**Orthoses and Medial Tibial Stress Syndrome (MTSS)**

"as much as 50% of all lower leg injuries reported in select populations...we must thoroughly understand MTSS in order to develop effective prevention methods.

Medial tibial stress syndrome: evidence-based prevention.  

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**Current Definition (I)**

- Medial Tibial Stress Syndrome (MTSS)

  "...a specific overuse injury producing pain along the posteromedial aspect of the distal 2/3's of the tibia."


**Current Definition (II)**

- Tibial Fasciitis

  "A stress reaction of the crural fascial insertion on the tibia characterized by pain commonly localized to postero-medial tibial crest & uncommonly to anterior tibial crest"


**Articles: Pathomechanics Tibial Fasciitis**

- Medial tibial stress syndrome (tibial fasciitis): a proposed pathomechanical model involving fascial traction.
  - We conclude that fascial tension may play a role in the pathomechanics of medial tibial stress syndrome. The tenting effect of the posterior tibial, flexor digitorum longus, and soleus tendons caused by muscle contraction exerts a force on the distal tibial fascia that is directed to its tibial crest insertion...As a result of localized tension force, we speculate that the pathology of MTSS is a stress reaction resulting in tibial fasciitis,

  - Bouché RT, Johnson CH  

**“Shin Splints” – What are they?**

- Medial Tibial Stress Syndrome
  - Stress Reaction  
  - Stress Fracture Continuum

- Tibial Fasciitis

**“Shin Splints” – Can we treat them?**
Conclusion

- Measuring load on the crural fascia
  - With load and foot maximally pronated
  - With load and muscle tension (FDL, PT, and Achilles)
    - When tibia is loaded without muscle tension applied...no strain on fascia
    - When tibia is loaded & muscle tension applied...linear strain on fascia
    - With use of high & low shin "straps"- no decrease in strain on fascia

Articles: Pathomechanics

- Tibial Bending
  - Bone deformation recorded in vivo from strain gauges attached to the human tibial shaft.
  - The area moment of inertia of the tibia: a risk factor for stress fractures.
    - This finding indicates that bending forces about the approximate AP axis are an important causal factor for tibial and many other stress fractures. The bone's bending strength, or ability to resist bending moments, as measured by the area moment of inertia, helps determine risk to stress fracture.

Tibial Bending

Stress Fracture

The area moment of inertia of the tibia: a risk factor for stress fractures.

Articles: Treatment

  - Experts do not agree upon the cause of MTSS.
  - Although no single prevention method has been proven consistently effective for MTSS, several methods have proved useful: shock-absorbent insoles, pronation-control insoles (specifically controlling navicular drop), and graduated running programs. Stretching of the lower leg musculature has been consistently proven to not prevent MTSS.
  - Messier and Pittala showed that not only was increased pronation significant in participants with MTSS, but the maximum velocity of pronation had a greater correlation in those with MTSS than did pronation alone.
**Articles: Treatment**

- The Prevention of shin splints in sports: a systematic review of the literature.
  - The clinical relevance of these components directs clinicians to
    - (1) increase the strength and endurance of the soleus muscle in their athletes,
    - (2) control over pronation, which may allievate some stress on the medial fascial attachment of the soleus,
    - (3) promote adequate shock absorption via insoles, new shoes, and maintenance of proper foot biomechanics, and
    - (4) work with coaches to commit at least 1 day per week to a pool workout or some other form of cross-training that unloads the tibia and allows the bone remodeling response to catch up.
  - Thacker SB, Gilchrist J, Stroup DF, Kimsey CD.

**Differential Diagnosis**

- Non-Traumatic
  - Overuse
    - Stress Reaction
    - Stress Fracture
    - Shin Splints
    - Tendinopathy
    - Muscle Strain
    - Muscle Soreness
  - Atypical
    - Chronic Compartment Syndrome
    - Popliteal Entrapment
    - Common Peroneal Nerve Entrapment
    - DVT

**Anatomy**

**Etiology**

- Problems with tibial bending model clinically:
  - "Only" stress fracture continuum that resolves in most cases with continued or even increased exercise
  - Bone scan uptake should have vertical and horizontal uptake if a "continuum" and not just horizontal uptake
  - Pain relieved with local anesthetic block along posteromedial tibial crest...should not relieve bone stress reaction or stress fracture pain...it does!

**Etiology**

- Training
  - Frequency, duration, intensity, hills, surfaces
- Equipment
  - Worn Out Shoes
  - Improper shoe for foot biomechanics
- Strength
  - Gastroc/soleus strengthening
  - Single leg "zigzag" hop
- Flexibility
  - No proven benefit
- Biomechanics
  - Pronation: CV, GV, FFV, etc.
  - Shock Absorption: TV and Uncompensated FFV

**Clinical Exam**

- Pain
  - posteromedial crest of the tibia primarily distal 2/3
  - running early stages
  - walking chronic stages
Diagnosis

- Bone Scan
  - Most often helpful
  - 1st and clear
  - 3rd ph
  - Cases negative

- MRI
  - Often most clear in acute

Treatment

- Training
  - Pre-season condition
  - Rarely discontinue
  - Aqua jog if D/C activity

- Physical Therapy
  - US & DTH, ice massage
  - Strengthen gastroc/soleus complex

- Taping
  - Immediate benefit or no benefit

- Biomechanical evaluation
  - Orthoses with cushioning
    - Correction to deformity
    - Flexible Polyprop
    - EVA arch fill
    - Bespoke full length
    - Poron forefoot
  - Shoe wear – mileage, defects, breakdown
  - Shoe recommendation

- Injections
  - Severe initial cases
  - Chronic cases

Conclusion / Thoughts

- Research
  - More research into why certain people fracture and why others only develop tibial fasciitis
  - Is it a continuum from medial tibial stress syndrome to stress fracture or not
  - Why women significantly increased incidence over men
    - 10:1 in military recruits
  - Tibial diameter (men vs. women, fracture vs. tibial fasciitis)

- Clinical
  - Make sure and differentiate stress fractures from tibial fasciitis
  - Don’t just treat them biomechanically
  - Check surfaces
  - Check shoes for wear and recommend appropriate shoe
  - Evaluate training
  - Injections can be very effective in acute and chronic management of tibial fasciitis
  - Incorporate bone (zigzag hop) and muscle exercises

Thank You!

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