

Second Life - The Lower Limb

A walk through detailing the bones, muscles, arteries, veins, lymphatic system, and innervation of the leg.

Second Life - The Lower Limb

- The Lower Limb will be presented in three different modules:

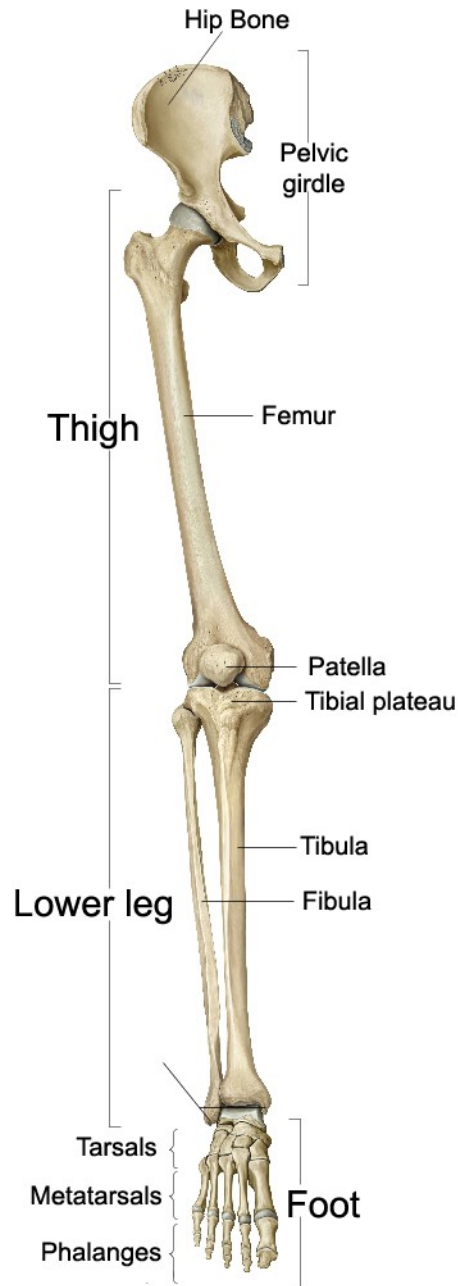
1. The Thigh
2. The Lower Leg
3. The Foot

Within each module relevant structure of bone, muscle, nerve innervation, arterial and venous supply and lymphatic system will be described as a unit.

Second Life - The Lower Limb

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Distinct Regions of the Lower Limb

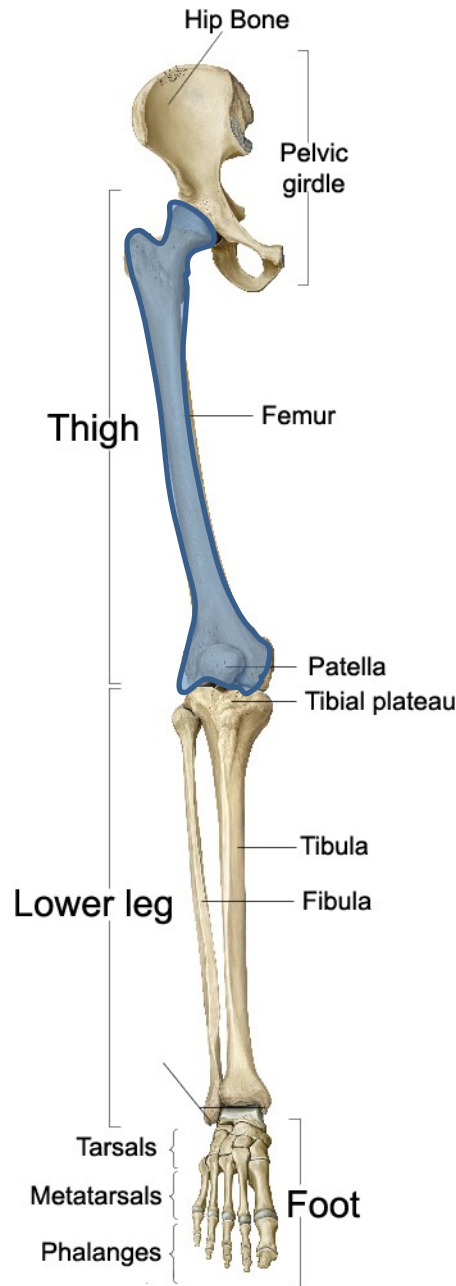


The Lower limb is subdivided into three regions: **Thigh**, **Lower Leg**, and **Foot**.

These regions comprise the entire lower limb, which is attached to the body at the pelvic girdle.

We will take an in-depth look at each of these three distinct lower limb regions. First let's begin by understanding the structure and function of the leg.

Distinct Regions of the Lower Limb

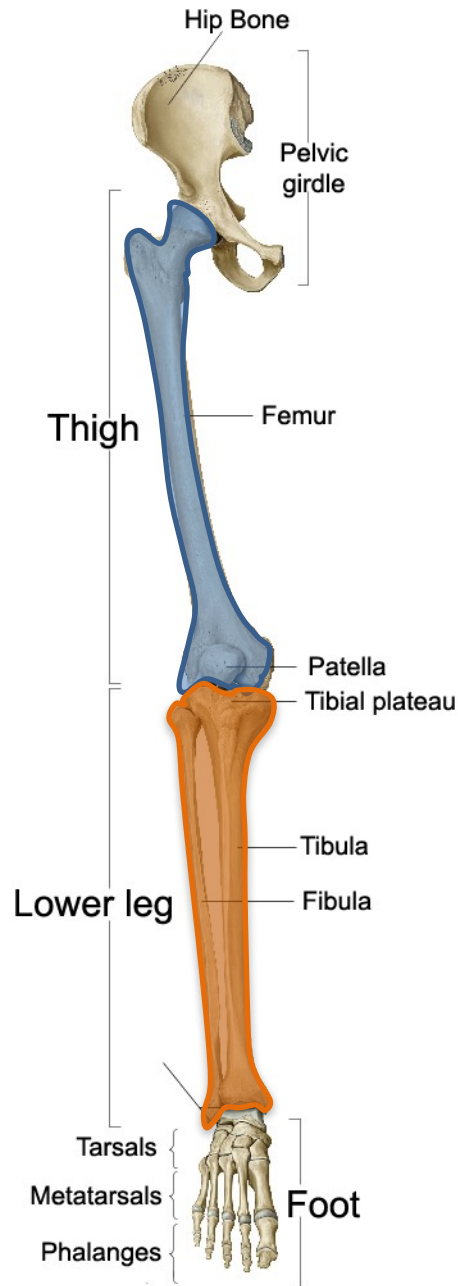


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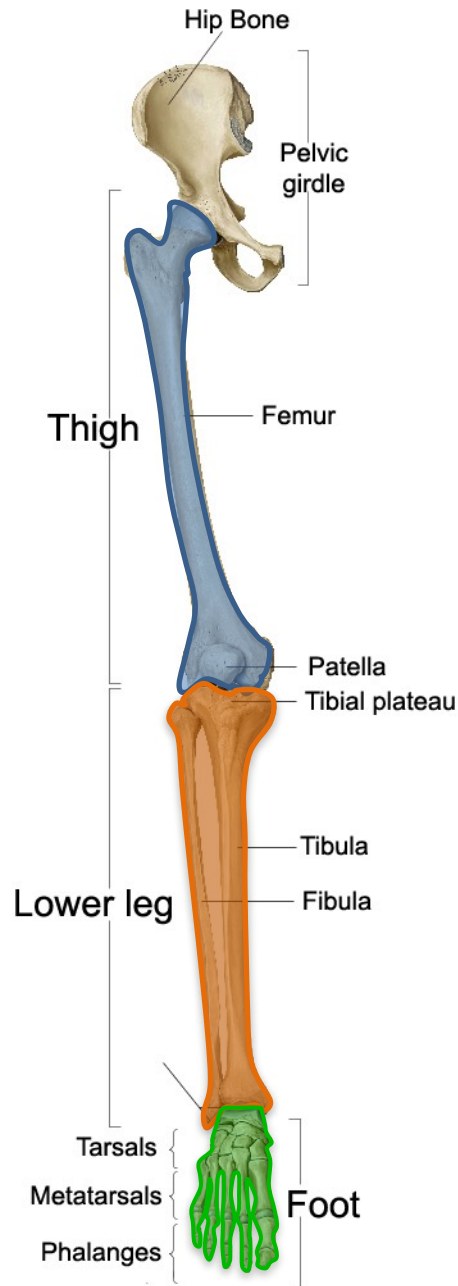


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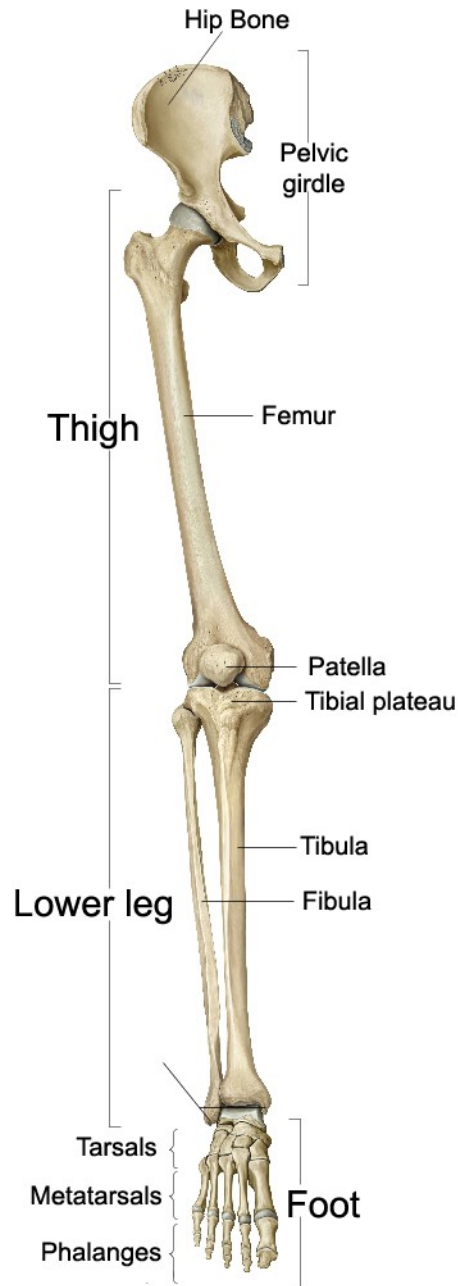


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The Femur



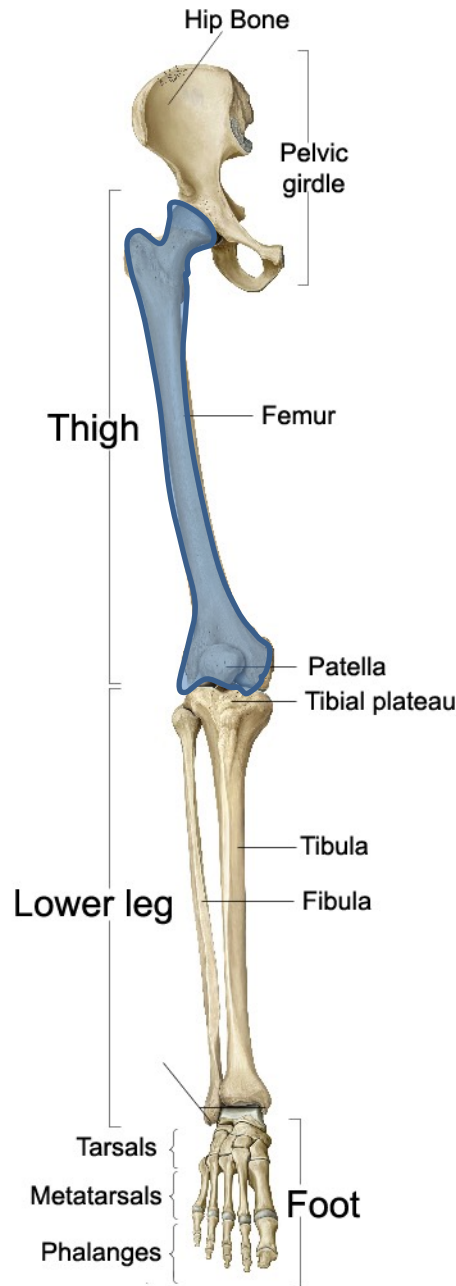
The lower limb is very similar to the upper arm in many ways yet has a more restricted range of motion. While the arm is built for movement, the leg is built for stability.

We will begin by covering the surface anatomy of the Femur. Understanding the features of this bone will provide the foundation for learning about the rest of the leg.

Only one bone composes the thigh: the *femur*.

There are several muscles that act on the femur that allow for such a complex movement as bipedal walking. Before we look at the muscles of the thigh, there are numerous features that make up the femoral surface.

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Right Femur:
Anterior View



Proximal Features of the FEMUR:

The femur is the longest bone in the human body and is responsible in bearing the most weight. The proximal end of the femur consists of two major tuberosities, a constricted neck and its hemispherical **head** where it articulates with the pelvis in a ball-and-socket joint.

The anterior processes and bony ridges in which the powerful muscles of the hip attach, include the **greater** and **lesser trochanters** (tro-CAN-turs) and **intertrochanteric line**.

Right Femur:
Anterior View

Head

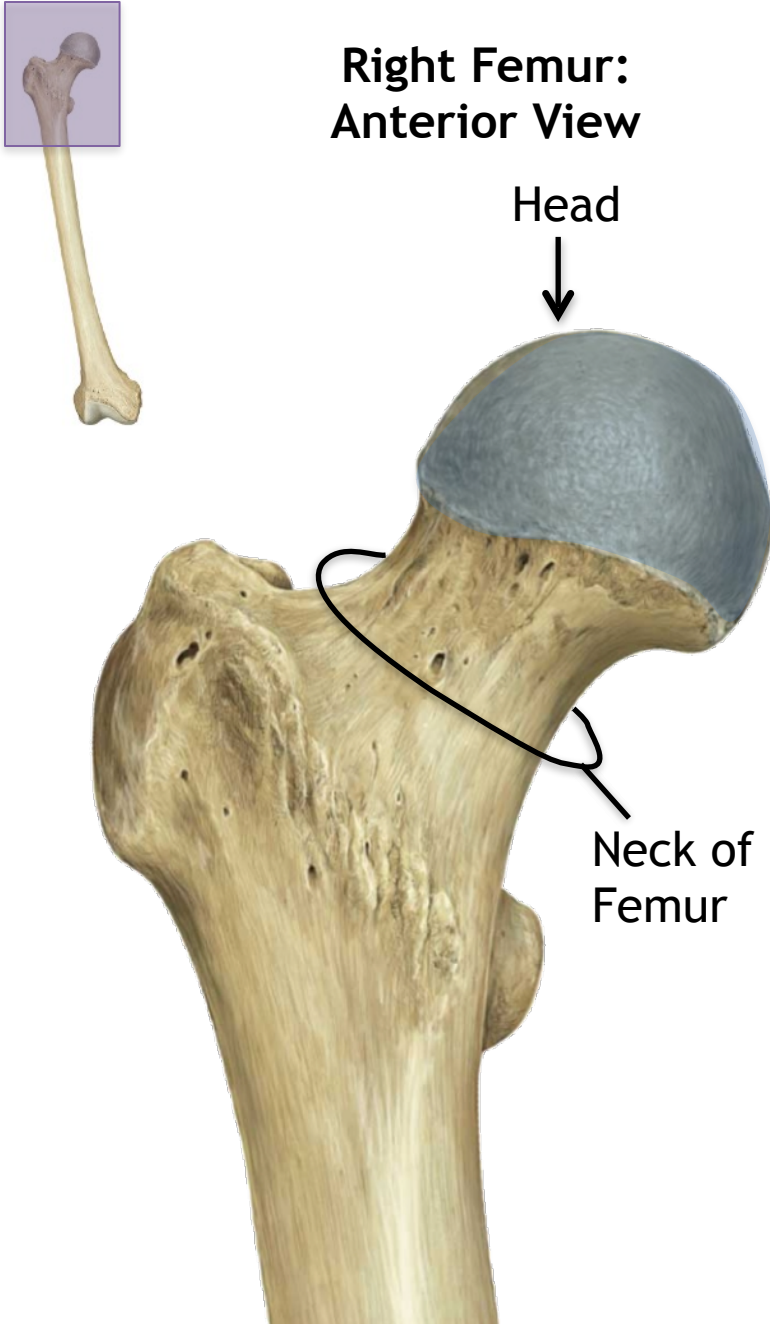


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Anterior View

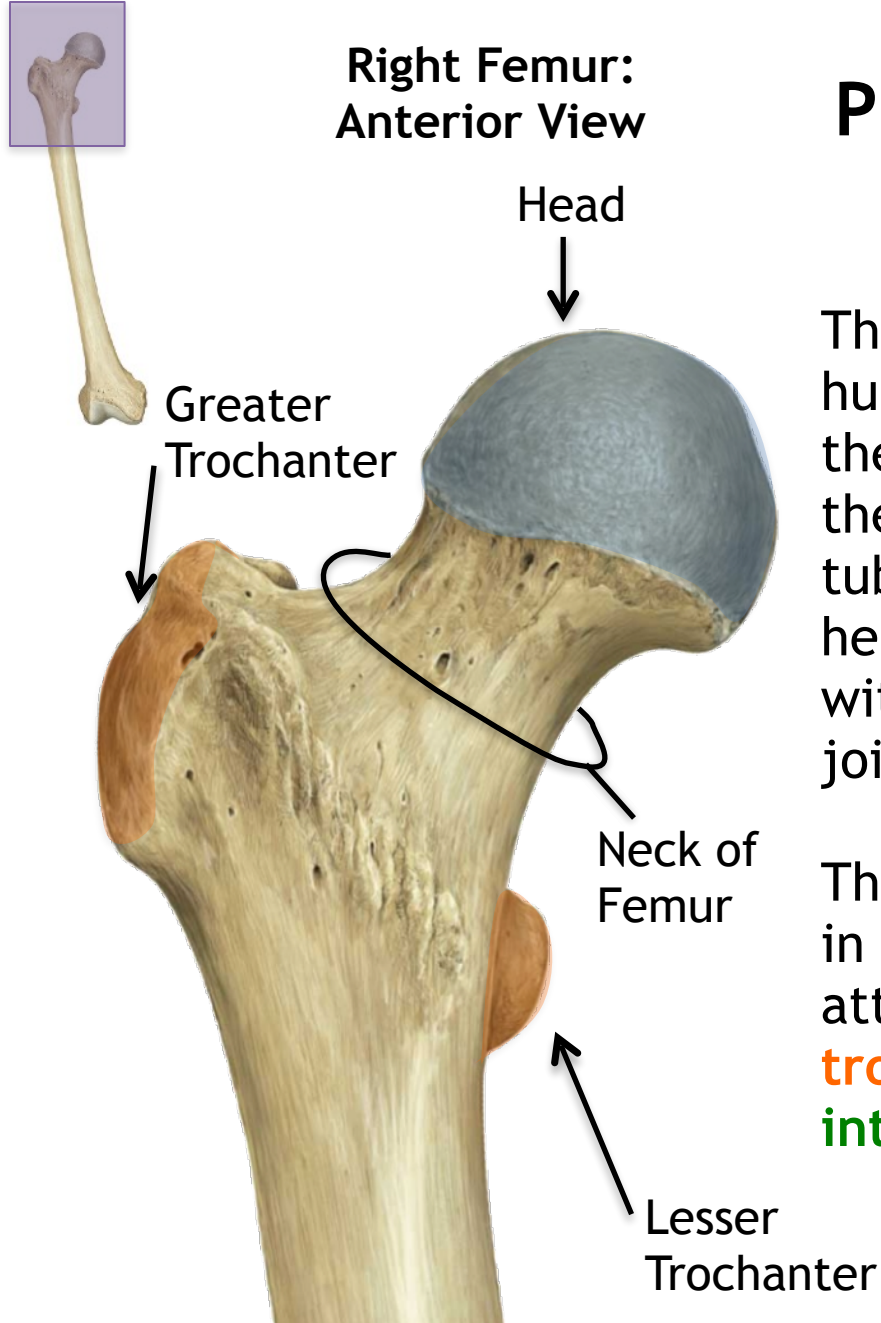


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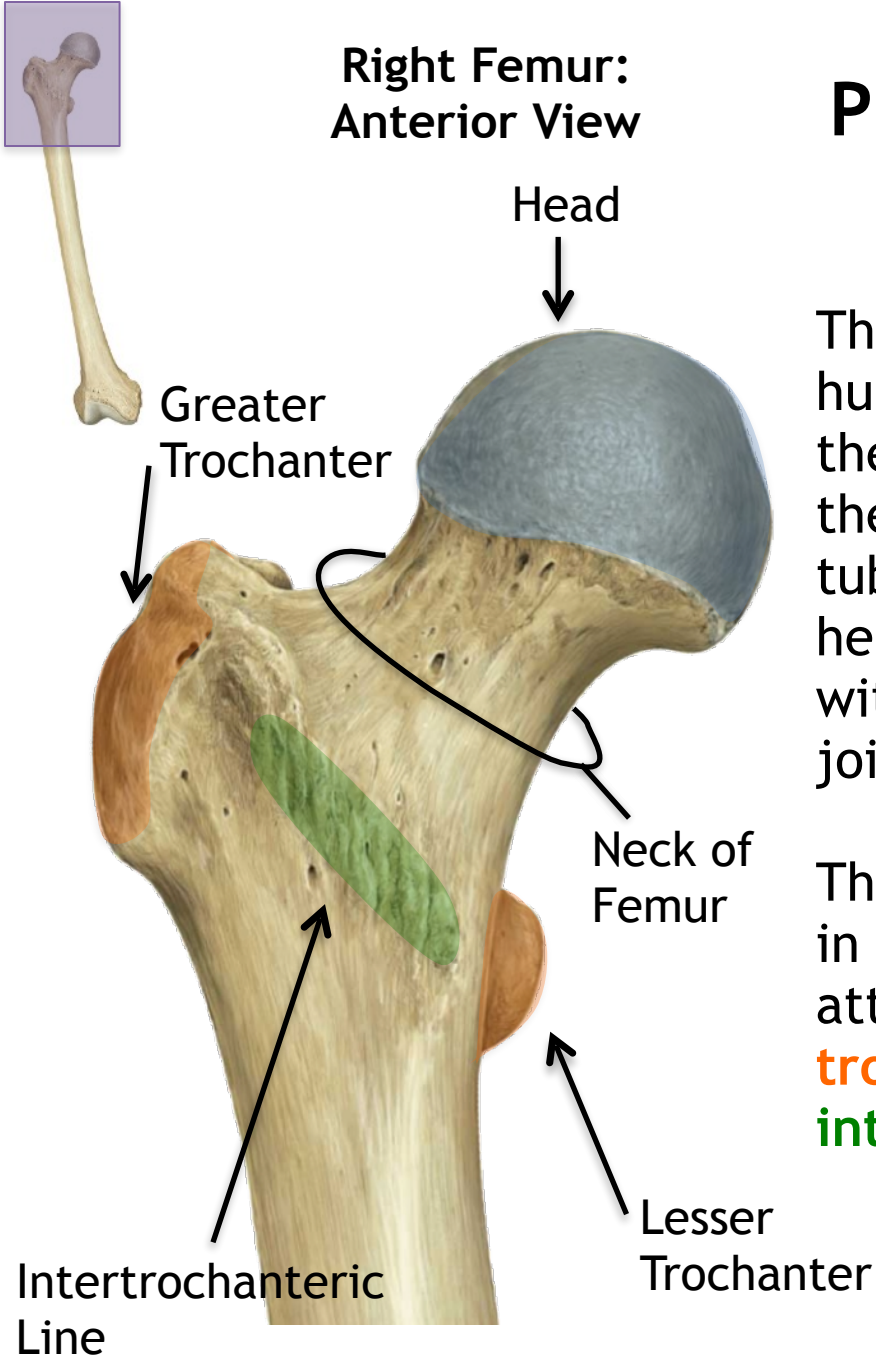


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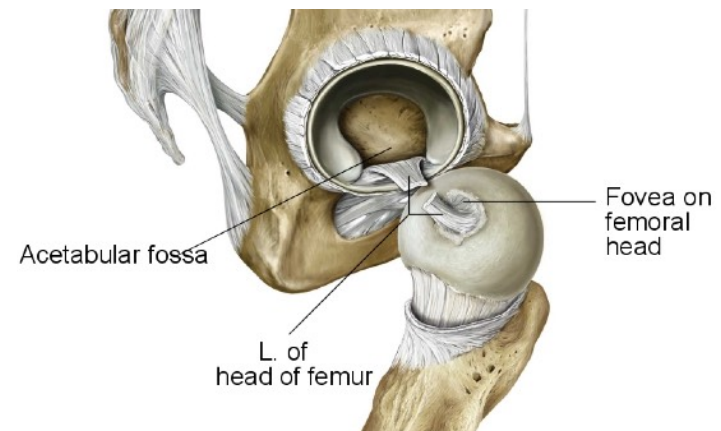
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Right Femur:
Posterior View

Proximal Features of the FEMUR:

On the posterior portion of the femur is the **intertrochanteric crest**.

The **fovea capitis** is also slightly viewable from the posterior side of the femur. It is at this pit that the Ligament of the Head of the Femur attached the femur to the hip as well as delivering part of the femur's blood supply.

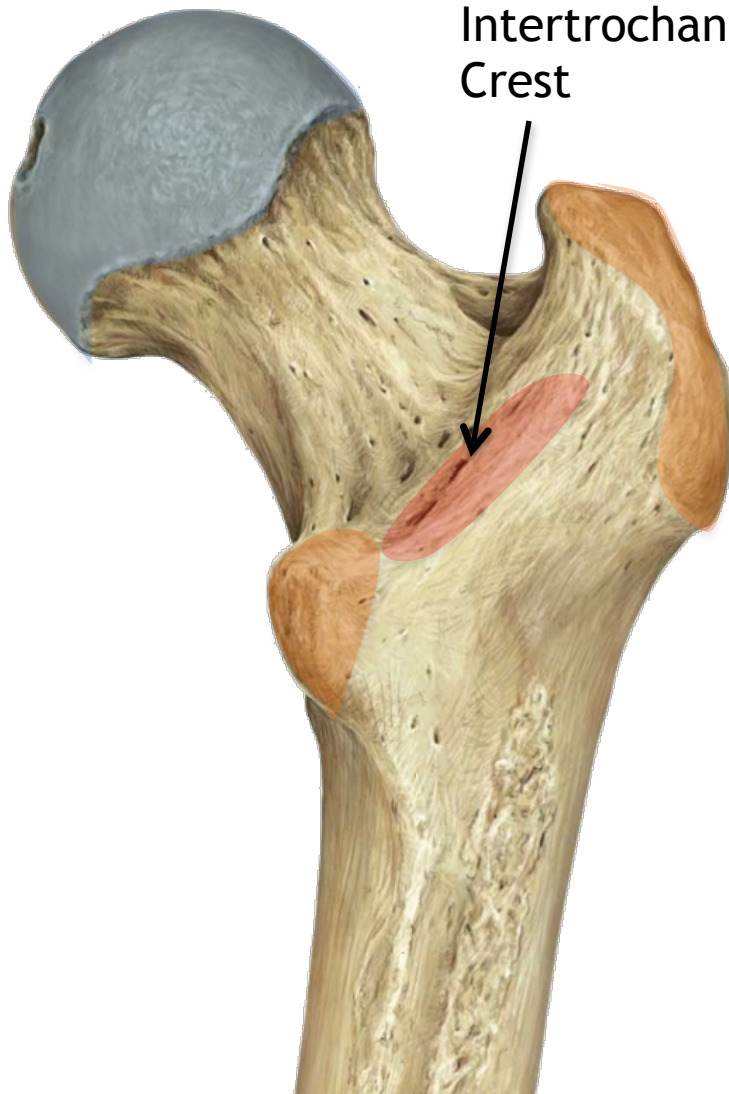
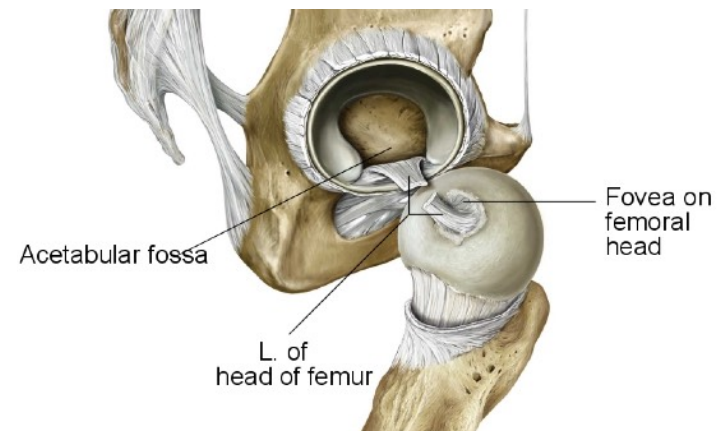


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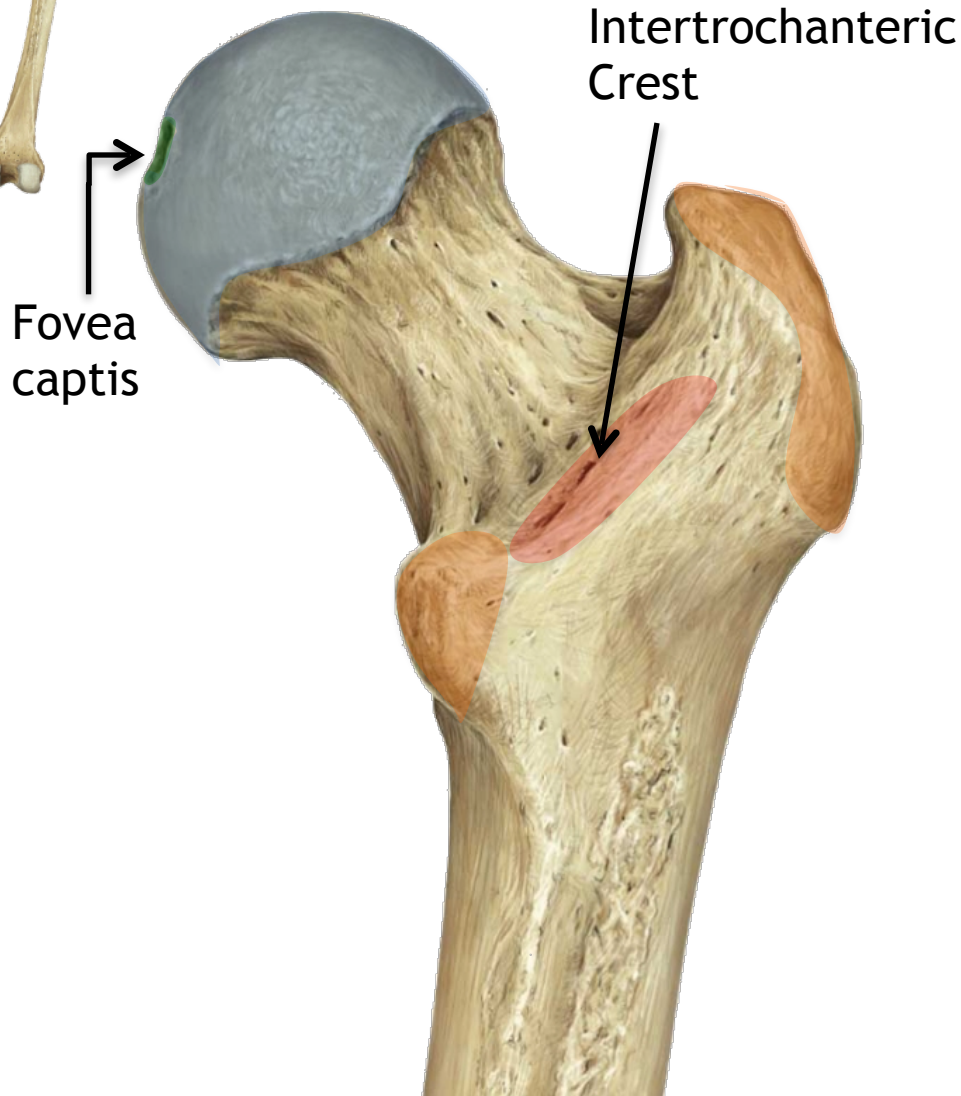
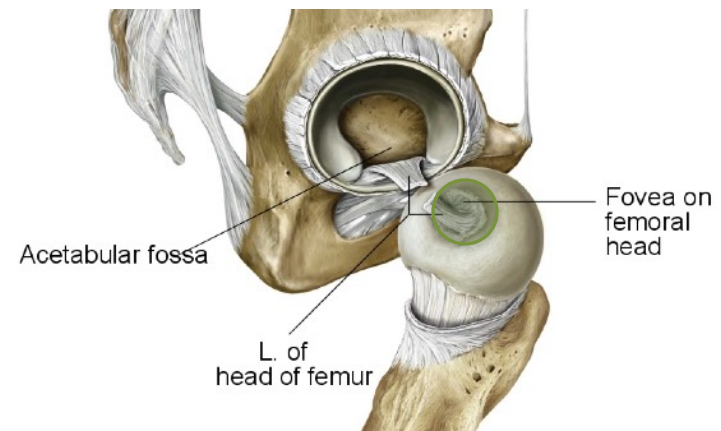


Right Femur: Posterior View

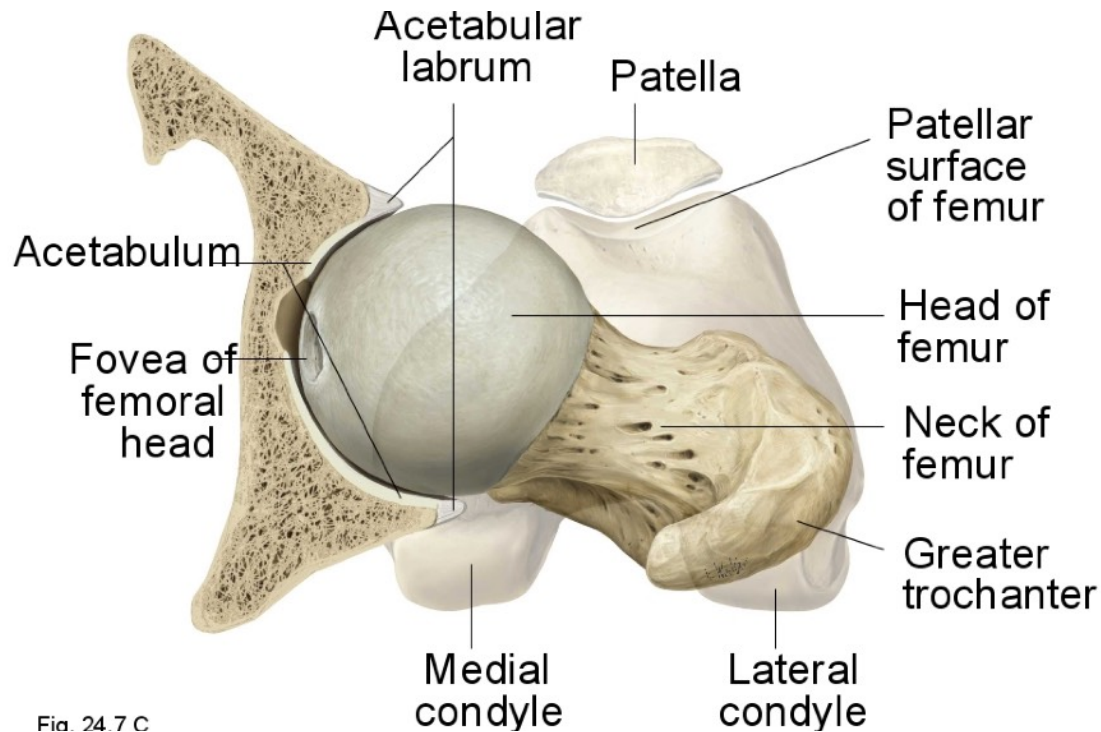
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The Hip Joint



The head of the Femur articulates at the acetabulum of the hip bone.

The Hip Joint: Acetabulum

The acetabulum is located at the intersection of three bones that fuse between the ages of 14 to 16. These three bones include the **ilium**, **ischium** and **pubis**. It is at this point that the femur articulates with the hip and is connected by multiple ligaments



Ilium



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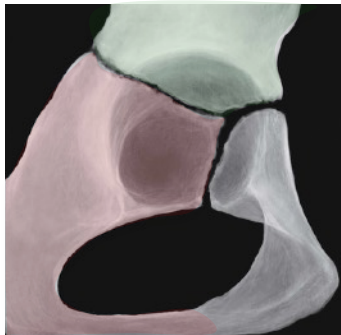


Ischium



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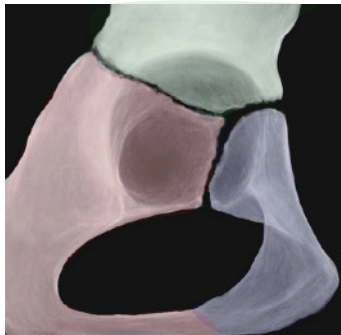
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Ischium

Pubis



Ilium

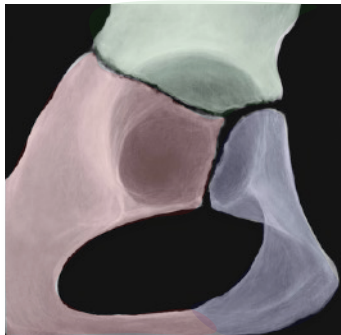
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Ischium

Acetabular rim

Pubis



Ilium

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Ischium

Acetabular rim

Pubis

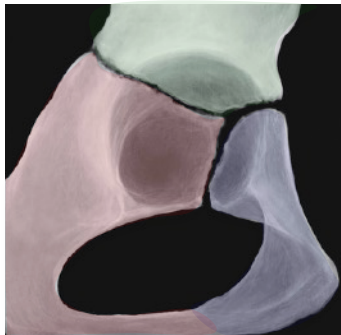
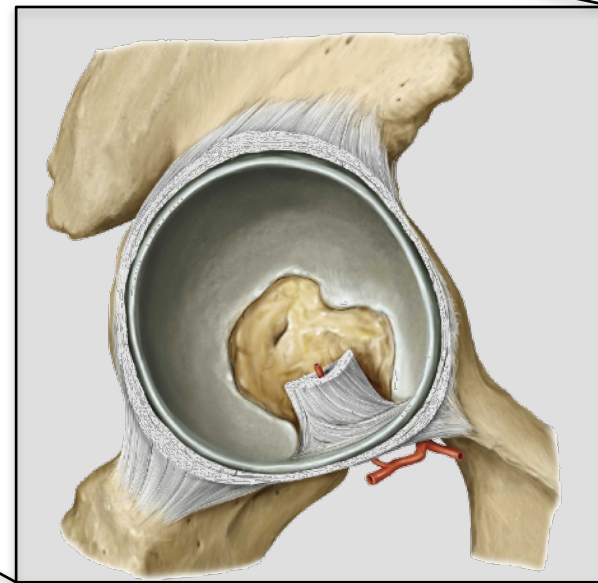


Fig 24.11C Acetabulum

Ilium

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Ischium

Acetabular rim

Pubis

Acetabular labrum

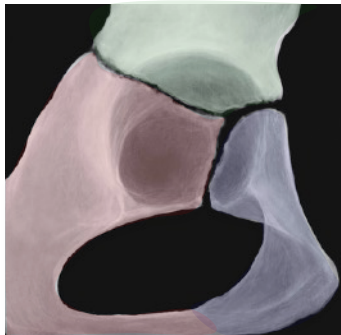
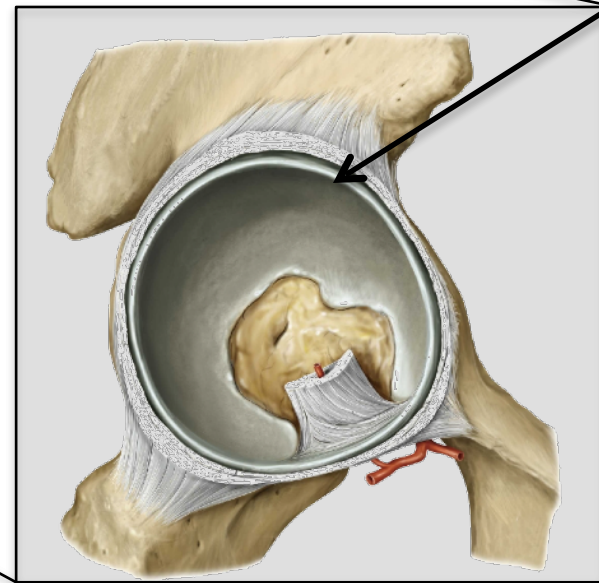


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Ischium

Acetabular rim

Pubis

Acetabular labrum

Lunate surface

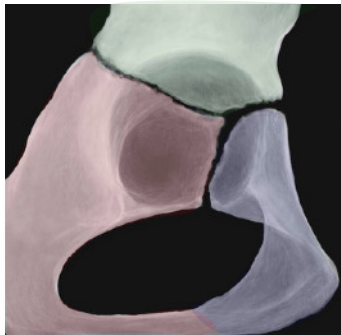
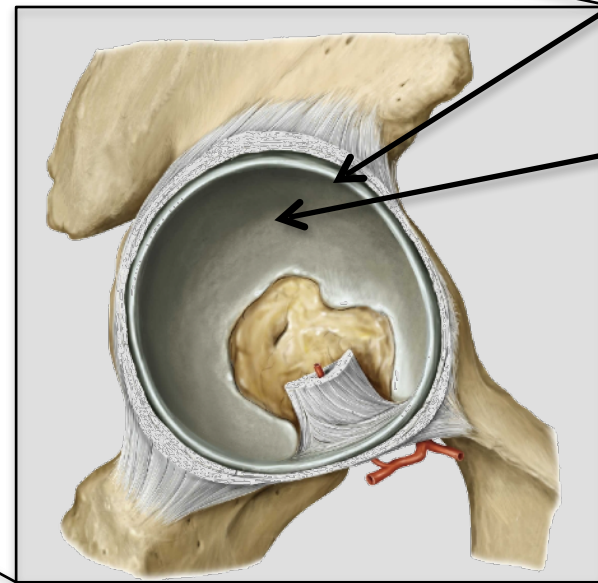


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Ischium

Acetabular rim

Pubis

Acetabular labrum

Lunate surface

Acetabular Fossa

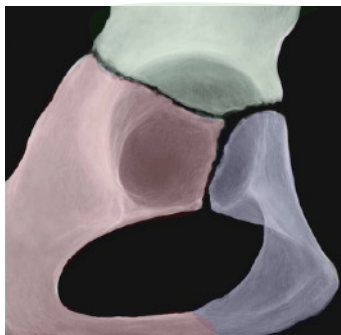
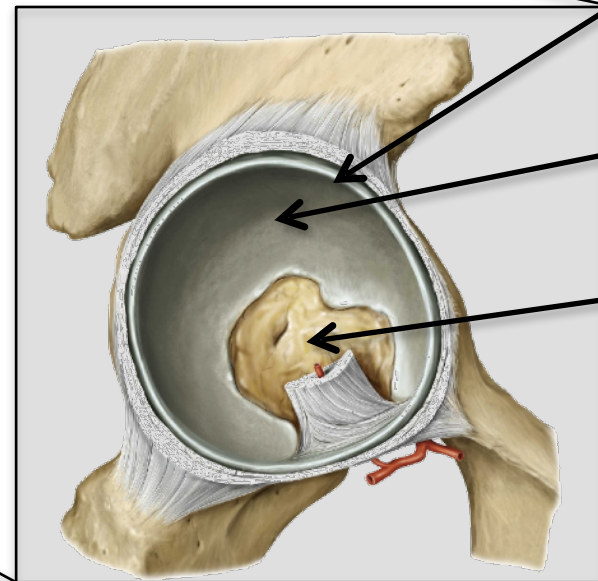


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Ilium

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Ischium

Acetabular rim

Pubis

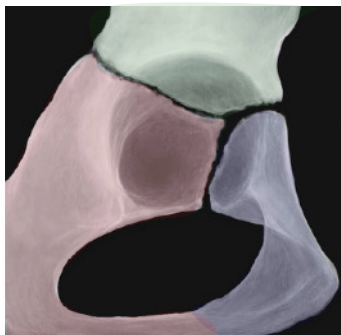
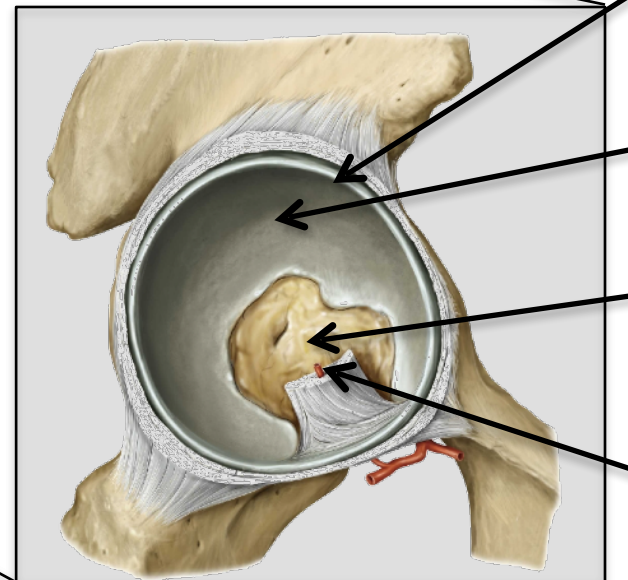
Acetabular labrum

Lunate surface

Acetabular Fossa

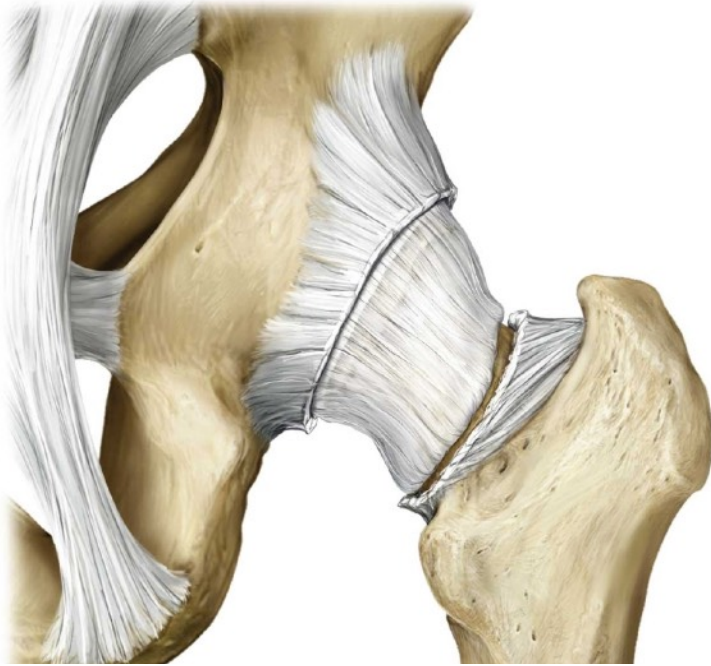
Obturator artery
Main source of blood to the femoral head

Fig 24.11C Acetabulum



The Hip Joint: Ligaments

Right Hip:
Posterior View



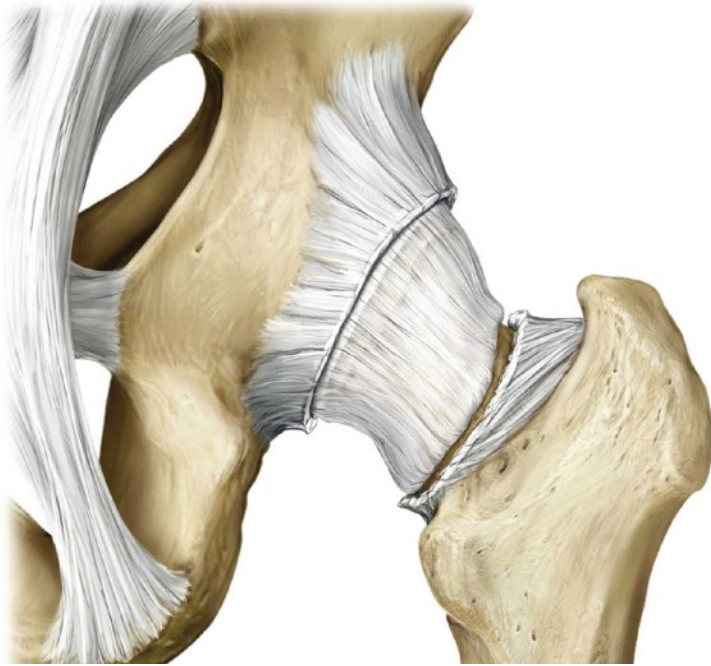
Right Hip:
Anterior View



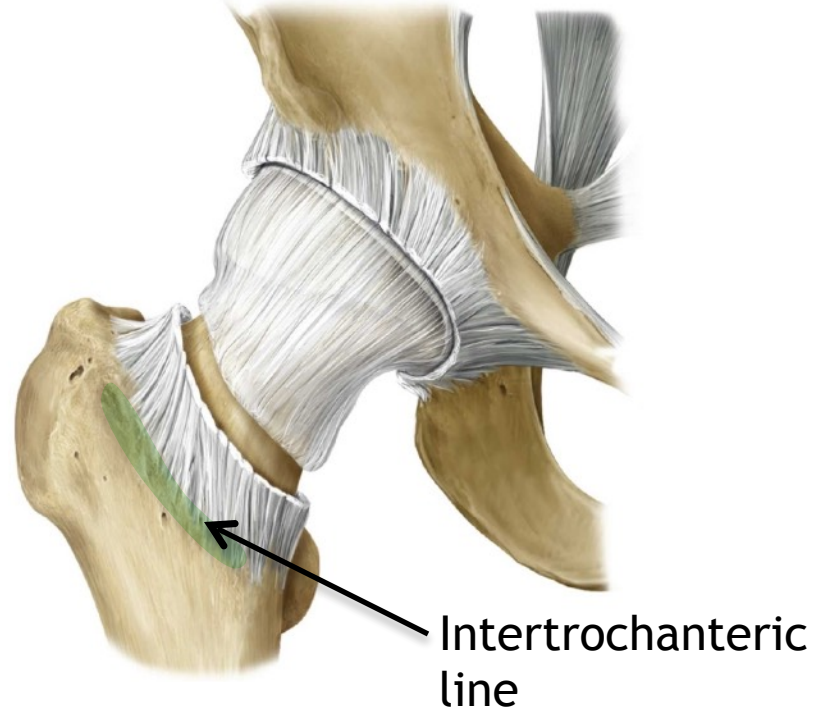
Like the shoulder joint, the hip joint is a ball and socket joint. There are a many more ligaments reinforcing the hip compared to the shoulder because the hip is responsible for keeping the body in an upright position while standing. This increase in number of ligaments makes the hip more stable in comparison to the shoulder, yet with a smaller range of motion.

The Hip Joint: Ligaments

Right Hip:
Posterior View



Right Hip:
Anterior View

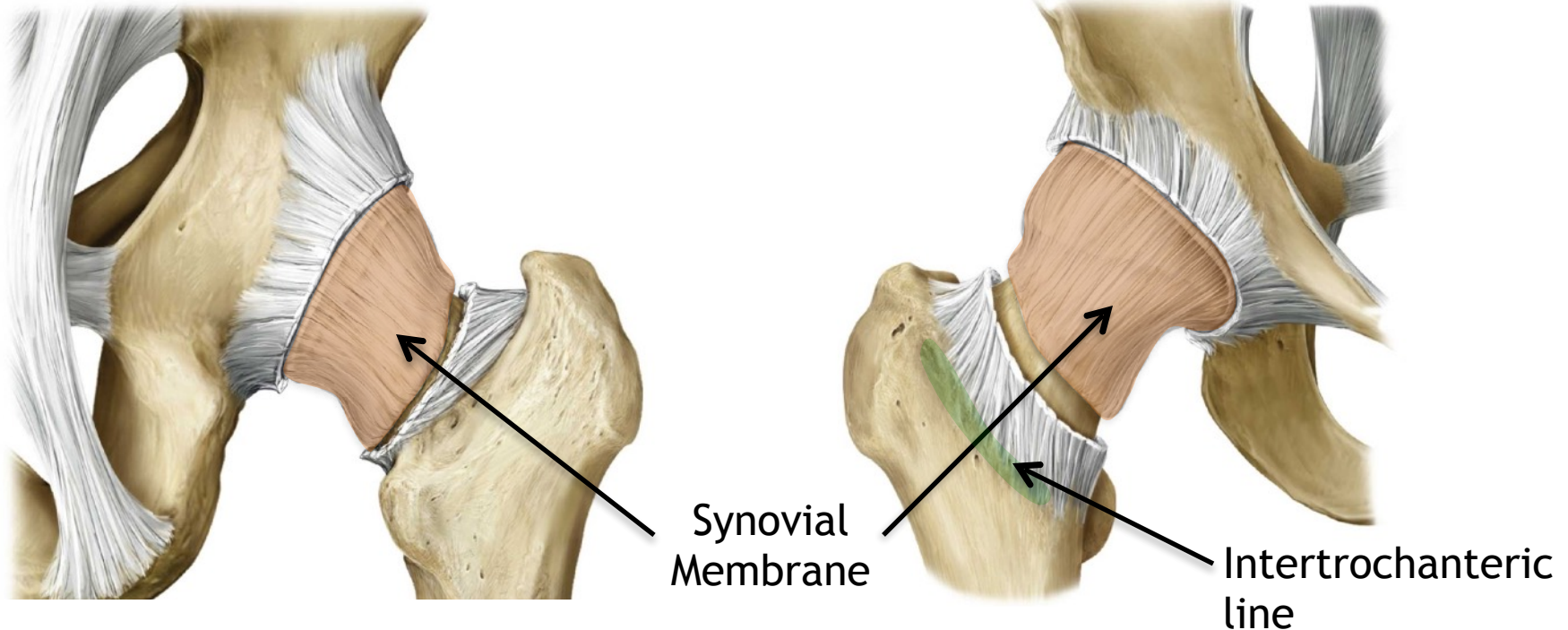


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Right Hip:
Posterior View

Right Hip:
Anterior View

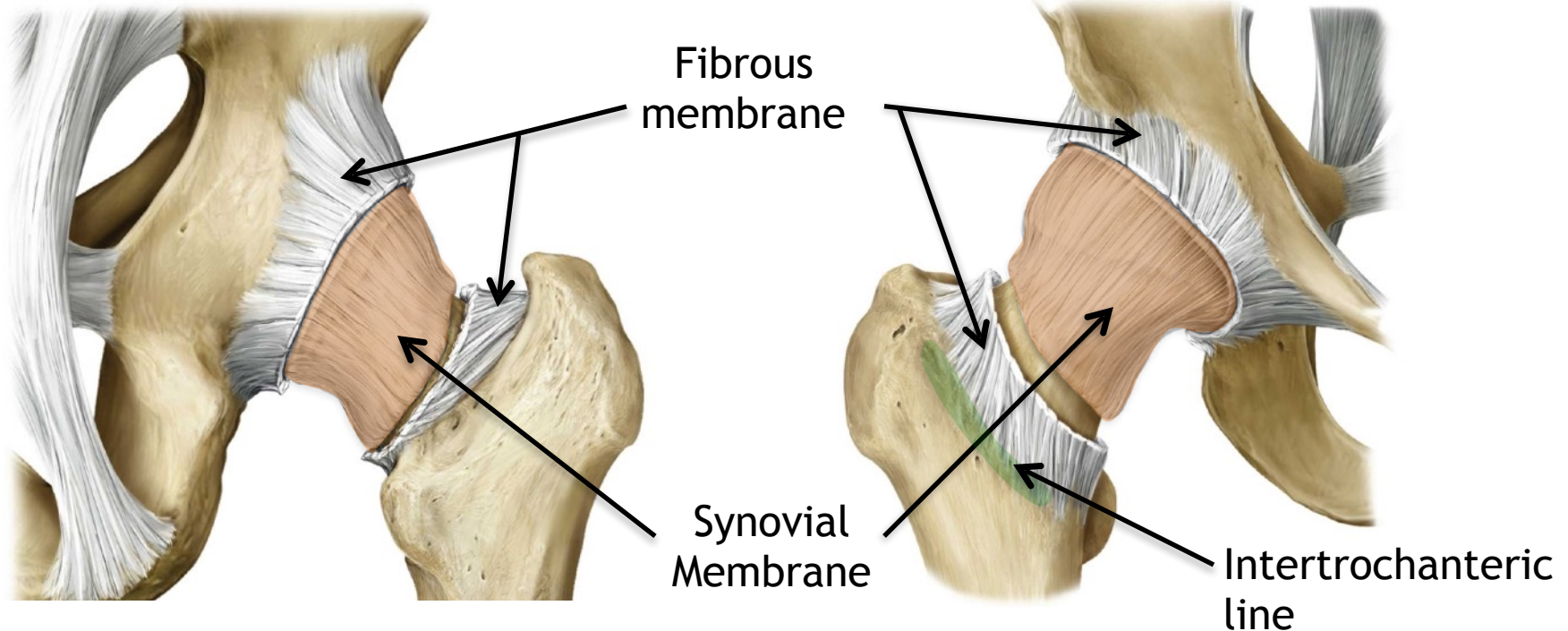


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Posterior View

Right Hip:
Anterior View



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Right Hip: Lateral View

Posterior ← → Anterior



The Hip Joint: Ligaments

The hip joint is encapsulated by a synovial membrane and held together by 4 ligaments. Three of the four ligaments are extracapsular and one is intracapsular.

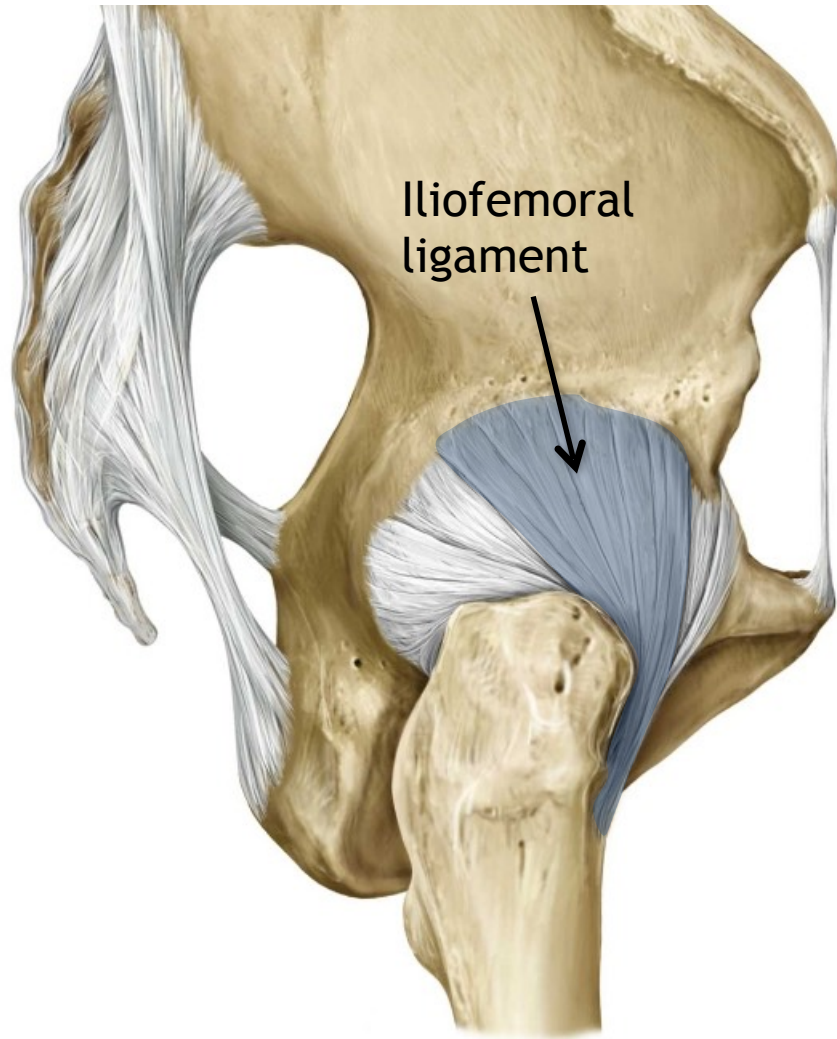
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The intracapsular ligament attaches the fovea captis of the femur to the acetabulum and is identified as the transverse ligament of acetabulum.

Weak spots, where tearing is more common, are marked in **red**.

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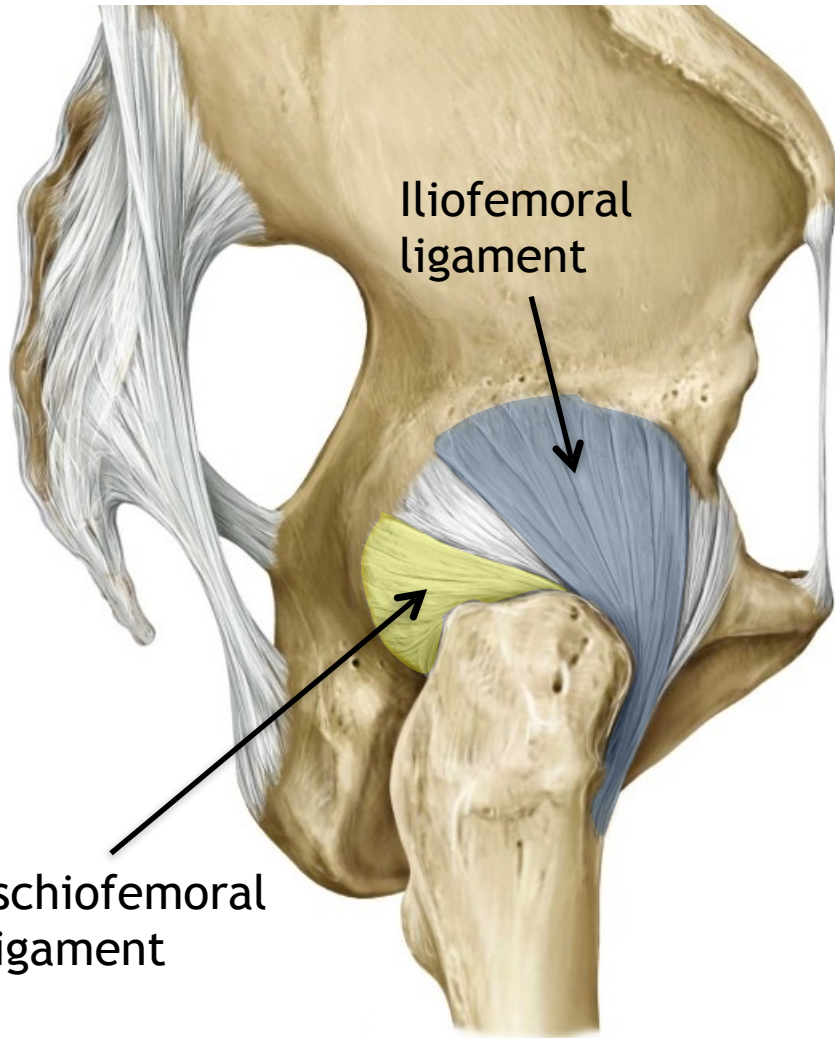
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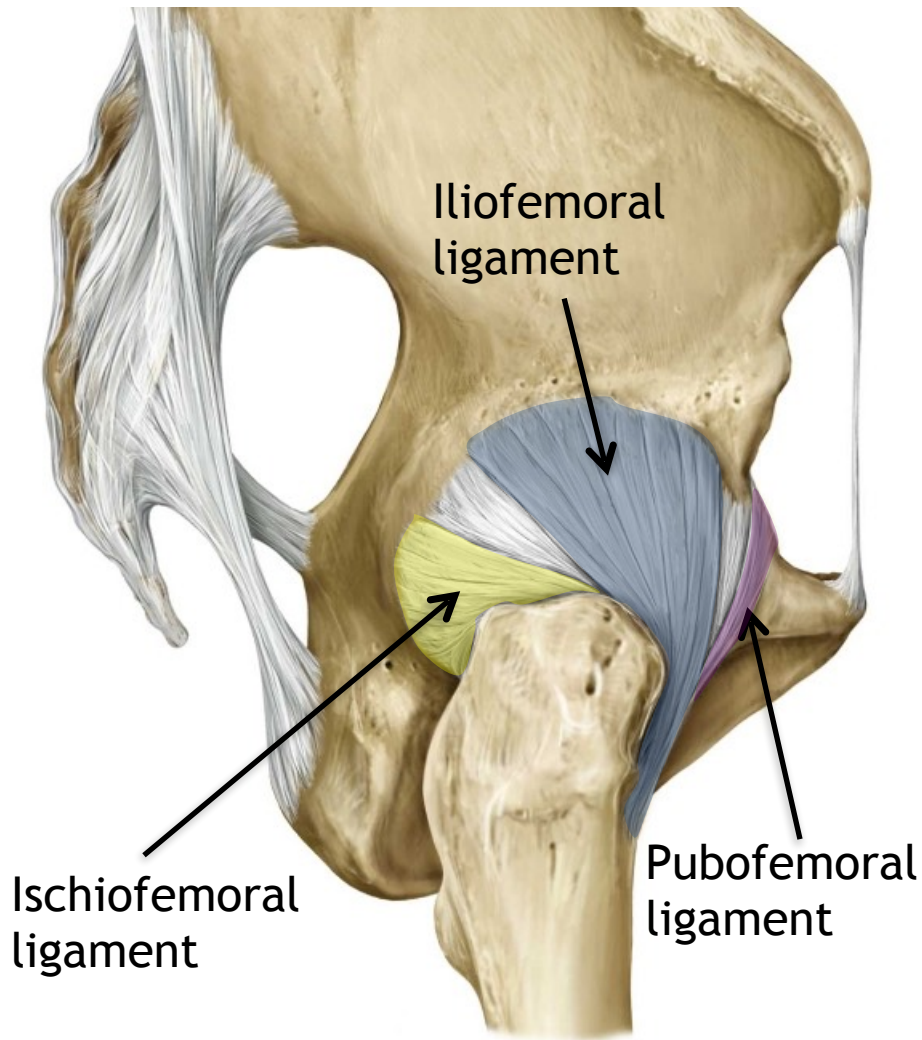
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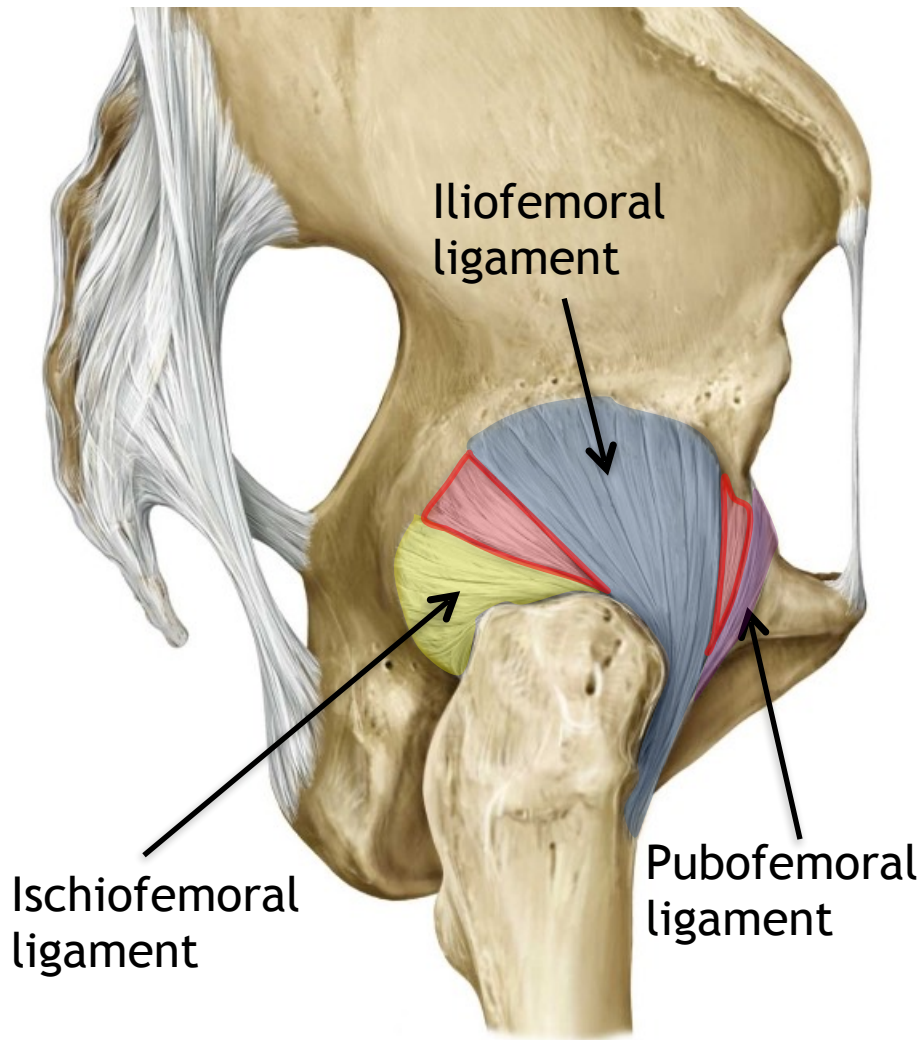
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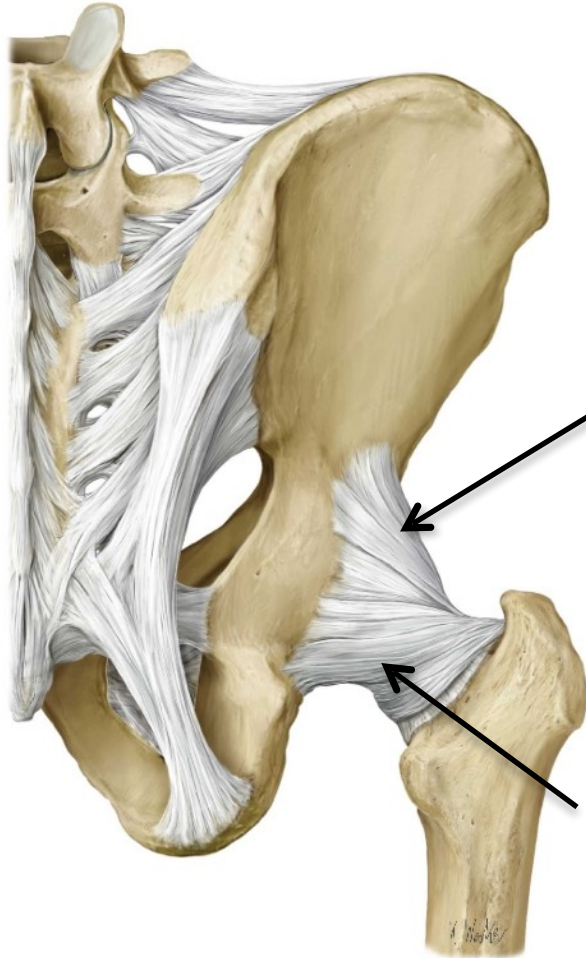
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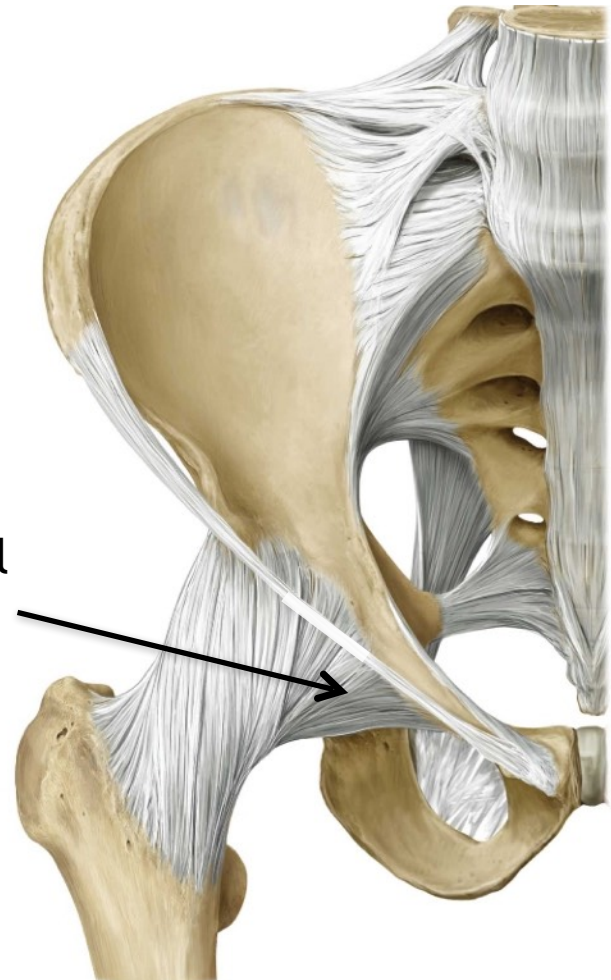
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The Hip Joint: Ligaments

Right Hip:
Posterior View



Right Hip:
Anterior View



Ilioferoral
ligament

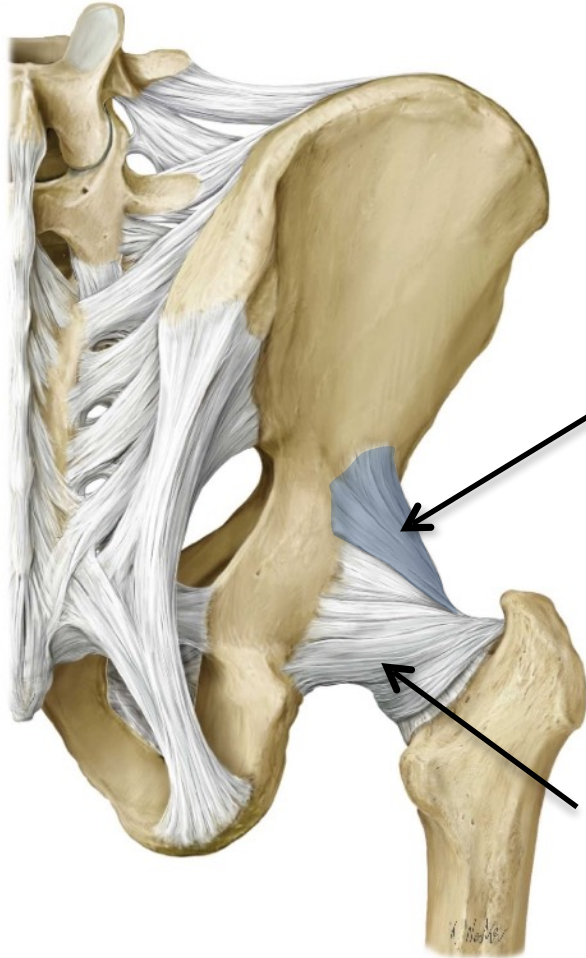
Pubofemoral
ligament

Ischiofemoral
ligament

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The Hip Joint: Ligaments

Right Hip:
Posterior View

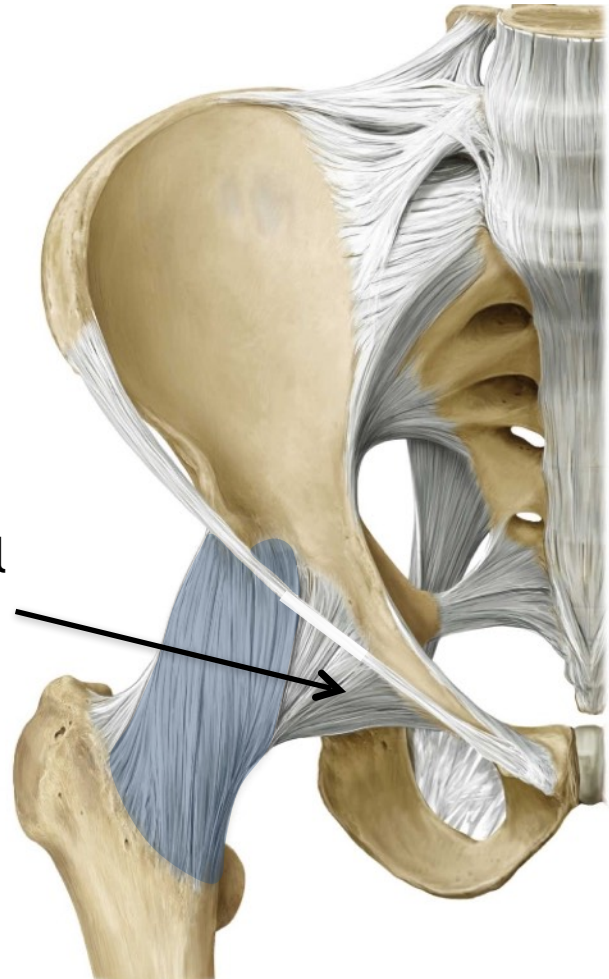


Ilioferoral
ligament

Pubofemoral
ligament

Ischiofemoral
ligament

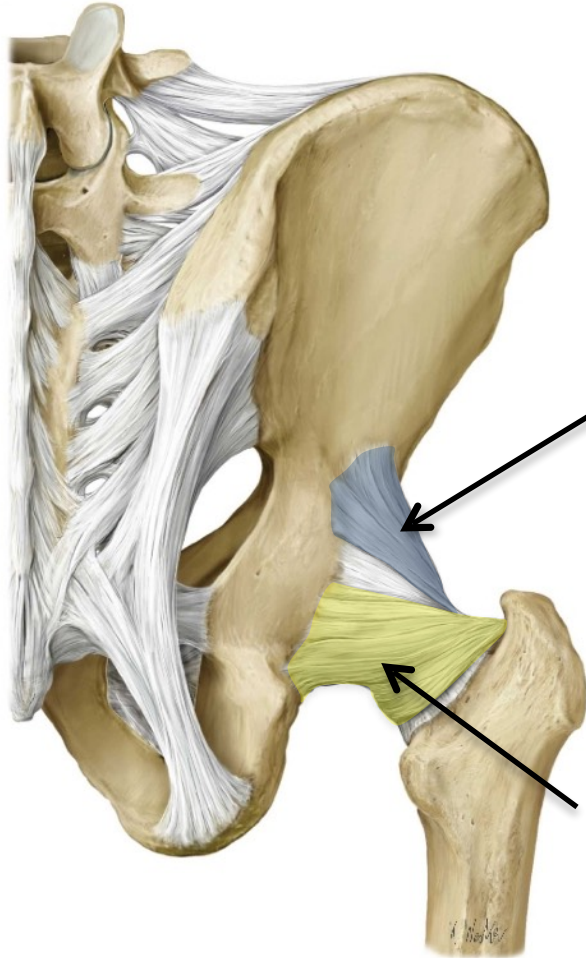
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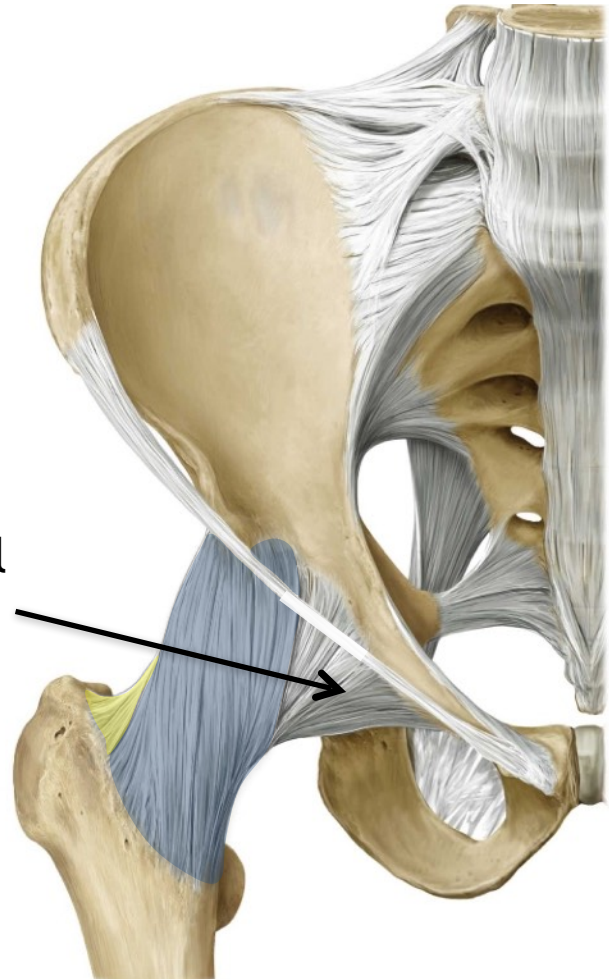


Iliofemoral
ligament

Pubofemoral
ligament

Ischiofemoral
ligament

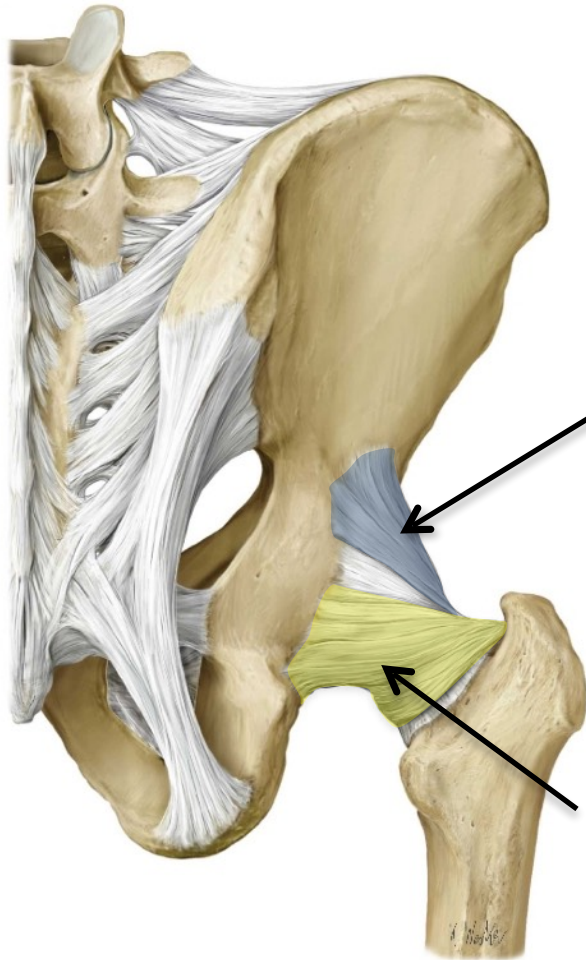
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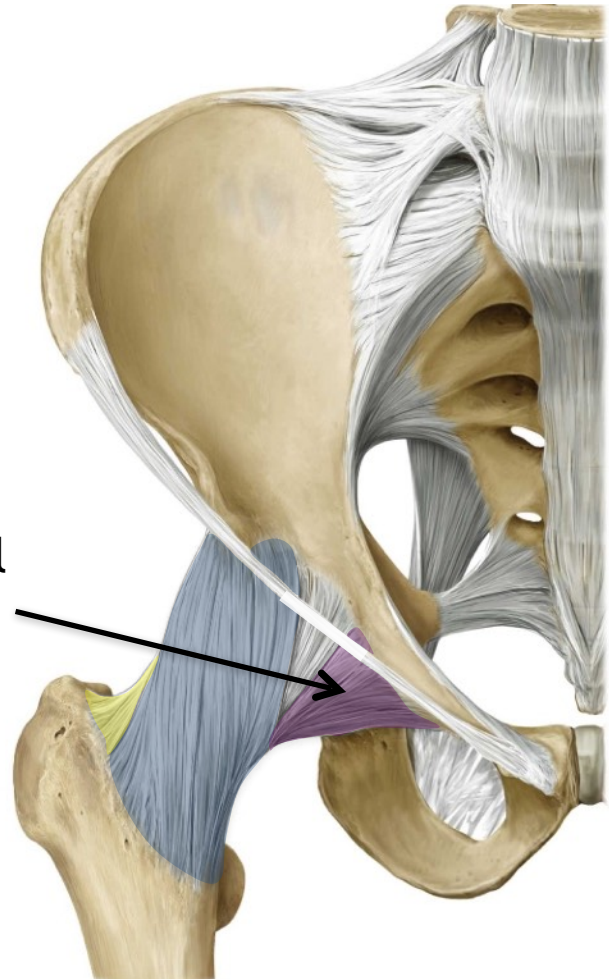


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ligament

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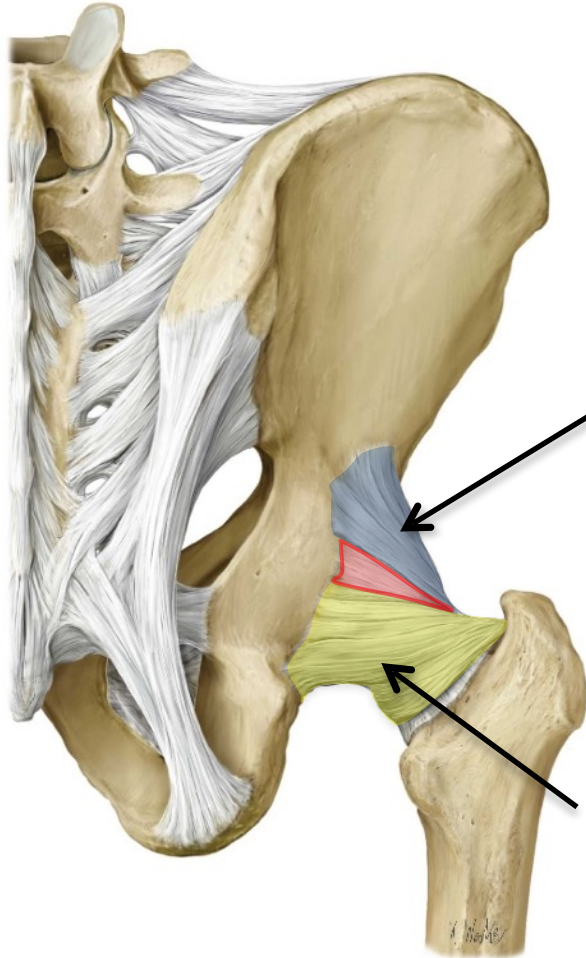
Right Hip:
Anterior View



The **iliofemoral ligament** is the strongest ligament in the body and keeps the torso in an upright position while standing without the need of muscular contraction.

The Hip Joint: Ligaments

Right Hip:
Posterior View

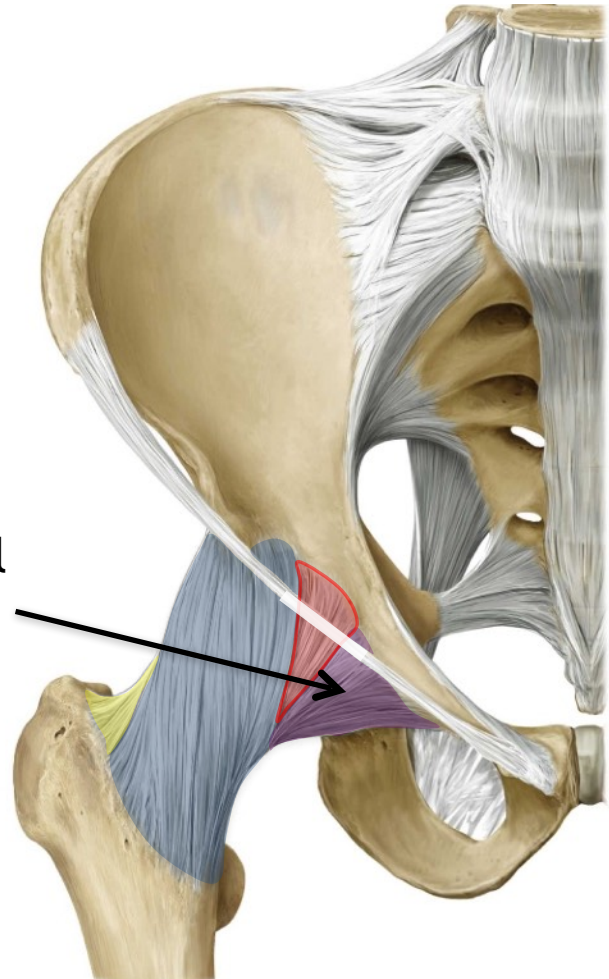


Iliofemoral
ligament

Pubofemoral
ligament

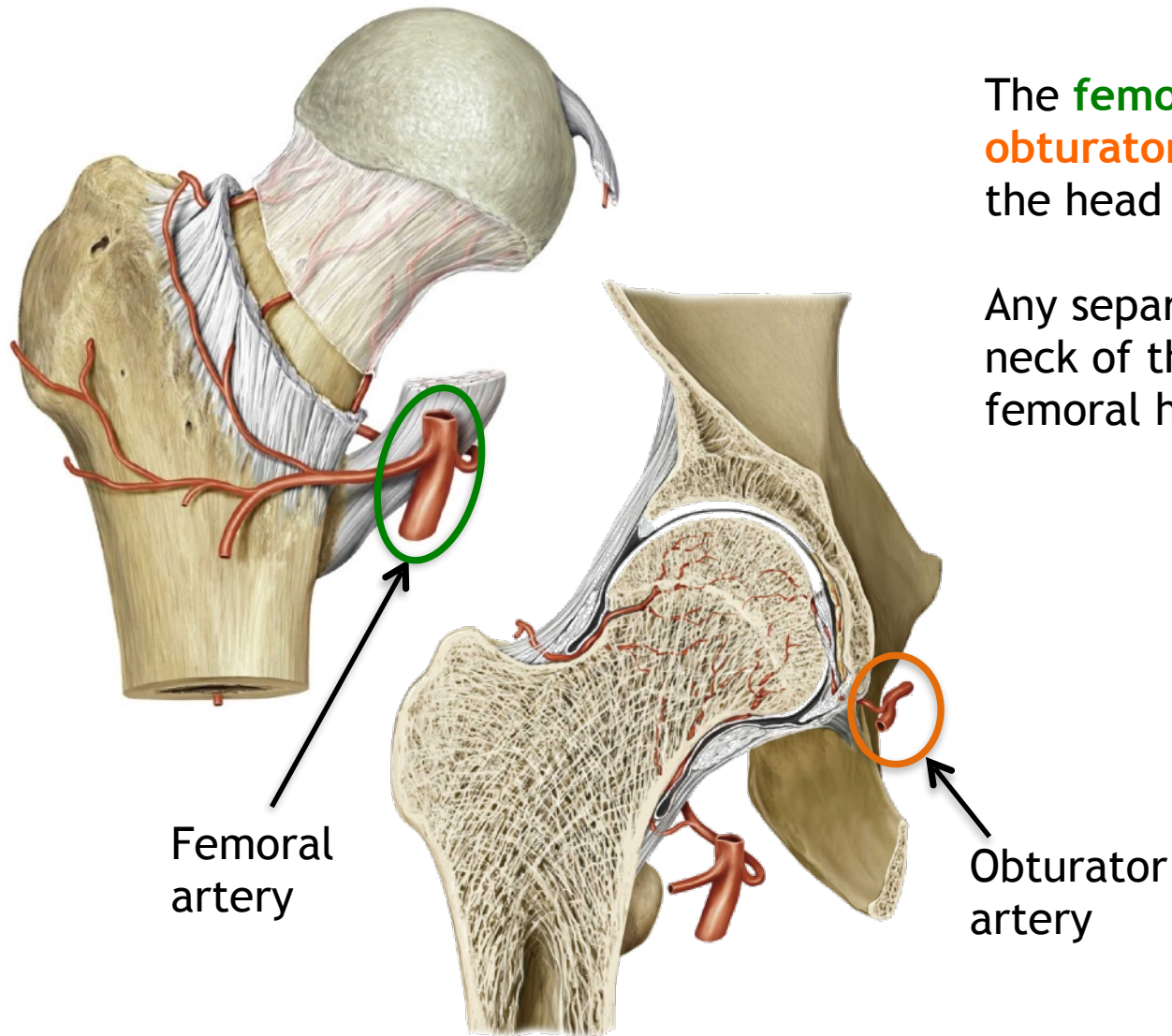
Ischiofemoral
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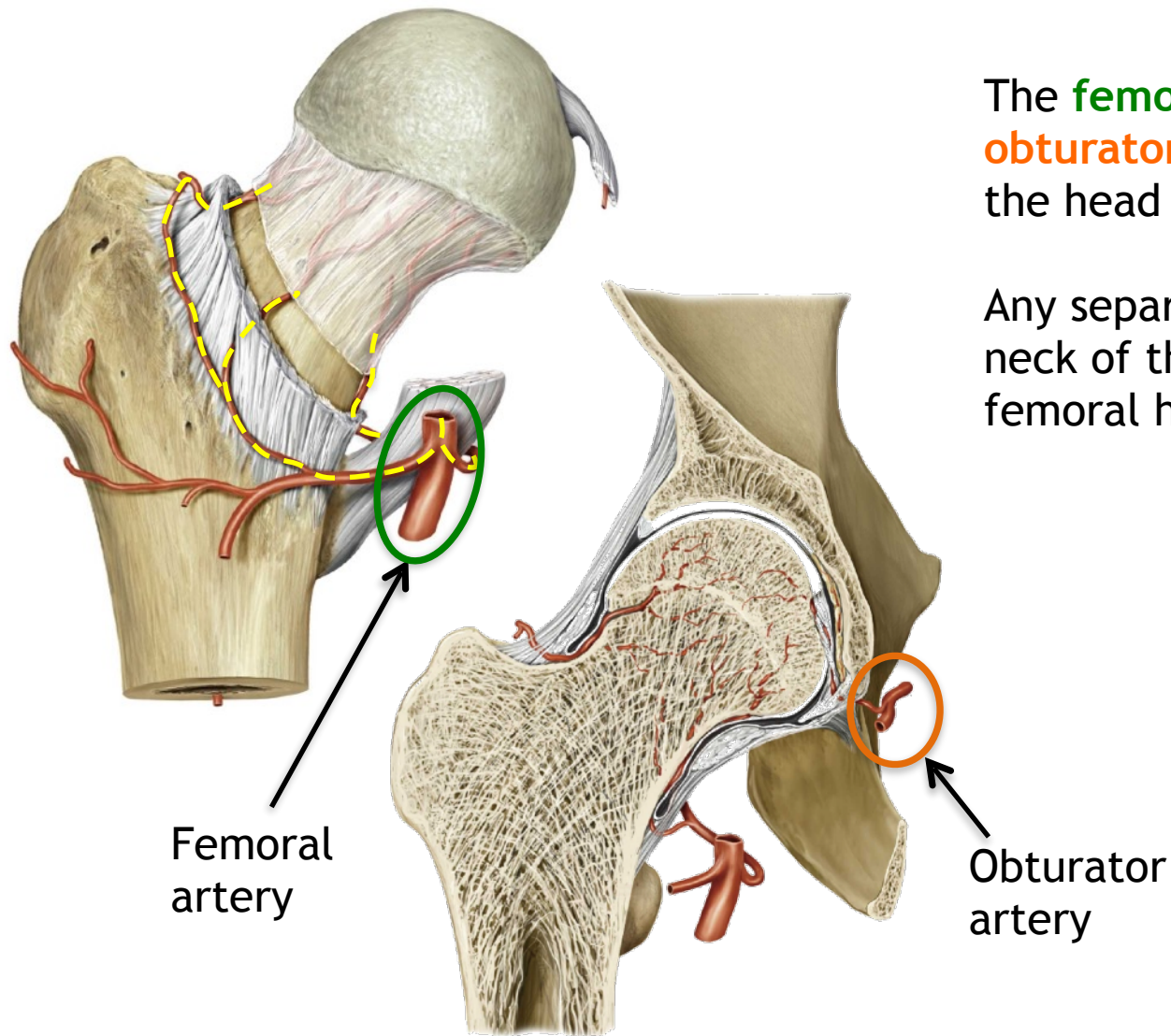
Femoral Head Blood Supply



The **femoral artery** along with the **obturator artery** deliver blood to the head of the femur.

Any separation or damage to the neck of the femur can lead to femoral head necrosis.

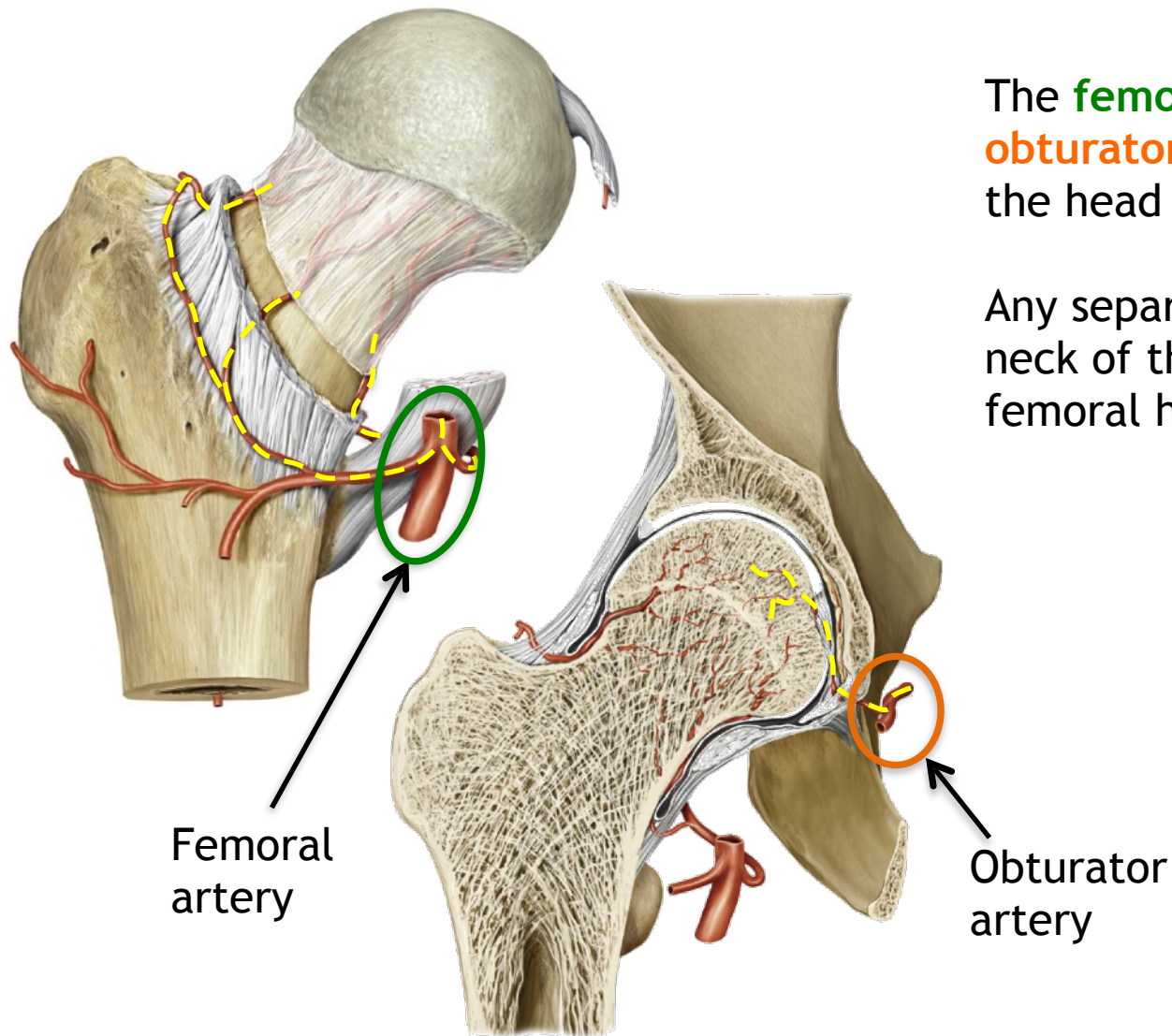
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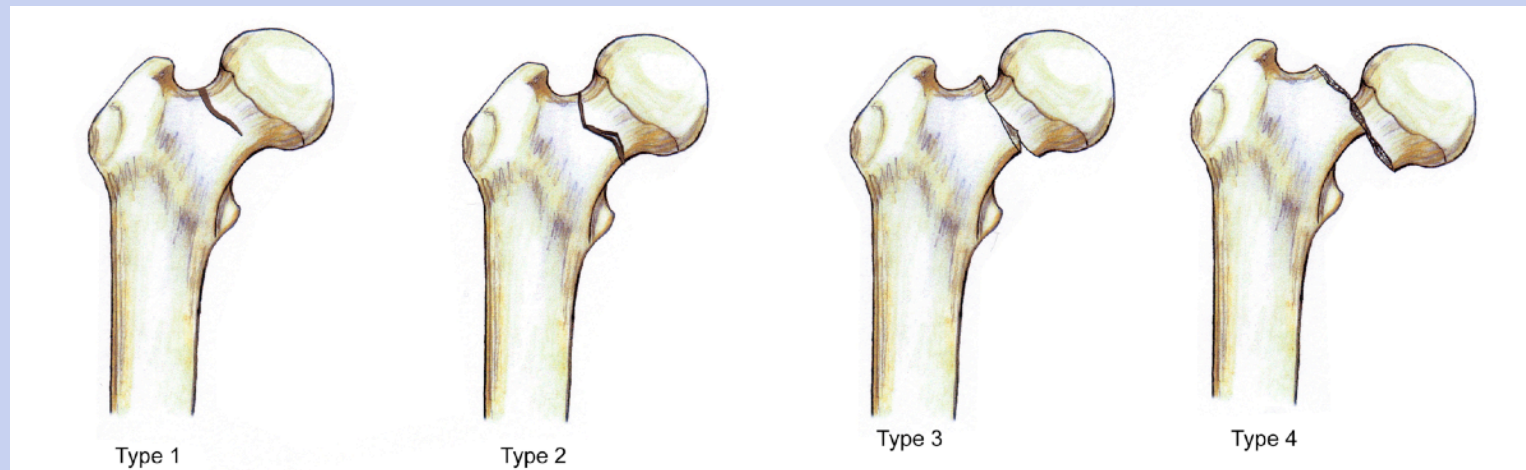


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Clinical: Femoral Neck Fractures

Femoral neck injuries are one of the major injuries that can occur to the femur. They are most common in senior citizens due to osteoporosis yet can be seen with victims of a motor vehicle collision. Femoral Neck Fractures are commonly classified as non-displaced or displaced depending on the degree of the head's displacement.



Non-displaced

Displaced

Clinical: Femoral Neck Fractures



Non-Displaced



Displaced

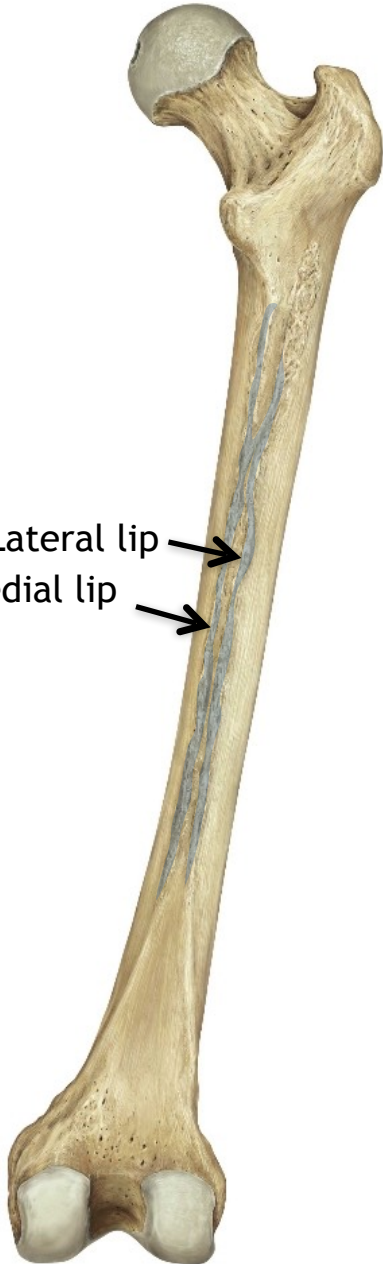


The Shaft of the Femur

One of the femur's predominant features is the **linea aspera**, a ridge that splits proximally into the **pectineal line** (spiral line) and **lesser gluteal tuberosity**. Distally, the linea aspera divides to form the **lateral** and **medial supracondylar lines**.

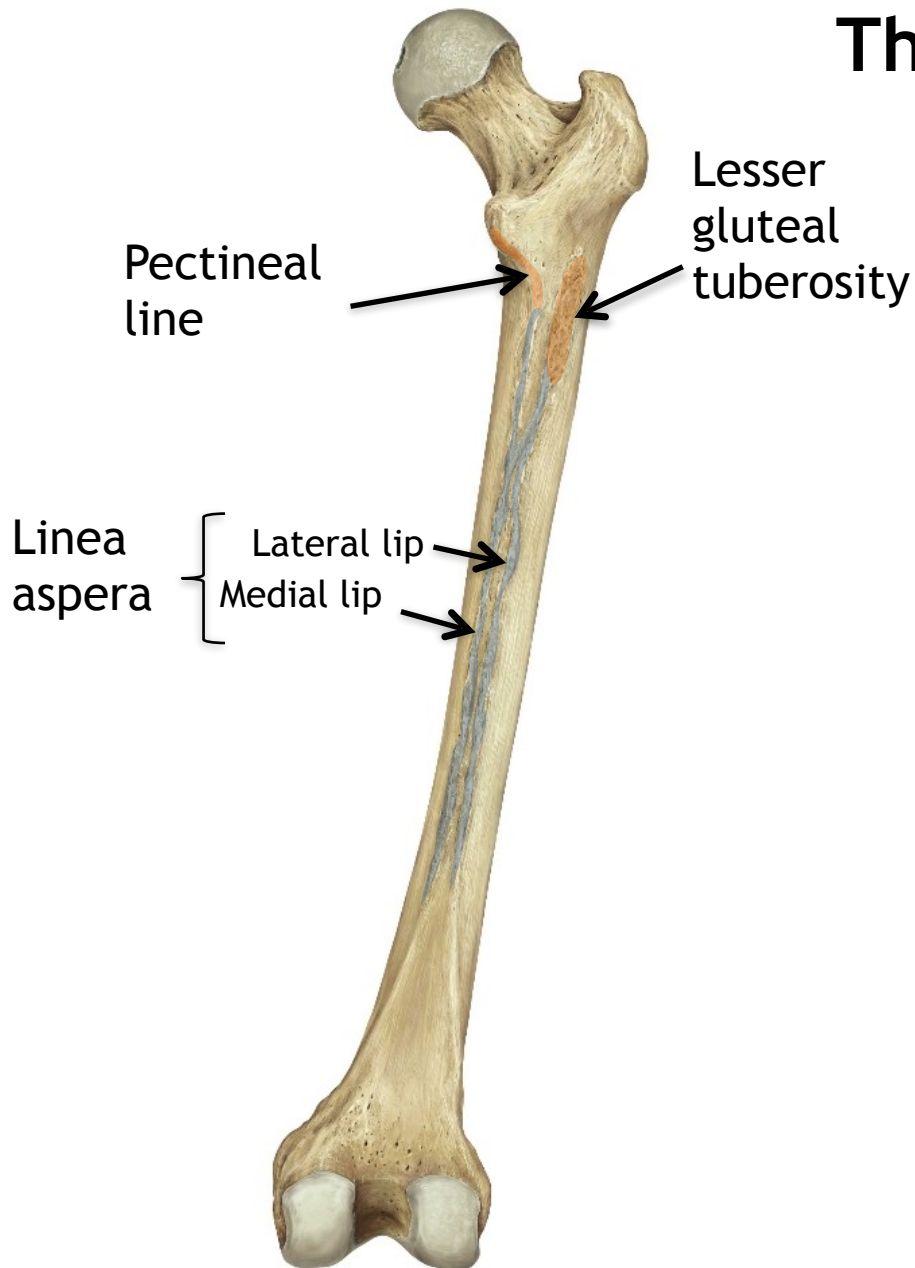
The Shaft of the Femur

Linea aspera { Lateral lip
Medial lip



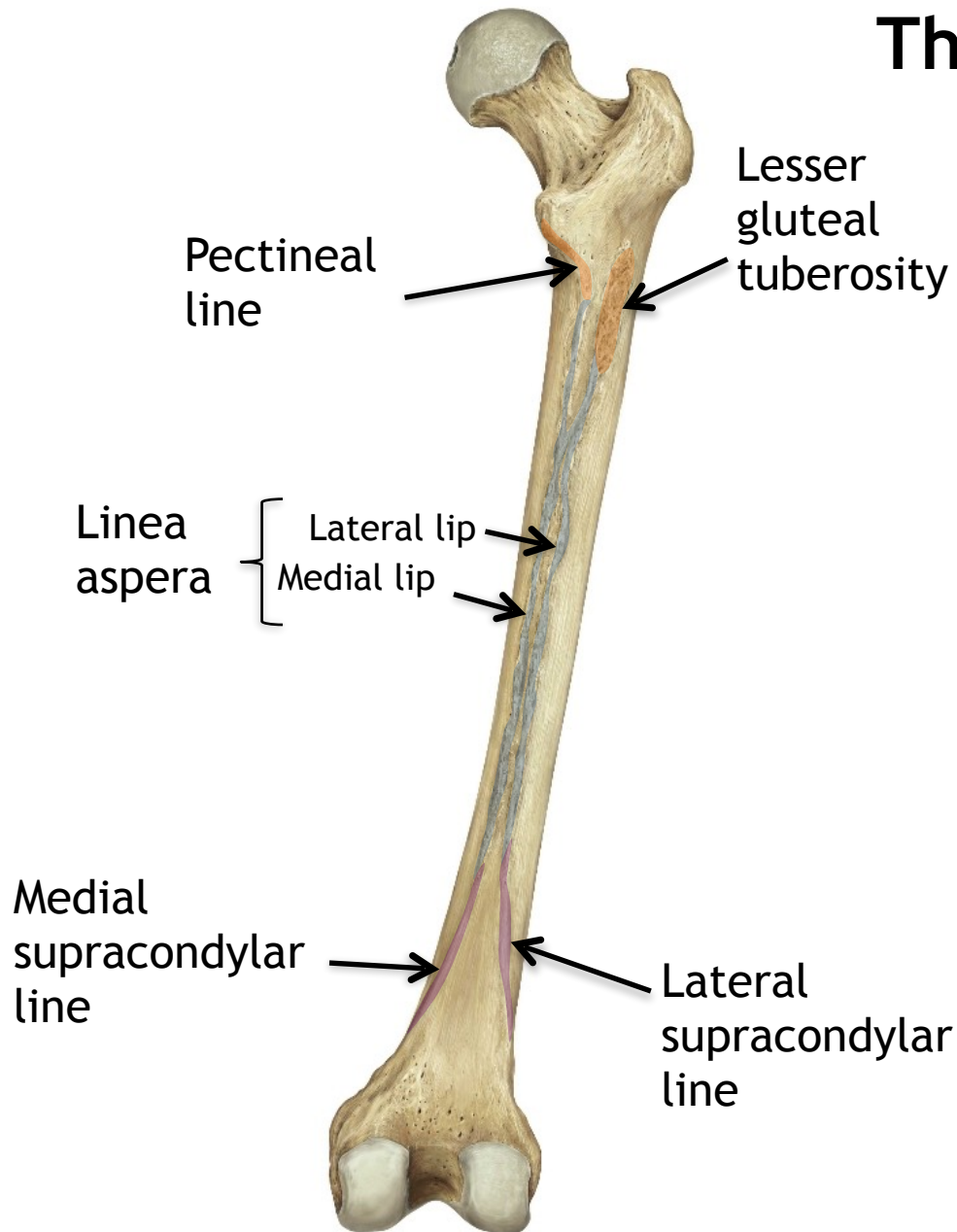
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Right Femur:
Anterior View



Distal Features of the FEMUR:

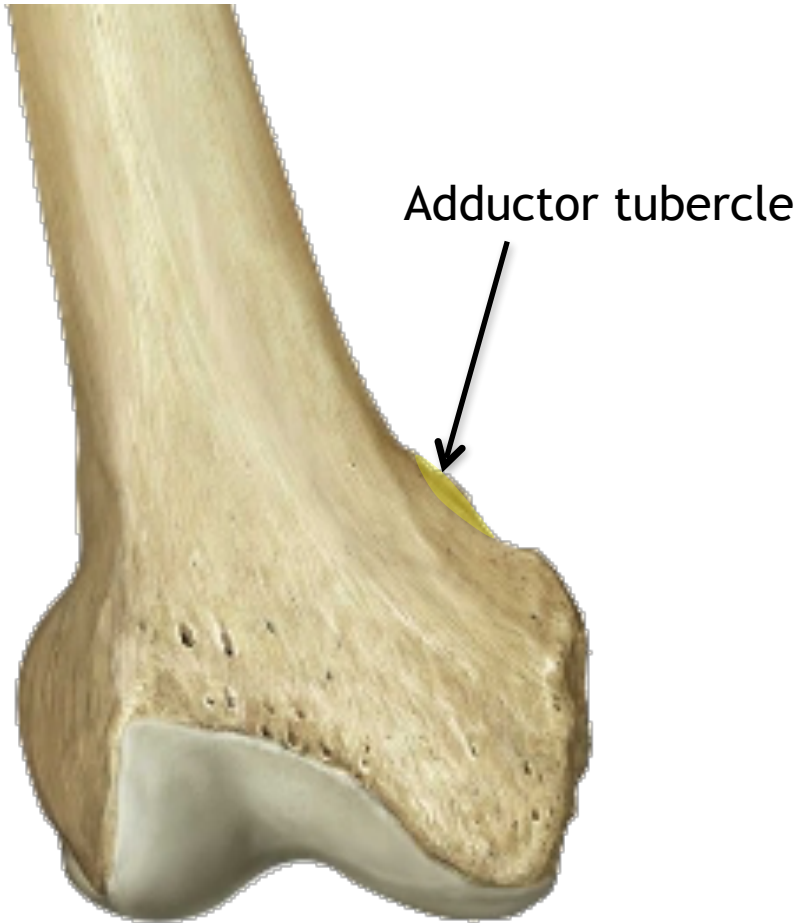
The distal end of the femur articulates with the fibula and tibia of the lower limb at the knee joint.

The **medial** and **lateral condyles** are joined at a surface known as the **patellar surface**, then split posteriorly.



Right Femur:
Anterior View

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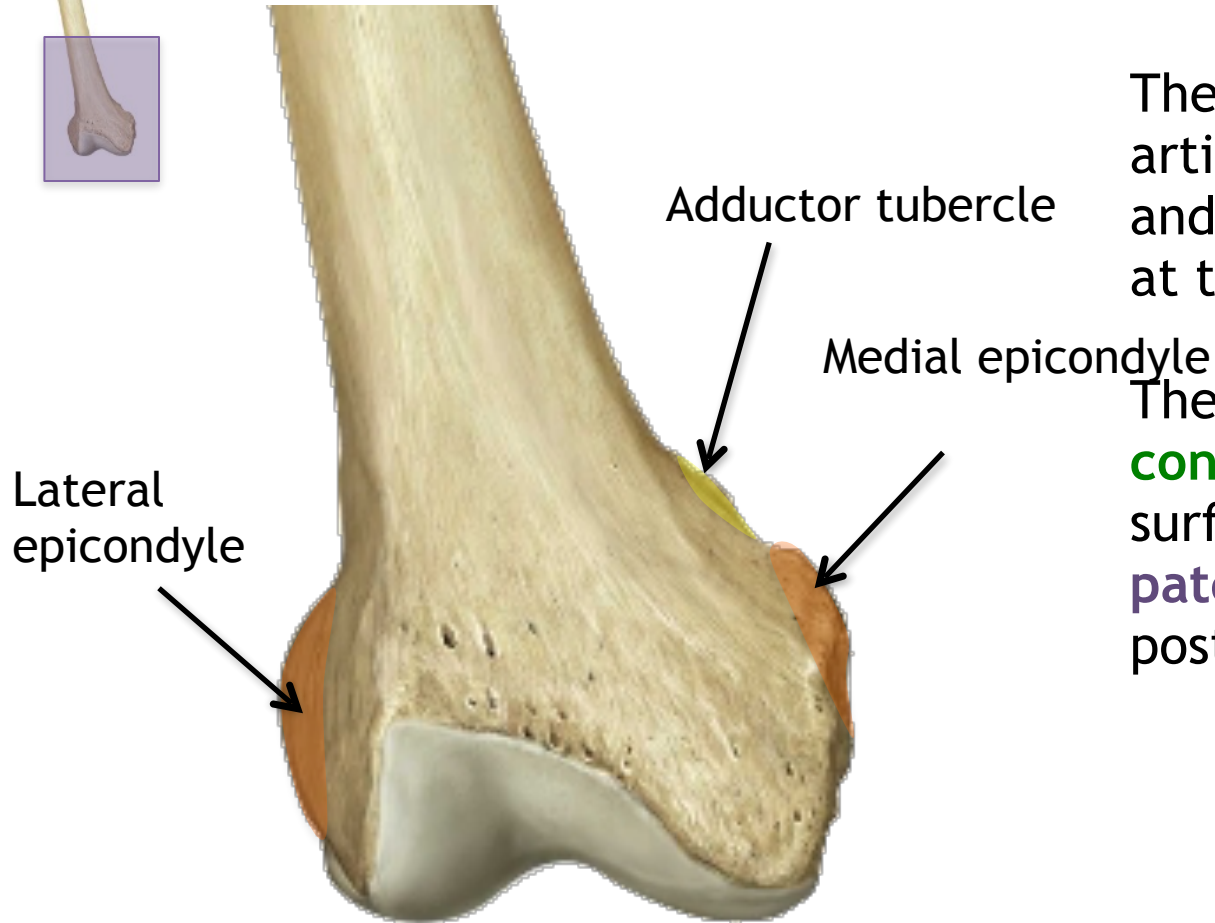
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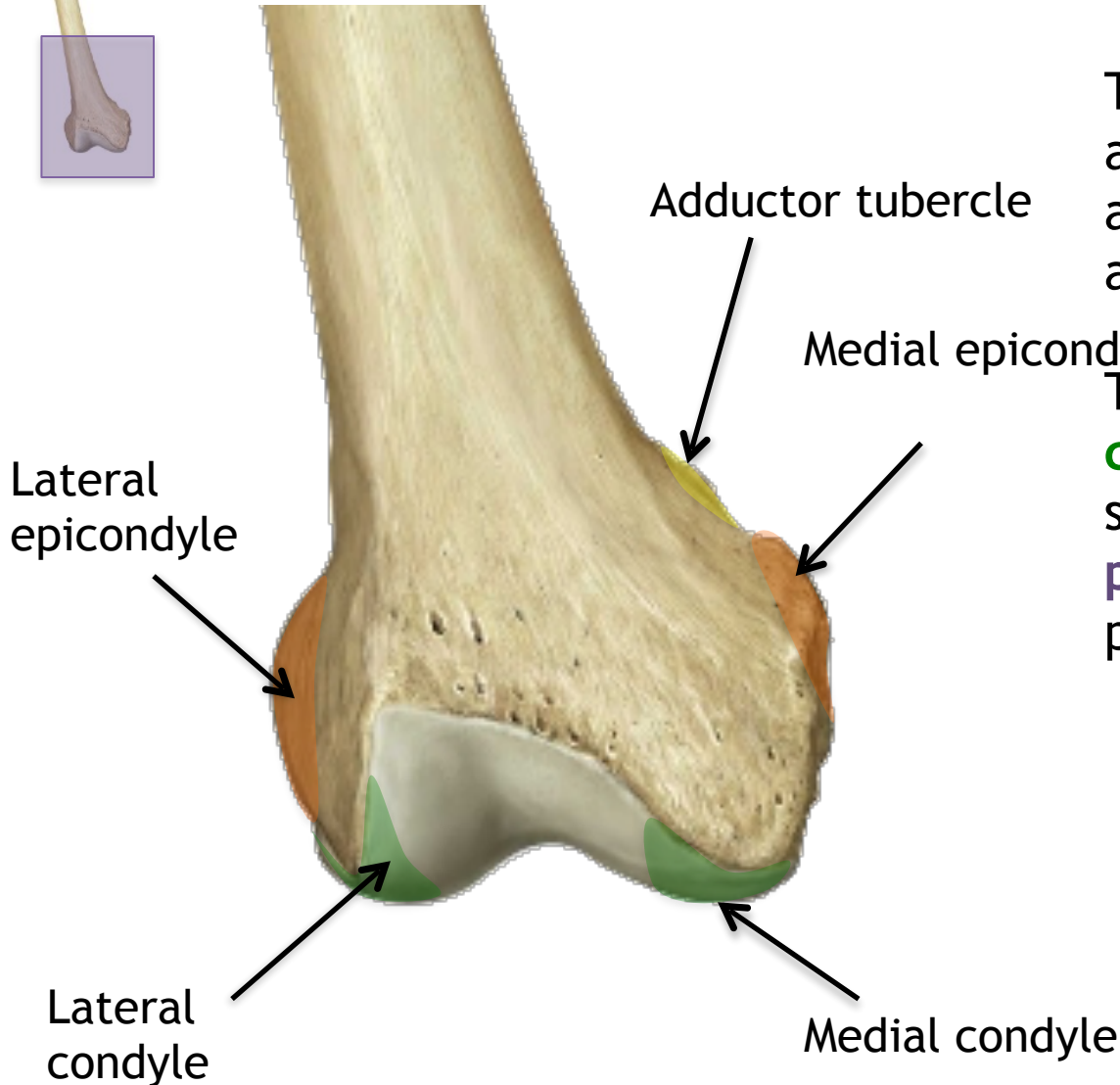
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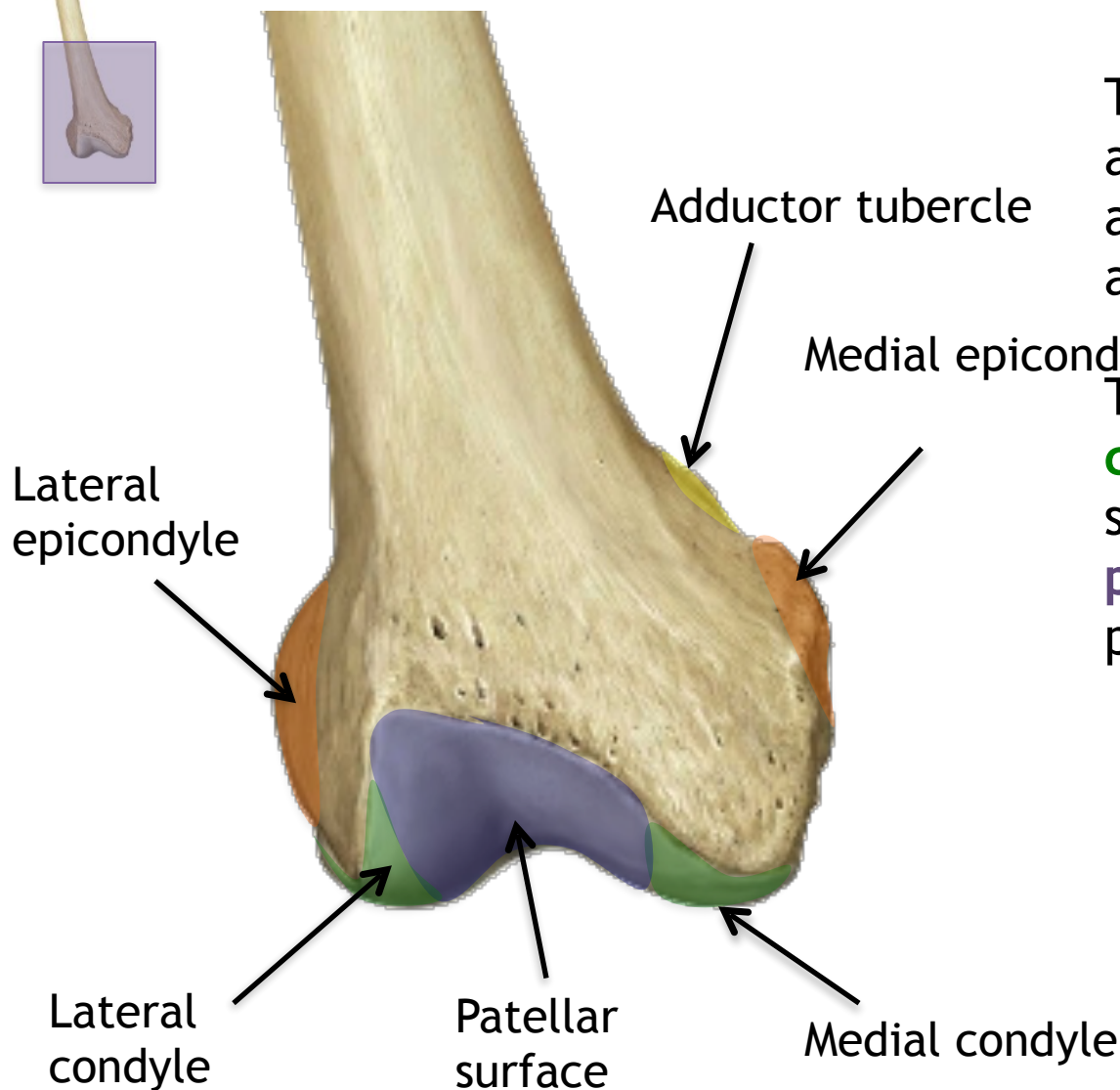
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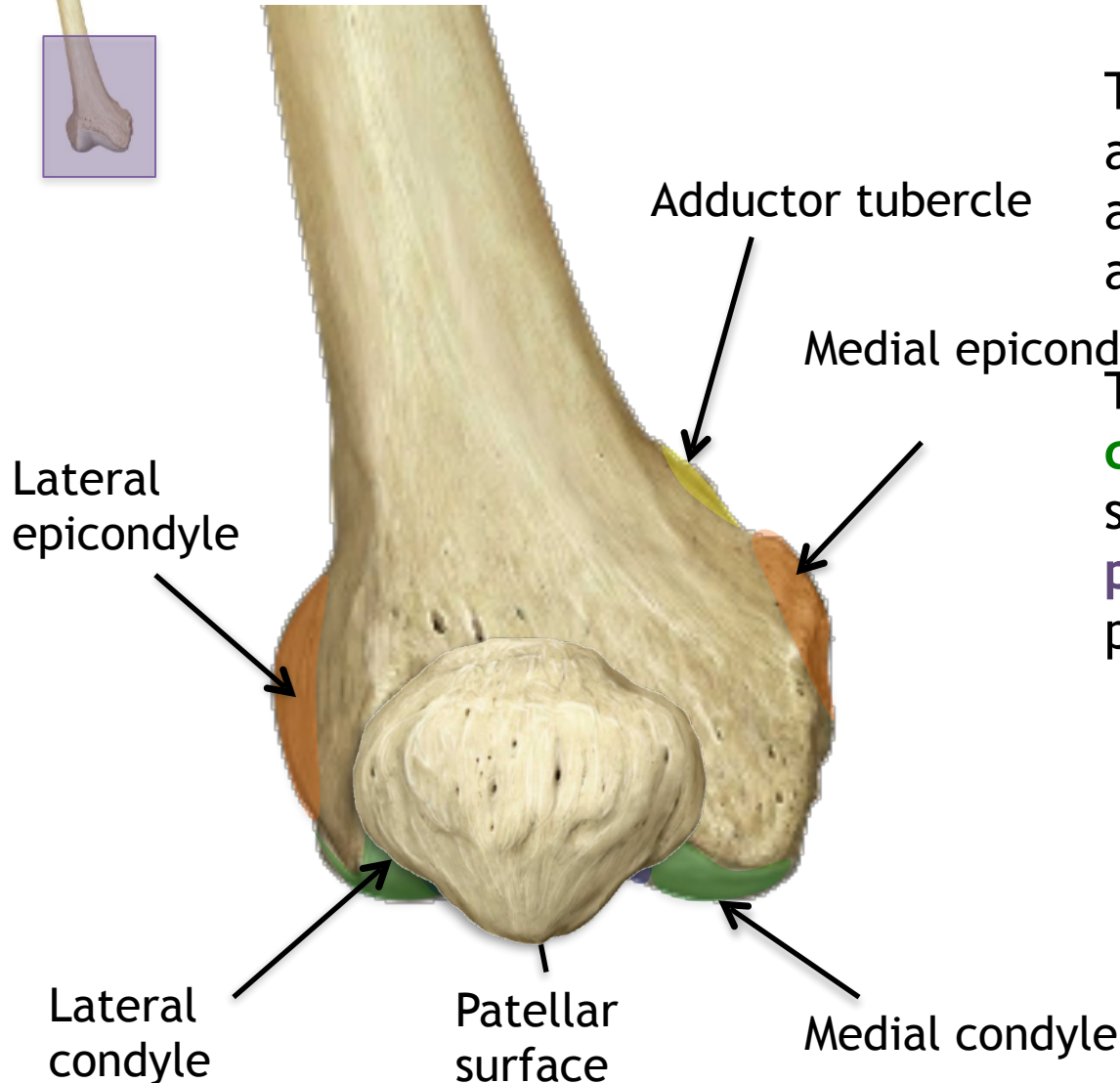
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Right Femur:
Posterior View



Distal Features of the FEMUR:

The distal end of the femur has 3 points in which it articulates with other bones. The two **condyles** (**medial** and **lateral**) articulate with the tibia at the knee joint. The patellar surface articulates with the patella.

The fibula is not involved in the knee joint and does not make contact with the femur yet the fibular collateral ligament does attach the two, adding stability to the knee joint.



Right Femur:
Posterior View



Medial condyle

Lateral
condyle

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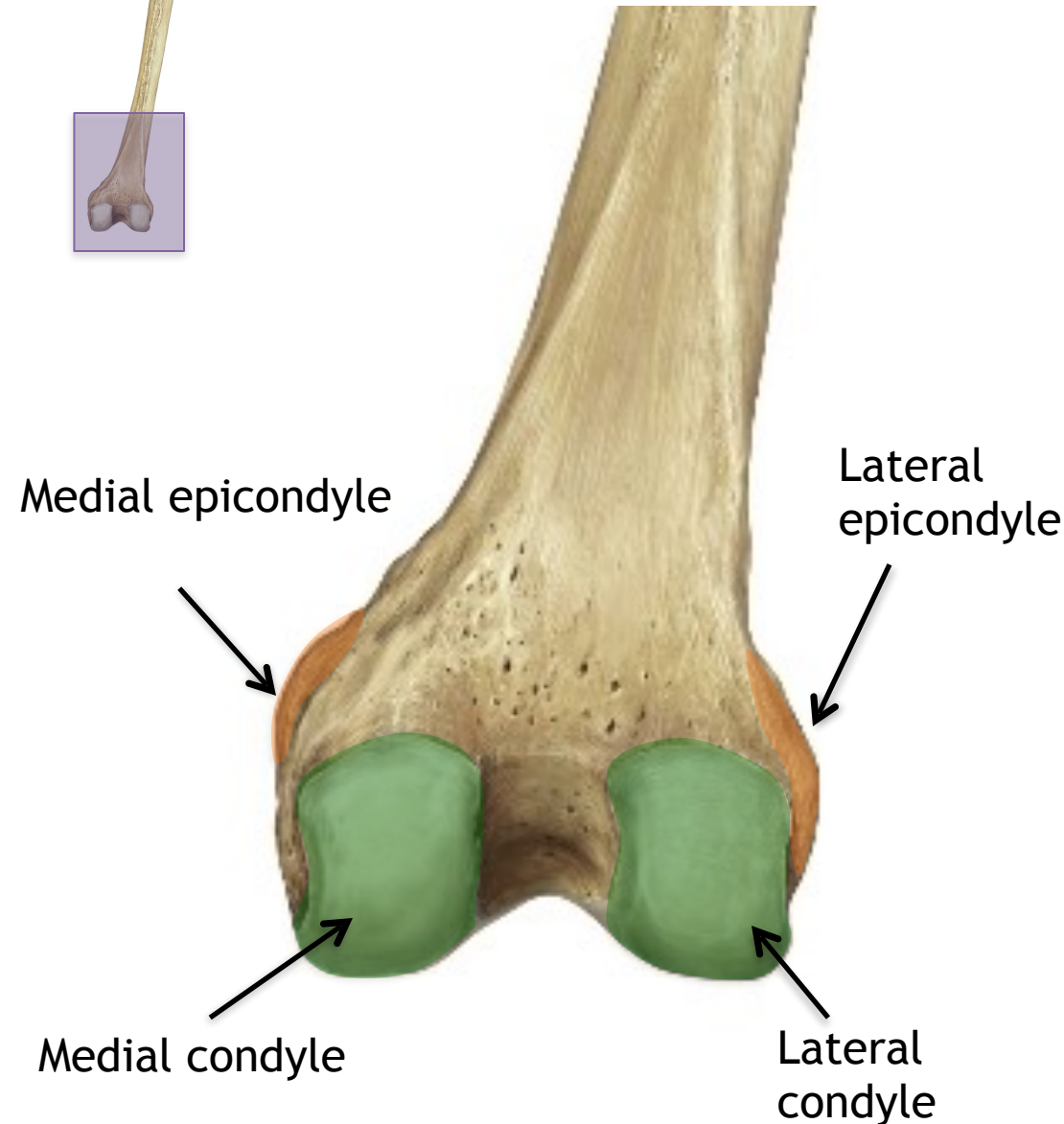


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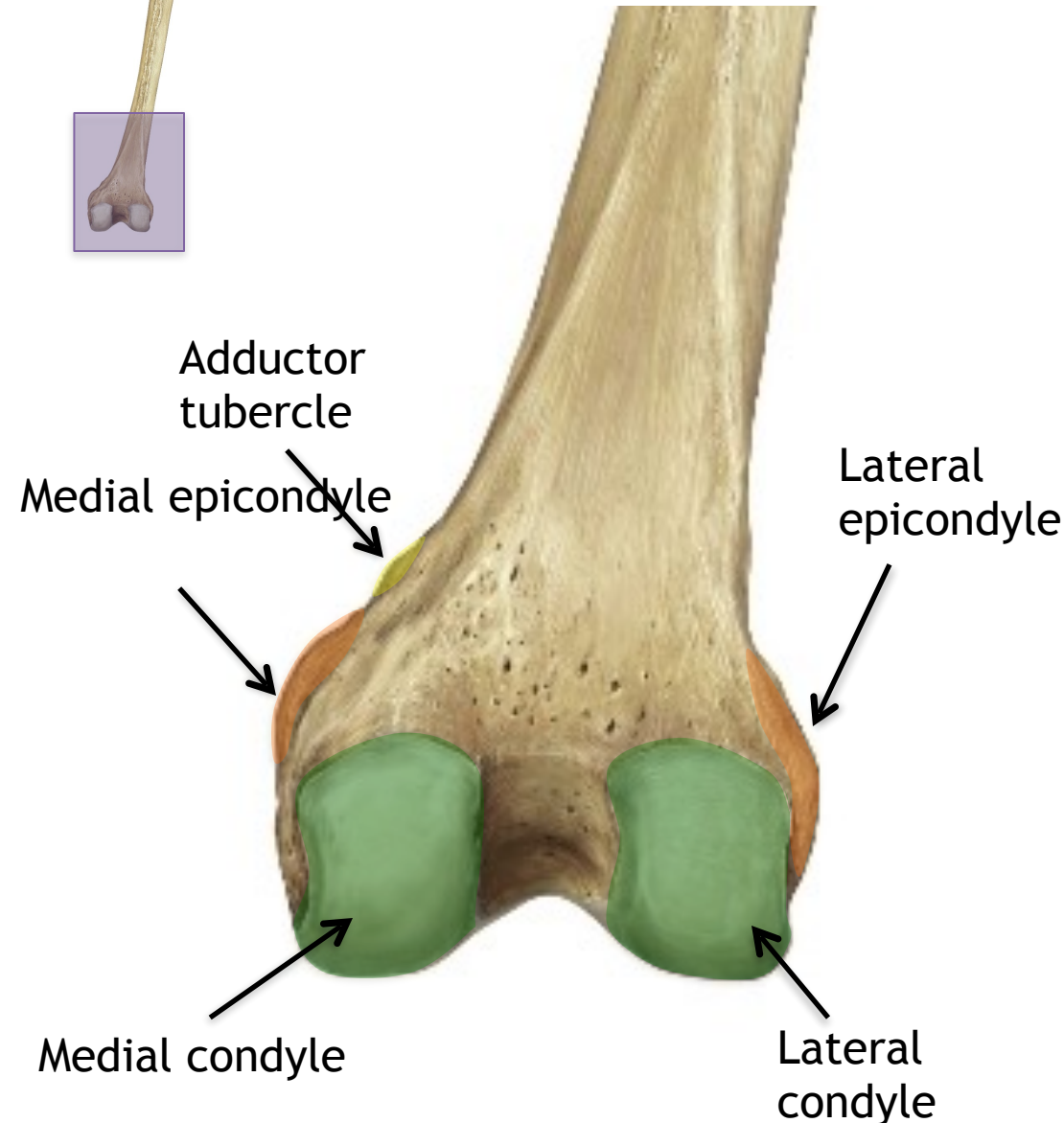


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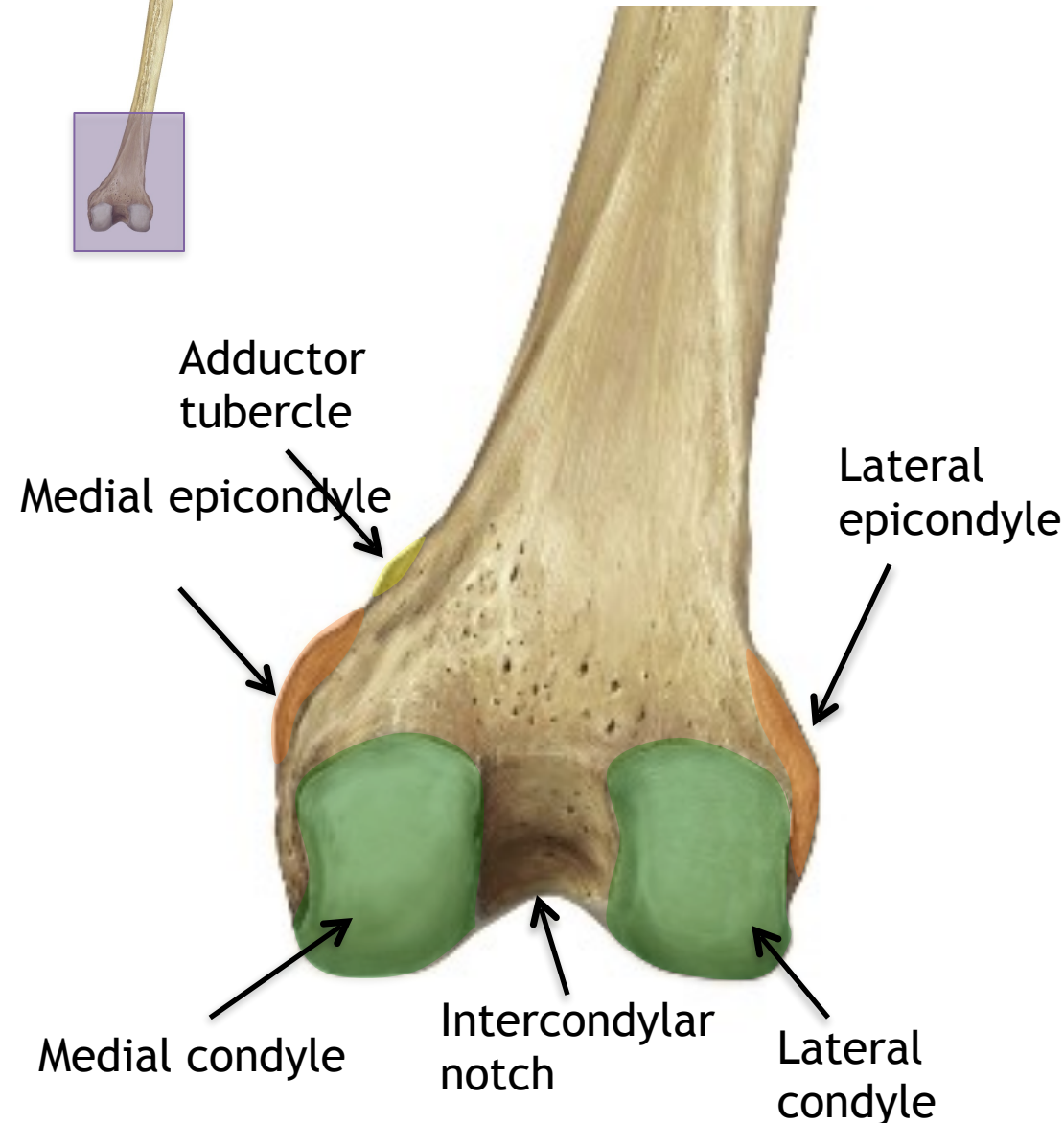


Right Femur:
Posterior View

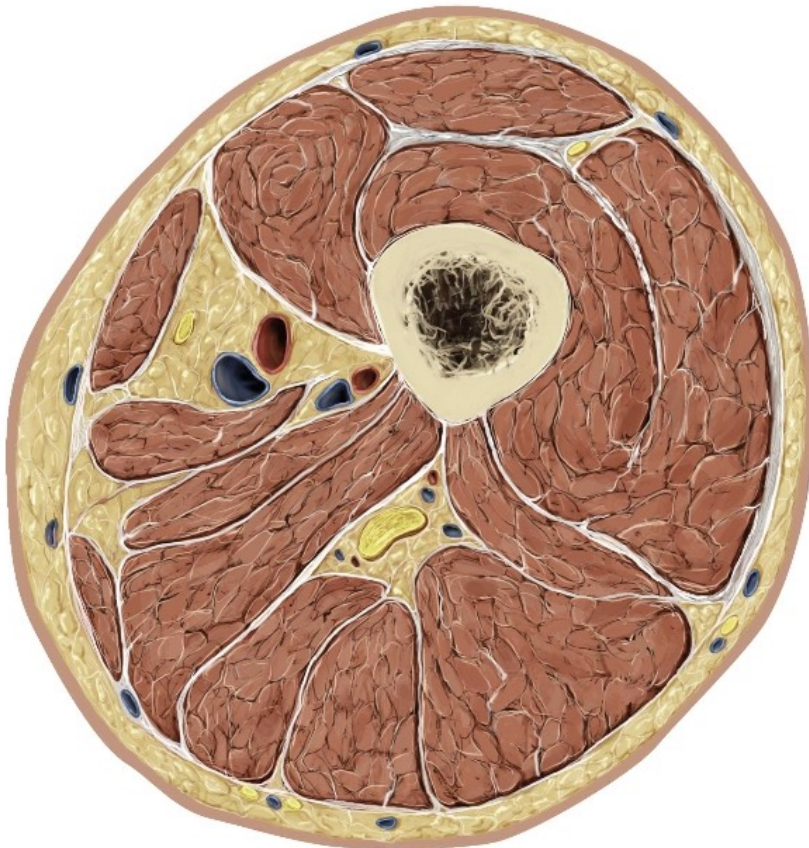
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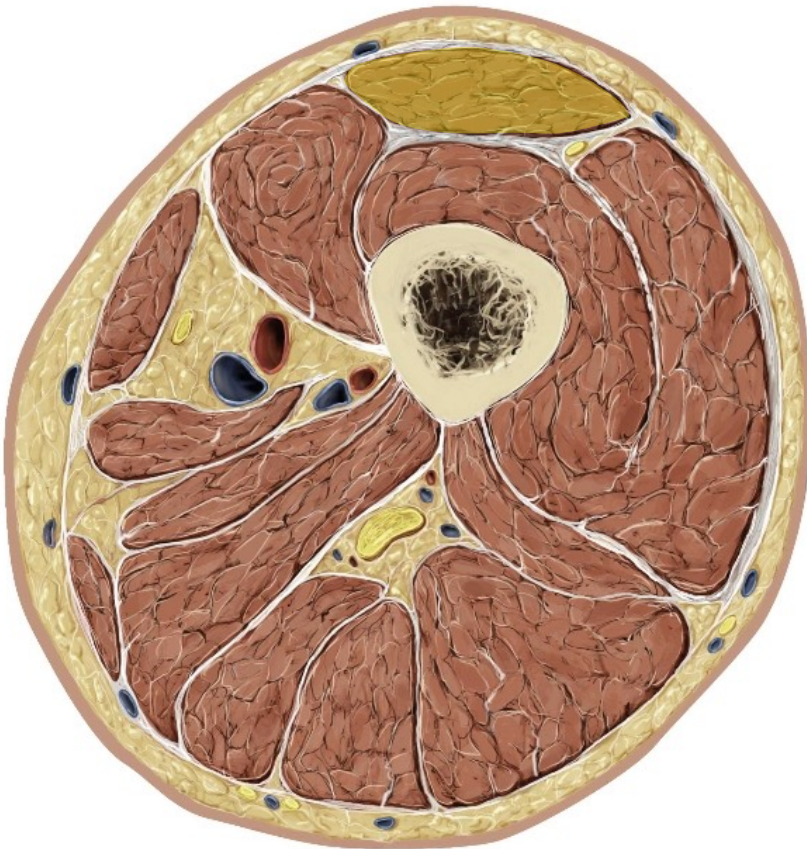
Cross Section of the Thigh



The fascia extends inward to separate the thigh into anterior, posterior and medial compartments.

The **anterior compartment** consists of the thighs primary flexors. The **posterior compartment** consists of the thighs primary extensors. The **medial compartment** consists of the thighs primary adductors.

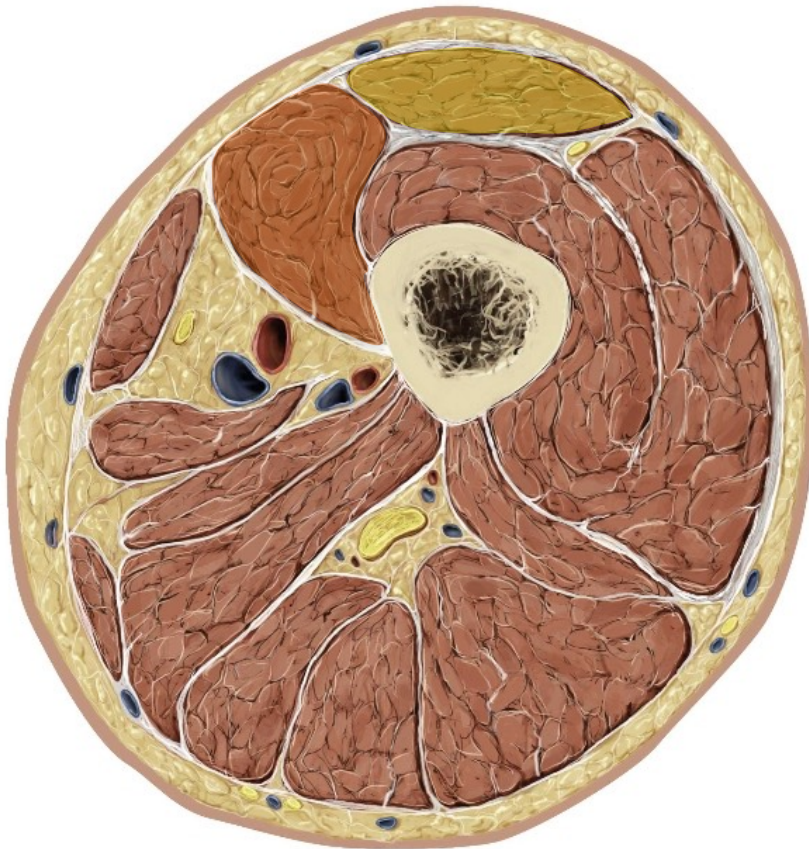
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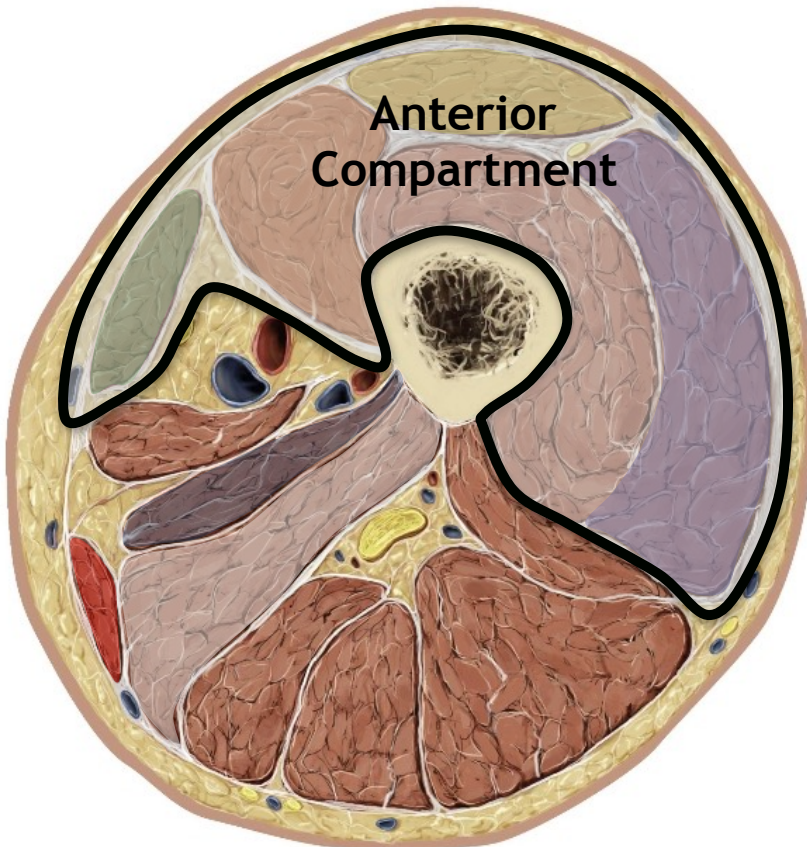
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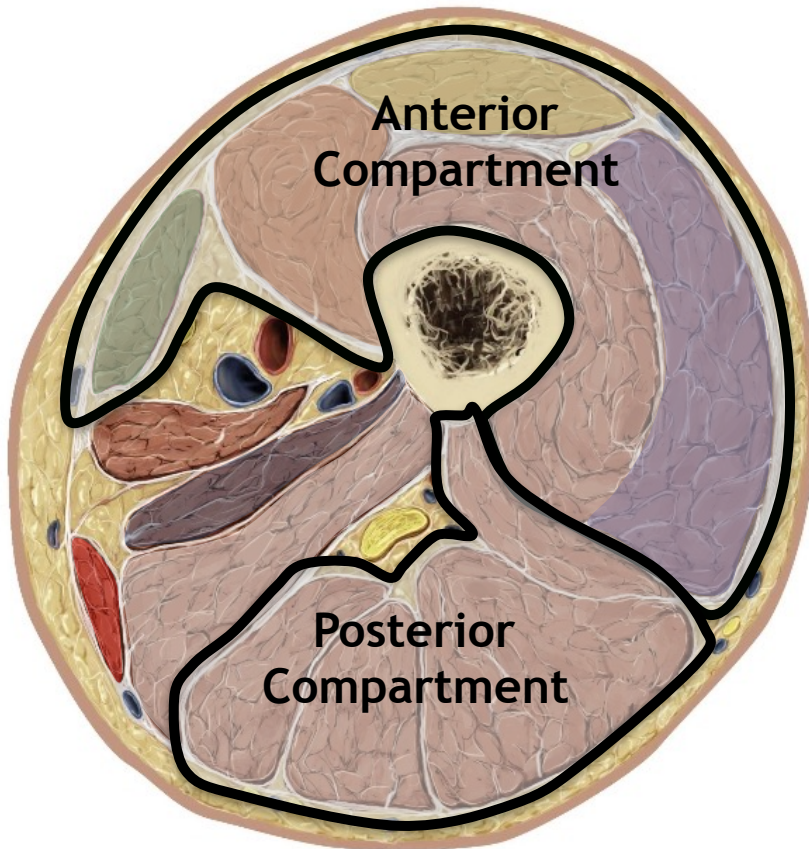
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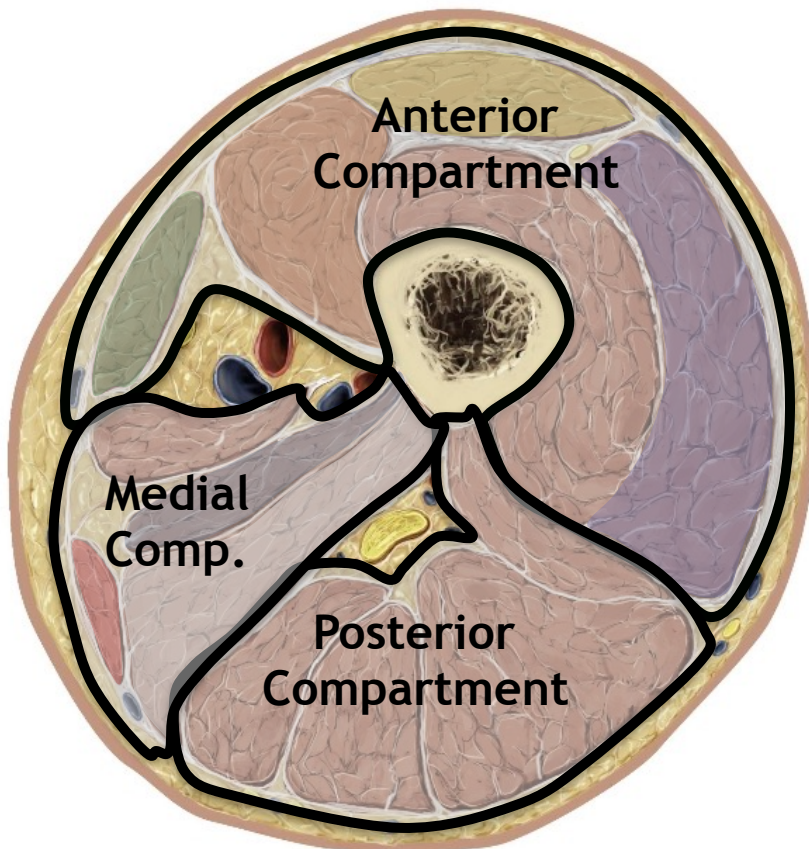
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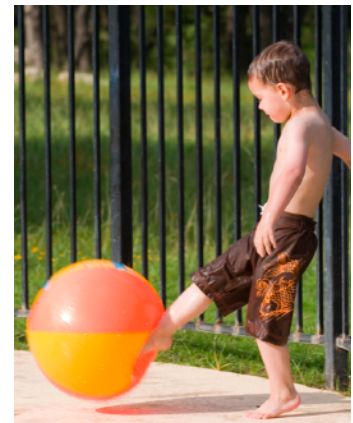
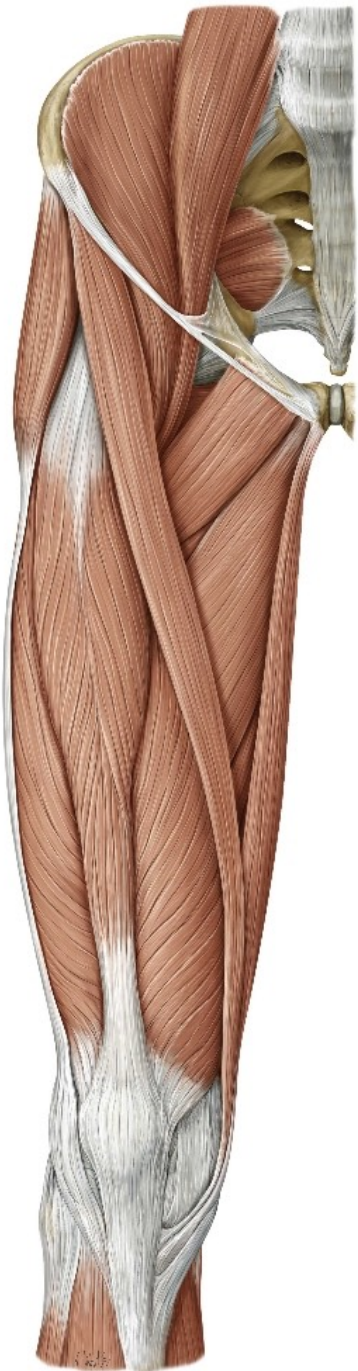
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Muscles of the Thigh: Anterior

The muscles of the thigh are divided into an anterior and a posterior section. The anterior section consists of majority flexors innervated by the femoral nerve, including the **sartorius** and the **quadriceps femoris**.

The **sartorius** is the lateral edge of what is known as the femoral triangle. It rests on top of the adductor canal and is commonly used in surgical practice as a guide to locating the femoral artery. It serves to *flex, abduct and externally rotate the hip joint* and *flex and internally rotate at the knee joint*. It's this internal flexion and rotation that aids in sitting cross-legged.

The **quadriceps femoris** muscles allow for *flexion at the hip joint* and *extension at the knee* as when juggling (bouncing) and kicking a soccer ball. These muscles are very important in running and are exercised while performing squats.

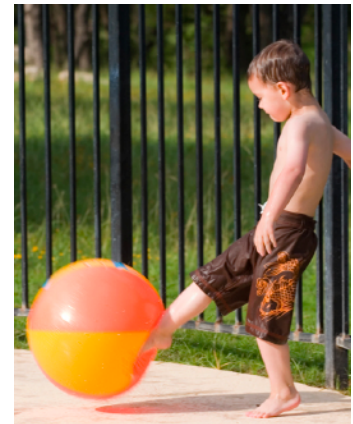
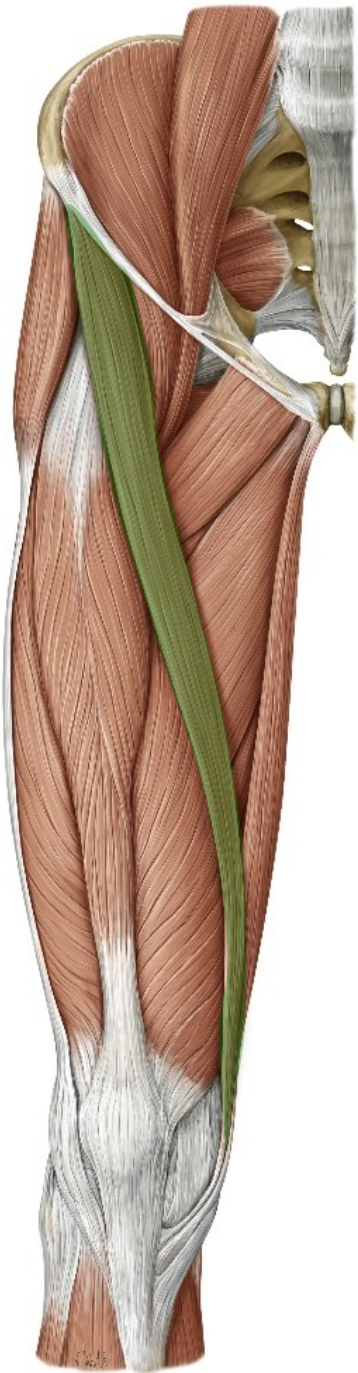


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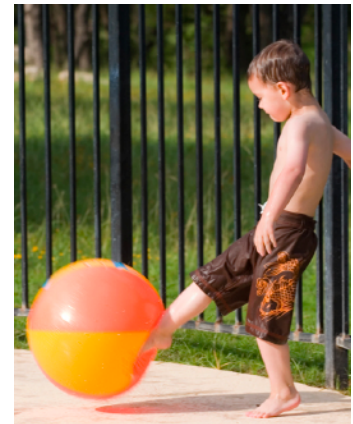
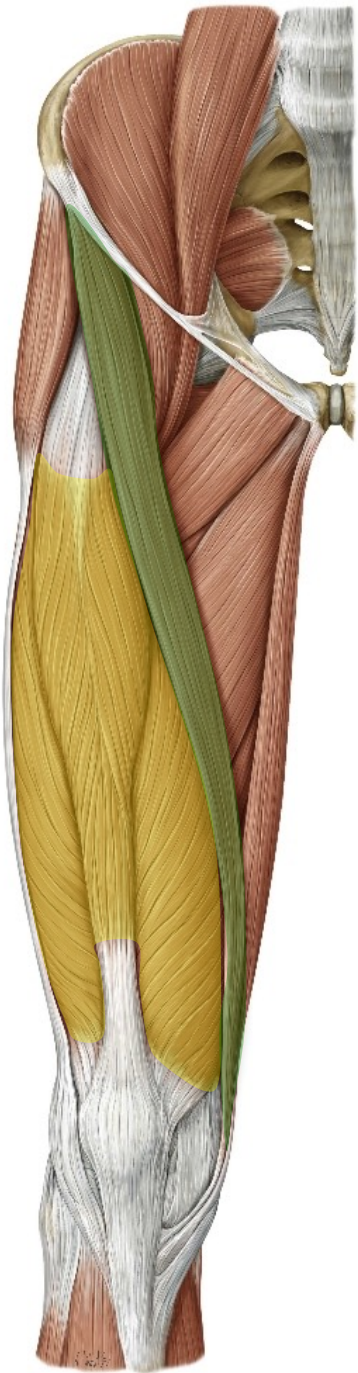


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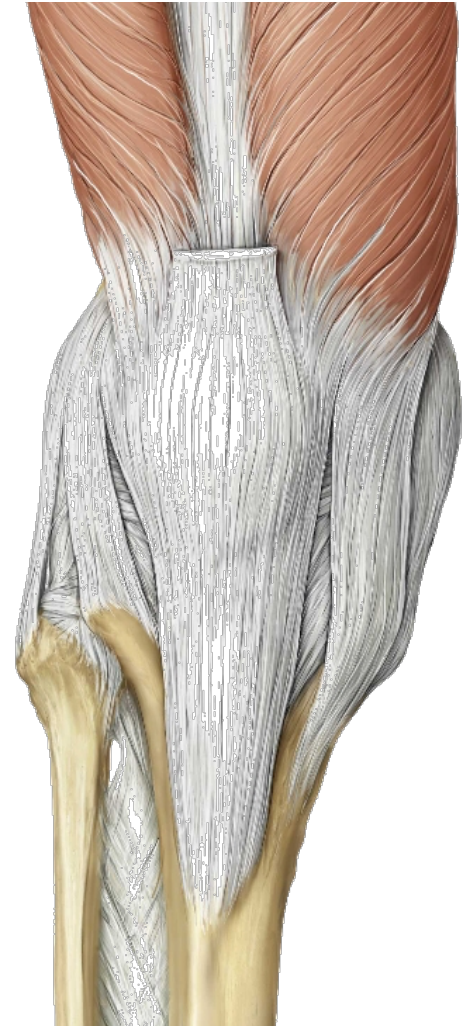


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These four muscles merge at the **quadracep femoris** tendon, at the point in which it embeds the patella then continues downwards towards the foot, taking on the name patellar ligament.

When testing reflexes of the lower spine, it is the patellar ligament that is tapped and the **quadriceps femoris** contracted.

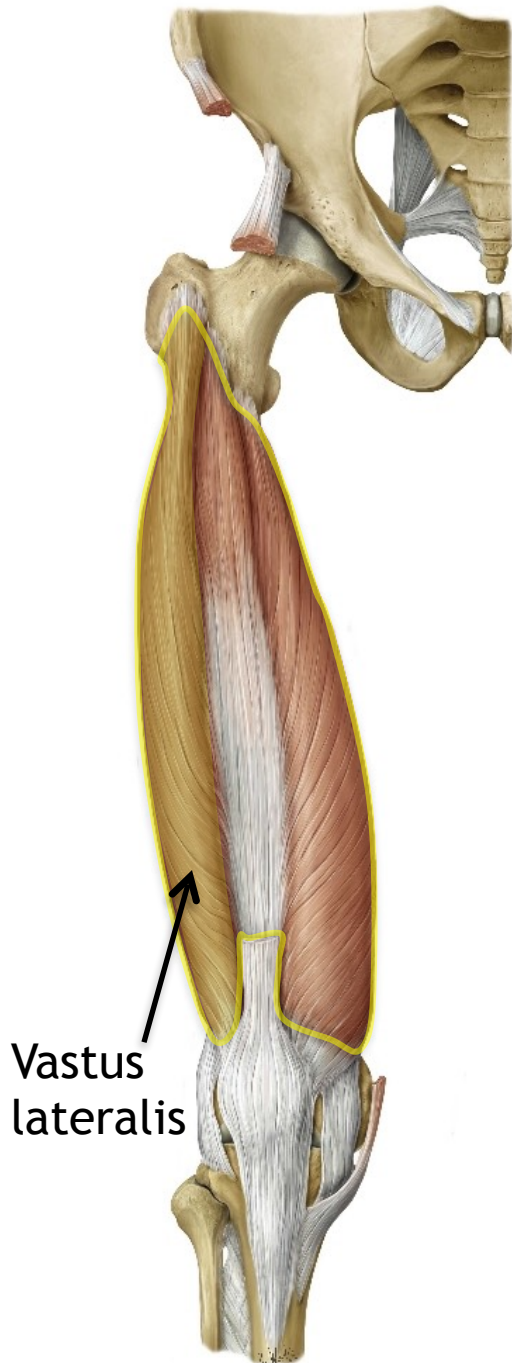
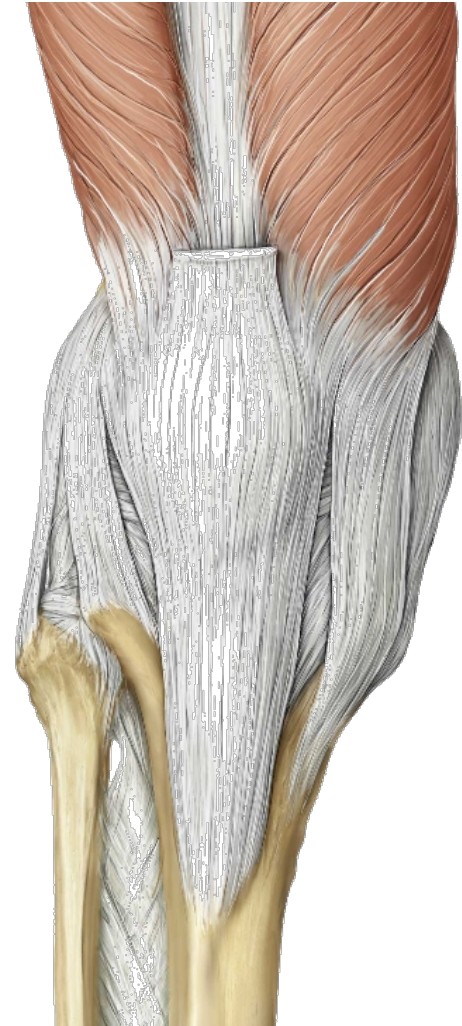


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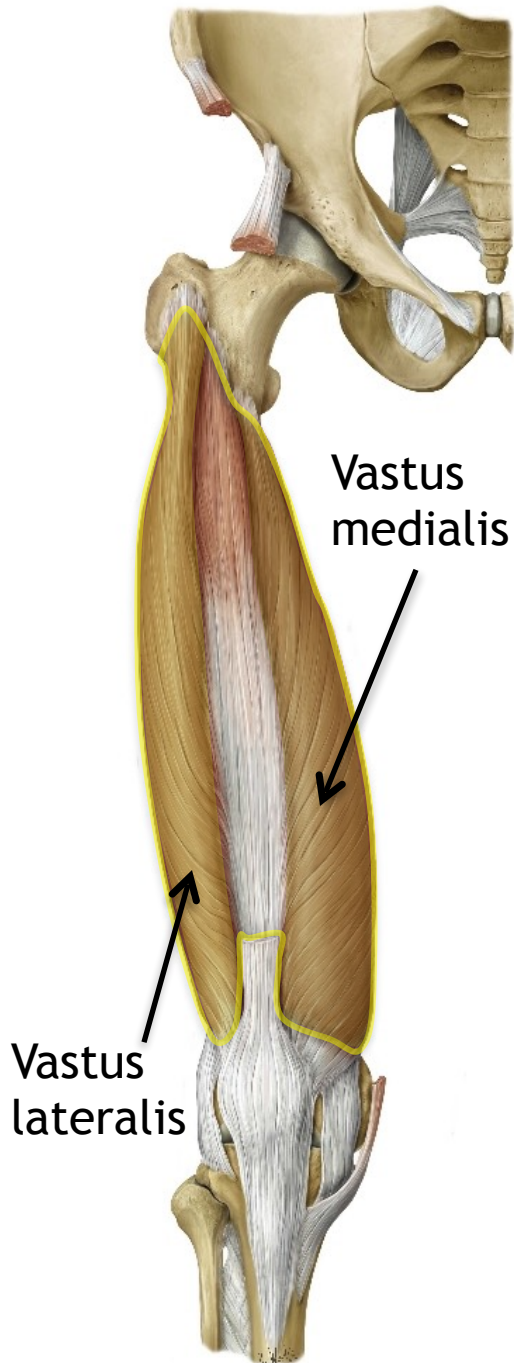
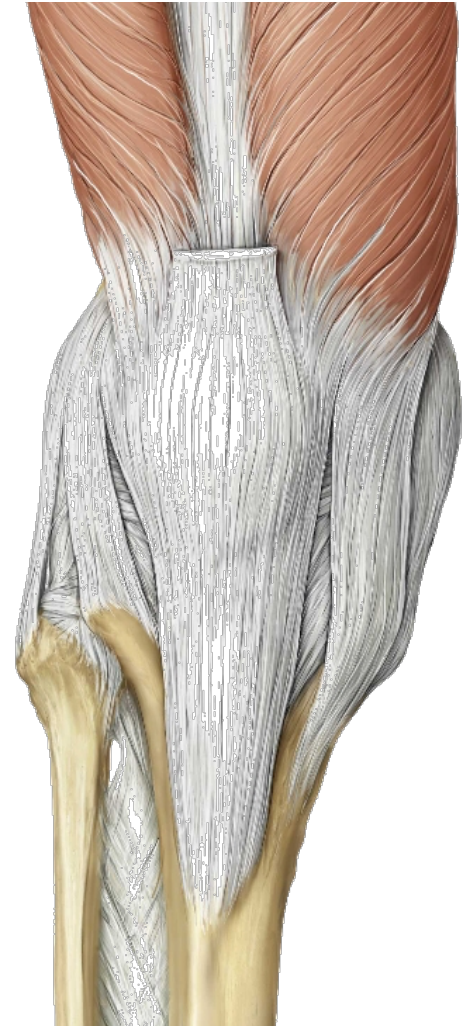


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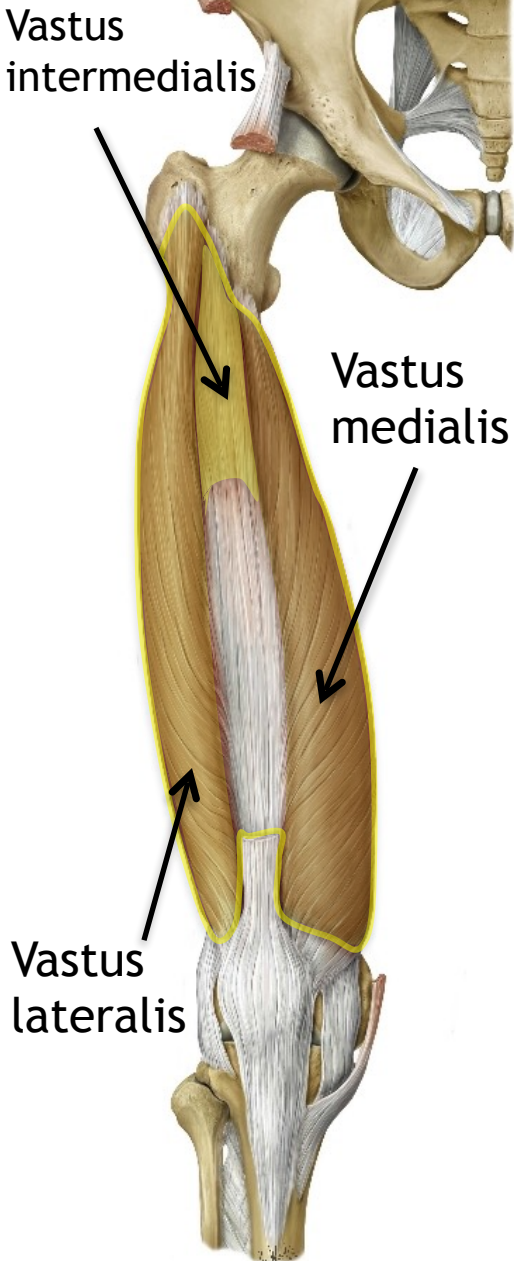
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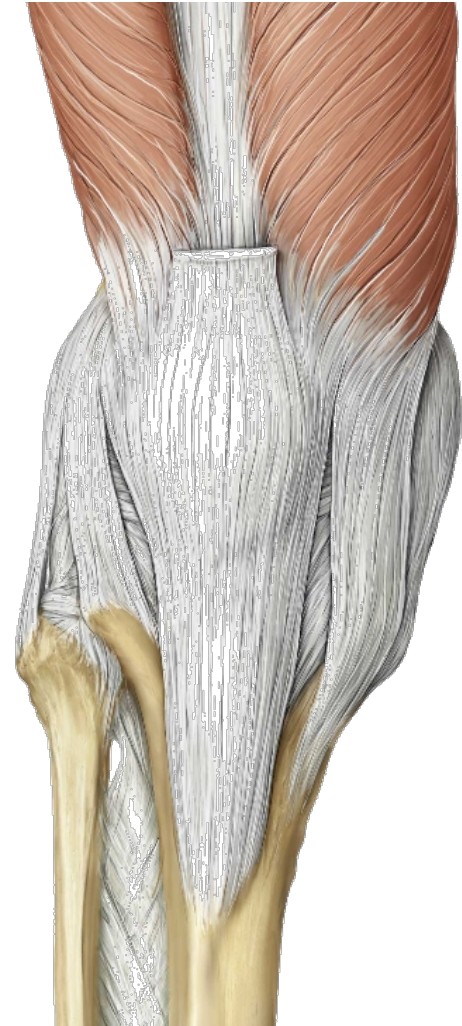
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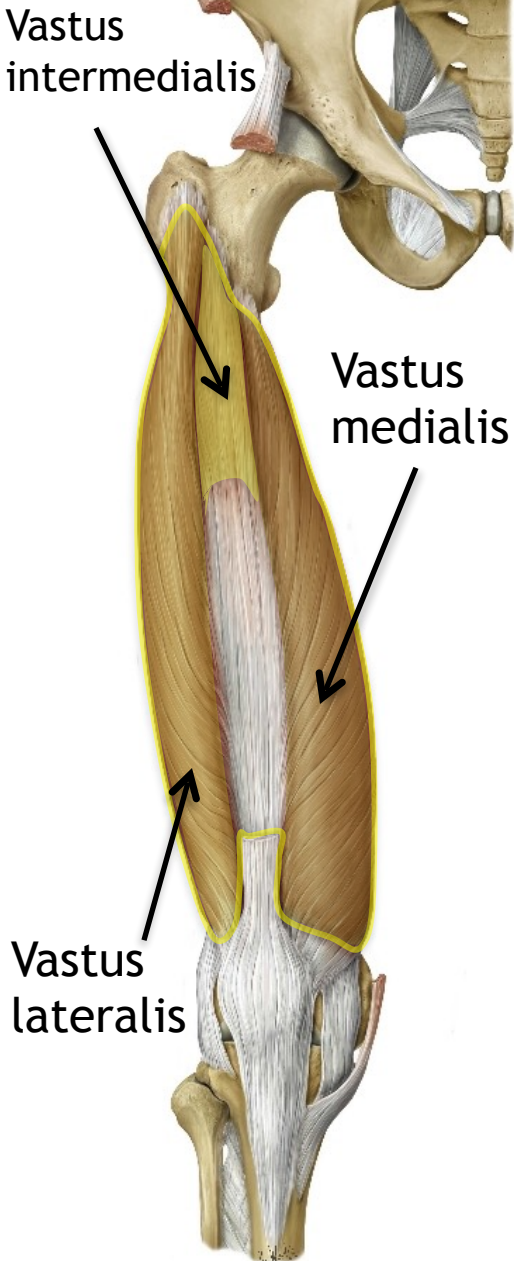
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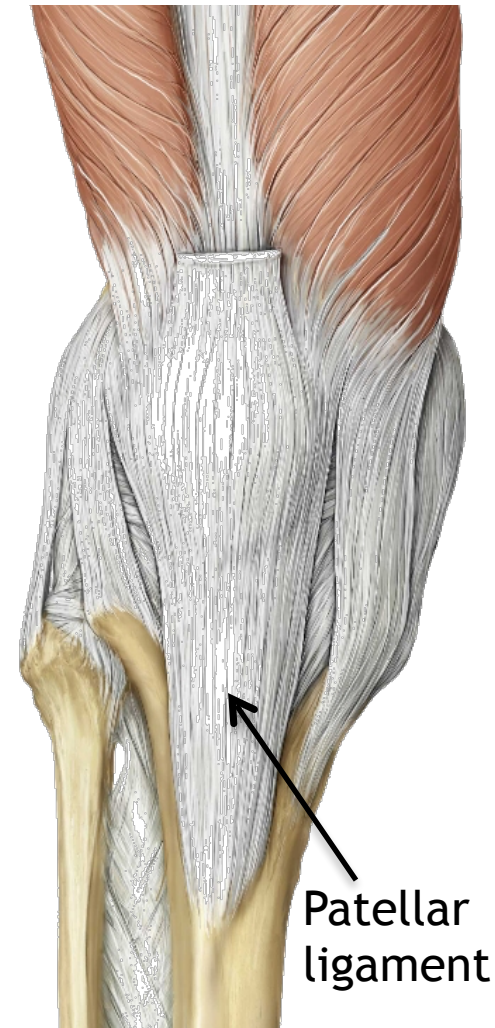
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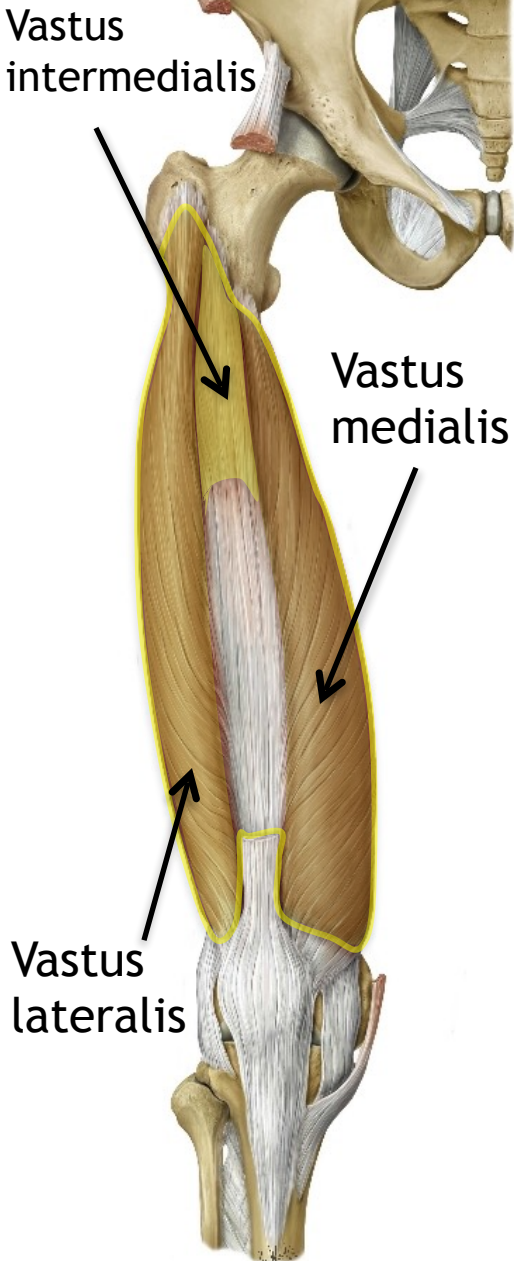
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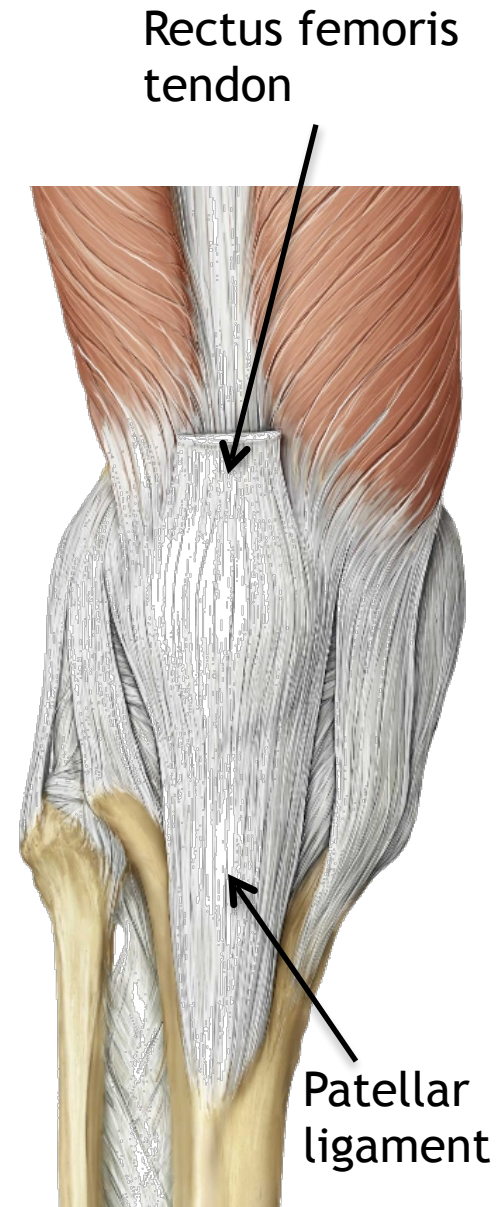
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As antagonists to the anterior quadriceps femoris and sartorius, these muscles actions are opposite to those in the anterior compartment. These actions include *extending* and *stabilizing the hip* and *flexing* and *externally rotating the leg* at the knee joint.

The biceps and semitendinosus tendons form the lateral and medial sides of the popliteal fossa, located on the backside of the knee

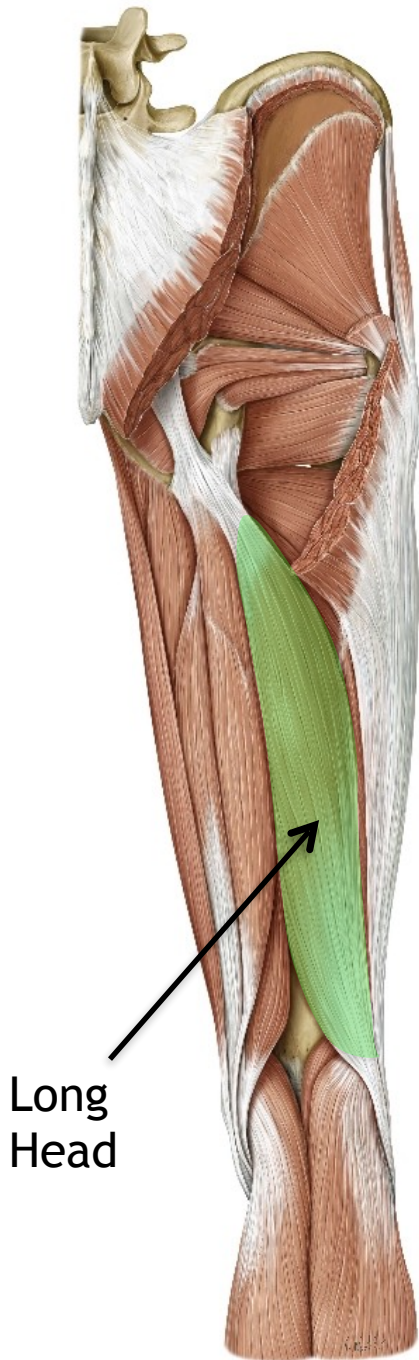
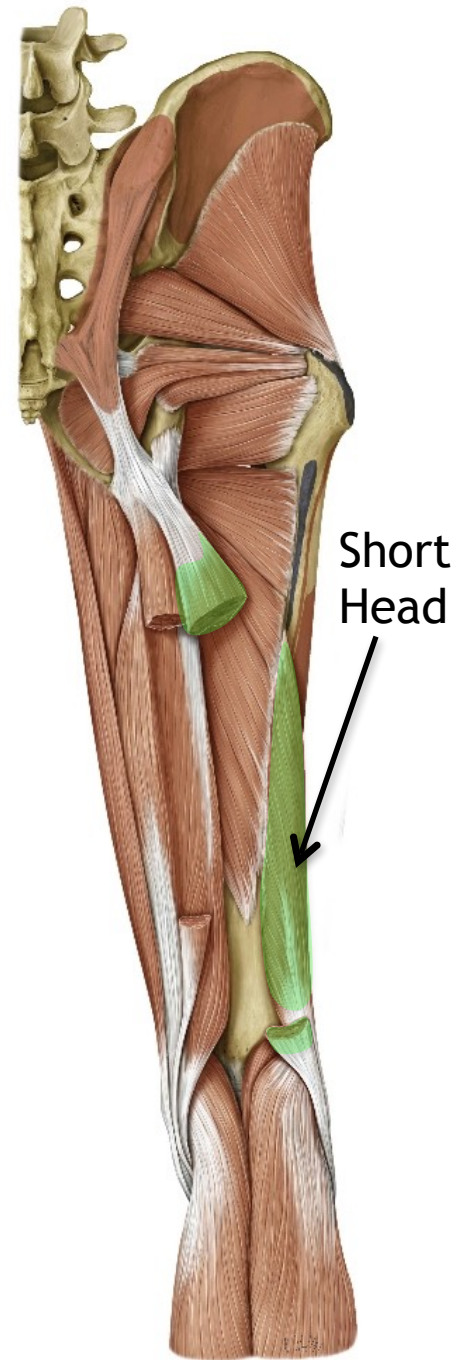


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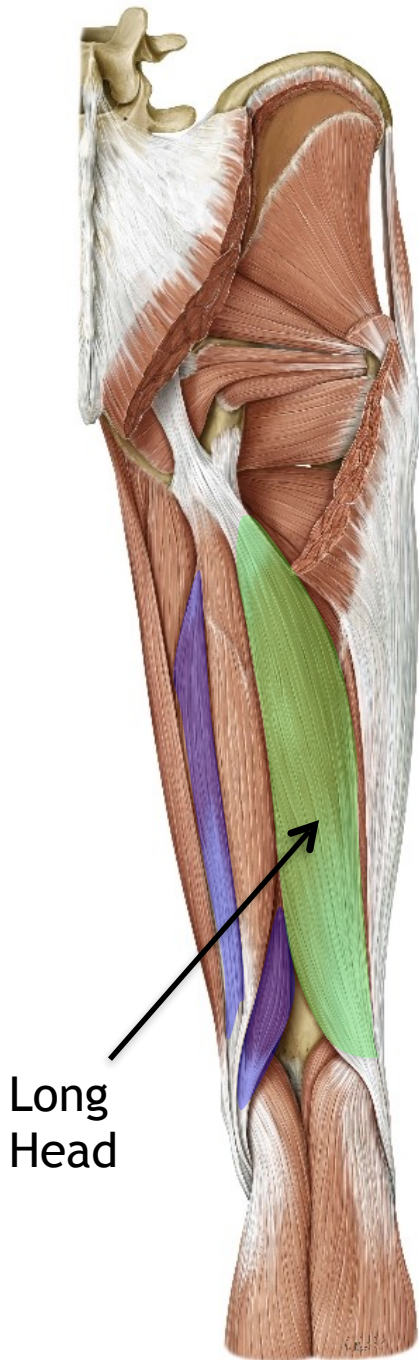
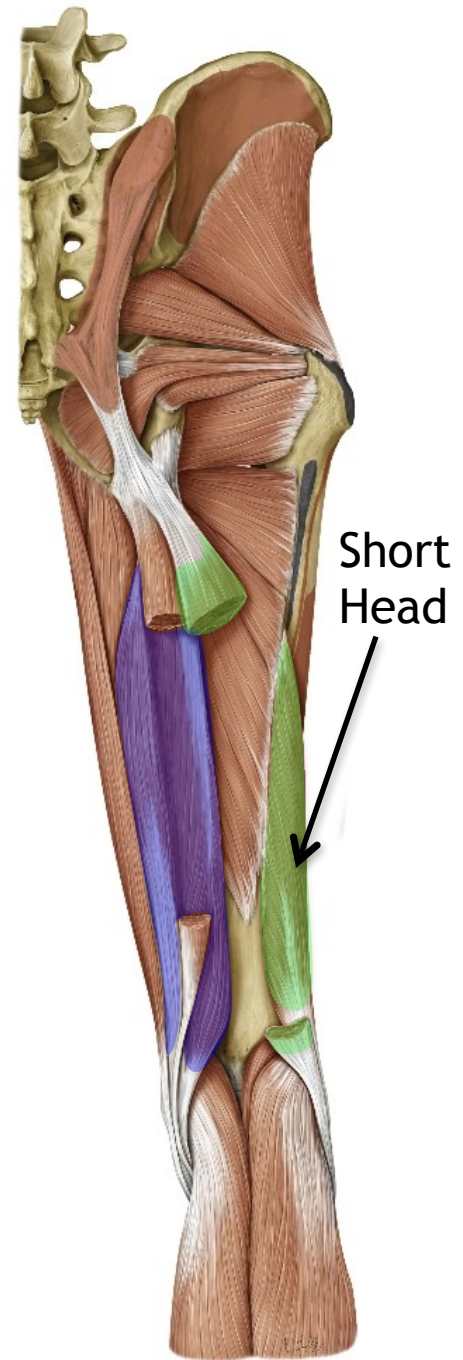


Muscles of the Thigh: Posterior

The posterior region of the thigh's main function is to extend the thigh and flex the leg. They include the **biceps femoris**, **semimembranosus** and **semitendinosus**. These four muscles are collectively known as the *hamstrings*.

As antagonists to the anterior quadriceps femoris and sartorius, these muscles actions are opposite to those in the anterior compartment. These actions include *extending* and *stabilizing the hip* and *flexing* and *externally rotating the leg* at the knee joint.

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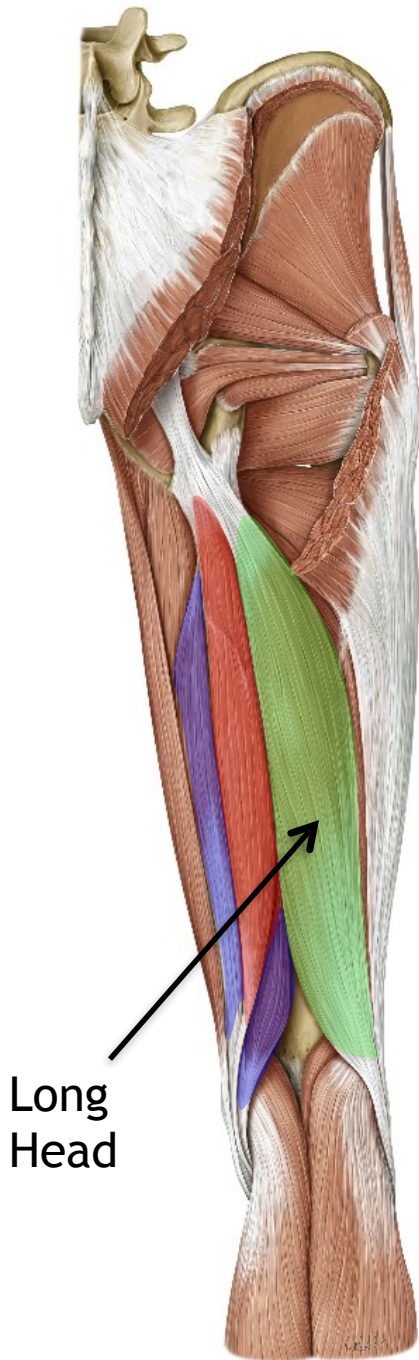
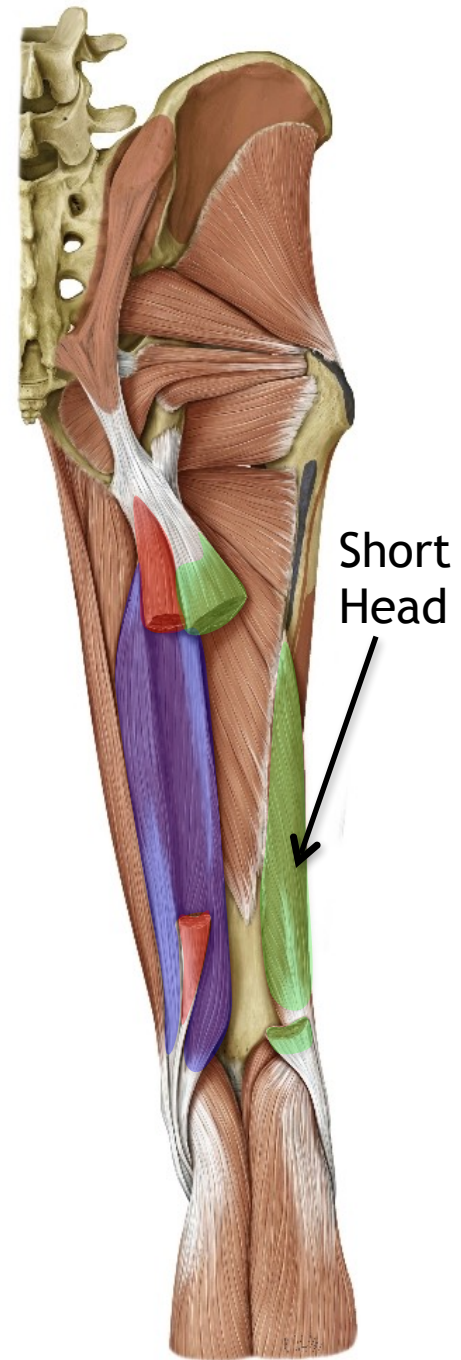


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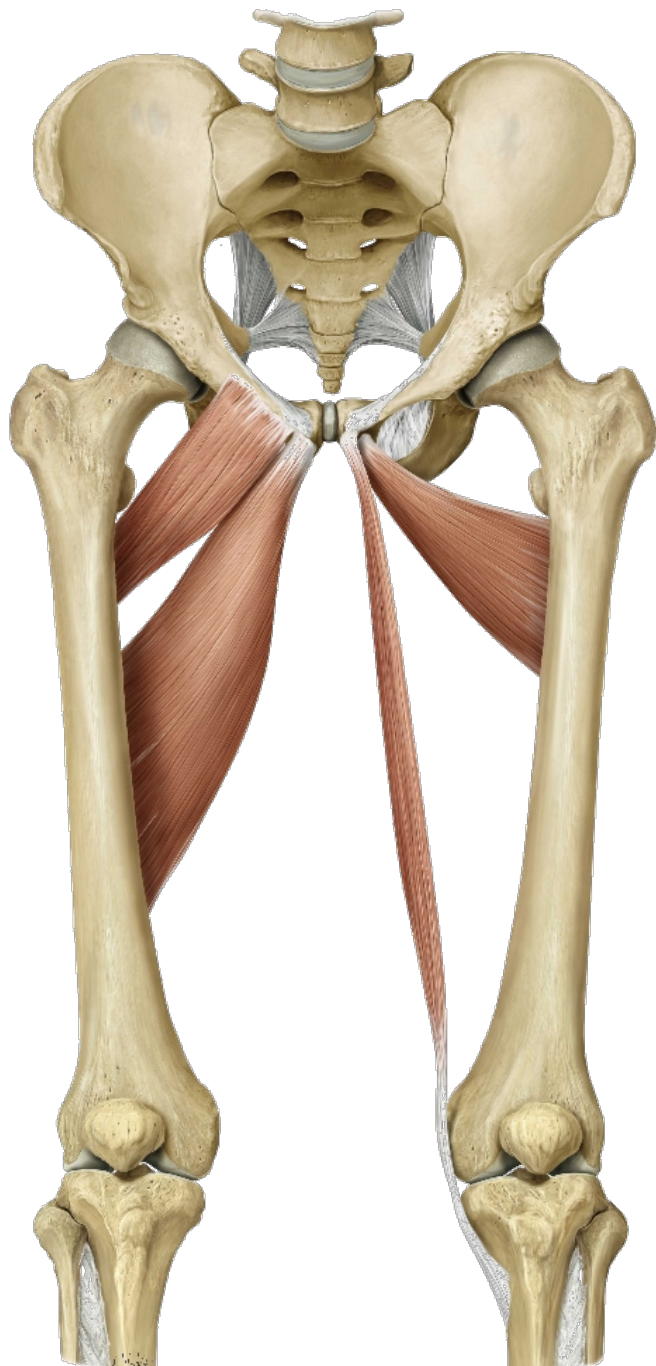
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Muscles of the Thigh: Medial Superficial



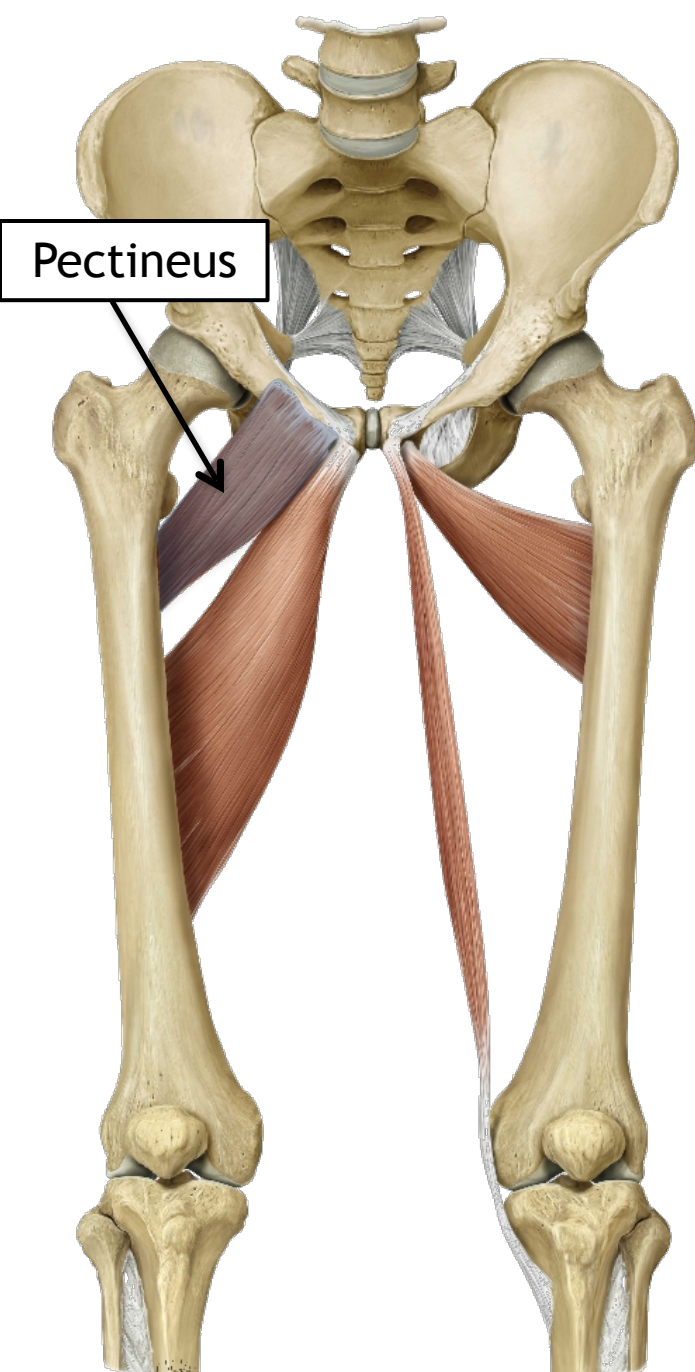
The medial portion of muscles in the thigh serve primarily to *adduct the thigh*. These superficial muscles of this group include the **pectineus**, **adductor longus**, **adductor brevis** and **gracilis**. The **adductor brevis** is deep to **adductor longus**.

All four muscles originate on the pubic bone and all except for **gracilis** insert on different parts of the femur. The **gracilis** reaches around the knee and inserts on the tibia of the lower leg.

Innervation is supplied by both the femoral and obturator nerves branching from the lumbar plexus (L2, L3, L4).

Horseback riders can get what is called “rider’s leg” through overuse of thigh adductors causing discomfort. This discomfort is caused by ossification in the distal tendon of the adductor longus.

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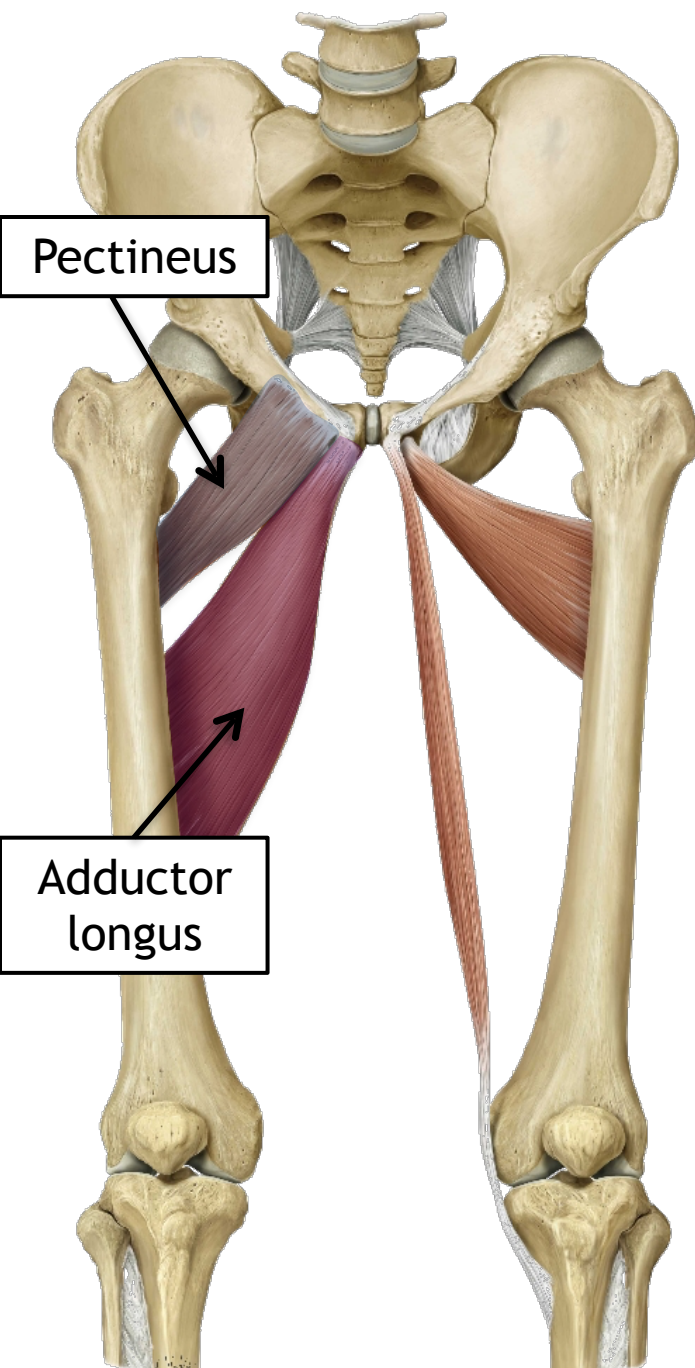
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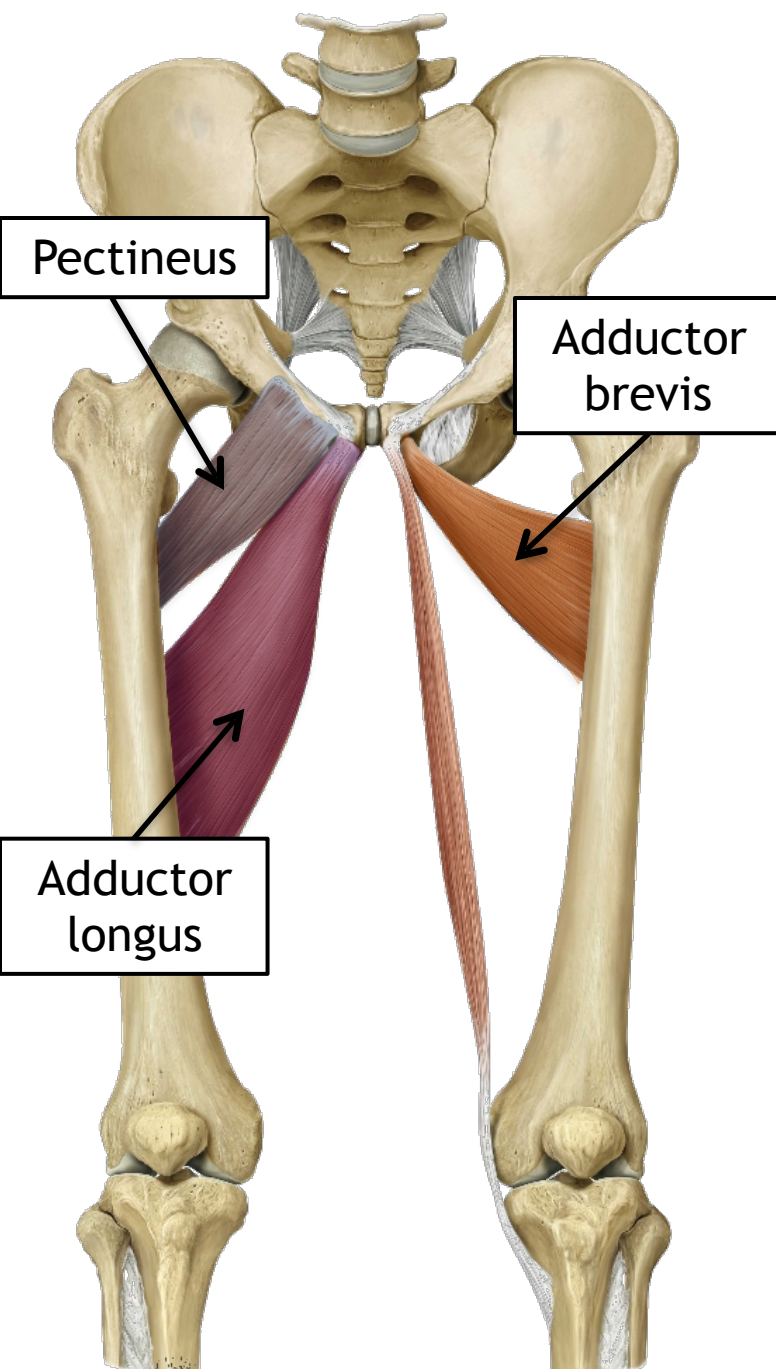
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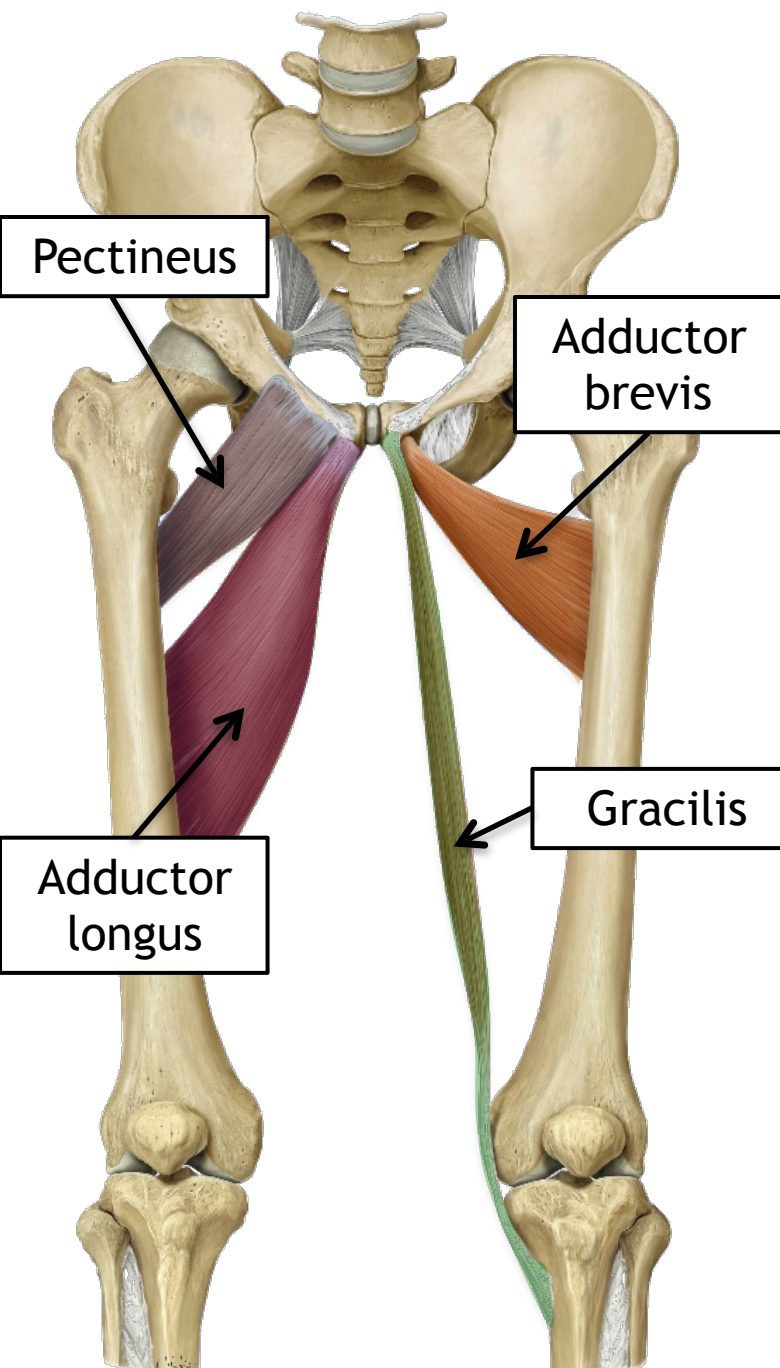
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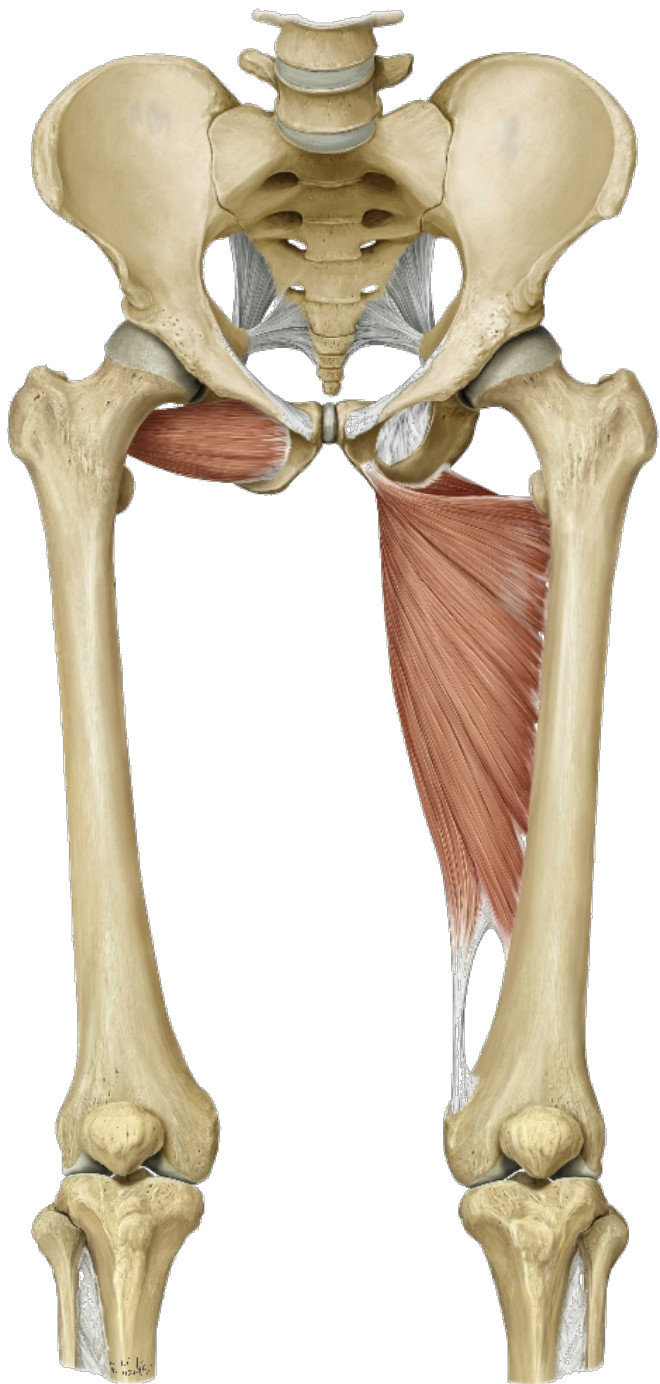


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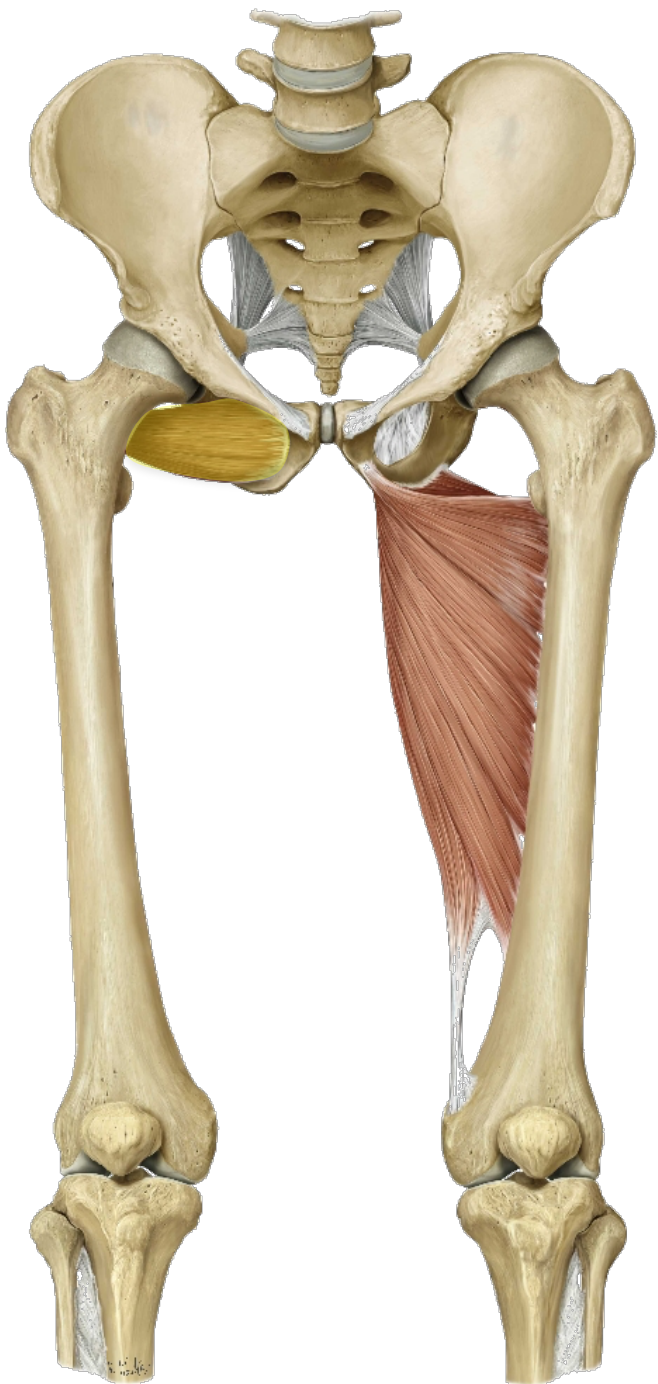


Muscles of the Thigh: Medial Deep

The deep layer of medial thigh muscles include the **obturator externus**, **adductor minimus** and **adductor magnus**.

These three muscles also *aDduct the thigh* at the hip joint. They also play an important role in *stabilizing the pelvis*. The **adductor magnus** acts as both an adductor where it attaches to the **linea aspera** of the femur and a hamstring portion.

Note the empty space between the distal end of the femur and the adductor magnus tendon. This hole is called the **adductor hiatus**. It is here that the femoral artery travels through anteriorly, transitioning into the popliteal artery posteriorly.

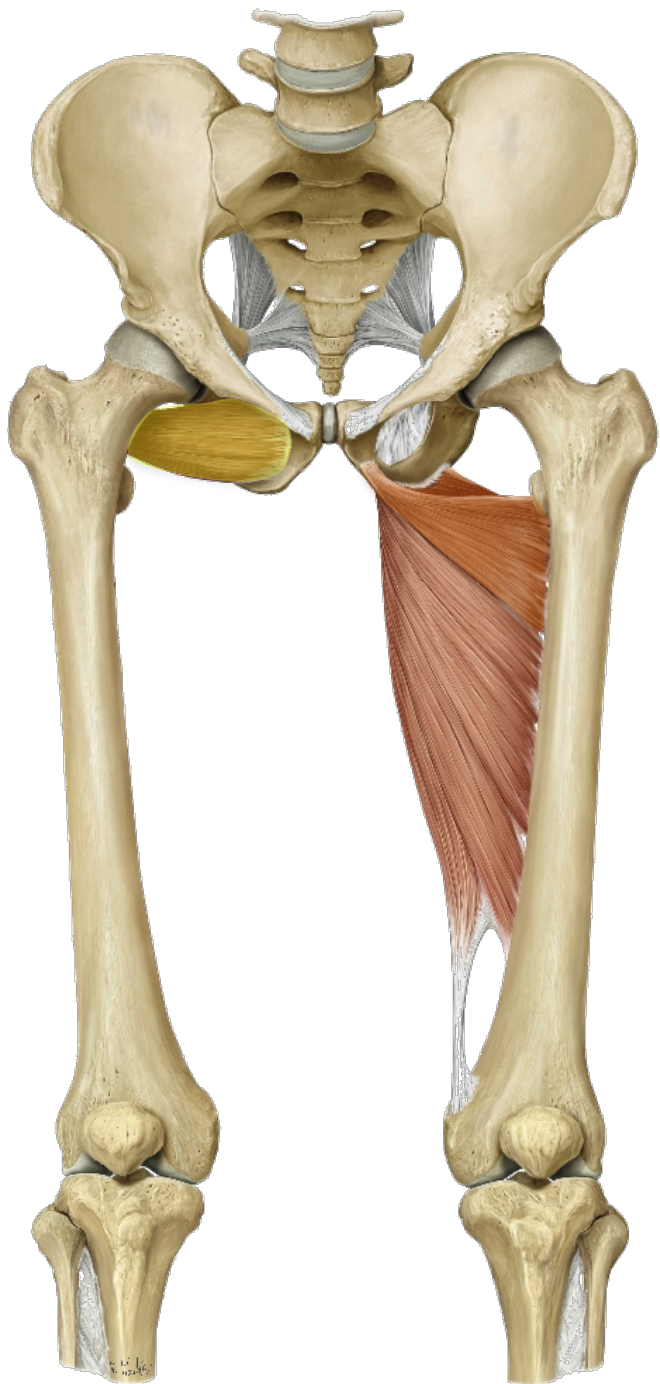


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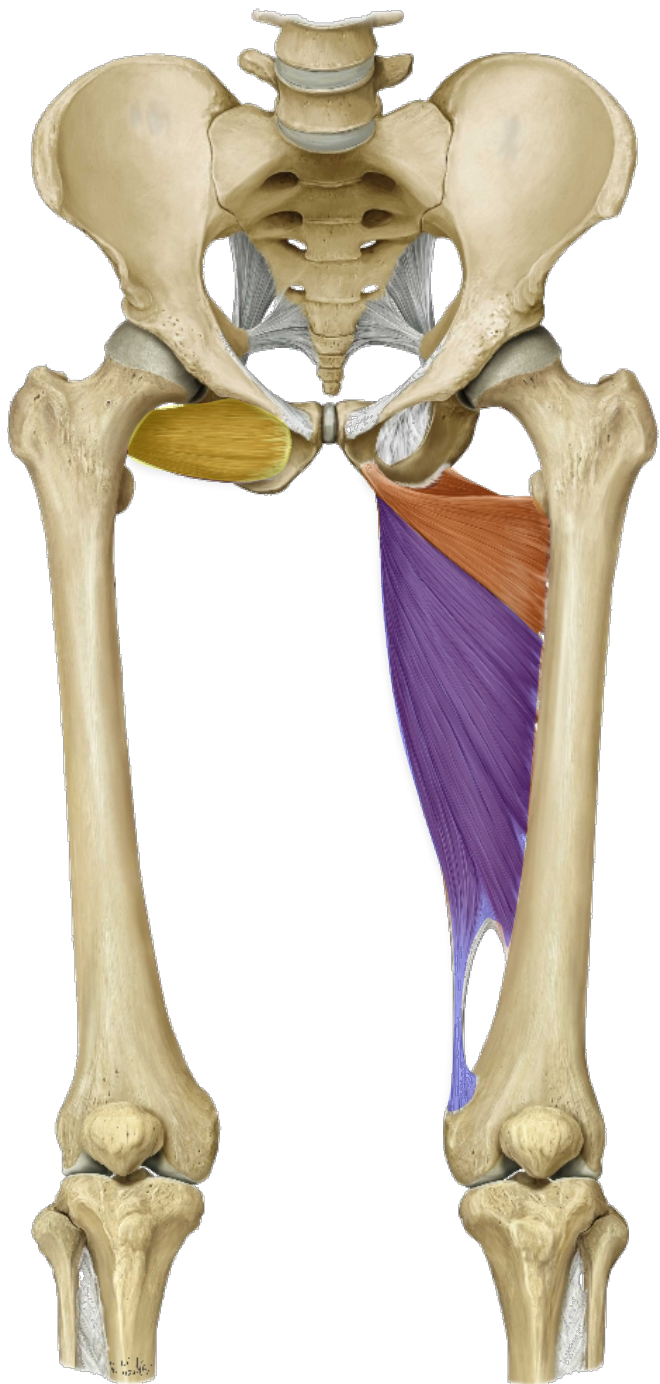


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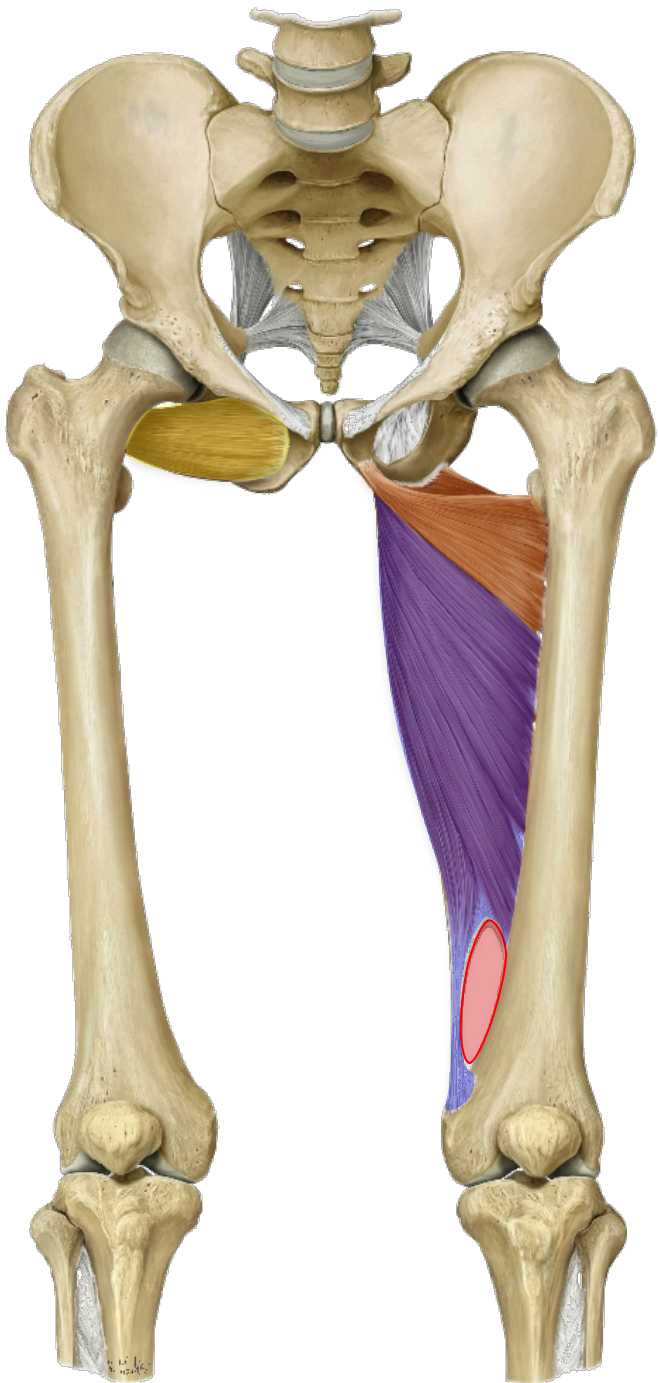
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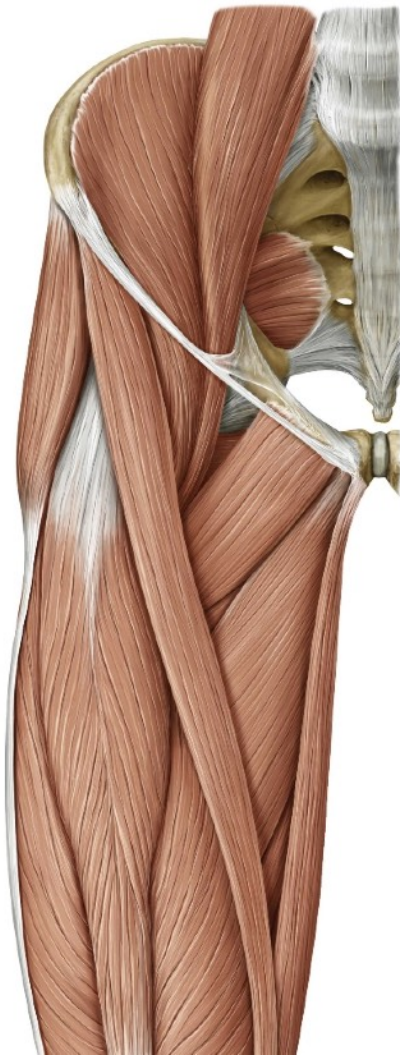
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Muscles of the Thigh		
Muscles	Proximal Attachment	Distal Attachment
Sartorius	Iliac spine	Medial to tibial tuberosity
Rectus femoris		Tibial tuberosity
Vastus medialis	Linea aspera, intertrochanteric line	Both sides of tuberosity
Vastus lateralis	Linea aspera, greater trochanter	
Vastus intermedius	Femoral shaft	Tibial tuberosity
Biceps Femoris [short heat]	Linea aspera and femur	Head of fibula
Biceps femoris [long head]	Ischial tuberosity and sacrotuberous ligament	
Semimembranosus	Ischial tuberosity	Medial tibial condyle, oblique, popliteal ligament and popliteus fascia
Semitendinosus	Ischial tuberosity and sacrotuberous ligament	Medial to the tibial tuberosity in pes anserinus

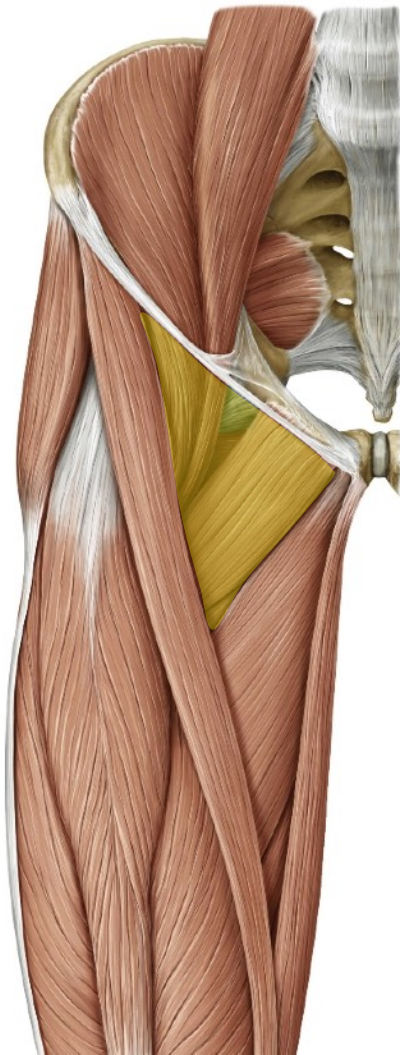
Muscles of the Thigh (cont.)		
Pectineus	Pectin pubis	Linea aspera and pectineal line
Adductor longus	Superior pubic ramus and anterior side of symphesis	Linea aspera
Adductor brevis	Inferior pubic ramus	
Gracilis	inferior pubic ramus below the symphesis	Tibia
Obturator externus	Outer surface of obturator membrane	Trochanteric fossa of the femur
Adductor minimus	Inferior pubic ramus	Medial lip of the linea aspera
Adductor magnus	Inferior pubic ramus, ischial ramus and ischial tuberosity	Deep: linea aspera Superficial: adductor tubercle of femur

The Femoral Triangle:



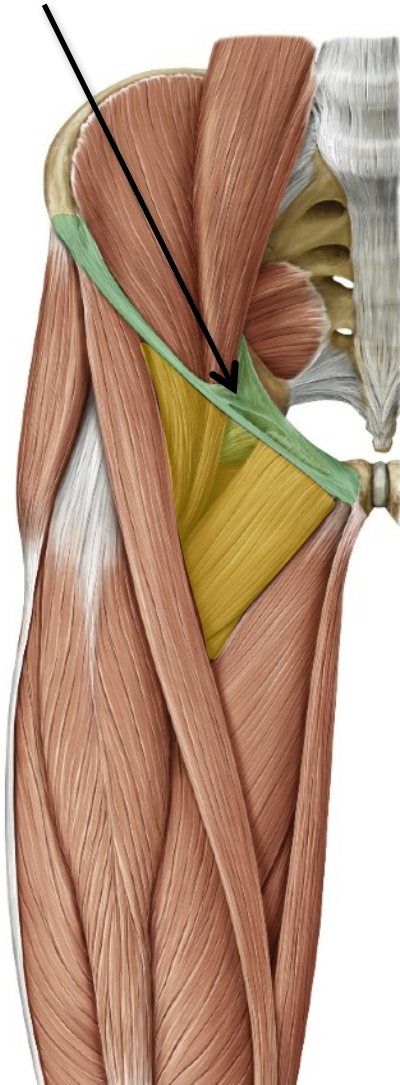
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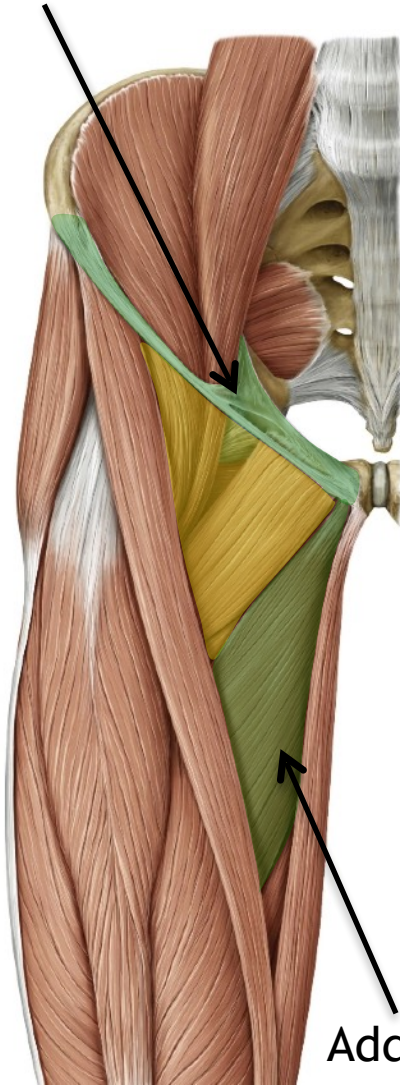
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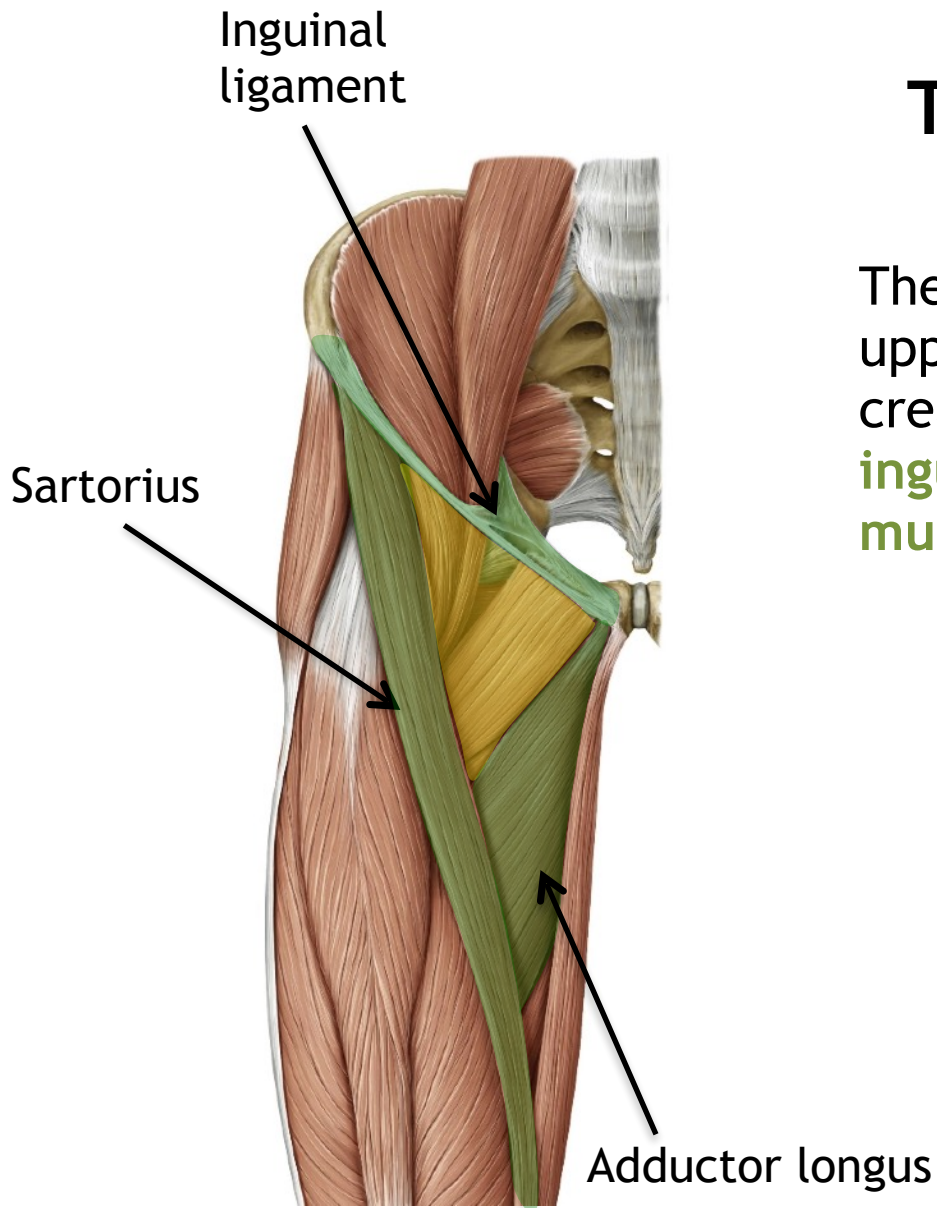
Adductor longus

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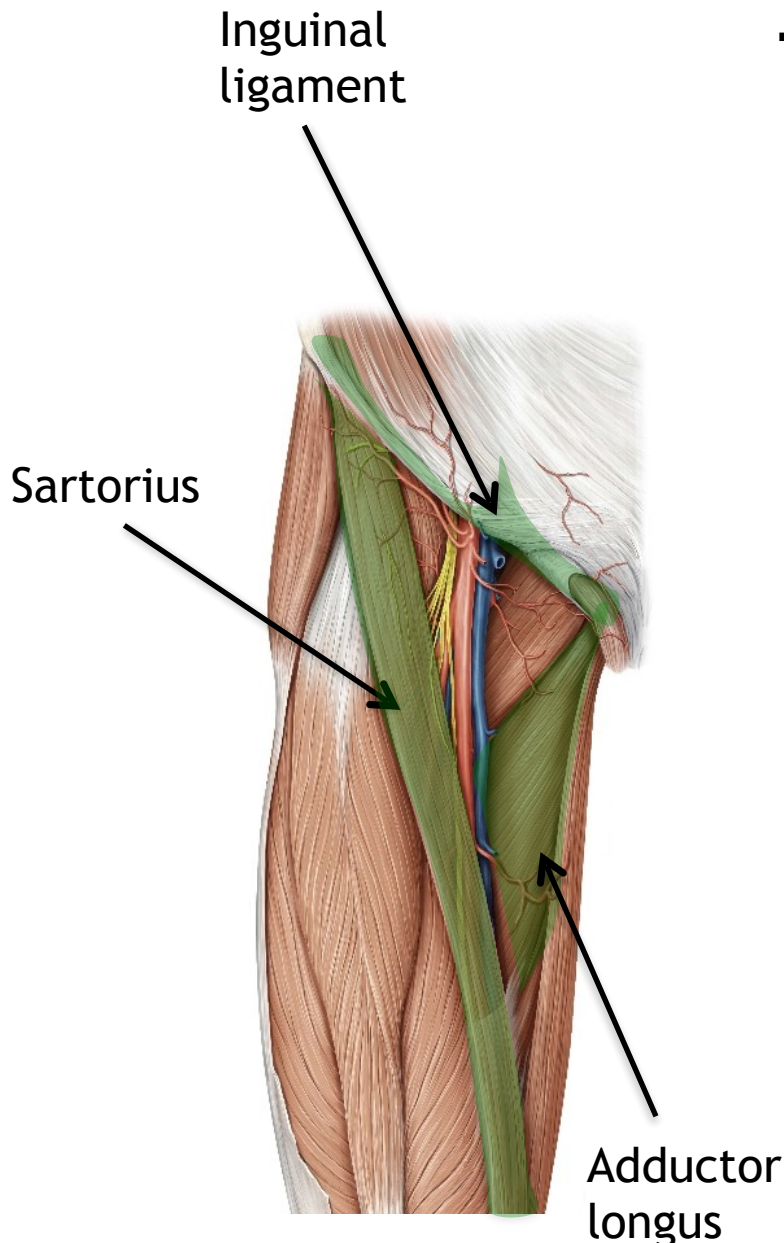
All the major blood supply and innervation of the lower limb travels through this region.

This includes the **femoral artery**, **femoral vein**, and **femoral nerve**.

All three pass behind the inguinal ligament then travel down the middle third of the thigh through the adductor canal.

The contents of the neurovascular bundle of the femoral triangle can be remembered (lateral to medial) by the acronym **N.A.V.E.L.**, femoral Nerve, Artery, Vein, Empy space [that contains] Lymph. The femoral artery and vein are found within the **femoral sheath** while the nerve, wanting to avoid compression, is located outside the sheath.

The pulsations of the femoral artery are easily felt.



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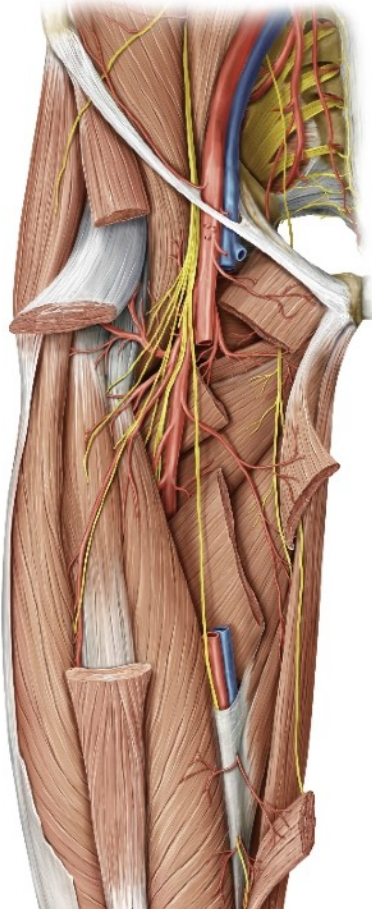
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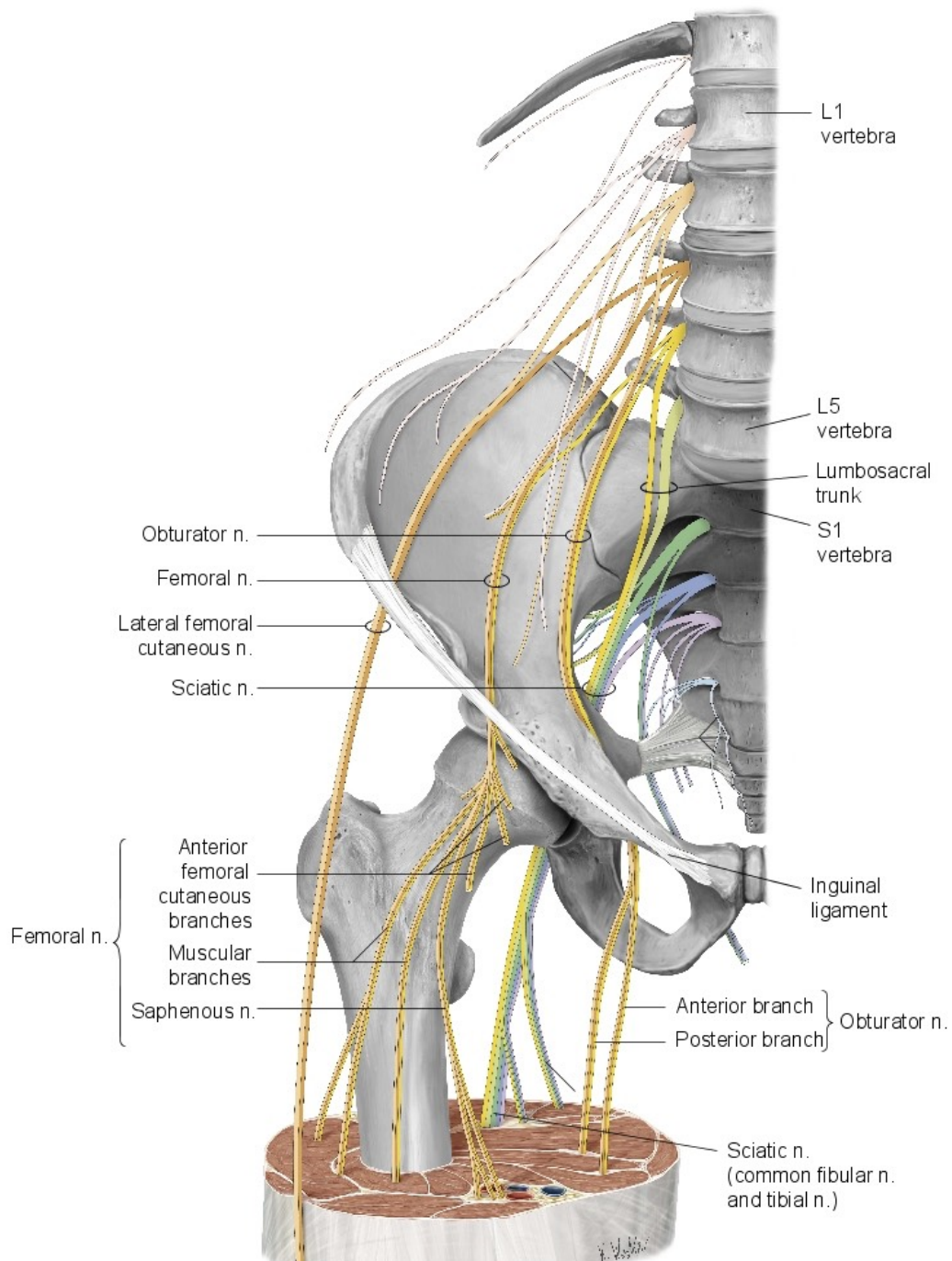
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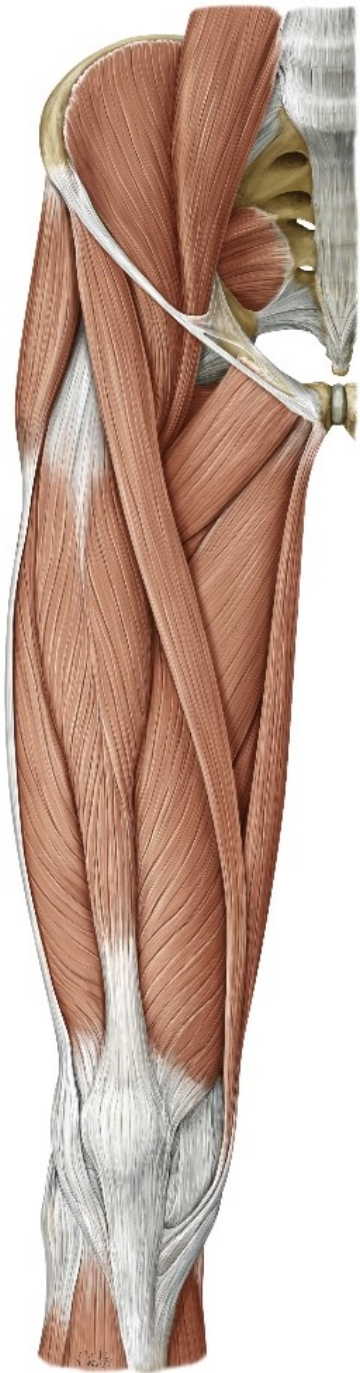
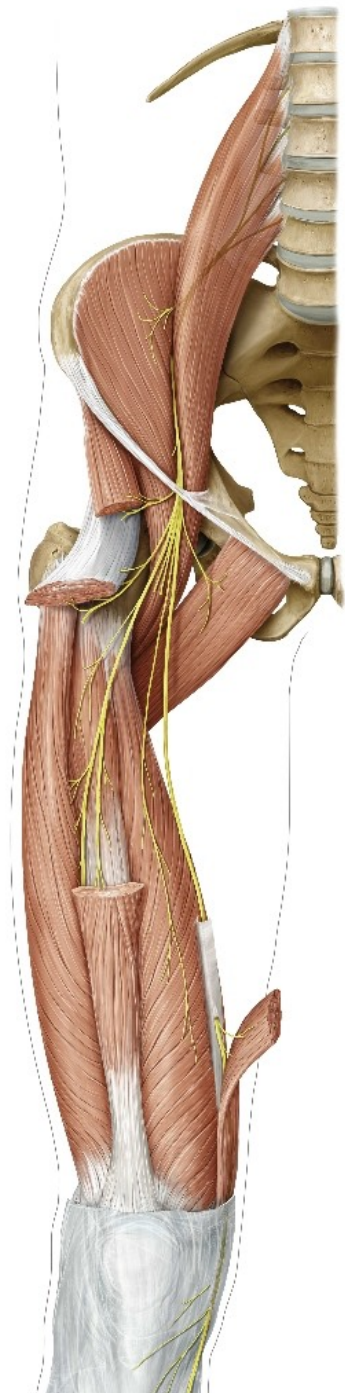
Innervation of the Thigh

Innervation of the Thigh: Femoral Nerve

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The nerve innervates the following muscles of the thigh:

- Sartorius
- Quadriceps femoris
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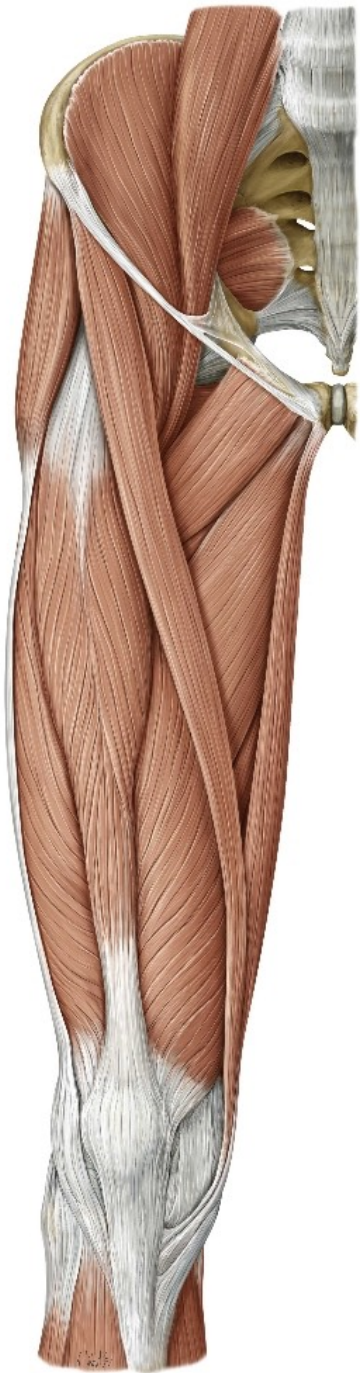
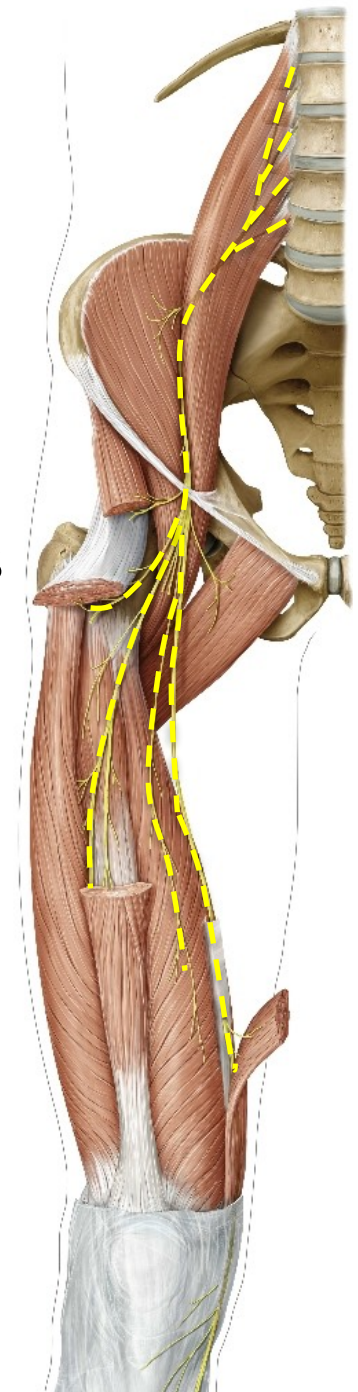


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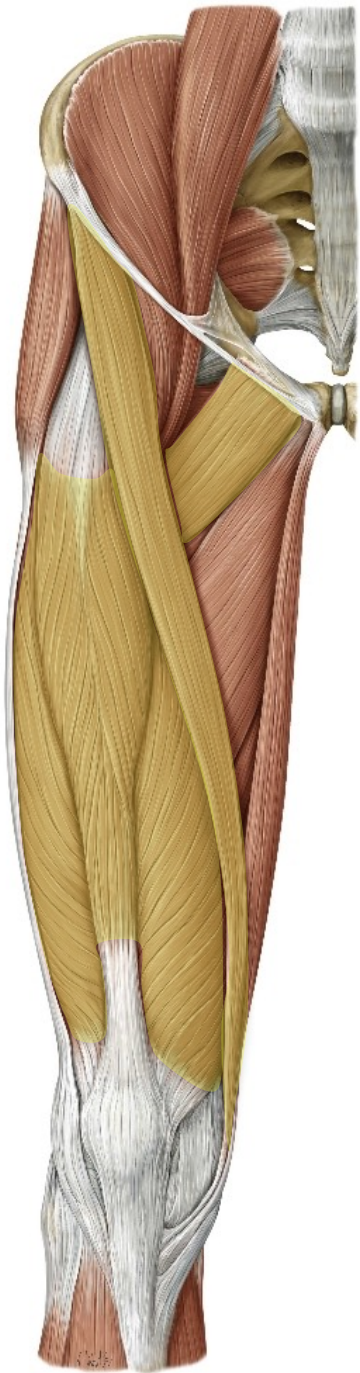
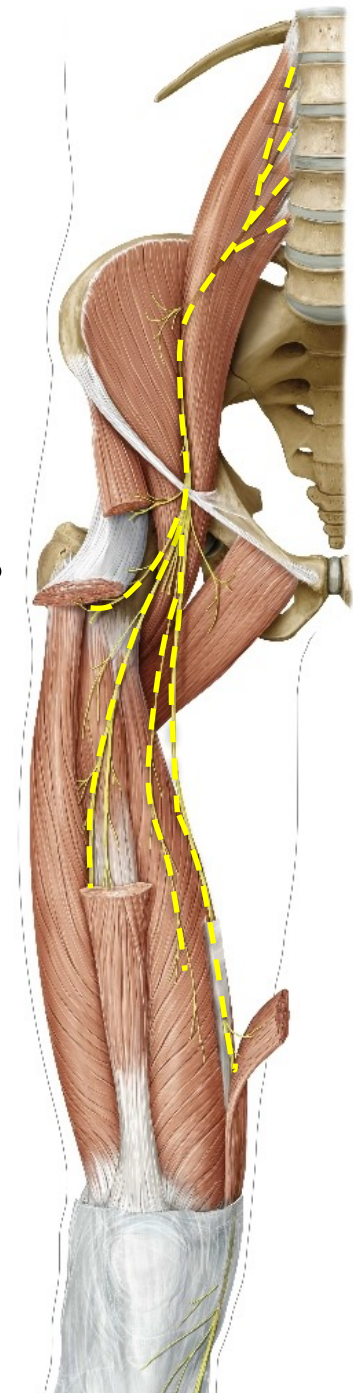


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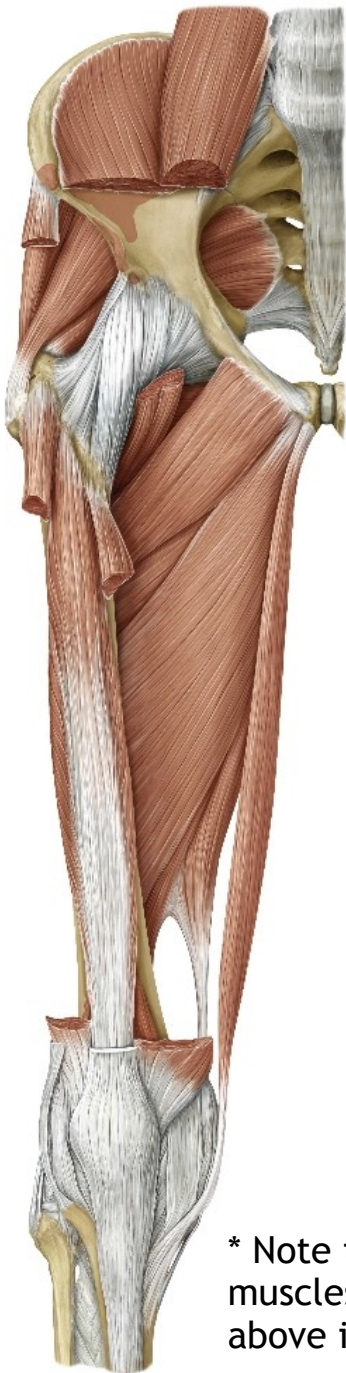
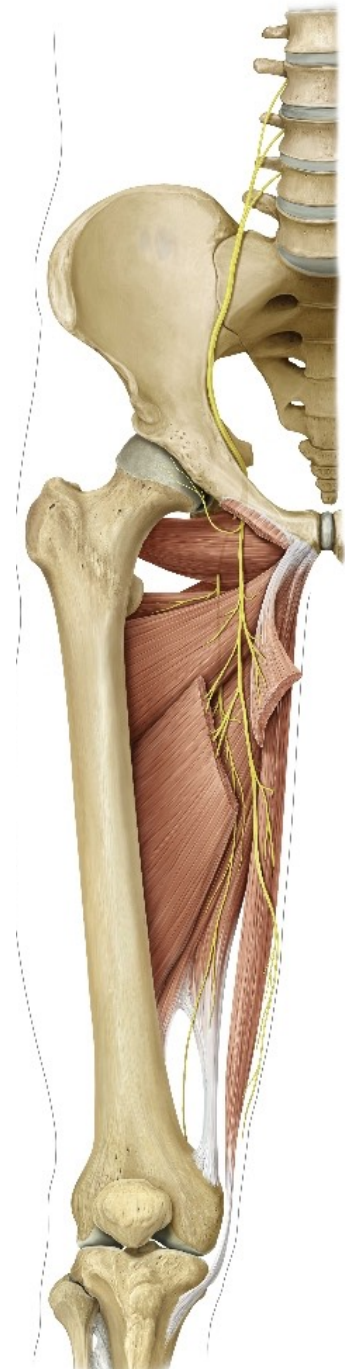
Innervation of the Thigh: Obturator Nerve

The **obturator nerve** exits the spine at L2 to L4, passes through the obturator foramen and enters the thigh.

The nerve innervates the following muscles of the thigh:

- Pectineus
- Adductor longus
- Adductor brevis
- Gracilis
- Adductor Magnus [deep part]
- Adductor minimus*
- Obturator externus*

* Note that some innervated muscles are not visible in the above image



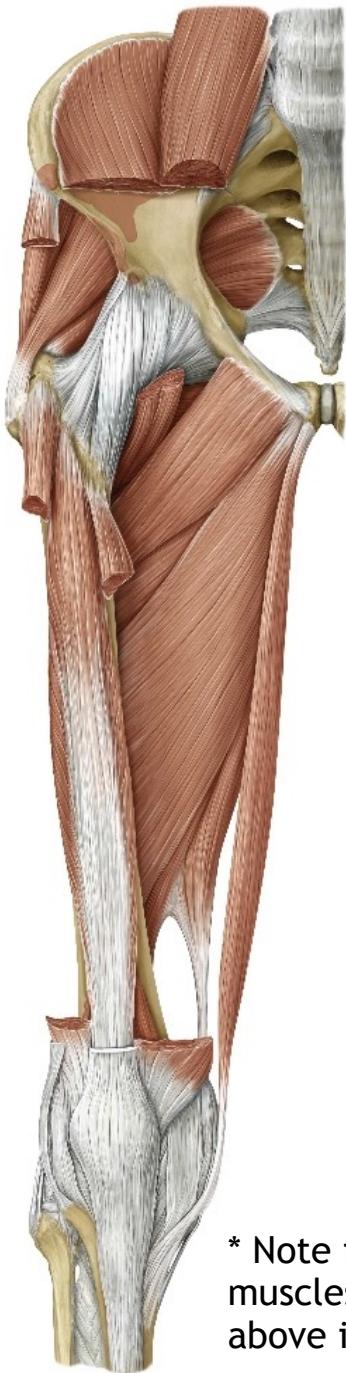
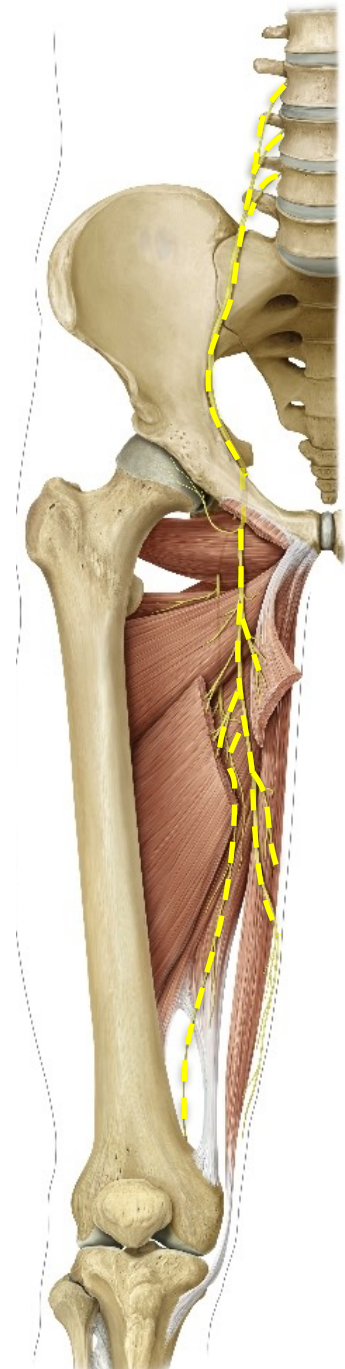
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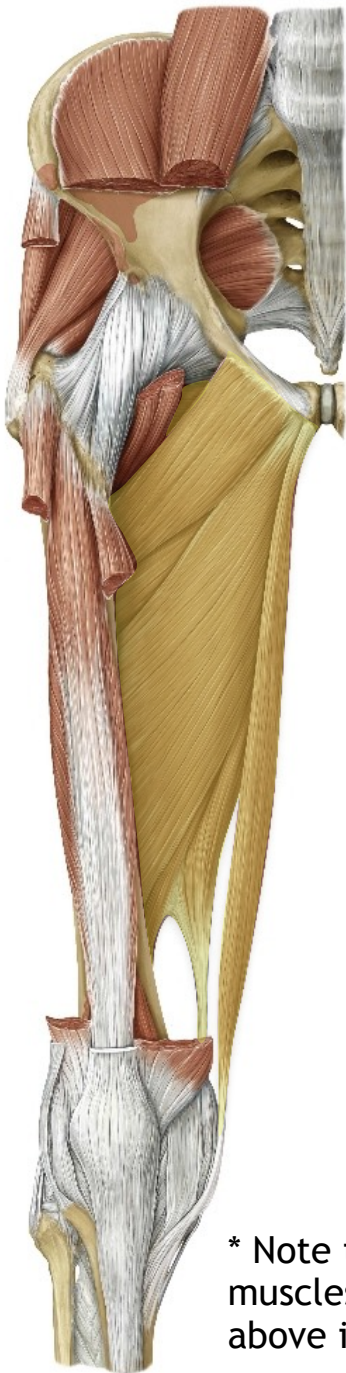
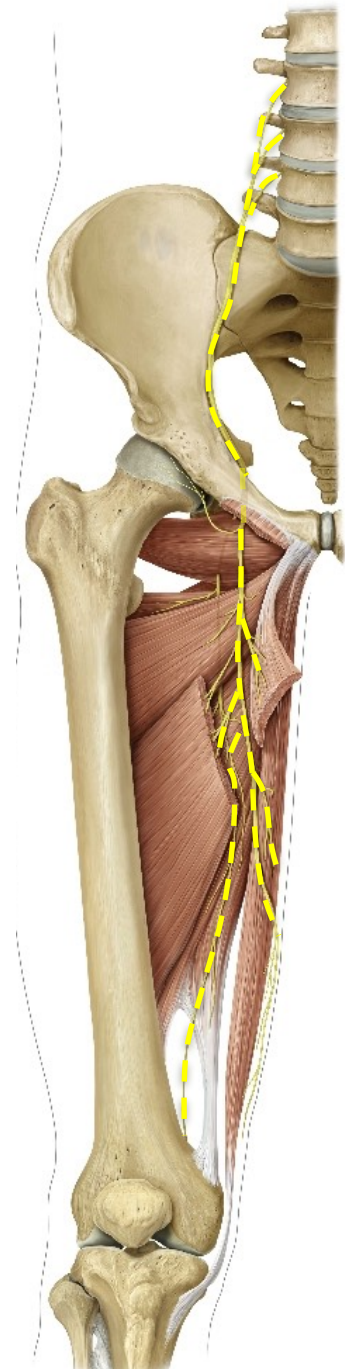
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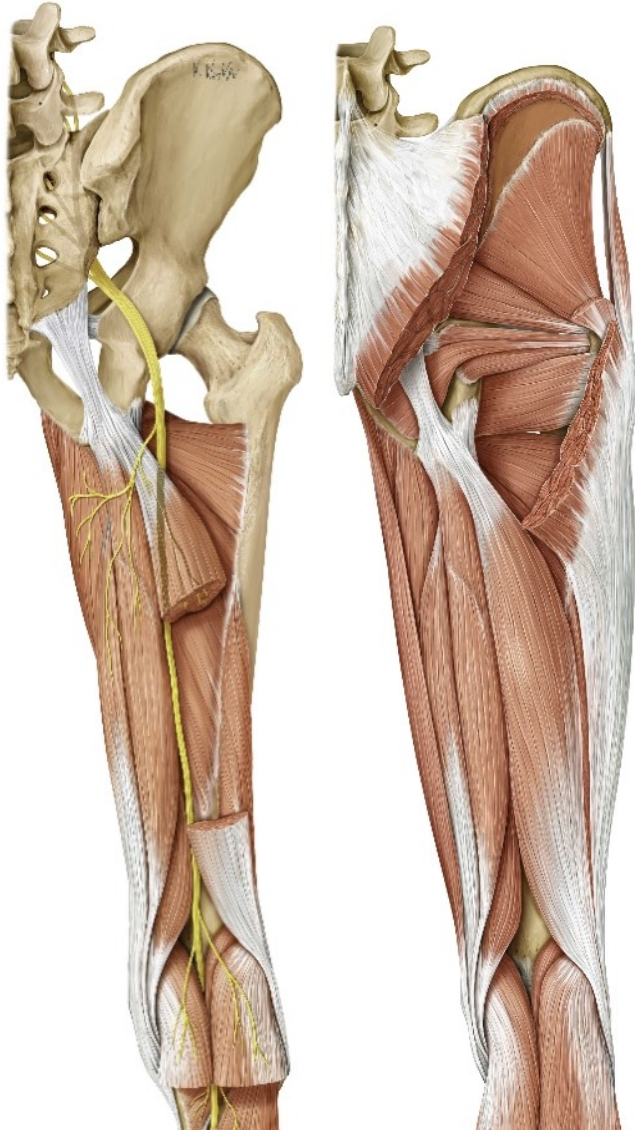
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Innervation of the Thigh: Sciatic Nerve

[Tibial Division]



Tibial Nerve

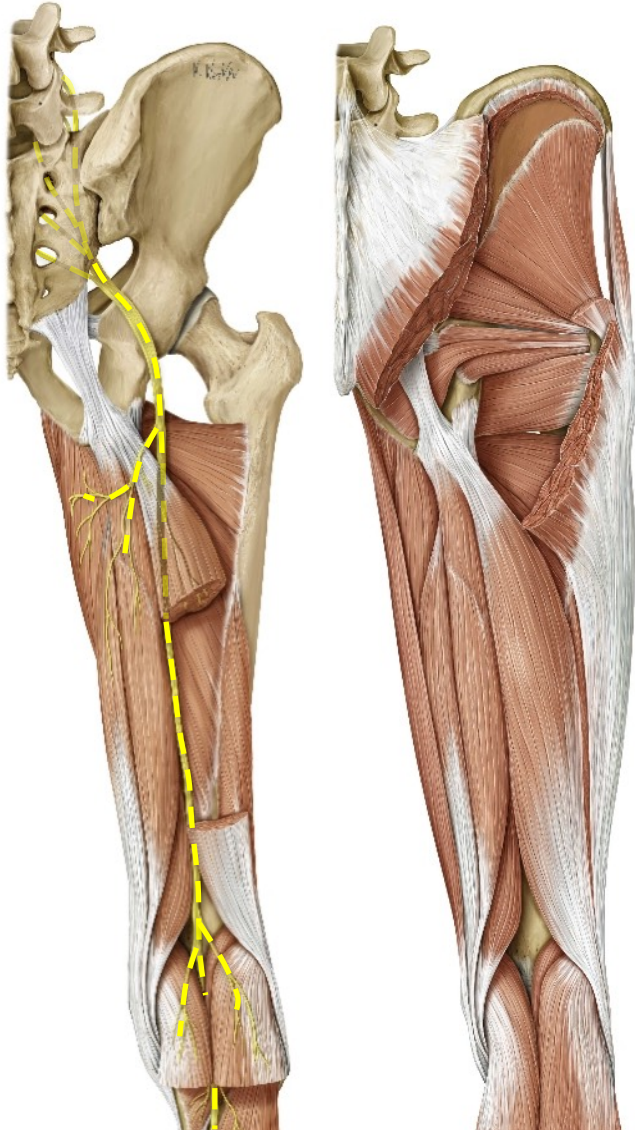
The **sciatic nerve** is the largest nerve in the human body, branches from the L4 to S3 regions and runs down the posterior region of the thigh. It divides just proximal to the popliteal fossa into the fibial and tibial divisions.

The **tibial branch** of the sciatic nerve innervates the following muscles of the thigh:

- Adductor magnus [superficial]
- Biceps femorus [long head]
- Semimembranosus
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Innervation of the Thigh: Sciatic Nerve

[Tibial Division]



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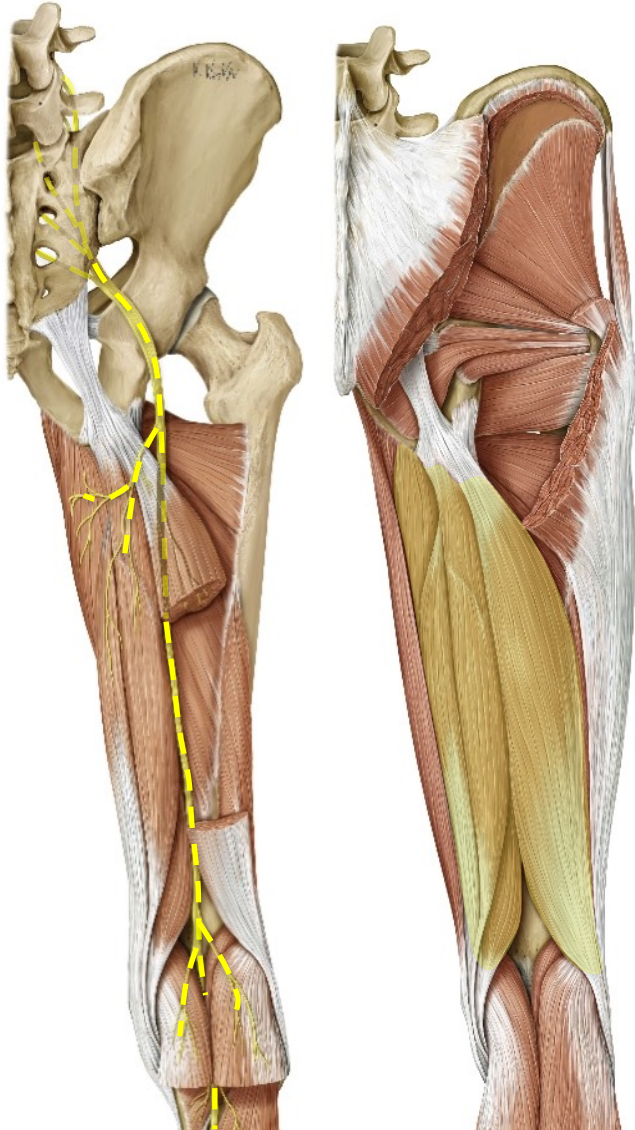
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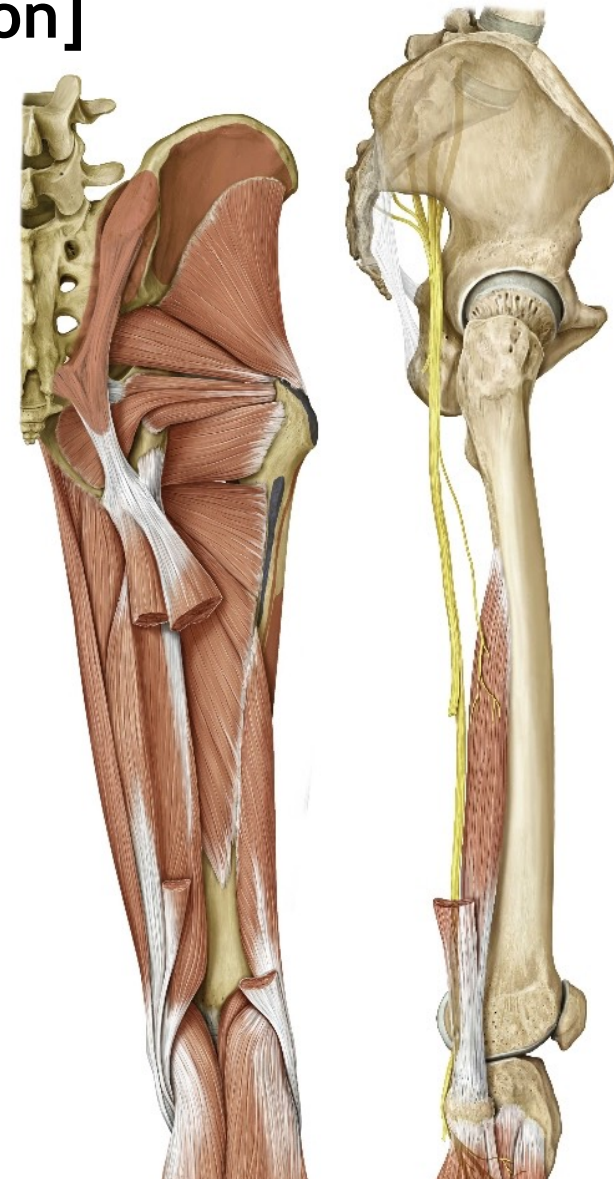
[Common Fibular Division]

The **sciatic nerve** is fused in the thigh and splits just proximal to the popliteal fossa. Its two divisions are the **tibial nerve** and the **common fibular nerve**.

The **common fibular branch** of the sciatic nerve innervates the following:

- biceps femorus [short head]

The **biceps femorus** originates at the **linea aspera** of the femur and attaches to the head of the fibula. The **biceps femorus** is unable to extend the hip like the other hamstrings, as it does not cross the hip joint. Instead its only responsibility is flexing the knee joint.



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Innervation of the Thigh: Sciatic Nerve

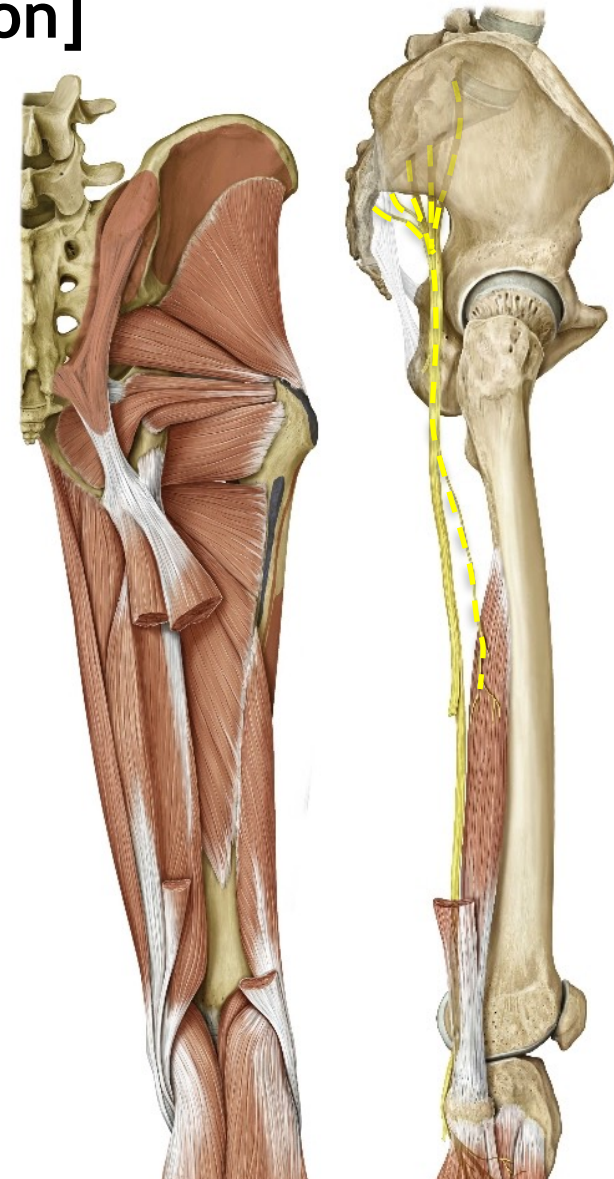
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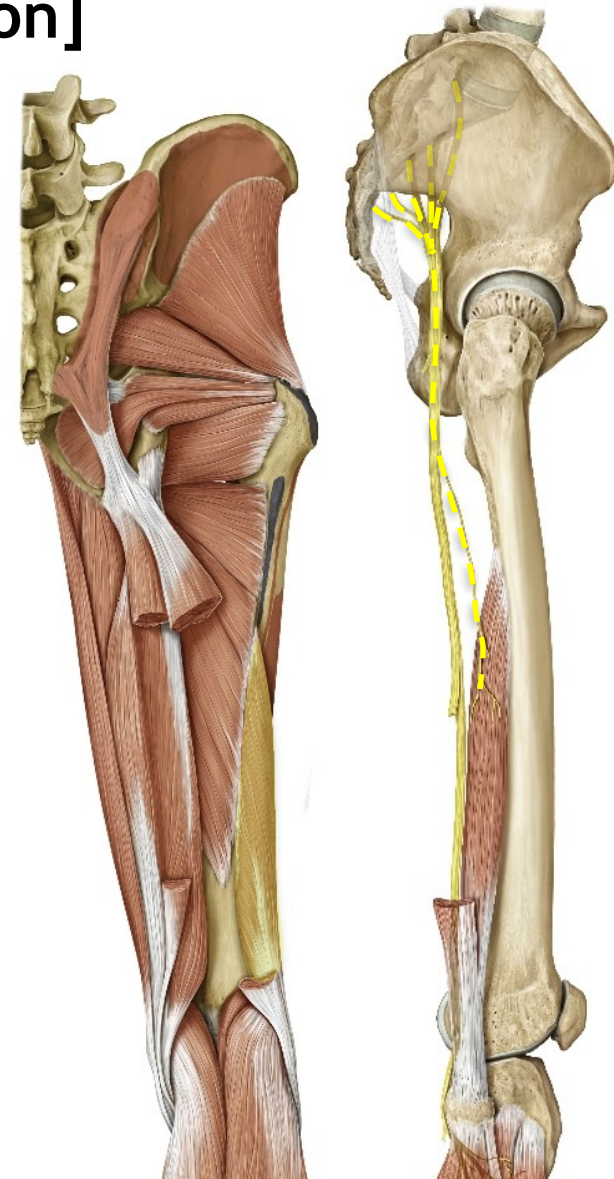
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The **common fibular branch** of the sciatic nerve innervates the following:

- biceps femorus [short head]

The **biceps femorus** originates at the **linea aspera** of the femur and attaches to the head of the fibula. The **biceps femorus** is unable to extend the hip like the other hamstrings, as it does not cross the hip joint. Instead its only responsibility is flexing the knee joint.



Common Fibular Nerve

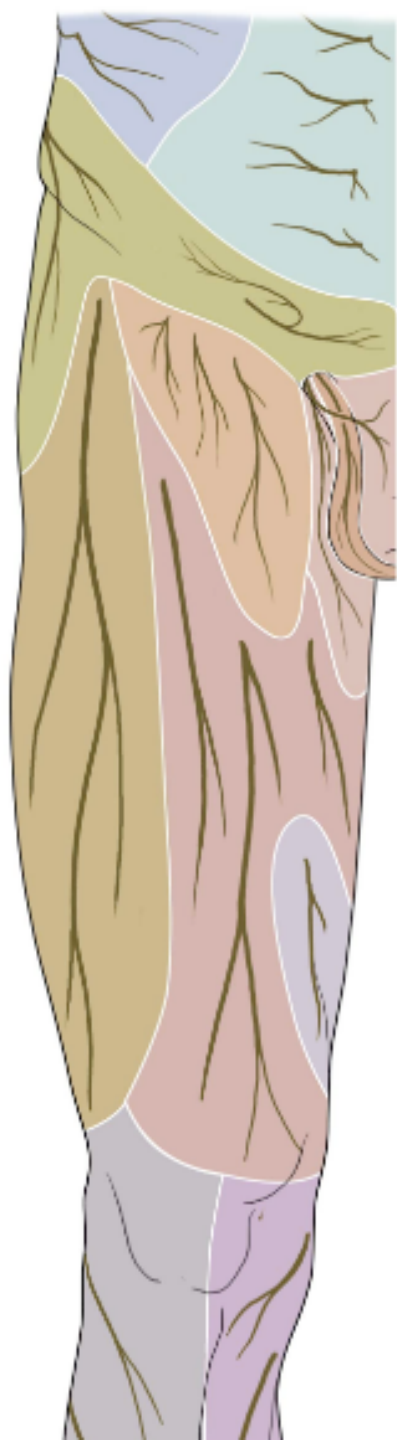
Innervation of the Foot: Sensory Distribution

The sensory receptors of the anterior portion of the thigh are supplied by the **femoral**, **iliohypogastric**, **genitofemoral**, **obturator**, **lateral femoral cutaneous** and **posterior femoral cutaneous** nerves.

The **femoral nerve** supplies sensory innervation to the medial portion of the thigh apart from a small region near the knee which is supplied by the **obturator nerve**.

The **genitofemoral nerve** is responsible for the region of the femoral triangle. Proximal is the region supplied by the **iliohypogastric nerve**.

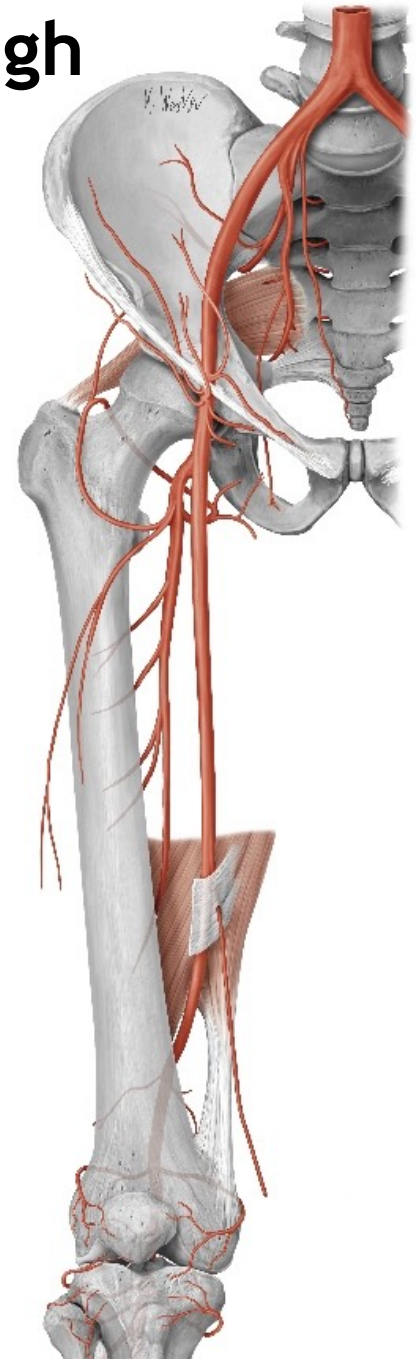
The lateral portion of the thigh is supplied by the **lateral femoral cutaneous nerve**. The posterior portion is supplied by the **posterior femoral cutaneous nerve**.



Arterial Supply to the Thigh

The **abdominal aorta** branches into two common iliac arteries in the lumbar region; these common branches divide into an internal and external branch. The **external iliac artery** is the primary blood supplier of the thigh (internal iliac supplies structures inside the pelvis).

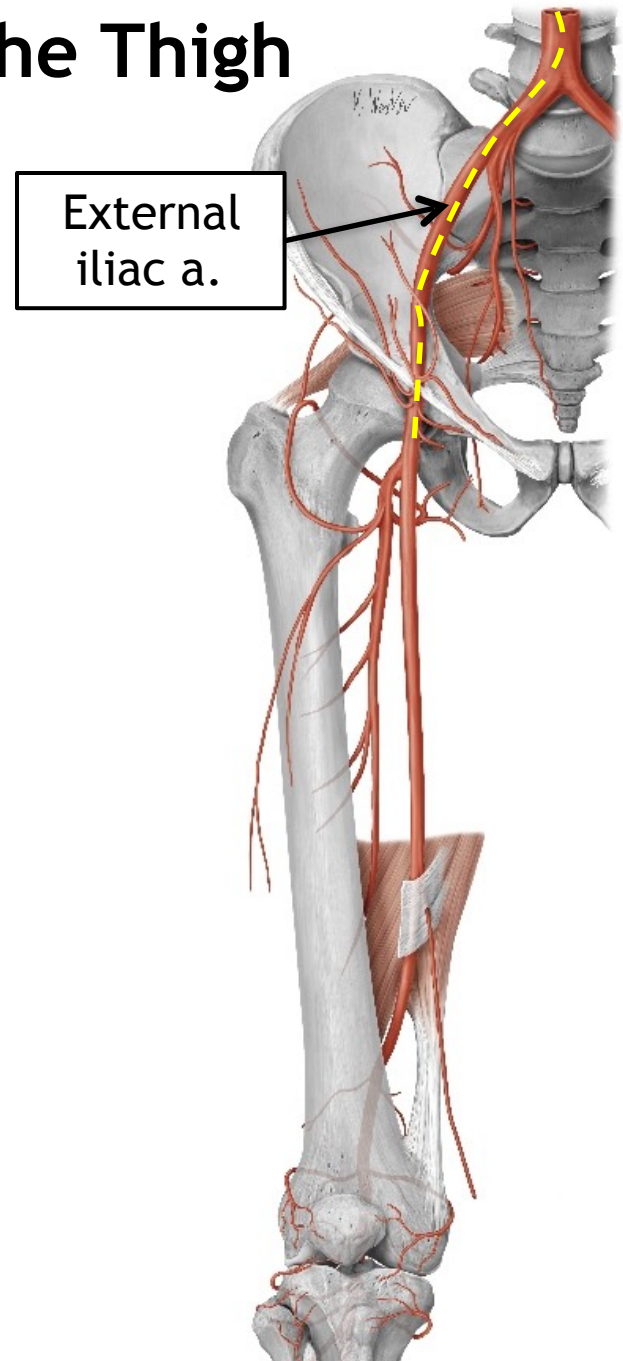
From there the external iliac artery passes through the inguinal ligament and transitions into the **femoral artery**. Within the femoral triangle, the femoral artery branches into a large and smaller branch (**deep femoral artery**).



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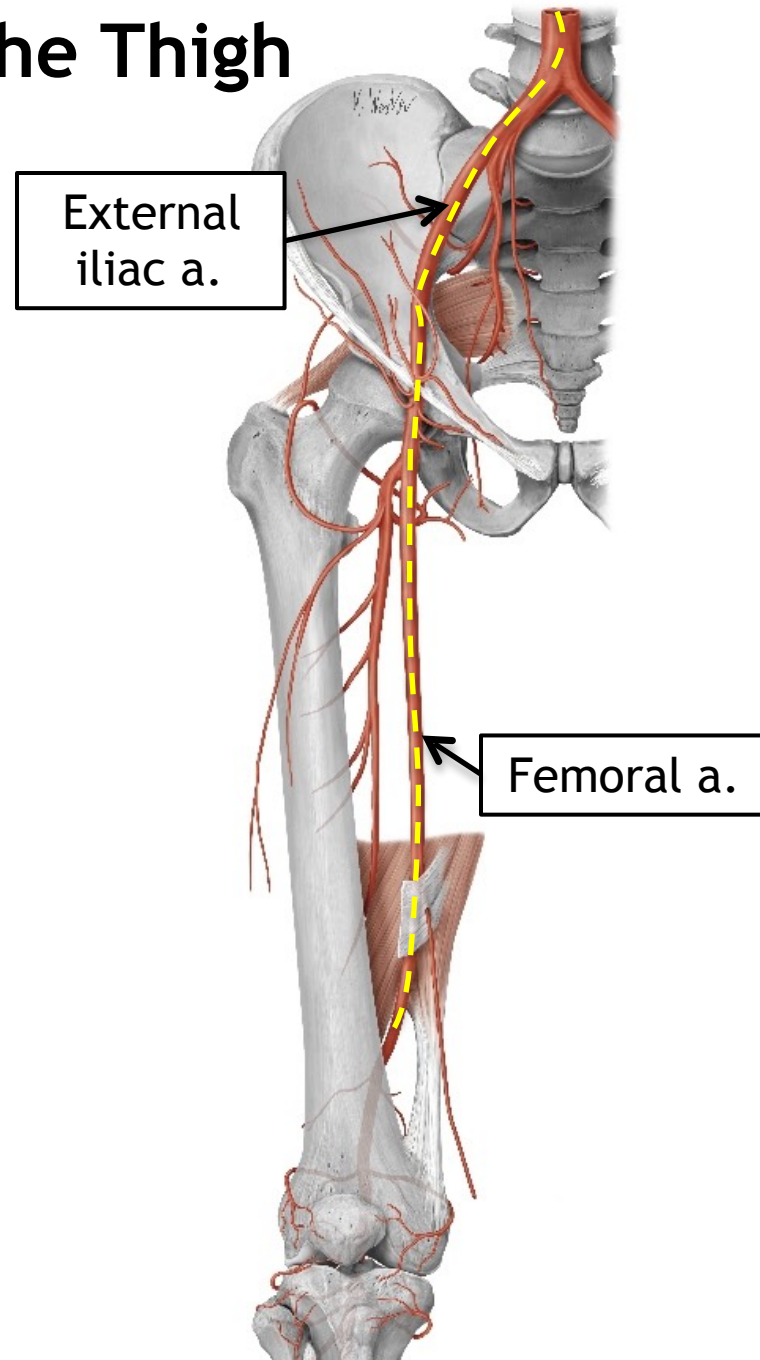
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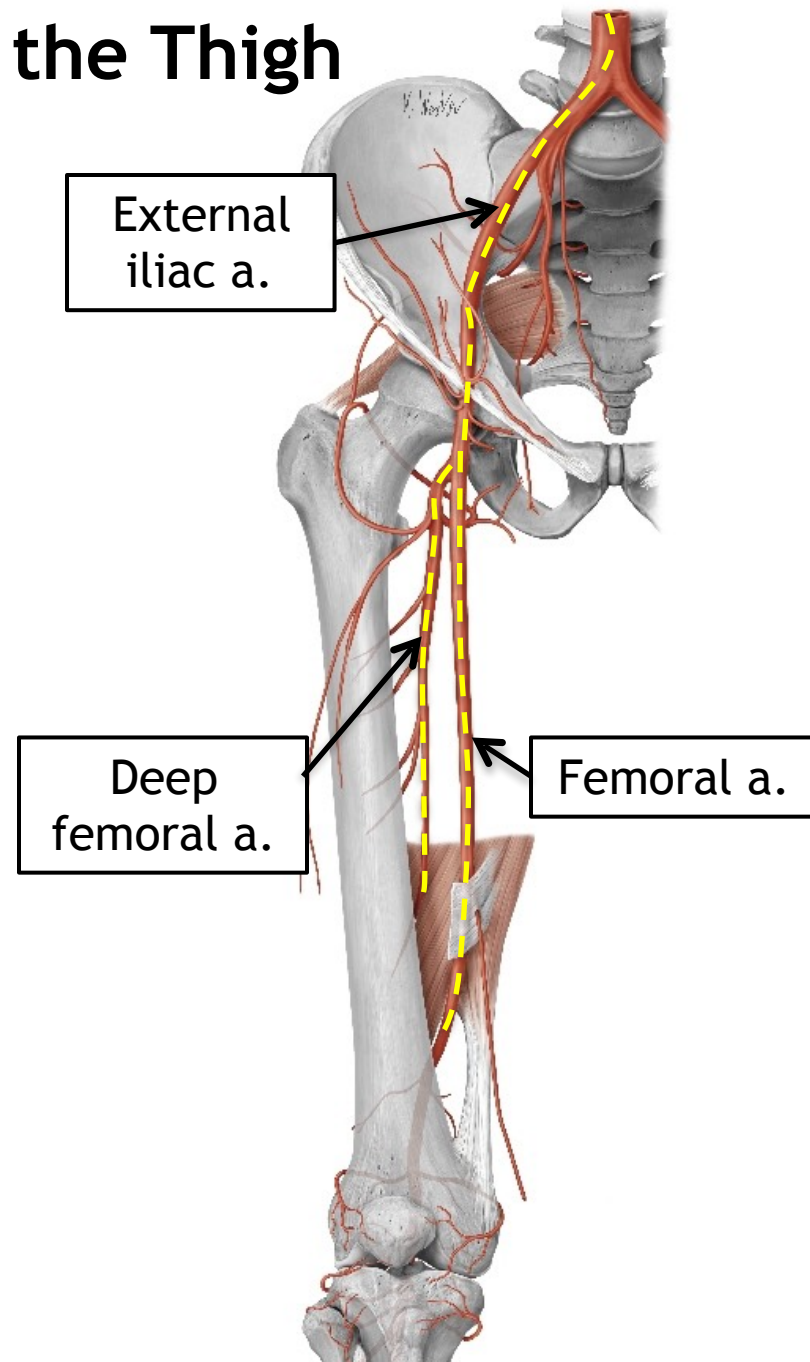
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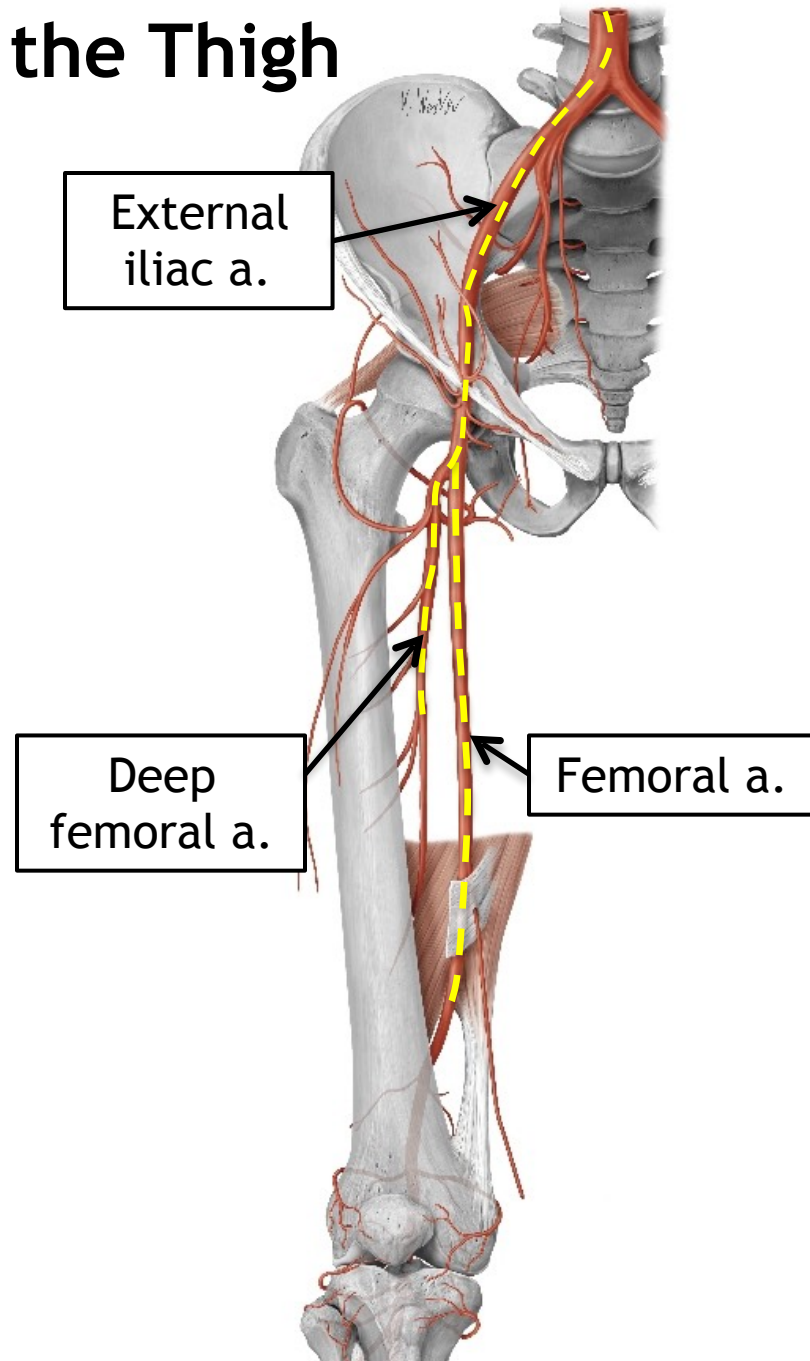
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The **medial and lateral circumflex arteries** branch from the deep femoral artery to supply blood to the deep adductors and posterior muscles of the thigh.

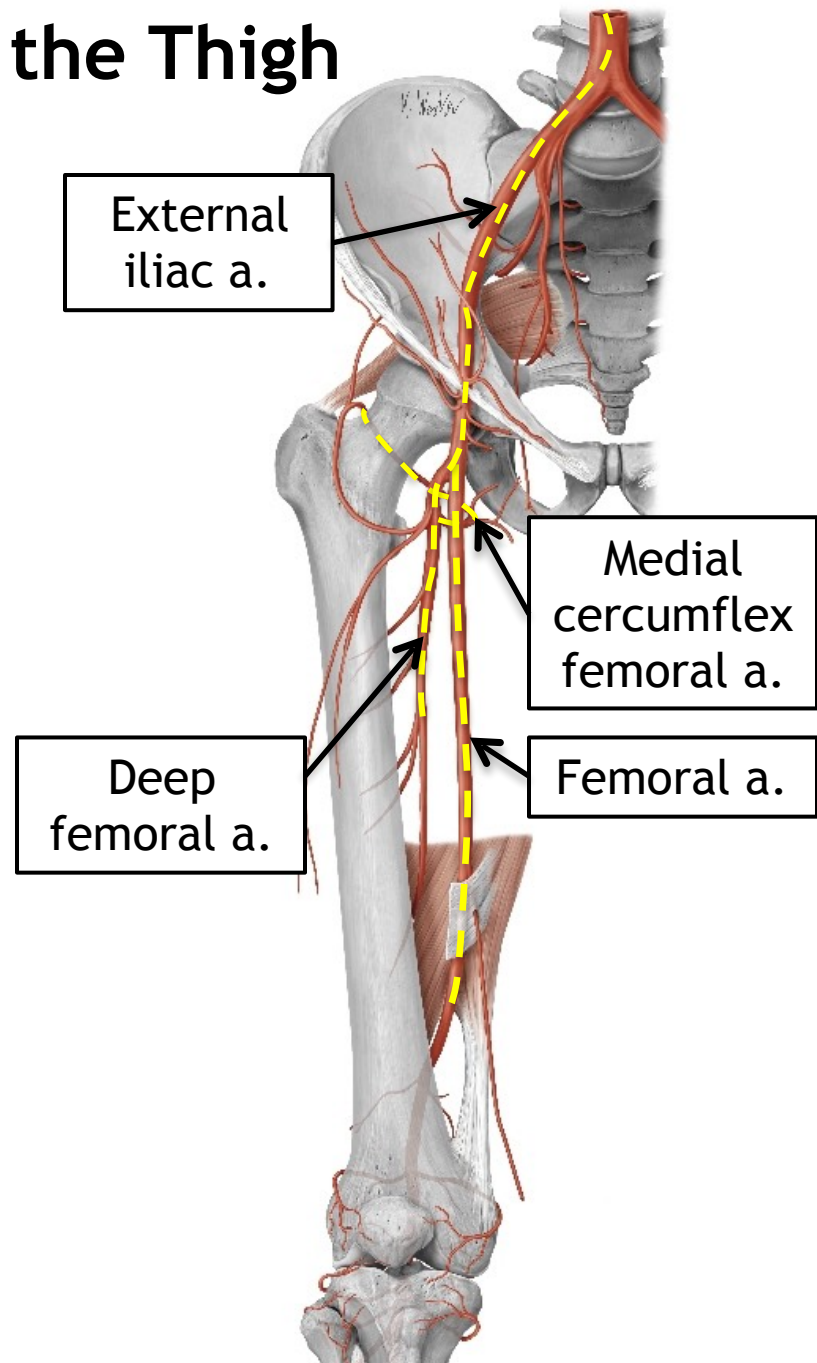
The larger branch is labeled simply as the **femoral artery**. The femoral artery travels through the adductor hiatus and becomes known as the **popliteal artery**. The popliteal artery travels behind the knee, branches, changes names and continues down the posterior region of the lower leg towards the foot.



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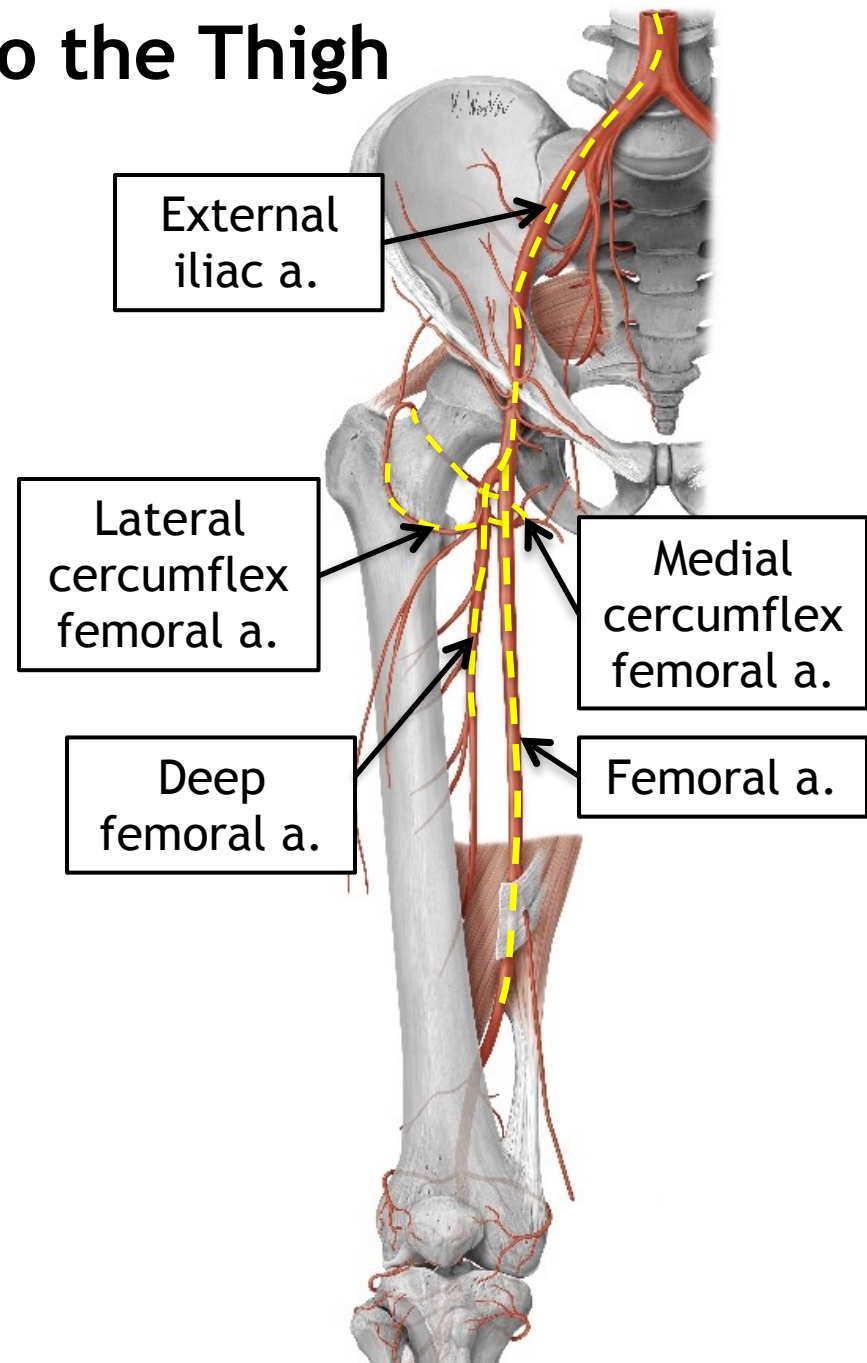
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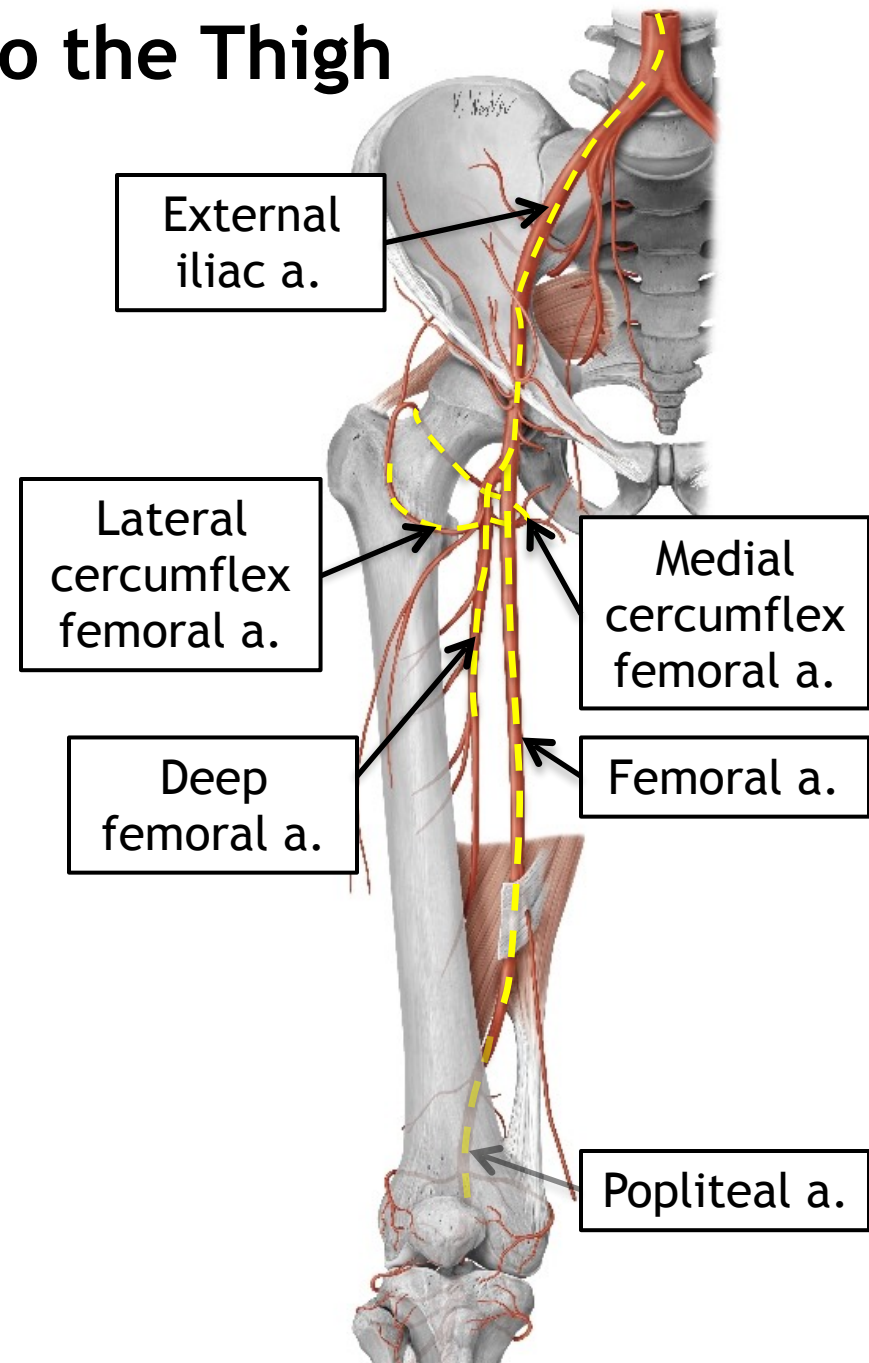
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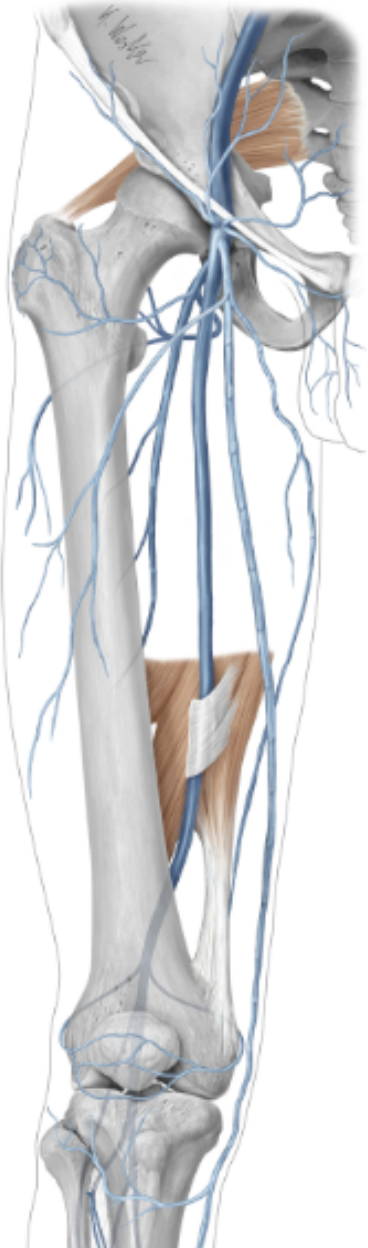
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Venous Drainage of the Thigh

Deep



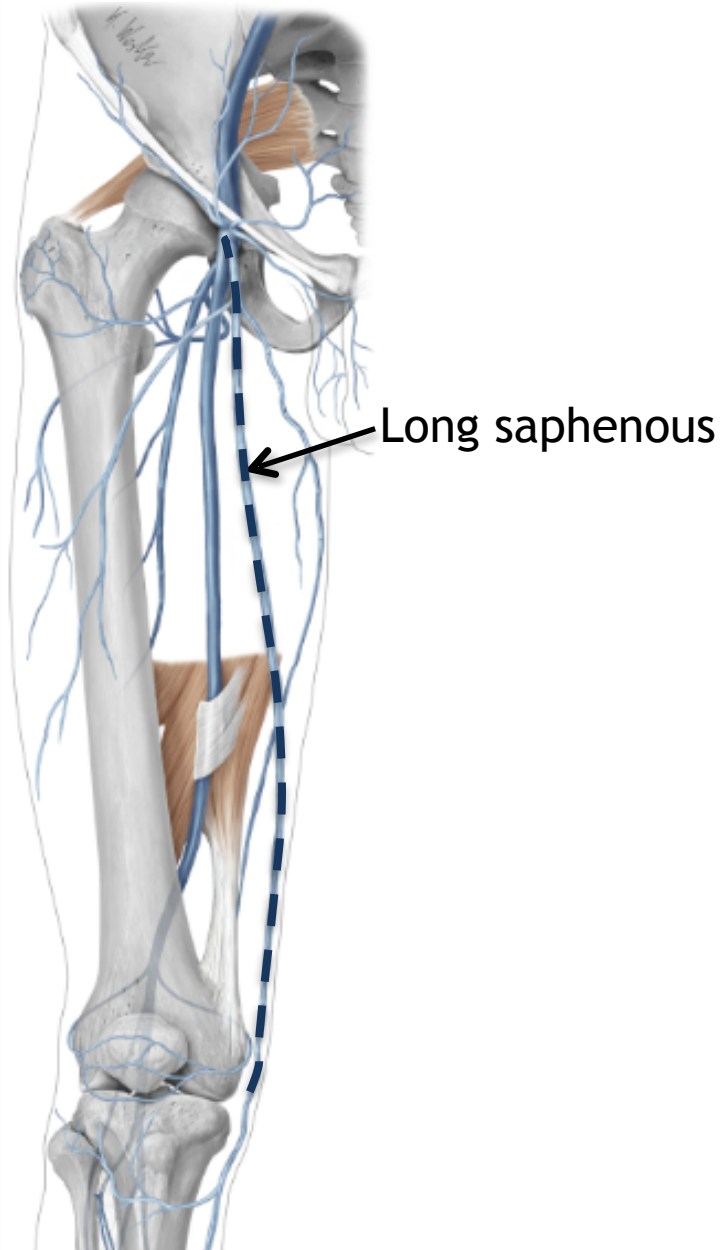
Superficial



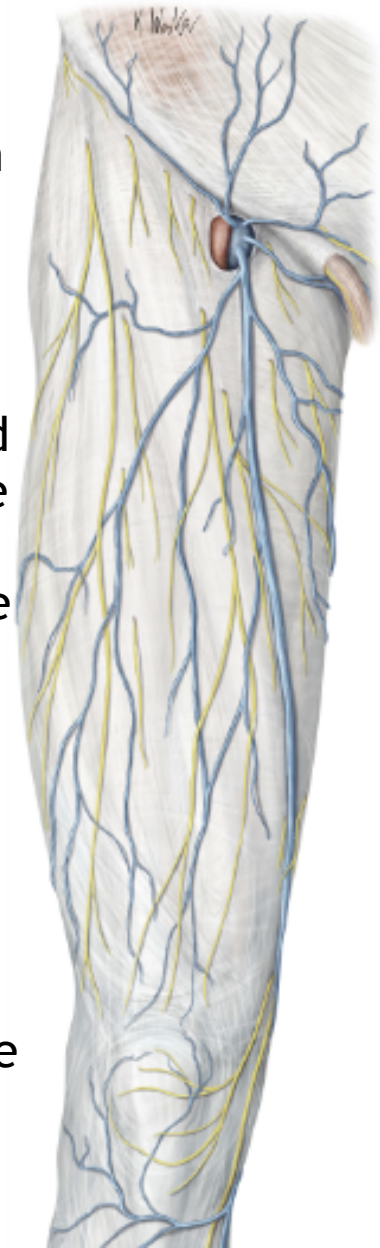
The main vein responsible for transporting blood from the thigh back to the heart is the **long (great) saphenous vein**. This vein originates at the dorsal venous arch of the foot and travels up the length of the lower limb. In the region of the femoral triangle, the vein merges with the **femoral vein** and **deep femoral vein**. The **medial and lateral circumflex veins** join the deep femoral vein before it converges with the **deep femoral** and dumps into the **external iliac vein**.

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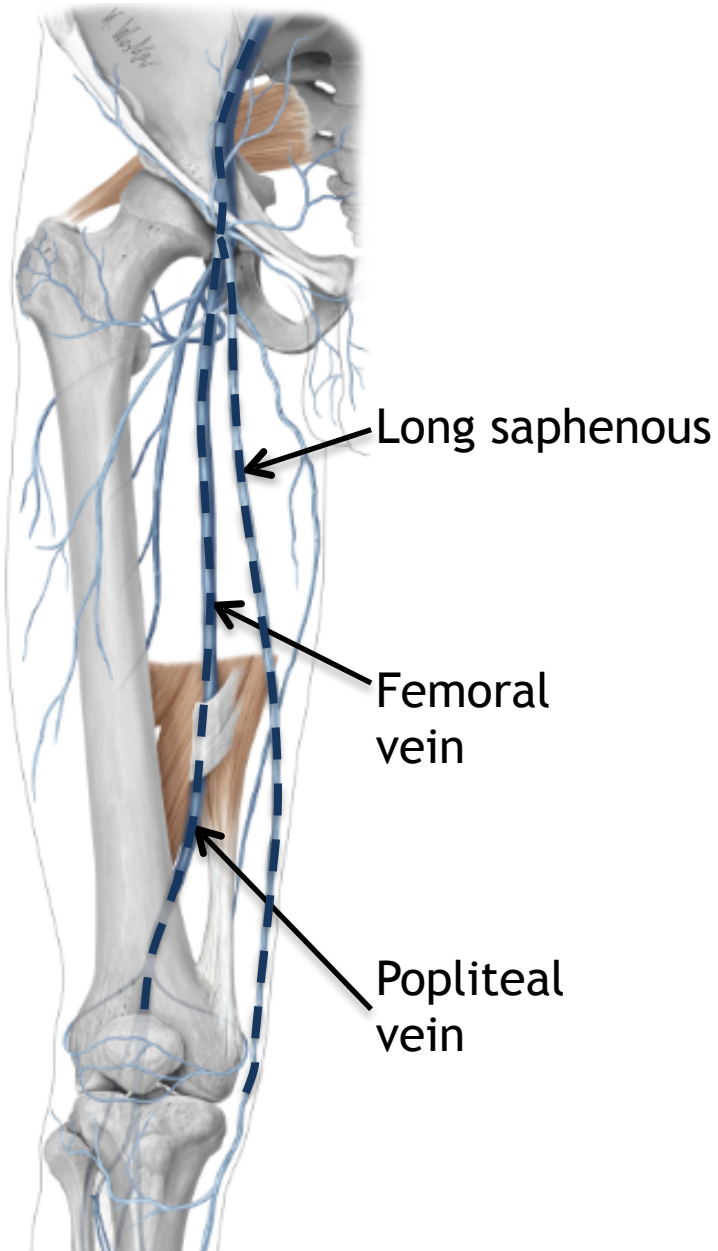
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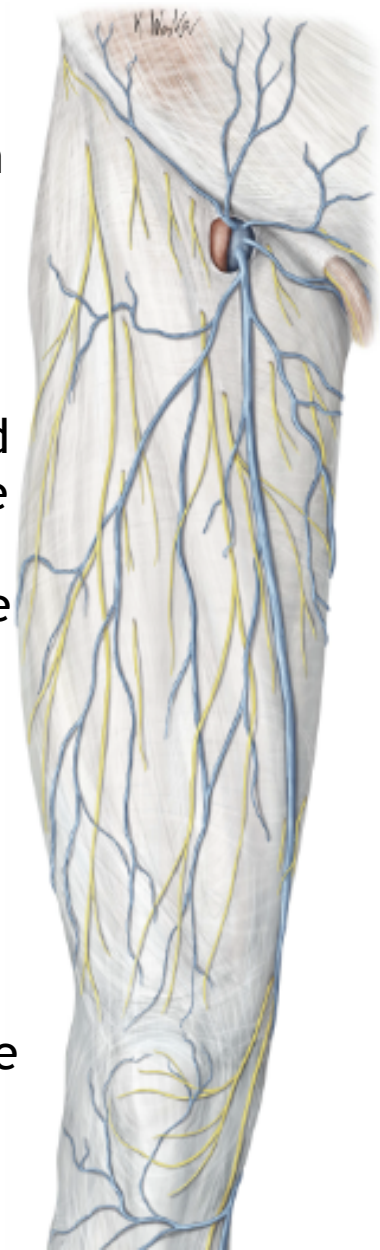
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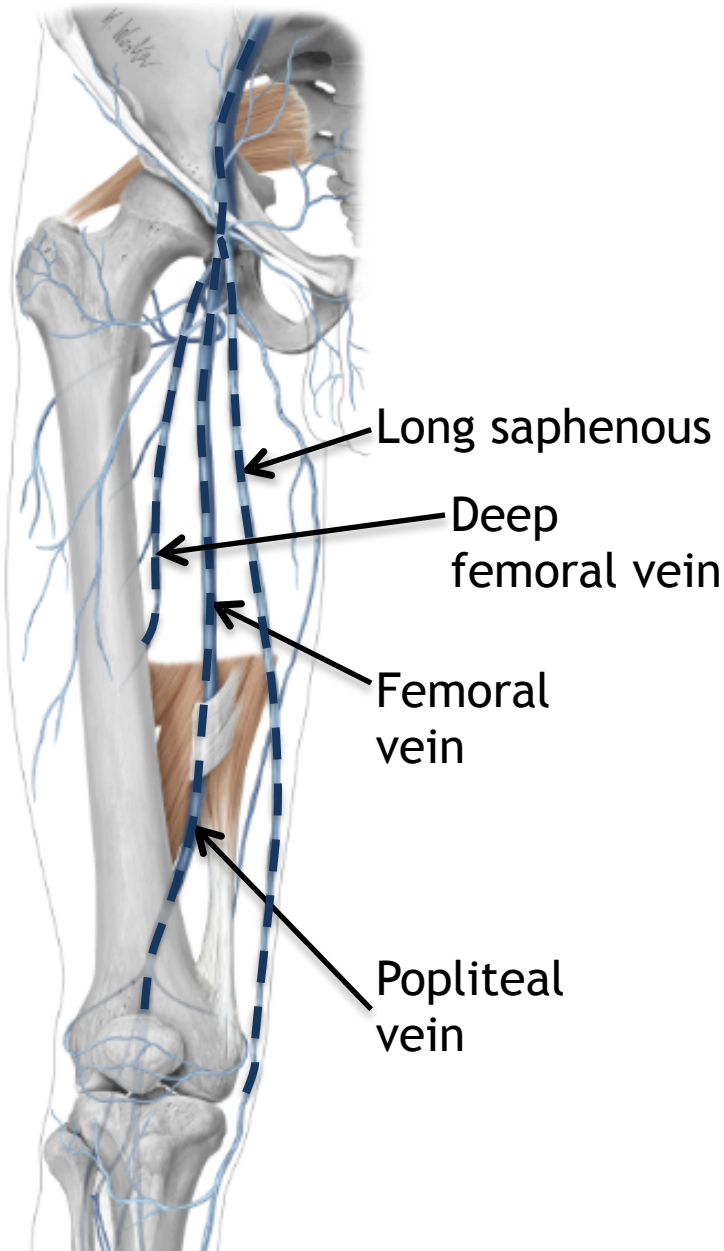
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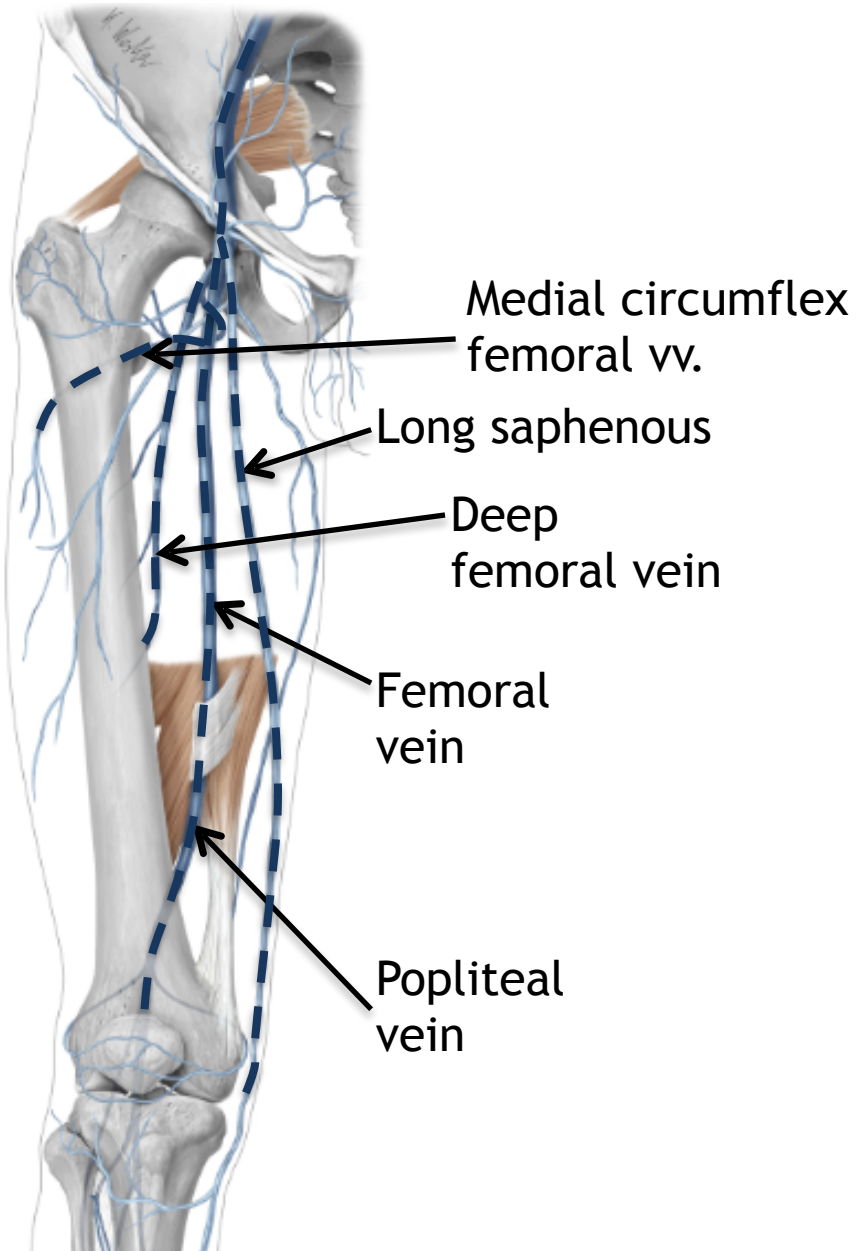


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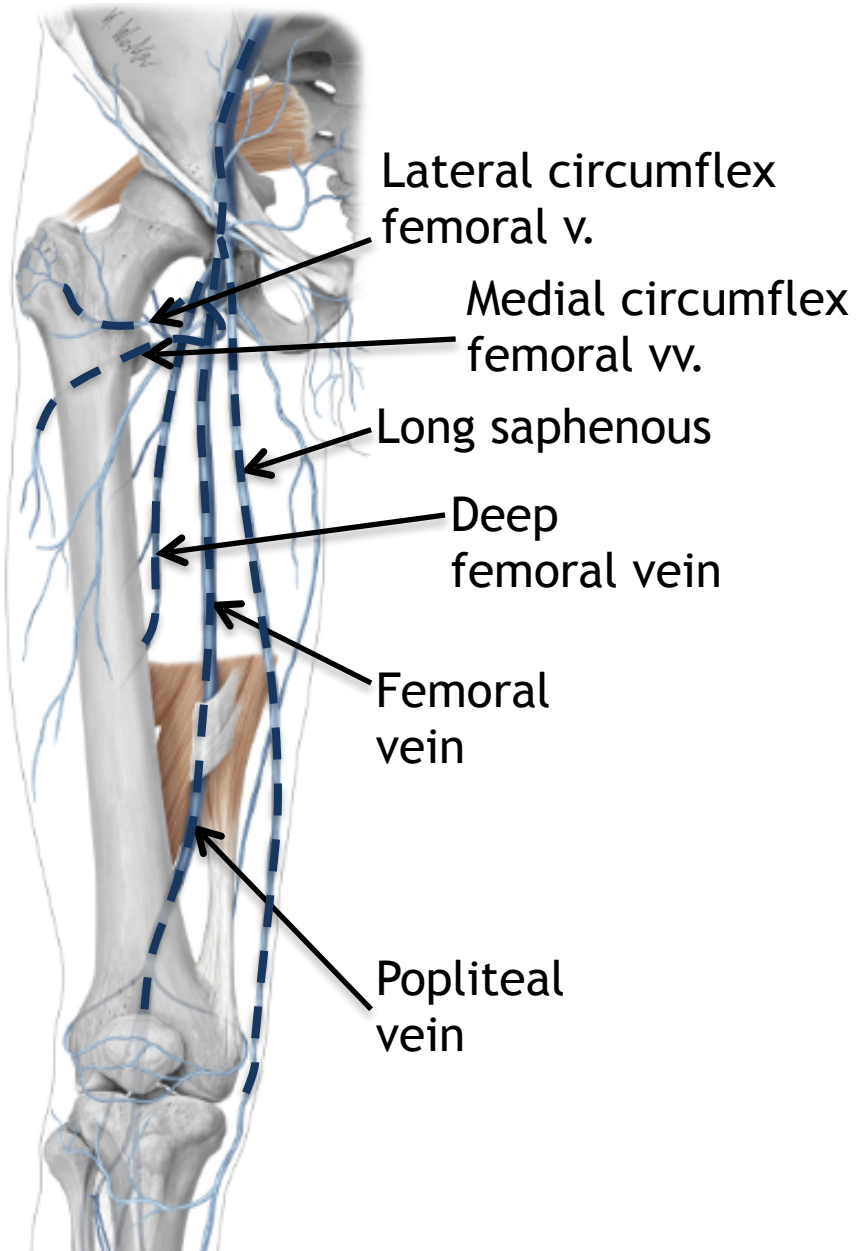


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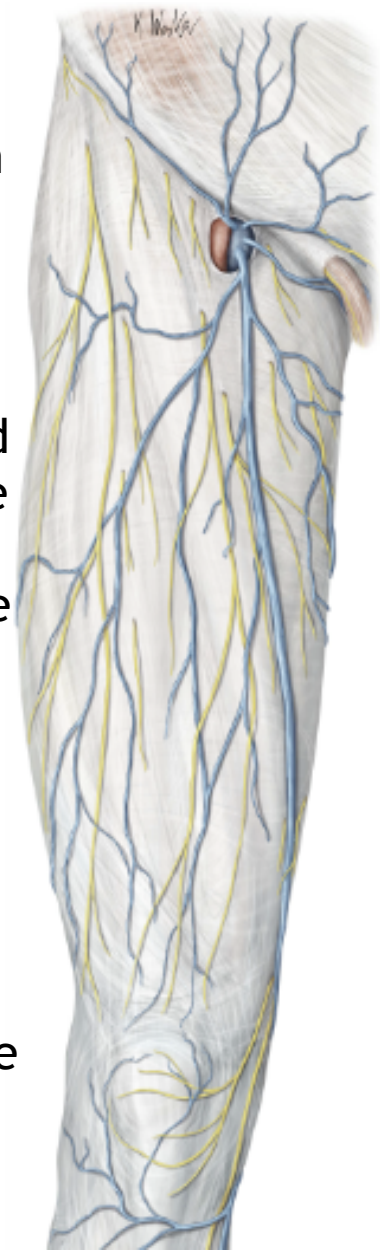


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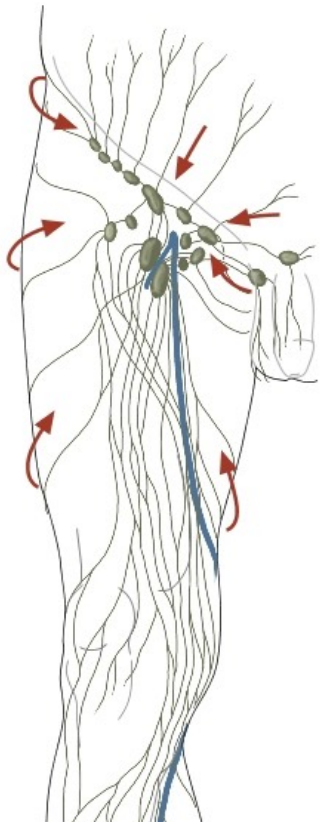


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Lymphatic Structures of the Thigh



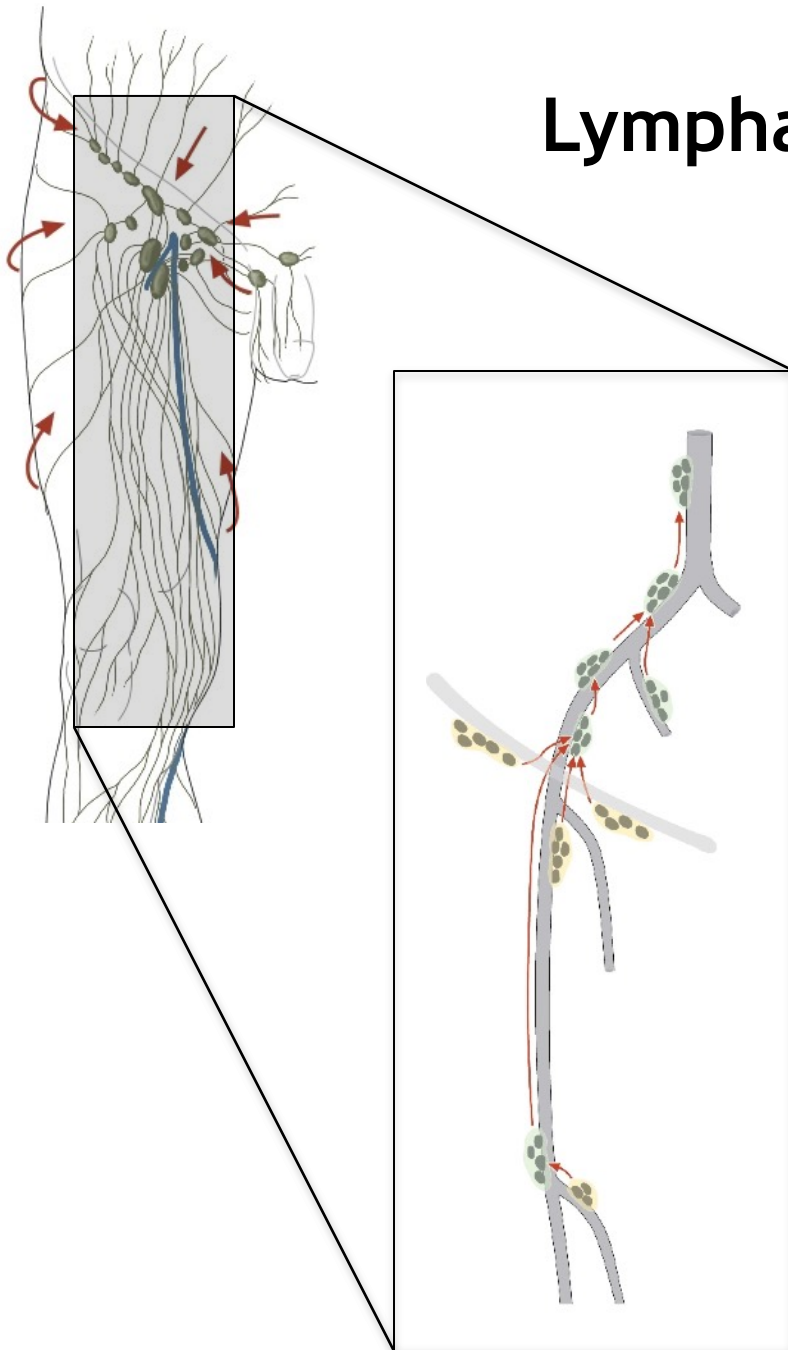
The red arrows pictured on the left show the general flow of lymph. Notice that the flow of lymph follows the same direction as the venous drainage of the thigh. Lymphatic fluid drains from **superficial** tissues, inward to **deep** tissues.

The **popliteal lymph nodes** receive drainage from the lower leg and foot.

Drainage from the skin, abdominal wall, lower back, gluteal region, bowel, anal region and external genitalia drain to the **superficial inguinal lymph nodes**.

The **deep iliac lymphatic nodes** receive drainage from the deep portions of the lower limb.

Lymphatic Structures of the Thigh



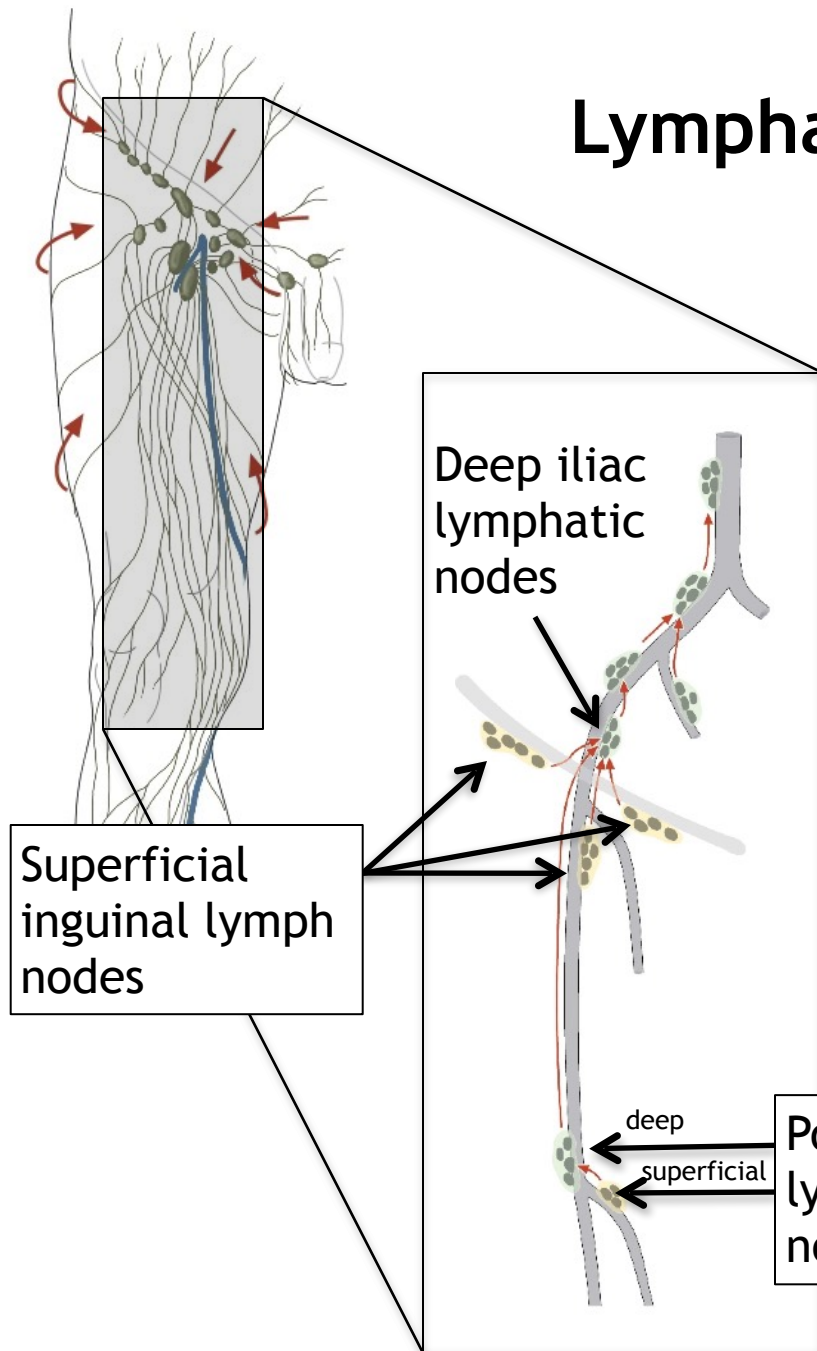
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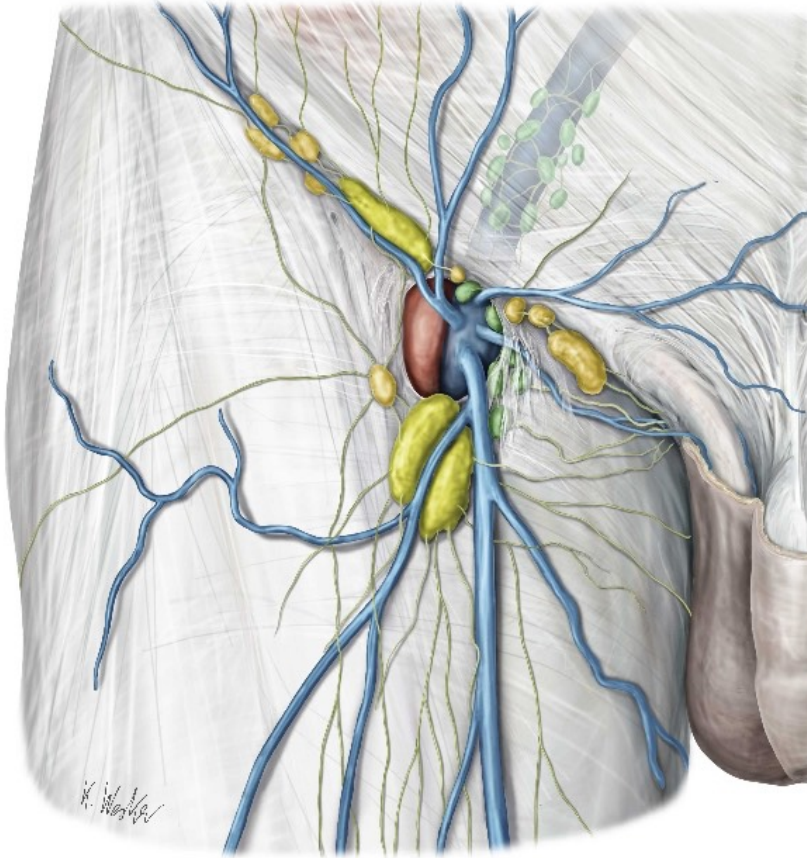
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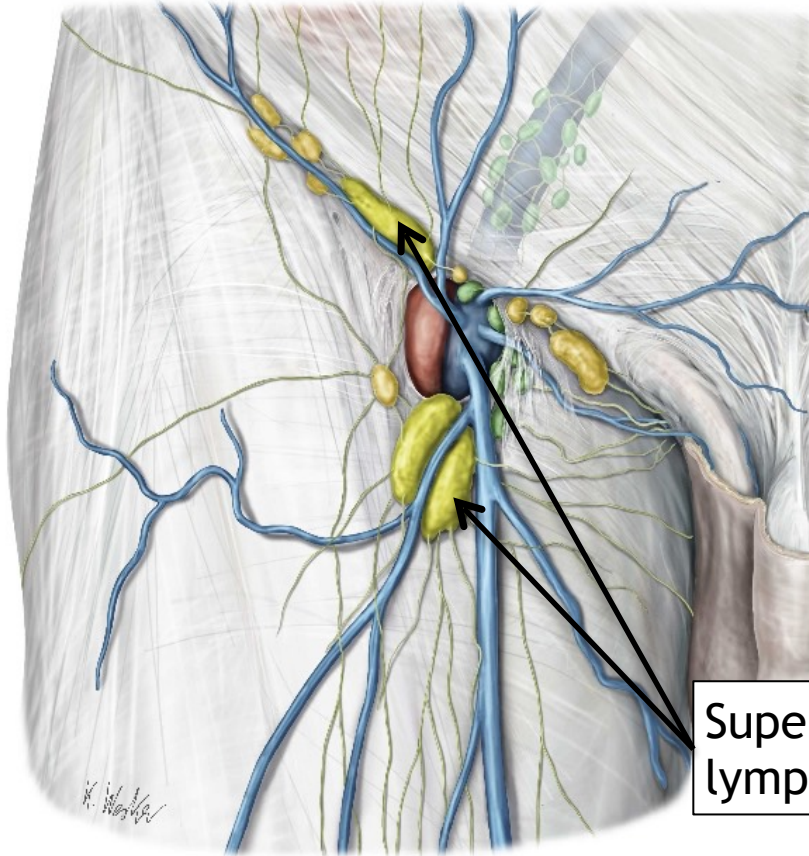
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Lymphatic Structures of the Thigh (cont.)



The femoral triangle has a major collection of **superficial** and **deep** lymph node in which the lymph collected from the lower limb passes before heading back towards the heart.

Lymphatic Structures of the Thigh (cont.)

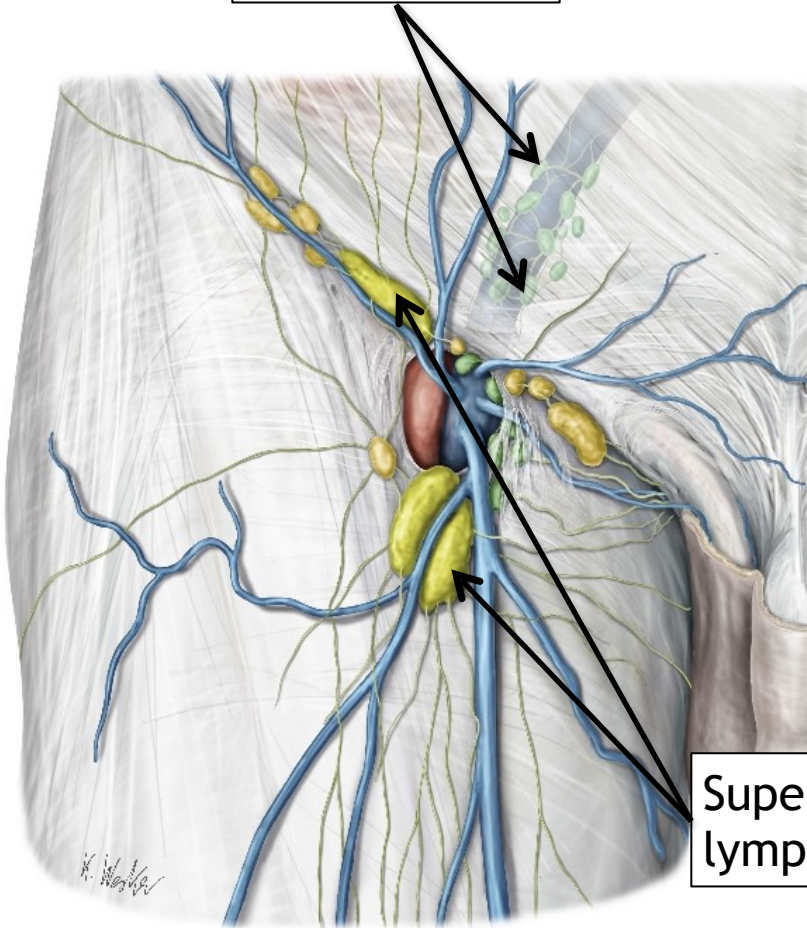


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Superficial
lymph nodes

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Deep lymph
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Superficial
lymph nodes

The Knee

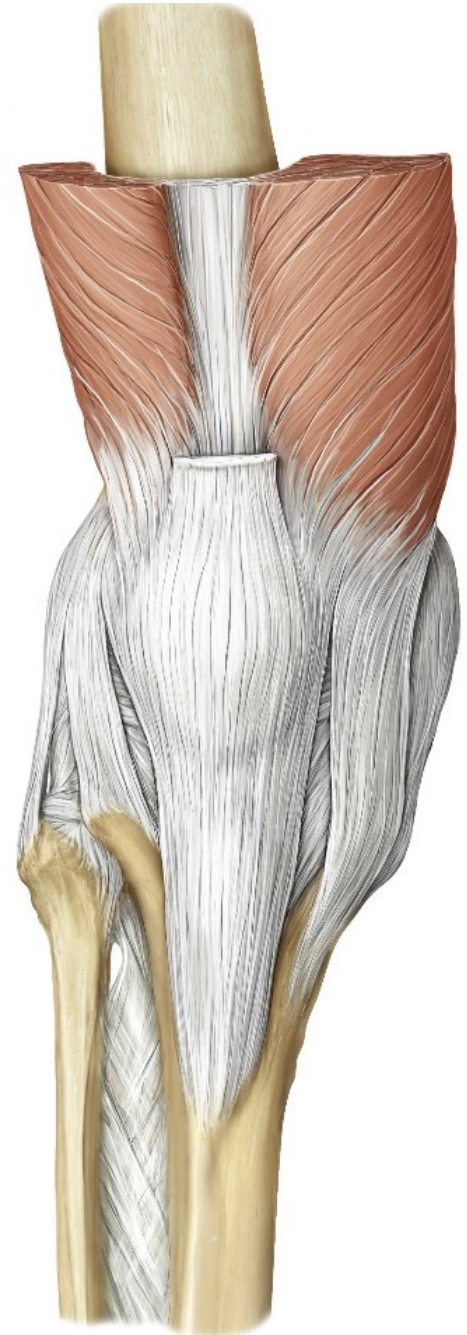


The Knee: Stability

Due to the poor construction of the knee joint, its stability depends primarily on the muscles and ligaments that surround it. The quadriceps femoris is an important stabilizing group of muscles for the knee.

Illustrating the poor evolutionary development of the human knee joint, used for bipedal walking, its construction is commonly compared to two balls sitting atop a warped table.

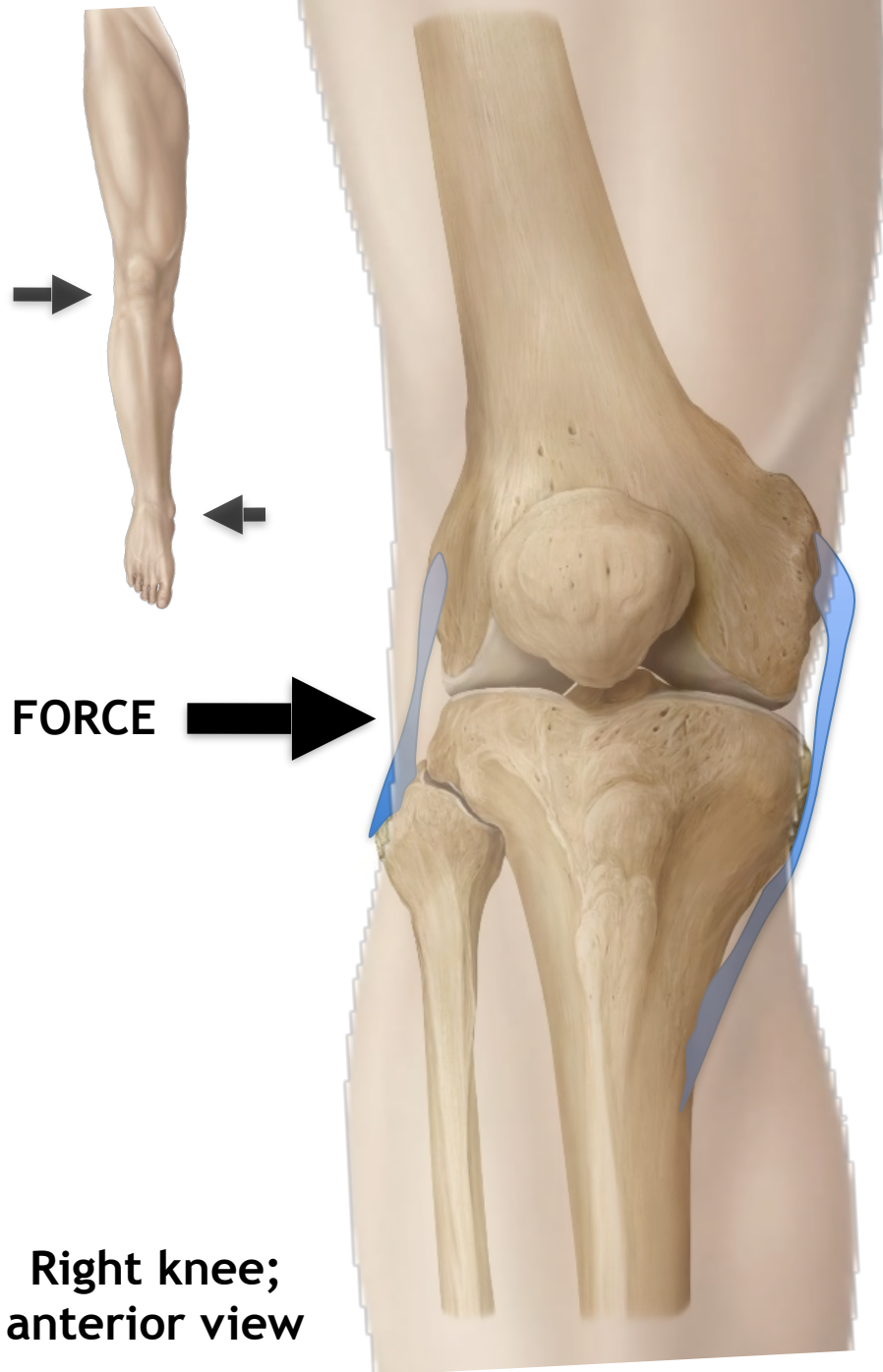
The knee is most stable when extended. In this position the articulations of the knee are most congruent.



The Knee: Injury

Knee injuries are very common in athletes. Damage is most commonly done to the soft tissues (ligaments and cartilage).

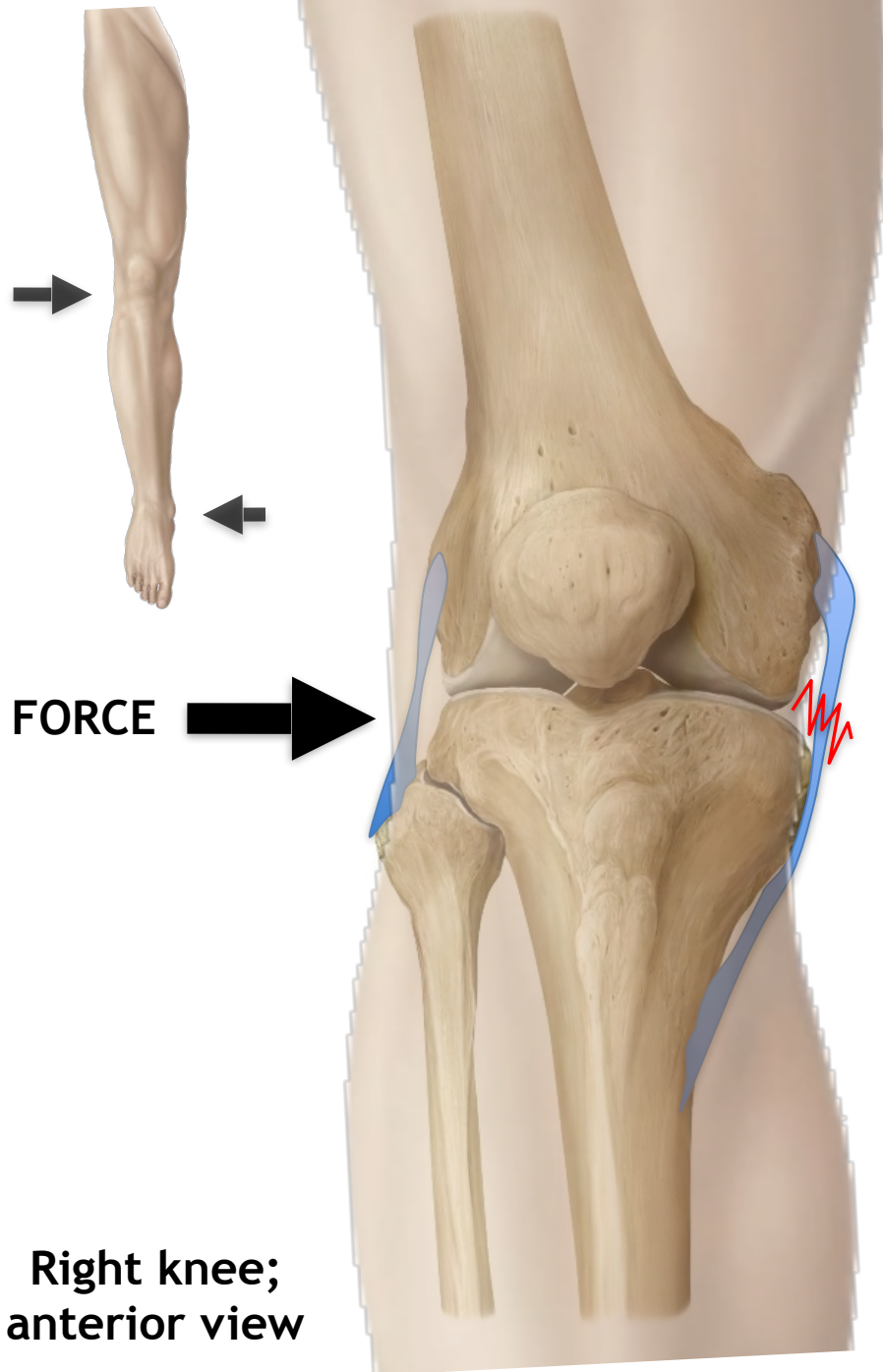
The medial and lateral collateral ligaments restrict the knee's range of motion from side-to-side. The **medial collateral ligament** can easily be sprained or torn if too much inward force is applied. Damage to the **lateral collateral ligament** is possible yet usually only occurs in congruence with other ligament damage.



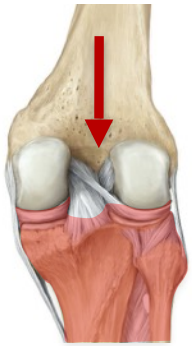
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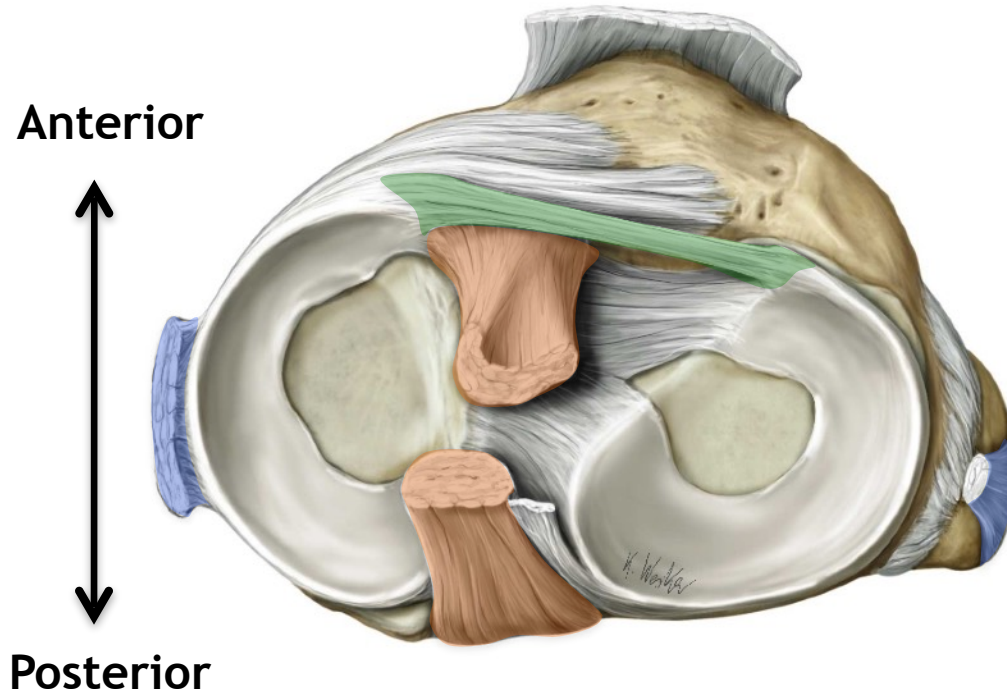


The Knee: Menisci



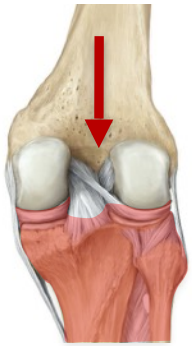
The medial and lateral condyles of the femur rest on the **medial meniscus** and **lateral meniscus** of the knee, respectively. The menisci are articular cartilage that act as shock absorbers.

The menisci are easily injured during sports or while lifting heavy objects. Injuries occur most often to the medial meniscus and is the result of a sudden extension or rotation of the knee while the foot is planted. The two types tears include a **bucket-handle tear** and a **radial tear** (pictured as a **radial tear of the posterior horn**).



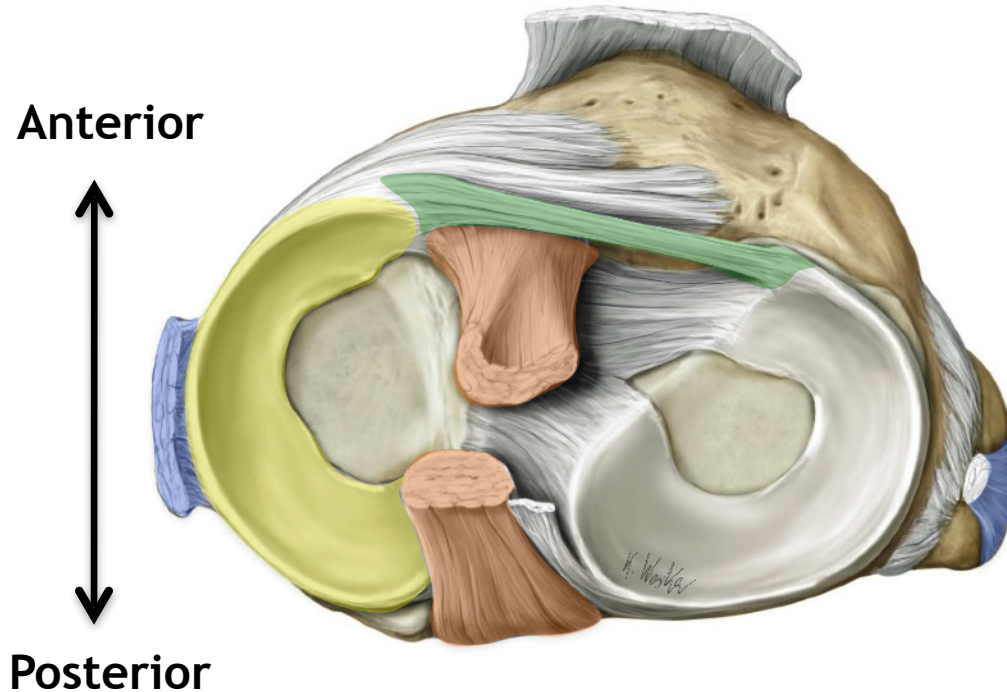
The ACL is a ligament commonly talked about in reference to sports injury and results from the same general scenario.

The Knee: Menisci



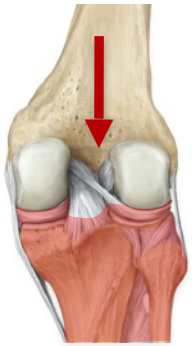
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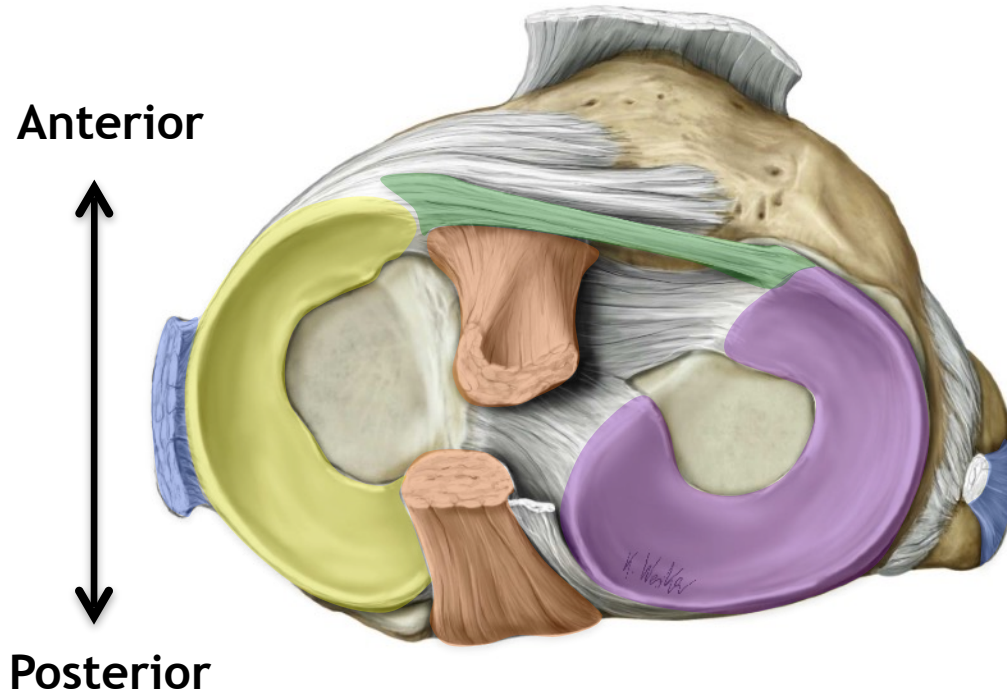
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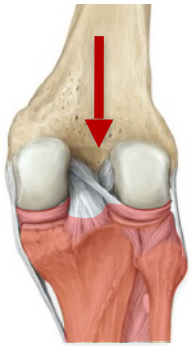
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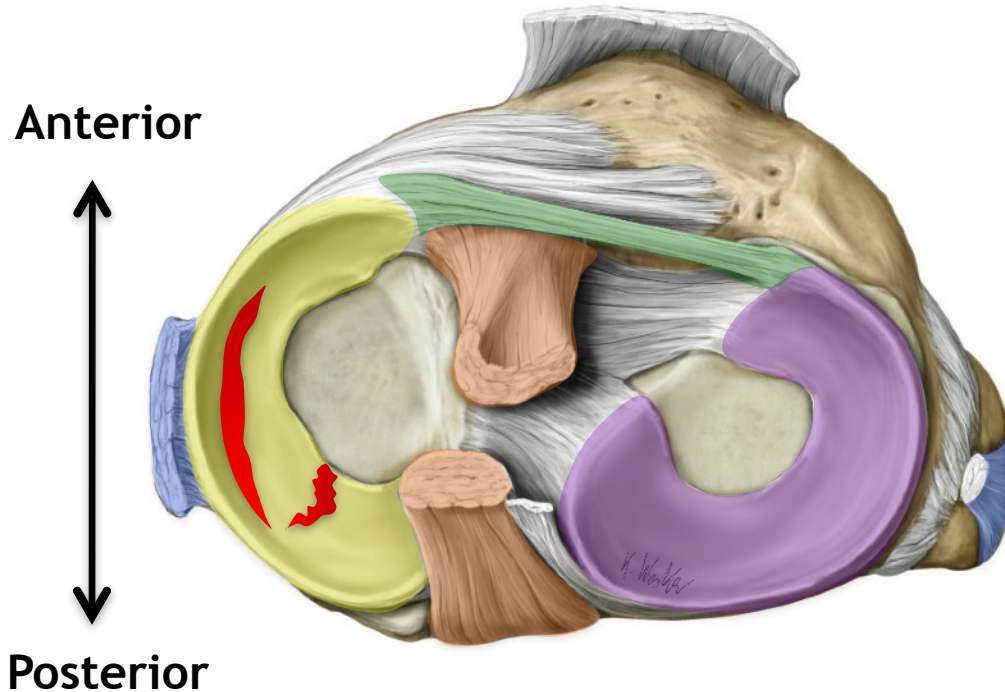


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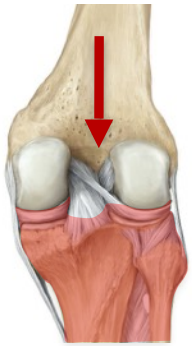
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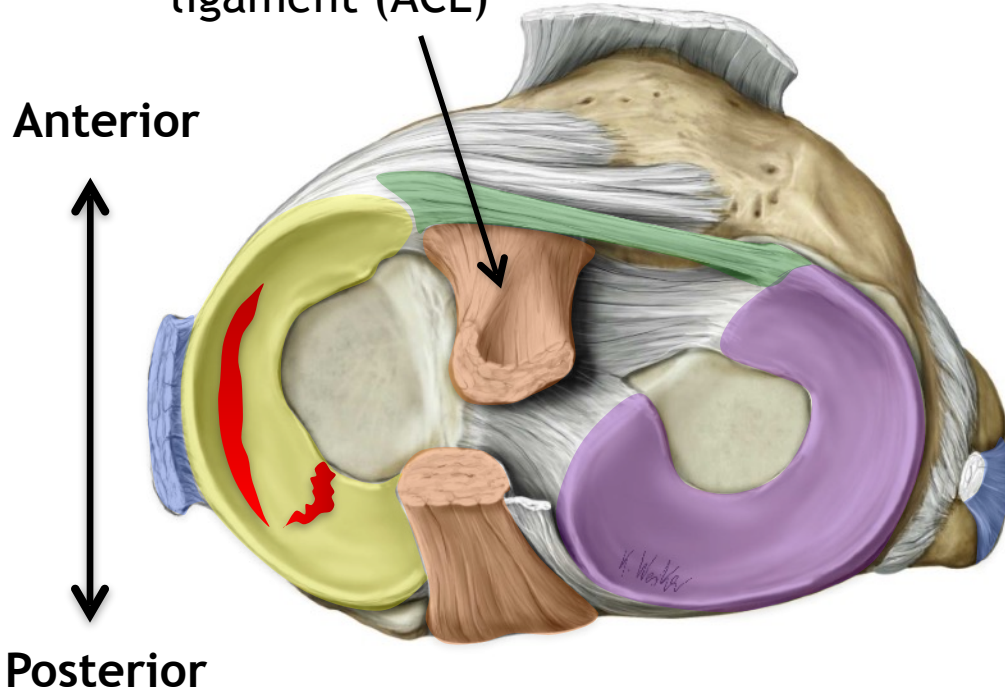
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The Knee: Menisci



Anterior cruciate
ligament (ACL)

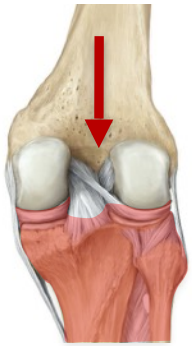


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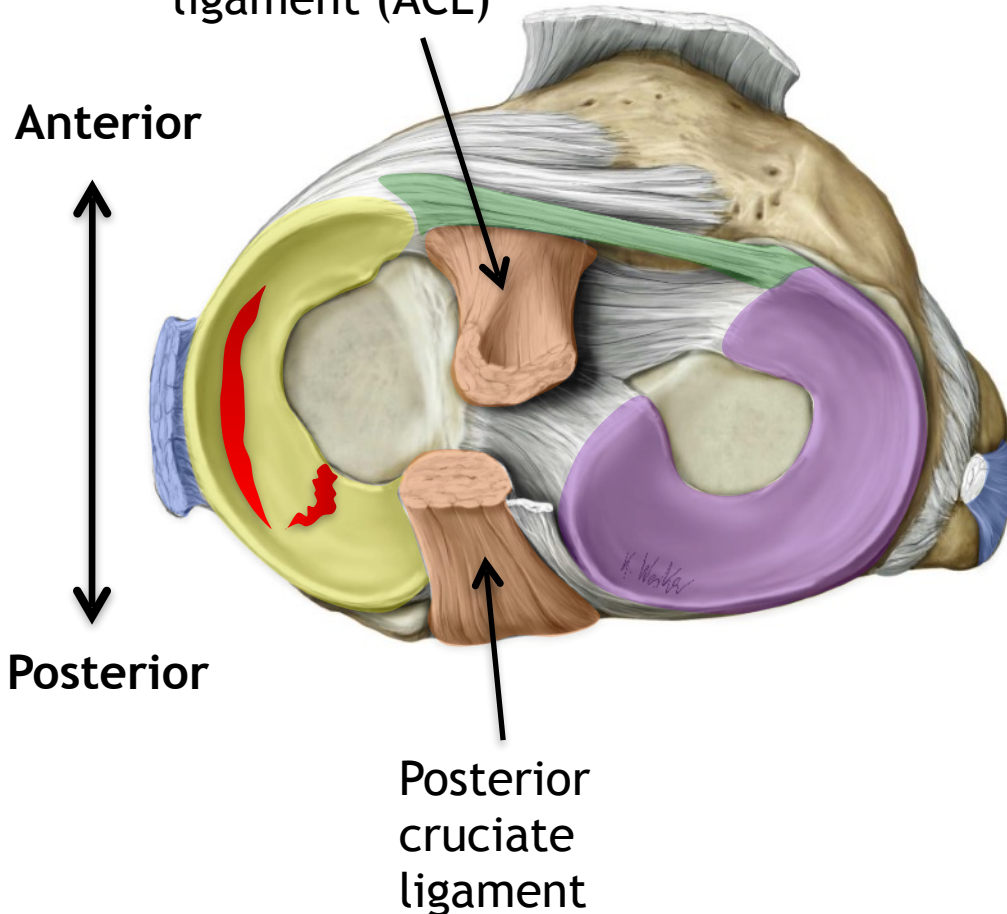
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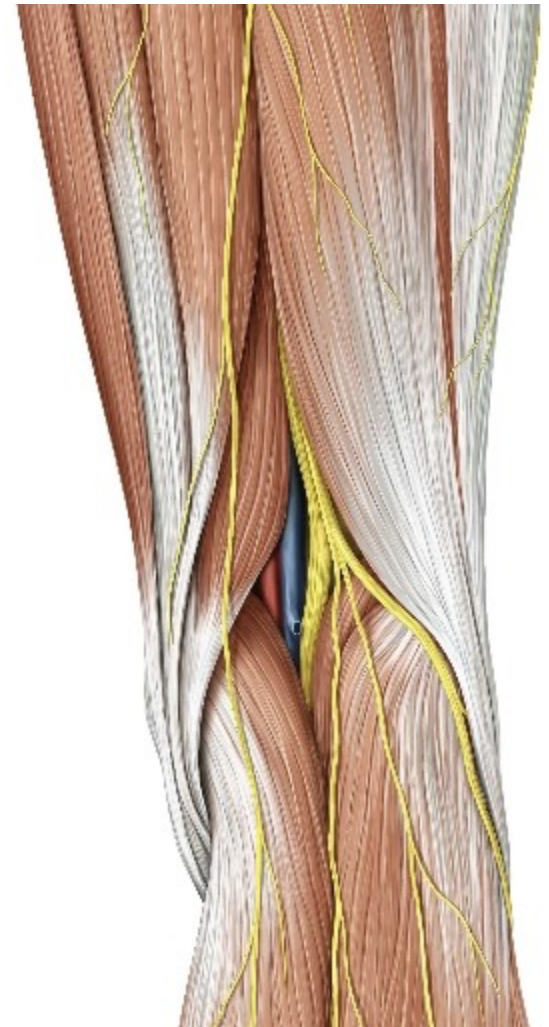
Popliteal Fossa

Located behind the knee is the diamond shaped popliteal fossa. This region is visible and palpable. The region is made proximally by the tendons of the posterior muscles of the thigh, including the **biceps femorus** and **semimembranosus**, and distally by the lateral and medial heads of the **gastrocnemius muscle** and the **plantaris** and **popliteus** muscles of the lower leg (not visible).

This region holds many important structures including:

- Common peroneal nerve
- Tibial nerve
- Popliteal vessels
- Lymph nodes
- Bursae

All structures are cushioned by fat. In addition, the small saphenous empties into the popliteal vein.



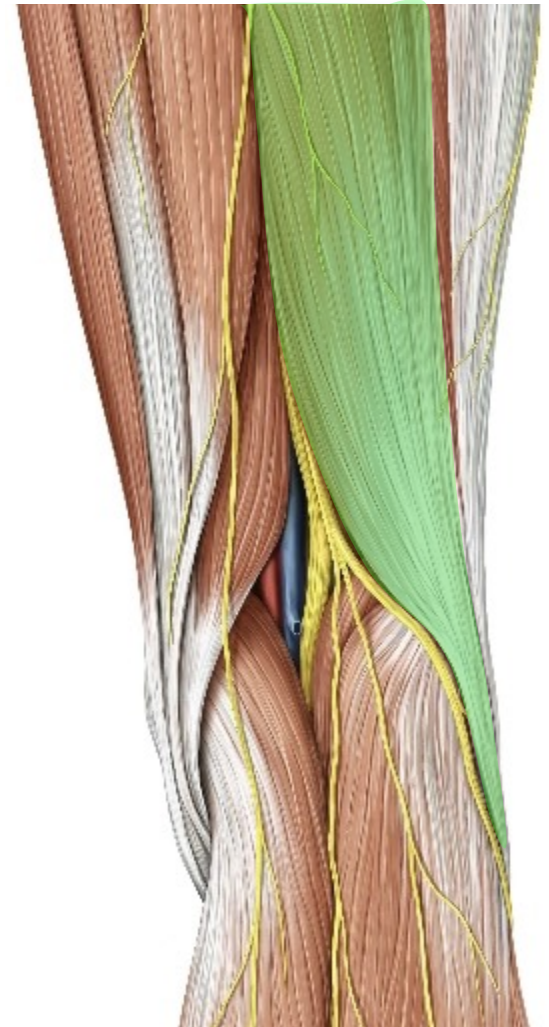
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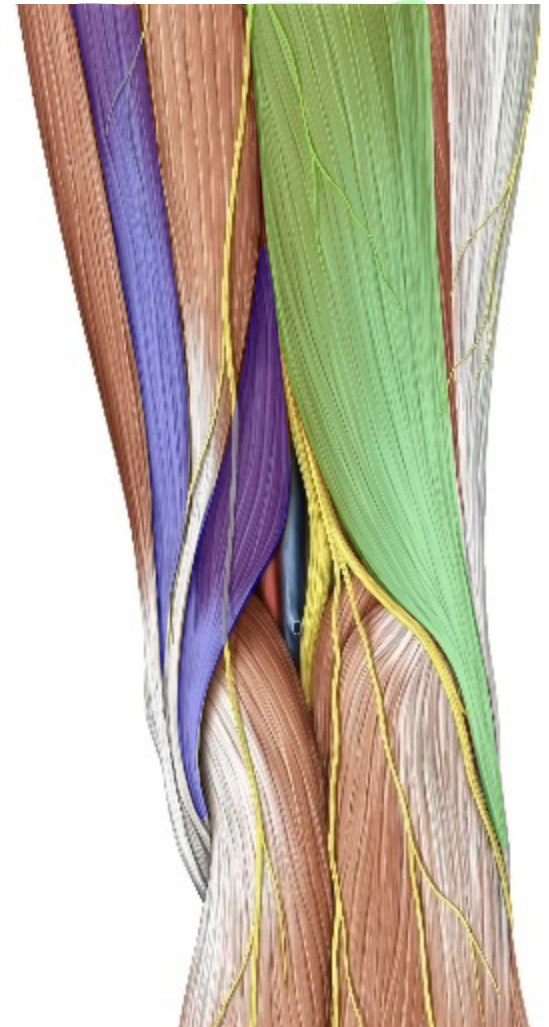
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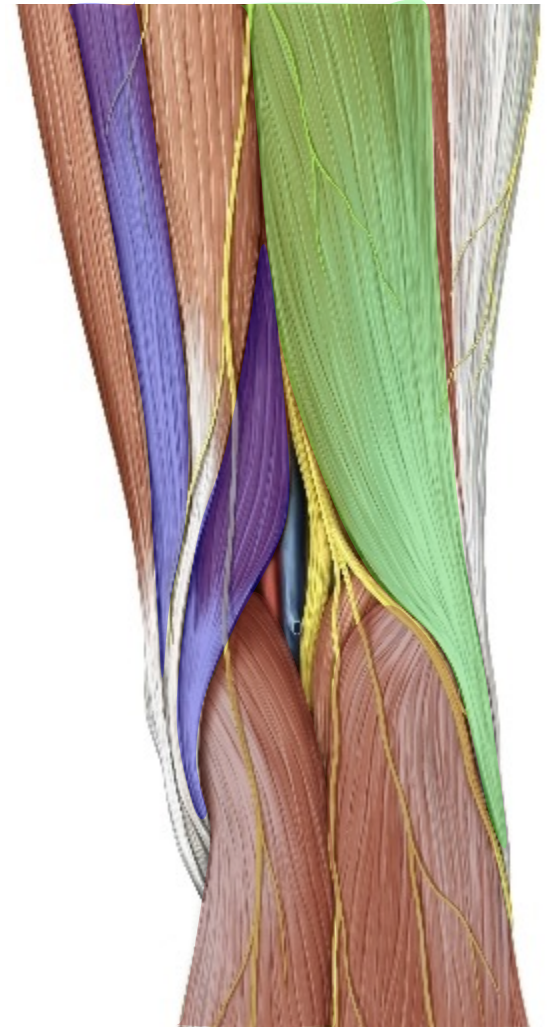
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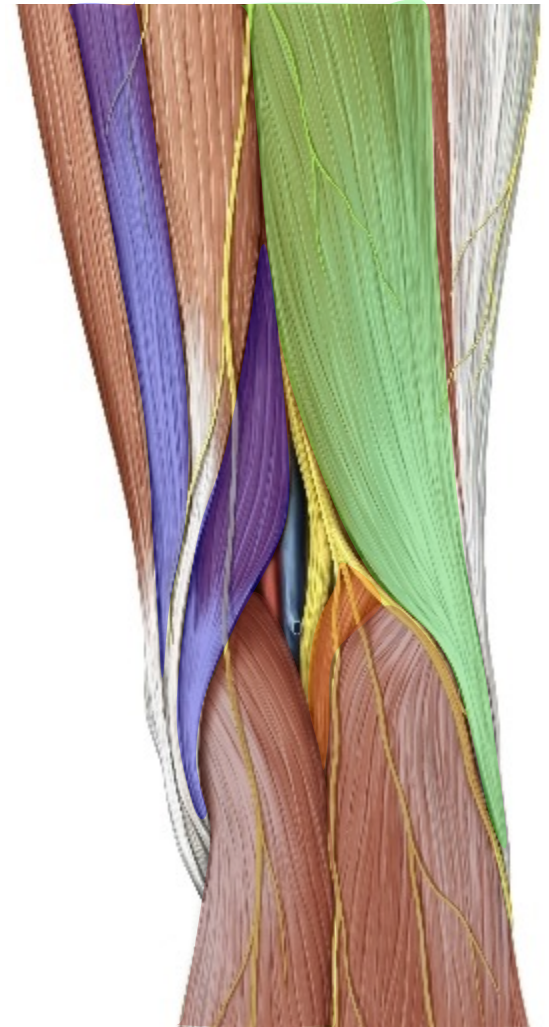
Popliteal Fossa

Located behind the knee is the diamond shaped popliteal fossa. This region is visible and palpable. The region is made proximally by the tendons of the posterior muscles of the thigh, including the **biceps femorus** and **semimembranosus**, and distally by the lateral and medial heads of the **gastrocnemius muscle** and the **plantaris** and **popliteus** muscles of the lower leg (not visible).

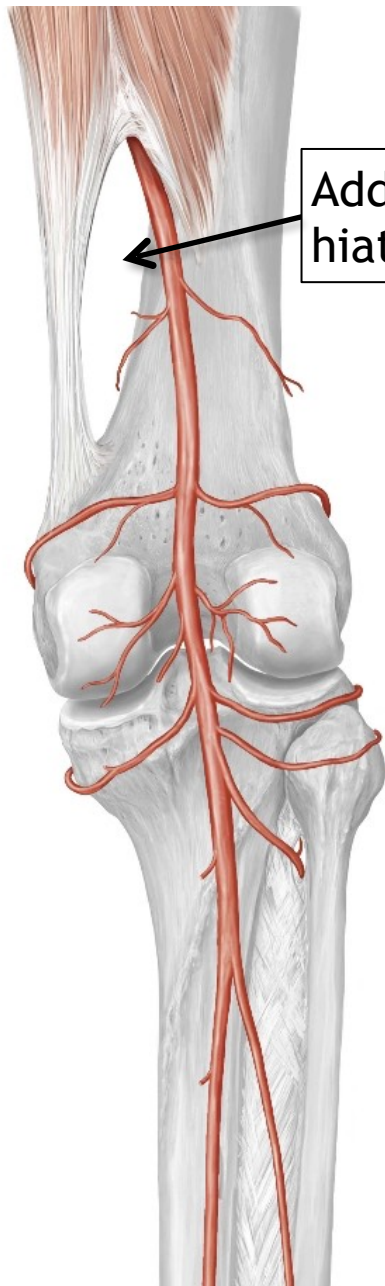
This region holds many important structures including:

- Common peroneal nerve
- Tibial nerve
- Popliteal vessels
- Lymph nodes
- Bursae

All structures are cushioned by fat. In addition, the small saphenous empties into the popliteal vein.



The Knee: Arterial Supply



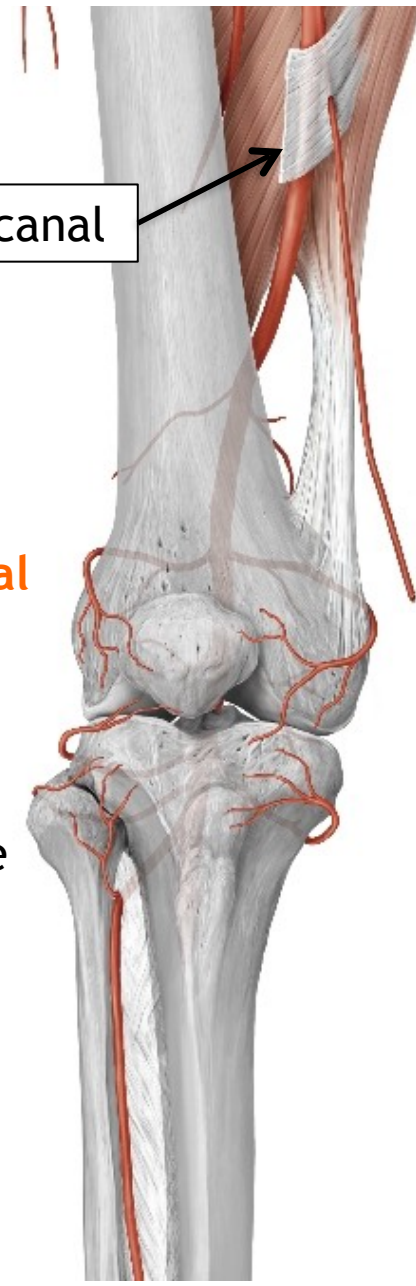
Adductor
hiatus

Posterior

The **popliteal artery** provides the bones and muscles of the knee with its necessary blood supply.

The popliteal artery originates from the **femoral artery** that travels anterior to the adductor magnus of the thigh, down the **adductor canal** and through the **adductor hiatus**, transitioning to the posterior region of the knee joint. The popliteal artery branches and wraps around the knee allowing for sufficient blood supply.

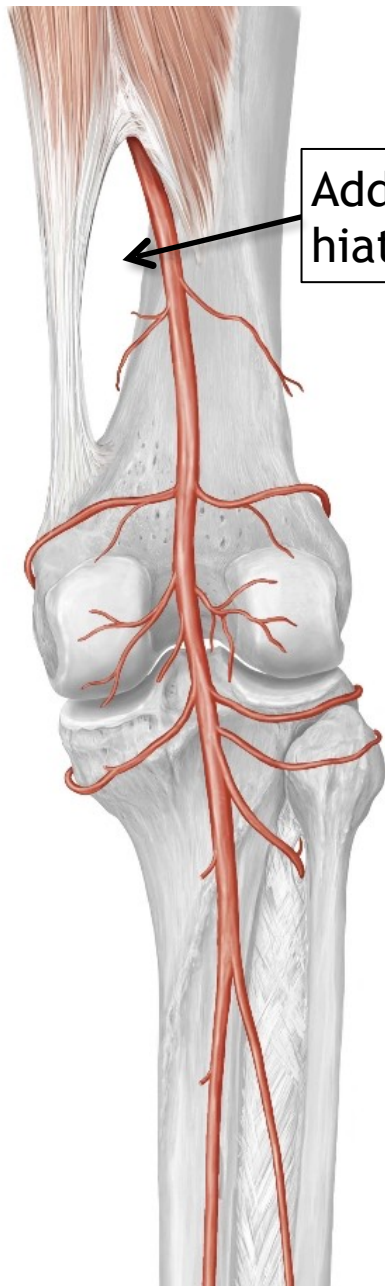
Once passing the knee, the popliteal artery forks into the **anterior tibial artery** and the **posterior tibial artery**. The **fibular artery** branches from the posterior tibial artery.



Adductor canal

Anterior

The Knee: Arterial Supply



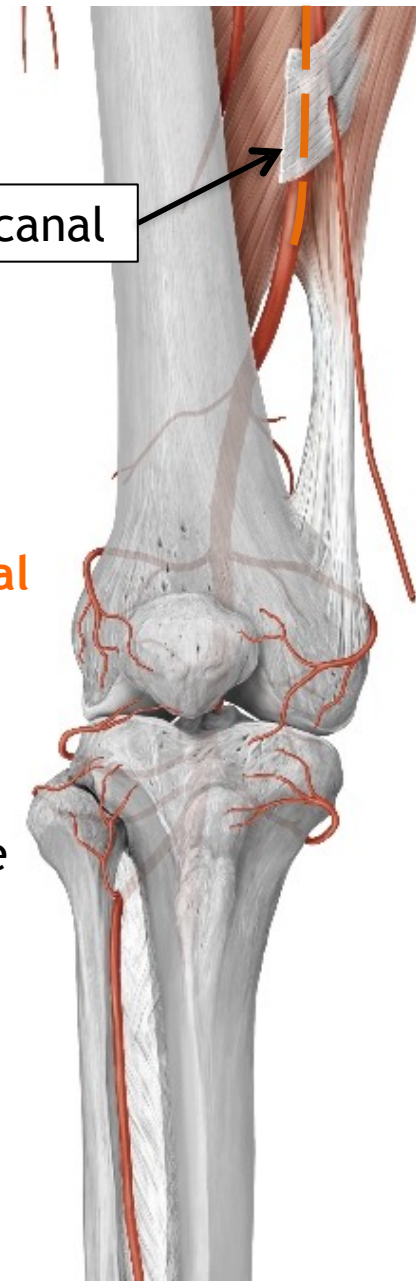
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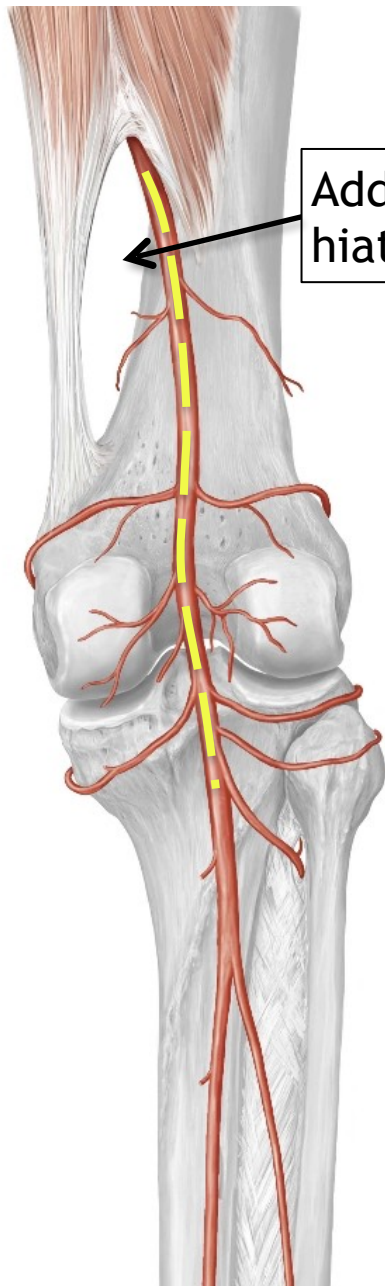
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Adductor canal

Anterior

The Knee: Arterial Supply



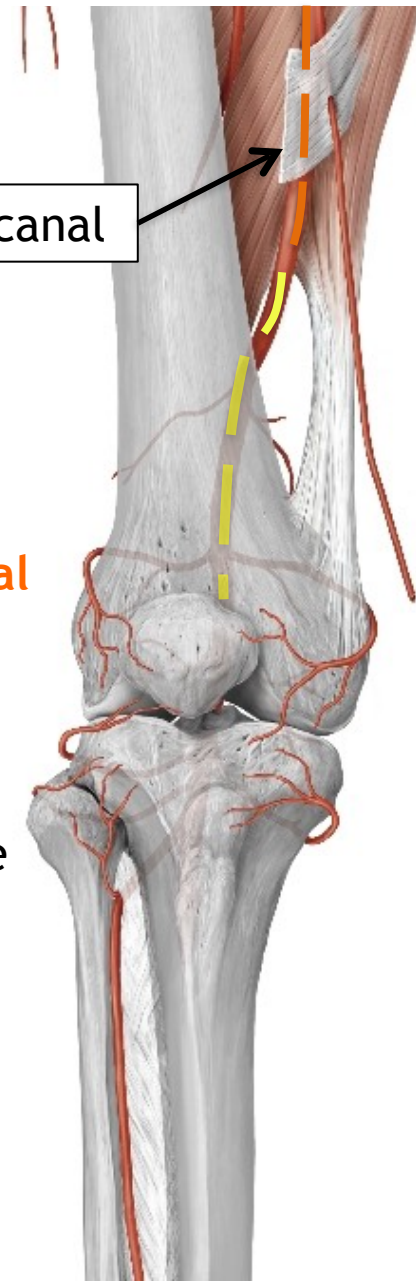
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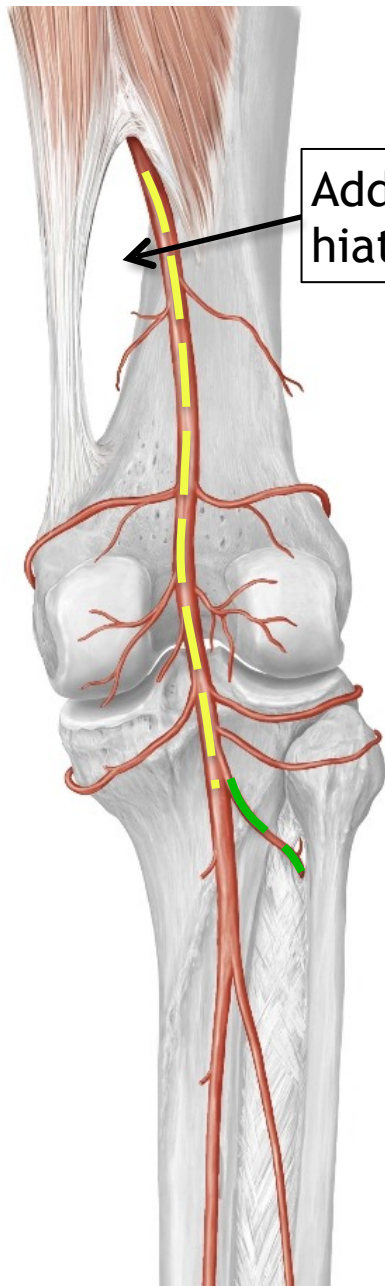
Posterior



Adductor canal

Anterior

The Knee: Arterial Supply



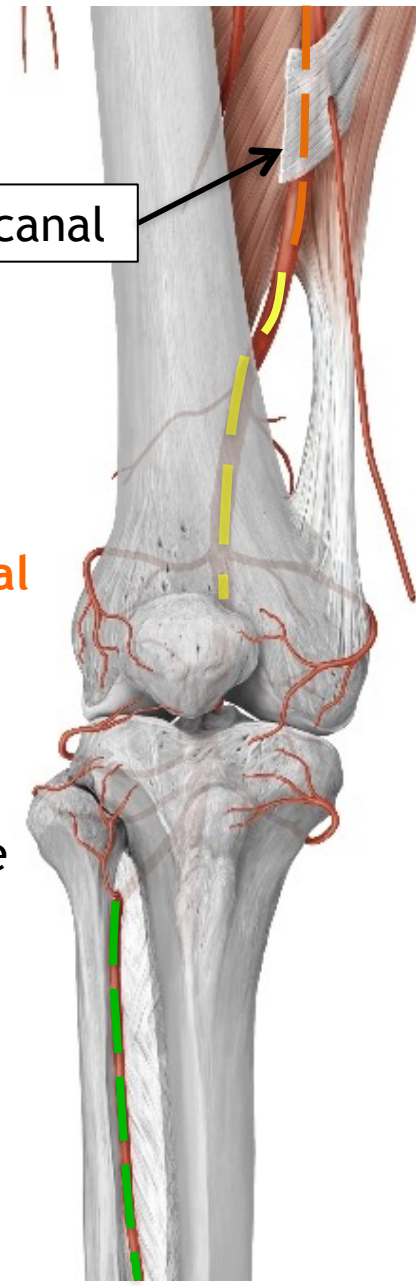
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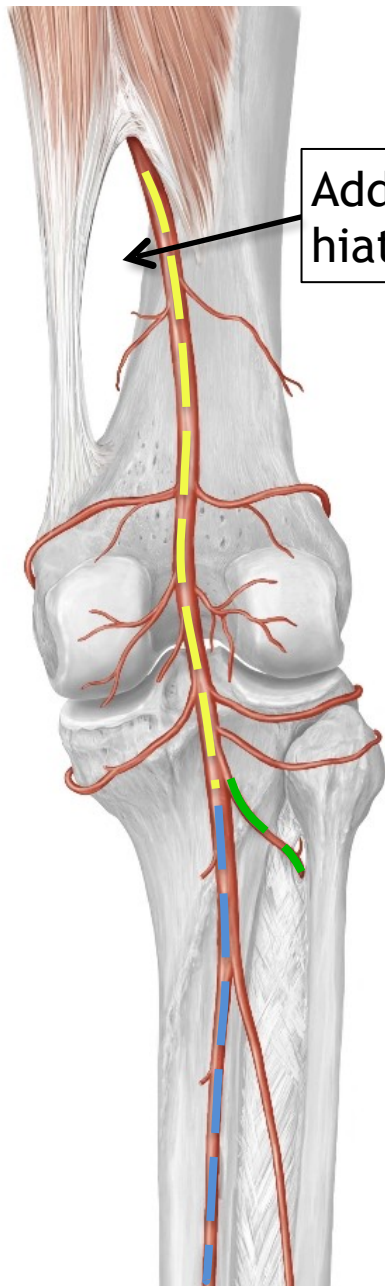
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Adductor canal

Anterior

The Knee: Arterial Supply



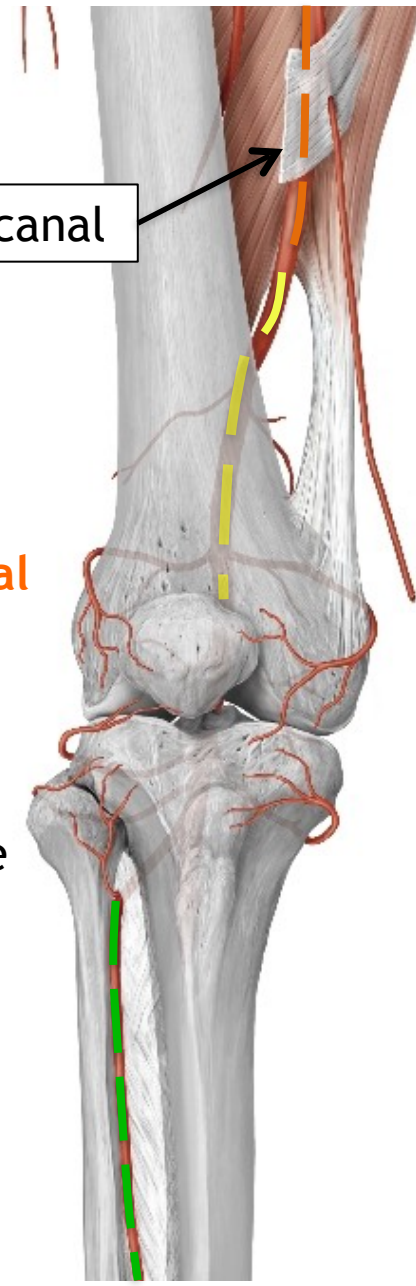
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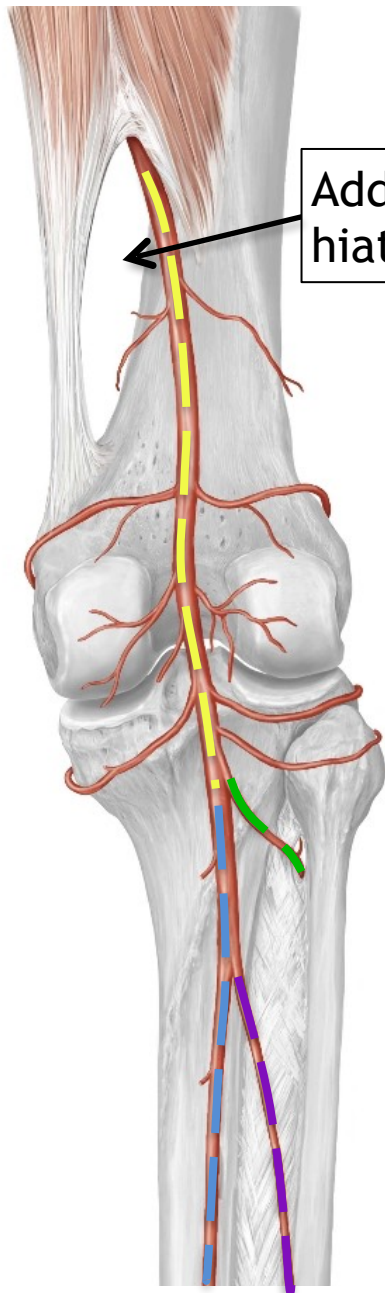
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Adductor canal

Anterior

The Knee: Arterial Supply



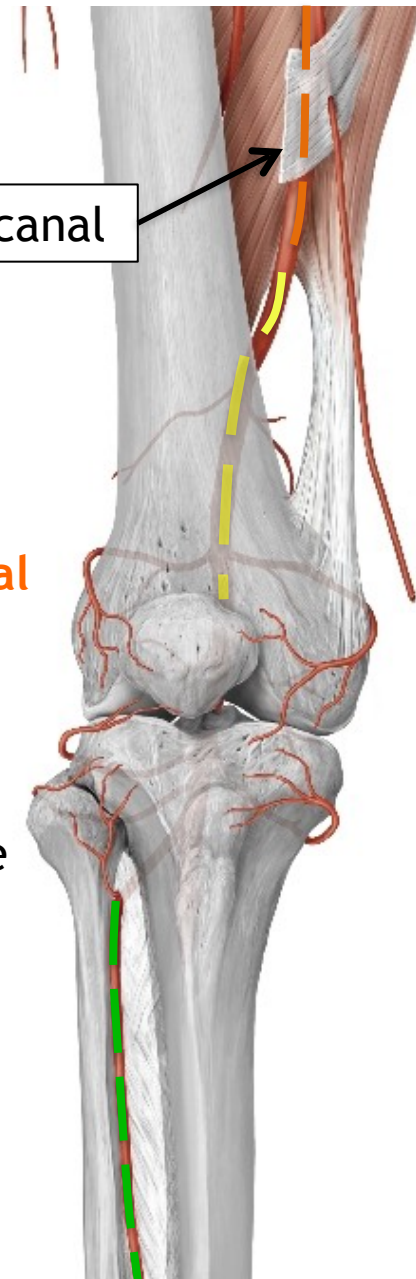
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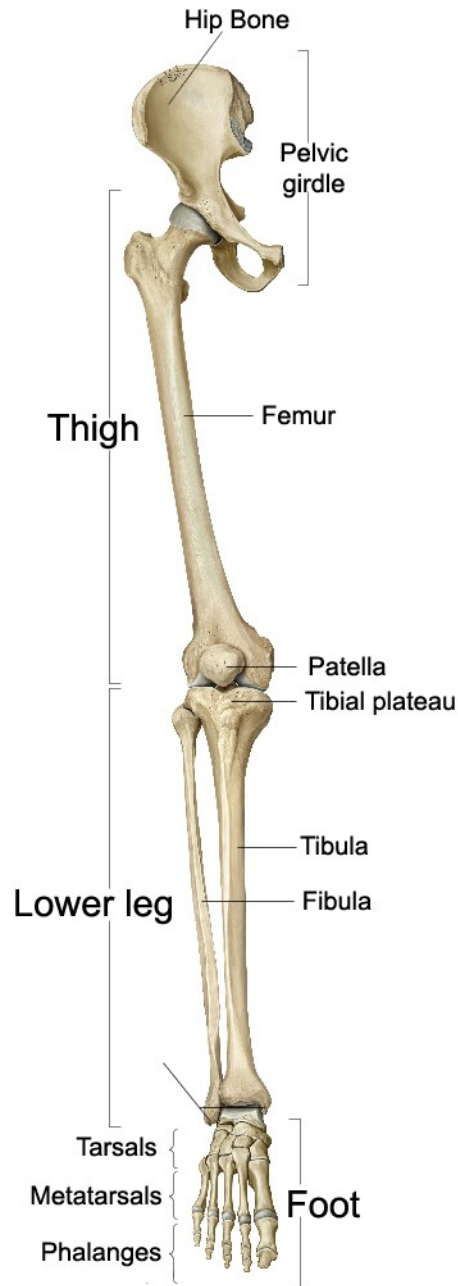
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Adductor canal

Anterior

The Lower Leg

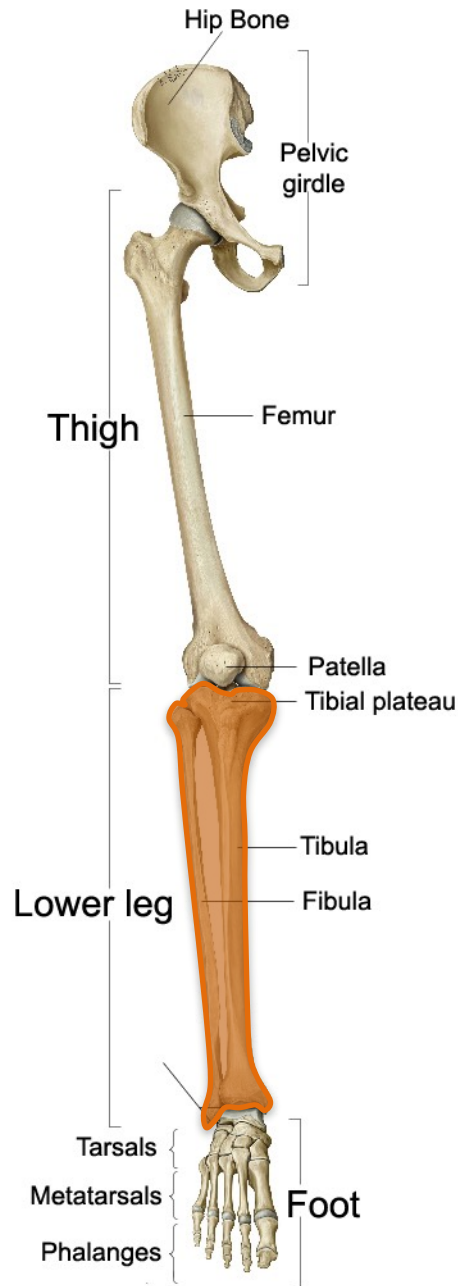


The lower limb is composed of the fibula and tibia.

The lower leg is much more constricted in comparison to the range of motion of the thigh. The primary function of the muscles in the lower leg is movement of the the bones in the foot. Bound together by the interosseous membrane, the tibia and fibula are virtually immobile.

We will begin understanding the lower leg by covering the surface anatomy of the fibula and tibia.

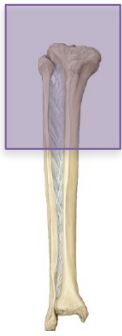
The Lower Leg



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Tibia & Fibula: Proximal View

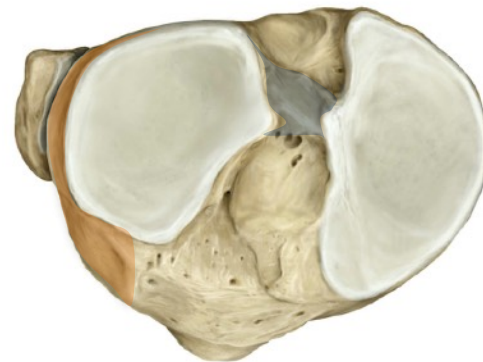
The proximal end of the tibia has a **lateral** and a **medial condyle** that hold the medial and lateral menisci of the knee. The **tibial tuberosity** is where the patellar ligament attaches.



Posterior



Anterior



Tibia & Fibula: Proximal View

Lateral condyle

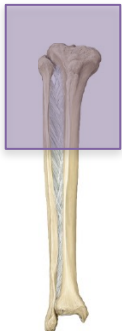
Medial condyle

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Posterior



Anterior



Tibia & Fibula: Proximal View

Lateral condyle

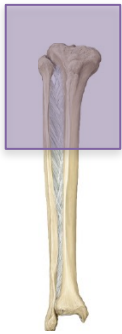
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Posterior



Anterior



Tibia & Fibula: Proximal View

Lateral condyle

Medial condyle

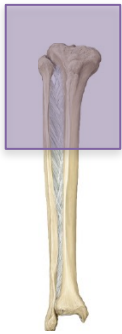
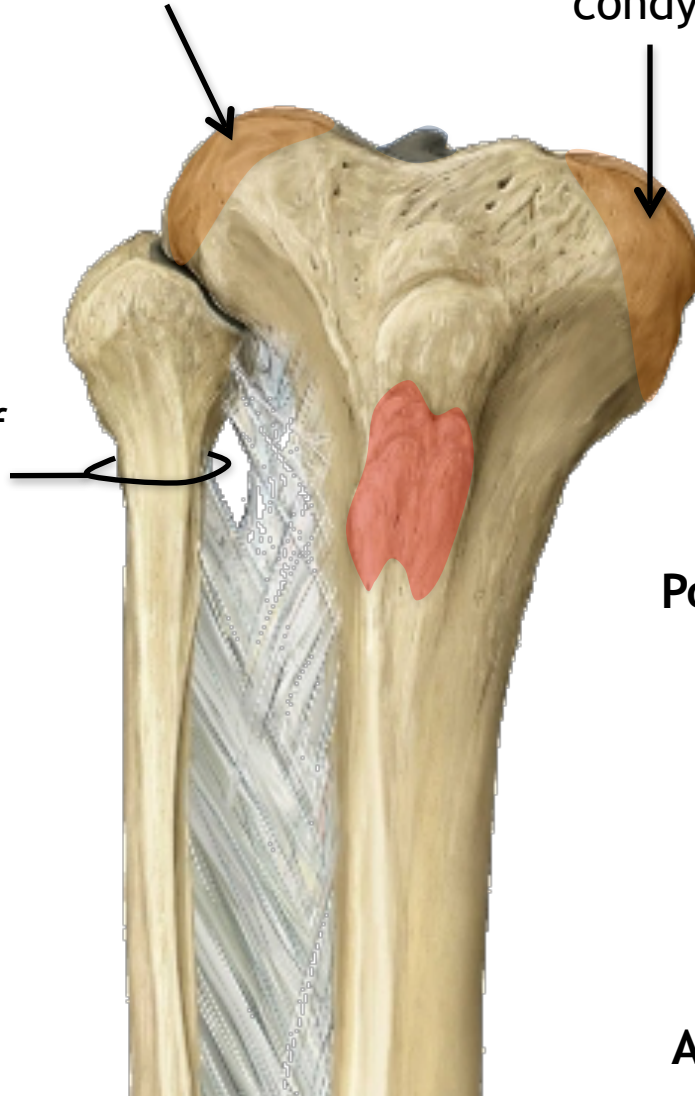
Neck of fibula

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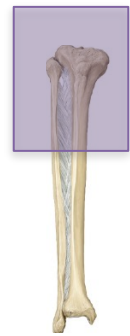
Posterior



Anterior



Tibia & Fibula: Proximal View



Lateral condyle

Medial condyle

Head of fibula

Neck of fibula

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Posterior



Anterior





Tibia & Fibula: Proximal View

The **intercondylar eminence** articulates with the intercondylar notch of the femur and is capable of fractures. The **soleal line** is a prominent ridge found on the posterior side of the tibia and serves as an attachment point for muscles and fascia of the posterior compartment of the lower leg, including insertion of the popliteus and origin of the soleus, flexor digitorum longus and tibialis posterior.

The **interosseous membrane** is a fibrous fascia, like that found between the radius and ulna, connecting the two bones. This membrane is opened at small point to allow for passage of blood vessels. It divides the leg into posterior and anterior compartments.





Intercondylar
eminence



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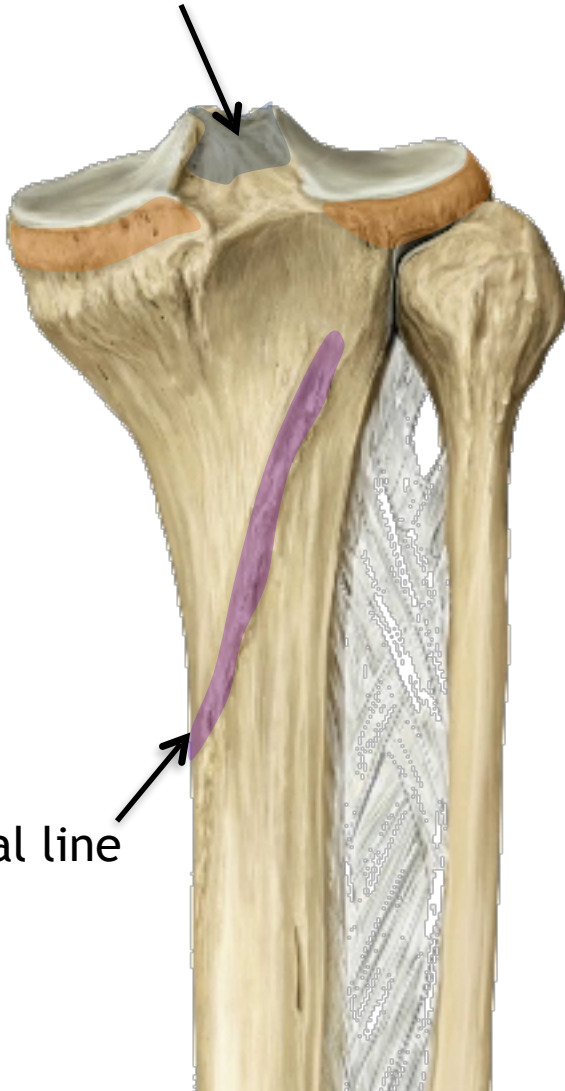
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Tibia & Fibula: Proximal View



Intercondylar
eminence



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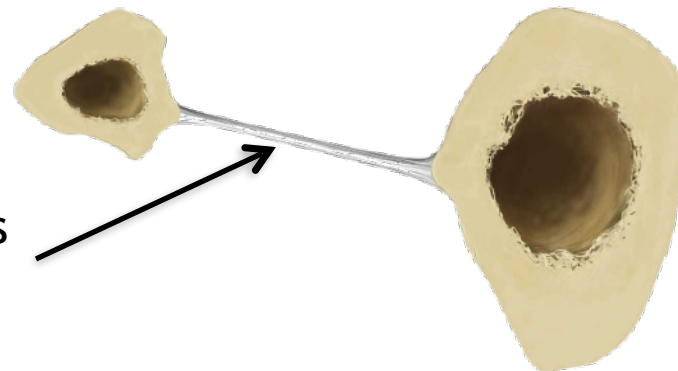
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Soleal line

Interosseous
membrane



Tibia & Fibula: Proximal View



Intercondylar
eminence



Head of tibia



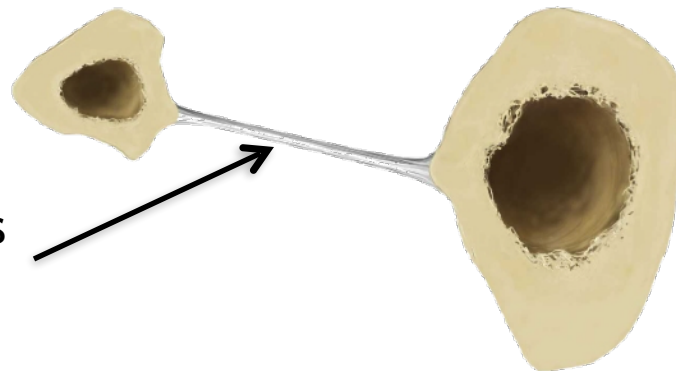
Soleal line

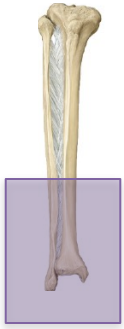


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Interosseous
membrane





Tibia & Fibula: Distal View

The distal end of the tibia and fibula make up the *ankle bones*, formally known as the **lateral and medial malleolus**.

The **tibiofibular syndesmosis** is a non-cartilaginous joint formed by the tibia and fibula. Many ligaments attach at this point, stabilizing the ankle joint.

Syndesmosis sprains are common and if severe enough, may require temporary screws (shown in grey) for immobilization and healing.



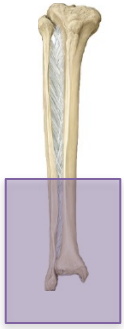
Anterior

Anterior



Posterior



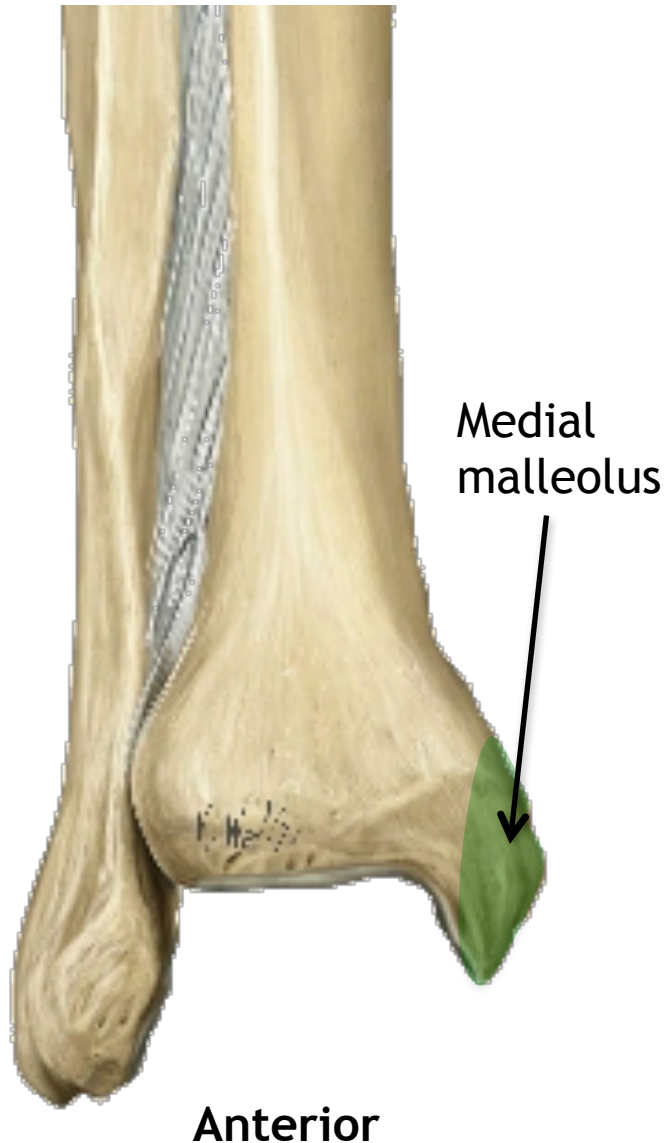


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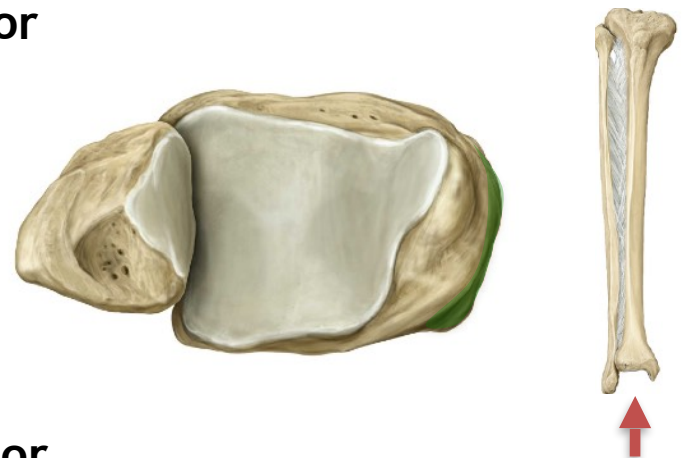
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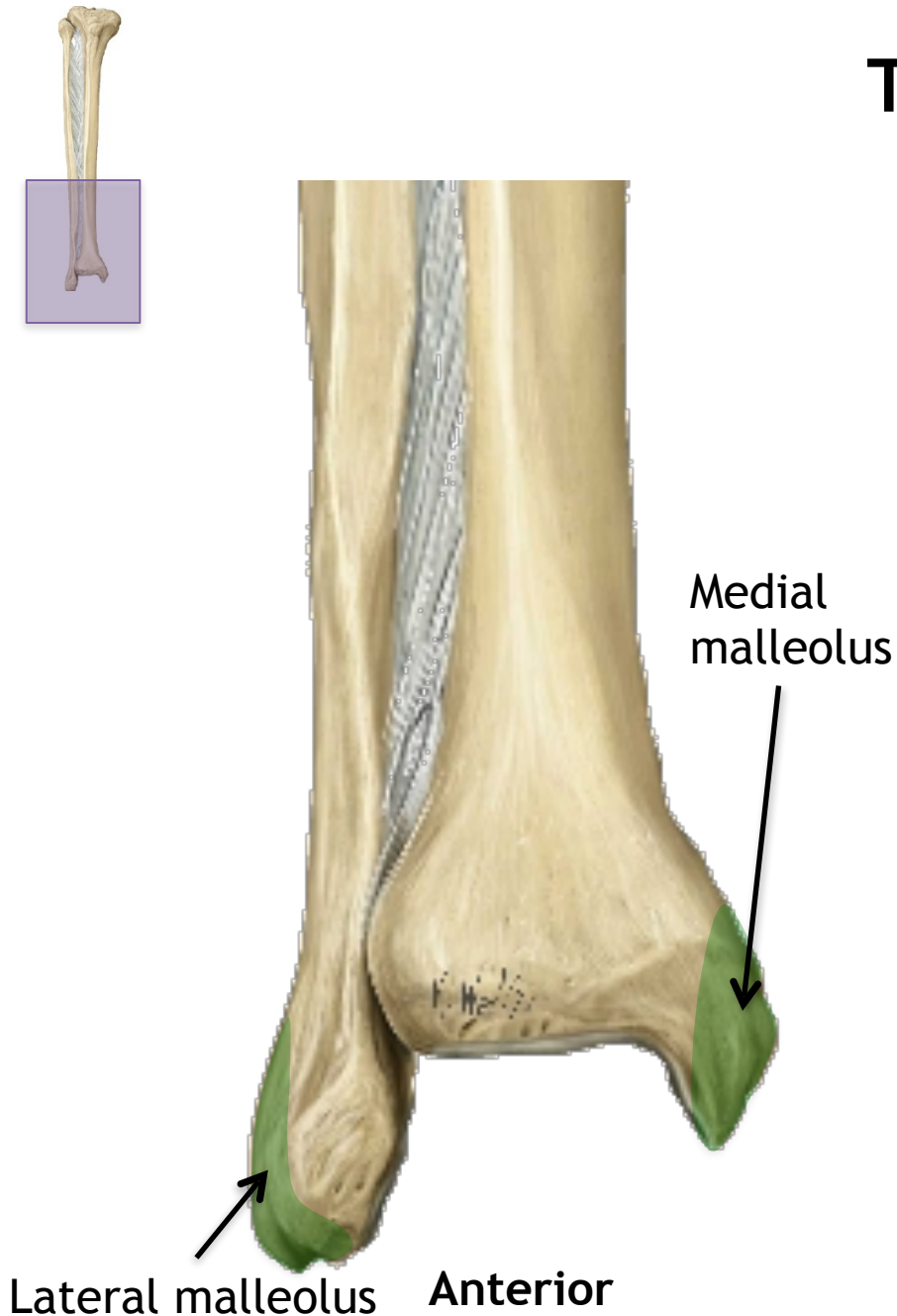
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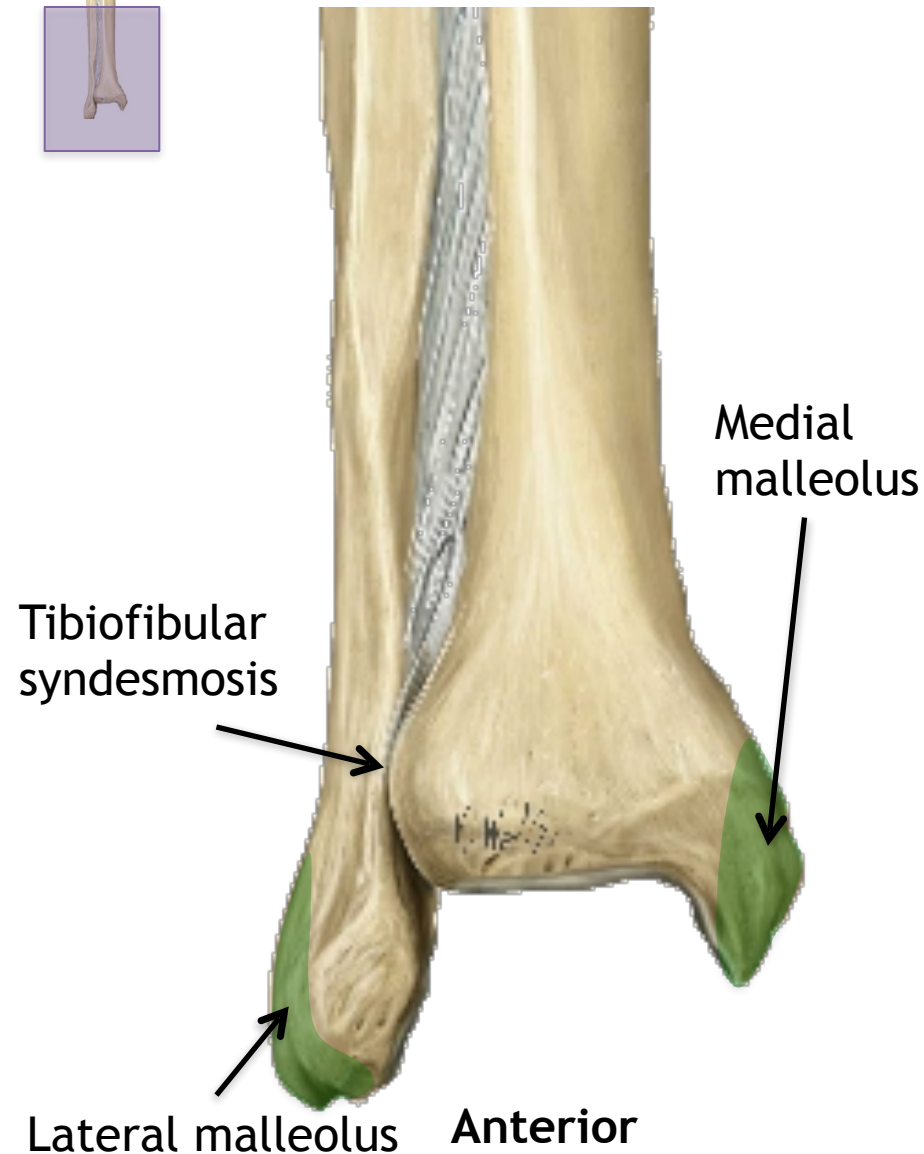
Posterior



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Anterior

Posterior

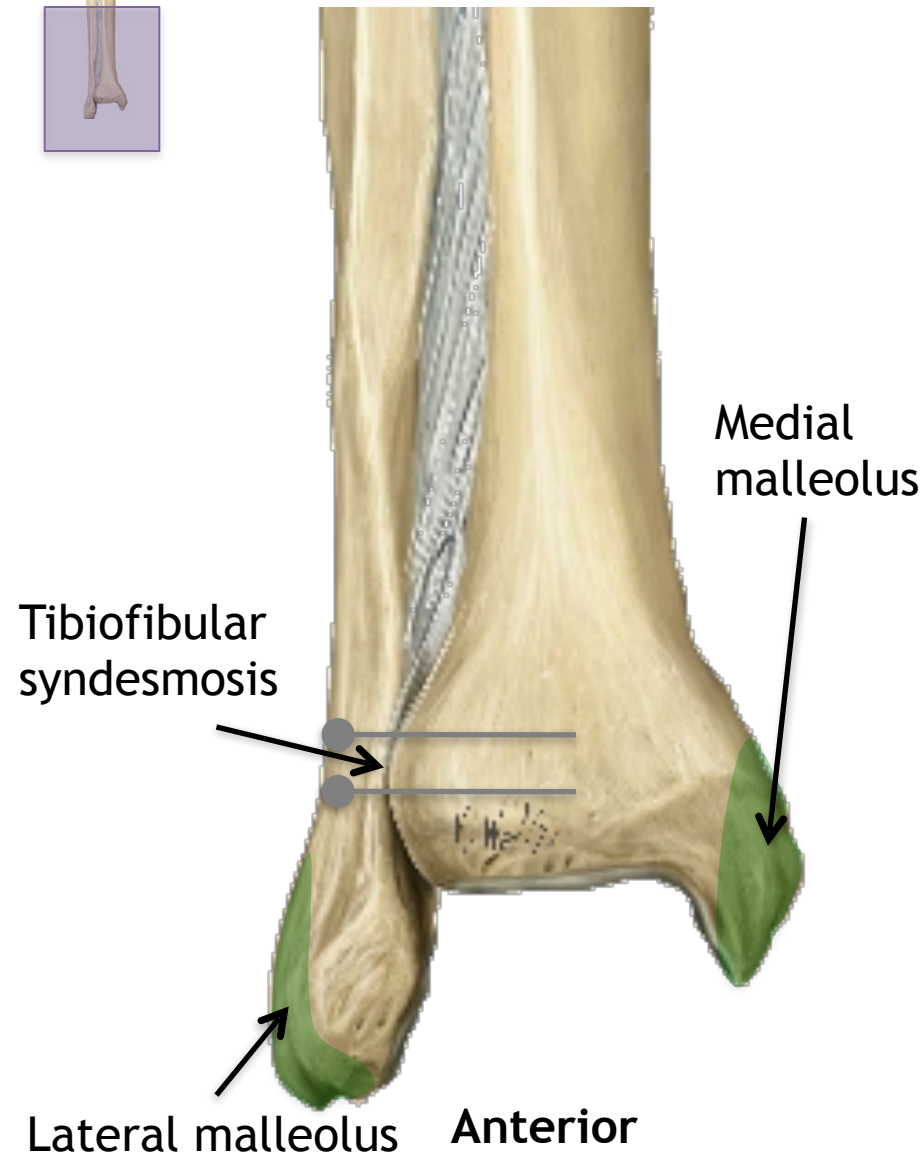


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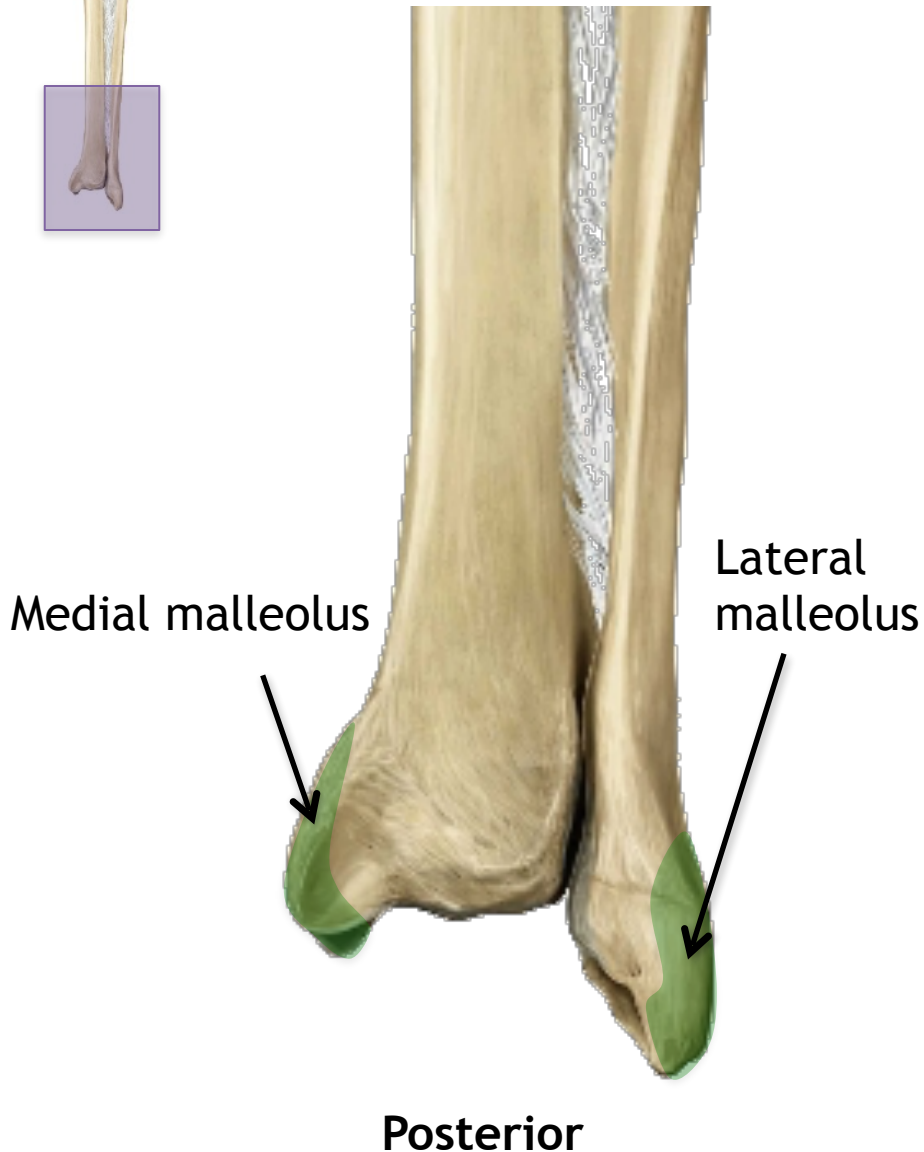
Anterior



Posterior



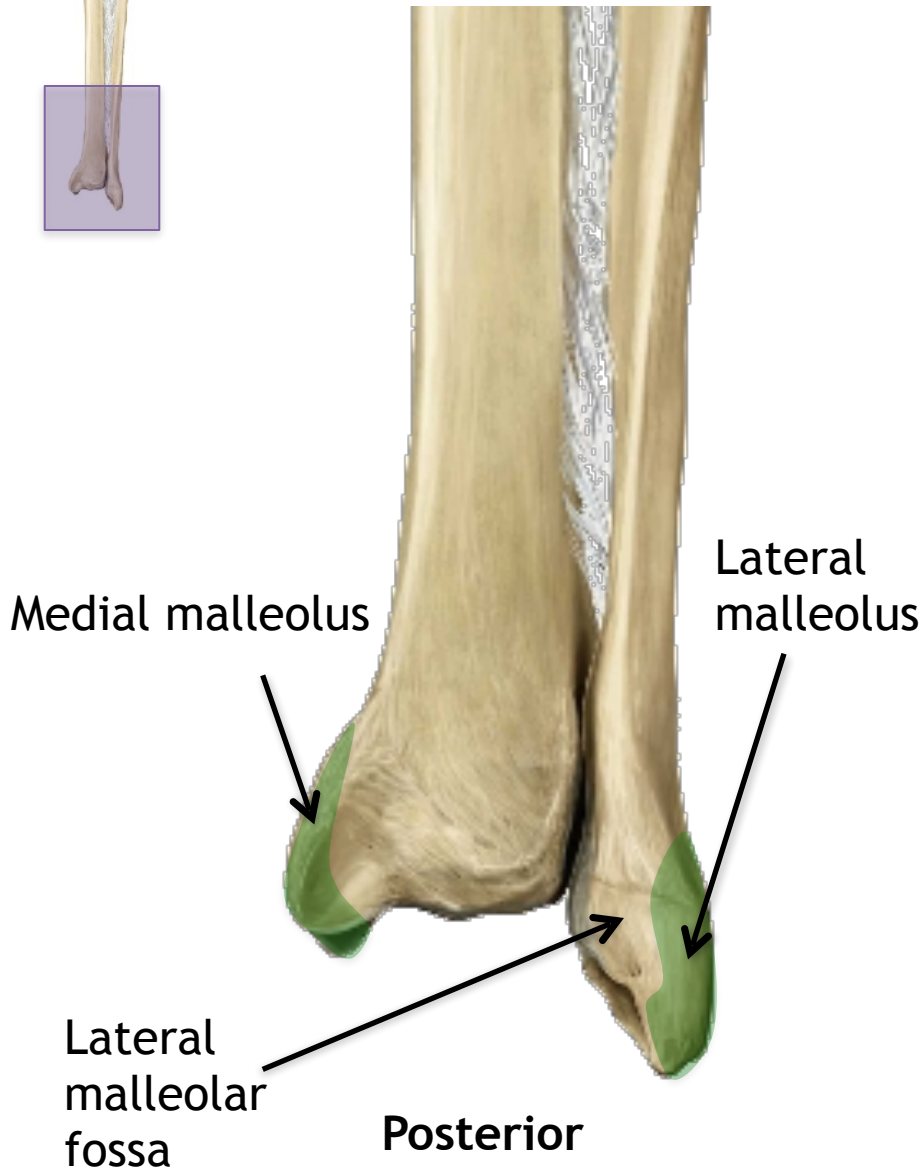
Tibia & Fibula: Distal View



The distal end of the fibula and tibia articulate with the talus of the foot at the ankle joint. The ankle is a synovial joint.

The **lateral malleolar fossa** is a rough depression in the fibula that provides a spot for attachment of the posterior talofibular and the transverse tibiofibular ligaments.

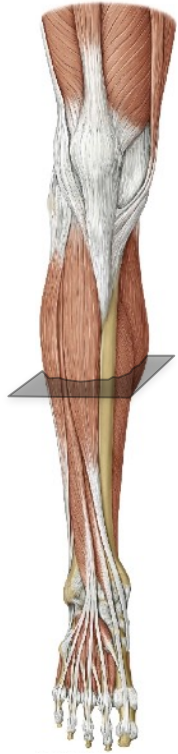
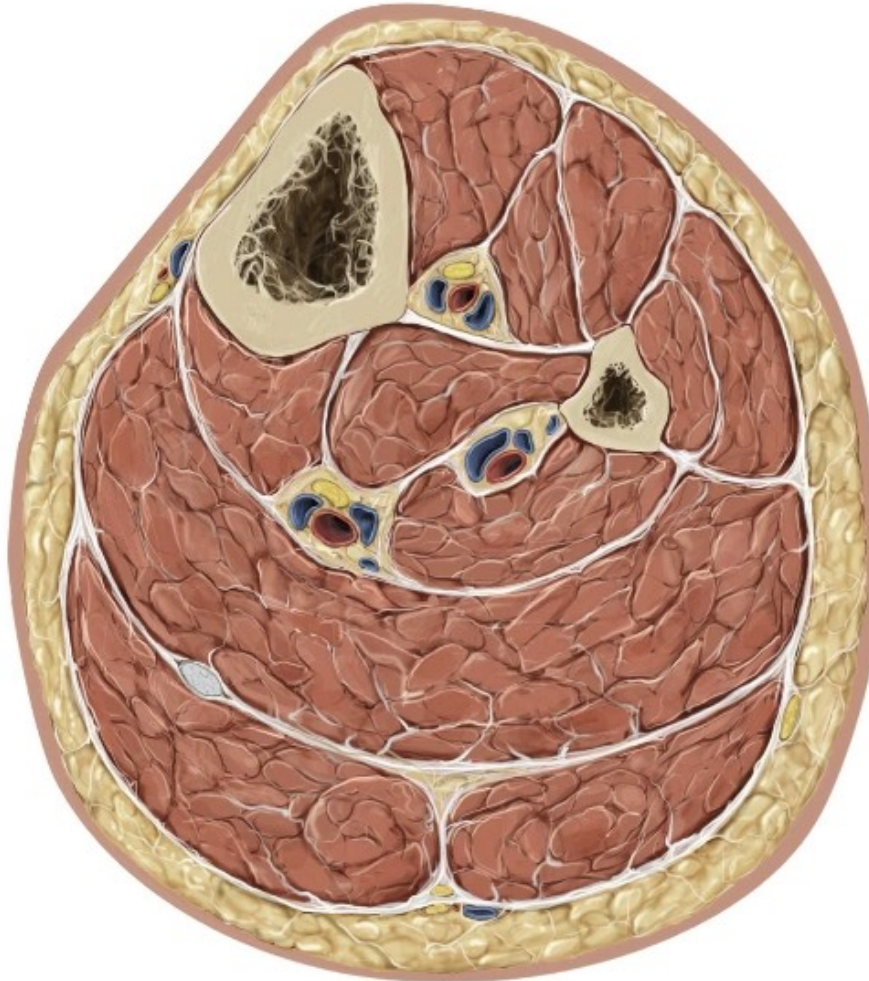
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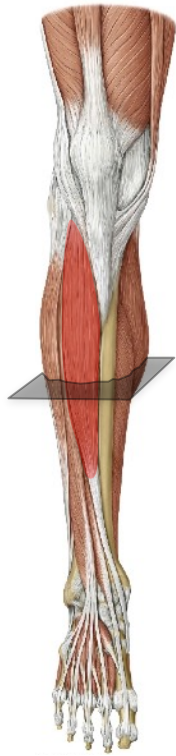
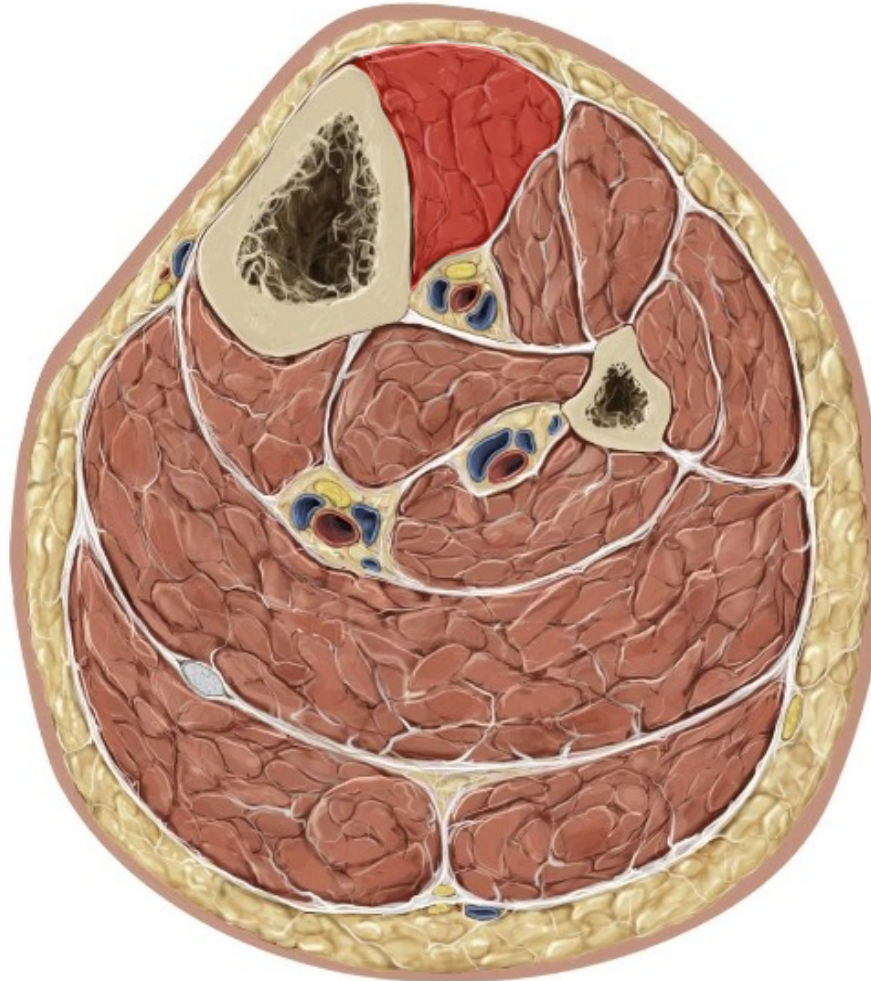
Cross Section of the Lower Leg



Fascia extends inward to separate the lower leg into an anterior, posterior and lateral compartment.

The posterior compartment, commonly referred to as the *calf muscles*, makes up the majority of the lower leg and plantarflex the foot. The anterior and lateral compartments are responsible for dorsiflexion (extension), supination and pronation (eversion) of the foot.

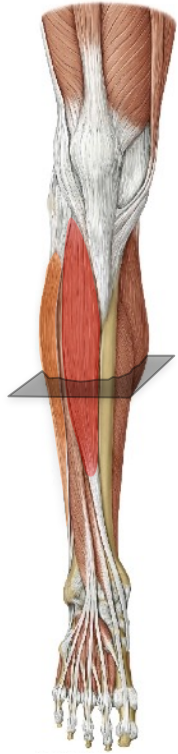
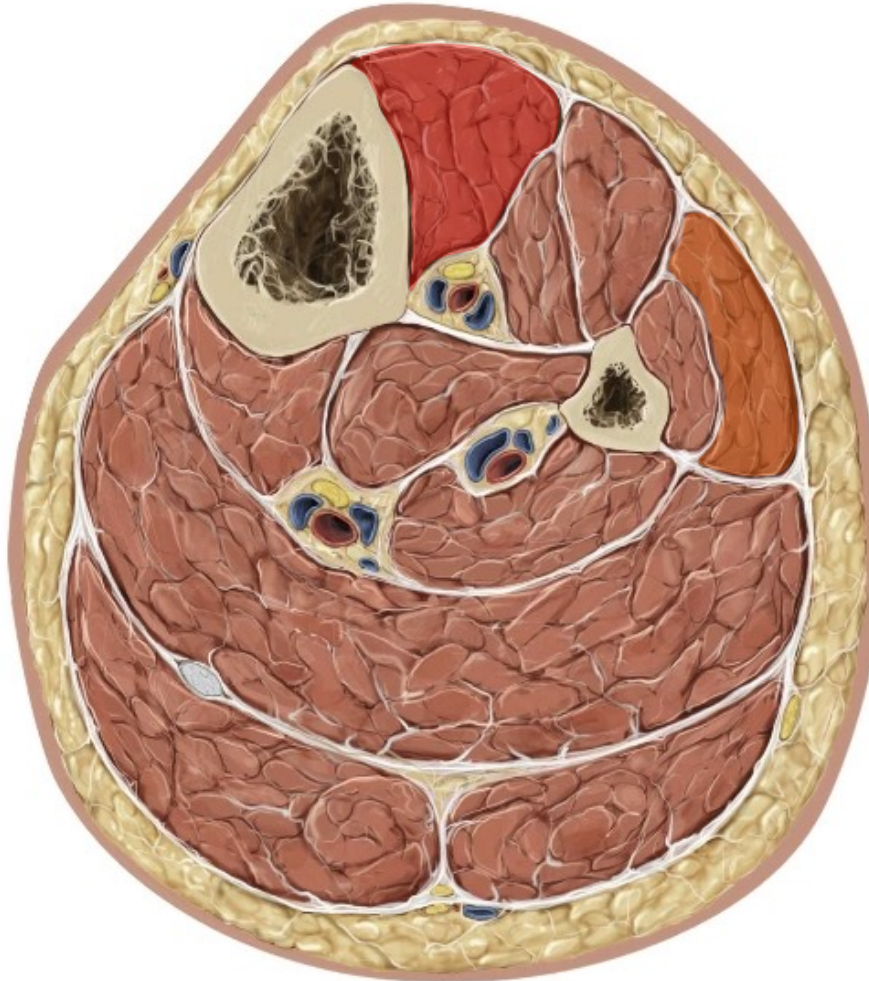
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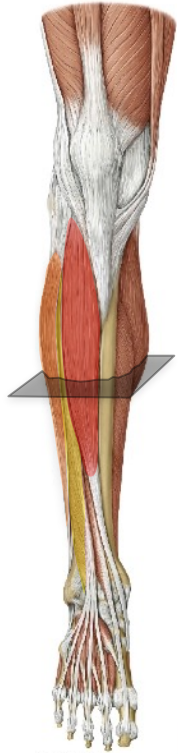
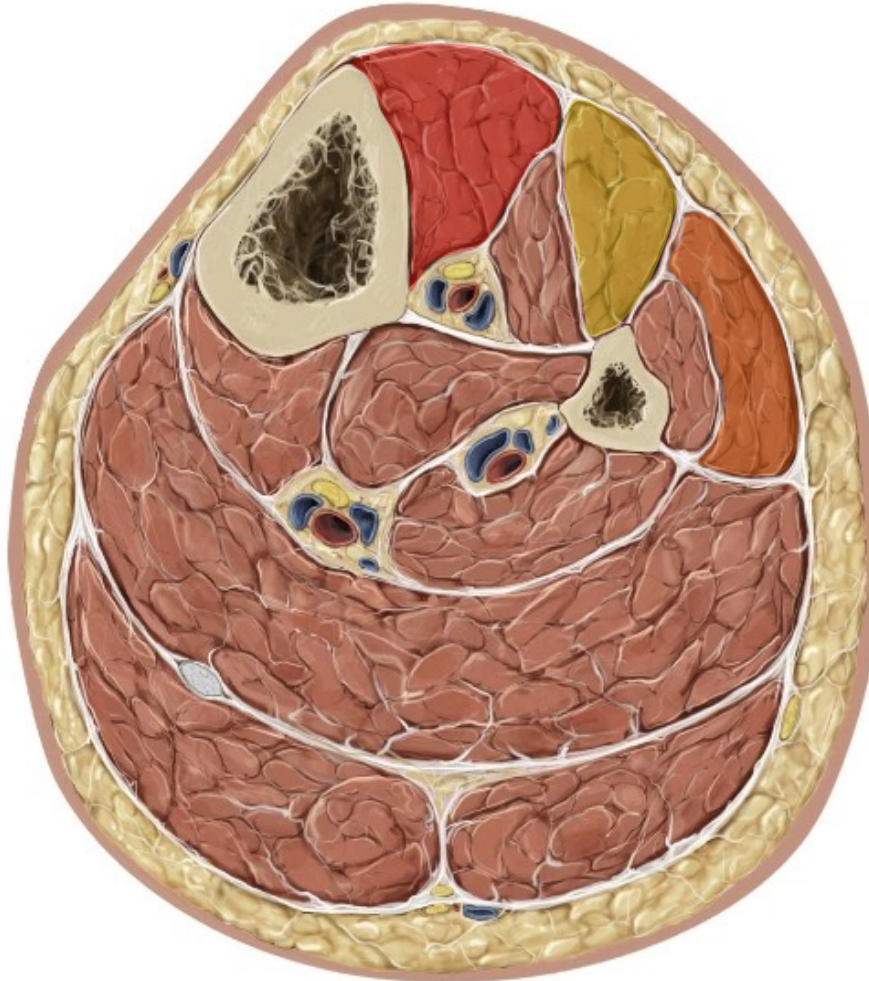
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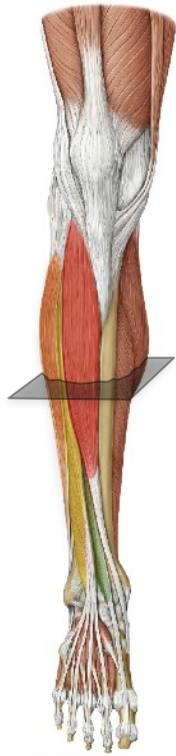
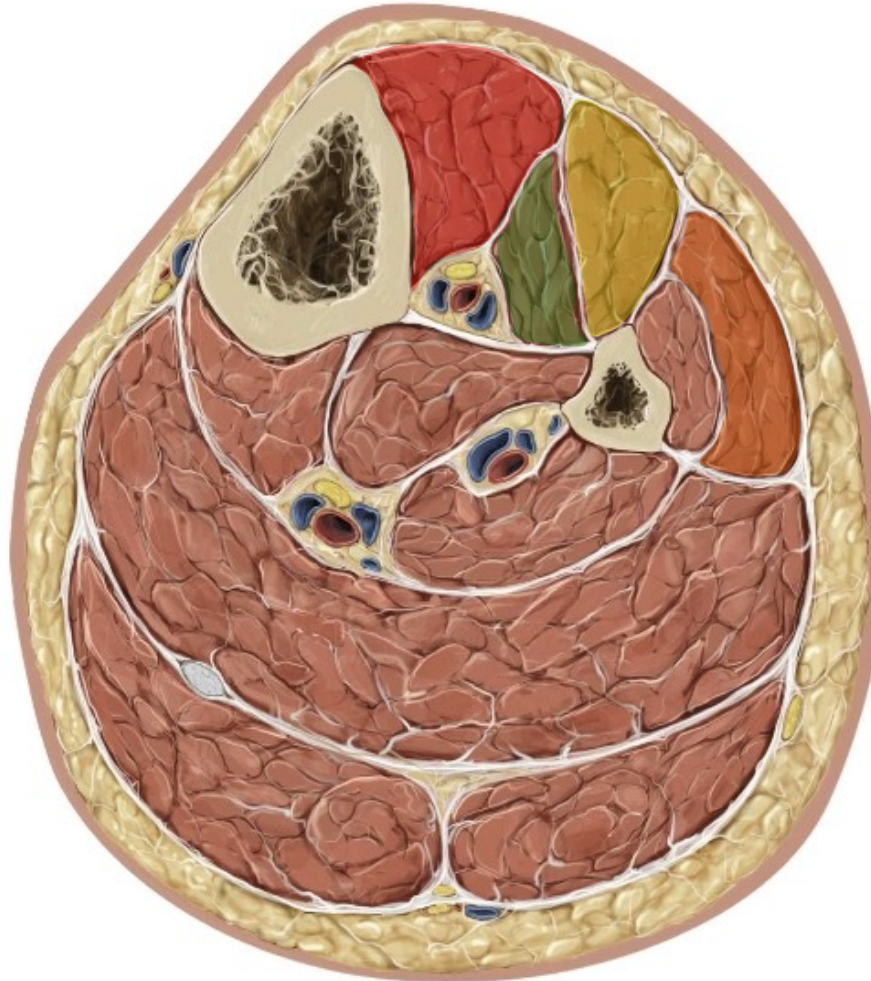
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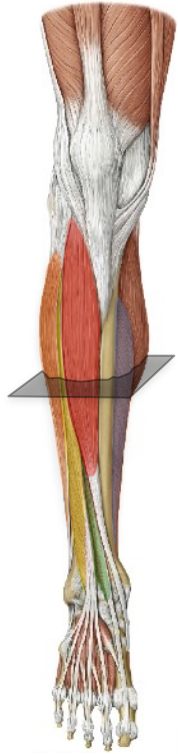
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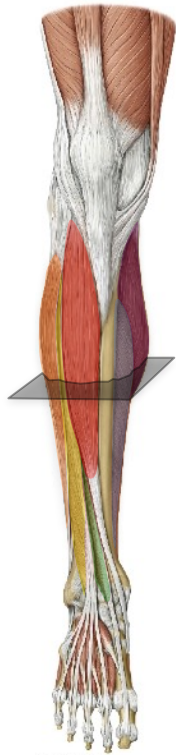
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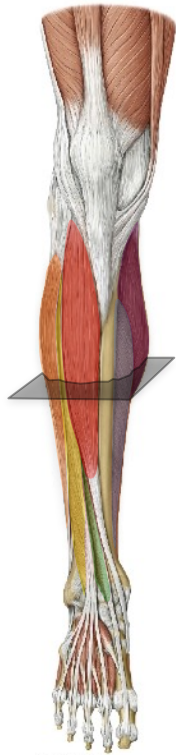
Cross Section of the Lower Leg



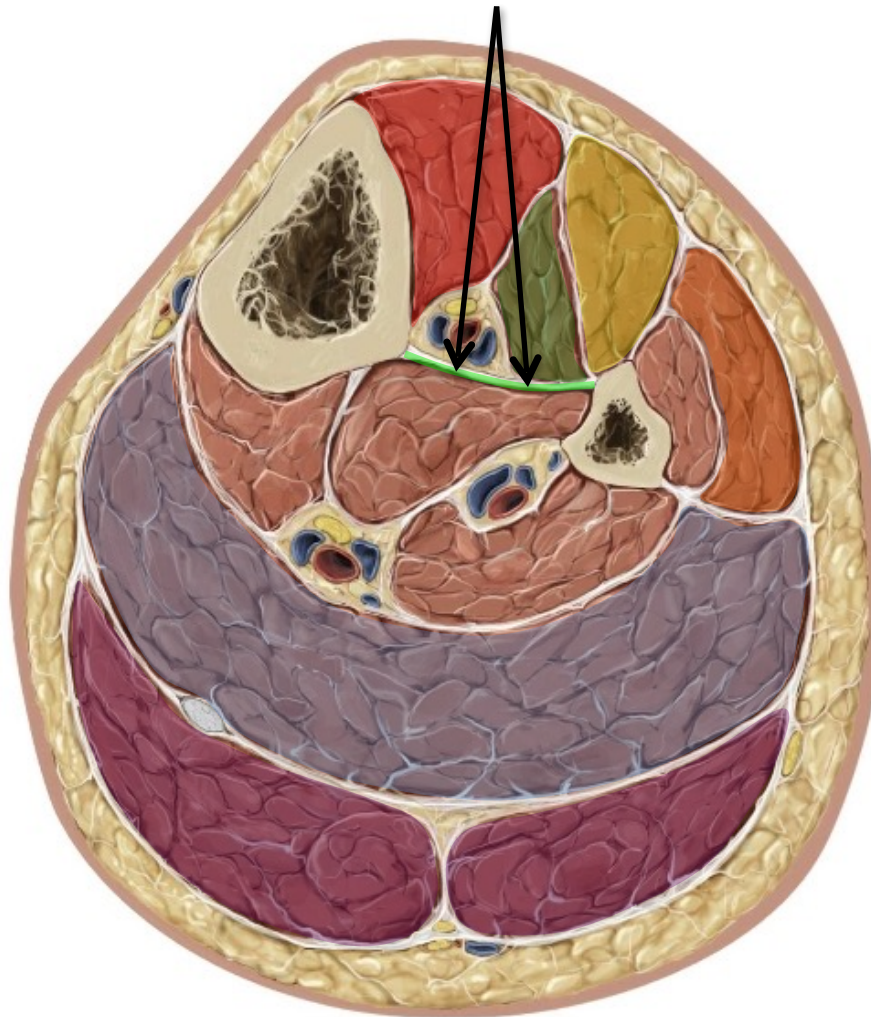
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Cross Section of the Lower Leg



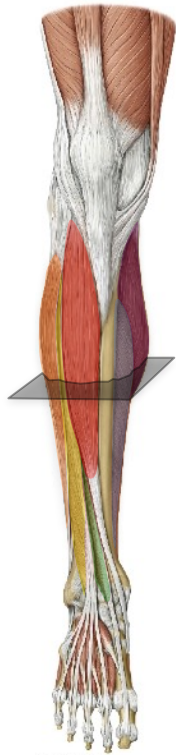
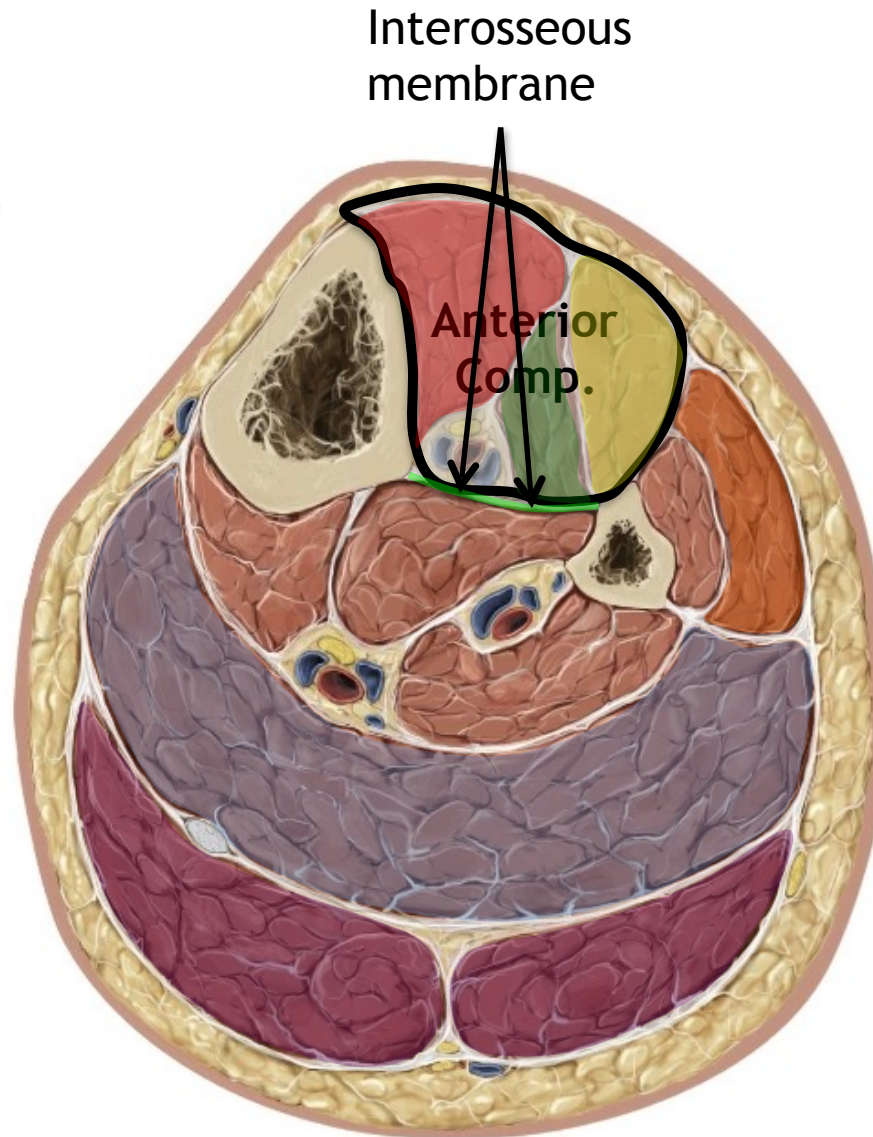
Interosseous
membrane



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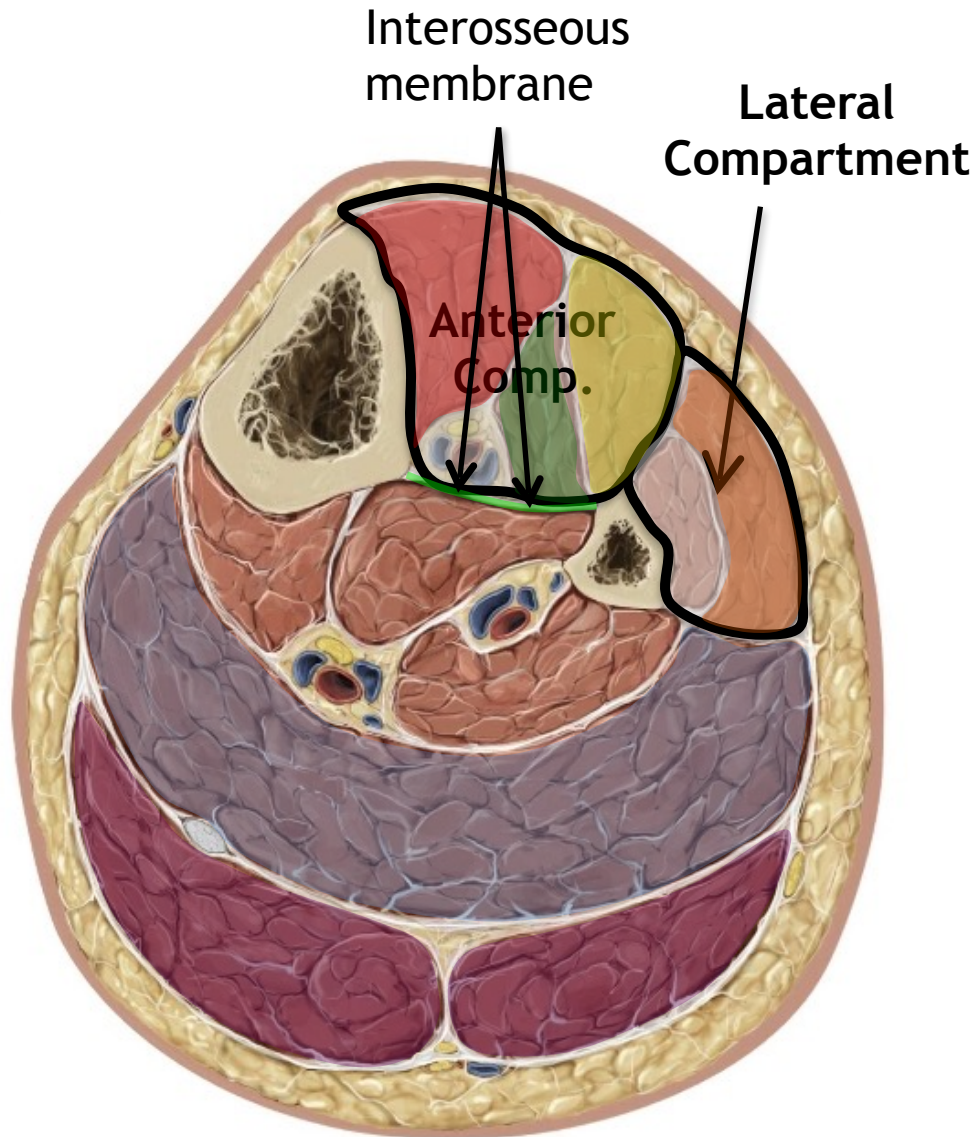
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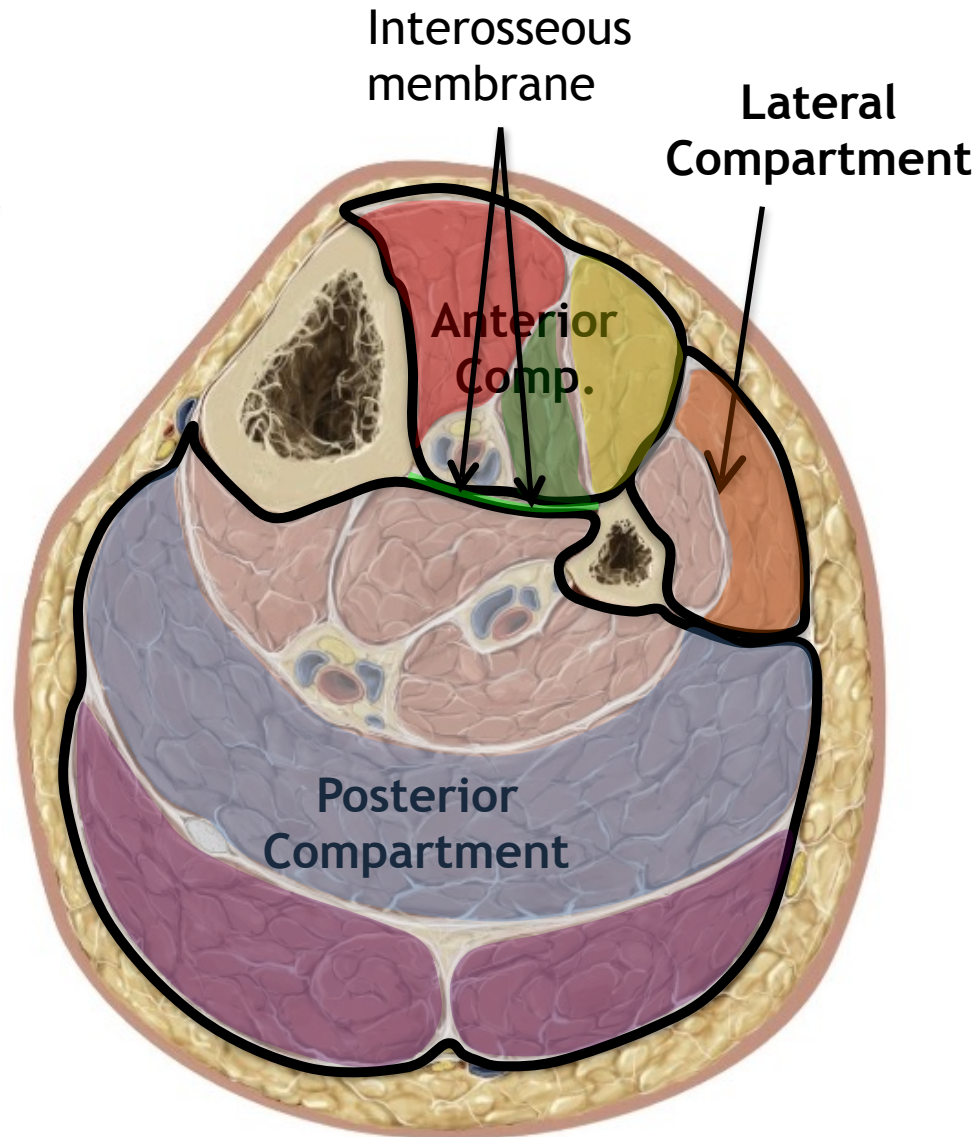
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Muscles of the Lower Leg: Anterior

The four muscles of the anterior compartment are the **tibialis anterior**, **extensor hallucis longus**, **extensor digitorum longus** and **fibularis tertius**. As suggested by the names, the muscles of the anterior compartment are extensors that *extend* the digits of the toes and act on the ankle to *dorsiflex* the foot as a whole.

These muscles originate on the tibia and fibula of the lower leg and insert on the bones of the foot. Due to this setup, there are two band-like thickenings of fascia, referred to as retinacula, that restrain the muscles at the ankle in order to avoid bowstringing during dorsiflexion.



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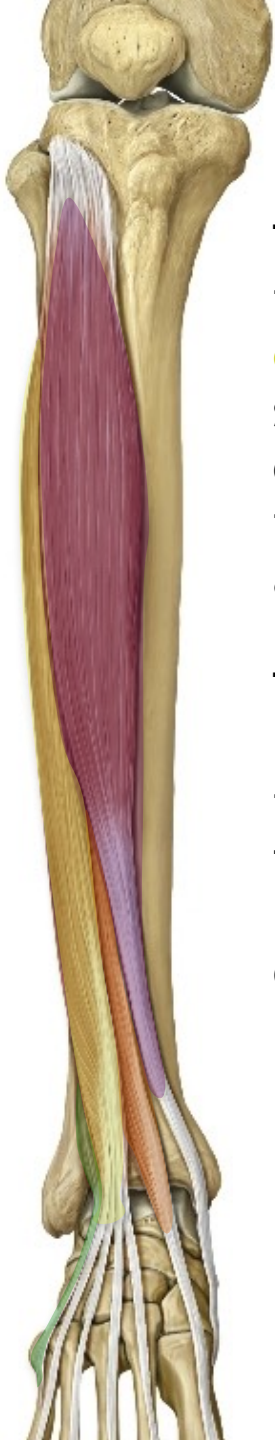
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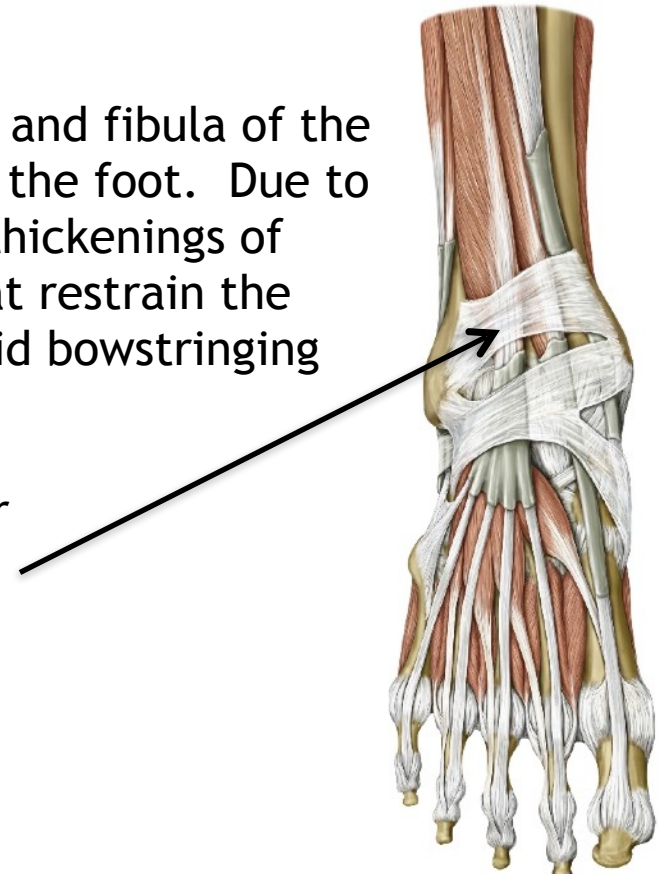


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Superior extensor
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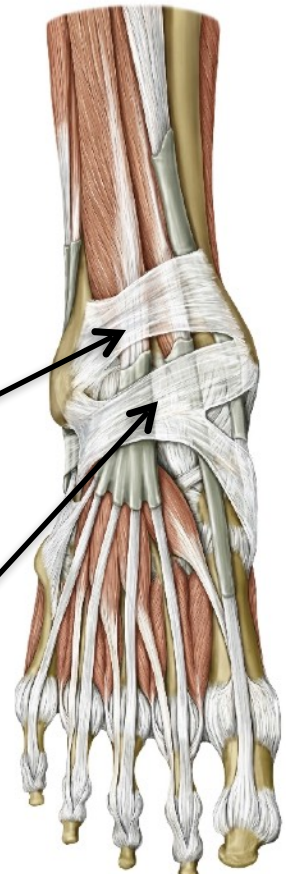
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Muscles of the Lower Leg: Lateral

The lateral compartment contains the **fibularis longis** and **fibularis brevis** muscles.

The fibularis muscles are responsible for *eversion of the foot at the ankle*. Essentially they serve as major balancing tools while walking or standing in place. For example, if one is standing on one foot, and the body feels as though the center of gravity is shifting medially, the fibularis muscles contract, pressing the medial portion of your foot downward and pulling the center of gravity back to the center of the limb.

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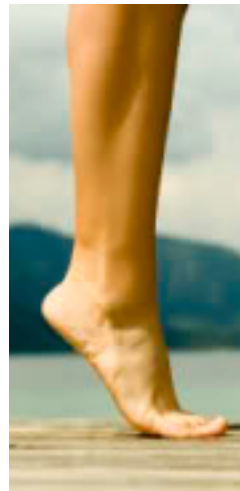
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Muscles of the Lower Leg: Posterior [superficial]

The superficial part of the posterior compartment of the lower leg consists of the **gastrocnemius**, **soleus** and **plantaris**. The **gastrocnemius** and **soleus**, referred to together as the **triceps surae**, share a common tendon, the **Achilles' (calcaneal) tendon**. This tendon is the strongest in our body.

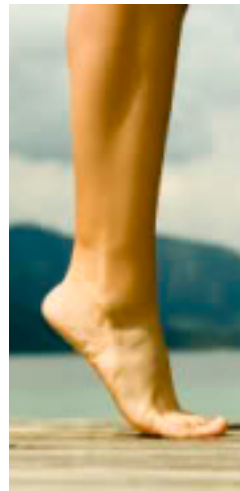
Contraction of the posterior compartment results in *plantarflexion of the foot*. It is this action that “pushes” a person forward while walking or up when jumping. Most of the force is exerted on the ball of the foot.



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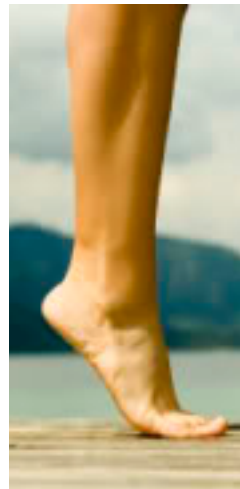
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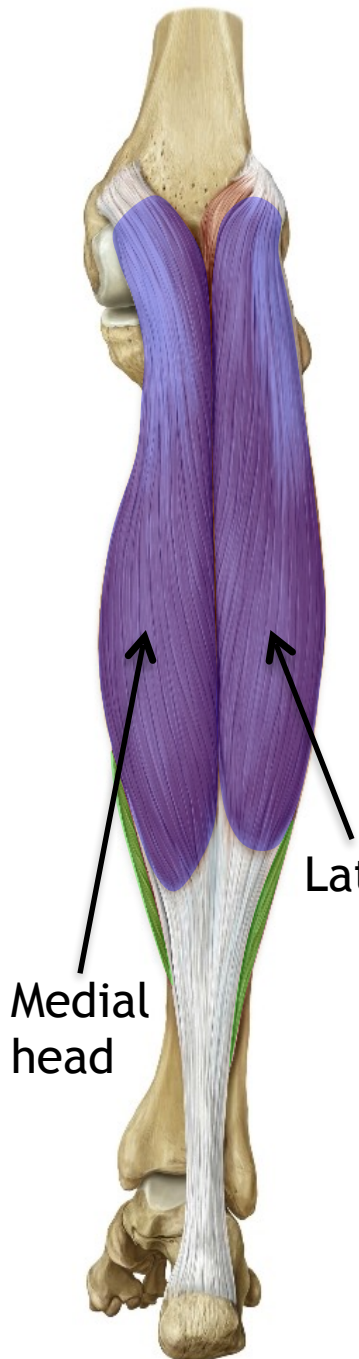
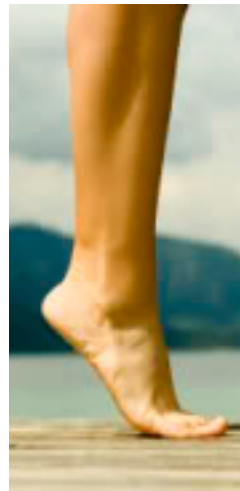
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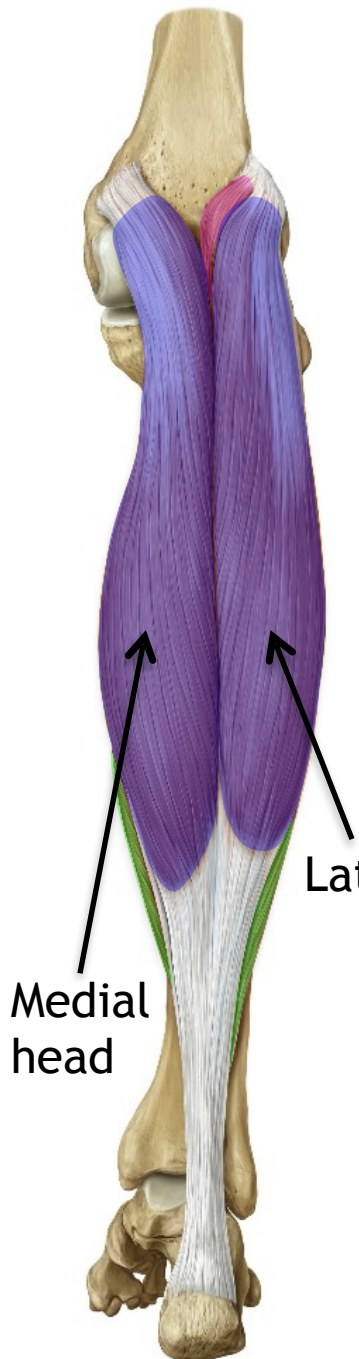
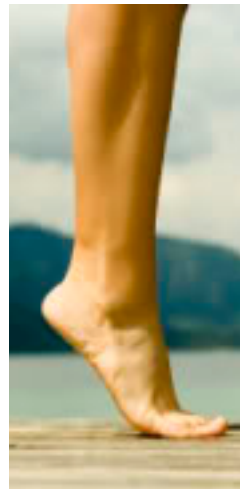
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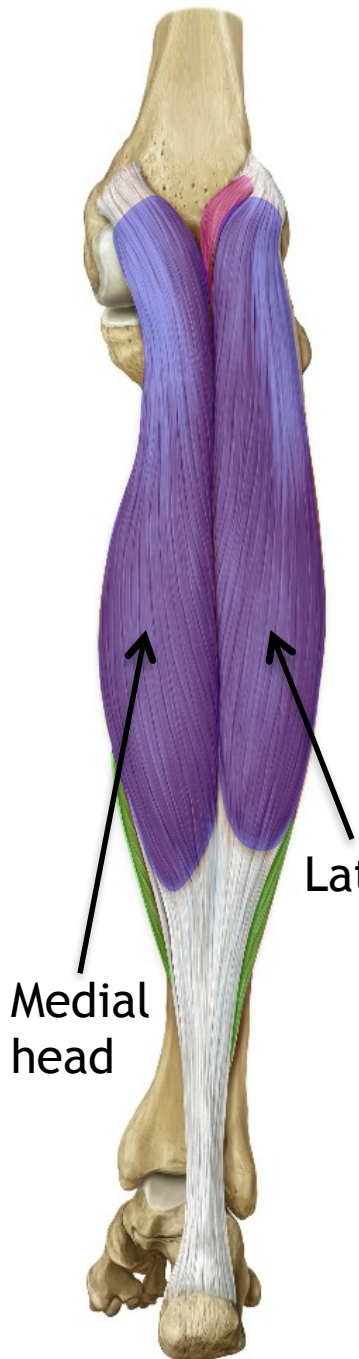
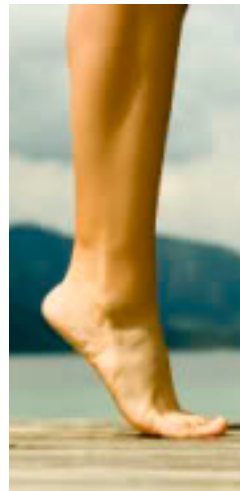
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Achilles' tendon



Muscles of the Lower Leg: Posterior [deep]

The **tibialis posterior**, **flexor digitorum longus**, **flexor hallucis longus** and **popliteus** muscles make up the deep portion of the posterior compartment of the lower leg. The **popliteus** acts as a *stabilizer for the knee* while the other three muscles assist the superficial posterior compartment with *plantarflexion* and *flexion* of the toes.

Due to the arrangement of the deep muscle tendons to the foot in comparison to the Achilles' tendon of the superficial muscles, the deep muscles contribute a very small amount to the overall force applied when flexion occurs.

The next slide will identify the order in which these muscles pass through medial malleolus.



* “Longus” muscle tendons usually attach *at the tip* of a joint while their “brevis” counterparts usually attach more *at the joint*.



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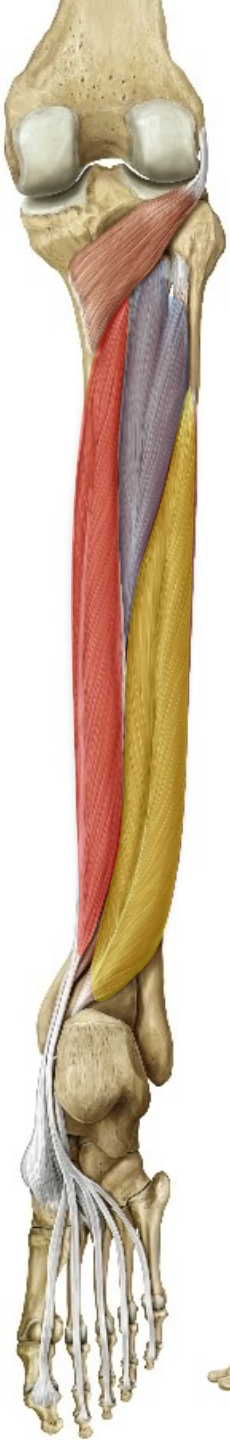
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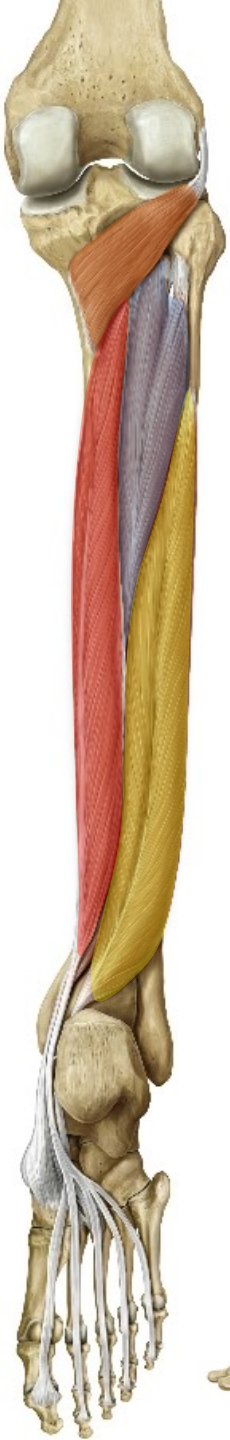
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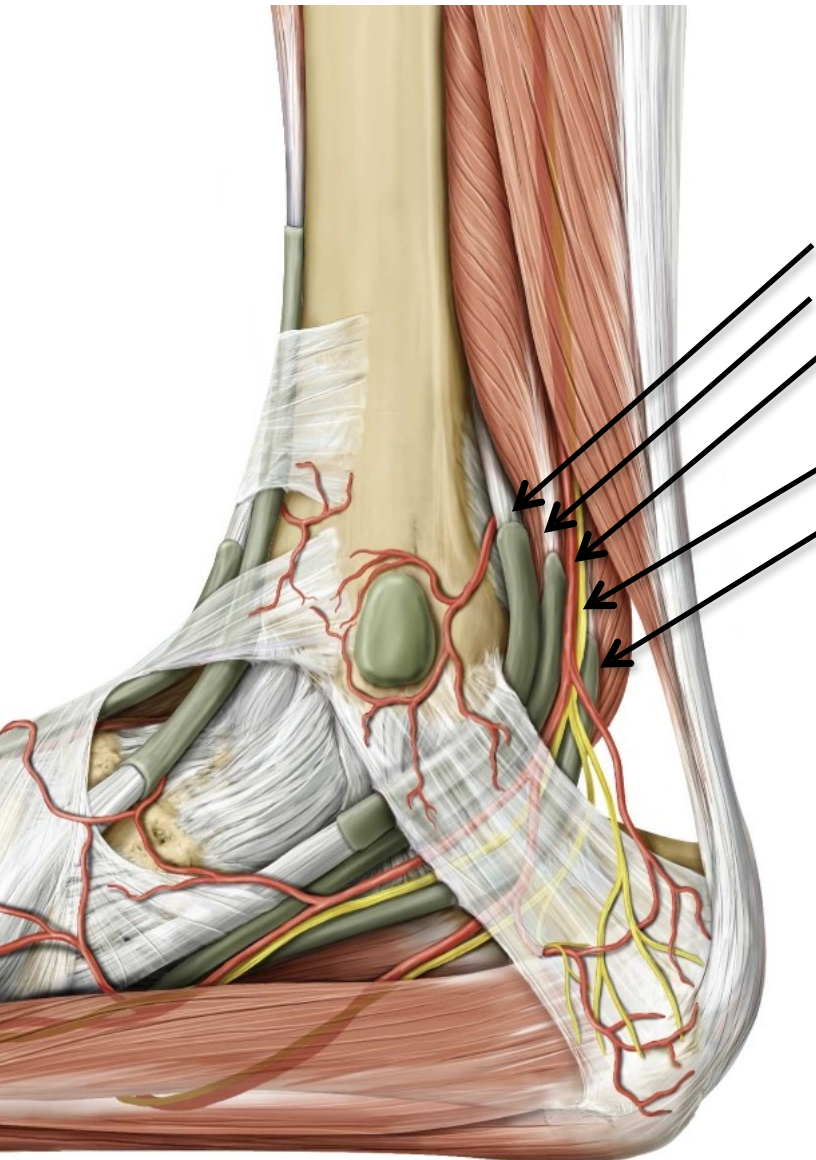


Muscles of the Lower Leg		
Muscle	Proximal Attachment	Distal Attachment
Fibularis longus	Head of fibula and proximal surface	Medial cuneiform, 1 st metatarsal
Fibularis brevis	Distal half of fibula, intermuscular septa	5 th metatarsal
Tibialis anterior	Upper two thirds of tibia	Medial cuneiform, 1 st metatarsal
Extensor hallucis longus	Middle third of fibula	1 st toe
Extensor digitorum longus	Head and anterior border of fibula and lateral condyle of tibia	2 nd to 5 th toes
Extensor digitorum longus	Distal fibula	5 th metatarsal

Muscles of the Lower Leg (cont.)		
Muscle	Proximal Attachment	Distal Attachment
Gastronemius	Medial and lateral epicondyles of the femur	Calcaneal tuberosity
Soleus	Head and neck of fibula and soleal line of tibia	
Plantaris	Lateral epicondyle of fibula	
Tibialis posterior	Interosseus membrane	Navicular tuberosity, cuneiforms, 2 nd to 4 th metatarsals
Flexor digitorum longus	Middle third of tibia	2 nd to 5 th distal phalanges
Flexor hallucis longus	Distal fibula, adjacent interosseous	1 st distal phalanx
Popliteus	Lateral femoral condyle, posterior horn of lateral meniscus	Posterior tibial surface

Muscles of the Lower Leg: Tarsal Tunnel

In the order you come upon them....
Tom, Dick, And Very Nervous Harry

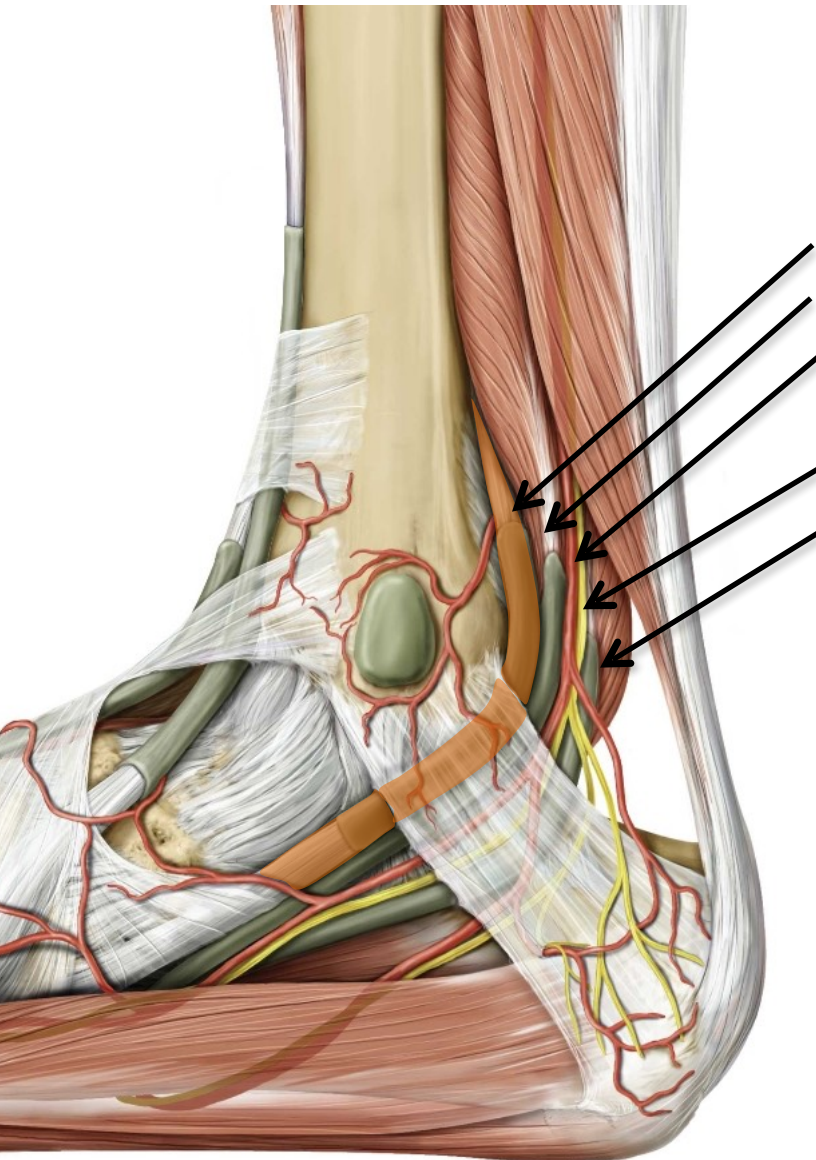


Tibialis posterior muscle
flexor Digitorum longus muscle
posterior tibial Artery
posterior tibial Vein (not shown)
tibial Nerve
flexor Hallucis longus muscle



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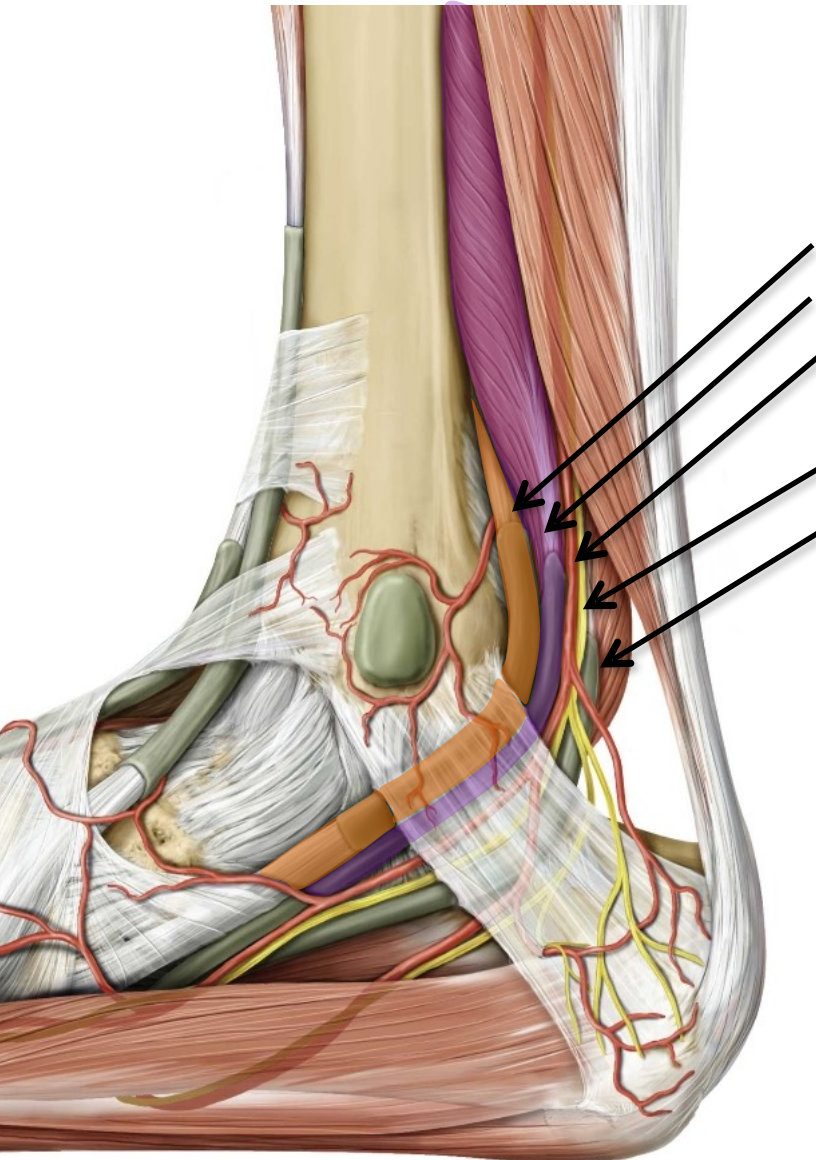


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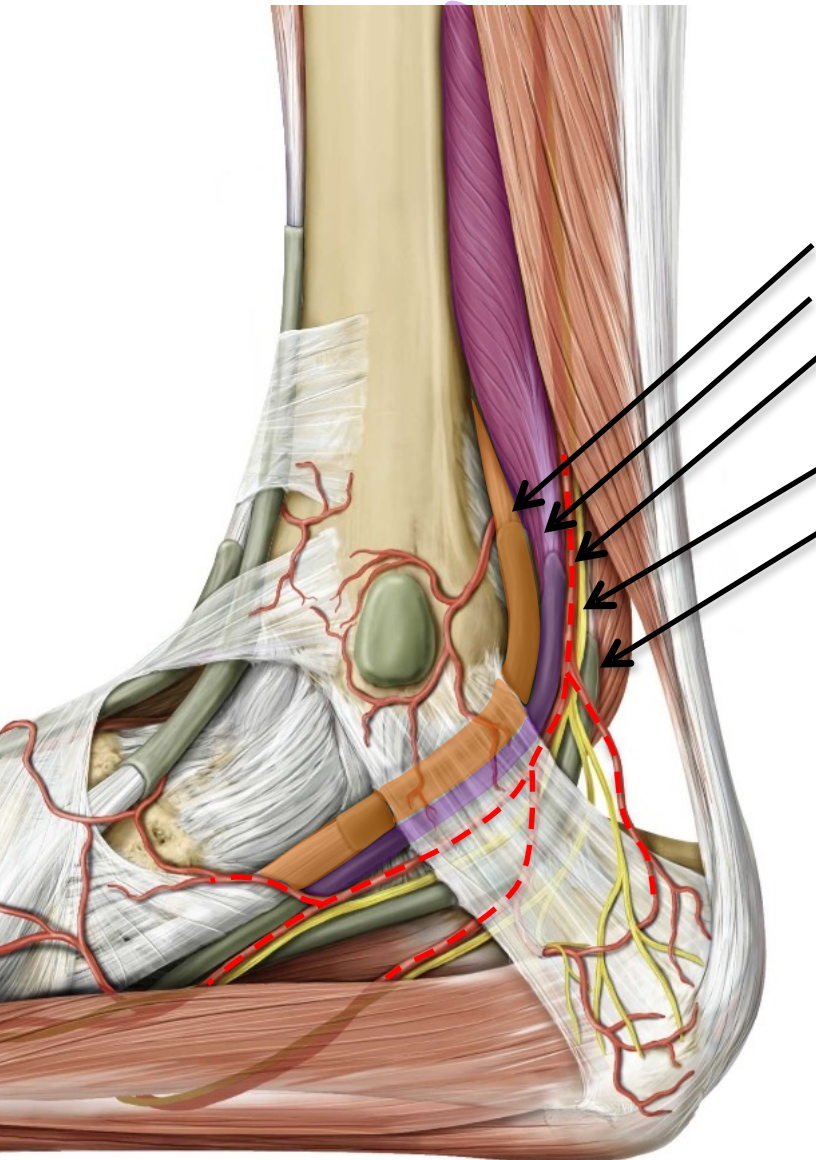


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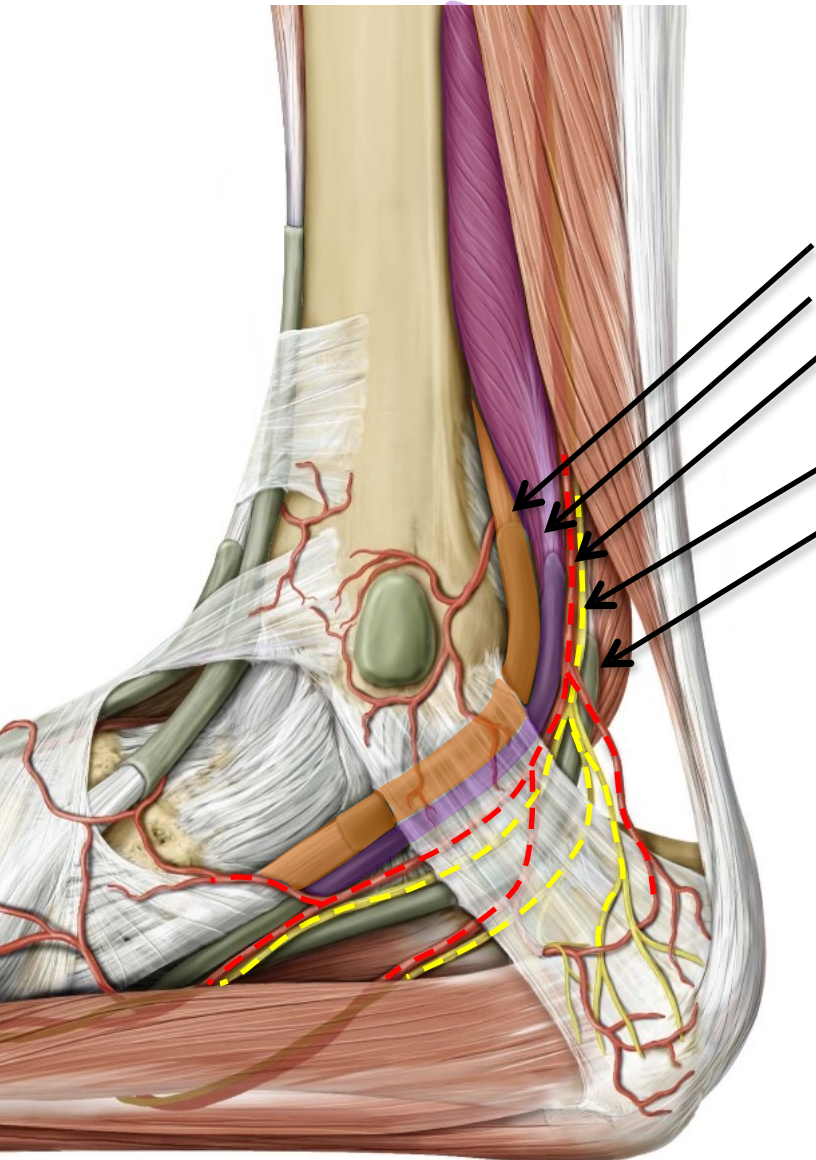


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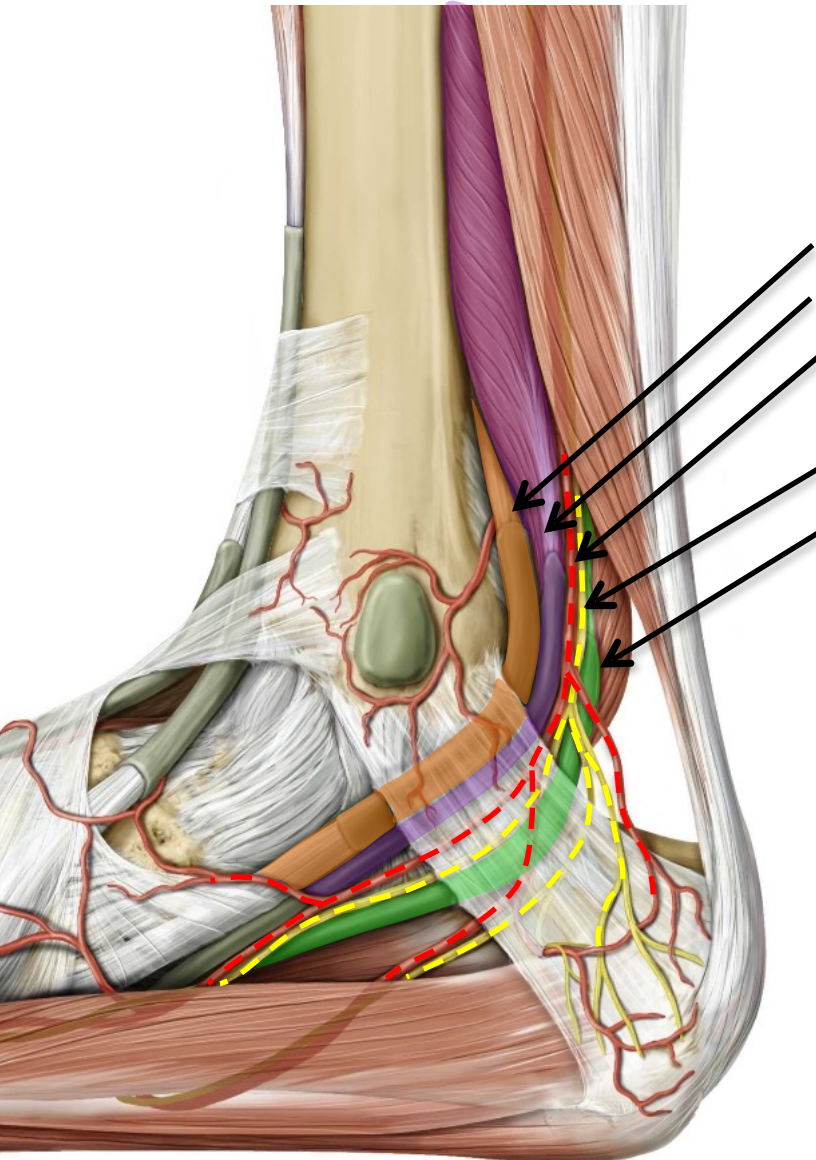
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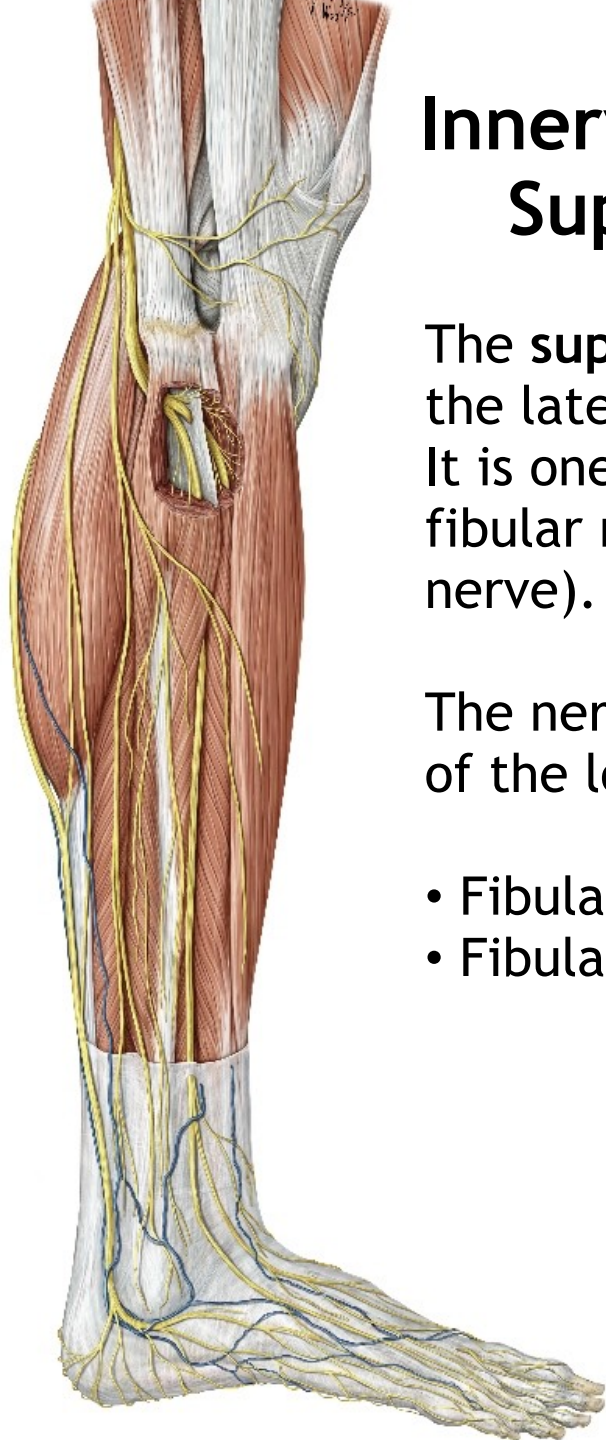


Innervation of the Lower Leg: Superficial Fibular Nerve

The **superficial fibular nerve** innervates the lateral compartment of the lower leg. It is one of two branches of the common fibular nerve (a branch of the sciatic nerve).

The nerve innervates the following muscles of the lower leg:

- Fibularis longus
- Fibularis brevis

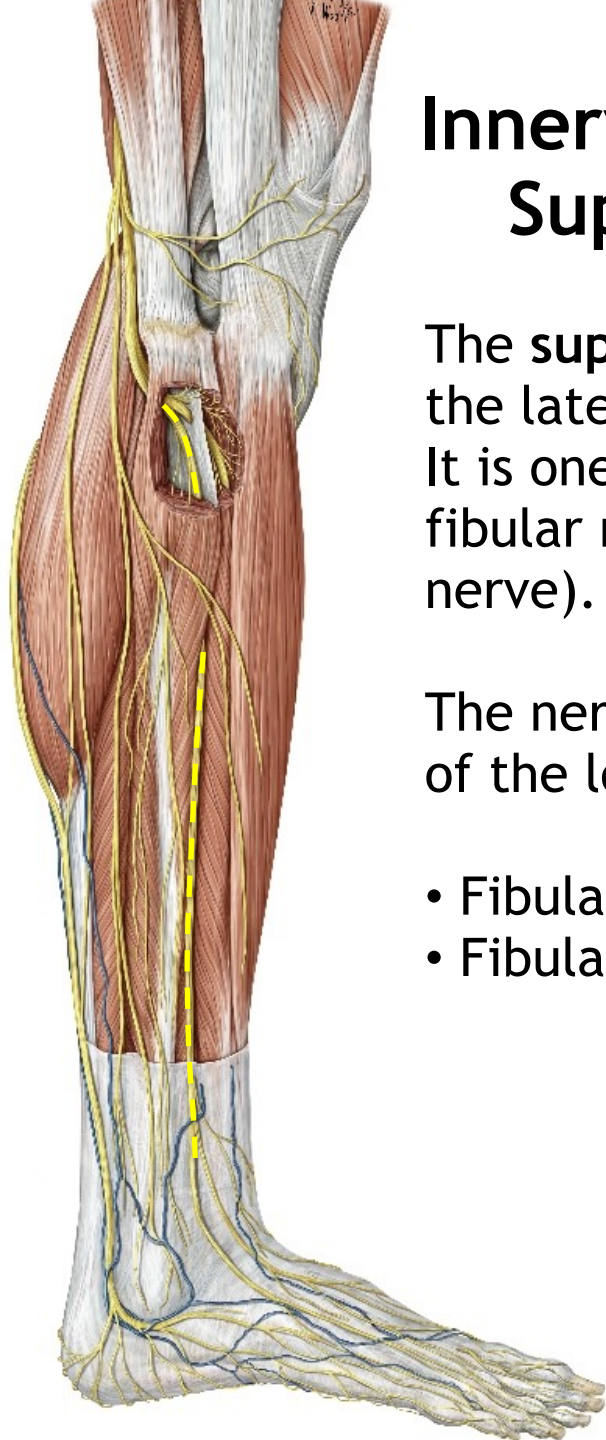


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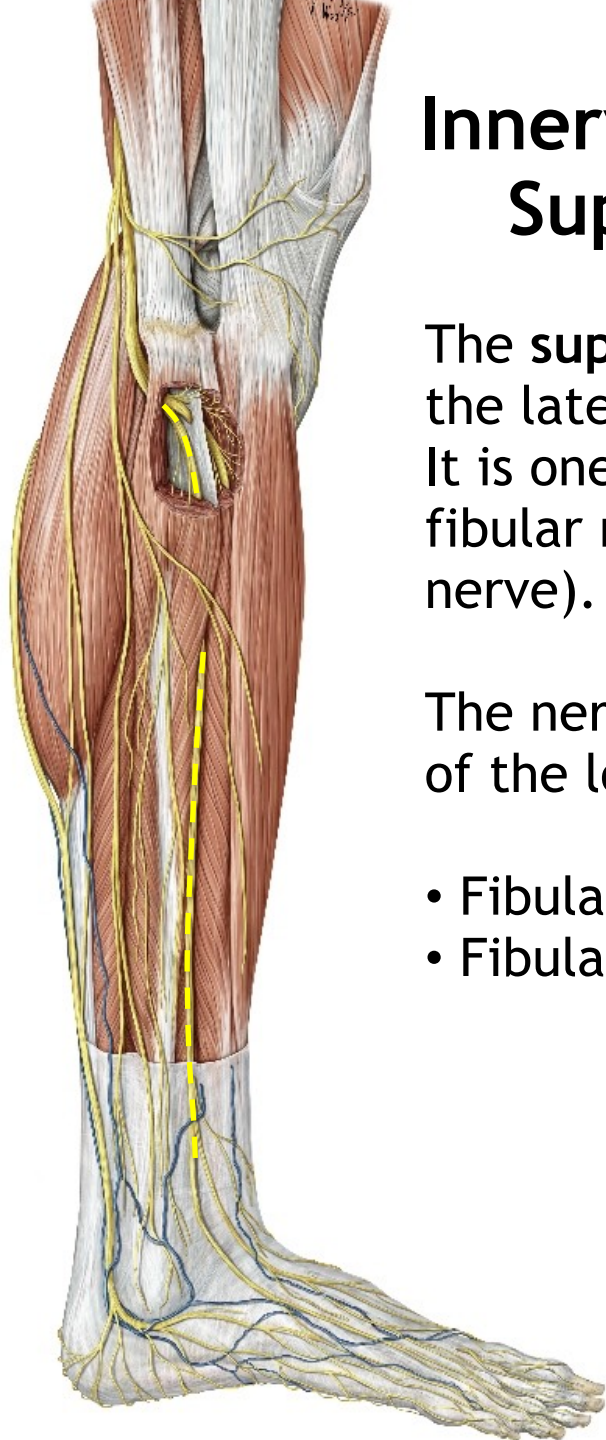


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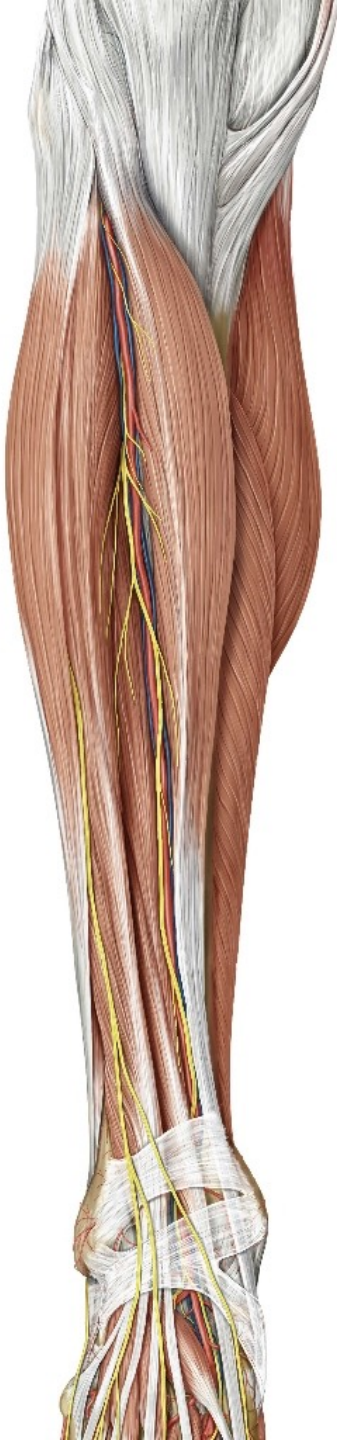
Innervation of the Lower Leg: Deep Fibular Nerve

The **deep fibular nerve** innervates the anterior compartment of the lower leg. It along with the superficial fibular nerve, make up the two branches of the common fibular nerve.

The nerve innervates the following muscles of the lower leg:

- Tibialis anterior
- Extensor hallucis longus
- Extensor digitorum longus
- Fibularis tertius

Injury to this nerve would result in footdrop (disability dorsiflex/clear the foot while walking).



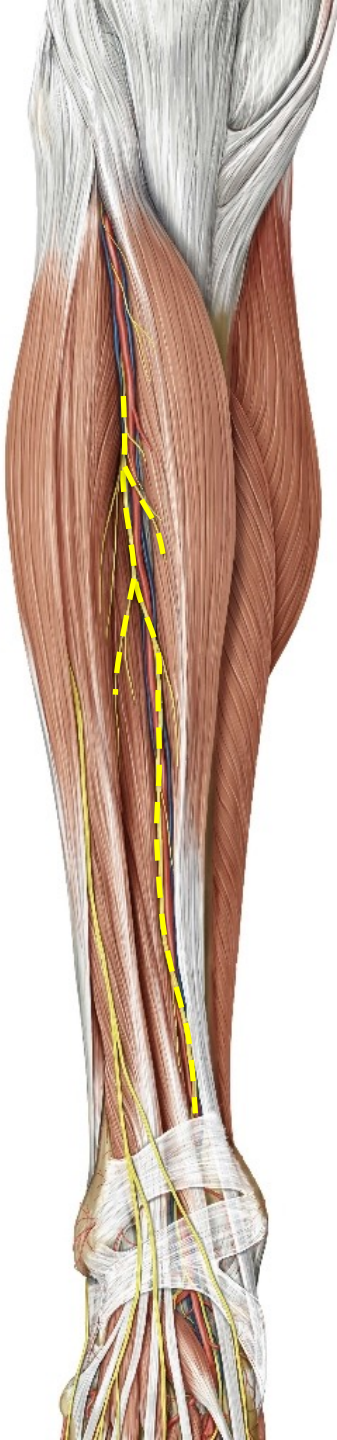
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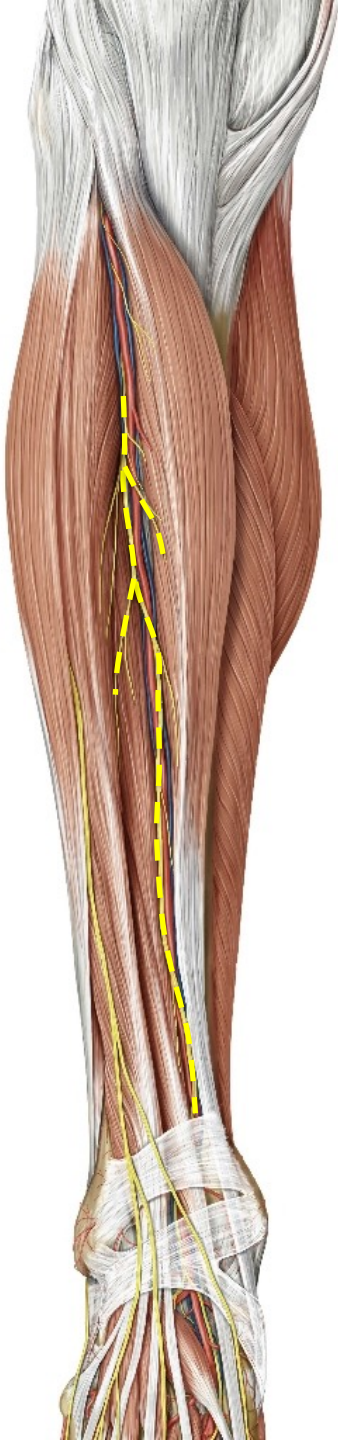
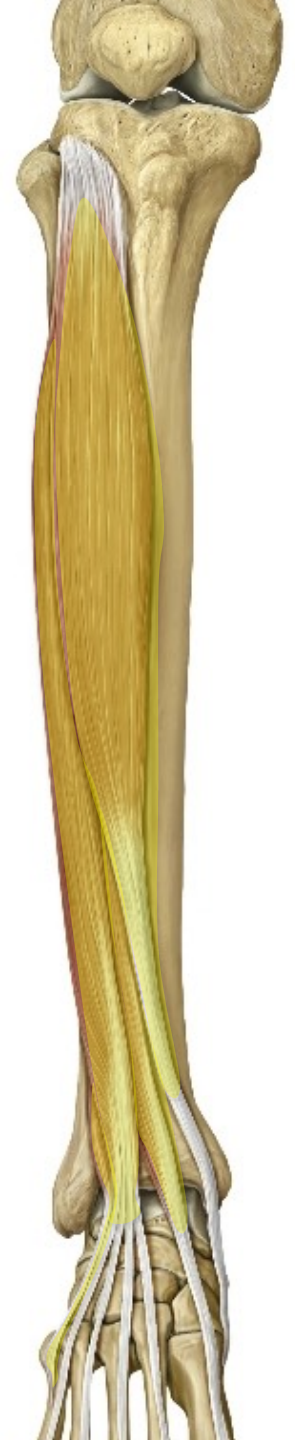
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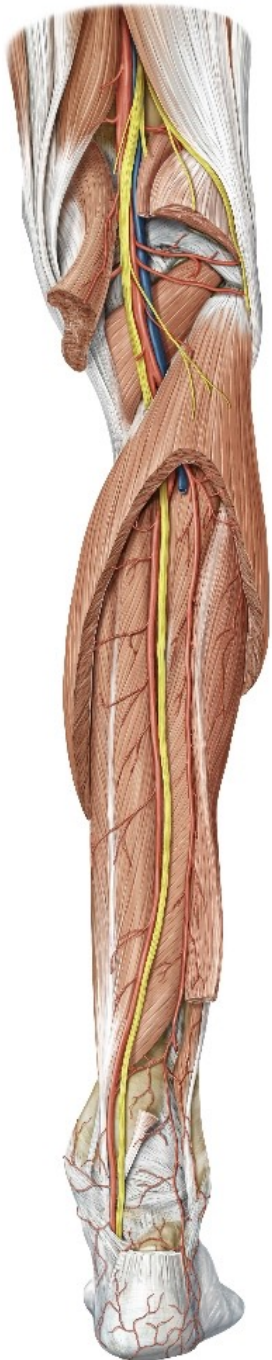
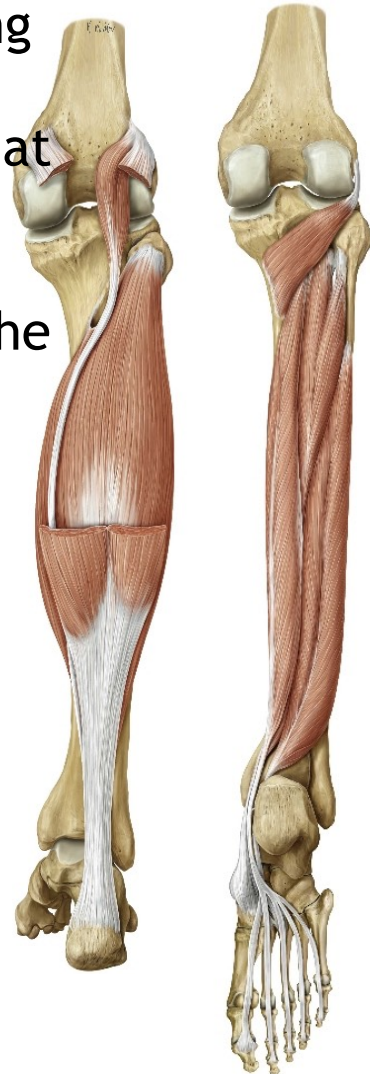


Innervation of the Lower Leg: Tibial Nerve

Along with innervating 4 muscles of the posterior thigh, the **tibial nerve** is in charge of innervating the entire posterior compartment of the lower leg. It branches directly from the sciatic nerve at variable distances above the popliteal fossa.

The nerve innervates the following muscles of the lower leg:

- Triceps surae
 - Gastrocnemius
 - Soleus
- Plantaris
- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
- Popliteus

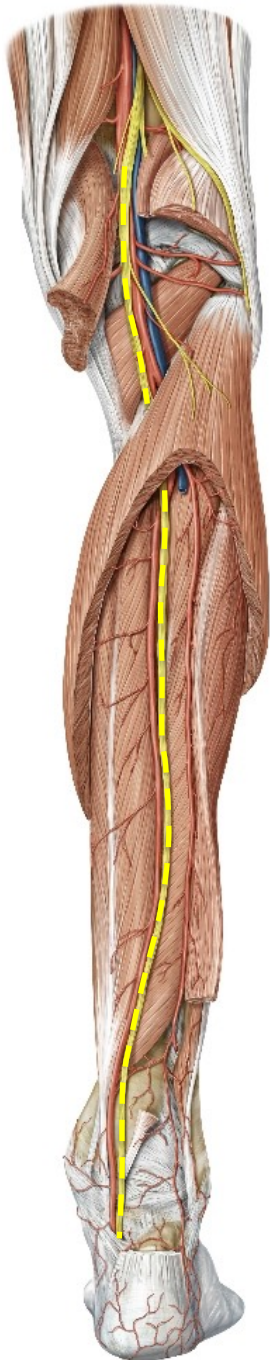
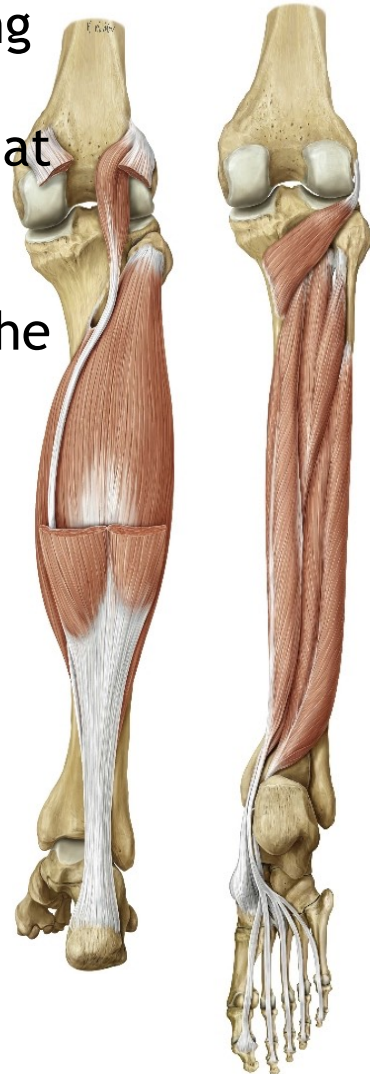


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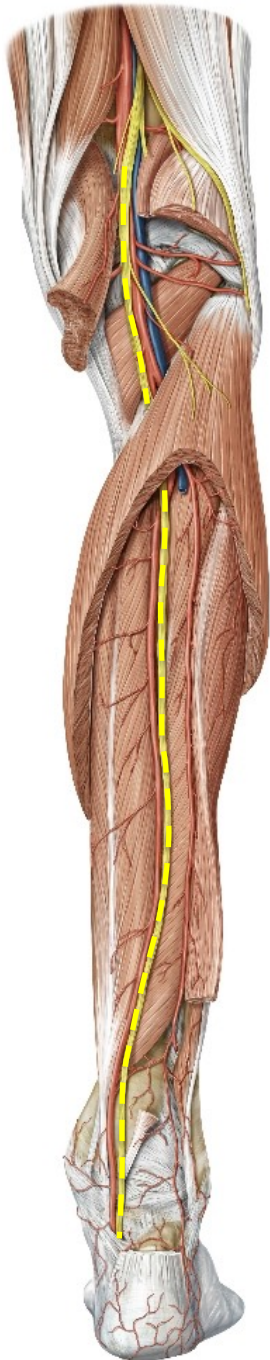
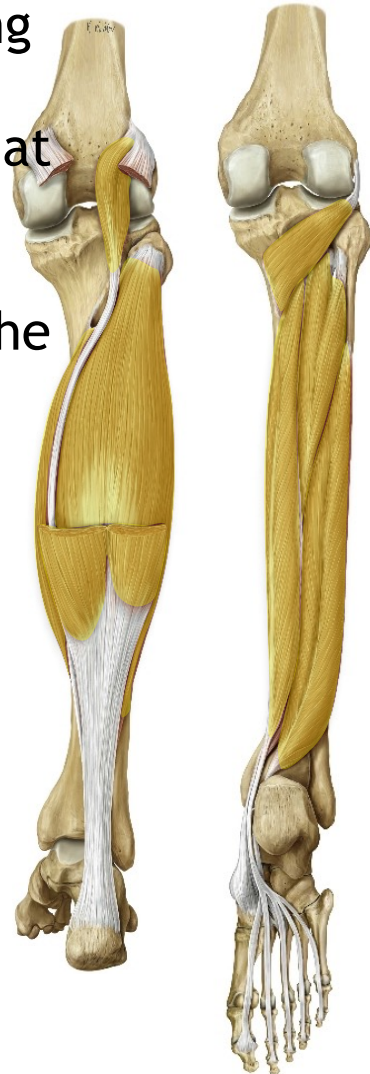


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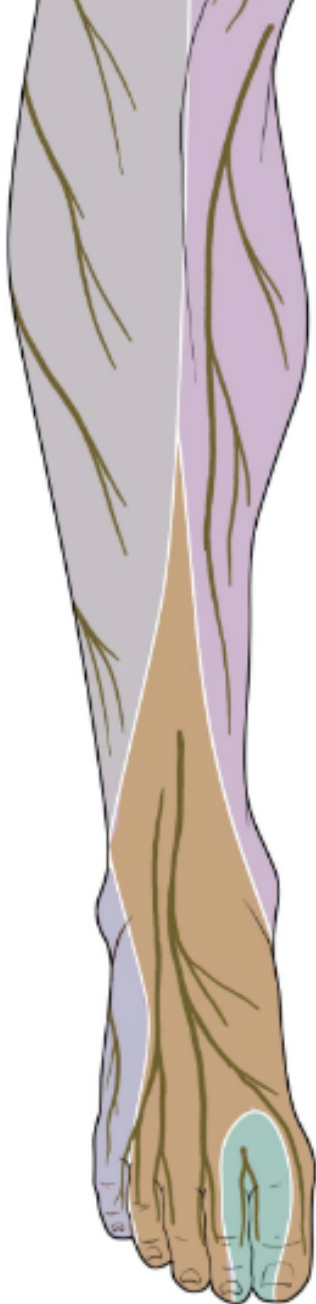


Innervation of the Lower Leg: Sensory Distribution

The **femoral** and **sciatic** nerves supply the lower leg with its sensory innervation.

The **femoral nerve** continues from the thigh and is responsible for sensory innervation of the medial, anterior portion of the lower leg. The lateral portion is supplied by the **common fibular** division of the **sciatic nerve**.

The **tibial** division of the **sciatic nerve** supplies the posterior region of the lower leg and continues downwards towards the plantar side of the foot.

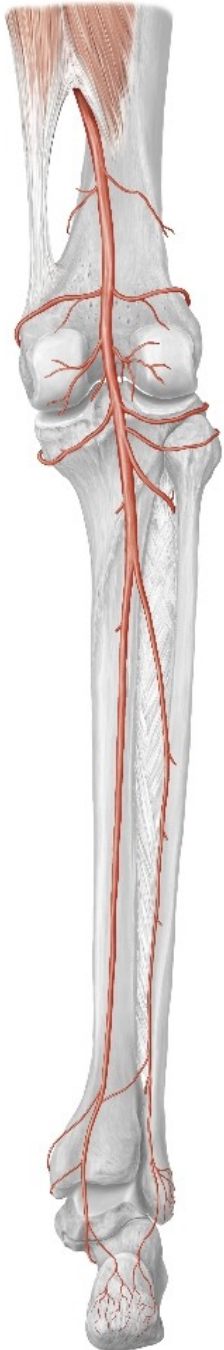


Arterial Supply of the Lower Leg

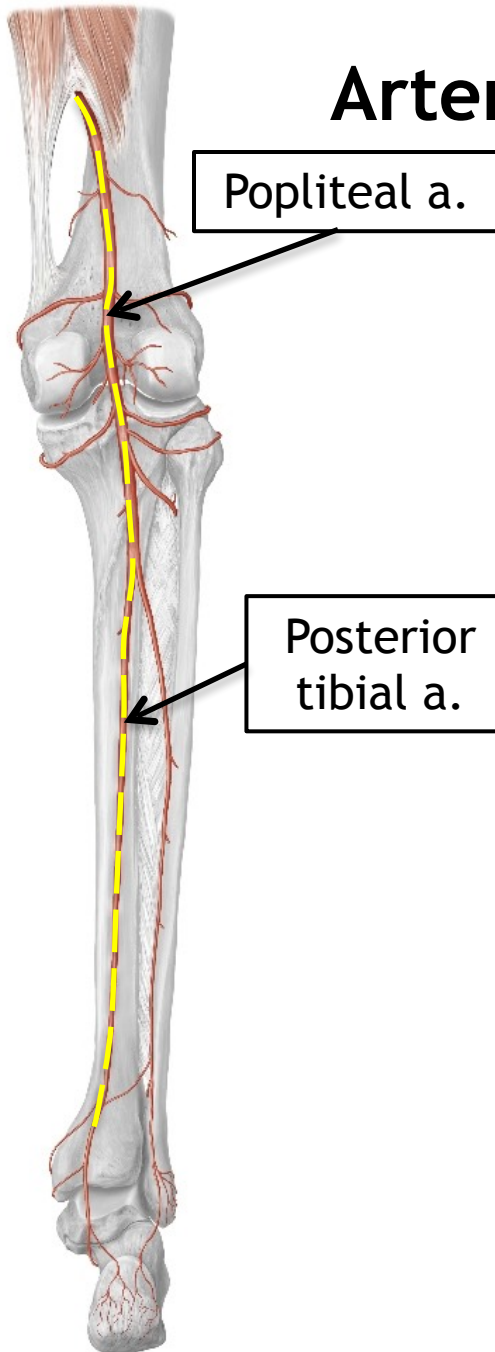
Blood is supplied to the lower leg from the three branches of the **popliteal artery**. These branches include the **posterior** and **anterior tibial arteries** and the **fibular artery**.

The **posterior tibial artery** and **fibular artery** are the main blood suppliers of the posterior and lateral compartments of the lower leg while the **anterior tibial artery** supplies the anterior compartment.

These arteries continue on into the foot where they terminally branch and provide nutrients.



Arterial Supply of the Lower Leg



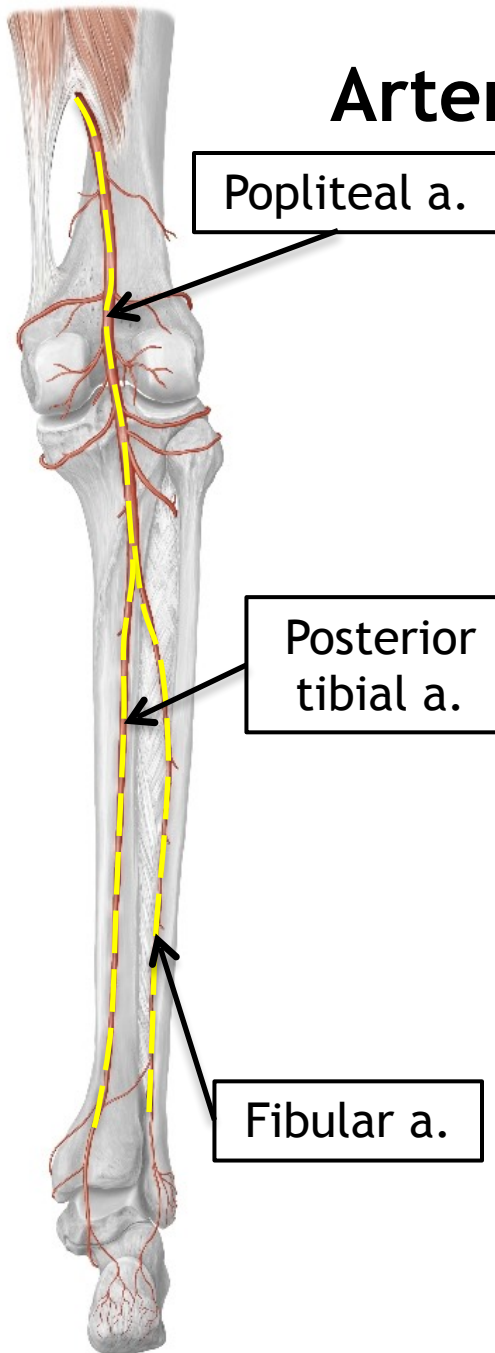
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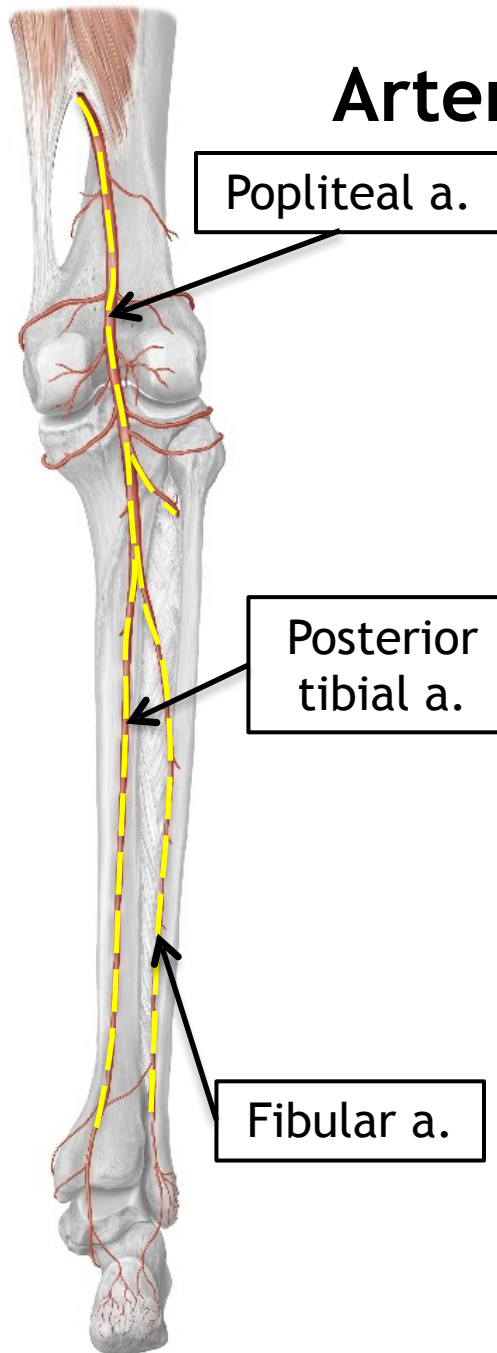
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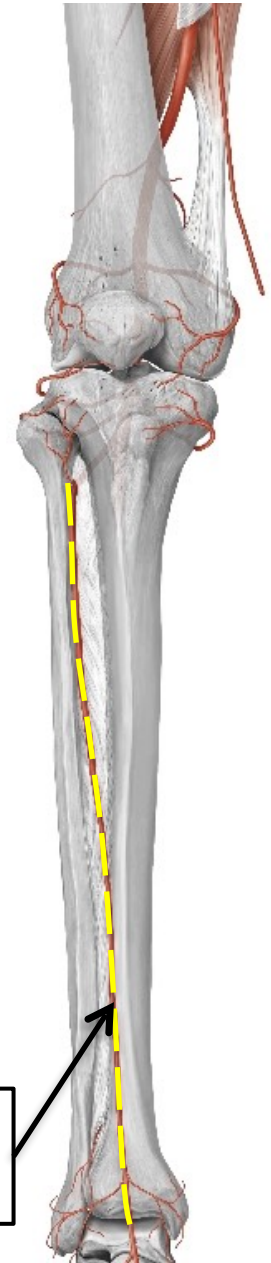


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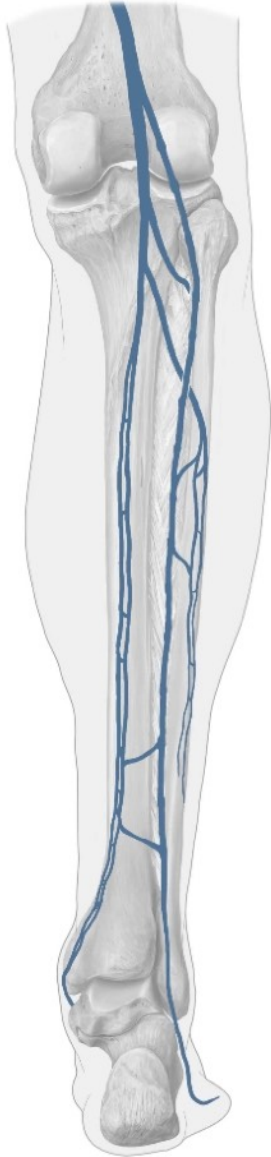
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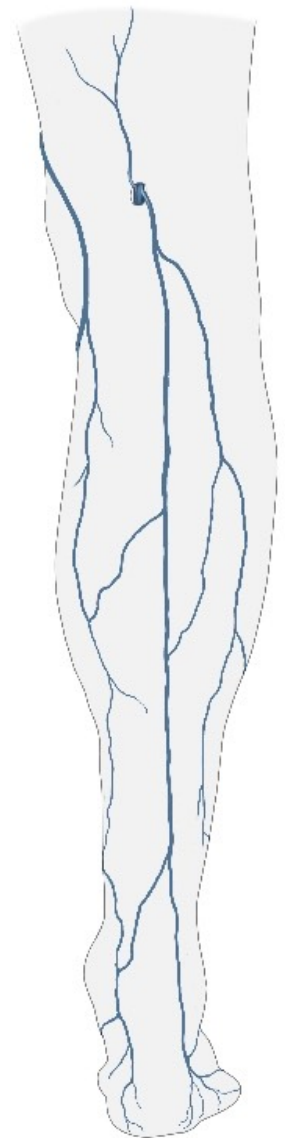
Venous Drainage of the Lower Leg

Deep



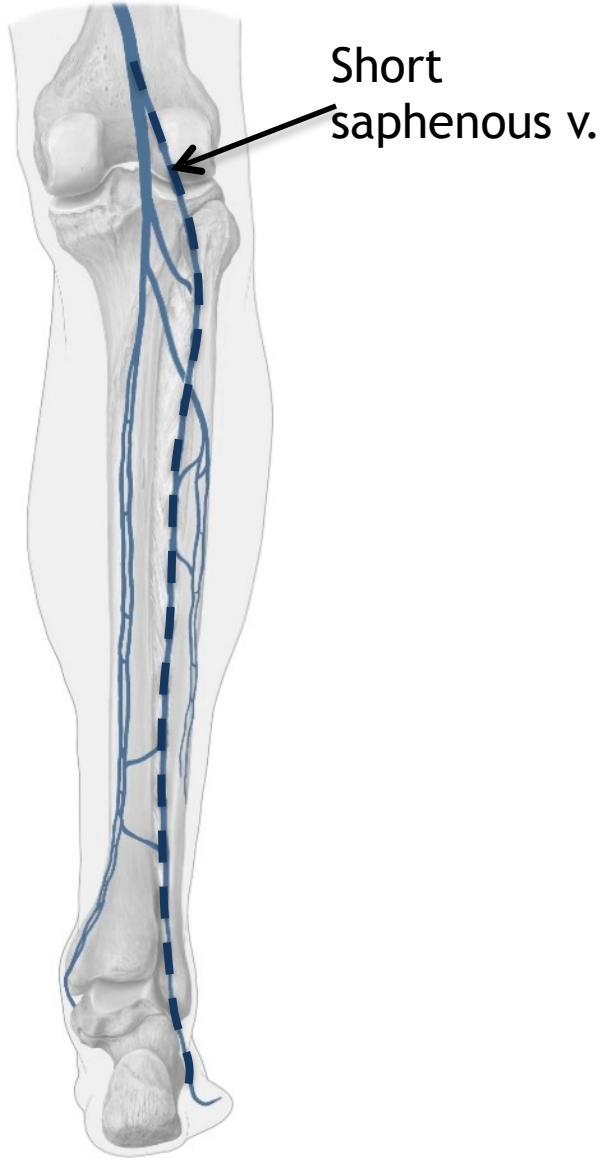
The veins of the lower leg converge into the **popliteal vein** of the knee. The two major veins are the **short saphenous** and the **posterior tibial veins**, both originating in the foot. The **fibular vein** is located on the lateral side of the lower leg and merges into the **posterior tibial vein**. The **anterior tibial vein** is located between the proximal portions of the **short saphenous** and the **posterior tibial veins**.

Superficial



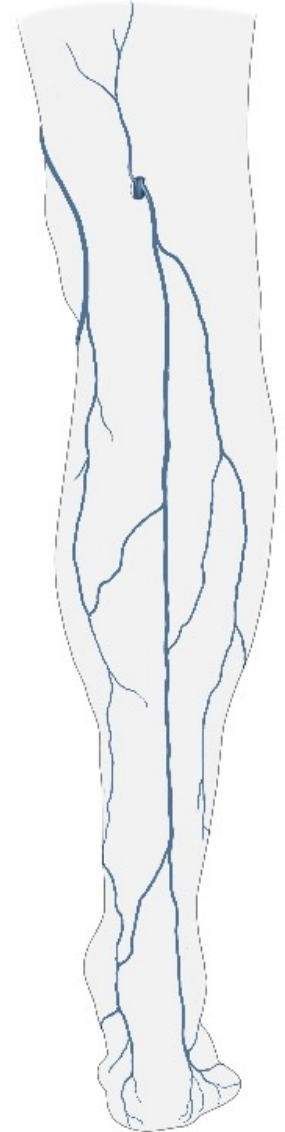
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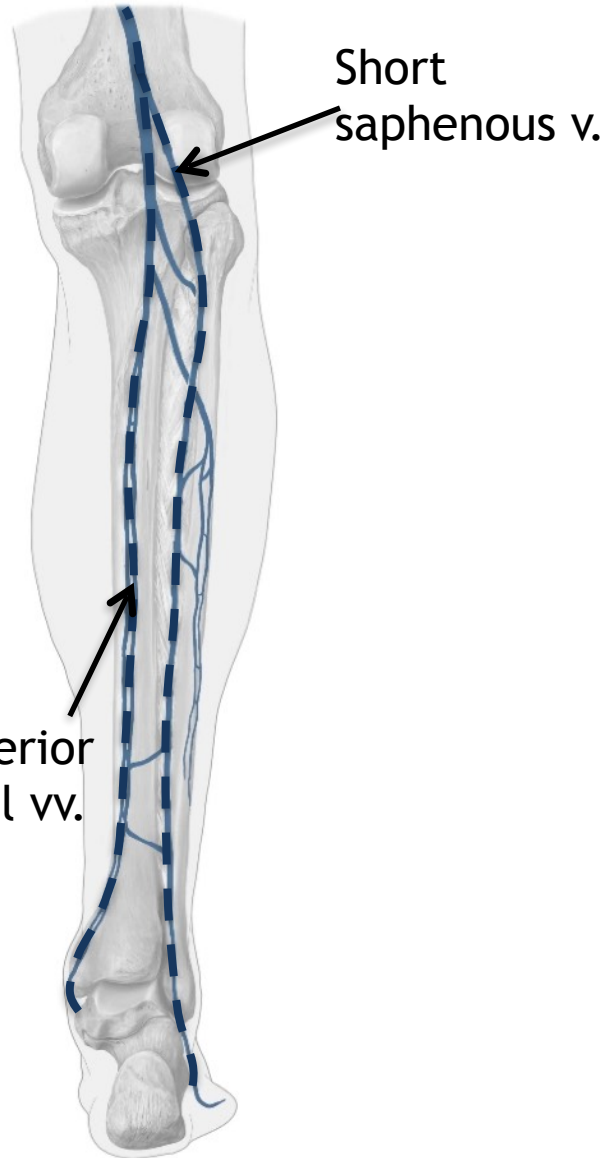
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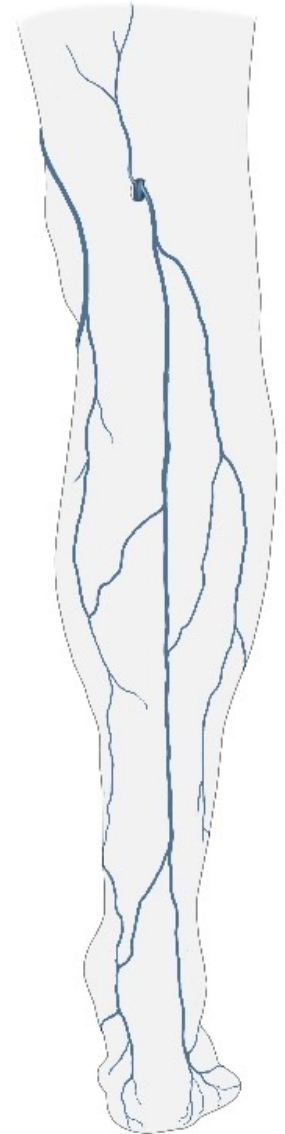


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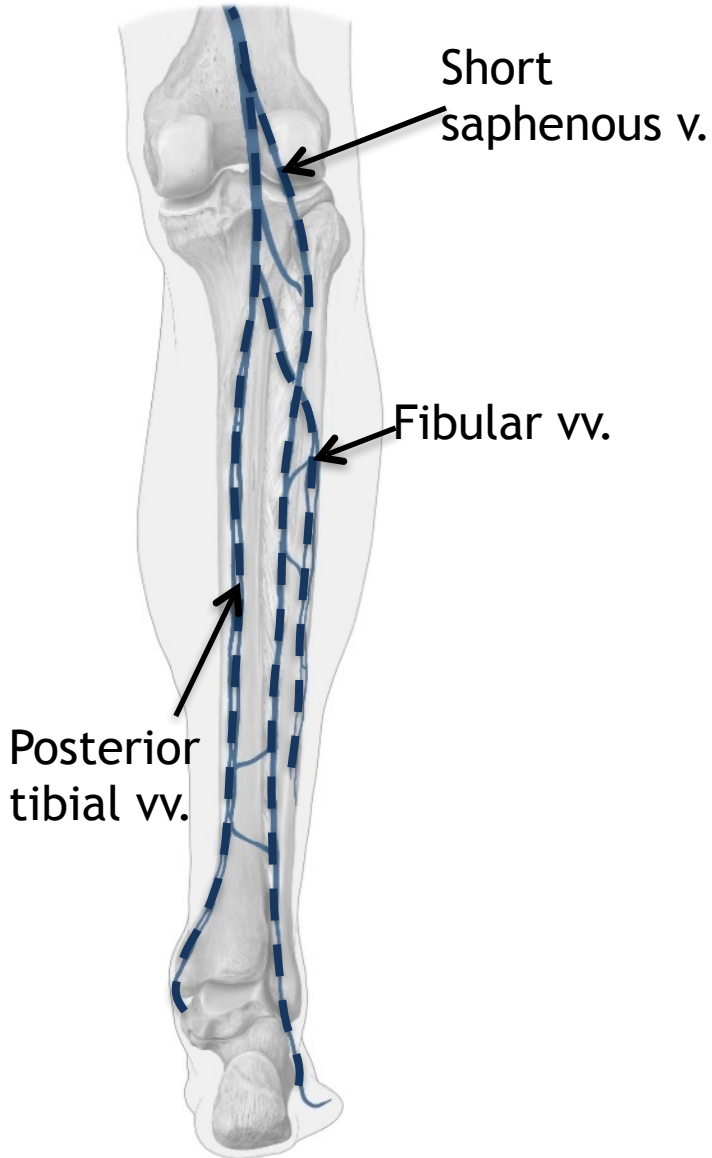
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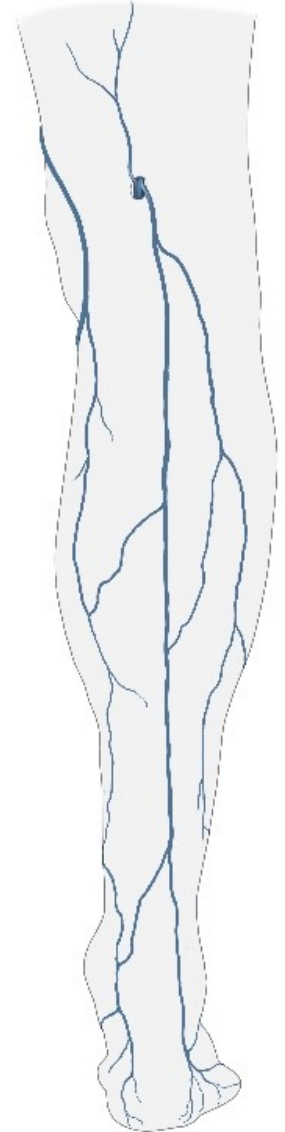
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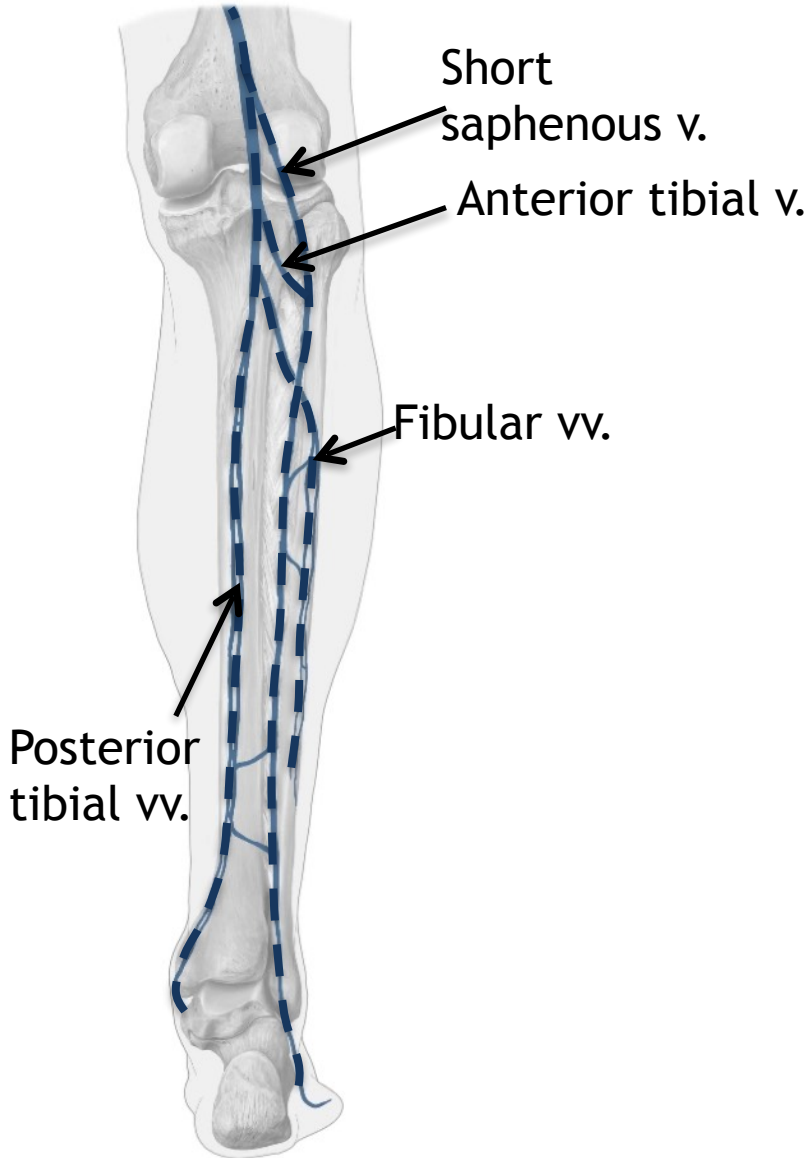
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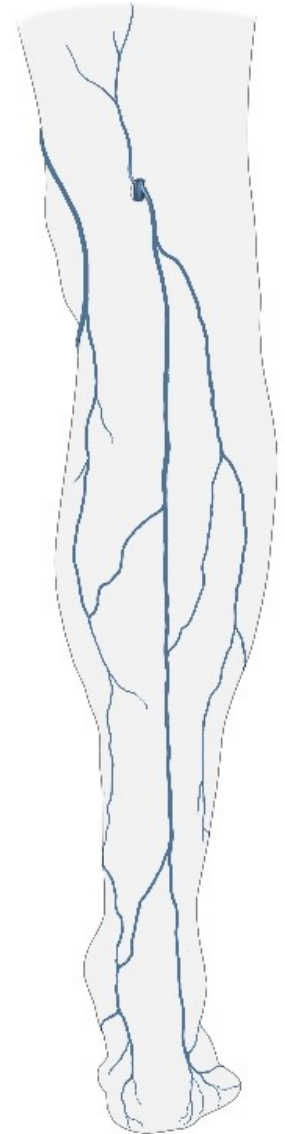
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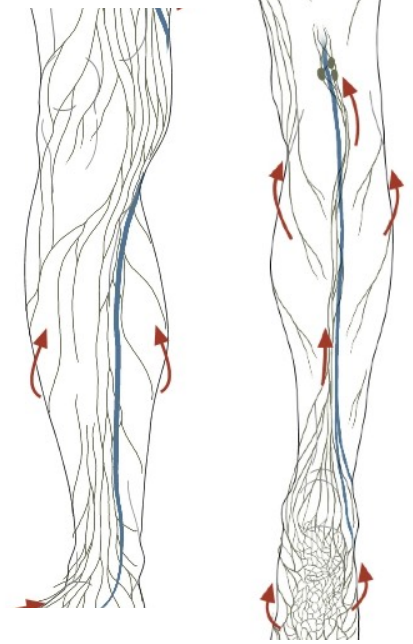
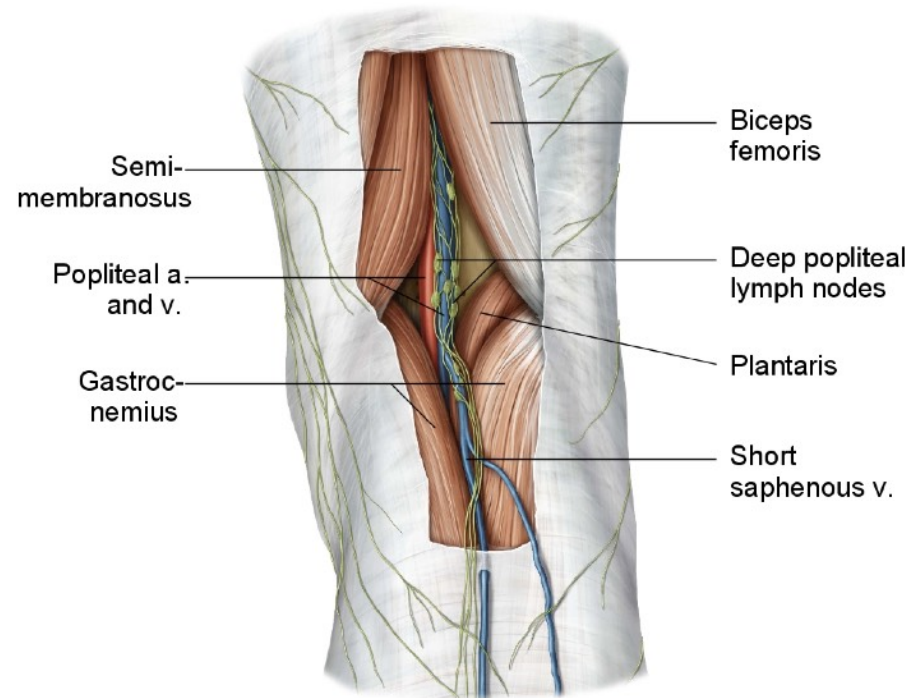
Superficial



Lymphatic Drainage of the Lower Leg

The red arrows on the right show the general flow of lymph in the lower leg. The direction of flow follows that of the veins.

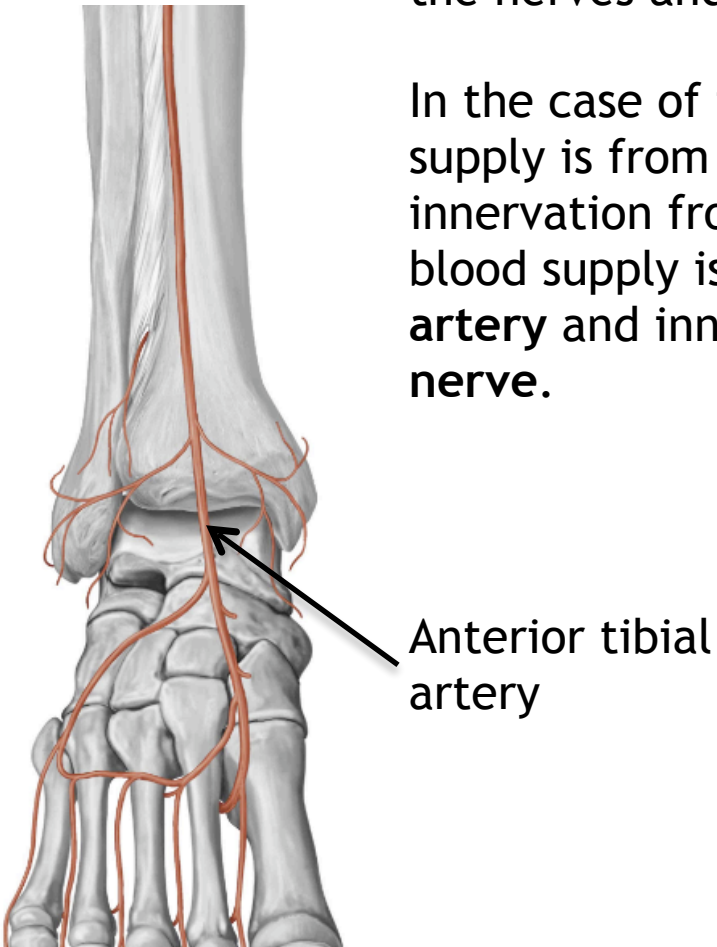
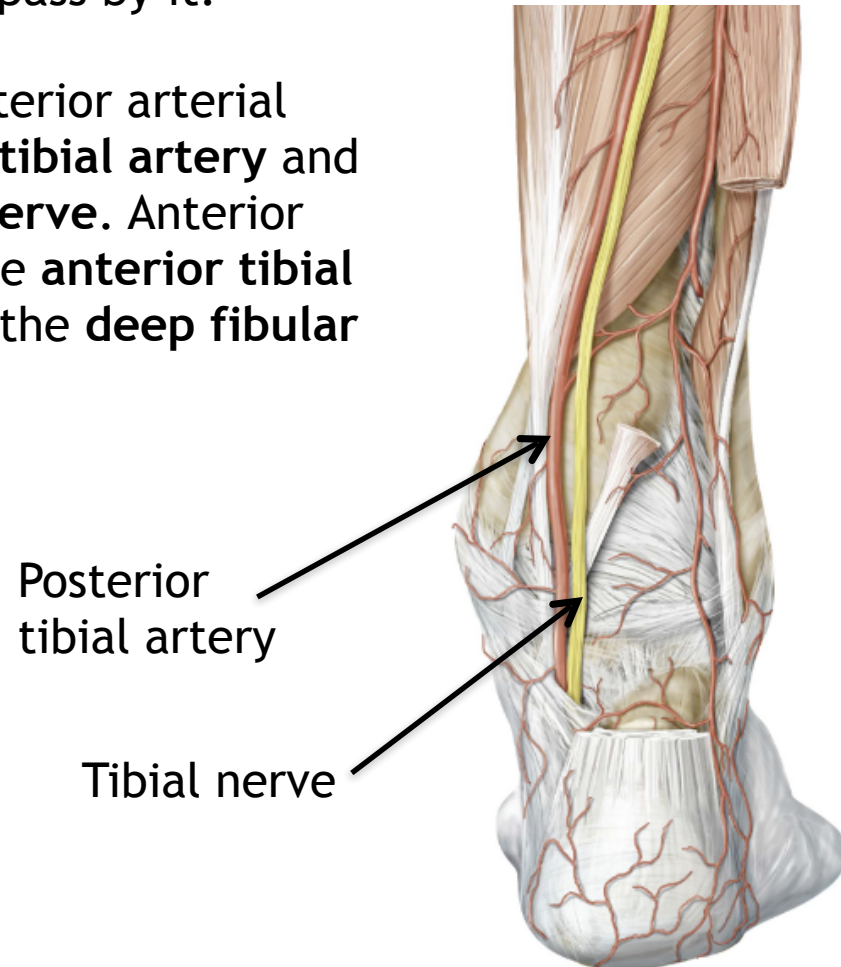
Lymph from the superficial and deep lymphatic vessels of the lower leg drain into the superficial and deep **popliteal lymph nodes** respectively. From there, the flow continues on to the deep inguinal lymph nodes located in the femoral triangle of the upper thigh.



The Ankle

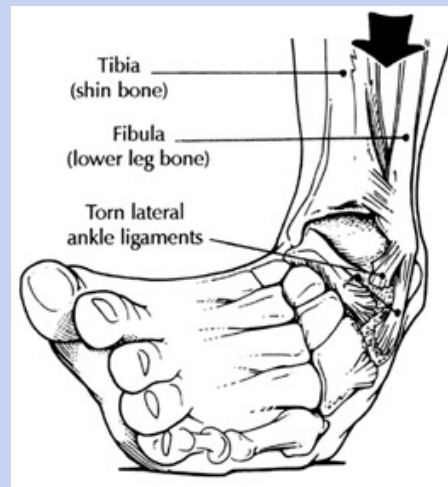
Joint innervation and blood supply is done by the nerves and arteries that pass by it.

In the case of the ankle, posterior arterial supply is from the **posterior tibial artery** and innervation from the **tibial nerve**. Anterior blood supply is given from the **anterior tibial artery** and innervation from the **deep fibular nerve**.



Clinical: Ankle Sprain

The most common ankle related injuries are ankle sprains with roughly 1 million visiting the doctor about sprain related injury. Ankle sprains are common in sports yet can also happen while carrying out everyday tasks. Injuries in which the foot is *inverted* rather than *everted* are more common. This action causes the ligaments of the ankle, more specifically the **calcaneo fibular ligament** and **anterior talofibular ligament**, to be hyper-stretched and possibly tear. Swelling, pain and redness are common symptoms of ankle sprains.



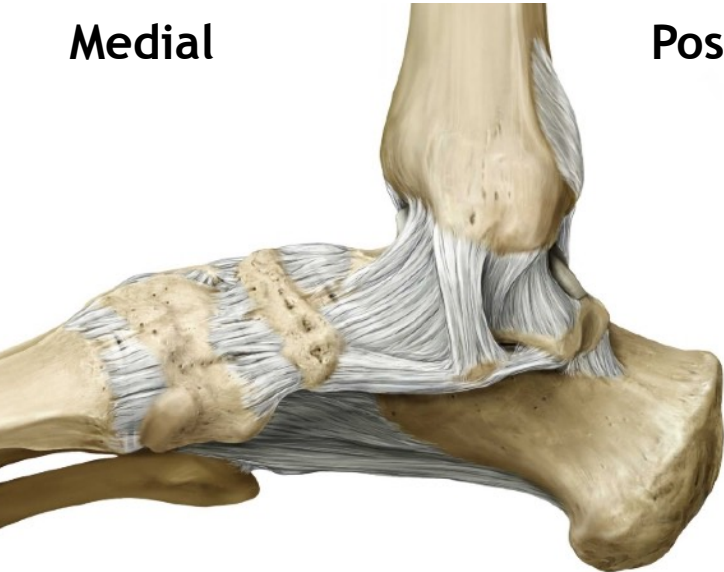
Inversion of the foot at the ankle joint

Major Ligaments of the Ankle

Three major ligaments of the ankle joint include the **deltoid ligament**, **posterior tibiofibular ligament** and **calcaneofibular ligament**. What is referred to as the deltoid ligament is actually a group of four smaller ligaments that stabilize the ankle from over everting the foot.

These three major ligaments are what are commonly injured or torn when a person sprains their ankle.

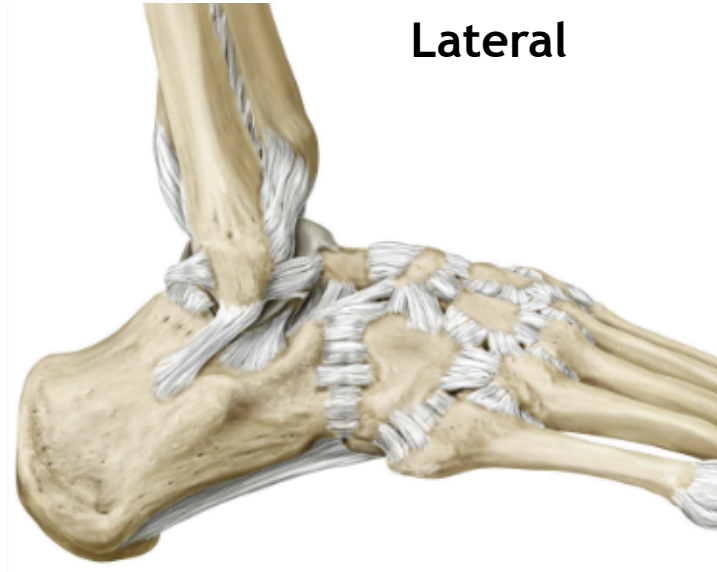
Medial



Posterior



Lateral

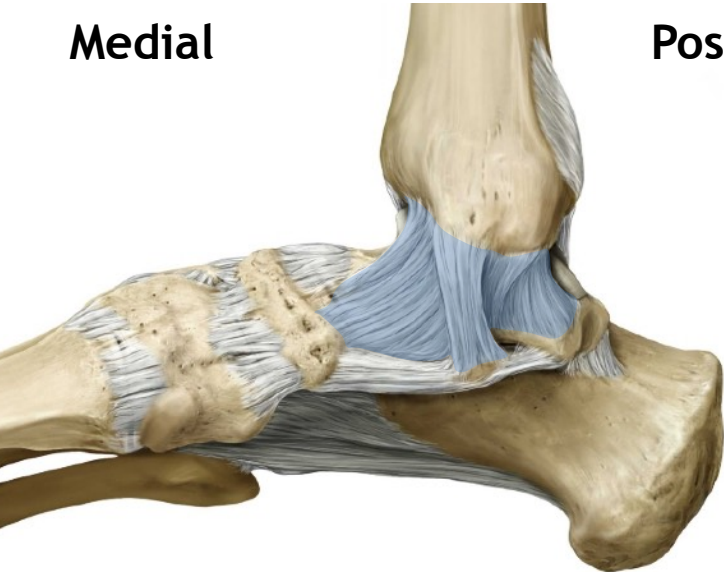


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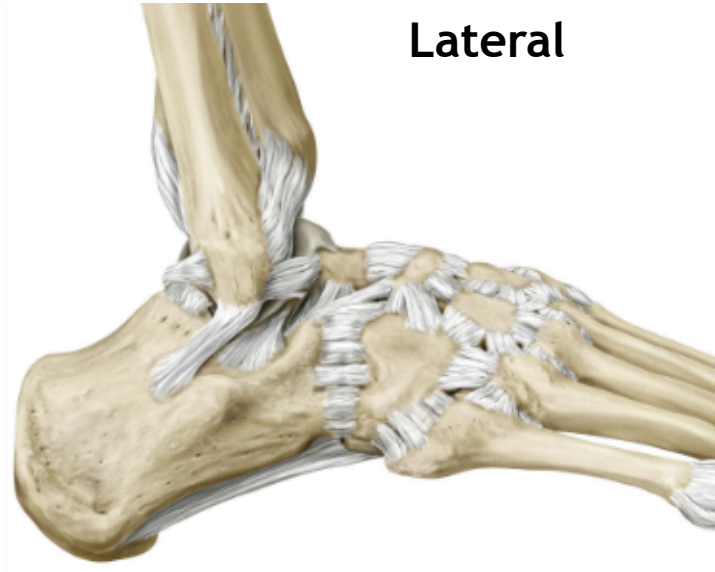
Medial



Posterior



Lateral

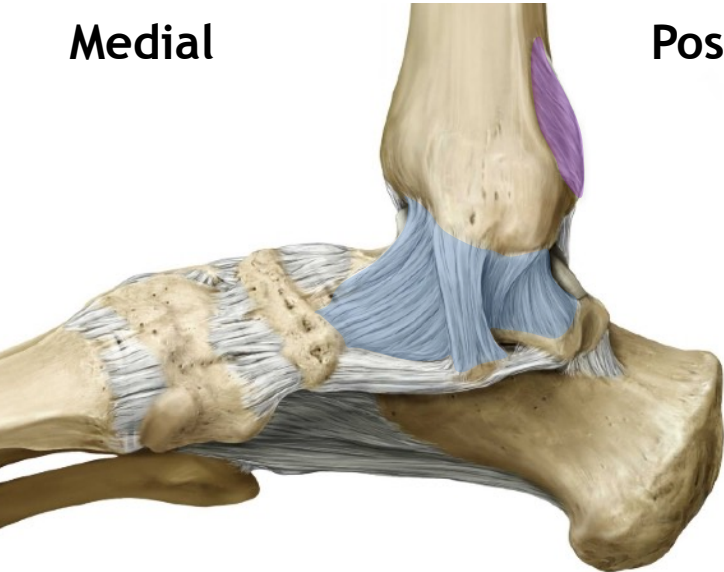


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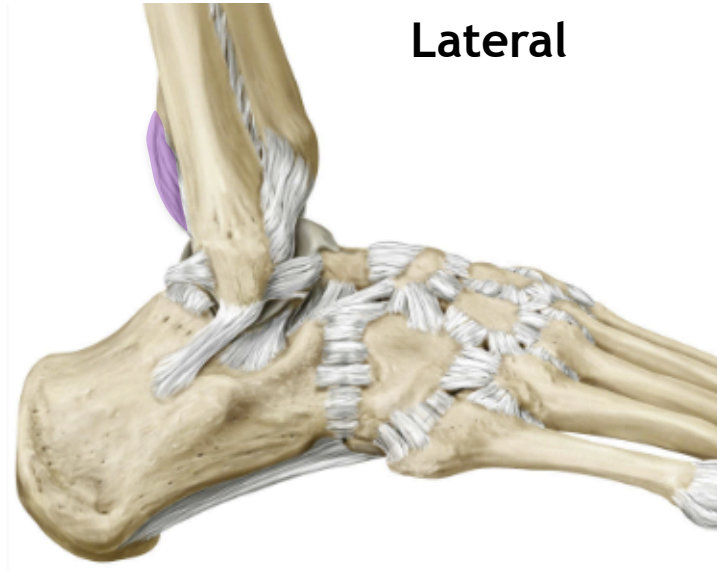
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Posterior



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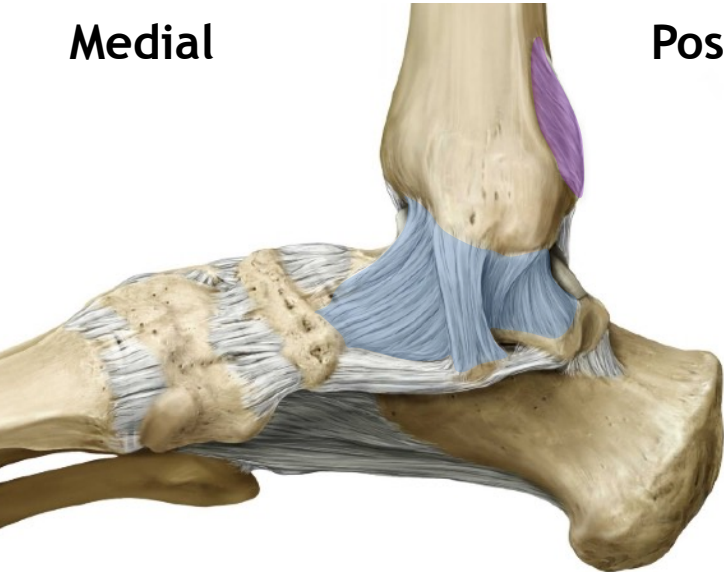


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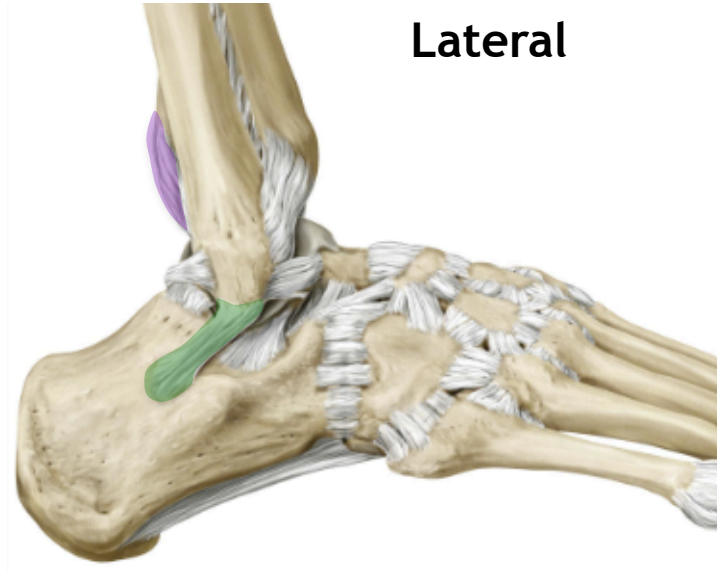
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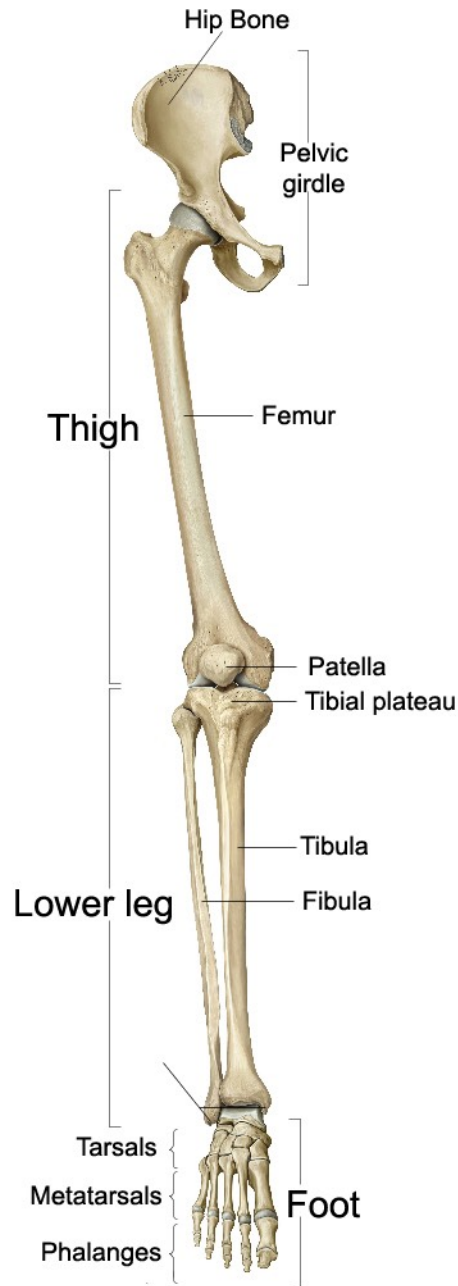
Posterior



Lateral

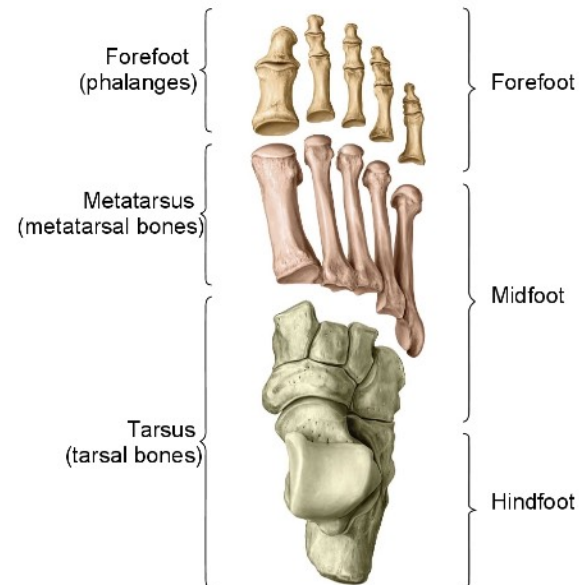


The Foot

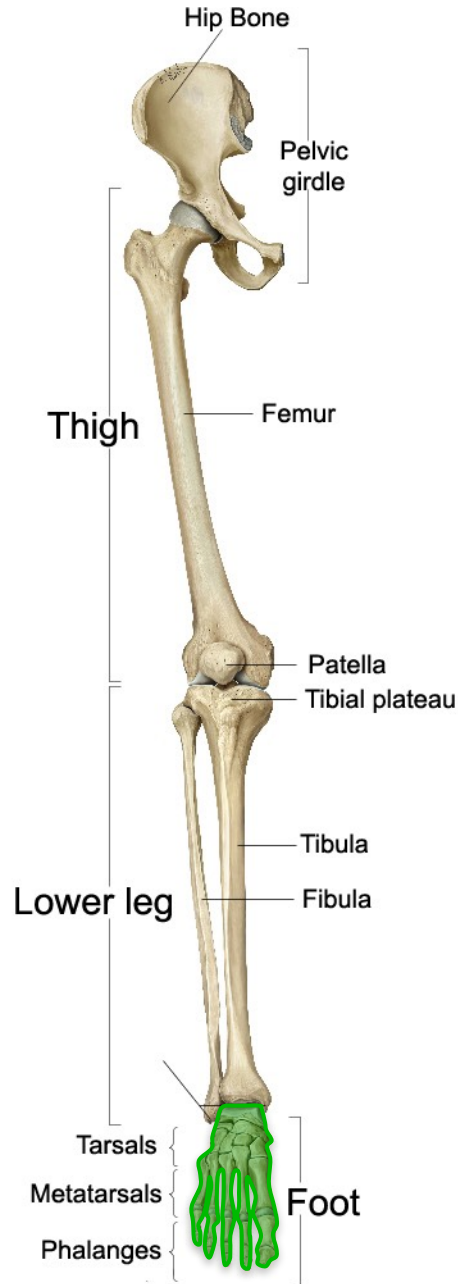


The foot is the most weight bearing region of the entire body and is constructed in a way to withstand a great amount of pressure as well as allow for balance while standing or walking.

The foot is divided into three sections, the tarsus, metatarsus and forefoot. These bones are analogues to the carpal bones, metacarpals and phalanges of the hand.

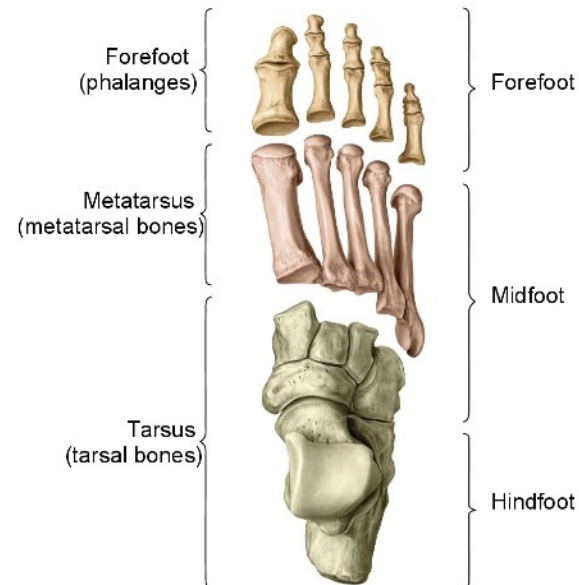


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Bones of the Foot: Tarsus



The tarsus of the foot includes seven bones: the **talus**, **calcaneus**, **cuboid**, **navicular** and three **cuneiforms** (**lateral**, **intermediate** and **medial**).

The **talus** is the bone in which articulates with the tibia and fibula, forming the ankle joint. The **talus** receives all the weight of the body and disperses it to the other bones of the foot through multiple joints in the foot.

The **calcaneus** forms the heel of the foot and is the first to hit the ground when walking. It articulates with the **talus** and **cuboid**.

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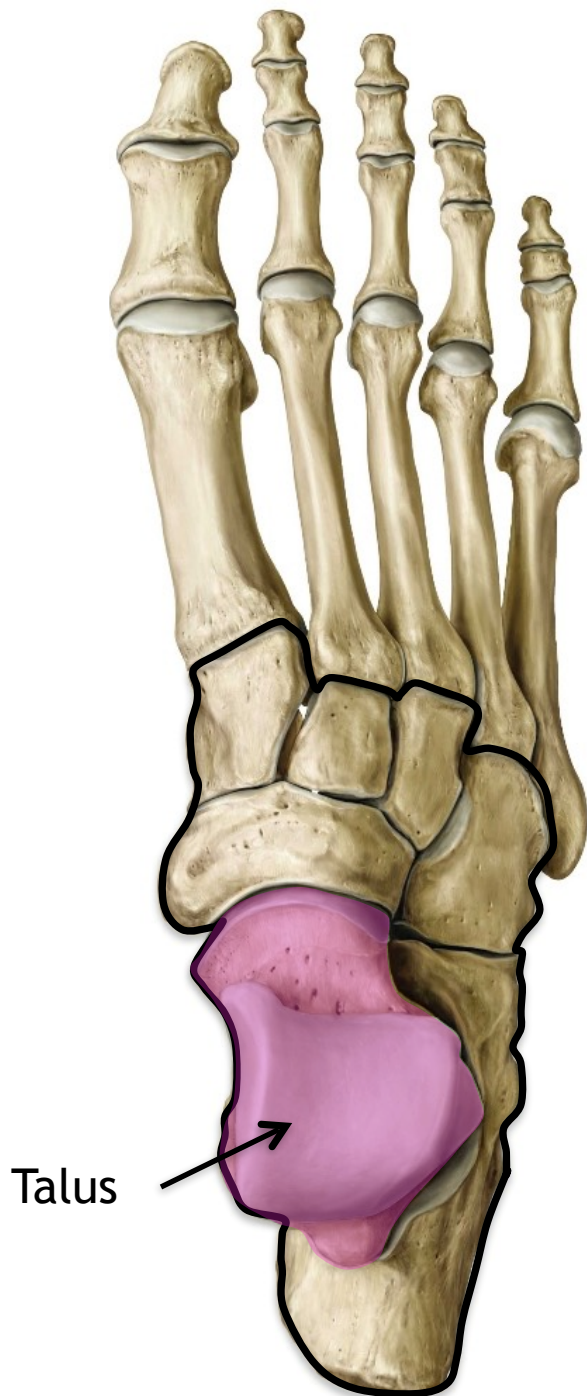
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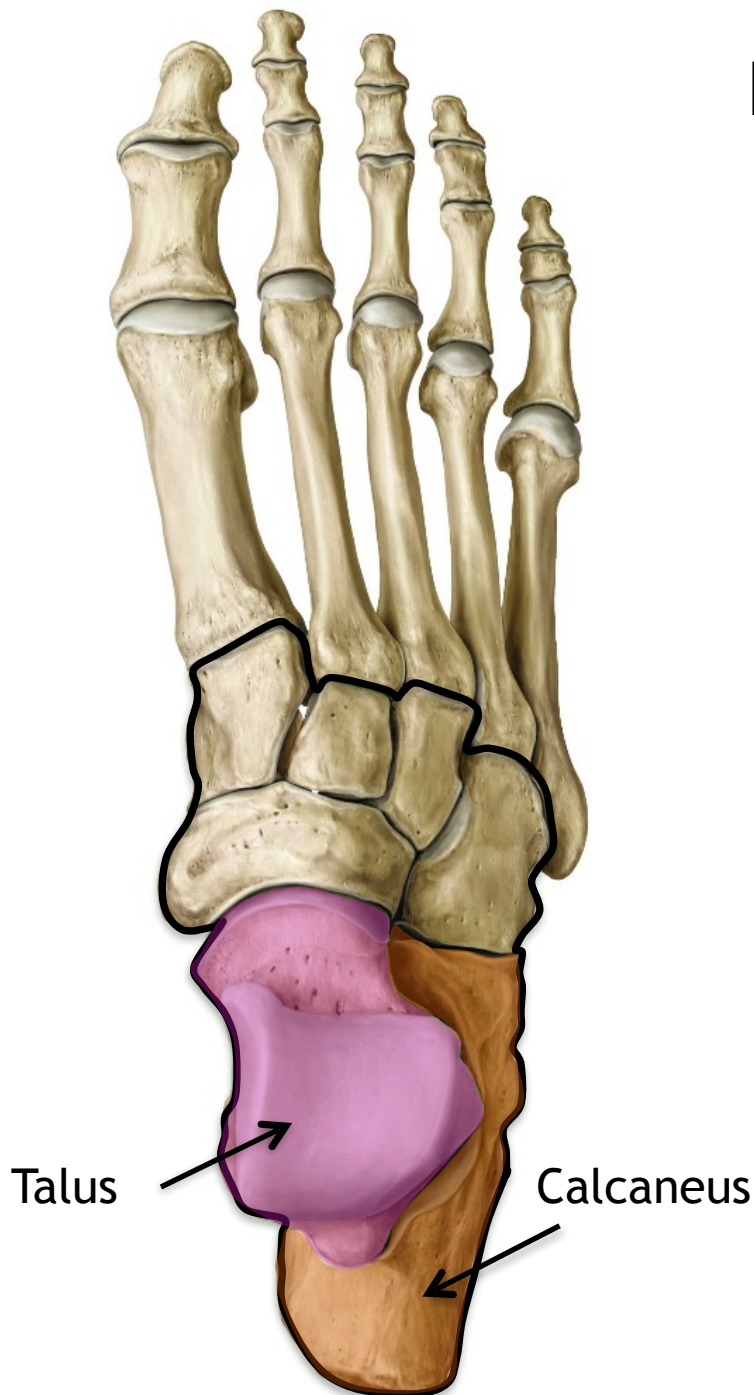
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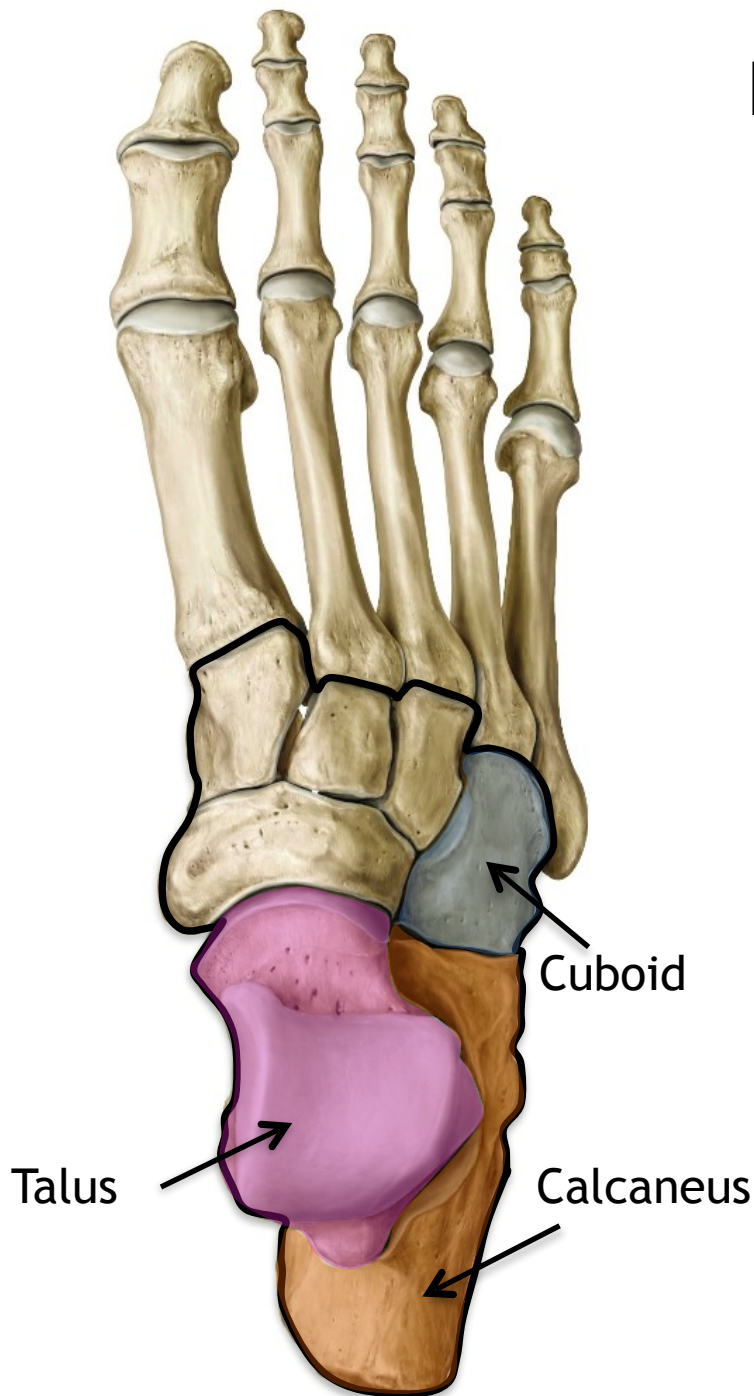
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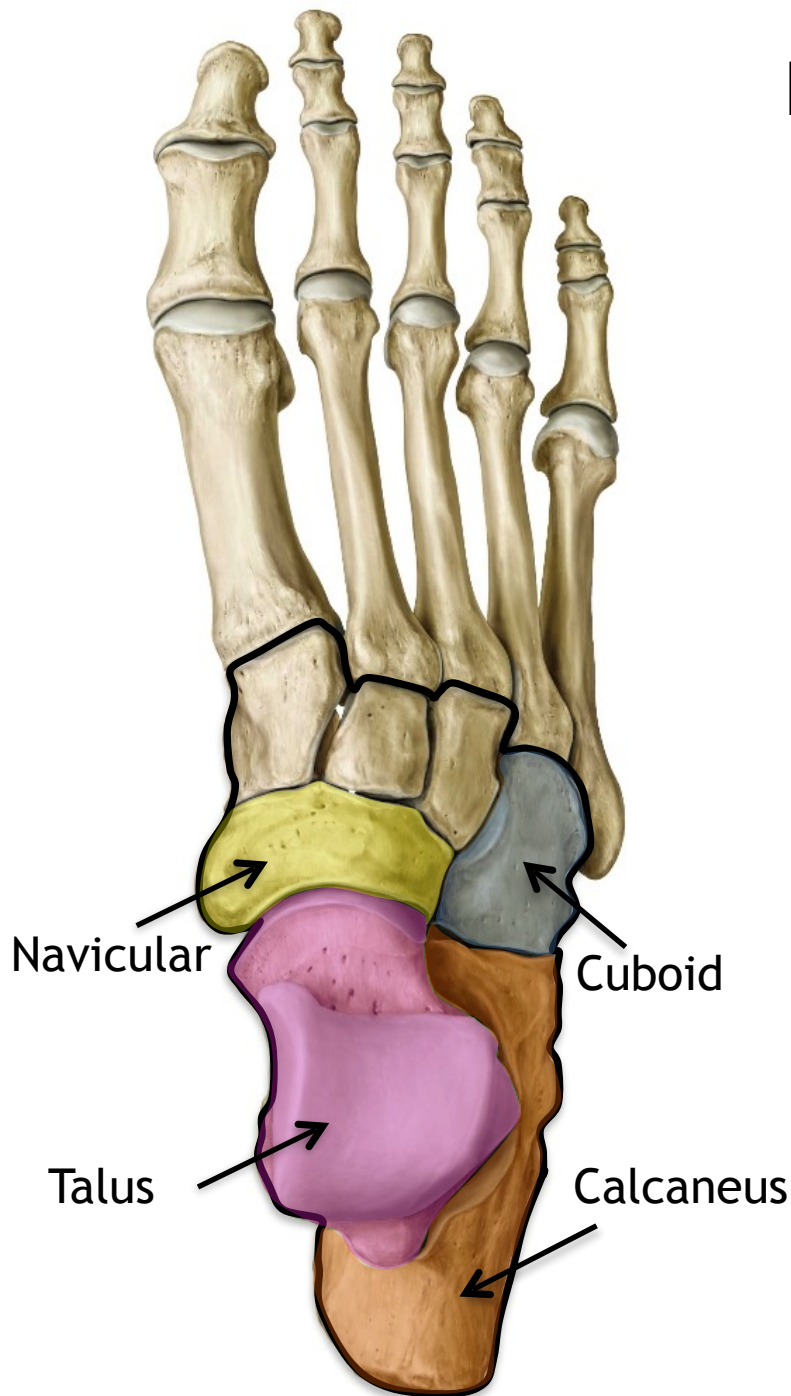
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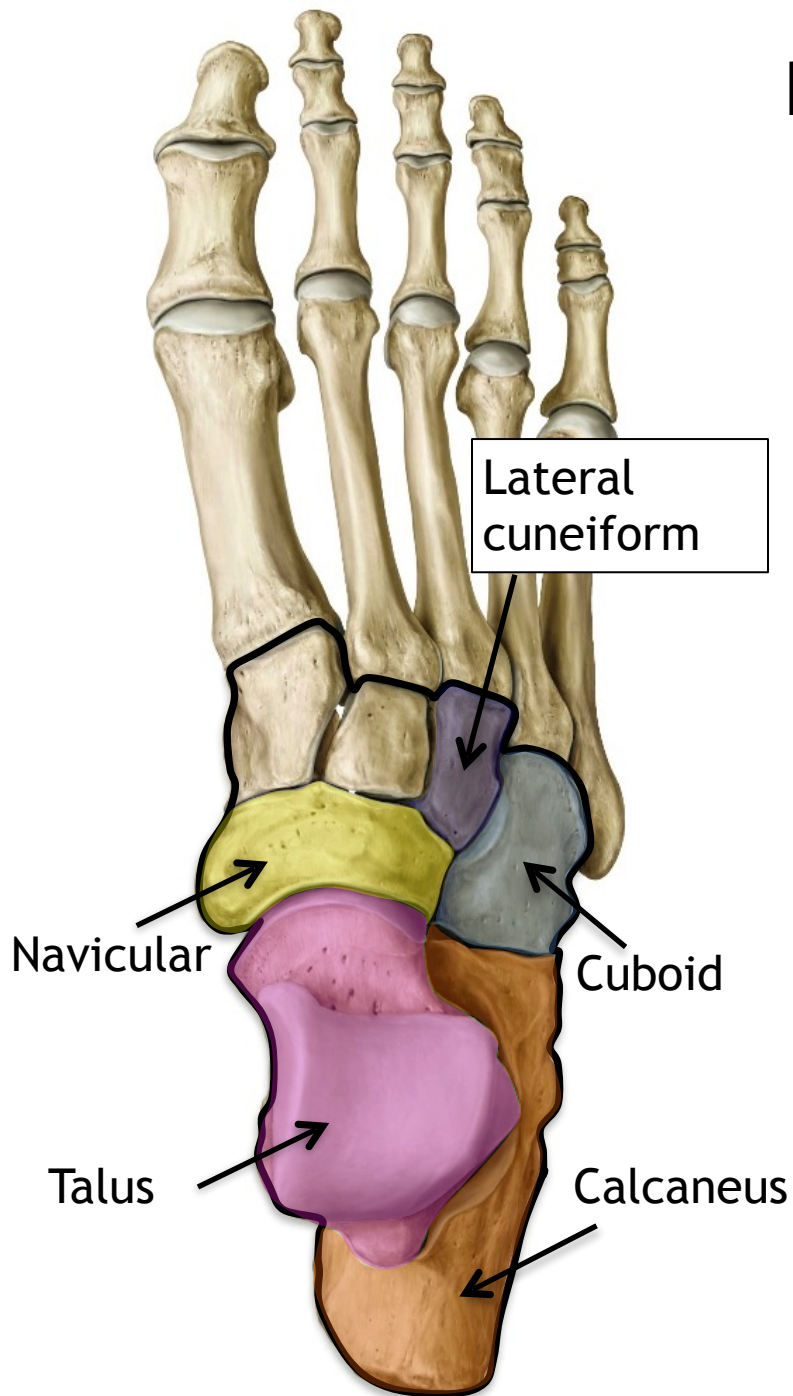
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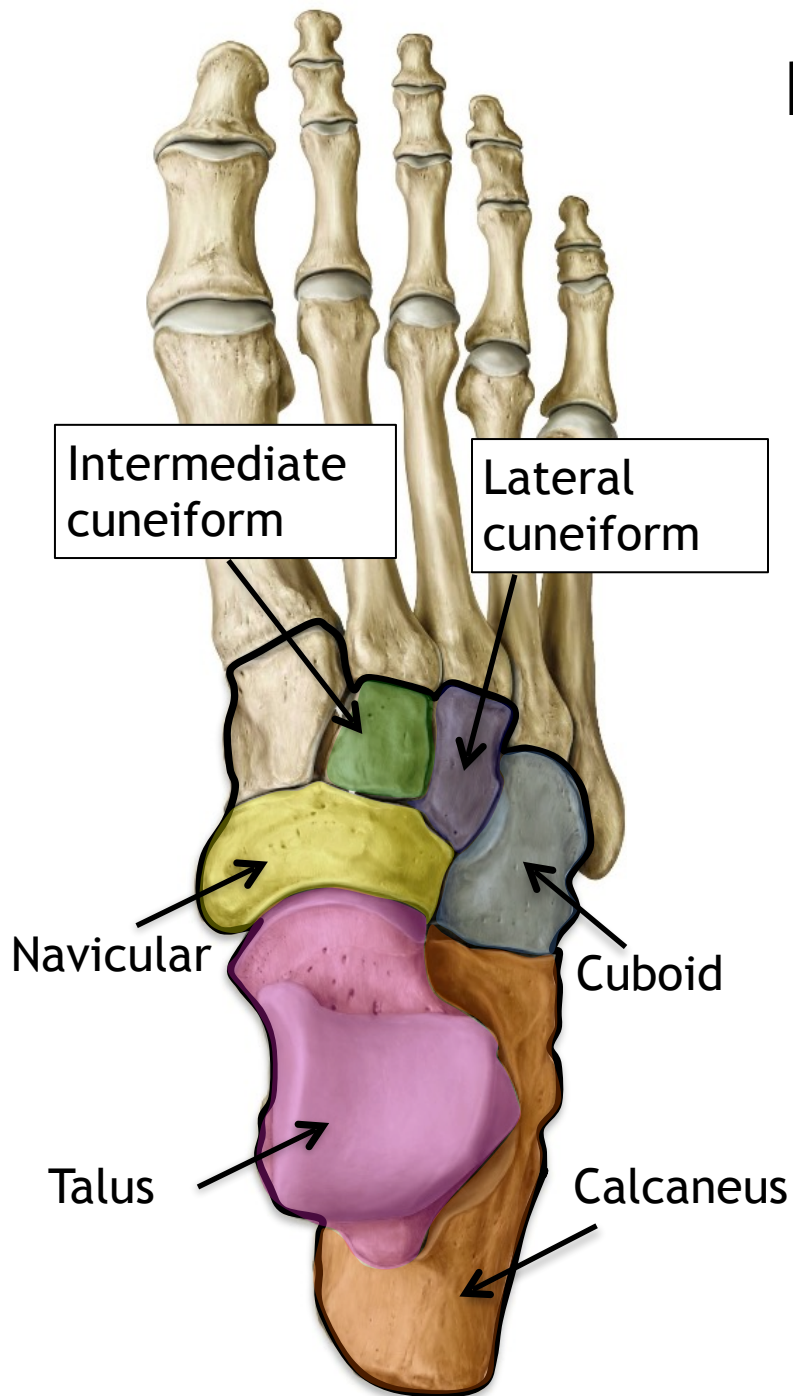
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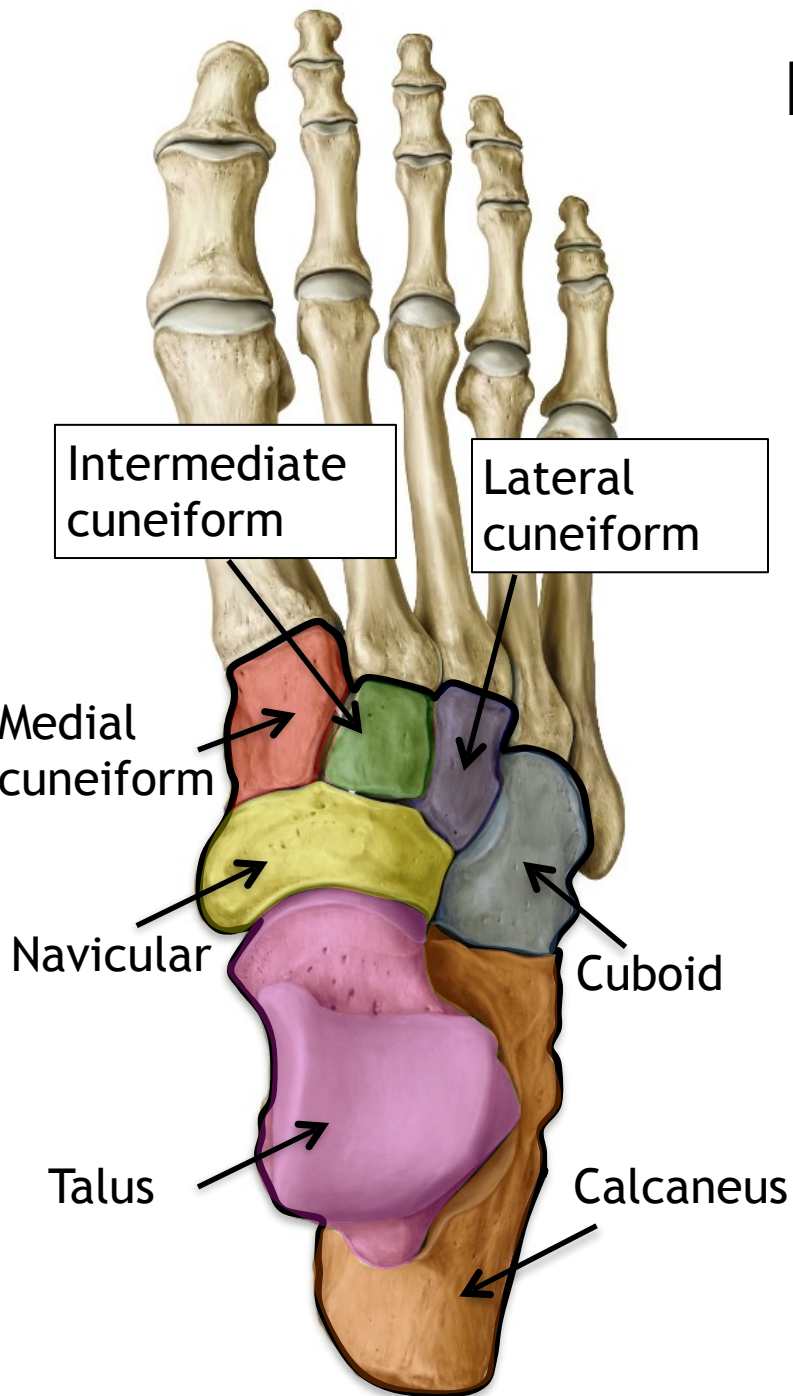
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Bones of the Foot: Metatarsus

The metatarsus of the foot includes the five metatarsals of the toes:

1st metatarsal

2nd metatarsal

3rd metatarsal

4th metatarsal

5th metatarsal

The bones are numbered as they are positioned in the foot, from medial to lateral.

These bones are similar to the metacarpal bones of the hand.

The second and third metatarsal are fixed while walking and because of this can easily experience a stress fracture after prolonged use.



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Bones of the Foot: Forefoot

The forefoot consists of the **phalanges** (**proximal**, **middle** and **distal**). These bones construct the visible digits of the foot and are able to flex, extend, abduct and adduct.

The phalanges are very similar in shape yet differ in size and length.

Notice that there is no middle phalanx in digit one.



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Joints of the Foot

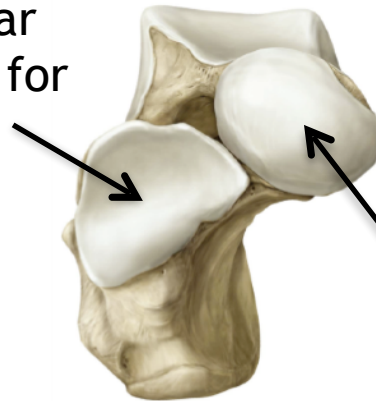
The foot is made up of 26 individual bones and 33 joints in which they articulate.

The **transverse tarsal joint** is located in the tarsus of the foot and is made up of the **talonavicular joint** and **calcaneocuboid joint**.

Amputation of the foot at this joint is referred to as a Chopart Amputation.



Calcaneus
(articular
surface for
cuboid)

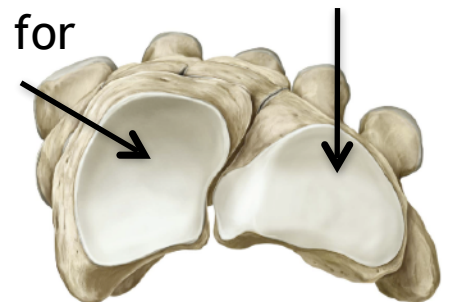


Navicular
(articular
surface for
talus)

Talus



Cuboid

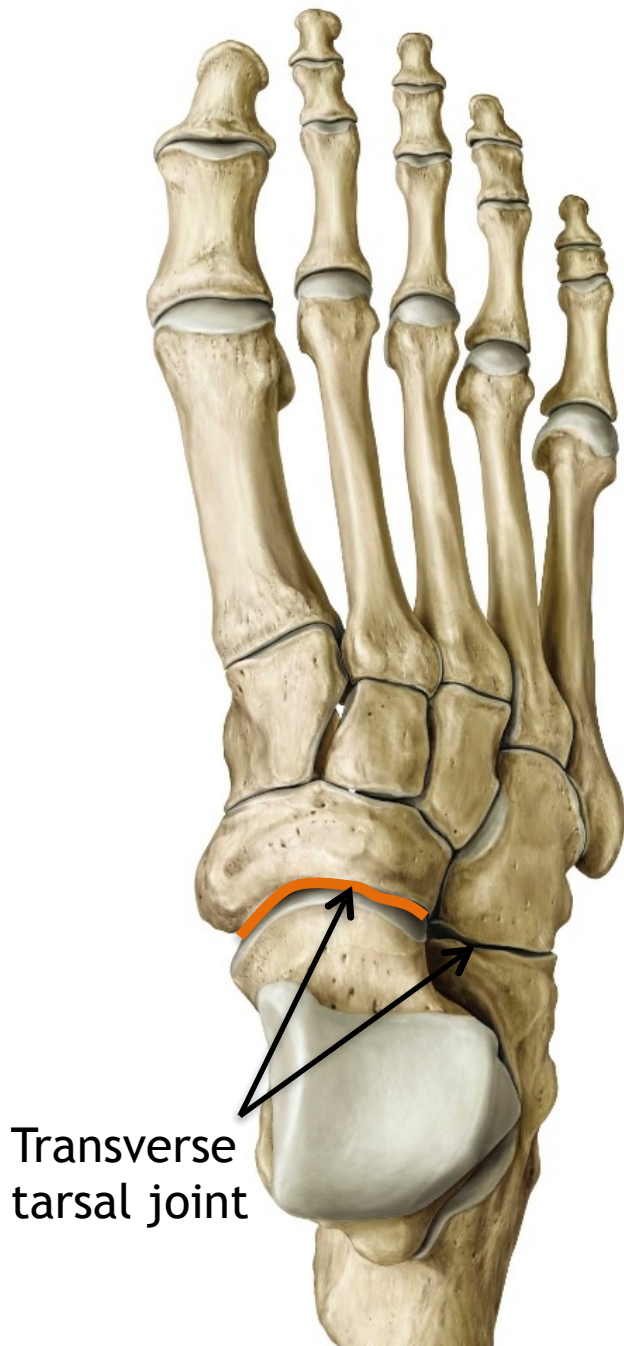


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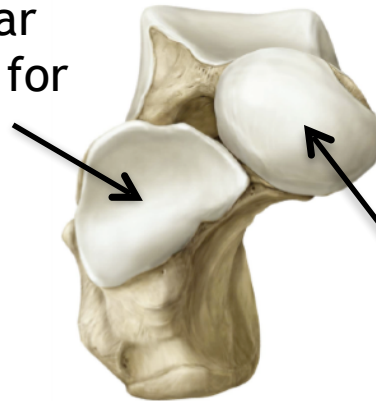
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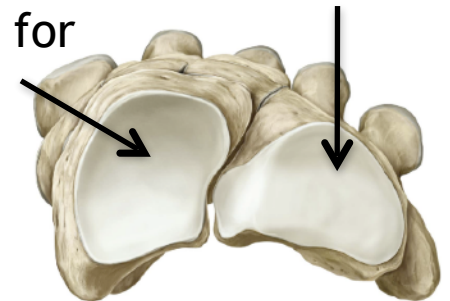
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Talus

Cuboid

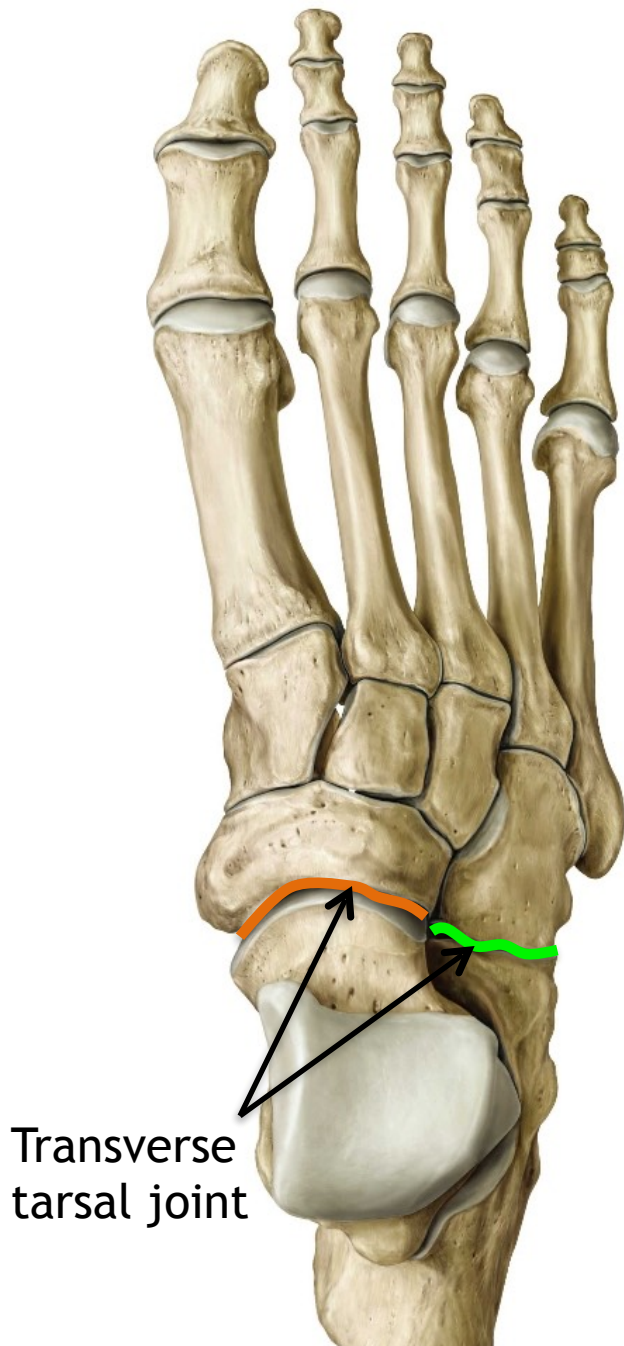


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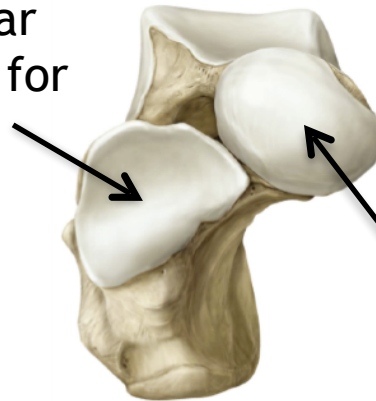
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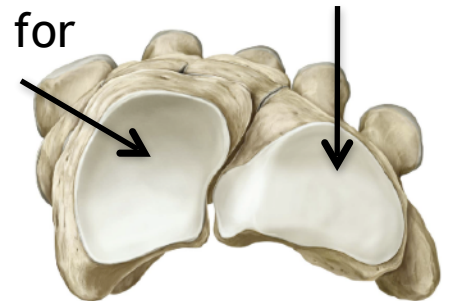


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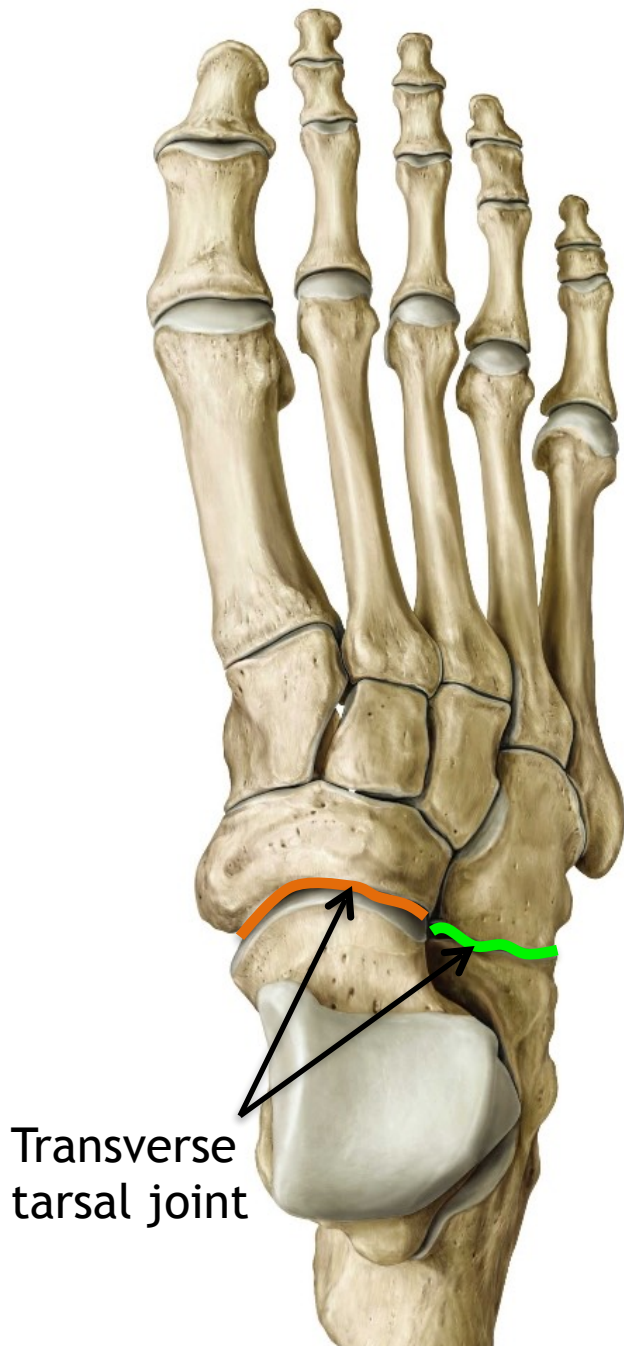


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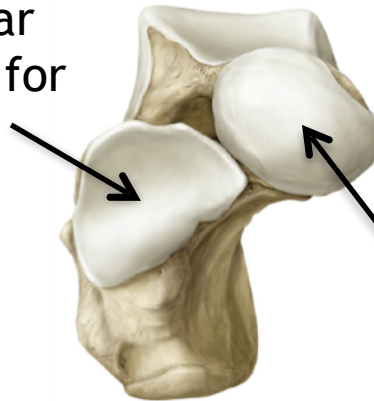
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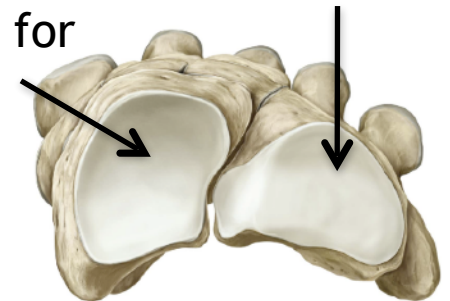
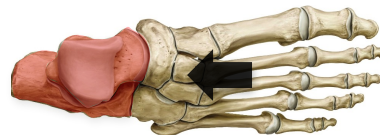
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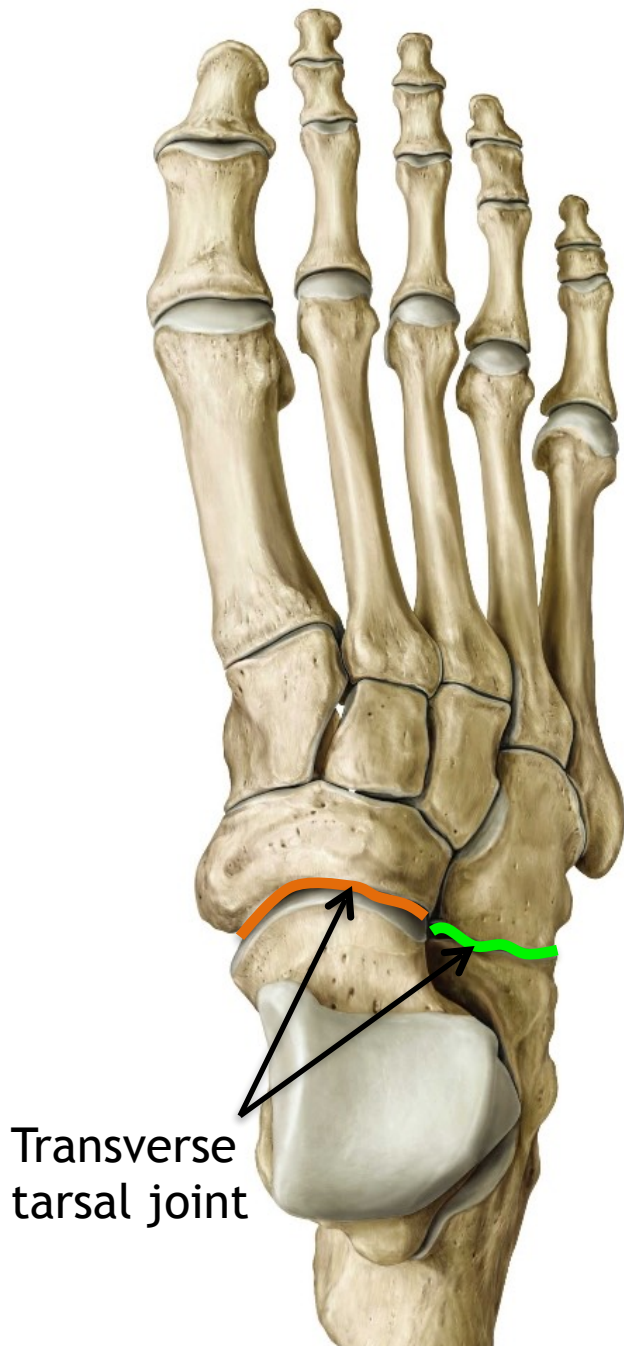


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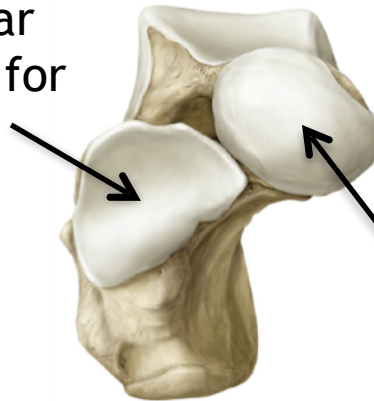
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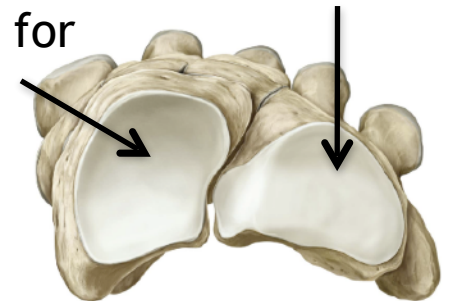


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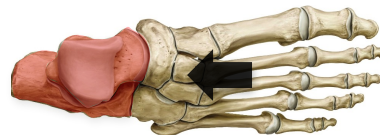


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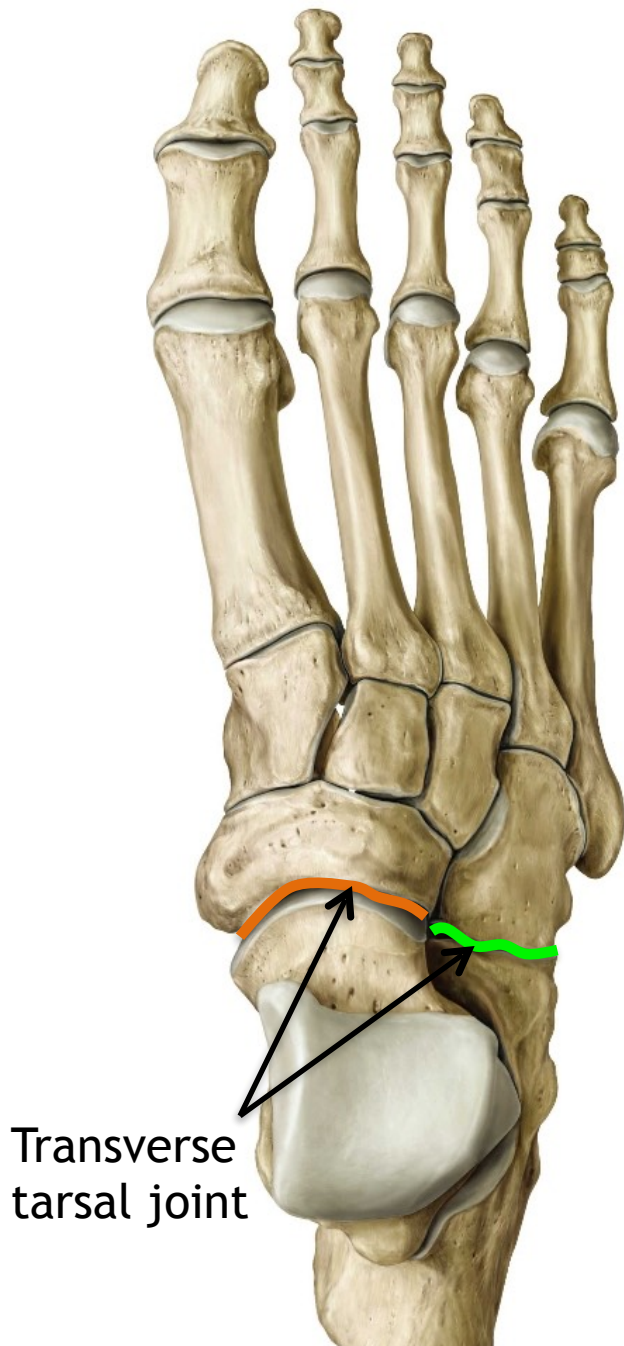


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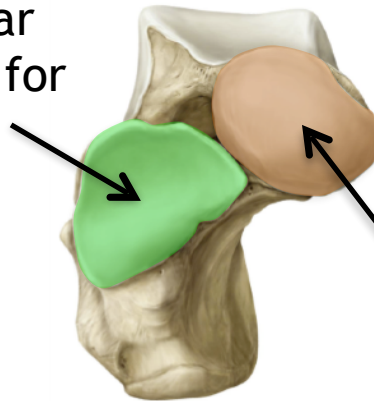
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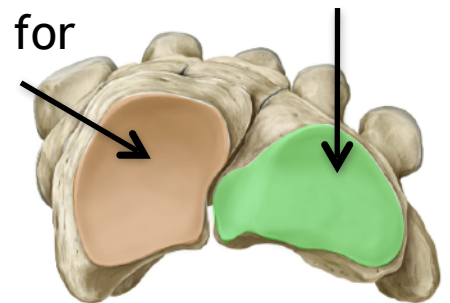
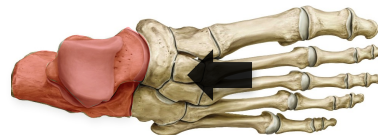
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Ligaments of the Foot

The bones of the foot are connected by many ligaments, the major ones consisting of the **Plantar calcaneonavicular ligament** (spring ligament), **long plantar ligament** and the **plantar aponeurosis**.

The **plantar calcaneonavicular ligament** extends from the talus to the navicular and helps with the transfer of weight from the talus while walking, giving support and helping to maintain the arch. A lax ligament would be evident in a collapsing arch or the extreme, known as “flatfoot” (lacking an arch).

The **long plantar ligament** runs from the calcaneus to the cuboid and metatarsals 3, 4 and 5, creating a tunnel where the fibularis longus tendon passes through.

The **plantar aponeurosis** runs from the calcaneus, alongside the flexor digitorum brevis muscle, and attaches to the phalanges. Its sole purpose is to maintain the arch of the foot



Plantar View



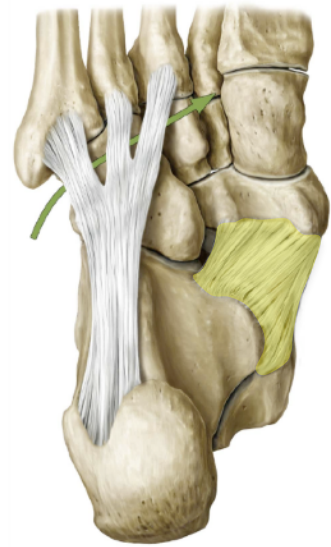
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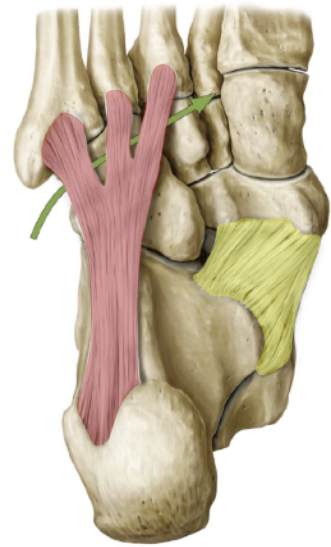
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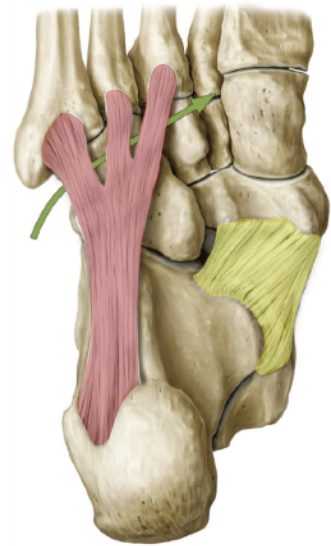
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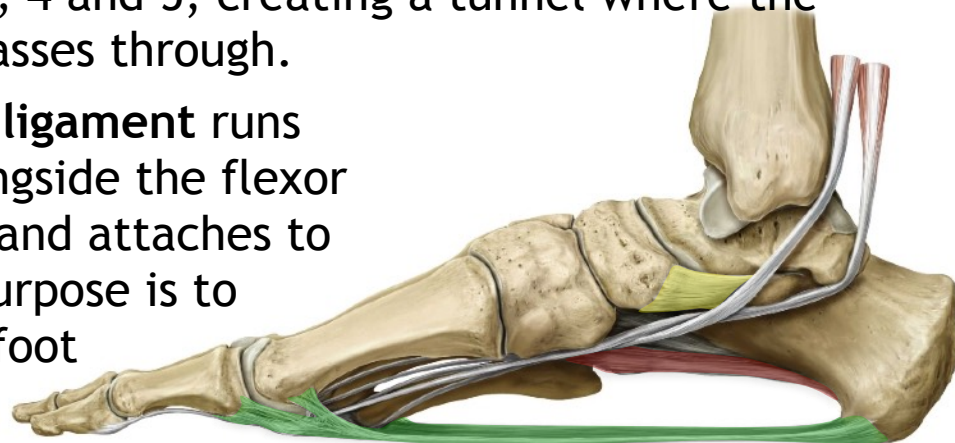
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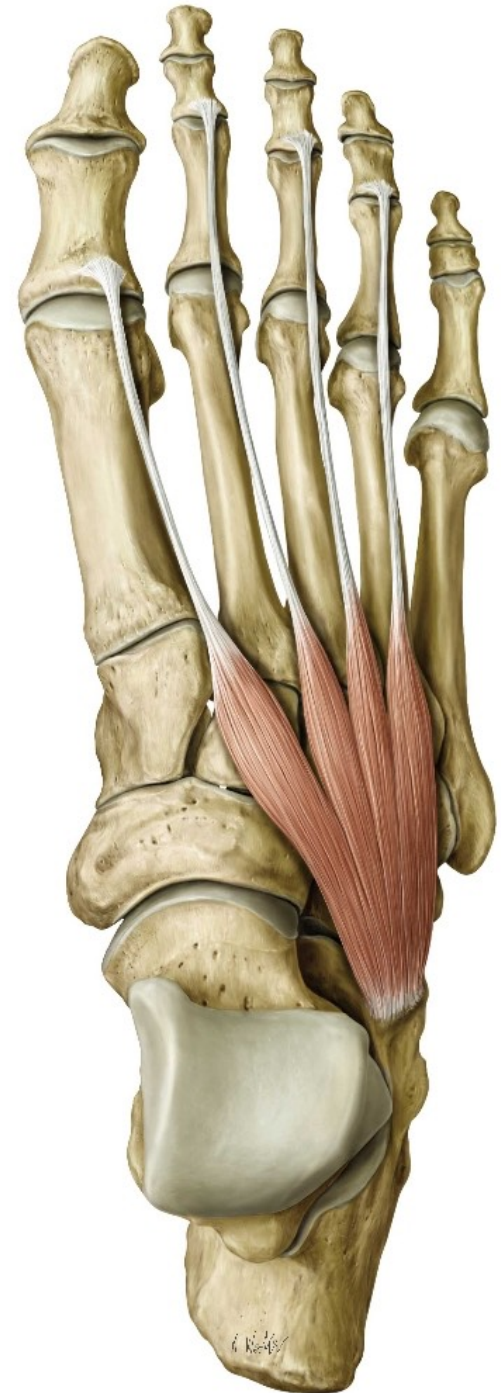
Muscles of the Foot:

Intrinsic Muscles of the Dorsum

The intrinsic muscles of the dorsum include the two muscles **extensor digitorum brevis** and **extensor hallucis brevis**. These muscles are responsible for *extending* the the 1st through 4th toe.

The **extensor digitorum brevis** attaches to the base of the middle phalanges of the 2nd to 4th toe while the **extensor hallucis brevis** attaches to the proximal phalanx of the 1st toe at the dorsal aponeurosis.

Muscles labeled “brevis”, in contrast to “longus”, attach *at* a joint (i.e. metatarsophalangeal joints and proximal interphalangeal joints). Muscles labeled “longus” attach to the tip of the joint.



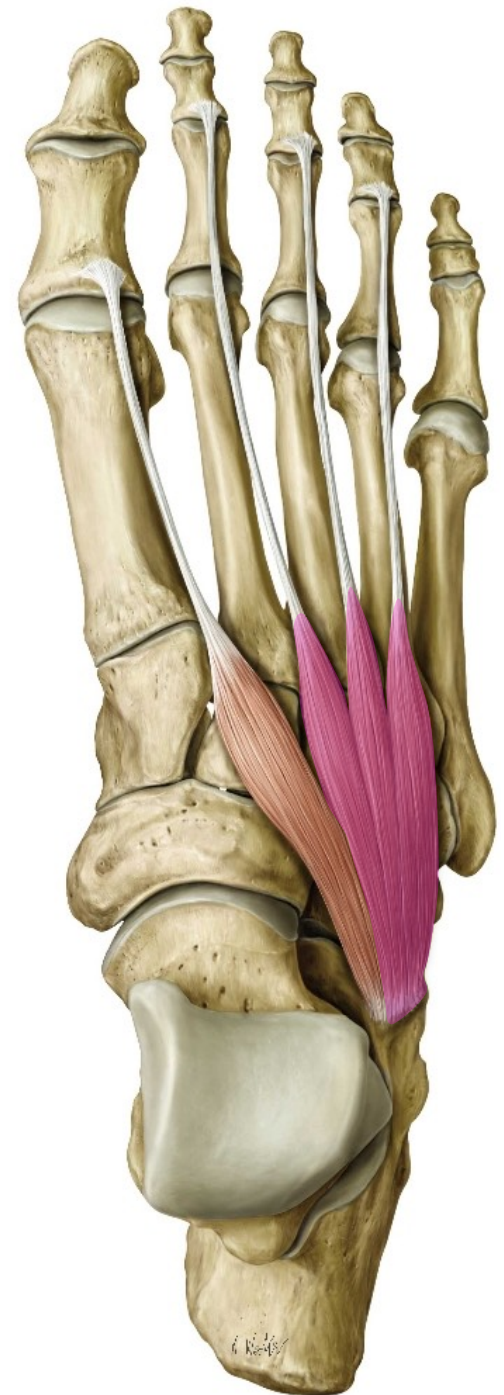
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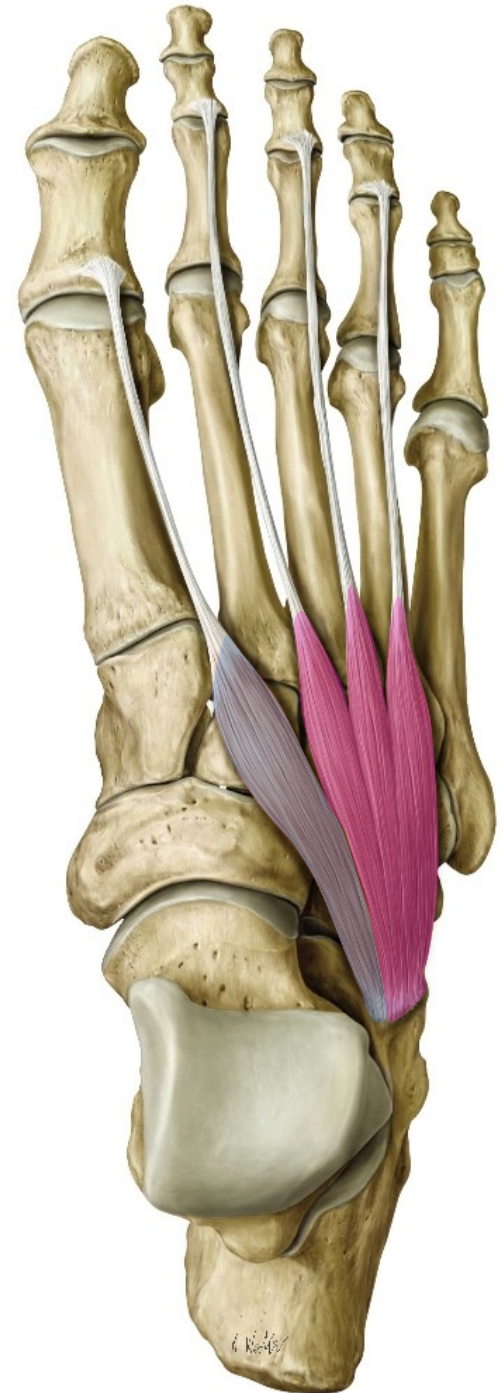
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Intrinsic Muscles of the Foot: Layer 1 (Superficial) Abductors of the foot

The superficial intrinsic muscles of the sole are found on the underside of the foot, originating at the calcaneal tuberosity and attaching at different points on the phalanges. These muscles include the **abductor hallucis**, **flexor digitorum brevis** and **abductor digiti minimi**.

These muscles are primarily responsible for *flexion of the foot* and support of the longitudinal arch. As suggested by the name, the **abductor hallucis** and **abductor digiti minimi** are responsible for *aBducting the 1st and 5th toes*, respectively.



Plantar View

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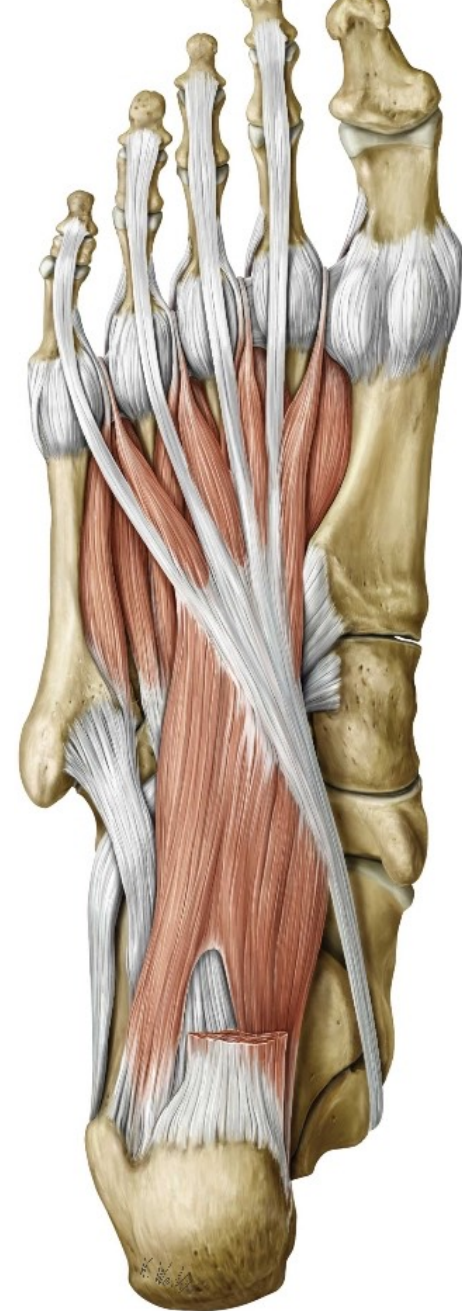


Plantar View

Intrinsic Muscles of the Foot: Layer 2

The second layer of muscles are the main *flexors* of the toes. The **quadratus plantae** originates on the calcaneal tuberosity and inserts on the **flexor digitorum longus tendon**, redirecting the pull of the tendon. There is no homolog to the **quadratus plantae muscle** in the hand.

The four **lumbricals** of the foot connect the **flexor digitorum longus tendon** to toes 2 through 5. They attach more proximally than the **flexor digitorum longus tendon** and therefore *flex* the toes to a lesser degree. They are also capable of *adducting* toes 2 through 5 towards the big toe.

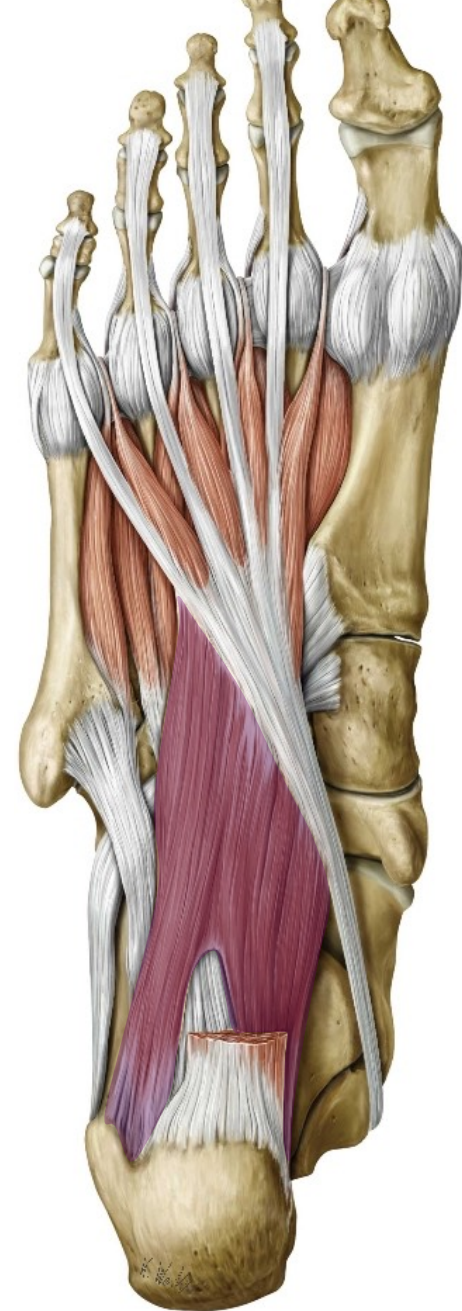


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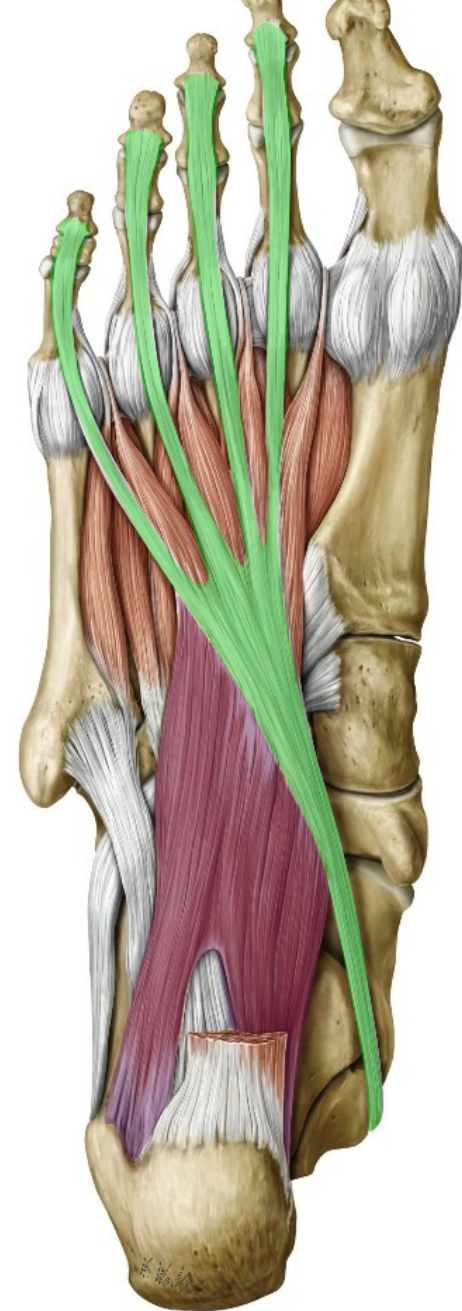


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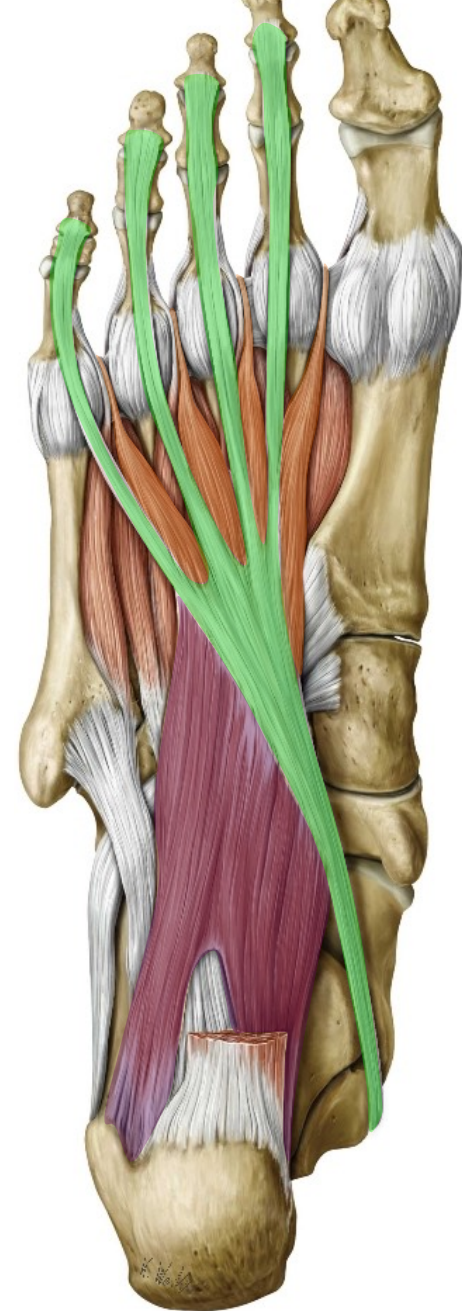


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Plantar View

Intrinsic Muscles of the Foot: Layer 3

The third layer of muscles also flex the toes at the metatarsophalangeal (MTP) joints of the foot. These muscles include the **flexor hallucis brevis**, **adductor hallucis** and **flexor digiti minimi brevis**.

The **flexor hallucis brevis** has two heads, one medial and one lateral, both responsible for *flexing* the MTP joint and supporting the longitudinal arch.

The **adductor hallucis** muscle has two heads as well, a transverse and an oblique head. Both act primarily on the big toe, *flexing* and *adducting*. The transverse head helps in supporting the transverse arch while the oblique head aids in longitudinal arch support.

Flexor digiti minimi brevis runs along the 5th metatarsal and is responsible for *flexing* the MTP joint of the little toe.



Plantar View

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The **adductor hallucis** muscle has two heads as well, a transverse and an oblique head. Both act primarily on the big toe, *flexing* and *adducting*. The transverse head helps in supporting the transverse arch while the oblique head aids in longitudinal arch support.

Flexor digiti minimi brevis runs along the 5th metatarsal and is responsible for *flexing* the MTP joint of the little toe.



Plantar View

Intrinsic Muscles of the Foot: Layer 3

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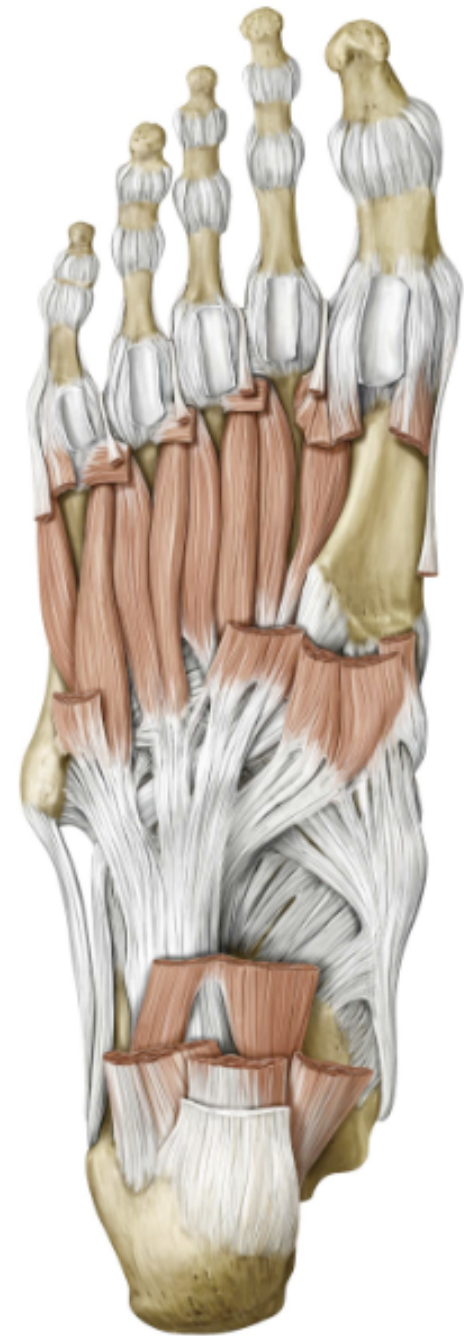
Plantar View

Intrinsic Muscles of the Foot: Layer 4

The fourth layer of the sole includes the seven **plantar** and **dorsal interossei**.

There are three **plantar interossei** muscles located on toes 3, 4 and 5, laterally to the respective dorsal interossei. These three muscles *flex*, *extend* and *adduct* the 3rd to 5th toes.

There are four **dorsal interossei** muscles originating on all 5 metatarsals and effecting phalanges 2 through 4. These four muscles are capable of *flexing*, *extending* toes 2 through 4, and *abducting* only the 3rd and 4th toes.



Plantar View

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Plantar View

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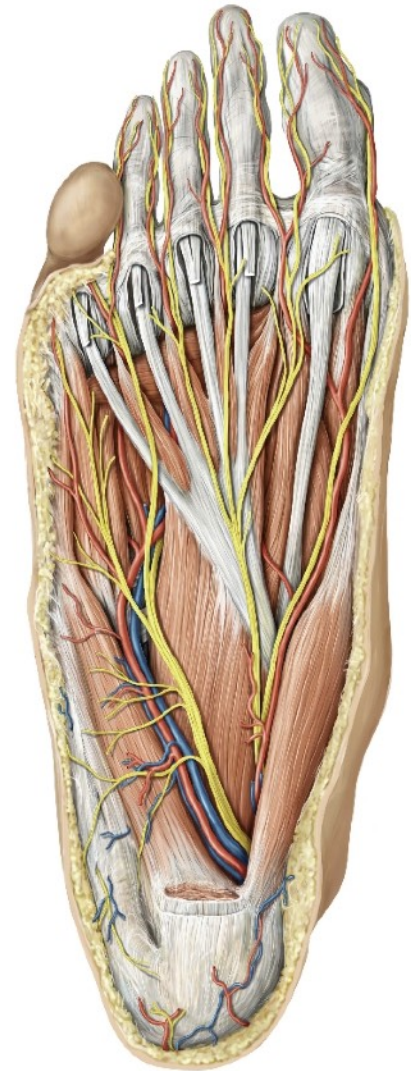
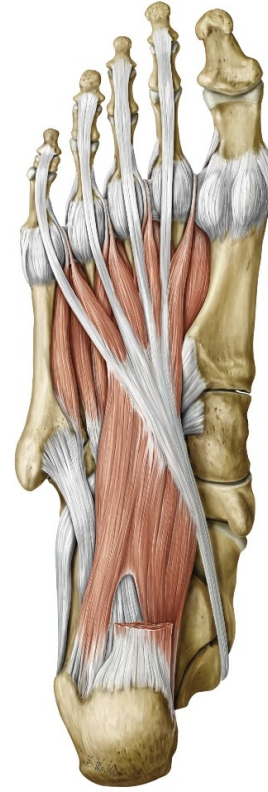
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Plantar View

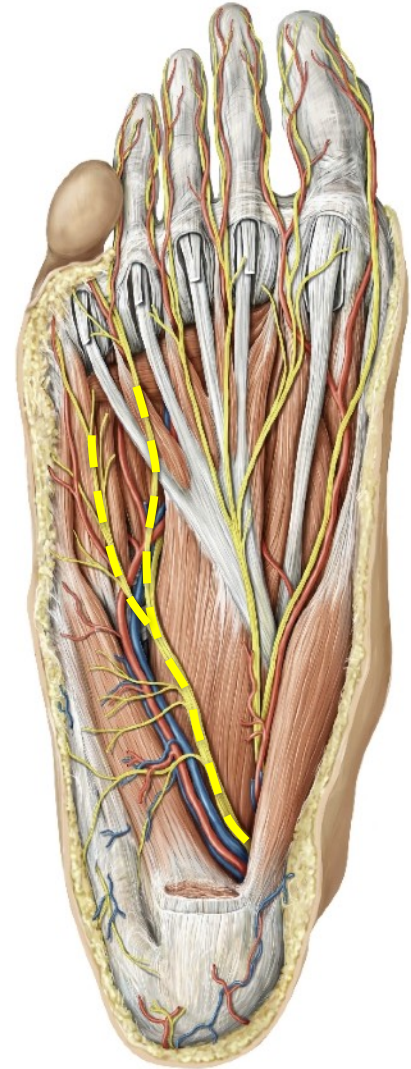
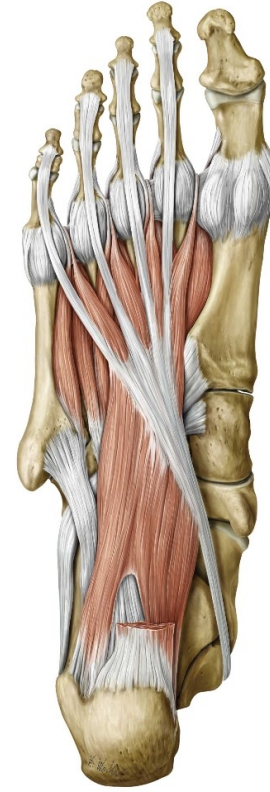
Innervation of the Foot: Lateral and Medial Plantar Nerve

The lateral and medial plantar nerves provide innervation to all the muscles of the plantar side of the foot.



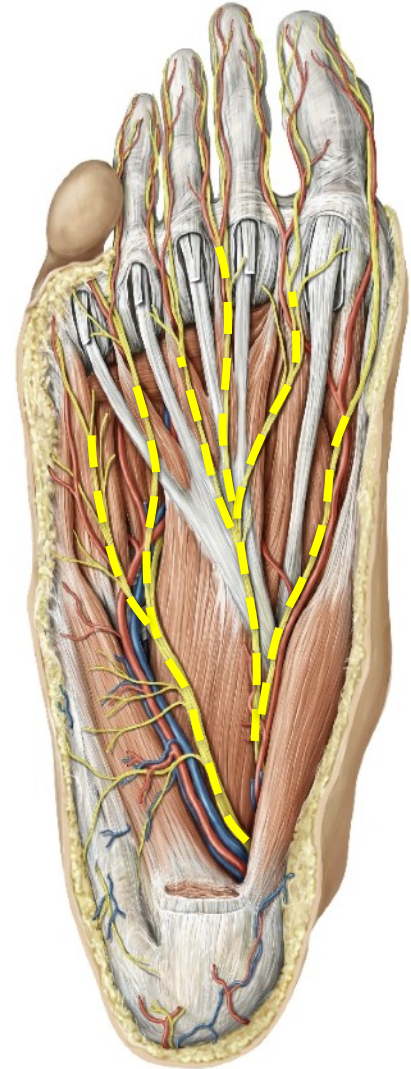
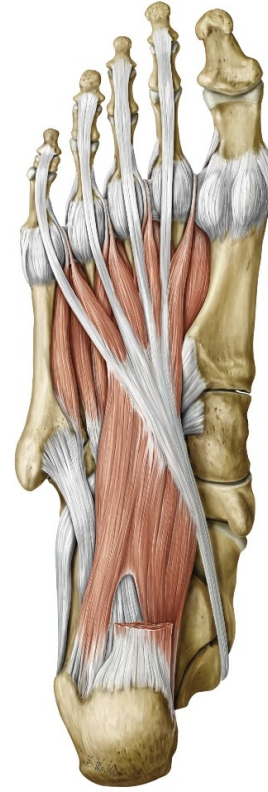
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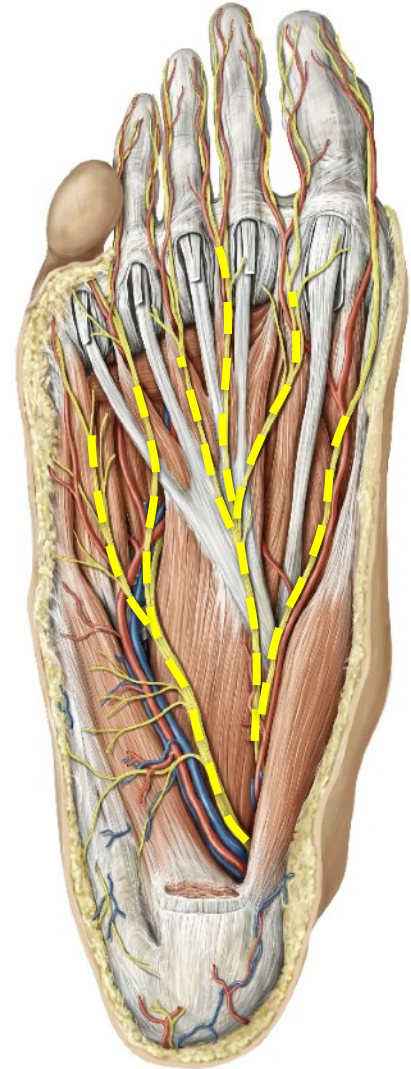
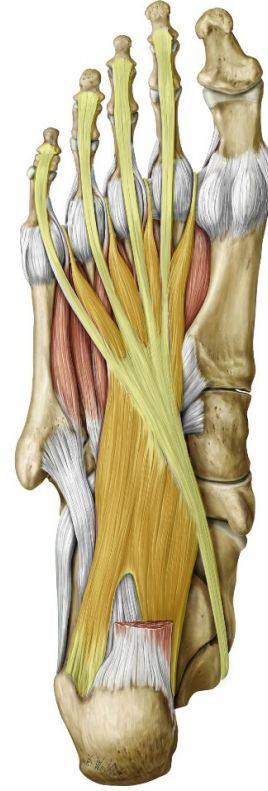
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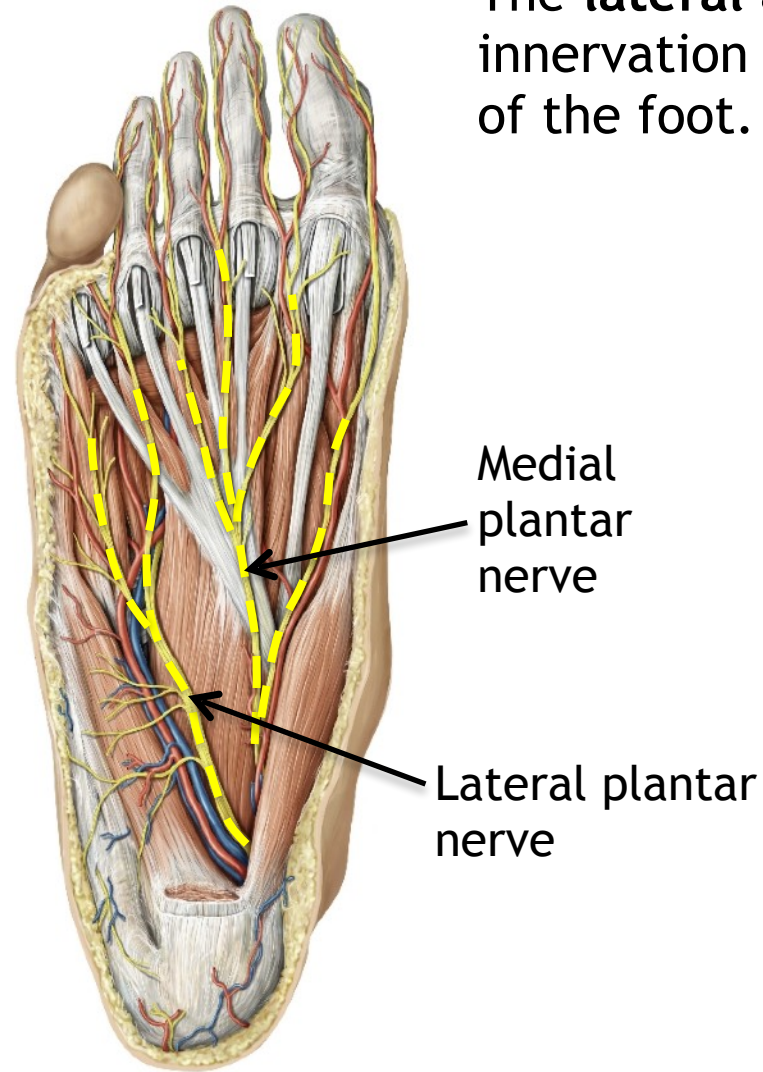
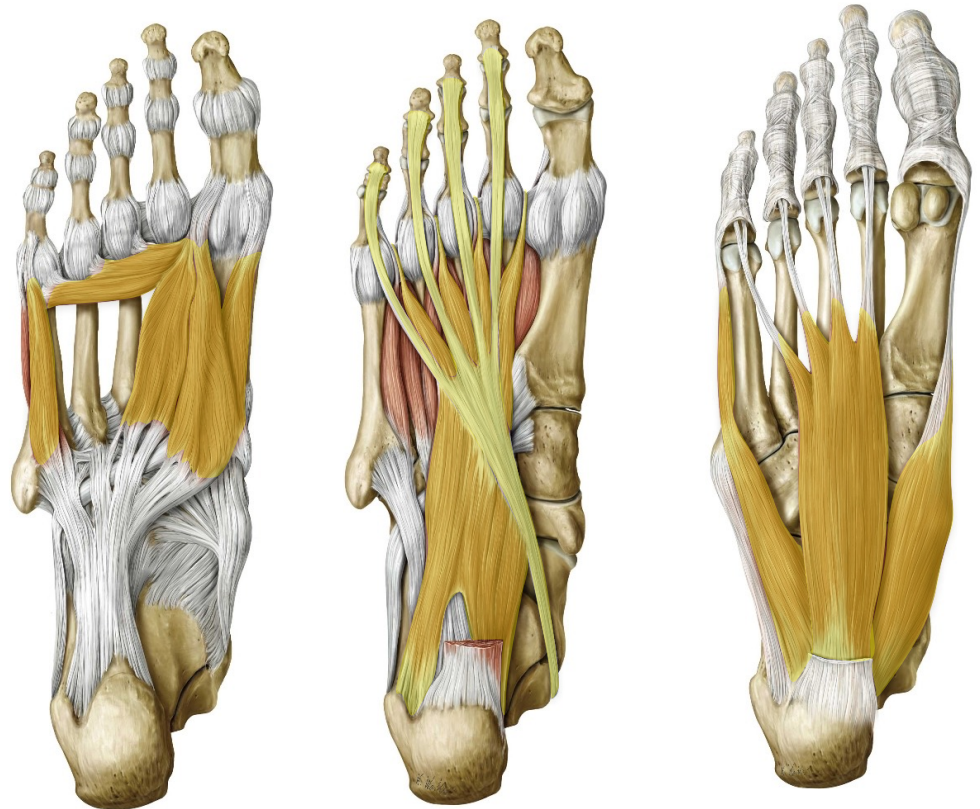
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Innervation of the Foot: Lateral and Medial Plantar Nerve

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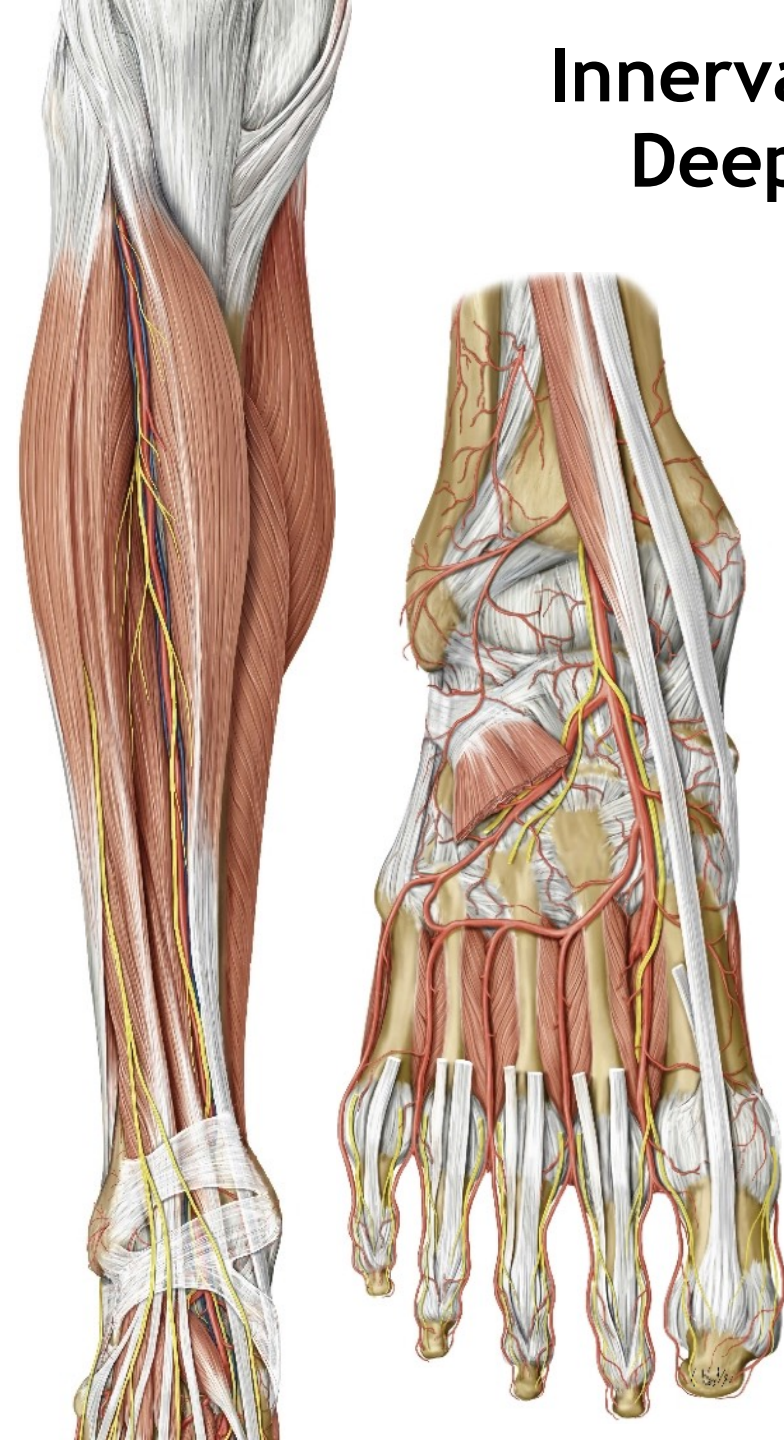
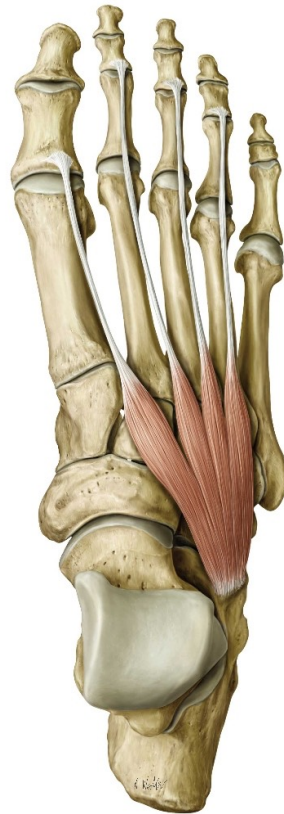


Muscles of the Foot		
Muscle	Proximal Attachment	Distal Attachment
Extensor digitorum brevis	Dorsal surface of calcaneus	2 nd to 4 th toes
Extensor hallucis brevis		1 st toe
Abductor hallucis	Medial process of calcaneal tuberosity	1 st toe
Flexor digitorum brevis	Medial tubercle of calcaneal tuberosity, plantar aponeurosis	2 nd to 5 th toes
Abductor digiti minimi		5 th toe, 5 th metatarsal
Quadratus plantae	Calcaneal tuberosity	Flexor digitorum longus tendon
Lumbricals (four muscles)	Flexor digitorum longus tendons	2 nd to 5 th toes
Flexor hallucis brevis	Cuboid, lateral cuneiforms, and plantar calcaneocuboid ligament	1 st toe

Muscles of the Foot (cont.)		
Muscle	Proximal Attachment	Distal Attachment
Adductor hallucis	Oblique head: 2 nd to 4 th metatarsals Transverse head: MTPs of 3 rd to 5 th toes, deep transverse metatarsal ligament	1 st proximal phalanx
Flexor digiti minimi brevis	5 th metatarsal, long plantar ligament	5 th toe
Opponens digiti minimi	Long plantar ligament, fibularis longus	5 th metatarsal
Plantar interossei (three muscles)	3 rd to 5 th metatarsals	3 rd to 5 th toes
Dorsal interossei (four muscles)	1 st to 5 th metatarsals (has two heads)	1 st interosseus: 2 nd proximal phalanx 2 nd to 4 th interossei: 2 nd to 4 th proximal phalanges, 2 nd to 4 th toes

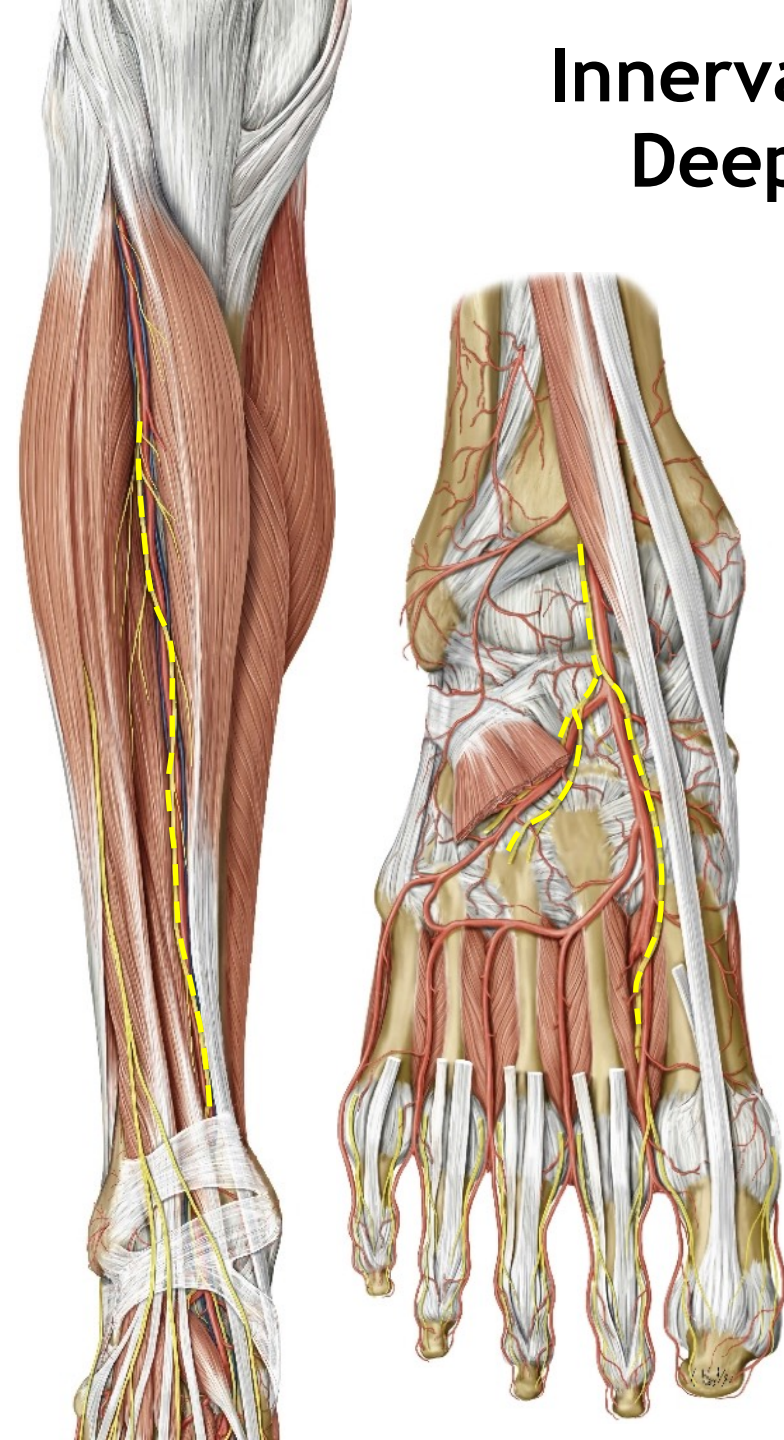
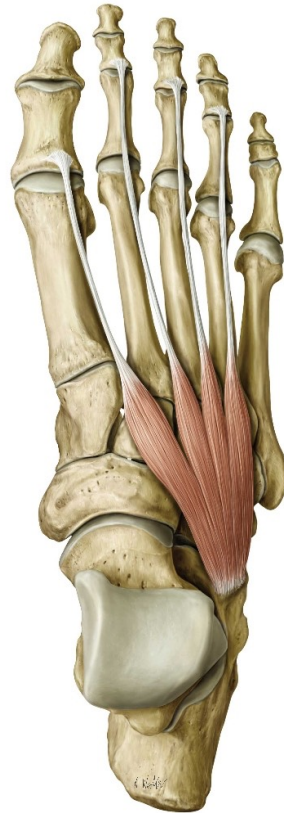
Innervation of the Foot: Deep Fibular Nerve

The deep fibular nerve innervates the two intrinsic muscles of the dorsum. These muscles include the **extensor digitorum brevis** and the **extensor hallucis brevis**.



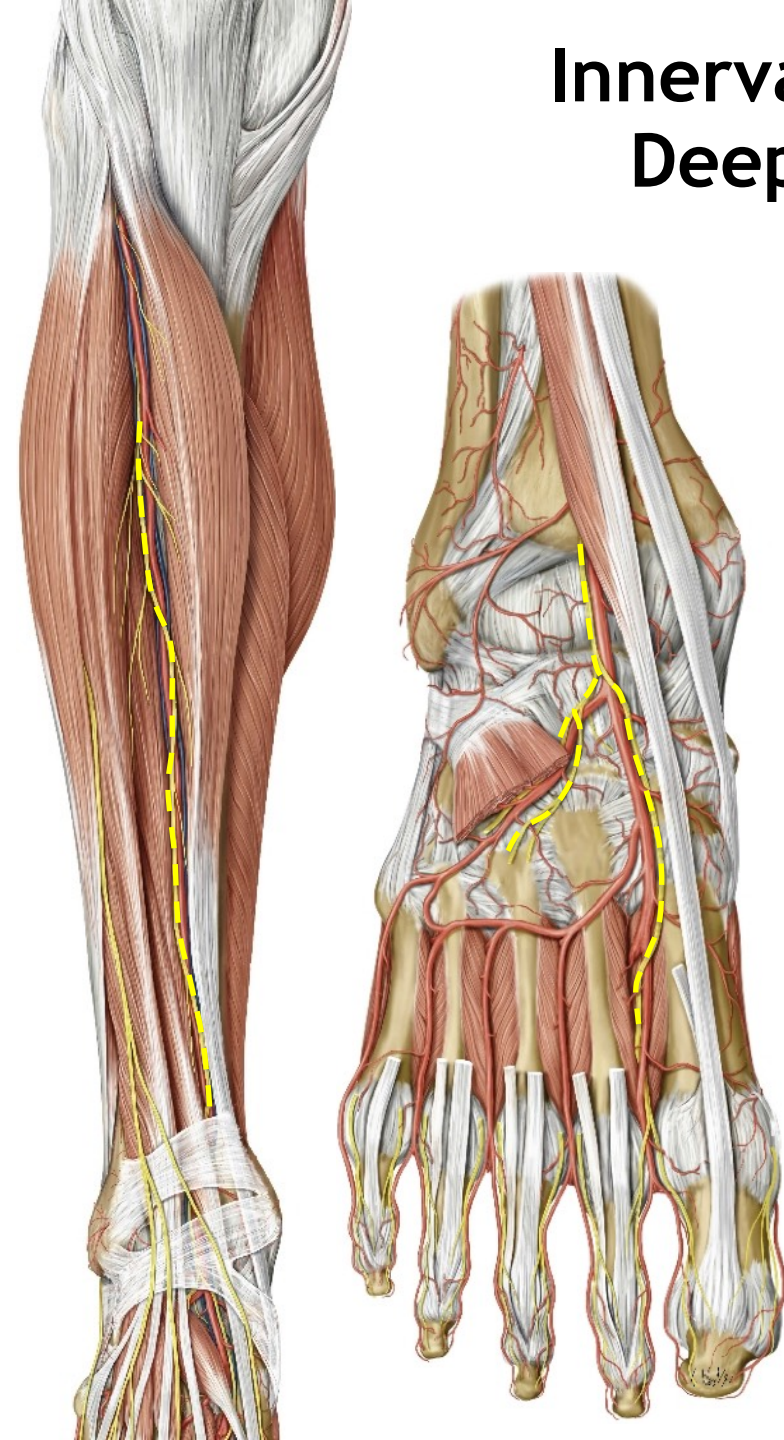
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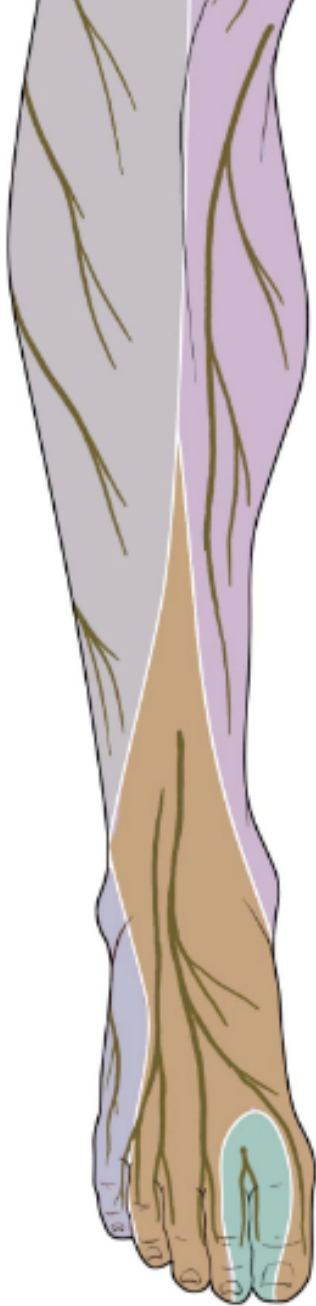
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Innervation of the Foot: Sensory Distribution

The sensory receptors of the anterior (top) surface of the foot are primarily supplied by the **common fibular nerve** while the **tibial nerve** receives sensory signals from the bottom of the foot.

The **superficial fibular nerve** (medial dorsal cutaneous nerve and intermediate dorsal cutaneous nerve) receives sensory information for the majority of the dorsal surface of the foot. The plantar portion of the foot is sensed by the **proper plantar digital nerve**.

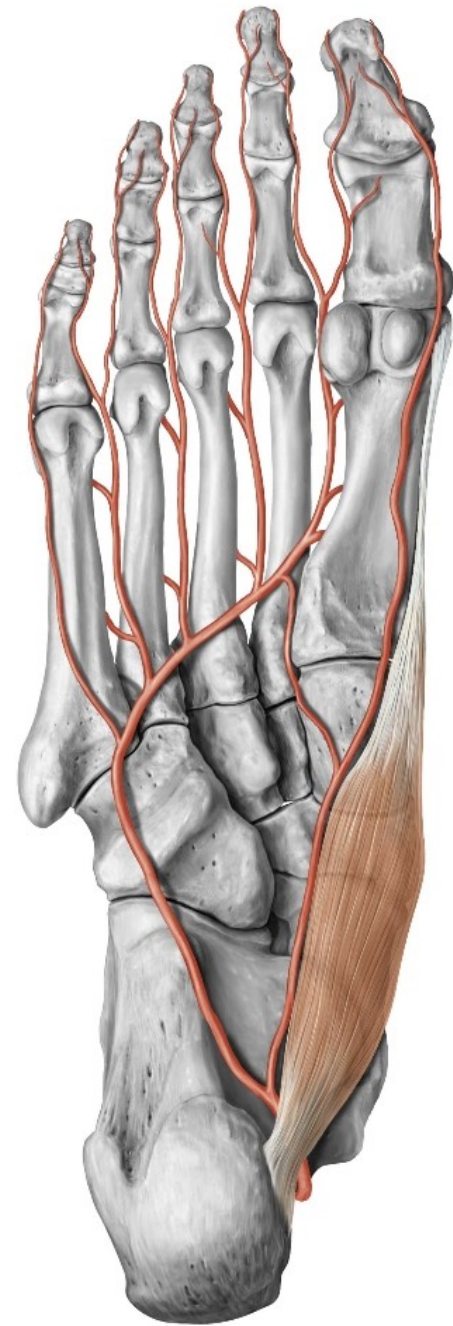


Arterial Supply to the Foot



Anterior/Dorsal View

The **anterior tibial artery** is the major blood supplier to the dorsal region of the foot. Originating from the anterior tibial artery, traveling through the tarsal tunnel (Tom, Dick And Very Nervous Harry) and terminating at the **dorsalis pedis artery**, the **lateral and medial plantar arteries** provide sufficient nutrients to the bottom of the foot.



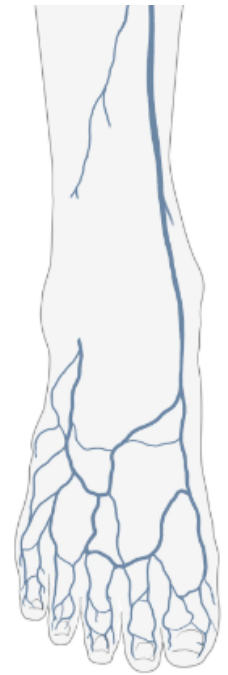
Plantar View

Deep

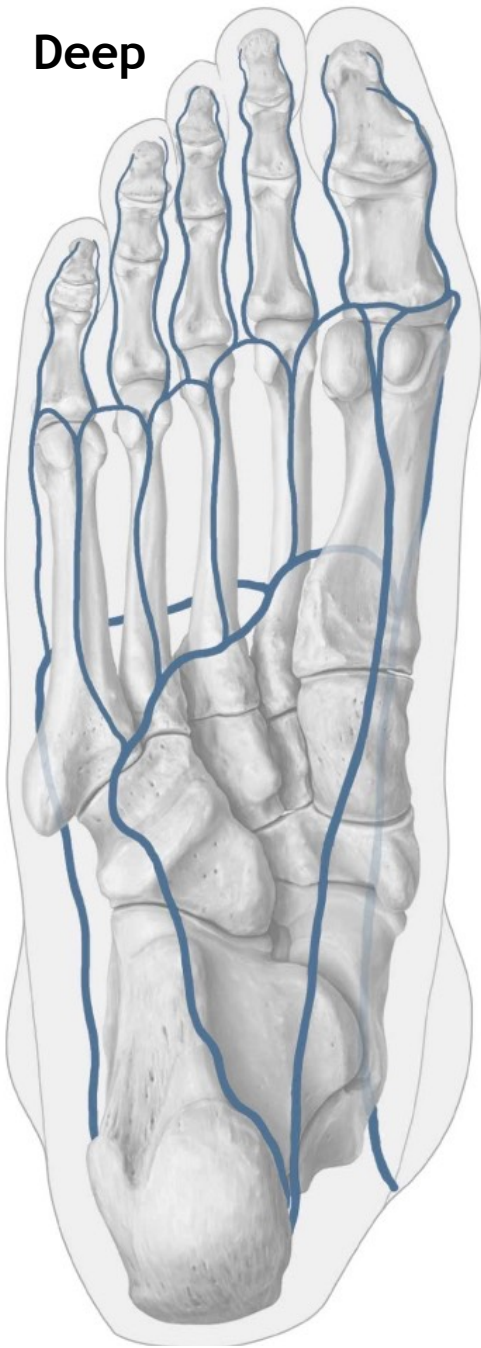
Venous Drainage of the Foot

Superficial

The **plantar digital veins** begin in the toes and run along the lateral side of toes 1-4. The plantar digital vein of the 5th toe is located medially. The veins continue to follow the metatarsals towards the heel as the **plantar metatarsal veins**. The veins of digits 2 through 5 converge to form two arches known as the **dorsal venous arch** and **plantar venous arch**. The **dorsal venous arch** gives rise to the **long (great) saphenous vein**. Digit one drains into the **medial plantar vein**. The **short saphenous vein** supplies drainage laterally to and originates around the 5th metatarsal.



The network of veins located on the top of the foot are known collectively as the **dorsal venous network**.

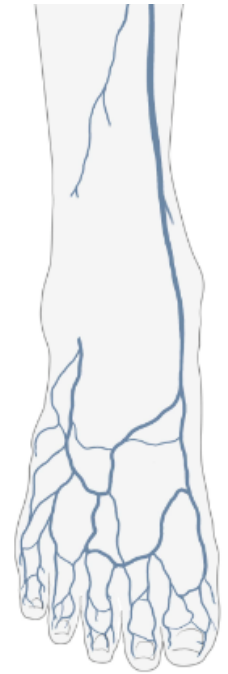


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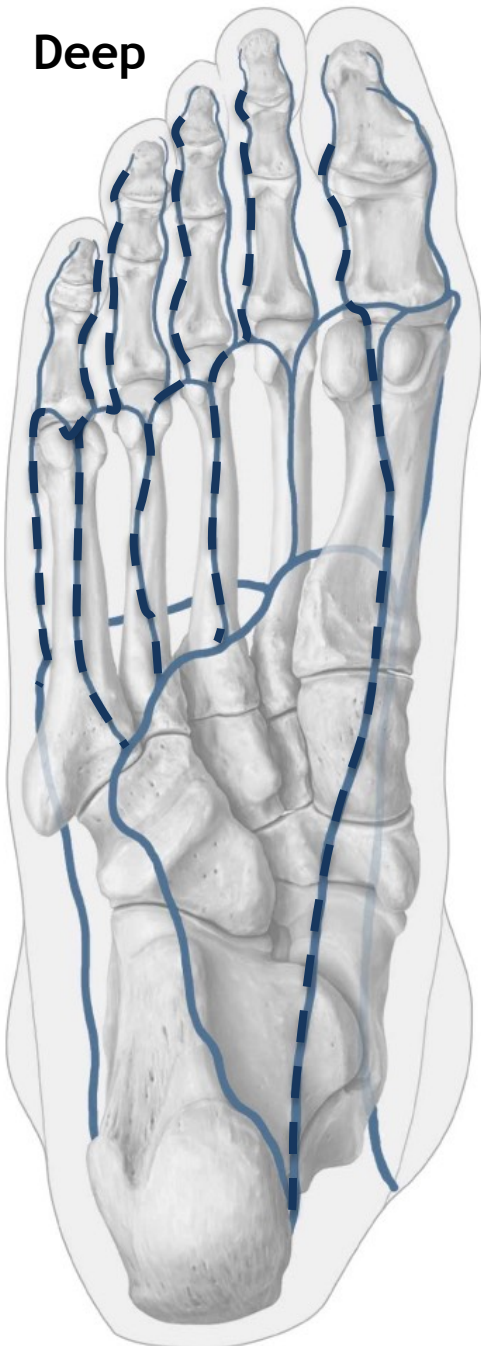
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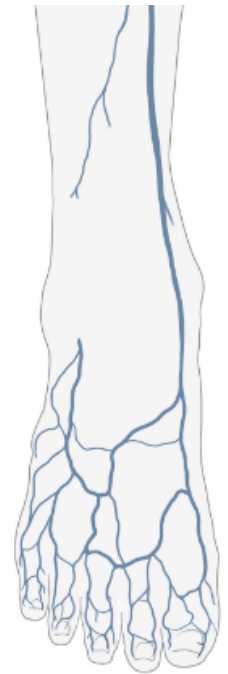
Deep

Venous Drainage of the Foot

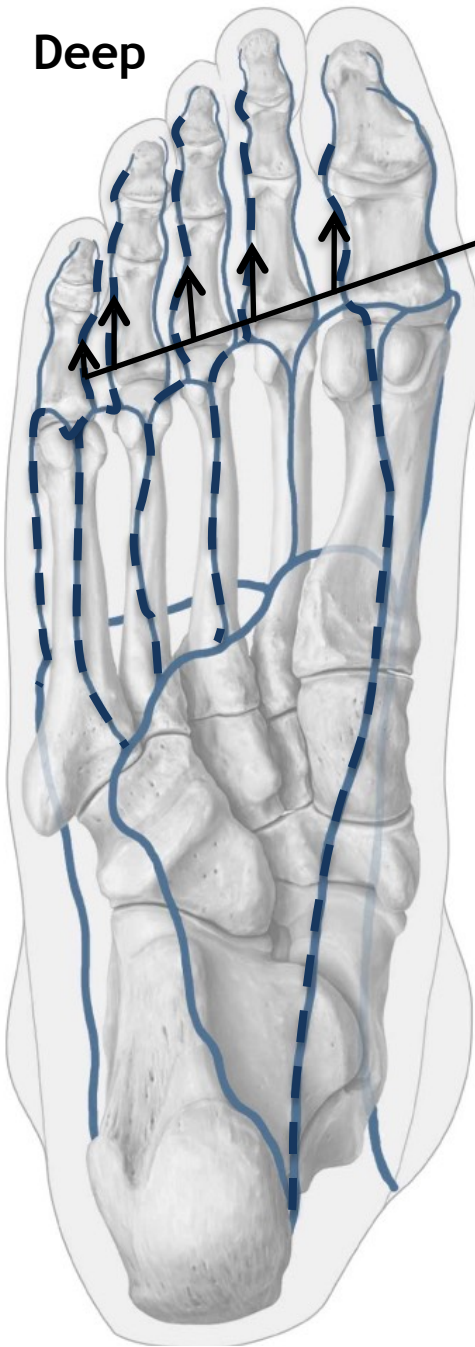
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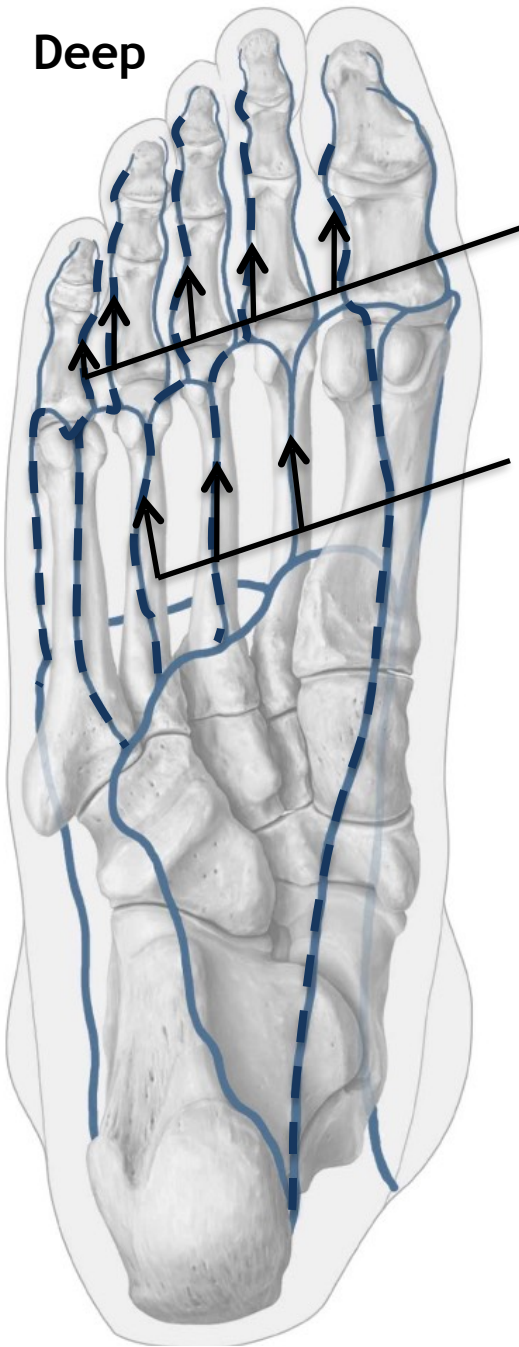
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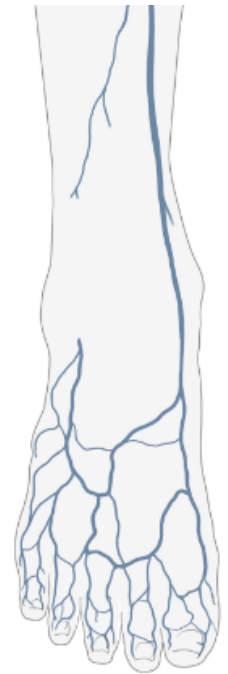
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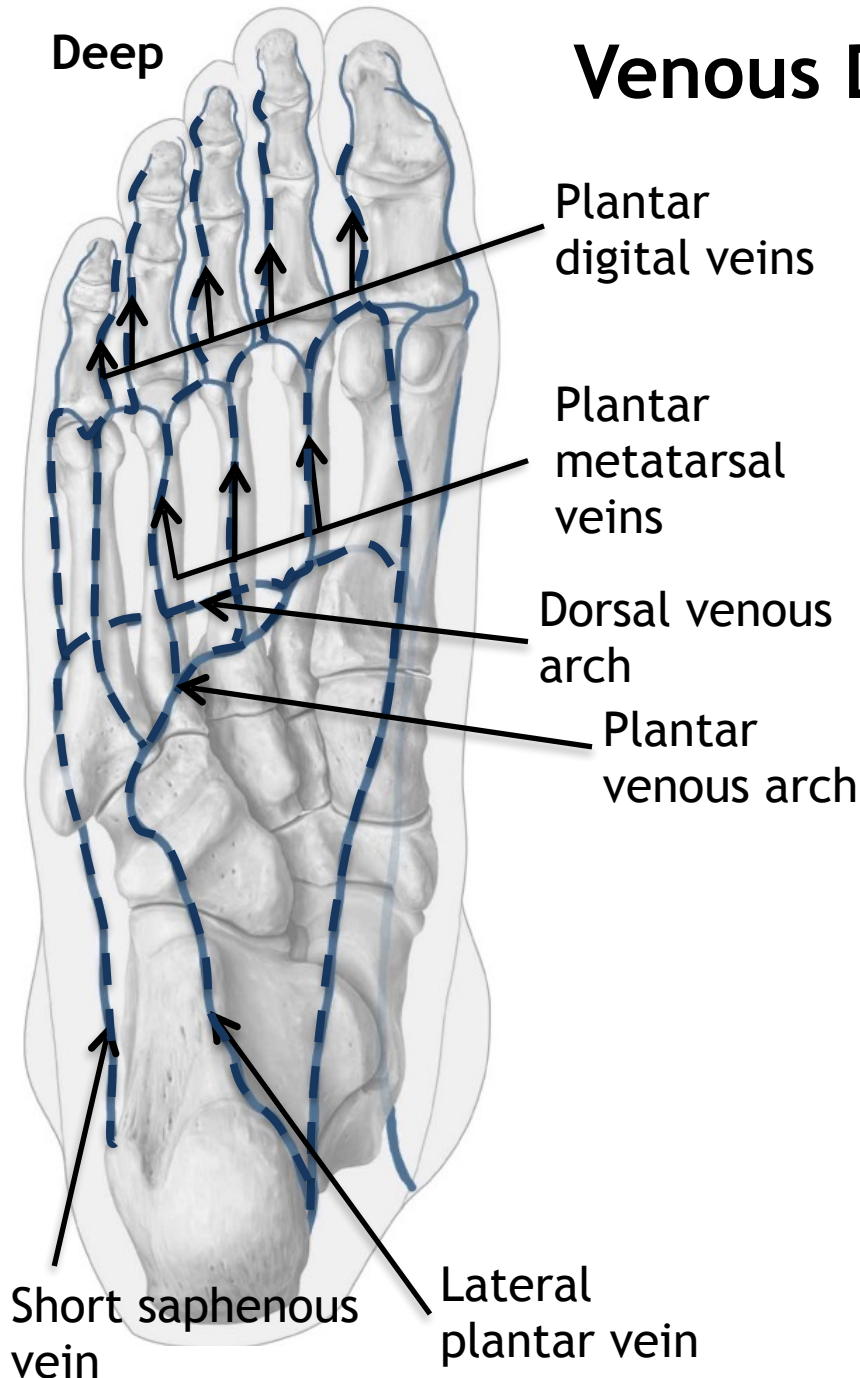


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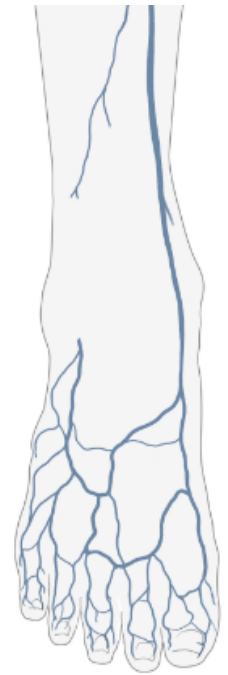
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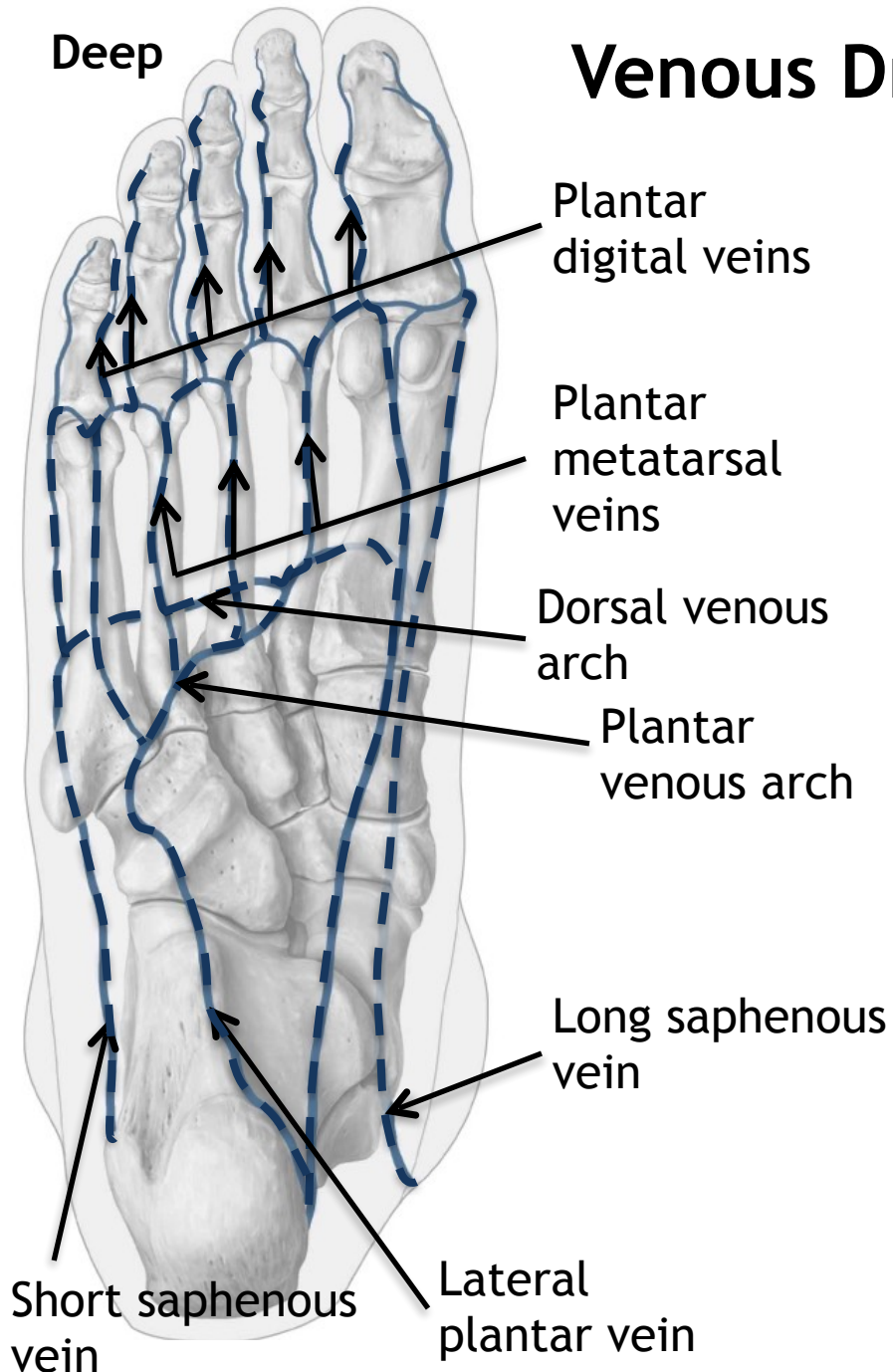


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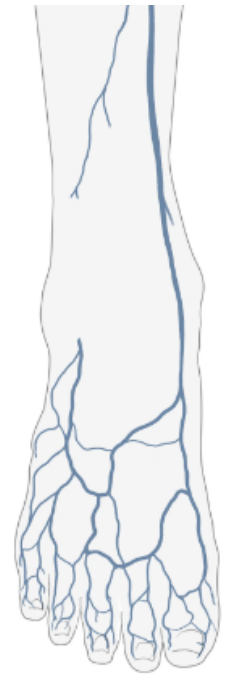
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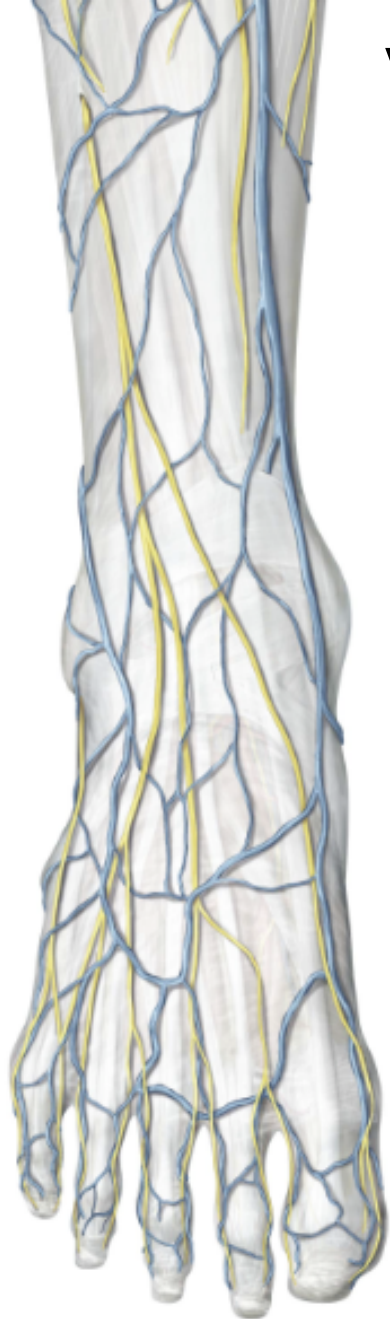
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Venous Drainage of the Foot: Superficial Veins

The blood flows....

Notice the lack of superficial veins on
the bottom of the foot...pressure...

Differentiate small saphenous and great
saphenous.

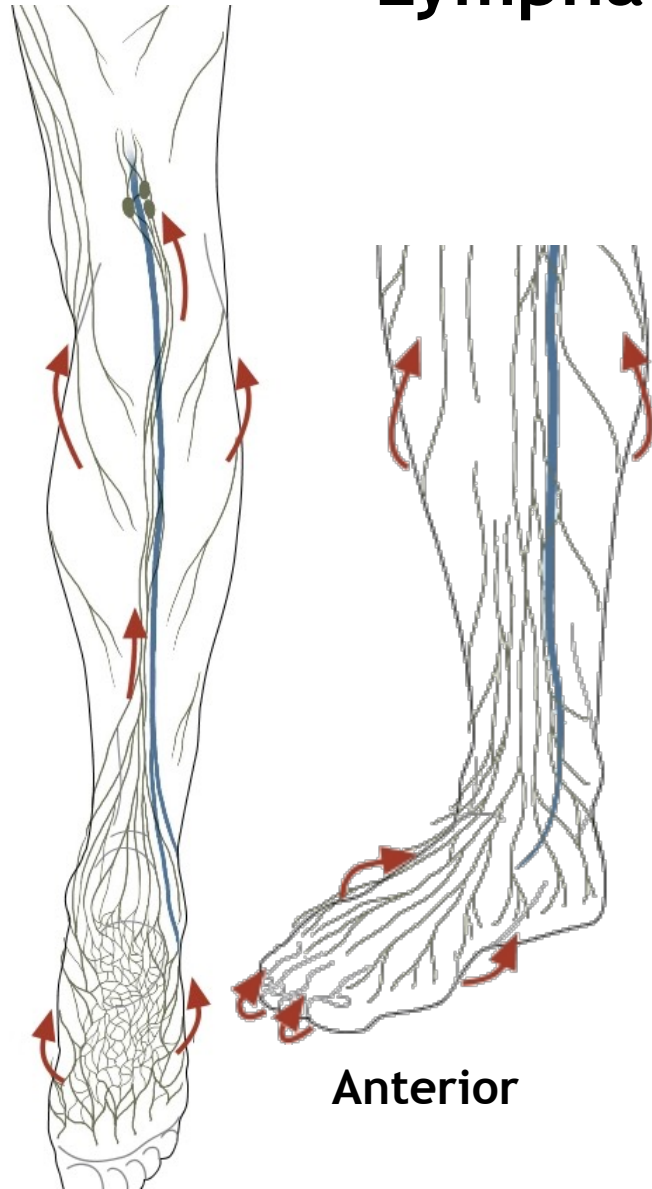


Anterior



Posterior

Lymphatic Drainage of the Foot



The lymph of the foot travels from the plantar region to the anterior region of the foot then upwards towards the lower leg and into the popliteal lymph nodes.

As with the rest of the body, the lymph follows the general venous flow of the foot.

Anterior

Posterior

For extra visual practice check out:

<http://www.getbodysmart.com/index.htm>