

# Anterior Cruciate Ligament Injuries

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## Introduction

The anterior cruciate ligament (ACL) is probably the most commonly injured ligament of the knee. In most cases, the ligament is injured by people participating in athletic activity. As sports have become an increasingly important part of day-to-day life over the past few decades, the number of ACL injuries has steadily increased. This injury has received a great deal of attention from orthopedic surgeons over the past 15 years, and very successful operations to reconstruct the torn ACL have been invented.

This guide will help you understand

- where in the knee the ACL is located
- how an ACL injury causes problems
- how doctors treat the condition

## Anatomy

Where is the ACL, and what does it do?

Ligaments are tough bands of tissue that connect the ends of bones together. The ACL is located in the center of the knee joint where it runs from the backside of the femur (thighbone) to connect to the front of the tibia (shinbone).

The ACL runs through a special notch in the femur called the intercondylar notch and attaches to a special area of the tibia called the tibial spine.

The ACL is the main controller of how far forward the tibia moves under the femur. If the tibia moves too far, the ACL can rupture. The ACL is also the first ligament that becomes tight when the knee is straightened. If the knee is forced past this point, or hyperextended, the ACL can also be torn.

Other parts of the knee may be injured when the knee is twisted violently, as in a clipping injury in football. It is not uncommon to

also see a tear of the medial collateral ligament (MCL) on the inside edge of the knee, and the lateral meniscus, which is the U-shaped cushion between the outer half of the tibia and femur bones.

Related Document: A Patient's Guide to Knee Anatomy

## Causes

How do ACL injuries occur?

The major cause of injury to the ACL is sports. The types of sports that have been associated with ACL tears are numerous. Those sports requiring the foot to be planted and the body to change direction rapidly (such as basketball) carry a high incidence of injury. Football is also frequently the source of an ACL tear. Football combines the activity of planting the foot and rapidly changing direction and the threat of bodily contact. Downhill skiing is another frequent source of injury, especially since the introduction of ski boots that come higher up the calf. These boots move the impact of a fall to the knee rather than the ankle or lower leg. An ACL injury usually occurs when the knee is forcefully twisted or hyperextended. Many patients recall hearing a loud pop when the ligament is torn, and they feel the knee give way.

The number of women suffering ACL tears has dramatically increased. This is due in part to the rise in women's athletics. But studies have shown that female athletes are two to four times more likely to suffer ACL tears than male athletes in the same sports.

Recent research has shown several factors that contribute to women's higher risk of ACL tears. Women athletes seem less able to tighten their thigh muscles to the same degree as men. This means women don't get their knees to hold as steady, which may give them less knee protection during heavy physical activity. Also, tests show that women's quadriceps and hamstring muscles work differently than men's. Women's quadriceps muscles (on the front of the thigh) work extra hard during knee-bending activities. This pulls the tibia forward, placing the ACL at risk for a tear.

Meanwhile, women's hamstring muscles (on the back of the thigh) respond more slowly than in men. The hamstring muscles normally protect the tibia from sliding too far forward. Women's sluggish hamstring response may allow the tibia to slip forward, straining the ACL. Other studies suggest that women's ACLs may be weakened by the effects of the female hormone estrogen. Taken together, these factors may explain why female athletes have a higher risk of ACL tears.

## Symptoms

What does a torn ACL feel like?

The symptoms following a tear of the ACL can vary. Usually, the knee joint swells within a short time following the injury. This is due to bleeding into the knee joint from torn blood vessels in the damaged ligament. The instability caused by the torn ligament leads to a feeling of insecurity and giving way of the knee, especially when trying to change direction on the knee. The knee may feel like it wants to slip backwards.

The pain and swelling from the initial injury will usually be gone after two to four weeks, but the knee may still feel unstable. The symptom of instability and the inability to trust the knee for support are what require treatment. Also important in the decision about treatment is the growing realization by orthopedic surgeons that long-term instability leads to early arthritis of the knee.

Related Document: [A Patient's Guide to Osteoarthritis of the Knee](#)

## Diagnosis

How do doctors identify ACL injuries?

The history and physical examination are probably the most important ways to diagnose a ruptured or deficient ACL. In the acute (sudden) injury, the swelling is a good indicator. A good rule of thumb that orthopedic surgeons use is that any tense swelling that occurs within two hours of a knee injury usually represents blood in the joint, or a hemarthrosis. If the swelling occurs the next day, the fluid is probably from the inflammatory response.

Placing a needle in the swollen joint and aspirating (or draining as much fluid as possible) gives relief from the swelling and provides useful information to your doctor. If blood is found when draining the knee, there is about a 70 percent chance it represents a torn ACL. This fluid can also show if the cartilage on the surface of the knee joint was injured.

During the physical examination, your doctor will determine how badly the ACL was injured and whether other knee ligaments or joint cartilage were injured.

Your doctor may order X-rays of the knee to rule out a fracture. Ligaments and tendons do not show up on X-rays, but bleeding into the joint can result from a fracture of the knee joint, or when portions of the joint surface are chipped off.

Magnetic resonance imaging

(MRI) is probably the most accurate test for diagnosing a torn ACL without actually looking into the knee. The MRI machine uses magnetic waves rather than X-rays to show the soft tissues of the body. This machine creates pictures that look like slices of the knee. The pictures show the anatomy, and any injuries, very clearly. This test does not require any needles or special dye and is painless.

In some cases, arthroscopy may be used to make the definitive diagnosis if there is a question about what is causing your knee problem.

Arthroscopy is an operation that involves inserting a small fiber-optic TV camera into the knee joint, allowing the orthopedic surgeon to look at the structures inside the joint directly. The vast majority of ACL tears are diagnosed without resorting to this type of surgery, though arthroscopy is sometimes used to repair a torn ACL.

## Treatment

How do doctors treat an ACL injury?

### Nonsurgical Treatment

Initial treatment for an ACL injury focuses on decreasing pain and swelling in the knee. Rest and mild pain medications, such as acetaminophen (Tylenol®), can help decrease these symptoms. You may need to use crutches until you can walk without a limp. Most patients are instructed to put a normal amount of weight down while walking. The knee joint may need to be drained with a needle (mentioned earlier) to remove any blood in the joint.

Most patients receive physical therapy after having an ACL injury. Therapists treat swelling and pain with the use of ice, electrical stimulation, and rest periods with your leg supported in elevation.

Exercises are used to help you regain normal movement of joints and muscles. Range-of-motion exercises should be started right away with the goal of helping you swiftly regain full movement in your knee. This includes the use of a stationary bike, gentle stretching, and careful pressure applied to the knee by the therapist. Exercises are also given to improve the strength of the hamstring and quadriceps muscles. As your symptoms ease and strength improves, you will be guided in specialized exercises to improve knee stability.

### Hamstring Tendon Graft

Surgeons also commonly use a hamstring graft to reconstruct a torn ACL. This graft is taken from one of the hamstring tendons that attaches to the tibia just below the knee joint. The hamstring muscles run down the back of the thigh. Their tendons cross the knee joint and connect on each side of the tibia. The graft used in ACL reconstruction is taken from the hamstring tendon, called the semitendinosus. This tendon runs along the inside part of the thigh and knee. Surgeons also commonly include as part of the hamstring graft a tendon just next to the semitendinosus, called the gracilis. When arranged into three or four strips, the hamstring graft has nearly the same strength as a patellar tendon graft.

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