



# University of Colorado Hospital

UNIVERSITY OF COLORADO HEALTH

## Why Do Females Injure Their Knees Four to Six Times More Than Men...And What Can You Do About It?

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Many women and their children are following the recommended guidelines to "be active". However, along with exercise women should consider adding some preventive measures to reduce the risk of injury. Of course, at University of Colorado Hospital we fully support exercise routines as the antidote for obesity and proper mental health outlets. Experts are in the news every day highlighting the benefits of exercise. But we hear stories of injuries from friends too. All

too often we hear about a forty year old woman who injured her knee while skiing or someone's daughter who tore her knee playing soccer. Research shows that many of these injuries are preventable with the proper neuromuscular training. Yet, most youth coaches and weekday/weekend warriors do not take time to practice evidence based and accepted injury prevention routines. We would like you to enjoy the benefits of exercise and minimize the risk of injury. Our experts can provide valuable information and tips to reduce the risk of injury.

In the spring of 2009, University of Colorado Hospital coordinated a lecture series called "Knowledge is Power". One of the subsets of that program highlighted the vast experience of our CU Sports Medicine team. [Dr. Deborah Saint-Phard](#), [Dr. Michelle Wolcott](#) and [Iñigo San Millán, PhD](#), taught our female audience about the current methods of training and injury prevention. Important feedback from the seminar came from a mom with athletic daughters. She asked that we bring the injury prevention program to the community by teaching our soccer clubs, elementary and middle schools, and lacrosse teams about the simple exercises that athletes can do to reduce their risk of injury. Maria Osborne, a prominent CU Sports Physical Therapist, executed this great idea for CU Sports Medicine and some of her UCH colleagues. They have worked to embed this program into the curriculum of the Colorado Fusion Soccer Club.

### **Anterior Cruciate Ligament (ACL) damage is the most common knee injury:**

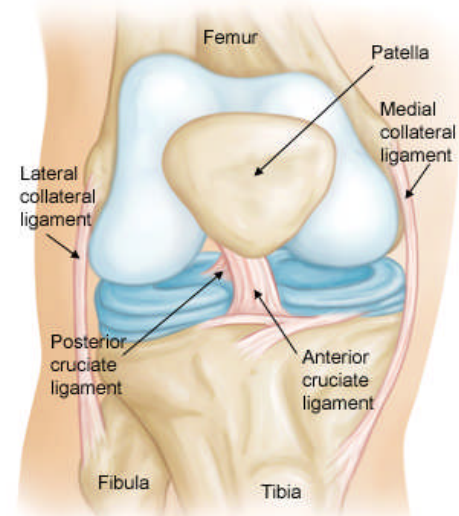
The most common knee injuries involve an Anterior Cruciate Ligament (ACL) sprain or tear. These injuries often occur in high demand sports involving planting and

cutting, jumping with a poor landing, stopping suddenly or changing directions quickly (Soccer, Volleyball, Skiing, Lacrosse, Football etc). They are often non-contact injuries but can also be the result of a collision such as in soccer, basketball, skiing or football.

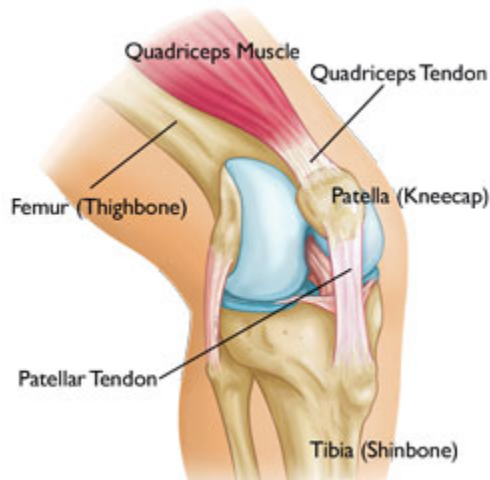
### What is an ACL and why are women more prone to injury?

The ACL runs diagonally in the middle of the knee. It provides stability for the knee by limiting the amount of forward translation of the tibia (lower leg bone) on the femur (upper leg bone). It also helps provide rotational stability.

There are between 100,000 and 200,000 ACL ruptures per year in the United States. Most injuries occur from noncontact athletics such as when an athlete is running or jumping and suddenly slows down and changes direction.



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Interestingly, women are more prone to injury than men. ACL injuries occur with a **four to six fold** greater incidence in female compared to male athletes playing the same high-risk sports. The combination of increased risk of ACL injury and a 10-fold increase in sports participation since the enactment of Title IX in 1972 has led to an almost epidemic rise in ACL injuries in female athletes (*North American Journal of Sports Physical Therapy* Dec 2010).

Researchers suggest a few reasons for this finding. First, women tend to have an imbalance in the strength ratio between with quadricep muscle (giant muscle in the front of the leg bone or femur) and their hamstring muscle (muscle behind the leg bone or femur). A female athlete is more likely to use their quadricep muscle to slow down from a sprint thus causing instability in the knee. A male athlete is more likely to decelerate using his hamstring to absorb the change in speed. This slight difference provides an inherent protection to the ligaments of the knee.

Next, doctors have studied videos of athletes in motion and identified that four common motor components occur when improper body mechanics happen and when the center of the body mass is outside the base of foot support. On video sequences of actual ACL injuries these four common things are examined:


1. As the at-risk female athlete lands, her knee buckles inward.
2. The injured knee is relatively straight.
3. Most if not all of her weight is on a single lower extremity, and
4. Her trunk tends to be tilted laterally.

Additionally, some doctors think women are more likely to have an ACL injury because of the differences in the amount of circulating hormones such as estrogen and realxin. Both of these hormones give ligaments strength and flexibility and the fluctuations of the hormone may influence the function of the nerves and muscles.

Finally, doctors continue to study the effect of soft and harder playing surfaces, use of footwear such as cleats vs. sneakers as well as the anatomical differences between men and women to understand the higher rate of women with an ACL rupture. At this time no evidence-based information is available to strongly support that surfaces, footwear or anatomy of a female have a role in the higher rate of injury.

### **How do you know if you need to get your knee checked out?**

If you've had an acute injury or fall that results in a "pop", pain, and swelling, you might need to consult a professional. Sometimes you may not hear or feel a "pop", but when you resume your activity, you have instability or may fall again. Other symptoms include difficulty/pain with walking, loss of motion, and tenderness along the joint line.



**Did you know?**

- ❖ ACL rupture is costly, with conservative estimates of surgery and rehabilitation at \$17,000-\$25,000 per injury (*Scand J Med Sci Sports. 2000*).
- ❖ Aside from cost, there is a potential loss of entire seasons of sports, scholarships, lowered academic performance, long-term disability, and significantly greater risk of radiographically diagnosed osteoarthritis (*Clin Orthop Related Res. 1998, Knee. 2002*).

### **How to Prevent Knee injuries?**

Athletes can reduce their risk of ACL injuries by performing training drills that require balance, power and agility. Adding plyometric exercises such as jumping, and balance drills helps improve neuromuscular conditioning and muscular reactions and ultimately shows a decrease in the risk of ACL injury. Many sports physicians now routinely recommend an ACL conditioning program, especially for their female players.

[Watch this Video](#) of Maria Osborne teaching the essential principles of the *ACL Risk Reduction program*.

### **UCH- Colorado Fusion Soccer Club ACL Risk Reduction Program:**

As mentioned above, ACL injuries are four to six times more likely to happen in a female athlete and they typically sideline an athlete for 6-12 months. Research shows that many of these non-contact injuries are preventable with the proper neuromuscular training program.

Predicated on this research, Matt Carlson, Liz Walley, Joy Anderson, Andrea Fetzer (ATC) and Maria Osborne (physical therapists at the Park Meadows, Stapleton, and Sports Clinics) have teamed up with the Colorado Fusion Soccer Club in a community outreach program to keep young soccer athletes healthy. Physical therapists and athletic trainers from three of the UCH satellite physical therapy and sports medicine clinics have introduced a warm-up specially designed to reduce the risk for non-contact ACL injuries in athletes.

The FIFA 11+ program was rolled out in South Africa for the World Cup in 2010. Research has shown that the warm up program can reduce injury rates by 30-50% when performed 2-3 times a week. The FIFA 11+ program is a 15-minute warm up that focuses on **agility**, landing **techniques/plyometrics**, and **core strength**. Utilizing the "FIFA 11+" warm-up program, our therapists take these young athletes through proper jumping and cutting technique to minimize the strain on the ACL. The main principles of these warm-up sessions are important for all young (and older) athletes to remember. When jumping and cutting, the athlete should always have the hip, knee, and ankle in a straight line stacked over the foot. When cutting or pivoting on one foot, the trunk and shoulders should be relatively still over the pelvis. The most important way to minimize risk for injury in the extremities (such as knees and ankles) is by maintaining a strong core.

The *ACL Risk Reduction program* began in February 2012 and since then Matt, Liz, Andrea and Maria have been out to the fields to instruct 12 girls' teams and their coaches in the program. The boys programs were then rolled out in May. The program has been well received by the coaches who recognize the need for a preventive strengthening program. According to the Director of the Fusion Soccer Club, they make time for the FIFA 11+ program in their practices and they also note the girls look stronger.

Matt, Liz, Andrea and Maria enjoy working with the Colorado Fusion Soccer Club teams and feel they are making a dent in the community need. They plan on continuing the program each new season, starting again this fall 2012.

### **How to Diagnose of ACL injury?**

Often the diagnosis can be made on the basis of the physical exam alone, but you may need tests to rule out other causes and to determine the severity of the injury.

The most commonly used tests to determine the presence of an ACL tear is the Lachman test, which is performed to evaluate abnormal forward movement of the tibia. By pulling the tibia forward, your doctor can feel for an ACL tear. The knee is flexed at 30 degrees. The examiner pulls on the tibia to assess the amount of anterior motion of the tibia in comparison to the femur. An ACL-deficient knee will demonstrate increased forward translation of the tibia at the conclusion of the movement

### **X-rays**

X-rays may be needed to rule out a bone fracture. However, X-rays can't visualize soft tissues such as ligaments and tendons.

### **Magnetic Resonance Imaging (MRI)**

An MRI uses radio waves and a strong magnetic field to create images of both hard and soft tissues within the body. An MRI can show the extent of an ACL injury and whether other knee ligaments or joint cartilage also are injured.

### **Ultrasound**

Using sound waves to visualize internal structures, ultrasound may be used to check for injuries in the ligaments, tendons, and muscles of the knee.

### **Arthroscopy**

During arthroscopy, the surgeon inserts a narrow, fiber-optic viewing scope and other instruments into the knee through very small incisions. This allows the surgeon to directly see the damage and, in many cases, perform repairs at the same time.

### **Treatment Options:**

#### **Michelle Wolcott, MD, Orthopaedic Surgeon, Gives Guidance**

ACL injuries, although common, are not necessarily routine to treat. Much depends on associated injuries, such as cartilage, meniscal or other ligamentous injuries. Likewise, the needs and expectations of the patient need to be carefully considered. Some of these injuries can be treated nonoperatively and a thoughtful conversation of alternatives needs to occur. For instance, an individual with underlying arthritis will not do well with a reconstruction as the ACL will increase stability of the knee and may make stiffness and therefore pain, worse. A reconstruction will likewise not address underlying arthritis at all and if pain is the primary complaint, it will not improve with surgery.

In very active individuals with otherwise healthy knees, ACL reconstruction is most often recommended. The ACL acts to resist anterior translation and rotational instability of the knee. Repeated episodes or even one bad episode of instability can injure the cartilage or meniscus and accelerate degenerative changes in the knee. That being said, there is no evidence that ACL reconstruction prevents arthritis. In fact, the incidence of arthritis increases when the ACL tears, regardless of surgical reconstruction. It is important however, that reconstruction restores, in part, the biomechanics of the knee and improves function and stability.

There are several types of ACL reconstructions but all require the ACL be removed and a graft placed in the native ACL footprint. Many types of grafts are frequently used for this purpose and choosing one depends upon the patient and the surgeon. There are two main categories of grafts, autografts (from the patient) and allografts (donor cadaver grafts). In general allografts are used more commonly in revisions or in older patients. Autografts are used more frequently in teenagers and young adults. This is primarily because in young patients allografts have a higher failure rate that normalizes in older adults and less active individuals. Allografts have a faster recovery rate due to less postoperative pain but return to sports in general is no different for each graft type. There are several different autograft types and choosing one is primarily dependent on the patients' specific needs and surgeon experience.

We strongly encourage athletes who participate in sports that place them at risk for injury to the ACL and women who exercise routinely to participate in a well designed, neuromuscular injury prevention program as described by Maria Osborne and her team at University of Colorado Hospital. If you have any doubts about an injury consult your physician for proper care right away.

**Questions regarding your own ACL “health”, or that of your young athlete?**

CU Sports Medicine, Stapleton and Park Meadows clinics offer self-pay classes that progress through a curriculum over a 6-week time period ensuring skill development. Cost is \$50/session for private or \$30 each for semi-private (up to 4 athletes/session).

Call the location of your choice to schedule:

Sports Physical Therapy @ I 25 and Colorado Blvd- 720-848-8208

Stapleton- 720-848-9010

Park Meadows- 720-848-9330

Testimonial from a Colorado Fusion Soccer club parent: “As I learned more about what the experts at CU physical therapists do, I took the next step and brought my two children to see Maria. All of my children play competitive soccer and two of my three children age 11 and 13 were very worried about the pain they each felt in their knee. Maria evaluated them and identified that there was no serious damage. She taught them that pain was an indication that they were not using proper body mechanics. And, if they continued with improper body mechanics an injury could happen. She taught them self care for the tendonitis and five very doable daily exercises to ensure proper warm up and improve range of motion. She stressed the importance of strengthening the hamstrings, the muscle behind the leg, to off set the big giant quadricep muscle. She instructed them on how to exercise in a pain free zone and take responsibility for their bodies”. – Chiara 2012

**Women’s Integrated Services in Health (WISH) has made a commitment to help our patients become knowledgeable about their health.**

**If you would like more information**

**Call 720-848-9474 or go to [www.wishforwomen.org](http://www.wishforwomen.org)**