OBJECTIVES

- *Describe the anatomy of femoral triangle & adductor canal regarding:*
- *site, boundaries and contents.*
- *Femoral sheath*
- *Femoral canal*
- *Femoral hernia -applied*

SARTORIUS

ORIGIN

Anterior superior iliac spine

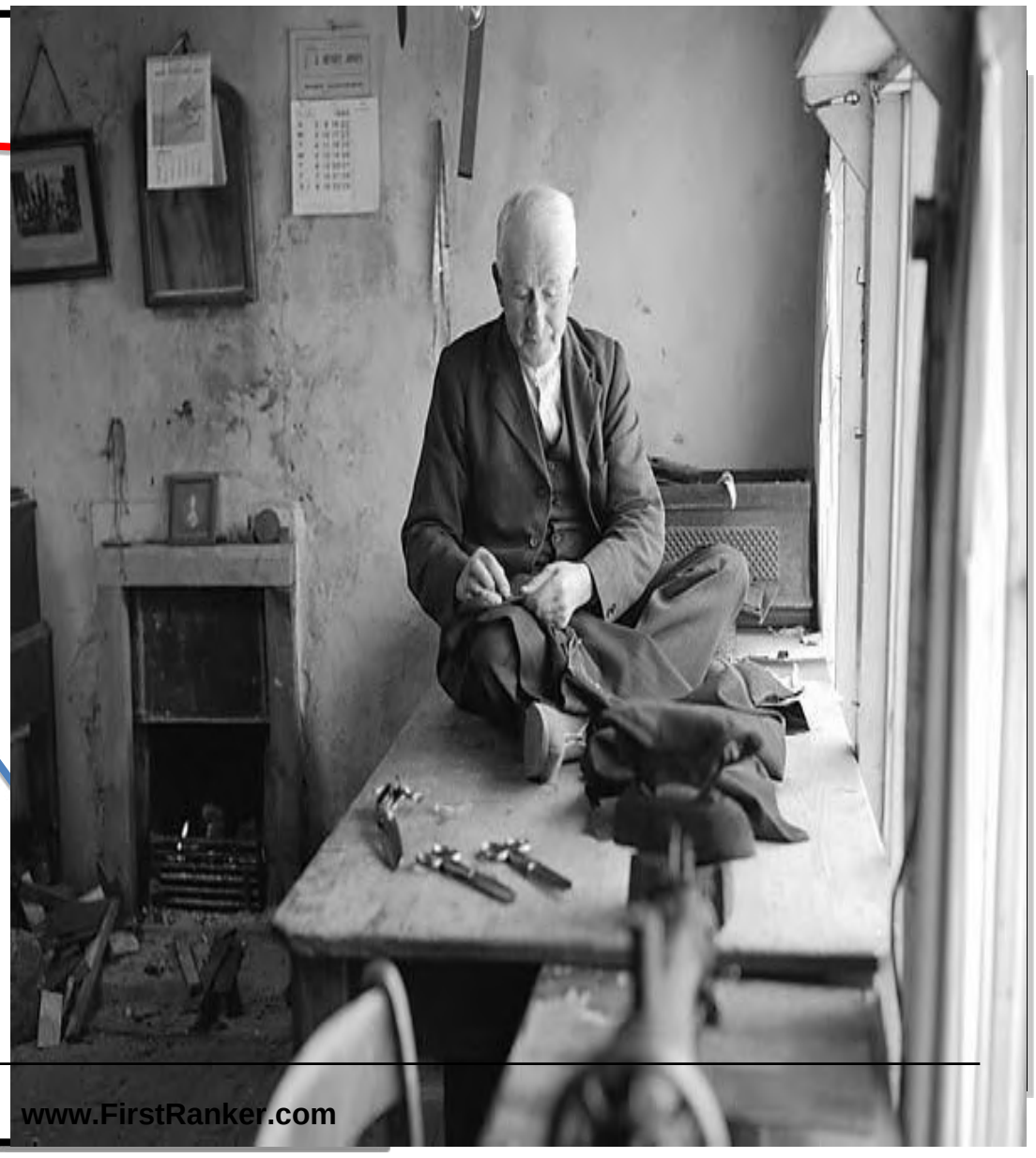
INSERTION

Upper part of medial surface of tibia

ACTION

(TAILOR'S POSITION)

- ❑Flexion, abduction & lateral rotation of hip joint
- ❑Flexion of knee joint



PECTINEUS

ORIGIN:

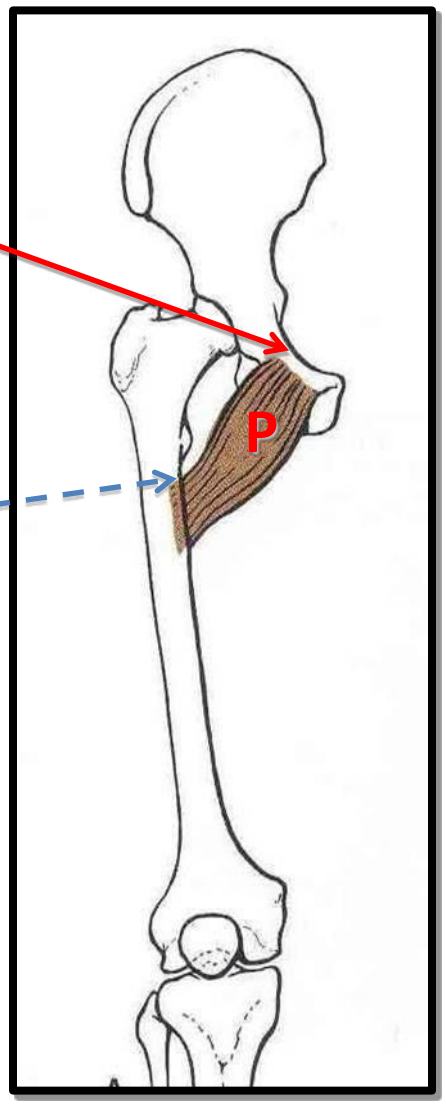
Superior pubic ramus

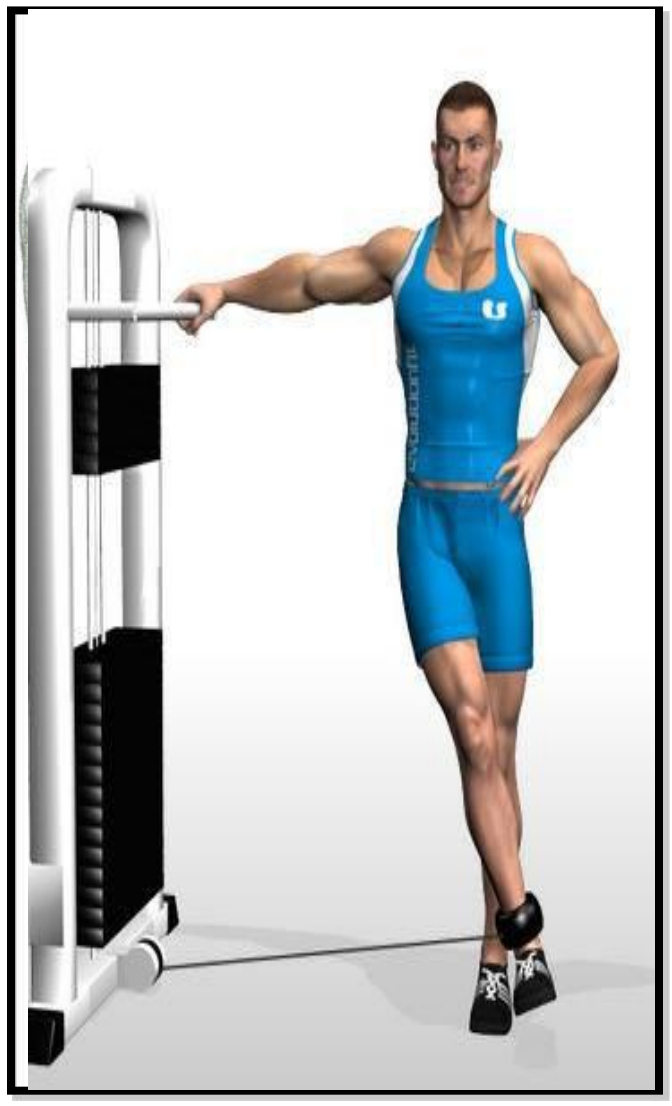
INSERTION:

Back of femur (below lesser trochanter)

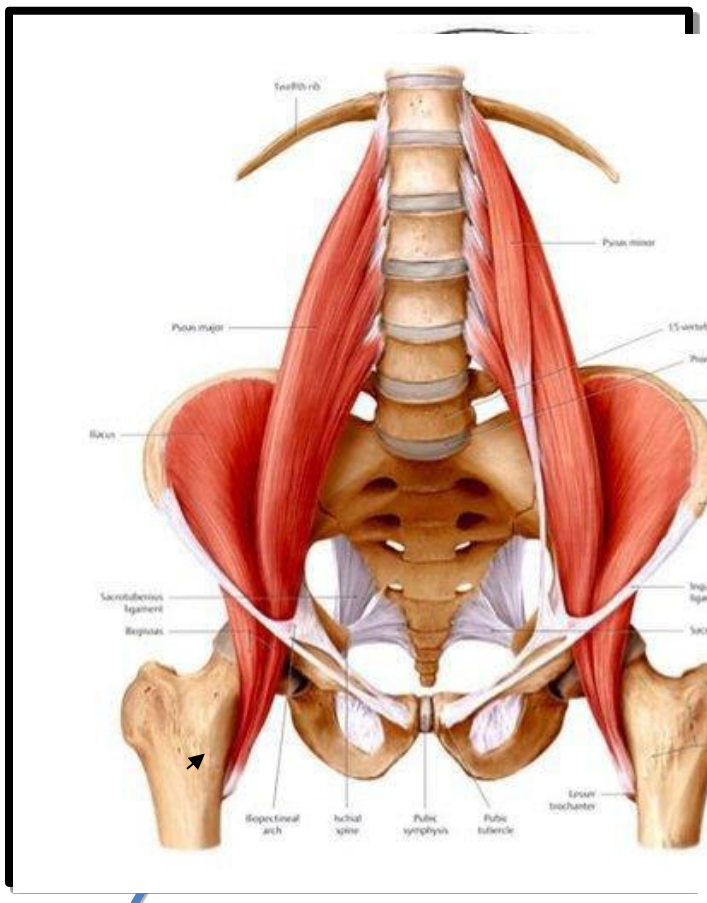
ACTION:

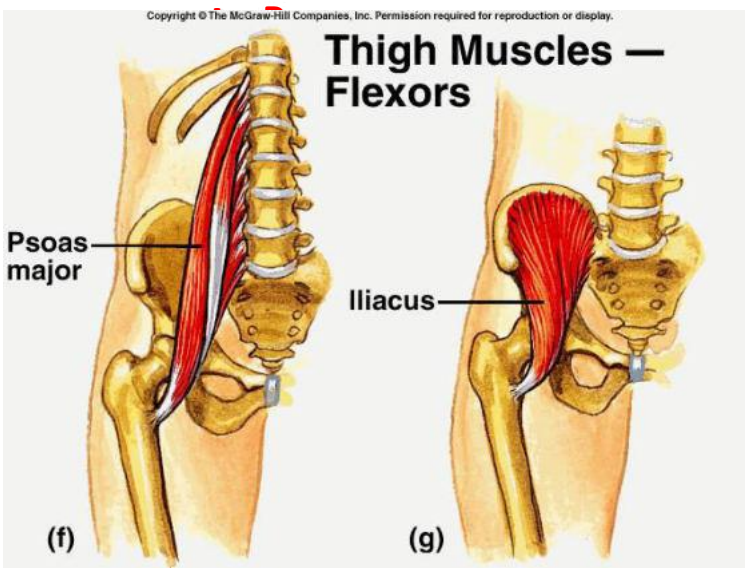
- Flexion & adduction of hip joint





ILIOPSOAS: ILIACUS & PSOAS MAJOR





INSERTION:

Lesser trochanter of femur

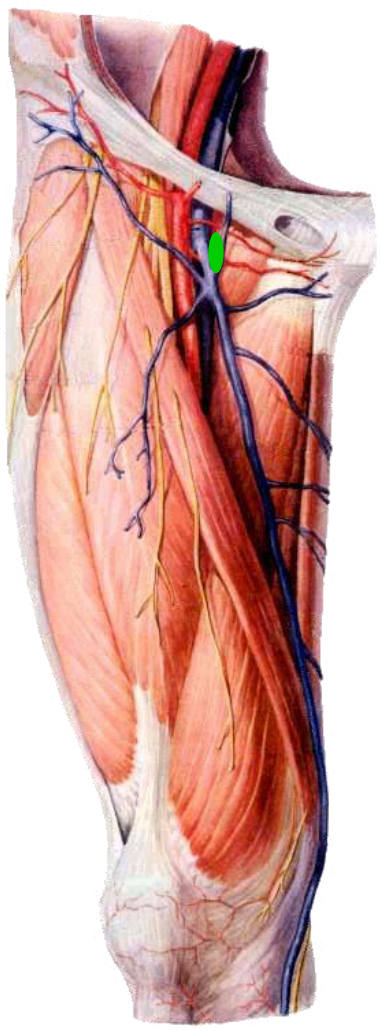
ACTION:

Flexion of hip joint

Femoral triangle

Contents

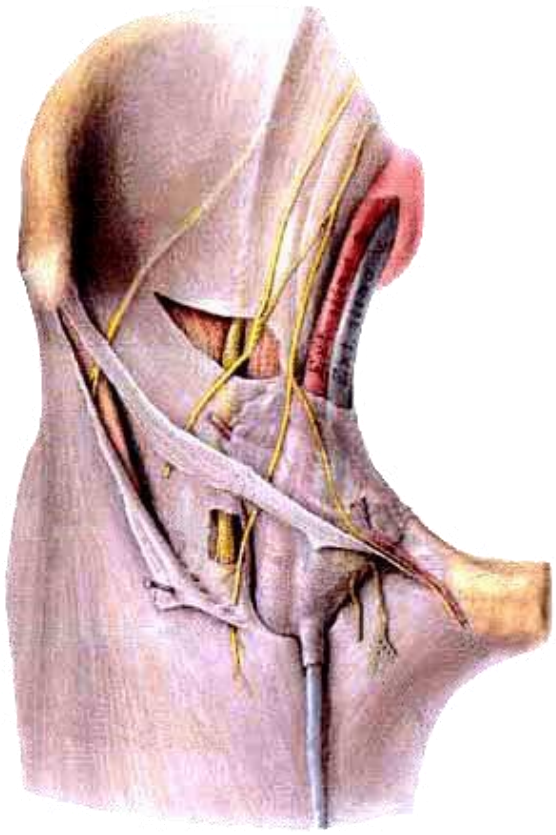
- Femoral n.
- Femoral sheath
- Femoral a. and its branches
- Femoral vein and its tributaries.
- Femoral canal
- Deep inguinal lymph nodes
- Fatty tissue



Femoral triangle

Femoral sheath

- A funnel- shaped sheath
- Derived from transversalis fascia anteriorly and iliac fascia posteriorly
- It surrounds the femoral vessels and lymphatic about 2.5cm below the inguinal ligament.

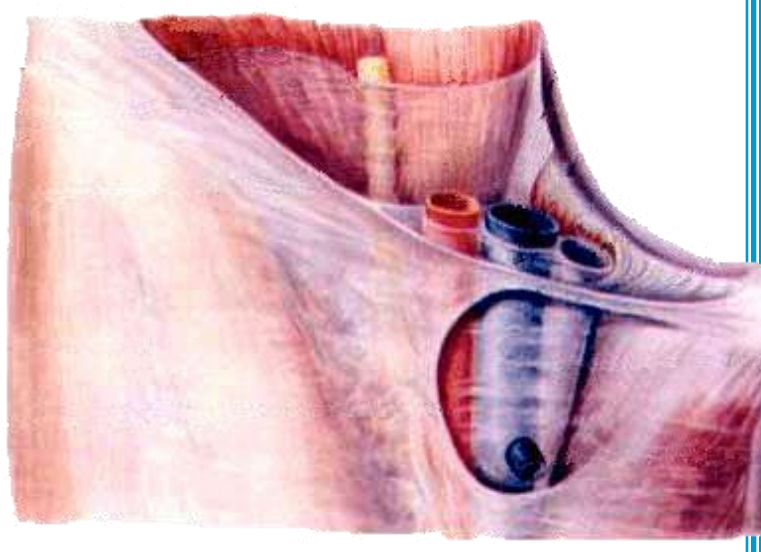


Femoral sheath

Femoral sheath

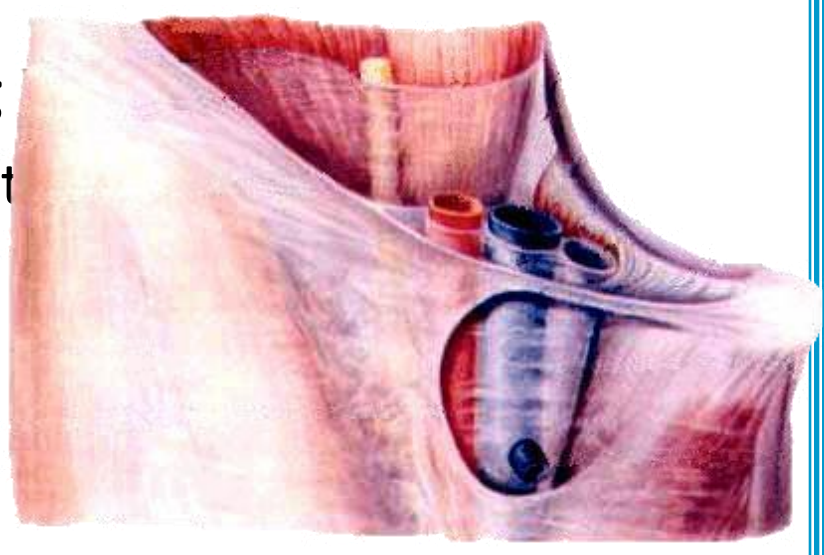
Divided into three compartments by two fibrous septa

- Lateral compartment: femoral a.
- Middle compartment: femoral v.
- Medial compartment: femoral canal



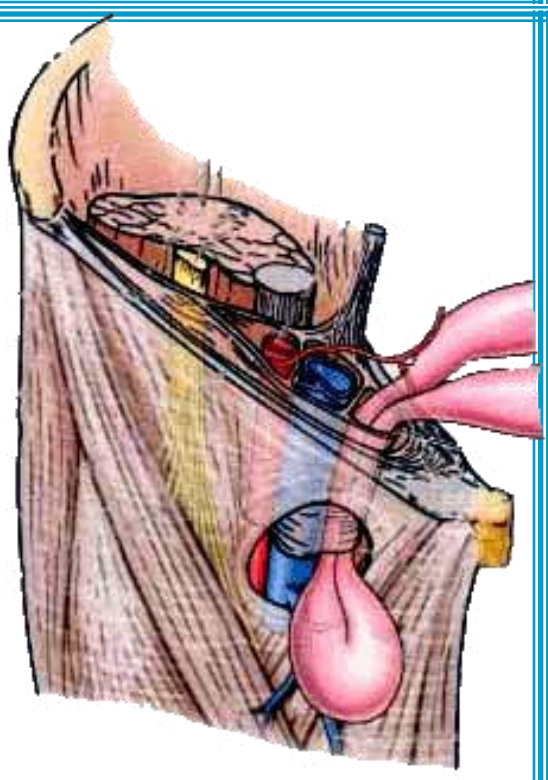
The femoral canal

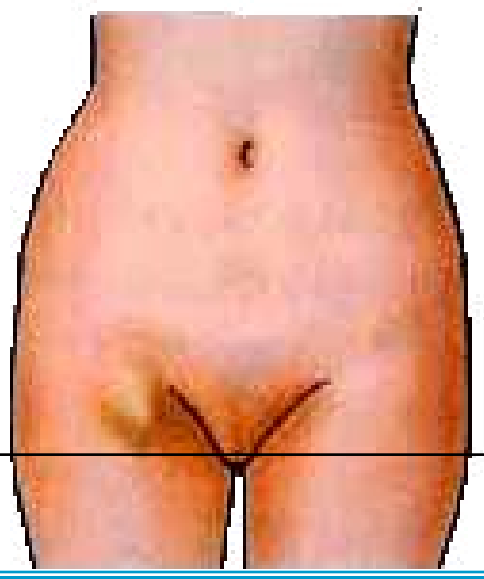
- About 1.3cm long , and its upper opening is called the **femoral ring**
- Content: a little loose fatty tissue, a small lymph node of CLOQUET and some lymph vessels.
- The boundaries of the **femoral ring**
  - **Anteriorly**: the inguinal ligament
  - **Medially**: the lacunar ligament
  - **Posteriorly**: the pecten of pubis
  - Laterally: the femoral vein
  - Superior: covered by femoral septum



Femoral hernia

- If a loop of intestine is forced into the femoral ring, it expands to form a swelling in the upper part of the thigh. Such a condition is known as a **femoral hernia** .
- A femoral hernia is more common in women than in men (possibly because their wider pelvis and femoral canal).

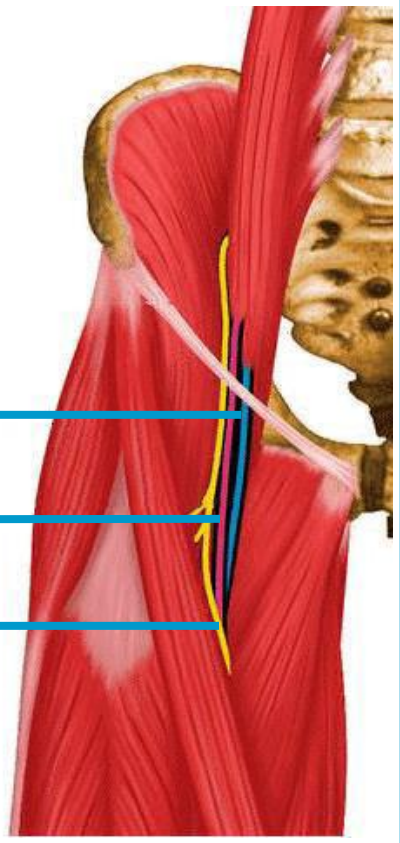




Femoral Triangle

Arrangement of Nerve, Artery, Vein

From medial to lateral



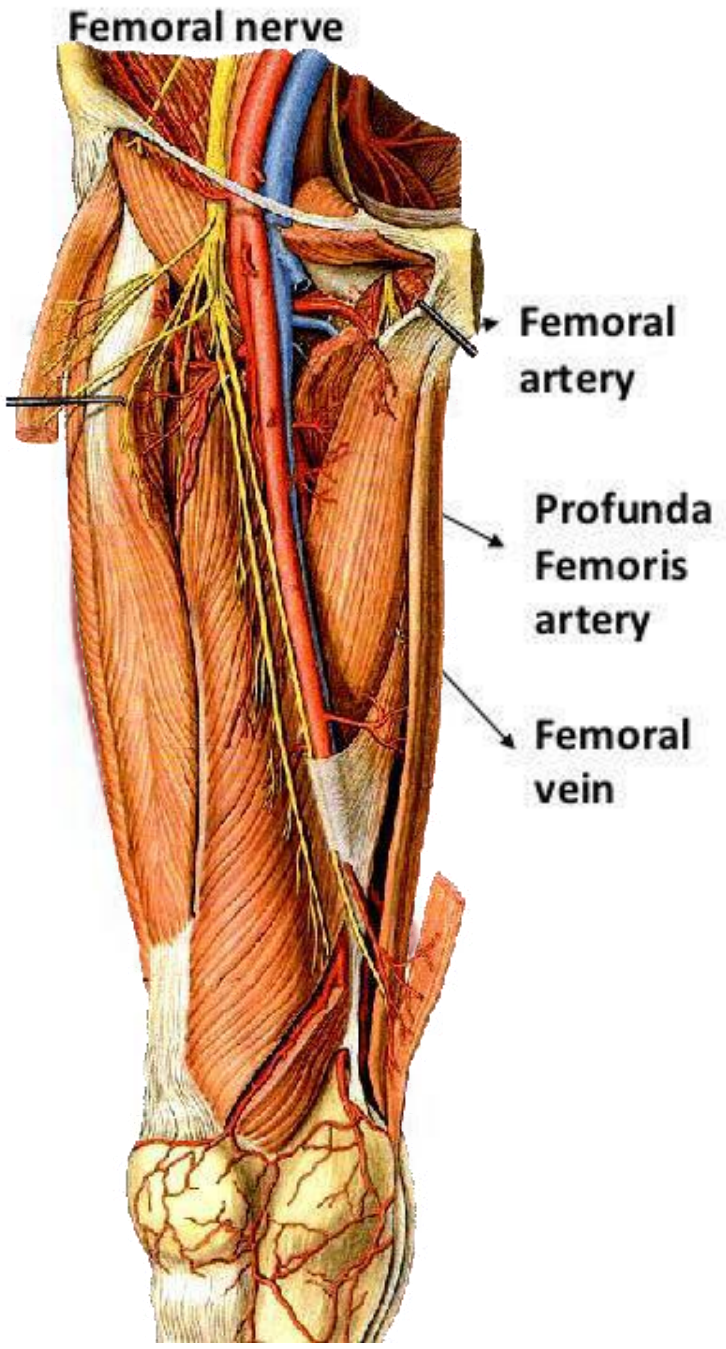
Femoral Vein

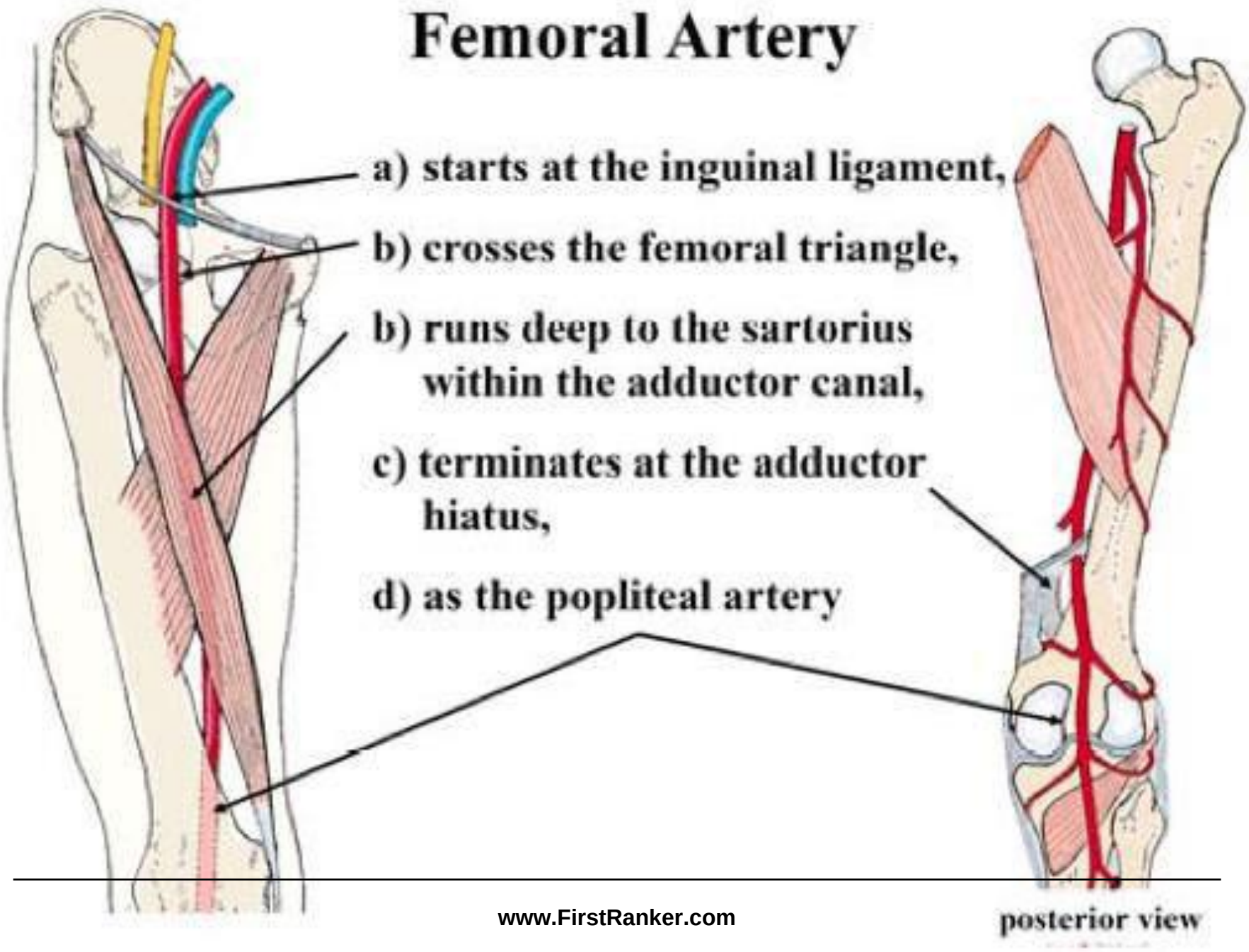
Femoral Artery

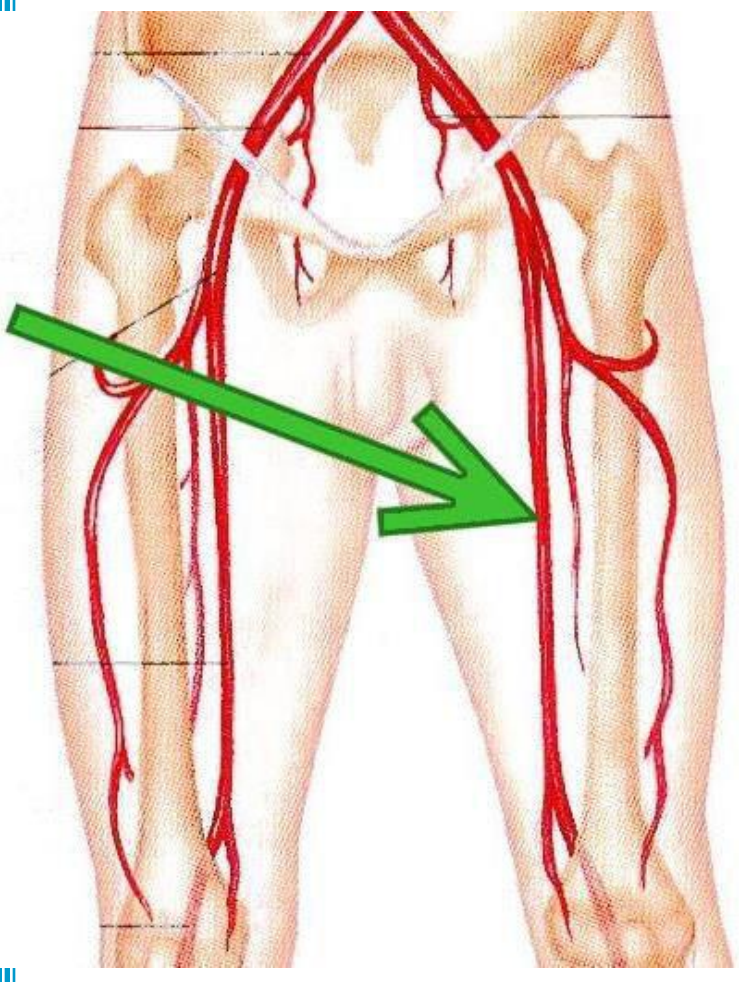
Femoral Nerve

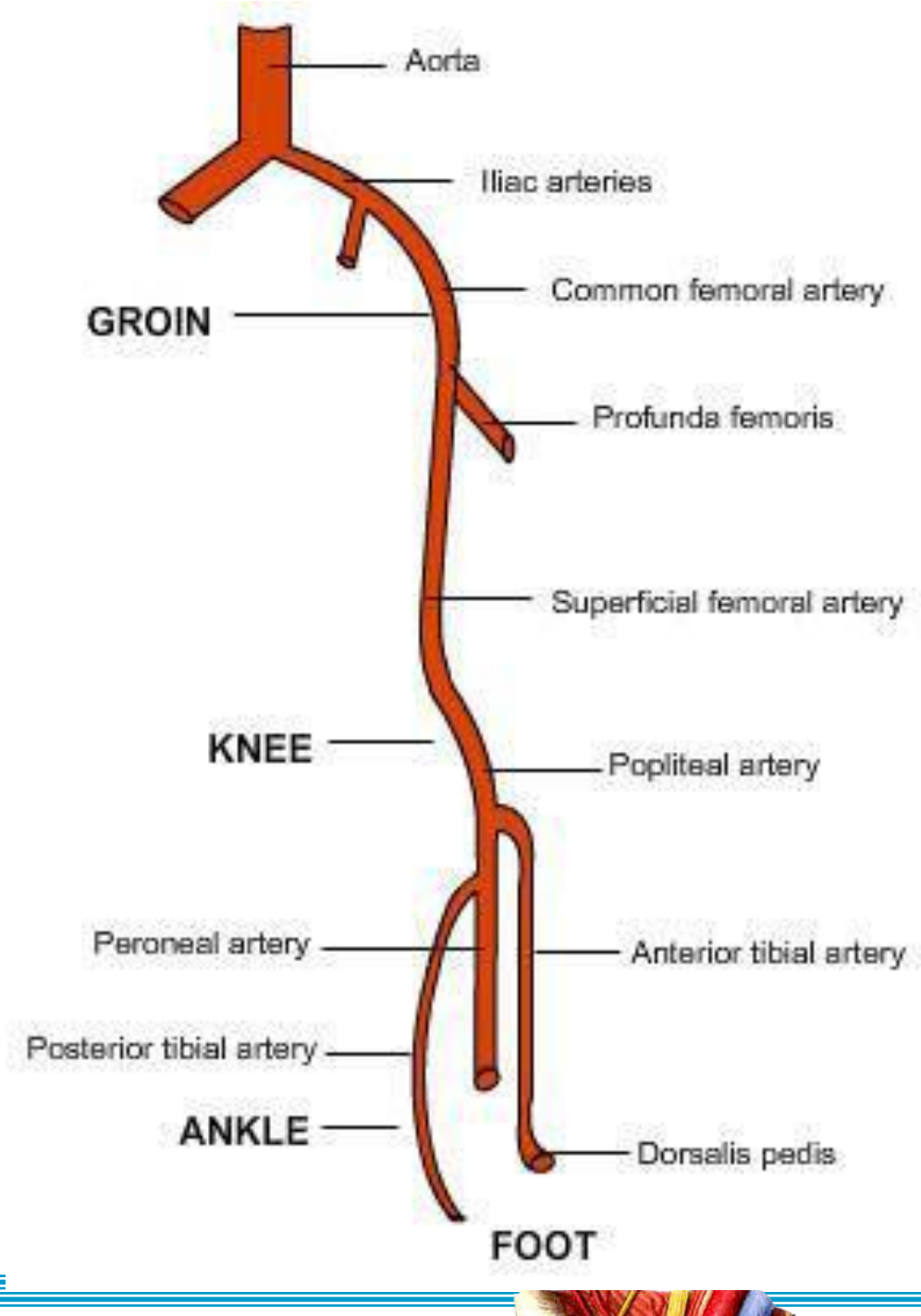
VAN

- **Femoral artery:**
- **Origin:**
- Continuation of external iliac artery - behind the inguinal ligament
- **Course:**
- Runs in the femoral triangle from the base to apex
- Runs in the adductor canal
- **Termination:**
- Continues as popliteal artery



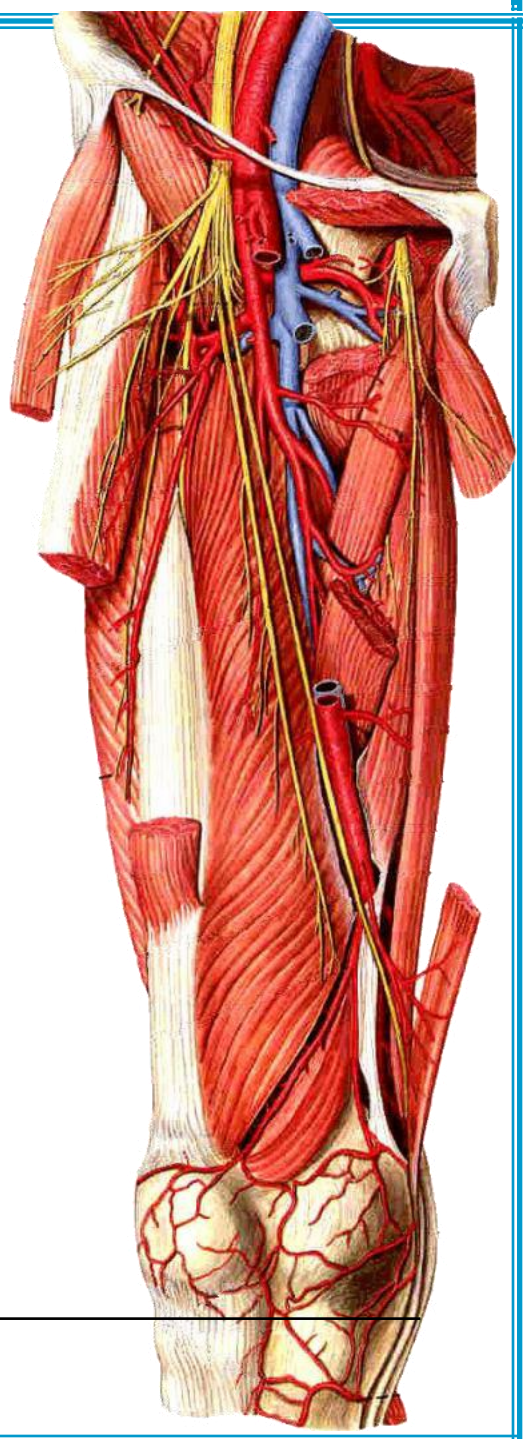


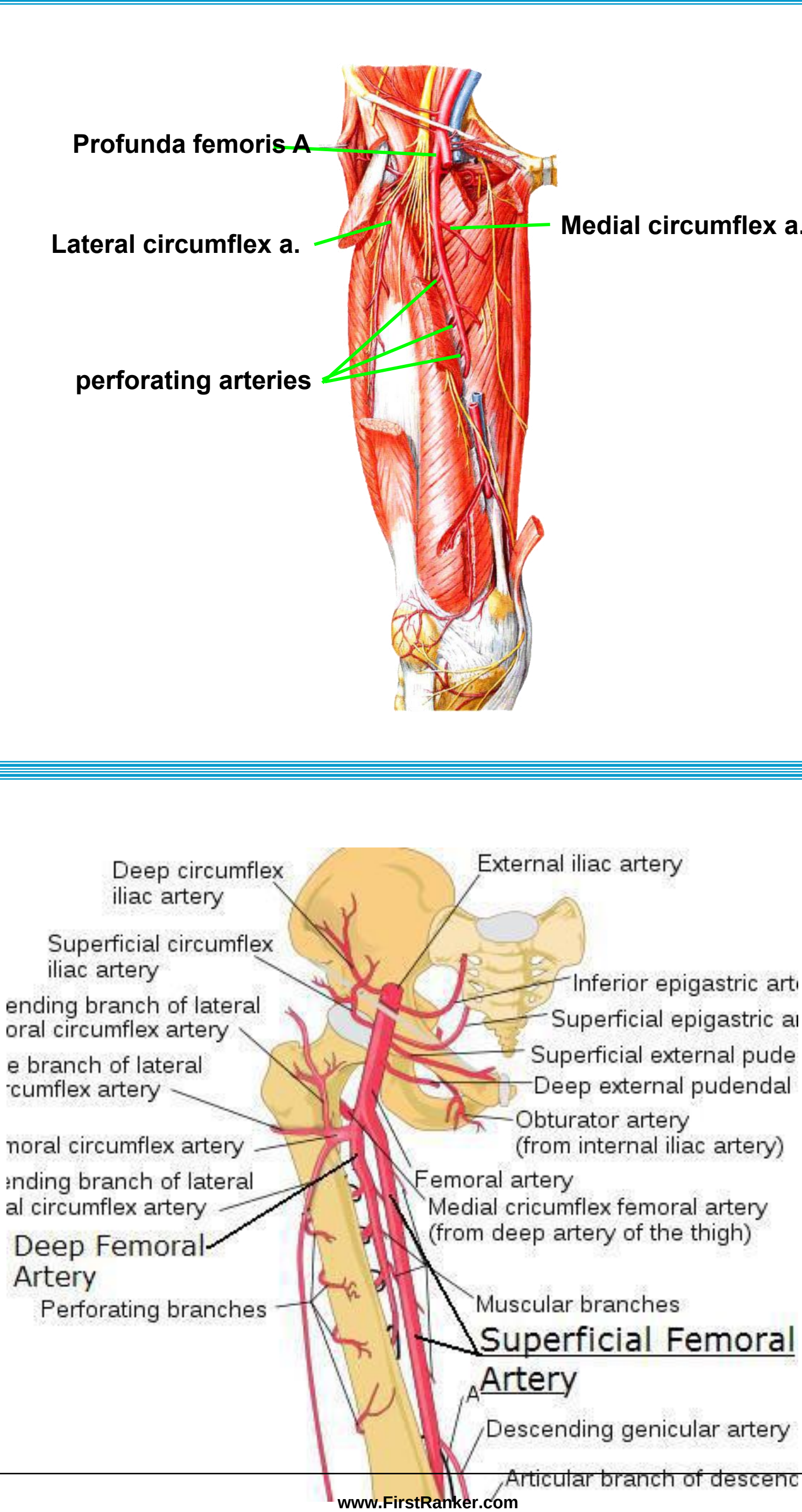


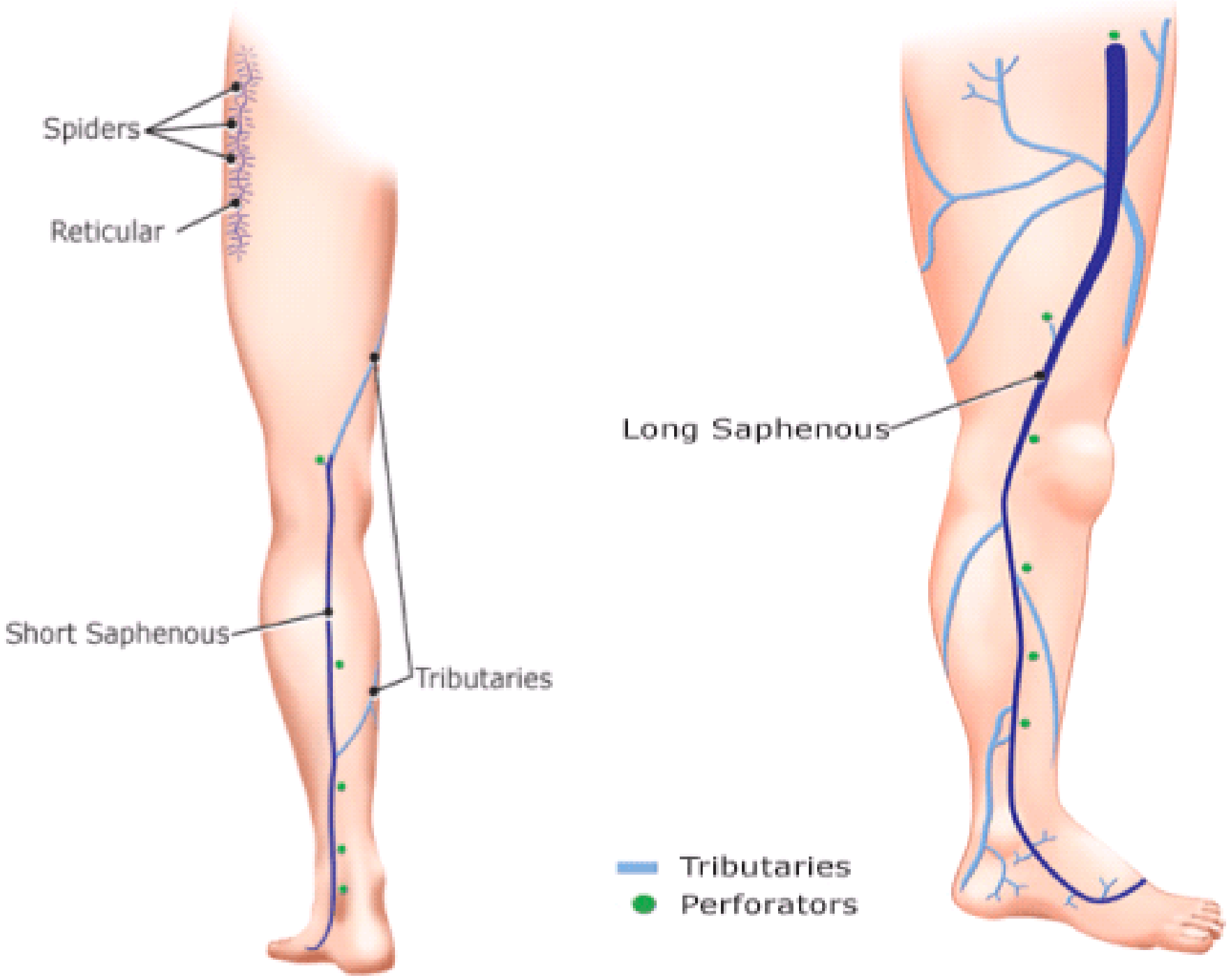


Profunda femoris

- Arises from the posterolateral surface of the femoral artery about 5 cm below the inguinal ligament.
- Branches:
  - **Lateral circumflex artery**.
  - **Medial circumflex artery**.
  - **Perforating arteries**







Femoral vein

- Begins at the adductor tendinous opening
- Continues as external iliac vein deep to inguinal ligament
- Contains several valves

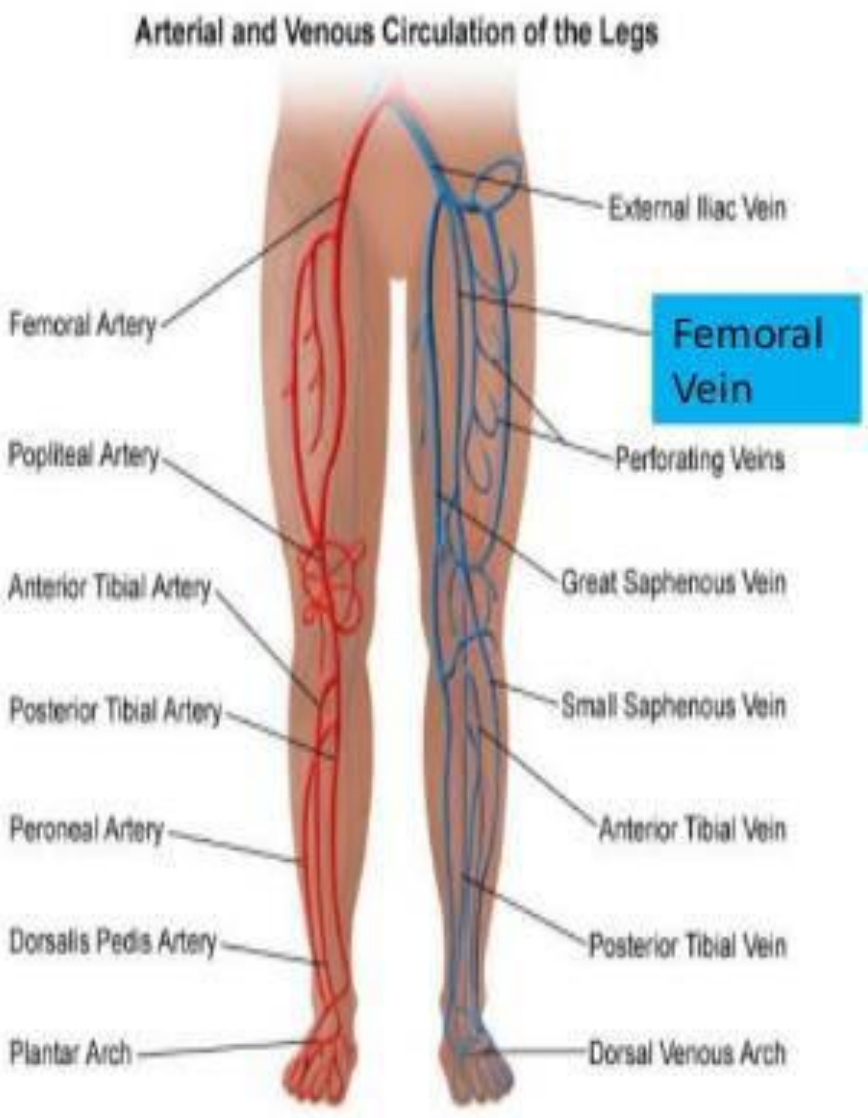
Femoral Vein

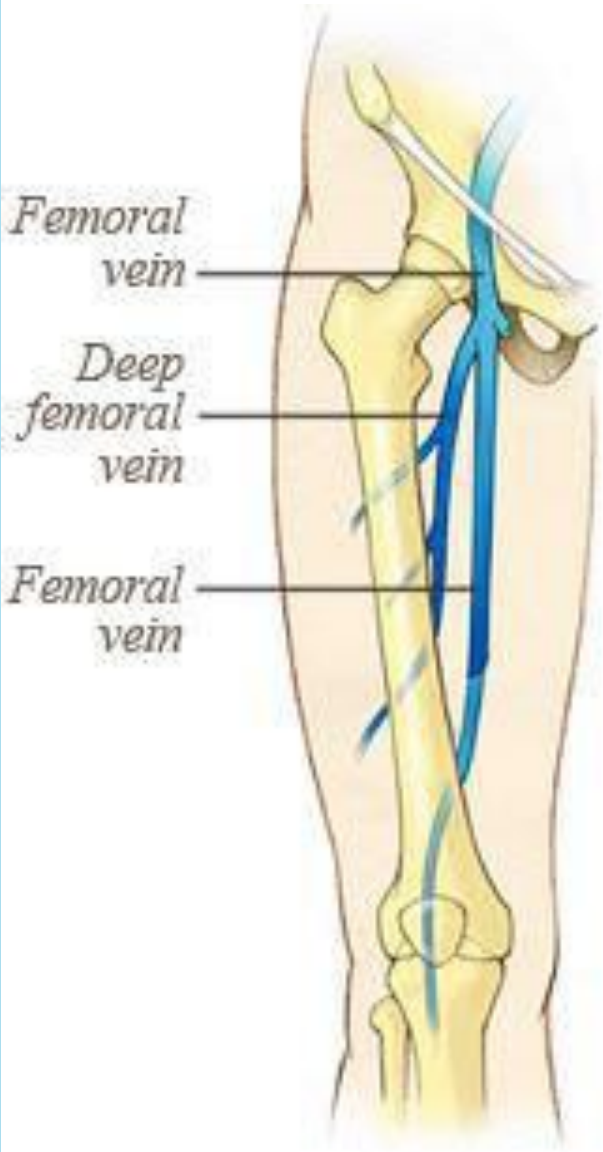
- The femoral vein is a blood vessel that accompanies the femoral artery in the femoral sheath.
- It begins at the **adductor canal** (also known as *Hunter's canal*) and is a **continuation** of the **popliteal vein**.
- It **ends** at the inferior margin of the **inguinal ligament**, where it **becomes the external iliac vein.**

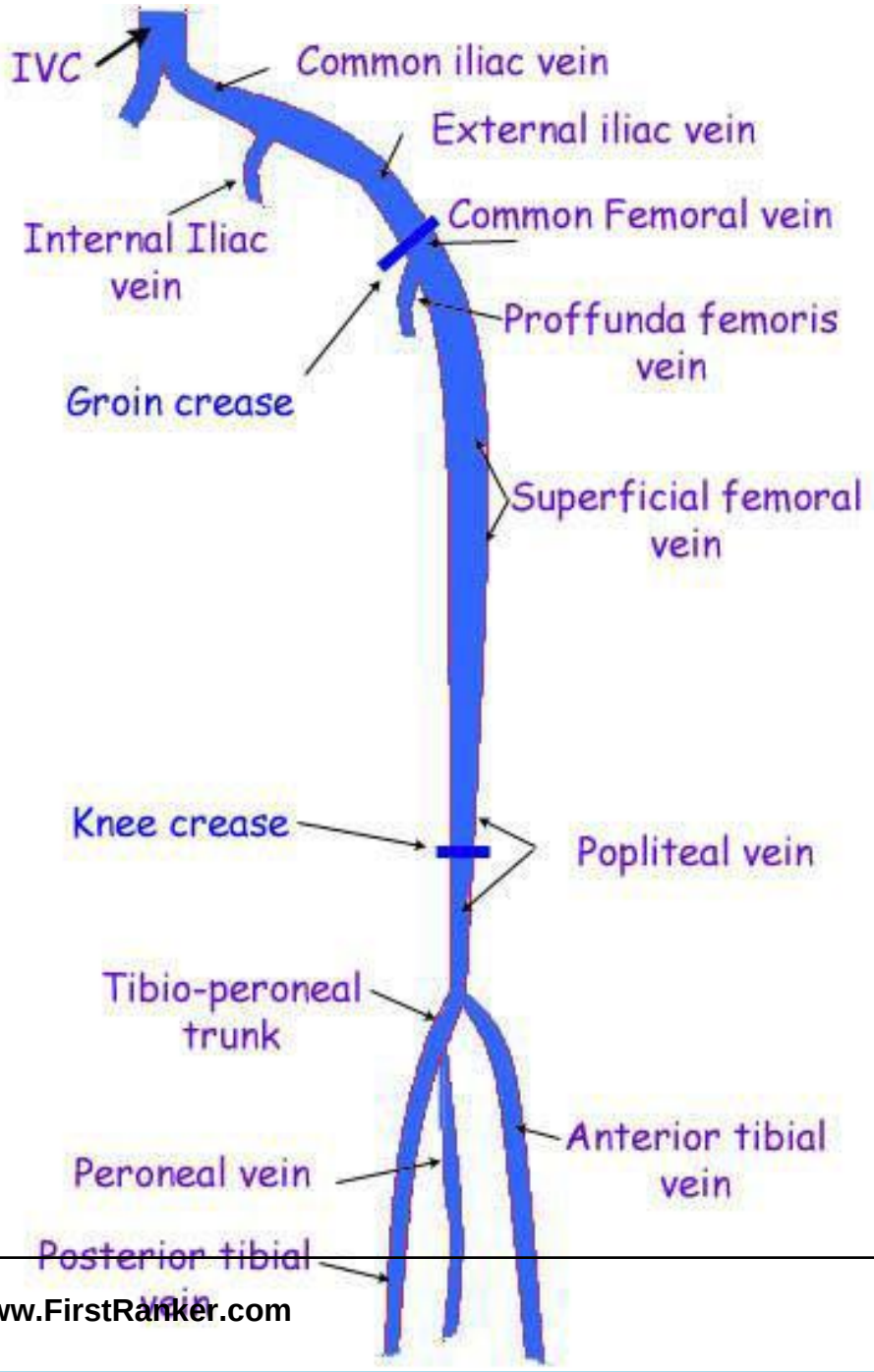
Drainage

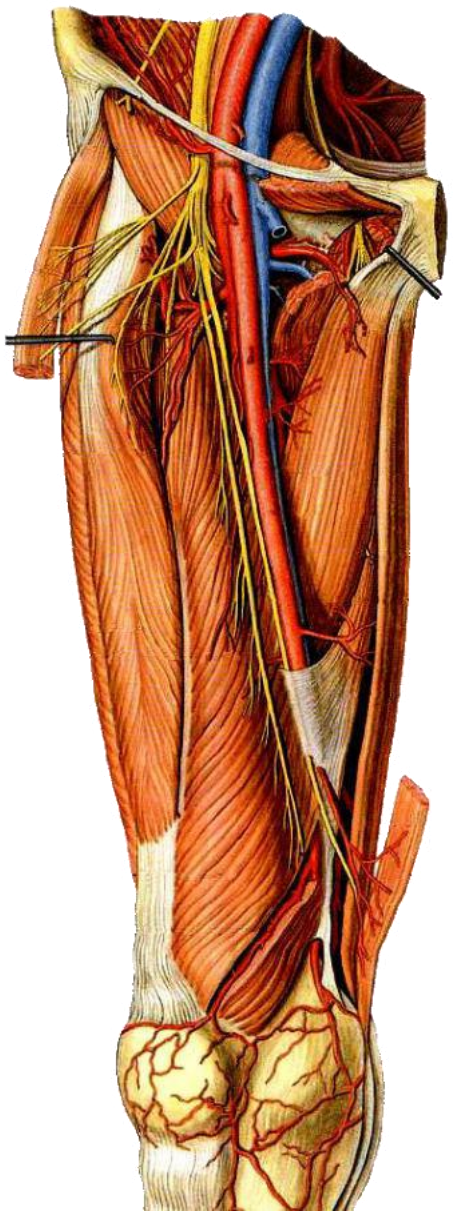
Several large veins drain into the femoral vein:

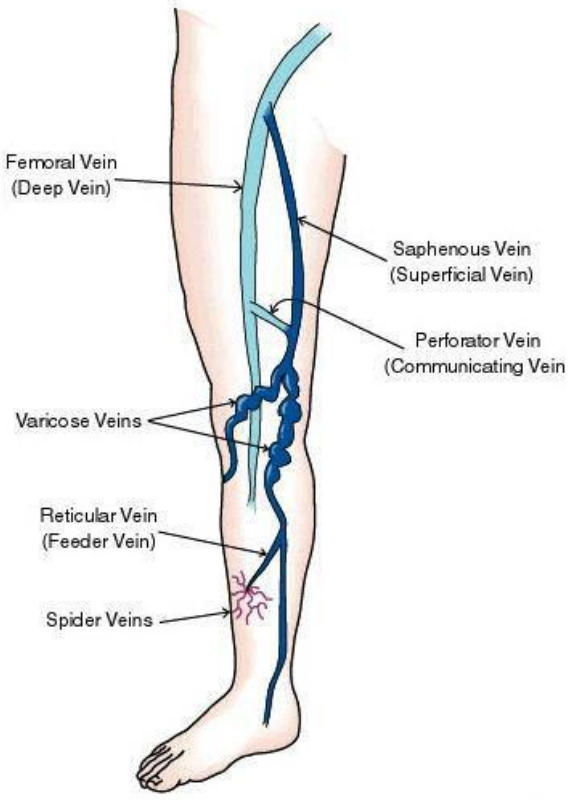
- **Popliteal vein**
- **Profunda femoris vein**
- **Great saphenous vein**

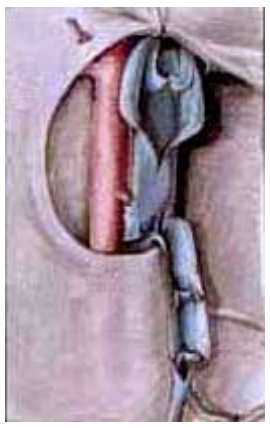






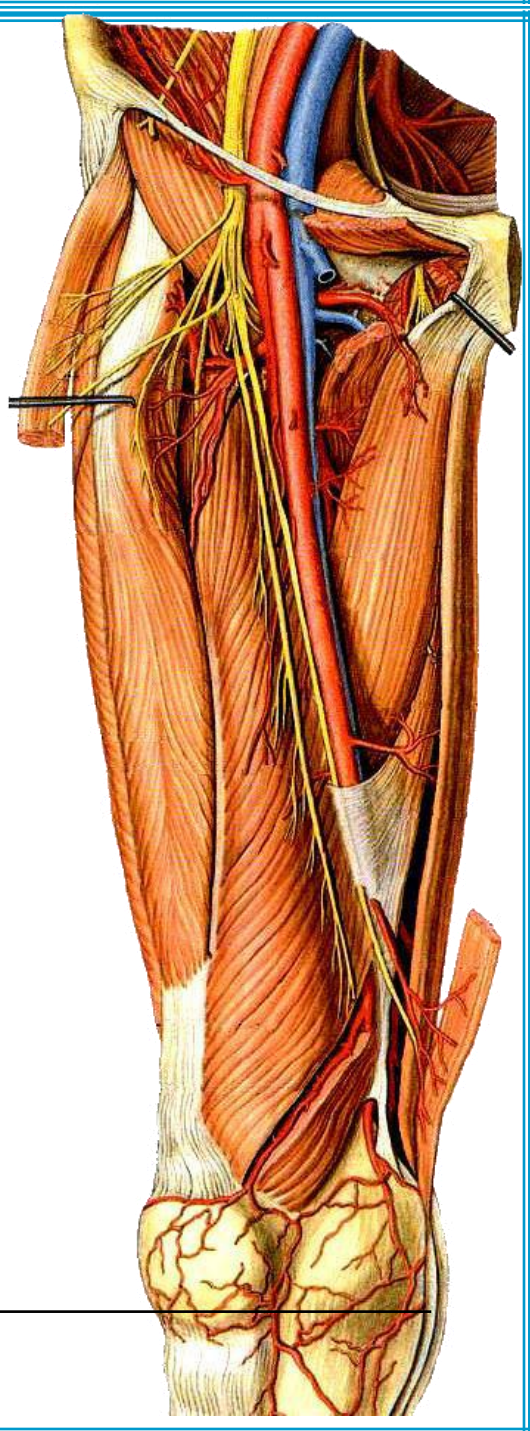






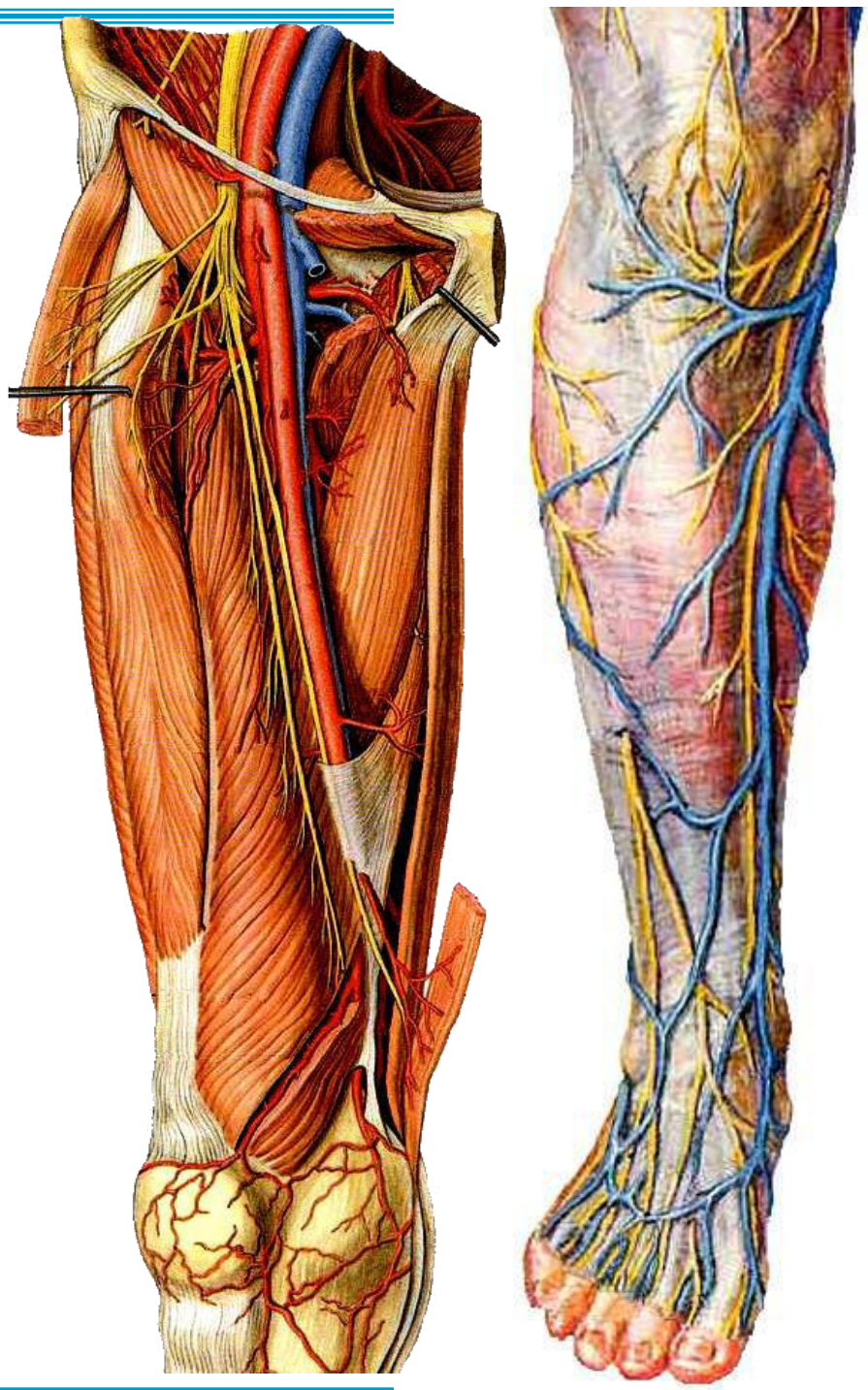
Femoral nerve

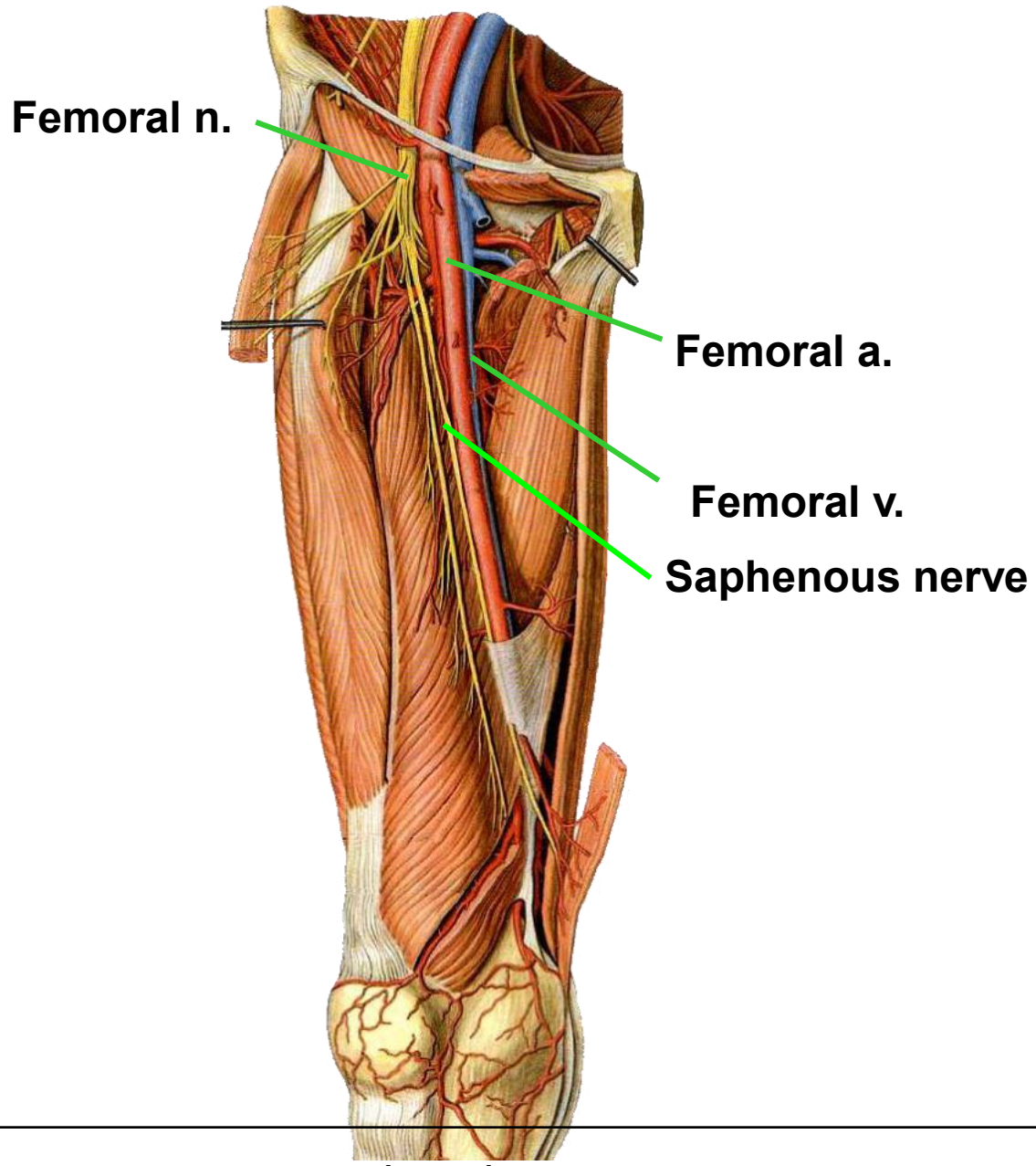
- Arises from the lumbar plexus in the abdomen, and enters the thigh posterior to the inguinal ligament and lateral to the femoral artery.
- It ends by dividing into a number of branches 2 cm below the inguinal ligament.
- *Muscular branches* to: pectineus, sartorius, quadriceps femoris

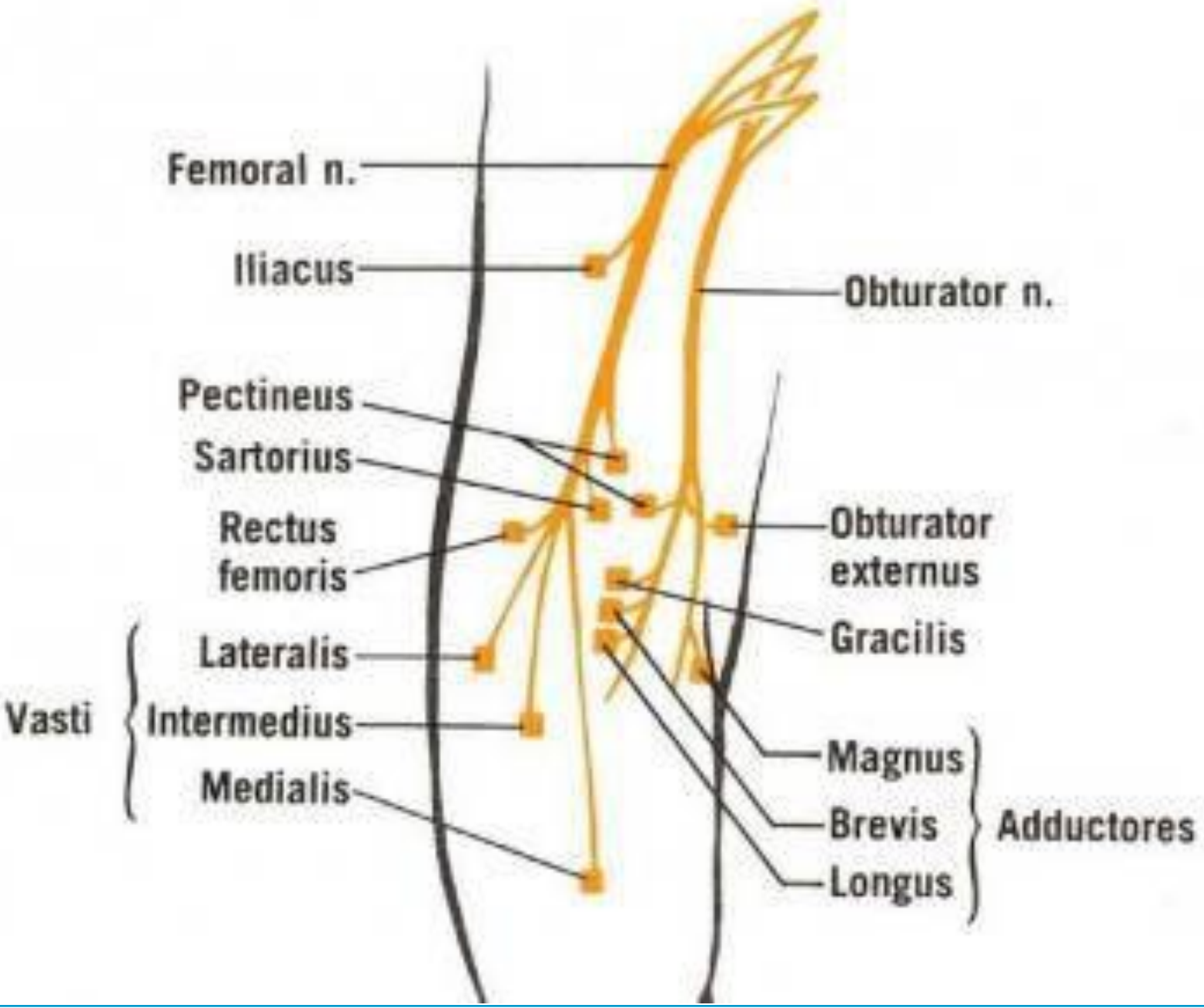


Femoral nerve

- *Cutaneous branches:*
  - Anterior cutaneous nerves of the thigh
  - **Saphenous nerve** is the longest branch of the femoral nerve. It accompanies the femoral vessels in the adductor canal, then accompanies the great saphenous vein to the medial side of the leg and food.

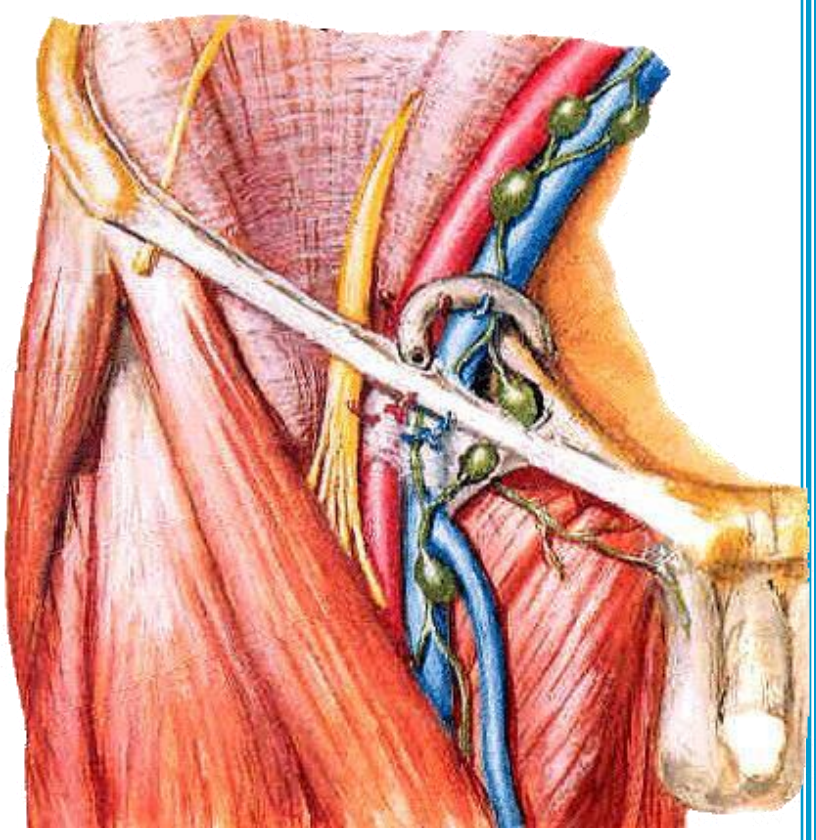






The deep inguinal lymph nodes

- Lie medial to the femoral v.
- Receive deep lymphatics of lower limb, perineal region, and efferent lymphatics from the superficial inguinal ln.
- Drain into the external iliac ln.



Applied/Clinical Anatomy

- -stab wound at the apex of the femoral triangle may cut all the large vessels of the lower limb , injury to femoral vessels results in fatal hemorrhage.
- -femoral artery is quite superficial in the femoral triangle thus can be easily exposed for ligation. catheters are passed upwards till the heart for certain minor operations.
- -femoral vein is commonly used fir intravenous infusions in infants.

Clinical Relevance of the Femoral Triangle

- **Femoral Pulse**
- Just inferior to where the **femoral artery** crosses the inguinal ligament, it can be palpated to measure the femoral pulse.

- The femoral artery crosses exactly midway between the **pubis symphysis** and **anterior superior iliac spine**. The presence of a femoral pulse means that blood is reaching the lower extremity.

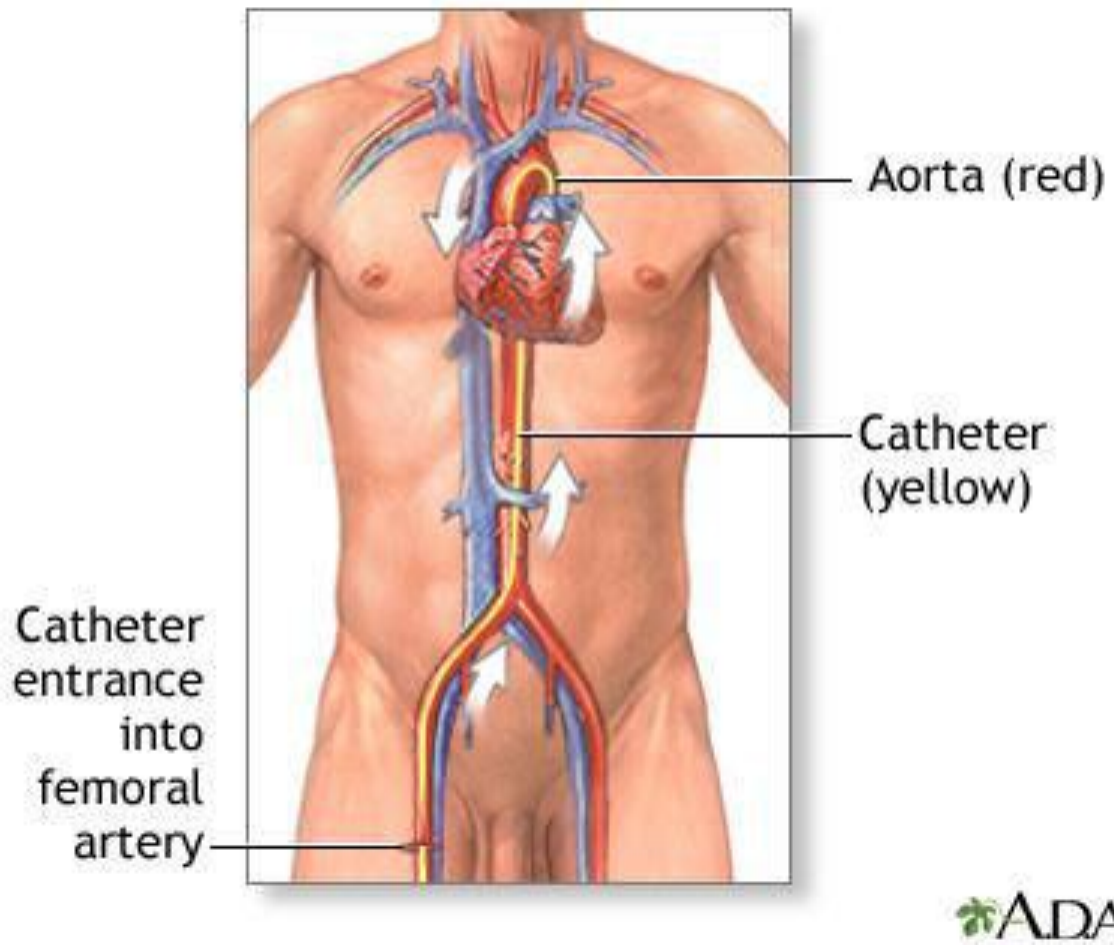
Access to the Femoral Artery

- Within the femoral triangle, the femoral artery is located **superficially**, and thus easy to access. This makes it suitable for a range of clinical procedures.
- One such procedure is **coronary angiography.**
- Here, the femoral artery is **catheterized** with a long, thin tube. This tube is navigated up the external iliac artery, common iliac artery, aorta, and into the **coronary vessels**.

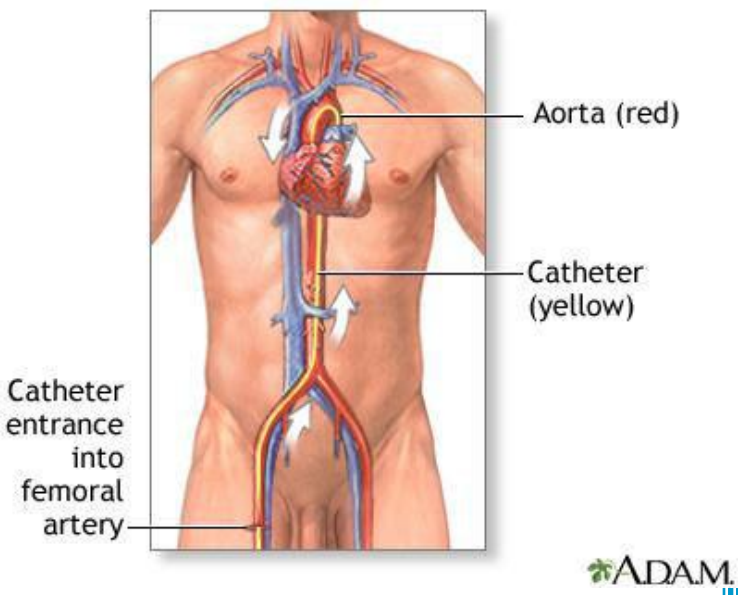
Cardiac catheterization

- (also called heart catheterization) is a diagnostic and occasionally therapeutic procedure that allows a comprehensive examination of the heart and surrounding blood vessels.
- It enables the physician to take angiograms
- record blood flow,
- calculate cardiac output and vascular resistance
- perform an endomyocardial biopsy, and evaluate the heart's electrical activity.
- Cardiac catheterization is performed by inserting one or more catheters (thin flexible tubes) through a peripheral blood vessel in the arm (antecubital artery or vein) or leg (femoral artery or vein) under x-ray guidance.

Coronary artery balloon angioplasty

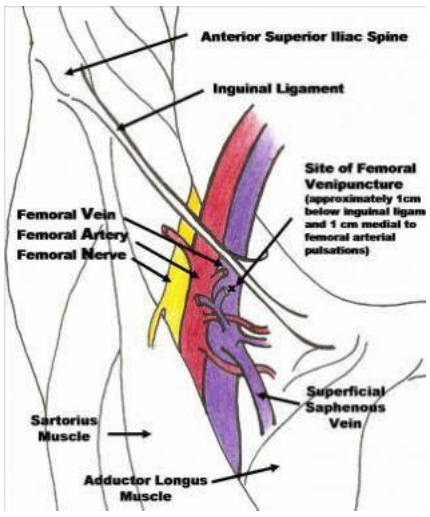


- A radioactive dye is then ejected into the coronary vessels, and any wall thickening or blockages can be visualized via x-ray imaging.
- The femoral artery can also be catheterised to draw blood for **arterial blood gases.**



FEMORAL VENOUS CATHETERIZATION

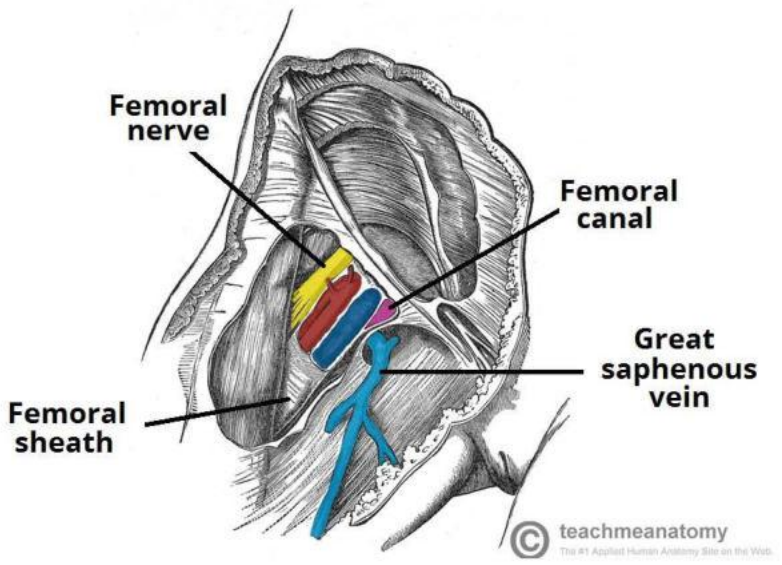
- **Indications**
- Emergency venous access during cardiopulmonary resuscitation (CPR), in that it provides a rapid and reliable route for the administration of drugs to the central circulation of the patient in cardiac arrest
- In hypotensive trauma patients
- Urgent or emergency hemodialysis access
- Hemoperfusion access in patients with severe drug overdose
- Central venous pressure monitoring

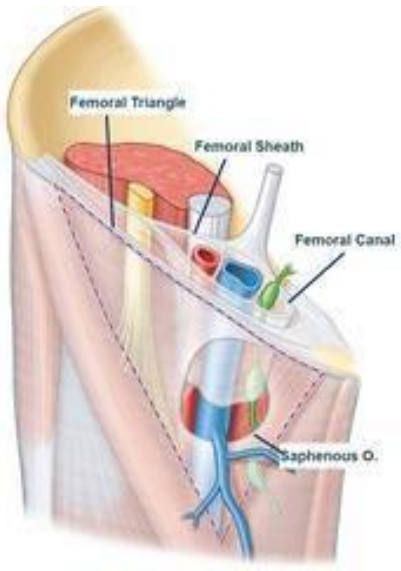


EMBALMING

FEMORAL SHEATH

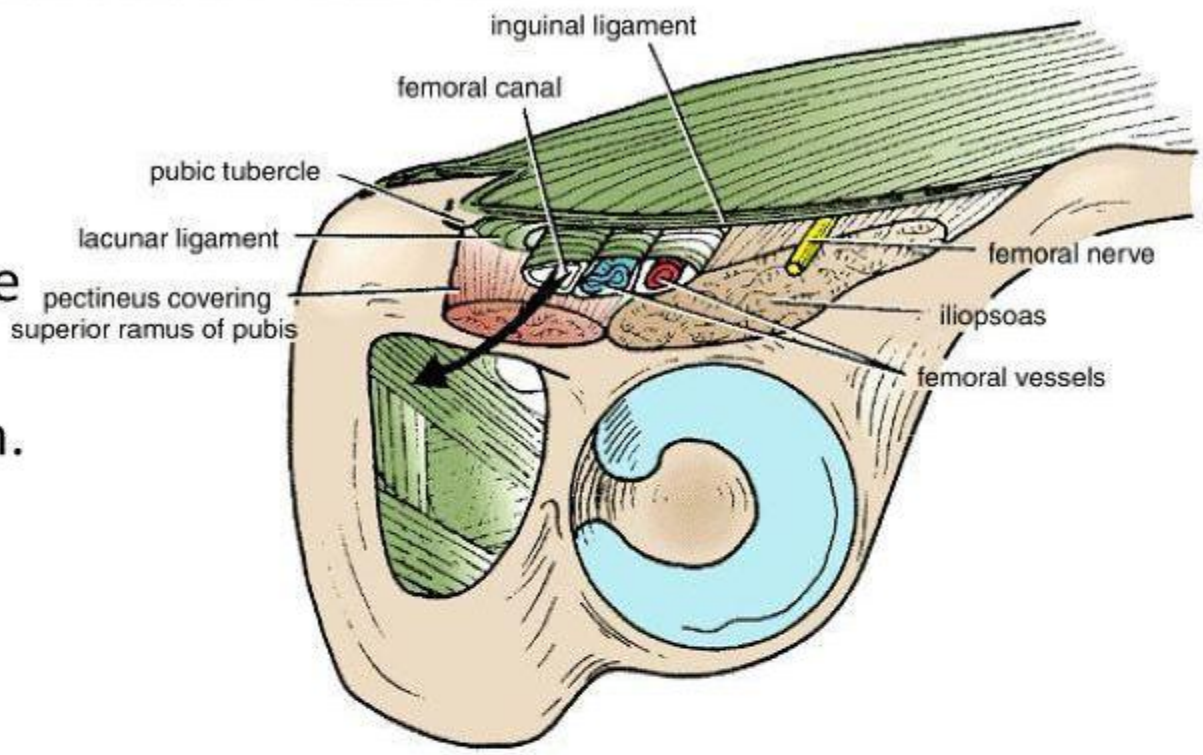
- The femoral artery, vein and canal are contained within a fascial compartment – known as the **femoral sheath**.

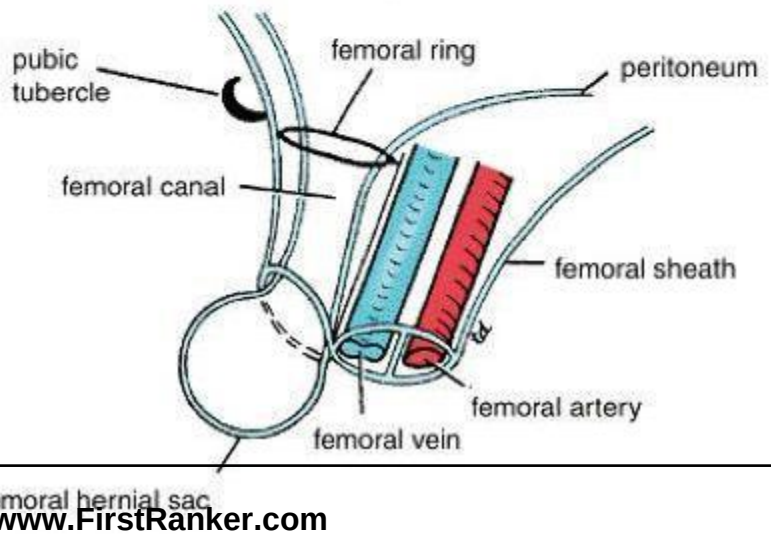


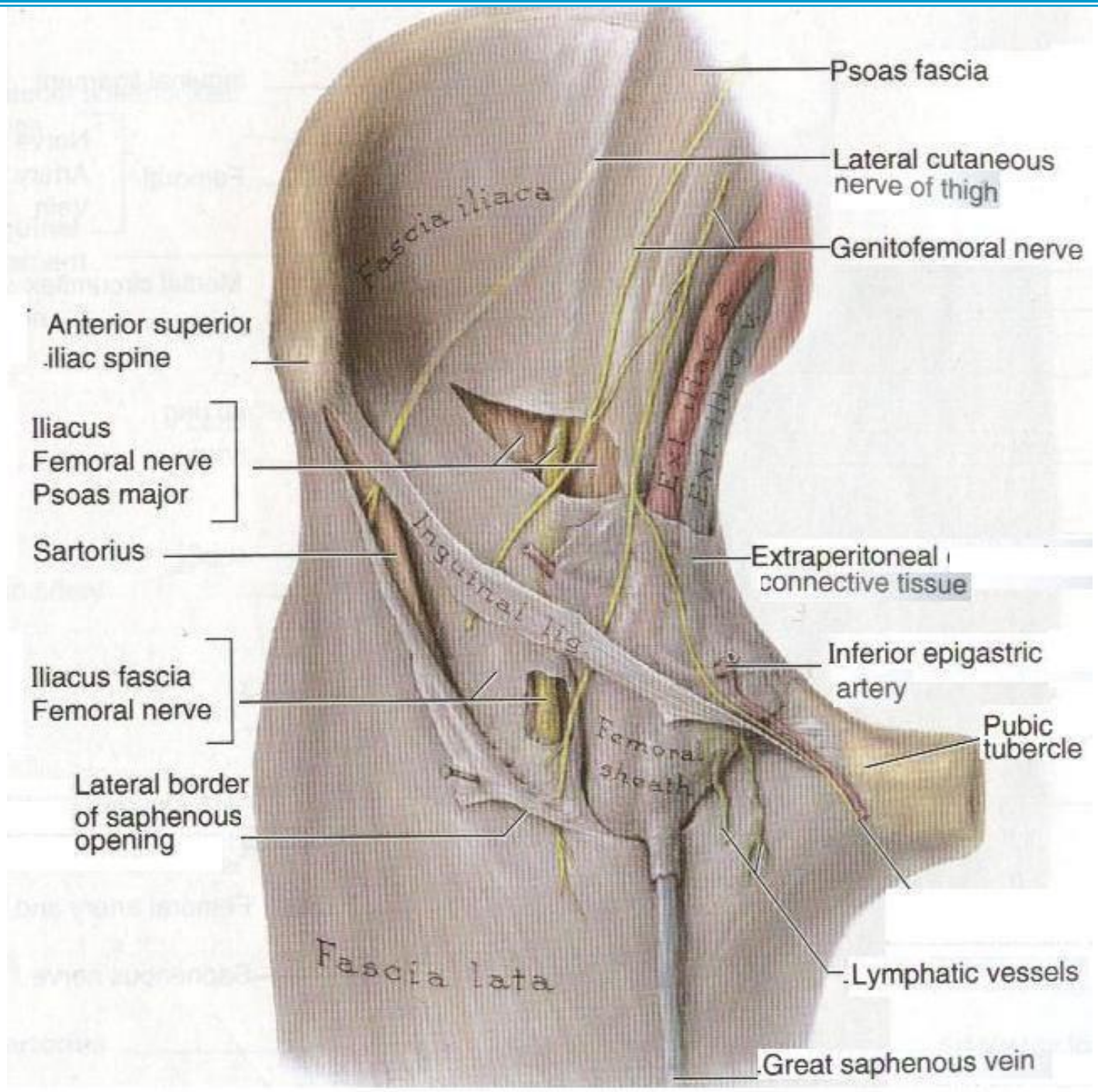


Femoral sheath

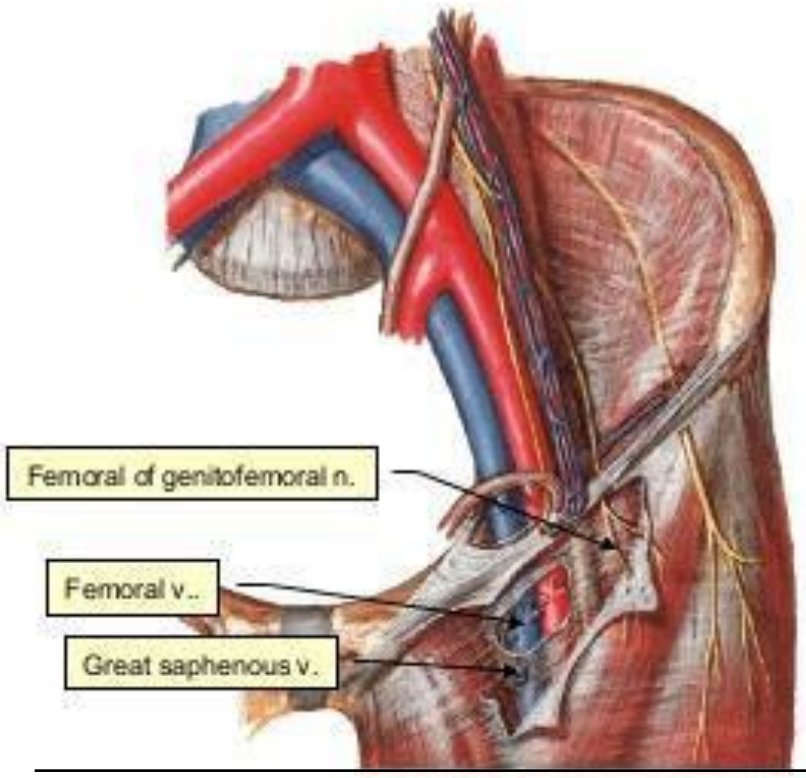
Femoral sheath is a downward prolongation of the fascial lining around the femoral vessels and lymphatics, for about 1.5 in. (4 cm) into the thigh, behind the inguinal ligament. Because the femoral nerve lies outside the fascial envelope, it has no sheath.

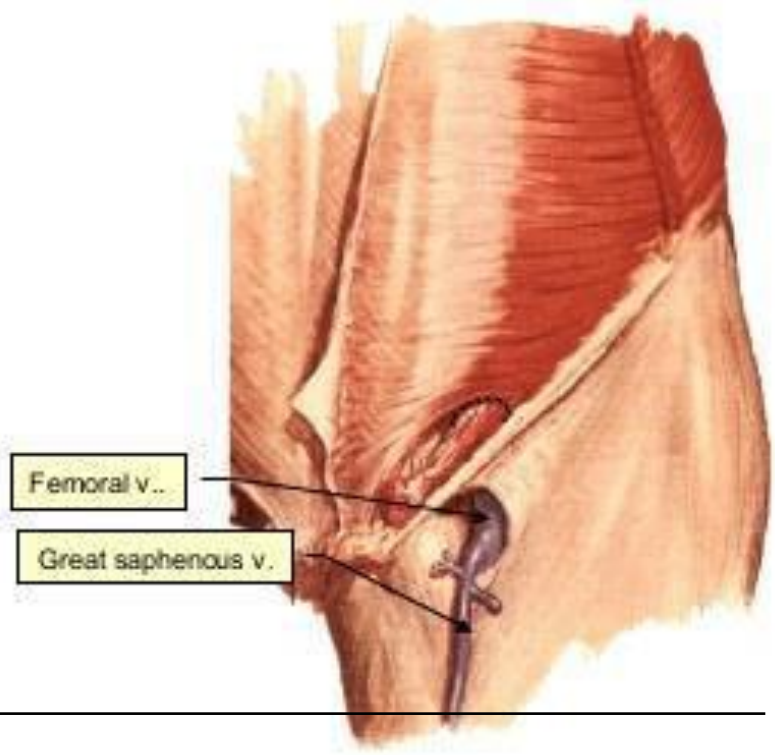






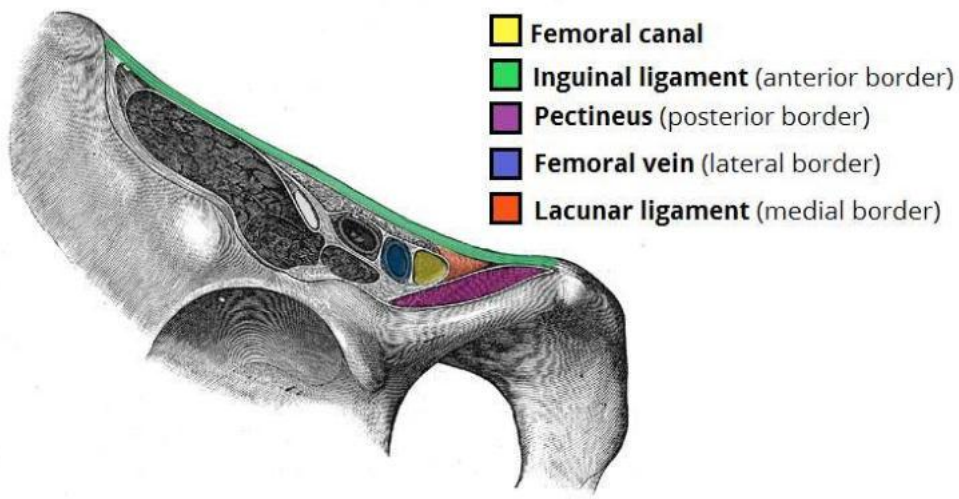
- The femoral sheath is **pierced**
  - Anteriorly: femoral branch of the genitofemoral nerve (to supply skin over the femoral triangle).
  - Medially: great saphenous vein as it joins the femoral vein.





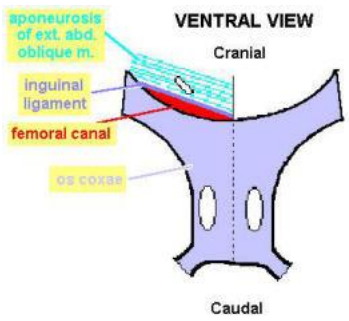
THE FEMORAL CANAL

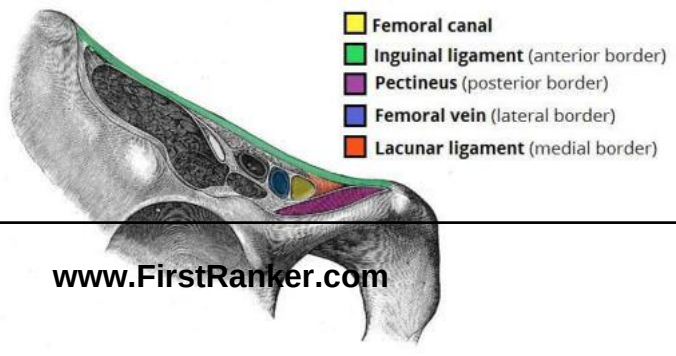
- The femoral canal is an anatomical compartment, located in the anterior thigh. It is the smallest and most medial part of the femoral sheath.
- It is approximately 1.3cm long.



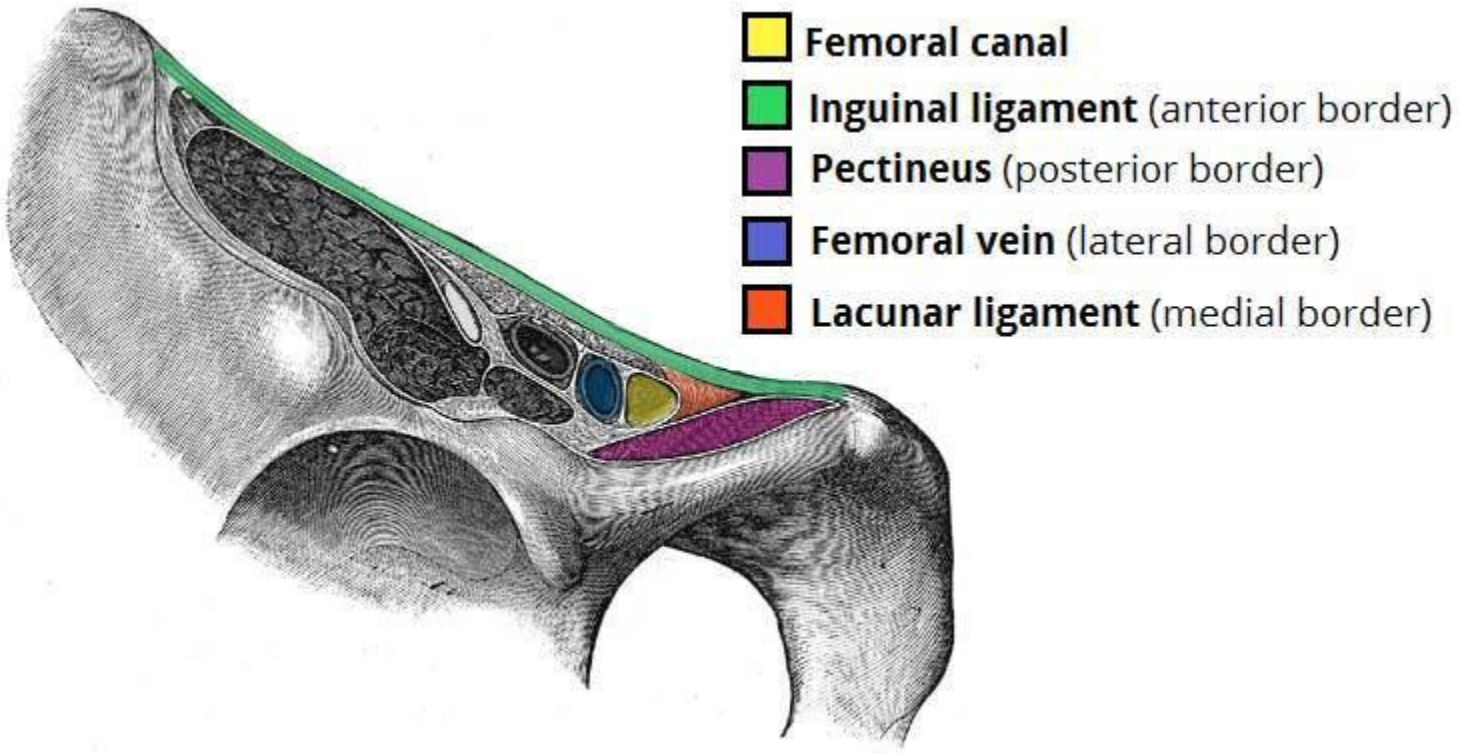
FEMORAL CANAL - BOUNDARIES

- The femoral canal is located in the anterior thigh, within the femoral triangle. It can be thought of as a **rectangular** shaped compartment.
- It has four borders and an opening:
- **Medial border** – Lacunar ligament.
- **Lateral border** – Femoral vein.
- **Anterior border** – Inguinal ligament.
- **Posterior border** – Pectineal ligament, superior rami of the pubi and the pectineus muscle



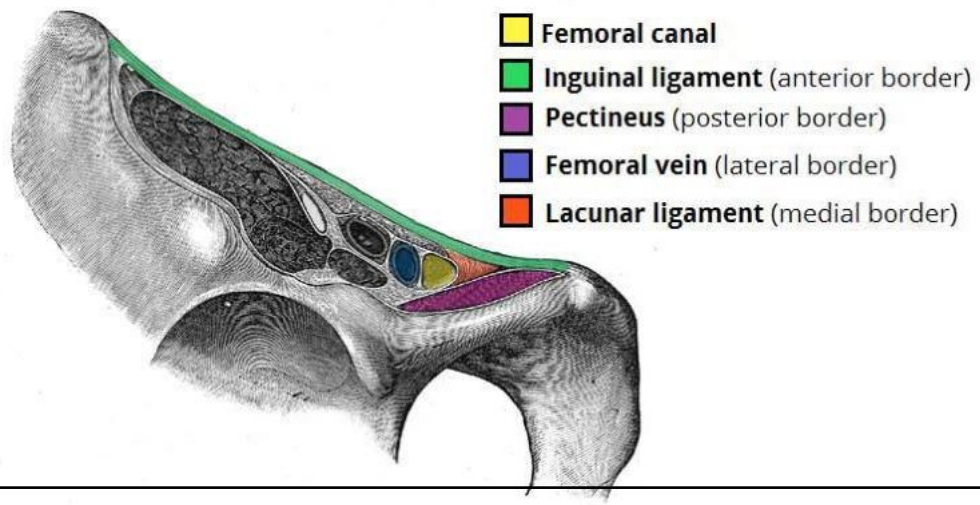


Borders of the femoral canal



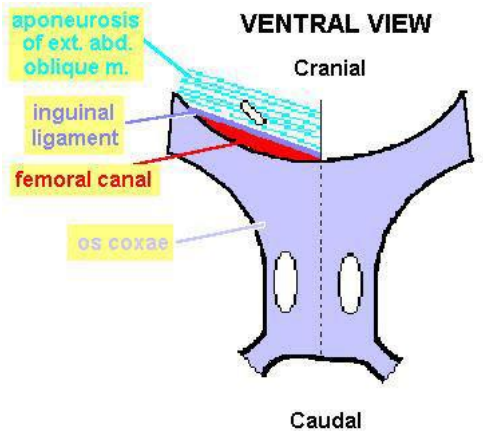
- The opening to the femoral canal is located at its superior border, known as the **femoral ring**. The femoral ring is closed by a connective tissue layer – the **femoral septum**.

- This septum is pierced by the lymphatic vessels exiting the canal.



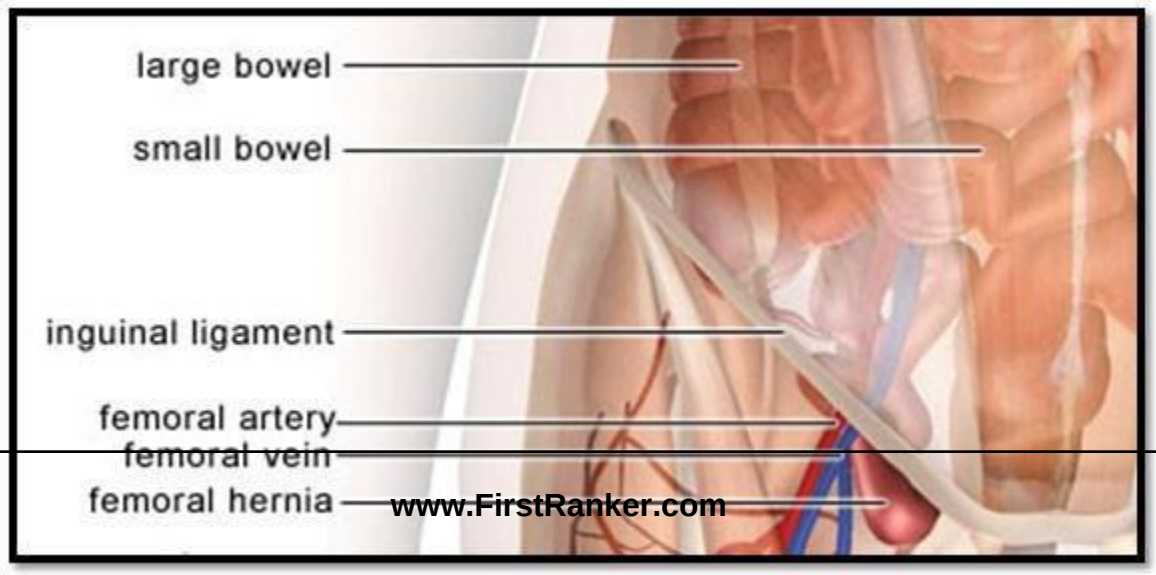
CONTENTS

- The femoral canal contains:
- Lymphatic vessels – draining the deep inguinal lymph nodes.
- Deep lymph node – the lacunar node.
- Empty space.
- Loose connective tissue.
- The empty space allows **distension** of the adjacent femoral vein, so it can cope with increased venous return, or increased intra-abdominal pressure..



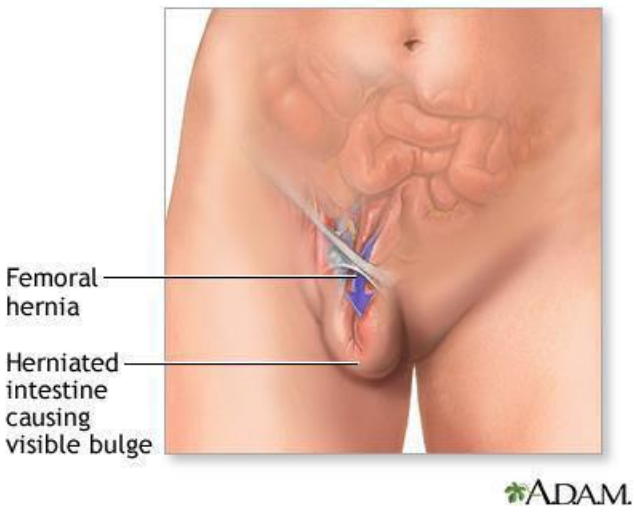
Clinical Relevance: Femoral Hernia

- The femoral canal is of particular clinical importance, as it a common site of **bowel herniation**.
- A hernia is defined as '*where an internal part of the body pushes through a weakness in the muscle or surrounding tissue wall*'.
- In a femoral hernia, part of the small intestine protrudes through the **femoral ring**.



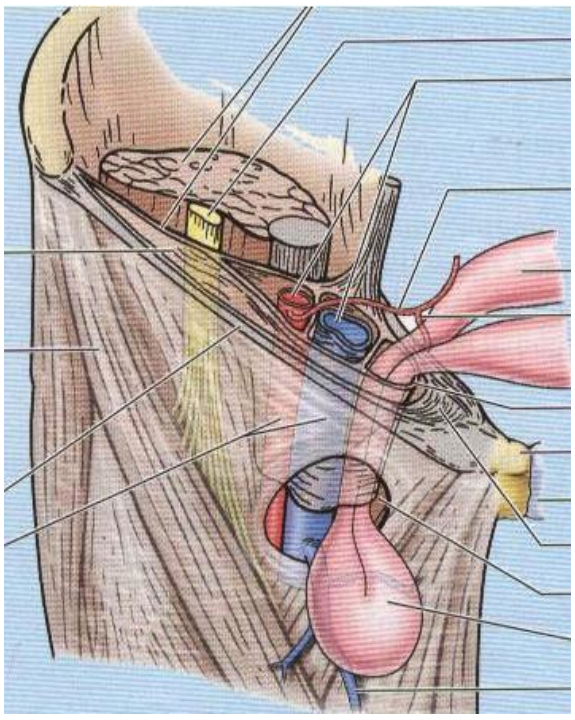
FEMORAL HERNIA

- It presents as a lump situated inferolaterally to the **pubic tubercle**.
- more common in women due to
- their wider bony pelvis
- Narrower blood vessels



FEMORAL HERNIA

- The borders of the femoral canal are tough, and not particularly extendible.
- This can compress the hernia, interfering with its blood supply. A hernia with a compromised blood supply is known as a **strangulated** hernia

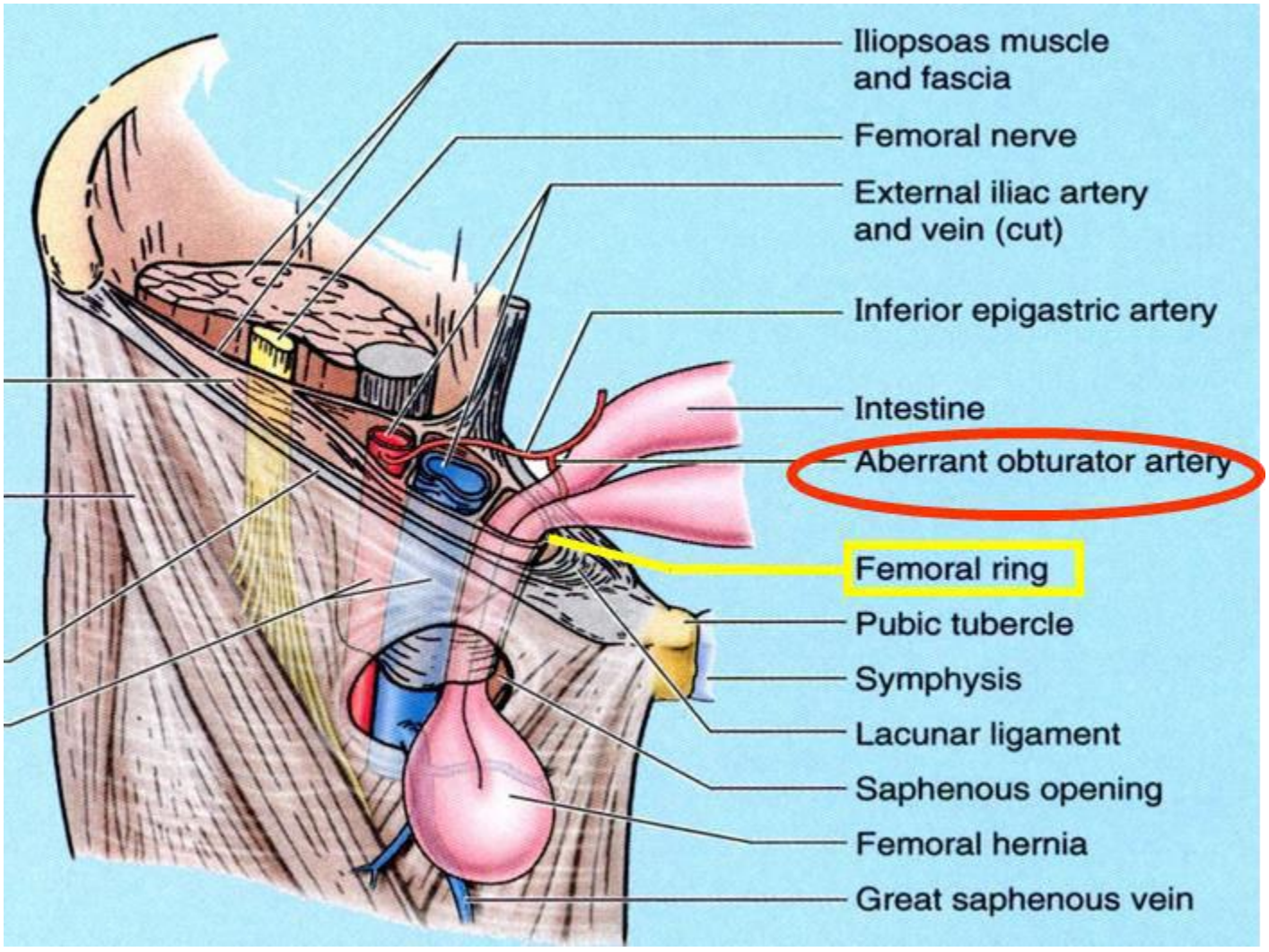


Femoral Canal

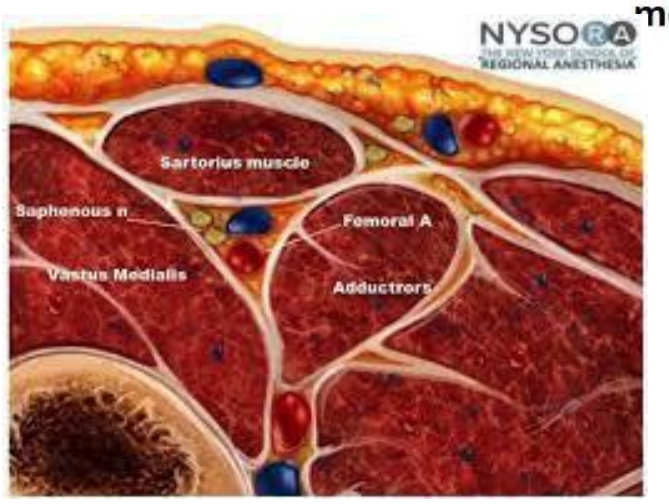
- During open femoral hernia repair lacunar ligament may have to be incised – this puts an accessory obturator artery at risk

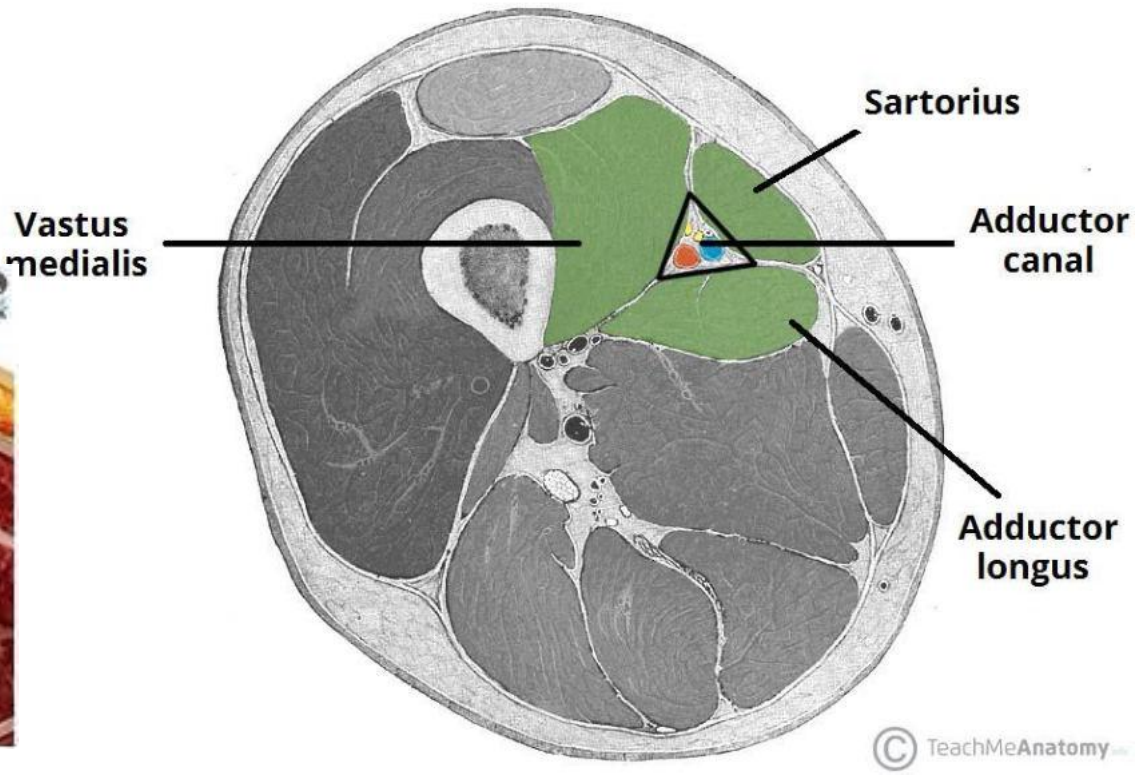
- 50% of people have an ***accessory*** or ***abnormal obturator artery***

- ***Accessary Obturator Artery:***
  - Deep inferior epigastric gives a pubic branch to the periosteum of superior pubic ramus – this anastamoses with the pubic braches of obturator artery
  - If obturator artery absent – then this anastamosis is patent



Cross-section of the thigh, showing the borders of the adductor canal.





Note: the adductor magnus is not visible in this illustration

CONTENTS

- The adductor canal serves as a **passageway** from structures moving between the anterior thigh and posterior leg.
- It contains the femoral artery, femoral vein, nerve to the vastus medialis and the saphenous nerve (the largest cutaneous branch of the femoral nerve).
- As the femoral artery and vein exit the canal, they become the **popliteal artery** and **vein** respectively.

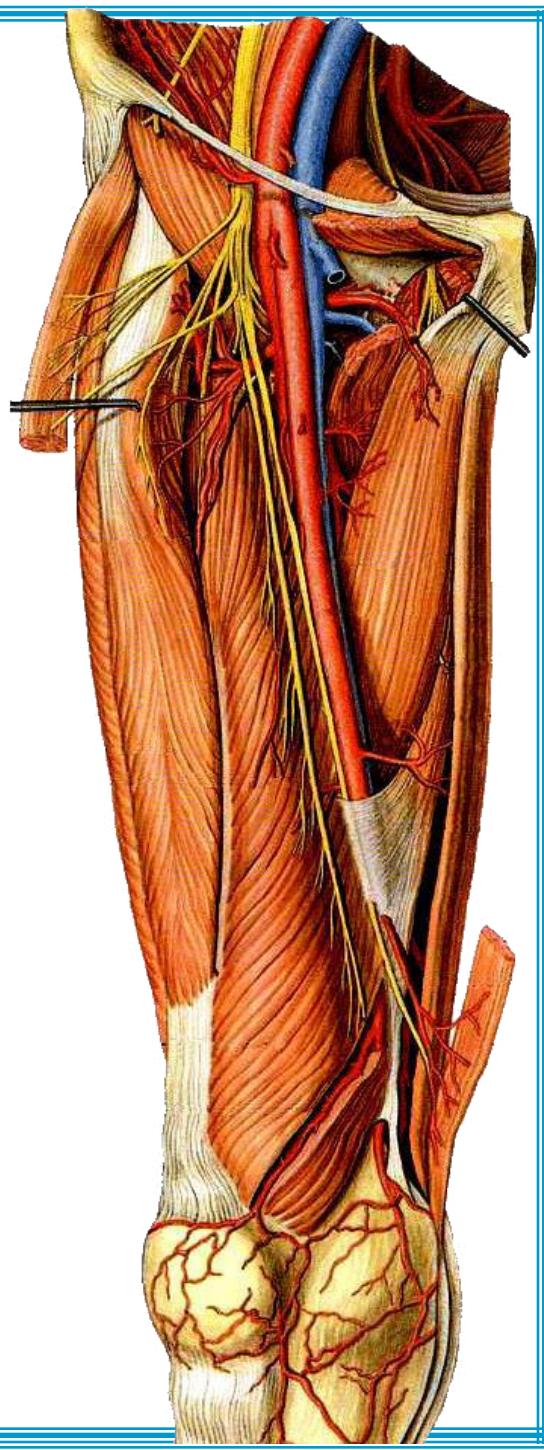
Clinical Relevance – Adductor Canal Block

- In the adductor canal block, local anaesthetic is administered in the adductor canal to block the **saphenous nerve** in isolation, or together with the nerve to the vastus medialis.
- The block can be used to provide sensory anaesthesia for procedures involving the distal thigh and femur, knee and lower leg on the medial side.
- The sartorius and femoral artery are used as anatomical landmarks to locate the saphenous nerve.

Adductor Canal Compression Syndrome

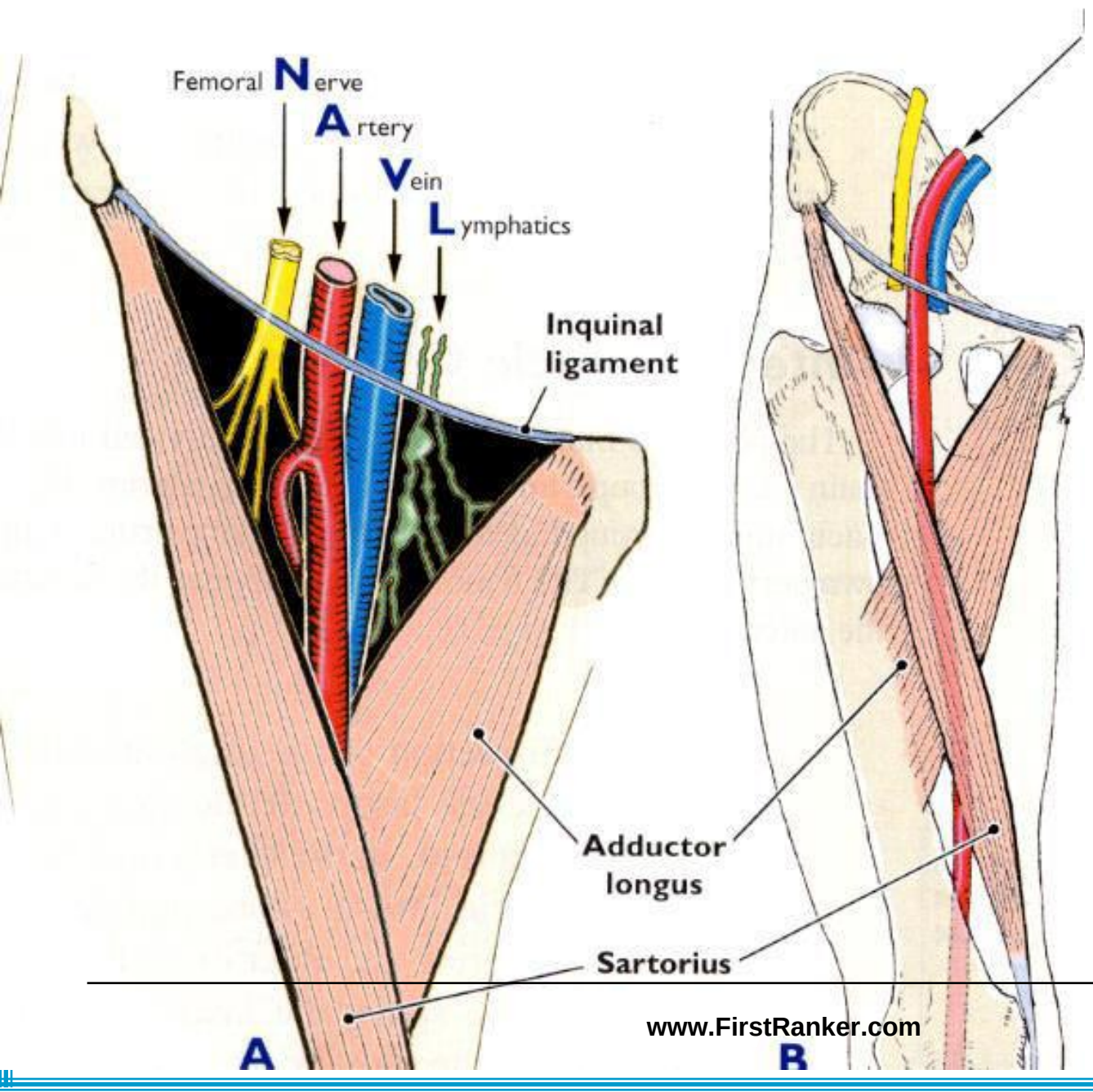
- Adductor canal compression syndrome describes **entrapment** of the neurovascular bundle within the adductor canal.
- caused by hypertrophy of adjacent muscles such as **vastus medialis**.
- It is most common in young males, who may present with claudication symptoms due to femoral artery occlusion (more common) or neurological symptoms due to entrapment of the saphenous nerve.

Adductor canal



- An intermuscular cleft situated on the medial aspect of the middle third of the thigh beneath the sartorius.
- Extends from apex of femoral triangle to adductor tendinous opening
- **Boundies**
  - Anterior wall: adductor lamina and sartorius
  - Lateral wall : vastus medialis
  - Posteomedial wall: adductors longus and magmus
- **Contents**
  - Saphenous n.
  - Femoral a. and femoral v.
  - lymphatic vessels and loose connective tissue

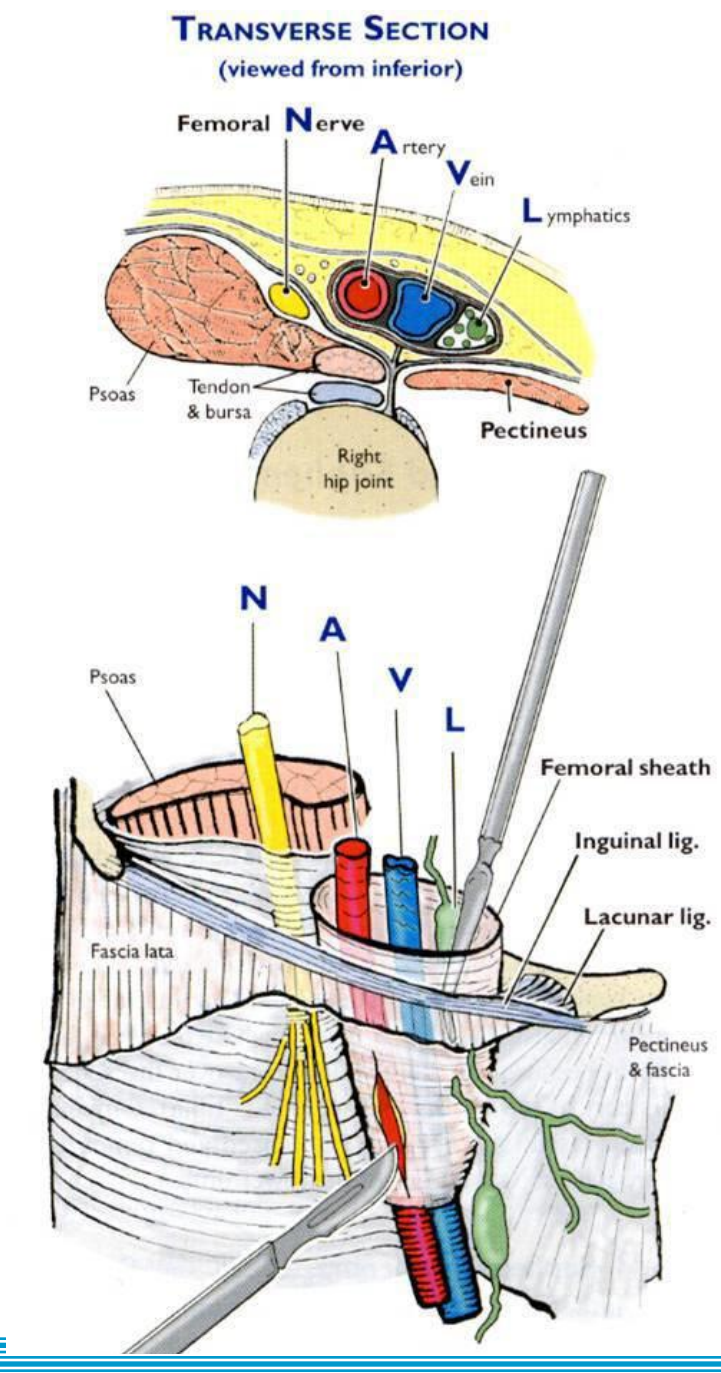
Femoral triangle / RELATIONS



Deep contents

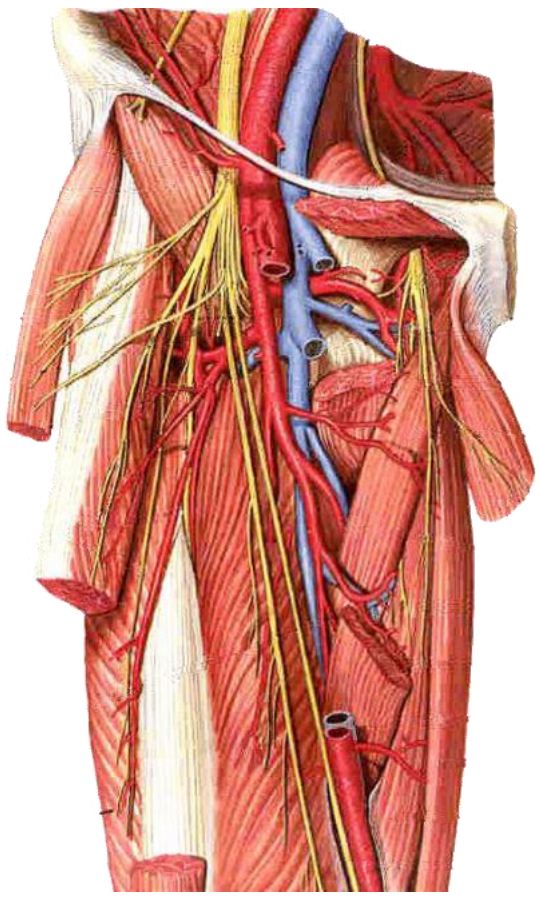
- *Femoral a. & v.* surrounded by *femoral sheath*
- *Profunda femoris a.* – principal artery of thigh
- *Lat and med. femoral circumflex aa.*
- *Deep external pudendal a.*
- *Femoral n.*
- A few deeper lymph nodes --

Femoral triangle / RELATIONS



Blood vessels and nerve of medial side of thigh

- **Obturator a.**
  - Arises from internal iliac artery in the lesser pelvis
  - passes through the obturator canal where it divides into anterior and posterior branches.
- **Obturator n.**
  - Arises from the lumbar plexus in the abdomen.
  - Enters the thigh through the obturator canal where it divides into anterior and posterior branches.
  - Supplies medial group of muscles of thigh, obturator externus, and skin of medial side of thigh



Test

Question

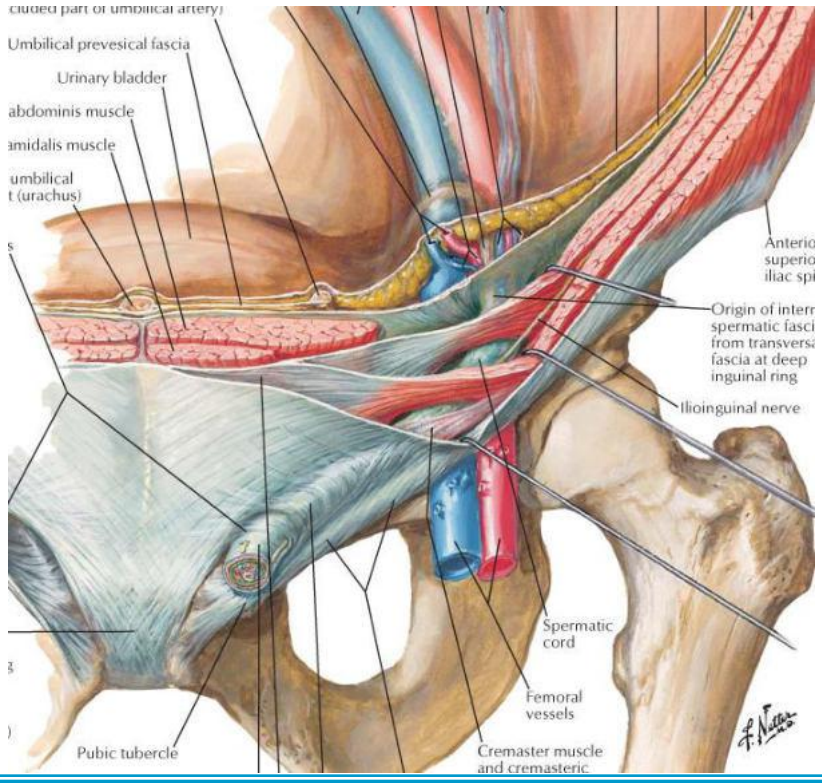
- What is the midinguinal point?

- Name the structure for which the midinguinal point is a landmark?

Answer

– ½ way between PS and ASIS

– Femoral artery



Test

Question

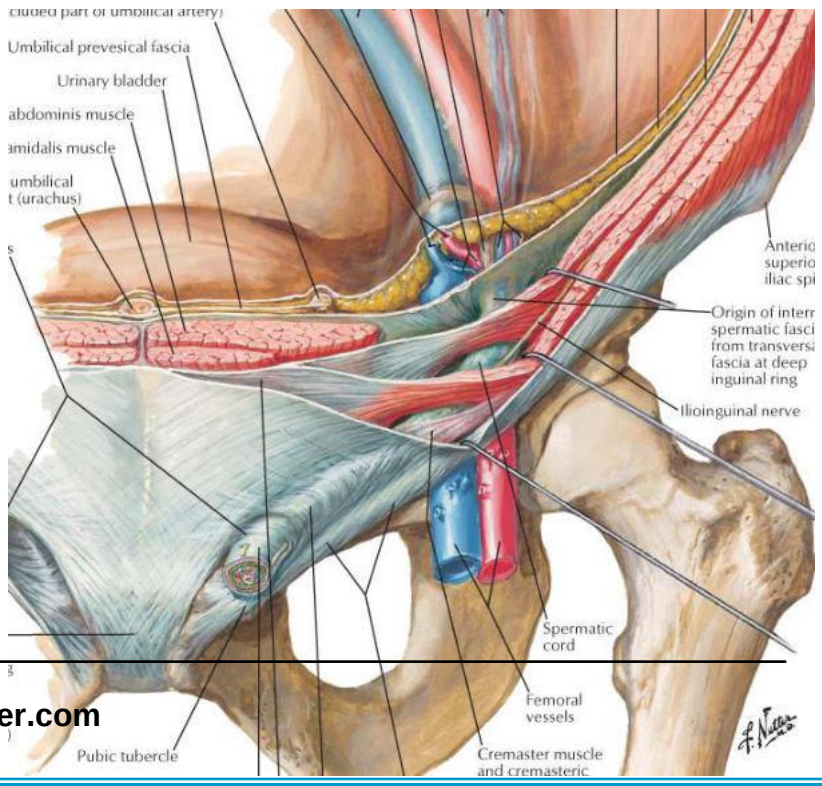
- What is the midinguinal point?

- Name the structure for which the midinguinal point is a landmark?

Answer

– ½ way between PT and ASIS

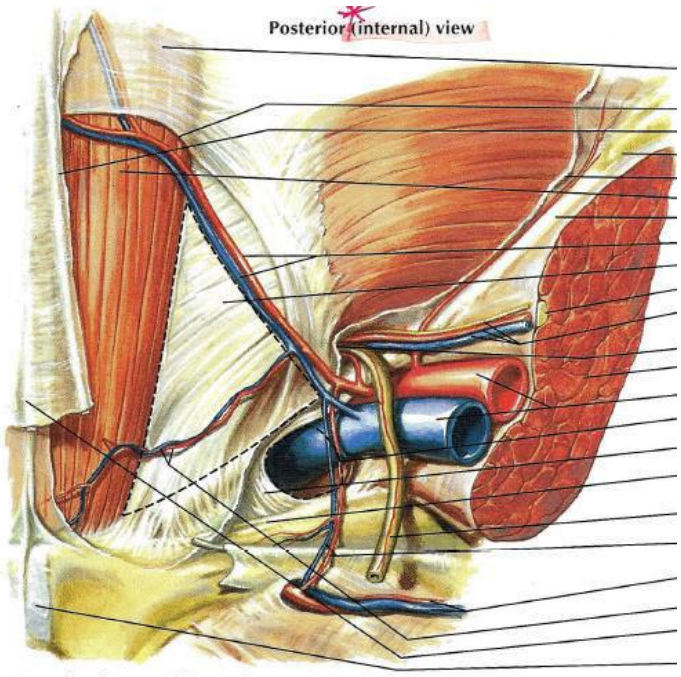
– Deep inguinal ring



Test

Question

- What are the borders of the Femoral Ring?



Hesselbach's triangle by Carlos Machado after Frank Netter

Answer

- Anterior – medial part of inguinal ligament
- Lateral – femoral vein
- Posterior – pectineal ligament and pectaneus
- Medial – crescentic edge of lacunar ligament