Evaluation and Management of Metatarsal and Forefoot Injuries

Charles J. Gatt, Jr., MD
Chair, Department of Orthopaedic Surgery
Rutgers Robert Wood Johnson Medical School
New Brunswick, NJ
• No Disclosures
Questions

• What are the common injuries of the forefoot?
• What are the causes of injury?
• What is the treatment?
The Problem

- 300,000 lbs of stress per mile of running is centered on heel and then dissipated to the rest of the foot.
Foot and Ankle Sports Injuries History

- Sport
- Surface
- Shoes
- Custom/Prefab Orthosis
- Onset
- Position at injury
- Noise
- Pain location
- Swelling
- Time out of Sports
Foot and Ankle Sports Injuries
Physical Exam

- Gait
- Callus Distribution
- Shoe Wear
- Orthosis wear
- Palpation
- Auscultation
- Range of Motion
- Percussion
- Pulses
- Sensory Exam
Imaging

- Xray
  - Weight bearing xray may add clarity
- MRI
- MSK US
Metatarsalgia

- Common overuse injury described as pain in the forefoot that is associated with increased stress over the metatarsal head region

- Often referred to as a symptom, rather than as a specific disease.
Common causes of Metatarsalgia

- Sesamoiditis
- Interdigital neuroma (also known as Morton neuroma)
- Avascular necrosis (Frieberg’s Infarction)
- Metatarsophalangeal Synovitis
  - Inflammatory arthritis
  - Synovitis/Inflammation from Repetitive Trauma
Sesamoiditis

SIGNS

- Local Tenderness
- Pain with Hyperextension
- Rare Swelling
Sesamoid Fracture
Mechanism

- Acute fall from height (Ballet)
- Hyperextension of MTP (football)
- Stress fracture (Runners)
- Osteochondritis
Sesamoiditis
Incidence

- Stress Fracture
  - Any age
  - Tibial or Fibular Sesamoid

- Osteochondritis
  - Female, 20’s
  - lateral Sesamoid

X-Ray of foot in high-heeled shoe – Beyond any postural deviation/compensation that must happen above, just look at the physical stress that is placed on the metatarsophalangeal joints! It is sad to see what people do to themselves in the name of fashion.
Sesamoid Fracture
X-RAY

- AP/Lat/Oblique
- Tangential Views
Acute sesamoid fracture

- Presentation
  - May mimic Turf Toe

- Treatment
  - Depends on amount of Diastasis
Acute sesamoid fracture

- Diastasis >2mm
  - Bony Fixation
  - Soft tissue repair

- Diastasis < 2mm
  - SLC 3-6 weeks
  - Steel shank insole
  - Prevent Hyperextension
Sesamoid Fracture
Surgical Treatment

- Displaced Fracture
- Non-Disp Fx Not Resp to cast Immob. or shoe inserts x 12 wks
- Unrelieved Sesamoiditis/Bursitis
- Osteomyelitis
Sesamoid Fracture
Excision of Fragment-Complications

- Migration of Hallux 10%
- Persistent Pain 41-50%
- Stiffness 33%
- Weakness 60%
Sesamoid Fracture
Late Repair

• Seventeen Patients
• Treated with Currettage and Bone Grafting
• Post-op SLC for Six Weeks
• Mean Follow-up 33 months
• 15/17 Asymptomatic return to all Pre Injury Activities
• 14/15 Healed by Tomography at 12 weeks

Anderson/McBryde AOFAS March 1991
Turf Toe
Mechanism

- **Acute**
  - Hyperextension of first MTP
  - Direct blow to heel with toe planted in dorsiflexion

- **Chronic**
  - Repetitive valgus stress
  - Runner’s (Especially Cross-country)
Turf Toe in Football

**College Football**
- Incidence .062/1,000 AE
- 14 x more likely in games vs practice
- Contact w/ other player

**Professional FB**
- 80 players surveyed
- Time loss equal to Ankle sprains
- 83% first time on artificial turf
- Hyper extension mechanism
- 60% Offense
  - OL
  - >Age 27 (5+ years exp)
- Progression to chronic injury
  - Career ending


Turf Toe
Anatomy

- MTP Capsule
- Articular Cartilage
- Great Toe Flexors
- Sesamoids
- Abductor Hallicus
- Plantar Nerves
- Bones
Turf Toe
Treatment

- No role for injections
- RICE, Shoe Mod. And Taping
- If can’t jog w/in 3 wks. Consider
  - open treatment
  - Late repair works

Hallux Rigidus

- Literally “Stiff Big Toe”
- Sentinel Finding –
  - Decreased Dorsiflexion (Pain)
- Can be predisposed
  - Type of foot
  - Type of activity
    - Acute injury squellae
    - Chronic repetitive injury
Hallux Rigidus
17yo
Hallux Rigidus

Treatment

- Nonoperative
  - Symptomatic
  - Mechanical – Decrease Dorsiflexion

- Operative
  - Cheilectomy
  - Arthroplasty
  - Biologic
Hallux Rididus
Morton's Neuroma

Symptoms

- Classically described as a burning pain in the forefoot
- Can also be felt as an aching or shooting pain in the forefoot
- Pain may occur in the middle of a run or at the end of a long run
- If shoes are tight or the neuroma is very large, the pain may be present even when walking
- Occasionally a sensation of numbness is felt in addition to the pain or even before the pain appears.
Morton’s Neuroma

- “Click” which is known as Mulder's sign
- There may be tenderness in the interspace
- Rule out similar or concurrent problems
  - Tenderness at one of the metatarsal bones can suggest a stress reaction (pre-stress fracture or stress fracture) in the bone.
  - An ultrasound scan can confirm the diagnosis and is a less expensive and at this time, at least as sensitive a test as an MRI
- An x-ray does not show neuromas, but can be useful to "rule out" other causes of the pain.
Morton’s Neuroma

- **Cause**
  - An enlargement of the sheath of an intermetatarsal nerve in the foot
  - Most Common – The third intermetatarsal space
  - The second interspace being the next most common location.
Morton’s Neuroma

Contributing Factors

- **Pronation** of the foot can cause the metatarsal heads to rotate slightly and pinch the nerve running between the metatarsal heads.

- Chronic pinching can make the nerve sheath enlarge. As it enlarges it than becomes more squeezed and increasingly troublesome.

- **Tight shoes**, shoes with little room for the forefoot, pointy toeboxes can all make this problem more painful.

- **Walking barefoot** may also be painful, since the foot may be functioning in an over-pronated position.
Morton’s Neuroma

Self-Treatment

- Wear wide toe box shoes
- Don't lace the forefoot part of your shoe too tight
- Make sure your feet are in supportive shoes that do not squeeze your forefoot
Morton’s Neuroma

- Orthotics – esp. for the Pronator
- Injection of Steroid and Local Anesthetic
- Occasionally injection of other substances to "ablate" the neuroma.
- Surgical Removal of Neuroma

Tips
- Wear shoes designed with a roomy toebox.
- Wear shoes that have good forefoot cushioning.
- Use sport specific shoes.
- Fit your shoes with the socks that you plan to wear during aerobics activity.
Freiberg's Infraction

- AKA Avascular Necrosis, Osteonecrosis, Osteochondrosis

**General considerations**

- Named “infraction” because it was originally thought secondary to trauma
- Exact cause remains uncertain but thought to be one of the osteochondroses in adolescents
  - *Osteochondroses* are diseases that usually affect the epiphyses of growing bones resulting in necrosis most likely on a vascular basis, although the exact mechanism is not known
- In others, Freiberg's may be due to a combination of trauma, and vascular insults
Metatarsal Stress Fractures

- .7-21% Incidence Literature
- 90 Reported (63 F, 27 Male)
  - F – basketball, Lax
  - M – Football, indoor track
- 2\textsuperscript{nd} MT Most common
  - Middle 1/3
  - Majority Occurred on grass

<table>
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<th>Location</th>
<th># of Athletes</th>
<th>Distal 1/3</th>
<th>Middle 1/3</th>
<th>Proximal 1/3</th>
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<td>1</td>
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<td>13</td>
<td>6</td>
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<td>12</td>
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<tr>
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<td><strong>Grand Total</strong></td>
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<td><strong>32</strong></td>
<td><strong>16</strong></td>
<td><strong>9</strong></td>
<td><strong>7</strong></td>
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</table>
Base of 5th metatarsal fracture

- Tuberosity Avulsion Fracture
- Mechanism - Inversion
- Heals Clinically-3 wks
  Radiographically-6 wks
Dancer’s Fracture

- Spiral Fracture of the Fifth Metatarsal
  - Treat WBAT in post op shoe
  - Longer time to healing
Stress fractures of the 5th metatarsal Jones fracture

- Gradual increase in lateral foot pain
- Point tender metaphysis of 5th MT
- High index of suspicion
- MRI if x-rays negative and high suspicion
Stress fractures of the 5th metatarsal - Jones fracture

Early Detection Reduces Threat Of Foot Injury In College Basketball Players

Date: December 6, 2004
Source: Duke University Medical Center
Summary: Early identification of potential stress fractures with magnetic resonance imaging (MRI) can reduce the threat of season-ending injuries for college basketball players, according to a Duke University Medical Center radiologist.

Durham, N.C. -- Early identification of potential stress fractures with magnetic resonance imaging (MRI) can reduce the threat of season-ending injuries for college basketball players, according to a Duke University Medical Center radiologist.

The findings -- based on the study of 26 male college basketball players -- suggest that such diagnostic work should perhaps be included as a standard part of physical examinations for male and female basketball players, who regularly place considerable stress on their feet, said Duke radiologist Nancy Major, M.D. Other athletes whose sport or training regimen puts similar stresses on bones of the feet might also stand to benefit from the...
Jones Fracture Treatment

- Asymptomatic and positive MRI
  - ? Orthotic/shoe modification
- Symptomatic and positive MRI
  - Orthotic
  - Activity modification
  - Close monitoring of symptoms!!
- Symptomatic with visible fracture line, hypertrophy
  - Strongly consider surgery
Acute on chronic stress fracture
Jones Fracture

- IM Fixation
- WBAT in cam walker when callus visible
- Healed Radiographically by 13 weeks
Summary

- Many causes of forefoot pain
- Detailed history important
- Clinical exam important; Prompt recognition
- Conservative and aggressive treatment
- High level of suspicion with adolescent bony pain
Thank you