Common Foot & Ankle Injuries

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Disclosures

• None

Foot & Ankle Center of Excellence

• Comprehensive care for all adult foot and ankle problems:
  • Sports injuries / Sprains / Cartilage disorders
  • Arthritis / Degenerative conditions
  • Deformities
  • Trauma / Fractures
  • Bunions / Hammertoes
  • Whatever is causing your pain
Common Problems of the Foot & Ankle

- Acute ankle sprains
  - Late pain after ankle sprains / associated injuries
- Stress fractures
- Achilles tendon ruptures
- Plantar fasciitis
- Bunions
- Ankle arthritis

Acute Ankle Sprain

- Exceedingly common
  - 10-40% of civilian athletic injuries annually
    - Significant time lost to injury
  - 1 inversion event per 10,000 people per day
    - 23,000 to 30,000 ankle injuries per day in U.S.
    - 10% or ER visits in U.S.
  - 45% of all basketball injuries
  - 31% of collegiate football injuries
  - 20% of soccer injuries
  - Leading cause of time loss in NFL
  - Most common cause of acute injury in volleyball
The Ankle Sprain

- Mainstay of treatment is functional rehabilitation
  - 80% make a full recovery with conservative treatment
  - 20-30% may be symptomatic 3 months after surgery
  - Associated injuries may result in continued pain and dysfunction
  - Repeat sprains or inadequate rehabilitation may result in chronic lateral instability in 20%

Anatomy and Biomechanics

- Calcaneofibular (CFL)
- Anterior Talofibular (ATFL)
Mechanism

• Position of instability: plantarflexion and inversion
  • Talus is more narrow posteriorly
• Failure occurs in predictable order
  • Anterolateral capsule
  • ATFL (involved in 85%)
    • Restraint to inversion in PF
  • CFL (also injured in 20-40%)
    • Restraint to inversion in neutral or dorsiflexion
  • PTFL rarely injured

Diagnosis

• History of injury
  • Mechanism of injury
    – Forces involved
    – Direction of foot deviation
  • Prior episodes and frequency
  • Immediate ability to weight bear
Examination of the Foot & Ankle

- **Examination**
  - Be systematic (knee to toe)
  - Inspection / gait
    - Ecchymosis and swelling
    - Localize tenderness
      - Soft tissue vs bony
    - Ambulatory capacity
    - Neurovascular exam
    - Range of motion

- **Examination – special tests**
  - Anterior drawer
  - Squeeze test
  - External rotation stress test
Anterior Drawer

- Allow the leg to hang freely with foot plantarflexed 25°
- Stabilize the tibia with 1 hand and grasp the heel with the other.
- Pull foot anteriorly, allowing it to rotate internally (around the deltoid) as it translates.
- Incompetent ATFL => Excessive anterior translation relative to other side
  * Acute laxity does not correlate with development of late symptoms = does not always require surgery

Are RADIOGRAPHS indicated?

- Ottawa rules
- ANKLE X-rays
  - Posterior tenderness distal 6 cm of tibia or fibula
  - Malleolar tip tenderness
  - Both immediate inability to WB and not able to walk more than 4 steps in ED
Are RADIOGRAPHS indicated?

- Ottawa rules
- FOOT X-rays
  - Navicular tenderness
  - 5th metatarsal base tenderness
  - Both immediate inability to WB and not able to walk more than 4 steps in ED

MRI

- Not required in the ACUTE setting
- Considered for the patient with chronic pain (>6 weeks) after ankle sprain
  - Useful for assessing concomitant pathology
  - 90% accuracy for ATFL and CFL tears
- Does not give an absolute indication for surgery
Clinical Classification

- **Mild Sprain**
  - Able to walk without limp
  - Minimal swelling or point tenderness
  - Pain with reproduction of mechanism of injury

- **Moderate Sprain**
  - Walking with a limp
  - Localized swelling with point tenderness
  - Unable to rise on toes or hop on injured ankle

- **Severe Sprain**
  - Prefers crutches and has difficulty bearing weight
  - Diffuse tenderness and swelling

<table>
<thead>
<tr>
<th>Grade I</th>
<th>Grade II</th>
<th>Grade III</th>
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</thead>
<tbody>
<tr>
<td>Edema, ecchymosis</td>
<td>Localized, slight</td>
<td>Localized, moderate</td>
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<tr>
<td>Weight bearing</td>
<td>Full or partial without significant pain</td>
<td>Difficult without crutches</td>
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<tr>
<td>Ligament pathology</td>
<td>Ligament stretch</td>
<td>Partial tear (ATFL)</td>
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<tr>
<td>Instability testing (anterior drawer)</td>
<td>None</td>
<td>None or slight</td>
</tr>
<tr>
<td>Time to return to sport</td>
<td>11 days</td>
<td>2-6 weeks</td>
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</table>
• Mainstay of treatment is nonoperative management, even in the athletic population

**Treatment – Acute Ankle Sprain**

• P.R.I.C.E
  - Protection
  - Rest
  - Ice
  - Compression
  - Elevation
• Progressive weightbearing as tolerated
• Early range of motion
• Physical Therapy – functional ankle rehabilitation
Treatment – Acute Ankle Sprain

- Bracing
  - Protection from inversion to prevent weaker type III collagen → elongation
  - 3 weeks → collagen starts to mature, controlled stress on the ligament promotes proper collagen orientation

- Functional Rehabilitation
  - Ankle motion, stretching and strengthening will avoid harmful effects of immobilization on muscle, joint cartilage, and bone
  - Full return to activities between 4-8 weeks

<table>
<thead>
<tr>
<th>Grade 1 &amp; 2</th>
<th>Grade 3</th>
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<tbody>
<tr>
<td><img src="image1.png" alt="Semi-rigid ankle support" /></td>
<td><img src="image2.png" alt="Semi-rigid ankle support" /></td>
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</tbody>
</table>

Semi-rigid ankle support: shorter time to return to work & sport, less symptomatic instability at short-term follow-up
The Ankle Sprain

- Functional Rehabilitation
  - Achieve full ROM
  - Peroneal tendon strengthening and proprioception
  - Gradual progression of weightbearing and return to play

- Supervised PT has better outcome with regard to strength and proprioception in the short term
  - Re-injury rates and long term functional results similar to home therapy plans

The Ankle Sprain

- Grade I and II → good to excellent
- Grade III → a little more controversial
Acute Sprain → Chronic Instability

- 10-20% risk after ankle sprain
- Two types
  - **Mechanical**
    - Abnormal clinical laxity
    - pathologic hypermobility of the tibiotalar joint
  - **Sign**
  - **Functional**
    - Subjective instability
    - unreliable ankle, no demonstrable radiographic signs of instability
    - **Symptom**

Operative Indications for Lateral Ankle Reconstruction

- Continued pain and instability despite extensive non-operative management
  - Must rule out and/or treat other pathology
Surgical Management of Lateral Ankle Instability

- Anatomic reconstruction
  - Modified Brostrom lateral ligament reconstruction
  - Allograft lateral ligament reconstruction

Return to Play after Lateral Ligament Reconstruction

- Outcomes of athletes after Brostrom
  - 58% returned to preinjury level
  - 16% competing at a lower level
  - 26% discontinued sport but still active
  - (Maffulli et al, AJSM 2013)
Rehab and Recovery after Reconstruction

- Phase I – ROM
- Phase II – Endurance
- Phase III – Strength
- Phase IV – Power
- Phase V – Return to Sport Testing and Physician Clearance
  - Achieve 90% of contralateral limb strength

Clinically significant late pain after ankle sprain

- Clinically significant pain >6 weeks after injury without recurrent injury or instability
  - Consider pathology that may be in conjunction with an ankle sprain or consider a different diagnosis
    - Soft tissue lesions
    - Bone / articular lesions
Soft Tissue Lesions

- **Anterolateral soft tissue impingement**
  
  - **Complaint**: focal anterolateral pain, worse with dorsiflexion and cutting maneuvers
  
  - **Exam**: focal anterolateral ankle tenderness
  
  - **Treatment**: steroid injection; arthroscopic debridement

Soft Tissue Lesions

- **Peroneal tendon tear**
  
  - **Complaint**: focal lateral pain, worse with eversion
  
  - **Exam**: swelling, focal lateral tenderness, pain with eversion
Soft Tissue Lesions

- **Peroneal tendon tear**
  - **Treatment**: NSAID/immobilization, lateral heel wedge, surgical debridement or repair if no response

Soft Tissue Lesions

- **Peroneal tendon subluxation**
  - **Complaint**: pain and snapping of tendons over fibula
  - **Exam**: swelling, focal ttp posterior to distal fibula, dislocation of tendons with resisted eversion
Soft Tissue Lesions

- **Peroneal tendon subluxation**
  - **Treatment**: fibular groove deepening and retinacular reconstruction

Soft Tissue Lesions

- **Sinus tarsi syndrome**
  - **Complaint**: pain and swelling lateral hindfoot, exacerbated on uneven surfaces
  - **Exam**: swelling, focal ttp anterior to distal fibula
  - **Treatment**: NSAID/immobilization, steroid injection, arthroscopic debridement
**Syndesmotic Injury – High Ankle Sprain**

- Collision sports, 10% of all ankle sprains
- Mechanism: external rotation
  - Direct force posterior calf of downed player with foot externally rotated
  - External rotation force on knee while foot firmly planted

**Soft Tissue Lesions**

- **Syndesmotic injury**
  - Complaint: pain in distal leg and ankle with cutting/twisting
  - Exam: external rotation stress test; squeeze test
  - Xrays/MRI/US:
    - Stress x-rays: disruption or widening of syndesmosis
**Syndesmotic injury - Treatment**

- Grade I and II:
  - RICE, PT, ankle brace or taping
- Grade III:
  - Acute- ORIF (screws/Tightrope)
  - Chronic- arthroscopic debridement + fixation
- Longer time to return to play and more residual symptoms than simple ankle sprain

**Soft Tissue Lesions**

- **Superficial peroneal neuropraxia** – intermediate branch
  - **Complaint**: anterolateral pain / burning / numbness
  - **Exam**: focal ttp, + tinels, decreased sensation dorsolateral foot
  - **Treatment**: neurontin / lidoderm patch / desensitization
    - Neurolysis vs. transection
Bone / Articular Lesions

- Juxta-articular fractures
  - **Complaint:** pain swelling in the area of the fx
  - **Exam:** focal ttp, pain with provocative maneuvers
  - **Imaging:** often apparent on xray but must look closely
    - Bone scan: hot locally
    - CT scan: define fragment size and articular involvement to define surgical plan
  - **Treatment:** immobilization in cast or boot 4-6weeks
    - Excision vs. ORIF if large articular fragments

Bone / Articular Lesions

- Juxta-articular fracture
- **Anterior process of the calcaneus**
Bone / Articular Lesions

- Juxta-articular fracture
  - Posterior talar process (Stieda process)

Bone / Articular Lesions

- Juxta-articular fracture
  - Lateral talar process
Bone / Articular Lesions

- Juxta-articular fracture
  - Dorsal navicular rim avulsion
- Distal fibular avulsion
- Cuboid avulsion

Bone / Articular Lesions

- Osteochondral lesion of the talus (OLT)
  - **Complaint:** swelling, sharp pain/aching deep in joint, occasional mechanical locking/catching
  - **Exam:** focal ttp @medial / lateral shoulder of talus
  - **Imaging:** xray may show cyst in chronic OLTs, CT/MRI is diagnostic
  - Sometimes an incidental finding
    - If not symptomatic does not require treatment
Bone / Articular Lesions

- **Osteochondral lesion of the talus (OLT)**
- **Non-operative management**
  - Non displaced acute lesions
    - Immobilization x 6 weeks
- **Operative Management:**
  - Failed conservative care, large and/or displaced fragments

**Surgical Treatment:**

- Mesenchymal cell stimulation
  - Microfracture, abrasion chondroplasty
- Autograft osteochondral transfer
- Allograft osteochondral transfer
- Allograft chondral transfer
- Autologous chondrocyte implantation (ACI)
- Juvenile particulated allograft cartilage
- Biocartilage
Bone / Articular Lesions

- **5th metatarsal fractures**
  - Poor blood supply to zone 2
  - Clinically assess for:
    - Area(s) of tenderness
    - Cavovarus foot posture
    - Chronicity of fracture (sclerosis or periosteal reaction)

Zones:
1. tuberosity avulsion fractures (may enter 5th MT-cuboid articulation)
2. Jones fractures (metaphyseal-diaphyseal junction)
3. stress fractures (distal to 4/5 IM ligaments, extends distally into diaphysis for 1.5cm)
Zone 1 - 5th MT tuberosity avulsion fractures

- Treatment usually hard-soled shoe or boot
- 4 wks usually patients asymptomatic
- Time to healing approximately 8 wks
  - Symptomatic nonunion - excise fragment

Jones Fracture
5th Metatarsal Jones fracture

- Non-displaced fractures: Nonweightbearing cast or boot 6-8 wks
- Consider surgery if:
  - Displaced fracture
  - Athlete
    - Quill 1995: 25-50% of fractures treated closed found not to heal or to re-fracture
  - Delayed union or nonunion:
    - Return to play @8-10 wks post ORIF if radiographically healed fracture

Jones fracture
Bone / Articular Lesions

- **Tarsal coalition**
  - **Complaint:** recurrent ankle sprains in the adolescent, lateral hindfoot pain
  - **Exam:** rigid subtalar motion
  - **Imaging:**
    - *Calcaneonavicular bar*
    - *Talocalcaneal coalition*
  - **Treatment:** immobilization always first step
    - Resection/arthrodesis depending on size and location of refractory

Bone / Articular Lesions

- **Anterior impingement**
  - “Footballer’s ankle”
  - Runners and jumpers
  - Pain, localized anteriorly
  - Limited ROM
  - Xrays: exostosis distal tibia (usually lateral), cupping of talar neck +/- spur
  - **Treatment**
    - Conservative: ↓ activity
    - Surgery if persistent symptoms and xray evidence of impingement
Metatarsal stress fractures

- "March" fractures
- Military recruits or dancers frequently affected
  - Increase in duration or intensity of exercise
  - 2nd MT involved more commonly than 3rd MT
- Fatigue-type fractures
- Point tenderness over affected metatarsal (not web)
  - Circumscribed swelling over dorsal foot that does not extend to medial or lateral border of foot
- Initial xrays usually negative
- Treatment: hard-soled post-op shoe, cessation of inciting activity
- Recovery variable: usually return to normal shoewear by 6-8wks
  - Shoe modification with orthosis

Navicular Stress Fractures

- Exam:
  - Dorsomedial vague pain, prolonged symptoms
  - Positive percussion test over navicular
  - Limited motion of subtalar joint (50%)
  - Pain generated in navicular area when patient stands on toes
- Often xrays negative:
  - Bone scan sensitive, CT determines fx location and extent, MRI shows early edema
Navicular stress fracture

- Incomplete or nondisplaced fractures:
  - Cast and nonweightbearing for 6 wks
  - Protected WB for 6 wks
  - RTP avg 4 months; +/- orthotic with medial longitudinal arch support
- Operative treatment considered:
  - Complete fractures with sclerosis
  - Displaced fractures
  - High-demand athletes with nondisplaced fractures
    - Quicker RTP (83% healing, RTP 3.6mos vs 5.6mos)
    - Persistent symptoms or failed conservative treatment

Stress fractures

- MRI – most accurate test for suspected lower extremity stress fractures
- Meta-analysis
  - Radiographs (sensitivity 12-56%)
  - Bone Scans (sensitivity 50-97%)
  - CT scans (sensitivity 32-38%)
  - Ultrasound (sensitivity 43-99%)
  - MRI (sensitivity 68-99%)

Achilles Tendon Rupture

- Dual blood supply
  - Muscles above
  - Bony attachment below
  - Watershed zone
    - 1-4 inches above tendon attachment to heel bone

Achilles Tendon Rupture

- Complete disruption of Achilles tendon
- Location
  - Often 5-7 cm above insertion to heel bone
- Commonly affected
  - Middle aged (average age in 40s)
  - Men (M:F ~3:1)
  - “weekend warriors”
Achilles Tendon Rupture

• **History**
  - Mechanism of injury
    - Eccentric loading (pushing off)
  - Pop
    - “someone hit the back of my ankle”
  - Inability or difficulty walking
  - Pain behind ankle
  - Possible association with
    - Prodromal symptoms
    - Recent fluoroquinolone use
    - Recent steroid use

• **Examination**
  - 20-30% delayed diagnosis
  - High clinical suspicion
  - Thompson Test
  - Gap sign
  - Loss of resting equinus
Achilles Tendon Rupture

• Examination
  • Thompson Test

Achilles Tendon Rupture

• Examination
## Achilles Tendon Rupture

### Imaging – not usually required
- **Xrays**
  - May rule out fracture
- **MRI**
  - Helpful for delayed presentation or equivocal clinical exam
- **U/S**
  - Inexpensive, can confirm diagnosis and localize tear

### Initial Treatment
- Immobilize in plantarflexion
- Keep nonweightbearing with crutches
- RICE therapy
- Counsel on signs and symptoms of DVT
Achilles Tendon Rupture

• **Treatment**
  • Controversial
    • With early diagnosis and immobilization, may achieve similar results
  • Management depends on surgeon and patient preference
  • May favor surgery for athletes, younger patients, and delayed diagnosis with diastasis of tendon ends

Achilles Tendon Rupture

• **Treatment**
  • Nonoperative
    • NOT a passive treatment program
    • **Immediate immobilization in plantarflexion**
    • Progression to formal Physical Therapy for functional rehab after 2 weeks
      – Transition to boot with 2cm heel lift
      – Progressive return to weightbearing and controlled strengthening
### Achilles Tendon Rupture

**Treatment**
- **Operative**
  - Multiple options
  - Open
  - Limited incision
  - No significant differences confirmed between methods

### Heel Pain – Plantar Fasciitis

- Most common cause of plantar heel pain
- Peak age of incidence between 40-60 years
- Risk factors include runners, prolonged standing, obesity, limited dorsiflexion of the ankle
Plantar Fasciitis

• **History**
  • Insidious onset without trauma
  • Typical pain with start up or initiation of weight bearing
  • First thing in the morning or after sitting for periods of time (watching TV, driving, eating)
  • Typically lessened or not symptomatic during activity
  • Often recent increase in activity or change in shoe wear

• **Examination**
  • Pain at the medial tubercle of the calcaneus
Plantar Fasciitis

• Differential
  • Calcaneal stress fracture
    • Specific onset of symptoms
    • Constant pain
    • Tender on both sides of the heel
    • Worse with weight bearing
    • Present on plain radiographs

  Neurogenic (tarsal tunnel, peripheral neuropathy, radiculopathy)
    • Pain may not be specific to the medical calcaneal tuberosity
    • Patients often report burning and tingling pain
    • Tinel’s sign
    • Radiating symptoms
    • Lack of focal symptoms to exam
    • Not specific to weight bearing
Plantar Fasciitis

- Treatment
  - Non-operative treatment
    - Majority of patients >90% will improve with non-operative treatment
    - Tissue specific plantar fascia stretching
      - Achilles stretching
    - Heel cups
    - Over the counter orthotics
    - Night splints
    - NSAIDs

Plantar Fasciitis

- Treatment - Nonoperative
  - Injections
    - Cortisone
    - Platelet rich plasma
      - Limited studies documenting its efficacy
  - Extracorporeal shockwave treatment
    - High and low energy options
    - Well tolerated
  - Immobilization
    - Cam boot 2-4 weeks
Plantar Fasciitis

- **Treatment – Surgical**
  - Recalcitrant cases > 12 months
    - Plantar fasciotomy
    - Open or endoscopic techniques
    - Assess lateral plantar nerve
    - Achilles or Gastrocnemius lengthening

Hallux Valgus - Bunions

- **Common causes**
  - Extrinsic
    - Inappropriate shoegear
  - Intrinsic
    - Hereditary
      - Incompetent soft tissue restraints
      - Generalized joint hypermobility
      - Predisposing bony anatomy
Hallux Valgus - Bunions

- Conservative Therapy is always the first line
  - Operate on the shoe
  - Pads, Spacers

Bunions

- Surgical Treatment
  - Symptoms that persist despite nonsurgical treatment
  - Factors to consider
    - Existence of arthritis or arthrosis
    - Degree of deformity and passive correctability
  - Patient expectations
    - May potentially discourage surgery in
      - Athletes not willing to potentially give up sports
      - Women wanting to constantly wear high heels with narrow toe boxes
Bunions

- Surgical Treatment
  - Requires Osteotomy (cutting and resetting) or Fusion

- Minimally Invasive
- Traditional
Ankle Arthritis

• Etiology
  • Osteoarthritis is not the most common etiology
    • Trauma
    • Inflammation
    • Infection
    • Instability

• Symptoms
  • Band of pain and swelling around ankle
  • Limited motion (loss of dorsiflexion more common)
  • Possible deformity
  • Gait disturbance / Limp
Ankle Arthritis

- Xrays
  - Loss of joint space
  - Periarticular osteophytes
  - Subchondral sclerosis and cysts

Ankle Arthritis

- Nonoperative Treatment
  - Activity modification
  - NSAIDs
  - Bracing
  - Rocker bottom shoes
  - Injections
Ankle Arthritis

- Surgical Treatment
  - Arthroscopic/ open debridement
  - Bone and soft tissue impingement
  - Tibial/ calcaneal osteotomy
  - Distraction arthroplasty
  - Allograft replacement
  - Arthrodesis
  - Total ankle replacement

Ankle Arthritis

- Surgical Treatment
  - Tibial osteotomy
Ankle Arthrodesis

Total Ankle Replacement

- Ideal patient
  - Reasonably mobile
  - Middle-to-old aged patient
  - Normal or low BMI
  - Good bone stock
  - Minimal deformities
  - Multiple joint arthritis
    - Rheumatoid arthritis
  - No neurovascular impairment
Summary

• Treatment of foot and ankle conditions can prove quite complicated
  • impact quality of life
  • minor foot and ankle problems can turn into big ones
• We provide comprehensive care responsive to current and long-term patient needs
  • Most problems can be treated effectively without surgery

• Forefront of orthopaedic technology, offering cutting-edge techniques and developing new procedures for difficult problems