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Total Knee Replacement

Knee Anatomy

Sitting, standing, and walking depend on the bending and straightening of the leg at the knee joint. The knee is a hinge-like joint which unites two leg bones, the **femur** (thighbone) and **tibia** (shinbone). The front of the knee joint is protected by the **patella** (kneecap) which articulates with the femur (patello-femoral joint).



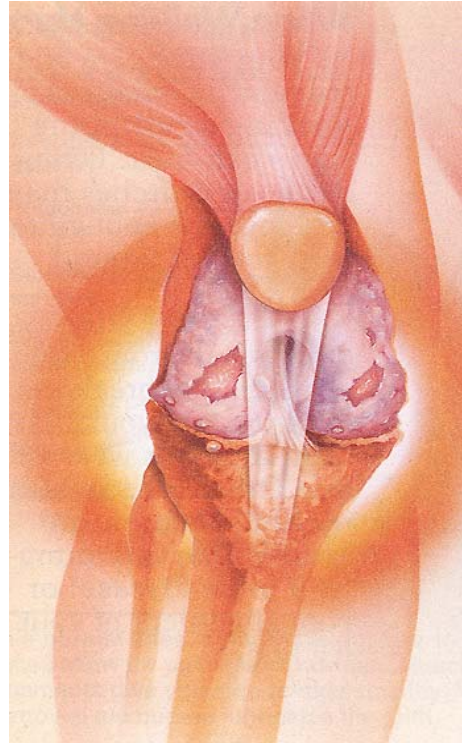
Inside the joint, bone ends are covered with a thick, elastic and smooth tissue called **articular cartilage**. The joint is lined with a **synovial membrane**, which produces **synovial fluid** (joint nutrient and lubricant).

In a normal knee, smooth weight bearing surfaces allow free painless movement. Muscles and ligaments give you power to move the joint and provide side-to-side stability. The normal movement of the knee depends on joint fluid and smooth healthy articular cartilage, as well as the strength and flexibility of the surrounding muscles and ligaments.

Illustration: Frank Netter, MD©

What is Arthritis?

Knee pain and stiffness often results from **osteoarthritis** (wear and tear of joint articular cartilage and bone), **rheumatoid arthritis** (an inflammatory joint disease) or an injury and poor alignment of your leg bones. With arthritis your articular cartilage cushion wears away, bones become rough and rub together causing pain. Your joint may also be inflamed and swollen. There are many conditions that can result in the degeneration of the knee joint: the most common is osteoarthritis or OA. Commonly known as "wear and tear", osteoarthritis can occur with no previous history of injury to the knee joint: the knee simply "wears out".



For many years, doctors and scientists believed that the nagging, aching pain of arthritis is caused by joint inflammation. Research now tells us that it's "wear and tear" of articulating surfaces and changes in subchondral bone, not inflammation only, that cause arthritis. Arthritis pain comes from the gradual wearing down of articular cartilage, the shock absorbing tissue in your joints, which exposes subchondral bone to increased pressure. The causes of osteoarthritis are not well understood. Although ageing is the factor strongly associated with OA, it is important to understand that OA is not a normal consequence of ageing. Osteoarthritis is a slowly progressive condition. However, previous injuries and consequent damage to articulating cartilage will result in "accelerated" osteoarthritis. There may be a genetic tendency in some people that increases chances of developing osteoarthritis.



Are You a Candidate for Total Knee Replacement?

- Do you experience pain while bearing weight on your knee?
- Do you limp?
- Does your knee become swollen with fluid?
- Are you experiencing a decrease in your range of motion?
- Is your ability to walk significantly reduced?
- Have you noticed that your knee deteriorated rapidly, in past six to twelve months?

If you answered yes to more than a couple of these questions, you may be suffering from a degenerative knee disease. When your knee deteriorates, you will experience pain while bearing weight on the affected area. As your condition becomes worse, the pain may be present all the time and may even prevent you from sleeping at night.

Benefits of Knee Joint Replacement

Once your new joint has completely healed you should experience following benefits of the surgery: reduced or no joint pain, increased movement and mobility, correction of angular leg deformity, increased leg strength (if you exercise!), improved quality of life and the ability to return to normal activities and pastimes.

If You Don't Know - Ask!

Consider asking your surgeon the following questions **before** your operation:

- How much improvement can I expect from the surgery?
- What type of implant will be used?
- What is the track record for this type of knee prosthesis?
- What risks are involved? How likely are they?
- What type of anaesthesia will be used? What are the risks?
- Will I have to stop taking any of my medications before surgery?
- What options are available to avoid blood transfusions?
- What complications can arise after surgery?
- What is your experience in doing this operation and how many have you done?
- Approximately how many of total knee replacements are done each year at this hospital?

Your New Knee



One of the most important orthopaedic surgical advances of this century, knee replacement was first performed in 1968. Improvements in surgical materials and techniques since then have greatly increased its effectiveness. Total knee replacement means resurfacing the bones of your knee joint with a prosthesis. Of the three surfaces in your knee that may become roughened and painful, you may need two or all three surfaces replaced.

Like a normal knee, your prosthesis has smooth weight-bearing surfaces. The **femoral component** covers your thighbone, the **tibial component** covers the top of your shinbone, and the **patellar component** covers the underside of your kneecap. All components are usually cemented to prepared bone surfaces. Total knee replacement is now as safe as total hip surgery, although your knee is a more complex and less stable joint than your hip.

What Materials are Used for Implants?

Joint implant manufacturers, orthopaedic surgeons and scientists continually strive to improve the durability of these devices. Current scientific advances in metallurgy have resulted in the use of titanium and cobalt-chrome alloys, which are used for femoral and tibial implants, and a low friction plastic component, made of ultra-high molecular weight polyethylene polymer, which acts as a spacer and articulating surface between two metal components. All materials used in moving surfaces are very durable, but they will eventually



wear out. This is as true in surfaces of artificial joint implants as in those of car tires. Orthopaedic companies have been working hard to find better materials that will not wear out for a long time.

The studies of modern knee arthroplasty report clinical survivorship of up to 96% of total knee implants at 10 to 15 years. The average survivorship of total knees seems to be approximately 12 years.

Getting into Shape, Mentally and Physically

After you and your surgeon have decided that knee replacement surgery is appropriate for you, consider these four essential steps that will help you get into shape before knee replacement surgery:

- **Commit yourself to the success of your surgery.** Working as a team, you, your surgeon, physiotherapist and your family must adopt a positive attitude toward the success of your surgery. Together, you will gain a clear understanding of the common goals and expectations of the procedure.
- **Lose excess weight.** People who are overweight are six times as likely to end up with arthritis in both of their knees than normal weight individuals. Obese people are more than eight times as likely as their thinner counterparts to develop osteoarthritis in both knees. Obesity seems to be a mechanical rather than a systemic risk factor for osteoarthritis with the knee joint being especially susceptible. Therefore, losing weight is one of the best ways to improve the condition of your knee and optimise surgical results. Remember to seek your doctor's advice before beginning your weight loss program. Patients with a body mass index (BMI) of 25 are considered normal weight, those with a BMI between 25 and 30 overweight, and those with a BMI over 30 obese. A person 5'6" would have a BMI of 25 if they weighed 155 pounds and a BMI of 30 if they weighed 185 pounds.
- **Start low-impact exercise plan.** After a comprehensive assessment of your condition, your physiotherapist will recommend a low-impact exercise plan that will strengthen your knee without creating further damage.
- **Stop smoking.** If you have not already done so, it is suggested that you stop smoking. This will be good for you during and after your surgery.

Preoperative Preparation

- Preoperative weight control and exercises are extremely important.
- Do not assume anything - ask, if you have any questions.
- Bring your medication and your relevant medical documentation.
- Tell us about any relevant medical conditions and allergies.

Postoperative Pain Management

A knee replacement is a painful operation, and your postoperative pain is real. However, postoperative pain is manageable:

Pain medication allows you to rest comfortably and start your exercises with minimum discomfort. Pain can be managed and it should not prevent you from mobilising. If you are in pain, ask your nurse or a physiotherapist to discuss this with a doctor on duty. When you are convalescing at home, it is a good idea to take your pain medication at night, even if you are not in severe pain, to assure a good night's rest. Pain often signals overactivity, so you might try rest and elevation to help relieve discomfort. Avoid alcohol if you are taking pain medication.

Ice is a natural anaesthetic that helps relieve pain. Ice also controls swelling by slowing the circulation in your knee. You can use a bag of frozen peas or a plastic bag filled with crushed ice. Wrap the ice bag with a small moist towel to protect your skin. Cover your



knee with a blanket and leave the ice on for 30 to 60 minutes, several times a day, if your knee tends to swell up. You may also experience knee pain or swelling after exercise or activity. You can relieve this by elevating your leg and applying ice wrapped in a towel.

After the Operation

It is very important that you mobilise as soon as possible after the operation. Early mobility, joint movement and weight-bearing are essential in prevention of serious complications like blood clotting and deep venous thrombosis (DVT). You will also have bilateral foot or calf pumps, as a part of our deep venous thrombosis prophylaxis. Nursing staff and physiotherapists will aim to mobilise you as soon as on day one or two after the operation. This depends on your recovery from general anaesthetic, amount of bleeding, pain and muscle strength. During the first couple of days you will be given prophylactic antibiotics and pain medication intravenously. You may also need a blood transfusion, although we try to avoid this as much as possible. Initially, you will be connected to various drips, drains and a possibly a urinary catheter, but all this should be disconnected by the

second or third day. At this stage your knee will be X-rayed and blood tests done. You should wear white elastic stockings (TED's), on both legs, most of the time, up to six weeks after the operation.

However, we are trying to phase them out as there is no convincing evidence that they play a significant role in the prevention of blood clotting in your legs. Most patients find them very awkward. Early mobilization, as soon as on day one or two postoperatively, and the gradual increase in mobility over the following couple of weeks are more important than any other form of prophylaxis, including the chemical one. **You should aim to get up and walk aided, with a frame or on crutches, as soon as you can, preferably on day two after the operation.**

DRESSING keeps your knee clean and helps prevent infection. Your skin may be closed with a variety of stitches or skin clips and covered with gauze and bandage. The skin clips are usually removed 10 days or two weeks after the operation, by a nurse in your GP's surgery. Continue to use a light compressive dressing (elastic bandage or a tubigrip) until your first follow-up appointment. Make sure that the dressing is not too tight.

BATH OR SHOWER wait to take your first shower until you can stand comfortably for at least 15 minutes. Do not get your skin scar wet unless it is dry and closed.

CIRCULATION EXERCISES help prevent complications, such as blood clotting in your leg. Point and flex your foot, and wiggle your toes, for a few minutes, as often as you can, while you are in the hospital and up to two weeks after the operation. Due to inevitable damage to local blood vessels, your knee, your lower leg and foot may remain swollen for a couple of months or more.

CRUTCHES will help to keep weight off your knee as it heals. You can weight bear as tolerated. Be sure you know how to set the hand rests and the right height for you (check this with your physiotherapist before you leave the hospital). Try to walk normally and keep your body upright. **Your crutches should move with your bandaged leg.** Once you are confident, you can replace crutches with two sticks, or use just one only. This is usually possible at two to six weeks after the operation. The physiotherapist should check on your

gait periodically and make sure that you can walk properly. Bad gait may affect your hips, back and the opposite knee.

SHOES: you should wear **comfortable shoes** or **trainers** with thick and soft soles, to cushion the impact.

WALKING helps you regain the range of movement in your ankle, knee and hip. Early restoration of a minimal range of movement is essential: 70 degrees of flexion is needed for walking and 105 degrees to rise from sitting. A combination of joint movement and weight bearing are essential for normal joint function and nutrition. Even if you are on crutches and not yet bearing full weight on your leg, you should start walking as soon as possible, to improve circulation and speed up the healing process in your leg. Gradually put more weight on your leg and try to keep your ankle, knee and hip bending as normally as possible.

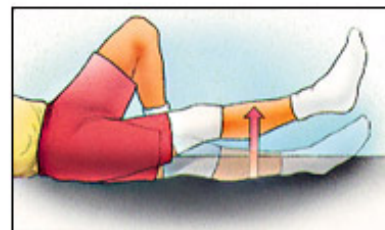
EXERCISES

Exercises are very important after a total knee replacement! Rebuilding the muscles that support and stabilise your knee is one of the best ways to help your knee recover fully. If you think of your new joint as machinery, your muscles are the engine that will drive it. The sooner you start these exercises, the better. You will get the most benefit from these exercises if you do them with slow, steady movements, and on both legs to maintain your muscle balance. Some patients may need additional supervised physiotherapy.

Early Post-operative Exercises

Start the following exercises as soon as you are able. You can begin these in the recovery room shortly after surgery. You may feel uncomfortable at first, but these exercises will speed up your recovery and actually diminish your post-operative pain.

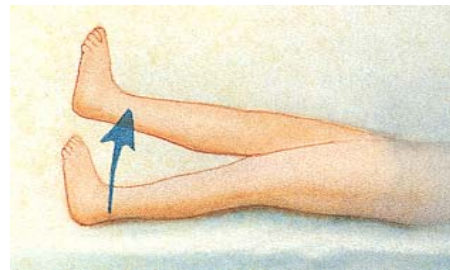
Quad Sets: tighten your thigh muscle. Try to straighten your knee. Hold for 5 to 10 seconds. Repeat this exercise approximately 10 times during a two minute period, rest one minute and repeat. Continue until your thigh feels fatigued.



Ankle Pumps: move your foot up and down rhythmically by contracting the calf and shin muscles. Perform this exercise periodically for two to three minutes, two or three times an hour in the recovery room. Continue this exercise until you are fully recovered and all ankle and lower-leg swelling has subsided.



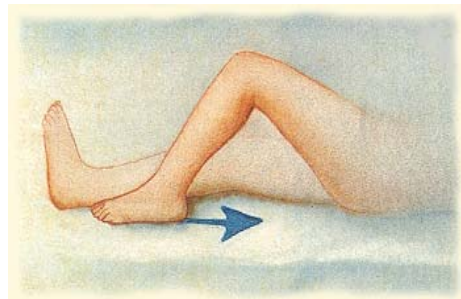
Straight Leg Raises: tighten the thigh muscle with your knee fully straightened on the bed, as with the Quad set. Lift your leg several inches. Hold for five to 10 seconds. Slowly lower. Repeat until your thigh feels fatigued. You also can do leg raises



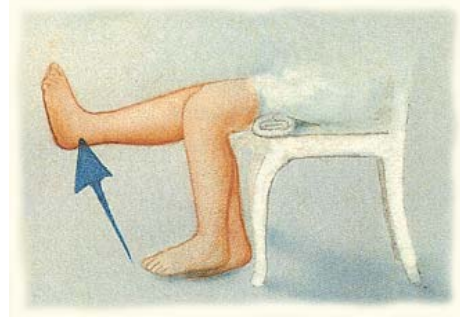
while sitting. Fully tighten your thigh muscle and hold your knee fully straightened with your leg unsupported. Repeat as above. Continue these exercises periodically until full strength returns to your thigh.

Knee Straightening Exercises: place a small rolled towel just above your heel so that it is not touching the bed. Tighten your thigh. Try to fully straighten your knee and to touch the back of your knee to the bed. Hold fully straightened for five to 10 seconds. Repeat until your thigh feels fatigued.

Bed-supported Knee Bends: bend your knee as much as possible while sliding your foot on the bed. Hold your knee in a maximally bent position for 5 to 10 seconds and then straighten. Repeat several times until your leg feels fatigued or until you can completely bend your knee.



Sitting Supported Knee Bends: while sitting at bedside or in a chair with your thigh supported, place your foot behind the heel of your operated knee for support. Slowly bend your knee as far as you can. Hold your knee in this position for 5 to 10 seconds. Repeat several times until your leg feels fatigued or until you can completely bend your knee.



Sitting Unsupported Knee Bends: while sitting at the bedside or in a chair with your thigh supported, bend your knee as far as you can until your foot rests on the floor. With your foot lightly resting on the floor, slide your upper body forward in the chair to increase your knee bend. Hold for 5 to 10 seconds. Straighten your knee fully. Repeat several times until your leg feels fatigued or until you can completely bend your knee.

Early Activity

Soon after your surgery, you will begin to walk short distances in your hospital room and perform everyday activities. This early activity aids your recovery and helps your knee regain its strength and movement:

Walking

Proper walking is the best way to help your knee recover. At first, you will walk with a walker or crutches. Your physiotherapist will tell you how much weight to put on your leg. Stand comfortably and erect with your weight evenly balanced on your walker or crutches. Advance your walker or crutches a short distance; then reach forward with your operated leg with your knee straightened so the heel of your foot touches the floor first. As you move forward, your knee and ankle will bend and your entire foot will rest evenly on the floor. As you complete the step, your toes will lift off the floor and your knee and hip will bend so that you can reach forward for your next step. Remember, touch your heel first, then flatten your foot, then lift your toes off the floor.

Walk as rhythmically and smooth as you can. Don't hurry. Adjust the length of your step and speed as necessary to walk with an even pattern. As your muscle strength and endurance improve, you may spend more time walking. You will gradually put more weight on

your leg. You may use a cane in the hand opposite your surgery and eventually walk without an aid.

When you can walk and stand for more than 10 minutes and your knee is strong enough so that you are not carrying any weight on your walker or crutches (often about two to three weeks after your surgery), you can begin using a single crutch or cane. Hold the aid in the hand opposite the side of your surgery. You should not limp or lean away from your operated knee.

Stair Climbing and Descending

The ability to go up and down stairs requires strength and flexibility. At first, you will need a handrail for support and will be able to go only one step at a time. Always lead up the stairs with your good knee and down the stairs with your operated knee. Remember, "up with the good" and "down with the bad." You may want to have someone help you until you have regained most of your strength and mobility. Stair climbing is an excellent strengthening and endurance activity. Do not try to climb steps higher than the standard height (7 inches) and always use a handrail for balance. As you become stronger and more mobile, you can begin to climb stairs foot over foot.

Advanced Exercises and Activities

Once you have regained independence for short distances and a few steps, you may increase your activity. The pain of your knee problems before surgery and the pain and swelling after surgery have weakened your knee. A full recovery will take many months. The following exercises and activities will help you recover fully.

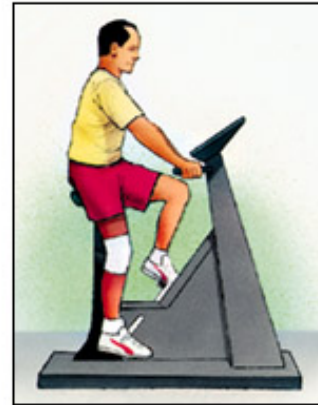
Standing Knee Bends: standing erect with the aid of a walker or crutches, lift your thigh and bend your knee as much as you can. Hold for 5 to 10 seconds. Then straighten your knee, touching the floor with your heel first. Repeat several times until fatigued.

Assisted Knee Bends: lying on your back, place a folded towel over your operated knee and drop the towel to your foot. Bend your knee and apply gentle pressure through the towel to increase the bend. Hold for 5 to 10 seconds; repeat several times until fatigued.

Knee Exercises with Resistance: you can place light weights around your ankle and repeat any of the above exercises. These resistance exercises usually can begin four to six weeks after your

surgery. Use one- to two-pound weights at first; gradually increase the weight as your strength returns. Inexpensive wrap-around ankle weights with Velcro straps can be purchased at most sporting goods stores.

Exercise Cycle: exercise cycling is an excellent activity to help you regain muscle strength and knee mobility. At first, adjust the seat height so that the bottom of your foot just touches the pedal with your knee almost straight. Peddle backward at first. Ride forward only after a comfortable cycling motion is possible backwards. As you become stronger (at about four to six weeks) slowly increase the tension on the exercycle. Exercise for 10 to 15 minutes twice a day, gradually build up to 20 to 30 minutes, three or four times a week.



Sports After Total Knee Replacement. Why not?

Total knee replacement operations have been documented to relieve pain, improve function, increase social mobility, and contribute to psychological well-being. However, total knee replacements are increasingly being performed to improve function and the quality of life. At the turn of the century, 90% or more patients can expect 10 to 20 years of satisfactory knee function. Joint replacement operations allow patients with arthritic knees to increase their exercise and activity level.

Continuing exercises at home for several months following surgery will help you regain your strength, confidence and independence. An active lifestyle which includes walking, swimming or even cycling is essential in maintaining movement of your joints and keeping you, and your new knee healthy. Your new knee requires care and attention in your daily activities. Avoid strenuous movements such as twisting or frequent kneeling that may damage your new joint. Gardening (kneeling) may be a source of problems.

Keep in mind that your prosthesis is designed for activities of daily living. Some activities like swimming, walking, cycling and golf, done in moderation, are very useful exercises. Rehabilitation and increasing physical activity is the key to maintaining your health and well-being.

It is possible that you can restore yourself beyond your original expectations, and with care, you can continue to enjoy a full and active life.

To the average active person the words "Total Knee Replacement" may sound as the end of their active life and all sports. This is definitely not the case. Once a knee replacement is performed, successful rehabilitation will allow you to walk, hike, swim, dance, bowl, cross-country ski, cycle and play golf. One of the most important things for average patient to remember about having knee surgery, is that you will be making a lifetime commitment to physical fitness. For a total recovery, which means returning to a functional and pain free life, the typical patient will need to go through rehabilitation home-based "maintenance" physiotherapy for approximately 6 months after surgery. This means at least 45 minutes to 1 hour of exercises, three times a week for an average patient. Most likely, running, jumping, jogging or other high-impact activities will be discouraged, simply because those activities will result in accelerated wear and possibly premature loosening of knee joint implants.

And just a few more things:

- **Be sure you know about** any special instructions on taking pain medication, how to use crutches, which home recovery exercises to do, and when to schedule your first follow-up appointment.
- **Driving** is usually possible after a month or two. However, it may longer before it is safe to drive after a knee replacement. As a general rule you should be able to drive safely as soon as you can perform an emergency stop. For further information please visit DVLA's website (www.dvla.gov.uk).
- **Flying:** there is no universal agreement as to when it is safe to travel by plane after a total knee replacement. It seems that most Orthopaedic Surgeons advise their patients not to fly for at least 6 to 8 weeks following knee replacement. Short flights do not seem to be a problem. However, long intercontinental flights are a potential problem as there is an increased incidence of spontaneous DVT (deep venous thrombosis). It is possible that sitting for long period of time, in a confined space and with very little leg room in economy class, could predispose to the development of deep venous blood clots, especially in people following recent knee surgery. If you have to travel by plane,

before 6 weeks after your knee replacement, it would be wise to contact your airline's Medical Department and ask them for advice. Also, please discuss this issue with your GP, as you may have to take prophylactic medication (anticoagulants) for several weeks.

- **Complications** can occur with total knee replacement, as with all major surgical procedures. They include excessive swelling or bleeding, blood clots (DVT or deep vein thrombosis), phlebitis, joint infection, limited flexion or extension, stiff joint (arthrofibrosis), etc. There are also anaesthetic risks, both during and after the procedure.
- **Discuss all of your concerns with your nurse, physiotherapist and surgeon, before you leave the hospital.**
- **Problems?** Contact your GP if you bleed or your wound discharges continuously, if you have a fever of 38⁰C or above, severe nausea, increased pain unrelieved by medication and rest, increased painful swelling unrelieved by elevation and ice, pain in the calf, shortness of breath, chest pain or abnormal coughing. **In an emergency please contact your GP who will, if necessary, get in touch with your surgeon.**
- **Questions:** if you have questions about your rehabilitation, or any problems with exercises, please contact our **Physiotherapy Department on 01244 684 314**, and arrange an appointment, especially if you experience skin redness, excessive swelling, or severe pain during or after exercise.
- **Appointments:** if you wish to book or change your follow-up appointment please call **Outpatient Appointments on 01244 684 325.**