

knee

The knee joint, which appears like a simple hinge-joint, is one of the most complex joint. It consists of femur (thighbone), tibia (shinbone) and patella (kneecap). The knee is a synovial joint, which means it is lined by synovium. The synovium produces fluid lubricating and nourishing the inside of the joint. Articular cartilage is the smooth surfaces at the end of the femur and tibia. It is the damage to this surface, which causes arthritis. The knee joint actually comprises two separate joints:

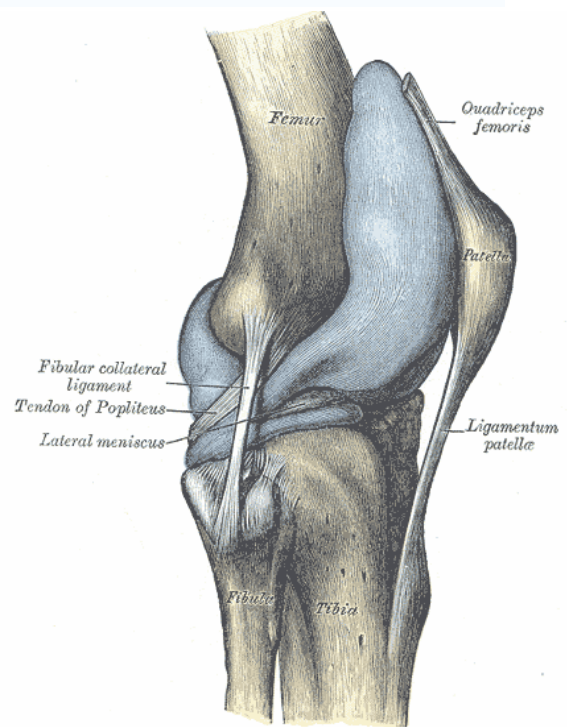
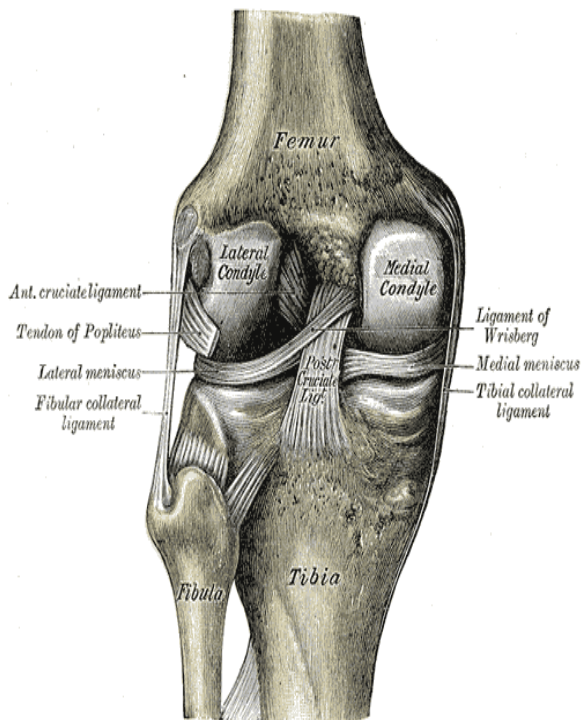
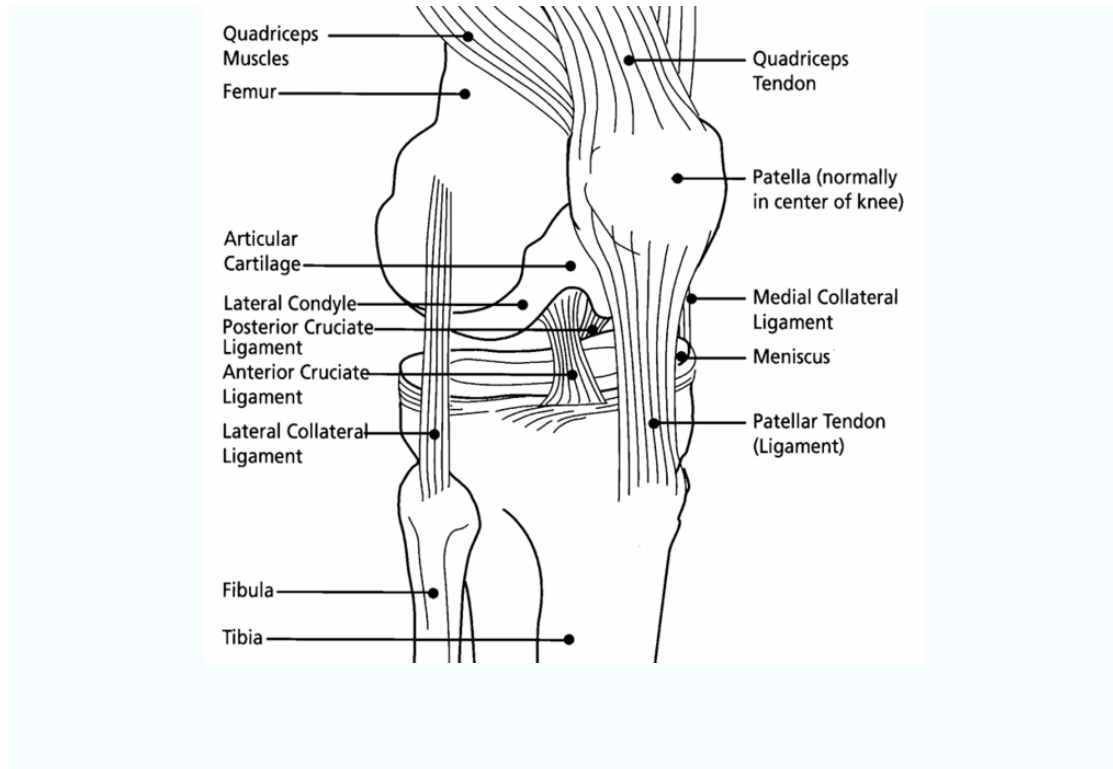
- The *femoro-patellar joint* consists of the patella, or "kneecap", a so-called sesamoid bone which sits within the tendon of the anterior thigh muscle (*m. quadriceps femoris*), and the patellar groove on the front of the femur through which it slides.
- The *femoro-tibial joint* links the femur, or thigh bone, with the tibia, the main bone of the (lower) leg. The joint is bathed in a viscous (synovial) fluid which is contained inside the "synovial" membrane, or joint capsule.

The recess behind the knee is called the popliteal fossa.

Structures around the knee:

- **Menisci** - The medial and the lateral meniscus are thin C-shaped layers of fibrocartilage, incompletely covering the surface of the tibia where it articulates with the femur. The majority of the meniscus has no blood supply and for that reason, when damaged the meniscus is unable to undergo the normal healing process that occurs in the rest of the body. In addition, meniscus begins to deteriorate with age, often developing degenerative tears. Typically, when the meniscus is damaged, the torn pieces begin to move in an abnormal fashion inside the joint. The menisci act as shock absorbers, protecting the articular surface of the tibia as well as assisting in rotation of the knee. As secondary stabilizers, the intact menisci interact with the stabilizing function of the ligaments and are most effective when the surrounding ligaments are intact.
- **Anterior Cruciate Ligament (ACL)** - The anterior cruciate ligament is the major stabilizing ligament of the knee. The ACL is located in the center of the knee joint and runs from the femur to the tibia, through the center of the knee. The ACL prevents the femur from sliding backwards on the tibia (or the tibia sliding forwards on the femur). Together with Posterior Cruciate ligament (PCL), ACL stabilizes the knee in a rotational fashion. Thus, if one of these ligaments is significantly damaged, the knee will be unstable when planting the foot of the injured extremity and pivoting, causing the knee to give way.
- **Posterior Cruciate Ligament (PCL)** - The PCL prevents the femur from moving too far forward over the tibia. The PCL is the knee's basic stabilizer and is almost twice as strong as the ACL and it is injured far less often than the ACL. It provides a central axis about which the knee rotates.

- **Collateral ligaments** - These ligaments prevent hyperextension, adduction and abduction of the knee.
 - **Medial Collateral Ligament (MCL)** - Resists valgus (bending out) force)
 - **Lateral Collateral Ligament (LCL)** - resists varus (bending in) force.



Common Injuries of the Knee and Knee pain.

Ligament Injuries

Anterior and Posterior Cruciate Ligament Injuries

Injuries to the cruciate ligaments are typically sprains. The anterior cruciate ligament (ACL) injury is quite often happen from a sudden twisting motion while the feet remain planted. Very common in sports that need to plant the feet and twist/turn, like Netball. The posterior cruciate ligament (PCL) is most often injured by a direct impact, such as in rugby. Cruciate ligament injuries don't always cause pain, but typically cause a loud "pop".

Medial Collateral Ligament (MCL) and Lateral Collateral Ligament Injuries (LCL)

MCL injury is most often caused by a direct blow to the outer side of the knee that stretches and tears the ligament on the inner side of the knee. The LCL injury would be a direct blow on the inner side that stretches and tears the ligament on the outer side, and the classic sign of this injury is hearing a "pop" and feeling the knee buckle sideways.

Cartilage and Meniscal injuries

Meniscal Injuries

It is very often injured during movements that forcefully rotate the knee while bearing weight. An injured meniscus causes mild to severe pain (particularly when the knee is straightened) depending upon the extent of the injury. Severe pain is common when a torn meniscus fragment catches between the femur and tibia. Swelling is common at the time of injury, but can develop hours later as the joint tissues inflame. Frequently, an injury to the meniscus causes an audible click or pop, or the knee may lock, or feel weak.

Osteoarthritis of the Knee

Osteoarthritis is a degenerative disease that causes the knee cartilage to wear down. Osteoarthritis may be caused by excess stress on the joint and causes pain, swelling, and a decrease in knee motion. A common symptom is morning stiffness that decreases with use. The knee may also pop or click, or even lock up at times. Osteoarthritis of the knee is treated with pain-reducing medicines, such as aspirin or acetaminophen (Tylenol) nonsteroidal anti-inflammatory drugs (NSAIDs) and exercises to strengthen the knee. The condition often limits activity levels in sufferers and even the desire to exercise. But studies suggest that basic strength training exercise can dramatically reduce the symptoms of arthritis and allow individuals to increase their activity levels.

One study, published in the [Journal of Rheumatology](#), followed two groups of individuals with a diagnosis of osteoarthritis over four months. One group followed

their regular routine. The other group performed simple home-based weight bearing exercise, including such things as squats and leg extensions. Those who performed simple weight training exercises reported a 43 percent reduction in pain and a 44 percent improvement in physical functioning (walking, stair climbing, sitting, and standing) than compared to the non-exercising group. The researchers conclude that high intensity, home based strength training can produce substantial improvements in strength, pain, physical function and quality of life in patients with knee osteoarthritis. They reason that weight training exercise can reduce the symptoms of arthritis because strong muscles act as shock absorbers for the joints. If muscles are able to take pressure off of the joints during activities such as walking, there is less joint-related pressure and pain.

Patellofemoral Pain Syndrome

One of the most complex joints in the human body, the knee, is prone to a variety of sports related injuries. One of the more common is Patellofemoral Pain Syndrome. This term usually refers to pain under and around the knee cap. The pain tends to worsen with activity, while descending stairs and after long periods of inactivity. Pain may occur in one or both knees.

While the exact cause of patellofemoral pain isn't known, it likely has something to do with the way the patella tracks along the groove of the femur. The patella can move up and down, side to side in the groove, as well as tilt and rotate. All this movement means that the patella can have contact with many of the articular surfaces of the knee depending upon a variety of factors such as muscle strength and balance, overuse, and incorrect tracking. It also means that the cause of the pain may be from a variety of different factors.

Treatment, Exercises and Rehabilitation for knee injuries.

The early or acute stage of management for injuries to the knee is generally R.I.C.E. – rest, ice, compression and elevation help to reduce pain and swelling for the first 2-4 weeks. During the end of first week of management, simple strengthening exercises are prescribed for maintaining the muscle strength and to strengthen up any weak muscles around the knee joint. Sometimes other parts of the kinetic chain, like the ankle, hip and back need to be addressed depends on the injury. Then, depends on the progression of the management, the exercises will be progressed to a harder stage that are specific to the patient. Below are some examples of the exercises that can be done for common knee injuries. For more information and specific exercise for your needs, please talk to your physiotherapist.

Knee Flexion on standing

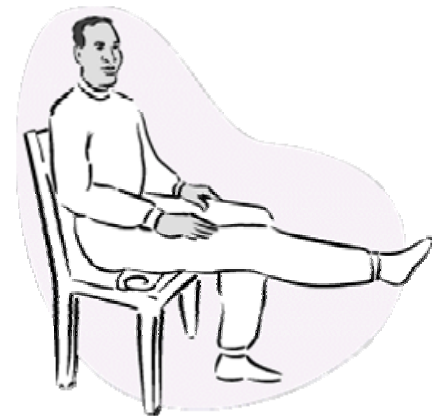


1. Stand straight; hold onto table or chair for balance.
2. Slowly bend knee as far as possible, so foot lifts up behind you.
3. Hold position.
4. Slowly lower foot all the way back down.
5. Repeat with other leg.
6. Add modifications as you progress.

Knee Extension on sitting

1. Sit in chair. Put rolled towel under knees, if needed.
2. Slowly extend one leg as straight as possible.
3. Hold position and flex foot to point toes toward head.
4. Slowly lower leg back down.
5. Repeat with other leg.

Strengthens muscles in front of thigh and shin. Use ankle weights, if you are ready to.



Heel raise

1. Stand straight, holding onto a table or chair for balance.
2. Slowly stand on tip toe, as high as possible.
3. Hold position.
4. Slowly lower heels all the way back down.
5. Repeat 8 to 15 times.
6. Rest a minute, then do another 8 to 15 repetitions.
7. Add modifications as you progress.

