AMSER Case of the Month
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69 year old male with R knee pain s/p motorcycle crash

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Patient Presentation

• **HPI:** 69 year old M presents with right knee pain immediately following motorcycle crash. Pt was wearing a helmet and had no LOC. He was driving his motorcycle 20 mph at the time of accident.

• **PMH:** Hx of Left Rotator Cuff Tear, CAD, HCC, HLD, HTN

• **Past Surgical Hx:** Partial partial liver lobectomy

• **Family History:** None

• **Social History:** Former smoker (quit in 2000), does not drink alcohol currently
Physical Exam

• Vitals: BP 135/72; Pulse 65; Resp 20; SpO2 98%; Temp 98.1 F

• Pertinent Exam Findings:
  • Right Lower Extremity: Swelling and tenderness to right knee/lower leg with TTP in this region, several fracture blisters over medial knee with superficial abrasion, Motor and Sensory Intact, 2+ DP
What Imaging Should We Order?
Select the applicable ACR Appropriateness Criteria

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiography knee</td>
<td>Usually Appropriate</td>
<td></td>
</tr>
<tr>
<td>CTA lower extremity with IV contrast</td>
<td>Usually Appropriate</td>
<td></td>
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<tr>
<td>Arteriography lower extremity</td>
<td>May Be Appropriate</td>
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<tr>
<td>CT knee with IV contrast</td>
<td>May Be Appropriate (Disagreement)</td>
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<tr>
<td>CT knee without IV contrast</td>
<td>May Be Appropriate</td>
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<tr>
<td>MRA knee without and with IV contrast</td>
<td>May Be Appropriate</td>
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<tr>
<td>MRI knee without IV contrast</td>
<td>May Be Appropriate</td>
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</tr>
<tr>
<td>MRA knee without IV contrast</td>
<td>Usually Not Appropriate</td>
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<tr>
<td>Bone scan with SPECT or SPECT/CT knee</td>
<td>Usually Not Appropriate</td>
<td></td>
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<tr>
<td>CT knee without and with IV contrast</td>
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<tr>
<td>MR arthrography knee</td>
<td>Usually Not Appropriate</td>
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<td>MRI knee without and with IV contrast</td>
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<tr>
<td>US knee</td>
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This imaging modality was ordered by the ER physician.
Findings (labeled)

• Radiograph shows **acute comminuted tibial plateau fractures**

There is a sharp margin on the medial side of tibia and multiple fracture lines.
Select the applicable ACR Appropriateness Criteria

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<td>MRI knee without IV contrast</td>
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<td>0</td>
</tr>
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<td>CT knee without IV contrast</td>
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</tr>
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Variant 5: Adult or child 5 years of age or older. Fall or acute twisting trauma to the knee. Tibial plateau fracture on radiographs. Suspect additional bone or soft-tissue injury. Next study.
Findings: (unlabeled)
Depression at the lateral tibial plateau

Medial displacement of the medial component

Transverse metadiaphyseal component
Findings: (unlabeled)
Findings: (labeled)

Inferior displacement of medial component

Medial view of tibial plateau fracture
Findings: (unlabeled)
- Fat-fluid level can be seen on the **cross table lateral view** of CT Knee.

- **Lipohemarthrosis** is indicative of an intra-articular fracture, but absence of this finding does not exclude an intra-articular fracture.
Final Dx:

Acute displaced comminuted bicondylar tibial plateau fractures with transverse metadiaphyseal component (Type 6)

and associated comminuted fracture of right fibular head
Case Discussion- Tibial Plateau Fracture

• Epidemiology:
  • Overall incidence is 10.3 per 100,000 people annually, M>F, mean age at time of injury is 52 years old
  • Most commonly involves the lateral tibial plateau (over the medial)
  • Occurs after a direct, forceful blow to the knee (motor vehicle accident, falls, trauma)

• Symptoms:
  • Localized pain, swelling, and tenderness over the bone
  • Compartment syndrome

• Physical Examination
  • Pain with movement, which may limit knee exam
  • For open fractures: puncture/missile wounds and lacerations
  • Knee effusion (the aspiration will reveal hemarthrosis with lipid elements)
Case Discussion- Tibial Plateau Fracture

• **Work Up:**
  
  • Plain Radiograph (AP & Lateral View)
    • It is possible for XR to be unremarkable or underestimate the severity of the injury.
  
  • CT of the knee without contrast (Coronal, Sagittal, Cross-Table Lateral View)
    • CT imaging can better define the injury to the bone.
    • CT imaging can help with pre-operative planning for orthopedic fixation.
    • Cross-Table Lateral View is important to look for lipohemarthrosis.

• MRI of knee
  • To assess associated ligamentous and meniscal injury.
Case Discussion- Schatzker Classification

- **Schatzker I**: wedge-shaped pure cleavage fracture of the lateral tibial plateau, originally defined as having less than 4 mm of depression or displacement.

- **Schatzker II**: splitting and depression of the lateral tibial plateau; namely, type I fracture with a depressed component.

- **Schatzker III**: pure depression of the lateral tibial plateau; divided into two subtypes:
  - **Schatzker IIIa**: with lateral depression
  - **Schatzker IIIb**: with central depression

- **Schatzker IV**: medial tibial plateau fracture with a split or depressed component.

- **Schatzker V**: wedge fracture of both lateral and medial tibial plateau.

- **Schatzker VI**: transverse tibial metadiaphyseal fracture, along with any type of tibial plateau fracture (metaphyseal-diaphyseal discontinuity).

Case Discussion- Tibial Plateau Fracture

• Complications
  • Acute compartment syndrome
  • Varus or valgus deformity
  • Inability to regain normal gait
  • Accelerated osteoarthritis

• Treatment
  • For tibial plateau fractures with any degree of displacement or depression, meniscal or ligamentous injury:
    • **Consult orthopedics within 48 hours** because the injury may require surgical open reduction and internal fixation.
  • Otherwise, initial treatment involves:
    • Compression, icing, analgesics (if appropriate), and early mobilization
References:

1. ACR Criteria of Appropriateness: Acute Trauma to Knee. https://acsearch.acr.org/list
3. Fields, KB. Proximal tibial fracture. In: UpToDate, Post, TW (Ed), UpToDate, Waltham, MA, 2014.