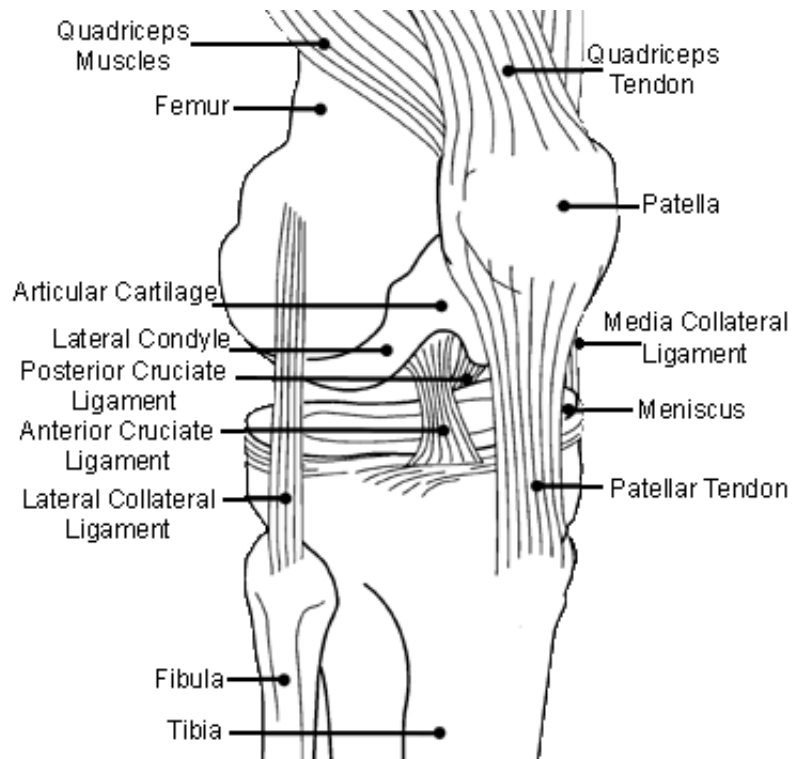


Anterior Cruciate Ligament Tear

Introduction The Anterior Cruciate Ligament (ACL) is the most commonly injured ligament of the knee. The ligament is most commonly injured during an athletic activity. Due to the fact that sports are an increasingly important part of day to day life in the United States, the number of ACL injuries have steadily increased over the past few decades. 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 anterior cruciate ligament have been invented.

Anatomy If you have not reviewed the section on knee anatomy, you may want to look at this page now. Remember that the ACL controls how far forward the tibia moves in relation to 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 straight. If the knee is forced past this point, or hyperextended, the ACL can also be torn. This tearing of the ligament results in the loud pop and the feeling of instability in the knee. The ACL may not be the only ligament injured when the knee is twisted violently, such as in a clipping injury in football. It is not uncommon to see both the medial collateral ligament (MCL) and the ACL injured.



Causes The major cause of injury to the ACL is sports related. The types of sports which 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, of course, is 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 forces caused by a fall to the knee rather than the ankle or lower leg. The ACL injury usually occurs when the knee is forcefully twisted, or hyperextended. Many patients recall hearing a loud pop when the ligament tears, and feel the knee give away.

There has been a dramatic increase in the number of females who suffer an ACL tear. This is in part due to the rise in women's athletics, but studies have shown that female athletes are more likely to suffer this injury when compared to their male counterparts. It is uncertain why this is the case. Initially, it was thought that females were at higher risk because of differences in training intensity. But more evidence suggests that there may be a difference in the anatomy of the female knee, or the female ligament may not be as strong due to the effects of the female hormone estrogen. These factors may lead to a higher risk of ACL injury for the female athlete.

Symptoms How does a torn anterior cruciate ligament cause problems?

The symptoms following a tear of the ACL are not always the same in different people. Usually, there is swelling of the knee 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 bend to far backwards.

The pain and swelling from the initial injury will usually be gone after 2 to 4 weeks, but the instability remains. The symptom of instability, and the inability for the patient to trust the knee for support is what requires treatment. Also important in making decisions about which way the knee should be treated is the growing realization by orthopedic surgeons that long term instability leads to early arthritis of the knee. (These two images illustrate the degenerative arthritis present after longstanding ACL deficiency, both in the x-ray films and in the artist's rendition based on the x-rays.) Many orthopedic surgeons feel that by treating the

instability and performing a reconstruction of the ligament, the risk of developing wear and tear arthritis in the knee can be reduced.

Diagnosis How do we look into this problem?

The history and physical examination is probably the most important tool in diagnosing a ruptured or deficient ACL. In the acute 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 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% chance it came from a torn ACL.

X-Rays of the knee to rule out a fracture may also be ordered on the initial examination. Ligaments and tendons do not show up on x-rays, but bleeding into the joint also occurs when a fracture through the knee joint is present, or when portions of the joint surface are chipped off.

Probably the most accurate test without actually looking into the knee, is the MRI scan. The MRI (Magnetic Resonance Imaging) machine uses magnetic waves rather than x-rays, to show the soft tissues of the body. With this machine, we are able to "slice" through the area we are interested in and see the anatomy, and 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 a type of an operation where a small fiberoptic TV camera is placed into the knee joint, allowing the orthopedic surgeon to look at the structures inside the knee joint directly. The vast majority of ACL tears are diagnosed without resorting to surgery, and arthroscopy is usually reserved to treat the problems identified by other means.

Treatment How do we treat this problem?

Initial treatment for ACL injury includes crutches and rest until the swelling resolves. The knee joint may be aspirated to remove the blood in the joint. Aspirated means simply putting a needle in the knee joint and draining out the blood.

Once, the initial pain and swelling begins to resolve, physical therapy will probably be initiated to regain as much of the normal range of motion as possible. One of the problems that tearing the ACL causes, is that small proprioceptive nerve endings in the ligament are torn as well. These nerves are there to give the brain information about where the body is in 3D space. For instance, these nerves are what makes it possible for you to touch your nose with your eyes closed. The joints rely on these nerves to fine tune the muscles' actions that allow the joint to function properly. A good physical therapy program will help retrain these nerves as they repair themselves, and will strengthen certain muscles that will take over some of the functions of stabilizing the knee joint from the loss of the ACL.

To help replace the stability of the knee due to the loss of the ACL, an ACL brace may be suggested. These braces are fairly effective at preventing the knee from giving way during strenuous activity. Most of these braces must be fitted by a certified orthotist, a physical therapist, or physician. They are NOT the type you can buy at the drugstore. Most orthopedists will recommend wearing a brace for at least 1 year after a reconstruction, so even if you decide to have surgery, a brace is a good investment.

If the symptoms of instability are not controlled by a brace and rehabilitation program, then surgery may be suggested. Most surgeons now favor reconstruction of the ACL using a piece of tendon or ligament to replace the torn ACL. Today, this surgery is most often done using the arthroscope. Incisions are usually still required around the knee, but the joint itself is not opened. The arthroscope is used to perform the work needed on the inside of the knee joint. Most patients can have the surgery as an outpatient.

In the typical surgical reconstruction, the torn ends of the ACL must first be removed. Once this has been done, the type of graft that will be used is determined. One of the most common tendons used for the graft material is the patellar tendon. This tendon connects the kneecap (patella) to the lower leg bone (tibia). Another very common graft that is used is to combine two of the hamstring muscle tendons that attach to the tibia just below the knee joint - the gracilis tendon and the semitendinosus tendon. Studies have shown that these two tendons can be removed without really affecting the strength of the leg. There are other, much bigger and stronger hamstring muscles that can take over the function of the two tendons that are removed.

If the patellar tendon is used, about one third of the patellar tendon

is removed, with a plug of bone at either end. The bone plugs are rounded and smoothed. Holes are drilled in each bone plug to place sutures that will pull the graft into place. The next procedure is to prepare the knee to place the graft. The intracondylar notch is enlarged so that there is no rubbing on the graft. This process is referred to as a notchplasty. Once this is done, holes need to be drilled in the tibia and the femur to place the graft. These holes are placed so that the graft will run between the tibia and femur in the same direction as the original anterior cruciate ligament. The graft is then pulled into position using sutures placed through the drill holes. Screws are used to hold the bone plugs in the drill holes.

Other types of materials are also used to replace the torn ACL. In some cases, an allograft is used. An allograft is tissue that comes from someone else. This tissue is harvested from tissue and organ donors at the time of death and sent to a tissue bank. There the tissue is checked for any type of infection, sterilized, and stored in a freezer. When needed, the tissue is ordered by the physician and used to replace the torn ACL. The advantage of using allograft is that the surgeon does not have to disturb or remove any of the normal tissue from your knee to use as a graft. The operation is also usually takes less time because the graft does not to be harvested from your knee.

After surgery, a physical therapist will be contacted to begin your rehabilitation program. You will probably be involved in some type of rehabilitation for 6 months after surgery to ensure the best result from your anterior cruciate ligament reconstruction. The first 6 weeks following surgery expect to see the physical therapist about three times a week. Following the initial period, you may be placed on a home program and monitored by the therapist.