Running Medicine 2020

Foot and Ankle Entrapment Neuropathy Case

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UVA Outpatient Physical Therapy @ Fontaine
Patient Case - Subjective

• Pt is a 44 yo female 2 year history of plantar foot pain

• Onset with increased running/training program for 10 Miler

• Sxs initially plantar heel pain – severe following running

• Sxs have worsened over 2 years to broader distribution with inconsistent distribution: Plantar heel, medial aspect plantar foot, lateral aspect plantar foot; entire foot; proximal medial lower leg, post lower leg; Achilles insertion, retro calcaneus medial > lateral aspects

• Sxs inconsistently described as aching, soreness, burning, tightness
Patient Case - Subjective

- **Aggravating Factors:** Walking/standing > 15'; Running > 5'; Exercise classes -> all LQ exercise (personal trainer); PT (18 months – massage, DF stretching, orthotics, TPDN, “Nerve flossing”)

- **Easing factors:** none consistent except limiting activity

- **PMHX:** Lumbar radiculopathy ® (10 years ago) severe x 8 months, no recurrence; Bilateral CTS (pregnancy); PFPS (bilateral); 2 nd MT stress fx; Cervical myofascial pain, inconsistent PM distal NT (ulnar distribution); IBS; Anxiety/Depression
Biopsychosocial

• Very distressed about sxs:
  • Worsening
  • Inconsistent distribution
  • Various medical “theories”
  • Unresponsive to treatment
  • Unable to exercise (stress management/social)
  • Hx: Anxiety/depression

• HYPERVIGILANT
Patient Case - Objective

- **Observation/Posture:**
  
  - Min Rearfoot valgus; mid foot hypermobility (navicular drop); mild hallux valgus; recurvatum; Hip hyperextension; ant pelvic tilt; increased lordosis
Functional Screen:

- Single leg stance: Mild Rearfoot EVR, Navicular drop
- Single leg squat: Mild Rearfoot EVR, Navicular drop, Tibial IR, Fem ADD/IR (mod)
- Step down: Mild Rearfoot EVR, Navicular drop, Tibial IR, Fem ADD/IR (mod)
- APPREHENSIVE for all movement/loading
• Palpation:

• Diffuse tenderness Post tib muscle -> tendon; Plantar heel; medial/lateral aspect calcaneus; tarsal tunnel (proximal/distal to med malleolus) – tender everywhere (unable to localize to any specific tissue)

• Excessive Rearfoot/STJ mobility; mild limitation TC DF (diffuse sxs at end ROM)
Patient Case - **Objective**

- (+) Slump with DF/EVR structural differentiation/sensitization
- (+) Hyper reflexia (UQ/LQ); UMN cluster:
  - (-) Babinski, Hoffmans, Clonus
- (-) Full pain free lumbar ROM, (-) quadrant
- (+) SLR with DF/EVR structural differentiation
- (+) Tinel’s – various locations (hard to differentiate) all palpation provocative
SLR with DF/EVR Structural Differentiation
Hypothesis

- **Tarsal Tunnel Syndrome**
- **Hyper Sensitive Nervous System**
- **Central Sensitization**
- **Peripheral Sensitization**

**TABLE 1**

<table>
<thead>
<tr>
<th>Category</th>
<th>Condition</th>
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<tbody>
<tr>
<td>Mechanical</td>
<td>Plantar heel pain:&lt;br&gt;  - Plantar Fasciitis&lt;br&gt;  - Heel Spur Syndrome&lt;br&gt;  - Plantar Fasciosis&lt;br&gt;  - Posterior heel pain:&lt;br&gt;  - Insertional Achilles Tendinopathy or Enthesopathy&lt;br&gt;  - Haglund’s Deformity with or without Retrocalcaneal Bursitis</td>
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<tr>
<td>Neurologic</td>
<td>Distal&lt;br&gt;  - Tarsal Tunnel Syndrome (Posterior Tibial)&lt;br&gt;  - Heel Neuroma (Medial Calcaneal)&lt;br&gt;  - Medial Plantar&lt;br&gt;  - Lateral Plantar&lt;br&gt;  - Sural, including Lateral Calcaneal&lt;br&gt;  - Proximal&lt;br&gt;  - S1 Radiculopathy&lt;br&gt;  - Double-Crush Syndrome</td>
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<tr>
<td>Arthritis</td>
<td>Seronegative Arthritis&lt;br&gt;  - Psoriatic Arthritis&lt;br&gt;  - Reiter’s Disease&lt;br&gt;  - Diffuse Idiopathic Skeletal Hyperostosis (DISH)&lt;br&gt;  - Rheumatoid Arthritis&lt;br&gt;  - Fibromyalgia&lt;br&gt;  - Gout</td>
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<tr>
<td>Traumatic</td>
<td>Calcaneal fracture&lt;br&gt;  - Intra-articular fracture&lt;br&gt;  - Stress fracture&lt;br&gt;  - Soft tissue trauma (Acute Plantar Fascia Rupture)</td>
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<tr>
<td>Other</td>
<td>Benign or malignant tumor&lt;br&gt;  - Infection (soft tissue or bone)&lt;br&gt;  - Vascular&lt;br&gt;  - Calcaneal apophysitis in adolescents</td>
</tr>
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Prevalence of Neuropathic Pain Symptoms in Foot and Ankle Patients

Neuropathic mechanism includes peripheral sensitization, central sensitization, reduced descending inhibition, and atrophy of cortical areas.⁴

These mechanisms can develop due to direct irritation or injury to the peripheral nerve itself or through chronic sensitization and nerve modulation. Heterogeneous pain mechanisms may explain variable responses to recommended pain therapies.
“Amplification of the neural signaling in the CNS that elicits pain hypersensitivity”
CNS processing changes

- Impaired descending inhibitory mechanisms
- Activation ascending/descending Pain facilitation pathways
- Increased activity in brain pain centers
- Noxious stimulus are amplified, prolonged, and widely spread: Hyperalgesia
- Increased excitability: Non noxious → Noxious: Allodynia
Treatment

• Hypersensitive nervous system
• Pain Neuroscience Education
• Reduce mechano hypersensitivity
  • Neurodynamics
• Reduce fear
• Reduce threat
• Discuss findings
• Discuss specific treatment plan
• Reappraise ability to move
• Discuss plan for return to exercise
BIOPSYCHOSOCIAL MANAGEMENT OF BACK PAIN

Is like Teenagers and Sex;
Everybody talks about it,
Nobody really knows how to do it,
Everyone thinks everyone else is doing it,
So everyone claims to be doing it.
Prior Treatment

- 18 months
  - STM GS/Post tib
  - TPDN “trigger points”; ie.
    Entrapment sites of maximal tenderness
  - Stretching GS (DF/EVR)
  - Intrinsics – Toe Yoga, Towel curls
Division of tibial nerve at ankle

Areas of compression of the posterior tibial nerve and its branches.
“Has anyone explained to you why you are still hurting?”
The Effect of Neuroscience Education on Pain, Disability, Anxiety, and Stress in Chronic Musculoskeletal Pain

Adriaan Louw, PT, MAAppSc, Ina Diener, PT, PhD, David S. Butler, PT, EdD, Emilio J. Puentedura, PT, DPT

• **TNSE**
  - Improved Movement
  - Decr Pain perception
  - Decr Disability
  - Decr Catastrophization

• **Re conceptualize** - Chronic Pain caused by *increased sensitization* not tissue damage
  - Decrease Threat
  - Reappraise ability to move
Individualize Education

- Build Therapeutic Alliance
- Express Empathy
- Open/Reflective Questioning
- Summarizing
- Identify Discrepancies
- Goal setting
- Support Self efficacy
WHAT YOU NEED TO PASS ON

WHAT YOU NEED TO KNOW

EXPLAIN PAIN
Visualization of Painful Experiences Believed to Trigger the Activation of Affective and Emotional Brain Regions in Subjects with Low Back Pain

Patients with LBP! Displayed activation in cortical areas related to Fear and Emotions

Bioplasticity works both ways
Bioplasticity works both ways
Plasticity of the Nervous System

- Pain is constantly modulated with the CNS - **Neuroplasticity**
- Pain is a sensory and emotional experience - not just tissue damage
- Pain is a **perception** (like other inputs/senses) – the brain has to decide how to interpret
Reappraise the ability to move

- Are there other factors that effect amount of pain/sensory modulators and your ability to move/exercise?
Teach pain is in your head
Without teaching that pain is in your head

- **Pain is an output of the brain developed to protect**
- **Pain is a reflection of the brain’s evaluation of danger messages to body tissues**
- **Modulated by many systems/factors**
  - Beliefs
  - Cognitive
  - Physical
  - Emotional
  - Social
  - Lifestyle
Bioplasticity works both ways

Relay 1: The dorsal horn

Relay 2: The thalamus

It's not that dangerous
Pain

Beliefs
Knowledge, logic
Other sensory cues
Social context
Anticipated consequences
Family
media
previous history
culture

Bioplasticity works both ways
BioPsychoSocial Appraisal/Check list

- What other factors in my life today that could possibly effect the sensitivity of my nervous system?
- What factors can I change?
- **What if I can’t change any of those stressors?...**
fluxuating sensitivity contributors

Bioplasticity works both ways

No Worries Mate
Practical Application

• In this study nerve mobilization exercises had a positive effect on 2-point discrimination and light touch and Tinel’s sign in patients with tarsal tunnel syndrome.
- Non dermatomal/territorial distribution of symptoms is the norm
- Neurodynamic tests are not diagnostic for entrapment neuropathies
- Neurodynamic Tests detect heightened Neural mechanosensitivity
The effects of Neurodynamic treatment may extend well beyond biomechanical mechanisms.

Treatment of the peripheral trigger is an integral part of treatment.

- Even when central mechanisms are present.
Biopsychosocial factors influencing hypersensitivity
• Decrease mechanical hypersensitivity – Pain modulation
• Neural Dynamics
• Daily Assessment
• Measure of Irritability

Bioplasticity works both ways
Manual Therapy as a Pain Modulating Modality

Bioplasticity works both ways

Relay 1: The dorsal horn

Relay 2: The thalamus

It’s not that dangerous
Reduce environment and social threats, and increase mechanical load/threat.
Eccleston and Crombez⁸ state, “Pain is an ideal habitat for worry to flourish.” Without such a reconceptualization, clinicians will likely remain unaware of the potential harm that their words may hold. As a result, they may continue to unknowingly fertilize pain’s vulnerable ground.
Resiliency

- Fragile
- Vulnerable
- Weak

- Resilient
- Strong
- Plastic
- Athletic
- Incredible
"Rehabilitation will increase the 'capacity' of your ...insert musculoskeletal tissue here..." 
Defining 'tissue capacity': a core concept for clinicians

JL Cook and SI Docking

Br J Sports Med December 2015 Vol 49 No 23
Graded Exercise/Exposure

- Behavioral approach
- Decrease fear through controlled experience
- Encourages confrontational response
- Patients learn (direct experience) activities will not harm the tissue
- Fearful activities assessed
- Education
- Positive reinforcement
- Utilize coping strategies
The effects of facial expression and relaxation cues on movement economy, physiological, and perceptual responses during running.

As such, the efficacy of smiling to improve RE and lower effort perception suggests periodic smiling may be beneficial to enhance running performance and as brief contact cue for psychological interventions (e.g., Meijen et al., 2016) with endurance participants.
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