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In Perspective: Anterior Cruciate Ligament Tears

In 1992, Dr. Jack C. Hughston (1917-2004), one of the world's most respected authorities on knee ligament surgery, shared some of his thoughts regarding injuries to the ACL.

"You tore your anterior cruciate ligament." On hearing your physician speak those words, you are filled with a sense of dread. You envision the end of your athletic life, even recreational sports.

Today, a torn ACL (**Fig. 1**) has almost become a household word. Through friends, newspapers, television, sports magazines, and even our physicians, we are inundated with the hype that the knee joint will deteriorate and become arthritic if the ACL is not operated on as soon as possible.

You have been convinced that to save your knee you must have an operation immediately to repair the ligament. Your surgery is scheduled for the following day. You are scared.

But there is an old truism in orthopaedic surgery that says, "no knee is so bad that it can't be made worse by operating on it."

For many years, torn ACLs were treated as an emergency and were operated on immediately, even before the initial pain and swelling of the injury subsided.

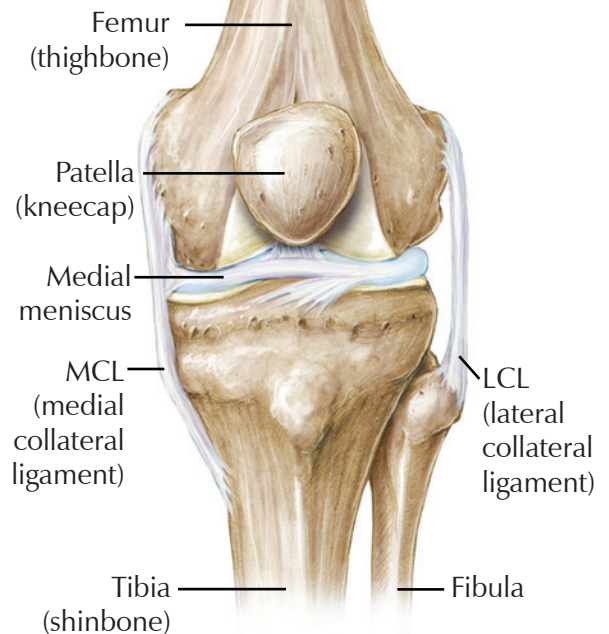
The trauma of the injury, plus the trauma of the operation added insult to injury, often resulting in the formation of scar tissue. Sometimes the results were stiff, painful knees without normal motion or function. The result was knees that caused the patient disability, even with simple walking.

Over the years, I have had to try to correct these problem knees. Those that were less stiff often responded to concentrated rehabilitation exercises and regained acceptable functional status. Others, however, required surgical release, and some had to have multiple operations to remove scar tissue to loosen the joint.

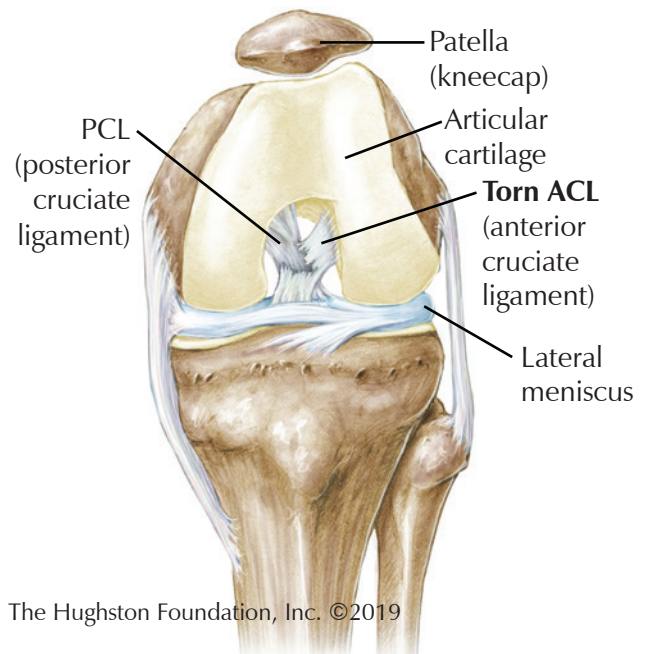
FOR A HEALTHIER LIFESTYLE

Fig. 1. Knee anatomy and ACL injury.

Extended (straight) knee

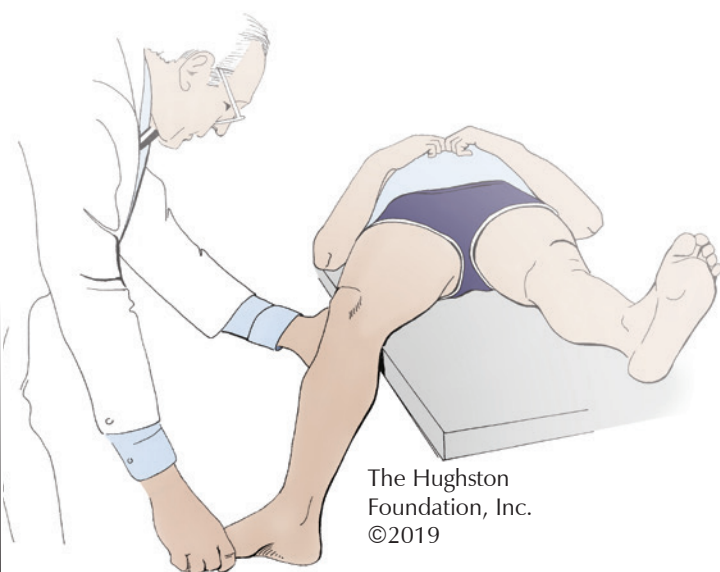


Flexed (bent) knee



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Fig. 2. Examination performed to test medial (inside) ligament damage.



Internal view of the bones, that make up the knee, during the examination.

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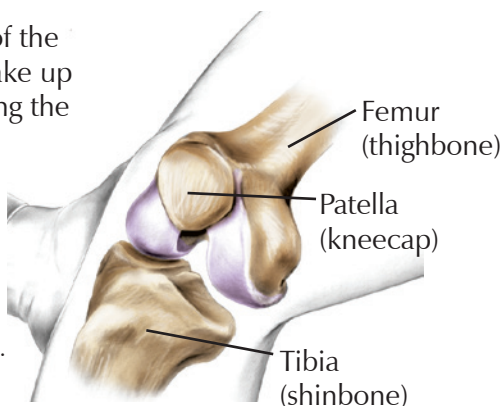
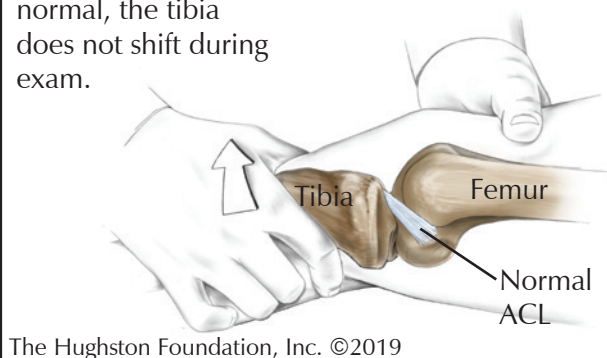


Fig. 3. Examination performed to test if the ACL is normal.

When the ACL is normal, the tibia does not shift during exam.



Isn't there an alternative to this all too common scene? Another treatment approach that isn't as frightful? The answer is a definite "YES"! In many instances, nonsurgical treatment is successful. In other cases, surgery is necessary. Immediate surgery may be needed to repair other ligaments and torn menisci in the knee. But if only the ACL is torn, immediate repair is not necessary.

If the knee is shown to be loose during the physical exam, then most likely other ligaments in addition to the ACL have been damaged (**Fig. 2**). These other ligaments, when torn badly enough, may need to be surgically repaired within the first week. After they have been repaired and after a good rehabilitation program of six or more months, the decision to reconstruct the ACL can be made. If, at this time, there is a functional need for a ligament replacement, the operation can be done without the risk of subsequent stiffness and disability that can result from emergency repairs of the ACL.

If only the ACL is torn, it may be difficult for your physician to confirm any looseness or instability of the knee joint by physical exam (**Fig. 3**). I have seen cases where the ACL tear was only diagnosed by MRI or some other form of imaging study, and based on those findings, the patients were advised to have immediate surgery to repair the ligament. Be wary of this sort of advice. If your knee is not loose enough for your physician to be able to physically demonstrate the instability to you, then you should get a second opinion before having surgery.

In other cases, when the ACL and other ligaments are damaged and there is significant joint instability, surgery can be planned when the pain and swelling have subsided and knee motion has returned to almost normal. This usually occurs six weeks or more after the injury, in the meantime, you will have been performing prescribed daily rehabilitation exercises and using crutches to aid with your walking. When the knee is re-examined, there will be less discomfort and your physician will be able to perform a better evaluation. If the looseness is severe enough, an ACL reconstruction can be performed and the chance of complications is less than with an emergency operation.

The important thing to remember in all of this is that you don't need to be frightened that your knee will be ruined forever if the torn ACL is not repaired immediately. On the contrary, a torn ACL by itself is not a reason for emergency surgery. Rather, it is time for calm, conservative management and appropriate follow-up. If this does not seem to be the approach your physician is taking, don't hesitate to get a second opinion.

A remembrance of

Jack C. Hughston, MD (1917-2004)

Celebrating his life and legacy, 15 years since his passing.

Orthopaedic Components:

WHAT MAKES A TOTAL KNEE IMPLANT?

A commonly performed procedure, knee arthroplasty, or knee replacement, allows people with debilitating osteoarthritis, or other conditions of the knee, to improve their activity levels and decrease their pain. Although some people have a partial knee replacement, total knee replacement is most common. Removal of arthritic bone in the knee was performed as early as the 1860s. In an attempt to reduce their patients' pain, surgeons used various materials, including skin, muscle, fat, and even pig bladder, to place between the arthritic ends of the bones in the knee. During the 1970s, a replacement resembling those used today was developed. Current designs of total knee implants are constantly being changed and improved, but there are some basic concepts that apply to total knee replacement components.

Four basic components (**Fig.**) are used in a total knee replacement: 1) the femoral (thighbone) component, 2) the tibial (shinbone) component, 3) a plastic portion between the femur and tibia, and 4) the patellar (kneecap) component. During a total knee arthroplasty the diseased ends of the femur and the tibia and the diseased surface of the patella are cut away. The meniscus (crescent-shaped soft tissue between the tibia and femur) is removed, as well. The medial and lateral ligaments (tissues that connect bones) are left in place to stabilize the replacement components. The end of the femur and tibia are replaced with metal parts, and a polyethylene component replaces the meniscus between them. A polyethylene component can also be used to replace the joint surface of the patella.

Metallic orthopaedic implants are made of stainless steel or other metal alloys. An alloy is defined as a substance that is composed of 2 or more metals fused, or dissolved, together. A cobalt-based alloy (cobalt, chromium, molybdenum) is often used in the femoral and tibial components. The cobalt-based alloy is well suited for use in joint replacement surgery, because it has good resistance to wear and corrosion. It is also biocompatible, which means it is less likely to be rejected by the body.

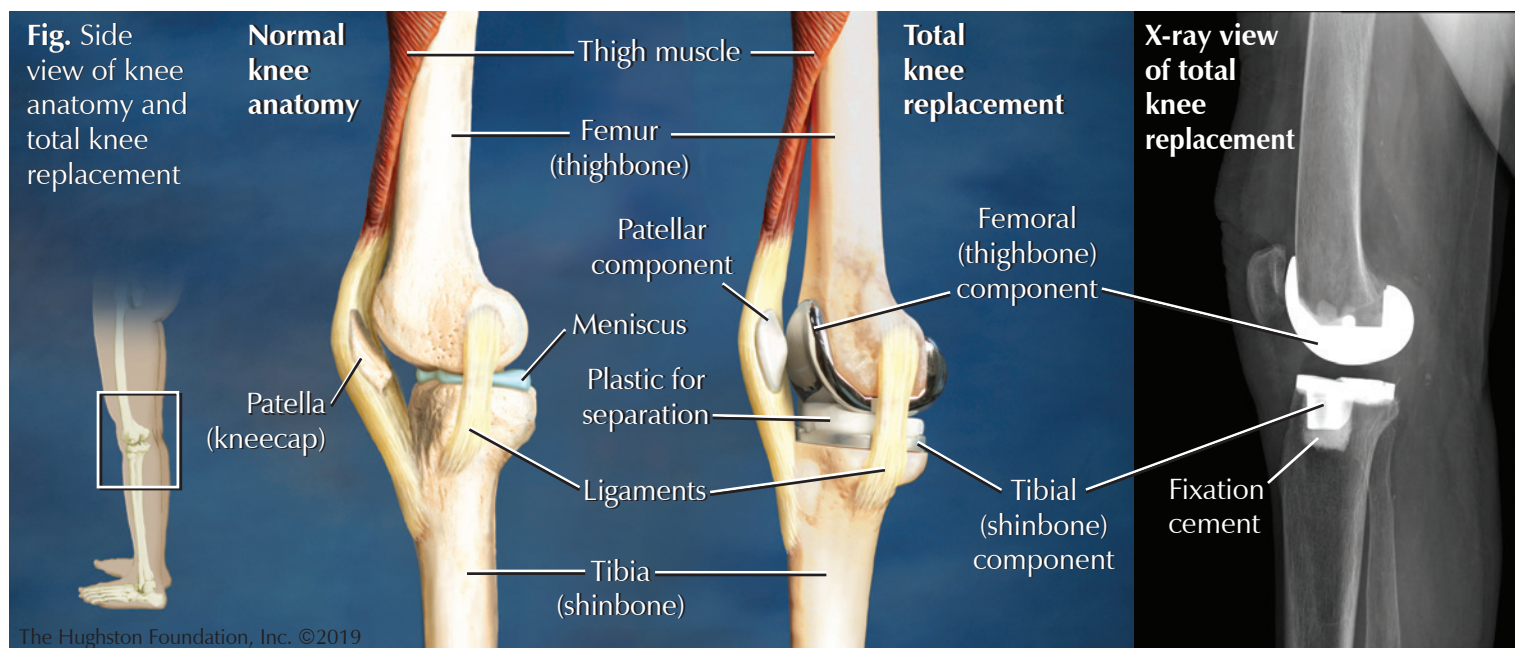
During surgery, the metal components must be securely fixated, or attached, to the bone. Fixation can be achieved with a press-fit design (the metal is textured to create a tight fit) or by using polymethylmethacrylate (PMMA) cement. PMMA is used like a grout to hold the metal components to the bone. The PMMA is radiopaque so the cement can be seen on x-rays, and antibiotics are often added to the cement mixture to help decrease the risk of infection.

A hard polyethylene component attaches to the tibial metal component and acts as a replacement for the meniscus. The femoral metal component rests on the plastic where it is able to rotate and allow the knee to bend and straighten. The surface of the patella can also be replaced; the diseased portion of the cartilage is removed and replaced with a polyethylene component that rests on the femoral metal and allows the kneecap to function. Altogether, these artificial components form a total knee arthroplasty.

If the weight-bearing surfaces of your knee are causing you pain, you may be a candidate for knee replacement. After considering your age and lifestyle, your surgeon will choose the components for a surgical procedure that can help you return to an active, enjoyable life.

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Surgical Approaches to Knee and Hip Replacement

Arthritis and rheumatic conditions are a leading cause of disability among adults in the United States. Almost 50% of Americans, 65-years-old and older have been diagnosed with arthritis. As baby boomers age, the number of people who will need treatment for knee and hip arthritis is expected to skyrocket. Many will consider total knee and total hip arthroplasty (joint replacement) to alleviate their symptoms.

Over the years, orthopedic surgeons have refined the surgical approaches used in knee and hip arthroplasty. The goal of the surgical approach is to gain enough exposure (allows access and visualization of the bone) to complete the surgery while minimizing the effects to the surrounding tissues. Improvements in both technique and instruments have allowed us to minimize injury to the muscles and tendons (connects muscles to bones). With a trend towards shorter hospital stays, and even outpatient surgery, we continue to look for new ways to speed recovery after surgery.

Fig. 1. Right knee anatomy

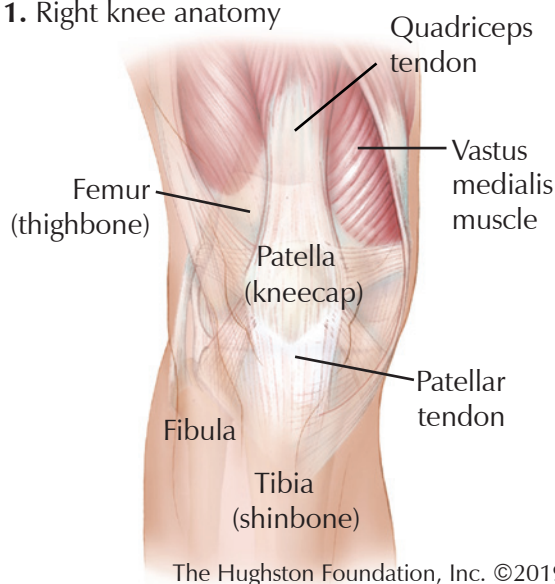
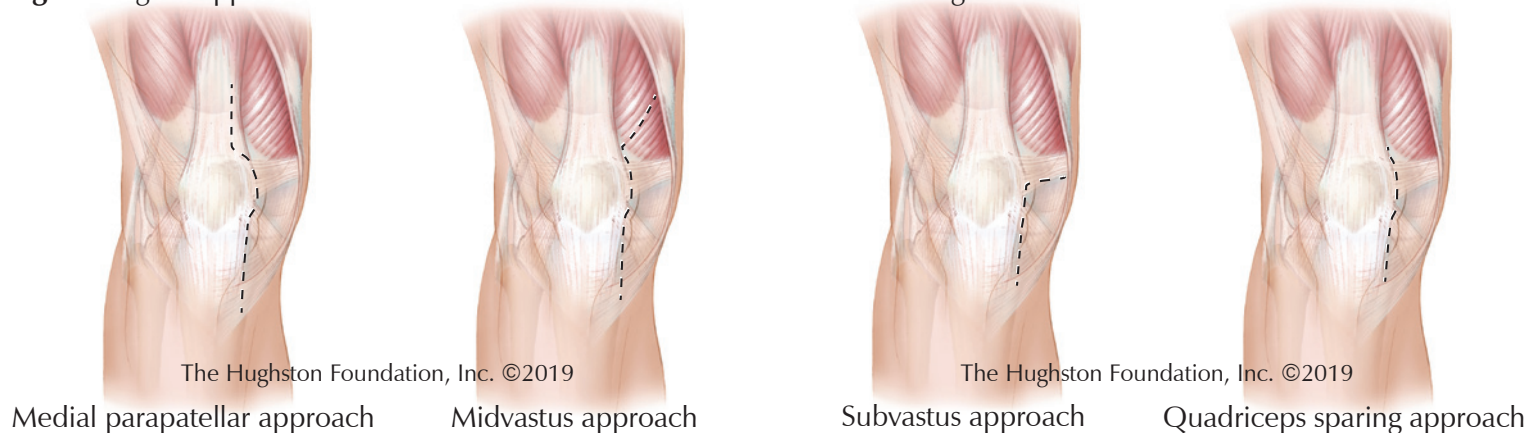


Fig. 2. Surgical approaches to the knee. Dotted line shows incisions on the right knee.



Each surgical approach has its advantages and disadvantages; but how your surgeon performs your surgery often depends on his or her own preference, your overall health, and health history (**Figs. 1, 2 & 3**). For example, if you have arthritis, if you are thin or obese, if you have damaged your knee or hip joint in the past, or if you smoke—your surgeon considers all of these factors and more before surgery.

Surgical approaches to the knee

Medial parapatellar approach

For many years, this approach has been the standard incision for orthopedic surgeons. The medial parapatellar incision descends down and around the patella (kneecap), offering the best view of the joint. The disadvantages, however, include cutting into the quadriceps tendon, which then requires repairing, and during the procedure the patella is flipped over, sometimes stretching the knee tendons in the process.

Midvastus approach

First described by Gerald A. Engh, MD, and colleagues in 1997, the midvastus approach is a variation of the medial parapatellar approach that does not cut the quadriceps tendon. Instead, this incision splits the vastus medialis muscle and requires repair and healing of the muscle fibers. Depending on the surgeon, the patella may be flipped during this approach.

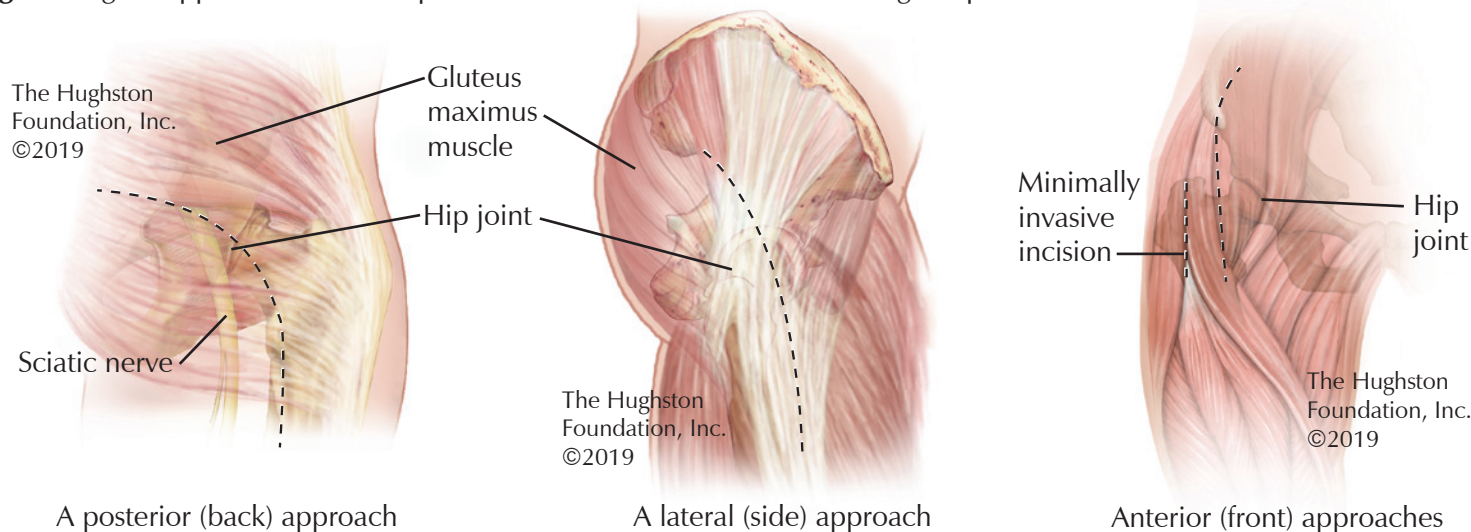
Subvastus approach

The subvastus approach, which is a L-shaped incision below the vastus medialis muscle actually elevates the muscle instead of cutting into it and this procedure also avoids flipping the patella. A drawback, however, is that patients who are obese, or who have limited range of motion may not be good candidates for this approach. Additionally, since the surgeon elevates the muscle, this approach may be difficult for patients who are muscular with a large vastus medialis muscle.

Quadriceps sparing approach

This is the most minimally invasive approach since it completely preserves the quadriceps tendon and its muscle attachments and there is less tendon stretching since the kneecap is not flipped. The disadvantages are that it provides the least exposure for the surgeon and some studies have demonstrated an increased complication rate.

Fig. 3. Surgical approaches to the hip. Dotted line shows incisions on the right hip.



Surgical approaches to the hip

Posterior approach

The posterior (back) approach is the most common surgical approach used for total hip replacement worldwide. Surgeons perform this procedure with the patient lying on their side. The posterior approach involves splitting the gluteus maximus muscle in line with the muscle fibers and the short external rotator muscles (muscles that allow outward rotation of the hip) are detached either completely or partially and then repaired at the end of the surgery. Surgeons prefer this approach because it offers an extensile (stretched or open) exposure that provides an excellent view of the femur (thighbone). The disadvantages include a slightly higher dislocation (comes out of socket) rate and a muscle-splitting approach.

Direct lateral approach

The modern direct lateral (side) approach was popularized by orthopaedic surgeon, Kevin Hardinge in 1982. It is the second most common surgical approach for total hip arthroplasty used worldwide. Surgeons perform the surgery with the patient on either the side or supine (face up). Similar to the posterior approach, the direct lateral approach involves splitting the gluteus maximus muscle and a portion of the gluteus medius muscle (muscle that stabilizes the hip while standing) for good exposure for the surgeon. Advantages of the direct lateral approach include the lowest dislocation rate among the most popular approaches and an excellent view of the acetabulum (socket). The major disadvantages of this approach are a significant incidence of limp and abductor (movement away from the body) muscle weakness.

Direct anterior approach

Dr. Marcus Smith-Petersen first described the anterior approach to the hip in 1917, when physicians primarily used it for reducing congenital (at birth) hip dislocations.

In recent years, this approach has regained popularity with modifications to the original procedure and the development of new instruments specifically used for anterior hip arthroplasty. It is now the third most common surgical approach used for total hip replacement worldwide. This approach is truly intermuscular and internervous. In other words, surgeons do not cut or split major muscles and they navigate between nerves. The advantages of the direct anterior approach are a low dislocation rate with a muscle-sparing approach, which means faster soft-tissue healing. The disadvantages of this approach are a lack of exposure of the femur and some studies have suggested an increased fracture risk.

Newer approaches

More recently, surgeons have developed the supercapsular percutaneously-assisted total hip, or SuperPATH approach and the direct superior approach. Both of these approaches are variations of the posterior approach, but with smaller incisions and less soft tissue damage that are meant to improve postoperative recovery. The SuperPATH also avoids dislocation of the hip during the procedure.

Which is the right approach?

Surgeons have successfully performed knee and hip arthroplasty using a variety of approaches for many years now and these surgeries have been tremendously successful for treating patients with disabling arthritis. Each surgical approach has advantages and disadvantages and the scientific evidence has not demonstrated a superior approach for any procedure. When considering surgery, the patient's overall health and lifestyle, along with the surgeon's experience are paramount in making the best decision on the approach to use.

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Meniscus Tears

The knee is the largest and most complex joint in the body. Although it is built to withstand all kinds of stresses from everyday activities, such as walking and bending—or even more strenuous activities such as running—injuries to the various structures of this joint can and do occur. A common type of knee injury is a tear of the meniscus, 1 of the fibrocartilage discs inside the joint. When you hear people say that they have torn the cartilage in their knee, they usually mean that they have torn their meniscus.

Knee anatomy

The knee joint consists of the lower end of the femur (thighbone) and the upper end of the tibia (shinbone), while a third bone, the patella (kneecap), slides in a groove at the end of the femur. Two main ligaments provide stability for side-to-side motion at the knee: the medial collateral ligament (MCL) and the lateral collateral ligament (LCL) (**Fig. 1**). Within the joint, 2 other ligaments can be found: the anterior cruciate ligament (ACL) and its counterpart, the posterior cruciate ligament (PCL). At the end of both the femur and the tibia is a thin layer of hyaline cartilage, a translucent bluish-white cartilage that is slippery and reduces friction. Additionally, between these 2 bones rest 2 crescent-shaped fibrocartilage discs called menisci (meniscus, the singular form, is from the ancient Greek word for “little or crescent moon”) (**Fig 2**). The medial meniscus (inside disc) is C-shaped, while the lateral meniscus (outside disc) is more U-shaped.

Meniscus function

The menisci are tough and rubbery and serve as cushions between the bones of your knee joint. They also distribute your body’s weight and absorb shock so that the weight load transfers from the femur to the tibia smoothly. In

addition to stabilizing the knee, the menisci contribute to the lubrication and nourishment of the joint. A meniscus can be torn by a sudden twisting and turning motion, as occurs predominantly in younger individuals while playing sports. If you are an athlete who participates in contact sports, such as football, or activities that involve pivoting, such as tennis or basketball, you are at greater risk for a torn meniscus.

Each meniscus can be divided into 3 parts. The outer third or rim is vascular, which means it contains an abundance of blood vessels that transport blood to supply oxygen and nutrients to the area. The middle third is less vascular while the inner rim of the meniscus is completely avascular or lacking in blood vessels. Thus, whether or to what extent your meniscus tear heals depends greatly on its location—tears on the vascular part usually heal well while those on the avascular portion do not heal at all. Your injury can also be classified according to the way in which the tear extends into or from its meniscus. For example, when a fragment tears off the medial meniscus and extends into the joint space, it resembles a bucket handle, and is therefore called a bucket-handle tear.

Symptoms

While you can tear your meniscus by twisting your knee or damage it by tearing your ACL, you can also tear your meniscus in a less forceful way, which means you may experience only gradual pain and swelling in the joint. A prominent symptom of a torn meniscus is a “clicking” sensation inside the joint with or without intermittent locking of the knee. Any type of meniscus tear will likely cause some pain and swelling. You may also have stiffness in the joint and be unable to bend it completely.

Diagnosis and imaging

In diagnosing knee injuries, x-rays are often used to rule out fractures and to detect the presence of any loose bodies within the joint. They are also used to estimate the amount of space inside the knee joint and to look for signs of arthritis; however, an x-ray will not show the menisci themselves. Using extremely high frequency sound waves, an ultrasound test can produce images of the inside of the knee joint as it moves. As a diagnostic tool, it can help to determine whether a loose flap of torn cartilage is getting caught in the joint as the knee bends and straightens. The best tool, however, for diagnosing a meniscus tear is magnetic resonance imaging (MRI)—a scan that uses radio waves and a strong magnetic field to produce cross-sectional images of internal structures, including soft tissues such as the menisci, tendons, and ligaments.

Treatment

The treatment plan for your torn meniscus will depend largely upon the type and size of the tear as well as its location—whether in a vascular or avascular part of the fibrocartilage disc. Your age, health, and current activity

Fig 1. A frontal cut- away view of the right knee

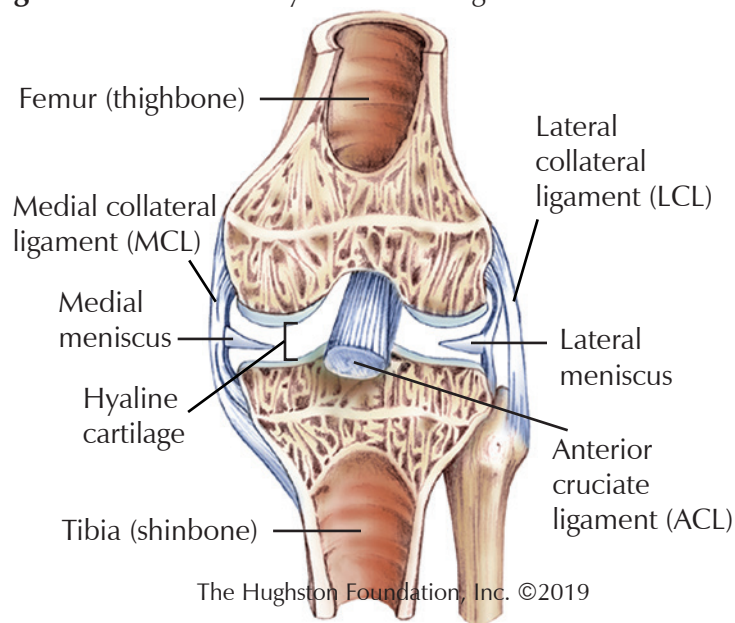
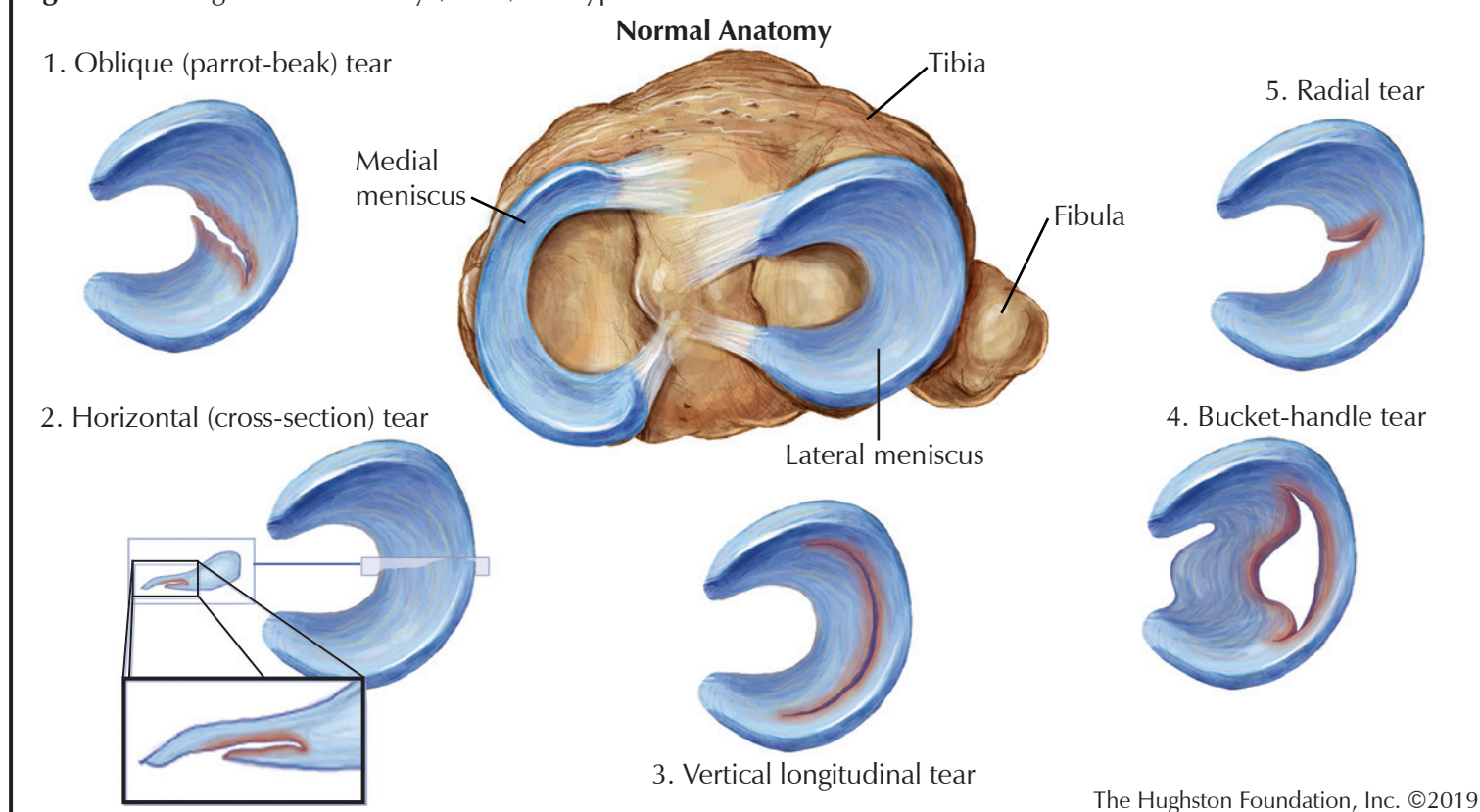


Fig 2. Normal right knee anatomy (aerial) & 5 types of meniscus tears



level will also be factors in determining the best treatment options from management of symptoms to postsurgical therapy.

Management of symptoms. Whether or not you need surgery, there are measures you can take to manage the symptoms of a torn meniscus. Resting the knee, applying ice and compression (as with an ace bandage), and keeping the limb elevated are initial steps you can take to control the swelling and inflammation in your knee. Taking nonsteroidal anti-inflammatory drugs (NSAIDs) may also help to reduce inflammation and alleviate pain.

Nonsurgical treatment. If your symptoms do not subside, your doctor may recommend a corticosteroid injection into the area to decrease the inflammation. Additionally, you may benefit from wearing an athletic brace to support the injured knee. If your affected leg continues to be weaker than the other, you can try physical therapy to strengthen the muscles that support the knee. These are measures to consider when surgery is not applicable. For instance, tears in the vascular area (outside third) of the meniscus heal on their own while horizontal, flap, long-standing, and degenerative tears of the meniscus cannot usually be repaired by surgery.

Surgical treatment. Most meniscus tears occur in the avascular portion (inside third) of the disc, which means they do not heal; however, they can be removed during arthroscopic surgery by using a camera and shaver that are inserted through small incisions in the skin. Such a procedure is called a partial meniscectomy. It is typically

performed in cases of displaced bucket-handle tears (where a fragment of the outer rim of the meniscus extends into the joint space resulting in locking and clicking of the knee joint) or in cases where there is also an ACL injury. Additionally, radial or vertical tears to the meniscus can often be repaired surgically. If surgery is needed, it should be done promptly to avoid further injury to the meniscus. However, if you have a tear in the vascular area that does not heal properly and later requires surgery, waiting should not affect the outcome.

Postsurgical therapy. After surgery, you may need physical therapy to gain strength and flexibility in the leg muscles, especially those surrounding the knee. A physical therapist can help you to establish strength, flexibility, and range of motion goals and to work toward them by monitoring your progress and any pain you may have.

Staying in the game

Regardless of its type or whether or not it requires surgery, a tear to the meniscus does not have to permanently sideline you from playing sports or doing the activities you love. Getting a prompt diagnosis and proceeding with treatment as soon as possible will speed your recovery and return to play.

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