

Acute Traumatic Patellar Tendon Rupture

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RAD 4001

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Clinical History

- 18 yo M who reportedly got into a physical altercation and fell directly onto his R knee 3 days before arrival to the ED
 - unable to bear weight, “knee feels unstable”
- Relevant SHx: ACL reconstruction utilizing patellar tendon autograft in addition to LCL reconstruction 3 years ago
- Physical Exam:
 - Vitals WNL
 - Mild R knee effusion, -ecchymosis
 - R anterior knee tenderness
 - Palpable gap inferior to patella
 - Limited ROM (unable to extend knee; normal knee flexion)
 - Distal pulses 2+
 - R LE compartments soft

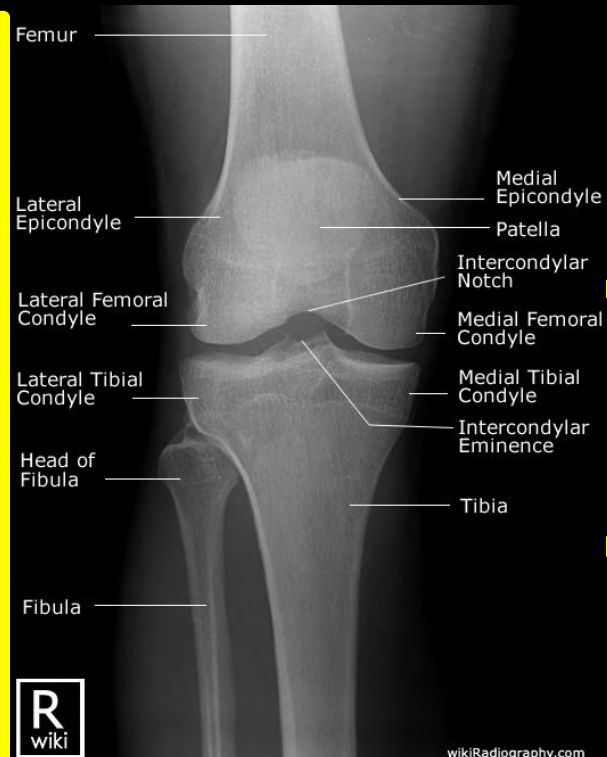
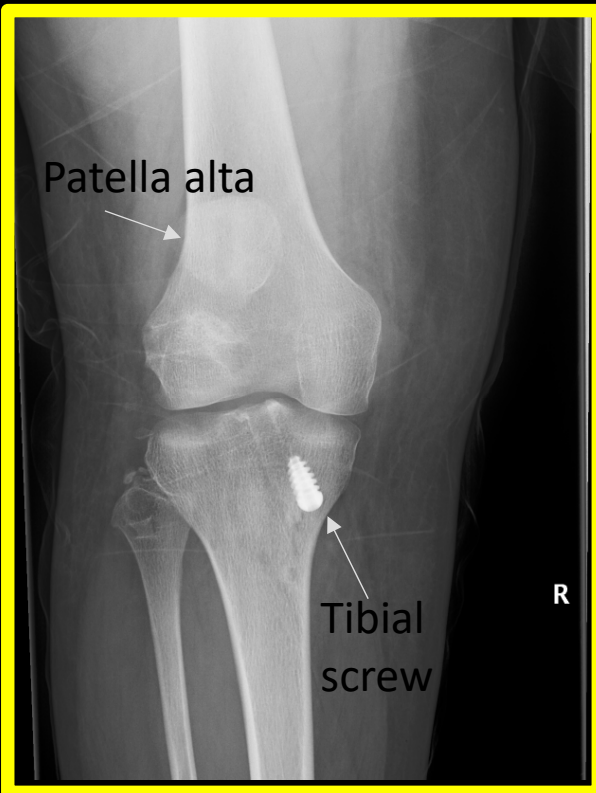
Differential Diagnoses

- Patellar tendon rupture
- Patellar tendon partial tear
- ACL reconstruction re-rupture (does not fit imaging)
- Tibial tubercle avulsion fracture
- Patella sleeve fracture

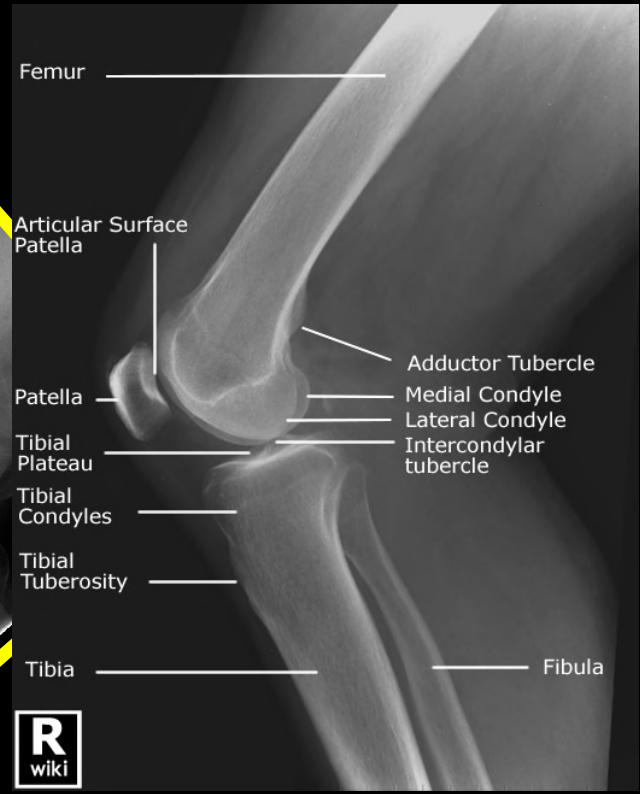
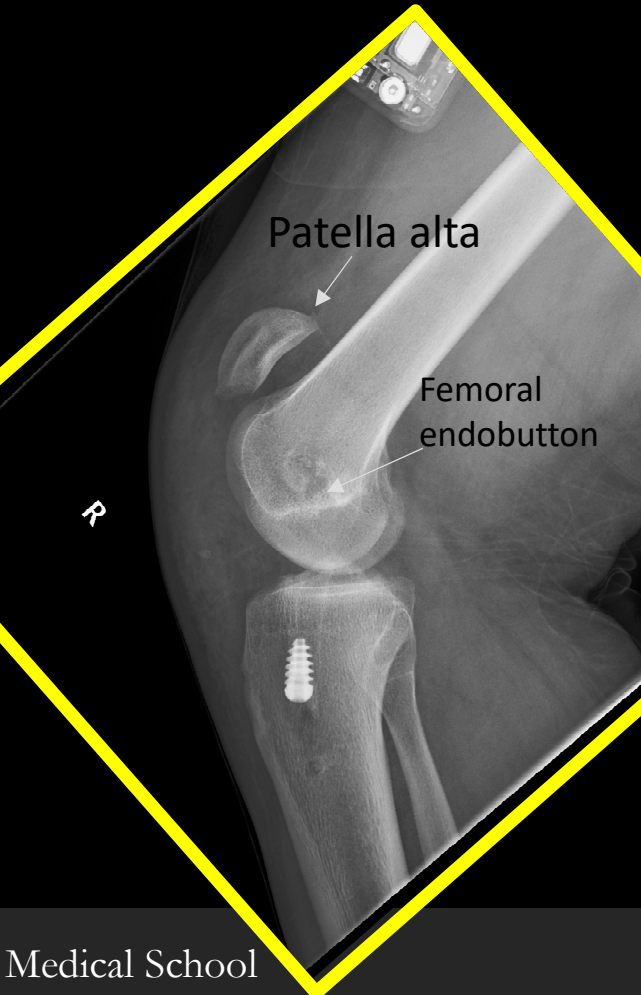
AP and Lateral Xrays of R knee



AP and Lateral Xrays of R knee (1/27/2020)



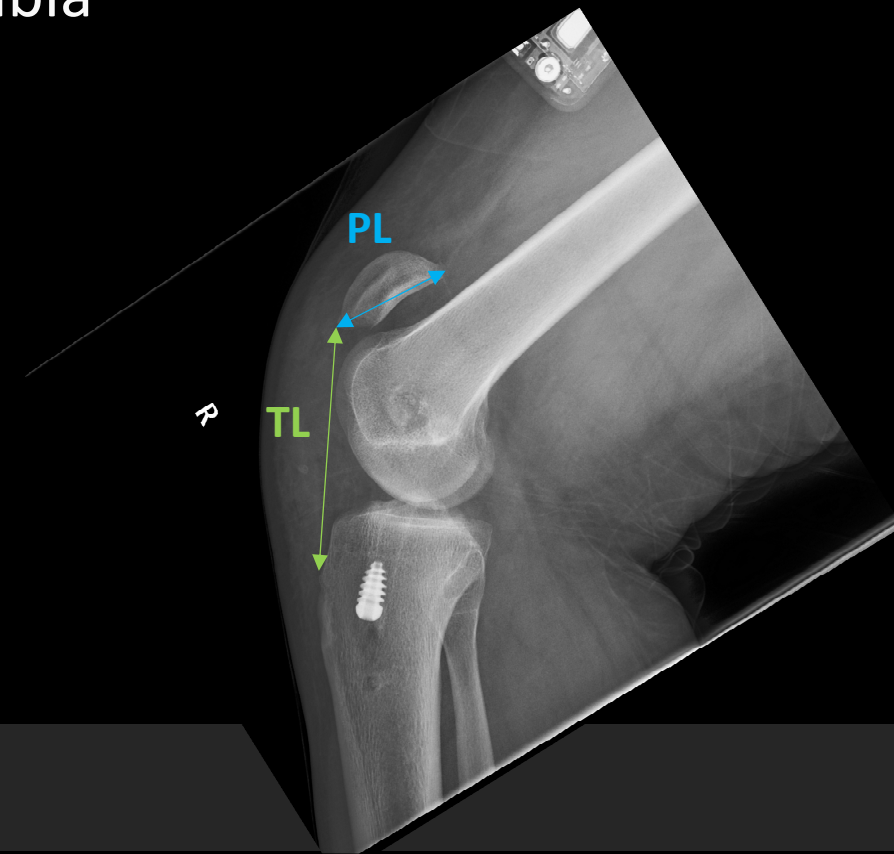
[http://www.wikiradiography.net/page/Knee+\(non+trauma\)+Radiographic+Anatomy](http://www.wikiradiography.net/page/Knee+(non+trauma)+Radiographic+Anatomy)



<http://www.wikiradiography.net/page/lateral+knee+radiography>

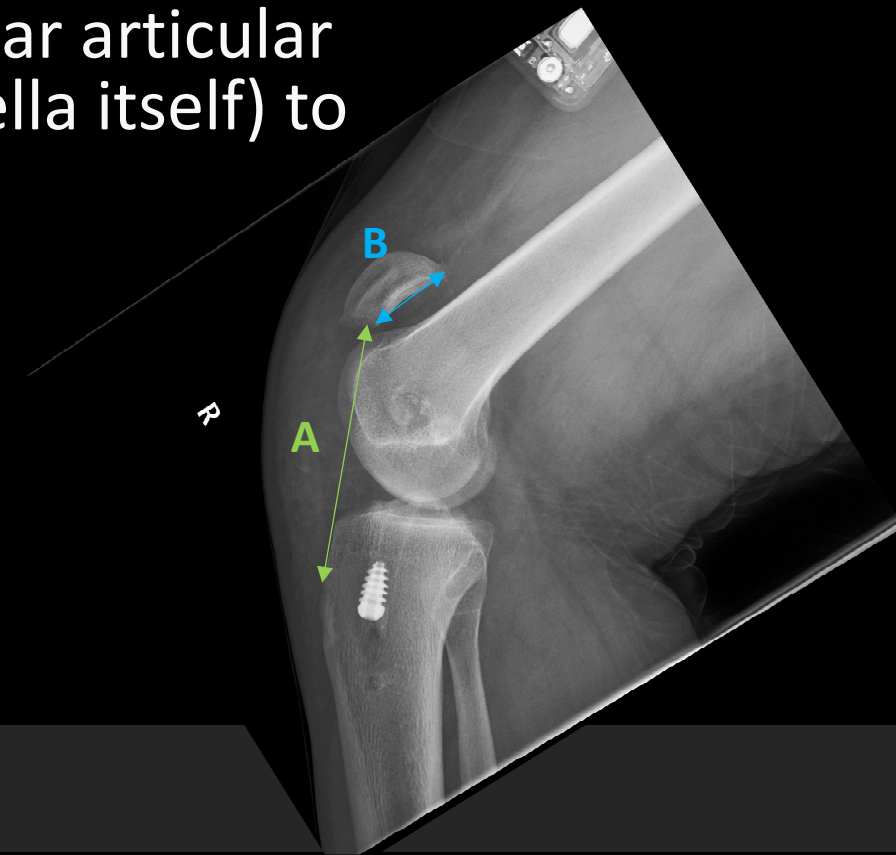
Insall-Salvati Ratio

- **TL/PL (with 30 degree knee flexion on lateral view)**
- **Patella Tendon Length (TL)** = length of posterior surface of patellar tendon from lower pole of patella to insertion site on tibia
- **Patella Length (PL)** = greatest pole to pole length
- Normal TL/PL = 0.8-1.2
- Patella Alta > 1.2
- Patella Baja < 0.8
- **Our patient = 2.3**

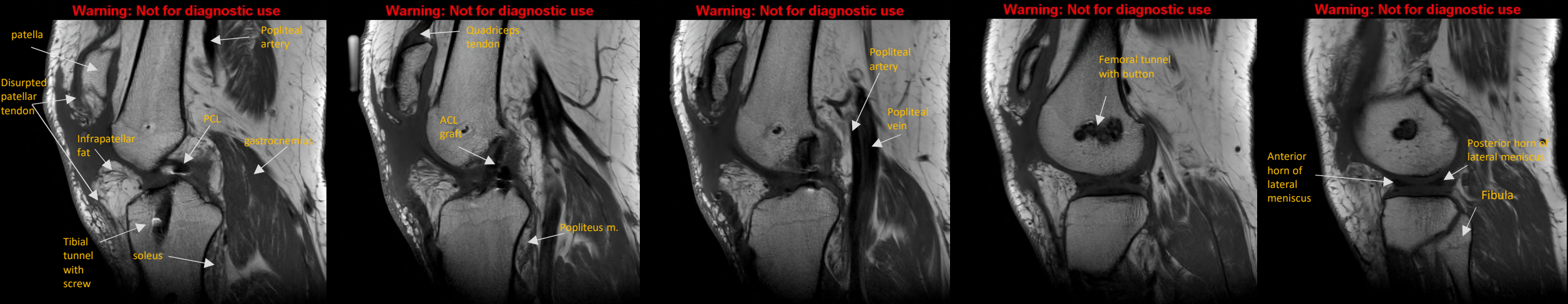


Modified Insall-Salvati Ratio

- **A/B (with 30 degree knee flexion on lateral view)**
- **A** = distance from the inferior margin of the patellar articular surface (as opposed to the lower pole of the patella itself) to the patellar tendon insertion
- **B** = length of the patellar articular surface
- Normal A/B = 1.25
- Patella Alta > 2.0
- **Our patient = 2.625**



Sagittal Proton Density (PD) Weighted MRI



- Balance of T1 and T2 weighting → results in image that derives contrast based on number of protons in each tissue
- Great at delineating hyaline and fibrocartilage → excellent for assessing joint pathology (meniscal tears, articular cartilage abnormalities)
- Less sensitive for marrow and edema pathology

Fat → high/intermediate signaling
Fluid → intermediate signaling

Sagittal T2 STIR MRI

Warning: Not for diagnostic use



Effusion following injury

Fat suppressed sequence that results in dark cortical bone/marrow

- T2 → fluid is bright
- STIR = “Short Tau Inversion Recovery” → suppresses fat signal → allows for GREATER contrast with any edematous process

Fat → very low signaling
Fluid → very high signaling

Key Findings

- Disrupted patellar tendon proven by increased Insall-Salvati ratio on lateral radiograph and tendon disruption with joint effusion seen on PD and T2 STIR sequences of MRI
 - In support of physical exam findings (inability to bear weight and palpable gap inferior to patella), as well as mechanism of injury (direct anterior blow to knee during fall)

Discussion

- Pathophysiology of patellar tendon rupture:
 - Tensile overload of extensor mechanism (quadriceps m., quadriceps tendon, patella, patellar tendon, tibial tubercle) → most occur with knee in flexed position (greatest forces on tendon when knee flexion >60 degrees)
 - Patient could have been at higher risk due to previous surgery of ACL reconstruction using patella tendon autograft
- No further work up needed if complete tendon rupture is confirmed on imaging → continue with treatment

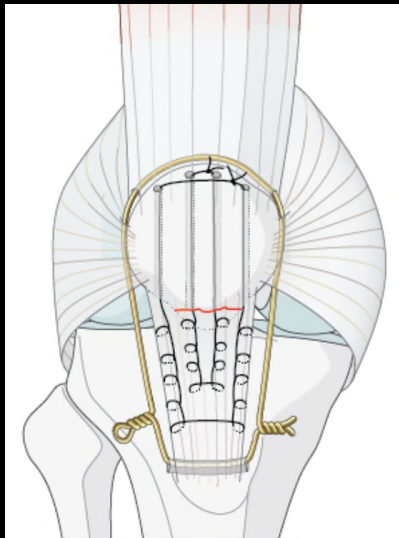
Final Diagnosis

Right complete proximal patella tendon tear

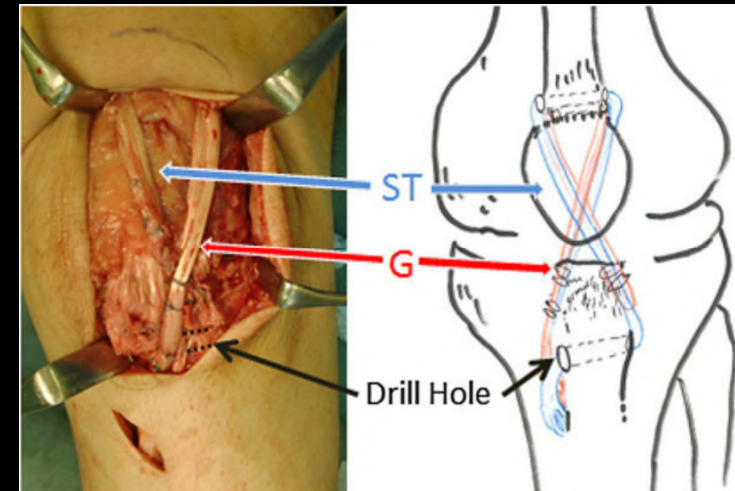
Treatment

- Due to COMPLETE rupture rather than partial, management includes operative repair options:
 - 1) primary repair: end-to-end repair, suture-anchor tendon repair
 - Our patient had primary repair (shown below)
 - 2) tendon reconstruction: can use semitendinosus or gracilis tendon autograft

Krackow stitch →



https://www2.aofoundation.org/wps/portal/lut/p/a1/04_S9CPyKssy0xPLMhMz0vMAYGzrOKN_AOM3D2DDb29_UMMDRyDXQ3dw9wMDA:MNYEKivEccDQnTr880UboQEH_OW5okADA4ENa5/d15/d5/L2dJOseVUUt3Q580SmIFLto2XzJPMDBH5VMwS09PVDEwQVNFMuWwRjAwMDcz/7showPage=redfix&bone=Knee&segment=Patella&classification=34-Extraarticular,%20Avulsion&treatment=-&method=Suture%20repair&implantsttype=-&approach=-&redfix_url=1524138057991



https://www.researchgate.net/figure/Reconstruction-of-the-patellar-tendon-using-semitendinosus-and-gracilis-tendons-with_fig1_273657944

ACR Appropriateness Criteria

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	○
MRA knee without and with IV contrast	Usually Not Appropriate	○
MRA knee without IV contrast	Usually Not Appropriate	○
MRI knee without and with IV contrast	Usually Not Appropriate	○
MRI knee without IV contrast	Usually Not Appropriate	○
US knee	Usually Not Appropriate	○

- 1) Patient received radiograph first in the ED
- 2) Elevated Insall-Salvati ratio causing high suspicion for tendon tear (either complete or partial)
- 3) Then sent for MRI to confirm complete or partial tear for management/treatment

Costs

- National average knee radiograph cost = ~\$200
- National average inpatient knee MRI cost = \$2,250

Total cost = \$2,450

*retrieved from NewChoiceHealth.com

Take Home Points

- Routine evaluation following trauma or sports related injury to the knee includes radiographs followed by fat suppressed PD-weighted sequences, sagittal PD- and T2-weighted sequences
- PD MRI sequence great at assessing joint pathology and anatomy due to advanced delineation in hyaline and fibrocartilage
- T2 MRI sequences excellent for fluid/edema as well as assessment of ligamentous and tendinous structures
- T2 STIR MRI suppresses signal from fat and results in a higher contrast image

References

1. Raediopedia.org
2. Hartley, Katherine G. et al. "MRI techniques: a review and update for the orthopaedic surgeon." *The Journal of the American Academy of Orthopaedic Surgeons* 20 12 (2012): 775-87.
3. <https://www.orthobullets.com/knee-and-sports/3024/patella-tendon-rupture>
4. Aofoundation.org



Questions?