Proximal Tibial Fracture

Sally Choi
Date: 1/22/2020
RAD 3030
Dr. Manickam Kumaravel
History 12/20/2019

• 30s M
• Large tree limb fell on the patient when his neighbor was sawing a branch off a tree. EMS cut away parts of the tree limb to retrieve the patient
• Presents with L knee, neck, and back pain
• Physical Exam (related to knee) - large L knee swelling, TTP, ROM limited due to pain, right arm and lower chest wall TTP, non weight bearing
• L knee imaging: XR Knee 12/20/19, CT Knee with Contrast 12/21/19, MRI Knee 12/21/19
Differential Diagnosis for swollen knee

• Fracture/Broken Bones
• Hemarthrosis
• Torn Ligaments
• Joint Effusion
• Bursitis
XR Left Knee

Warning: Not for diagnostic use
XR Left Knee

Warning: Not for diagnostic use

Femur

Tibia

Fibula
XR Left Knee

Warning: Not for diagnostic use

- Medial Epicondyle
- Lateral Epicondyle
- Medial Condyle
- Lateral Condyle
- Tibial Plateau
- Intercondylar Eminence
- Lateral Condyle
- Head of Fibula

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• Mildly displaced fracture at the lateral condyle of the tibia
XR Left Knee

Warning: Not for diagnostic use

• Minimally displaced comminuted fracture of the head of the fibula
CT Knee w/o Contrast - Coronal

Posterior Lateral

Posterior Medial
CT Knee w/o Contrast - Coronal
CT Knee w/o Contrast - Coronal

Posterior Tibial Plateau

Proximal Fibula
Soft Tissue on CT - Sagittal

Warning: Not for diagnostic use

T2-weighted sagittal image of normal ACL

Soft Tissue on CT - Sagittal

Warning: Not for diagnostic use

T2-weighted sagittal image of normal ACL

Key imaging findings

• Bone fragment from tibia off posterior margin of medial tibial plateau and posterior lateral margin lateral tibial plateau
• Depression of the posterior tibial plateau.
• Comminuted fractures of the proximal fibula with minimal displacement.
• Suppected ACL and PCL injury
Segond Fracture

- An avulsion fracture (ligament pulls on bone) of the knee that involves the lateral aspect of the tibial plateau associated with ACL injury

- Possible ligaments responsible: lateral capsular ligaments, iliotibial band and anterior oblique band of the fibular collateral ligament

Case courtesy of Dr Maulik S Patel, Radiopaedia.org, rID: 9758
https://radiopaedia.org/articles/segond-fracture?lang=us
Schatzker Classification of Tibial Plateau Fractures

• 6 types:

Final Diagnosis

- Segond Fracture. Schatzker type II type of fracture of left tibia.
- Comminuted fractures of the proximal fibula with minimal displacement.
- Suspected ACL and PCL injuries (full thickness midsubstance ACL rupture and partial thickness tearing of the anterolateral bundle of the tibial attachment of the PCL confirmed on MRI 12/21/19)
MRI Left Knee

Warning: Not for diagnostic use

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### ACR Appropriateness Criteria – Acute Trauma to the Knee

**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.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
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</thead>
<tbody>
<tr>
<td>Radiography knee</td>
<td>Usually 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 with IV contrast</td>
<td>Usually Not Appropriate</td>
<td>★</td>
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<td>CT knee without and with IV contrast</td>
<td>Usually Not Appropriate</td>
<td>★</td>
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<tr>
<td>CT knee without IV contrast</td>
<td>Usually Not Appropriate</td>
<td>★</td>
</tr>
<tr>
<td>MR arthrography knee</td>
<td>Usually Not Appropriate</td>
<td>★</td>
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<tr>
<td>MRA knee without and with IV contrast</td>
<td>Usually Not Appropriate</td>
<td>★</td>
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<tr>
<td>MRA knee without IV contrast</td>
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<tr>
<td>MRI knee without and with IV contrast</td>
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<td>★</td>
</tr>
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<td>MRI knee without IV contrast</td>
<td>Usually Not Appropriate</td>
<td>★</td>
</tr>
<tr>
<td>US knee</td>
<td>Usually Not Appropriate</td>
<td>★</td>
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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.

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<tr>
<td>MRI knee without IV contrast</td>
<td>Usually Appropriate</td>
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<tr>
<td>CT knee without IV contrast</td>
<td>Usually Appropriate</td>
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</table>
Cost - Inpatient at MHH (knee)

- KNEE 3 VIEWS UNILATERAL - $770
- CT LOWER EXT W/O CON UNILAT - $3,078
- MRI LOWER EXT JOINT W/O-W UNI - $6,232
- TOTAL: $10,080
Cost - Inpatient at MHH (all imaging)

- Chest 1 view (x4) = $683x4 = $2,732
- Ankle 3 views = $847
- Elbow 3 views = $825
- Femur series - $919
- Humerus 2 views - $797
- Knee 3 views = $770
- NO READ Fluoro assist to 1 hour = $1450
- Pelvis AP = $845
- Shoulder 1 view = $629.25
- Shoulder series (x2) = $882.25x2 = $1,764.5
- Tibia fibula series - $742
- Chest/Abd/Pelvis w/ con CT – $7,998
- CT head or B w/o (x2) = $3,157x2 = $6,314
- CTA Head/Neck CT = $4,460
- Knee wo contrast w/ 3D CT = $3,078
- Shoulder wo contrast w/ 3D CT = $3,837
- Spine cervical wo contrast CT (x2) = $4,057x2 = $8,114
- Abdomen 1 v for Placement = $1,148
- MR Knee without contrast = $6,232
- MRI spine ce w/o = $6,389
- Spine Cranio-junction wo contrast MR = ?? $6,389

- TOTAL: $66,279.75
Take Home Points

• Be able to identify Segond fractures and classify into Schatzker types
• CT studies can be used to evaluate soft tissue as well as bones
• Use clinical acumen to look for associated injuries (such as ACL injury with Segond fracture)
References

- https://radiopaedia.org/articles/segond-fracture?lang=us
- https://acsearch.acr.org/docs/69419/Narrative/
- https://www.memorialhermann.org/patients-caregivers/memorial-hermann-charge-master/