



Anterior Cruciate Ligament (ACL) Injuries

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The anterior cruciate ligament (ACL) is one of the most commonly injured ligaments of the knee. The incidence of ACL injuries is currently estimated at approximately 200,000 annually, with 100,000 ACL reconstructions performed each year. In general, the incidence of ACL injury is higher in people who participate in high-risk sports such as basketball, football, skiing, and soccer; however, injuries may occur in automobile accidents or work related injuries. The rate of ACL injury is greater in females than males, especially in younger individuals. As the number of females participating in competitive and recreational activity continues to increase, the number of females sustaining ACL injury can be expected to increase. The majority of ACL injuries involve no contact with another athlete. Approximately 70 percent of ACL injuries are non-contact in nature and almost always occur as the body undergoes rapid deceleration while performing either: 1) planting and cutting maneuvers or 2) landing from a jump. In addition, females are at 3-times greater risk for sustaining an ACL injury during non-contact mechanisms when compared to males competing in the same sport. It has been proposed that this is due to differences in physical conditioning, muscular strength, and neuromuscular control. Other hypothesized causes of this gender-related difference in ACL injury rates include pelvis and lower extremity (leg) alignment, increased ligamentous laxity and the effects of estrogen on ligament properties.

The information that follows includes ACL anatomy, ACL tear findings, treatment options, and a brief description of ACL surgical techniques and rehabilitation.

What is the ACL?

The ACL (anterior cruciate ligament) is one of the four main ligaments in the knee and is the primary stabilizer for rotational movement. It connects the thighbone (femur) to the shinbone (tibia) in the center of your knee. The knee is essentially a hinged joint that is held together by the medial collateral (MCL), lateral collateral (LCL), anterior cruciate (ACL) and posterior cruciate (PCL) ligaments. The ACL runs diagonally in the middle of the knee, preventing the tibia from sliding out in front of the femur as well as providing rotational stability to the knee (Figure 1).

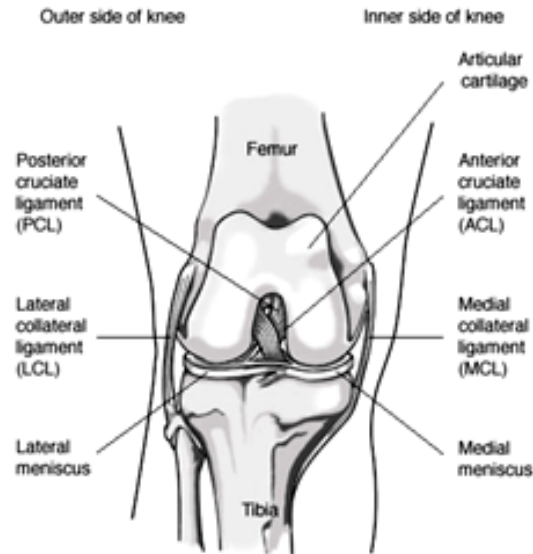


Figure 1. Diagram of the knee.

The weight-bearing surface of the knee is covered by a layer of articular cartilage. On either side of the joint, between the cartilage surfaces of the femur and tibia, are the medial meniscus and lateral meniscus. The menisci act as shock absorbers and work with the cartilage to reduce the stresses between the tibia and the femur. Without an ACL, the knee may be unstable during activities that involve running, jumping or twisting and injuries to the cartilage or menisci may occur. It is estimated that 50 percent of ACL tears are accompanied by cartilage tears, and 20 to 30 percent involve other ligament damage.

ACL Tears

Immediately after the injury, patients usually experience pain and swelling and the knee feels unstable. Within a few hours after a new ACL injury, patients often have a large amount of knee swelling, a loss of full range of motion, pain or tenderness along the joint line and discomfort while walking. It is estimated that up to 75% of athletes who develop and large, swollen knee after suffering a sports-related knee injury will have a torn ACL.

In addition to performing special tests for identifying meniscus tears and injury to the bones or other ligaments of the knee, the physician will often perform a physical examination to see if the ACL is intact. If the ACL is torn, the examiner will feel increased forward (upward or anterior) movement of the tibia in relation to the femur (especially when compared to the normal leg) and a soft, mushy endpoint (because the ACL is torn) when this movement ends. X-rays and MRIs are often ordered to confirm the diagnosis and rule out other injuries.

The natural history of an ACL injury without surgical intervention varies from patient to patient and depends on the patient's activity level, degree of injury and instability symptoms.

Complete ACL ruptures generally do not have a favorable outcome. After a complete ACL tear, some patients are unable to participate in cutting or pivoting-type sports, while others have instability during even normal activities such as walking. There are some rare individuals who can participate in sports without any symptoms of instability. This variability is related to the severity of the original knee injury as well as the physical demands of the patient. Secondary damage may occur in patients who have repeated episodes of instability due to ACL injury. With chronic (long-term) instability, greater than 90 percent of patients will have meniscus damage. Similarly, the prevalence of articular cartilage lesions increases up to 70 percent.

Treatment

Some people with a completely torn ACL are able to build their muscle strength enough to resume normal activities without surgery. While activities of daily living may be possible with a torn ACL, it is unlikely that patients will be able to return to cutting and twisting sports or demanding work and other activities. An untreated ACL may leave the patient unable to trust the stability of the knee. It may continue to buckle and give-way which increases the risk for further injury to other knee structures. An untreated ACL injury may cause cartilage damage that can lead to the premature onset of osteoarthritis. Having surgery or forgoing it is partly a personal choice. Those who are not very active may choose a strengthening program instead of surgery, since the injury is not likely to interfere with their daily activities. Such a program takes about four months to complete.

Active, athletic people are more likely to opt for surgery. The goal of surgery is to reconstruct the torn ligament and rehabilitate the leg to enable a return to previous activities. ACL reconstruction in which a free tendon graft is substituted for the torn ligament is very common. Because the menisci, articular surfaces, and other restraining structures around the knee are susceptible to injury during episodes of instability, it is generally accepted that ACL reconstruction should be offered to patients who have or are at risk for having recurrent knee instability.

The goal of ACL reconstruction is to restore normal anterior knee stability, and when deciding on surgical intervention, the orthopaedist has to determine which graft substitute best accomplishes this goal. The ideal graft is one that retains strength at least equivalent to that of the normal ACL, allows for secure fixation, enables unrestricted rehabilitation, and is associated with minimal graft harvest morbidity (pain or problems from the “donor” site). Historically, orthopaedists have preferred an autograft (harvested from another site in the patient), however, there has recently been an increase in the use of cadaver tissue (allograft). For many years, the patellar tendon has been the most popular autograft source, however given the associated morbidity, many surgeons have turned to newer techniques using soft-tissue grafts (hamstring tendons and allograft tissues) which have shown equivalent results with fewer complications. Biomechanical testing has shown the strength of a soft-tissue graft (hamstring or allograft) to be as strong or stronger than the normal ACL and the patellar tendon autograft. The biggest advantage of the soft-tissue grafts over patellar tendon grafts is preservation of the extensor (knee cap) mechanism and utilization of much smaller, cosmetically pleasing incisions. As a

result, postoperative problems such as patellar fracture, patellar tendon rupture, patellofemoral pain, patellar tendonitis, and knee stiffness are minimized. Patellofemoral pain has been a problem when patellar tendon grafts are used, with a 17% to 56% postoperative incidence of pain. Pain on kneeling has been reported to occur in 42% of those who undergo ACL reconstruction with patellar tendon autograft. Deterioration of the patellofemoral (knee cap joint) articular surfaces, documented by second-look arthroscopy, has been reported in as many as 57% of patients after the use of a patellar tendon autograft. Hamstring weakness can be documented after harvesting a portion of the hamstring but this weakness has very little effect on overall strength or function after rehabilitation. Some surgeons are concerned about using hamstring tendon autografts in female athletes secondary to the females natural quadriceps muscle imbalance, not seen in males. Allografts have the advantage of no donor-site morbidity, small incisions, decreased post-operative pain and earlier return of range of motion. There have been reports of disease transmission in allograft tissue which is very rare.

Rehabilitation following surgery can take as little as four months but usually takes nine months to a year. Rehabilitation is demanding and requires a commitment of at least 45 minutes, three days a week. The success rate is about 90 percent which means the majority of people will be able to return to their previous active lifestyles after ACL reconstruction.

Further information and references on ACL injuries are available via the internet at: <http://www.wakeortho.com/links.html> (click on the "Patient education and information" icon)

Dr. Wood practices at Wake Orthopaedics and has an office in Cary and Raleigh. He specializes in knee and shoulder injuries with an emphasis on arthroscopic reconstructive procedures. Contact and appointment information is available at www.wakeortho.com.