

# Knee Joint Preservation

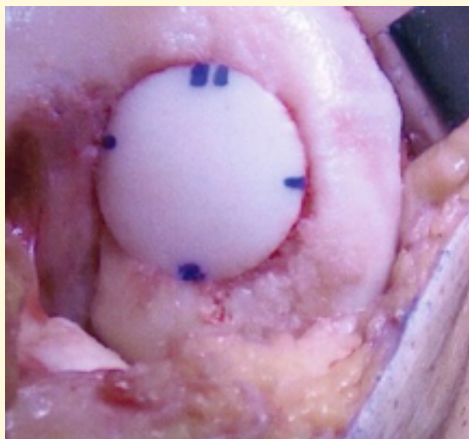




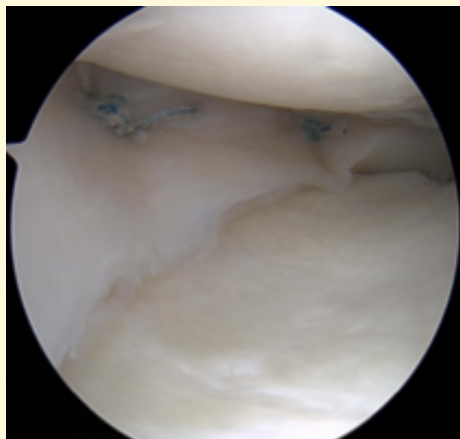
Osteotomy



Partial Knee Replacement



Cartilage Resurfacing



Meniscus Transplant

## What is early knee osteoarthritis?

Osteoarthritis means inflammation of the joint with degeneration of the cartilage. Cartilage is the glistening tissue that covers the ends of bones. Healthy cartilage allows smooth joint movement as the bones to glide over each other and also helps to absorb shock of movement.

In osteoarthritis, the cartilage layer breaks down and no longer remains as a smooth surface. When this happens, the bones in the joints move closely against each other with higher amounts of friction. The results in pain, swelling, stiffness, and sometimes, lead to the formation of bone spurs.

Osteoarthritis occurs in older people as they progressively get older. Early knee osteoarthritis means that it happens in knee joints of patients who are less than 60 years old.



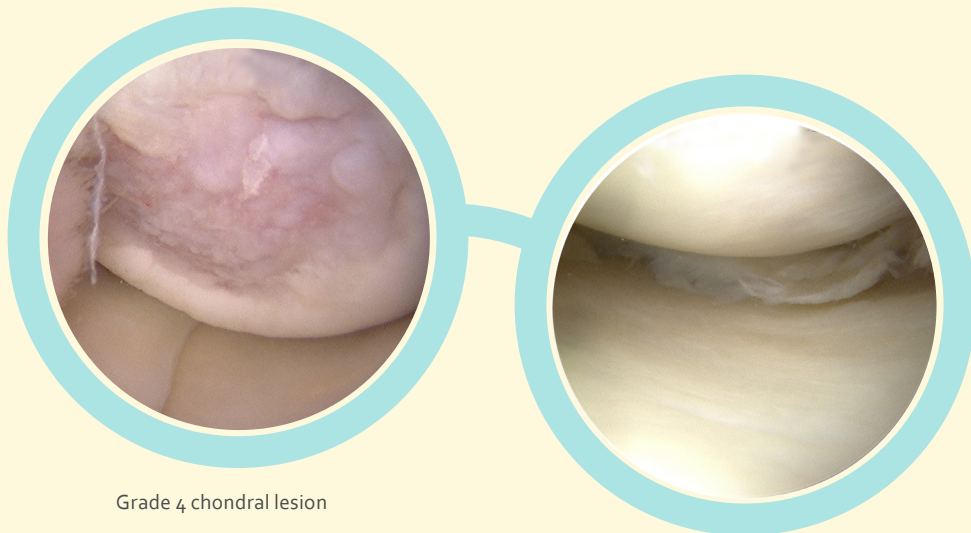
Medial compartment OA right knee

The knee is divided into three major compartments: the medial compartment (inside), lateral compartment (outside) and the patellofemoral compartment (front of the knee behind the kneecap). Early osteoarthritis can also predominantly be in one compartment of the knee, for example, localized to just the medial compartment of the knee.

## What are risk factors for early knee osteoarthritis?

Young or Middle-aged patients can get accelerated osteoarthritis from various causes:

- Prior knee joint injury left untreated such as a torn meniscus or ligament
- Prior surgery to remove torn meniscal cartilage ie meniscectomy
- Knee malalignment loading to excess loading in one compartment
- Obesity with excess joint loading
- Inflammatory arthritis



Grade 4 chondral lesion

Degenerative meniscus

## What are the symptoms of knee osteoarthritis?

- Knee pain that increases when you are active, but gets better with rest
- Knee swelling and warmth
- Knee stiffness, especially on getting up after sitting for a while
- Decreased knee mobility, making it difficult to climb up or come down the stairs

## How do we assess early knee osteoarthritis?

- A history will be taken to determine the severity of the condition, the aggravating factors and the predominant location of the knee pain – medial / lateral / patellofemoral
- A physical examination to assess the knee range of motion and exact location of knee pain
- Knee weight bearing radiographs
- Full length lower limb radiographs to assess limb alignment
- Magnetic Resonance Imaging (MRI) to evaluate the compartment that the osteoarthritis has occurred in and review the condition in other parts of the knee joint



Exposed subchondral bone medial compartment

## What are the non-surgical treatment options for early knee osteoarthritis?

- Weight loss; even a small amount of weight loss can decrease knee pain
- Topical analgesic creams and patches
- Oral analgesia and Anti-inflammatory medications
- Intraarticular hyaluronic acid injections into the knee
- Using a unloader knee brace; this helps to take the weight away from the side of the knee affected by osteoarthritis
- Using a support knee brace; this provides support for knee instability and relieves pain
- Physical therapy to strengthen muscles around the knee and increase the joint flexibility



Off loader brace

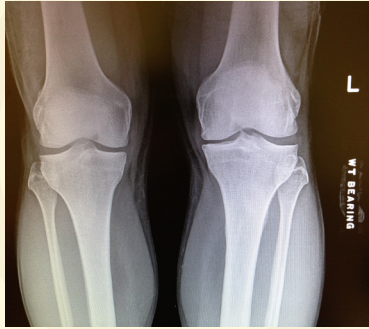
## When is surgery required for the treatment of early knee osteoarthritis?

The primary goals of treating osteoarthritis of the knee are to relieve the pain and improve mobility. Surgery needs to be considered when the non-surgical measures have been tried for a period of time and have not been successful.

### Surgical treatment options include:

- Knee Arthroscopy
- Meniscus Transplant
- Knee Osteotomy
- Unicompartament Knee Arthroplasty (UKA)
- Or as a last resort, Knee Total Joint Arthroplasty (TKA).

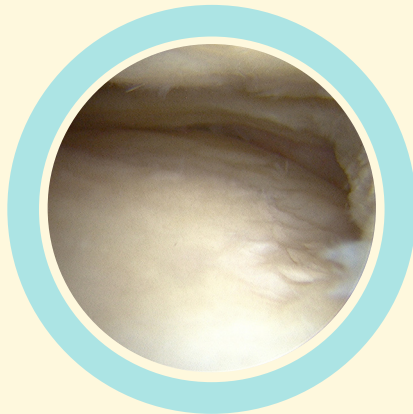
## Knee Arthroscopy



Early osteoarthritis in the left knee

Arthroscopy uses a small camera (arthroscope) and other instruments to perform surgery through small incisions. The surgeon uses the arthroscope to inspect the knee joint space. The damaged cartilage, meniscus or loose bodies can be removed (Debridement) and the repair of damage tissue can be performed.

In some cases, the knee arthroscopy helps to inspect the cartilage surfaces in other compartments of the knee joint as part of the full assessment. Arthroscopy is often used in order to delay more complex surgeries which may be subsequently still required.



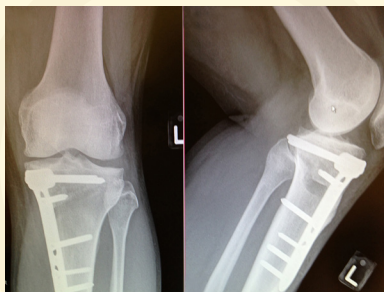
Inspection of the knee cartilage

## Knee Osteotomy

Osteotomy means “cutting of the bone”. In a knee osteotomy, the upper part of the tibia (shin bone) or the distal part of the femur (thigh bone) is cut and realigned. This is indicated in patients where the knee osteoarthritis which is localized to one area of the knee joint.

During the surgery, the alignment of the lower limb (which passes through the knee) is altered to shift the line of weight bearing away from the affected half of the joint and into the good half. This will reduce the symptoms from the early osteoarthritis and also slow down the rate of its progression. This is usually recommended for patients who are young and wish to preserve their native knee joint. For them, a joint replacement at an early age may not be the viable option.

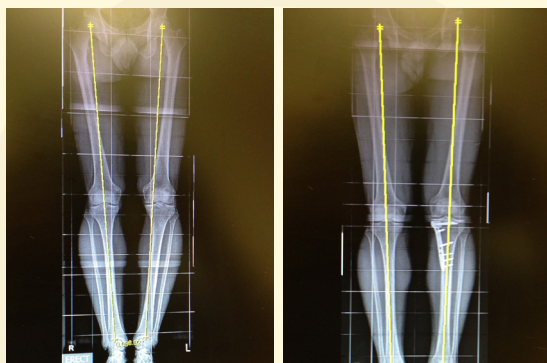
Occasionally, a knee osteotomy can also be used to treat complex knee ligament instability, or with combined with surgery to repair meniscus and cartilage damage in the knee joint. In these patients, the osteotomy is performed to protect the meniscus or cartilage replacement from failure due to excessive compressive forces on the repair graft.



High Tibial Osteotomy

## What is a High Tibial Osteotomy?

High Tibial Osteotomy (HTO) is a surgical procedure where the upper part of the tibia (shin bone) is cut to realign the varus knee (bowlegged). In such cases, the alignment of the lower limb passes through the medial (inside) compartment of the knee and creates medial compartment overload, which presents with pain on the inside of the knee. Therefore, if the pain is unbearable, the HTO is performed to shift the line of weight bearing into the lateral (outside) compartment of the knee.



Realignment of mechanical axis after HTO

A High Tibial Osteotomy is performed by planning the optimal degree of correction to realign your lower limb and offload the knee compartment. After cutting the bone (osteotomy), metal plates and screws will be required to hold the bones in place till the osteotomy site heals.

## Recovery after HTO

The stay in hospital is usually between 2-4 days. You will need to use crutches for 2-3 months to allow for the osteotomy to heal. The osteotomy is followed up with repeat radiographs to evaluate healing. During this time, physical therapy is necessary to improve the knee range of motion and strength.

It will take 3 – 6 months for your osteotomy to heal fully and 6 – 12 months for you to get maximum benefit from your osteotomy. In some patients, the metal plate and screws may feel prominent under the skin and have to be removed at about 12 months after surgery.

## Results of HTO

Over 90% of patients feel improvement in their knee pain following HTO. For over 70% of patients, this improvement lasts for 10 years or more. However, in some patients, if the pain persists, either a Unicompartmental Knee Arthroplasty (UKA) or Total Knee Arthroplasty (TKA) may be needed.

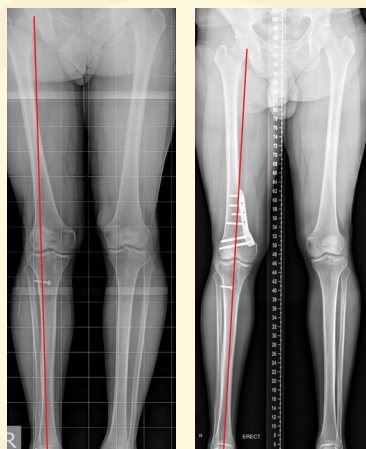
## What are possible problems after HTO?

Like all surgery, High Tibial Osteotomy can associate with complications:

- Delayed or non-healing healing of osteotomy, seen usually in smokers
- Superficial or deep infections
- Deep venous thrombosis
- Limb may be longer in HTO by up to 1 cm.
- Numbness around your scars
- Incomplete pain relief or progression of the arthritis with time
- Prominence of metal implants
- Injury to the blood vessels and nerves around the knee

## Distal Femoral Osteotomy (DFO)

Instead of being bowlegged (varus deformity), some patients have a valgus knee deformity (knock-knee) with pain on the outside (lateral compartment) of the knee. To relieve the symptoms of lateral compartment pain and lateral compartment overload, a distal femoral osteotomy can be performed where the femur (thigh bone) is cut and realigned. This procedure is rarer than HTO, but the surgical progress, post – operative course, risks and benefits, and outcomes are similar.



Realignment of mechanical axis after DFO

## Meniscus Transplant

### What are meniscus and what are their functions?

The meniscus are C-shaped structures which separates the thigh (femur) bone from the shin bone (tibia) and helps to protect the knee joint. Their functions are to:

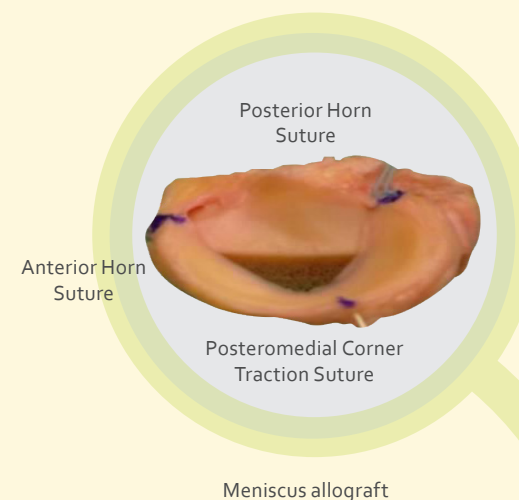
- Reduce load transmission across the knee
- Influence the stability of the knee joint
- Role in joint proprioception and cartilage nutrition
- Protects ACL graft in ACL reconstructed knee

It has been shown that loss of the meniscus tissue increases point loading, resulting in premature wear of the knee and progression of radiographic knee osteoarthritis.

## What is a Meniscus Transplant?

Meniscus Transplant is a surgical procedure where the deficient meniscus is replaced with donor tissue.

There is a rigorous screening process performed before the tissue bank procures the cadaveric donor tissue. The donor tissue undergoes tests for viruses such as HIV/AIDS, Hepatitis B and C and bacteria culture tests are performed. The donor meniscus is processed so that it is safe and viable for use.

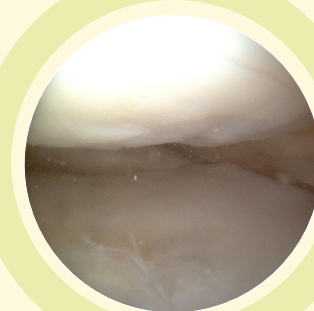


Meniscus allograft

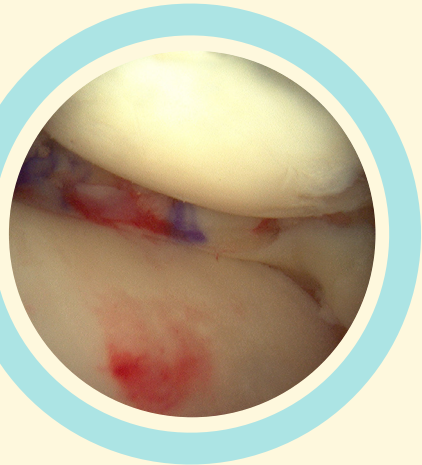
### Who should have Meniscus Transplant?

#### The criteria for Meniscal Transplants are:

- Young patients less than 50 years old and are active
- Absent meniscus or a meniscus deficiency from previous meniscectomy or injury
- Persistent activity-related pain localized to the compartment with the meniscus deficiency
- Patients who have minimal damage to the articular cartilage of the joint, stable knee ligaments and normal knee alignments



Absent meniscus with cartilage damage



After meniscus transplant

## How is a Meniscus Transplant performed?

A donor meniscus that will appropriately fit your knee will be identified from tissue banks using information of your knee parameters from sizing radiographs performed.

The Meniscus Transplant is done with arthroscopic assistance where the remaining meniscus will be debrided to prepare it as a bed for the new donor tissue to be attached to. The new donor meniscus will be prepared and inserted into the knee joint. The new donor meniscus is anchored to the shinbone to stabilize the transplant as well as attached to the knee joint capsule with additional stitches.

## Recovery after a Meniscus Transplant

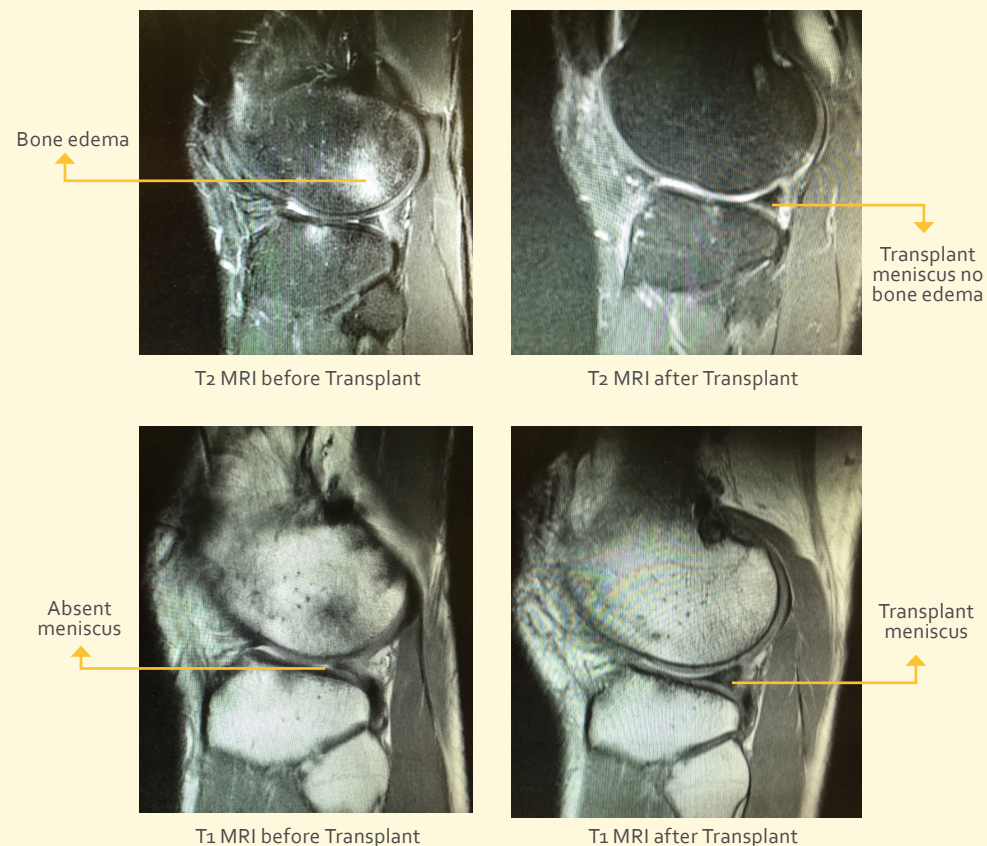
You will need to use crutches to avoid full weight bearing and use a knee brace to limit your knee range of motion for the first 6-8 weeks after surgery. This gives the transplanted tissue time to become firmly attached to the bone and capsule.

Physical therapy will commence after surgery to reduce swelling, restore the knee range of motion and coordination. As healing progresses, strengthening exercises will be added to your program. It is important to continue these exercises for up to one year after surgery. Full release to sports depends on strength recovery and is at least 12 months after surgery.

## Outcomes after Meniscus Transplant

The improvements in pain relief, activities and function are reported in over 80% of patients after Meniscus Transplant surgery. But Meniscus Transplant surgery is not a good option for every patient.

The patients must be young, compliant to rehabilitation and motivated for best results. It must also be understood that full return to sports at the same level may not be possible and some activity modification may still be required. The main purpose of this surgery is to slow down the rate of progression of osteoarthritis in the affected compartment of the knee. For patients who are correctly selected, Meniscus Transplant can provide significant benefits.





## Possible complications from Meniscus Transplant

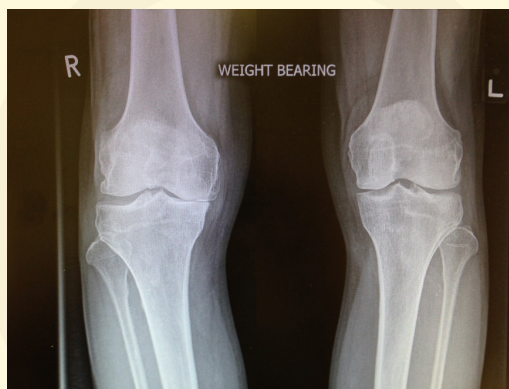
- Superficial or deep infection
- Knee stiffness
- Failure of the surgery to relieve symptoms
- Failure of the meniscus to heal
- Tear of the meniscus graft tissue or graft extrusion
- Injury to blood vessels and nerves around the knee

## Unicompartmental Knee Arthroplasty (UKA)

### What is Unicompartmental Knee Arthroplasty?

The knee is divided into three major compartments: the medial compartment (inside), the lateral compartment (outside) and the patellofemoral compartment (front part of the knee behind the kneecap).

Unicompartmental Knee Arthroplasty (also called Unicompartmental Knee Replacement) is a surgical procedure used to relieve arthritis in one of the knee compartments in which the damaged parts of the knee are replaced. In general, this procedure constitutes approximately 5- 10% of knee arthroplasty.



Bilateral medial compartment OA

## When can UKA be performed?

This is determined from the history and physical examination performed as part of the assessment. You may be asked to identify your knee pain with one finger, and if you have a pain in only one area of the knee, you may be a candidate for UKA.

In addition, knee radiographs, knee MRIs and Lower limb full length films may be required to evaluate the knee.

### Advantages of UKA compared with Total Knee Arthroplasty:

- Less blood loss during surgery
- Quicker recovery with a shorter hospital stay
- Smaller Incision with less pain after surgery
- More natural feeling knee as the bone, cartilage, and ligaments in the healthy parts are preserved and not removed



Bilateral UKA post op

### Disadvantages of UKA compared with Total Knee Arthroplasty:

- Less predictable pain relief
- Potential need for subsequent surgery

## How is UKA performed?

An incision will be made in the front of your knee. Using cutting guides and saws, the cartilage from the damaged compartment of your knee will be removed. This will be replaced with metal components and are held in place with bone cement. A plastic insert is placed between the two metal components to allow for a smooth and painless gliding surface.



Lateral view of post op UKA

## Recovery after UKA

After surgery, the hospital stay will be for 1- 3 days. You can put weight on your knee immediately after surgery. You may need a walker for the first week or two until you become comfortable enough to walk without assistance. A physical therapist will teach you exercises to help maintain your range of motion and restore your strength.

## Outcomes of UKA

At 10-15 years follow-up, many studies showed that more than 90% of patients reported good or excellent outcomes and the overall survival rate of UKR surgery was more than 90%. Only about 10% of patients need a total knee replacement subsequently because of the progress of arthritis in the other compartments over time.

Our hospital performs over 50 knee preservation procedure annually.

Our team of Surgeons, Nurses, Physiotherapists and Sports Trainers in Changi General Hospital are ready to manage all types of complex knee reconstructions and Pre-TKR surgical options.

2 Simei Street 3 Singapore 529889  
Tel: 6788 8833 Fax: 6788 0933 www.cgh.com.sg  
Reg No 198904226R

For appointments and enquiries,  
please call the CGH Appointment Centre at  
Tel: (65) 6850 3333

**CGH Appointment Centre operating hours:**  
8.30 am to 8.00 pm (Monday to Friday)  
8.30 am to 12.30 pm (Saturday & Sunday)  
Closed on Public Holidays

For more information, please visit  
<http://www.cgh.com.sg>



Organisation Accredited by  
Joint Commission International



A MEMBER OF  
**EASTERN  
HEALTH  
ALLIANCE**