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## ANTERIOR CRUCIATE LIGAMENT INJURY (ACL)

The following is designed to present an overview about an Anterior Cruciate Ligament (ACL) injury so that you might better understand what it is and what the treatment options are.

This is a very serious injury to the knee, as ligaments are structures that give the joint stability. The anterior cruciate ligament (ACL) is one of the most important ligaments and when injured, it is one of the more difficult to treat. It is located in the middle of the knee joint and goes from the femur (thigh bone) to the tibia (shin bone). When it tears, it almost always tears like a rope pulling apart. Before a tear in the ligament actually occurs, it is usually stretched beyond its ability to recover to its original length (which means it has lost its elasticity). This means that some of the ligament that appears intact, may actually be seriously injured and will not function as a normal ligament. Most tears of this ligament, however, are complete and the ligament is usually shredded in its mid-substance.

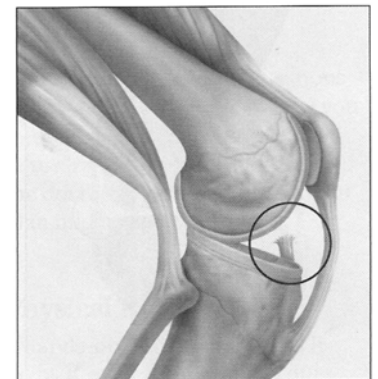
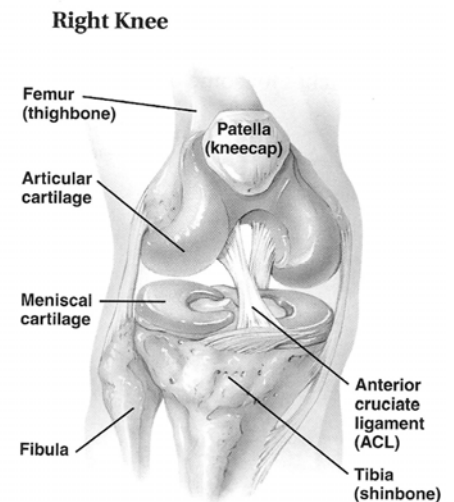
A good blood supply is necessary for healing soft tissue and bony injuries. Unfortunately, the anterior cruciate ligament has a poor blood supply and the chances of it healing after tearing are minimal. These factors among others also make it almost impossible to repair this ligament by just sewing the ends of the tear back together again. Years of investigation have proven conclusively that this will not work. What can be done for this injury will be discussed at length further on in this handout.

Once the ACL is torn, the knee remains unstable allowing the knee joint to move in directions that are not normal and not intended. This can happen suddenly, as when trying to jump or change directions quickly, causing the knee to “give way” or “pop out”. This abnormal motion can result in pain and possibly additional damage within the joint, such as a torn cartilage.

The cartilages or menisci between the tibia and femur serve many functions. The more important ones deal with load transmission, stability of the knee joint, and lubrication of the joint. One or both of these cartilages are torn in 50-70% of the patients with acute ACL tears. In patients with a torn ACL for more than a year, the chances of a torn cartilage increase to 90-95%. Therefore, although the torn ACL is the major problem, there is a good chance for a torn cartilage as well.

In treating the meniscal cartilage tears, it is important to save as much as possible. Unlike the ACL, some types of cartilage tears can be repaired. A good blood supply is found in the outer third of the cartilage and certain tears located in this area are repairable. Suturing of these tears, either arthroscopically or through an open incision, is usually recommended. If the tear is felt to be un-repairable, the cartilage will need to be partially or entirely removed, depending on the severity of the tear.

Knees with a chronically torn ACL are at a high risk of developing premature arthritis. This usually occurs secondary to the instability, the cartilage tears, and repeated injuries to the knee. This is the same kind of arthritis that occurs as we get older, only it can happen at a much younger age and more severely, especially if the injury occurred in the teen years. Even with



ACL after injury

proper surgical treatment, arthritis can still develop. However, surgical reconstruction of the ligament generally will decrease the severity and retard the progression of the arthritis, especially in those cases where the cartilage are not torn or are saved by repair.

Instability of the knee is a significant disability that is experienced by virtually every patient whose ACL is injured and that is involved in activities that require sudden stops/starts, change of direction, jumping or twisting. Missteps, such as going down stairs, stepping off a curb, or walking on rough ground, can also cause this sensation of instability. Therefore, activities that require a sudden change in momentum and direction are generally the ones most significantly hampered by a torn ACL. An athlete's knee in particular would be seriously compromised by this injury. Normal daily activities can also be difficult secondary to the absence of the support of this ligament and frequently from the presence of a torn cartilage. Sensations, such as, the knee giving way or popping out of joint, occur combined with pain (sometimes severe), and usually swelling.

It is evident from the above information that this is a very difficult and disabling injury. The knee can be improved with surgery and hopefully eliminate the previous problems caused by the lack of an ACL and by tears of the cartilages. Even with current treatment options, the knee cannot be completely return to "normal." However, surgical reconstruction is an attempt to make it as close to normal as possible.

Treatment Options (3):

**Option 1: Minimal Treatment**

Use crutches and participate in an appropriate rehabilitation program with gradual attempted return to desired activities. This would take a minimum of 4-6 weeks. A brace to compensate for the torn ligament would be used for activities. However, these have not proven to be satisfactory. A torn cartilage could also be present which would continue to cause dysfunction and disability with further damage to the knee. If the cartilage was initially repairable, it may not be after one or more re-injuries occur. Although treating the injury this way is an option, experience has shown that the vast majority of patients will continue to have difficulties with the knee as described above, unless they become rather inactive or sedentary, and avoid almost all athletic and work activities that put stress on the knee. This type of treatment is not our recommendation for "young" active individuals.

**Option 2: Knee arthroscopy**

This option involves examining the knee under anesthesia, placing an arthroscope in the knee, and partially removing or repairing the cartilage as indicated. This option does not do anything for the torn ligament or to stabilize the knee, but does address the cartilage pathology. After surgery, the knee would be rehabilitated and placed in a brace during activities. If you continued to experience problems with the knee slipping out and giving way, then a reconstructive procedure could be performed at a later date. The disadvantage of this treatment option is that if you continued to have episodes of instability, re-injury to the knee could occur, with further injuries to the cartilages and acceleration of the degenerative process. Interim disability, dysfunction acceleration, degenerative changes, and torn cartilages are the risks involved with postponing the reconstructive procedure.

In my opinion, the best treatment option would be to restore the injured knee to as close to normal as possible. As the ACL cannot be successfully sutured back together again, it would need to be reconstructed using other body tissues to stabilize the knee. If a cartilage repairs is attempted without stabilizing the knee, then 40-60% of these repairs will re-tear within the next 1-3 years. With satisfactory stabilization of the knee by reconstruction, the incidence of cartilage re-tears should be less than 10%.

**Option 3: Reconstruction**

The third and last treatment option would be to arthroscope the knee, to address the cartilage pathology by partial removal or by repair, and to reconstruct the ACL. Reconstruction of the ligament can be with an, **AUTOGRAFT** (your own tissue obtained from elsewhere in your body, usually the affected leg), or with an **ALLOGRAFT** (tissue from organ donors).

Artificial or synthetic ligaments are basically no longer used and were only available for use in knees that had previously failed reconstruction as per FDA guidelines.

Allograft or tissue from organ donors, have been successfully used to reconstruct the ACL. Their continued use is determined by the availability of the patient's own tissue which can be used as a graft or if the patient requests one.

There are circumstances of multiple knee ligament injuries, where an insufficient amount of your own tissue is available; an allograft becomes the only reasonable option.

Autograft (your own tissue) seems to be the best substitute for the ACL. It is obtained by taking the central portion (middle 1/3) of the patella tendon (located on the front of the knee). As much as 50% of this tendon can be harvested without significantly weakening the extensor mechanism. Some studies have even demonstrated a regeneration of this tendon following harvest. Although there are many different types of autograft reconstructions, the patella tendon free graft is the “state-of-the-art” and “gold standard” for ACL reconstruction.

This procedure requires two small incisions or one relatively short incision, over the front of the knee to harvest the patella tendon graft while the rest of the procedure is performed arthroscopically. The patella tendon graft is harvested along with two small wedges of bone, one from the kneecap and one from the shin bone. The graft is then moved in to the appropriate position to replace the ACL; it is passed through drilled tunnels in the shin bone and thigh bone, and anchored into place using the wedges of bone and screws. The entire procedure usually takes 2 to 2 ½ hours and routinely performed on an out-patient basis.

**DO NOT EAT OR DRINK ANYTHING AFTER MIDNIGHT ON THE DAY OF YOUR SURGERY. DO NOT TAKE ANY ANTI-INFLAMMATORY MEDICATIONS SUCH AS ASPIRIN, ADVIL, ALEVE, NAPROSYN, ETC. FOR 10 DAYS PRIOR TO YOUR SURGERY.** If insect bites, scratches, or pimples occur on or around the knee prior to surgery, contact the office immediately.

It is very important to regain the ability to do a strong quadriceps contraction and obtain full extension of the knee in the first few days of surgery. These exercises will be demonstrated to you **prior** to the surgery and will be reinforced prior to discharge postoperatively. A brace is not usually used except if needed to protect an injured or repaired ligament other than the ACL. No cast is needed. Crutches will be required for a total of 4-6 weeks and may be discarded at that time if you have regained sufficient strength and motion, usually when you can walk without a limp. Crutches are needed to protect you and the graft. Although you may feel that you do not need the crutches prior to the 4-5 weeks, it is strongly recommended that you continue to use them until instructed otherwise.

Certain activities can begin at different time frames. You can ride a stationary bicycle and swim at the end of 2-4 weeks. At the end of 4-6 weeks, you can advance to a regular bicycle, or you can continue to use a stationary bicycle and begin some walking or brisk walking if desired. Running can begin at 3-4 months without sudden starts or stops. Resumption of most athletic activities can begin after 4-6 months depending on the patients' sport, desires, and state of rehabilitation.

Depending on your doctor, post operative office visits are usually 10-14 days from the time of surgery, one month from the time of surgery, then monthly for the next five months, then nine and twelve months from the time of surgery.

You will absolutely need to be seen by a physical therapist prior to your surgery and instructed in proper pre-and post-op exercises. We strongly suggest that you be seen by the same physical therapist about 3-5 days post-op and again at the first post-op physician visit at about 10-14 days after the surgery. The number and frequency of post-op visits is extremely variable from one patient to another, and depends on motivation, age, desired time of return to which sport, etc. You will have a program individually tailored to your needs and desires. After the first two visits, further physical therapy visits can be arranged in any facility you desire as long as they are willing to follow our instructions and protocol. It is important to remember that physical therapy is **YOU**, the patient, doing the appropriate exercises, and you must do them at home, **on your own**, in addition to the supervised physical therapy visits.

Questions commonly asked at this point are: What will my knee be like? and What percentage of normal will it be? There is not a precise answer to these questions. The idea is complete 100% function, but our goal would be to achieve at least 85-95% of normal value, assuming no complications, good motivation, and adequate rehabilitation. It must be remembered that if you could tear your normal ligament, you could certainly tear the replacement. However, our experience has shown that this occurrence is rare. In fact, there is a greater likelihood that you will tear your other knee's ACL before you tear the reconstruction.

Complications of the surgery are rare, but they can and do occur. Loss of motion is the most common complication which can occur. After the surgery, stiffness, swelling, and scarring can occur around the kneecap and cause difficulty with the rehabilitation. A strict adherence to the rehab protocol can help diminish this occurrence. If this does occur, its worst form is called arthrofibrosis (meaning scarred joints); there can be severe loss of motion and pain out of proportion to known causes. This could lead to permanent loss of motion. This occurrence is rare, and difficult to treat. Mild forms are not uncommon but respond well to vigorous rehabilitation. The exact cause of this complication is not known. Appropriate timing of the surgery may also diminish the incidence of post operative stiffness and pain making it easier to comply with the rehab protocol. Studies have demonstrated that the surgery should be delayed in the acute phase for at least 3 weeks or until the pain has subsided and full, painless range of motion of the knee has been regained.

Other complications include failure of the operation, either through stretching of the graft over time or by another injury to the knee. Infection can occur and is a serious and difficult complication usually requiring further surgery. Phlebitis or blood clots in the leg and thigh can occur, and is also a very serious complication and could potentially be life threatening. Rupture or breakage of the patella ligament from the graft harvest site and fracture of the kneecap have also been reported. All of these complications are unusual and do not pose an unreasonable risk in young, healthy people.

An extremely rare complication following injury and/or surgery on the extremities is a condition called reflex sympathetic dystrophy. It is an abnormal response to injury and/or surgery involving the small nerves (sympathetic nerves) that supply the blood vessels and sweat glands. It is extremely painful, and symptoms can involve the entire limb. These symptoms include hypersensitivity, increased sweating, skin color change, and others. It can usually be successfully treated, but the process can be long and frustrating for both the patient and the physician.

Nerve and blood vessel injuries have been reported but are quite rare. Nerve injuries can occur as a result of the surgery or secondary to pressure from the tourniquet. If nerve function does not return, there will be serious dysfunction and disability to the leg. Blood vessel injuries can occur for the same reason, and in the

worst case example, could lead to loss of limb. It should be remembered that these serious complications are **extremely** rare. Sensory nerves which supply sensation (feeling) to the front of the knee are often cut when the graft is harvested resulting in some numbness in this area. This usually does not cause disability, and the perception of the numbness will usually diminish with time.

Other types of reconstructions (for example, the hamstrings), use autografts obtained from the different location in the body, that are routed in the same or different ways than described above. Still other procedures attempt to tighten the structures on the outside of the knee. However, this “outside” repair alone does not restore normal anatomy and is probably not strong enough to last. Occasionally, there can be a combination of the inside and outside procedures to repair a severely unstable knee.

This injury in young patients who still have open growth plates in their legs requires a slightly different procedure to avoid drilling tunnels through their grown centers. The autograft would be obtained from the hamstrings and substituted for the torn ACL in a similar fashion as to that of an adult. The post operative rehab is approximately the same. Secondary to recurrent injuries, it is extremely important to stabilize the knee in this group of patients.

Occasionally, an MRI (Magnetic Resonance Imaging) will be recommended prior to surgery to further delineate an injury to the cartilage or ligament. The MRI scanner is composed of a large electromagnet with computerized recording devices and is used to study many areas of the body including the knee. It is a painless test but does require the patient to lie still for approximately 30-45 minutes at a time. Many factors are considered prior to recommending an MRI versus arthroscopy. The MRI scan is the best non-invasive test available. However, there are limitations to the accuracy of this procedure. While MRI scans are reported to be over 90% accurate, arthroscopy approaches 100% accuracy for the diagnoses of meniscal, ligament, and ACL injuries. Generally, it is obvious that someone has a torn ACL and desires to have the ligament reconstruction, an MRI would be an unnecessary step and expense. However, if your circumstance indicates that you would benefit from an MRI, then this can easily be arranged. If an MRI is obtained, a return office visit would be required to discuss the results.



The information contained in this patient education packet is intended to help you and your families/caretakers better understand a particular diagnosis and/or the treatment options available. If you have any questions after reading this, please don't hesitate to contact Dr. Longobardi's office at 201.343.1717 for a further explanation or you can also go to [www.universityorthopaedic.com](http://www.universityorthopaedic.com) and click on Patient Education to gather more information. Thank you.