Anterior Cruciate Ligament (ACL) Injury

The anterior cruciate ligament is one of the most commonly injured ligaments of the knee. Incidence of tears is about 200,000 per year in the United States, with 100,000 of these undergoing surgical repairs. In general, the incidence of ACL injury is higher in people who participate in higher risk sports, such as basketball, football, soccer, lacrosse, and skiing.

It is estimated that 70 percent of ACL injuries occur through non-contact mechanisms, while 30 percent result from direct contact with another player or object. The mechanism of injury is often associated with deceleration coupled with cutting, pivoting or sidestepping maneuvers, awkward landings or "out of control" play. Several studies have shown that female athletes have a higher incidence of ACL injury than male athletes in certain sports. 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 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. It is one of four major ligaments around the knee offering stability and guidance to knee motion.

At the time of injury, most athletes relate a “pop” in the knee, often times heard by other players. There is usually immediate swelling and inability to continue play. The knee often feels unstable, like it will give out from under the player. Testing of the knee is usually done by the athletic trainer on the field, but may be delayed until a physician consult. The on-site testing is called a Lachman’s test and is done by pulling forward on the leg just below the knee when the knee is bent a small amount (30°). A positive test allows forward shifting of the leg under the knee with a soft limit or no limit to movement.
Treatment of ACL tears can be non-surgical for partial tears, but is often surgical, especially if the player wishes to return to the previous level of play. Partial tears can be treated conservatively for 2-3 months through physical therapy and athletic retraining to enable return to sports. If there is continued symptom of instability or feelings of giving way, the partial tear may still warrant surgical reconstruction.

For surgical intervention, there are several key factors that must be considered. In young children or adolescents with ACL tears, early ACL reconstruction creates a possible risk of growth plate injury, leading to bone growth problems. The surgeon can delay ACL surgery until the child is closer to skeletal maturity or the surgeon may modify the ACL surgery technique to decrease the risk of growth plate injury. Activity level, significant functional instability, and presence of combined injuries (meniscal, additional ligamentous, or cartilage damage) are all further indications for surgical intervention.

The current “gold-standard” for reconstruction of the ACL is to use the patellar tendon graft. This involves using the central 1/3 of the same knee’s patellar tendon and bone chips on each end to reconstruct the ACL. Tunnels are drilled into the bone above and below the knee to place the ACL graft. The benefits of the bone-tendon-bone graft are that the bone chips heal well to the bony tunnels in the leg bones, lower risk of graft failure, and improved stability. Pitfalls associated with patellar tendon grafts include anterior knee pain, patellar (kneecap) pain, weakness of the quadriceps muscle (front of the thigh), and a low risk of patellar (kneecap) fracture.

The hamstring can also be used for grafting the ACL. This is generally done through a smaller incision, has little pain associated with the front of the knee, and generally has faster return of quadriceps strength. Fixation of the hamstring graft has been shown to be equal to or greater than the bone-tendon-bone fixation. The cons with hamstring grafting are weakness of hamstring and inner thigh muscle groups and possible elongation of the graft itself.

After surgery, physical therapy is a crucial part of successful ACL reconstruction, with exercises beginning immediately after the surgery. Much of the success of ACL reconstructive surgery depends on the patient's dedication to rigorous physical therapy. With new surgical techniques and stronger graft fixation, current physical therapy uses an accelerated course of rehabilitation.

The patient's sense of balance and control of the leg must also be restored through exercises designed to improve neuromuscular control. This usually takes 4 to 6 months. The use of a functional brace when returning to sports is ideally not needed after a successful ACL reconstruction, but some patients may feel a greater sense of security by wearing one. For return to sports, it is recommended that the athlete participate in sport specific training to mimic sporting activities in a controlled environment before returning to competitive play. This is recommended to prevent re-injury, as well as to maximize the athlete’s ability to play well, without fear or anxiety regarding the injured knee.