Blunt Ankle Trauma Radiographic Evaluation of

Jack Casey, HMS IV
Gillian Lieberman, MD
Overview

• Importance of ankle injuries
• Imaging— when, how, and what to look for
• Anatomy review
• Common ankle injuries
  radiologic classification— Patient cases to illustrate
mechanisms of injury and 
Focus on radiology
Early writings on fractures and dislocations of the ankle stressed the seriousness of these injuries. The authors reported only a rare cure, often permanent disability, and not infrequently amputation or death as a consequence. Dupuytren (1778–1835) noted that, even under favorable conditions, fractures of the ankle almost always resulted in deformity and lameness.
Still A Major Problem

Blunt Ankle Trauma

• Most common MSK injury
  significant fractures
• Less that 15% of patients have clinically
• Ankle films are 3rd ordered in many hospitals
  most common radiologic study
radiographs in North America

> $500 million spent annually on ankle

Clinical guidelines can help guide management

Indications for Imaging

The Ottawa Ankle Rules

blunt ankle trauma. • Set of clinical guidelines, designed to have sensitivity of 100% for detecting fractures s/p — willing to accept trade-off of lower specificity

health care costs, ED waiting time. • Expected benefits: Limit radiation exposure,
Ottawa Ankle Rules - The basics

Ankle x-ray series is only necessary if there is pain near the malleoli and any of these findings:

ED (four steps) 1. Inability to bear weight both immediately and in
Ottawa Ankle Rules - The basics

Foot x-ray series is only necessary if there is pain in the mid-foot and any of these findings:

1. PF (four steps)• Inability to bear weight immediately and in
Ottawa Ankle Rules

- How good are they?

term outcomes.
• 28% reduction in use of ankle radiography
• No decrease in patient satisfaction

• Systemic review of 27 studies (15,581 patients)
  – Sensitivity 96.4-99.6%
  – Specificity varied widely (10-79%)
  – Ankles actually had a fracture.
  – Less than 2% of patients who were negative for fx according to
    Missed fractures were almost always minor, did not affect

Ottawa Ankle Rules

A few limitations

Not applicable to:
– <18 y/o
– Altered mental status
– Multi-system trauma
– Chronic/subacute injuries
Always trust clinical judgment
Implementing the OAR

Thorough (but brief) H+P
Evaluate skin/ soft tissue. Assess for open fx.
Check and document neurovascular status
patient to bear weight
Palpate entire distal 6 cm of both malleoli before
asking metatarsal and navicular for tenderness

Palpate for tenderness over proximal fibula to exclude potential Maisonneuve fracture

• Think about underlying anatomy and mechanism of injury
THREE principal sets of ligaments support the ankle, all of which are essential to its stability.
Basic Anatomy 3 - Tendons
Anatomy - Putting it All Together
Bones and connective tissue give rise to ring-like structure surrounding the talus.
Ankle Injuries - Inversion

Greenspan, Orthopedic Radiology

Remember Ring-Like Structure in Conceptualizing Injury.
Ankle Injuries - Eversion

- Sprain of deltoid ligament
- Rupture of deltoid ligament
- Avulsion of deltoid ligament
- Fracture of medial malleolus
- Fracture of lateral malleolus with rupture of deltoid ligament

Greenspan, Orthopedic Radiology
Appropriate Views

• Must always include:
  1) AP
  2) Mortise (ankle in 10 - 25 degrees of internal rotation)
  3) Lateral

with uninjured ankle) • May add additional
views in questionable cases (i.e. stress views, comparison views)
Regions of Interest

• Bones of ankle joint seen in at least one projection. • The fifth metatarsal tuberosity should be the calcaneus. • Important to visualize anterior process of
Normal AP Radiograph

www.rad.washington.edu
Foot internally rotated 10-35 degrees to allow for improved visualization of the mortise.
AP vs. Mortise Views

Images from Greenspan, Orthopedic Radiology
Normal Lateral Radiograph

Note: ROI not fully included (5 metatarsal absent)

www.rad.washington.edu
Classifying Fractures

- Anatomic
- Weber (AO)
- Other
Identifying additional sites of fracture is not just an academic exercise— as bi/tri malleolar fx usually require orthopedics eval, surgical

Gillian Lieberman, MD
Patient 1—s/p eversion injury, fall from 10 feet
Image from BIDMC PACS
Patient 2-
Fall with ankle inversion. Please
r/o fracture"
Trimalleolar Fx

Images from BIDMC PACS
Weber Classification of Fx

Type A: Avulsion fibular fracture at or below joint level with associated fracture of medial malleolus or

Type B: Spiral fibular fracture with partial disruption of tibiofibular ligament and avulsion fracture of medial malleolus or

Type C: High fibular fracture with rupture of tibiofibular ligament and interosseous membrane and avulsion fracture of medial malleolus or
Based on the level of fibular fracture injury, A < B < C. Used to determine extent of syndesmotic.
Patient 4- s/p fall with ankle inversion. r/o fx.

Avulsion fx
disruption of Spiral fibular fx: with partial tibiofibular
How would you classify anatomically?

Bimalleolar (comminuted)

Patient 6 — s/p ankle trauma r/o fx\textsuperscript{[BIDMC PACS.]}Page 32
Recap of Classifications

• Anatomic- Uni/ Bi/ Tri Malleolar

• Weber- A/ B/ C

Page 33
Fracture 5

Metatarsal

Patient “s/p ankle inversion injury. r/o fx”
Mechanism of Injury

Metatarsal Fracture 5th