

Imaging Lower Extremity Injuries 2



"File:Samples of boots for wounded or maimed soldiers (Reeve 012667), National Museum of Health and Medicine (3443228386).jpg" by National Museum of Health and Medicine is licensed under CC BY 2.0.

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Knee Injuries

Review of MRI knee anatomy

DICOM 00



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Ottawa Knee Rules

- For knee injuries < 7 days old
- Validated in adults, be cautious with <18yo (physeal injuries)
- If there are no positive criteria, less than 1% chance of significant fracture
- Stiell IG, Greenberg GH, Wells GA et-al. Derivation of a decision rule for the use of radiography in acute knee injuries. Ann Emerg Med. 1995;26 (4): 405-13.



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Ottawa Knee Rules

- For knee injuries < 7 days old
- These are “OR” rules
 - Age > 55
 - Fibular head tenderness
 - Isolated tenderness of patella
 - Inability to flex 90 degrees
 - Inability to flex to 60 increases specificity
 - Inability to bear weight for four steps after injury AND in the clinic
 - Regardless of limping



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Soft Tissue Finding

- Lipohearthrosis
 - FBI sign
 - Fat-Blood Interface
 - Indicates intracapsular fracture



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Bumper / Fender Fracture

- Depressed tibial plateau fracture
- Valgus mechanism
- Femoral condyle driven into tibial plateau
- 80% lateral plateau
- “FBI” sign (*lipohearthrosis*)
- Most patients over age 50
 - Osteoporosis



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Segond Fracture

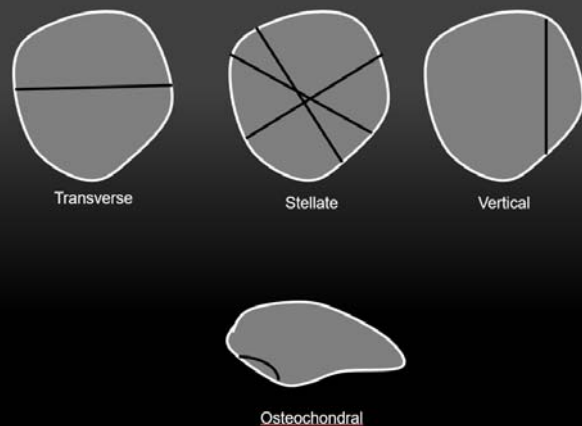
- Avulsion of anterolateral ligament, usually with avulsion of ITB insertion
- Lateral aspect of lateral tibial plateau
- Associated with
 - 90% ACL tear
 - 70% meniscal tear
- LCL typically intact



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Patellar fractures

- Direct or indirect trauma
- Potential for severe displacement
- Orientation
 - 60% transverse
 - 25% stellate (comminuted)
 - 15% vertical
 - Osteochondral Fx
 - Secondary to dislocation
- DDX: Bipartite patella



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Bipartite Patella

- Ununited accessory ossification center
- Most commonly superolateral margin
- Generally asymptomatic
- Can become painful in quad based activities
- Radiographs are diagnostic, MR for bone marrow edema
- DICOM 03

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Prepatellar Bursitis “Housemaids Knee”

- Inflammation of bursa anterior to patella
- Well defined painful fluid filled mass
- Chronic trauma MC or acute injury
- DICOM 04



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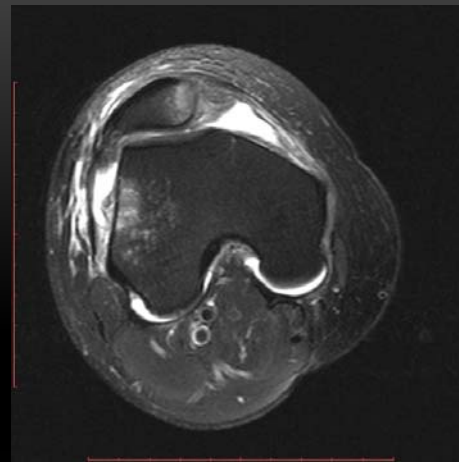
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Patellar Dislocation

- Lateral dislocation most common
- Transient and recurrent
- Osteochondral fracture vs. bone bruise
 - Medial facet of patella
 - Lateral femoral condyle
 - Requires a sunrise view



Case courtesy of Dr Hector Rivera-Melo, Radiopaedia.org, rID: 27014



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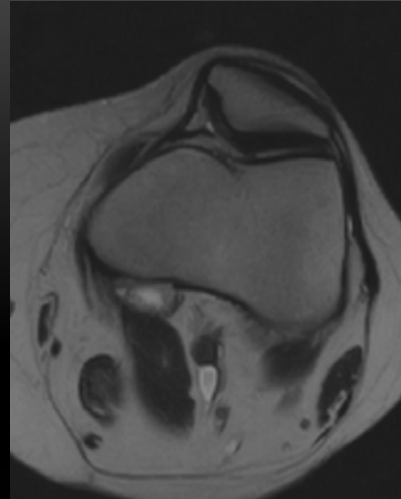
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Plica

- Embryological remnant
- Band of tissue from the joint capsule to various structures
- Medial is most common symptomatic, infrapatellar is most common but not symptomatic
- Recurrent trauma causes inflammation
- Intermittent knee pain, snapping or clicking on patellar motion, catching
- DICOM 05

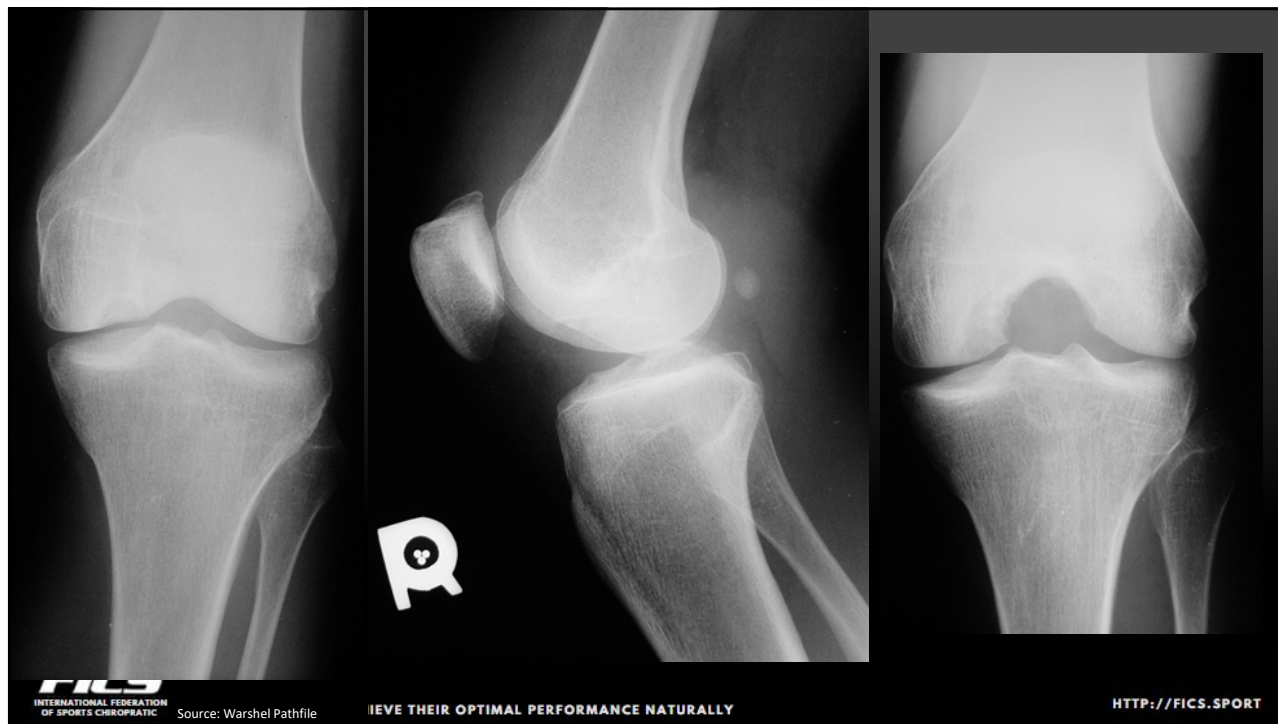


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Osteochondral Fractures of the Knee

- Aka osteochondritis dissecans
- Traumatic etiology
- Children and adolescents
- Medial femoral condyle is most common location for OCD in the knee
 - Followed by patella secondary to dislocation
- Non-weight bearing surface
 - Lateral aspect of medial femoral condyle

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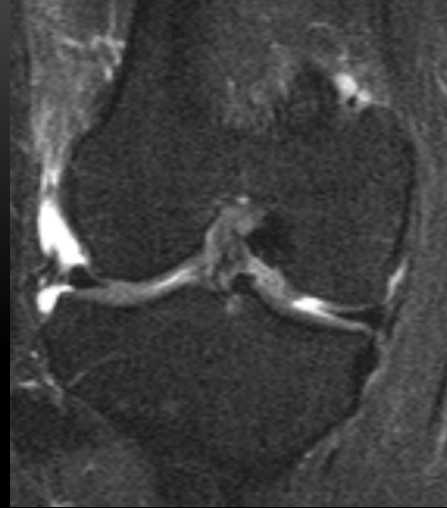
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Chondral Injury

- Cartilage tear, frequently with subjacent bone marrow edema if acute
- Typically on weight bearing surfaces
- Can be complete, flap, delaminating
- DICOM 07

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Quadriceps Tendon Tears

- Typically tears immediately superior to patella
- Quad retracts, patella becomes baja

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Sinding Larsen Johansson “Jumpers Knee”

- Patellar apex / proximal infrapatellar tendon
- Chronic overuse results in tendinosis with tearing
- Possible fragmentation of the apex of the patella
- DICOM 08a



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Osgood Schlatter

- Chronic quad overuse in adolescents
- Partial avulsion / osteochondrosis of the tibial tuberosity
- Fragmentation of the tuberosity



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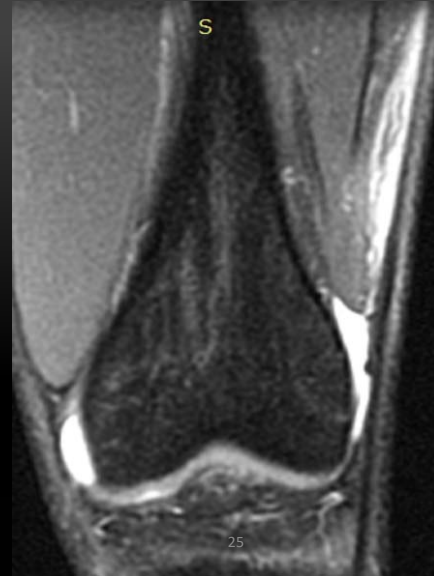
Case courtesy of Dr Mohammad Taghi Niknejad, Radiopaedia.org, rID: 20861

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IT Band Syndrome

- Friction between IT band and lateral femoral condyle
- Can involve higher portions of the IT band
- DICOM 09



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Plantaris Tear

- MC tears at musculotendinous junction
- Pt describes being hit in the back of the calf
- Swelling w/wo bruising
- Can involve more distal portion
- DICOM 09b



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Maisonneuve Fracture

- Ankle injury with associated proximal fibular fracture
- Potential common peroneal nerve injury



Case courtesy of Dr Henry Knipe, Radiopaedia.org, rID: 23312



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Ligamentous Injuries



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ACL/PCL/MCL/LCL Tears

- ACL and MCL are the most common to be torn
- ACL tears from pivot shift injuries
 - Planted foot and body rotation
- MCL from valgus injury



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ACL injuries

- Common injury
- Females > males (2-8:1)
- “Pivot shift” mechanism
- Patients feel “pop” and knee giving out
- Minimal radiographic findings
- MRI is necessary
- Can be partial or complete



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Associated Injuries

- O'Donoghue's unhappy triad
 - ACL tear
 - Posterior horn medial meniscal tear
 - Medial collateral ligament tear
- Osteochondral femoral fracture
- Tibial spine avulsion
- Second fractures
- PCL injuries



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ACL Tears

- NEW THOUGHT on ACL
 - Used to be thought that it only explodes
 - Now we see partial tears commonly
 - 2 bundles
 - Anteromedial is taut in extension
 - Posterolateral is taut in flexion
- Imaging
 - Evaluate on sagittal sequences
 - The normal ligament is striated
 - Loss of normal fiber orientation, or loss of low signal indicates tear
 - ACL should align near Blumensaats line

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DICOM

- DICOM 10: Partial thickness ACL
- DICOM 11: ACL rupture with kissing contusions

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PCL Injuries

- Much less common than ACL tear
- Traumatic posterior drawer - direct blow to the tibia with the knee is flexed
 - Falling to the knees
 - Dashboard style injury
- MRI sensitivity > 90%
- DICOM 13



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MCL Tears

- Valgus stresses
- Can represent a complex injury
- Grades
 - 1: Mild
 - 2: Moderate
 - More substantial tear, longer healing time
 - 3: Complete
 - Full thickness tear, often results in instability



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DICOM

- DICOM 19: Grade 1
- DICOM 20: Grade 3

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Pelligrini Steida

- Chronic injury to the MCL
- Results in HADD/myosotis ossificans



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Meniscal Injuries



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Meniscal Tears

- Medial meniscus more frequently torn
- The posterior horn of either is more common location of tear
- Tears vs. myxoid degeneration
 - If the signal is in the central portion, and does not communicate, it is degeneration
 - Tears will communicate with at least 1 articular surface



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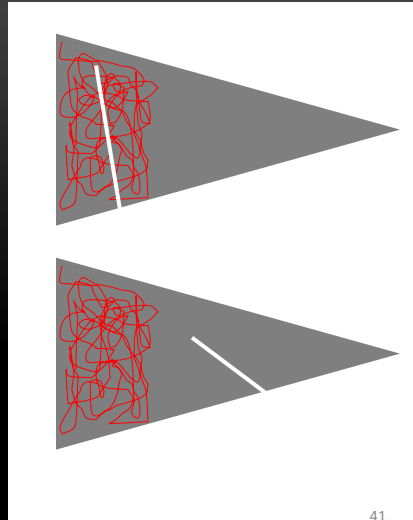
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Meniscal Tears

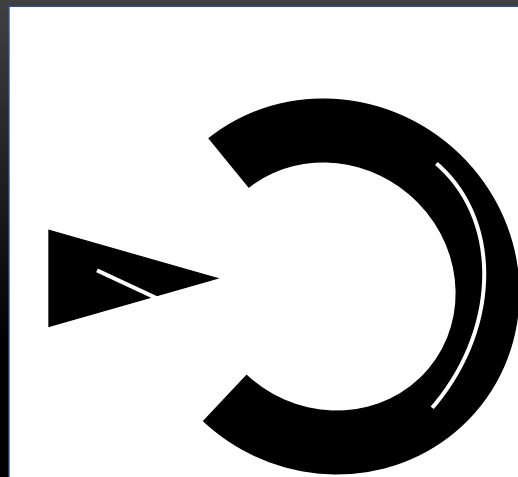
- Tears in the periphery heal better due to vascularity
- Tears in the more central portions tend to not heal
 - Consider surgical options



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Meniscus Tear Types

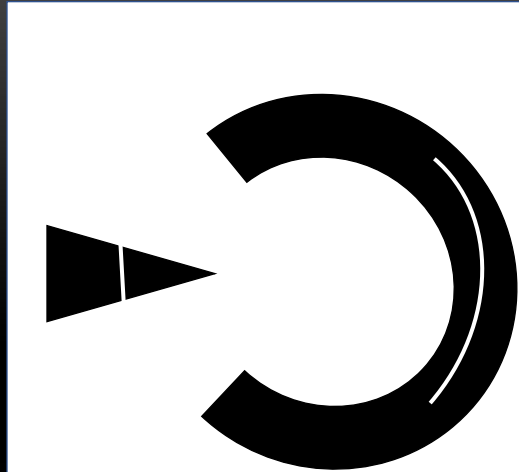
- Horizontal/oblique
- Bucket-handle
- Radial
- Parrot beak



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Meniscus Tear Types

- Horizontal/oblique
- Bucket-handle
- Radial
- Parrot beak



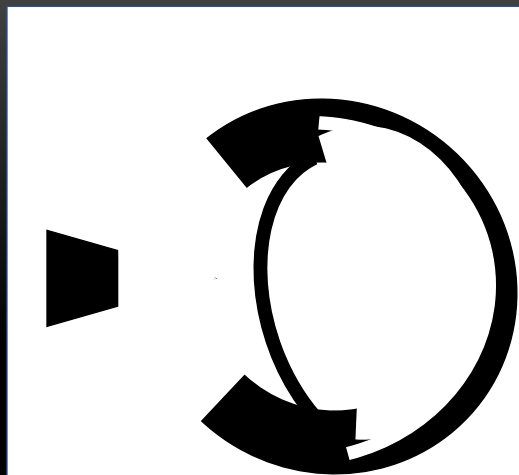
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Meniscus Tear Types

- Horizontal/oblique
- Bucket-handle
 - Flipped bucket-handle
 - Double PCL sign
- Radial
- Parrot beak



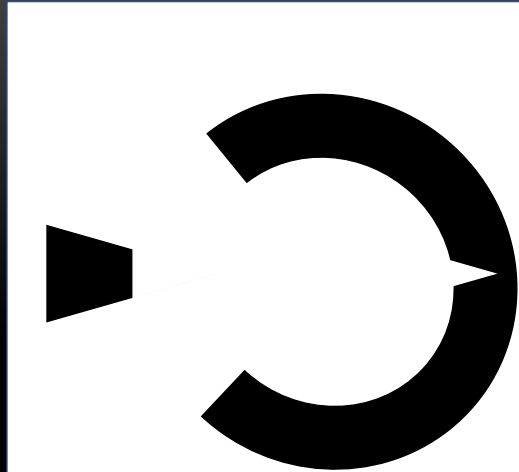
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Meniscus Tear Types

- Horizontal/oblique
- Bucket-handle
- Radial
- Parrot beak



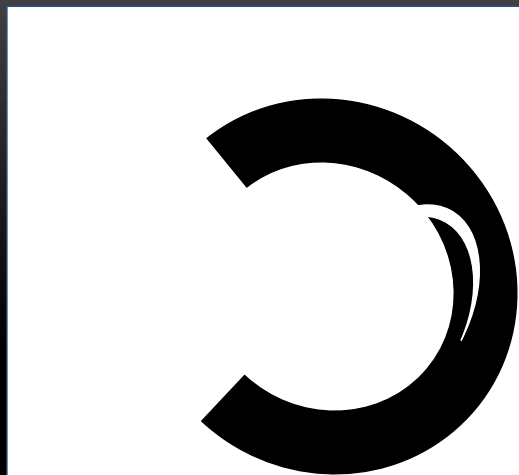
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Meniscus Tear Types

- Horizontal/oblique
- Bucket-handle
- Radial
- Parrot beak



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DICOM

- DICOM 30: horizontal tear
- DICOM 32: bucket handle
- DICOM 34: radial/parrot beak



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Discoid Meniscus

- Instead of being normal "C" shape, there is a plate-like meniscus
- Comes in variable forms, from simple thickening of the body, to a complete disc
- On sagittal sequences, there should only be 2 bowtie slices
- Greater than 2 bow ties, suspect discoid



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Discoid Meniscus

- Affects ~3% of the population
- Lateral >> medial
- Predisposed to tear
- Can be painful even in the absence of tear
- DICOM 35

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End of Lower Extremity Injuries 2

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