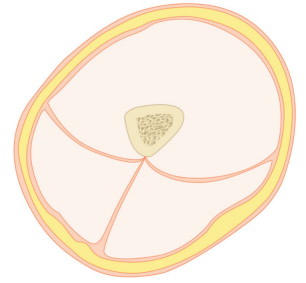


# CHAPTER 2



## Anterior and Medial Compartments of the Thigh

### Learning Objectives

At the end of the dissection, you should be able to identify the following:

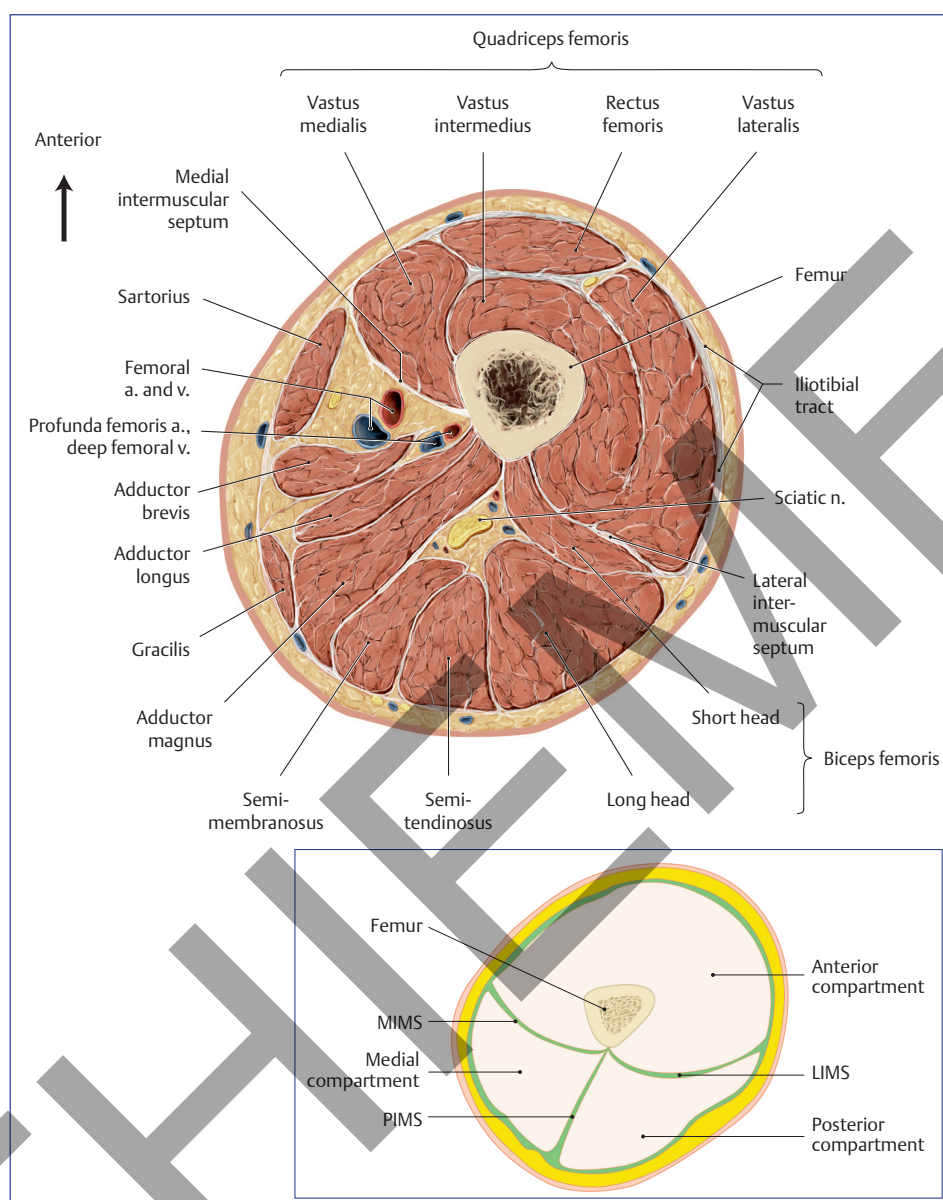
- Cutaneous nerves innervating the skin of the anterior and medial aspects of the thigh.
- Saphenous opening and the structures passing through it.
- Great saphenous vein and its tributaries.
- Muscles of the anterior compartment of the thigh.
- Femoral triangle: Structures forming its boundaries and contents.
- Femoral sheath and its compartments and contents.
- Femoral artery and its branches.
- Femoral vein and its tributaries.
- Superficial and deep inguinal lymph nodes.
- Muscles of the medial compartment of the thigh.
- Obturator nerve and its branches.
- Structures forming boundaries of the adductor canal and its contents.

### Introduction

The thigh extends from the hip joint to the knee joint. The deep fascia (fascia lata) of the thigh encloses the entire thigh like a sleeve/stocking. From the deep aspect of the fascia lata, three fibrous intermuscular septa—lateral, medial and posterior—pass to the linea aspera of the femur and divide the thigh into three compartments—anterior, medial and posterior (**Fig. 2.1**). The anterior (extensor) compartment of the thigh lies between the lateral and medial intermuscular septa, and the medial compartment lies between the medial and posterior septa.

### Surface Landmarks

1. Before starting the dissection, study the surface anatomy of the region. Palpate the bony landmarks and relate them to the respective bones on the articulated skeleton (refer to **Fig. 1.1**).



**Fig. 2.1** Transverse section of the thigh (right, superior view). Figure in the inset below shows three compartments of right thigh. MIMS, medial intermuscular septum; LIMS, lateral intermuscular septum; PIMS, posterior intermuscular septum.

2. Run your finger along the *fold of the groin (inguinal groove)*, a shallow groove extending from the pubic tubercle to the anterior superior iliac spine. It corresponds to the underlying inguinal ligament that separates the anterior abdominal wall from the front of the thigh. Feel the resilient band (inguinal ligament) in the groove extending between the anterior superior iliac spine and pubic tubercle.
3. Palpate the *anterior superior iliac spine* at the lateral end of the fold of the groin and observe that it forms the anterior end of the iliac crest of the hip bone.
4. Palpate the *pubic tubercle*, a small bony projection at the medial end of the fold of the groin. It lies approximately 2.5 cm lateral to the pubic symphysis. The tubercle is less easily felt in males as it is covered by the spermatic cord.
5. Use chalk to mark the *midinguinal point* and the *midpoint of the inguinal ligament* along the inguinal groove. The *midinguinal point* is a point midway between the anterior superior iliac spine and pubic symphysis, whereas the midpoint of the inguinal ligament is midway between the anterior superior iliac spine and pubic tubercle.

6. At the lower end of the thigh, identify the *medial* and *lateral condyles of the femur* and *tibia*. They form large bony masses on the medial and lateral sides of the knee, respectively.
7. *Feel the patella*, a triangular bone in front of the knee, and try to move it when the knee is extended.
8. Palpate the *tibial tuberosity*, a bony prominence in front of the upper part of the tibia.
9. *Ligamentum patellae* is a strong fibrous band that extends between the patella and tibial tuberosity.

## Dissection and Identification

### Anterior Compartment of the Thigh

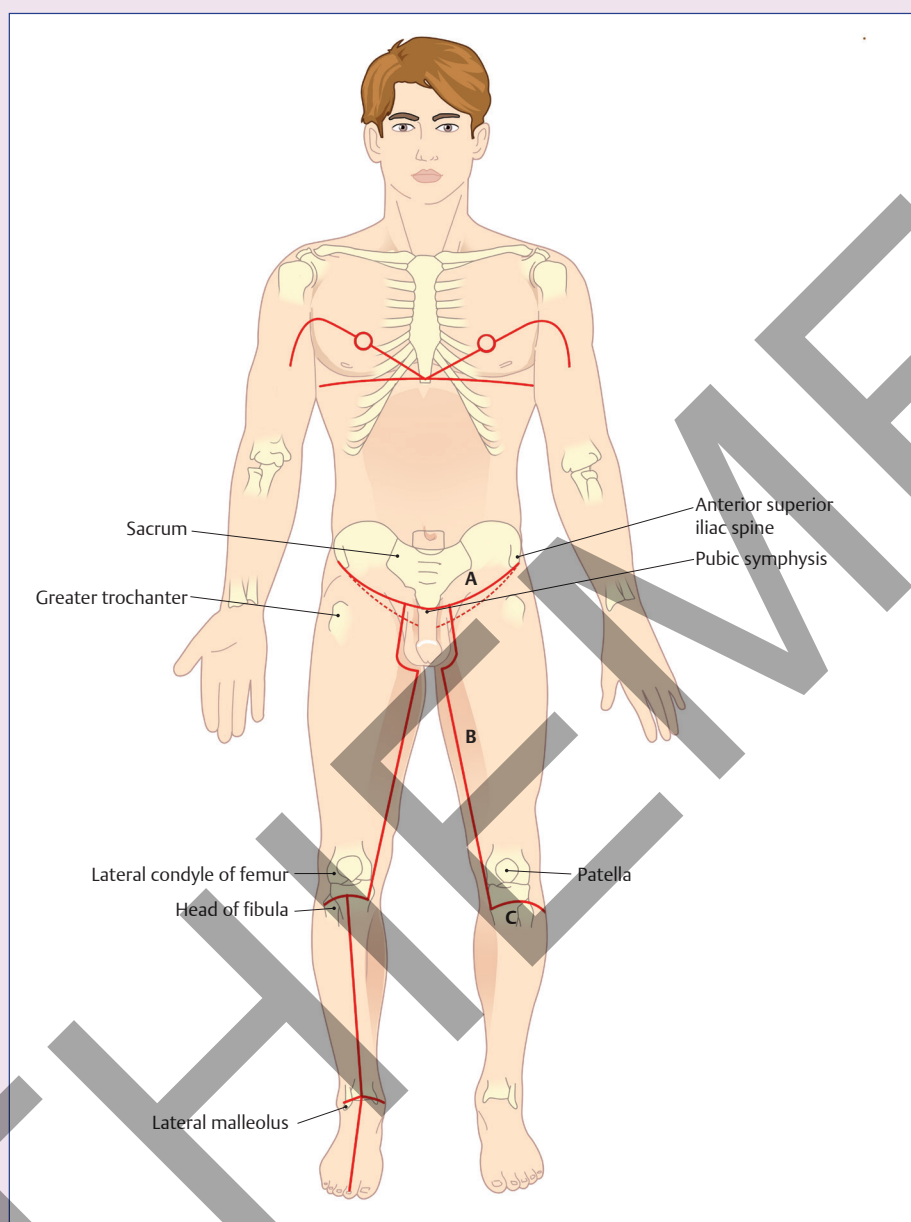
1. Make a horizontal incision 'A' through the skin from the anterior superior iliac spine to the midline and continue the incision downwards lateral to the external genitalia. Make a vertical incision 'B' from the lower end of the above incision till the medial condyle of the tibia. Make another horizontal incision 'C' from the lower end of the vertical incision passing laterally till the lateral condyle of the tibia (**Fig. 2.2**).

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2. Reflect the skin from the superficial fascia and turn it laterally, taking care not to damage the cutaneous nerves.
3. Strip the superficial fascia from the front and lateral aspects of the thigh by blunt dissection. Find the cutaneous nerves (lateral cutaneous nerve of the thigh, femoral branch of the genitofemoral nerve, intermediate cutaneous nerve of the thigh and medial cutaneous nerve of the thigh) which pierce the deep fascia at different points (**Fig. 2.3**) and follow them distally.
4. Find the *great saphenous vein* in the superficial fascia of the medial part of the anterior surface of the thigh. Trace it downwards till the knee and upwards where it turns backwards through the *saphenous opening* (hiatus) to enter the femoral vein. Note that this area is 3 to 4 cm inferolateral to the pubic tubercle and is about 3 cm long and 1.5 cm wide. In this area, the deep fascia is thin and perforated (*cribriform fascia*). Put your finger beside the upper end of the great saphenous vein to feel the sharp thick edge of the deep fascia (*falciform margin*) which limits the saphenous opening all around except medially (**Fig. 2.4**).

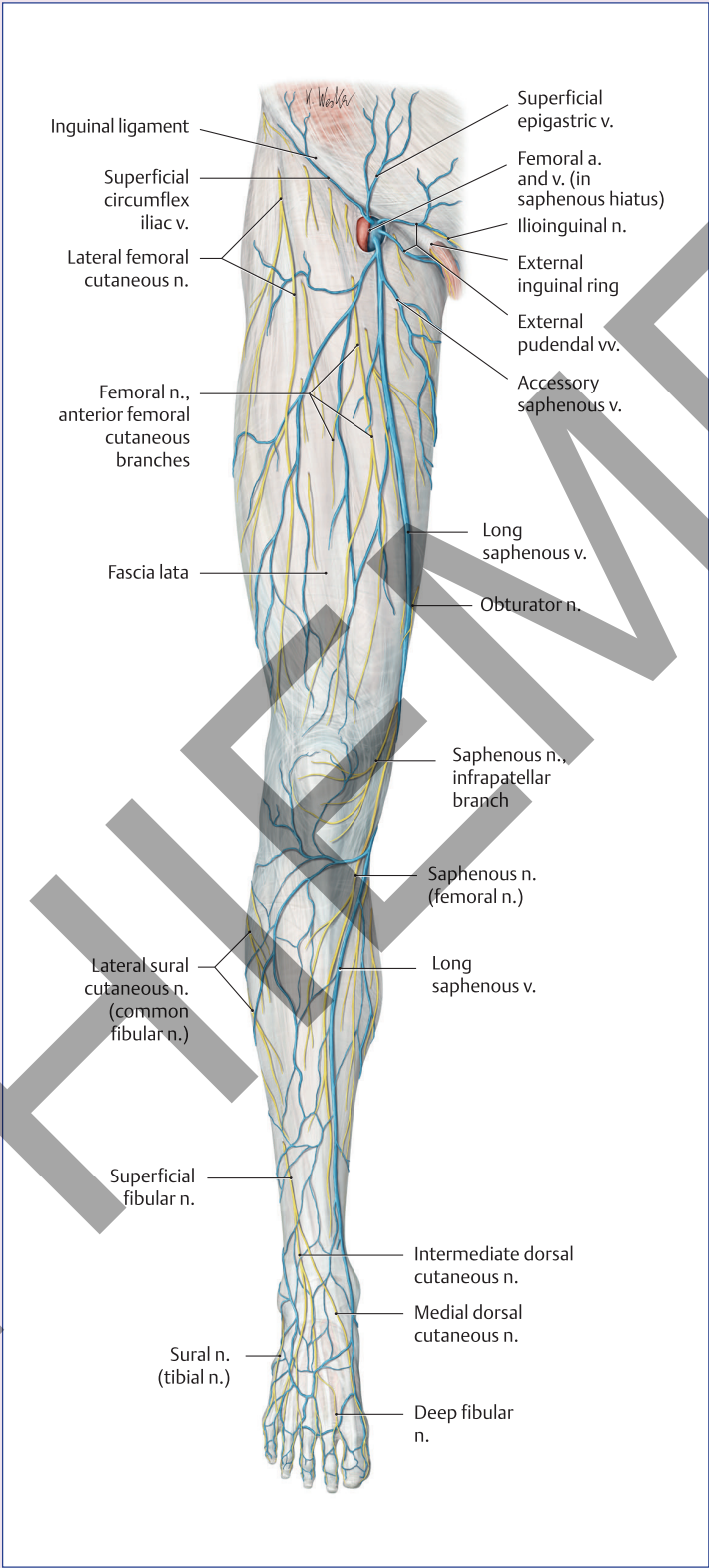
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5. Identify the lower group of the superficial inguinal lymph nodes scattered along the upper part of the great saphenous vein.
6. Observe that at least three small veins enter the great saphenous vein near its termination. Follow these veins along with the superficial branches of the femoral artery, which pierce the cribriform fascia, and accompany them. The superficial epigastric vessels course superiorly to the anterior abdominal wall, the superficial circumflex iliac artery courses laterally below the inguinal ligament and the superficial external pudendal vessels pass medially to the external genitalia.
7. Use a pair of scissors to cut through the deep fascia to expose the muscles and deeper structures in the upper anterior compartment of the thigh. Expose the sartorius muscle extending from the anterior superior iliac spine to its insertion into the upper part of the medial surface of the tibia. Medially, expose the adductor longus muscle down to the point where it meets the sartorius muscle.
8. Identify the boundaries of the femoral triangle: superiorly formed by the inguinal ligament, laterally by the sartorius and medially by the medial border of the adductor longus. Clean the structures, that is, the femoral nerve, femoral artery and femoral vein within the triangle (**Fig. 2.5**).
9. Follow the great saphenous vein to the femoral vein. Split the femoral sheath lateral and medial to the femoral vein to expose the femoral artery and femoral canal, respectively. Note the two septa of the femoral sheath that separate the three compartments containing the femoral artery, femoral vein and femoral nerve (lateral to medial) (**Fig. 2.5**).
10. Put your little finger into the femoral canal and push it upwards. Feel the peritoneum which covers the abdominal opening of the canal. Move the tip of your little finger to feel the structures bounding the abdominal opening of the femoral canal. Feel the inguinal ligament anteriorly, the edge of the lacunar ligament medially and the pecten pubis posteriorly.



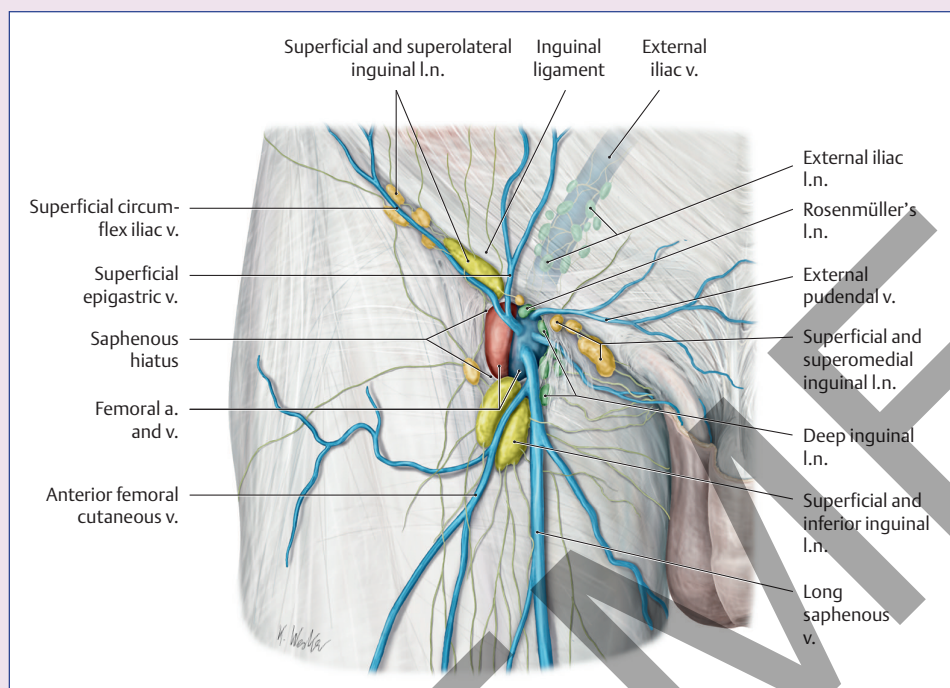
**Fig. 2.2** Incisions for dissection of the front of the lower limb.

11. Find the femoral nerve lateral to the femoral artery in the groove between the muscles and observe that it immediately divides into anterior and posterior divisions from which arise a number of cutaneous and muscular branches. Trace the nerve to the pectineus passing medially posterior to the femoral artery. Follow the other cutaneous and muscular branches till they leave the femoral triangle (**Fig. 2.6**).
12. Remove the venae comitantes of the smaller arteries in this region to trace the deep branches of the femoral artery. Retract the femoral artery medially and identify the profunda femoris artery which arises from the posterolateral aspect of the femoral artery. Follow it downwards along with the profunda femoris vein till the apex of the femoral triangle. Note that at the apex of the femoral triangle the femoral artery, femoral vein, profunda femoris vein and profunda femoris artery lie in this order from before backwards.



**Fig. 2.3** Superficial cutaneous vein and nerves on the front of right lower limb.

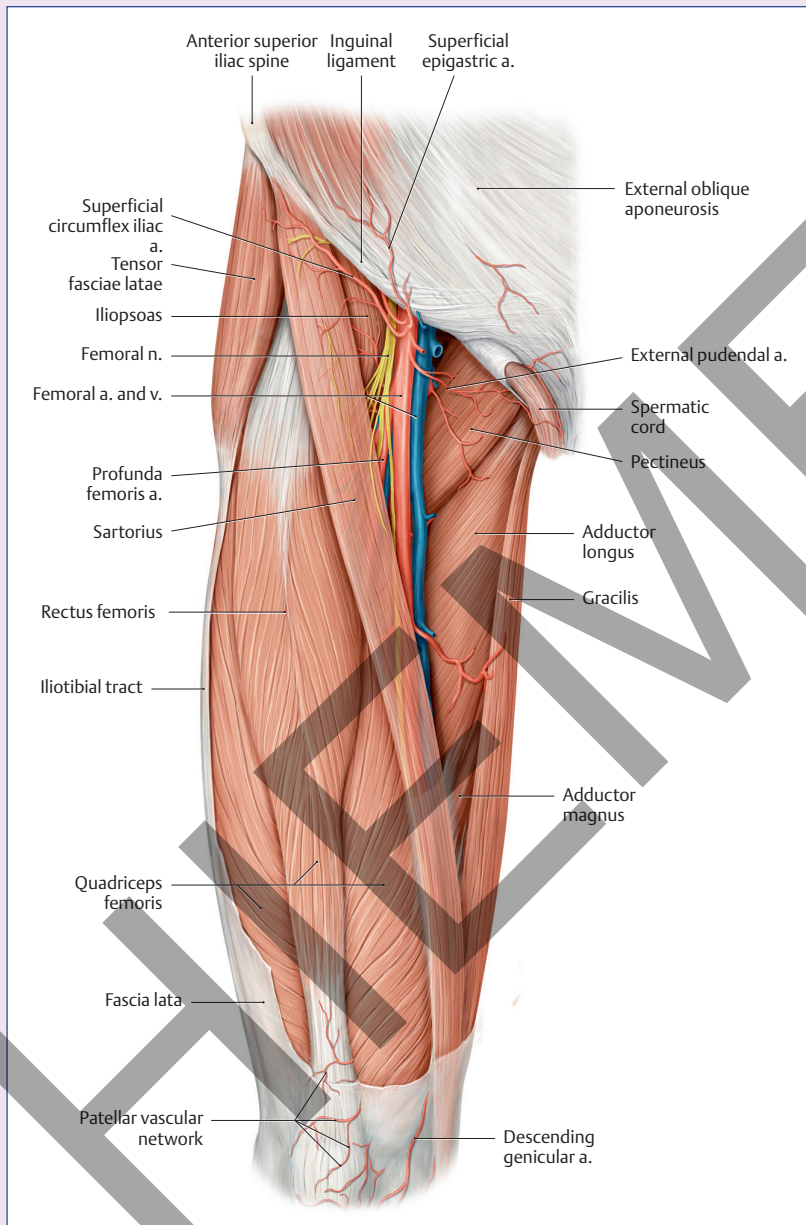




**Fig. 2.4** Superficial dissection of proximal part of the front of thigh. The saphenous opening and the superficial lymph nodes of the groin.

13. Find the lateral and medial circumflex arteries which usually arise from the profunda femoris near its origin. Trace the lateral circumflex artery as it passes laterally among the branches of the femoral nerve and deep to the upper part of the rectus femoris and gives three branches, that is, the ascending, transverse and descending branches.
14. Strip the fascia from the iliacus and psoas major muscles in the floor of the femoral triangle. Place your finger on the tendon of the psoas major and push it downwards and backwards to reach its insertion to the lesser trochanter. Trace the medial circumflex artery as it passes backwards between the psoas and pectineus muscles.  
<https://www.winkingskull.com/dissector/V2/video.aspx?vid=328>
15. Make a vertical incision in the fascia lata from the iliac crest to the lateral margin of the patella and remove the fascia between this incision and the sartorius. This would expose the underlying quadriceps femoris muscle and tensor fasciae lata (**Fig. 2.5**).
16. Use your fingers to separate the sartorius muscle from the underlying fascia in the middle third of the thigh. Cut the sartorius muscle a little above the apex of the femoral triangle and turn the lower part downwards to expose the narrow strip of the fascia extending between the vastus medialis and adductor muscles which forms the roof of the adductor canal. Using a pair of scissors, split the fascia to find the contents of the adductor canal, such as, the femoral vessels, saphenous nerve and nerve to the vastus medialis (**Fig. 2.6**).
17. Note the femoral vein lies posterior to the femoral artery and the femoral vessels leave the adductor canal to enter the popliteal fossa (at the back of the knee) by passing through the opening in the adductor magnus.
18. Observe the bipennate rectus femoris in the middle of the front of the thigh and obliquely running fibres of the vastus lateralis and medialis on either side of the rectus femoris. Retract the rectus femoris laterally or medially to expose the underlying vastus intermedius. Note that the four parts of the quadriceps femoris muscle mentioned above unite to form the quadriceps tendon which is attached to the patella, and the patellar ligament attaches the patella to the tibial tuberosity.  
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19. Femoral nerve



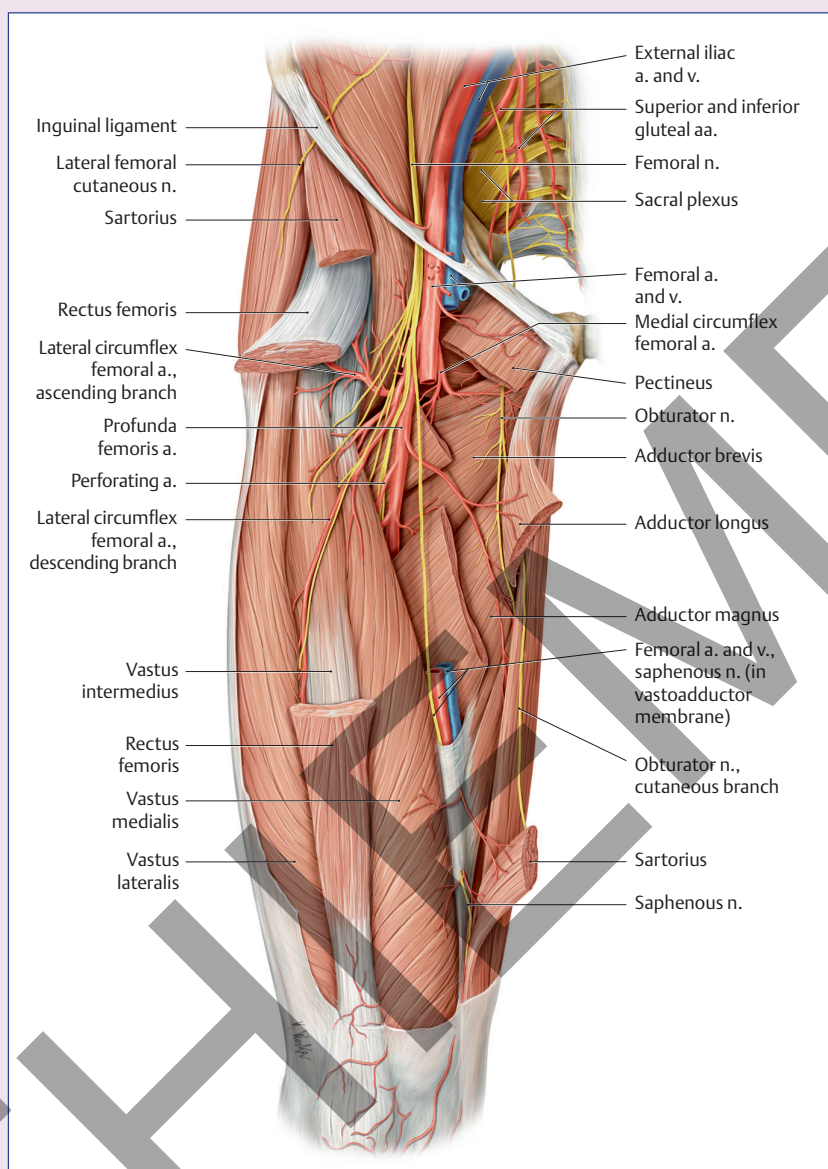
**Fig. 2.5** Femoral triangle.

### Medial Compartment of the Thigh

1. Identify and clean the strap-like gracilis muscle extending from the pubic bone to its inferior attachment on the medial surface of the tibia posterior to the attachment of the sartorius muscle.
2. Use blunt dissection to remove the deep fascia to expose the other muscles of the adductor/medial compartment. Note the muscles are arranged in three layers.
3. Observe that the pectineus (in the floor of the femoral triangle) and adductor longus (forming the medial boundary of the femoral triangle) lie side by side and form the superficial layer.

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4. Cut the adductor longus muscle about 4 to 5 cm inferior to its upper attachment to the pubic bone and reflect the lower part downwards and laterally. This will expose the adductor brevis muscle which forms the middle layer and the anterior division of the obturator nerve overlying it.



**Fig. 2.6** Neurovascular structure of the anterior thigh.

Follow the anterior division of the obturator nerve superiorly where it lies between the pectineus and adductor brevis. Note the branches of the anterior division of the obturator nerve supplying the adductor longus, adductor brevis, gracilis and sometimes pectineus muscles.

5. Cut the adductor brevis muscle close to its origin from the pubic bone taking care to preserve the posterior division of the obturator nerve which lies deep to it on the adductor magnus muscle (forms the deep layer).
6. Trace the posterior division of the obturator nerve superiorly and note that it reaches the adductor compartment by piercing the obturator muscle.
7. Find the muscular branches of the posterior division of the obturator nerve supplying the obturator externus, adductor brevis and adductor magnus.



Muscles

Muscles of the anterior and medial compartments of the thigh are shown in **Table 2.1**.

**Table 2.1** Muscles of the anterior and medial compartments of the thigh

Compartment	Muscles	Action	Nerve supply
Anterior	Rectus femoris	Flexion at the hip joint Extension at the knee joint	Femoral n.
	Quadriceps femoris		
	Vastus medialis	Extension at the knee joint	Femoral n.
	Vastus intermedius		
	Vastus lateralis		
	Sartorius	Flexion and lateral rotation at the hip joint Flexion at the knee joint	
Medial/adductor	Adductor longus	Adduction of the thigh	Obturator n.
	Adductor brevis		
	Adductor magnus	Adduction of the thigh Extension at the hip joint (ischial part)	Obturator and tibial division of the sciatic n.
	Pectineus	Flexion and adduction at the hip joint	Obturator and femoral n.
	Gracilis	Adduction of the thigh	Obturator n.
		Flexion at the knee joint Medial rotation of the leg	

Arteries of the Anterior and Medial Compartments of the Thigh

*Branches of the femoral artery:*

- 1. Superficial branches
  - Superficial epigastric
  - Superficial circumflex iliac
  - Superficial external pudendal
- 2. Deep branches
  - Deep external pudendal
  - Profunda femoris
    - a. Medial circumflex femoral
    - b. Lateral circumflex femoral
  - Muscular branches
  - Descending genicular

*Branches of the profunda femoris artery:*

- 1. Medial circumflex femoral artery
- 2. Lateral circumflex femoral artery
- 3. Muscular branches
- 4. Three perforating arteries

The profunda femoris artery ends by piercing the adductor magnus as the fourth perforating artery.

## Nerves of the Anterior and Medial Compartments of the Thigh

*Branches of the femoral nerve:* Root value: L2, L3 and L4 (dorsal divisions)

Femoral nerve divides into anterior and posterior divisions:

1. Branches of the anterior division are
  - Muscular branches to
    - a. Pectineus
    - b. Sartorius
  - Cutaneous branches to
    - a. Medial cutaneous
    - b. Intermediate cutaneous
2. Branches of the posterior division are
  - Muscular branches to
    - a. Quadriceps femoris
    - b. Sartorius
  - Cutaneous branches to
    - a. Saphenous nerve (longest cutaneous nerve of the body)
  - Articular branches to
    - a. Hip joint via nerve to the rectus femoris
    - b. Knee joint via branches to the vasti

The effects of injury to the femoral nerve are as follows:

*Motor loss:* Paralysis of the quadriceps femoris and sartorius.

*Sensory loss:* Loss of sensations on the anterior and medial aspects of the thigh, medial aspect of the leg and medial aspect of the foot till the head of the first metatarsal.

## Muscles Supplied by the Obturator Nerve (Root Value: L2, L3, L4; Ventral Divisions)

The obturator nerve is the nerve of the adductor compartment of the thigh. It divides into the anterior and posterior divisions.

1. Muscles supplied by the anterior division:
  - Adductor longus
  - Adductor brevis
  - Gracilis
  - Pectineus
2. Muscles supplied by the posterior division:
  - Adductor brevis
  - Adductor magnus
  - Obturator externus

## Femoral Triangle

It is a triangular intermuscular space on the front of the upper one-third of the thigh. Its boundaries are as follows:

1. *Lateral:* Medial border of the sartorius
2. *Medial:* Medial border of the adductor longus
3. *Apex:* It is where the sartorius overlaps the adductor longus
4. *Base:* Inguinal ligament
5. *Roof:* It is formed by the following:
  - Skin
  - Superficial fascia with superficial blood vessels and superficial inguinal lymph nodes
  - Deep fascia (fascia lata)

6. *Floor* is formed by the following muscles (lateral to medial):

- Iliacus
- Psoas major
- Pectineus
- Adductor longus

7. *Contents:*

- *Arteries:* Femoral artery and its branches
  - a. *Superficial branches:* Superficial epigastric, superficial circumflex iliac, superficial external pudendal
  - b. Deep external pudendal
  - c. Profunda femoris and its branches: Lateral and medial circumflex femoral
- *Veins:* Femoral vein and its tributaries
- *Nerves:*
  - a. Femoral nerve and its branches
  - b. Lateral cutaneous nerve of the thigh
  - c. Femoral branch of the genitofemoral nerve
- Deep inguinal lymph nodes
- Fibro-fatty tissue

## Femoral Sheath

1. It is a funnel-shaped fascial sheath that surrounds the upper part of the femoral vessels and it also encloses the femoral canal.
2. It is formed:
  - Anteriorly by the fascia transversalis
  - Posteriorly by the fascia iliaca
3. It is divided into three compartments:
  - *Medial compartment:* It is called the femoral canal and is filled with areolar tissue and contains a lymph node (Gland of Cloquet) which drains the glans penis/clitoris.
  - *Intermediate compartment:* The femoral vein passes through it.
  - *Lateral compartment:* It allows the passage of the femoral artery and the femoral branch of the genitofemoral nerve.

The femoral nerve lies outside the femoral sheath, lateral to the femoral artery.

## Femoral Canal

1. It is the funnel-shaped medial compartment of the femoral sheath.
2. It is 1.2 cm long.
3. It contains some areolar tissue and a lymph node of the deep inguinal group.
4. Its upper end opens toward the abdominal cavity and is bounded by the femoral ring.
5. Boundaries of the femoral ring are
  - *Lateral:* The femoral vein
  - *Medial:* The lacunar ligament
  - *Anterior:* The inguinal ligament
  - *Posterior:* The pectineal line of the pubic bone
6. The femoral ring is closed by a plug of fat called the femoral septum.

The femoral canal is wider in females because:

1. The bony pelvis is wider.
2. The femoral vessels are smaller in diameter.

Therefore, *femoral hernia is more common in females.*

## Adductor Canal/Subsartorial Canal/Hunter's Canal

1. It is a narrow intermuscular canal located in the middle one-third of the medial aspect of the thigh.

2. It extends from the apex of the femoral triangle to the osseoponeurotic opening in the adductor magnus.
3. It allows the passage of the femoral vessels from the femoral triangle to the popliteal fossa.
4. Its boundaries are:
  - *Anterolateral*: Vastus medialis
  - *Anteromedial (roof)*: Fibrous covered by the sartorius
  - *Posterior*:
    - a. Adductor longus (in the upper part)
    - b. Adductor magnus (in the lower part)
5. Contents:
  - Femoral artery
  - Femoral vein
  - Saphenous nerve
  - Nerve to the vastus medialis
  - Branches of the obturator nerve
  - Descending genicular branch of the femoral artery

All the contents enter the canal through the apex of the femoral triangle but femoral vessels leave it through the opening in the adductor hiatus (lower end), saphenous nerve by piercing the roof and nerve to the vastus medialis by entering the vastus medialis (anterolateral wall).



## Clinical Notes

1. **Femoral pulse**: The pulsations of the femoral artery can be felt in the femoral triangle just below the midinguinal point against the head of the femur.
2. **Femoral hernia**:
  - It is an abnormal protrusion of the abdominal contents (e.g., small intestine) through the femoral canal.
  - Lies inferior and lateral to the pubic tubercle.
  - The herniated structure enters the canal through the femoral ring, then bulges anteriorly through the saphenous opening and bends superolaterally toward the inguinal ligament.
  - Strangulation of a femoral hernia may occur due to the sharp, stiff boundaries of the femoral ring.
  - Femoral hernia lies inferior and lateral to the pubic tubercle whereas the inguinal hernia lies above and medial to the pubic tubercle.
  - Surgical reduction of the femoral hernia: Lacunar ligament has to be divided to relieve strangulation. Care has to be taken to ligate the abnormal obturator artery which may run along the lateral margin of the lacunar ligament.
  - Abnormal obturator artery (enlargement of the anastomosis between the pubic branches of the inferior epigastric and pubic branch of the obturator artery) is in danger of being cut during surgery (femoral hernia reduction) as it lies close to the medial border of the femoral ring (along the lacunar ligament). This may cause severe bleeding.
3. The femoral artery can be ligated in the adductor canal to treat popliteal aneurysm. Following ligation of the femoral artery, blood can reach the popliteal artery through the anastomotic channels around the knee. This was first described in the eighteenth century by John Hunter.