Acute Knee Ligament Injuries

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Menu

Sideline Assessment of Injuries

To Make the Diagnosis:

Use observation of mechanism, physical exam skills, and talk to the athlete

KNEE

Concept of Rotatory Instability, Not Cruciate-Deficient Knee

Dr. Jack Hughston's legacy

- My fellowship at Hughston Clinic, Columbus Georgia, 1984
- Taught me how to listen to patients and examine knees

Hughston JC, Andrews JR, Cross MJ, Moschi A: Classification of knee ligament instabilities Part 1. The medial compartment and cruciate ligaments. Part 2: The lateral compartment. J Bone Joint Surg Am 1976;58:173-179.

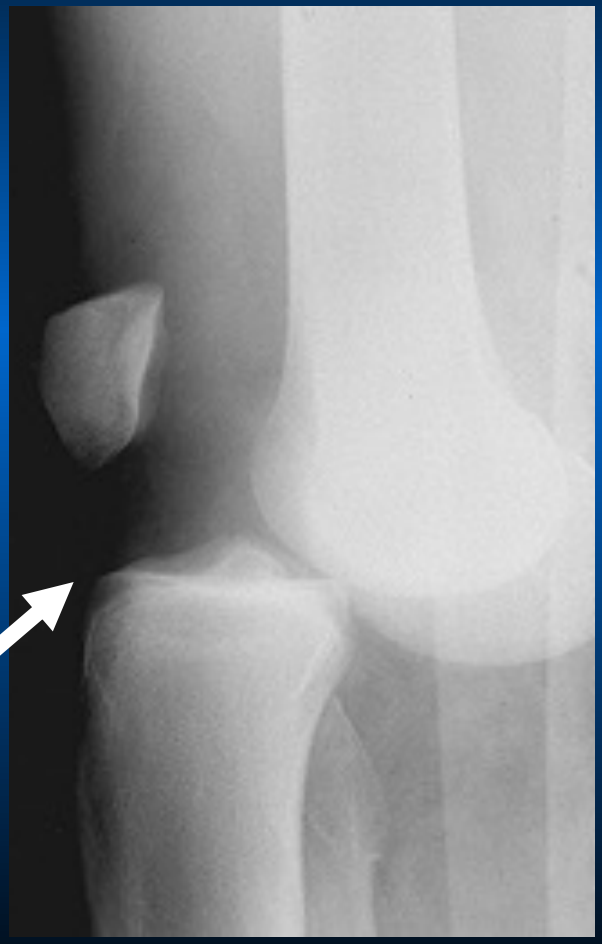
Instabilities

- Anteromedial rotatory instabilities (AMRI)
- Combined AMRI and ALRI
- Anterolateral rotatory instabilities (ALRI)
- Straight posterior
- Posterolateral rotatory instabilities (PLRI)
- Combined ALRI and PLRI
- Straight instabilities

Hughston JC, Andrews JR, Cross MJ, Moschi A. Classification of knee ligament instabilities. Part I. The medial compartment and cruciate ligaments. J Bone Joint Surg 1976;58A:I59-172, 173- 179.

Acute Knee Dislocations

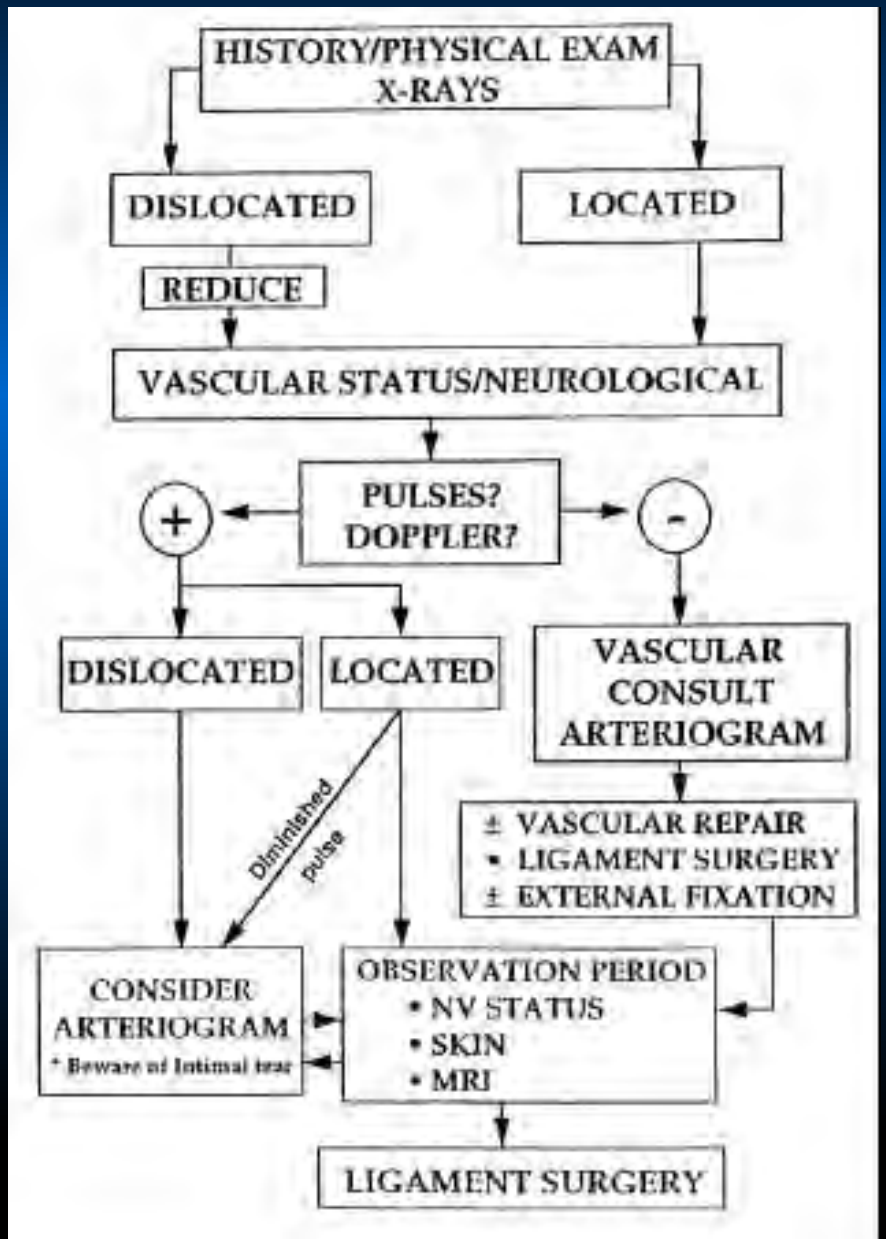
- Uncommon, but . . .
  May be underdiagnosed
- If knee opens to varus/valgus stress testing in extension, assume a knee dislocation
- Direction of dislocation
  - Anterior: hyperextension mechanism
  - Posterior: direct blow anterior proximal tibia



Knee Dislocations

- Most knee dislocations reduce spontaneously
- Refer to center with vascular surgeon
- Communicate with ER
  - Use your cell phone to call the ER
  - Put a note on the patient
  - Transfer to facility with angiography suite and vascular surgeon on call
- If high suspicion, do arteriogram

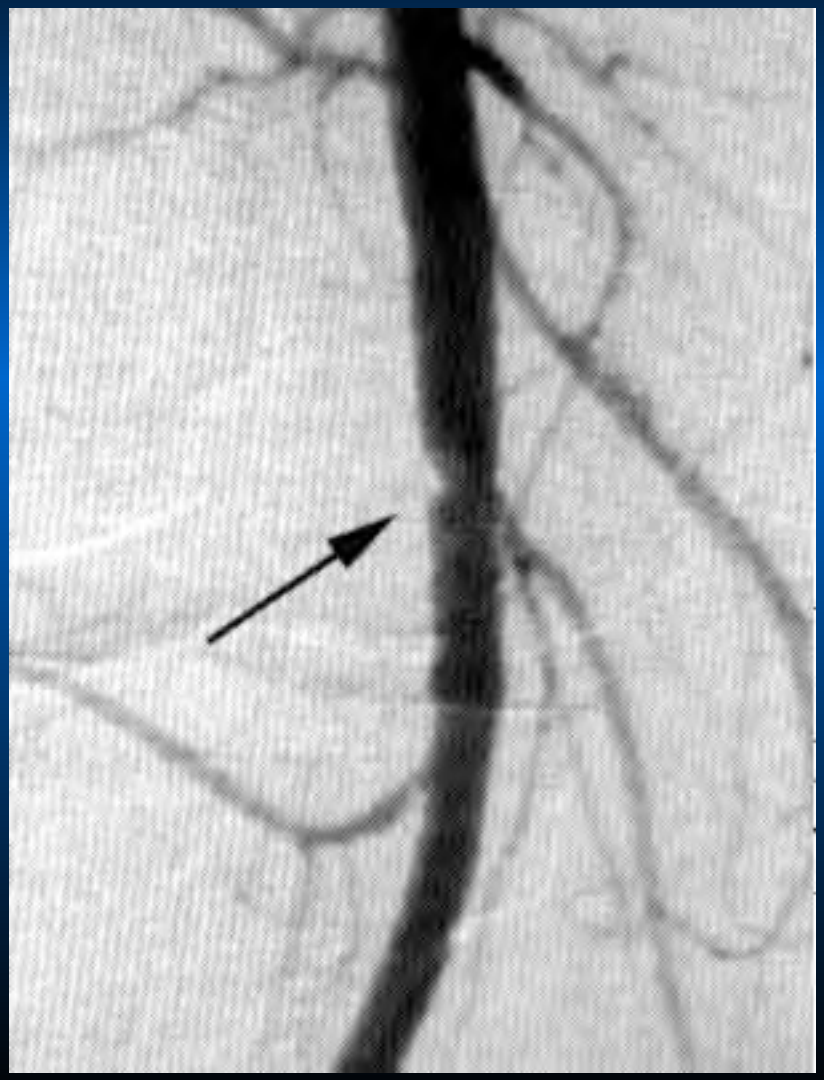
Knee Dislocation Algorithm



Algorithm for treatment of the Multiple Ligament Injured Knee, from Harner, CD, "Complex Knee Injuries including dislocation: Preoperative planning, evaluation and pitfalls," AAOS, Phoenix AZ, Feb. 3-6, 2000.

If you suspect Vascular Involvement...

- Transfer to Level I Trauma Center
- More likely to be Sued for Vascular Complications than Musculoskeletal Diagnoses



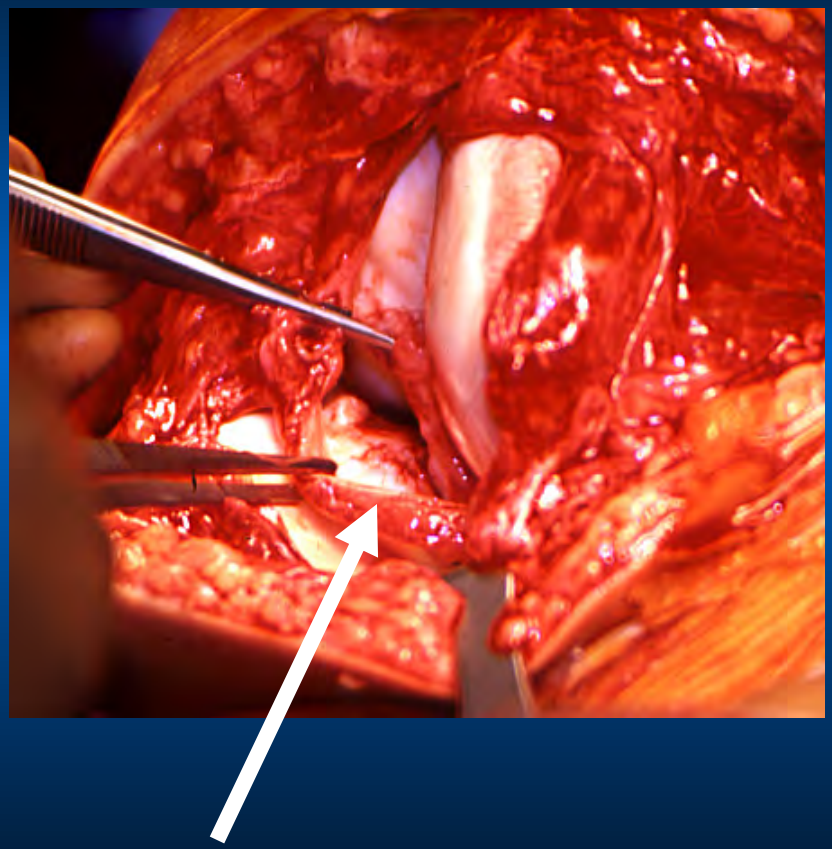

Knee Unstable in Extension. . .

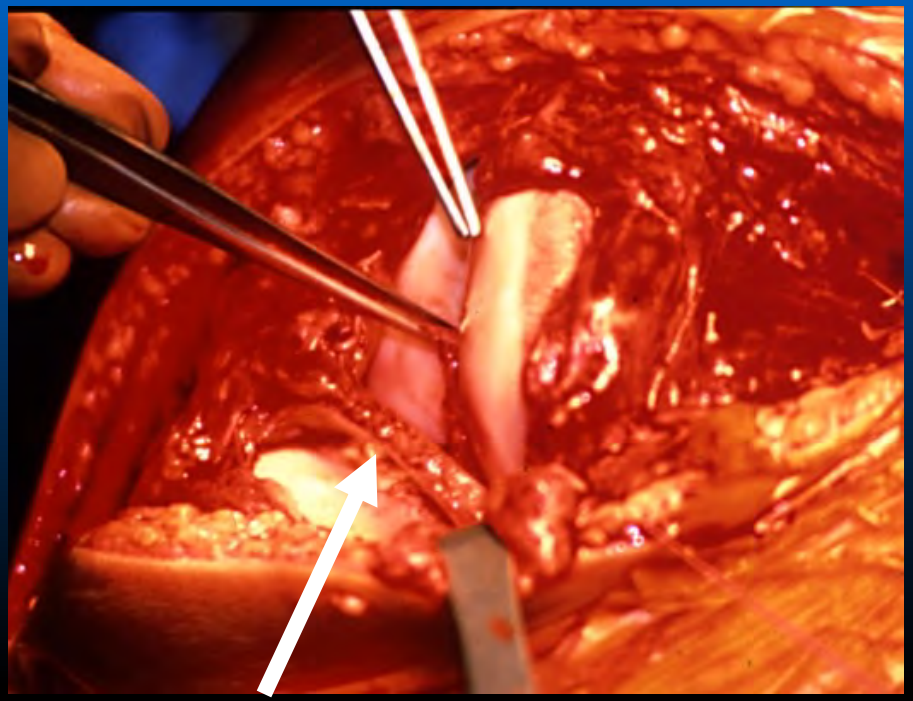

Dislocated Knee or Patella

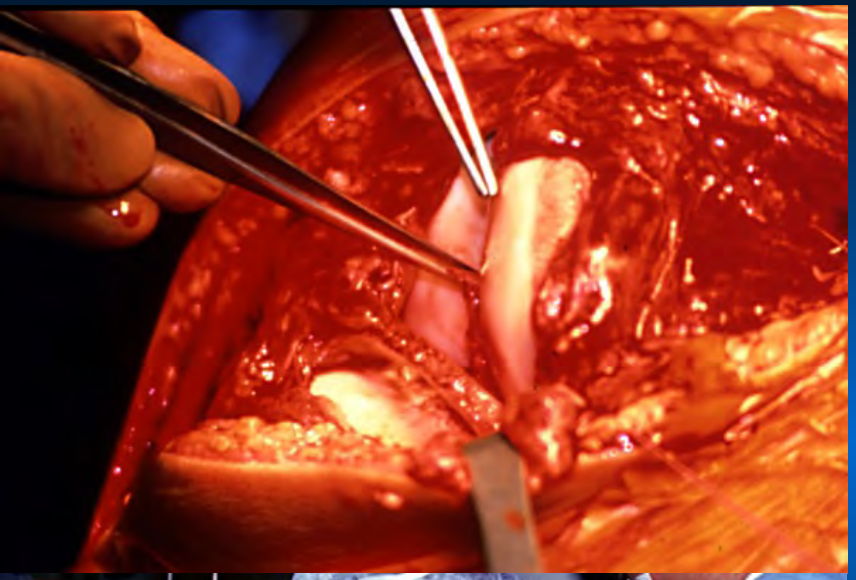
Knee dislocation ACL/PCL/MCL tears
Skin only stabilizing medial side of the knee

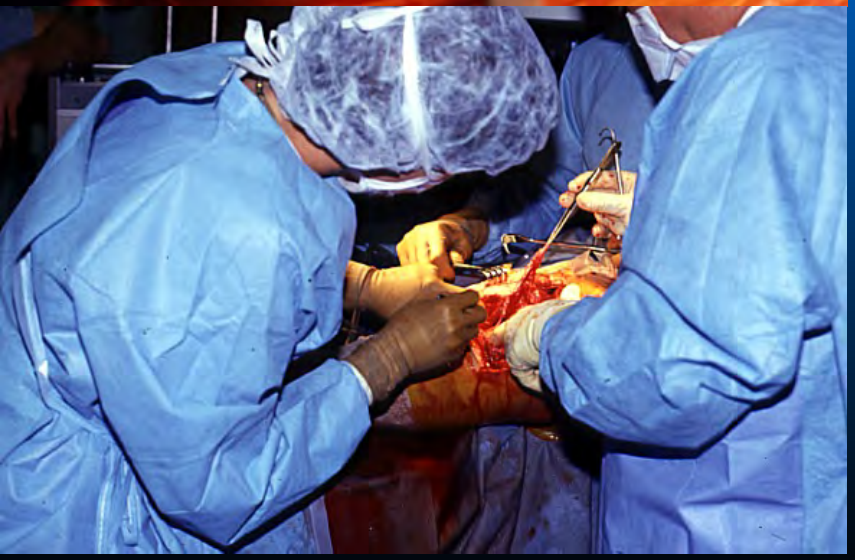
Combined instabilities:
AMRI, ALRI, Straight posterior

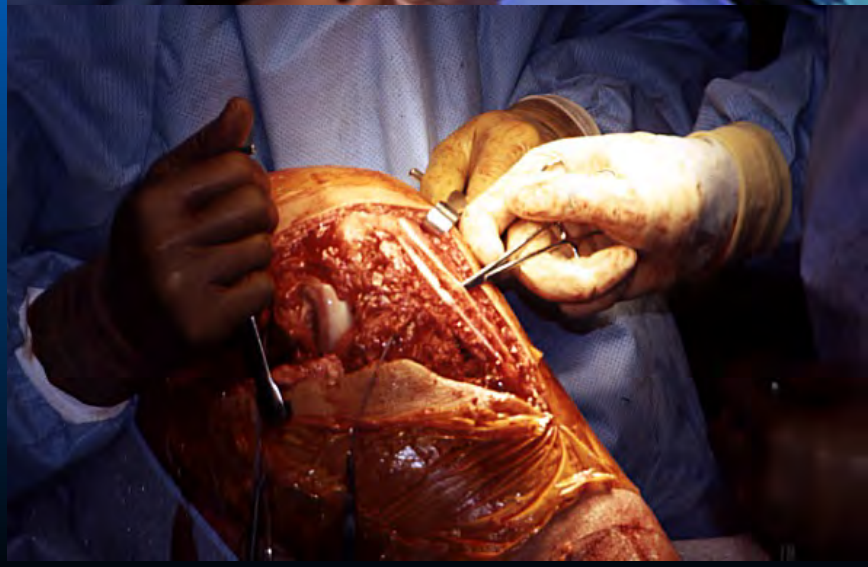
Medial Meniscus











PCL

- Mechanism
  - Low velocity – sports blow to anterior tibia, foot plantarflexed
- Exam
  - Grades I-II-III based on relation to medial femoral condyle
- Assess collateral ligaments
  - Most commonly posterolateral instability
  - Greater tibial external rotation
- Acute reconstruction
  - Knee dislocation
  - Grade III collateral ligament injuries

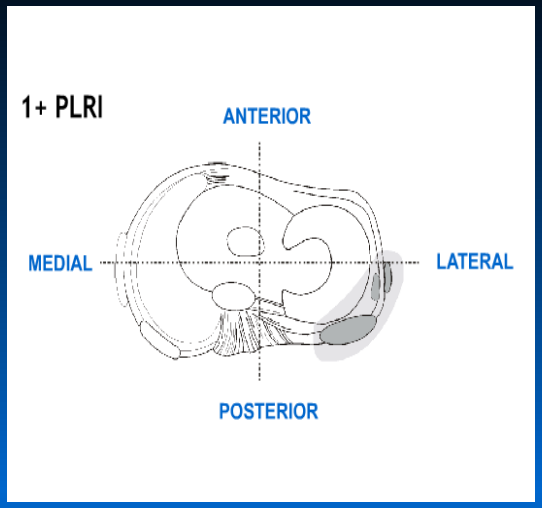
PCL – 22 YO Offensive Lineman

Straight posterior instability

Normal Knee Exam: PCL Exam

Knee Instabilities

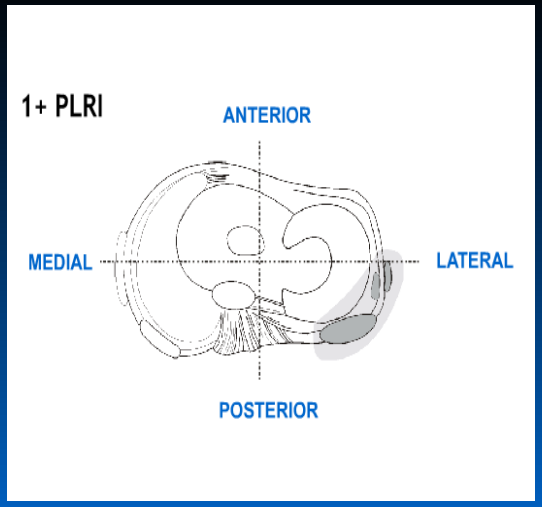
PLRI

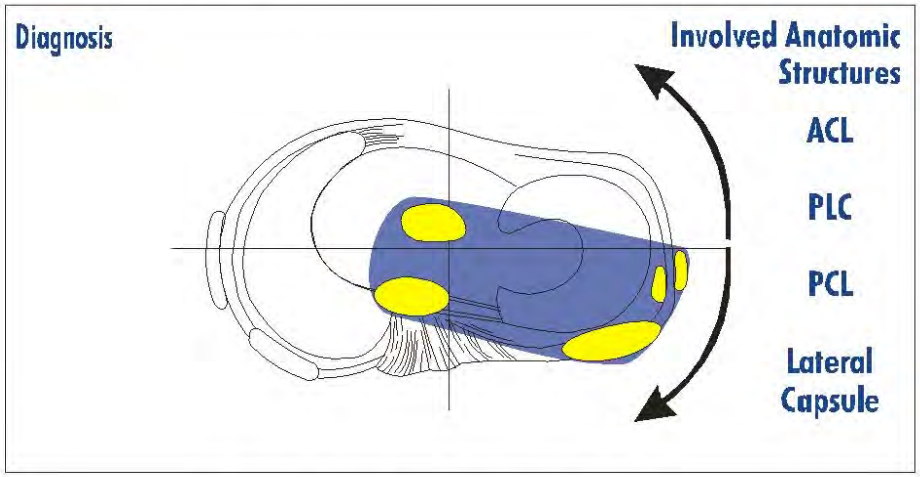


Soccer

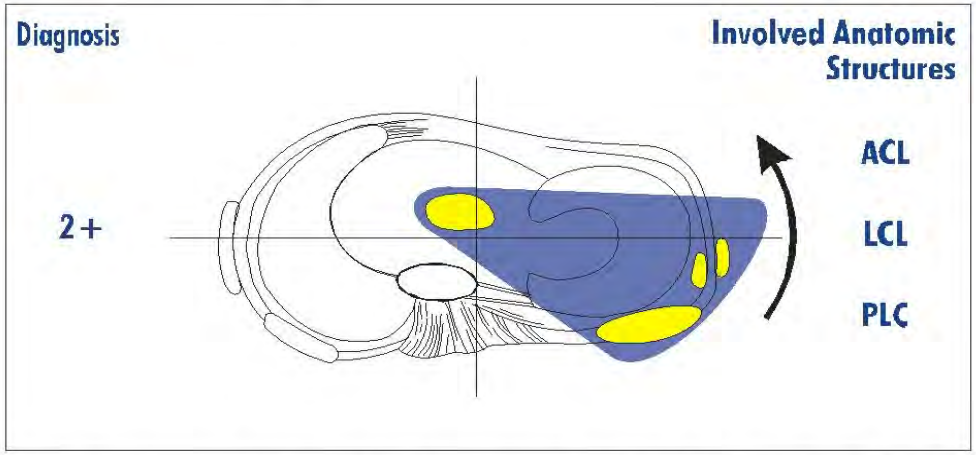
Knee Instabilities

PLRI





Combined ALRI and PLRI

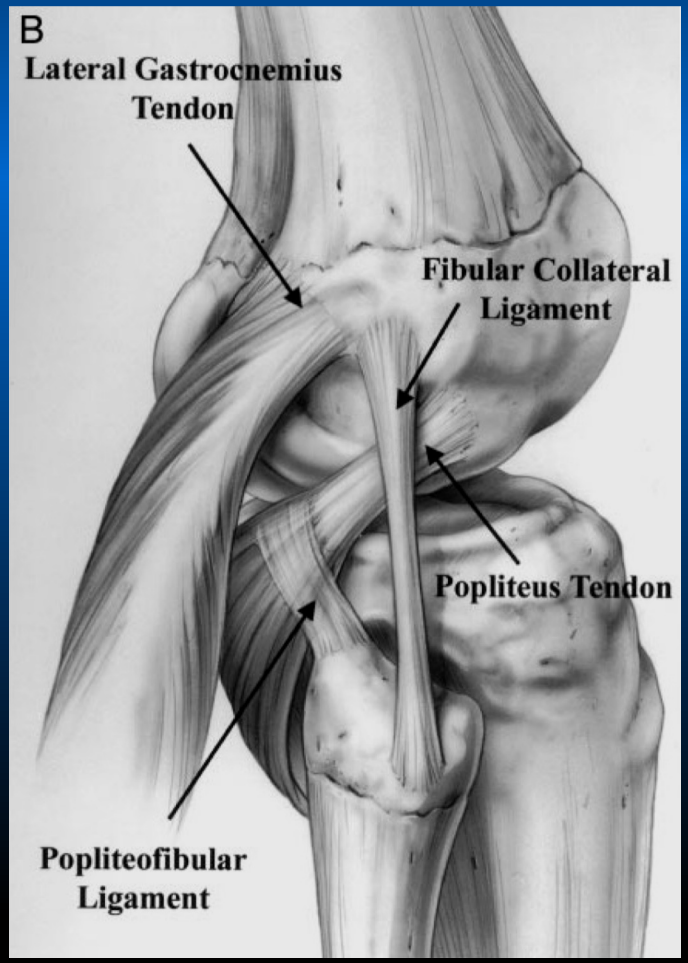


Antero-Lateral Rotatory Instabilities (ALRI)

OKU 10: "Soft Tissue Injuries About the Knee," Kaar et. al., p. 455, Fig. 1B.

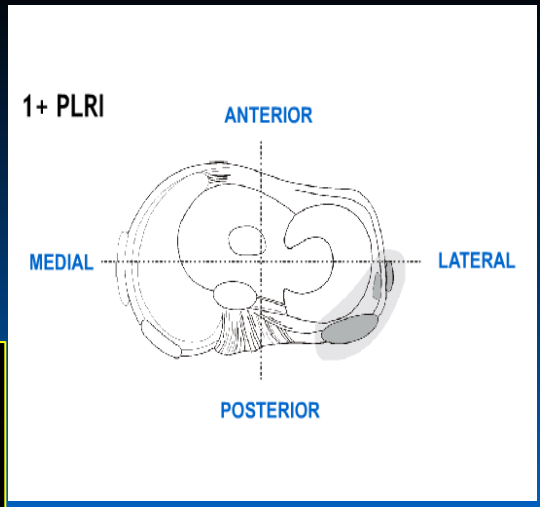
Posterolateral corner: Static stabilizers

- Fibular collateral ligament
- Popliteofibular ligament
- Posterolateral capsule
- Popliteus serves as dynamic and static stabilizer
- Popliteus femoral attachment in anterior popliteal sulcus, 2cm. anterior and distal to FCL attachment
- Upside down muscle: origin distal, insertion proximal



Knee Instabilities

PLRI

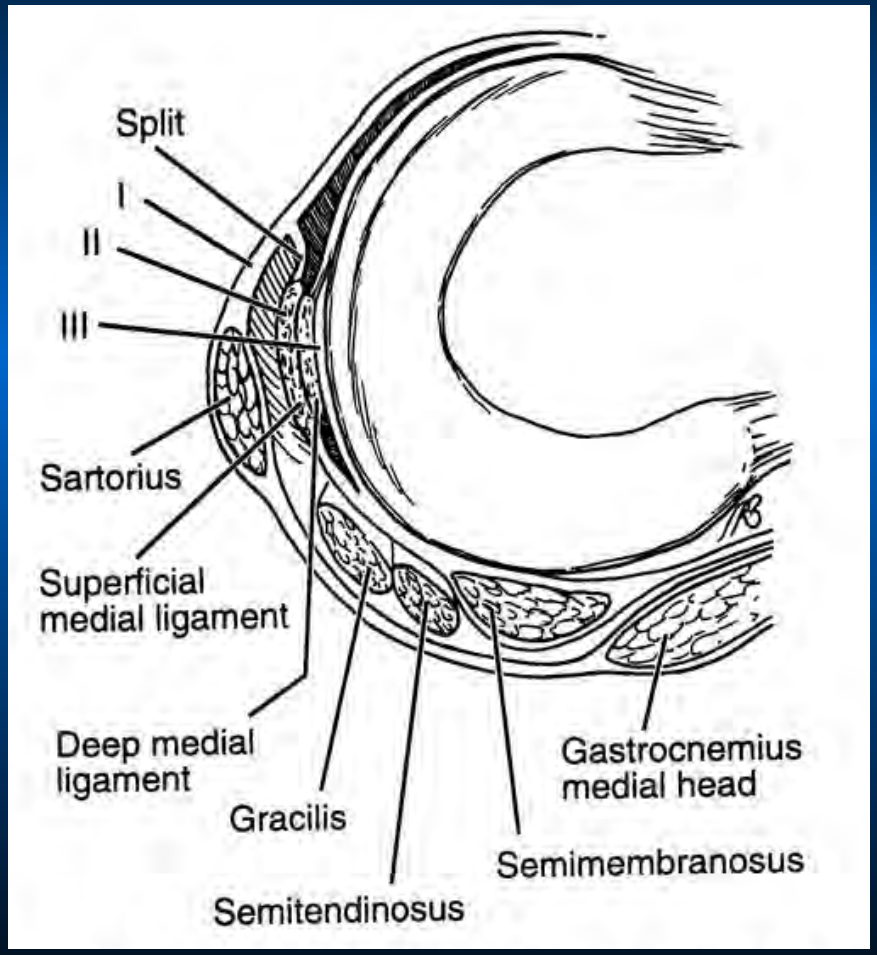


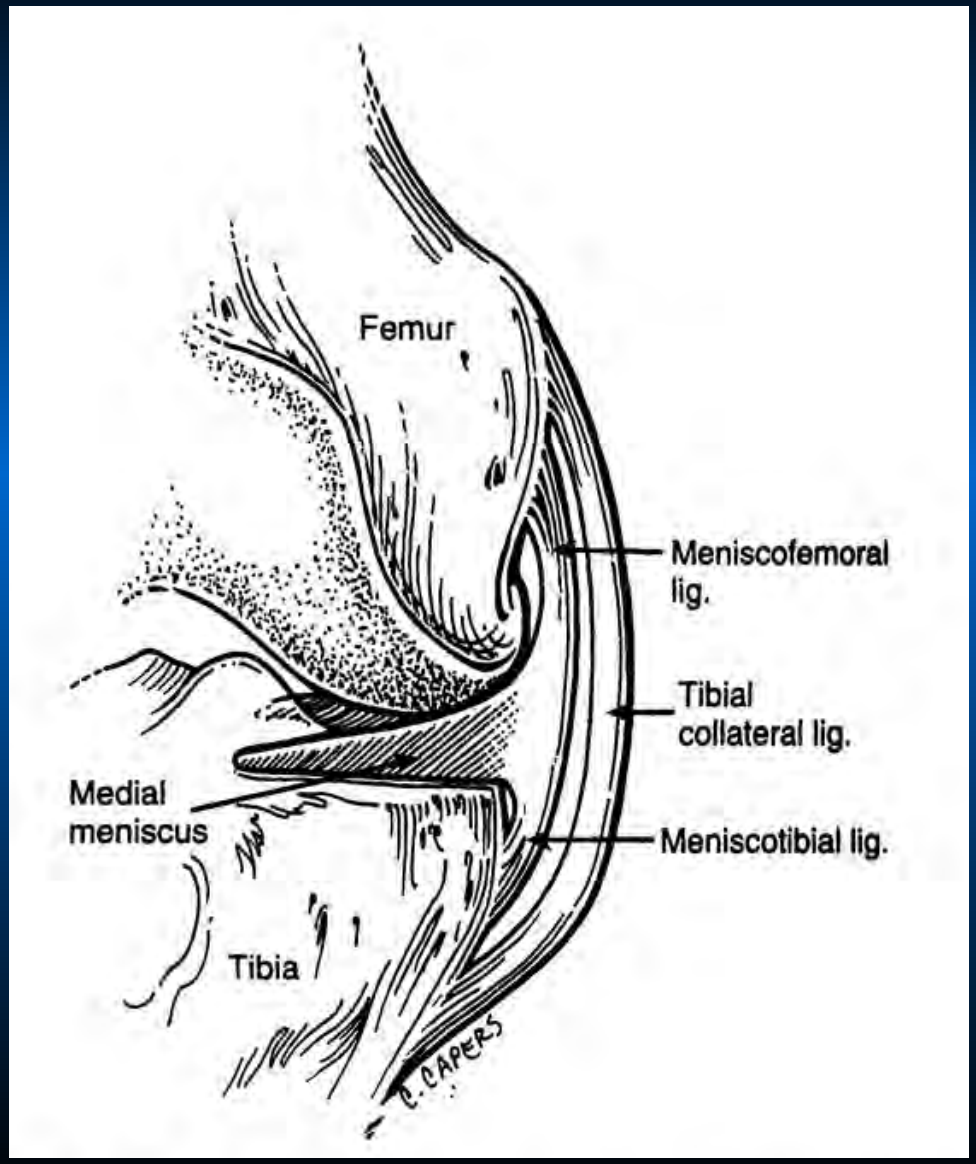
History

- 16YO white male, high school football player
- Football game, valgus twisting blow to body injury
- Unable to keep playing
- Evaluated on sideline, seen in ER
- Seen in office 3 days later


XL/90
0
7/Ef
31.2kHz
x16
/1.0sp


13
SE-XL/90
3450
82.7/Ef
1/1 31.2kHz
REM
:16x16
thk/1.0sp

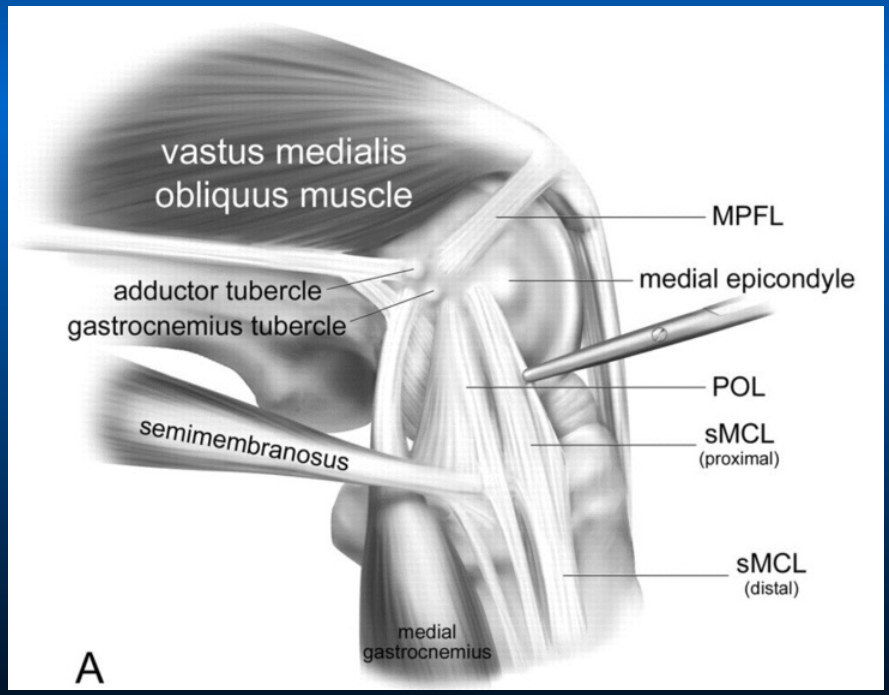

Split
I
II
III
Sartorius
Superficial medial ligament
Deep medial ligament
Gracilis
Semitendinosus
Semimembranosus
Gastrocnemius medial head


Femur
Meniscofemoral lig.
Tibial collateral lig.
Medial meniscus
Meniscotibial lig.
Tibia
C. CAPERS

OKU 10: "Soft Tissue Injuries About the Knee," Kaar et. al., p. 455. Fig. 1A.

Posteromedial corner:

- Medial collateral ligament
  - Superficial and deep layers
  - Meniscotibial and meniscofemoral ligaments
- Posterior Oblique ligament
  - Runs posterior to superficial MCL
  - Multiple bands attaching to posteromedial capsule, semimembranosus, and proximal tibia




Mag = 1.0
FL:
ROT:
ET:8
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FSE-XL/90
TR:2466
TE:35.2/Ef
EC:1/1 20.8kHz
EXTREM
FOV:16x16
4.0thk/1.0sp
20/02•23


Mag = 1.
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09:56:24 AM
Mag = 1.0
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Mag = 1.0
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Mag = 1.0
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FL:
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TREM
/:16x16


Mag = 1.0
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FRFSE-XL/90
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TE:82.2/Ef
EC:1/1 31.2kHz
EXTREM
FOV:16x16
4.5thk/1.0sp


FL:
ROT:
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P
S
R:616
E:14
C:1/1 15.6kHz
XTREM
OV:16x16
.5thk/1.0sp


Mag = 1.0
FL:
ROT:
ET:13
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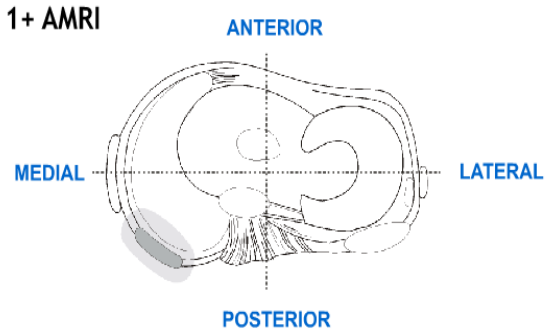
FRFSE-XL/90
TR:3266
TE:82.2/Ef
EC:1/1 31.2kHz
EXTREM
FOV:16x16
4.5thk/1.0sp

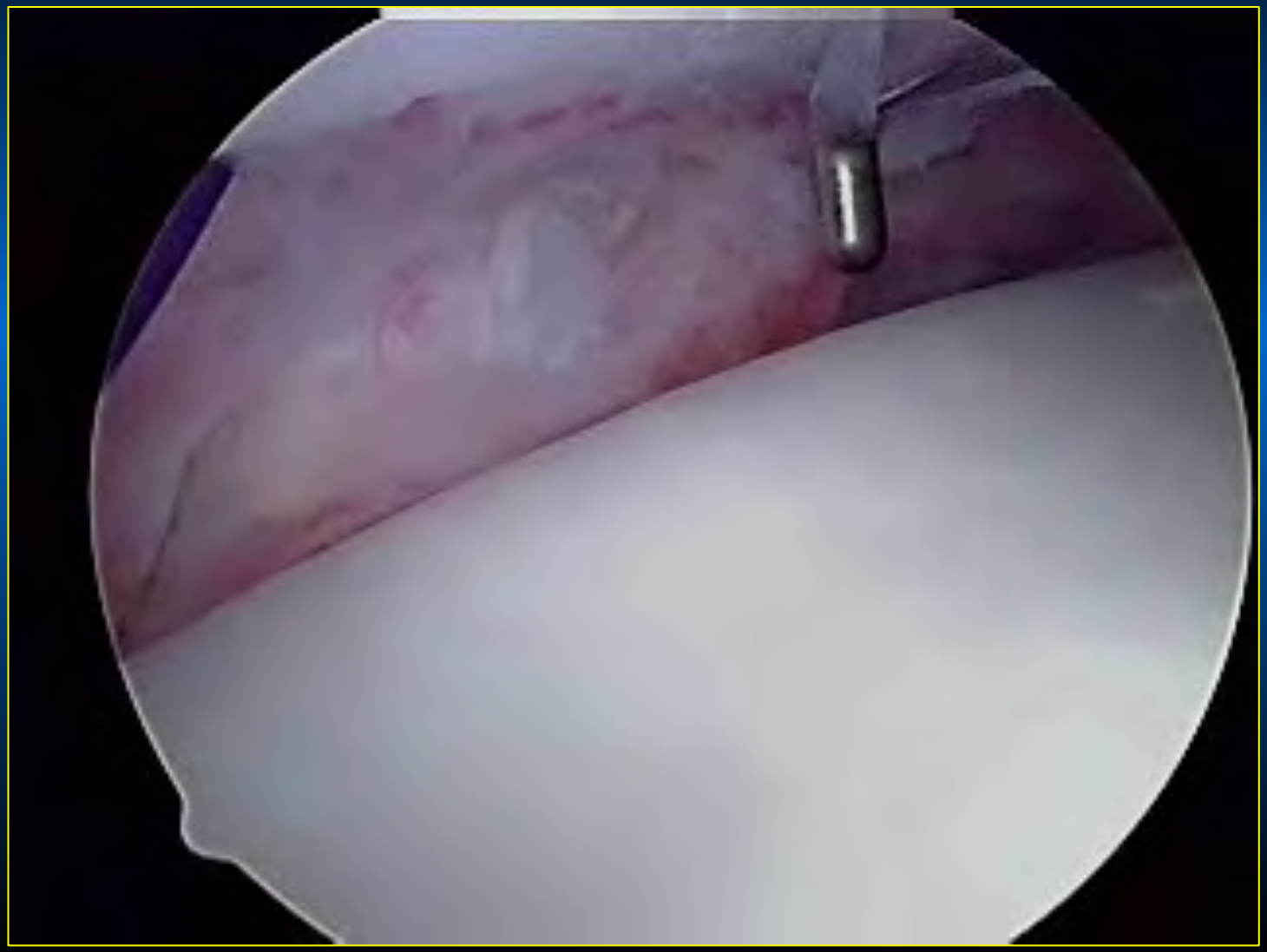
Knee Instabilities

AMRI



Surgery: Arthroscopy

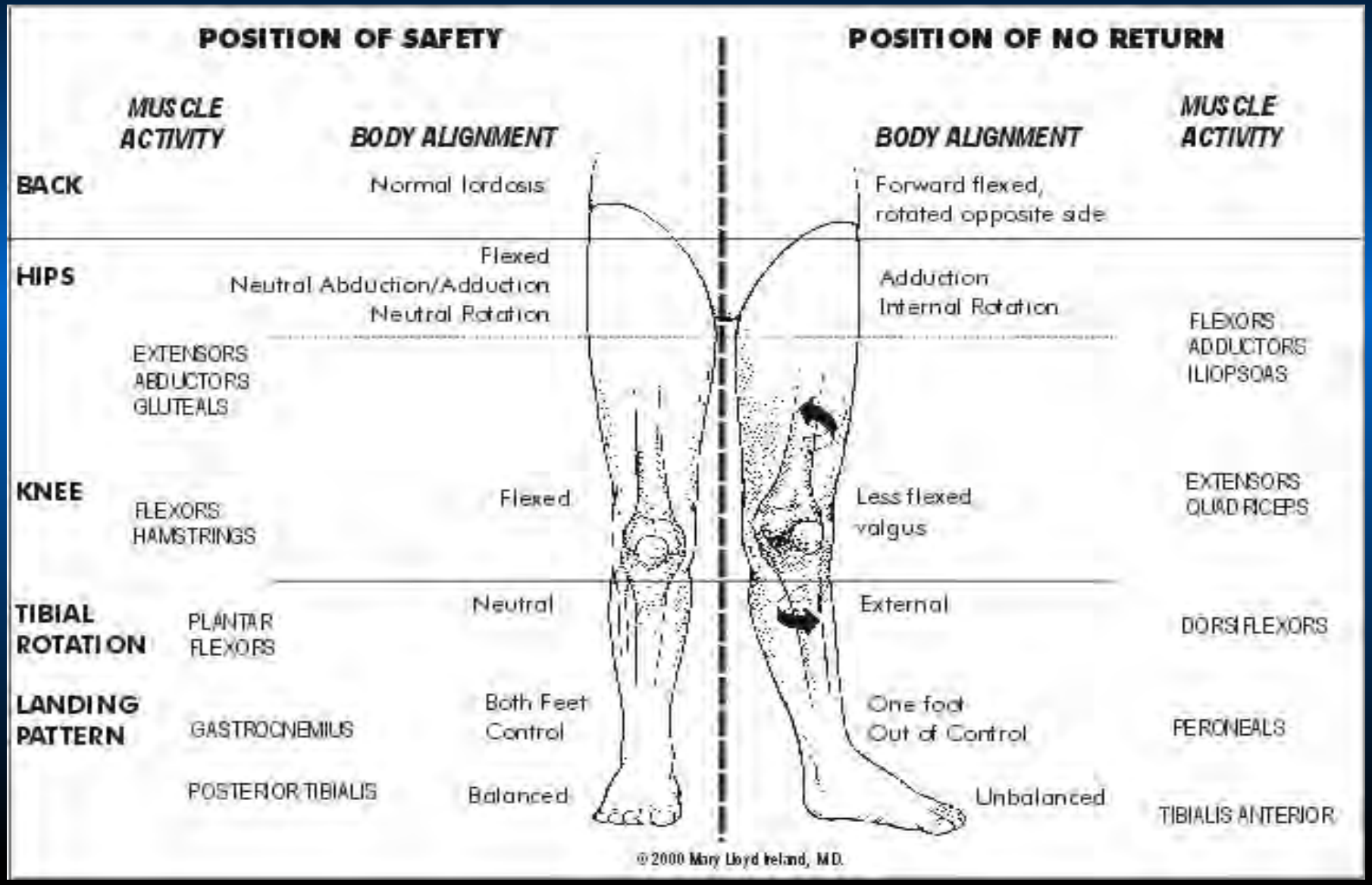
Surgery: MCL Repair



ACL Tears

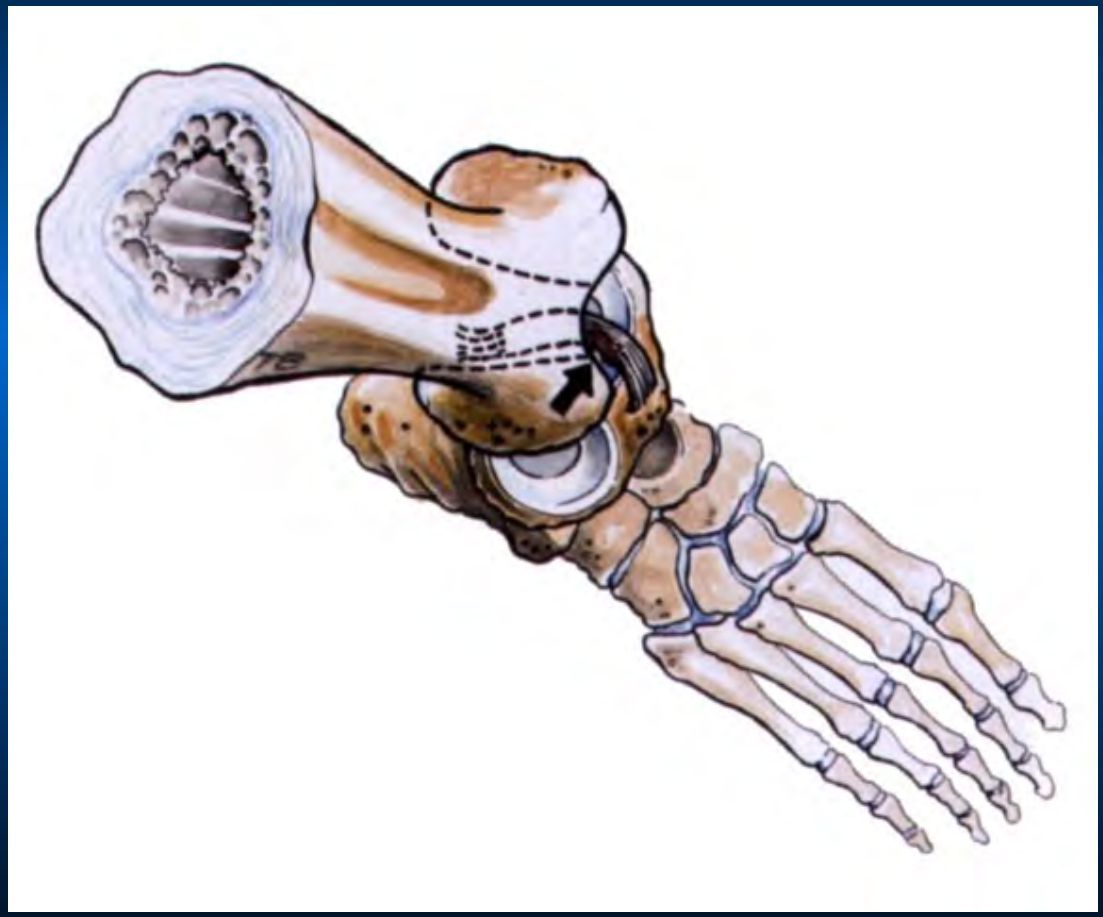
- Mechanisms
  - Non Contact 70%
  - Females 3:1 Greater Incidence
  - Functional Pivot Shift
- Incidence Per Year
  - 200,000
  - 100,000 ACL Reconstructions
- Associated Injuries 50%
  - Menisci, Articular Cartilage, Other Ligaments

Injury Mechanisms – Body Positions



Team Handball

Olsen OE,
Myklebust G,
Engebretsen L,
and Bahr R,
"Injury Mechanisms for Anterior Cruciate Ligament Injuries in Team Handball: A Systematic Video Analysis,"
in Am J Sports Med 32(4); June 2004, 1002-1012.



ACL Injury occurred,
Foot fixed and externally rotated
Wide Stance, 15˚ Knee Flexion,
20 ˚ valgus, tibia IR 10 ˚

ACL injury occurred
Foot fixed and externally rotated, knee 20°, tibia ER 10°, valgus 10°

Off-balance, in the air

Gymnastics

The ACL “Fisted Knuckle” Sign

Photo courtesy of Mary Lloyd Ireland, MD

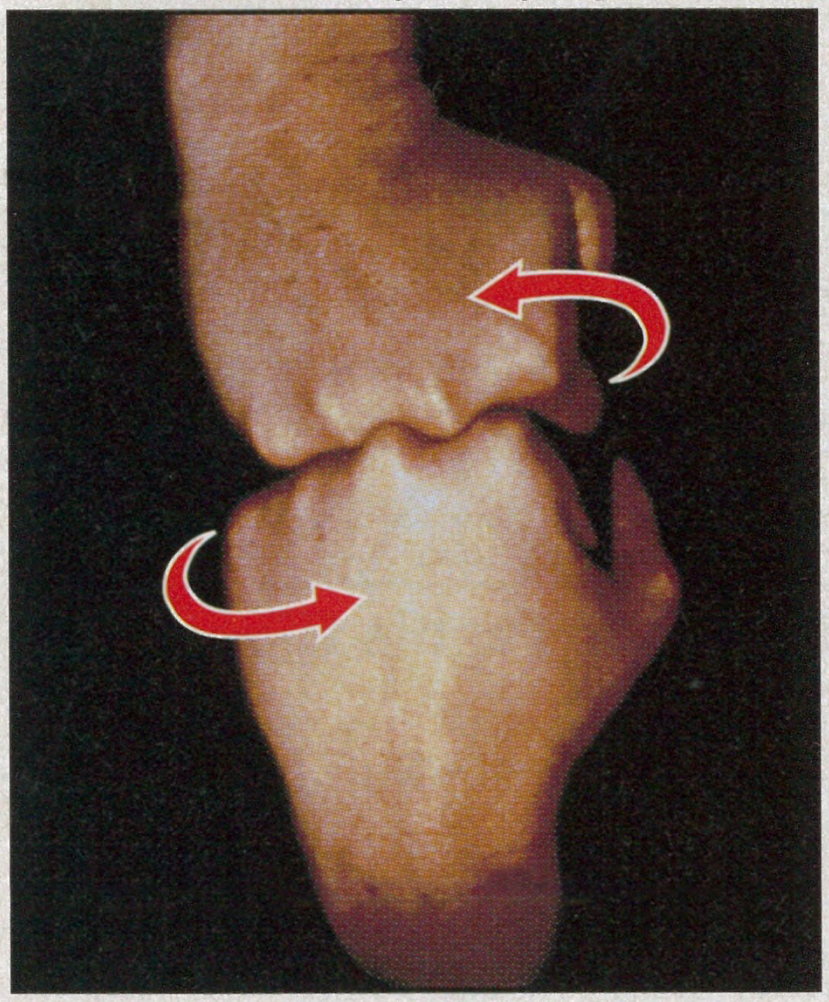


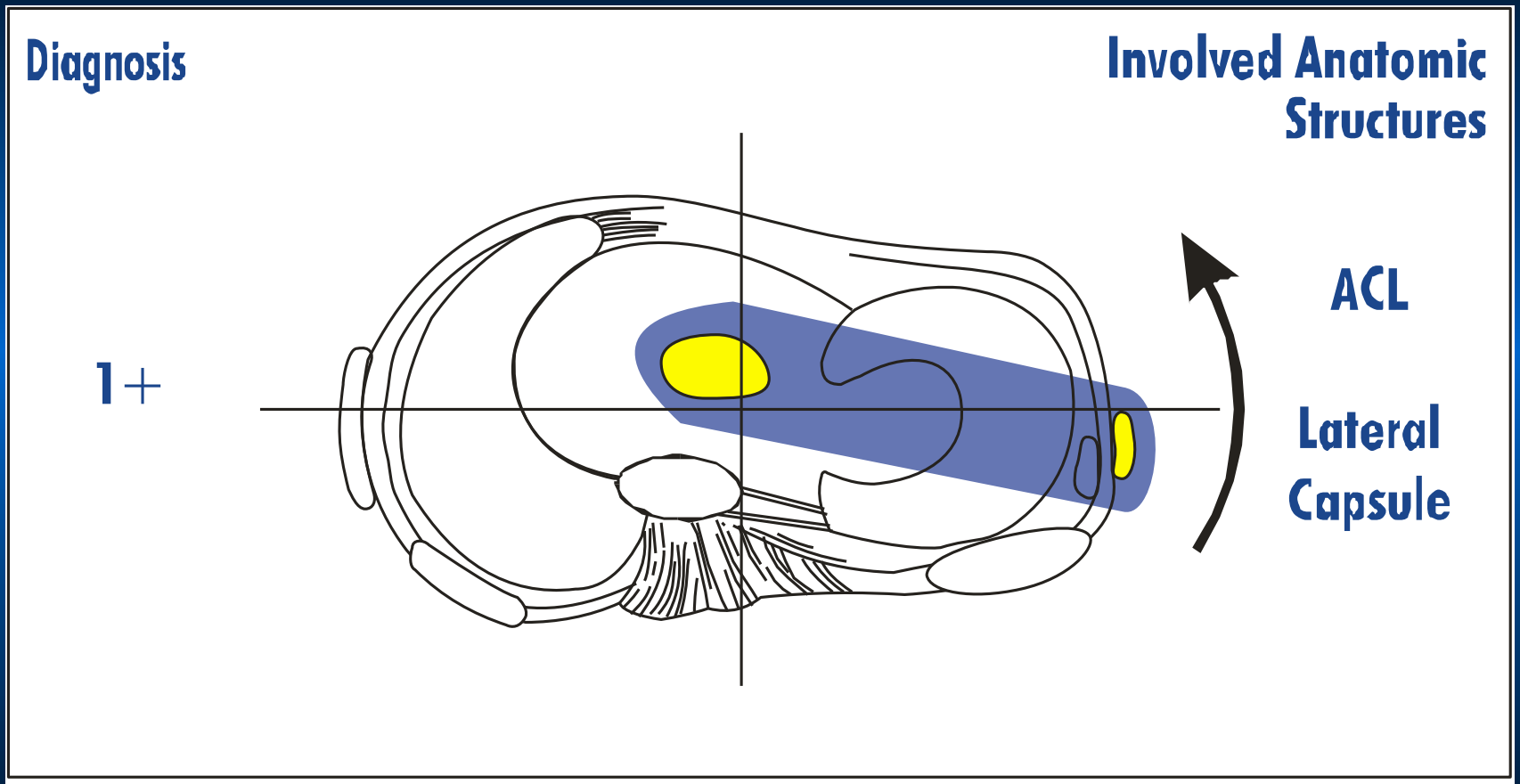
Figure 1. The ‘fisted knuckle’ sign.

Basketball

Basketball:
non-contact, unexpected, not thinking

Basketball

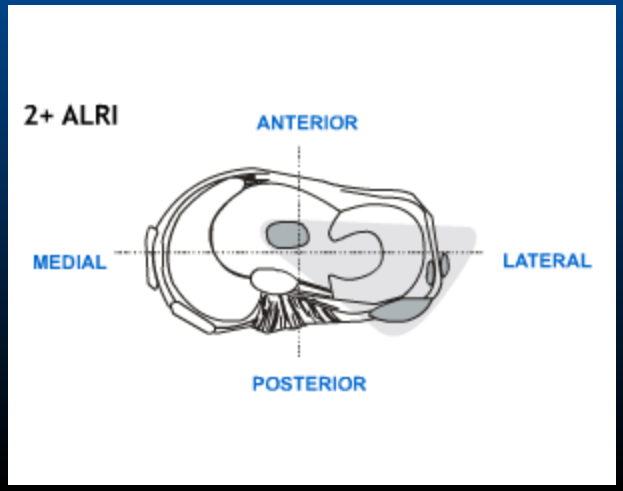
Knee Instability



Antero-Lateral Rotatory Instabilities (ALRI)

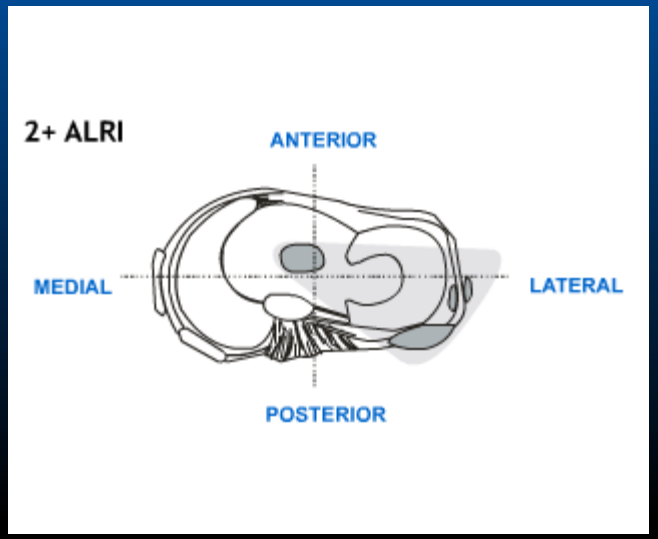
EUA:

Correlate mechanism of injury, anatomy, surgical findings to study design in the lab

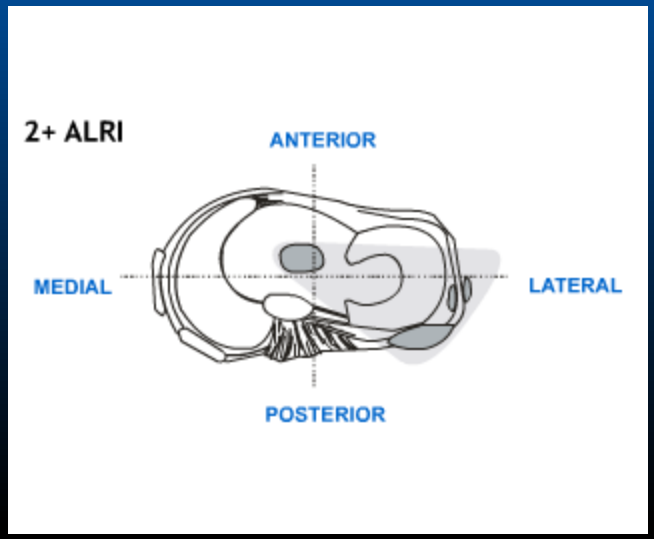


Pivot Shift

Lateral tibial plateau internally rotating, anteriorly subluxing at 30 to 0 degrees

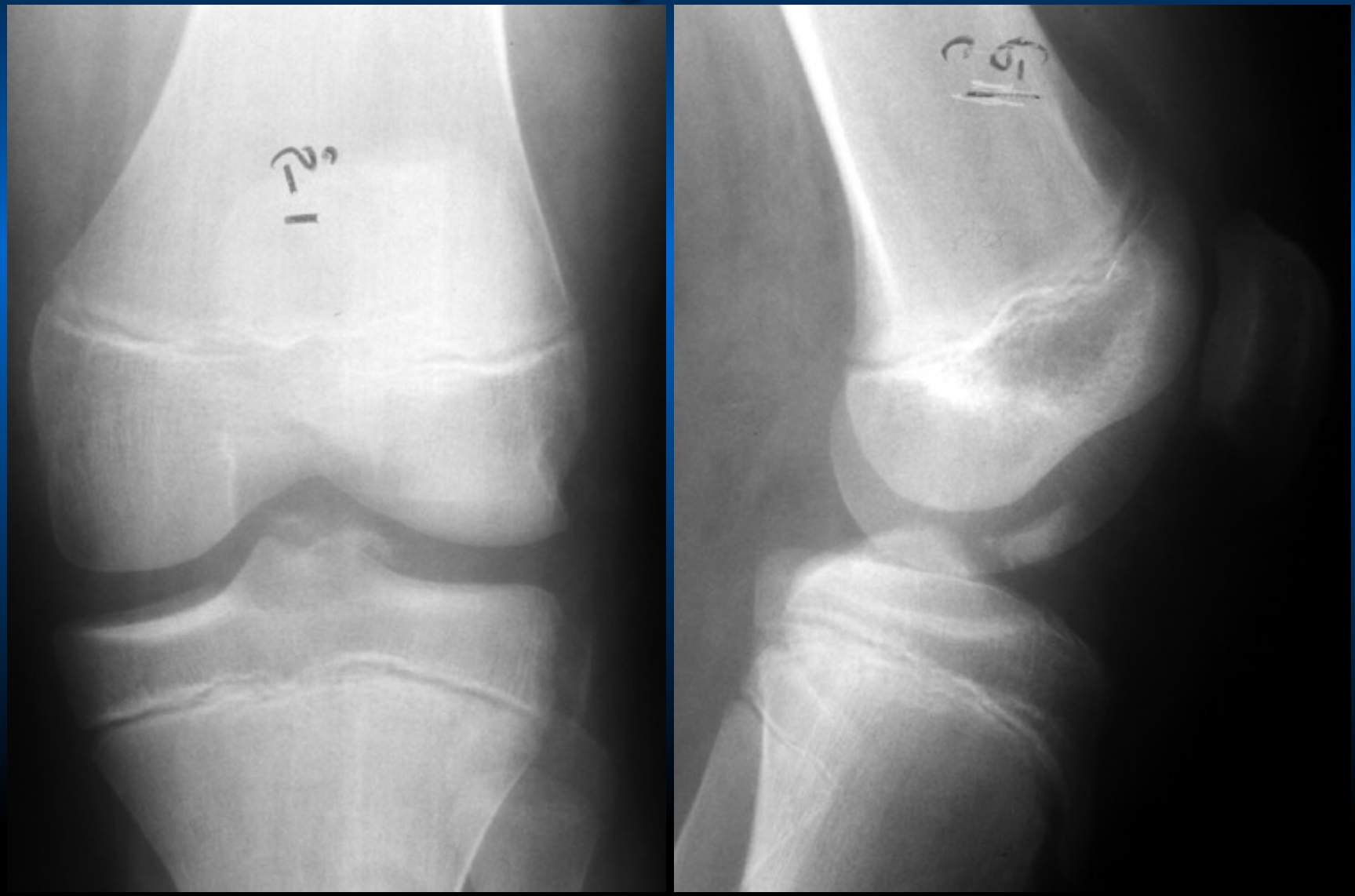


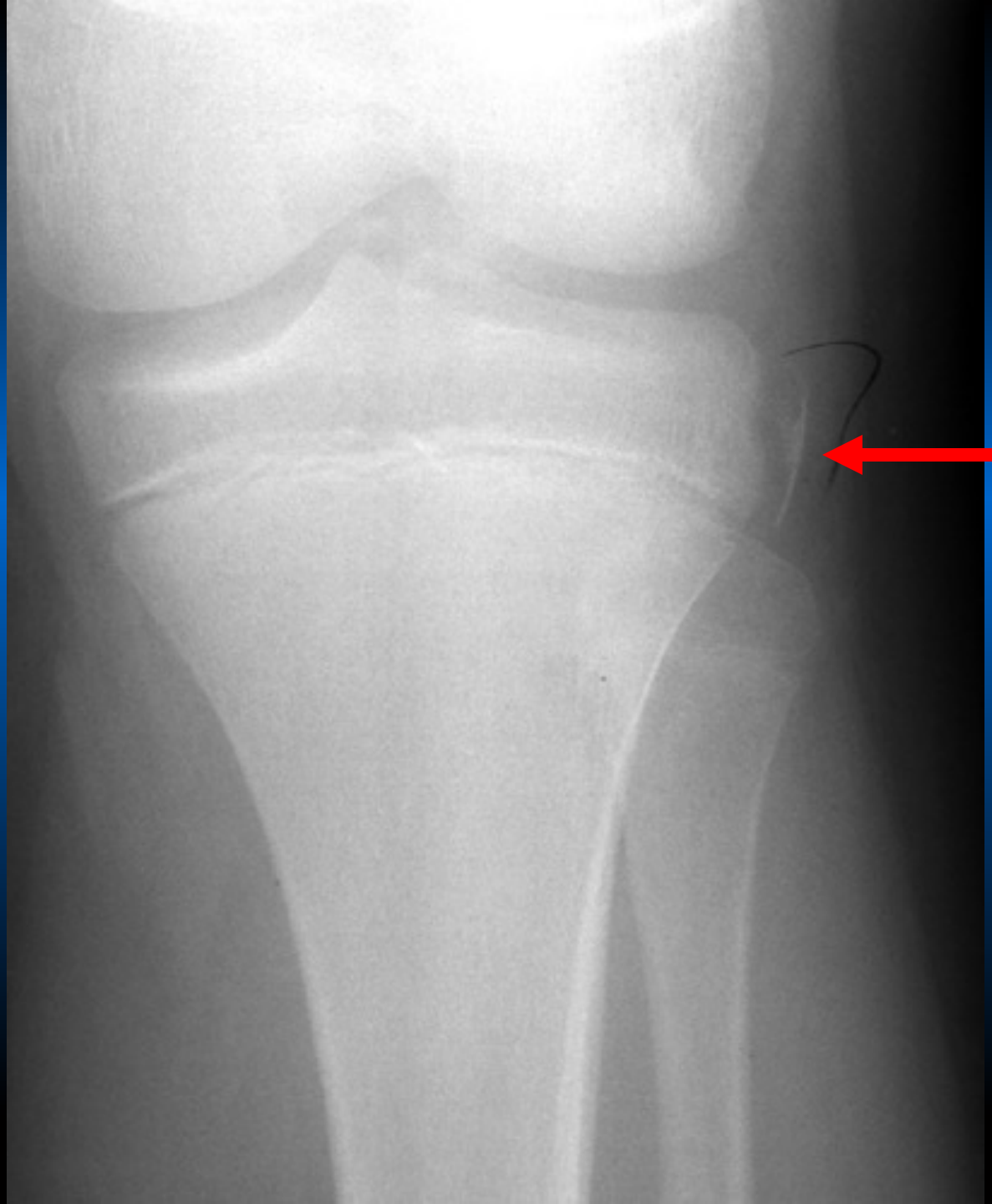
Medial compartment:
compressive forces posterior medial meniscus, typical tear pattern vertical, posterior



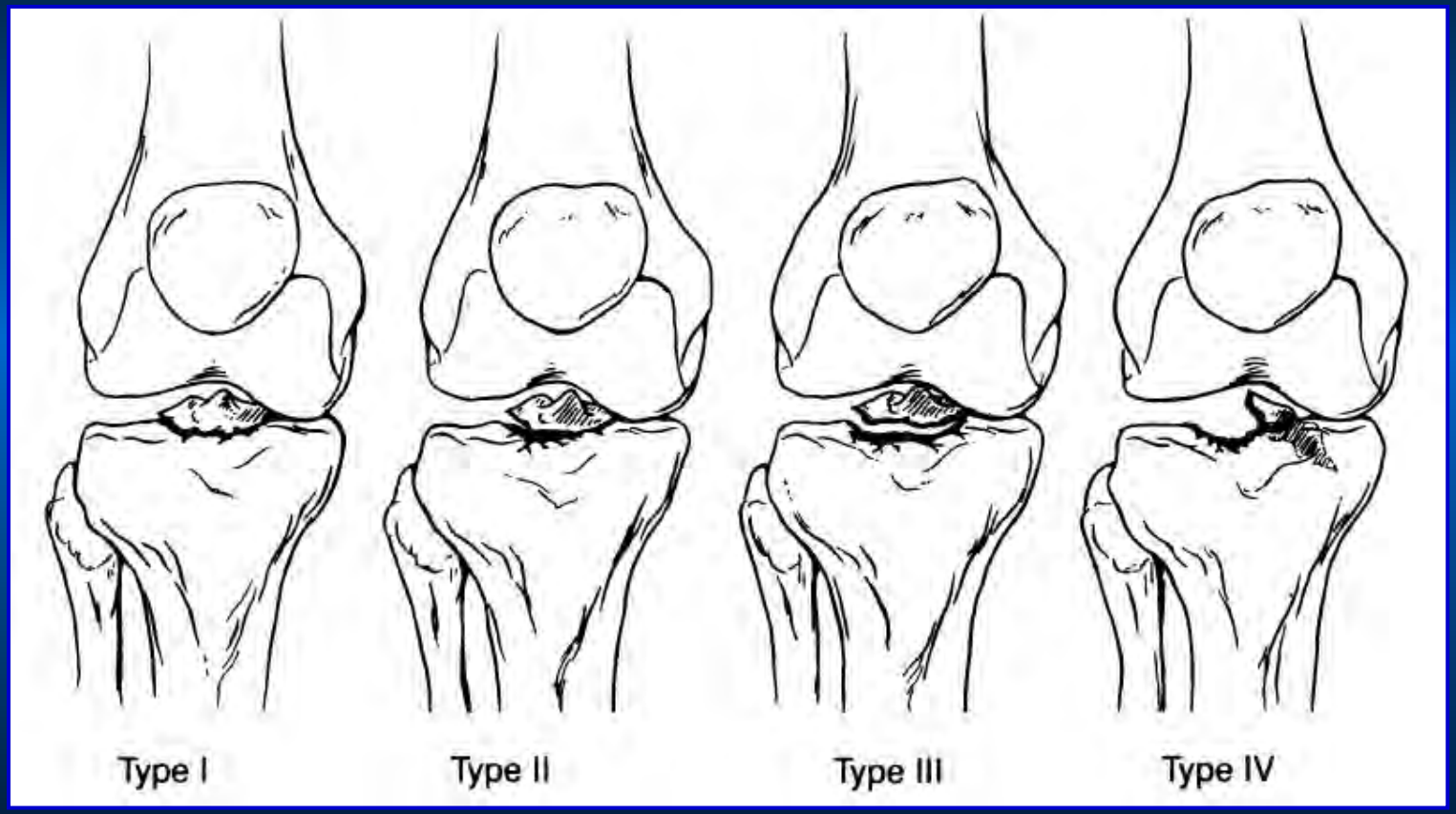
13 YO Male

- Fell Off of His Bicycle
- C/O Swelling + Pain, Left Knee

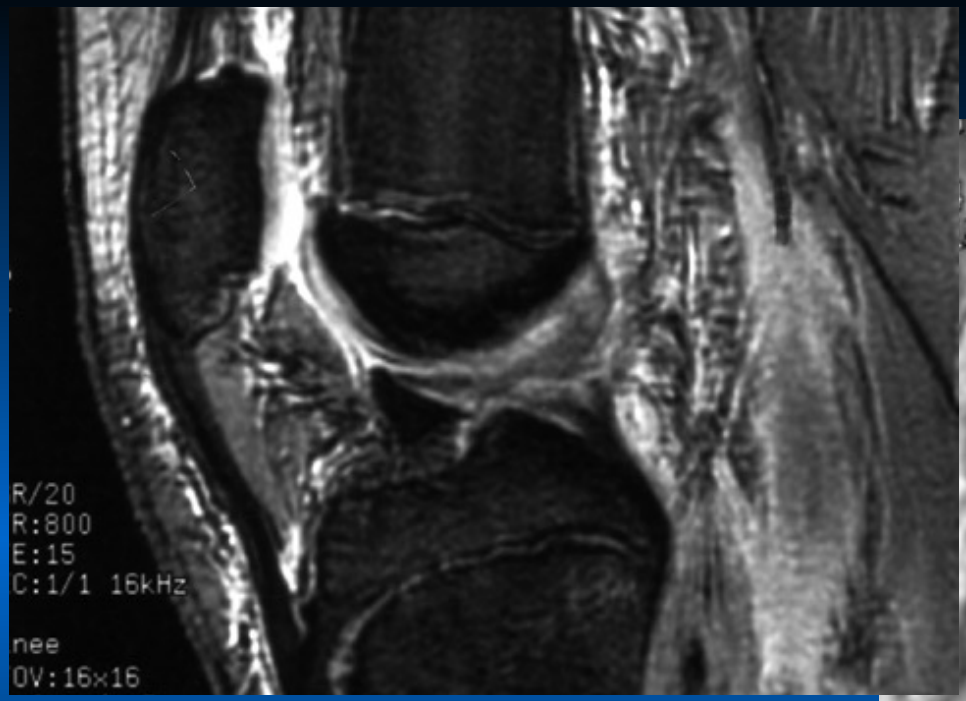




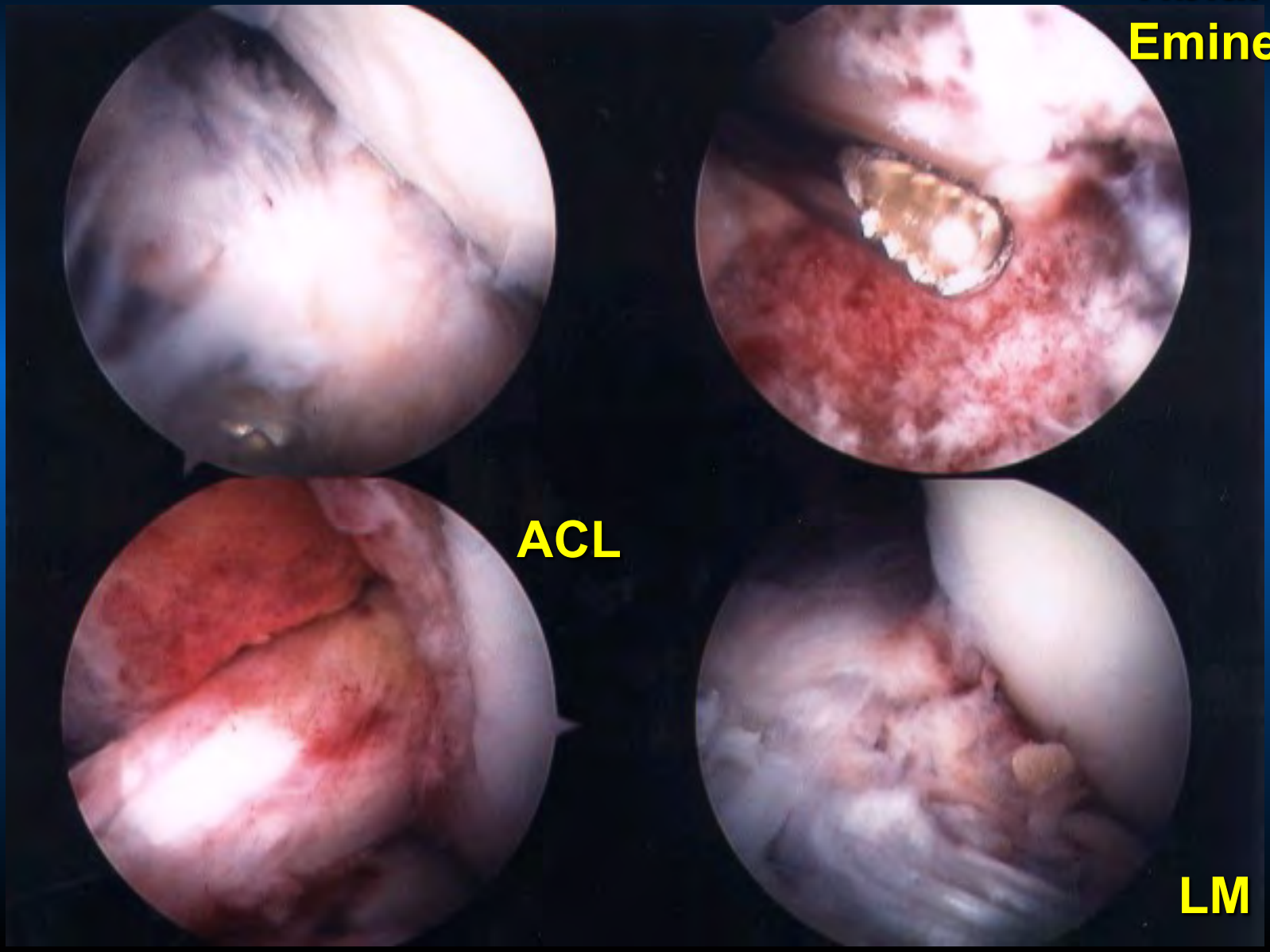
TIBIAL EMINENCE FRACTURES

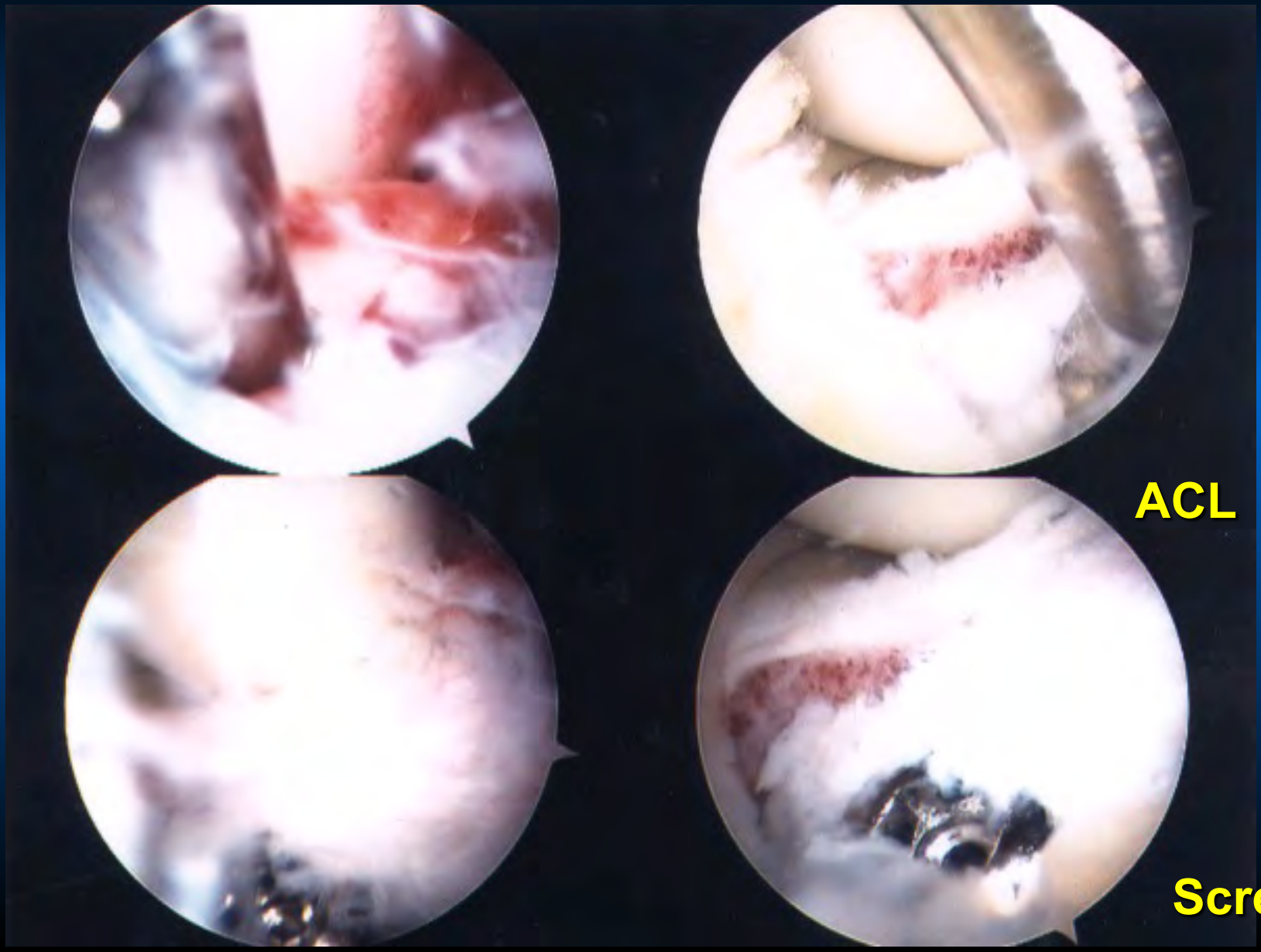


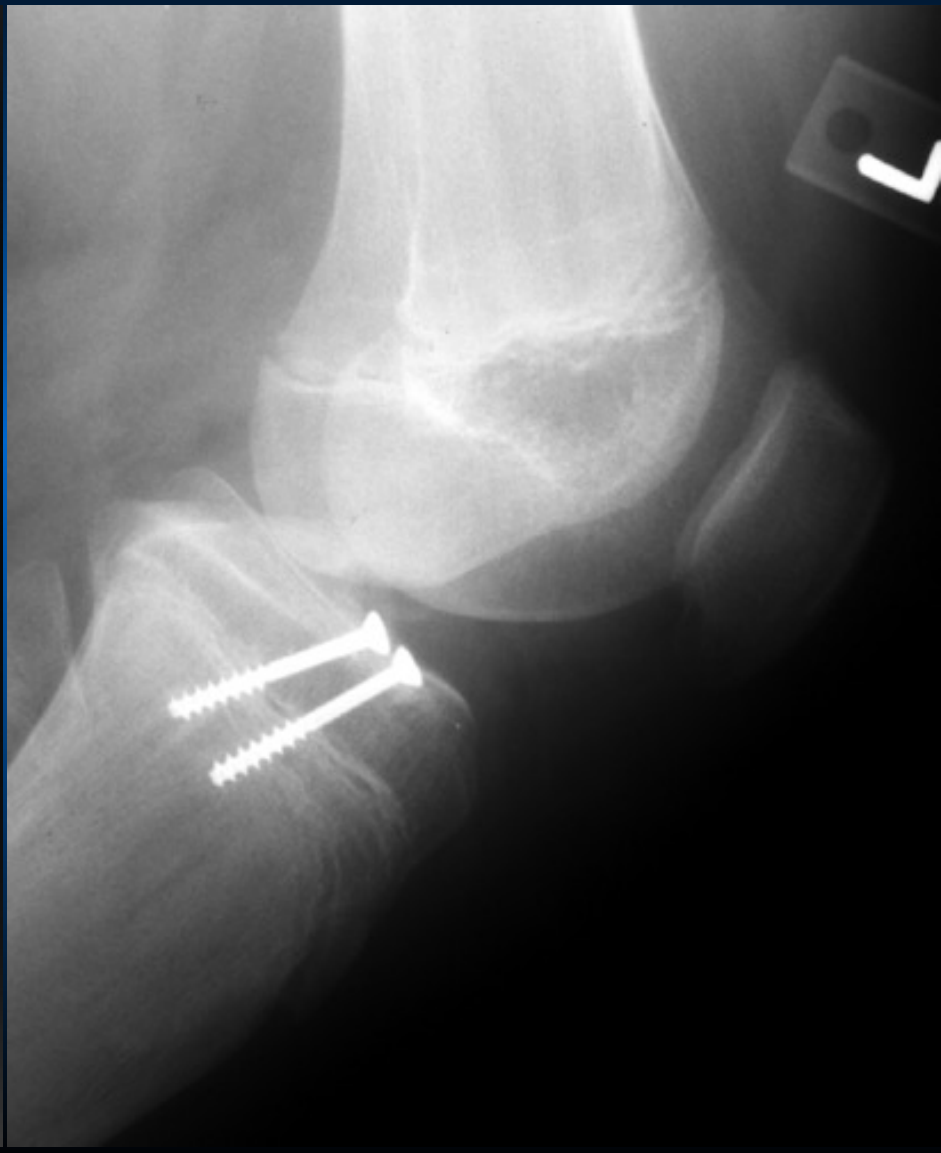
Meyers and McKeever Classification of tibial eminence fractures.


R/20
R:800
E:15
C:1/1 16kHz
nee
OV:16x16

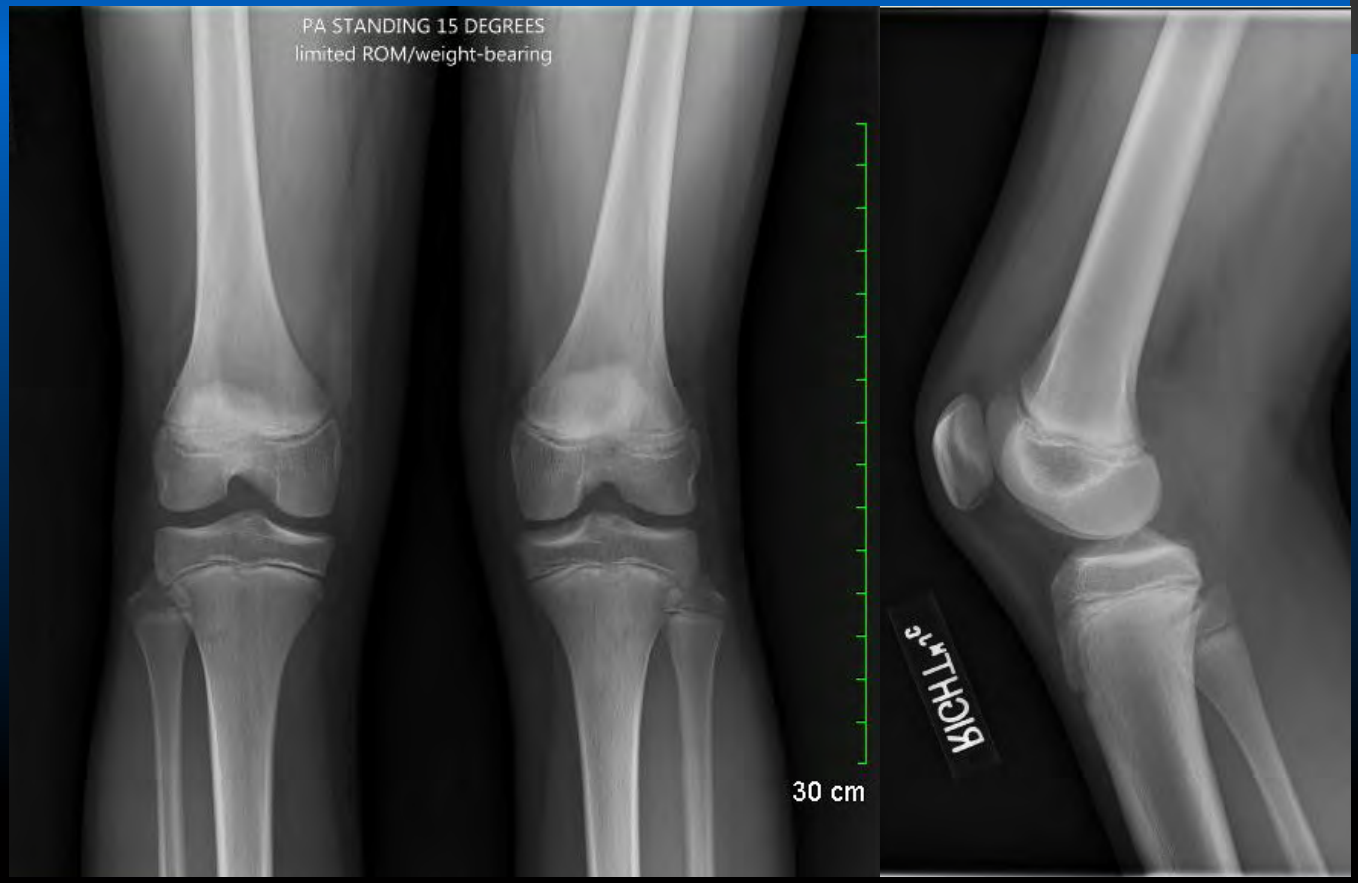

5.5
20
800
15
1/1 16kHz
:16x16
thk/1.0sp
03:54
x192/1.5 NEX
IPR


Tibial Eminence
ACL
LM


ACL
Screw

12 YO Linebacker
Contact injury RT ACL Tear

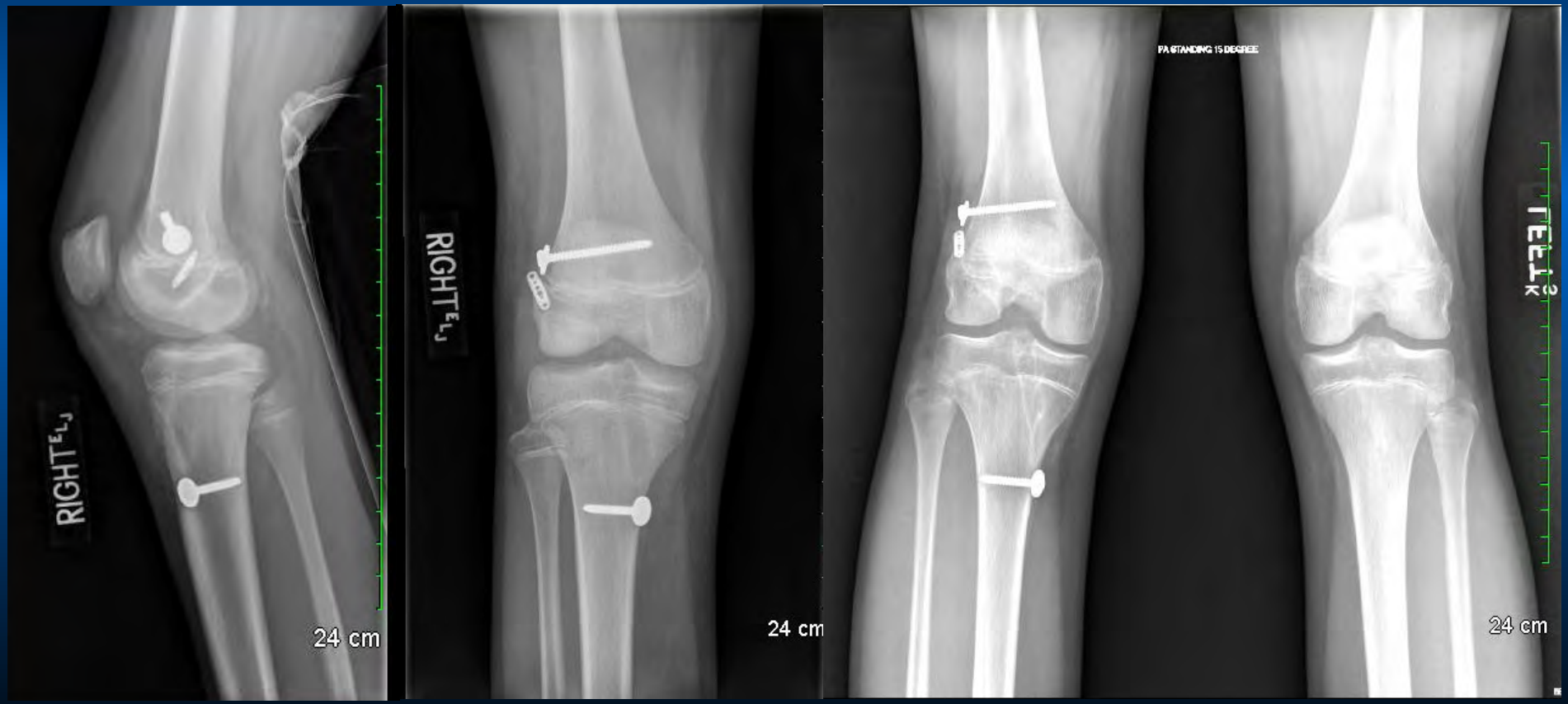


Bone age
13 years
10 months

ACLR with Hamstring Autograft

2 weeks PO

1 Year PO



14 Year + 4 Mo. Old Male

Koman JD and Sanders JO, "Valgus Deformity After Reconstruction of the Anterior Cruciate Ligament in a Skeletally Immature Patient," JBJS Vol. 81A, No.5 (May 1999), pp. 711-715.

Salter-Harris Fractures

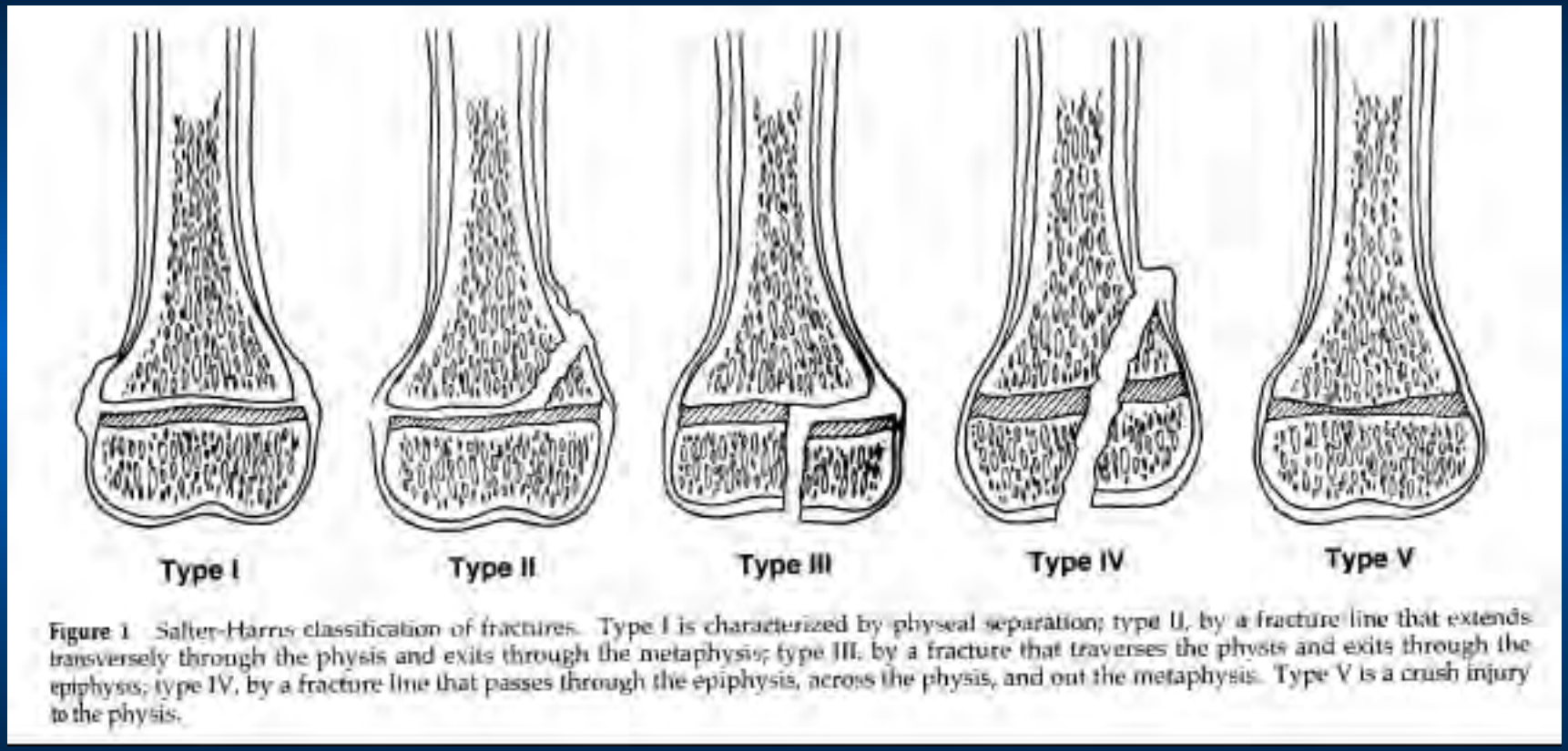
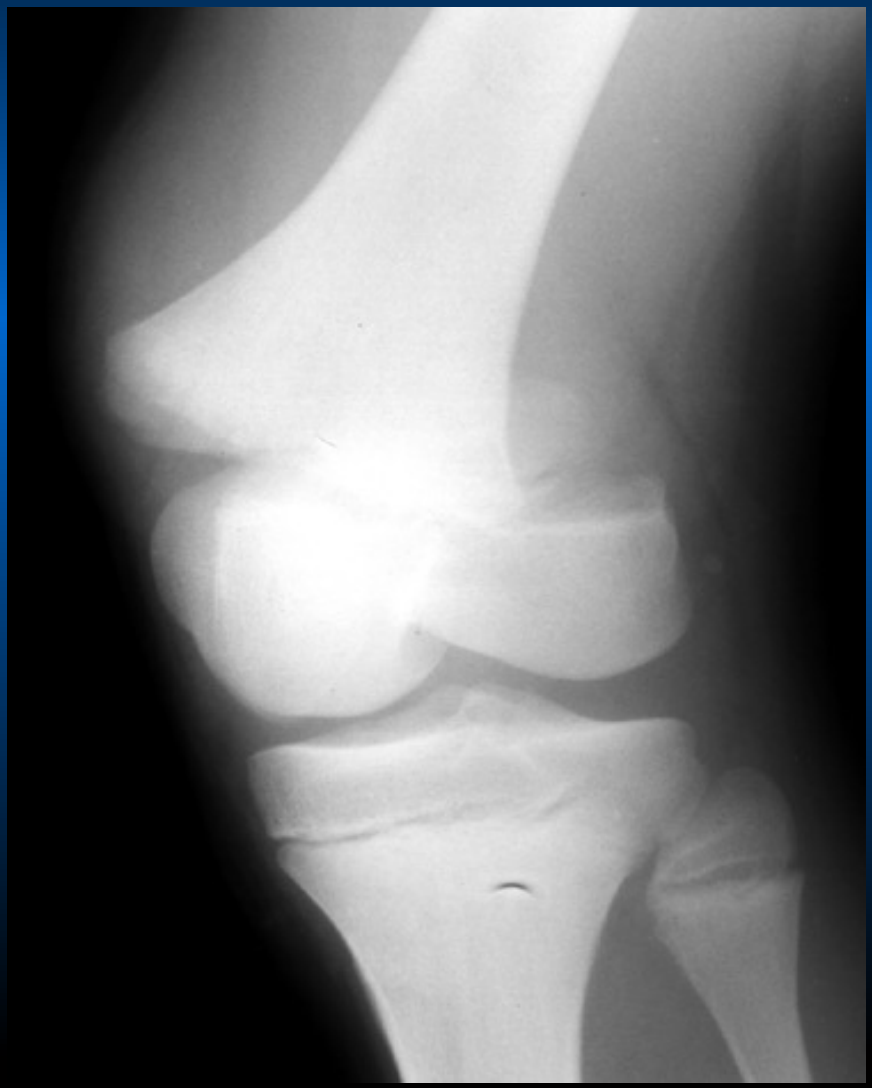


Figure 1 Salter-Harris classification of fractures. Type I is characterized by physeal separation; type II, by a fracture line that extends transversely through the physis and exits through the metaphysis; type III, by a fracture that traverses the physis and exits through the epiphysis; type IV, by a fracture line that passes through the epiphysis, across the physis, and out the metaphysis. Type V is a crush injury to the physis.

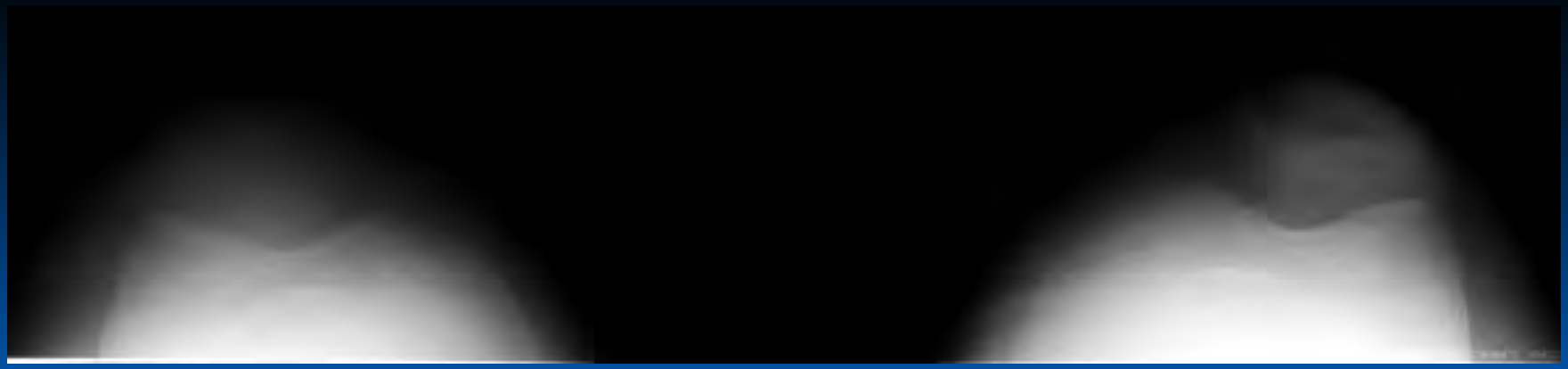
Kay RM and Matthys GA, "Pediatric Ankle Fractures: Evaluation and Treatment," JAAOS 9:4 (July-August 2001); 268-278.

14 YO M
Punter Was Hit

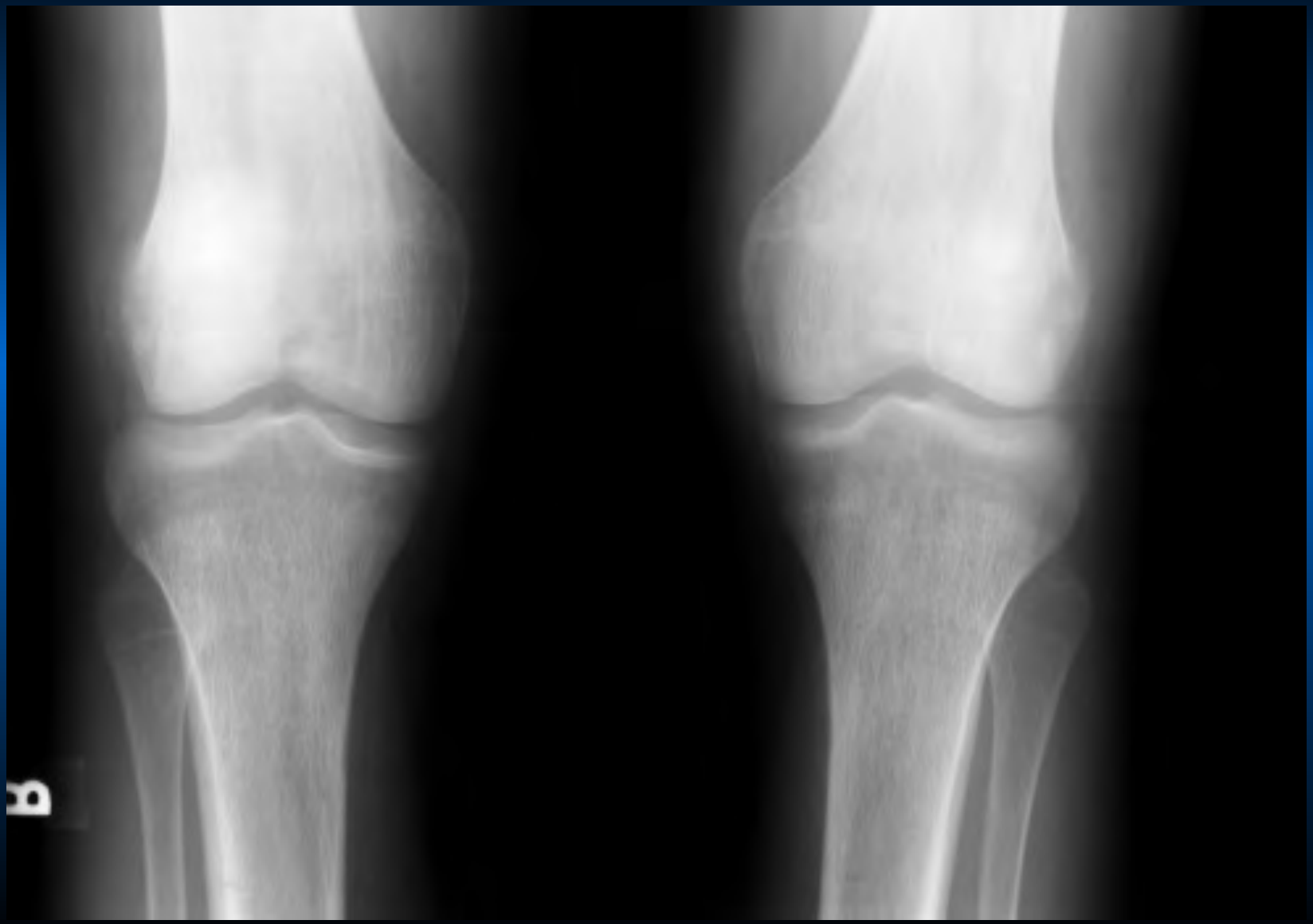


21 YO Male

- Playing basketball
- Renal dialysis patient on peritoneal dialysis



Low-riding tilted patella = quad tendon rupture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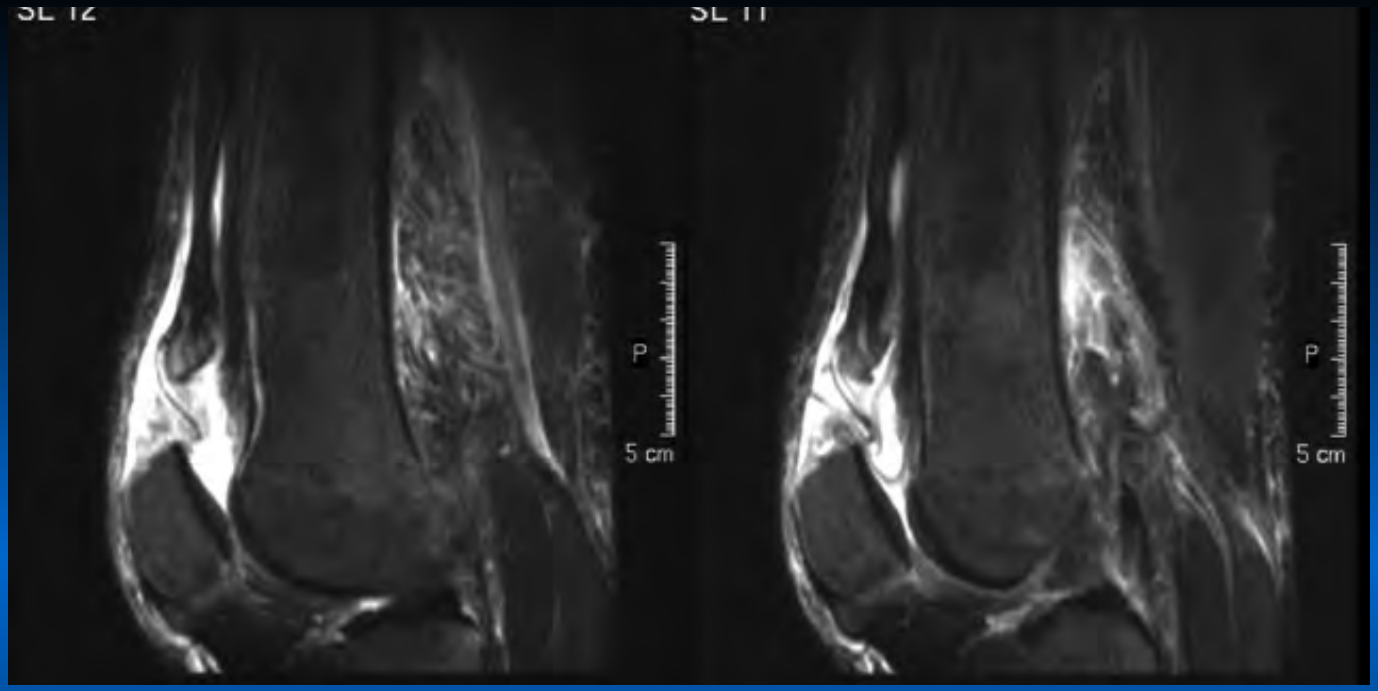
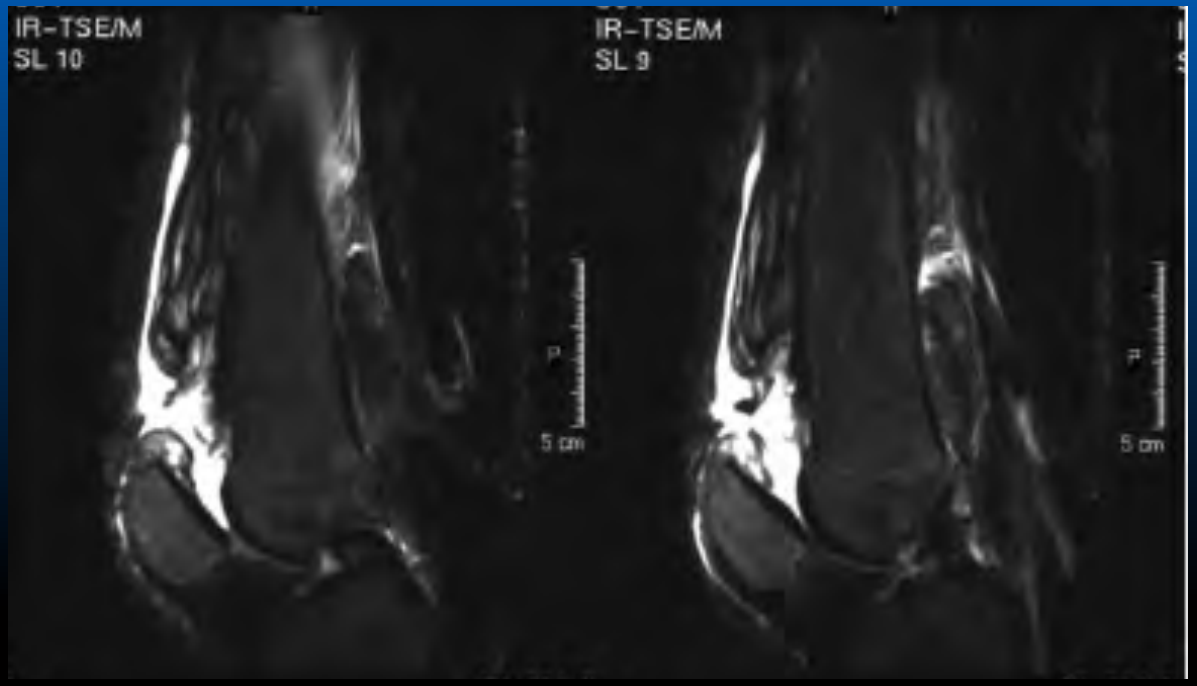
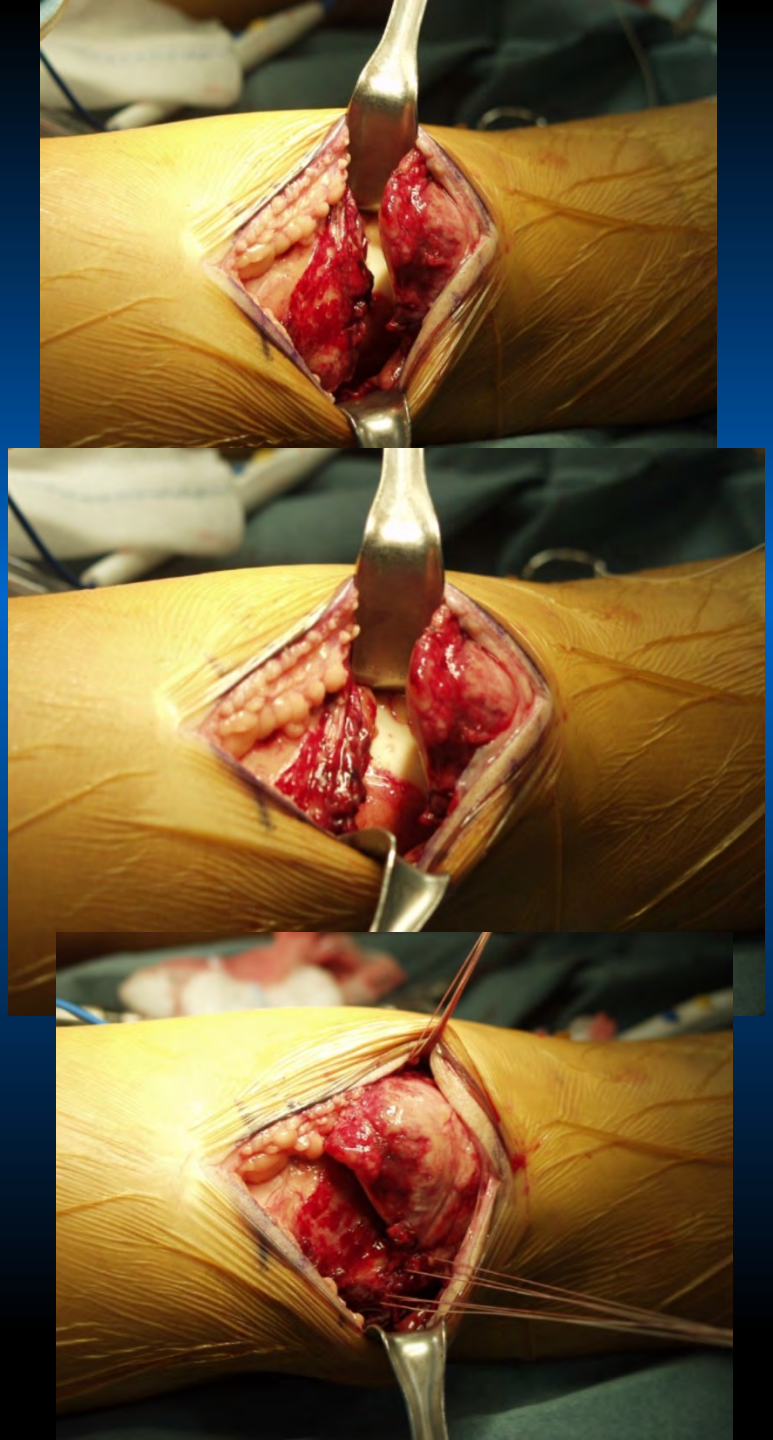


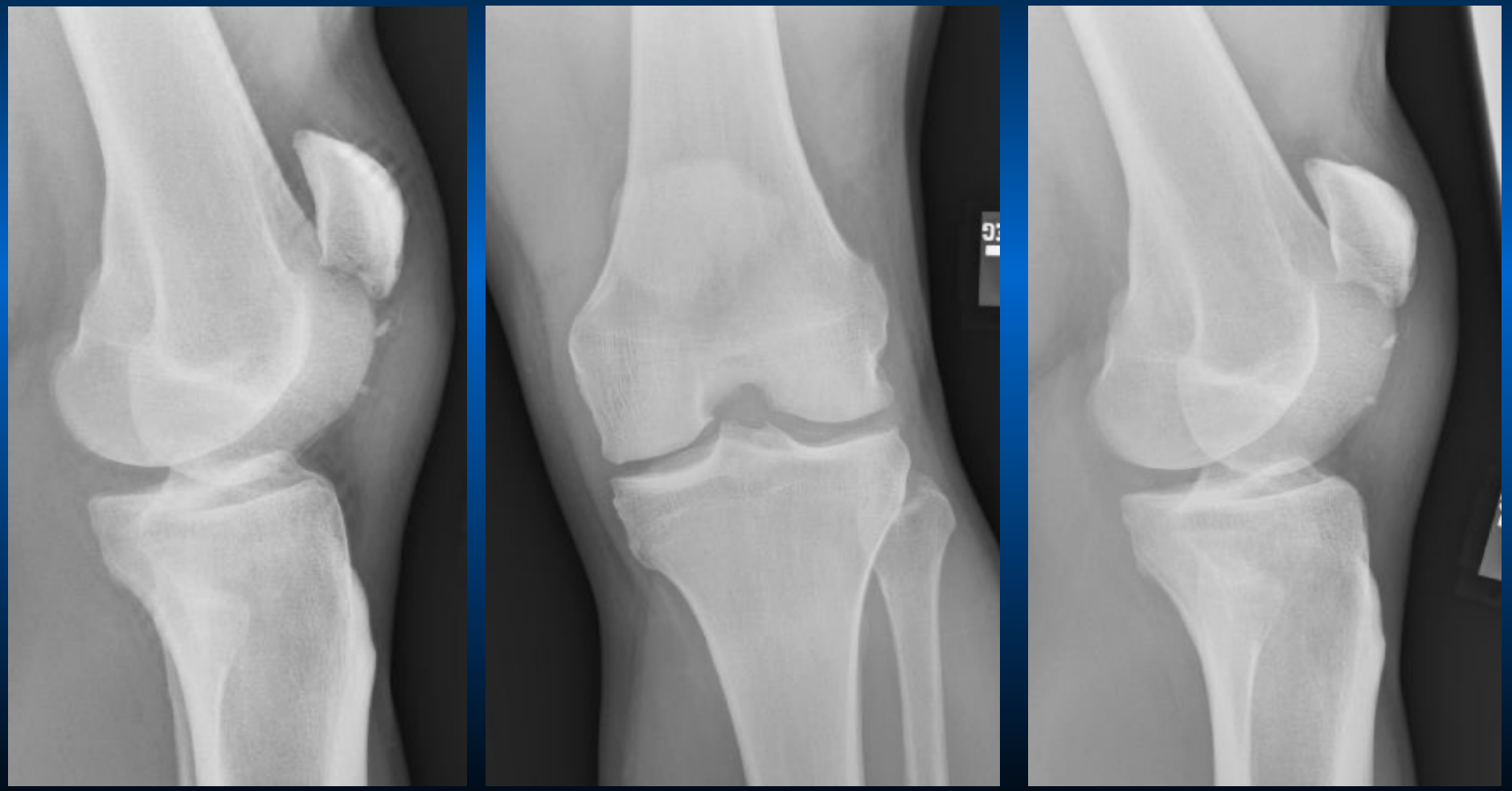
MRI: Right Knee



MRI: Left knee



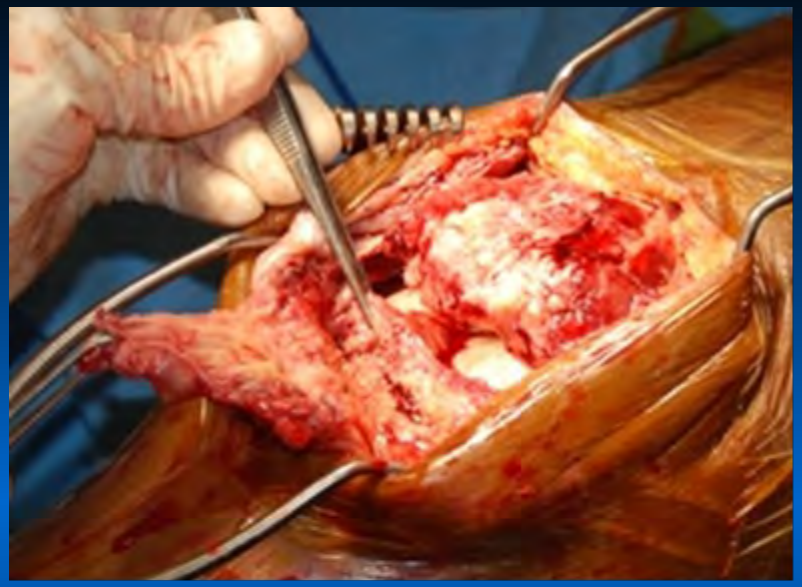
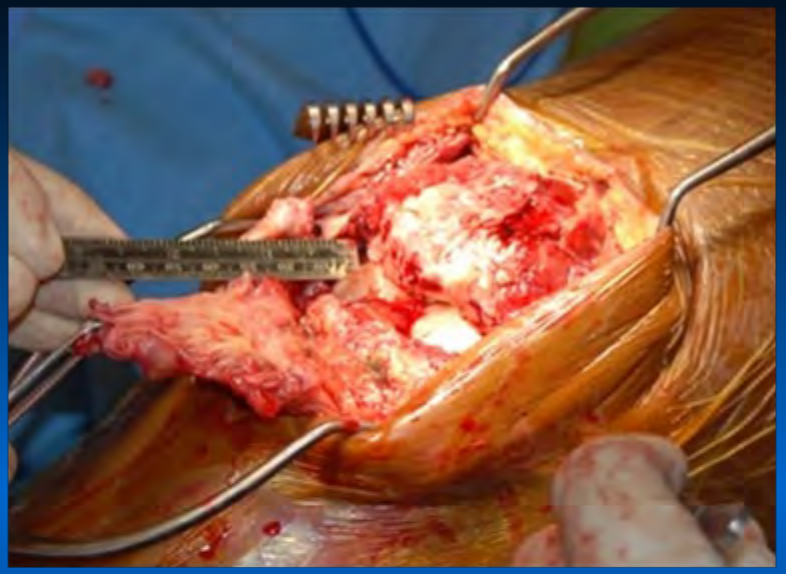
42 YO Retired NFL Offensive Center
Injured left knee playing basketball:



High-riding patella = patella tendon rupture

Surgery

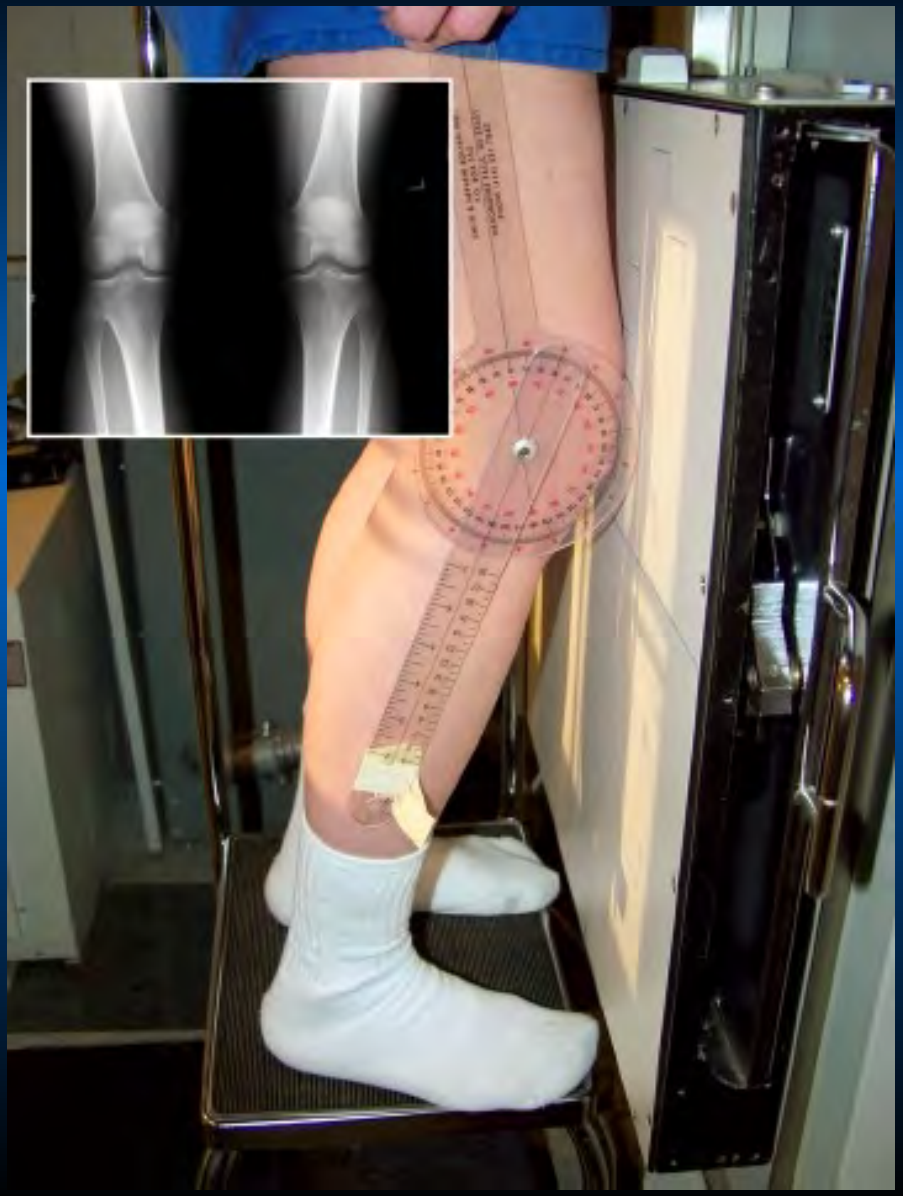
Tear pattern: periosteal sleeve type

45 Degree Flexed Weight-Bearing PA View is most sensitive for detecting joint space loss

Cole BJ, Harner CD, Degenerative arthritis of the knee in active patients: evaluation and treatment. JAAOS 1999, Nov.-Dec. 7(6):389-402.

Dervin GF, Feibel RJ, Rody K, Grabowski J., 3-Foot standing AP versus 45 degrees PA radiograph for osteoarthritis of the knee. Clin J Sports Med. 2001 Jan;11(1):10-6.

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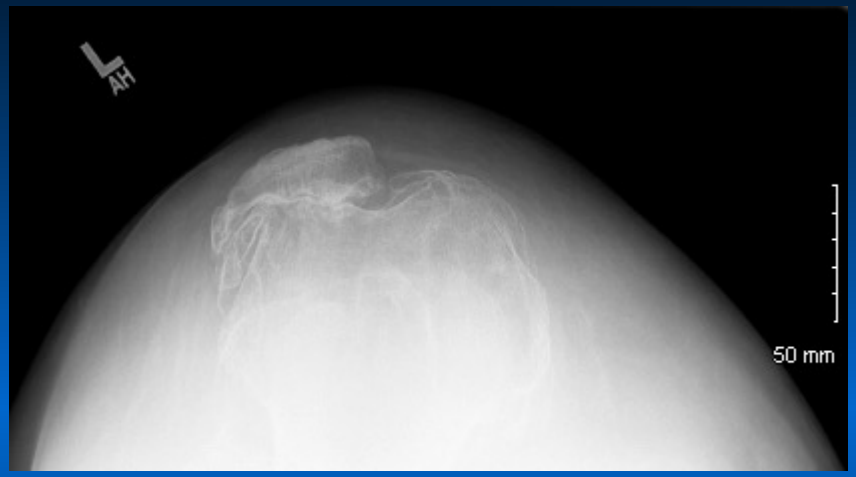
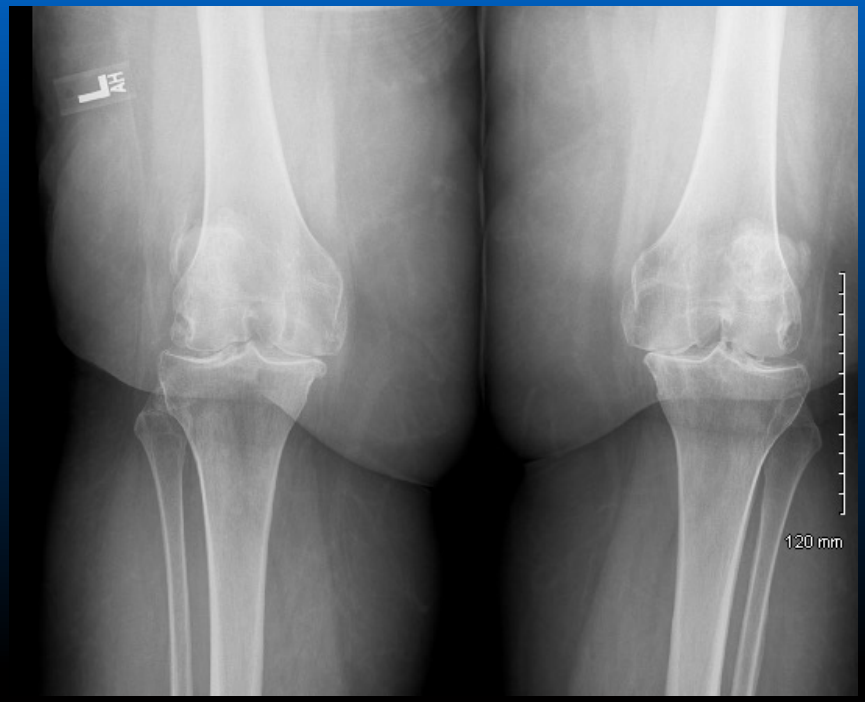
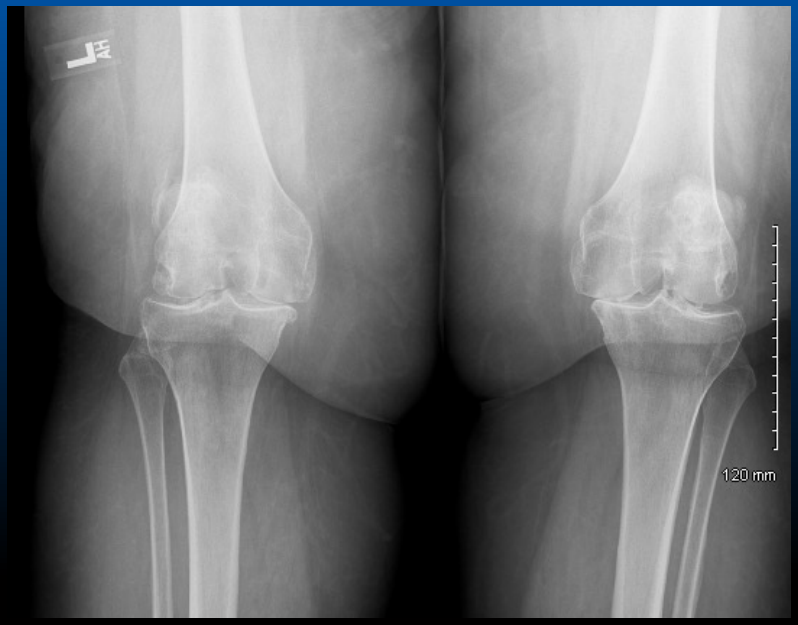
55 YO Female
PE: Height 5’ 5½”, weight 303: BMI 43

Left Knee



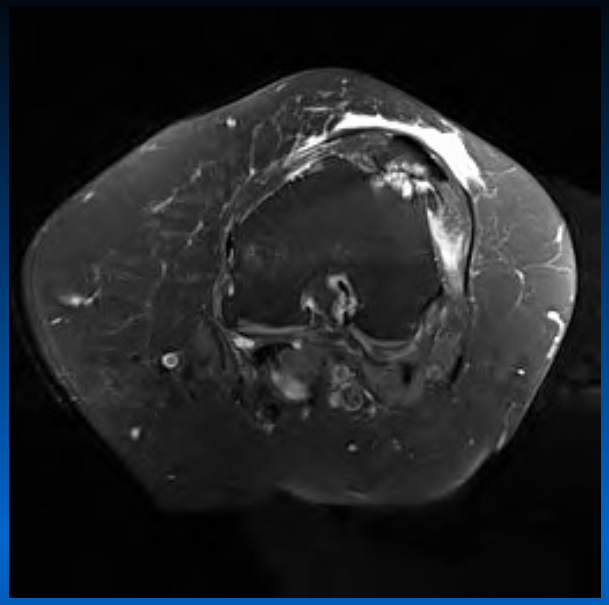


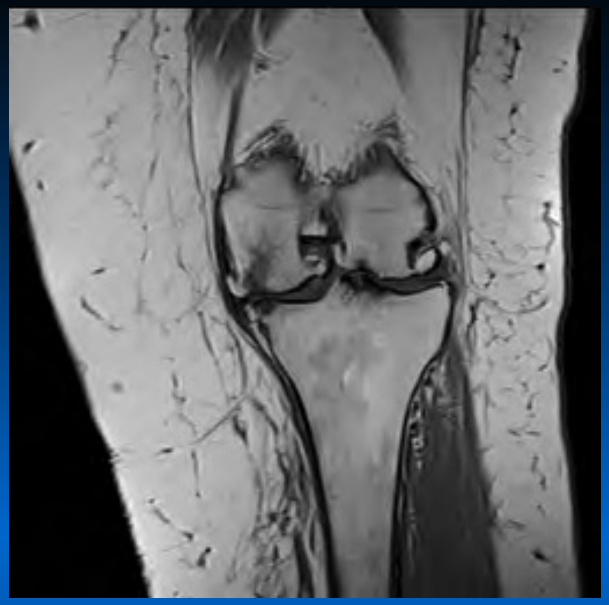
Right Knee

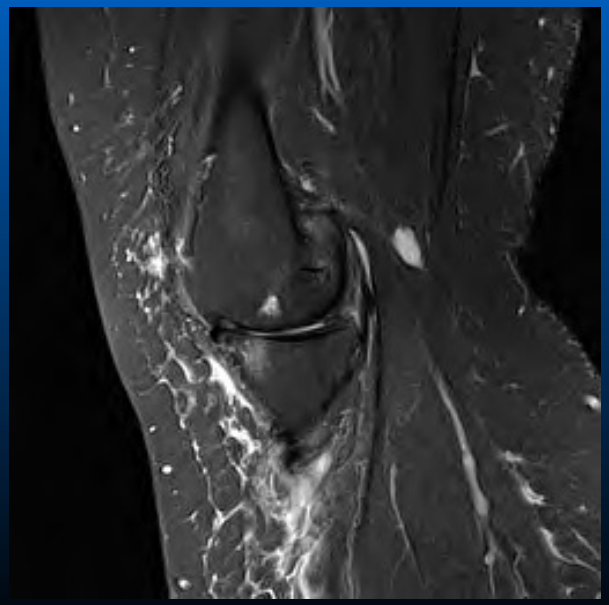


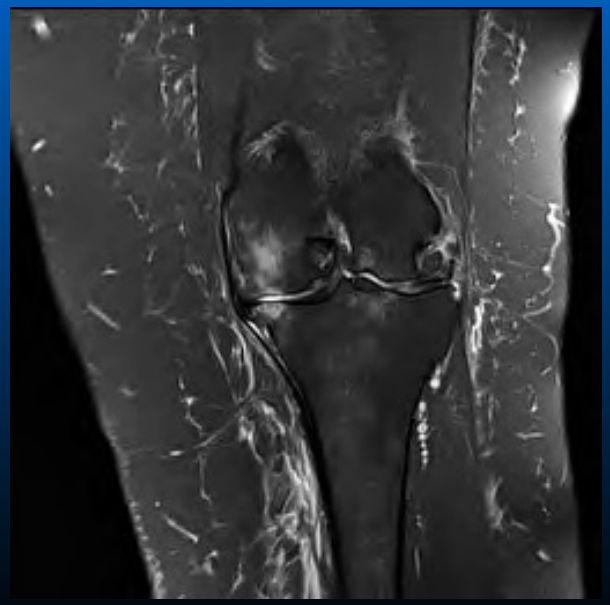
What test would you do next?

MRI







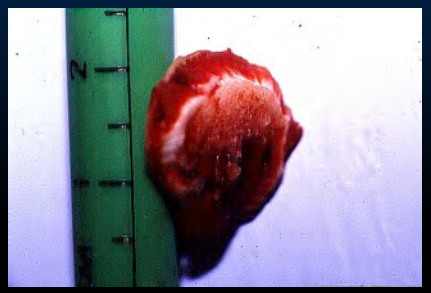


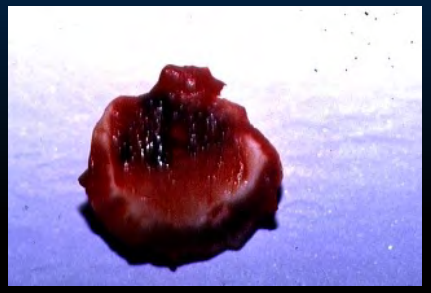
Are more tests needed?

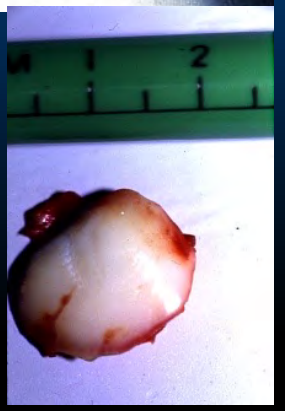
MRI Scan in the Arthritic Knee After 50 years

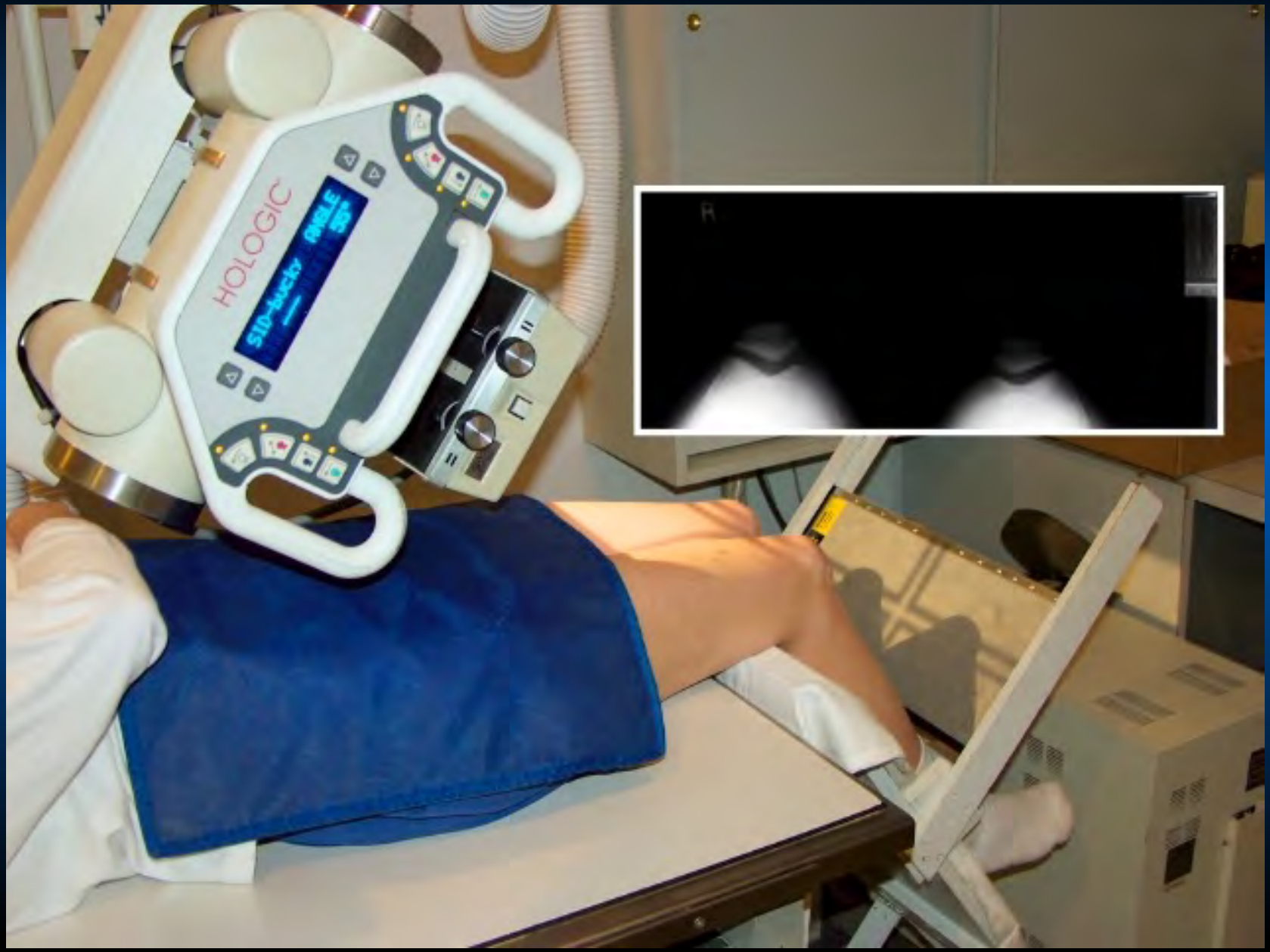
- Is the root of the Medial Meniscus Avulsed?
- What about my Baker's Cyst?
- Think tree - MRI Scan
  - In a Big Forest – Arthritis —The Plain Xrays show us the reason for stiffness & pain: Arthritis

Patellar Dislocations





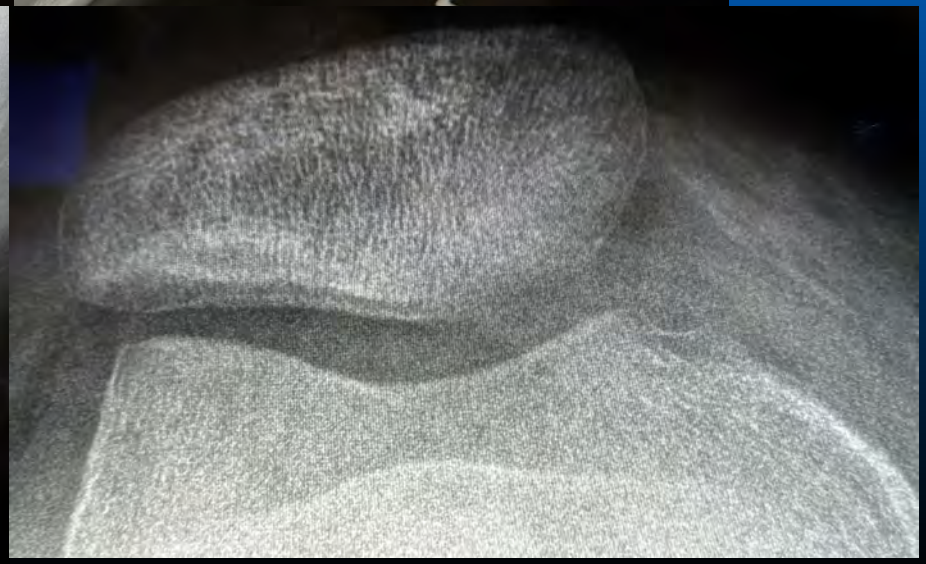



HOLOGIC
R

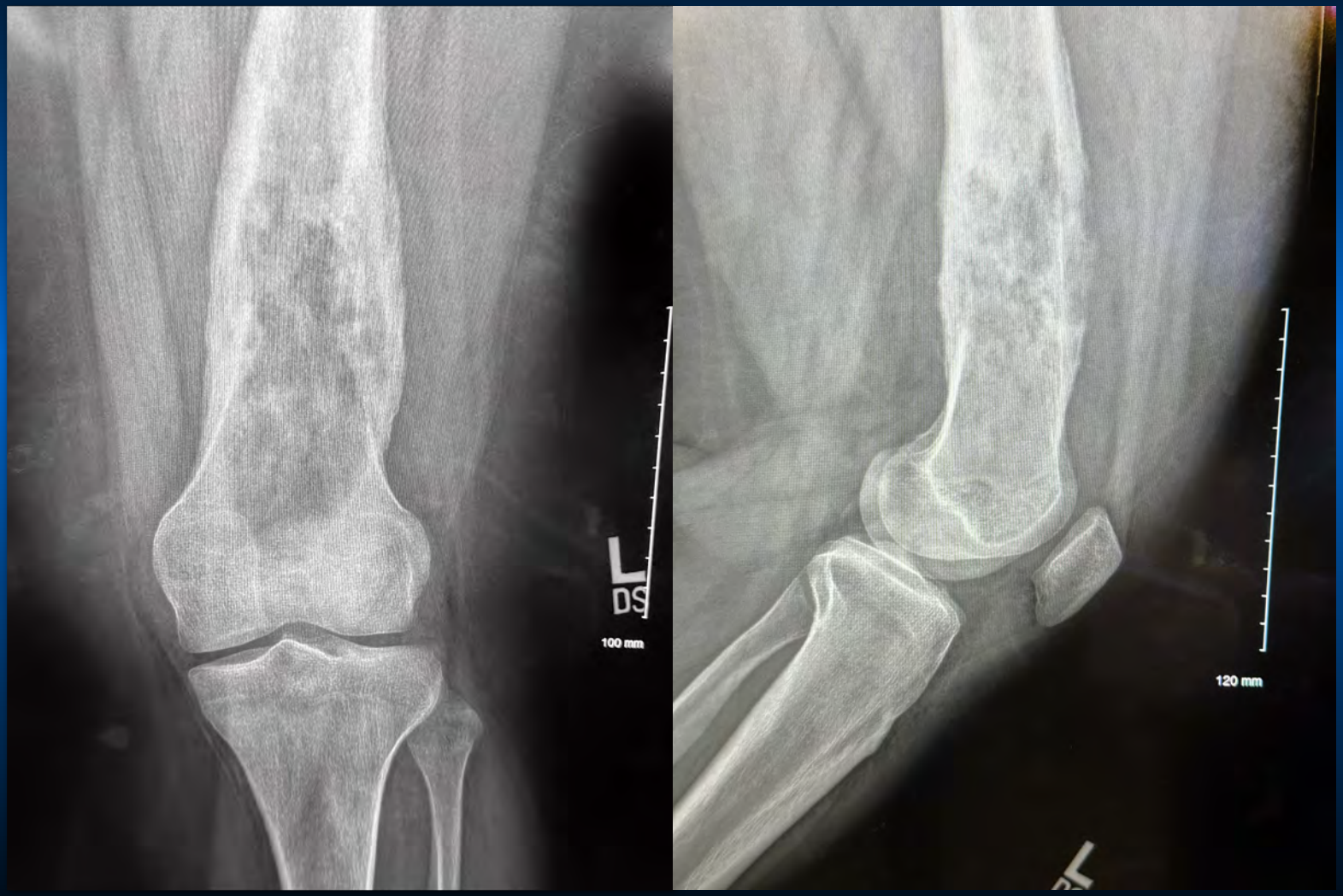
You Look for What You Know and You Find What You Look For

You may not have seen it, but it has seen you.

14 YO Female, 3 weeks leg pain, no injury



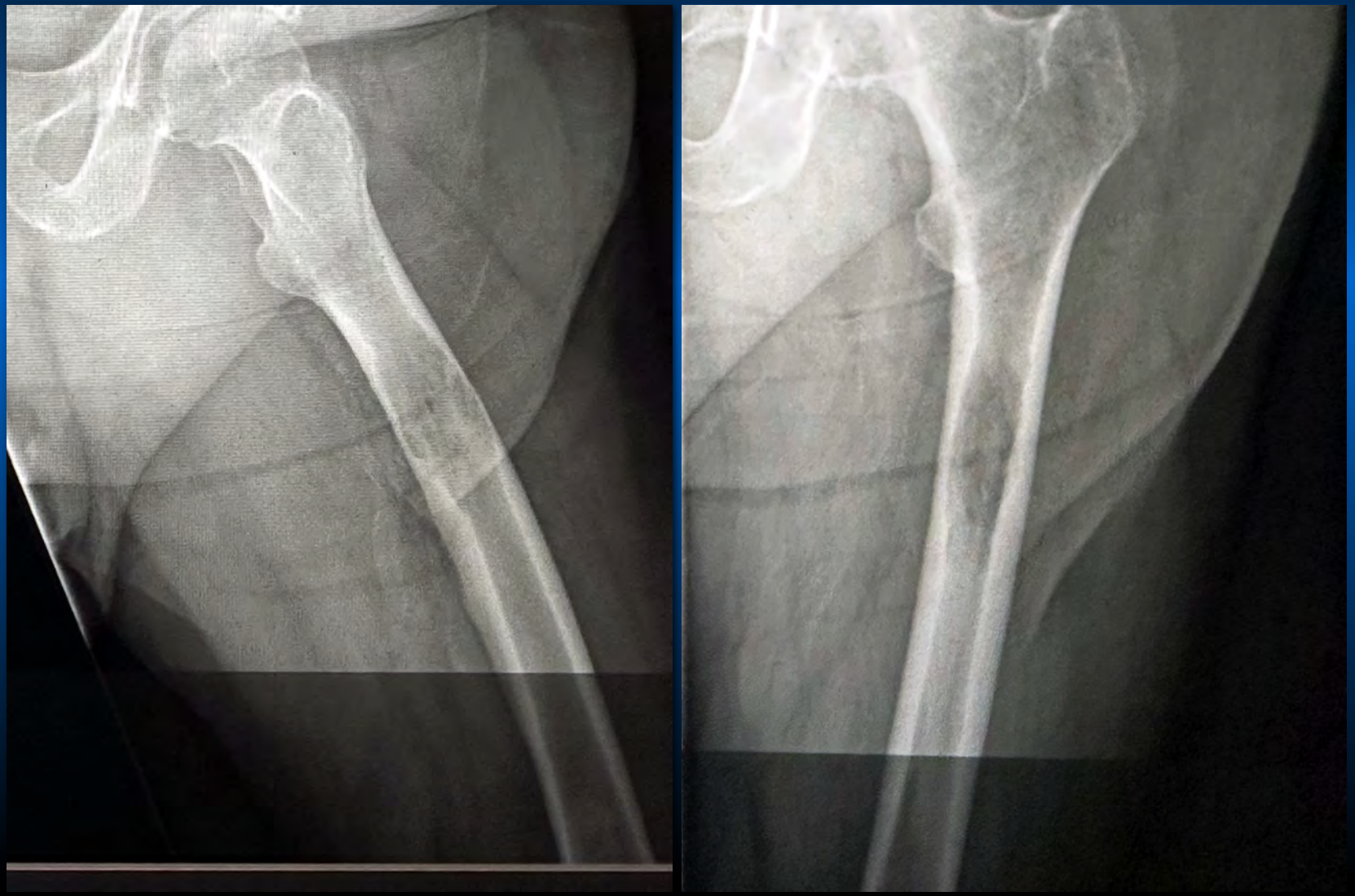
14 YO Female, 3 weeks leg pain, no injury



DX Osteosarcoma

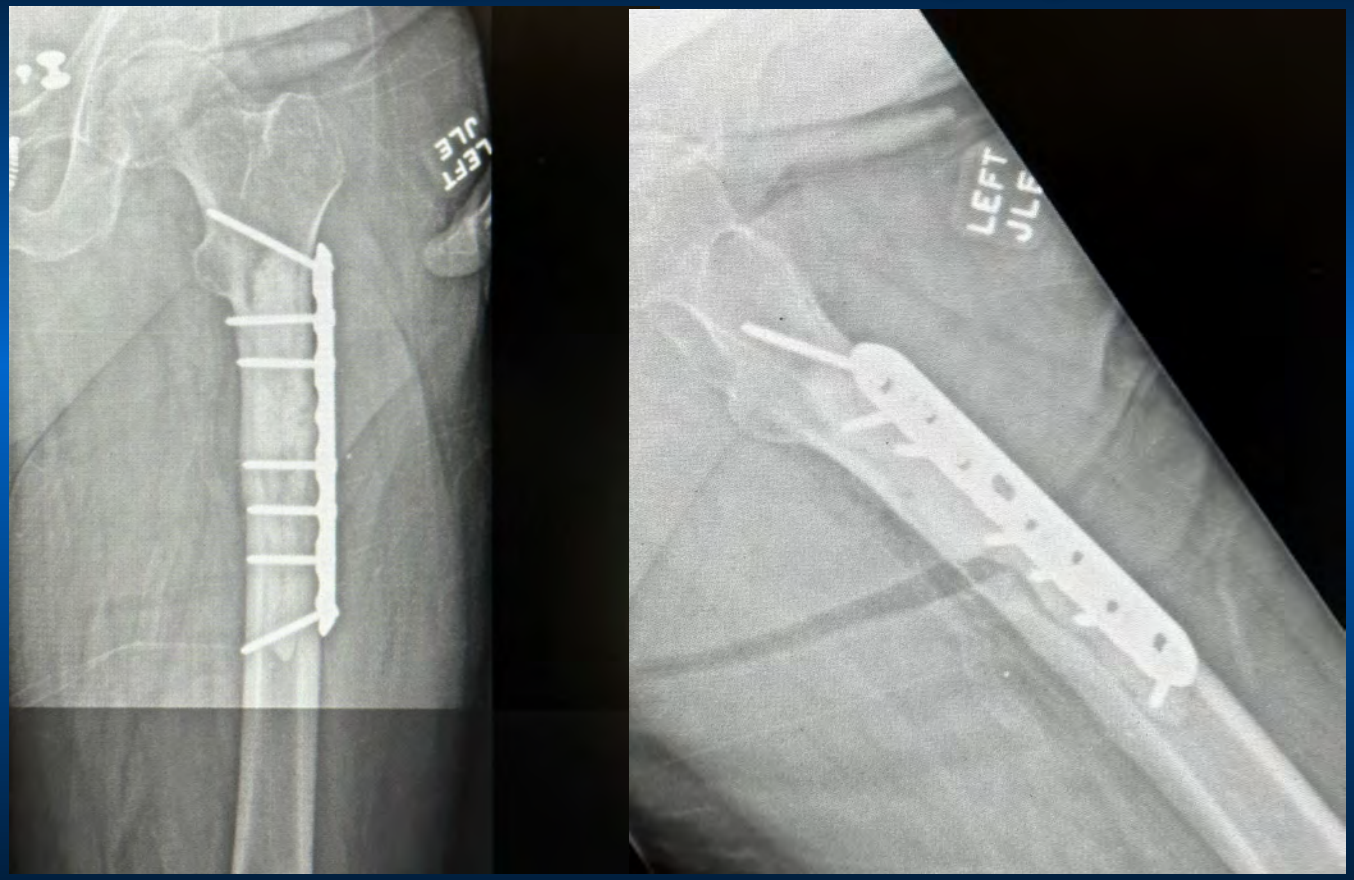
75 YO Male: 2 Month History

Left Thigh Pain. No injury



75 YO Male: 2 Month History

Left Thigh Pain. No injury



- DX Multiple Myeloma on Chemo
- Procedure Biopsy, Cementation, & Plating
- Plasmacytoma

Sideline Assessment of Injuries

To Make the Diagnosis:

Use observation of mechanism, physical exam skills, and talk to the athlete

Intro

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- Presentations
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- Intern Arthroscopy
- James E. Ireland Foundation
- Web Links
- Other Readings and Discussion

Mary Lloyd Ireland M.D.

The End Thank You!

Mary Lloyd Ireland, M.D.

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