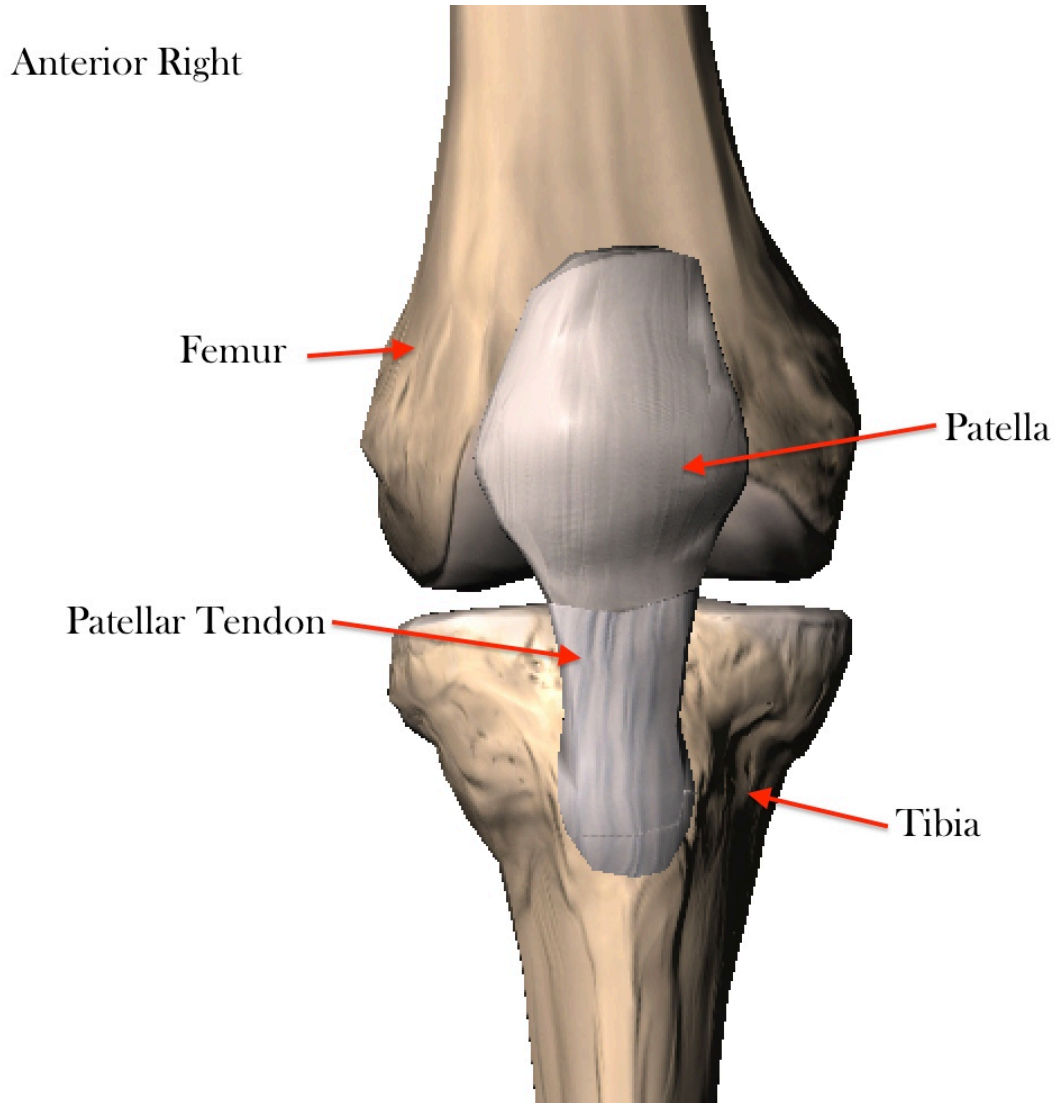


Knee Joint Anatomy 101

Bone Basics

There are three bones at the knee joint – femur, tibia and patella – commonly referred to as the thighbone, shinbone and kneecap. The fibula is not typically associated with the knee because it lies outside the capsule and is associated with ankle function.

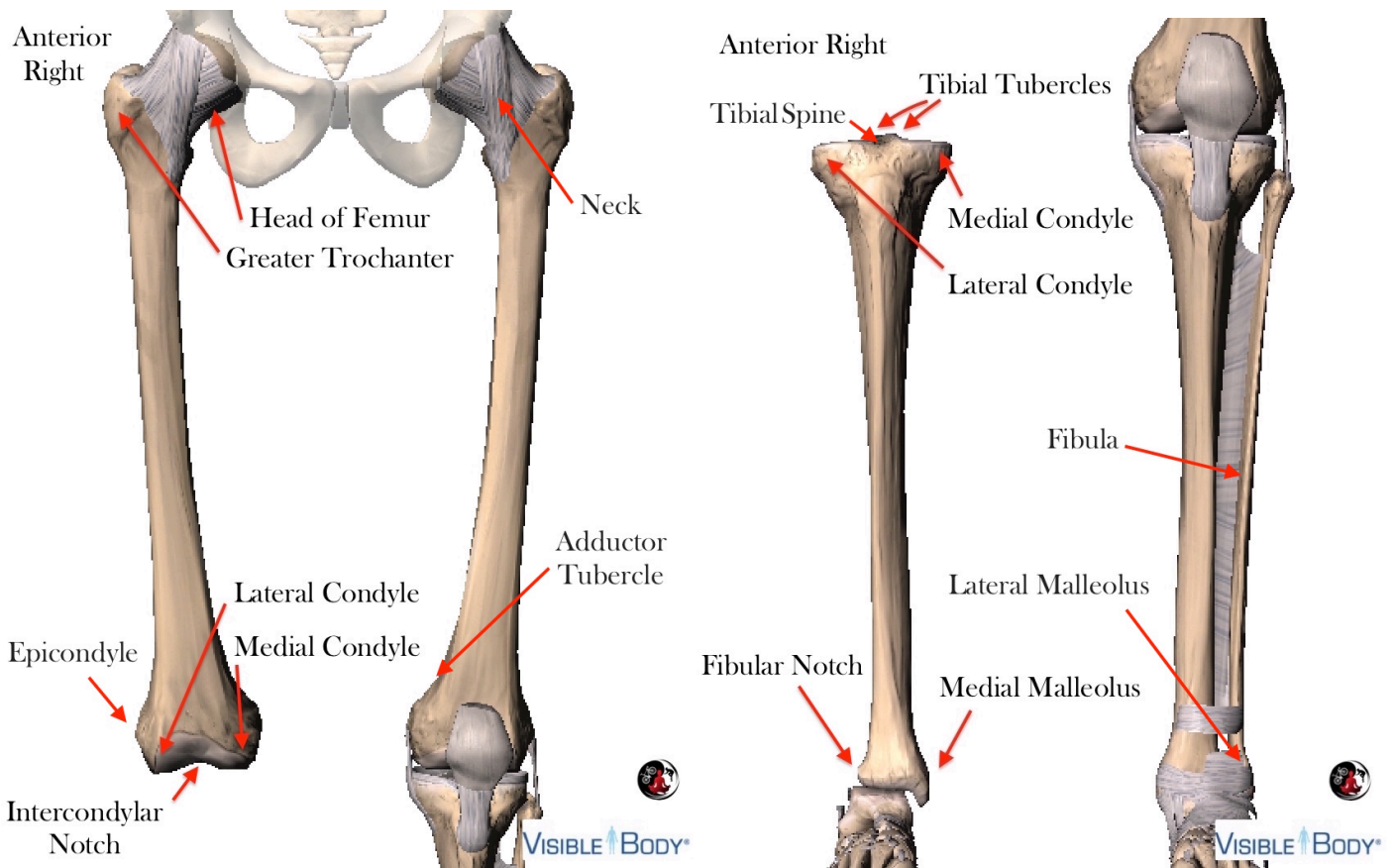


We need to consider the osteological features (study of bones) of this joint to fully appreciate the numerous complex movements necessary to accomplish flexion and extension.

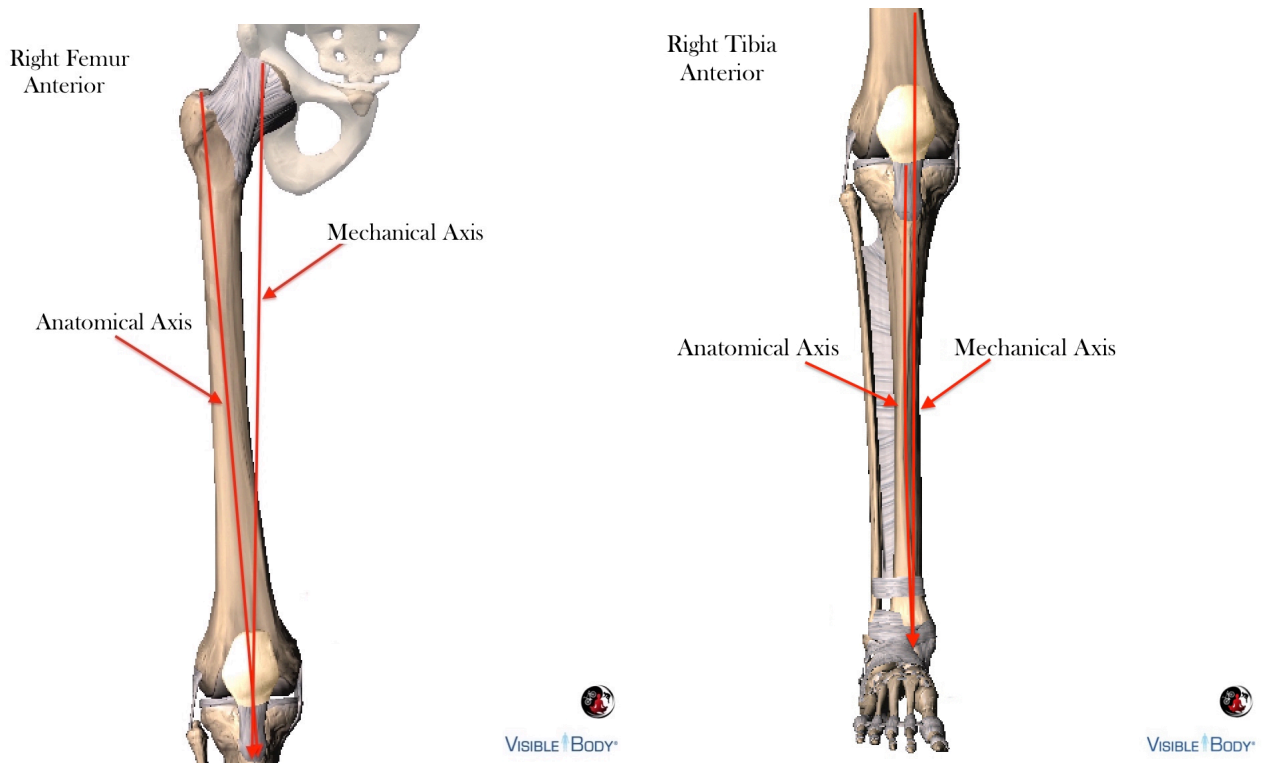
The femoral head sits inside the acetabulum at the ball and socket hip joint with the neck connecting laterally to the greater trochanter.

Distal features include the convex medial/lateral condyles, Intercondylar notch or patellar groove and adductor tubercle.

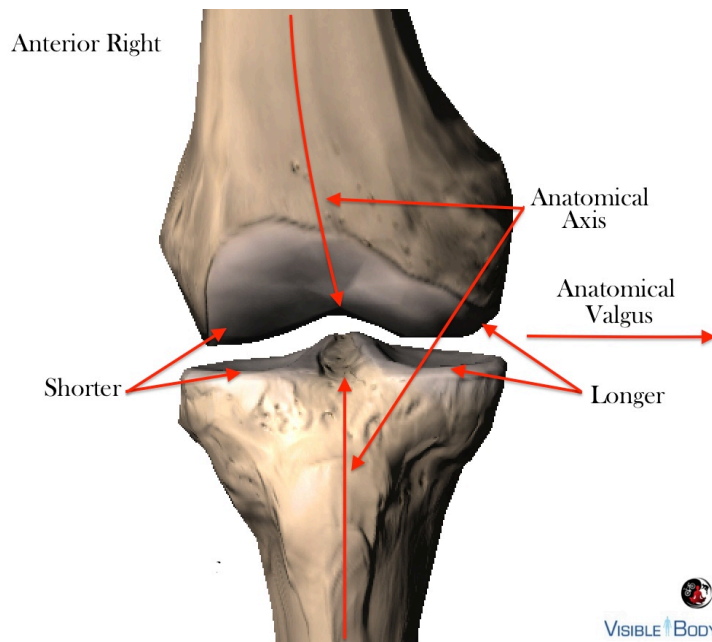
The femur articulates at the tibial plateau. These condyles are concave medially, convex laterally, and divided by the tibial tubercles, which fit snugly into the Intercondylar notch in extension.



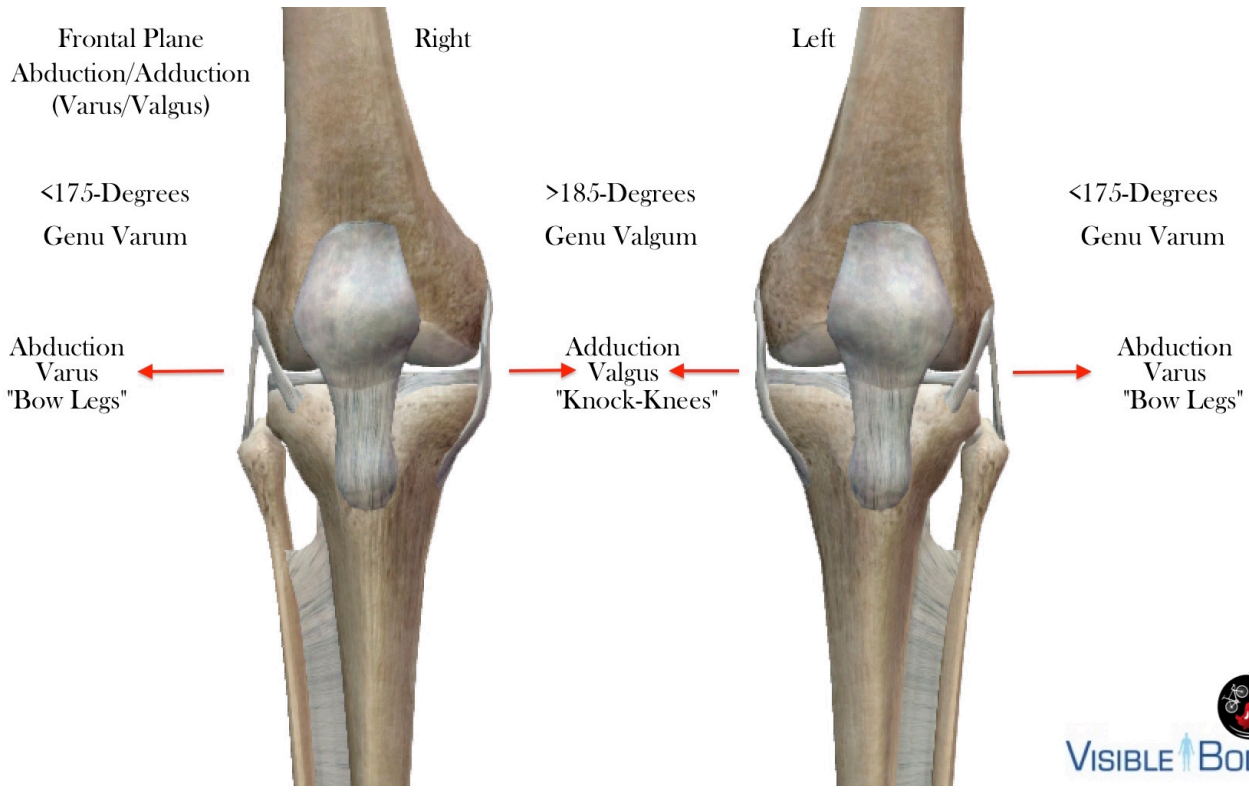
The anatomical axis of the femur bone is divergent from the mechanical axis, descending medially from the center of the greater trochanter to the Intercondylar notch; conversely, the anatomical and mechanical tibial axis are nearly identical.



Close examination of the tibial and femoral medial condyles of both femur and tibia extend further than their respective counterparts, which creates a physiologic valgus angle of the knee approximating 180-185-degrees.



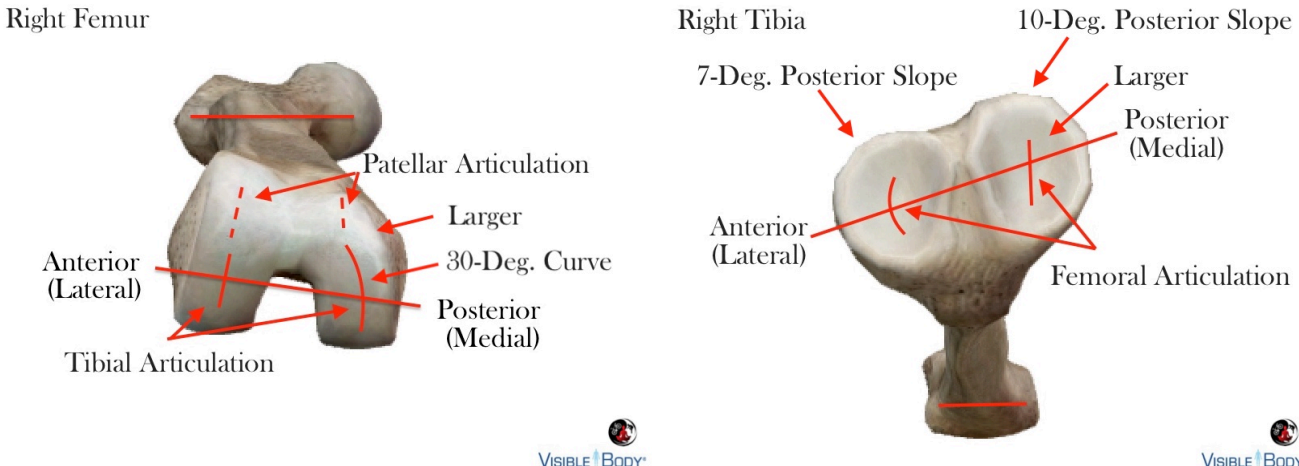
Diagnostic criteria for abnormal frontal plane adduction is >185 -degrees (Genu Valgum) or ≤ 175 -degrees abduction (Genu Varum), measured at the medial-tibiofemoral joint in extension.



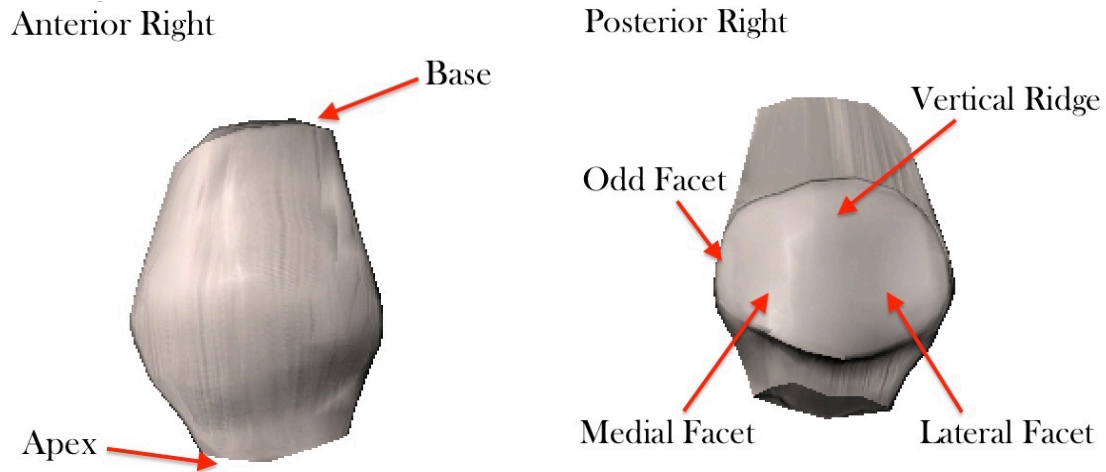
The anterior orientation of both lateral condyles and a 25-30-degree curve on the medial femoral condyle are probably the most distinct features of the tibiofemoral articulating surface structure.

The medial femoral condyle articulating surface area is larger and curved relative to the lateral condyle, which is flatter, smaller and more circular. Both structures are convex.

At the tibial plateau, the medial condyle is concave and 50% larger than the partially convex lateral condyle. The degree of posterior slope varies between condyles, as does the amount of cartilage.



The patella is embedded within the retinacula layer between the femur and tibia, attached superiorly to the quadriceps tendon and inferiorly to the patellar tendon. Exposed posteriorly to articulate with the femoral sulcus, the surface contains a central vertical ridge and facets.

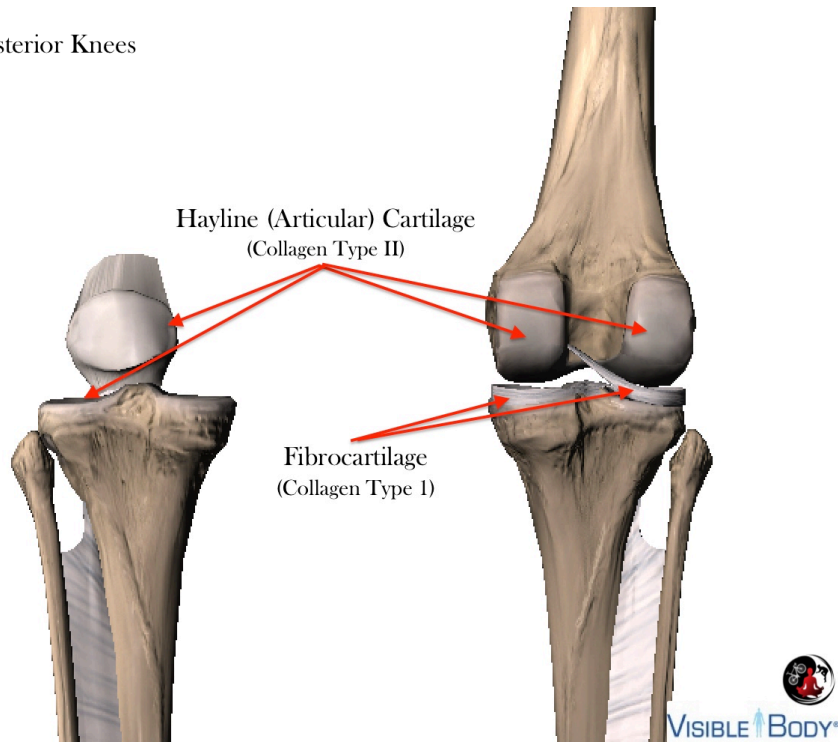


Cartilage Basics

Hyaline cartilage covers a large portion of the femoral condyles and posterior patella to reduce patellofemoral articular friction.

Fibrocartilagenous menisci at the tibial plateau create a semi-flexible housing that compensate tibiofemoral obliquity.

Posterior Knees

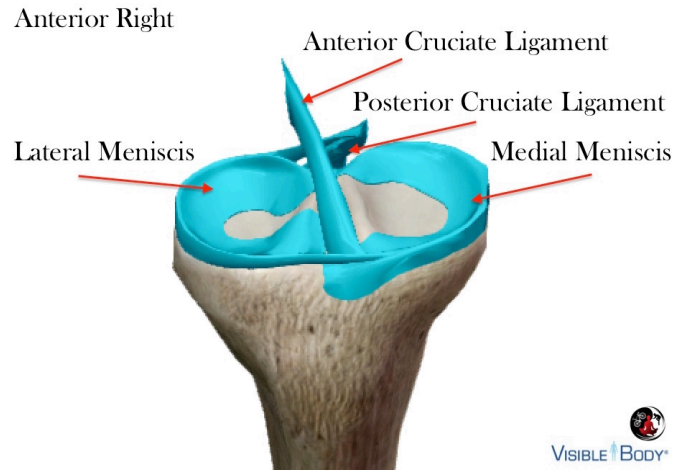
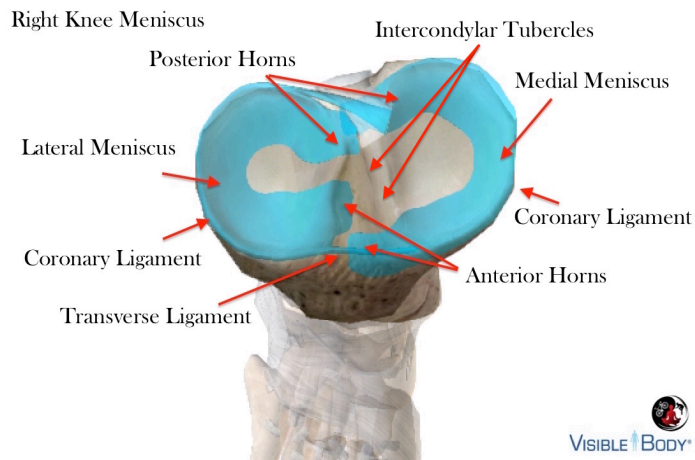


Menisci attached to the surface of the tibial plateau improve congruence, pressure distribution and articulation at the tibiofemoral joint.

Fixed to the tibia at the horns and coronary ligaments they are joined anteriorly by the transverse ligament.

The lateral meniscus forms a nearly complete circle and covers a majority of the tibial condyle's surface, with anterior and posterior horns (typically) blending into the attachment of the ACL. There is no attachment between the lateral meniscus and the lateral collateral ligament, providing increased mobility in comparison to the medial meniscus.

The c-shaped medial meniscus is larger, but covers significantly less surface area than the lateral meniscus. Anterior fibers of the ACL blend with the transverse ligament and anterior horn of the medial meniscus. And capsular attachments join to the deep medial collateral ligament directly and patella via the patellomeniscal ligaments.



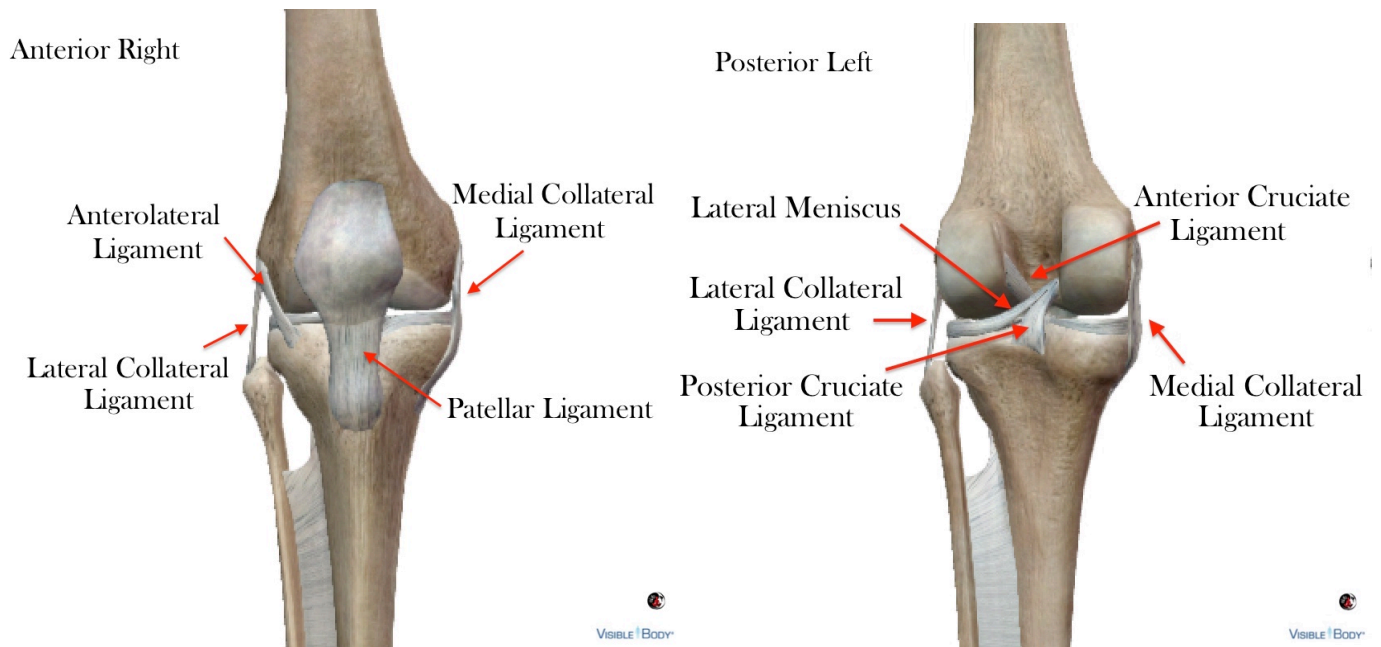
Ligament Basics

Ligaments create passive resistance to facilitate optimal knee function and stability.

Tibiofemoral Ligaments:

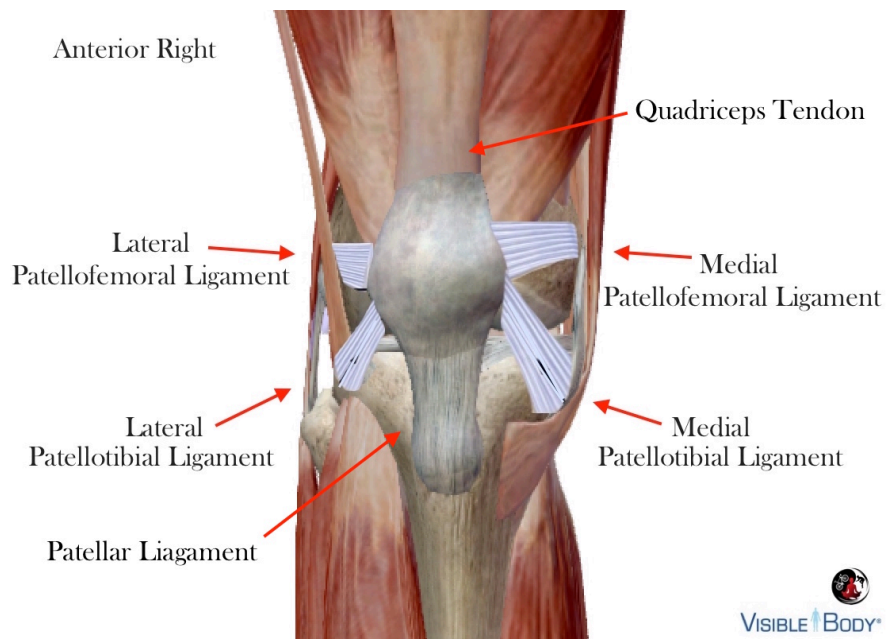
The deep anterior and posterior cruciate are considered Intracapsular and extra synovial because they exist inside the joint capsule but outside the synovial membrane, crossing anterior/posterior & posterior/anterior between femur and tibia.

The medial (tibial) collateral ligament contains superficial (extracapsular) and deep (capsular) components, between femur and tibia, and the lateral (fibular) ligament is purely extracapsular, connecting femur to fibula.



Patellofemoral Ligaments

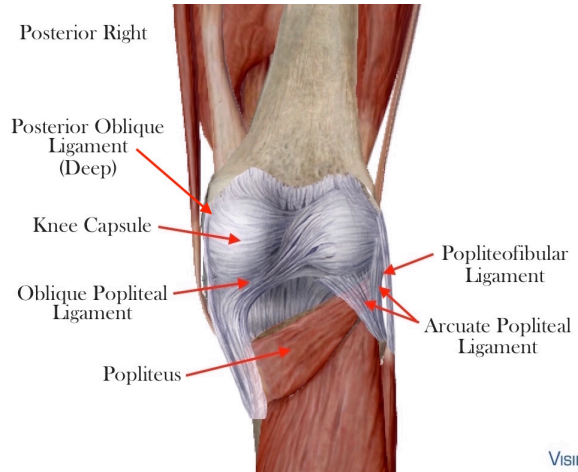
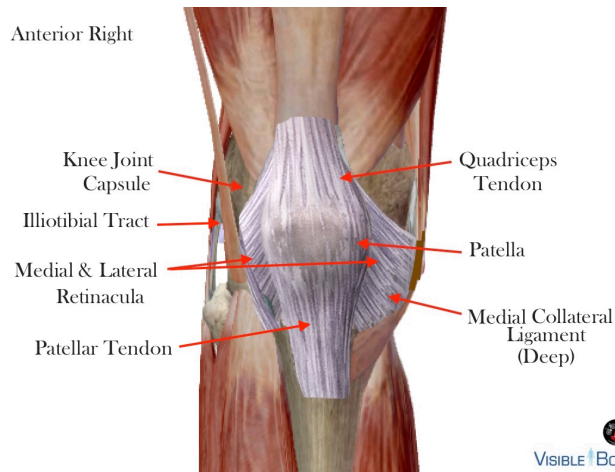
Patellar movement is initiated by the quadriceps and guided by the medial/lateral tibial and femoral ligaments.



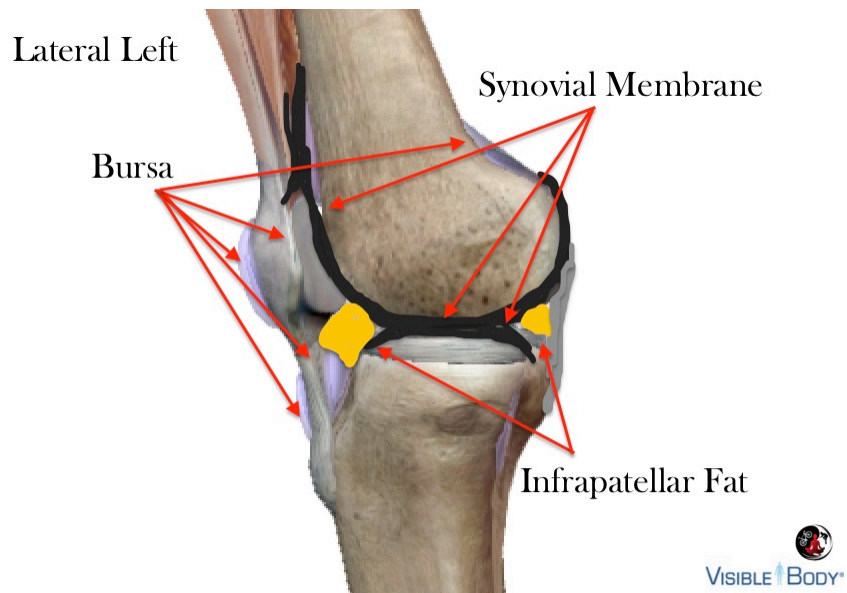
Knee Joint Capsule

Consistent with other synovial joints, the knee exists within a capsule made of connective tissue and bone.

The outer layer consists of a fibrous membrane with openings at the patella for the suprapatellar bursa and lateral tibial condyle for popliteal muscle, inseparable with numerous supporting capsular ligaments.

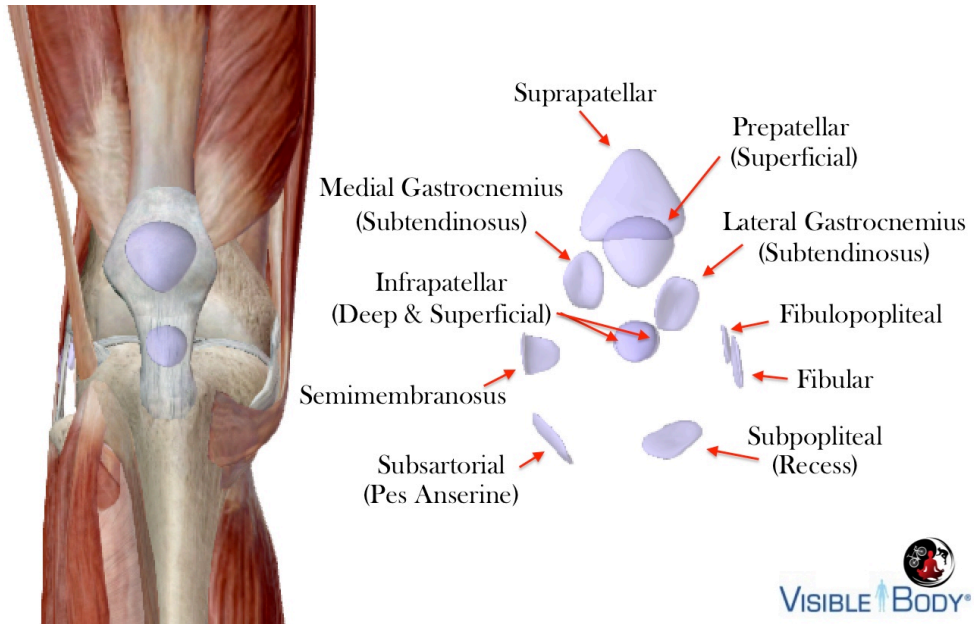


The inner-membrane secretes synovial fluid (and nutrients) to reduce friction between joint surfaces



Bursa and fat-pads are interspersed between muscles, tendons and bones as buffers for friction and pressure.

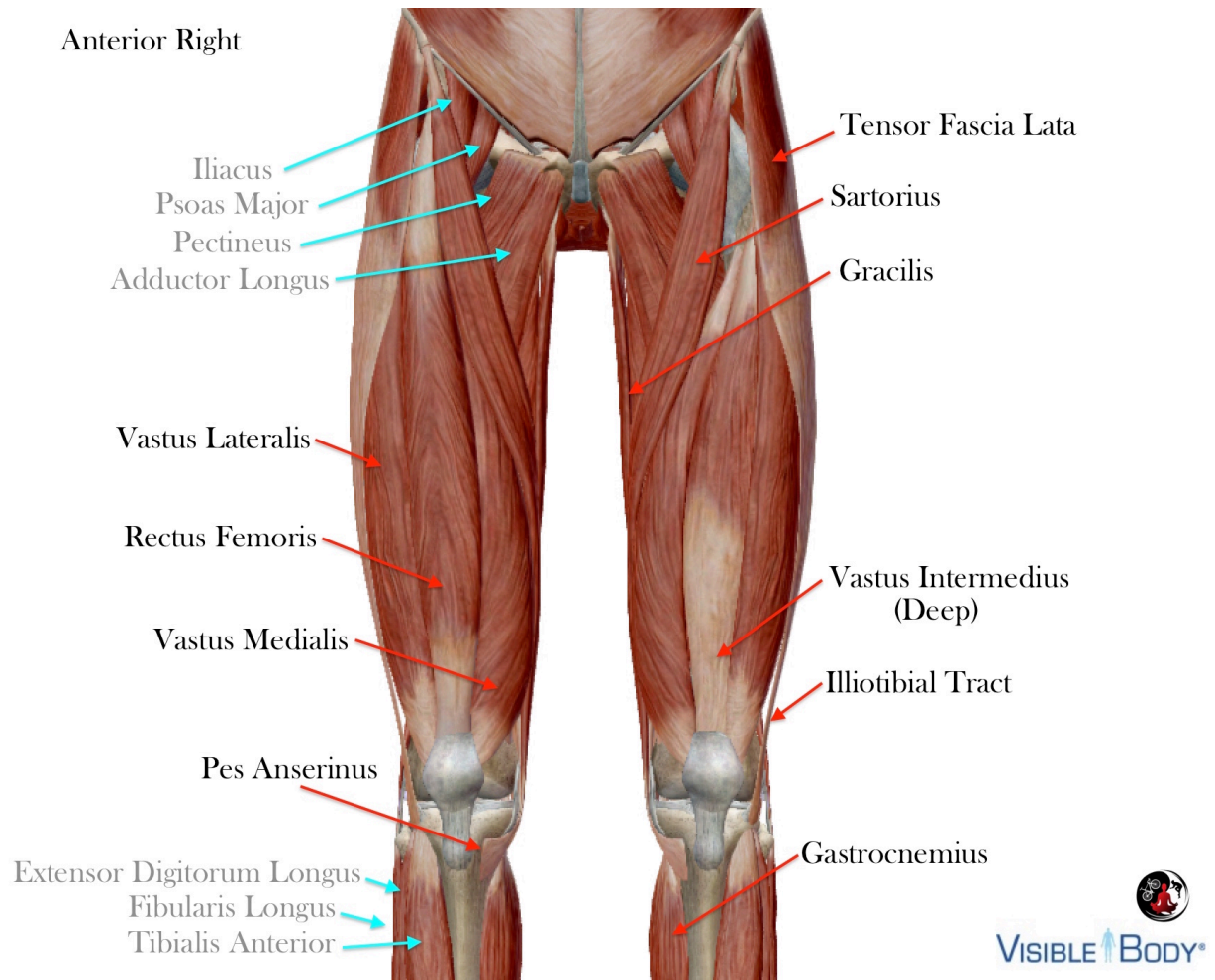
Anterior



Muscle Basics

Anterior muscles of knee joint are monoarticulating (articulate/cross one-joint) or biarticulating (articulate/cross two-joints).

Muscles indirectly influencing the knee are indicated with blue arrows.



Posterior muscles of the knee joint are also mono- and biarticulating.

Muscles indirectly impacting the knee are indicated with blue arrows.

