Evaluation of the Patient with Knee Pain

Robert Sallis, MD, FAAFP, FACSM

Partner Emeritus; Kaiser Permanente

Clinical Professor of Family Medicine

Kaiser Permanente Bernard J. Tyson

School of Medicine

Chief Medical Officer; Los Angeles Football Club

Lead Team Physician; Los Angeles Clippers

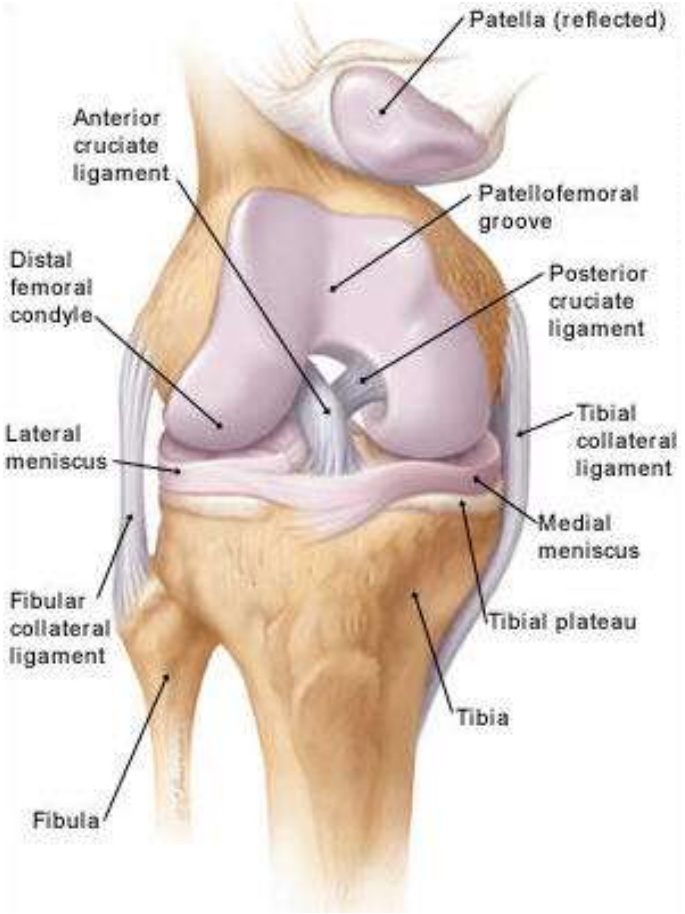
Introduction

- Knee problems are extremely common in primary care
- Injury can result from acute trauma or chronic overuse
- They often present diagnostic challenge requiring a skilled history and physical exam for proper assessment



The Knee

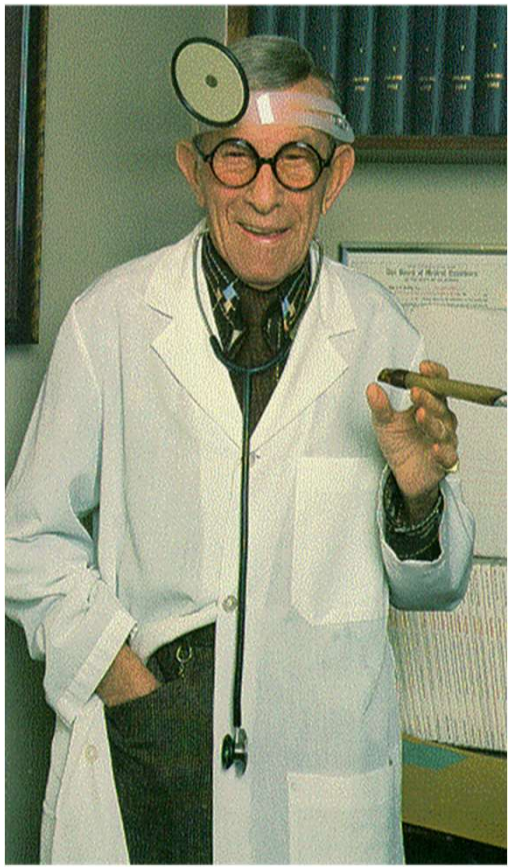
- Largest joint in the body
- Hinged joint with 2 articular surfaces
  - Tibiofemoral joint.
  - Patellofemoral joint.
- 4 Ligaments stabilize
  - ACL and PCL
  - MCL and LCL
- 2 menisci absorb shock and transmit loads



Common Causes of Knee Pain by Age

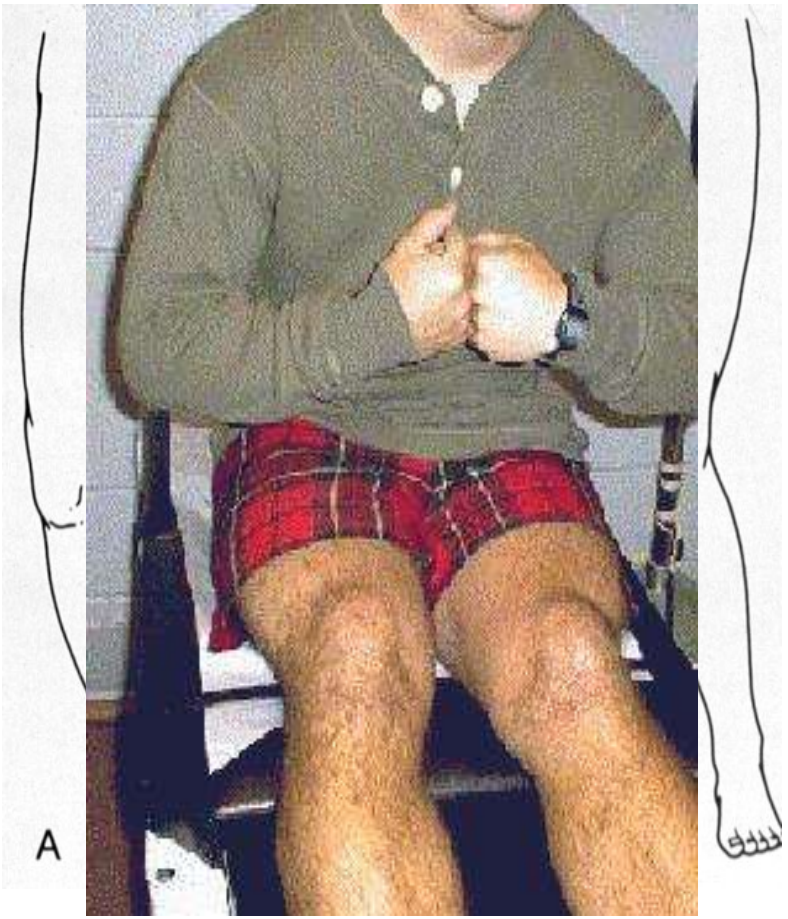
- Children and Adolescents:
  - Osgood Schlatter's; Sinding-Larsen (apophysitis)
  - Patella subluxation; Patellofemoral dysfunction
  - Referred pain (Hip; SCFE/Perthes); OCD
- Adults:
  - PFD, Patella tendonitis, Bursitis
  - Ligament sprains and tears (MCL, ACL); acute meniscal tears
- Older Adults:
  - OA; Crystal arthropathy (gout, pseudo)
  - Degenerative meniscal tears, Baker's cyst

History Questions



What Was the Mechanism of Injury?

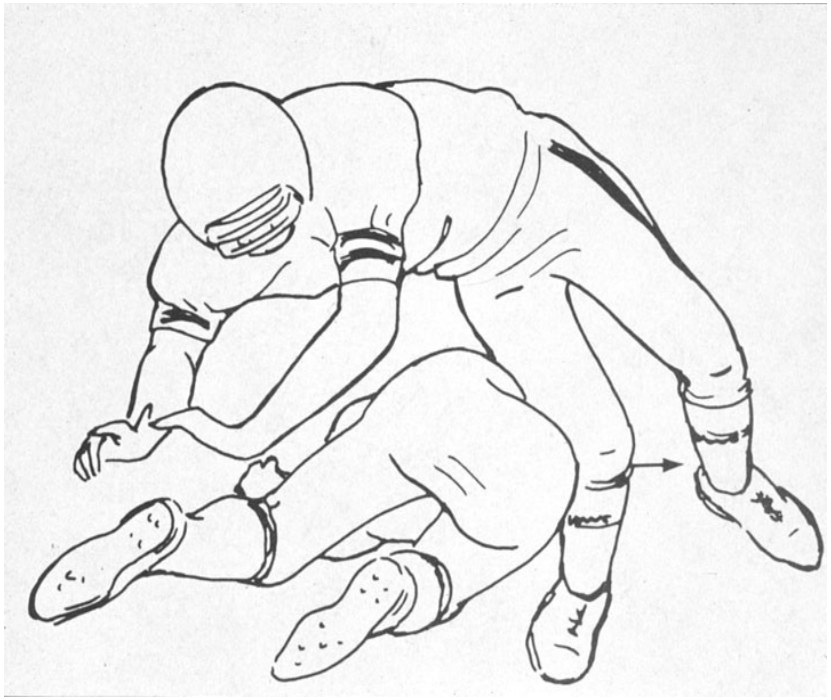
- Picture forces applied to knee
- Most common causing injury are varus, valgus, AP, PA, twist, or hyperextension
- *"Two fist sign"* – patient describes injury by twisting opposing fists; Suggests ACL injury



Mechanism of Injury - MCL

- Planted knee hit from lateral side creating a valgus stress





Mechanism of Injury - ACL

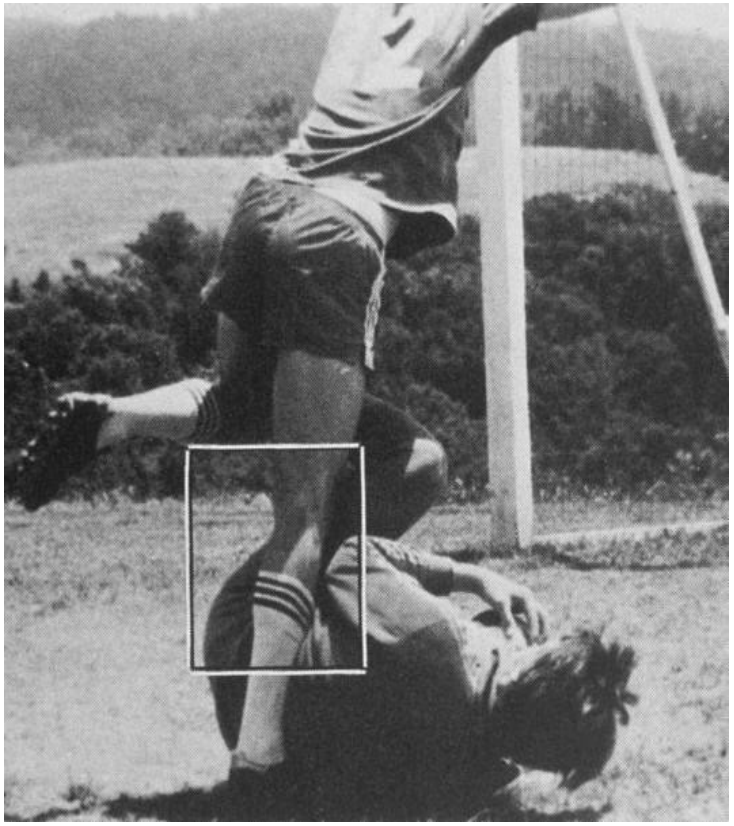


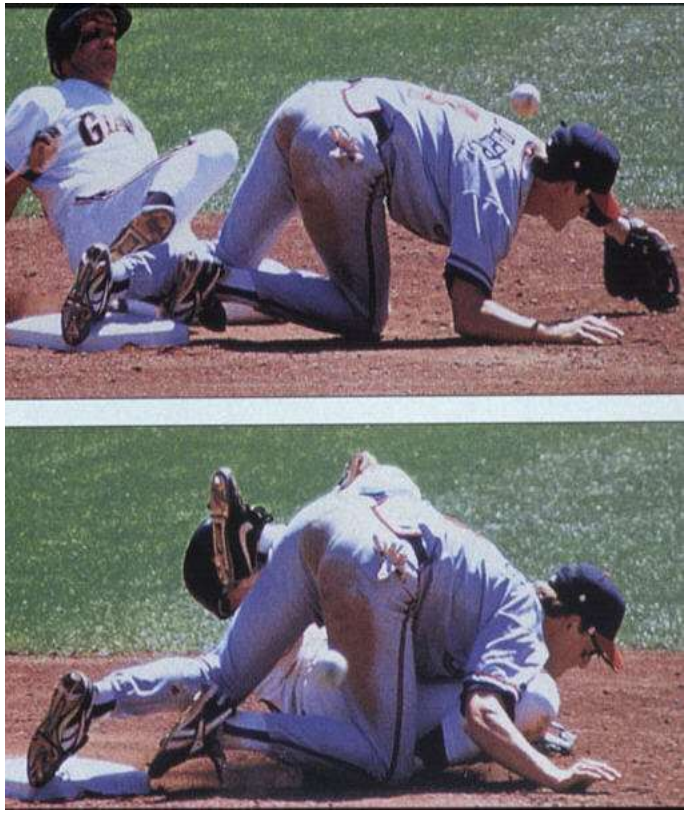
Anterior Force



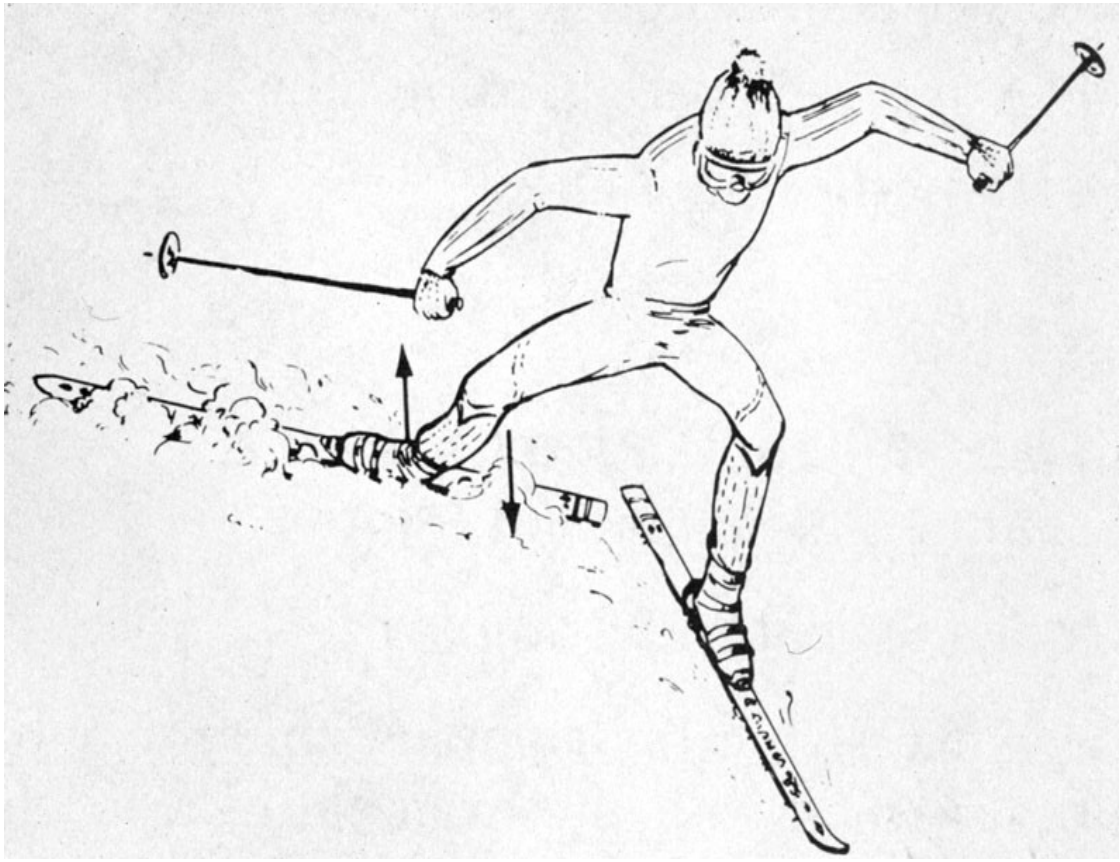
Twisting Force

Mechanism of Injury - PCL





Mechanism of Injury – “Unhappy Triad” (External rotation and valgus)



Severe Hyperextension Injury



Severe Valgus Trauma



132 Patiets With Acute Knee Injury and Hemearthrosis: All Had Arthroscopy

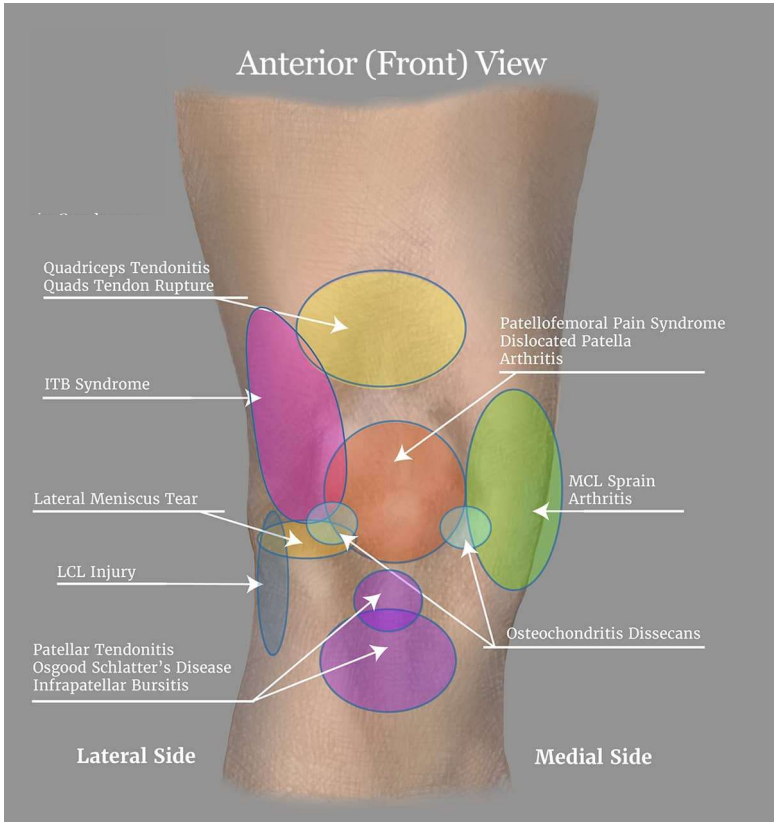
- 101 (77%) had ACL tears
- 17 (13%) had meniscal tears
- 11 (8%) had osteochondral fractures
- Only 2 knees (1.5%) showed no abnormality



Hardaker, Southern Med J; 1990

Where Is the Pain Located?

- Medial – MCL, meniscus, Pes anserine
- Lateral – meniscus, IT band, LCL, Poster lateral corner
- Front – patella, ACL (deep), patellar tendon, quad tendon
- Back – hamstring tendon, PCL, Baker's cyst



Were They Able to Continue Activity?

- Unlikely to continue if serious ligament or cartilage injury
- ACL may try but invariably stop because knee feels unstable
- MCL feels fine going straight ahead but hurts to run laterally



How Long Until Swelling Occurred?

- 0-12 hours – suspect ACL tear, patellar dislocation
- 12-24 hours – suspect meniscus tear
- Recurring – suspect chronic or degenerative meniscus tear, or OA
- Rapid swelling (within 24 hrs) almost always blood



What Treatments Were Used?

- If RICE was used and knee still swollen and sore, then significant injury is more likely
- If ROM and PT exercises have been done and knee still stiff or atrophied, then significant injury is more likely



Any Mechanical Symptoms Occurring Since the Injury?

- These include locking, give-way or swelling
- Locking is inability to extend knee
- These symptoms suggest meniscus tear



Any History of Prior Knee Problems?

- Patella dislocation is at risk to recur
- Healed or repaired meniscus tear is at risk for re-injury
- Natural history of ACL-deficient knee is to develop meniscus tear, followed by early OA (although more recent studies do not show this)



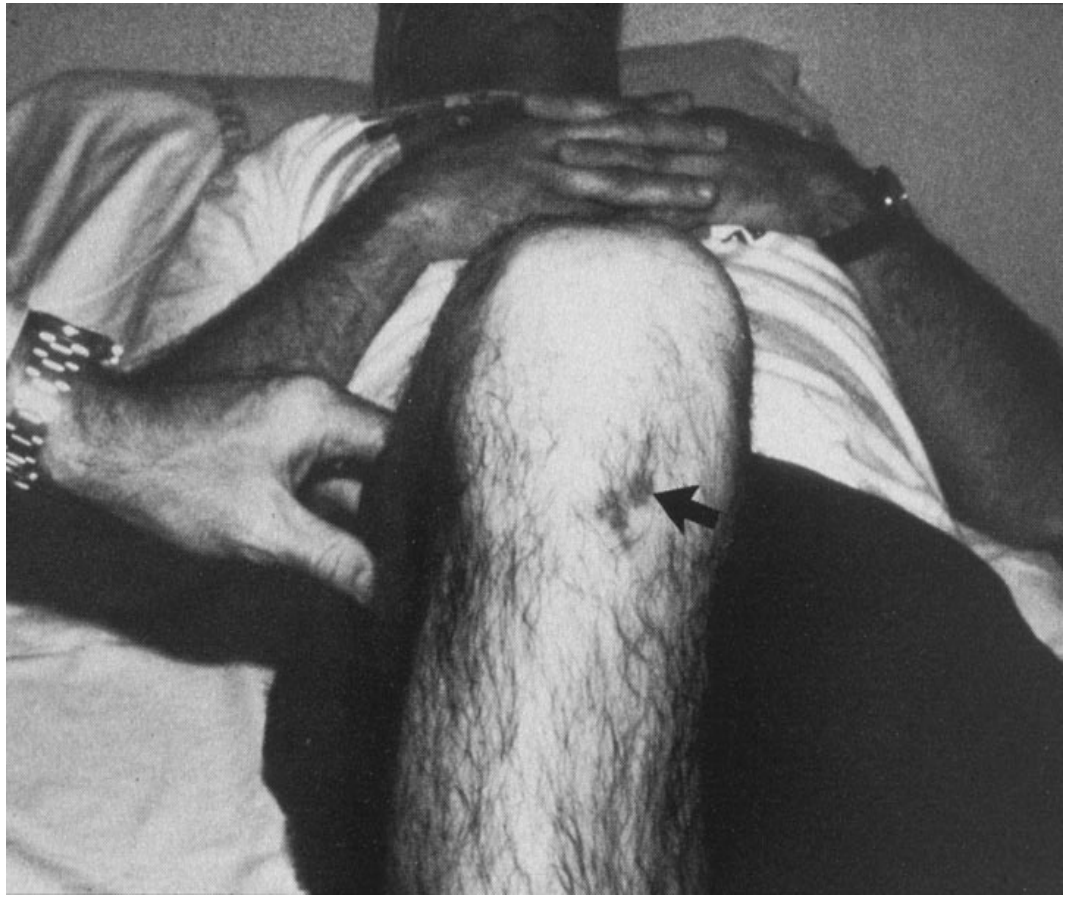
Physical Exam
Should Include:

- Inspection
- Palpation
- Range-of-motion
- Ligament testing
- Meniscal tests
- Patella tests



Inspection

- Swelling – is it in front of (pre-patella bursa) or behind (knee joint) the kneecap?
- Quad atrophy – suspect significant internal derangement
- *Ecchymosis* – suggests bleeding from trauma or tear



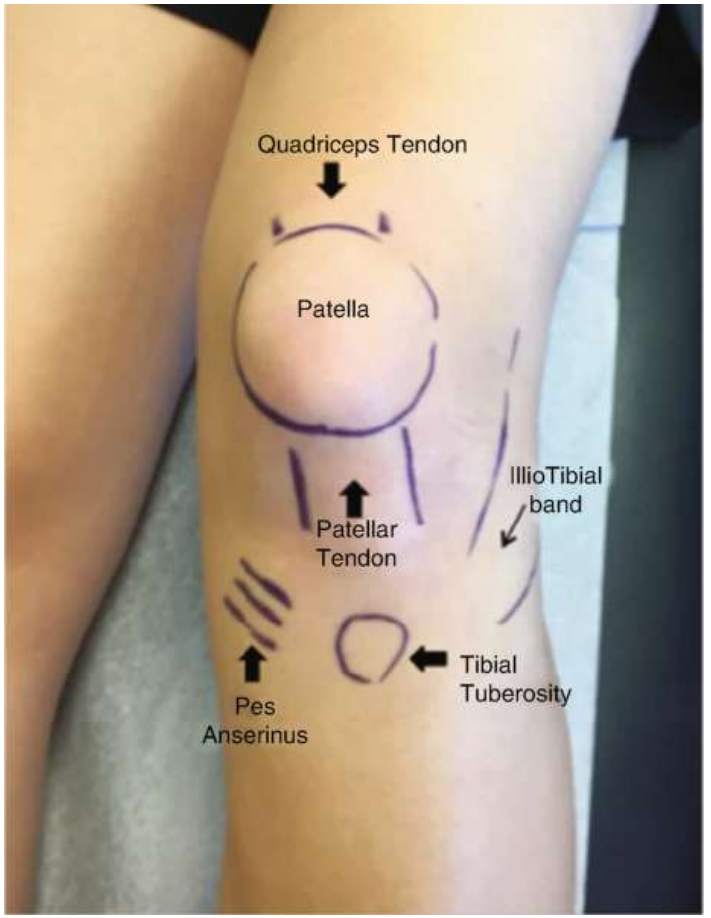
Effusion (Swelling in Knee Joint)
Graded 0 – 3+

- 0 (no effusion) – normal
- 1+ (trace) – think OA, old meniscus tear
- 2+ (moderate) – think meniscus tear, PCL tear
- 3+ (large) – think ACL tear, patella dislocation



Tenderness to Palpation

- Tibial tubercle – Osgood Schlatter's
- Patella tendon – tendonitis
- Patella (around and under) – PFD, bursitis, chondral injury, Sinding-Larsen disease)
- Joint line (medial/lateral and AP) – meniscal tear
- Medial side – MCL, Pes anserine
- Lateral side – IT band, LCL



Range of Motion

- Flexion (130 °) – limited by joint effusion or quadriceps tightness
- Extension (0 °) – lack suggests mechanical block (meniscus tear, loose body) or hamstring tightness
- *Prone* knee extension – measure heel height difference to document extension
- *Extensor* mechanism (quad-patella-tibia) – check with active extension





Range of Motion

ROM 0-130^{o}



Prone Knee Extension



Ligament Testing

- MCL – valgus stress
- LCL – varus stress
- ACL – Lachman test, anterior drawer, pivot shift
- PCL – sag sign, posterior drawer



MCL Tests: 3 Grades of Injury

- Test with valgus stress at 0^o and 20^o flexion
- Grade I – pain without laxity
- Grade II – pain with slight laxity (weak end point)
- Grade III – less pain with significant laxity (no good end point)



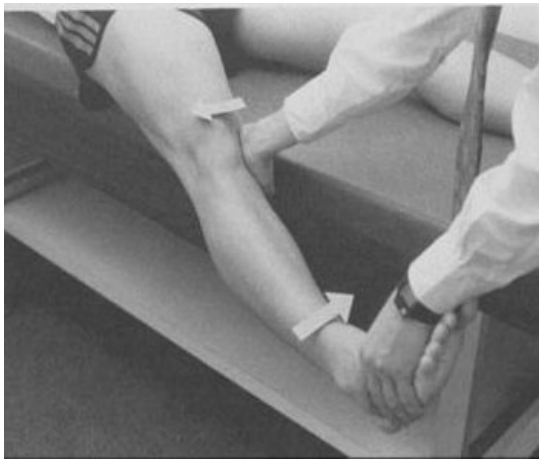


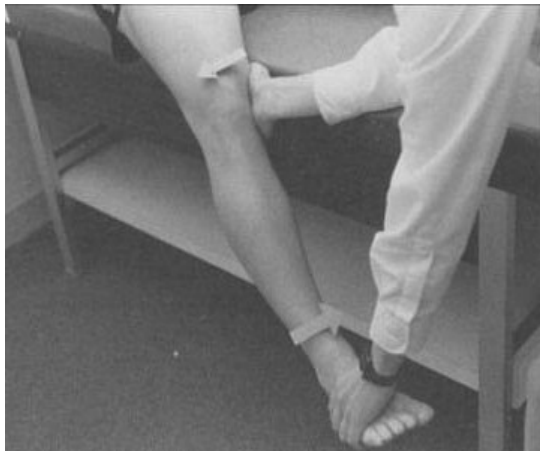
MCL – valgus stress



LCL Tests

- Test with varus stress at 0^{o} and 20^{o} flexion
- Same grading as MCL but seen much less commonly
- If significant laxity, suspect posterolateral corner injury, which may accompany knee dislocation





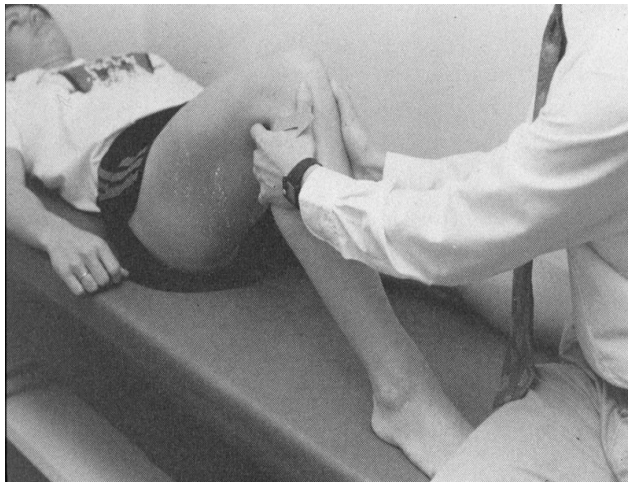
LCL – varus stress



ACL Tests

- Lachman test – done supine with knee in 20^{o} flexion, apply AP force. Definitive test
- Anterior drawer test – done supine with knee in 90^{o} flexion, apply AP force. Limited by collateral ligaments
- Pivot shift – helpful in assessing secondary knee restraints. Positive with very lax knee





Lachman test

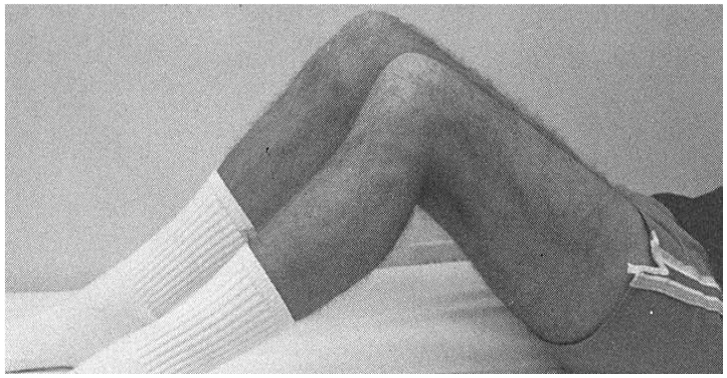


Anterior & Posterior drawer tests



PCL Tests

- Sag sign – done with knee bent to 90^{o} and foot flat on table. Tibia sags posterior
- Posterior drawer – done with knee in 90^{o} flexion, and posterior force applied





Meniscal Tests

- Prone knee extension – look for difference in heel height
- Thessaly Test – knee bent ~20 and rotate 3 times (IR and ER)
- Bounce test – bouncing knee into full extension causes pain
- Duck walk (in full squat) – unlikely able to do this with meniscus tear



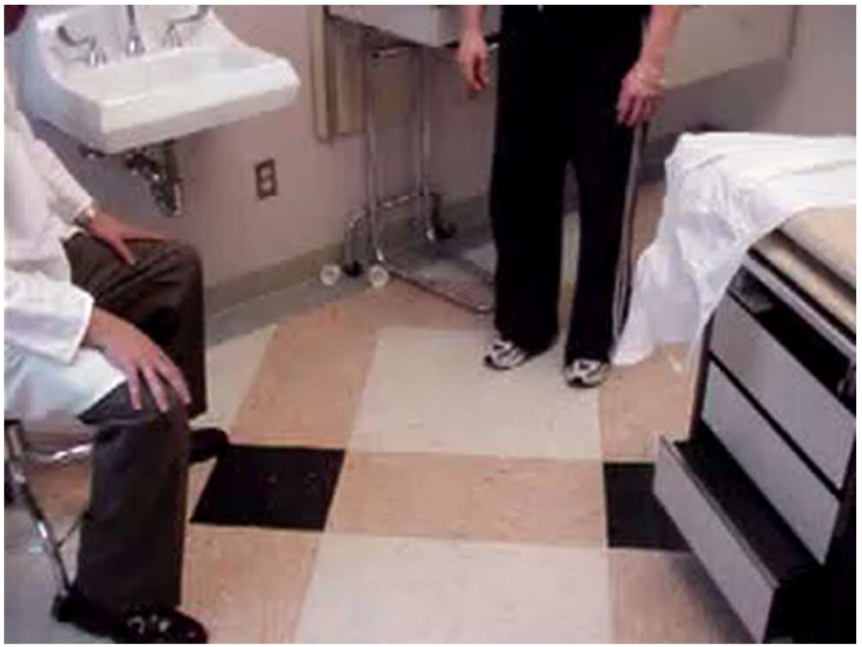
Thessaly Test

- Patient stands flat footed first with 5^{o} and then 20^{o} bend in knee
- Examiner holds hands for support
- Patient rotates (IR and ER) 3 times over each flexed knee
- Pain or locking at joint line suggests meniscus injury



Bounce Test and Duck Walk





Meniscal Tests
(Continued)

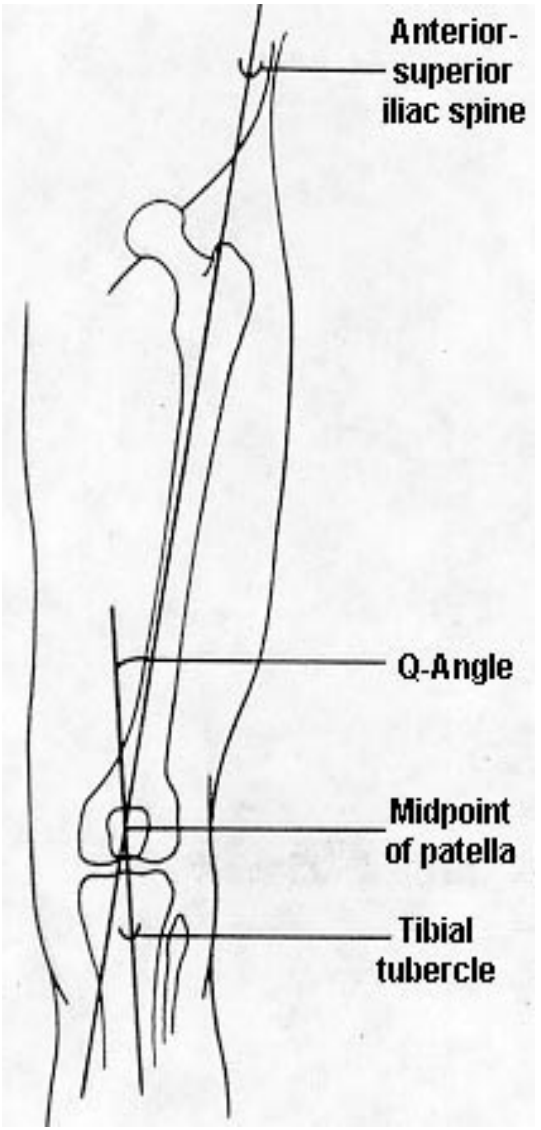
- McMurray's test – lie supine, then flex and extend knee with internal and external rotation, feeling for clunk
- Apply compression test – lie prone with knee flexed to 90^{o}, and axial load. Look for pain or click
- Both these tests have high rate of false positives





Patella Tests

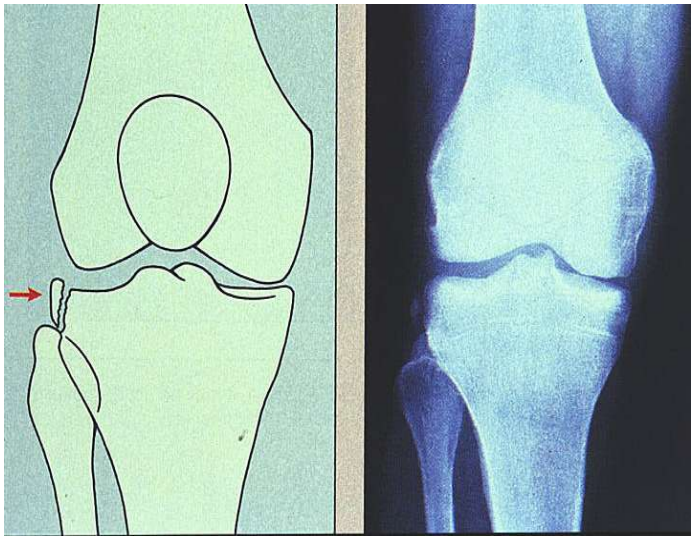
- Q-angle (quadriceps angle) - >15^{o} in female and >10^{o} in male predisposes to PFD
- Apprehension test – pushing kneecap in lateral direction causes apprehension after dislocation
- Patella grind test – pushing down on kneecap and grinding back and forth causes pain with PFD (frequent false +)



Patella Apprehension and Grind Tests



X-rays



- AP/lateral views – look for OA (wt bearing), Segond fracture (lateral capsular avulsion), tibia or femoral condyle fracture
- Tunnel view (knee in 90^{o} flexion) – look for tibial spine avulsion in suspected ACL or PCL tear
- Merchant view – tangential view of kneecap, done if PFD or dislocation suspected



Ottawa Knee Rules

X-ray if any of the following:

- Age $\geq$ 55 years
- Isolated tenderness over patella
- Tender at head of fibula
- Inability to flex to 90^{o}
- Unable to take 4 steps

MRI Done When Results Change Mgmt

- Acute injury with suspected major structural damage: ACL/PCL or other ligament tear, displaced meniscal tear (locking), extensor mechanism rupture, osteochondral injury, or occult fracture despite normal X-rays.
- Persistent symptoms despite treatment: Pain, swelling, instability, or loss of motion after 2–6 weeks of appropriate rehabilitation.
- Mechanical symptoms: Locked knee, recurrent catching, or giving way suggesting an injury that may require surgery.
- To guide return-to-play decisions, surgical referral, or treatment when the diagnosis remains uncertain.
- Usually not needed initially: Typical MCL sprains, PF pain, tendinopathy, IT band syndrome, or other overuse conditions with a classic history and examination.

Is MRI Too Sensitive in the knee?

- 991 R knees in ambulatory 50-90 years of age using 1.5-tesla MRI scans (***Englund, N Engl J Med 2008***)
  - Prevalence of meniscus damage ranged from 19% in women 50-59 to 56% in men 70-90 years of age
  - 63% with symptomatic OA and 60% with no symptoms had meniscus tear
- 230 knees of 115 asymptomatic relatively sedentary adults (64 females; median age: 44 years); Median BMI 25; All had bilateral knee 3.0-tesla MRIs (***Horga; Skeletal Radiol, 2020***)
  - MRI showed abnormalities in the majority (97%) of knees!
  - 30% had meniscal tears and 18% showed meniscal degeneration
  - 50% had Mod-severe Cartilage and bone marrow lesions in knee joint
- A normal MRI is abnormal in middle-aged and older adults!

Knee Exam Summary

- A focused history should point you toward the correct diagnosis of an injured knee
- Physical exam used to narrow differential diagnosis
- Exam should include inspection, palpation, ROM, ligament, meniscus and patella tests
- Imaging should be used when diagnosis is not clear


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