

Anterior Cruciate Ligament (ACLs)

Women and girls are more vulnerable to ACL injuries than men. The anterior cruciate ligament (ACL) is the most commonly damaged ligament of the knee, accounting for up to 50% of documented ligamentous knee injuries. But among women ACL injury rates are four to eight times higher than for men. In the US alone, women incur 38,000 ACL injuries every year. That is significant difference.

In figure skating it is accepted that from time to time a skater will receive up a contact injury from falling. Many skaters typically wear protective padding on their knees. However, research shows that women are not damaging their ACLs through contact injuries.

The leading causes are non-contact mechanisms such as poor landing strategies, high impact forces (women generate higher peak impact forces than men over shorter time frames) and rapid decelerations.

Researchers in the United States, aware of these predisposing factors, set about developing and testing out a 'prehab' training program to help prevent non-contact ACL injuries.

The article ***Effects of Knee Ligament Injury Prevention Exercise Program on Impact Forces In Women*** was published in *The Journal of Strength and Conditioning Research*, Volume 18, Issue 4 (November 2004), pp. 703–707

<http://apt.allenpress.com/perlserv/?request=get-abstract&doi=10.1519/R-13473.1&ct=1>

Twenty-eight female subjects were randomly assigned into control and treatment groups. The treatment group took part in two 'prehab' training sessions per week for nine weeks, while the control group did nothing.

To assess improvements in landing strategies the scientists looked at ground reaction forces and rate of force development during a "step land assessment" (step from a height of 69cm, landing on a force plate with both feet) before and after the nine-week training period.

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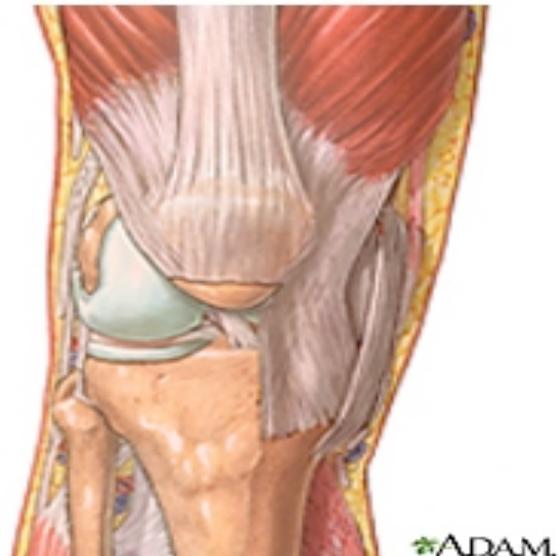
Knee Injuries and Disorders

Your knee joint is made up of bone, cartilage, ligaments and fluid. Muscles and tendons help the knee joint move. When any of these structures is hurt or diseased, you have knee problems. Knee problems can cause pain and difficulty walking.

Arthritis is the most common disease that affects bones in your knees. The cartilage in the knee gradually wears away, causing pain and swelling. Injuries to ligaments and tendons also cause knee problems.

A common injury is to the anterior cruciate ligament (ACL). Most individuals injure their ACL by a sudden twisting motion. ACL and other knee injuries are common sports injuries.

Treatment of knee problems depends on the cause. In some cases your doctor may recommend knee replacement.



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The Anterior Cruciate Ligament (ACL)

http://en.wikipedia.org/wiki/Anterior_cruciate_ligament

The anterior cruciate ligament (ACL) is one of the four major ligaments of the human knee. In the quadruped stifle (analogous to the knee), based on its anatomical position, it is referred to as the cranial cruciate ligament.[1]

The ACL originates from deep within the notch of the distal femur. Its proximal fibers fan out along the medial wall of the lateral femoral condyle. There are two bundles of the ACL—the anteromedial and the posterolateral, named according to where the bundles insert into the tibial plateau.

The ACL attaches in front of the intercondyloid eminence of the tibia, being blended with the anterior horn of the lateral meniscus. These attachments allow it to resist anterior translation of the tibia, in relation to the femur.

Anterior cruciate ligament injury is the most common knee ligament injury especially in athletes.

Causes of injury

The ACL is the most commonly injured knee ligament [2] and is commonly damaged by athletes. The ACL is often torn during sudden dislocation, torsion, or hyperextension of the knee. Commonly patients report hearing or feeling a "pop", but many report minimal pain at the time of ACL rupture.

In the hours following ACL rupture, however, most patients notice progressive swelling (usually due to bleeding of the vessels along the torn ACL). This swelling generally is quite painful, but can be minimized by icing the knee.

ACL tears typically occur in sports where cutting, twisting, and turning are common, such as Skiing, Gymnastics, American Football, and Soccer.

The most common causes of ACL rupture can be divided into three major classifications:

- environmental
- anatomical
- hormonal [3]

Environmental causes

Sports which include running and jumping pose the most potential for injury to the athlete. The risk for rupture of the anterior cruciate ligament does not increase in contact sports (as opposed to noncontact sports).

Anatomical causes

ACL injuries are especially common in female athletes, due to many possible contributing factors. The most prevalent explanation relates to female athletes tending to land more straight-legged than men, removing the quadriceps' muscles shock-absorbing action on the knee. Often the knee on a straight leg can't withstand this and bends sideways.

Hormonal causes

High levels of specific hormones have been associated with an increased risk of ACL rupture. Estrogen is one of these hormones. Some anatomical and hormonal causes (such as high levels of estrogen) may put women at a higher risk for injury.[3]

Women and ACL tears

Statistics show that females are now more than 8 times as likely to tear their ACL than male athletes. Statistics also show that female athletes have

a 25% chance of tearing their ACL a second time after having the reconstruction surgery done. Differences between the sexes in hormones, adolescence, ligament dominance and quadriceps dominance, biomechanics, anatomy, asymmetry, and psychology all may contribute to this anomaly.

Main Reason For Female ACL Tears

As a result of the increased angle formed by a woman's hips and her knees, the ligaments are constantly under more pressure than a man's.

Adolescents

Young girls aren't as likely to tear their ACLs as young women, because their hips have not widened more than a boy's of the same age. According to Anna Kessel, when puberty occurs this changes the risk of women tearing their ACL from 2 times to 4 times more than men.

Ligament and quadriceps dominance

Women's bodies tend to work in a way that uses the ligaments more than it uses muscles. When ligaments are compensating for muscles, it makes the ligaments weak and more susceptible to damage.[4]

Male athletes are more likely to use their hamstrings instead of their ligaments for stability. Instead of using their hamstrings, women tend to use their quadriceps, which compresses the joint and pulls the tibia forward. Doing this can cause damage or stress on the Anterior Cruciate Ligament.

The quadriceps are made up of four muscles that help straighten the knee. [5] When an athlete tears an ACL and has reconstruction surgery, the quadriceps are one of the most important muscles to strengthen at therapy.

Biomechanics

Women's bodies are shaped in a such a way that when they are jumping, pivoting, and landing, their knees are likely to bend inward. Doing so distributes the weight unevenly throughout the woman's body.

Scientists also suggest that the difference in men's and women's femoral notch may be another reason women tear their ACL more often than men. The femoral notch - the space at the bottom of the femur, where the ACL runs - is narrower in women than in men. It is suggested that since the woman's femoral notch is smaller, the femur grinds the ACL and can make it weaker.

Another biomechanic that is said to likely cause ligament damage is the quadriceps femoris muscle angle, also known as the "Q-Angle". The Q-Angle is larger in women's bodies than men's, be-

cause of their larger pelvises. The female's ACL is shaped slightly differently than a male's; it is also slightly smaller, according to Dr. Jonathan C. Cluett, M.D., a board certified orthopedic surgeon in Massachusetts, USA.

Diagnosis

Several diagnostic maneuvers help clinicians diagnose an injured ACL. In the anterior drawer test, the examiner applies an anterior force on the proximal tibia with the knee in 90 degrees of flexion.

The Lachman test is similar, but performed with the knee in only about twenty degrees of flexion, while the pivot-shift test adds a valgus (outside-in) force to the knee while it is moved from flexion to extension. Any abnormal motion in these maneuvers suggests a tear.

The diagnosis is usually confirmed by MRI, the availability of which has greatly lessened the number of purely diagnostic arthroscopies performed.

Treatment options

Treatment for an ACL injury can either be non-surgical or surgical depending on the extent of the injury.

Nonsurgical options may be used if the knee cartilage is undamaged, the knee proves to be stable during typical daily activities, and if the patient has no desire to ever again participate in high-risk activities (activities involving cutting, pivoting, or jumping).

If the nonsurgical option is recommended, the doctor may recommend physical therapy, wearing a knee brace, or adapting some typical activities. If physical therapy is recommended it will be used to strengthen the muscles around the knee to compensate for the absence of a healthy ACL.

Physical therapy will focus on strengthening muscles such as the hamstring, quadriceps, calf, hip, and ankle. This therapy will help to re-establish a full range of motion of the knee.

With the use of these nonsurgical options a patient can expect to be back to normal daily activity within one month. However, most ACL-deficient athletes conclude that their knee continues to feel unstable, again confirming the important role of the ACL in normal knee stability.

Other non-surgical options include prolotherapy, which has been shown by Reeves in a small randomized controlled trial (among patients already suffering arthritis) to reduce translation on KT-1000 arthrometer versus placebo.[6]

This article may be of interest for those who are older, or have knee degeneration, but is not as applicable to the younger ACL-deficient patient who does not have arthritis of the knee. The future of non-surgical care for ACL laxity (partial ligament tear) is likely bioengineering. Fan has demonstrated that ACL reconstruction is possible using mesenchymal stem cells and a silk scaffold.[7]

Surgical options may be used if the knee gives way during typical daily activities, showing functional instability, or if the patient is unable to refrain from participating in high-risk activities ever again.

Reconstructive surgery may also be recommended if there is damage to the meniscus (cartilage). This surgery is completed using arthroscopic techniques. There is also an option for an autograft to be done using a chosen tendon.

There are, however, pros and cons to the surgical treatment, and consideration of possible complications must be thought through and discussed with your surgeon before proceeding with this form of treatment.

If the surgical treatment is chosen there are also rehabilitation requirements. Physical therapy must be completed in three phases after the surgery is completed. With the use of the surgical treatment option, rehabilitation included, a patient can expect to be returning to previous and desired levels of activity in six to nine months.[8]

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