Differential Diagnosis Between Pain of Lumbar Origin and Pain of Peripheral Origin: Central Sensitization

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Case History

• 42yr old male comes in with complaints of R Achilles tendonitis pain.

• He is a runner and says that he began to notice the pain a couple of months ago but just kept running through it. Says that over the past few weeks the pain has caused him to cut his runs short.

• He says that he has tried massage/heat/ice but nothing seems to help for more than a brief time and he is still not able to run as much as he would like.
• Pt also says that at times he feels like his R calf is not as strong as his L.

• Upon further questioning the pt says that he played football in college. He does remember one injury where he felt a “pop” in his LB during practice. He said that the next morning he was unable to get out of bed secondary to pain.

• Pt has had intermittent episodic LBP over the years, but this is the first time he can remember having leg pain.
Case History Objective Findings

- Palpable tenderness in R calf and along Achilles tendon
- Consistent weakness of R gastroc
- Exaggerated Achilles tendon reflex
- Stiff skin rolling of R gastroc compared to L
- (-) slump test
- (+) sustained PA pressure
- (-) torsion
History of Peripheral and Central Sensitization

1940’s

IRVING KORR- Facilitated Segment
They stated that when a neuron is damaged a super-sensitivity will develop.
4 Types of Super-sensitivity

The time of the response of the end organ is unchanged but its duration is prolonged.

End organs: sensory and motor
4 Types of Super-sensitivity
The threshold to elicit a response is lower; i.e. less stimulus to produce a response.

Lessened stimuli produces a normal response rather than a lessened response “Facilitated”
4 Types of Super-sensitivity

Capacity of the tissue to respond is augmented, i.e. can perhaps elicit more units to fire than normal

Sensory ------------ Motor-------------ANS
4 Types of Super-sensitivity

This increased sensitivity can be found in:
- Skeletal muscle
- Smooth muscle
- Spinal neurons: Sensory effects
- Sympathetic ganglia: ANS effects
- Sweat glands
Cannon and Rosenbuth’s observations correlate directly with what is now known as:

PERIPHERAL SENSITIZATION
New perspective is:

CENTRAL SENSITIZATION

Represents anatomical and chemical changes in the CNS in response to the persistent stimulation of the nociceptive pathways in the periphery.
Central sensitization consists of:

- An increase in the size of the receptive field (can include the entire limb or opposite limb).

- Facilitation is spreading.
Continued......

- Increased responsiveness to innocuous stimuli
- Decreased threshold to innocuous or noxious stimuli

Central Facilitation
Innocuous Stimuli can also include Ab fibers

Electronic cross talk between neurons of different types so mechanical allodynia for example could start----result will be perceived pain upon pressure/palpation
Where is this likely to occur in the lumbar spine?

- Areas of disc degeneration and loss of disc height or previous history of disc injury
- Areas that are “functionally unstable”
Clinical Implications of Sensitization or Facilitation

Sensory
Pain can now be felt throughout any or all parts of the dermatome (peripheral sensitization)

Pain may be felt in other non-dermatomal areas (central sensitization)

Tenderness to palpation (peripheral and central)
Motor

- Hypertonus in segmental muscles
  - Loss of normal length/tension relationship
  - Loss of normal motor endplate function
  - Development of painful TrP’s
  - Progressive weakening
  - Neurological inhibition of antagonists as well

- Increased reflex response: Brisk reflexes
• Increased tone in smooth muscle – vasoconstriction ----- changes in circulation
  o Skin/fascia becomes “stiffer”-skin rolling difficult and painful
  o Area becomes cooler
  o Pitting edema in skin/fascia - matchstick test +
• Sweat glands --- Clammy skin
• So how does this knowledge of central sensitization relate to our case study?
• How can it help streamline our evaluation and treatment?
• How can it help us treat the target tissue rather then the secondary pain?
Purpose of Scanning Exam

• Screen for serious signs of pathology
• Access a patient’s neurological status
• Develop a working hypothesis and figure out which areas need further biomechanical assessment
History

• Pain History
• Health History and Systems Review
History

- Integumentary System
- Cardiovascular/Pulmonary System
- Neurological System
- Endocrine System
- Gastrointestinal System
AROM/Overpressure/Resistance
AROM

1. Tests the patient’s ability to move against gravity.
2. Do not assist in motion; overpressure is given if pain has not been reproduced (except for extension).
3. Motions in the scan are done in cardinal planes: flexion, extension, rotation, side bending.
4. Resistance is given to the antagonist of the motion being tested except for in extension.
5. Limit motion to the lumbar spine by monitoring sacral motion (flexion/extension) or stabilizing the pelvis (rotation/side bending)
6. Tell the patient you are interested in reproduction of THEIR pain
AROM

- Flexion
- Extension
AROM

- Side Bending

- Rotation
Stress Tests of the Lumbar Spine
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• Three main forces to which the lumbar spine is subjected during weight bearing
  1) Loading
  2) Torsion
  3) Shearing
Compression Overload

Reproduction of the patient’s reported pain constitutes a positive test and indicates damage to the vertebral body, end-plate or disc.
Torsion
Torsion

• A unilateral positive test indicates the possibility of a fracture through the Z-joint (being compressed), or a traumatic arthritis (being distracted).

• It must be borne in mind that in chronic dysfunctions a positive result may indicate a segmental instability.

• A bilateral positive i.e., reproduction of the patient’s reported pain with stress in both directions, indicates the possibility of an acute disc/end-plate lesion, or the possibility of a fracture through the neural arch.
PA Pressures

• Reproduction of the patient’s reported symptoms with the initial, rapid P/A thrusts indicate the possibility of an acute or irritable segmental dysfunction.

• If rapid PA pressure is (-) then perform slow sustained PA pressure
  • Reproduction of the patient’s reported symptoms and a soft end-feel indicates the possibility of a segmental P/A instability.
Neurological Testing
Nerve Roots

• Constant pain and/or paraesthesias in any or all parts of the relevant segmental dermatome – radiculopathy

• True area of numbness will be a **SMALL, ILL DEFINED AREA** in the distal portion of the dermatome.
Nerve Trunk or Peripheral Nerve

- Pain and/or paraesthesias tend to be more intermittent (no dorsal horn)
- Paraesthesias in specific area where that nerve(s) supplies the skin; actual anaesthesia will be in a **LARGE, WELL DEFINED AREA**.
Light Touch

- Light Touch
  - Use a cotton swab or your fingertips
  - Map the distribution
  - Determine if it is a nerve root or peripheral distribution
Motor Testing
Motor Testing

• Weak and painful
  • frequently a sign of serious local pathology, such as a major tear of a contractile unit, acute inflammation, fracture

• Weak and painless
  • Possible serious spinal pathology, lower motor neuron or peripheral nerve lesion, complete tear of contractile structures

• Strong and painful
  • Minor to moderate partial tear of contractile unit

• Strong and painless
  • Normal
Motor Testing

- L2 psoas
- L3 quads
Motor Testing

- L4 Tibialis Anterior
- L5 EHL
Motor Testing

• L5/S1 Peroneals

• S1 Hamstrings
Motor Testing

- S1 Gluts
- S1-2
  10 unilateral heel raises
Motor Testing

• Take the muscle to its “break point” – the maximal motor unit recruitment

• Do either rapid repeated contractions or hold at maximal contraction for 8-10sec

• Looking for consistent or fatigable weakness.

• Don’t grade the segment on a 0-5 scale, this is not a power test
Reflex Testing
Rating

- 5+ sustained clonus
- 4+ very brisk, hyperreflexia, with clonus
- 3+ brisker or more reflexive than normal
- 2+ normal
- 1+ low normal, diminished
- .5+ reflex that is only elicited with reinforcement
- 0 no response
Reflex Testing

- Patellar L3
- EDB L4
Reflex Testing

• Hamstring L5

• Achilles S1
Babinski (UMN)

- Run a pointed instrument up the lateral border of the foot and crossing to the medial side over the metatarsal pad (the weight bearing surfaces of the foot)

- Positive test = great toe extension/dorsiflexion and the other toes fan out
Clonus (UMN)

- Technique can be done at wrist or ankle
- Examiner takes up slack into dorsiflexion, then applies a quick overpressure to the movement at the ankle
- A positive response is more than three involuntary beats of the ankle or wrist
Hoffmans (UMN)

• Examiner applies a stimulus to the middle finger by nipping the fingernail of the patient between his or her thumb and index finger or by flicking the middle finger with the examiners fingernail.

• A positive test is adduction and opposition of the thumb and slight flexion of the fingers.
Dural Testing
Dural Testing

• The dura mater is insensitive to pressure or traction forces
• The dura mater is innervated by nocioceptors but they are specifically chemo-nocioceptors
• For a dural test to be positive, the dura mater must first be sensitized by inflammatory exudates
Slump Test

• (+) Slump means that you brought on and alleviated the pain from above and below

• If you are only able to bring on the pain from one direction then the pain generator is most likely an adhesion to the periosteum of a previously inflamed nerve root/disc
Straight Leg Raise

• Test will be (+) if it reproduces the pt’s pain between 30 and 60 (up to 70) degrees of hip flexion

• As with Slump must be able to bring on pain and alleviate pain from above and below
Thank You!