Less Common Foot and Ankle Injuries You DO NOT Want to Miss !!!

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Relevant Disclosure and Resolution

Under Accreditation Council for Continuing Medical Education guidelines disclosure must be made regarding relevant financial relationships with commercial interests within the last 12 months.

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I have no relevant financial relationships or affiliations with commercial interests to disclose.
Experimental or Off-Label Drug/Therapy/Device Disclosure

I will NOT be discussing any experimental or off-label drugs, therapies and/or devices that have not been approved by the FDA.

OU Lower Extremity Joint Preservation Program

- 50% Foot and Ankle
  50% Hip and Knee
- Cartilage transplantation arthroscopic surgery
  (Hip – Knee – Ankle)
- Deformity correction – Limb Alignment
- Limb Salvage
  - Diabetic Charcot ankles/feet
  - Infected joints
- Total Joint Replacements
  - Partial
  - Total
Test Question 1

A 38-year-old competitive slalom skier is making a turn to the left around a pole. The right ski sticks in the snow as shown in Figure A, causing external rotation of the right ski and boot. He presents with pain at the anterolateral aspect of the ankle with inability to weight bear. An external rotation stress test is positive. What is the most likely diagnosis:

A- Lateral ankle sprain (anterior talo-fibular ligament)

B- High ankle sprain (anterior inferior tibio-fibular ligament)

C- Deltoid ligament sprain
Test Question 2

A 30-year-old professional ballet dancer presents with persistent ankle pain after an ankle sprain 6 months ago. Physical therapy and NSAID’s have not alleviated the symptoms. Physical exam reveals some joint swelling but no ligamentous instability. Radiographs are unremarkable. What is the next appropriate step in the management of this patient?

A- Continue physical therapy
B- Avoidance of dancing with CAM walker boot for 2 weeks
C- MRI of the ankle
D- Ankle steroid injection
E- Diagnostic ankle arthroscopy
A 34-year-old male has persistent lateral ankle pain after a snowboarding injury 1 week ago and is unable to bear weight. Ankle radiographs are negative for fracture. What is the next step in management?

A- MR arthrogram of the ankle
B- Bone scan
C- CT scan
D- Diagnostic injection
E- Repeat radiographs
A 35-year-old motorcyclist is involved in a motor vehicle accident. He complains of pain and swelling in his right foot. Examination demonstrates dorso-medial midfoot tenderness. A clinical photograph is seen in Figure A. Supine and standing radiographs are seen in Figures B and C respectively. What is the most appropriate definitive treatment step?

A- Non-weightbearing in a CAM walker boot for 6-10 weeks

B- Weightbearing as tolerated in a CAM walker boot for 6-10 weeks

C- Closed reduction and K-wire fixation of the first and second tarsometatarsal joints

D- Open reduction and rigid internal fixation of the first and second tarsometatarsal joints
Learning Objectives

Upon completion of this session, participants will improve their competence and performance by being able to:

1. **Identify** less common injuries of the foot and ankle with serious sequel

2. **Differentiate** most common causes of pain in different areas of the ankle and foot associated with such injuries

3. **Interpret** clinical exam findings and radiologic imaging results

4. **Develop** proper strategies for diagnosis

5. **Initiate** appropriate non-surgical treatment and identify when to refer for specialized orthopaedic surgeon

Introduction

- Foot and ankle injuries are a common presentation in the PCP

- Ankle sprains account for the major most common injuries: 2.15 per 1000 persons/year in US

- There are less common F&A injuries → devastating sequelae

- Should be identified and managed appropriately to prevent complications
Outline

According to area of clinical presentation/pain:

1- Anterolateral ankle pain
2- Lateral ankle/hindfoot pain
3- Midfoot pain

Anterolateral Ankle Pain

1. High ankle sprains
2. Osteochondral fractures/lesions (OCLs) of the anterolateral talus
High Ankle Sprains

• Incidence
  • 0.5% of all ankle sprains without fracture
  • 13% of all ankle fractures

• Mechanism of injury
  • Most commonly external rotation injuries → SKIERS !!

  • Forces talus to rotate laterally and push the fibula away from tibia

• Associated injuries
  • Osteochondral defects (15% to 25%) → loose bodies
  • Fx ankle Weber C
  • Deltoid ligament injury

• Prognosis
  • Missed injuries may → end-stage ankle arthritis

  • Syndesmosis function:
    • Maintains integrity between tibia and fibula (ankle mortise)
    • Indirectly stabilizes the medial ankle mortise
High Ankle Sprains

Symptoms
- Anterolateral ankle pain proximal to AITFL
- Difficulty bearing weight
- Lateral ankle sprains are often able to bear weight
- May → medial ankle tenderness/swelling

Physical exam
- Palpation
  - Syndesmosis tenderness
  - Single best predictor for return to play
- Provocative tests
  - Squeeze test
    - Compression of tibia and fibula at midcalf level causes pain at syndesmosis
    - https://www.youtube.com/watch?v=3L7dv9tqZc
  - External rotation stress test
    - Pain over syndesmosis is elicited with external rotation/dorsiflexion of the foot with knee and hip flexed to 90 degrees
    - https://www.youtube.com/watch?v=Ev6EVCl0rQ8

Imaging:
1- X-rays:
   - AP, lateral, mortise view of ankle (STANDING)
   - AP, lateral of entire tibia → fracture proximal fibula
   - External rotation stress radiograph
   - Gravity stress view or STANDING films: determine competence of deltoid lig
   - Contralateral ankle radiographs: help clarify syndesmosis widening versus normal anatomic variant

2- CT/MRI: Indications
   - Clinical suspicion with normal radiographs
High Ankle Sprains

Tx:
1- Nonoperative: NWB CAM boot/cast → 2 to 3 weeks
   • Indications: syndesmotic sprain without diastasis or ankle instability
   • Technique: delay WB until pain free →
   • PT using a brace that limits external rotation
   • Outcomes: notoriously prolonged and highly variable recovery period → recovery may be twice that of standard ankle sprain
   • BEWARE OF THE DIABETIC (UNCONTROLLED) PATIENT ++ NWB

Take home: NWB Cast 2-3 weeks → Refer

2- Operative: syndesmosis fixation
   • Indications:
     • syndesmotic sprain (w/o fx) with instability on stress radiographs
     • syndesmotic injury with fracture → remains unstable after fx fixation of fracture
     • syndesmotic sprain refractory to conservative treatment
   • Outcomes: excellent if syndesmosis accurately reduced
   • BEWARE OF THESE
     • DIABETIC (UNCONTROLLED)
     • NEUROPATHIC (EARLY CHARCOT): e.g. Alcoholic
Anterolateral Ankle Pain

1. High ankle sprains

2. Osteochondral fractures (OCLs) of the anterolateral talus

Osteochondral Lesions of Talus

Mechanism:
- Trauma: severe twisting ankle injury
- Repetitive microtrauma (multiple minor ankle sprains) with no history of acute trauma
- Medial or lateral talar dome

Presentation:
- Symptoms
  - AL ankle pain, swelling
  - Mechanical symptoms: catching or locking
- Physical exam
  - TTP AL Ankle
  - Effusion
  - -ve Squeeze/ER stress test
Osteochondral Lesions of Talus

Imaging:

1- Radiographs:
   • may be normal
   • may see subtle lucency or bone fragmentation

2- CT
   • helpful in evaluating lesions seen on radiographs

3- MRI
   • indicated in ankle sprains that do not heal with time

Tx:

• Nonoperative
  • Short leg cast + NWB x 6 weeks
    • Indications
      • acute injury
      • nondisplaced fragment with incomplete fracture

• Operative
  • arthroscopy with removal of the loose fragment and microfracture or antegrade drilling of the base with cartilage transplantation.
    • Indications
      • chronic fractures
      • size < 1 cm
      • displaced smaller fragment with minimal bone on the osteochondral fragment (poor healing potential)

  • retrograde drilling and or bone grafting
    • Indications
      • size > 1 cm with intact cartilage cap

  • ORIF vs. osteochondral grafting
    • Indications
      • size > 0.5 cm and displaced
Lateral Ankle/Hindfoot Pain

All share similar clinical presentation:

Mechanism:
Twisting (inversion) injury of the ankle

Symptoms:
• pain with weight bearing
• recurrent instability
• catching or popping sensation may occur following recurrent sprains

Physical exam
local tenderness and swelling over lateral ankle/hindfoot

Differential Diagnosis:
1- Ankle sprain (Low ankle sprain): Ant Talo-fib Lig (ATFL):
+ve Anterior Drawer test (COMPARE TO OPP SIDE)  
https://www.youtube.com/watch?v=sIwuEtbHEQ4

2- Peroneal tendon subluxation/dislocation → Tear:
Palpable. Painful “click” on ankle eversion, circumduction  
https://www.youtube.com/watch?v=eaIQBfXZZt0

3- Lateral process of the talus fx: TTP lat talus

4- Anterior process of calcaneus fx: TTP distal to #3

5- 5th metatarsal base fx: TTP distal to #4
Lateral Ankle/Hindfoot Pain

Imaging:
1- Ankle sprain:
   Xray: Varus stress test
   MRI: torn Lig

2- Peroneal tendon
tear/subluxation/dislocation
   MRI

3- Lateral process of the talus fx:
   Xrays – CT – Bone Scan

4- Anterior process of calcaneus fx:
   Xrays – CT – Bone Scan

5- 5th metatarsal base fx:
   Xrays – CT

CT OR MRI ????

- Bony injury → CT
- Soft tissue injury → MRI
- Both injuries → ????
Lateral Ankle/Hindfoot Pain

Tx:
A) Nonoperative:
NOT WRONG TO PRESUME ANKLE SPRAIN IN LIGHT OF NORMAL XRAYS ➔
• RICE
• NSAIDs
• Immobilization:
  Splint/CAM boot/Ankle brace
  (Depending on swelling+ pain)
• WBAT ➔ Early ROM + PT
BUT...IF PERSISTANT PAIN/SWELLING AFTER 2-3 WEEKS ➔ Consider advanced imaging (CT- MRI) + REFERRAL

B) Operative:
1- Ankle sprain:
LCL Recon: significant instability/pain failed PT > 6 m
2- Peroneal tendon tear/subluxation/dislocation:
Persistent pain/subluxation
3- Lateral process of the talus fx:
> 2mm displacement/comminution on XR → CT
4- Anterior process of calcaneus fx:
> 2mm displacement/comminution on XR → CT
5- 5th metatarsal base fx: Zone 1-3
50% Chance of nonunion (Zone 2 = Jones Fx) ➔ ORIF
NWB + CAM: Zone 1 (pseudo-Jones) and Zone 3 fx
• Midfoot Pain

Lisfranc injury
(Tarsometatarsal fracture-dislocation)

• Lisfranc Lig

• Def Lisfran Injury:
  • Disruption between articulation of medial cuneiform and base of 2\textsuperscript{nd} metatarsal \(ightarrow\) disruption of TMT joint complex

• Mechanism of injury:
  • Range from high velocity (MVA, FFH) \(ightarrow\) severe dislocations \(ightarrow\) easily identified
• **Lisfranc Injury**

**Mechanism of injury:**
- Low energy (athletic injuries, twisting foot) → CAN BE EASILY MISSED → THEREFORE DIAGNOSIS IS CRITICAL!!
- Usually caused by axial load + hyperplantar flexed forefoot +/- rotation
- “My foot bent under my body”

**Missed injuries**
- Progressive flatfoot deformity
- Chronic pain: midfoot arthritis → dysfunction

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**Midfoot Pain**

**Symptoms**
- Severe pain
- Inability to bear weight

**Physical exam**
- **Medial plantar bruising**
- **Swelling throughout midfoot**
- TTP over tarsometatarsal joint
- Instability test:
  - grasp metatarsal heads and apply dorsal force to forefoot while other hand palpates the TMT joints → dorsal subluxation → instability
- Provocative test:
  - pain with pronation and abduction of forefoot
  - compartment syndrome: not uncommon

https://www.youtube.com/watch?v=v8SGVwz2Rhs
Midfoot Pain

Radiographs
• AP, lateral, obliques of foot
  **STANDING:** usually NWB XRs are normal
• If high suspicion → Bilateral WB Foot AP XRs

**Cardinal radiographic signs:**
1. Disruption of continuity of a line drawn from medial base of 2nd metatarsal to medial side of middle cuneiform
2. Widening of the interval between the first and second ray (>2-5mm widening compared to opposite side)
3. Fleck sign

CT-MRI: if XRs inconclusive w high suspicion

BEWARE OF THE DIABETIC/CHARCOPATHIC PATIENT !!!!
Midfoot Pain

Tx:
1- Nonoperative: NWB Vs. WBAT Cast x 8 weeks
   • Indications:
     • No displacement on WB XRs+ no evidence of bony injury on CT = (dorsal sprains)

2- Operative (PLEASE REFER ASAP):
   • Indications: any evidence of instability (> 2mm shift)
     A) ORIF: for Bony injury
     B) 1-3 TMT Fusion: for
       • Pure Ligamentous injury
       • Delayed tx
       • Chronic deformity (flatfoot + abd)
     C) Midfoot Fusoin: post-traum O.A

Test Question 1

A 38-year-old competitive slalom skier is making a turn to the left around a pole. The right ski sticks in the snow as shown in Figure A, causing external rotation of the right ski and boot. He presents with pain at the anterolateral aspect of the ankle with inability to weight bear. An external rotation stress test is positive. What is the most likely diagnosis:

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Test Question 2

A 30-year-old professional ballet dancer presents with persistent ankle pain after an ankle sprain 6 months ago. Physical therapy and NSAID’s have not alleviated the symptoms. She recently started complaining of occasional “catching” sensation in her ankle. Physical exam reveals some joint swelling but no ligamentous instability. Radiographs are unremarkable. What is the next appropriate step in the management of this patient?

A- Continue physical therapy

B- Avoidance of dancing with CAM walker boot for 2 weeks

C- MRI of the ankle

D- Ankle steroid injection

E- Diagnostic ankle arthroscopy

**Explanation:**
- Majority of ankle sprains heal with time, rest, therapy, and temporary immobilization.
- 10% do not improve → osteochondral lesion of the talus and persistent instability must be considered.

Test Question 3

A 34-year-old male has persistent lateral ankle pain after a snowboarding injury 1 week ago and is unable to bear weight. Ankle radiographs are negative for fracture. What is the next step in management?

A- MR arthrogram of the ankle

B- Bone scan

C- CT scan

D- Diagnostic injection

E- Repeat radiographs

**Explanation:**
- Fractures of lateral process of talus are frequently overlooked
- Should always be considered in the D.D of ankle pain in snowboarders.
- The common mechanism for fracture is dorsiflexion of the ankle and eversion of the hindfoot.
- Short leg cast is recommended for nondisplaced fractures and surgery for displaced or comminuted fractures.
Test Question 4

A 35-year-old motorcyclist is involved in a motor vehicle accident. He complains of pain and swelling in his right foot. Examination demonstrates dorso-medial midfoot tenderness. A clinical photograph is seen in Figure A. Supine and standing radiographs are seen in Figures B and C respectively. What is the most appropriate definitive treatment step?

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E - Open reduction and rigid internal fixation of the first to third tarsometatarsal joints and K-wire fixation of the fourth and fifth tarsometatarsal joints

Test Question 4

**Explanation:**
- Lisfranc dislocations are caused by hyperplantarflexion/axial compression/abduction moments at the forefoot → dorso-lateral metatarsal displacement, most commonly involving at least/most importantly the 2nd TMT joint.
- Where NWB radiographs are normal and there is high clinical suspicion, WB stress radiographs are indicated.
- Any evidence of instability (lateral shift/widening) is an indication for ORIF.
Conclusion and Clinical Pearls

- **Anterolateral and lateral ankle pain** following twisting injuries is EXTREMELY common
- While **low ankle sprains** are the most common injuries, **other injuries** should be carefully excluded upon **clinical examination/suspicion**
- **WEIGHT BEARING X-RAYS** of the ankle and foot are the **work horse** in diagnosis ➔ preferred to NWB/Supine X-rays
- **Persistence of symptoms 2-3 weeks** following initial non-operative treatment ➔ prompt **further investigation** and/or **referral**
- **Midfoot pain, swelling** and bruising after axial loading the foot in **hyperplantarflexion** ➔ **highly suspicious** for **Lisfranc injuries** ➔ **WB Bilat Feet AP XRs** ➔ if **unstable** ➔ **surgery** to avoid:
  - **Midfoot collapse** ➔ **flatfoot/abduction deformity**
  - **Post Traumatic O.A of Midfoot** ➔ **severe pain/dysfunction**

References

6. Tucker DJ, Feder JM, Boylan JP. Fractures of the lateral process of the talus: two case reports and a comprehensive literature review. Foot Ankle Int. 1998 Sep;19(9):641-6
THANK YOU

WE WILL CHANGE THE WORLD
ONE FOOT AT A TIME