Diagnosis-Driven Physical Examination of the Knee

Co-Director(s):
Michal "Kalli" Hose, MD

Co-Director(s):
Anna Quan, MD

Melissa Le Roux, MD

David G. Liddle, MD, FACP, FAMSSM

Paul Meirick, MD, Member

Greg I. Nakamoto, MD, FACP

Carlin Senter, MD, FACP, FAMSSM

Gregory Summerville, MD, Member
DIAGNOSIS-DRIVEN PHYSICAL EXAMINATION OF THE KNEE

ACP Musculoskeletal Medicine Teaching Group
ACP National Conference 2024

ACP KNEE EXAM CLINICAL SKILLS WORKSHOP FACULTY

Michal “Kalli” Hose, M.D.
UC San Diego

Melissa LeRoux, MD
UNC Chapel Hill Sports Medicine Fellowship

David G. Liddle, MD, FACP
Intermountain Sports Medicine
Utah State University

Paul Mevento, MD
St. Cloud Orthopedics

Greg Nakamoto, MD
Virginia Mason
Franciscan Health
University of Washington

Greg Summerville, MD
University of North Carolina – Chapel Hill

Carlin Senter, MD, FACP
UC San Francisco

Anna Quan, M.D.
UC San Diego
DISCLOSURE OF FINANCIAL RELATIONSHIPS

Visit any speaker’s profile within the ACP Meeting mobile app or the meeting’s web platform to view disclosure of relevant financial relationships.

OBJECTIVES

1. Organize the knee musculoskeletal exam
2. Identify key historical factors in a patient with knee pain
3. Palpate key anatomical structures of the knee
4. Perform key provocative maneuvers of the knee exam and interpret towards likely diagnosis
MUSCULOSKELETAL ORGANIZATIONAL SCHEME

• History
• Inspection
• Palpation
• Range of motion
• Provocative tests

COMMON PRIMARY CARE KNEE CONDITIONS

• Essential
  • Patellofemoral syndrome (PFPS)
  • Meniscus tear
  • Osteoarthritis (OA)
• Bonus
  • Anterior cruciate ligament (ACL) tear
  • Medial collateral ligament (MCL) tear
  • Pes anserine bursitis
  • Iliotibial band (ITB) syndrome
## KEY KNEE HISTORY:
MOST COMMON DIAGNOSES IN PC

<table>
<thead>
<tr>
<th></th>
<th>Patellofemoral pain syndrome (PFPS)</th>
<th>Meniscus tear</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td>Younger/female</td>
<td>Young-middle age</td>
<td>Older</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Overuse injury</td>
<td>Acute or degenerative</td>
<td>Acute or overuse</td>
</tr>
<tr>
<td><strong>Swelling</strong></td>
<td>Soft tissue (no effusion)</td>
<td>+/- effusion</td>
<td>+/- effusion</td>
</tr>
<tr>
<td><strong>Locking</strong></td>
<td>May endorse but usually crepitus</td>
<td>If bucket handle tear</td>
<td>May endorse but usually crepitus</td>
</tr>
<tr>
<td><strong>Instability</strong></td>
<td>Pain may lead to this esp. down hills/ stairs</td>
<td>Not usually</td>
<td>Preceded by pain</td>
</tr>
</tbody>
</table>

## BONUS CONDITIONS

<table>
<thead>
<tr>
<th></th>
<th>ACL tear</th>
<th>MCL tear</th>
<th>Pes anserine bursitis</th>
<th>ITB syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td>Usually under 40</td>
<td>Any age</td>
<td>Middle/Upper age</td>
<td>Any age</td>
</tr>
<tr>
<td><strong>Mechanism of injury</strong></td>
<td>Traumatic/twisting injury (noncontact)</td>
<td>Valgus force to the knee</td>
<td>Overuse/limping</td>
<td>Running, overuse</td>
</tr>
<tr>
<td><strong>Swelling</strong></td>
<td>Yes, within an hour</td>
<td>Yes, medially</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Locking</strong></td>
<td>No, unless concomitant bucket handle meniscal tear</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Location of pain</strong></td>
<td>Nonlocalizable, possibly lateral</td>
<td>Medial knee</td>
<td>Anteromedial aspect of the proximal tibia</td>
<td>Lateral knee</td>
</tr>
<tr>
<td><strong>Instability</strong></td>
<td>Yes</td>
<td>No, unless high grade tear</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
KNEE ANATOMY – 4 LIGAMENTS

1. ACL
2. PCL
3. MCL
4. LCL

3 SURFACES

Illustration by Carlin Senter
MENISCUS

- Medial and lateral
- Shock absorber
- Stabilizer

KNEE BURSAE

1. Suprapatellar bursa
2. Prepatellar bursa “housemaids knee”
3. Infrapatellar bursa
4. Pes Anserine bursa

http://www.aidmybursa.com/_img/prepatellar-bursitis.jpg
KNEE EXAM

- Inspection
  - Abnormal gait
  - Alignment: Varus, valgus, neutral
  - Bony abnormalities
  - Quad atrophy
  - Erythema
- Palpation with knee extended
  - Evaluate for effusion
  - Quad, patellar tendons, tibial tubercle
  - Patellar facets
  - Patellar grind test
- Range of motion
  - Crepitus
- Palpation with knee flexed 90 degrees
  - Joint lines, bony prominences
  - MCL, LCL tenderness
  - ITB, Gerdy’s tubercle
  - Pes anserine bursa
- Provocative Tests
  - Ligaments
    - Anterior/Posterior drawer (ACL/PCL) – 90 degrees
    - Lachman (ACL) – 30 degrees
    - Varus stress (MCL)
    - Valgus stress (LCL)
  - Meniscus
    - McMurray
    - Thessaly** - standing
    - Squat** - standing

** Standing tests done if suspect meniscal tear and patient doesn’t have significant knee OA

INSPECTION

- Gait
- Alignment
- Normal, Varus, Valgus
- Bony changes
- Quad atrophy
- Effusion
PALPATION WITH KNEE EXTENDED

- Evaluate for effusion
- Quad, patellar tendons, tibial tubercle
- Patellar facets
- Patellar grind test

EFFUSION
PATELLAR GRIND TEST

Examiner positions hand at superior pole of patella to ‘trap’ patella then asks patient to gradually and gently contract the quadriceps muscle. Anterior knee pain with this motion is (+) patellar grind test indicating patellofemoral joint pathology.

Note: There is no audio accompanying this video.

KNEE RANGE OF MOTION

- ROM: normal 0-135
- Feel for crepitus
- Determine if knee is locking or if ROM is limited due to:
  - effusion
  - pain/guarding/stiffness
- Locking: think bucket handle meniscal tear
- Urgent x-rays, MRI
- Urgent referral to sports surgeon for arthroscopy
PALPATION WITH KNEE FLEXED 90 DEGREES

- Joint lines, bony prominences
- MCL, LCL tenderness
- ITB, Gerdy’s tubercle
- Pes anserine bursa

PROVOCATIVE TESTS

- Ligaments
  - Anterior/Posterior drawer (ACL/PCL) – 90 degrees
  - Lachman (ACL) – 30 degrees
  - Varus stress (MCL)
  - Valgus stress (LCL)
- Meniscus
  - McMurray
  - Thessaly** - standing
  - Squat*** - standing

** Standing tests done if suspect meniscal tear and patient doesn’t have significant knee OA
ANTERIOR DRAWER FOR ACL

Low sensitivity 48% and specificity 87% compared to Lachman’s test for ACL

This is a normal exam (no laxity)

POSTERIOR DRAWER FOR PCL

This is a normal exam (no laxity)
This is a negative Lachman test: there is an endpoint to the anterior tibial translation.

Note: There is no audio accompanying this video

Sensitivity 75-100%, Specificity 95-100%

**VALGUS STRESS FOR MCL AND VARUS STRESS FOR LCL**

This is a normal exam (no laxity)

**MENISCUS: McMURRAY TEST**

Lateral meniscus: Internally rotate the tibia and extend
Medial meniscus: Externally rotate the tibia and extend

Pain and/or snap/click at the joint line = concerning for meniscus tear

Sensitivity medial 65%, Specificity medial 93%
MENISCUS: THESSALY TEST

Medial Meniscus: Pain medially when pivot medially
Lateral Meniscus: Pain laterally when pivot laterally

Note: There is no audio accompanying this video

MENISCUS: SQUAT

Deep squat increases compression on posterior horn meniscus.
Patient stands flat-footed while examiner holds their hands for balance, and the patient goes as low as possible.
(+ ) if knee medial or posterior joint line pain reproduced or feeling of locking during knee flexion (while knees are bent).

Sensitivity 75-77%, Specificity 36-42%
(Snoeker BAM et al. JOSPT, 2015)