

Knee Anatomy

Introduction

Physical Therapy in Congress Park, Denver Downtown, Central Park, and Highlands Area for Knee



Welcome to Atlas Physical Therapy's patient resource about Knee problems.

To better understand how knee problems occur, it is important to understand some of the anatomy of the knee joint and how the parts of the knee work together to maintain normal function.

First, we will define some common anatomic terms as they relate to the knee. This will make it clearer as we talk about the structures later.

Many parts of the body have duplicates. So it is common to describe parts of the body using terms that define where the part is in relation to an imaginary line drawn through the middle of the body. For example, medial means closer to the midline. So the medial side of the knee is the side that is closest to the other

knee. The lateral side of the knee is the side that is away from the other knee. Structures on the medial side usually have medial as part of their name, such as the medial meniscus. The term anterior refers to the front of the knee, while the term posterior refers to the back of the knee. So the anterior cruciate ligament is in front of the posterior cruciate ligament.

This article will help you understand:

- what parts make up the knee
- how the parts of the knee work

Hear from some of our patients who we treated for **Knee Pain**

“ Alex and his staff recently helped me with a knee injury and frozen shoulder. A couple years ago they helped me after my neck surgery. I am very pleased with the results and highly recommend their... ”

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Stephanie F

Denver, CO

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“ By far the best physical therapists I have ever gone to! Alex and Kate have fixed everything that has come up from foot issues, to knee problems to all the tiny little things that happen during training or just life in general. Lexi and Emma are awesome at making sure im doing exercises correctly and making it fun at the same time. With the help of everyone at Atlas Physical Therapy I was able to complete my first ultramarathon and look forward to completing many other ridiculous goals. ”

Amanda H

Denver, CO

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“ Very professional people! Nikhil and Frank were respectful and yet personable in my time with them. I went in with a hurt knee that kept me from running. They were very conscientious about my desire... ”

“ Very professional people! Nikhil and Frank were respectful and yet personable in my time with them. I went in with a hurt knee that kept me from running. They were very conscientious about my desire to run again and worked hard to that end. I recommend them highly. ”

Elizabeth H

Denver, CO

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“ I have been going to Atlas Physical Therapy for years, alas for different body parts. Each time I have gone, for various body parts (knee, shoulder, and now hip), Atlas has been there for me. You won't regret it. Hope to (not) see you there - to your health! ”

Kimberly S

Denver, CO

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“ Brett, will and the team were great to work with. I was rehabbing a knee injury and that were very knowledgeable, helpful and accommodating to my schedule to ensure I got the treatment and care needed. After a few sessions I saw great improvement in my knee and back to normal now. We highly recommend based on knowledge and skill alone but also super friendly fun and supportive staff along the way. ”

Holland A

Denver, CO

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“ Brett, Will, and the entire Atlas team made my experience a great one. When I began therapy, my knee pain was preventing me from doing the activities I love, but within just a few weeks of treatment, my pain was reduced by at least 75%. Brett and Will did a great job not only challenging me to make progress quickly, but made the experience fun. On top of that, Atlas uses an app for your home exercises that makes your exercises easier to do and rewards you for consistency. Highly recommend! ”

Zach W

Denver, CO

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“ I am a runner and runners sometimes get hurt! Alex has magic hands. The man has helped me get through plantar fasciitis on both feet, hip and knee issues and a pulled hamstring! All while keeping it... ”

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Maili Aring Dilworth

Denver, CO

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“ Forever grateful for this place and getting my knee back up in order after repeat injuries. I recommend seeing like for any PT needs. Great place for overall recovery in addition to dry needling. I hope not to spend much time back here but in case I do, it’s handy to have a trusted PT near work in downtown. ”

Casey M

Denver, CO

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“ Always helping me with recovering from knee replacement! Progress with a great attitude!. ”

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John And Brenda Davis

Denver, CO

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“ I went to Atlas PT for what ended up being a torn meniscus. While we worked on healing/getting stronger I had two friends who also torn their meniscus and quickly opted surgery. I had my moments where I wanted to do the same but Alex was super patient with me, making sure I understood my options and then supported me with whatever I choose. Lexi was great as well, showing me new strength building exercises and always took the time to answer questions I had about workouts outside of PT.I will always recommend Atlas PT to friends and family. They are knowledgeable and willing to work around your schedule (early mornings, and some early evenings.) ”

Melissa A

Denver, CO

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“ Andrea and Nate were such an amazing team in helping me recover from my dislocated kneecap. They are patient, kind, encouraging, and truly cared in helping me make progress in my recovery. They helped me go from 2 crutches, to 1 crutch, to no longer wearing a knee brace/tape, and finally being able to walk normally again within 4 months. I would highly recommend this team to anyone! This is a really nice, fun office that made me feel good about going in every appointment. I also appreciate Cat's kindness and stellar customer service at the front desk. ”

LK D

Denver, CO

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“ It was all my fault, I waited until my knee tendonitis was so bad I could barely walk. At my age (63) you would think I should know better. But the team at Atlas did a remarkable job of putting me back together.

• After the third visit I felt substantial improvement. • They gave me some new stretches to do on a daily basis, and made some minor modifications to my current exercise program that will prevent this from reoccurring. • Of course it was completely up to me to do the stretches and exercises, Luke and Hanna canâ€˜ t do them for me. • But by following their directions I am fully back on my feet and enjoying the summer. ”

Zeke H

Denver, CO

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“ I worked with Andrea and Nate for almost 3 months to rehab after a meniscectomy. They were great from start to finish, always taking the time to assess progress and constantly tweaking my workout regimen to continue challenging me. As an expert Andrea would explain what was going on with my muscles and ligaments and help me understand how certain motions can hurt/help. Nate was fun to talk with while going through the exercises and always took time to make sure the weight and # of repetitions was just right.

Highly recommend this place and will be coming back when my other knee needs work, haha. ”

Chris W

Denver, CO

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“ My first PT experience was at Atlas! I tore my left ACL during a ski accident a few years ago and decided to get it replaced a year ago. Luke is the bomb and had me up and walking in a month! Also... ”

“ My first PT experience was at Atlas! I tore my left ACL during a ski accident a few years ago and decided to get it replaced a year ago. Luke is the bomb and had me up and walking in a month! Also gives the best advice for what you can/cant do and what you should focus on. Unfortunately I had a year long string of bad luck and tore my right ACL in a bike accident and had replacement surgery and then had my meniscus touched up a few months later. My year long recovery has been at Atlas and they havenâ€˜ t let me down!

Their times are always flexible and the people there are super fun and make the recovery process something to look forward to every week. Matt and Abby were also really fun and helpful and were great at keeping spirits up. I will definitely be coming back!! (fingers crossed I donâ€˜ t tear anything else though!) ”

Danielle D

Denver, CO

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Sarah J

Denver, CO

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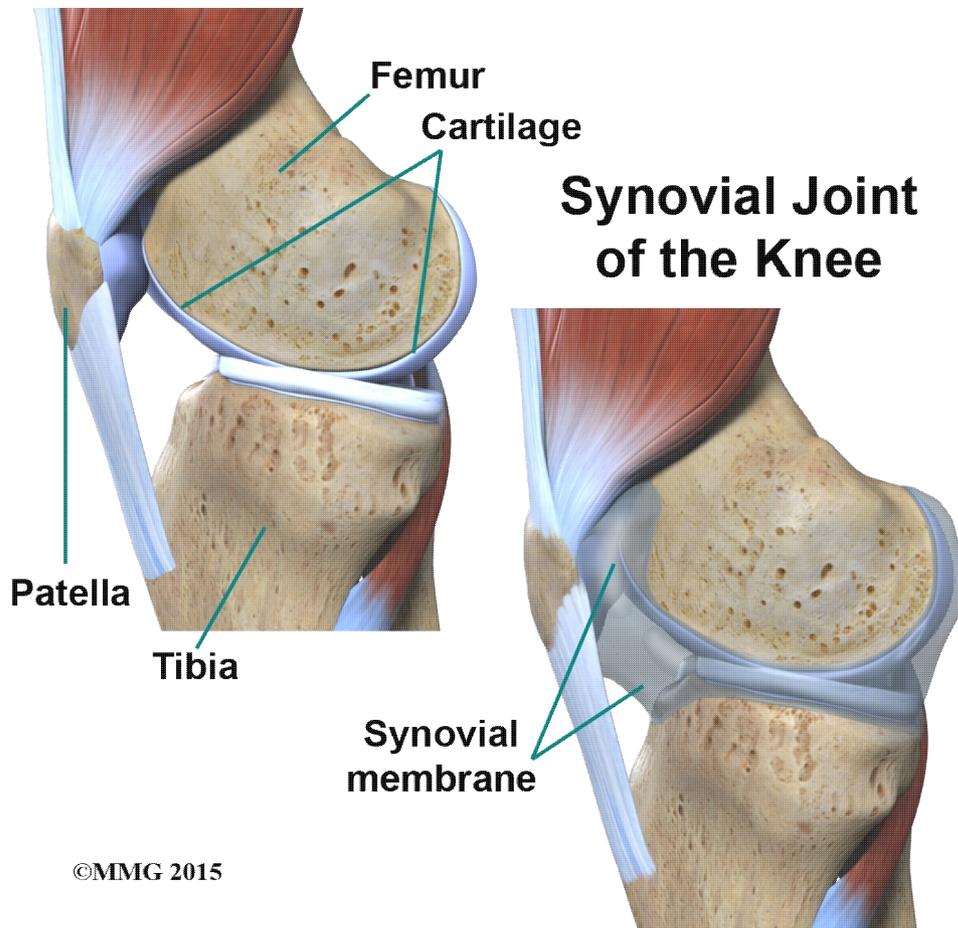
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Important Structures

The important parts of the knee include:

- bones and joints
- ligaments and tendons
- muscles
- nerves
- blood vessels



Bones and

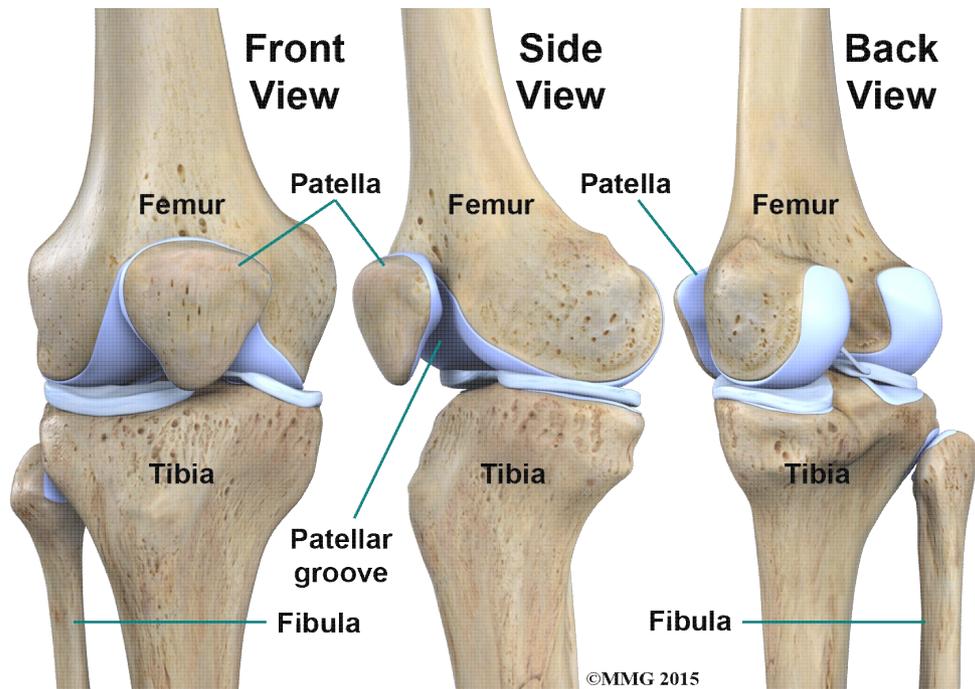
Joints

The knee is the meeting place of two important bones in the leg, the *femur* (the thighbone) and the *tibia* (the shinbone). The *patella* (or *kneecap*, as it is commonly called) is made of bone and sits in front of the knee.

The knee joint is a *synovial joint*. Synovial joints are enclosed by a ligament capsule and contain a fluid, called *synovial fluid*, that lubricates the joint.

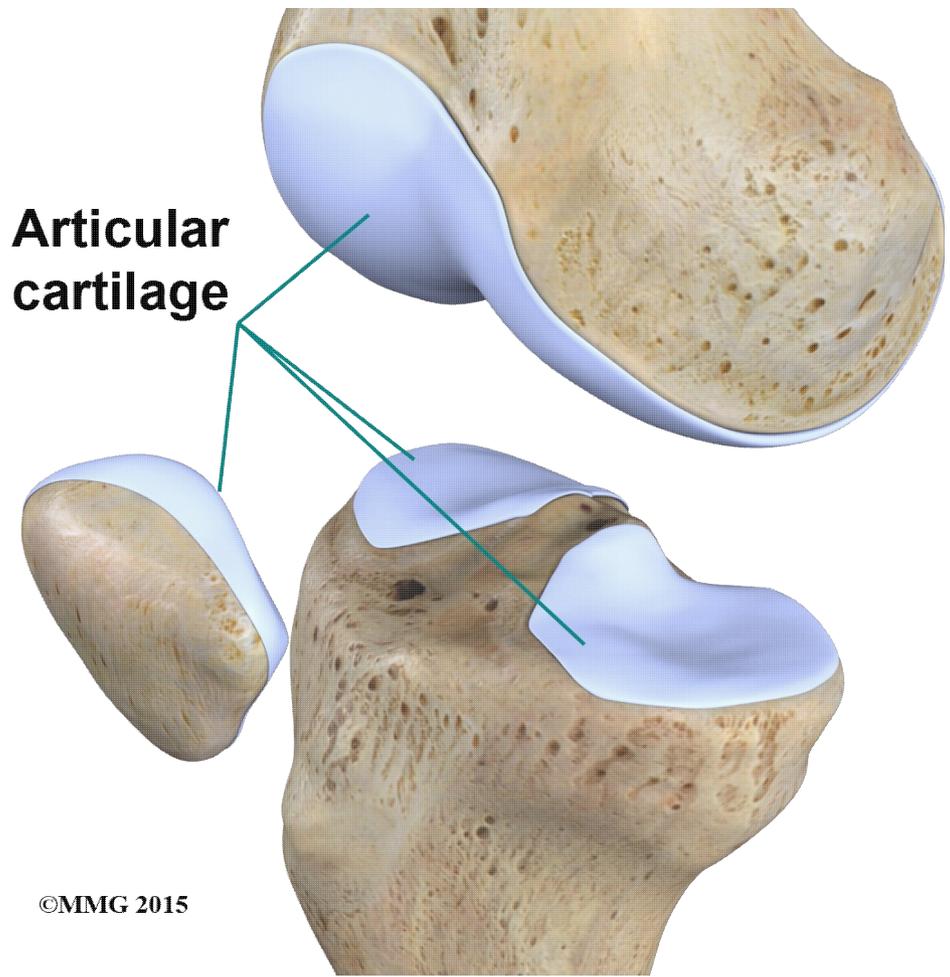
The end of the femur joins the top of the tibia to create the knee joint. Two round knobs called *femoral condyles* are found on the end of the femur. These condyles rest on the top surface of the tibia. This surface is called the *tibial plateau*. The outside half (farthest away from the other knee) is called the *lateral tibial plateau*, and the inside half (closest to the other knee) is called the *medial tibial plateau*. The patella glides through a special groove formed by the two femoral condyles called the *patellofemoral groove*.

The smaller bone of the lower leg, the *fibula*, never really enters the knee joint. It does have a small joint that connects it to the side of the tibia. This joint normally moves very little.



Articular cartilage is the material that covers the ends of the bones of any joint. This material is about one-quarter of an inch thick in most large joints. It is white and shiny with a rubbery consistency. Articular cartilage is a slippery substance that allows the surfaces to slide against one another without damage to either surface. The function of articular cartilage is to absorb shock and provide an extremely smooth surface to facilitate motion. We have articular cartilage essentially everywhere that two bony surfaces move against one another, or *articulate*. In the knee, articular cartilage covers the ends of the femur, the top of the tibia, and the back of the patella.

Articular Cartilage

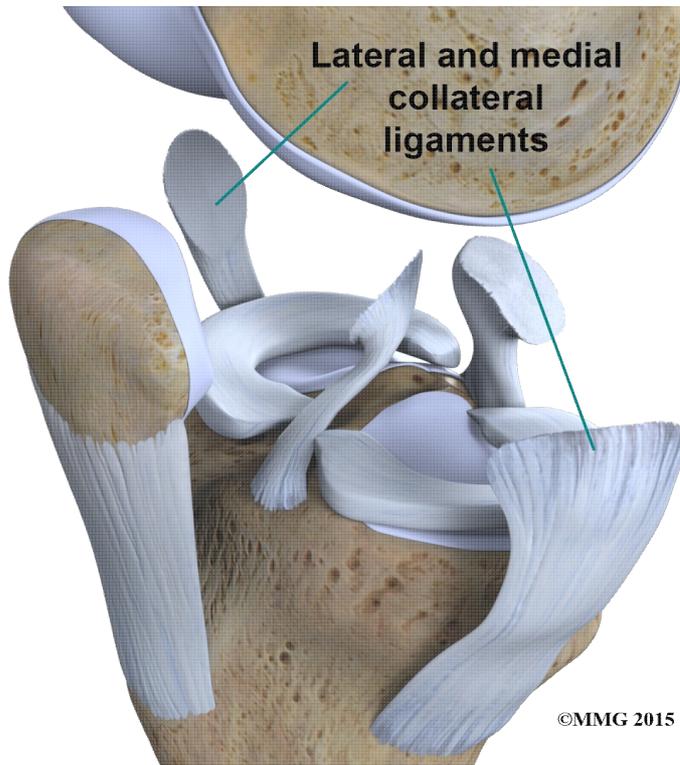


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Ligaments and Tendons

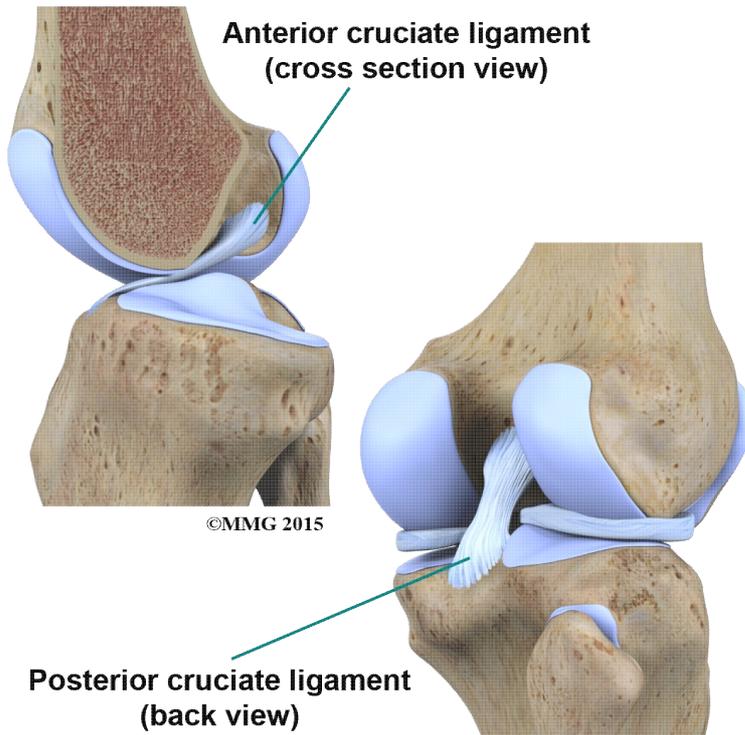
Ligaments are tough bands of tissue that connect the ends of bones together. Two important ligaments are found on either side of the knee joint. They are the *medial collateral ligament* (MCL) and the *lateral collateral ligament* (LCL).

Ligaments

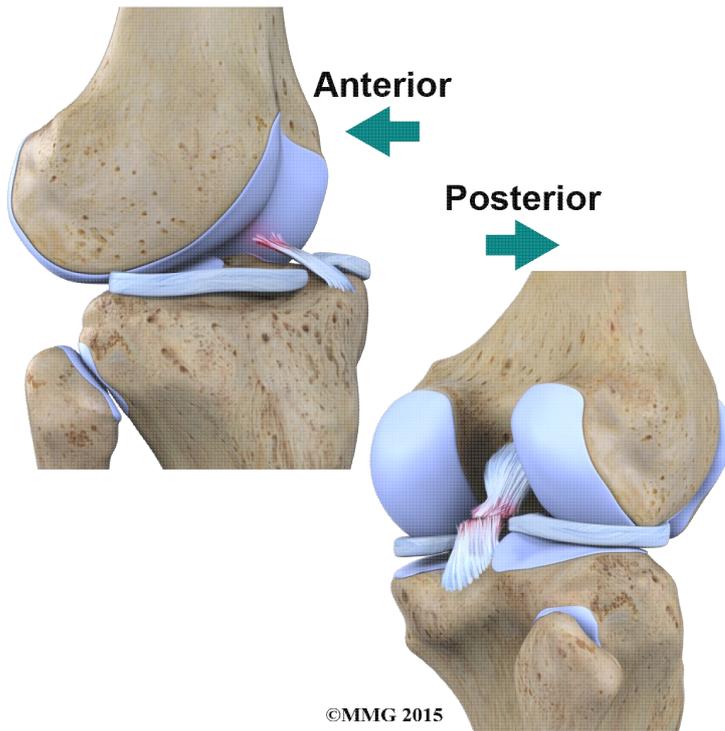


Inside the knee joint, two other important ligaments stretch between the femur and the tibia: the *anterior cruciate ligament* (ACL) in front, and the *posterior cruciate ligament* (PCL) in back.

Other Important Ligaments



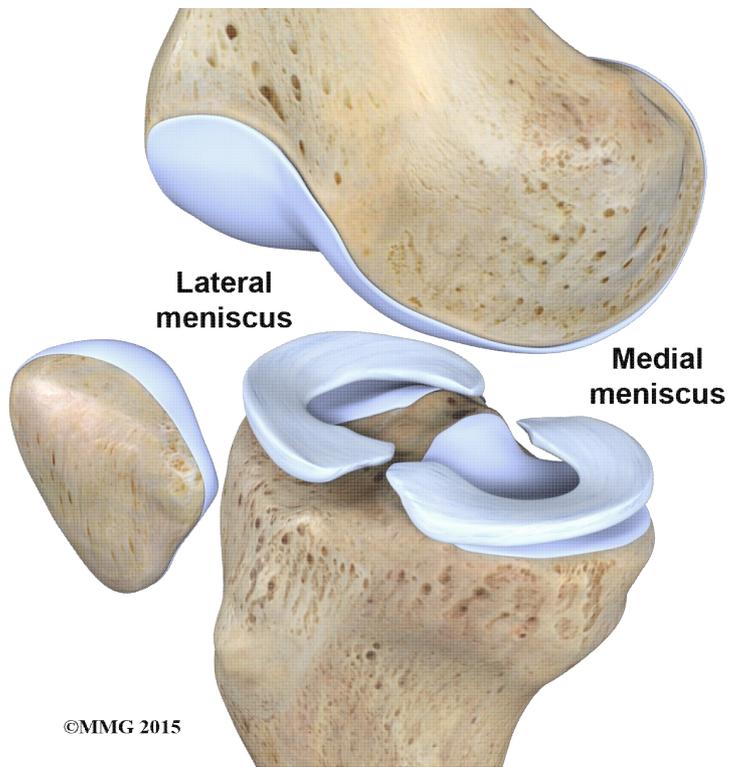
The MCL and LCL prevent the knee from moving too far in the side-to-side direction. The ACL and PCL control the front-to-back motion of the knee joint.



The ACL keeps the tibia from sliding too far forward in relation to the femur. The PCL keeps the tibia from sliding too far backward in relation to the femur. Working together, the two cruciate ligaments control the back-and-forth motion of the knee. The ligaments, all taken together, are the most important structures controlling stability of the knee.

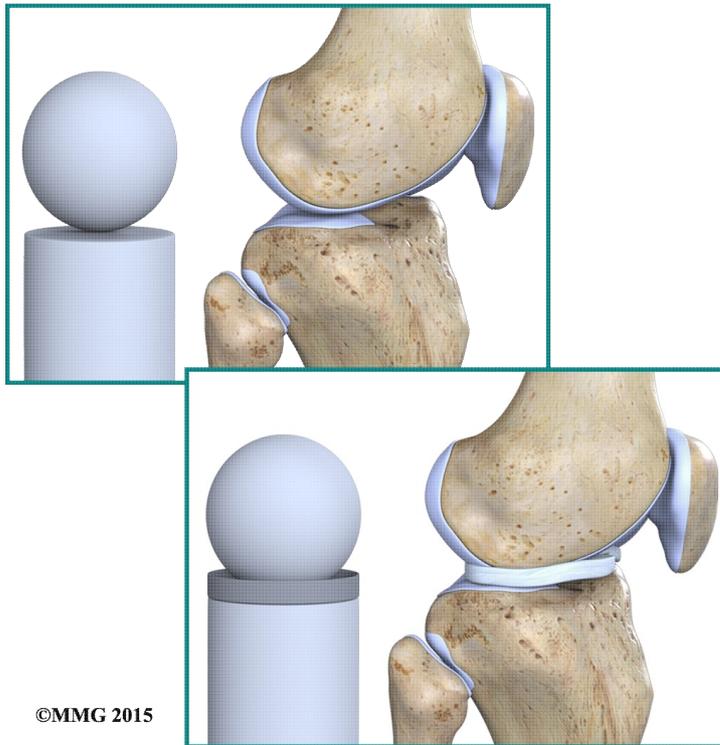
Two special types of ligaments called menisci sit between the femur and the tibia. These structures are sometimes referred to as the *cartilage* of the knee, but the menisci differ from the articular cartilage that covers the surface of the joint.

Menisci

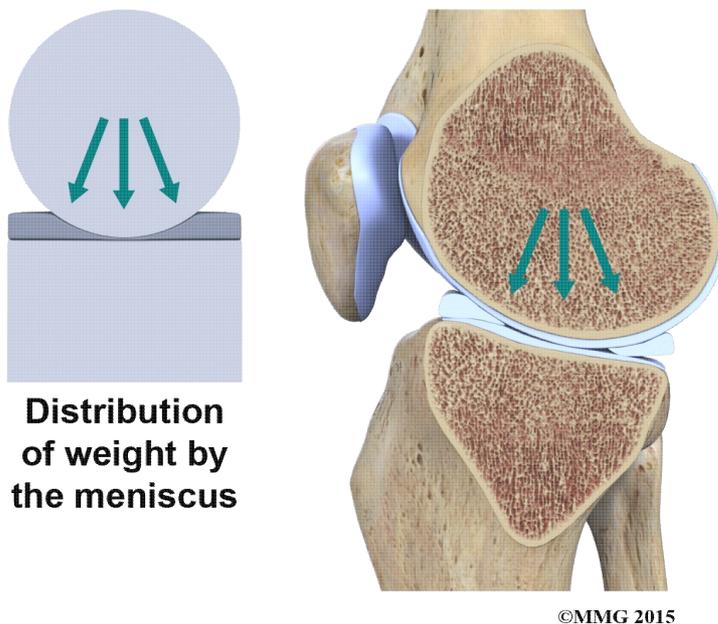


The two menisci of the knee are important for two reasons: (1) they work like a gasket to spread the force from the weight of the body over a larger area, and (2) they help the ligaments with stability of the knee.

Imagine the knee as a ball resting on a flat plate. The ball is the end of the thighbone as it enters the joint, and the plate is the top of the shinbone. The menisci actually wrap around the round end of the upper bone to fill the space between it and the flat shinbone.



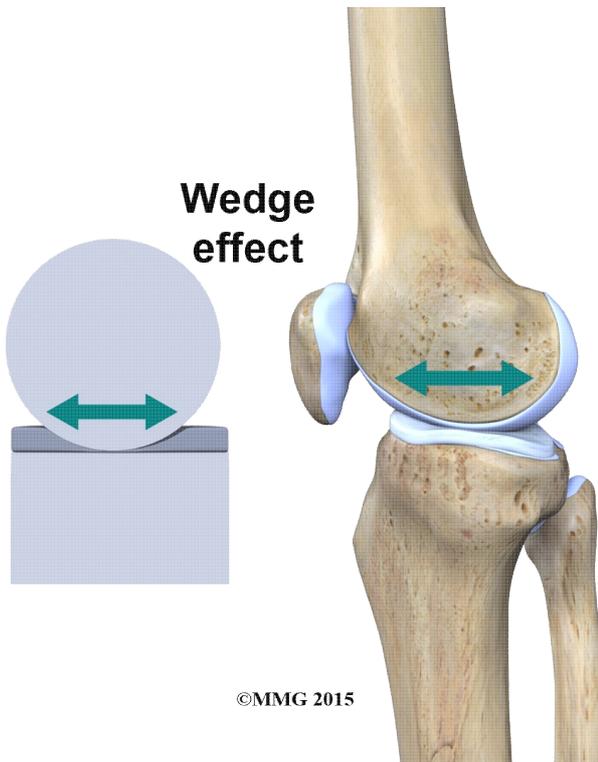
The menisci act like a gasket, helping to distribute the weight from the femur to the tibia.



Without the menisci, any weight on the femur will be concentrated to one point on the tibia. But with the menisci, weight is spread out across the tibial surface. Weight distribution by the menisci is important because it protects the articular cartilage on the ends of the bones from excessive forces. Without the

menisci, the concentration of force into a small area on the articular cartilage can damage the surface, leading to degeneration over time.

In addition to protecting the articular cartilage, the menisci help the ligaments with stability of the knee. The menisci make the knee joint more stable by acting like a wedge set against the bottom of a car tire. The menisci are thicker around the outside, and this thickness helps keep the round femur from rolling on the flat tibia. The menisci convert the tibial surface into a shallow socket. A socket is more stable and more efficient at transmitting the weight from the upper body than a round ball on a flat plate. The menisci enhance the stability of the knee and protect the articular cartilage from excessive concentration of force.



Taken all together, the ligaments of the knee are the most important structures that stabilize the joint. Remember, ligaments connect bones to bones. Without strong, tight ligaments to connect the femur to the tibia, the knee joint would be too loose. Unlike other joints in the body, the knee joint lacks a stable bony configuration. The hip joint, for example, is a ball that sits inside a deep socket. The ankle joint has a shape similar to a mortise and tenon, a way of joining wood used by craftsmen for centuries.

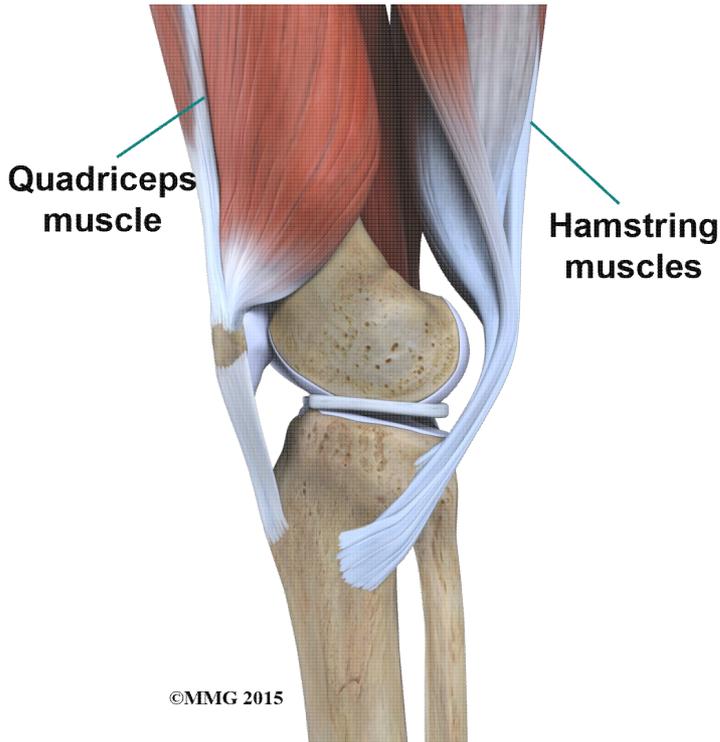
Tendons

Tendons are similar to ligaments, except that tendons attach muscles to bones. The largest tendon around the knee is the *patellar tendon*. This tendon connects the patella (kneecap) to the tibia. This tendon covers the patella and continues up the thigh.

There it is called the *quadriceps tendon* since it attaches to the quadriceps muscles in the front of the thigh. The *hamstring muscles* on the back of the leg also have tendons that attach in different places around the knee joint. These tendons are sometimes used as tendon grafts to replace torn ligaments in the knee.

Muscles

The *extensor mechanism* is the motor that drives the knee joint and allows us to walk. It sits in front of the knee joint and is made up of the patella, the patellar tendon, the quadriceps tendon, and the *quadriceps muscles*. The four quadriceps muscles in front of the thigh are the muscles that attach to the quadriceps tendon. When these muscles contract, they straighten the knee joint, such as when you get up from a squatting position.



The way in which the kneecap fits into the patellofemoral groove on the front of the femur and slides as the knee bends can affect the overall function of the knee. The patella works like a fulcrum, increasing the force exerted by the quadriceps muscles as the knee straightens. When the quadriceps muscles contract, the knee straightens.

The hamstring muscles are the muscles in the back of the knee and thigh. When these muscles contract, the knee bends.

Nerves

The most important nerve around the knee is the *popliteal nerve* in the back of the knee. This large nerve travels to the lower leg and foot, supplying sensation and muscle control. The nerve splits just above the knee to form the *tibial nerve* and the *peroneal nerve*. The tibial nerve continues down the back of the leg while the peroneal nerve travels around the outside of the knee and down the front of the leg to the foot. Both of these nerves can be damaged by injuries around the knee.

Blood Vessels

The major blood vessels around the knee travel with the popliteal nerve down the back of the leg. The *popliteal artery* and *popliteal vein* are the largest blood supply to the leg and foot. If the popliteal artery is

damaged beyond repair, it is very likely the leg will not be able to survive. The popliteal artery carries blood to the leg and foot. The popliteal vein carries blood back to the heart.

Summary

The knee has a somewhat unstable design. Yet it must support the body's full weight when standing, and much more than that during walking or running. So it's not surprising that knee problems are a fairly common complaint among people of all ages. Understanding the basic parts of the knee can help you better understand what happens when knee problems occur.

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