



# The Knee



# INTRODUCTION

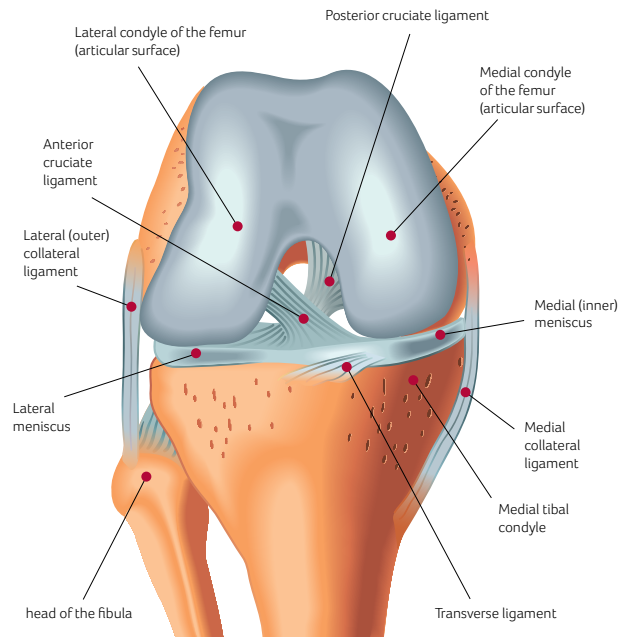
## THE KNEE

The knee is one of the largest joints in the body, formed between three bones – the thigh bone (femur), the shin bone (tibia), and the kneecap (patella).

At the joint, the surface of each bone is covered in a thin layer of substance called articular hyaline cartilage. This cartilage contributes to the smooth movement of the knee, and protects the bone underneath from getting damaged.

Knee pain can be caused by a number of factors including accidents (trauma), malalignment, the way in which the knee moves (biomechanics), and due to aging (degeneration).

Depending on the nature of your condition, conservative methods of treatment, including physiotherapy and / or injections are often trialled prior to surgery.



*Image of right knee.*



# INTRODUCTION

## HOW THE KNEE WORKS

The knee is a hinge joint. This means that the knee's main function is to allow the lower leg to bend and straighten up relative to the thigh. The knee also allows a small degree of medial (inner) and lateral (outer) rotation when the knee is bent.

A joint capsule surrounds the knee joint to provide strength and lubrication.

There are also four main strips of tough tissue, called ligaments, which stabilise the knee joint:

- The anterior cruciate ligament (ACL) prevents the largest bone on the lower leg, the tibia, from sliding forward too much. This ligament also provides the knee with rotational stability.
- The posterior cruciate ligament (PCL) prevents the tibia from sliding backwards too much.
- The medial and lateral collateral ligaments (MCL & LCL) provide lateral stability by controlling the sideways motion of the knee.

The knee also has two C-shaped rings of cartilage called the medial and lateral menisci. These act as shock absorbers in the knee, whilst also contributing to the stability and smooth movement of the knee.

Small pockets (known as bursae) filled with a fluid called synovial fluid surround the knee joint. These bursae help to cushion and protect the joint from friction.

There are also pockets of a tissue called adipose tissue, known as fat pads, which help to cushion the knee from external stress.

The main muscles that make up the knee are the quadriceps, the hamstrings, the gastrocnemius of the calf, and some smaller, deeper muscles.

When the quadriceps are engaged, the knee is straightened, whereas engaging the hamstrings and gastrocnemius muscle will bend the knee.

One of the muscle groups of the hips, the gluteal muscles, are also extremely important for controlling the knee joint.



# PROBLEMS AND TREATMENTS

## CARTILAGE

The ends of our joint surfaces are lined with articular cartilage. This cartilage is made up of small cells called chondrocytes, along with a combination of proteins, collagen, and lots of water. In healthy joints, this durable cartilage allows joint surfaces to move against one another with minimal friction. Cartilage also acts as a shock absorber, by facilitating the transmission of loads to the underlying (subchondral) bone.

Losing cartilage in certain areas can often interfere with the normal movement of joints and limbs. This can result in pain and being less able to carry out regular daily or sporting activities.

In some cases it may be possible for us to fill missing sections with new cartilage which provides new protection for the joint surface. However, in cases where there are more extensive areas of missing or damaged cartilage there is an increased likelihood of arthritis and other management options may have to be explored.

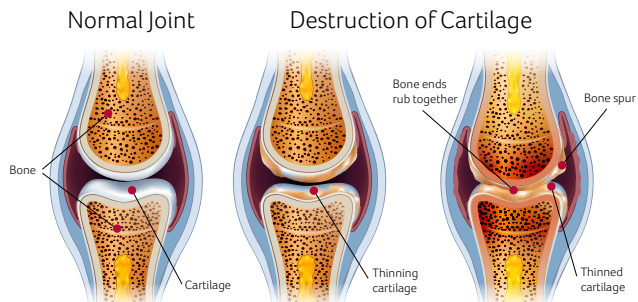
## MENISCUS

The meniscus plays a role in joint stability, as well as load distribution. Tears in the meniscus are common, and often happen because of an acute injury.

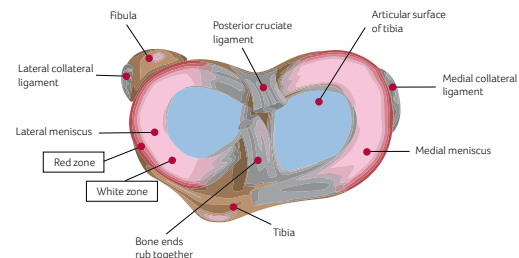
Meniscal tears are often treated by removing a piece of the torn meniscus, which is called a partial meniscectomy, which may make the joint more vulnerable to degeneration of the articular cartilage.

Some meniscal injuries can be repaired via key-hole surgery (arthroscopically), where the torn piece(s) of the meniscus are sutured / stitched back together. This depends on the type of tear, as well as the overall status of the damaged meniscus and age of patient. Unfortunately due to the relatively poor blood supply of the menisci, many tears are not suitable for repair.

### Osteoarthritis



### Superior (top) view of the right knee







# PROBLEMS AND TREATMENTS

## LIGAMENTOUS INJURY

### Anterior Cruciate Ligament (ACL)

The ACL is important in controlling rotation of the knee, during lateral, multi-directional and landing movements, and is one of the most commonly injured structures among athletes.

Typical symptoms of an ACL injury include:

- An audible “popping” sensation within the knee
- Swelling
- Pain
- A feeling of instability like the knee may “give way”
- Stiffness / loss of full range of motion

Treatment options for ACL injury can vary depending on a person's specific needs.

Reconstructive surgery is often recommended to restore stability of the knee required for multi-directional movement or sport. However for people with a lower level of activity, less invasive measures such as rehabilitation and / or bracing of the knee may be more suitable.

As the ACL cannot usually be repaired, restoring a torn ACL through surgery involves replacing the ACL with a piece of tissue taken from another part of the leg (a graft), such as from the patellar tendon or the hamstring. Other graft options are also sometimes considered.

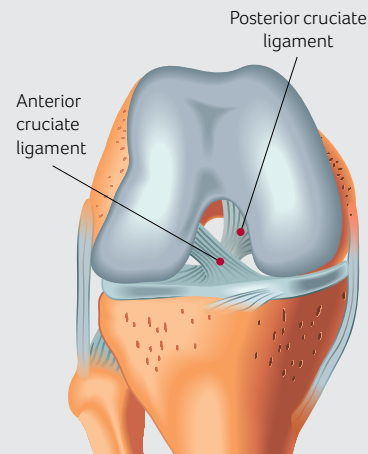
### Posterior Cruciate Ligament (PCL)

The PCL prevents the tibia from sliding backwards too much, and also helps stabilise the knee in rotational movements.

Injuries to the PCL are generally the result of a direct blow to the front of the knee, when the leg is in a bent position, (such as falling on a bent knee). PCL injuries can also occur when the knee twists or straightens too much (hyperextends).

Isolated PCL injuries generally do not cause instability. A large amount of instability may mean there is a PCL injury combined with an injury to another specific section of the knee called the posterolateral corner.

Treatment depends on how severe the injury is, and whether it is an isolated or combined injury. Rehabilitation is a vital component of recovery in both surgical and conservative cases.





# PROBLEMS AND TREATMENTS

## COLLATERAL LIGAMENTS

### Medial Collateral Ligament (MCL)

The MCL connects the femur to the tibia and stabilises the inner side of the knee.

Injuries to the MCL are usually caused by a force pushing the knee inwards (valgus) or in combination with a twisting force. The ligament becomes stressed, over-stretched, and damaged. Often, MCL tears occur alongside other knee injuries such as ACL tears. Pain around the inner aspect of the knee and stiffness are common with MCL injury.

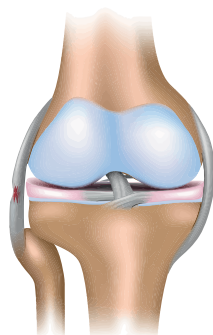
Recovery depends on the how severe the injury is. Protecting the range of motion, as well as a structured rehabilitation / strengthening programme forms the basis of conservative treatment for MCL injuries.

### Lateral Collateral Ligament (LCL)

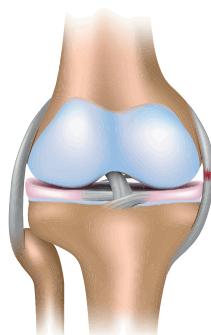
The LCL connects the femur to the fibula, and stabilises the outer side of the knee.

Injuries to the LCL are usually caused by an outward twisting force, or varus, to the knee. LCL injuries often occur alongside other knee injuries. Surgery is generally the preferred course of treatment if there is a complete (Grade 3) tear to the ligament or if the ligament becomes detached, or avulsed, from the bone. A structured rehabilitation programme is an essential part of recovery from an LCL injury.

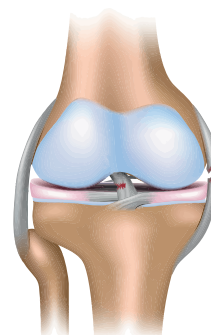
Right knee, Front view



Torn lateral collateral ligament (LCL)



Torn medial collateral ligament (MCL)



Torn medial collateral ligament (MCL) and anterior cruciate ligament (ACL)



# PROBLEMS AND TREATMENTS

## PATELLOFEMORAL CONDITIONS

### PATELLOFEMORAL PAIN

Patellofemoral pain is a broad term used to describe pain at the front of the knee.

There are various factors that contribute to patellofemoral pain, both internal and external to the knee, including malalignment. However, the main risk factors appear to be overuse and overload.

Management of the injury requires a multi-faceted approach. Particular emphasis is placed on load management, along with a structured rehabilitation programme to strengthen the surrounding muscles as well as addressing abnormal movement patterns.

### PATELLAR INSTABILITY

The kneecap (patella) sits in a notch on the femur bone called the trochlea. If this groove is too shallow, the patella can become unstable and slide off, resulting in a partial or complete dislocation of the kneecap.

Dislocation can also occur during an acute injury such as a fall, or a rotational type injury of the knee.

Patients with a high riding patella that sits above the groove and patients with other anatomical variants are also more prone to dislocation.

If the patella becomes dislocated, it needs to be relocated or “reduced”, which often happens spontaneously. If the instability keeps reoccurring,

surgery may be needed to stabilise the patella, followed by a rehabilitation programme to strengthen the soft tissue structures of the knee, and to prevent any further dislocations.

### PATELLAR FRACTURES

Fractures to the patella bone usually happen because of a fall or hard blow to the front of the knee.

Treatment options for this type of injury depend on the type of fracture. An undisplaced fracture of the patella, where the broken bone remains in the correct place, generally responds well to being immobilised in a knee brace or cast. Displaced fractures often require surgical treatment to stabilise the site of the fractured bone.

Both conservative and surgical treatments need to be complemented with a rehabilitation programme to strengthen the muscles around the knee.





# PROBLEMS AND TREATMENTS

## LIMB ALIGNMENT

Proper knee alignment is essential for normal function and for balance in the joint. Poor movement patterns which cause uneven forces throughout the knee can damage both its articular cartilage and ligaments.

There are two types of malalignment in the knee, which can contribute to its condition:

- Knee varus where the weight passes medially, (more through the inside of the knee joint), causing degeneration to the inside of the knee
- Knee valgus where the weight passes laterally, (more to the outside of the knee joint) causing degeneration to the outside of the knee

A corrective surgical procedure called an osteotomy redistributes the forces bearing down on the knee by cutting a wedge of bone from either the tibia or femur, to reposition and realign the knee.

## OSTEOARTHRITIS

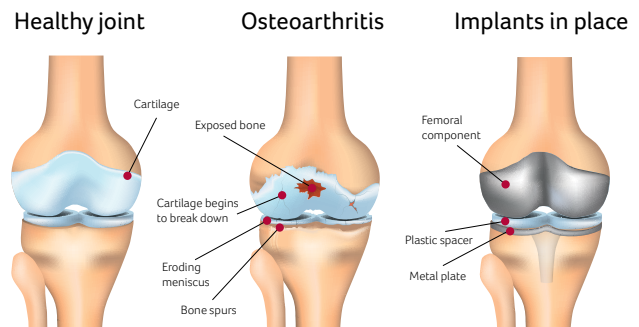
Osteoarthritis is the most common form of arthritis, and often affects the knee joint.

Osteoarthritis is caused by aging and wear and tear of cartilage. Symptoms of osteoarthritis in the knee may include knee pain, stiffness, and swelling.

## KNEE REPLACEMENT

If the degree of osteoarthritis is quite severe and debilitating, a Total Knee Arthroplasty is often the recommended form of treatment.

This open procedure involves removing the damaged areas of cartilage loss, and replacing them with synthetic components (often metal), to recreate the joint surfaces. The inner surface of the patella may also be resurfaced if needed. An artificial “spacer” is inserted between the metal components to allow the new joint to glide smoothly and efficiently.





# SURGICAL PROCEDURES

## ORTHOPAEDIC EVALUATION

We carry out an orthopaedic evaluation of your knee through the following three activities:

- A medical history to gather information about current complaints, duration of symptoms, pain and limitations, injuries, and past treatment with medications or surgery.
- A physical examination to assess swelling, tenderness, range of motion, strength, instability, and limb alignment.
- Diagnostic tests, such as X-rays or magnetic resonance imaging (MRI), which may be required to assess both the bony and soft-tissue structures of the knee.

We will discuss the results of your orthopaedic evaluation and the various treatment options available to you in detail.

## TYPES OF SURGICAL PROCEDURES

### ARTHROSCOPY

Arthroscopic surgery is when the surgeon inserts a thin, pencil-sized device, containing a tiny lens and lighting system, into a small incision to look inside the knee joint. The images inside the joint are shown on a TV monitor and allow the surgeon to make a clear diagnosis.

Other surgical instruments can also be inserted so that repairs can be made, depending on the diagnosis.

Surgeries such as a partial meniscectomy, meniscal repair, or ACL reconstruction, are generally carried out using these arthroscopic methods.

### OPEN SURGERY

Knee replacement is an open surgery performed through an incision at the front of the knee. Other surgeries such as collateral ligament reconstruction and osteotomy are also performed by open incisions to the knee of varying lengths and location depending on the specific procedure.

## REHABILITATION

Rehabilitation is crucial to maximise the success of any knee surgery, and commitment to a structured rehab programme is an essential part of your recovery.

This rehabilitation should be closely followed in consultation with your orthopaedic surgeon and chartered physiotherapist.





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INITIAL DIAGNOSIS TO  
RETURN TO NORMAL  
DAILY ACTIVITIES  
AND SPORT.







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