

Radiology Challenge: The Painful Walk

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Case:

The patient is a 30 year-old man brought in by ambulance to the Emergency Department from a head-on motor vehicle collision. The patient was a restrained driver of car going at 30 MPH. He sustained no loss of consciousness and was found to be alert and oriented in the field complaining of diffuse aches and pains. On presentation and while in the ED his vitals remained stable. His physical exam was normal and all related imaging and lab work was normal.

Prior to discharge the patient was asked to take a trial walk during which time he was found to have difficulty bearing weight and complaining of right foot pain. Reexamination of the foot showed swelling of the midfoot and tenderness at the tarsometatarsal joint. Frontal, oblique, and lateral films were obtained.



Answer:

This patient has a Lisfranc dislocation, an injury that is often missed or misdiagnosed. The Lisfranc joint is named after Jacques Lisfranc, a surgeon of Napoleon's army who developed an amputation technique at the tarsometatarsal articulation. Lisfranc injuries involve tarsometatarsal dislocations, fractures, and fracture-dislocations in which both the lateral and vertical alignment of the joint is disrupted. An oblique ligament connecting the first cuneiform to the base of the second metatarsal also referred to as the Lisfranc ligament, dictates the extent of the Lisfranc injury.

There are various ways by which a Lisfranc injury can be sustained. The joint can be disrupted as a result of direct force on to the foot such as a car driving over the foot. It can also result from an axial load injury with severe folding of the midfoot onto the forefoot during severe plantar flexion. A more common mechanism is that which occurs to a driver of a vehicle during an abrupt deceleration impact while the foot is caught beneath the brake or clutch pedal. The forefoot is trapped beneath the pedal and sustains the impact of the forward velocity that is transmitted through the hindfoot and midfoot (1).

On physical exam, a Lisfranc joint disruption presents with swelling and tenderness along the tarsometatarsal articulation. Patients often complain of pain when walking or have inability to bear weight. On radiological examination the findings depend on the extent of injuries to the tarsometatarsal ligaments and bones involved. Oftentimes, a weight bearing radiograph is preferred so that it better delineates the level of injury. A torn Lisfranc ligament solely results in joint space widening while an intact ligament results in an avulsion fracture of the first cuneiform or of the second metatarsal at the areas where the ligament attaches. There are several radiographic criteria that indicate a Lisfranc dislocation:

- (1) On the frontal view, loss of vertical alignment of the lateral margin of the first metatarsal base with the lateral edge of the medial/first cuneiform.
- (2) On the frontal view, loss of vertical alignment of the medial margin of the second

metatarsal base with the medial edge of the middle/second cuneiform.

- (3) On the frontal view, greater than 2 mm widening of the space between the first and second metatarsal bases.

- (4) On the oblique view, loss of alignment of the medial margin of the third metatarsal base with the medial margin of the third cuneiform.

- (5) On the oblique view, loss of alignment of the medial margin of the fourth metatarsal base with the medial margin of the cuboid.

- (6) On the lateral view, a malalignment/step-off between the dorsal surface of the proximal second metatarsal and the dorsal surface of the middle cuneiform.

- (7) The presence of avulsed fragments indicative of ligamentous injury.





As can be seen by the below radiographs, an intact Lisfranc joint has alignment of the first metatarsal with the first cuneiform, the second metatarsal with the middle cuneiform, and on the oblique, alignment of the third metatarsal with the third cuneiform and fourth metatarsal with the cuboid. On the lateral there is alignment of the second metatarsal and the middle cuneiform.

(Normal Views)



It is extremely important to diagnose a Lisfranc injury early so as to lessen the likelihood of developing post-traumatic arthritis, chronic pain, loss of arch, and impaired circulation to the distal foot (5). The greatest determinant of developing degenerative arthritis is the extent of initial injury and the type of treatment chosen (5).

Treatment of a mild injury in which the radiograph shows no diastasis involves the use of a nonweight-bearing cast for four to six weeks (2). In the Emergency Department, a short posterior-leg splint can be placed temporarily until an orthopedist is seen. Prior to placing the splint, compartment syndrome of the forefoot must be excluded first. Depending on the extent of injury and the orthopedist, a more extensive injury may require surgical repair in the first 12-24 hours after the injury or within seven to ten days once the swelling has resolved. Although supporting literature remains controversial, some surgeons may choose a closed fixation approach as opposed to an open reduction and internal fixation with screws. More recently it has become routine to treat via an open technique for it has been found to result in better long term outcomes (4). Regardless of the treatment modality chosen, patients with Lisfranc injuries should be seen by an orthopedist within 24 hrs and are expected to be non-weightbearing for up six weeks.

The following radiograph depicts the screws placed to realign the bones. These screws are left

in place for four to five months and patients are not allowed to bear weight for six weeks (2).



(Post surgical view)

References:

- (1) Harris J, Harris W. *The radiology of emergency medicine* 4th ed. Philadelphia: Lippincott Williams & Wilkins, 2000.
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- (4) Mulier T, Reynders P, Sioen W et al. The treatment of lisfranc injuries. *Acta Orthop Belg*. 1997 Jun;63:82-90
- (5) Philbin T, Rosenberg G, Sferra J. Complications of missed or untreated lisfranc injuries. *Orthopedic Foot and Ankle*. 2003 Mar;8:61-71.