

# The Knee Joint: Part Two- ACL Injuries

## By Tracy Anderson

Last month I covered the anatomy of the knee joint and this month I would like to begin discussing injuries associated with the Anterior Cruciate Ligament (ACL). This article serves to provide you with information on injuries, ACL tests and common rehabilitative practices. The information is provided for your personal education, it is not intended to treat, diagnose or preclude any information provided by a practicing therapist or physician. If you believe you have injured your ACL, I strongly suggest you seek professional diagnosis and treatment.

Last month I briefly described what the ACL was and its location. I would like to expand on those thoughts. The biomechanical function of the ACL is complex because it provides both mechanical stability and proprioceptive feedback to the knee. The ACL's stabilizing role has four main functions:

- \* Restrains the tibia from moving too far forward, beyond the femur,
- \* Prevents hyperextension of the knee,
- \* Reinforces the medial collateral ligament, acting as a secondary stabilizer to valgus stress,
- \* Lastly it controls rotation of the tibia on the femur in knee extension of 0-30 degrees.

ACL deficiency causes failure of this "screw home" mechanism, which results in subluxation of the tibia on the femur. This function is critical for movements that involve side stepping and pivoting as seen in many sports.

The most common cause of ACL injury is a traumatic force being applied to the knee in a twisting movement. Such as seen in movements of wide receivers in football, or tennis players. An injury can occur with or without a direct force. About half of ACL injuries are initiated without a direct force, while half are initiated with a force.

Rapid swelling within the joint capsule following an injury is nearly always due to hemarthrosis, or simply blood in the joint. ACL rupture is present in about three-quarters of people who suffer from acute hemarthrosis and is due to bleeding from vessels within the torn ligament. Although different diagnosis may be observed such as PCL tear or meniscal tear.

Injury to the ACL can cause short or long term disability. With each episode of ACL instability there is subluxation of the tibia on the femur, which causes stretching of the joint capsular ligaments and abnormal shearing forces on the menisci. Delay in diagnosis and treatment can attribute to increased articular joint damage as well as lengthening of secondary capsular structures. The long term outlook for a deficient ACL is the development of osteoarthritis.

The diagnosis of an ACL injury can be validated by some testing of the joint. While there are many different ways to test instability of the knee, and different variations of the same tests. I will discuss two common tests that are generally accepted.

The **pivot shift test** reproduces the rotary subluxation that occurs in ACL deficiency. This test is more difficult than it sounds and should only be performed by qualified therapists. The test involves the injured person lying down on their back while the therapists holds the leg with both hands. The knee is in about 20 degree flexion and in neutral rotation. While the injured person relaxes their muscles, the femur will drop backwards, if there is an ACL injury. The knee is then placed in full extension and then valgus stress and internal rotation is applied. Then the knee is slowly flexed while the stress is maintained. If the test is positive, subluxation will occur at about 20-40 degrees indicating an injury. An isolated tear will produce only small subluxation, greater subluxation will indicate lateral capsular or semimembranosus tendon deficiency.

The **lachman test** is carried out with the knee in 15 degrees flexion and externally rotated. This will relax the Iliotibial Band. The therapists hand grasps the inner aspect of the calf while the other hand grips the outer aspect of the thigh toward the knee. A shearing pressure is applied and the therapists attempts to quantify the displacement in millimeters. This is compared to the uninjured side. Depending on the displacement, the injury is regarded as mild, moderate or severe. The end feel should also be noted and graded as hard or soft. If the end feel is hard, it is the ACL limiting range, if it is soft, the capsular ligaments will halt movement.

Once the diagnosis of an injured ACL is made, management can be divided into conservative and surgical choices. The choice of treatment will be the sum of three factors: Age, Functional disability and

Functional Requirements. While some can survive happily with an injured ACL, most will require some form of treatment.

Since the 1980's, ACL rehabilitation has undergone many changes for the better. The major goals of rehab is to restore joint anatomy, increase static and dynamic stability, increase muscular conditioning and psychological well-being and lastly to return the person back to work or their chosen sport. Most rehab programs require very active patient involvement, and sometimes is not very pleasant.

An example of an ACL rehabilitation plan might look like:

- \* First two weeks: Reduce swelling and decrease pain and increase range of motion

- \* Two-Six Weeks: Continue to increase ROM, increase weight bearing and increase control of hamstring and quadricep muscles. Increase proprioception input through balancing techniques, and increase conditioning with exercises performed in a pool.

- \* Six-Twelve Weeks: Improve muscular control, proprioception and general muscular conditioning.

- \* Twelve weeks until finished: Gradual introduction to sport specific and functional training.

Improve agility and reaction times and continue to increase general leg strength.

If you have injured your knee, or any other joint, you should consult a qualified health care provider. There are some things you can do to decrease your healing time and enable your body to better heal itself. The old adage of R.I.C.E. works well. The Mayo Clinic has added the letter "P". So the acronym stands as P.R.I.C.E. and is used as follows:

P- **Protect** the area from further injury with wrapping or putting it in a sling.

R- **Rest** to promote tissue healing.

I- **Ice** the area immediately, even as you seek medical attention. Ice for about 15-20 minutes every one to two hours.

C- **Compress** the area with an elastic band until swelling stops. Don't wrap it too tightly or you will slow, or stop, circulation to the injured area. Loosen if pain increases.

E- **Elevate** the area above your heart, especially during the night. Gravity will help reduce swelling by draining excess fluids.

After about 48 hours, if the swelling is gone, heat may be applied to improve blood flow, which will increase healing.

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