

MR IMAGING OF THE MENISCI

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MR IMAGING OF THE MENISCI: LEARNING OBJECTIVES

- Review relevant anatomy/MR imaging planes
- Review MR appearance of meniscal tears and associations
- Discuss post-surgical meniscus
- Discuss mimics/pitfalls of meniscal tears
- Surgical implications:
 - “What the surgeon wants to know”
 - The radiology report

MR IMAGING KNEE TECHNIQUE

- Dedicated knee coil
- High resolution imaging; FOV 16cm or less
- Slice thickness - 3-4 mm
- Matrix - 256x192 or higher 512
- Imaging planes
 - Sagittal (menisci/cruciates/cartilage)
 - Coronal (collaterals/cartilage/menisci/cruciates)
 - Axial (cartilage/cruciates/menisci)

MR IMAGING KNEE OUR PROTOCOL

- Sagittal oblique PD FSE nonfat suppressed
- Sagittal oblique T2 FSE fat suppressed
- Coronal T1
- Coronal T2 FSE fat suppressed
- Axial PD FSE fat suppressed



MR IMAGING KNEE TECHNIQUE: T1

- Important to get one plane with this sequence
 - Overall Anatomy
 - Osseous structures (marrow)
 - Distinguish fat/hemorrhage
 - Soft tissue/osseous masses
 - Muscle (atrophy)
 - Menisci (high sensitivity and specificity)

MR IMAGING KNEE TECHNIQUE: PD

- Menisci (no fat suppression)
 - High sensitivity and specificity
- Hyaline cartilage (fat suppression)
- FSE or SE - Speed vs. blurring
 - Increase bandwidth
 - Short effective TE (less than 20)
 - Echo train length of 5 or less
 - Decrease interecho spacing

MR IMAGING KNEE TECHNIQUE: T2

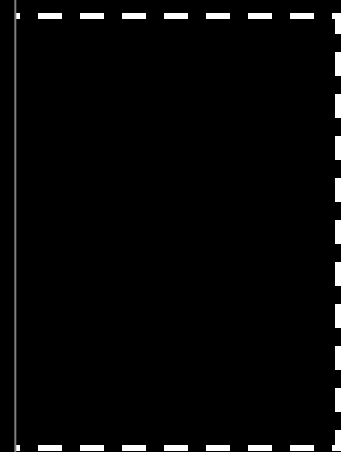
- STIR or fat suppressed
- Menisci - high specificity, low sensitivity
- Hyaline cartilage - high sensitivity and specificity
- Marrow pathology
- Soft tissue/collateral ligament injury

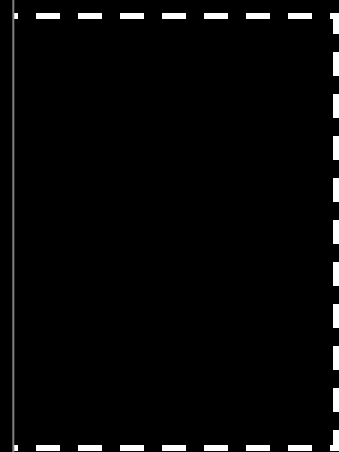
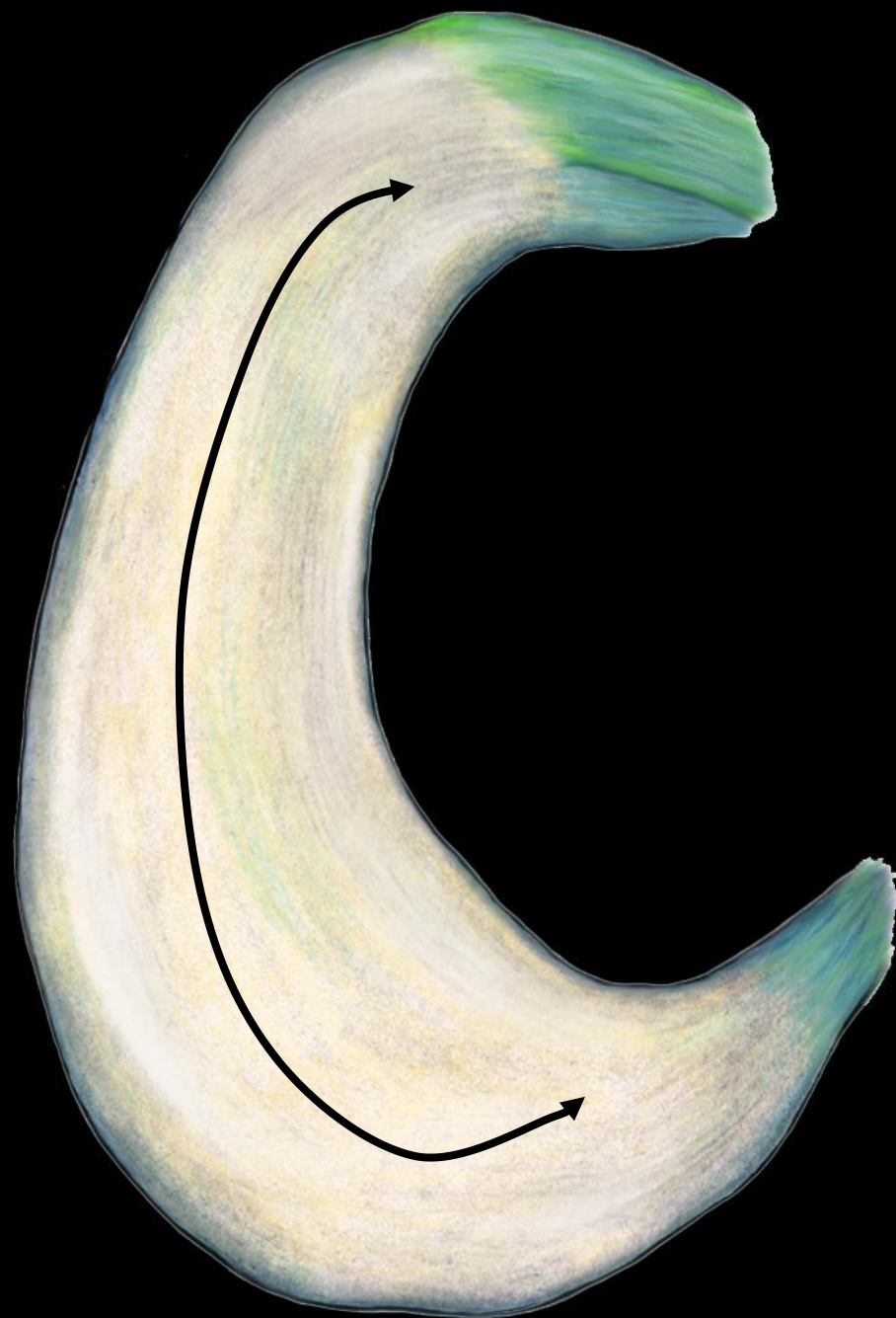
MR IMAGING KNEE TECHNIQUE: GRADIENT

- SPGR and 3D volumetric
- Menisci - high specificity, high sensitivity
- Hyaline cartilage - high sensitivity and specificity
- Poor for marrow pathology
- Poor for cruciate/collateral ligament injury
- Increased susceptibility artifacts

MENISCAL FUNCTION

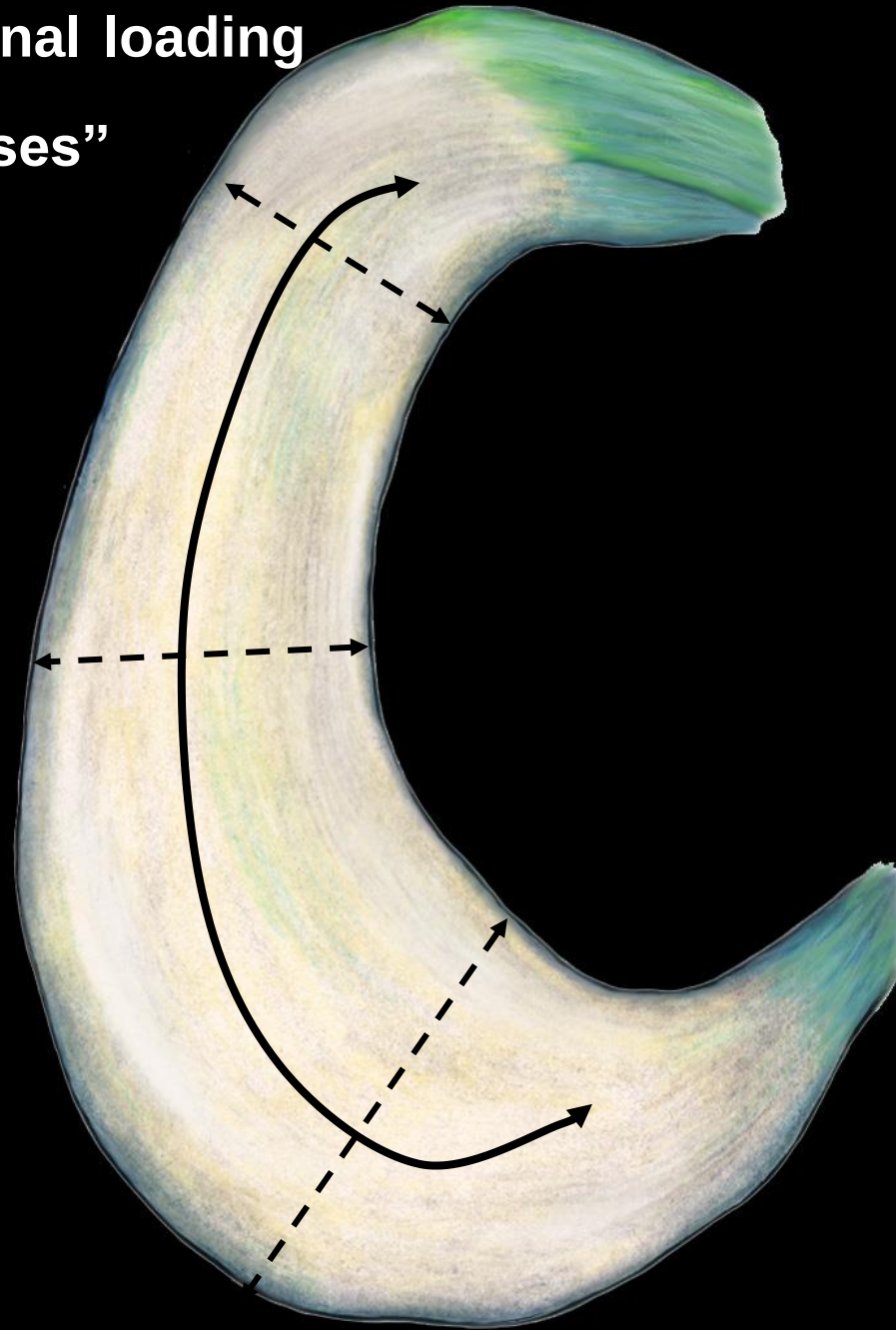
- Distribute torsional and compressive forces
 - Shock absorber
- Limit abnormal movement
- Joint congruity
- Distribute synovial fluid over articular surface
- Prevent synovial impingement

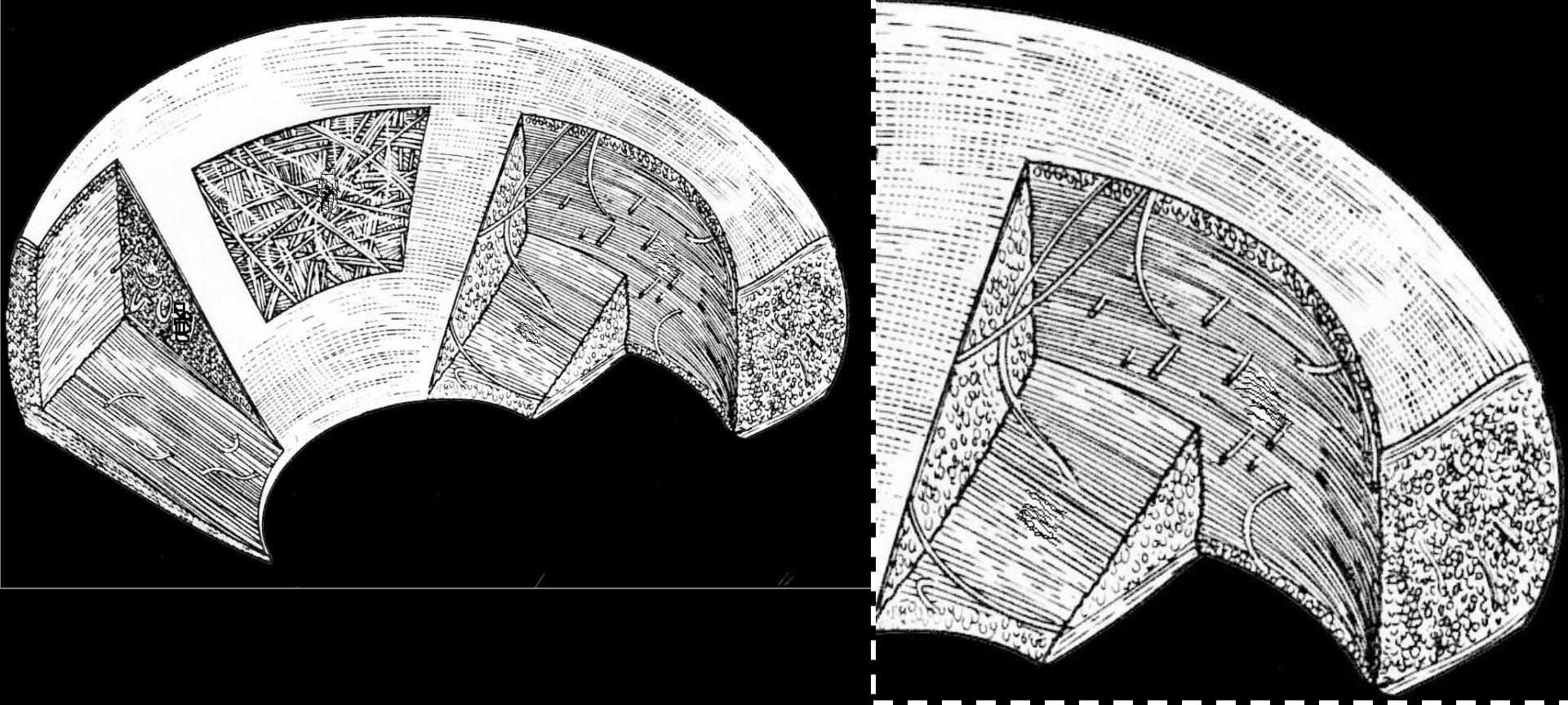




Resist longitudinal loading

“hoop stresses”



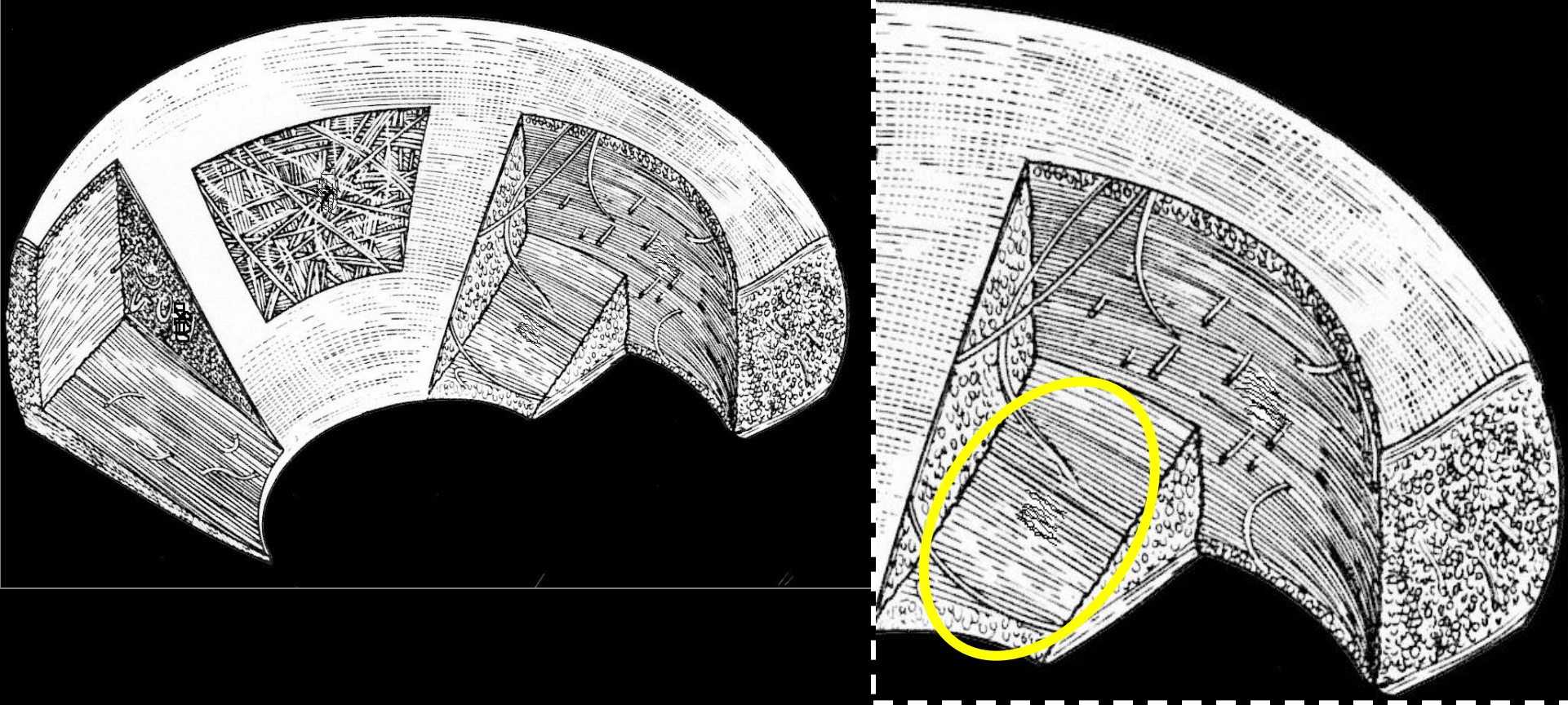


Microstructure

— Collagen bundles

Circumferential

Transverse (“tie fibers”)

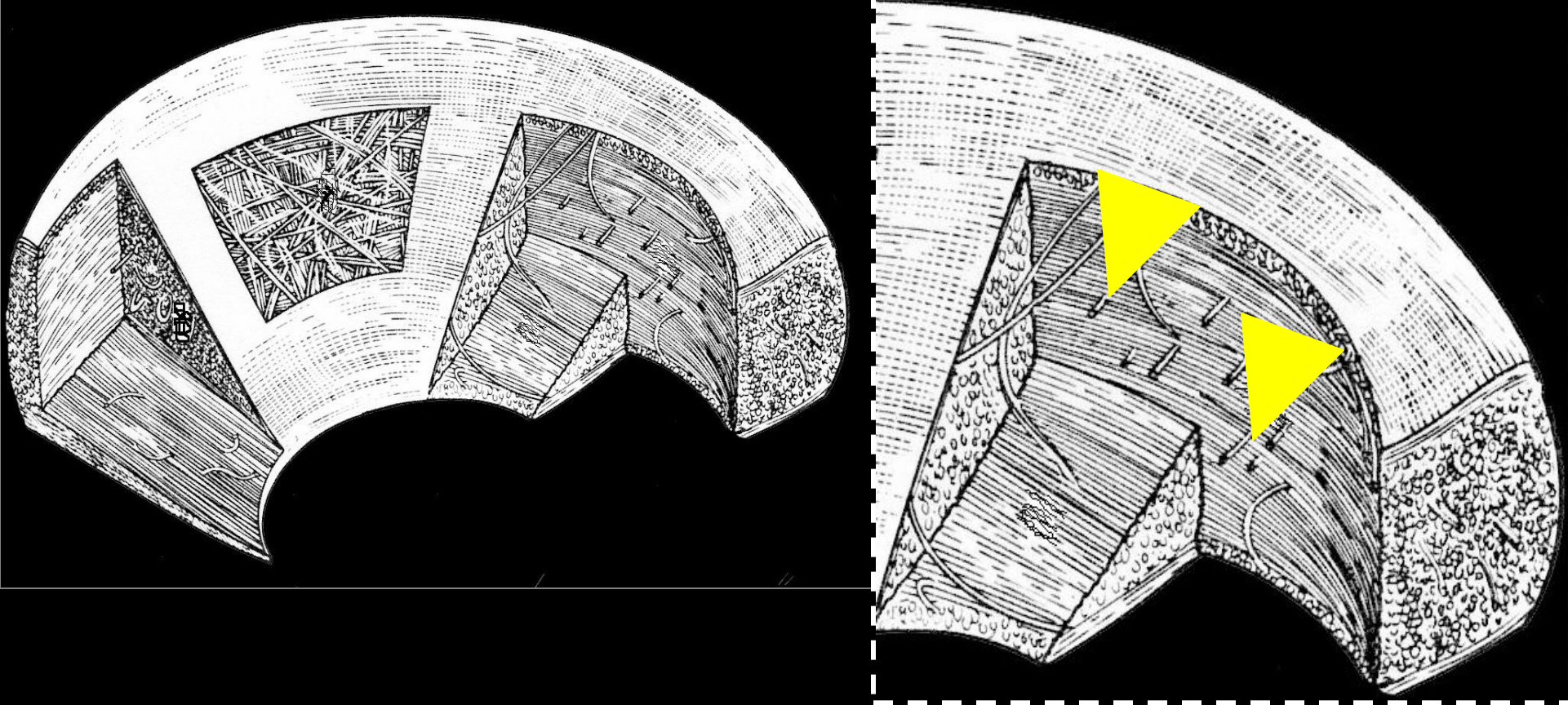


Microstructure

— Collagen bundles

Circumferential

Transverse (“tie fibers”)



Microstructure

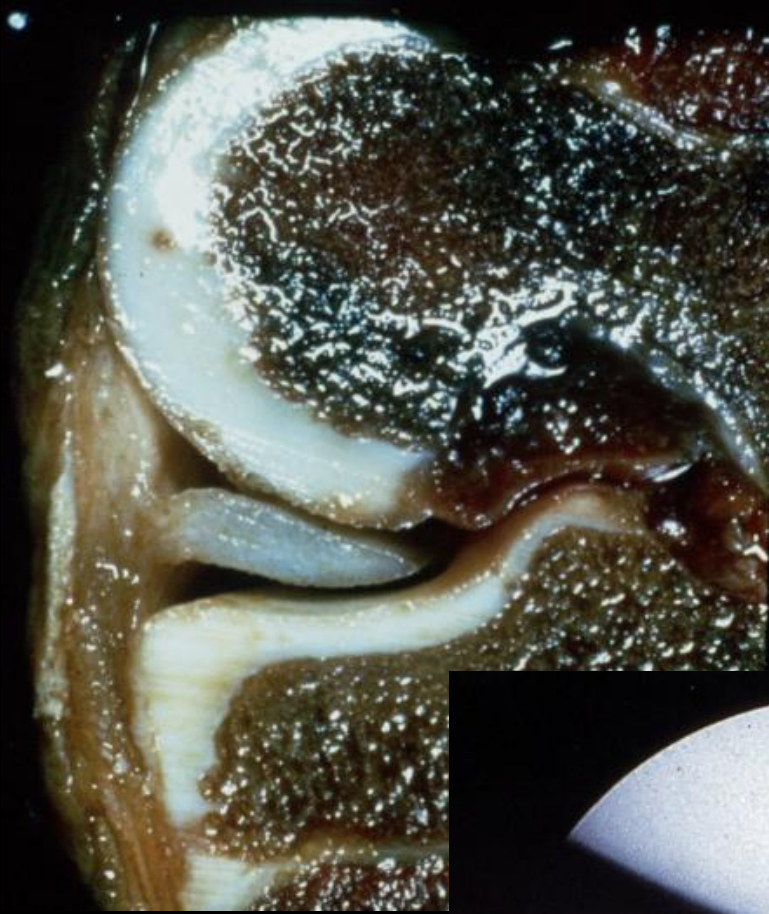
— Collagen bundles

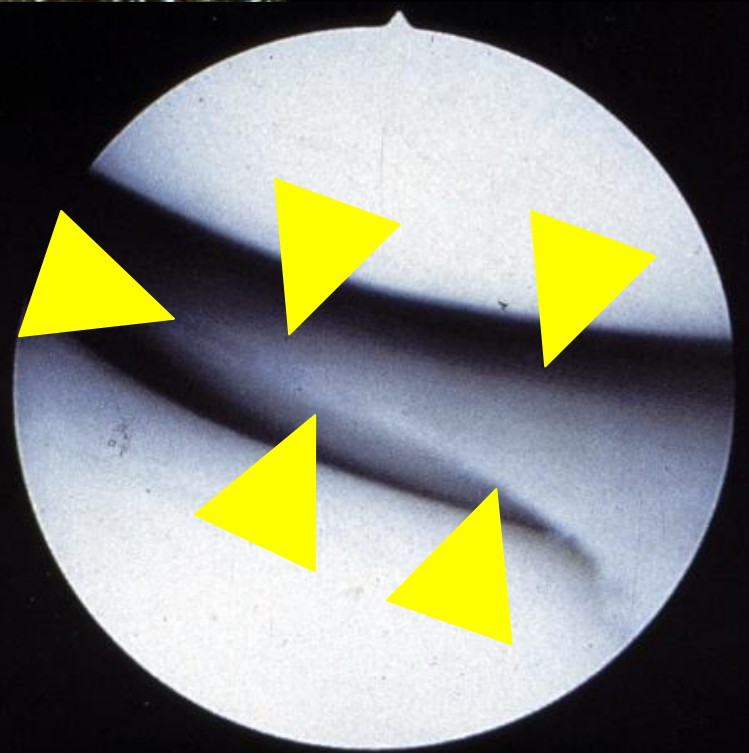
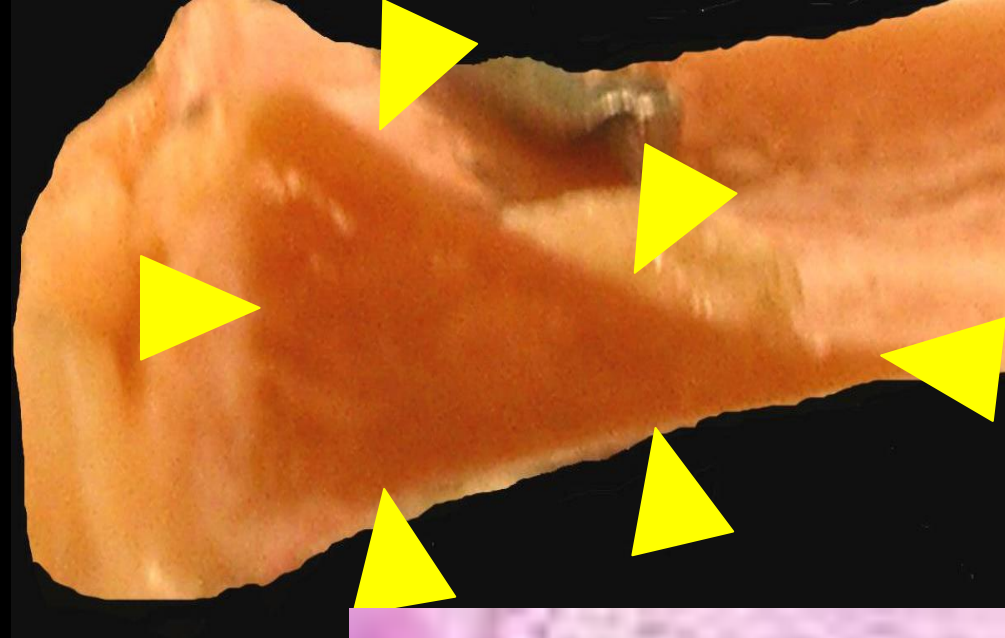
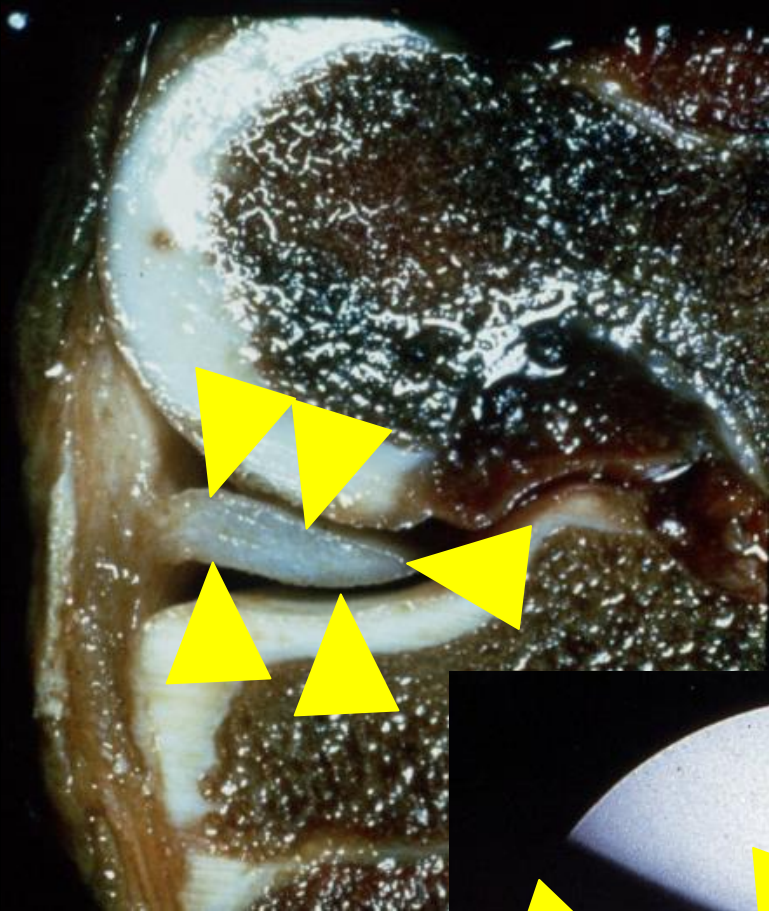
Circumferential

Transverse (“tie fibers”)

MENISCAL ANATOMY

- Fibrocartilage
- 4-7 mm in size, triangular and taper to point
- Innervated
- Peripheral 1/3 vascular
- Medial and lateral
- Anterior, body and posterior horns

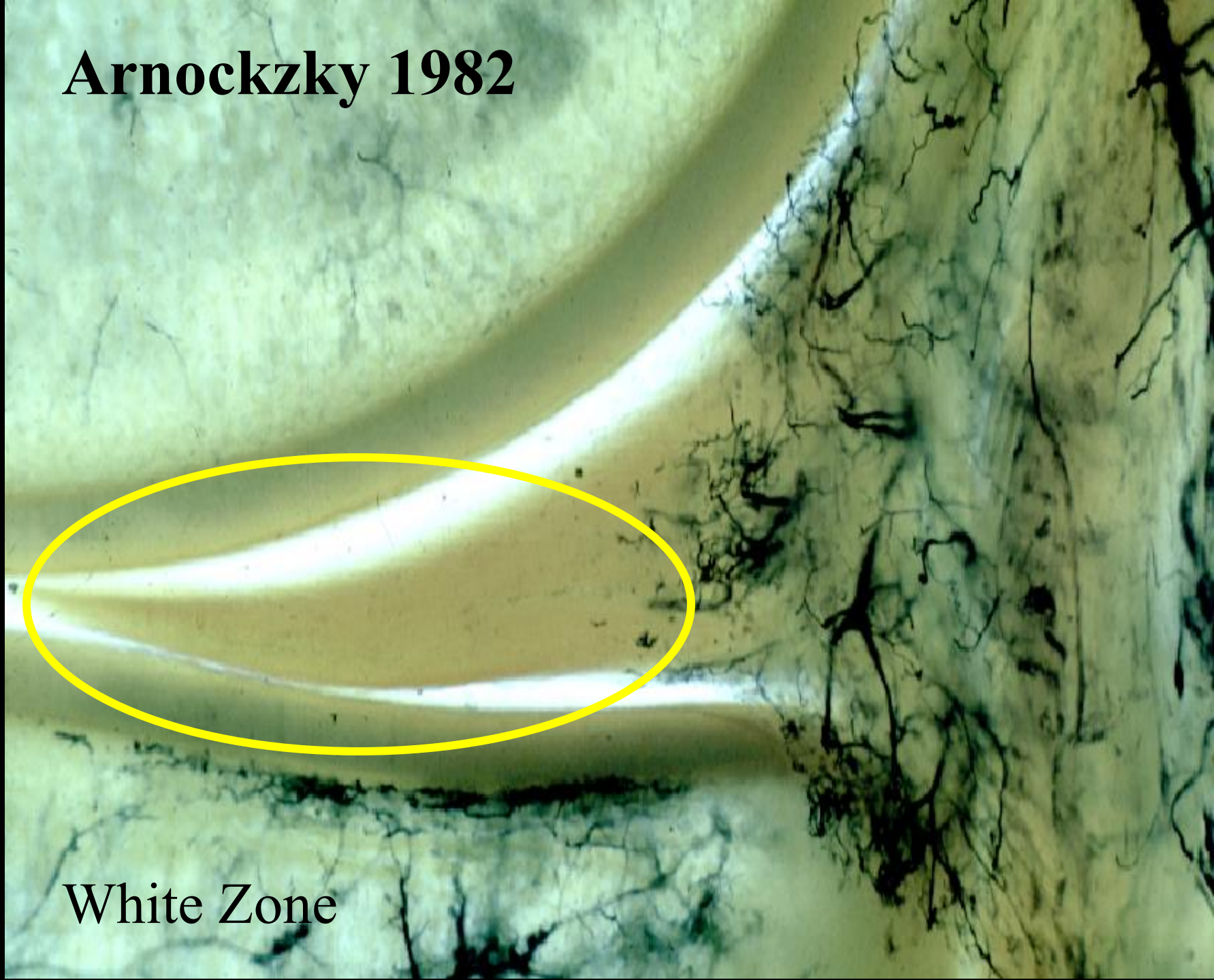




Arnockzky 1982

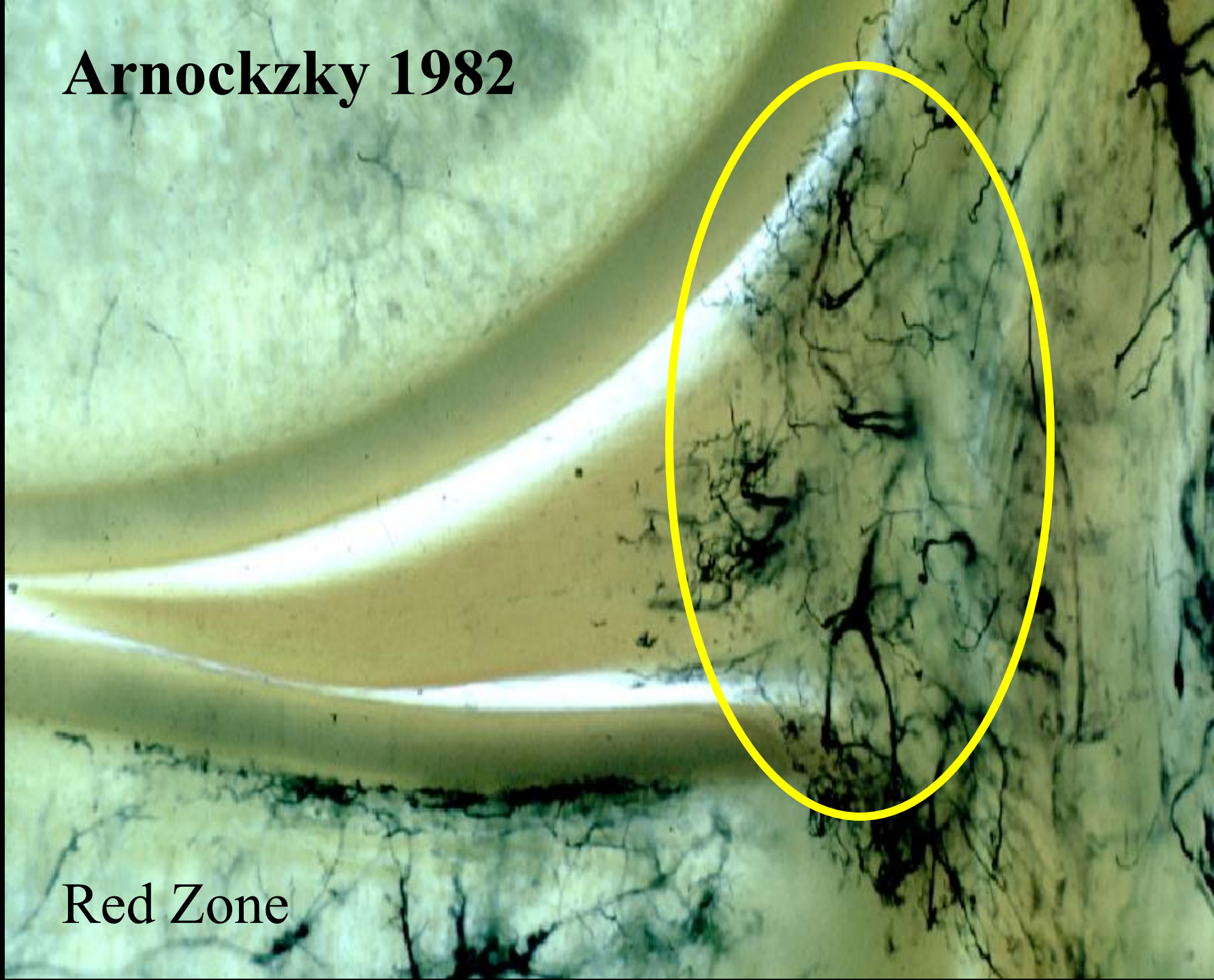


Arnockzky 1982



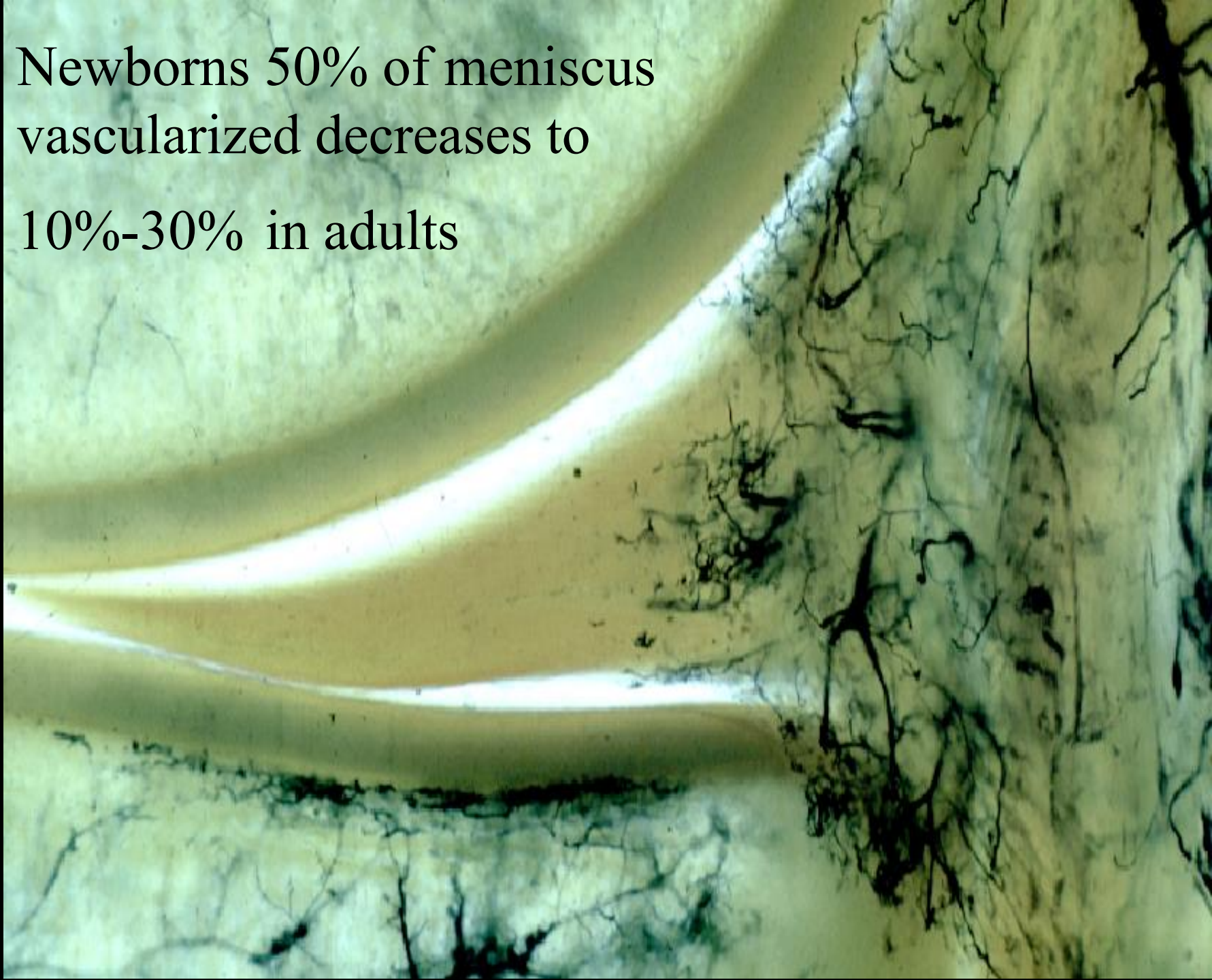
White Zone

Arnockzky 1982



Red Zone

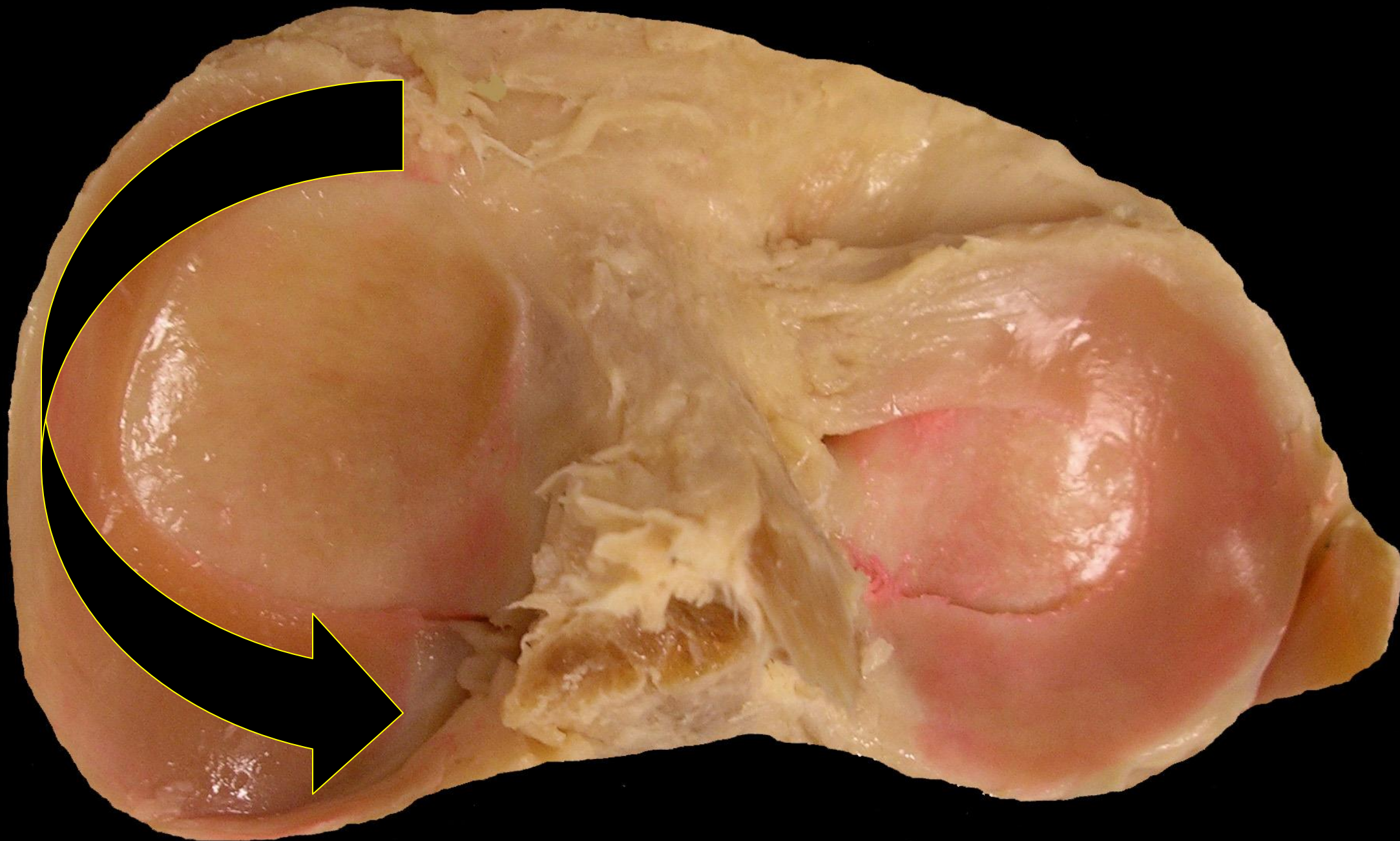
Newborns 50% of meniscus
vascularized decreases to
10%-30% in adults



MEDIAL MENISCUS NORMAL ANATOMY

- Larger radius of curvature or “C”
- Covers 50% contact surface of tibial plateau
- Anterior, body and posterior horns
- Larger posterior horn compared to anterior
- Firmly attached to capsule









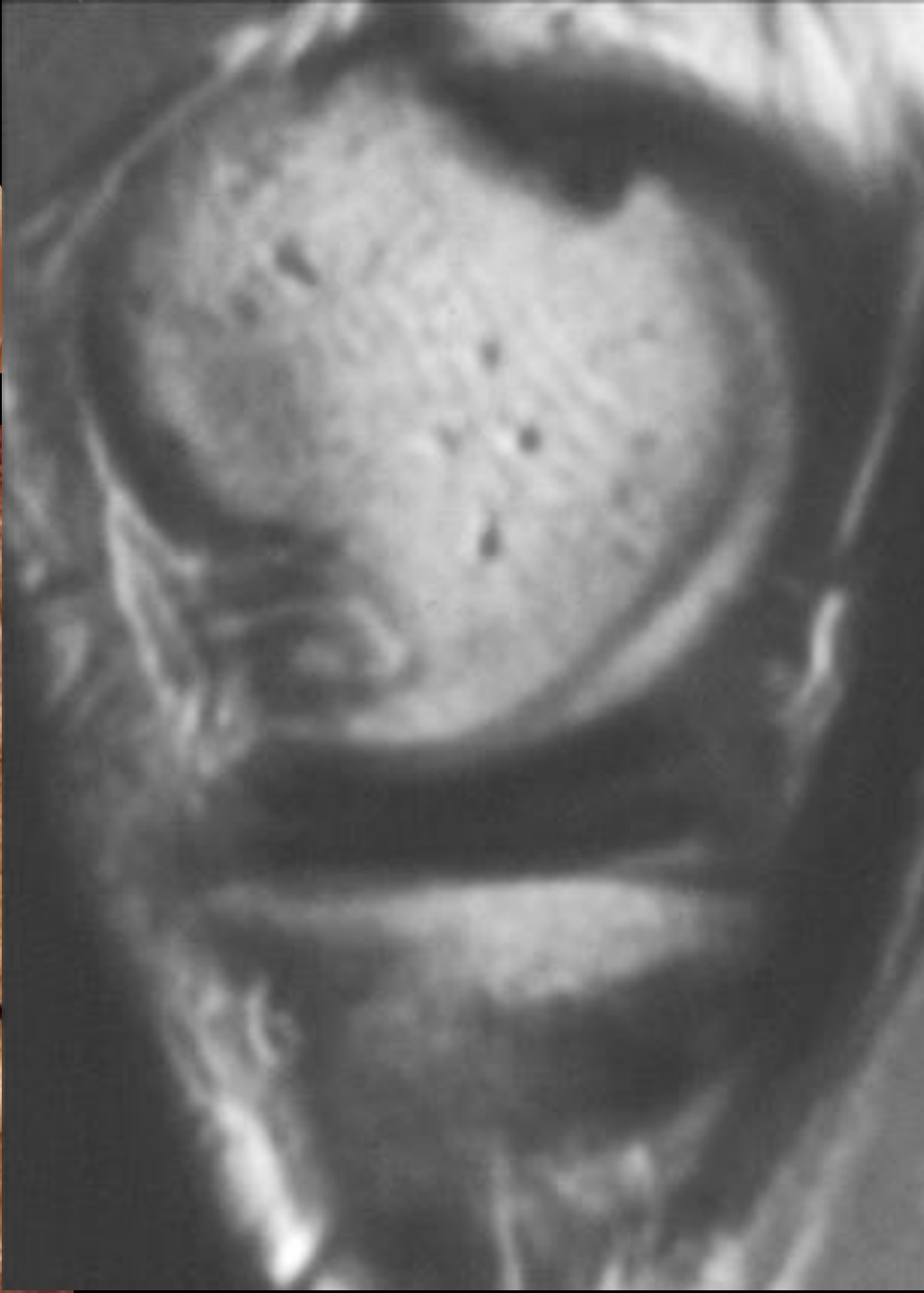
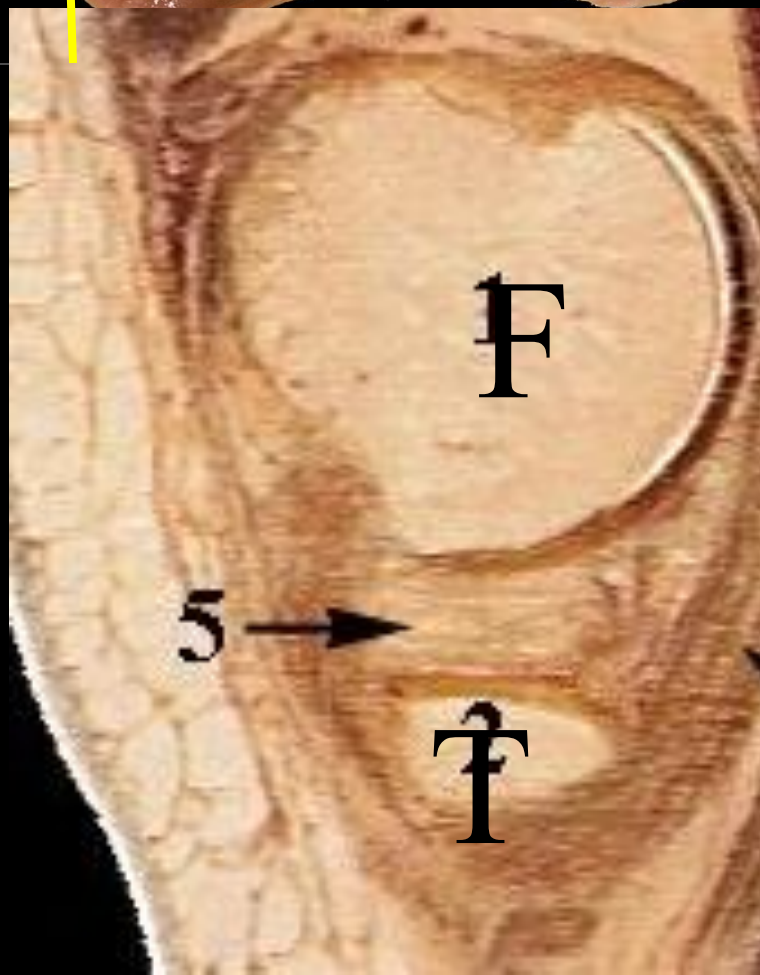


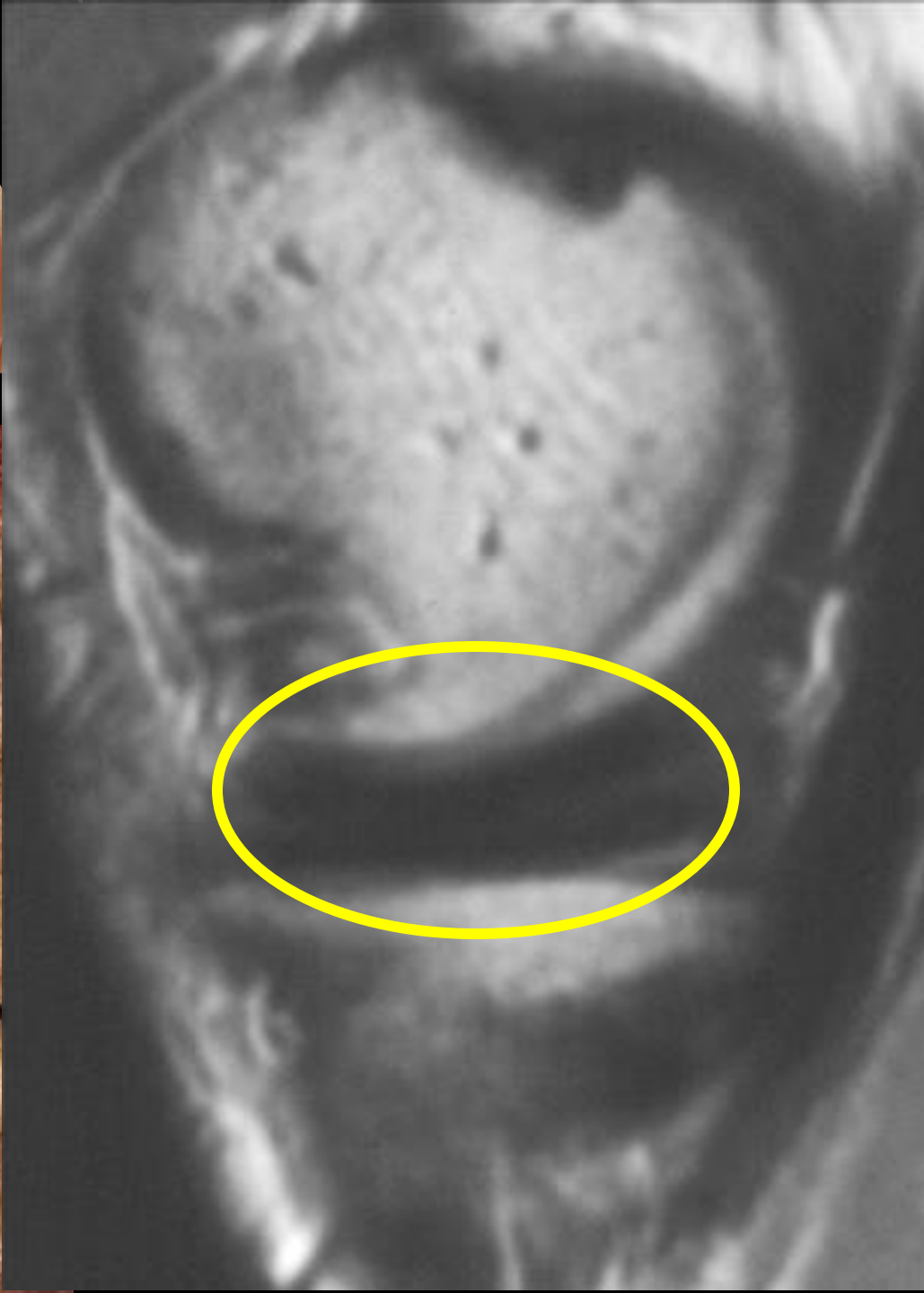
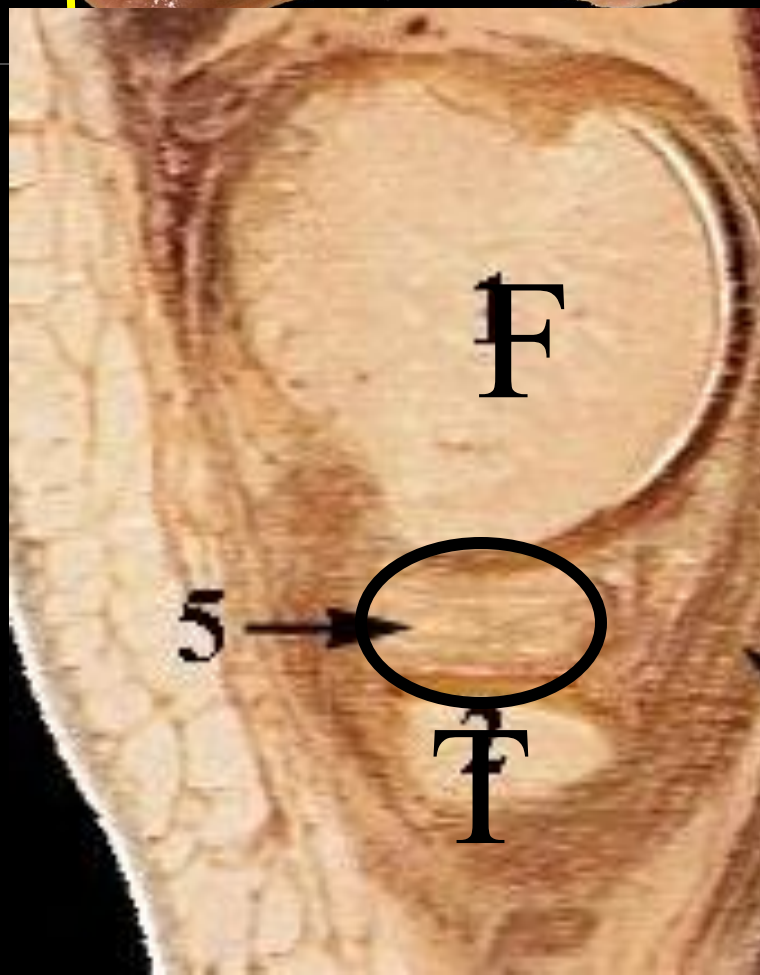


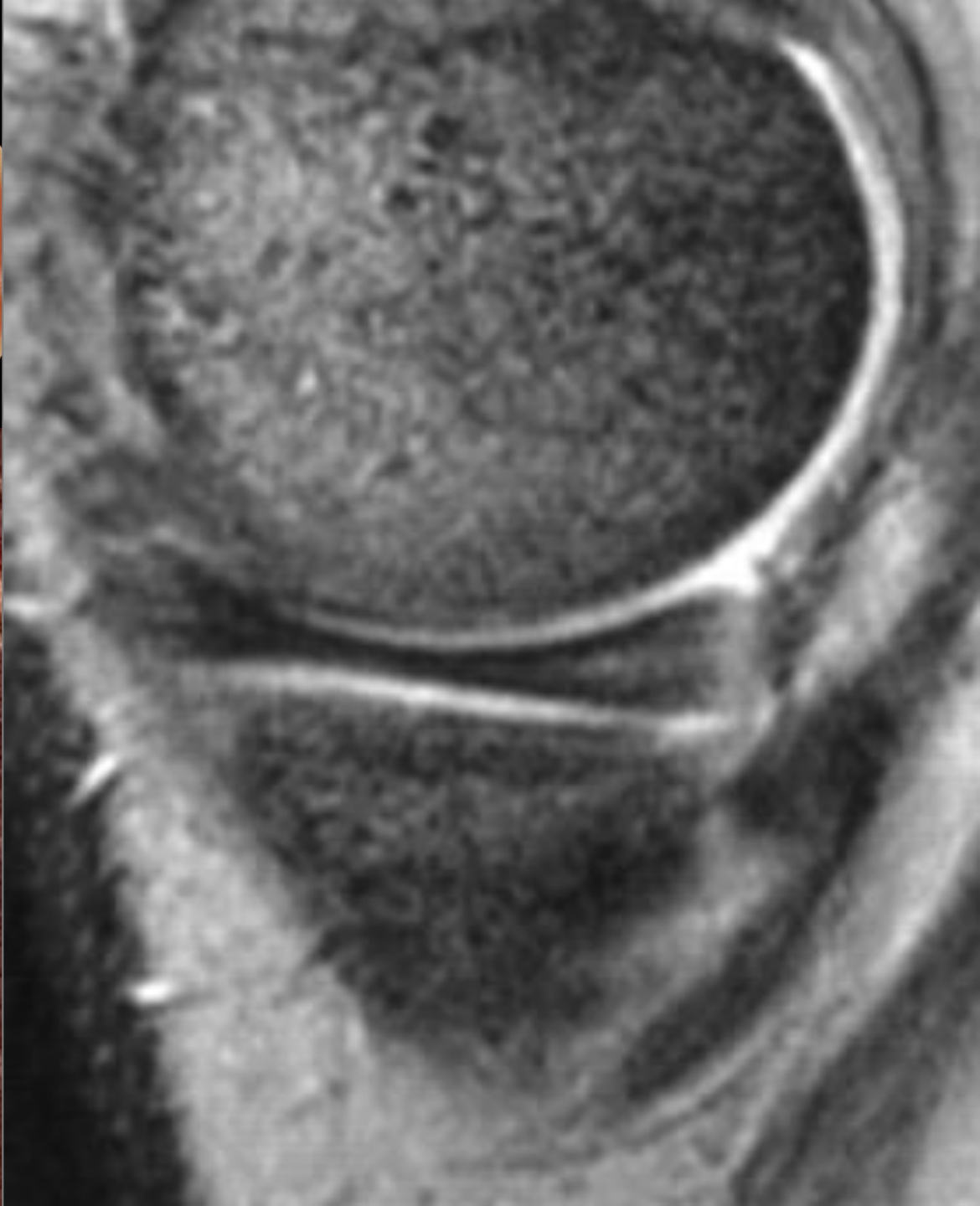


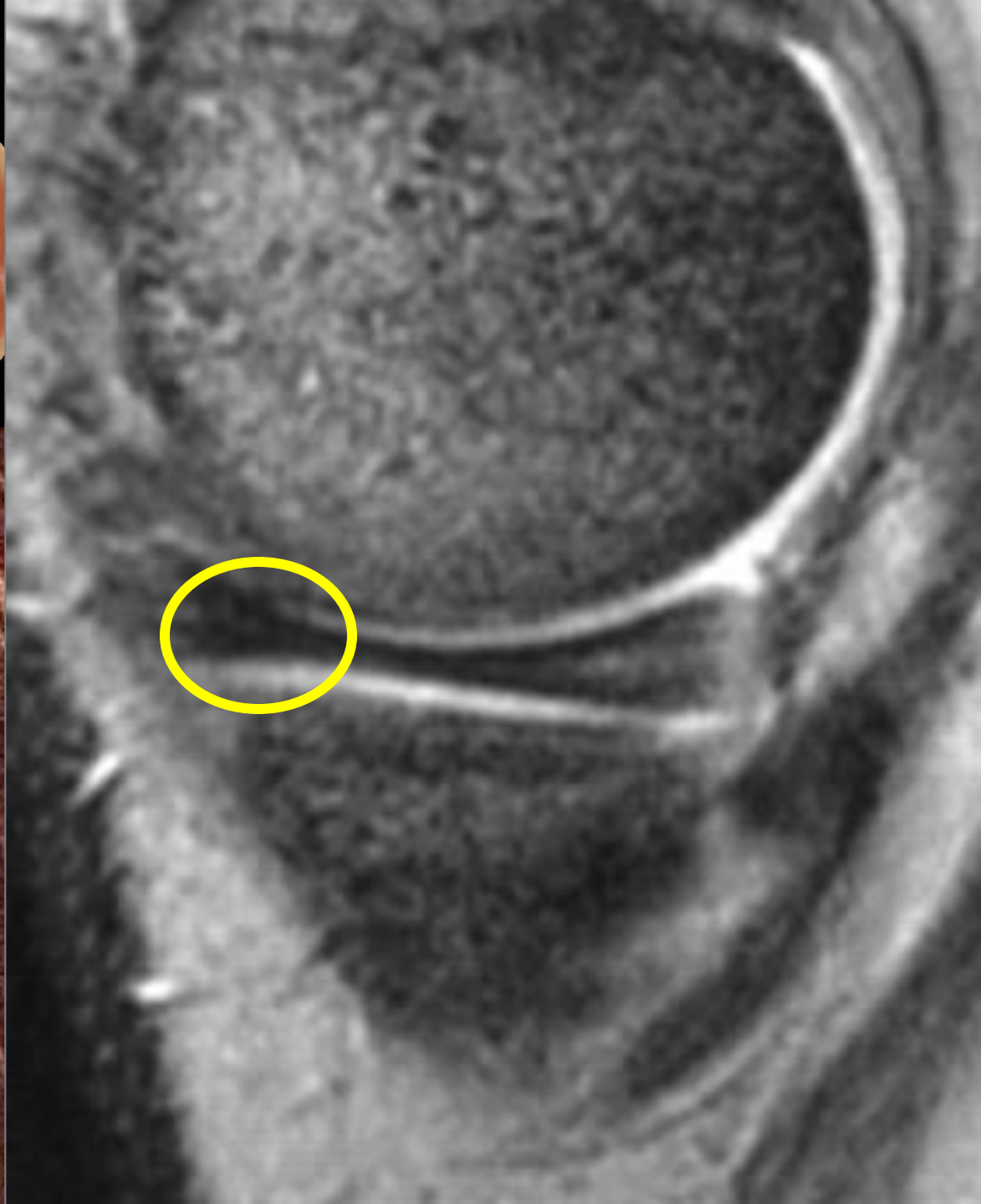
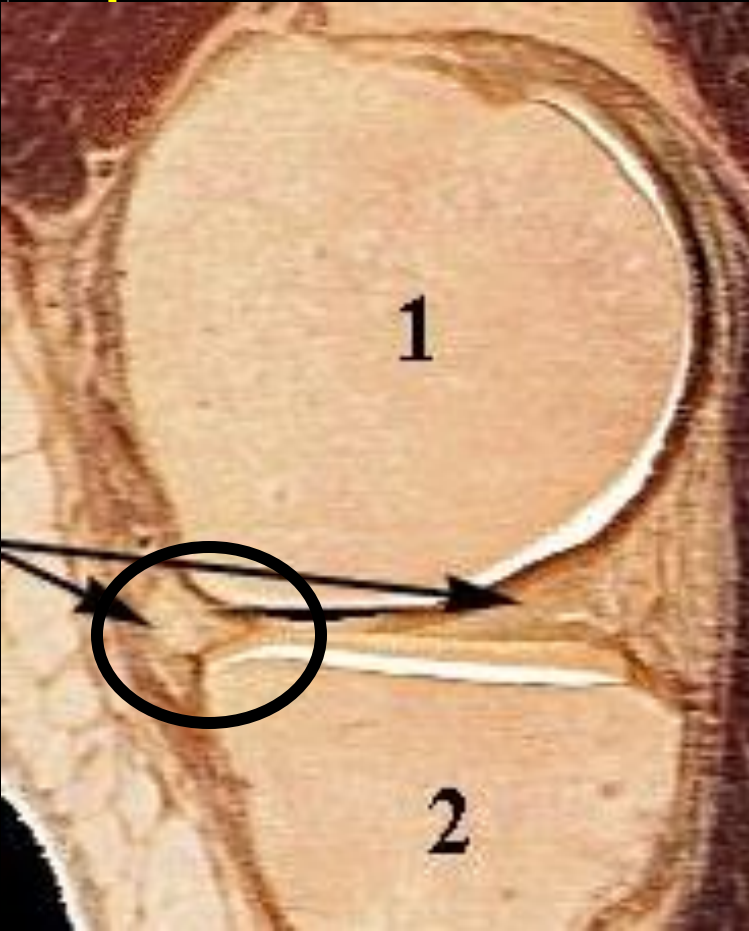
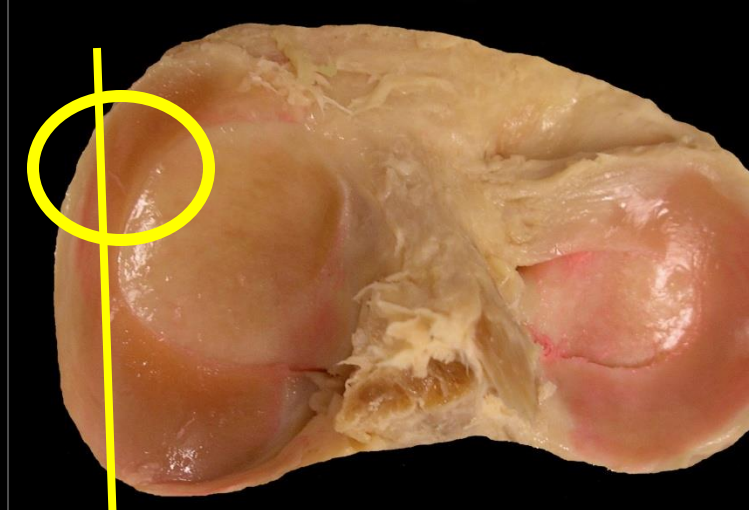
MEDIAL MENISCUS NORMAL SAGITTAL MR IMAGING

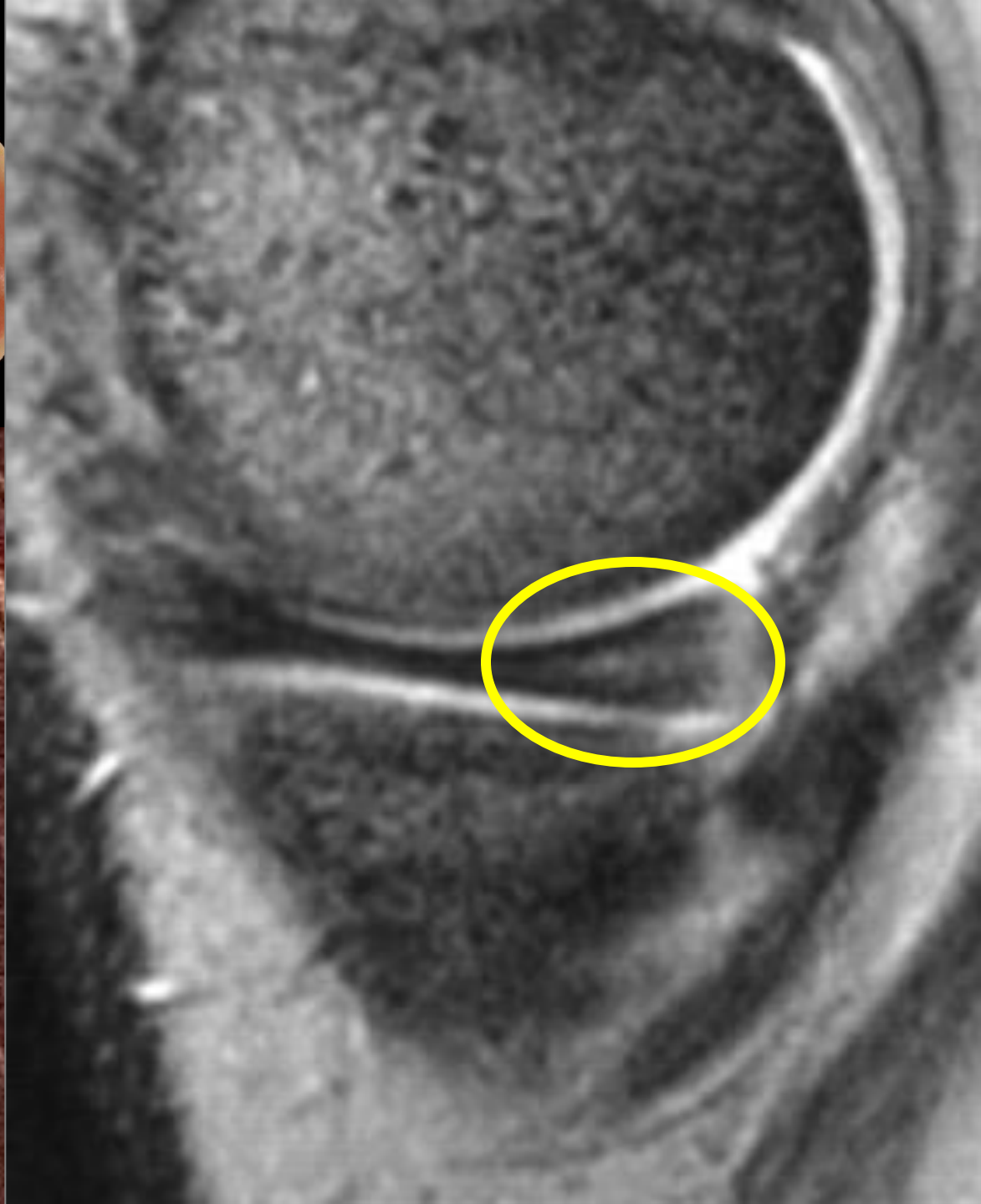
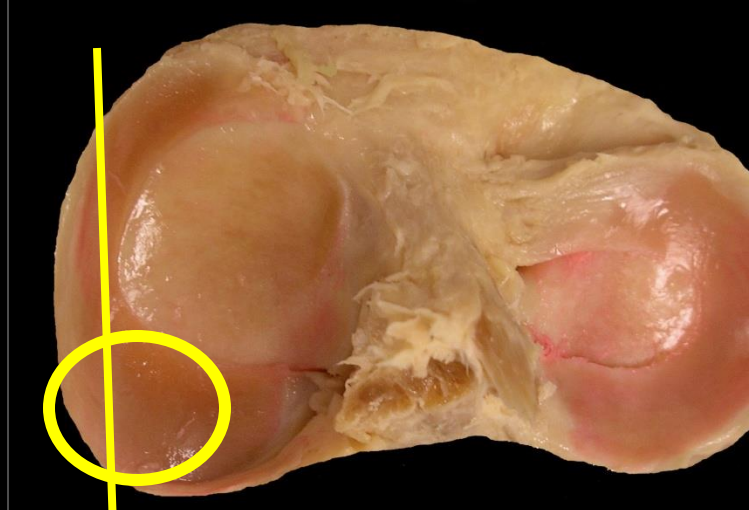
- Low signal intensity sideways triangles
- Larger posterior horn compared to anterior
- No more than 2 bow ties
- No surfacing intermediate or high signal

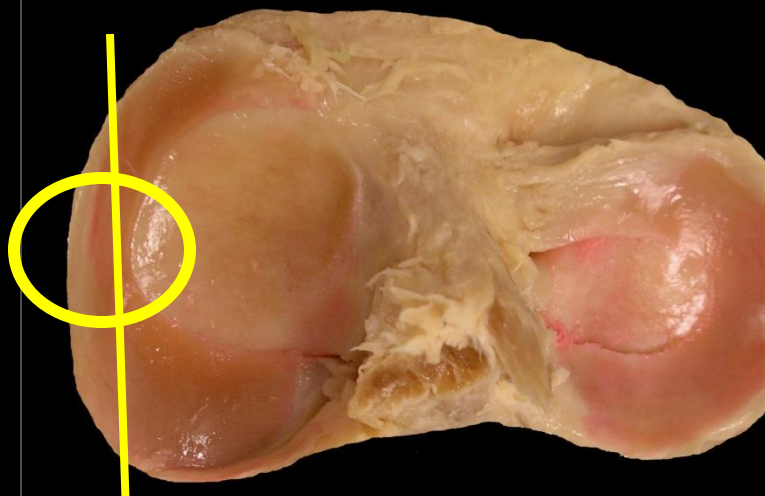


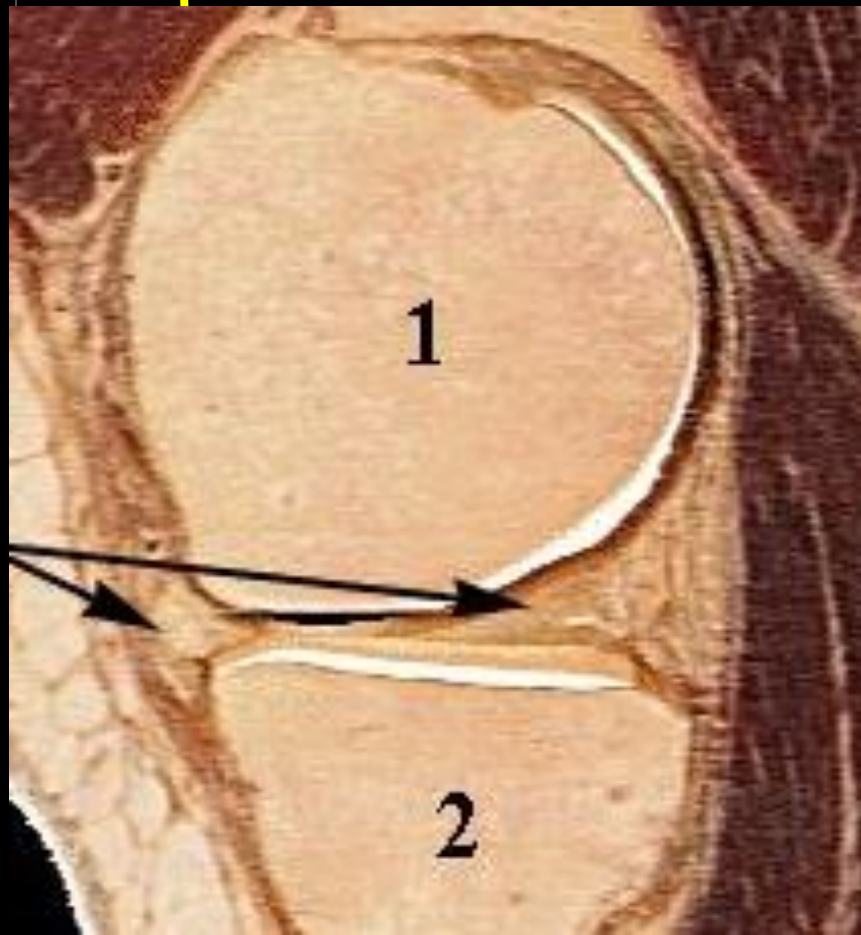


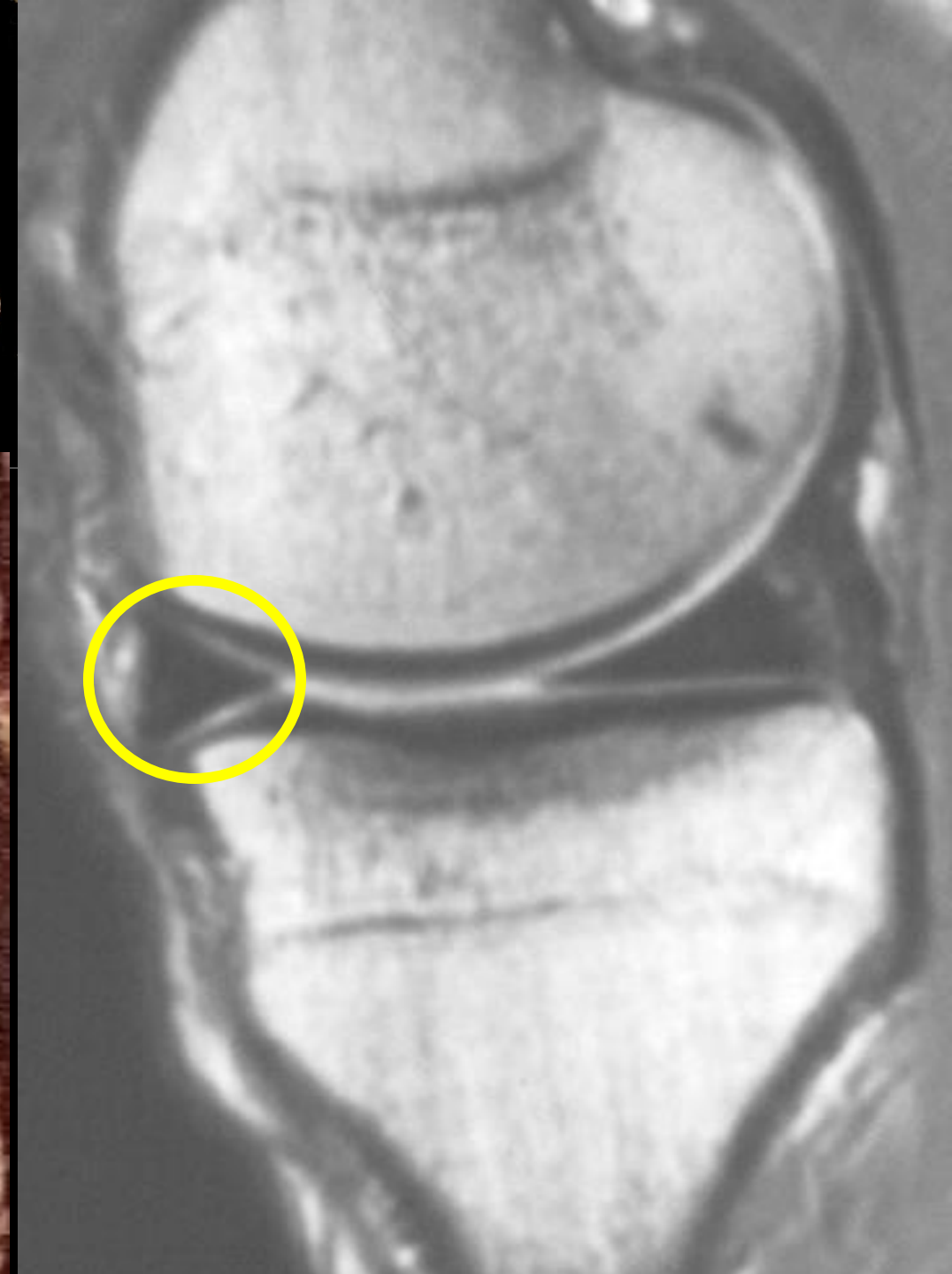
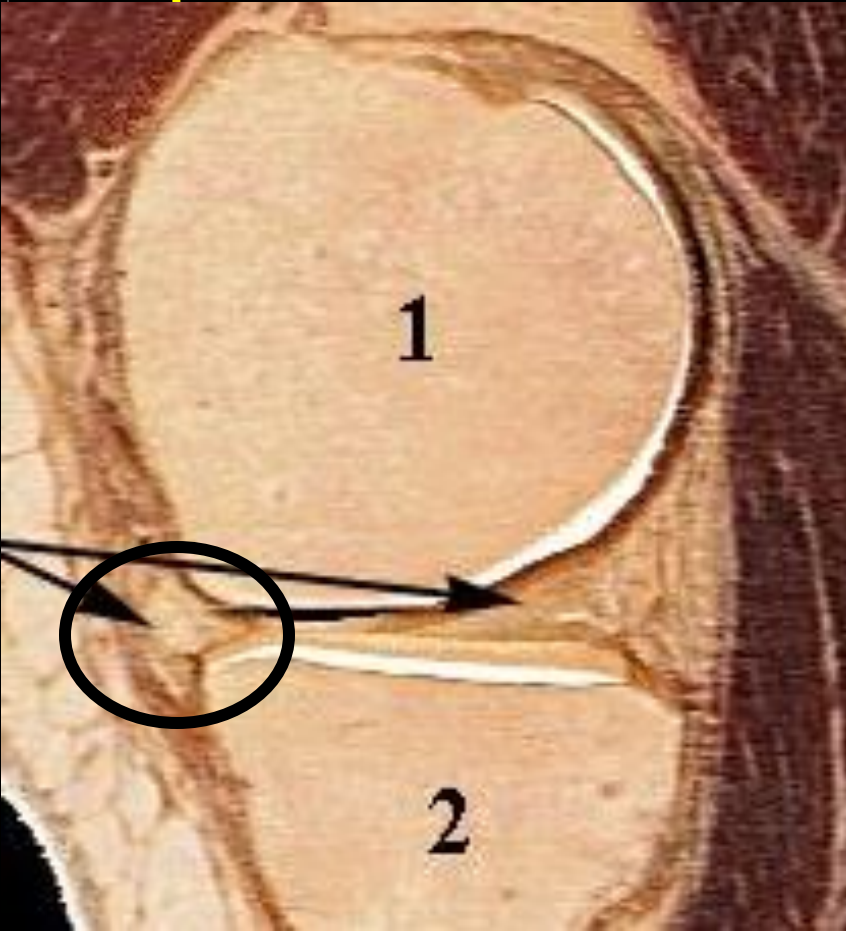
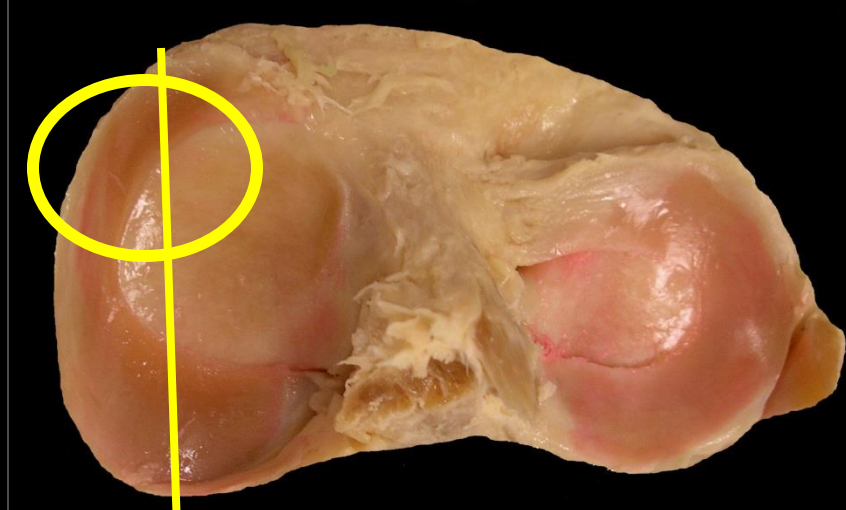


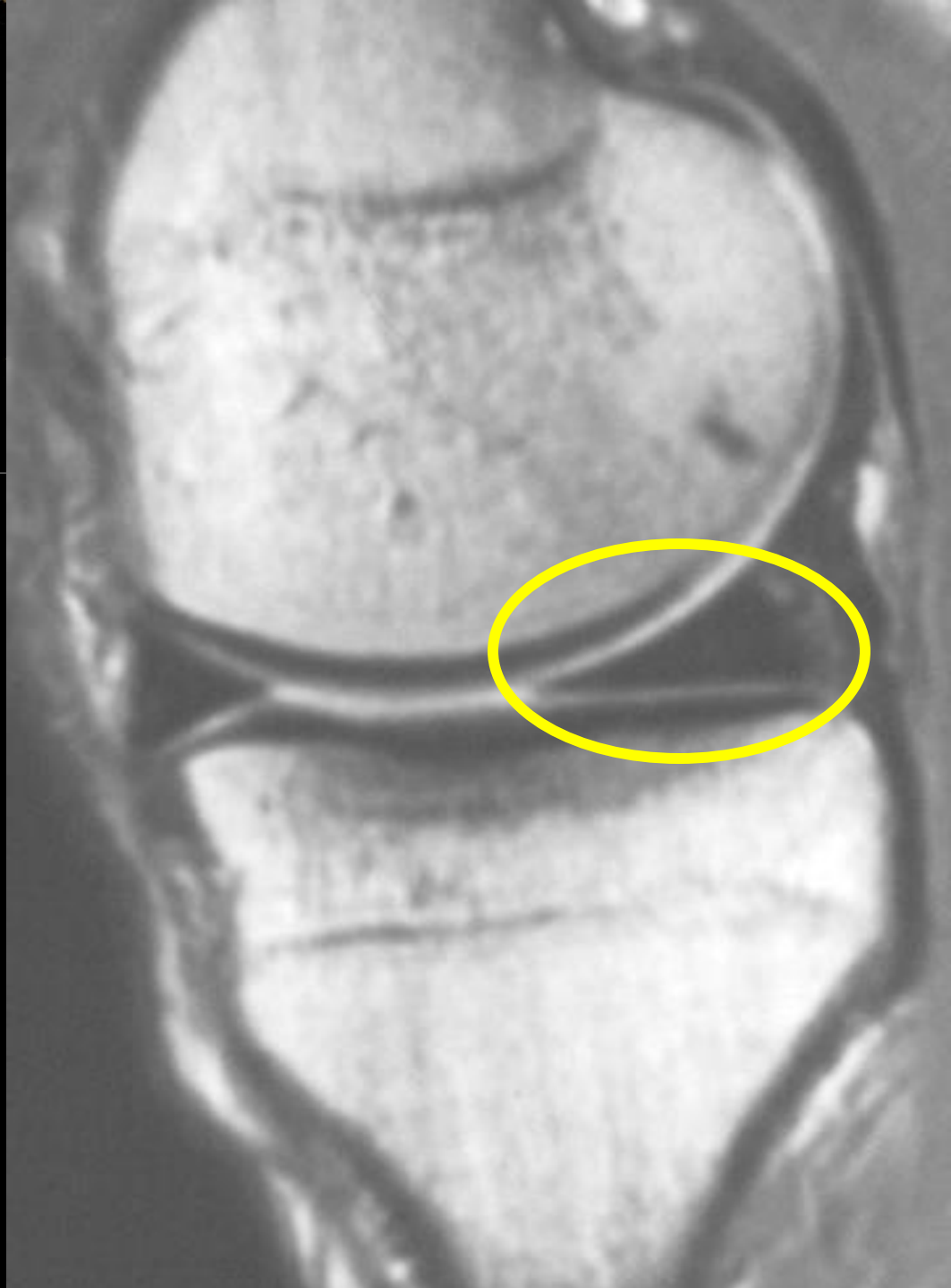
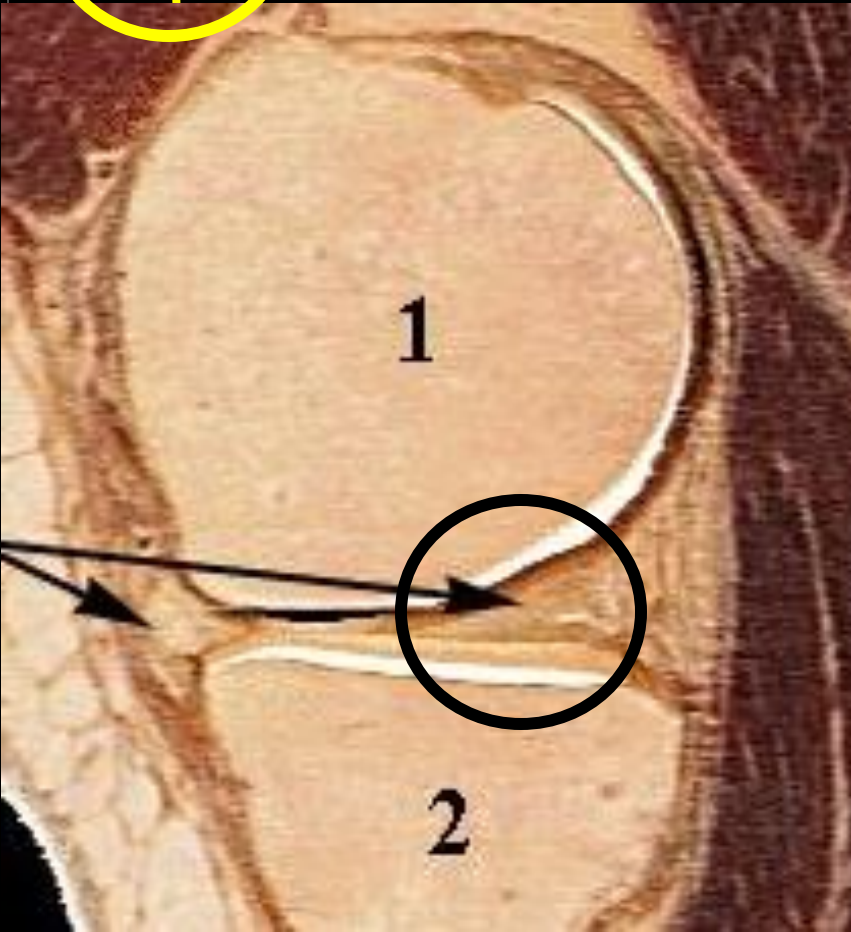
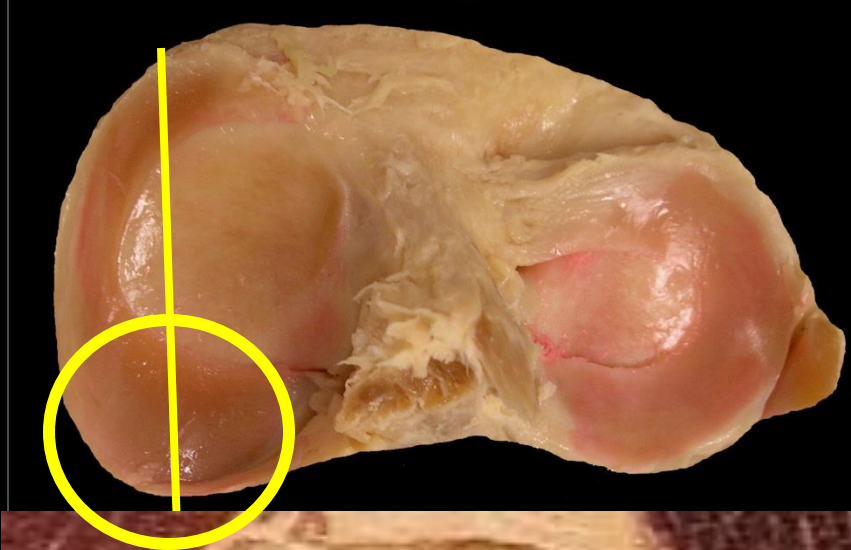


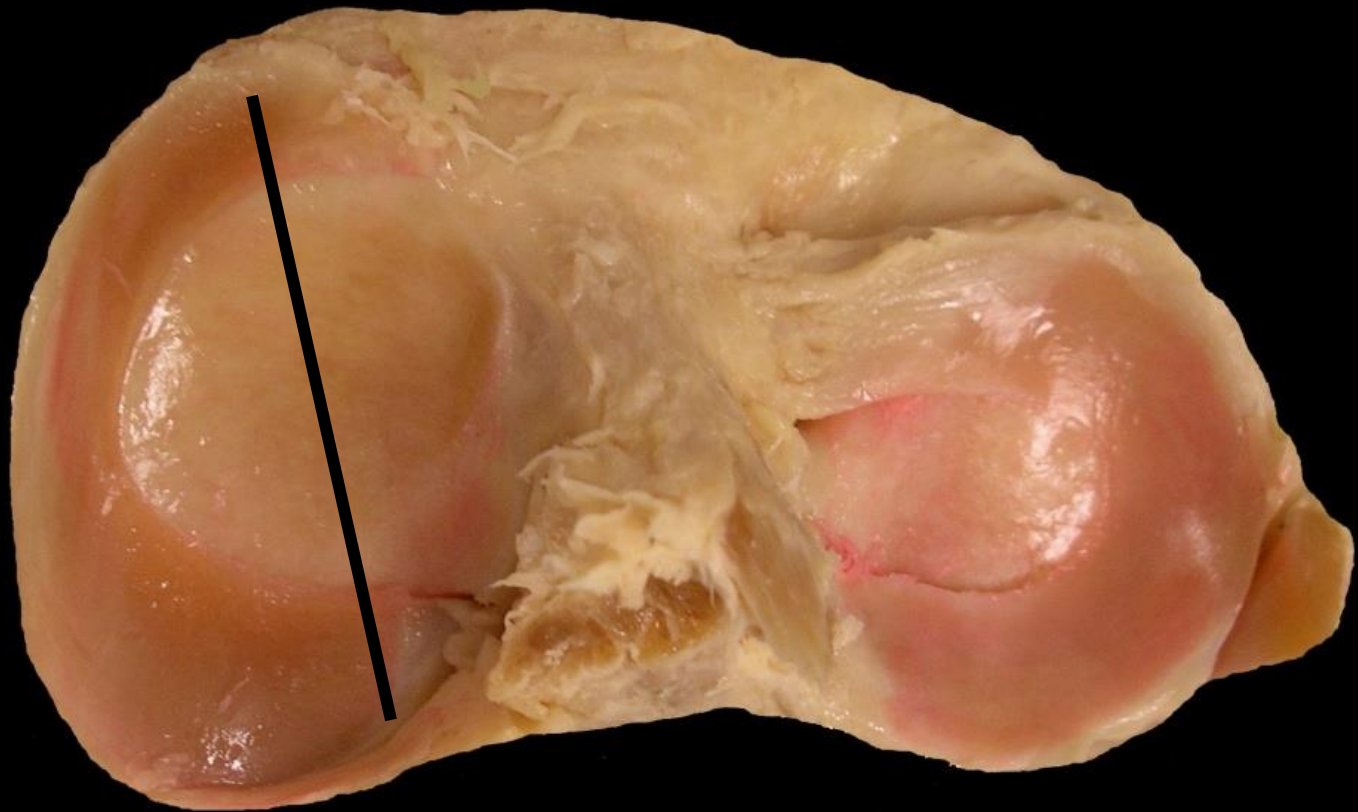


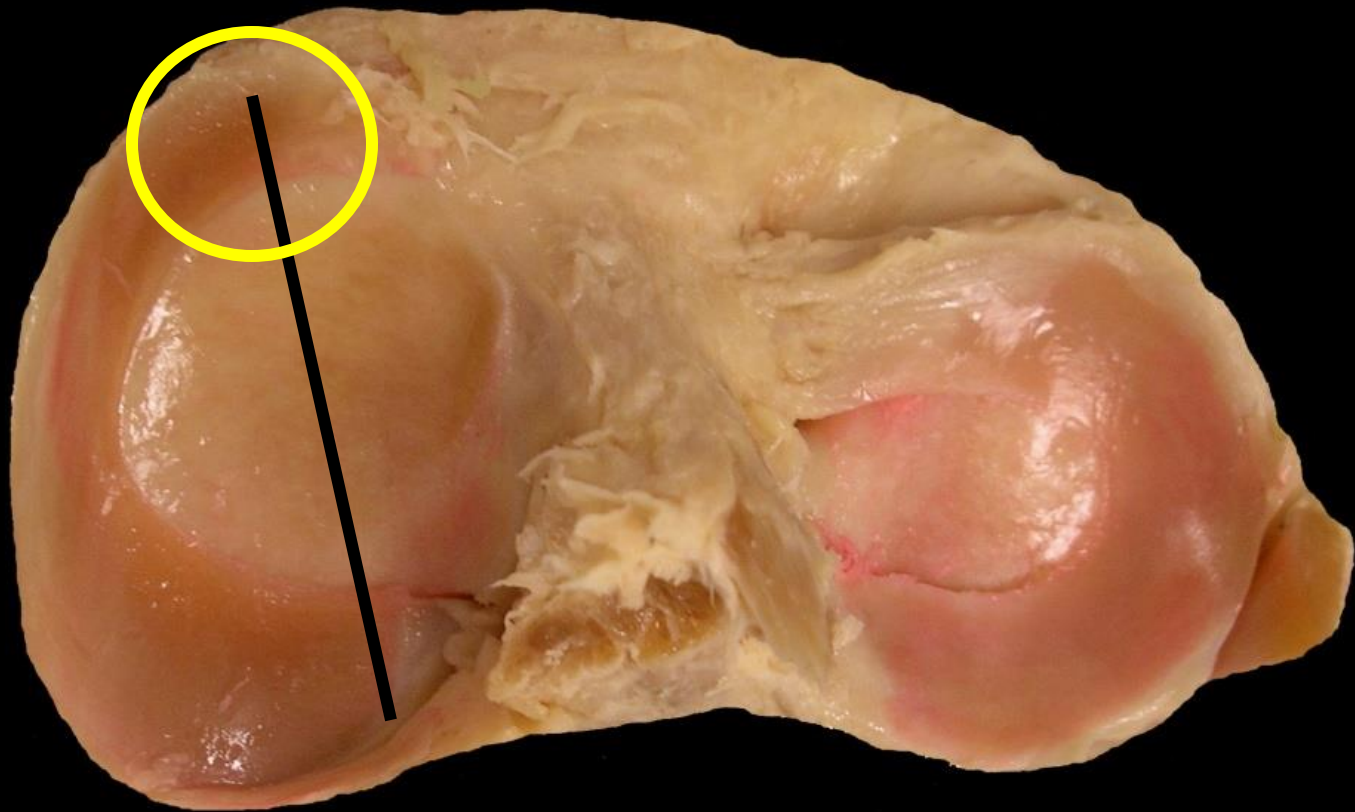


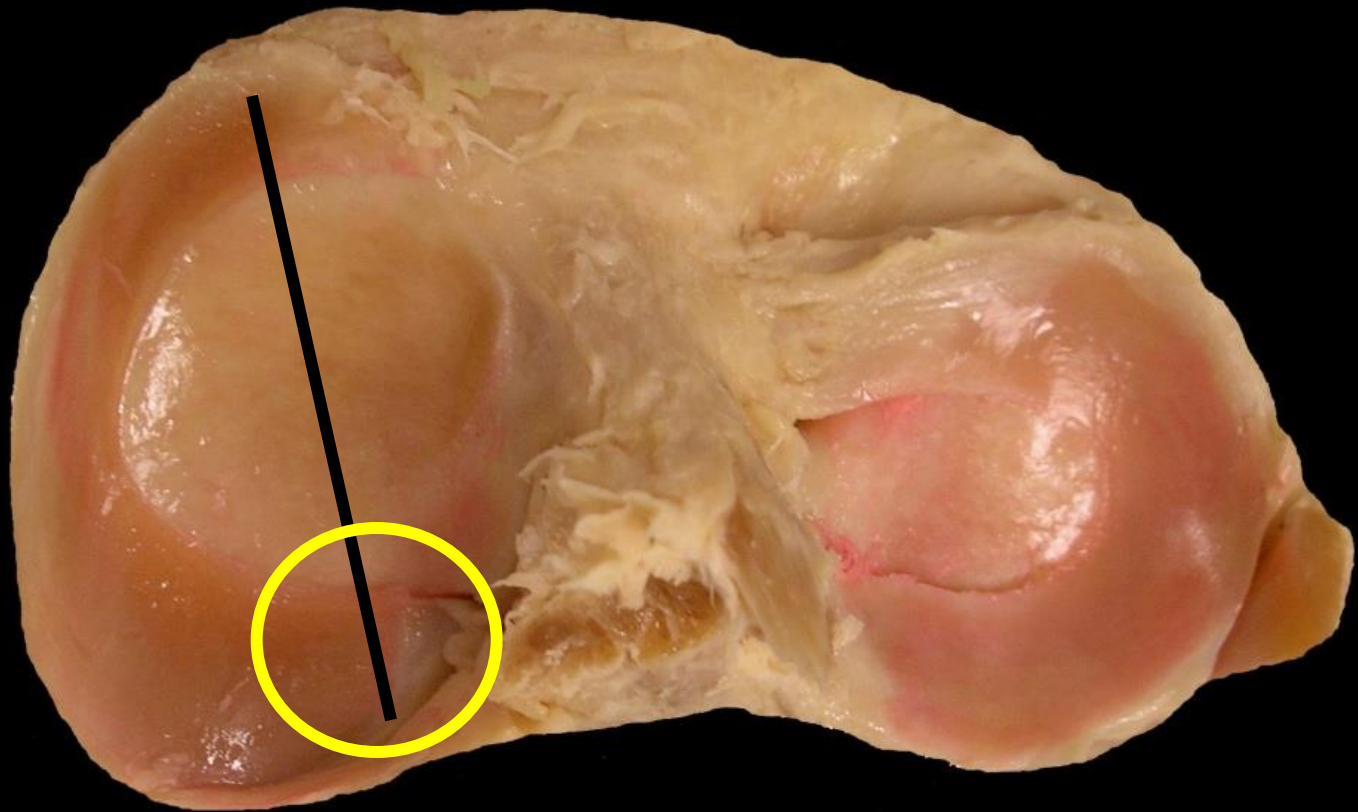






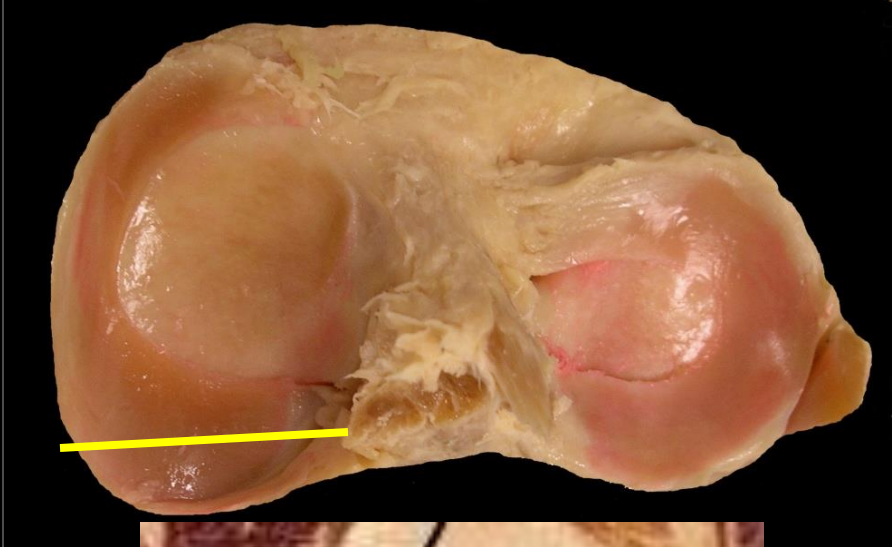


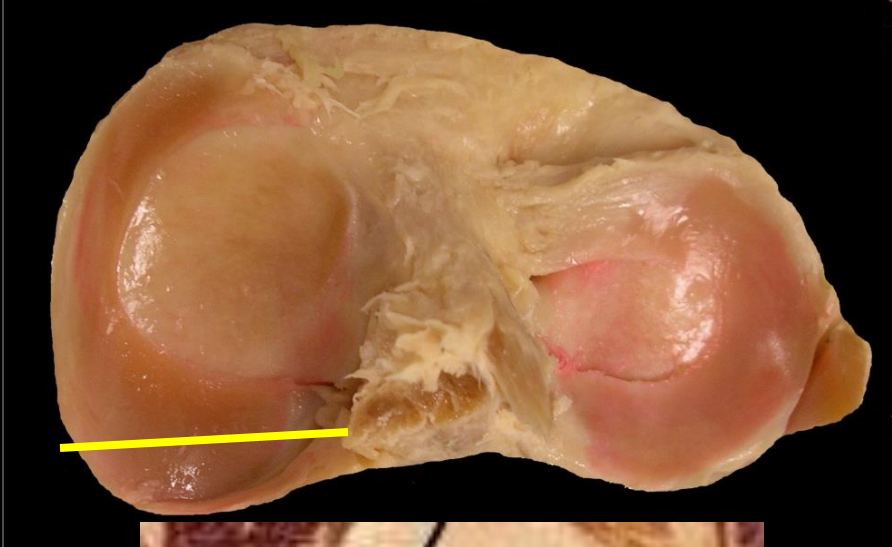


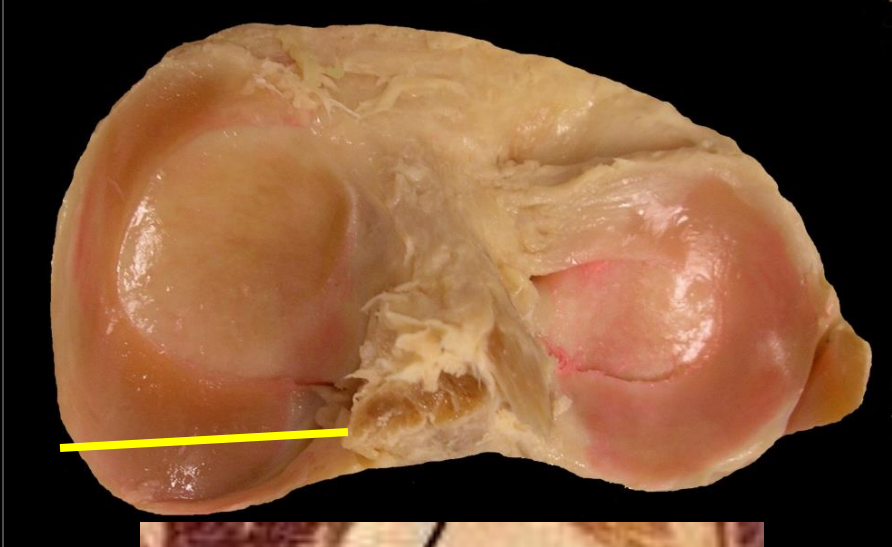


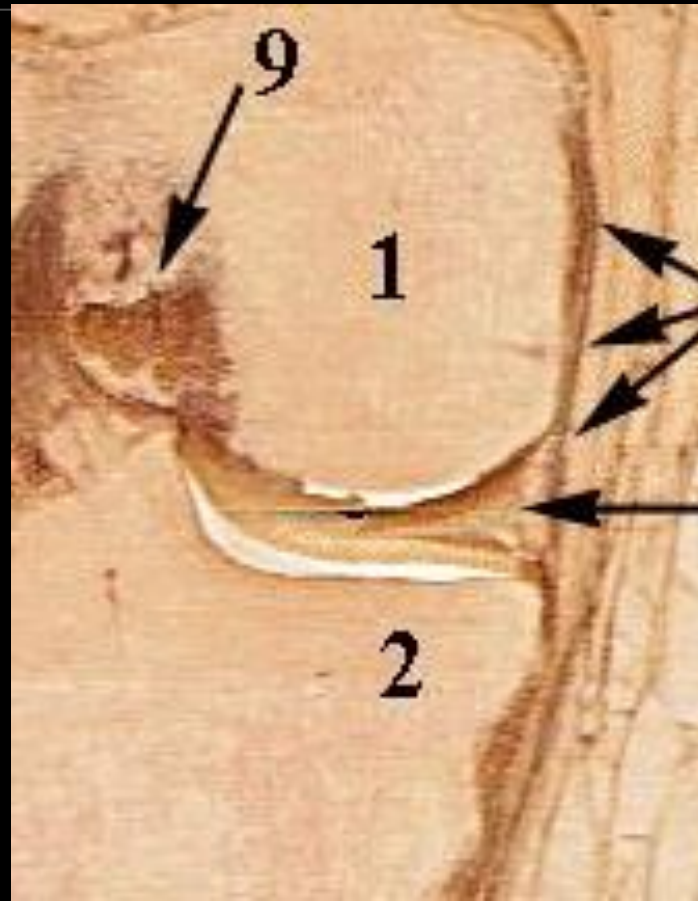
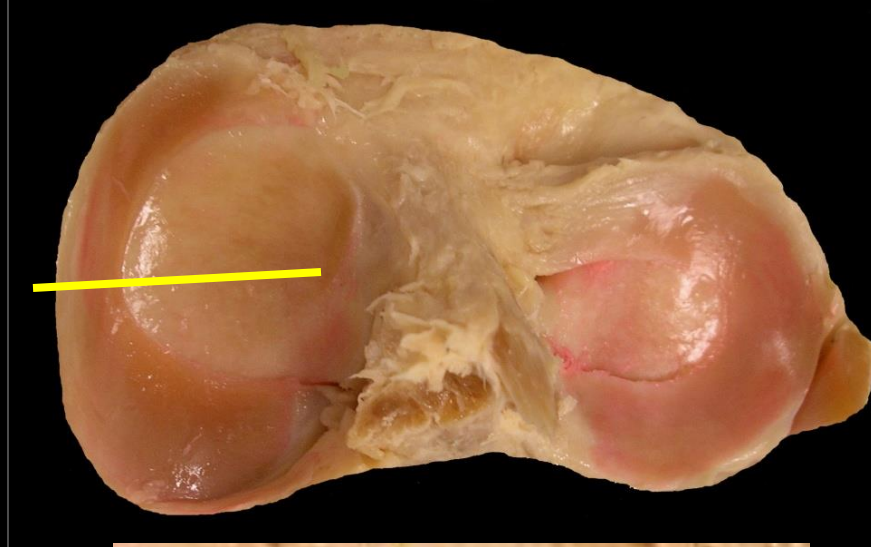
MEDIAL MENISCUS NORMAL CORONAL MR IMAGING

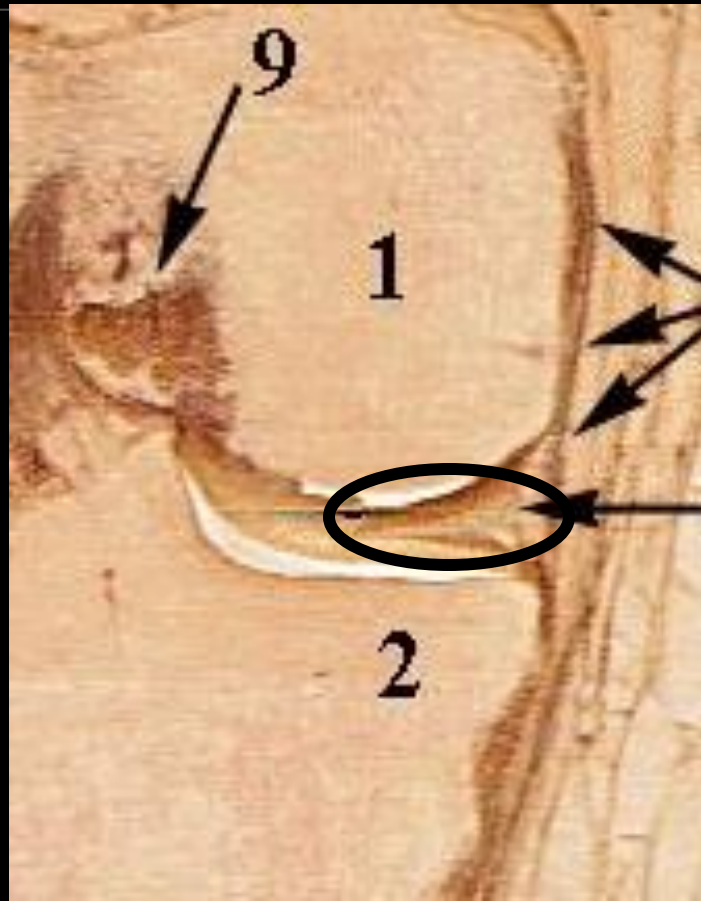
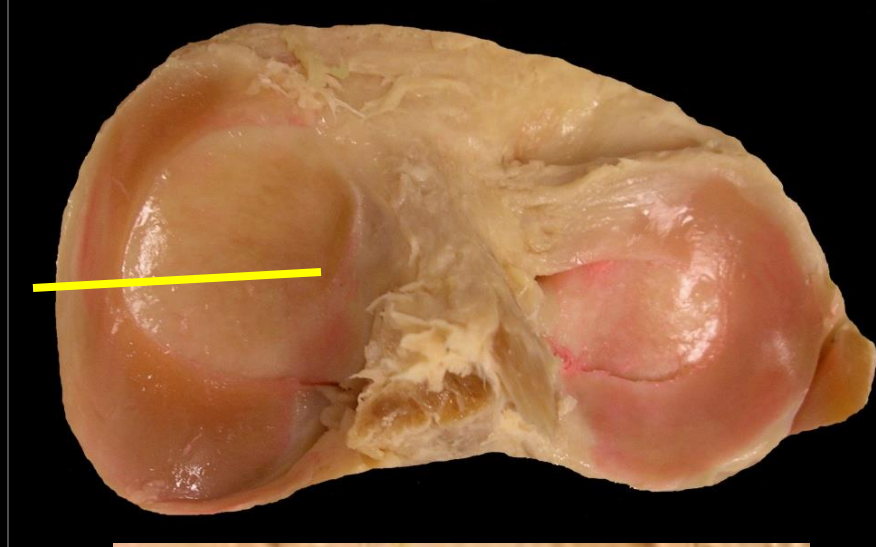
- Low signal intensity sideways triangles
- Larger posterior horn compared to anterior
- No surfacing intermediate or high signal
- Posteriorly should extend toward midline
 - Meniscal root
- Firmly attached to capsule

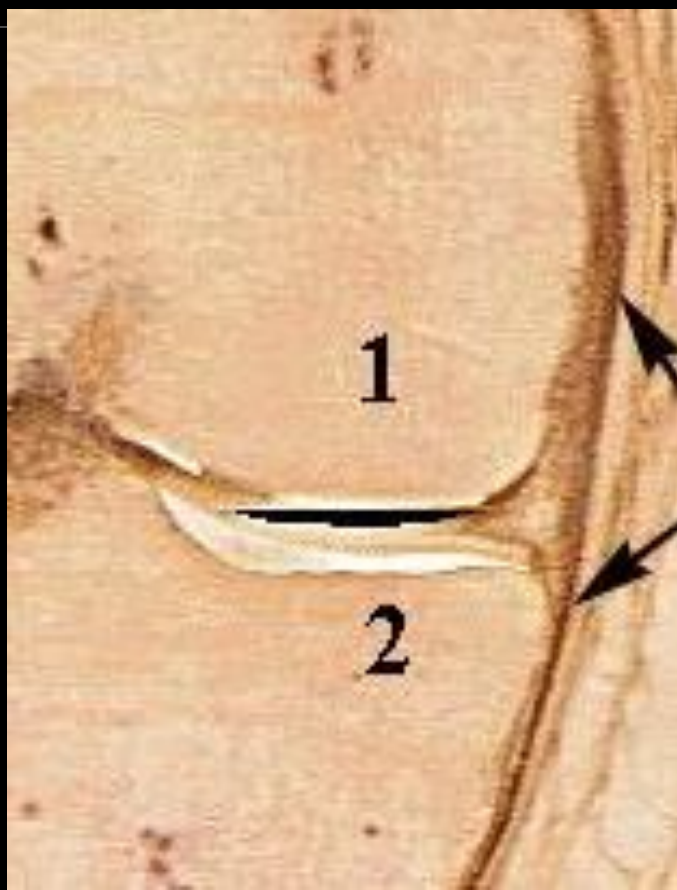
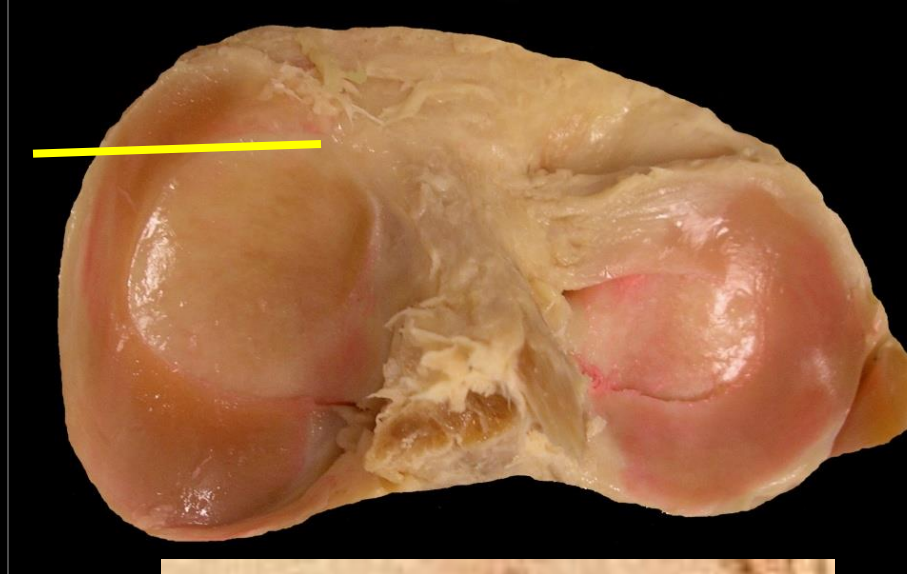


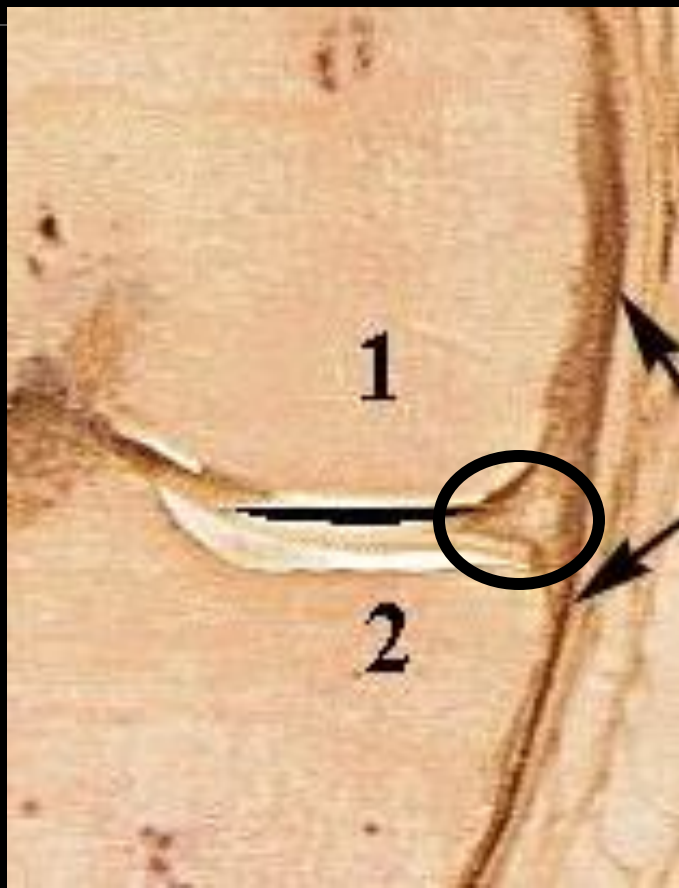
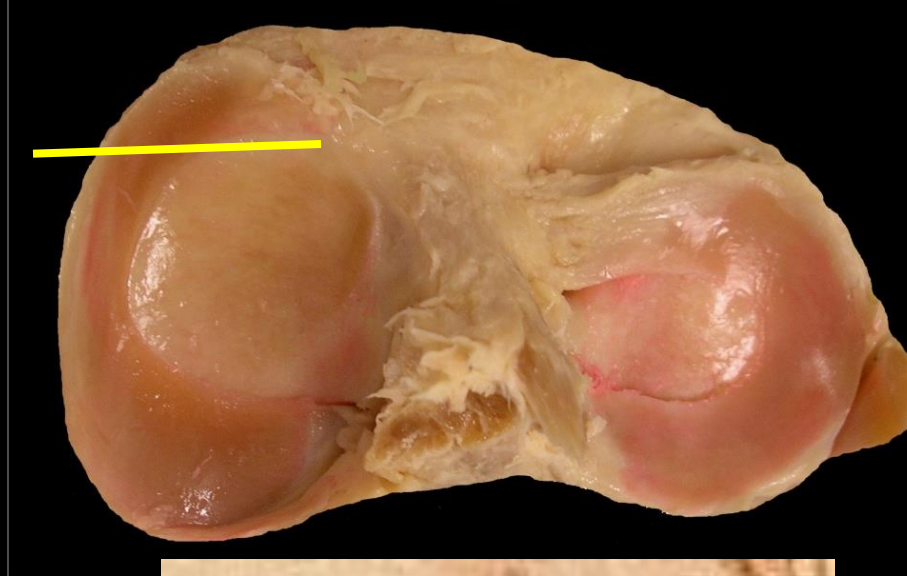






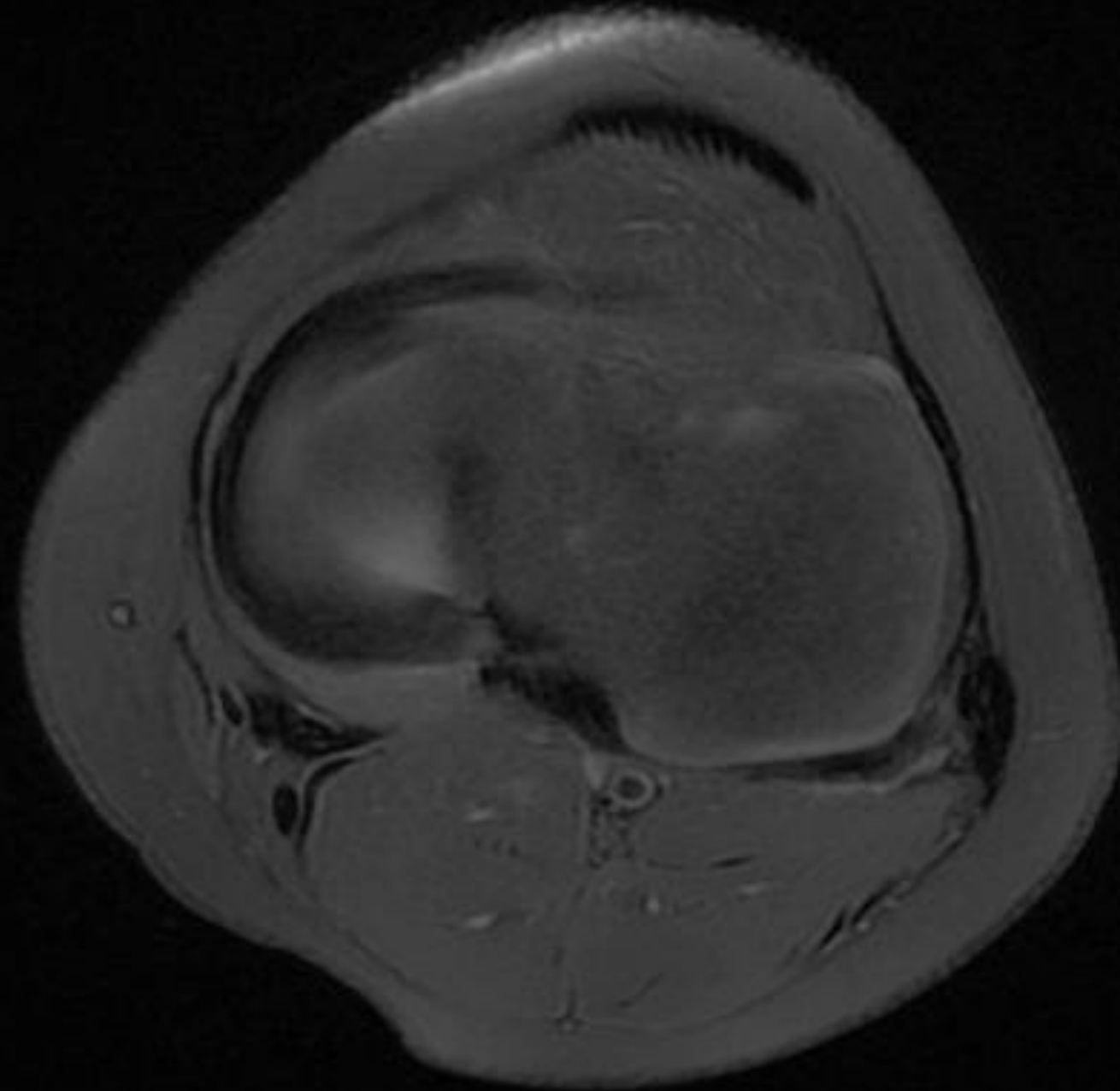


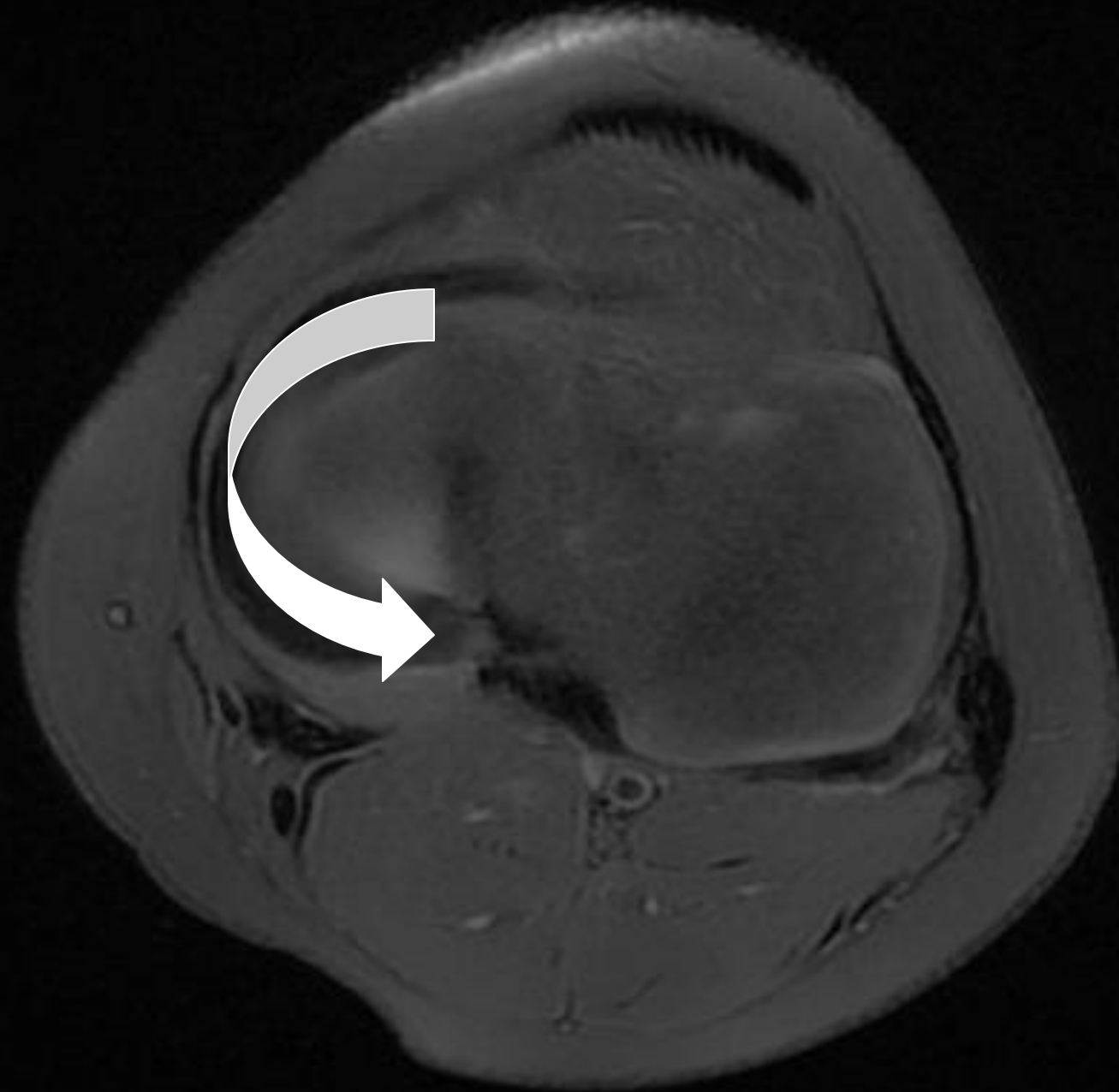
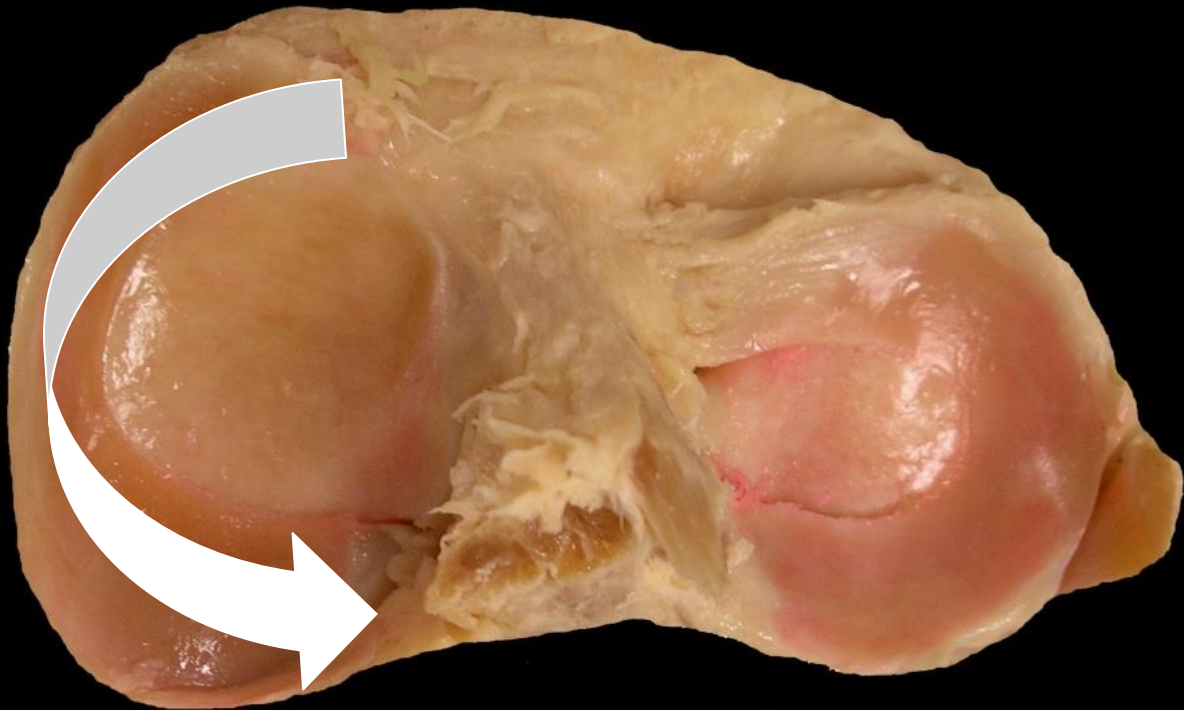




MEDIAL MENISCUS NORMAL AXIAL MR IMAGING

- Do not forget about this plane
- May not have any images through menisci
- Often only see 1 or at most two images



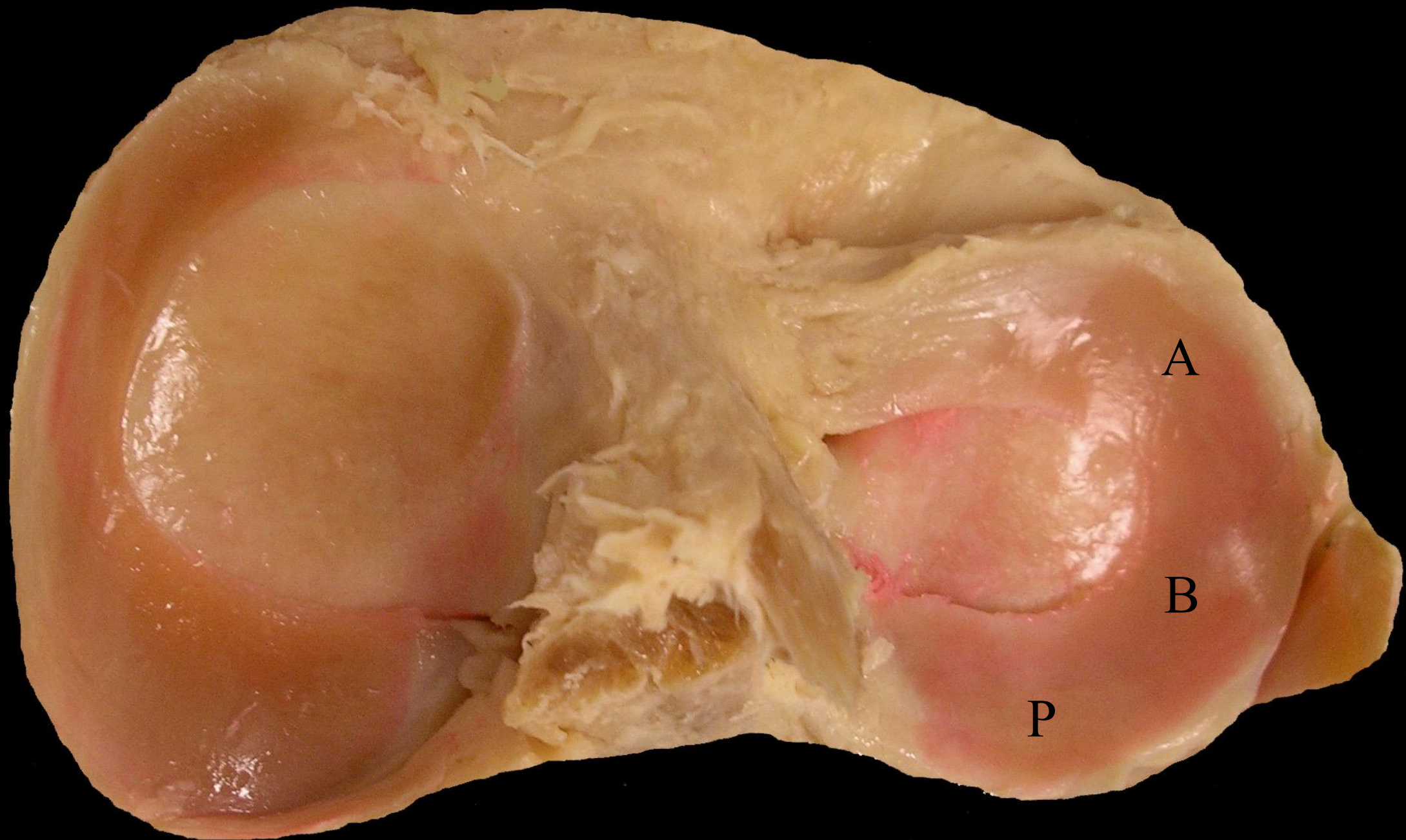


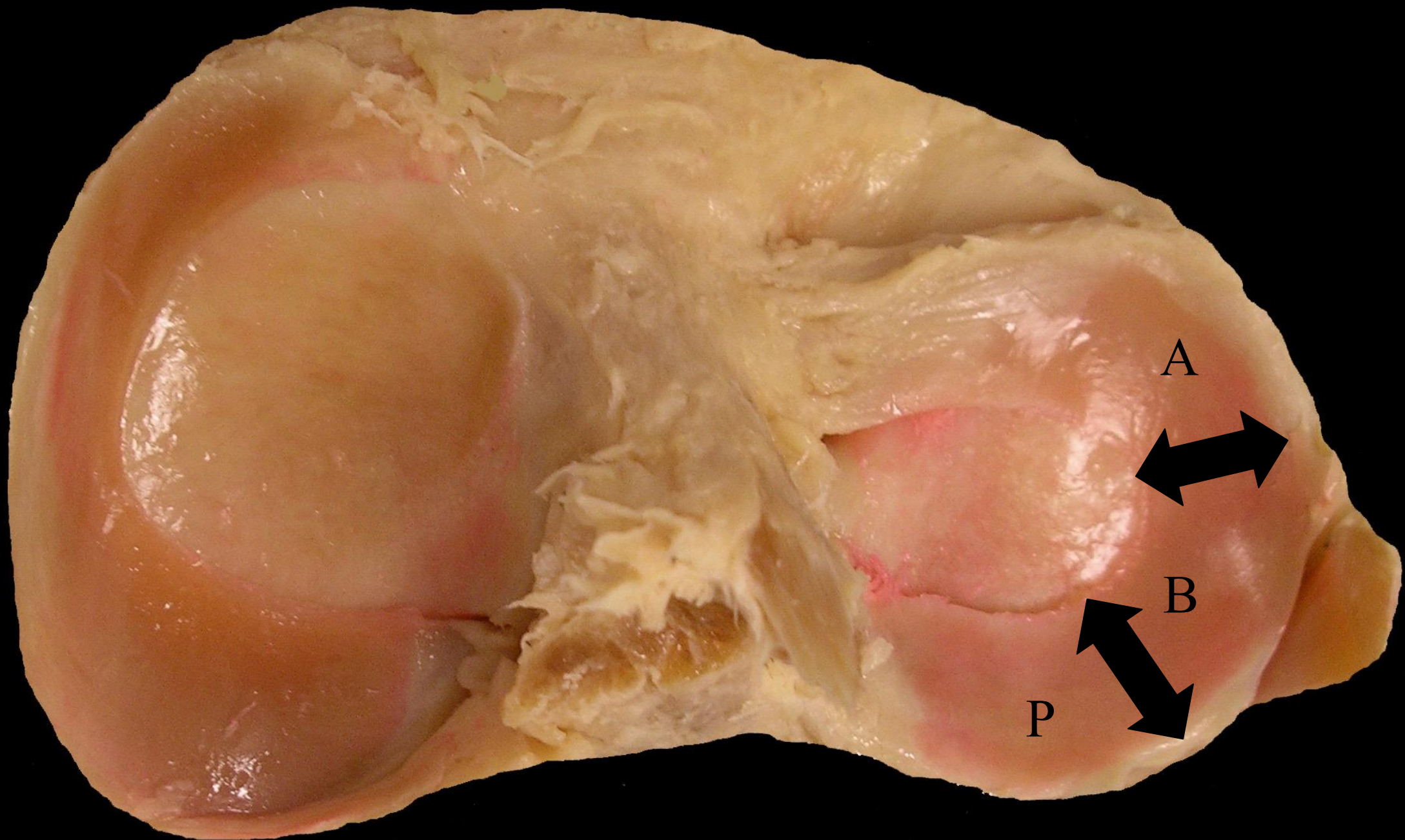
LATERAL MENISCUS NORMAL ANATOMY

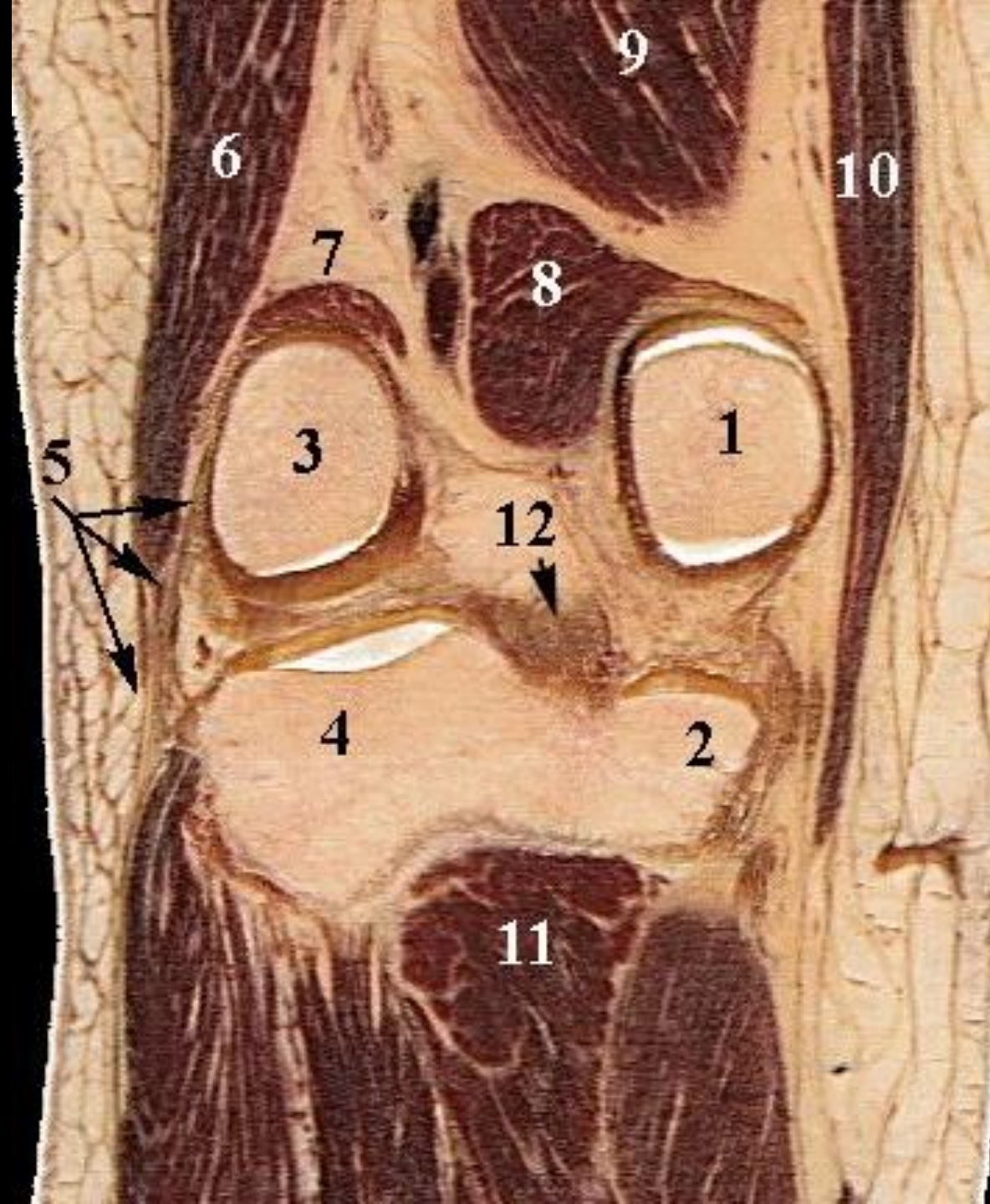
- Smaller radius of curvature or tighter “C”
- Covers 75% contact surface of tibial plateau
- Anterior, body and posterior horns
- Posterior horn equal in size to anterior
- More loosely attached to capsule and mobile
 - Popliteal tendon
 - Meniscal fascicles

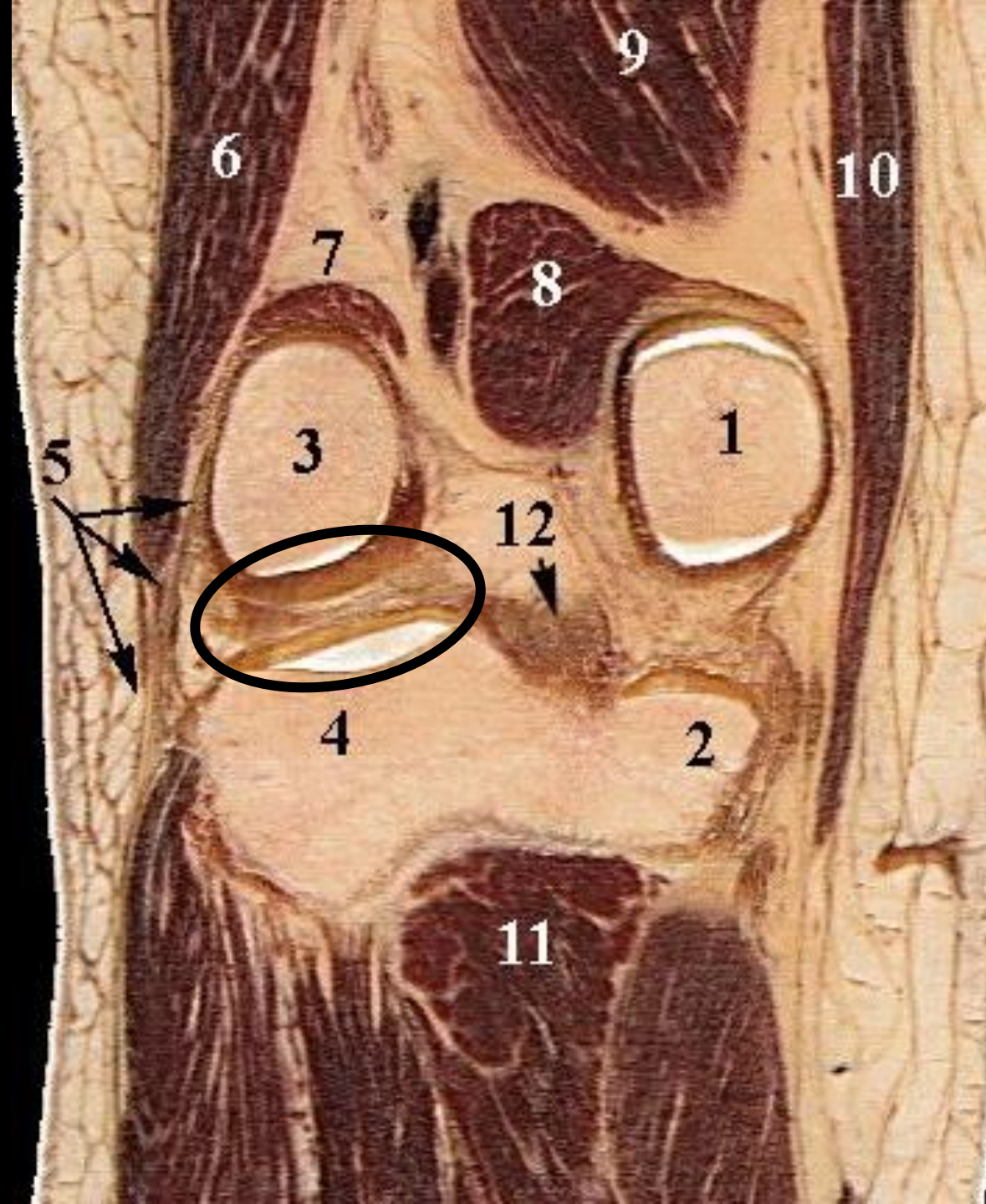


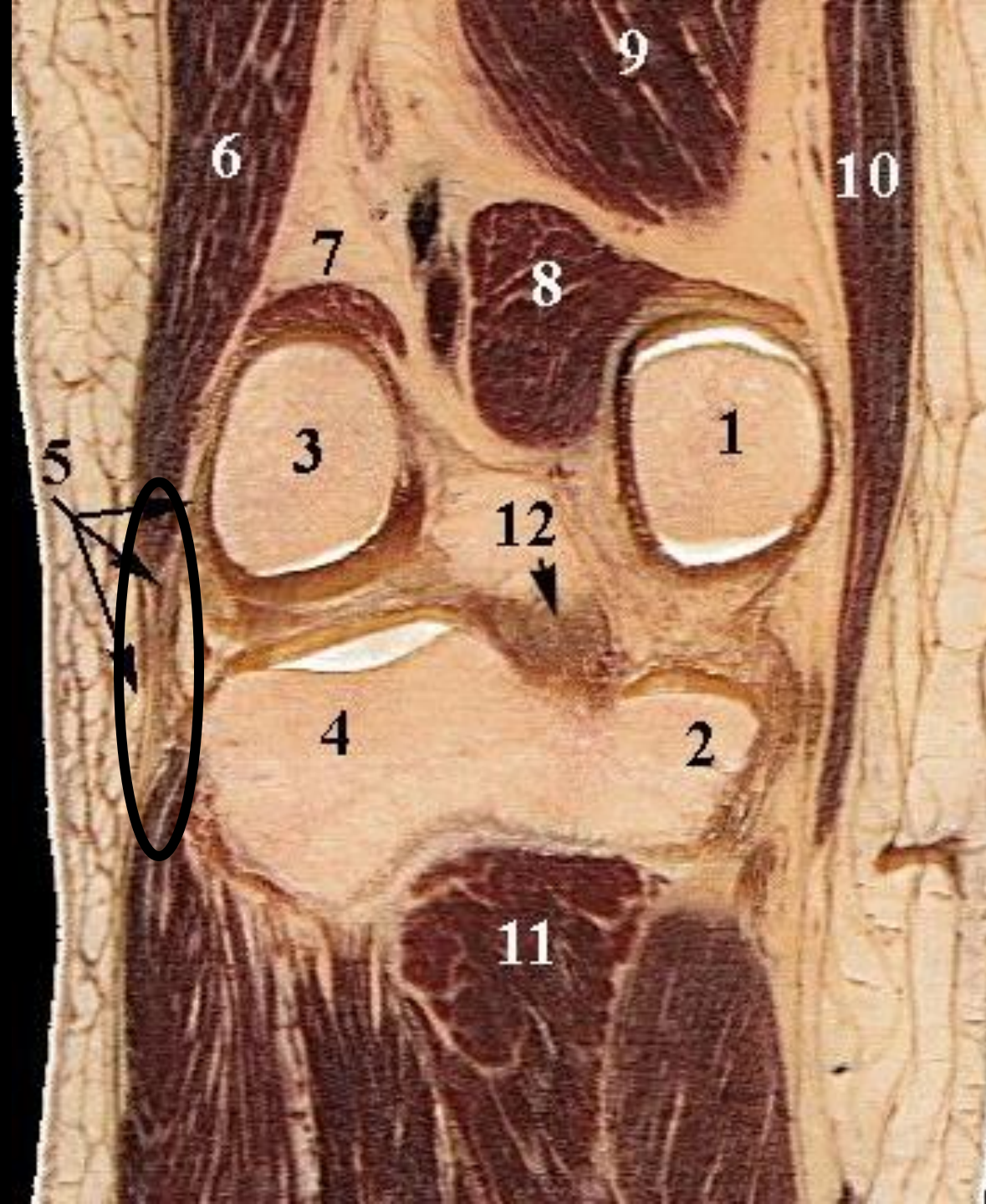


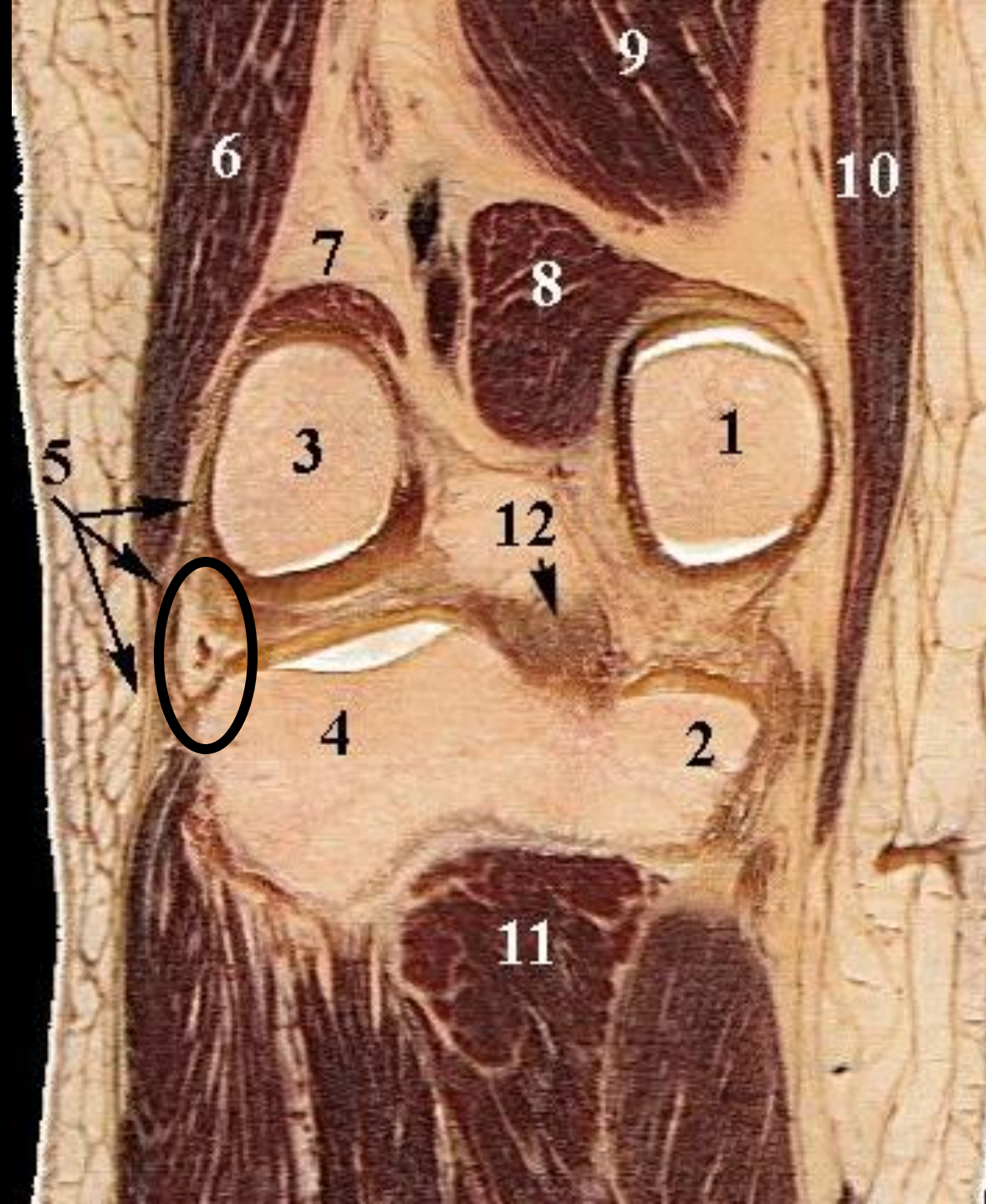






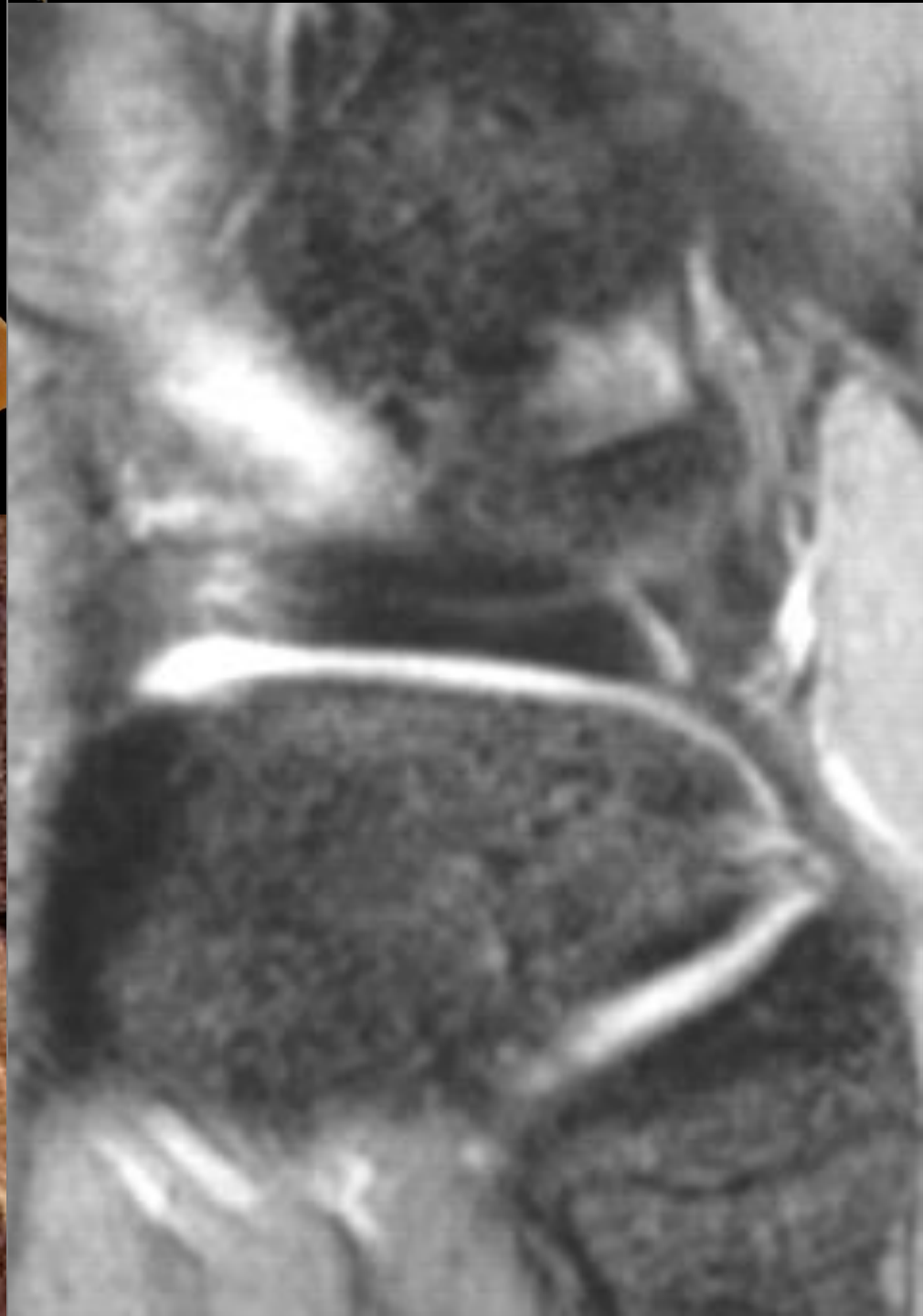
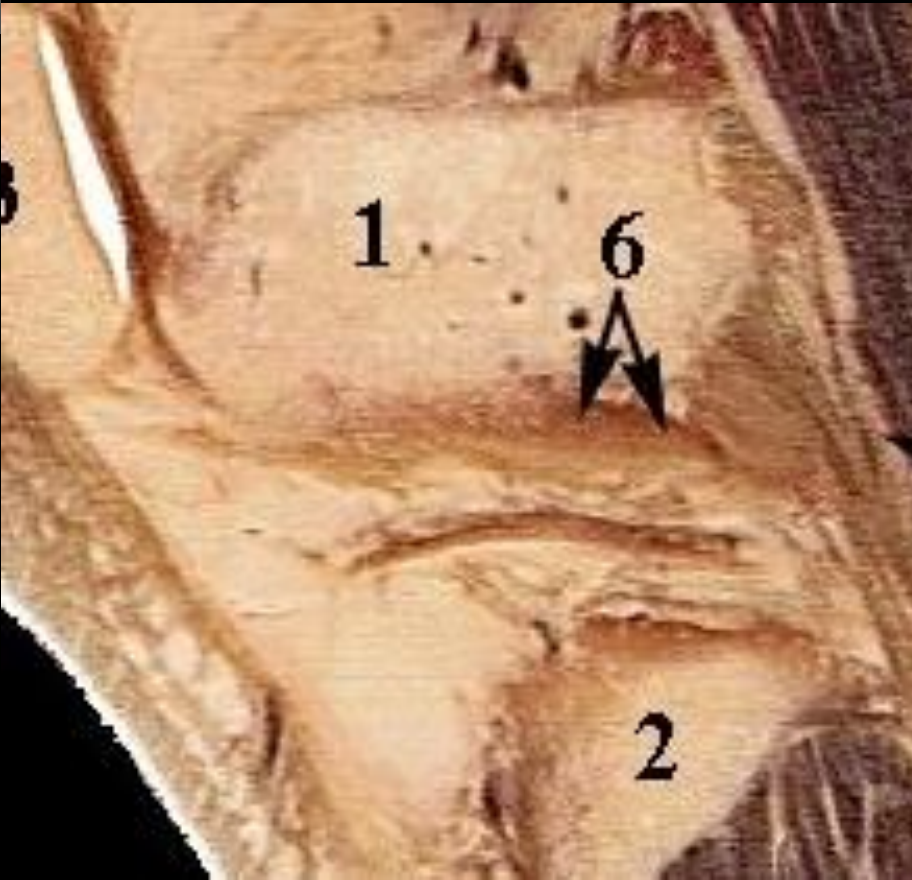


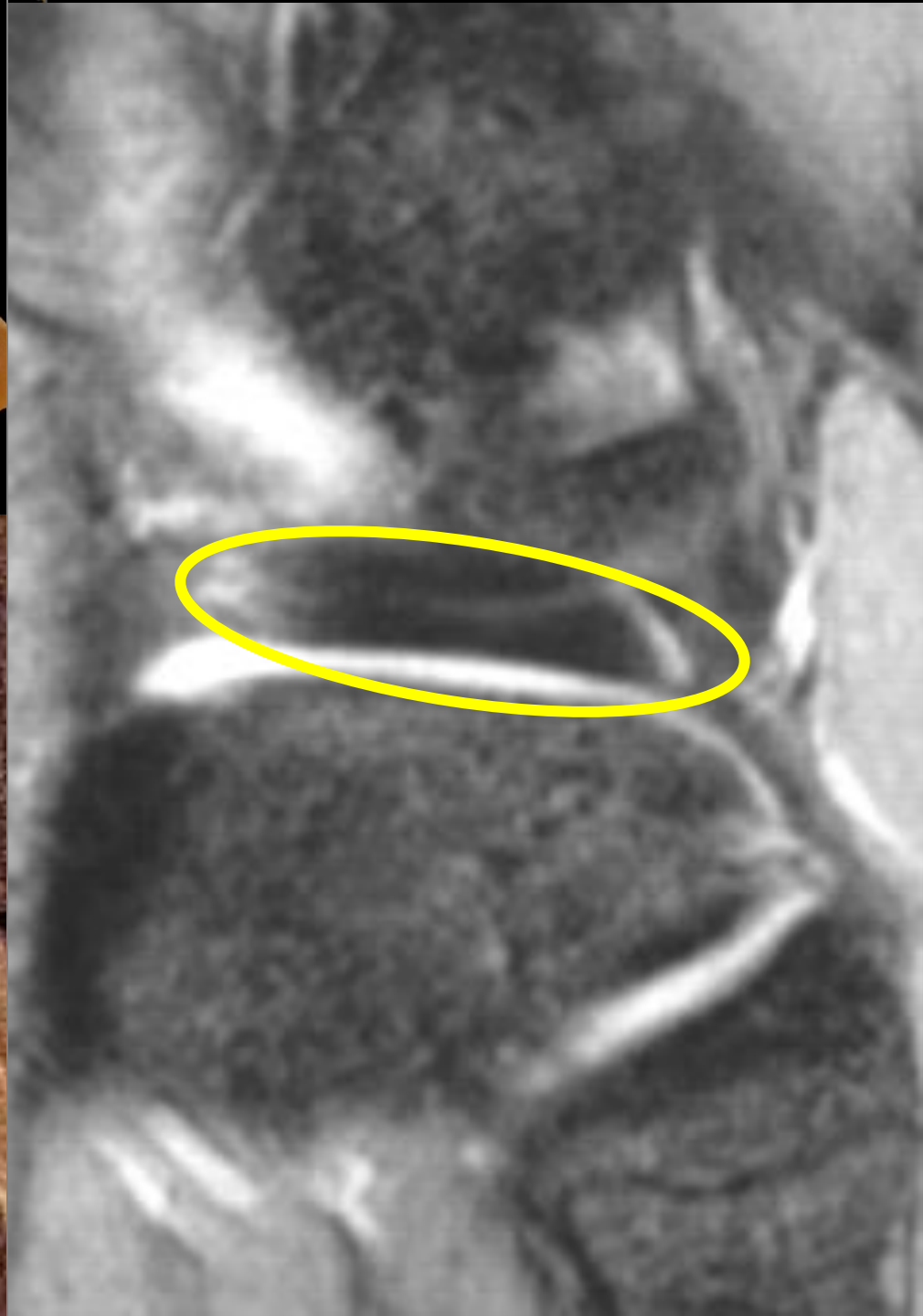
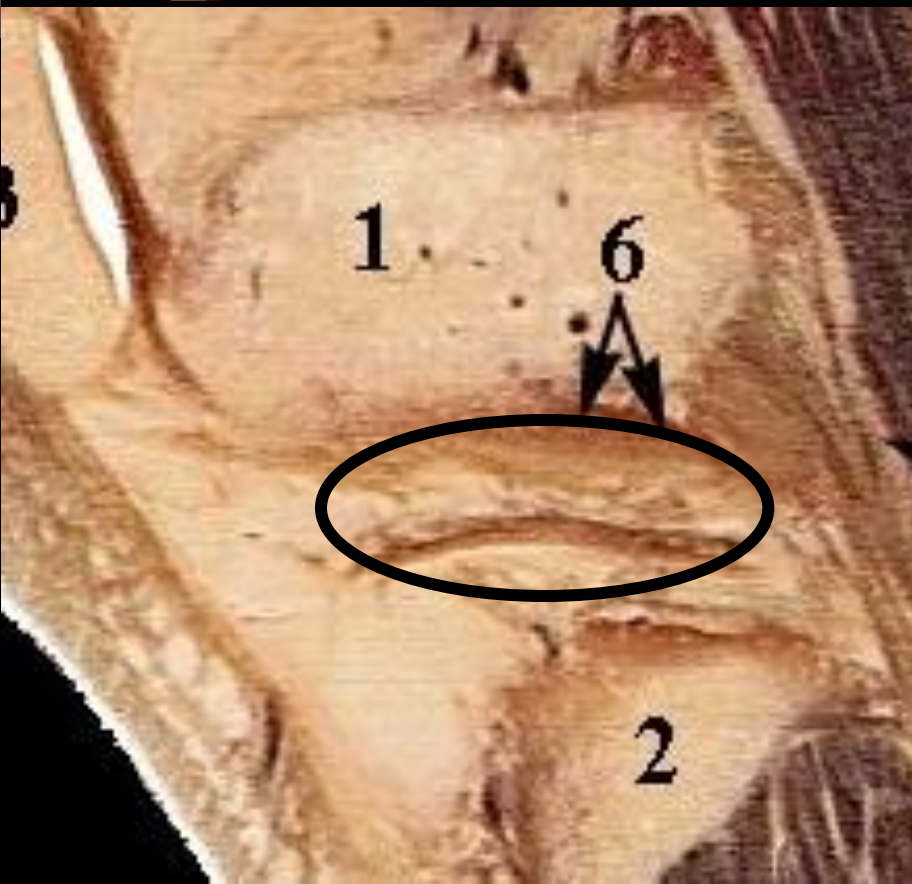


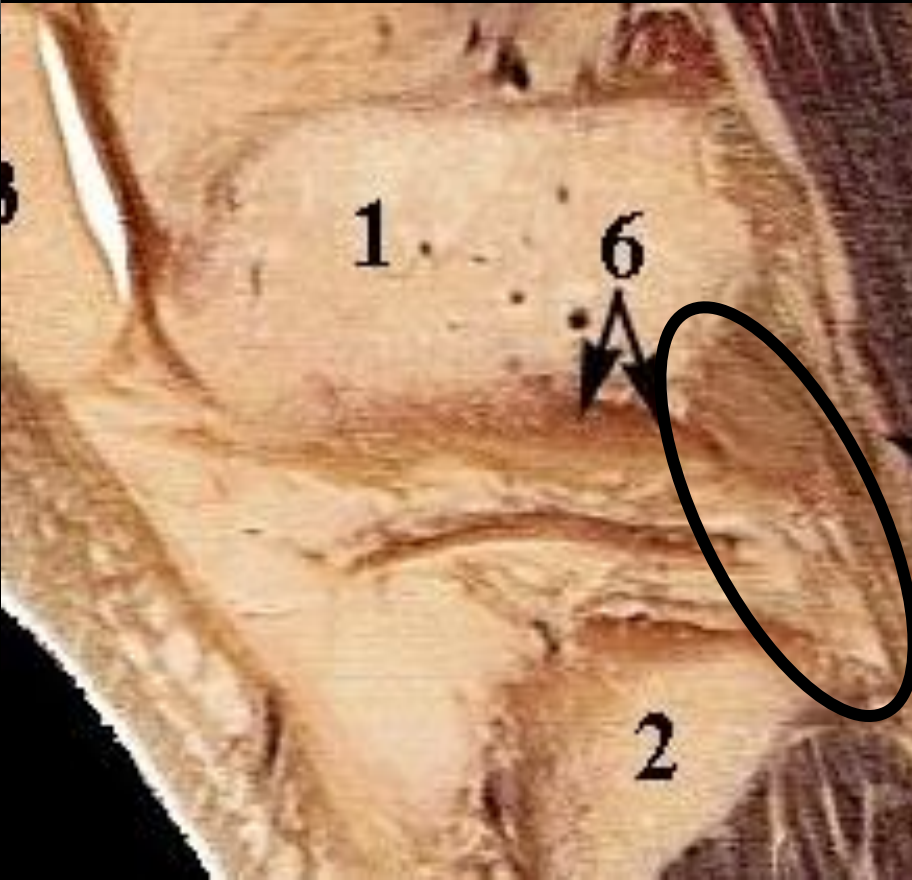


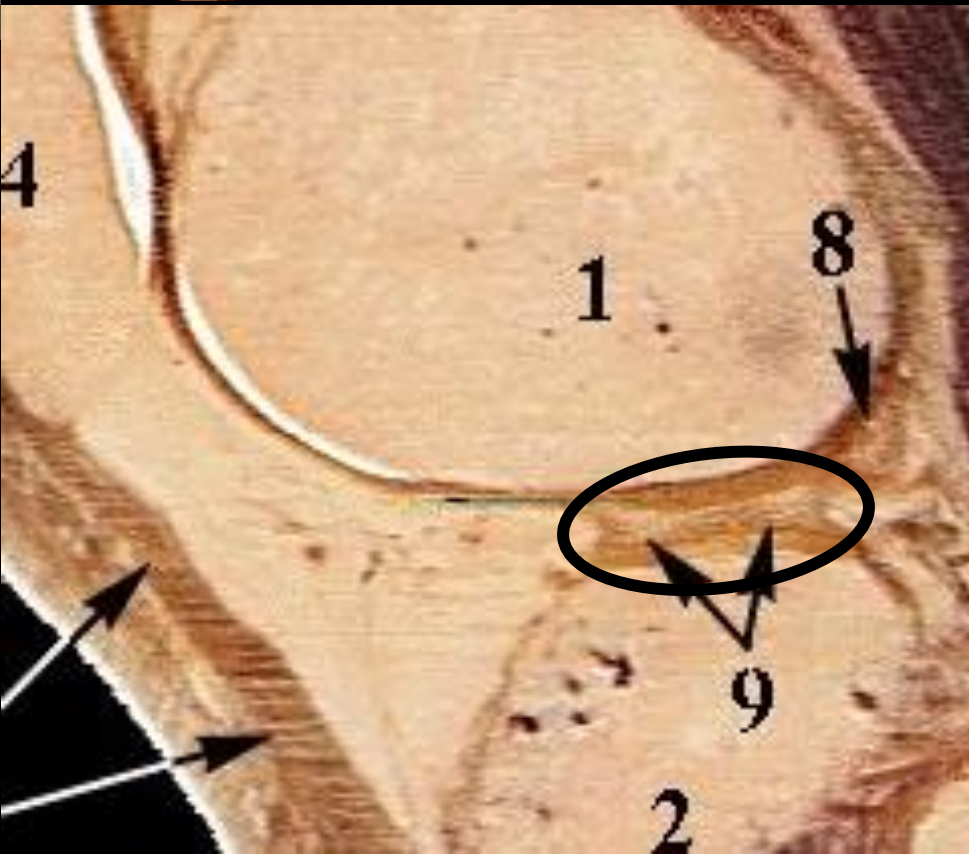
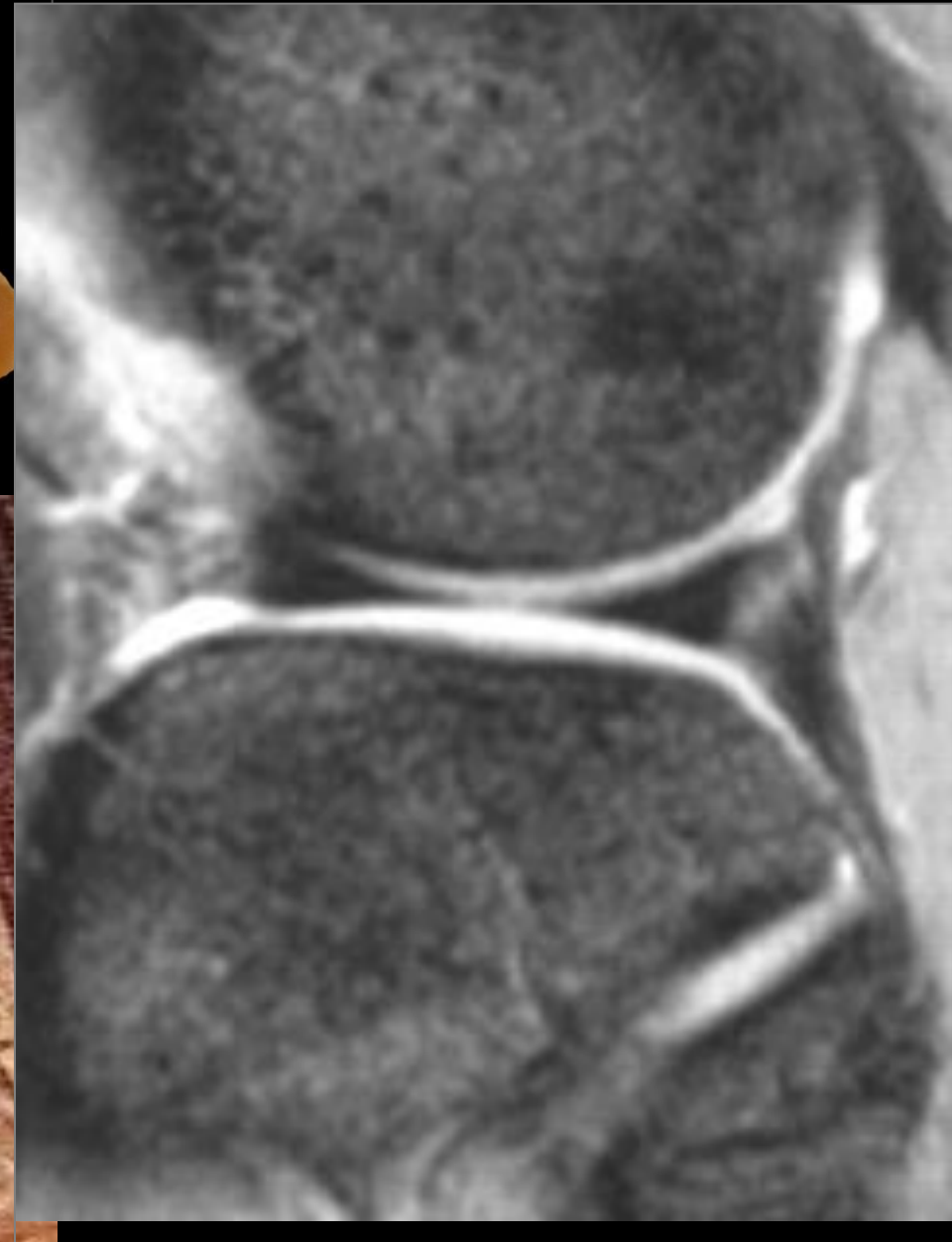
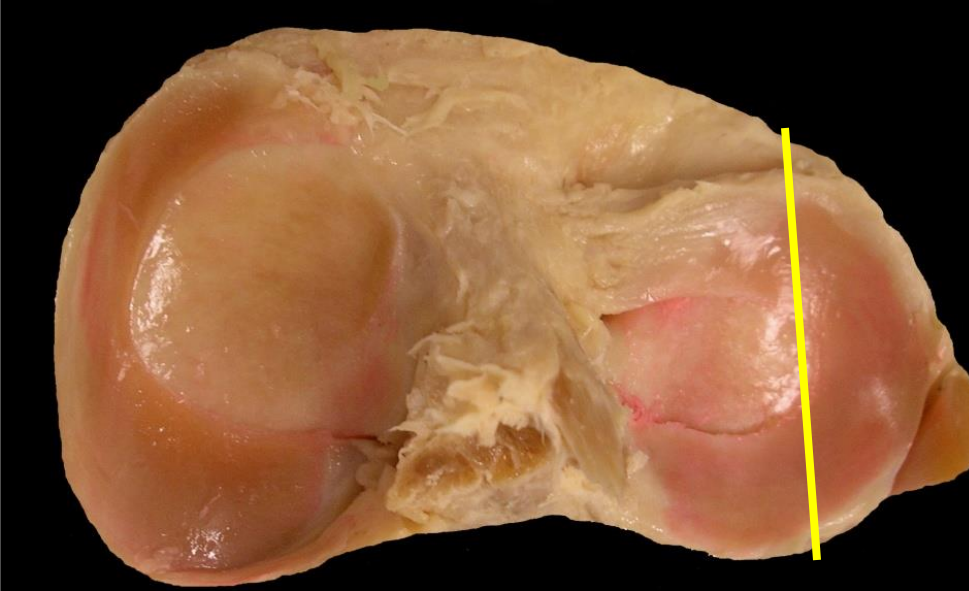
LATERAL MENISCUS NORMAL SAGITTAL MR IMAGING

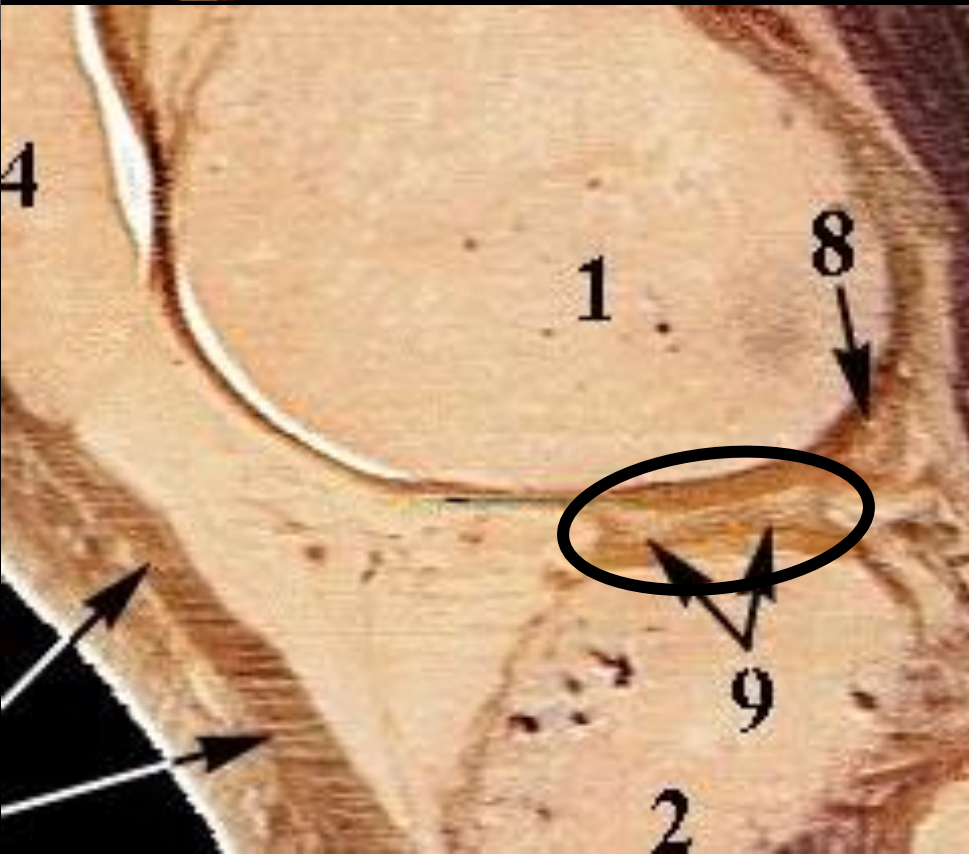
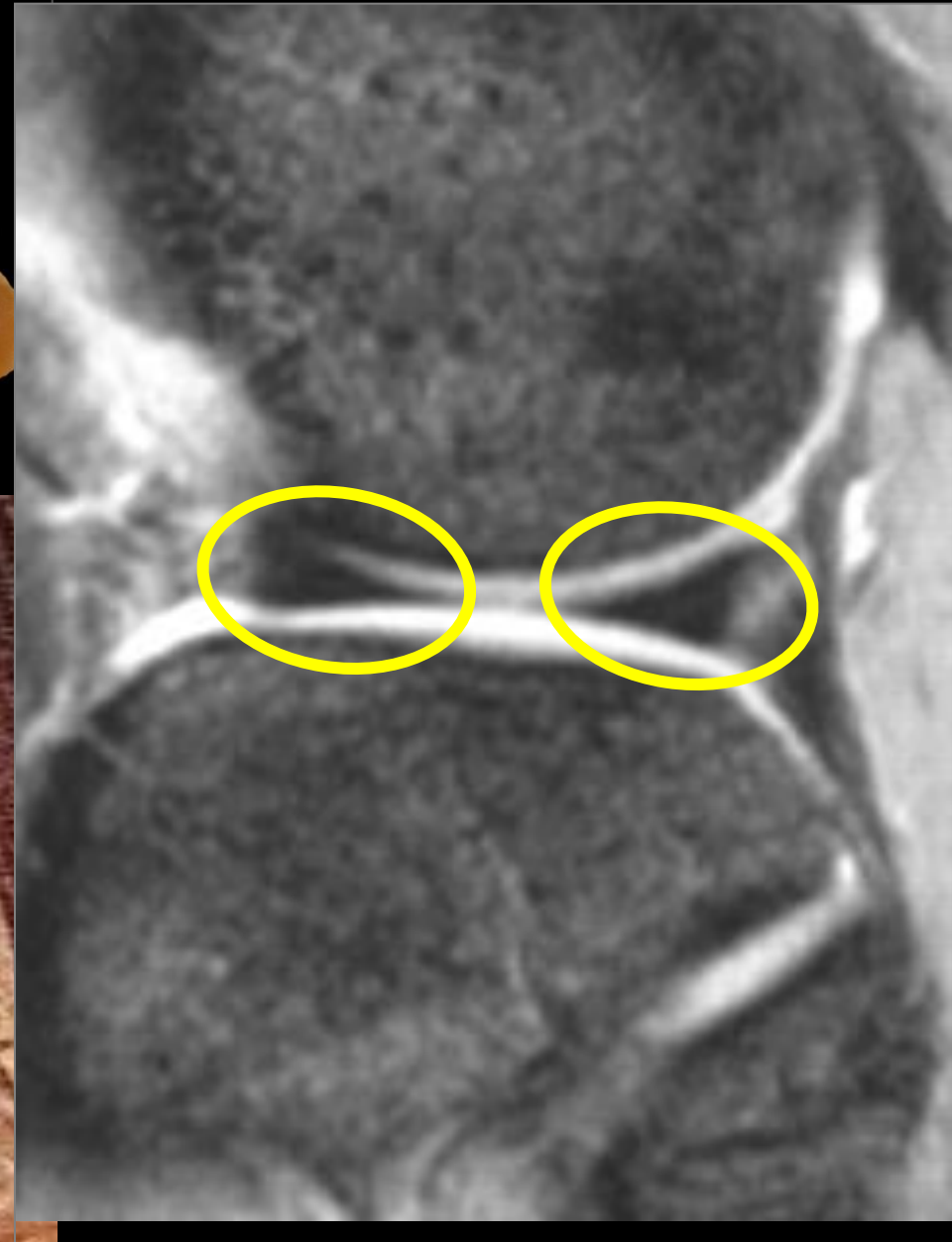
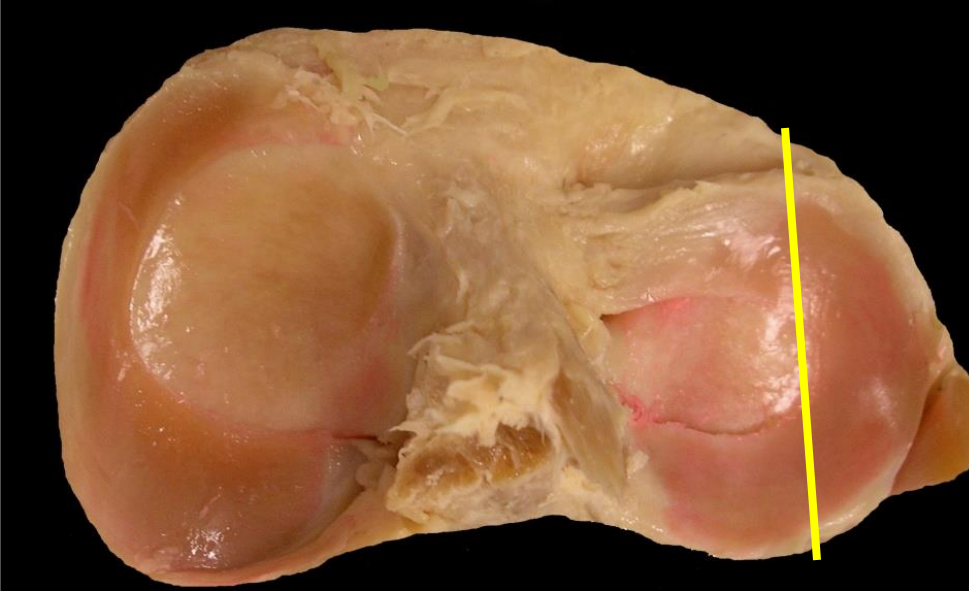
- Low signal intensity sideways triangles
- Same sized anterior and posterior horns
- No more than 2 bow ties
- Meniscus not attached to capsule
 - Popliteus tendon/ hiatus
 - Superior and inferior fascicles
- No surfacing intermediate or high signal

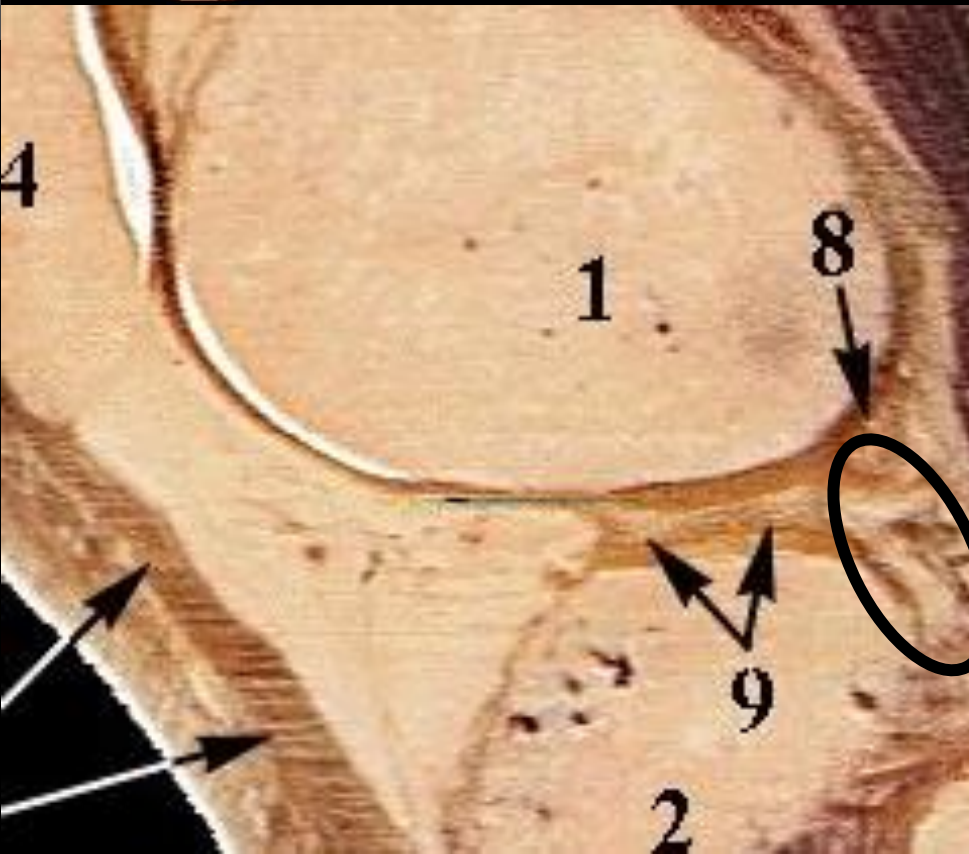
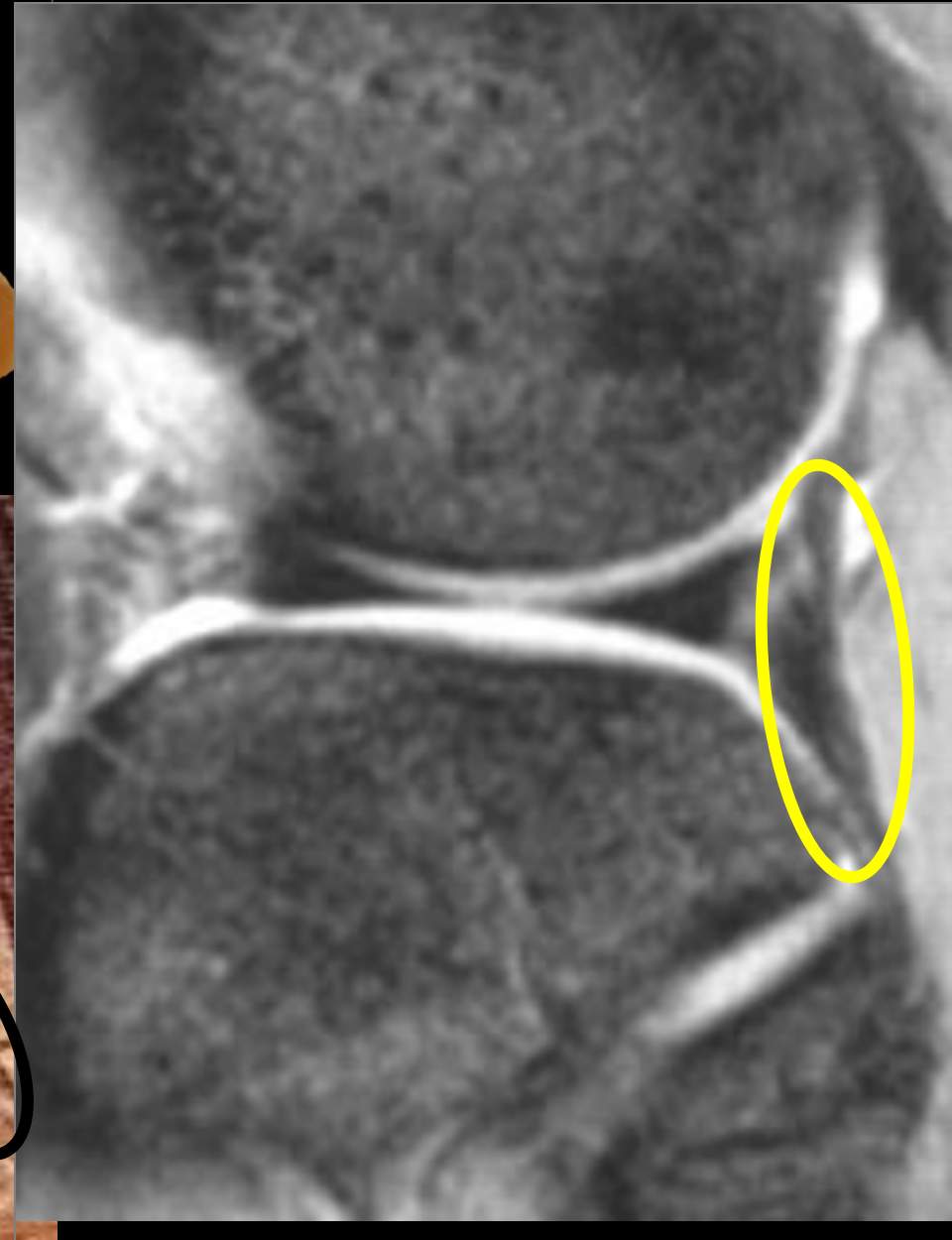


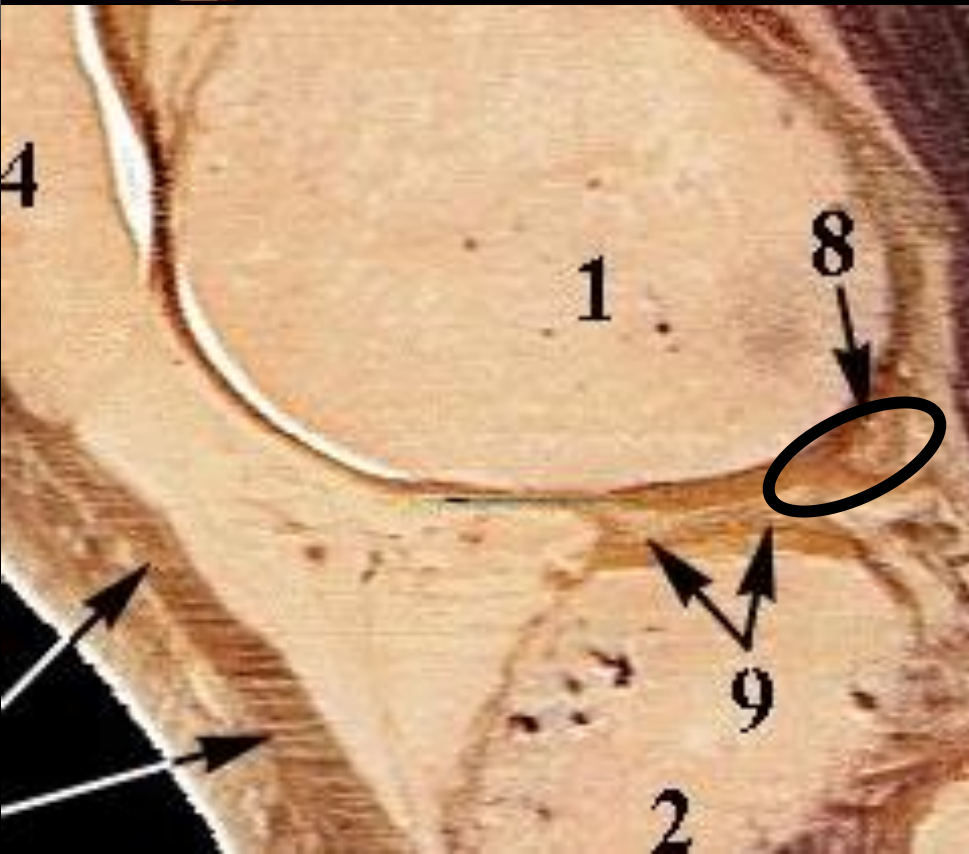
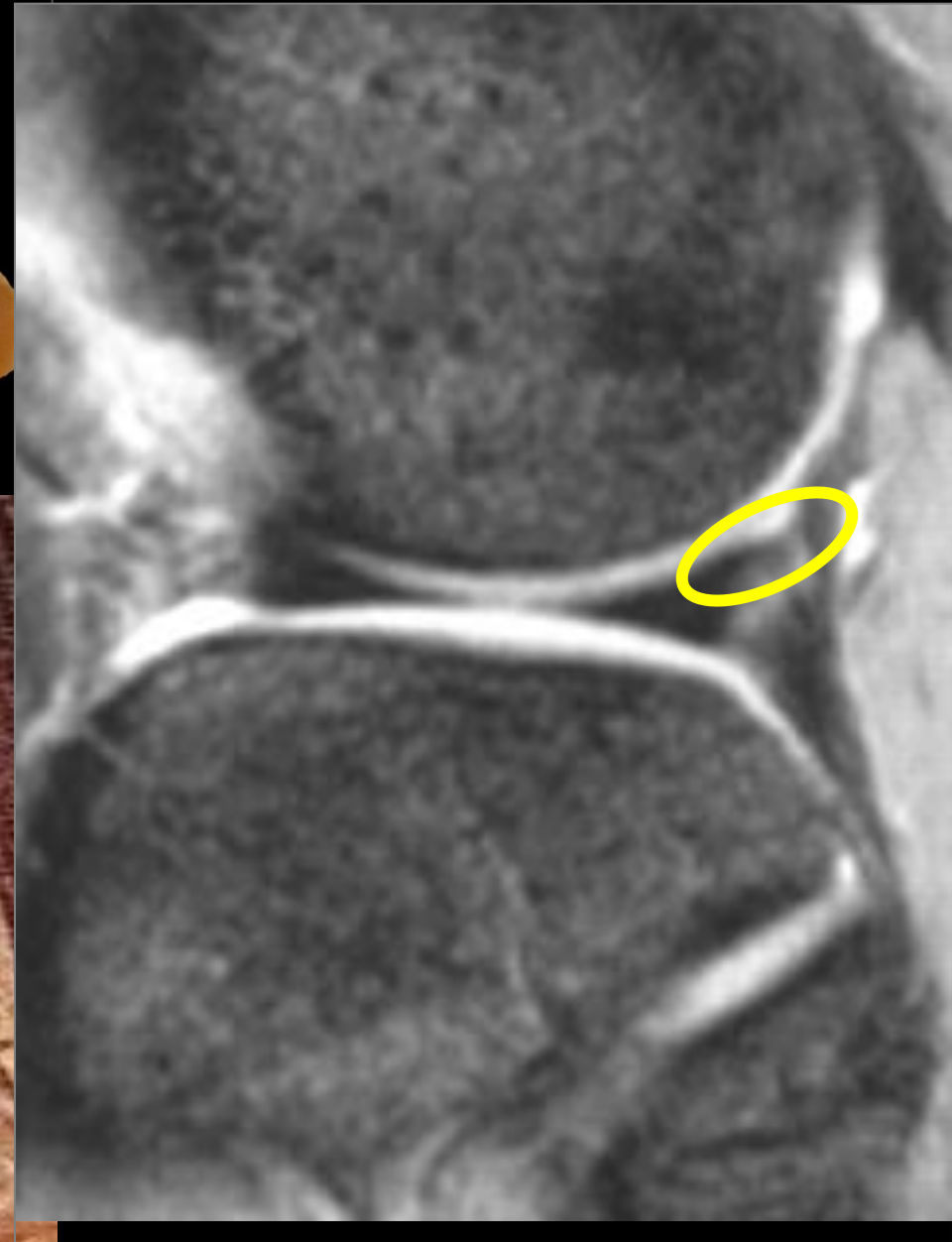
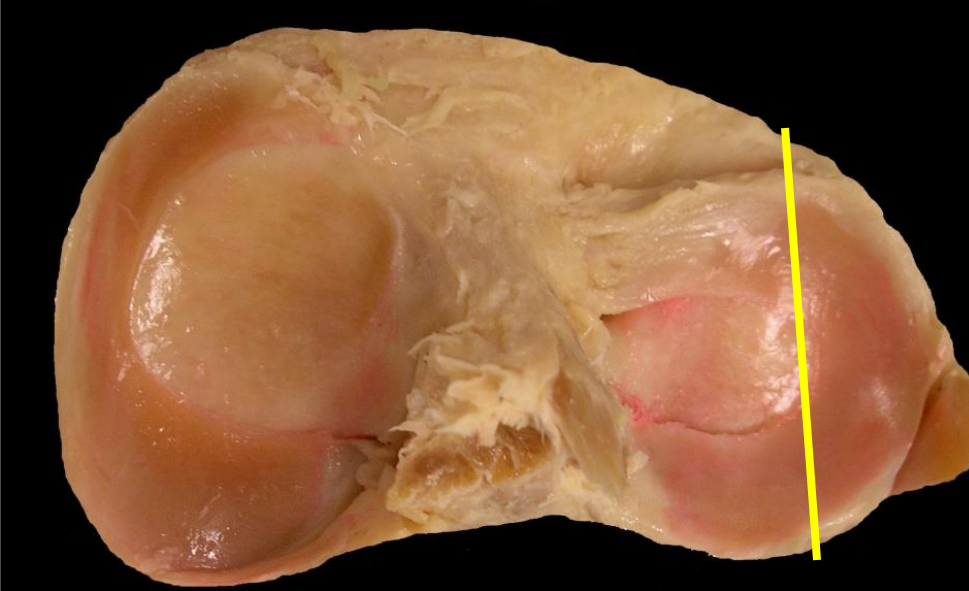


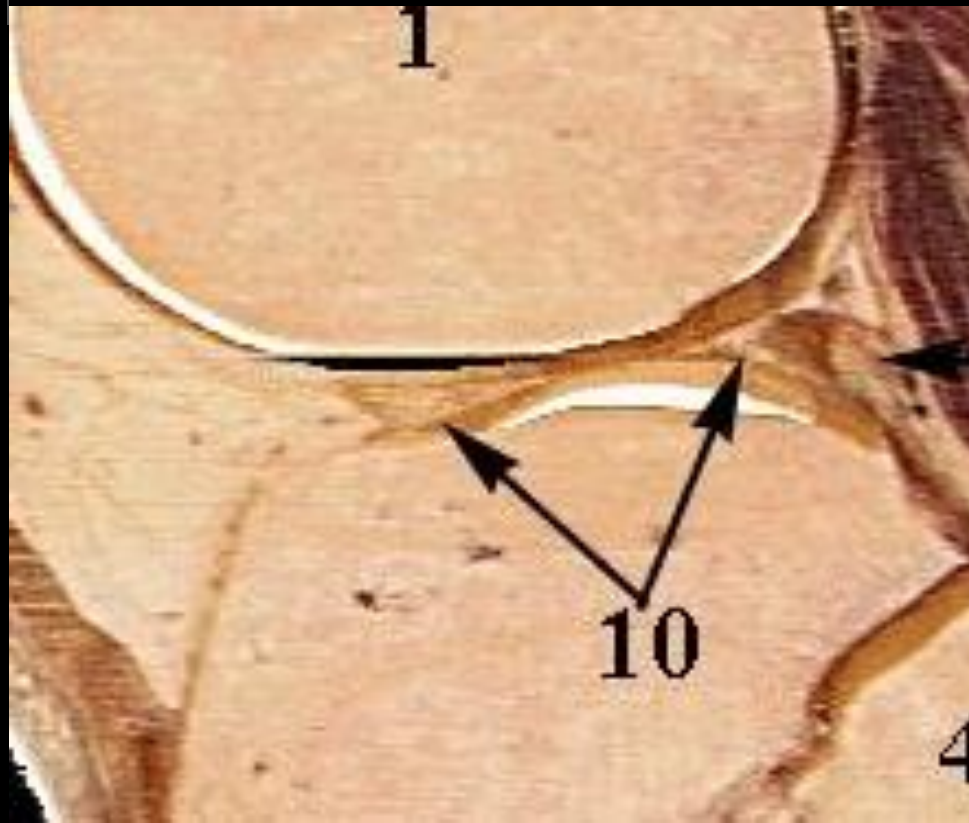
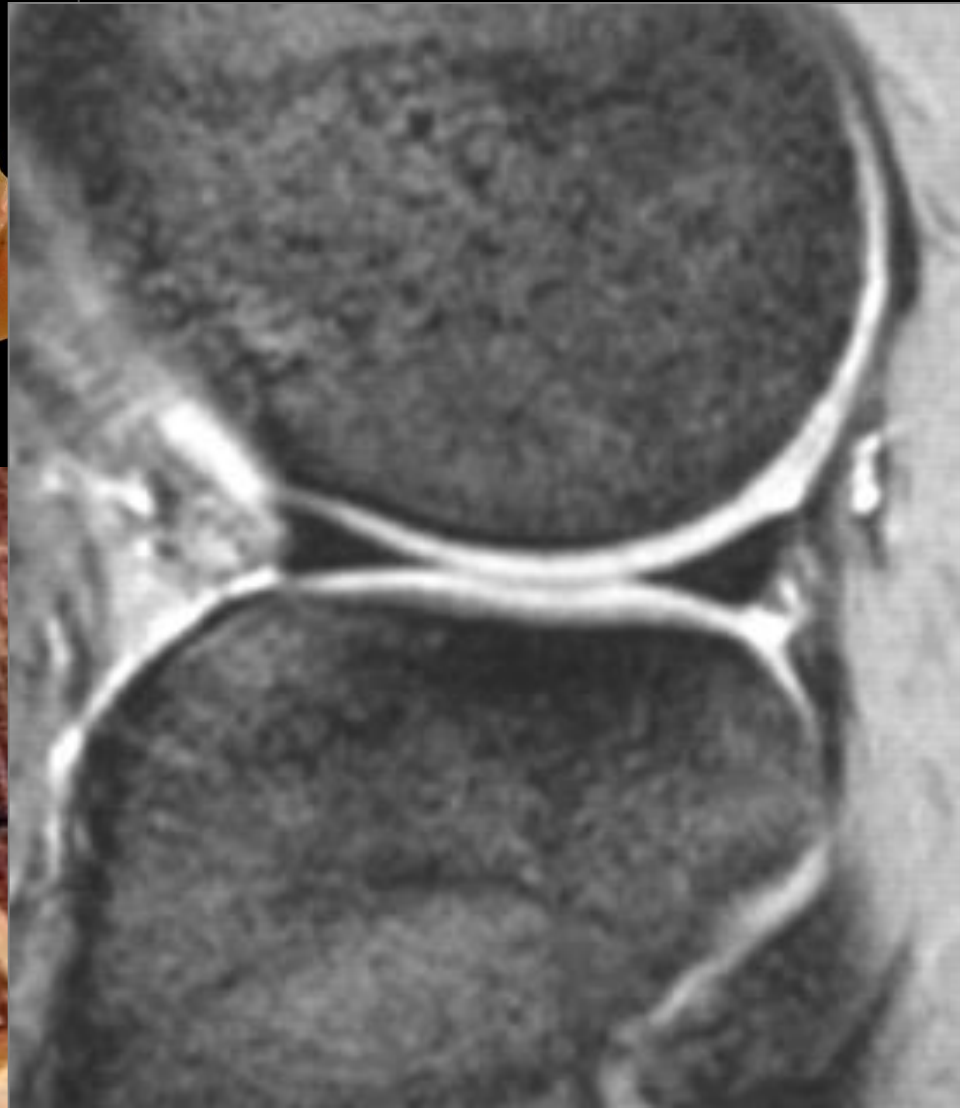
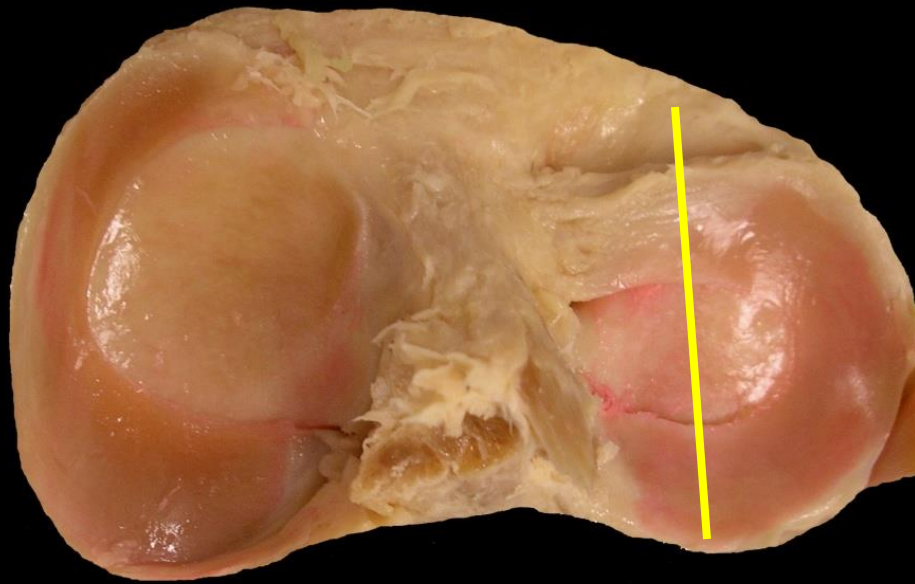


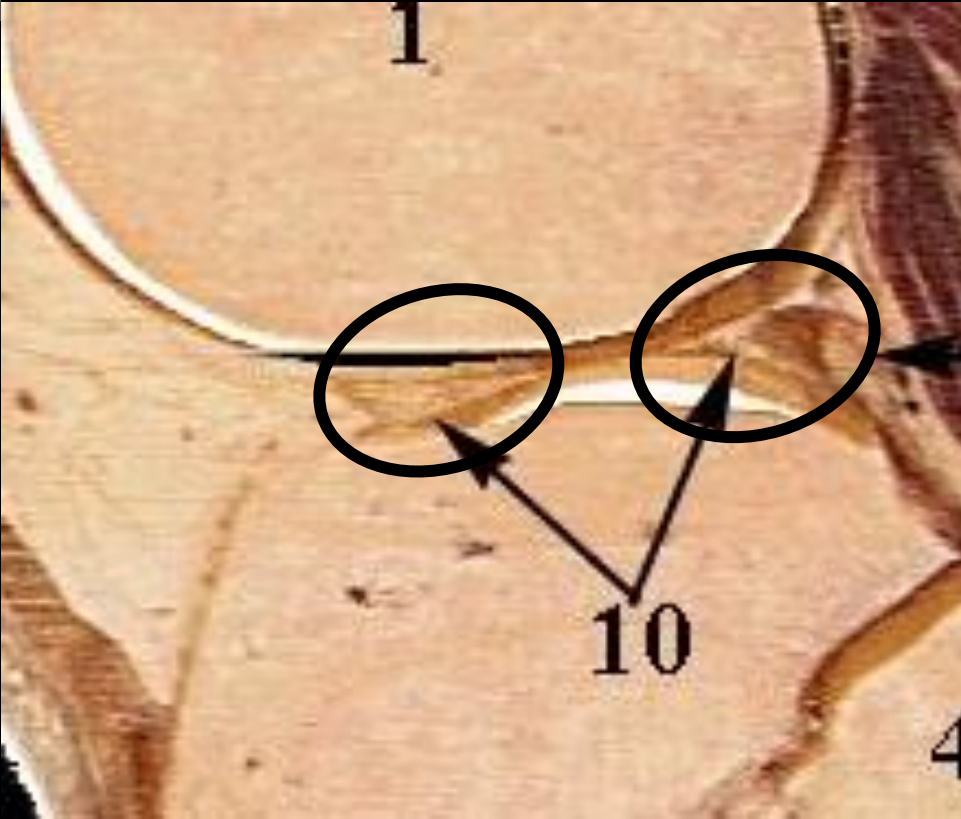
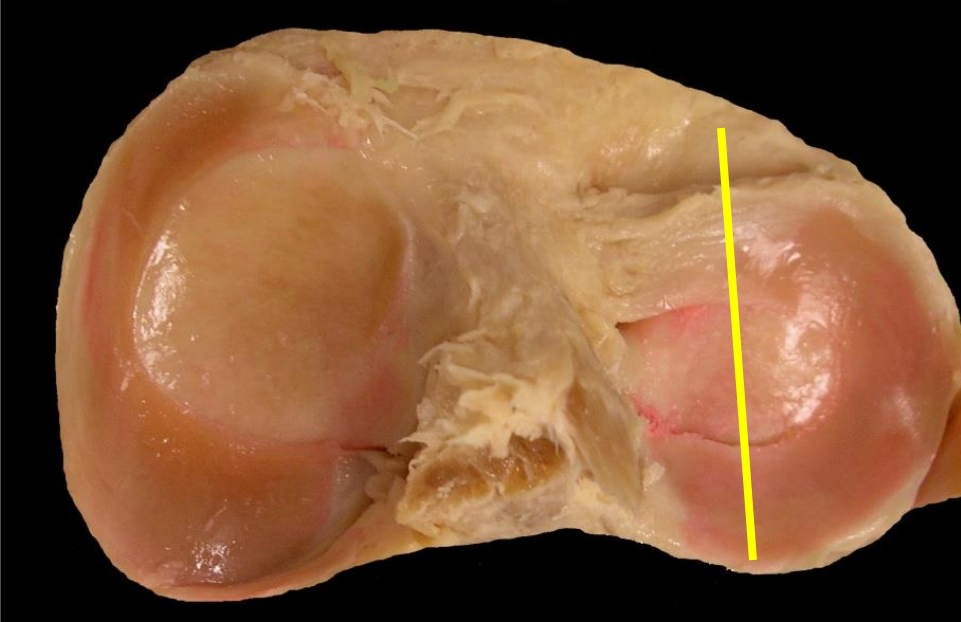


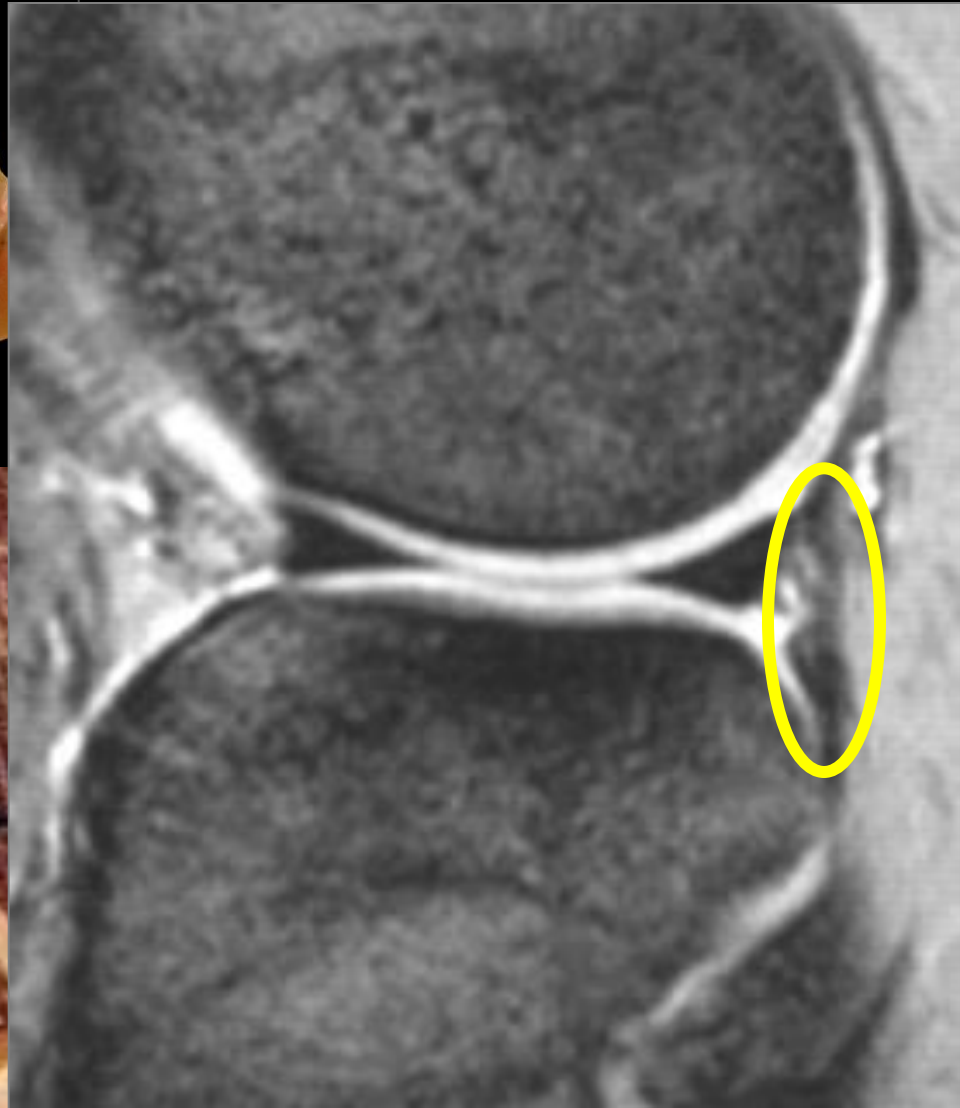
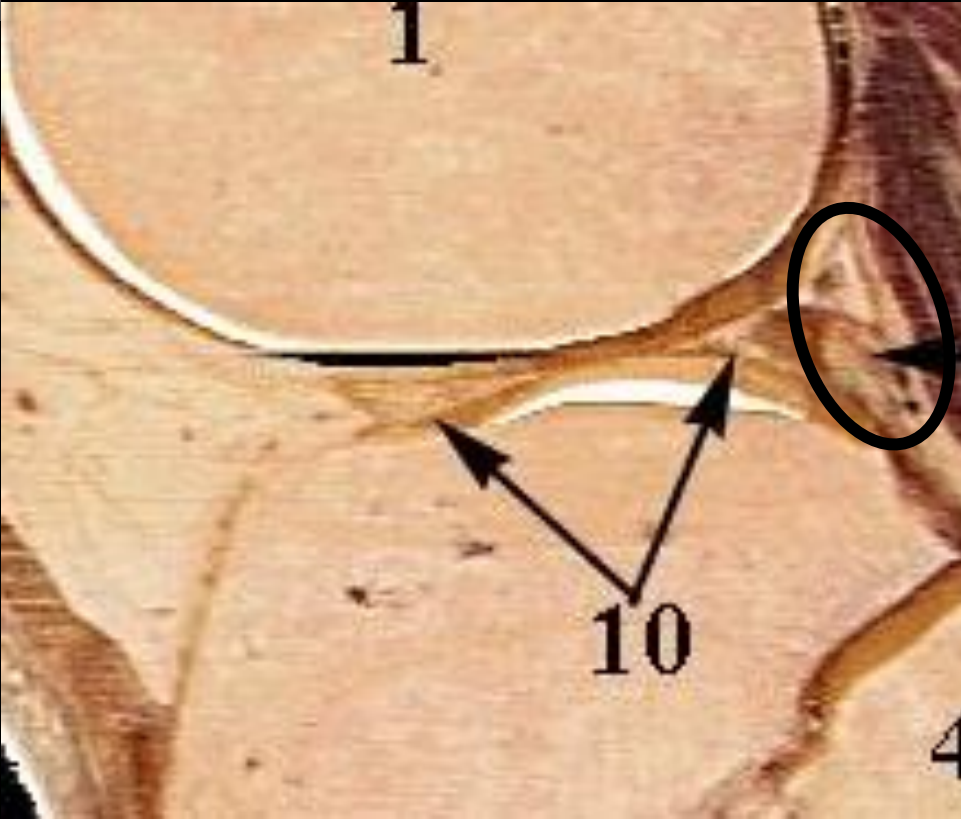
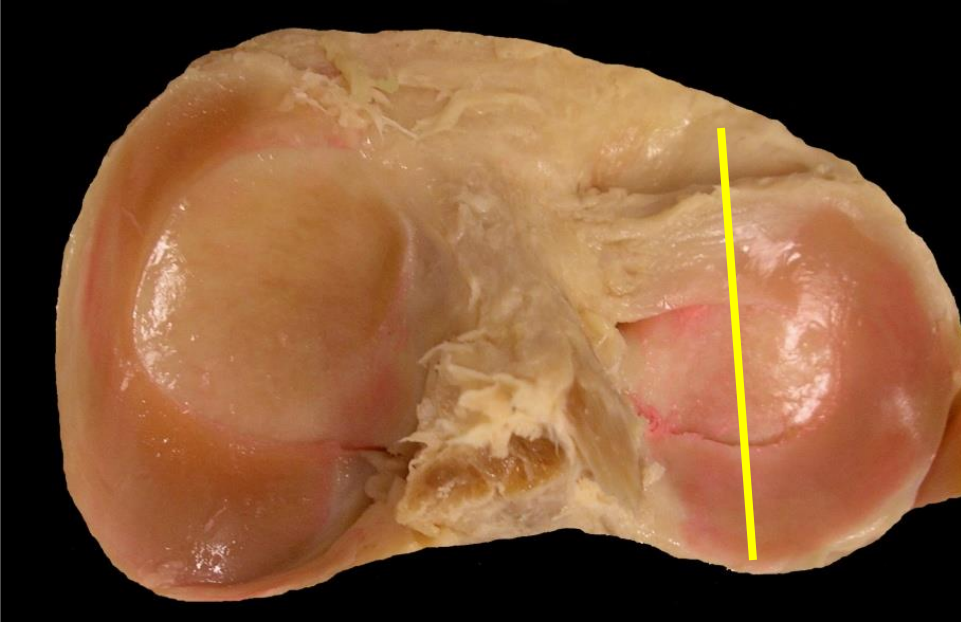


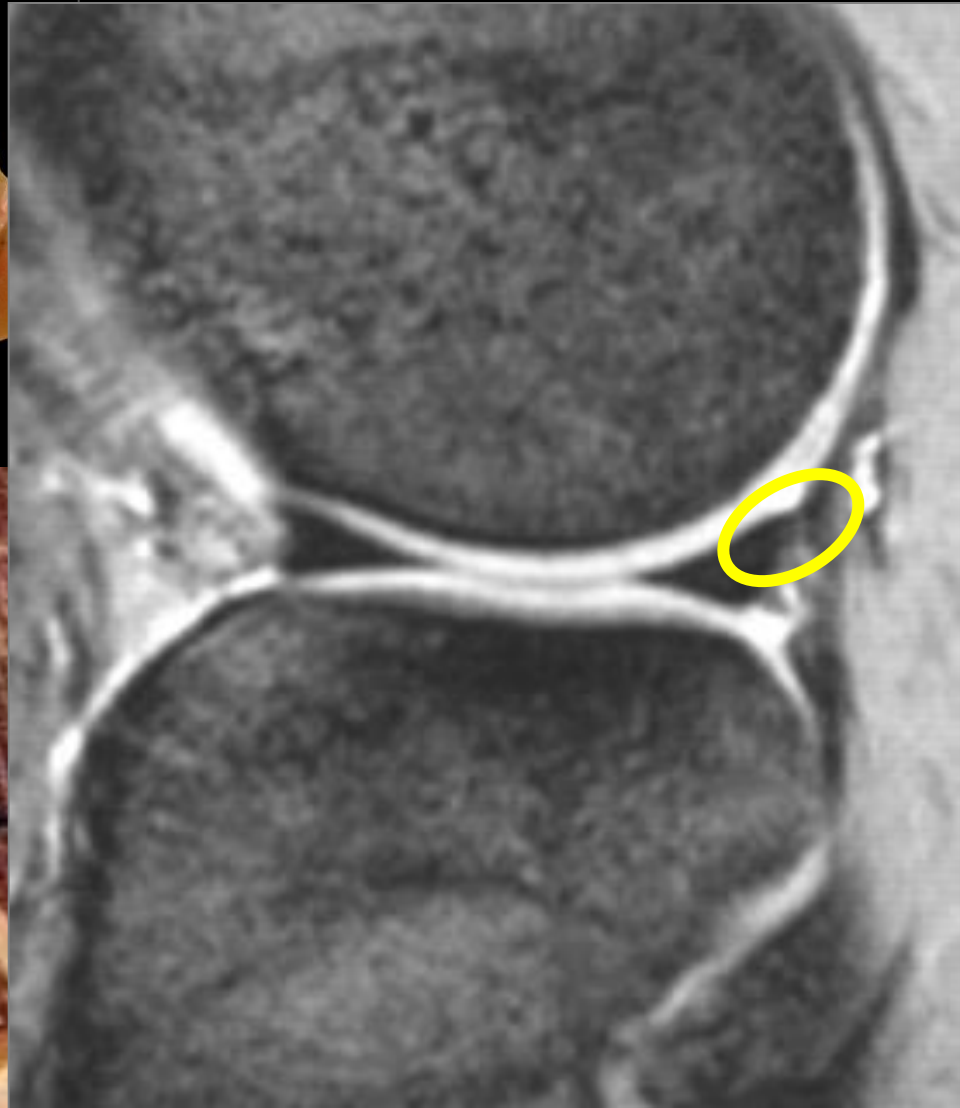
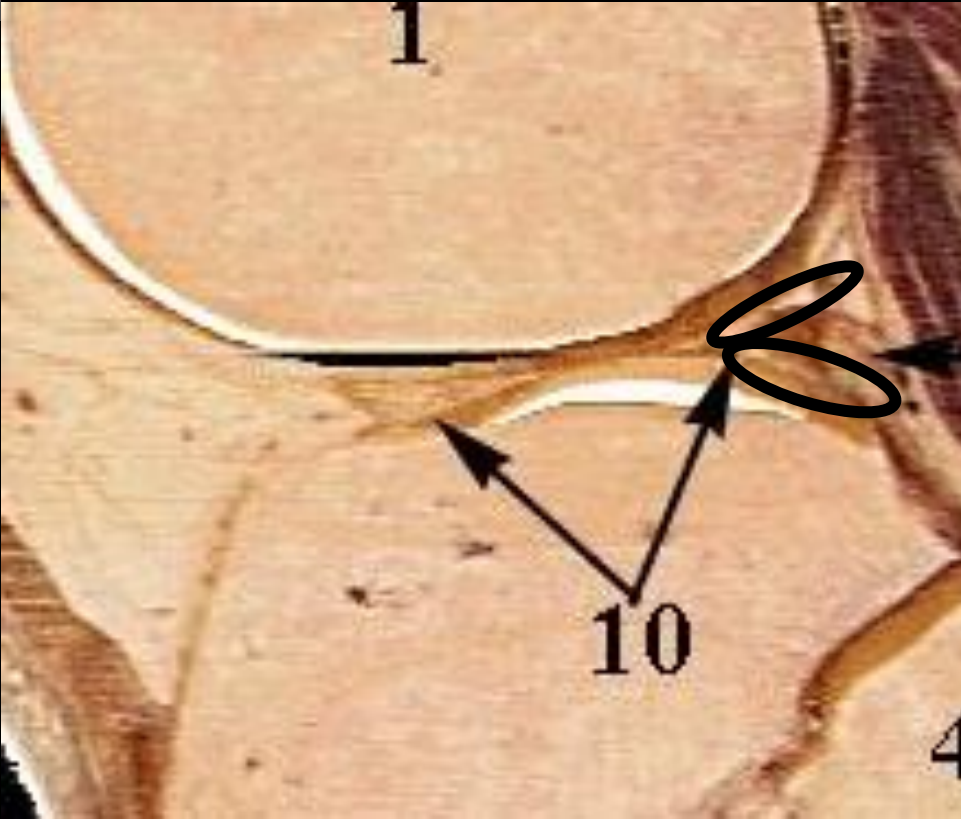
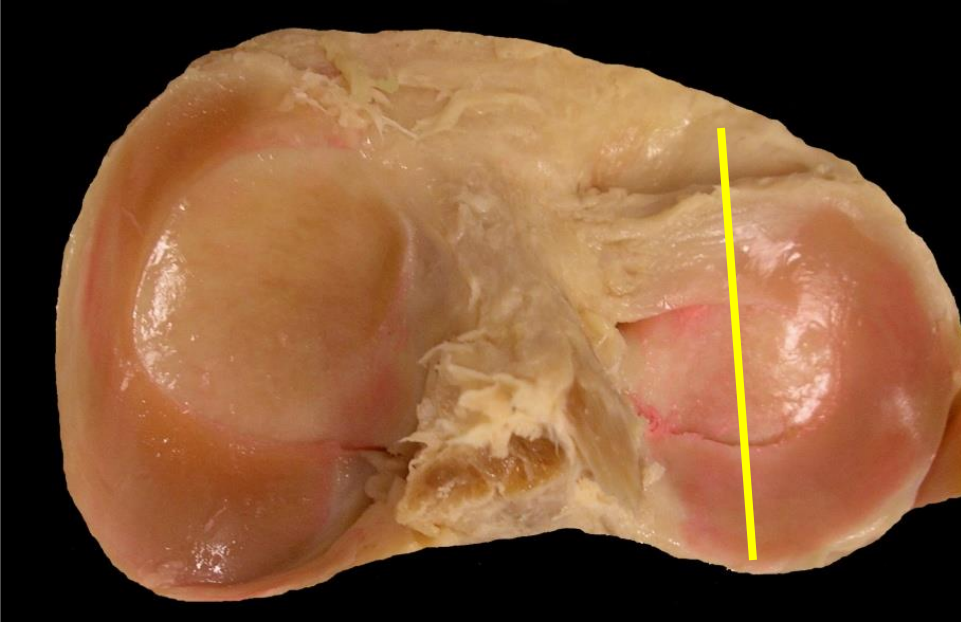


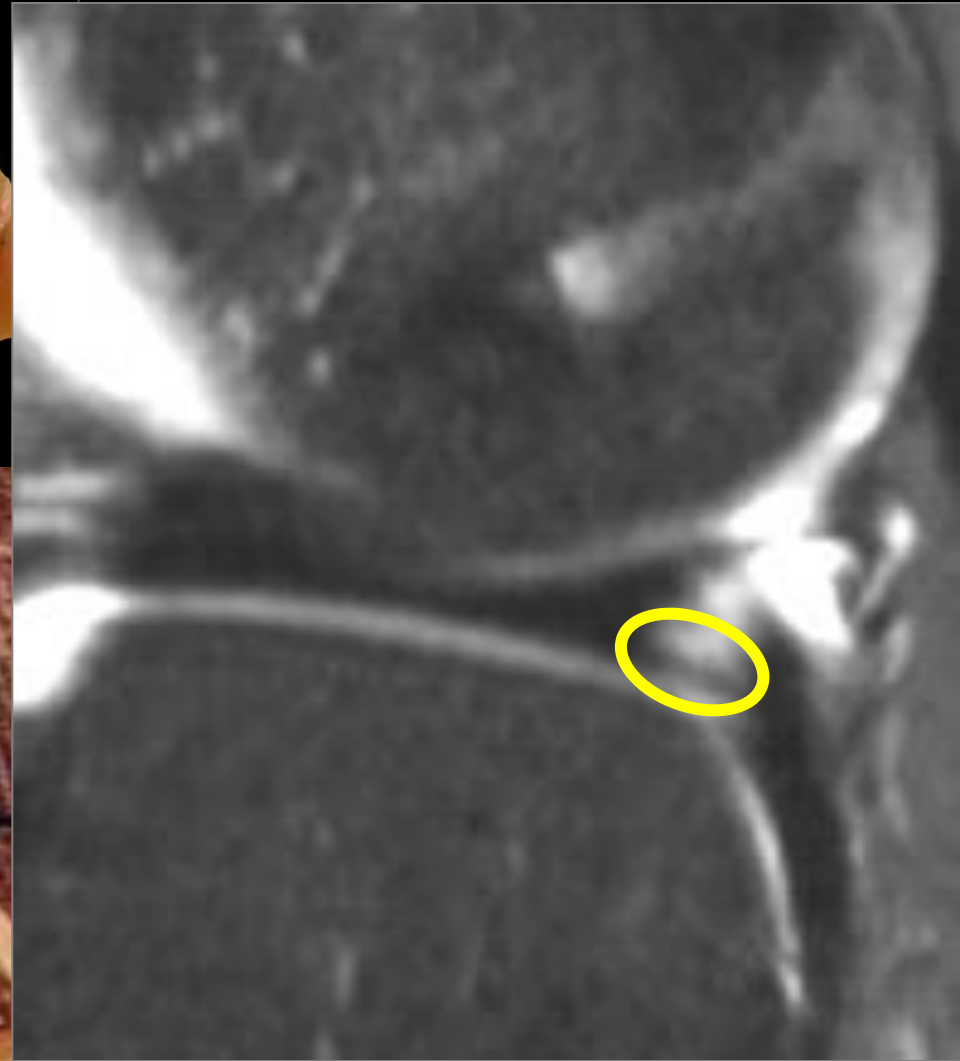
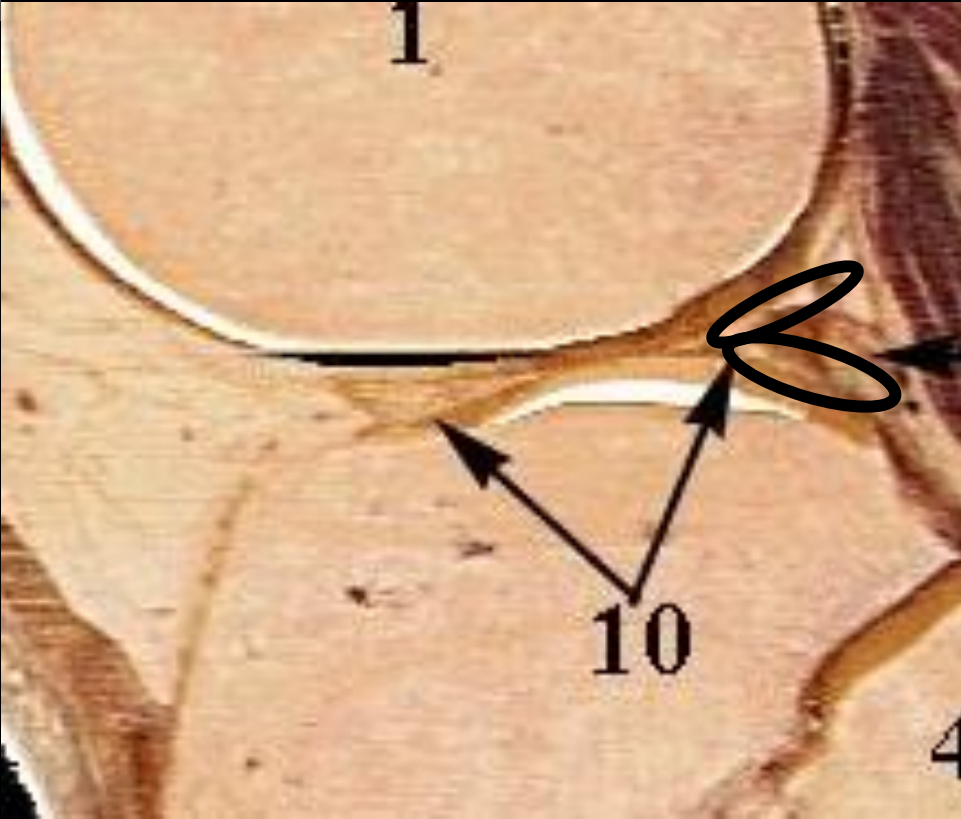
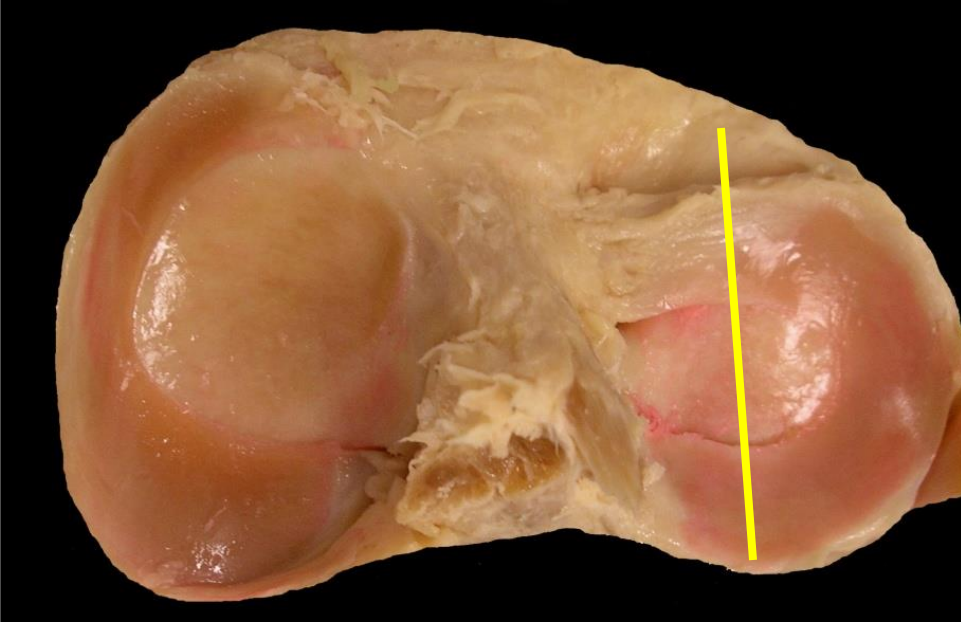








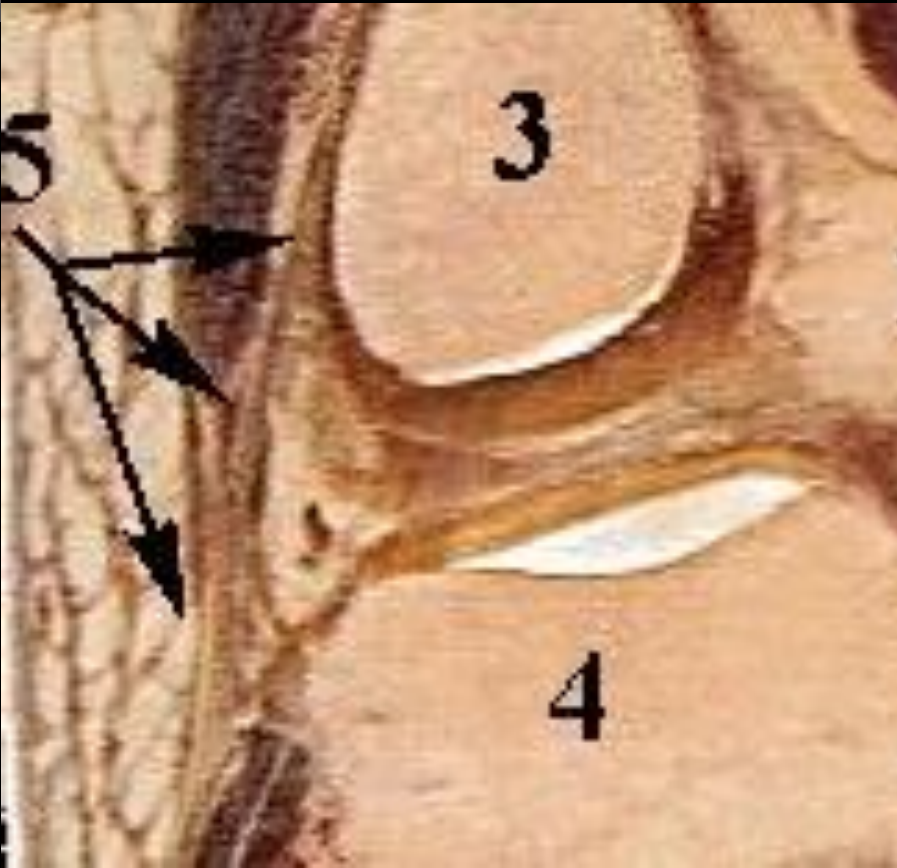
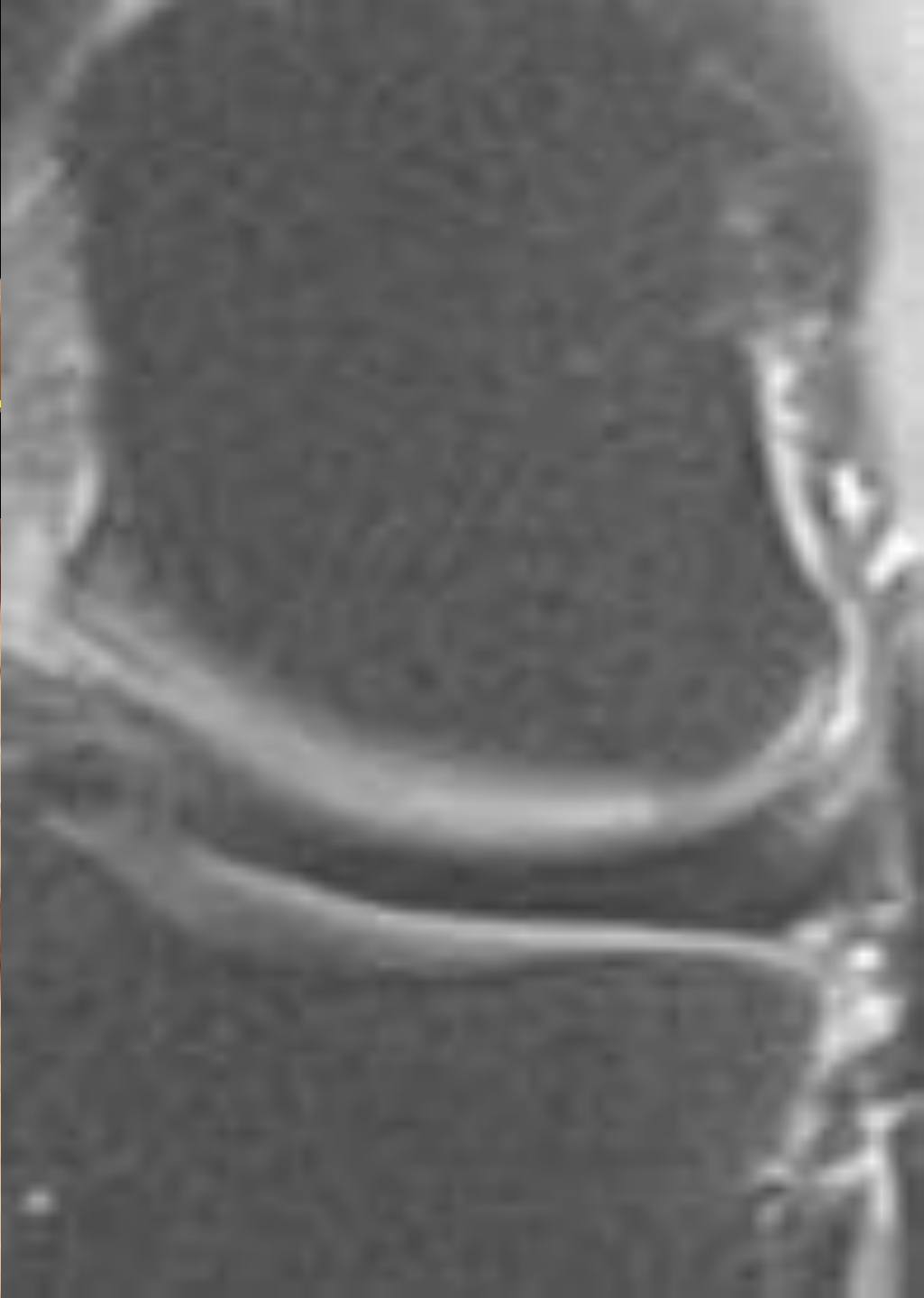
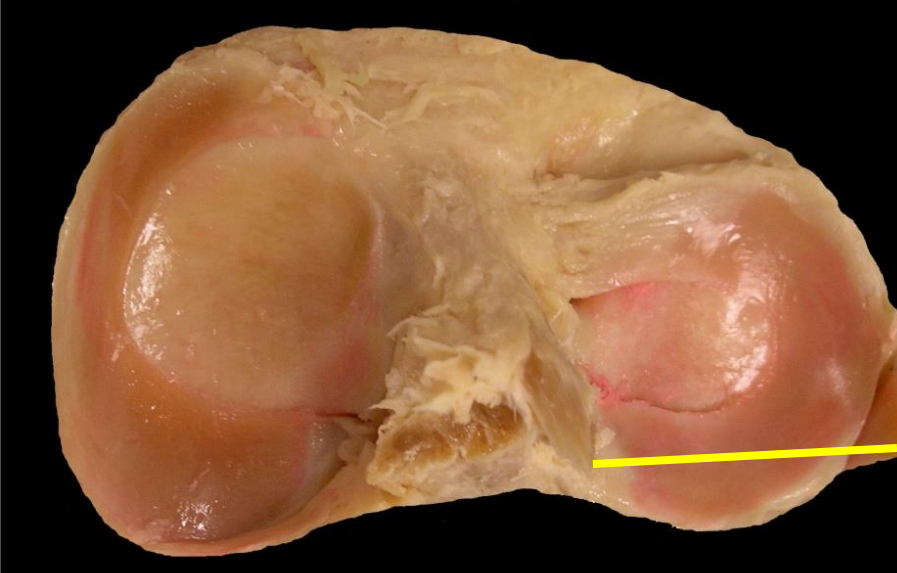


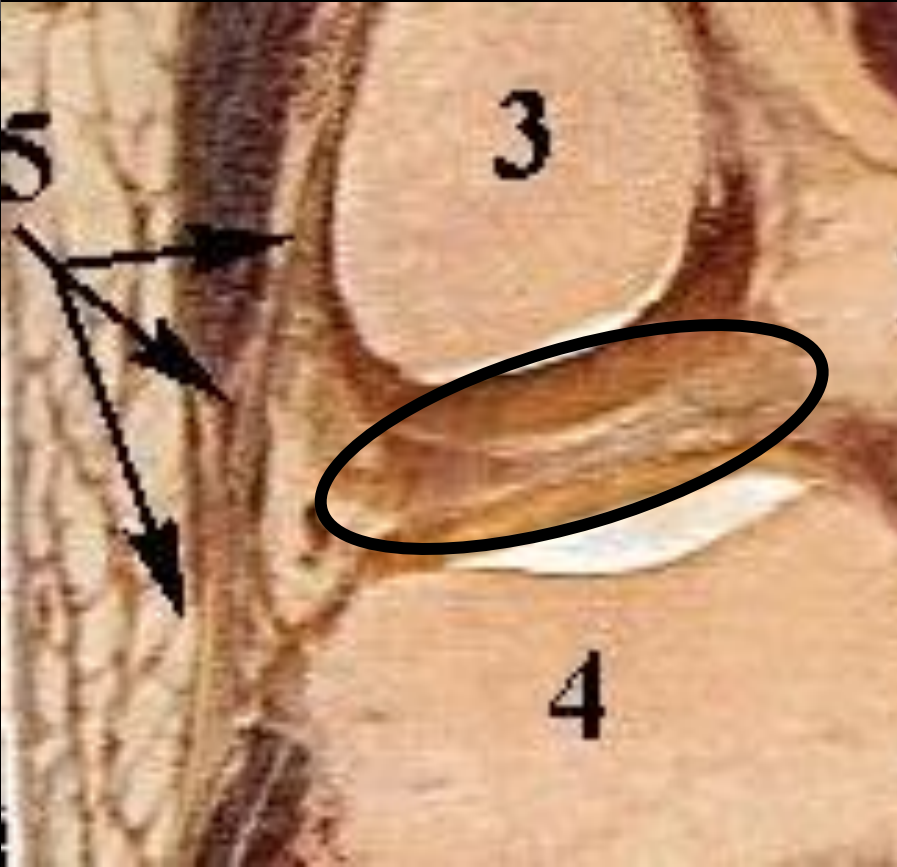
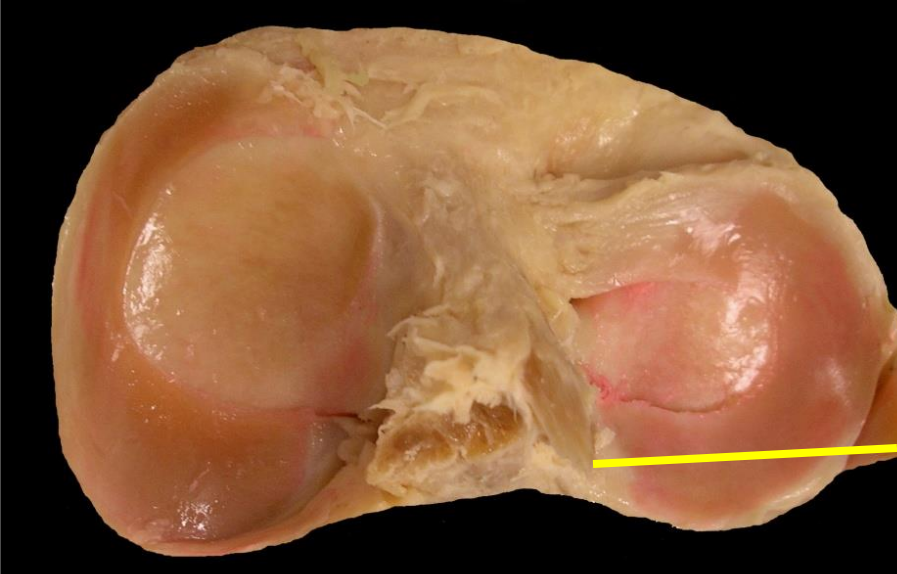


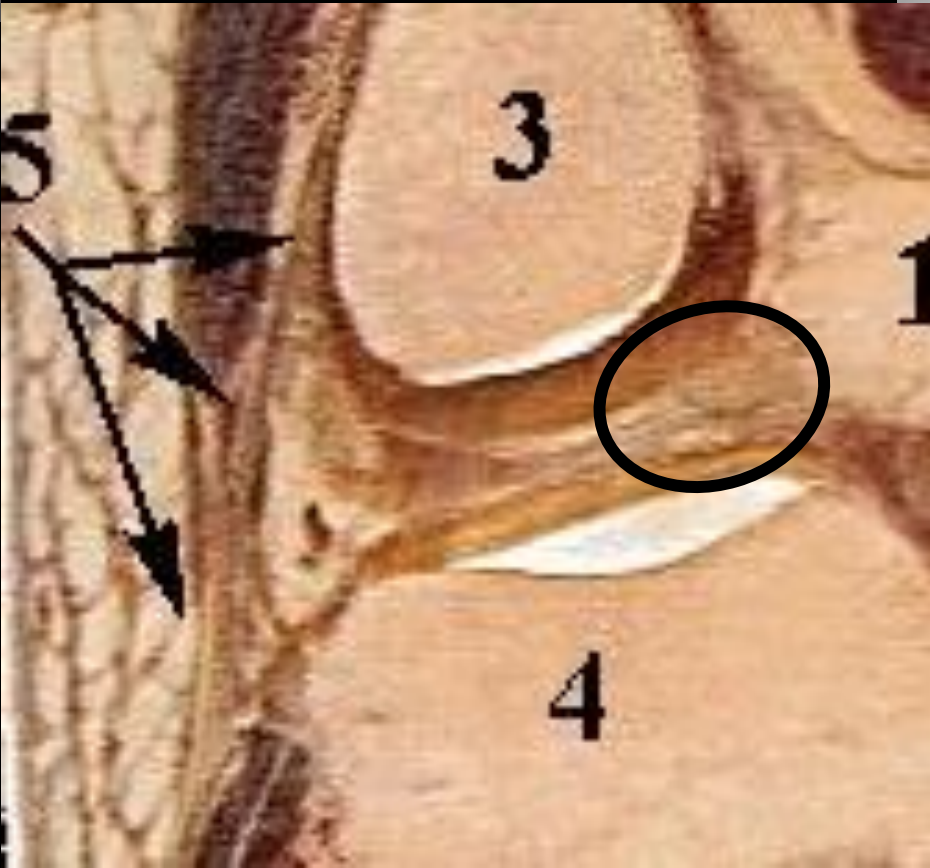
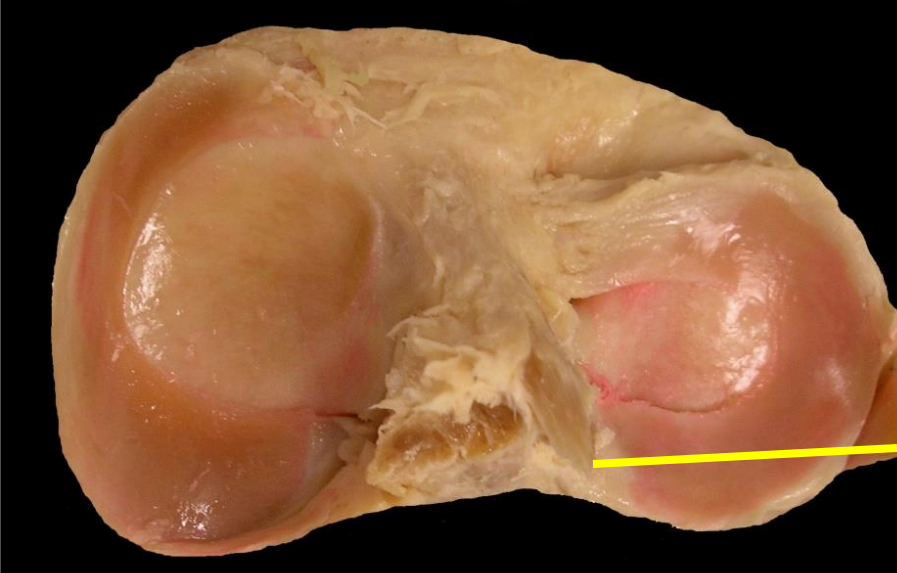
Seen in 90% of asymptomatic knees on MR

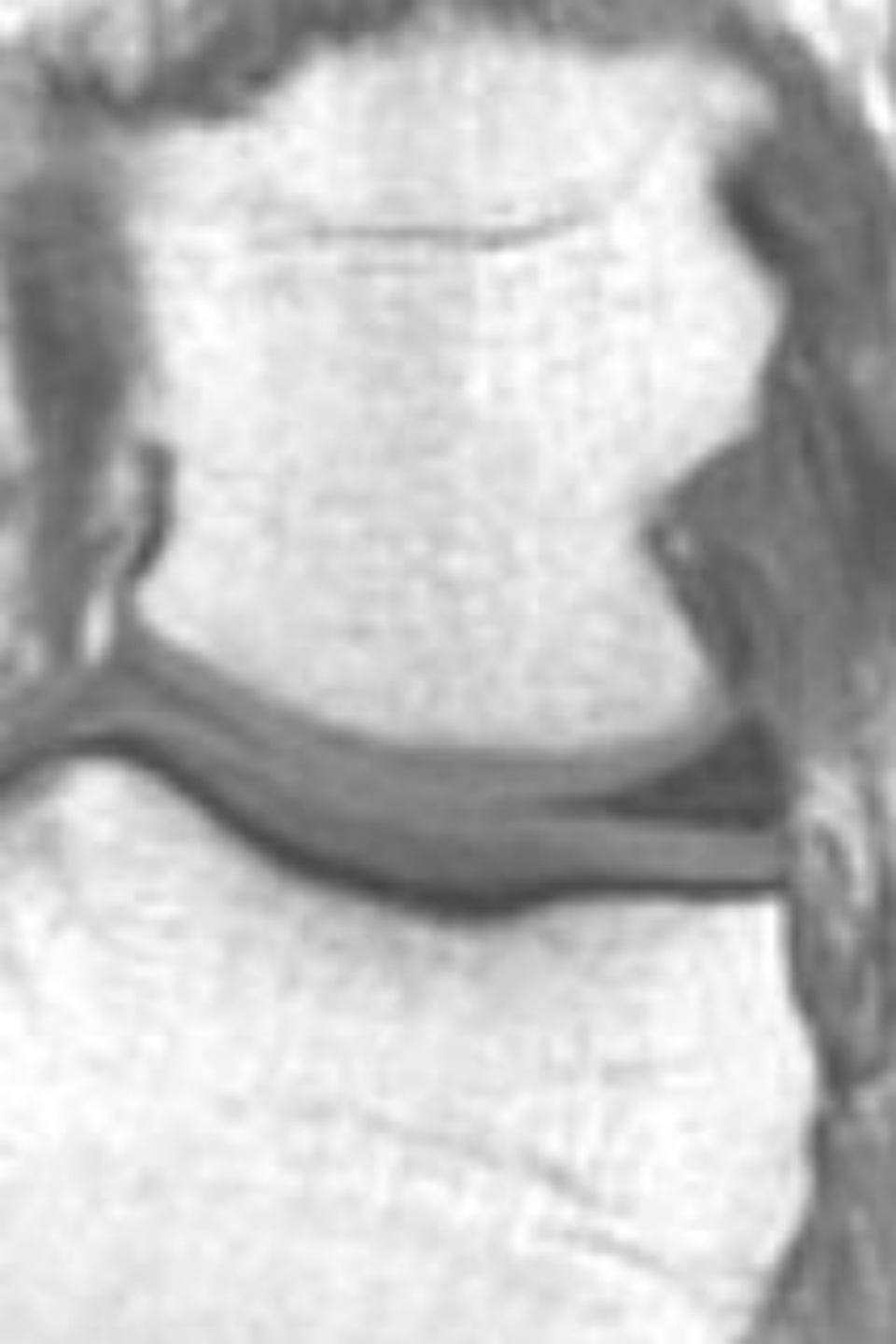
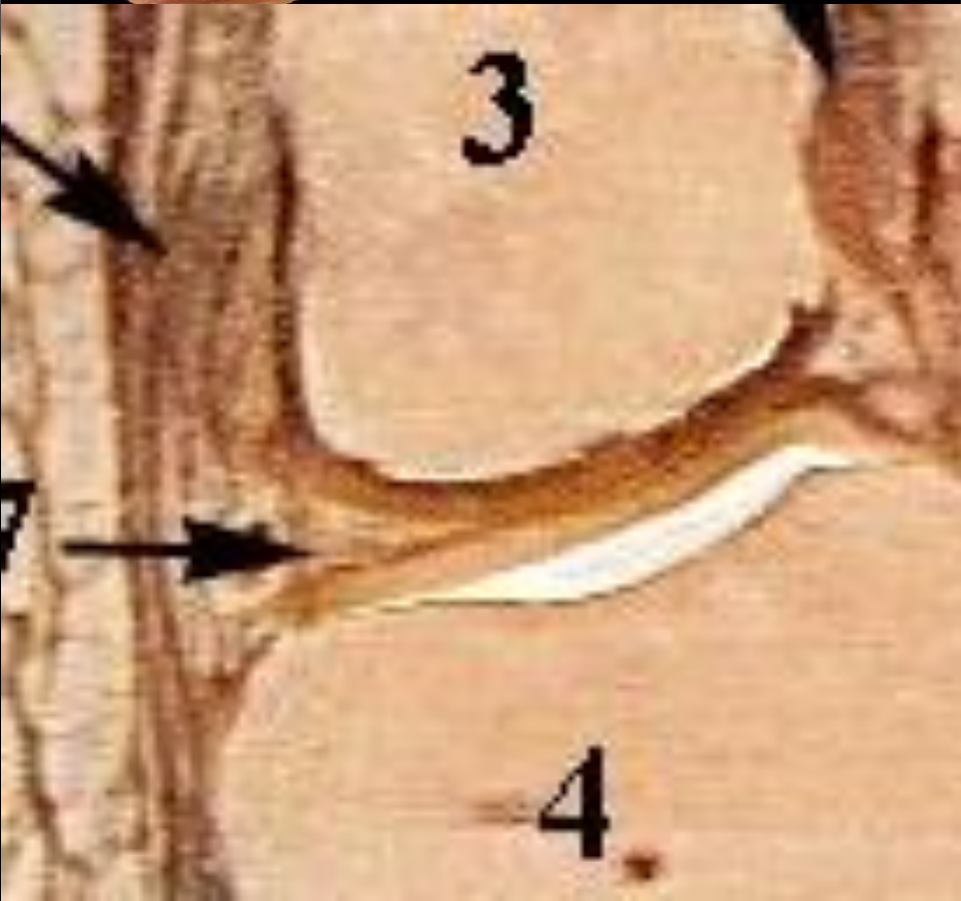
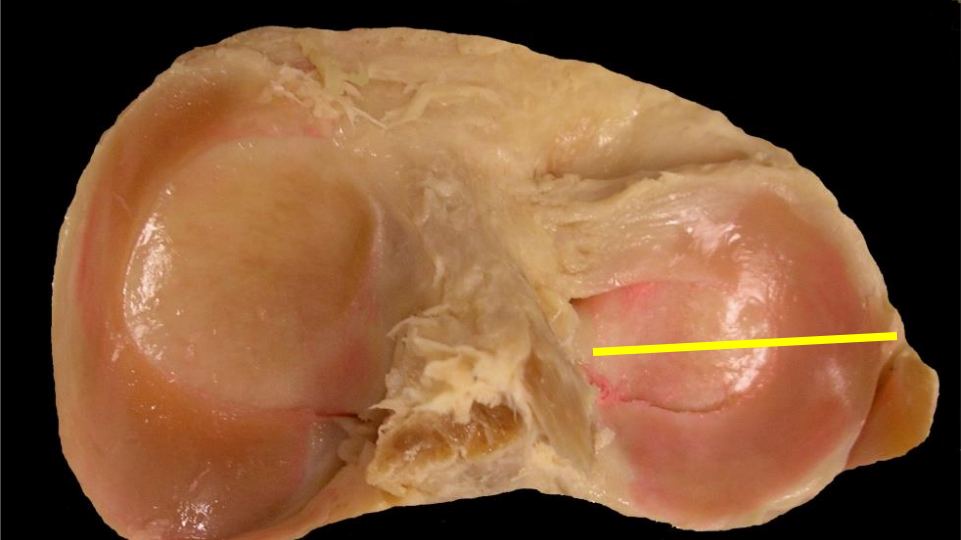
LATERAL MENISCUS NORMAL CORONAL MR IMAGING

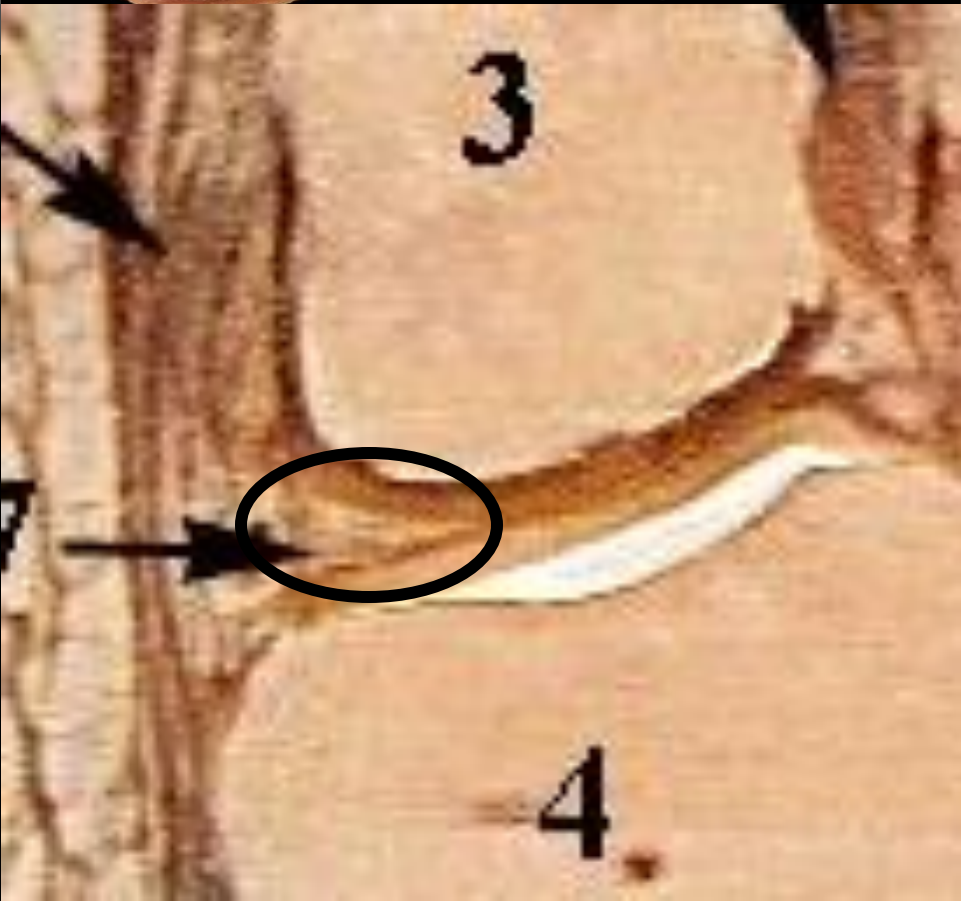
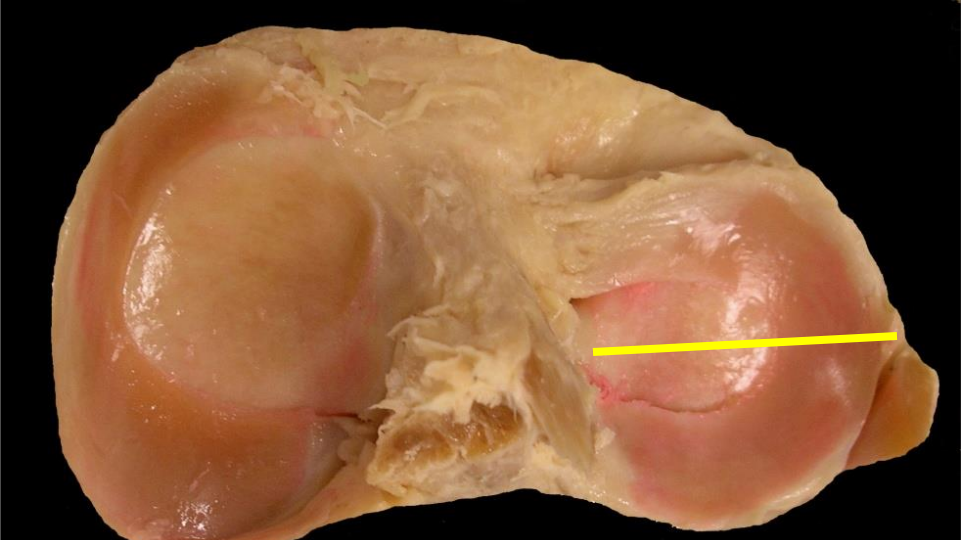
- Low signal intensity sideways triangles
- Same sized anterior and posterior horns
- Posteriorly should extend toward midline
 - Meniscal root
- Meniscus not attached to capsule
 - Popliteus tendon/ hiatus
- No surfacing intermediate or high signal

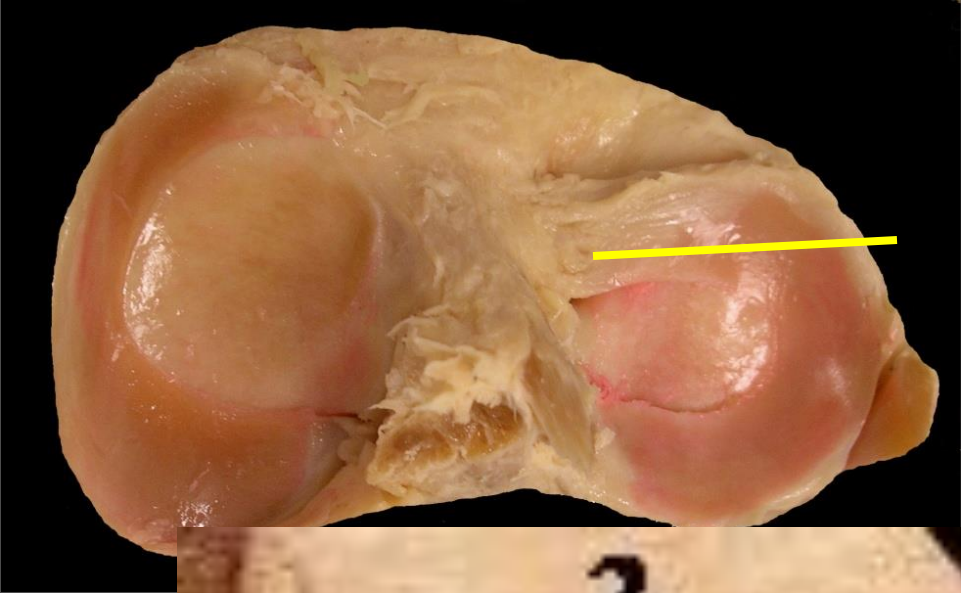


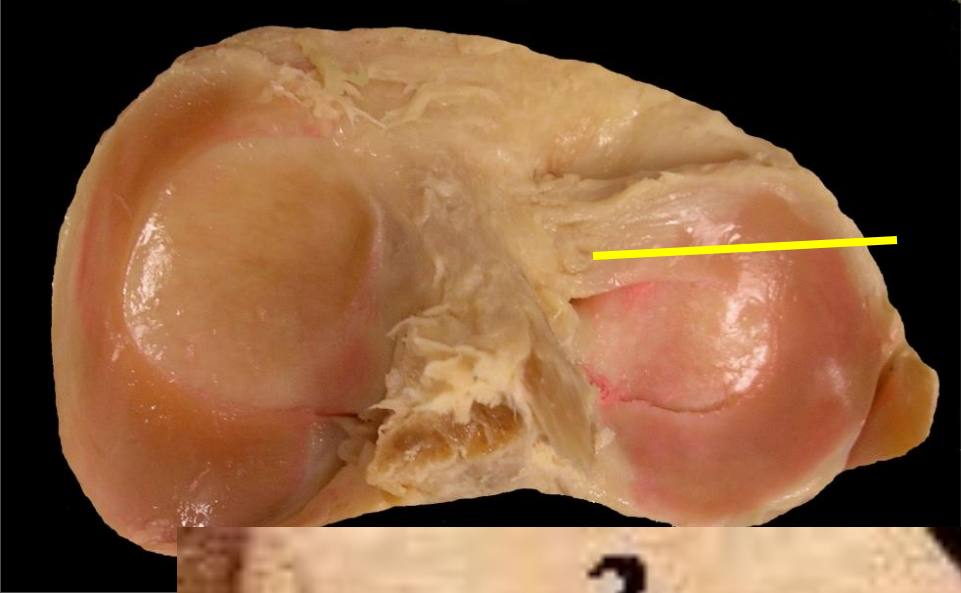






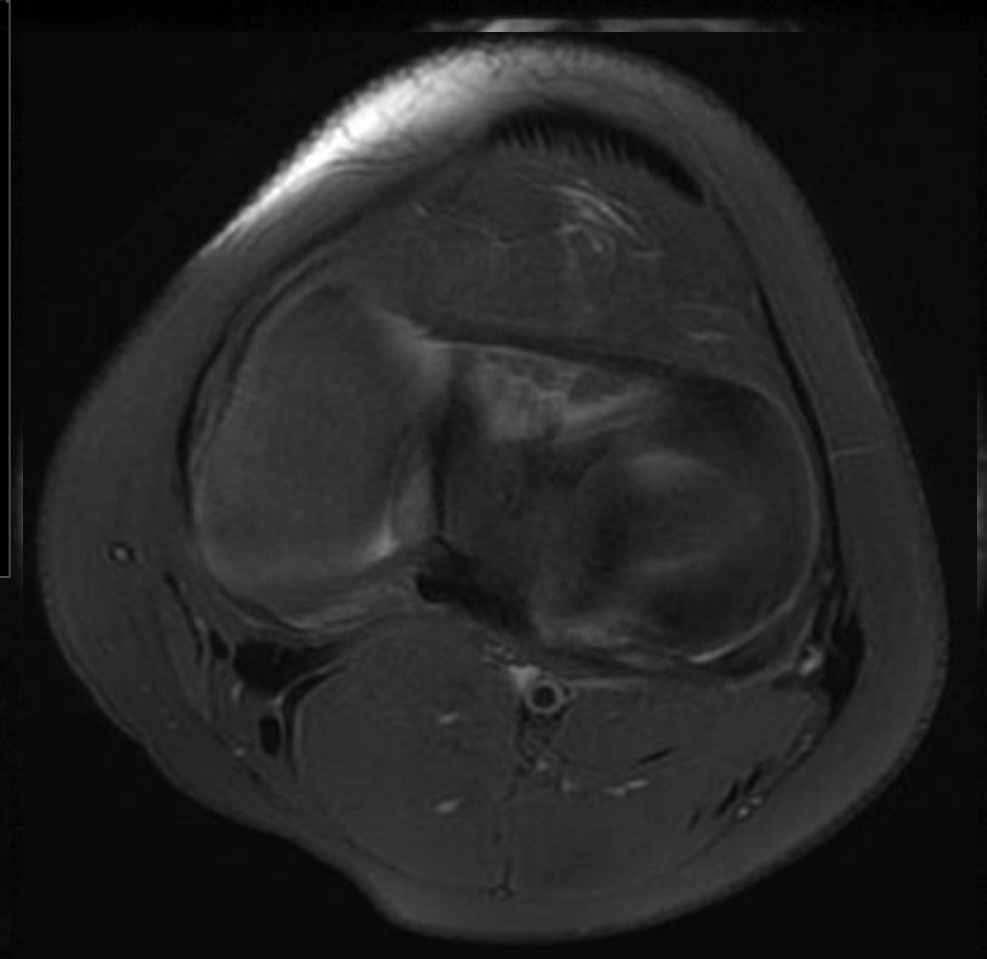


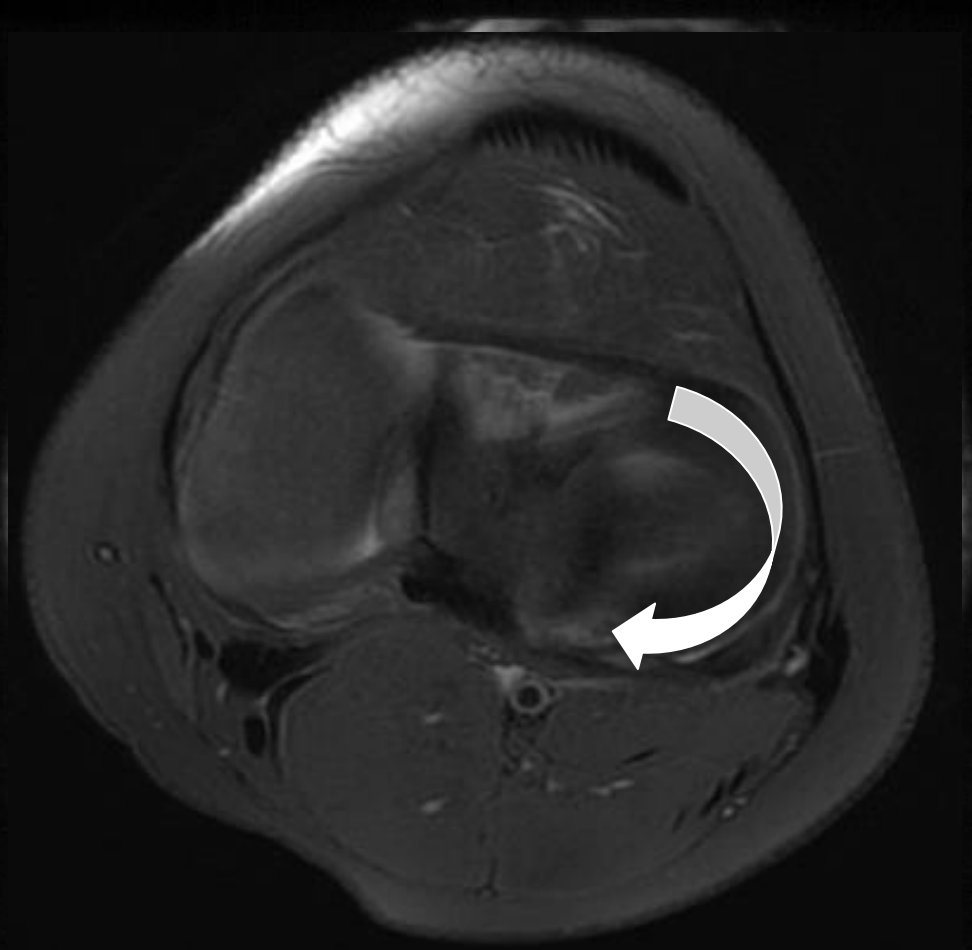




LATERAL MENISCUS NORMAL AXIAL MR IMAGING

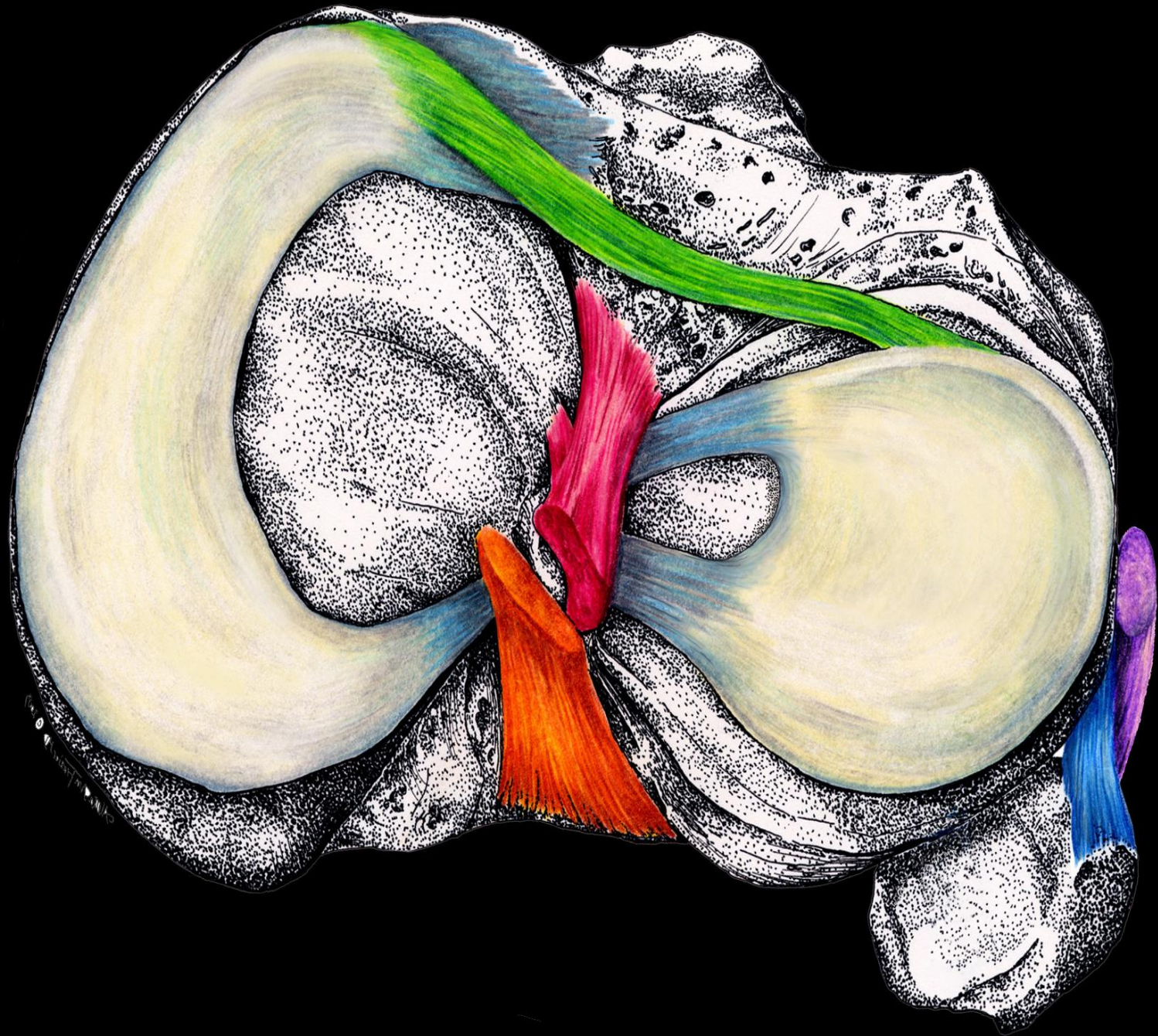
- Do not forget about this plane
- May not have any images through menisci
- Often only see 1 or at most two images

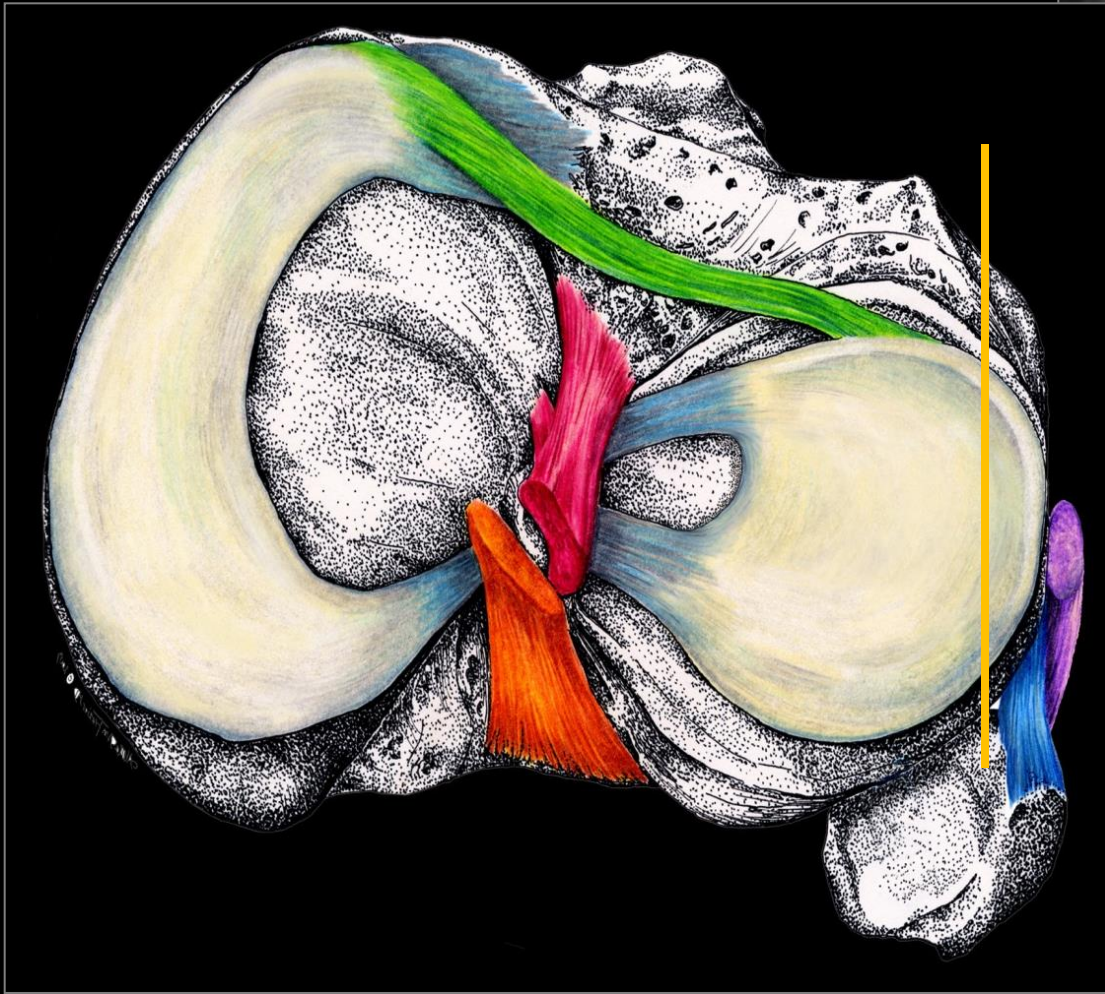


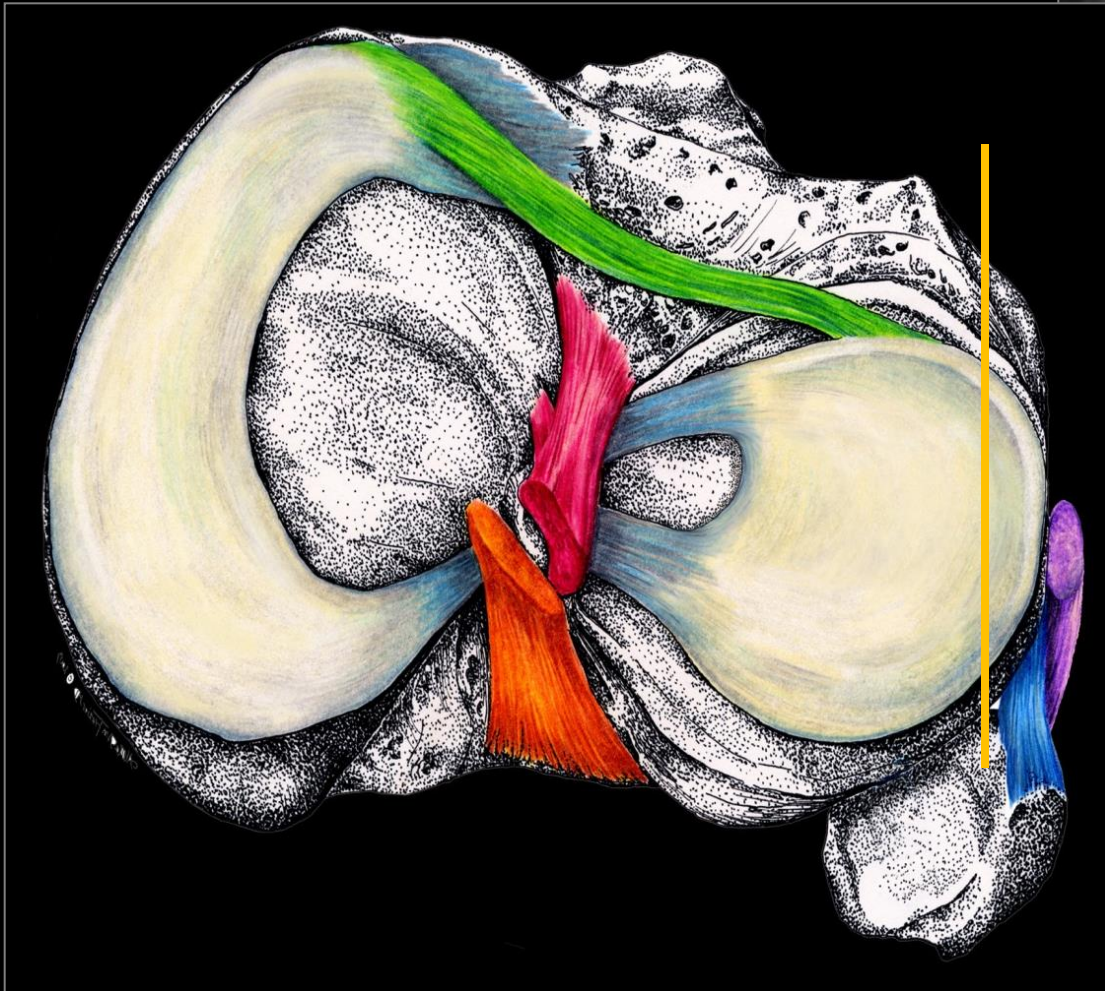


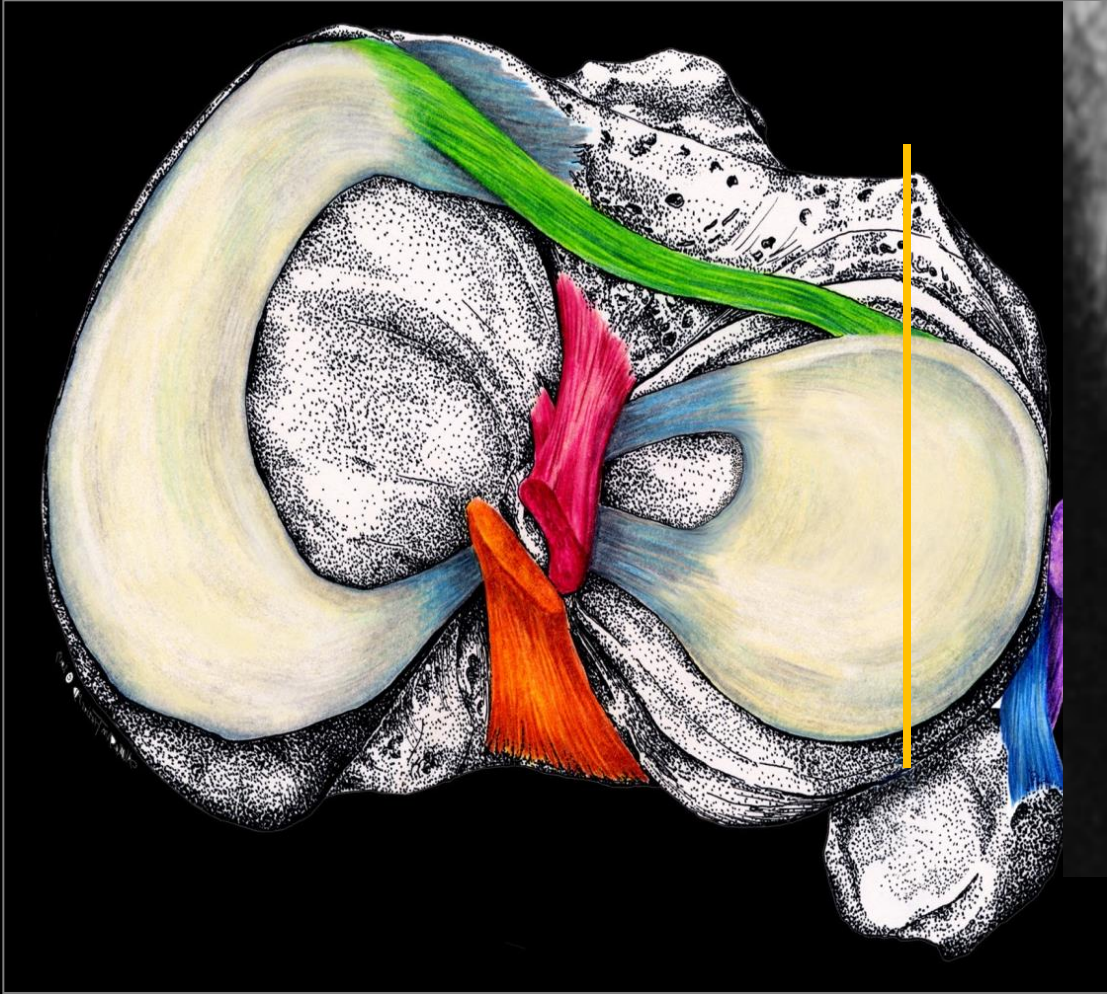
LATERAL MENISCUS DISCOID

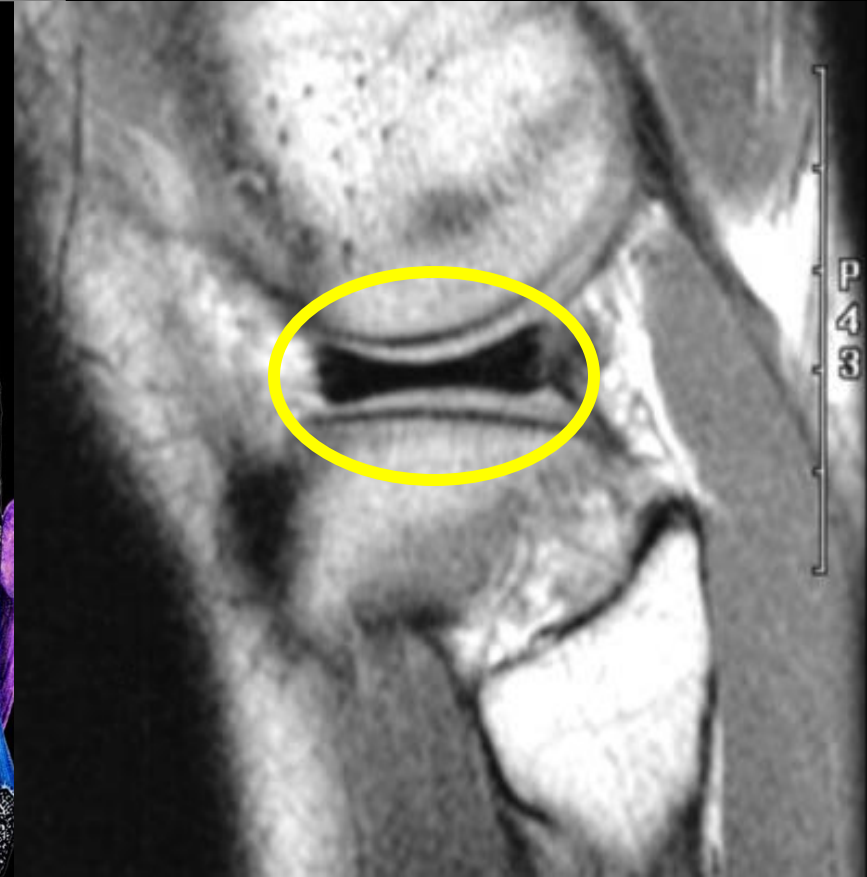
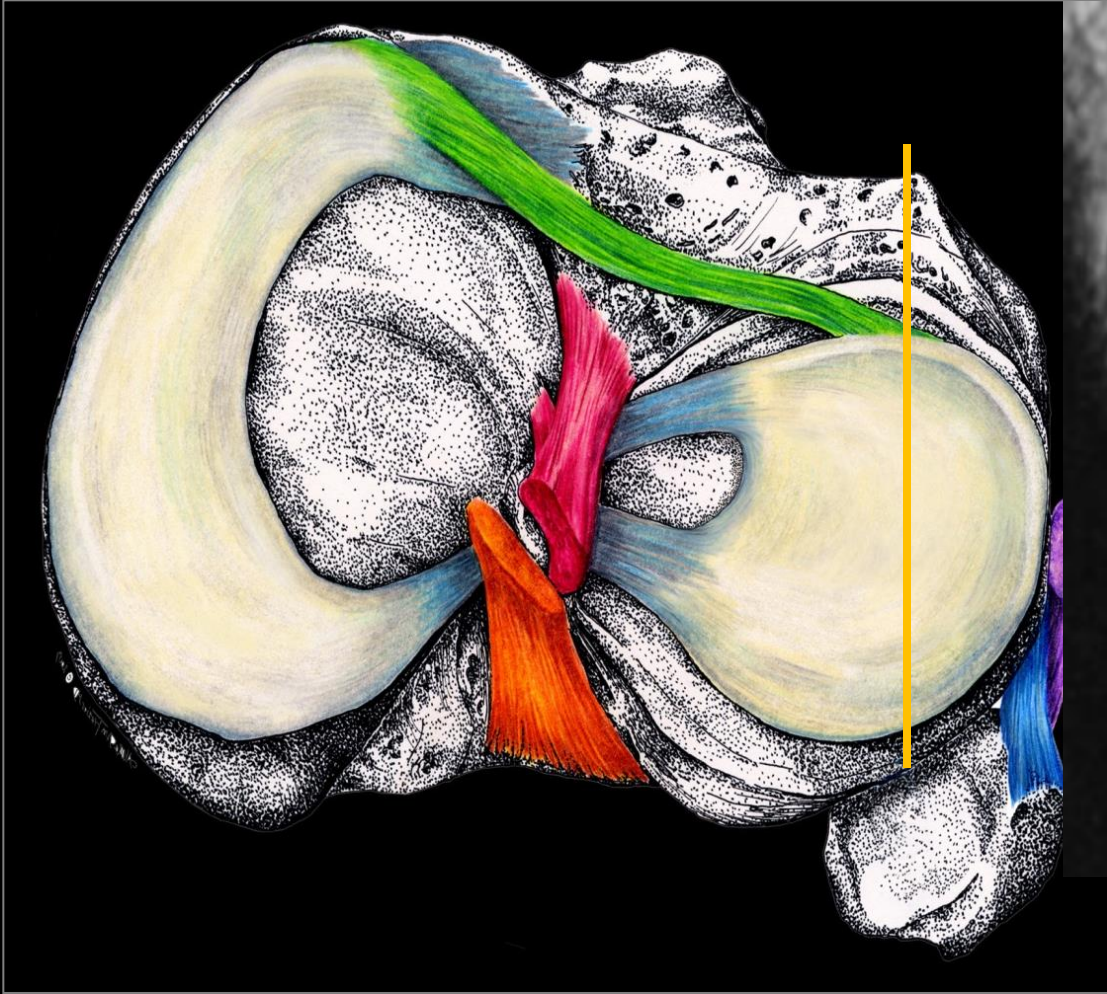
- Common normal variant (0.4-17%)
- More common in the Asian population
- Enlarged meniscus; lateral (10-20X) >>medial
- Complete, incomplete or Wrisberg variants
- Too many “bow-ties” on MR
- Predisposed to tears (up to 22%) often horizontal or longitudinal type

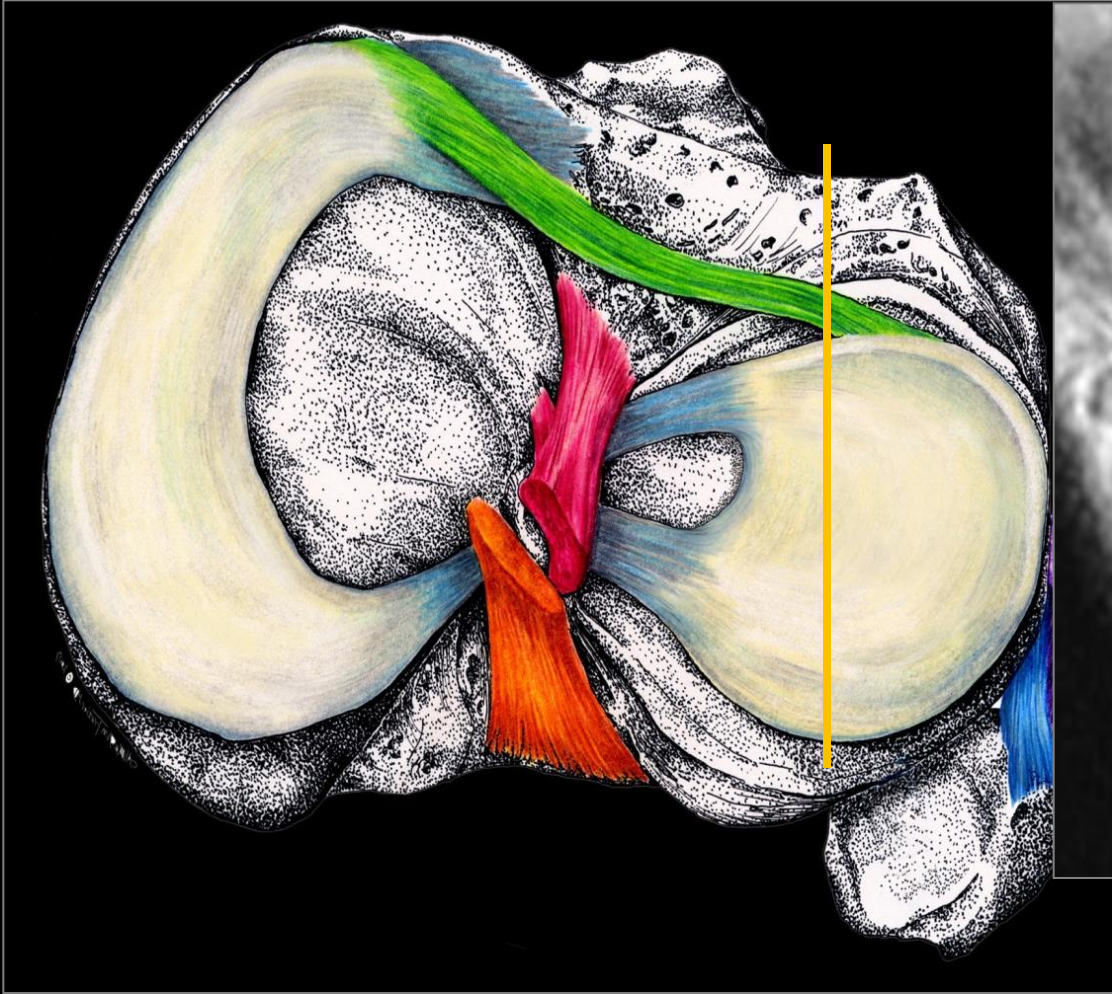


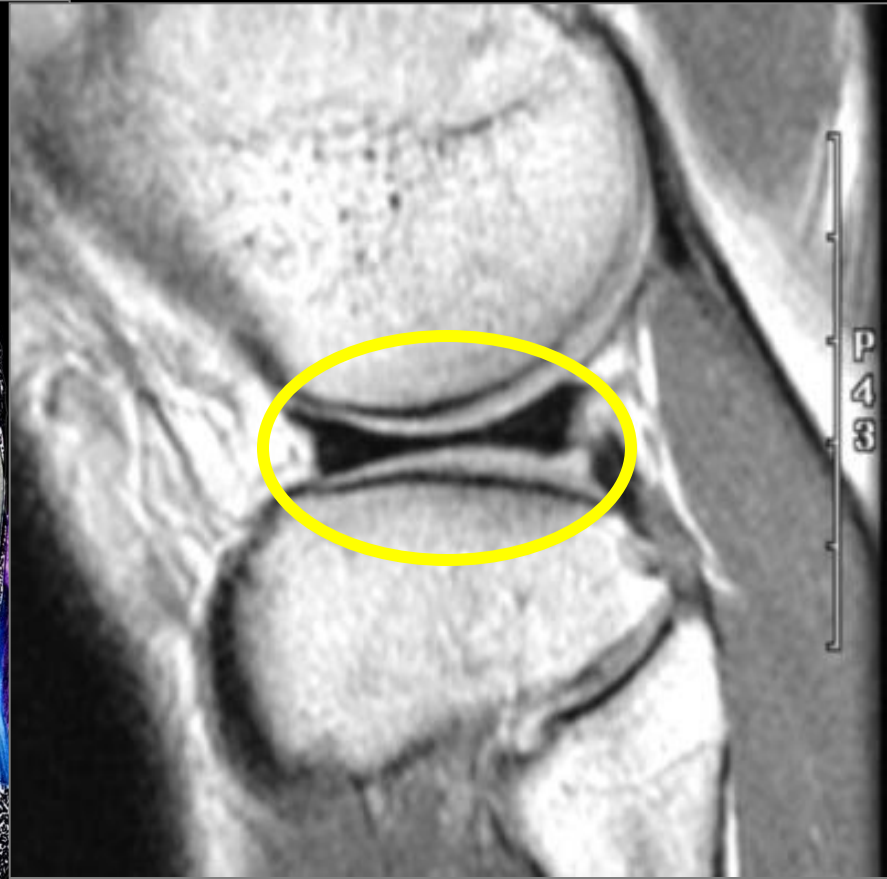
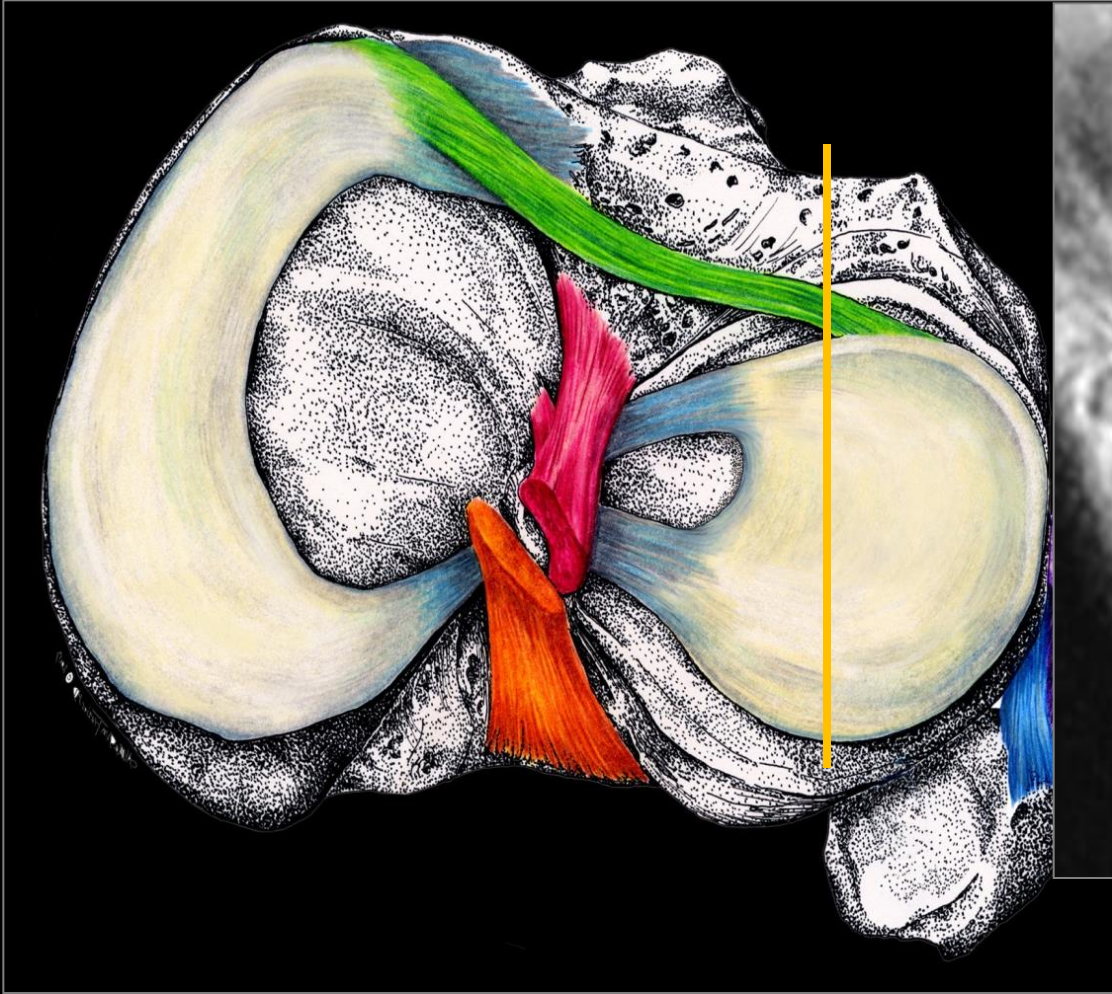


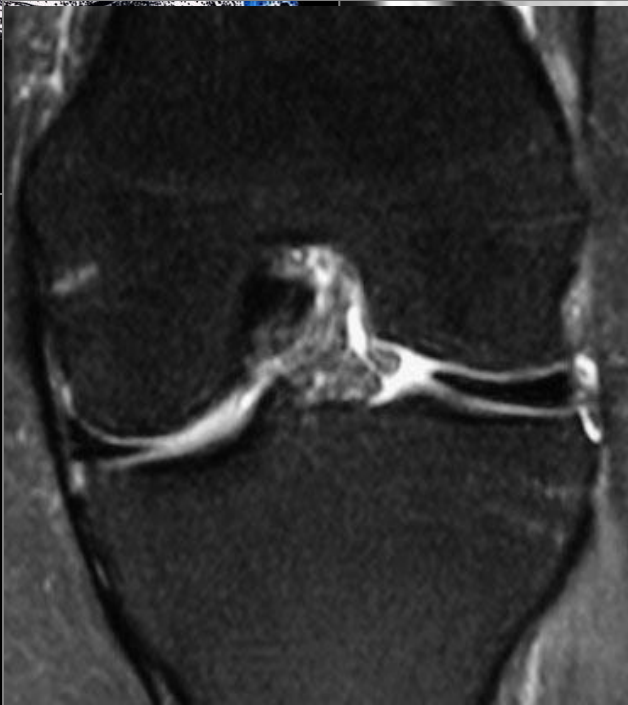
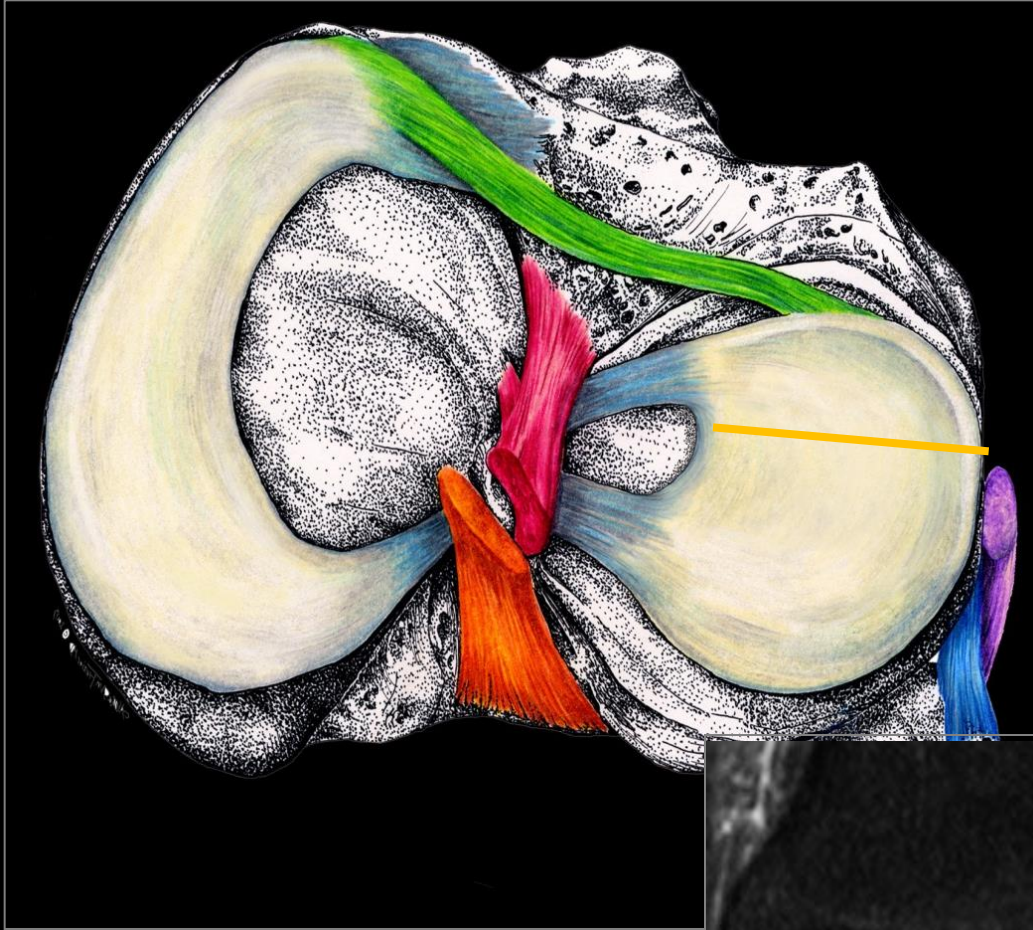


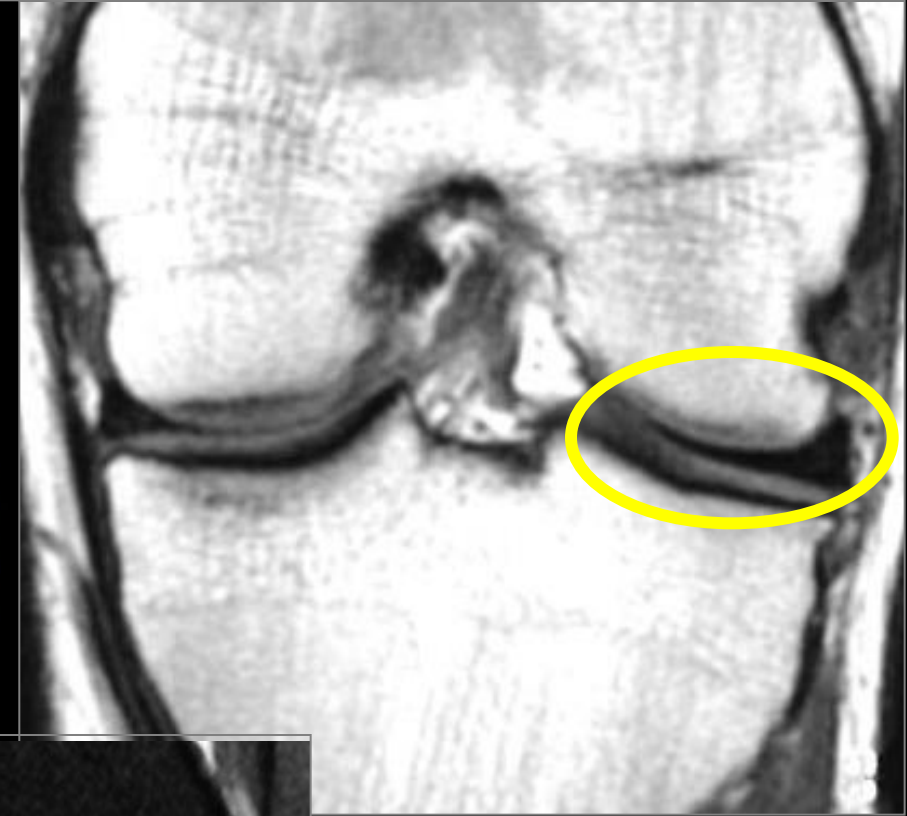
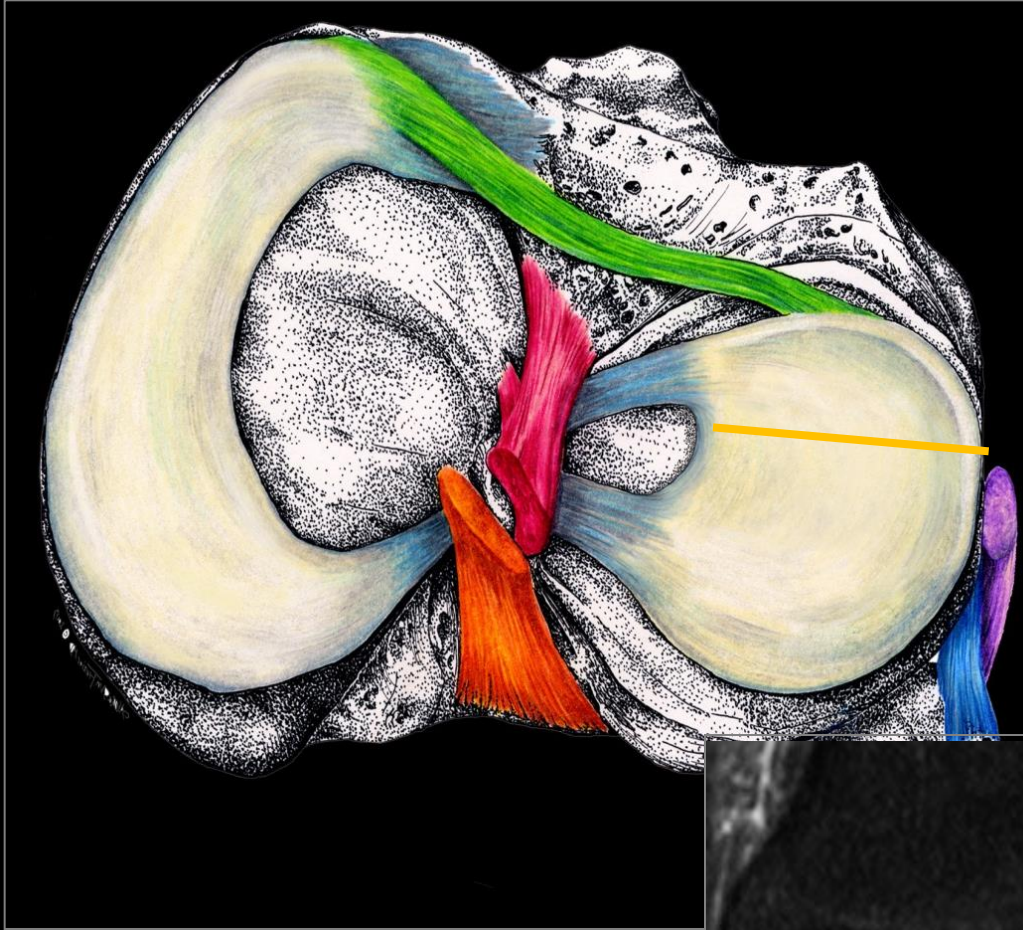




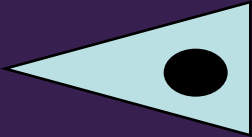
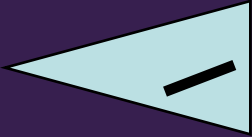
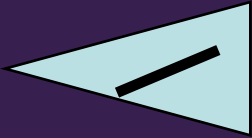




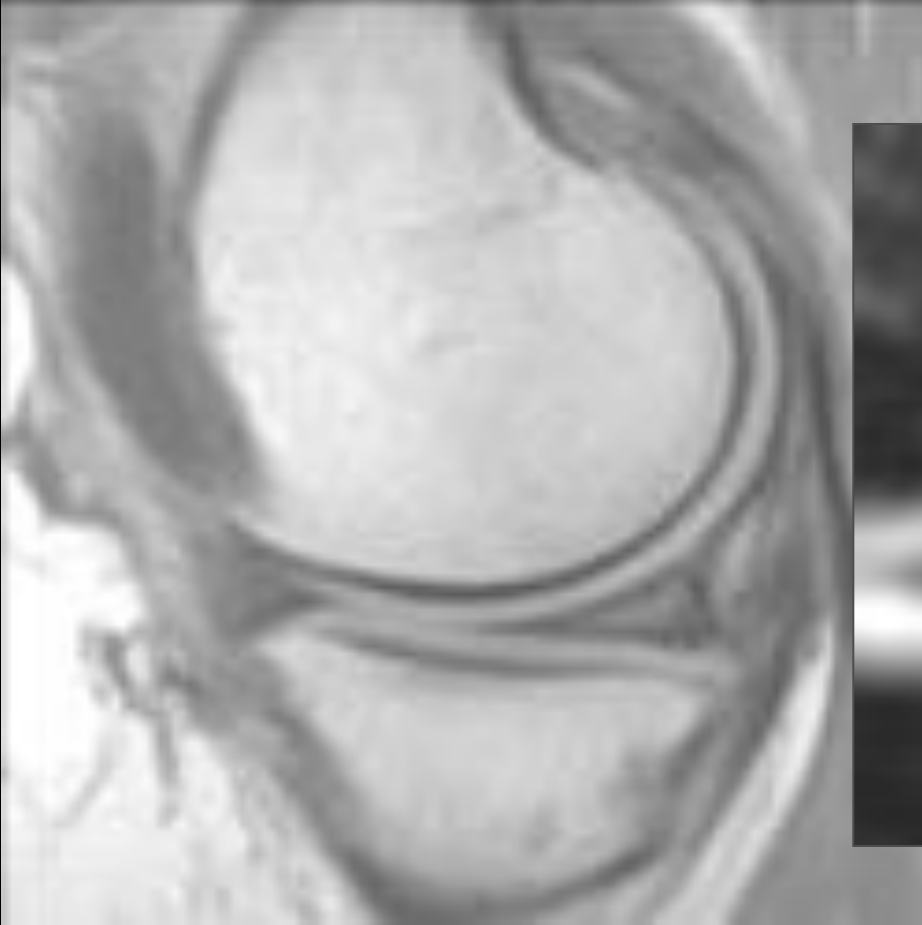




MENISCAL SIGNAL

- Grade I  myxoid, hyaline, mucinous degeneration
- Grade II  bands of degeneration
- Grade III  tear

INTRAMENISCAL SIGNAL



TYPE 1



TYPE 2

MENISCAL TEAR

- Intrameniscal linear signal
 - Needs to touch articular surface on two images (definite tear, 94%-96% PPV)
 - Touch on one image (possible tear)
(Medial 43%-55%; Lateral 18%-30% PPV)
 - Short TE images most sensitive
 - Diffuse signal touching a free edge (57%-78% PPV)
- Abnormal morphology
 - Size
 - Blunt tip

MENISCAL TEAR MRI ACCURACY

- 50% on sagittal images only
- 3%-5% on coronal images only
- Medial meniscus
 - Sensitivity 86%-96%
 - Specificity 84%-94%
- Lateral meniscus
 - Sensitivity 70%-92%
 - Specificity 89%-98%

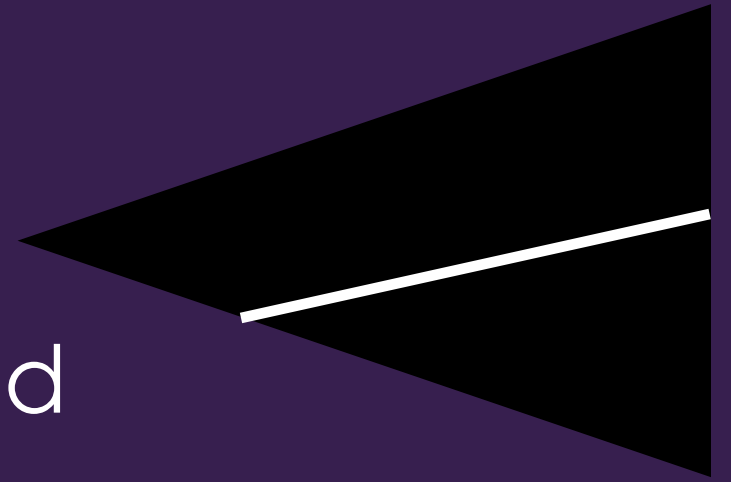
MENISCAL TEAR TYPES

- Horizontal/oblique
- Vertical/Longitudinal
 - Meniscocapsular separation
- Radial (vertical perpendicular)
- Displaced fragments (Bucket handle/flaps)
- Complex

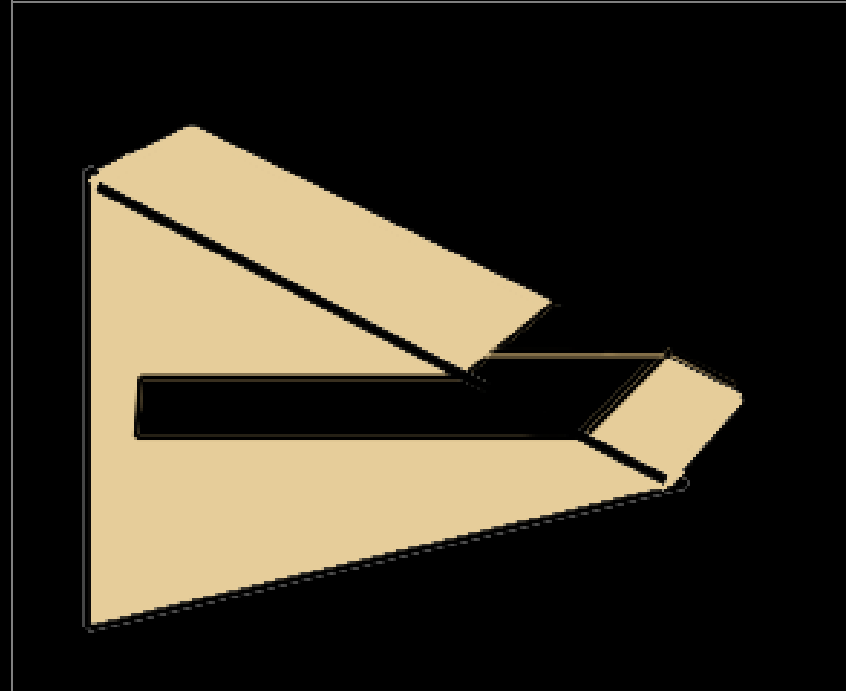
MENISCAL TEAR

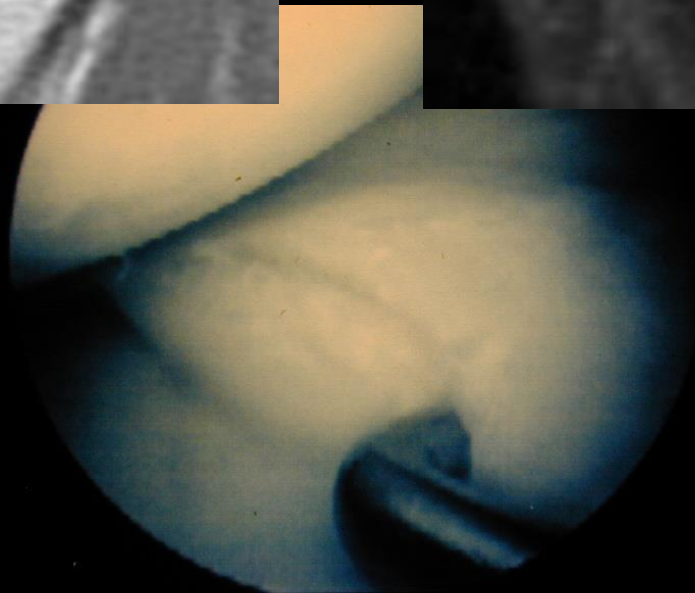
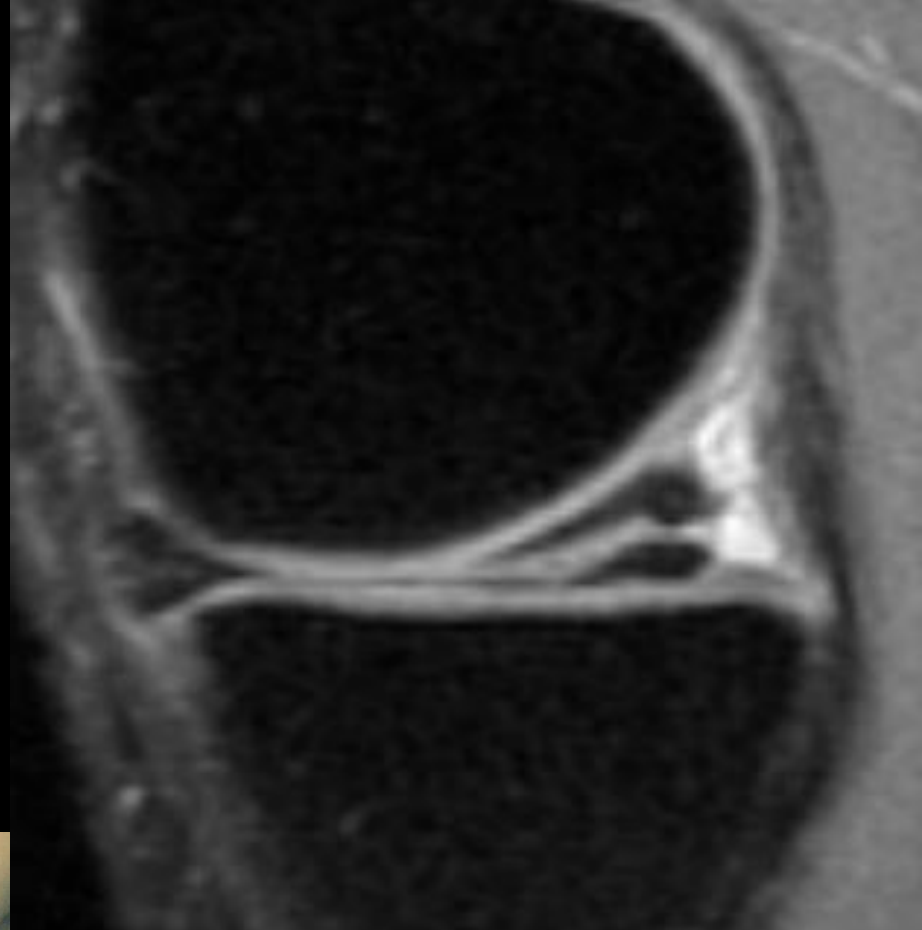
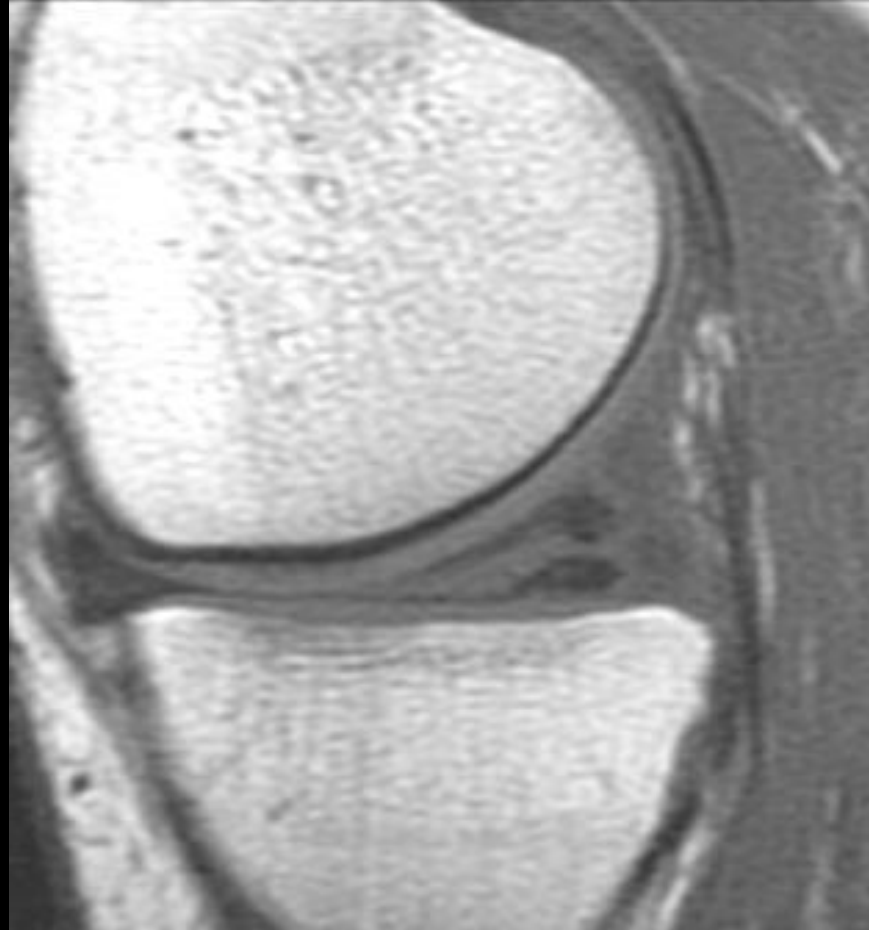
HORIZONTAL/OBLIQUE

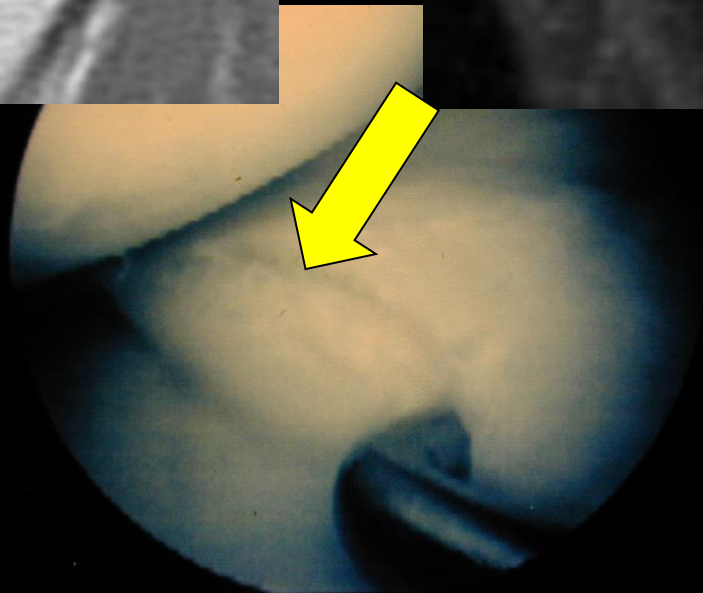
- Most common, may require partial meniscectomy
- Degenerative
- May be asymptomatic
- 20% of people over age 50
- Divides meniscus into superior and inferior components

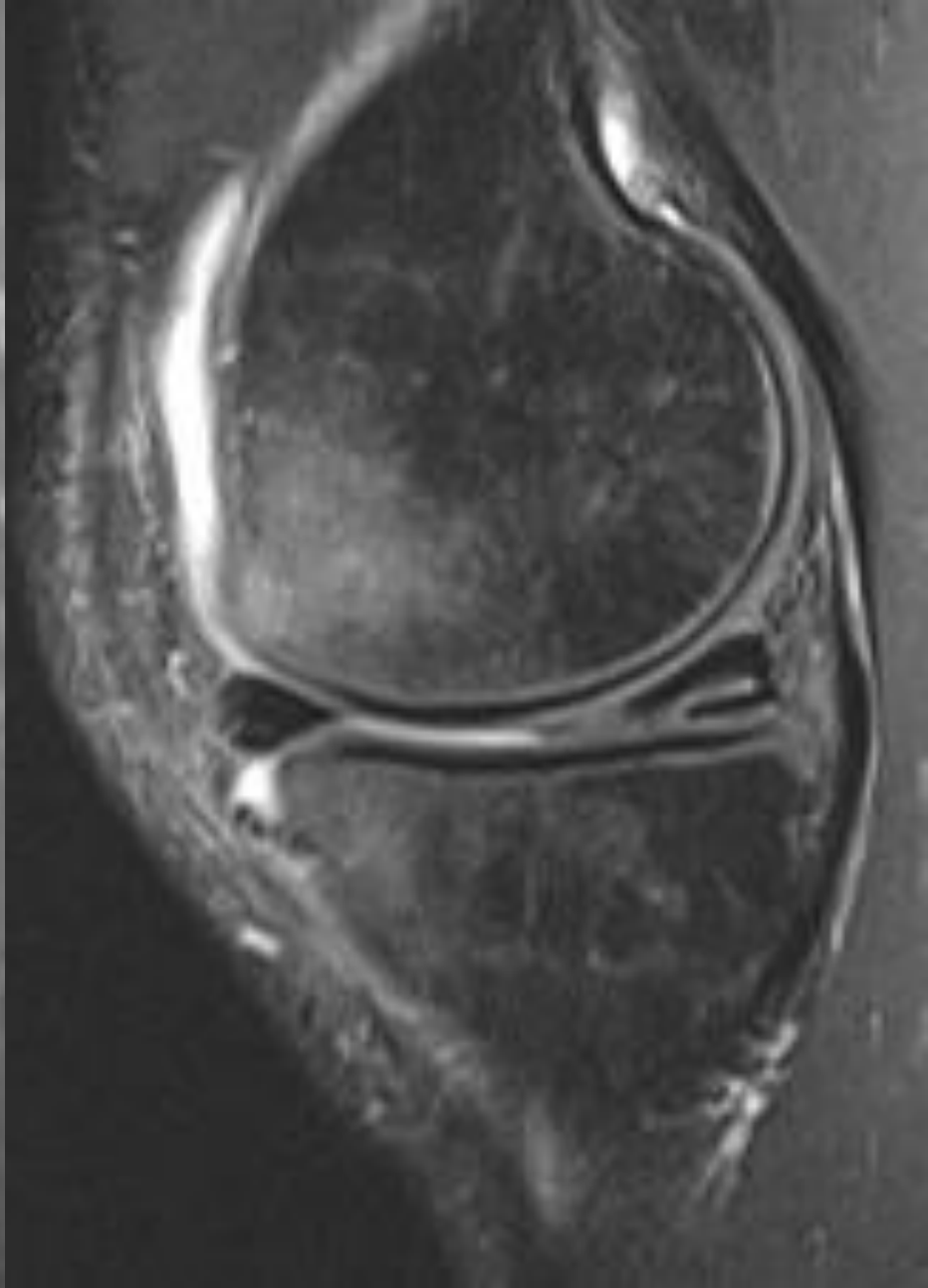
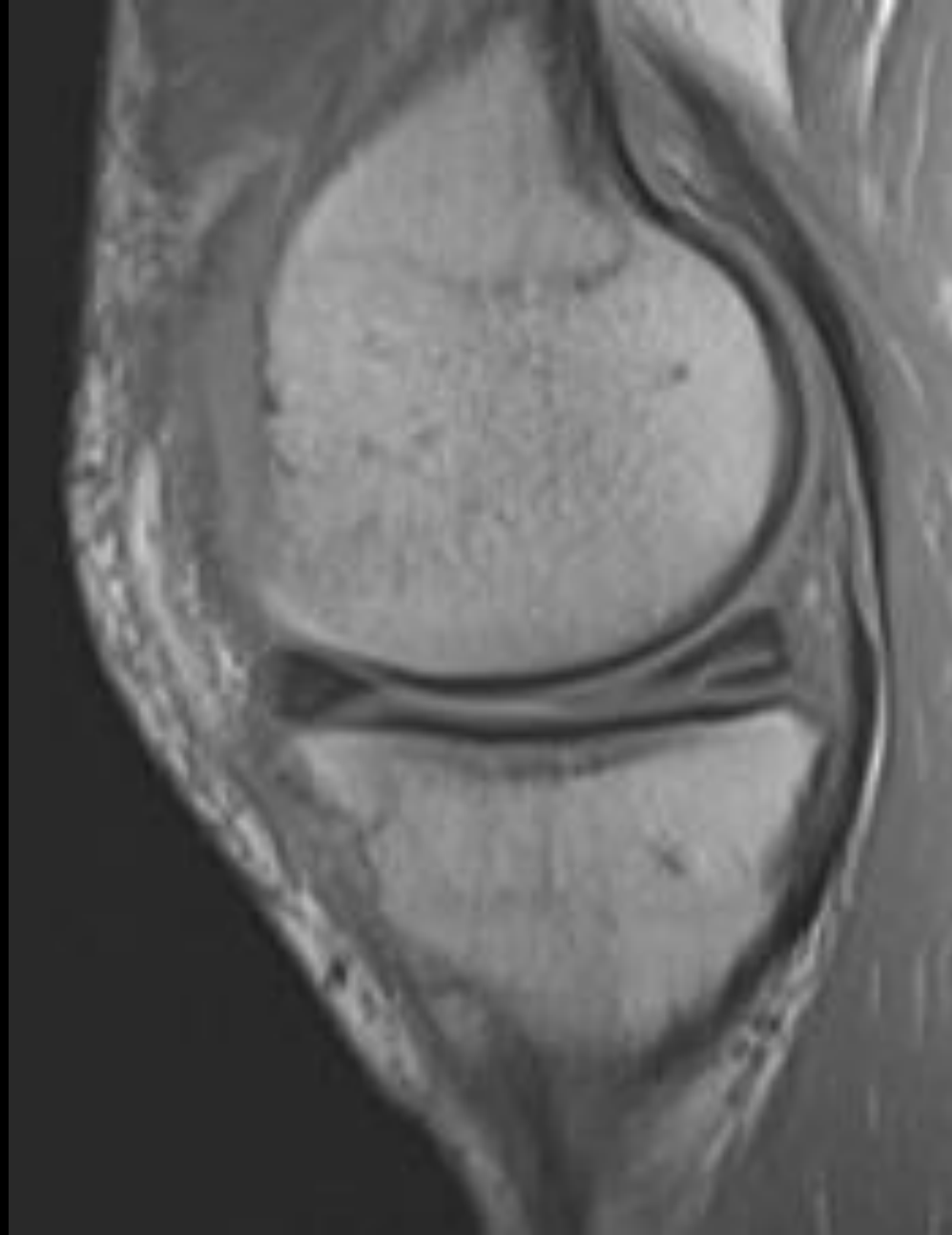


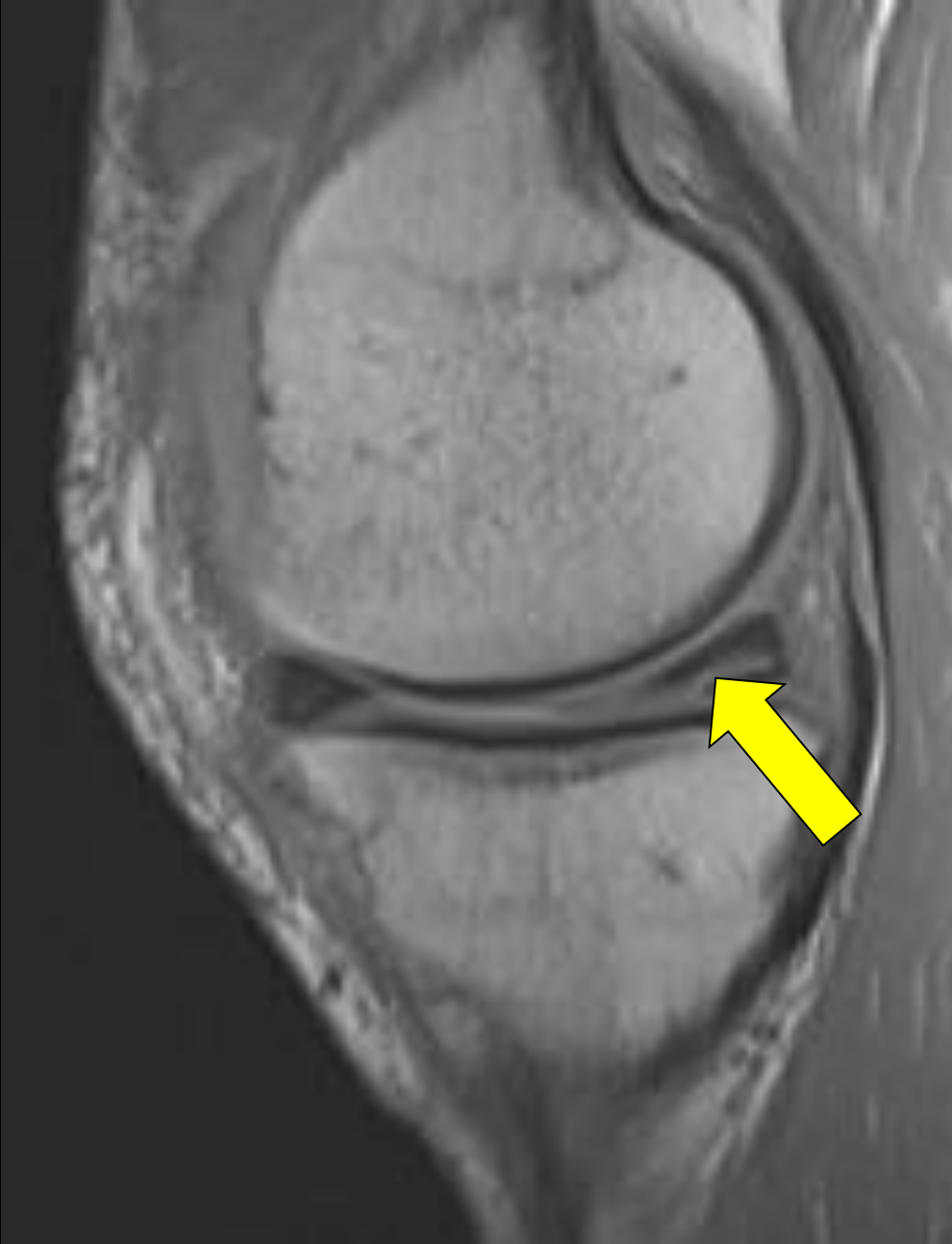
MENISCAL TEAR HORIZONTAL/OBLIQUE

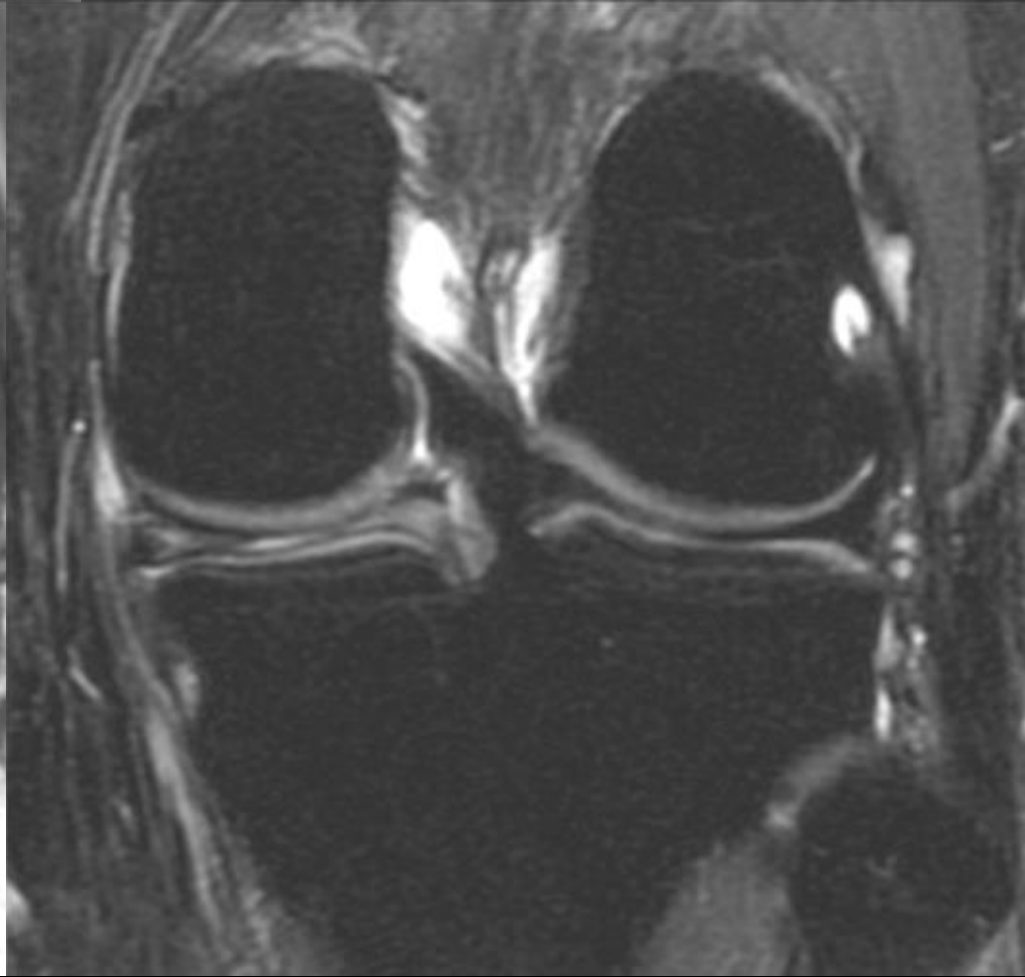


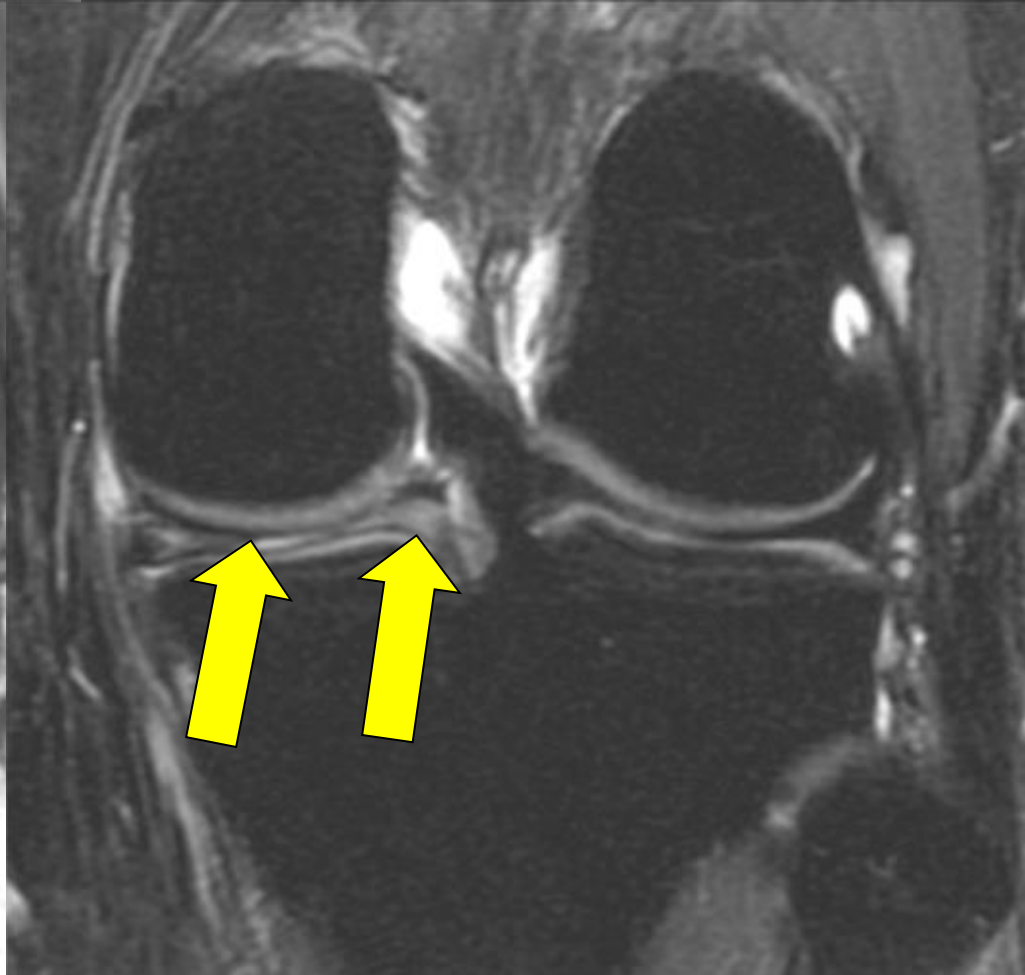
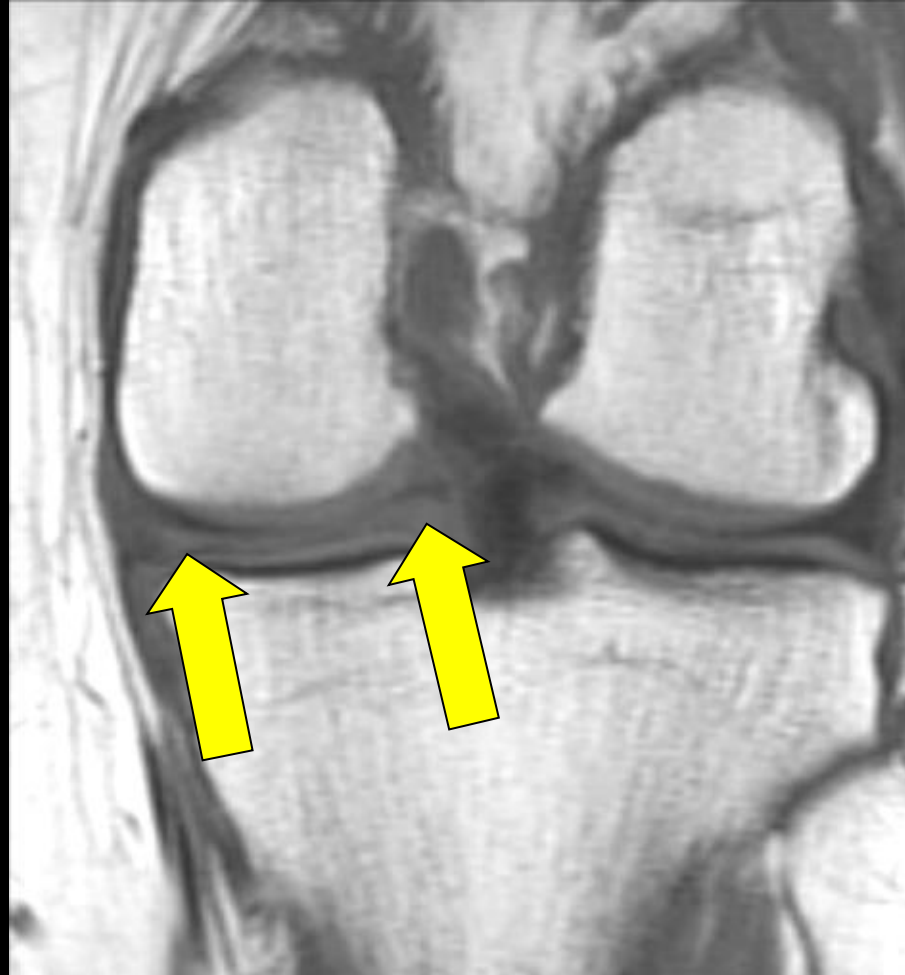




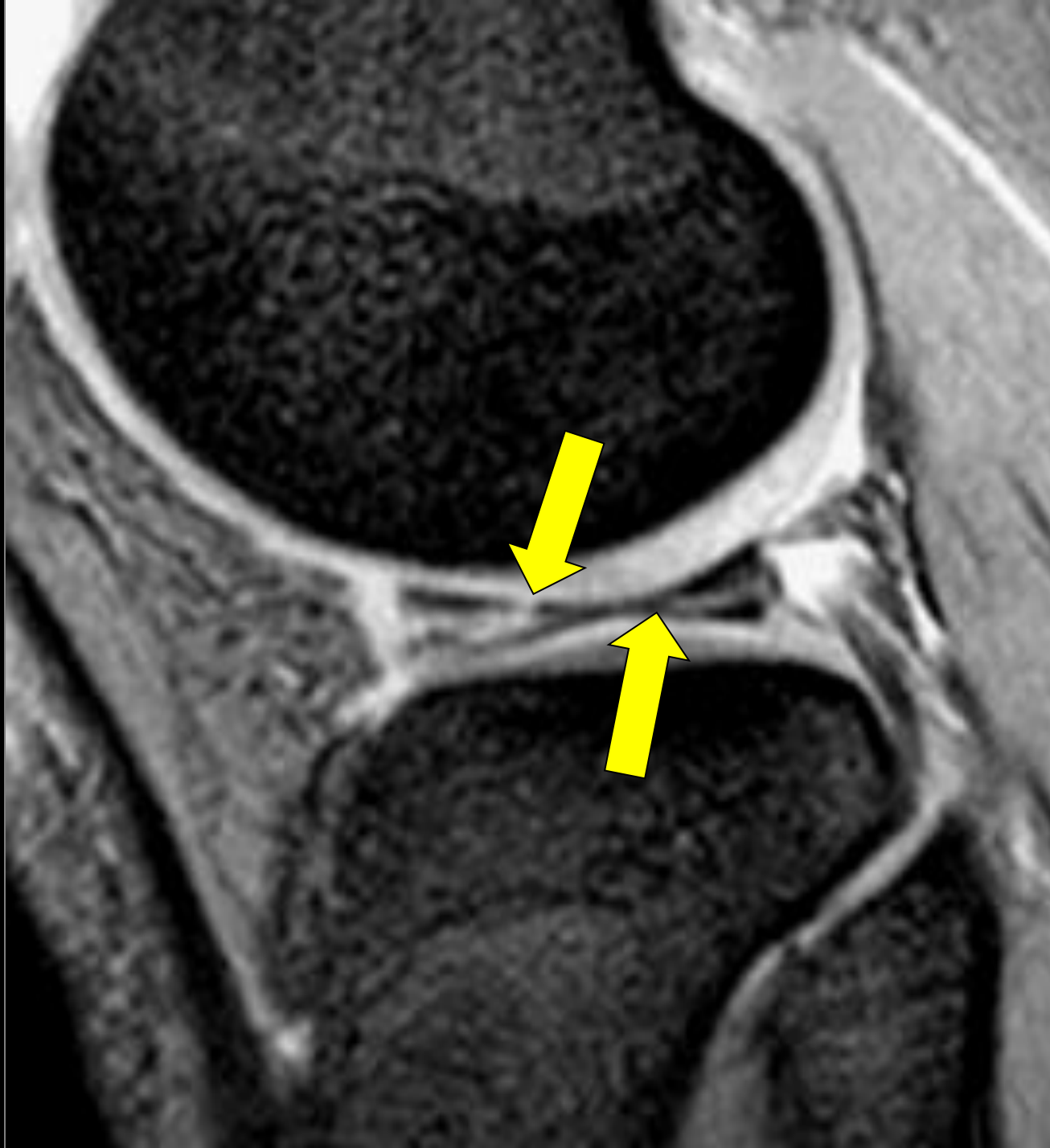










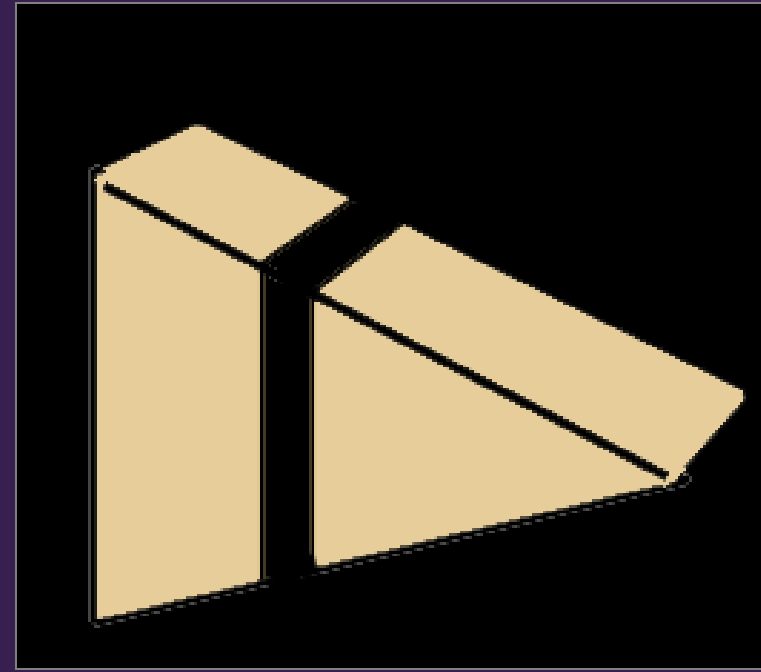




MENISCAL TEAR

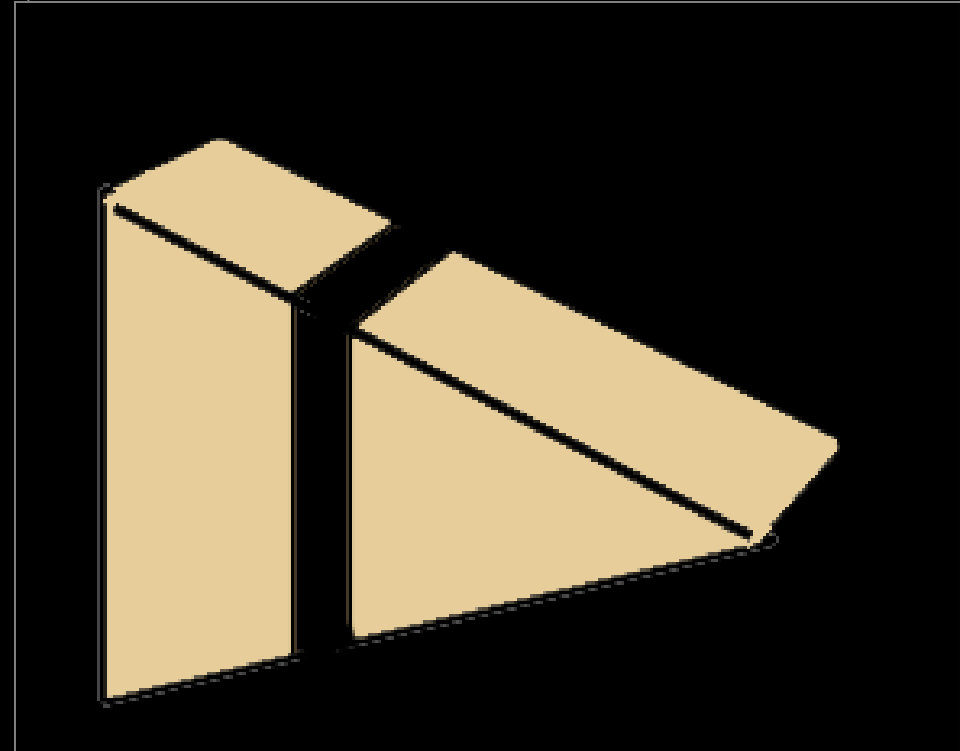
VERTICAL/LONGITUDINAL

- Along axis of meniscus
- Common to occur with ACL tears [medial 90% (Ramp lesion) lesions & lateral 83%]
- May be reparable
- May be peripheral and heal (outer third red zone)
- Divides meniscus into outer and inner components

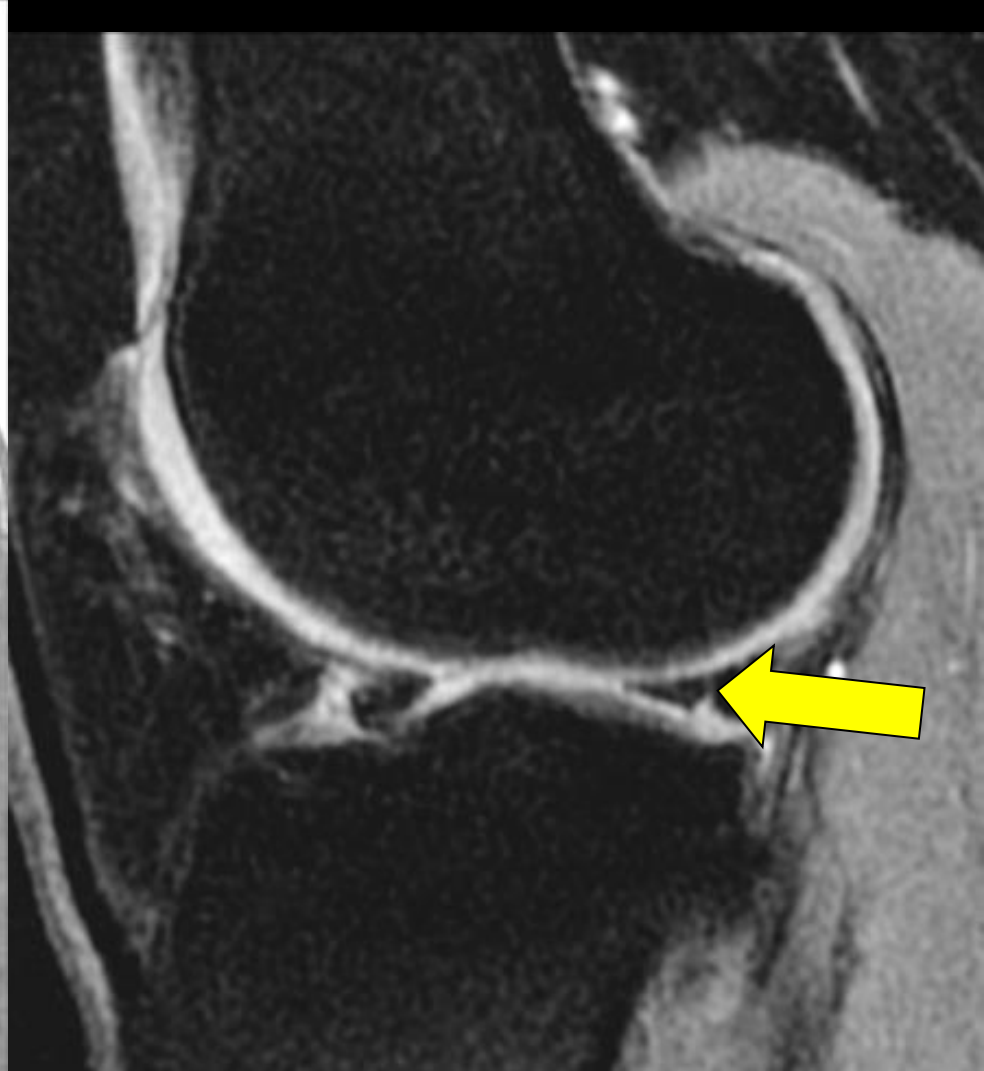


MENISCAL TEAR

VERTICAL/LONGITUDINAL



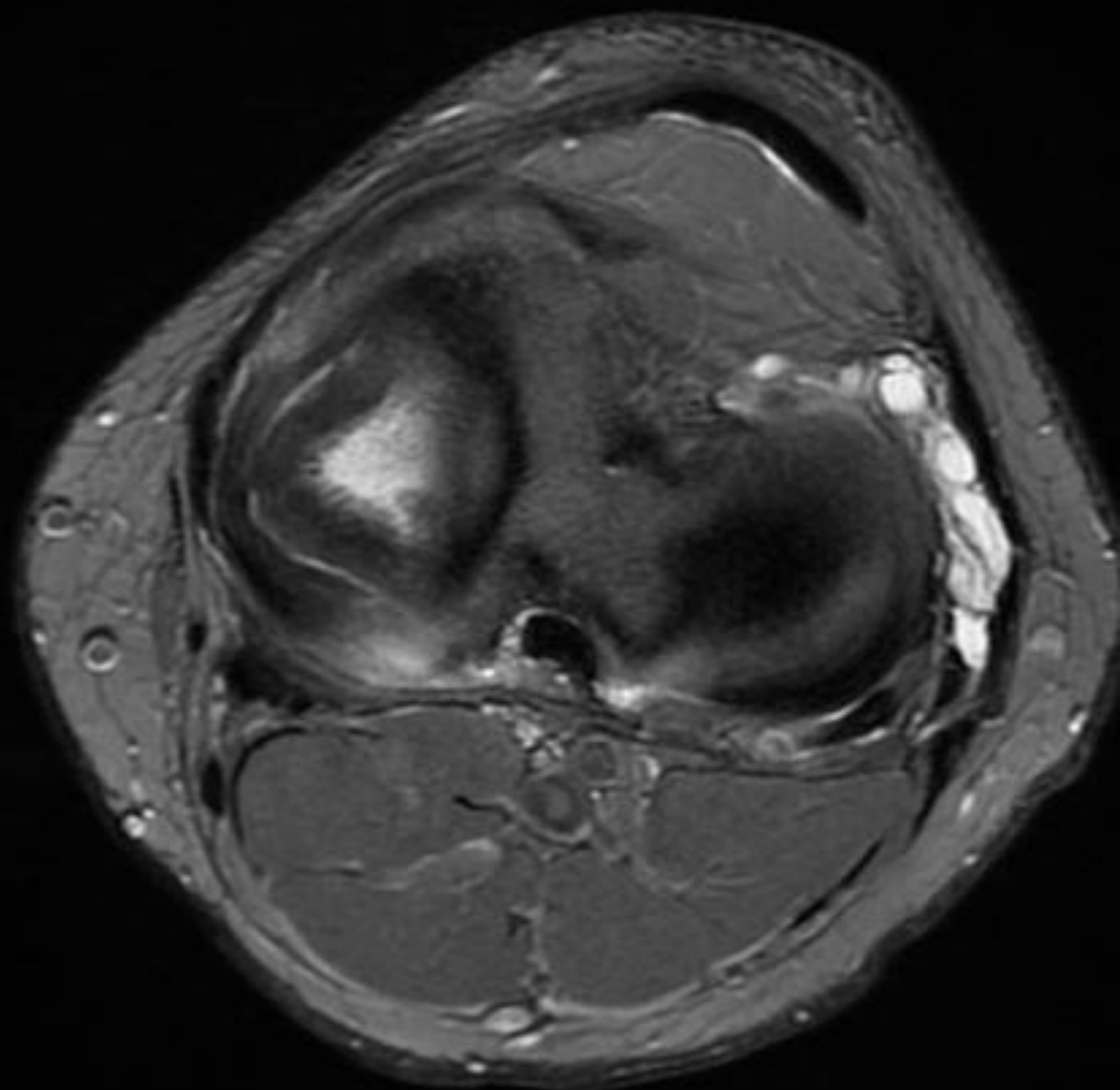


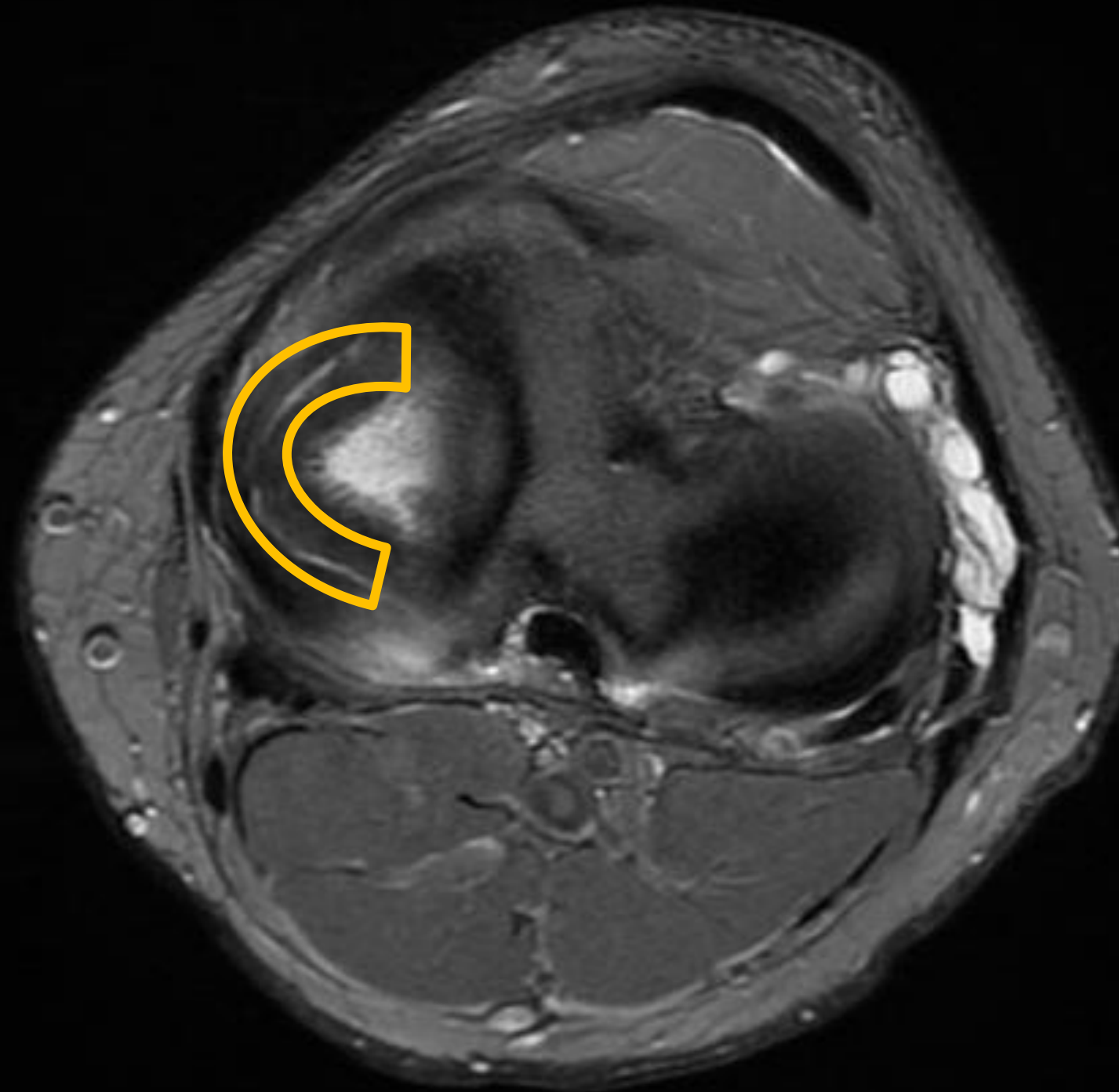


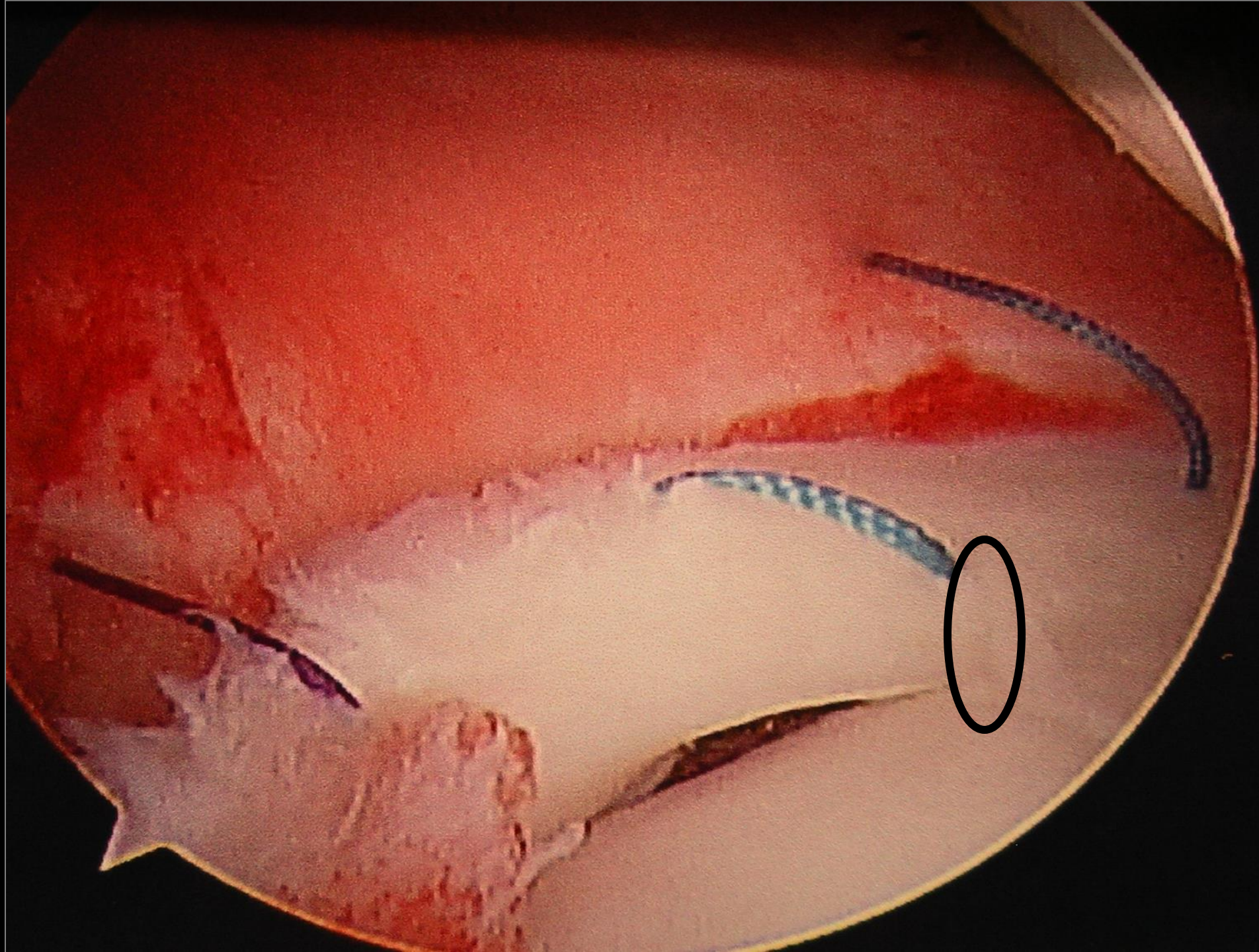








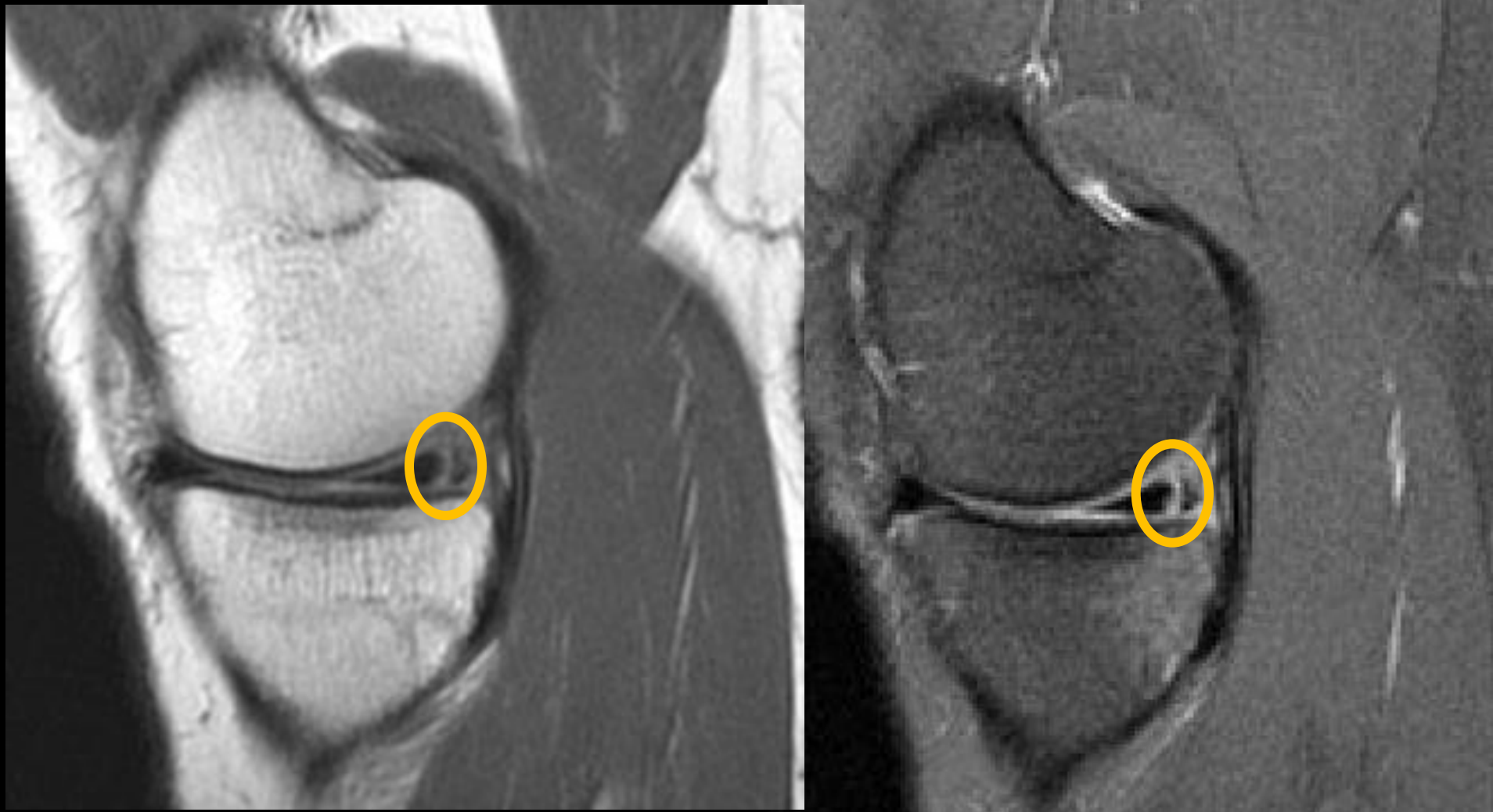




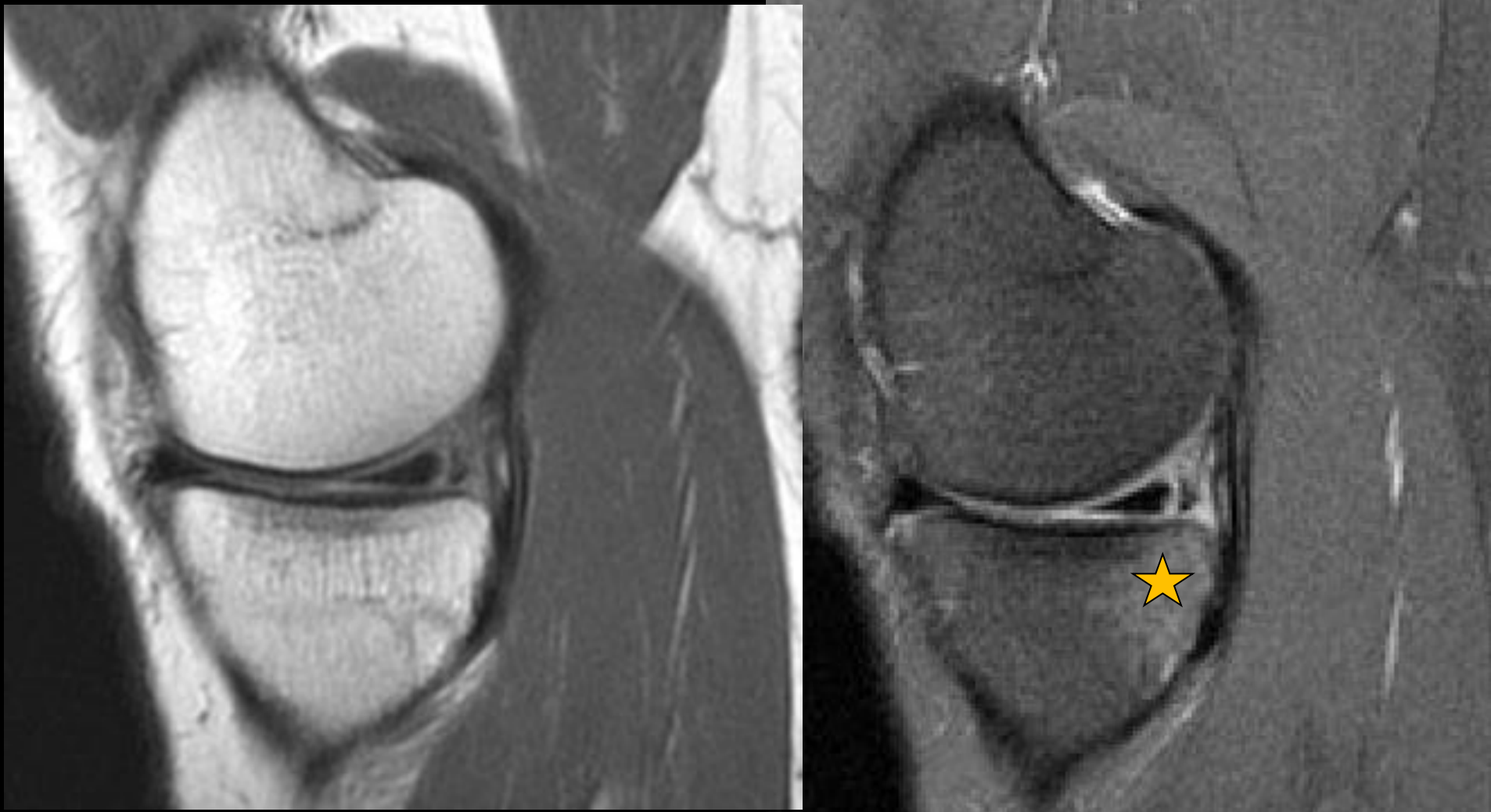
PERIPHERAL MEDIAL MENISCAL TEAR AND CONTUSION (RAMP LESION)



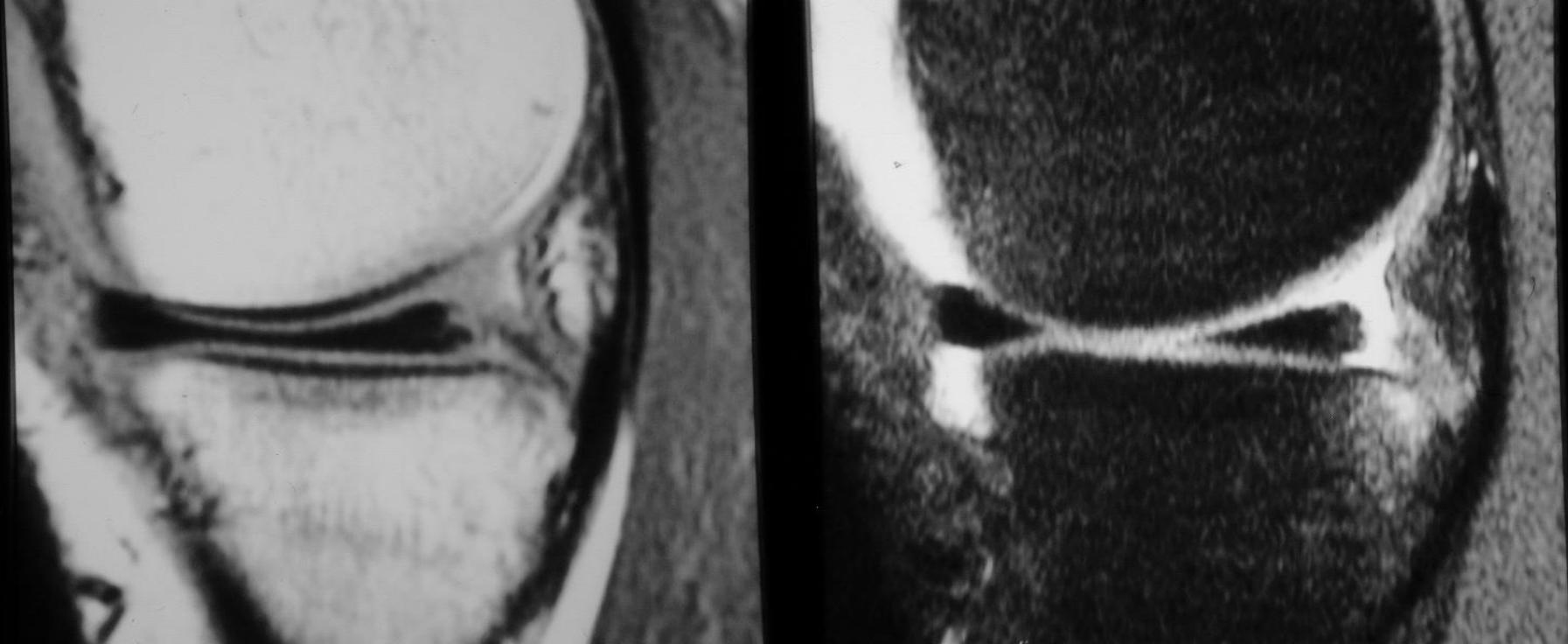
PERIPHERAL MEDIAL MENISCAL TEAR AND CONTUSION (RAMP LESION)



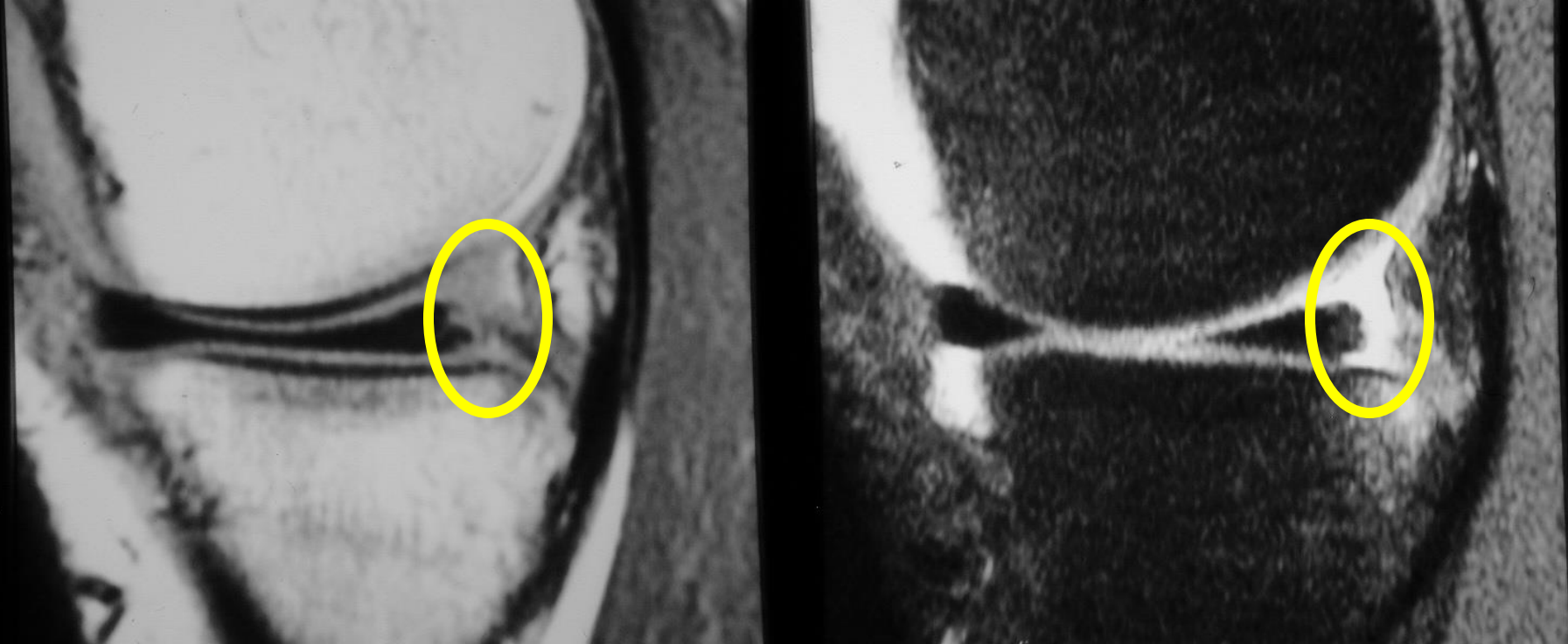
PERIPHERAL MEDIAL MENISCAL TEAR AND CONTUSION (RAMP LESION)



MENISCOCAPSULAR SEPERATION

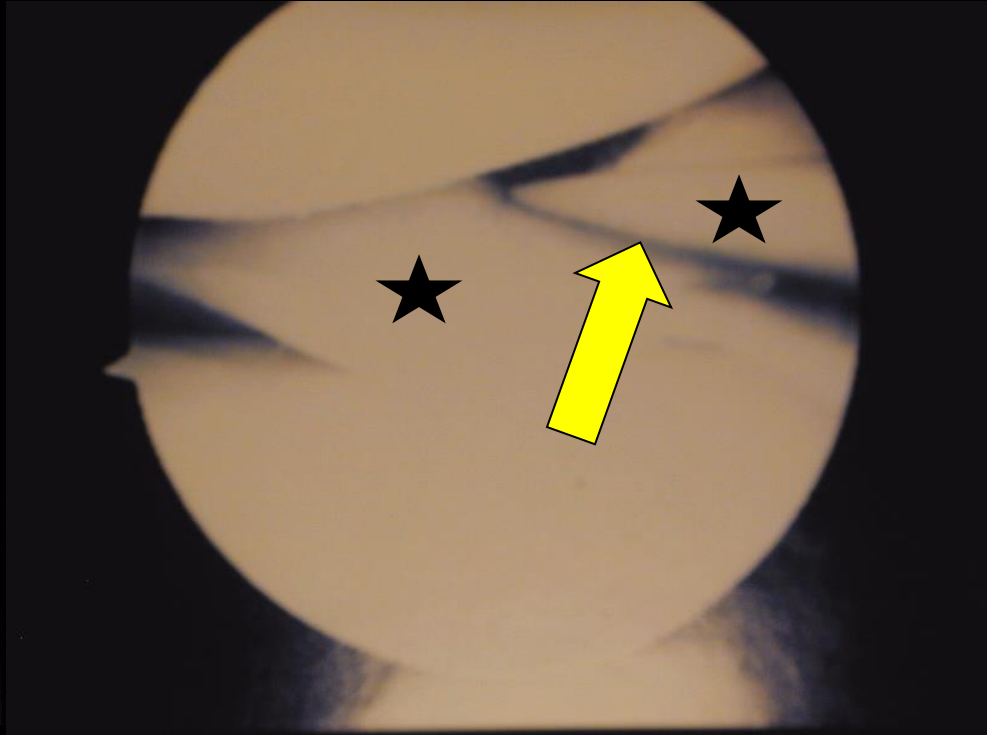
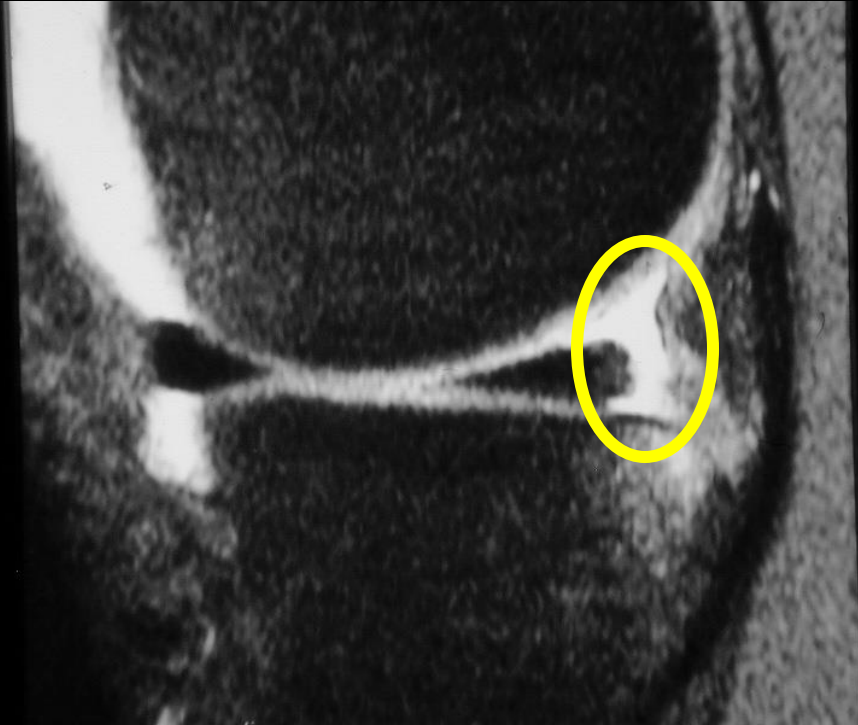


MENISCOCAPSULAR SEPERATION



Be careful not to over diagnose, look
for very high signal on T2

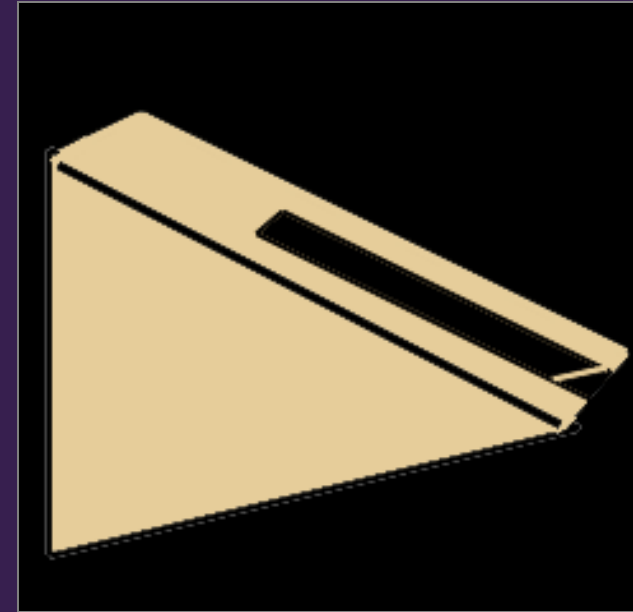
MENISCOCAPSULAR SEPERATION



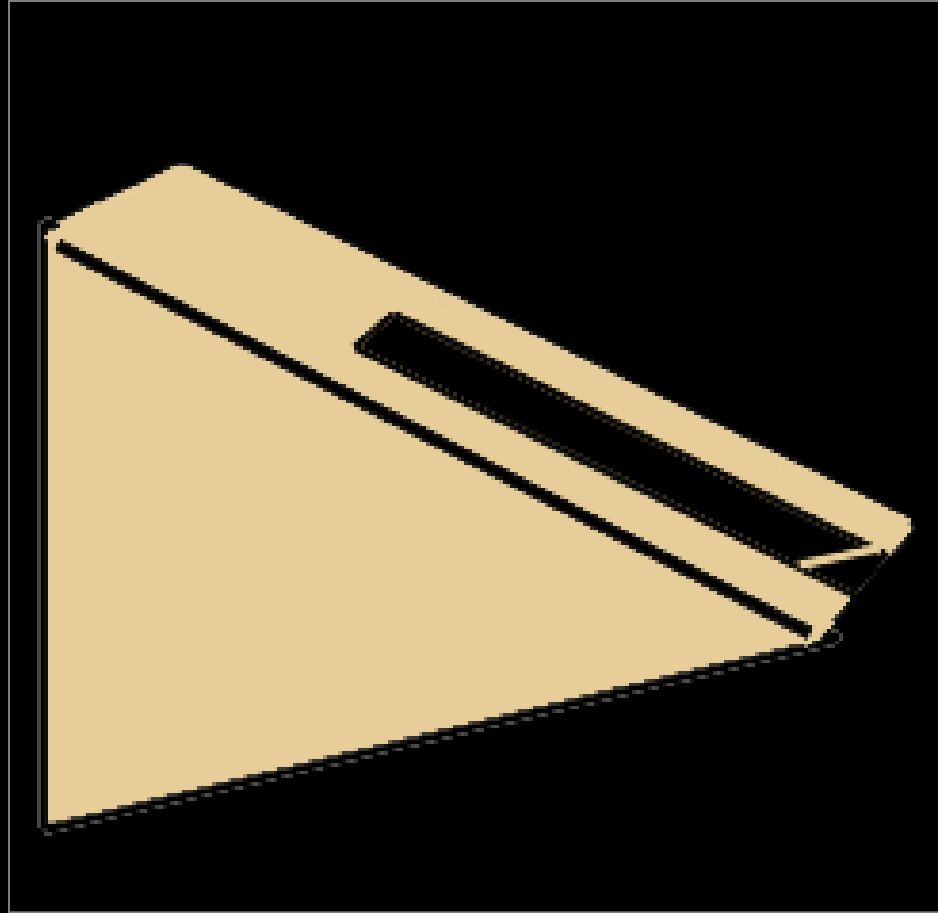
Can be unstable

MENISCAL TEAR RADIAL TYPE

- Vertical tear perpendicular to meniscal curve, often require partial meniscectomy
- Traumatic or degenerative (15%)
- PHMM (53%); PHLM (26%)
- Hoop stress function destroyed
- Mechanically equivalent of total meniscectomy (unrepairable)
 - Increased risk of subchondral fracture “SONK”



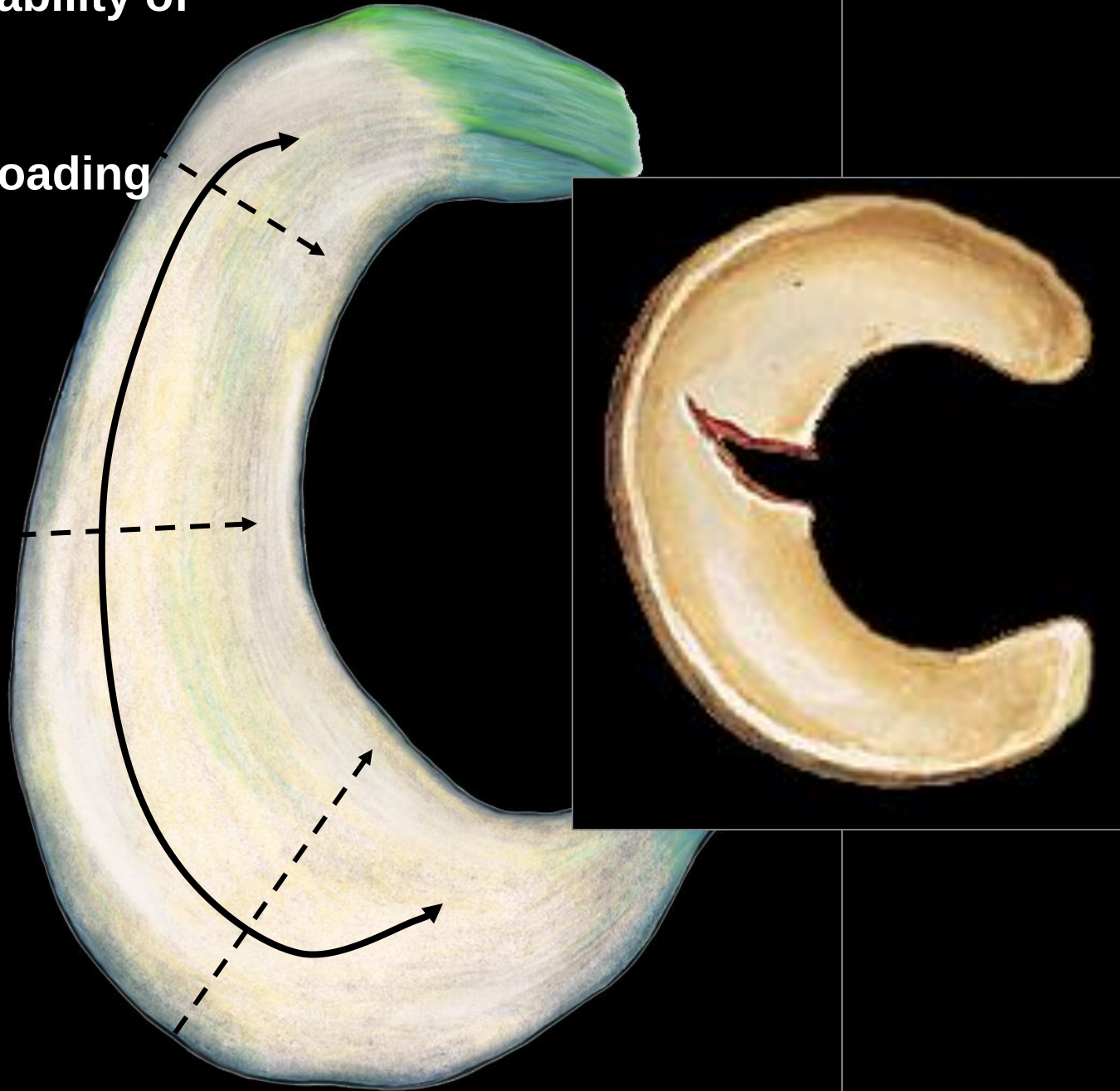
MENISCAL TEAR: RADIAL TYPE



Radial tears disrupt ability of
meniscus to:

Resist longitudinal loading

“hoop stresses”



MENISCAL TEAR: RADIAL TYPE MR IMAGING FEATURES

- Cleft or globular sign (also seen in vertical longitudinal tears)
 - Body (sagittal plane), Horns (coronal plane)
- Marching cleft sign
- Truncated triangle sign
- Ghost meniscus sign
- Axial images important for morphology
- May involve meniscal root and lead to extrusion



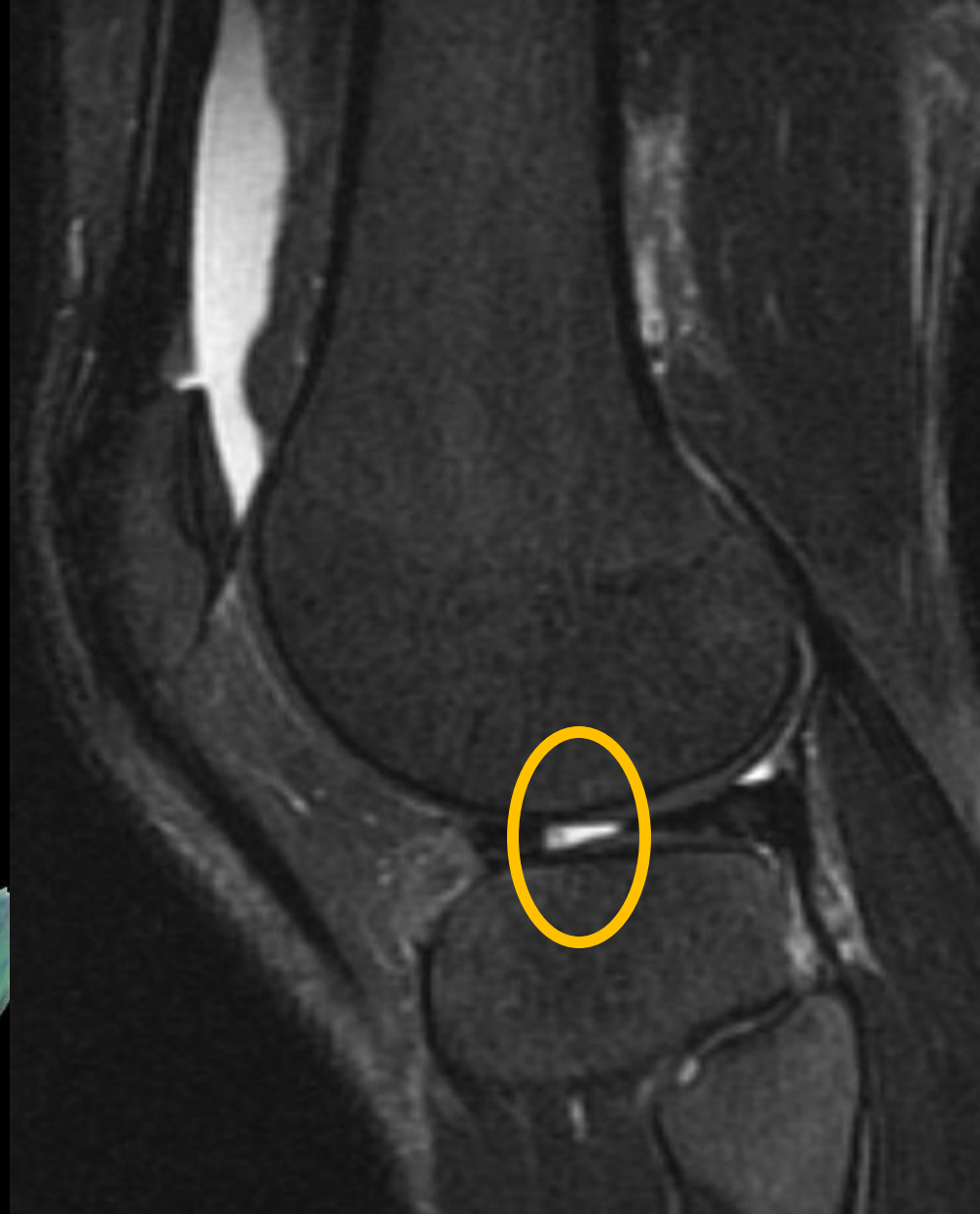
CLEFT SIGN



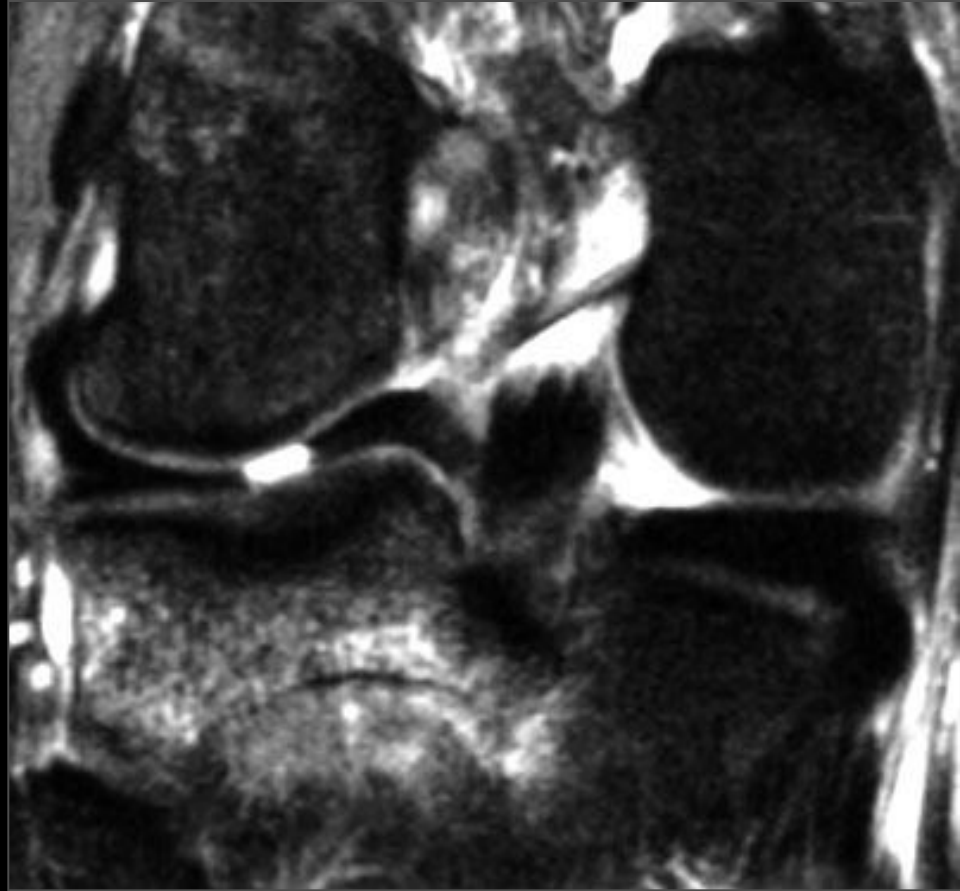
CLEFT SIGN



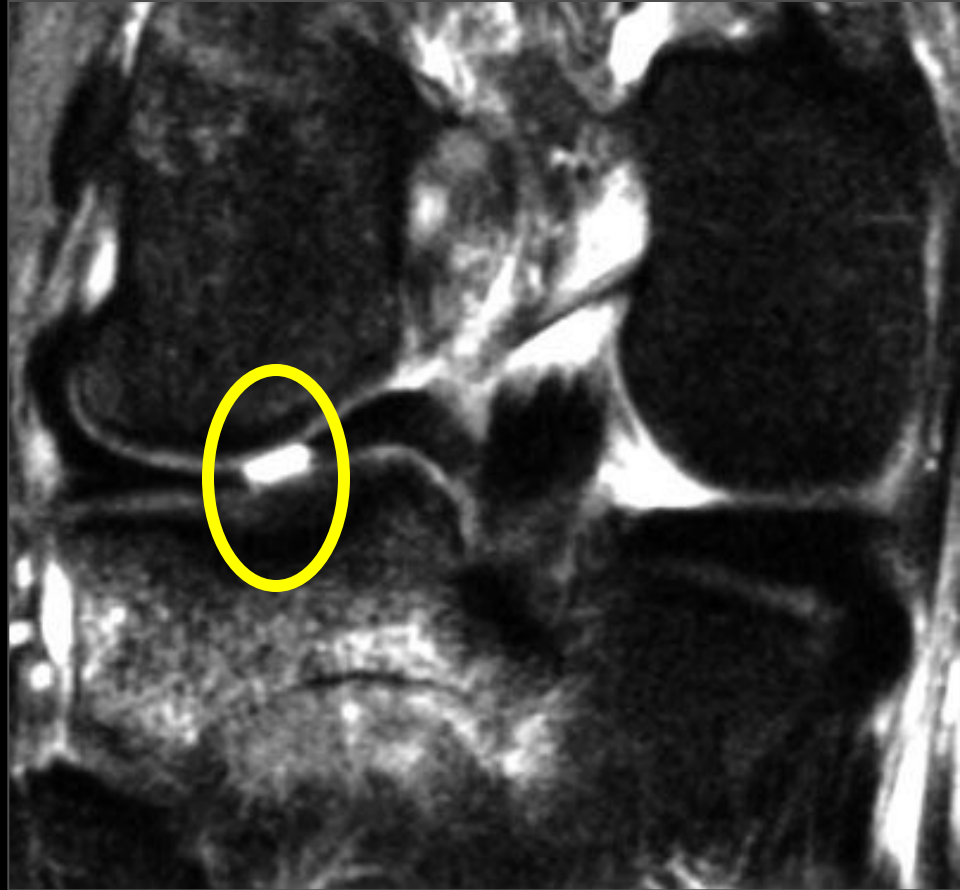
MARCHING CLEFT SIGN



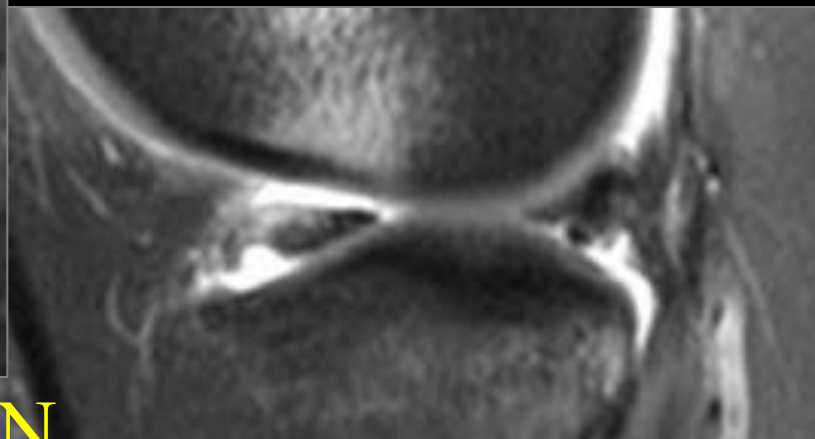
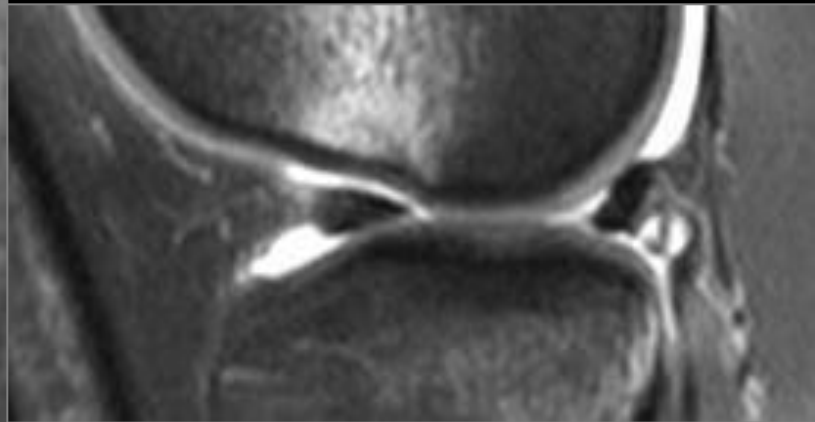
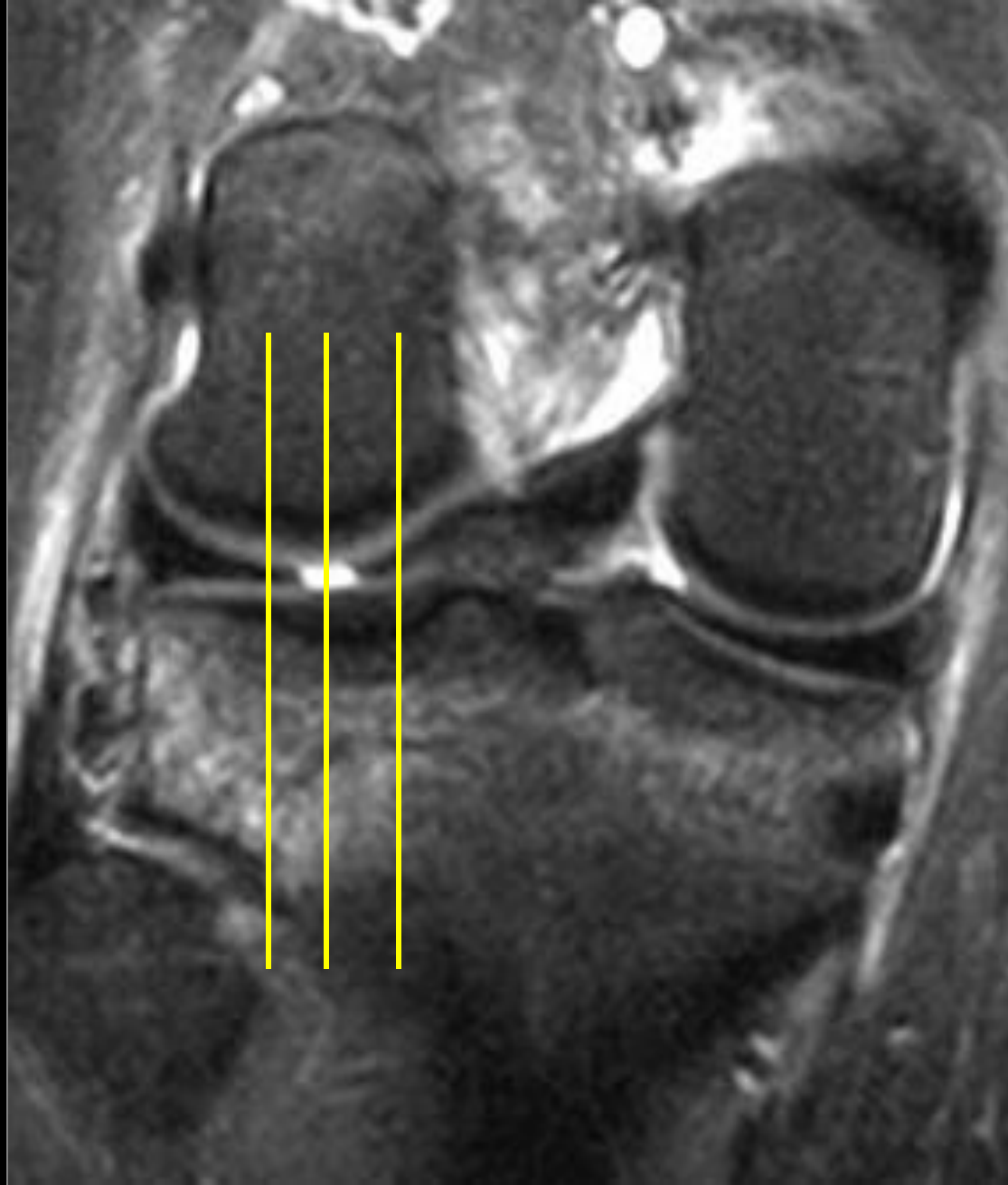
MARCHING CLEFT SIGN



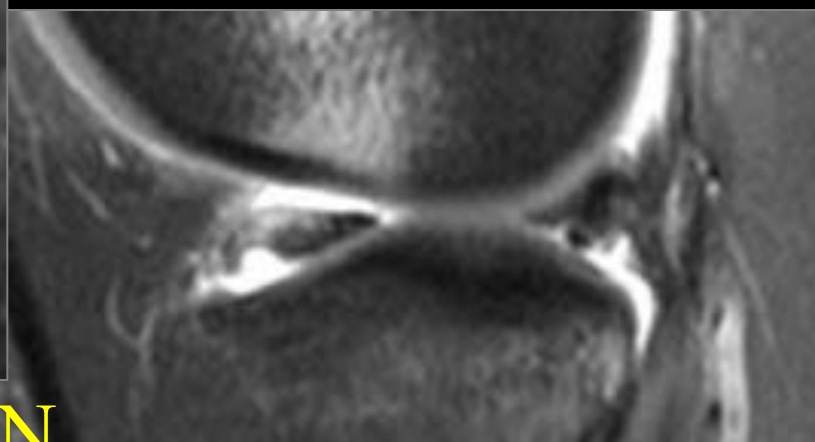
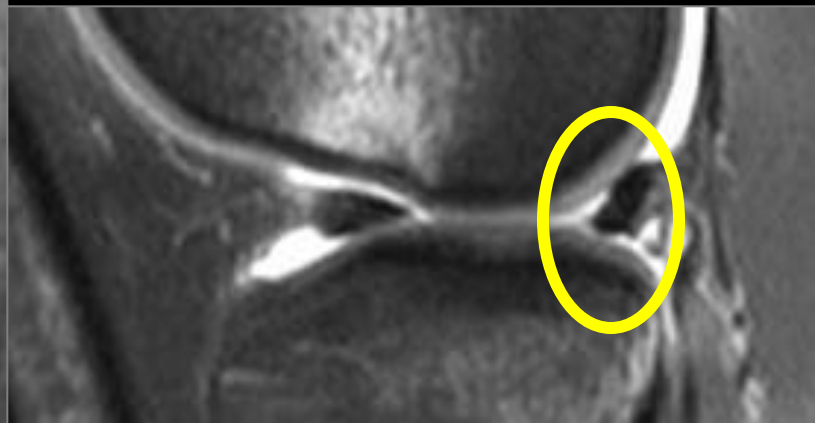
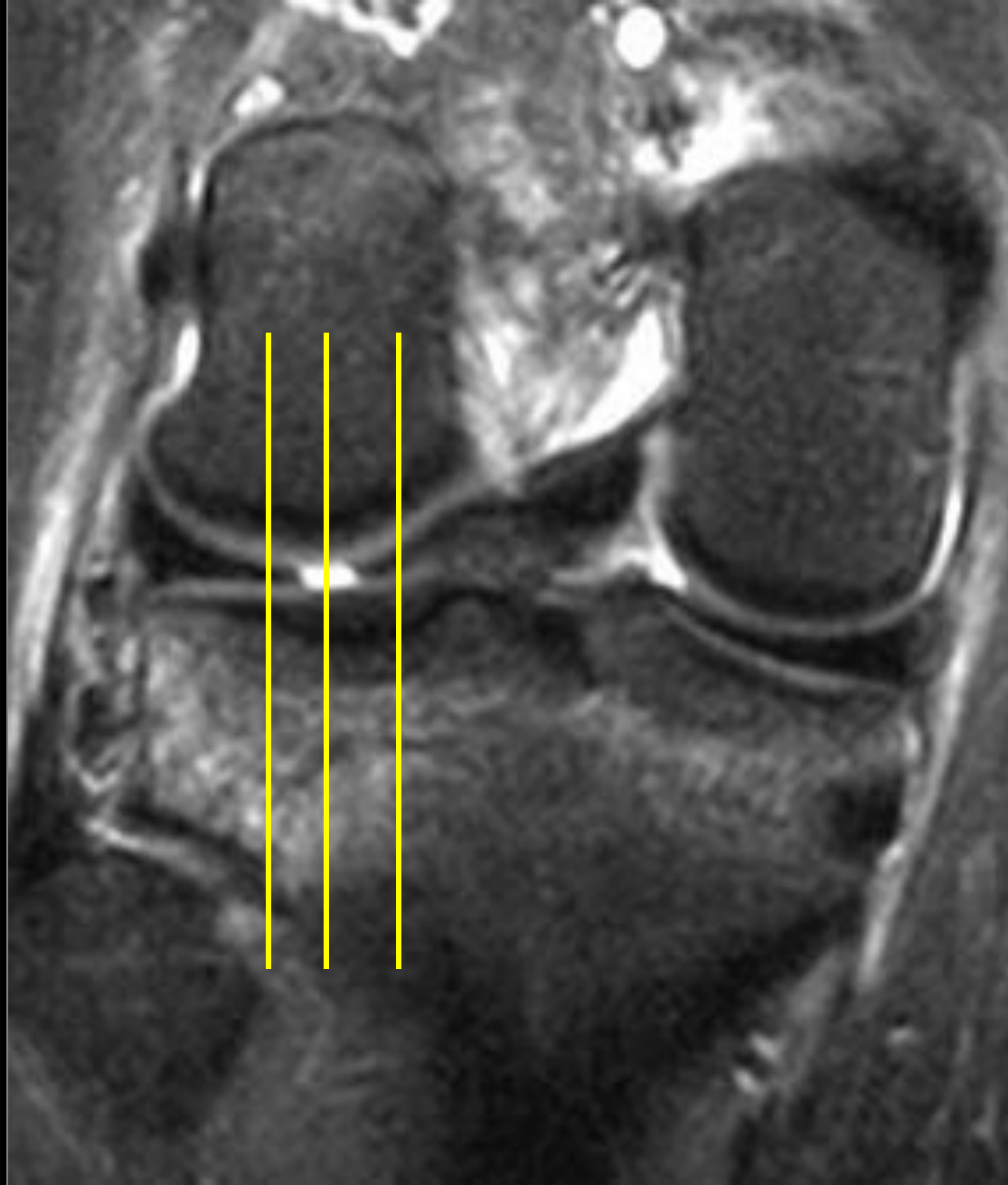
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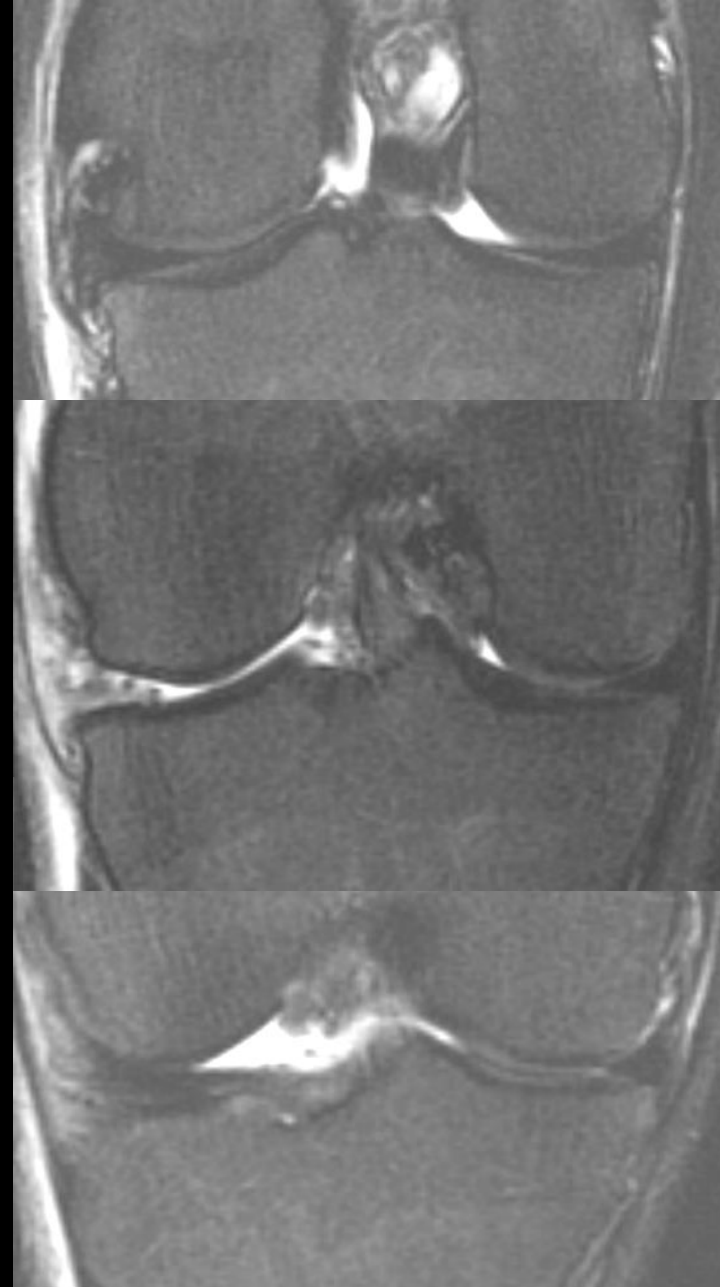
CLEFT SIGN



TRUNCATED TRIANGLE SIGN



TRUNCATED TRIANGLE SIGN



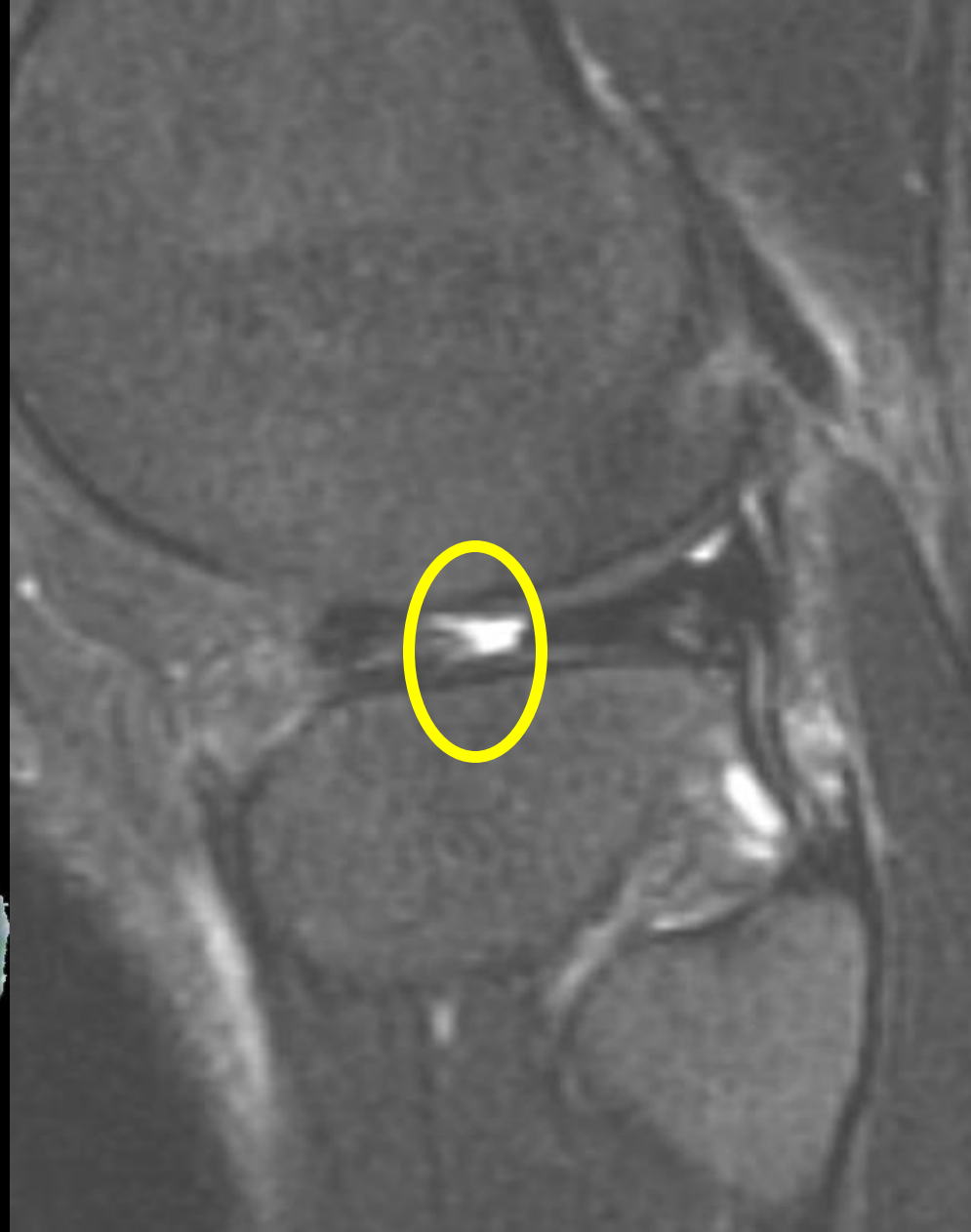
GHOST MENISCUS SIGN



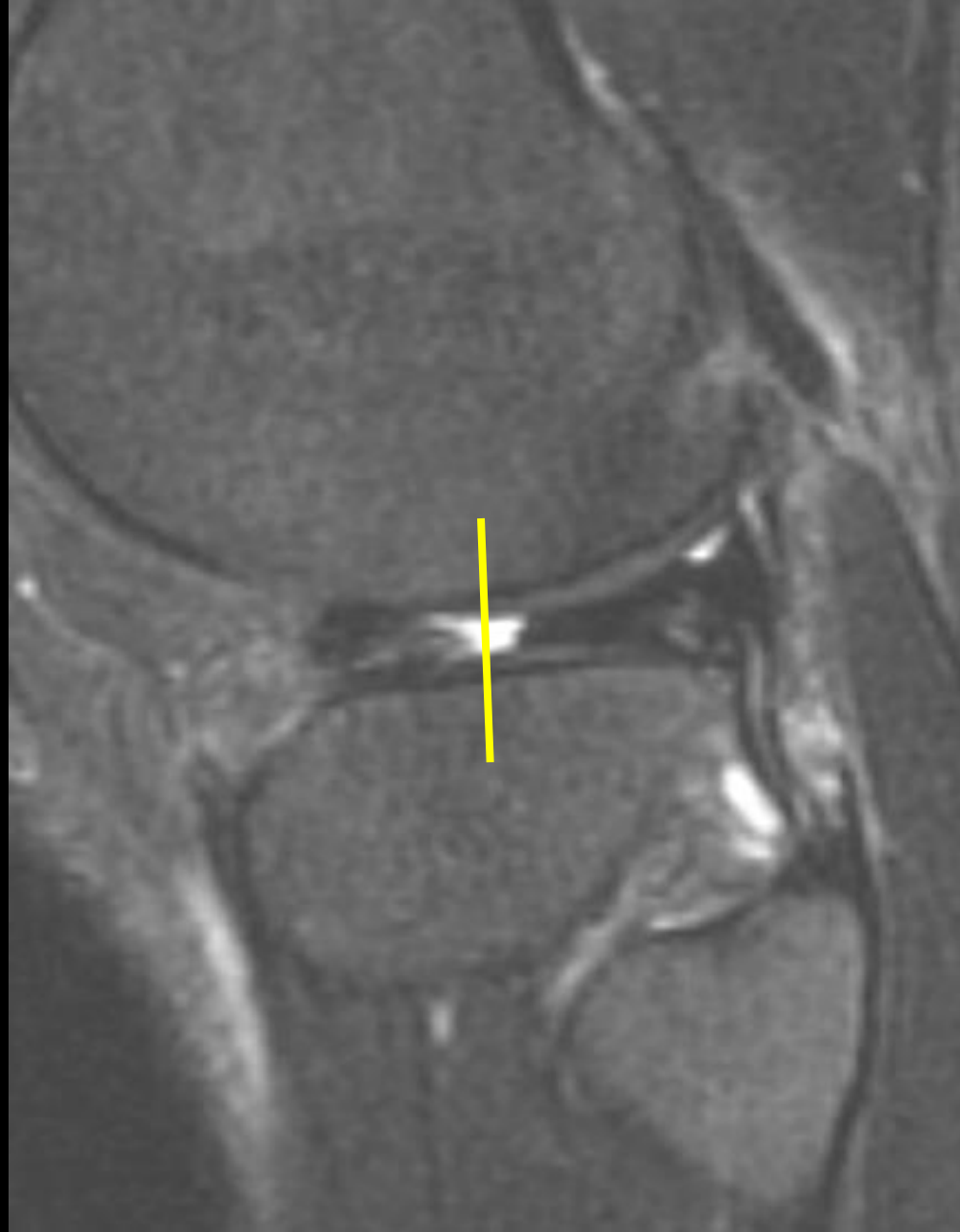
GHOST MENISCUS SIGN



GHOST MENISCUS SIGN



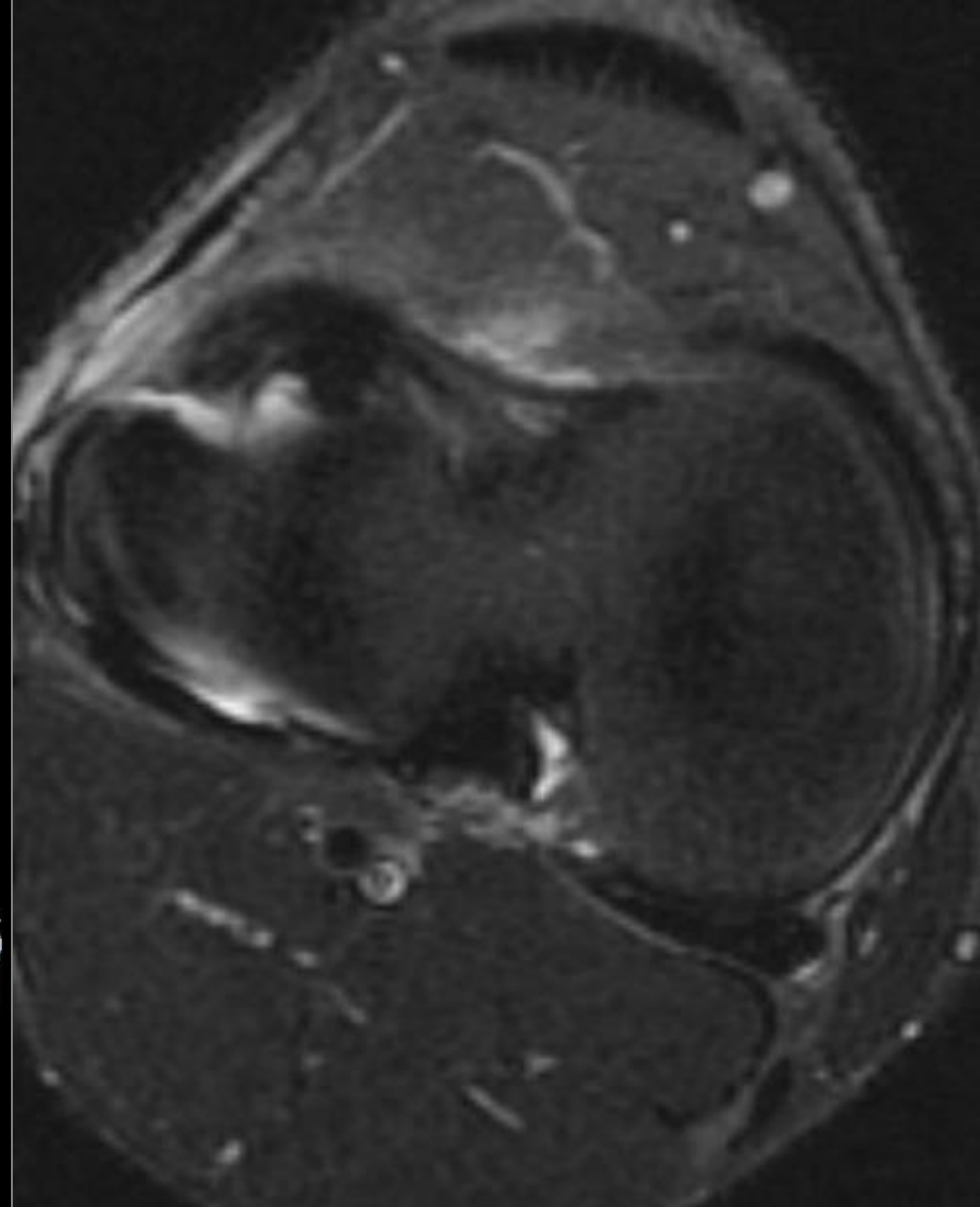
GHOST MENISCUS SIGN

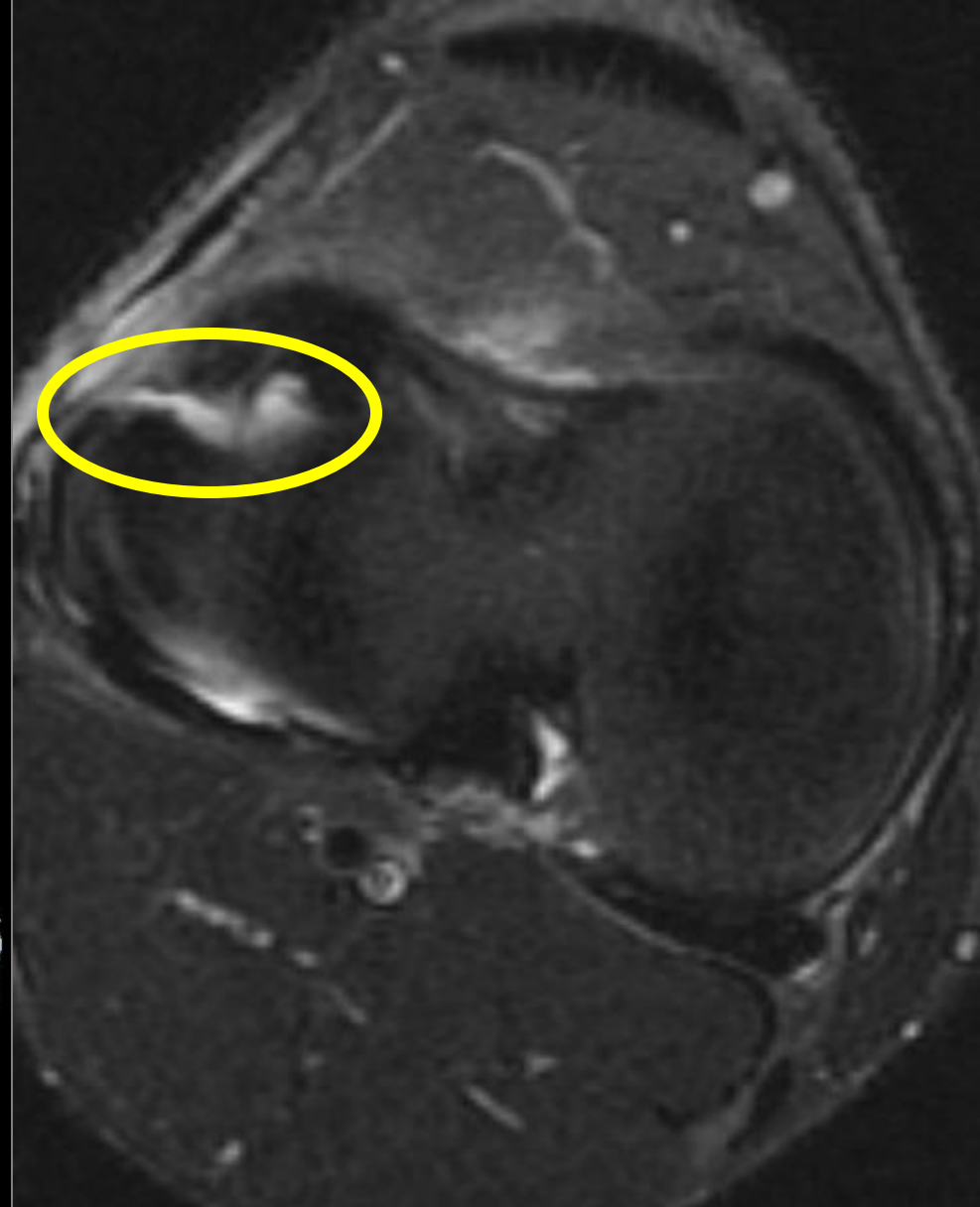


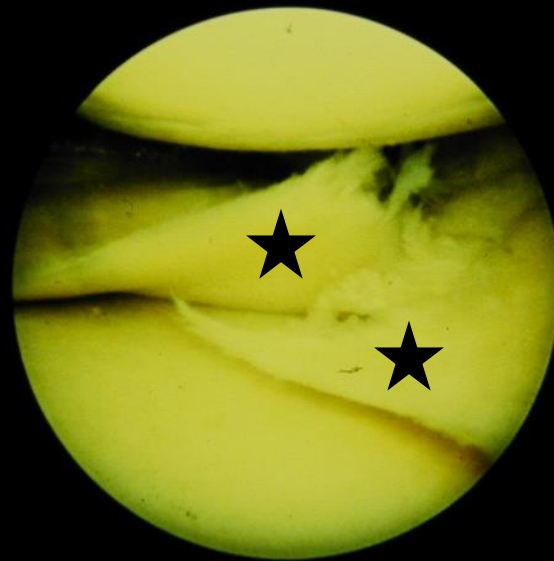
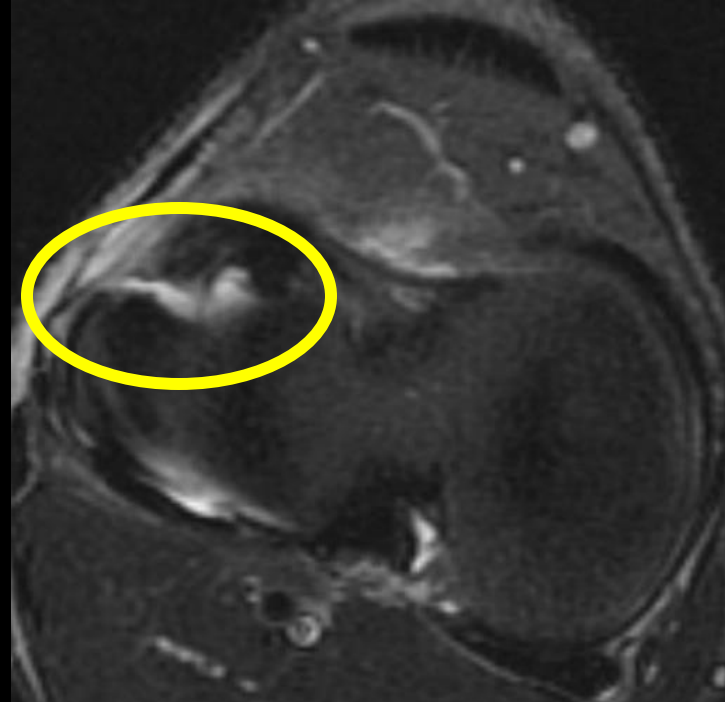
GHOST MENISCUS SIGN



GHOST MENISCUS SIGN

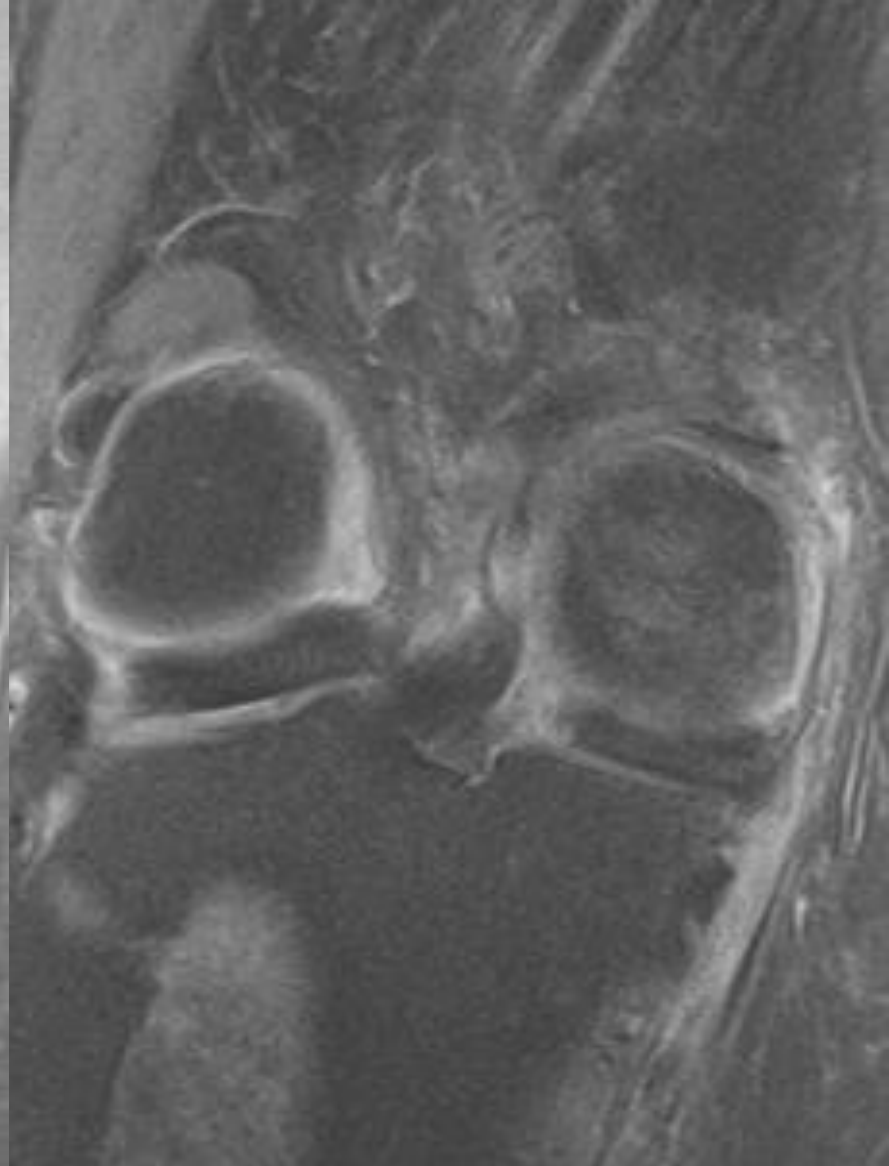








Normal



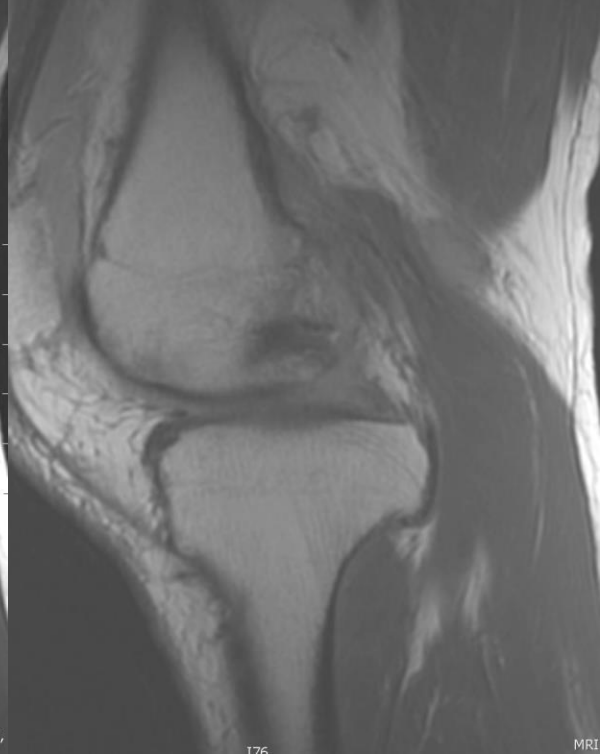
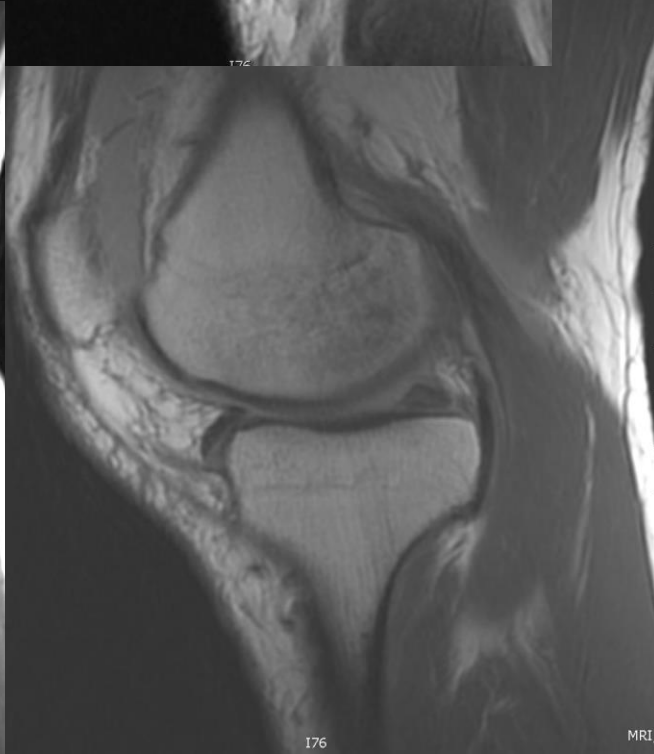
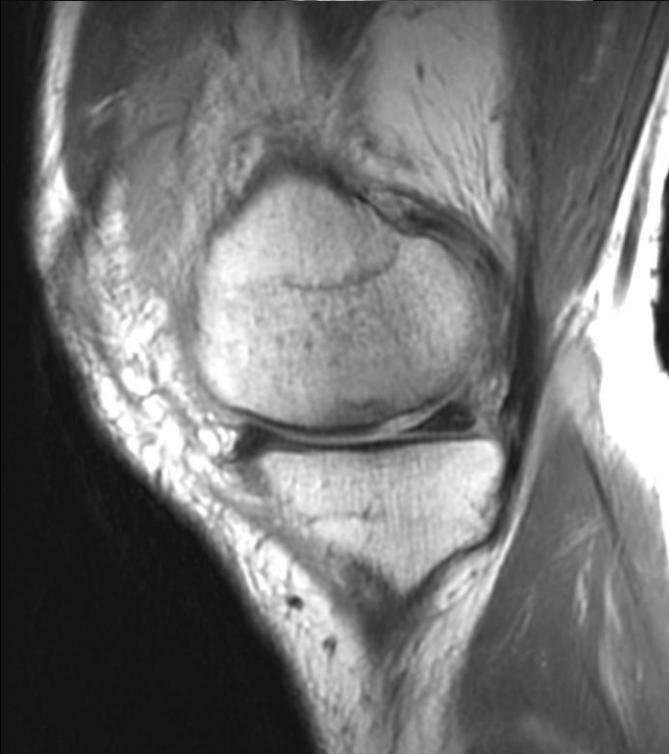
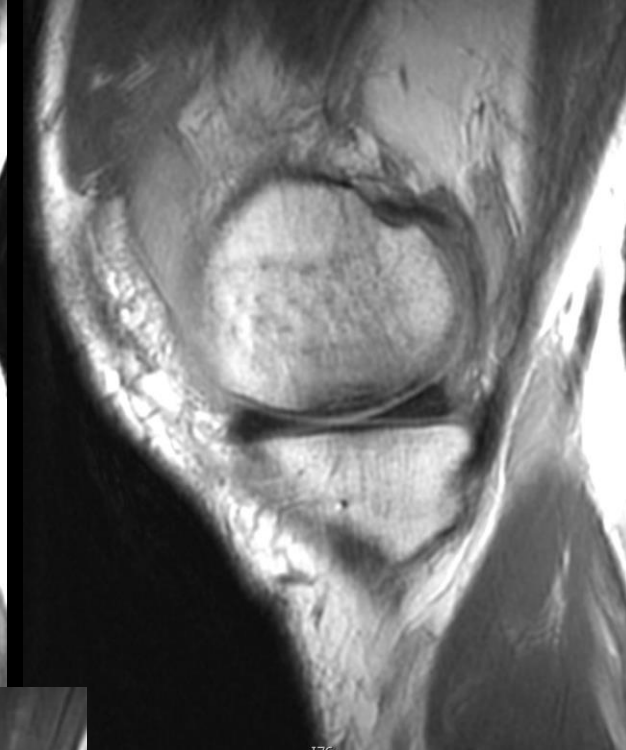
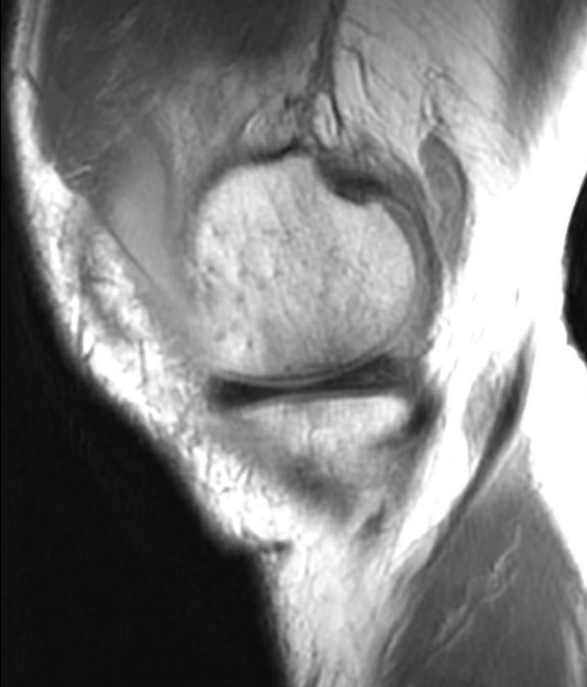
Radial meniscal root tear

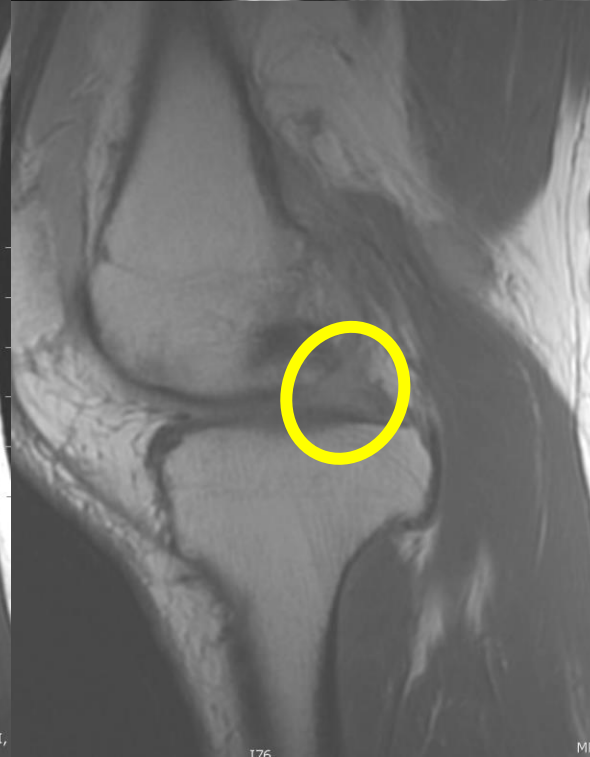
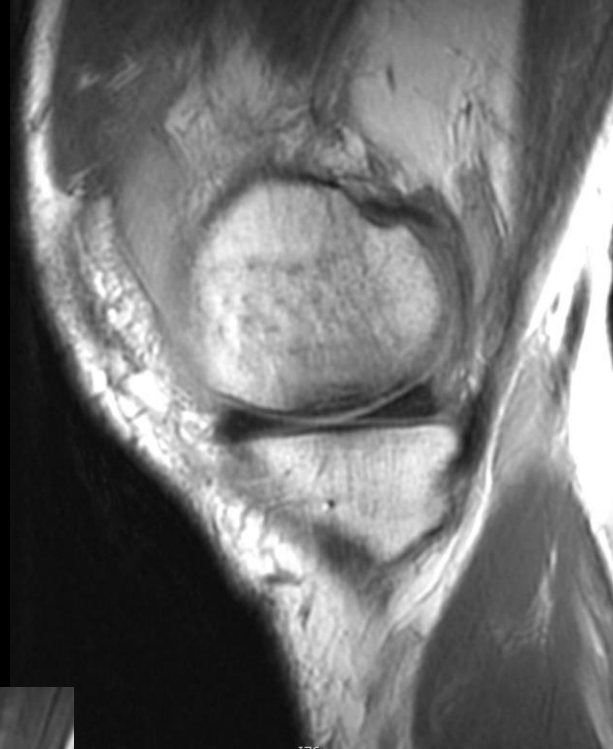
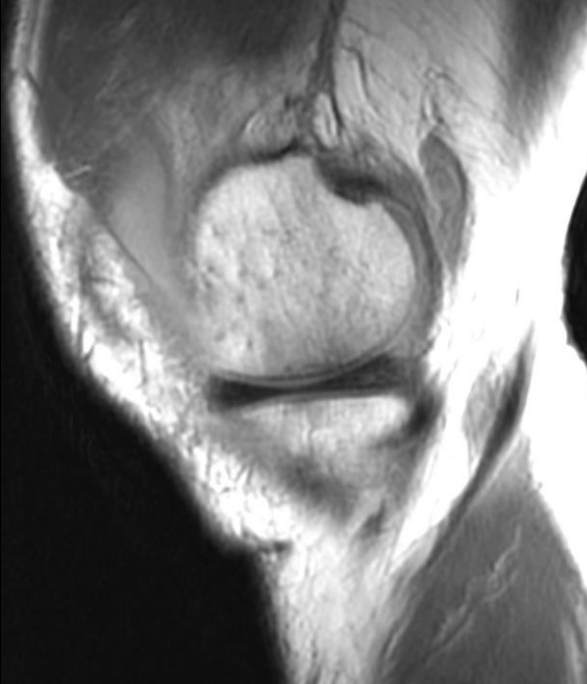


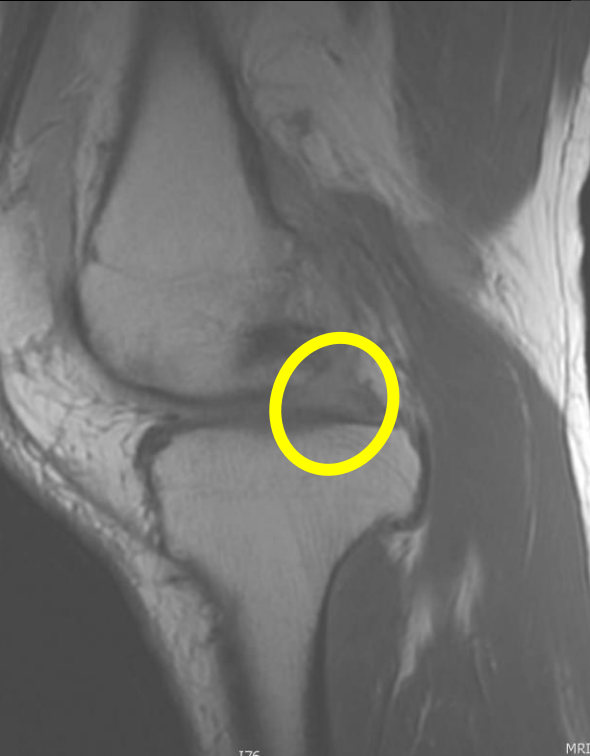
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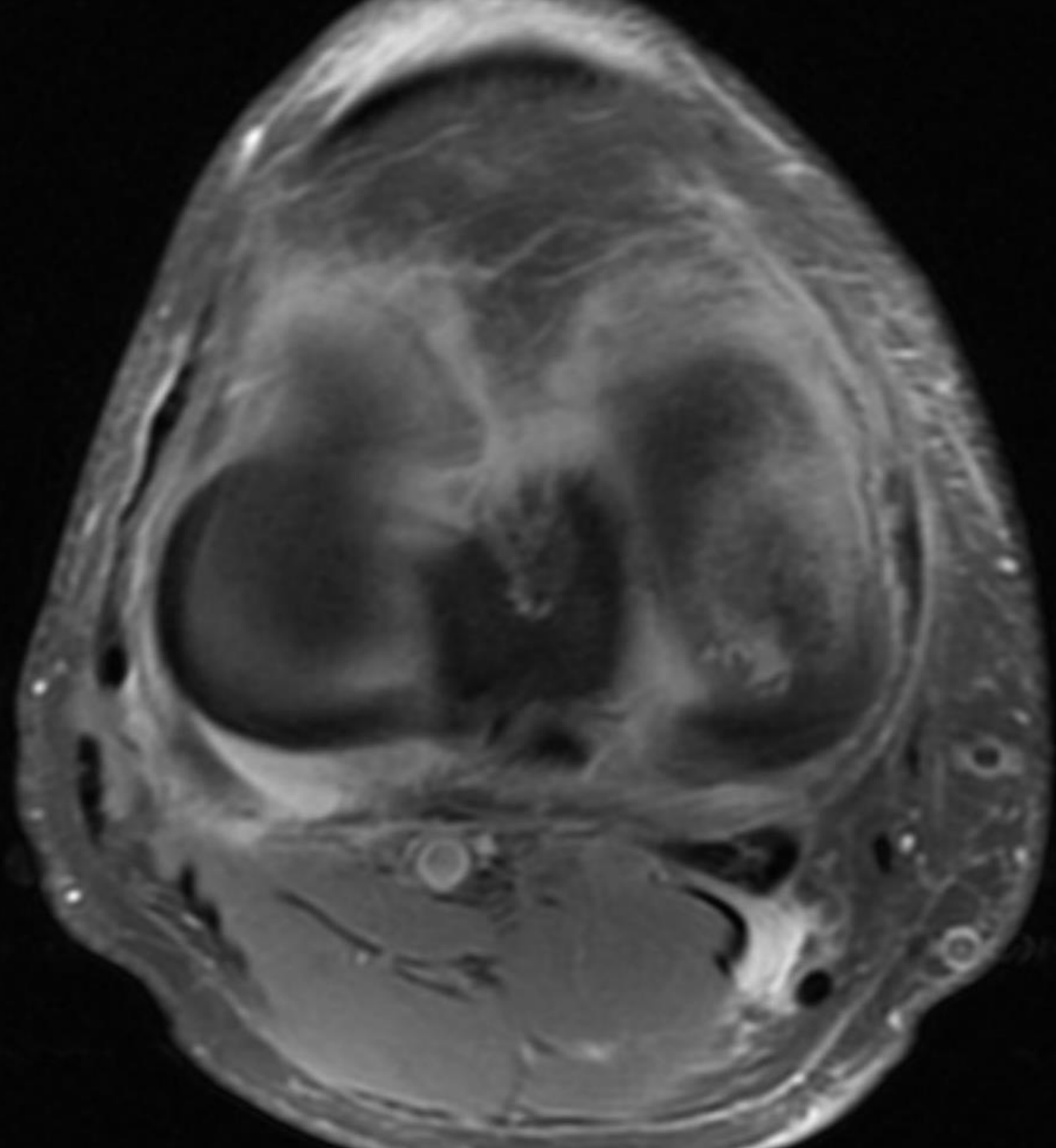


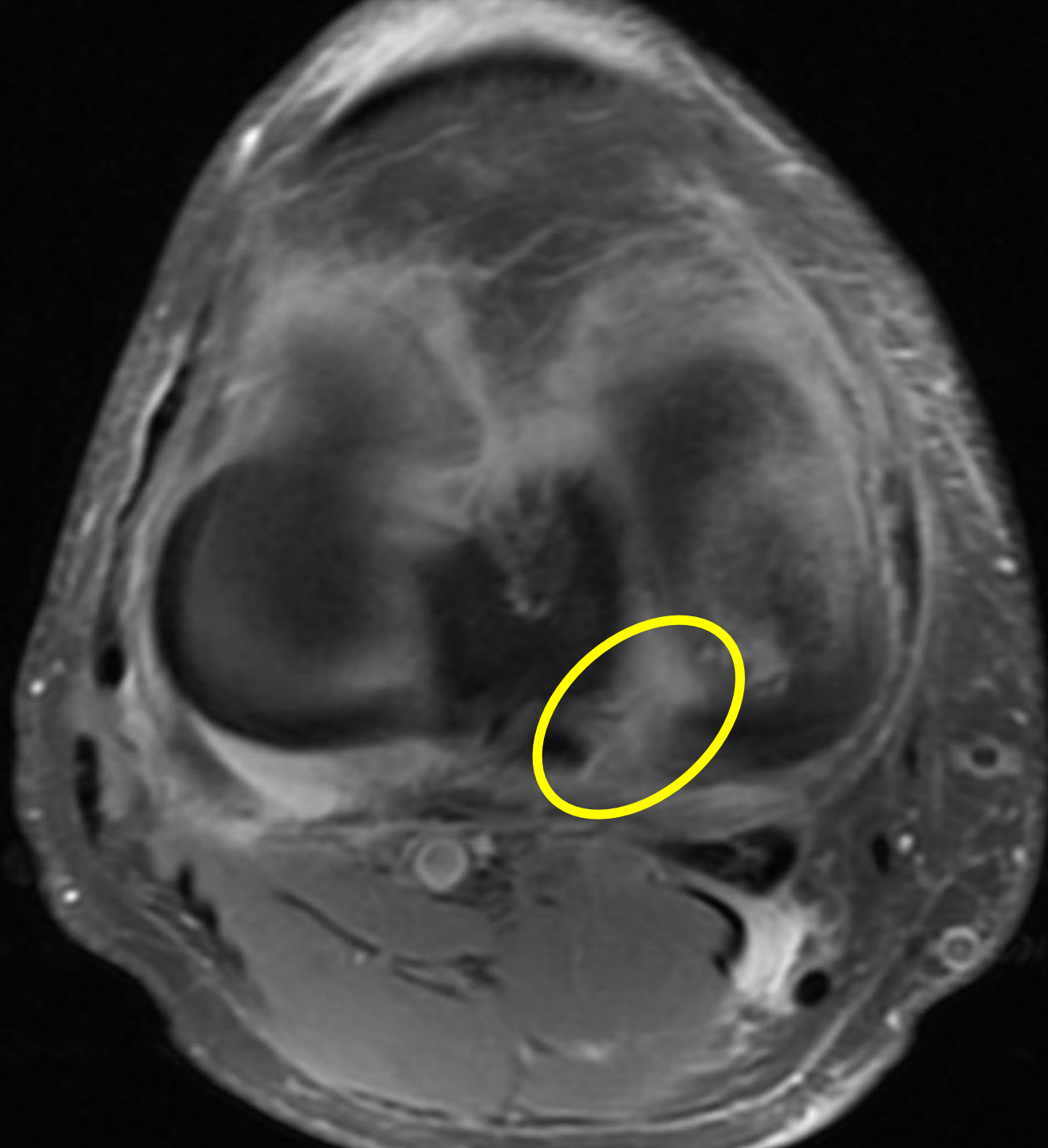
Radial meniscal root tear

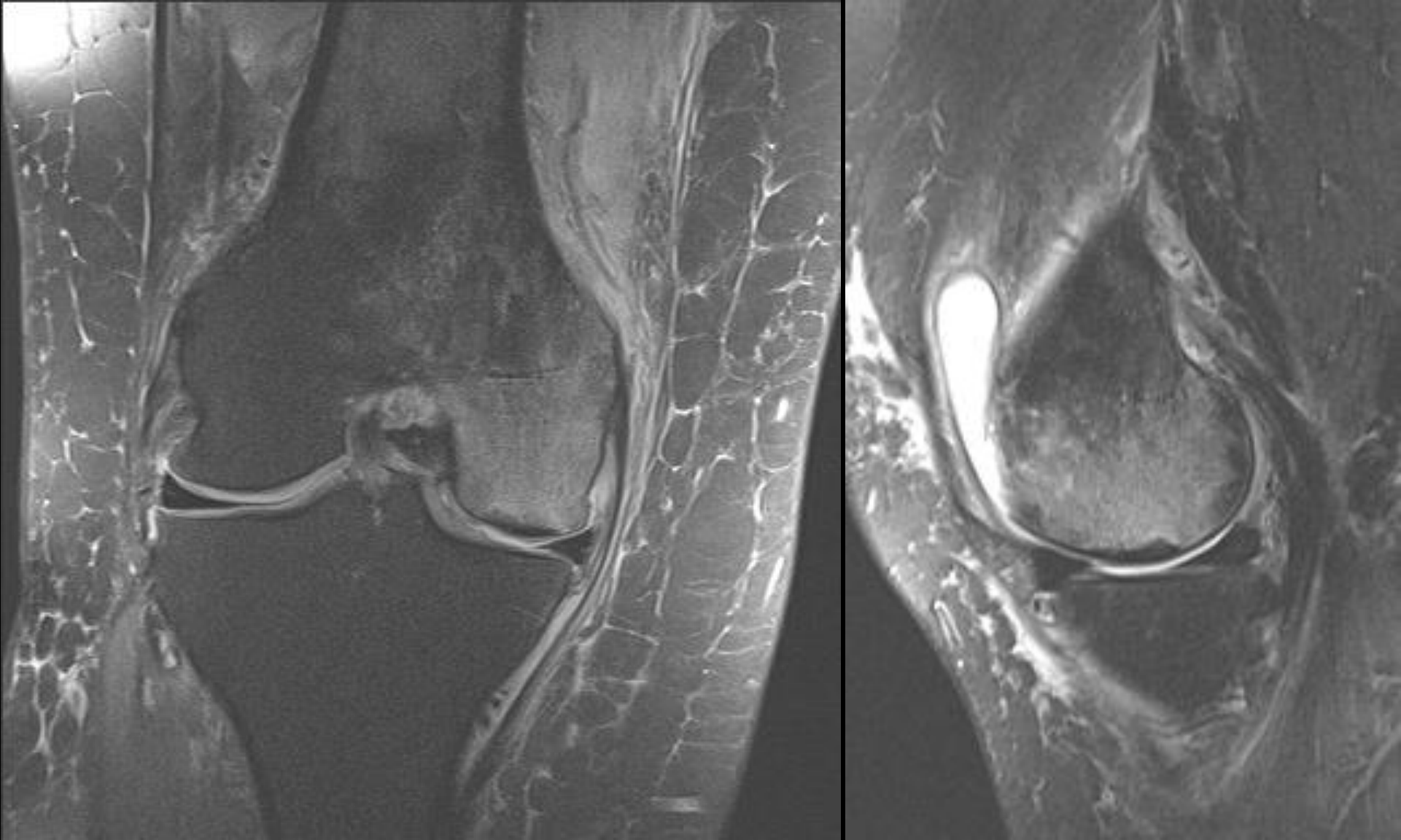




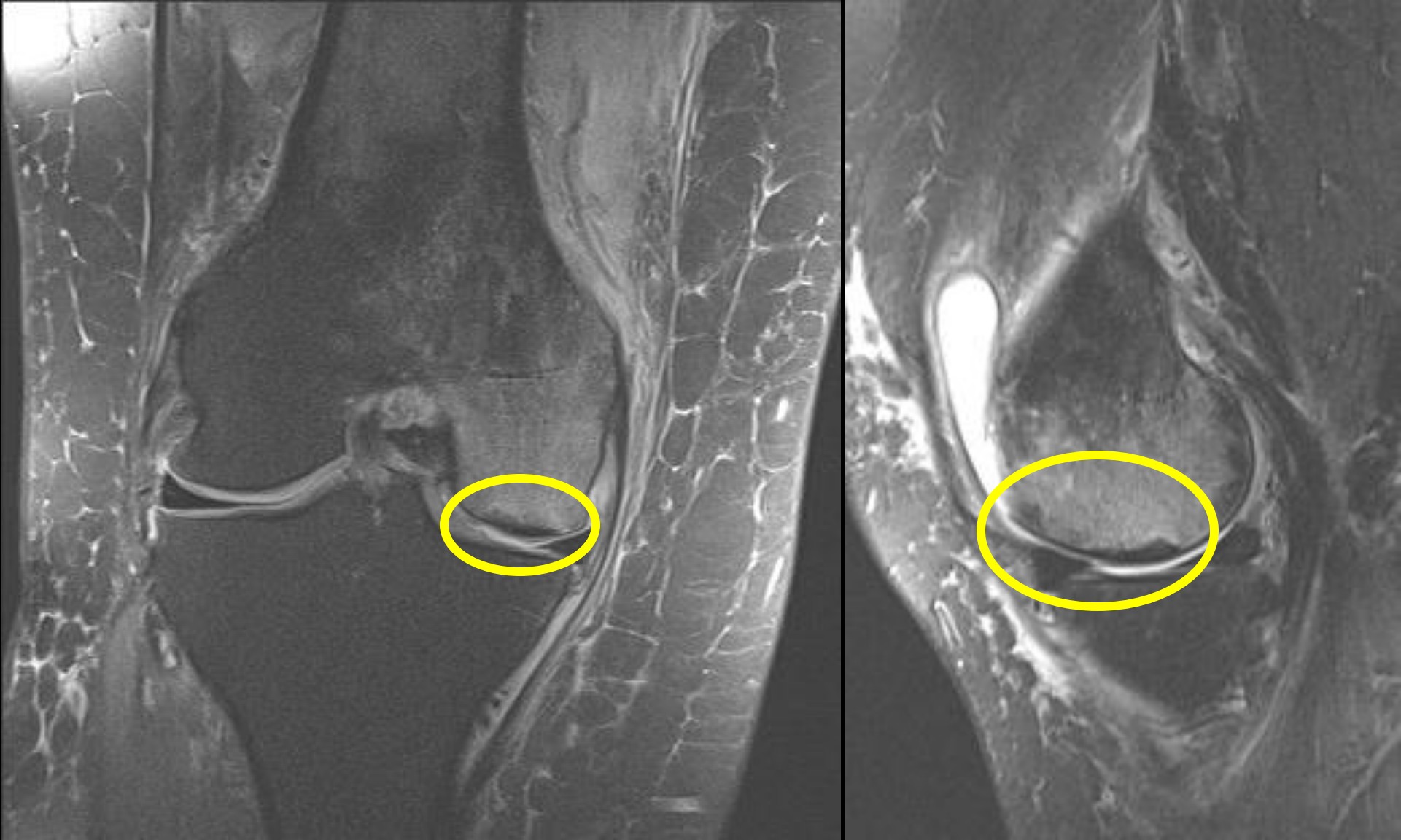








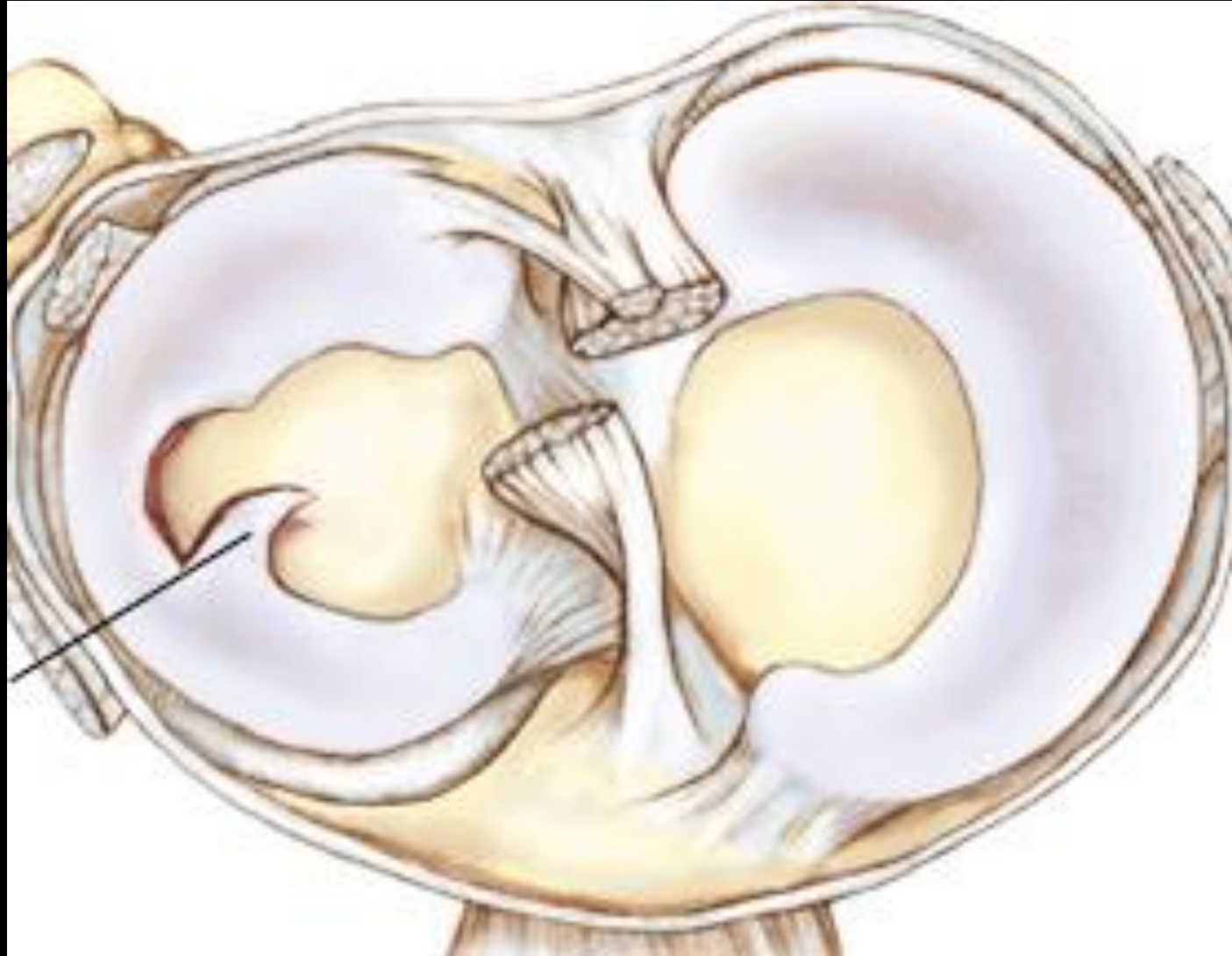
Subchondral Fracture
Spontaneous Osteonecrosis (SONK)



Subchondral Fracture
Spontaneous Osteonecrosis (SONK)

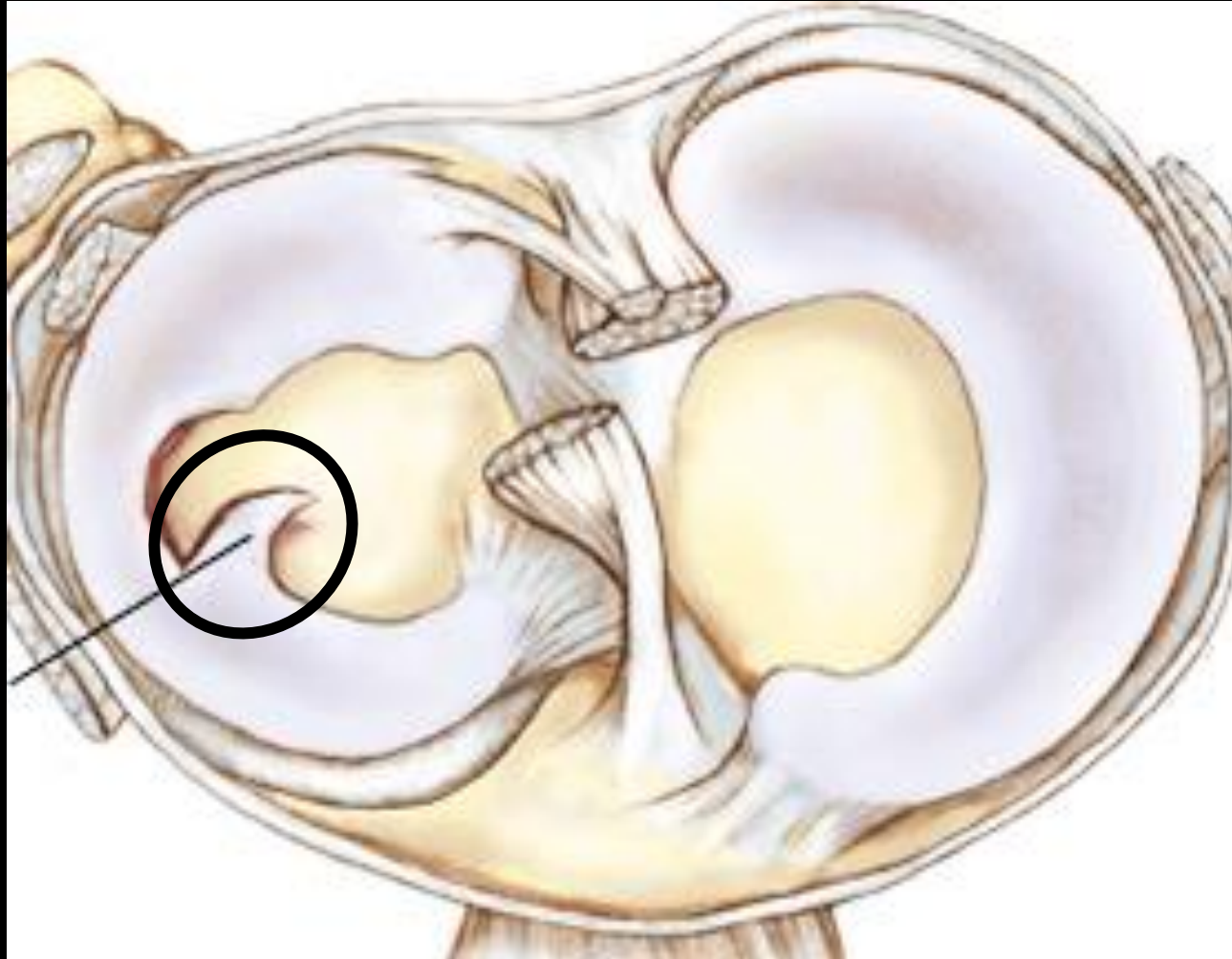
MENISCAL TEAR

RADIAL/ PARROT BEAK



MENISCAL TEAR

RADIAL/ PARROT BEAK

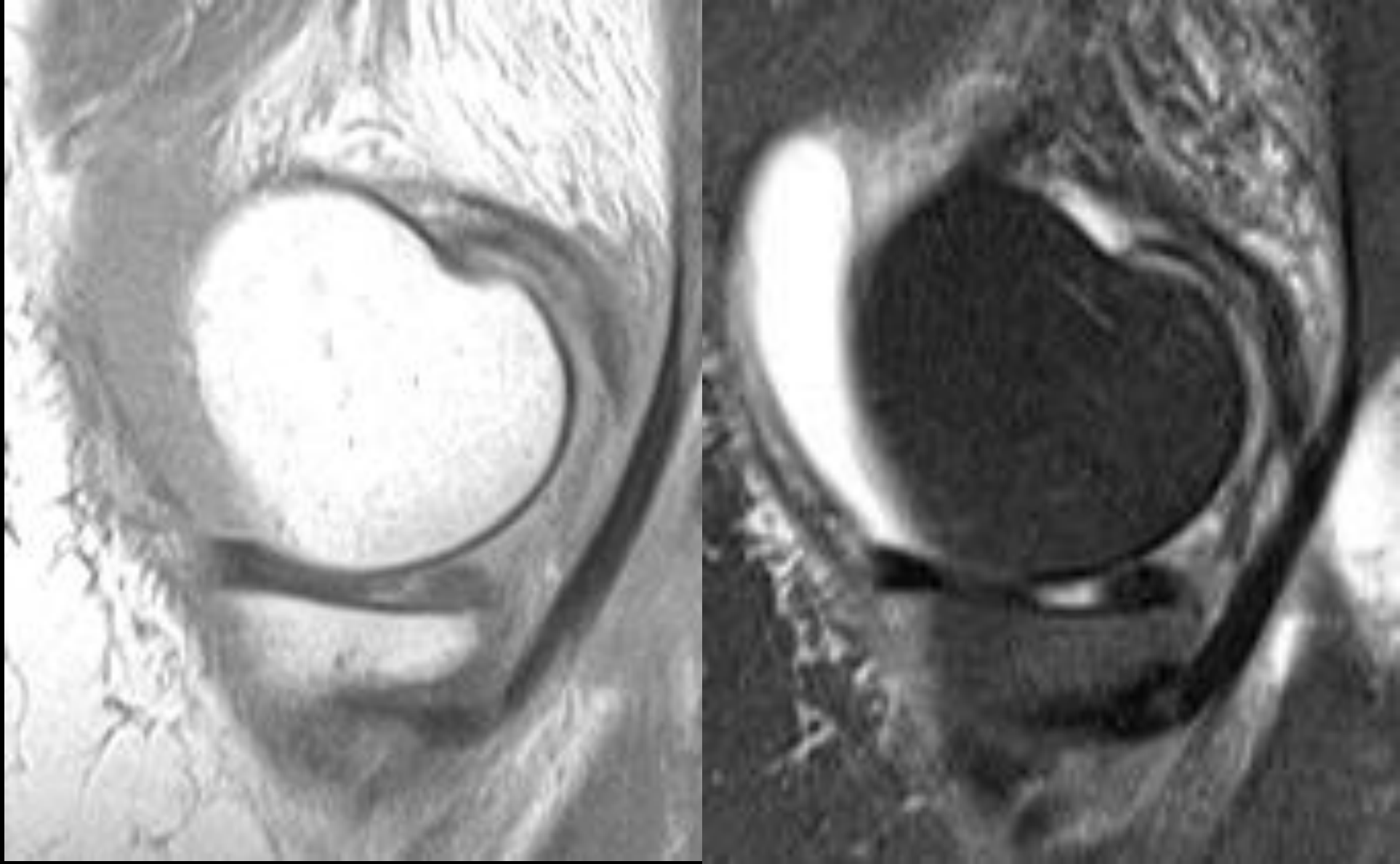


Combination of
radial
and longitudinal

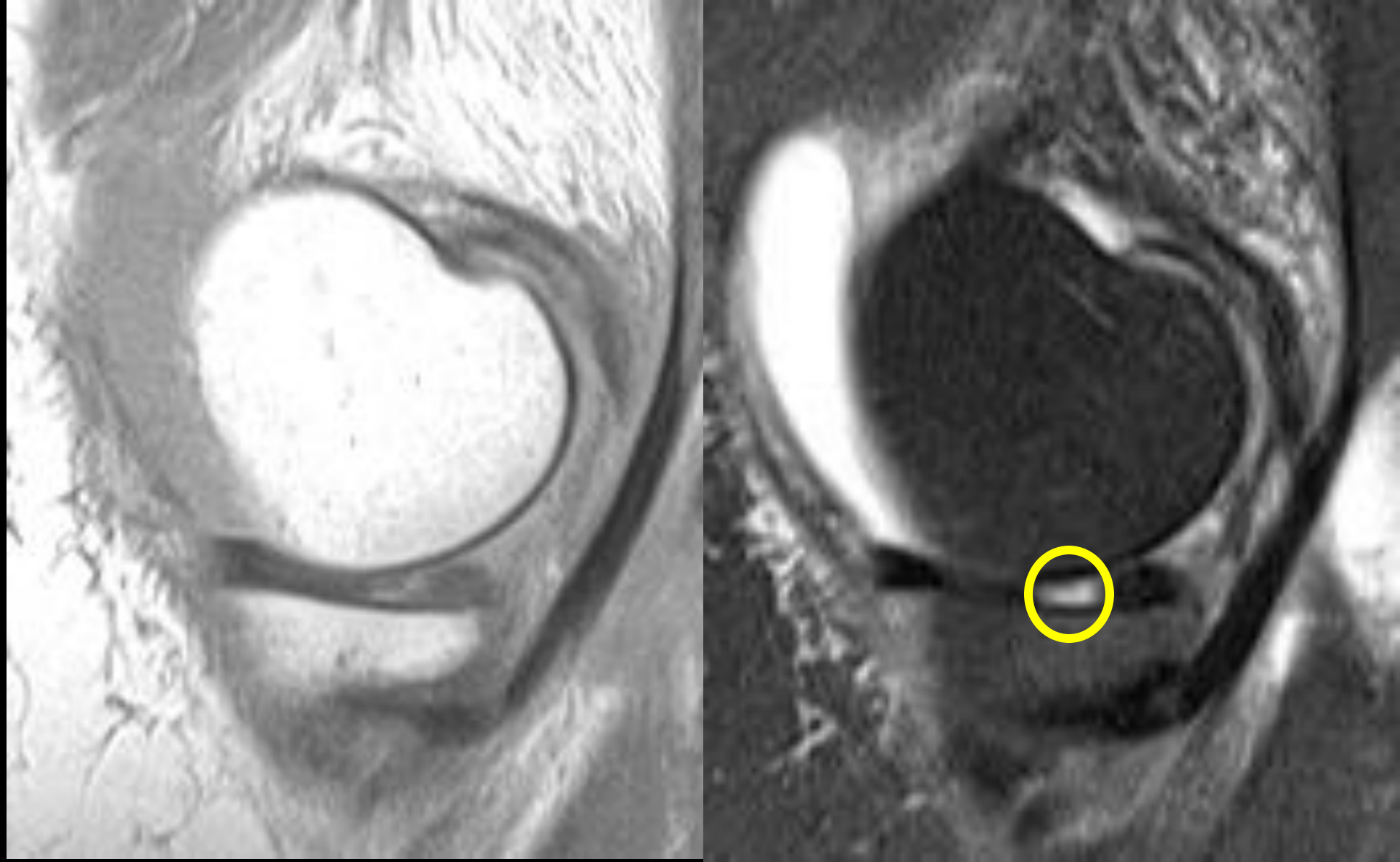
MENISCAL TEAR

RADIAL/ PARROT BEAK

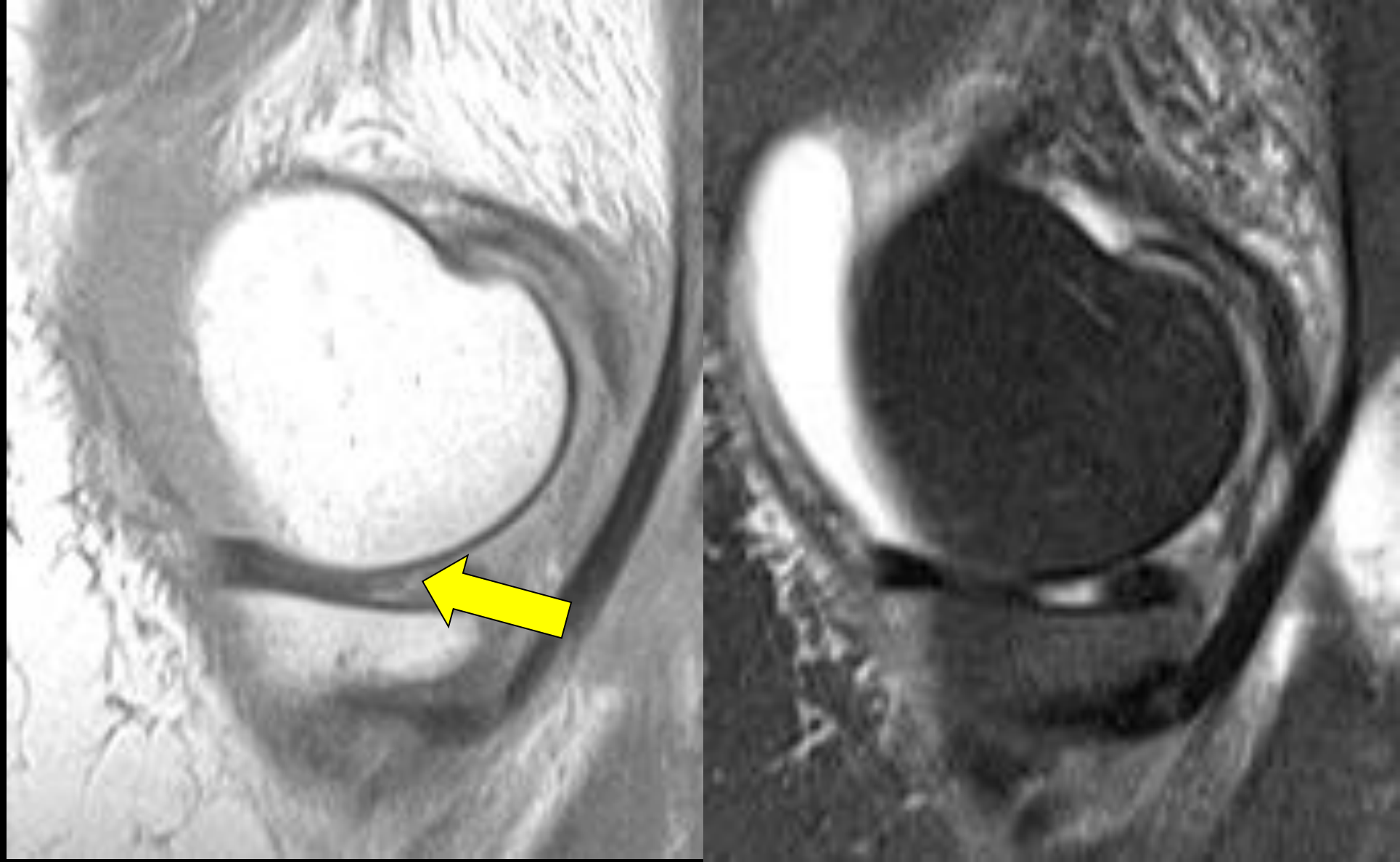




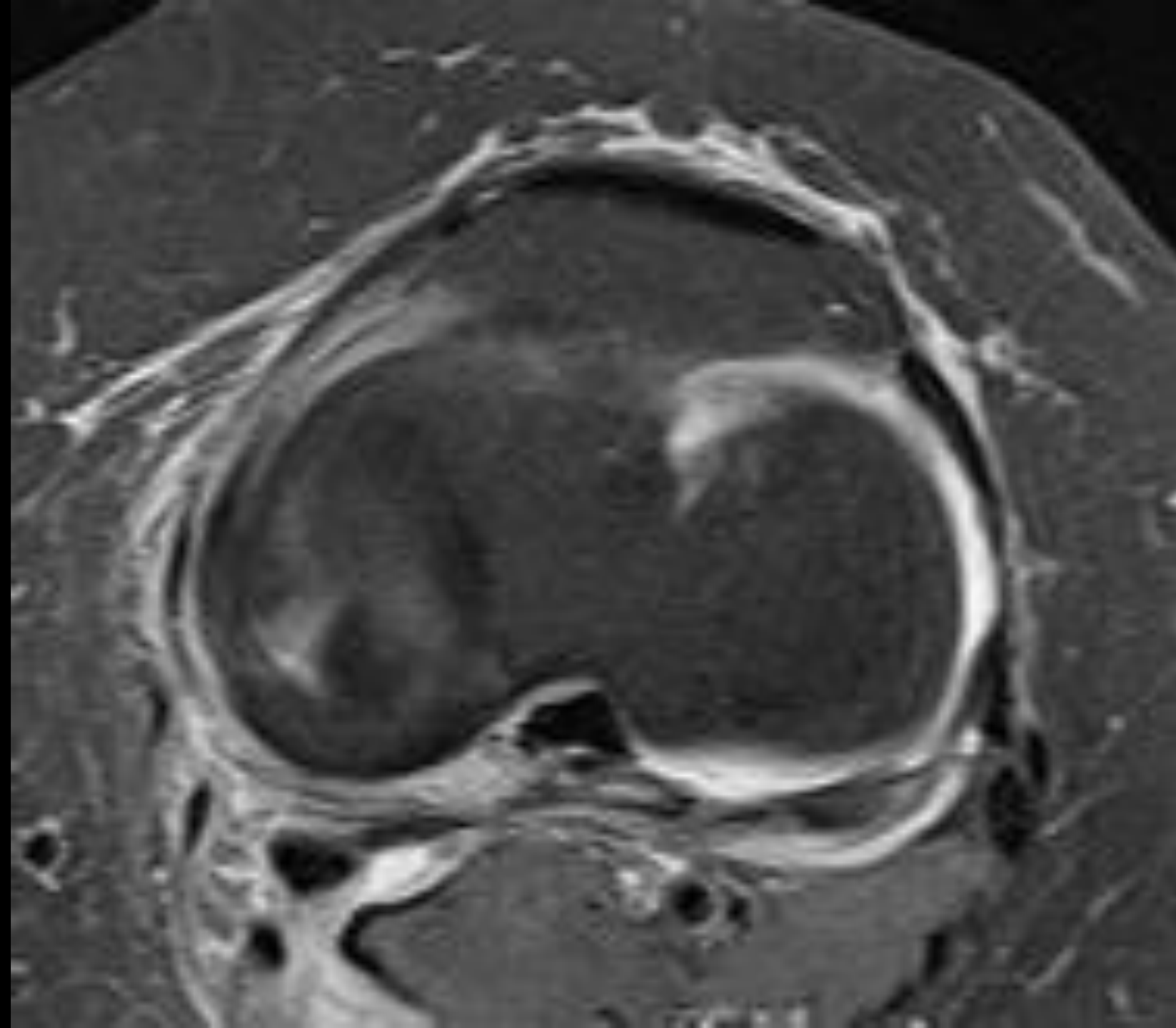
Parrot Beak Tear

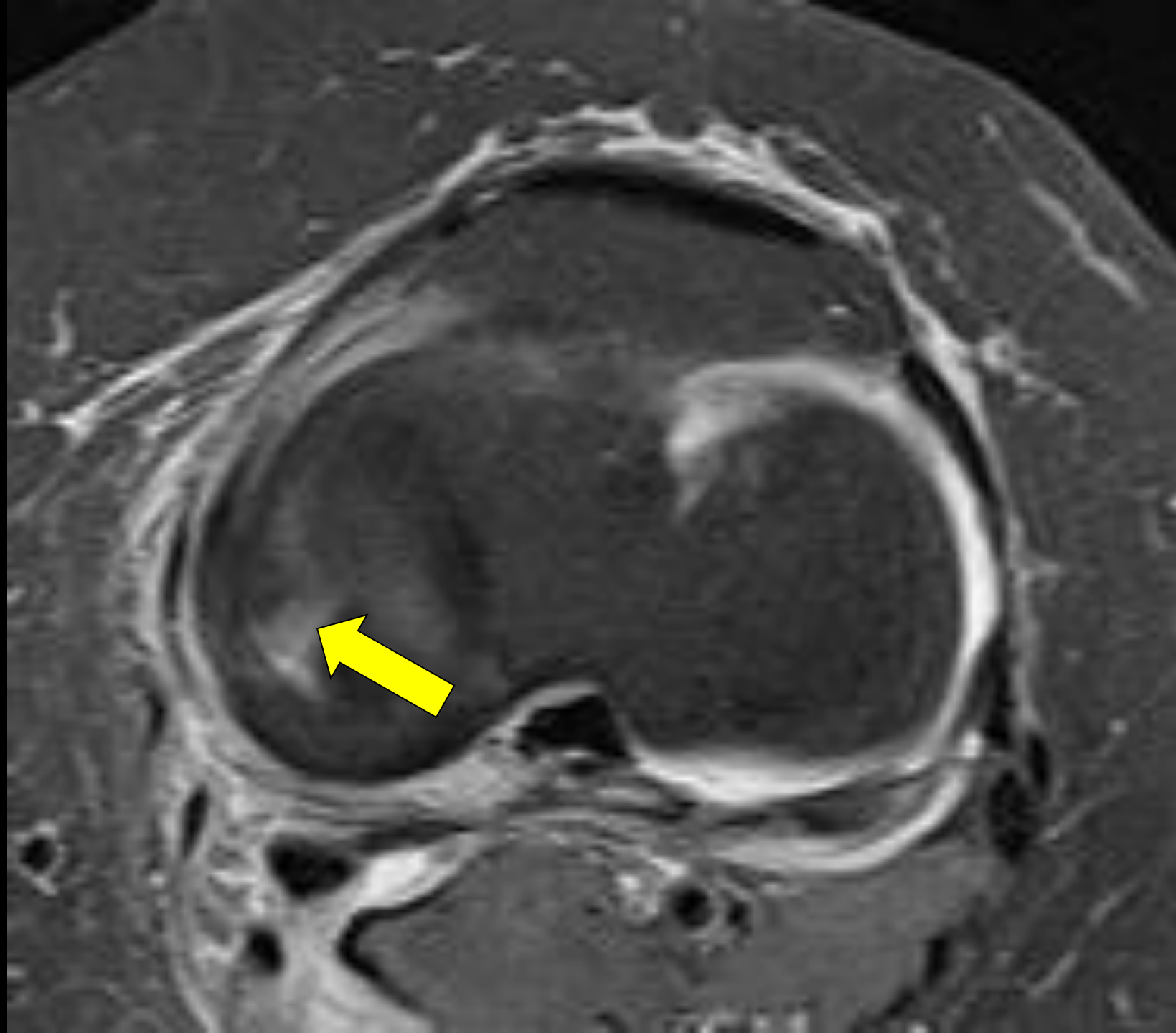


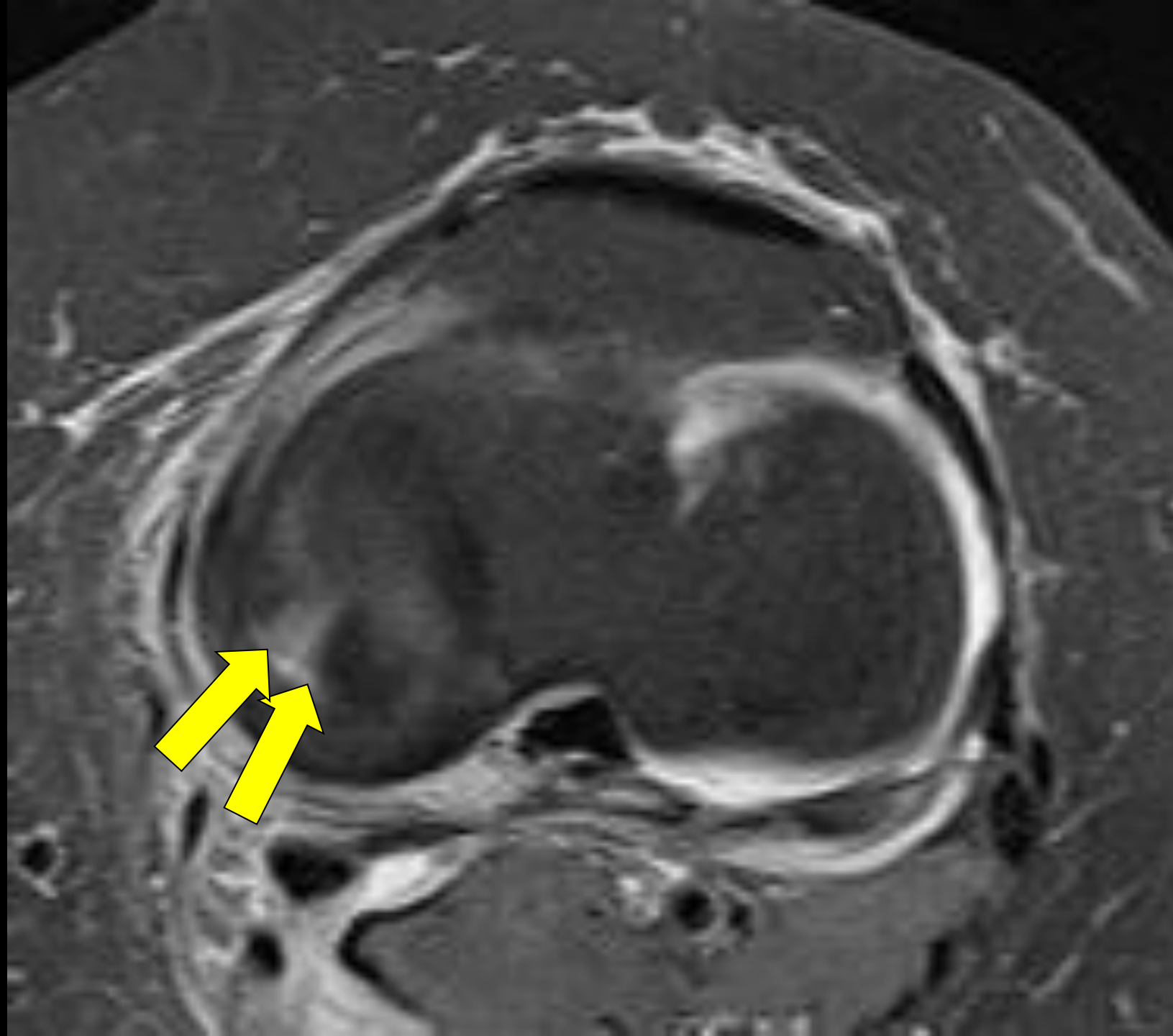
Parrot Beak Tear

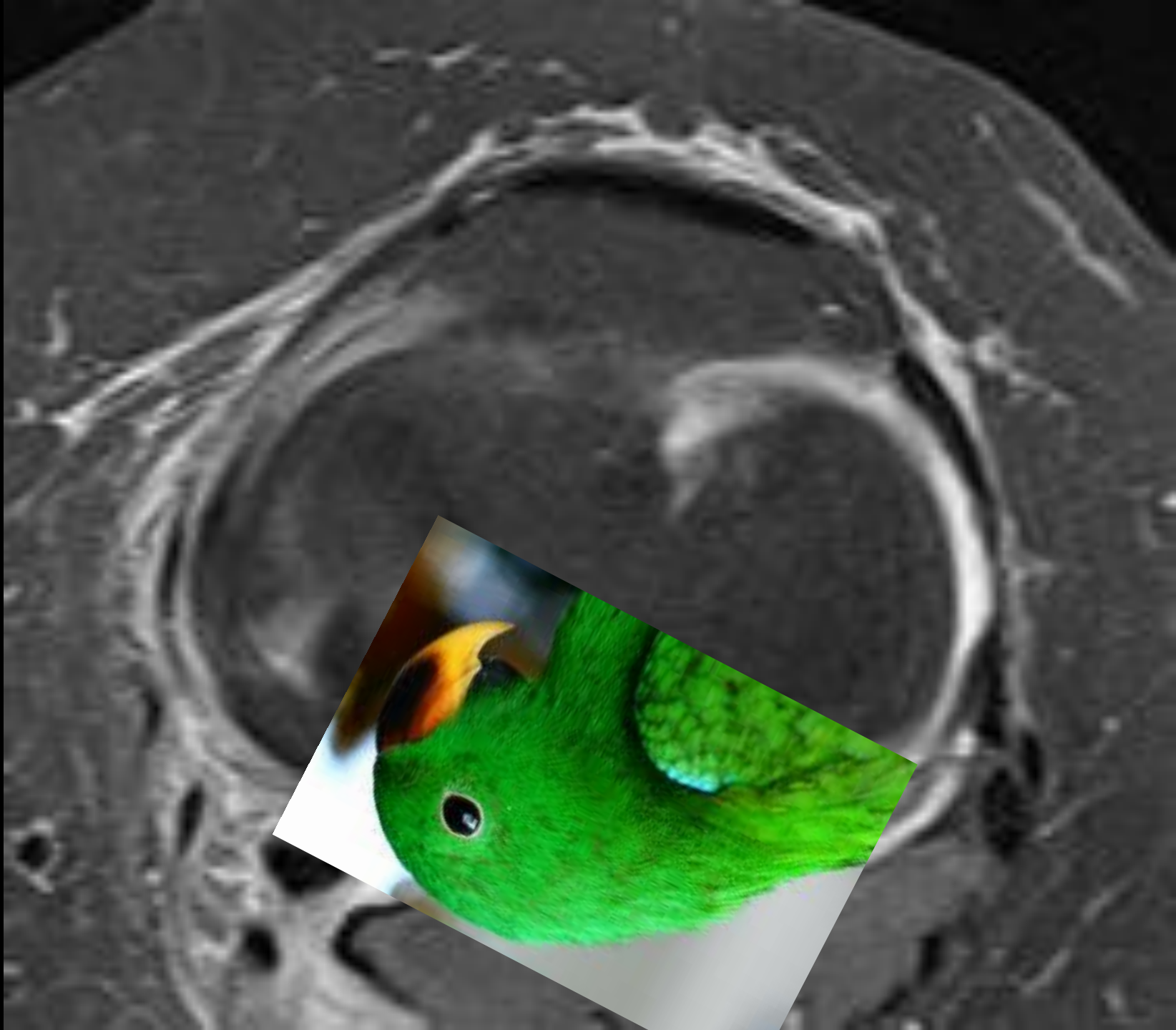


Parrot Beak Tear









MENISCAL TEAR DISPLACED FRAGMENTS

- Bucket handle
- Flipped
- Gutter
- Extruded



MENISCAL TEAR DISPLACED FRAGMENTS

- Early diagnosis for surgical repair
- Decreased volume of meniscal tissue
 - Displaced meniscus
 - Postoperative partial meniscectomy
- Best appreciated on T2 weighted images
 - Fluid signal in meniscus
 - Fragments in effusion

MENISCAL TEAR

DISPLACED FRAGMENTS

BUCKET HANDLE TEAR

Coronal

- Displaced fragment
- Blunted body

Sensitivity

(94%)

(64%)

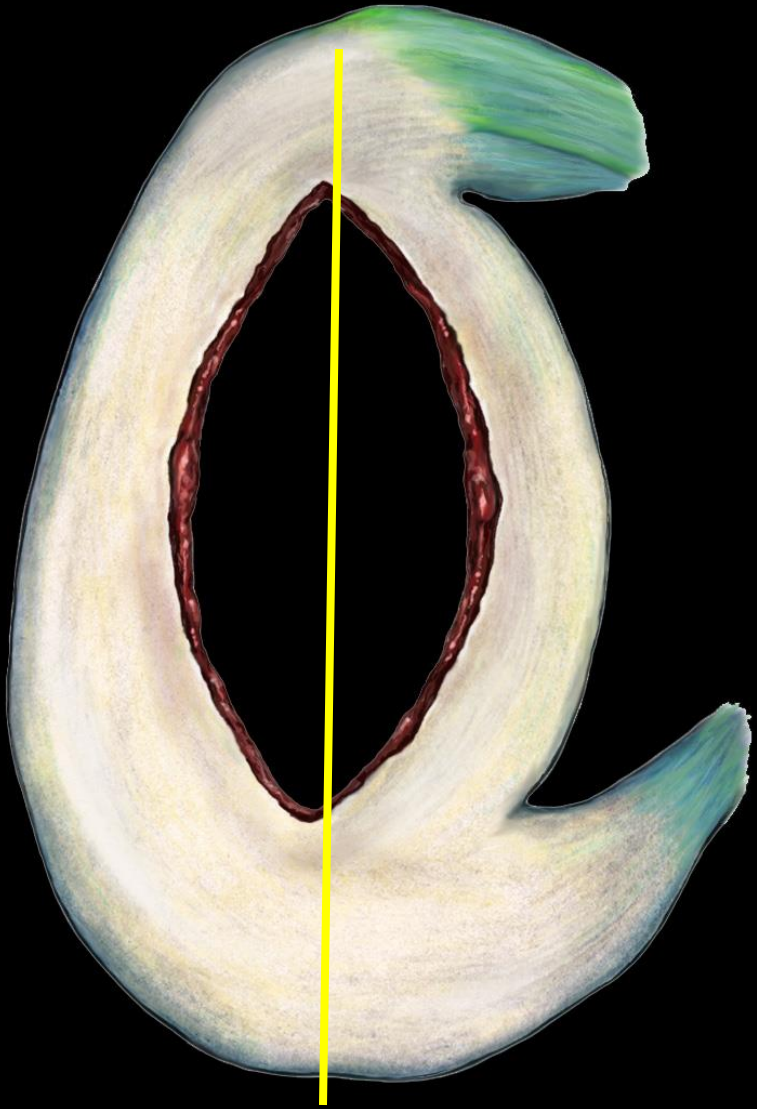
Sagittal

- Too few “bow ties”
- Double PCL

(97%)

(30%)





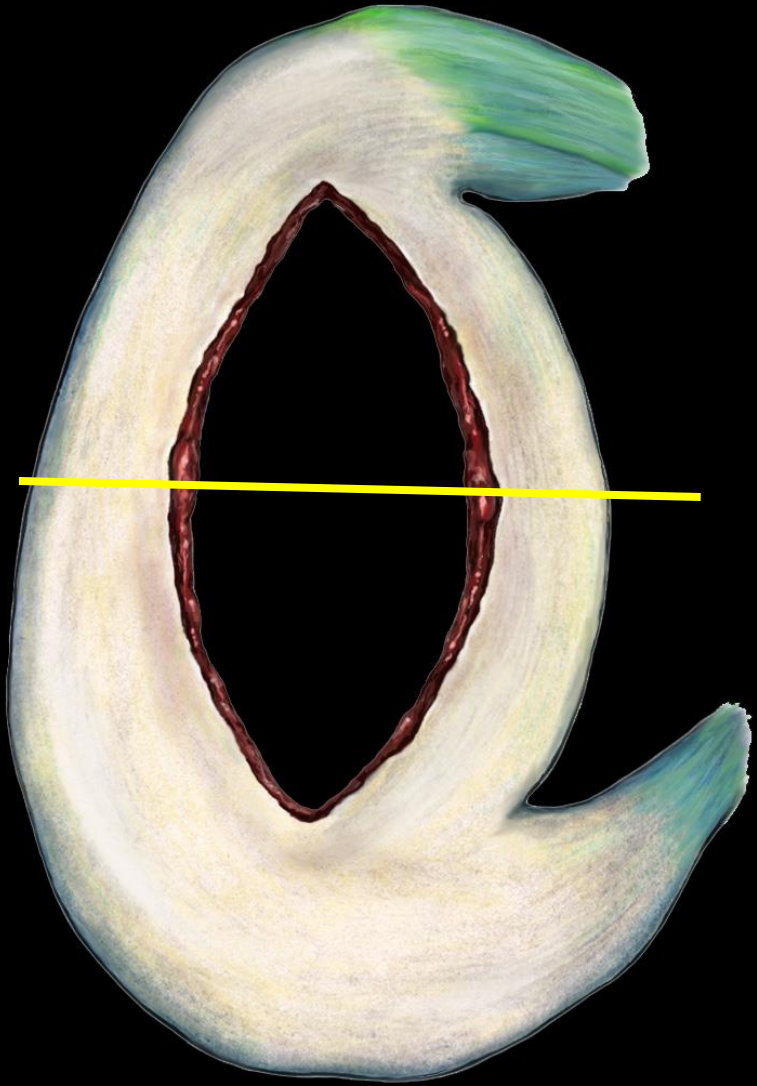
Too few “bow ties”



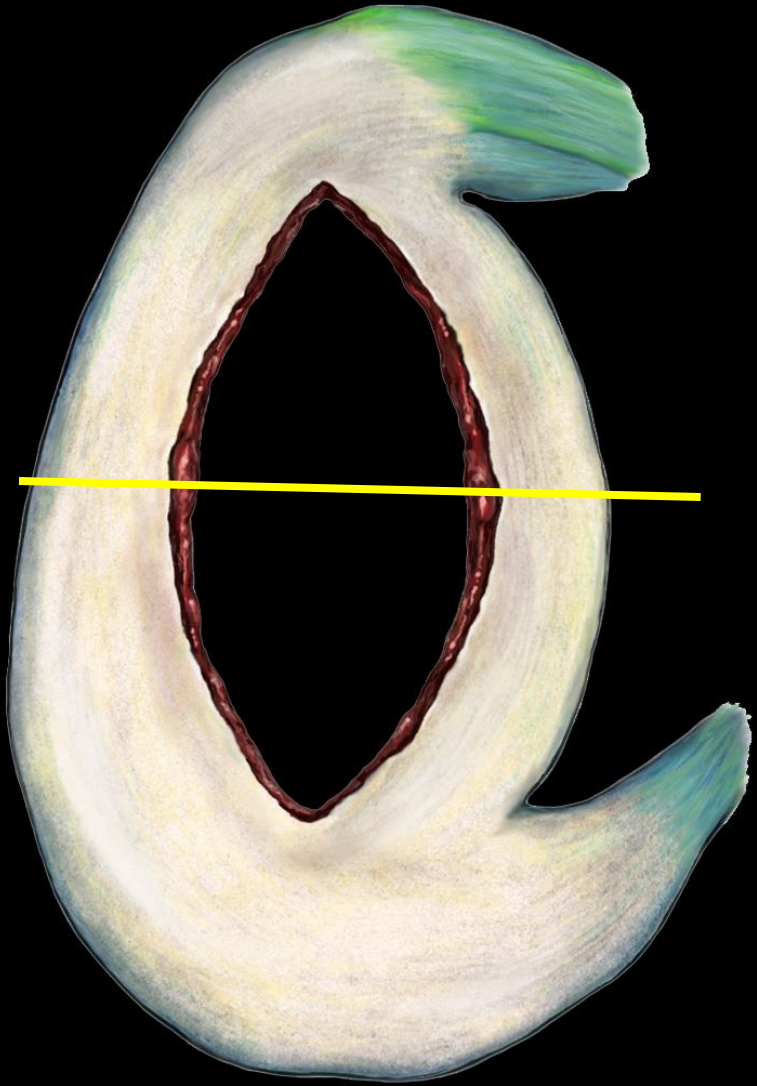


DOUBLE PCL SIGN

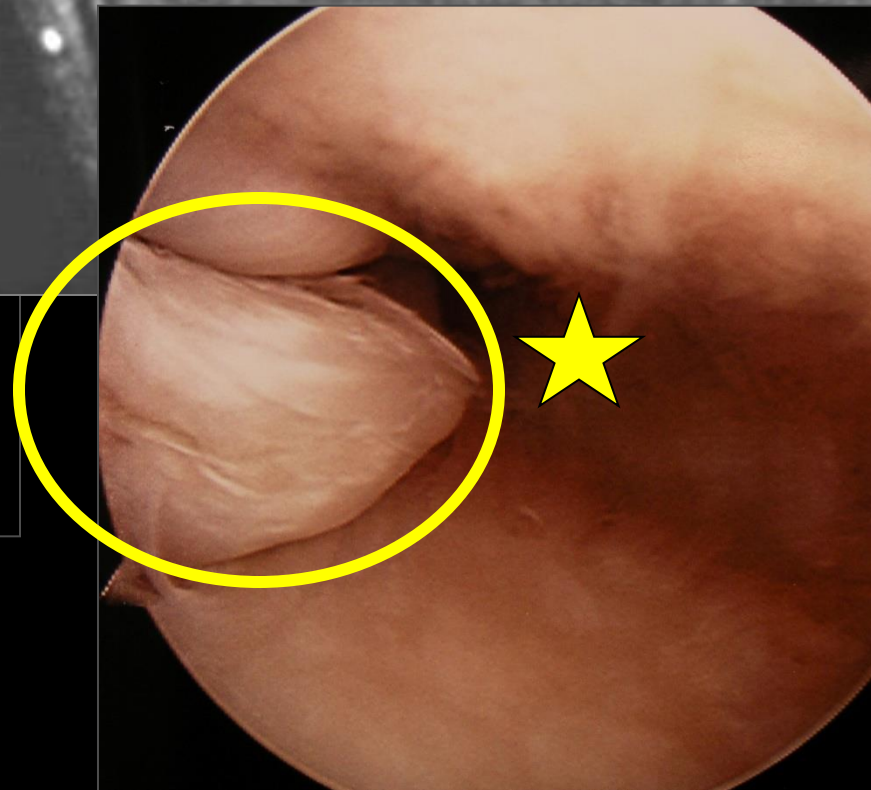
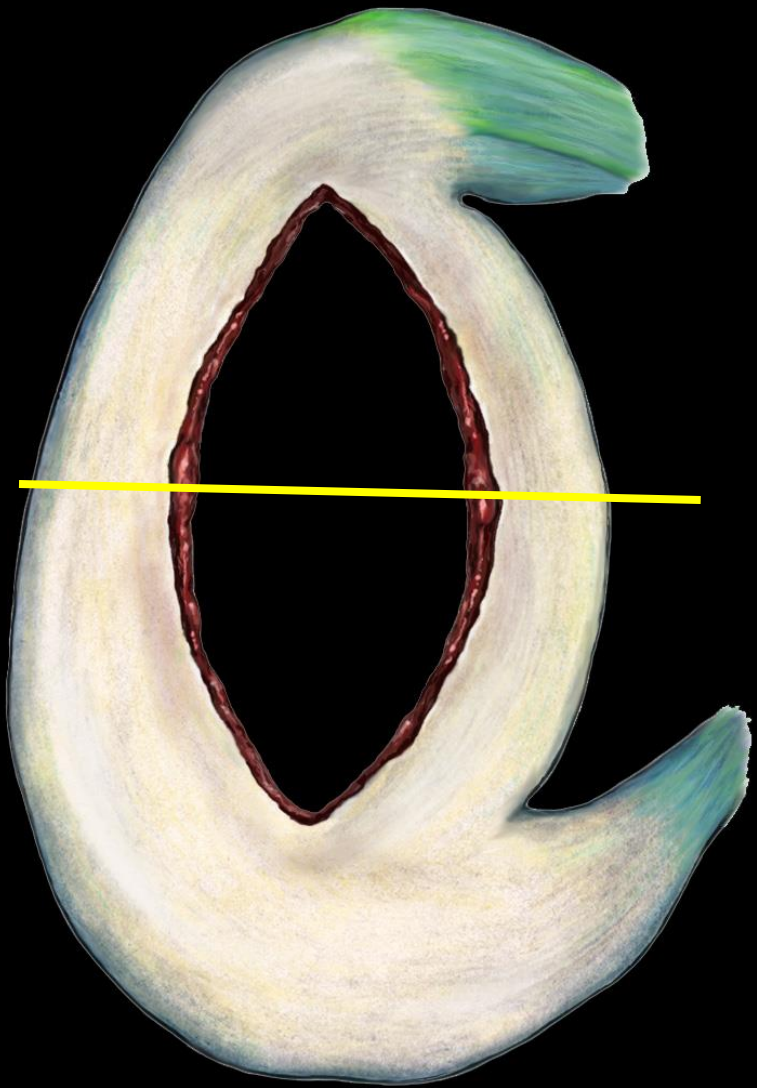




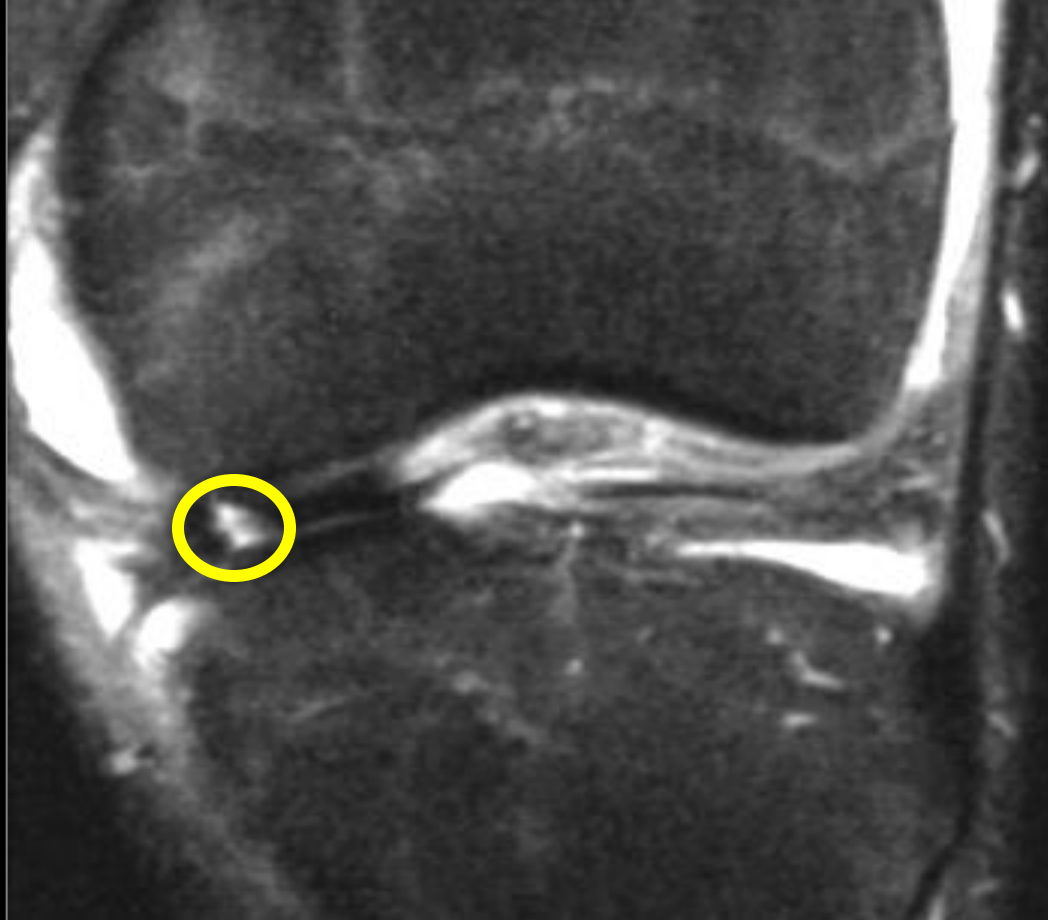
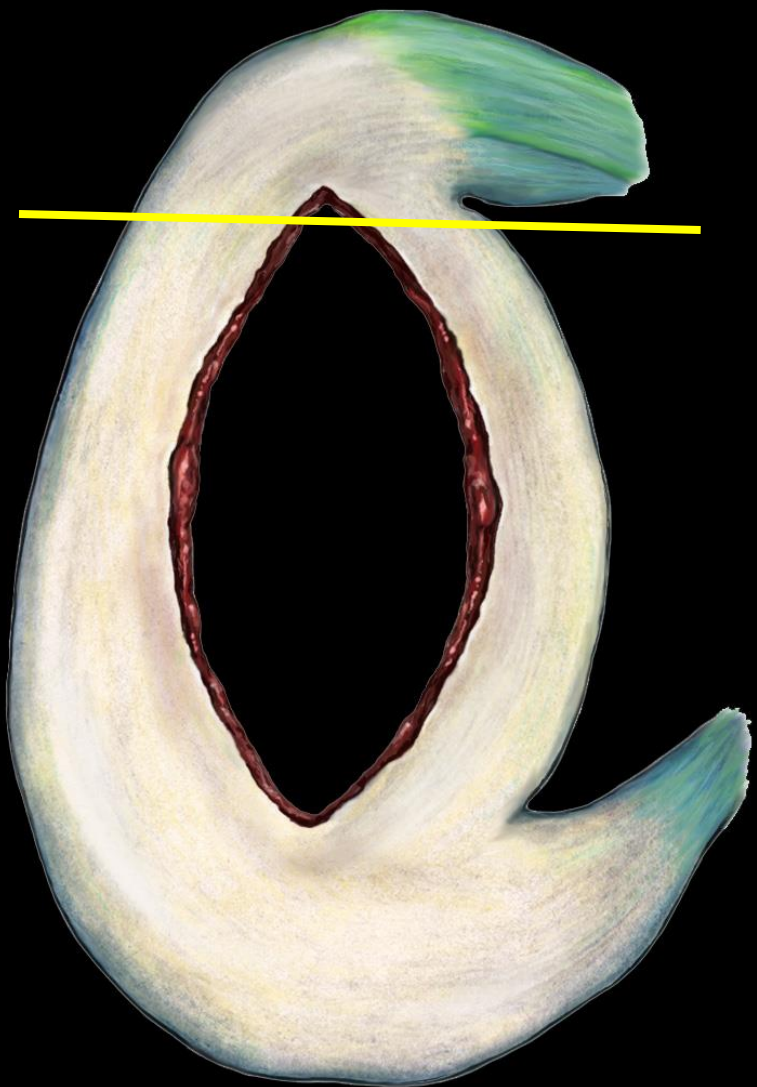
Blunted body

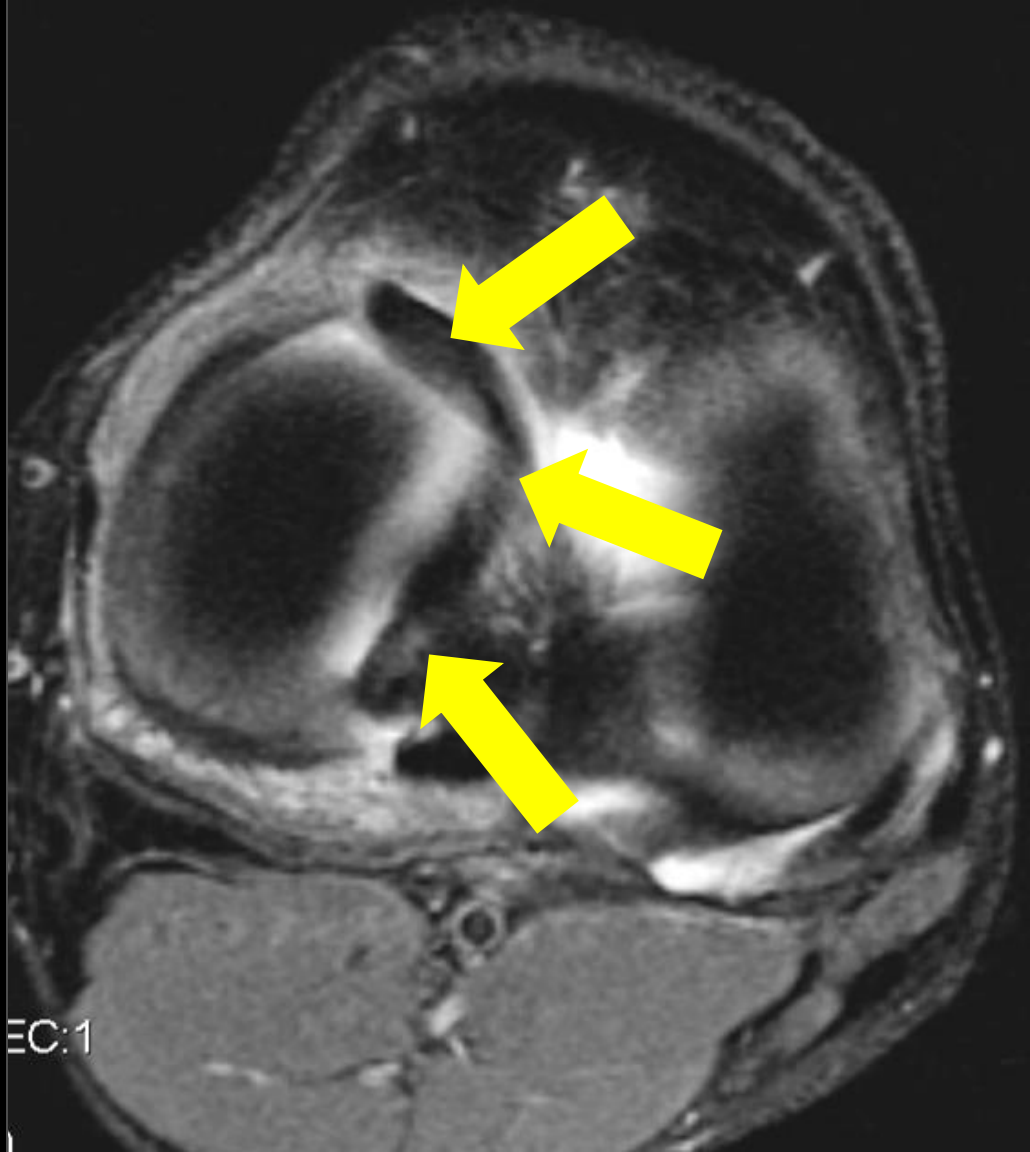
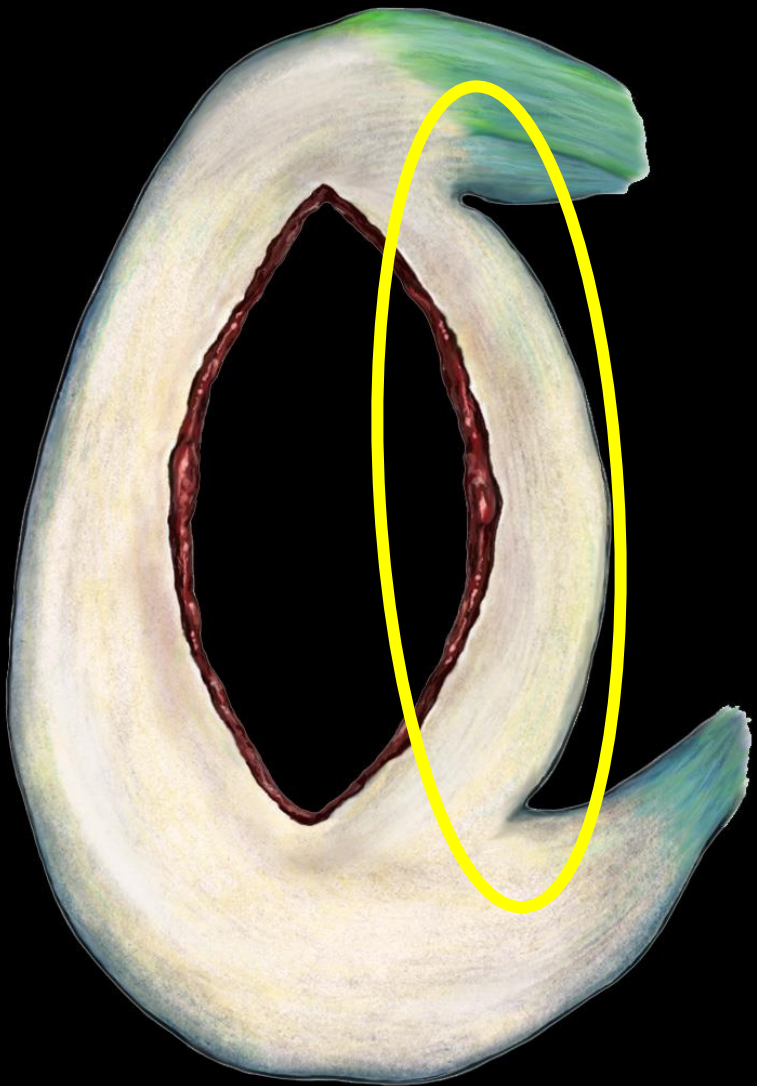


Displaced fragment

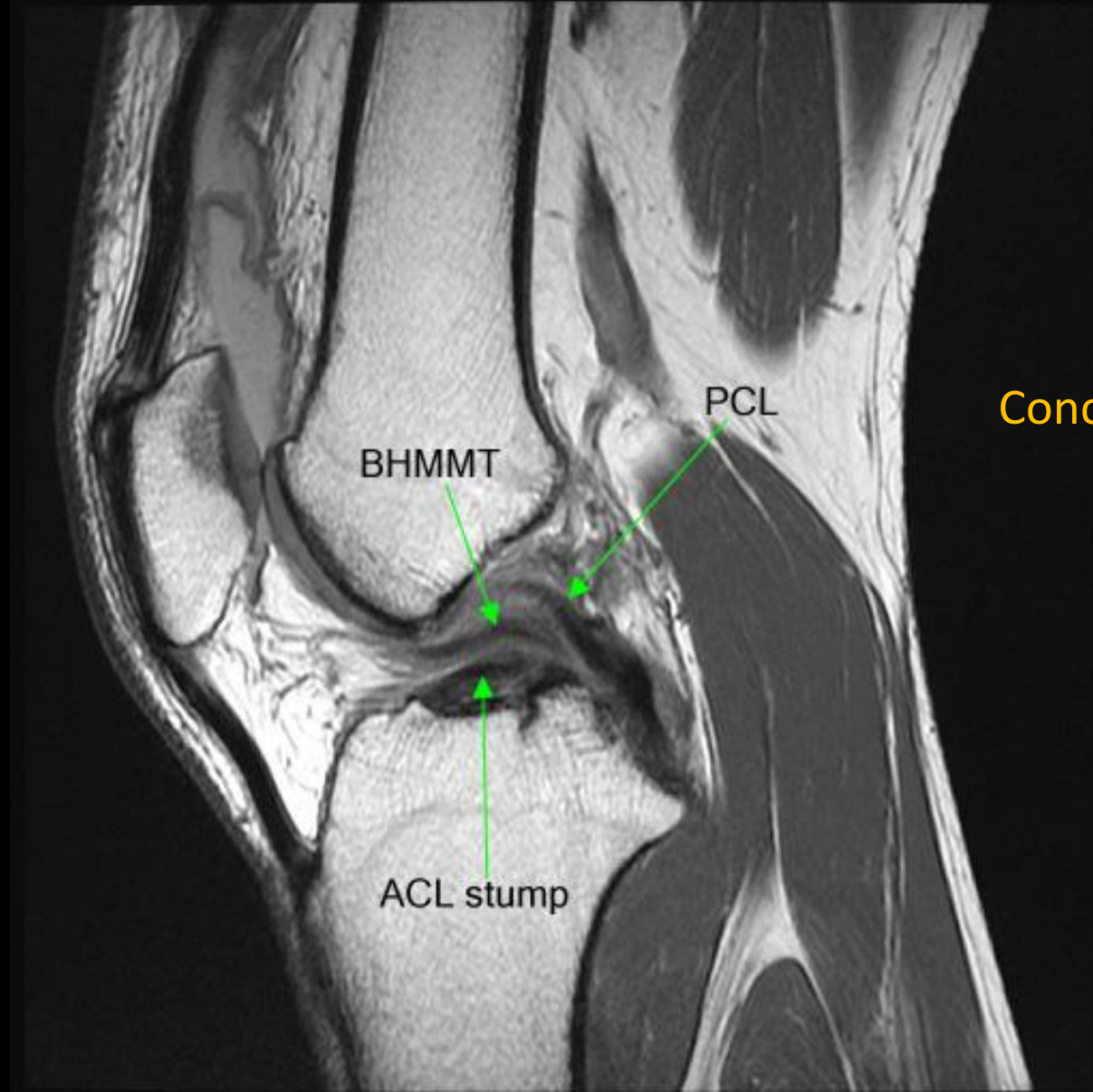


Displaced fragment



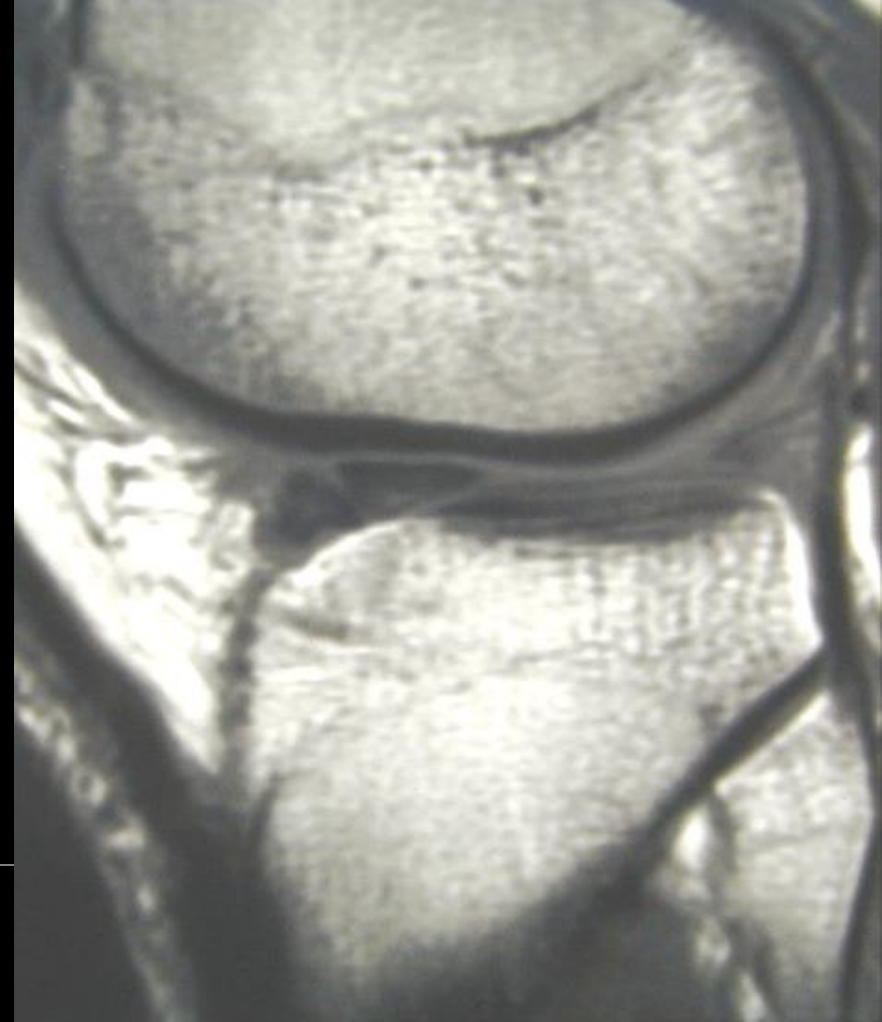
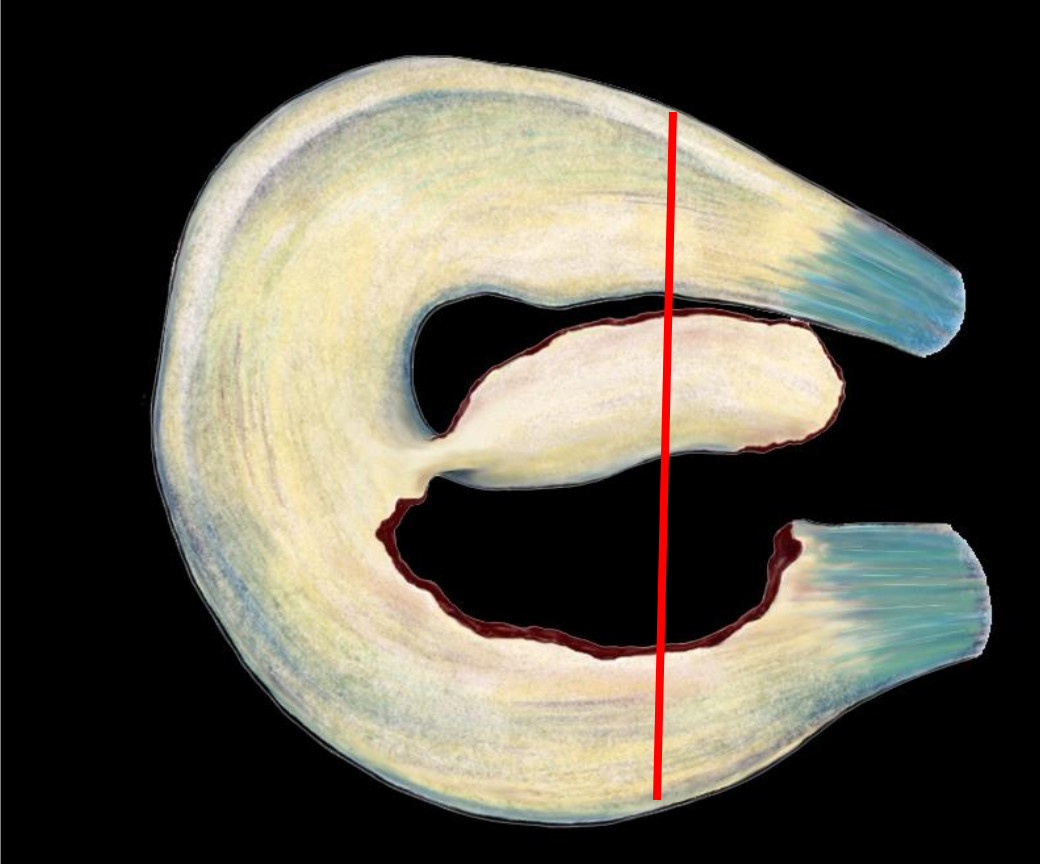


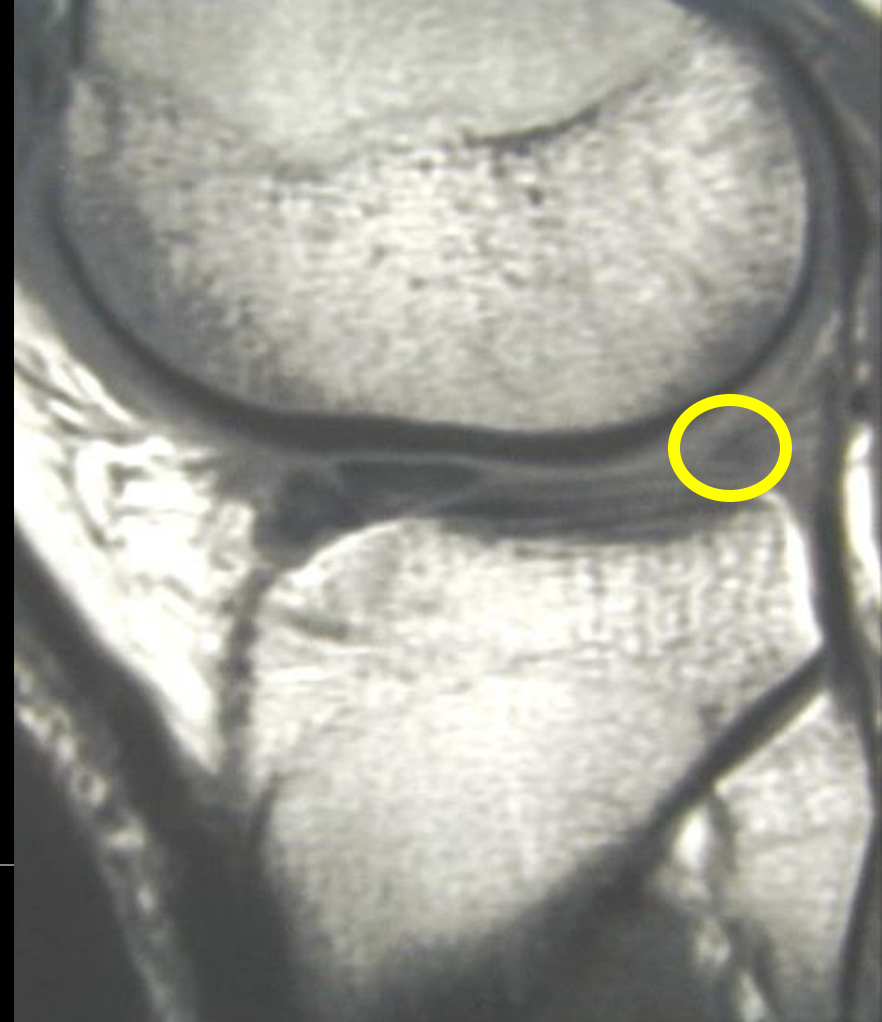
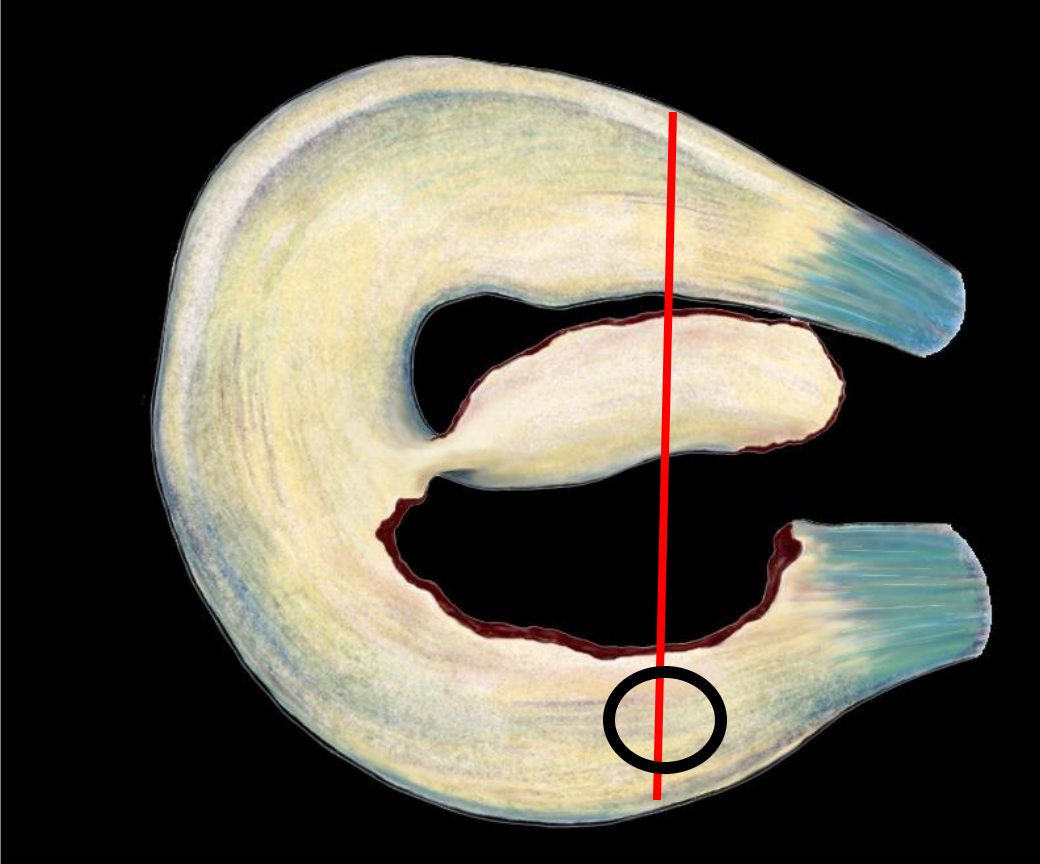


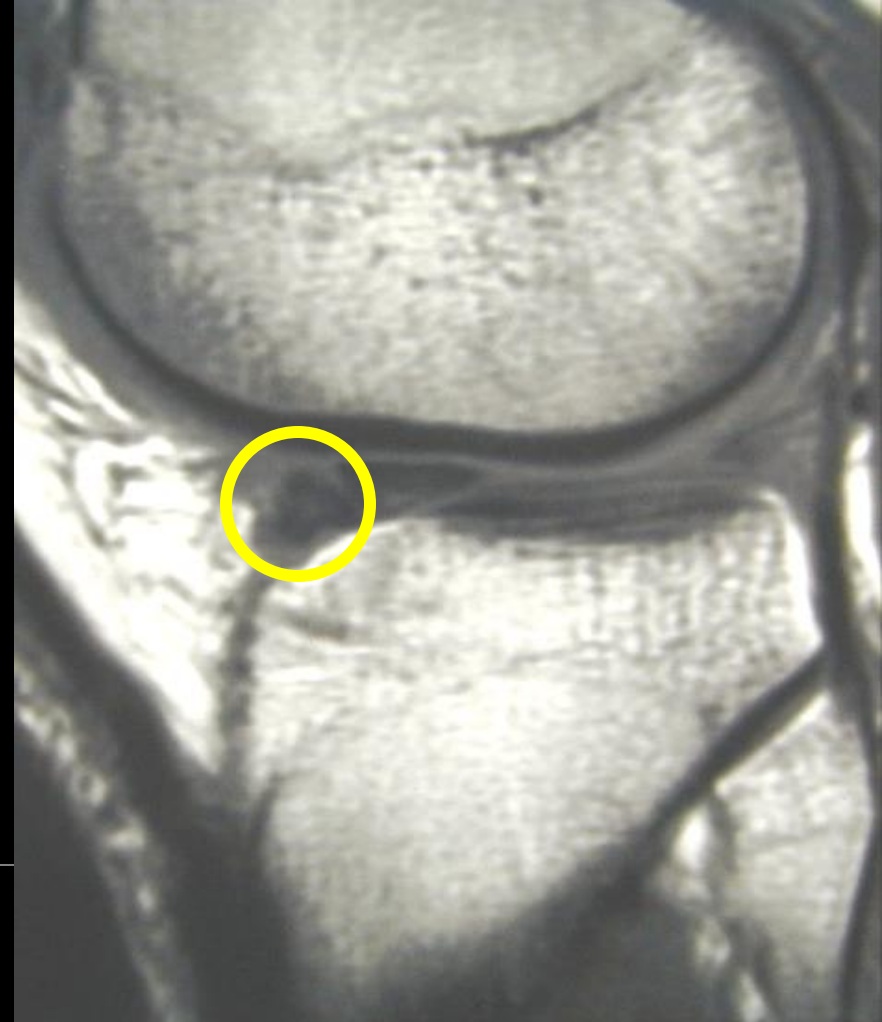
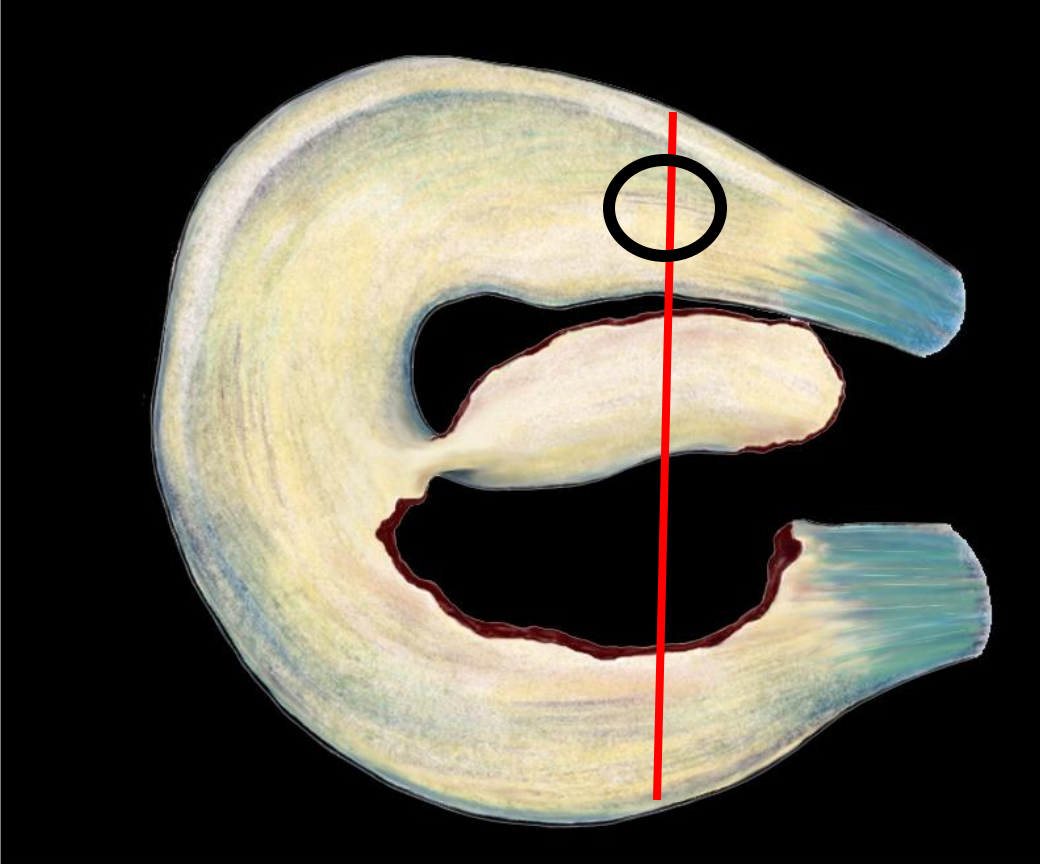


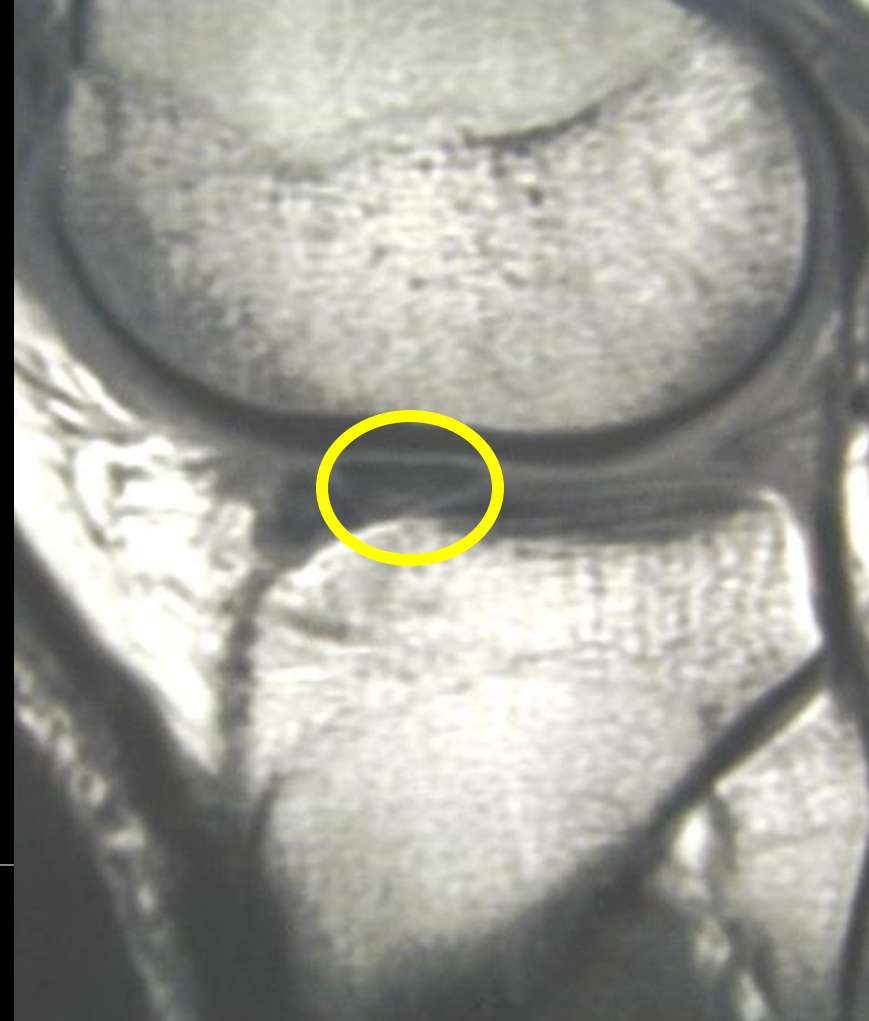
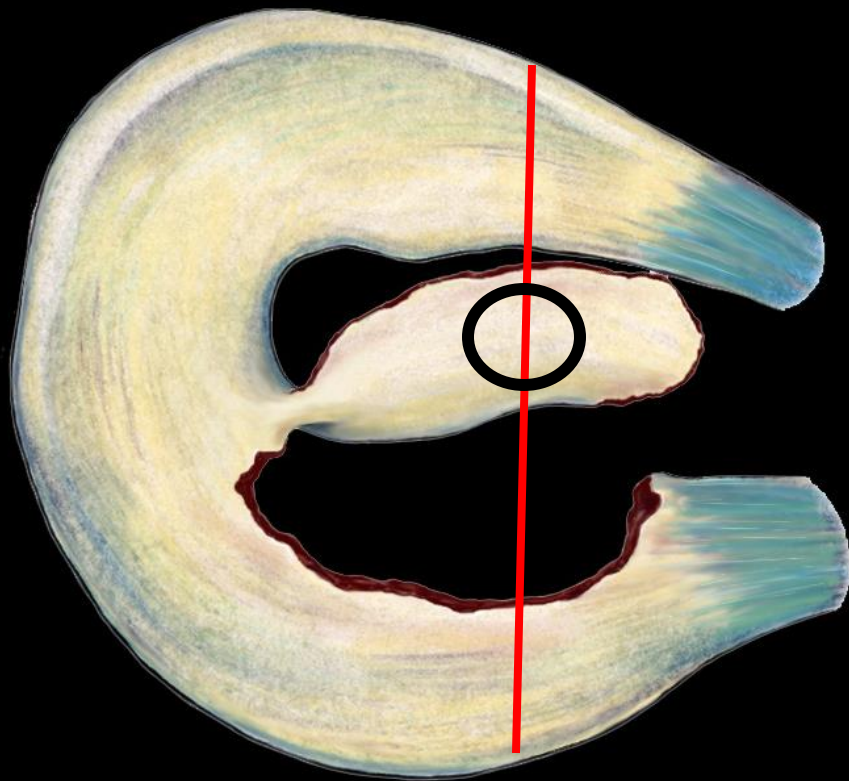
Concurrent BHMMT and ACL tear

“Triple PCL sign”?

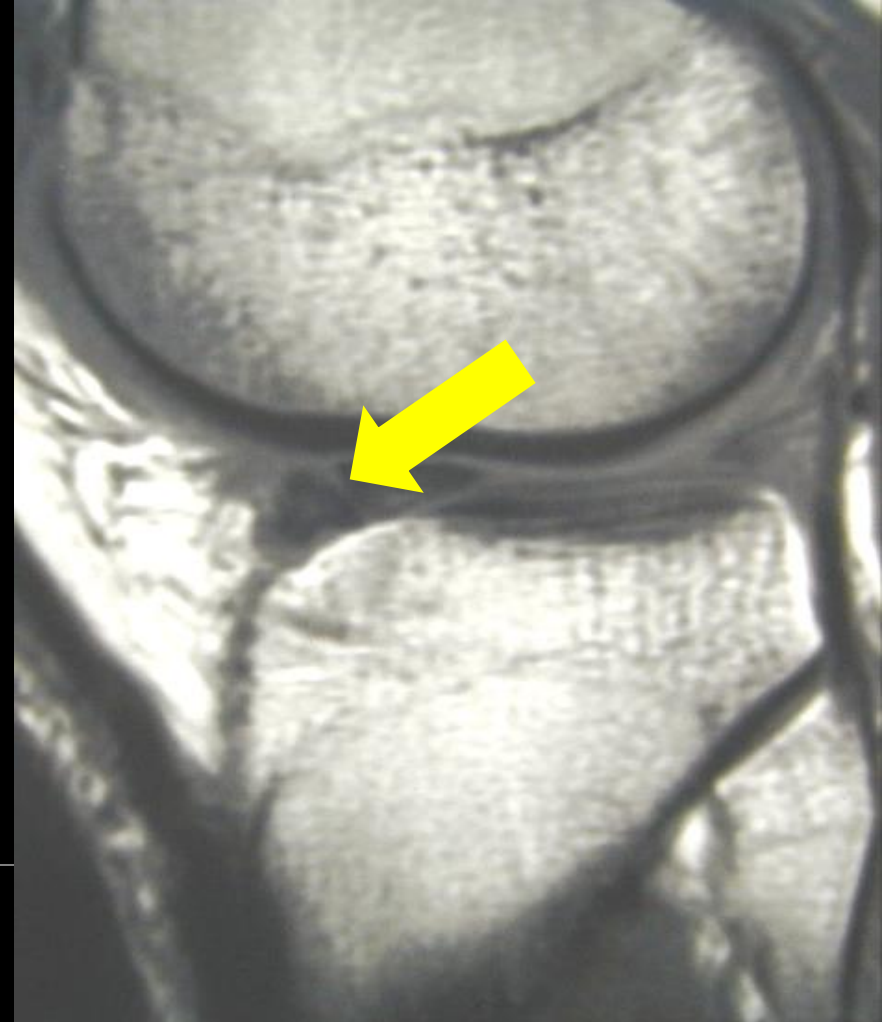
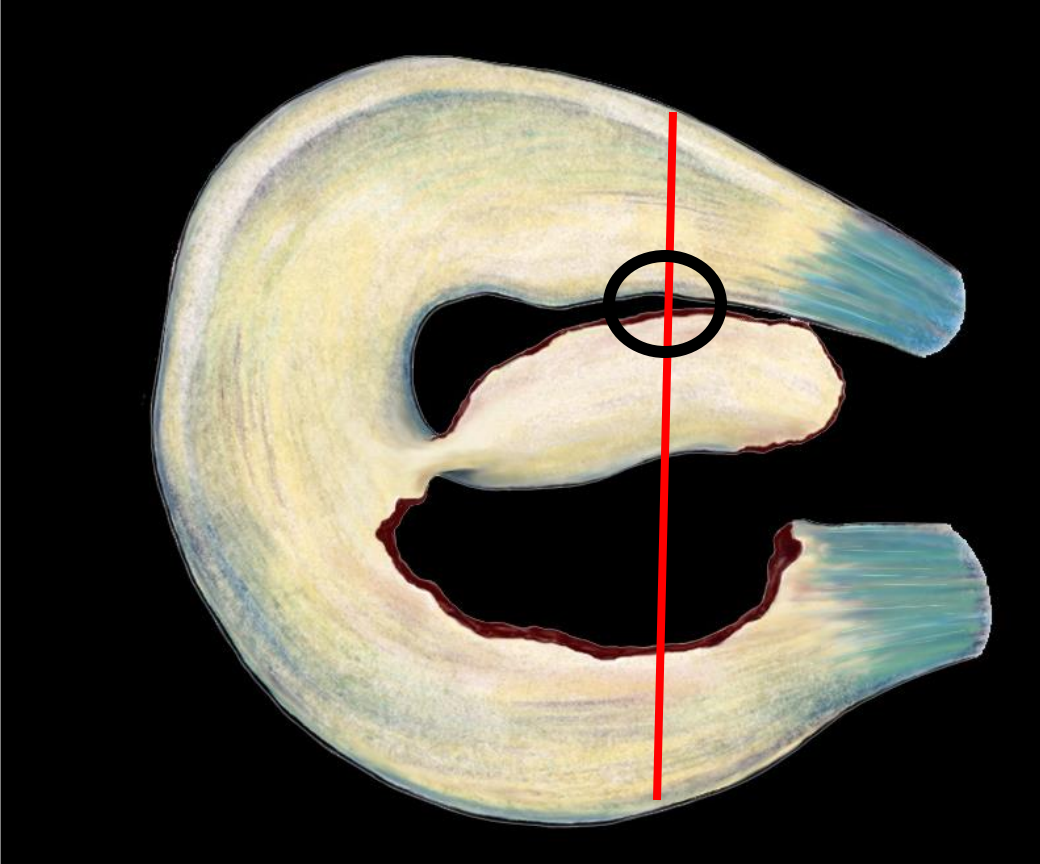






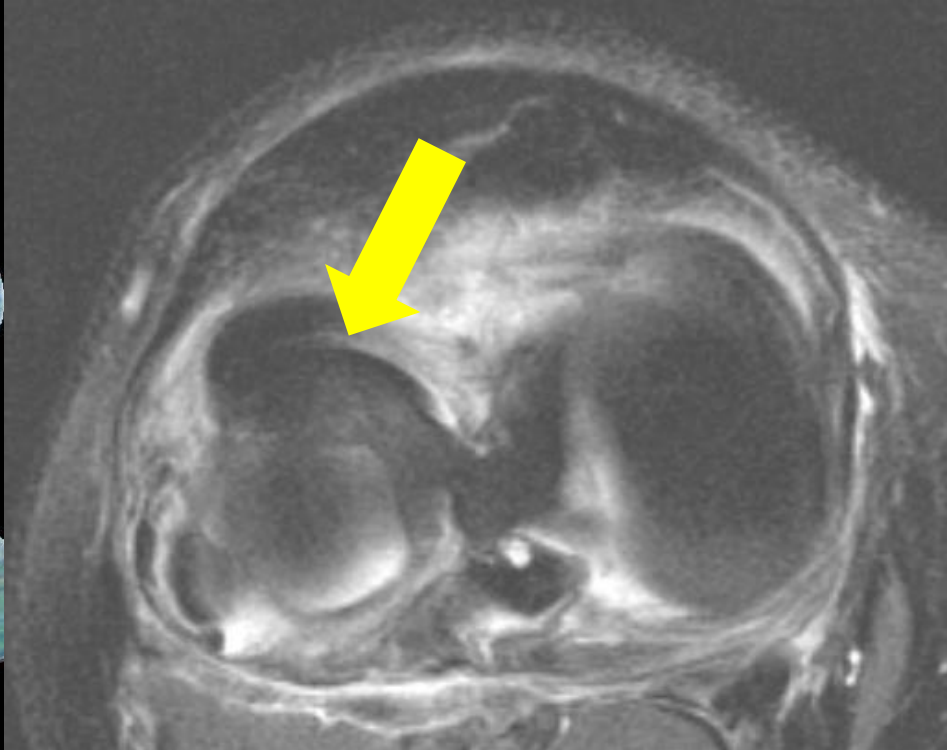
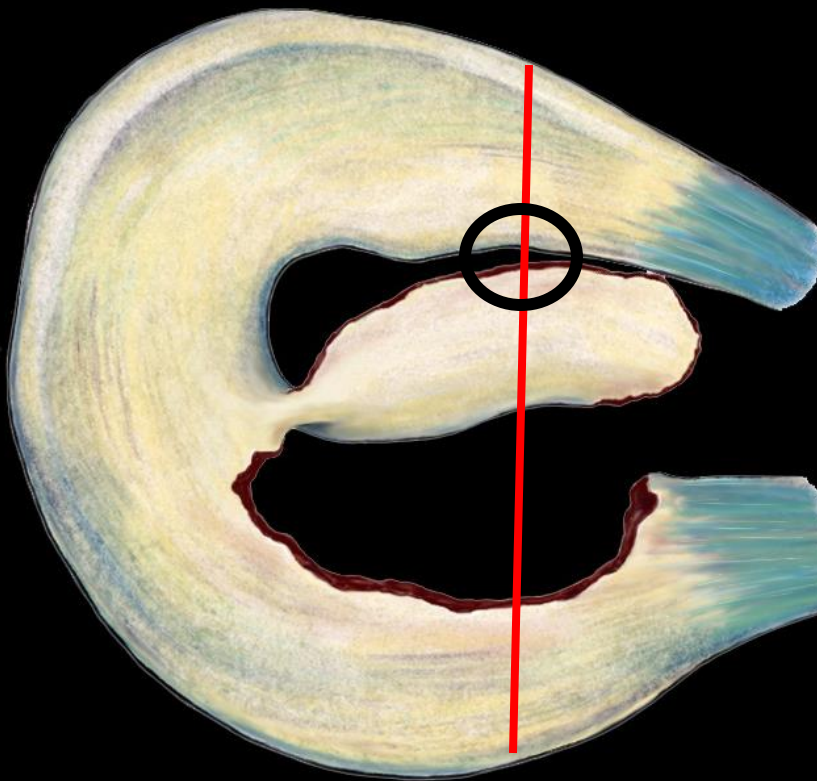


FLIPPED MENISCUS

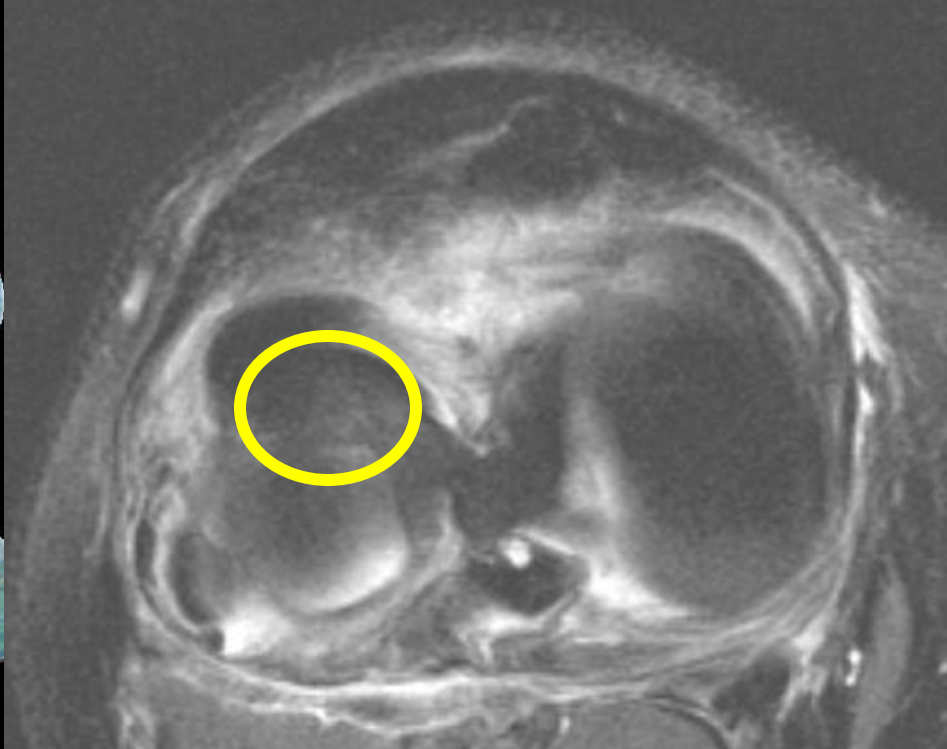
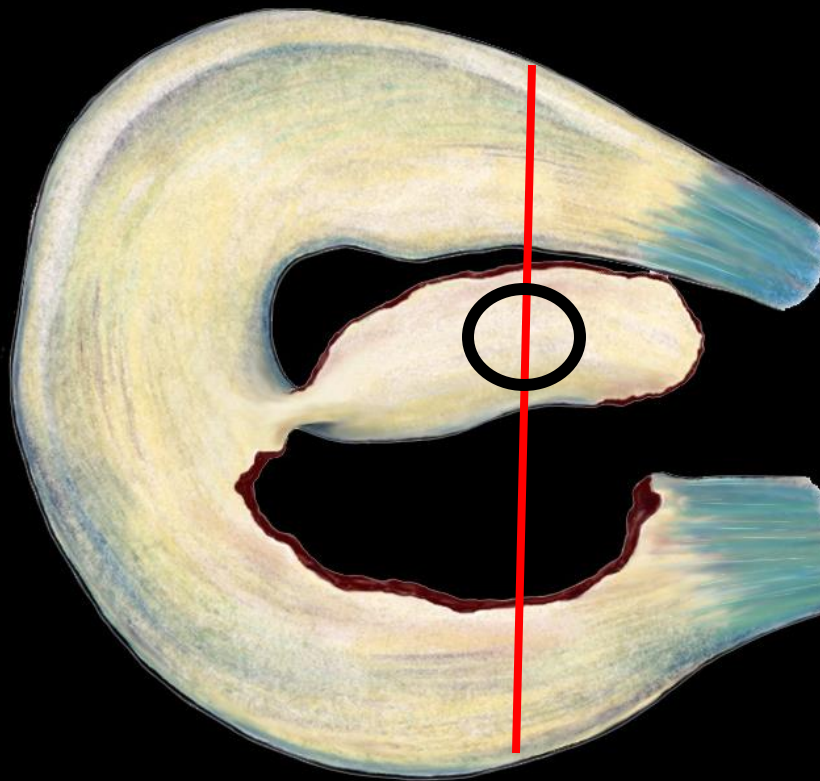




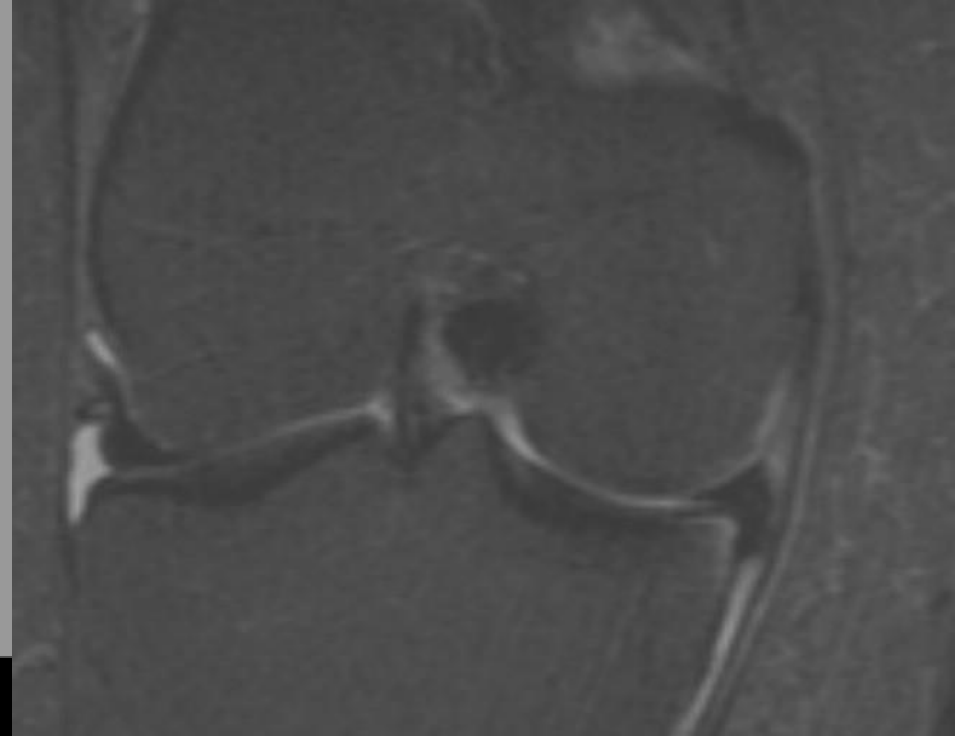
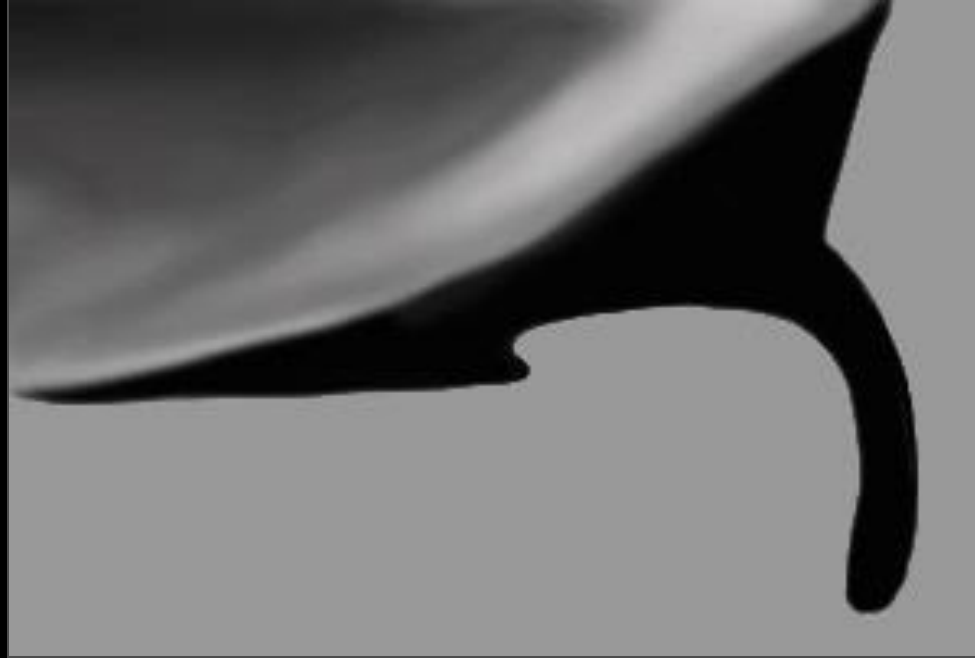
FLIPPED MENISCUS



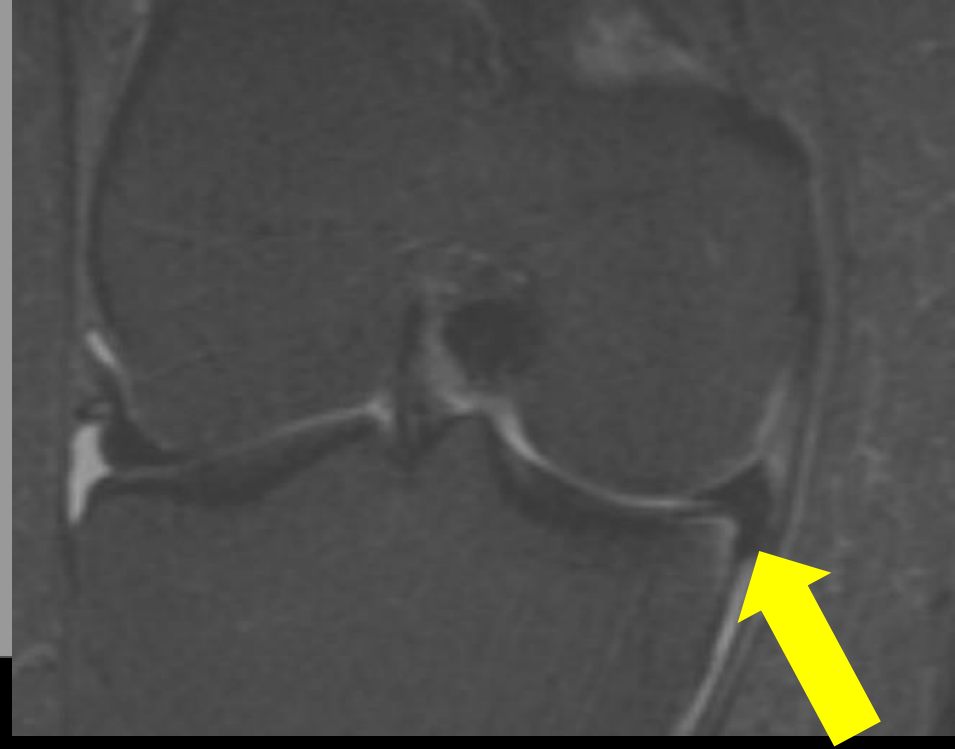
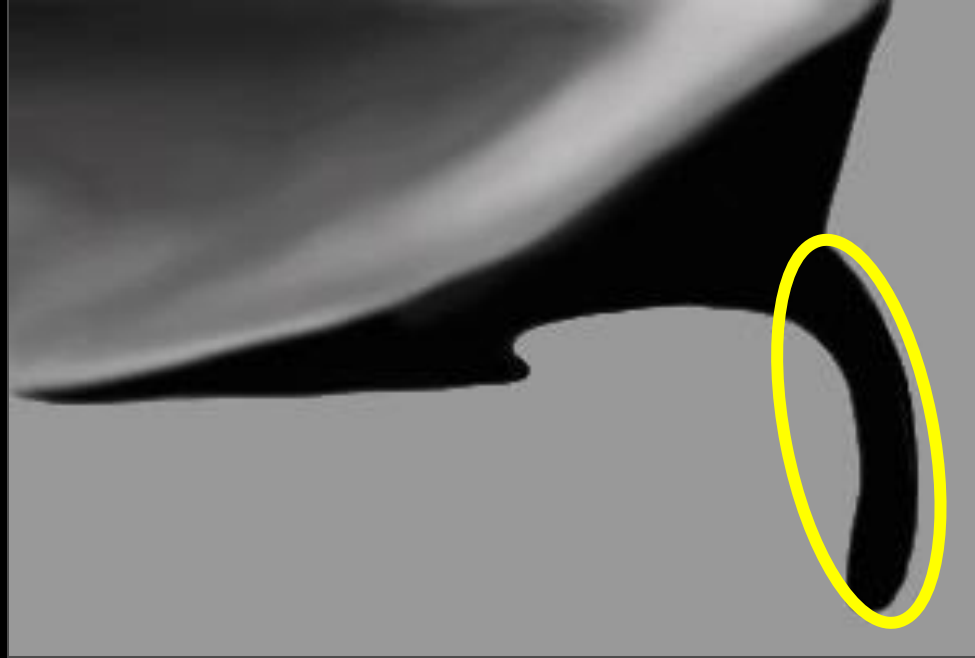
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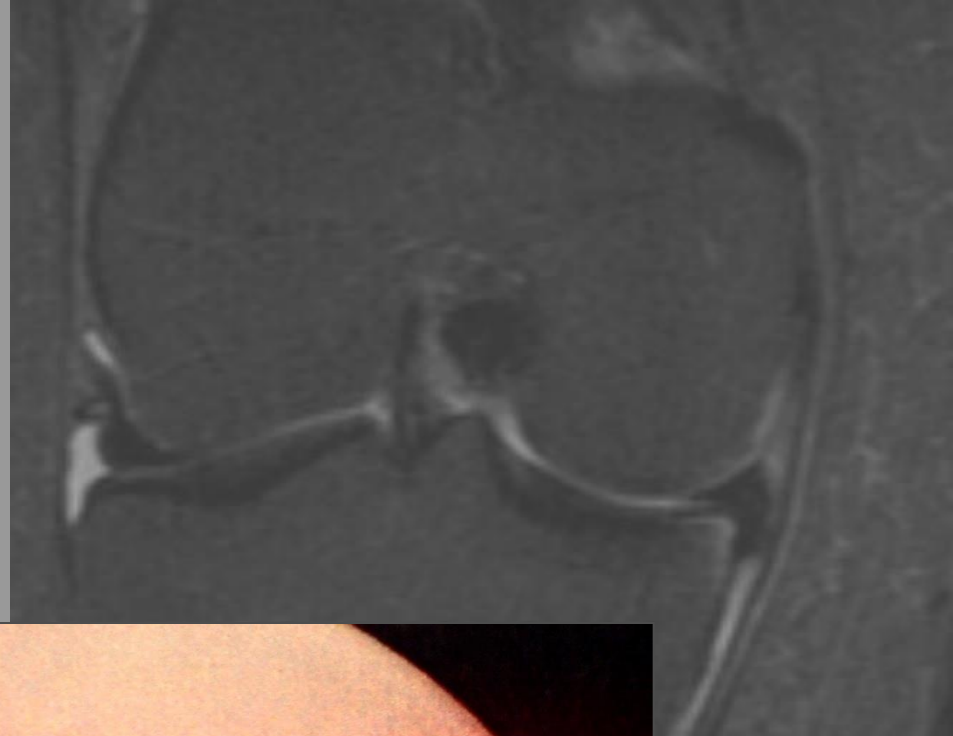
FLIPPED MENISCUS



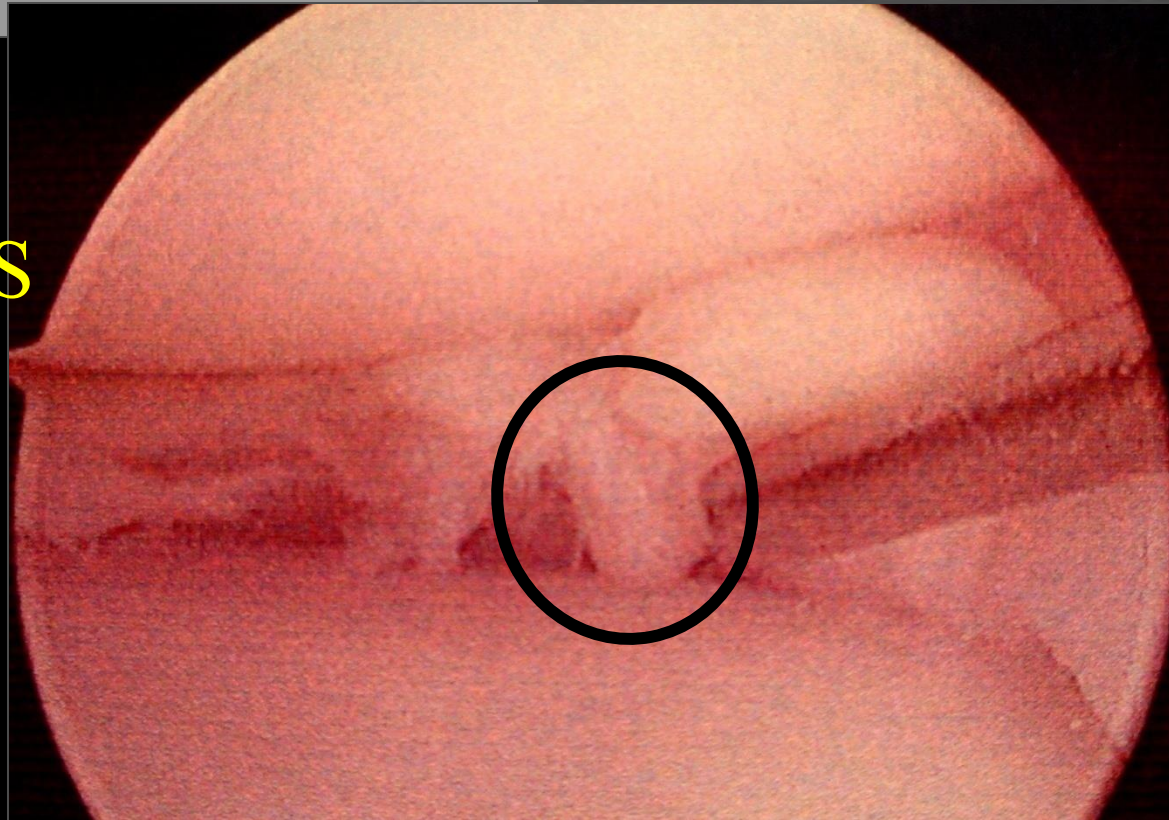
FLIPPED MENISCUS INTO GUTTER

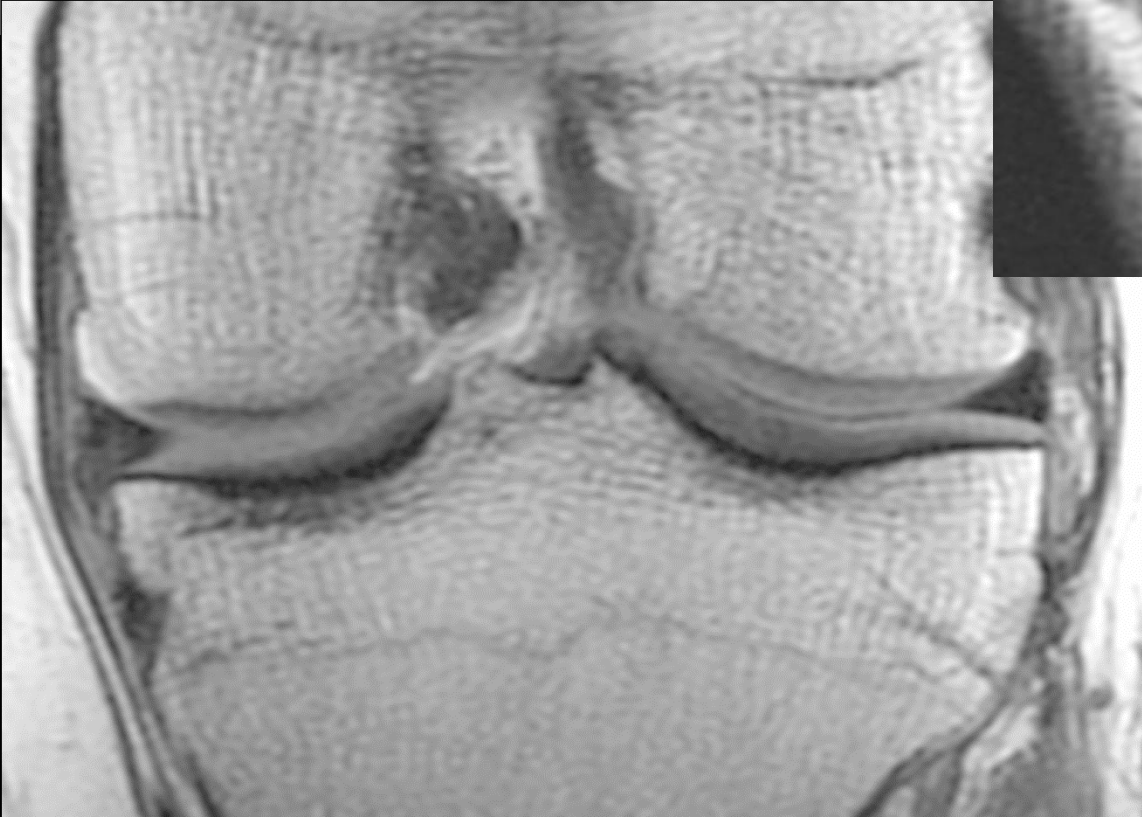
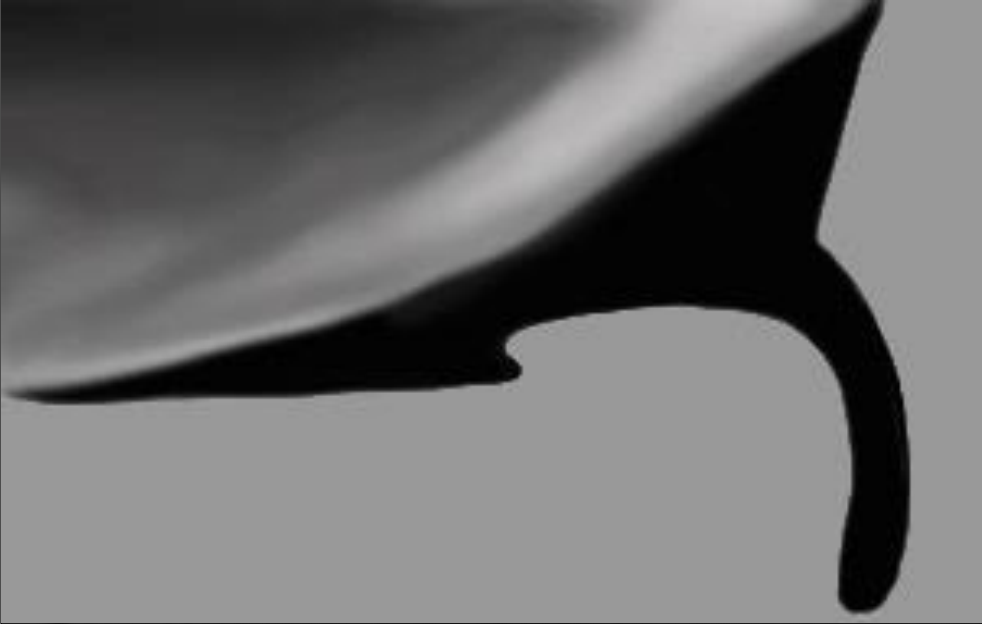


FLIPPED MENISCUS INTO GUTTER



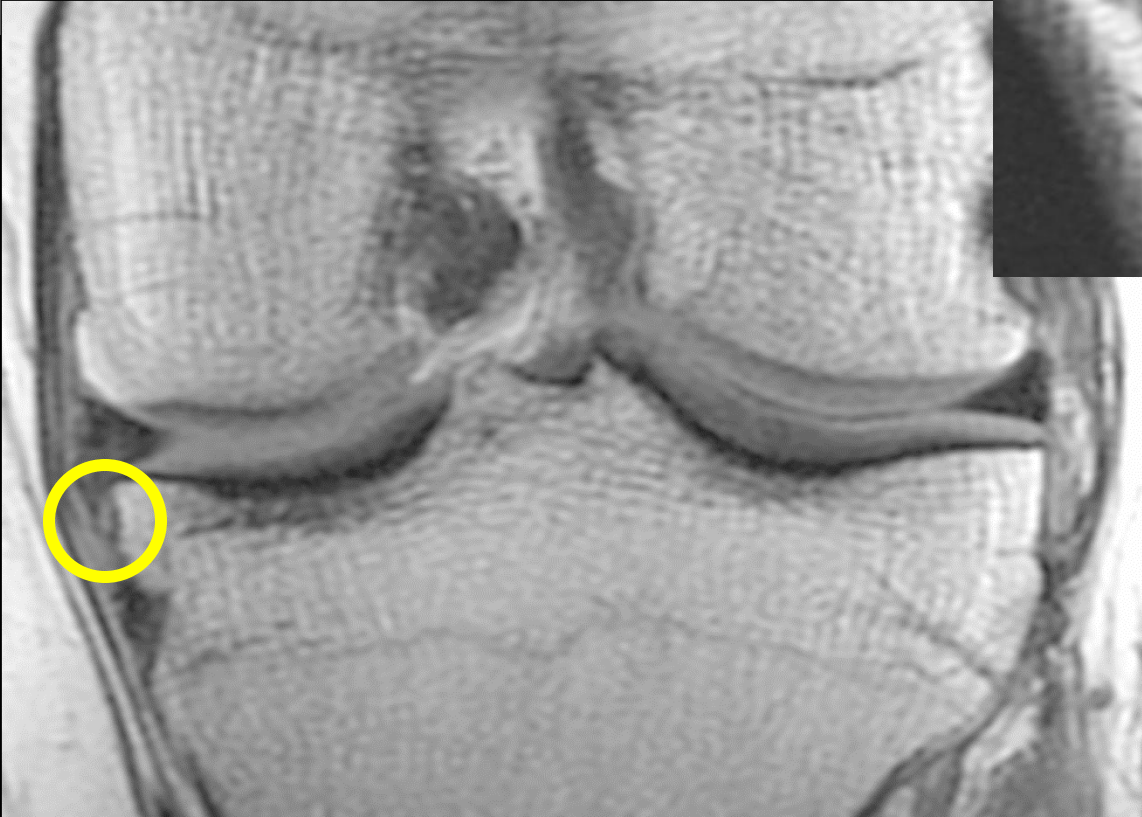
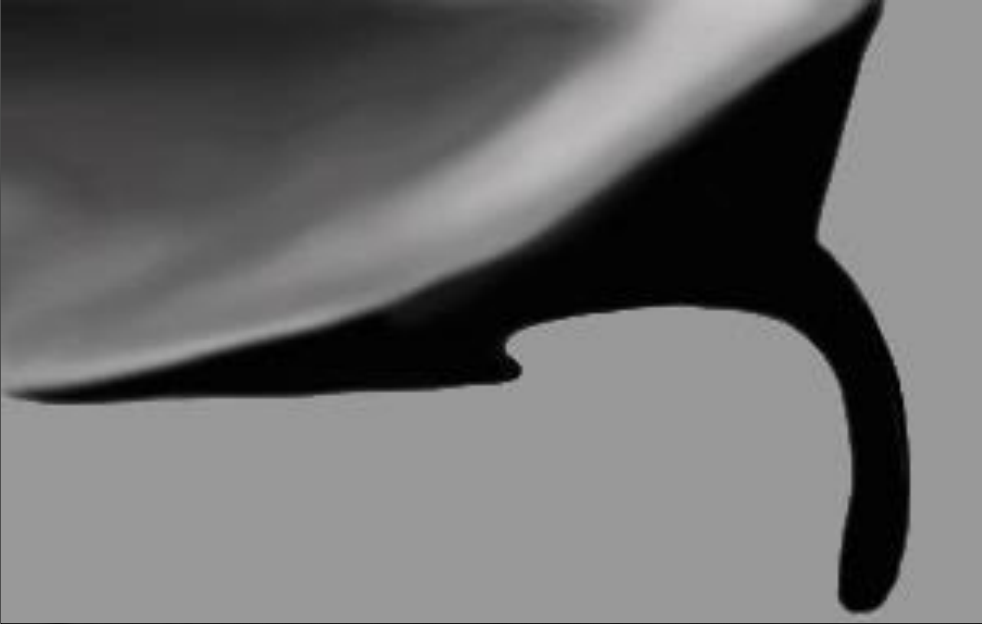
FLIPPED
MENISCUS
INTO
GUTTER





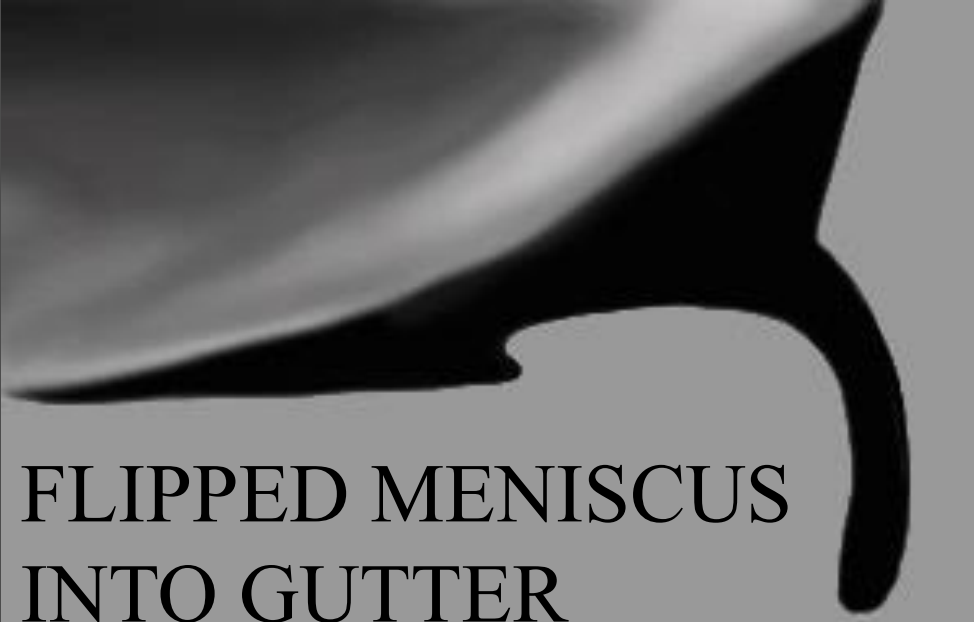
**FLIPPED
MENISCUS INTO
GUTTER**

CASE COURTESY KIRK DAVIS MD

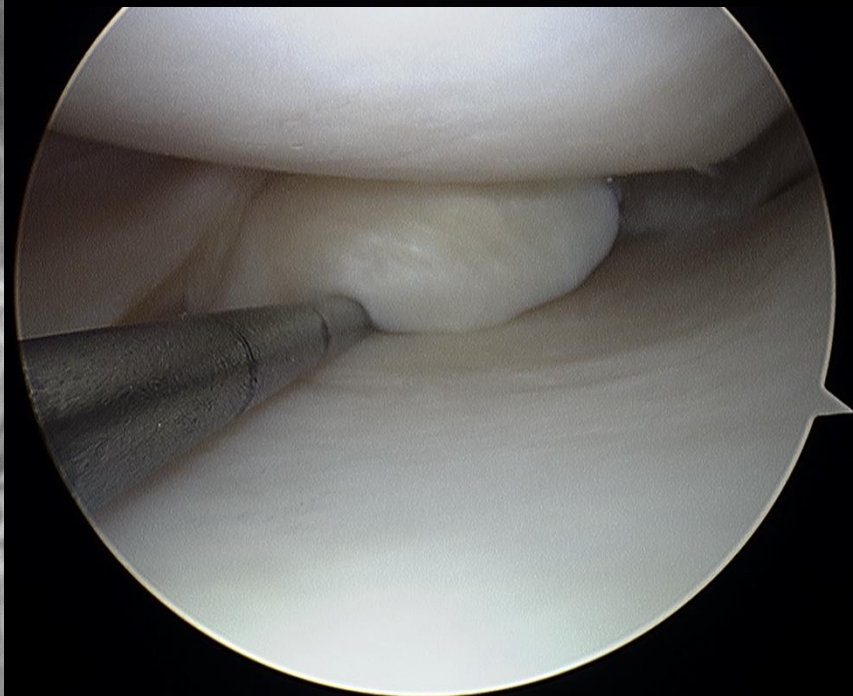
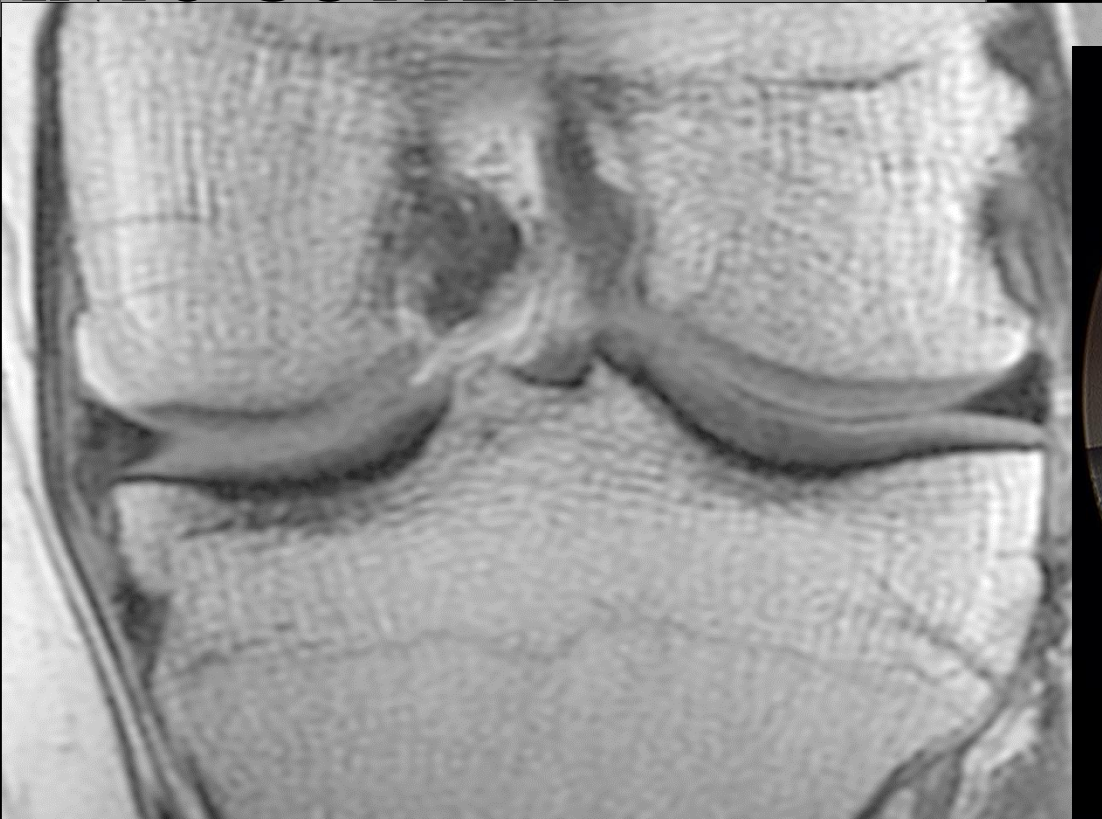
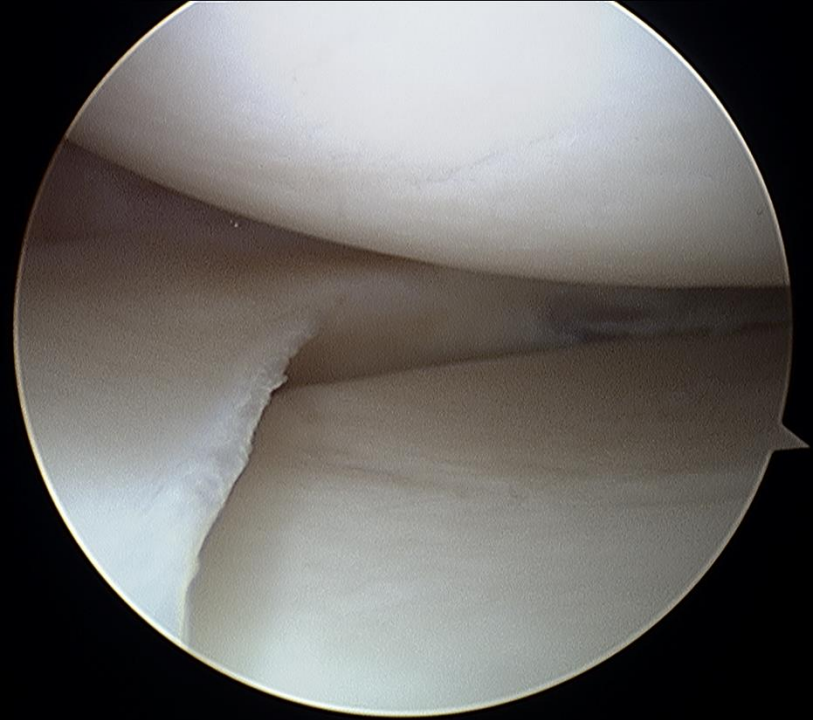


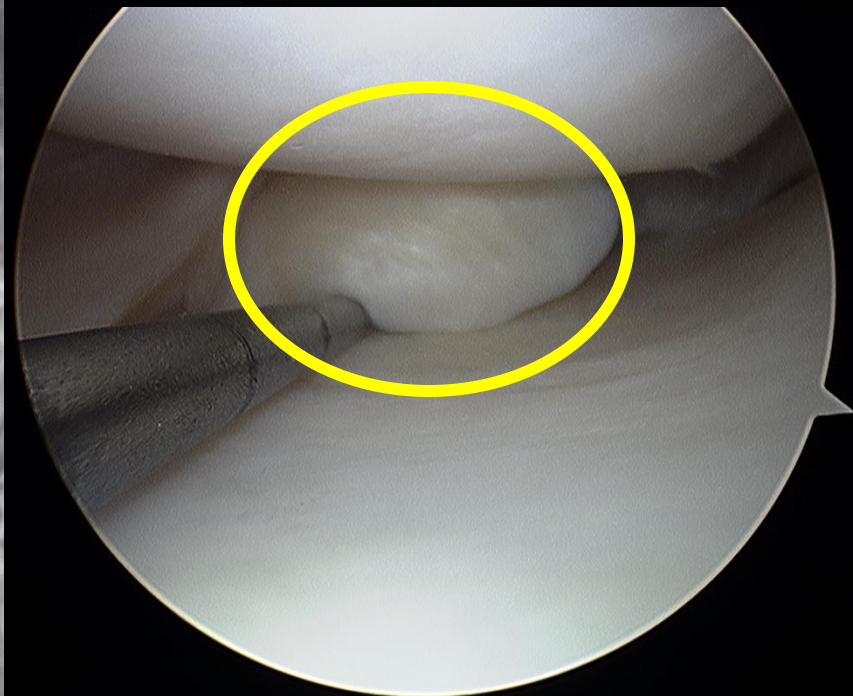
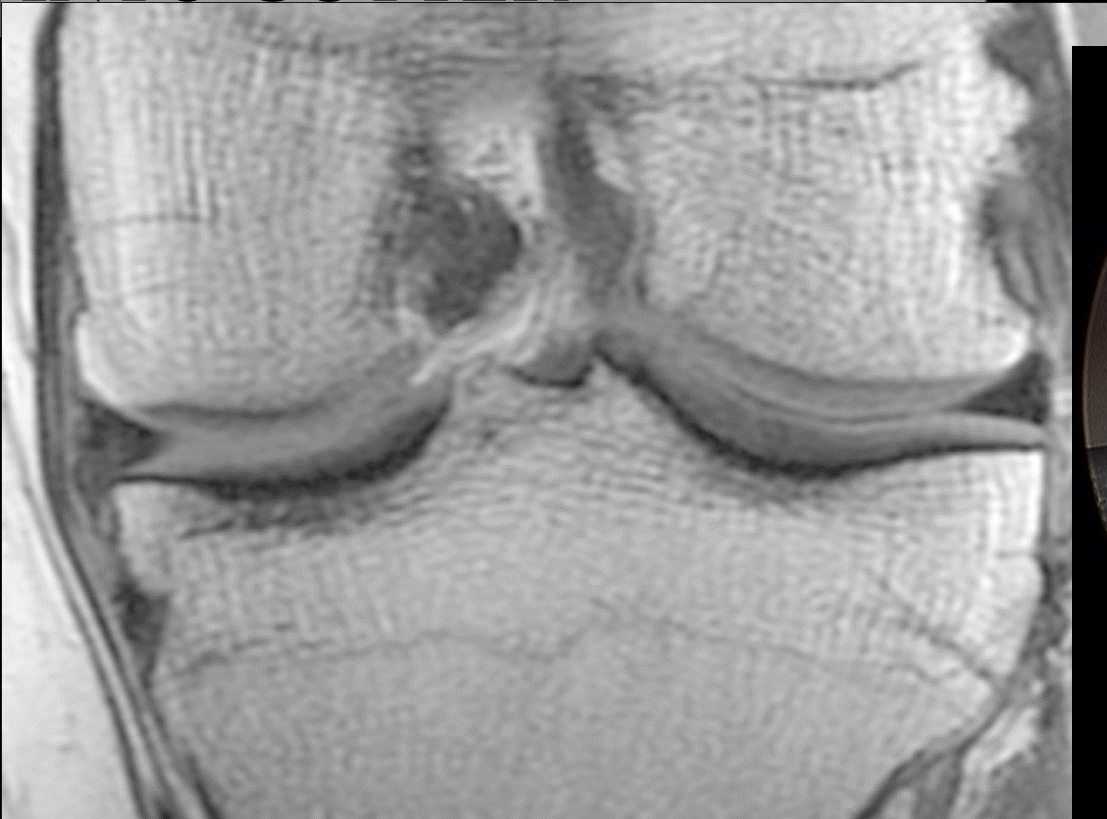
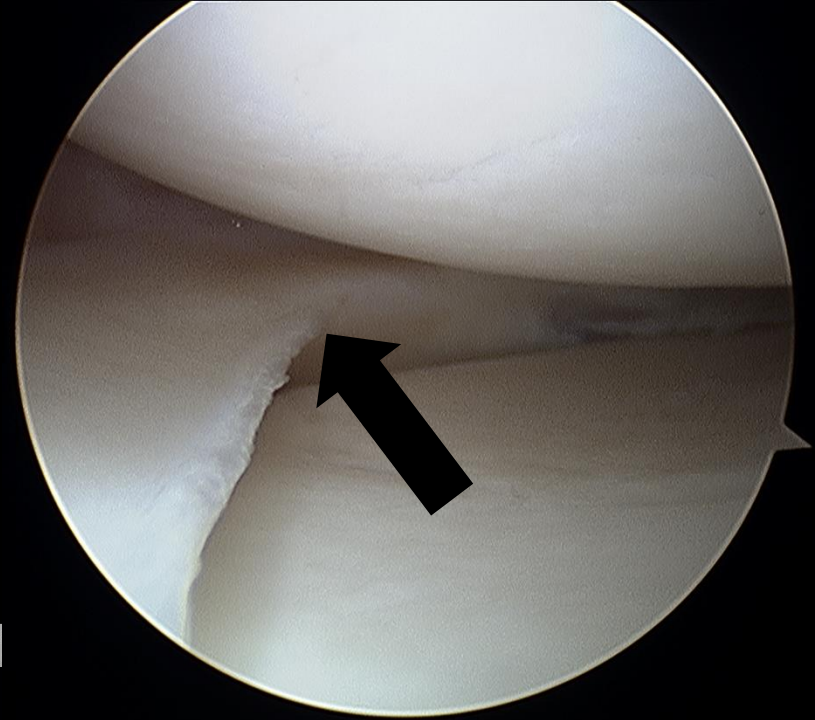
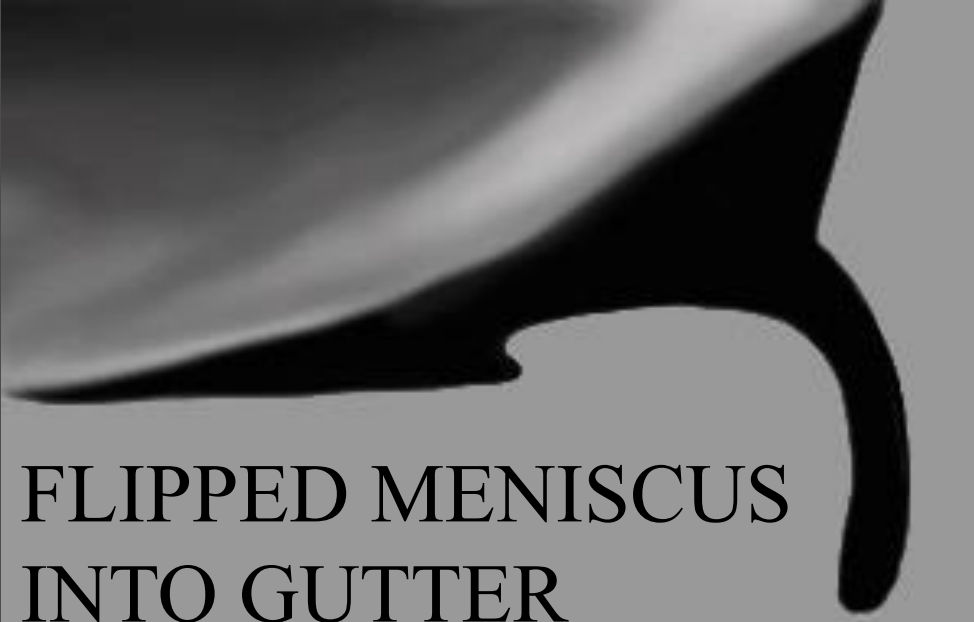
**FLIPPED
MENISCUS INTO
GUTTER**

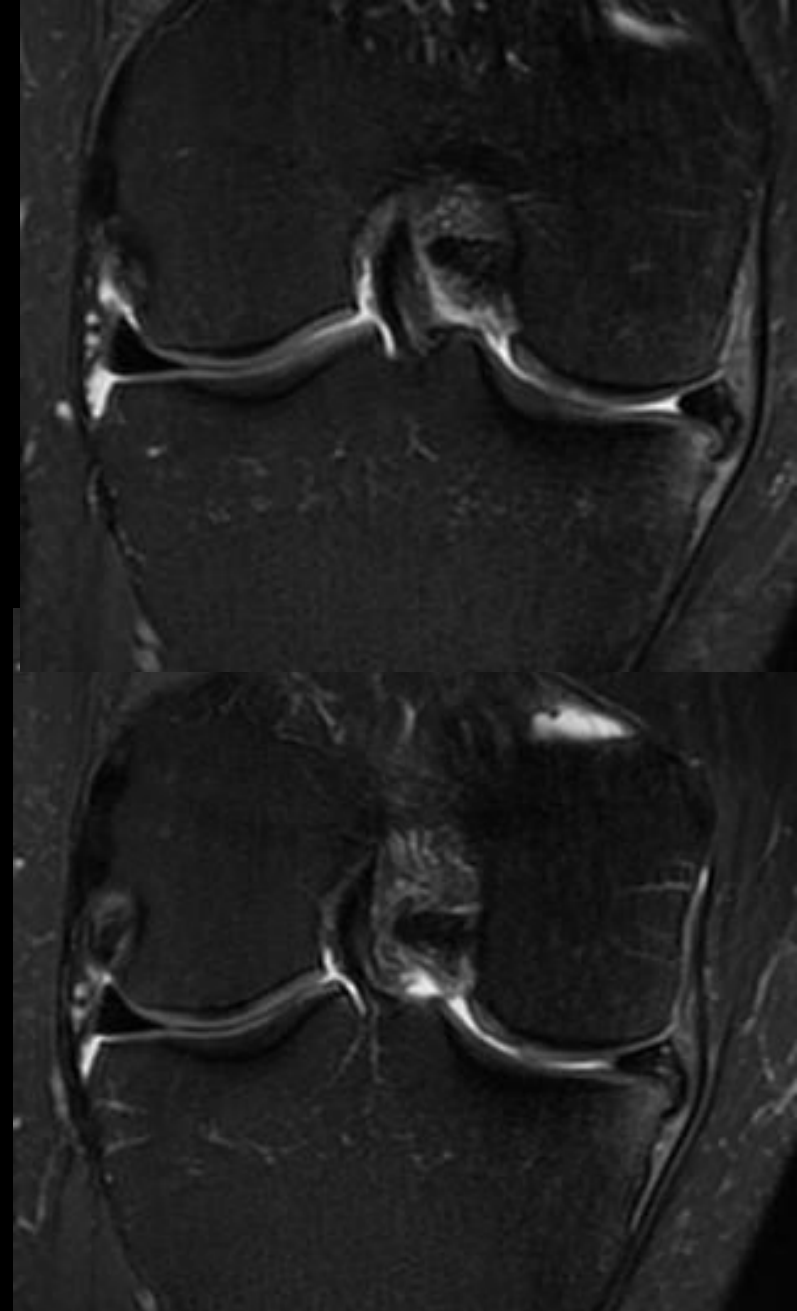
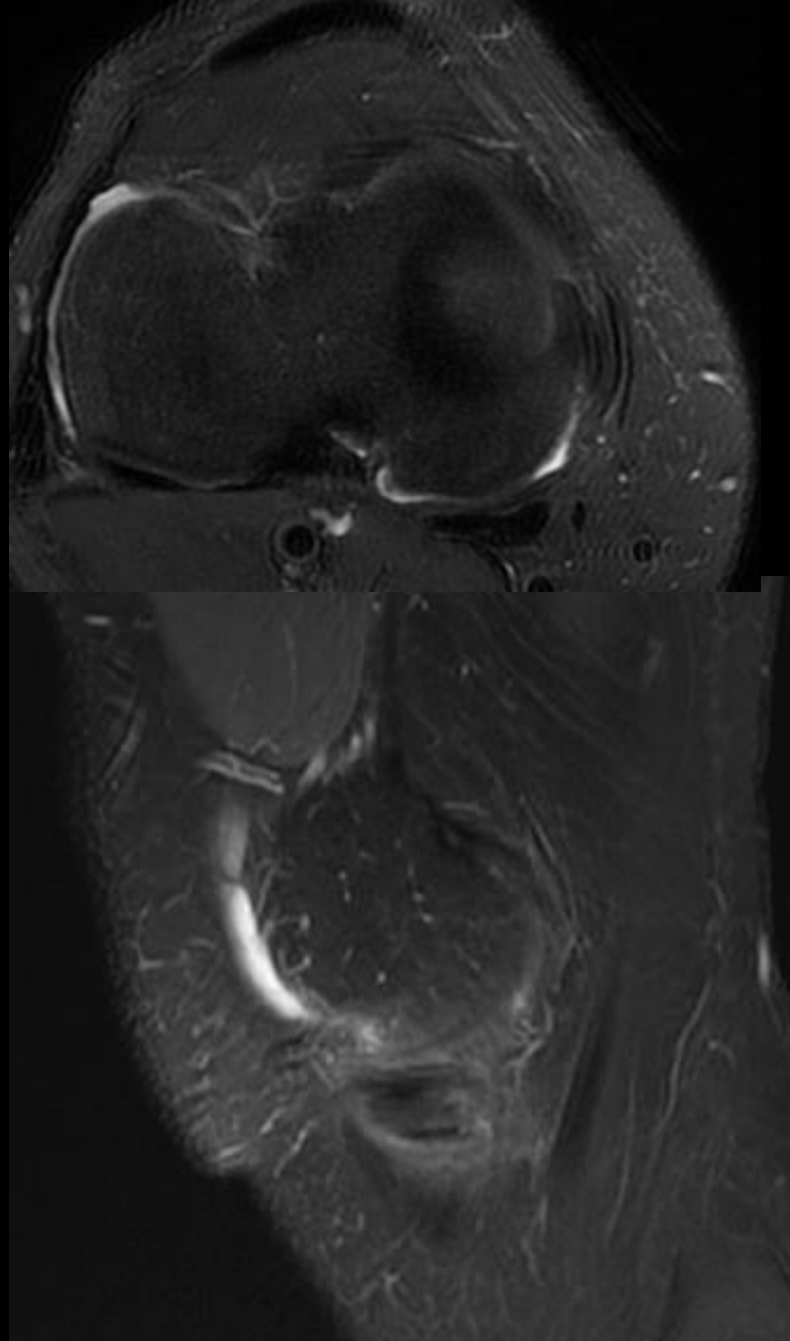
CASE COURTESY KIRK DAVIS MD



FLIPPED MENISCUS
INTO GUTTER



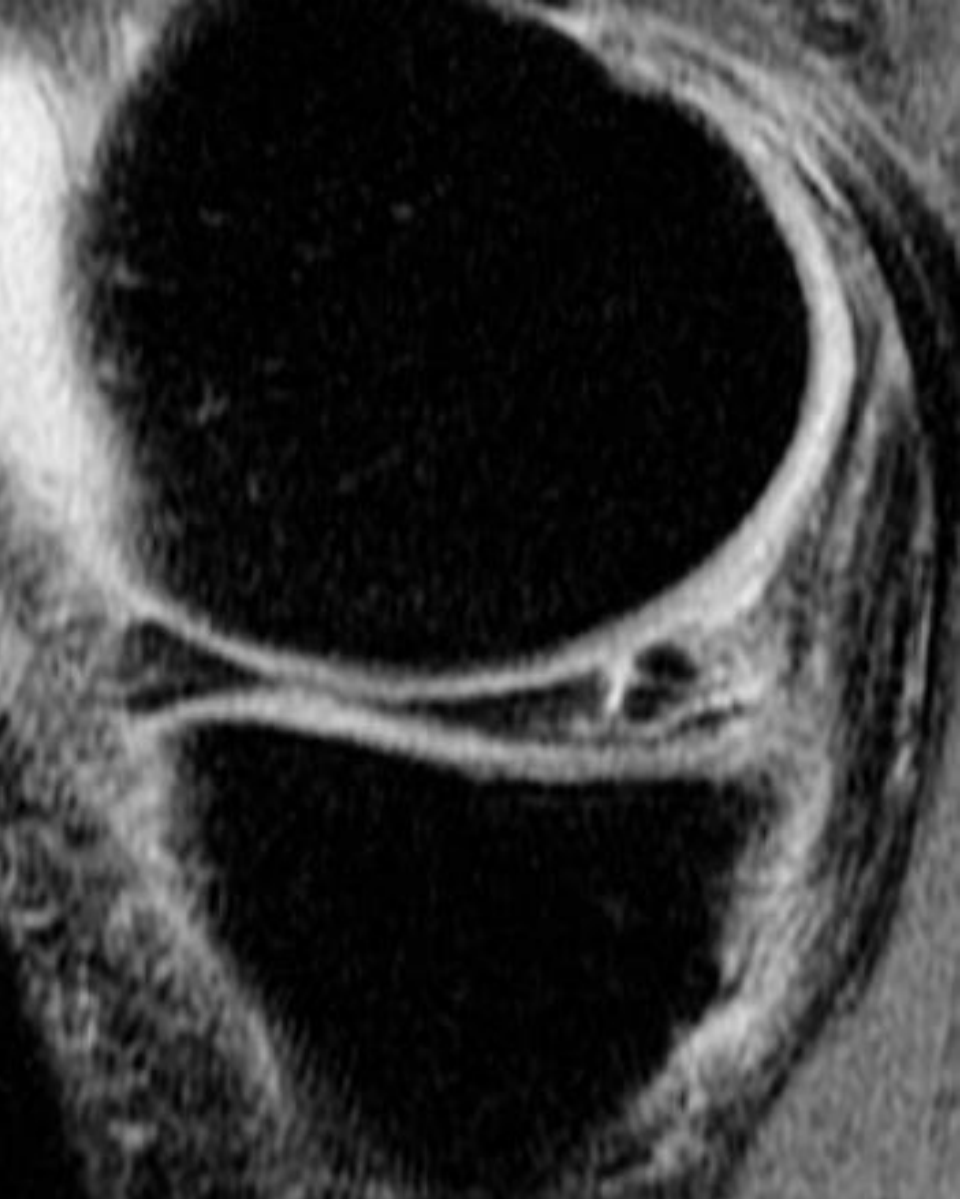




FLIPPED MENISCUS INTO GUTTER

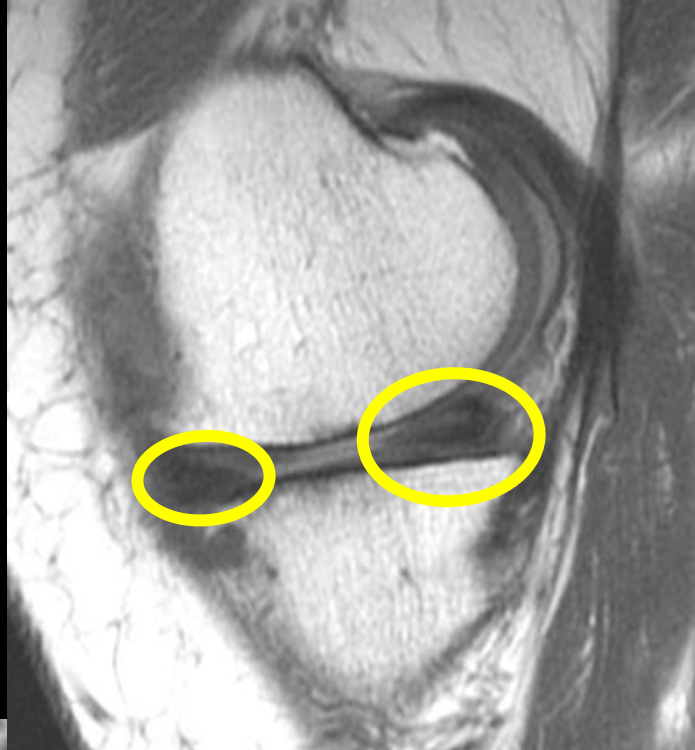
MENISCAL TEAR COMPLEX

- Combination of patterns
- Meniscal extrusion (>3mm from bone)
 - Root tear, macerated body tear
 - Prominent hyaline cartilage loss
- Extensive maceration usually associated with prominent degenerative disease/hyaline cartilage loss
- Older patients

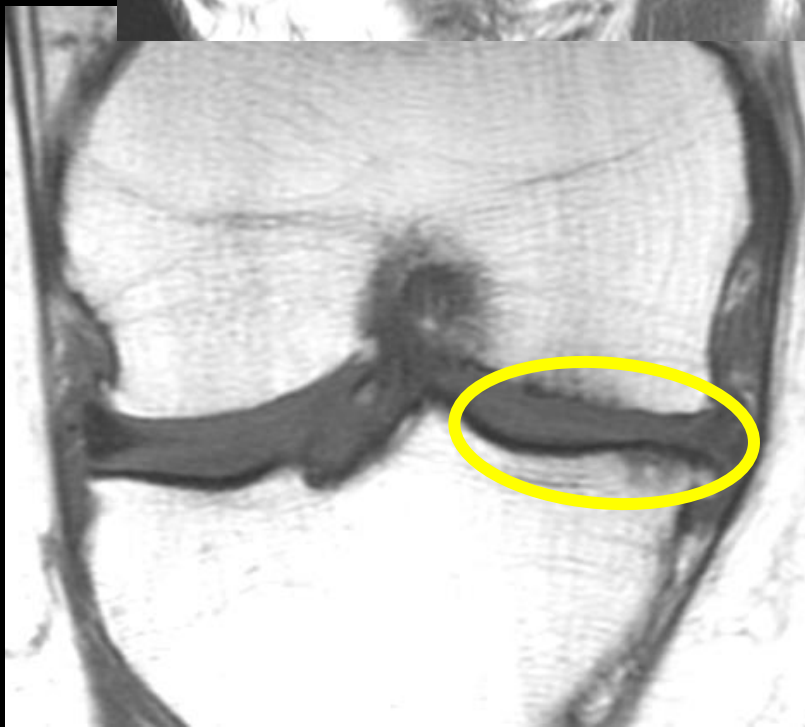










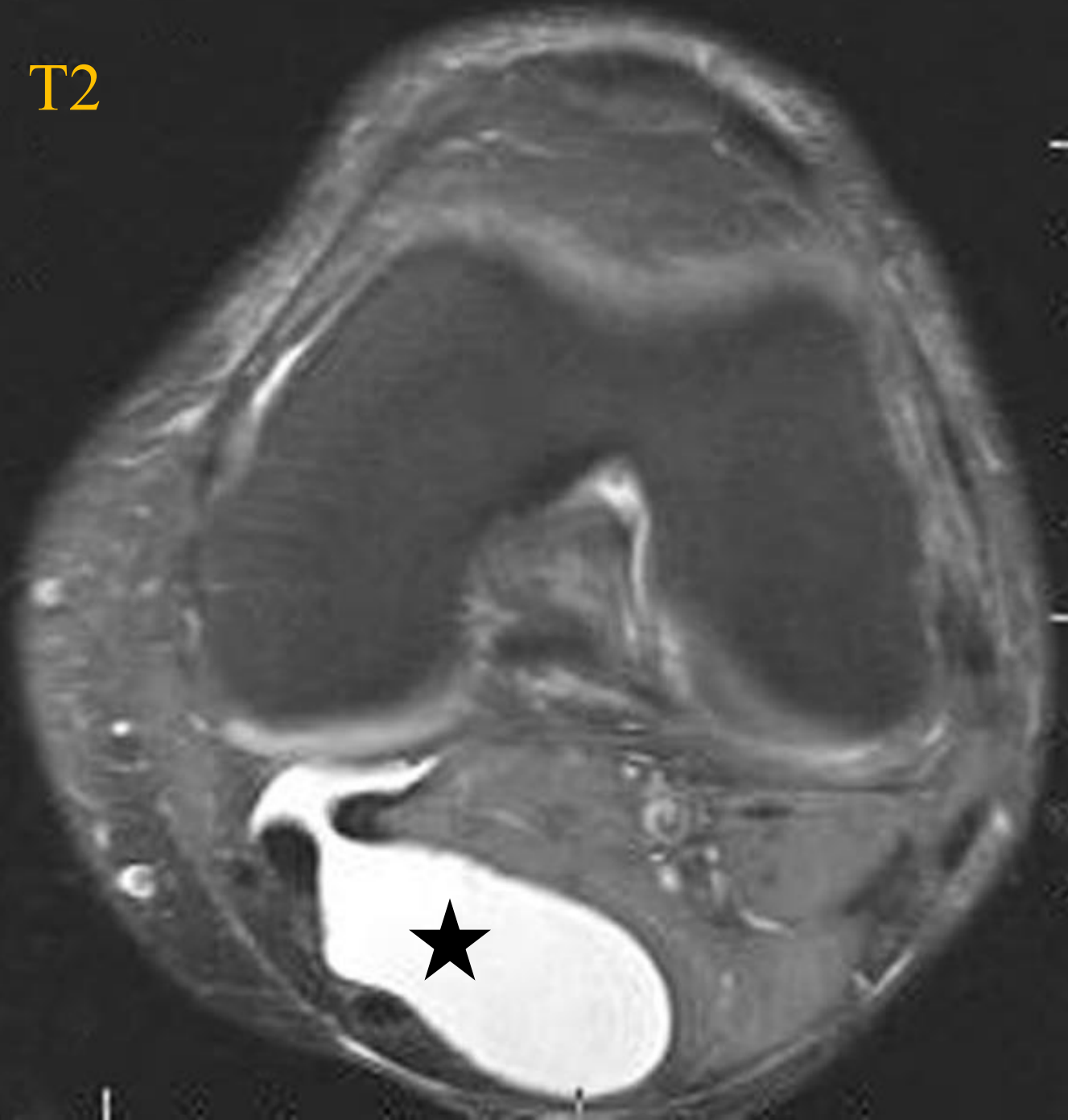




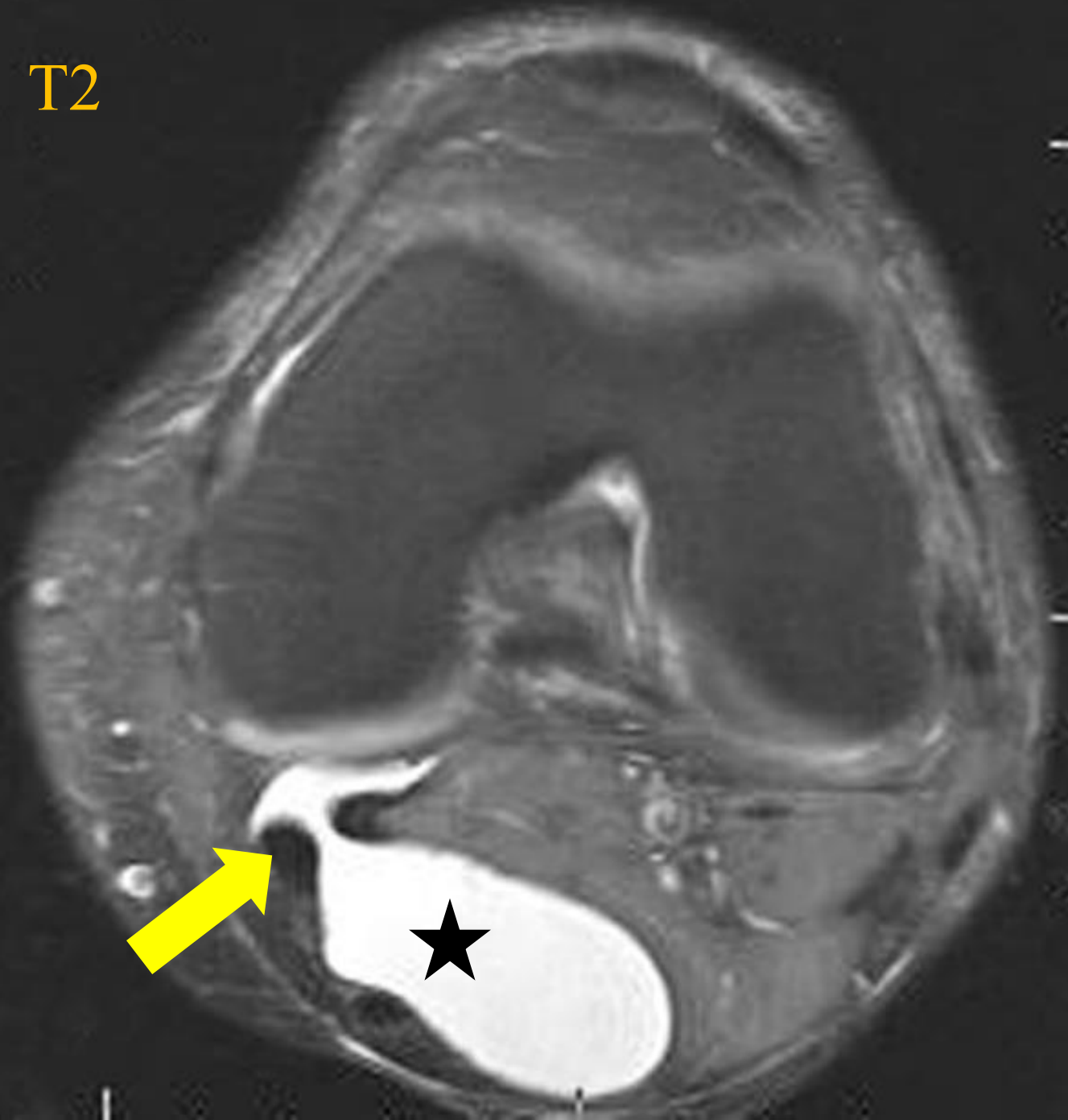
MENISCAL TEAR ASSOCIATED FINDINGS

- Popliteal cyst
 - 80%-90% associated with meniscal pathology
- Meniscal (perimeniscal) cyst (2:1 M-F ratio)
 - 85%-100% association with meniscal tear (>90% PPV) (1.7%-4% incidence); **except anterolaterally** (64%-67% PPV)
 - Lateral meniscus most commonly involved (3-10:1 now more equivalent)
 - Medial meniscus cysts often smaller and intrameniscal due to tight capsular attachment
 - Connect directly to tear (horizontal type)

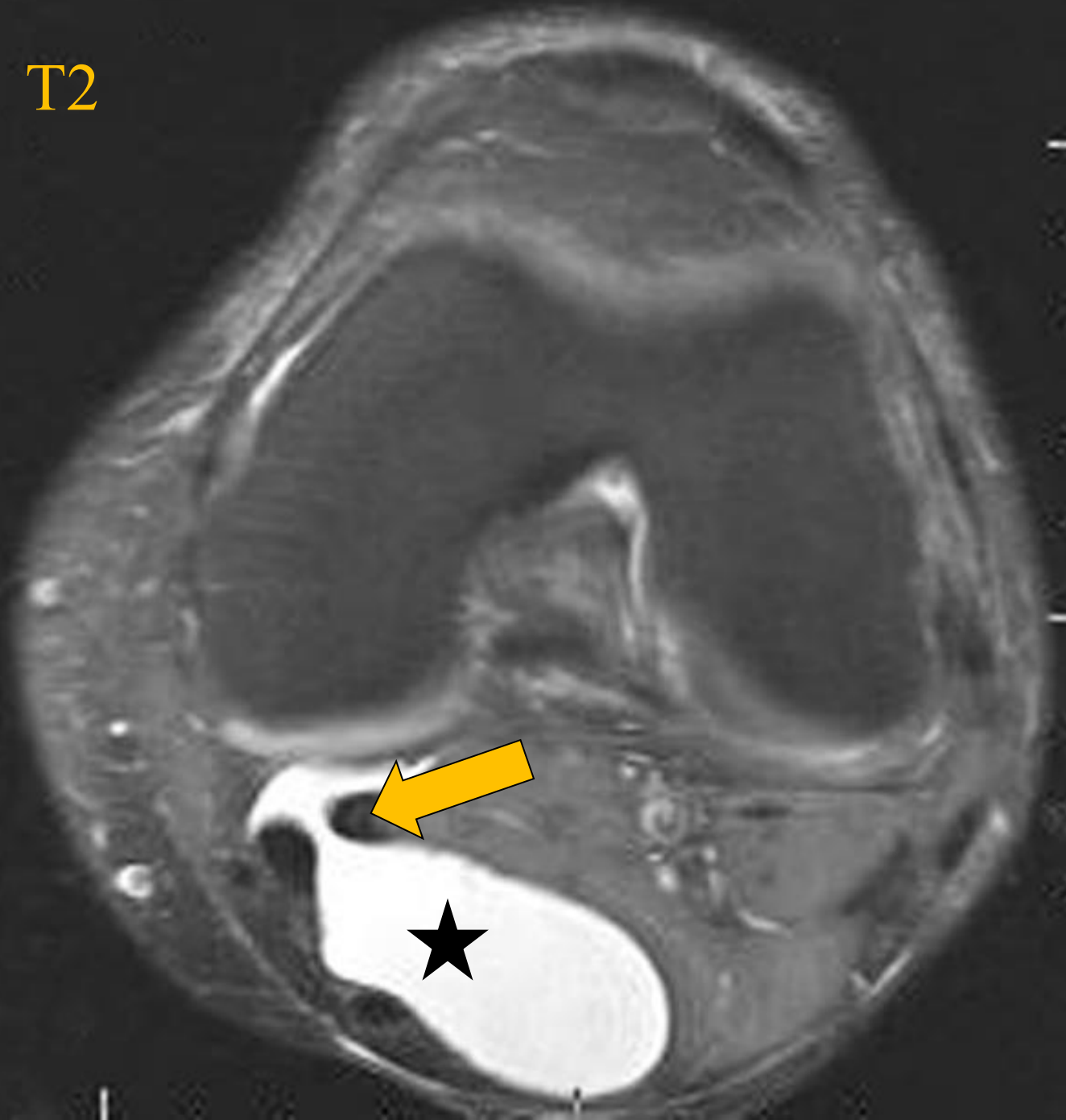
T2

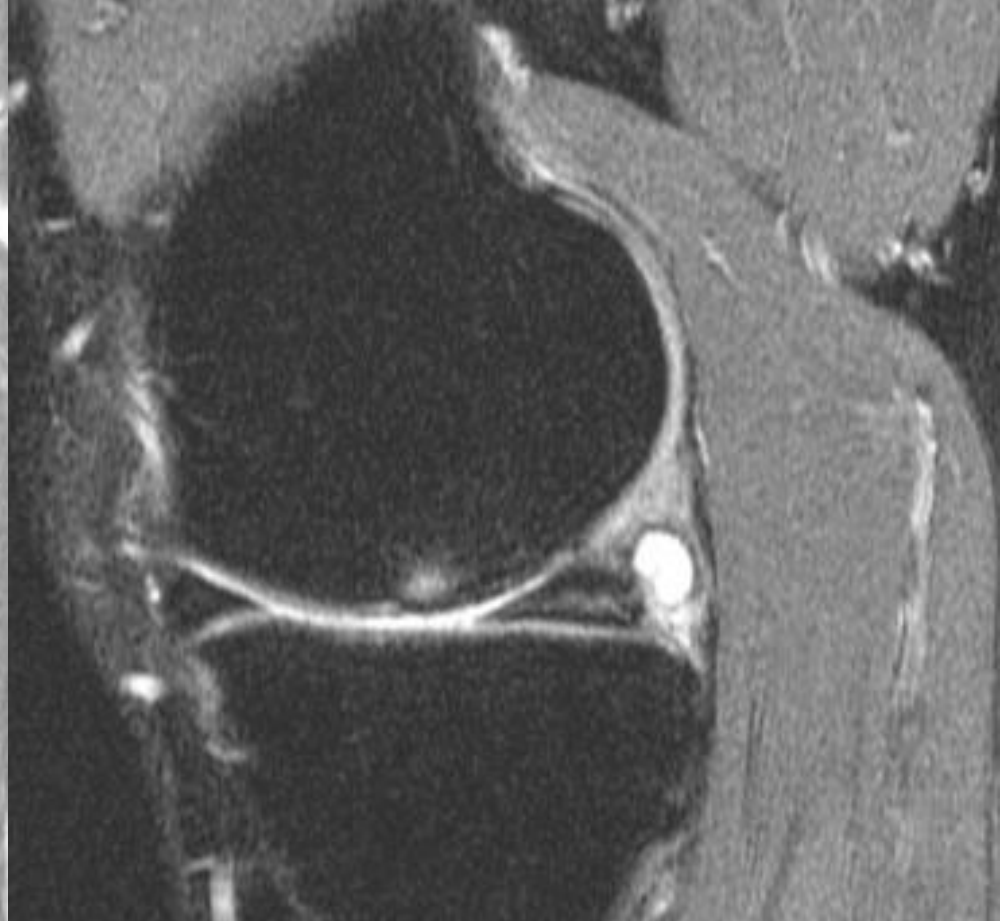


T2

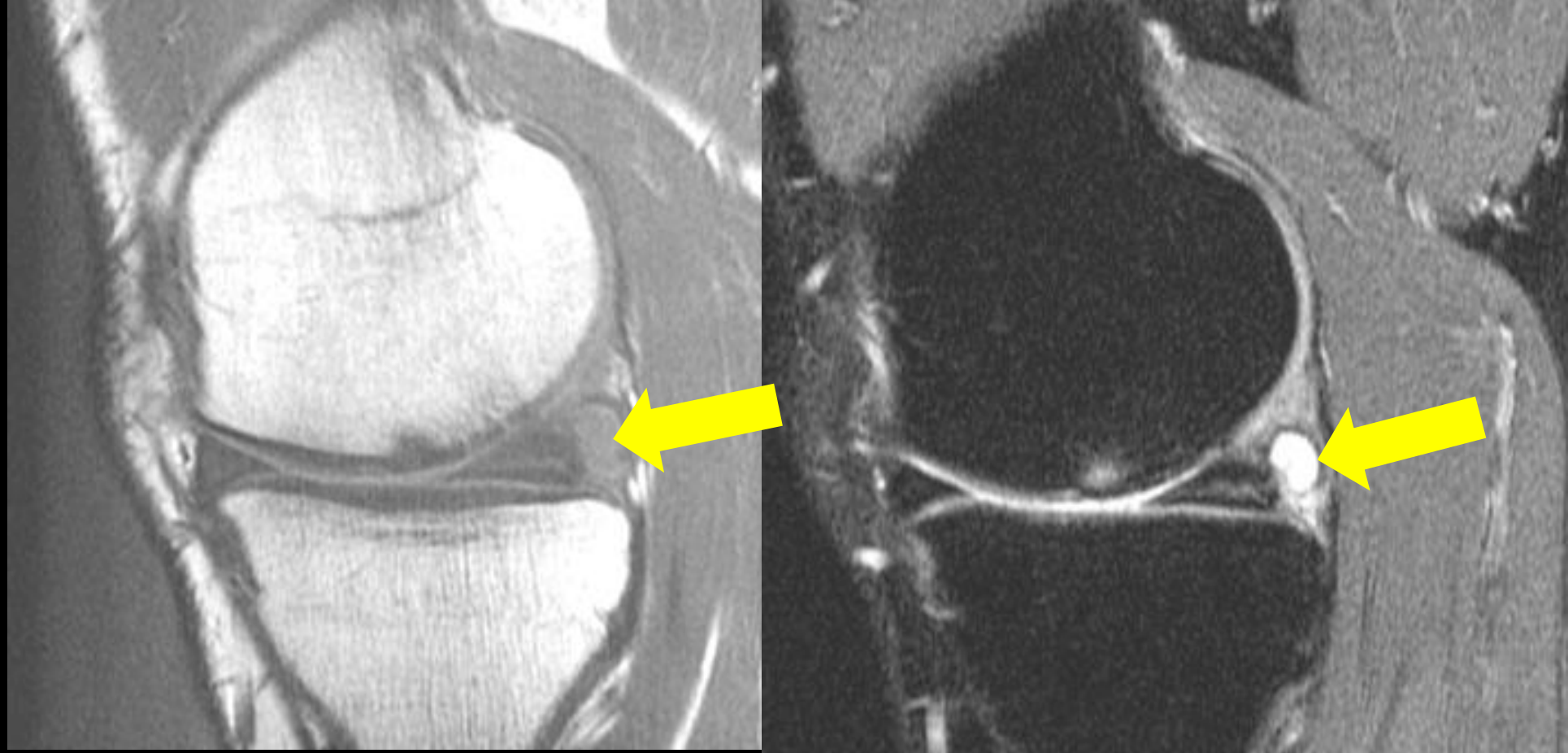


T2









MENISCAL RETEAR POST-SURGICAL

- Challenging
 - Signal may contact articular surface
 - May appear truncated
- Noncontrast MR
 - OK < 25% meniscus removed
 - Findings of retear
 - Fluid signal in defect or meniscal cyst
 - Displaced fragment
 - New finding remote from surgical site

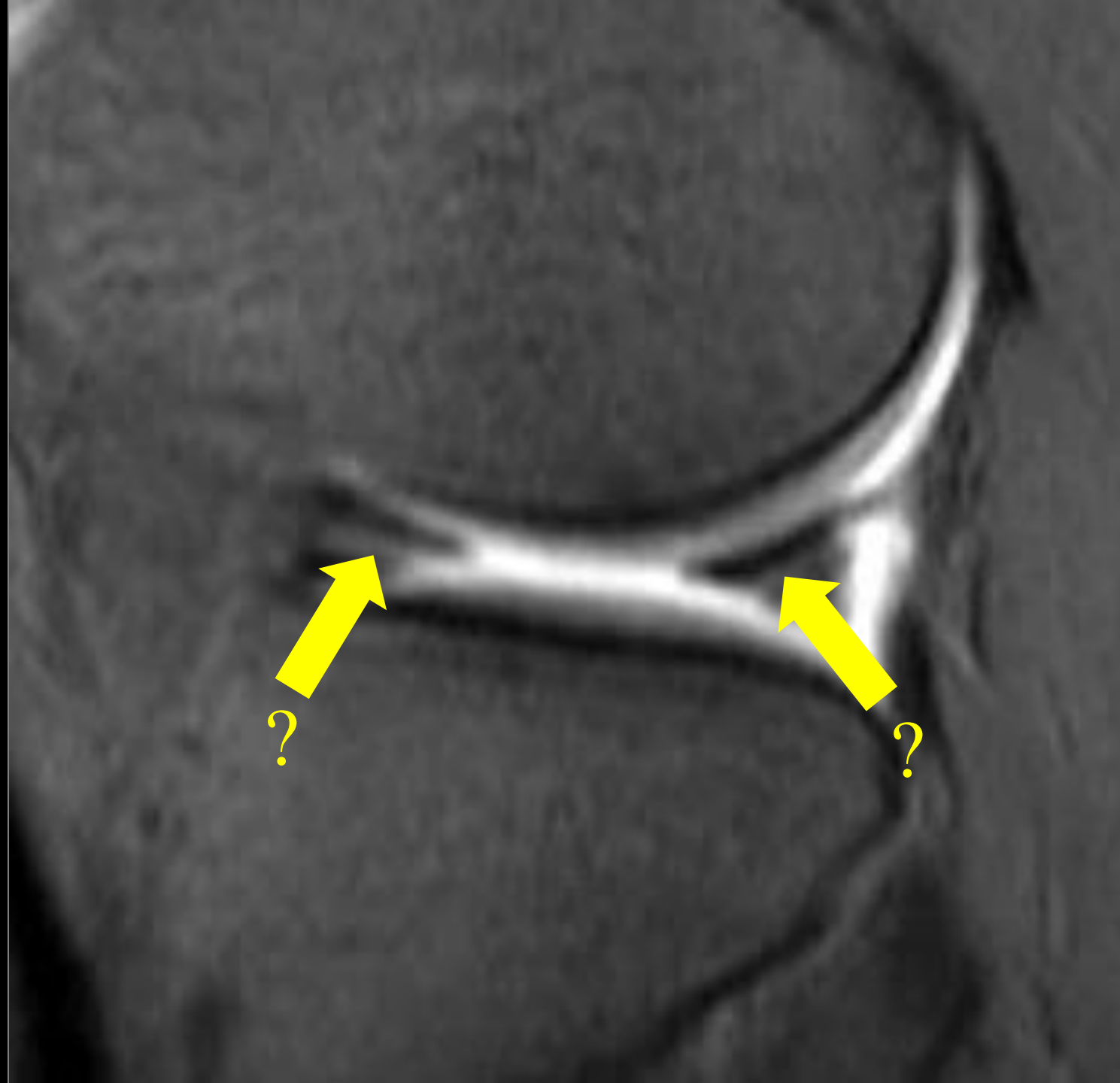
MENISCAL RETEAR POST-SURGICAL

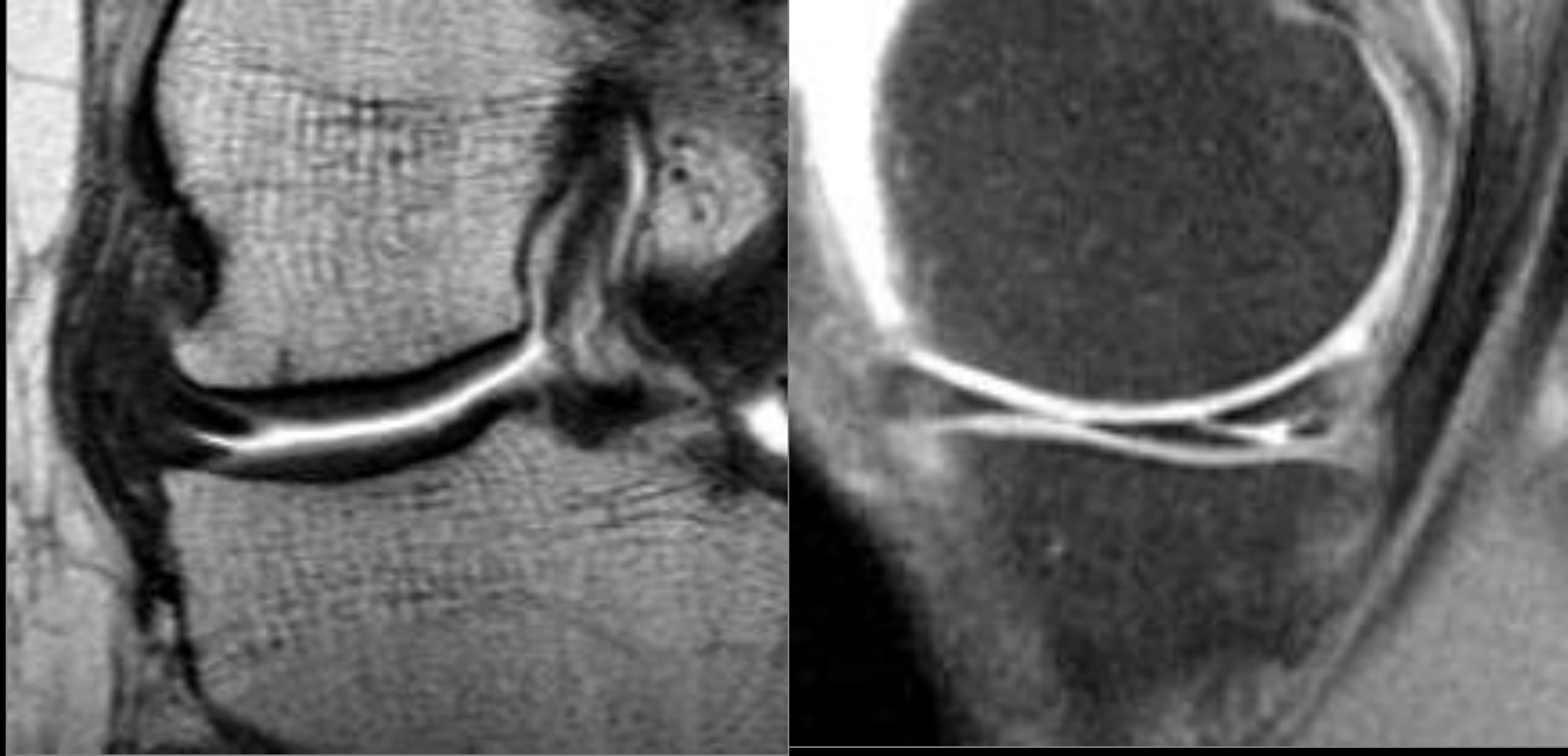
- Noncontrast MR
 - Look for other causes of pain
 - Chondral defects
 - Subchondral fractures
- Arthrography
 - MR direct or indirect
 - CT direct
 - Contrast extends into defect

MR ARTHROGRAPHY TECHNIQUE

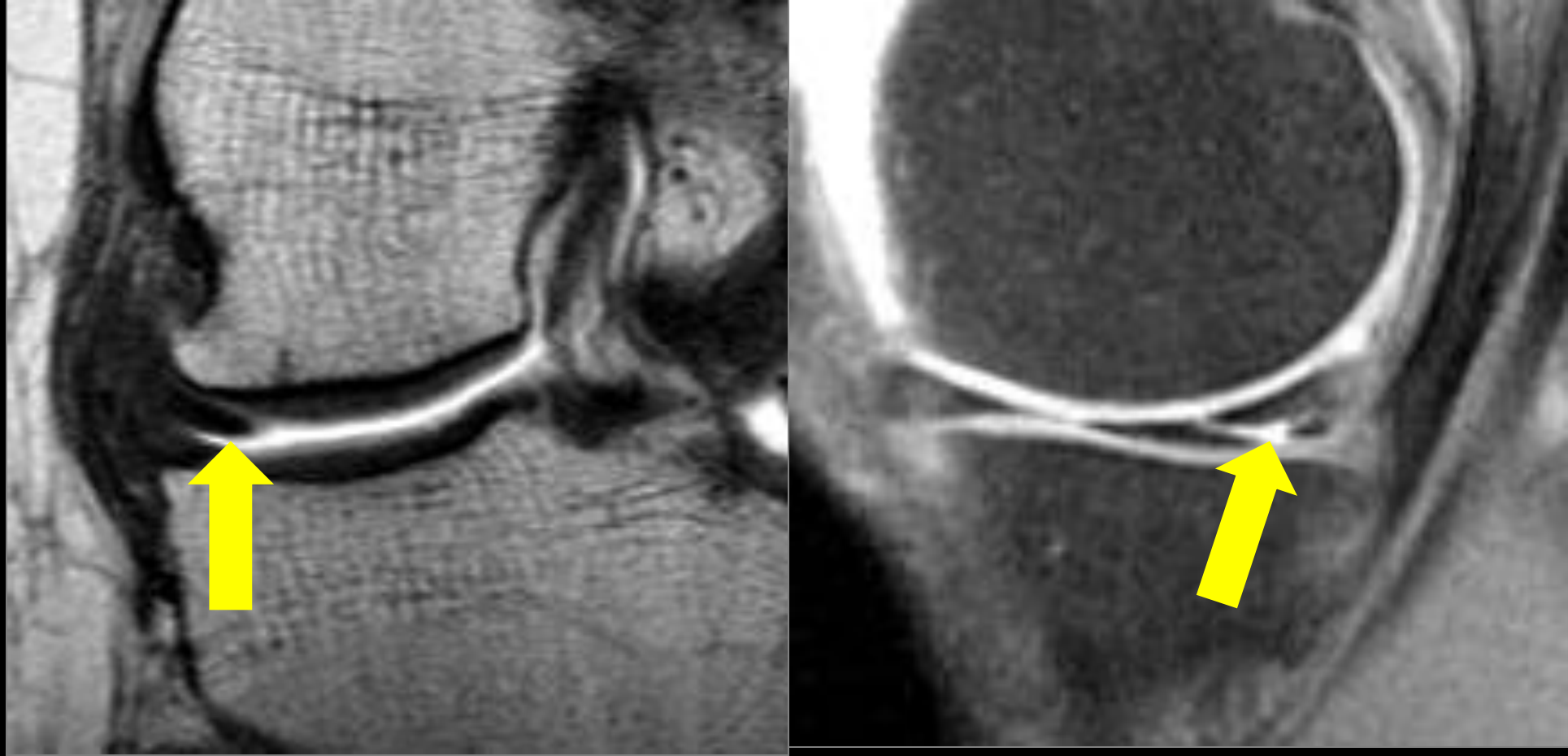
- 0.2 cc Gd + 20 cc saline
- Approximately 40cc of this mixture of contrast
- Axial, sagittal and coronal fat suppressed T1-weighted images
- Additional fluid sensitive sequences



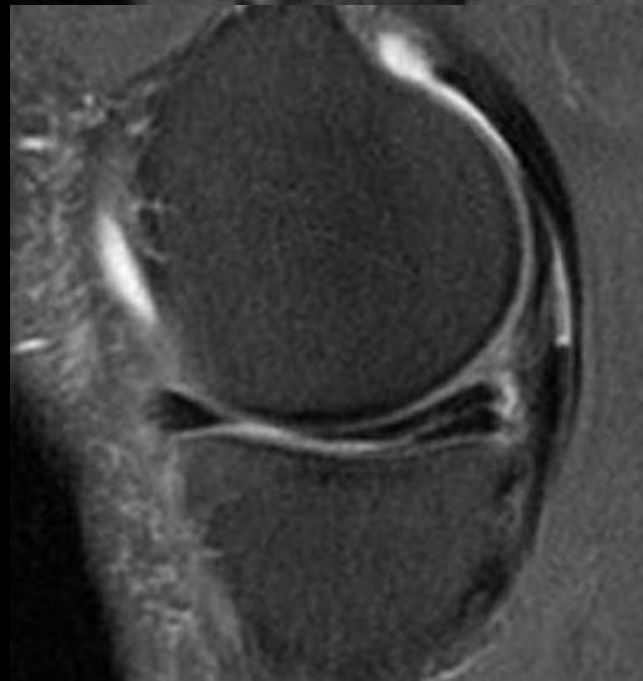
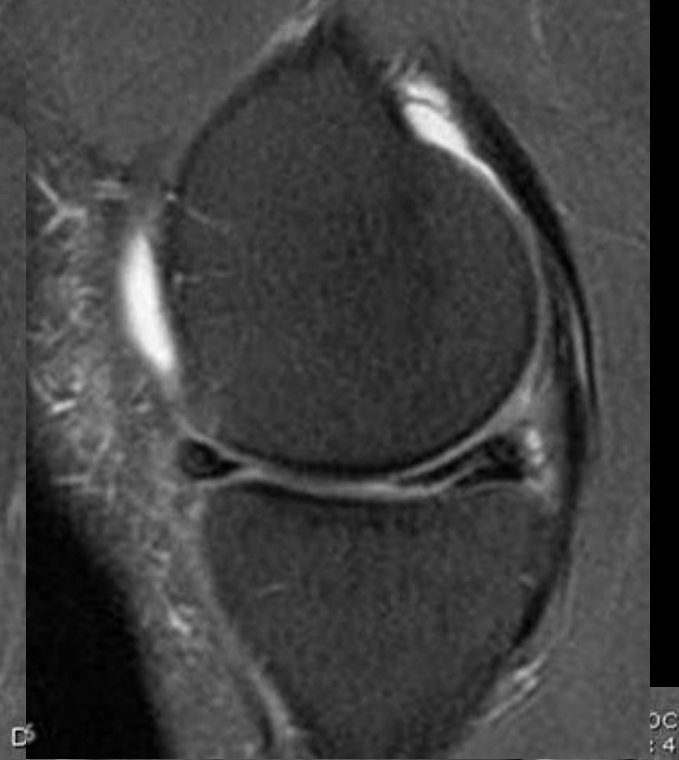


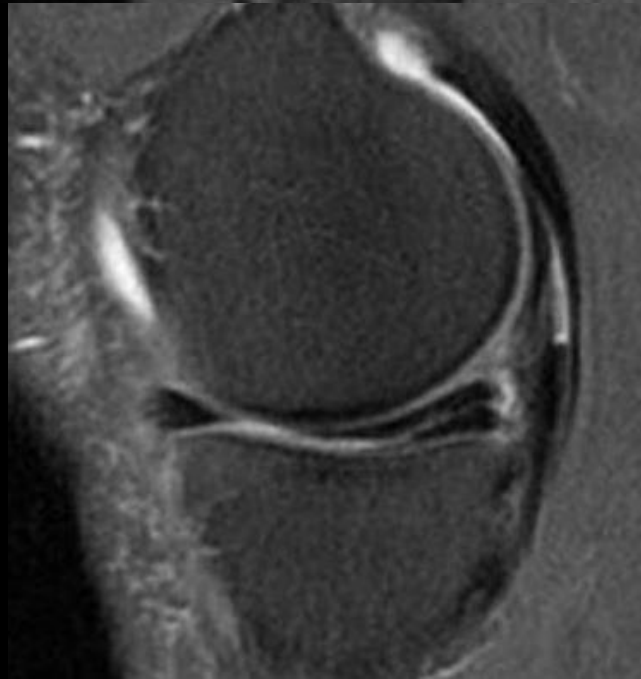
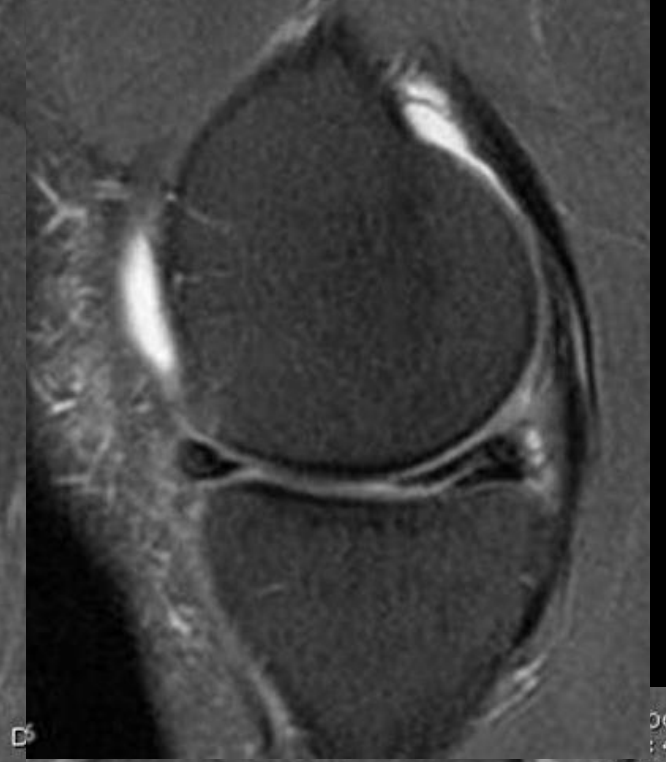


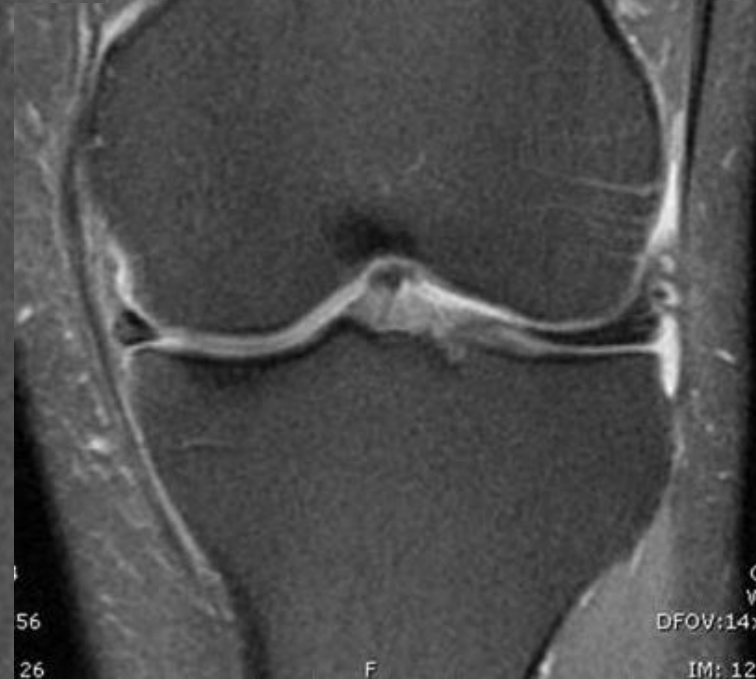
MR ARTHROGRAPHY

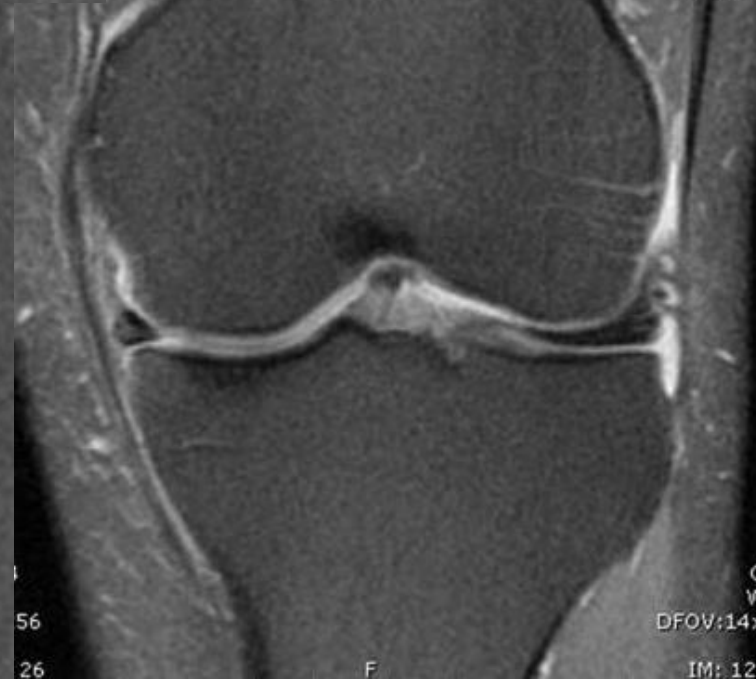
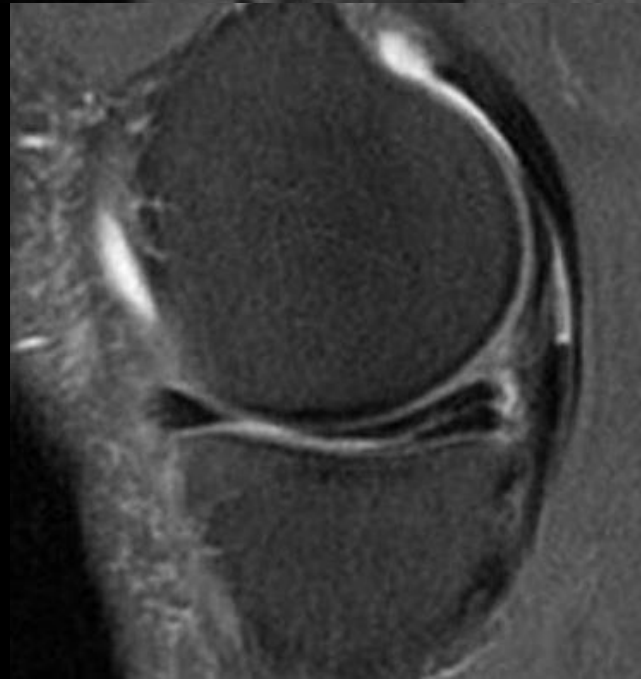


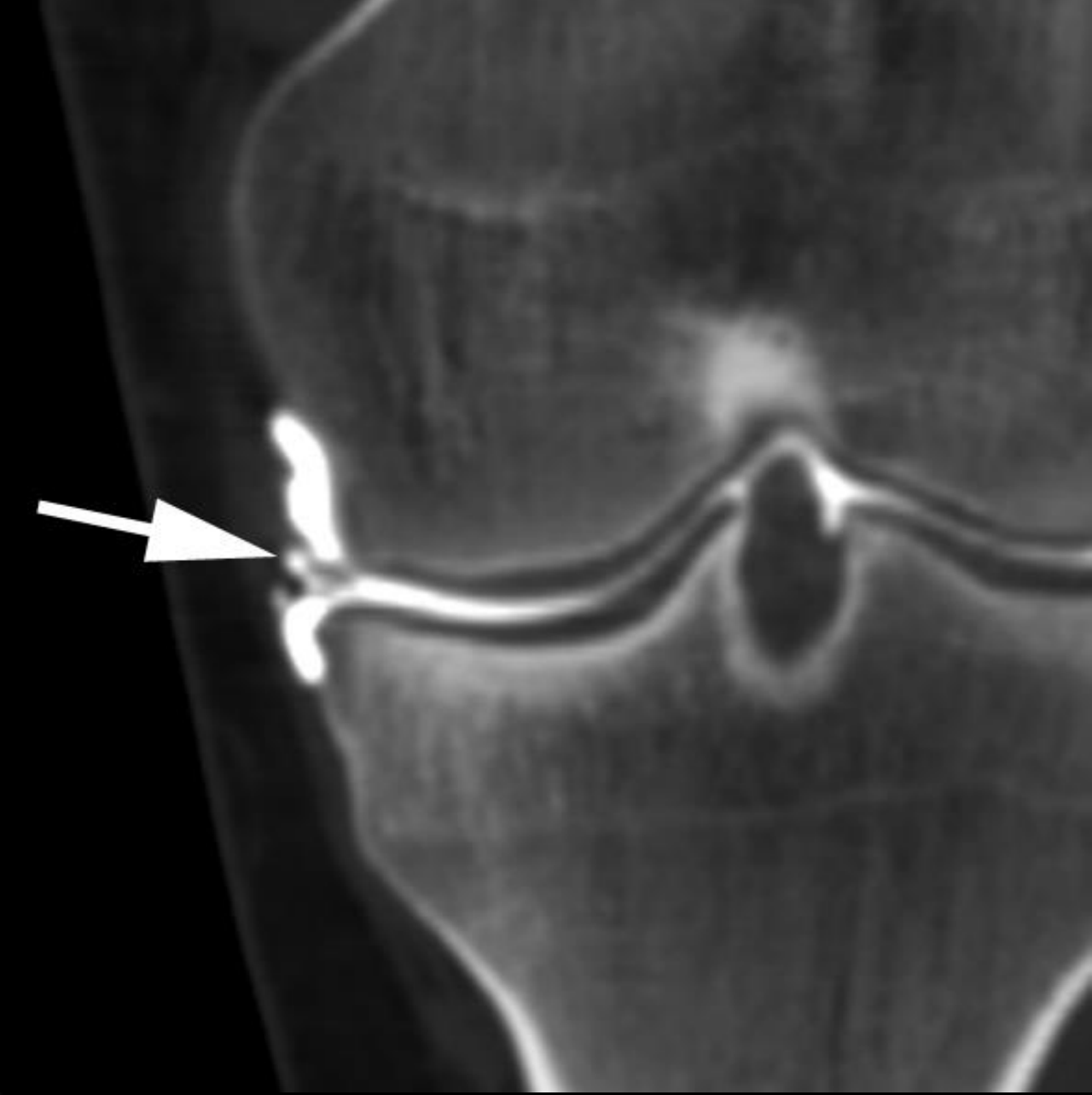
MR ARTHROGRAPHY







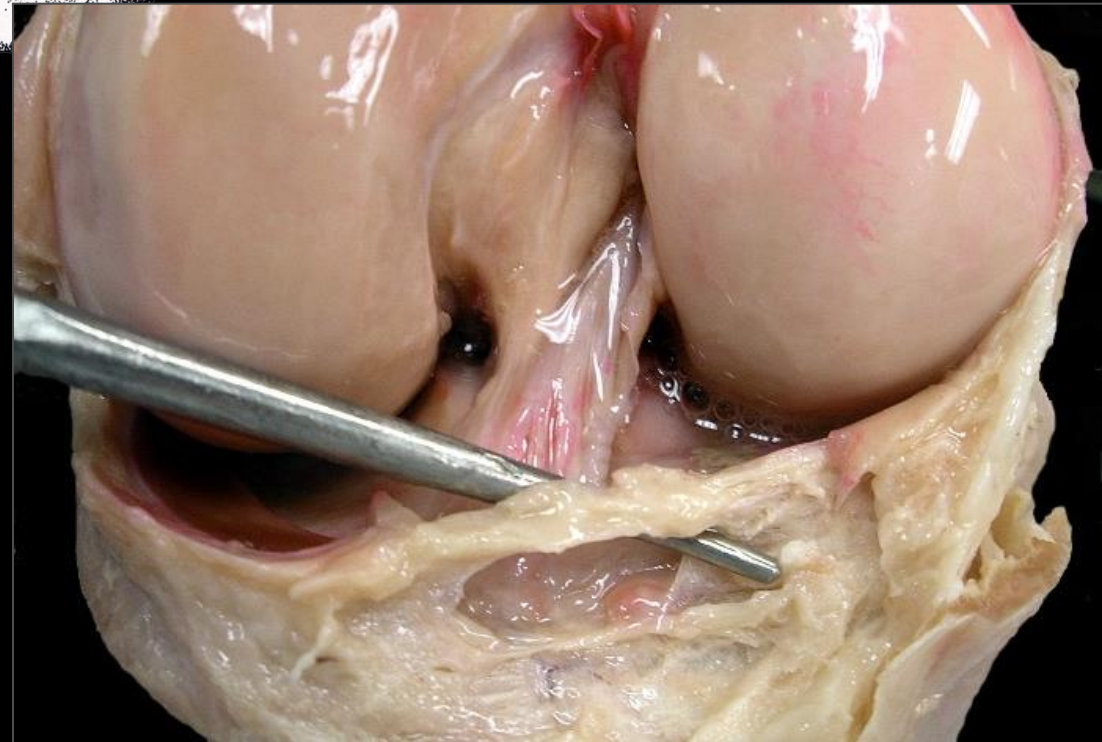
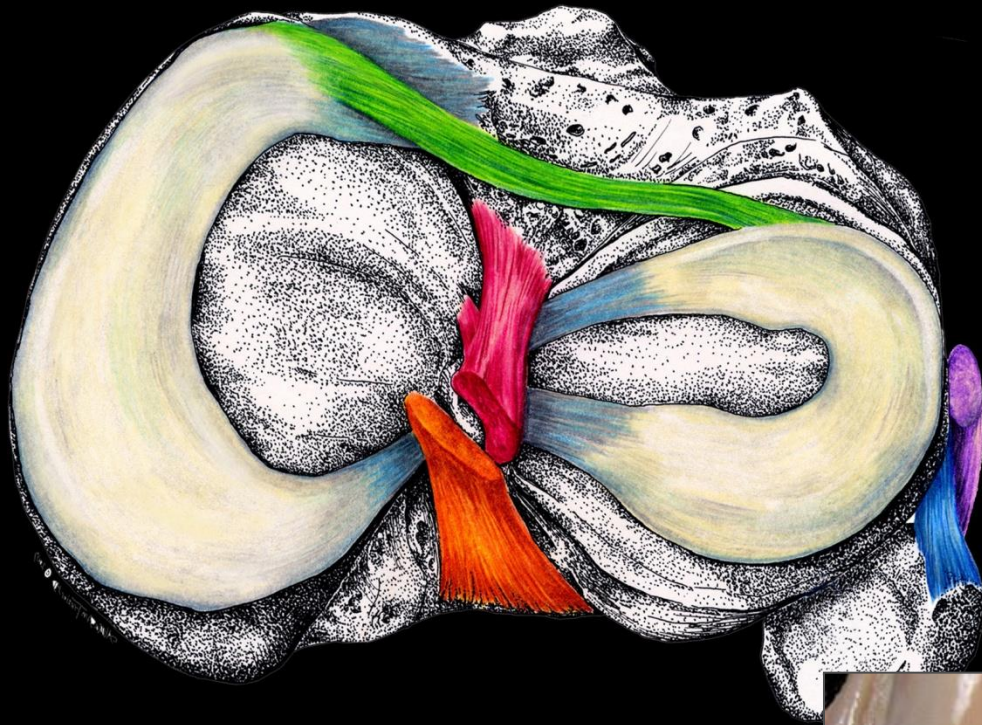


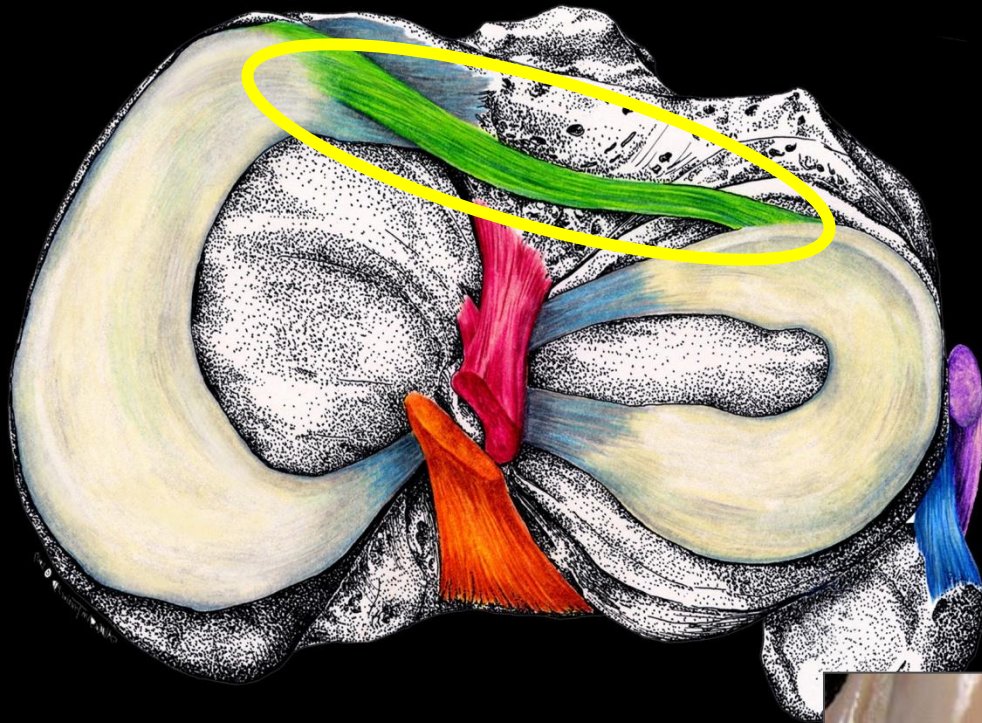


MENISCAL TEARS

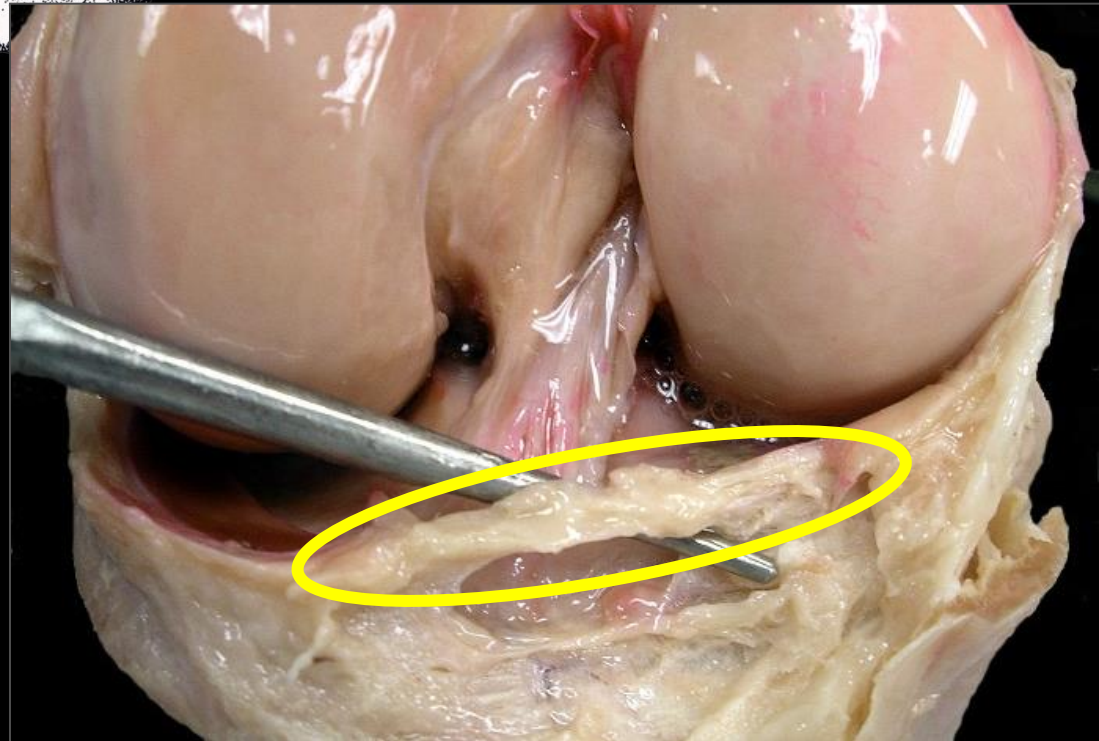
PITFALLS: FALSE POSITIVES

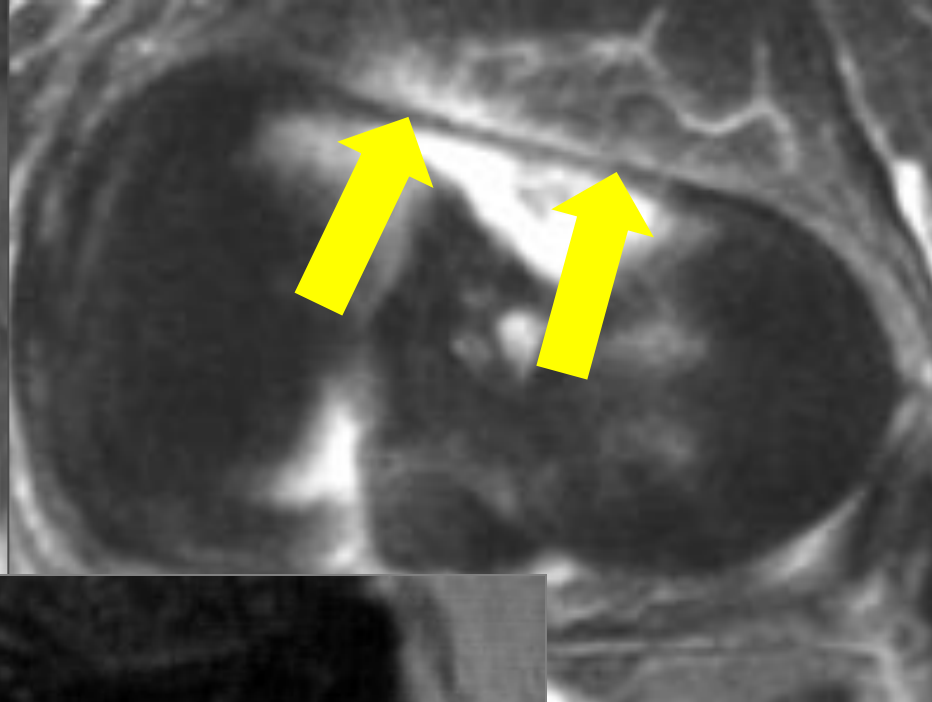
- Normal structures: ligaments (transverse, meniscofemoral, oblique meniscomeniscal), popliteus tendon, geniculate vessels
- Artifacts: patient motion, phase encoding, magic angle
- Chondrocalcinosis, gas, hemosiderin
- Meniscal ossicle and flounce
- Partial meniscectomy
- Meniscal repair/ healed meniscus
- Arthroscopic “gold standard” (really yellow)

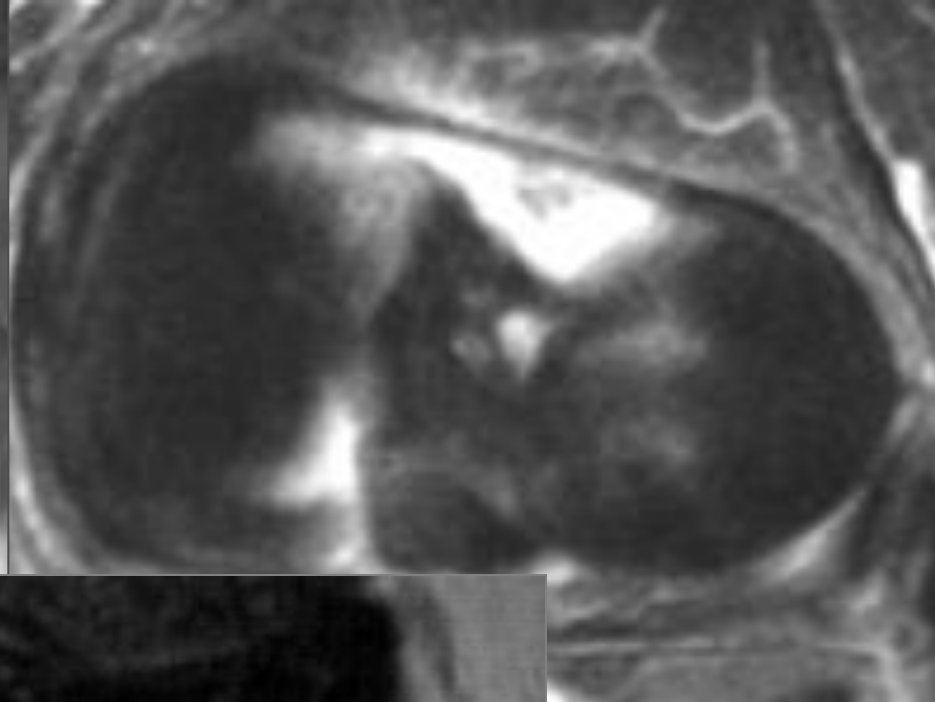
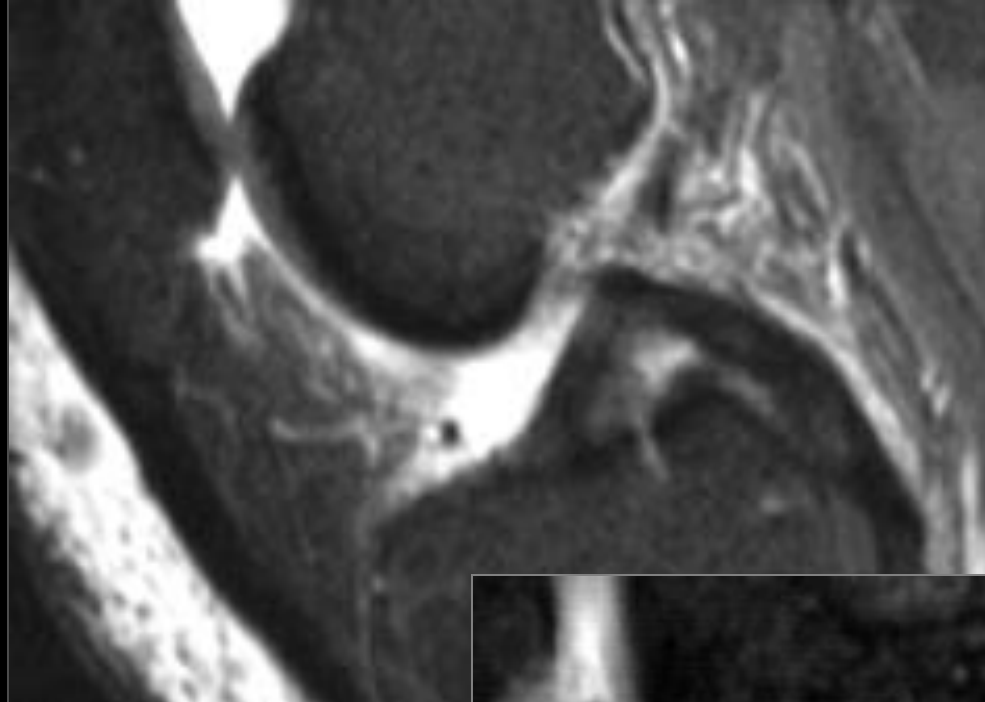


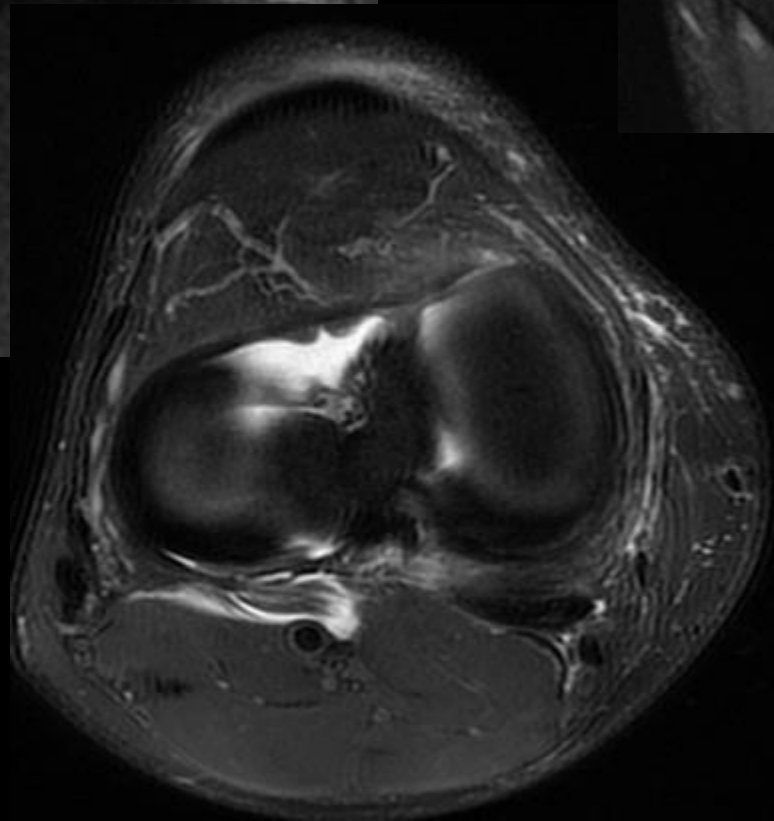
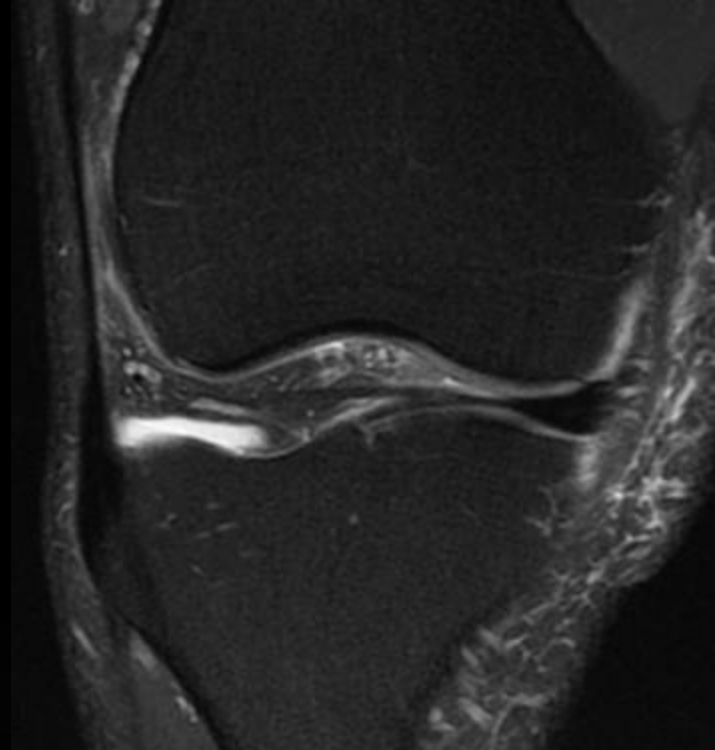
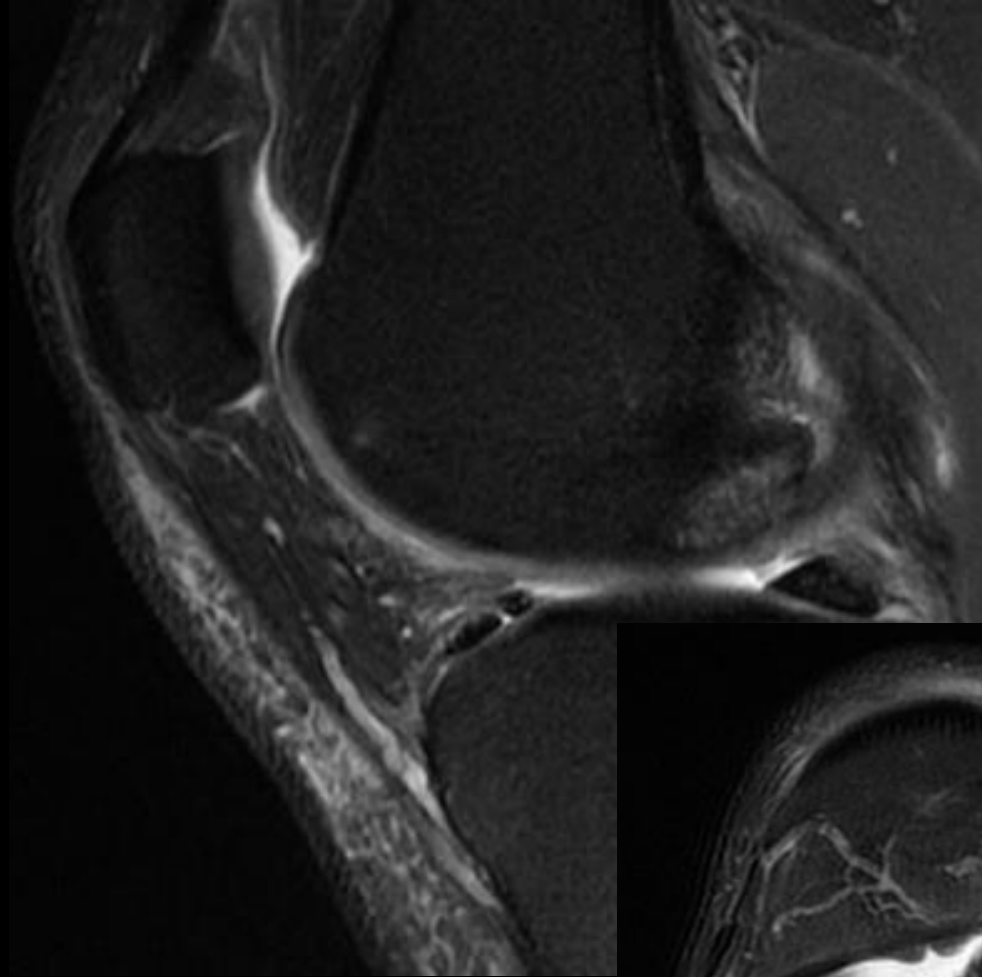


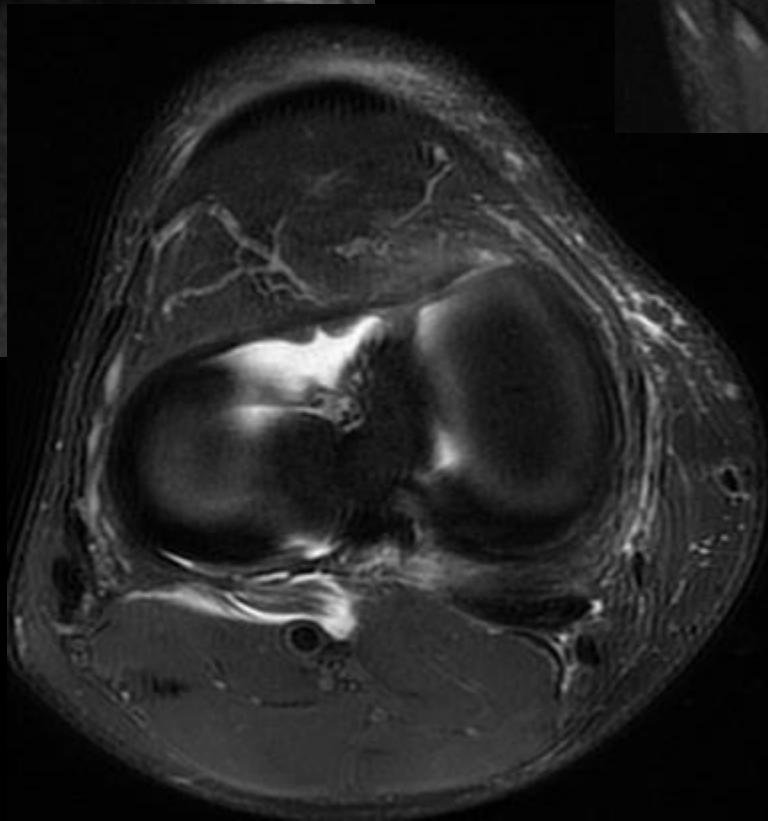
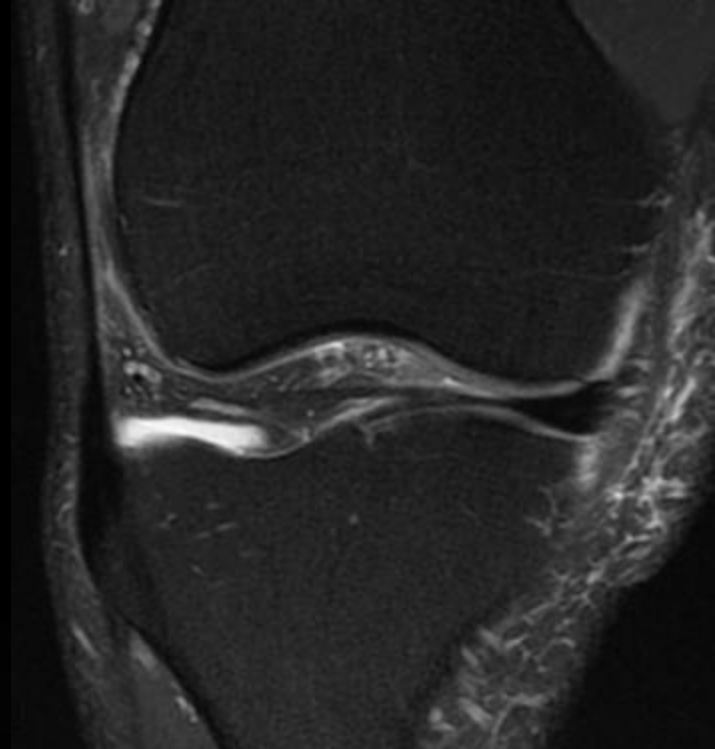
Present in 90% of
dissections and 83%
on MR

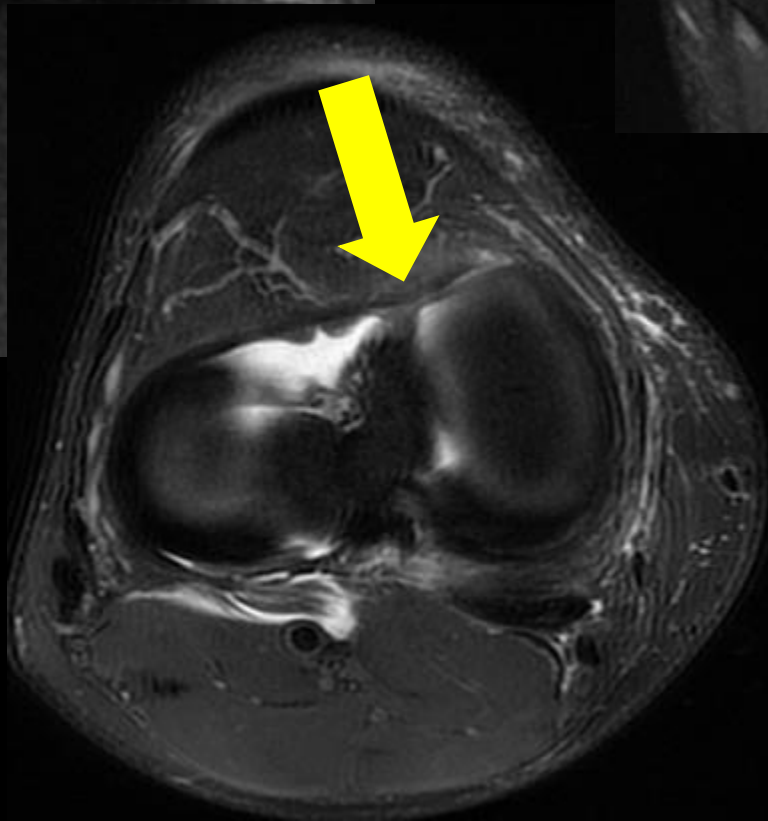
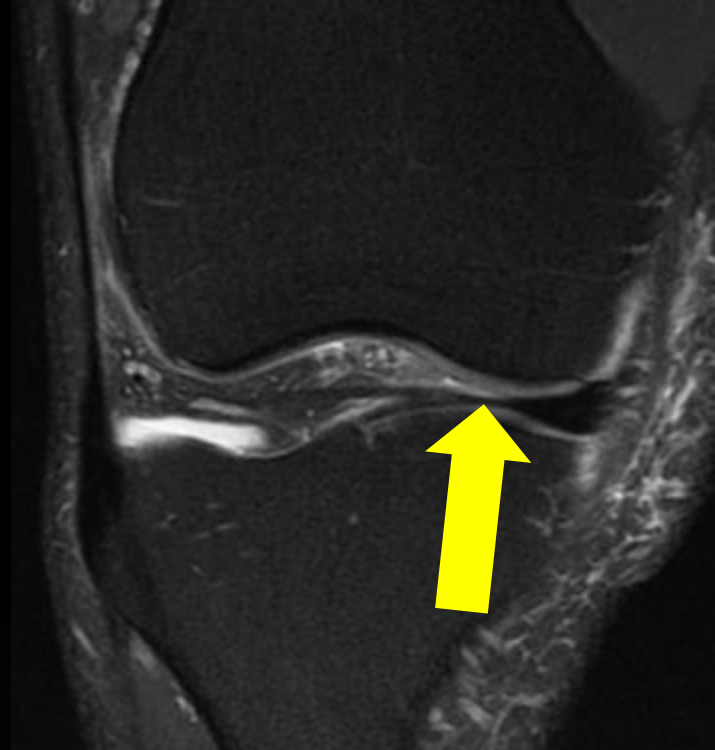
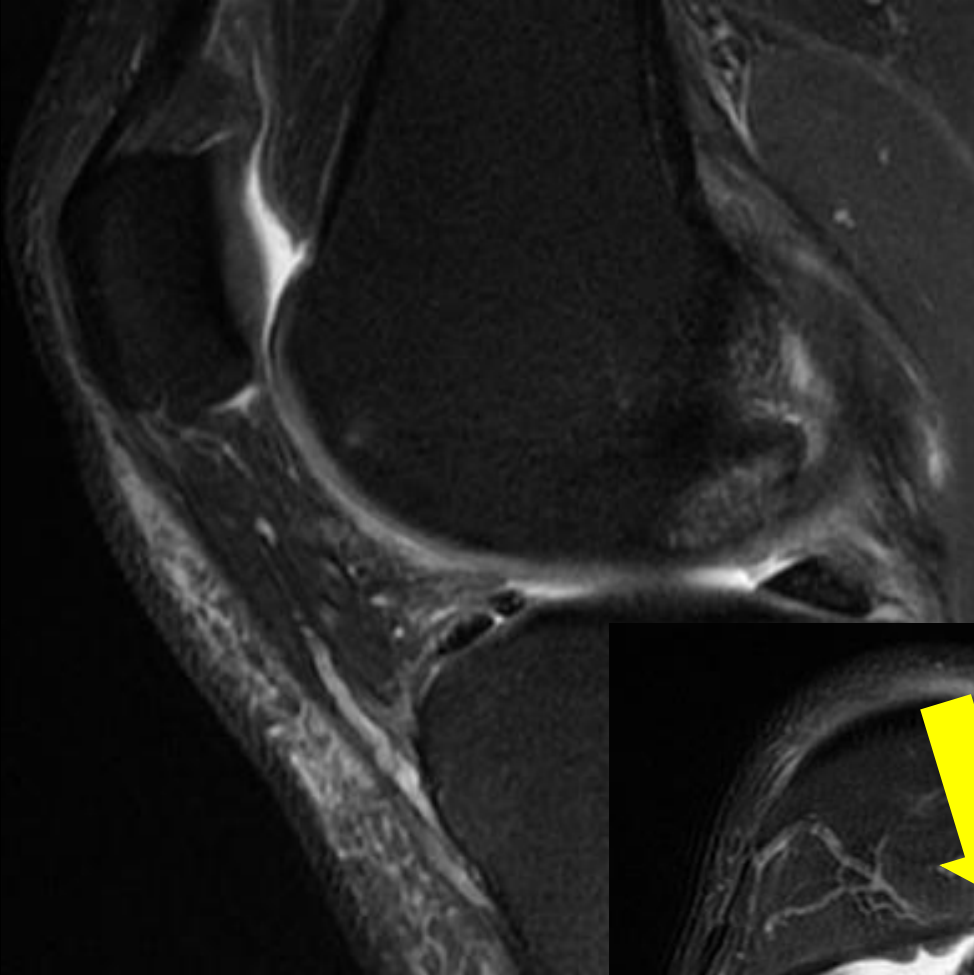


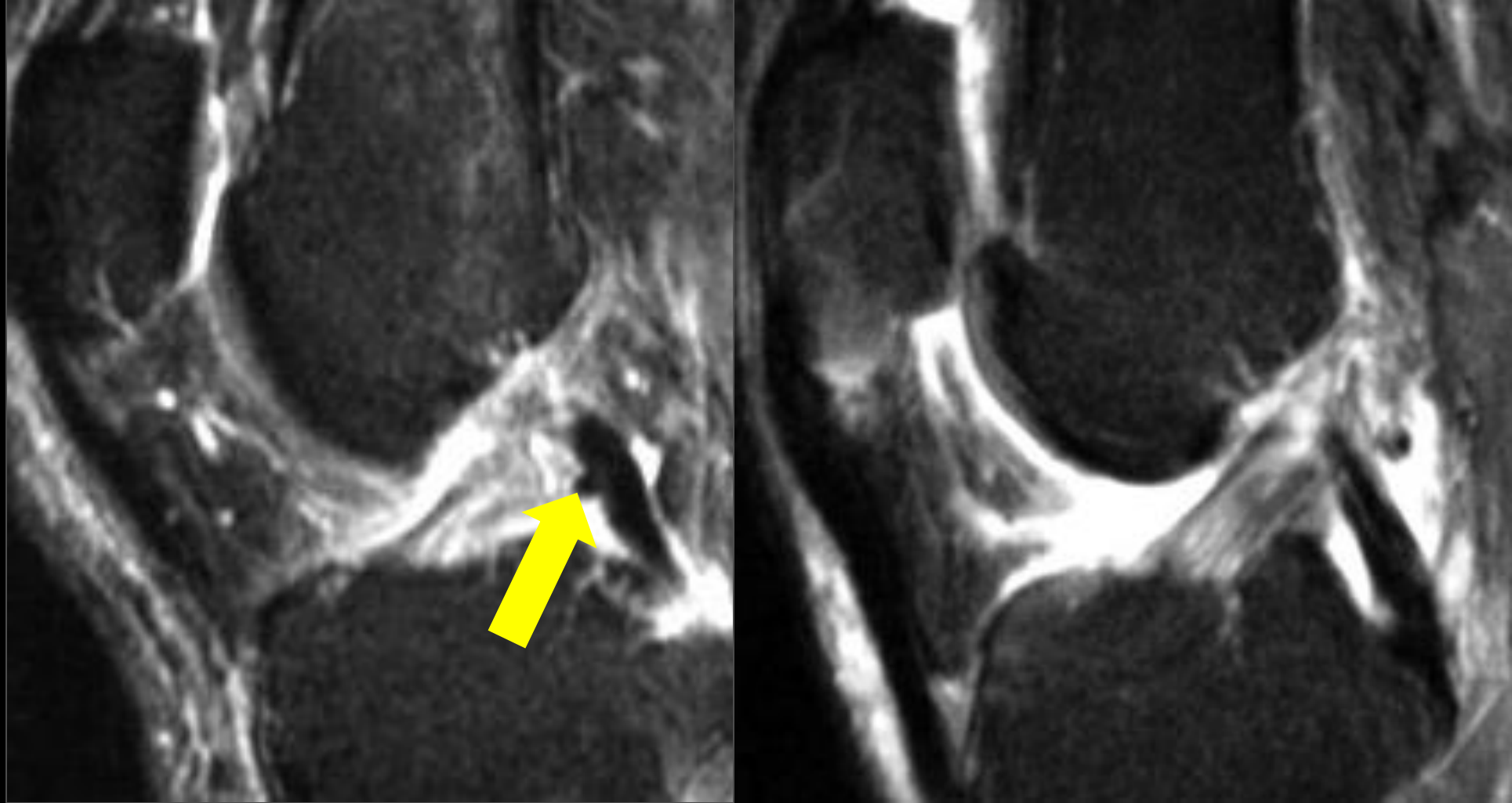




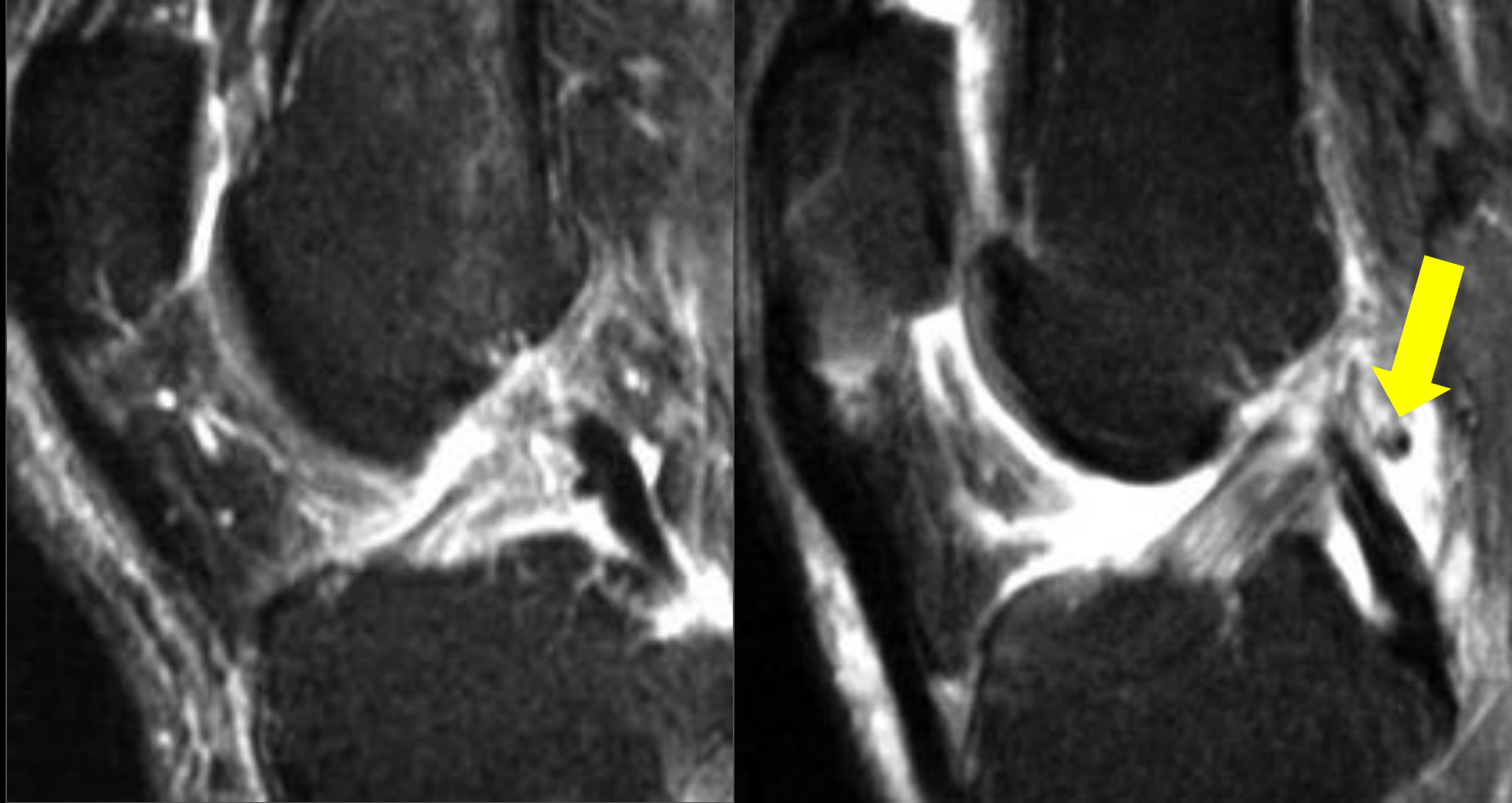




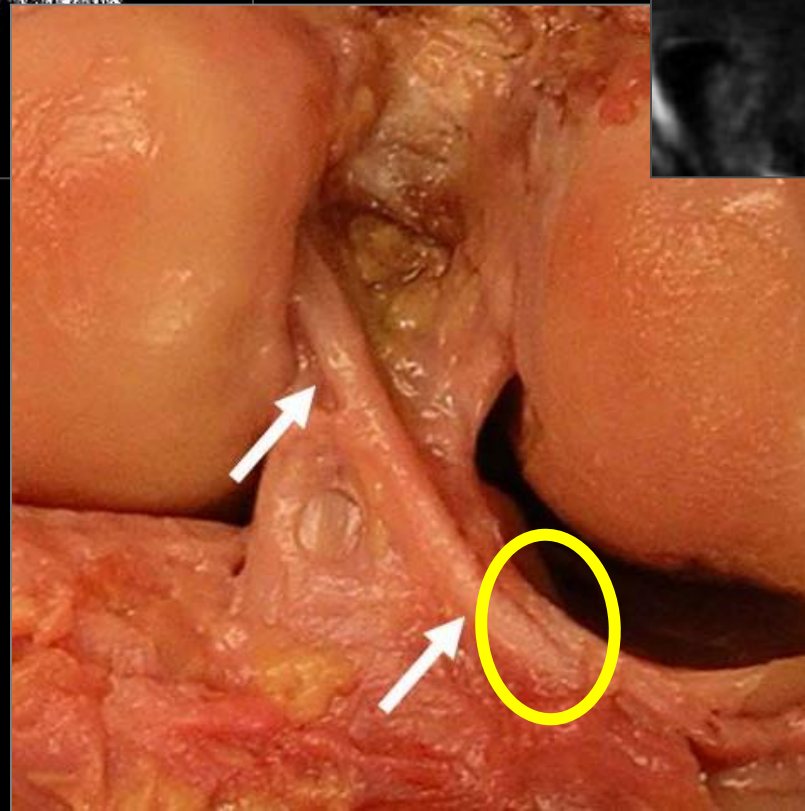
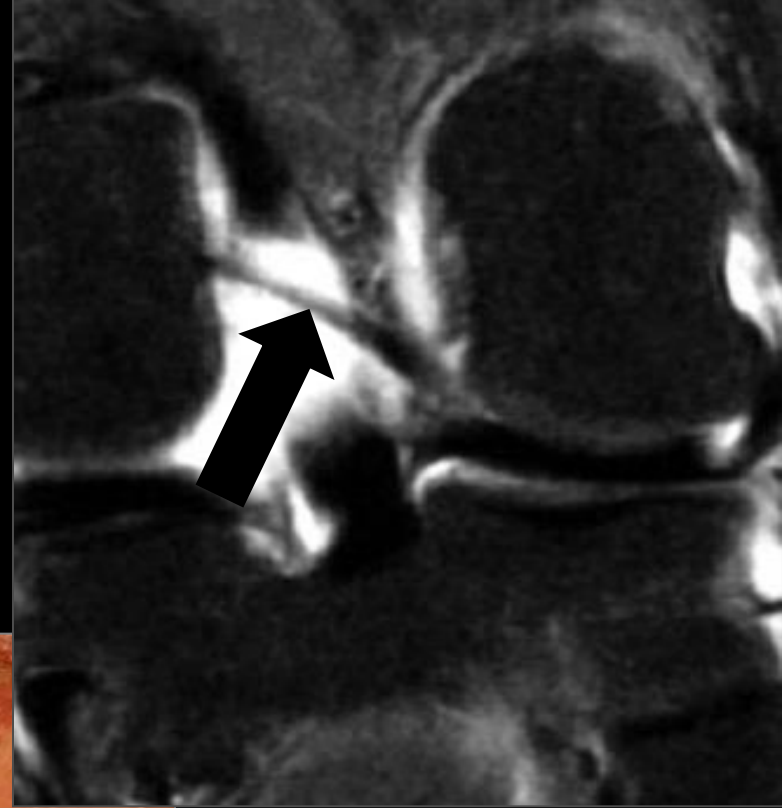
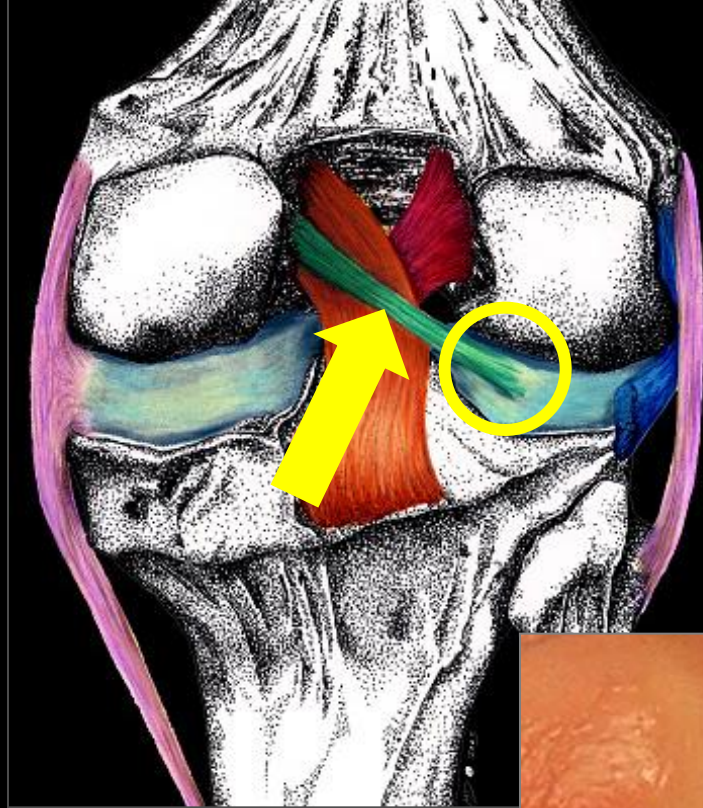




MENISCOFEMORAL LIGAMENT OF HUMPHRY

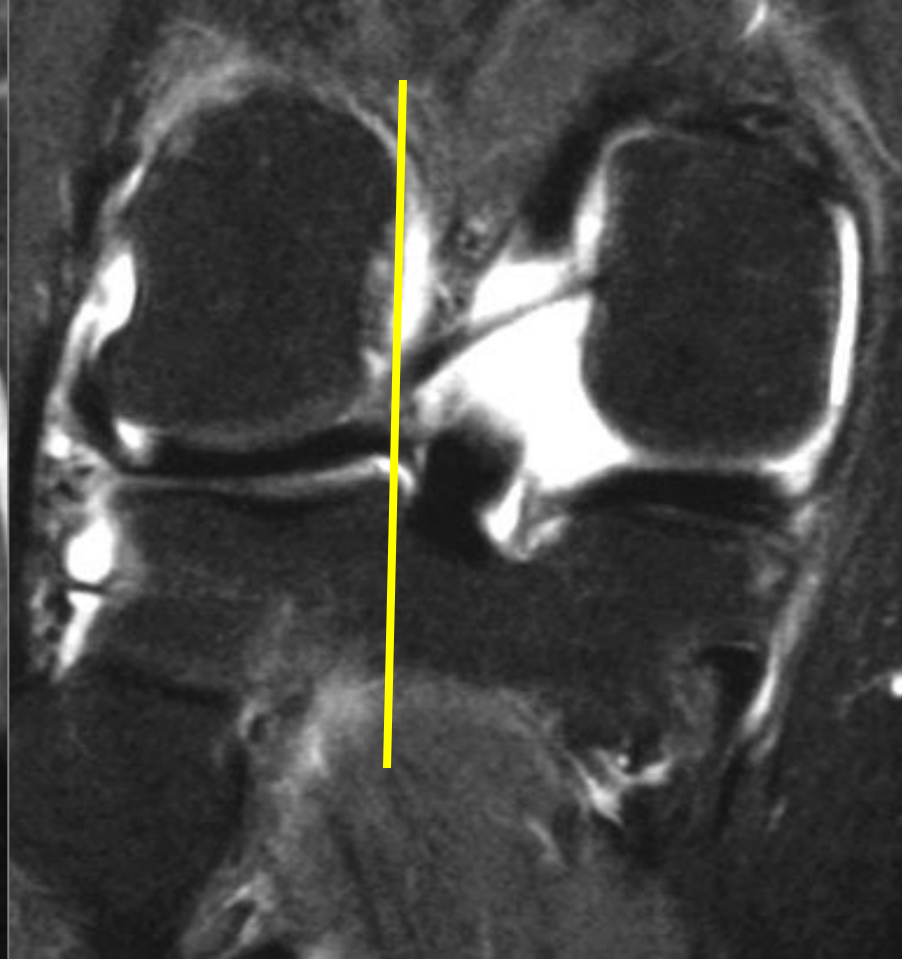


MENISCOMFEMORAL LIGAMENT OF HUMPHRY



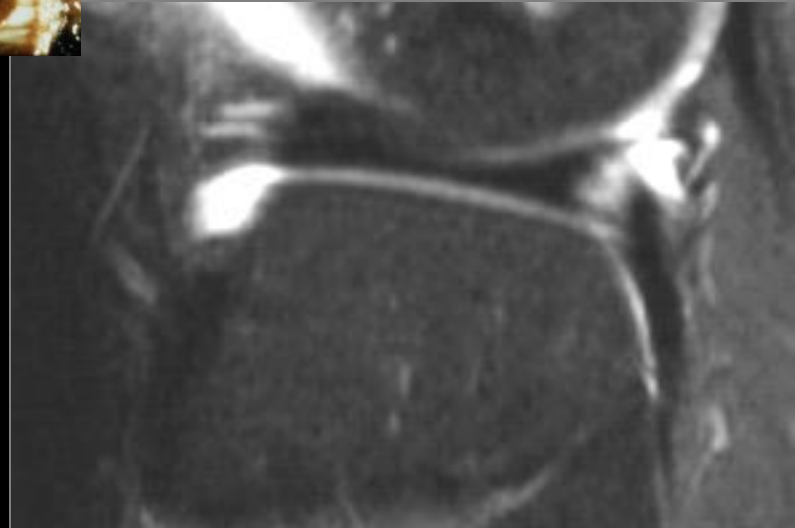
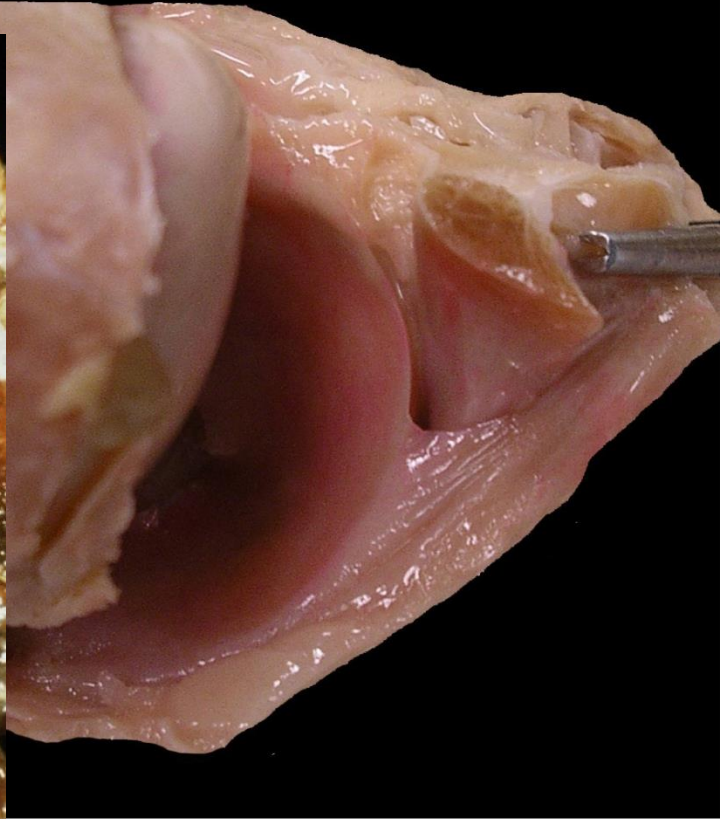
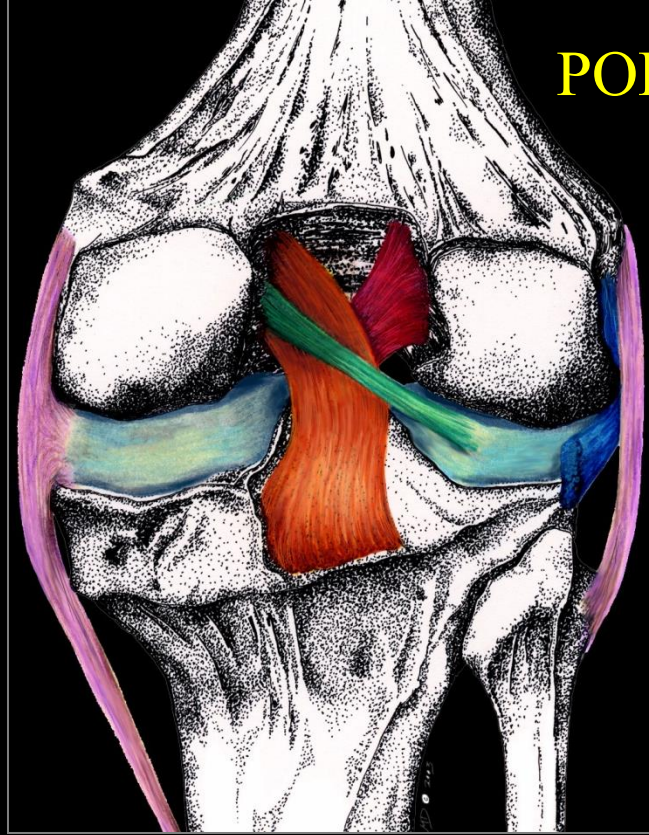


At least one meniscomfemoral ligament present
in 89% of dissections and 93% on MR

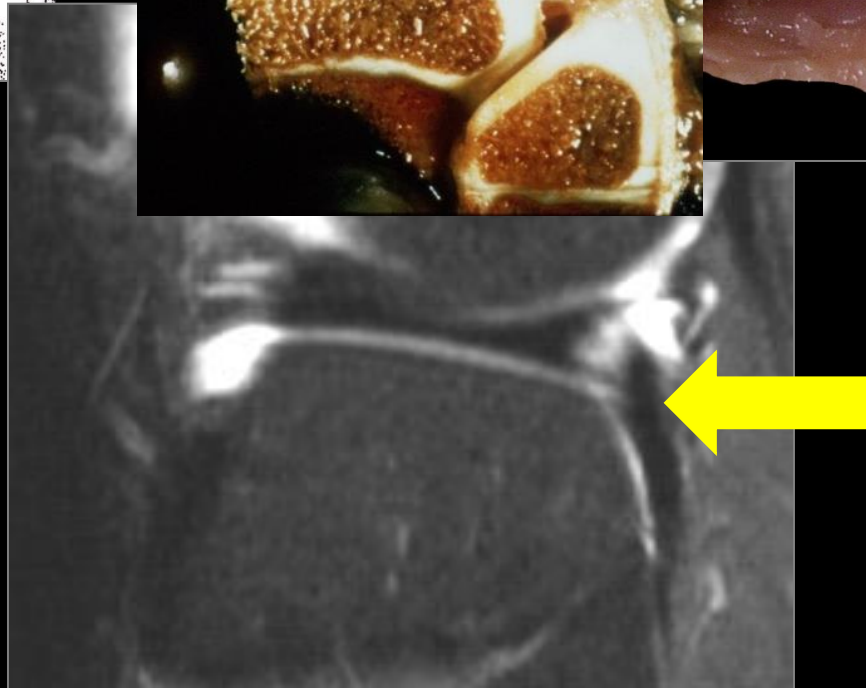
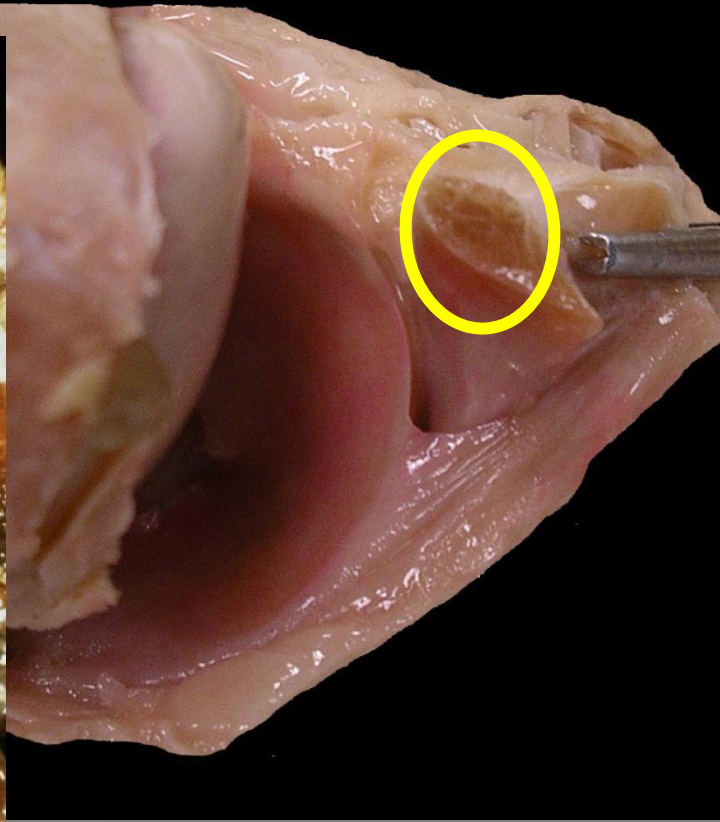
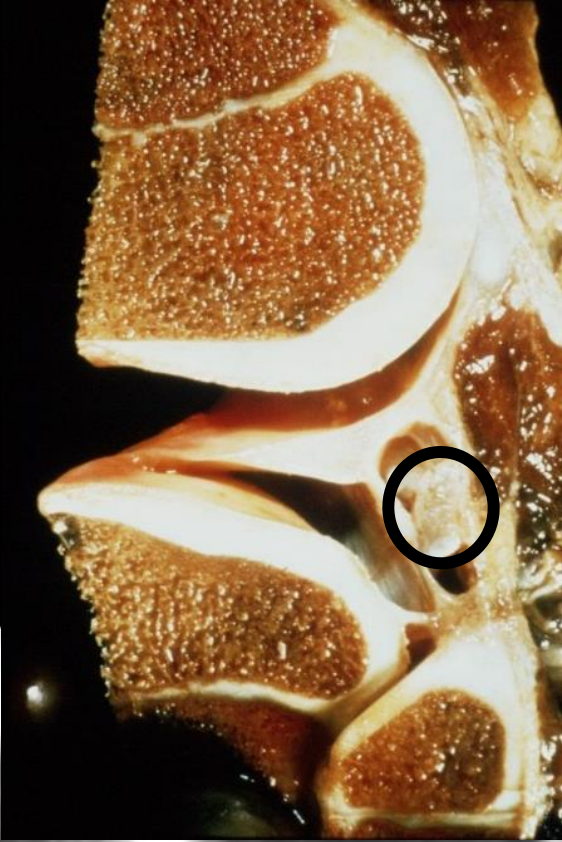
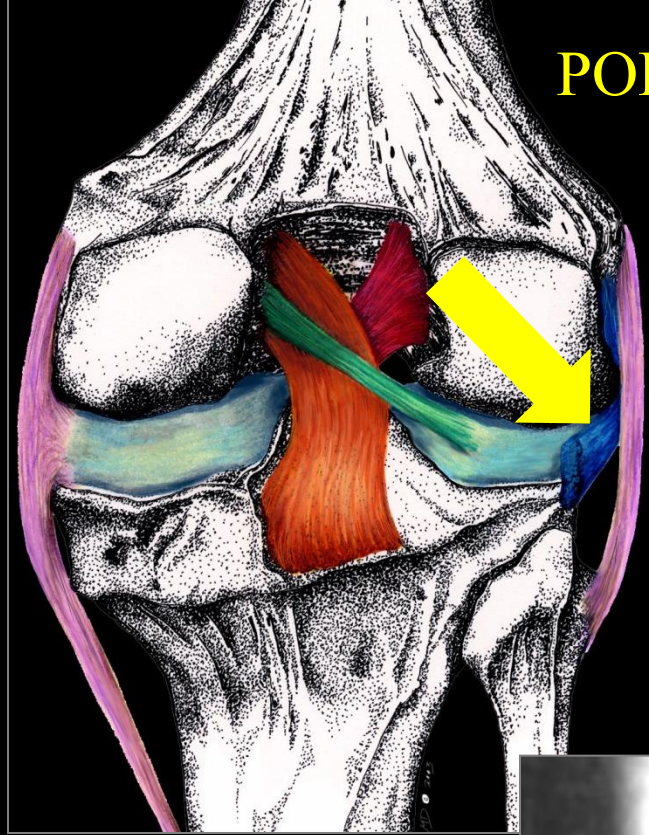




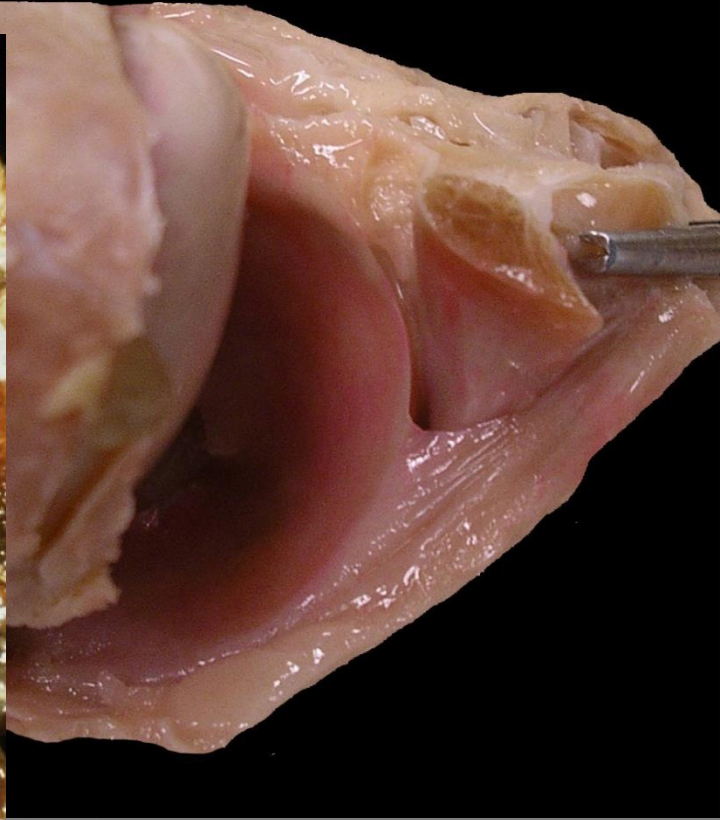
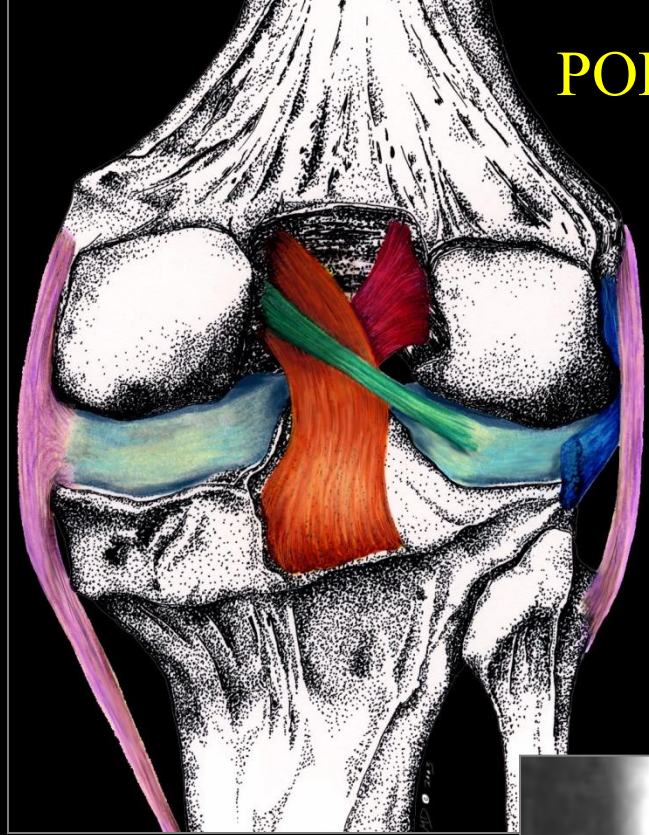
POPLITEUS TENDON

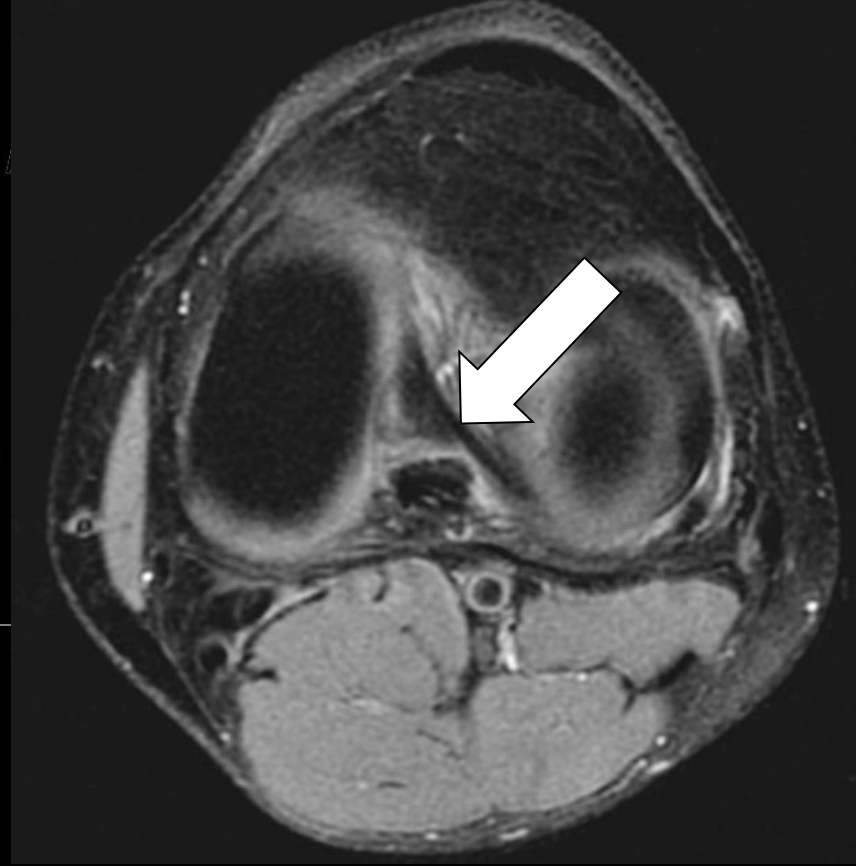


POPLITEUS TENDON



POPLITEUS TENDON

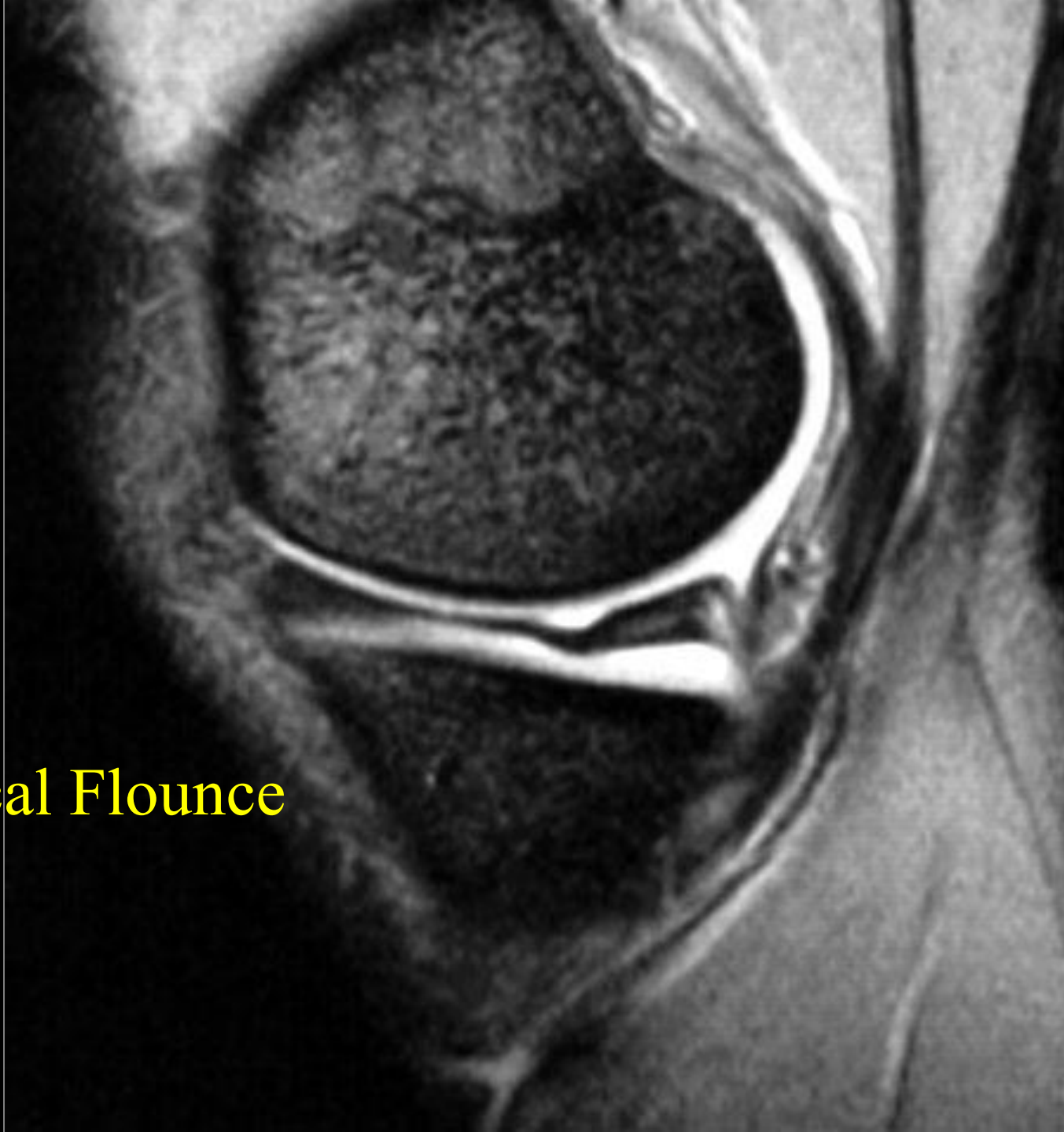


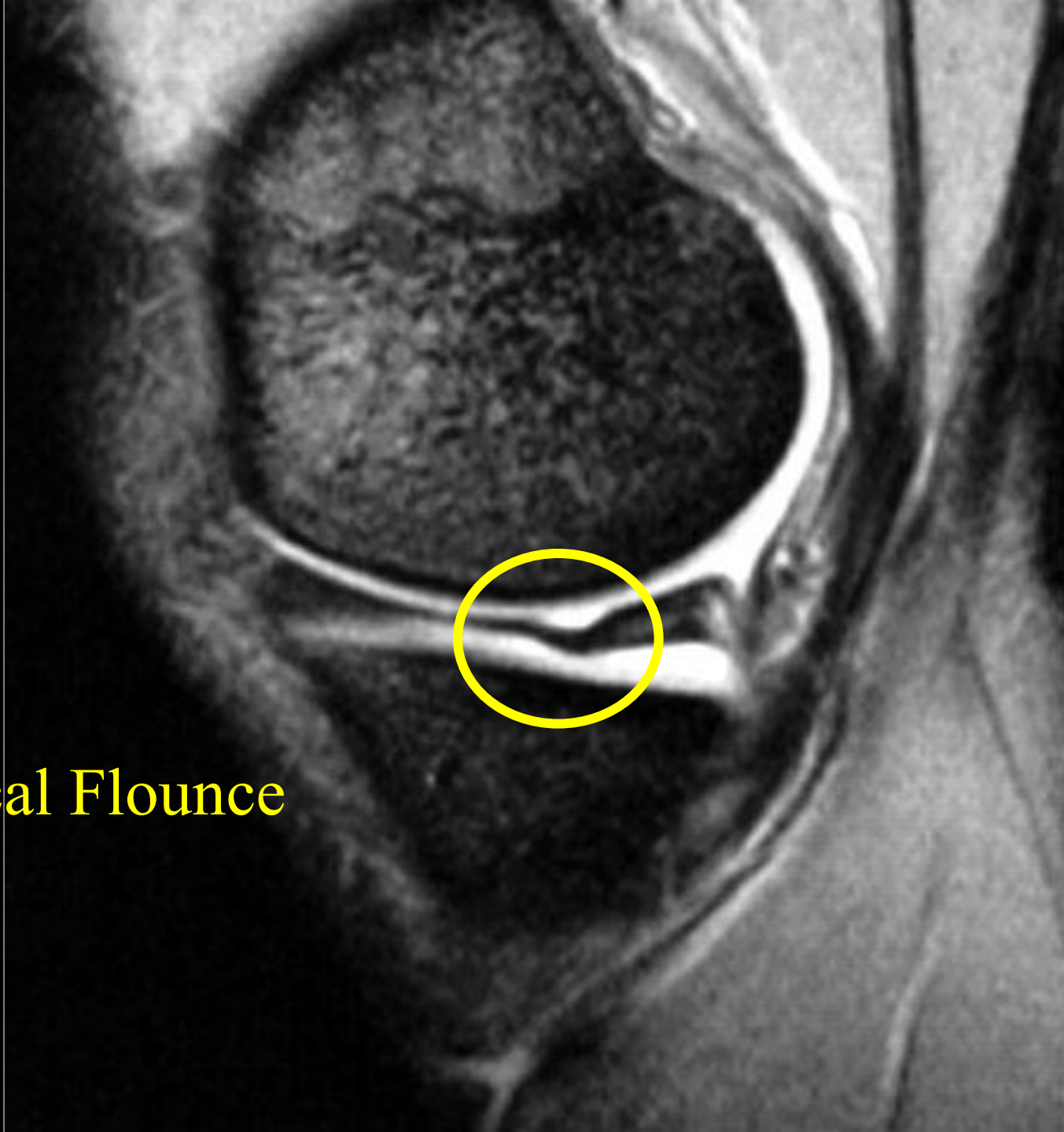


**Oblique menisco-meniscal ligament
(1%-4% of cases)**

Sanders, Radiology 1999

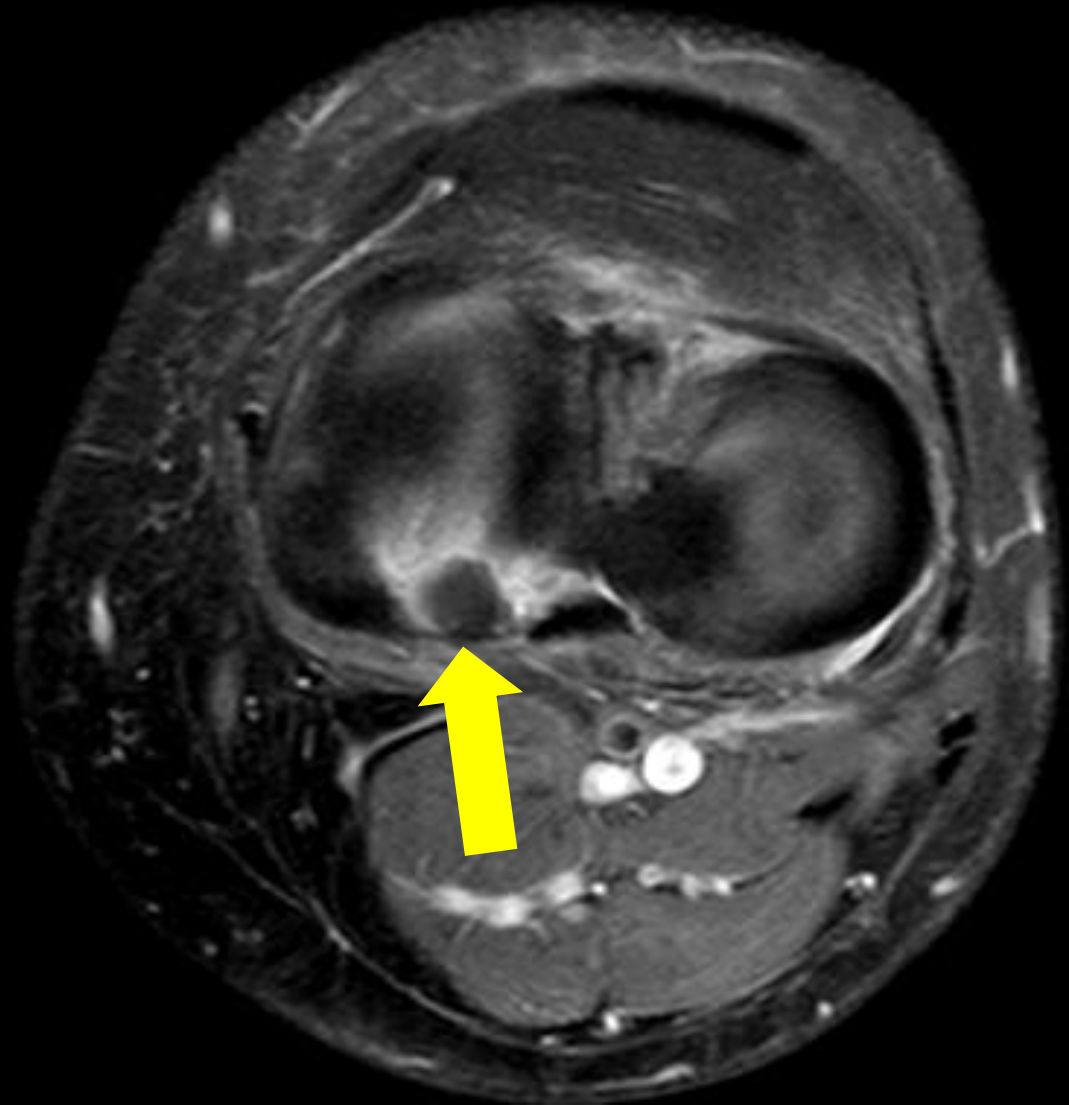
Meniscal Flounce

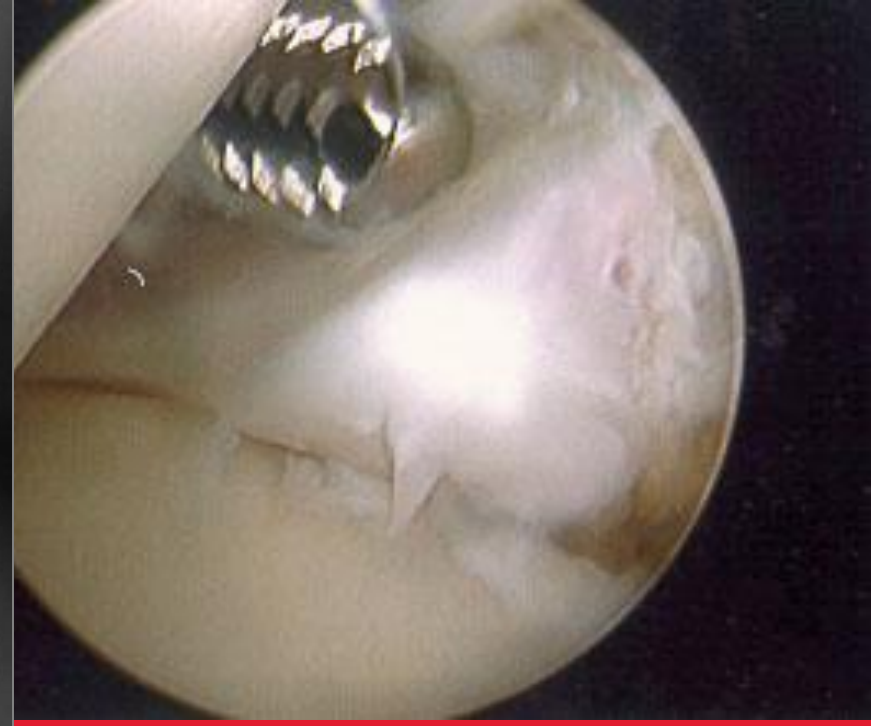




Meniscal Flounce

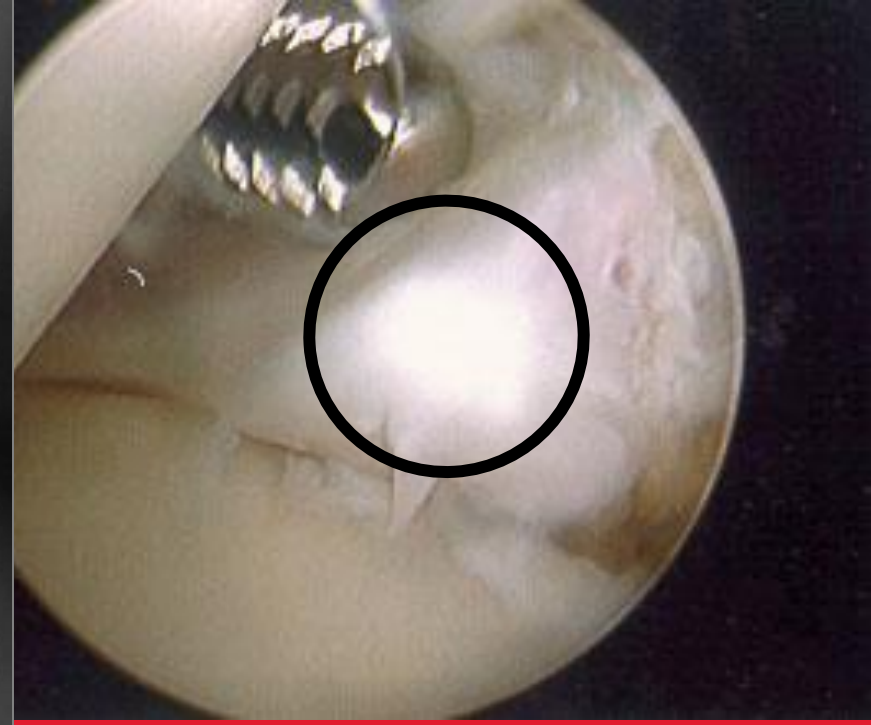
MENISCAL OSSICLE





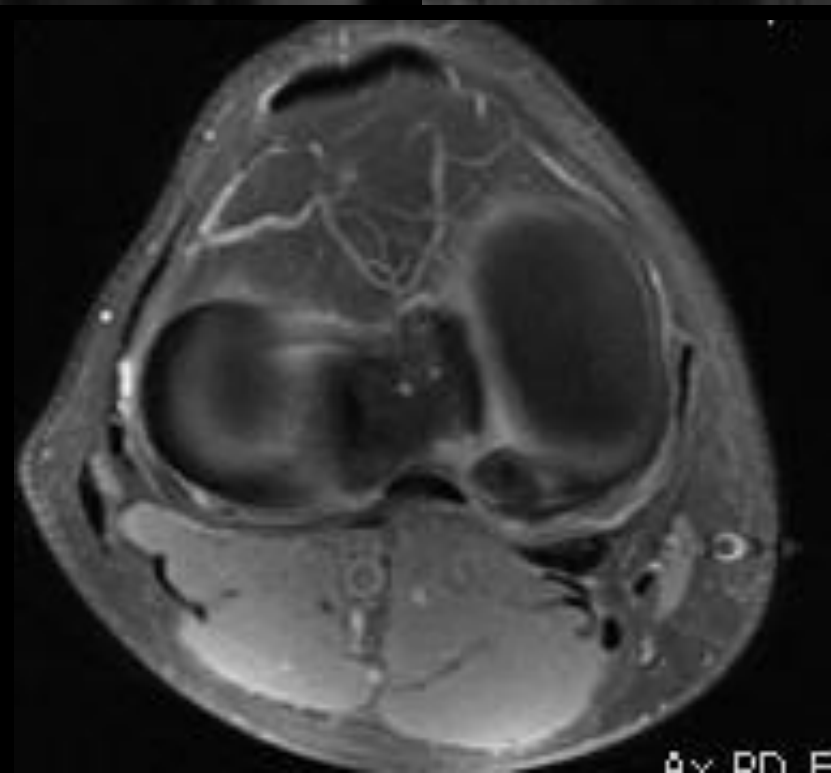
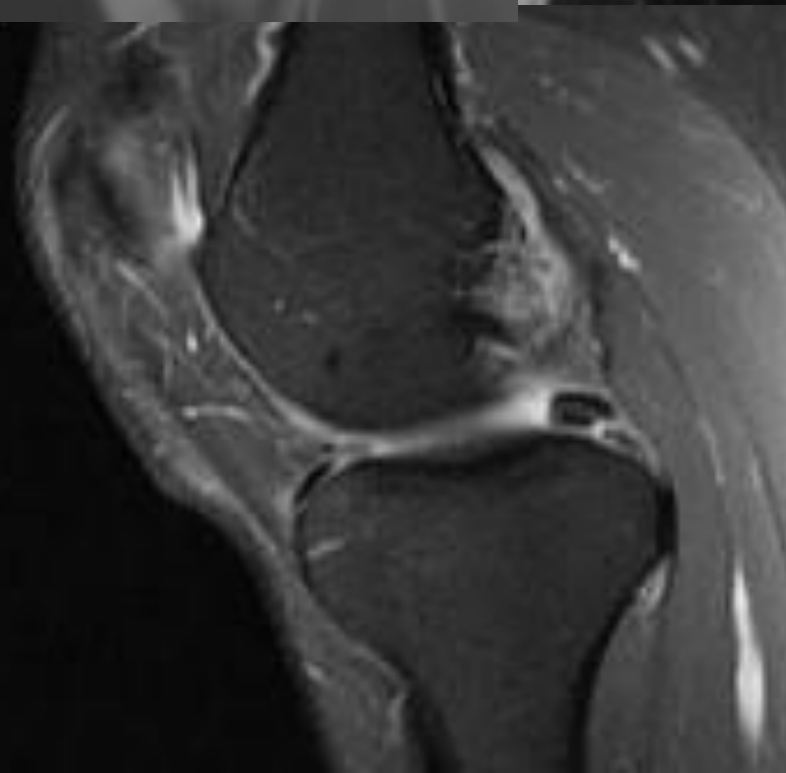
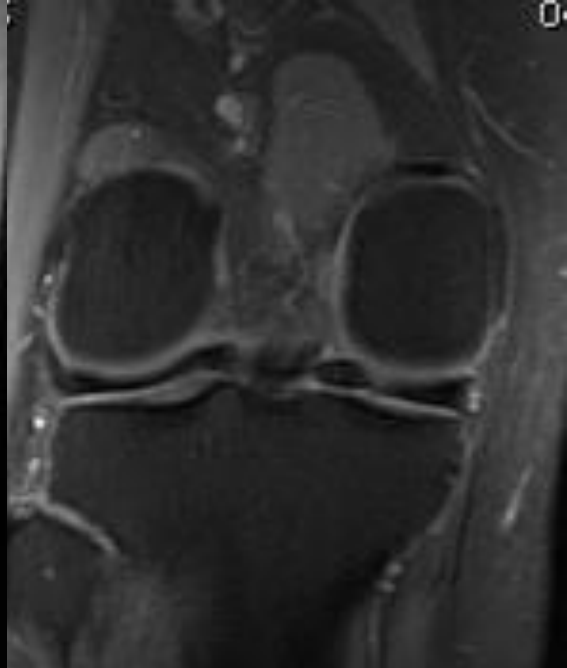
MENISCAL OSSICLE

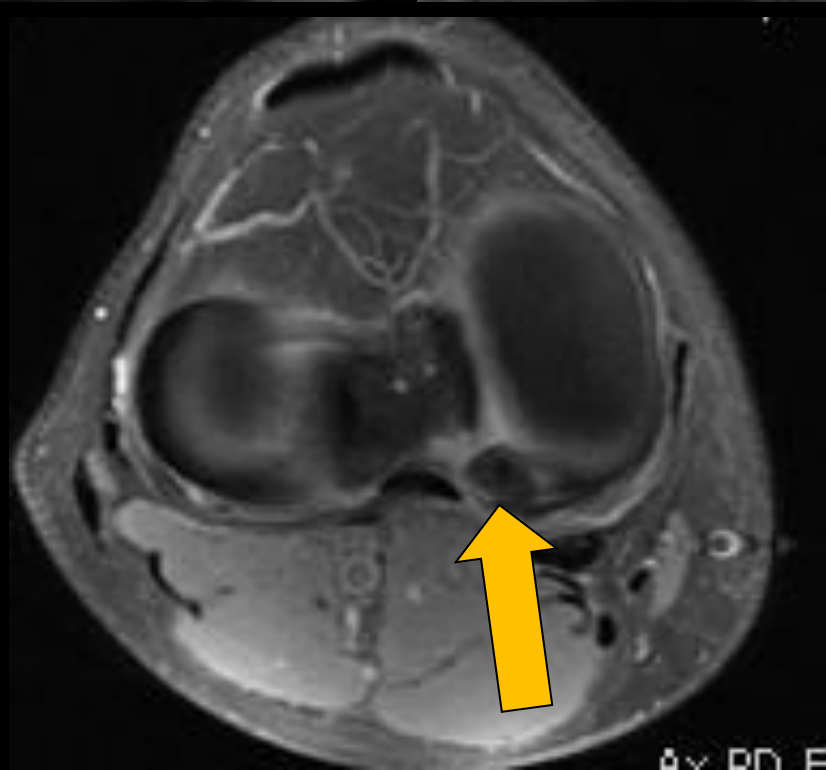
Probably due to previous tear and heterotopic
bone formation (AJR 2014 November)



MENISCAL OSSICLE

Probably due to previous tear and heterotopic
bone formation (AJR 2014 November)

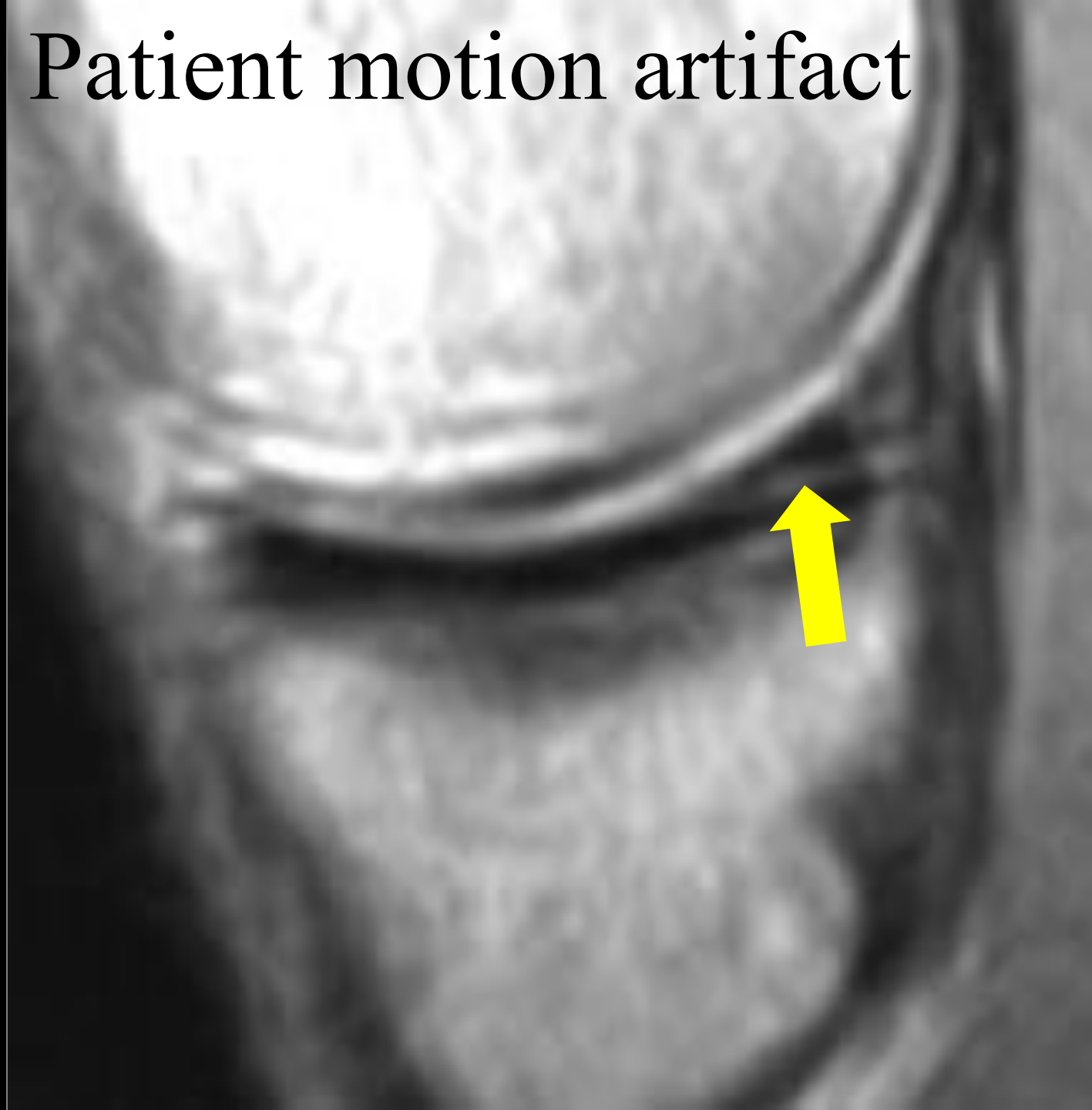








Patient motion artifact



MENISCAL TEARS

PITFALLS: FALSE NEGATIVES

- Lateral meniscus
 - ACL tear
 - Posterior horn and body
- Small tears
 - Contrast
- Opposed edges
- Arthroscopic “gold standard” (really yellow)

SURGICAL IMPLICATIONS

- Correlation between amount of meniscal tissue removed and forces transmitted to articular cartilage
- Primary goal to preserve as much meniscal tissue as possible

SURGICAL IMPLICATIONS

MENISCAL TEAR CHARACTERISTICS

- Stable or Unstable?
 - Displaced fragment
 - Complex tear/Radial tear
 - Horizontal tear >10mm in length
 - Longitudinal tear >10 mm in length
 - Fluid signal in tear on T2 images
- Associated chondral defect
 - Surgery less likely to result in long term pain relief

SURGICAL IMPLICATIONS MENISCAL TEAR CHARACTERISTICS

- Repairable
 - Longitudinal >10 mm
 - Peripheral third
 - Bucket handle
- Not repairable
 - Radial and horizontal tear
 - Complex body tears
 - Tears in central 2/3rd
 - Stable tear

WHAT THE SURGEON WANTS TO KNOW: RADIOLOGY REPORT

- Know the normal anatomy
- Identify abnormal meniscus
 - Abnormal signal touching free edge or morphology
 - Two slice touch rule definite tear; one slice possible tear
 - Use all sequences and planes
- Identify tear location
 - Anterior, body or posterior horn

WHAT THE SURGEON WANTS TO KNOW: RADIOLOGY REPORT

- Characterize the type of meniscal tear
 - Horizontal/oblique, vertical/longitudinal, radial, displaced fragments, complex
 - Use all sequences and planes
 - Associated abnormalities (chondral lesions)
- Stable versus unstable tears
- Repairable versus not repairable

MR IMAGING OF THE MENISCI

Mark D. Murphey MD, FACR

Physician-in-Chief, Chief, Musculoskeletal Imaging AIRP
Professor of Radiology Uniformed Services University of the Health Sciences
Staff Radiologist Musculoskeletal Section,
Walter Reed National Military Medical Center, Bethesda, Maryland

SPECIAL THANK YOU

- Mark Anderson MD
- Donald Flemming MD
- Mark Kransdorf MD

