

LAB 16: ANTERIOR AND MEDIAL COMPARTMENTS OF THIGH; HIP JOINT

GOALS

1. Identify the parts of the hip bones, femur, patella, and tibia that are associated with the anterior and medial thigh.
2. Identify the femoral triangle, its boundaries, and contents, including the structures passing through the subinguinal space.
3. Identify the adductor canal and its contents.
4. Identify the muscles, nerves, and vessels in the anterior compartment of the thigh.
5. Identify the muscles, nerves, and vessels in the medial compartment of the thigh.
6. Identify the bony and ligamentous features of the hip joint.

OSTEOLOGY RELEVANT TO THIS SESSION



COMPLETE ANATOMY

Sacrum

Review These Parts of the Pelvic Skeleton

- Iliac crest
- Anterior superior and anterior inferior iliac spines
- Superior ramus and inferior ramus of pubis
- Body of pubis (where the pubic rami meet—the left and right pubic bodies are joined by the pubic symphysis)

- Obturator foramen
- Ischiopubic ramus
- Ischial tuberosity

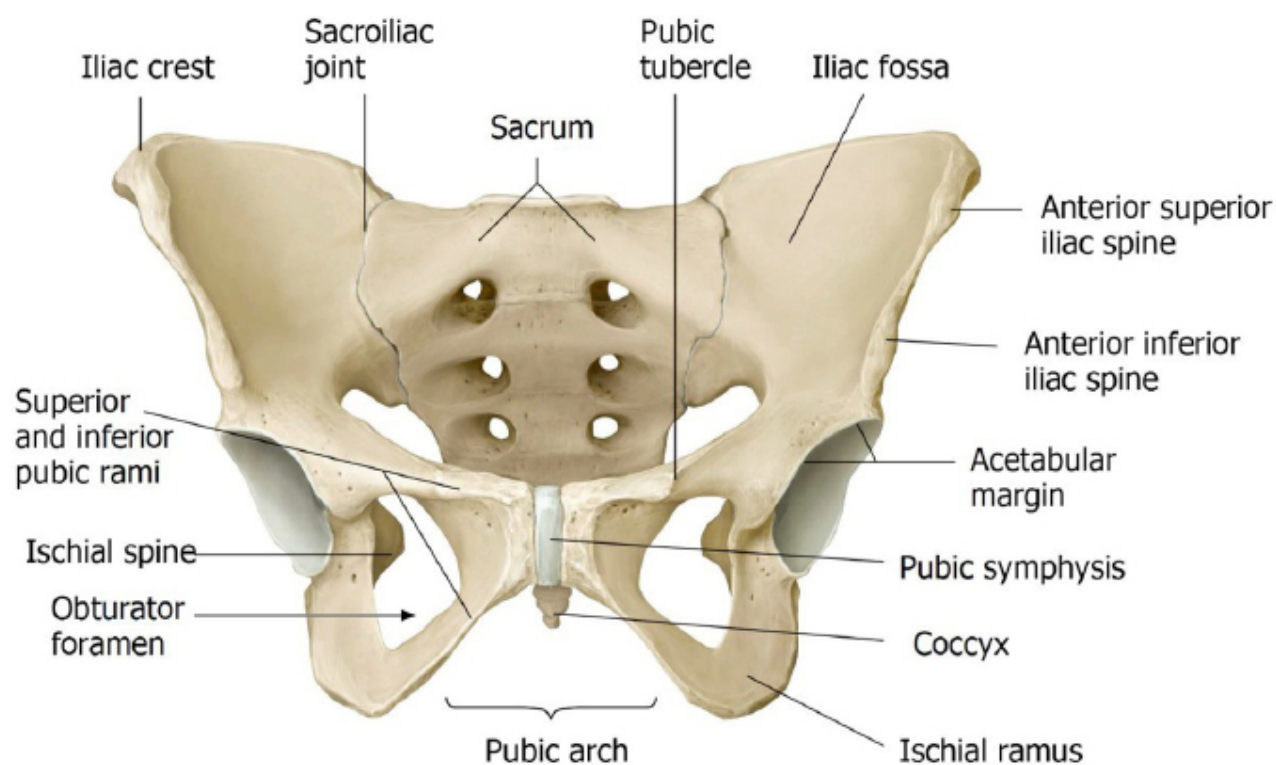


Figure 1.

Femur



COMPLETE ANATOMY

Femur

- **Head**
- **Fovea capitis** (the ligament of the head of the femur attaches here)
- **Neck**
- **Shaft**
- **Greater trochanter** (insertion for gluteus minimus and medius)
- **Lesser trochanter** (insertion for iliopsoas)

- **Intertrochanteric line** (anterior—connecting the trochanters) and **Intertrochanteric crest** (posterior—connecting the trochanters)
- **Trochanteric fossa**
- **Linea aspera**: A vertical ridge on the posterior femoral shaft where many muscles attach (origin of vastus lateralis and medialis; insertion of adductor longus, brevis, and magnus)
- **Medial and lateral condyles** (articulate with the condyles of the tibia)
- **Medial and lateral epicondyles**
- **Adductor tubercle**: On medial condyle—the hamstrings part of the adductor magnus attaches here
- **Intercondylar fossa** (notch): The cruciate ligaments occupy this space and attach on the inner surfaces of the condyles
- **Patellar surface**
- **Popliteal surface**

Patella

- A **sesamoid bone** contained within the quadriceps tendon.



QUESTION

What's a sesamoid bone?

- Identify the **base** and **apex** of the patella.

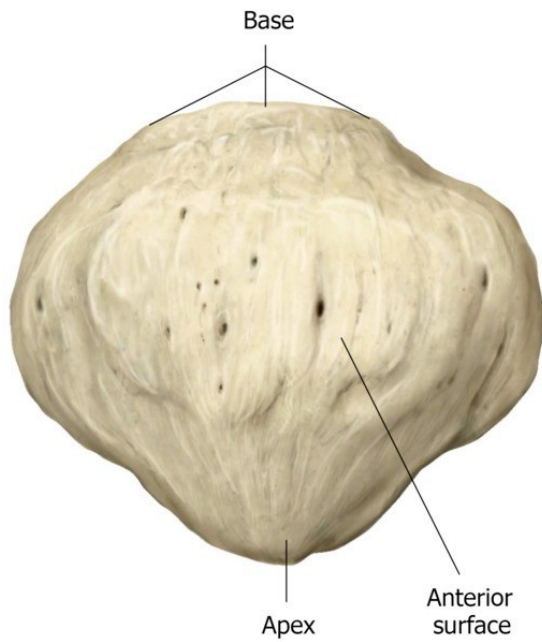


Figure 2. Patella.

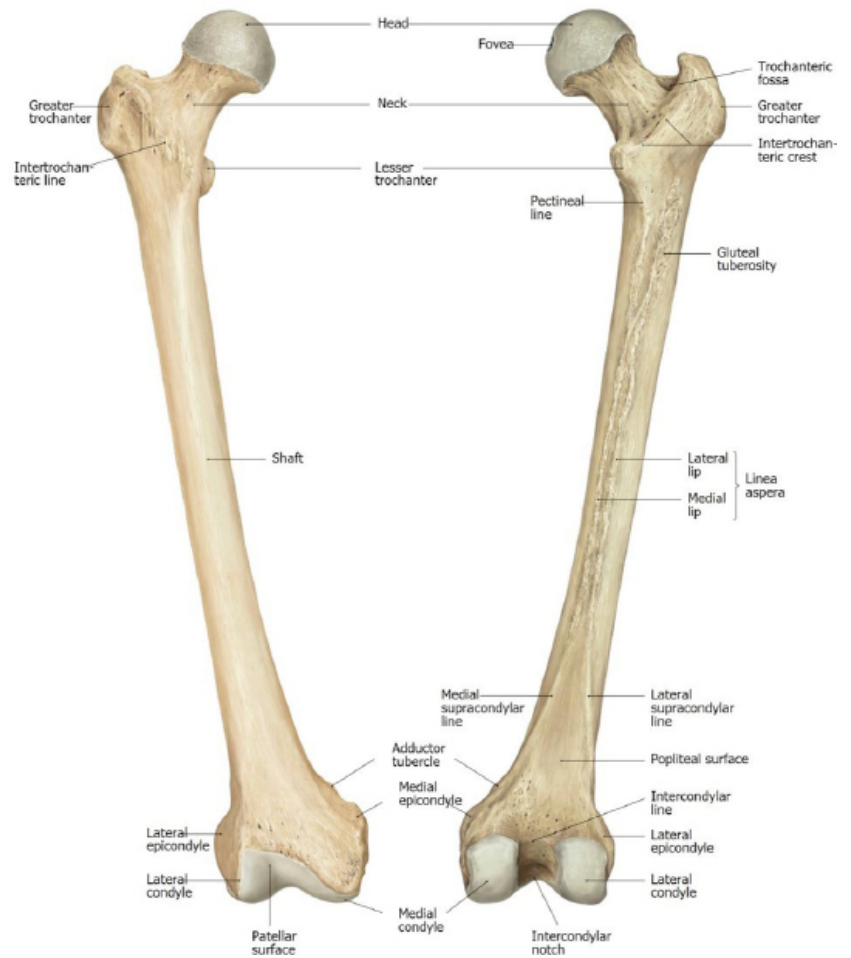


Figure 3. Anterior and posterior views of femur.

Proximal Tibia

- **Tibial tuberosity** (attachment site for the patellar ligament)
- **Anterolateral tubercle of tibia (Gerdy's tubercle)** – the distal attachment site of the iliotibial tract
- **Medial and lateral condyles (articulate with the condyles of the femur)**
- **Tibial plateau** (the menisci and cruciate ligaments of the knee attach here)
- **Anterior border of tibia** ("shin")

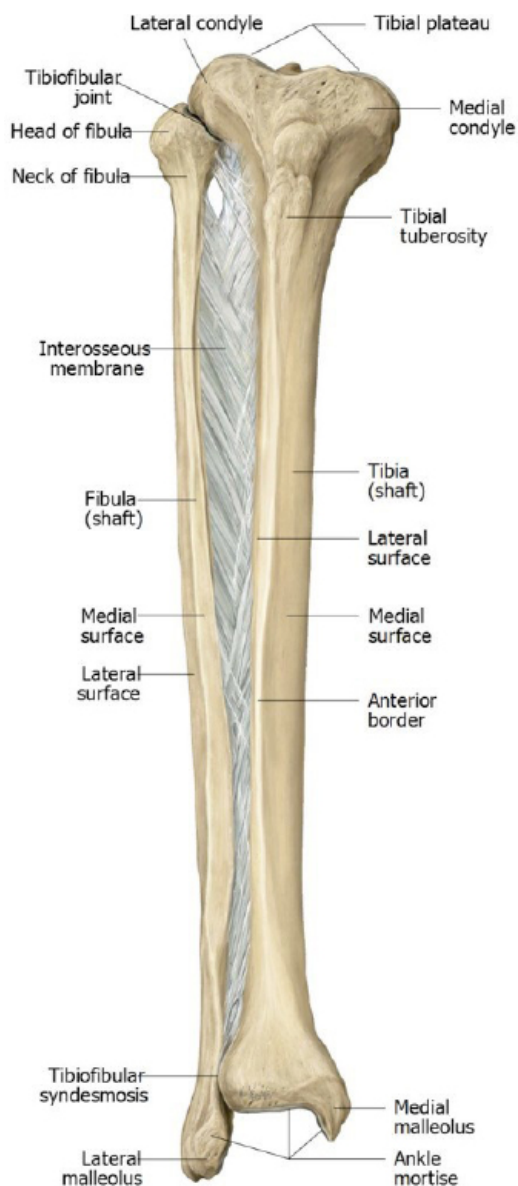


Figure 4. Right tibia and fibula. Surface Anatomy.

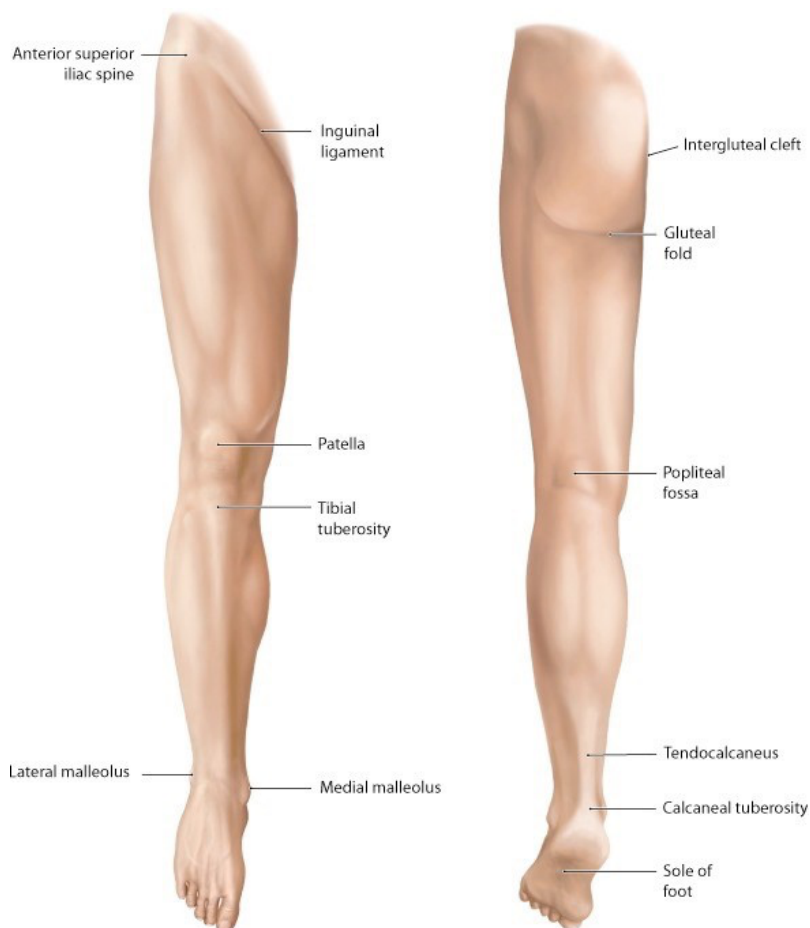


Figure 5. Surface anatomy of thigh.

Surface landmarks

Before cutting, see if you can locate and palpate the following:

- **Anterior superior iliac spine** and **pubic tubercle**—these are attachment sites for the **inguinal ligament**
- Surface projection of the **femoral artery, vein, and nerve** (visualize these by identifying the **mid-inguinal point** midway between the two bony landmarks listed above)
- **Patella**
- **Patellar ligament**—attaches distally to **tibial tuberosity**

- Medial and lateral condyles of femur
- Medial and lateral condyles of tibia

NOTE



There will be superficial and deep sides to your dissections. It's not important to select these up front—you can do this as you work—but do pay attention to the directions for the deep work later in these instructions.

Anterior Compartment of the Thigh



Both sides: Perform the following tasks on both of the limbs.

- ☐ Make a vertical incision in the skin of the anterior thigh and proximal leg from the **mid-inguinal point superiorly** to the **tibial tuberosity (just below the patella) inferiorly**.
- ☐ Make a transverse incision in the skin over the proximal tibia through the tibial tuberosity.
- ☐ **Reflect the two flaps of skin—one medially and one laterally**—to expose the superficial fascia.

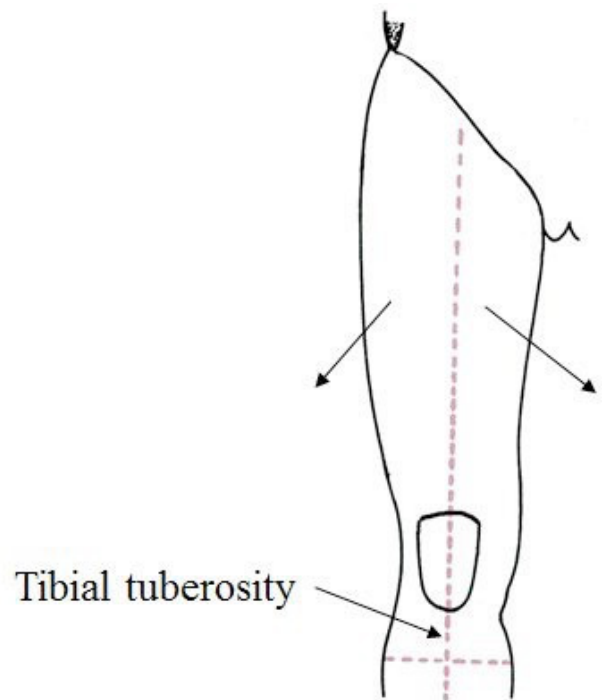


Figure 6. Skin incisions.

DON'T REMOVE TOO MUCH OF THE SUPERFICIAL FASCIA WITH THE SKIN FLAPS.

Don't cut too deep when you reflect the lateral skin flap because you might damage the **IT band**.



Don't take too much superficial fascia with the medial skin flap because you might damage the **great saphenous vein**.

- There may be lots of adipose here—the **superficial fascia in the anterior thigh** is continuous with the Camper's fascia (superficial layer of superficial fascia) of the abdominal wall.



Both sides: Identify and clean superficial vessels and nerves.



COMPLETE ANATOMY

Veins of the leg

- Use scissors and forceps to probe the superficial fascia along the medial thigh to locate the **great saphenous vein** (Figure 7).

BEST BET



Locate and clean the great saphenous vein in the superficial fascia on the medial side of the knee and then follow it upwards along the medial thigh.

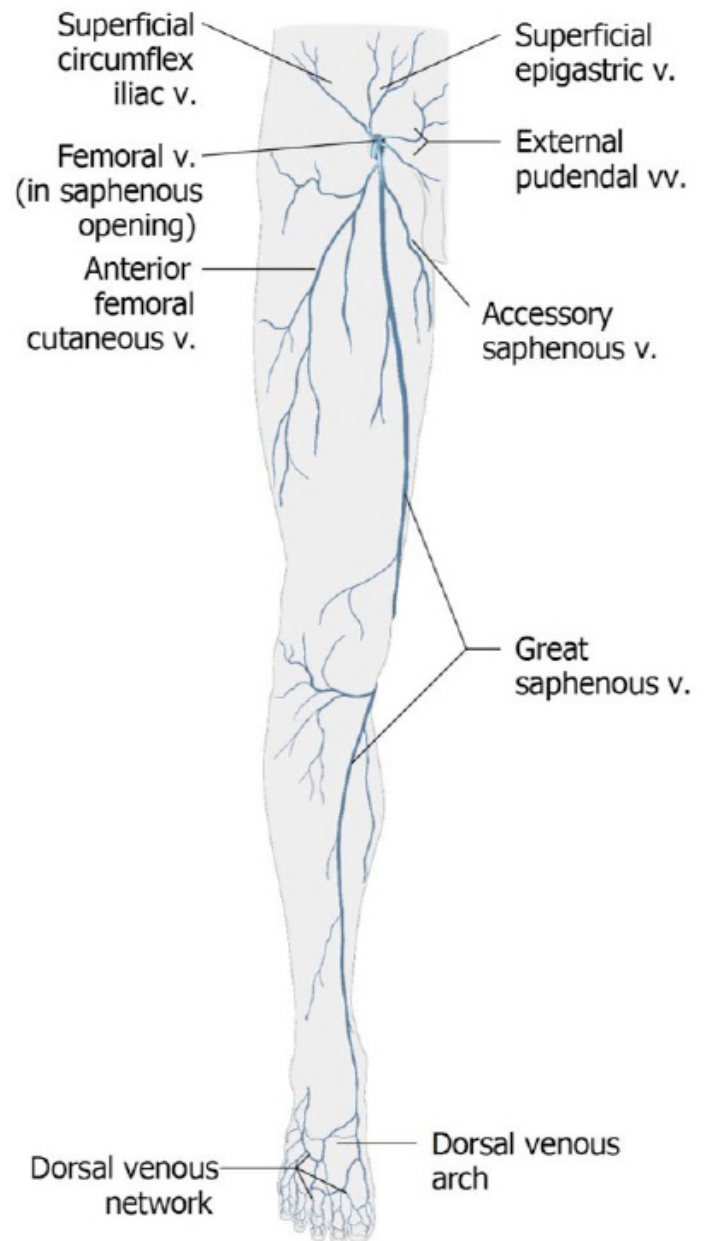


Figure 7. Superficial veins of the anterior thigh.

- Clean the vein from inferior to superior and note in the upper thigh (just below the inguinal ligament) that the vein is joined by several large tributaries, including the **external pudendal veins** (these receive blood from the external genitalia).
- The great saphenous vein is a tributary of the femoral vein. These veins join just below the inguinal ligament. See Figures 7 and 8.
- Clean the superficial fascia from the anterior thigh—noting any cutaneous nerves. These are **anterior cutaneous branches of the femoral nerve**. See Figure 8.
- Locate the **lateral cutaneous nerve of the thigh** piercing the inguinal ligament several centimeters medial to the ASIS. See Figure 8.

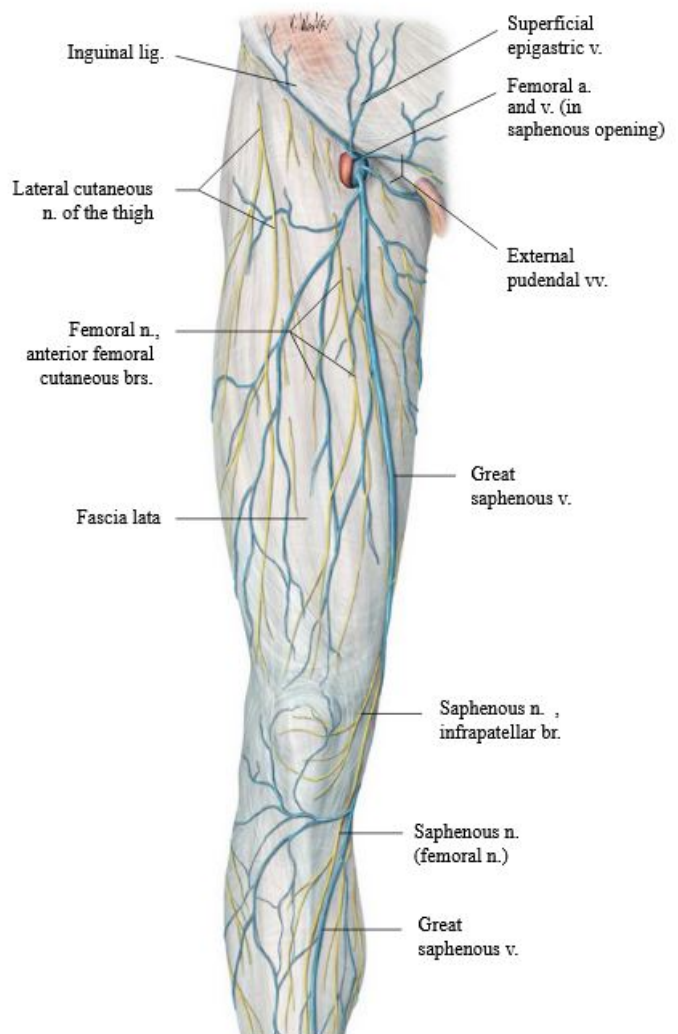


Figure 8. Superficial veins and nerves of the anterior thigh.

- **After the superficial fascia is removed, you will see the tough and dense deep fascia of the thigh = the fascia lata.** This fits the thigh like a tight stocking.
- There is a hole in the fascia lata called the **saphenous opening** just inferior to the inguinal ligament. The **great saphenous vein** passes through this hole to drain into the **femoral vein**.
- The **femoral nerve, artery, and vein** are deep to the fascia lata in the upper thigh.
- **Identify a few superficial inguinal lymph nodes** in the superficial fascia, scattered around the saphenous opening and inguinal ligament. See Figure 9.

CLINICAL CORRELATION



The superficial inguinal nodes receive lymph from the entire lower limb, most of the perineum, and the superficial tissues of the abdominal wall and back, below the level of the umbilicus. That's a lot of territory!!

□ **Deep inguinal nodes** are deep to the fascia lata, in or near the **femoral canal** (remember this potential space?). You won't see these yet.

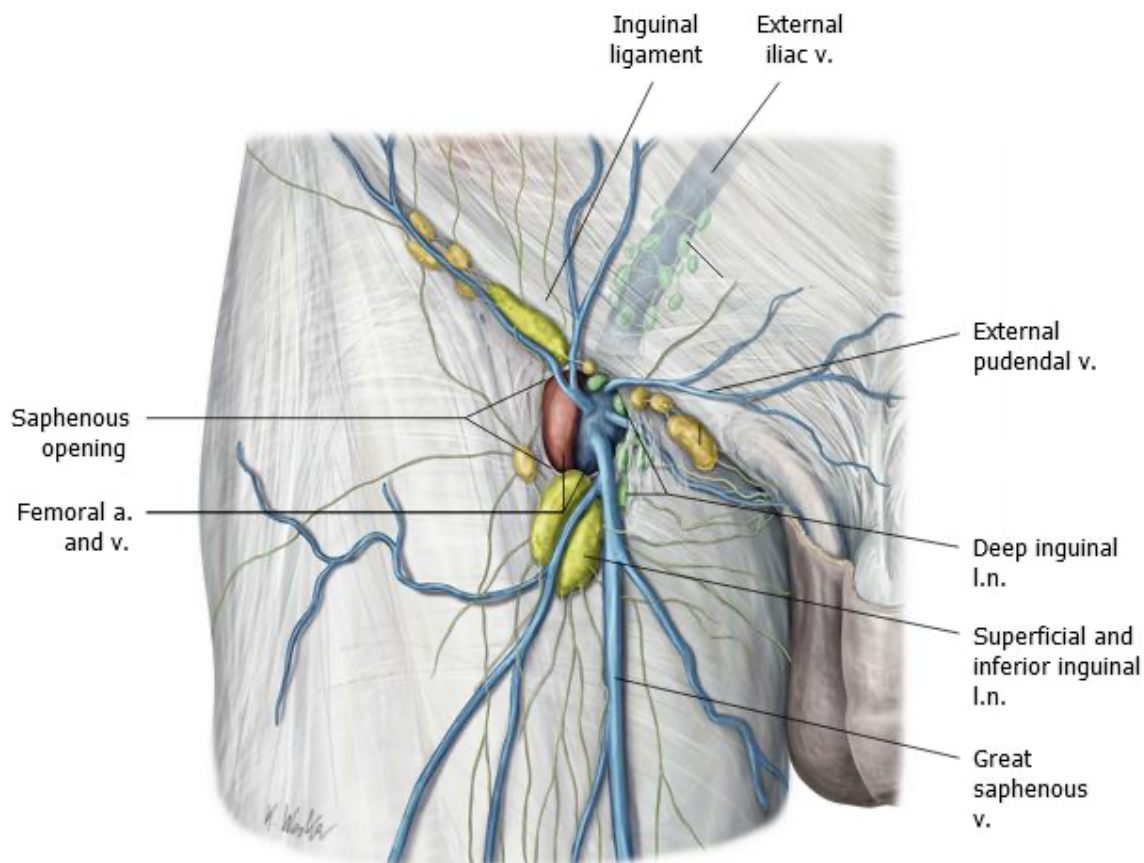


Figure 9. Inguinal lymph nodes.



Both sides: Clean and identify the deep fascia (fascia lata).

ALERT



The fascia lata along the lateral thigh is thick and is known as the **iliotibial tract** (also called the IT band). **Remove the deep fascia from the anterior thigh, but LEAVE THE FASCIA LATA along the lateral thigh.**

- ☐ Identify the **tensor fasciae latae muscle** originating from the lateral margin of the iliac crest. It inserts into the IT tract. See Figure 10.
- ☐ The IT tract crosses the knee joint and attaches to **Gerdy's tubercle (anterolateral tubercle of tibia)** on the lateral condyle of the proximal tibia.
- ☐ Use scissors to remove the fascia lata just below the inguinal ligament. The area deep to the inguinal ligament is the **subinguinal space** = it connects the abdominopelvic cavity to the upper thigh.

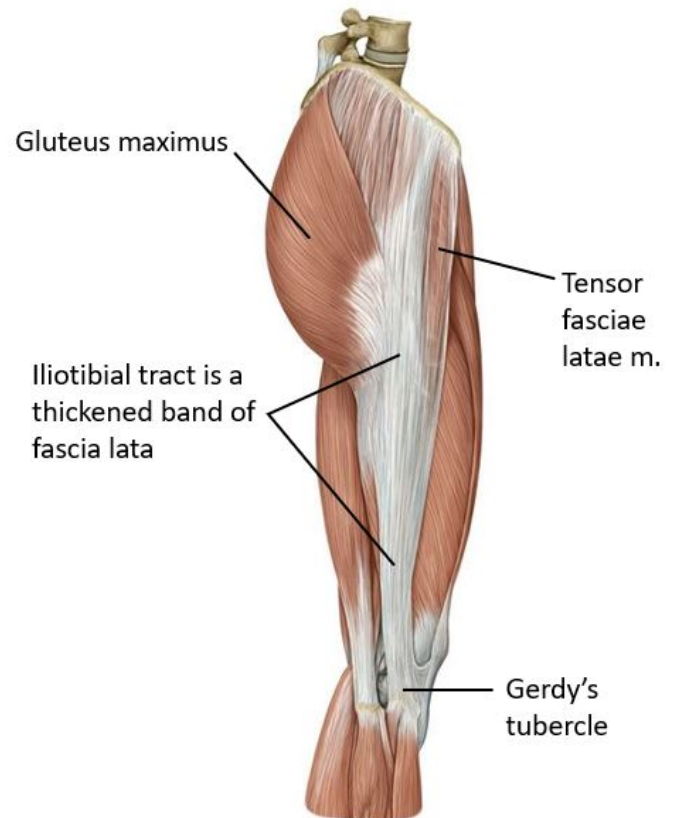


Figure 10. Iliotibial tract (band).

REVIEW!



The neurovascular structures in the subinguinal space—from lateral to medial—can be remembered with a simple mnemonic: **NAVEL** = what does this mean?

QUESTION



How could you identify the location of the **femoral artery** on the surface of the proximal thigh? Why is this important to know?

QUESTION



What is the clinical relevance of the femoral canal (the “empty space” in the NAVEL mnemonic)?

- The **iliopsoas muscle** also passes through the subinguinal space, lateral to the femoral vessels. See Figures 11 and 12.

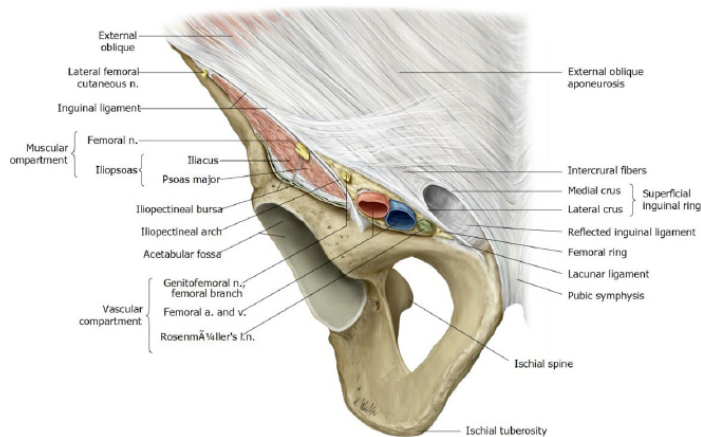


Figure 11. Structures traversing the subinguinal space.

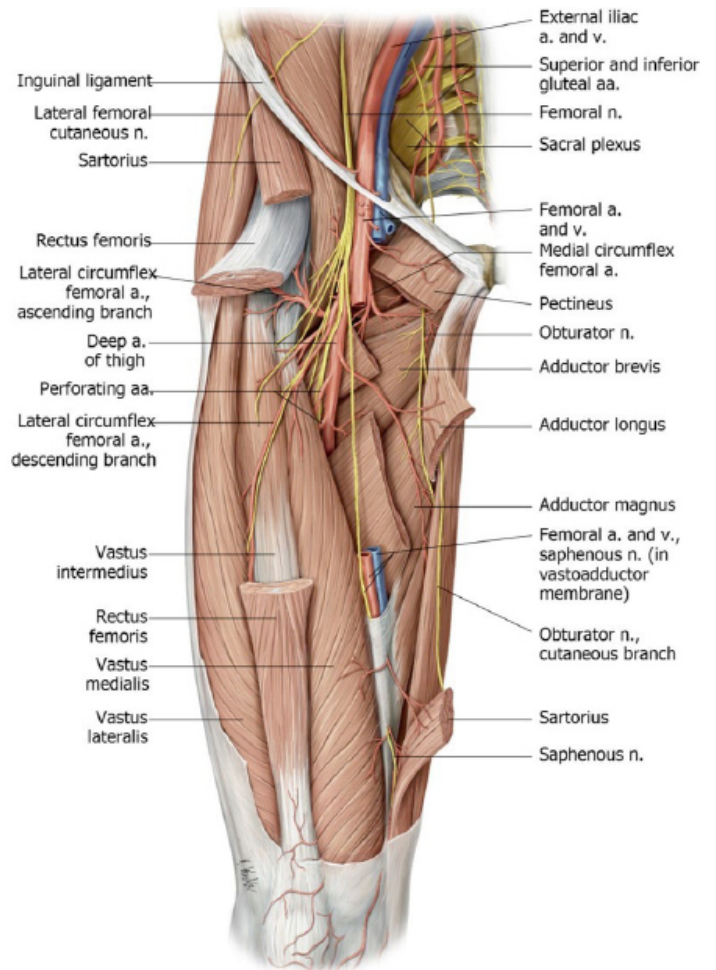


Figure 12. Structures traversing the subinguinal space.



Both sides: Clean the femoral triangle.



COMPLETE ANATOMY

Femoral triangle

- Identify and clean the deep fascia from the **sartorius** and **adductor longus** muscles. Together with the inguinal ligament, they define the **femoral triangle** (inverted triangle: broad above, tapered below).
- Clean and separate the **femoral vessels** and the **femoral nerve** within the triangle. Any nodes you find medial to the femoral vein are **deep inguinal nodes**.
- Identify and clean the muscles in the floor of the triangle: the **iliopsoas** and **pectineus**.

QUESTION

The **iliopsoas** is a compound muscle formed by the fusion of two muscles. Which muscles? Identify the origins and innervations of the two muscles that make up the iliopsoas. Where does the iliopsoas insert? What is its function?

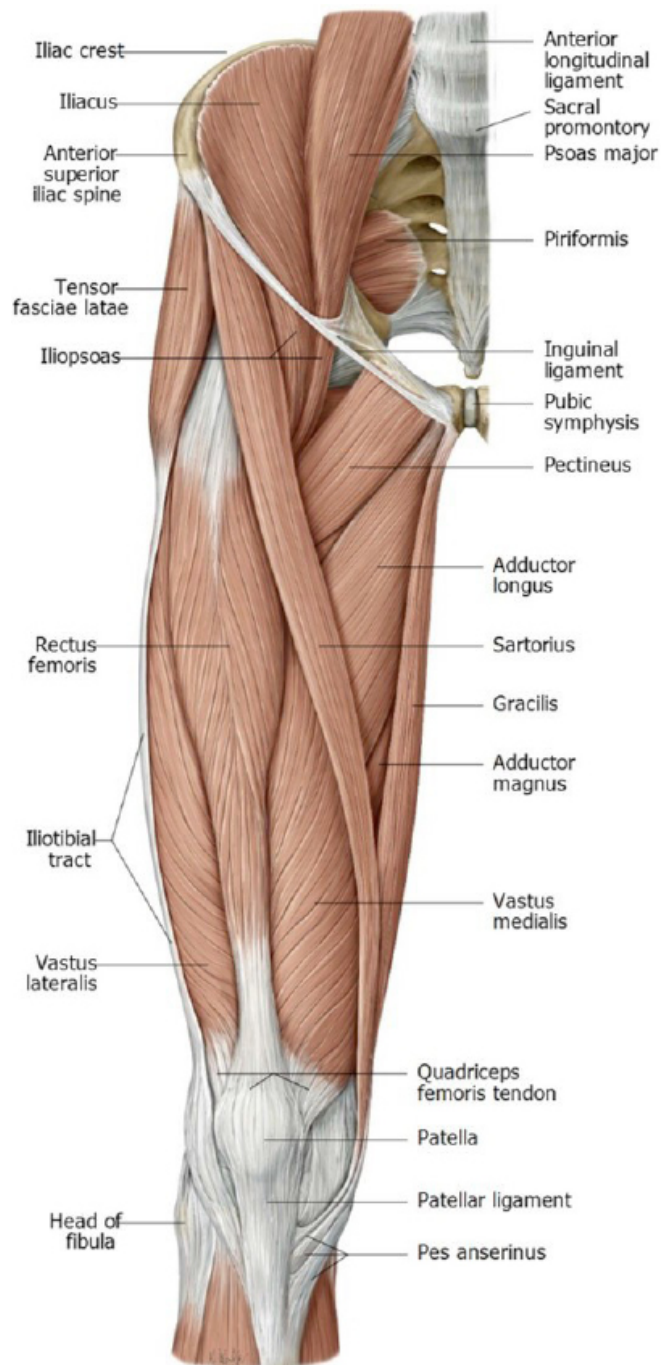


Figure 13. Muscles of the anterior thigh.

Identify these *femoral nerve branches* within the femoral triangle:

- **Motor branches** to the quadriceps, sartorius, and pectineus
- **Anterior cutaneous branches** to the skin of the anterior thigh. These will be stumps since the skin has been removed.
- *The terminal branch* of the femoral nerve is the **saphenous nerve**—it leaves the apex of the femoral triangle to enter the **adductor canal**.

NOTE

The saphenous nerve has no function in the thigh. It is an important sensory nerve below, supplying the medial side of the knee, leg, and foot.



CHALK TALK



Sketch the boundaries of the femoral triangle.

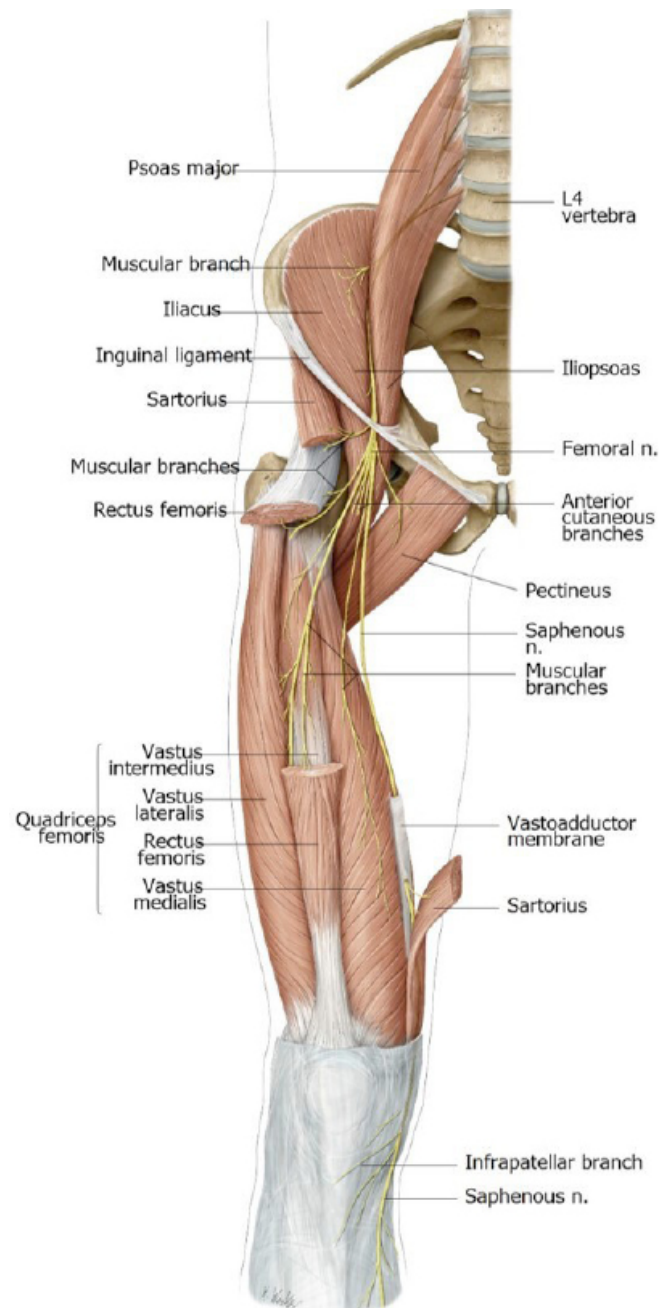


Figure 14. The femoral nerve and its branches.

Vessels in the Anterior Thigh



One side: Preserve veins.
Other side: Remove veins.

Arteries in the Anterior Thigh

On one side, remove the veins to get a better look—keep the veins on one side of the dissection.

□ Clean and identify these **branches of the femoral artery** within the femoral triangle. You will be able to follow them easier on the side where the veins have been removed.

- **Deep artery of the thigh (Profunda femoris artery)**. The largest branch of the femoral artery and the chief source of blood to the thigh. It usually arises from the lateral or posterior side of the femoral artery in the femoral triangle.
- **Lateral and medial circumflex femoral arteries**. These usually arise from the deep artery of the thigh, but may branch from the femoral artery.
- The **lateral circumflex femoral** arises from the lateral side of the deep artery of the thigh and circles around the anterior side of the proximal femur. The **medial circumflex femoral** arises from the medial side of the deep artery and circles behind the proximal femur. As the names suggest, the circumflex femoral arteries form an anastomosis around the proximal femur. See Figure 15.

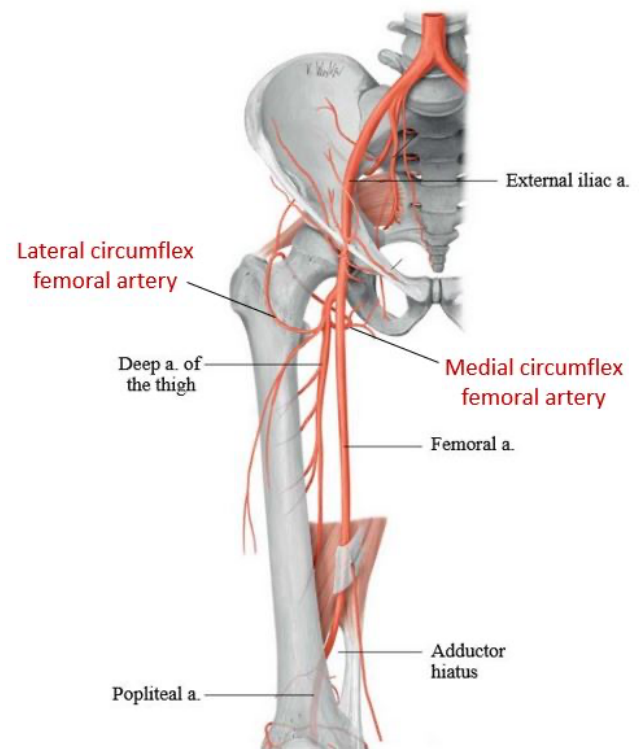


Figure 15. Branches of the femoral artery in the thigh.

CLINICAL CORRELATION

Clinicians often use different terminology when describing the femoral artery in the thigh.



The proximal part between the inguinal ligament and the origin of the deep artery of the thigh is referred to as the “**common femoral artery**.” The part of the femoral artery distal to the origin of the deep artery of the thigh is referred to as the “**superficial femoral artery**.”

CLINICAL CORRELATION



The medial circumflex femoral artery is important since it is the chief blood supply to the head and neck of the femur. Why is this clinically important (think hip fractures)?



Expose the adductor canal.

DO THIS ON ONE SIDE.

This will be the DEEP SIDE of your dissection.



NOTE

It might be easiest if the DEEP side of your dissection is done on the detached limb—the one that was separated from the body when you hemisected the pelvis. This limb can be laid on its side so the medial compartment can be accessed and visualized better when you dissect this area.

- ☐ Clean the **sartorius muscle** and then transect it just above the apex of the femoral triangle.
- ☐ Reflect the inferior part of the cut muscle to expose the **adductor canal (Hunter's canal)**. See Figure 16. It connects superiorly to the apex of the femoral triangle and inferiorly it opens into the **popliteal fossa** via the **adductor hiatus** (a gap in the adductor magnus muscle). *The adductor canal thus connects the anterior thigh to the popliteal fossa (posterior to the knee).* Distal to the adductor hiatus, the femoral vessels change their names to the **popliteal artery and vein**—same vessels, different names.

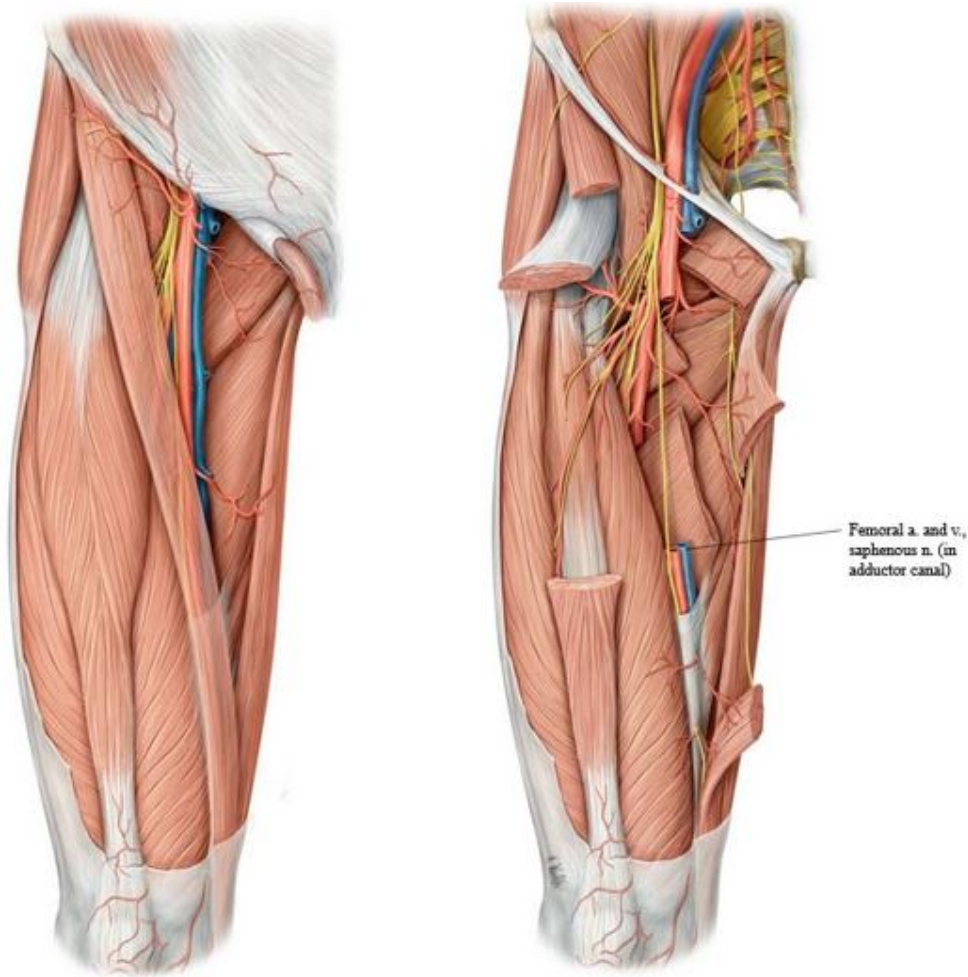


Figure 16. Exposing the adductor canal.

□ Adductor canal contents:

- **Femoral artery and vein**
- **Saphenous nerve (from the femoral nerve):** The saphenous nerve enters the proximal part of the adductor canal but *does not* leave the canal distally (through the adductor hiatus). ***It becomes superficial at the medial knee, passing distally along the medial side of the leg in the superficial fascia with the great saphenous vein.***

CLINICAL CORRELATION



A blow to the inner knee compresses the saphenous nerve against the superficial bones here. That hurts! This is the “funny bone” of the lower limb!



Both sides: Identify and clean the quadriceps femoris.

Deep side (same side as the transected sartorius): Cut through the rectus femoris muscle.



COMPLETE ANATOMY

Anterior compartment of the thigh

- ☐ Clean the fascia from the quadriceps femoris.

QUESTION



What are the four muscles that make up the quadriceps femoris?

- ☐ On the deep side (same side as transected Sartorius), cut the rectus femoris near its mid-point in the anterior thigh. Reflect the superior part of the muscle.

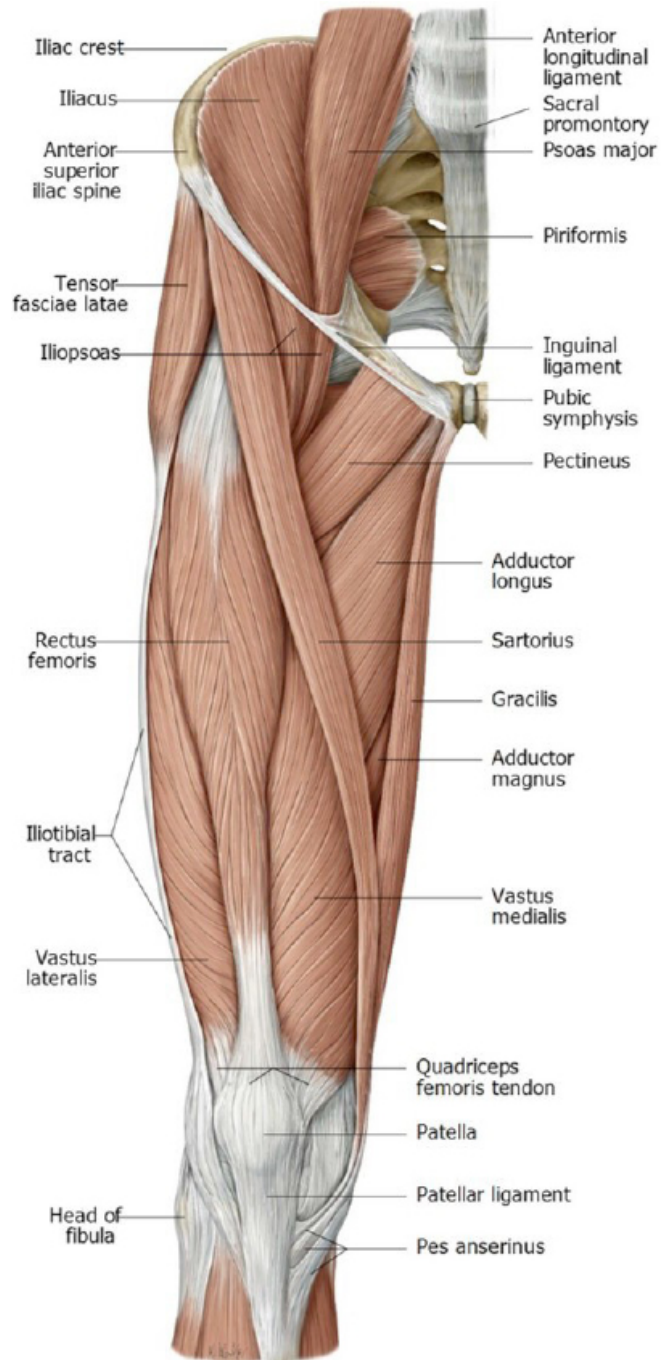


Figure 17. Quadriceps femoris.

NOTE



The **rectus femoris** has two proximal attachments (origins) on the hip bone. One is from the **anterior inferior iliac spine**. The other is from ilium, just above the acetabulum.

- Identify the three **vastus muscles**: **medialis**, **lateralis**, and **intermedius**.
- These muscles along with the rectus femoris join distally and attach to the superior border (base) of the patella via the **quadriceps tendon**.

NOTE

Note that part of the vastus medialis continues several centimeters below the quadriceps tendon, attaching to the medial side of the patella. This lower part of the vastus medialis produces a noticeable bulge on the surface and is often referred to as the **vastus medialis obliquus (VMO)**. It is thought to be important for maintaining normal patellar tracking = preventing lateral pull on the patella (due to the “**Q angle**”—see **Anterior and Medial Compartments of the Thigh** in the **Gross Anatomy textbook**). See Figure 18.

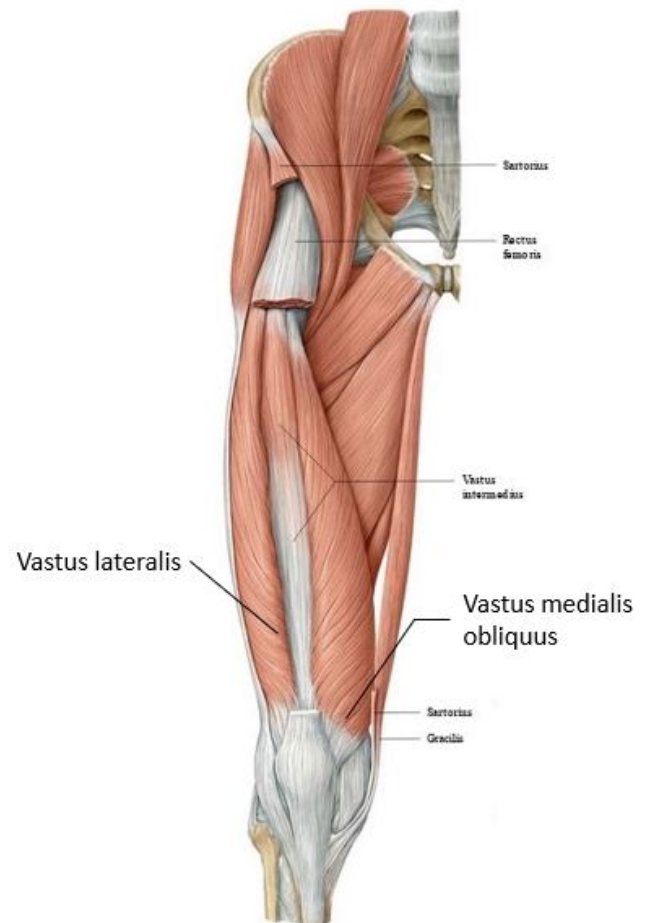


Figure 18. Vastus muscles.

- Distal to the patella, observe the **patellar ligament** attaching to the **tibial tuberosity**.



Both sides: Dissect the medial (adductor) compartment of the thigh.



COMPLETE ANATOMY

Nerves and muscles of the medial compartment of the thigh

- ☐ Clean and separate via blunt dissection the **adductor longus**, **adductor brevis**, **adductor magnus**, **pectineus**, and **gracilis muscles**. See [Figure 19](#).

QUESTION

The obturator nerve supplies all these muscles EXCEPT the pectineus. Which nerve innervates the pectineus? Can you locate the obturator nerve above in the pelvic cavity? Which spinal nerves give rise to the obturator nerve? How does the obturator nerve leave the pelvic cavity and enter the thigh?



Deep side (same side where you transected the sartorius and rectus femoris): Cut the adductor longus just below its proximal attachment to the pubic bone and reflect it inferiorly.

- ☐ Identify the **adductor brevis muscle** (the “baby” of the adductor group). ***The obturator nerve splits around the adductor brevis.*** The **anterior branch of the obturator nerve** passes in front of the adductor brevis.
- ☐ Cut the adductor brevis muscle just below its proximal attachment. Reflect it inferiorly and find the **posterior branch of the obturator nerve** behind the adductor brevis.
- ☐ Now you can observe the grandeur of the huge **adductor magnus muscle**. They don’t call it “magnus” for nothing!

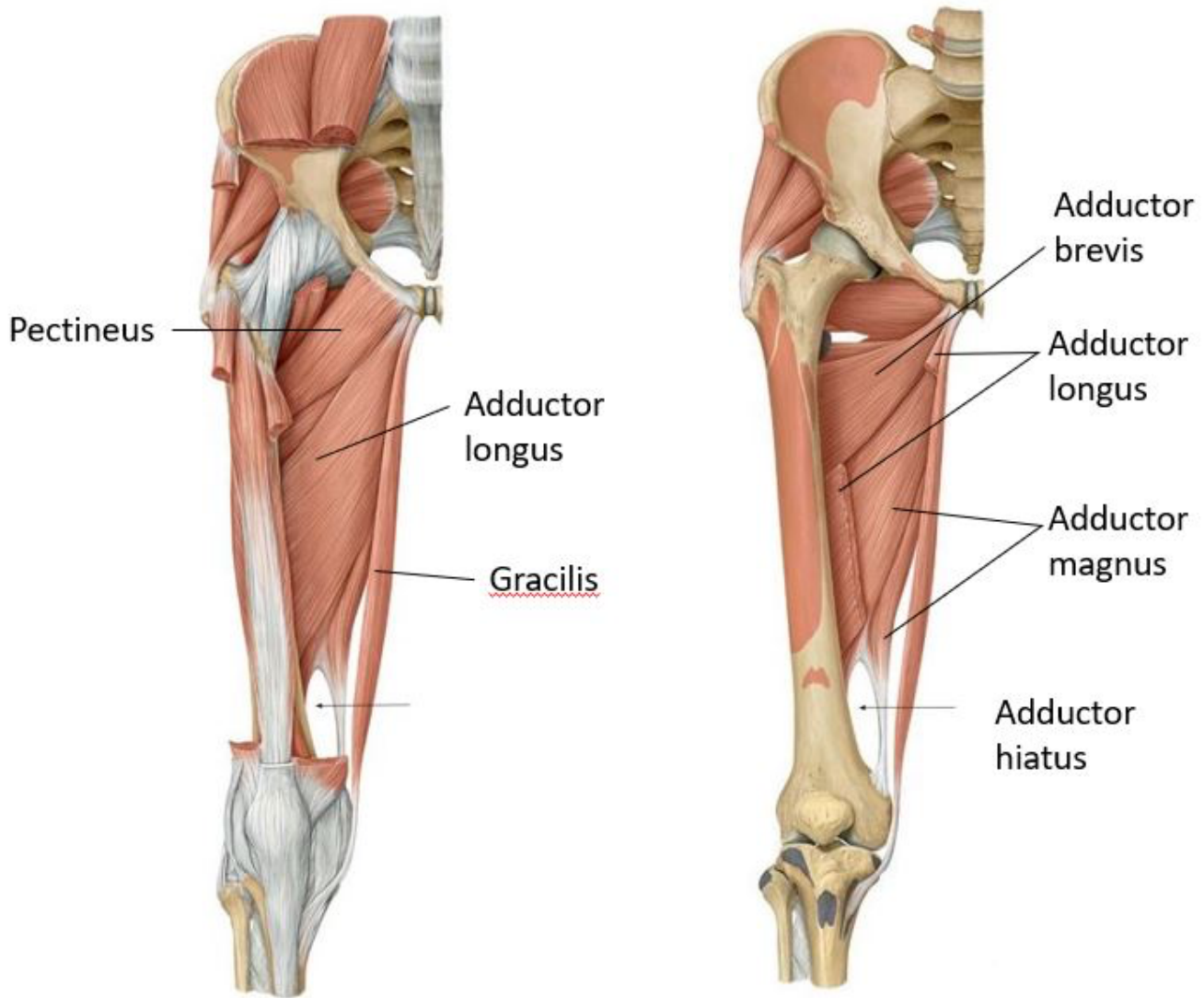


Figure 19. Muscles in the medial compartment of the thigh.

□ Recall that the adductor magnus has two parts: **Adductor part and hamstrings parts**. See if you can identify each. These two parts of the adductor magnus have different functions and different innervations.

- The **adductor part** has the same functions and innervation as the other “adductor” muscles.
- The **hamstrings part** has the same function (at the hip joint) and same innervation as the hamstrings.
- The **adductor hiatus** is between the two parts of the adductor magnus. *Recall that it is the distal opening of the adductor canal.* See [Figure 19](#).

Hip Joint

(Use the model—and view a prosection if available.)



COMPLETE ANATOMY

Hip joint

- On a model, identify the extracapsular ligaments of the hip joint: **iliofemoral** (“Y” ligament of Bigelow), **pubofemoral**, and **ischiofemoral**.



QUESTION

Of these, which is the strongest?

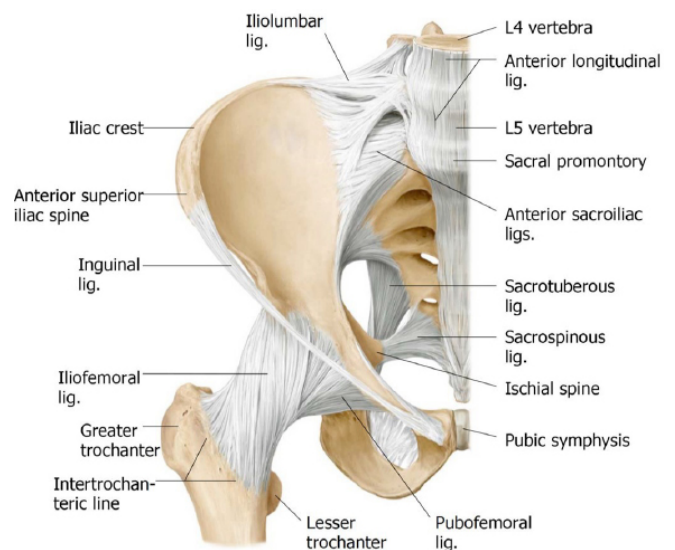


Figure 20. Extracapsular ligaments of hip joint.

- Examine the open hip joint. Identify the **femoral head**, **acetabulum**, and **acetabular labrum**.

NOTE



Both the head and neck of the femur are within the articular capsule of the hip joint (they are intracapsular).

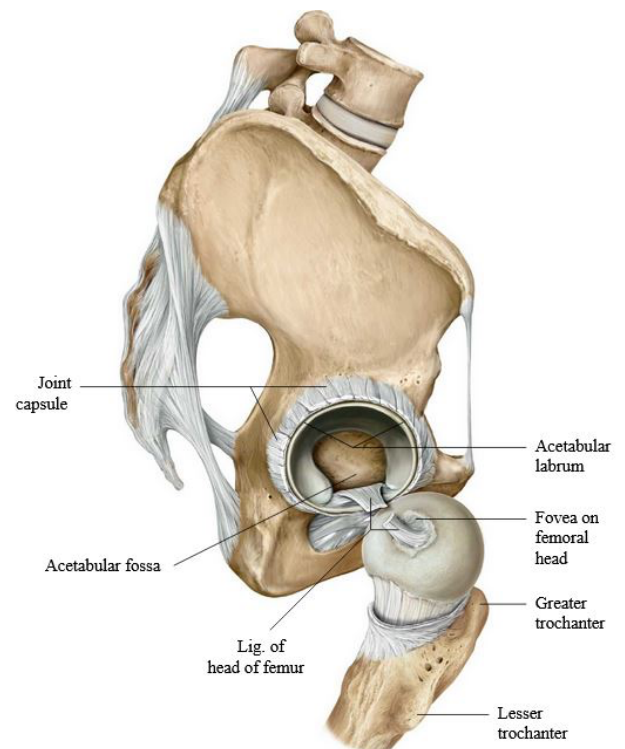


Figure 21. Open hip joint.

CHECKLIST, LAB #16

REVIEW AND MAKE SURE YOU HAVE IDENTIFIED EACH OF THE STRUCTURES BELOW.

BONES

- See the lists above, in the Osteology section of the Dissection Guide

MUSCLES AND FASCIA

- Know attachments, actions, and innervations of muscles. If we are learning specific bony landmarks (greater and lesser trochanters, adductor tubercle of femur, for example), you should know the muscles that attach to them. If muscles have broad, somewhat ill-defined origins (like the adductor muscles from the pubic bones)—know the attachment in broad terms (proximal attachments of adductors are to pubic bones—that's broad!).
- Quadriceps femoris muscle: Rectus femoris, vastus medialis, vastus intermedius, vastus lateralis
- Quadriceps tendon and Patellar ligament
- Sartorius
- Iliopsoas
- Pectineus
- Adductor muscles: longus, brevis, and magnus
- Gracilis
- Tensor fasciae latae (we will see this again in the next lab)
- Fascia lata = the deep fascia of the thigh
- Iliotibial tract (band) = the lateral, thickened part of the fascia lata
- Know the contents and arrangement of structures within the subinguinal space (NAVEL)
- Boundaries and contents of femoral triangle
- Proximal and distal openings and contents of adductor (Hunter's) canal

NERVES

- Femoral nerve with anterior cutaneous nerves of thigh
- Saphenous nerve
- Obturator nerve with anterior and posterior branches
- Lateral cutaneous nerve of the thigh

VESSELS AND NODES

- Femoral artery and vein
- Superficial inguinal lymph nodes
- Deep artery of thigh (profunda femoris artery)
- Medial and lateral circumflex femoral arteries
- Great saphenous vein

HIP JOINT: MODELS AND PROSECTION (IF AVAILABLE)

- Head of femur and acetabulum of hip bone
- Iliofemoral ligament (see this on a model)
- Acetabular labrum