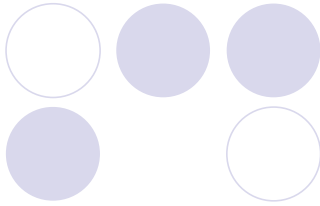




Getting Under Your Skin



Vital Importance of the Connective Tissue System

Your Instructors



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Course Objectives



- Understand the properties skin/fascia and its interface with the musculoskeletal and neurologic systems.
- Develop a 3 dimensional visual understanding of the histological subunits of myofascial layers.
- Understand trigger points, common referred pain patterns, fascial lines, and Janda's postural syndromes.
- Learn 3 methods for improving your mobility with a fascial focus

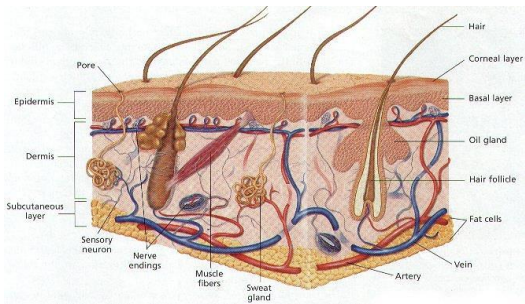
Who we work with that also think this is important:



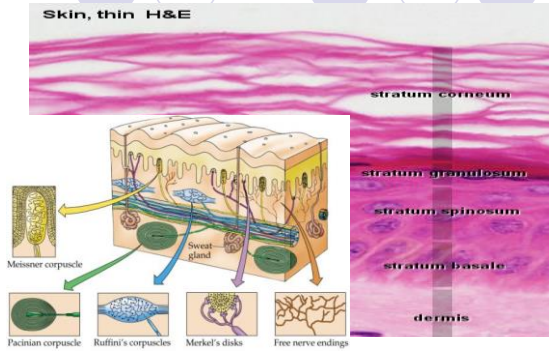
Integument



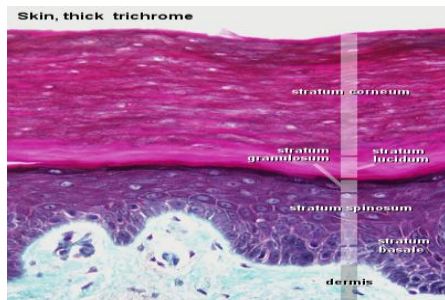
Skin layers



Epidermis: thin skin



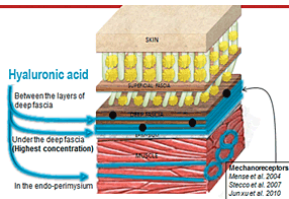
Epidermis: thick skin



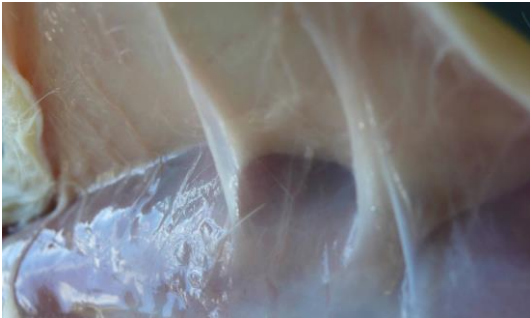
Fascial Layers



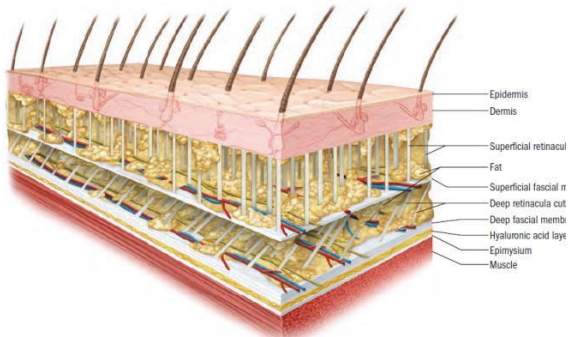
- Superficial
 - Deep = Aponerotic & Epimysial
 - TLF, TFL, rectus sheath...
- Intermuscular
- Visceral



Retinacula Cutis



Skin: more complex than we learned

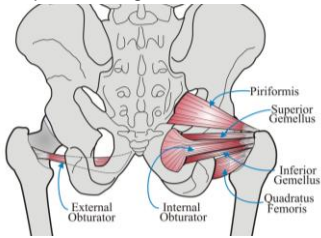


Fascia is analogous to...

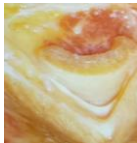
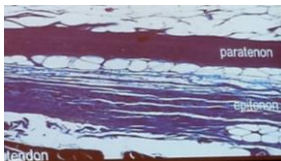


Functions of muscles

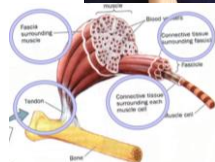
- We learn action, but as we move in real world multiple functional pulls for each muscle
 - ERs become IRs past 90 degrees



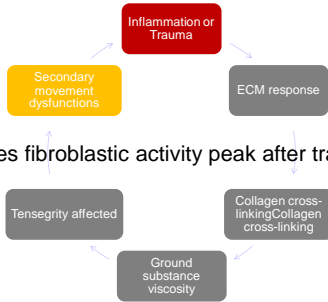
Paratendonitis/osis



Periostitis

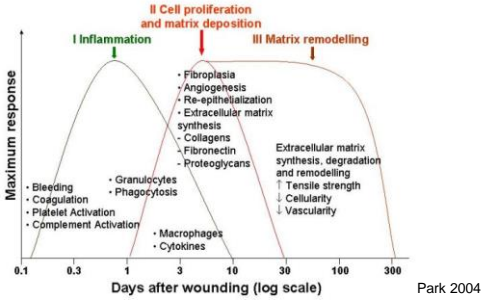


Mechanical CT Changes



When does fibroblastic activity peak after trauma???

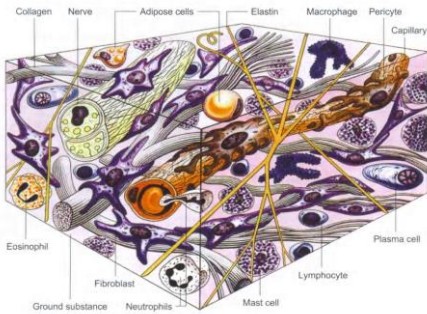
When is appropriate timing for IASTM??



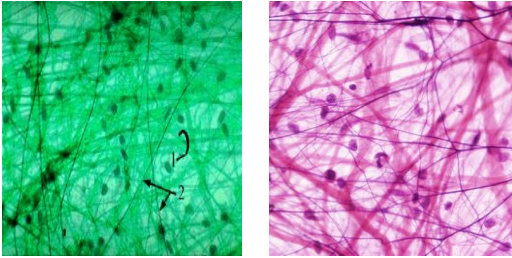
Fascial Components

- **Fibroblasts**
 - Make and secrete all fibers of areolar connective tissue
- **Collagen fibers**
 - Strongest and most abundant; cross linking leads to immense tensile strength
- **Elastic fibers**
 - Rubber like proteins which allow tissue to return to original shape
- **Reticular fibers**
 - Connect vessels and nerves; have more give than collagen
- **Ground substance**
 - Extracellular matrix that holds interstitial fluid via sugar-protein molecules that soak fluid like a sponge; with increased inflammatory response it becomes more viscous

The Colloidal Matrix



Viscoelastic properties of skin



REMEMBER: THIS IS FASCIA

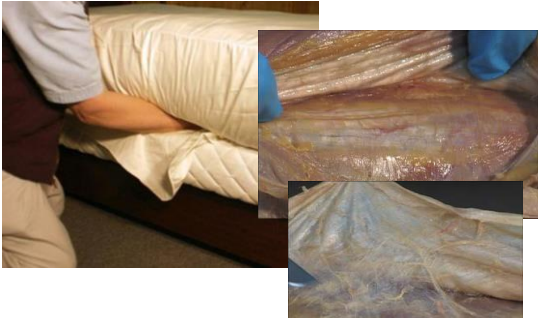
Living tissue is hydrated and dynamic



Fascial Contributions

- Support structure, tension, and suspension for tissues; “scaffolding”
- Fluid mobility; high amount of plasticity
- Connecting multiple muscles = functional kinetic chain

Fascia encapsulates and supports



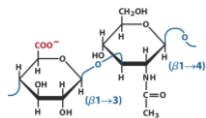
Viscoelastic properties: Collagen

- Dermis is made up of 80% collagen, dry weight, and of that collagen, 85% is type I
- Type 3 collagen is ~15% of dermal collagen, but is higher in immature tissue
- With age, ratio of type 1:3 collagen increases
- Increased collagen fiber density with age= decreased ground substance space



Viscoelastic properties: Ground substance – with GAGs

- Glycosaminoglycans
 - Proteoglycans and repeating disaccharide units
 - Commonly hyaluronan and chondroitin sulfate; including dermatan sulfate
 - Bind water in normal healthy tissue
 - In aged skin, less binding to water and bind more to elastic material= thickened



Viscoelastic properties:Thixotropic Effect

- **Thixotropy** is the property of certain gels or fluids that are thick (viscous) under normal conditions, but flow (become thin, less viscous) over time when shaken, agitated, or otherwise stressed.



Viscoelastic properties: Creep and Hysteresis

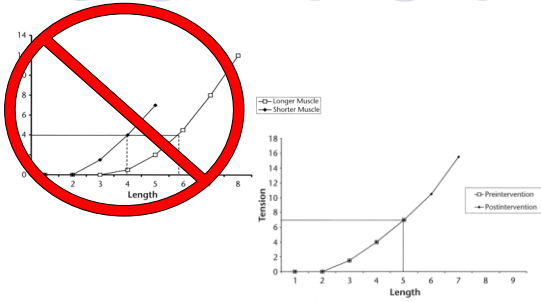
- Creep is the distortion of tissues as a function of pressure over time
- Hysteresis is the exchange of heat and energy as tissues are distorted; permanent deformation. Microtrauma.
- With MFR 90-120 seconds is the time for generally the first barrier (R1) to release and push into new range of extensibility.
- Tendon Hysteresis in 5-10 minutes(Kubo 2001)

What really happens when we stretch?

- Sensory endpoint theory (Wepppler & Magnusson 2010)
 - Very little evidence that Torque/angle curves shift; even w/ 8 weeks
 - More likely that the perception of the stretch sensation occurs later in the application of similar force
 - PF stretch doesn't change reflex pathway (Hayes 2012)



Stretching



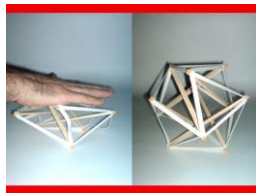
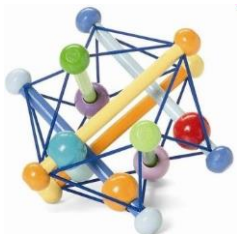
Soft tissue mobility: Folding

- CT ability to compress upon itself
- Shoulder Elevation= inferior capsule and axillary fold stretched, but also superior and anterior structures need to fold



- parallel fiber arrangement demonstrates more elastic qualities, improved mobility

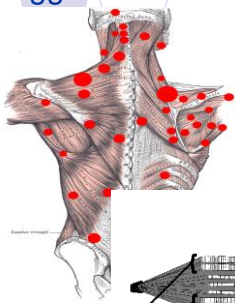
Tensegrity



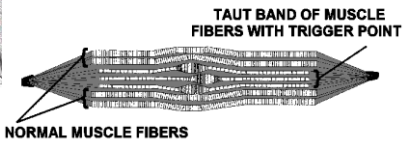
Tensegrity



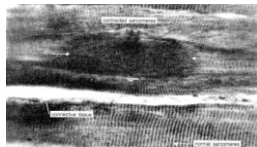
Trigger Points



● Travel and Simons



Trigger Points



- Lower levels of oxygen, nutrients, blood perfusion
- Increased levels of Calcium, leading to excessive chronic muscle fiber contracture, spasms
- Stress can lead to abnormal excess afferent stimulation
- Can have shortening of sarcomeres

Literature: Analysis of trigger points

Simons et al. JOSPT(2000), Sciotti et al. (2001):

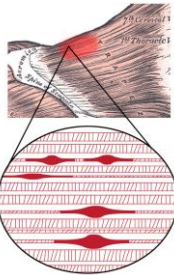
- (1) presence of a palpable taut band in a skeletal muscle
- (2) presence of a hypersensitive tender spot within the taut band
- (3) local twitch response elicited by the snapping palpation of the taut band
- (4) reproduction of referred pain in response to TrP compression. A TrP was considered active the referred pain evoked by its compression reproduced the same subject's head pain; whereas a TrP was considered latent if the evoked referred pain did not reproduce a usual or familiar pain



Literature:

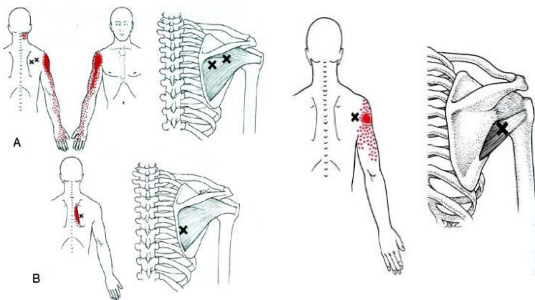
• Fernández-de-Las-Peñas 2014, Ge et al. 2008

- central sensitization mechanisms in local pain syndromes; pain perception may result from a deregulation in peripheral afferent and central nervous system pathways = "chronic excitability"

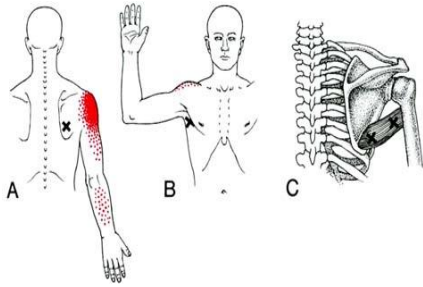


Likely a central phenomenon initiated, activated, and maintained by peripheral sensitization

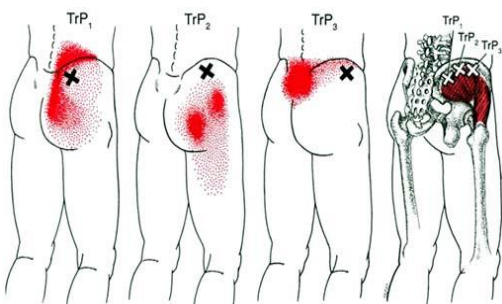
Infraspinatus and Teres Minor



Teres Major



Gluteus medius

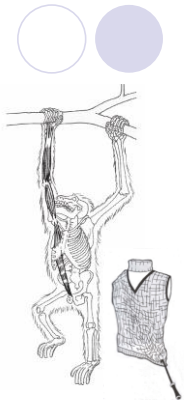


With Ultrasound imaging



Myofascial Lines

- Work of Thomas Myers
- Myofascial Tracks= muscles, tendons, ligaments and fascia
- Bony Stations= joints or insertional sites at bony landmark
- Have to be of similar depth
- Can be static or motion driven
 - Picture: Pec minor, biceps, coracobrachialis, rectus abdominis

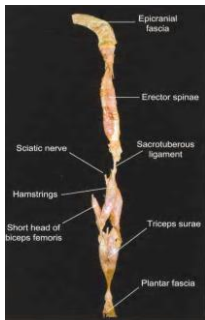


Superficial Back Line



- Includes:
- ✓ Plantar fascia
 - ✓ Achilles tendon and Gastrocnemius
 - ✓ Hamstrings
 - ✓ Sacrotuberous ligament
 - ✓ Thoracolumbar fascia
 - ✓ Erector spinae
 - ✓ Scalp fascia

Superficial Back Line

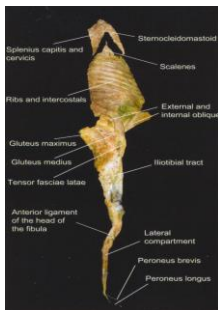


Lateral Line



- Often involved with leg length differences and pelvic obliquities
- Includes:
 - ✓ Peroneals
 - ✓ Anterior ligament of the head of fibula
 - ✓ ITB and TFL
 - ✓ Superior fibers of glute max, medius
 - ✓ External and internal obliques
 - ✓ Splenius capitis and SCM

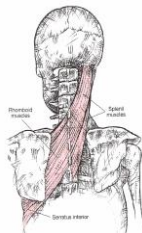
Lateral Line



The Spiral Line

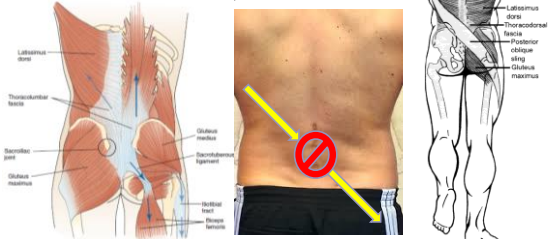


- The Serape=double spiral
- Includes:
- ✓ Splenius capitis and cervicis
 - ✓ Rhomboids
 - ✓ Serratus anterior
 - ✓ Ext/Int obl. & ab aponerosis
 - ✓ TFL and ITB
 - ✓ Tib anterior
 - ✓ Peroneals
 - ✓ Bicep femoris to sacrotuberous ligament
 - ✓ Lumbar fascia and erector spinae



Fascial mechanics

- Translating forces = "Slings"
- Lats to TLF to contra glute max and down lateral thigh = ITB Tx



Postural Syndromes

- Vladimir Janda, MD, DSc
 - Czech neurologist and physiatrist
 - Described characteristic patterns and syndromes of muscle imbalance that lead to chronic pain and disability
- The Sensorimotor system functions as one entity, integrating the central nervous system (CNS) and musculoskeletal system.
 - The muscles are often a "window" to the function of the CNS.
 - The CNS regulates two phylogenic subsystems: the tonic muscle groups and the phasic muscles



Crossed

UPPER	Inhibited: Deep cervical flexors	Facilitated: Upper trap, levator scap, Suboccipitals	CROSS
	Facilitated: SCM /Pectorals	Inhibited: Lower Trap, Serratus Ant., Middle Trap.	
LOWER	Inhibited: Abdominals	Facilitated: Thoraco-lumbar extensors, QL	CROSS
	Facilitated: Rectus femoris / Iliopsoas, TFL	Inhibited: Gluteus Min / Med / Max	



Figure 1 : Janda's Muscle Imbalance Syndromes

Lower Crossed Syndrome

Tonic/Short

- Gastroc-Soleus
- Hip Adductors
- Hamstrings
- Rectus Femoris
- Iliopsoas
- Tensor Fascia Lata
- Piriformis
- Thoraco-lumbar extensors
- Quadratus Lumborum

Phasic/Lengthened

- Peroneus Longus, Brevis
- Vastus Medialis, Lateralis
- Gluteus Maximus, Medius, Minimus
- Rectus Abdominus

Upper Crossed Syndrome

Tonic/Short

- Pectoralis Major
- Upper Trapezius
- Levator Scapulae
- Scalenes
- Sternocleidomastoid

Phasic/Lengthened

- Serratus Anterior
- Rhomboids
- Lower Trapezius, Middle Trap
- Deep neck flexors

Postural Distortions

- Therefore patterns of muscle imbalance may be due to CNS influence, rather than structural changes within the muscle itself.
- The coordinated firing patterns of muscle are more important than the absolute strength of muscles; ie: HAMSTRINGS; function with ECC
- Sensorimotor Training- increasing proprioceptive input into the CNS with a specific exercise program using proper firing patterns and recruitment = neuro re-ed



IASTM

- ASTYM
- Graston
- SASTM
- FAKTR
- Iamtools
- GuaSha Orthopedic
- Target Point
- Edge
- Fuzion Tool
- Voodoo bands
- Hawkgrrips
- GuaSha
- Negative pressure MFD

Cost 8\$- 2K



Is foam rolling sufficient?

- What really happens when we FR?
 - No long term ROM changes (Cheatham 2015)
 - No change Thomas test after 2-3 min intervention (Vigotsky 2015)
 - Reduces arterial stiffness and improves vascular endothelial function; CNS changes?
 - Improved knee ROM without changes in MVC (McDonald 2013)



Neurophysiologic responses

- tissues become ischemic
- thereafter blood reenters areas as indicated flushing, hyperemia
- produce endogenous opioids or endorphins that affect the limbic system and brain stem, enkephalins that affect the central nervous system
- Soft tissue therapy relieves pain by acting as a counterirritant

Neurophysiologic responses

- Mechanoreceptors, the morphologic substrate for proprioception and kinesthesia
- Muscle spindles and Golgi tendon organs (GTOs) are the best-known types of receptors, but must also consider free nerve endings.
- Melzack and Wall's gate-control theory of pain, the large diameter A-beta nerve fibers that transmit superficial pain can inhibit the small diameter A-delta and C nerve fibers that transmit deep pain

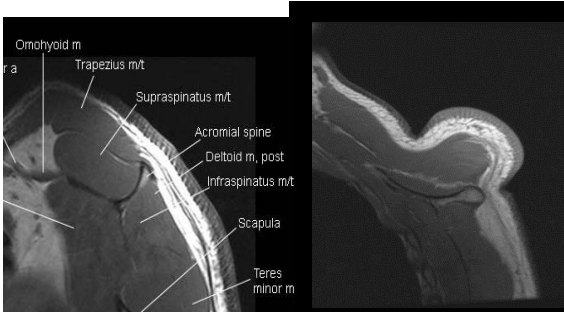
Other STM:



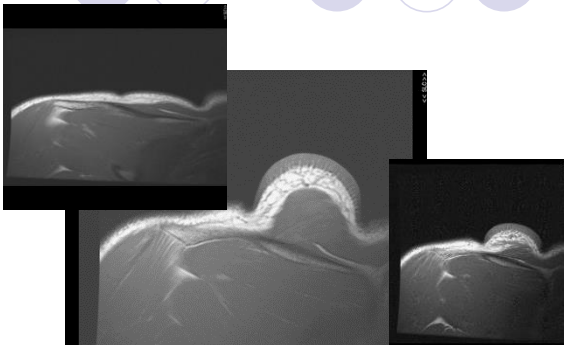
What is really going on:

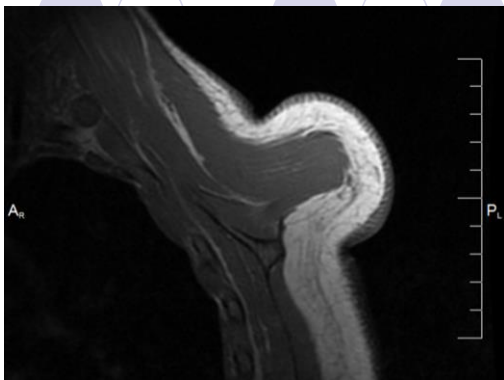


Proof of Concept Study MFD



Proof of Concept Study





Tissues



Summary:

Why is soft tissue work important?

- Release tonic, tight, facilitated muscles
- Decrease densification in specific myofascial layers
- Release trigger points, bringing in blood flow and nutrient exchange
- Traction out deep connective tissue elements that are in dysfunction; most importantly collagen cross bonding and mobilizing viscous ground substance

Why is soft tissue work important?

- Thixotropic effect: decreased viscosity
- Gate control theory of pain, large A-beta nerve fibers that transmit superficial pain can inhibit the small diameter A-delta and C nerve fibers that transmit noxious pain
- Endogenous opioids or endorphins that affect the limbic system and brain stem, enkephalins that affect the central nervous system

Why is this so important?

The site of pain is often not the cause of the pain.



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Thank You!!
