

Project: Ghana Emergency Medicine Collaborative

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Plain Films of the Ankle and Foot

Brian M. Fuller, MD



Objectives

- ★ Review Ottawa Ankle Rules
- ★ Go over some general considerations about radiographs of the ankle and foot
- ★ Review the normal bony and ligamentous anatomy
- ★ View some of the more common fractures/injuries to the ankle and foot

Ottawa Ankle Rules

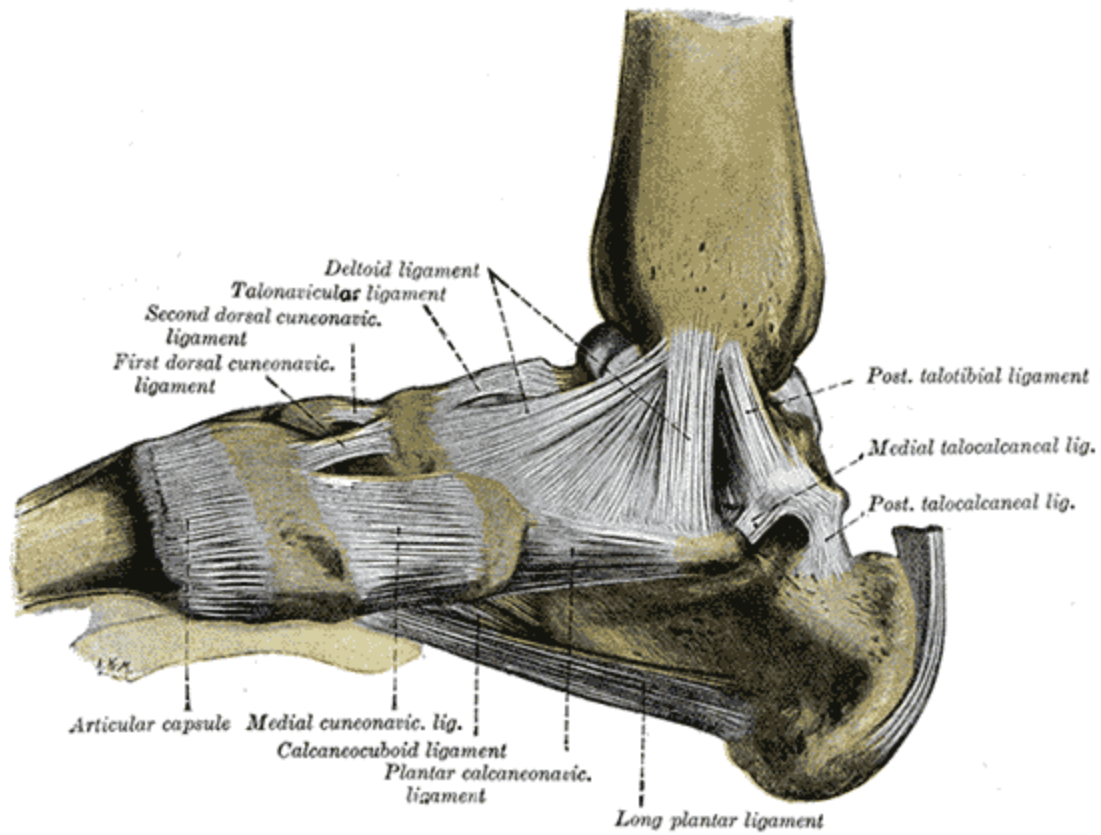
- ★ Ankle Xray Series
- ★ Required only if there is pain in malleolar zone and any one of:
 - ★ 1) tenderness along the distal 6cm of the posterior edge of the fibula or tip of the lateral malleolus
 - ★ 2) tenderness along the distal 6cm of the posterior edge of the tibia or tip of medial malleolus
 - ★ 3) inability to bear weight for 4 steps both immediately and in the ED

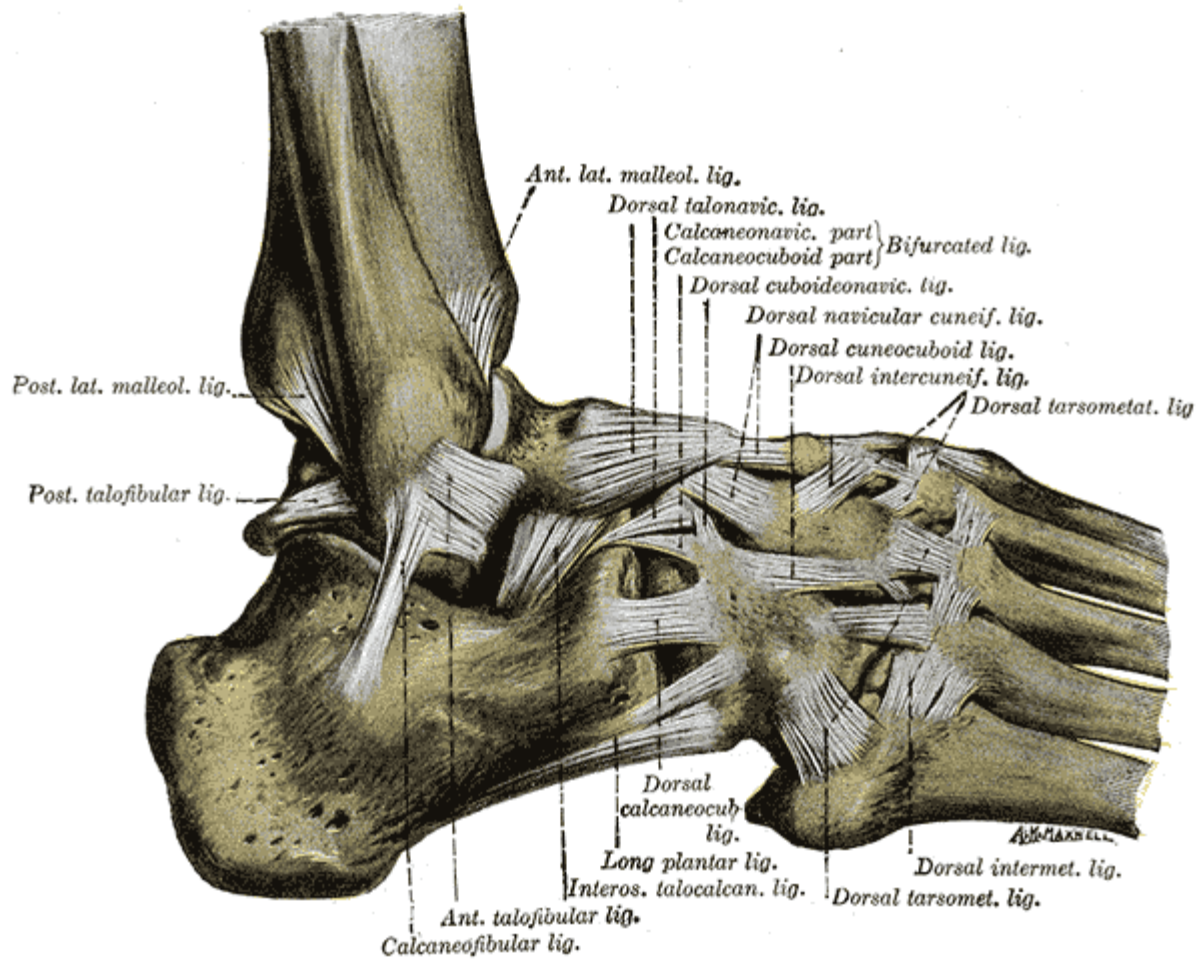
Ottawa Ankle Rules

- ★ Foot Xray Series
- ★ Required only if there is pain in the midfoot zone and any one of:
 - ★ 1) tenderness at the base of the 5th metatarsal
 - ★ 2) tenderness at the navicular bone
 - ★ 3) inability to bear weight for 4 steps both immediately and in the ED

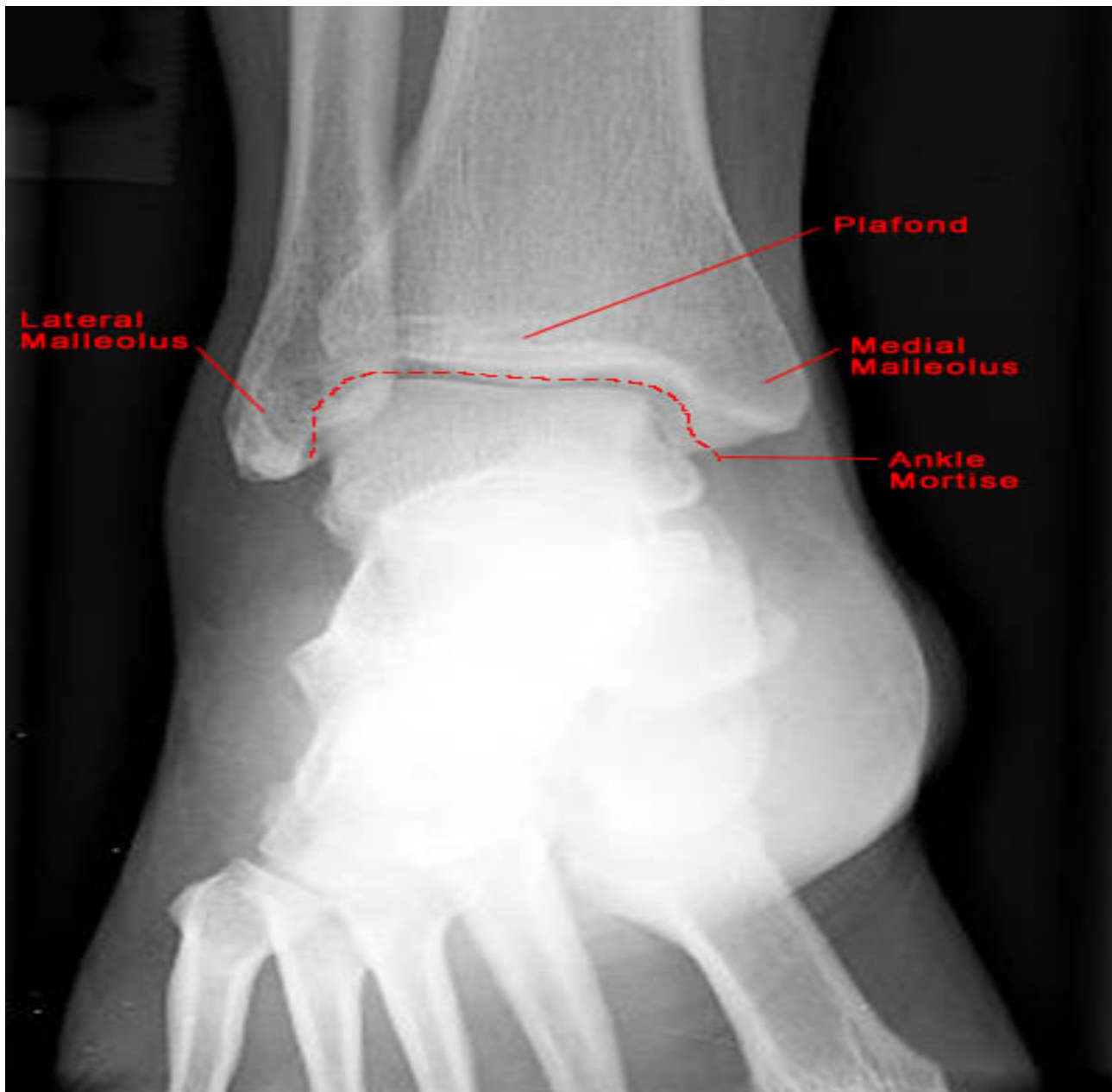
The Ankle: General Considerations

- ★ Consists of: articulations between distal tibia, distal fibula, and talus
- ★ Ankle Mortise: combo of the medial and lateral malleoli, together with the horizontal plate of the distal articulating surface of the tibia
- ★ Radiographic Exam: consists of AP view, mortise view, externally rotated oblique, and lateral projections
- ★ Ligamentous Anatomy:













Targeted Approach to Analysis

- ★ Examine the Malleoli – 90% of fractures involve the Malleoli. Distal fibula most common
- ★ Examine the Mortise – Uniformity. Small bone fragment may represent Talar dome fx – significant morbidity
- ★ Examine Peripheral Areas – Base of 5th Metatarsal, Soft tissues (Joint Effusion)
- ★ Order more films – Proximal fibular fx suspected when no fibular fx at ankle despite medial malleolar fx or joint space widening.

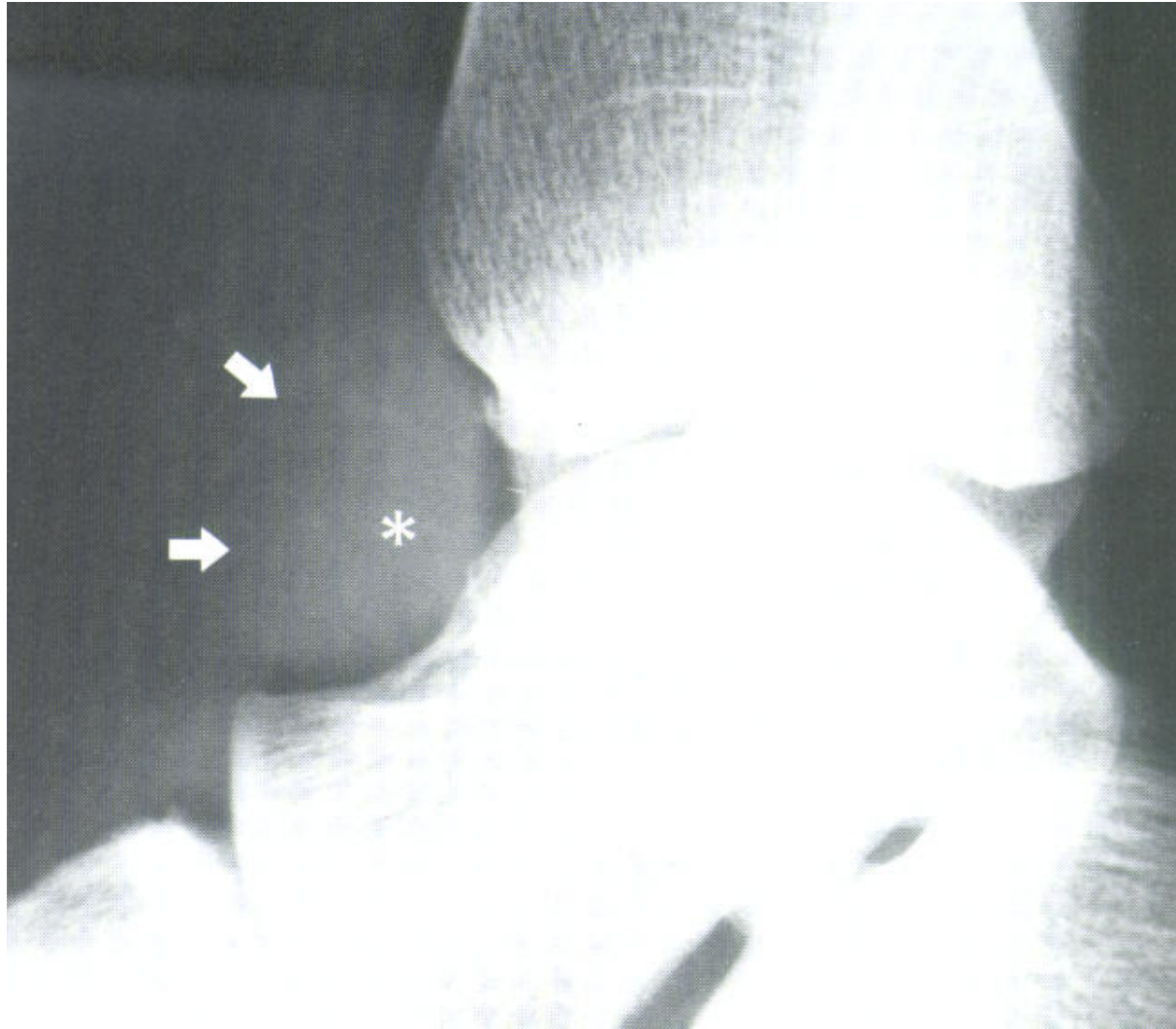


Common Injuries to the Ankle



BarneyStinson13, [Wikimedia Commons](#)

Ankle Effusion

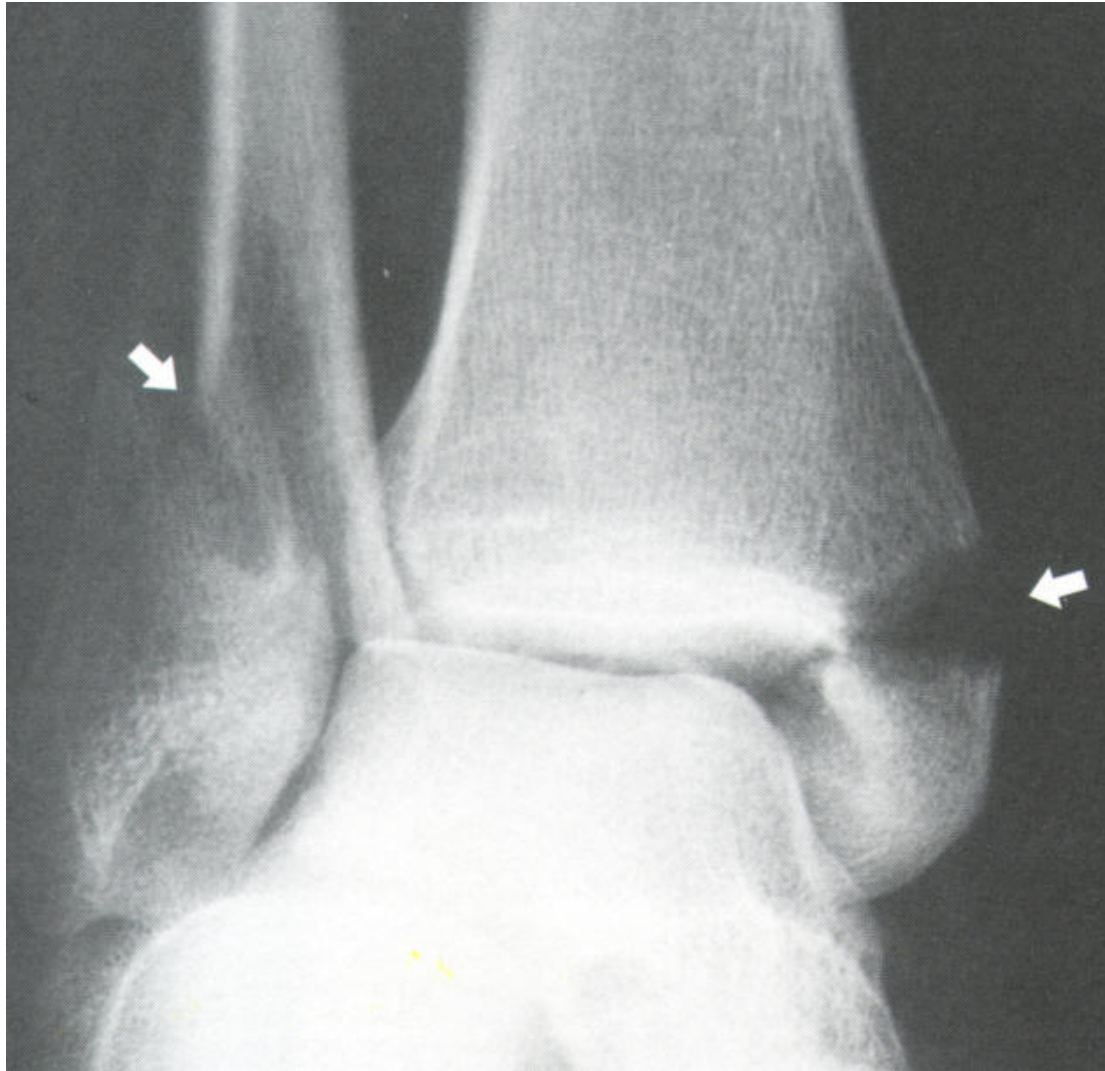


Single and Bimalleolar Fractures

- ★ Single Malleolar fracture is considered stable
- ★ Bimalleolar fractures are unstable and require operative repair



Bimalleolar Fracture



Maisonneuve Fracture

Due to strong eversion at ankle

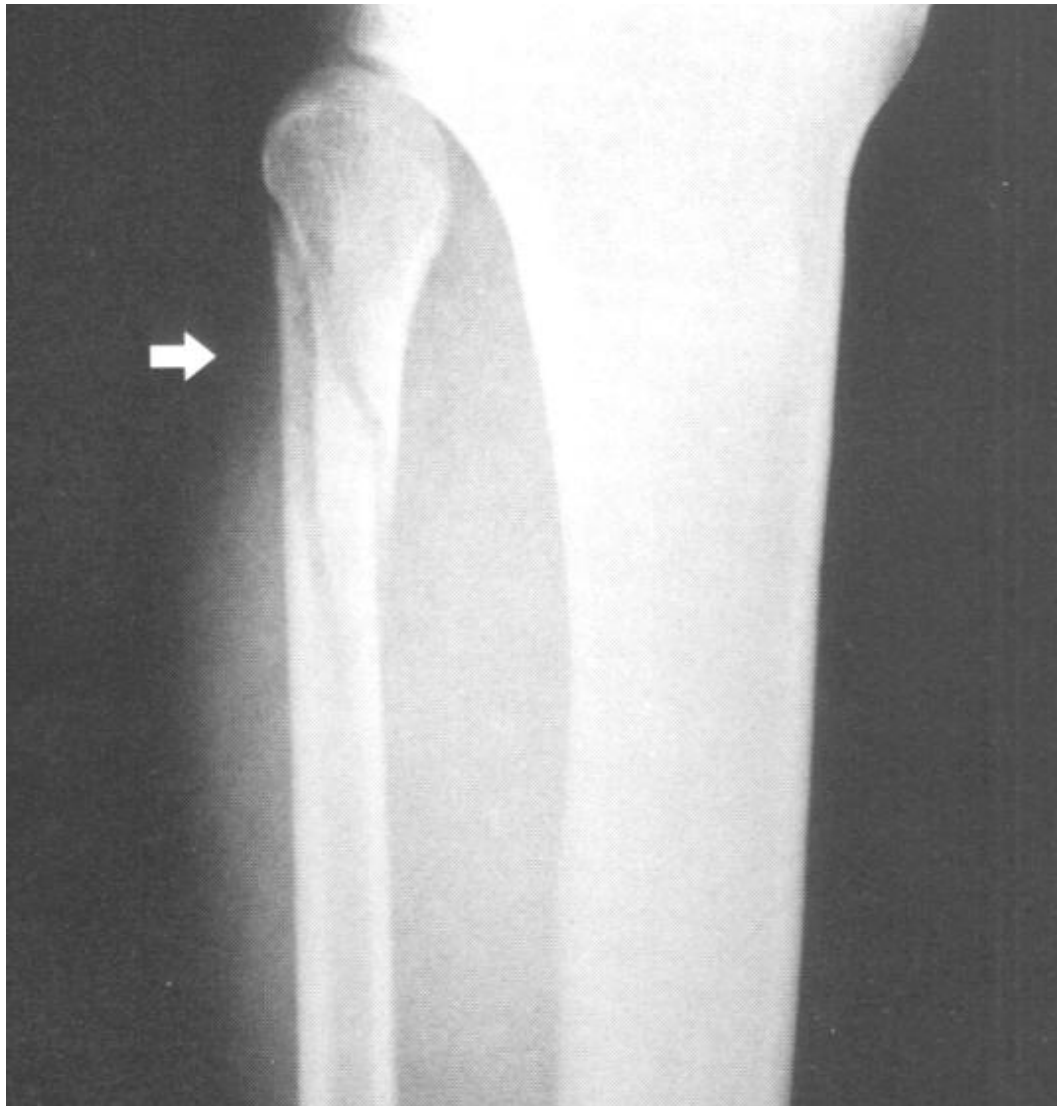
Commonly causes fx of proximal $\frac{1}{2}$ of fibula; also fx of medial malleolus, tearing of tibiofibular lig, and disruption of tibiofibular syndesmosis

Radiographic clues – Widening of medial jointspace, medial or posterior malleolar fx without lateral malleolar fx

Maisonneuve Fracture



Maisonneuve Fracture



Pilon Fracture

- ★ Fracture of the Tibial Plafond (intraarticular distal tibial fx)
- ★ Mechanism is axial loading (fall from height or MVA)
- ★ a/w injuries to calcaneus, tibial plateau, hip, pelvis and spine



Pilon Fracture



Common Injuries to the Ankle

- ★ Inversion/Eversion Injuries
- ★ Malleolar Fx due to: avulsion forces and impaction forces
- ★ Avulsion force created by intact ligaments; create horizontal fx lines
- ★ Impaction force due to forced talar shift striking appropriate malleolus; create oblique fx line



The Foot

- ★ “Man’s foot is all his own. It is unlike any other foot. It is the most distinctly human part of his whole anatomical make up. It is a human specialization and, whether he be proud of it or not, it is his hallmark and so long as Man has been man, and so long as he remains Man, it is by his feet that he will be known from all other members of the animal kingdom.” Frederick W. Jones
- ★ Dude has a serious fetish!!



The Foot: General Considerations

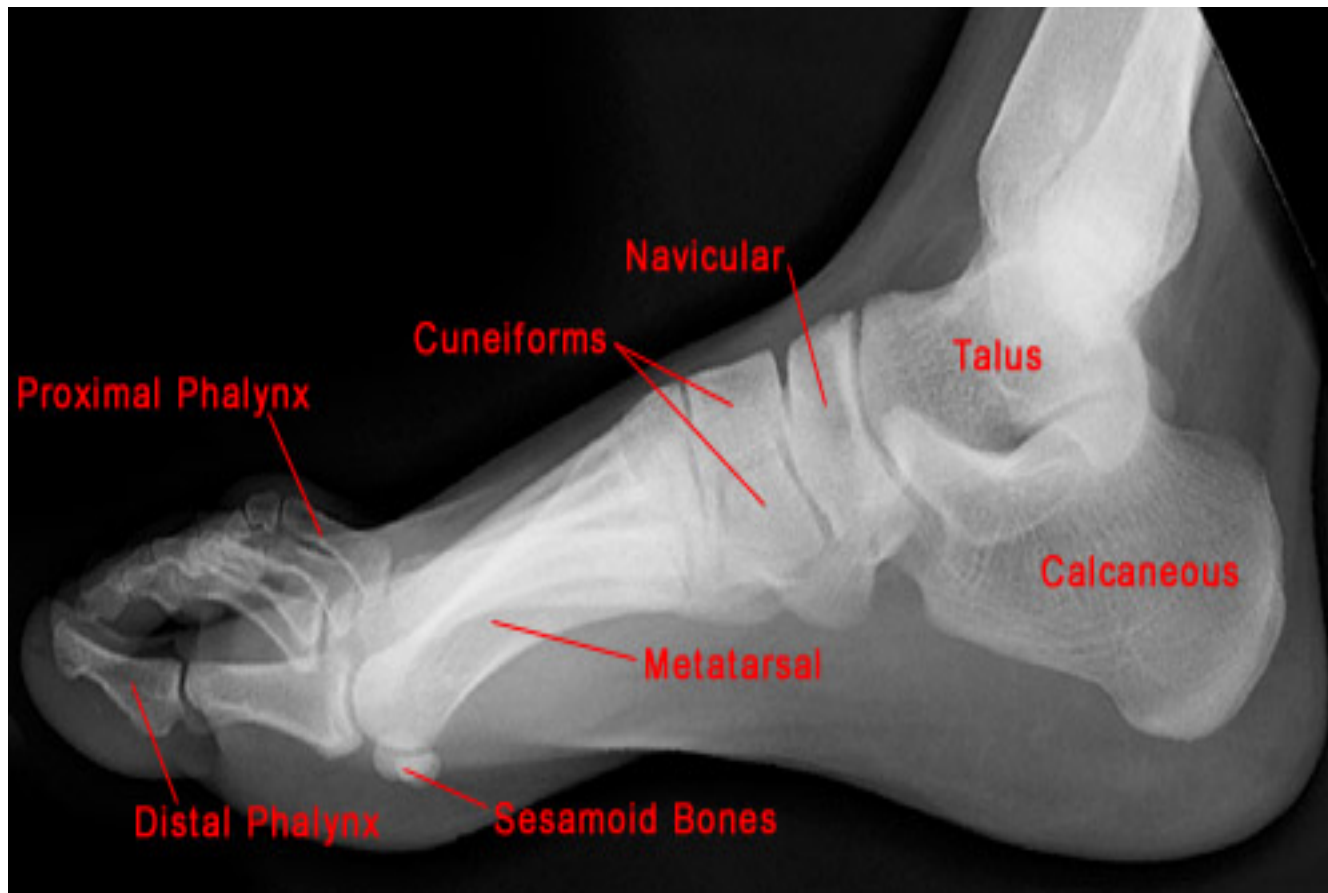
- ★ Consists of: all of the tarsal bones, metatarsals, and the phalanges
- ★ Forefoot: metatarsals and phalanges
- ★ Midfoot: navicular, cuboid, and three cuneiforms
- ★ Hindfoot: talus and calcaneous
- ★ Radiographic Exam: consists of anteroposterior, internally rotated oblique, and lateral views
- ★ The heel is routinely examined in the lateral and axial projection



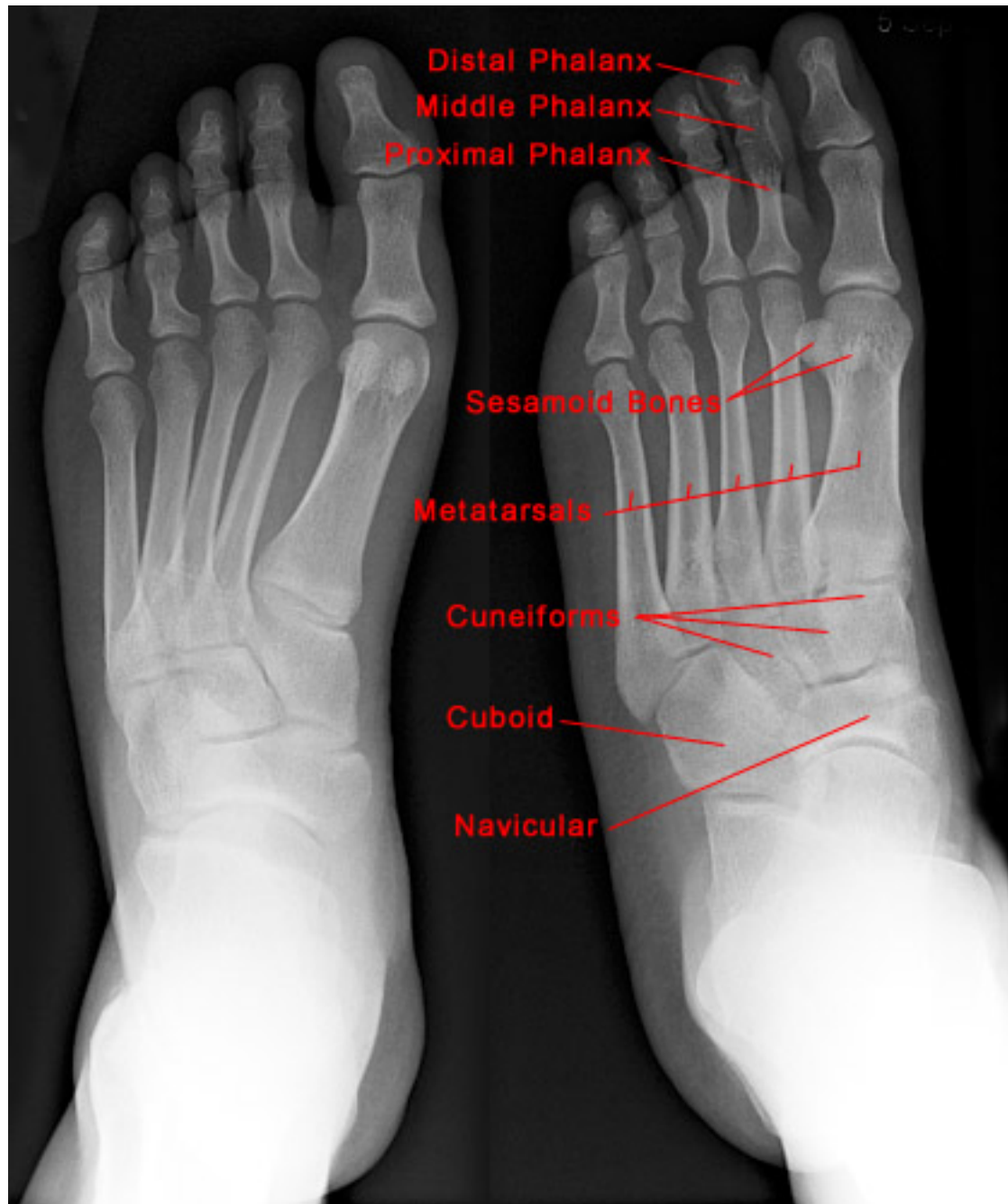
Clinical Decision Making - Foot

- ★ No Specific Guidelines for ordering films of the entire foot
- ★ Midfoot Guidelines are part of Ottawa Ankle Rules
- ★ Soft tissue swelling and ecchymosis – poor indicators of skeletal injury
- ★ Localized bone tenderness and inability to bear weight are more specific signs of fx
- ★ Isolated injury of distal phalanx – radiography can be deferred, however injuries of the Great Toe should be evaluated





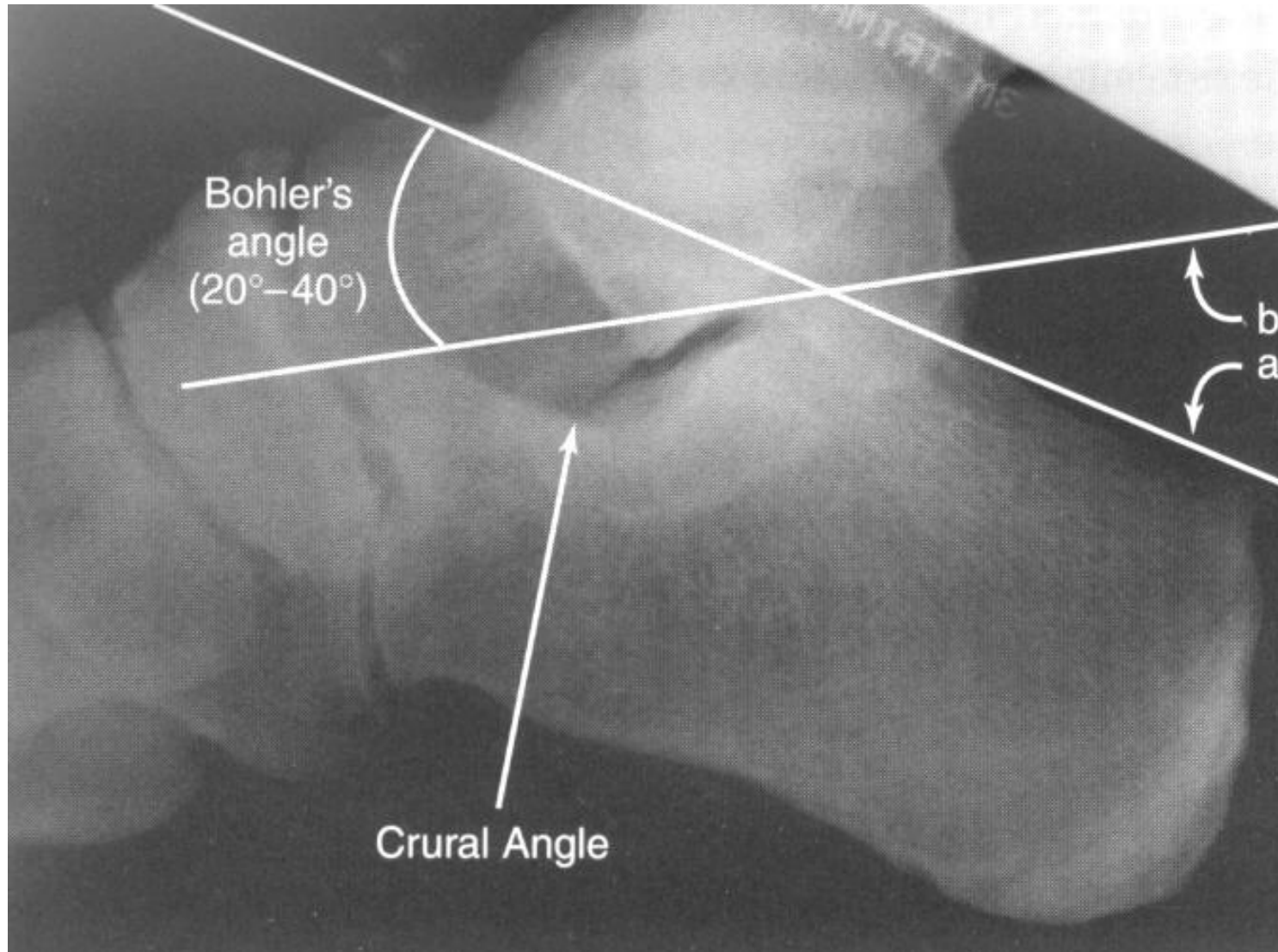
Source undetermined



Common Injuries to the Foot



Bohlers Angle



Calcaneal Fx

- ★ Most commonly fractured tarsal bone, usually by fall or axial loading
- ★ Calcaneal Compression Fx can be detected by measuring Bohler's angle
- ★ Bifurcate ligament stress can cause subtle anterior process avulsion fx
- ★ Vertebral fx occur in over 20% of calcaneal fx (also a/w fx of hip and knees)



Calcaneal Compression Fracture



Jones vs. PseudoJones

- ★ Jones fracture – Transverse fracture through proximal shaft of 5th Metatarsal – often complicated by nonunion and requires full cast
- ★ PseudoJones – avulsion fracture of tuberosity of 5th Metatarsal at insertion of Peroneus Brevis tendon (sprain) – Heals quickly without sequelae

Jones vs. Pseudojones



Jones Fracture



PseudoJones Fracture



37

Lisfranc Fracture/ Dislocation

- ★ Tarsometatarsal joint is Lisfranc
- ★ Associated with high energy trauma (MVA or Fall) or Diabetic Neuropathy
- ★ Lisfranc dislocation detected by malalignment of medial edge of 2nd metatarsal and medial edge of 2nd cuneiform
- ★ A/W fx of Cuneiforms, Metatarsal shafts and bases
- ★ 2 Types – Homolateral and Divergent



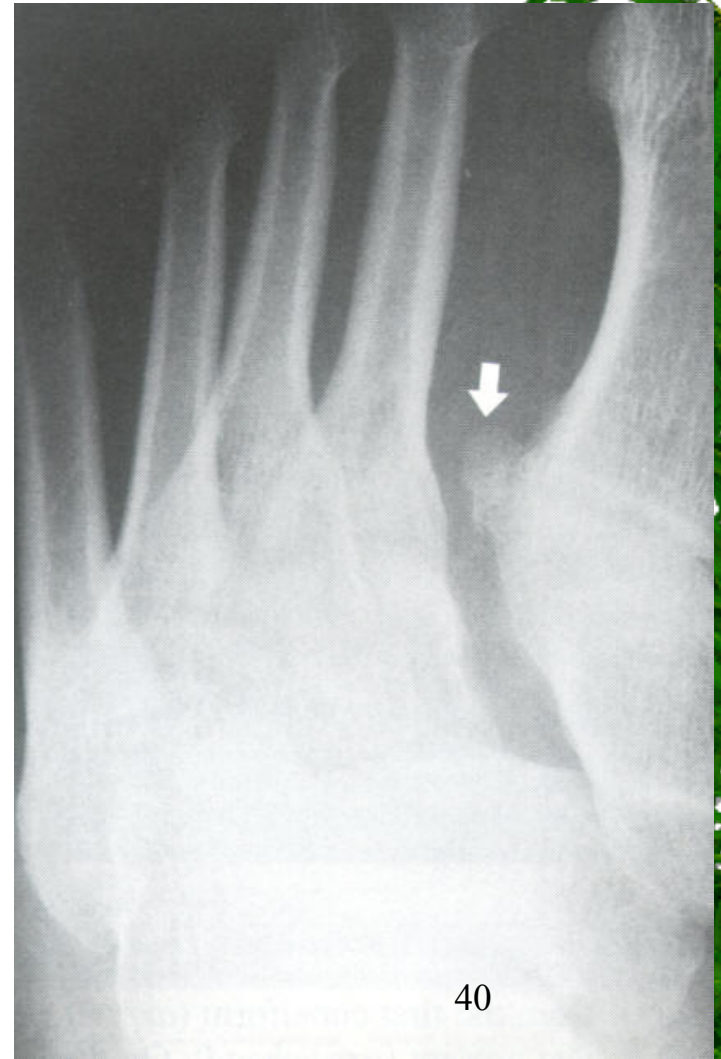
Lisfranc Homolateral Type

- ★ Lateral Displacement of 1st and 2nd – 5th Metatarsals



Lisfranc – Divergent Type

- ★ 1st and possibly 2nd Metatarsal dislocates medially or stays fixed and more lateral metatarsals are displaced laterally.



Metatarsal Fx

