

Temple Physical Therapy

A General Overview of Common Knee Injuries

Anatomy of the Knee



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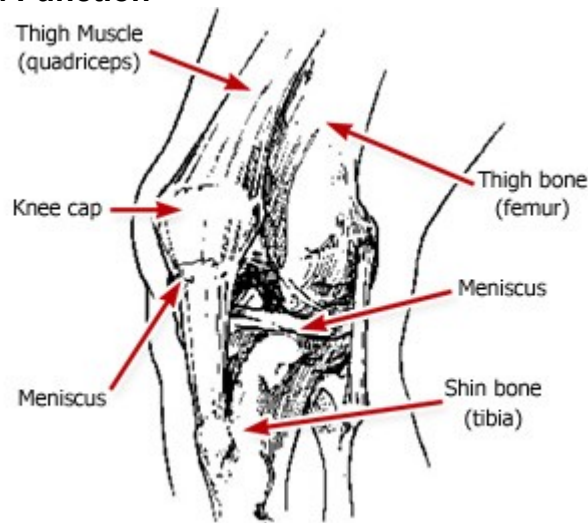


Common Knee Injuries

In 2003, patients made approximately 19.4 million visits to physicians' offices because of knee problems. It was the most common reason for visiting an orthopaedic surgeon.

The knee is a complex joint with many components, making it vulnerable to a variety of injuries. Many knee injuries can be successfully treated without surgery, while others require surgery to correct. Here are some facts about the knee from the American Academy of Orthopaedic Surgeons.

Knee Anatomy and Function



The knee is the largest joint in the body, and one of the most easily injured. It is made up of the lower end of the thighbone (femur), which rotates on the upper end of the shinbone (tibia), and the knee cap (patella), which slides in a groove on the end of the femur. The knee also contains large ligaments, which help control motion by connecting bones and by bracing the joint against abnormal types of motion. Another important structure, the meniscus, is a wedge of soft cartilage between the femur and tibia that serves to cushion the knee and helps it absorb shock during motion.

Common Knee Injuries

Many athletes experience injuries to their knee ligaments. Of the four major ligaments found in the knee, the anterior cruciate ligament (ACL) and the medial collateral ligament (MCL) are often injured in sports. The posterior cruciate ligament (PCL) may also be injured.

- **ACL injury**
Changing direction rapidly, slowing down when running, and landing from a jump may cause tears in the ACL. Athletes who participate in skiing and basketball, and athletes who wear cleats, such as football players, are susceptible to ACL injuries.

- **MCL injury**
Injuries to the MCL are usually caused by a direct blow to the outside of the knee. These types of injuries often occur in contact sports, such as football or soccer.
- **PCL injury**
The PCL is often injured when an athlete receives a blow to the front of the knee or makes a simple misstep on the playing field.
- **Torn cartilage**
When people talk about torn knee cartilage, they are usually referring to a torn meniscus. The meniscus is a tough, rubbery cartilage that is attached to the knee's ligaments. The meniscus acts like a shock absorber. In athletic activities, tears in the meniscus can occur when twisting, cutting, pivoting, decelerating, or being tackled. Direct contact is often involved.

Treatment of Knee Injuries

Orthopaedic surgeons use a variety of methods to treat knee injuries in athletes. A common method used to treat mild knee injuries is R.I.C.E., which stands for "rest, ice, compression, and elevation." Rest the knee by staying off it or walking only with crutches. Apply ice to control swelling. Use a compressive elastic bandage applied snugly, but loosely enough so that it does not cause pain. Finally, keep the knee elevated.

The most important advice is to seek treatment as soon as possible, especially if you:

- Hear a popping noise and feel your knee give out at the time of injury
- Have severe pain
- Cannot move the knee
- Begin limping
- Have swelling at the injury site

Knee Osteoarthritis Statistics

Osteoarthritis, also known as "wear and tear" arthritis, is a common problem for many people after they reach middle age.

Knee osteoarthritis is a leading cause of disability in the United States. In 2005, approximately 9 million American adults were diagnosed with knee osteoarthritis. About 55% of people with knee osteoarthritis are older than 65.

For more statistical information on osteoarthritis and other musculoskeletal conditions, visit Orthopaedic Statistics (<http://www.aaos.org/research/stats/patientstats.asp>).

Orthopaedic Statistics is maintained by the American Academy of Orthopaedic Surgeons. It presents the most recent data from the U.S. Department of Health and Human Services; Centers for Disease Control and Prevention; and the National Center for Health Statistics.

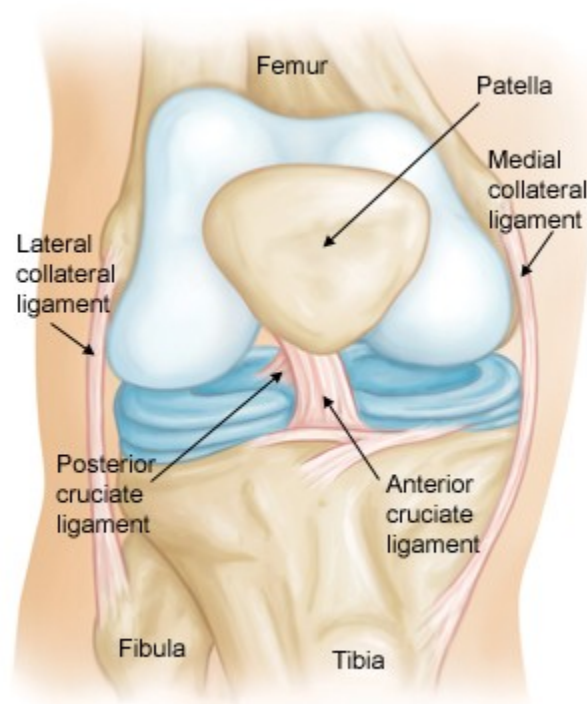
Anterior Cruciate Ligament Injuries

One of the most common knee injuries is an anterior cruciate ligament sprain or tear.

Athletes who participate in high demand sports like soccer, football, and basketball are more likely to injure their anterior cruciate ligaments.

If you have injured your anterior cruciate ligament, you may require surgery to regain full function of your knee. This will depend on several factors, such as the severity of your injury and your activity level.

Anatomy



Normal knee anatomy, front view

Three bones meet to form your knee joint: your thighbone (femur), shinbone (tibia), and kneecap (patella). Your kneecap sits in front of the joint to provide some protection.

Bones are connected to other bones by ligaments. There are four primary ligaments in your knee. They act like strong ropes to hold the bones together and keep your knee stable.

Collateral Ligaments

These are found on the sides of your knee. The medial collateral ligament is on the inside and the lateral collateral ligament is on the outside. They control the sideways motion of your knee and brace it against unusual movement.

Cruciate Ligaments

These are found inside your knee joint. They cross each other to form an "X" with the anterior cruciate ligament in front and the posterior cruciate ligament in back. The cruciate ligaments control the back and forth motion of your knee.

The anterior cruciate ligament runs diagonally in the middle of the knee. It prevents the tibia from sliding out in front of the femur, as well as provides rotational stability to the knee.

Description

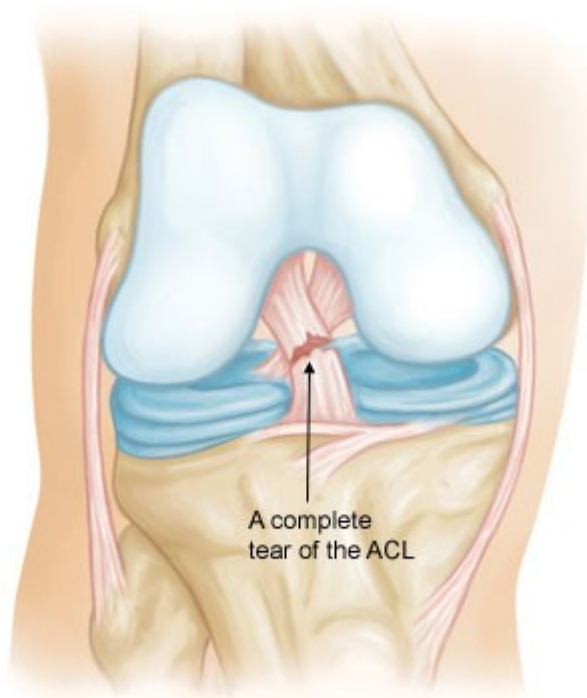
About half of all injuries to the anterior cruciate ligament occur along with damage to other structures in the knee, such as articular cartilage, meniscus, or other ligaments.

Injured ligaments are considered "sprains" and are graded on a severity scale.

Grade 1 Sprains. The ligament is mildly damaged in a Grade 1 Sprain. It has been slightly stretched, but is still able to help keep the knee joint stable.

Grade 2 Sprains. A Grade 2 Sprain stretches the ligament to the point where it becomes loose. This is often referred to as a partial tear of the ligament.

Grade 3 Sprains. This type of sprain is most commonly referred to as a complete tear of the ligament. The ligament has been split into two pieces, and the knee joint is unstable.



Partial tears of the anterior cruciate ligament are rare; most ACL injuries are complete or near complete tears.

Cause

The anterior cruciate ligament can be injured in several ways:

- Changing direction rapidly
- Stopping suddenly
- Slowing down while running
- Landing from a jump incorrectly
- Direct contact or collision, such as a football tackle

Several studies have shown that female athletes have a higher incidence of ACL injury than male athletes in certain sports. It has been proposed that this is due to differences in physical conditioning, muscular strength, and neuromuscular control. Other suggested causes include differences in pelvis and lower extremity (leg) alignment, increased looseness in ligaments, and the effects of estrogen on ligament properties.

Symptoms

When you injure your anterior cruciate ligament, you might hear a "popping" noise and you may feel your knee give out from under you. Other typical symptoms include:

- Pain with swelling. Within 24 hours, your knee will swell. If ignored, the swelling and pain may resolve on its own. However, if you attempt to return to sports, your knee will probably be unstable and you risk causing further damage to the cushioning cartilage (meniscus) of your knee.
- Loss of full range of motion
- Tenderness along the joint line
- Discomfort while walking

Doctor Examination

Physical Examination and Patient History

During your first visit, your doctor will talk to you about your symptoms and medical history.

During the physical examination, your doctor will check all the structures of your injured knee, and compare them to your non-injured knee. Most ligament injuries can be diagnosed with a thorough physical examination of the knee.

Imaging Tests

Other tests which may help your doctor confirm your diagnosis include:

X-rays. Although they will not show any injury to your anterior cruciate ligament, X-rays can show whether the injury is associated with a broken bone.

MRI. This study creates better images of soft tissues like the anterior cruciate ligament. However, an MRI is usually not required to make the diagnosis of a torn ACL.

Treatment

Treatment for an ACL tear will vary depending upon the patient's individual needs. For example, the young athlete involved in agility sports will most likely require surgery to safely return to sports. The less active, usually older, individual may be able to return to a quieter lifestyle without surgery.

Nonsurgical Treatment

A torn ACL will not heal without surgery. But nonsurgical treatment may be effective for patients who are elderly or have a very low activity level. If the overall stability of the knee is intact, your doctor may recommend simple, nonsurgical options.

Bracing. Your doctor may recommend a brace to protect your knee from instability. To further protect your knee, you may be given crutches to keep you from putting weight on your leg.

Physical therapy. As the swelling goes down, a careful rehabilitation program is started. Specific exercises will restore function to your knee and strengthen the leg muscles that support it.

Surgical Treatment

Rebuilding the ligament. Most ACL tears cannot be sutured (stitched) back together. To surgically repair the ACL and restore knee stability, the ligament must be reconstructed. Your doctor will replace your torn ligament with a tissue graft. This graft acts as a scaffolding for a new ligament to grow on.

Grafts can be obtained from several sources. Often they are taken from the patellar tendon, which runs between the kneecap and the shinbone. Hamstring tendons at the back of the thigh are a common source of grafts. Sometimes a quadriceps tendon, which runs from the kneecap into the thigh, is used. Finally, cadaver graft (allograft) can be used.

There are advantages and disadvantages to all graft sources. You should discuss graft choices with your own orthopaedic surgeon to help determine which is best for you.

Because the regrowth takes time, it may be six months or more before an athlete can return to sports after surgery.

Procedure. Surgery to rebuild an anterior cruciate ligament is done with an arthroscope using small incisions. Arthroscopic surgery is less invasive. The benefits of less invasive techniques include less pain from surgery, less time spent in the hospital, and quicker recovery times.

Unless ACL reconstruction is treatment for a combined ligament injury, it is usually not done right away. This delay gives the inflammation a chance to resolve, and allows a return of motion before surgery. Performing an ACL reconstruction too early greatly

increases the risk of arthrofibrosis, or scar forming in the joint, which would risk a loss of knee motion.

For a more in-depth discussion of ACL injury and surgical treatment: [ACL Injury: Does It Require Surgery? \(topic.cfm?topic=A00297\)](#)

Rehabilitation

Whether your treatment involves surgery or not, rehabilitation plays a vital role in getting you back to your daily activities. A physical therapy program will help you regain knee strength and motion.

If you have surgery, physical therapy first focuses on returning motion to the joint and surrounding muscles. This is followed by a strengthening program designed to protect the new ligament. This strengthening gradually increases the stress across the ligament. The final phase of rehabilitation is aimed at a functional return tailored for the athlete's sport.

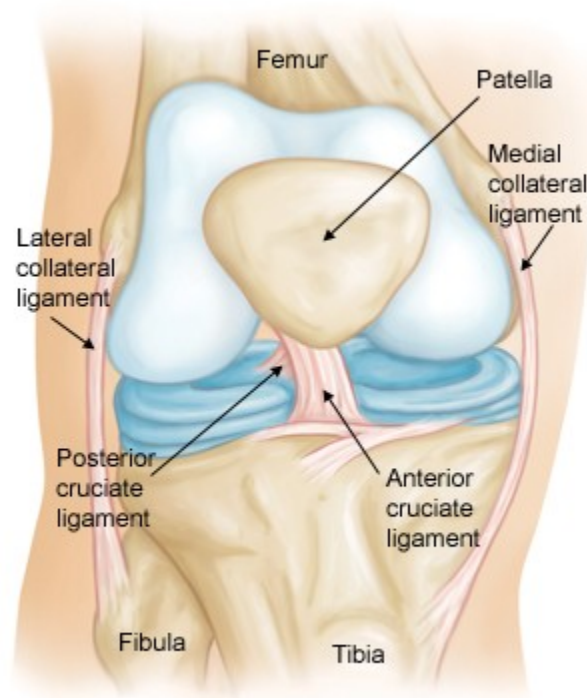
Collateral Ligament Injuries

The knee is the largest joint in your body and one of the most complex. It is also vital to movement.

Your knee ligaments connect your thighbone to your lower leg bones. Knee ligament sprains or tears are a common sports injury.

Athletes who participate in direct contact sports like football or soccer are more likely to injure their collateral ligaments.

Anatomy



Normal knee anatomy, front view

Three bones meet to form your knee joint: your thighbone (femur), shinbone (tibia), and kneecap (patella). Your kneecap sits in front of the joint to provide some protection.

Bones are connected to other bones by ligaments. There are four primary ligaments in your knee. They act like strong ropes to hold the bones together and keep your knee stable.

Cruciate Ligaments

These are found inside your knee joint. They cross each other to form an "X" with the anterior cruciate ligament in front and the posterior cruciate ligament in back. The cruciate ligaments control the back and forth motion of your knee.

Collateral Ligaments

These are found on the sides of your knee. The medial or "inside" collateral ligament (MCL) connects the femur to the tibia. The lateral or "outside" collateral ligament (LCL) connects the femur to the smaller bone in the lower leg (fibula). The collateral ligaments control the sideways motion of your knee and brace it against unusual movement.

Description

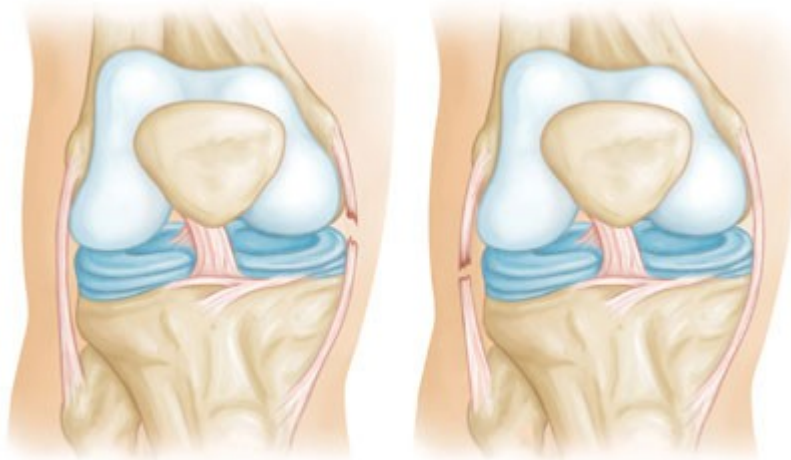
Because the knee joint relies just on these ligaments and surrounding muscles for stability, it is easily injured. Any direct contact to the knee or hard muscle contraction — such as changing direction rapidly while running — can injure a knee ligament.

Injured ligaments are considered "sprains" and are graded on a severity scale.

Grade 1 Sprains. The ligament is mildly damaged in a Grade 1 Sprain. It has been slightly stretched, but is still able to help keep the knee joint stable.

Grade 2 Sprains. A Grade 2 Sprain stretches the ligament to the point where it becomes loose. This is often referred to as a partial tear of the ligament.

Grade 3 Sprains. This type of sprain is most commonly referred to as a complete tear of the ligament. The ligament has been split into two pieces, and the knee joint is unstable.



Complete tears of the MCL (left) and LCL (right).

The MCL is injured more often than the LCL. Due to the more complex anatomy of the outside of the knee, if you injure your LCL, you usually injure other structures in the joint, as well.

Cause

Injuries to the collateral ligaments are usually caused by a force that pushes the knee sideways. These are often contact injuries, but not always.

Medial collateral ligament tears often occur as a result of a direct blow to the outside of the knee. This pushes the knee inwards (toward the other knee).

Blows to the inside of the knee that push the knee outwards may injure the lateral collateral ligament.

Symptoms

- Pain at the sides of your knee. If there is an MCL injury, the pain is on the inside of the knee; an LCL injury may cause pain on the outside of the knee.
- Swelling over the site of the injury.
- Instability — the feeling that your knee is giving way.

Doctor Examination

Physical Examination and Patient History

During your first visit, your doctor will talk to you about your symptoms and medical history.

During the physical examination, your doctor will check all the structures of your injured knee, and compare them to your non-injured knee. Most ligament injuries can be diagnosed with a thorough physical examination of the knee.

Imaging Tests

Other tests which may help your doctor confirm your diagnosis include:

X-rays. Although they will not show any injury to your collateral ligaments, X-rays can show whether the injury is associated with a broken bone.

MRI. This study creates better images of soft tissues like the collateral ligaments.

Treatment

Injuries to the MCL rarely require surgery. If you have injured just your LCL, treatment is similar to an MCL sprain. But if your LCL injury involves other structures in your knee, your treatment will address those, as well.

Nonsurgical Treatment

Ice. Icing your injury is important in the healing process. The proper way to ice an injury is to use crushed ice directly to the injured area for 15 to 20 minutes at a time, with at least 1 hour between icing sessions. Chemical cold products ("blue" ice) should not be placed directly on the skin and are not as effective.

Bracing. Your knee must be protected from the same sideways force that caused the injury. You may need to change your daily activities to avoid risky movements. Your doctor may recommend a brace to protect the injured ligament from stress. To further

protect your knee, you may be given crutches to keep you from putting weight on your leg.

Physical therapy. Your doctor may suggest strengthening exercises. Specific exercises will restore function to your knee and strengthen the leg muscles that support it.

Surgical Treatment

Most isolated collateral ligament injuries can be successfully treated without surgery. If the collateral ligament is torn in such a way that it cannot heal or is associated with other ligament injuries, your doctor may suggest surgery to repair it.

Return to Sports

Once your range of motion returns and you can walk without a limp, your doctor may allow functional progression. This is a gradual, progressive return to sports activities.

For example, if you play soccer, your functional progression may start as a light jog. Then you progress to a sprint, and eventually to full running and kicking the ball.

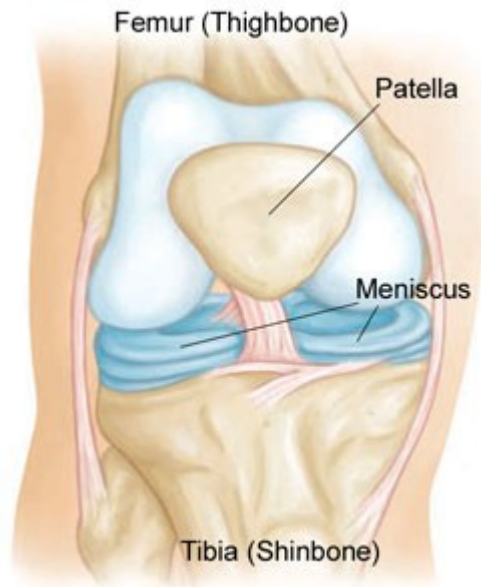
Your doctor may suggest a knee brace during sports activities, depending on the severity of your sprain.

Meniscal Tears

Your knee is the largest joint in your body and one of the most complex. Because you use it so much, it is vulnerable to injury. Because it is made up of so many parts, many different things can go wrong.

Meniscal tears are among the most common knee injuries. Athletes, particularly those who play contact sports, are at risk for meniscal tears. However, anyone at any age can tear a meniscus. When people talk about torn cartilage in the knee, they are usually referring to a torn meniscus.

Anatomy



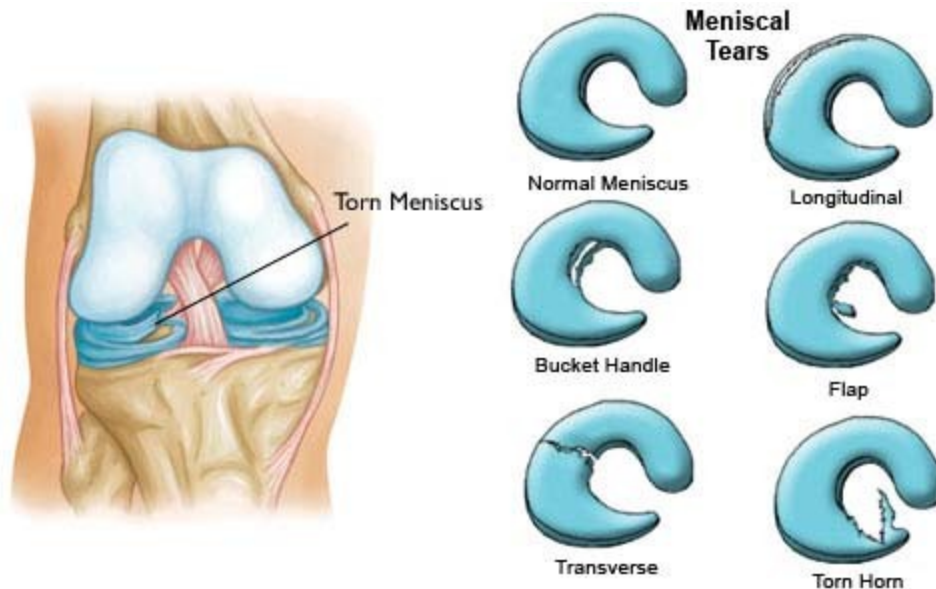
Normal knee anatomy

Three bones meet to form your knee joint: your thighbone (femur), shinbone (tibia), and kneecap (patella).

Two wedge-shaped pieces of cartilage act as "shock absorbers" between your thighbone and shinbone. These are called meniscus. They are tough and rubbery to help cushion the joint and keep it stable.

Description

Menisci tear in different ways. Tears are noted by how they look, as well as where the tear occurs in the meniscus. Common tears include longitudinal, parrot-beak, flap, bucket handle, and mixed/complex.



Common types of tears

Sports-related meniscal tears often occur along with other knee injuries, such as anterior cruciate ligament tears.

Cause

Sudden meniscal tears often happen during sports. Players may squat and twist the knee, causing a tear. Direct contact, like a tackle, is sometimes involved.

Older people are more likely to have degenerative meniscal tears. Cartilage weakens and wears thin over time. Aged, worn tissue is more prone to tears. Just an awkward twist when getting up from a chair may be enough to cause a tear, if the menisci have weakened with age.

Symptoms

You might feel a "pop" when you tear a meniscus. Most people can still walk on their injured knee. Many athletes keep playing with a tear. Over 2 to 3 days, your knee will gradually become more stiff and swollen.

The most common symptoms of meniscal tear are:

- Pain
- Stiffness and swelling
- Catching or locking of your knee
- The sensation of your knee "giving way"
- You are not able to move your knee through its full range of motion

Without treatment, a piece of meniscus may come loose and drift into the joint. This can cause your knee to slip, pop or lock.

Doctor Examination

Physical Examination and Patient History

After discussing your symptoms and medical history, your doctor will examine your knee. He or she will check for tenderness along the joint line where the meniscus sits. This often signals a tear.

One of the main tests for meniscal tears is the McMurray test. Your doctor will bend your knee, then straighten and rotate it. This puts tension on a torn meniscus. If you have a meniscal tear, this movement will cause a clicking sound. Your knee will click each time your doctor does the test.

Imaging Tests

Because other knee problems cause similar symptoms, your doctor may order imaging tests to help confirm the diagnosis.

X-rays. Although X-rays do not show meniscal tears, they may show other causes of knee pain, such as osteoarthritis.

Magnetic resonance imaging (MRI). This study can create better images of the soft tissues of your knee joint.

Treatment

How your orthopaedic surgeon treats your tear will depend on the type of tear you have, its size, and location.

The outside one-third of the meniscus has a rich blood supply. A tear in this "red" zone may heal on its own, or can often be repaired with surgery. A longitudinal tear is an example of this kind of tear.

In contrast, the inner two-thirds of the meniscus lacks a blood supply. Without nutrients from blood, tears in this "white" zone cannot heal. These complex tears are often in thin, worn cartilage. Because the pieces cannot grow back together, tears in this zone are usually surgically trimmed away.

Along with the type of tear you have, your age, activity level, and any related injuries will factor into your treatment plan.

Nonsurgical Treatment

If your tear is small and on the outer edge of the meniscus, it may not require surgical repair. As long as your symptoms do not persist and your knee is stable, nonsurgical treatment may be all you need.

RICE. The RICE protocol is effective for most sports-related injuries. RICE stands for Rest, Ice, Compression, and Elevation.

- **Rest.** Take a break from the activity that caused the injury. Your doctor may recommend that you use crutches to avoid putting weight on your leg.
- **Ice.** Use cold packs for 20 minutes at a time, several times a day. Do not apply ice directly to the skin.
- **Compression.** To prevent additional swelling and blood loss, wear an elastic compression bandage.
- **Elevation.** To reduce swelling, recline when you rest, and put your leg up higher than your heart.

Non-steroidal anti-inflammatory medicines. Drugs like aspirin and ibuprofen reduce pain and swelling.

Surgical Treatment

If your symptoms persist with nonsurgical treatment, your doctor may suggest arthroscopic surgery.

Procedure. Knee arthroscopy is one of the most commonly performed surgical procedures. In it, a miniature camera is inserted through a small incision. This provides a clear view of the inside of the knee. Your orthopaedic surgeon inserts miniature surgical instruments through other small incisions to trim or repair the tear.



Arthroscopic treatment of meniscal tears

Rehabilitation. After surgery, your doctor may put your knee in a cast or brace to keep it from moving.

Once the initial healing is complete, your doctor will prescribe rehabilitation exercises. Regular exercise to restore your knee mobility and strength is necessary. You will start with exercises to improve your range of motion. Strengthening exercises will gradually be added to your rehabilitation plan.

For the most part, rehabilitation can be carried out at home, although your doctor may recommend physical therapy.

Recovery

Meniscal tears are extremely common knee injuries. With proper diagnosis, treatment, and rehabilitation, patients often return to their pre-injury abilities.

Posterior Cruciate Ligament Injuries

The posterior cruciate ligament is located in the back of the knee. It is one of several ligaments that connect the femur (thighbone) to the tibia (shinbone). The posterior cruciate ligament keeps the tibia from moving backwards too far.

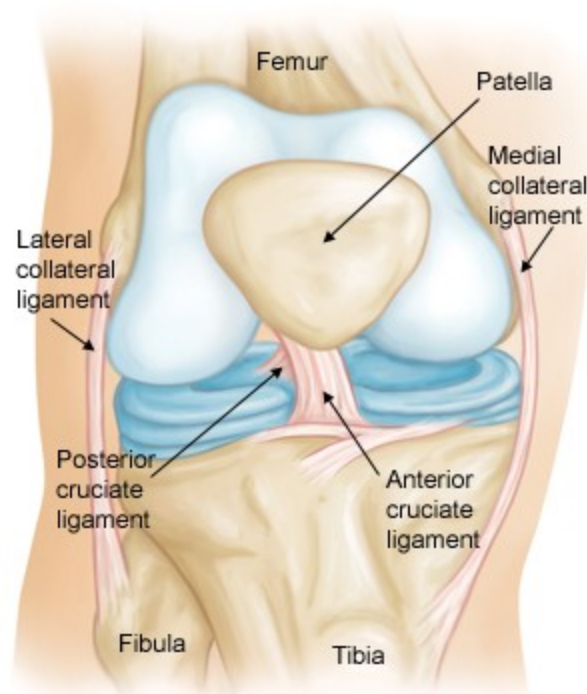


An injury to the posterior cruciate ligament requires a powerful force. A common cause of injury is a bent knee hitting a dashboard in a car accident or a football player falling on a knee that is bent.

Anatomy

Two bones meet to form your knee joint: your thighbone (femur) and shinbone (tibia). Your kneecap sits in front of the joint to provide some protection.

Bones are connected to other bones by ligaments. There are four primary ligaments in your knee. They act like strong ropes to hold the bones together and keep your knee stable.



Normal knee anatomy, front view

Collateral ligaments. These are found on the sides of your knee. The medial collateral ligament is on the inside and the lateral collateral ligament is on the outside. They control the sideways motion of your knee and brace it against unusual movement.

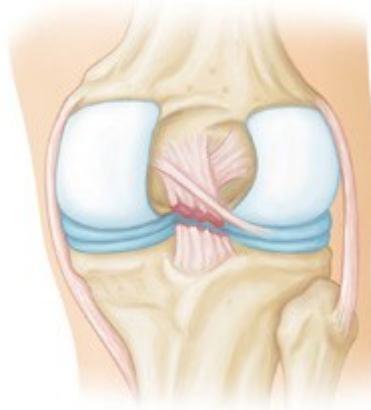
Cruciate ligaments. These are found inside your knee joint. They cross each other to form an "X" with the anterior cruciate ligament in front and the posterior cruciate ligament in back. The cruciate ligaments control the back and forth motion of your knee.

The posterior cruciate ligament keeps the shinbone from moving backwards too far. It is stronger than the anterior cruciate ligament and is injured less often. The posterior cruciate ligament has two parts that blend into one structure that is about the size of a person's little finger.

Description

Injuries to the posterior cruciate ligament are not as common as other knee ligament injuries. In fact, they are often subtle and more difficult to evaluate than other ligament injuries in the knee.

Many times a posterior cruciate ligament injury occurs along with injuries to other structures in the knee such as cartilage, other ligaments, and bone.



A complete tear of the posterior cruciate ligament, back view.

Injured ligaments are considered "sprains" and are graded on a severity scale.

Grade 1 Sprains. The ligament is mildly damaged in a Grade 1 Sprain. It has been slightly stretched, but is still able to help keep the knee joint stable.

Grade 2 Sprains. A Grade 2 Sprain stretches the ligament to the point where it becomes loose. This is often referred to as a partial tear of the ligament.

Grade 3 Sprains. This type of sprain is most commonly referred to as a complete tear of the ligament. The ligament has been split into two pieces, and the knee joint is unstable.

Posterior cruciate ligament tears tend to be partial tears with the potential to heal on their own. People who have injured just their posterior cruciate ligaments are usually able to return to sports without knee stability problems.

Cause

An injury to the posterior cruciate ligament can happen many ways. It typically requires a powerful force.

- A direct blow to the front of the knee (such as a bent knee hitting a dashboard in a car crash, or a fall onto a bent knee in sports)
- Pulling or stretching the ligament (such as in a twisting or hyperextension injury)
- Simple misstep

Symptoms

The typical symptoms of a posterior cruciate ligament injury are:

- Pain with swelling that occurs steadily and quickly after the injury
- Swelling that makes the knee stiff and may cause a limp
- Difficulty walking
- The knee feels unstable, like it may "give out"

Doctor Examination

During your first visit, your doctor will talk to you about your symptoms and medical history.

During the physical examination, your doctor will check all the structures of your injured knee, and compare them to your non-injured knee. Your injured knee may appear to sag backwards when bent. It might slide backwards too far, particularly when it is bent beyond a 90° angle. Other tests which may help your doctor confirm your diagnosis include X-rays and magnetic resonance imaging (MRI). It is possible, however, for these pictures to appear normal, especially if the injury occurred more than 3 months before the tests.

X-rays. Although they will not show any injury to your posterior cruciate ligament, X-rays can show whether the ligament tore off a piece of bone when it was injured. This is called an avulsion fracture.

MRI. This study creates better images of soft tissues like the posterior cruciate ligament.

Treatment

Nonsurgical Treatment

If you have injured just your posterior cruciate ligament, your injury may heal quite well without surgery. Your doctor may recommend simple, nonsurgical options.

RICE. When you are first injured, the RICE method - rest, ice, gentle compression and elevation — can help speed your recovery.

Immobilization. Your doctor may recommend a brace to prevent your knee from moving. To further protect your knee, you may be given crutches to keep you from putting weight on your leg.

Physical therapy. As the swelling goes down, a careful rehabilitation program is started. Specific exercises will restore function to your knee and strengthen the leg muscles that support it. Strengthening the muscles in the front of your thigh (quadriceps) has been shown to be a key factor in a successful recovery.

Surgical Treatment

Your doctor may recommend surgery if you have combined injuries. For example, if you have dislocated your knee and torn multiple ligaments including the posterior cruciate ligament, surgery is almost always necessary.

Rebuilding the ligament. Because sewing the ligament ends back together does not usually heal, a torn posterior cruciate ligament must be rebuilt. Your doctor will replace your torn ligament with a tissue graft. This graft is taken from another part of your body, or from another human donor (cadaver). It can take several months for the graft to heal into your bone.

Procedure. Surgery to rebuild a posterior cruciate ligament is done with an arthroscope using small incisions. Arthroscopic surgery is less invasive. The benefits of less invasive techniques include less pain from surgery, less time spent in the hospital, and quicker recovery times.

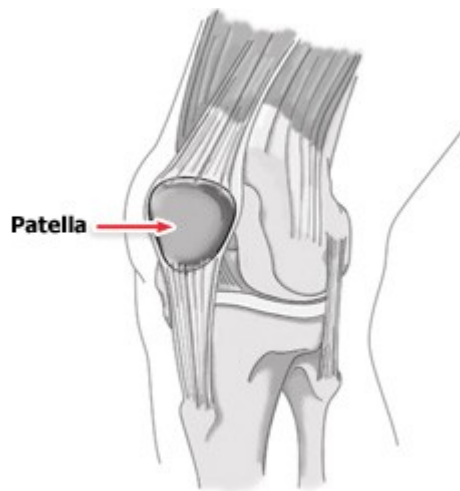
Surgical procedures to repair posterior cruciate ligaments continue to improve. More advanced techniques help patients resume a wider range of activities after rehabilitation.

Runner's Knee (Patellofemoral Pain)

Runners, jumpers, and other athletes such as skiers, cyclists, and soccer players put heavy stress on their knees. Runner's knee is a term used to refer to a number of medical conditions that cause pain around the front of the knee (patellofemoral pain). These conditions include anterior knee pain syndrome, patellofemoral malalignment, and chondromalacia patella.

Symptoms

A dull, aching pain under or around the front of the kneecap (patella) where it connects with the lower end of the thighbone (femur). Pain occurs when walking up or down stairs, kneeling, squatting, and sitting with a bent knee for a long period of time.



Causes

The knee is a complex structure and is very sensitive. A number of factors can contribute to runner's knee, including:

- Malalignment of the kneecap
- Complete or partial dislocation
- Injury
- Excessive training or overuse
- Tightness, imbalance, or weakness of thigh muscles
- Flat feet

Patellofemoral pain may be the result of irritation of the soft tissues around the front of the knee. Strained tendons are fairly common in athletes. Other contributing factors to patellofemoral pain include overuse, muscle imbalance and inadequate stretching. Pain that begins in another part of the body, such as the back or hip, may cause pain in the knee (referred pain).

In some people with runner's knee, the kneecap is out of alignment. If so, vigorous activities can cause excessive stress and wear on the cartilage of the kneecap. This can lead to softening and breakdown of the cartilage on the patella (chondromalacia patella) and cause pain in the underlying bone and irritation of the joint lining.

Prevention

- **Stay in shape.** Good general conditioning is important to controlling and preventing patellofemoral pain. If you're too heavy, you may need to lose weight to avoid overstressing your knees.
- **Stretch.** Before running or any other exercise, first do a 5-minute warm up, followed by stretching exercises. Stretching, particularly in the face down position (prone), will help keep the supporting structures around the front of the knee flexible and less likely to be irritated with exercise. For example, when lying prone, grab the ankle of the affected leg with one hand, and gently stretch the front of the knee. Stretch before and after exercise.
- **Increase training gradually.** Avoid sudden changes in the intensity of exercise. Increase force or duration of activities gradually.
- **Use proper running gear.** Use running shoes with good shock absorption and quality construction. Be sure that shoes fit properly and are in good condition. If you have flat feet, you may need shoe inserts.
- **Use proper running form.** Lean forward and keep your knees bent. Also, try to run on a clear, smooth, resilient, even, and reasonably soft surface. Never run straight down a steep hill. Walk down it, or run in a zigzag pattern.

Diagnosis

Medical History

Your doctor will take a complete medical history and inquire about your symptoms. Tell your doctor about any sports participation or training you are involved in, and which activities aggravate your knee pain. Have there been any recent changes to the duration, frequency, or intensity of your activities? Any changes to the surfaces you run or play upon?

Physical Examination

Your doctor will perform a physical examination on your knee to help determine the cause of pain.

To assess your knee's strength, mobility and alignment, the doctor may ask you to stand, walk, jump, squat, sit, and lie down.

The physical examination will include a check of the alignment of your lower leg, kneecap, and quadriceps; knee stability, hip rotation, and range of motion of knees and hips; under the kneecap for signs of tenderness; the attachment of thigh muscles to the kneecap; strength, flexibility, firmness, tone, and circumference of quadriceps and hamstring muscles; tightness of the heel cord and flexibility of the feet.

Imaging

The doctor may order diagnostic imaging studies, such as X-rays, magnetic resonance imaging (MRI) and computed tomography (CT) scans, and blood tests to rule out damage to the structure of the knee and the tissues that connect to it.

Nonsurgical Treatment

After resting the knee until the pain and swelling go down, you may need reconditioning to regain full range of motion, strength, power, endurance, speed, agility, and coordination. Your doctor may prescribe an exercise program to normalize the flexibility and strength of thigh muscles, or recommend cross-training exercises that emphasize stretching the lower extremities. Your doctor will tell you when you may gradually resume running and other athletic activities.

Other nonsurgical treatments involve taping the kneecap or using a special brace for knee support during sports participation. Special shoe inserts (orthotics) may sometimes be prescribed and may help relieve the pain.