Evaluating Shin Pain

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• I have no disclosures.
Validation of the Shin Pain Scoring System
Questions:

• What is the optimal clinical approach for evaluating the lower leg for signs of injury?
• How sensitive and specific are current clinical tests for predicting injury?
Traumatic vs Non-Traumatic

**Traumatic**
- Single incident

**Type**
- Contusion, Fracture, Traumatic musculotendinous injury, Traumatic Compartment syndrome

**Signs**
- Ecchymosis
- Swelling
- Deformity
- Increased temperature
- Increasing numbness/weakness

**Non-Traumatic**
- No MOI
- Overuse
- Repetitive motion

**Type**
- Stress Fx, Compartment syndrome, “itis”, Nerve Entrapment

**Signs**
- Pain
- Change in gait
- Performance decline
- Night pain
- Swelling???
## Non-Traumatic Injury

<table>
<thead>
<tr>
<th>Intrinsic</th>
<th>Extrinsic</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Changes in Training</td>
</tr>
<tr>
<td>Menstrual Hx</td>
<td>Equipment</td>
</tr>
<tr>
<td>Leg Length</td>
<td>Training surface</td>
</tr>
<tr>
<td>Family History</td>
<td>Faulty mechanics</td>
</tr>
<tr>
<td>BMD</td>
<td>Sleep/rest</td>
</tr>
<tr>
<td>Hormones</td>
<td>Stress</td>
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<tr>
<td></td>
<td>Diet</td>
</tr>
</tbody>
</table>
Shin Pain: Differential Diagnosis

- V
- I
- T
- A
- M
- I
- N
- C
Shin Pain: Differential Diagnosis

- VASCULAR -- Exertional Compartment Syndrome, Popliteal artery entrapment syndrome
- INFECTIOUS -- Osteomyelitis
- TRAUMA -- Contusion, Fracture, Strain
  - Medial tibial stress syndrome
- AUTOIMMUNE/ALLERGIC
- METABOLIC -- STRESS FRACTURE
- IDIOPATHIC
- NEUROLOGIC -- Radiculopathy
- CANCER -- Boney or soft tissue tumor
Shin Pain = HUGE problem
Non-Traumatic Shin Pain Evaluation

- Frequency of shin pain can be overwhelming
- Good published studies on clinical tests are limited
- Thorough evaluation can be time consuming
- Best imaging can be costly

- Net result – SHIN SPLINTS!!!
What are Shin Splints Anyway?

• No FORMAL Diagnosis
• Garbage term for chronic shin pain
  – Theoretical “Pulling away” of muscles
    • Posterior Tib, Soleus, Flexor Hallucis Longus, Flexor Digitorum Longus
• Literature does not support “Pulling away” Theory or which tendon causes it.
• Can’t identify it on MRI
  • Ohnishi J, Sports Orthop Trauma 2015
• Use of the term is “highly inappropriate.”

Shin Splints

Please don’t perpetuate the ignorance!!!
Interesting Finding

- 64 Subjects evaluated w/ hx of 1 wk shin pain.
  - Xray + Bilateral MRI
- 58/64 show evidence of bony stress injury on MRI
- 45/64 (70%) (show bilateral bony stress injury
- 37/45 (82%) > Gr II = Significant bony injury
  - (21 Gr II, 9 Gr III, 7 combo II/III)
    - Validation of Shin Pain Scoring System Initial findings.
      » Ongoing Study
Early detection is key!

- Tibial stress injuries can be disruptive to regular fitness routines and can end careers of competitive athletes.
- Establish diagnosis to avoid progression onto true fx.
- Each 1 unit increase in MRI grade increases RTS recovery by 48 days.
  
  **Nattiv A, AJSM 2013**

- Significant difference in recovery based on diagnosis win first 3 weeks of symptoms vs later
  
  **Ohta-Fukushima et al,**
Take an interest to make an impact

Start a Dialogue

- Menstrual Dysfunction
- Eating disorders
- Absorption issues
  - Crohn’s or Celiac Disease
  - Lactose intolerance
- Low BMD
  - Low Vit D or Ca+
- Compartment syndrome
- Tumors
- High Stress/Anxiety disorders
- Sleep disorders
- Identify problems, educate your patients
- Eliminate repeat offenders
- Keep people active

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History:

- MOI
- How long have you had the pain?
- How bad is the pain on a scale of 0-10?
  - >6 considered significant
  - National Stress Fx Registry
- Numbness or tingling?
- Treatment?
- Impact performance?

Table 17: Subjective Pain Score

* NSFR
Observation

- Swelling
- Skin color
- Bumps, Bruises
- Obvious deformities
- Increased temperature
- Abnormal rashes
Clinical Tests

- Palpation Test
- Fulcrum Test
- Tap Test
- Shin Edema Test
- Hop Test
- Weight Bearing Lunge Test (WBLT)
- Tuning Fork
- Therapeutic US
- Standing Heel Rise Test
- Manual Repeated DF/PF x 1 min
- Manual Muscle testing
  - Lower leg and hip musculature
Clinical Exam: Palpation

- Palpation
- Firm Squeeze
  - Medial edge of tibia
  - Anterior spine
  - Fibula
  - Marker
  - Compartments
- Look for focal tenderness
- Palpation found to be significant predictor
Fulcrum Test

• Provide perpendicular force to lower leg while moving distal low leg toward the force applied
• Use fulcrum at Distal 1/3, and also at mid tibia
  – Positive test if patient expresses pain
  – If painful suspect bony injury
• Inter tester reliability low
• Sensitivity/Specificity low to moderate
  – Current research
Tap or Percussion test

• Utilize 2-3 fingers to firmly tap up and down tibia
  – Hit suspicious areas 3-4 times
  – Notation of pain is positive test
    • Look for wince, remark of increased pain
  – Suspect bony injury

• Inter-tester reliability low
• Specificity and Sensitivity moderate
  – unpublished research
Palpate medial edge of tibia along entire length of tibia
Shin Edema Test

Firm finger pressure over surface of Medial Tibia for 5-10 seconds and look for pitting edema
- Positive Test leaves indentation

• Found to be significant predictor for later onset of MTSS.

- Australian Defense Force Academy Study
  - Shin oedema test OR 76.1 95% CI 9.6 to 602.7, Positive
  - Likelihood Ratio 7.26, Negative Likelihood Ratio 0.095

Tuning Fork - Vibration

• Utilize vibrating tuning fork
  – On Bone
  – Over most painful site
  – Increased pain is positive sign

• Stethoscope
  – Proximal
  – Tuning fork distal
    • Change in tone/volume

• Limited published evidence

• 128Hz
  – Sensitivity – 75%
  – Specificity – 67%

• 256Hz
  – Sensitivity – 92.3%
  – Specificity – 19%

• Does not support using as stand alone diagnostic test

Schneiders AG, JOSPT 2012

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Single Leg Hop Test

• Instruct athlete to do 10 single leg hops as high as they can in repetitive fashion.
  – Note flat footed hoping
  – Increased landing (increased knee flexion)
  – Decreased hop height
  – Drifting
  – Increased pain
  – Video for illustration/education
  – * Non Published test for shin pain, and findings not validated
Bilateral Shin Pain, worse in Left
Weight Bearing Lunge Test (WBLT)

- Determine tightness/ROM
- Facing wall, extend ruler from wall, position foot with toe facing forward, bend knee over fixed foot to touch the wall. Move foot back till can no longer touch wall without letting the heel come up off the floor.
  - Measure distance from toe to wall cm
  - Compare with other side
Weight Bearing Lunge Test (WBLT)

- WBLT has a high correlation with the reference standard for assessing dorsiflexion range of motion.

- The WBLT results were significantly correlated with ankle dorsiflexion in all directions on the YBT-LQ (P < .05). A strong correlation was found between the inclinometer measurement of the WBLT and ankle dorsiflexion (r = .74, r² = .55)
Therapeutic Ultrasound

- Therapeutic US –
  - 1-3cm head
  - .5-2.0 w/cm2
  - 30 sec application
  - 1 cm/sec application
- Finding of increased pain/ache

- Good number of studies
- Variable quality, lacks consistency of measure
- 9 Studies in Meta analysis
- Pooled Sensitivity – 64%
- Pooled Specificity – 63%
  - 95 % CI
- Pooled + LR 2.09
- Pooled - LR .35
  - Low to moderate

Schneiders AG, JOSPT 2012
Standing Heel Rise Test

• ID: Weakness, Lack of endurance
• Stand straight, single leg heel rise to point, one finger for support, metronome 30-40, raise with each beat.
  – Test terminated if knee flexed, ht decreased by ½ or leaned/pressured on support
  – 25 SHR considered NORMAL
  – Validated
    • Mean 27 (SD= 11.1, Range 6-70,)
    • Upper/lower 99% confidence intervals 29.8, 25.8
    • Male/Female equal
      – Lunsford B, Phys Ther 1995; 75(8):694-698
Manual Dorsi/Plantar Flexion Test

- MRE
- Sitting on table
- Repeated DF/PF x 1 minute
  - Numbness /tingling into foot + Test
  - Preferred over repetitive heel rise as component of DF activity for Ant compartmental work

- Non Published study, findings not validated
Radiographic Work-up

• Plain radiographs
  – Rule out Frank Fx
  – Often negative
    • Initial - only 5-25% positive
    • Less than 50% ever positive over time
  – Sometimes can see periosteal reaction, cortical thickening, “dreaded black line”
  – Often used as basis of diagnosis – False Negative
Bone Tumors – they do happen!
Manual Muscle Testing

• Manual muscle testing to R/O musculotendinous injury
• Identify muscular weakness
  – Gastroc Soleus
  – Peroneals
  – Anterior/Posterior Tibialis
  – Flexor Hallucis

– Hip
  • Hip weakness contributing factor to lower leg pain.
Summary

- Shin pain is common, take time to evaluate
- Shin pain may be the tip of the iceberg
- Utilize clinical tests to identify source of pain
- Clinical tests not highly publicized or validated
- Radiology is recommended initially, but avoid false negative diagnosis
- Earlier diagnosis leads to quicker resolution
Take home points

- Bony stress injury is a common cause of shin pain
- Initial x-ray important
- Pain > 6 considered significant
- Positive Palpation and hop test significant
- Earlier identification leads to better outcomes
- Take time to evaluate and open the dialogue