Knee: Extensor Mechanism

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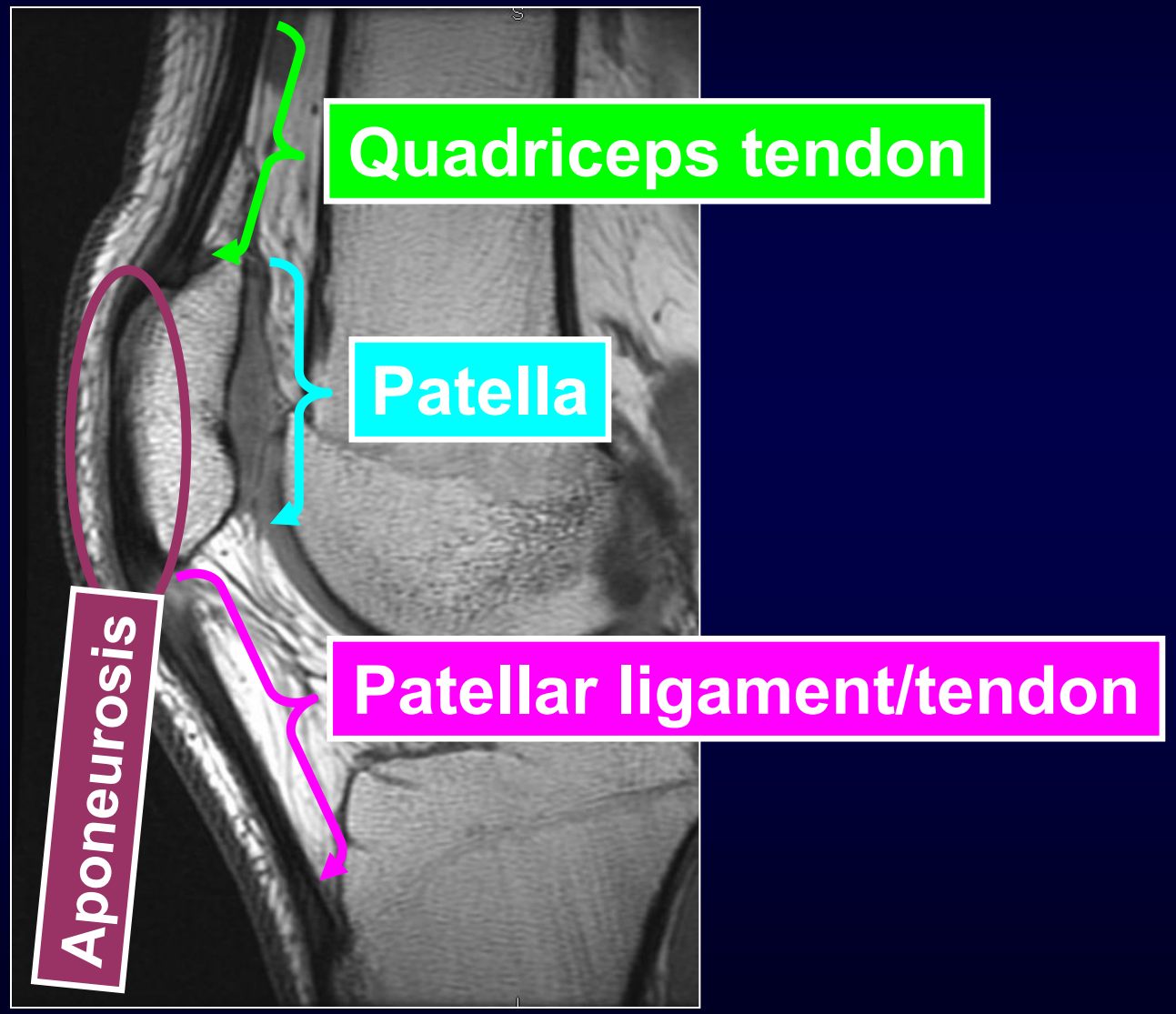
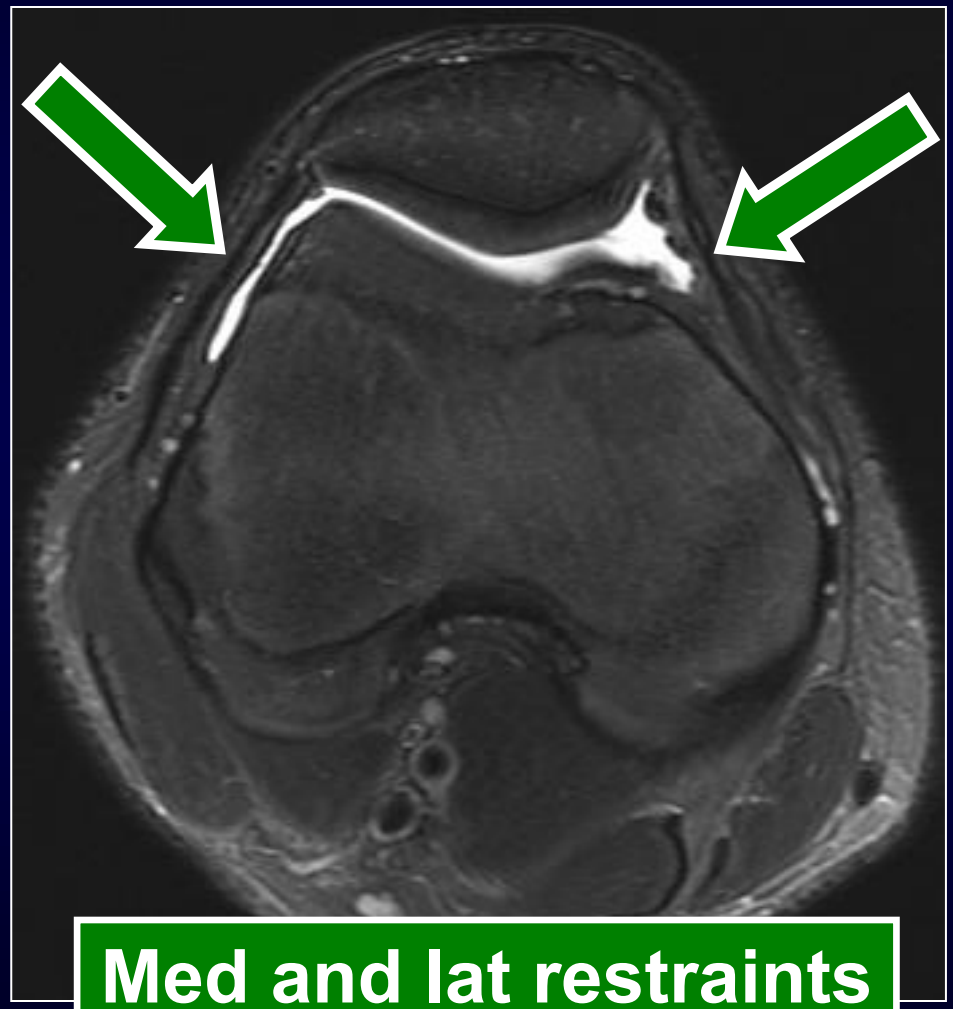
Augusta
Providence
NO TRUCK
STOPPING
STANDING
PARKING
SPEED LIMIT
15
$100

Disclosures

Financial

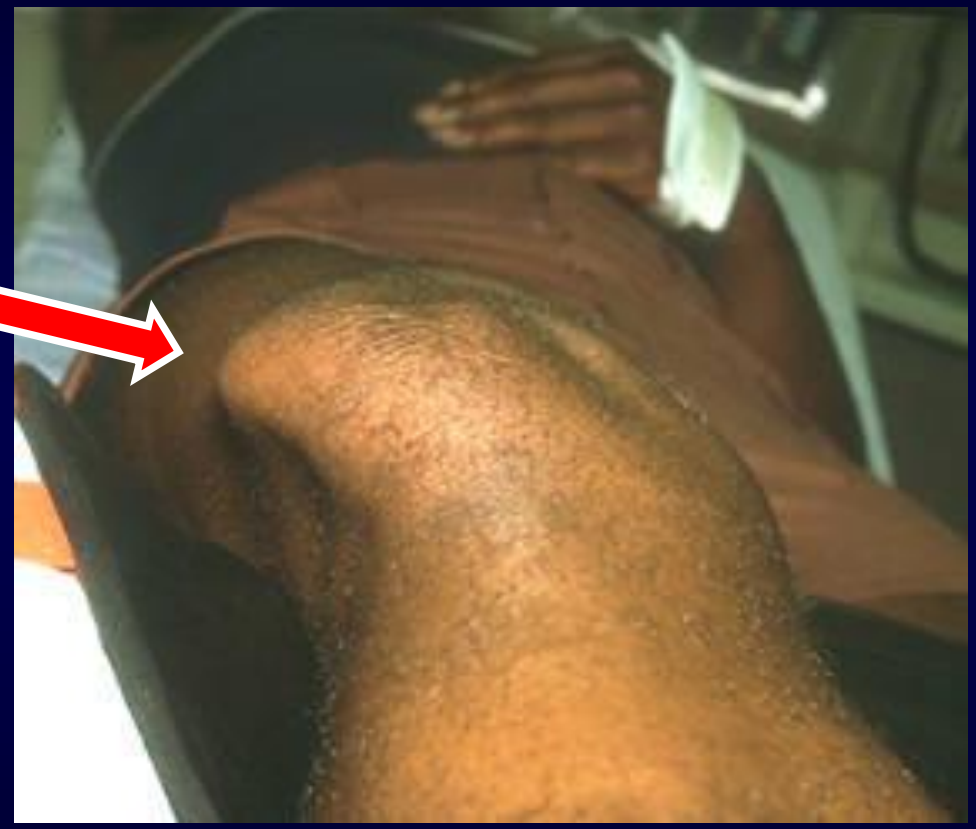
Extensor Mechanism





Knee Extensor Mechanism

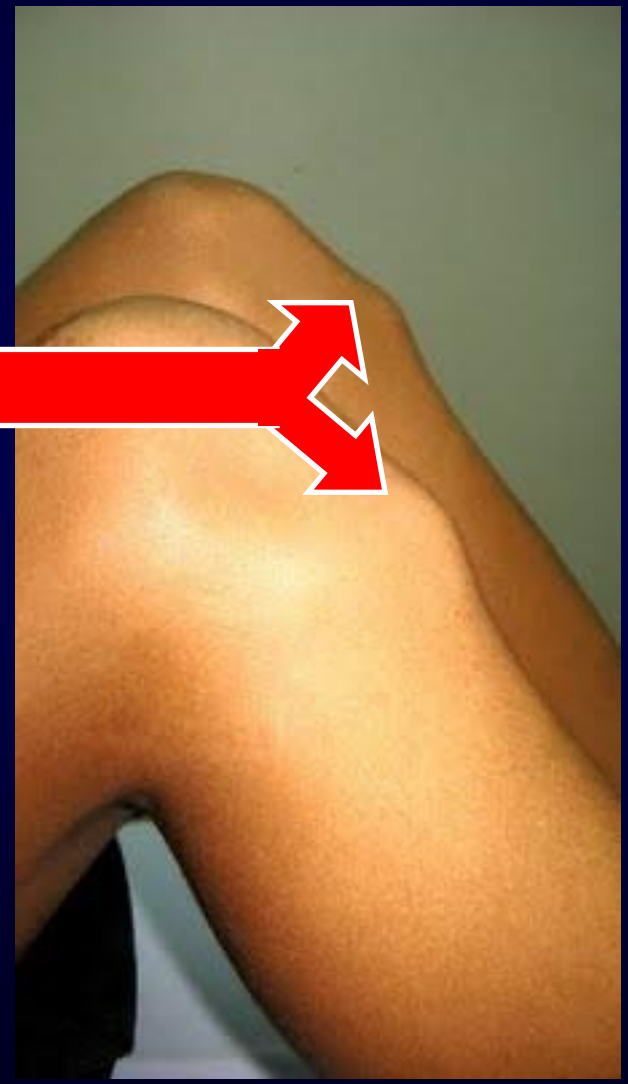
1. Extensor tendon / ligament injury
2. Patella dislocation
3. Fat pad syndromes
4. Anterior bursitis
5. Plicae
6. Patella miscellaneous



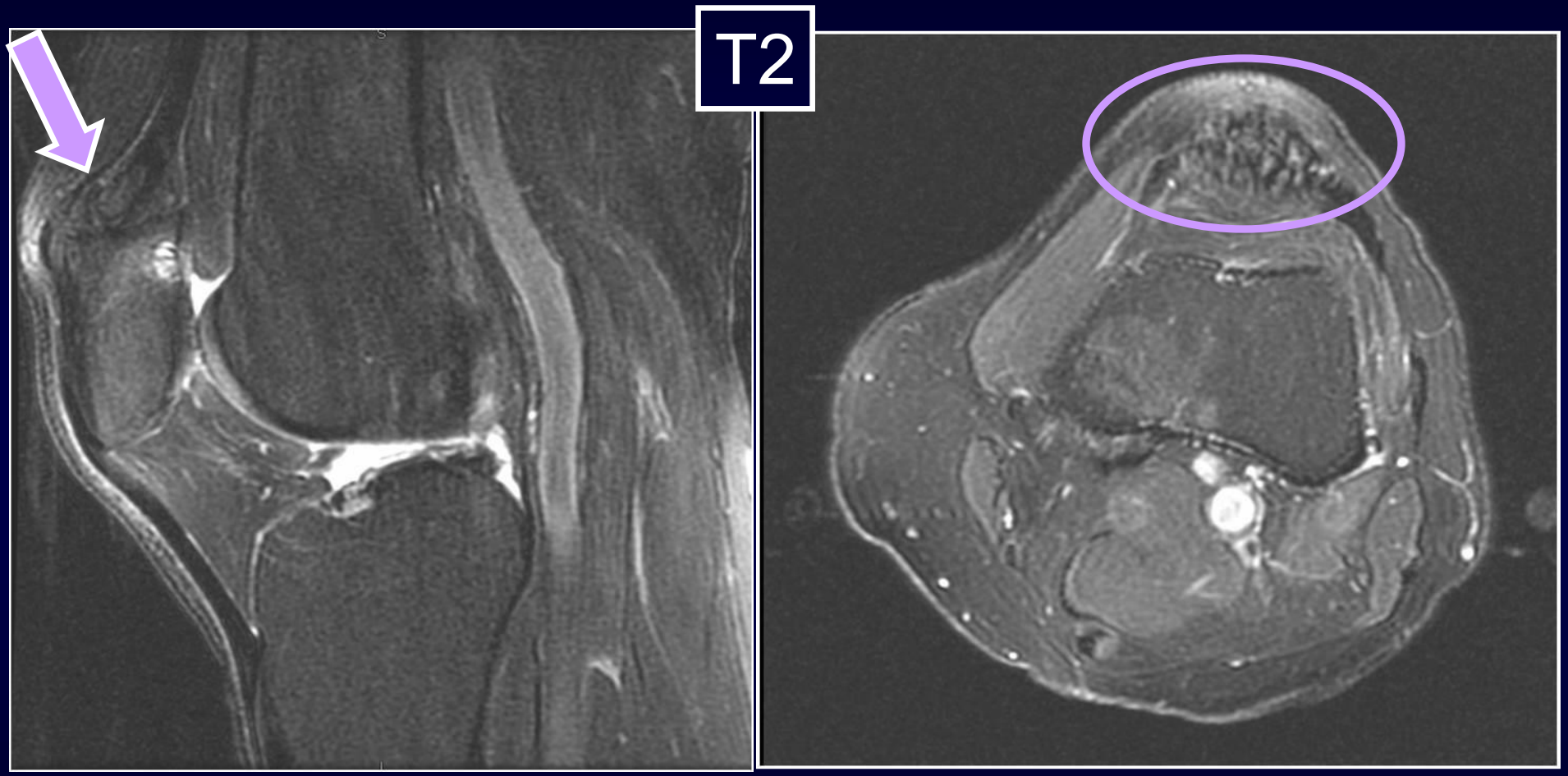
Extensor Tendon/Ligament Injury

Extensor Tendon/Ligament

- Quadriceps tendon
- Jumper's knee
- Osgood-Schlatter



Quadriceps Tendinopathy

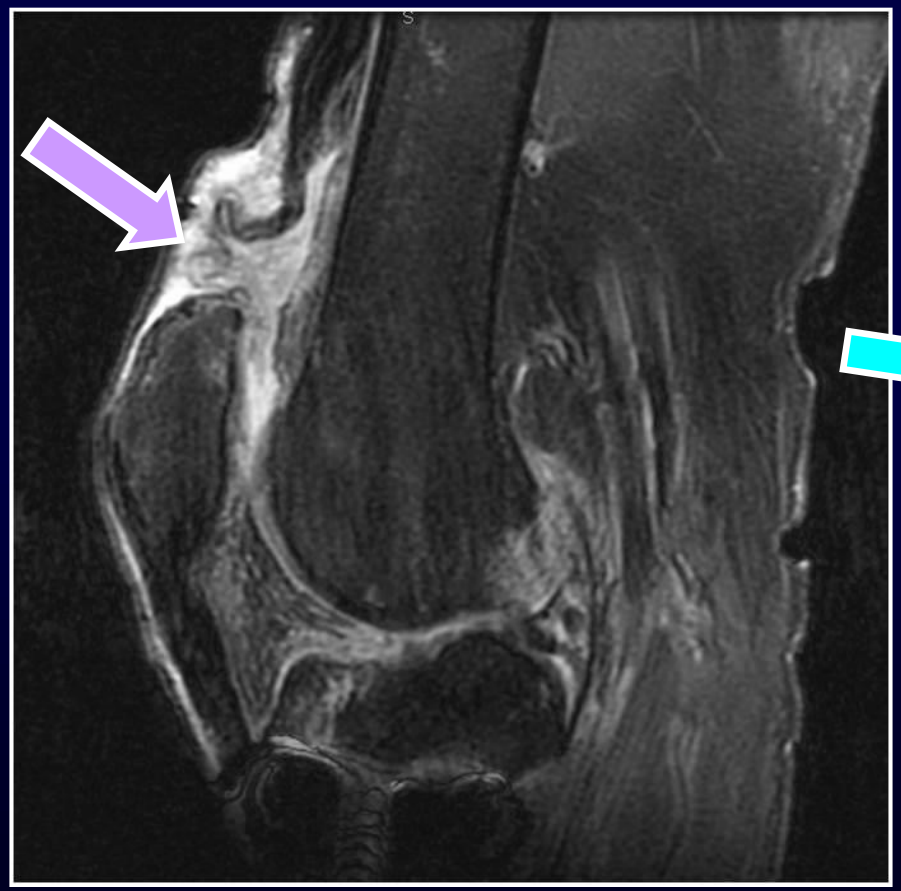


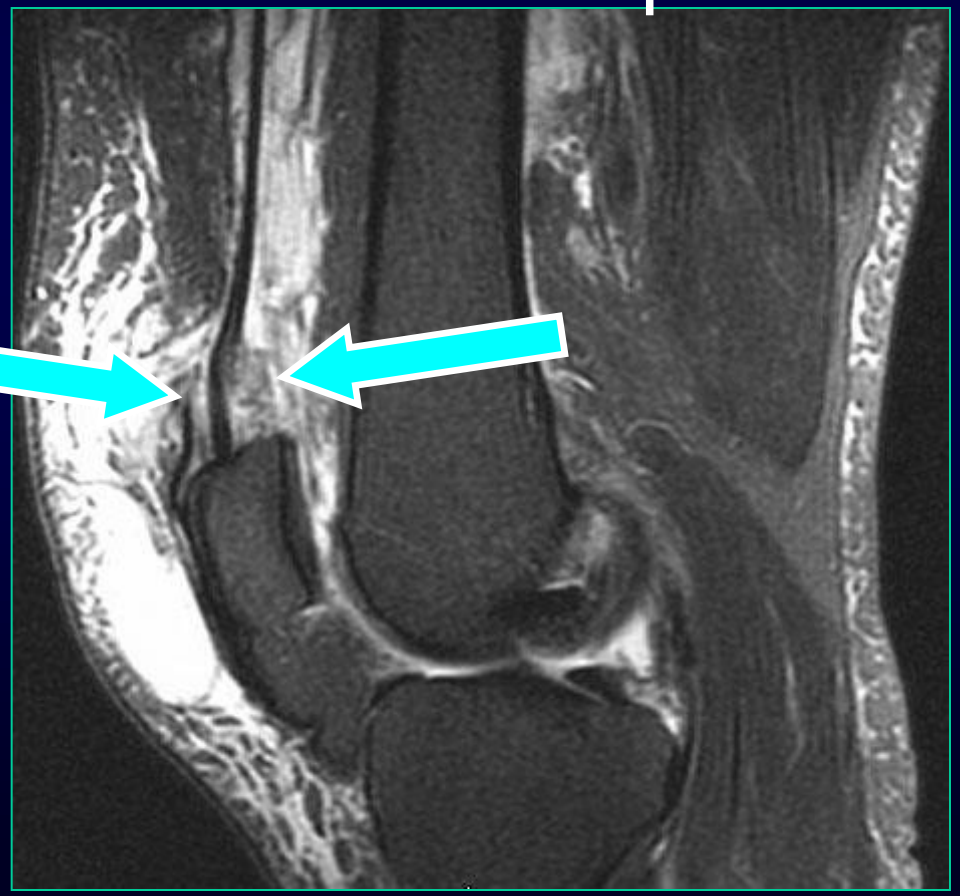
- Microscopic damage: “wear and tear”
- Streaks of intermediate signal = normal

Quadriceps Tear

- > 40, w/ acute trauma
- Also: diabetes, renal failure

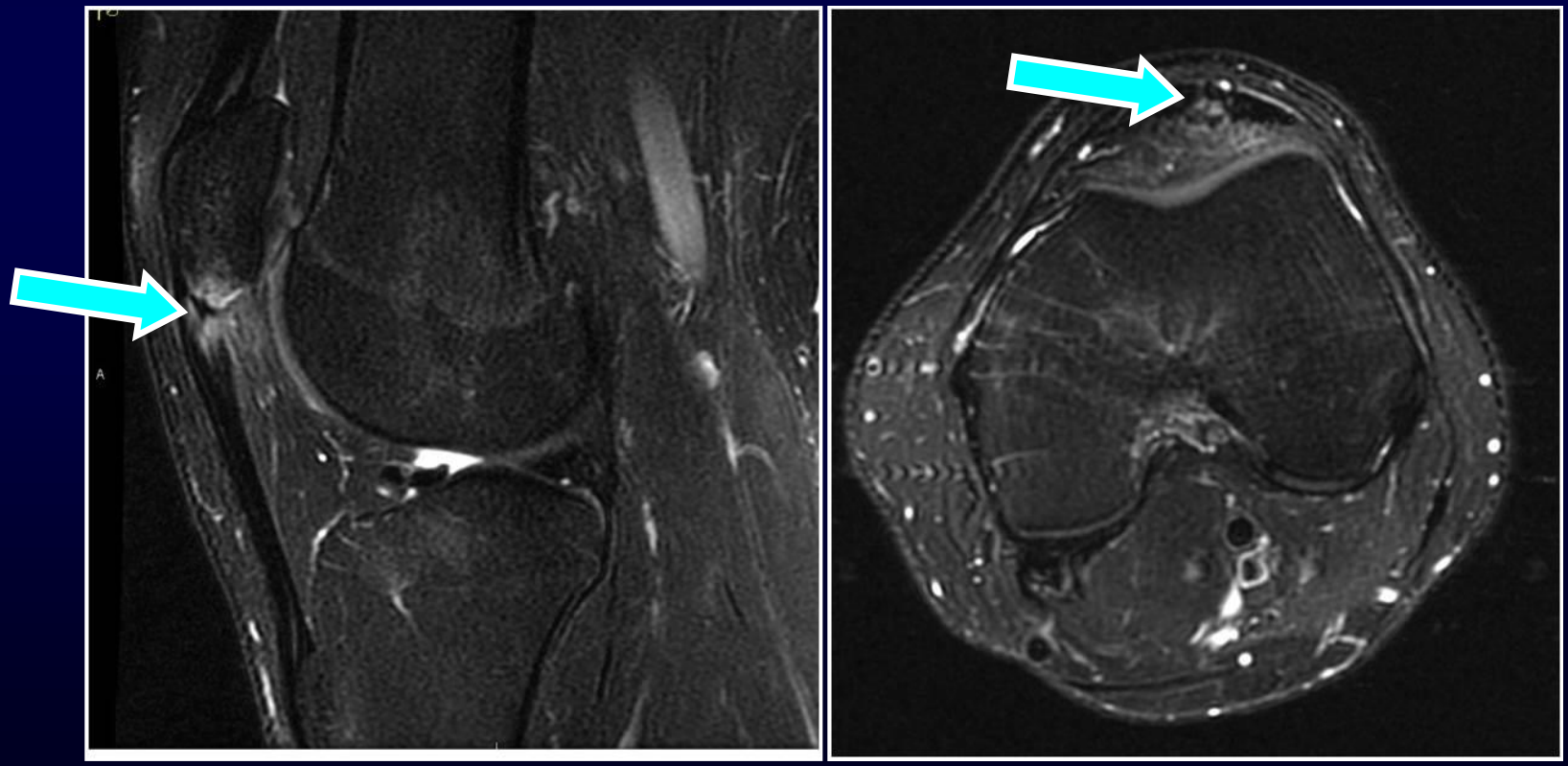
- Partial tear: some ability to extend
- List torn components



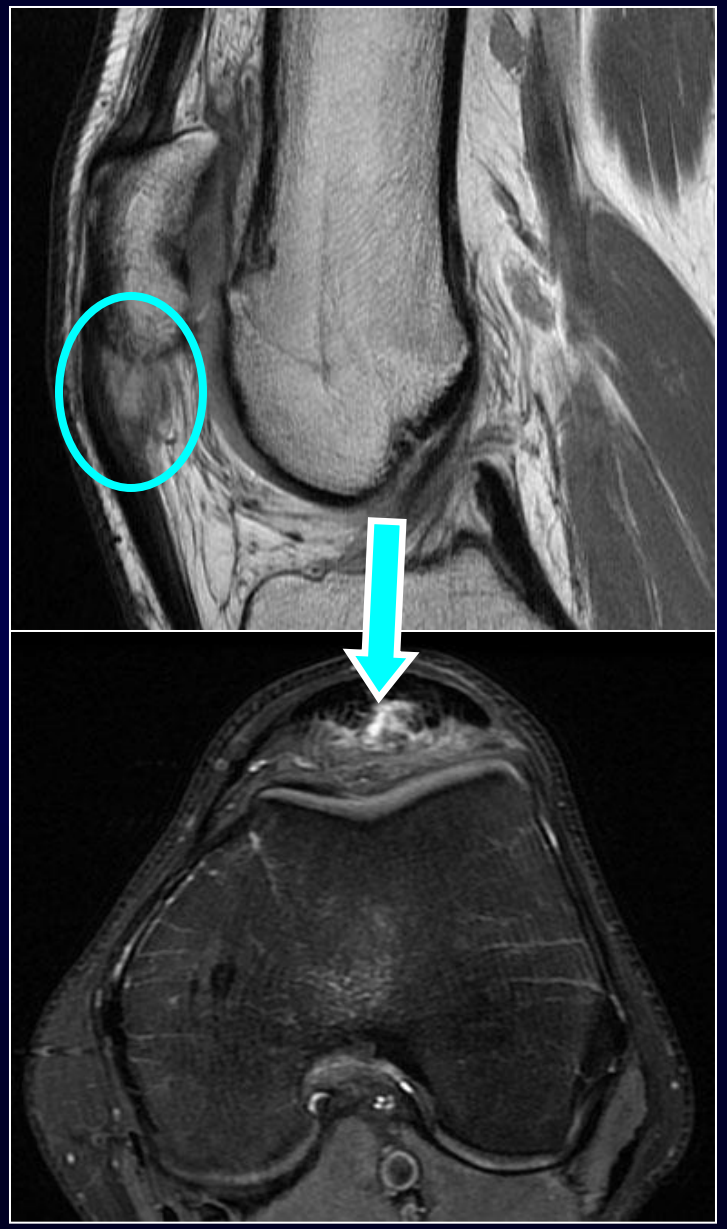


Jumper's Knee

- Proximal patella tendinopathy/itis--overuse
- Up to 20% athletes in jumping sports, running
- Most force occurs during landing



Jumper's Knee



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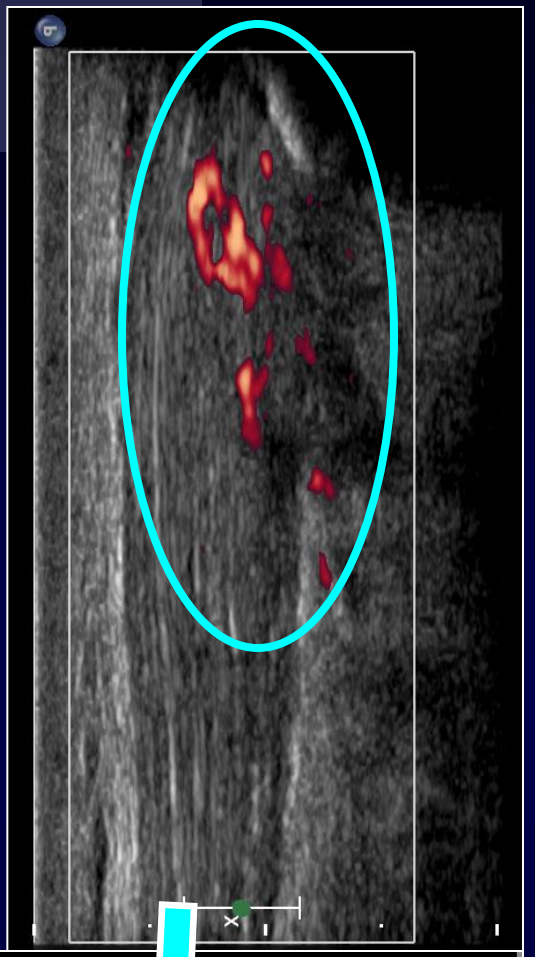
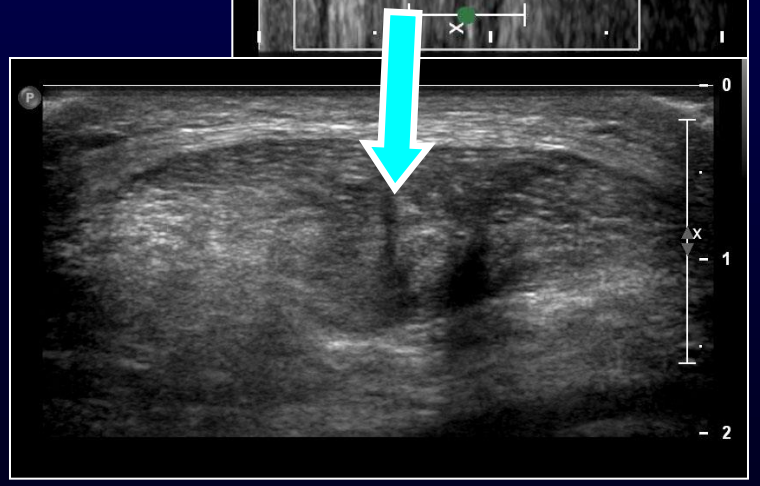
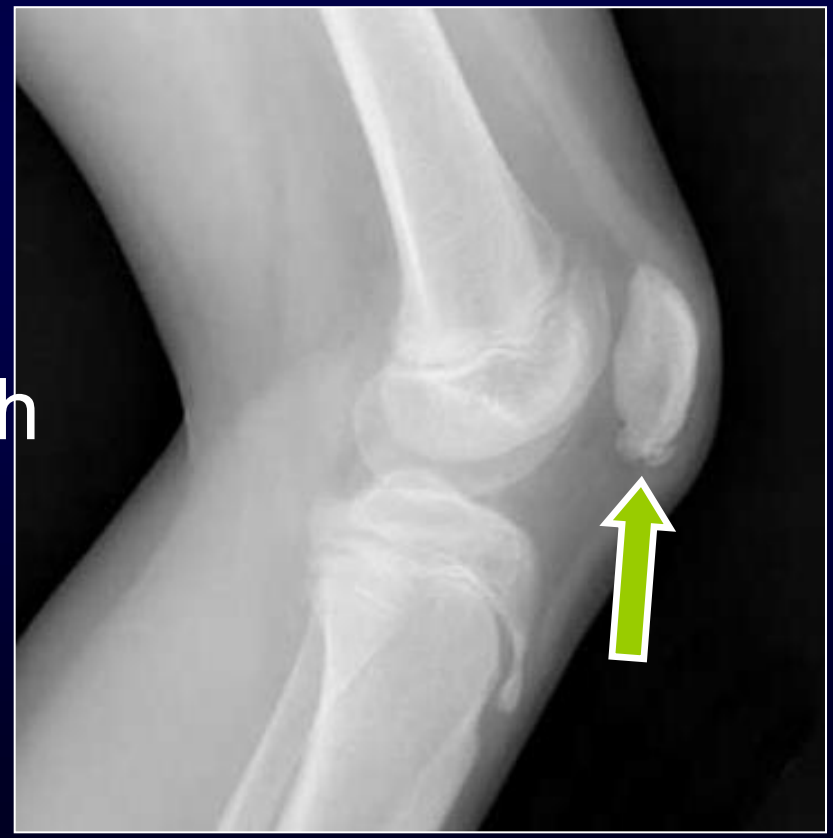




Sinding-Larsen-Johansson

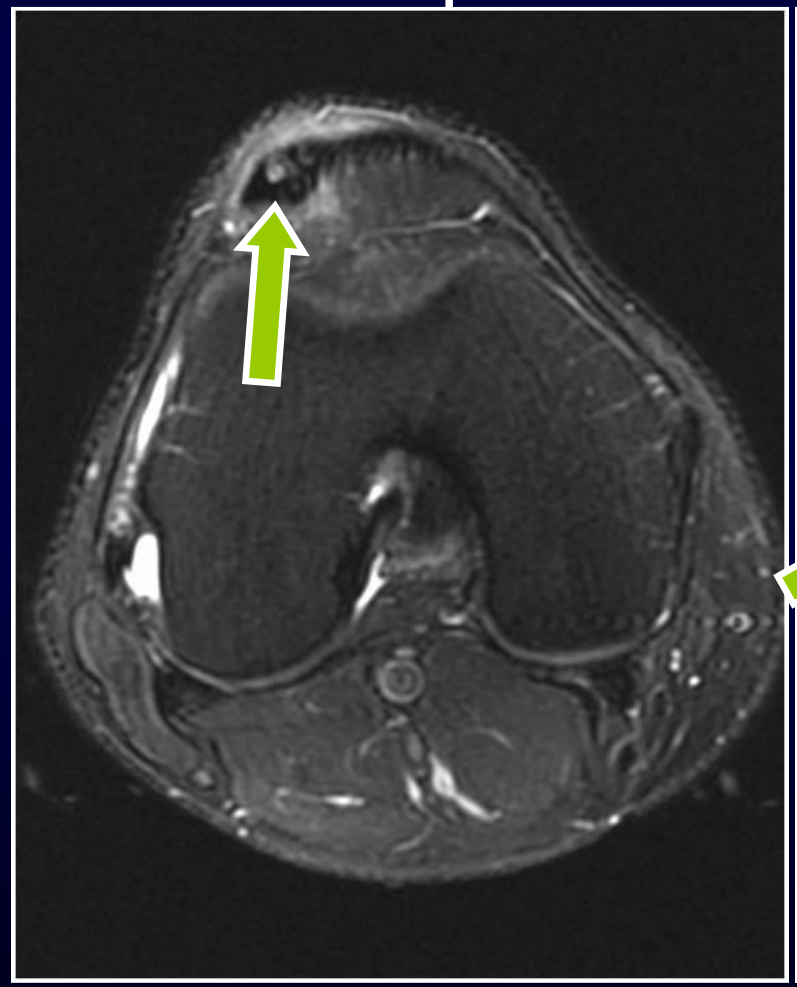
- Similar symptoms to jumper's knee
- 10-14 y.o.; tendon stronger than bone
- **Traction apophysitis**
- Swelling, edema
- Bone/cartilage fragmentation
  - Or heterotopic ossification
- 12-18 month self-limited course with "resolution"

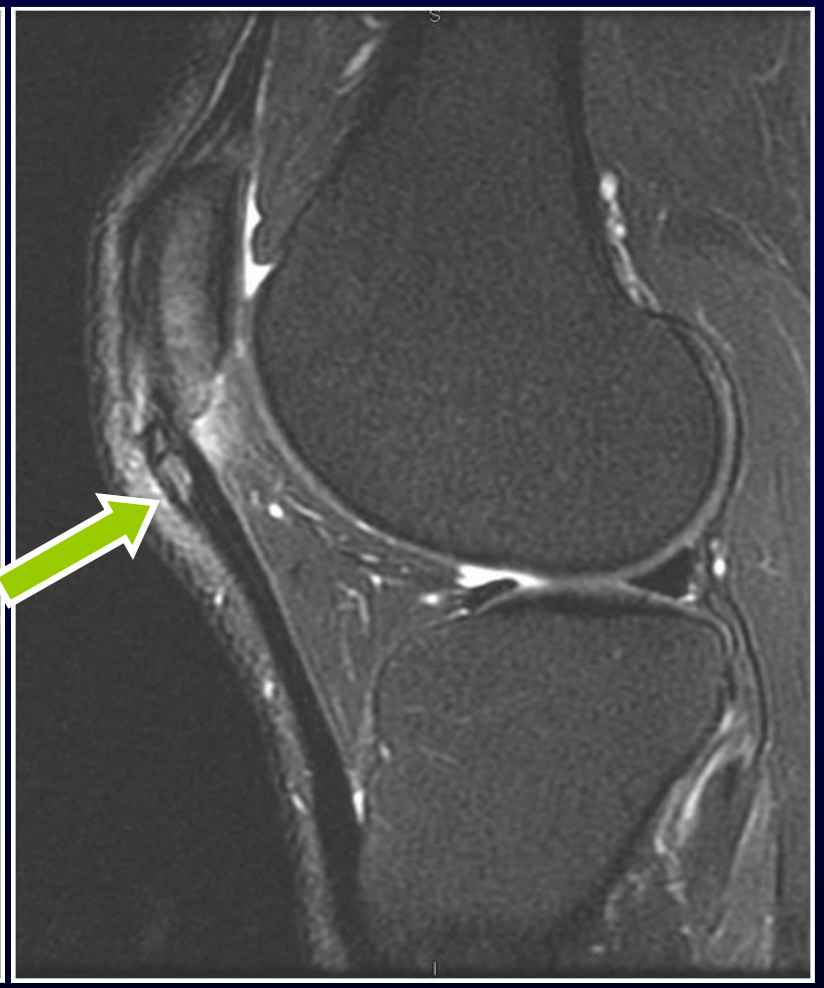


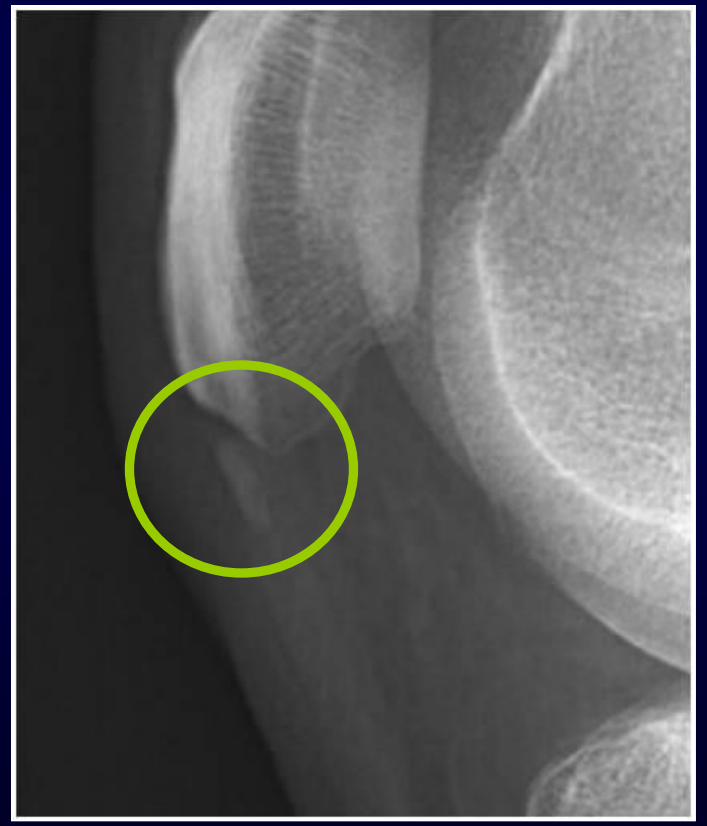
Stanitski CL. *Ped Ortho* 1993; 483-495.

Sinding-Larsen-Johansson

- Ossicle can persist in pts with repeated episodes

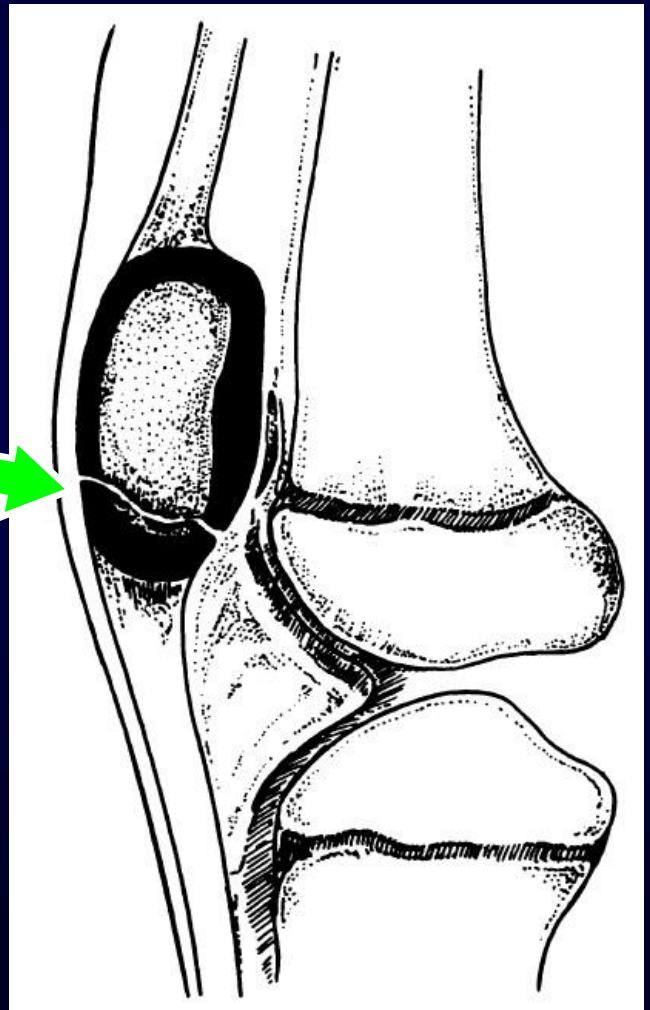






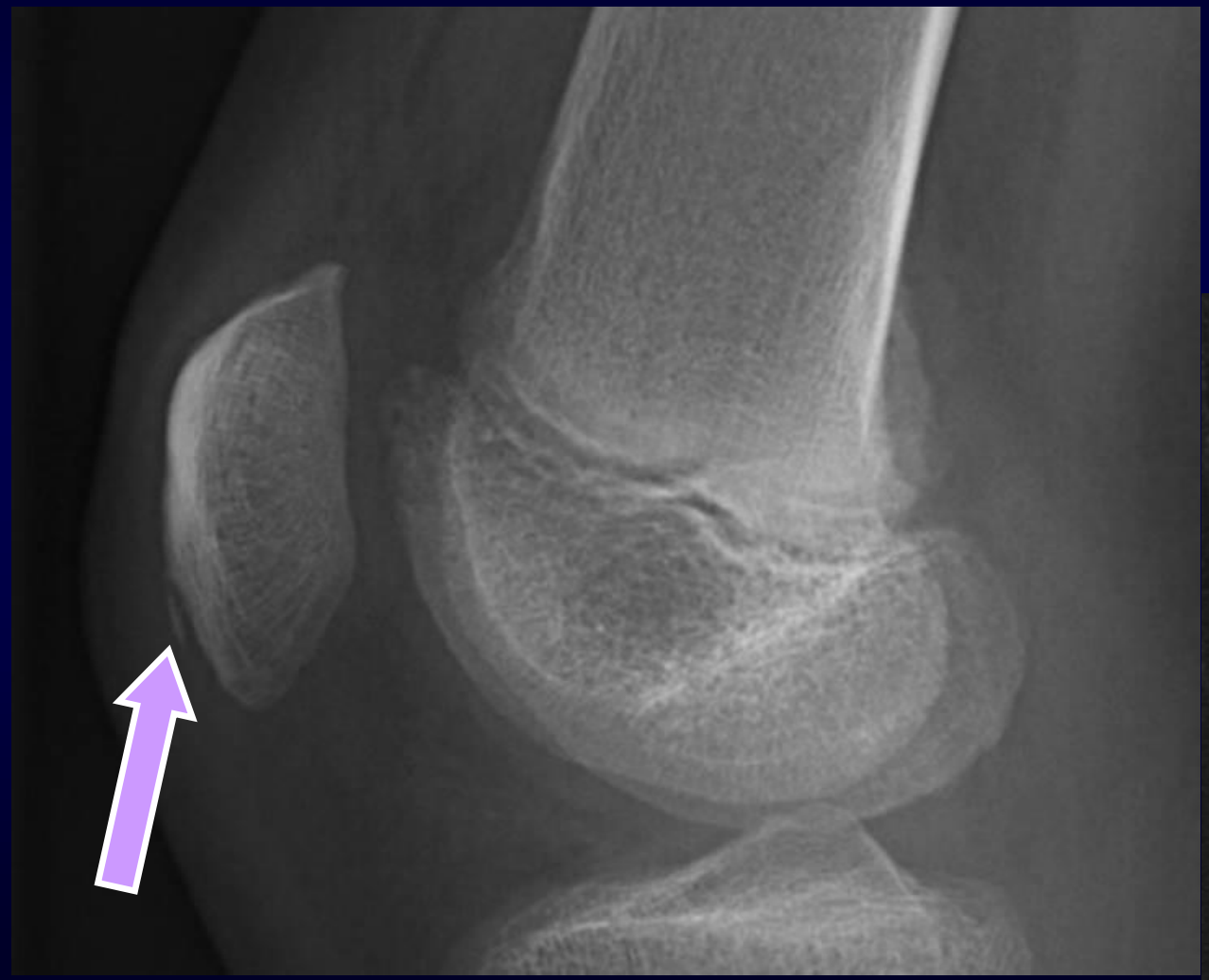
Patellar Sleeve Avulsion Fracture

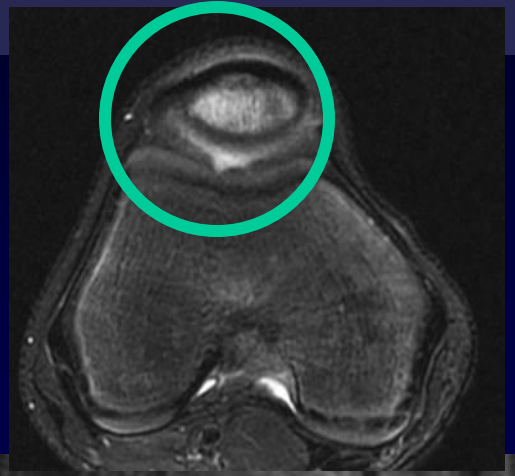
- Pediatric
- Small bone fragment @ inf. patella
- Significant injury also to unossified patella

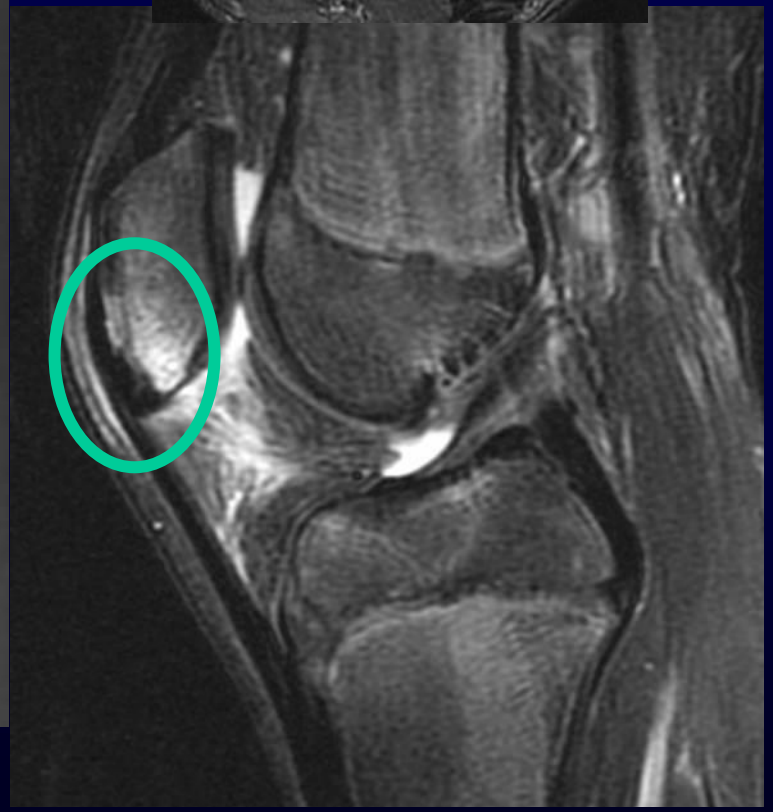


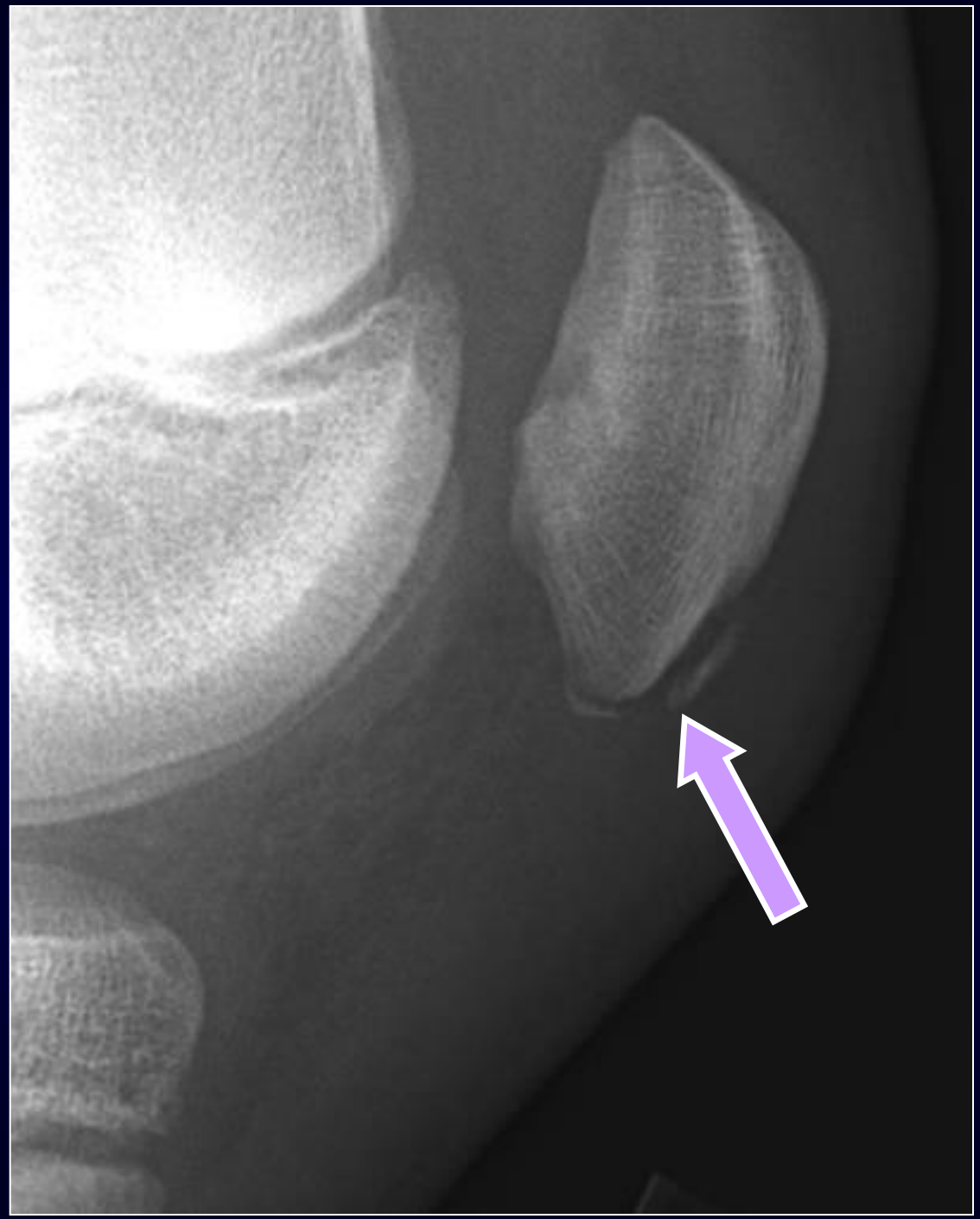
Bates et al. *Radiology* 1994

Patellar Sleeve Avulsion Fracture



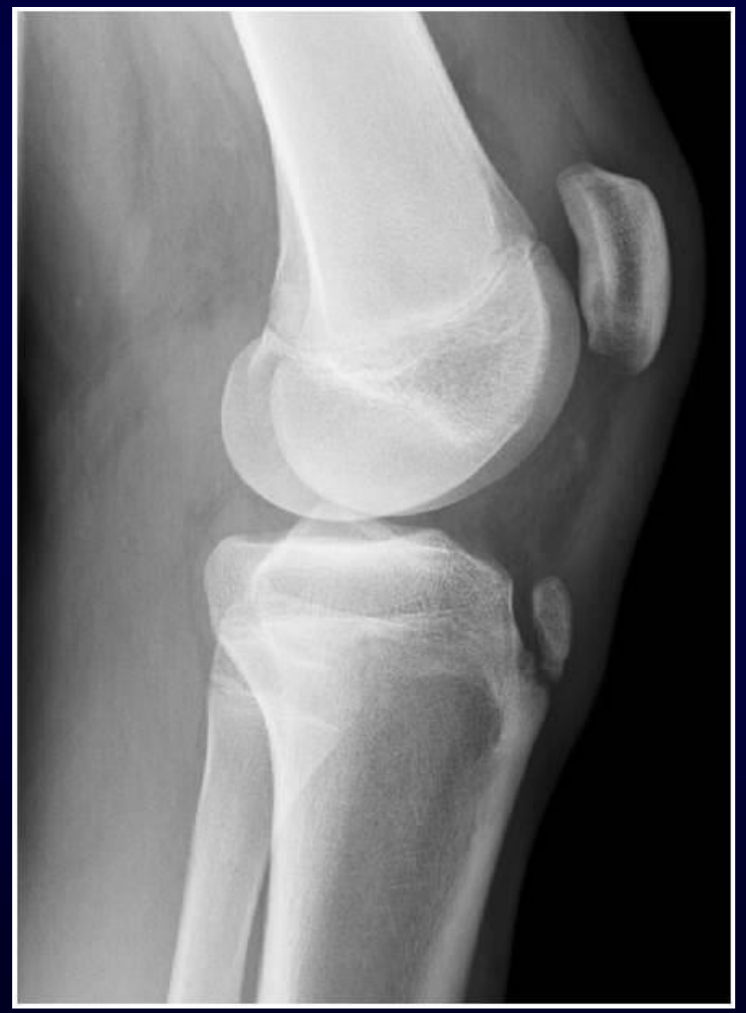






Osgood-Schlatter Disease

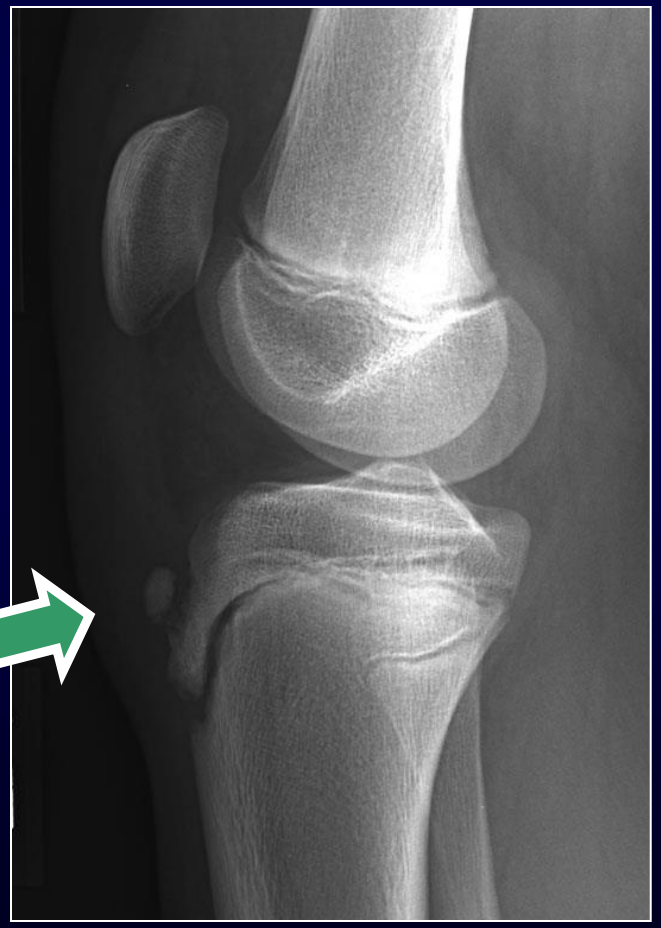
- **Traction apophysitis** at attachment of patellar ligament to tibial tubercle
- Repetitive tensile forces on this immature junction create an avulsion
- 50% have ossicle in tendon
- Swelling, edema, hyperemia
- 12-18 month self-limited course with "resolution"

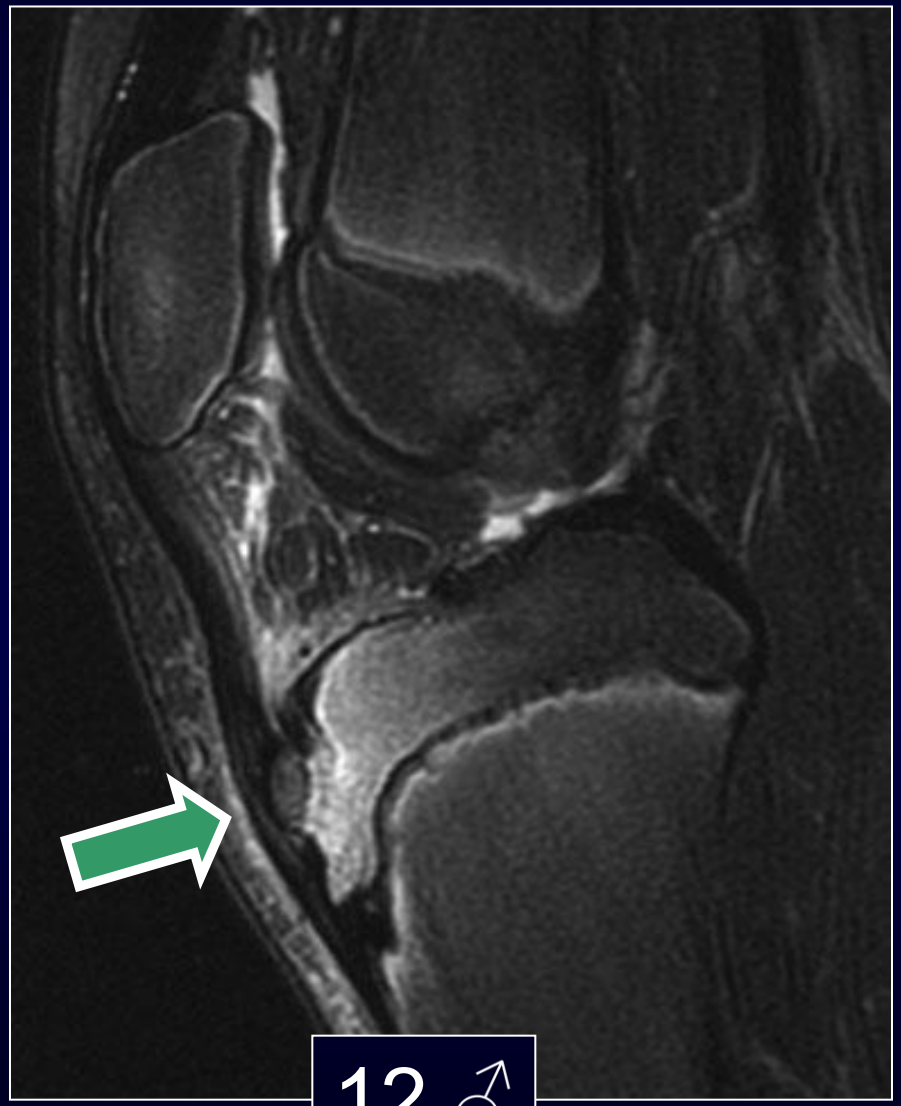


Stanitski CL. *Ped Ortho* 1993; 483-495.

Osgood-Schlatter Disease: OSD

- 25% bilateral
- Adolescent growth spurt





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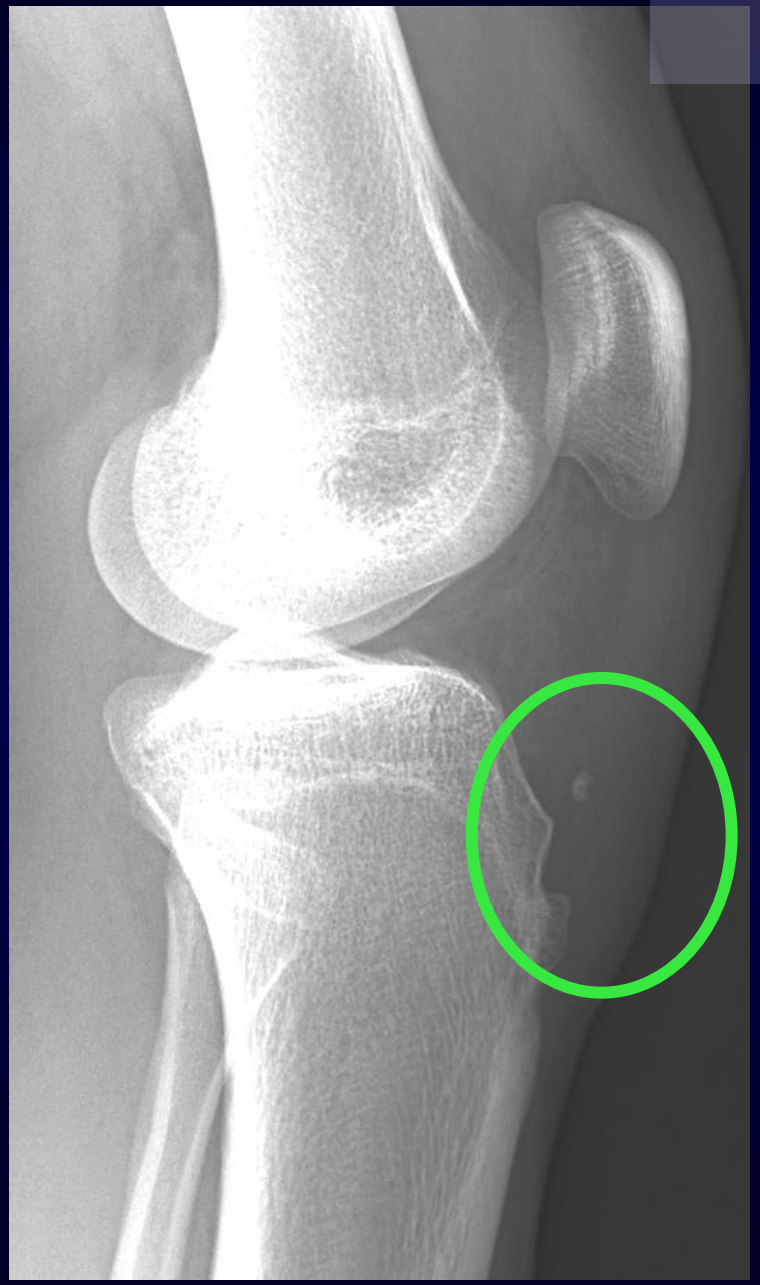
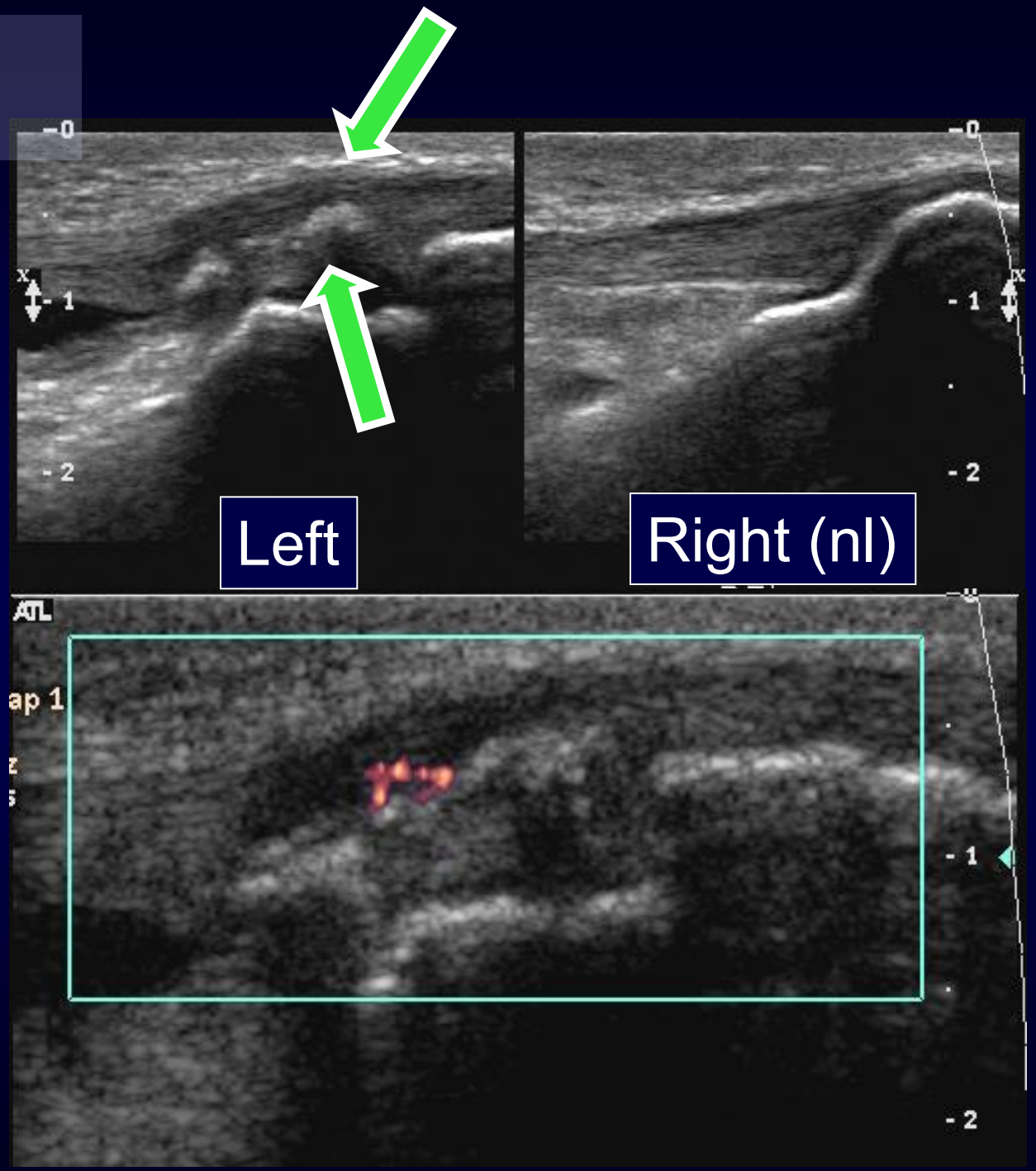
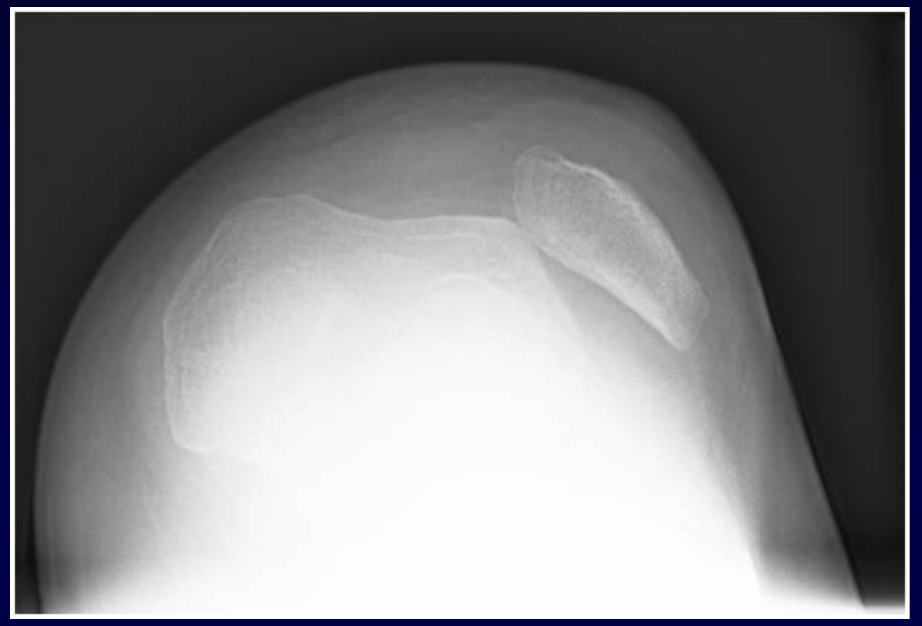




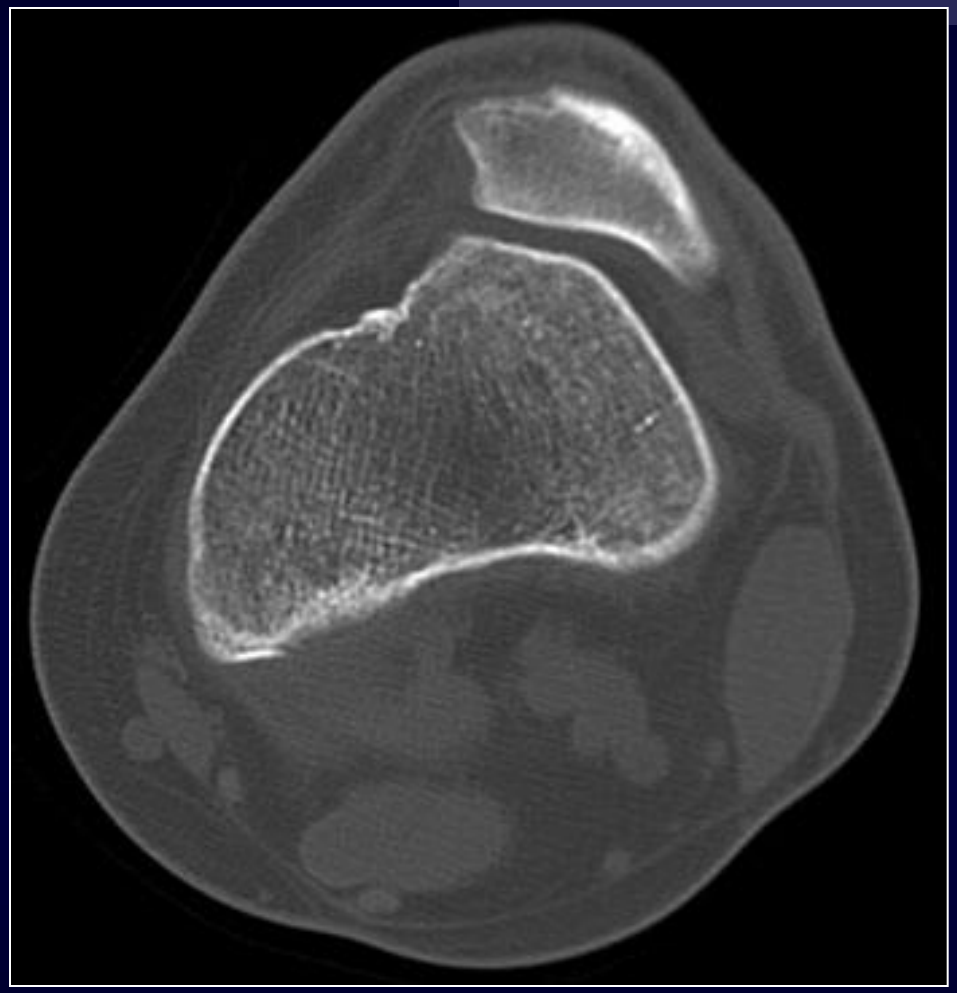
Patella Dislocation

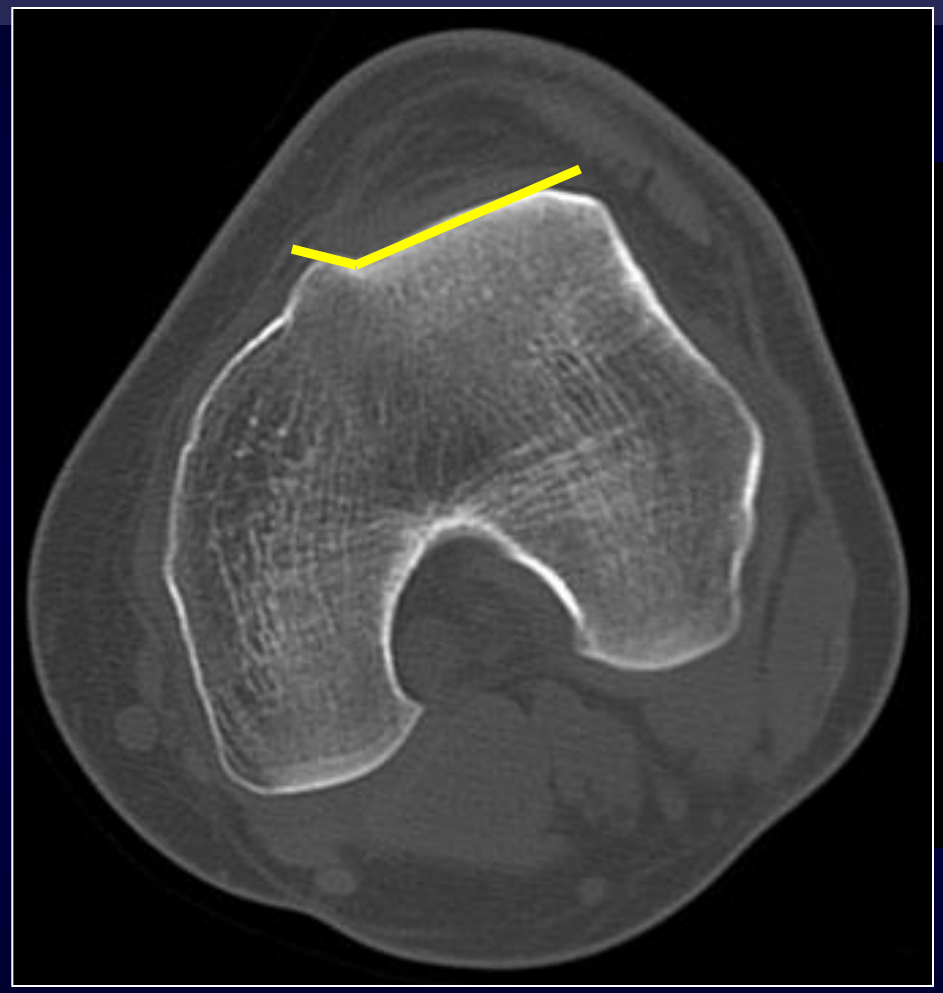
Patella Dislocation

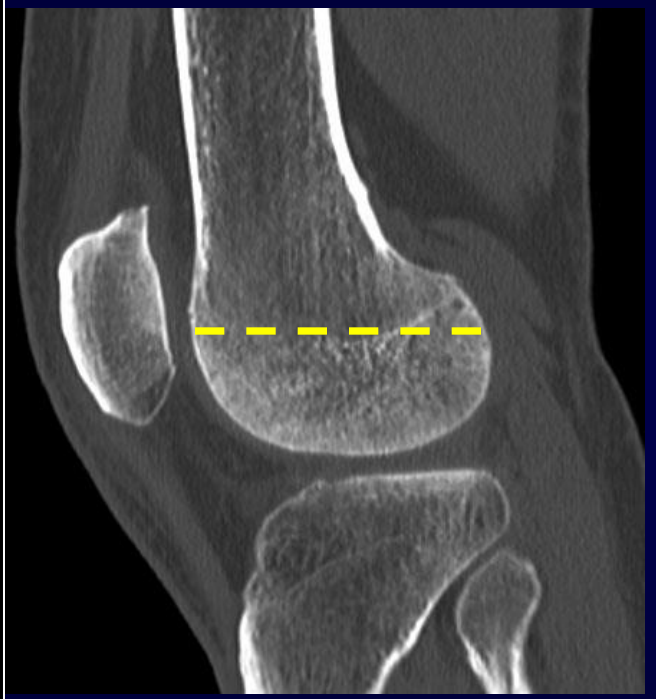
- Usually transient
- Clinically unsuspected 50%
  - Often 1st dx'd @ MR
- Risk factors: shallow trochlea, patella alta, flat dorsal patella



Patella Dislocation







Sulcus angle > “145°” abnormal

Colvin AC. *JBJS* 2008; 90:2751-62.

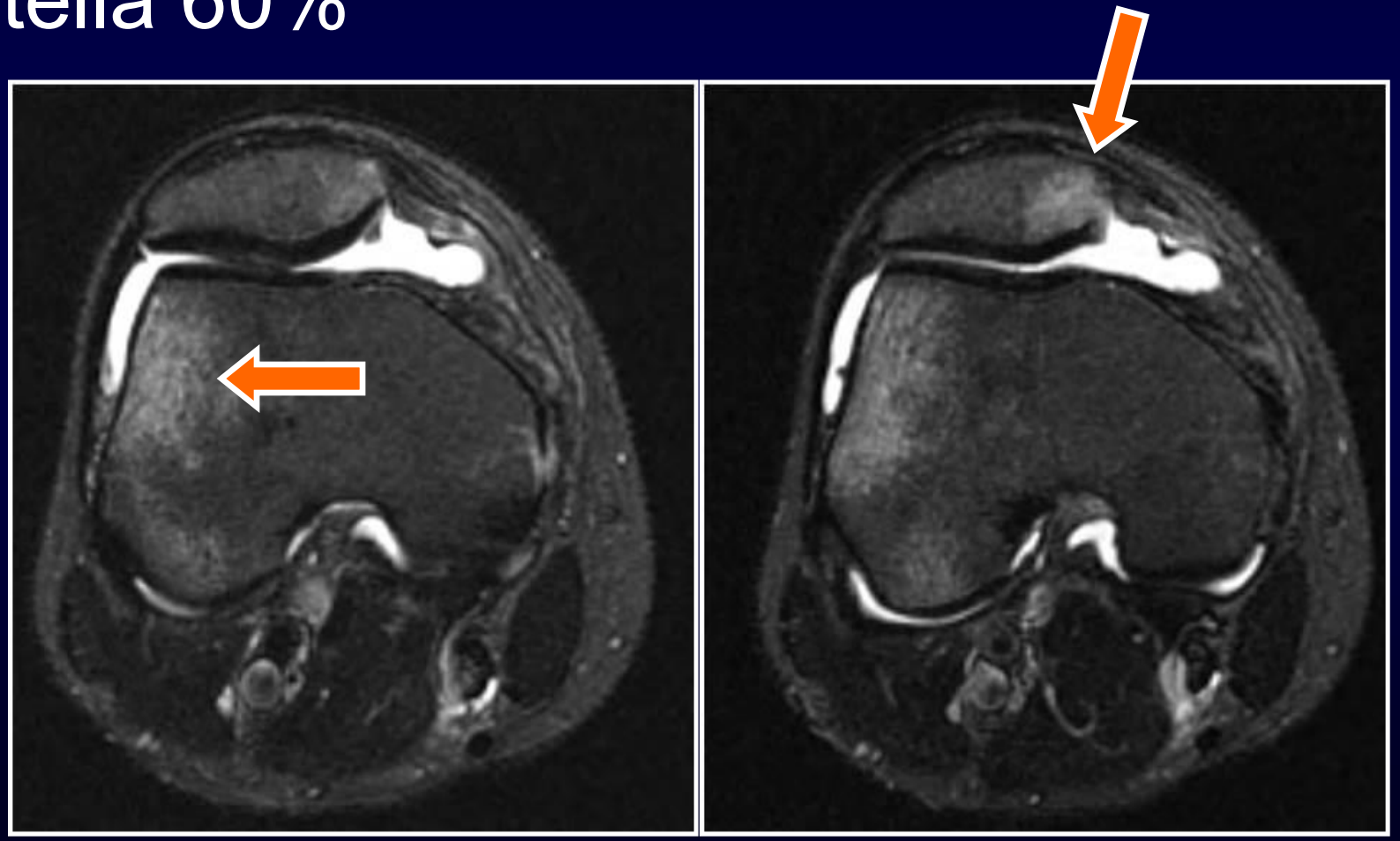
Transient Patellar Dislocation: TPD

- Peak age 14-18
- Most common acute knee disorder in adolescents—twist with planted foot or fall
- Almost always lateral
- MRI signs:
  - Contusions: LFC, med patella, **inf pole patella w/ impaction**
  - Osteochondral fracture of lateral femur, patellar avulsion medially
  - Torn medial stabilizers: retinac, **MPFL**, VMO
  - Effusion (hemarthrosis)

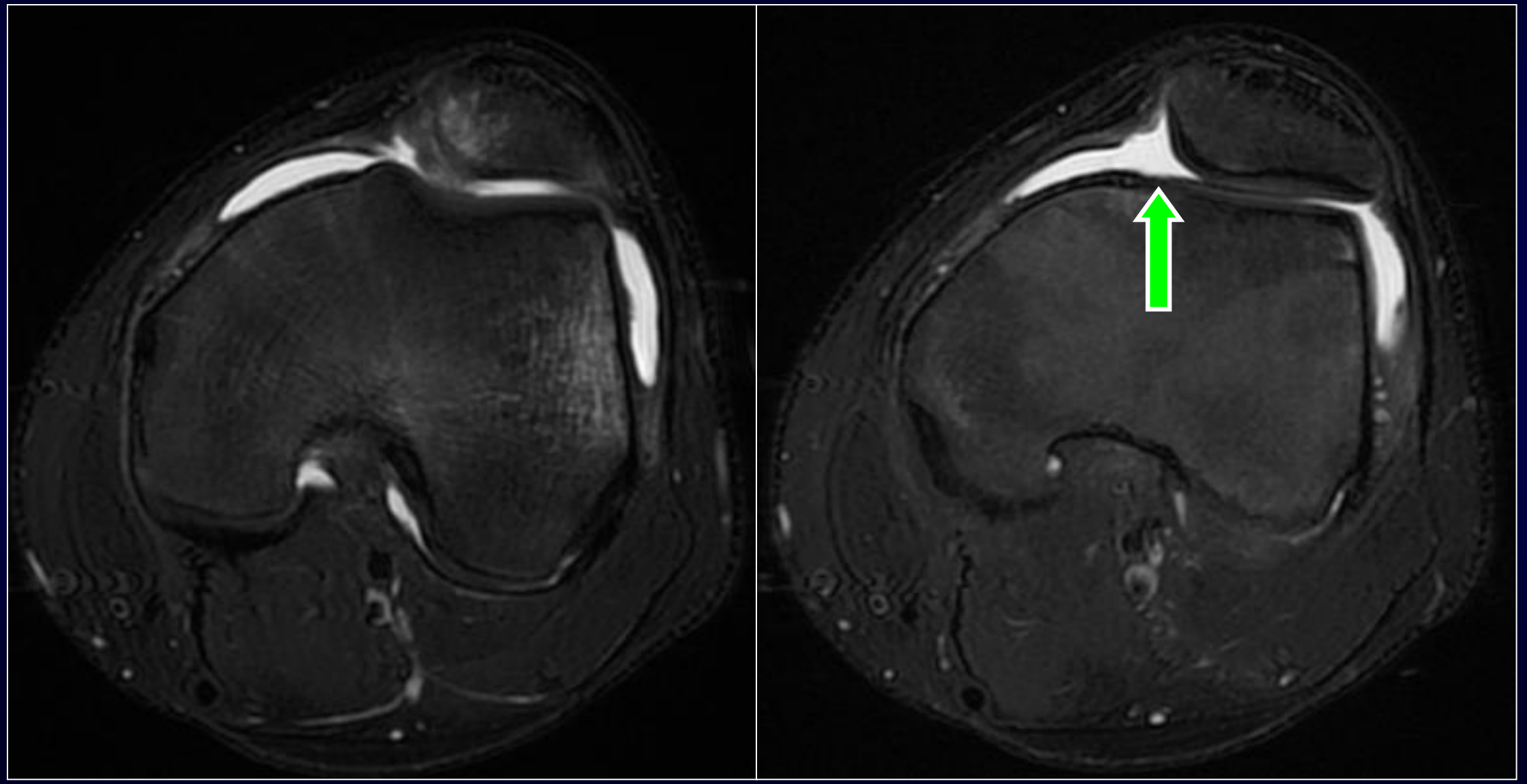
TPD: MRI

- Edema LFC 80%
- Edema med patella 60%

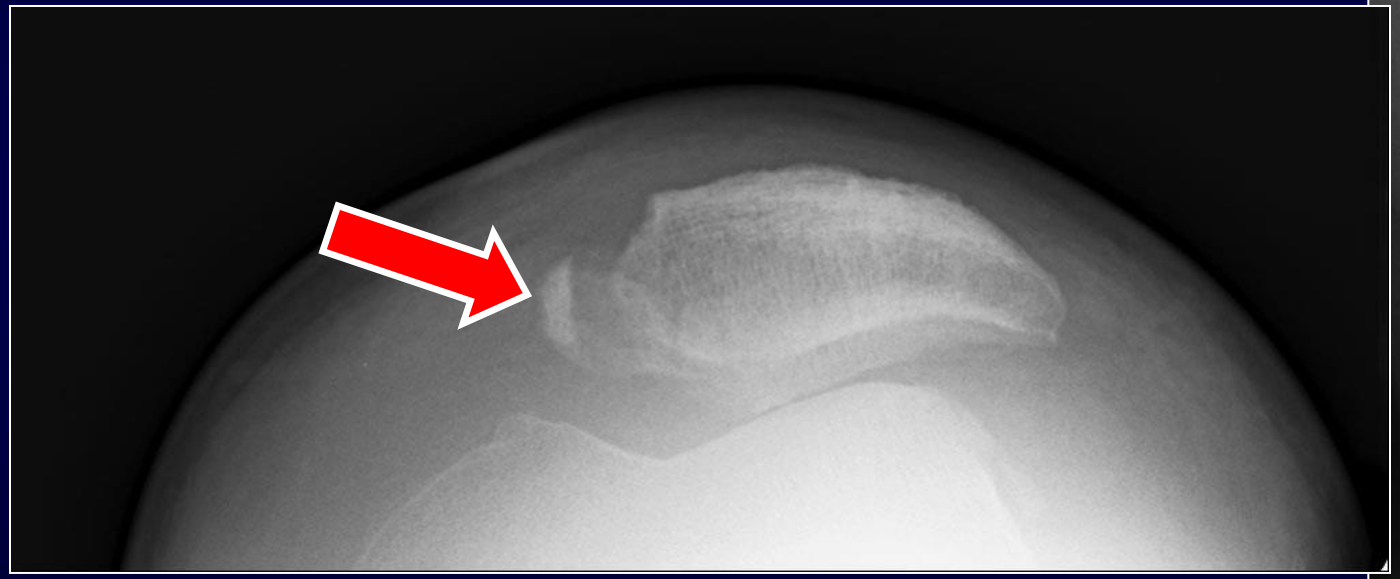
Elias DA. *Rad* 2002; 225:736-743

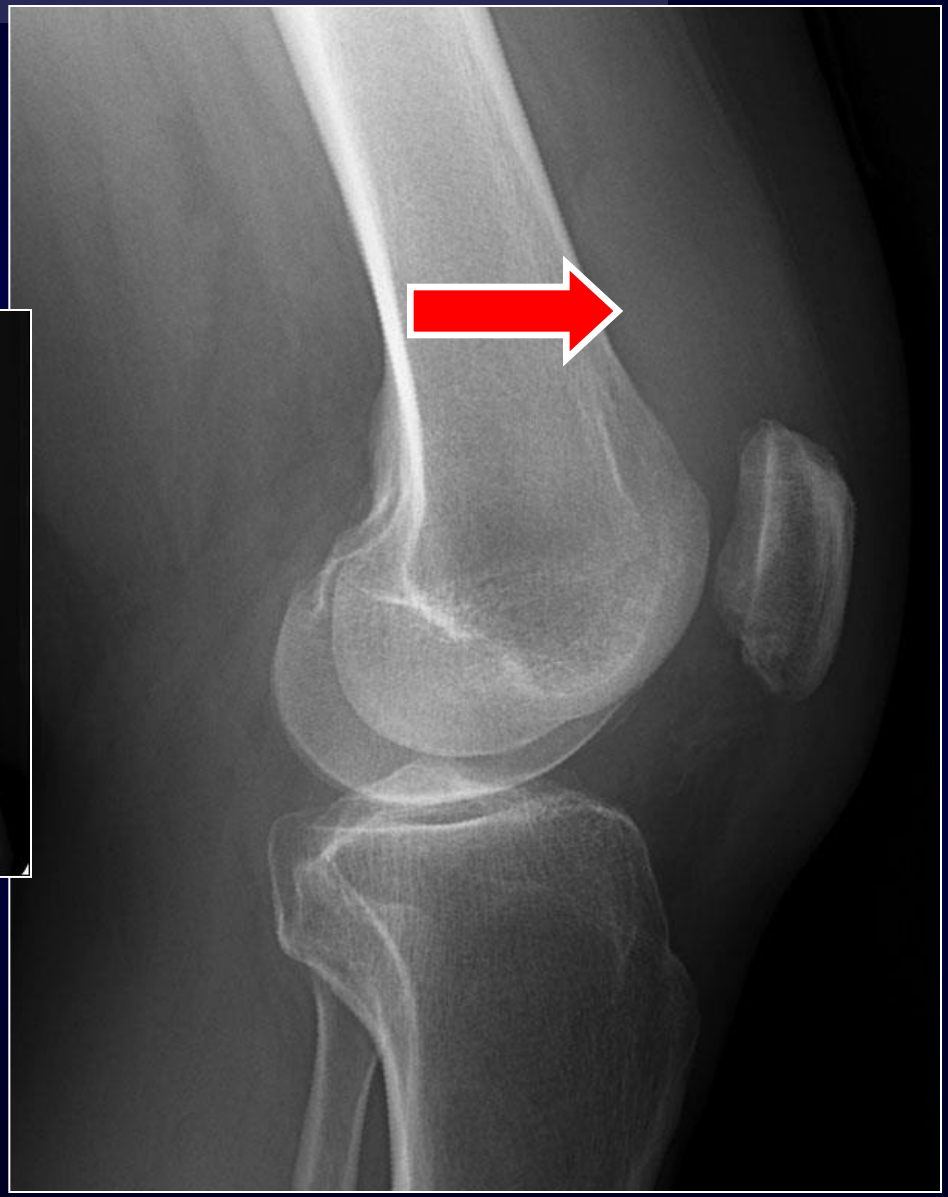


TPD: 14 ♂

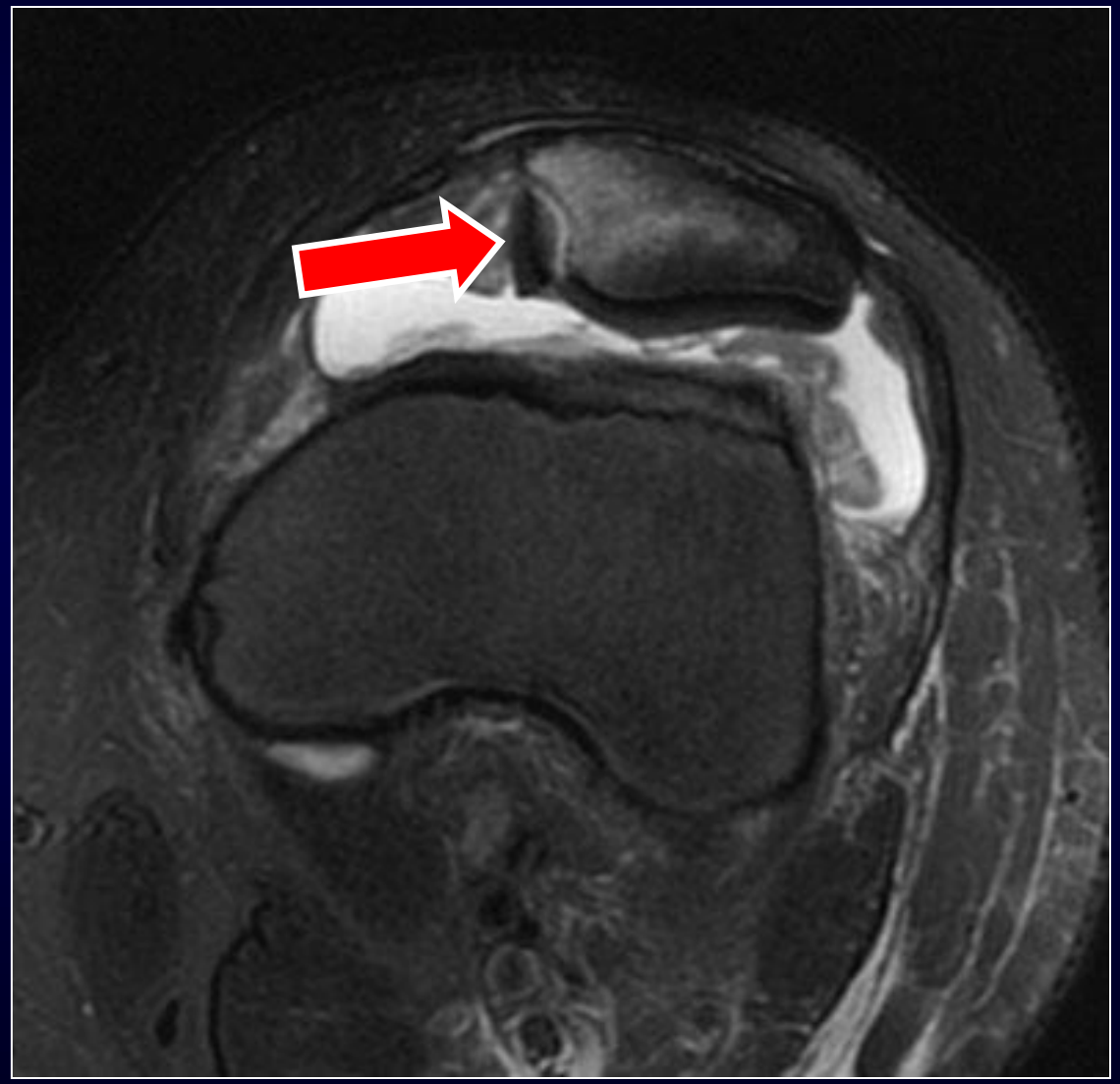


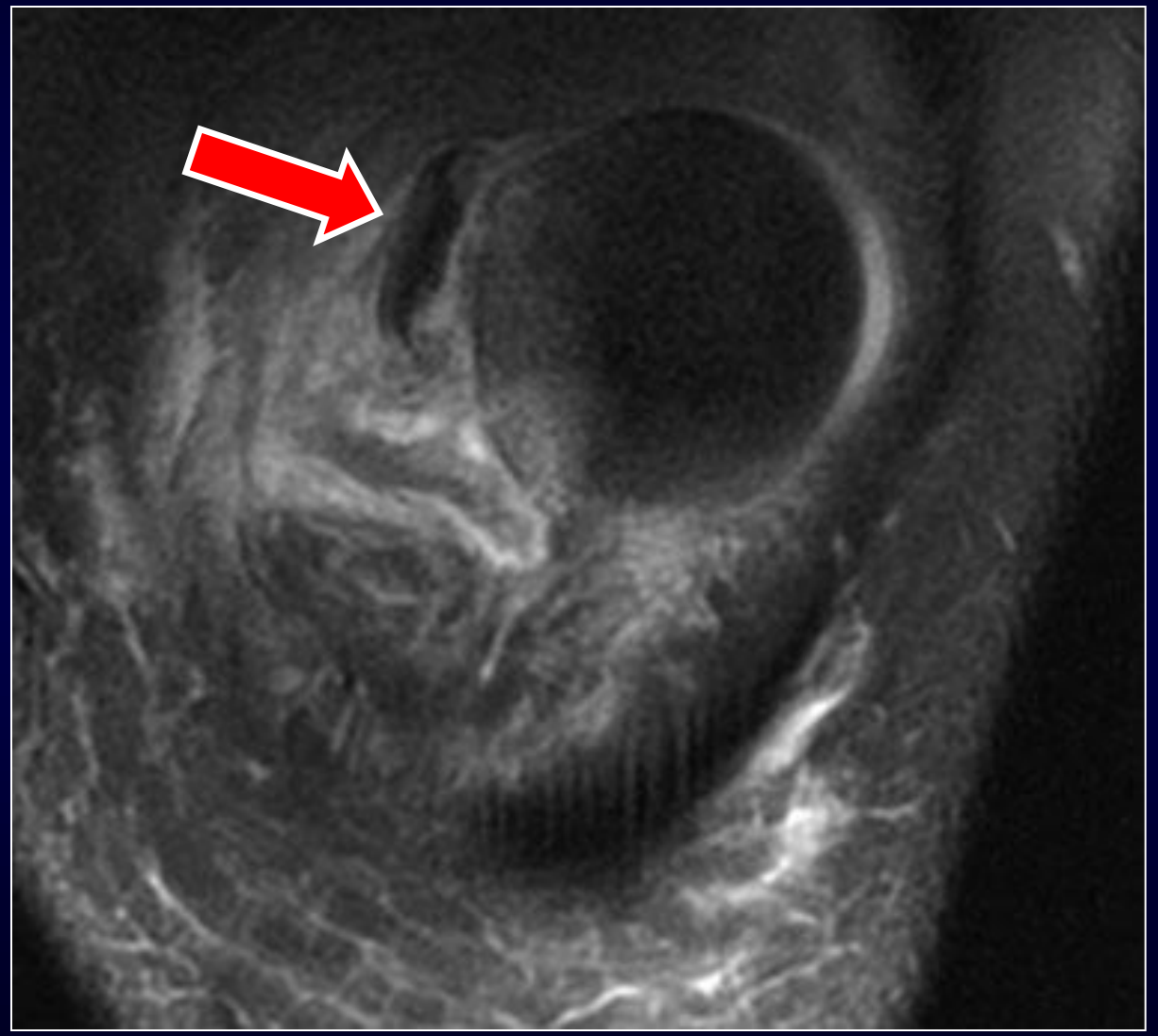
TPD: Patella Avulsion Fx



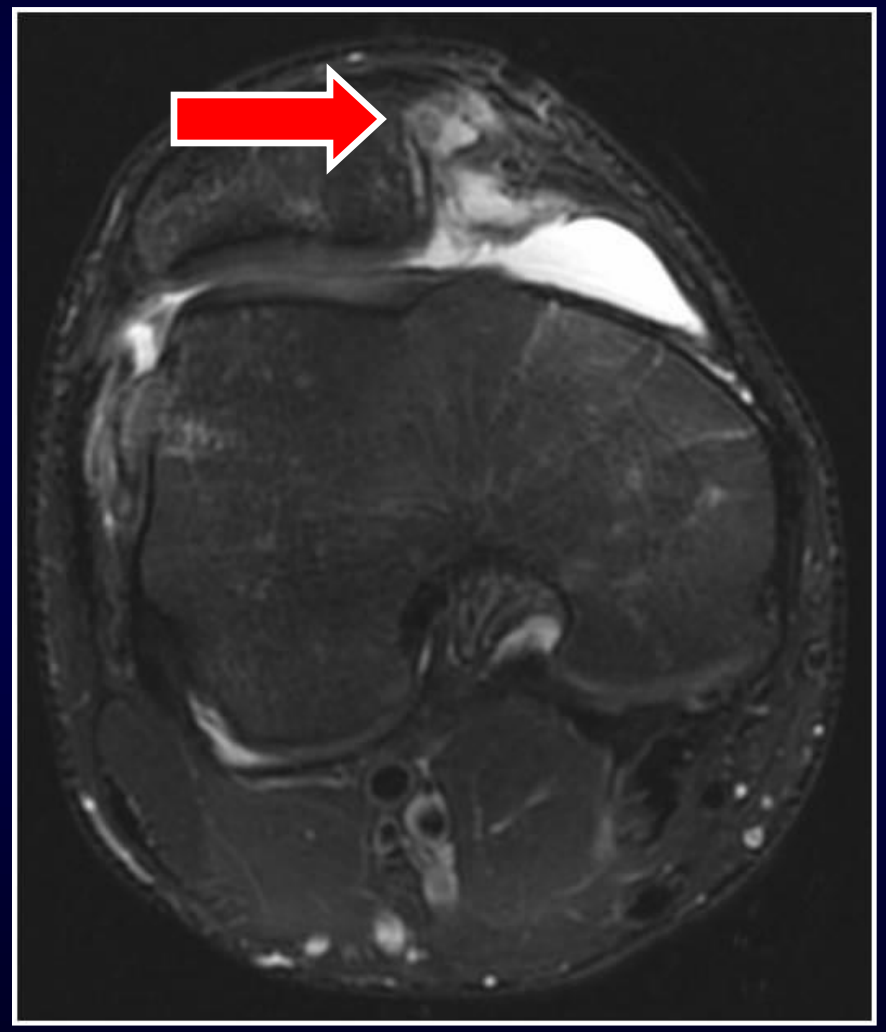


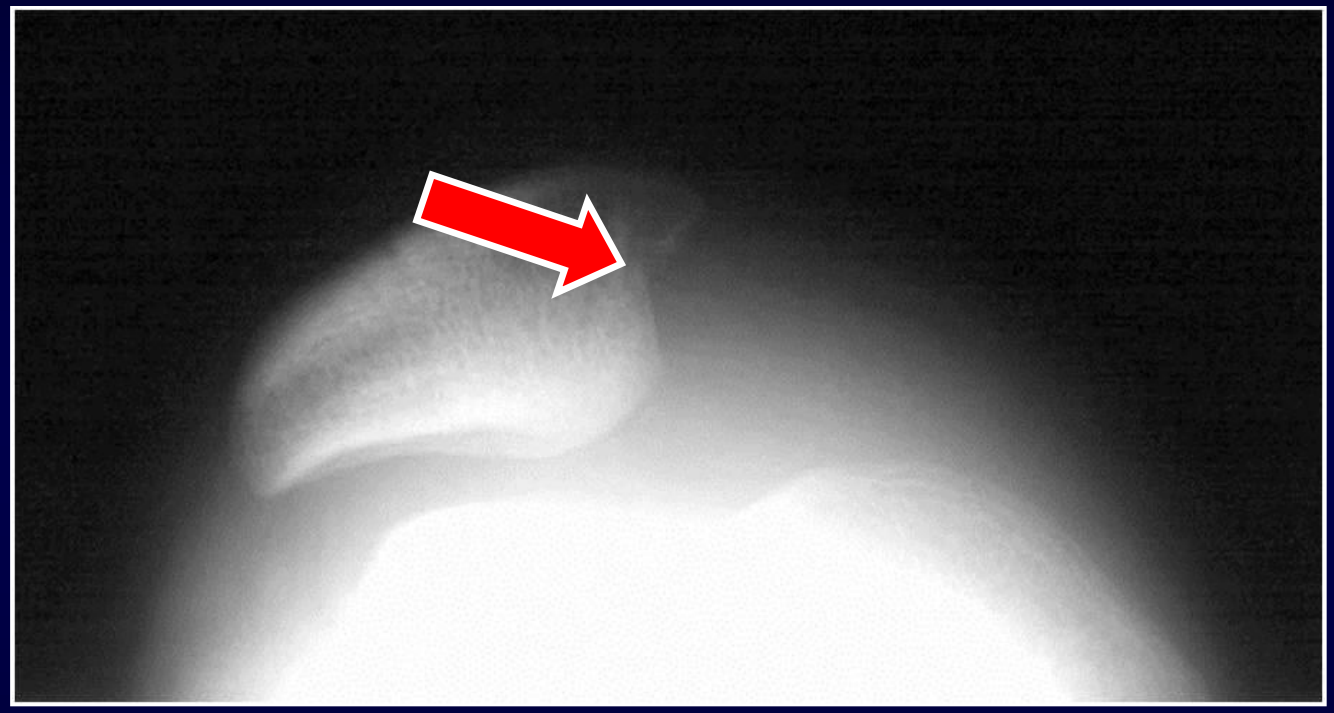
TPD: Patella Avulsion Fx





TPD: Patella Impaction Fx

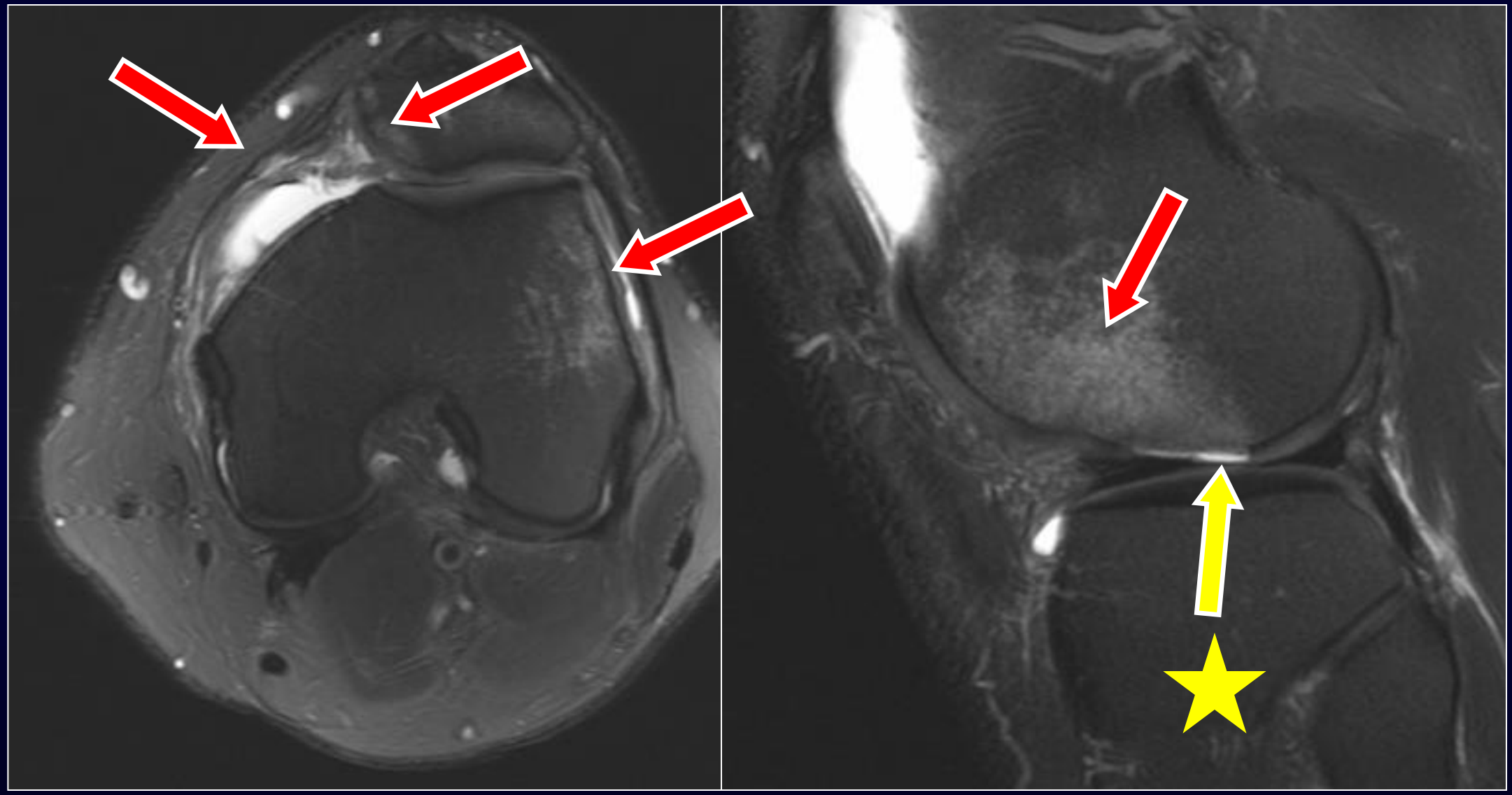




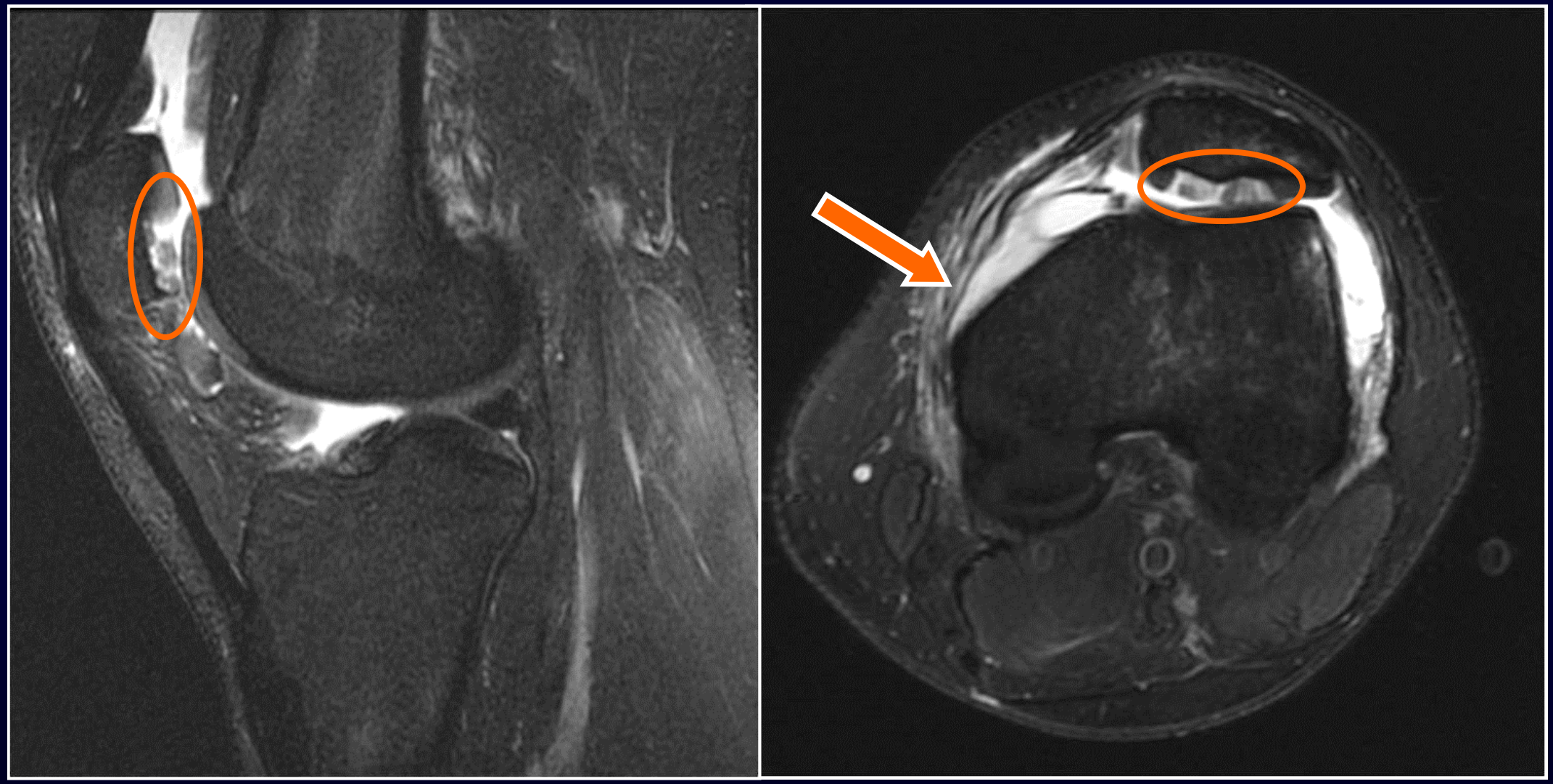
- 45% of TPD

Elias DA. *Rad* 2002; 225:736-743

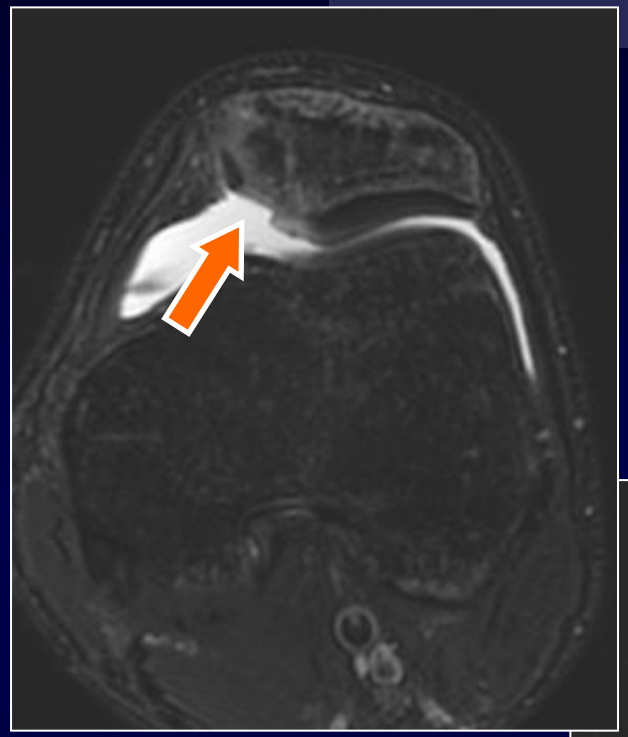
TPD: LFC Cartilage Injury

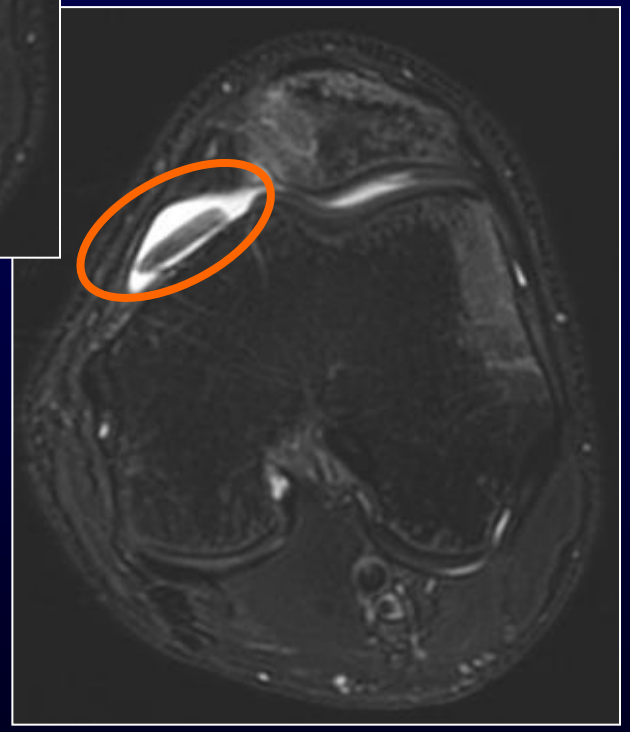


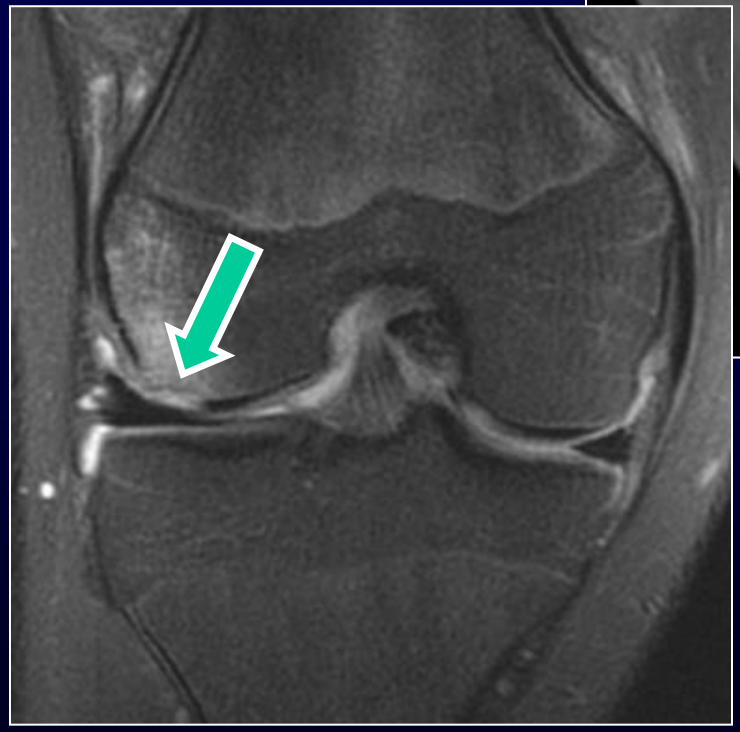
TPD: Patella Cartilage Injury

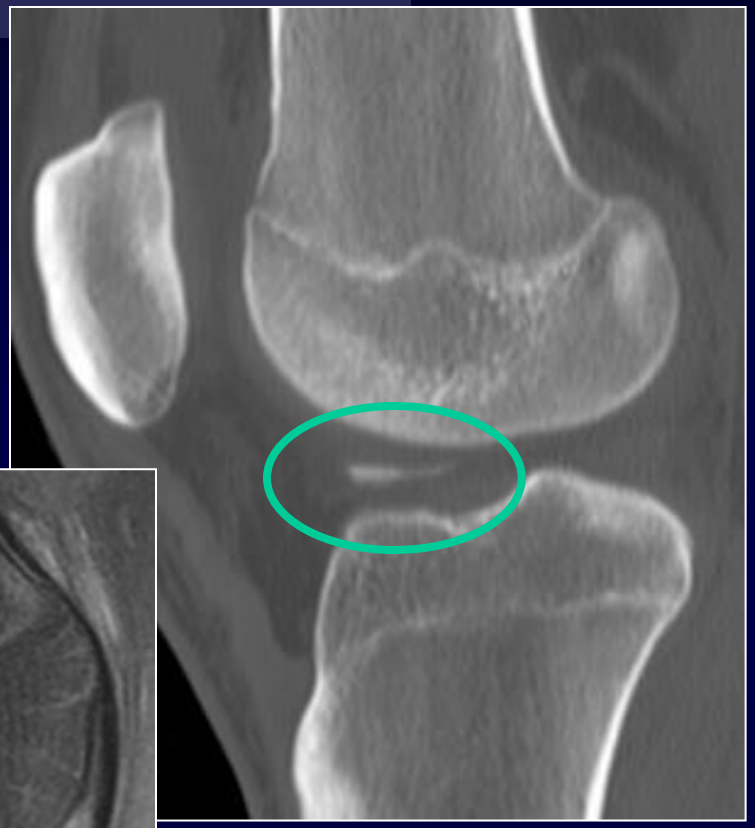


TPD: Osteochondral Injury





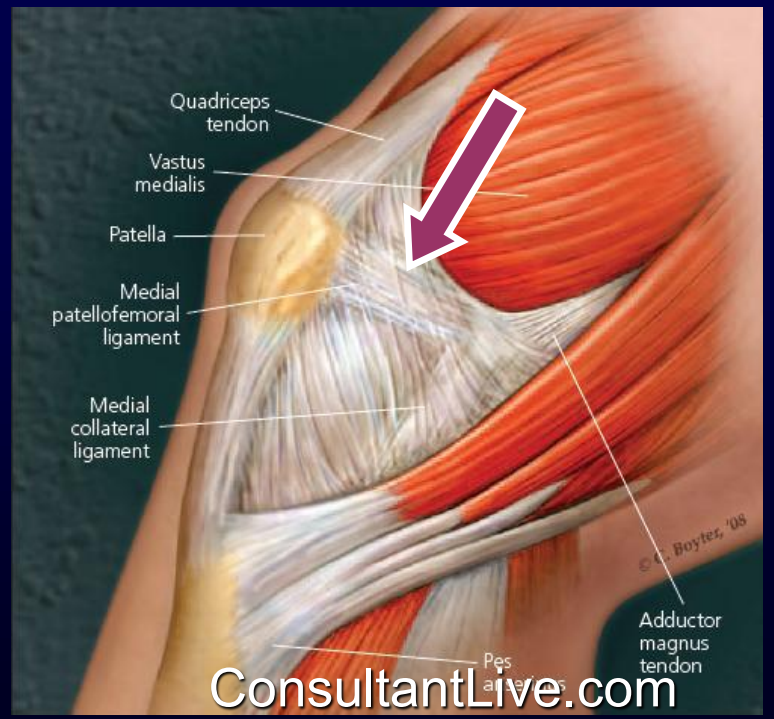




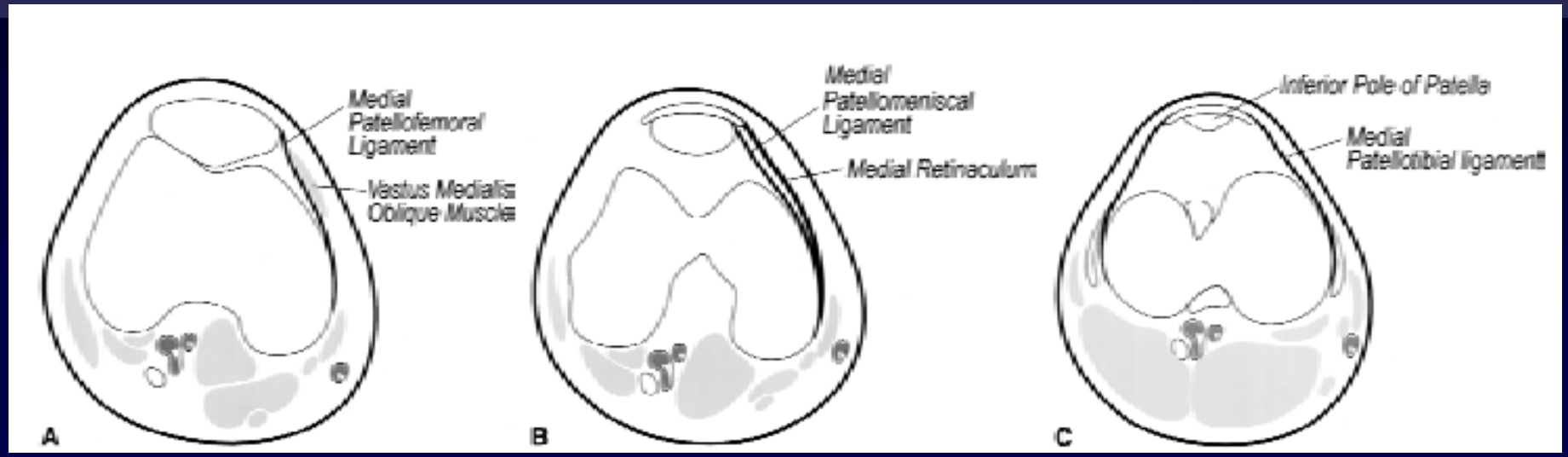
TPD: MRI

- Edema LFC 80%
- Edema med patella 60%
  - 45% impaction fx
- Medial PatelloFemoral Lig tear ~50% (MPFL)

Sanders TG. *JCAT* 2001; 25:957-962

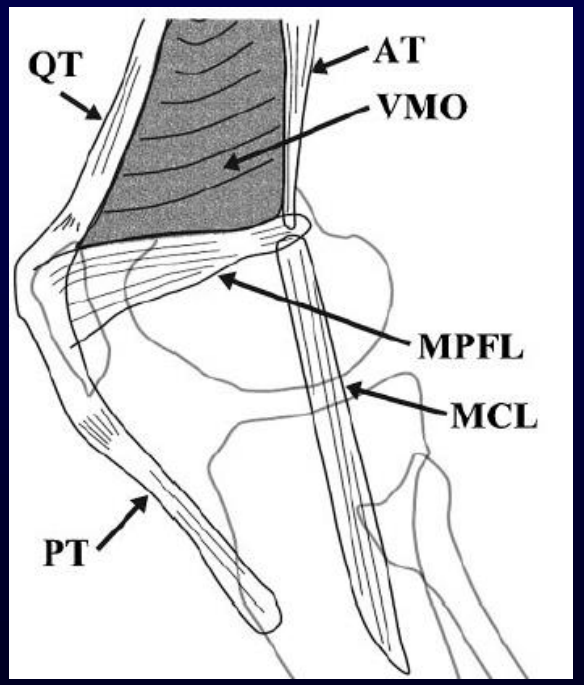


Medial PatelloFemoral Ligament



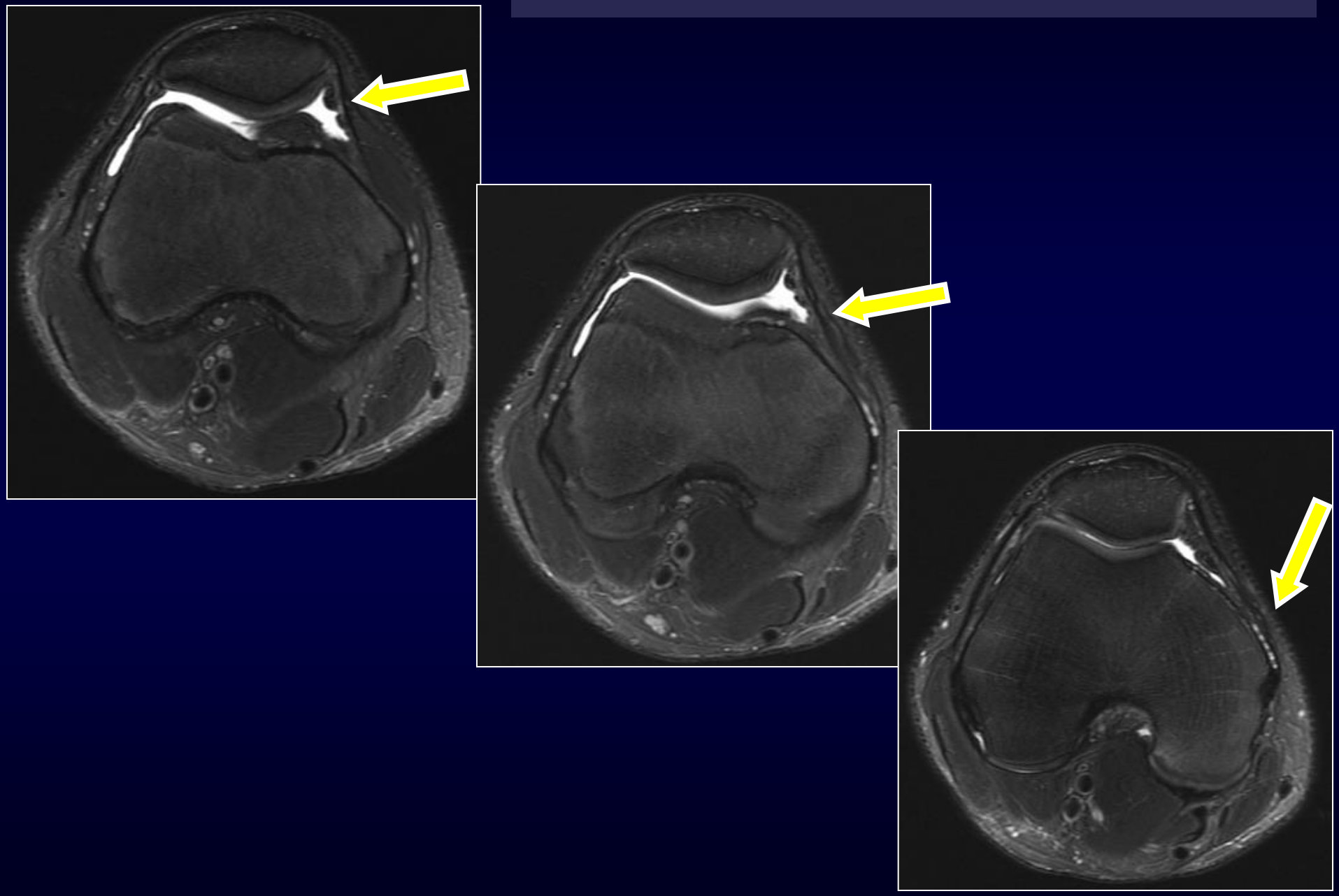
Sanders TG. *JCAT* 2001; 25:957-962

1° medial restraint for the patella
-50-80% passive restraint

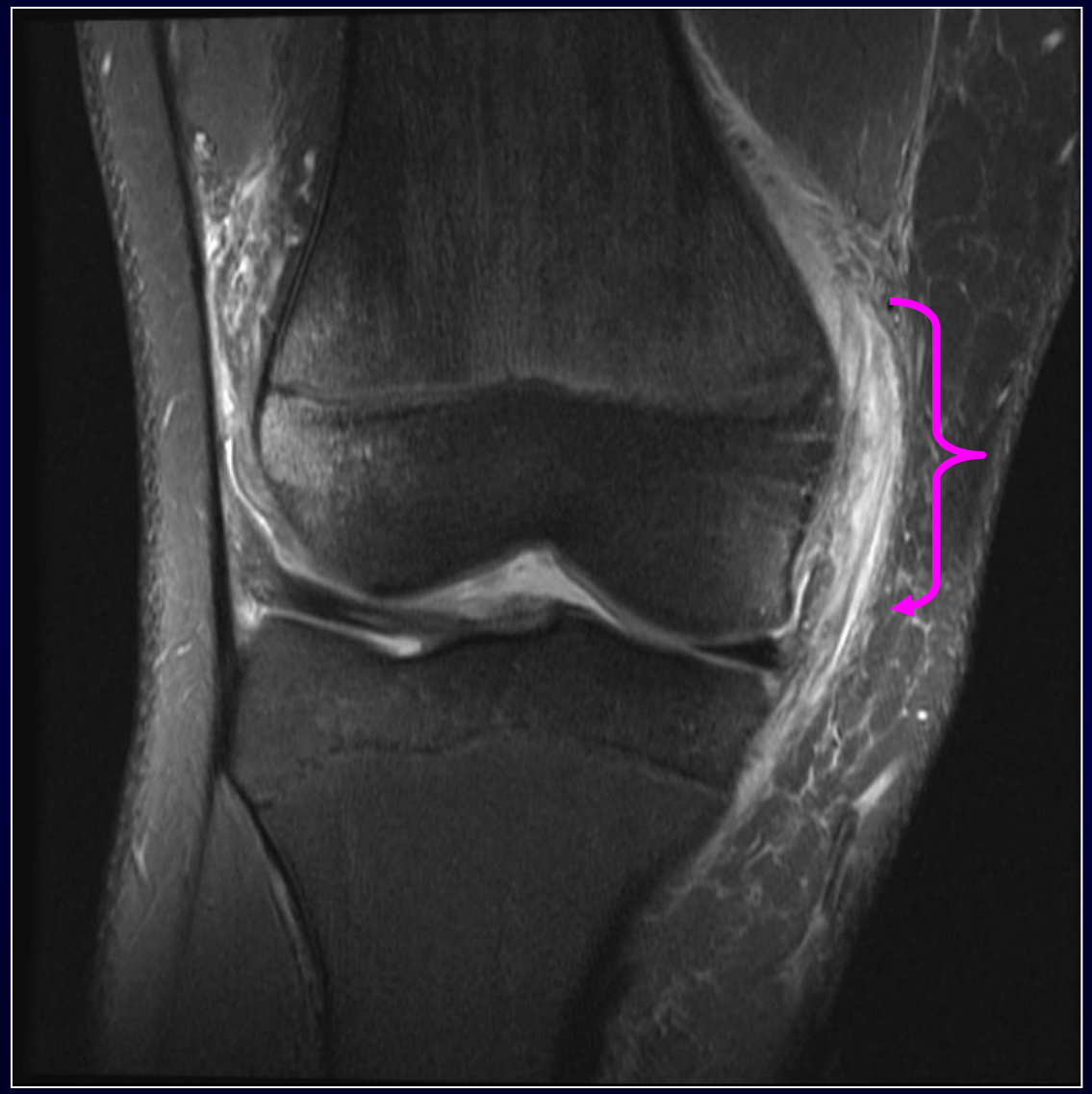


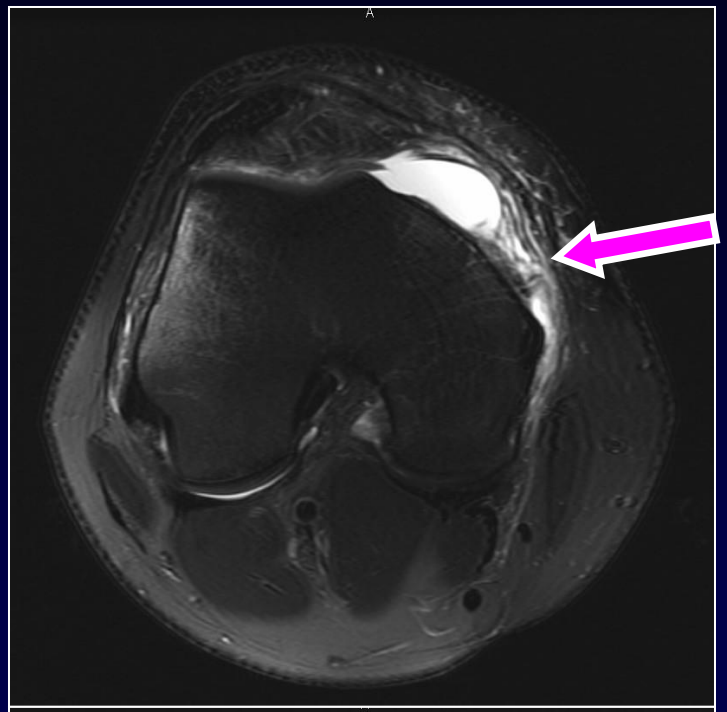
Elias DA. *Rad* 2002; 225:736-743

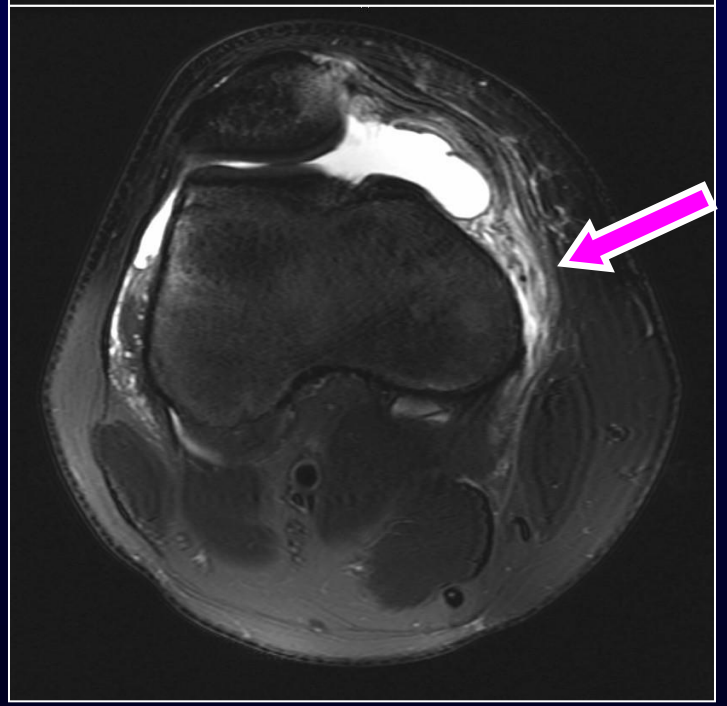
MPFL: Normal



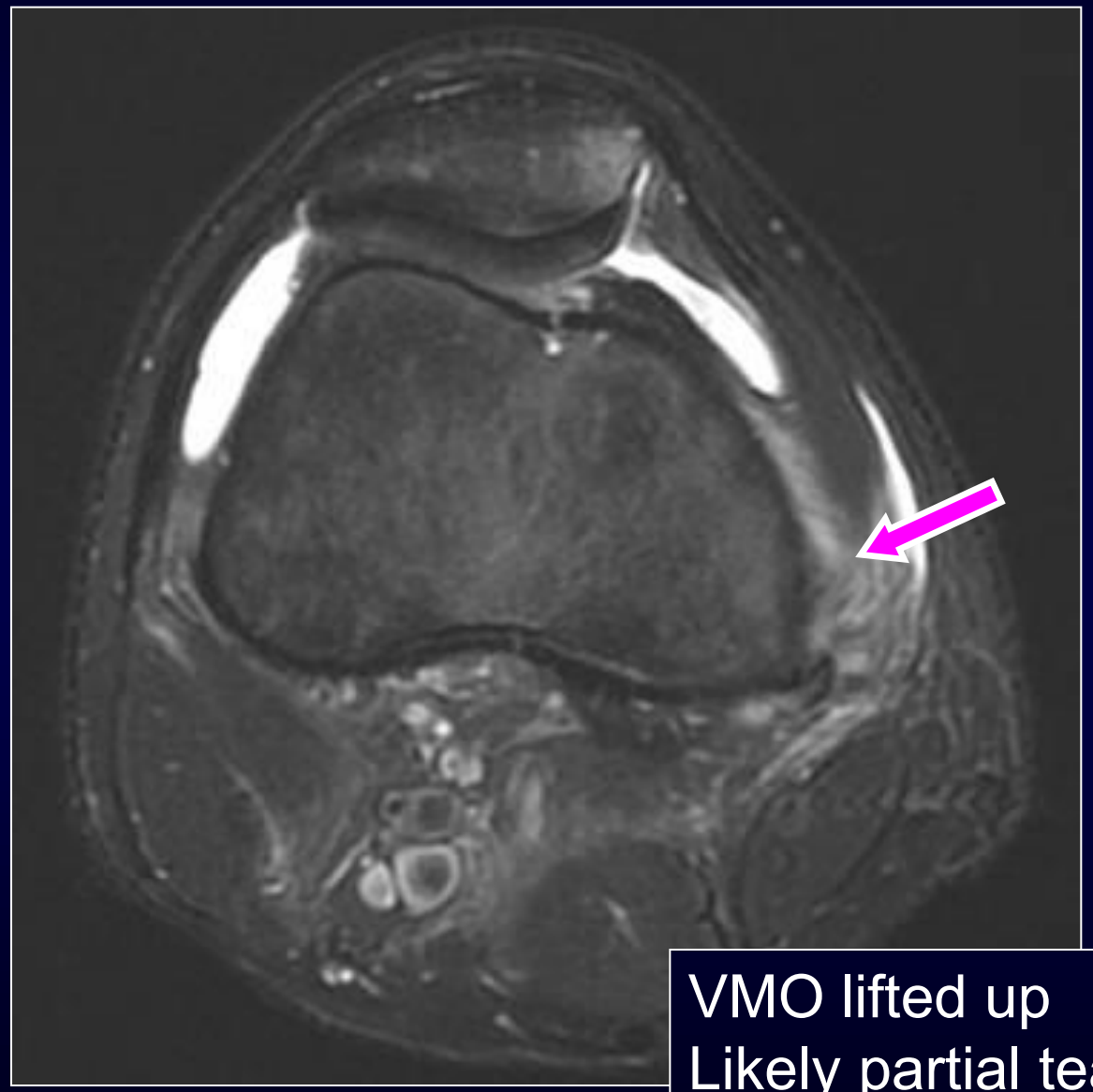
MPFL Tear







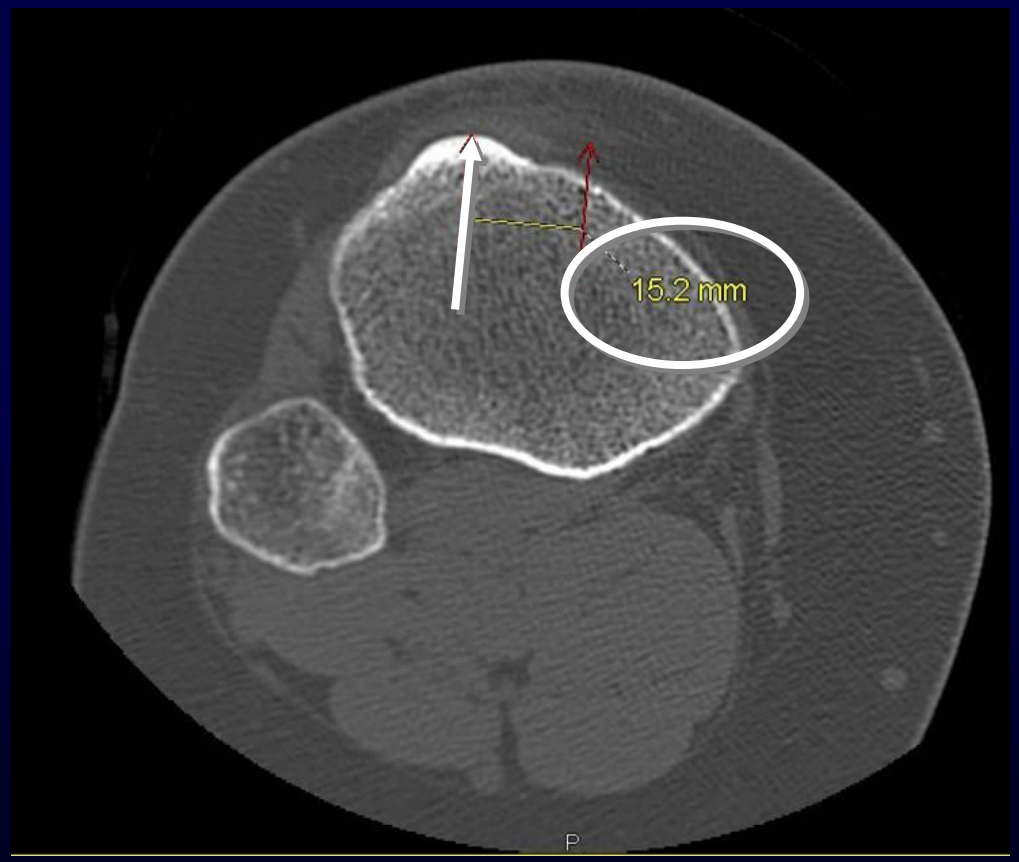
TPD: MPFL

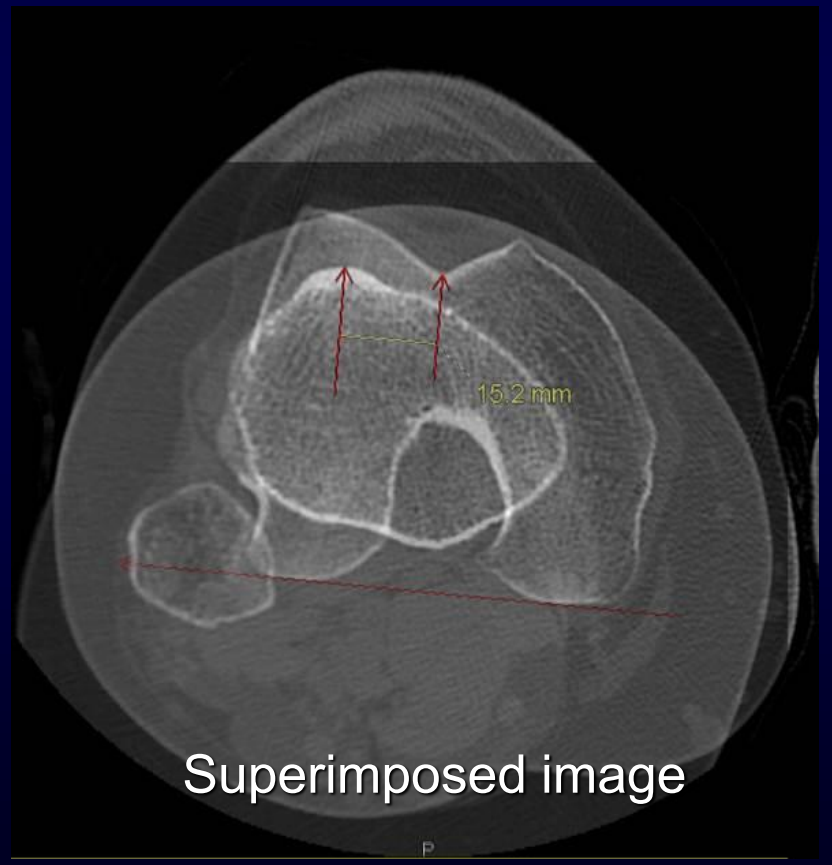


VMO lifted up
Likely partial tear MPFL

Patella Tracking

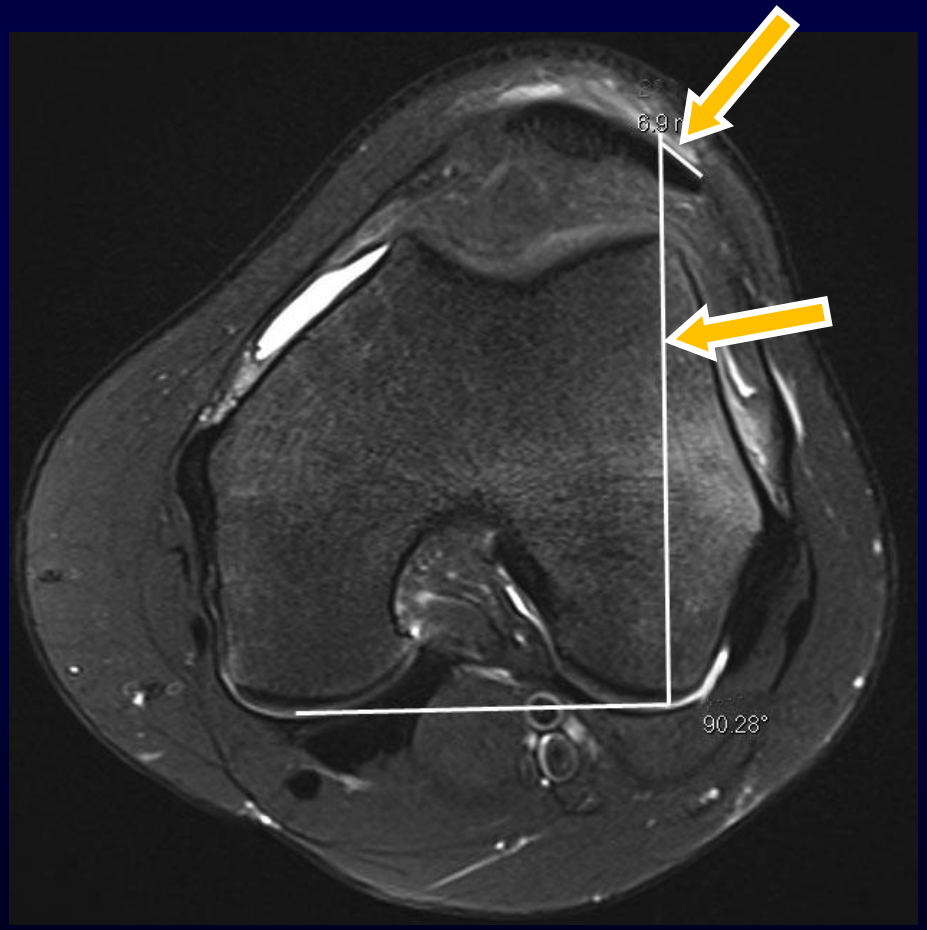
Tibial tubercle-to-trochlear groove distance (TT-TG): <15 nl >20 abnml





Patella Tracking

Patellar Tendon-Lateral Trochlear Ridge (PT-LTR):



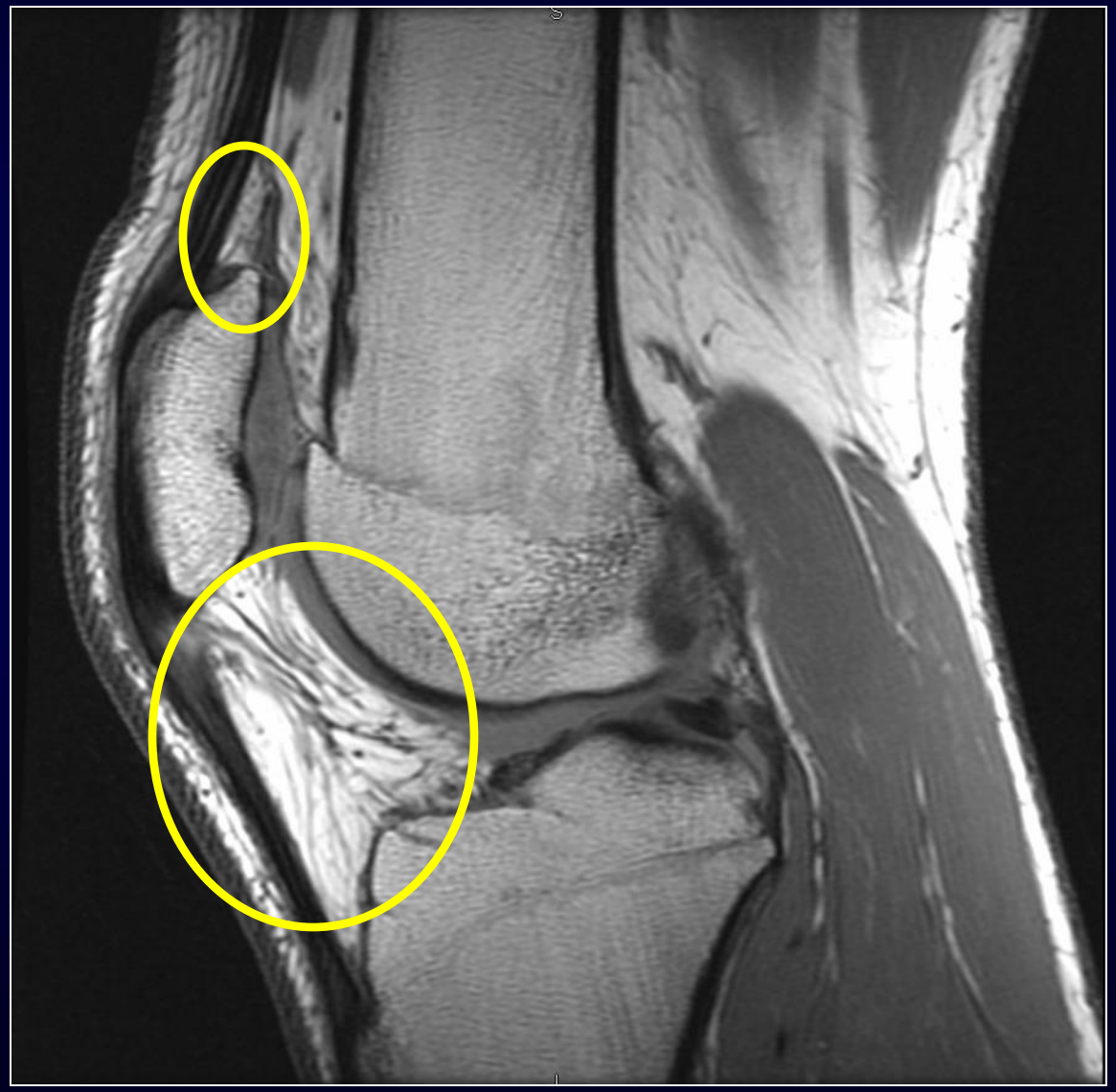
- First slice below patella
- Measure a perpendicular from condyles to lateral ridge
- PT-LTR distance is the amount of patellar tendon lateral to the line
- > 5.5 mm → 73% sens, 89% spec for patella instability (better specificity than TT-TG)

Mistovich RJ et al: *AJSM* 2018;46:3400-3406

Fat Pad Syndromes

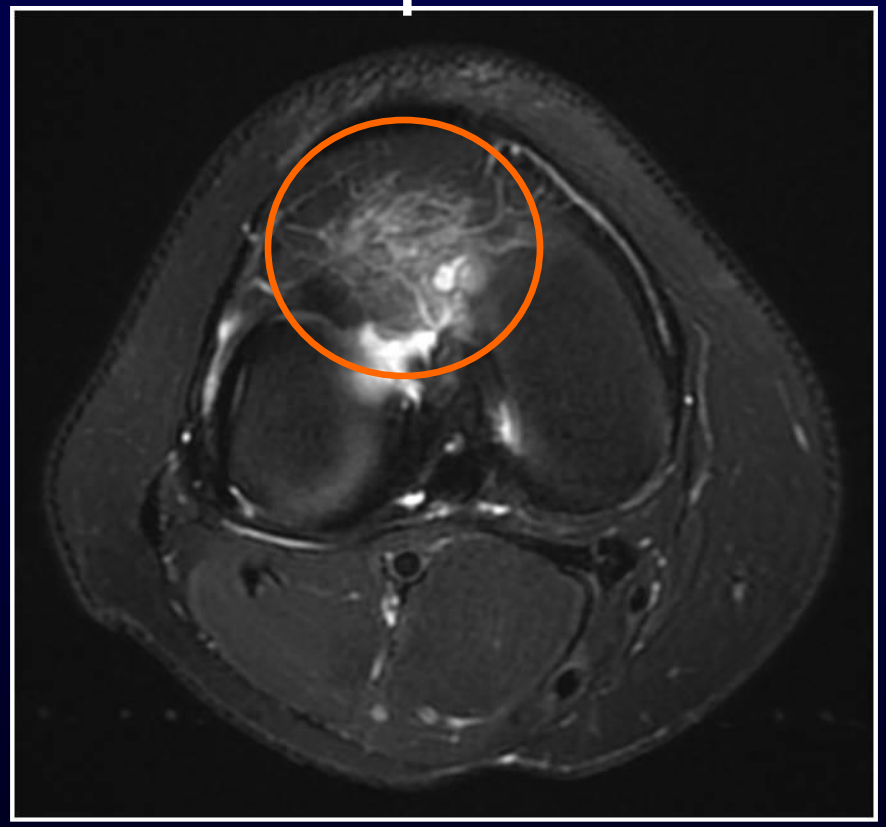
Fat Pad Syndromes

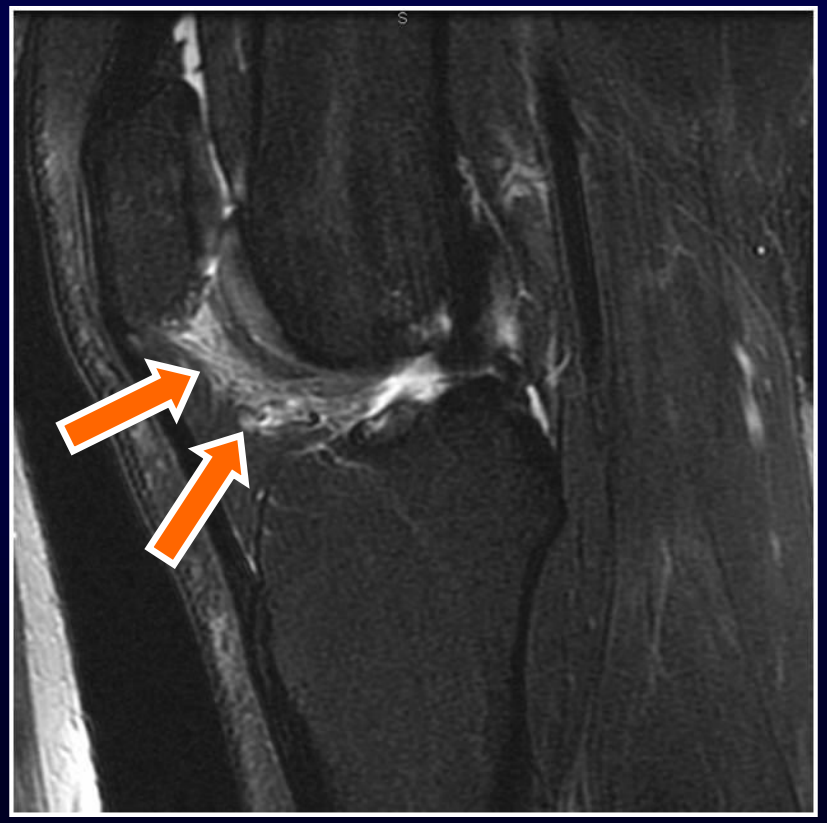
- Hoffa's disease
- Quadriceps fat pad syndrome



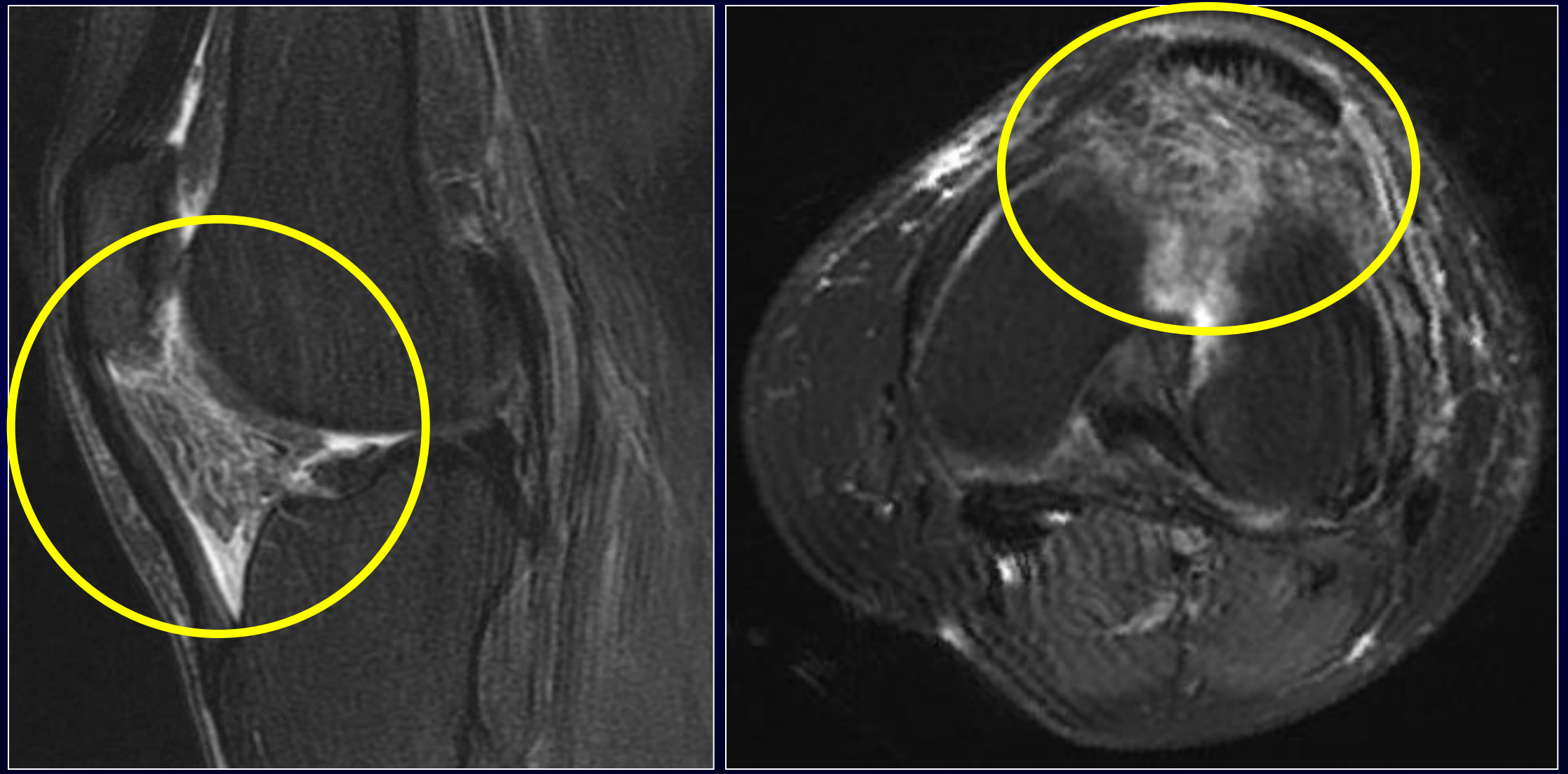
Hoffa's Disease

- Infrapatellar fat pad impingement syndrome
- Acute or repetitive trauma

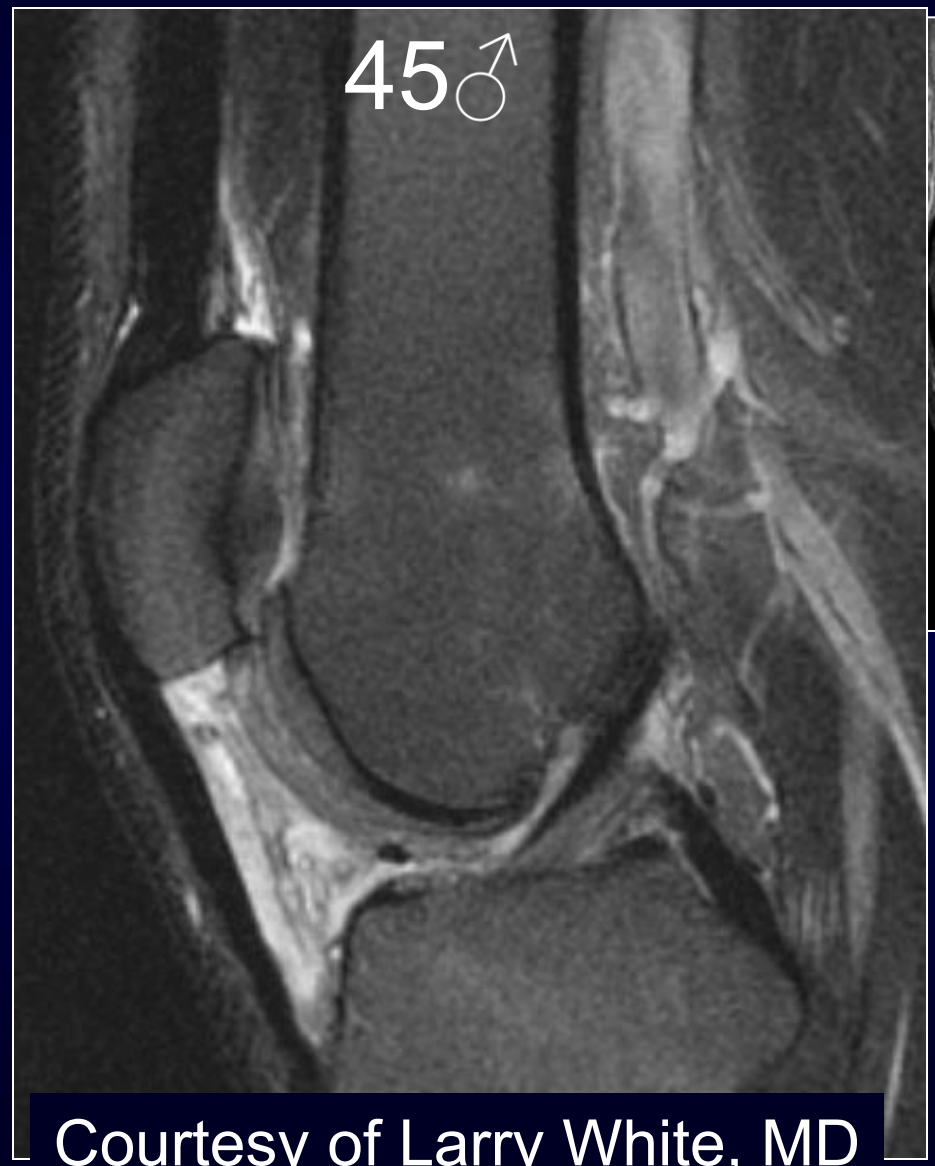




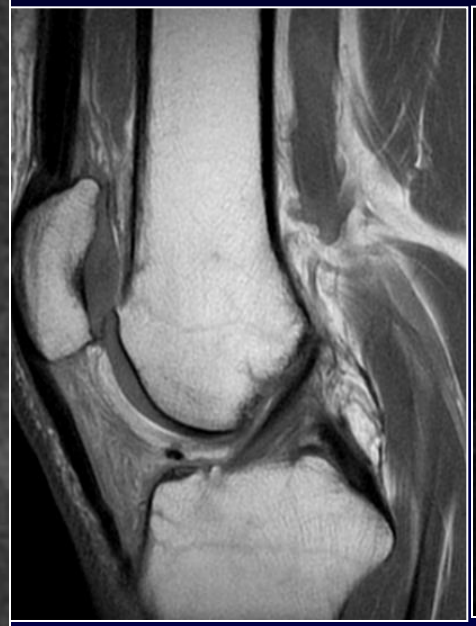
Hoffa's Disease

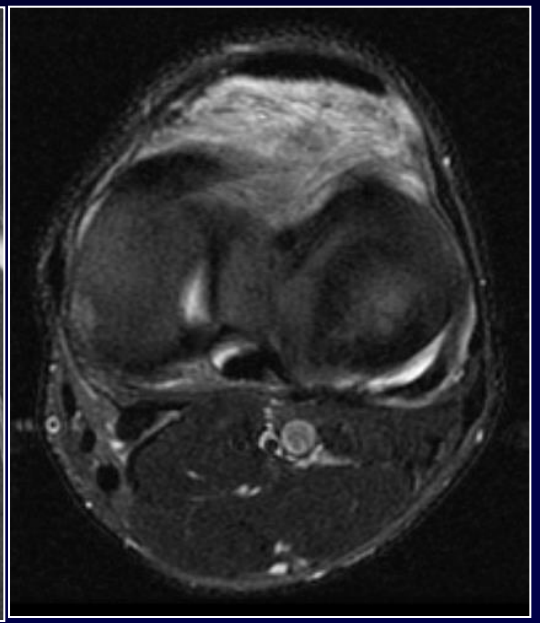


Hoffa's Disease: HIV/AIDS



Courtesy of Larry White, MD



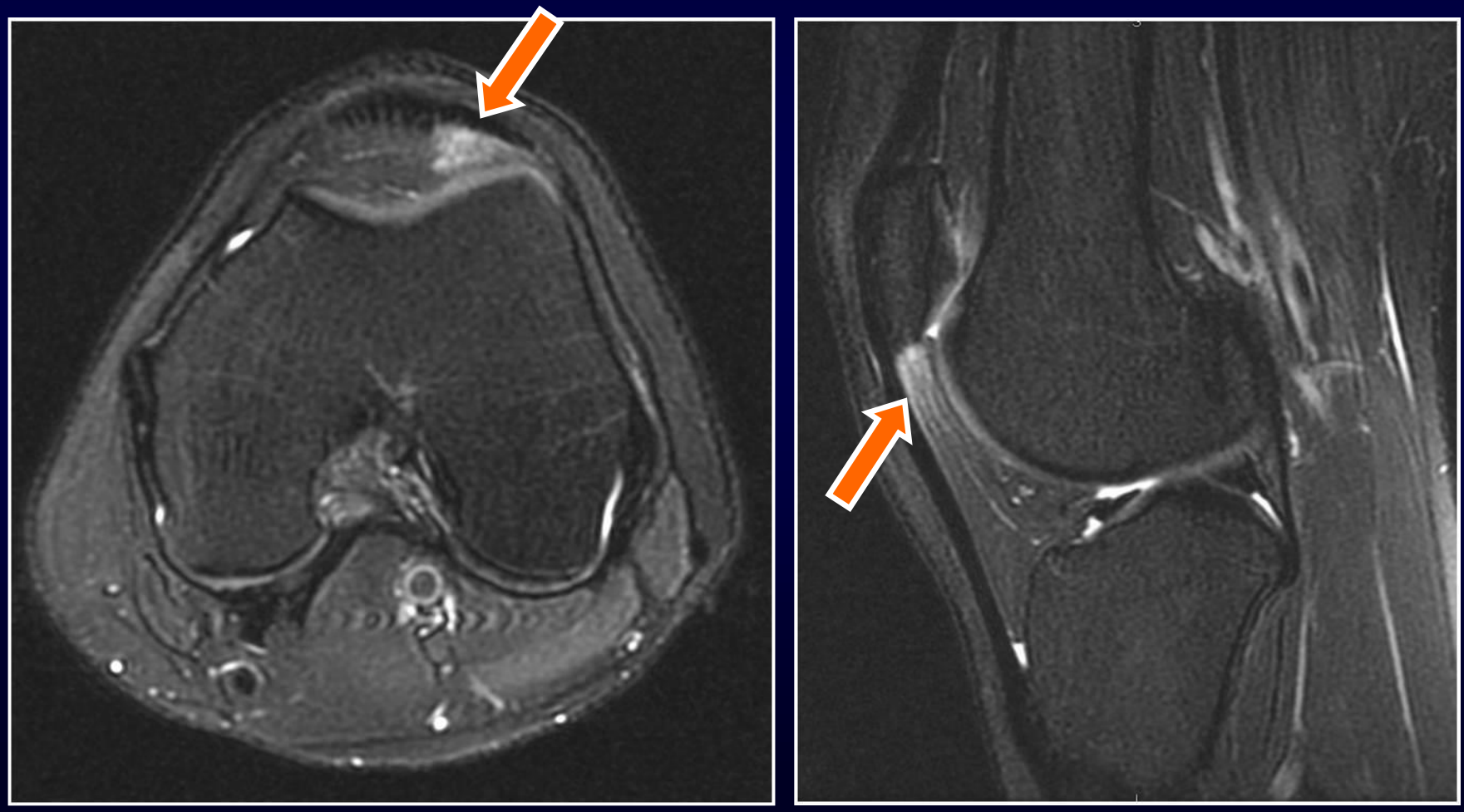


- Inflammatory?
- Drug-related (HAART)?
- Serous atrophy?

Torshizy H. *Skel Rad* 2007; 36:35-40

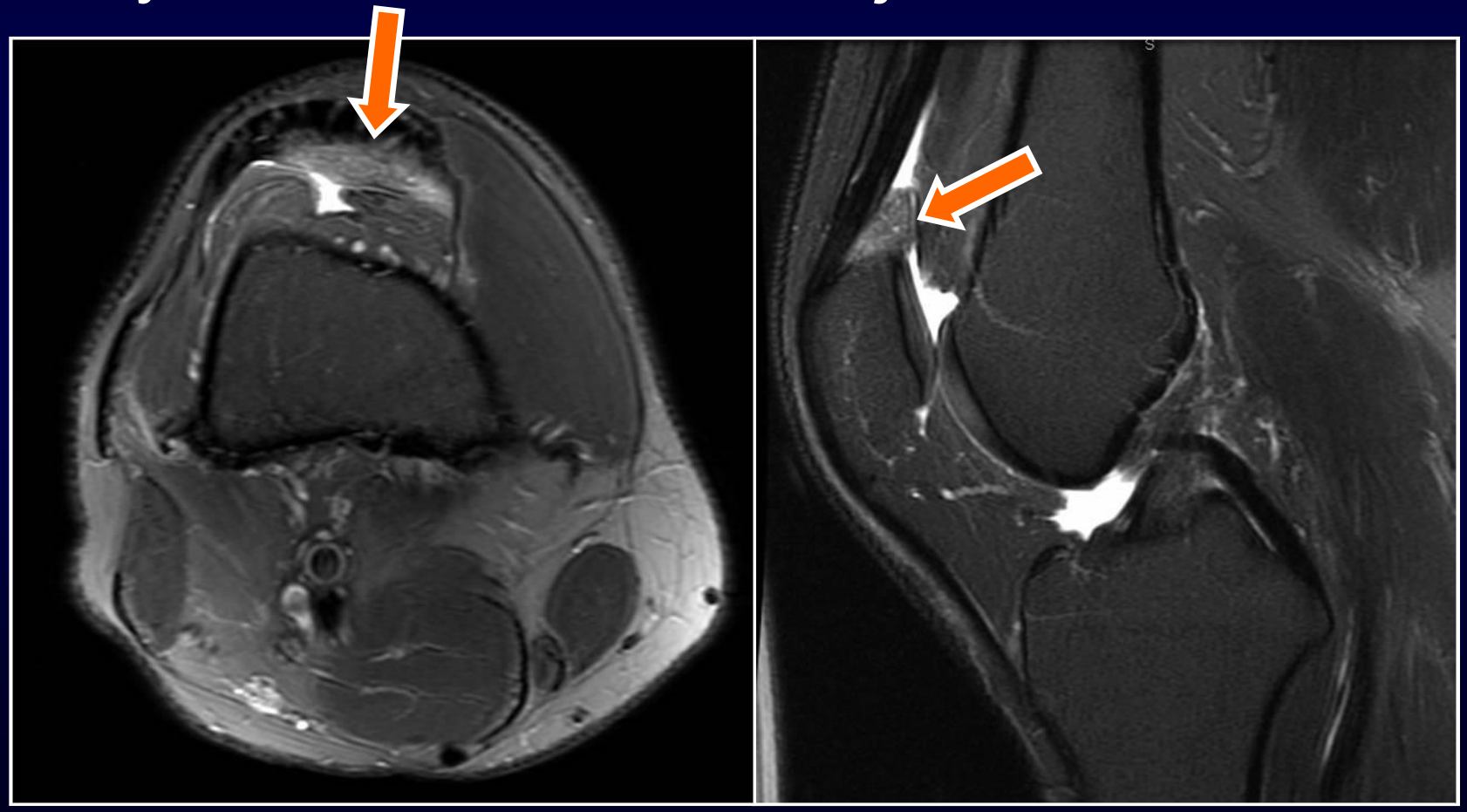
Superolateral Hoffa's Disease

- Assoc. w/ patellar maltracking



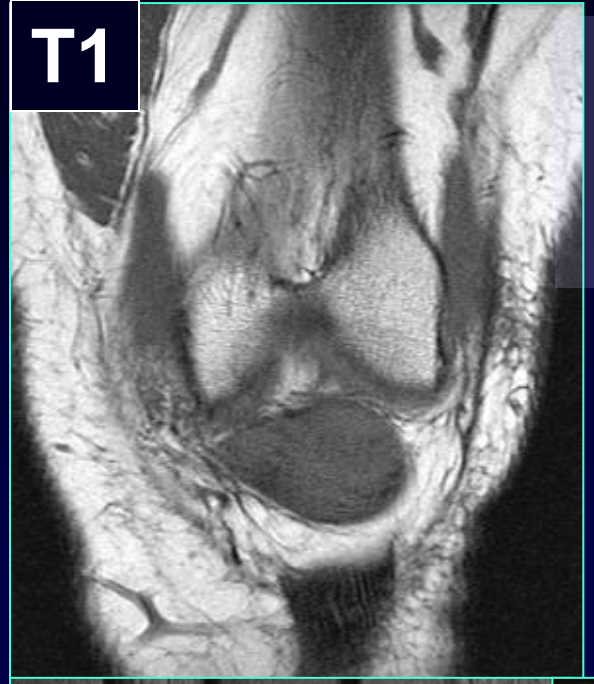
Quadriceps Fat Pad Syndrome

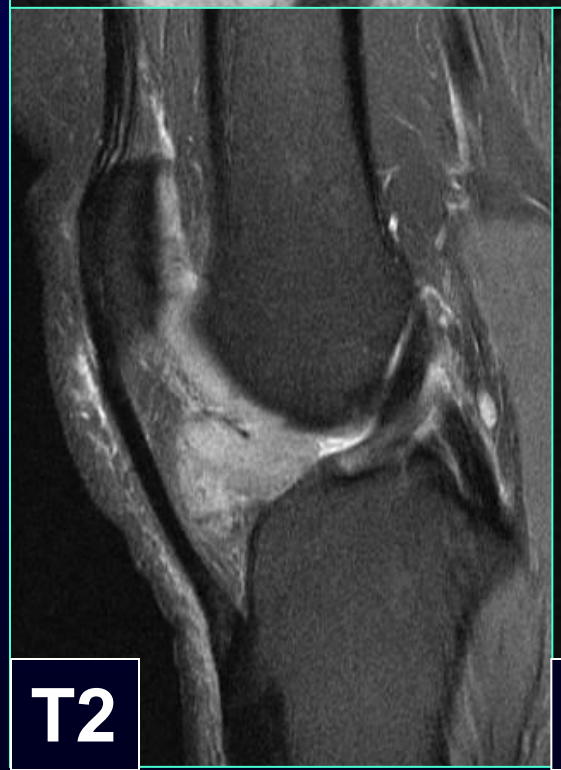
- Suprapatellar fat pad
- May have mass effect on joint recess

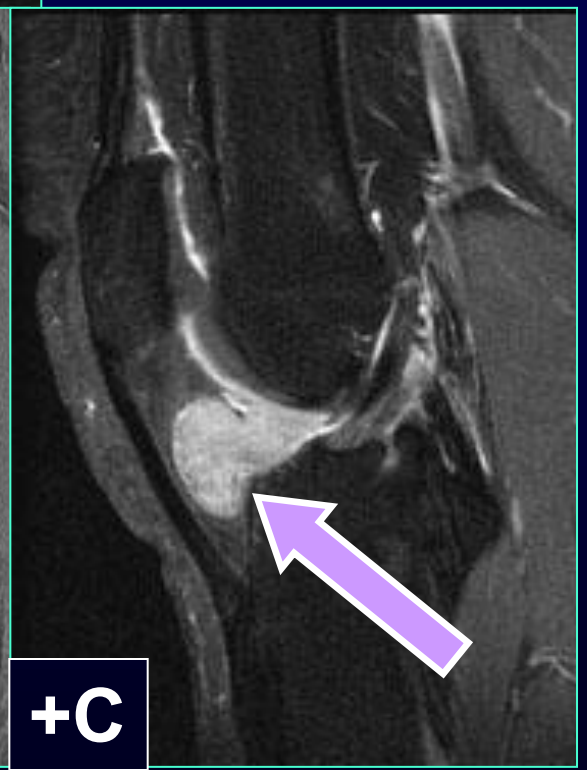


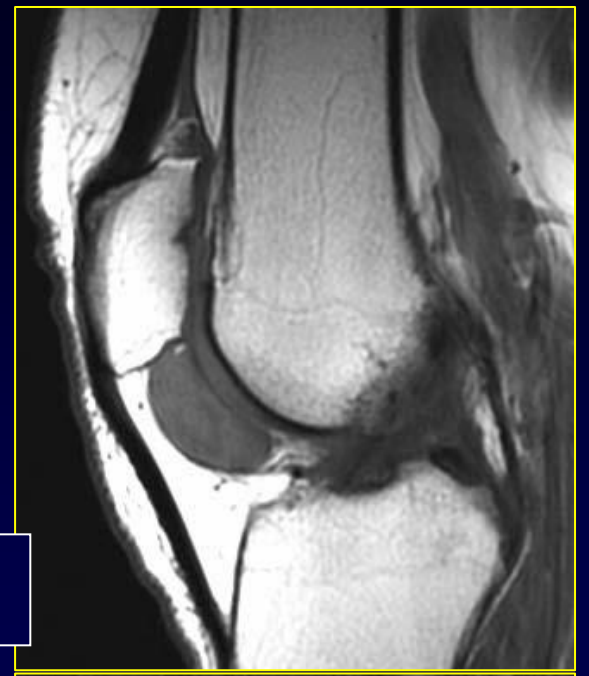
Focal Nodular Synovitis/ PVNS

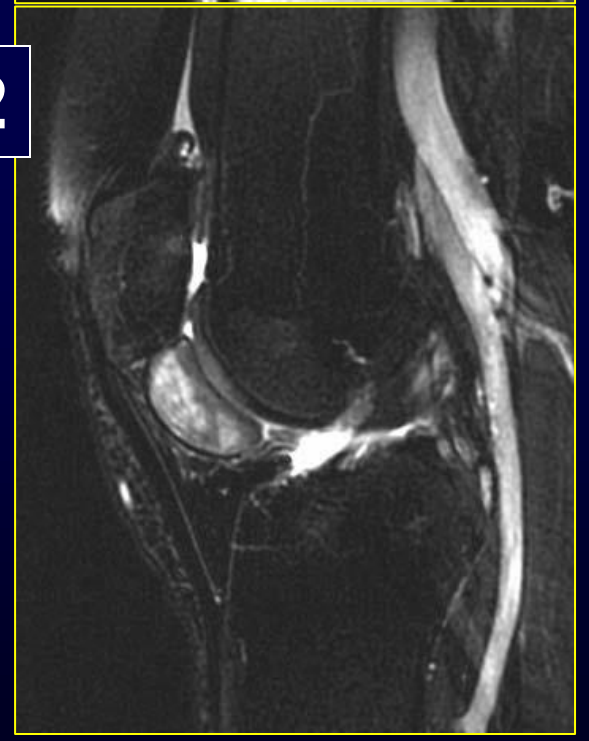
→ Tenosynovial Giant Cell Tumor







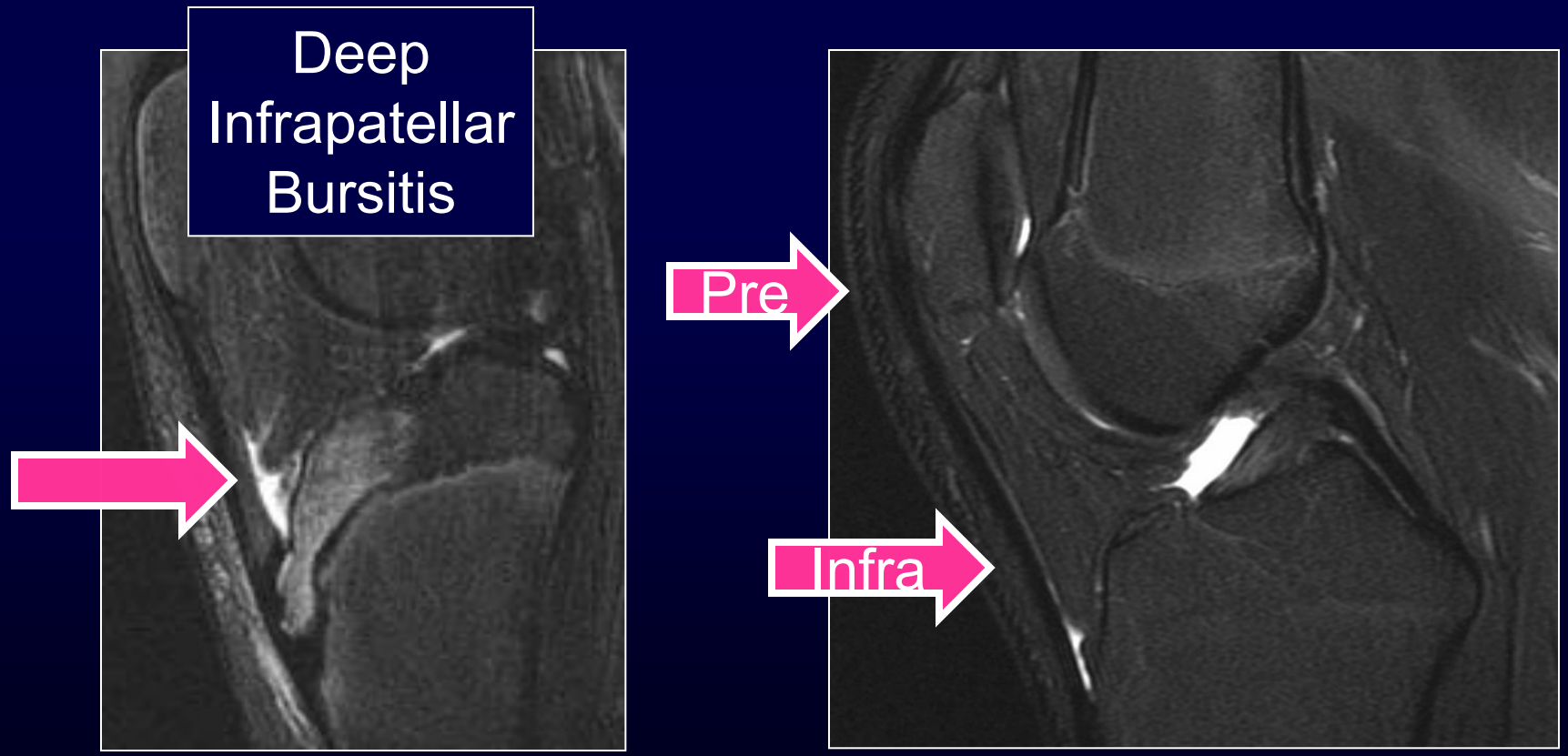




Anterior Bursitis

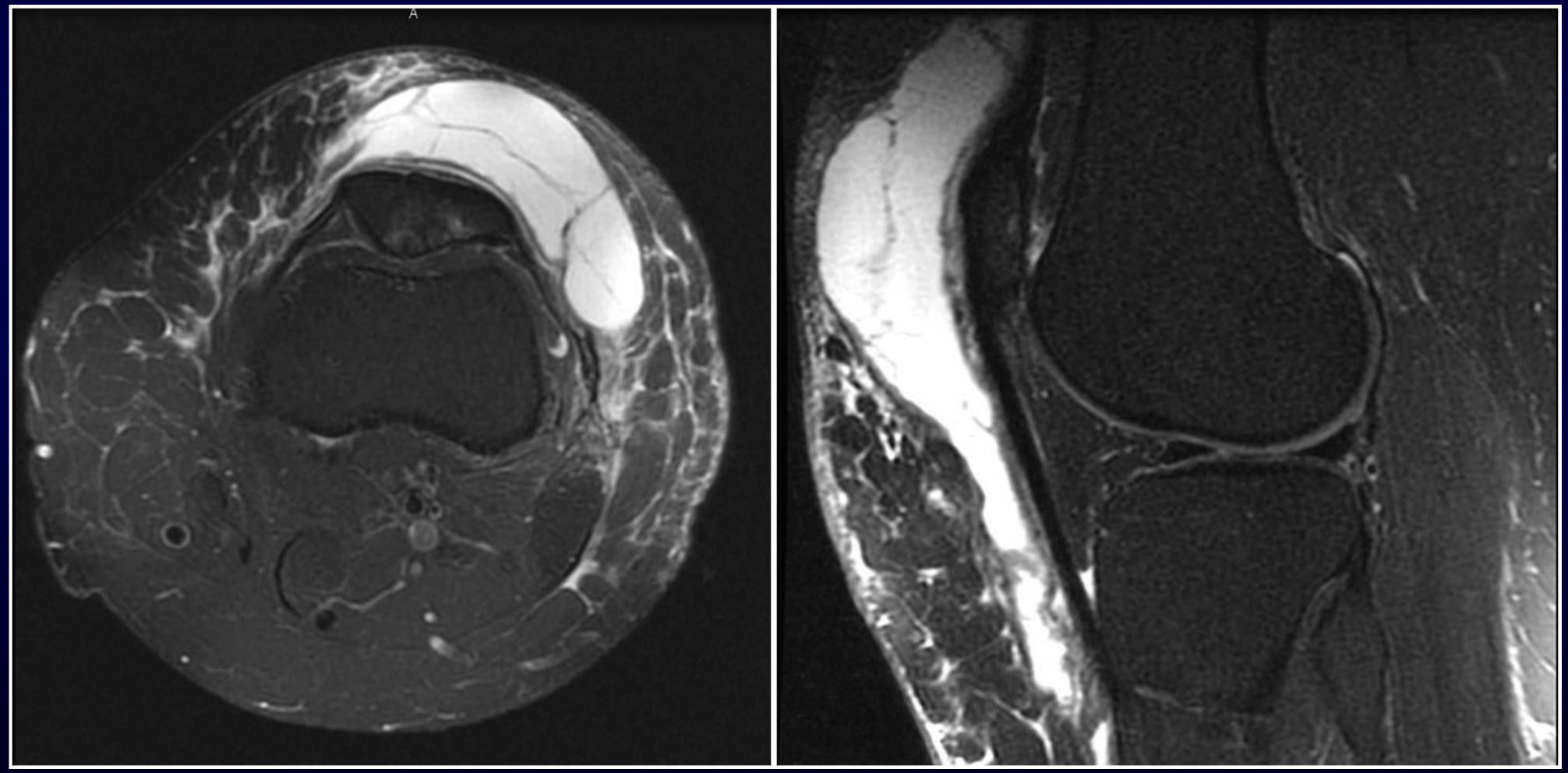
Anterior Bursitis

- Prepatellar bursitis
- Superficial infrapatellar bursitis (pre-tibial bursitis)



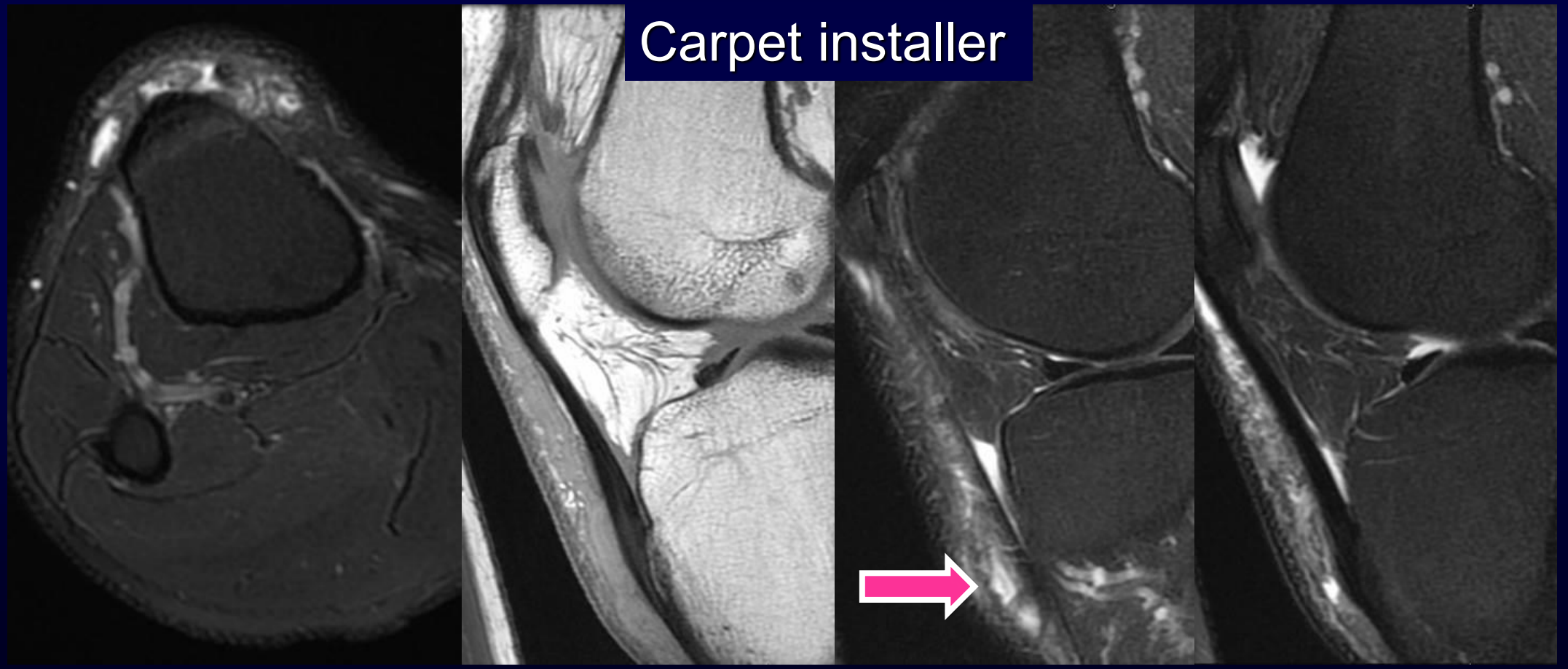
Prepatellar Bursitis

"Housemaid's knee"



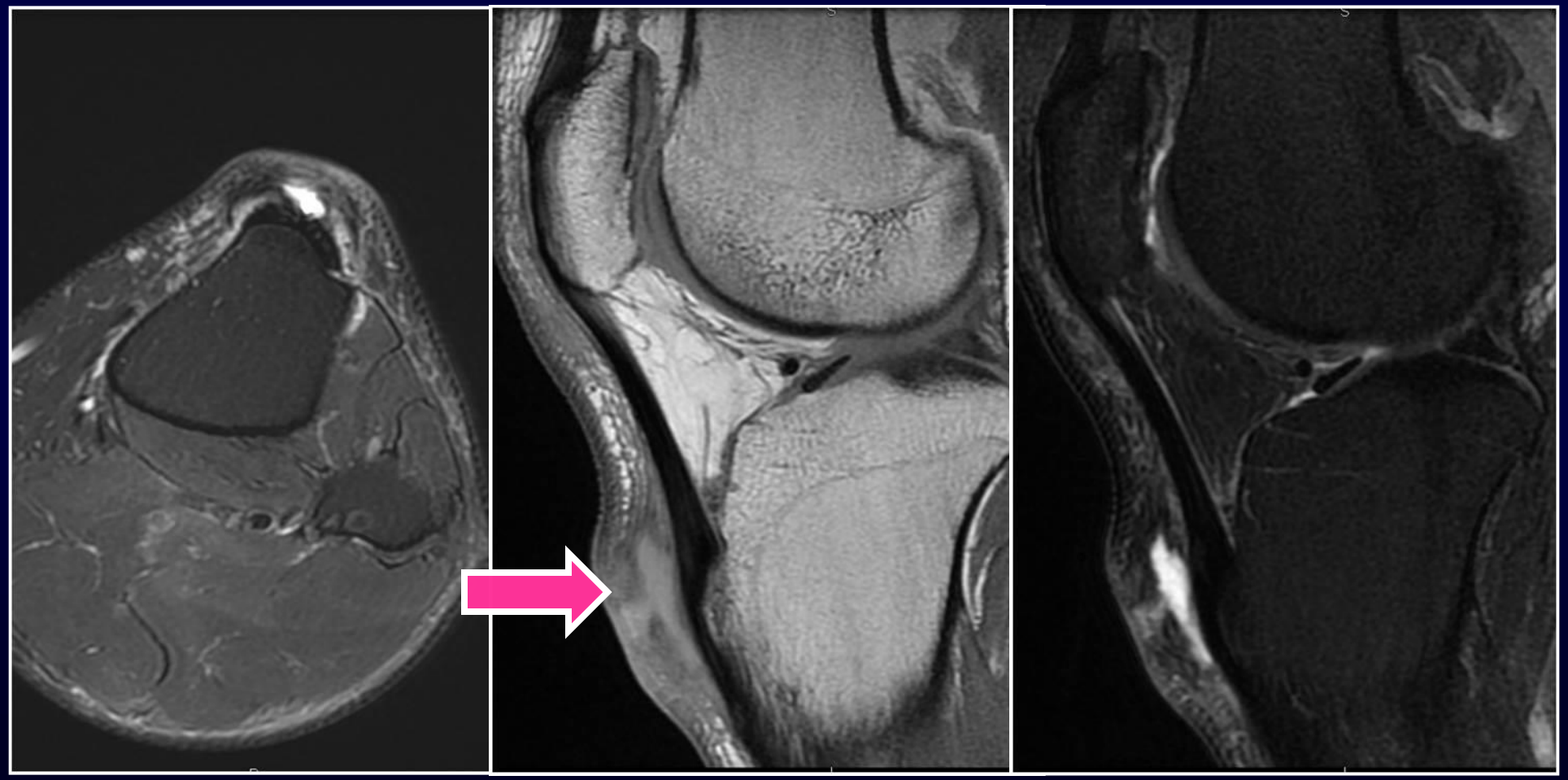
Superficial Infrapatellar Bursitis

"Preacher's knee" (Pretibial bursitis)



Superficial Infrapatellar Bursitis

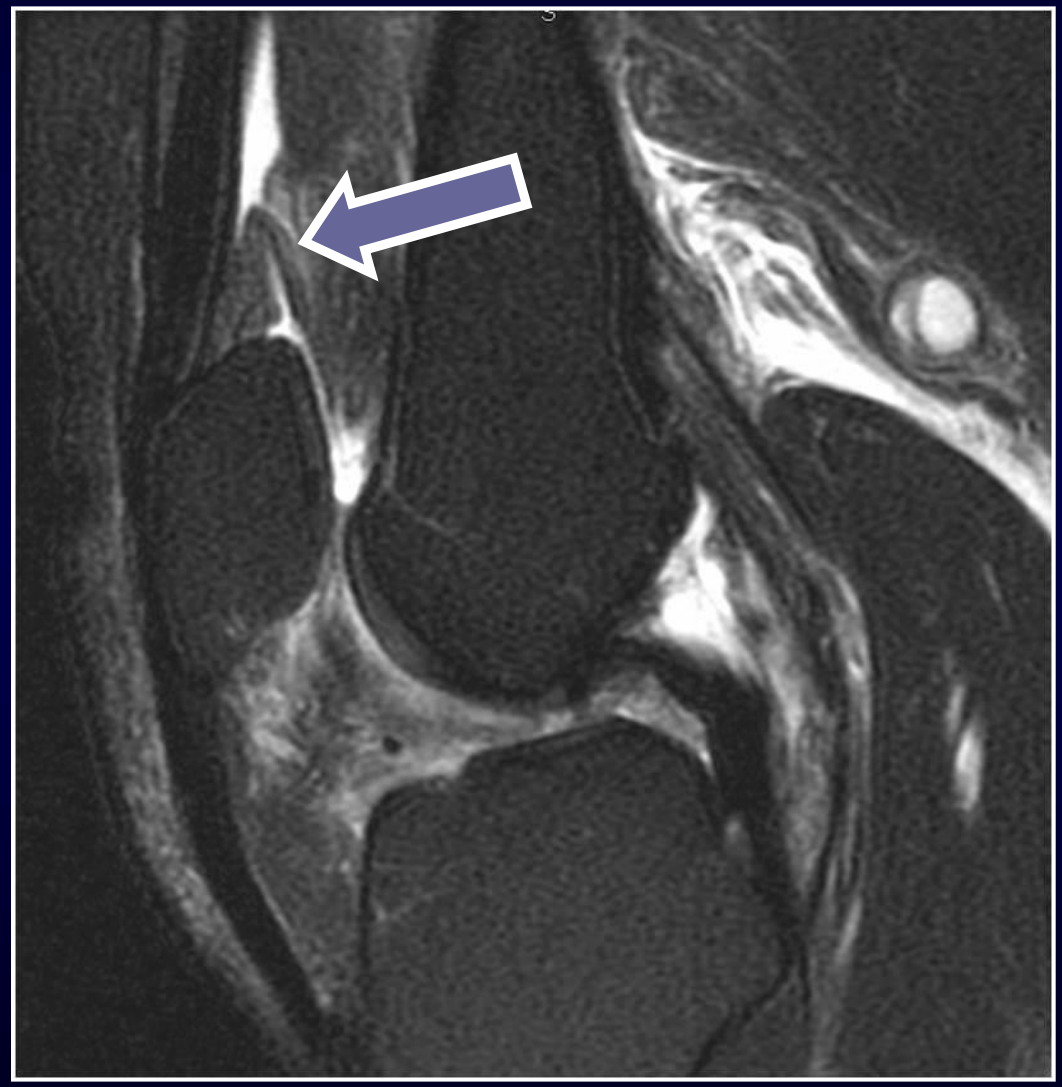
Landscaper, deck builder



Plica Syndrome

Plica Syndrome

- Suprapatellar
- Medial patellar
- Infrapatellar (ligamentum mucosum)
- Lateral patellar (rare)



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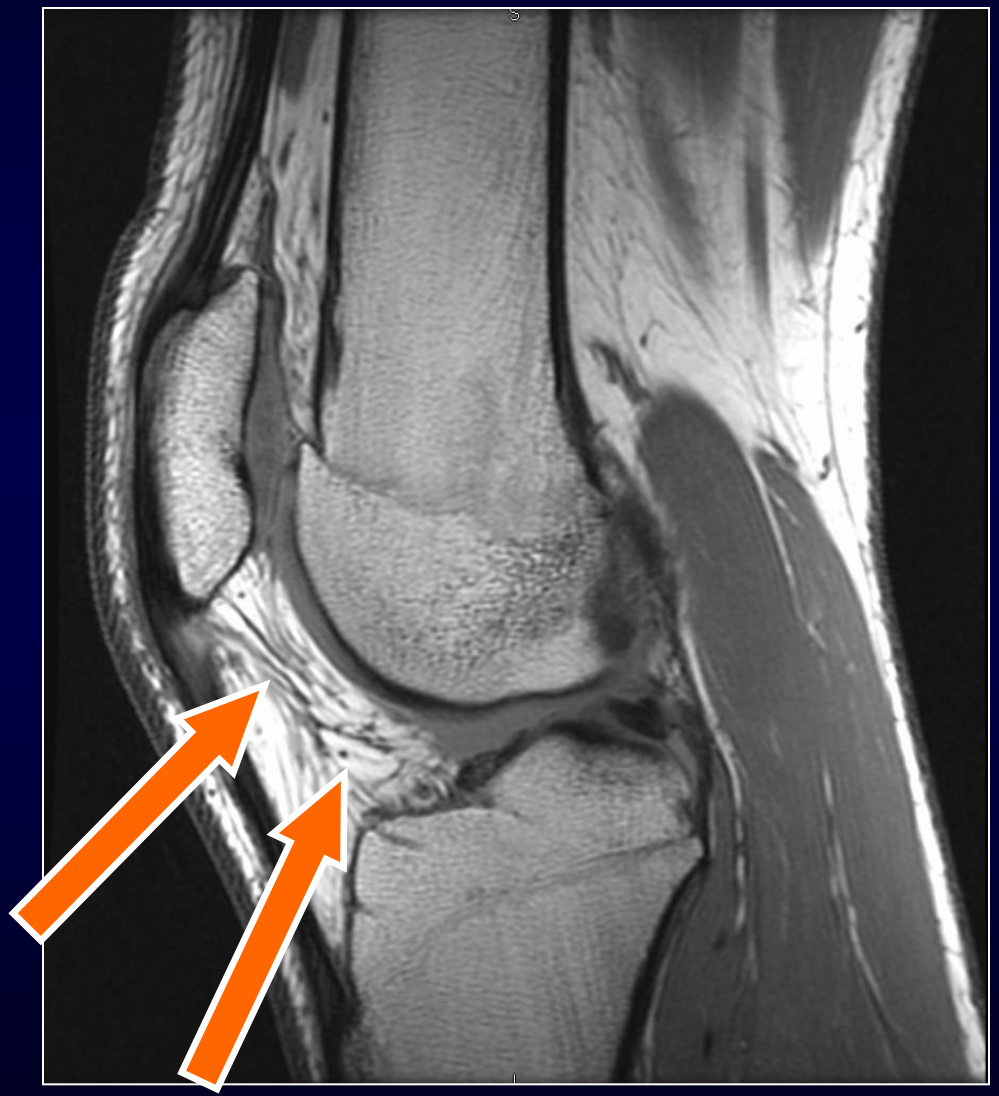

Plica Syndrome

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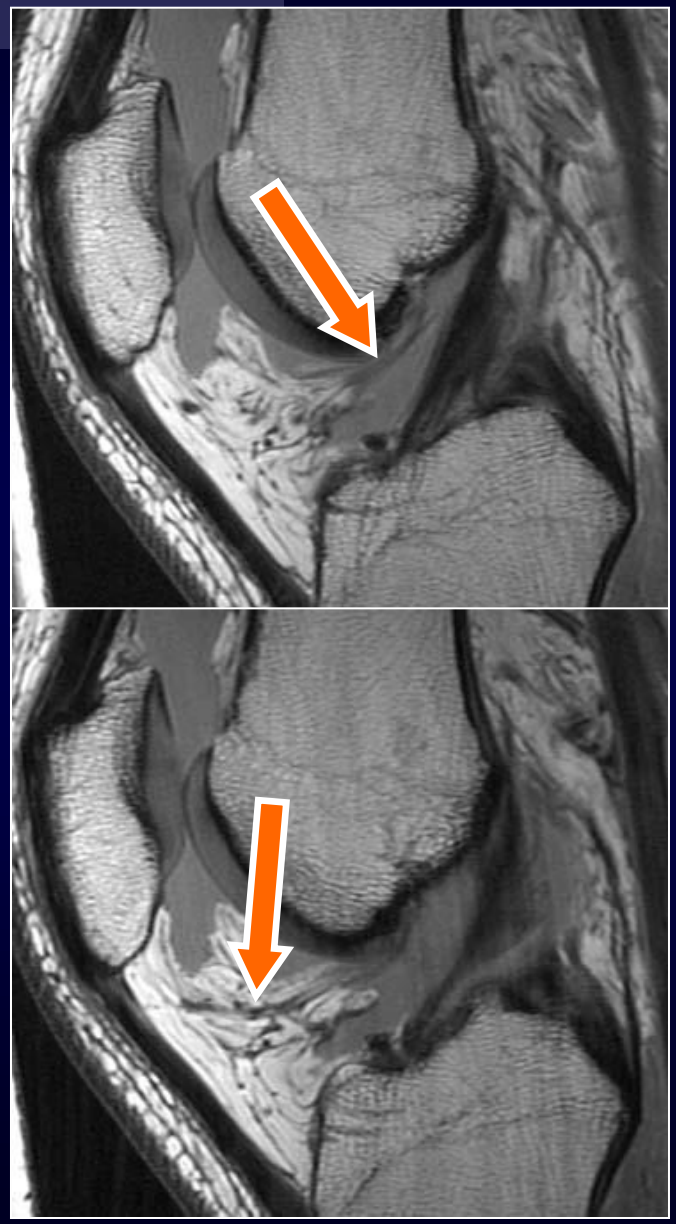
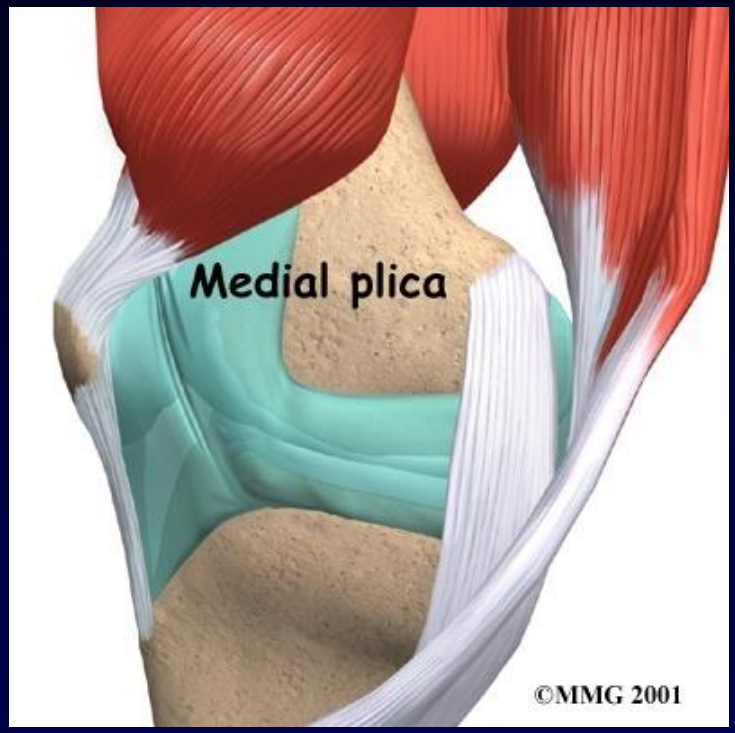
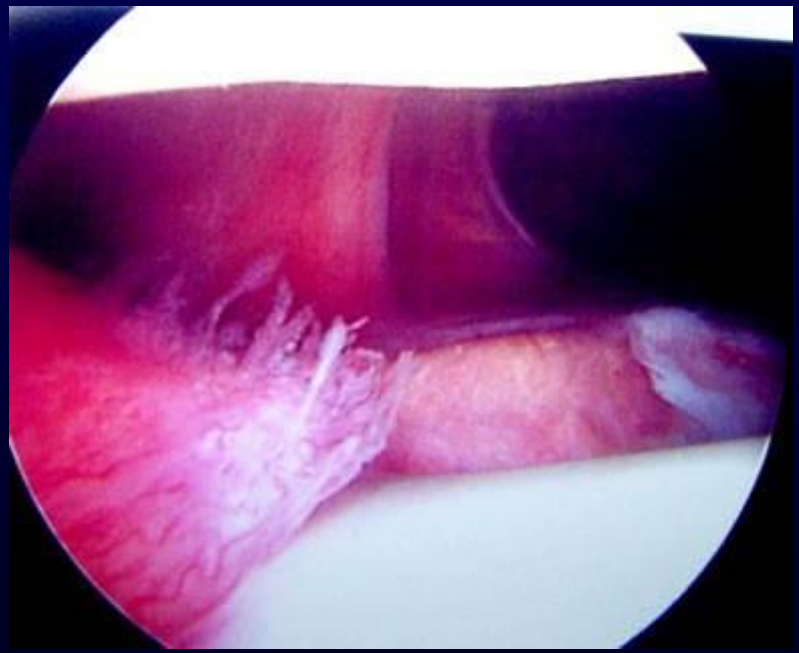
- Medial patellar
- Infrapatellar (ligamentum mucosum)
- Lateral patellar (rare)



Plica Syndrome

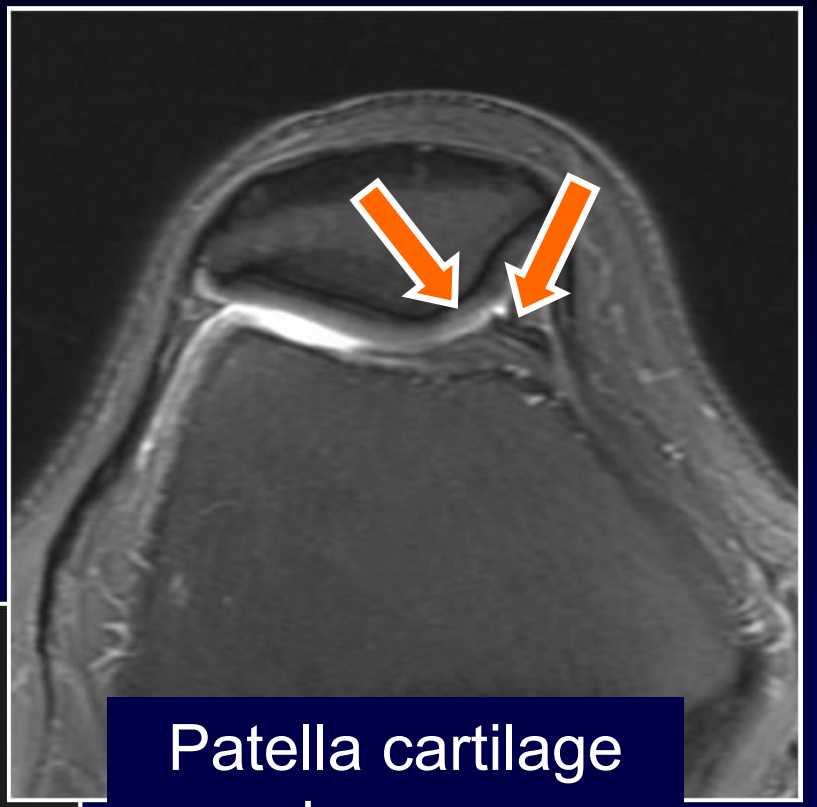
- Suprapatellar
- Medial patellar
  - 20-25% have med. plica
  - Can be thickened
  - Most common symptomatic plica
    - Abrade cartilage
    - Inflamed & tender



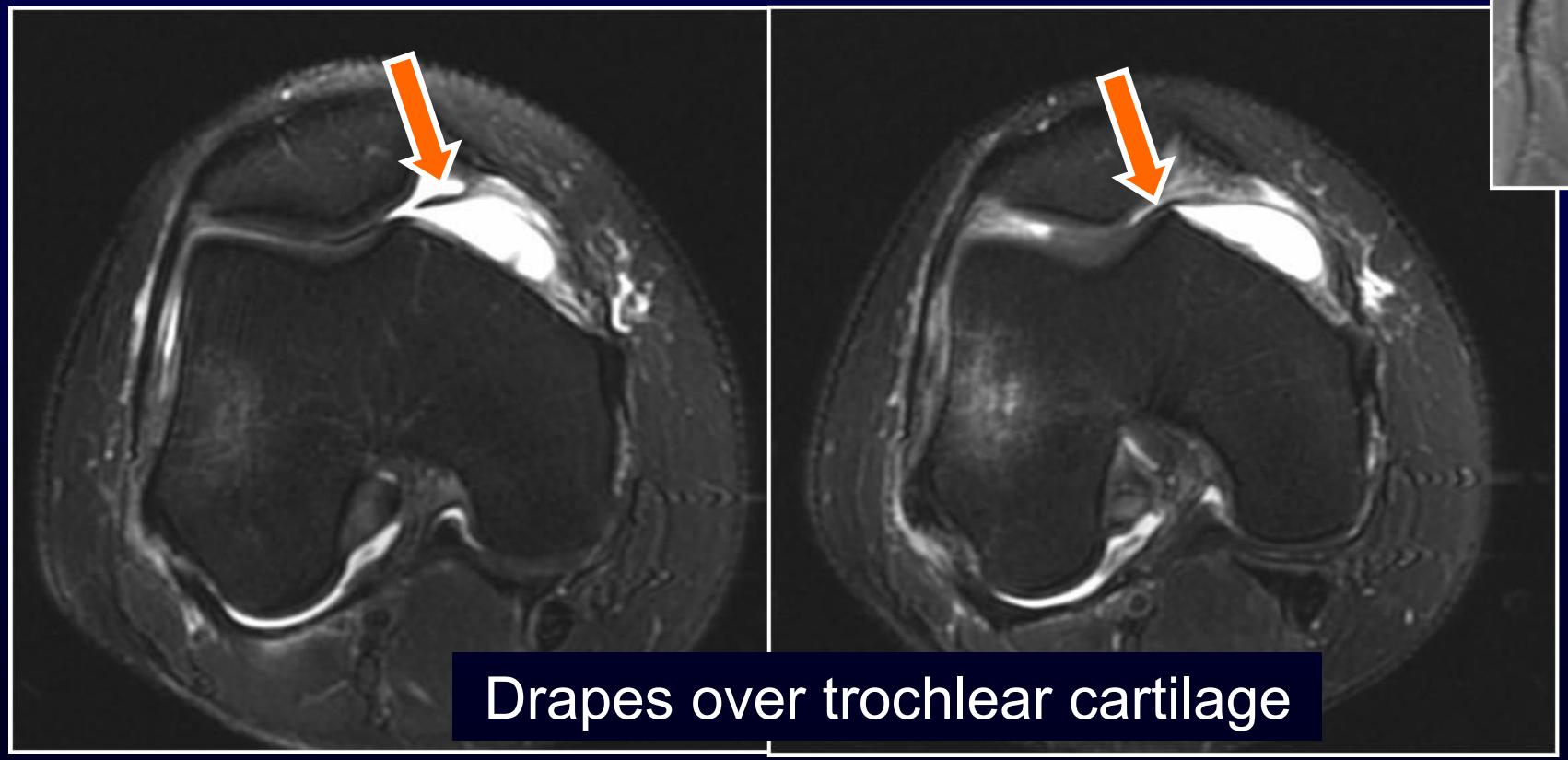


Medial Plica Syndrome

- Abrade cartilage
- Tender if inflamed



Patella cartilage damage



Drapes over trochlear cartilage

Patella: Other

Osteochondritis Dissecans (OCD)

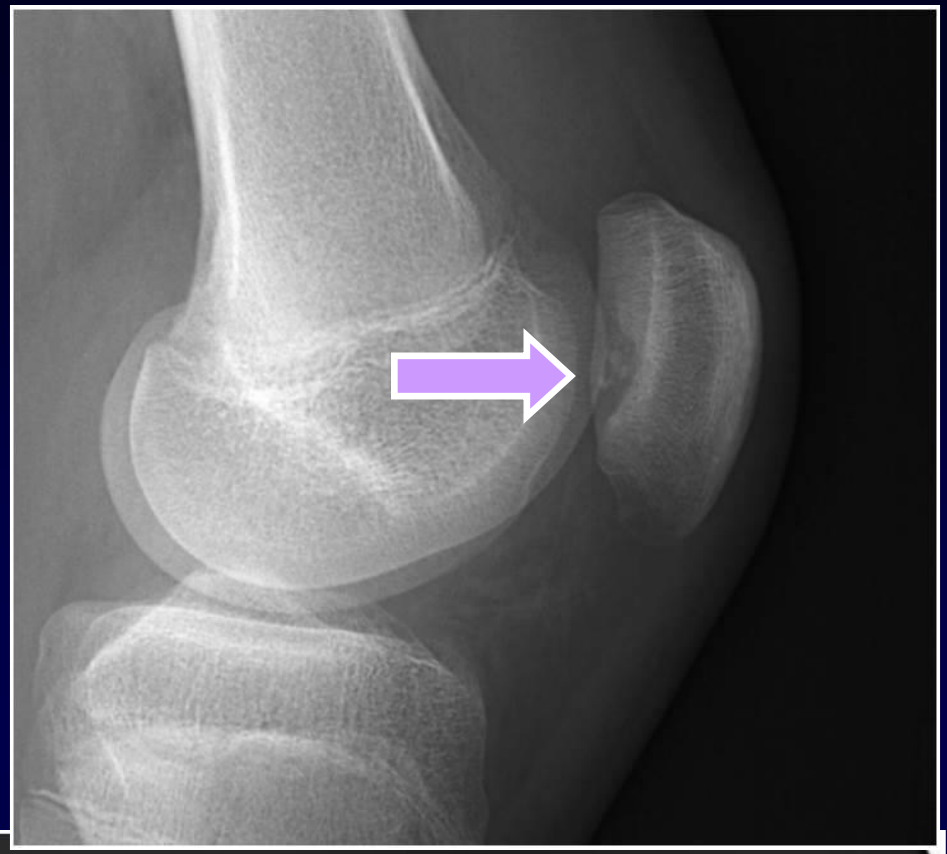
“Partial or total separation of a fragment of articular cartilage and subchondral bone from the articular surface.” -Choi

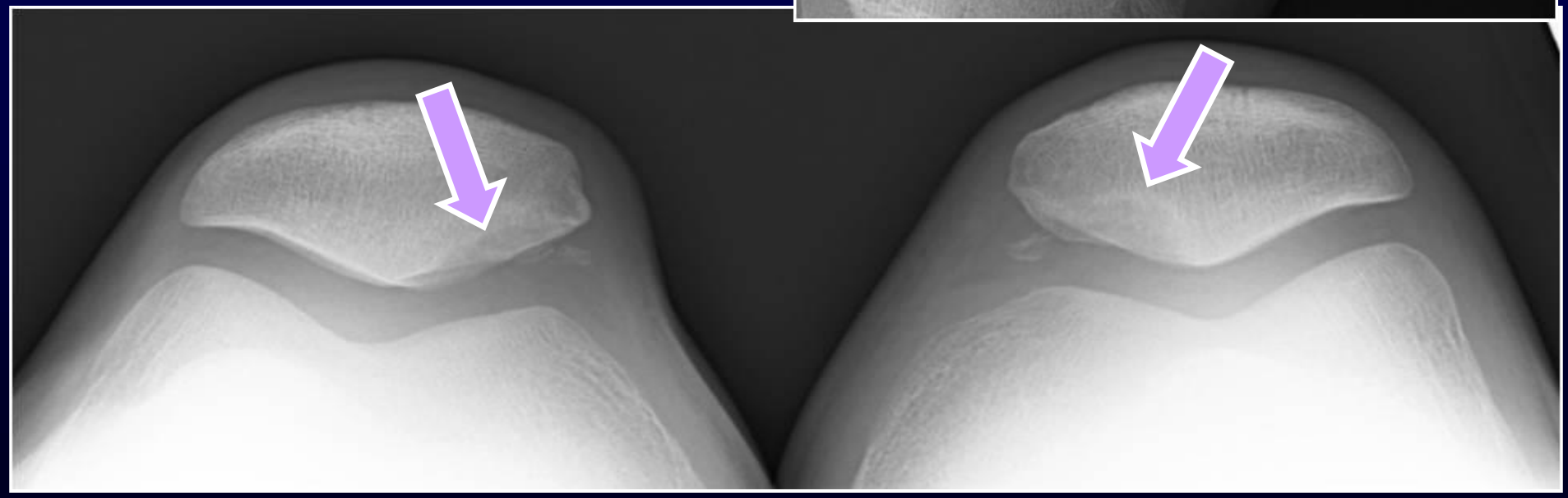
Patella OCD

- Much less common than OCD med fem condyle
- Lower ½ of patella
- Central / medial facet
- 20% Bilateral
- Probably shear injury
  - Patella alta 45%
  - Hypoplastic trochlea 35%

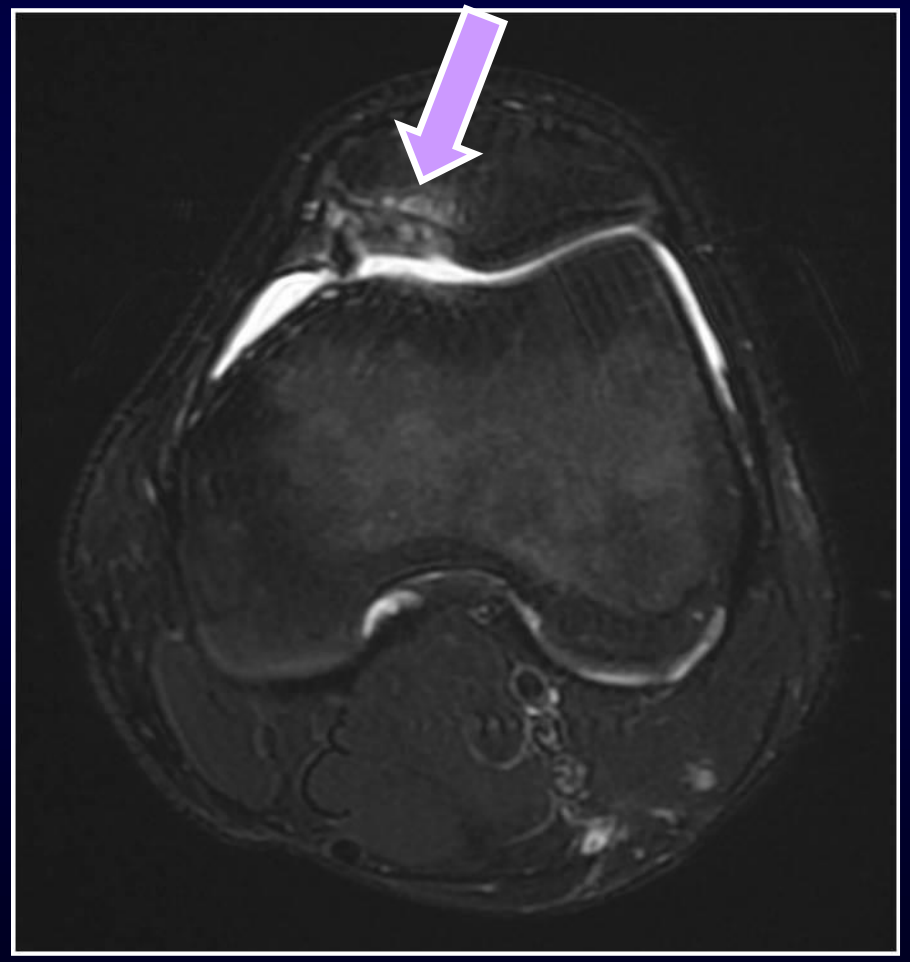
Choi et al. *Skel Rad* 2007

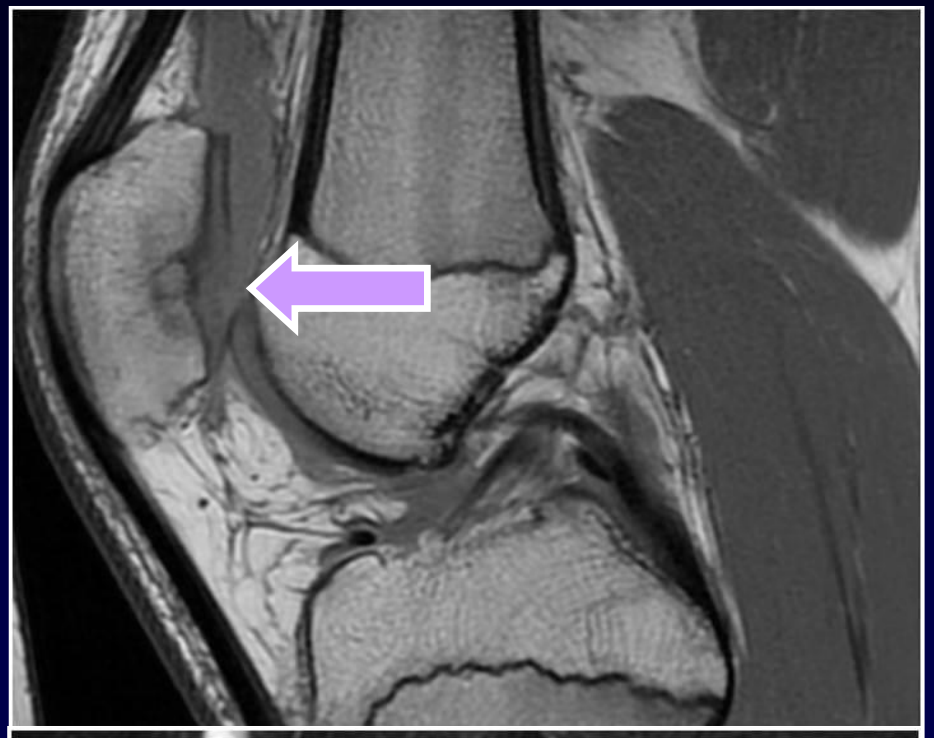
Patella OCD

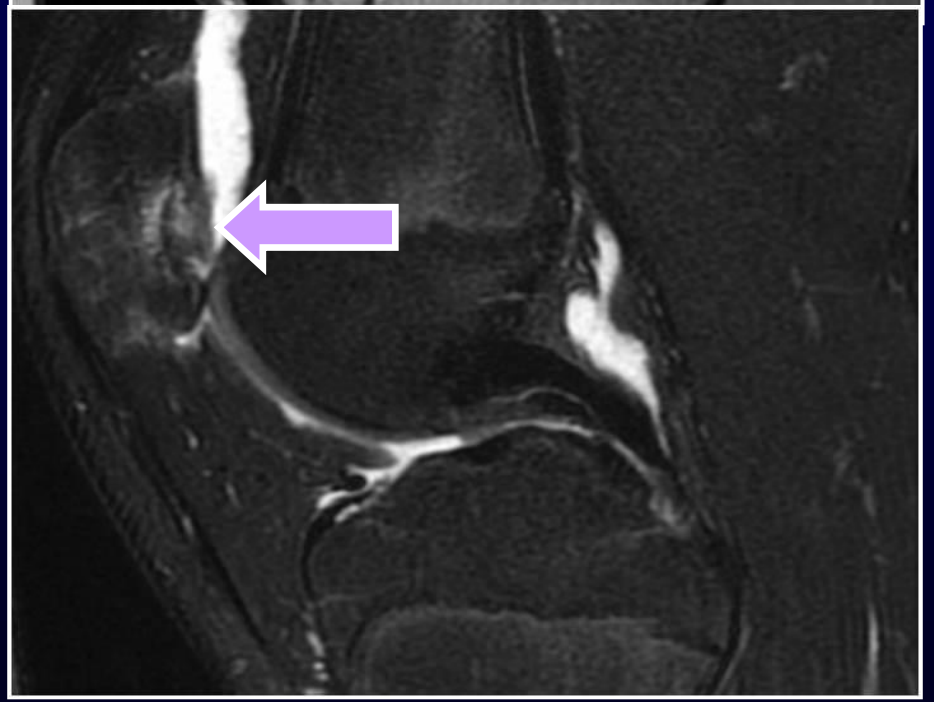




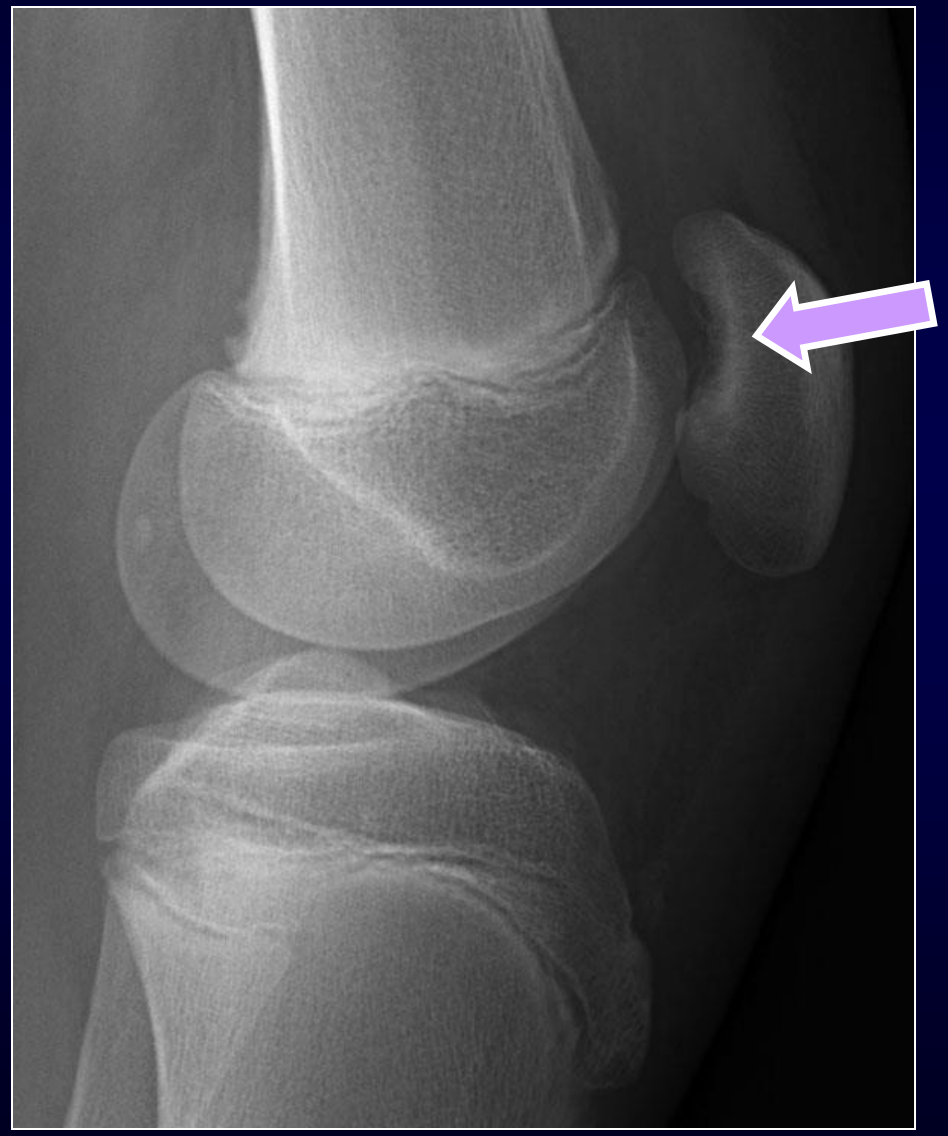
Patella OCD

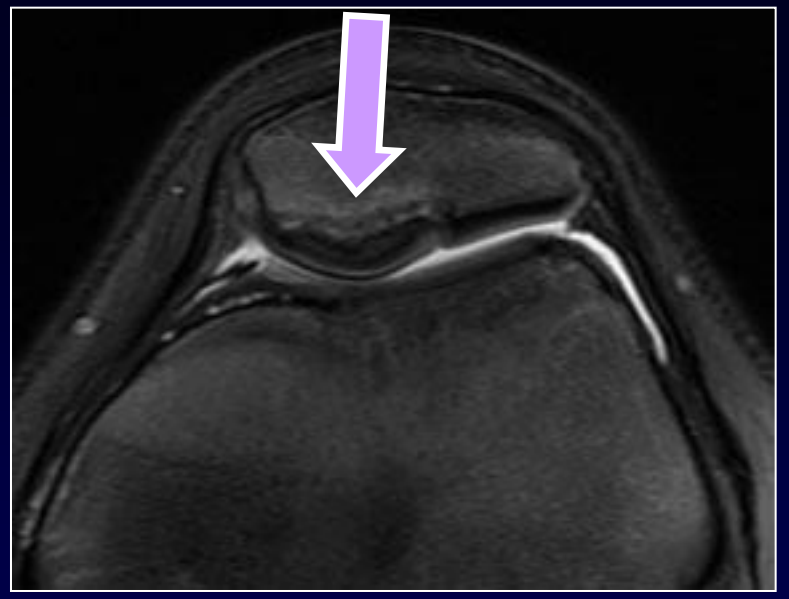


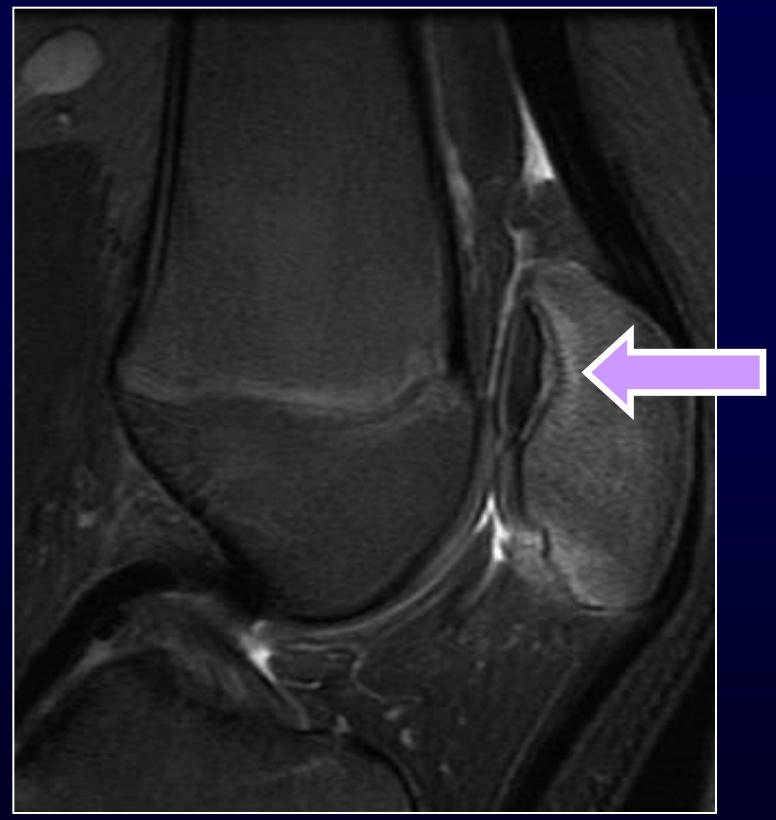




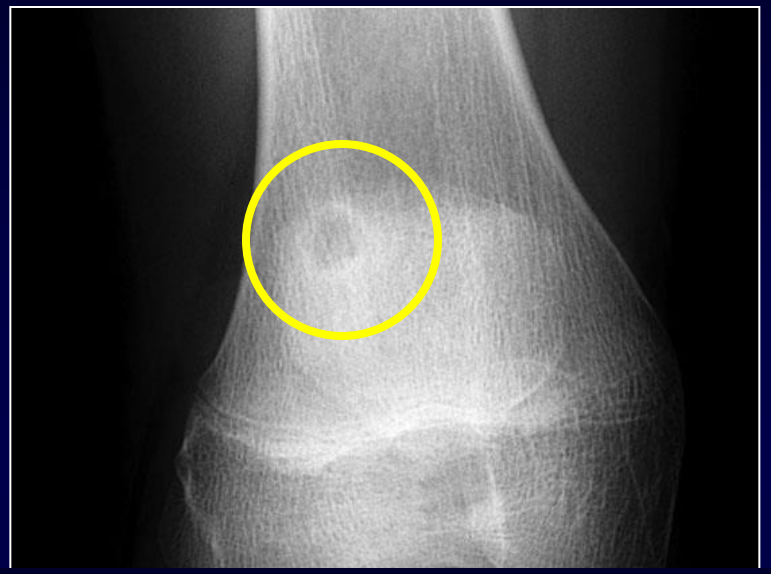
Patella OCD

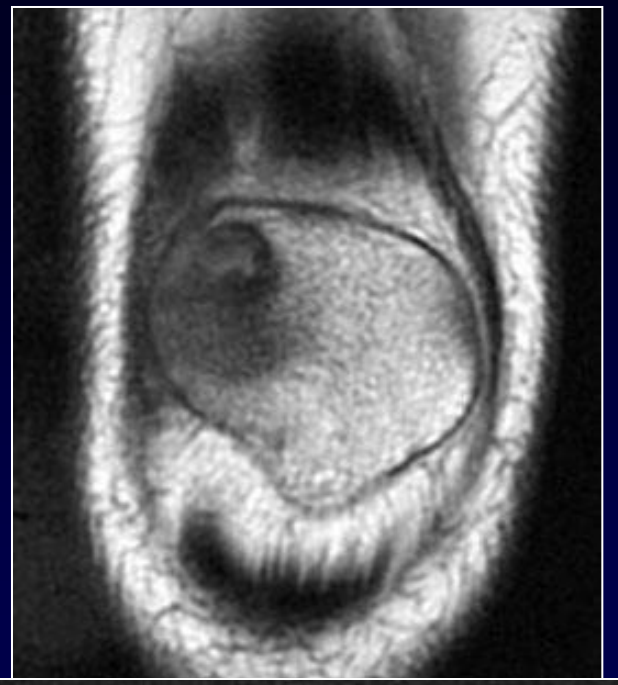


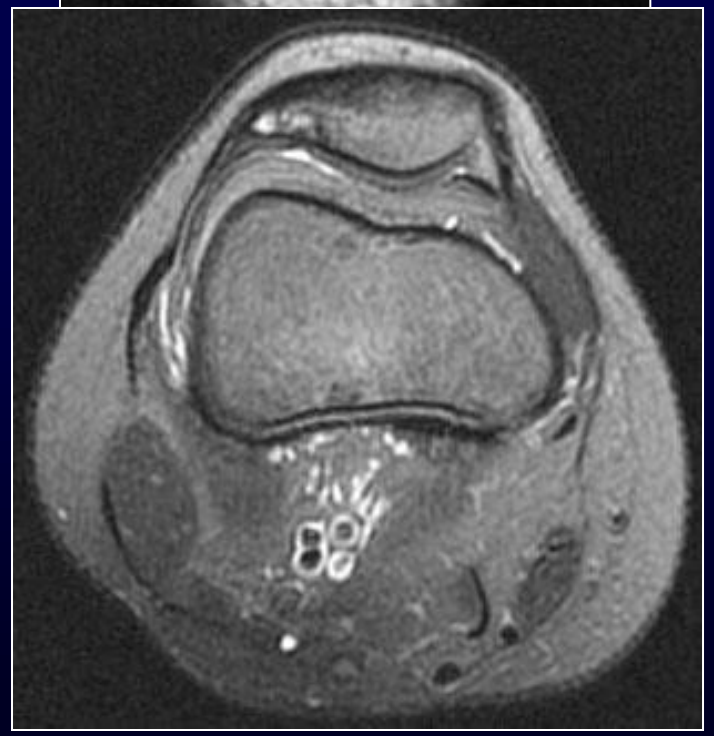




Dorsal Defect of Patella

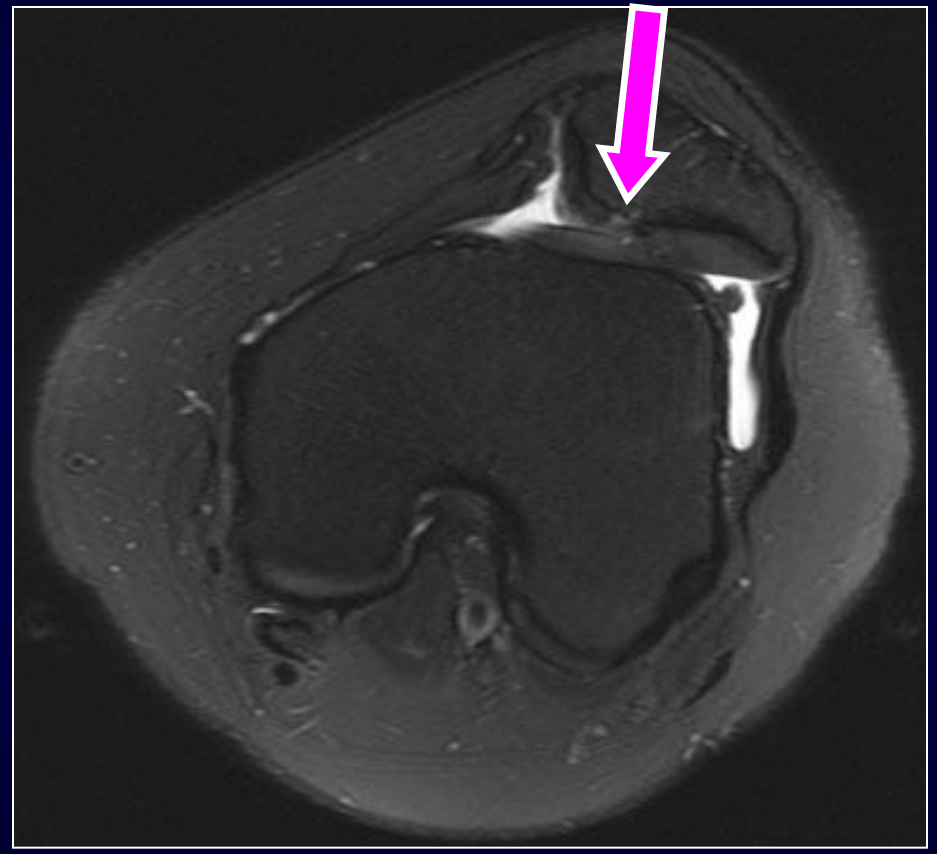




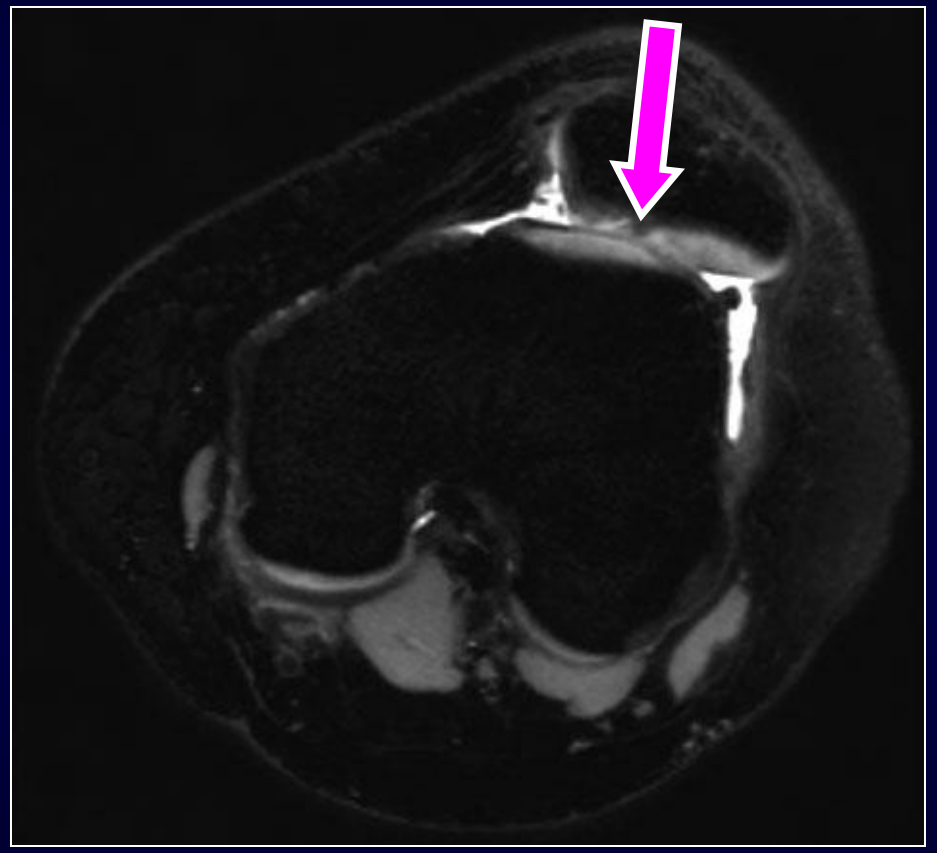


- Occur ~1% individuals
- Location: Superolateral
- Intact overlying cartilage
- Filled with fibrous tissue
- Generally asymptomatic
  - Local pain/tenderness may occur

Patella Cartilage Lesions



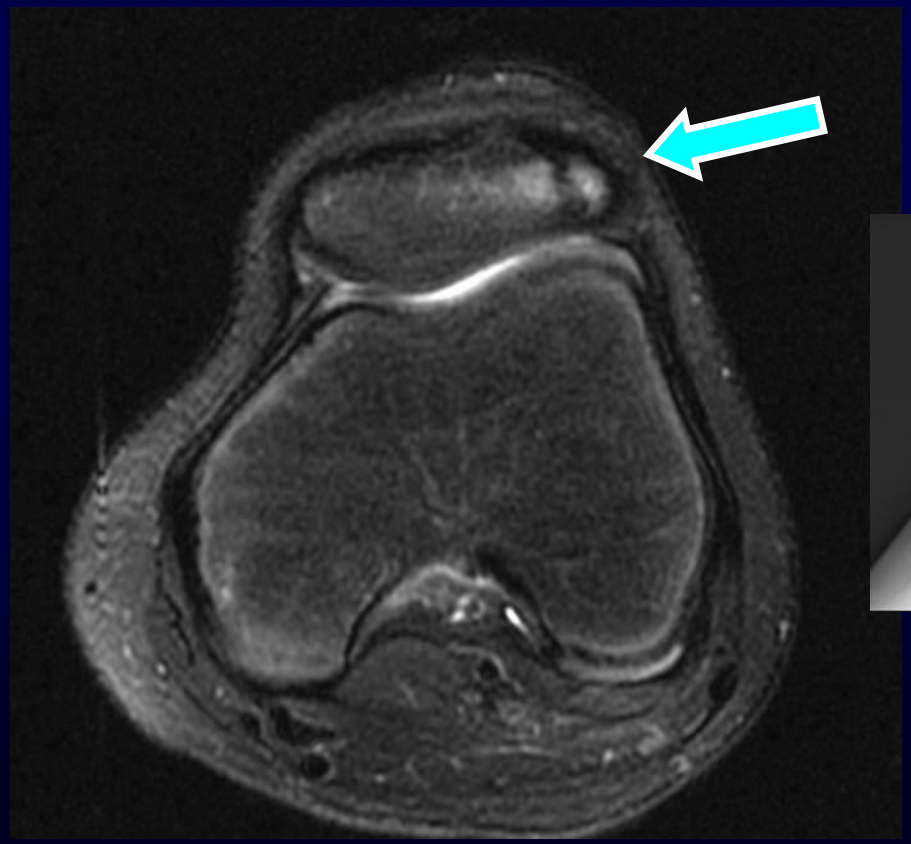
T2

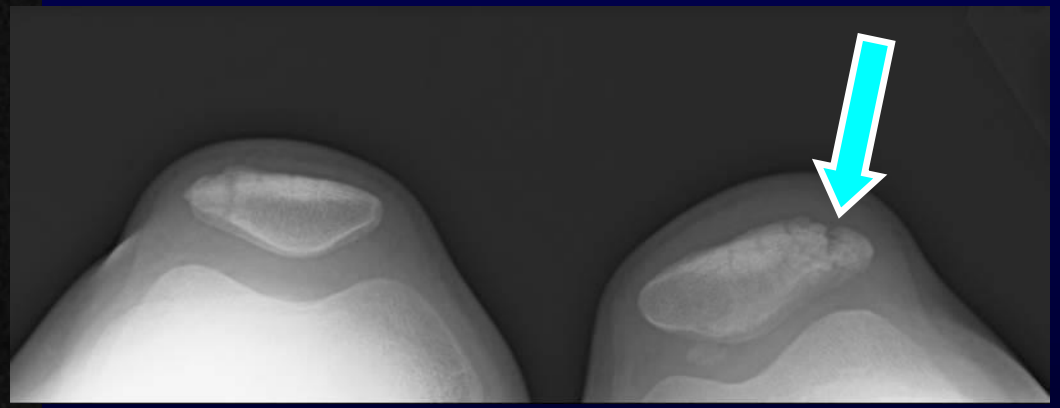


3D SPGR

Symptomatic Bipartite Patella

- Bipartite 1%
- May be symptomatic in adolescents





Summary

- Extensor t./ lig. – can injure @ several sites
  - Findings relate to skeletal maturity
- Patella dislocation – transient
- Fat pad syndromes – anterior knee pain
- Bursitis – carpet installers