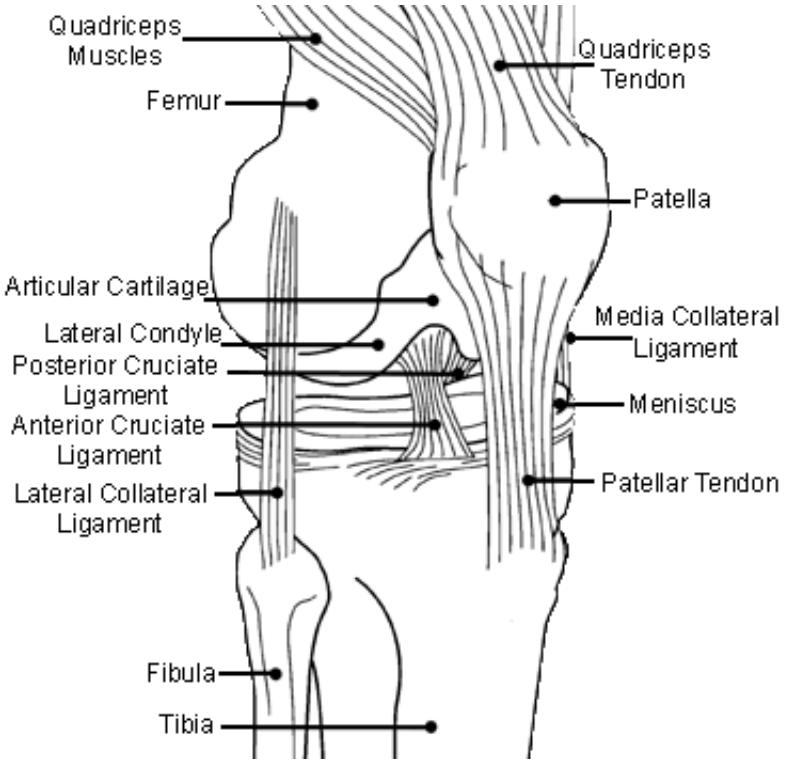
# Posterior Cruciate Ligament Tear

**Introduction** The Posterior Cruciate Ligament (PCL) is one of the less commonly injured ligaments of the knee. Understanding this injury and developing new ways for treatment for this injury has lagged behind the other cruciate ligament in the knee, the anterior cruciate ligament (ACL), probably because there are far fewer PCL injuries than ACL injuries.

**Anatomy** The posterior cruciate ligament (PCL) controls how far backward the tibia moves in relation to the femur. If the tibia moves too far the PCL can rupture or tear.




**Causes** This injury can occur when the knee is forcefully twisted or hyper extended, but other ligaments are usually injured or torn, before the posterior cruciate ligament (PCL) is torn in these injuries. The most common way for the posterior cruciate ligament (PCL) alone to be injured is from a direct blow to the front of the knee while the knee is bent. If the tibia moves too far the posterior cruciate ligament (PCL) can rupture. This is a common cause of injury to the posterior cruciate ligament (PCL) during an automobile accident. As the automobile strikes another and stops suddenly, the front passenger or driver slides forward. The bent knee hits the dashboard just below the knee cap. This forces the tibia backwards on the femur tearing the posterior cruciate ligament (PCL). The same force can occur during a fall on the bent knee,

where the force of the fall on the tibia pushes it back against the femur and tears the posterior cruciate ligament (PCL).

The posterior cruciate ligament (PCL) may not be the only ligament injured when the knee is injured violently, such as a severe hyperextension injury where the knee is forced backwards (bends in the opposite direction that is should). This injury may occur when the foot is planted on the ground and the knee is struck from the front, (such as with a car bumper, or another player in soccer or football). It is not uncommon to see several ligaments injured in addition to the PCL during a true knee dislocation.

**Symptoms**

The symptoms following a tear of the PCL are not the same in each person. Some people have more problems than other, probably because in some folks other ligaments can take up some of the function lost when the PCL is torn. Since the PCL is really outside of the knee joint, swelling from torn blood vessels in the ligament may not fill the joint with blood (in contrast to the anterior cruciate ligament (ACL) tear). The instability caused by the torn ligament leads to a feeling of insecurity and giving way of the knee, especially when trying to change direction on the knee.

The pain and swelling from the initial injury will usually resolve after 2 to 4 weeks, but the instability remains. The symptom of instability, and the inability for the patient to trust the knee for support is what requires treatment. Also important in the decisions about treatment is the growing realization by orthopedic surgeons that long term instability can lead to early arthritis of the knee.

**Diagnosis**

The History and Physical Examination is probably the most important tool in diagnosing a ruptured or deficient posterior cruciate ligament (PCL). Your orthopedic surgeon can tell if the tibia moves too far back on the femur by his physical examination.

X-Rays of the knee to make sure that there is no fracture in the knee may also be ordered on the initial examination. Ligaments and tendons do not show up on x-rays. Probably the most accurate test without actually looking into the knee, is the MRI scan. The MRI (Magnetic Resonance Imaging) machine uses magnetic waves rather than x-rays, to show the soft tissues of the body. With this machine, we are able to slice through the area we are interested in and see the anatomy, and injuries, very clearly. This test does not require any needles or special dye, and is painless.

In some cases, Arthroscopy may be used to make the definitive

diagnosis if there is a question about what is causing your knee problem. Arthroscopy is a type of an operation where a small fiberoptic TV camera is placed into the knee joint, allowing the orthopedic surgeon to look at the structures inside the knee joint directly. The vast majority of posterior cruciate ligament (PCL) tears are diagnosed without resorting to surgery, and arthroscopy is usually reserved to treat the problems identified by other means.

**Treatment**

The first goal of treatment for a posterior cruciate ligament injury is to limit swelling and pain. Immediately after this type of injury, ice is a good first aid treatment to control swelling and pain. A long-leg brace and a pair of crutches may be suggested to help you protect the knee from further stresses and to help limit pain.

You will then begin a series of physical therapy to continue speeding you toward this first goal. Less severe tears of the posterior cruciate ligament (PCL) are usually treated with a progressive rehabilitation program. Patients involved in demanding activities, like cutting, pivoting, or working on unlevel surfaces may require a knee brace before returning to work or sport.

The key to successful non-surgical treatment is to provide long term control of swelling, give way, and pain. If you are able to manage these areas, surgery may not be needed. However, you may also need to modify your current activities to avoid high level sport, hobby, or occupational demands of pivoting, cutting, and jumping.

Protective rest is beneficial in the early stages of healing to give your body a chance to recover. Your brace may be locked at first to help you avoid painful movements. It is important not to overdo it during these early stages.

As swelling and pain decrease, you will move through a gradual and progressive rehabilitation program. Treatment will focus on restoring normal movement of the knee, developing strength and control in the quadriceps muscles (the large muscles in front of the thigh), and doing exercises that simulate normal activity.

To help replace some of the stability of the knee due to the loss of the posterior cruciate ligament (PCL), a PCL brace may be suggested. These braces are fairly effective at preventing the knee from giving way during strenuous activity. Most of these braces must be fitted by a certified orthotist, physical therapist or physician. They are NOT the type you can buy at the drugstore. Most orthopedists will recommend wearing a brace for at least 1

year after a surgical reconstruction, so even if you decide to have surgery, a brace is a good investment.

If the symptoms of instability are not controlled by a brace and rehabilitation program, then surgery may be suggested. Most surgeons now favor reconstruction of the PCL using a piece of tendon or ligament to replace the torn PCL. Today, this surgery is most often done using the arthroscope. Incisions are usually still required around the knee, but the joint itself is not opened. The arthroscope is used to perform the work needed on the inside of the knee joint and most surgeries are being done outpatient, where you leave the hospital the same day.

In the typical surgical reconstruction, the torn ends of the PCL must first be removed. Once this has been done, the type of graft that will be used is determined. One of the most common tendons used for the graft material is the patellar tendon. This tendon connects the kneecap (patella) to the lower leg bone (tibia). Another very common graft that is used is to combine tow of the hamstring muscle tendons that attach to the tibia just below the knee joint - the gacilis tendon and the semitendonosis tendon. Studies have shown that these two tendons can be removed without really affecting the strength of the leg. There are other, much bigger and stronger hamstring muscles that can take over the function of the two tendons that are removed.

If the patellar tendon has been selected as the graft to be used, about one third of the patellar tendon is removed, with a plug of bone at either end. The bone plugs are rounded and smoothed. Holes are drilled in each bone plug to place sutures that will pull the graft into place. The next procedure is to prepare the knee to place the graft. Once this is done, holes need to be drilled in the tibia and the femur to place the graft. These holes are placed so that the graft will run between the tibia and femur in the same direction as the original posterior cruciate ligament. The graft is then pulled into position using sutures placed through the drill holes. Screws are used to hold the bone plugs in the drill holes.

Other types of materials are also used to replace the torn PCL. In some cases, an allograft is used. An allograft is tissue that comes from someone else. This tissue is harvested from tissue and organ donors at the time of death and sent to a tissue bank. There the tissue is checked for any type of infection, sterilized, and stored in a freezer. When needed, the tissue is ordered by the physician and used to replace the torn PCL. The advantage of using allograft is that the surgeon does not have to disturb or remove any of the normal tissue from your knee to use as a graft. The operation is

also usually takes less time because the graft does not to be harvested from your knee.

After surgery, a physical therapist will be contacted to begin your rehabilitation program. You will probably be involved in some type of rehabilitation for 6 months after surgery to ensure the best result from your Posterior Cruciate Ligament (PCL) Reconstruction. The first 6 weeks following surgery expect to see the physical therapist about three times a week. Following the initial period, you may be placed on a home program and monitored by the therapist.

As your pain and swelling begins to go away, exercises to help regain normal movement of joints and muscles may be suggested. When soreness is still present, these exercises must be done slowly and carefully to avoid further irritation. Initially, you will likely be instructed in a few home exercises to help with knee motion. As the soreness goes away, more vigorous stretching can be used to insure full movement in the knee.

The next part of your rehabilitation following injury will focus on straightening the knee. A set of exercises called closed kinetic chain exercises have become popular among therapists. These are exercises done with the foot fixed to the ground. They generally do not require any fancy equipment and can be done at home. These exercises are designed to allow the muscles around the knee to be exercised while easing stress on the ligaments. These exercises are functional - because they represent activities we do throughout the day. Examples include stepping, squatting, lunging, and half kneeling.

The final stages of knee rehabilitation involve balance and proprioception exercises. Healthy ligaments send information to the brain about the position of a joint. This process is called proprioception. This partly explains how you know precisely where your finger is -- even when your eyes are closed. Once a ligament has been injured, these nerves that do this are torn, and unable send the needed information to the brain. This increases the possibility of injury in the future. Balance and proprioception exercises help restore this position sense by retraining the nerves as they grow back. Examples of these types of exercises involve standing and walking on uneven or very soft surfaces, balancing on one leg, and jumping exercises.