The Diagnosis-Driven Physical Exam of the Knee

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Carlin Senter MD, Natalie Voskanian MD, Veronica Jow MD

Carlin Senter, MD
Assistant Clinical Professor
UCSF Sports Medicine
Small group experts: UCSF residents and faculty

Outline

• Knee anatomy
• Knee exam
• Knee hands on exam practice
• Cases
• Questions
Knee: top 3 diagnoses in primary care referrals to ortho (at UCSF)

1. Osteoarthritis (OA)
2. Meniscus tear
3. Patellofemoral pain
   1. Patellofemoral pain syndrome
   2. Patellofemoral chondromalacia

Musculoskeletal work-up

- History
- Inspection
- Palpation
- Range of motion
- Other Tests

- Strength
- Neurovascular
Knee Anatomy

The quadriceps muscles extend the knee

http://thefitcoach.wordpress.com/2012/04/07/267/

http://scientia.wikispaces.com/Thigh+and+Leg++Lecture+Notes
The quadriceps muscles merge to form the quadriceps tendon... patellar tendon

The hamstrings flex the knee
Pes anserine bursa

Common cause of medial knee pain (hurts with side to side or twisting maneuvers): +TTP below the jointline; can extend from posteromedial pes tendons to anteromedial bursa on medial tibia. Tx = PT, nsaids, injection

There are 4 main ligaments in the knee

**MCL:** resists valgus
- medial femoral condyle to medial tibia (crosses medial jointline)

**LCL:** resists varus
- Lateral femoral condyle to fibular head (crosses lateral jointline)
  - resists varus

**ACL:** resists anterior tibial translation

**PCL:** resists posterior tibial translation
Meniscus

• Medial
• Lateral

• Cushion the knee joint and protect the articular cartilage

• Pain and tenderness in medial or lateral jointline
• +/- effusion
• May or may not have h/o trauma

• OA pts get degenerative tears (XR is sufficient in these pts)

Knee history: MOI

• Acute vs sub-acute or chronic
• Direct fall onto patella
  – Patellar fracture or cartilage damage or prepatellar bursitis
• Varus or valgus force to the knee
  – MCL or LCL
• Noncontact with a pop
  • ACL

3 Key Q’s to Ask in a Knee Injury

1. **Locking or catching** = displaced meniscus flap (bucket handle tear) or intra-articular loose body (loose piece of cartilage or bone)
2. **Instability** = ligament tear or muscle inhibition (quad, hamstring)
3. **Effusion** = intra-articular derangement
   1. Immediate: due to blood/hemarthrosis (ACL, fracture, cartilage injury, patellar dislocation)
   2. Subacute: 8-24 hours, due to synovial fluid buildup (meniscus, OA)

Where is the knee pain?

- **Anterior:**
  - Patellofemoral syndrome
  - Quadriceps tendinitis
  - Patellar tendinitis

- **Lateral:**
  - Lateral jointline: meniscus tear or OA
  - IT band syndrome
  - LCL sprain (rare)
  - Fibular head: fracture (rare)

- **Medial:**
  - Medial joint-line: meniscus tear or OA
  - MCL sprain
  - Pes anserine bursitis

- **Posterior:**
  - Hamstring tendinitis
  - Gastrocnemius strain
  - OA
  - Meniscus tear
  - Effusion, popliteal cyst
Knee exam

Permission for use provided by Dr. Charles Goldberg, UCSD

Valgus


Inspection

Permission for use provided by Dr. Charles Goldberg, UCSD
Significance of inspection


Evaluating for an Effusion

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Milking & Ballotment
Differentiating effusion from “swelling”

- Anything can cause swelling (soft tissue)
  - skin/soft tissue trauma, superficial bruise
  - MCL sprain
  - Pes anserine bursitis/tendinitis
  - Patellofemoral disorders

- But an effusion indicates intra-articular pathology (fluid comes from inside the joint)

Ddx acute traumatic knee injury with effusion

- ACL tear
  - awkward landing in sport, heard a “pop”, now w/ instability episodes
- Patellar dislocation/subluxation
  - landed or lunged forward, felt “knee get stuck” or kneecap shift out
- Meniscus tear
- Patellar or Quad tendon rupture
  - can’t stand nor extend the knee, + defect & pain above or below patella
- Fracture
- Bone contusion
- Cartilage (aka chondral) injury
- OA exacerbation in OA patient

Ddx of *atraumatic* knee effusion

- Meniscus tear
- Osteoarthritis
- Crystal arthropathy (pseudogout, gout)
- Inflammatory arthritis
- Septic arthritis
- Benign or malignant tumor

Palpation of joint line seated or supine

Permission for use provided by Dr. Charles Goldberg, UCSD
Patellar grind or inhibition

Knee range of motion

- ROM: normal 0-135
  - Determine if knee is locking or if ROM is limited due to effusion and/or pain/guarding/stiffness
  - Locking: think bucket handle meniscus.
    - Urgent x-rays, MRI
    - Urgent referral to sports surgeon for arthroscopy
Other Tests: Lachman to evaluate ACL
Sensitivity 75-100%  Specificity 95-100%

ACL: Anterior Drawer
Sensitivity 22-41%, Specificity 97%
PCL: Posterior Drawer

Video used with permission from Anthony Luke, MD.

PCL: Sag sign
MCL and LCL grading

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury</th>
<th>Translation compared to unaffected side</th>
<th>Patient response</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Strain</td>
<td>Minimal laxity, firm endpoint</td>
<td>Pain</td>
</tr>
<tr>
<td>II</td>
<td>Partial tear</td>
<td>Some laxity, firm endpoint</td>
<td>Pain, may feel loose</td>
</tr>
<tr>
<td>III</td>
<td>Complete tear</td>
<td>Obvious laxity, no endpoint</td>
<td>Minimal pain, may feel very loose</td>
</tr>
</tbody>
</table>
Why test MCL and LCL at 30° flexion and full extension?

- Laxity at 30° flexion, no laxity at full extension = isolated MCL or LCL injury
- Laxity at 30° flexion and laxity at full extension = MCL or LCL + possible ACL or PCL injury

4 tests for meniscus tear

1. Isolated joint line tenderness
2. McMurray
3. Thessaly
4. Squat
Meniscus: McMurray

Sensitivity medial 65%, Specificity medial 93%


Meniscus: Thessaly

Video used with permission from Anthony Luke, MD.
Meniscus: squat

Chronic anterior knee pain

- **DDx**
  - Patellofemoral pain syndrome
  - Patellofemoral chondromalacia
- Inspect and assess the kinetic chain
- Identify tight structures and/or weak structures
  - Iliotibial band tightness
  - Gluteus medius (hip abduction) strength
Patellofemoral pain syndrome: miserable malalignment syndrome

- Femoral anteversion (inward rotation of femur)
- Squinting patella (inward patellar rotation)
- Patella alta
- Increased Q-angle
- Excessive outward tibial rotation

http://www.gla.ac.uk/ibs/US/fab/tutorial/biomech/akp3.html

Ober’s Test for tight IT Band
Hip abduction (gluts) strength

http://www.youtube.com/watch?v=9Iy-QrcuGno&feature=player_detailpage

One-legged standing squat

• Patient standing on unaffected leg
• Do 3 slow 1-legged squats
• Watch for stability, valgus angulation of knee, ask about pain
• Switch and perform on affected leg
• Sign of weak hip abductors, weak core
• Can bring out pain of patellofemoral pain
One-legged standing squat

- Will insert video
Knee Exam Hands On

• Standing: inspection
  – Genu Varum or valgum
  – Look for Quad atrophy
  – Abnormal gait, limping
  – Look for effusion when sitting

• Sitting: palpation
  – Joint line
  – Femoral condyles
  – Tibial plateau
  – Fibular head
  – Quad tendon, patellar tendon
  – Pes anserine bursa/tendons

• Supine: test ROM, strength, & begin provocative tests
  – Knee flexion (130 deg) & extension (0 deg)
  – Patellar facets
  – Patellar grind

• Special tests
  – Milking (effusion)
  – Ballotment (effusion)
  – Patellar grind (patellofemoral syndrome)
  – Anterior drawer (ACL)
  – Lachmans (ACL)
  – Posterior drawer (PCL)
  – Valgus (MCL)
  – Varus (LCL)
  – McMurray’s (meniscus)
  – Ober’s (IT Band)
  – Thessaly’s (meniscus)
  – Squat test (meniscus)
  – Single leg squat
  – Hip abduction strength

Knee cases
Case #1: House of Air

• 35 y/o woman on trampoline half-pipe. Jumped down and felt a pop with immediate knee pain and swelling.
• Went to ER: placed in knee immobilizer and given Vicodin for pain relief.
• Now, 3d later, has posterior pain, tightness with bending.
• Knee feels unstable if not in the brace.

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• Meniscus tear
• Patellar or Quad tendon rupture
  - can’t stand nor extend the knee, + defect & pain above or below patella
• Fracture
• Bone contusion
• Cartilage (aka chondral) injury
• OA exacerbation in OA patient

Knee exam case #1

- Tender medial joint line
- Able to perform active straight leg raise
- ROM: 5-90, limited due to pain
  - Determine if knee is locking or if ROM is limited due to effusion
  - Locking: think bucket handle meniscus.
    - Urgent x-rays, MRI
    - Urgent referral to sports surgeon for arthroscopy

Knee exam case #1

- Strength 5/5 hip flexion, knee extension, PF, DF.
- 2+ dorsalis pedis pulses bilaterally
- Sensation intact to light touch over legs bilaterally
- Reflexes 2+ at patella and achilles bilaterally
Case #1 special tests

- (+) pain with medial McMurray, (-) lateral
- Unable to do thessaly and squat 2/2 medial knee pain, instability
- (-) laxity to varus or valgus at 0 and 30
- (+) Lachman
- (+) Anterior drawer
- (-) Posterior drawer

Case #1 diagnosis

1. Patellar tendon rupture
2. PCL tear
3. ACL tear
4. MCL tear
5. Meniscus tear
6. ACL tear + meniscus tear
Case #2: Sketcher Shape-Ups

40 y/o woman with sharp anterior knee pain x 1 month. No injury. Might have some swelling. No locking but the knee is popping. Feels unstable when walking down stairs. Pain worse up/down stairs, prolonged walking. Painful when gets up from sitting. Hasn’t been doing squats/lunges. Hurts to kneel when cleaning under the bed.

Exercise: started a walking program for New Year’s resolution, wearing new Sketcher Shape-Up shoes.

Ddx subacute-chronic anterior knee pain

1. Patellofemoral pain syndrome
2. Patellar chondromalacia
3. Osteoarthritis of patellofemoral joint
Case #2: Sketcher Shape-Ups
Physical exam

- Valgus angulation of the knees
- No effusion
- +Tender medial and lateral patellar facets
- ROM 0-135, crepitus
- No laxity with lachman, posterior drawer, varus or valgus at 0 and 30 degrees
- (+) Patellar grind
- (+) Ober bilaterally
- 4/5 hip abductor strength bilaterally
- Unstable 1-legged squat with valgus knee angulation

Case #2 diagnosis

1. Patellofemoral pain syndrome
2. Patellar chondromalacia
3. Osteoarthritis
Case #3

- 65 y/o man with lateral knee pain and swelling of the R knee since hiking last week
- h/o lateral meniscus surgery 8yrs ago
- No locking, no instability
- Knee feels stiff particularly when has been resting for a while
- Exam: +effusion, +tender lateral joint line, (+) lateral knee irritation with lateral McMurray, (+) lateral pain with squat and Thessaly, no ligamentous laxity

Diagnosis?

A. Lateral meniscus tear
B. ACL tear
C. Osteoarthritis
D. Patellar dislocation
E. Septic arthritis
F. Osteoarthritis with degenerative lateral meniscus tear
## Meniscus Tear: Treatment

- Individualized to the patient, age, type of tear, associated pathology

- Asymptomatic -> no intervention

- Pain/swelling without mechanical symptoms (not bucket handle tear) -> trial of non-surgical treatment often is tried
  - PT, rest, cortisone injection, nsaids
  - if fail non-surg then can consider elective surgery

- Catching/locking, bucket handle tear -> surgery

- Degenerative meniscus tears are part of OA, surgery is not effective and does not treat the OA which is the primary problem (so don’t get an MRI if XR shows OA… unless suspect malignancy, etc)