



EM CASES SUMMARY

Prepared by Dr. Keerat Grewal, Oct 2014

Episode 52 – Commonly Missed Uncommon Orthopedic Injuries

Drs. Ivy Cheng & Hossein Medhian

Lisfranc Injuries

Q: What is a Lisfranc injury?

Lisfranc injuries are a spectrum of injuries, from a simple sprain to complete disruption of the tarso-metatarsal joints in the midfoot. These typically occur at the base of the 2nd metatarsal. Lisfranc injuries are easy to miss because they are very uncommon and because the x-ray findings are often subtle or even absent. Low velocity injuries are typically more commonly missed than high velocity ones.

Q: What is the usual mechanism of injury for a Lisfranc?

Plantar flexion with external rotation is typical for a Lisfranc injury. A classic example is a fall from a horse with the foot caught in a foot stirrup. Other examples include: MVC, foot planted in hole, awkward step off of a curb. In children,

a classic history for a Lisfranc injury is the “bunk bed fracture” where a child leaps from one bunk bed to another, landing on their toes with an axial load on a plantar flexed foot.

Q: What are the physical exam findings in a Lisfranc Injury?

Patients are typically unable to weight bear. A key clinical clue is a hematoma/ecchymosis on the plantar aspect of the foot. Commonly, there is significant dorsal midfoot swelling.

Look for signs of compartment syndrome, which may include: paresthesias or hyperesthesia, particularly in the first dorsal webpace.

For more on compartment syndrome see [Episode 28 on Vascular Catastrophes](#) with Anil Chopra and David Carr.

Q: What are x-ray findings of a Lisfranc injury?

Commonly, patients have a normal-appearing x-ray. Obtain 3 views of the foot (AP, lateral and standard 45 degree oblique views).

Common x-ray findings include:

1. *Misalignment* – normally on the AP x-ray, the medial edge of the base of the 2st metatarsal should line up with the medial edge of the medial cuneiform. On the oblique x-ray, the medial edge of the 3rd and 4th metatarsals should line up with the medial edges of the middle and lateral cuneiforms.



Fig 1A, 1B: (A) normal alignment of 2nd metatarsal on ap x-ray. (B) normal alignment of 3rd/4th metatarsal on oblique x-ray

2. *Widening* – look for widening between the bases of the 1st and 2nd or 2nd and 3rd metatarsal bases. Widening >2mm is an indication for urgent surgical intervention.
3. *Any fracture or avulsion* – look for a ‘**fleck sign**’ (fig 2), which is pathognomonic for a Lisfranc injury. This is a small bony fragment avulsed from the second metatarsal base or medial cuneiform.



Fig 2. Fleck Sign

Q: What if the x-rays are normal, but you still clinically suspect a Lisfranc injury?

Obtain a *30 degree oblique x-ray* – this eliminates overlap of metatarsals.

Consider *weight-bearing stress views*, following an ankle nerve block.

Consider a *CT of the foot* if the x-rays still do not show an injury and you remain suspicious.

Q: What is the appropriate ED management for a patient with a Lisfranc injury?

For an undisplaced or suspected injury without radiographic findings, place the patient in a posterior back slab. Patients should be non-weight bearing, and outpatient follow up should be arranged with orthopedics. Discharge instruction should include elevation of the leg, and warning signs of compartment syndrome of the foot.

In a significantly displaced injury or dislocation (>2mm widening at the Lisfranc joint) – immediate

orthopedics referral in the ED is required for urgent surgical intervention.

Perilunate Injuries

Q: What spectrum of injuries occur in perilunate injuries?

The spectrum of injuries that usually result from a FOOSH mechanism range from the least significant scapholunate dissociation to the most significant lunate dislocation:

1. **Scapho-lunate dissociation** – a ligamentous injury with minimal clinical findings and a gap on the AP x-ray of the wrist between the scaphoid and the lunate (The Terry Thomas, or David Letterman or Madonna sign); this is the most common cause of SLAC (scapholunate advanced collapse).
2. **Perilunate dislocation** – with advancement of injury, the capitate dislocates from the lunate fossa.
3. **Lunate dislocation** occurs with further advancement of this injury, which is a volar dislocation of the lunate out of the 'seat' of the capitate.

Q: Why are perilunate dislocations commonly missed?

Swelling and deformity are often absent on exam. The x-ray findings can be very subtle.

Q: What should you be looking for on the AP x-ray for perilunate injuries in general?

1. On the AP x-ray of the wrist, think of carpal bones as flagstones that should have equal distances of 1-2mm between them. Any narrowing/overlap or widening between carpal bones should make you suspicious of a serious perilunate ligamentous injury. If you can't 'drive a car around the bones' then you should suspect a perilunate injury.
2. There are typically 3 smooth Gilula lines (fig 3), which form arcs between the rows of carpal bones. These lines should be smooth, if there are any steps or disruption of these lines, you need to consider a perilunate ligamentous injury.

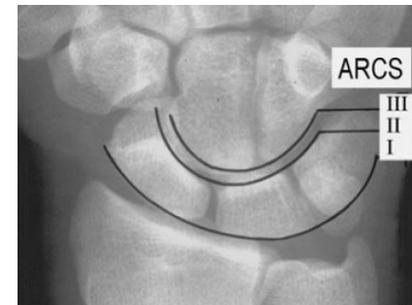


Fig 3: Normal Gilula lines

Q: What is the main x-ray finding of a scapholunate dissociation?

A gap between the scaphoid and lunate on the AP x-ray of the wrist of >3mm is a scapholunate

dissociation until proven otherwise. This x-ray finding has been described as The Terry Thomas Sign and the David Letterman Sign as well as the Madonna Sign as all 3 of these famous entertainers have a gap between their two front teeth.



Fig 4: Terry Thomas Sign of Scapholunate Dissociation

Q: What are the main x-ray findings for a perilunate dislocation and lunate dislocation on x-rays of the wrist?

On the AP x-ray of the wrist, there is crowding of the carpal bones such that the normal 1-2mm of space in between the carpal bones is lost in both *perilunate* and *lunate* dislocations. Sometimes a *triangular appearing lunate* will be found in a *lunate dislocation*.

On the lateral x-ray, there should be normal *'stacking of cups'* (fig 5). The radius, capitate,

and base of metacarpals are all look like cups and should stack on top of each other in a straight line. Assess the radio-lunate-capitate line, a vertical line through the radius, which should normally bisect the capitate. If there is not normal stacking, consider a perilunate dislocation. With further displacement of the lunate out of the seat of the capitate, the lunate appears like a *'spilled tea cup'* and then is classified as a complete *lunate dislocation*.



Fig 5: Normal 'stacking of cups'



Fig 6: Spilled tea-cup sign of a lunate dislocation

Q: What are consequences of missing a perilunate dislocation?

There can be long-term functional disability and pain. There is a high risk of median nerve palsy, pressure necrosis, compartment syndrome and long-term wrist dysfunction.

Clinical Pearl: a FOOSH injury + acute carpal tunnel syndrome = perilunate dislocation until proven otherwise

Q: How do you perform a perilunate dislocation reduction in the ED?

Reduction of a perilunate dislocation is a simple procedure that can and should be done by the ED physician in the ED. The elbow is flexed to 90 degrees and hand placed in finger traps. 10–15lbs of longitudinal traction is applied for 10 min. With a dorsal dislocation, the wrist is initially extended and traction is applied. The wrist is then flexed with volar pressure applied to the lunate. A palpable clunk may be perceived.

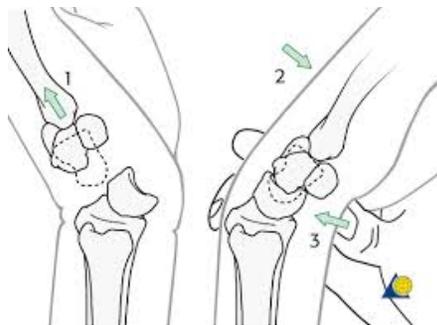


Fig 7: Closed reduction of perilunate dislocation

Post-reduction, these patients should be placed in a volar slab, in *neutral* position to avoid median nerve damage.

If adequate anatomical reduction is achieved, these patients require close orthopedics follow up in 1–2 days for possible operative management.

Distal Radius Ulnar Joint (DRUJ) Injuries

Q: When would you suspect a DRUJ injury?

After a FOOSH, either in isolation or associated with a wrist fracture, pain that is predominantly over the distal ulna is a DRUJ injury until proven otherwise.

Q: What are physical exam findings in a DRUJ dislocation?

Be suspicious of a DRUJ dislocation if:

1. The ulnar styloid is more or less prominent on the affected wrist or looks displaced.
2. You may feel crepitus and/or blocking on pronation or supination of the wrist.
3. You may feel the '*piano key*' sign, which is the ability to ballot the ulnar styloid.
4. Look for the ulnar *fovea sign* (fig 8), which is point tenderness over the ulnar capsule, palmar to the extensor carpi ulnaris tendon.



Fig 8: Ulnar fovea sign

Q: What are the spectrum of DRUJ injuries?

The spectrum of DRUJ injuries range from a simple sprain to a complete dislocation of the joint. DRUJ injuries are commonly associated with a FOOSH injury, with or without distal radius fractures. DRUJ injuries can also occur with other carpal injuries. In a patient with a suspected DRUJ injury, rule out a radial head fracture at the elbow.

Q: What are x-ray findings of a DRUJ dislocation?

On the AP x-ray of the wrist, look for widening of the joint > 2mm. On the lateral x-ray, look for displacement or subluxation of the distal ulna compared to the distal radius. The majority of DRUJ dislocations are dorsal.

Q: How are subluxed or dislocated DRUJs reduced and immobilized?

The majority of DRUJ subluxations or dislocations are dorsally displaced. In these cases, **supination** and pressure over the ulnar head typically reduces this injury. Post-reduction, place the patient in an above elbow splint in supination similar to the way you would immobilize a patient with a Smith's fracture.

Pelvic Apophyseal Avulsion Fractures

Q: What are apophyseal avulsion fractures?

Epiphyseal plates and apophyses are the weakest part of the MSK chain. Because ligaments and tendons are stronger than these bony growth areas in children and young adults, avulsion fractures of these areas can occur in patients under the age of 25. The mechanism of injury is typically a sudden or forceful eccentric muscle contraction during running, jumping or kicking, and so these are usually sports-related injuries.

Q: What are the common sites affected by pelvic apophyseal avulsion fractures?

The ischial tuberosity is the most common site of a pelvic apophyseal avulsion fracture that results from a sudden contraction of the hamstring muscle.

Other Pelvic Apophyseal Injuries include:

- iliac crest avulsion
- anterior superior iliac spine (ASIS) avulsion

- anterior inferior iliac spine (AIIS) avulsion
- greater trochanter avulsion
- lesser trochanter avulsion

Q: Why is it important of ED practitioners to know about pelvic apophyseal avulsion fractures?

These avulsion fractures take longer to heal compared to a simple strain (can take up to 6–8 weeks). Commonly, management is initiated with non-weight bearing ambulation with crutches, then weaning as tolerated.



Fig 9: Avulsion fracture

Key References

1. Anderson, RB, Hunt, KJ, & McCormick, JJ. Management of common sports-related injuries about the foot and ankle. 2010. *J Am Acad Orthop Surg*, 18(9): 546–56. Abstract available at: <http://www.ncbi.nlm.nih.gov/pubmed/20810936>
2. Caswell, F & Brown C. Identifying foot fractures and dislocations. 2014. *Emerg Nurse*, 22(6): 30–4. Abstract available at: <http://www.ncbi.nlm.nih.gov/pubmed/25270819>
3. Stanbury, SJ & Elfar, JC. Perilunate dislocation and perilunate fracture-dislocation. 2011. *J Am Acad Orthop Surg*, 19(9): 554–562. Abstract available at: <http://www.jaaos.org/content/19/9/554.abstract>
4. Boyd, KT, Peirce, NS, & Batt, ME. Common hip injuries in sport. 1997. *Sports Med*, 24(4): 273–88. Abstract available at: <http://www.ncbi.nlm.nih.gov/pubmed/9339495>
5. Moeller, JL. Pelvic and hip apophyseal avulsion injuries in young athletes. 2003. *Curr Sports Med Rep*, 2(2): 110–5. Abstract available at: <http://www.ncbi.nlm.nih.gov/pubmed/12831668>