AMSER Case of the Month: November 2019

57 y/o male presents with acute left ankle pain

Kyle Hatcher, MS3
Drexel University College of Medicine

Dr. William Peterson, MSK Radiologist

Allegheny Health Network

Allegheny Health Network

DREXEL UNIVERSITY College of Medicine

AMSER

Patient Presentation

- HPI: 57 y/o male presents to the ED with acute left ankle pain after sliding on railroad tracks and falling off his bicycle onto his left side
- PMHx: obesity, hyperlipidemia, diverticulitis
- SHx: left knee replacement
- Social: daily alcohol use, occasional cannabis use
- Vitals: BP 131/86, Pulse 88, Temp. 98.2 °F, RR 12
- Physical: oriented x3, obvious deformity of left ankle, 2+ left ankle DP and PT pulses, limited range of left ankle motion

What Imaging Should We Order?

ACR Appropriateness Criteria

Variant 4: Adult or child >5 years old. Acute injury to the ankle with persistent pain. Radiographs not obtained at time of injury. Initial study.

Procedure	Appropriateness Category	SOE	Adult RRL	Peds RRL	Rating	Median
X-ray ankle	Usually appropriate		☢ <0.1 mSv		9	n/a
CT ankle without IV contrast	Usually not appropriate		☢ <0.1 mSv		1	n/a
CT ankle without and with IV contrast	Usually not appropriate		☢ <0.1 mSv		1	n/a
CT ankle with IV contrast	Usually not appropriate		☢ <0.1 mSv		1	n/a
MRI ankle without IV contrast	Usually not appropriate		O 0 mSv	O 0 mSv [ped]	1	n/a
MRI ankle without and with IV contrast	Usually not appropriate		O 0 mSv	O 0 mSv [ped]	1	n/a
US ankle	Usually not appropriate		O 0 mSv	O 0 mSv [ped]	1	n/a

This imaging modality was ordered by the ER physician

Findings (unlabeled)

Findings: (labled)

Transverse fracture fracture through base of medial malleolus

Oblique fracture through lateral malleolus extending to syndesmosis

Coronal fracture through posterior malleolus and posterior dislocation of the tibiotalar joint

Final Dx:

Left trimalleolar ankle fracture/dislocation

Following external reduction, a CT was performed looking for additional fractures, tendon entrapment, interposed fragments and to aid is surgical planning.

Transversely oriented fracture of the medial malleolus

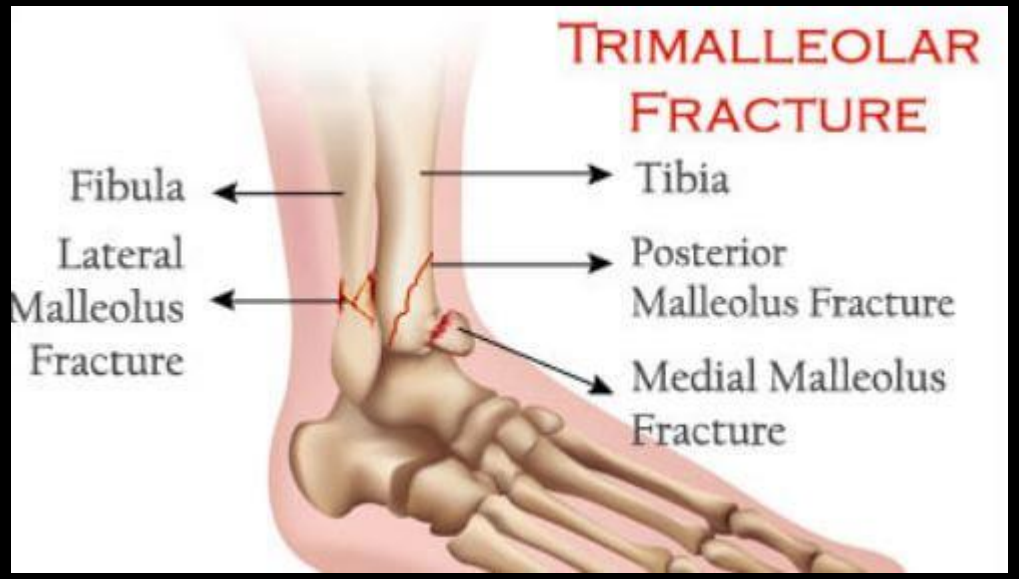
Oblique fracture through lateral malleolus

Reduction of tibiotalar dislocation

Up to 8 mm posterior displacement of the posterior malleolus fracture

Trimalleolar Fractures

- Three part fracture of the ankle
- Includes:
  - Medial malleolus
  - Posterior tibial plafond (aka posterior malleolus)
  - Lateral malleolus
- Associated with ligamentous injury



Ankle Fracture Epidemiology

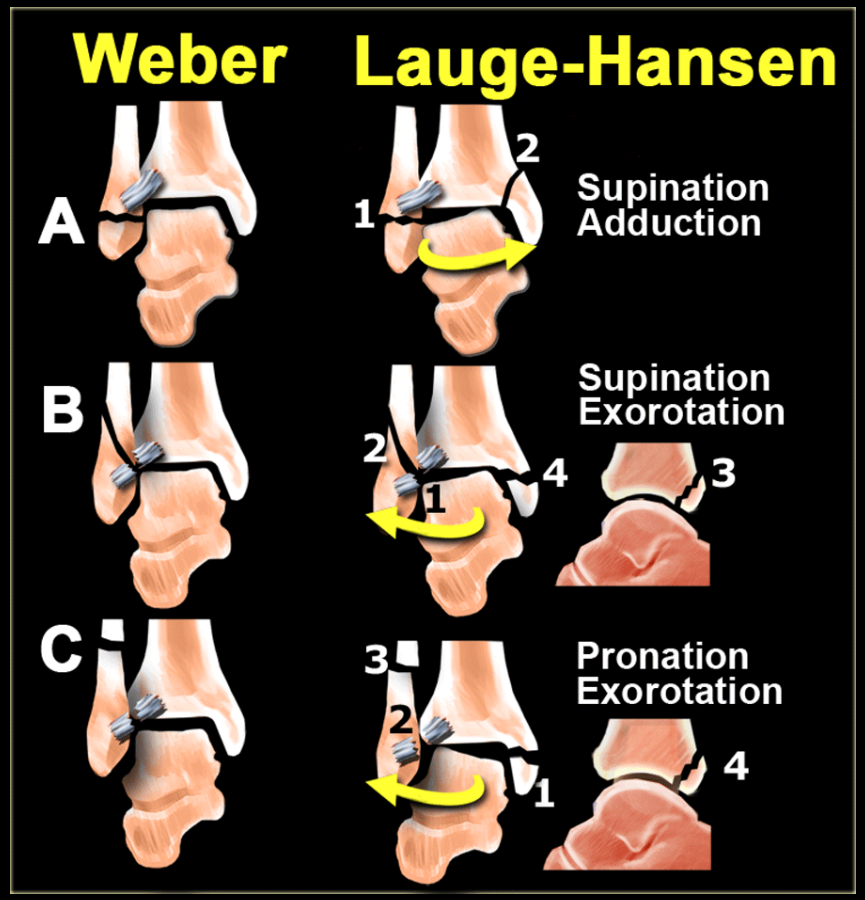
- Mechanism: dependent on direction of ankle and force applied
  - Logical progression described by the Weber and Lauge-Hansen Classification
- Bimodal age distribution of malleolar fractures
  - Young males associated with sports
  - Elderly females associated with osteoporosis
- Associated with tobacco use and obesity
- 60-70% Unimalleolar
- 15-20% Bimalleolar
- 7-12% Trimalleolar

Simplified Weber and Lauge-Hansen Classification

- Used to estimate and predict the extent of ligamentous injury and ankle stability
  - Weber system focuses on integrity of the syndesmosis
  - Lauge-Hansen focuses on the trauma mechanism
- Weber: three categories
  - Type A: Infrasyndesmotic
  - Type B: Transsyndesmotic
  - Type C: Suprasyndesmotic
- Lauge-Hansen: two word description of ankle injury
  - First word: Pronation or supination – position of foot at time of injury
    - In ankle pronation, medial ligaments fully stretched/vulnerable
    - In ankle supination, lateral ligaments fully stretched/vulnerable
  - Second word: adduction, abduction, or exorotation – injuring force direction
    - Ankle adduction results in initial lateral malleolar tension
    - Ankle abduction results in initial medial malleolar tension
    - Ankle exorotation results in initial fibula tension or medial malleolar tension

Simplified Weber and Lauge-Hansen Classification

- Weber A: Infrasyndesmotic
  - Supination/adduction
  - Infrasyndesmotic tension results in avulsion of the lateral malleolus (stage 1), followed by medial malleolus (stage 2)
- Weber B: Transsyndesmotic
  - Supination/exorotation
  - Transyndesmotic tension results in oblique fibula fracture (stage 2), followed by avulsion of the posterior malleolus (stage 3), followed by avulsion of the medial malleolus (stage 4)
  - Our patient likely had a Weber B Stage 4 injury
- Weber C: Suprasyndesmotic
  - Pronation/exorotation
  - Suprasyndesmotic tension results in avulsion of medial malleolus (stage 1), followed by fibula fracture (stage 3), followed by avulsion of the posterior malleolus (stage 4)



Trimalleolar Fracture Treatment

- Trimalleolar fractures require surgical repair using open reduction and internal fixation
- Non-surgical treatment is considered in patients with significant comorbidities
  - Associated with malunion
- Recovery typically lasts six to twelve weeks

Surgical Treatment For Our Patient

- Plate and screw fixation of distal fibula fracture
- Medial malleolar screws placed
- Tibiofibular syndesmotic screw placed
- Improved alignment

Patient F/U with Orthopedic Surgeon

- Discharged post-op day 2
- Patient undergoes OT at home
  - Revaluation after 2 weeks
- Continues to have sensation and full range of motion

References:

- ACR Criteria of Appropriateness for Acute Ankle Trauma. Accessed July 1 2019. https://acsearch.acr.org/docs/69436/Narrative/
- Knipe H, et al. “Trimalleolar Fracture.” Accessed July 1 2019. https://radiopaedia.org/articles/trimalleolar-fracture?lang=us
- Crist, B. “Ankle Fractures.” Accessed July 1 2019. https://orthoinfo.aaos.org/en/diseases--conditions/ankle-fractures-broken-ankle
- Medical Foxx. “Trimalleolar Fracture.” Accessed July 1 2019. https://medicalfoxx.com/trimalleolar-fracture.html
- UpToDate. “Overview of ankle fractures in adults.” Accessed July 3 2019. https://www.uptodate.com/contents/overview-of-ankle-fractures-in-adults
- Smithuis, Robin. “Ankle fracture – Weber and Lauge-Hansen Classification.” Accessed July 3 2019. http://www.radiologyassistant.nl/en/p420a20ca7196b/ankle-fracture-weber-and-lauge-hansen-classification.html
- Rezaee, et al. “Lauge-Hansen classification of ankle injury.” Accessed July 3 2019. https://radiopaedia.org/articles/lauge-hansen-classification-of-ankle-injury?lang=us

AMSER