# Common Foot/Ankle Injuries: Diagnosis/Workup

William E. Saar, D.O.
Orthopedic Surgeon – Foot/Ankle Reconstruction

Tri Rivers Musculoskeletal Centers
UPMC Foot/Ankle Center

Faculty – UPMC Foot/Ankle
Fellowship Program

# Common Foot/Ankle Injuries

- Target Audience:
  - Medical Students/Residents
  - Primary Care Clinicians
  - Non Orthopedic Specialists
  - Urgent Care/Emergency Medicine Providers
- Disclosures
  - I have no relevant financial relationship(s) within the products or services described, reviewed, evaluated or compared in this presentation.

# Foot/Ankle Injuries - General

- Very common
  - 1-5 MILLION/year in US
- Significant variability in regards to severity
- Can effect ALL age groups
  - Pediatric → Geriatric
- Evaluation/Treatment by MANY different providers
  - ED, Urgent Care, PCP, Trainers, Therapists, Surgeons

# Foot/Ankle Injuries - History

- Mechanism of Injury
  - Why/When/Where/How??
  - *Beware correlation - severity
- Position of Ft/Ankle
  - Which structures at risk?
  - *Lauge-Hansen Classification
- Audible/Visible Δ
  - Minor vs. Major Deformity
  - Listen to patient long enough….

# Foot/Ankle Injuries - History

- Prior Injury/Tx
  - Results
  - Frequency of Injury
- Pre-existing S/S
  - Pain prior to or between injury(ies)
- Comorbid Medical Conditions
  - DM, PVD, Inflammatory arthritis, Neuro Conditions
  - Tobacco, EtOH, W/C

# Physical Examination

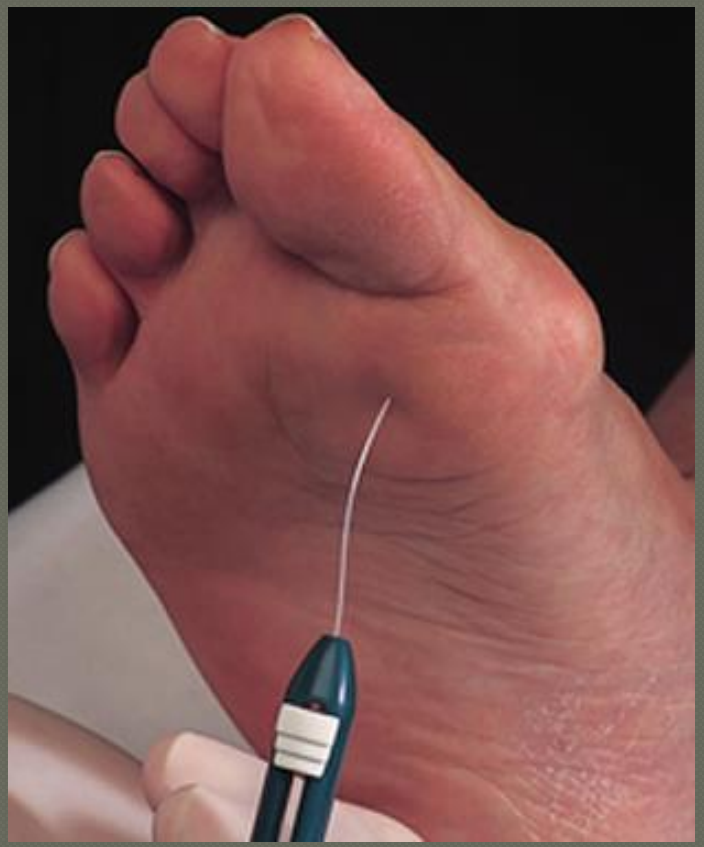
- Establish a ROUTINE!!
- Step-by-Step Exam
  - Less likely to miss an injury
- Contralateral Exam
  - Especially in Peds
- WB vs NWB Exam (if possible)
  - Both PE and Xray exam
- Don't forget the basics!!!

# Physical Examination - Basics

- Visual Exam
  - Deformity/Alignment
  - Ecchymosis/Swelling
  - Open Wounds
  - Sitted/Standing Exam
- Shoewear
  - ?Abnormal Wear Pattern
  - Type of shoe used
- Gait Pattern
  - Antalgic Pattern?
  - Tight Heel Cord?

# Physical Examination - Basics

- Neurogical Exam
  - Sensation; ? Tinels
  - Remember anatomy!!
- Vascular Exam
  - DP/Tibial; Cap Refill
- Range of Motion
  - Heel Cord Tightness?
  - Hypermobility?
- Muscle Strength



# Physical Examination - Basics

- Have patient lead the way….
  but beware!!

- Palpatory Exam****

- Routine – Step Approach
  - Proximal Fibula/Shaft
  - Medial/Lateral Malleolus
  - Achilles Tendon
  - Base of 5th Metatarsal
  - Midfoot
  - Anterior Process of Calcaneus
  - Lateral Talar Process

# Physical Examination Specific Foot/Ankle Tests

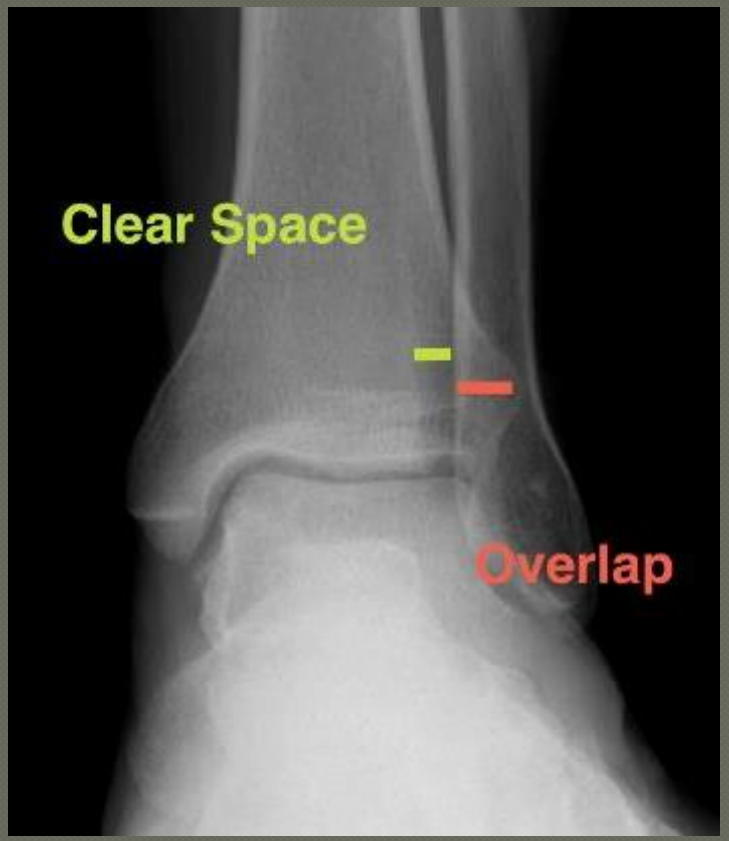
- Thompson's Test
  - Achilles Rupture
- Homan's
  - DVT
- Ant. Drawer/Talar Tilt
  - Ankle Instability (ATFL/CFL)
- 'Squeeze' Test
  - Syndesmotic Injury
- Single/Double Heel Rise
  - PTTD

# Radiographic Exam – Foot/Ankle

- Standard Exam
  - Ankle (AP/Lat/Mortise)
  - Foot (AP/Lat/Oblique)
- WB vs. NWB
  - Prefer WB if possible**
- Special Views
  - Calcaneus (Axial/Broden)
  - Stress Views

# Xray 'Pearls' – Foot/Ankle

- Ankle Exam
  - Deltoid Injury
    - Medial Clear Space > 5 mm with Ext. Rotn Stress test
    - Normal - = or < 4 mm
  - Syndesmotic Injury
    - Decreased Tib/Fib Overlap
      - >6 mm (AP); >1 mm (Mortise)
    - Increased Medial Clear Space
    - Increased Tib/Fib Clear Space
      - <6 mm on both AP/Mortise
  - Fibular Length



# Xray Pearls – Foot/Ankle

- Foot Exam
  - Arch appearance
    - Meary's Angle
    - Talar Head Uncovering
  - Metatarsal Cascade
  - Accessory Ossicles
  - Bohler's Angle – Calc. Fx
  - Midfoot Relationships
    - AP View – 1/2 MT - Cuneiform
    - Oblique View – 4 MT - Cuboid
    - Lateral View – Dorsal Surface
    - 'Fleck' Sign

# Ankle Sprains - General

- Most common sports related injury (up to 40%)
  - 45% of Basketball; 31% Soccer
  - 15% of time lost in Football
- 10% of all ED visits
- 1 /10,000 people/day
- Avg. ED Cost for Ankle Sprain = $1,211
- Annual Cost > $1.1 billion**

# Ankle Sprains – Exam/Work-Up

- Remember the Routine
- Basics
  - Specs of Injury; Preinjury pain?
  - N/V Exam; Visual Exam
  - Anterior Drawer / Talar Tilt
  - Palpate Key Areas**
  - Assess Peroneal Tendons
  - Assess for Tarsal Coalition
  - Classification
- Xrays
  - 3 View (AP/Lat/Mortise)
  - OLT? (Role of MRI)
  - Ottawa Rules**

## Ottawa Ankle Rules

Ankle pain PLUS one of the following:

- bone tenderness along the distal 6 cm of the posterior edge of the tibia or tip of the medial malleolus
- bone tenderness along the distal 6 cm of the posterior edge of the fibula or tip of the lateral malleolus
- inability to bear weight immediately after injury and during clinical evaluation for four steps

# Ankle Sprains – Treatment

- Acute
  - Three Phase Functional Tx
    - I – R/I/C/E
    - II – Short Period Immob/Protection
    - III – AROM, WB, Proprioception, Peroneal Strengthening
- Chronic
  - Surgical Indications
  - > 80 Surgical Procedures
  - Anatomic vs. Nonanatomic
  - Treat Associated Conditions

# Ankle Sprains – Long Term Issues

- Functional vs. Mechanical
- Acute ➔ Chronic Instability
- Associated Pathology
  - Impingement Syndrome
  - Peroneal Tendon Pathology
  - OLT
  - Unrecognized Bone Trauma
  - Neuropraxia

# Ankle Fractures - General

- Account for 9% of all fractures
- ↑ incidence over last 30 years
- 2% of general population will sustain an ankle fracture during their life
- Need to determine Stable vs. Unstable

# Ankle Fractures – Exam/Work-Up

- Classification
  - Dennis-Weber
  - Lauge-Hansen
- Basics
  - Areas of Tenderness
  - N/V Evaluation
- Radiographic Findings
  - AP/Lateral/Mortise
  - Mortise Instability??
  - Stress Views??
  - Stable vs. Unstable ***

# Ankle Fractures - Treatment

- Nonoperative
  - SLC (WB?)
  - Indications
    - Nondisplaced Medial Malleolus Fx
    - Distal Fibula Fx with < 3 mm. displacement and ⦸ Talar displacement
    - Posterior Malleolar Fx with < 25% or < 2 mm. step-off

# Ankle Fractures - Treatment

- Operative
  - Anatomic Reduction with stable internal fixation
  - Indications:
    - Any Talar Displacement
    - Displaced Isolated MM, LM Fxs
    - Bimalleolar (or equivalent) Fracture
    - Posterior Malleolar Fx with > 25% or 2 mm. displacement
    - Open Fractures
    - Maisonneuve Fracture
    - 'Pilon' Fracture

# Ankle Fractures – Long Term Issues

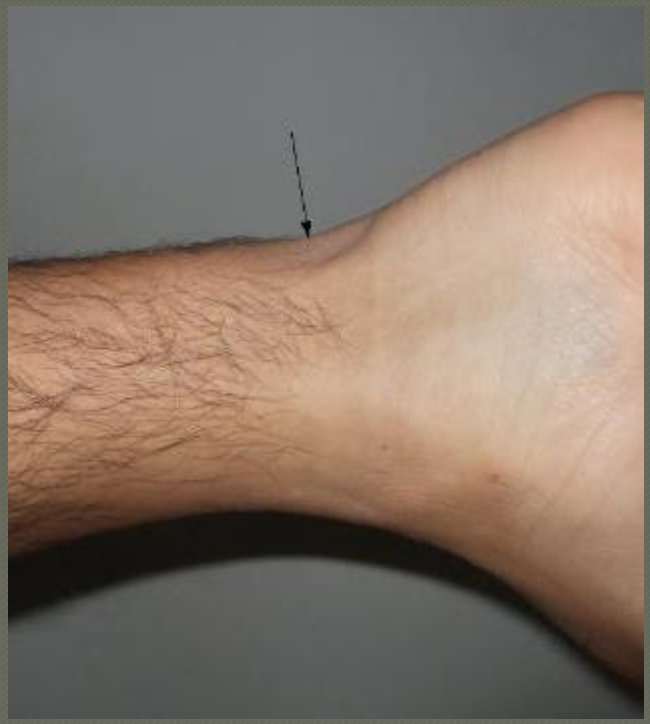
- Overall success rate 90%; however prolonged recovery (2 years)
- Worse outcomes with: smoking, increased age, alcohol use, decreased education
- Complications
  - Infection (Superficial/Deep)
  - Posttraumatic Arthrofibrosis/Arthritis
  - Irritable Hardware

# Achilles Rupture - General

- Incidence has increased over last 50 years
  - Growing interest/participation in sports
- 2-10 cases/100,000 people annually in industrialized nations
- Male predominance 2:1 to 19:1
- Less common causes
  - Steroids
  - Quinolone Abx
  - Gout, Hypothyroid, Renal Insufficiency, Arteriosclerosis

# Achilles Rupture – Exam/Work-Up

- Dx by patient history
  - Feeling of direct blow/pop
- Clinically
  - Difficult gait/Pushoff weakness
  - Indentation/Ecchymosis
  - Thompson Sign
    - Calf Squeeze Test
- Radiographic
  - Xrays (Avulsion Fx)
  - MRI, U/S



# Achilles Rupture - Treatment

- Nonoperative
  - Significant medical issues or limited functional gains/expectations
  - Serial casting with progressive dorsiflexion
- Operative
  - Direct (or Percutaneous) End-to-End Repair, followed by aggressive functional rehab
  - Gastroc. Turndown/Plantaris/FHL
  - Beware 'Cast Disease'

# Achilles Rupture – Long Term Issues

- Complications
  - Missed Diagnosis
  - Nonoperative
    - Incomplete Return to Function
    - **Rerupture (3-4x more common)
  - Operative
    - Infection/Wound Dehiscence
    - Nerve Injury / Scar Tissue
- Results/Outcomes
  - Dynamic Resting Length Δ
  - Long Term Achilles Tendinosis

# Midfoot Injuries – General

- Relatively uncommon
  - About 0.2% of fractures
- Mechanism of Injury
  - Direct (Crush Injury)
  - Indirect (Axial Load of Plantar flexed foot /Abd.)
- TMT Anatomy
  - 2nd MT Base – Wedge Shaped
  - Lisfranc Ligament
  - 3 Columns (Medial, Middle, Lateral)

# Midfoot Injuries – Exam/Work-Up

- High Index of Suspicion!!
  - 20% missed in Polytrauma
- TTP at Midfoot/Swelling
  - Midarch Ecchymosis**
- Remember Xray Pearls!!
  - 3 Views – each valuable
  - 'Fleck' Sign
  - Stress Radiographs
  - Comparison Views

# Midfoot Injuries - Treatment

- Nonoperative
  - Limited role
  - Medically unstable
- Operative
  - Timing based on Soft Tissue
  - Anatomic Reduction with Rigid Internal Fixation
  - ? Percutaneous Fixation
  - ? External Fixation
  - Primary Arthrodesis

# Midfoot Injuries – Long Term Issues

- Most studies recommend operative management with displaced injuries
- Anatomic Reduction does NOT guarantee excellent results!!
- Posttraumatic DJD, pain, swelling is commonplace

# 5Th Metatarsal Fx - General

- Different location of frxs = different treatment options
- Avulsion (Dancer's) Fx
  - Inversion Injury of Foot
  - Peroneus Brevis vs. PF
- Jones Fracture (Acute/Stress)
  - Fx at Metaphyseal/Diaphyseal Junction
  - Precarious Blood Supply
  - Beware the Cavovarus Foot!!

# 5th Metatarsal Fx – Exam/Work-Up

- Acute vs. Stress Fracture
  - ? Prodrome of pain in area
  - Check foot/ankle deformity
- Radiographs
  - Fracture at junction M/D
  - Check for sclerosis/osteolysis at fracture site

# 5th Metatarsal Fx - Treatment

- Nonoperative
  - NWB 6-8 wks with SLC
  - PWB 2-4 wks with Boot
  - ? Smoking/NSAID use
  - Bone Stimulator??
- Operative
  - 'High Caliber Athlete'??
  - IM Screw Fixation (Solid vs. Cann)
  - Plate/Screw Fixation
  - Address deformity (Cavovarus)
  - Bone Graft??
  - Bone Stimulator??

# 5th Metatarsal Fx – Long Term Issues

- Nonunion
  - Inadequate Fixation
  - Failure to address deformity
  - Noncompliance
- Hardware Issues
  - Failure
  - Prominence