

Shin Splints

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KAISER PERMANENTE SANTA ROSA



Disclosures:

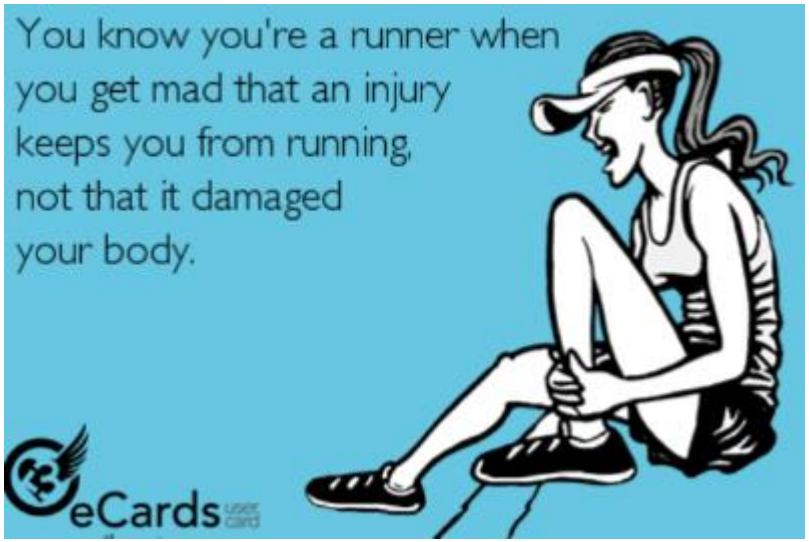
Dr. Todd Weitzenberg has no relationships to disclose.

OBJECTIVES:

- What are ‘Shin Splints’?
- Diagnostic Considerations.
- Rule out stress fracture?
- Current treatment strategies.



Primarily effects runners….







Who Gets Hurt?



Risk Factors

- Novice runners (< 3 years)
- > 6 events a year
- Running > 40 miles a week
- High arches

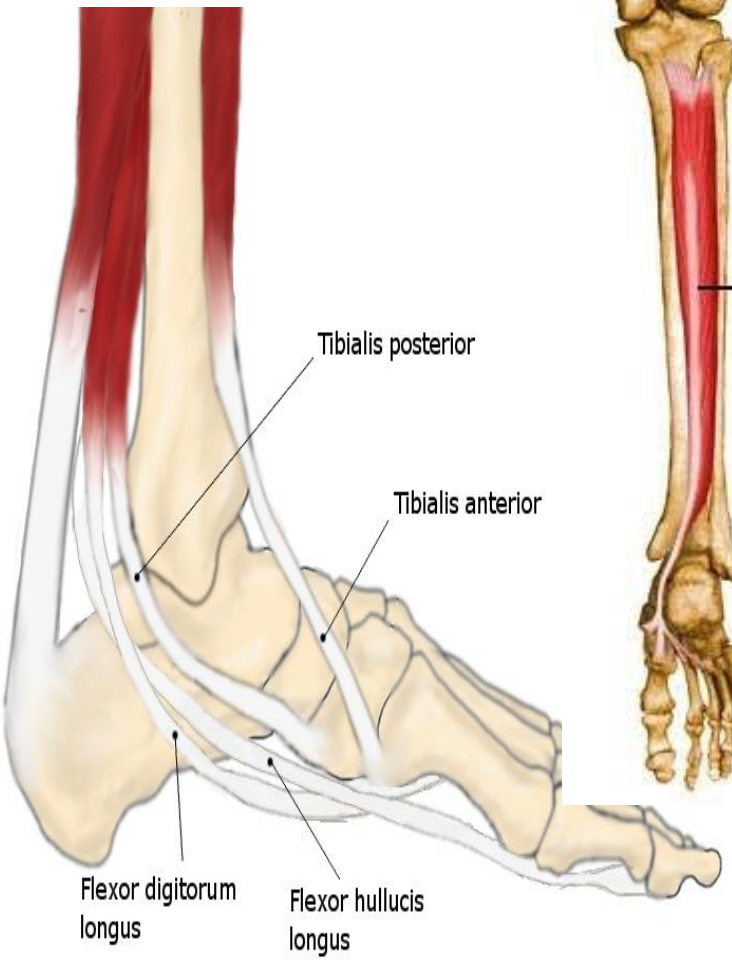
Protective factors

- Running < 24 miles a week
- Adding in resistance training
- Proper ramping of volume and pace

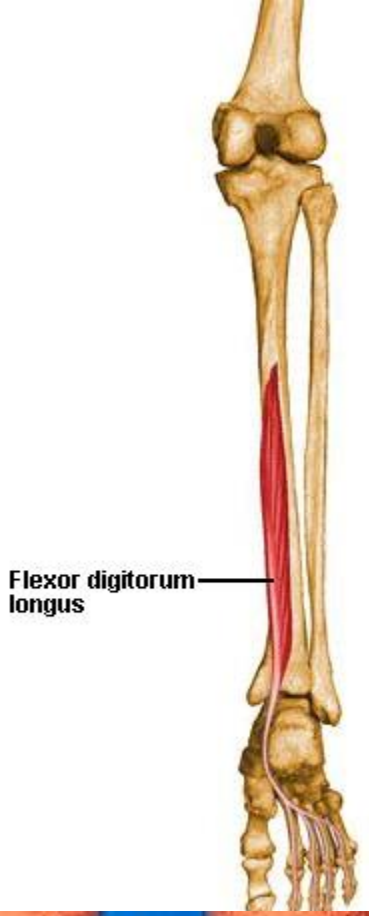
Shin Splints = Medial Tibial Stress Syndrome (MTSS)

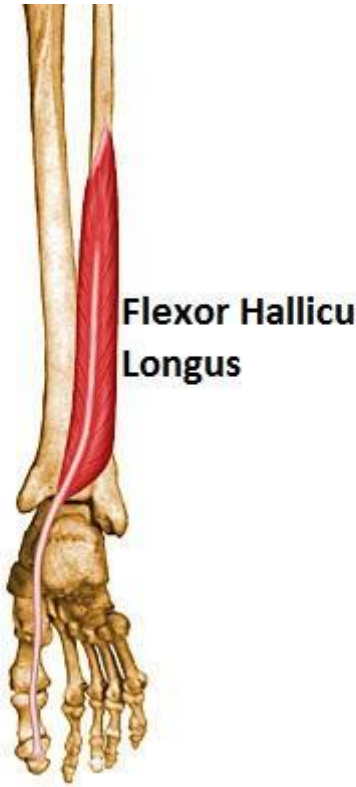
= Pain experienced along the posterior medial border of the distal tibia

**not caused by ischemic disorders or a stress fracture.


Tibialis posterior
Tibialis anterior
Flexor digitorum longus
Flexor hullucis longus

Tibialis posterior


Flexor digitorum longus


Flexor Hallicu
Longus



Medial Tibial Stress Syndrome (MTSS)

- Must be clinically differentiated from tibial stress fracture!
- May be difficult, especially in highly competitive athletes.
- May represent a continuum of injury from localized stress reaction to stress fracture.

- Slow onset of dull-aching pain along medial tibia, worsens as running increases, relieved with rest.

MTSS → Increased Force or Frequency → STRESS FRACTURE

- Pain that persists after running and continues with daily ambulation.

Predictor of Injury

Weekly distance is the strongest predictor of future injuries.

Studies show and increasing injury rate with increasing distance beyond **32 km/20.48 mi** per week

- Macera CA, Sports Med 1992; 13 (1):50-57




NIKE WOMEN'S




GO TEAM
AMBER
TEAM
12,746
17,743

Group Training Programs and Self-Reported Injury Risk in Female Marathoners

Parker, Daniel T. MD, MPH*; Weitzenberg, Todd W. MD†; Amey, Annette L. PhD‡; Nied, Robert J. MD†

Clinical Journal of Sport Medicine: November 2011 - Volume 21 - Issue 6 - p 499–507
doi: 10.1097/JSM.0b013e3182377080
Original Research

Abstract | Author Information | Article Outline | Article Metrics

Objective To investigate the association of group training program (GTP) participation and other known risk factors with training and intrarace injury rates in female marathoners.

Design Multivariate analysis of a self-reported questionnaire.

Setting Nike Women's Marathon, San Francisco, CA.

Participants Three hundred seventy-eight female marathoners.

Main Outcome Measures Training and intrarace injury rates, severity of these injuries, and satisfaction rates.

Results Participants of GTPs were 2.36 times more likely to experience intrarace injury than non-GTP participants ($P = 0.02$). Runners with mild and severe injuries in the past 12 months preceding training were 3.54 and 5.08 times more likely to be injured during training ($P < 0.0001$ and $P < 0.0001$), respectively, and those with previous severe injury were 6.43 times more likely to experience severe training injury ($P < 0.0001$). Similarly, the risk for intrarace marathon injury was 3.79 and 7.09 times greater among those with mild and severe injuries during training ($P = 0.003$ and $P < 0.0001$), and the risk of severe intrarace injury was 5.63 times greater for those reporting a severe training injury ($P < 0.001$). Runners with previous marathon experience had a 0.53 risk of severe training injury compared with inexperienced runners ($P = 0.04$).

Conclusions Participants of GTPs were more likely to be injured during the marathon in multivariate analysis but were also more satisfied with training in bivariate analysis. Female runners with previous injury had a greater risk of future training and race injury, and severe previous injury was associated with severe training and intrarace injury. Previous marathon experience was protective of severe training injury.

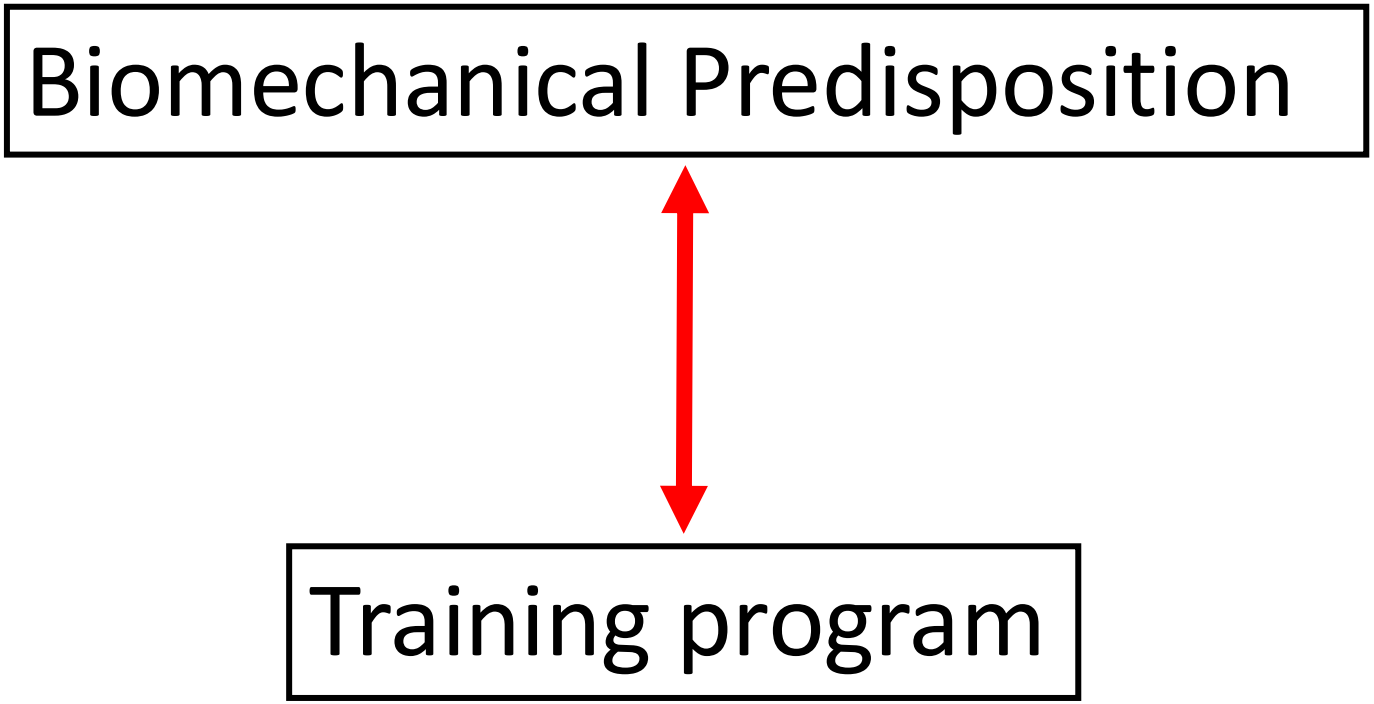
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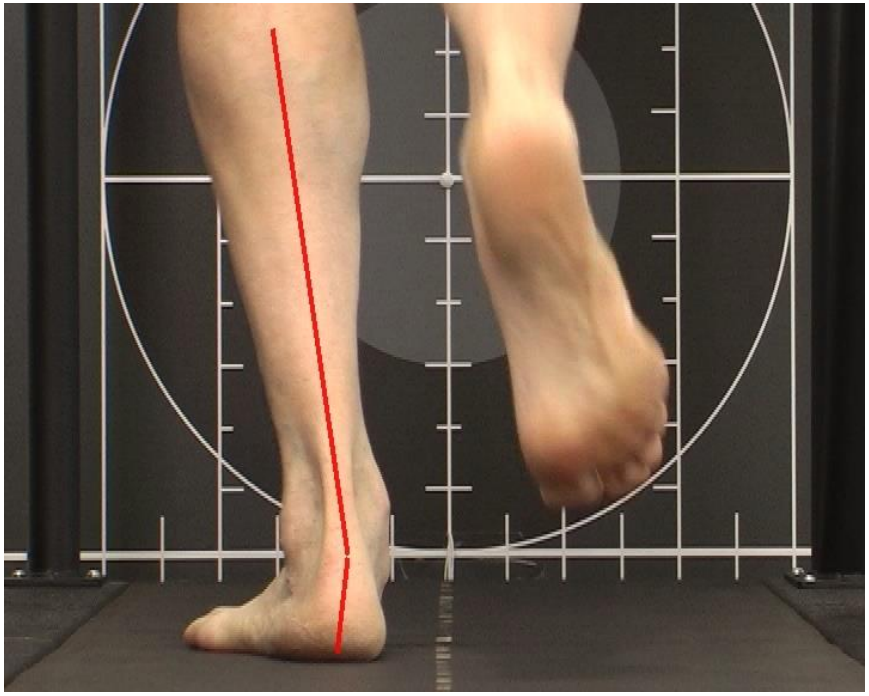
Take Home Messages:

1. Group Training Participants (GTP) are more likely to be injured, but…
   - They are also more likely to be satisfied.
2. GTP with previous injury, were more likely to be injured during event.
   - Serious pre-event injury, more likely to have serious event injury.
3. Previous marathon experience was protective of serious event injury.


Biomechanical Predisposition
Training program

MTSS Predisposing Factors: BIOMECHANICAL

- Increased training duration and intensity
- Tight gastroc-soleus musculature
- Hindfoot and forefoot varus
- Degree and velocity of foot pronation



Running Analysis



Modifiable Risk Factors

- Training distance
- Training intensity
- Training duration
- Running surface
- Inadequate rest following hard training
- Appropriate footwear

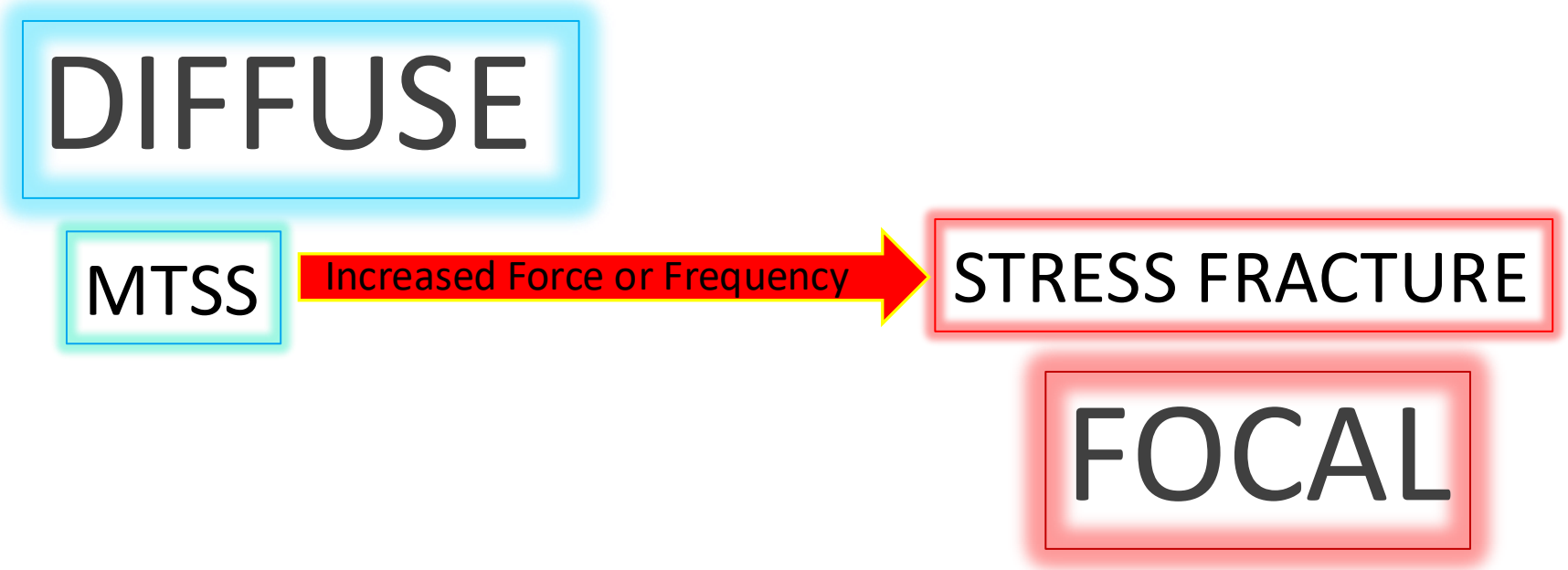


MTSS: Physical Exam

- Diffuse TTP
  - tenderness along posterior-medial edge of tibia, usually distal third
- Diffuse pain with forceful, passive ankle dorsiflexion
- Diffuse pain aggravated by active resisted muscle testing:
  - soleus, posterior tibialis, flexor digitorum longus

Differentiate from tibial stress fracture:

- Focal TTP
- Focal pain from indirect percussion
- Focal pain from hop test
- Focal pain with vibration

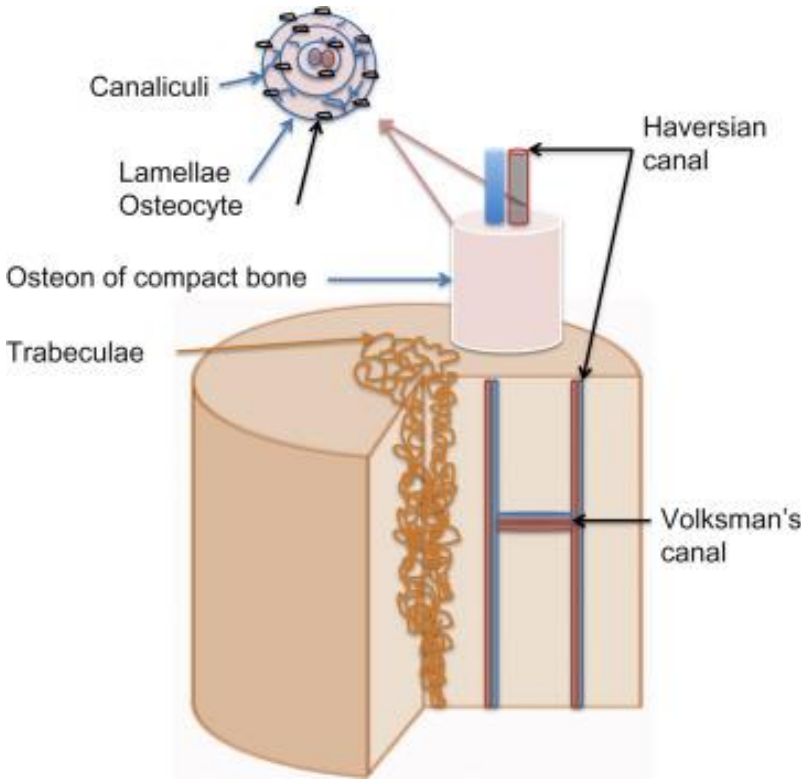

DIFFUSE
MTSS
Increased Force or Frequency
STRESS FRACTURE
FOCAL

Bone Metabolism

1. There is an inverse relationship between bone mineral density and the risk of stress fractures!
   - Med Sci Sports Exerc. 2008;40(11 Suppl.):S660–S670

2. No significant variation in bone density in athletes with MTSS
   - J Sports Sci Med. 2011 Dec; 10(4): 743–747

3. Risk of stress fractures is similar for females and males
   - Joint Bone Spine. 2012;79(Suppl. 2):S86–S90



MTSS Imaging

X-rays rarely helpful during acute phase

- If no improvement with 6-8 weeks of conservative treatment, then order AP and lateral x-rays prior to specialty referral
- Rule-out bony pathology
- ‘The dreaded black line’





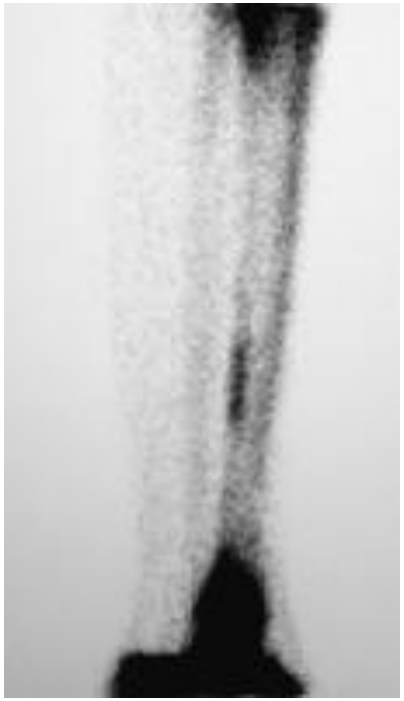
MTSS Advanced Imaging

Bone Scan and MRI
- Cortical stress reaction

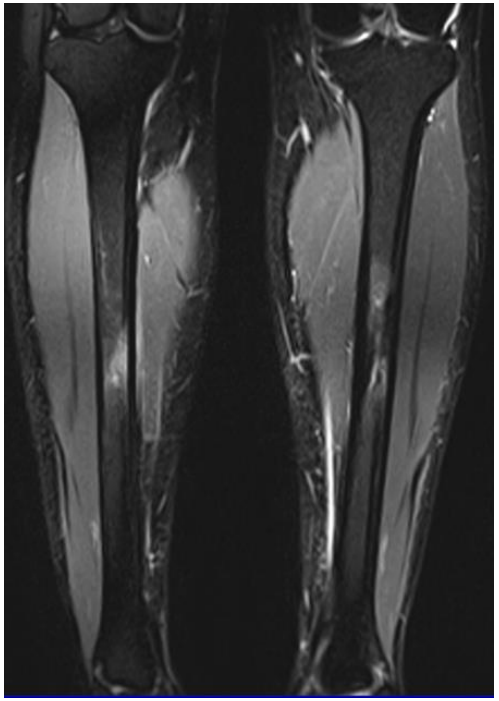
Bone Scan:
- Linear, non-focal uptake

MRI:
- Non-specific edema along periosteum

DIFFUSE

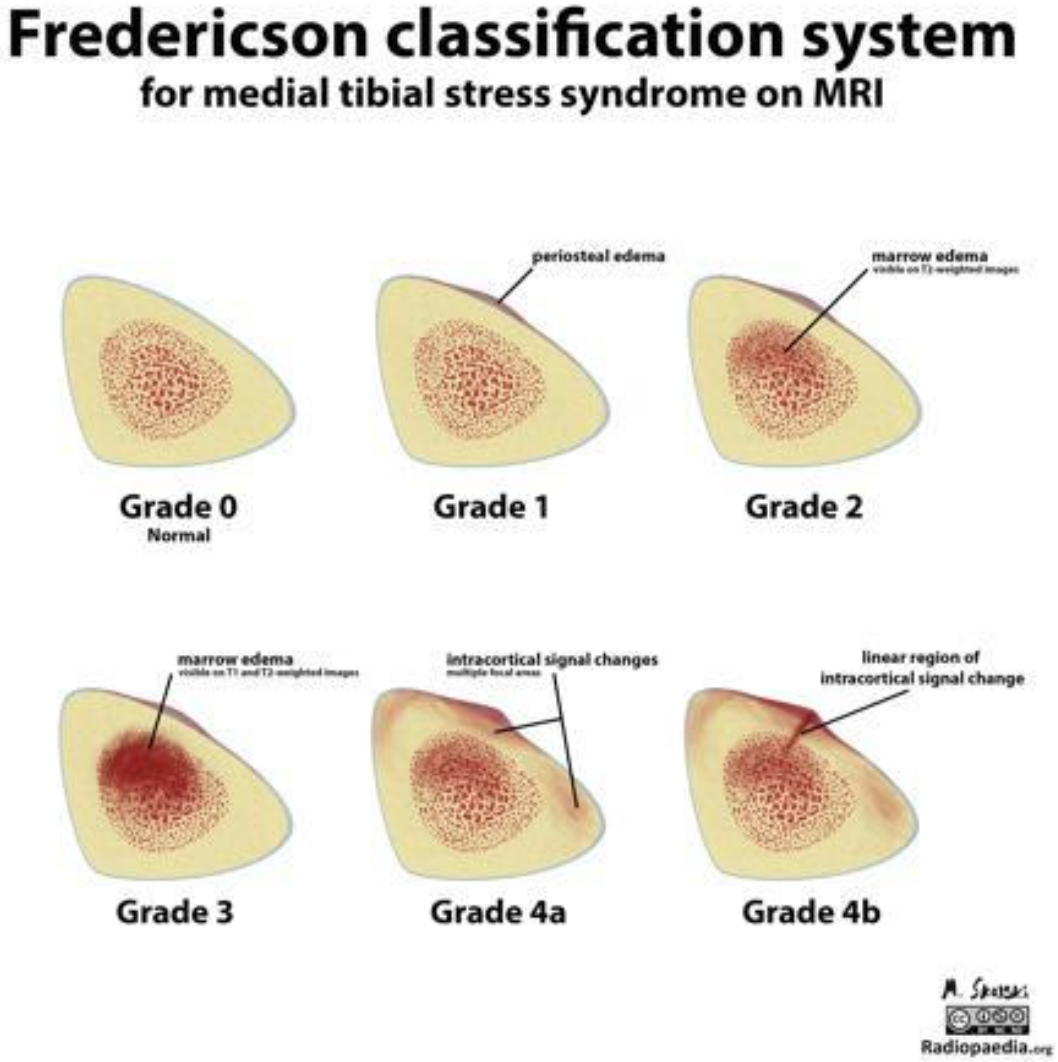


Spect Bone Scan



MRI

MRI GRADING SYSTEM



Grade1= MTSS (periosteal edema)

Grade2= Marrow edema T2 only

Grade3= Marrow edema T1 & T2

Grade4= All of above+fracture line

Stress Fracture

FOCAL



Bone Scan



MRI

International Delphi consensus on bone stress injuries in athletes

Tim Hoenig [1], Karsten Hollander [2], Kristin L Popp [3,4], Michael Fredericson [5], Emily A Kraus [5], Stuart J Warden [6], Adam S Tenforde [7], Bone Stress Injury Authorship Group

British Journal of Sports Medicine: 2024: RISK FACTORS:

Increase training load

Low BMI

Early sport specialization

Functional strength deficits

Biomechanics

=100% Agreement

Personal history of bone injury

History of eating disorder

Not enough calories

Menstrual dysfunction

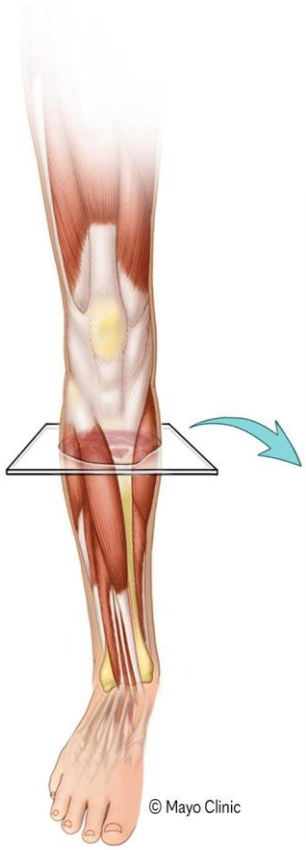
Low testosterone

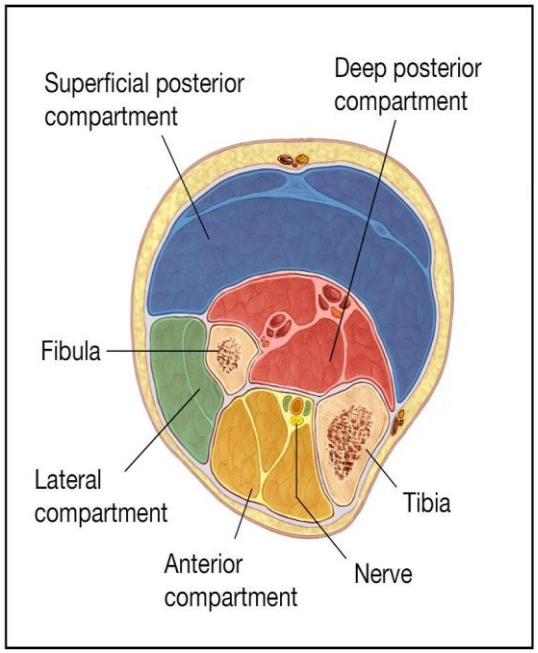
Change in habitual shoe wear

=High Level of Agreement

CECS: Chronic Exertional Compartment Syndrome.

- Aching, burning or cramping pain, with numbness or weakness.
- Generally, occurs at a consistent time/distance with activity.
- Tends to follow a consistent pattern based on the peripheral nerve effected, depending on the specific compartment involved.
- Resolves with rest.





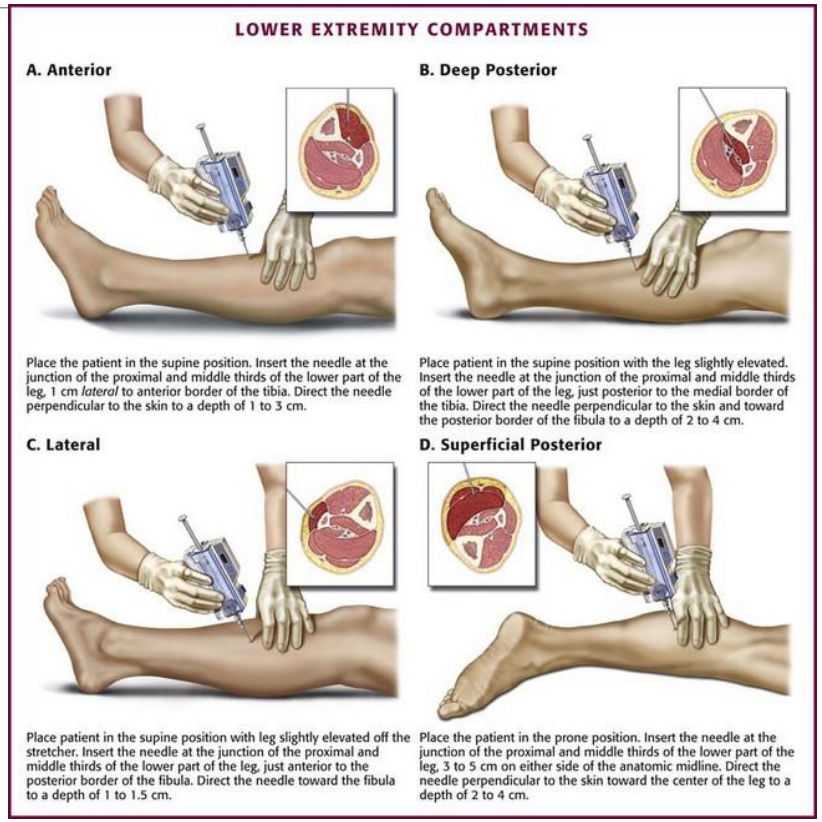
CECS-pathology and risk factors

- Muscles can expand up to 20% during exercise.
- If surrounding fascia compartment is too tight, it can lead to pressure build up and compromise of circulation to the nerves in that compartment.
- Repetitive, high-impact activities, excessive training, poor exercise mechanics, and sometimes supplement use (e.g., creatine).



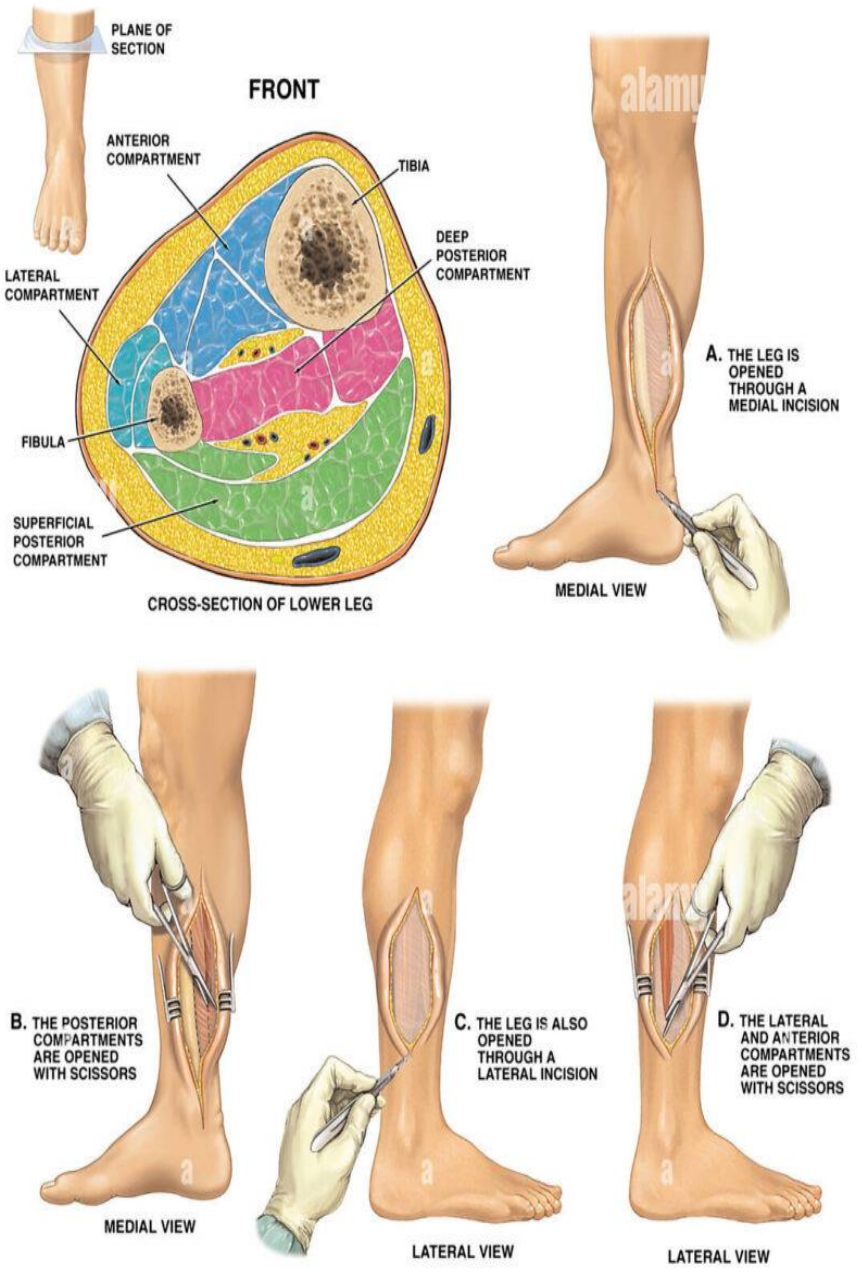
CECS-Diagnosis

- Diagnosis is based on clinical history and physical exam.
- Compartment pressure testing.
- Intra-compartmental pressure (ICP) testing, **before** and immediately **after** exercise:
  - >30 mmHg 1 min post exercise
  - >20mm Hg 5 min post exercise



CECS-Treatment

- Activity modification, physical therapy, gait modification, and, in some cases, Botulinum toxin injections.
- If conservative treatment measures fail, then surgical **fasciotomy** can be considered.
- Surgery is often successful, allowing many patients to return to their sport. Recovery includes leg elevation for 3–5 days, with normal activities often resumed within 4 weeks.



MTSS: Treatment-Evidence Based

Conclusion: None of the studies are sufficiently free from methodological bias to recommend any of the treatments investigated. Of those examined, **ESWT appears to have the most promise.**

- Sports Medicine. 43(12):1315-1333, December 2013



MTSS Treatment

- No land based running = REST
  - May gradually resume soft dirt or grass running one week after tibial pain/tenderness has resolved
  - Rate of return to running depends on severity at time of presentation, chronicity, and premorbid functional level
- Cross-training:
  - Pool running, stat.bike, elliptical trainer, stair climber
- Icing
- NSAIDs
- P.T.
  - Stretching: gastroc-soleus complex
  - Strengthening: anterior tibial muscles
- Orthotics

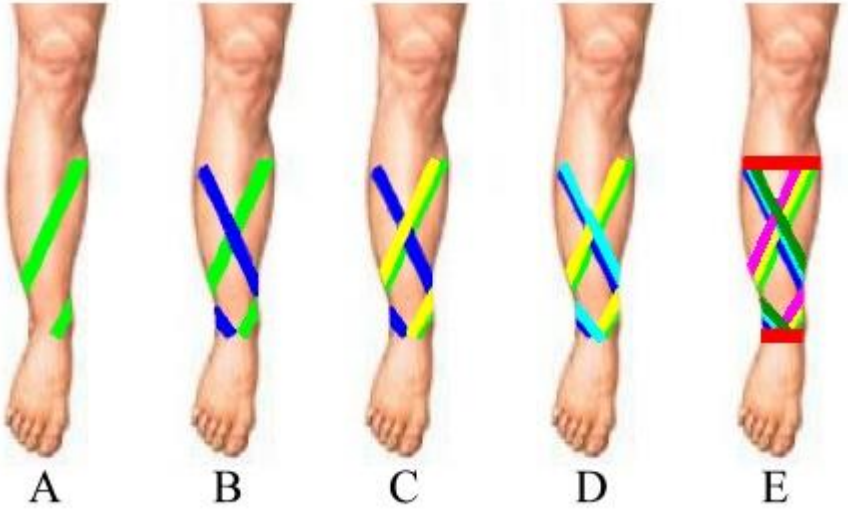
Specialty referral if no improvement in 6-8 weeks

Orthotics

- Some evidence supports the use of orthotic insoles.
- Cochrane cites four medium-quality studies that show some reduction of risk of MTSS and tibial stress fractures.

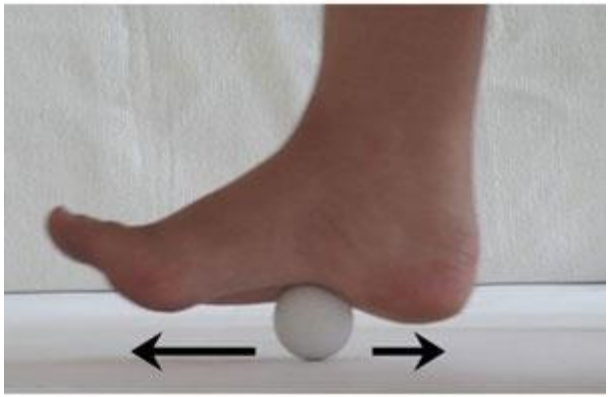


Other …













Running Mechanics

Change landing load:

- Excessive ankle dorsiflexion (heel strike) will increase knee energy absorption and increase quad and PF loads.
- Leads to high impact
- Increase risk of Stress fracture

Increase knee flexion to 45 degrees during landing:

- Critical in runners with history of stress fractures because knee flexion is a source of shock absorption
- low angles leads to higher impact

Increase cadence:

- 10% increase will significantly reduce peak Ground Reaction Force
- Will also reduce impact, stride length and vertical displacement

Rehabilitation Program





Stretch and Strengthen

- Gastrocnemius
- Soleus





Improve Core Stabilization

Improve hip abduction/stabilization





When to replace your shoes?

- 300-500 miles
- Depends on:
  - Quality of shoe
  - Body weight
  - Running surface



What about barefoot running?

"While there is biomechanical evidence to support the ability of "barefoot" runners to disperse impact forces, no clinical study has demonstrated its superiority in reducing injury."



-Current Sports Medicine Reports

Issue: Volume 11(3), May/June 2012, p 160–165

GPS Data & Volume?

Based on the results from the current study, increases in weekly training progression may become deleterious at a weekly increase above 30%, which is more than the 10% rule currently used as a guideline for correct progression in weekly volume by runners and coaches.

- Journal of Strength & Conditioning Research. 27(6):1471-1478, June 2013.

10% Rule

MTSS: Summary

- Differentiate between MTSS and Stress Fracture and CECS.
- Address both BIOMECHANICAL and MODIFIABLE factors.
- Imaging:
  - X-rays: Dreaded black line
  - MRI: Less radiation
  - Bone Scan: Helpful for MTSS vs Stress Fracture

Treatment:

Rest+Symptoms+Biomechanics+Training+Rehab



Thank you!

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