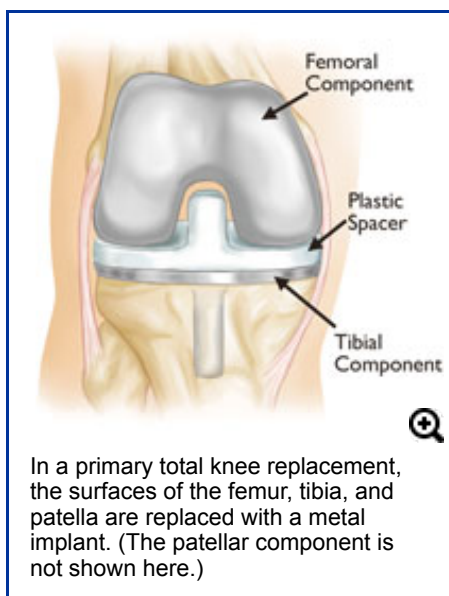


Revision Total Knee Replacement

Total knee replacement is one of the most successful procedures in all of medicine. In the vast majority of cases, it enables people to live richer, more active lives free of chronic knee pain. Over time, however, a knee replacement may fail for a variety of reasons. When this occurs, your knee can become painful and swollen. It may also feel stiff or unstable, making it difficult to perform your everyday activities.

If your knee replacement fails, your doctor may recommend that you have a second surgery—revision total knee replacement. In this procedure, your doctor removes some or all of the parts of the original prosthesis and replaces them with new ones.

Although both procedures have the same goal—to relieve pain and improve function—revision surgery is different than primary total knee replacement. It is a longer, more complex procedure that requires extensive planning, and specialized implants and tools to achieve a good result.

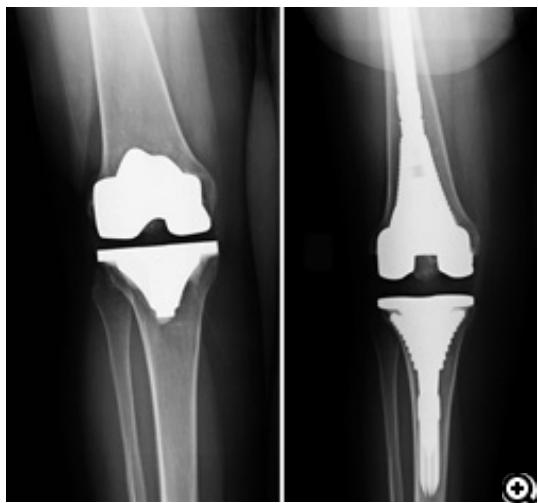


Description

During primary total knee replacement, the knee joint is replaced with an implant, or prosthesis, made of metal and plastic components. Although most total knee replacements are very successful, over time problems such as implant wear and loosening may require a revision procedure to replace the original components.

There are different types of revision surgery. In some cases, only one implant or component of the prosthesis has to be revised. Other times, all three components—femoral, tibial, and patellar—need to be removed or replaced and the bone around the knee needs to be rebuilt with augments (metal pieces that substitute for missing bone) or bone graft.

Damage to the bone may make it difficult for the doctor to use standard total knee implants for revision knee replacement. In most cases, he or she will use specialized implants with longer, thicker stems that fit deeper inside the bone for extra support.



(Left) In this x-ray, the primary knee replacement implant is unstable due to weakened bone.
(Right) In revision surgery, components with longer stems fit more securely into the bones and provide stability.

Daines BK, Dennis DA: Management of Bone Defects in Revision Total Knee Arthroplasty. Instr Course Lect 2013; 62:341-348.

When Revision Total Knee Replacement Is Recommended

Implant Loosening and Wear

In order for a total knee replacement to function properly, an implant must remain firmly attached to the bone. During the initial surgery, it was either cemented into position or bone was expected to grow into the surface of the implant. In either case, the implant was firmly fixed. Over time, however, an implant may loosen from the underlying bone, causing the knee to become painful.

The cause of loosening is not always clear, but high-impact activities, excessive body weight, and wear of the plastic spacer between the two metal components of the implant are all factors that may contribute. Also, patients who are younger when they undergo the initial knee replacement may "outlive" the life expectancy of their artificial knee. For these patients, there is a higher long-term risk that revision surgery will be needed due to loosening or wear.

In some cases, tiny particles that wear off the plastic spacer accumulate around the joint and are attacked by the body's immune system. This immune response also attacks the healthy bone around the implant, leading to a condition called *osteolysis*. In osteolysis, the bone around the implant deteriorates, making the implant loose or unstable.

Infection



Osteolysis (red arrow) has occurred around the tibial component, causing it to become loosened from the bone (blue arrow).

Infection is a potential complication in any surgical procedure, including total knee replacement. Infection may occur while you are in the hospital or after you go home. It may even occur years later.

If an artificial joint becomes infected, it may become stiff and painful. The implant may begin to lose its attachment to the bone. Even if the implant remains properly fixed to the bone, pain, swelling, and drainage from the infection may make revision surgery necessary.

Revision for infection can be done in one of two ways, depending on the type of bacteria, how long the infection has been present, the degree of infection, and patient preferences.

- **Debridement.** In some cases, the bacteria can be washed out, the plastic spacer can be exchanged, and the metal implants can be left in place.
- **Staged surgery.** In other cases, the implant must be completely removed. If the implant is removed to treat the infection, your doctor will perform the revision in two separate surgeries. In the first surgery, he or she will remove the implant and place a temporary cement spacer in your knee. This spacer is treated with antibiotics to fight the infection and will remain in your knee for several weeks. During this time, you will also receive intravenous antibiotics. When the infection has been cleared, your doctor will perform a second surgery to remove the antibiotic spacer and insert a new prosthesis. In general, removing the implant leads to a higher chance of curing the infection, but is associated with a longer recovery.



An antibiotic spacer placed in the knee joint during the first stage of treatment for joint replacement infection.

Instability

If the ligaments around your knee become damaged or improperly balanced, your knee may become unstable. Because most implants are designed to work with the patient's existing ligaments, any changes in those ligaments may prevent an implant from working properly. You may experience recurrent swelling and the sense that your knee is "giving way." If knee instability cannot be treated through nonsurgical means such as bracing and physical therapy, revision surgery may be needed.



Injured ligaments can make the knee unstable.

Reproduced from McAuley JP, Engh GA, Ammeen DJ: Treatment of the unstable total knee arthroplasty, in Instructional Course Lectures 53. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2004, 237-241.

Stiffness

Sometimes a total knee replacement may not help you achieve the range of motion that is needed to perform everyday activities. This may happen if excessive scar tissue has built up around the knee joint. If this occurs, your doctor may attempt "manipulation under anesthesia."



To break down scar tissue, your doctor may perform manipulation under anesthesia.

In this procedure, you are given anesthesia so that you do not feel pain. The doctor then aggressively bends your knee in an attempt to break down the scar tissue. In most cases, this procedure is successful in improving range of motion. Sometimes, however, the knee remains stiff. If extensive scar tissue or the position of the components in your knee is limiting your range of motion, revision surgery may be needed.

Fractures

A *periprosthetic* fracture is a broken bone that occurs around the components of a total knee replacement. These fractures are most often the result of a fall, and usually require revision surgery.

In determining the extent of the revision needed, your doctor will consider several factors, including the quality of the remaining bone, the type and location of the fracture, and whether the implant is loose. When the bone is shattered or weakened from osteoporosis, the damaged section of bone may need to be completely replaced with a larger revision component.



The femur (thighbone) has broken in several places around the implant.

Reproduced from Parvizi J, Azzam K: Periprosthetic fractures about the knee, American Academy of Orthopaedic Surgeons website: Orthopaedic Knowledge Online Journal, 2008. Accessed May 2015.

Preparing for Surgery

Medical Evaluation

You will be asked to schedule a complete physical examination with your primary care doctor several weeks before revision surgery. This is needed to make sure that you are healthy enough to have the surgery and complete the recovery process. Patients with chronic medical conditions, like heart disease, may also be evaluated by a specialist, such as a cardiologist, before surgery.

Tests

Imaging tests. Your doctor will usually order imaging tests to learn more about the condition of your knee.

- **X-rays.** These provide images of dense structures such as bone. Your doctor may order x-rays taken around the area of the joint replacement to look for loosening or a change in the position of the components.
- **Other imaging tests.** A nuclear medicine bone scan may help determine if the prosthesis has loosened from the bone. In some cases, a magnetic resonance imaging (MRI) scan or a computed tomography (CT) scan will be used to help determine why your knee has failed and the condition of the bone.

Laboratory tests. To determine whether you have an infection, your doctor may order blood tests. He or she may also aspirate your knee. In this procedure, joint fluid is removed using a needle and syringe, then analyzed in a laboratory to determine if infection is present.

Home Planning

Because your mobility will be limited after surgery, you will need help for several weeks with such tasks as cooking, shopping, bathing, and doing laundry if you live alone.

Your doctor's office, a social worker, or a discharge planner at the hospital can help you make advance arrangements to have someone assist you at home. Depending on your condition, you may need to stay at a nursing facility or rehabilitation center for some time after you leave the hospital. Your healthcare team can also help you arrange for a short stay in an extended care facility during your recovery, if needed.

Complications

As with any surgical procedure, there are risks associated with revision total knee replacement. Because the procedure is longer and more complex than primary total knee replacement, it has a greater risk of complications. Before your surgery, your doctor will discuss each of the risks with you and will take specific measures to help avoid potential complications.

The possible risks and complications of revision surgery include:

- Poor wound healing
- Reduced range of motion or stiffness in the knee
- Infection in the wound or the new prosthesis
- Bleeding
- Blood clots
- Bone fracture during surgery
- Damage to nerves or blood vessels
- Pulmonary embolism—a blood clot in the lungs
- Medical problems such as heart attack, lung complications, or stroke

Surgical Procedure

You will most likely be admitted to the hospital on the day of surgery.

Anesthesia

After admission, you will be evaluated by a member of the anesthesia team. The most common types of anesthesia are general anesthesia (you are put to sleep) or spinal, epidural, or regional nerve block anesthesia (you are awake but your body is numb from the waist down). The anesthesia team, with your input, will determine which type of anesthesia will be best for you.

Procedure

Revision total knee replacement is more complex and takes longer to perform than primary total knee replacement. In most cases, the surgery takes from 2-3 hours.

To begin, your doctor will follow the line of the incision made during your primary total knee replacement. The incision may be longer than the original, however, to allow the old components to be removed. Once the incision is made, the doctor will move the kneecap and tendons to the side to reveal your knee joint.

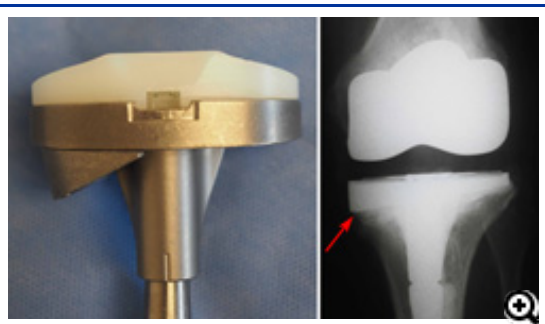
Your doctor will examine the soft tissues in your knee to make sure that they are free from infection. He or she will assess all the metal and/or plastic parts of the prosthesis to determine which parts have become worn or loose or shifted out of position.

Your doctor will remove the original implant very carefully to preserve as much bone as possible. If cement was used in the primary total knee replacement, this is removed, as well. Removing this cement from the bone is a time-consuming process that adds to the complexity and length of the revision surgery.

After removing the original implant, the doctor will prepare the bone surfaces for the revision implant. In some cases, there may be significant bone loss around the knee. If this occurs, metal augments and platform blocks can be added to the main components to make up for the bony deficits.



Examples of metal augments that can be added to implants to make up for lost bone.



(Left) In this tibial component, an additional block has been attached to make up for lost bone. (Right) An x-ray of the augmented component in place within the knee.

Rarely, bone graft material may be used to help rebuild the knee. The graft may come from your own bone (autograft) or from a donor (allograft).

Finally, the doctor inserts the specialized revision implant, repairs any surrounding soft tissues that are damaged, and carefully tests the motion of the joint. A drain may be placed in your knee to collect any fluid or blood that may remain after surgery.

After surgery, you will be moved to the recovery room, where you will remain for several hours while your recovery from anesthesia is monitored. After you wake up, you will be taken to your hospital room.

Your Recovery in the Hospital

You will most likely stay in the hospital for several days. Although recovery after revision surgery is usually slower than recovery after primary total knee replacement, the type of care you will receive is very similar.

Pain Management

After surgery, you will feel some pain. This is a natural part of the healing process. Your doctor and nurses will work to reduce your pain, which can help you recover from surgery faster.

Medications are often prescribed for short-term pain relief after surgery. Many types of medicines are available to help manage pain, including opioids, non-steroidal anti-inflammatory drugs (NSAIDs), and local anesthetics. Your doctor may use a combination of these medications to improve pain relief, as well as minimize the need for opioids.

Be aware that although opioids help relieve pain after surgery, they are a narcotic and can be addictive. Opioid dependency and overdose has become a critical public health issue in the U.S. It is important to use opioids only as directed by your doctor. As soon as your pain begins to improve, stop taking opioids. Talk to your doctor if your pain has not begun to improve within a few days of your surgery.

Physical Therapy

A physical therapist will give you specific exercises to strengthen your leg and restore range of motion so that you may begin walking and resume other daily activities as soon as possible after surgery.

To restore movement in your knee and leg, your doctor may also use a continuous passive motion machine (CPM). This device is a knee support that slowly moves your knee while you are in bed. Some doctors believe that use of a CPM helps restore early range of motion.

Blood Clot Prevention

Your doctor may prescribe one or more measures to prevent blood clots and decrease leg swelling. These may include special graded compression stockings, inflatable leg coverings (compression boots), and blood thinners.

Foot and ankle movement also is encouraged immediately following surgery to increase blood flow in your leg muscles to help prevent leg swelling and blood clots.

Preventing Infection

One of the most serious complications facing patients who undergo revision surgery is infection. Although infection occurs in only a small percentage of patients, it can prolong or limit full recovery. To prevent infection, you will be given antibiotics both before and after surgery. The risk of infection is slightly higher after revision surgery than after primary total knee replacement.

Your Recovery at Home

You will need some help at home for several days to several weeks after discharge. Before your surgery, arrange for a friend, family member or caregiver to provide help at home. You may need a walker, cane, or crutches for the first few days or weeks until you are comfortable enough to walk without assistance.

Wound Care

You will have stitches or staples running along your wound or a suture beneath your skin on the front of your knee. The stitches or staples will be removed several weeks after surgery. A suture beneath your skin will not require removal.

Avoid soaking the wound in water until it has thoroughly sealed and dried. You may continue to bandage the wound to prevent irritation from clothing or support stockings.

Physical Therapy

It is important to continue moving and exercising your knee when you are home. Your physical therapist will provide you with specific exercises to increase your strength and mobility and improve your ability to do everyday activities. You will also work with your therapist to ensure that you can straighten your leg and then bend your knee to at least 90 degrees of flexion.

Preventing Complications

Follow your doctor's instructions carefully to reduce your risk of developing complications, including blood clots and infection, during the first several weeks of your recovery. He or she may recommend that you continue taking the blood-thinning and antibiotic medications that you started in the hospital.

Long-Term Outcomes

The vast majority of patients who have revision surgery experience favorable long-term outcomes, including relief from pain and increased stability and function. Complete pain relief and restoration of function is not always achievable, however, and some patients may still experience pain or knee stiffness following revision surgery.

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