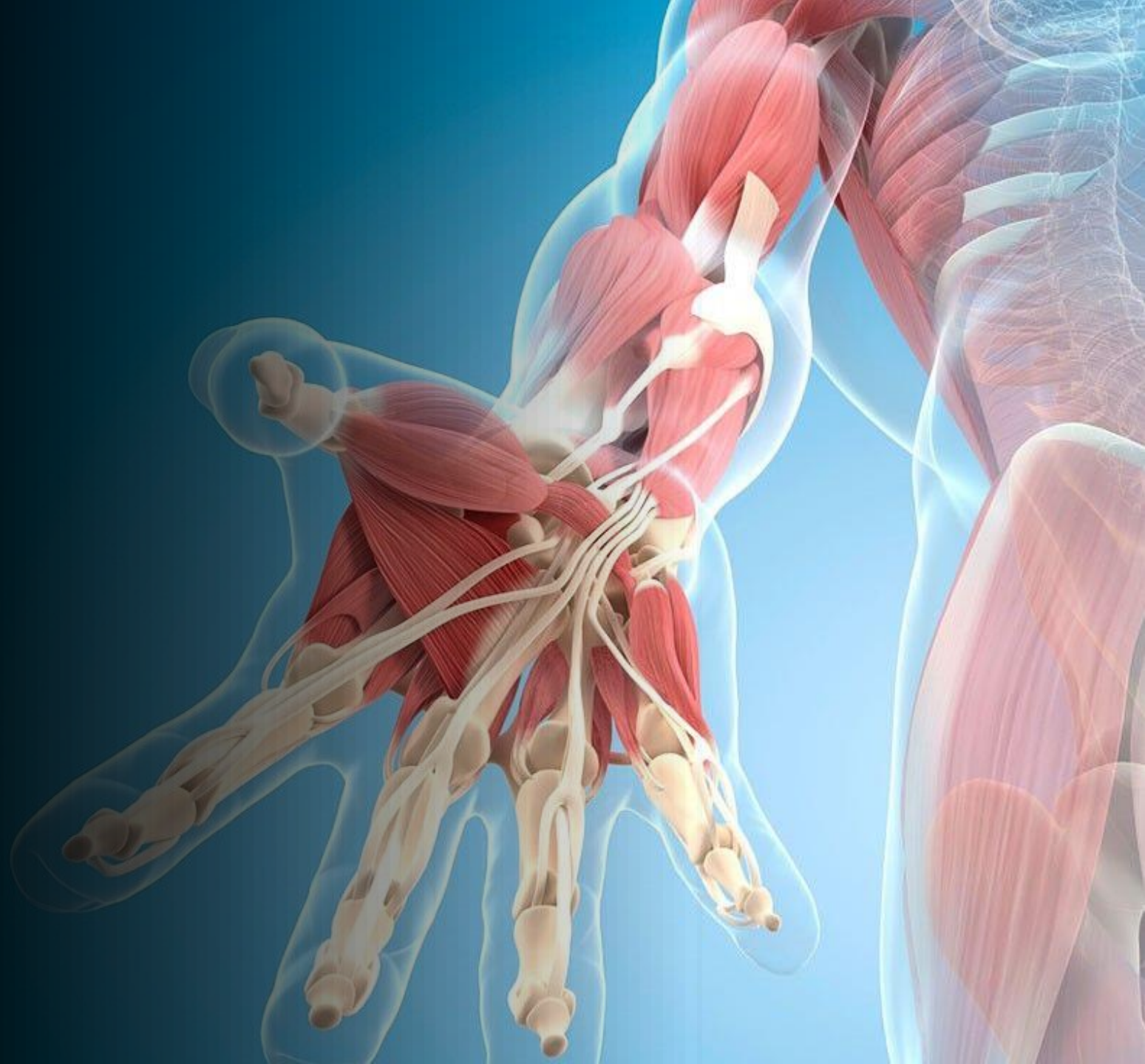
Fascial Pain Report

Dr. Junggi Hong



Schleip

“Fascia is the dense irregular connective tissue that surrounds and connects every muscle, even the last myofibril, and every single organ of the body, forming continuity throughout the body”

The Network of Fasciae

Fasciae are sheets of connective tissue that form interconnecting planes spanning the entire body, surrounding and separating muscles, and creating biomechanical interfaces between them.

Fasciae are composed of irregularly arranged but tightly woven connective tissue that can bear high tensile loads.

Fascial planes are separated by planes of “loose” connective tissue that allows the fasciae to glide past one another.

Recent Updates on Fascia

Flexibility and Fascia

We usually think of musculoskeletal flexibility as “loose” or “tight” joints—ligaments, joint capsules—and muscles.

But another important part of the musculoskeletal system that tends to be overlooked is the network of fasciae.

Fascia Mobility

The motion between the fascia layers is a significant component of musculoskeletal mobility.

When two adjacent layers become adherent, either due to scarring after an injury, or due to posture habits, some of the interfacial mobility is lost.

The consequences of reduced fascia mobility on the function of muscles and joints are potentially profound, but mostly unknown.

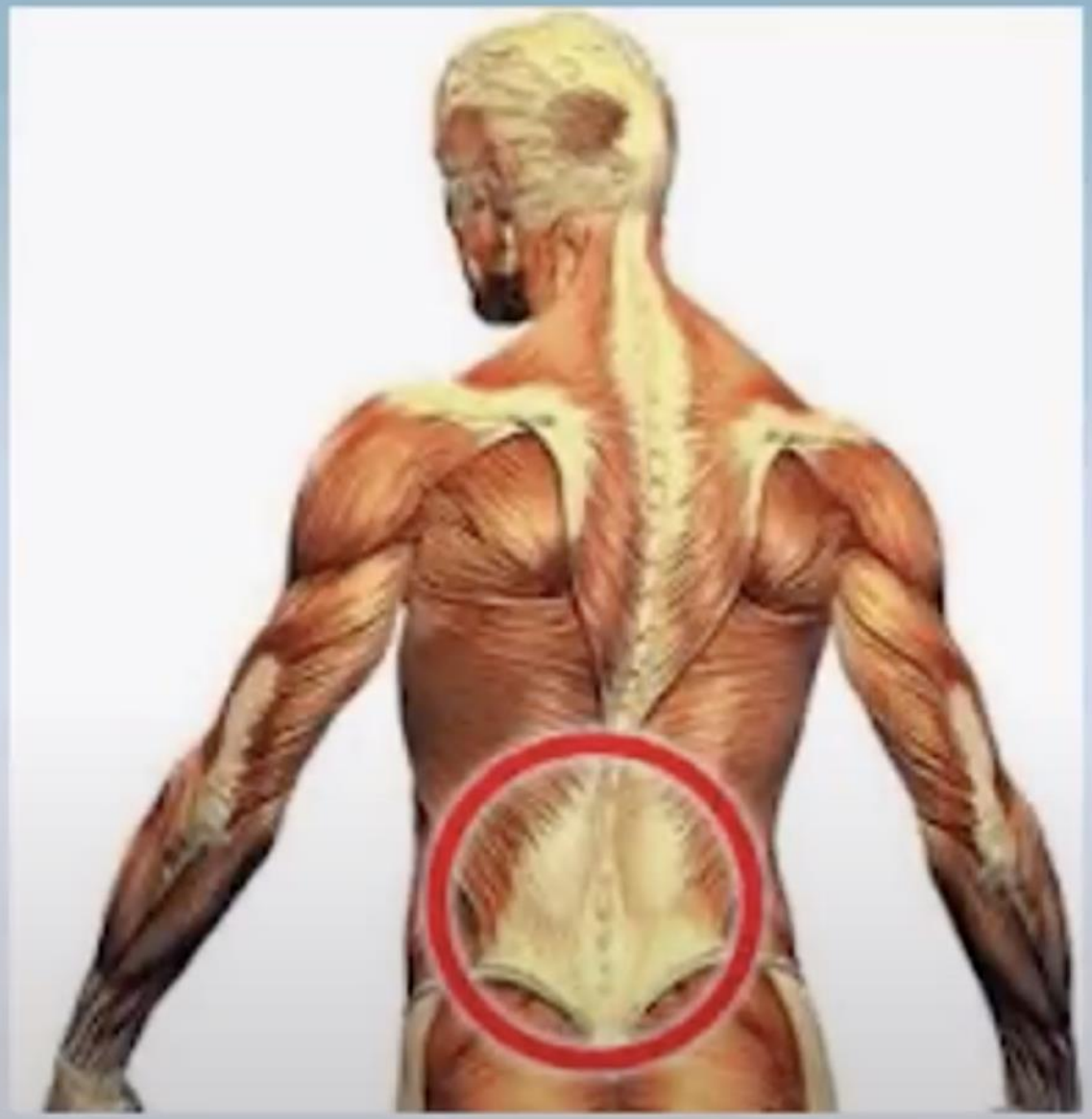
Fascia and Muscle Spindles

- Muscle spindles are localized in the periphery of the muscle.
- The capsule that encloses the muscle spindle is part of the perimysium, giving the muscle spindle the ability to perceive the level of tension of all the connective tissue of the muscle (endomysium, perimysium, and epimysium) and of the surrounding fascia.

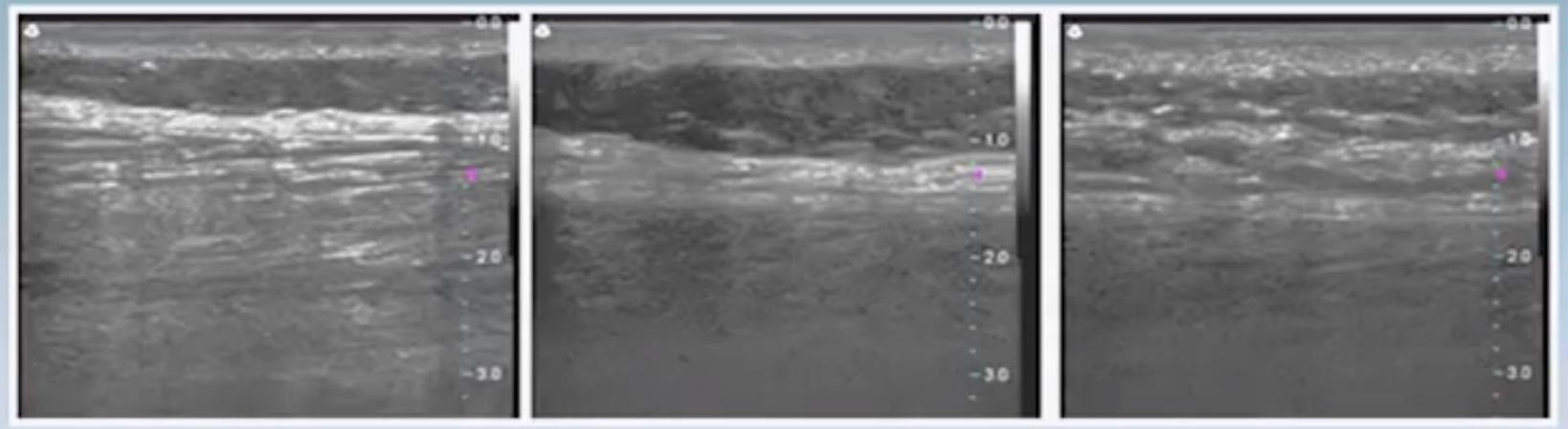
Fascia and Muscle Spindles

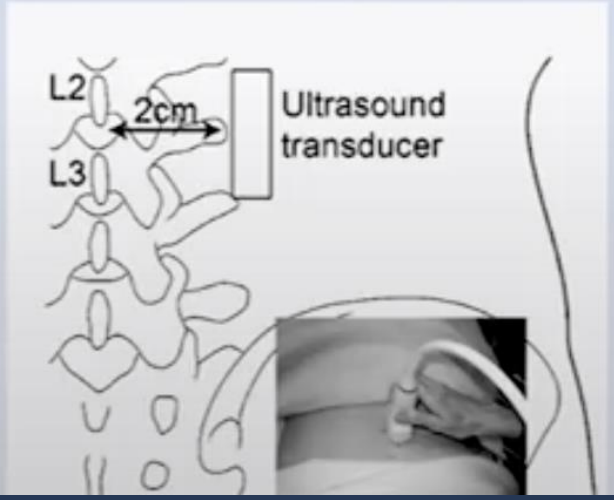
- If the fascia is altered, the spindle cells may not function normally, depriving the central nervous system (CNS) of necessary information about muscle coordination and position. Spindle cells are stretched during muscle contraction or passive stretch.
- It is therefore probable that if the spindle cells are embedded in thickened, densified fascia, its ability to be stretched would be affected and normal spindle cell feedback to the CNS would be altered.

Thoracolumbar fascia



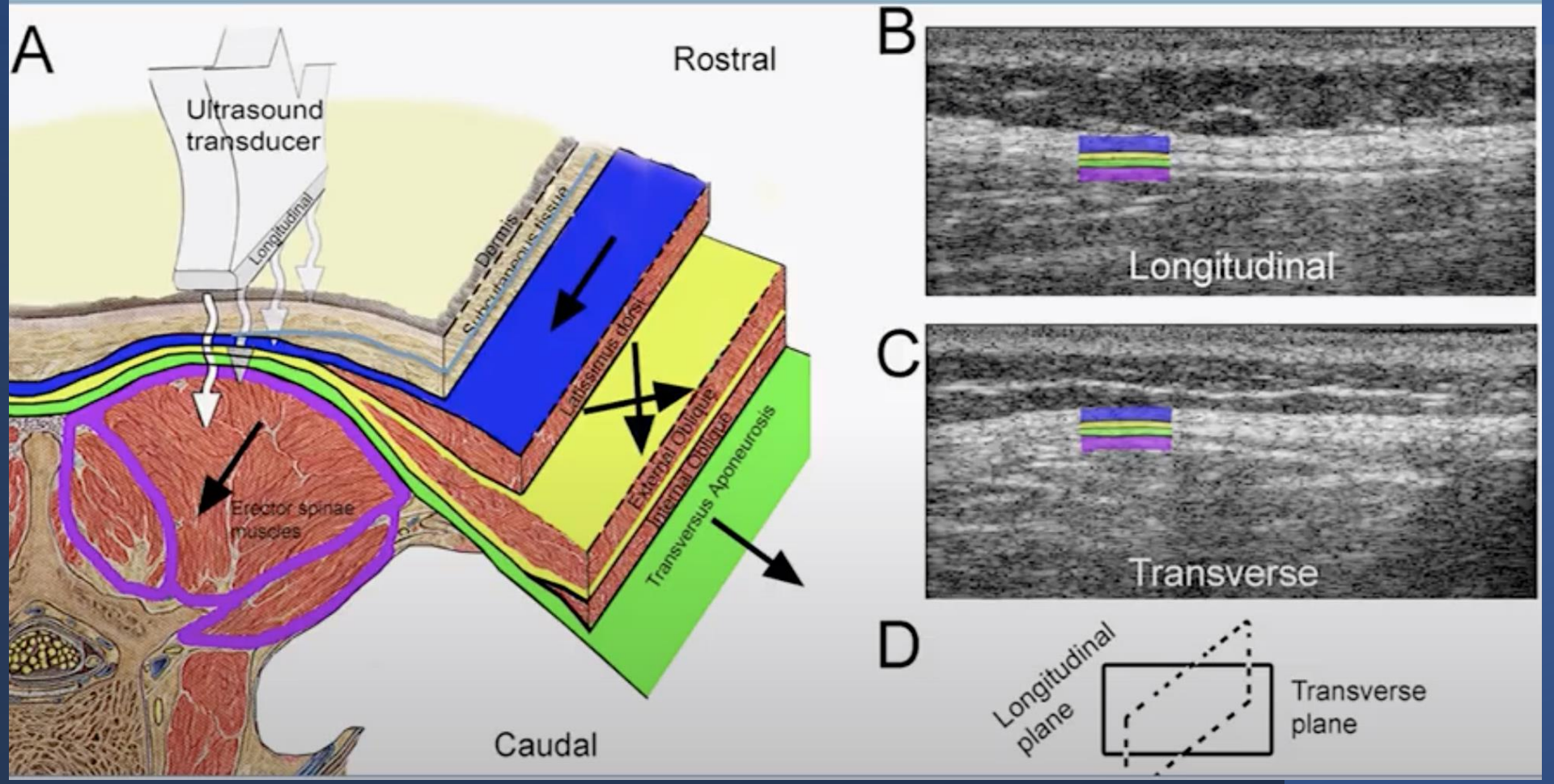
chronic low back pain



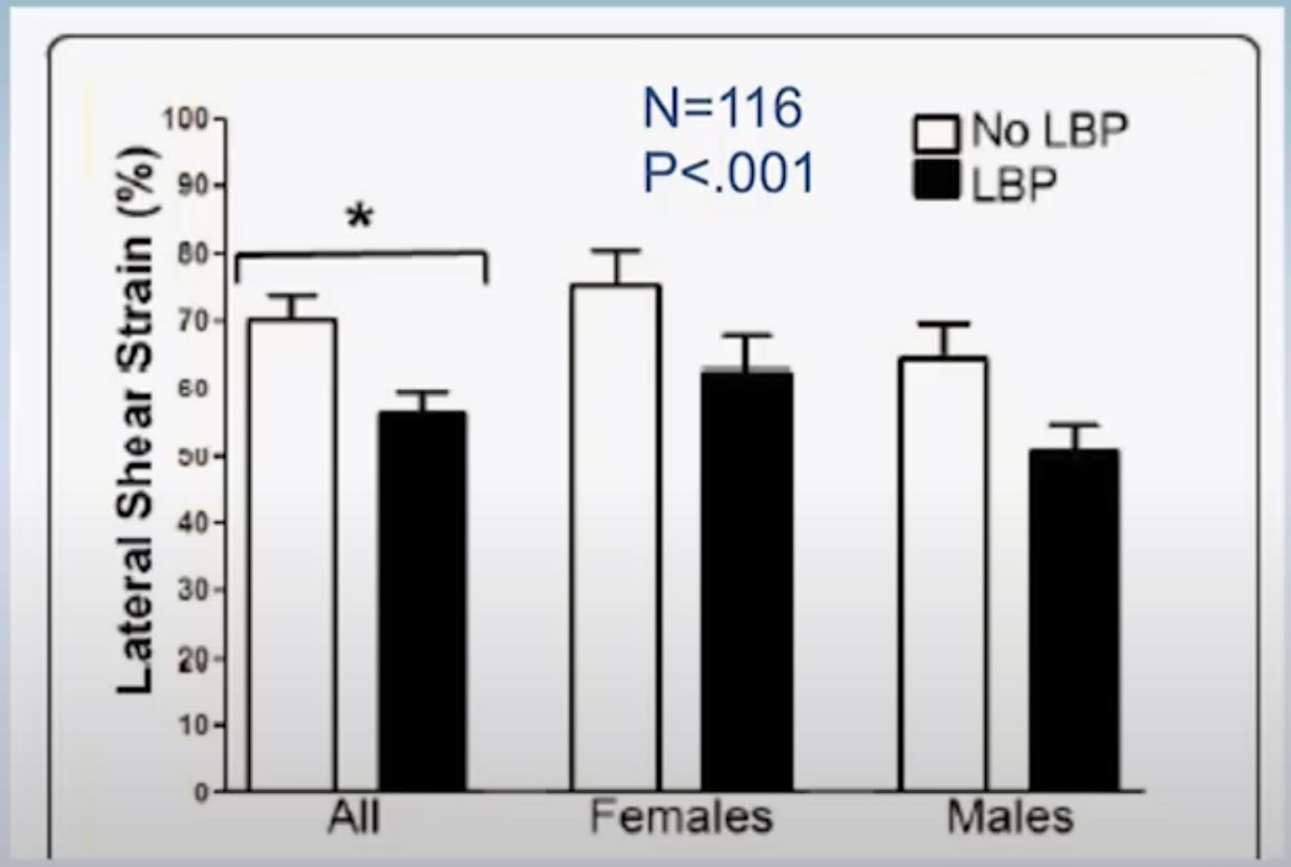


- 107 human subjects
- 60 chronic LBP
- 47 No-LBP
- LBP >12 mo
- Matched for age, sex, BMI

Connective tissue layers within thoracolumbar fascia



Thoracolumbar fascia shear strain in subjects with and without low back pain



BMC Musculoskel Dis 2011

Motive for Fascial Pain Research

Furthermore, the sensory information derived from fasciae and its contribution to proprioception (internal “body-sense”) and musculoskeletal pain is basically unstudied.

This is because, historically, more attention has been given to specialized musculoskeletal tissues (i.e., bones, cartilage, intervertebral discs, muscle) than to “non-specialized” connective tissue, including fasciae, but this is beginning to change.

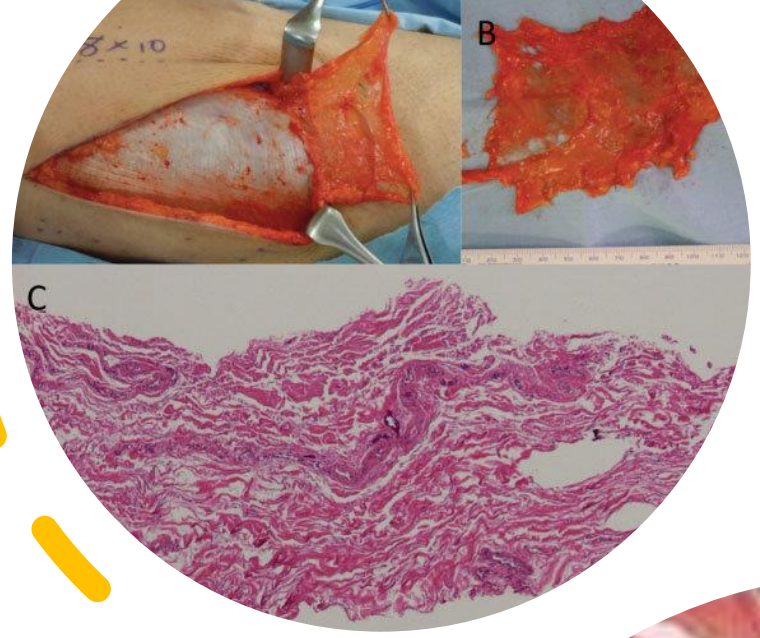
Fascial Pain

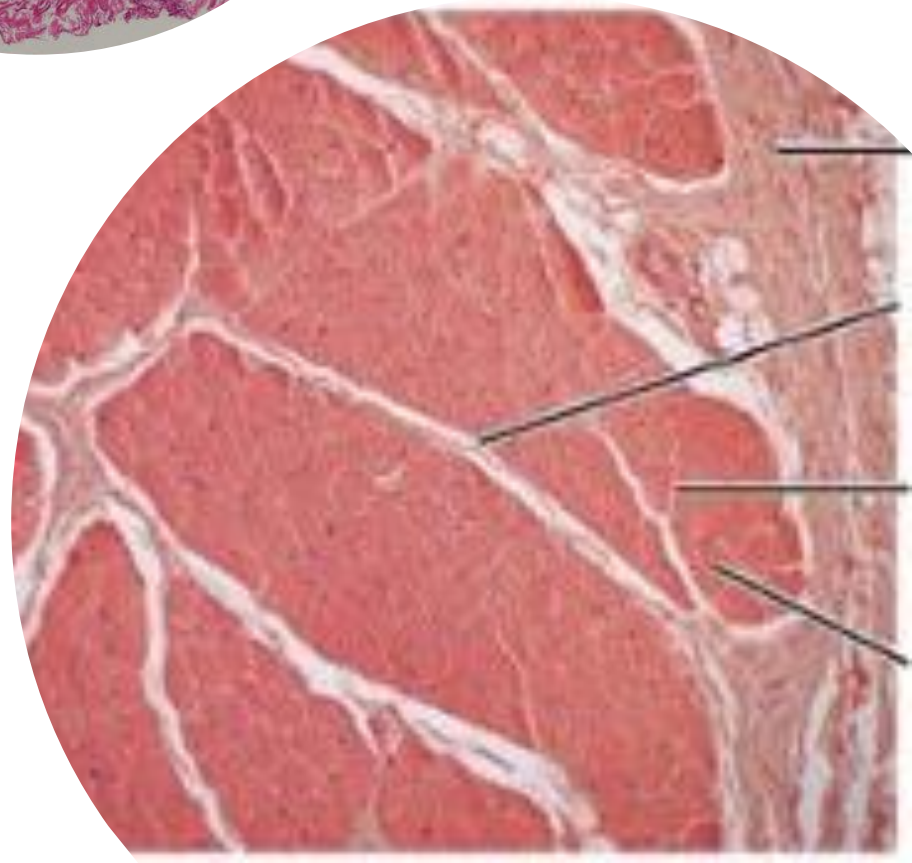
Although the clinical syndrome of “myofascial pain” remains poorly characterized, it is estimated to be present in approximately 30% of patients with chronic musculoskeletal pain in the back, neck, shoulder, hip, and pelvis as well as temporomandibular pain, and headache.

Over the past two years, three National Institutes of Health (NIH) workshops have addressed these related topics to stimulate research: “Quantitative Evaluation of Myofascial Tissues”, “Neurocircuitry of Force-Based Manipulation”, and “The Science of Interoception and Its Roles in Nervous System Disorders”

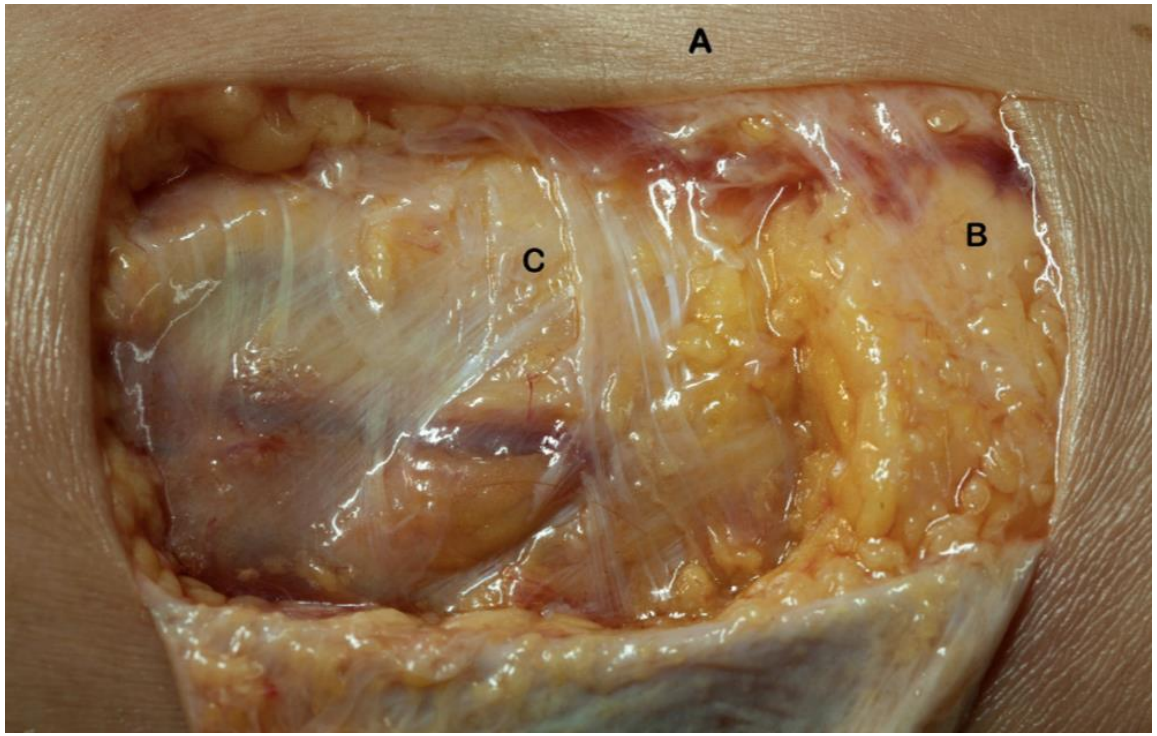
Inner vs. Outer

- Fasciae are part of a network that is given different names as one moves from the cellular level, to tissues, organs, and the whole body: extracellular matrix, interstitium, connective tissue, and fasciae.
- Some types of connective tissue (e.g., areolar subcutaneous tissue) are loosely organized and compliant, while others (e.g., deep epimysium) are tightly woven and stiffer.





Fascia



The New Findings about Fascia

Until recently, there was very little knowledge on the innervation of connective tissue. It is now clear that at least the deep muscular fasciae and aponeuroses are known to be richly innervated with small-diameter afferent fibers that can transmit nociceptive signals

What remains unknown is the degree to which connective tissue contributes to nonpainful sensations such as those experienced during deep pressure and stretching, and the degree to which sensations arising from it contribute to proprioception and interoception.

Proprioception in Fascia

Interoception

- Interoception is the processes by which the body senses, interprets, integrates, and regulates signals from within itself, and includes sensations arising from connective tissue deep to the skin. This definition includes proprioception in its broadest sense, meaning the sensory perception and awareness of the position and movement of the body.

Proprioception

Clinically, however, proprioception is defined more narrowly and evaluated as the ability to sense whether a joint is moving in one direction versus another.

We know that this ability is dependent on the functioning of fast-adapting specialized mechanoreceptors in joint capsules and tendons; however, there may be other important aspects of proprioception beyond joint position sense.

Associations of Proprio- and Interoceptive Dysfunctions with Specific Pathologies

Proprioceptive Impairment	Interoceptive Dysregulation
Chronic low back pain	Eating disorders
	Irritable bowel syndrome
Complex regional pain syndrome (CRGP)	Posttraumatic stress disorder
Whiplash	Depression
	Panic disorder
	Generalized anxiety disorder
Attention deficit hyperactivity disorder (ADHD)	Substance use disorders
Systemic hypermobility	Autism spectrum disorders
	Depersonalization/derealization disorder
Scoliosis	Somatic symptom disorders
	Functional disorders
Other myofascial pain syndromes	Chronic fatigue syndrome

Pathophysiology of Fascia

The ingrowth of nociceptive fibers and immuno- reactions to substance P have been found in the loose connective tissue of the deep fascia (retinaculum) of patients with patella–femoral alignment problems, whereas a loss of nerve fibers in the TLF has been reported in patients with chronic lumbalgia.

Innervation of the TLF, by both A and C fiber nociceptors, has been suggested by the long-lasting sensitization of the deep fascia in response to mechanical pressure and chemical stimulation.

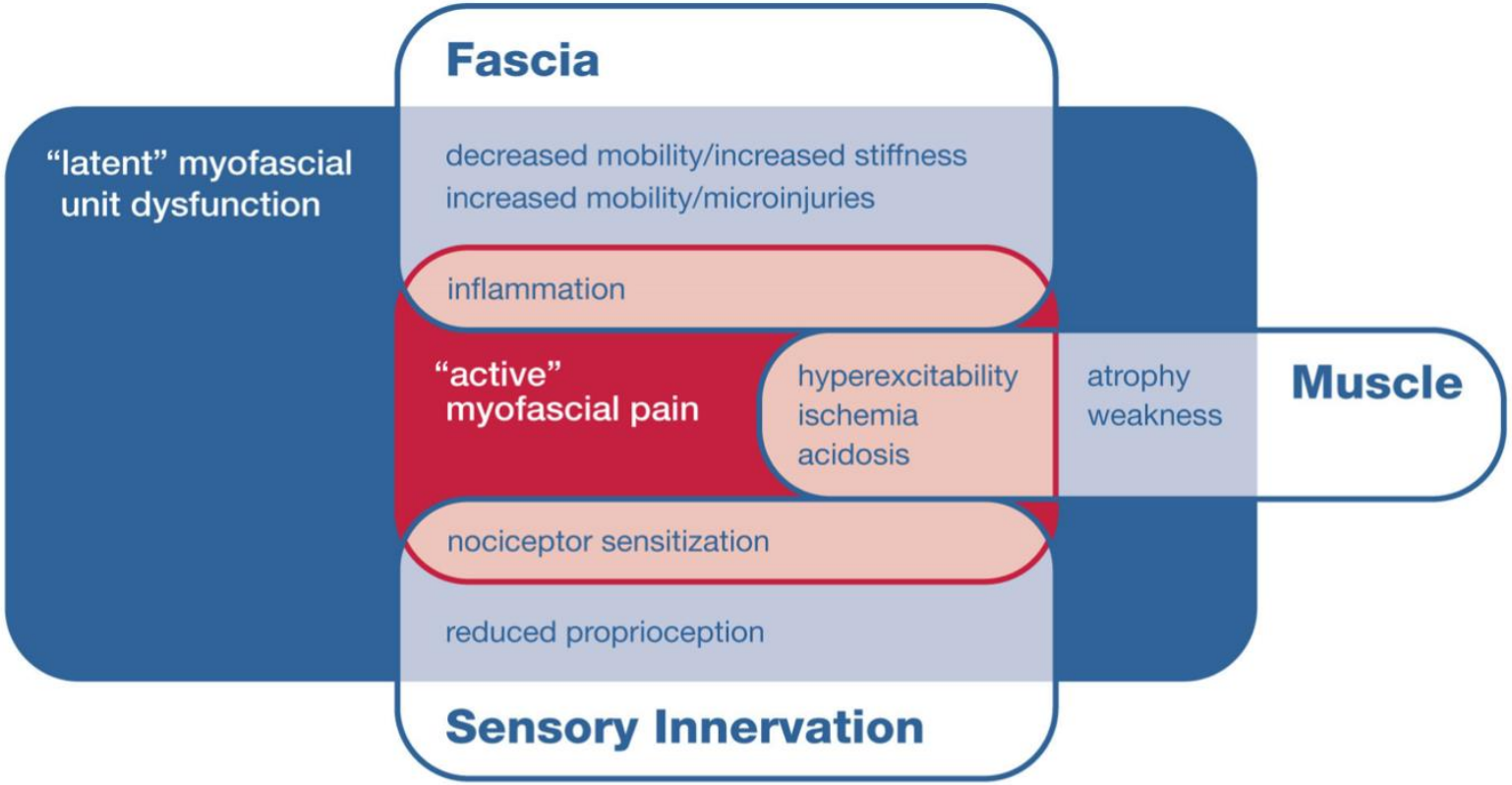
Interestingly, the same authors demonstrate that the sensitized free nerve fiber endings within muscle fascia are stimulated more effectively when the fascia is “prestretched” by muscle contraction.

Pathophysiology of Fascia

Given that free nerve endings and the proprioceptive corpuscles are completely embedded inside the fascia, it is possible that the viscoelasticity of fascia can modify activation of the proprioceptors within the fascia.

If the deep fascia is either over- stretched or it becomes too viscous, it is probable that the nerves inside the fascia will be activated in a negative way.

Recently Developed Fascial Pain Model



Sources for Fascial Pain

Possible pathophysiological mechanisms involving the myofascial unit—muscles and associated connective tissue, nerves, blood vessels, and lymphatics—that may contribute to myofascial pain include neurogenic and chronic inflammation, peripheral sensitiza- tion, muscle hyperexcitability, ischemia, and acidosis.

Several of these mechanisms may involve reduced or increased fascia mobility. Chronic inflammation with macrophage infiltration and fibrosis of deep fasciae and perineural tissues has been well documented in an animal model of repetitive motion injury.

Because fasciae are organized in layers, an important effect of fibrosis is adhesion between the layers with reduced shear strain.

Implications

A person with generalized connective tissue hyperlaxity may have regional hypolaxity in some regions following injury or due to posture habits.

The role of developing an improved sense of proprioceptive interoception in guiding movement is also an area that clinicians should consider.

Developing “precision” interventions based on a better understanding of fascia biomechanics and proprioception would be important to developing safer and more effective approaches to myofascial pain.

Takehome Messages

Fascia mobility, proprioception, and myofascial pain are three topics that, to date, have not merged in the scientific literature but have much to contribute to one another.

Fascia mobility is critical for musculoskeletal function and needs to be better integrated into biomechanical models of musculoskeletal pain.

Patients with both connective tissue mobility disorders and inherited proprioception deficits suffer from musculoskeletal pain in large numbers and have poorly understood fascia biomechanics.

Takehome Messages

Myofascial pain is a nascent discipline that needs to develop robust tissue biomarkers to facilitate the development of effective treatments.

A better understanding of these three scientific areas will potentially synergize and result in improved care for a wide variety of patients with musculoskeletal pain.