

The Knee Joint : Part One

By Tracy Anderson

The knee joint may not appear to be very complex, but in fact it is a very complex joint. It is complex because it is supported and maintained entirely by muscles and ligaments, without stability from bones. The knee joint is one of the most frequently injured joints because it is exposed to severe stress and strain.

The knee joint is classified as a synovial hinge joint with the motions of flexion and extension. From the 0 (zero) degree mark of the knee, when the knee is fully extended, there is about 135 degrees of flexion. The knee joint, technically, is not a true hinge joint because it has a rotational component. This rotation is not a free movement, but an accessory motion that accompanies flexion and extension. This motion is known as arthrokinematic motion, and will be saved for a later article.

The knee joint consists of two bones, two cruciate ligaments, two collateral ligaments and two meniscus disks. The two bones are the femur and the tibia. The femur is the large bone in the upper leg, and the tibia is one of two bones in the lower leg, and is also known as the “shin” bone. The knee joint is formed with the distal end of the femur and the proximal end of the tibia. Remember that distal means away from the body and proximal means toward the body.

The two cruciate ligaments are located within the joint capsule. The anterior cruciate ligament (ACL) runs from the anterior, or front, portion of the tibia to the posterior, or back, portion of the femur. The posterior cruciate ligament (PCL) runs from the posterior, or back, portion of the tibia to the anterior, or front, portion of the femur. These two ligaments provide support in the sagittal plane, which is the plane that divides your body into right and left half's vertically. The ACL prevents the excessive forward motion or rotation of the tibia, or shin bone. The PCL prevents the excessive backward motion of the tibia.

The two collateral ligaments are called the medial and lateral collateral ligaments. The medial collateral ligament is located on the inside, or medial side, of the knee. On the lateral side, or outward side, of the knee is the lateral collateral ligament. Both ligaments run vertically on the side of the knee and provide stability in the frontal plane. The frontal plane divides your body into front and back half's vertically. The medial collateral ligament provides stability medially and the lateral collateral ligament provides stability laterally. These two ligaments become tight during extension, which contribute to the stability, and become slack during flexion. Also they work together with the ACL and PCL to keep the knee joint stable during movements.

The medial and lateral meniscus are two half moon shaped fibrocartilage disks located on the top surface of the tibia and are designed to absorb shock. These meniscus become thicker on the outer portion and are concave on the top inside portion. This functions to deepen the otherwise flat joint surface.

On a side note, there are about 13 bursa located throughout the knee and are used to reduce friction between the many tendons located around the knee joint.

Some of the muscles associated with the knee joint were discussed last month with the hip joint. For this reason, I will describe only the muscles associated with the knee, and mention the muscles that are associated with both joints.

The anterior muscles of the knee are the vastus lateralis, vastus medialis, vastus intermedialis and they act to extend the knee. The posterior muscles are the bicep femoris (short head), and the popliteus and these act to flex the knee. [The muscles associated with both joints are the rectus femoris, bicep femoris (long head), semimembranosus, semitendinosus, sartorius, gracilis, gastrocnemius and the tensor fascia latae.]

Anterior Muscles

The vastus lateralis muscle is located to the lateral side of the rectus femoris and originates from the linea aspera of the femur and spans the lateral side of the thigh to join the other quadricep muscles at the patella, or knee cap. The vastus medialis also comes from the linea aspera, but spans the thigh on the medial, or inside, thigh. The vastus intermedialis is located under the rectus femoris and arises from the front and top portion of the femur and spans the front portion of the thigh. This muscle blends together with the other vasti muscles of the thigh along its length. All four quadricep muscles attach to the base of the patella, or knee cap, and the patellar tendon. All four muscles act to extend the knee such as during squats, leg press and leg extensions.

Posterior Muscles

Because most of the posterior muscles were discussed in the last article, we will concentrate on the muscles that affect the knee joint only. The short head of the biceps femoris arises from the linea aspera and inserts onto the fibular head and acts to flex the knee. The popliteus muscle is located on the back of the knee under the gastrocnemius, or calf muscle. It arises from the bottom portion of the femur on the lateral side, and inserts on the medial side of the tibia on the back, upper portion. This muscle is a small muscle and functions to unlock the knee, or to initiate flexion.

I hope this helped you understand the anatomy of the knee joint, next month I will continue with common injuries and treatments associated with the this joint. If you have any questions or comments please visit my site at www.LFNOnline.com. On July 28 and 29th, I will be conducting a movement science clinic at Parrillo Headquarters, if you enjoy my articles I know you will love this clinic. It is on a Saturday and Sunday and is only \$199, but only 10 people will be allowed to attend. This is to ensure allot of one on one time. Call (937)743-9745 for more information, or visit my site.