

Anterior Cruciate Ligament Tear

Definition

- The knee joint is primarily made of three bones (patella, femur, and tibia), four major ligaments, and two menisci
- The anterior cruciate ligament (ACL) is one of the four major ligaments in the knee and participates significantly in stabilizing the joint
- This ligament prevents excessive forward movement of the tibia (also known as the shin bone) in relation to the femur (thigh bone)
- A sprain or tear of this ligament results in increased instability of the knee and potential for further damage

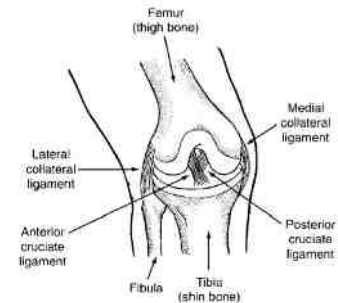


Figure 1
From Economou SG, Economou TS: Instructions for Surgery Patients. Philadelphia, WB Saunders, 1998, p. 377.

Risk Factors

- Contact sports
- Sports requiring pivoting, frequent changes in direction of motion (cutting), jumping, and/or landing
- Poor physical conditioning
- Female gender
- Direct trauma to the knee or surrounding bony structures

Mechanism

- Various motions may result in disruption of the ACL such as twisting or pivoting
- The injury typically occurs without contact. In some instances the player is hit from the outer side of the knee by another participant during a sporting event
- Force that exceeds the capacity of the ligament results in a spectrum of injuries from mild tearing to complete disruption
- The ACL has limited blood supply and poor surrounding support, thus tears of this ligament typically do not heal
- Due to the intimate involvement of the ligaments, menisci, and bones, other soft tissue damage may occur as well at the time of injury

Symptoms/Signs

- A “Pop” or tearing sensation at the time of injury
- Immediate swelling of the knee joint within 6-8 hours of injury, usually occurring within the first 2 hours

- Pain with flexion and extension of the joint
- Significant bruising over the joint
- Sensation of knee buckling under load, particularly when attempting to run and/or jump
- Difficulty returning to sports

Diagnostic Work Up

- Physical exam involves a detailed analysis of range of motion, gait, and dynamic ligament testing
- Radiographs of the knee are obtained initially to rule out injuries or fractures of the surrounding growth plates and bony structures
- If suggested by physical exam, magnetic resonance imaging (MRI) is used to delineate the precise location and severity of ligamentous injury and to assess for any concomitant injury

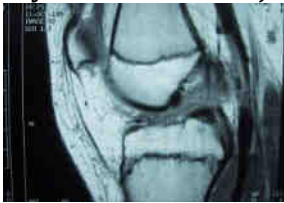


Figure 1 – MRI Torn ACL

Treatment Options

- Partial and some complete ACL injuries, depending in the severity, may be treated non-operatively with physical therapy and bracing
- Surgery is often recommended for complete ACL tears and in the following circumstances:
 - Individuals that wish to participate in sports, especially those requiring pivoting, cutting, jumping, and landing
 - Recurrent symptoms of buckling or instability
 - Concurrent meniscal injury or other ligamentous injury within the same knee
- Surgery is rarely conducted immediately after injury and is usually not conducted until the knee has achieved full range of motion, which may require 3 or more weeks following injury

Preparing for Surgery

- ACL reconstruction is an outpatient procedure, meaning the patient will arrive to the operating facility in the morning and usually be allowed to go home the same

evening. Surgical time typically ranges from 1-3 hours depending on the severity of the injury and presence of concomitant injury.

- The patient is placed under general anesthesia during the operation, thus he or she will not have any sensation of pain or memory of the surgery. Frequently the anesthesiologist will administer a femoral nerve block to numb the majority of the knee that will last during and for some time after the procedure.
- The surgeon views the inside of the knee using an arthroscope, which is a tiny camera. This camera is used to assist in the placement of a new ACL. The arthroscope is also used to examine the knee compartment for other injuries

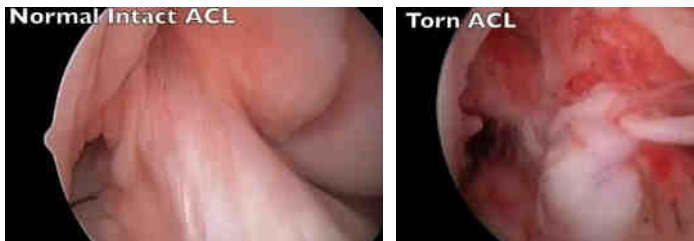


Figure 2 - Arthroscopic Images

- Surgical intervention involves replacing the damaged ligament with tissue (graft) obtained either from the patient (autograft) or donor tissue (allograft)
- The torn ACL is removed in preparation for the ACL graft.
- This graft may be collected from the patellar tendon, hamstring tendon, quadriceps tendon or an allograft (a tendon collected from a cadaver). Each graft has its benefits and risks. The patient should discuss each option with his or her surgeon for optimal outcome.

- Autograft Options

- Bone-Tendon-Bone - obtained from the front bottom part of the patient's injured knee. This is done by removing a small portion of the front part of the patella (knee-cap) the central third of the patellar tendon and a small plug of bone from the tibia (shin bone) which is then prepared for implantation into the knee to replace the ACL
- Hamstring Tendons - Two of the hamstring tendons located in the posterior (back part) of the thigh are harvested from the injured knee thru a small incision and are prepared for implantation into the knee to replace the ACL
- Quadriceps Tendon- obtained from the front top part of the patient's injured knee. This is done by removing a small portion of the front part of the patella (knee-cap) and the central third of the quadriceps tendon which is then prepared for implantation into the knee to replace the ACL

Figure 3 Hamstring ACL Post-Op Knee Appearance



- **Fixation-** following the graft preparation a camera (arthroscope) assists with the visualization needed to place the graft inside the knee in two small tunnels created in the femur (thigh bone) and tibia (shin bone). The graft is tensioned to recreate the ACL and is fixated on both ends with an orthopedic implant (metal or absorbable screws or buttons)

Figure 4 – X-ray post ACL reconstruction Femoral Button Fixation



- The graft is placed in relatively the same location as the original ACL and is secured by the placement of screws, heavy sutures, buttons, washers, or staples. Hardware does not need to be removed in most circumstances and should cause the patient no pain or limitations of function



Figure 4 – Arthroscopic Photo ACL Graft

Postoperative Care and Return to Sports

- The success of surgery is based on three nearly equal factors: the surgeon's expertise, the rehabilitative course and physical therapist, and the compliance of the patient with rehabilitative care. Failure of one of these will result in a less than optimal outcome
- Physical Therapy starts in the first or second week following surgery and is continued for months following the surgery.
- Absence from school ranges from 3-10 days following surgery.
- Crutches are used for the first 4-6 weeks following surgery and the ability to weight bear on the operated extremity will depend on the specific circumstances of each surgery
- A knee brace is worn for the first 4-6 weeks following surgery.
- With good participation in rehabilitative care, the patient can expect a reduction in swelling, improvement in range of motion, stability and strength.
- If the joint has properly healed and the surgeon clears the patient to play in sports, the patient may return to their desired sporting activity typically in 6-9 months after ACL reconstruction