AMSER Case of the Month: May 2020
Right Foot Pain

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Patient Presentation

HPI: 46 y.o. male presented to ED with 3 day history of right foot pain, after “skipping” the last stair while walking down steps, and falling on his inverted foot. Developed immediate pain over right medial midfoot. Weight-bearing was limited by pain. No paresthesias. No prior injuries to right foot.

- **PMHx:** HTN
- **PSx:** None
- **Meds:** Lisinopril
- **Social:** Drinks alcohol
- **V/S:** Within normal limits
Physical Exam

Right ankle/foot examination:
  • Swelling and ecchymosis over the dorsal foot and digits. No noticeable deformities.
  • Significantly tender to palpation over midfoot. Medial and lateral malleolus were nontender to palpation.
  • Anterior drawer negative.
  • Sensation to light touch intact. Dorsalis pedis pulse 2+.

Left ankle/foot examination:
  • Exam within normal limits.
What Imaging Should We Order?
Select the applicable ACR Appropriateness Criteria

This imaging modality was ordered by the physician

**Variant 4:** Adult or child older than 5 years of age. Acute trauma to the foot. Ottawa rules can be evaluated without exclusionary criteria. Ottawa rules are negative. Suspected pathology in an anatomic area not addressed by Ottawa rules (not involving the midfoot; eg, metatarsalphalangeal joint, metatarsal, toe, tendon, etc). Initial imaging.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiography foot</td>
<td>Usually Appropriate</td>
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<tr>
<td>Radiography foot with weightbearing</td>
<td>Usually Appropriate</td>
<td></td>
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<tr>
<td>CT foot without IV contrast</td>
<td>May Be Appropriate (Disagreement)</td>
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<tr>
<td>CT foot with IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>CT foot without and with IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>Fluoroscopy foot</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>MRI foot without and with IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>MRI foot without IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>US foot</td>
<td>Usually Not Appropriate</td>
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Findings (unlabeled)
Findings (labeled)

- Anterior-Posterior
  - Tarsometatarsal joint
  - Avulsed cortical fragment
- Lateral
  - Abnormally widened tarsometatarsal joint
  - Soft tissue swelling
- Oblique
  - Accessory ossicle (normal anatomic variant)

- First metatarsal
- Medial cuneiform
These findings are consistent with an injury to the tarsometatarsal (Lisfranc) joint.
Select the applicable ACR Appropriateness Criteria

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Variant 5: Adult or child older than 5 years of age. Acute trauma to the foot. Suspect Lisfranc injury, tendon injury, or occult fracture or dislocation. Radiographs are normal or equivocal. Next imaging study.

This imaging modality was ordered by the physician.
Findings (unlabeled)

Coronal T1-Weighted Image

Anterior-Posterior Radiograph
Findings (unlabeled)

Axial T2-Fat Saturated Image  Axial T1-Weighted Image
Findings (labeled)

Coronal T1-Weighted Image

- Tarsometatarsal joint
- Medial cuneiform
- Middle cuneiform

AP Radiograph

- Avulsed cortical fragment
- Tarsometatarsal joint
- 2nd Metatarsal
- Middle cuneiform
- Medial cuneiform
Findings (labeled)

Axial T2-weighted Fat-Saturated

Cortical irregularity at avulsion site

Dorsal foot surface

Edema

Plantar foot surface

Axial T1-Weighted

Cortical irregularity at avulsion site

Head of the 1st Metatarsal

Head of the 2nd Metatarsal
Final diagnosis

- Complete Lisfranc ligament tear with cortical avulsion
- Plan: Patient was fitted with a CAM (controlled ankle movement) boot and is non-weight bearing (non-operative management)
Lisfranc Injury

Anatomy

- Tarsometatarsal (Lisfranc) joint complex includes the bones and ligaments that stabilize the midfoot and forefoot
  - Articulation of 5 metatarsals, three cuneiforms, and the cuboid
- Low-impact injuries may lead to Lisfranc sprains
- High-impact injuries may lead to Lisfranc fracture-displacements

[Link to OrthoInfo website: orthoinfo.aaos.org/en/diseases--conditions/lisfranc-midfoot-injury]
Case Discussion

Mechanism of Injury

• Twisting
• Axial Loading of a fixed foot
• Crush injury
• Motor vehicle collision

Clinical presentation

• Midfoot pain with difficulty in weight-bearing
• Swelling across the dorsum of the foot
• Deformity is variable
• Treatment
  • Non-operative: Non-weight-bearing cast
  • Operative: Internal fixation
Case Discussion

Diagnostic Challenge

• Relatively uncommon injury, but can result from either high- or low-impact trauma
• Estimated 20% may be initially undiagnosed, particularly in the setting of multiple trauma
• Findings can be difficult to assess on clinical exam due to extensive swelling
• Imaging often plays an essential role to prevent diagnostic delay and associated comorbidities
  • Midfoot instability and pain
  • Planovalgus deformity
  • Post-traumatic osteoarthritis
Case Discussion

**X-ray**
- Small chip fractures arising from the second metatarsal or medial cuneiform (fleck sign) may be the only finding on non-weight-bearing radiographs
- Weight-bearing radiographs can demonstrate more subtle midfoot abnormalities
- Deviation of normal alignment suggests an underlying injury:
  - Lateral border of first metatarsal (M1) should align with the medial cuneiform (C1)
  - Medial border of the second metatarsal (M2) should align with the middle cuneiform (C2)
  - Less than 2 mm should separate the medial cuneiform (C1) and the second metatarsal (M2)

**MRI**
- Most useful to identify more subtle or partial ligamentous injuries
References:


Tejwani, N. and Kirby, D.J. Lisfranc fracture dislocation. emedicine.medscape.com/article/1236228-overview. Updated October 5, 2018

Weatherford, B. Lisfranc (midfoot) injury. orthoinfo.aaos.org/en/diseases--conditions/lisfranc-midfoot-injury/. Updated September 2017