MRI OF KNEE

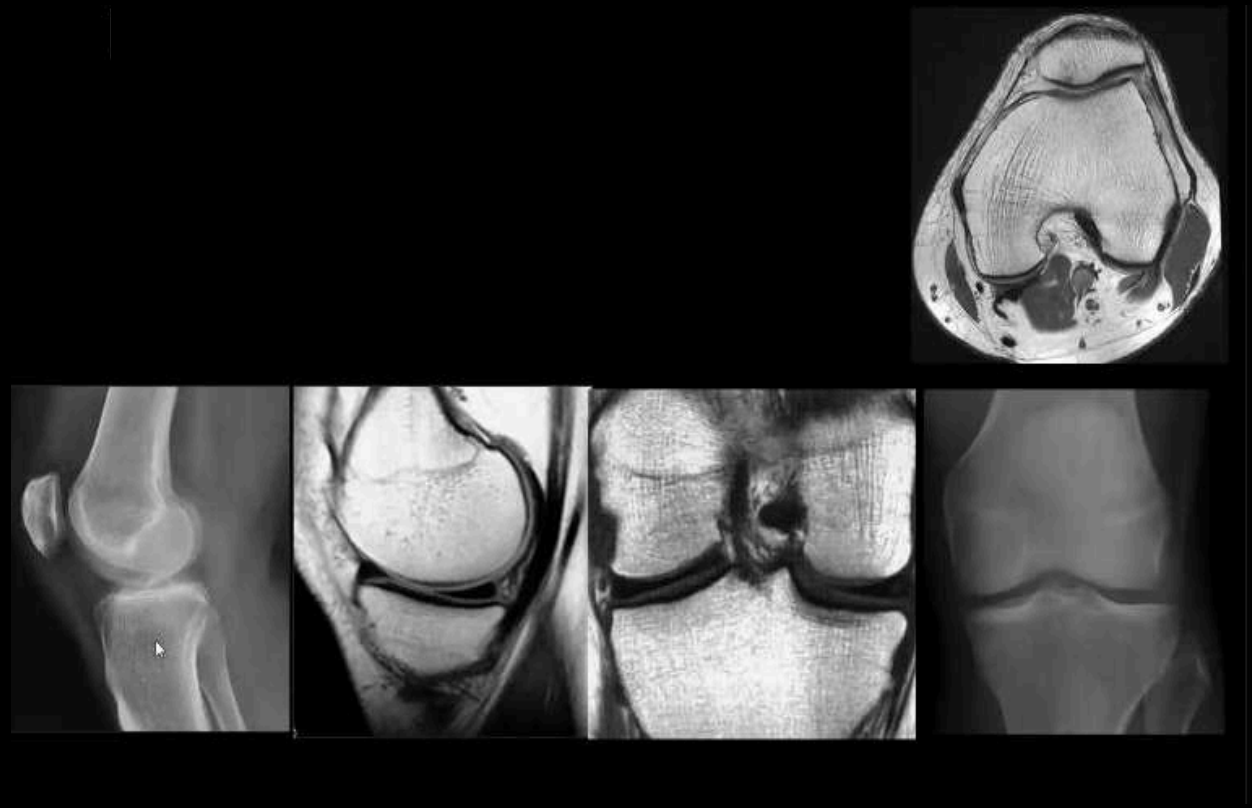
2/9/23

DR. ZAINAB VORA

PROTOCOL

- Axial T1 localizer
- sagittal T1, T2, PD
- Coronal gradient echo/MEDIC, STIR

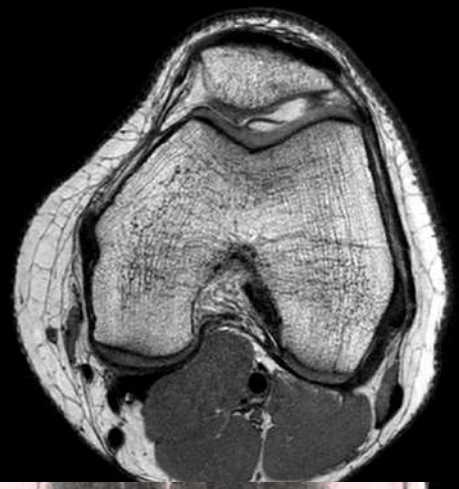
- Mr arthrography-
- post-op menisceal tear



Sequences

Sagittal

- Menisci (medial & lateral)
- Cruciate Ligaments (ACL, PCL)
- Tendons (Quadriceps, Pattelar)
- Bones
- Synovial effusion



Axial

Retinacular ligaments

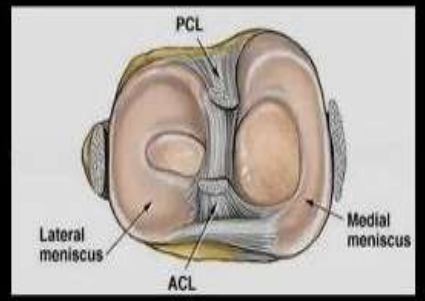
Coronal

Collateral ligaments

MENISCI

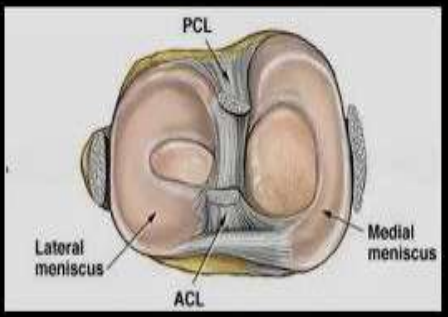
Medial meniscus

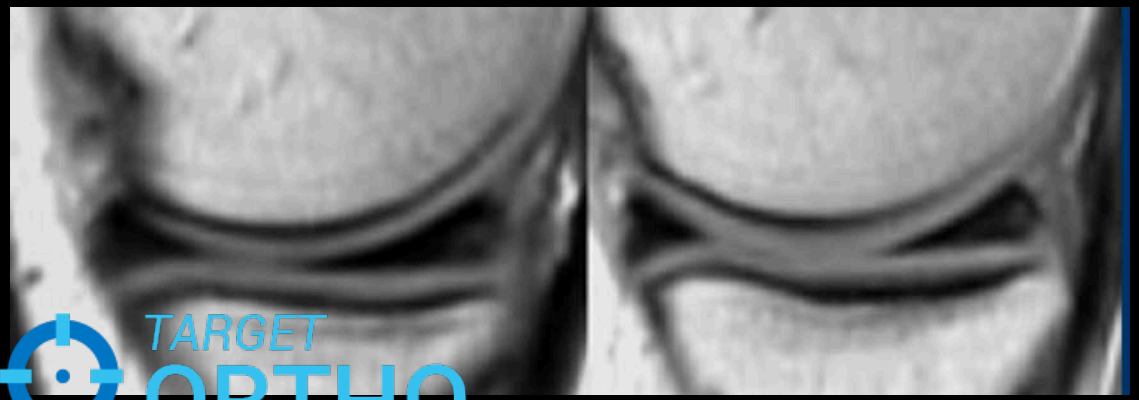
- Banana- shaped
- Posterior horn wider, longer, than anterior horn
- Posterior horn tightly attached to the capsule
- Grade II degeneration more common

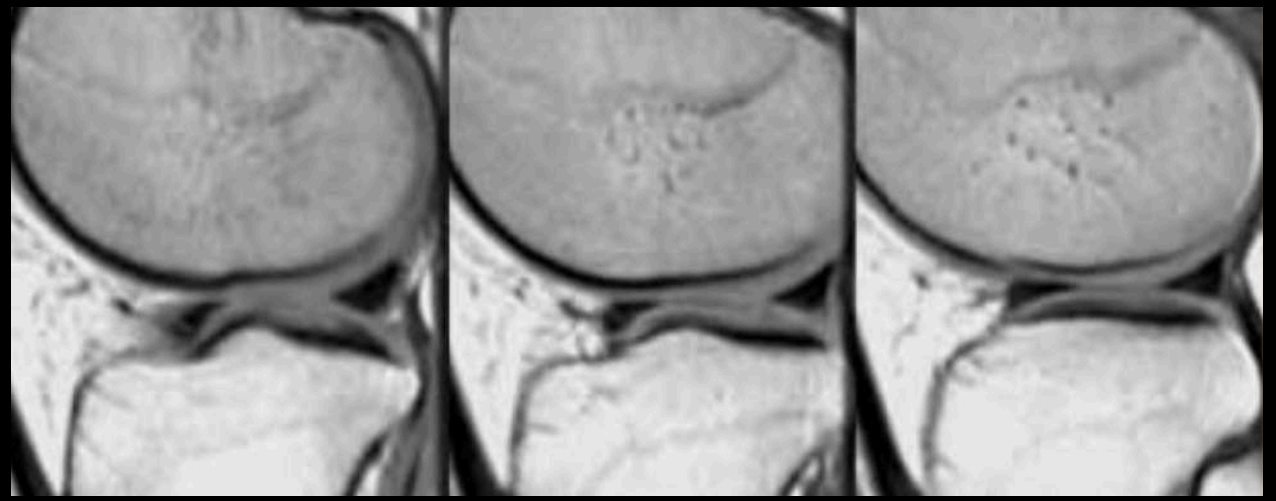


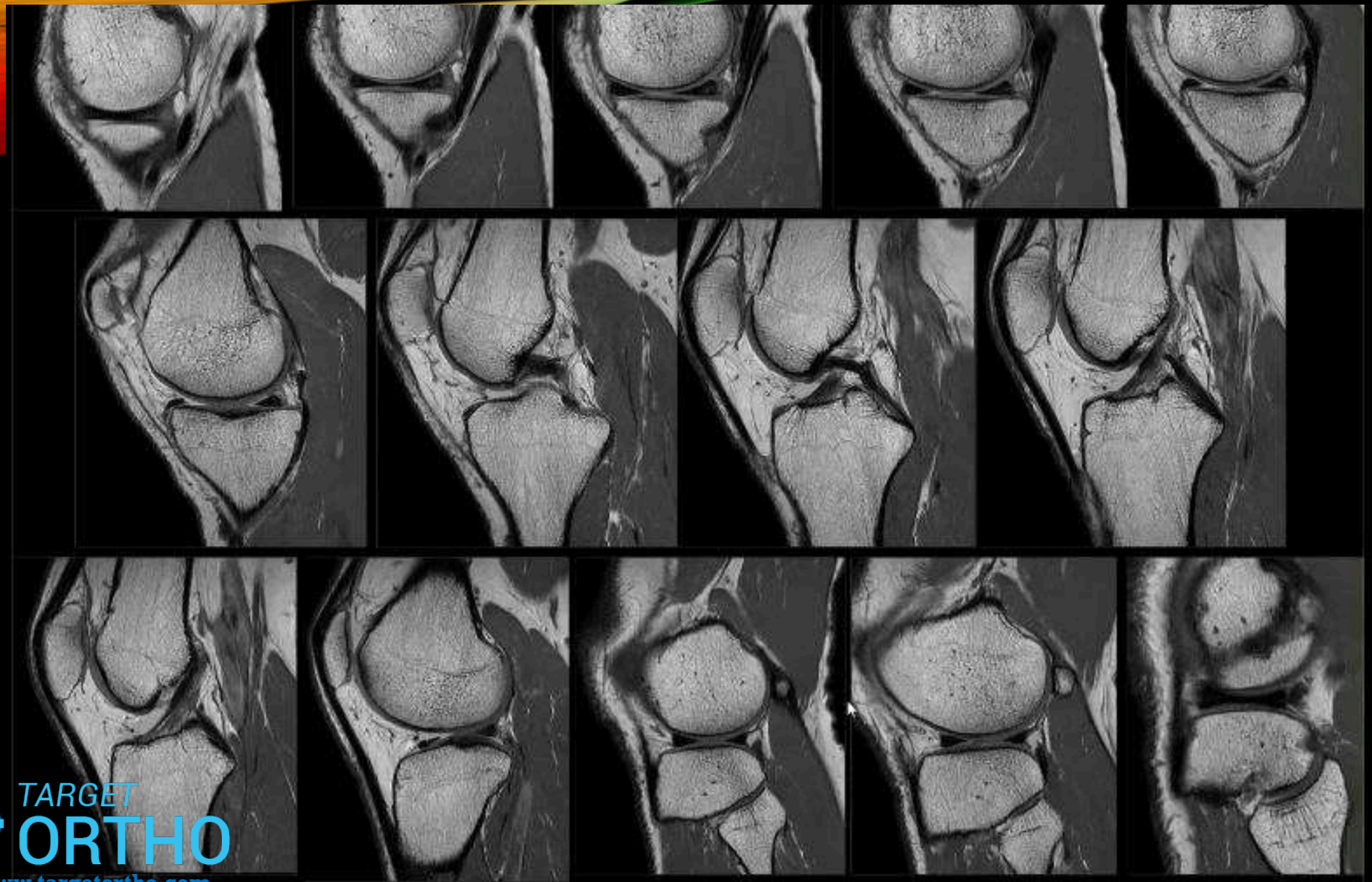
Lateral meniscus

- C- shape
- Posterior and anterior horns are symmetric
- Anterior horn may be hypo plastic, extremely thin
- Discoid meniscus and meniscal cysts more common

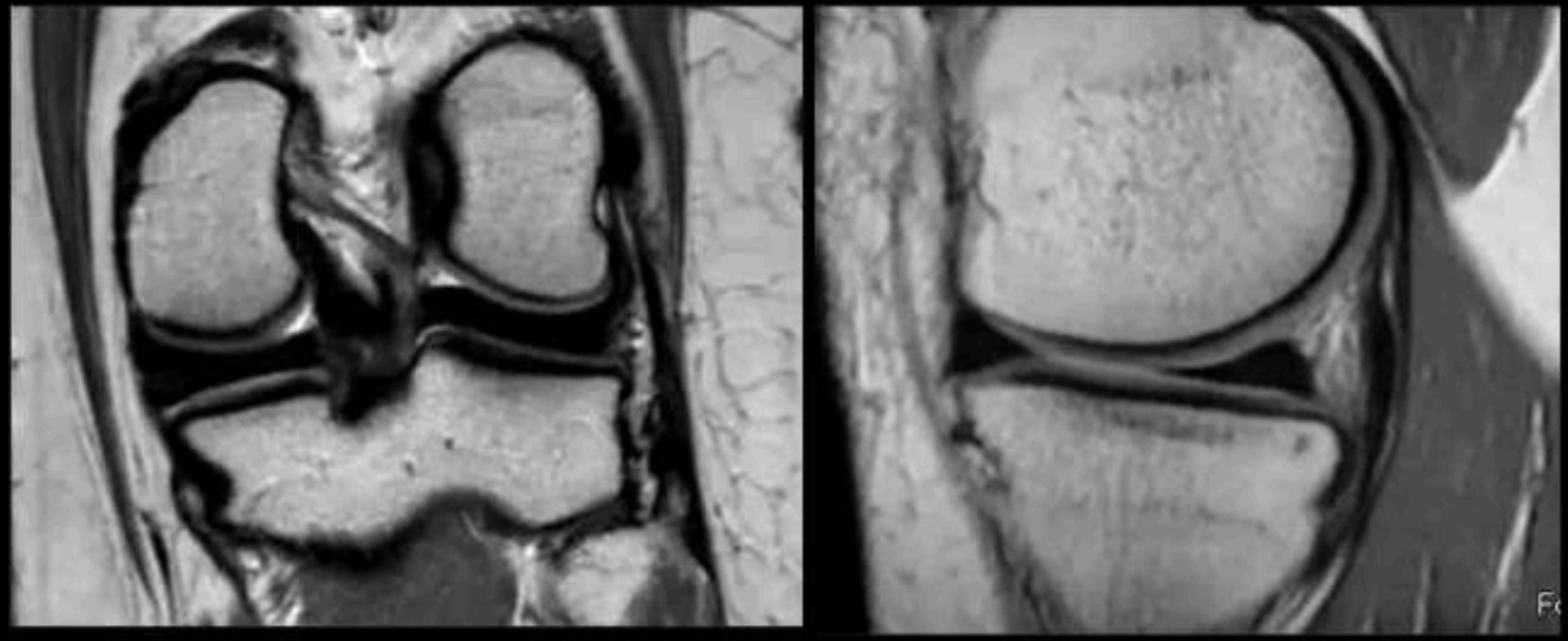








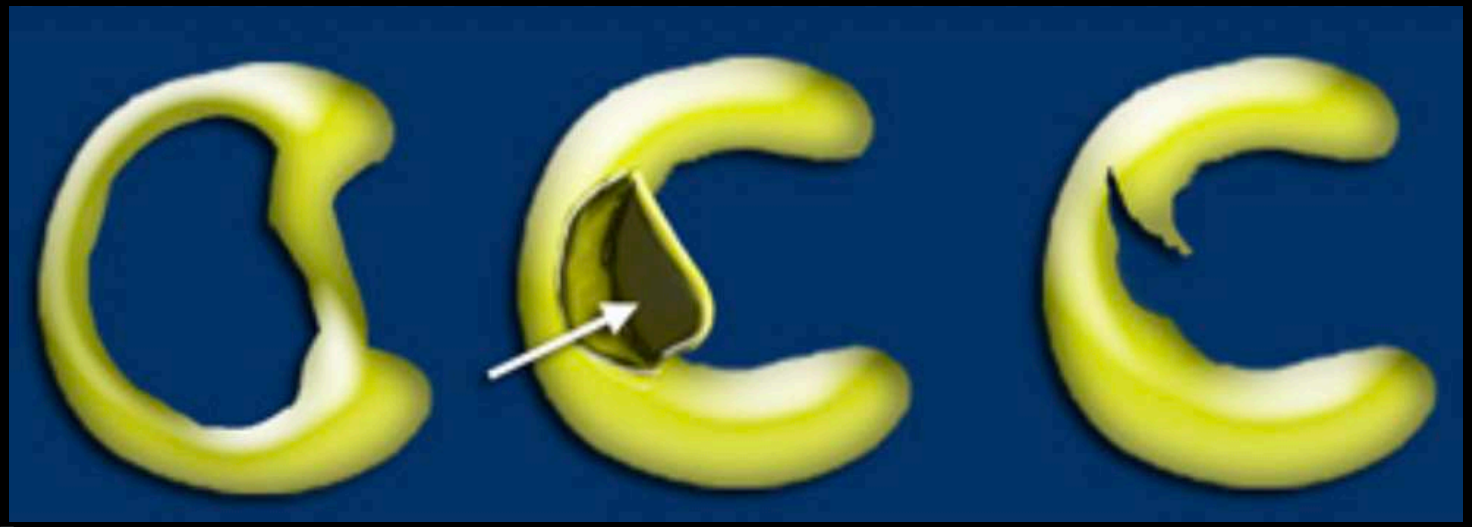
Coronal & sagittal images

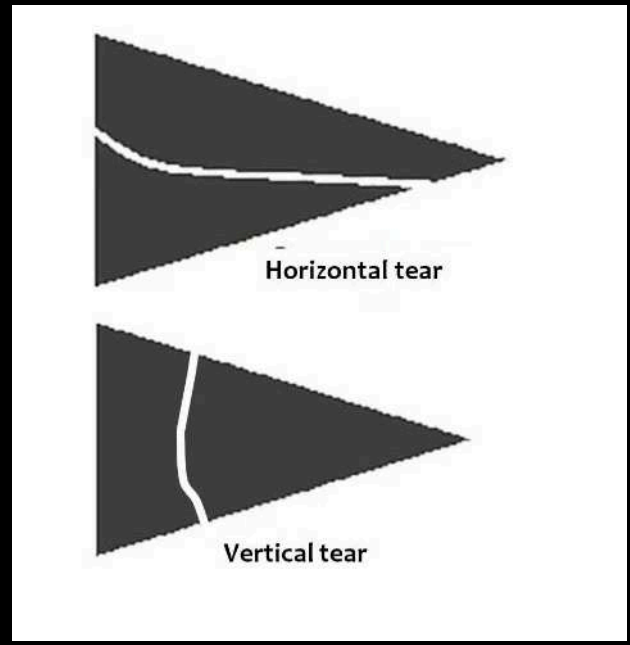


CRITERIA FOR MENISCEAL TERARS

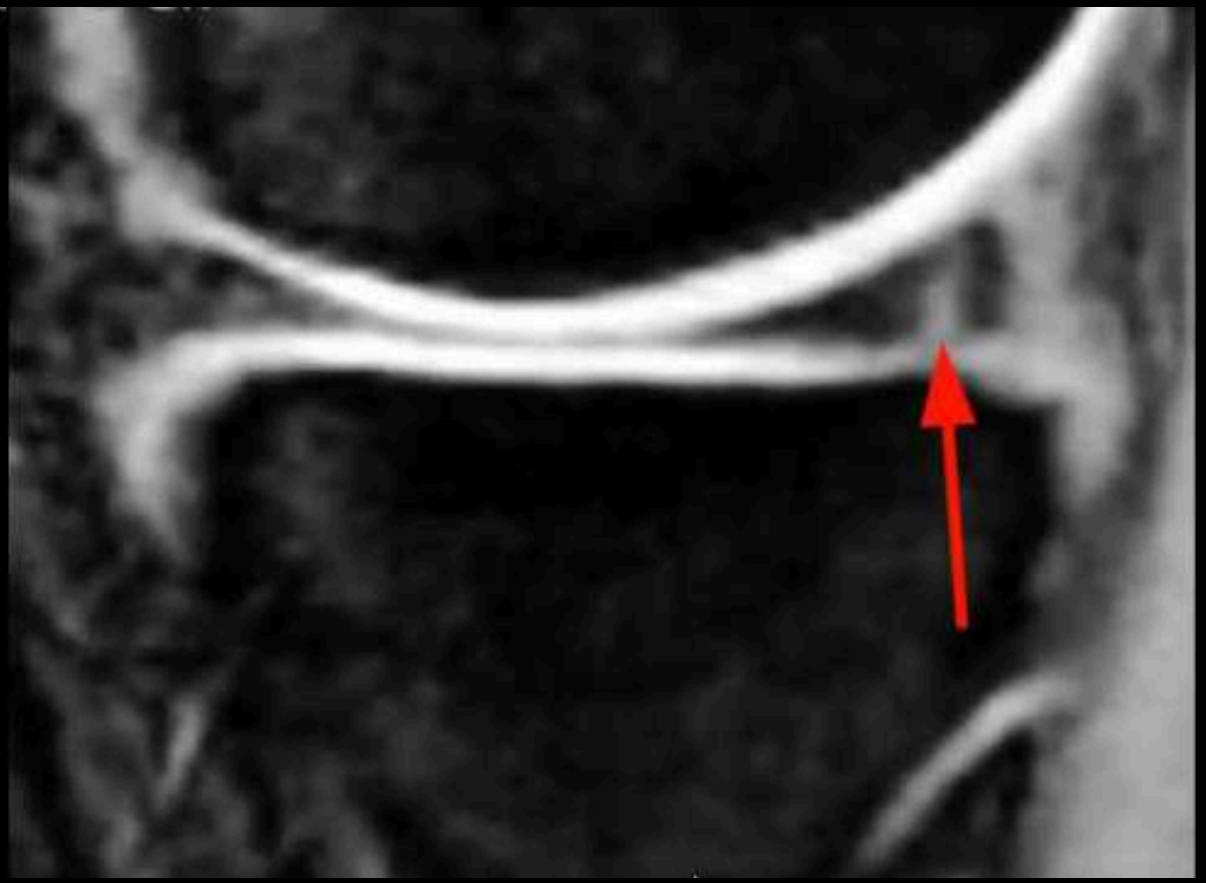
- Hyperintensity contacting the surface
- Abnormal morphology without prior surgery

TYPES OF TEARS

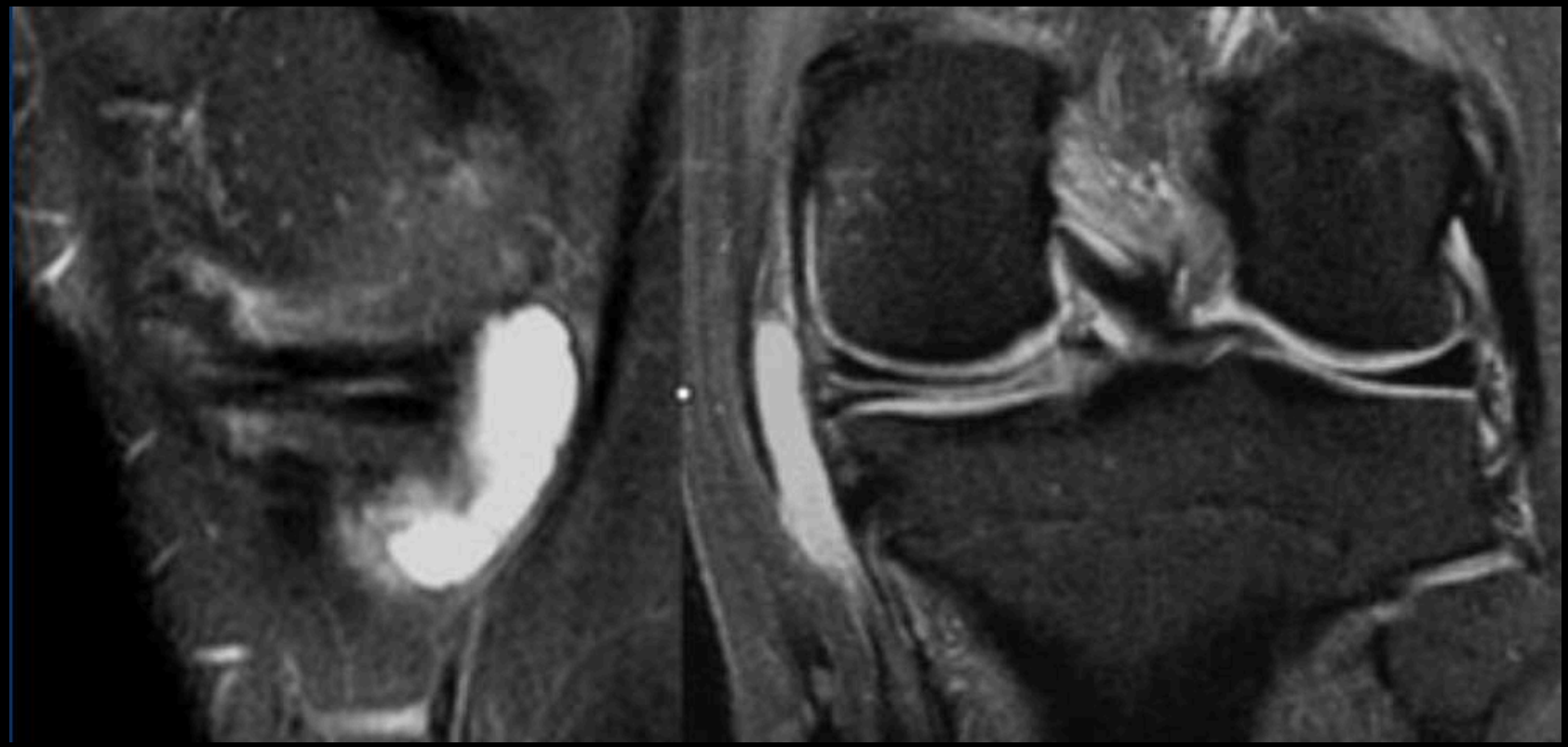




VERTICAL TEAR



HORIZONTAL TEAR WITH PARAMENISCAL CYST

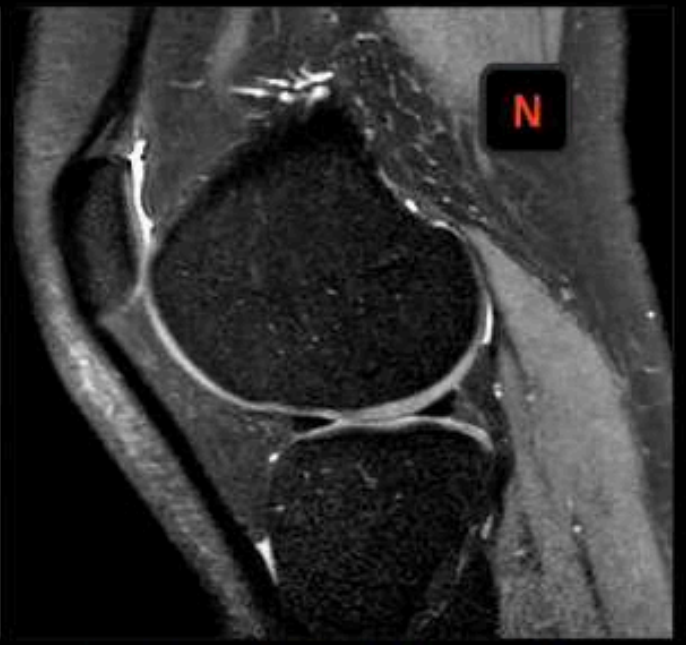


FISH MOUTH TEAR

- Should have tow components , horizontal and vertical
- Common in the medial meniscus

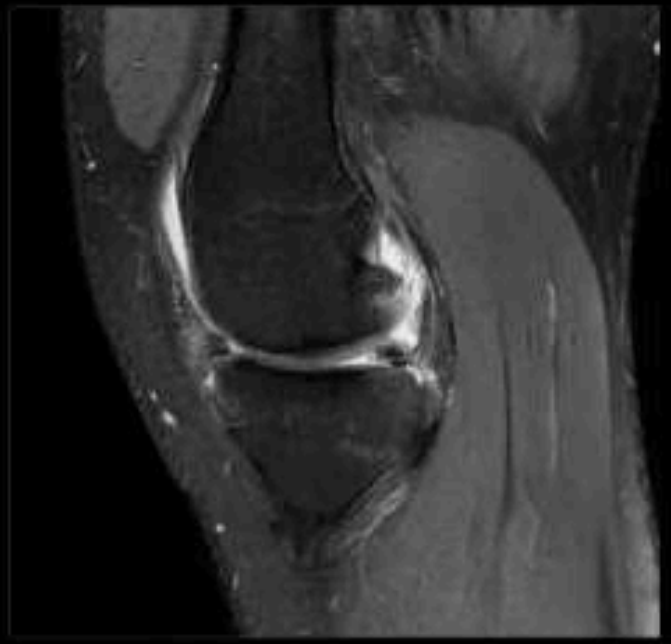
Fish mouth

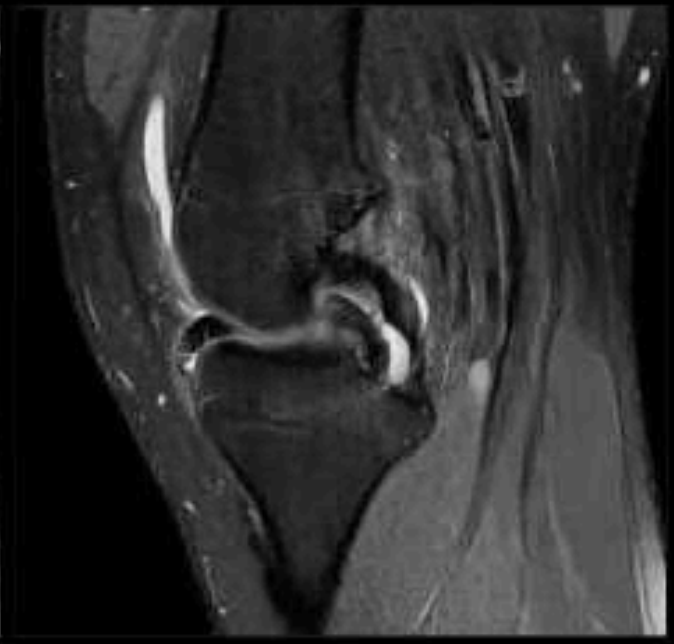
Bucket handle tear , LM



Flipped meniscus : Double Delta Sign

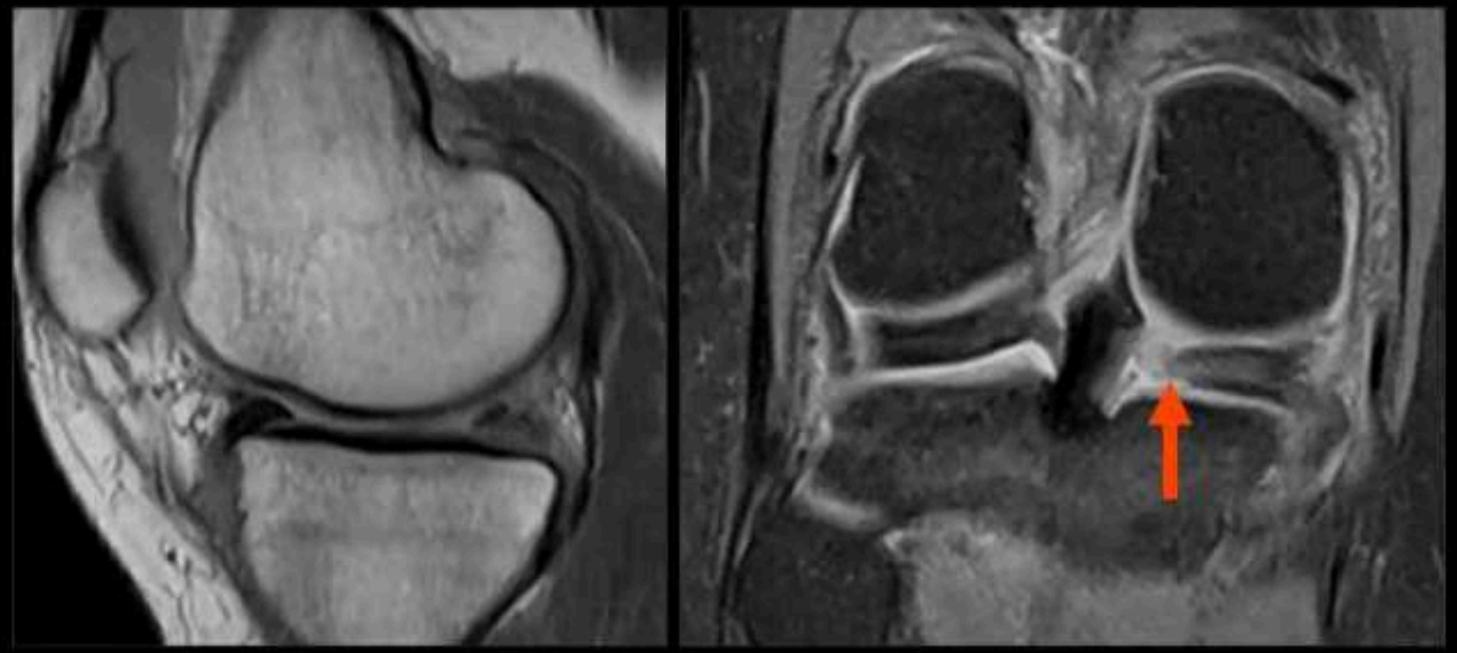
Bucket Handle Tear





TARGET ORTHO

Medial meniscus root tear

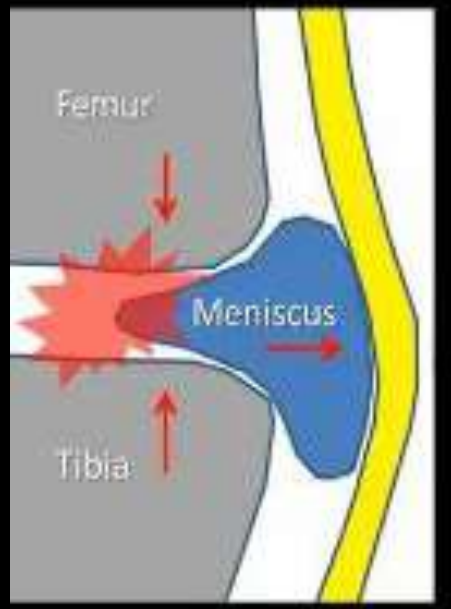


MENISCAL ROOT TEAR

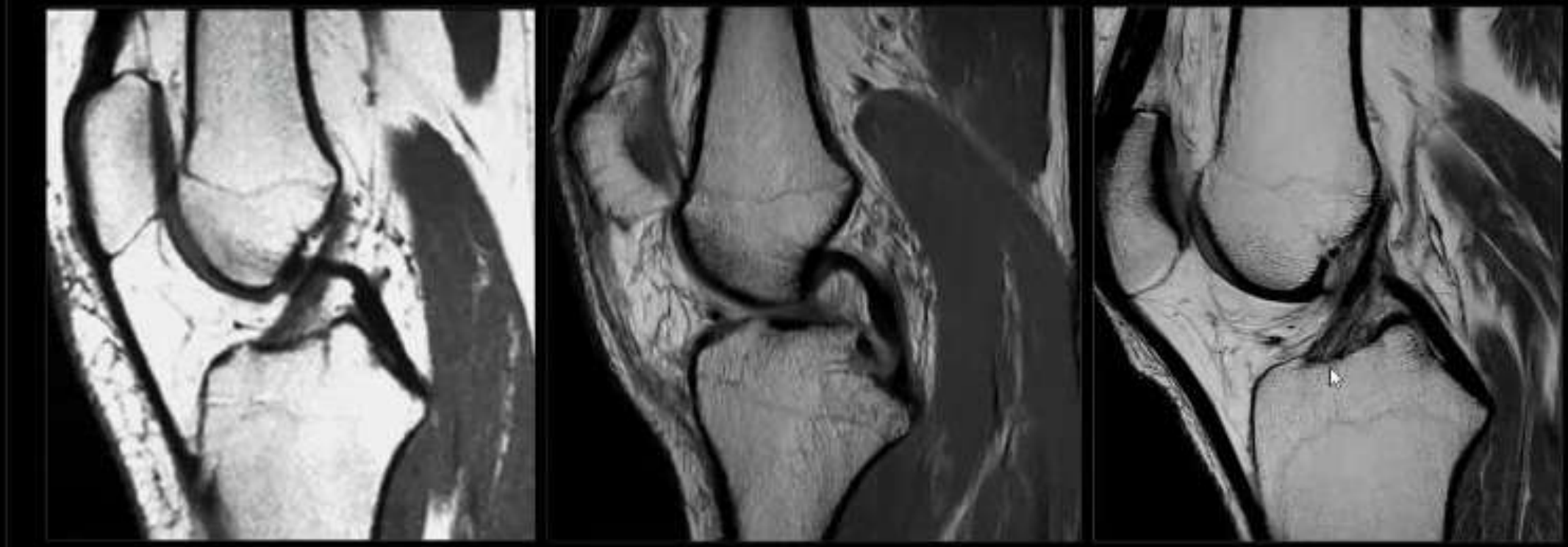
DISCOID MENISCUS

- Dysplastic meniscus with loss of normal semi lunar shape.
- 50% or more coverage of the tibial plateau.
- Meniscal body segment seen in 3 or more sagittal images

MENISCAL EXTRUSION



CRUCIATE LIGAMENTS



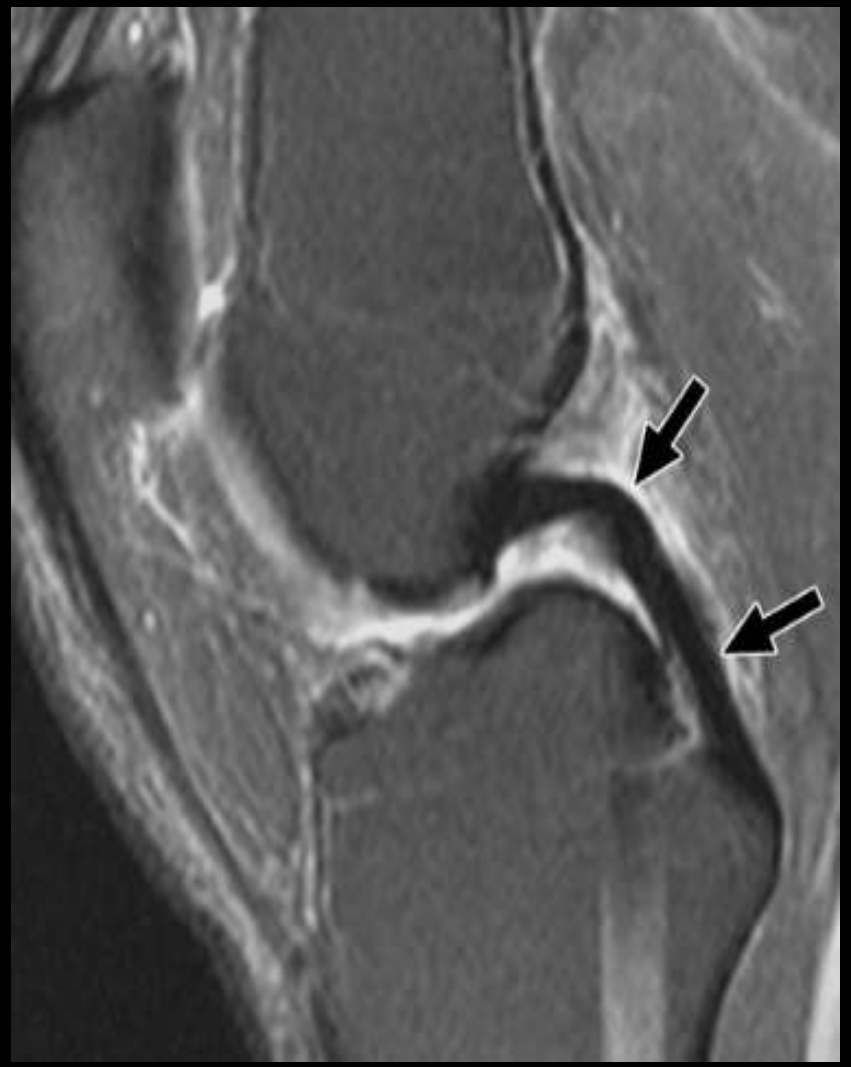
ANTERIOR CRUCIATE LIGAMENT

- Origin-medial aspect of Lateral femoral condyle
- Inserted into the tibial plateau in a depressed area anterolateral to the anterior tibial spine
- Tibial attachment site larger and more secure than femoral site
- Major blood supply: from middle genicular artery

Normal ACL

POSTERIOR CRUCIATE LIGAMENT

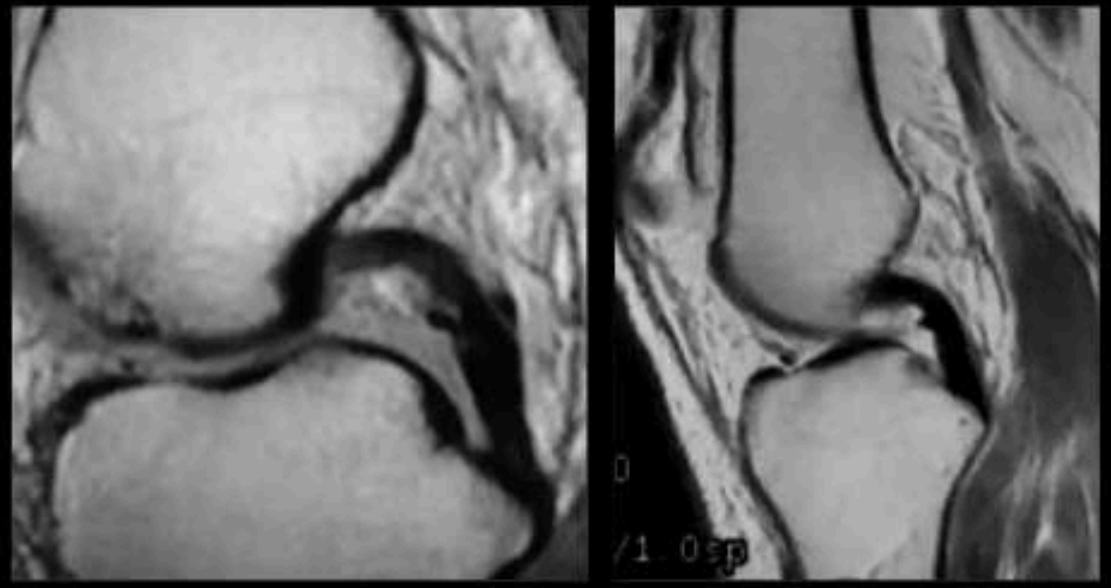
- PCL -twice as strong and thick as the normal ACL (therefore less commonly injured)
- Origin: antero-lateral aspect of medial femoral condyle in the area of intercondylar notch
- Attachment: Extra-articular, back of tibial plateau
- Hyperflexion: most common mechanism for an isolated PCL injury



Menisco -femoral ligaments

Connect the posterior horn of the lateral meniscus to the medial femoral condyle

- Ligament of *Humphrey* anterior to PCL
- Ligament of *Wrisberg* posterior to PCL



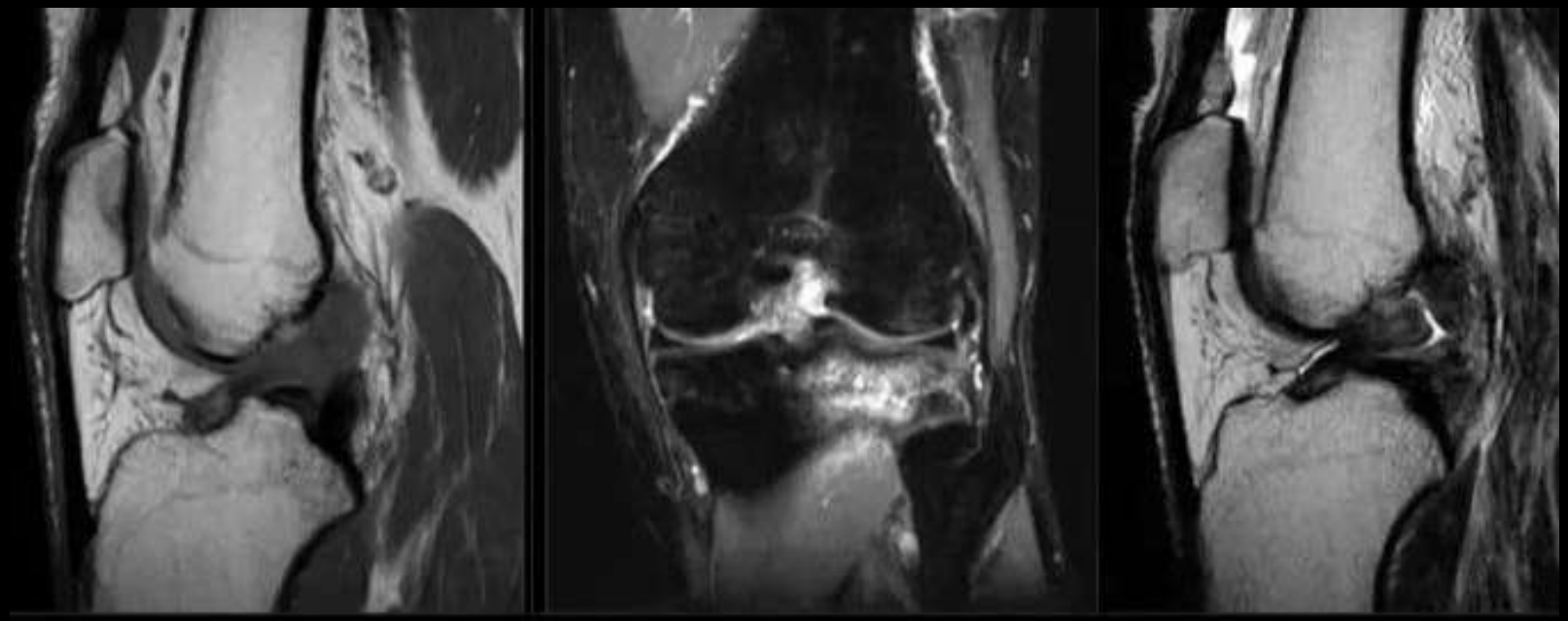
ACL TEAR- CRITERIA

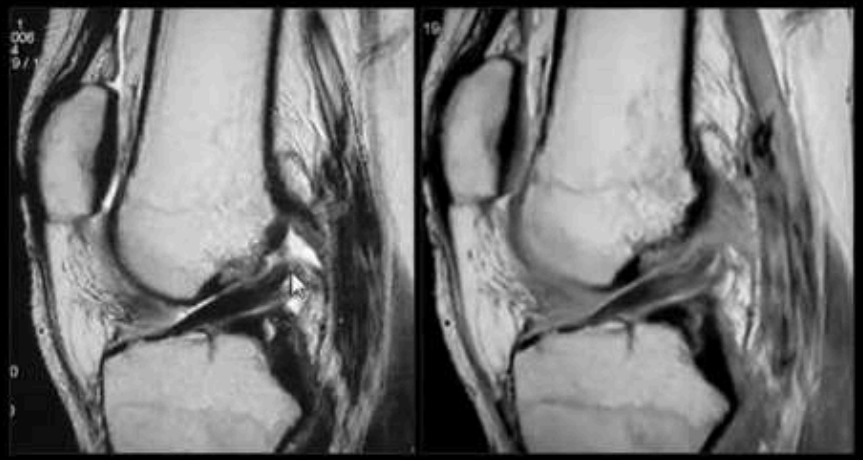
- PRIMARY SIGNS

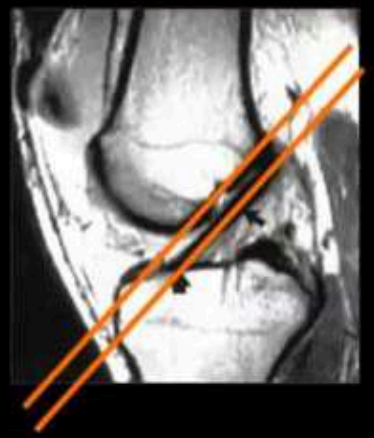
-Discontinuity
-T2 hyperintensity

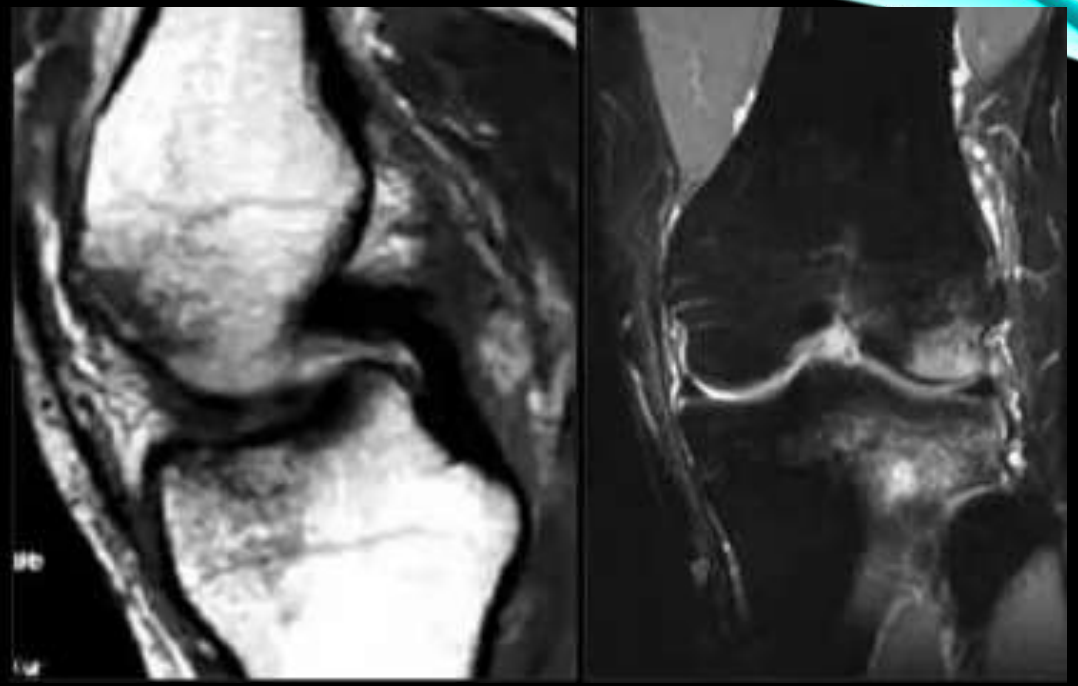
- SECONDARY SIGNS

-Bone contusion
-Tibial translation
-Segond fracture
-Avulsion fracture
-PCL buckling
-Empty notch sign

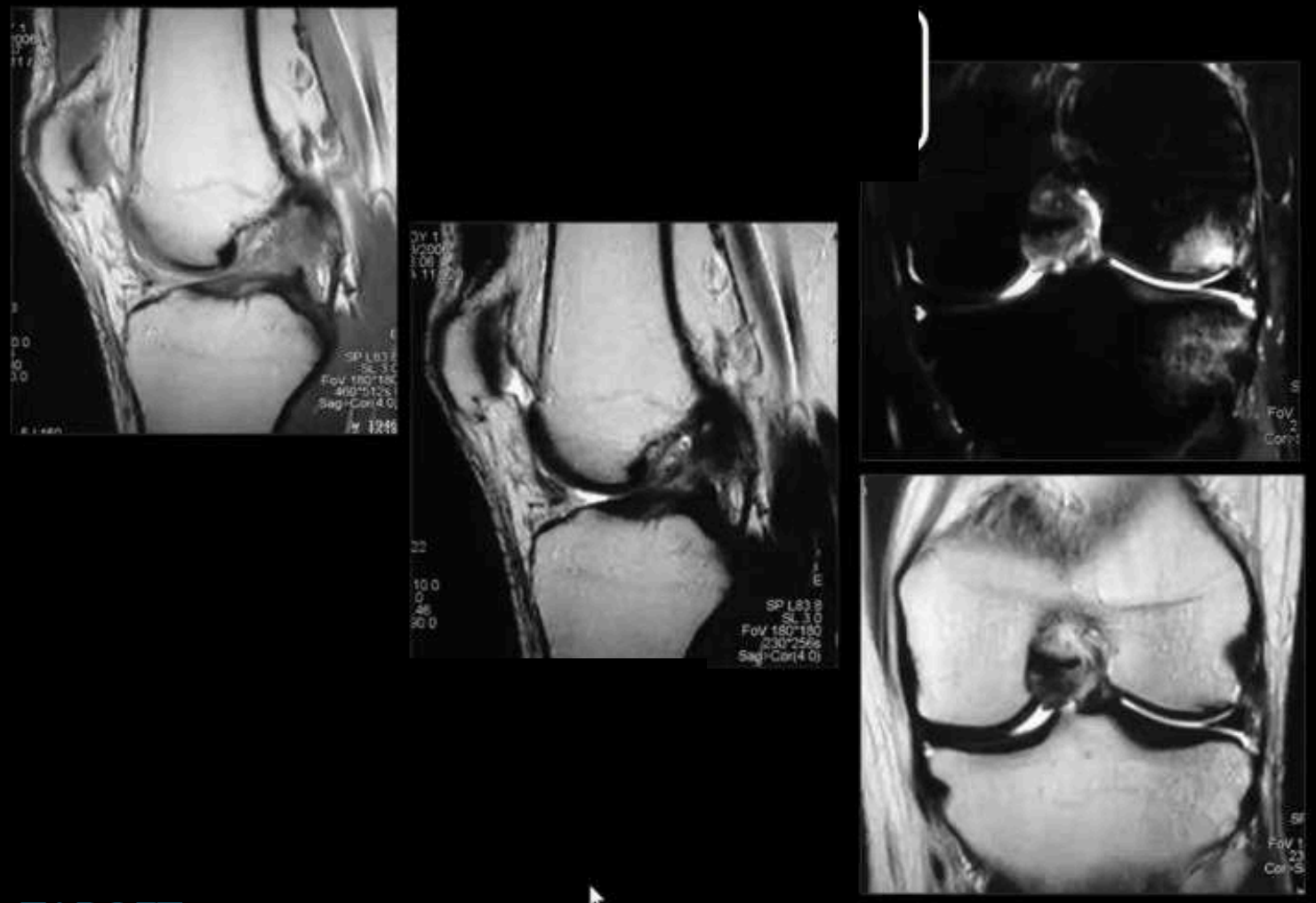








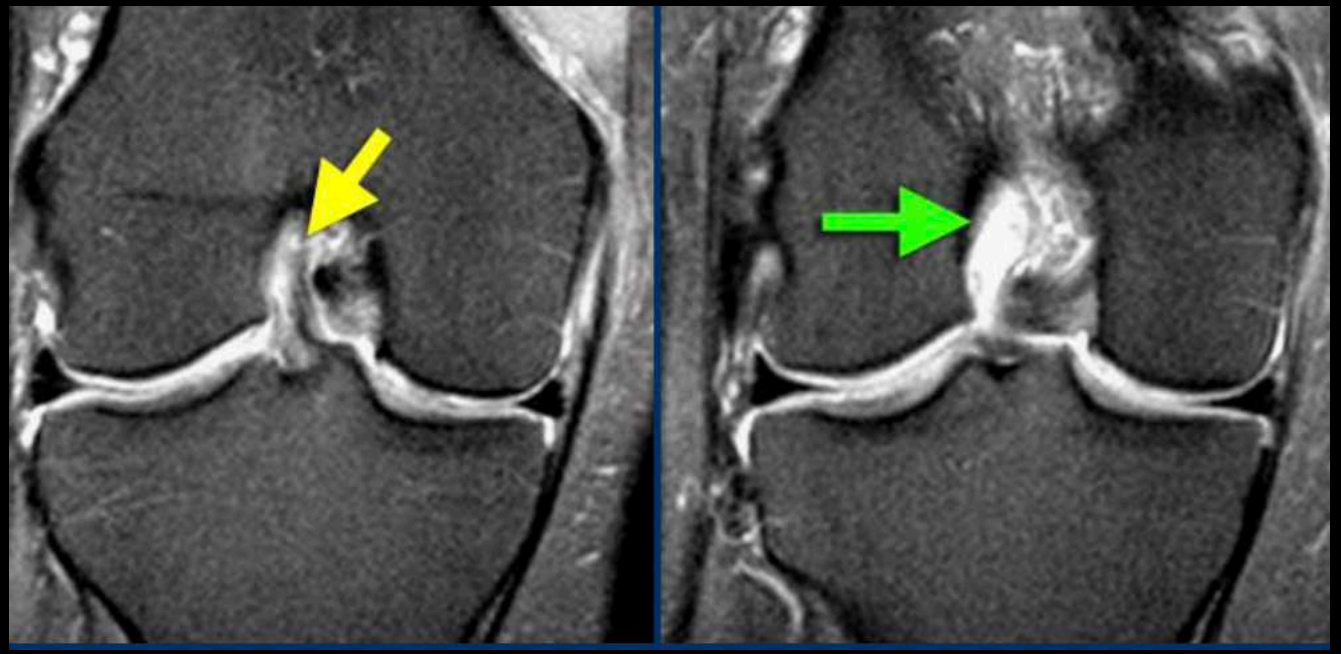
ACL TEAR



TARGET ORTHO

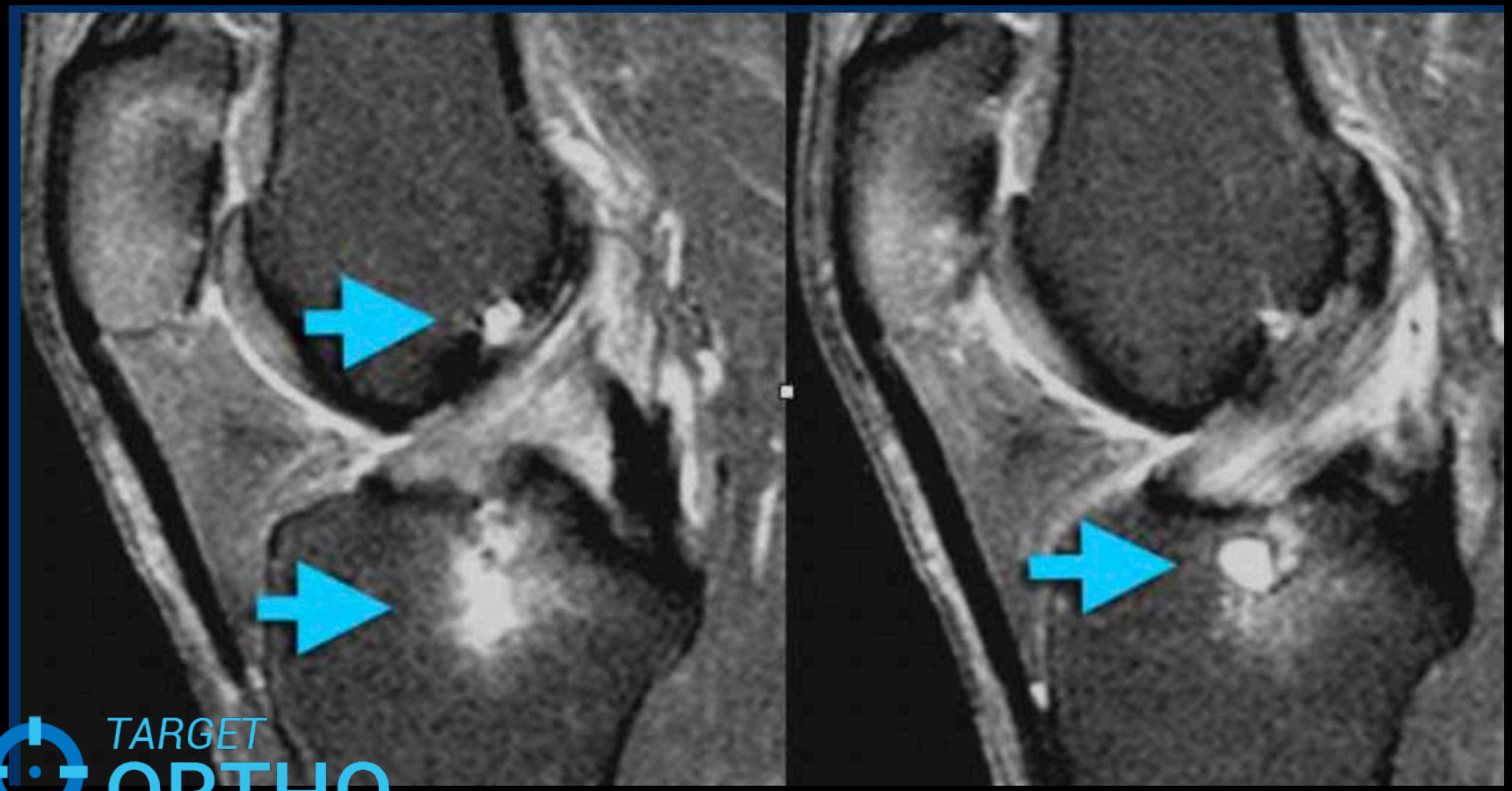
ANTERIOR TIBIAL TRANSLATION

EMPTY NOTCH SIGN



SEGOND FRACTURE

MUCOID DEGENERATION



TUNNEL POSITION-SAGITTAL PLANE

a) Tibial tunnel

- Parallel to the Blumensaat line
- Proximal opening just posterior to intersection of the Blumensat line with tibia

b) Femoral tunnel

- At intersection of the posterior femoral cortex and line along intercondylar roof

TUNNEL POSITION-CORONAL PLANE

- Femoral tunnel opening above lateral femoral condyle
- 10-11 o'clock right knee
- 1-2 o'clock left knee
- Tibial tunnel above intercondylar eminance

NORMAL APPEARANCE OF ACL GRAFT

- **Less than 3 months**

  -Graft is avascular

  -MR signal characteristics are identical to native tendon

  -Dark on T1 and T2WI

- **4-12 months**

  -Graft revascularization

  -Intermediate T1 and T2 SI

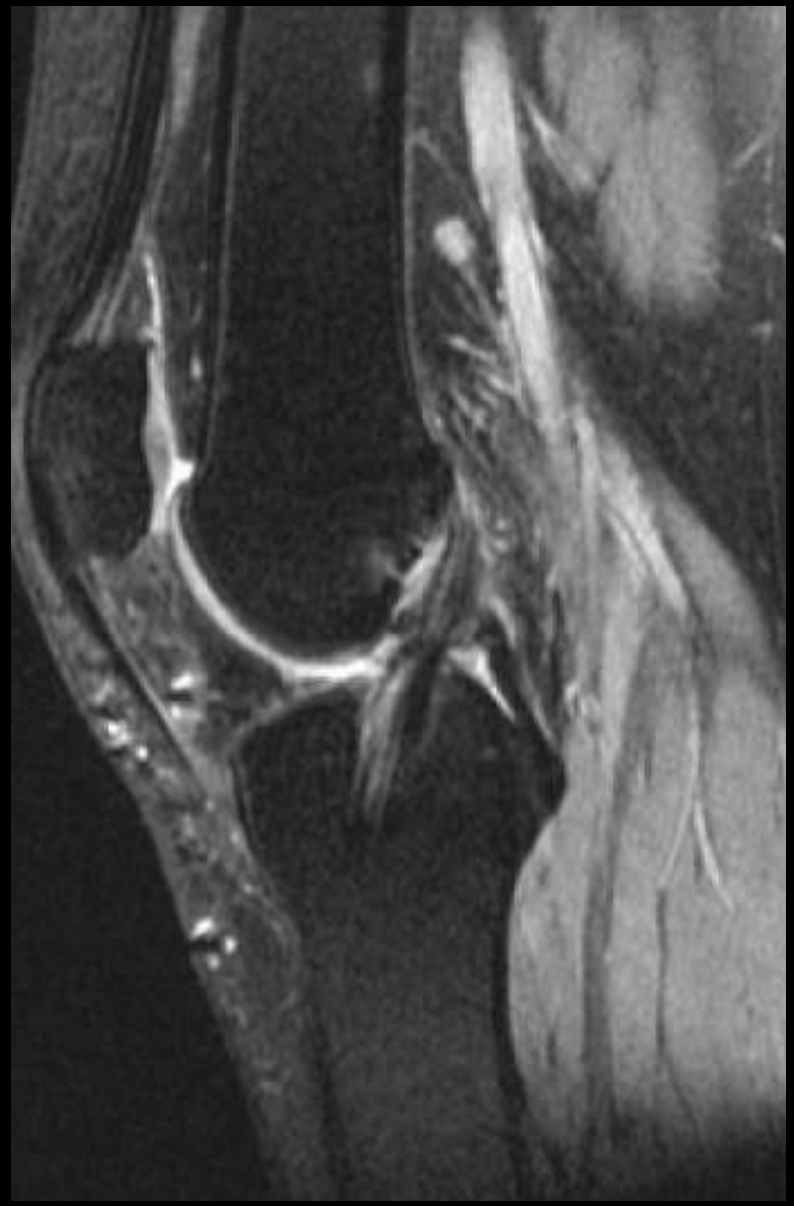
  -Normal graft should not have fluid signal within graft on T2WI

  -Most susceptible to graft tear during this period

More than 12months

-MR appearance similar to native ACL appearance

-Dark on T1 and T2 WI; Hamstring graft may have intermediate stranding in distal fibers



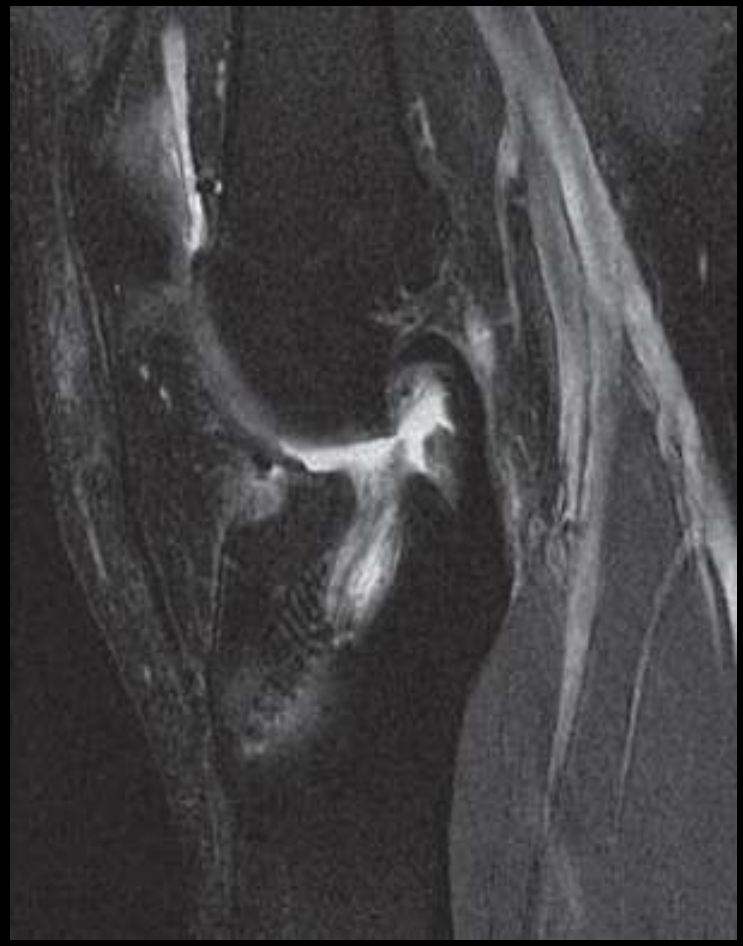
GRAFT TEAR

Primary signs:

- Diffuse increased graft signal intensity on T2WI
- Horizontal graft orientation on sagittal images
- Complete discontinuity

Secondary signs :

- Anterior tibial translation >5mm
- Posterior cruciate ligament (PCL) buckling
- Bony contusions/joint effusion

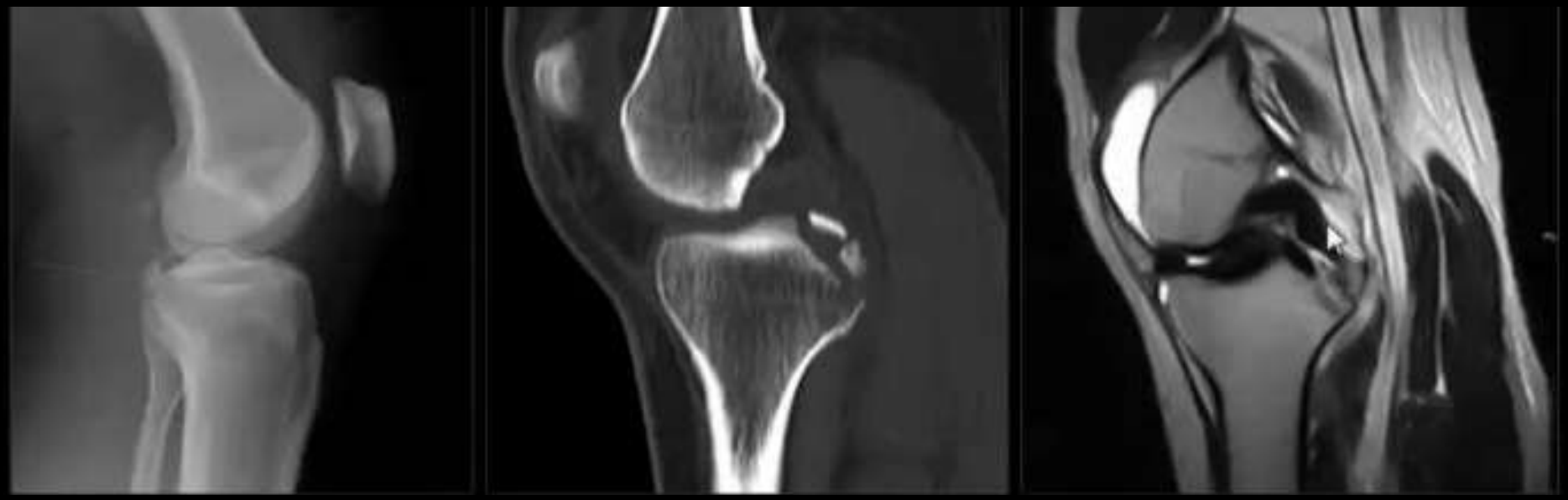


LOCALISED ARTHROFIBROSIS "CYCLOPS LESION"

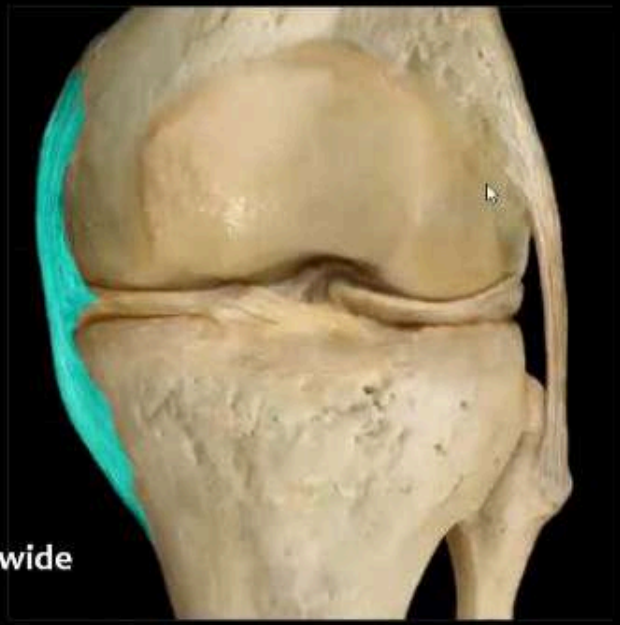
- Anterior intercondylar nodule with mixed intermediate signal intensity on T1, T2 and PD WI.
- Limits full extension of knee, anterior knee pain
- D/D: -Focal pigmented villonodular synovitis
  - Synovial chondromatosis
  -Loose body
  -Foreign body

PCL TEAR

PCL AVULSION TEAR



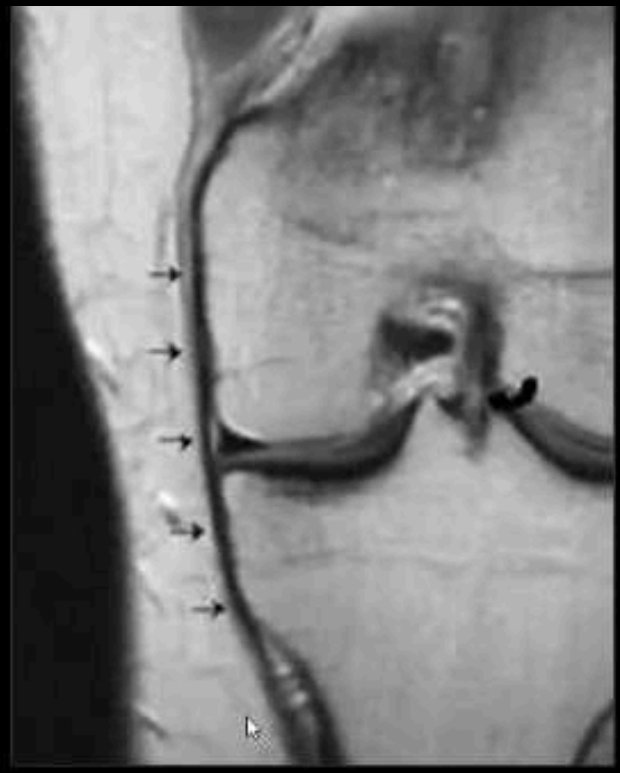
COLLATERAL LIGAMENTS



- MCL is about 8-11 cm long and 10-15 mm wide
- LCL is about 5-7 cm
- Isolated injuries are rare, usually with ACL and MM

MCL

A thin, well-defined, low-signal structure extending from the medial femoral epicondyle to the medial tibial metaphysis



LCL, BICEPS FEMORIS AND CONJOINT TENDON

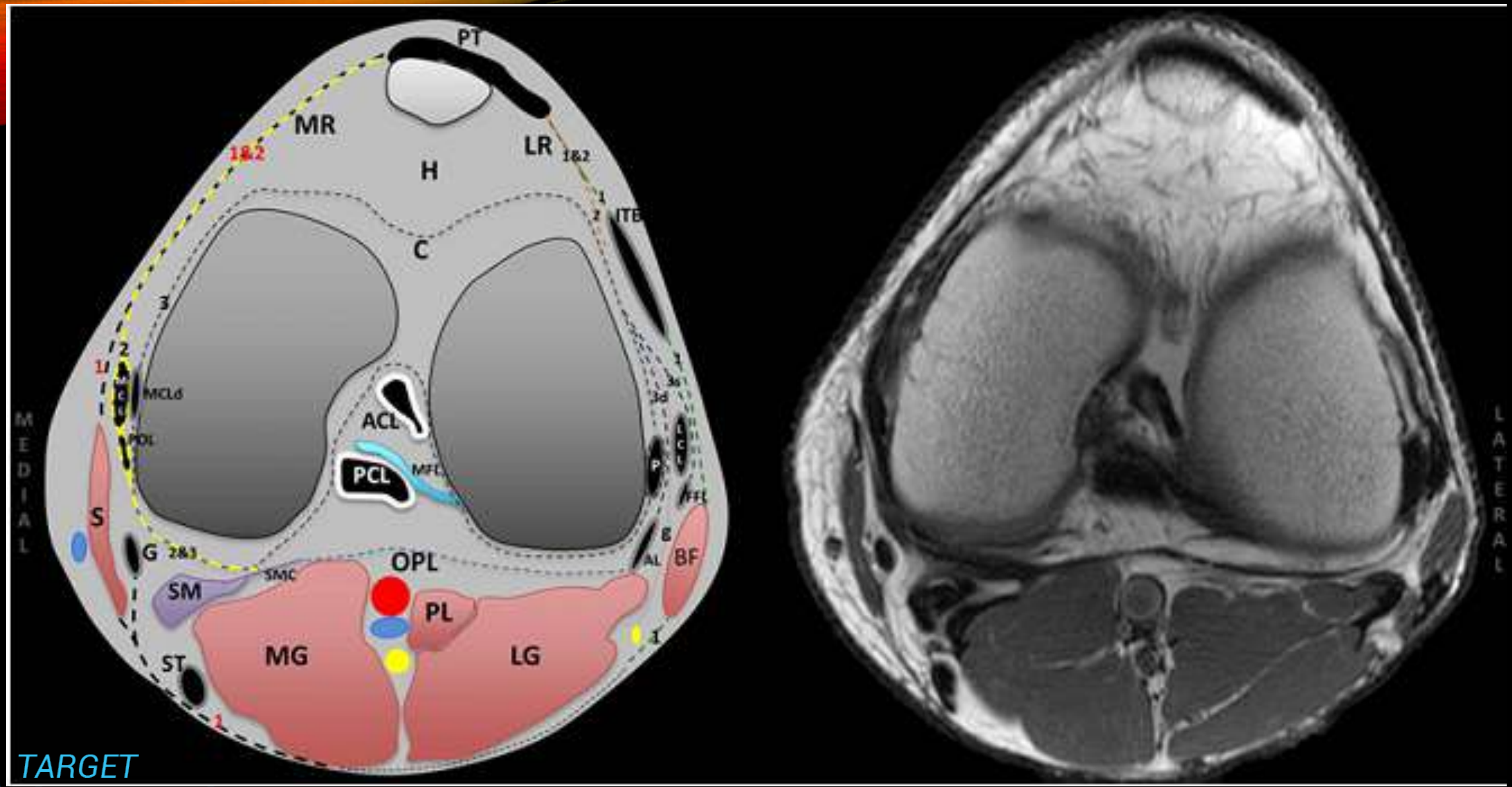
- LCL arises from lateral femoral condyle in mid-coronal line 2 cms above joint line
- Distally and posteriorly to attach on posterior aspect of fibular head
- Joins with tendon of BF long head to form conjoint tendon before insertion
- LCL: 3-4 mm normal

ILIOTIBIAL BAND

- Extension of tensor fascia lata and inserts at Gerdy's tubercle- Anterolateral part of tibia
- Coronal & axial plane

PLC ANATOMY

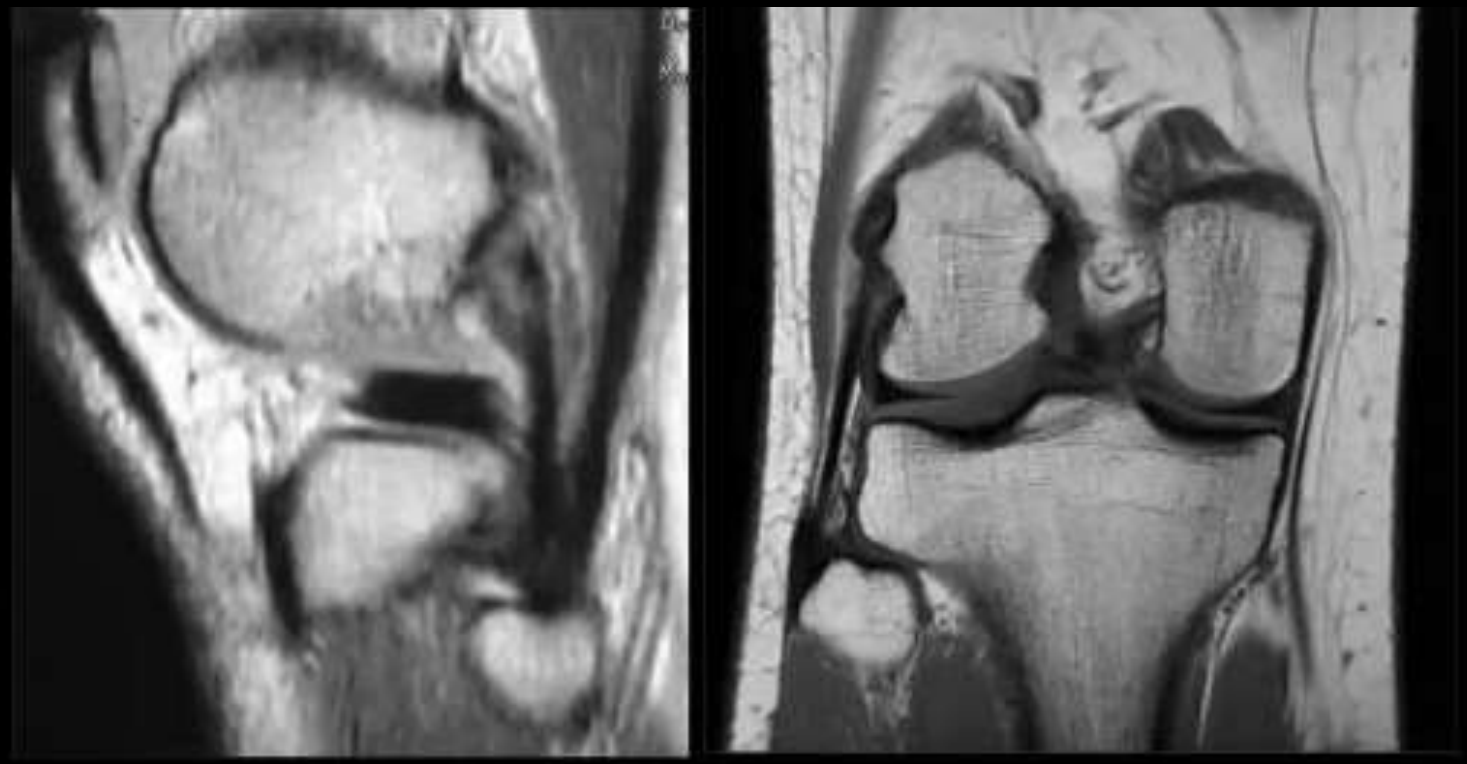
- 3 layered anatomy
- Superficial: Iliotibial band and Biceps femoris tendon
- Middle: Lateral patellar retinaculum, prox and distal patellofemoral ligaments
- Deep:
  a) Lateral collateral ligament (LCL)
  b) Lateral coronary ligament/meniscotibial ligament/mid third of lateral capsule,
  c) Popliteus muscle and tendon (PMT)
  d) Popliteofibular ligament (PFL)
  e) Popliteomeniscal ligaments (PML)
  e) Fabellofibular ligament (FFL)
  f) Arcuate ligament (AL)
  Others: Lateral head of gastocnemius



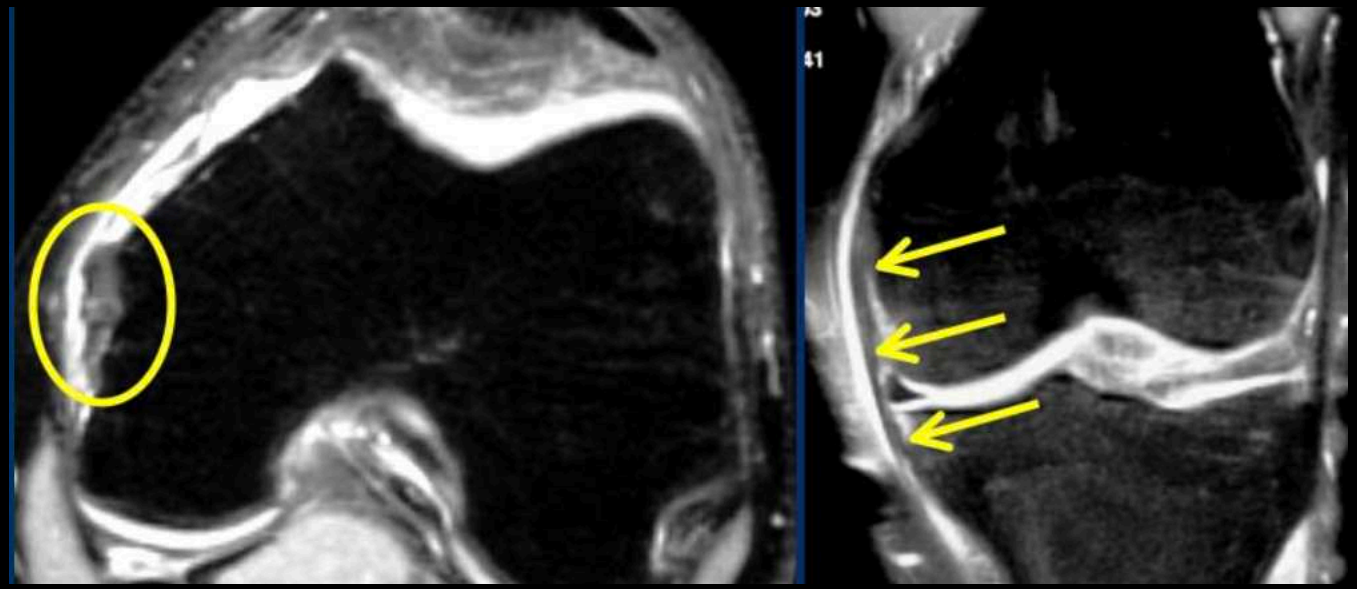
TARGET ORTHO

(C) www.targetortho.com

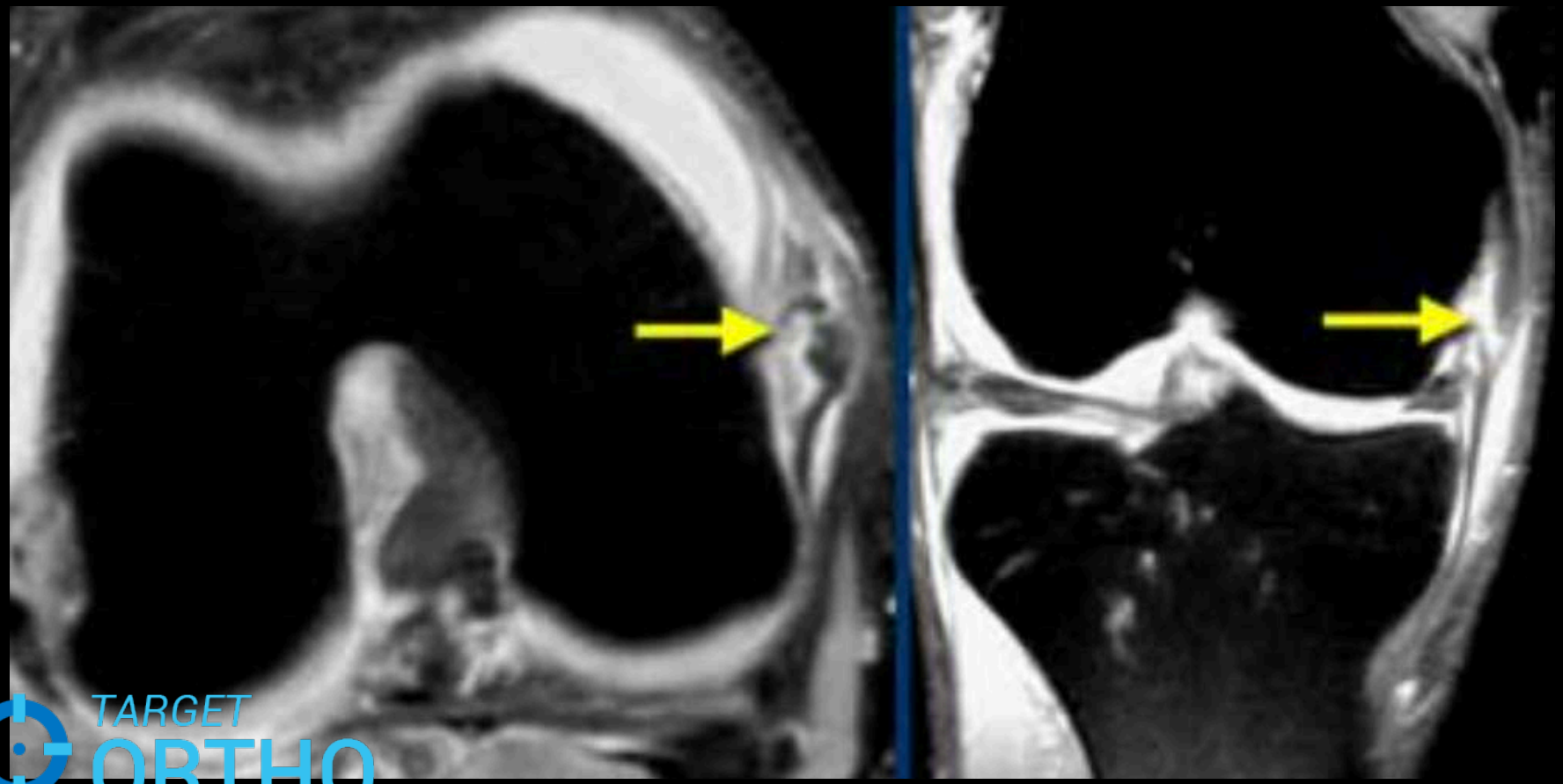
LCL



GRADE 1 MCL SPRAIN



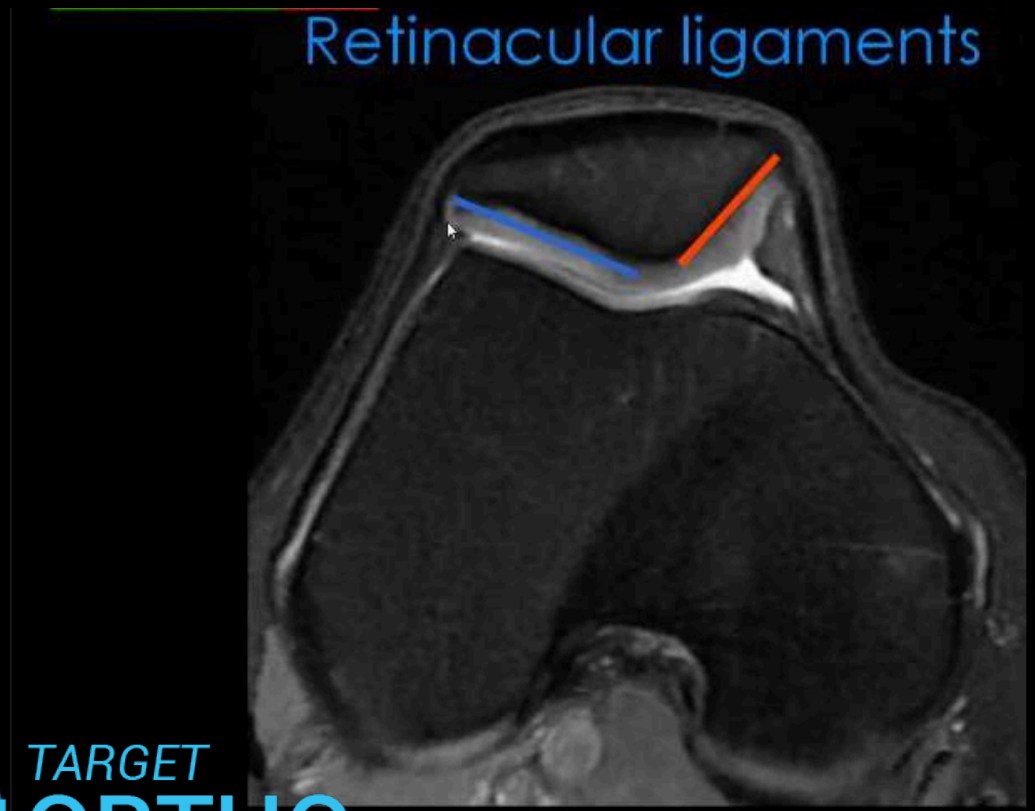
GRADE 2 MCL SPRAIN



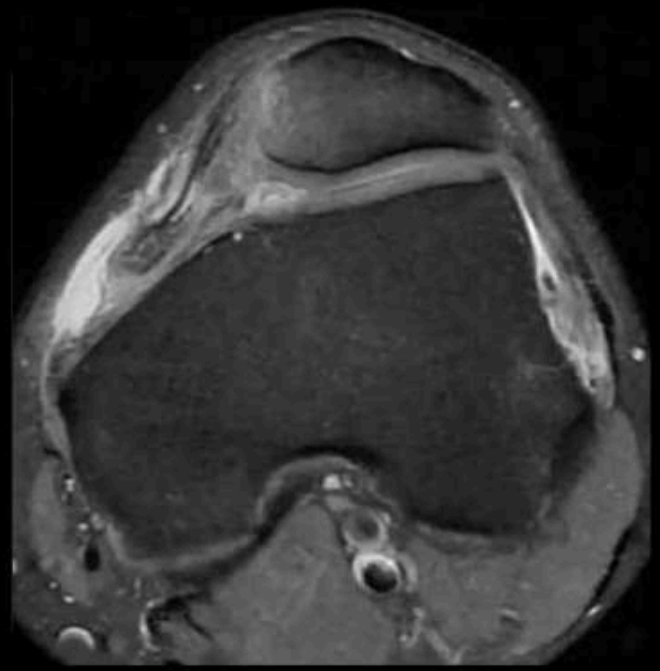
MCL TEAR

LCL TEAR

RETINACULAR LIGAMENTS



Torn medial patellar retinacula

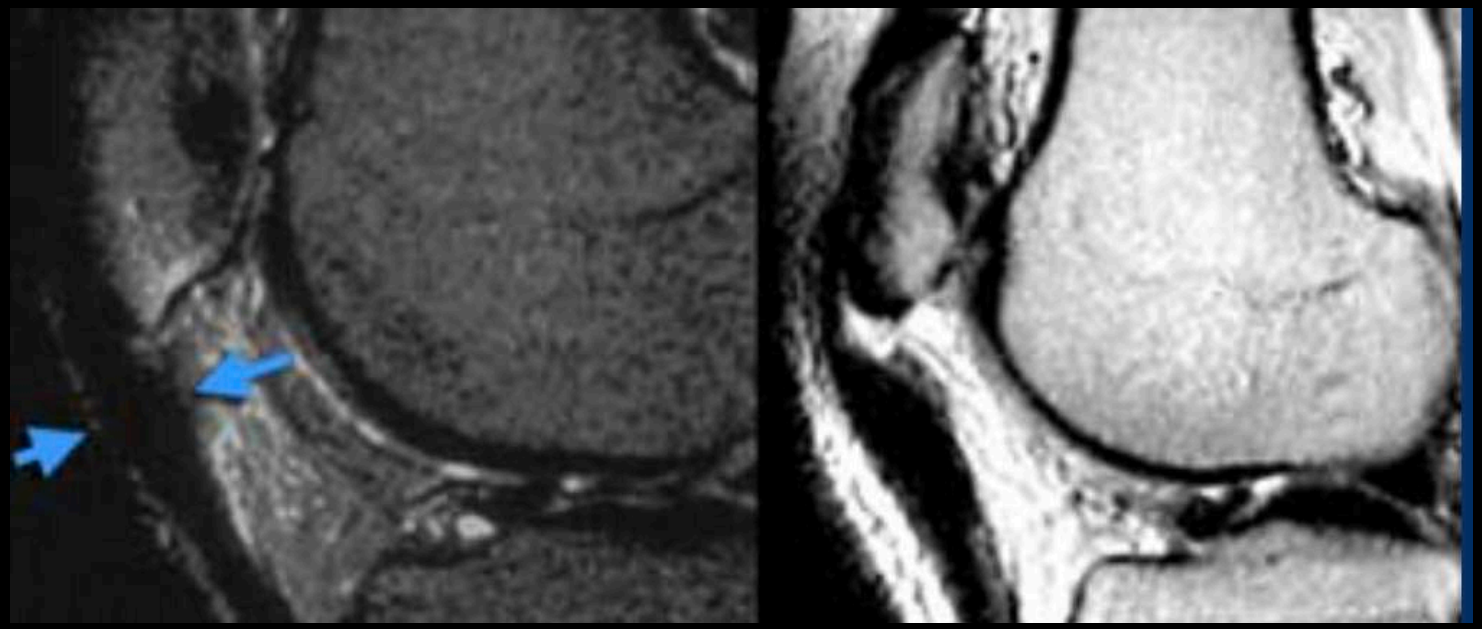


QUADRICEPS-PATELLAR TENDON

QUADRICEPS TENDON RUPTURE

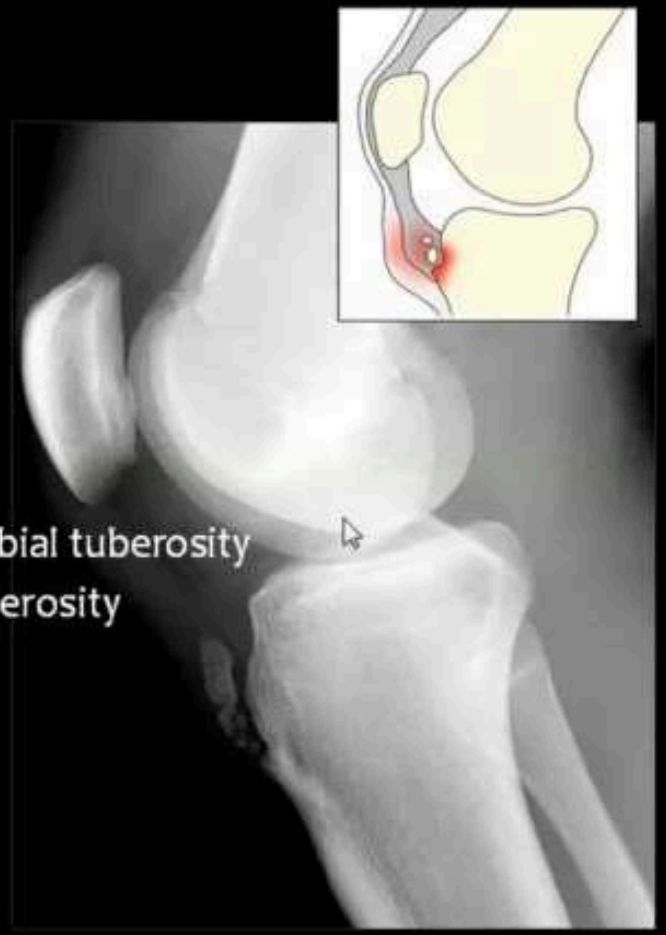
- Caused by forced muscle contraction or direct trauma
- Axial images to differentiate complete from partial tears
- Coronal images to assess the extent of muscle injury

PATELLAR TENDINOPATHY



OSGOOD SCHLATTER DISEASE

- Osteonecrosis of the tibial tuberosity
- Repeated micro trauma in adolescents
- Activity related pain , swelling , tenderness at the tibial tuberosity
- X-rays : avulsion and fragmentation of the tibial tuberosity



- Chronic avulsion injury of the tibial tuberosity
- Occurs in adolescents, between 10-15 years
- More often in boys than girls
- Usually unilateral
- Bilateral lesions are seen in 25 – 50%

THANK YOU

2/9/23