Knee Ligaments injury

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Anatomy

• The Knee Joint is the largest & most complicated joint, a synovial hinge joint.

• Consists of 3 Joints within a single synovial cavity:
  1. Medial Condylar Joint: Between the medial condyles of femur & tibia.
  2. Lateral Condylar Joint: Between the lateral condyles of femur & tibia.
  3. Patellofemoral Joint: Between the patella & the patellar surface of the femur.

• The fibula is NOT directly involved in the joint.
Knee - Cruciate and Collateral Ligaments
Right Knee in Extension

- Adductor tubercle (on medial epicondyle of femur)
- Posterior cruciate ligament
- Anterior cruciate ligament
- Posterior meniscofemoral ligament
- Medial femoral condyle (articular surface)
- Lateral femoral condyle (articular surface)
- Popliteus tendon
- Tibial collateral ligament
- Medial meniscus
- Lateral meniscus
- Head of fibula

Posterior View
Knee Ligaments

- Medial Collateral “extracapsular” Ligament
  - Attached to the tibia and femur on the medial side of the knee joint. Also attached to the medial meniscus, so injury to one can result in injury to both.
Knee Ligaments

- Lateral Collateral “extracapsular” Ligament- attached from the femur to the fibula on the lateral side of the knee. Shorter and stronger than the MCL.
Knee Ligaments

- The ACL “intracapsular” arises from the anteromedial aspect of the intercondylar area on the tibial plateau and passes upwards and backwards to attach to the medial aspect of the lateral femoral condyle. It prevents anterior translation of the tibia.

‘cruciate’ (Latin for like a cross)
• The PCL “intracapsular” attaches to the posterior **intercondylar area** and passes anterosuperiorly to insert into the lateral surface of the medial femoral condyle. Prevents posterior translation of the tibia on the femur.
• The **knee capsule** is a dual-layered structure that surrounds the knee joint. It is relatively thin anteriorly and posteriorly, thickened laterally by the collateral ligaments.

• The outer layer of the knee capsule consists of fibrous connective tissue to hold the joint in place, whereas the inner layer consists of a **synovial membrane** which secretes synovial fluid and provides lubrication.
Ligament injury
Sprains are classified into three degrees of severity.

A **first-degree sprain** of a ligament is defined as a tear of a minimal number of fibers of the ligament with localized tenderness but no instability;

a **second-degree sprain** as a disruption of more ligamentous fibers with more loss of function and more joint reaction with mild to moderate instability;

**third-degree sprain** as a complete disruption of the ligament with resultant marked instability.

These often are classified as mild, moderate, and severe for first-, second-, and third-degree sprains, respectively.
• Third-degree sprains, that is, those demonstrating marked instability, can be further graded depending on the degree of instability demonstrated during stress testing.
• With 1+ instability the joint surfaces separate 5 mm or less;
• with 2+ instability they separate 5 to 10 mm; and
• with 3+ instability they separate 10 mm or more
Intracapsular Ligaments

4 main ligaments (ACL, PCL, MCL & LCL)

**Anterior Cruciate Ligament (ACL):**
- Attached to the *anterior intercondylar area* of the tibia, passes upward, backward & laterally to get attached to the *lateral femoral condyle*.
- Prevents posterior displacement of the femur
- With knee joint flexed prevents the tibia from being pulled anteriorly.

**Posterior Cruciate Ligament (PCL):**
- Attached to the *posterior intercondylar area* of the tibia, passes upward, forward, & medially to get attached to the *medial femoral condyle*.
- Prevents anterior displacement of the femur
- With knee flexed prevents the tibia from being pulled posteriorly.
The **anterior cruciate ligament** ("ACL") is an important, internal, stabilizer of the knee joint, restraining **hyperextension**. It is injured when its biomechanical limits are exceeded (over stretched), often with a hyperextension mechanism.

Injury of the ACL is commonly seen in athletes (football, **American football**, basketball, rugby, professional wrestling, martial arts, and artistic gymnastics).
causes

• Overextending the knee or when an individual stops suddenly or plants his/her foot hard into the ground. ACL failure has also been linked to heavy or stiff-legged landing, sharp or sudden change in direction.

• Risk factors: high risk sports, female, age over 40.
History

• Knee pain
• Hearing a “pop” as the tissue is snapped during twisting or deceleration
• **Immediate** swelling
• Tenderness is most acute over the torn ligament.
• Continued athletic activity with ACL injury could lead to cartilage damage and risk for osteoarthritis
Physical examination

- Drawer -30
- Lachman-90: sensitive
- Pivot shift test: specific

The patient usually has fallen to the ground and is not immediately able to get up. Resumption of activity usually is not possible, and walking is often difficult. Within a few hours, the knee swells, and aspiration of the joint reveals hemarthrosis. In this scenario, the likelihood of an anterior cruciate ligament injury is greater than 70%.
Anterior Drawer Test

Anterior Cruciate Ligament Insufficiency

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Investigation

• the diagnosis is usually confirmed by MRI

• X-rays. Although they will not show any injury to your anterior cruciate ligament, x-rays can show whether the injury is associated with a broken bone.
Treatment

• Treatment for an ACL tear will vary depending upon the patient's individual needs. For example, the young athlete involved in sports will most likely require surgery while the elderly and low activity person will not, also severe tears require surgery

• Conservative: bracing and physical therapy

• *Surgical Treatment: reconstruction with a tissue graft*
• Grafts can be obtained from several sources. Often they are taken from the patellar tendon, which runs between the kneecap and the shinbone. Hamstring tendons at the back of the thigh are a common source of grafts. Sometimes a quadriceps tendon, which runs from the kneecap into the thigh, is used. Finally, cadaver graft (allograft) can be used.

• Surgery to rebuild an anterior cruciate ligament is done with an arthroscope.
• Mechanisms reported as possibly able to disrupt the anterior cruciate ligament with minimal injury of other supporting structures are hyperextension, marked internal rotation of the tibia on the femur, and pure deceleration.

• Isolated posterior cruciate disruption can result from a direct blow to the front of the tibia with the knee flexed.
Acute PCL injury

As with the anterior cruciate ligament, "isolated" tears of the posterior cruciate ligament are relatively rare; as a rule, ruptures of this ligament are associated with medial or lateral compartment disruptions, especially the latter.

Clinically, however, isolated tears of the posterior cruciate ligament can be caused by a fall on the flexed knee or striking of the flexed tibia on the dashboard in a motor vehicle accident.

Such a mechanism (the upper tibia driven posteriorly with the knee flexed) may produce posterior cruciate ligament disruption as the only clinically detectable instability. These "isolated" posterior cruciate ligament disruptions can be difficult to diagnose acutely unless a fragment of bone is avulsed from the posterior tibial insertion and is noted on roentgenograms.
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If surgical repair of the torn medial support of the knee is planned, arthroscopic examination of the knee to rule out other intraarticular pathological conditions is done before open surgical exploration.

The surgeon must be aware of the capsular disruption that may allow significant extravasation of irrigation fluid during arthroscopy of an acutely unstable knee.

Ordinarily a synovial or capsular rent will seal sufficiently to prevent dangerous extravasation of irrigation fluid if the arthroscopic examination is delayed for 5 to 7 days and the surgeon is skilled and expedites the examination. A lengthy examination of an acutely injured knee is not justified, and massive extravasation of irrigation fluid may occur in such instances.
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Thank you