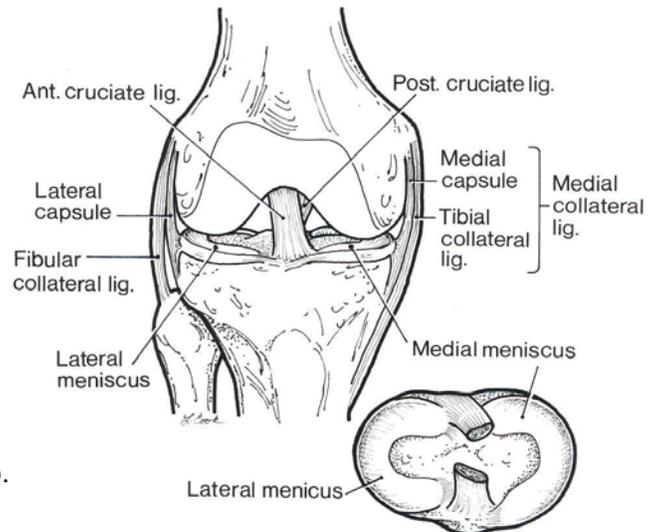


ANTERIOR CRUCIATE LIGAMENT INJURY

WHAT IS THE ANTERIOR CRUCIATE LIGAMENT?

The anterior cruciate ligament (ACL) is one of four major ligaments that stabilizes the knee joint. A ligament is a tough band of fibrous tissue, similar to a rope, which connects the bones together at a joint. There are two ligaments on the sides of the knee (collateral ligaments) that give stability to sideways motions: the medial collateral ligament (MCL) on the inner side and the lateral collateral ligament (LCL) on the outer side of the knee. Two ligaments cross each other (therefore, called “cruciate”) in the center of the knee joint: The crossed ligament toward the front (anterior) is the ACL and the one toward the back of the knee (posterior) is the posterior cruciate ligament (PCL). The ACL prevents the lower bone (tibia) from sliding forward too much and stabilizes the knee to allow cutting, twisting and jumping sports. The PCL stops the tibia from moving backwards.



HOW CAN THE ACL TEAR?

The most common mechanism that tears the ACL is the combination of a sudden stopping motion on the leg while quickly twisting on the knee. This can happen in a sport such as basketball, for example, when a player lands on the leg when coming down from a rebound or is running down the court and makes an abrupt stop to pivot. In football, soccer, or lacrosse, the cleats on the shoes do not allow the foot to slip when excess force is applied. In skiing, the ACL is commonly injured when the skier sits back while falling. The modern ski boot is stiff, high, and is tilted forward. The boot thus holds the tibia forward and the weight of the body quickly shifts backwards. Thus, too much force is suddenly applied to the knee. The excess force causes the ACL to “pop”.

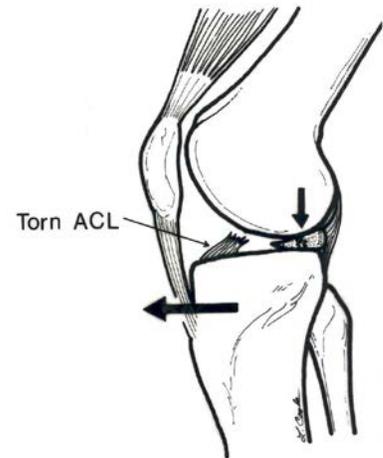
A contact injury, such as when the player is clipped in football, forces the knee into an abnormal position. This may tear the ACL, MCL and other structures.

WHAT ARE THE SIGNS THAT AN ACL IS TORN?

When the ACL tears, the person feels the knee go out of joint and often hears or feels a “pop”. If he or she tries to stand on the leg, the knee may feel unstable and give out. The knee usually swells a great deal immediately (within two hours). Over the next several hours, pain often increases and it becomes difficult to walk.

WHAT OTHER KNEE STRUCTURES CAN BE INJURED WHEN THE ACL TEARS?

The meniscus is a crescent shaped cartilage that acts as a shock absorber between the femur and tibia. Each knee has two menisci: medial (inner) and lateral (outer). The menisci are attached to the tibia. When the tibia suddenly moves forward and the ACL tears, the meniscus can become compressed between the femur and tibia tearing the meniscus. The abnormal motion of the joint can also bruise the bones.



There is a second type of cartilage in the knee joint called articular cartilage. This is a smooth, white glistening surface that covers the ends of the bones. The articular cartilage provides lubrication and as a result, there is very little friction when the joint moves. This joint cartilage can get damaged when the ACL tears and the joint is compressed in an abnormal way. If this articular cartilage is injured, the joint no longer moves smoothly. Stiffness, pain, swelling and grinding can occur. Eventually, arthritis can develop. The MCL and other ligaments in the joint can also be disrupted when the ACL tears. This is more common if an external blow to the knee caused the injury (such as if the knee was clipped while playing football) or when skiing.

WHAT IS THE INITIAL TREATMENT FOR A KNEE THAT MAY HAVE A TORN ACL?

The initial treatment of the injured joint is to apply ice and gentle compression to control swelling. A knee splint and crutches are typically used. The knee should be evaluated by a doctor to see which ligaments are torn and to be sure other structures such as tendons, arteries, nerves, etc. have not been injured. X-rays are taken to rule out a fracture. Sometimes an MRI is needed, but usually the diagnosis can be made by physical examination.

HOW WILL THE KNEE FUNCTION IF THE ACL IS TORN?

If no structure other than the ACL is injured, the knee usually regains its range of motion and is painless after six or eight weeks. The knee may feel “normal”. However, it can be a “trick knee”. If a knee has a torn ACL, the knee can give way or be unstable when the person pivots or changes direction. The athlete can usually run straight ahead without a problem but when he or she makes a quick turning motion, the knee tends to give way and collapse. This abnormal motion can damage the menisci or articular cartilage and cause further knee problems.

If a person does not do sports and is relatively inactive, the knee can feel quite normal even if the ACL is torn. Thus, in some older or less active patients, the ACL may not need to be reconstructed. In young, athletic patients, however, the knee will tend to reinjure frequently and give way during activities in which the person quickly changes direction. Therefore, it is usually recommended to reconstruct the torn ACL.

WHEN SHOULD SURGERY BE PERFORMED FOR A TORN ACL ?

It is best to wait for the pain and swelling to subside and to allow associated injuries to heal before performing surgery for the ACL. If surgery is done soon after injury, rehabilitation may be difficult, the knee may get stiff, and there could be permanent loss of motion. The athlete will usually get back to sports much more quickly if the knee is allowed to recover from initial injury and to regain its full painless range of motion (usually about six weeks) before performing surgery. At Boston Sports Medicine and Research Institute, we typically prefer that our patients have restored about 130-135 degrees of motion with minimal swelling and good quadriceps control prior to proceeding with surgical reconstruction. The final decision for timing of surgery is made on an individual basis, but these are general guidelines. By delaying surgery to attain these pre-operative goals, then an accelerated rehabilitation program can be used after surgery. With accelerated rehabilitation, continuous passive range of motion (CPM) is used for the first two weeks following surgery. The knee heals much more quickly and better joint function results.

The best treatment following acute ACL injury is to usually protect the joint and apply ice and use crutches for several weeks. As the swelling and pain subside, and the patient can put weight on the leg; then the immobilizer and crutches are discontinued. The emphasis is on regaining knee motion. Resistive exercises to build up strength should not be done during this time to prevent damaging the knee cap and causing chondromalacia patella.

If the knee also has an injured medial collateral ligament (MCL), it is best to allow the MCL to heal completely (usually six to eight weeks) before reconstructing the ACL. Then an arthroscopic procedure can be performed to reconstruct the ACL. The torn MCL typically does not need to be repaired surgically unless incomplete healing occurs.

There may be instances when immediate surgery is indicated following injury. Examples include some knee dislocation when multiple ligaments are torn. Tears of the outer knee ligaments (lateral collateral ligament) often do require timely surgical repair. Individual decisions need to be made on whether or not to reconstruct the ACL soon after injury in these instances where immediate surgery may be required.

DO ALL ACL TEARS NEED SURGERY?

No — some knees function reasonably well despite having a torn ACL. Good knee function is more common in patients who are over forty years old and who are relatively inactive in sports. Patients who are less than thirty years old, regardless of activity level, tend to have problems with instability and frequent episodes of giving way. Therefore, surgical reconstruction of a torn ACL is often recommended in these patients.

TREATMENT OPTIONS FOR A TORN ACL

I. NON-OPERATIVE

Some patients can function reasonably well even if the ACL is torn. However, it may be necessary to modify activities and avoid high risk sports (such as basketball, soccer and football). The key to prevent the knee that has a torn ACL from giving out is to avoid quick pivoting motions. Wearing a knee brace can help to prevent re-injury. The main effect of a knee brace is to be a constant reminder to be careful. However, a brace will not completely stabilize a knee that has a torn ACL. Exercises that restore the muscle strength, power, coordination,

and endurance will also improve knee function and help to stabilize the knee. However, a fully rehabilitated knee that has a torn ACL can still give way if a quick change in direction occurs.

II. LIMITED ARTHROSCOPIC SURGERY

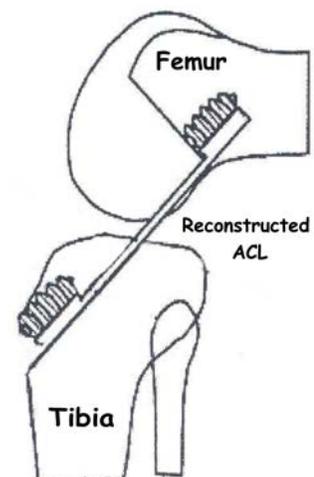
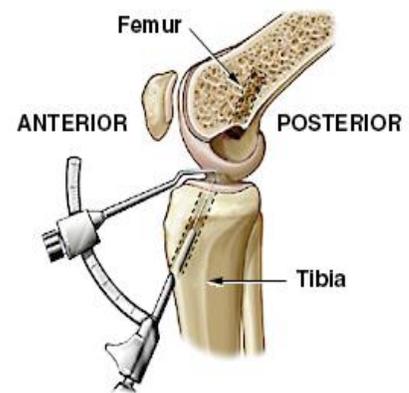
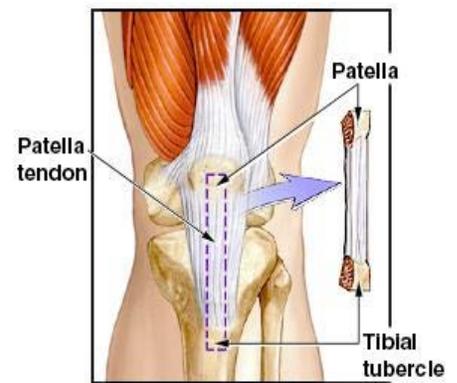
Many knees in which the ACL is torn have additional injuries such as torn menisci or fragments of articular cartilage that are knocked loose (creating a loose body and a defect in the articular cartilage). These associated injuries can cause symptoms of pain, swelling, and locking (in addition to symptoms of giving way due to a torn ACL). Arthroscopic surgery to remove torn menisci or to remove loose bodies can improve pain and eliminate locking. However, it would usually not eliminate symptoms of instability, i.e. giving way.

III. ACL RECONSTRUCTION

Surgical reconstruction of a torn ACL involves replacing the torn ACL with tissue (called a “graft”, usually a ligament or tendon) from another part of the knee and putting it into a position to take the place of the torn ACL.

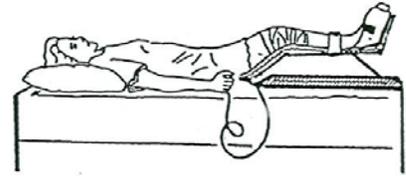
The most commonly used graft is taken from the middle third of the patellar tendon (the tendon connecting the knee cap to the tibial bone). Hamstring tendon grafts taken from the inner thigh on the back of the knee are also used. Occasionally, tendon grafts are taken from donor cadavers (referred to as “allograft”). For most of these procedures, the operation is done arthroscopically instead of making big incisions. The knee is examined arthroscopically and associated injuries such as torn menisci, loose bodies, etc are treated. If the middle third of the patellar tendon is used, a small incision is made on the inner side of the leg just below the knee to take the graft (this results in numbness on the front of the knee). While viewing the inside of the joint through the arthroscope, guides are used to create bone tunnels in the exact positions to allow proper reconstruction of the ACL. The graft is then pulled into the bony tunnels. Absorbable screws are placed in the tunnels to wedge the bone graft against the wall of the tunnel to give immediate stability and allow healing of the bone graft. Thus, the bone plug on one end of the graft is secured to the tunnel in the femur and the bone plug on the other end of the graft is secured to the tunnel in the tibia. The piece of patellar tendon graft between the two bone plugs becomes the new ACL.

Postoperatively, an accelerated rehabilitation program allows the optimal return of function. This necessitates using a continuous passive motion (CPM) machine for approximately 10 hours per day for the first 2 weeks following surgery. The patient can get up whenever he or she wishes for short periods of time using crutches and a knee brace. The CPM can be rented and it is a small device that sits on the bed and very slowly moves the knee.



The knee actually has less pain and regains its function much more quickly if CPM is used continuously. Therefore, it is best to devote the first week following surgery to use of the CPM at home as much as possible.

Two weeks after surgery, the sutures are removed and the patient can walk bearing full weight on the leg. A knee brace and crutches are used for the first week or two until the leg regains enough strength to allow unaided walking without a limp.



WHEN CAN I EXPECT TO RETURN TO SPORTS FOLLOWING SURGERY?

Within two weeks after surgery, the patient is usually walking on level surfaces without difficulty. At about five or six weeks, he or she can usually go up and down stairs without support. For the next several months, exercises are done to regain motion and strength in the knee. When the knee has full range of motion (usually at six to eight weeks), muscle-strengthening exercises are done. At four months, the patient is usually running and at six to eight months, participating in sports.

WHEN CAN I EXPECT TO RETURN TO ACTIVITIES AFTER SURGERY ?

Most people can get back to desk work or sedentary activity one or two weeks after surgery. If the right knee has been reconstructed, it may be several weeks before the knee is strong enough to drive safely. For heavy work, it may take 3 to six months before the leg is strong enough to allow working.

<u>WORK</u>	<u>RETURN</u>
Sedentary/Desk	1 to 2 weeks
General Office	2 to 3 weeks
Light	6 to 8 weeks
Medium	3 months
Heavy	4 to 6 months

<u>SPORTS</u>	<u>RETURN</u>
Normal walking/stairs	1 month
Light individual sports	3 to 4 months
Running	4 months
Jumping	6 months
Contact/high performance	9-12 months

WHAT ARE THE RISKS AND BENEFITS OF ACL TREATMENT?

NON-OPERATIVE

RISKS

- Repetitive injuries may cause further permanent damage and eventually lead to arthritis.
- Inability to participate in sports that require pivoting.

BENEFITS

- Some people manage well without surgery.

OPERATIVE

RISKS

<u>Complications</u>	<u>%</u>
Permanent numbness in the front of the knee near the incision	100
Other nerve injury	0.5
Patello-femoral pain (kneecap)	5
Flexion contracture (stiffness, reduced motion)	10
Reinjury (knee becomes unstable again)	5-10
Swelling	10
Superficial infection	1
Deep infection	0.5
Deep vein thrombosis (blood clots)	0.5
Delay in regaining motion	5
Vascular (damage to blood vessels)	0.01
Death	0.0

BENEFITS

- Return to work and sports with a stable knee
- Hopefully prevent further injury to the knee