Proximal Tibial Fracture

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RAD 3030

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History 12/20/2019

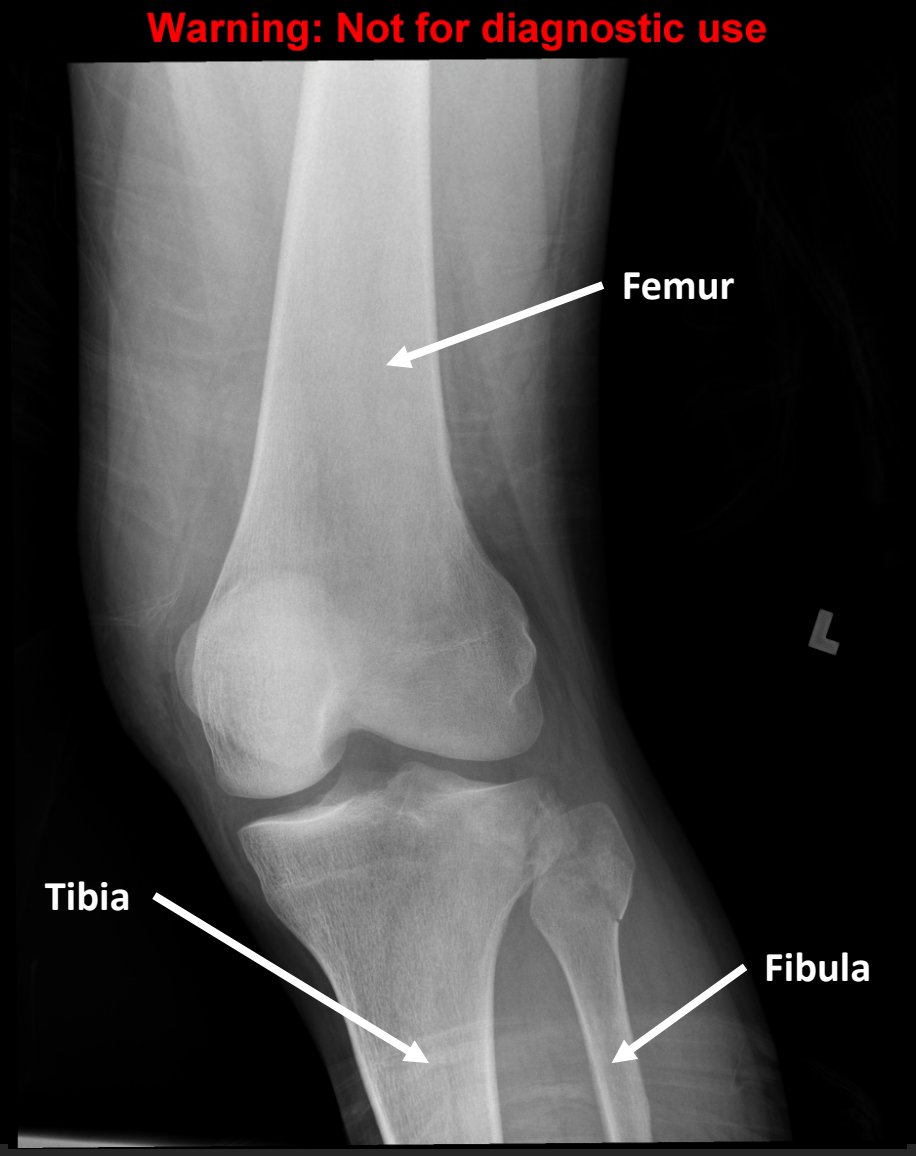
- 30s M
- Large tree limb fell on the patient when his neighbor was sawing a branch off a tree. EMS cut away parts of the tree limb to retrieve the patient
- Presents with L knee, neck, and back pain
- **Physical Exam** (related to knee) - large L knee **swelling**, TTP, ROM limited due to pain, right 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

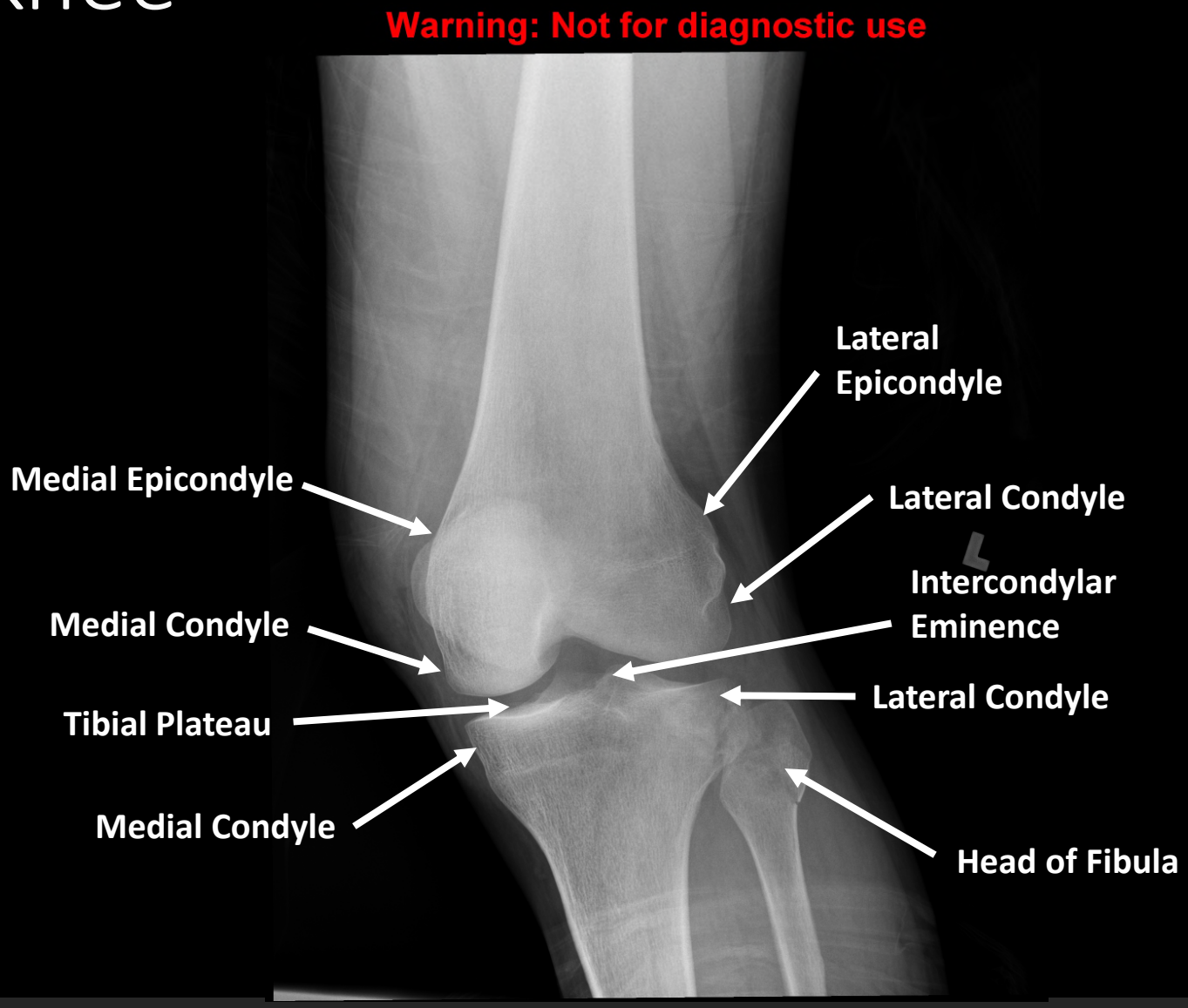
- Fracture/Broken Bones
- Hemarthrosis
- Torn Ligaments
- Joint Effusion
- Bursitis

XR Left Knee

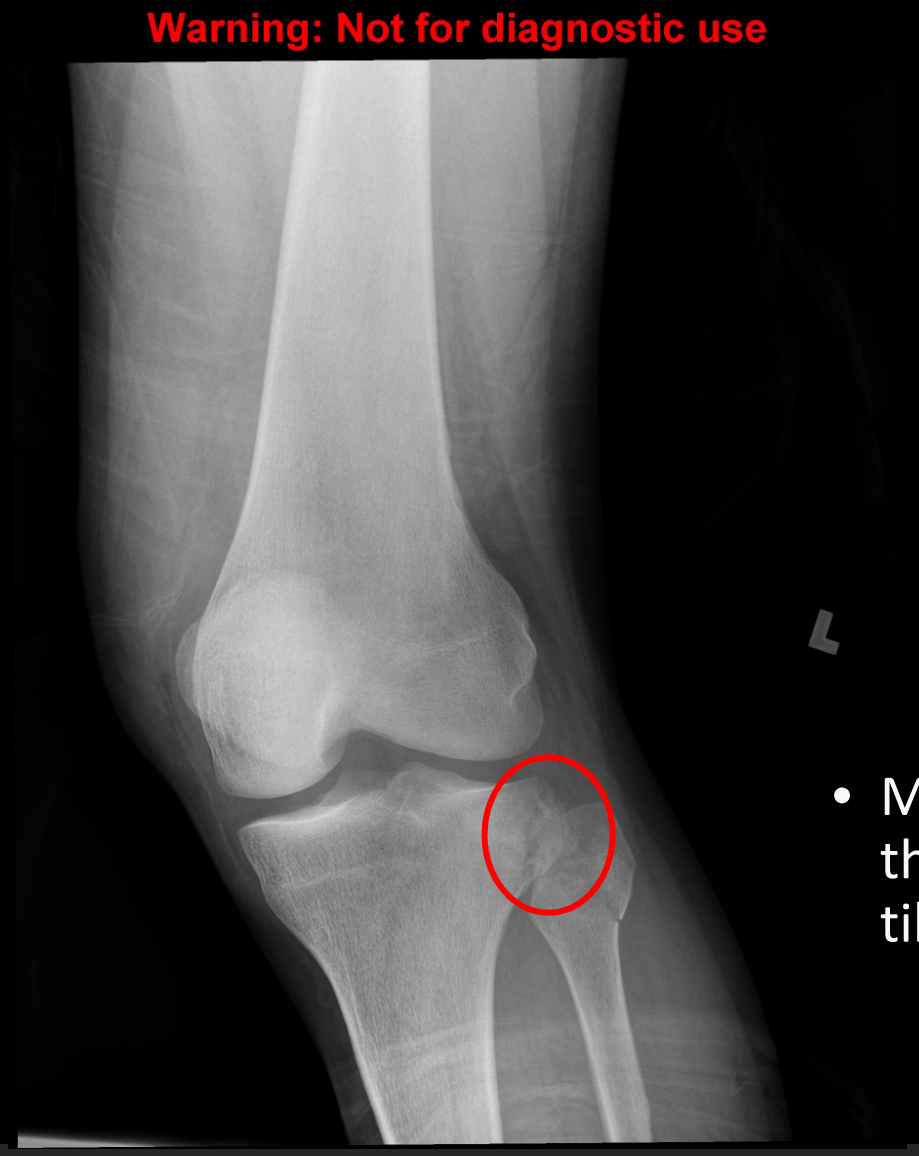
XR Left Knee



XR Left Knee

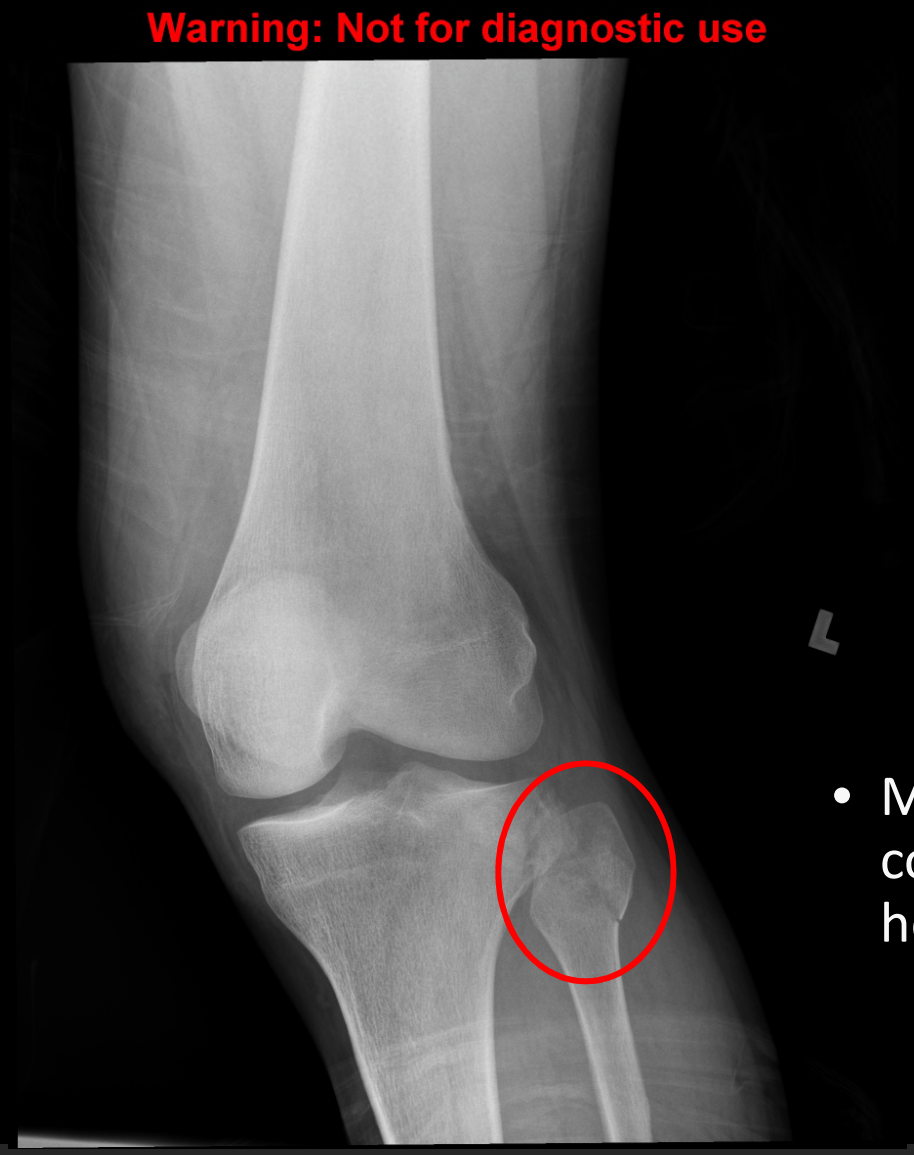

Warning: Not for diagnostic use
Lateral Epicondyle
Medial Epicondyle
Lateral Condyle
Intercondylar Eminence
Medial Condyle
Lateral Condyle
Tibial Plateau
Medial Condyle
Head of Fibula

XR Left Knee



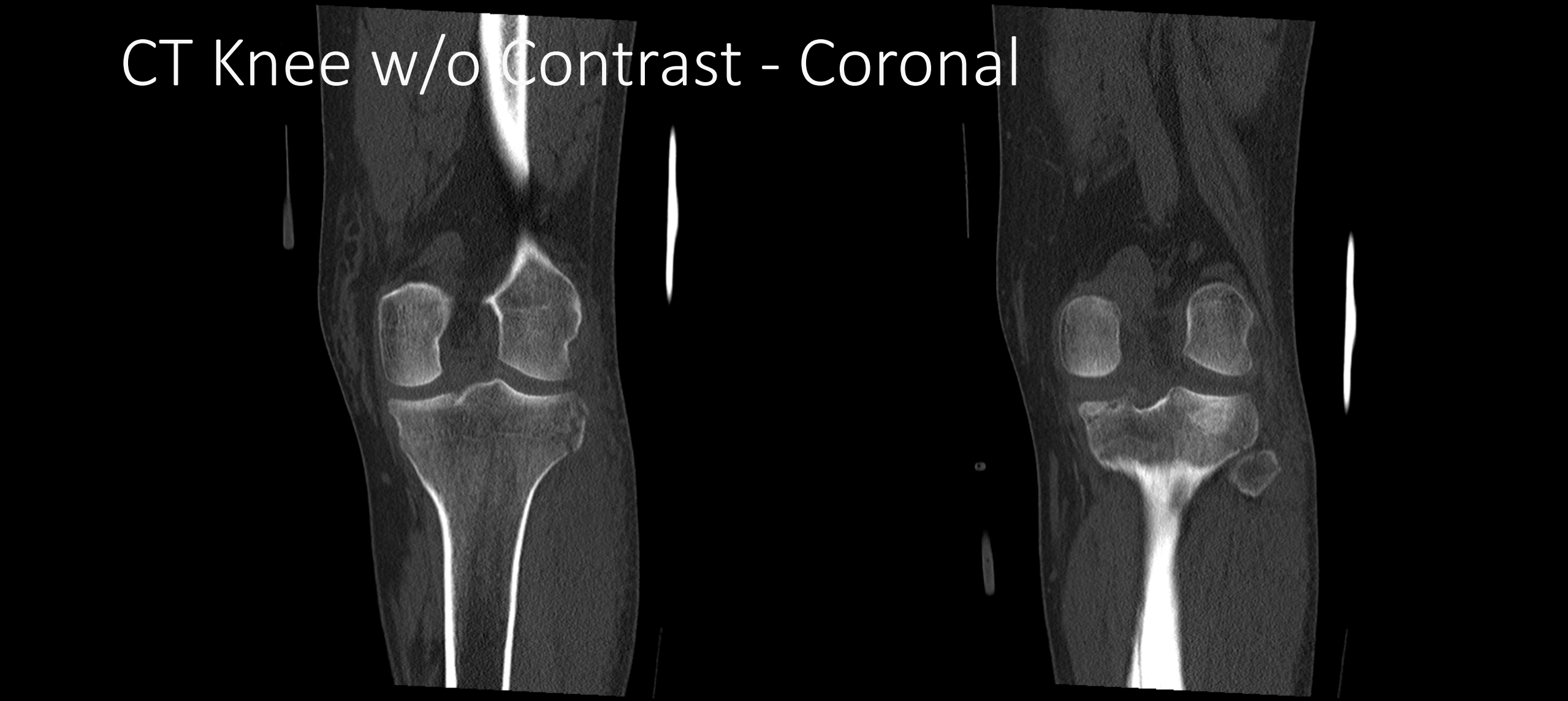
- Mildly displaced fracture at the lateral condyle of the tibia

XR Left Knee

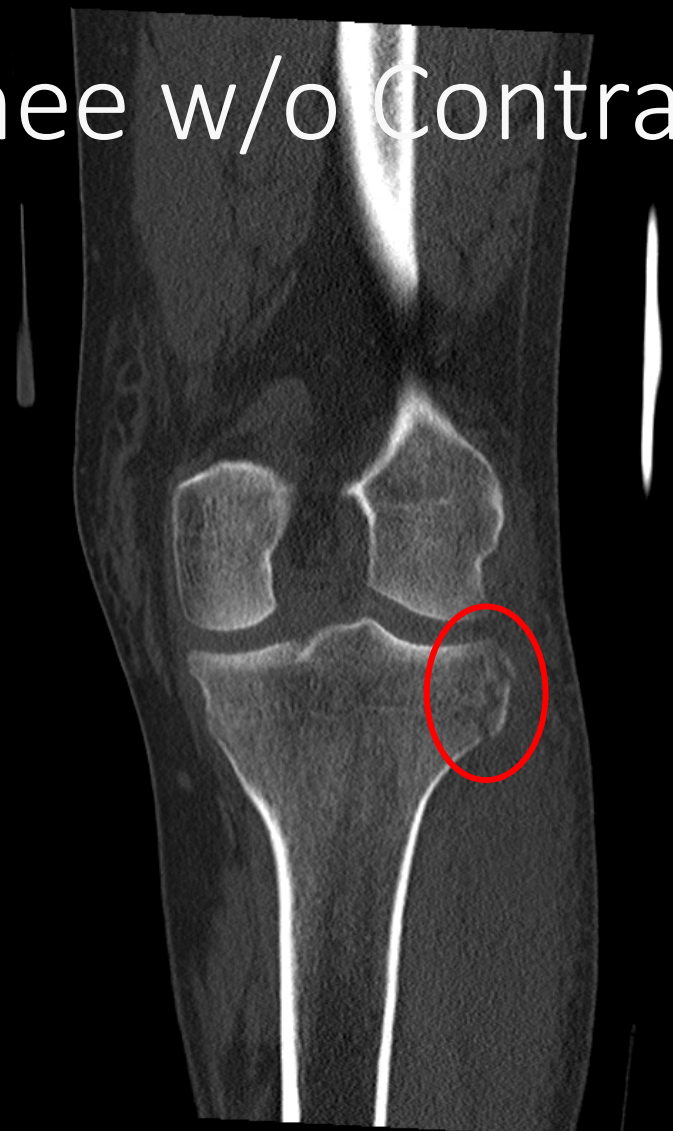


- Minimally displaced comminuted fracture of the head of the fibula

CT Knee w/o Contrast - Coronal



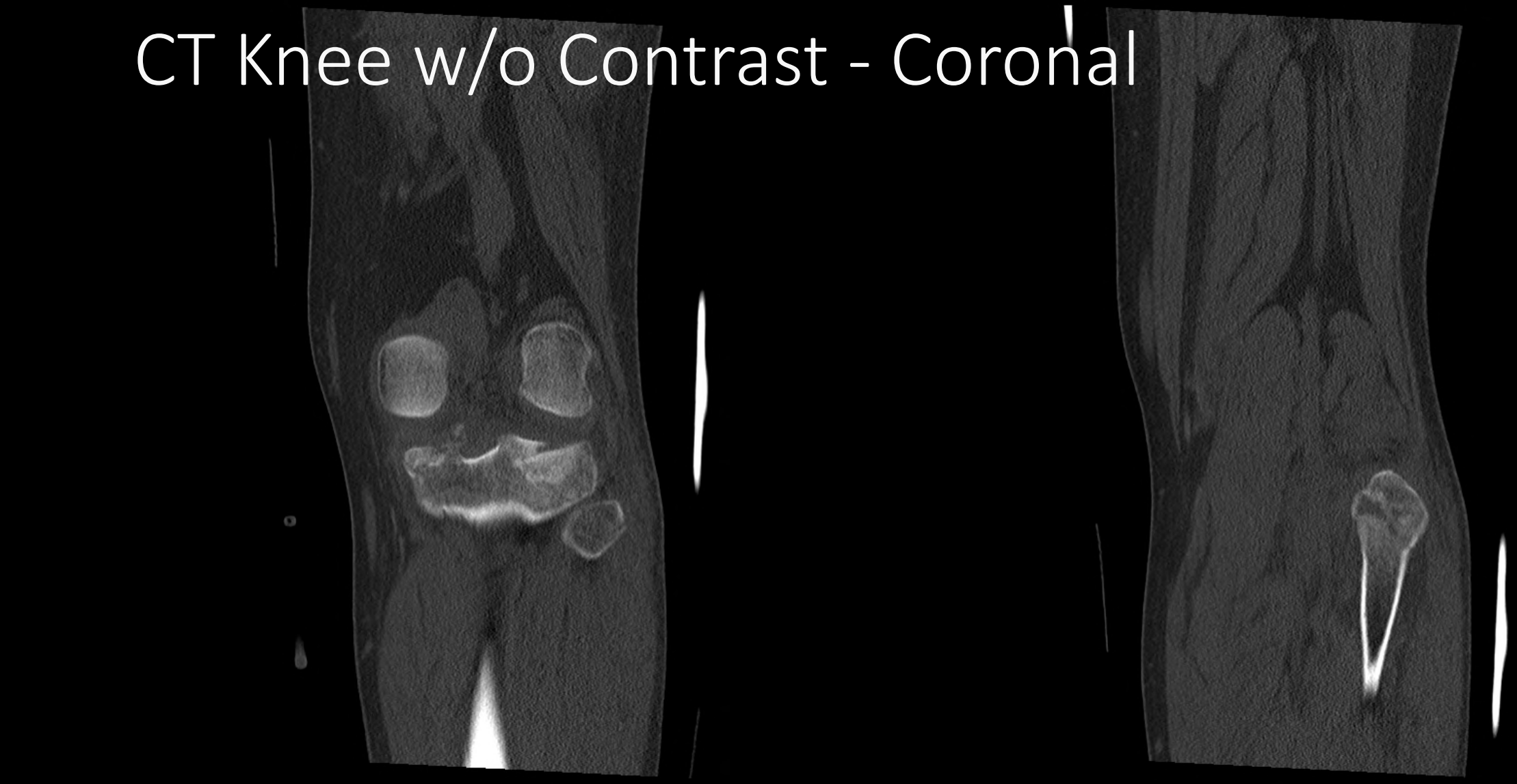
CT Knee w/o Contrast - Coronal



Posterior Lateral

Posterior Medial

CT Knee w/o Contrast - Coronal



CT Knee w/o Contrast - Coronal

Posterior Tibial Plateau

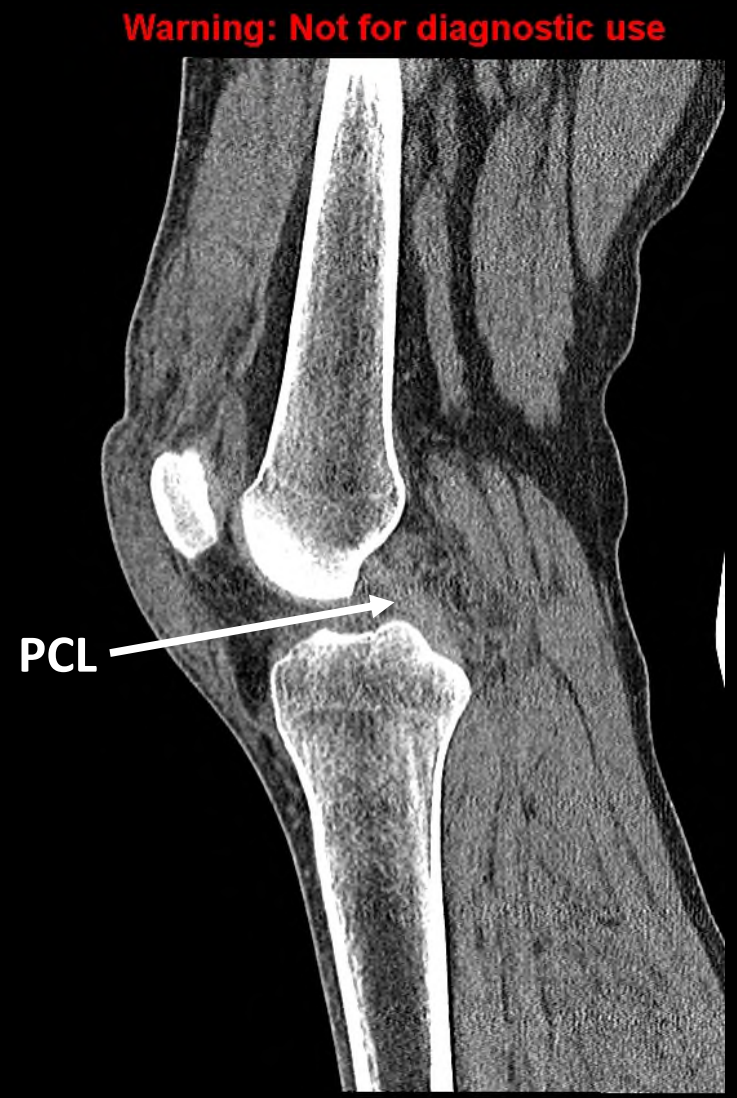
Proximal Fibula

Soft Tissue on CT - Sagittal

T2-weighted sagittal image of normal ACL

https://www.jbsr.be/articles/10.5334/jbr-btr.1197/

Soft Tissue on CT - Sagittal



T2-weighted sagittal image of normal ACL

https://www.jbsr.be/articles/10.5334/jbr-btr.1197/

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.
- Supsected ACL and PCL injury

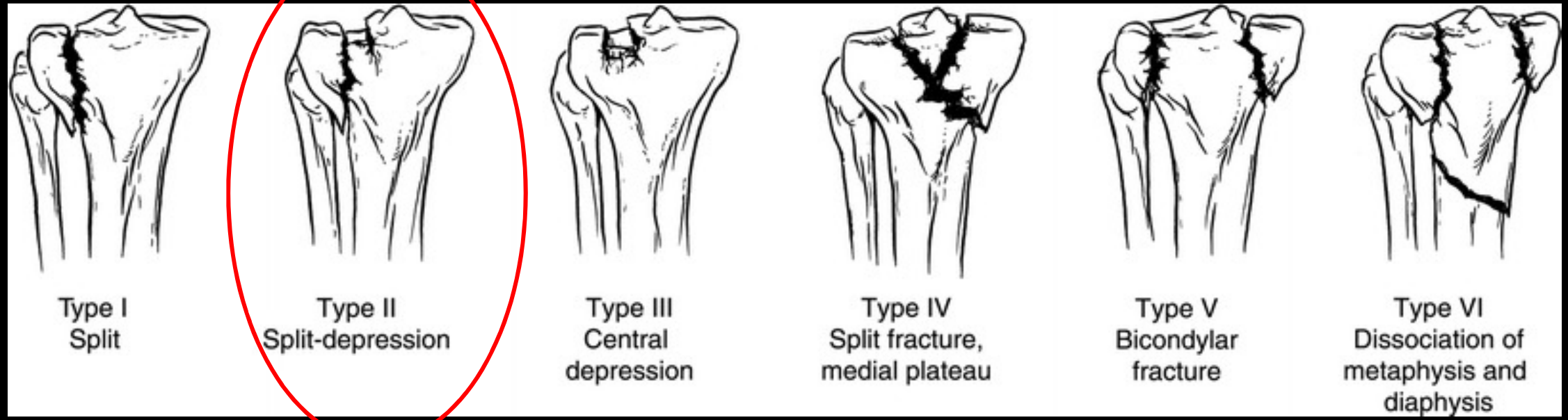
Segond Fracture

- 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:

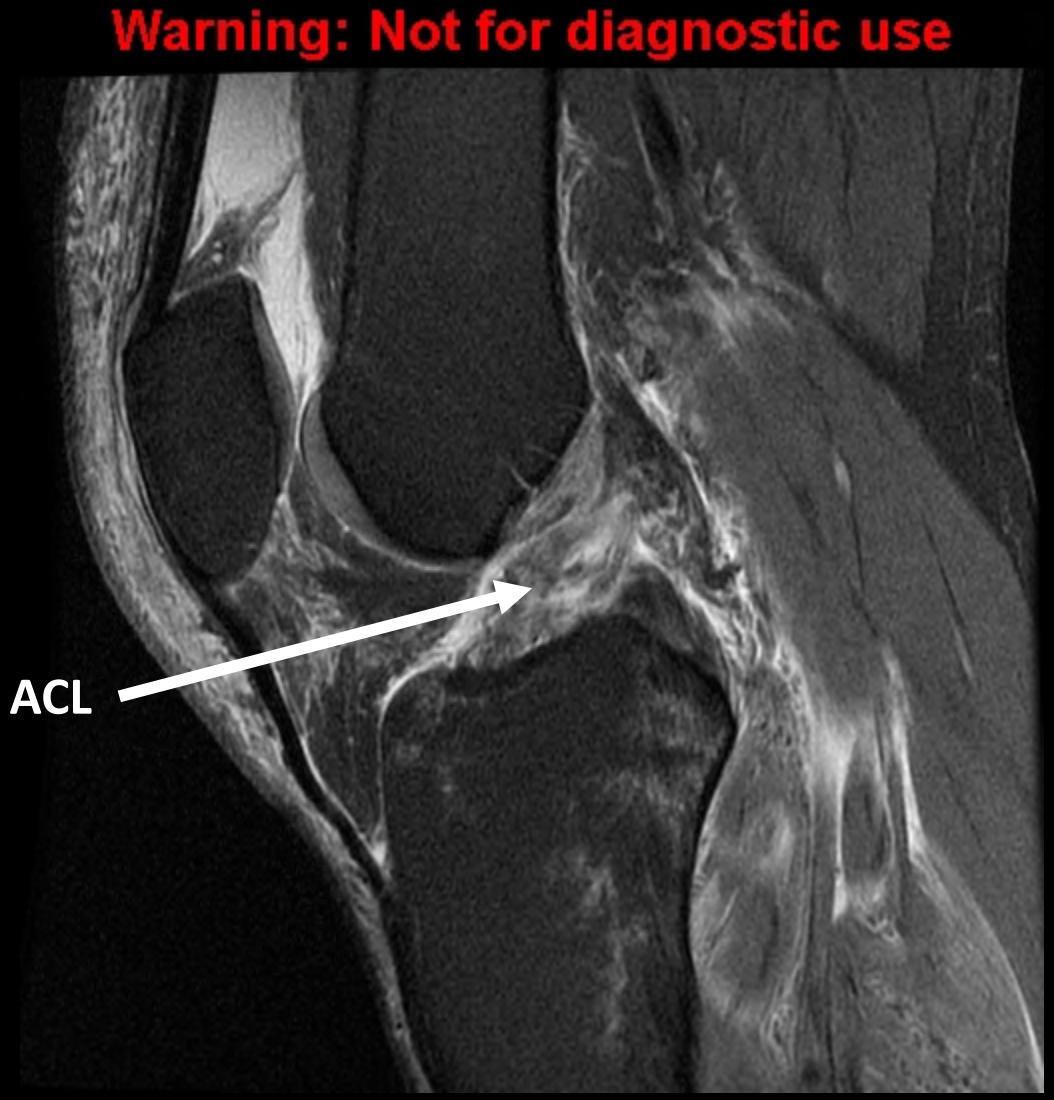


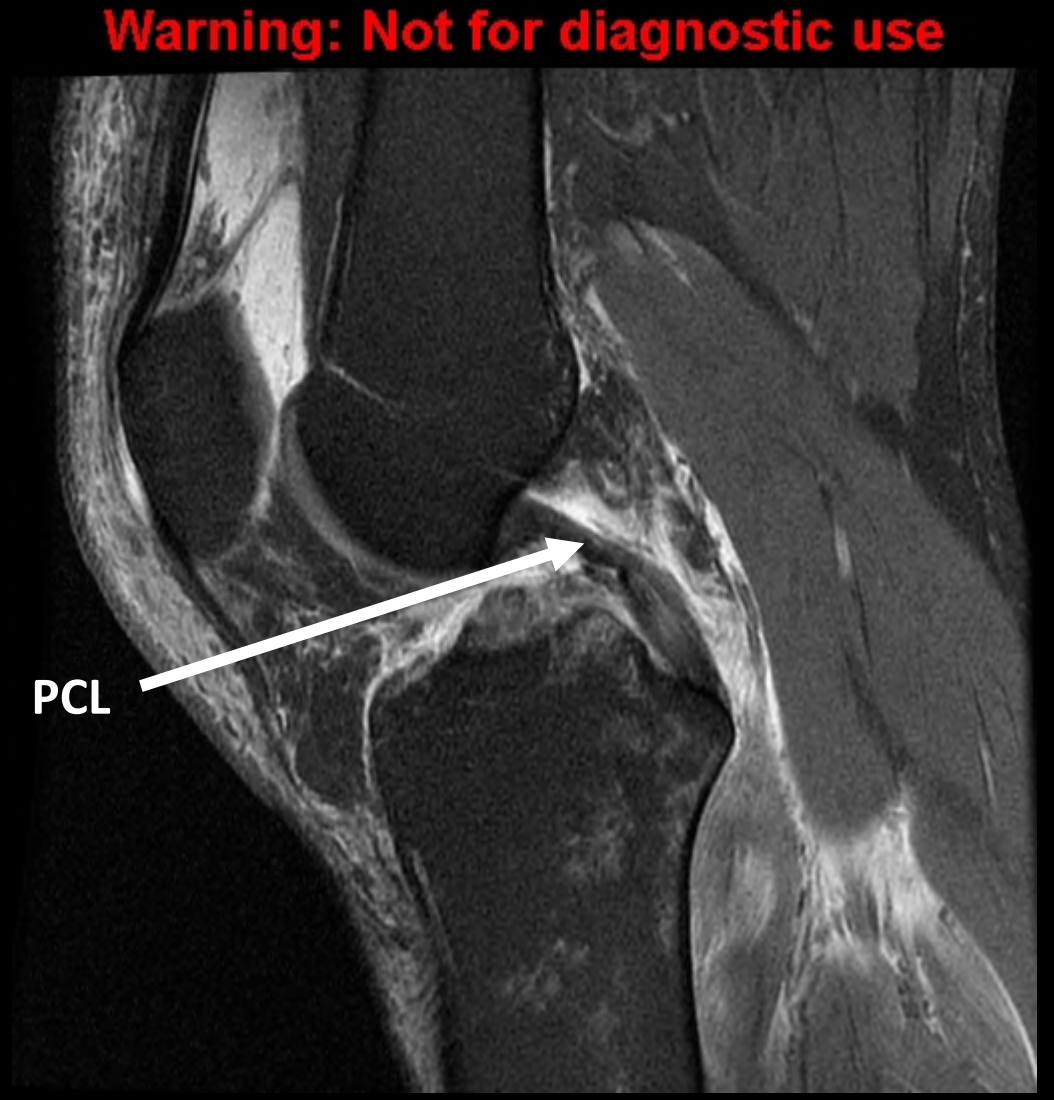
https://www.grepmed.com/images/2253/classification-tibialplateau-orthopedics-diagnosis-schatzker-fractures

Final Diagnosis

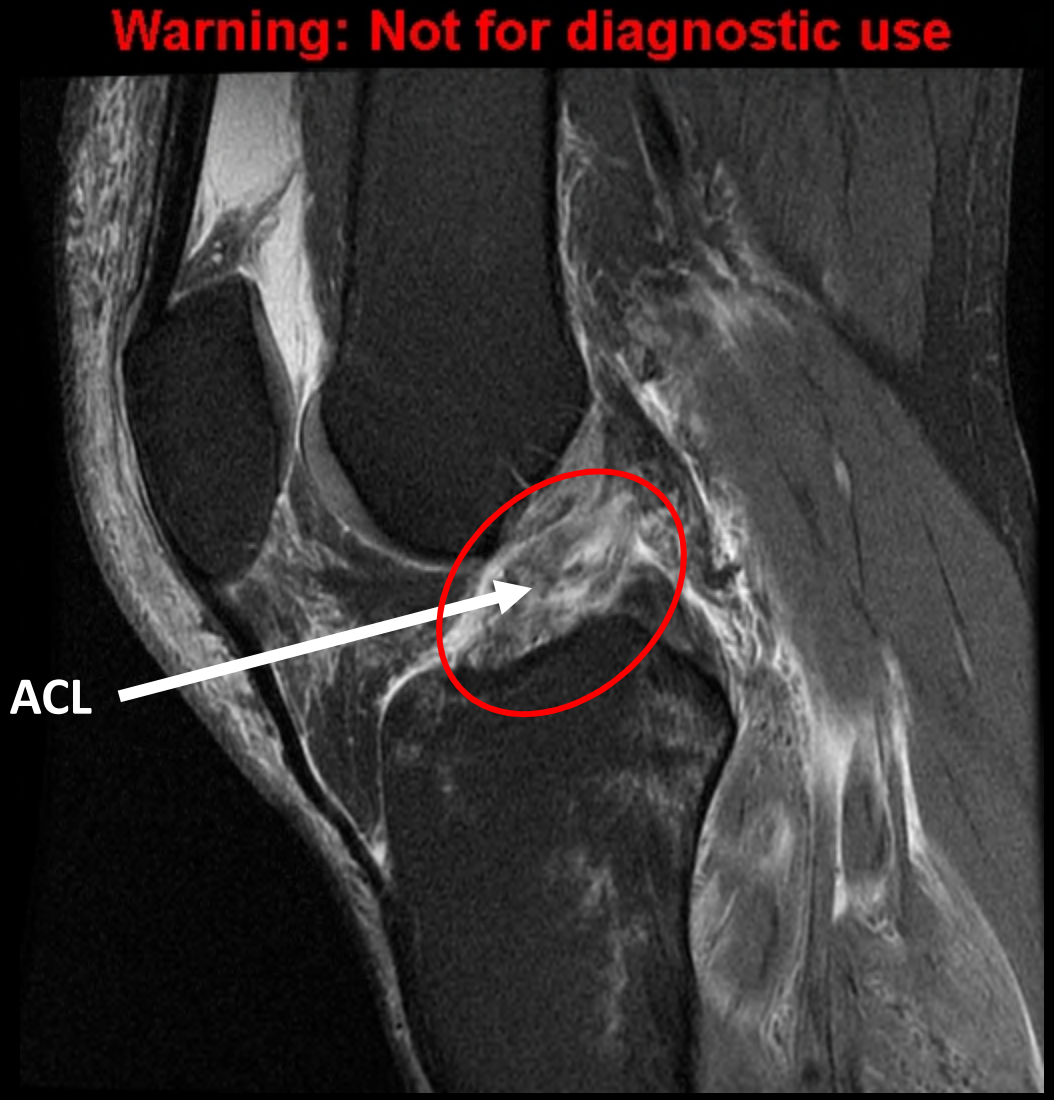
- Segond Fracture. Schatzker type II type of fracture of left tibia.
- Comminuted fractures of the proximal fibula with minimal displacement.
- Suspected ACL and PCL injuries (full thickness midsubstance ACL rupture and partial thickness tearing of the anterolateral bundle of the tibial attachment of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

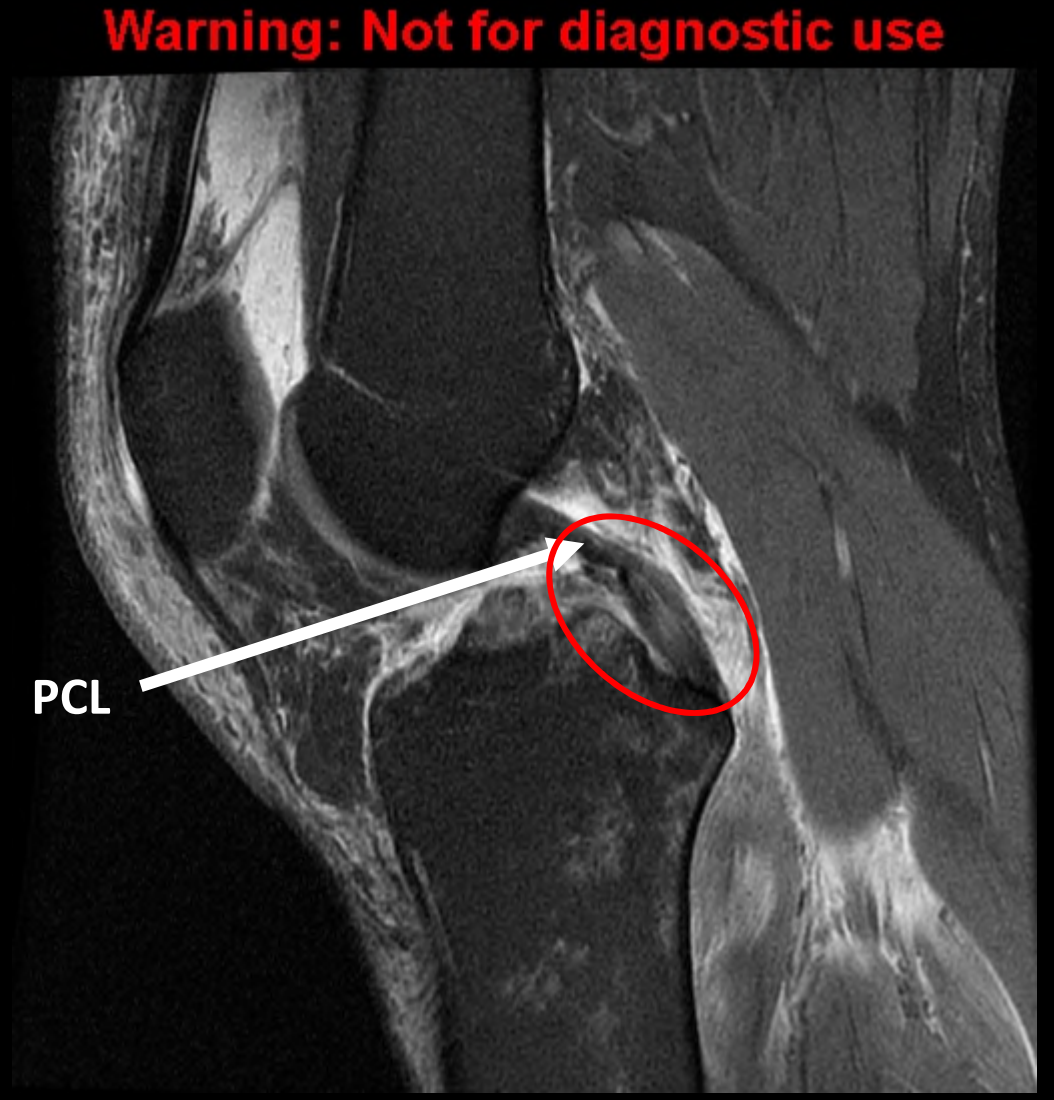
MRI Left Knee





MRI Left Knee





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.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography knee	Usually Appropriate	☢
Bone scan with SPECT or SPECT/CT knee	Usually Not Appropriate	☢☢☢
CT knee with IV contrast	Usually Not Appropriate	☢
CT knee without and with IV contrast	Usually Not Appropriate	☢
CT knee without IV contrast	Usually Not Appropriate	☢
MR arthrography knee	Usually Not Appropriate	O
MRA knee without and with IV contrast	Usually Not Appropriate	O
MRA knee without IV contrast	Usually Not Appropriate	O
MRI knee without and with IV contrast	Usually Not Appropriate	O
MRI knee without IV contrast	Usually Not Appropriate	O
US knee	Usually Not Appropriate	O

ACR appropriateness Criteria – Acute Trauma to the Knee

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	O
CT knee without IV contrast	Usually Appropriate	☢
Bone scan with SPECT or SPECT/CT knee	Usually Not Appropriate	☢☢☢
CT knee with IV contrast	Usually Not Appropriate	☢
CT knee without and with IV contrast	Usually Not Appropriate	☢
MR arthrography knee	Usually Not Appropriate	O
MRA knee without and with IV contrast	Usually Not Appropriate	O
MRA knee without IV contrast	Usually Not Appropriate	O
MRI knee without and with IV contrast	Usually Not Appropriate	O
US knee	Usually Not Appropriate	O

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://radiopaedia.org/articles/schatzker-classification-of-tibial-plateau-fractures-1?lang=us
- https://www.grepmed.com/images/2253/classification-tibialplateau-orthopedics-diagnosis-schatzker-fractures
- https://www.jbsr.be/articles/10.5334/jbr-btr.1197/
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