



ACL Tears in Young Athletes

BY: Michael T. Busch, MD

When attending middle school or high school basketball games this season, you may have noticed there seems to be more knee braces visible than water bottles. This is because knee injuries are very common, especially in females athletes. One particular injury, the torn ACL, is four to eight times more common in females when compared to males.

What is the ACL? The ACL, or anterior cruciate ligament, is one of the four main ligaments in the knee (ligaments connect bone to bone). It is a little over one inch long and is the main stabilizer of the knee in protecting the tibia (shinbone) from sliding forward on the femur (thighbone) during sudden decelerations. It also functions to stabilize the knee joint during rotational motions, landing from a jump, or during sudden unexpected changes of direction. Therefore, participation in sports involving sudden, sharp changes of direction, such as basketball and soccer, place females at the highest risk of ACL injuries. Of the roughly 500,000 ACL injuries that occur each year in the US, 80-85% are going to occur in females.

Why are ACL tears more common in females? Why is this injury more common in female athletes, especially basketball and soccer players? Is it because boys are simply better than girls? Absolutely not. Do girls play harder or rougher than boys? Doubtful. What is it then about our young middle school and high school female athletes that put them at such a high risk of this devastating injury?

There are several factors. ACL injuries in females and the biomechanics involved is currently one of the most widely studied topics in sports medicine. Through this research, we have learned that boys and girls differ in many ways other than the obvious.

Anatomic Differences Females have wider hips than males (for child bearing later in life). That increases the angle on the knee joint. The knee was designed as a hinge joint that is supposed to rock forward and backward in the frontal plane. With the wider hips in females, there is an inward-directed angle on the knee causing it to roll side to side (like a ball and socket joint) putting increased stress on the ACL, especially during landing and cutting movements.

Females also have a narrower notch in the inside of the knee. The ACL travels through the middle of the knee joint through a notch called the intercondylar notch. Since it is narrower in females, the ACL may get pinched or frayed during cutting, increasing the risk of tear.

Muscle Imbalances It has been proven that the hamstrings (muscles in the back of the thigh) are protective of the ACL and the quadriceps (muscles in the front of the thigh or quads) are antagonists of the ACL. In other words, during landing or cutting, if the hamstrings contract first, the tibia (shinbone) is stabilized and the ACL is "protected." On the other hand, if the quadriceps contract first, before the hamstrings can stabilize the ACL, then the stress on the ACL is increased leaving it at risk for a tear. To make matters worse (for females), their quadriceps are stronger than their hamstrings, putting the ACL at even higher risk. (In males, the hamstrings are stronger, protecting the ACL).



Also, it has been shown through biomechanical research, that the gluteus muscles or external rotators of the hip fire differently in males and females. In males, the hip muscles fire a split second before landing, thus stabilizing the hips, or core. With females, the glutes remain idle throughout the landing cycle, allowing the hips rotate in, buckling the knee, and thus stressing the ACL.

Landing Patterns Most sports involve some degree of running, jumping, landing, cutting, acceleration and deceleration. Females tend to perform these tasks with more of a straighter leg than males. This straight leg landing pattern does not let the muscles of the thighs and calves absorb the shock and the stress is transferred to the ligaments of the joint, like the ACL.

Treatment When the ACL is injured, 85% of the time it is completely torn. The 2 ends of the ligament shrivel up and will not grow back together. This is unlike other ligaments in the body such as the ankle, which are usually partially torn and eventually heal themselves with scar tissue. This leaves the ACL deficient knee unstable and at risk for further shifting and damage to the cartilage, which will eventually cause arthritis in the knee. Therefore, it is strongly recommended that young athletes to have their ACL surgically fixed to stabilize the knee. Since the two ends of the torn ligament curl up, it would be difficult to sew them back together. Also, the forces placed on the ACL during sports are too great for a "repaired" ligament to sustain so it would fail. Because of this, the recommended treatment for an ACL tear is surgical reconstruction. This involves creating a new ligament and putting it where the old one used to be. The surgery is done arthroscopically and takes less than 2 hours. The new "ligament" can come from several places. It can come from the middle third of the patellar tendon (the tendon connecting the kneecap to the shinbone), or from one of the hamstring tendons in the back of the thigh, near the knee. A third option is to use a "donor" graft ACL from a tissue bank. The stability, tightness, and length of recovery is similar for all three and your orthopedic surgeon can discuss which one may be his or her preferred choice. Holes are drilled through the thighbone and shinbone and the new ACL graft is "tunneled" through and anchored at both ends. It seems simple but it takes a great amount of skill to get the length, angles, and tightness perfect to insure proper function and stability of the reconstructed knee.

After the surgery, there is about 4-8 months of rehabilitation to strengthen the knee and let the graft incorporate itself into the body. Most athletes are ready to return to cutting and twisting six months after surgery. After completing rehab, most athletes can return to their sport with or without a brace.

The solution – Prevention is the key. The best way to manage the epidemic of ACL tears in female athletes is to prevent them from happening. This can be accomplished by identifying and correcting the biomechanical "risk factors" seen in athletes. Some of these risk factors can be corrected while others cannot.

On the other hand, through strength and proprioceptive (balance) training, we have been able to train females to fire their hip muscles and glutes similar to males, thus stabilizing their ACLs. We can also change the hamstring:quadricep strength ratio to make it more favorable to protect the ACL. It just may take a little more time for female athletes to "learn" and improve the biomechanical factors

that protect their ACLs. After all, males have been playing sports at a similar level for hundreds of years, but highly competitive sports for females have continued to improve strength, balance, and endurance since the mid seventies.



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