An Approach to the Patient with Knee Pain

I. Physical Examination of the Knee
II. Evaluation and Treatment of Common Problems of the Knee

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I. Physical Examination of the Knee
CASE

- 70 y/o male runner with gradual onset right medial knee pain for 3 months. Hurts to squat. Sometimes swells and catches.
CASE

• PE: Normal alignment at the knees. Medial joint line tenderness without tenderness above or below the joint line. McMurray’s test reproduces medial pain.
• X-rays: normal.
• Diagnosis: ?
OVERVIEW

• Differential diagnosis
• Anatomy
• Physical Exam
  – assessing alignment
  – finding the joint line
  – assessing for effusion
  – meniscal signs
  – collateral ligaments
  – cruciate ligaments
FIGURE 15-9
Evaluation of acute knee injuries. (ACL = anterior cruciate ligament; LCL = lateral collateral ligament; MCL = medial collateral ligament; PCL = posterior cruciate ligament.)
DIFFERENTIAL DIAGNOSIS

Acute

Trauma with obvious deformity (obtain X-rays)

- Dislocation: Usually reduced in the field, but may have residual pain along medial patella
- Acute dislocation: ***
- Patellar dislocation: ***

Fractures
- AVN fracture: ***
- Femur fracture: ***
- Patella fracture: ***
- Tibia fracture: ***

No fracture, @ hemarthrosis—if aspirated (controversial)—otherwise may be effusion.
(May be difficult to adequately examine for several days after injury.)

- @ Schuman, pivot shift, instability: usually pop felt or heard at time of injury with swelling over a few hours:
  - Anterior cruciate ligament tear: ***

- 1D: @M's Murray's test, joint line tenderness: pain with squating, twisting
  - Medial tear, hemarthrosis with peripheral tear: ***

- 1K: Tenderness along medial patella, @ patellar apprehension instability:
  - Patellar dislocation (already reduced): ***

No specific pattern of tenderness.
- Possible extensor mechanism injury.

No hemarthrosis, +/- effusion (aspiration necessary to distinguish hemarthrosis from effusion but not always recommended)

- 1F: Medial tenderness +/- instability with SVALGUS stress
  - Medial collateral ligament injury: ***

- 1G: Lateral tenderness +/- instability with VARUS stress
  - Lateral collateral ligament injury: ***
    - Posterior cruciate ligament injury: *** (usually with leg in full extension)

- @ Sag sign, posterior drawer test
  - Posterior cruciate ligament injury: ***

- Consider diagnoses usually associated with hemarthrosis but with concomitant capsular disruption (blood is unable to accumulate in joint if capsule is disrupted)

Locking or inability to extend knee fully beyond disability due to pain and swelling

- 1D: Mechanical lock, @M's Murray's test, joint line tenderness
  - Semi-urgent if unable to fully extend due to locking:
    - Medial tear: ***

- 1H or 1M: Quad weakness, palpable defect, ecchymosis
  - Patellar quadriceps tendon rupture:

- Consider exacerbation of CHRONIC injuries or medical diagnosis such as septic arthritis, osteoarthritis, gout or cellulitis.

- Consider HIP injury with pain referred to knee.
DIFFERENTIAL DIAGNOSIS

• osteoarthritis - hypertrophy, diffuse tenderness, xrays
• patellofemoral syndrome - feet, alignment, quad atrophy, patellar facet pain, patellar grind
• patellar instability - patellar apprehension
• meniscal injury - joint line tenderness, McMurray’s test
• collateral ligament sprain - tenderness, pain/laxity with varus or valgus stress
• cruciate ligament sprain - drawer testing, Lachman’s test,
• fracture - hemarthrosis, xrays
PHYSICAL EXAM: OVERVIEW

Physical Examination of the Knee

INSPECTION
BONY PALPATION
  Medial Aspect
  Medial Tibial Plateau
  Tibial Tubercle
  Medial Femoral Condyle
  Adductor Tubercle
  Lateral Aspect
  Lateral Tibial Plateau
  Lateral Tuber
  Lateral Femoral Condyle
  Lateral Femoral Epicondyle
  Head of the Tibia
  Trochlear Groove and Patella

SOFT TISSUE PALPATION
  Zone I — Anterior Aspect
  Zone II — Medial Aspect
  Zone III — Lateral Aspect
  Zone IV — Posterior Aspect

TESTS FOR JOINT STABILITY
Collateral Ligaments
Cruciate Ligaments

RANGE OF MOTION
Active Range of Motion
  Flexion ______ 135°
  Extension ______ 0°
  Internal Rotation ______ 10°
  External Rotation ______ 10°

NEUROLOGIC EXAMINATION
Muscle Testing
  Extension
  Flexion
  Internal and External Rotation
  Sensation Testing
  Reflex Testing
  Patellar Reflex: L2, 3, 4

SPECIAL TESTS
  McMurray Test
  Apley’s Compression and Distraction Tests
  Reduction Click
  “Bounce Home” Test
  Patella Femoral Grating Test
  Apprehension Test for Patellar Dislocation and Subluxation
  Tinel Sign
  Knee Joint Effusion Tests

EXAMINATION OF RELATED AREAS
PHYSICAL EXAM: OVERVIEW

• Standing: alignment, gait

• Sitting:
  • hip ROM
  • crepitus
  • joint line tenderness
  • tenderness above and below the joint line
  • pes anserine tenderness
PHYSICAL EXAM: OVERVIEW

• Supine:
  • effusion
  • patellar facet tenderness, grind, and apprehension
  • meniscus: McMurray’s exam
  • collaterals: valgus and varus pain and laxity
  • cruciates: drawer testing, Lachman’s test
PHYSICAL EXAM: STANDING

- Alignment
- Gait
PHYSICAL EXAM: STANDING

• Alignment
• Gait
PHYSICAL EXAM: SITTING

- hip ROM
- crepitus
- joint line tenderness
- tenderness above and below the joint line
- pes anserine tenderness

Fig. 4. Points of orientation for palpation of the knee.
PHYSICAL EXAM: SITTING

- tenderness above and below the joint line

Fig. 33. Palpation of the medial collateral ligament.
PHYSICAL EXAM: SITTING

- tenderness above and below the joint line

Fig. 37. The lateral collateral ligament.

Fig. 38. The lateral collateral ligament is accessible to palpation when the knee is flexed to 90°, and the hip is abducted and externally rotated.
PHYSICAL EXAM: SITTING

- hip ROM
- crepitus
- joint line tenderness
- tenderness above and below the joint line
- pes anserine tenderness

Fig. 9. The flare of the medial tibial plateau. The pes anserine insertion and bursa are located here.
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test
PHYSICAL EXAM: SUPINE

• effusion

Fig. 70. Test for major effusion—a ballotable patella.
PHYSICAL EXAM: SUPINE

- effusion
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam - patellar alignment
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test

FIGURE 8–5. The pull of the quadriceps on the patella is described as the Q angle. It is measured by the angle formed by the intersection of a line drawn from the center of the patella to the tibial tuberosity and a line drawn from the center of the patella to the anterior superior iliac spine.
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam - patellar facet tenderness
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test

Fig. 26. Full knee extension permits palpation of the under surface of the patella.
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam - patellar grind
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test

Fig. 67. The patellar femoral grinding test, to evaluate the quality of the patellar articulating surfaces.
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam - patellar apprehension
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test

Fig. 68. The apprehension test for patellar dislocation.
PHYSICAL EXAM: SUPINE

• effusion

• patellar exam

• McMurray’s exam

• collateral ligament pain and laxity - valgus and varus stress testing

• cruciate ligament laxity - drawer testing, Lachman’s test
PHYSICAL EXAM: SUPINE

- McMurray’s exam

**Fig. 58.** The McMurray test for meniscal tears. Flex the knee.

**Fig. 59.** With the knee flexed, internally and externally rotate the tibia on the femur.
McMurray’s exam

Fig. 60. With the leg externally rotated, place a valgus stress on the knee.

Fig. 61. With the leg externally rotated and in valgus, slowly extend the knee. If click is palpable or audible, the test is considered positive for a torn medial meniscus, usually in the posterior position.
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test
PHYSICAL EXAM: SUPINE

- collateral ligament pain and laxity - valgus and varus stress testing

Fig. 44. To test the medial collateral ligament, apply valgus stress to open the knee joint on the medial side.

Fig. 45. To test the lateral knee for stability, apply varus stress to open the knee joint on the lateral side.
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test

Fig. 47. A positive anterior draw sign: Torn anterior cruciate ligament.
PHYSICAL EXAM: SUPINE

- effusion
- patellar exam
- McMurray’s exam
- collateral ligament pain and laxity - valgus and varus stress testing
- cruciate ligament laxity - drawer testing, Lachman’s test
PHYSICAL EXAM: SUPINE

- cruciate ligament laxity - drawer testing, Lachman’s test
DIFFERENTIAL DIAGNOSIS

• osteoarthritis - hypertrophy, diffuse tenderness, x-rays

• patellofemoral syndrome - feet, alignment, quad atrophy, patellar facet pain, patellar grind

• patellar instability - patellar apprehension

• meniscal injury - joint line tenderness, McMurray’s test

• collateral ligament sprain - tenderness, pain/laxity with varus or valgus stress

• cruciate ligament sprain - drawer testing, Lachman’s test,

• fracture - hemarthrosis, x-rays
SUMMARY: PHYSICAL EXAM OF THE KNEE

• Standing: alignment, gait
• Sitting:
  • hip ROM
  • crepitus
  • joint line tenderness
  • tenderness above and below the joint line
  • pes anserine tenderness

• Supine:
  • effusion
  • patellar facet tenderness, grind, and apprehension
  • meniscus: McMurray’s exam
  • collaterals: valgus and varus pain and laxity
  • cruciates: drawer testing, Lachman’s test
II. Evaluation and Treatment of Common Knee Problems
CASE 1

• 35 y/o female runner with gradual onset bilateral anterior knee pain for 3 months. Worse with running downhill. Training for first 10k run.
CASE 1

• PE: Valgus alignment at the knees. Vastus medialis underdevelopment. Patellar facet tenderness. Patellar grind reproduces her pain.

• X-rays: normal.

• Diagnosis: ?
PATELLOFEMORAL SYNDROME

• Pathology/Anatomy

  • excessive friction of the patellar cartilage against the femoral condyle
  • factors which increase this friction can predispose to this problem
  • pain is worsened when patellofemoral joint is loaded
  • continuum: patellofemoral syndrome, chondromalacia patellae, patellofemoral compartment arthritis
PATELLOFEMORAL SYNDROME

- History
  - anterior knee pain
  - worse going down stairs
  - theater sign

- female
- overpronator
- runner/overuse
PATELLOFEMORAL SYNDROME

- Physical Exam
  - overpronation
  - valgus alignment at the knee
  - vastus medialis atrophy
  - +/- effusion
  - patellar facet tenderness

Fig. 26. Full knee extension permits palpation of the under surface of the patella.
PATELLOFEMORAL SYNDROME

- X-rays - patellar subluxation
PATELLOFEMORAL SYNDROME

• Treatment
  • rest, ice, NSAID
  • physical therapy for stretching, strengthening, and patellofemoral tracking program
  • bracing (knee sleeve with patellar cut out or lateral buttress), orthotics
  • surgical: lateral release
CASE 2

• 70 y/o male runner with gradual onset right medial knee pain for 3 months. Hurts to squat. Sometimes swells and catches.
CASE 2

- **PE:** Normal alignment at the knees. Medial joint line tenderness without tenderness above or below the joint line. McMurray’s test reproduces medial pain.
- **X-rays:** normal.
- **Diagnosis:** ?
MENISCAL TEAR

Pathology/Anatomy

- tear of the meniscal cartilage
- can be traumatic or degenerative
MENISCAL TEAR: HISTORY

- **Traumatic**
  - joint line pain
  - mechanism: hyperflexion, or “plant and twist”
  - swelling, +/- hemarthrosis
  - catching, locking

- **Degenerative**
  - joint line pain
  - gradual onset
  - + swelling
  - catching, locking
MENISCAL TEAR

• Physical Exam
  • often + effusion
  • + joint line tenderness
  • + McMurray’s
MENISCAL TEAR

- Physical Exam
  - often + effusion
  - + joint line tenderness
  - + McMurray’s
MENISCAL TEAR

• X-ray – normal
• MRI – meniscal tear
MENISCAL TEAR

- Treatment
  - rest, ice, NSAID, cortisone injection
  - physical therapy
  - surgery: arthroscopic menisectomy
MENISCAL TEAR

• Treatment
  • won’t heal on own, but may settle down and remain asymptomatic
    • degenerative tears more likely to settle down non-surgically than traumatic tears
  • if doesn’t settle down, then arthroscopic surgery
    • surgical outcomes for traumatic tears generally more satisfying than for degenerative tears
CASE 3

- 27 y/o female skier crashed 2 weeks ago. Immediate pain, disability, and swelling. ER said no fracture and to follow up with PMD. Improving, but feels like knee will buckle.
CASE 3

- PE: No effusion. No joint line tenderness. Laxity on Lachman’s testing
- X-rays: normal.
- Diagnosis: ?
ANTERIOR CRUCIATE LIGAMENT TEAR

- Pathology/Anatomy
  - The ACL prevents anterior subluxation of the tibia on the femur
ANTERIOR CRUCIATE LIGAMENT TEAR

- **History**
  - awkward stress or landing; hyperextension
  - audible pop
  - immediate swelling, hemarthrosis
  - generalized pain

- may begin to settle down, but knee may feel unstable and may buckle
ANTERIOR CRUCIATE LIGAMENT TEAR

- Physical Exam
  - +/- effusion
  - no significant tenderness (unless bone contusions)
  - laxity on Lachman’s
  - laxity on drawer testing
ANTERIOR CRUCIATE LIGAMENT TEAR

• Physical Exam
  • +/- effusion
  • no significant tenderness (unless bone contusions)
  • laxity on Lachman’s
  • laxity on drawer testing
ANTERIOR CRUCIATE LIGAMENT TEAR

- X-ray – normal (or small bony avulsion of the lateral capsule – aka Segond sign)
- MRI – ACL tear
ANTERIOR CRUCIATE LIGAMENT TEAR

• Treatment
  • ice, NSAIDS
  • rehabilitation – range of motion, quad strength
  • surgery – wait until swelling resolved, range of motion and strength restored. then elective surgery
CASE 4

- 25 y/o female soccer player with right medial knee pain after kicking the ball simultaneously against another player one week ago. Immediate pain, had to stop playing. No significant swelling.
CASE 4

• PE: No effusion. Medial joint line tenderness, as well as tenderness above and below the joint line. Laxity and pain on valgus stress testing.

• X-rays: normal.

• Diagnosis: ?
MCL SPRAIN

• Pathology/Anatomy
  • tear of the medial collateral ligament
  • intact MCL prevents valgus deformity at the knee
MCL SPRAIN

• History
  • valgus stress of the knee
  • no swelling, or local swelling only
  • medial sided pain
  • valgus instability
MCL SPRAIN

- Physical Exam
  - tender to palpation medially, along the course of the MCL, above and/or below the joint line
  - no effusion
  - + laxity on valgus stress of the knee

Fig. 33. Palpation of the medial collateral ligament.
MCL SPRAIN

- Physical Exam
  - tender to palpation medially, along the course of the MCL, above and below the joint line
  - no effusion
  - + laxity on valgus stress of the knee
    - Grade 1: pain only
    - Grade 2: loose but definite endpoint
    - Grade 3: complete tear; joint is lax, with poor endpoint; also test in full extension

Fig. 44. To test the medial collateral ligament, apply valgus stress to open the knee joint on the medial side.
MCL SPRAIN

• X-ray – normal; rule out fracture
• MRI – usually not necessary, but may see MCL tear
MCL SPRAIN: TREATMENT

• Grade 1
  • early active motion as soon as tolerated for grade 1 and 2
  • ice, NSAIDS
  • hinged knee brace with full range of motion, WBAT
  • rehabilitation as tolerated

• Grade 2
  • knee immobilizer x 2 weeks
  • then as with grade 1

• Grade 3
  • orthopedic referral
  • knee immobilizer, RICE while awaiting orthopedics
  • quadriceps sets, straight leg raises while awaiting orthopedics
CASE 5

- 65 y/o male with 2 months of right medial knee pain after excessive walking on vacation. Occasional swelling, no locking, no buckling.
CASE 5

• PE: No effusion. Medial joint line tenderness, as well as tenderness above and below the joint line. Also patellar facet tenderness. Negative McMurrays.

• X-rays: sharpening of the tibial spines, medial joint space narrowing.

• Diagnosis: ?
OSTEOARTHRITIS

• Pathology/Anatomy
  • loss of articular cartilage
  • synovial and bony hypertrophy
  • development of bony spurs
OSTEOARTHRITIS: HISTORY

- Chronically
  - slowly progressive pain, often generalized
  - swelling, stiffness
  - catching, feelings of instability
  - decreased walk tolerance

- Acutely
  - marked increase in pain and swelling
  - often in setting of overuse or trauma
OSTEOARTHROSIS

- Physical Exam
  - bony and synovial hypertrophy
  - pain above and below the joint lines
  - +/- effusion

Fig. 4. Points of orientation for palpation of the knee.
OSTEOARTHRITIS: X-RAYS

4 views of the knee
- AP weightbearing
- notch view, WB
- lateral, WB
- Merchant’s view (sunrise view)

Findings
- joint space loss
- sclerosis of subchondral bone
- osteophyte formation at joint margins (bone spurring, tibial spine sharpening)
- subchondral cyst formation
OSTEOARTHRITIS: X-RAYS

4 views of the knee
OSTEOARTHRITIS: X-RAYS

Findings
OSTEOARTHRITIS: X-RAYS

Findings: AP vs. notch view
OSTEOARTHRITIS: TREATMENT

• Chronically
  • Oral medications
    • Tylenol
    • Glucosamine
    • NSAIDS
  • Mechanical interventions
    • unloader bracing
    • physical therapy
    • weight control

• Acutely
  • NSAIDS

• Injection therapy
  • cortisone
  • viscosupplementation

• Surgery: joint replacement

• Cortisone
CASE 1

- 35 y/o female runner with gradual onset bilateral anterior knee pain for 3 months. Worse with running downhill. Training for first 10k run.
- X-rays: normal.
- Diagnosis: ?
CASE 2

• 70 y/o male runner with gradual onset right medial knee pain for 3 months. Hurts to squat. Sometimes swells and catches.

• PE: Normal alignment at the knees. Medial joint line tenderness without tenderness above or below the joint line. McMurray’s test reproduces medial pain.

• X-rays: normal.

• Diagnosis: ?
CASE 3

- 27 y/o female skier crashed 2 weeks ago. Immediate pain, disability, and swelling. ER said no fracture and to follow up with PMD. Better, but feels like knee will buckle.

- PE: No effusion. No joint line tenderness. Laxity on Lachman’s testing.

- X-rays: normal.

- Diagnosis: ?
CASE 4

• 25 y/o female soccer player with right medial knee pain after kicking the ball simultaneously against another player 1 week ago. Immediate pain, had to stop playing. No significant swelling.

• PE: No effusion. Medial joint line tenderness, as well as tenderness above and below the joint line. Laxity and pain on valgus stress testing.

• X-rays: normal.

• Diagnosis: ?
CASE 5

• 65 y/o male with 2 months of right medial knee pain after excessive walking on vacation. Occasional swelling, no locking, no buckling.

• PE: No effusion. Medial joint line tenderness, as well as tenderness above and below the joint line. Also patellar facet tenderness. Negative McMurrays

• X-rays: sharpening of the tibial spines, medial joint space narrowing.

• Diagnosis: ?
THE END