Test your Knowledge and Name the Fracture:
A Review of 10 Fractures of the Lower Extremity and their Radiographic Features

Stacey Speer & Stephany Pritchett
Department of Medical Imaging
London Health Sciences Centre
Western University
London, Ontario, Canada
Disclosure Statement

Dr. Stacey Speer and Dr. Stephany Pritchett of Western University do not have any actual or potential conflicts of interest in relation to this presentation.
Learning Objectives

• To highlight and review 10 fractures of the lower extremity.

• Provide a radiographic pictorial review involving the lower extremity as a means to illustrate key imaging features of commonly encountered and subtle fractures.
1. What is the diagnosis?
2. What is a common mechanism of injury?
3. What are the different types of injuries that may occur?
4. What vascular structure may be simultaneously injured?
Lisfranc’s Fracture Dislocation

- Lisfranc’s injuries are referred to as tarsometatarsal fracture dislocation injuries.

  - Transverse metatarsal ligament connect the bases of the second through fifth metatarsal bones, but this ligament does not exist between the first and second metatarsal bones.

  - The base of the second metatarsal bone is attached to the medial cuneiform by an oblique ligament named the Lisfranc Ligament.
Case 1 Answers – Lisfranc Fracture Dislocation

1. What is the diagnosis?
   • Lisfranc fracture dislocation.

2. What is a common mechanism of injury?
   • The mechanism of injury is often a forced plantar flexion of the forefoot.

3. What are the different types of injuries that may occur?
   • Homolateral – displacement of all five metatarsal bones in the same direction.
   • Divergent – medial displacement of the 1st metatarsal and lateral displacement of the 2nd to 5th metatarsals.

4. What vascular structure may be simultaneously injured?
   • The dorsalis pedis artery can be simultaneously injured.
1. What is the diagnosis?

2. What is the classification system used for this type of fracture?

3. What are the associated abnormalities that occur with this injury?
Tibial Plateau Fracture

• Fracture of tibial plateau due to axial loading +/- rotational injury +/- valgus angulation.

• 75-80% of fractures are lateral in location.

• Often referred to as “bumper” or “fender” fracture as 25% occurs as a result of an auto versus pedestrian injury.

• Radiographic appearance:
  – Fat - fluid line in suprapatella bursa.
  – Oblique or linear fracture line on radiograph.
  – Sclerotic horizontal line below level of cortex of either the medial or lateral tibial plateau.
Case 2 Answers – Tibial Plateau Fracture

1. What is the diagnosis?
   • Tibial plateau fracture.

2. What is the classification system used for this type of fracture?
   • Schatzker I – split fracture with no depression.
   • Schatzker II – lateral split / wedge fracture with depression of weight bearing portion.
   • Schatzker III – focal depression of articular surface, no associated split.
   • Schatzker IV – medial plateau split +/- depression, may involve tibial spines.
   • Schatzker V – split fracture of both medial and lateral plateau (aka bicondylar).
   • Schatzker VI – bicondylar split fracture with dissociation of metaphysis and diaphysis.

3. What are the associated abnormalities that occur with this injury?
   • Ligamentous injury to the ACL, PCL, MCL, LCL.
   • Injury to the posterolateral corner structures.
   • Popiteal artery injury.
Case 3

1. What is the diagnosis and what does it imply?
2. What structures are involved in this injury?
Case 3 Answers – Segond Fracture

1. What is the diagnosis and what does it imply?
   - Segond fracture.
   - Frequently associated with disruption of the anterior cruciate ligament.

2. What structures are involved in this injury?
   - Fibers of the iliotibial tract and the anterior oblique band of the fibulocollateral ligament.

   **Segond Fracture**
   - Mechanism of injury involves internal rotation and varus stress.
   - Avulsion of the lateral tibial rim cortex due to avulsion of lateral capsular ligaments.
   - Often associated with falls and sports injuries, i.e. baseball and basketball.
1. What is the diagnosis?
2. What co-existent injury may be present?
3. What is the mechanism of injury?
Case 4 Answers – Patella Sleeve Fracture

1. What is the diagnosis?
   • Patella sleeve fracture.

2. What co-existent injury may be present?
   • Extensor mechanism injury.

3. What is the mechanism of injury?
   • Acute injury due to a sudden and forceful contraction of the quadriceps.

   **Patella Sleeve Fracture**
   • Chondral and osteochondral avulsion injury at the inferior pole of the patella.
   • Occurs in the pediatric population, typically between the ages of 8 and 12.
   • Lateral x-ray may demonstrate swelling at the lower pole of the patella.
   • MRI may be necessary for the diagnosis.
Case 5

1. What is the diagnosis?
2. What is the mechanism of injury?
3. What is the name of the fracture that this one often gets confused with?
Case 5 Answers – Base of the 5th Metatarsal Fracture

1. What is the diagnosis?
   • Base of the 5th metatarsal fracture (pseudo-jones).

2. What is the mechanism of injury?
   • Caused by forceful inversion of the foot in plantar flexion.

3. What is the name of the fracture that this one often gets confused with?
   • Jones fracture.
1. What is the diagnosis?

2. What is the most commonly fractured tarsal bone?

3. What is the next test that should be performed if there are bilateral injuries?
Case 6 Answers – Calcaneal Fracture

1. What is the diagnosis?
   • Calcaneal fracture.

2. What is the most commonly fractured tarsal bone?
   • Calcaneus.

3. What is the next test that should be performed if there are bilateral injuries?
   • The spine should be evaluated as the mechanism of injury is often a large load to the axial skeleton.

   **Calcaneal Fractures**
   • Also known as a ‘lover fracture’ derived from the fact that a suitor may jump from great heights while trying to escape from the lover’s spouse.
   • Can be intra-articular or extra-articular.
   • A bohler’s angle is used for evaluating the lateral view to determine if a calcaneal fracture is present.
1. What is the diagnosis?

2. What is the relevance of this fracture in both adults and children?
Case 7 Answers – Lesser Trochanteric Fracture

1. What is the diagnosis?
   • Lesser trochanteric fracture.

2. What is the relevance of this fracture in both adults and children?
   • In adults, it is often pathologic.
   • In children, often represents an avulsion fracture of the iliopsoas muscle.

**Lesser Trochanteric Fracture**

• Radiographic hallmark of avulsion injury is irregularity of the cortex at the site of avulsion and displaced pieces of bone of variable size.
1. What is the diagnosis?

2. What is the mechanism of injury and epidemiology related to this fracture?

3. What is the classification system used for this type of fracture?
Case 8 Answers – Intertrochanteric Fracture

1. What is the diagnosis?
   • Intertrochanteric fracture.

2. What is the mechanism of injury and epidemiology related to this fracture?
   • Elderly patient with hip pain following a fall.
   • 90% of patients are above 65 years of age.

2. What is the classification system used for this type of fracture?
   • Evans Classification System
     – Type I – stable.
     – Type II – can be stable if medial apposition of fragments.
     – Type III – posterolaterally unstable.
     – Type IV – anteromedially unstable.
     – Type V – anteromedially and posterolaterally unstable.
     – Type R – reversed obliquity and unstable.
1. What is the diagnosis?
2. What associated ligamentous injury often simultaneously occurs?
3. What patient demographics is at highest risk for sustaining this type of injury?
4. What are two other names for this type of fracture?
Case 9 Answers – Tibial Spine Fracture

1. What is the diagnosis?
• Tibial spine fracture.

2. What associated ligamentous injury simultaneously occurs?
• Anterior cruciate ligament tear (ACL).

3. What patient demographics is at highest risk for sustaining this type of injury and why?
• Commonly seen in pediatric patients between the age of 8-13 and often associated with sports. It is considered to be related to the relative weakness of the incompletely ossified tibial eminence compared to the native ACL fibers.

4. What are two other names for this type of fracture?
• Tibial eminence fractures or ACL avulsion fractures.
1. What is the diagnosis?

2. What is an alternate name for this fracture that has been used?

3. What is the significance of this fracture in a pediatric patient?

4. What is the next step in patient management?
Case 10 Answers – Metaphyseal Corner Fracture

1. What is the diagnosis?
   • Metaphyseal corner fracture.

2. What is an alternate name for this fracture that has been used?
   • Bucket handle fracture.

3. What is the significance of this fracture in a pediatric patient?
   • Highly specific for child abuse in infants less than 1 year of age.

4. What is the next step in patient management?
   • Notify the referring physician so that the appropriate child protective services can be notified.

   **Metaphyseal Corner Fracture**
   • Thin crescent of bone along the physis separated from the metaphysis.
   • Secondary to forceful twisting, shaking of extremity.
References