

AMSER Case of the Month

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20-year-old woman presents with knee pain after soccer injury



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Patient Presentation

- HPI: 20 y/o female with no significant past medical history presents with acute onset severe left knee pain and swelling going on since a soccer injury yesterday. She was changing directions with the ball and was tackled by an opponent. She heard an audible "pop" and felt pain in her knee immediately after. She tried to get up on her own but felt unsteady on her left leg. She now rates her knee pain an 8/10. Along with the pain she reports diffuse swelling and limited active range of motion. Over-the-counter analgesics have provided minimal pain relief.

Patient Presentation

- Past Medical History: None
- Past Surgical History: Wisdom teeth extraction
- Medications: Acetaminophen and ibuprofen PRN for pain
- Vitals: Within normal limits
- Pertinent Labs: None
- Imaging: AP & lateral non-weightbearing radiographs show a large joint effusion without radiographic evidence of acute fracture or malalignment.

Patient Presentation

- Physical Exam
 - Significant edema around the left knee
 - Tenderness to palpation along the medial and lateral joint line
 - Limited ability to bear weight on the left leg secondary to pain and feeling unsteady
 - Anterior drawer laxity
 - Valgus laxity
 - Patient unable to tolerate McMurray test secondary to pain

What Imaging Should We Order Next?

Utilizing the ACR Appropriateness Criteria¹

Variant 3:

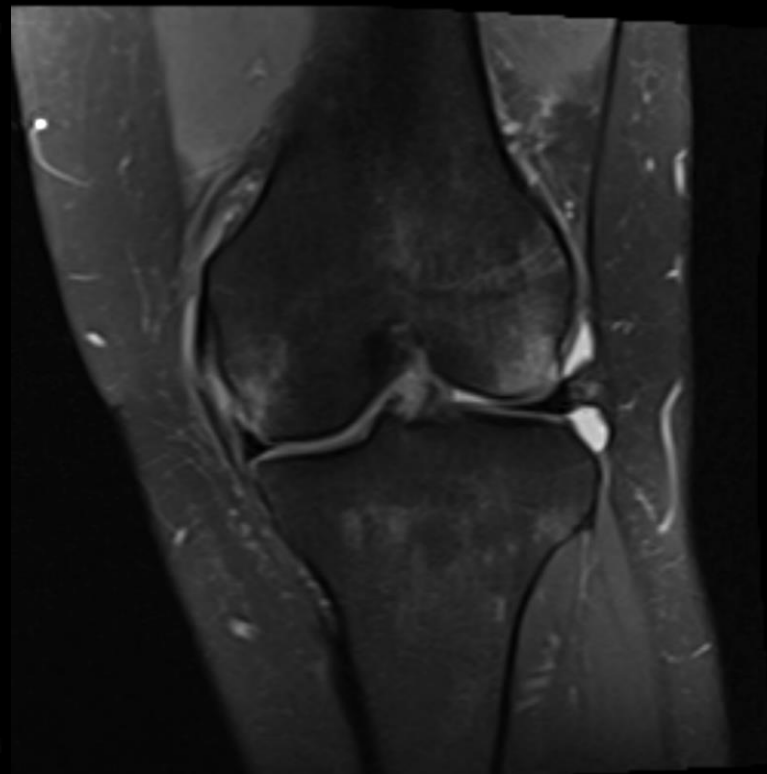
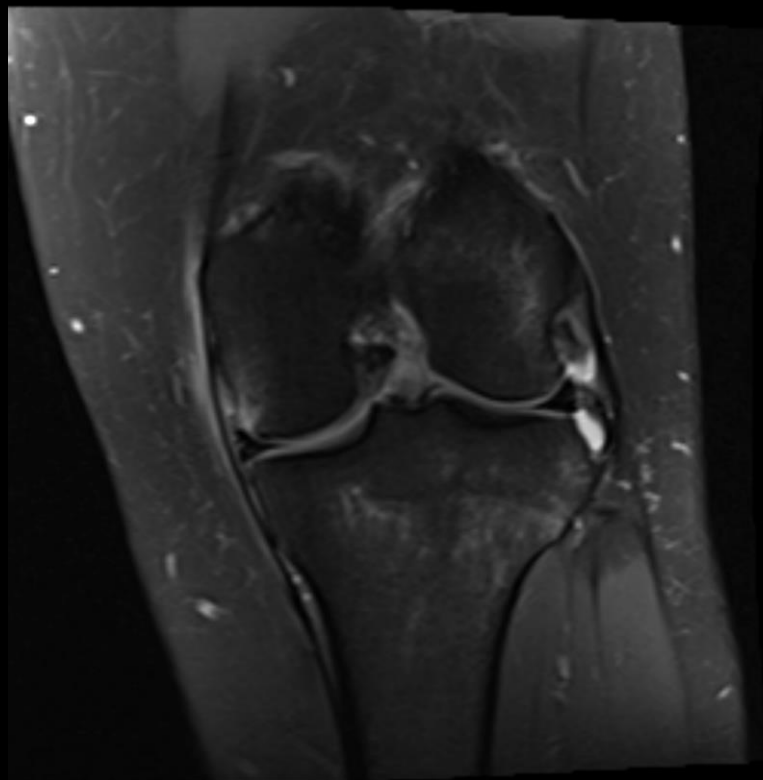
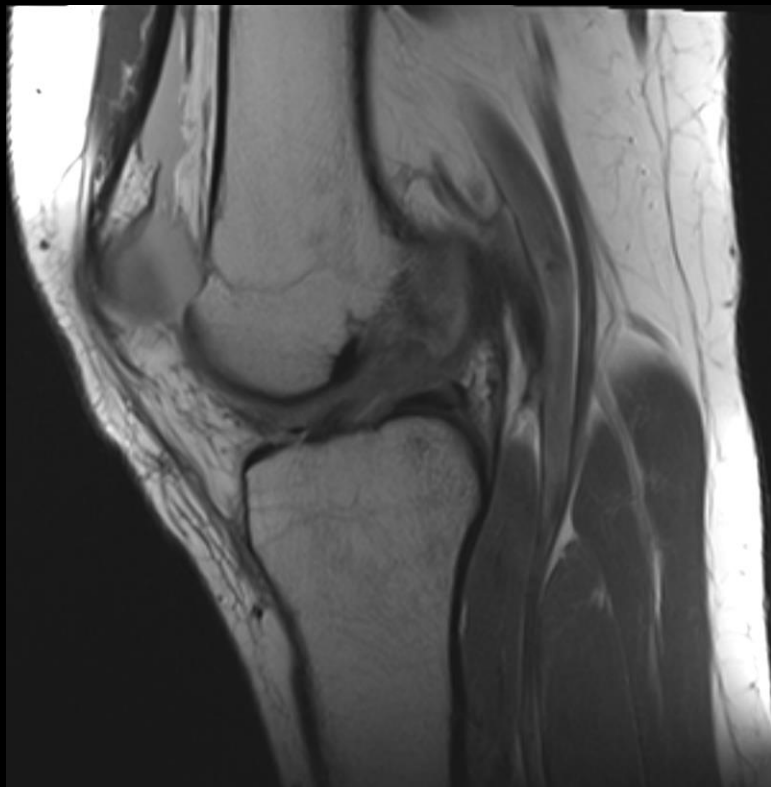
Adult or skeletally mature child. Fall or acute twisting trauma to the knee. No fracture seen on radiographs. Suspect occult fracture or internal derangement. Next study.

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	⊕⊕⊕
CT knee with IV contrast	Usually Not Appropriate	⊕
CT knee without and with IV contrast	Usually Not Appropriate	⊕
MR arthrography knee	Usually Not Appropriate	0
MRA knee without and with IV contrast	Usually Not Appropriate	0
MRA knee without IV contrast	Usually Not Appropriate	0
MRI knee without and with IV contrast	Usually Not Appropriate	0
US knee	Usually Not Appropriate	0

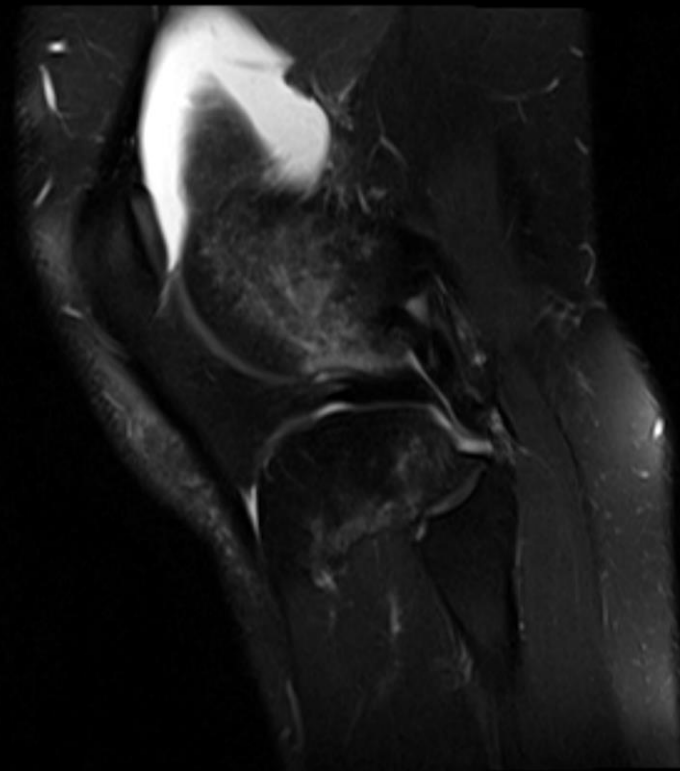
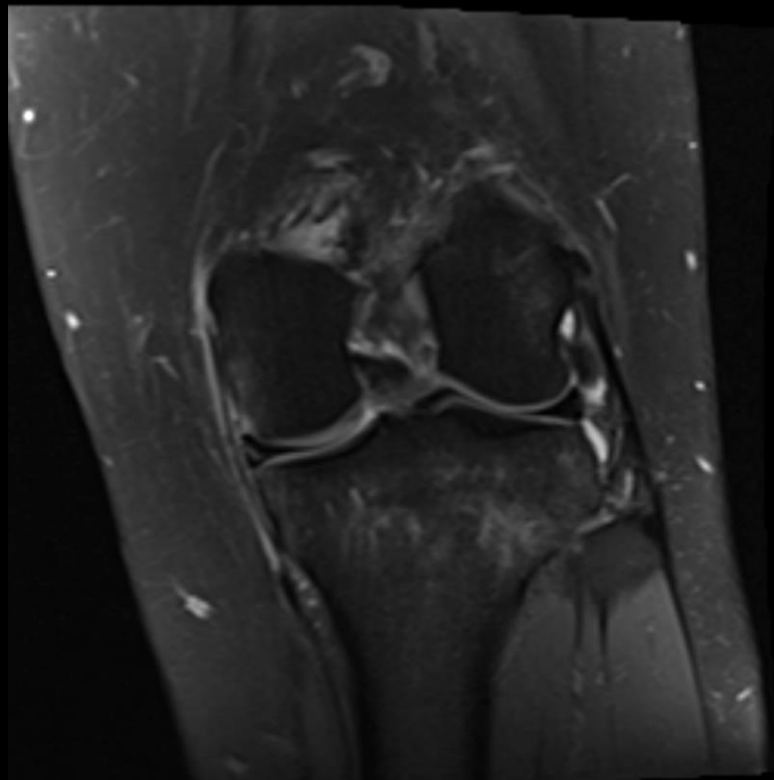
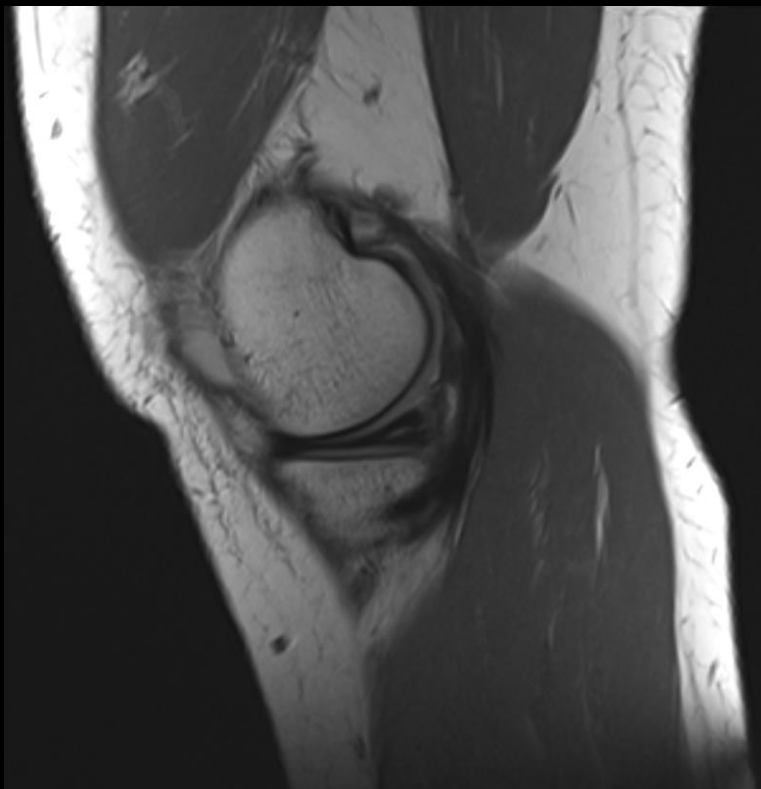
An MRI of the knee without IV contrast was correctly ordered.



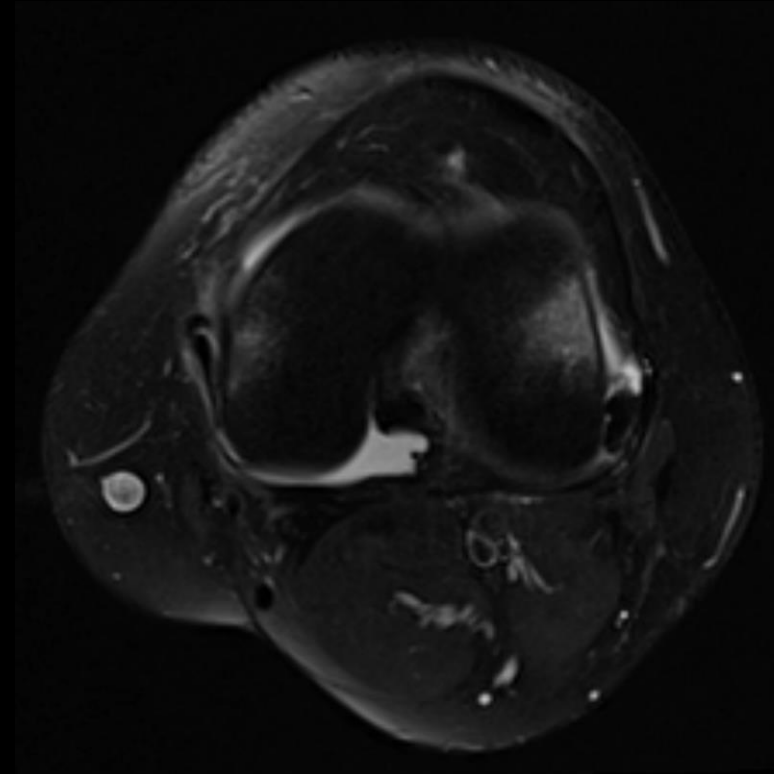
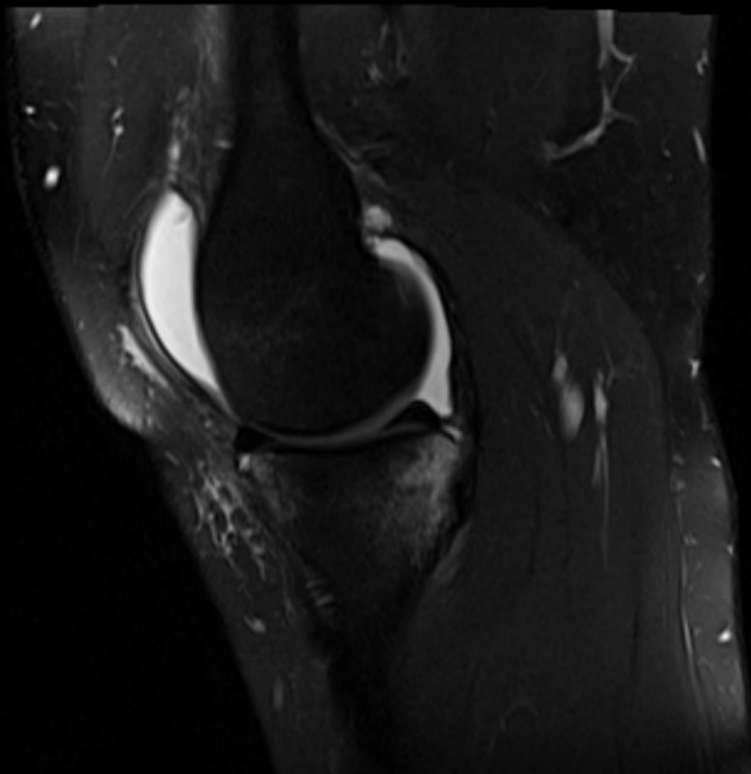
Findings (unlabeled)



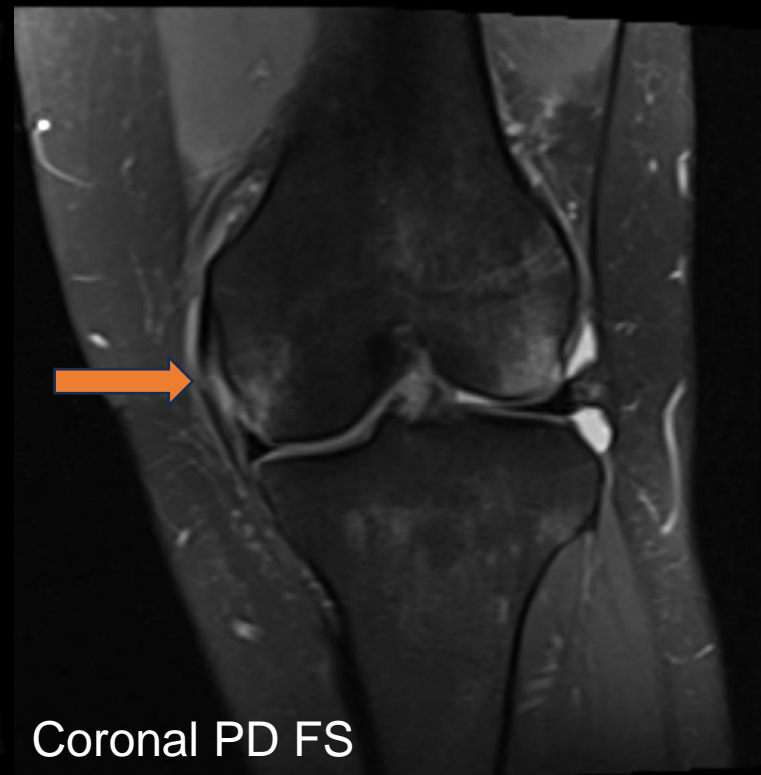
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Findings (unlabeled)



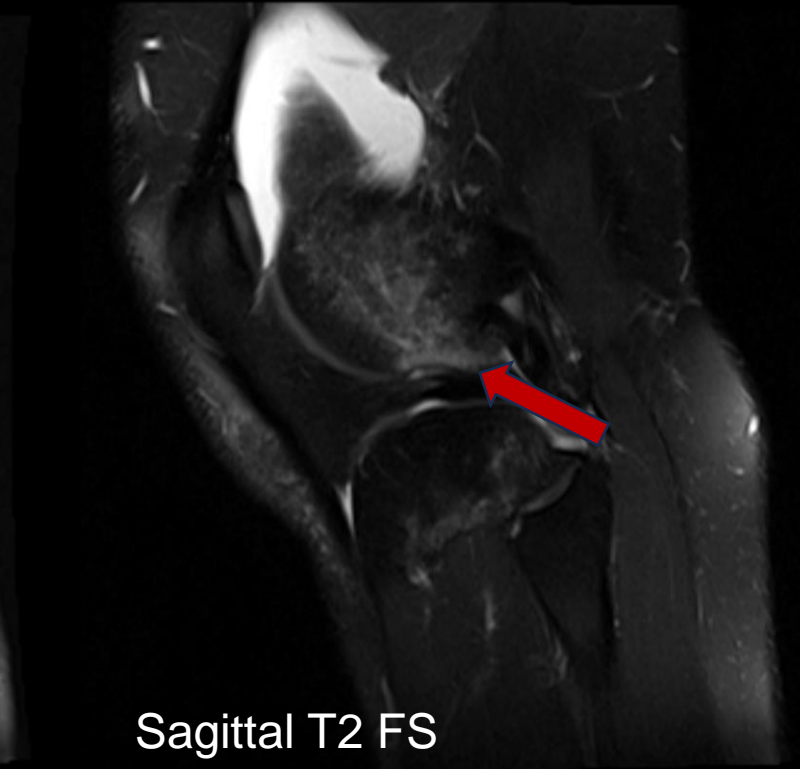
Findings (labeled)




Full thickness tear of Anterior Cruciate Ligament ()

Grade 2 injury to proximal Medial Collateral Ligament ()

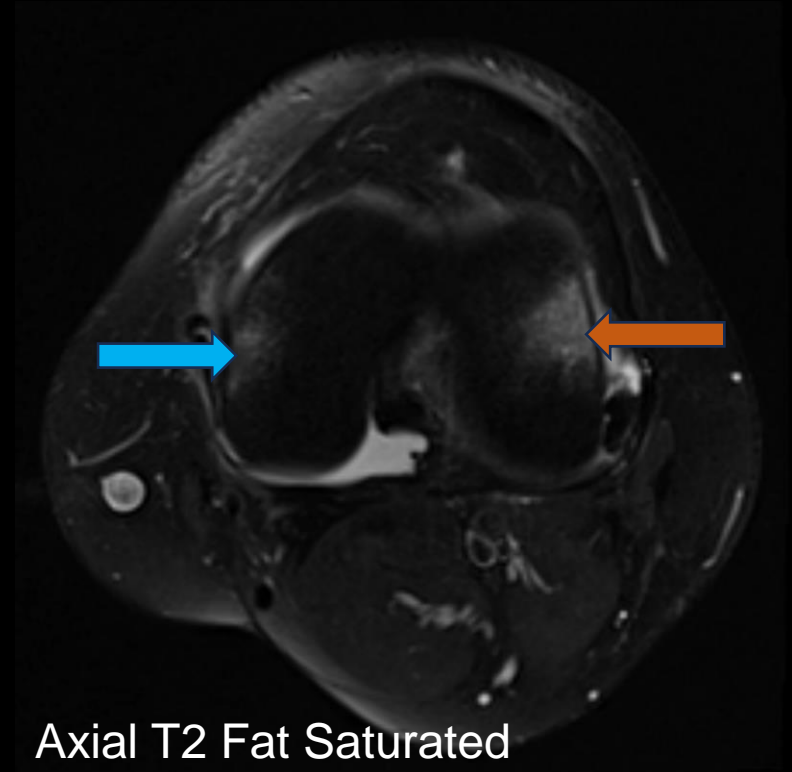
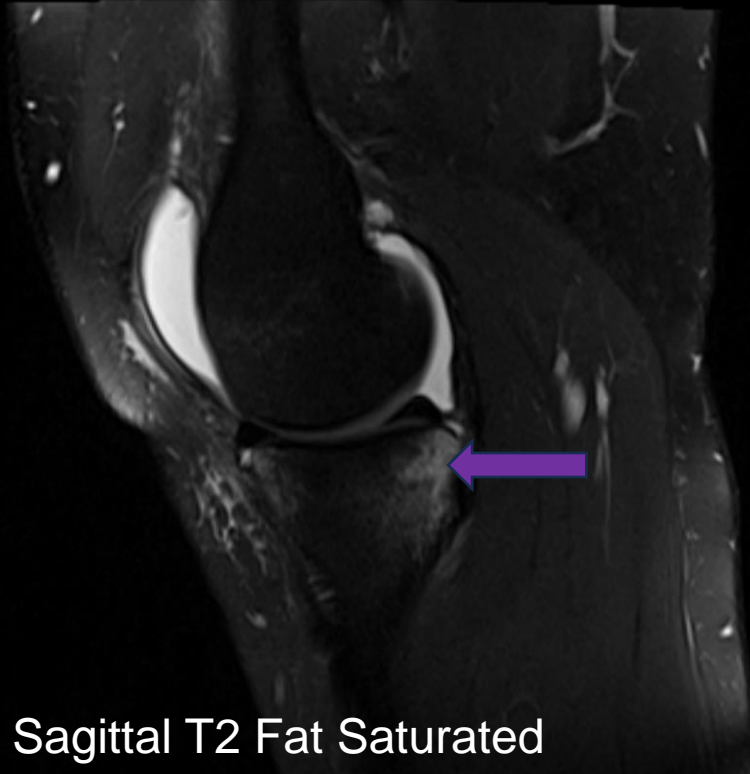
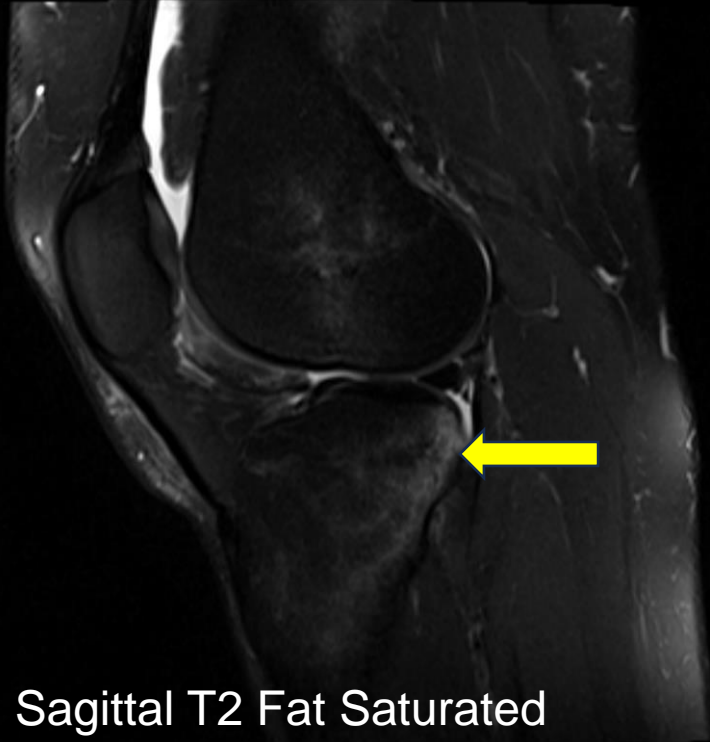
Findings (labeled)



Horizontal tear of the body of the Medial Meniscus ()

Impaction fracture of Lateral Femoral Condyle ()

Findings (labeled)



Posterior Lateral Tibial Plateau contusion ()

Lateral Femoral Condyle contusion ()

Posterior Medial Tibial Plateau contusion ()

Medial Femoral Condyle contusion ()

Final Dx:

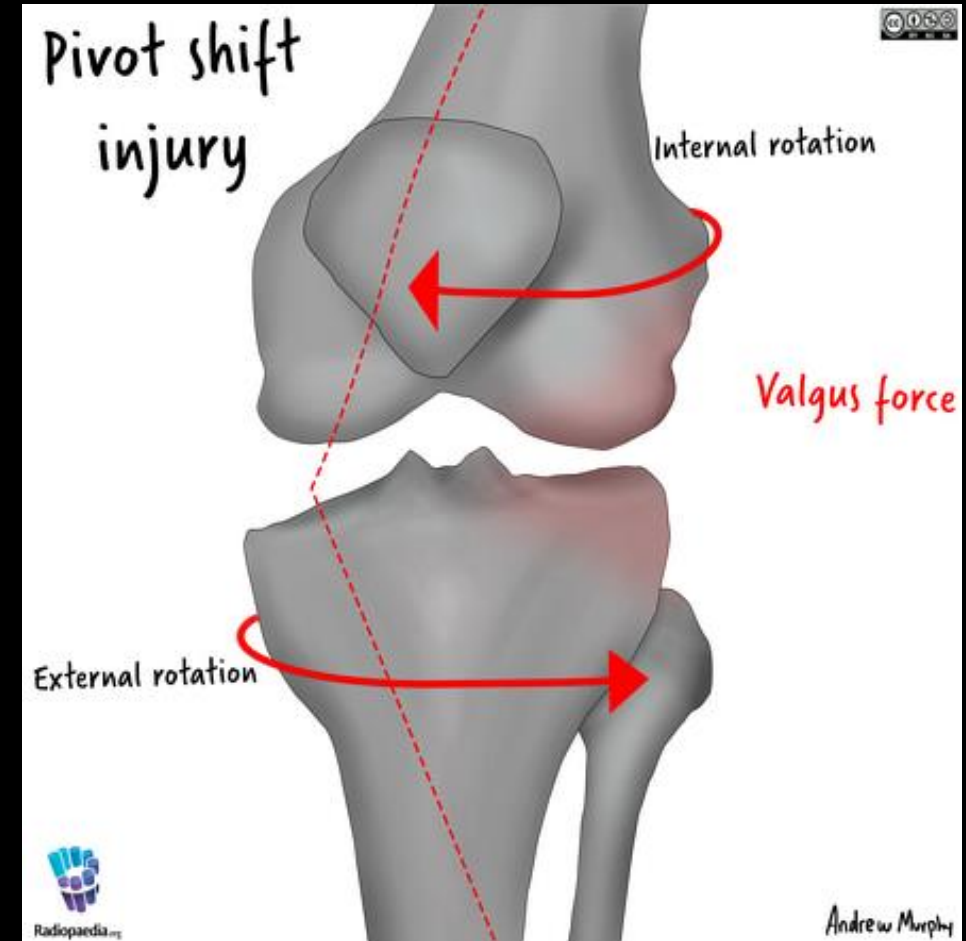
O'Donoghue's Unhappy Triad:
Injuries to the Medial Collateral Ligament, Anterior
Cruciate Ligament and Medial Meniscus

Case Discussion

- O'Donoghue's Unhappy Triad
 - Injuries to the Medial Collateral Ligament, Anterior Cruciate Ligament and Medial Meniscus.
 - Studies suggest that the lateral meniscus is more likely to be injured than medial meniscus.²
 - Occurs in contact and non-contact sports.³
 - Examples: Basketball, football, rugby, soccer and skiing.
 - Described by Dr. Don H. O'Donoghue in 1950.³
- Clinical Presentation
 - Knee pain, swelling, hemorrhage and dysfunctional muscle control.
 - Positive Lachman test, anterior drawer test and valgus stress test.

Case Discussion

- Mechanism
 - Valgus force on the knee that results in an abduction-external rotation mechanism of injury.³
 - Pivot-shift injury that also produces posterior lateral tibial plateau contusion.⁴
 - There is also an associated “contrecoup” injury of the posterior medial tibial plateau. This contusion is caused by the rebounding knee motion after the initial pivot-shift injury.⁴



Case Discussion

- Diagnosis
 - Orthopedic Tests: Lachman test, anterior drawer test and valgus stress test.
 - Imaging: Valgus stress radiograph and MRI.⁵
- Management
 - Recovery takes anywhere from 6 - 12 months.⁶
 - Arthroscopic ACL surgery using remaining ACL, allograft or autograft.⁶
 - Low grade Meniscus tears can be treated conservatively, but more severe tears will require surgical repair or partial meniscectomy.⁵
 - MCL tears are mostly treated conservatively but severe tears require surgery.⁵
 - Conservative measures include bracing, physiotherapy and rest.⁵
- Prognosis
 - 50% of patients who suffer the unhappy triad will suffer from osteoarthritis in 10-20 years.⁵
 - Long-term knee instability could also be a complication.⁵

References:

1. American College of Radiology. ACR Appropriateness Criteria[®]. Available at <https://gravitas.acr.org/acportal>. Accessed August 16, 2024.
2. Canby CA, Cassidy KM. The unhappy triad: Quest for a conclusive definition. *The FASEB Journal*. 2012;26(S1). doi:10.1096/fasebj.26.1_supplement.lb24
3. Feger J. O'Donoghue unhappy Triad: Radiology Reference Article. Radiopaedia. October 14, 2020. Accessed August 16, 2024. <https://radiopaedia.org/articles/odonoghue-unhappy-triad-1>.
4. Knipe H, Yap J, Al Kabbani A, et al. Patterns of bone bruise in knee injury. Radiology Reference article. Radiopaedia. March 3, 2016. Accessed on 16 Aug 2024. <https://doi.org/10.53347/rID-43268>
5. Hoveidaei AH, Sattarpour R, Dadgostar H, Razi S, Razi M. Unhappy triad of the knee: What are the current concepts and opinions? *World Journal of Orthopedics*. 2023;14(5):268-274. doi:10.5312/wjo.v14.i5.268
6. OSC O. A complex injury of the knee - the unhappy triad. Orthopaedic and Spine Center of Newport News. November 8, 2022. Accessed August 16, 2024. <https://www.osc-ortho.com/blog/the-unhappy-triad-a-complex-injury-of-the-knee/>.