

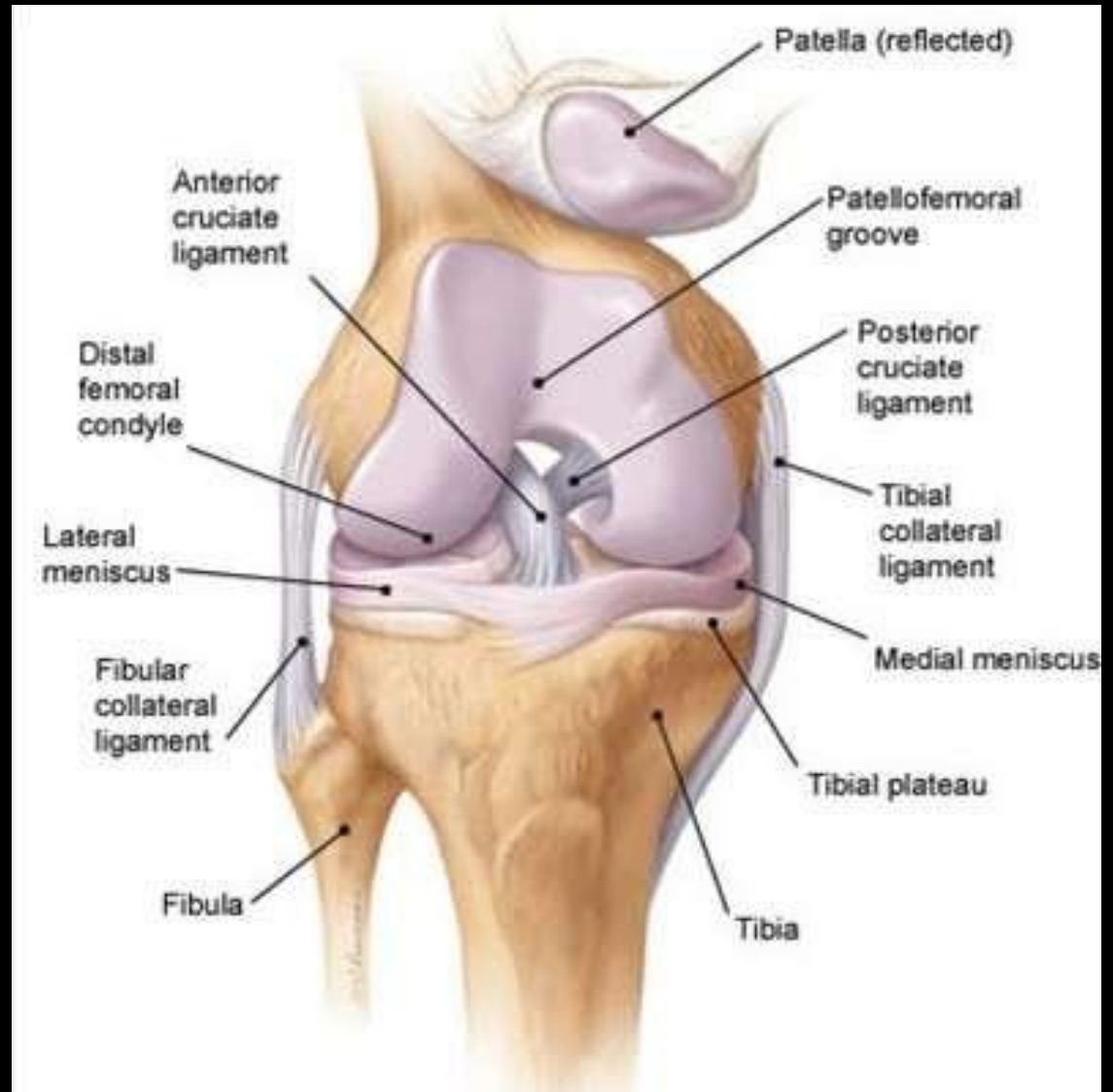
MGM Institute of Health Sciences,
Kamothe

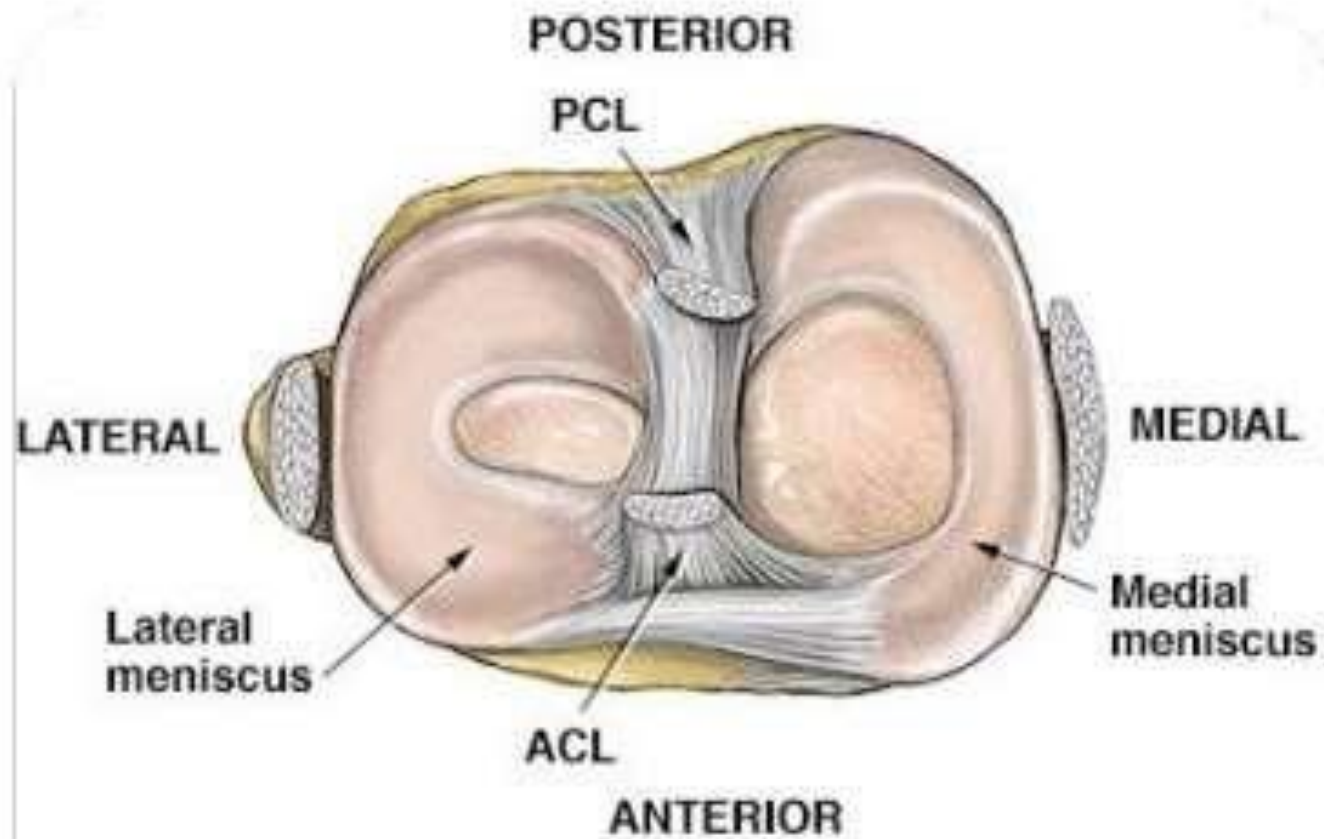
MRI KNEE

Presented By:-

Dr Sonali Mhaske Kadam

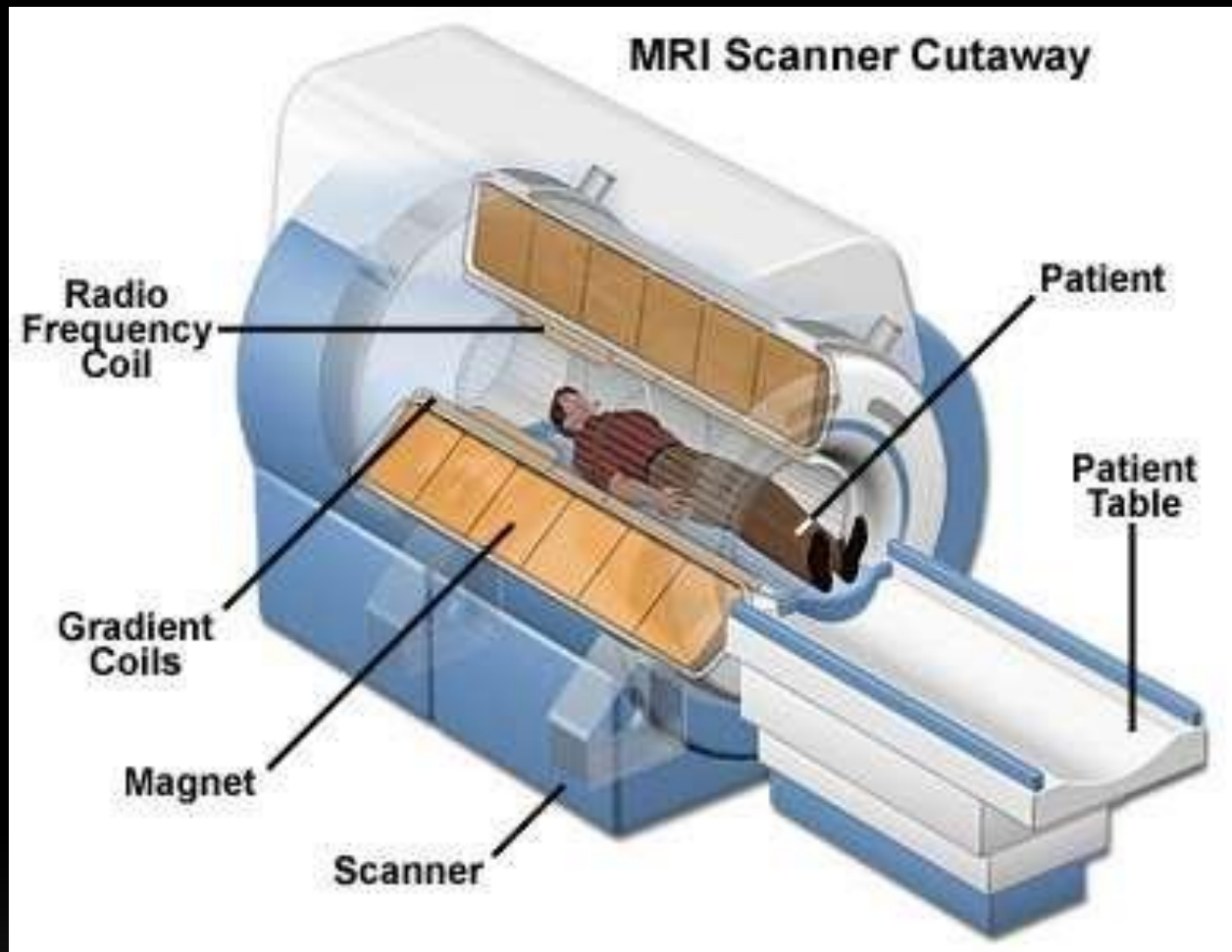
Anatomy







BASIC MRI



Tools in MSK imaging

- T1W1
- T2W1
- FAT SAT T1
- STIR
- FAT SAT T2
- Gadolinium studies
- MR arthrography

Basics of MRI



T1



Basics of MRI



T2



Basics of MRI

STIR



PD

Fat
Suppression



MRI Rules

	T1	T2
Fat	Hyperintense	Hyperintense
Water	Hypointense	hyperintense
Cortical bone	Hypointense	Hypointense
Fibrous tissue	Hypointense	Hypointense
Cartilage	Isointense	Isointense

Indications of MRI

- Occult fracture
- Marrow abnormality
- Ligament pathology
- Tendon pathology
- Muscular injury
- Infection
- Bone and soft tissue tumour

Sections

Coronal- Ant. To Post.

Sagittal- Lateral to Medial

Axial- From above downward

Position for knee MRI-

Knee in full extension and 5 degree of internal rotation

Meniscal Tear

➤ Imaging Criteria

1. Presence of linear signal intensity whether reaching superior or inferior articular surface or not
2. Abnormal meniscal morphology

Meniscal Tear

□ Grade

Grade 1- Globular signal within the meniscus

Grade 2- Linear signal within the meniscus
not reaching the articular surface

Grade 3- Linear signal within the meniscus
reaching the articular surface



0



I



II



III

Grade I



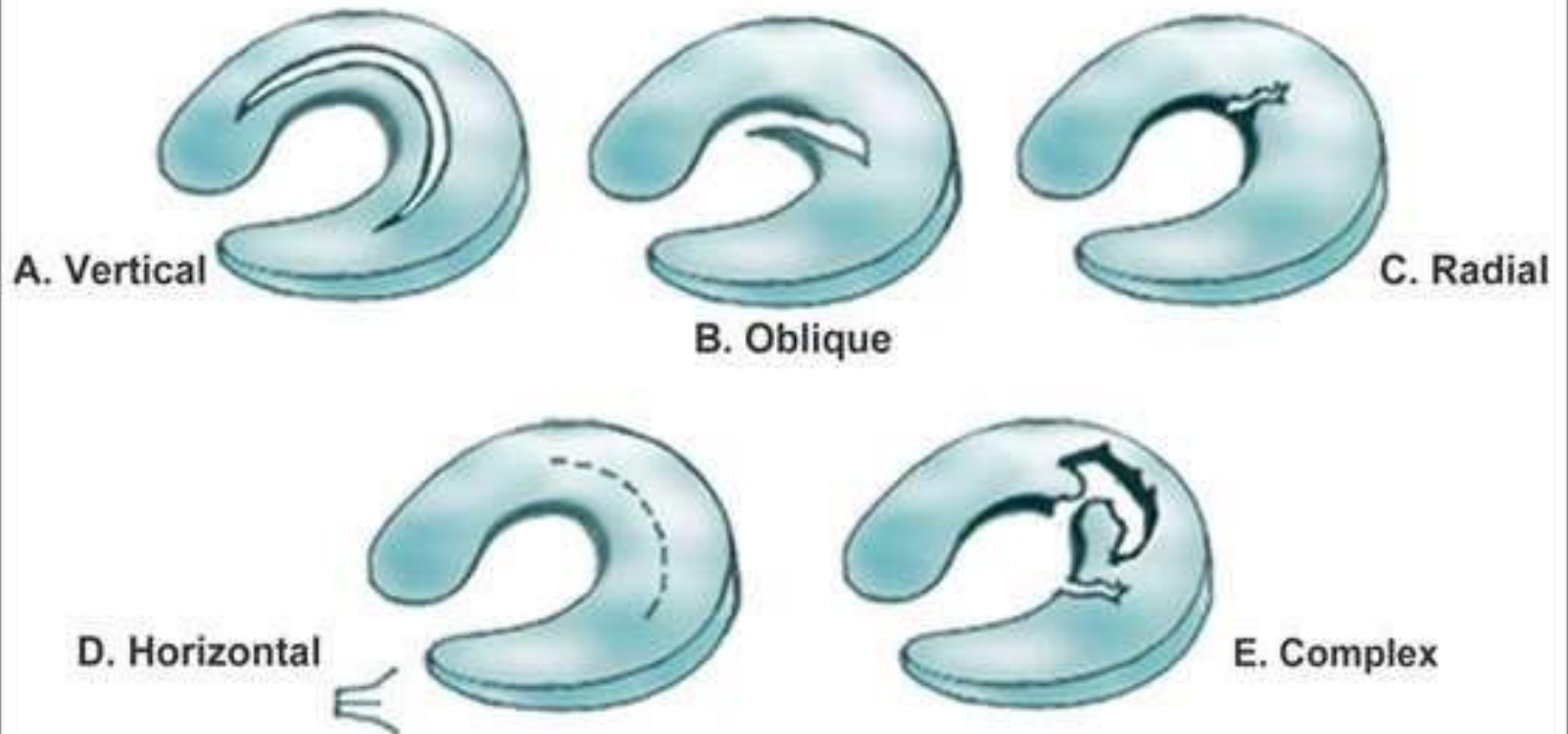
Grade II

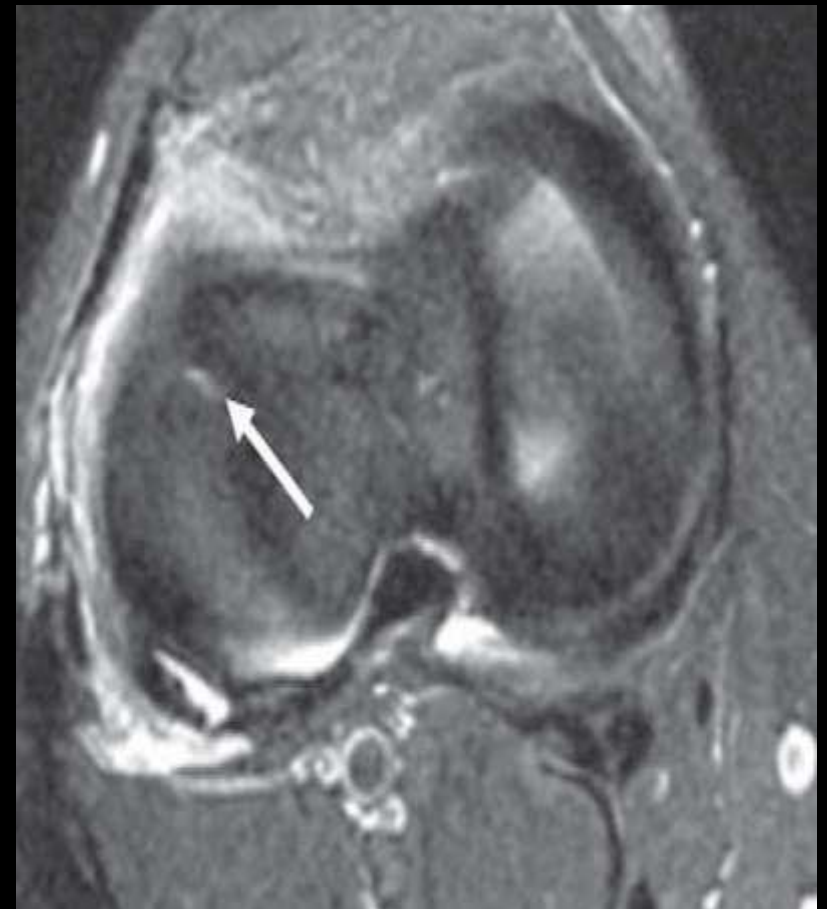
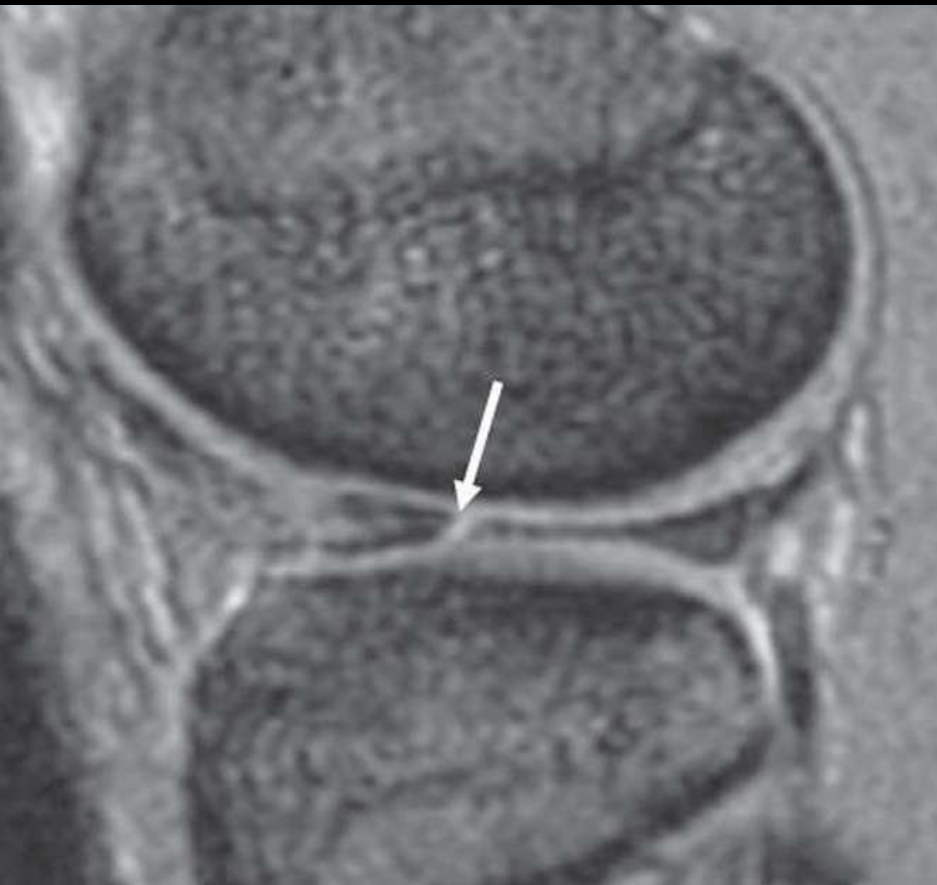


Grade III

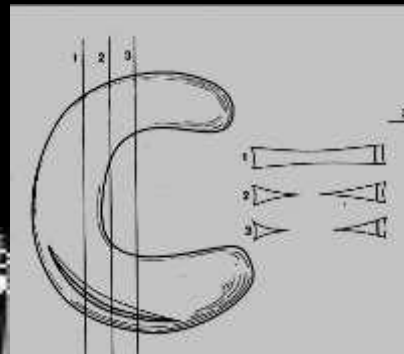


Meniscus Tear Patterns





Longitudinal tear

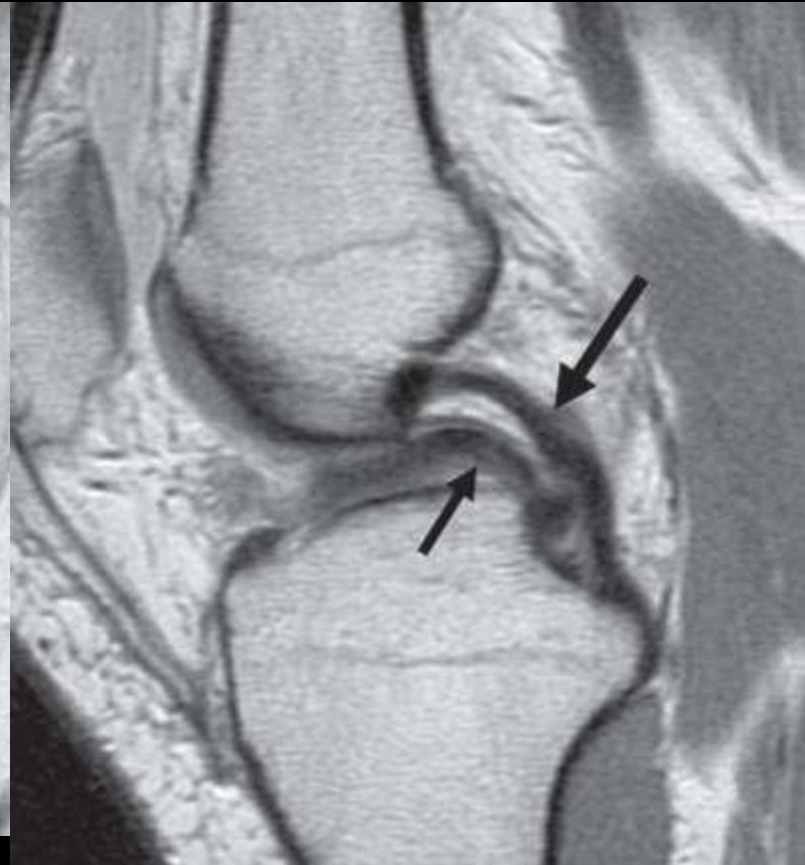
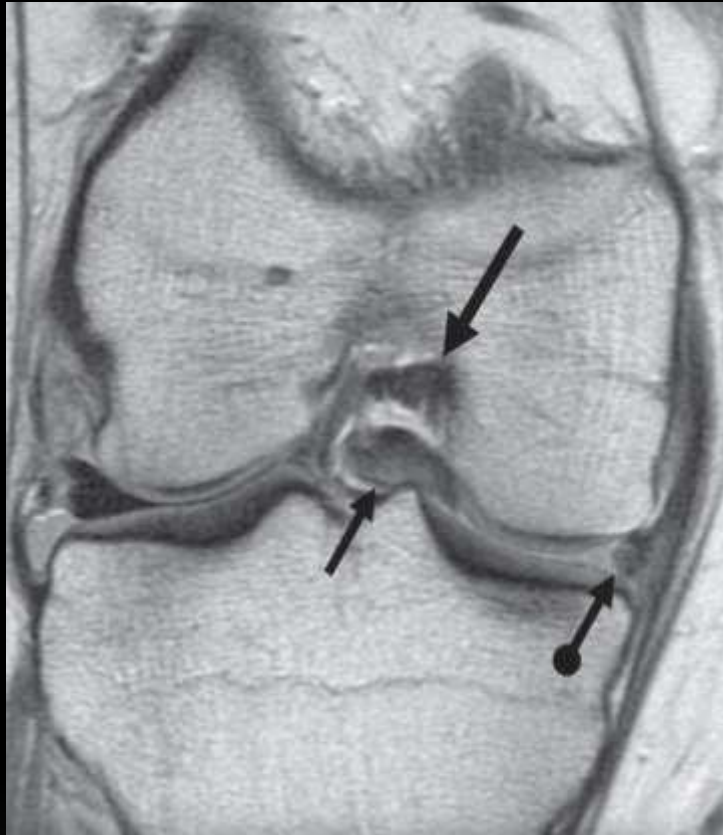
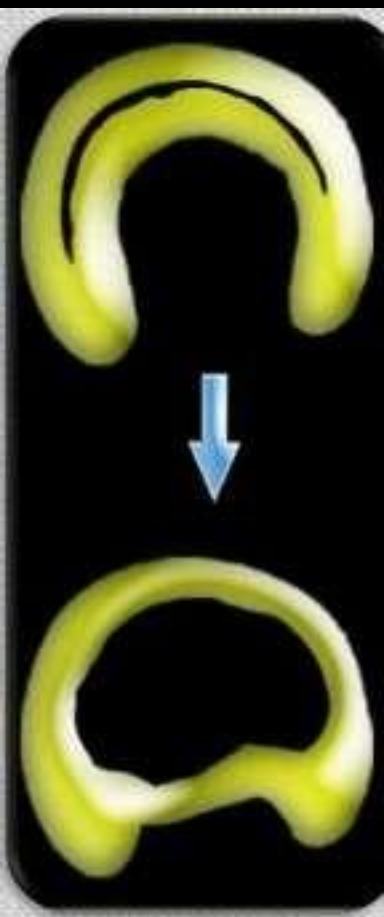




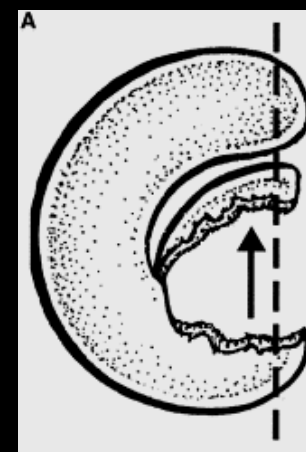
➤ Bucket Handle Tear- Longitudinal tear along the length of the meniscus and the inner rim flips into the intercondylar notch while remaining attached to the anterior and posterior horns.

➤ Double-PCL sign -The flipped fragment lies inferior and anterior to the PCL

Bucket Handle tear



Anterior flipped horn



Meniscal cyst

- Joint fluid is expressed into adjacent soft tissue through the tear
- Mostly occur in medial compartment
- Most common associated tear is horizontal cleavage tear



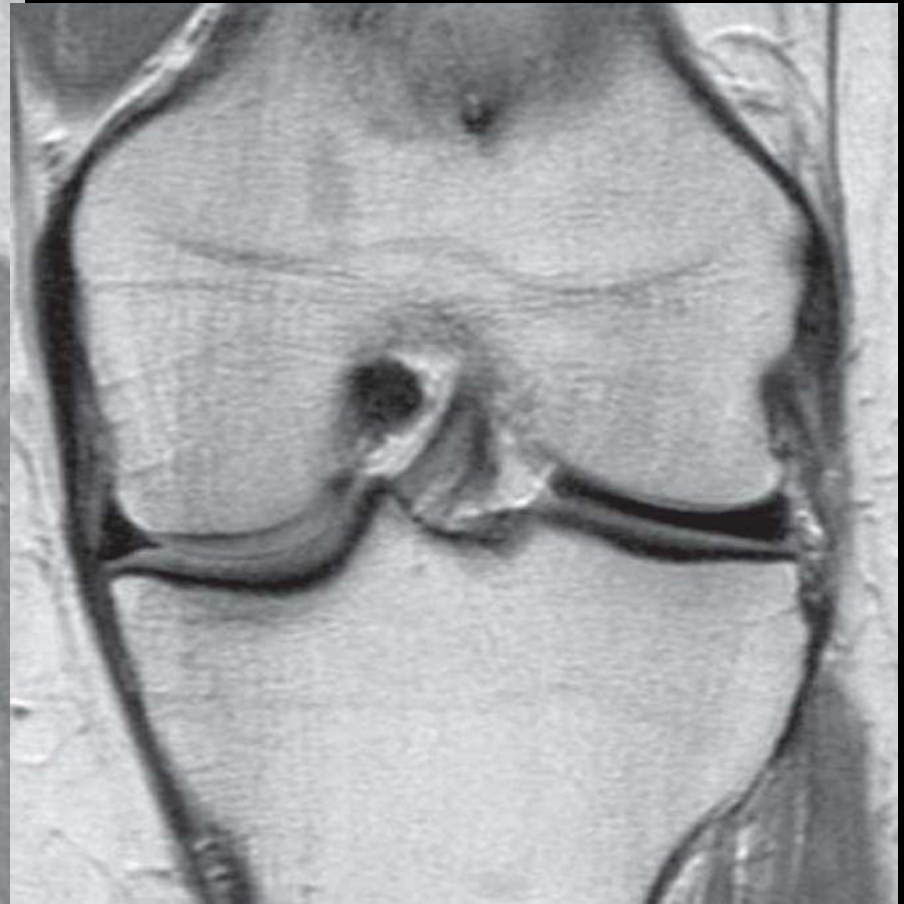
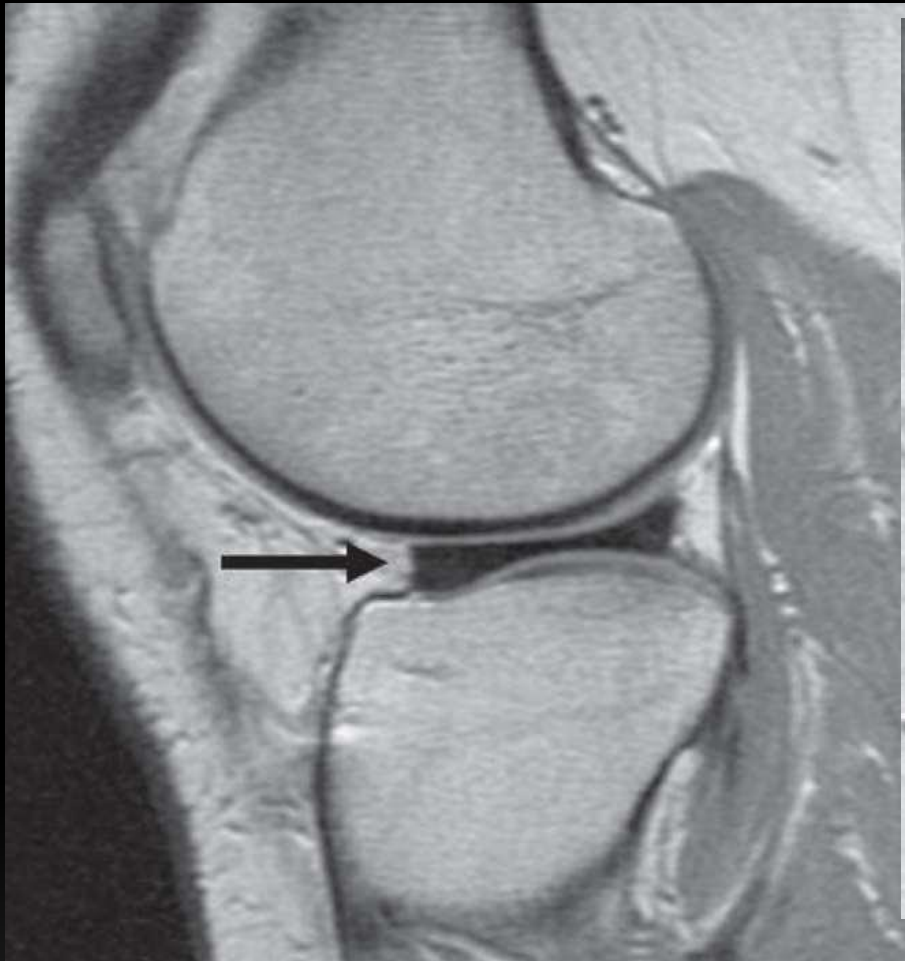
Discoid Meniscus-

- ❑ More common on lateral side
- ❑ High incidence of tear than normal meniscus
- ❑ Complete- Meniscus is a large slab of fibrocartilage instead of a crescent shaped wedge
- ❑ Incomplete- If lateral meniscus has wedge shaped but wedging is larger than that of medial meniscus
- ❑ Instability is more in complete discoid meniscus

Discoid meniscus



Complete discoid menscus



Meniscocapsular separation

- Fluid signal between posterior portion of medial meniscus and joint capsule



Anterior Cruciate Ligament

- Straight, parallel to Blumensaat line
- Linear striated appearance with intermediate signal intensity on T2 weighed image

ACL Tear

Acute-

- Replacement of normal striated appearance by cloud like high signal intensity
- Discontinuity of ligament and fibres don't go parallel to intercondylar roof

Chronic-

- Nonvisualisation of ligament or
- Angulation of ligament because of scarring
- Shallow orientation not parallel to intercondylar roof



Normal



Acute tear



Discontinuous fibres



non visible fibres



Chronic tear

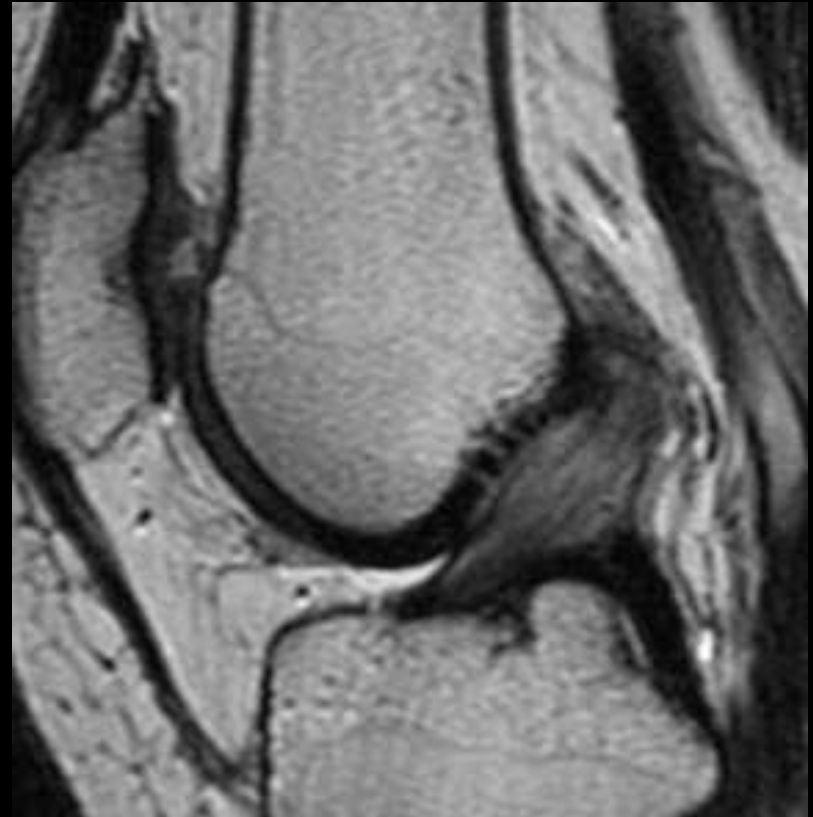
Empty notch sign

- Seen in complete ACL tear



ACL cystic mucoïd degeneration

- Ligaments appear thickened and illdefined
- MRI- Increased signal on all sequences
- Mimic ACL tear



Deep lateral femoral notch sign

- Indicator of chronic ACL insufficiency but may also be seen in acute tear



Associated injuries with ACL

- O'Donoghue's triad-
 - ACL rupture
 - MCL injury
 - Medial meniscal tear

O'Donoghue's triad



Second Fracture

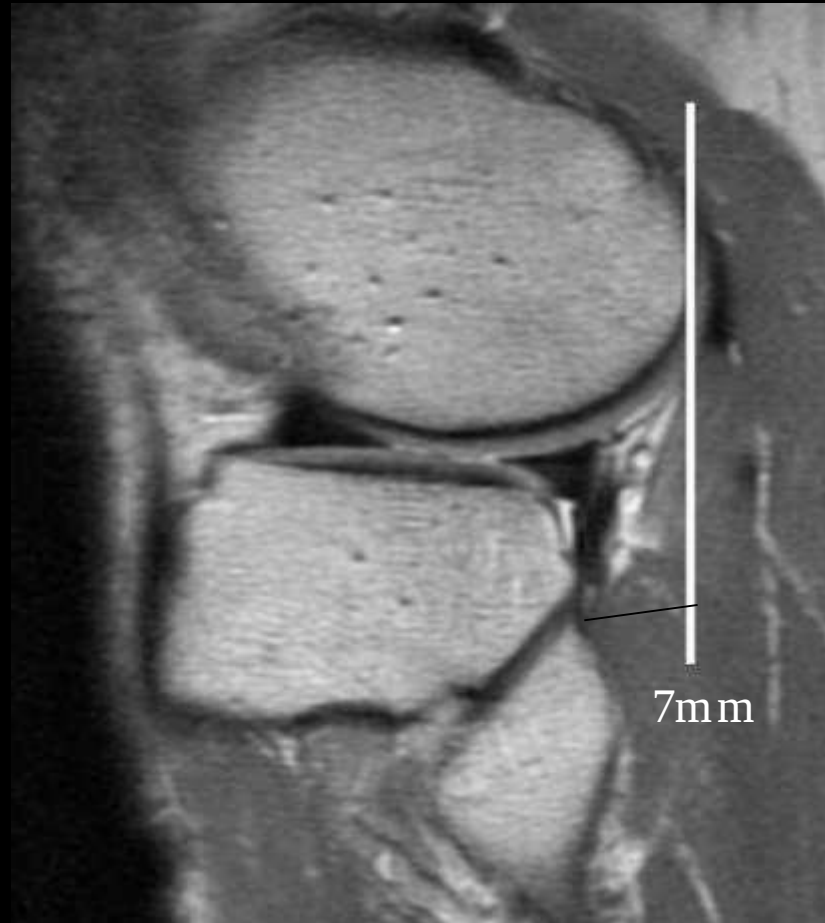


Other bony injuries with ACLtear

- ❑ Bruise in weight bearing portion of lateral femoral condyle and posterior aspect of lateral tibial plateau due to internal rotation of tibia and valgus angulation of knee



Uncovered Meniscus



Posterior Cruciate Ligament

- Normal- Uniform low signal intensity on all MR sequences



Tear- Generalised thickening of ligament with intermediate signal intensity on T1 weighed sequence and heterogenous high signal intensity on T2 weighed sequence



Medial Collateral Ligament

- Grade I- Mild partial interstitial tear ,appears as edema along superficial aspect
- Grade II- Extensive interstitial partial tear ,appears as thickening of ligament with internal signal abnormality or frank thinning due to extensive partial tear
- Grade III- Complete rupture of ligament



Grade I

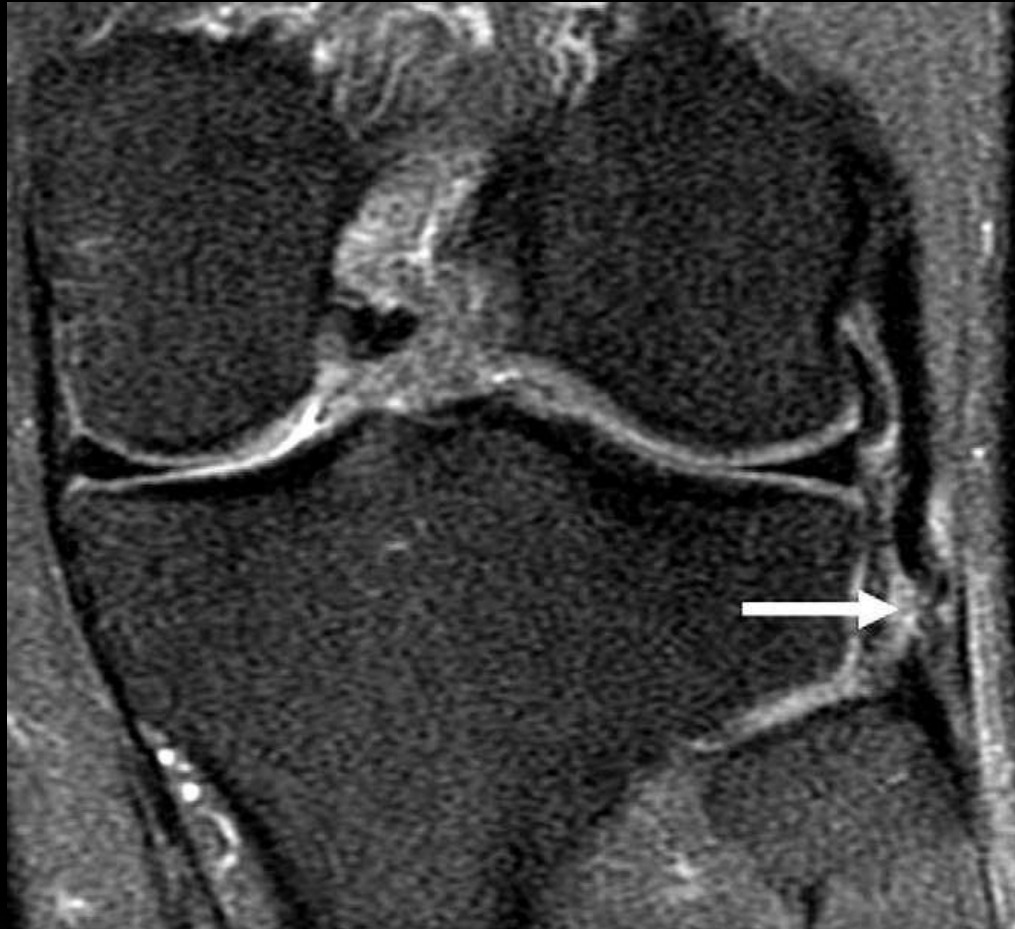


Grade II



Grade III

Lateral Collateral Ligament tear



Iliotibial Band Injury

- Overuse injury usually seen in runners and bicyclists
- Iliotibial band Friction syndrome- Due to rubbing of ITB against lateral femoral condyle



Quadriceps rupture

- Appears as balled up and mildly retracted tendon edge with edema in surrounding soft tissue and tendon gap



Jumper knee/Patellar tendinitis

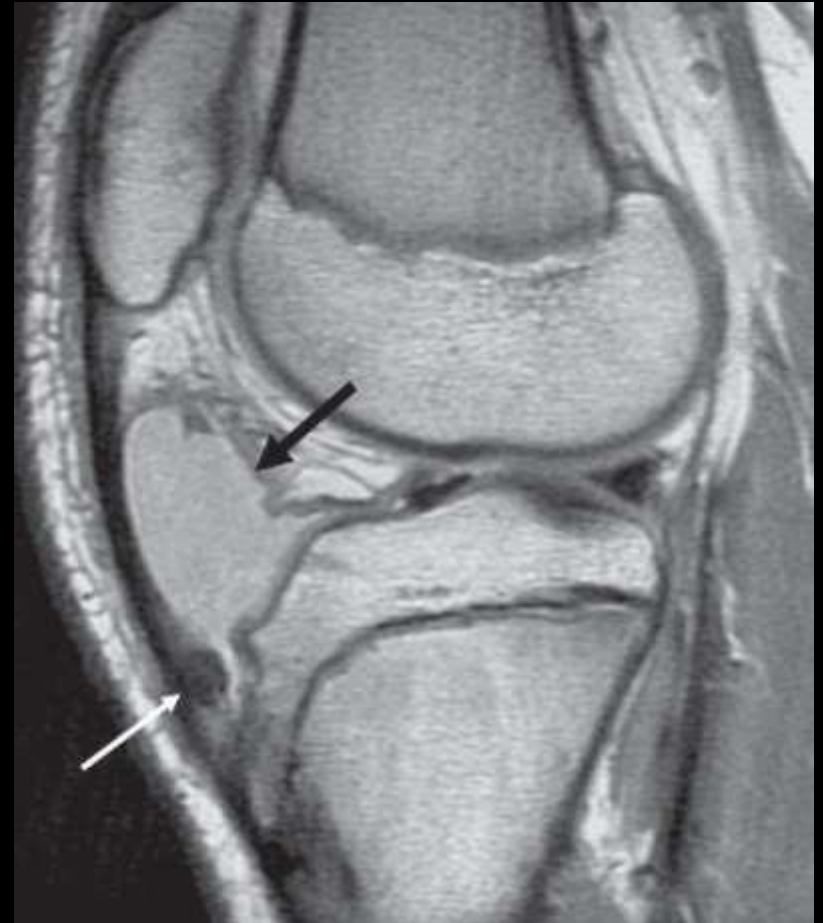
- Overuse injury to proximal aspect of patellar tendon
- Usually seen in basket/volleyball players
- Misnomer, mucoid degeneration of collagen fibres of tendon
- MRI- Swelling of proximal aspect of tendon with internal high signal intensity.



Fusiform swelling
Edema in Hoffa's fat pad

Osgood Schlatter disease

- Degeneration of distal aspect of patellar tendon
- Triad- Pain, soft tissue swelling, ossification in distal aspect of patellar tendon
- MRI- Enlarged distal tendon with low signal intensity foci of heterotopic ossification



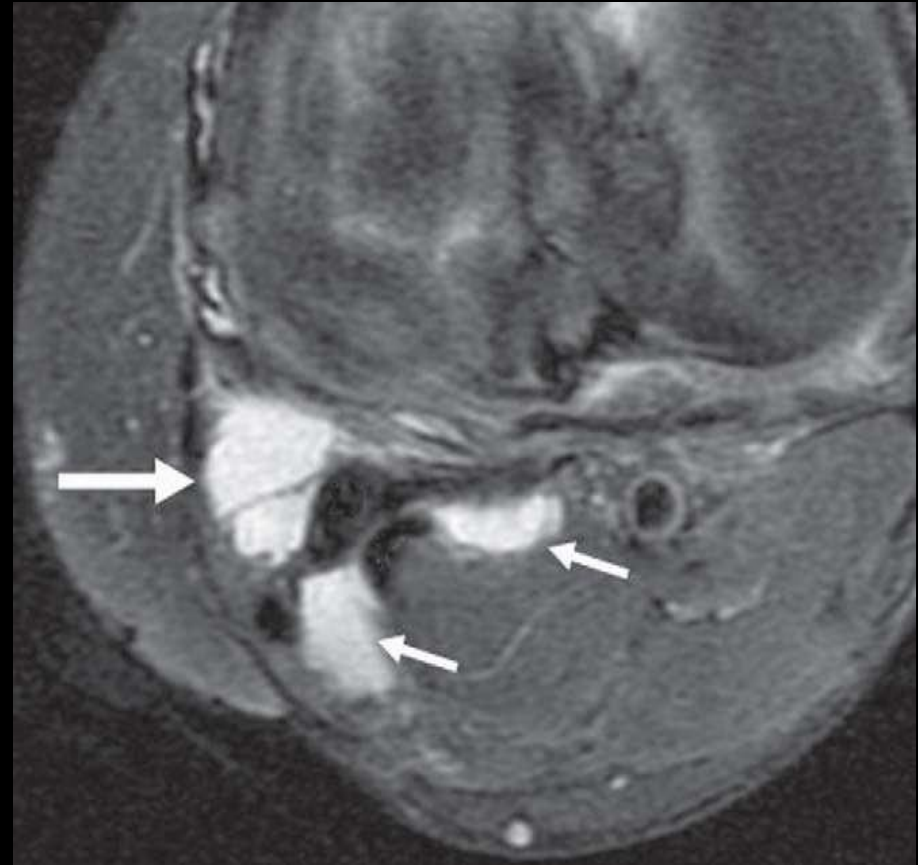
Lateral dislocation of patella

- Bony bruise in medial aspect of patella and lateral aspect of lateral femoral condyle
- Tear of medial retinaculum appears as thickening and internal high signal intensity on T2 weighed image
- Tear of vastus medialis oblique muscle appear as high signal intensity on T2 weighed image

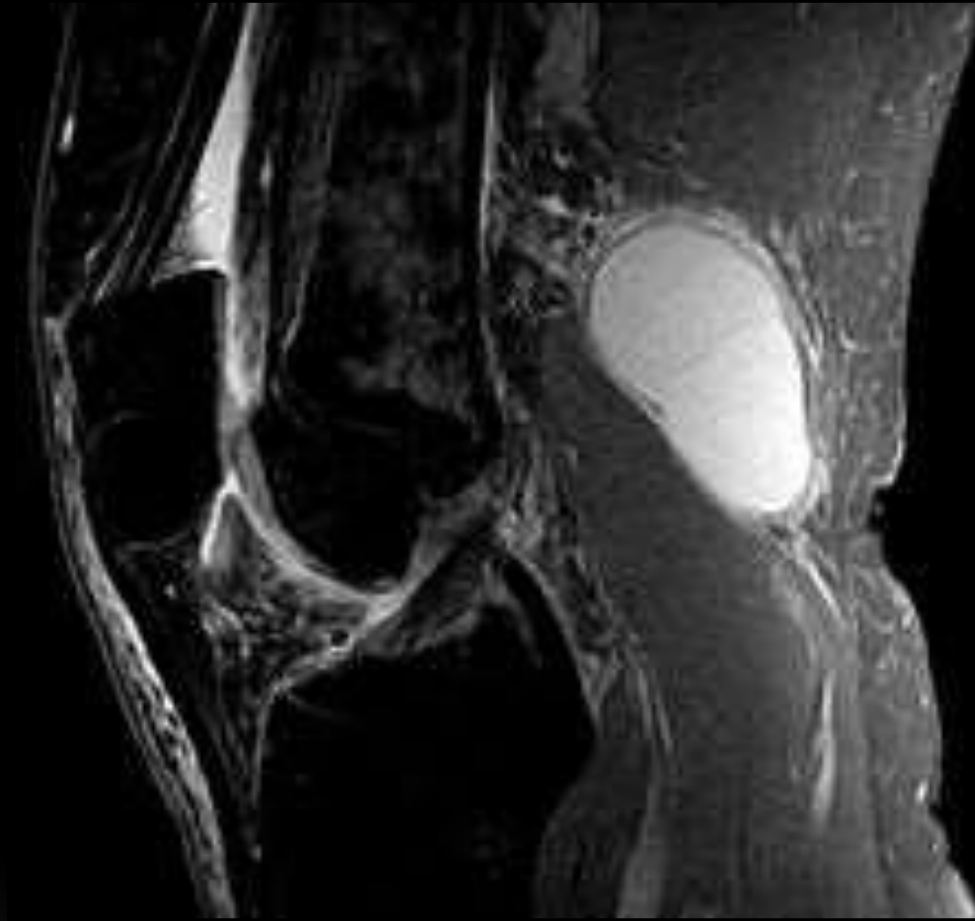


Baker cyst

- Fluid collection in semimembranosus-medial gastrocnemius bursa
- Axial MRI- comma shaped with neck extending between tendon of medial gastrocnemius and semimembranosus tendon

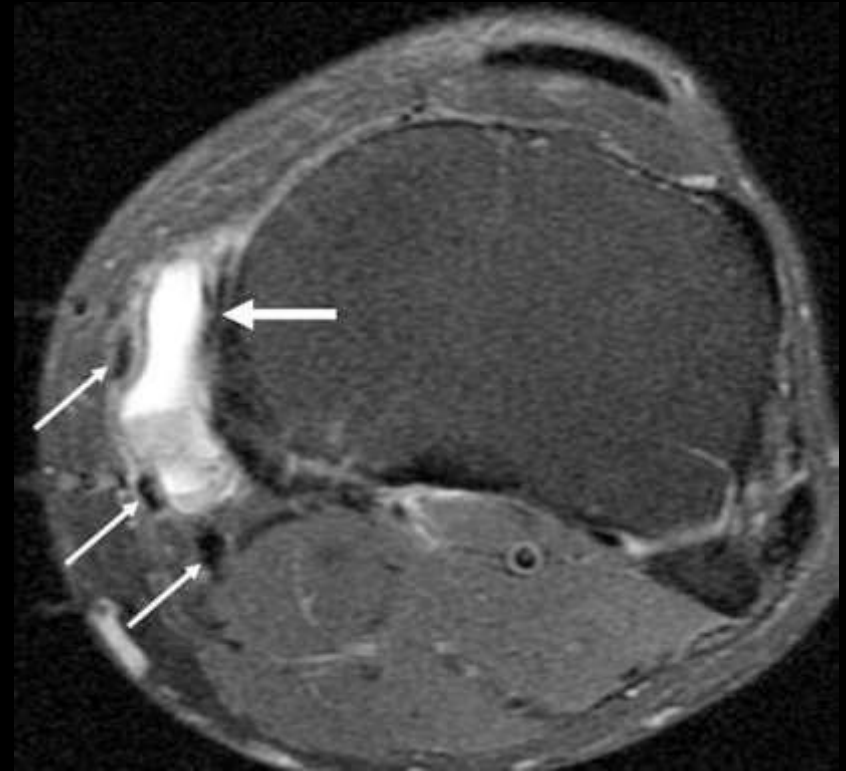


Baker cyst



Pes Anserinus Bursitis

- Pes anserinus bursa is located between tendon of pes anserinus and medial collateral ligament
- MRI- High signal intensity fluid filled bursa with low signal intensity internal debris



Superficial infrapatellar bursitis/Preacher's knee

- Present anterior to tibial tubercle and distal aspect of patellar tendon
- Named so because it gets compressed between tibial tubercle and wooden bench on which a preacher sit
- MRI- Low signal intensity on T1sequence and high intensity on T2 sequence



Synovitis

- Fat suppressed T1 weighed image after iv contrast shows thickened synovium



Osteochondral injury

- Can be a focal cartilage contusion or loose osteochondral fragment
- Instability- On T2 weighed image fluid signal intensity in the interface between fragment and donor pit and cystic change adjacent to donor pit

Osteochondral injury



High signal at interface



Cyst

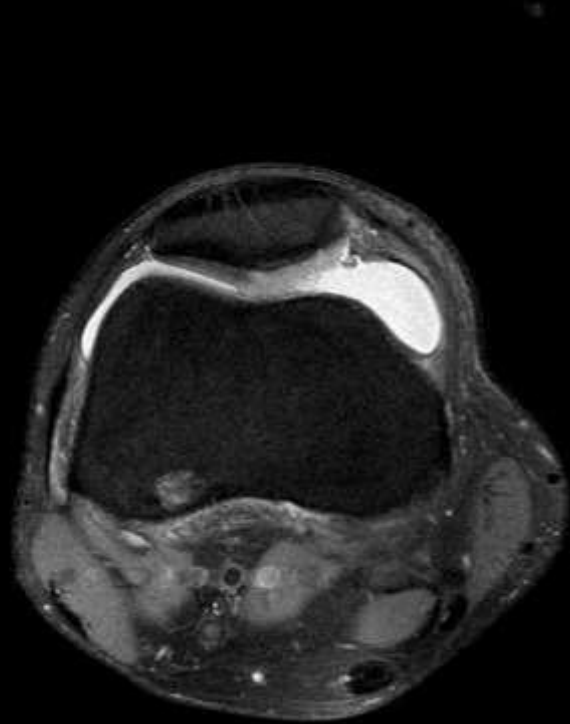
Chondromalacia patella

- Inflammation of underside of patella and softening of cartilage.
- Common in young adults, can mimic meniscal tear

Grade	MRI finding
I	Focal signal intensity changes without contour deformity (difficult to assess on MRI)
II	Focal signal intensity change and contour bulge (partial thickness)
III	Focal signal intensity change, contour irregularities, cartilage thinning and fluid extension into cartilage (full thickness)
IV	Similar to stage III with defects extending to the cortical bone (with subchondral bony changes)



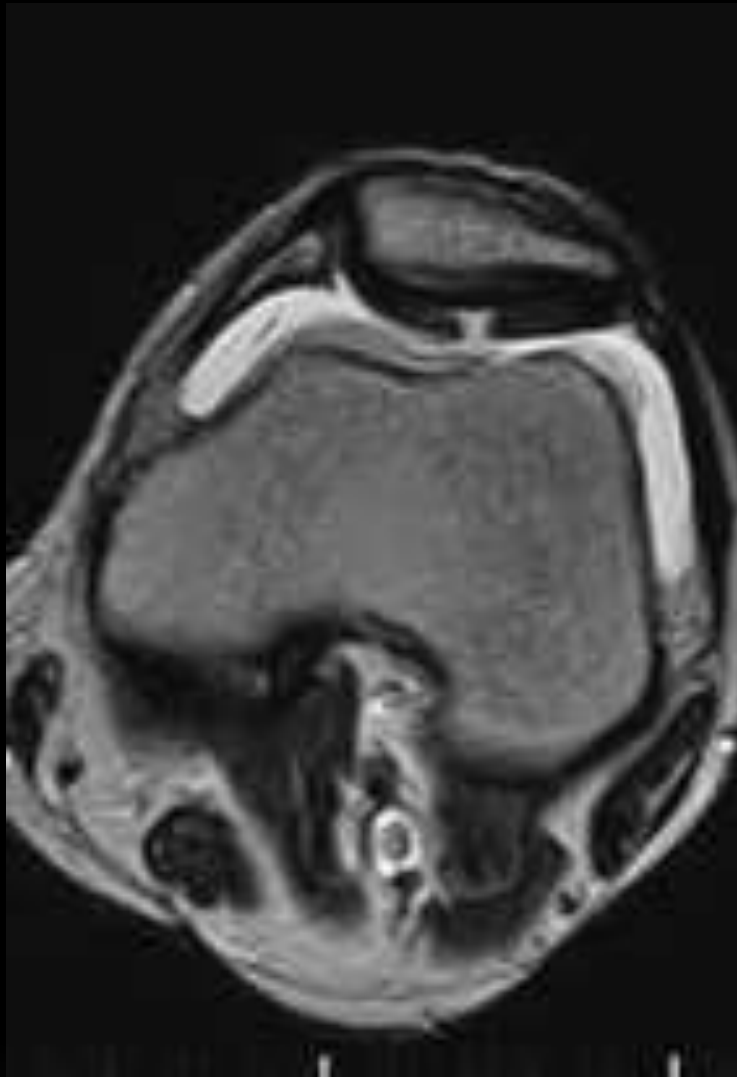
Normal



Grade II



Grade II



Grade III



Grade IV

Osteochondritis dissecans

- Occur due to blood deprivation
- Cracks forms in cartilage and subchondral bone
- Fragmentation of cartilage and bone in the joint



Osteochondritis dissecans - Staging

Stage I : lesion 1-3cm ; intact cartilage

Stage II : Cartilage defect ; no loose body

Stage III : Partially detached ost.chond fragment

Stage IV : Complete separation ; loose body +

Complete medial plica

- ❑ Plicae are remnants of fetal synovial tissue
- ❑ Symptomatic only if complete
- ❑ Forms a shelf from medial side of joint capsule to infrapatella fat pad
- ❑ Overuse injury in sports like running, bicycling
- ❑ MRI- Thickened low signal intensity on T2 weighed image

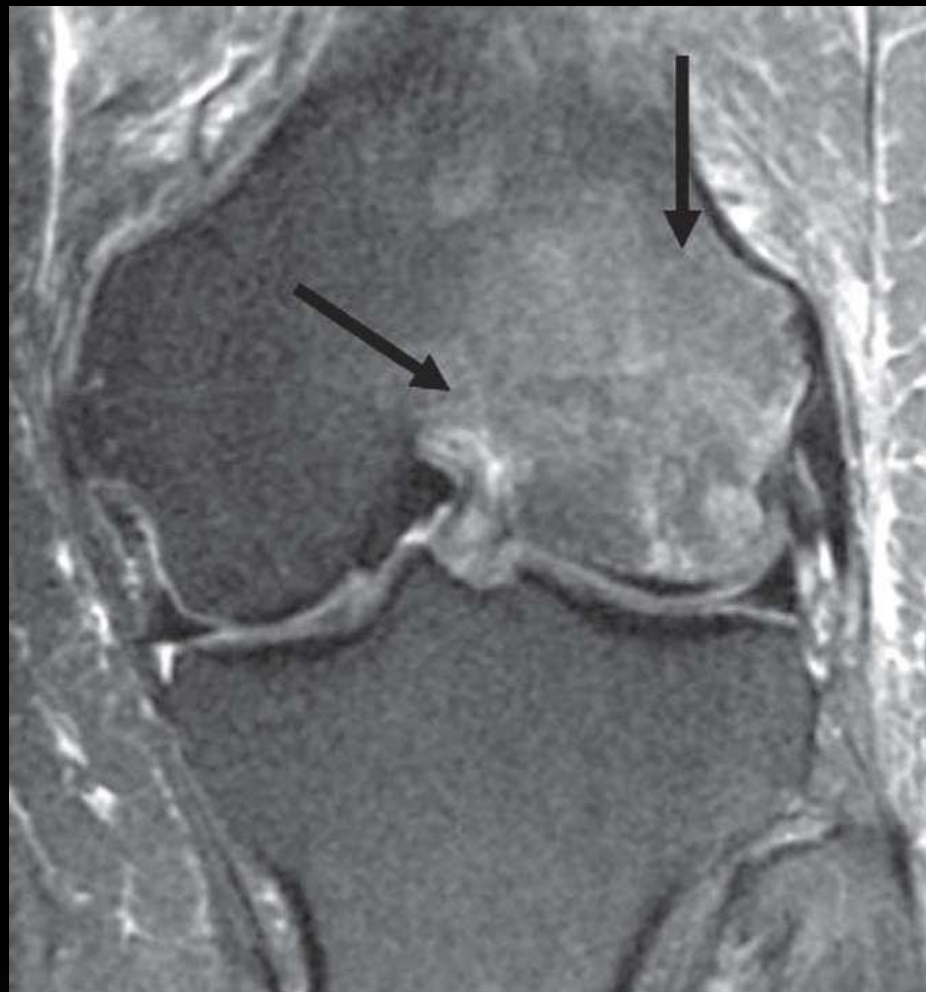


Complete medial plica



Avascular Necrosis

- Initial ischemia- Large area of ill defined marrow edema
- If ischemia persists- avascular necrosis of bone occur in subchondral portion manifested as single or double rim of demarcation and may have appearance of fat, edema, blood or sclerosis



Initial ischemia



Avascular necrosis
(demarcated zone)

Spontaneous Osteonecrosis of knee (SONK)/ Subchondral insufficiency fracture of knee (SIFK)

- Subchondral fracture followed by osteonecrosis
- MRI- Subchondral linear component representing fracture with low signal intensity and surrounding marrow edema with high signal intensity



Thank You

