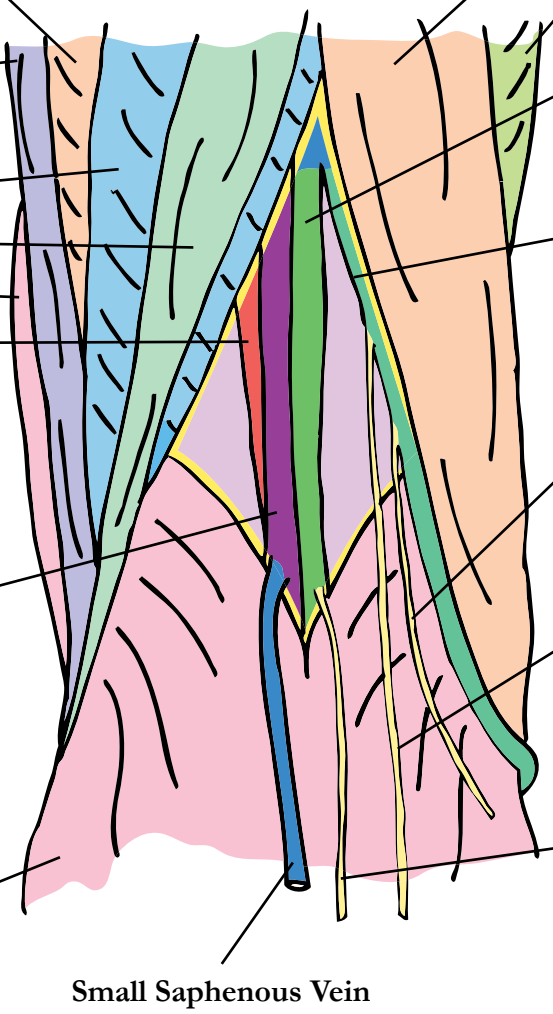
Popliteal Fossa - Knee
Posterior View

Medial **Lateral**



Sciatic Nerve

Adductor Magnus Muscle

Gracilis Muscle

Semimembranosus Muscle

Semitendinosus Muscle

Sartorius Muscle

Popliteal Artery
- passes through the popliteal fossa and enters the posterior compartment of the leg by passing through the fibrous arch of soleus muscle
- passes from a superomedial position to an inferocentral position within the popliteal fossa
- situated deep to both the popliteal vein and the tibial nerve within the popliteal fossa
- pulse can be palpated in this region; easiest superiorly, just medial to the midline with the knee slightly flexed

Popliteal Vein
- drains into the femoral vein, superiorly; formed by the union of the venae comitantes of the posterior tibial and the anterior tibial arteries
- enters the popliteal fossa via the fibrous arch of soleus muscle and exits the popliteal via the adductor hiatus
- drains the small saphenous vein
- crosses popliteal artery from posteromedial to posterolateral as it passes superiorly

Gastrocnemius Muscle
- plantaris muscle is immediatly deep to the gastrocnemius muscle

Small Saphenous Vein

Biceps Femoris Muscle

Vastus Lateralis Muscle

Tibial Nerve
- ventral division of ventral rami L-4, L-5, S-1, S-2 & S-3
- enters posterior compartment of the leg via the fibrous arch of soleus muscle

Common Fibular Nerve
- dorsal division of ventral rami L-4, L-5, S-1 & S-2
- passes along the superior lateral border of the popliteal fossa at the edge of the biceps femoris muscle to course around teh fibular head and neck
- enters lateral compartment of the leg by piercing the posterior intermuscular septum of the leg where it divides into its two terminal branches; superficial and deep fibular nerves

Lateral Cutaneous Nerve of the Calf
- dorsal division of ventral rami L-5, S-1 & S-2
- arises in the popliteal fossa and passes into the superficial fascia over the lateral calf region to supply the superior part of the lateral aspect of the leg

Fibular Communicating Nerve/ Lateral Sural Cutaneous Nerve
- dorsal division of ventral rami S-1 & S-2
- arises in the popliteal fossa from the common fibular nerve or in the leg from the lateral cutaneous nerve of the calf and passes inferomedially to join the sural nerve, in the inferior 1/2 of the leg.

Medial Sural Cutaneous Nerve/ Sural Nerve
- ventral division of ventral rami S-1 & S-2
- branch of tibial nerve that passes into the superficial fascia at the inferior aspect of the popliteal fossa, travels inferiorly through the leg region and passes posterior to the lateral malleolus to reach the lateral aspect of the foot.

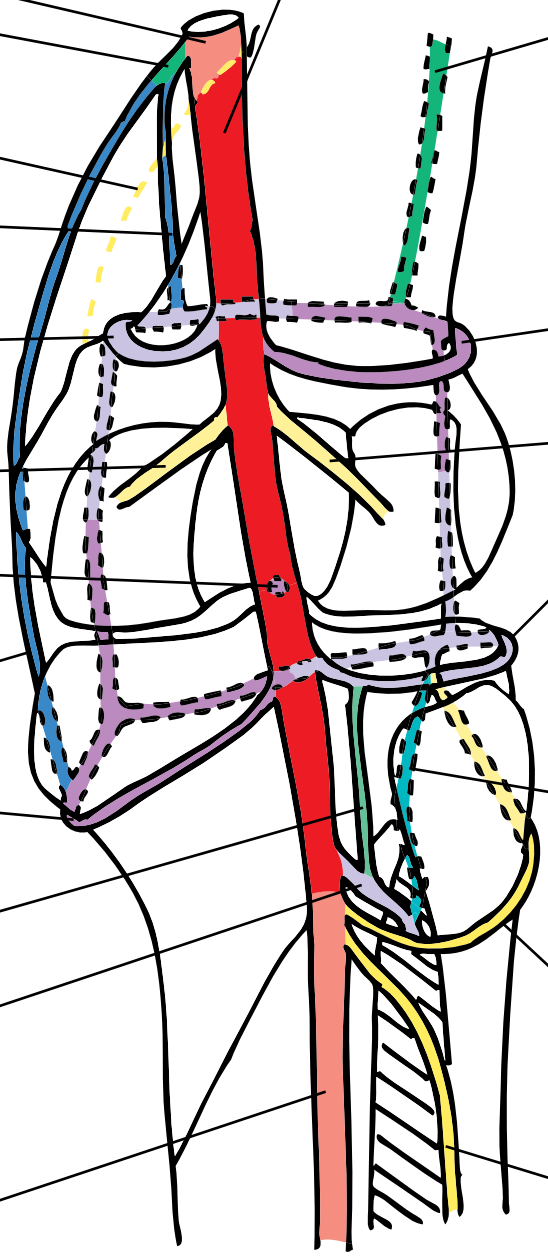
The fossa bulges posteriorly when the knee is extended and becomes depressed when the knee is flexed. Clinically, this is an important area as the pulse of the popliteal artery can be palpated here and the popliteal lymph nodes are located here.
There is much adipose tissue in the popliteal fossa to protect all of the neurovascular structures.

Floor:
Popliteal surface of the femur - superior
Oblique popliteal ligament - central
Popliteus muscle and its fascial covering - inferior

Roof: formed by skin and fasciae
Superficial Fascia - contains fat, terminal end of the small saphenous vein, and cutaneous nerves
Deep Fascia/popliteal fascia - thin, strong fascial covering that holds the borders together and connects the fascia lata to the fascia cruris

Vascular Supply - Knee Joint
Posterior View

note: Dashed lines are anterior



Femoral Artery

Popliteal Artery

***Descending Genicular**

***Descending Lateral Femoral Circumflex Artery**

Adductor Hiatus

***Articular Artery**

***Superior Medial Genicular Artery**
- passes toward the medial condyle of the femur, deep to the semimembranosus and semitendinosus muscles

***Superior Lateral Genicular Artery**
- passes toward the lateral condyle of the femur, deep to biceps femoris muscle

Sural Artery

Sural Artery
- 2 or 3 arteries that pass to the gastrocnemius, soleus and plantaris muscles
- muscular branches and functional end arteries

Middle Genicular Artery
- an anterior branch of the popliteal artery at the level of the knee joint which pierces the oblique popliteal ligament to supply the internal structures of the posterior knee joint

***Inferior Lateral Genicular Artery**
- passes toward the lateral condyle of the tibia superficial to the popliteus muscle and deep to the gastrocnemius and plantaris muscles.

***Saphenous Artery**

***Anterior Tibial Recurrent Artery**
- a branch of the anterior tibial artery arising immediately after passage into the anterior compartment of the leg
- passes superiorly within the tibialis anterior muscle belly

***Inferior Medial Genicular Artery**
- passes toward the medial condyle of the tibia along the superior border of popliteus muscle

***Posterior Tibial Recurrent Artery**
- a branch of the anterior tibial artery arising before passage into the anterior crural compartment
- passes superiorly, deep to the popliteus muscle, to supply the proximal tibiofibular joint

***Circumflex Fibular Artery**
- branch of the posterior tibial artery that courses around the neck of the fibula, deep to soleus muscle
- may be a branch of the anterior tibial artery

Anterior Tibial Artery
- terminal branch of the popliteal artery
- a lateral branch which arises near the inferior border of the popliteus muscle
- enters the anterior compartment of the leg by passing through the superior (proximal) opening in the interosseous membrane

Fibular Artery/ Peroneal Artery
- usually a branch of the posterior tibial artery that courses inferiorly along the posteromedial aspect of the fibula
- may arise from the popliteal artery when there is a trifurcation

Posterior Tibial Artery
- terminal branch of popliteal artery
- usually appears as the most direct continuation of the popliteal artery
- arises in the deep posterior crural compartment

***Genicular Anastomosis**

Knee Joint
Posterior View

Medial **Lateral**

Extracapsular Ligaments/Extrinsic Ligaments
- these ligaments are located outside of or are part of the knee joint capsule

Adductor Tubercle

Capsule
- knee joint capsule is well defined and reinforced by ligaments medially, laterally and posteriorly
- knee joint capsule is deficient anteriorly where it is replaced by the patellar tendon, the medial patellar retinaculum and the lateral patellar retinaculum

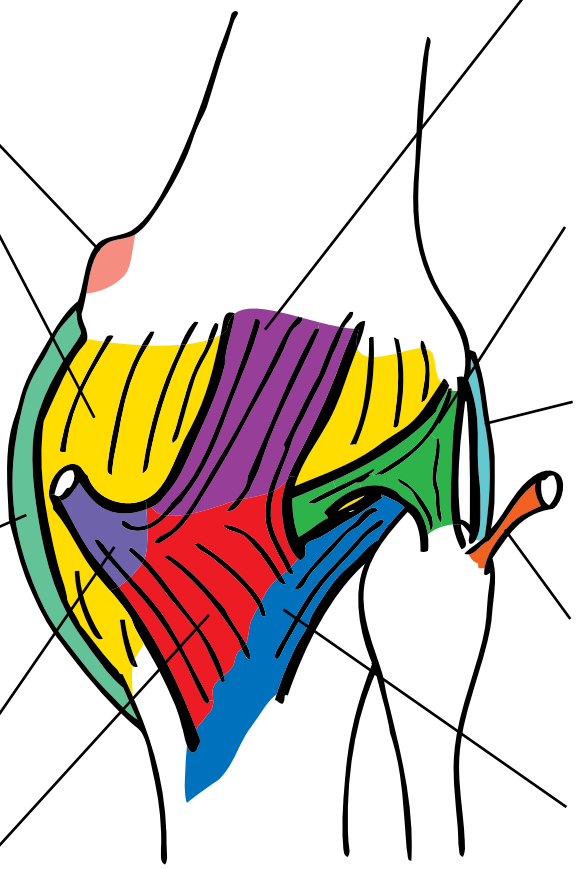
Medial Patellar Retinaculum
- a fascial extension from the vastus medialis muscle to the patella and patellar ligament
- reinforces the knee joint anteromedially

Lateral Patellar Retinaculum
- fascial extension from the vastus lateralis muscle to the patella and patellar ligament
- reinforces the knee joint anterolaterally

Medial Genual Collateral Ligament/ Tibial Genual Collateral Ligament
- a broad ligament that extends from the medial epicondyle of the femur to the medial surface fo the medial condyle and shaft of the tibia
- *its deep surface attaches to the medial surface of the medial meniscus* so if the ligament is damaged, the medial meniscus is generally also damaged
- reinforces the knee joint capsule, medially
- blends with the capsule

Semimembranosus Tendon

Fascia over Popliteus Muscle



Oblique Popliteal Ligament
- an extension of the semimembranosus tendon that attaches at the margins of the femoral intercondylar notch
- the fascia over the popliteus muscle is not considered to be a ligament and it is inferior to the knee joint
- reinforces the knee joint capsule, posteriorly
- blends with the capsule
- forms part of the floor of the popliteal fossa

Arcuate Popliteal Ligament/ Arcuate ligament of the Knee
- a Y-shaped ligament that attaches to the lateral epicondyle of the femur, the posterior tibial intercondylar fossa and the apex of the fibula
- reinforces the knee joint capsule, posteriorly

Lateral Genual Collateral Ligament/ Fibular Genual Collateral Ligament
- a relatively narrow, round ligament that extends from the lateral epicondyle of the femur to the apex of the fibula
- **does not** attach to the lateral meniscus
- reinforces the knee joint capsule, laterally

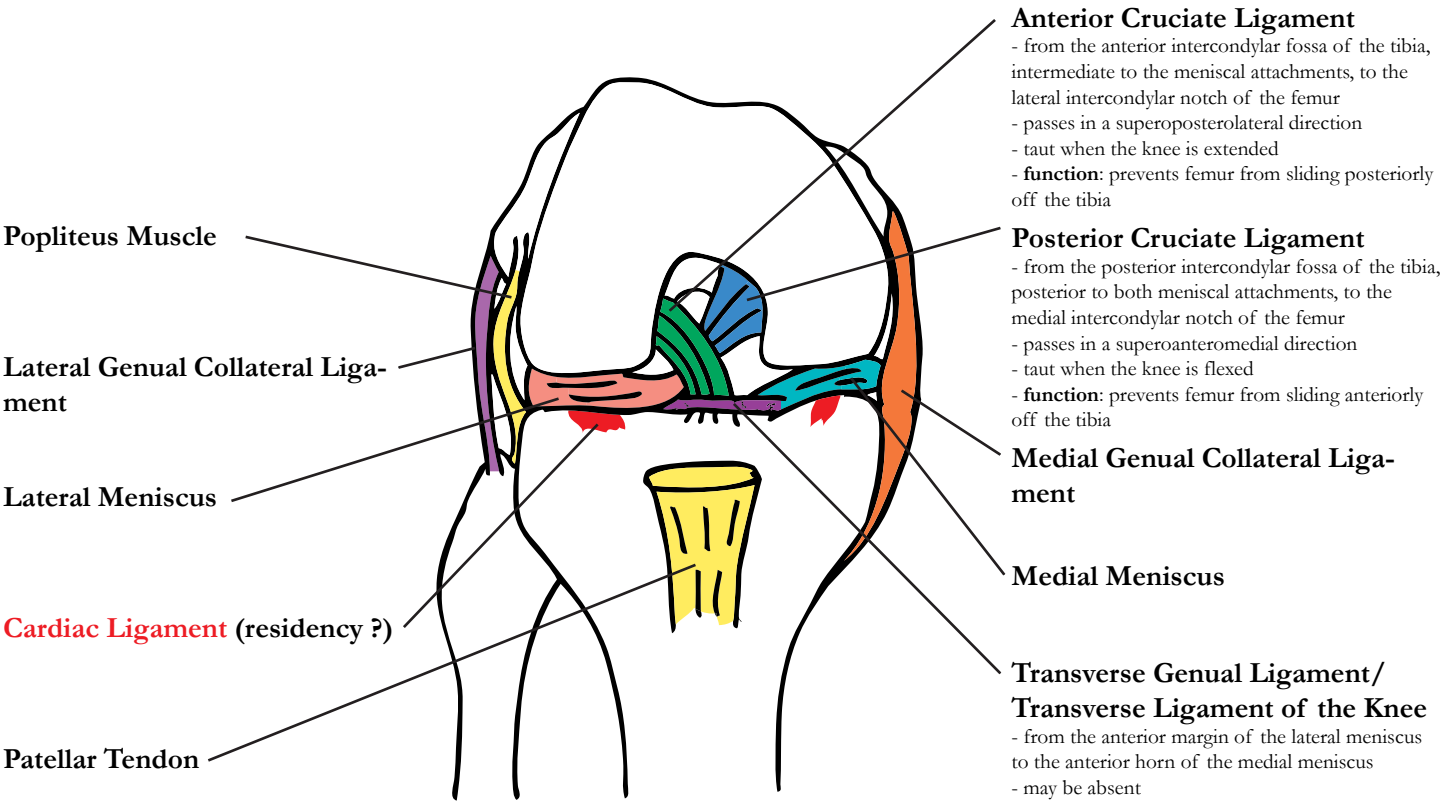
Biceps Femoris Tendon

Popliteus Muscle

- knee joint is often described as a ginglymus (hinge) type of joint, which only allows flexion and extension. However a small amount of rotation normally occurs at the knee joint as well. There is usually some medial rotation of the leg with the knee joint flexion and some lateral rotation of the leg with knee joint extension. This is most easily demonstrated by slowly flexing and extending the leg with the foot planted on the floor. As the knee flexes, the malleoli will internally rotate. As the knee extends, the malleoli will externally rotate. The knee joint is a structural synovial ginglymus or synovial bicondylar joint and a functional diarthrosis.
- arterial supply is from the *genicular anastomosis* and the *middle genicular artery*.
- innervation to the knee joint is supplied by branches of the *obturator, femoral, tibial and common fibular nerves*. The posterior branch of the obturator nerve generally sends a branch that enters the joint posteriorly with the middle genicular artery. The tibial nerve sends two or three branches that generally follow the medial and middle genicular arteries. The common fibular nerve sends branches that follow the lateral genicular arteries, and the anterior tibial recurrent artery. The anterior tibial recurrent branch innervates the infrapatellar fat pad. the saphenous nerve, and muscular branches to the vasti muscles from the femoral nerve supply the knee joint from the medial, anterior and lateral aspects.

Flexed Knee Joint
Anterior View

Lateral **Medial**



Popliteus Muscle

Lateral Genual Collateral Ligament

Lateral Meniscus

Cardiac Ligament (residency ?)

Patellar Tendon

Anterior Cruciate Ligament
- from the anterior intercondylar fossa of the tibia, intermediate to the meniscal attachments, to the lateral intercondylar notch of the femur
- passes in a superoposterolateral direction
- taut when the knee is extended
- **function**: prevents femur from sliding posteriorly off the tibia

Posterior Cruciate Ligament
- from the posterior intercondylar fossa of the tibia, posterior to both meniscal attachments, to the medial intercondylar notch of the femur
- passes in a superoanteromedial direction
- taut when the knee is flexed
- **function**: prevents femur from sliding anteriorly off the tibia

Medial Genual Collateral Ligament

Medial Meniscus

Transverse Genual Ligament/ Transverse Ligament of the Knee
- from the anterior margin of the lateral meniscus to the anterior horn of the medial meniscus
- may be absent

Menisci of the Knee joint
- cresent-shaped pads of fibrocartilage that produce a better fit between the tibia and the femur
- thicker at the external edge and very thin centrally
- surrounded by synovial fluid except at external surfaces
- may help to lubricate joint surfaces properly, so are intrasynovial and intracapsular
- sometimes regenerate after excision

Medial Meniscus
- semi-circular (C-shaped) pad that covers part of the superior articular surface of the medial condyle of the tibia
- attached to the medial genual collateral ligament, medially to maintain position

Anterior Horn of Medial Meniscus
- the anterior ligamentous part
- attaches to the anteromedial aspect of the *anterior intercondylar fossa* of the tibia, anterior to the attachments of the anterior cruciate ligament and the anterior horn of the lateral meniscus

Posterior Horn of Medial Meniscus
- the posterior ligamentous part
- attaches to the medial aspect of the *posterior intercondylar fossa* of the tibia, anterior to the attachment of the posterior cruciate ligament and posterior to the attachment of the posterior horn of the lateral meniscus

Lateral Meniscus
- an almost circular-shaped pad that covers the majority of the superior articular surface of the lateral condyle of the tibia
- its posterolateral edge attaches to the popliteus muscle which helps maintain its articular position

Anterior Horn of Lateral Meniscus
- the anterior ligamentous part
- attaches to the posterolateral aspect of the *tibial anterior intercondylar fossa*, immediately anterior to the intercondylar eminence and posterior to the attachement of the anterior cruciate ligament

Posterior Horn of Lateral Meniscus
- the posterior ligamentous part
- attaches to the anterolateral aspect of the *tibial posterior intercondylar fossa*, immediately posterior to the intercondylar eminence and anterior to the attachments of the posterior horn of the medial meniscus and the posterior cruciate ligament

Knee Joint
Posterior View
- capsule removed -

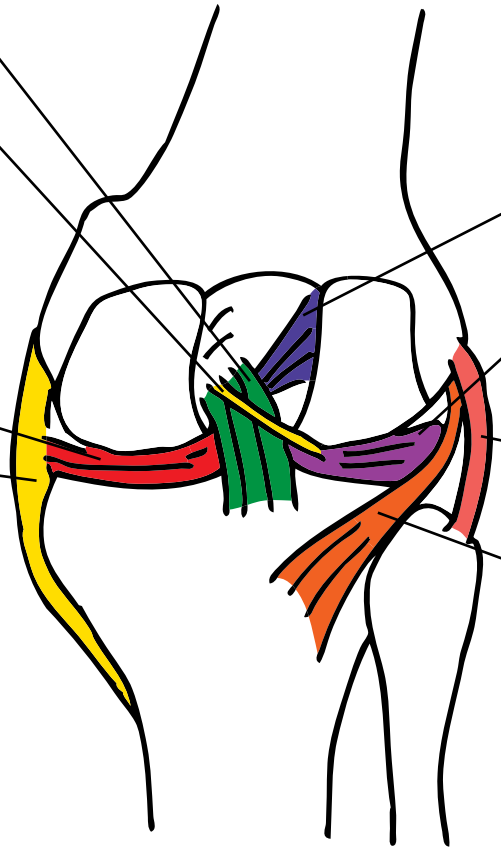
Medial **Lateral**

Posterior Cruciate Ligament

Posterior Meniscofemoral Ligament/ Ligament of Wrisberg
- from the posterior edge of the lateral meniscus to the lateral surface of the medial femoral condyle/ medial femoral intercondylar notch
- passes along the posterior aspect of the posterior cruciate ligament

Medial Meniscus

Medial Genual Collateral Ligament



Anterior Cruciate Ligament

Lateral Meniscus

Lateral Genual Collateral Ligament

Popliteus Muscle

Anterior Meniscofemoral Ligament/ Ligament of Humphry
- From the posterior edge of the lateral meniscus to the lateral surface of the medial femroal condyle / medial femoral intercondylar notch
- passes along the anterior aspect of the posterior cruciate ligament
- may be absent

Muscle
- the popliteus muscle is closely associated with the knee joint; its origin is intracapsular and it becomes extracapsular as it passes distal to the medial edge of the arcuate popliteal ligament
- it is an intracapsular and extrasynovial structure of the knee
- attaches to the posterolateral edge of the lateral meniscus which helps maintain the meniscal position

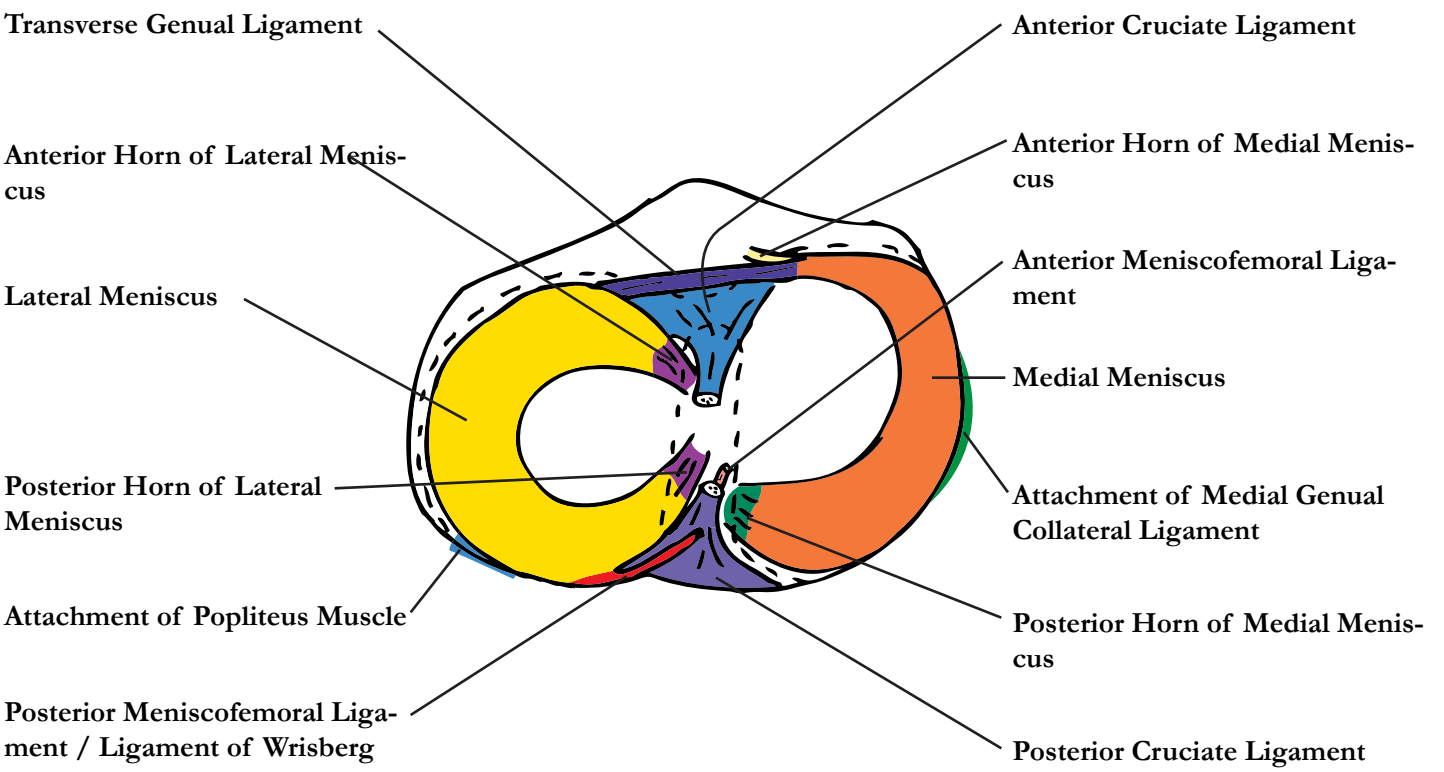
Tibia
- attaches along the margins of the articular cartilage on teh superior surface; it invaginates along the anterior and posterior intercondylar sulci

Anterior Intercondylar Sulcus
- the synovial membrane invaginates slightly form the anterior edge to line the posterior aspect of the *infrapatellar fat pad*
- passes superiorly to the patella from the central area or to the menisci from the articular margins

Posterior Intercondylar Sulcus
- the synovial membrane invaginates to line the anterior, medial and lateral aspects of both cruciate ligaments, so the posterior aspect of the capsule is not lined by synovium
- this part of the synovial membrane passes to the inferior edge of the intercondylar notch of the femur from the margins of the sulcus or to the inferior meniscal edges from the posterior articular margins of the sulcus.

Cross Section of Knee Joint
Superior View

Lateral **Medial**



Synovial Membrane (dashed lines)
- all structures in knee are extrasynovial
- synovial cavity of the knee is the largest in the body

Femur
- attaches along the margins of the articular cartilage of the distal femur; medially, anteriorly, laterally and posteriorly
- are two attachments at the inferior edge of the intercondylar notch; one from the apex of the patella and one from the anterior edge of the posterior intercondylar sulcus of the tibia.

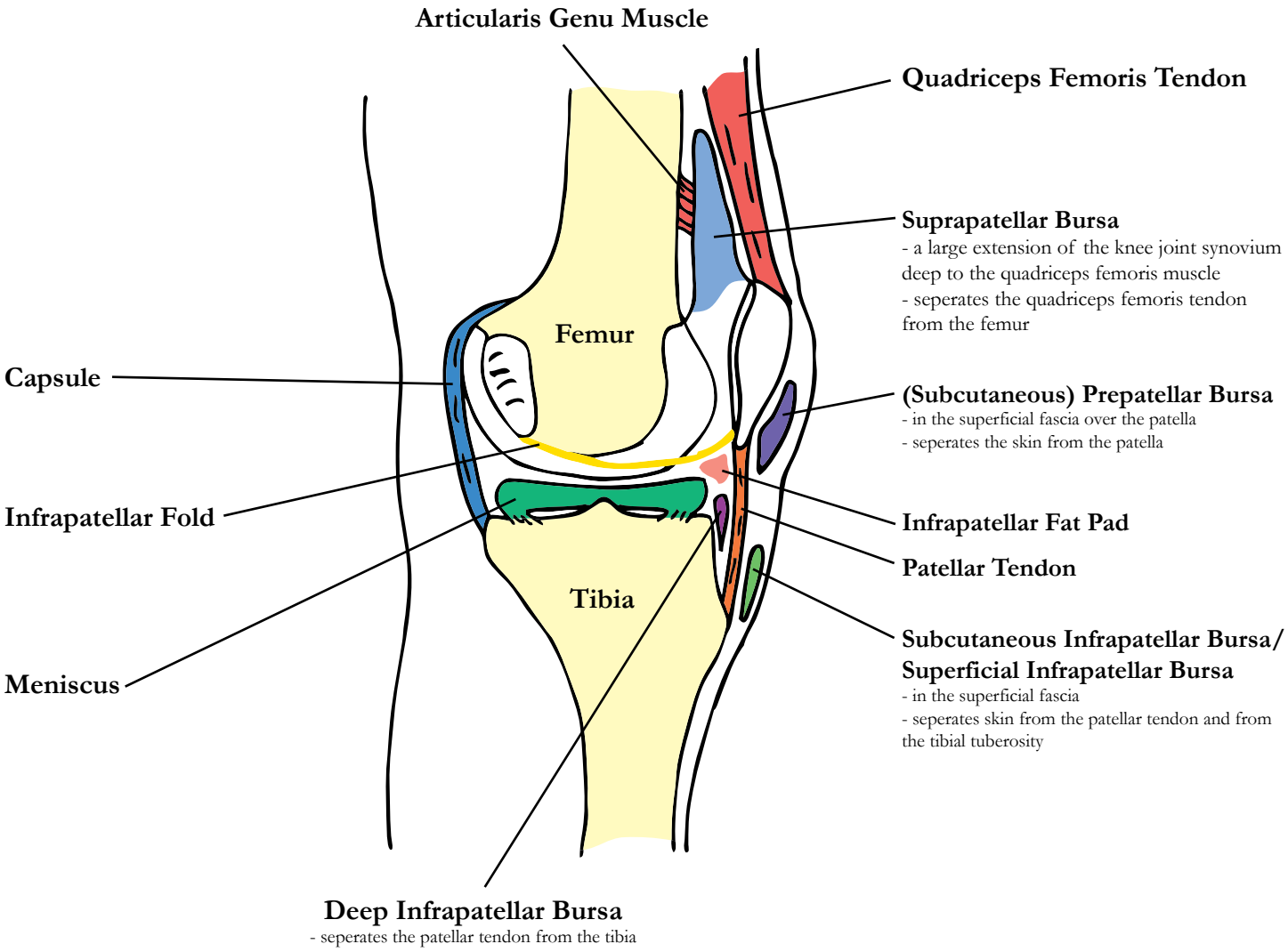
Menisci
- the synovium attaches to the external edges of the menisci and passes to the margins of the articular cartilage of the femoral and tibial condyles and the patella

Patella
- attaches along the margins of the articular cartilage on the posterior surface
- from the superior border of the patella to the superior edge of the patellar surface of the femur
- here it forms the *suprapatellar bursa* which extends superiorly, deep to the quadriceps femoris muscle

Patella cont.
- from the inferior edge / apex of the patella to the inferior edge of the intercondylar fossa of the femur, the synovium passes inferoposteriorly
  - here it forms the *infrapatellar fold*
- from the medial and lateral margins of the patella, the synovium passes superiorly to the corresponding edges of the patellar surface of the femur, and inferiorly to the anterior superior edges of the menisci and the anterior intercondylar sulcus of the tibia (where menisci are not present)

Knee Joint
Midsagittal View

Posterior **Anterior**



Bursae of the knee

- function: allow free movement of the structures that are seperated erior side and projects posteriorly in doing this

Anserine Bursa / Bursa Anserina (not pictured)
- located between the medial collateral ligament of the knee and teh pes anserinus, also around the individual tendons of the pes anserinus as they insert at the proximal medial tibial shaft
- seperates the patellar tendon from the tibia

Semimebranosus Bursa (not pictured)
- located between the semimembranosus muscle and the medial head of the gastrocnemius muscle at the area of the medial condyle of the femur

Popliteus Bursa (not pictured)
- located between the poplieus tendon and the lateral condyle of the tibia
- continuous wiht the knee joint inferior to the lateral meniscus (not pictured)
- located between the medial head of gastrocnemius muscle and the knee joint
- often communicates with the semimembranosus bursa
- may communicate with the knee joint

Infrapatellar Fat Pad

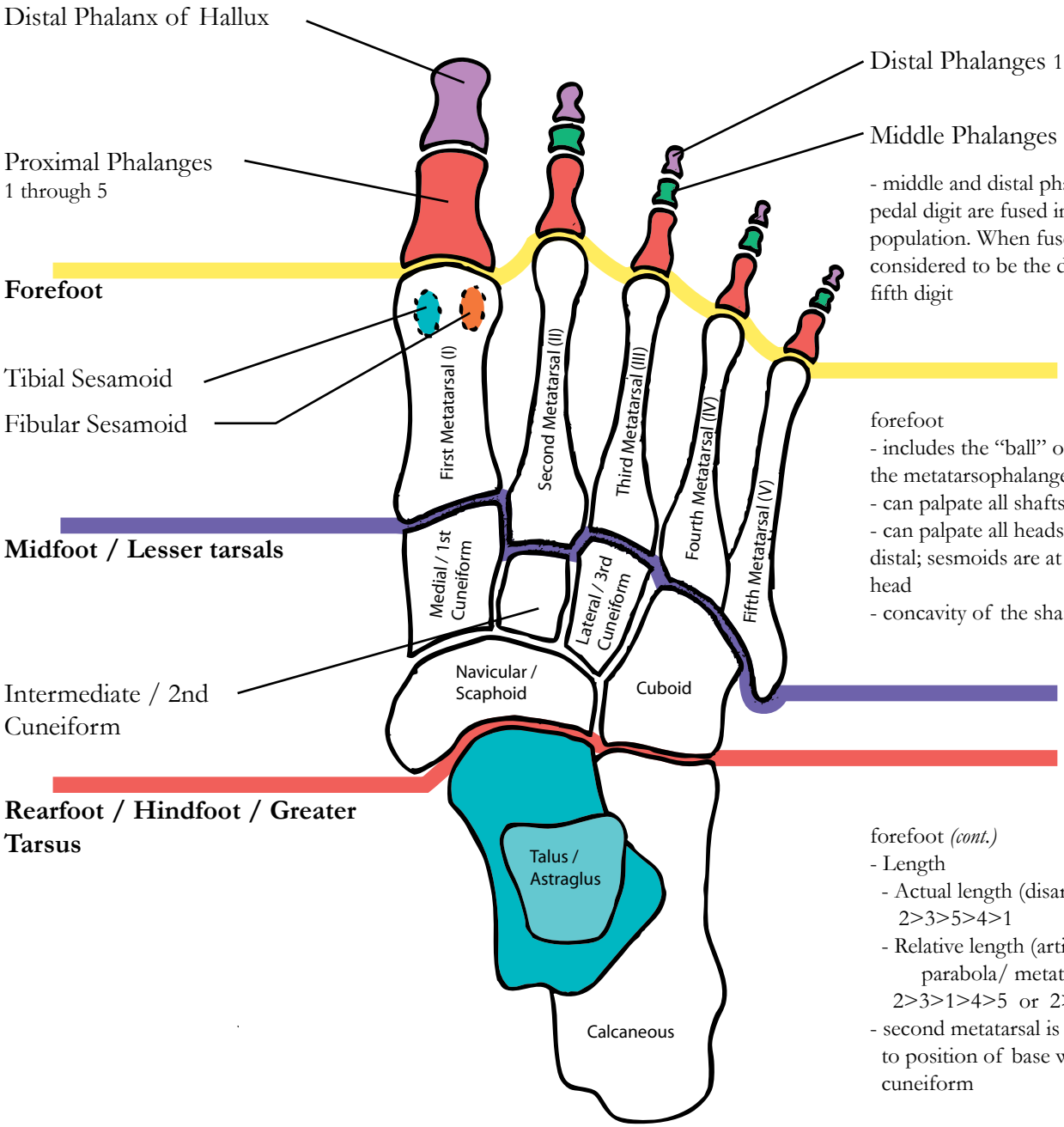
- adipose tissue which seperates the synovium from the patellar ligament
- the synovium lines this fat pad on its posterior side and projects posteriorly in doing this

Alar Folds
- two fringe-like structures that meet in the center, at the infrapatellar fold
- formed by the synovium as it lines the infrapatellar fat pad and passes from the patella to the menisci and tibia

Infrapatellar Fold
- extends from the apex of the patellar to the inferior margin of the intercondylar fossa of the femur
- where the alar folds meet (centrally)

Osteology of the Foot
Dorsal View

Medial **Lateral**



Distal Phalanges 1 through 5

Middle Phalanges of 2 through 5

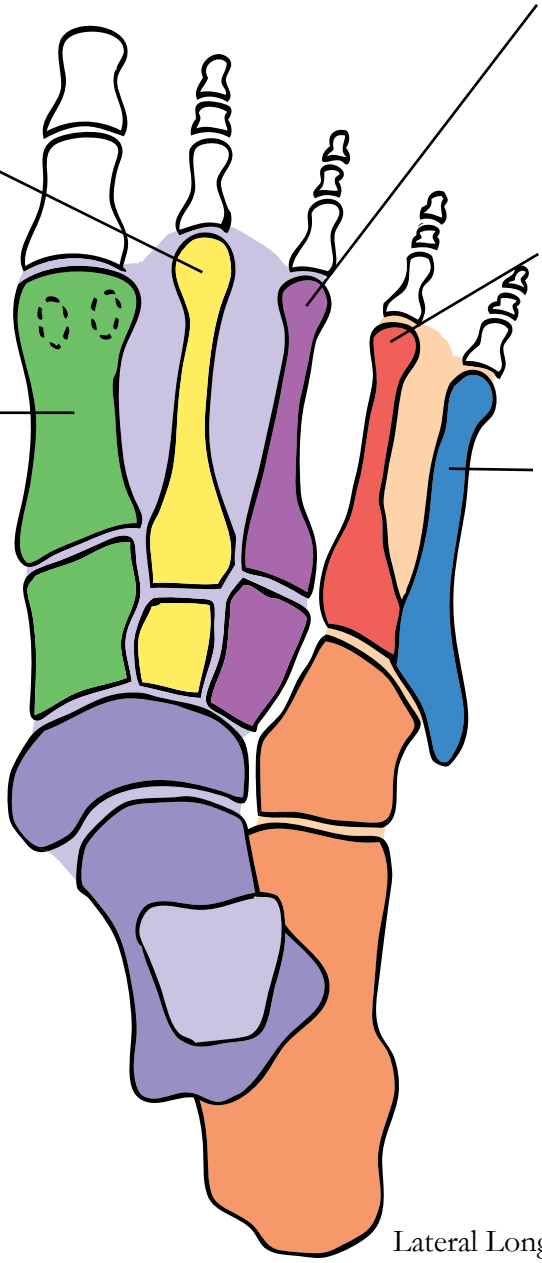
- middle and distal phalanges of the fifth pedal digit are fused in about 40% of the population. When fused they are considered to be the distal phalanx of the fifth digit

forefoot
- includes the "ball" of the foot which is the metatarsophalangeal joints
- can palpate all shafts dorsally
- can palpate all heads dorsal, plantar and distal; sesmoids are at the 1st metatarsal head
- concavity of the shafts is plantar

forefoot *(cont.)*
- Length
  - Actual length (disarticulated)
    2>3>5>4>1
  - Relative length (articulated); metatarsal parabola/ metatarsal protrusion
    2>3>1>4>5 or 2>3=1>4>5
- second metatarsal is the most stable due to position of base wedged between cuneiform

Functional Units - Foot
Dorsal View

Medial **Lateral**



Second Ray
- has least amount of motion because the metatarsal base is wedged between the medial and lateral cuneiform, the small amount of motion is directly dorsal and plantar

First Ray
- has the largest range of motion, in an arc around the second ray in the frontal plane

Third Ray
- motion describes an arc around the second ray, opposite direction to that of the first ray.
- greater amount of motion than the second ray; less motion than the fourth ray

Fourth Ray
- motion describes an arc, with a larger excursion than the same direction as the third ray
- less motion than the fifth ray

Fifth Ray
- motion describes an arc, with a larger excursion and the same direction as the fourth ray
- less motion than the first ray

Medial Column
- sometimes known as the mobile adaptor

Function: allows for efficient gait or propulsion

Includes: calcaneus, talus, navicular and the first through third rays (cuneiforms and metatarsals)

Lateral Column
- sometimes referred to as the rigid lever

Function: allows for efficient gait or propulsion

Includes: calcaneus, cuboid, fourth and fifth rays (metatarsals)

Arches of the foot
- **function**: allow the foot to absorb shock

Medial Longitudinal Arch
- layman's arch
- formed by the medial column of the foot
- from the heel to the first through third metatarsal heads, plantarly
- normally is a smooth curve of variable height, but higher than the lateral longitudinal arch

Lateral Longitudinal Arch
- formed by the lateral column of the foot
- from the heel to the fourth and fifth metatarsal heads, plantarly
- normally is a smooth curve of low height

Transverse Arch
- formed by the plantar aspect of the cuneiforms and the cuboids; 1/2 of this arch is in each foot
- some consider more than one transverse arch
  - also at the metatarsal heads, one in each foot
  - also at the metatarsal bases, 1/2 in each foot