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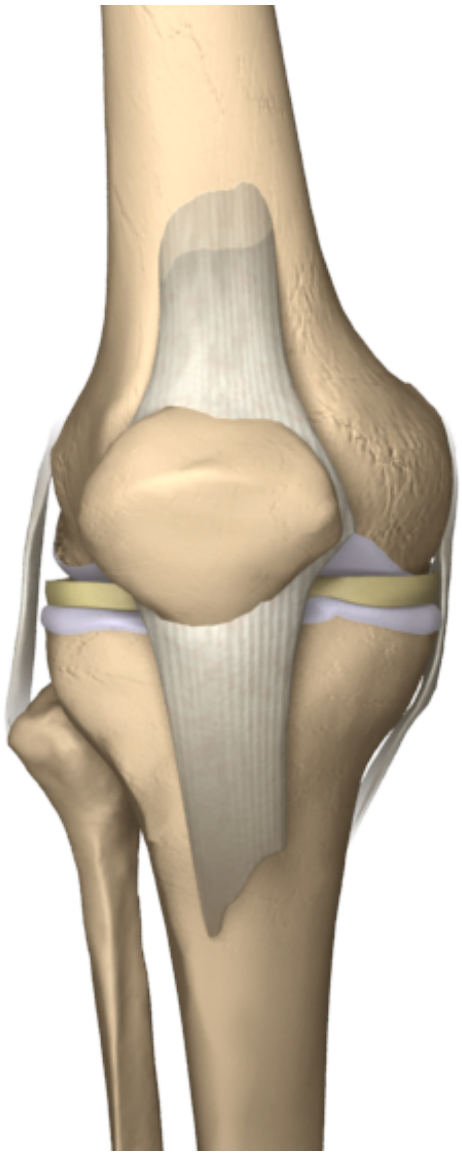
Total Knee Replacement

A total knee replacement, also known as total knee arthroplasty, involves removing damaged portions of the knee, and capping the bony surfaces with man-made prosthetic implants. A total knee replacement repositions the knee into proper alignment and replicates the original function, allowing for a near-normal range of motion. Common reasons for undergoing a total knee replacement include severe pain, stiffness, chronic inflammation or degeneration that limits everyday activities; pain that interferes with sleep; and mild knee deformity such as bowing inward (varus) or outward (valgus). Although knee replacements provide excellent results and patient satisfaction, they are typically reserved for patients who have exhausted other options in order to minimize the need for future revision procedures to repair or replace worn components.



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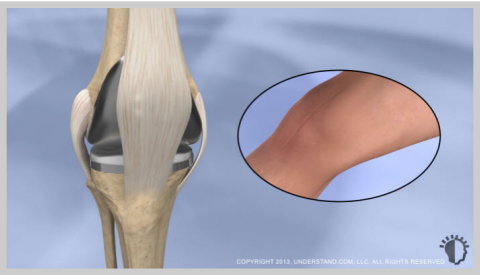
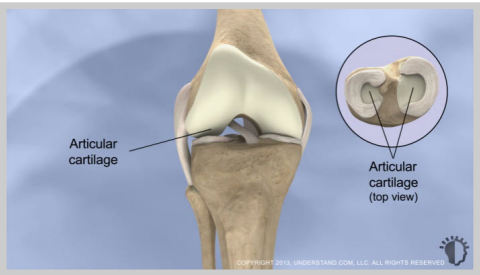


Introduction

A total knee replacement, also known as total knee arthroplasty, involves removing damaged portions of the knee, and capping the bony surfaces with man-made prosthetic implants. A total knee replacement repositions the knee into proper alignment and replicates the original function, allowing for a near-normal range of motion. Common reasons for undergoing a total knee replacement include severe pain, stiffness, chronic inflammation or degeneration that limits everyday activities; pain that interferes with sleep; and mild knee deformity such as bowing inward (varus) or outward (valgus). Although knee replacements provide excellent results and patient satisfaction, they are typically reserved for patients who have exhausted other options in order to minimize the need for future revision procedures to repair or replace worn components.



Knee Anatomy

Three major components comprise the knee joint: the femur (thigh bone), the tibia (shin bone), and the patella (knee cap). The patella is a rounded triangle-shaped bone embedded within the quadriceps tendon above it and the patellar tendon below. The two large, knob-like protuberances at the base of the femur, called the femoral condyles, form the top of the knee. Weight bearing portions of the condyles and the top of the tibia (tibial plateau) are lined with articular cartilage – a type of tissue that minimizes friction and prevents damage to the bones during movement. The knee's side-to-side motion is stabilized by the collateral ligaments (medial and lateral), and the cruciate ligaments (anterior and posterior) prevent excessive back and forth motion while allowing the knee to flex and extend.

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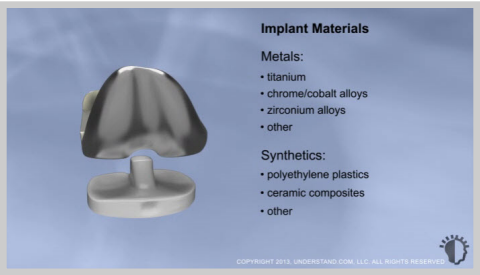

Implant Materials & Design

A wide variety of knee replacement implant designs exist. In general, they are made of metals, including titanium, chrome and cobalt alloys, and zirconium alloys; and synthetic materials, including dense polyethylene plastics and zirconium-based ceramics. They are usually oriented such that the metal moves against the synthetic material to minimize wear from abrasion.

The femoral component is most often a curved metal cap that emulates the shape of femoral condyles and has a groove in the center that allows for patellar movement. If the patella needs to be resurfaced, the rear (posterior) articular surface is removed and typically replaced with polyethylene. Tibial components vary considerably. Some consist of a metal cap fixed to the tibial surface or a metal plate with a stem that inserts into the core of the tibia. The stem may either be cemented in the bone or designed with a porous surface that allows bone ingrowth to seal it in place. A synthetic bearing that articulates with the femoral prosthesis is generally positioned on top the metal surface, although some designs do not have a metal plate and instead affix the bearing directly to the tibia.

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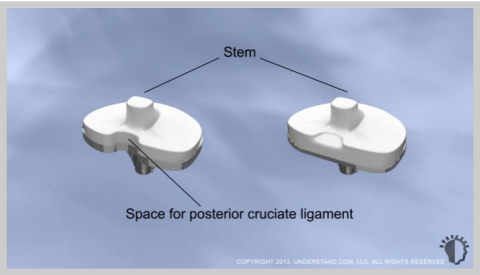
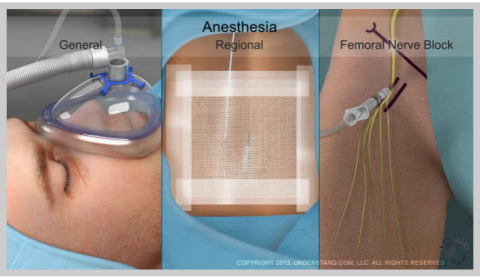


Bearing Designs - Functional Options

The tibial bearing may be either a fixed or mobile bearing. Fixed bearing implants are secured to the tibial platform, whereas mobile bearing implants move on the base, allowing for a limited amount of joint rotation. A stem mechanism that prevents excessive forward motion is present in many designs, particularly when the posterior cruciate ligament is removed during the procedure. Designs for use in procedures where the posterior cruciate ligament is preserved have a space through which the ligament passes. The conditions of your knee ligaments are among factors that help your surgeon determine whether to retain or substitute your PCL. Your surgeon will help you choose the best available design for your knee condition, age, weight, gender, and activity level based on their experience with particular designs, and surgical techniques.



Preparation

Prior to the procedure, detailed X-rays will indicate the extent of knee damage, whether any shape irregularities will need to be corrected, and will help with preoperative measurements. You will be positioned on your back for the procedure and may undergo general anesthesia, in which a gas puts you to sleep; regional anesthesia, in which a small tube called an epidural catheter delivers medication to the spinal column, numbing you from the waist down; or a femoral nerve block that numbs the surgical region. A tourniquet may be applied, and your knee will be free to be placed in a bent position to enable access to the joint surfaces. Once prepped, a total knee replacement procedure generally takes from one to three hours to complete.

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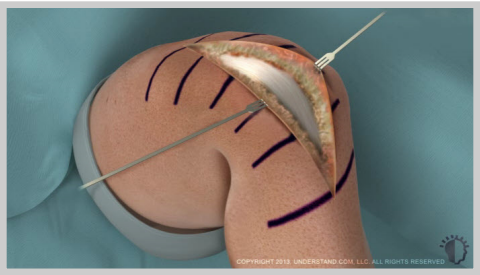
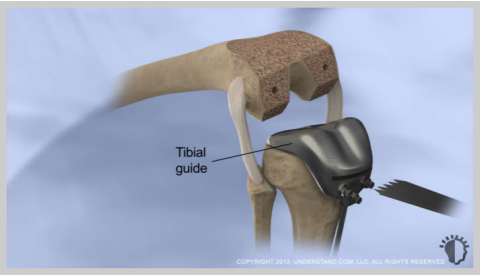


Procedure – Accessing the Joint Surfaces

Surgical details vary by procedure and component design. Some procedures involve computer-assisted 3D imaging and micro-robotic instruments to aid in removing damaged parts of the joint, while other procedures use manual instruments with precision guides. An incision will be made on the midline at the front of your knee; minimally invasive procedures use a four to six inch incision, whereas open procedures, as shown here, traditionally require a seven to ten inch incision.

Next, the surgeon accesses the joint. The patella is moved to the side to provide access to the femur and tibia, and any bony outgrowths (bone spurs) along the margins are removed, as are the menisci between the femur and tibia, the anterior cruciate ligament, and the posterior cruciate ligament in procedures where the PCL is not spared.



Preparing Implant Sites

Cutting blocks or guides are fixed to the femoral condyles. Retractors hold tissue away from the joint and protect the collateral ligaments and patellar tendon when the bones are cut. Using the guides, the surgeon makes precise cuts to remove degenerative portions of the femur and sculpt the ends to accept the femoral prosthesis.

Next, a tibial guide is positioned to accurately remove a small portion of the tibial surface. If the patella needs resurfacing, a series of similar steps are used to remove the damaged portion and prepare for the implant.

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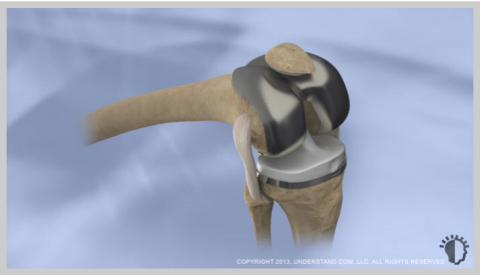

End of Procedure

For tibial components that involve a stem, the channel in which the stem inserts into the tibia is now created. Next the permanent femoral, patellar, and tibial prostheses are positioned and secured in place, and any excess material is removed. The bearing surface is affixed to the tibial plate to complete the repair. Finally the various layers of tissue are repaired with dissolvable sutures and the skin incision is closed with sutures or surgical staples. A bandage will be wrapped around your knee and you will be taken to recovery.

Recovery and Results

You will normally be given blood thinners and may wear compression stockings to reduce the possibility of clots after the surgery. Pain and discoloration following the procedure are common and will subside with time. Most patients will be ready to return home in three to five days, and you will be advised to begin physical therapy as soon as possible. Non-absorbable sutures or staples are typically removed within two weeks. Full recovery to the point where your knee functions and feels much better than before the surgery generally occurs between three and six months.