Approach to the Patient with Knee Pain

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Knee Pain in Primary Care

- Knee pain accounts for more than 1.9 million primary care outpatient visits annually in the US.
- Routine activities
  - Walking, stairs, kneeling
- Active adults/recreational activities
  - Running, gardening, fitness classes, tennis, hiking
- Competitive athletes

Case 1

A 19 year old basketball player jumped up for a rebound, and upon landing on her left leg she felt a sudden popping sensation of her left knee followed by pain.

- Unable to continue to play
- Swelling developed within one hour
- Her team's athletic trainer applied ice and a compression wrap.
- She presents 3 days after the injury. She is able to bear weight without much pain, but the knee is quite stiff. She has been using crutches.

Case

- **Additional History**
  - No prior injury
  - Denies locking or instability

- **Exam**
  - No ecchymoses
  - Moderate effusion
  - Limited range of motion
  - No focal tenderness
  - Neurovascular exam normal

Case

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  - Limited range of motion
  - No focal tenderness
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Case

Given the history and exam findings so far, which of the following is the most likely diagnosis?

1. Tibial plateau fracture
2. Medial meniscal tear
3. Anterior cruciate ligament tear
4. Medial collateral ligament sprain

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2. **Medial meniscal tear**
3. ***Anterior cruciate ligament tear***
4. **Medial collateral ligament sprain**

Acute, Non-Contact Knee Injury with Effusion:
Think ACL Tear

Knee Pain in Primary Care

- Comprehensive history
- Systematic, focused physical examination
- Selective imaging driven by history and exam

Obtaining the History

- The differential diagnosis for knee pain is extensive and complex.
- A practical approach that focuses on the history, including key symptoms, can quickly narrow the differential diagnosis.
- Initial goal: categorize into one of 4 buckets

Knee Pain Categories

1. Acute onset knee pain following trauma or due to a specific activity/inciting event

2. More gradual onset from repetitive loading/overuse (e.g running, tennis, squats, lunges)

3. Knee pain without trauma or repetitive loading – often OA in patients >50; rheumatologic conditions (e.g Lyme, seronegative arthropathies)

4. Acute on chronic – e.g. exacerbation of PFPS or OA

Knee Pain History
Narrowing the Diagnosis

- **Identify the timing, setting, and mechanism of the onset**
- **Acute vs. non-acute**
  - Can be somewhat arbitrary designation
  - Generally, acute = abrupt onset, less than 6 weeks duration
  - Are there recurrent episodes of acute symptoms that gradually resolve?
  - Assess for a specific event or activity the precipitated the onset (e.g. tennis, lunges, running)

Time Spent on the History is Time Well Spent!

- **Acute onset**
  - Mx of injury – type of activity and specific movement
    - Ask patient to describe position of the lower extremity
    - Was there a collision or external trauma?
  - Pop or snap
  - Able to continue the activity after the event
  - Pain with weight bearing
  - Swelling? If yes, did the swelling develop immediately, within a few hours, or the next day

Time Spent on the History is Time Well Spent!

- **Acute onset**
  - Painful clicking
  - Instability – “gives way,” often followed by recurrent swelling
  - TRUE locking i.e. sudden episodes where cannot actively extend the knee = “stuck”
  - Numbness, tingling, weakness
  - Prior injury (even if not evaluated)
  - Prior surgery

Important Symptoms
ALWAYS ask these 3 Questions

Locking or Catching

- Possibly meniscus
- Less likely loose body

Swelling

- Intraarticular: trauma (meniscus tear, ACL/PCL injury, fracture)
- Extraarticular: bursitis, contusion, sprain

Instability

- True instability – ligament injury
- Giving way because of pain – PFPS; patellar subluxation/dislocation; loose body

Additional Qualifying Questions

- Is the pain intermittent or constant?
- Does the pain only occur with specific activities?
- Does the pain limit or prevent certain activities?
- If pain occurs with weightbearing, does it resolve with non-weightbearing?
- Does pain occur at night?

Acute Knee Injuries

Common

- MCL injury (usually no effusion if isolated injury)
- ACL tear
- Meniscal tear
- Patellar dislocation or subluxation
- Intra-articular fracture – tibial plateau; insufficiency fxs
- Osteochondral injury
- Bone contusion

Less common

- PCL tear
- LCL injury
- Posterolateral corner injury
- Quadriceps or patellar tendon tear
- Fibular head or neck fracture
- Patellar fracture
- Knee (tibiofemoral) dislocation
  - severe trauma
  - beware NV injury

Mechanisms and Injuries

Mechanism	Possible Injury
Hyperextension	*ACL; medial meniscus*
Hyperflexion	*medial meniscus*
Valgus stress (Direct force to outside of knee)	*MCL; ACL; patellar dislocation*
Varus stress (direct force to inside of knee)	*LCL*
Twisting	*ACL; meniscus; patellar dislocation*
Direct blow to anterior tibia with flexed knee	*PCL*
Direct blow to patella or femoral condyle	*Patellar fracture; chondral fracture of articular surface*

Non-Acute Knee Injuries

- **Non-acute onset**
  - Timing
  - Precipitating activities
  - Onset of pain relative to onset of activity
    - Immediate and then continues or escalates with ongoing activity
    - Immediate and then dissipates with activity
    - Not at onset, but later during activity
    - After activity or next day
  - Swelling

Common Causes of Non-Acute Knee Pain

ANTERIOR

- Patellofemoral pain
- Patellar tendinopathy
- Patellar instability (can be acute)
- Prepatellar bursitis (can be acute)
- Infrapatellar fat pad impingement
- Patellar BSI
- Quadriceps tendinopathy
- Tibial tubercle apophysitis
- Apophysitis of the infrapatellar pole

MEDIAL, LATERAL OR POSTERIOR

- Pes anserine bursitis
- OA exacerbation
- Degenerative MMT
- Medial plica syndrome
- Saphenous neuritis
- ITB syndrome
- Degenerative lateral meniscal tear
- Hamstring tendinpathy (medial or lateral)
- Popliteus tendinopathy
- Popliteal cyst
- DVT

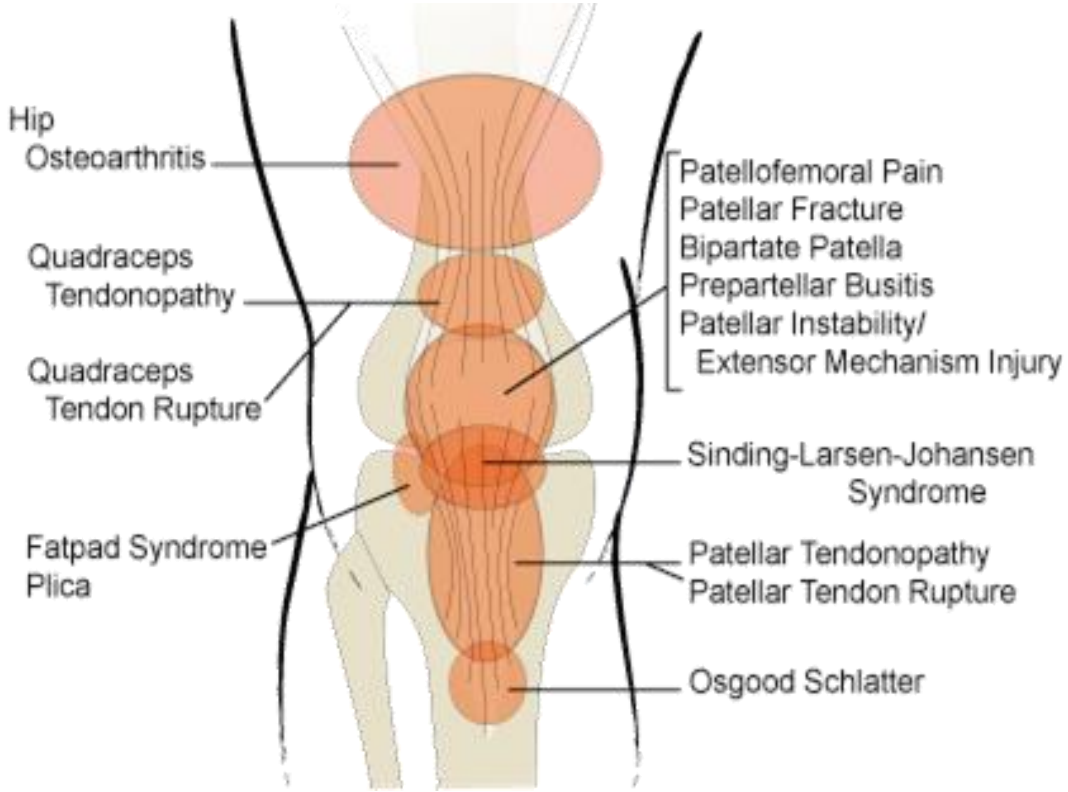
Location of Pain
Ask patient to point to site

Anterior – “circle sign” or “cover sign”

Medial

Lateral

Posterior



Qualifying Questions

Aggravating	With activity? At rest? Certain positions or movements? ***Clinical Pearl:** Pain with walking up/down hills/steps, prolonged sitting ("theater sign") **= patellofemoral pain**
Alleviating	What makes the pain better?
Quality	Throbbing? Aching? Burning? Sharp? Tearing?
Radiation	To upper or lower leg?
Severity	0-10; activities preventing from doing?
Occurrence	Constant? Intermittent?

Physical Exam

Inspection

Palpation

- Bone and Joint landmarks
- Soft tissue (muscles, tendons)
- Neurovascular status (pulses, sensation, cap refill)

Range of Motion

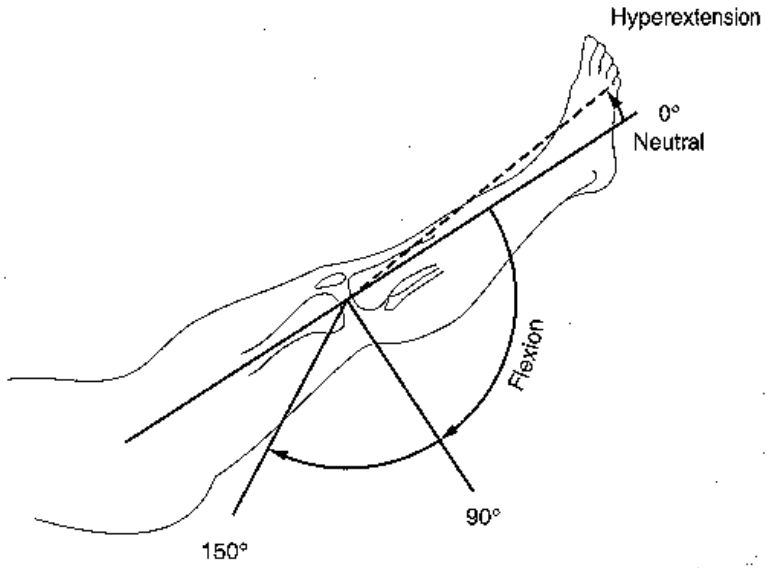
Strength

Special Tests

Keys to the Exam
You can Master This!

- Appearance – redness, location of any abrasions or ecchymoses
- Range of motion – Full extension (0) to full flexion (135)

- First key to exam – presence or absence of an effusion
- Second key – determine specific location of TTP (if any) and the associated anatomic structure



Always a red flag!

Prepatellar Bursitis or Effusion?

Bursitis

- Usually preceded by direct trauma or kneeling
- Pain often quickly resolves
- Swelling is outside the joint
- Typically, FROM and NTTP

Effusion

- Can be preceded by acute trauma or gradual onset
- Pain and/or stiffness
- Swelling within joint

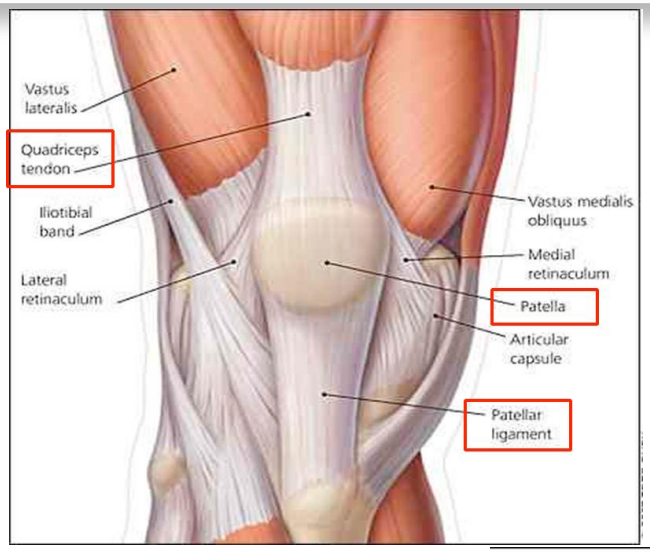
Examining for an Effusion

- Thumb and index finger form “C”
- Place over suprapatellar recess
- Place thumb and index finger of other hand next to medial and lateral patellar facets
- Compress downward on supratellar recess toward table and translate distally (“milk”)
- Feel for “bulge” of fluid next to facets

Palpation

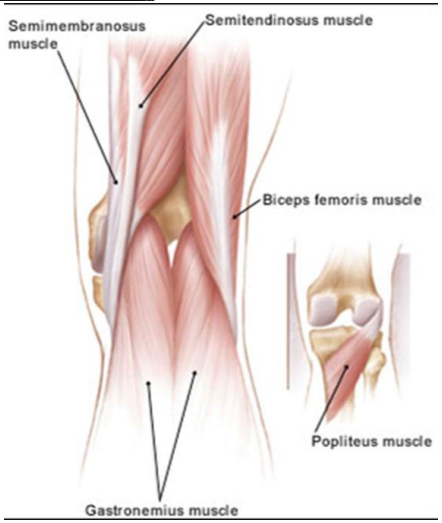
Bony

- Medial
- Lateral
- Patella
- Proximal tibia and fibula

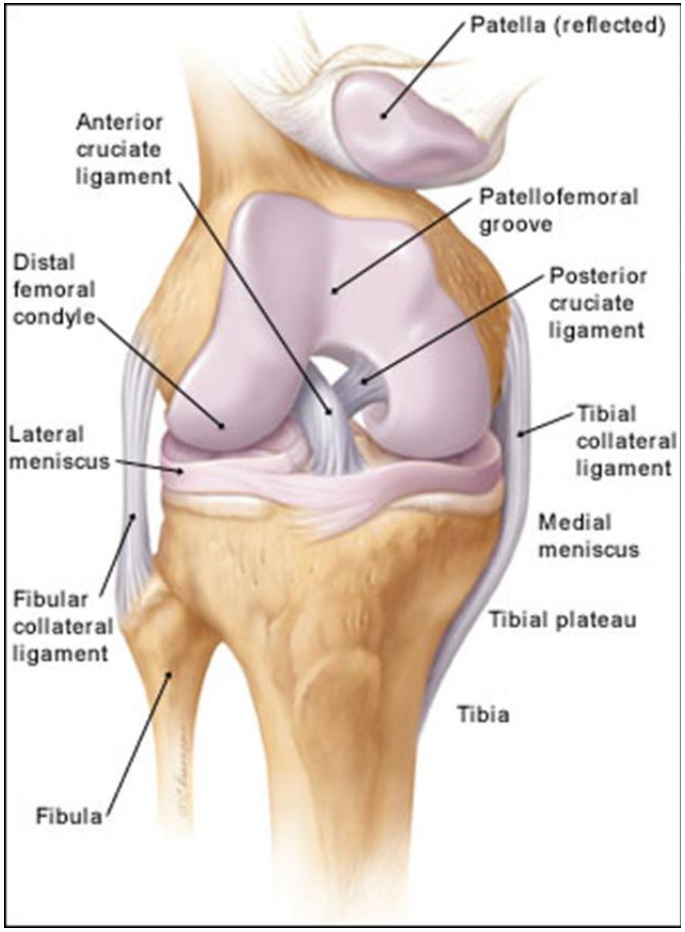


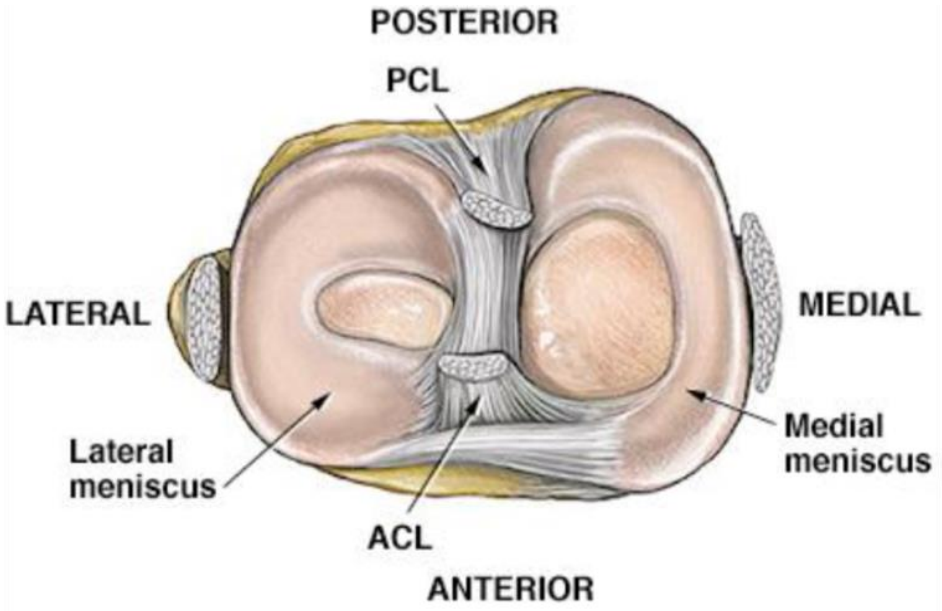
Soft tissue

- Quad tendon, patellar tendon
- Medial retinaculum
- ITB (and LFC)
- Popliteal fossa
- Gastroc tendons
- Hamstring tendons



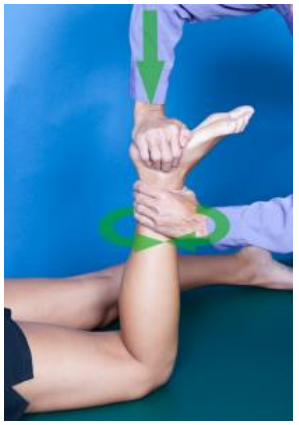
Special Testing





Examination - Meniscus

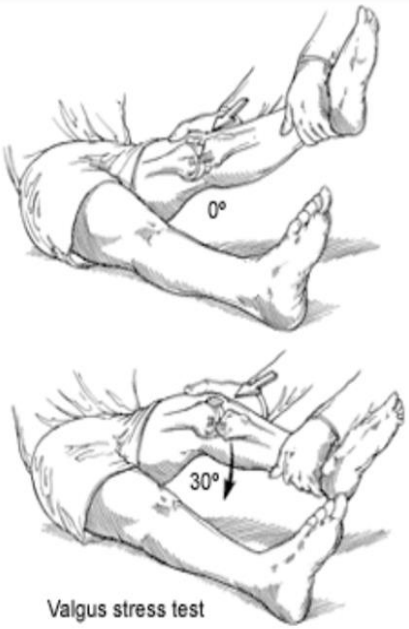
- Medial and lateral meniscus
  - Joint line tenderness
  - Pain at end range of flexion
  - McMurray's test
  - Appley compression test
  - Bounce test – passive extension from a flexed position
  - Active squat
  - Thessaly at 20^0



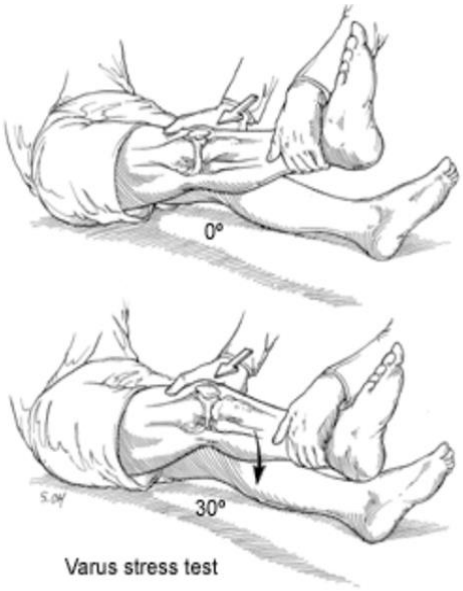
MCL and LCL Examination

MCL/LCL

- Varus and valgus stress testing
- Assess laxity and endpoint at 30^0 and in full extension



Valgus stress test



Varus stress test

ACL History and Exam

ACL

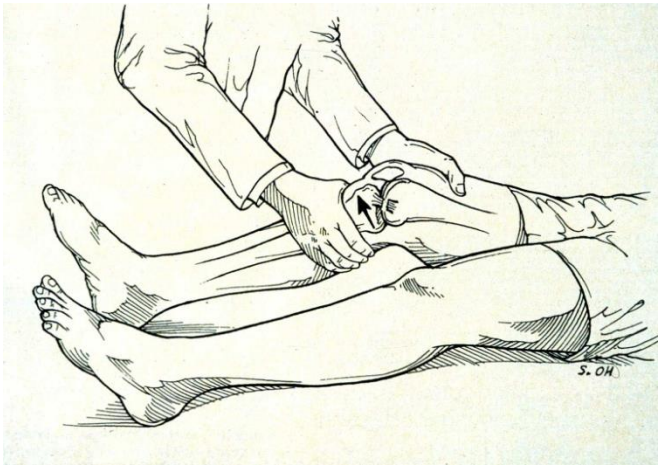
- 70% non-contact
- Acute onset
- Pop
- Swelling
- Effusion on exam

Lachman test

- 73-99% sensitive
- 95% specific

Pivot shift - difficult to perform

Anterior drawer - not accurate



Patient supine, knee flexed to 20-30 degrees

Tibia in neutral alignment.

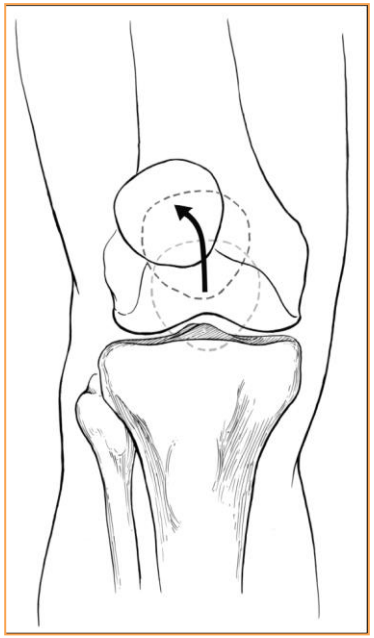
The distal femur is stabilized with one hand and anterior force is applied at the tibia with the other hand, displacing the tibia anteriorly on the femur.

Positive test: lack of a solid “endpoint” indicating the absence of anterior restraint normally provided by the ACL.

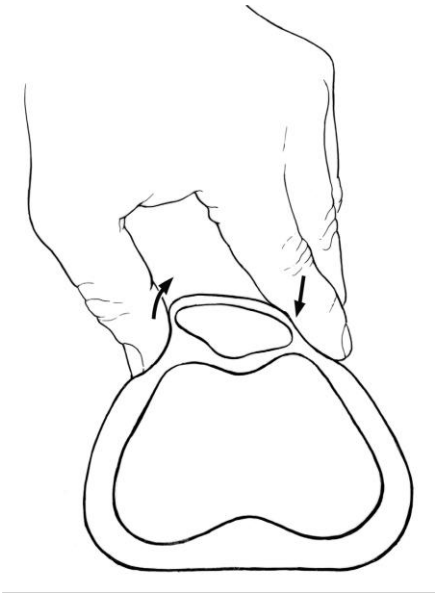
PCL Testing

Posterior drawer
Sag sign
Quad active test

Exam Techniques for PFPS

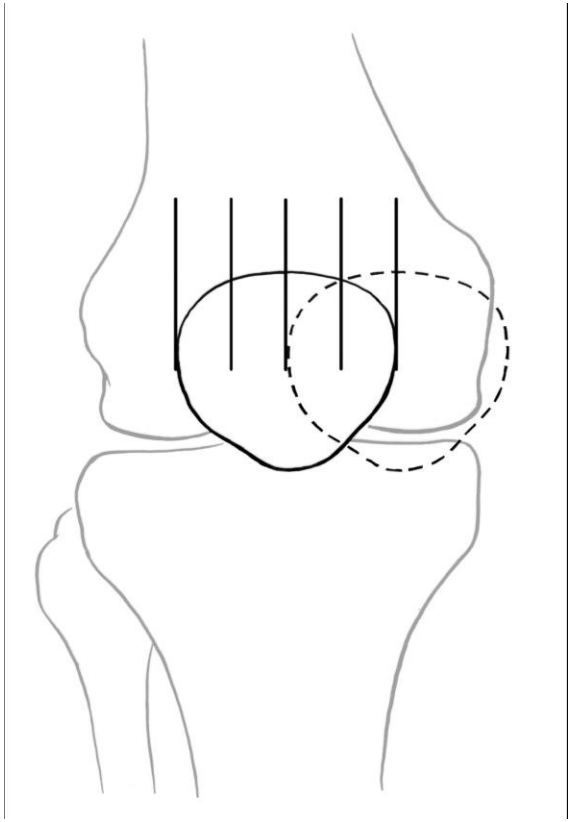


Patellar Tracking



Patellar Tilt

Medial Glide



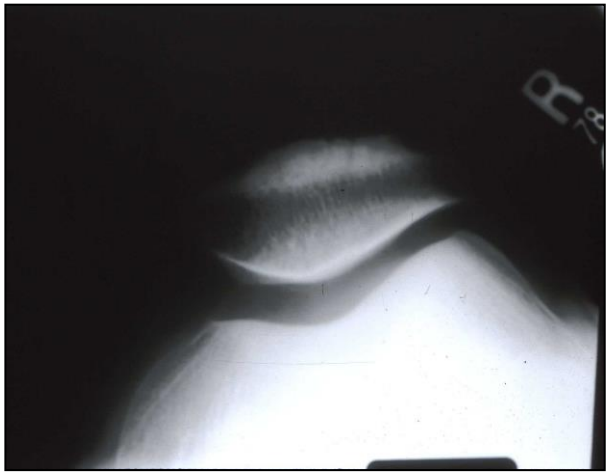
Exam for PFPS

Patellar Compression

Patellar Inhibition
(Grind)

Radiographs

- Views: AP, lateral, Merchant (sunrise)



Who Should Undergo Radiography After Knee Trauma?

Ottawa knee rules - 99% sensitive and 49% specific for identifying fractures

- Age ≥55 years
- Isolated tenderness of patella (with no other bony tenderness of the knee)
- Tenderness at the head of the fibula
- Inability to flex the knee to 90 degrees
- Inability to bear weight both immediately and in the emergency department for 4 steps

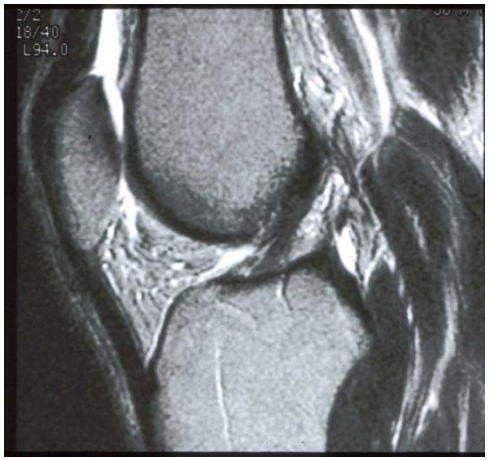
Pittsburgh decision rules (as sensitive and more specific than OKR)

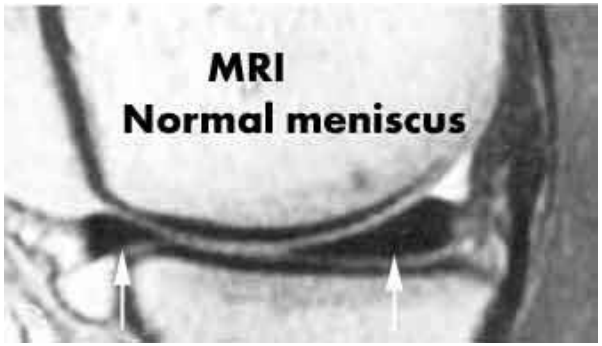
- Blunt trauma or a fall as mechanism of injury plus either of the following:
- Age younger than 12 years or older than 50 years
- Inability to walk four weight-bearing steps in the emergency department

J

Role of MRI

- A useful adjunct when
  - Diagnosis in doubt
  - Effusion present with normal xray
  - Suspected intraarticular injury (e.g. ACL, PCL, meniscal tear, insufficiency fracture, OCD)
  - Result will alter patient management
- Sensitivity and specificity are very high
- Requires careful interpretation and correlation with history and exam
  - "Treat the patient not the MRI findings"





Approach to Knee Pain Summary

- **The history is essential!**
- **Determine if knee pain is acute or non-acute**
- **Identify:**
  - Type of trauma or inciting activity in acute onset injuries
  - Mechanism of injury in acute injuries
  - For non-acute cases - specific activities/overuse that may have contributed
- **Categorize**
  1. Acute
  2. Non-acute associated with repetitive loading
  3. Non-acute with insidious onset
  4. Acute on chronic

Summary

- **Perform a systematic exam**
  - Inspection, ROM
  - Careful palpation for specific areas of tenderness and assessing for effusion are keys
  - Provocative testing
  - Talk to the patient during the exam to confirm pain location!
- **Imaging based upon history and exam**
- **An effusion always warrants further evaluation**
  - Xrays
  - MRI
  - Rheum work up if no structural cause

Case 1

A 19 year old basketball player jumped up for a rebound, and upon landing on her left leg she felt a sudden popping sensation of her left knee followed by pain.

- Unable to continue to play
- Swelling developed within one hour
- Her team's athletic trainer applied ice and a compression wrap.
- She presents 3 days after the injury. She is able to bear weight without much pain, but the knee is quite stiff. She has been using crutches.

ACL Injuries

Of ACL tears, what percentage are due to a non-contact injury mechanism?

1. 30%
2. 50%
3. 70%
4. 90%

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ACL Injuries

Among NCAA athletes, which of the following sports has the highest ACL injury rate:

1. Men's basketball
2. Women's Basketball
3. Men's soccer
4. Women's Soccer

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ACL Physical Exam

Which of the following tests performed in the office is most sensitive for diagnosing an ACL tear?

1. **Anterior drawer**
2. **Lachman test**
3. **Pivot shift test**
4. **McMurray's test**

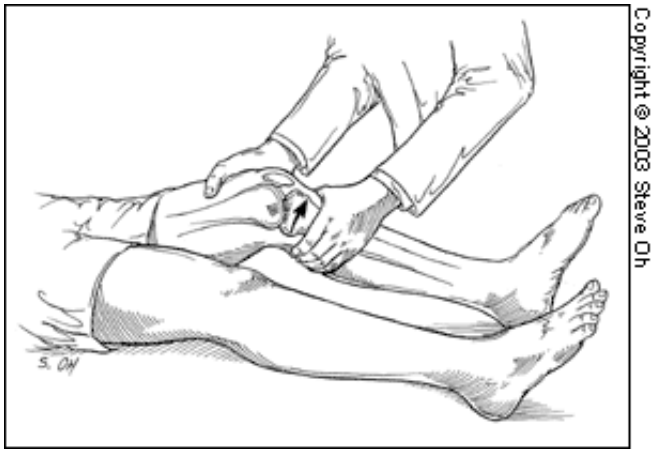
ACL Physical Exam

Which of the following tests performed in the office is the most sensitive for diagnosing an ACL tear?

1. **Anterior drawer**
2. ***Lachman test***
3. **Pivot shift test**
4. **McMurray's test**

Lachman Test

- **Patient supine,knee flexed to 20-30 degrees**
- **Tibia in neutral alignment.**
- **The distal femur is stabilized with one hand and anterior force is applied at the tibia with the other hand, displacing the tibia anteriorly on the femur.**
- **Positive test: lack of a solid "endpoint" indicating the absence of anterior restraint normally provided by the ACL.**



Torg JS, Conrad W, Kalen V. Clinical diagnosis of anterior cruciate ligament instability in the athlete. Am J Sports Med. 1976 Mar-Apr; 4(2): 84-93.

ACL Exam

	Sensitivity	Specificity
Anterior Drawer	62%	68%
Lachman	86%	91%
Pivot Shift	18-48%	98%

Scholten RJPM, Opstelten W, van der Plas CG, et al. Accuracy of physical diagnostic tests for assessing ruptures of the anterior cruciate ligament. J Fam Prac 2003, 52(9):689-694.

Don’t be Fooled !

- **Pseudopositive Lachman**
  - Increased translation, but solid endpoint
  - PCL injury
- **Non-contact injury with acute swelling, and negative Lachman – Think Fracture**
  - Tibial plateau (non-displaced)
  - Fibular head
  - Femoral condyle

MRI ACL Tear

Intact ACL

Torn ACL

The patient is interested in surgical reconstruction. All of the following are true regarding treatment of isolated ACL tears EXCEPT:

1. Surgical reconstruction of the ACL can restore functional stability

2. ACL reconstruction generally provides good outcomes in active individuals

3. The patient's desired future activity level plays a large role in determining operative vs. non-operative treatment

4. ACL reconstruction reduces the likelihood of the development of osteoarthritis

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2. ACL reconstruction generally provides good outcomes in active individuals

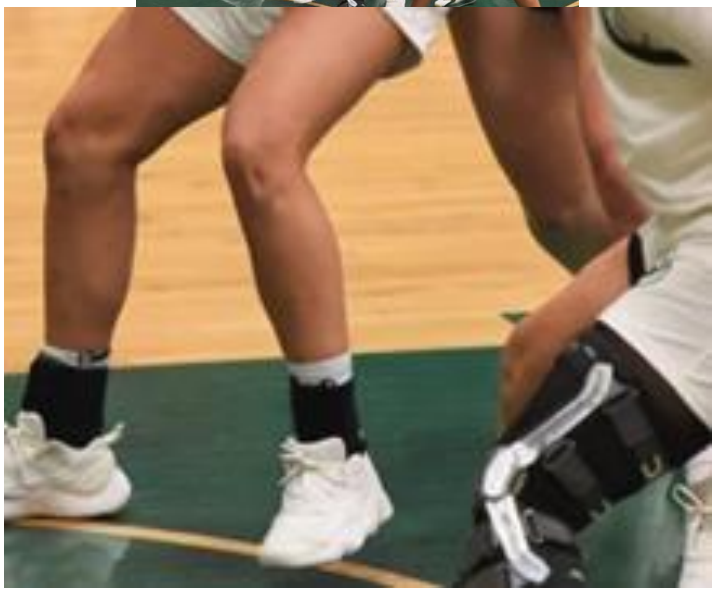
3. The patient's desired future activity level plays a large role in determining operative vs. non-operative treatment

4. ***ACL reconstruction reduces the likelihood of the development of osteoarthritis***

Treatment Options

- **Operative (ACLR) vs. Non-operative**

- **Factors**
  - Level of instability
  - Concomitant injury (e.g. multi-ligament)
  - Desired activity level
  - Prevention of secondary injury (meniscal tears)
  - Presence of osteoarthritis



Thank You!

Case History

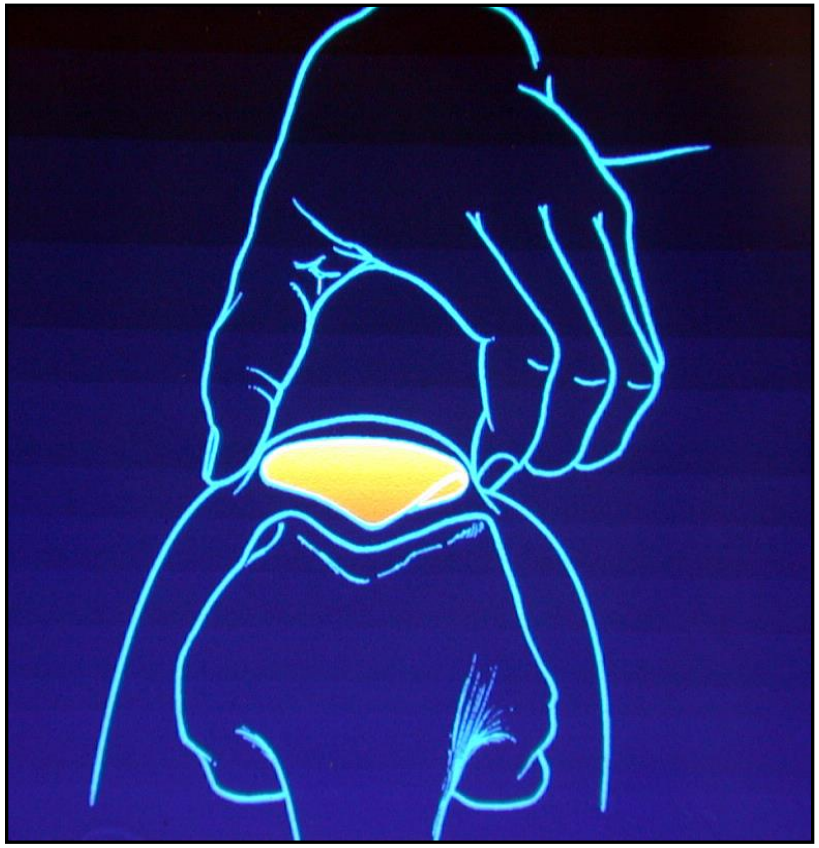
A 31 year old runner reports a 4wk history of L knee pain. The symptoms are anterior. She has not observed any swelling. She is training for a marathon, having increased her running mileage to 30 miles/week. She is able to run approximately 3-4 miles before the onset of pain, but she is able to finish the training runs despite the pain. Symptoms are also provoked when climbing stairs.

Case History

- Increased mileage from 20-30 mi/wk about 5 weeks ago.
- Last changed running shoes 1 year ago.
- No weight training.
- No squats/lunges
- No night pain.

Physical Exam

- No malalignment
- Full ROM
- No effusion
- Tender over lateral facet
- Medial patellar glide < 1 quadrant
- Positive patellar tilt and inhibition
- Tight IT Band
- Quad tone fair
- Quad and hamstring flexibility poor



Case Management

- Functional classification: 3 - pain during activity, early
- Imaging not necessary at this time.
- Inspect footwear: Replace shoes

Case Management

- Reduce running to 2-3 miles per session.
- Cycling or swimming as alternative (maybe elliptical)
- Begin rehab:
  - Quad and hamstring strengthening and flexibility
  - ITB flexibility
  - Soft tissue techniques; foam roller
  - Hip flexors, core
- Re-Assess 2-4 weeks