

40<sup>th</sup> Annual Symposium on Sports  
Medicine:

UT Health Science Center San  
Antonio School of Medicine  
January 19, 2013

---

---

---

---

---

---

---

---

**Rehabilitation of the Foot and  
Ankle**

**Julie Barnett PT, DPT, MTC**  
Director of PT The Non-Surgical Center of  
Texas  
Assistant Professor PT at UT-HSCSA

---

---

---

---

---

---

---

---

**Financial Disclosure**

Dr. Julie Barnett has no relevant financial  
relationships with commercial interestes to  
disclose.

---

---

---

---

---

---

---

---

## Overview

- Basic walk/run biomechanics: traditional
- EBM for 3 diagnosis of overuse foot/ankle injuries: plantar fasciitis, Achilles tendonitis, posterior tibialis tendonitis
- Controversial discussion of minimalistic biomechanics and shoes
- Future directions

---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---

## How Far Did You Run?



---

---

---

---

---

---

---

---

## Overuse Foot/Ankle Injuries in Sports

1. Plantar Fasciitis
2. Achilles Tendinitis
3. Tibial Stress Syndrome



---

---

---

---

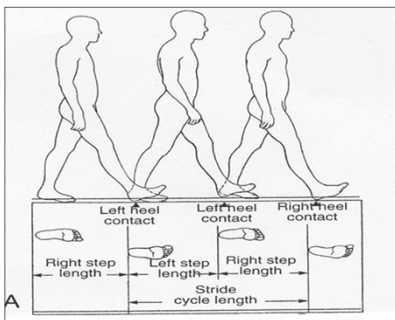
---

---

---

---

## Normal Gait



---

---

---

---

---

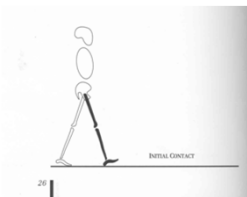
---

---

---

## Weight Acceptance @ Initial contact

- | Initial contact | ROM         | Muscle Action     |
|-----------------|-------------|-------------------|
| - Hip @         | 20° flexion | hip extensors     |
| - Knee @        | 5° flexion  | quadriceps        |
| - Ankle @       | 0°          | tibialis anterior |
- **Critical event**  
- Heel first contact



13

---

---

---

---

---

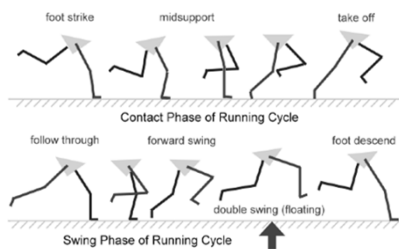
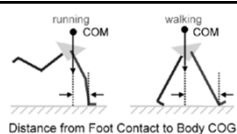
---

---

---

## Running

### ■ Key ranges of motion



14

---

---

---

---

---

---

---

---

## EBM Approach for Foot/Ankle Injuries

- Diagnosis
- Tests and Measurements
- Interventions for physical therapy
- Outcome Instruments




---

---

---

---

---

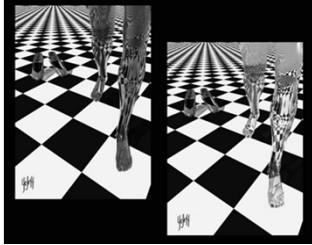
---

---

---

### Evidence-Based Practice and Gait Analysis

- Observational
- Video
- 3-D systems
- Pressure plate systems
- Global Positioning System (GPS)



---

---

---

---

---

---

---

---

### Plantar Fasciitis Diagnosis

- Clinical Assessment
- No gold-standard



---

---

---

---

---

---

---

---

### Plantar Fasciitis Tests and Measurements

- Tenderness at the medial calcaneal tubercle
- < 10 degrees of ankle dorsiflexion
- < 65 degrees of 1<sup>st</sup> MTP extension (weak evidence)



---

---

---

---

---

---

---

---

## Plantar Fasciitis Risk Factors

- Decreased ankle dorsiflexion
- Obesity
- Work-related weight-bearing



---

---

---

---

---

---

---

---

## Plantar Fasciitis Interventions (Low cost)

- Icing
- Strapping the foot (low dye)
- Calf and plantar fascia stretches
- Avoidance of flat shoes
- Avoidance of barefoot walking
- Use of over-the-counter arch supports
- Heel cushions
- Limitation of extended activities



---

---

---

---

---

---

---

---

## Low Dye Taping

- Supports rearfoot alignment
- Reinforces plantar fascia
- Lifts and supports medial longitudinal arch



---

---

---

---

---

---

---

---

## Taping Techniques

- McConnell Patella
- Kinesio Patella
- Ankle Sprain
- Low Dye



---

---

---

---

---

---

---

---

## Plantar Fasciitis Interventions (Higher Cost)

- Custom orthotics
- Night splints
- Immobilization with casts or other devices



---

---

---

---

---

---

---

---

## Night Splints

- Keeps plantar fascia on a stretch vs. plantar flexed and shortened
- Dorsal options available. Example: Strasburg sock.



---

---

---

---

---

---

---

---



### FootMaxx Pressure Plate System

- Patient walks across pressure plate barefooted to capture a dynamic foot print
- Scanning the foot



---

---

---

---

---

---

---

---

### Scan of Feet

- Pressure points are differentiated with a scale of colors.
- Points of higher impact are indicated in red.
- Gait line is drawn over the print
- Pressure Points



---

---

---

---

---

---

---

---

### Neutral Foot Slipper Cast

- Cast in subtalar neutral
- Mail neutral cast to lab
- Positive cast made
- Orthotic made from positive mold
- Both returned to clinic and patient



---

---

---

---

---

---

---

---

### Plantar Fasciitis Outcome Instrument

- American Academy of Orthopedic Surgeons (AAOS) Foot and Ankle questionnaire
- [www.aaos.org](http://www.aaos.org) - Click on "Research", and "Outcomes" for access to an array of outcomes assessment instruments

---

---

---

---

---

---

---

---

### Achilles Tendinitis Diagnosis

- Ultrasound: 0.80 sensitivity and 0.49 specificity
- MRI: 0.95 sensitivity and 0.50 specificity
- Clinical assessment may provide yardstick compared to imaging



---

---

---

---

---

---

---

---

### Achilles Tendinitis Tests and Measurements

- Point tenderness on the tendon
- Localized swelling
- Crepitation during movement



---

---

---

---

---

---

---

---

## Achilles Tendinitis Risk Factors

- Tight heel cord
- Achilles contractures
- Hyperpronation
- Repetitive heel running
- Change in shoes or running surface
- Increase in intensity or distance
- Hill climbing



---

---

---

---

---

---

---

---

## Achilles Tendinitis Interventions

- Stretching exercises
- Modification of training schedules
- Braces and insoles
- Questionable role of eccentric versus concentric strengthening (weak evidence)



---

---

---

---

---

---

---

---

## Achilles Stretches with slant board

- Slant board to keep foot in neutral
- Obtain a neutral heel for more aggressive stretch
- Avoids twisting midfoot with edge of step stretches



---

---

---

---

---

---

---

---

## Achilles Tendinitis Outcome Instrument

- Victorian Institute of Sport Assessment-Achilles questionnaire (VISA-A)
- AAOS Foot and Ankle questionnaire not specific for Achilles tendinitis



---

---

---

---

---

---

---

---

## Medial Tibial Stress Syndrome Diagnosis

- Bone scan is gold standard: 84% sensitivity and 22% specificity
- MRI: 79% sensitivity and 33% specificity

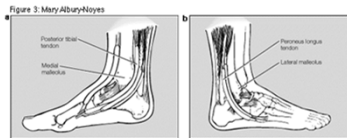


Figure 3. Tendinitis of the posterior tibial tendon on the medial side (a) and the peroneus longus tendon on the lateral side (b) can easily occur in the adult recreational athlete who participates in hours of stress. With inflammation of these tendons, pain and tenderness are usually present along the tendon inferior and distal to the malleolus.

---

---

---

---

---

---

---

---

## Posterior Tibialis Tendon



---

---

---

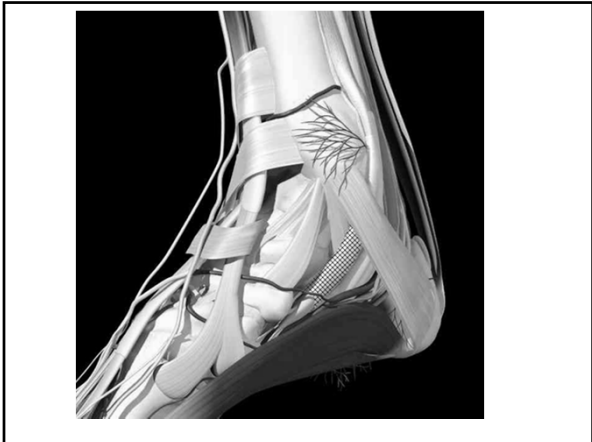
---

---

---

---

---



---

---

---

---

---

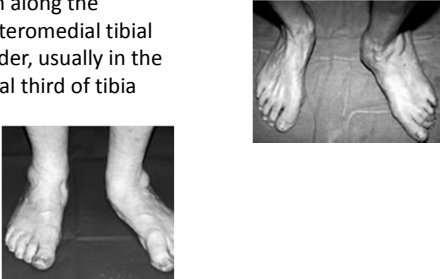
---

---

---

### Medial Tibial Stress Syndrome Tests and Measurements

- Pain along the posteromedial tibial border, usually in the distal third of tibia



---

---

---

---

---


---

---

---

### Medial Tibial Stress Syndrome Risk Factors

- Excessive and/or prolonged pronation
- Recent changes in:
  - Distance
  - Speed
  - Form
  - Stretching
  - Footwear
  - Running surface



---

---

---

---

---

---

---

---

### Medial Tibial Stress Syndrome Interventions

- Shock-absorbing insoles (best evidence)
- High-Dye and low-Dye taping podiatry study (weak evidence)
- Clinical experience and observational interventions:
  - Motion control shoes, ankle strapping **OR**
  - Minimalistic shoes to strengthen intrinsics and change running biomechanics from rearfoot strike to forefoot strike with less impact forces

---

---

---

---

---

---

---

---

### How Should We Run?



---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---

## Fit Flop – Barefoot Running



---

---

---

---

---

---

---

---

## Harvard Website

- <http://barefootrunning.fas.harvard.edu/>

---

---

---

---

---

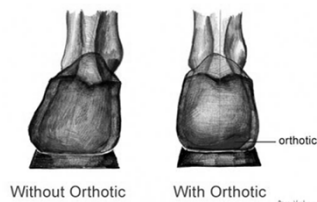
---

---

---

## Orthotics

- Alter rearfoot alignment
- Decrease stretch on posterior tibialis in over-pronators



---

---

---

---

---

---

---

---





Vibram → Neutral → Motion Control



---

---

---

---

---

---

---

---

Barefoot Research: inconclusive outcomes at this time



---

---

---

---

---

---

---

---