Knee Injuries

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PGY-1

UCI-CHOC RESIDENCY

Objective

A quick refresh on the knee anatomy

Approaches of knee pain in clinical setting

To understand the mechanism of injury, physical exam finding and treatment option of patellar dislocation

To understand the mechanism of injury, physical exam finding and treatment option of ACL and MCL injury

To understand the mechanism of injury, physical exam finding and treatment option ofacute and chronic prepatella bursitis

To understand the mechanism of injury, physical exam finding and treatment option of meniscal tear

Anatomy





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Approach to knee injuries

History:

- Ask about the mechanism of injury.
- Pain vs. mechanical symptoms
- Ask if able to bear weight!

Physical exam: inspection, palpation, range of motion, strength, neurovascular testing

• Specific tests according to your differential

Obtain radiograph if:

- Gross deformity
- Large knee effusion
- Palpable tenderness over femoral or tibial physis, fibular head, or patella
- Inability to bear weight or to walk four steps
- Concern for laceration or penetrating injury extending into the knee joint

Knee x-ray indications: Ottawa knee rules (acute)

- Age ≥55 years
- Isolated patella tenderness
- Tenderness at head of fibula
- Inability to flex knee 90°
- Inability to bear weight (4 steps) immediately after injury and in emergency department

Patellar dislocation

Presentation

- Mechanism of injury:
 - the lower leg is externally rotated and the quadriceps muscle forcefully contract to extend the knee
 - Common maneuvers that may cause the injury: spinning or twirling in dance or gymnastics, swinging a baseball bat, quick lateral change of direction when running or skating
 - Less commonly with sustained valgus force
- Hear a loud sound and feeling of tearing and dislocation
- If it's the person's first time dislocating the Patella, the medical retinaculum is likely to be teared as well which cause a medial hematoma
- Can be complicated with bone and chondral fracture



Physical Examination

- Knee is typically held in 20-30 degree of flexion and patella is palpable laterally
- •If the medial patellofemoral ligament is also injured
 - Hemarthrosis
 - Tenderness to palpation along medial edge of patella
 - Tenderness just proximal to medial femoral epicondyle
 - Acutely swollen knee





Imaging

- Imaging usually not needed
 - Unless trying to rule out other fractures
- •Obtain the skyline view->



Case courtesy of Dr Aditya Shetty, Radiopaedia.org, rID: 27274

Treatment

Reduction of lateral patella dislocation:

- Place patient in supine position with hips flexed
- Slowly extend knee while placing pressure to lateral aspect of dislocated patella
- Obtain x-ray after reduction to assess for fracture or avulsion

After reduction, place knee in patellar stabilizing brace or knee immobilizer until a brace
May return to play in 4-6 weeks with appropriate strengthening exercises with knee brace



Reduction of patellar dislocation

The knee is held in mild flexion. The distal thigh is fixed in place by an assistant. While slowly extending the knee, slight pressure is applied to the lateral aspect of the patella to reposition it medially.

Patellar subluxation

If the history is consistent with dislocation but the pain and exam findings have resolved

PE finding include:

- Laterally displaced patella
- Patellar apprehension test -> 2 ways of doing the test
 - knee in 30 degree flexion while pushing patella
 - Knee in full extension then flex knee to 90 degree while pushing patella

Treatment:

- quadriceps strengthen,
- strengthening hip abductors
- stretching iliotibial band



Examiner gently and slowly pushes the patella laterally and observes the patient for signs of verbal and nonverbal apprehension or reflex quadriceps contraction.

Ligamentous injuries

Mechanism of Injury



- ACL tear is the most common ligamentous knee injury in children
 - Usually present after a sudden change in direction or landing during sport that causes the knee to "pop" or give out
 - Or less commonly by a direct blow to the knee that results in hyperextension or valgus deformation
 - Contact injuries often associated with fracture or medial meniscus tear

MCL injury

- Usually through a valgus blow to lateral aspect of the knee
- abduction or rotation of lower leg
- Direct blows usually causing more injury

ACL Physical Examination Maneuvers

Lachman test

- Place the knee in 30 degree of flexion
- Stabilie distal femur with one hand
- Use other hand to pull the proximal tibia anteriorly
- (+) if no distinct endpoint

Anterior drawer test

Pivot shift

Hard to perform on conscious patient due to guarding



With the patient supine on the table and the injured knee flexed at 20 to 30 degrees, hold the patient's thigh with one hand and place your other hand beneath the tibia with the thumb of that hand on the tibial joint line. As you pull forward on the tibia, firm resistance suggests an unharmed anterior cruciate ligament (ACL). If, compared with the uninjured leg, the tibia moves freely without a hard endpoint, suspect ACL injury.

Anterior drawer test

- Pretty similar to Lachman test
- Knee flexed to 90 degree
- Foot stabilized with the practitioner's body
- Pull proximal tibia anteriorly
- (+) if pain, laxity, or more movement compared to other side

FIGURE 1 Anterior drawer test⁵



To perform this test, have the patient lie supine on the examination table with hips flexed to 45 degrees and knees flexed to 90 degrees. Sit on the table with part of your leg lightly resting on the patient's foot and grasp the tibia of the injured leg just below the knee. Place your thumbs on the tibial joint line. Draw the tibia forward toward you. If the tibia moves farther anteriorly compared with the tibia of the uninjured leg, or if the endpoint feels soft or is absent, the result is positive for an anterior cruciate ligament rupture.

Pivot shift test

Difficult to perform in conscious patient due to guarding

Life the leg until the hip is flex to 30 degree

injured knee in full extension

1. Internally rotate the tibia while placing valgus stress on the

2. Then flexed the knee-> causing reduction of subluxed tibia

(+) if felt a clunk



With the patient lying supine on the table, grasp either the heel of the foot or the ankle with one hand and use the other hand to grasp the proximal portion of the lower leg. Lift the leg until the hip is flexed to 30 degrees and the injured knee is in full extension (A). Rotate the foot or ankle medially, apply a valgus force to the knee, and slowly flex it (B). With an anterior cruciate ligament rupture, the tibia will translate posteriorly to the femur during flexion.

MCL Physical Examination Maneuvers

Valgus stress test

- Externally rotate the tibia
- While passively abducting the knee joint
- Would feeling gapping or pain
- https://www.youtube.com/watch?v=GSFbttpxCuQ
- Tenderness to MCL
- Decrease terminal knee extension and flexion beyond 100 degree due to pain
 - However, passive motion is not constrained



Imaging

- No imaging needed. Diagnosis usually by clinical exam
- However, do obtain imaging if unable to bear weight, focal bony tenderness, gross deformity, or if there is effusion.
- MRI is the gold standard for diagnosis
- MRI is also needed if considering surgical intervention

Treatment of ligamentous injuries

- Radiograph if concern for other injuries
- •If concern for multiple ligamentous injury (unstable knee) or displaced fracture- refer to ortho
- •If only ligamentous injury:
 - RICE (rest, ice, compression, elevation)
 - NSAIDs or Tylenol as needed for pain
 - Functional or hinge brace
 - Early range of motion is recommended
 - Weight bearing and other activities is advanced as tolerated
- Surgeries considered for those who:
 - Participate in high demand sport or occupations
 - Have significant knee instability

Prepatellar Bursitis

Prepatellar bursitis Presentation

- Acute bursitis usually infectious causes. Less commonly due to gout /trauma
 - localized redness, swelling, and tenderness anterior to the patella
 - Sympathetic knee effusion
 - Diffuse knee swelling
 - can closely resemble septic arthritis
 - However, patient are able to keep knee extended without discomfort

 Chronic bursitis is caused by repetitive trauma (people who spend lots of time on their knees/wrestling) (housemaid's knee).
 Less commonly cause by gout or rheumatoid arthritis

- Nontender fluid filled lump in front of patella,
- mild surrounding skin inflammation



⁽Left) Normal knee anatomy shown from the side. The bursa is small and located between the patella and the skin (Right) In prepatellar bursitis, the bursa becomes inflamed and swollen.

(Left) Reproduced from J Bernstein, ed: Musculoskeletal Medicine. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2003. (Right) Reproduced and adapted from The Body Almanac. (c) American Academy of Orthopaedic Surgeons, 2003. p. 191.

Physical Exam Findings

- Knee swelling anterior to the patella
- Possible overlying redness or skin breakdown indicating cellulitis
- If indolent peribursal inflammation + thickened surrounding tissue: think TB, brucellar or fungal etiology
- May have sympathetic knee effusion or diffuse knee swelling

Diagnostic testing

•Acute bursitis:

- Obtain bursal fluid aspiration and analysis-.
 - To rule out septic bursitis
 - look for crystals to rule out gout
- x-ray to evaluate extra-articular swelling. knee effusion, or bony spurs.
- Routine labs: CBC, glucose, uric acid
- If toxic appearing and febrile -> also get blood culture
- US and MRI not necessary

•Chronic:

- CT /MTI/bone scintigraphy useful to look for patellar osteomyelitis.
- US to look for gout
- If indolent cases-> also get bursal fluid to assess for TB/Brucella/fungus

Treatment

•Guided by the underlying cause

- Infectious:
 - transient immobilization of the knee with splint, antibiotics
 - re-aspirate as needed
 - vanco (for MRSA) and Ancef (for MSSA coverage). Keflex + Bactrim for oral regimen
- Gout:
- treat as gout flare: steroids vs NSAID vs colchicine
- Recurrent traumas:
- Limit trauma
- relieve immediate symptoms- NSAID for pain
- If kneeing can not be avoided-> provide them with a knee brace
- Do not inject steroids due to risk of infection

Meniscal tear

Presentation

•Usually the patient is able to continue participating in sport after the injury

- insidious pain and swelling occur over 24 hrs after the incidence
- Mechanical symptoms > pain (low nerve intervention)
- Sensation of locking, popping, and catching
- Other nonspecific symptoms:
 - swelling
 - pain with movement
 - weakness,
 - generalized aching



Mechanism of injury

- Occurs when the patient twist the leg while bearing weight (landing from jump)
- Similar mechanism when ACL injuries-> often occurring together



Physical Examination

- Joint line tenderness
- Positive bounce home test
 - Knee flexed to 15 degrees
 - Permitted to fall into extension with gravity
 - (+) if knee does not fully extend
 - If positive
 - displaced torn meniscal flap,
 - loose intraarticular body,
 - articular surface damage,
 - torn ACL



Thessaly test

https://www.youtube.com/watch?v=ebraZ4jM36A

- Patient stand on one leg which is flexed to about 20 degree
- Rotating the knee and body while maintaining knee flexion
- •(+) if pain or locking



Thessaly test. Physician should hold the patient's outstretched hands while the patient stands flat footed on the floor, with knee at 20° of flexion, and internally and externally rotates the knee three times. The other knee is flexed to avoid contact with the floor. Patient-reported pain at the medial or lateral joint line is a positive finding.

McMurray test



Passive flexion and extension of the knee is used to assess the smooth motion of the joint. The examiner's thumb and index fingers are placed on the medial and lateral joint lines. The knee is passively flexed. While applying torque to the foot, the knee is rotated medially to trap the lateral meniscus or laterally to trap the medial meniscus (noted by a painful click). The knee is then passively extended and the maneuver is repeated in a smooth back and forth motion, feeling for a popping sensation along the joint line. The test is positive when there is pain at the joint line, with or without a "thunk," and limited range of motion. A positive test implies meniscal injury.

Management

 Additional imaging not necessary unless concern for additional injuries, considering surgical intervention, or if no improvement in 3 weeks

•First step: RICE !

- Patellar restraining brace and crutches
- Straight leg exercises should be initiated early

•Refer to ortho when:

- Patient unable to fully extend knee
- Associated ACL tear
- Little improvement after 3-6 weeks

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