

The Knee Joint

Summary

The knee joint is the largest and one of the strongest and most important joints in the human body. It is a synovial hinge joint which typically means that it allows motion in one plane, flexion and extension, however, the knee joint is slightly unusual in that it allows a small amount of rotation.

The knee joint is a complex structure that is vital for movement, yet vulnerable to a variety of injuries due to the many components that are involved.



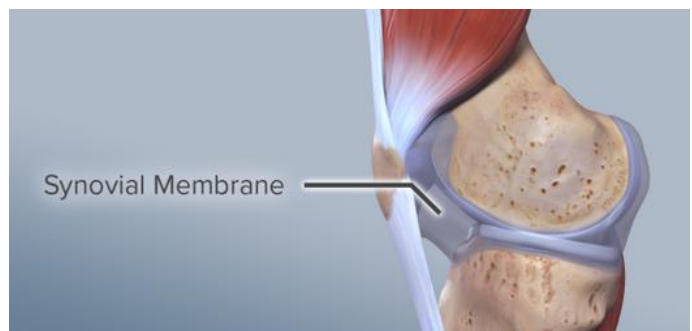
Patella



The knee joint is formed between three bones, the femur (thigh bone), the tibia (in the lower leg), and the patella (kneecap). The patella is a small, triangle shaped bone that sits in the quadriceps tendon and patellar ligament in front of the femur, on the anterior surface of the knee. It is lined with the thickest layer of cartilage in the body because it endures a great deal of force. The patella plays a vital role in how the knee bends. If the patella or the tendons associated with it become injured, a person will experience difficulty walking, running, standing and engaging in athletic activity.

Joint Capsule

The knee joint is a synovial joint meaning that it has a joint capsule which is like a sac surrounding the joint. The capsule contains synovial fluid which is produced by the synovial membrane. This fluid nourishes and lubricates the joint allowing it to move smoothly and painlessly. When the knee is at rest, the synovial fluid is contained in the cartilage, much like water in a sponge however, when the knee bends or bears weight, the synovial fluid is squeezed out.

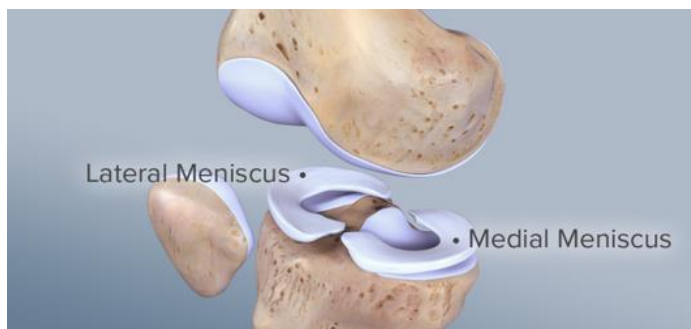


Articular Cartilage

The surfaces of the bones that meet at and form the knee joint are covered with a substance called articular cartilage. This is a smooth white tissue that is present in almost all the other joints in the body. The cartilage allows the bones to slide and glide on each other without friction. The articular cartilage can become worn and degrade through the stresses of athletic activity, repetitive use, and significant weight bearing.



Menisci



Between the femur and the tibia are C shaped layers of tough, rubbery cartilage known as the menisci. The menisci act as shock absorbers inside the knee to prevent the collision of the leg bones during strenuous activities such as running and jumping. The menisci also assist in the reduction of the

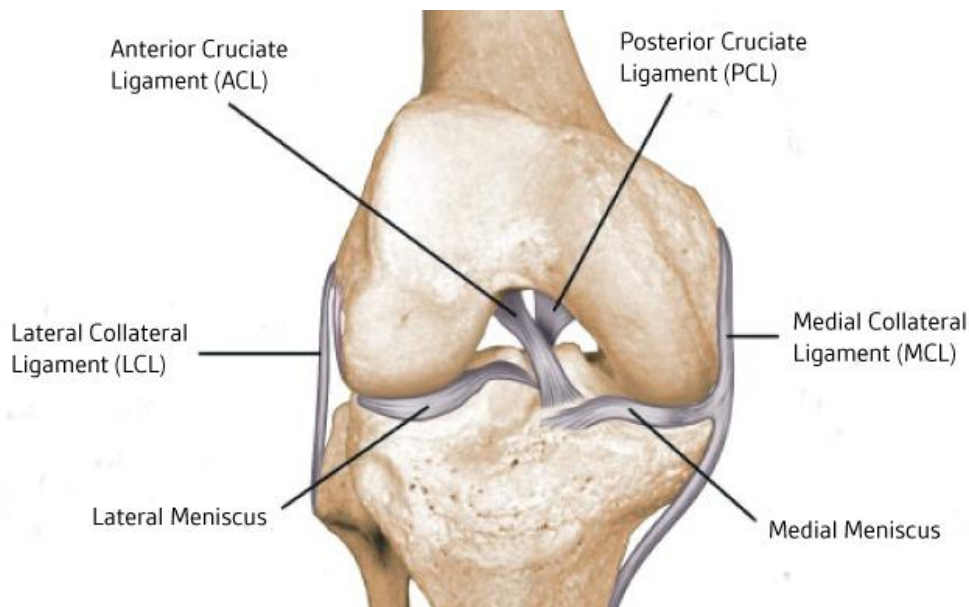
friction that would otherwise occur when the bones come into contact.

The knee joint has two menisci, the medial meniscus on the inner side of the knee is the largest of the two. The lateral meniscus is on the outer side of the knee.

Pain, swelling, difficulty bending and straightening the leg, and locking up are all symptoms of a meniscal injury.

Ligaments

Ligaments are tough, flexible, fibrous tissues that act like strong ropes to connect bones to other bones, preventing too much motion and promoting stability. The knee joint has a network of ligaments, each of which performs a specific stabilising function.

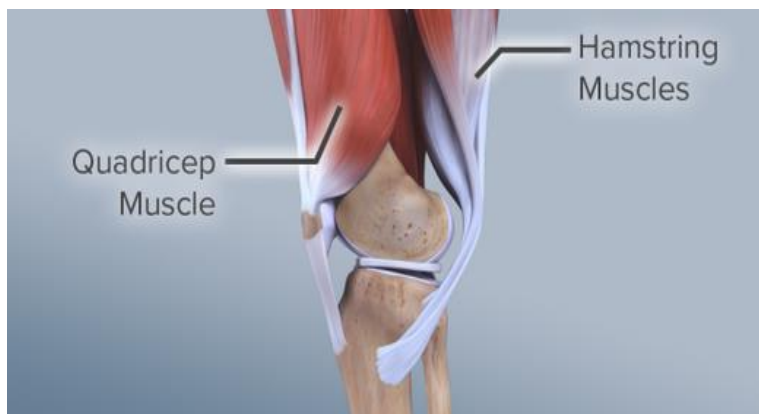


Anterior cruciate ligament (ACL)	The anterior cruciate ligament (ACL) is an internal ligament that helps to maintain proper alignment of the knee by preventing the femur from sliding backwards on the tibia, and the tibia from sliding forwards on the femur.
Posterior cruciate ligament (PCL)	The posterior cruciate ligament (PCL) sits directly behind the anterior cruciate ligament (ACL). The posterior cruciate ligament (PCL) prevents the femur from sliding forward on the tibia, and the tibia from sliding backwards on the femur.
Medial collateral ligament (MCL)	The medial collateral ligament (MCL) sits along the medial side of the knee and connects the medial side of the femur to the tibia. This ligament prevents side to side movement of the femur.
Lateral collateral ligament (LCL)	The lateral collateral ligament (LCL) binds the lateral side of the femur to the fibula and prevents side to side movement of the femur.

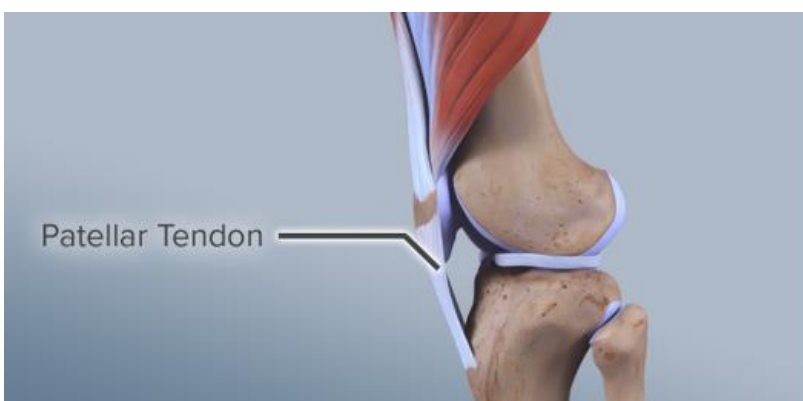
Because the knee joint relies on these ligaments and surrounding muscles for stability, they are easily injured. Any direct contact to the knee or hard muscle contraction, such as changing direction rapidly whilst running, can injure a knee ligament.

Muscles

For a knee joint to maintain its normal range of motion, the surrounding muscles must be flexible. The muscles must also be strong to provide adequate support to the knee joint. The muscles involved are the quadriceps muscles at the front of the thigh, the hamstrings at the back of the thigh, and the lower leg muscles including the gastrocnemius at the back of the calf.



Tendons



Tendons are tough bands of soft tissue that provide stability to the knee joint. They are similar to ligaments but instead of linking bone to bone, they connect bone to muscle. The largest tendon in the knee is the patellar tendon, which covers the kneecap, runs high up the thigh and attaches to the quadriceps.

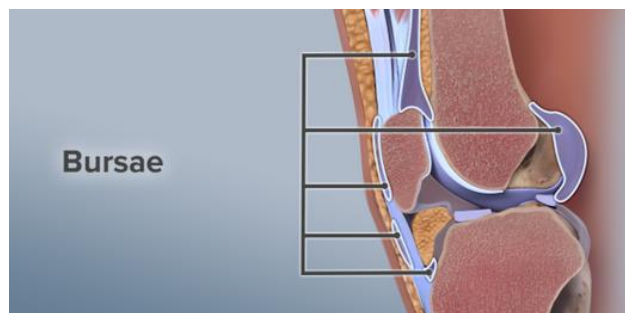
When the quadriceps muscles contract, the patellar tendon is pulled and the leg straightens.

Bursae

In addition to the joint capsule, ligaments and menisci that support the knee, there are also a number of structures surrounding the knee that help cushion and protect the joint from friction and outside forces.

These small pockets of synovial fluid, are known as bursae. Like cartilage, bursae reduce friction

however, whilst cartilage reduces friction between bones, bursae reduces friction between bones and soft tissues such as muscles and tendons. The bursae help muscles and tendons slide freely as the knee joint moves.



LexiMed Consultants

•• **Dr Peter Winstanley**
Orthopaedic Surgeon

•• **Dr David Shooter**
Orthopaedic Surgeon

•• **Dr Steven Hatcher**
Orthopaedic Surgeon

•• **Dr Glenn Davies**
Orthopaedic Surgeon

•• **Dr Richard Hudson**
Orthopaedic Surgeon

References:

<https://orthoinfo.aaos.org/en/diseases--conditions/collateral-ligament-injuries/>

<https://www.arthritis-health.com/types/joint-anatomy/knee-anatomy>

<https://www.medicalnewstoday.com/articles/299204.php>

<https://www.innerbody.com/image/skel16.html>