

Tibial Plateau Fractures

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RAD 4014



Clinical History

- HPI: 51-year-old man with no relevant PMH/PSH presented to the ED s/p MVC. Patient reported 6/10 abdominal pain and left leg pain and underwent emergent laparotomy. Patient continued to have LLE pain and a left tibial plateau fracture was noted on LLE trauma series.

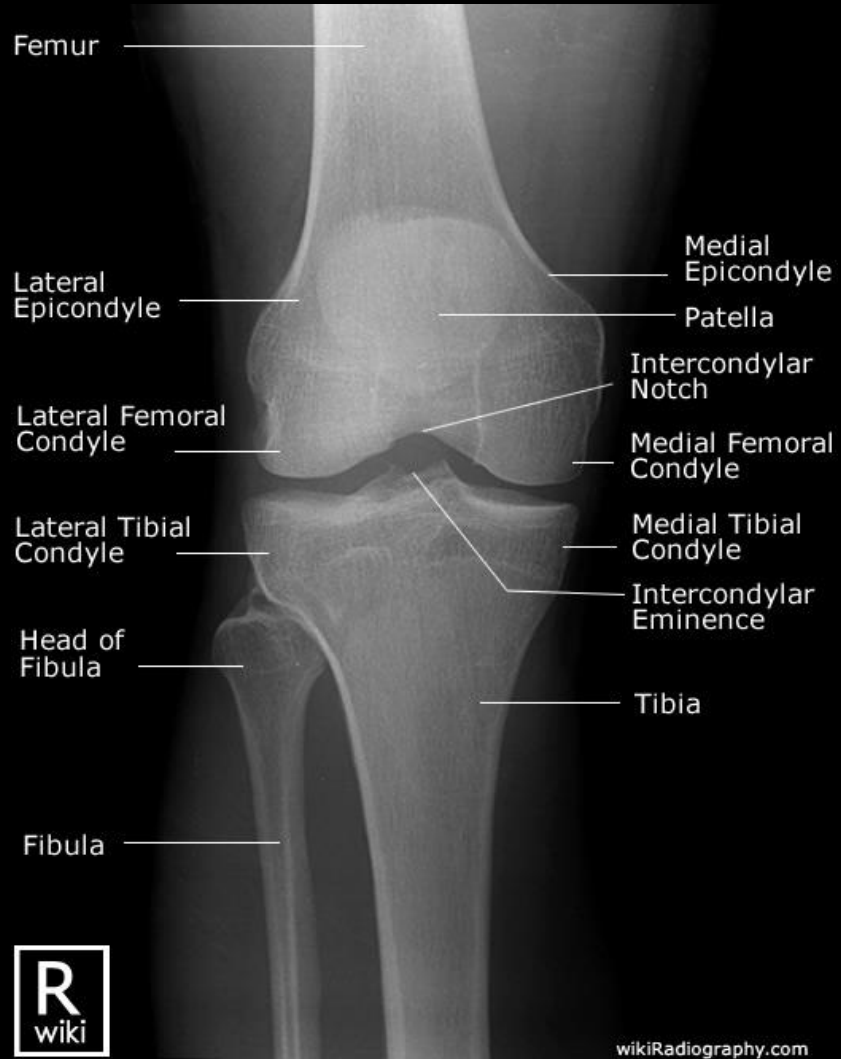
Vitals:

- HR: 84
- BP: 94/59
- Temp: 97.4
- RR: 22 O2: 95% RA

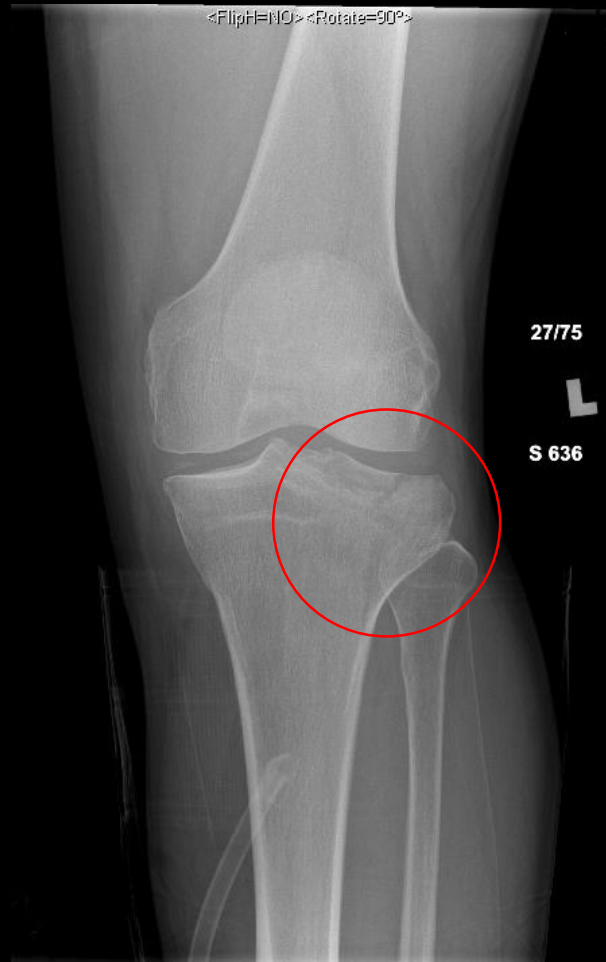
Physical Exam:

- Tender to palpation over the left lateral knee
- No abrasions or open wounds noted upon inspection
- Compartments were soft and LLE was neurovascularly intact

Normal Knee Anatomy



Initial Imaging



AP and Lateral radiographs of the left knee

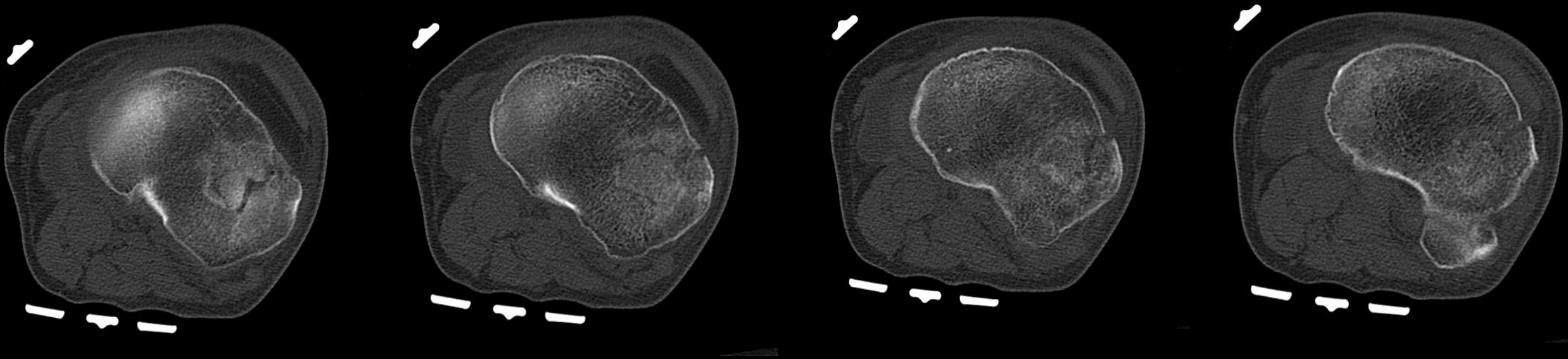
Initial Imaging



CT Left Knee Coronal Views

CT Left Knee Sagittal Views

Initial Imaging



CT Left Knee Axial Views

Key Imaging Findings

Findings

1. Depression fracture of the lateral tibial plateau, with comminution of the intercondylar notch.
2. Moderate knee joint hemarthrosis
3. Mild soft tissue swelling at the anterior aspect of the knee

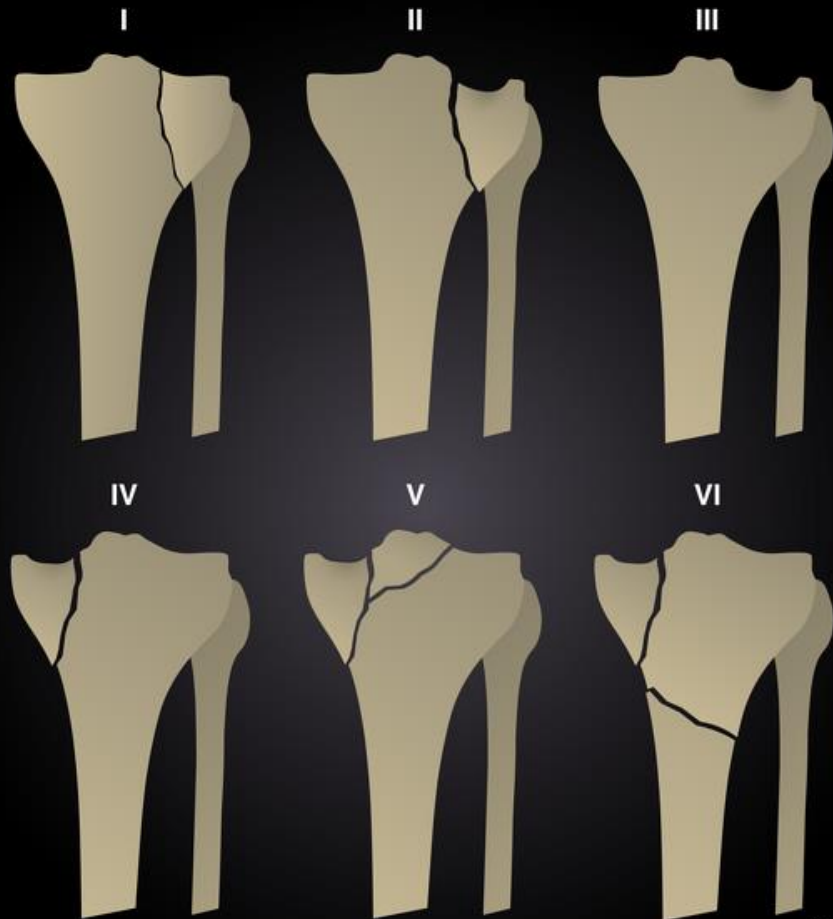
Other relevant findings:

- 1) Chondrocalcinosis of the medial compartment of the knee could represent CPPD
- 2) Pes anserine bursitis

Differential Diagnosis

- Tibial Spine Fracture or Nondisplaced Distal Femur Fracture
 - Initial plain radiographs don't always show definitive tibial plateau fracture. In the setting of acute traumatic injury to the knee with effusion and/or knee deformity, would need to investigate other sources of intra-articular fracture.
- Segond Fracture
 - Avulsion fracture of the lateral tibial plateau associated with ACL injury
- ACL or Meniscal Injury
 - Trauma to the knee with joint pain and effusion could be due to isolated ligamentous injury of the knee

Schatzker Classification



- Increasing number = increased severity and worse prognosis

Schatzker I: Lateral plateau split fracture

Schatzker II: Lateral plateau split-depressed fracture

Schatzker III: Lateral plateau pure depression fracture

Schatzker IV: Medial plateau fracture

Schatzker V: Bicondylar plateau fracture

Schatzker VI: Metaphyseal-diaphyseal dissociation

ACR Appropriateness

Variant 2: Adult or child 5 years of age or older. Fall or acute twisting trauma to the knee. One or more of the following: focal tenderness, effusion, inability to bear weight. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography knee	Usually Appropriate	⊕
Bone scan with SPECT or SPECT/CT knee	Usually Not Appropriate	⊕⊕⊕

Variant 6: Adult or child 5 years of age or older. Acute trauma to the knee. Mechanism unknown. Focal patellar tenderness, effusion, able to walk. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography knee	Usually Appropriate	⊕

Variant 7: Adult or child 5 years of age or older. Significant trauma to the knee (eg, motor vehicle accident, knee dislocation). Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography knee	Usually Appropriate	⊕
CTA lower extremity with IV contrast	Usually Appropriate	⊕⊕⊕
Arteriography lower extremity	May Be Appropriate	⊕⊕
CT knee with IV contrast	May Be Appropriate (Disagreement)	⊕
CT knee without IV contrast	May Be Appropriate	⊕
MRA knee without and with IV contrast	May Be Appropriate	○
MRI knee without IV contrast	May Be Appropriate	○
MRA knee without IV contrast	Usually Not Appropriate	○

ACR Appropriateness

Variant 3:

Adult or skeletally mature child. Fall or acute twisting trauma to the knee. No fracture seen on radiographs. Suspect occult fracture or internal derangement. Next study.

Procedure	Appropriateness Category	Relative Radiation Level
MRI knee without IV contrast	Usually Appropriate	0
CT knee without IV contrast	May Be Appropriate	⊕
Bone scan with SPECT or SPECT/CT knee	Usually Not Appropriate	⊖⊖⊖

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.

Procedure	Appropriateness Category	Relative Radiation Level
MRI knee without IV contrast	Usually Appropriate	0
CT knee without IV contrast	Usually Appropriate	⊕
Bone scan with SPECT or SPECT/CT knee	Usually Not Appropriate	⊖⊖⊖

Treatment Options

- Main keys for satisfactory long-term outcomes are restoration of joint stability and alignment
- Nonoperative
 - Conservative treatment with knee brace, partial weight bearing, and ROM exercises
 - Indicated in fractures that are low energy or minimally displaced, or in nonambulatory patients
- Operative
 - ORIF
 - Gold standard treatment used for plateau fractures
 - Can be immediate or delayed depending on extent of soft tissue injury
 - Arthroplasty
 - Especially useful in older patients with osteopenic/osteoporotic bone

Post-op Imaging



Discussion

- Tibial plateau fractures account for about 1% of all fractures
 - Typically sustained with high-energy mechanisms, with low energy mechanisms more common in elderly or osteoporotic patients
- Fracture can occur on the lateral aspect, the medial aspect, or be bicondylar
 - Incidence is lateral > bicondylar > medial
- Type II fractures are believed to comprise about 25% of all plateau fractures
 - 20% of patients have distraction injuries to the MCL or medial meniscus
- Soft tissue injury may occur more frequently than previously believed
 - In one study, 77% of patients with tibial plateau fractures sustained a complete tear or avulsion of one or more cruciate or collateral ligaments
 - 91% of patients had lateral meniscus pathology, 44% had medial meniscus tears

Discussion

- Plain radiographs are the initial imaging modality of choice
 - AP, lateral, and intercondylar notch views should be included
 - Tibial plateau fractures can sometimes be difficult to see on radiograph with a sensitivity of 85%
- If plateau fracture is identified on radiograph, a CT scan is typically done to further assess comminution, articular surface depression, fracture pattern, and to assist in surgical planning
 - Operative planning based on radiographs is changed in up to 60% of cases after CT and up to 21% of cases after MRI
- Although CT is usually the preferred follow-up imaging modality for plateau fractures, MRI can be used to more accurately evaluate damage to ligaments of the knee
 - One study found MRI to be as effective or better at determining degree of fracture displacement vs CT

Final Diagnosis

Schatzker II Lateral Tibial Plateau Fracture

Take Home Points / Teaching points

- Plain films are 85% sensitive for identifying tibial plateau fractures
 - Therefore, if high suspicion for fracture exists but radiographs are negative, CT/MRI can be indicated
- Schatzker Classification is applicable in about 90% of cases
- CT or MRI are better for demonstrating the extent of plateau depression and comminution of the fracture
 - MRI can better identify concomitant meniscal or ligamentous injury

References

- <https://radiopaedia.org/articles/tibial-plateau-fracture>
- <https://radiopaedia.org/articles/schatzker-classification-of-tibial-plateau-fractures>
- <https://www.statpearls.com/articlelibrary/viewarticle/30177/>
- <https://pubs.rsna.org/doi/full/10.1148/rg.292085078>
- <https://www.ajronline.org/doi/pdfplus/10.2214/ajr.163.1.8010201>
- [https://journals.lww.com/jorthotrauma/Abstract/2005/02000/The Incidence of Soft Tissue Injury in Operative.2.aspx](https://journals.lww.com/jorthotrauma/Abstract/2005/02000/The_Incidence_of_Soft_Tissue_Injury_in_Operative.2.aspx)
- https://bandj.scienceconnect.io/api/oauth/authorize?ui_locales=eng&scope=openid+settings+affiliations+login_method&response_type=code&redirect_uri=https%3A%2F%2Fonline.boneandjoint.org.uk%2Faction%2Fcallback&state=C3gmm_crltGxspGrAV8ARuTxnM_k0Pvh3jqXbYv3aZk&nonce=dtZAffhXMa3lxwAiofuoiw0SEgdskgZjcSyM3UTMr8%3D&prompt=none&client_id=bandj



Questions?