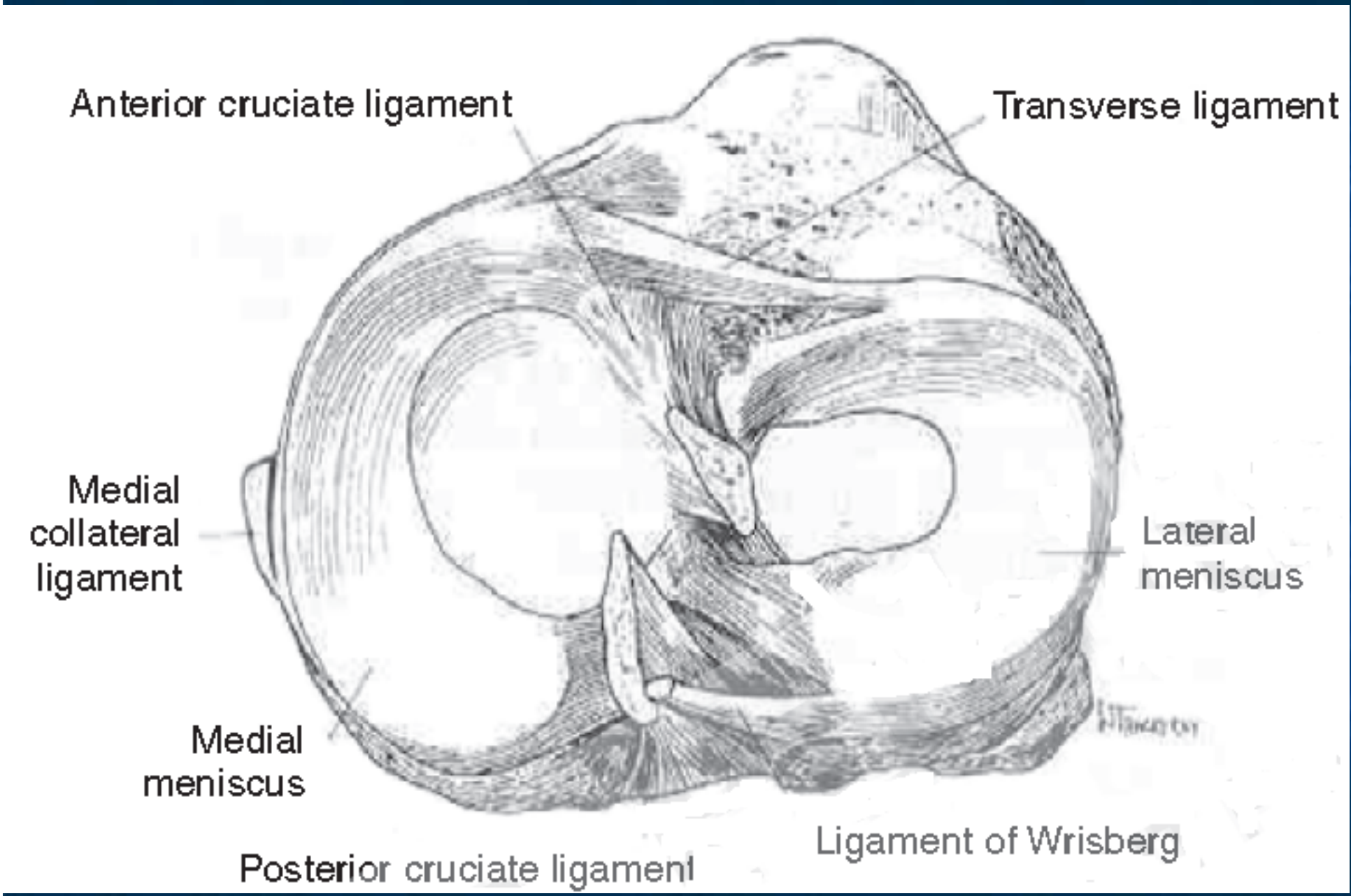
Meniscal Tears and Their Treatment: Should I Refer?

Objectives

- Discuss important teaching points in history, physical and testing leading diagnosis of damaged meniscus
- Understand the short and long term outcomes of meniscectomy
- Discuss the benefits and implications of surgical vs. conservative management of meniscal tear

Epidemiology

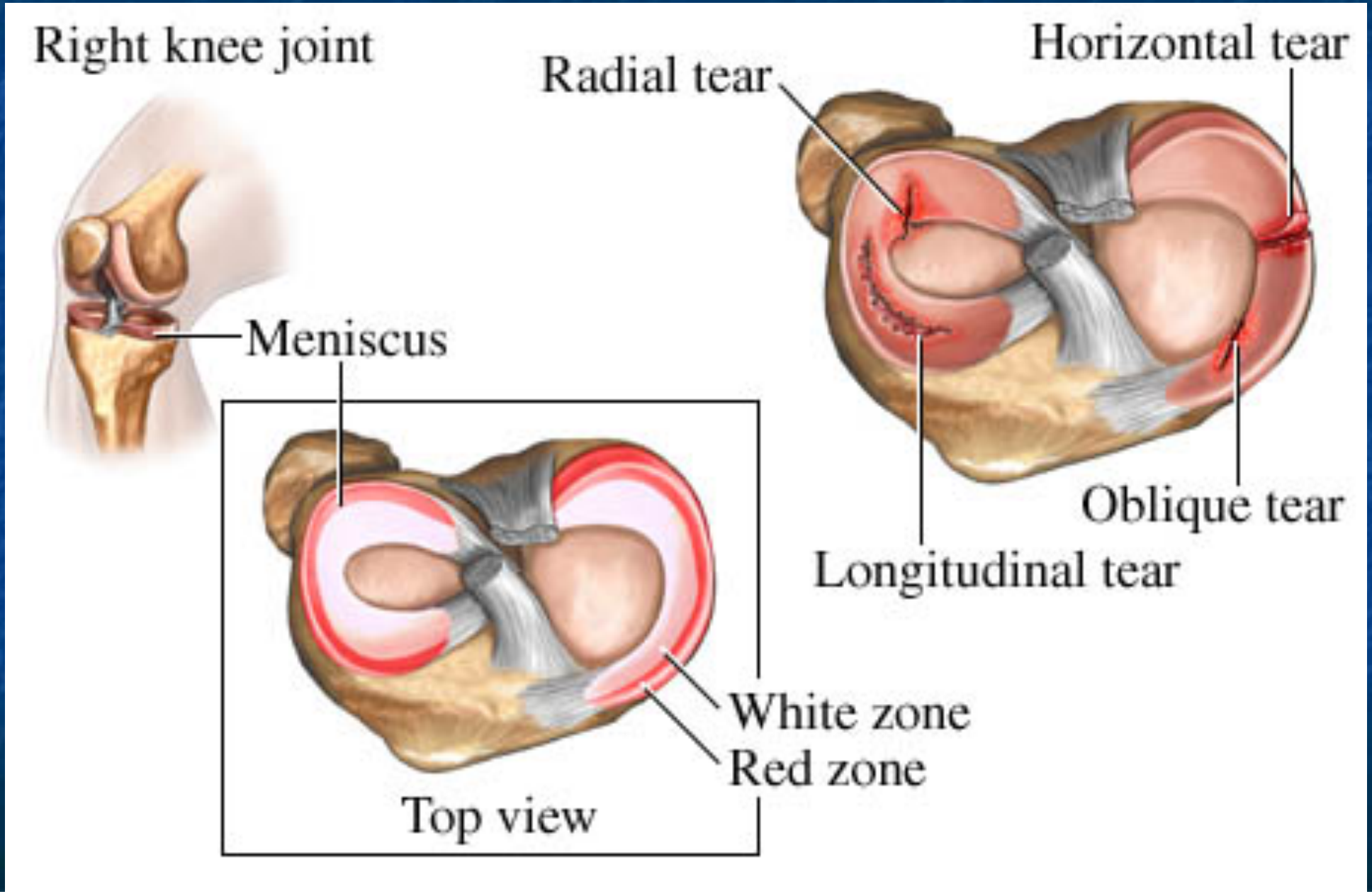
- Overall incidence unknown, but surgical incidence is 60-70 per 100,000 per year
- Most common orthopedic surgical procedure
- 1/3 of meniscal tears are sports-related (most of the rest from MVAs)
- 1/3 of meniscal tears associated with ACL injury


Anterior cruciate ligament
Transverse ligament
Medial collateral ligament
Lateral meniscus
Medial meniscus
Ligament of Wrisberg
Posterior cruciate ligament

Structure of the Meniscus

- Medial is semicircular
  - Moves 2-5 mm through full ROM
  - Lack of motion may promote tears
  - Fibers from the deep medial collateral
  - Covers 60% of articular cartilage
- Lateral almost a complete circle
  - Moves ~1 cm through full ROM
- Both made of fibrocartilage
  - 75% circumferential type 1 collagen fibers
  - 25% radial fibers
  - Covers 75% of articular cartilage

Tears and Zones



Structure of the Menisci

- Vascular supply good in the most peripheral 20% of the fibers
  - Supplied by the geniculate arteries
- Inner 1/3 of the ring is avascular
  - Relatively thin
  - Nourished through synovial fluid
- Middle 1/3 of the ring is combination

Function of the Menisci

- Distribute load across the knee joint
  - 2-4x body weight during walking
  - 6-8x body weight during running
- Axial compression is converted to "hoop stress", or circumferential elongation in the meniscus
- Lateral meniscus distributes more load than medial meniscus, which contributes to greater degeneration if disrupted
- Menisci deepen the socket of the tibial plateau, contributing to stability

Function of the Menisci

- Wedge shape limits translation of femur on tibial plateau
- Menisci forced posteriorly in flexion, anteriorly in extension of the knee
- Menisci reduce stresses on the ACL
- Menisci force synovial fluid into articular cartilage (helping to nourish the white zone) during compression.

Pathophysiology

- In acute knee injuries with ACL intact, medial meniscal injury is 5 times more likely than lateral
- In acute knee injuries with ACL ruptured, lateral meniscus more likely to be involved
- In repetitive deep squatting, medial meniscus most likely to be injured (20:1)
- In patients with arthritis in the knee, tears are present in the majority

History: the Key to Diagnosis

- Twisting on planted foot
  - Inertial forces or external forces
- Acute effusion in acute injury
- Waxing and waning course with pain and effusion intermittently in chronic injury
- Locking or popping of knee, especially if followed by effusion
- However…

Meniscal Tears in Arthritis

- In a random sample of 1000 people over age 50:
  - Meniscal tears seen in 35% of sample group
  - Just as common in asymptomatic as symptomatic groups in those with OA on Xray
  - Became more common in older pts in study
  - Twice as common in medial as lateral meniscus
  - Slightly more common in overweight

Physical Exam

Finding/Test	Sensitivity	Specificity
Joint Line Tenderness	71%	27%
McMurray	58.5% } 80%	93.4% } 95%
Apley	58%	80%
Thessaly 5º Thessaly 20º	66%Me, 81%La 89%Me, 92%La	96%Me, 91%La 97%Me, 96%La
MRI	75-87%	87-93%

*

*This test has undergone only one external validation study, but passed

Thessaly Test?

- Done with pt standing, first on normal leg
- Flex knee 5 degrees, rotate body on fixed leg back and forth 3 times, holding examiner's hands for stability
- Flex further to 20 degrees and repeat
- Repeat on affected leg
- Positive is pain at joint line or feeling of locking or catching
- Validation results: 98% specific, 90% sensitive, PPV 98%, NPV 86%, and accuracy 89%

Value of MRI as Diagnostic Tool

- Studies do NOT prove it superior to composite clinical exam
- Many false positives appear
- MRI has high NEGATIVE predictive value
- Sensitivity and specificity keep getting better as technology improves
- How will MRI result change treatment?
  - No surgeon would touch a knee without one
  - Helps with planning procedure

What About Ultrasound?

- Compared to MRI, sensitivity of U/S = 85%
- Compared to MRI, specificity of U/S = 85%
- Compared to MRI, accuracy of U/S = 85%
- Compared to MRI, pos predictive value of U/S = 76%
- Compared to MRI, neg predictive value of U/S = 92%

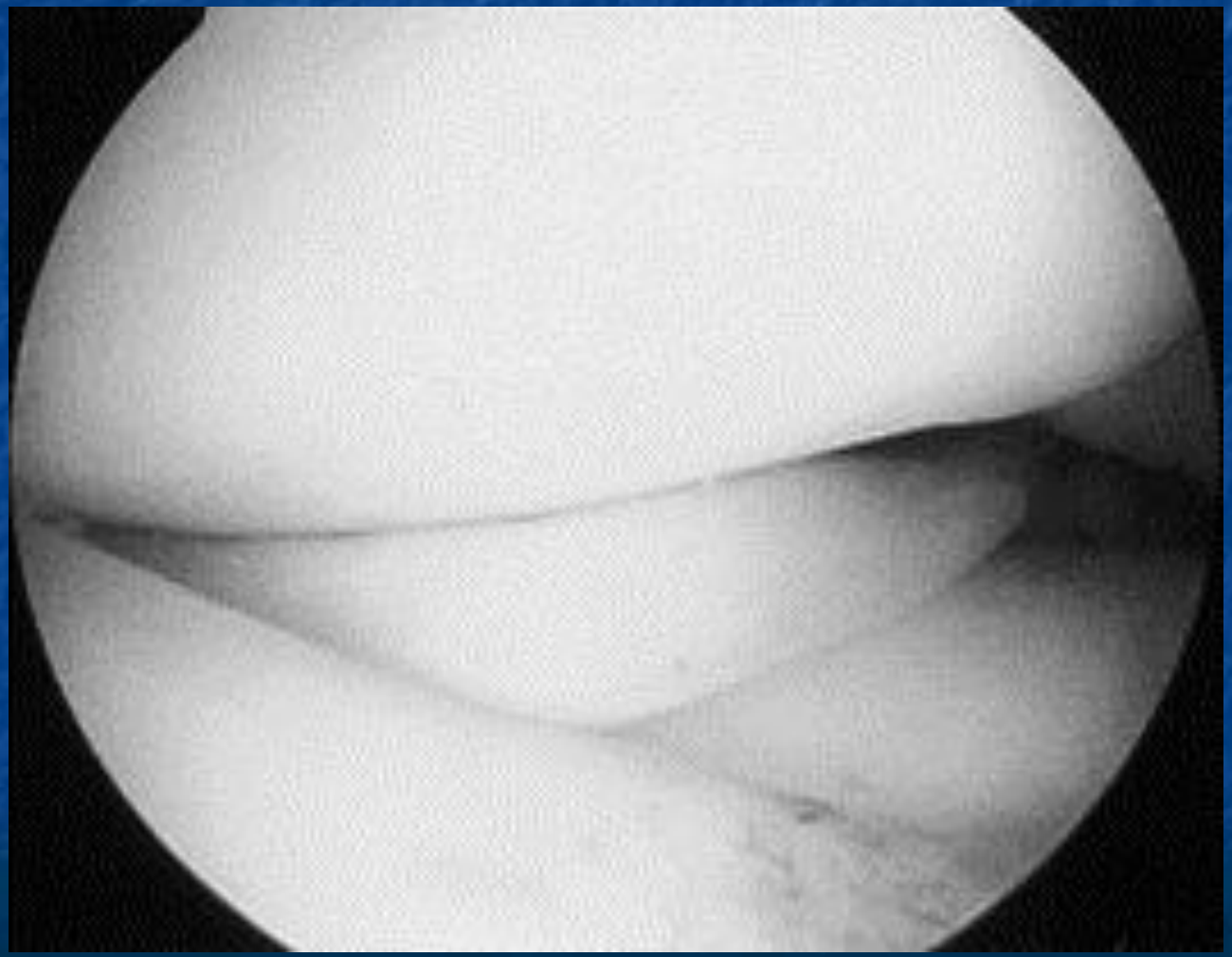
Treatment Options

- Total meniscectomy
- Partial meniscectomy
- Meniscal repair
  - Inside out
  - Outside in
  - All inside
- Conservative (No operative intervention)

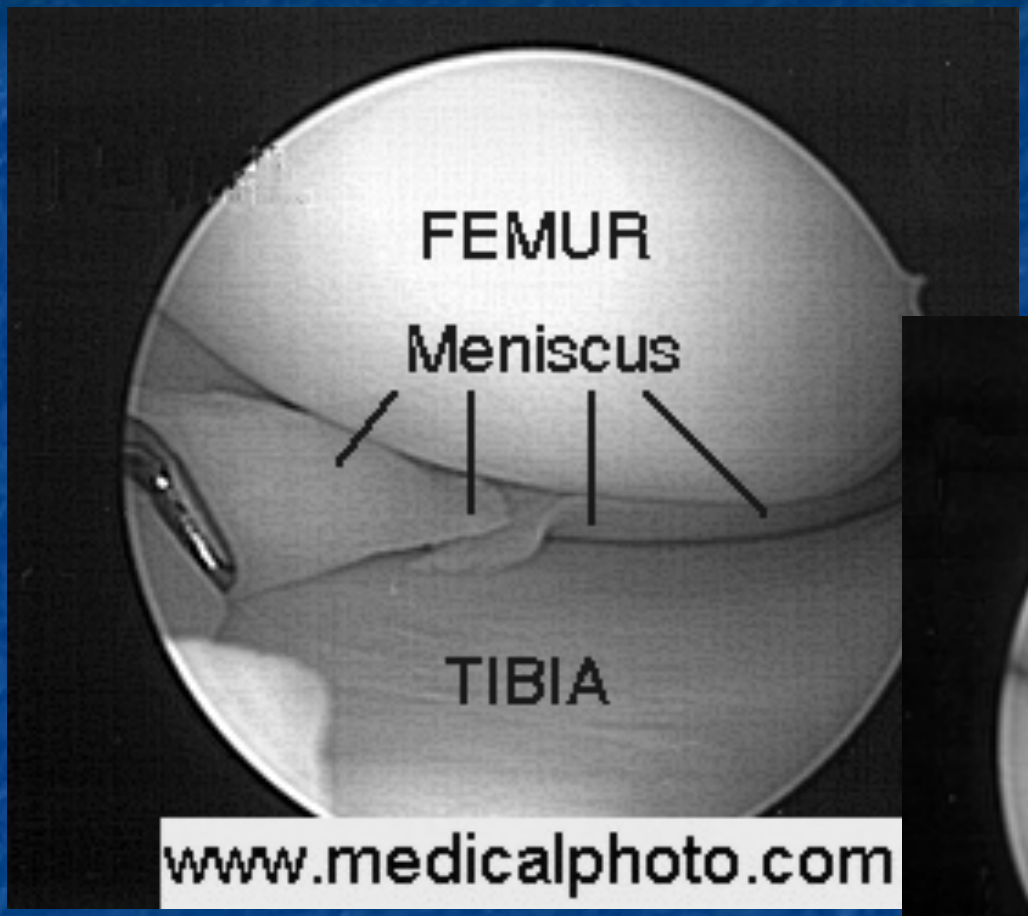
Consequences of Meniscectomy

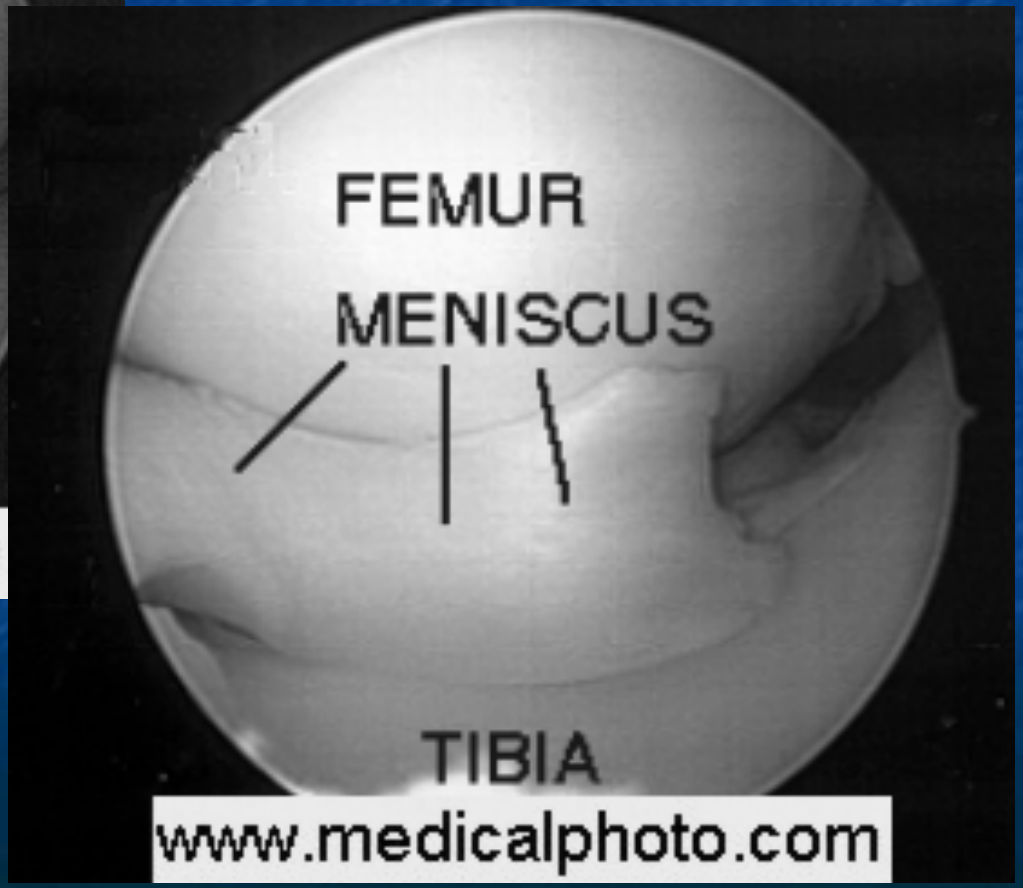
- As early as 1948 Fairbanks noted increased osteophyte formation and femoral cartilage deterioration in meniscectomized knees
- Total meniscectomy remained a common procedure until the 1980's
- In medial meniscectomy, load bearing surfaces are halved, doubling stress on tibial plateau
- If 15-30% of meniscus is removed, forces between tibia and femur increase up to 350%

Bucket Handle Tear



Oblique Tear





Criteria for Meniscal Repair vs. Partial Meniscectomy

Criterion	Repair	Ptl. Meniscectomy
Distance from rim	<3mm	>3mm
Mobility of fragment	Stable	Mobile
Age of injury	Recent	Old
Ret. To Play	Later	Sooner
Age of patient	Younger	Older

Partial Meniscectomy

- Done when tear involves interior 70%
- May be done when athlete wants to resume activity ASAP
- Done with mobile fragments
- 10-35 minute arthroscopic procedure under regional or general anesthetic
  - Mobile areas removed
  - Edges contoured to “prevent further tears”
- Immediate partial weight bearing allowed
- Crutches for 1-2 days

Partial Meniscectomy

- Sedentary workers back to work in 1 week
- Laborers back in 2-4 weeks
- Athletes back in 2-6 weeks
- 88% "excellent" results at 15 years*

*Burks RT, Metcalf MW, Metcalf RW; 15 yr f/u of arthroscopic partial meniscectomy; Arthroscopy 1997; 13:673-9.

Meniscus Repair

- Used in longitudinal tears
- Best results in (more vascular) red or pink zones
- Many fixation devices, none better than sutures, though some are faster
- Outside in, inside out, and all inside technique

Meniscus Repair

- Pts must wear brace with pwb for 2 weeks
- Sedentary workers back to work in 1 week
- Laborers back in 6-8 weeks
- Athletes back in 12-16 weeks
- 76% "excellent" results after 10 years*

* Johnson MJ, Lucas GL, Dusek JK, Henning CE. Isolated arthroscopic meniscal repair: a long term outcome study (more than ten years). *Am J Sports Med.* 1999;27:44-49.

Conservative Therapy

- Not an option if knee locked, fragment not reduced
- Symptom relief with post-exercise RICE
- Symptom relief with NSAIDS, immobilization
- Physical therapy focusing on closed chain exercise of quadriceps and hamstrings
- Failure includes recurrent effusion, recurrent locking or pain that interferes with ADLs
- No randomized trials

Conservative Study Result

- Retrospective review of 3612 arthroscopies
- Identified 80 "stable" tears (<3mm movement) for whom nothing was done
- 70 were longitudinal, 10 were radial
- Only 6 needed subsequent surgery, 4 of which had had additional trauma
- 32 patients had "second look" surgery
- 17/22 longitudinal tears, 0/6 radial tears healed completely

Weiss CB, Lundberg M, DeHaven KD, Gillquist J; Non-operative treatment of meniscal tears. JBJS 1989 71-A(6):811-22.

Conservative Study Results

- Yagashita et al. Am J Spts Med 2004 32 (8):1953
- "Stable" tears at ACL reconstruction left to heal and 2nd look removing ACL hardware
- Lateral: 74% healed, 6% incompletely healed, 14% unhealed
- Medial: 56% healed, 6% incompletely healed, 24% unhealed
- Healing rate was "length dependent"

Conservative Study Results

- 32 patients
- 30 lateral and 10 medial meniscal tears along with 25 ACL tears and 7 PCL tears
- Arthroscoped initially with repeat at 3 mo.
- Lateral meniscus: 69% completely healed and 18% incompletely healed
- Medial meniscus: 58% completely healed and 0% incompletely healed

Ihara H, Miwa M, Takayanagi K, Nakayama A.
Clin Orthop Relat Res. 1994 Oct;(307):146-54.

Results Without Surgery (Ihara)

Injury	Results at 2nd Look
Lat Meniscus	69% healed completely, 18% healed partially
Medial Meniscus	58% healed completely 0% healed partially
Ant. Cruc. Ligment	80% healed “satisfactorily”
Post Cruc. Ligament	3/7 (40%) healed “satisfactorily”

Cochrane Review 2002

- No evidence for comparing surgery to no treatment
- Partial is better than total meniscectomy:
  - Less operative time
  - Enhance recovery rate
  - Improved long term stability
- Arthroscopic is better than open meniscectomy
  - Less operative time
  - Quicker recovery post-op
- No long term advantages have been shown

Summary: What We Know

- Meniscus (torn or intact) helps to stabilize and dissipate axial force in the knee
- Meniscectomy contributes to degenerative disease of the knee (Williams, others)
- When meniscal repairs fail, pts often engaging in same activity as initial injury
- Longitudinal tears heal better than radial tears, simple tears better than complex ones
- Peripheral tears (in vascularized area) heal more readily than central tears (Noyes, Krych)

Summary: What We Know

- Meniscal tears are accompanied by ligament tears in the majority of cases
- Ligamentous pathology with meniscal tears makes degenerative changes more likely
- Repairing both meniscus and ligaments (when both injured) improves outcomes (Noyes) Younger pts do better with meniscal repair than older patients (Mintzer)
- Less surgery is better than more surgery
  - Arthroscopy better than open
  - Partial better than complete meniscectomy (Cochrane)

Summary: What We Don't Know

- Is no surgery better than less surgery?
  - Does operating on stable radial tears improve outcomes?
  - How do we tell (without surgery) that conservative treatment is a reasonable option
- Does immobilization help the acute tear?
  - If so, for how long?
- If a repair is undertaken, what timing and type of repair has the best outcomes?
- If no repair is done, should we do a "second look"? When?

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Thank you

_____ is a ____ year old M/F presenting with knee symptoms as follows:

Quality : [pain] [ache] [burning] [other]

Location : [right][left][bilateral], [diffuse][localized] [front (anterior)][back (posterior)][inside (medial)] [outside (lateral)]

Associated signs and symptoms: [swelling] [redness] [warmth] [fever] [rash]

Onset : [04/19/2007] after [ ][at home][at work] while playing [sport]

Course : [improving][stable][worsening]

Radiation : [to thigh] [to hip] [to shin] [to foot]

Severity : [1] [2][3][4][5][6][7][8][9][10] out of 10 at its worst,
and [1] [2][3][4][5][6][7][8][9][10] out of 10 now

Exacerbating Factors: [ ]

Remitting Factors: [ ]

The patient [does][does not] have a history of locking or popping. [think meniscus]

The patient [does][does not] have a history of prior knee injury.

The patient [does][does not] have a history of other musculoskeletal problem.

The patient [does][does not] have a history of weakness or knee giving away. [think quads atrophy, anterior cruciate tear]

The patient [does][does not] have a history of pain with jumping. [think tendonitis]

The patient [does][does not] have a history of pain after rest, needing to keep knee extended. [patellofemoral syndrome]

The patient [does][does not] have a history of effusion immediately after trauma [think internal derangement like AC tear, medial collateral or meniscus]

The patient [does][does not] have a feeling of friction or popping over lateral condyle. [think IT band problem]

Location of Pain/Tenderness

Anterior

- Quads tendinitis/tear
- Bipartite/fx patella
- Prepatellar bursitis
- Infrapatellar tendinitis
- Osgood Schlatter
- Housemaid's knee

Medial

- Sprain/rupture MCL
- Medial meniscus tear
- Arthritis
- Pes anserine bursitis
- Pes anserine tendinitis
- Tibial plateau fracture

Location of Pain/Tenderness

Lateral

- Iliotibial band friction
- Torn lateral meniscus
- Arthritis (female, obese)
- Fracture of fibula

Posterior

- Torn medial meniscus
- Bakers cyst
- Arthritis
- Popliteal aneurysm

Generalized

- Arthritis
- Septic joint
- Patellofemoral Syndrome

Observation:

[Valgus deformity][Varus deformity][Recurvatum deformity][no deformity]

The patient [does][does not] have quads atrophy.

The patient [does][does not] have effusion.

The patient [does][does not] have a limp.

The patient [does][does not] have arthritis evidenced by [osteophyte formation][crepitance][reduced ROM][effusion][other joint involvement].

Range of motion is [full.] *limited as follows: [ ] degrees extension to [ ] degrees flexion.*

Palpation:

Tenderness of: [tibial tubercle][inf. pole of patella][med. joint line][lat. joint line][med. collateral ligament][lat. collateral ligament][lat. femoral condyle][pes anserine insertion/ bursa].

No tenderness of: [tibial tubercle][inf. pole of patella][med. joint line][lat. joint line][med. collateral ligament][lat. collateral ligament][lat. femoral condyle][pes anserine insertion/ bursa].

There [is][is no] tenderness with patellar motion.

Provocative Testing:

Lachman test is [positive][negative]. [think ACL]

Drawer test is [positive][negative]. [think ACL]

Medial collateral or valgus stress test is [positive][negative].

Lateral collateral or varus stress test is [positive][negative].

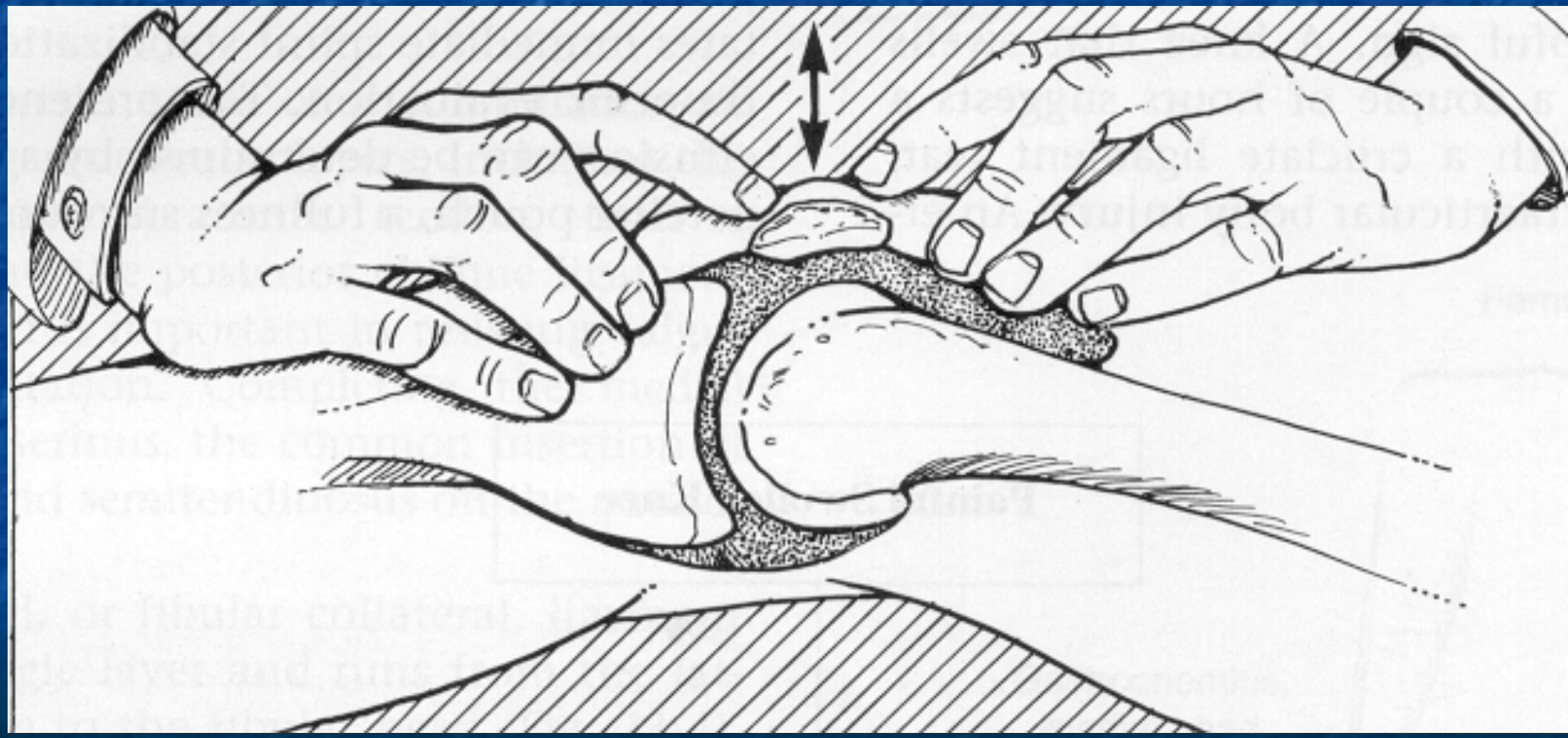
Apley test is [positive][negative]. [think meniscus tear]

McMurray test is [positive][negative]. [think meniscus tear]

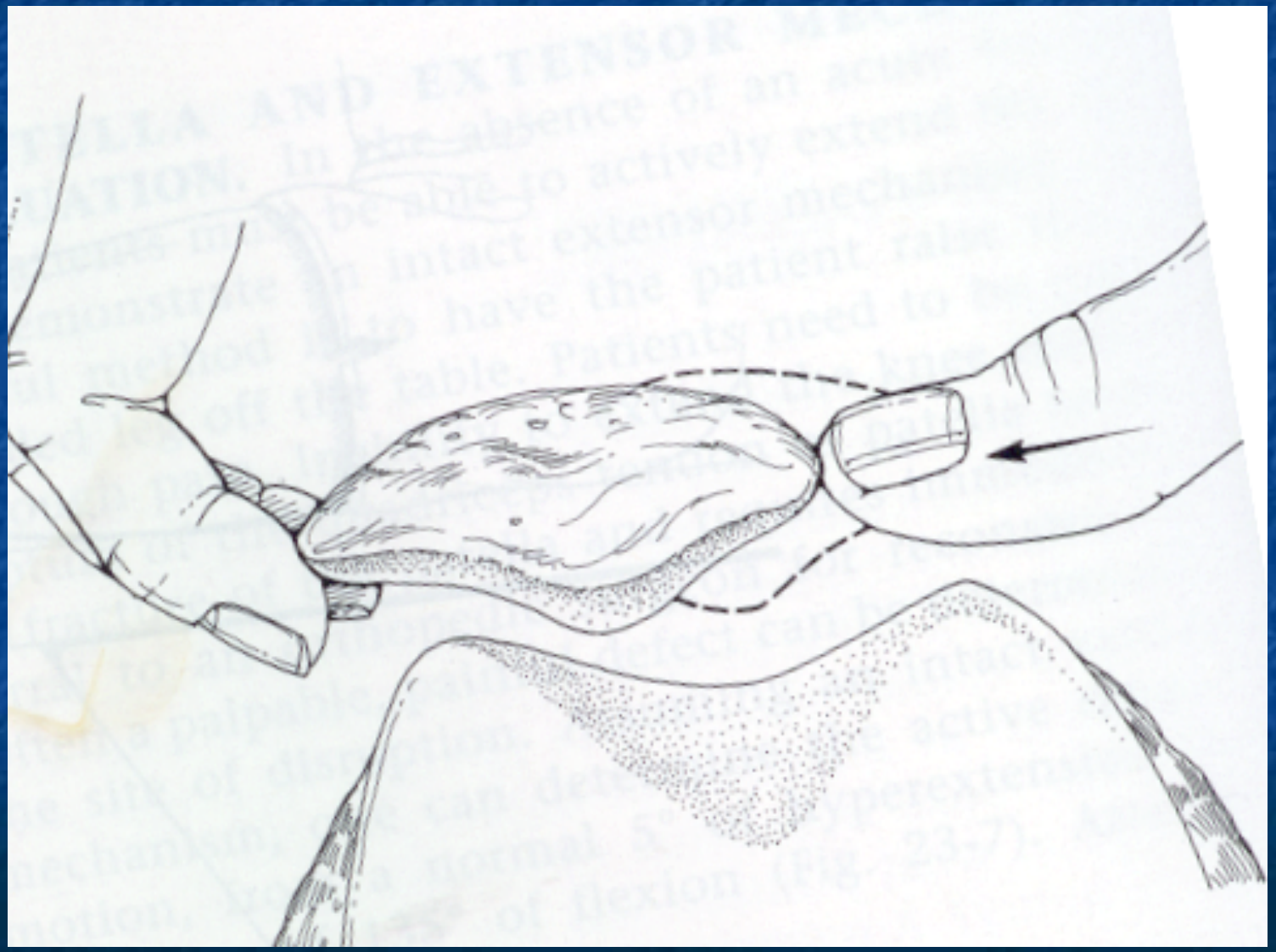
Ober test is [positive][negative]. [think ileotibial band]

Patellar ballotment is [positive][negative] for effusion.

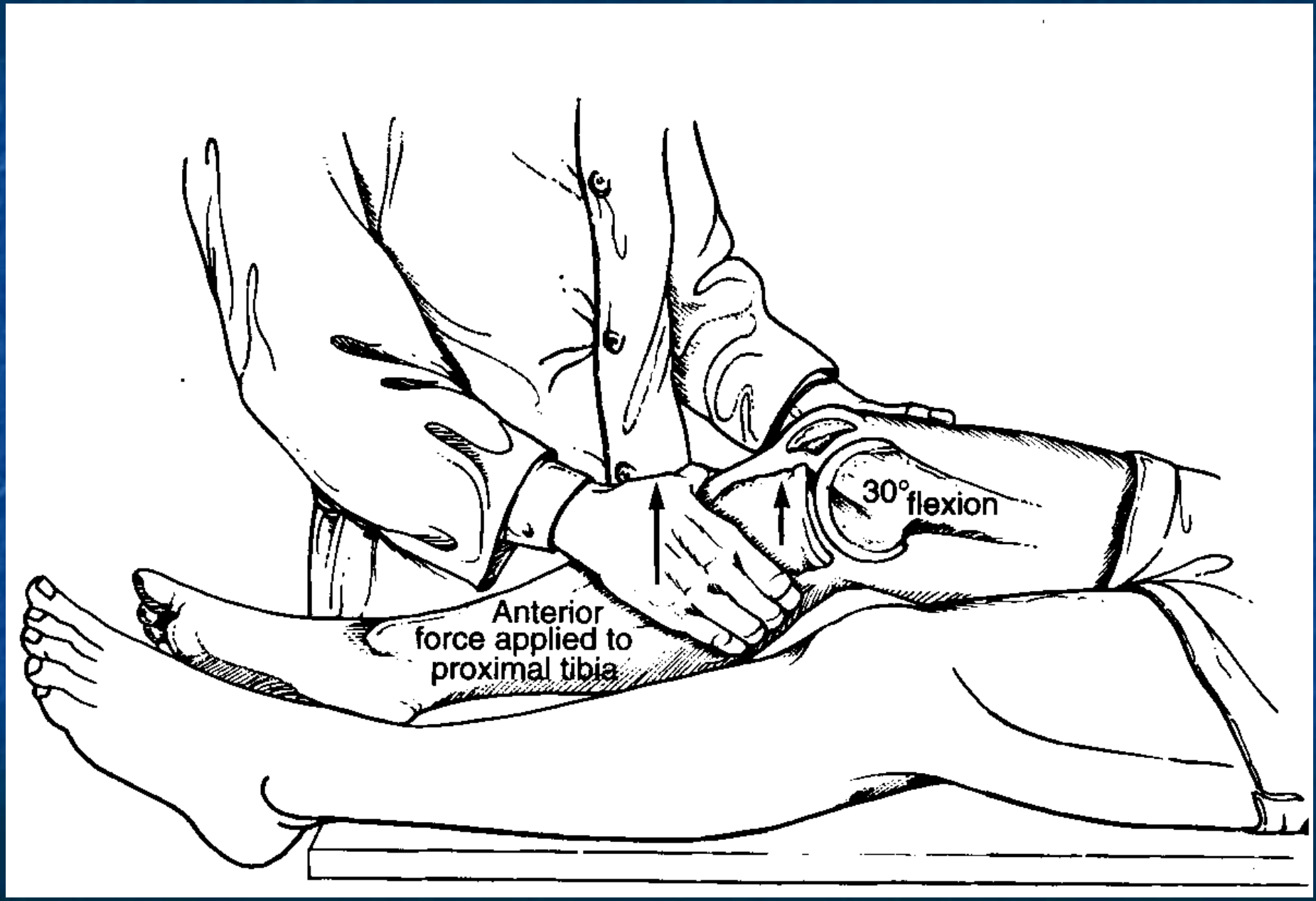
Is there effusion?



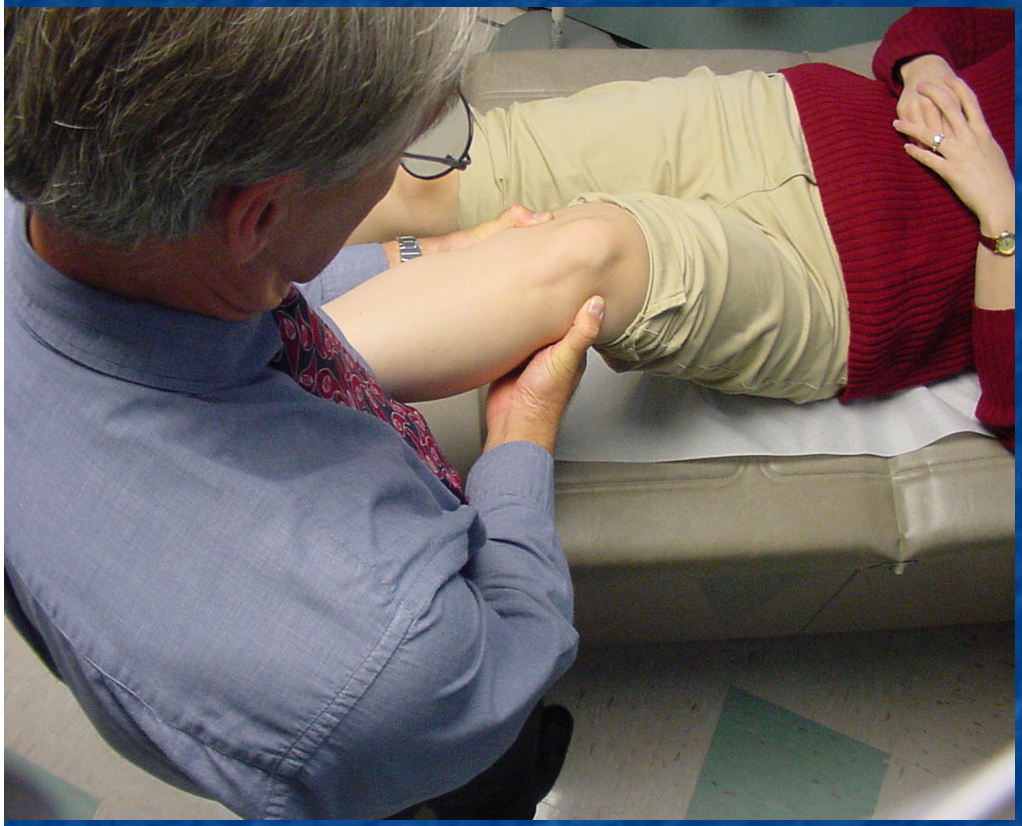
Patellar Palpation/Tilt/ Apprehension

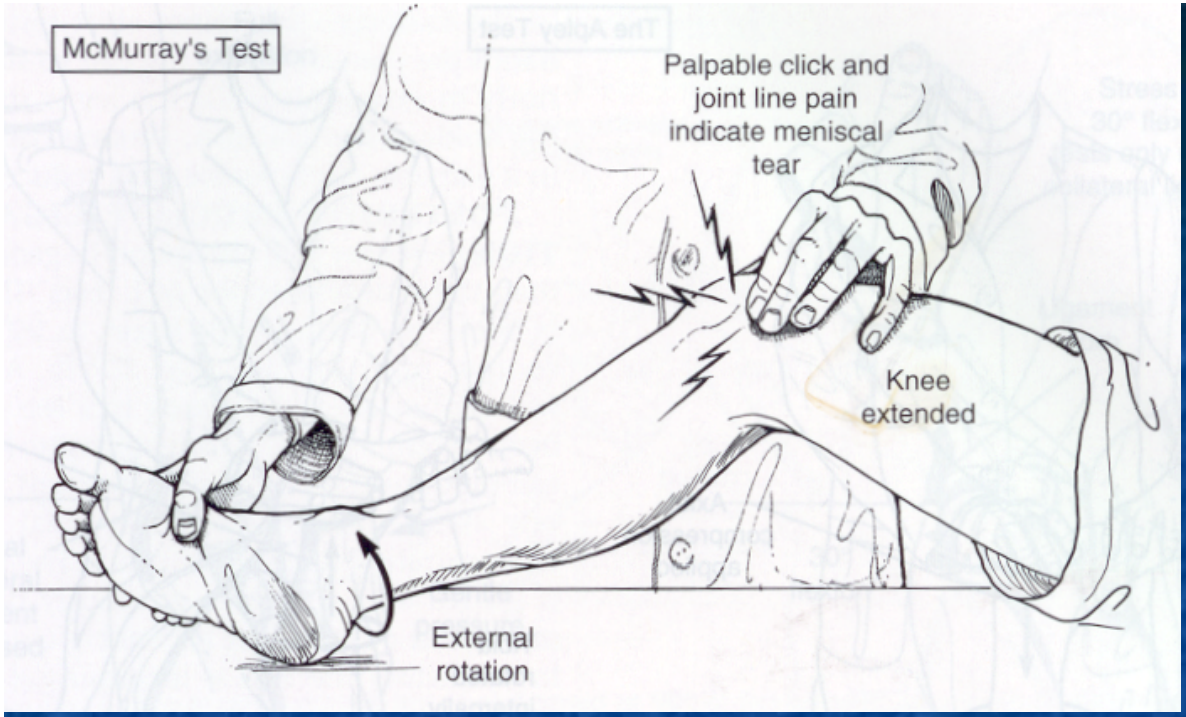


Lachman

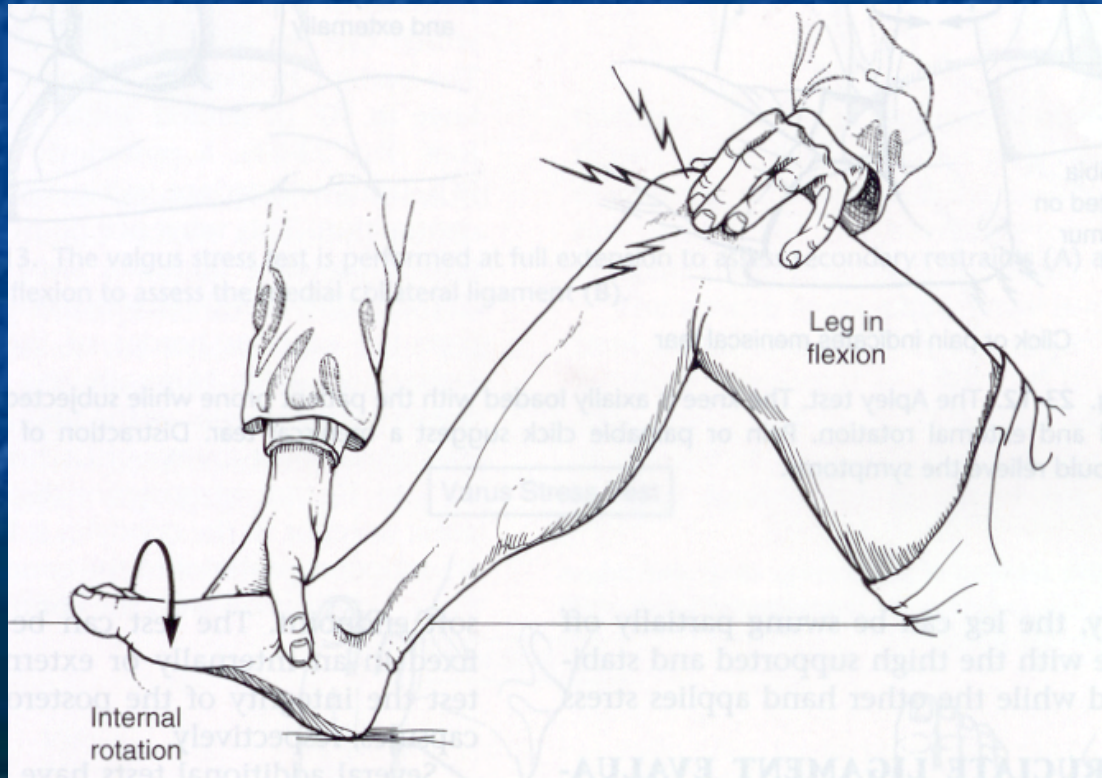


Valgus/Varus Stress

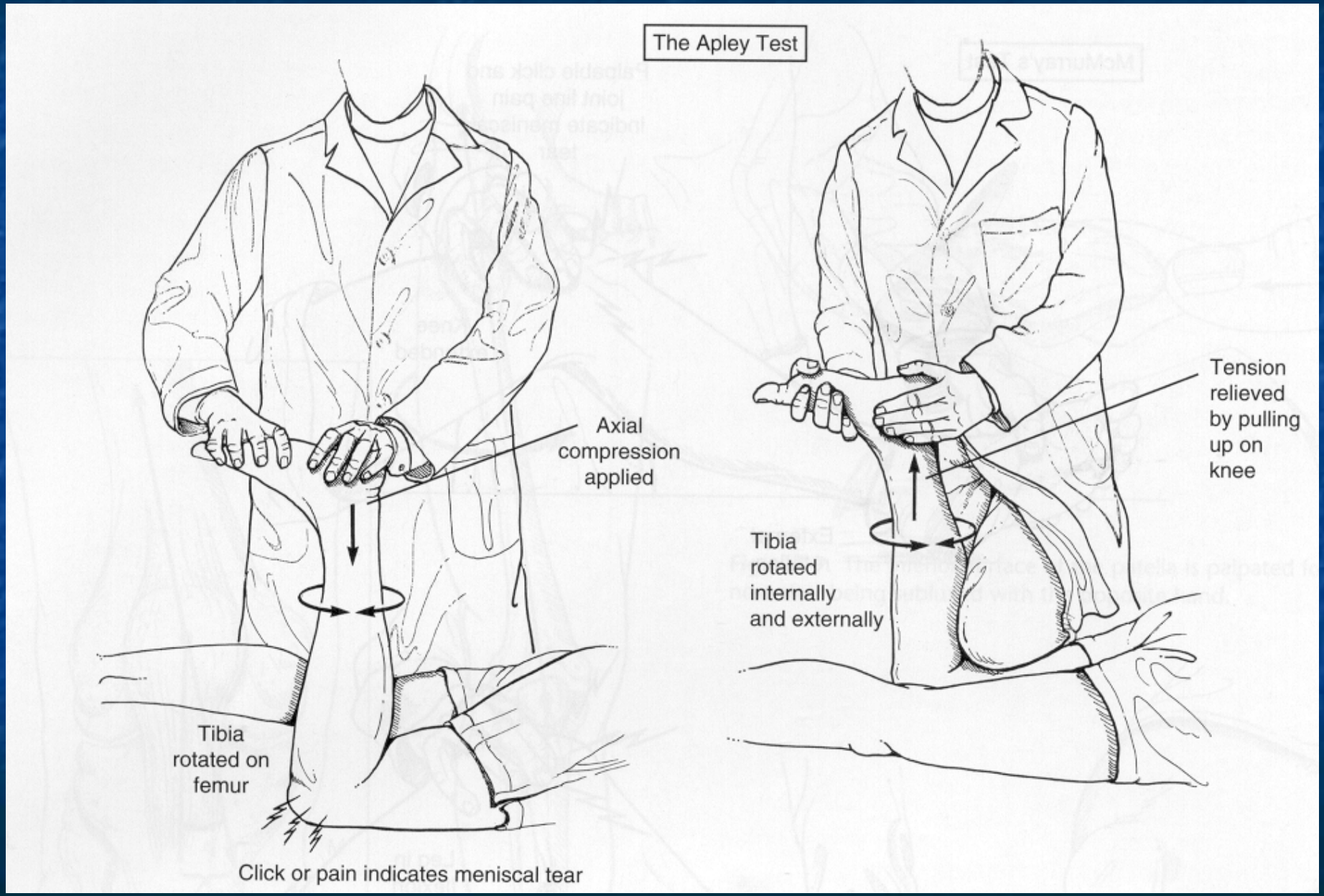




McMurray's Test



Apley's Test


The Apley Test
Axial compression applied
Tibia rotated on femur
Click or pain indicates meniscal tear
Tension relieved by pulling up on knee
Tibia rotated internally and externally

Ober Test