



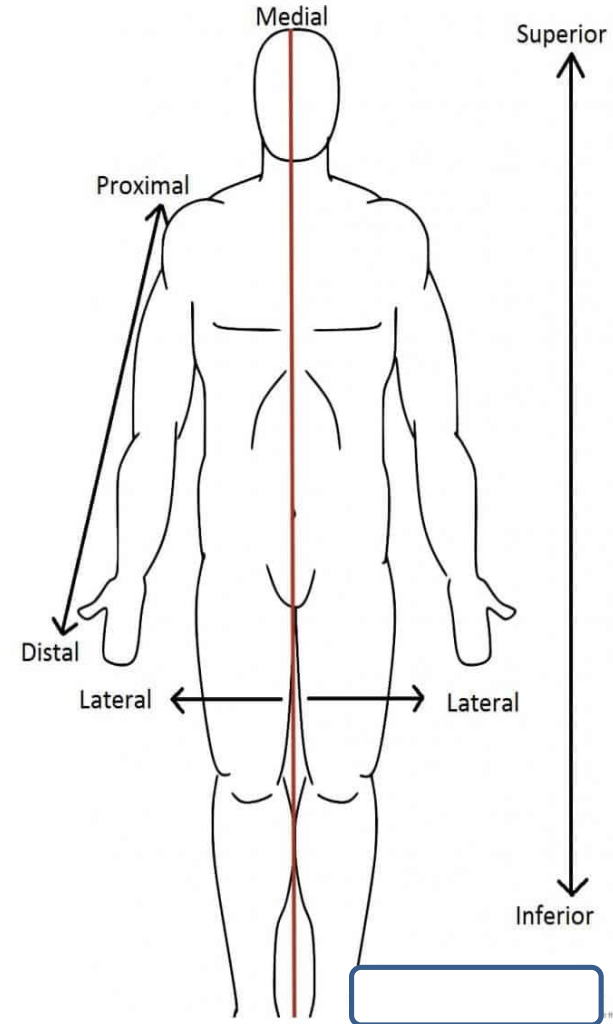
**AL MUSTAQBAL UNIVERSITY**

**College of Medicine / First Year**



**ANATOMY**

**(L2) Gluteal Region**



**Assist Prof. Dr. Abdulhusein Mizhir Almaamuri**

# Learning Objectives

- **Describe** the gluteal region
- **List** its muscles, vessels & nerves
- **Specify** the site of injection
- **Demonstrate** some important pathologies affecting the structures in this region

# Regions of lower limb

## The lower limbs have six major regions

- ❑ **The gluteal region:** transitional region between the trunk and free lower limbs.
- ✓ **the buttocks**
- ✓ **hip region** overlies the hip joint and greater trochanter
- ❑ **The femoral region (thigh).** The transition from trunk to free lower limb occurs abruptly in the inguinal region or groin.
- ❑ **The popliteal fossa (The knee region)**
- ✓ condyles of the distal femur and proximal tibia,
- ✓ the head of the fibula
- ✓ the patella
- ✓ the joints between these bony structures.
- ❑ **The leg region** includes most of the tibia and fibula
- ❑ **The ankle** includes the medial and lateral malleoli that flank the ankle joint.
- ❑ **The foot region** containing the tarsus, metatarsus, and phalanges



## **GLUTEAL REGION**

The gluteal region, or buttock, is bounded superiorly by the iliac crest and inferiorly by the fold of the buttock. The region is largely made up of the gluteal muscles and a thick layer of superficial fascia.

### **Skin**

Both anterior and posterior rami of spinal nerves supply cutaneous nerves in the following pattern:

**Upper medial quadrant:** supplied by the posterior rami of the upper three lumbar nerves and the upper three sacral nerves

**Upper lateral quadrant:** supplied by the lateral branches of the anterior rami of the iliohypogastric (L1) and 12th thoracic nerves

**Lower lateral quadrant:** supplied by branches from the lateral cutaneous nerve of the thigh (L2 and L3, anterior rami)

**Lower medial quadrant:** supplied by branches from the posterior cutaneous nerve of the thigh (S1, S2, and S3, anterior rami).

Small branches of the lower sacral and coccygeal nerves supply the skin over the coccyx in the floor of the cleft between the buttocks.

**The lymph vessels** drain into the lateral group of the superficial inguinal nodes.

# Gluteal Region: Buttocks and Hip Region

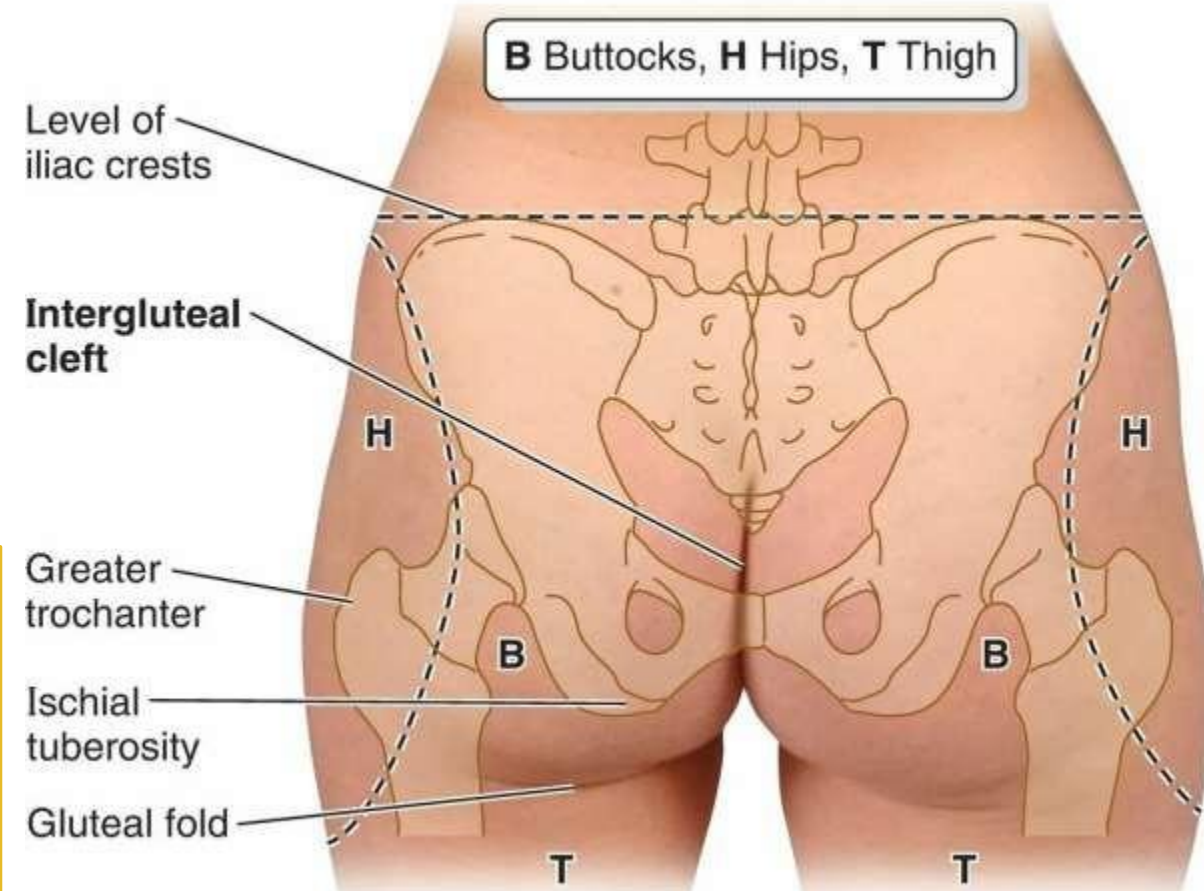
## The **Buttocks**:

- posterior to the pelvis
- inferior to the level of the iliac crests
- extending laterally to the posterior margin of the greater trochanter

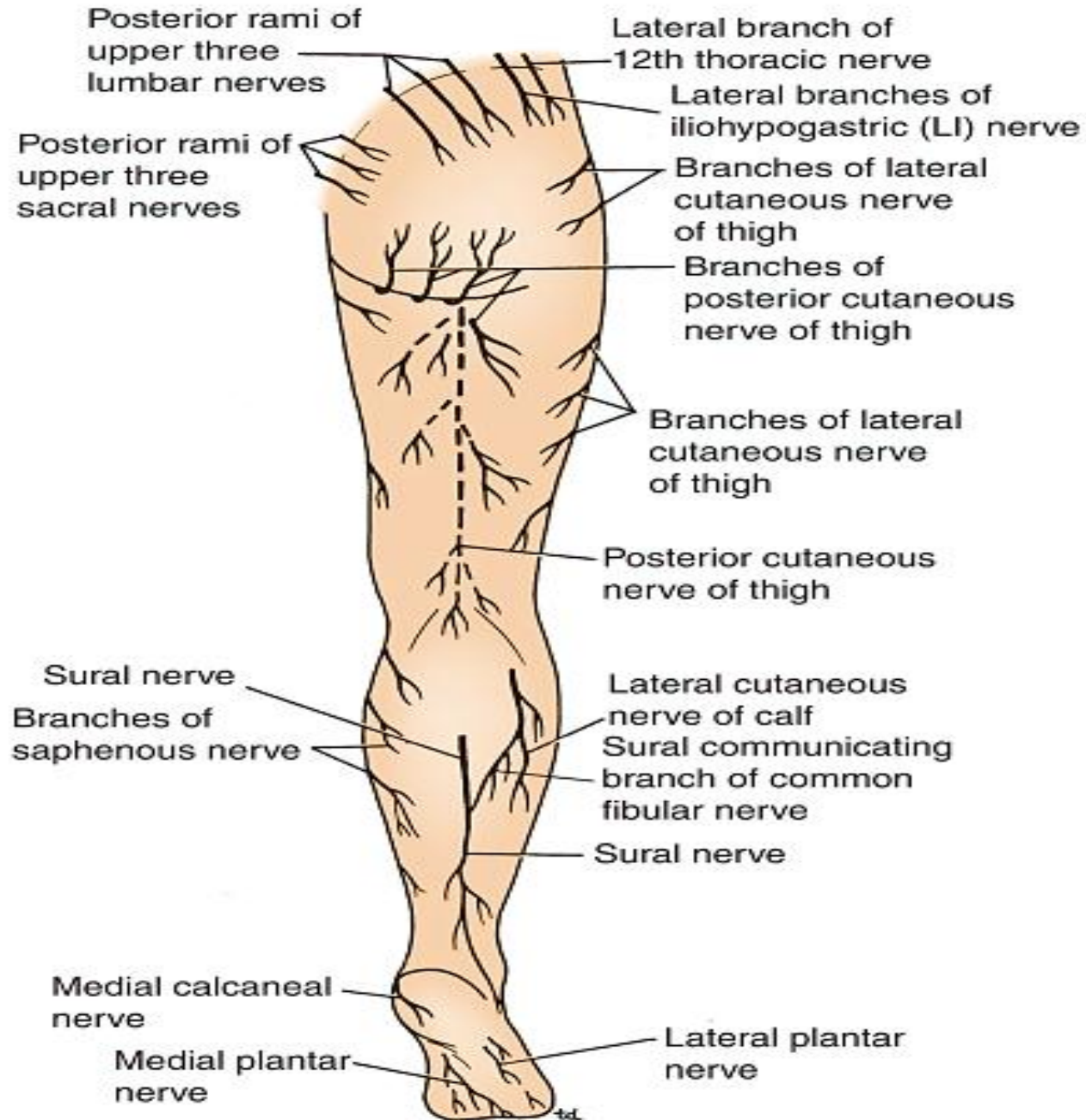
The **hip region** overlies the greater trochanter laterally, extending anteriorly to the ASIS.

The **intergluteal cleft (natal cleft)** is the groove that separates the buttocks from each other.

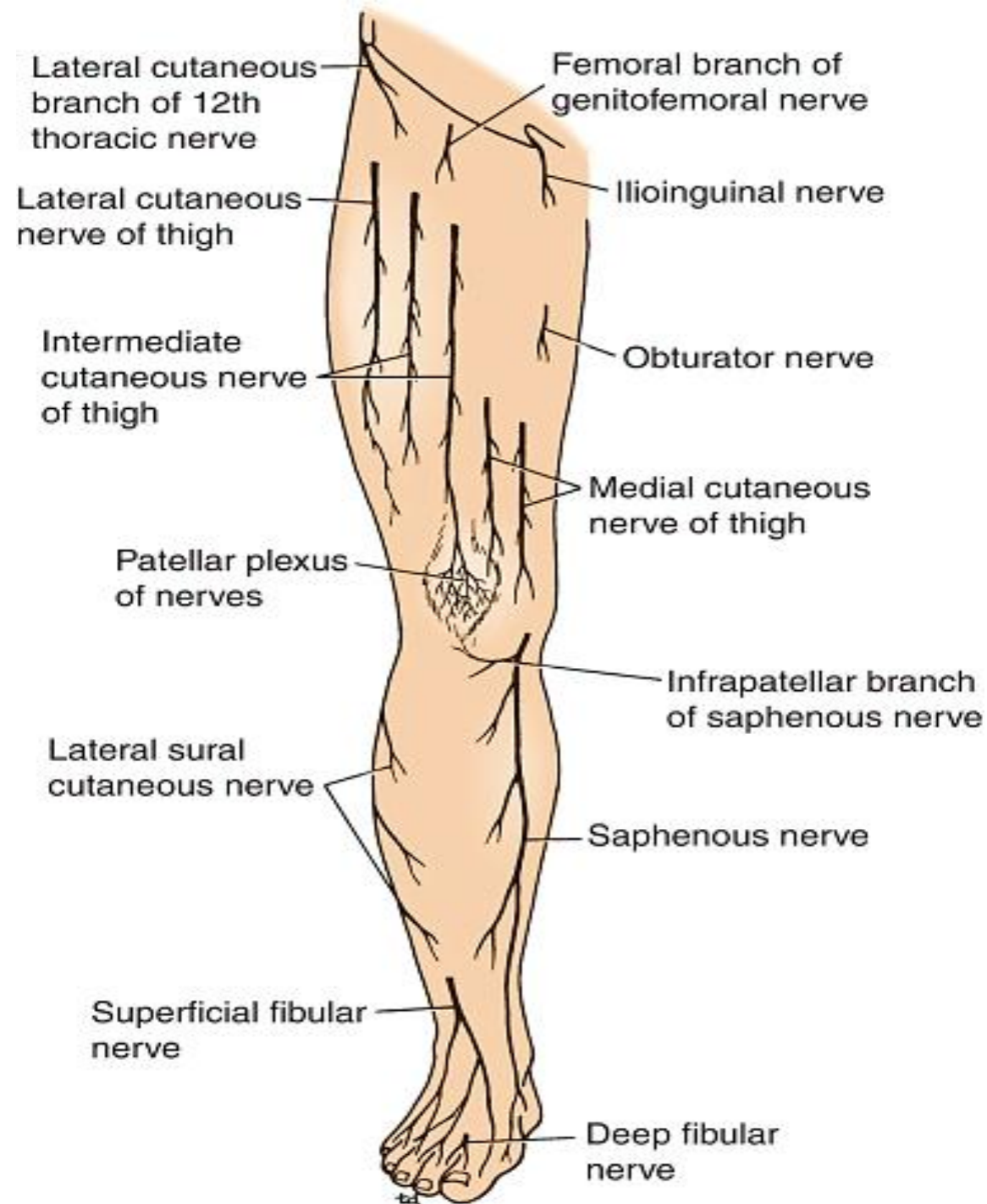
The **gluteal fold**  
 demarcates the inferior boundary of the buttock and the superior boundary of the thigh.



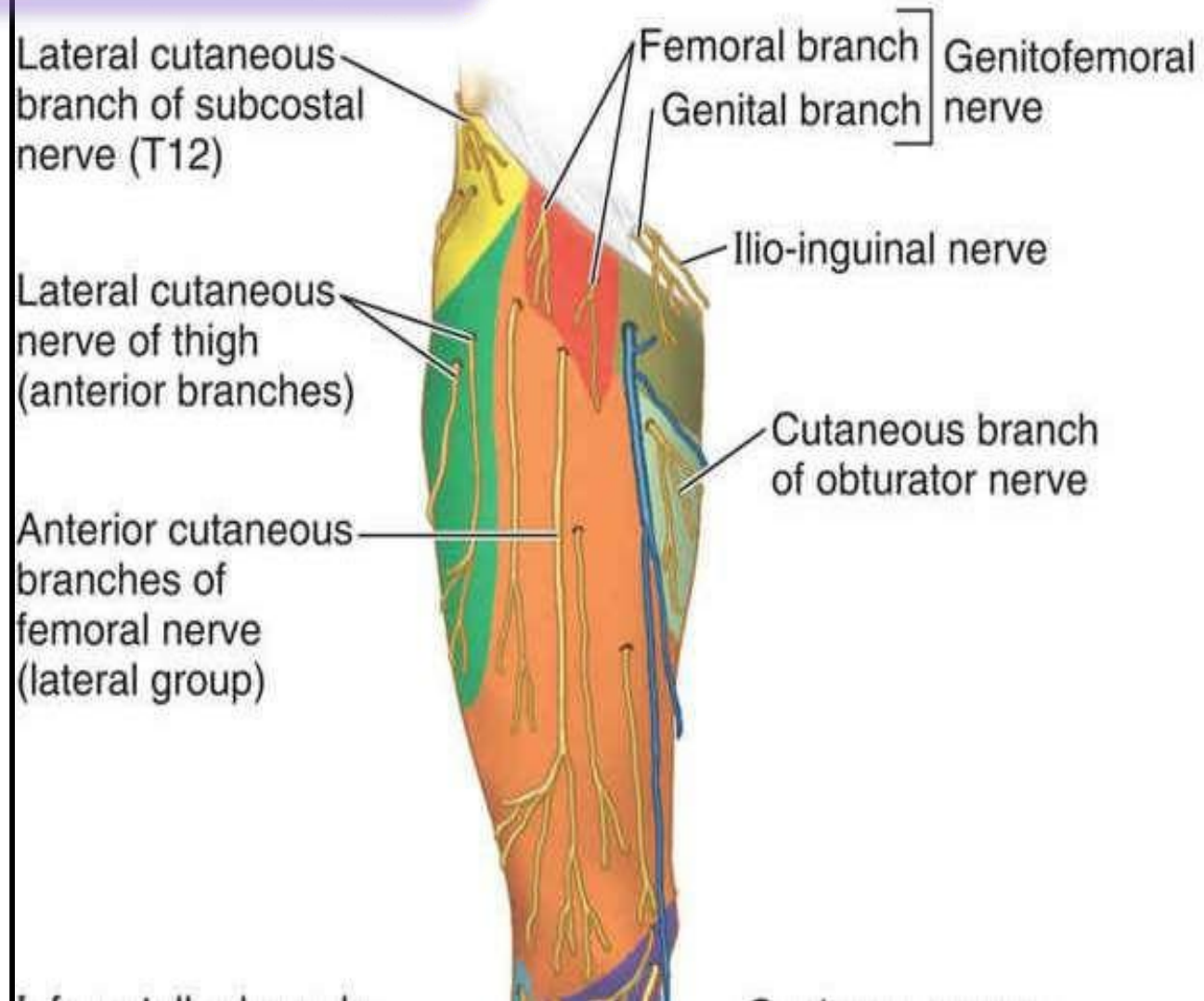
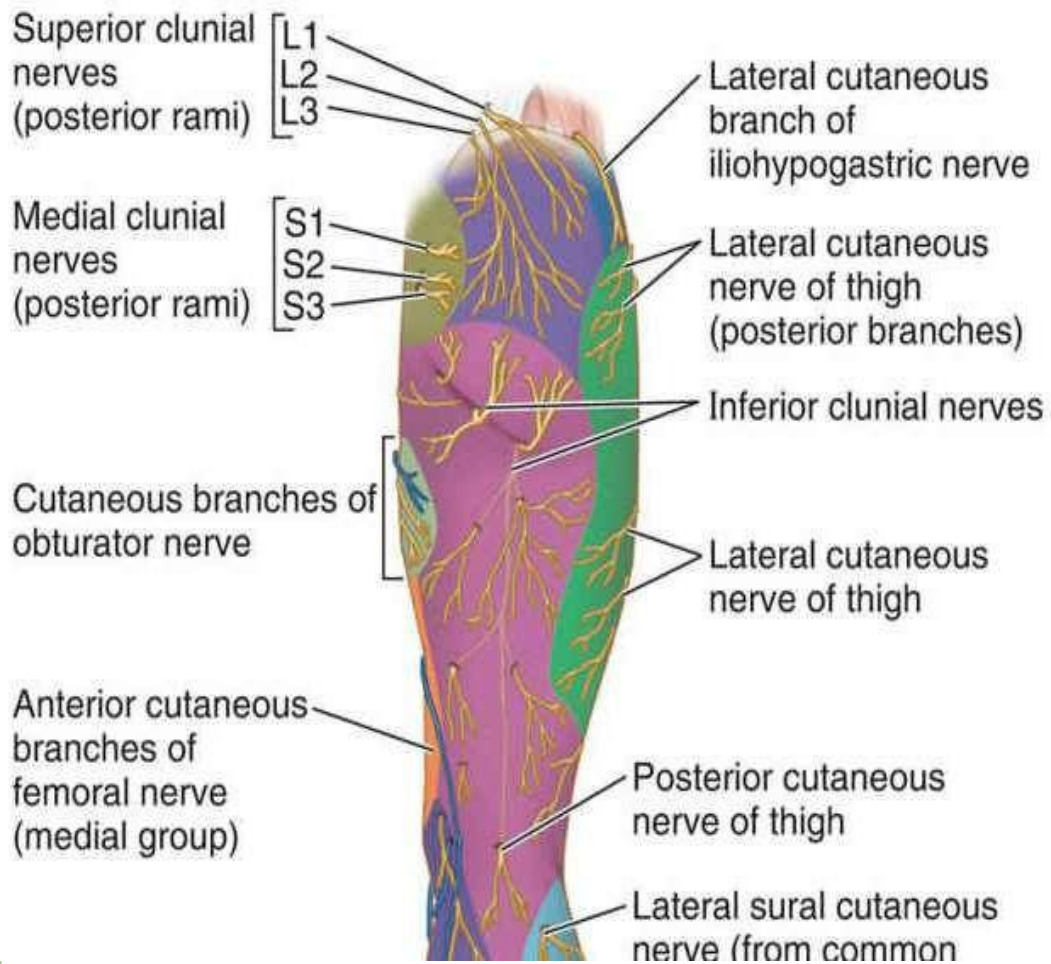
**Cutaneous nerves of the posterior surface of the right lower limb**

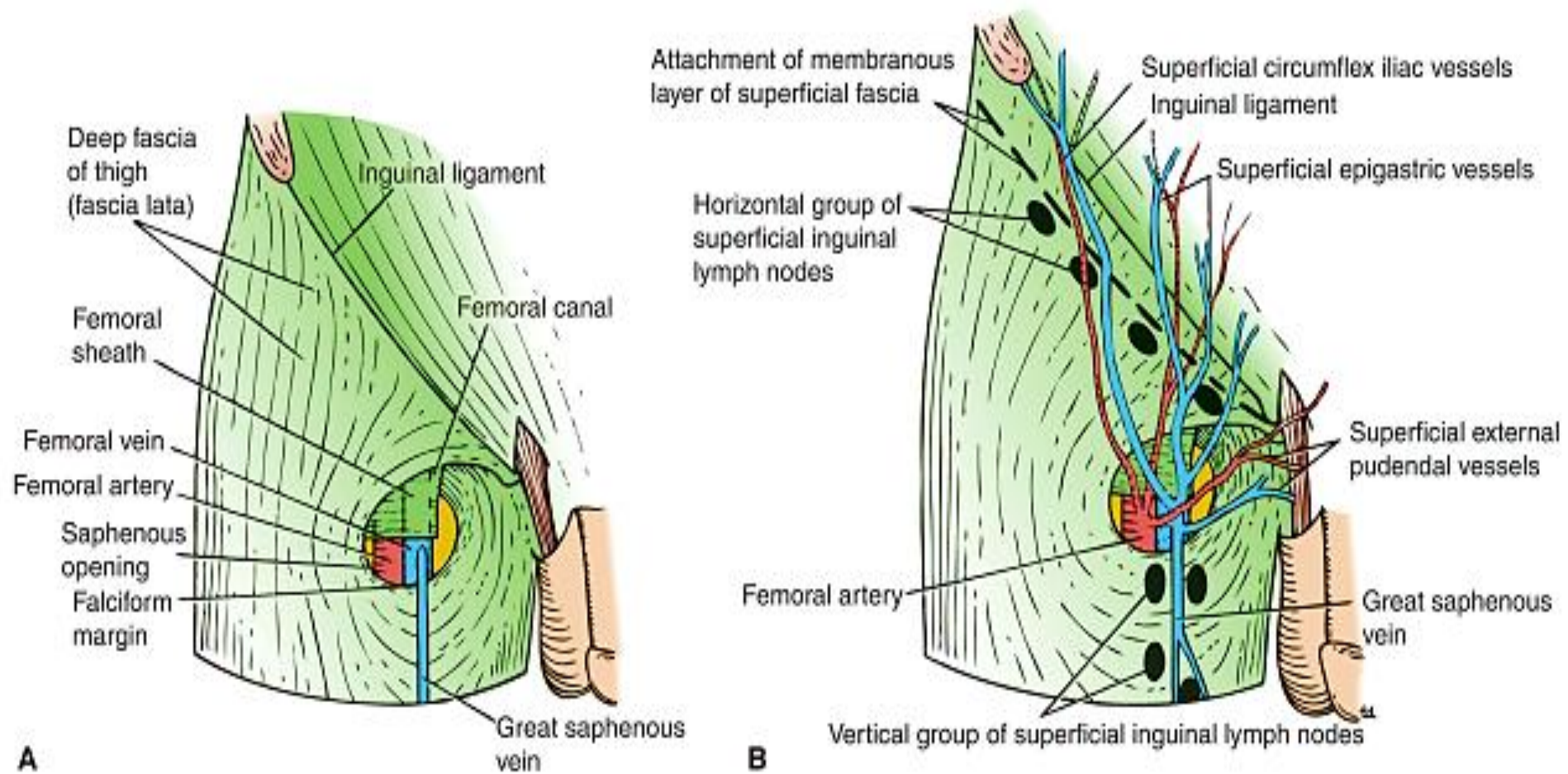


**Cutaneous nerves of the anterior surface of the right lower limb.**



# Cutaneous nerves



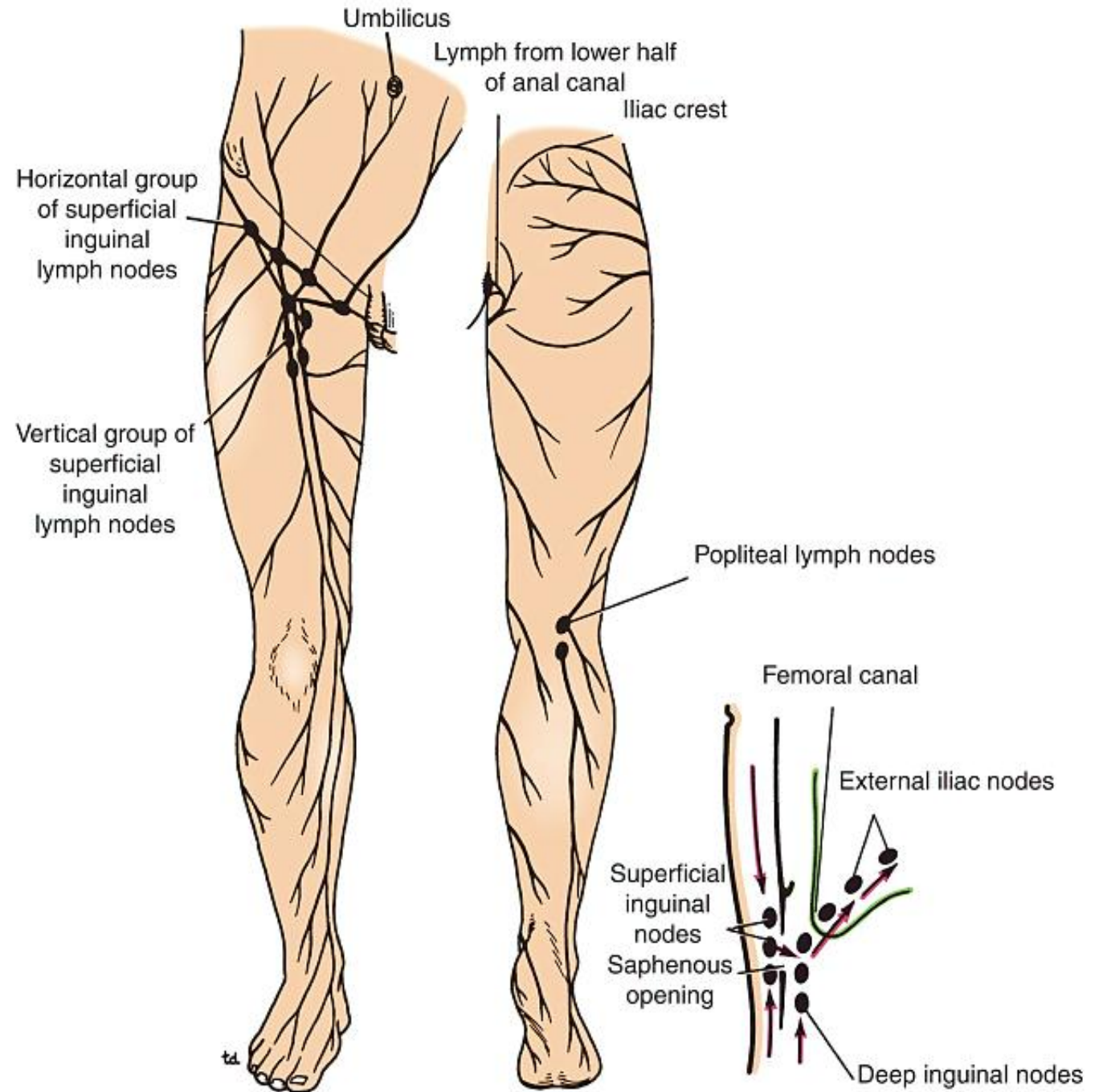


Superficial veins, arteries, and lymph nodes over the right femoral triangle. Note the saphenous opening in the deep fascia and its relationship to the femoral sheath. Note also the line of attachment of the membranous layer of superficial fascia to the deep fascia, about a fingerbreadth below the inguinal ligament.

Lymph drainage for the superficial tissues of the right lower limb and the abdominal walls below the level of the umbilicus.

Note the arrangement of the superficial and deep inguinal lymph nodes and their relationship to the saphenous opening in the deep fascia.

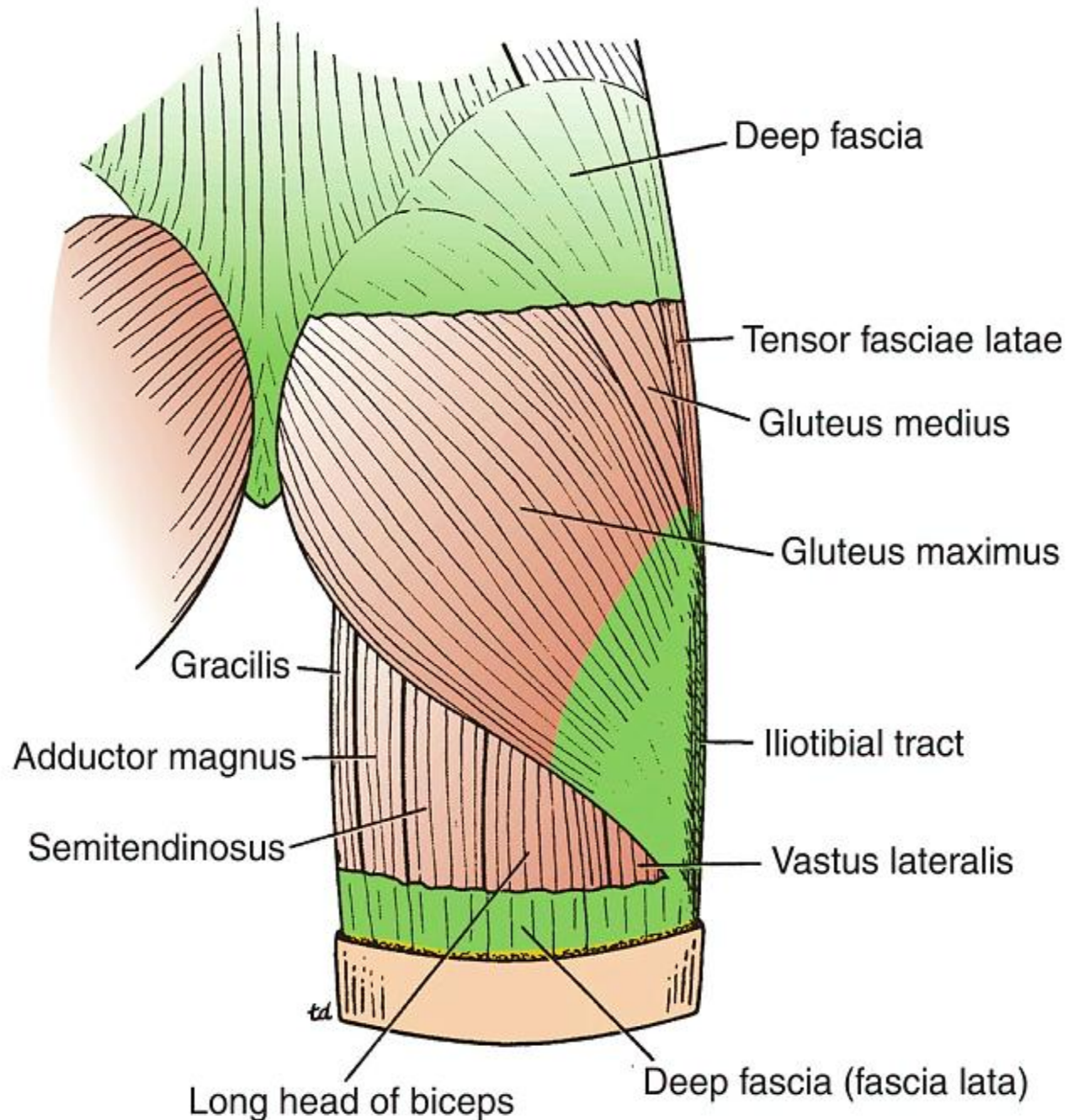
Note also that all lymph from these nodes ultimately drains into the external iliac nodes via the femoral canal.



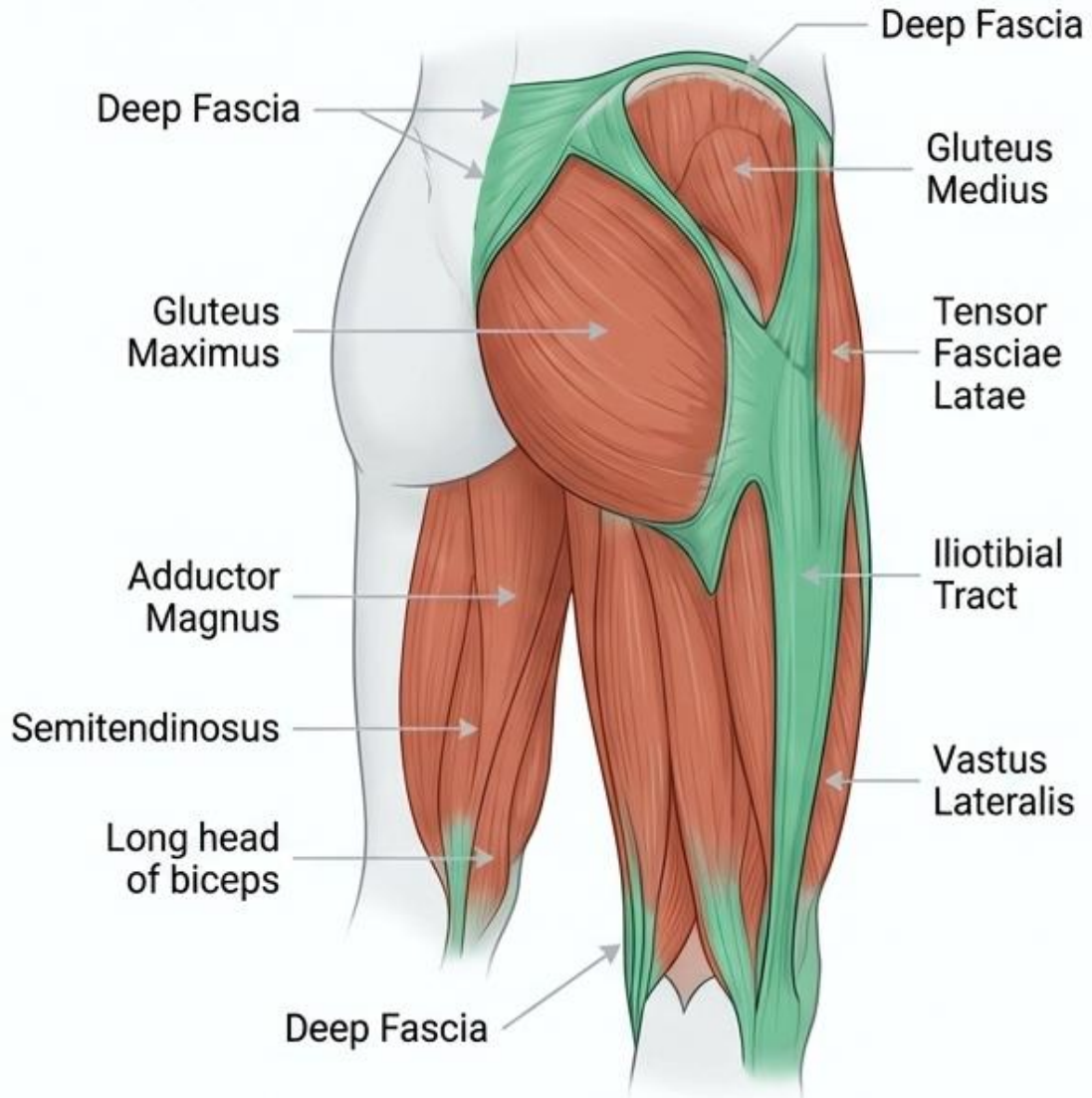
# Fascia

The **superficial fascia** is thick, especially in women. It is impregnated with large quantities of fat that contribute to the prominence of the buttock.

The **deep fascia** is continuous below with the deep fascia, or fascia lata, of the thigh. In the gluteal region, it splits to enclose the gluteus maximus muscle. Above the gluteus maximus, it continues as a single layer that covers the outer surface of the gluteus medius and attaches to the iliac crest. On the lateral surface of the thigh, the fascia lata is thickened to form a strong, wide band, **the iliotibial tract (iliotibial band)**. This is attached above to the tubercle of the iliac crest and below to the lateral condyle of the tibia. The iliotibial tract forms a sheath for the tensor fasciae latae muscle and receives the greater part of the insertion of the gluteus maximus.



# The Fascial Envelope & Iliotibial (IT) Tract



## Deep Fascia Behavior

Continuous with the fascia lata of the thigh. It specifically splits to enclose the Gluteus Maximus.

## The Iliotibial (IT) Tract

A strong, wide thickening of the fascia lata on the lateral thigh.

## Anchors

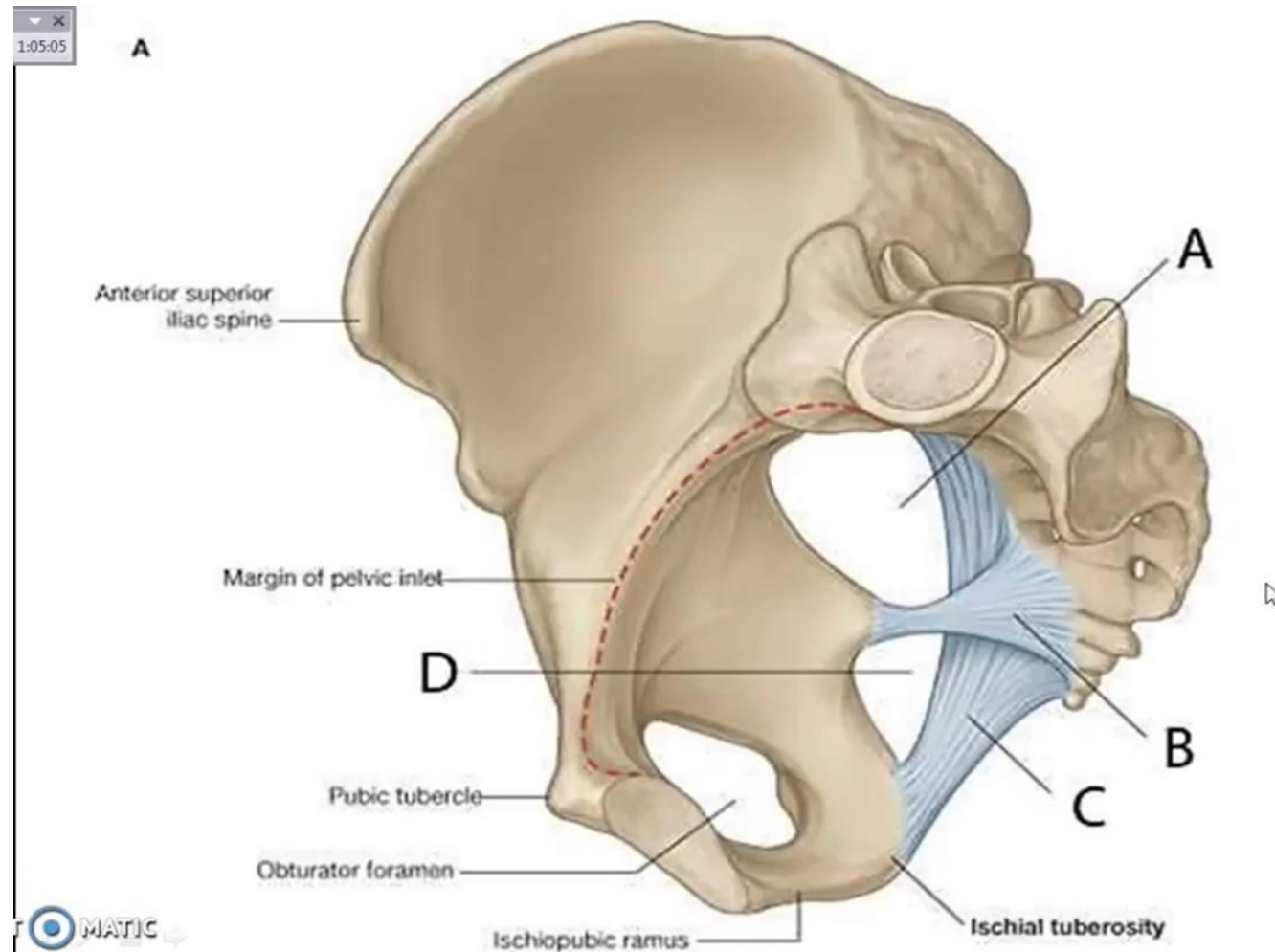
Attaches superiorly to the iliac crest tubercle and inferiorly to the lateral condyle of the tibia.

## Function

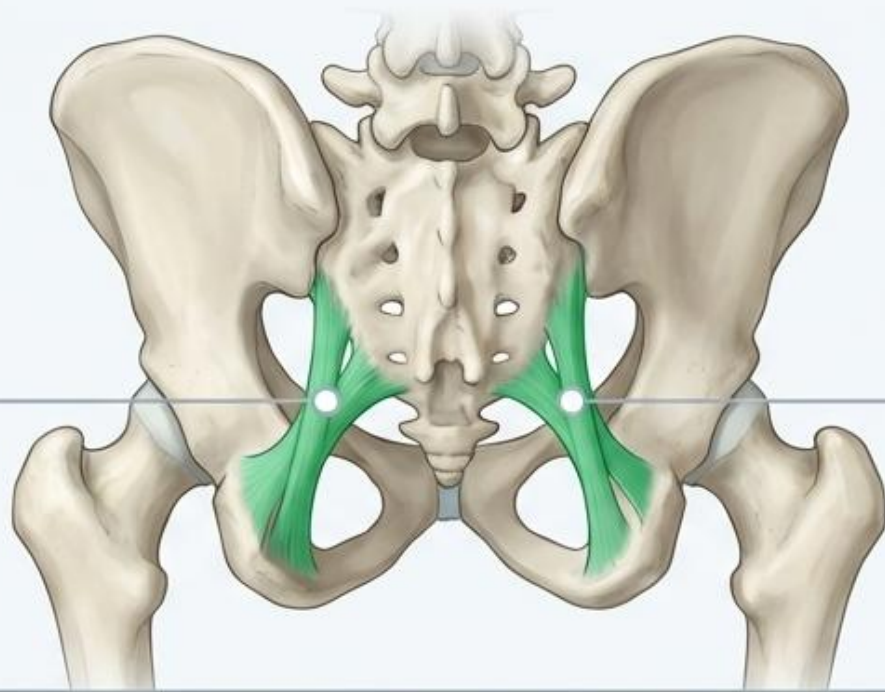
Forms a sheath for the Tensor Fasciae Latae (TFL) and receives most of the insertion of the Gluteus Maximus.

# Ligaments and Foramina

The **sacrotuberous** and **sacrospinous ligaments** are two prominent structures in the gluteal region. These function to stabilize the sacrum and prevent its rotation at the sacroiliac joint by the weight of the vertebral column. The sacrotuberous ligament (C) connects the back of the sacrum to the ischial tuberosity. The sacrospinous ligament (B) connects the back of the sacrum to the spine of the ischium. The arrangement of these ligaments forms the greater (A) and lesser sciatic foramina (D).



# The Bony Chassis: Ligaments & The Sciatic Gateways



**Sacrotuberous Ligament:**  
Connects posterior sacrum to ischial tuberosity.

**Sacrospinous Ligament:**  
Connects posterior sacrum to ischial spine.

## Greater Sciatic Foramen

Formed by the greater sciatic notch + both ligaments.

The primary exit from the pelvis into the gluteal region.

## Lesser Sciatic Foramen

Formed by the lesser sciatic notch + both ligaments.

The primary entrance into the perineum from the gluteal region.



**The greater sciatic foramen** is formed by **the greater sciatic notch** of the hip bone and the sacrotuberous and sacrospinous ligaments. It provides an exit from the pelvis into the gluteal region.

The following structures exit the greater sciatic forame:

**Piriformis muscle**

**Sciatic nerve**

**Posterior cutaneous nerve of the thigh**

**Superior and inferior gluteal nerves**

**Superior and inferior gluteal arteries and veins**

**Nerves to the obturator internus and quadratus femoris**

**Pudendal nerve**

**Internal pudendal artery and vein**

**The lesser sciatic foramen** is formed by the **lesser sciatic notch** of the hip bone and the sacrotuberous and sacrospinous ligaments. It provides an entrance into the perineum from the gluteal region. Its presence enables nerves and blood vessels that have left the pelvis through the greater sciatic foramen above the pelvic floor to enter the perineum below the pelvic floor.

The following structures pass through the lesser sciatic forame:

**Tendon of obturator internus muscle**

**Nerve to obturator internus**

**Pudendal nerve**

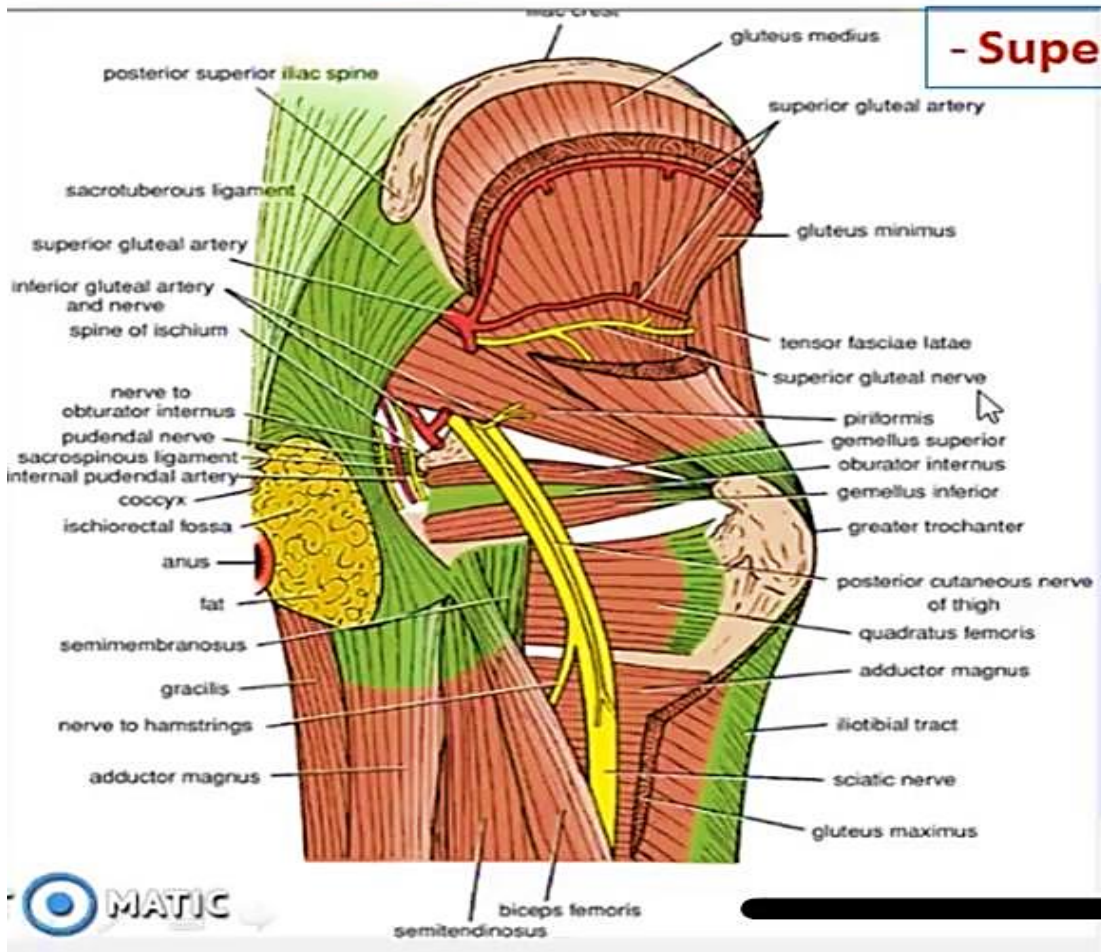
**Internal pudendal artery and vein**

# Structures passing through greater sciatic foramen

Tendon of piriformis muscle

Structures above piriformis

Structures below piriformis



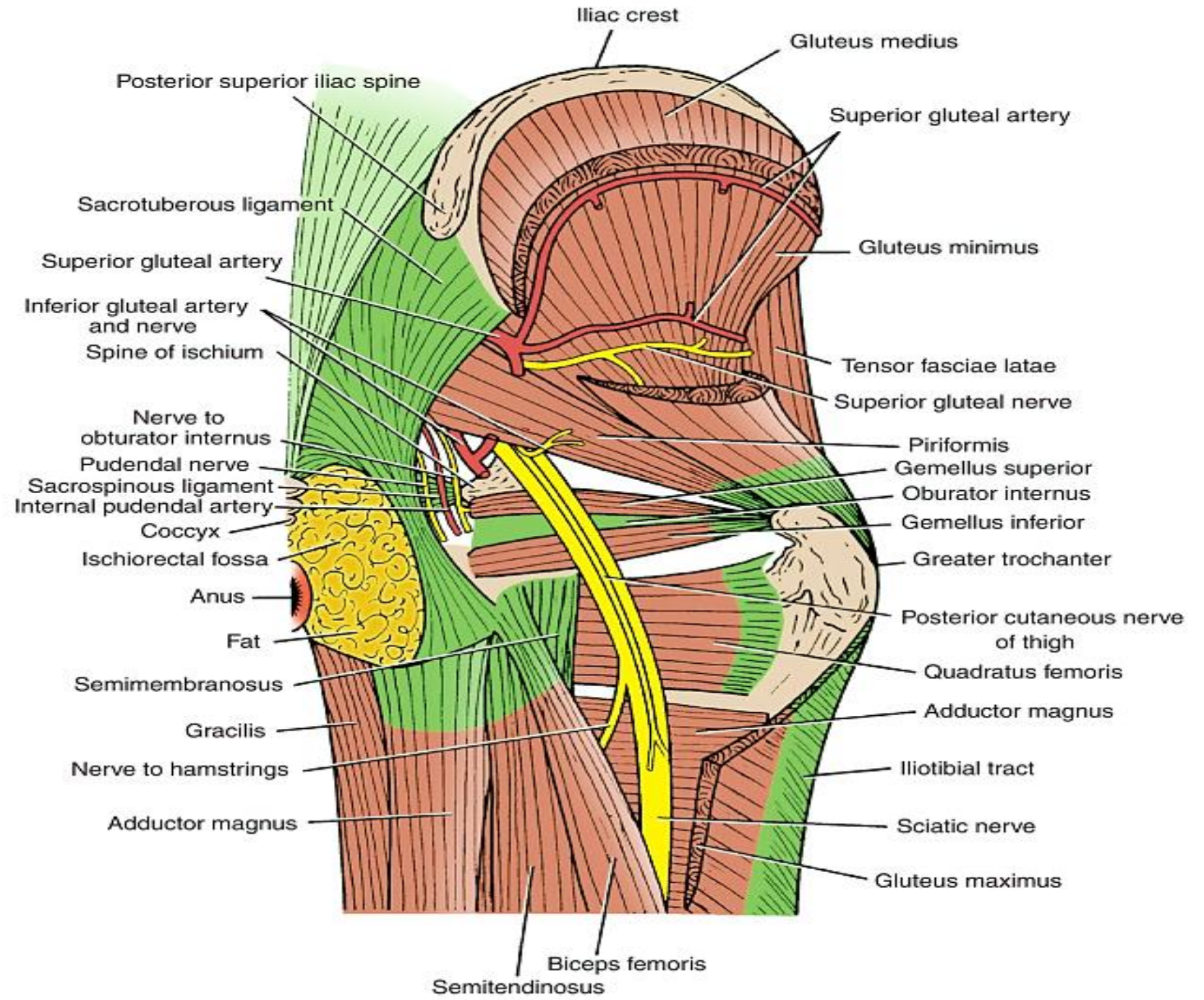
- Superior gluteal n.&vs.

- **3 lateral:** sciatic, posterior cutaneous n. of thigh, and n. to Q.F.
- **2 middle:** inferior gluteal n. and vessels.
- **3 medial:** n. to O. internus, pudendal n., and internal pubendal vessels.

- The 3 medial structures will pass through the lesser sciatic foramen to enter the perineum.



Structures in the right gluteal region. The greater part of the gluteus maximus and part of the gluteus medius have been removed.



## **Gluteal Region Muscles**

The muscles of the gluteal region include the gluteus maximus, the gluteus medius, the gluteus minimus, the tensor fasciae latae, the piriformis, the obturator internus, the superior and inferior gemelli, and the quadratus femoris.

### **Note the following:**

**The gluteus maximus** is the largest muscle in the body. It lies superficial in the gluteal region and is largely responsible for the prominence of the buttock.

**The tensor fasciae latae** runs downward and backward to its insertion in the iliotibial tract and thus assists the gluteus maximus muscle in maintaining the knee in the extended position.

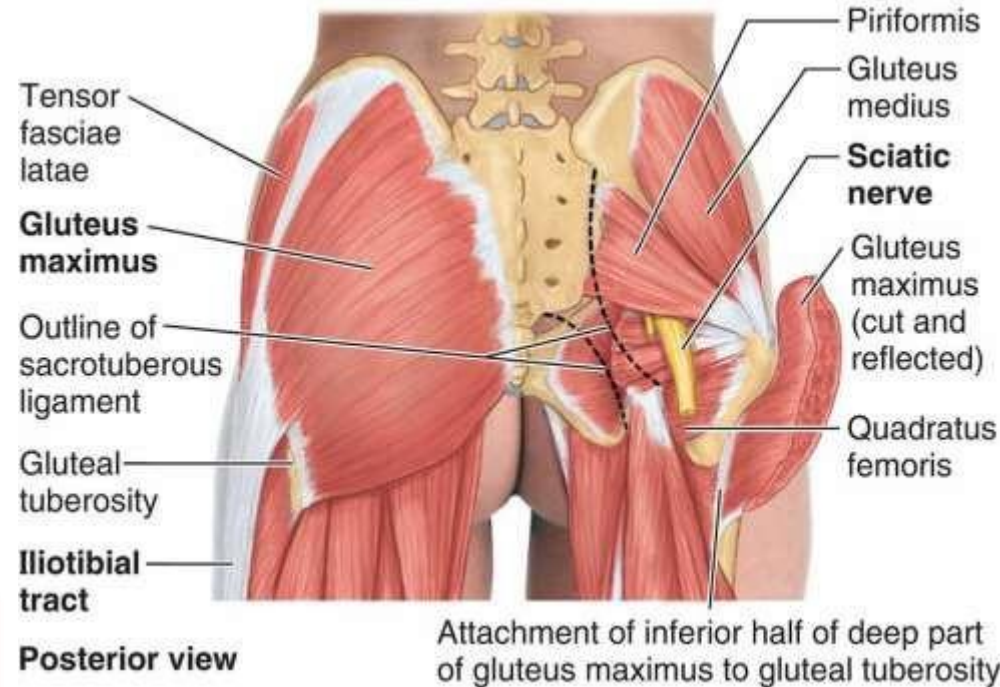
**The piriformis** lies partly within the pelvis at its origin. It emerges through the greater sciatic foramen to enter the gluteal region. Its position serves to separate the superior gluteal vessels and nerves from the inferior gluteal vessels and nerves.

**The obturator internus** is a fan-shaped muscle that lies within the pelvis at its origin. Its tendon emerges through the lesser sciatic foramen to enter the gluteal region. The tendon is joined by the superior and inferior gemelli and is inserted into the greater trochanter of the femur.

**Three bursae** are usually associated with the gluteus maximus: between the tendon of insertion and the greater trochanter, between the tendon of insertion and the vastus lateralis, and overlying the ischial tuberosity.

MUSCLE	ORIGIN	INSERTION	NERVE SUPPLY	NERVE ROOT <sup>a</sup>	ACTION
Gluteus maximus	Outer surface of ilium, sacrum, coccyx, sacrotuberous ligament	Iliotibial tract and gluteal tuberosity of femur	Inferior gluteal nerve	L5; <b>S1, 2</b>	Extends and laterally rotates hip joint; through iliotibial tract, it extends knee joint
Gluteus medius	Outer surface of ilium	Lateral surface of greater trochanter of femur	Superior gluteal nerve	<b>L5; S1</b>	Abducts thigh at hip joint; tilts pelvis when walking to permit opposite leg to clear ground
Gluteus minimus	Outer surface of ilium	Anterior surface of greater trochanter of femur	Superior gluteal nerve	<b>L5; S1</b>	Abducts thigh at hip joint; tilts pelvis when walking to permit opposite leg to clear ground
Tensor fasciae latae	Iliac crest	Iliotibial tract	Superior gluteal nerve	L4, 5	Assists gluteus maximus in extending the knee joint
Piriformis	Anterior surface of sacrum	Upper border of greater trochanter of femur	First and second sacral nerves	L5; <b>S1, 2</b>	Lateral rotator of thigh at hip joint
Obturator internus	Inner surface of obturator membrane	Upper border of greater trochanter of femur	Sacral plexus	L5; <b>S1</b>	Lateral rotator of thigh at hip joint
Gemellus superior	Spine of ischium	Upper border of greater trochanter of femur	Sacral plexus	L5; S1	Lateral rotator of thigh at hip joint
Gemellus inferior	Ischial tuberosity	Upper border of greater trochanter of femur	Sacral plexus	L5; S1	Lateral rotator of thigh at hip joint
Quadratus femoris	Lateral border of ischial tuberosity	Quadratus tubercle of femur	Sacral plexus	L5; S1	Lateral rotator of thigh at hip joint

# Muscles of Gluteal Region

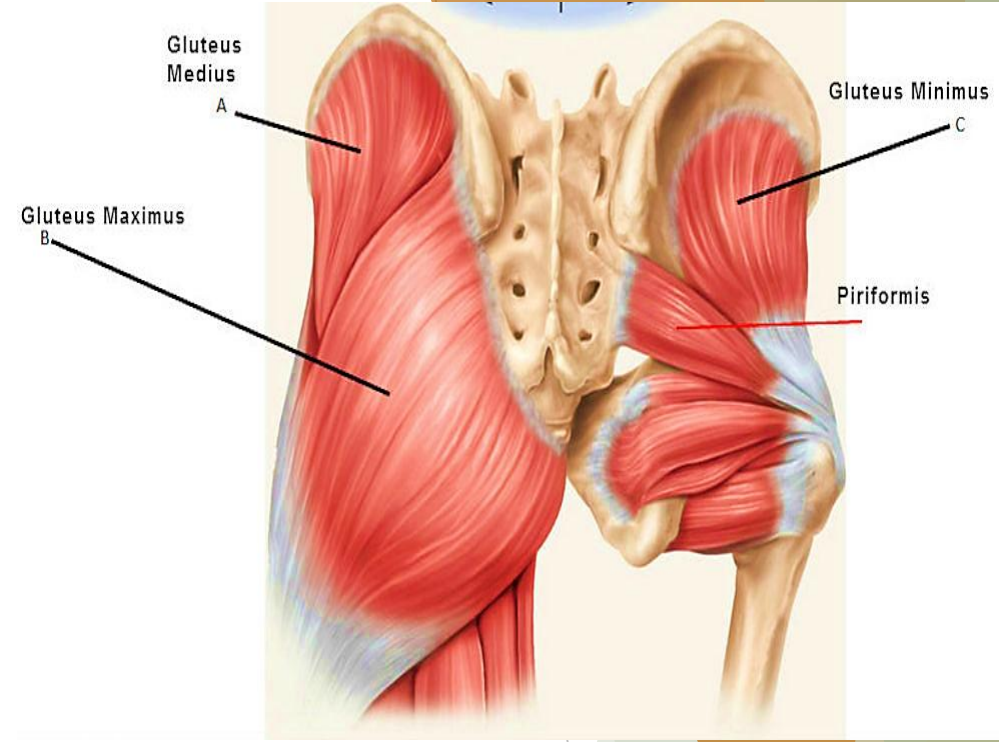
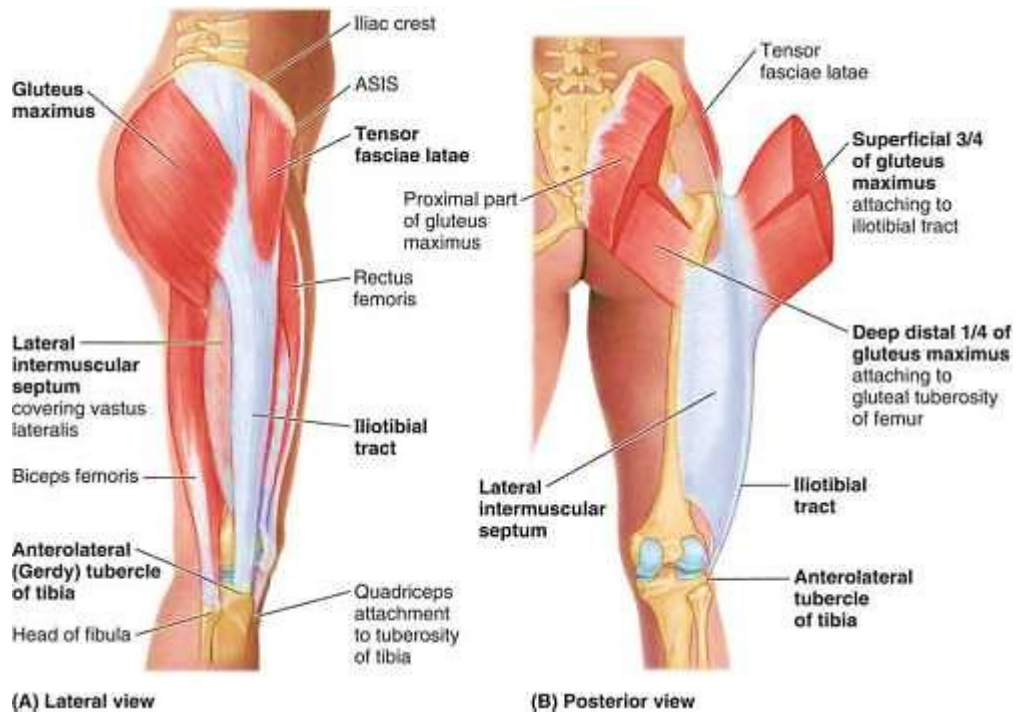


## Superficial layer

- ✓ consists of the three large overlapping glutei (maximus, medius, and minimus) and the tensor fasciae latae
- ✓ all have proximal attachments to external surface and margins of the ala of the ilium
- ✓ are mainly **extensors, abductors,** and **medial rotators of the thigh.**

## Deep layer

- ✓ consists of smaller muscles (**piriformis, obturator internus, superior and inferior gemelli,** and **quadratus femoris**)
- ✓ all have distal attachments on or adjacent to the intertrochanteric crest of the femur.
- ✓ are **lateral rotators** of the thigh, but they also **stabilize the hip joint,**



Muscle	Origin	Insertion	N Supply	Action
<b>Gluteus Maximus</b>	<ul style="list-style-type: none"> <li>○ Ilium posterior to posterior gluteal line;</li> <li>○ dorsal surface of sacrum and coccyx;</li> <li>○ sacrotuberous ligament</li> </ul>	<ul style="list-style-type: none"> <li>○ Most fibers end in iliotibial tract, which inserts into lateral condyle of tibia;</li> <li>○ some fibers insert on gluteal tuberosity</li> </ul>	<b>Inferior gluteal nerve (L5, S1, S2)</b>	<ul style="list-style-type: none"> <li>○ Extensor, abductor &amp; lateral rotator of femur</li> </ul>

## Actions of the Gluteus maximus

- ❑ It extends and laterally rotates the hip joint
- ❑ Through the iliotibial tract it helps maintain the knee joint in extension.
- ❑ It is most commonly used as an extensor of the trunk on the thigh
- ❑ The chief antigravity muscle of the hip.
- ❑ It is used in standing up from a sitting position, running & climbing up stairs.

- ✓ The **gluteus maximus** contracts only **briefly** during the **earliest part** of the **stance phase** .
- ✓ On **climbing stairs** , the gluteus maximus **contract strongly**.

❑ **Paralysis of the gluteus maximus** does not seriously affect **walking on level ground**.

## Testing the gluteus maximus

- ✓ the person is prone with the lower limb straight.
- ✓ The person tightens the buttocks and extends the hip joint
- ✓ G Max can be observed and palpated



<b>Muscles</b>	<b>Origin</b>	<b>Insertion</b>	<b>N Supply</b>	<b>Action</b>
<b>Gluteus medius</b>	External surface of ilium between anterior and posterior gluteal lines	Lateral surface of greater trochanter of femur	Superior gluteal nerve (L4, L5, S1)	<ul style="list-style-type: none"> <li>○ Abduct and medially rotate thigh;</li> <li>○ keep pelvis level when ipsilateral limb is weight-bearing and advance opposite (unsupported) side during its swing phase</li> </ul>
<b>Gluteus minimus</b>	External surface of ilium between anterior and inferior gluteal lines	Anterior surface of greater trochanter of femur		
<b>Tensor of fascia lata</b>	Anterior superior iliac spine; anterior part of iliac crest	Iliotibial tract, which attaches to lateral condyle of tibia		

# Actions of the Gluteus Medius & Minimus

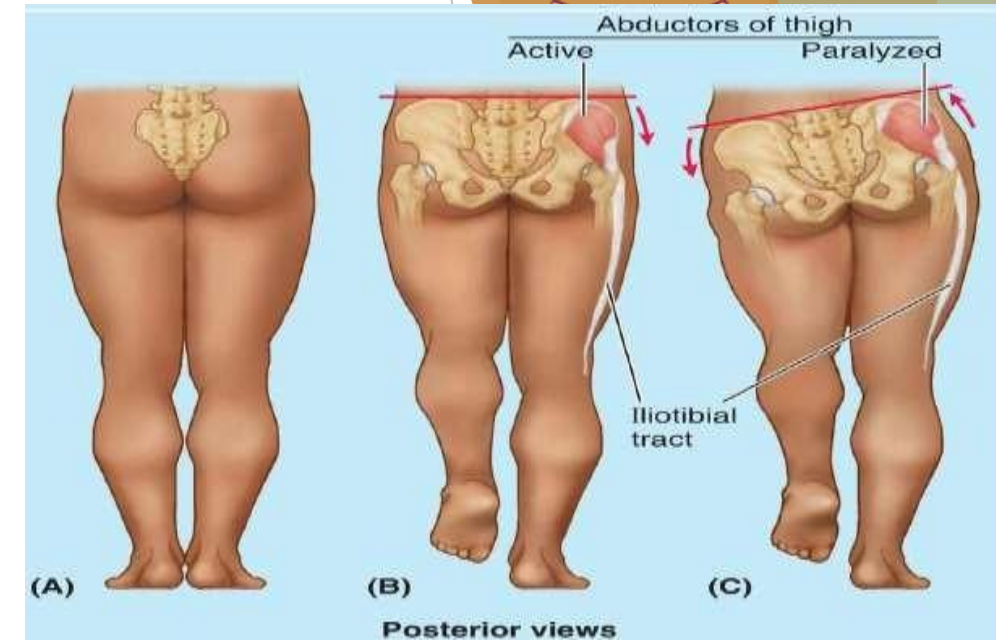
- ✓ abduct the hip joint
- ✓ rotate the thigh medially by their anterior fibres **called into play as the foot on one side is raised** during walking and running
- ✓ they are assisted by tensor fasciae latae
- ✓ They are important in **holding both hips** at the same level & **preventing drop of the lifted side** during walking

## Testing the Glute Med & Min:

- ✓ the person is side lying with the test limb uppermost and the lowermost limb flexed at the hip and knee for stability.
- ✓ The person abducts the thigh against resistance.
- ✓ The gluteus medius can be palpated

## Trendelenburg test

- ✓ patient standing on one leg
- ✓ pelvis on the opposite side should rise slightly;
- ✓ if it falls due to loss of abductor power on the supporting side, the test is positive



# Trendelburg's Sign

**Trendelenburg's sign** is found in people with weak or paralyzed abductor muscles of the hip, namely gluteus medius and gluteus minimus



*In A : Negative trendelenburg's test .  
The hip abductors are acting normally  
tilting the pelvis upwards when the  
opposite leg is raised from the ground*

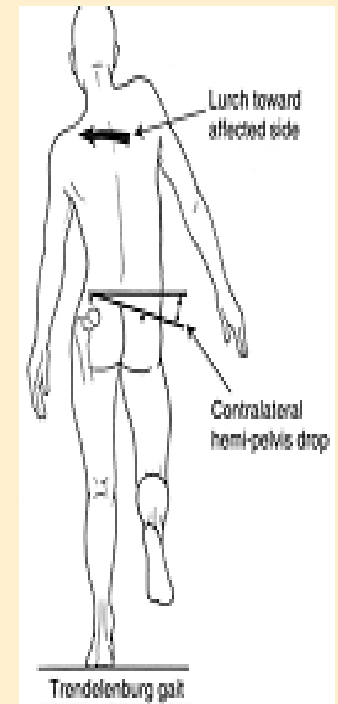
*In B : Positive Trendelenburg's test .  
The hip abductors are unable to  
control the dropping of the pelvis  
when the opposite leg is raised*

# TRENDELBURG'S GAIT

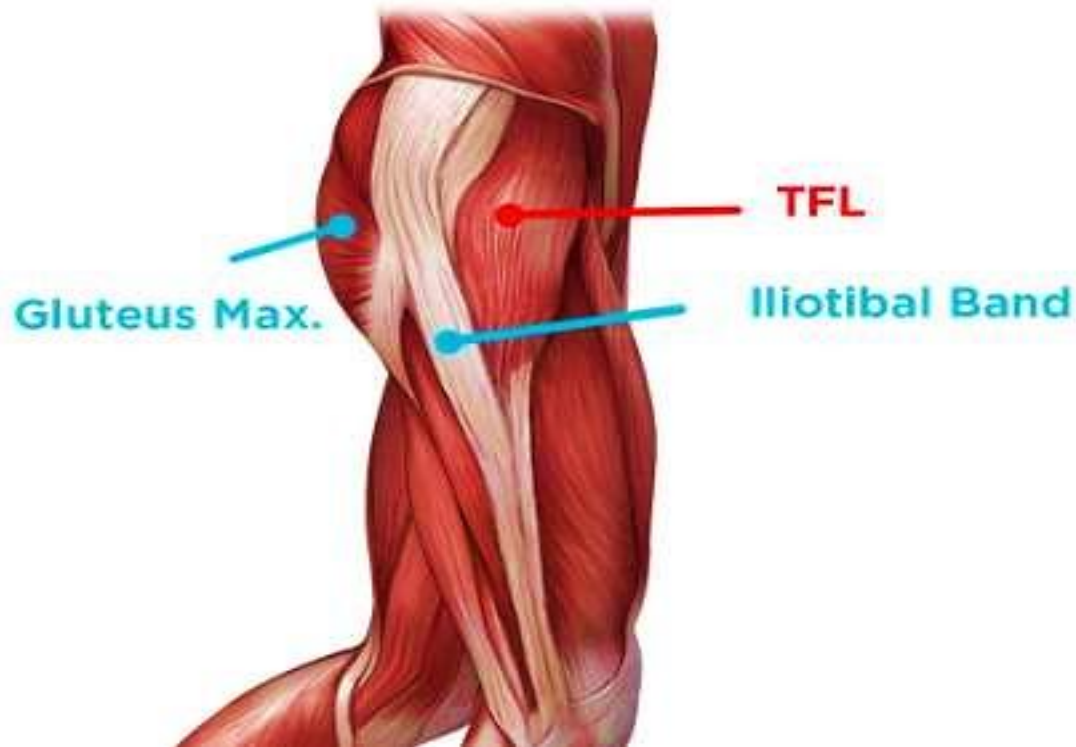
The **Trendelenburg gait** pattern (or **gluteus medius lurch**) is an abnormal gait (as with walking) caused by weakness of the abductor muscles of the lower limb, gluteus medius and gluteus minimus

➤ Have patient stand on one leg and assess if the pelvis drops

➤ (+) Trendelburg sign



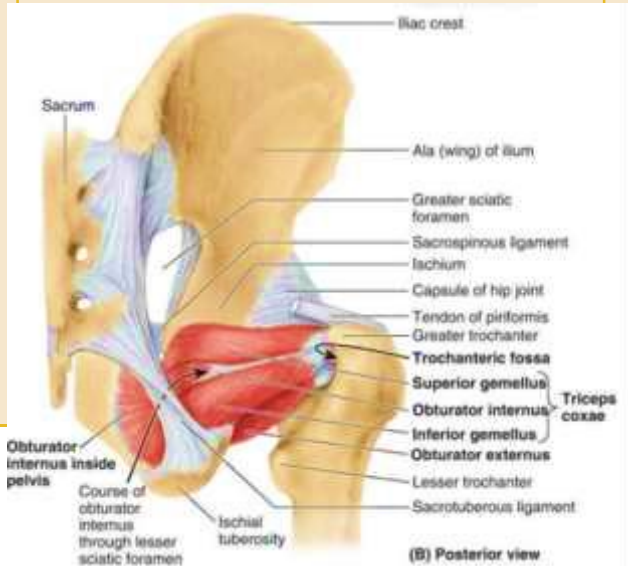
## Actions of tensor fasciae latae



- ❑ is primarily a **flexor of the thigh**. It acts in concert with the iliopsoas and rectus femoris.
- ❑ It also works in conjunction with other **abductor/medial rotator muscles** (gluteus medius and minimus) as a synergist or fixator.
- ❑ It exerts traction on the iliotibial tract assists the gluteus maximus muscle in **maintaining the knee in the extended position**.

# Triceps Coxae

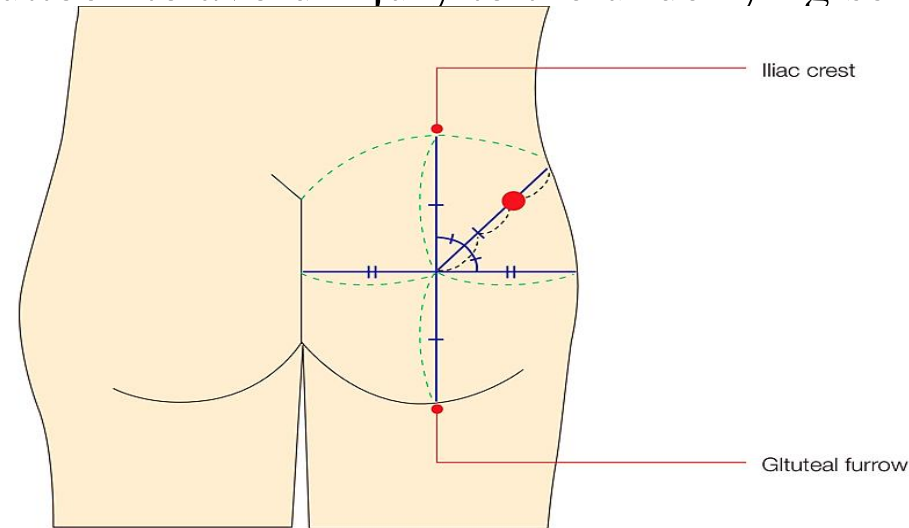
Muscles	Origin	Insertion	N Supply	Action
Piriformis	Anterior surface of sacrum; sacrotuberous ligament	Superior border of greater trochanter of femur	Branches of anterior rami of S1, S2	<ul style="list-style-type: none"> <li>Laterally rotate extended thigh</li> <li>abduct flexed thigh;</li> <li>steady femoral head in acetabulum</li> </ul>
Obturator internus	Pelvic surface of obturator membrane and surrounding bones	Medial surface of greater trochanter (trochanteric fossa) of femur	Nerve to obturator internus (L5, S1,S2)	
Superior and inferior gemell	<ul style="list-style-type: none"> <li>Superior: ischial spine</li> <li>Inferior: ischial tuberosity</li> </ul>	Medial surface of greater trochanter (trochanteric fossa) of femur	Superior gemellus: same nerve supply as obturator internus Inferior gemellus: same nerve supply as quadratus femoris	



# Clinical Notes

## Gluteus Maximus and Intramuscular Injections

The gluteus maximus is a large, thick muscle with coarse fasciculi that can be easily separated without damage. The great thickness of this muscle makes it ideal for intramuscular injections. The injection should be given well forward on the upper outer quadrant of the buttock to avoid injury to the underlying sciatic nerve.



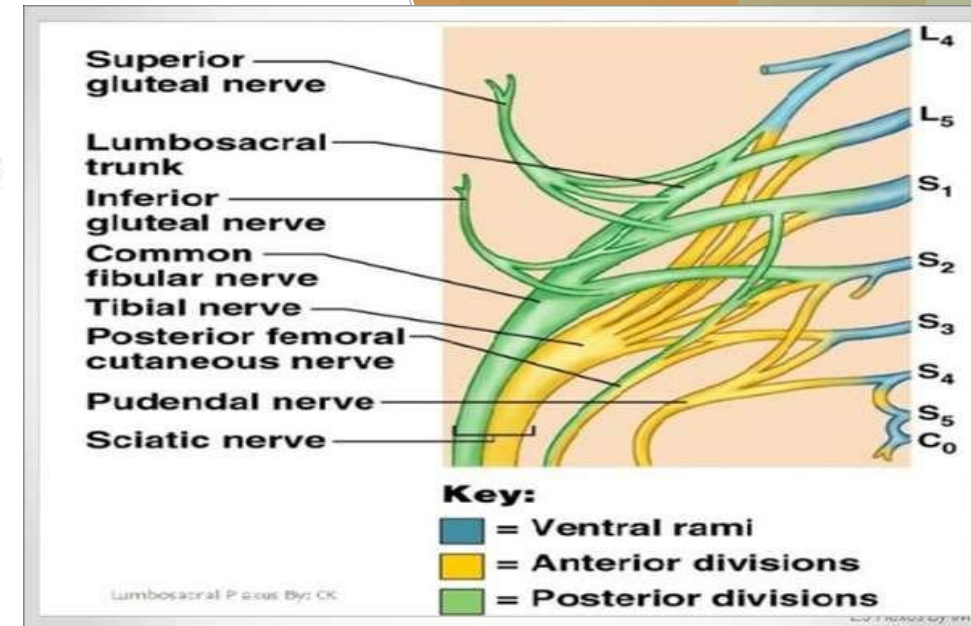
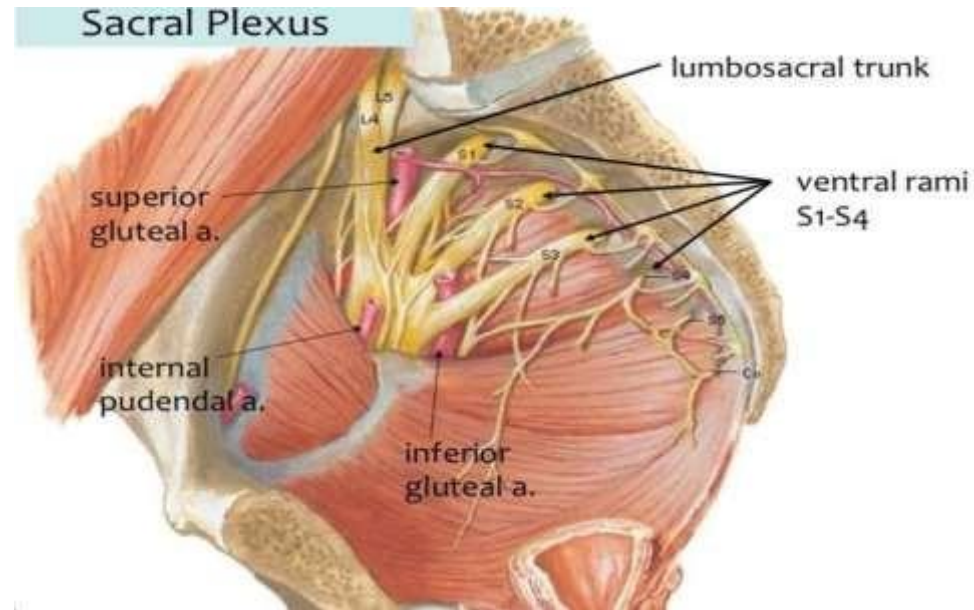
## Gluteus Maximus and Bursitis

Bursitis, or inflammation of a bursa, can be caused by acute or chronic trauma. An inflamed bursa becomes distended with excessive amounts of fluid and can be extremely painful. The bursae associated with the gluteus maximus are prone to inflammation.

## Gluteus Medius and Minimus and Poliomyelitis

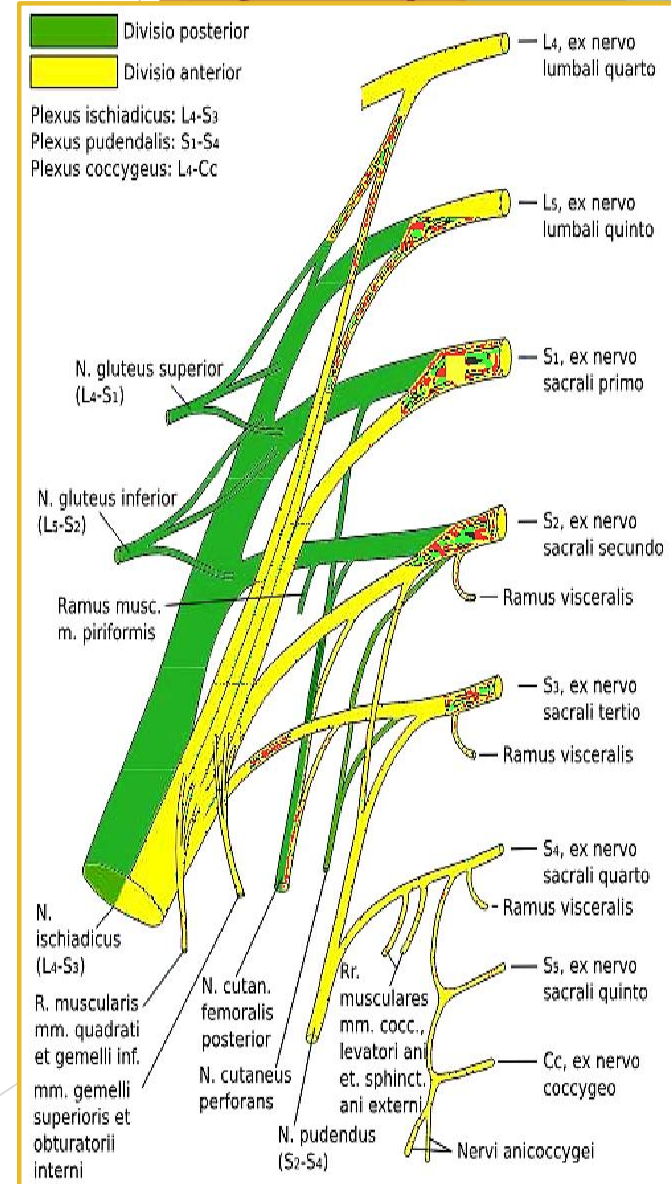
The superior gluteal nerve (L4, 5, and S1) supplies the gluteus medius and minimus muscles. They may be paralyzed when poliomyelitis involves the lower lumbar and sacral segments of the spinal cord. Paralysis of these muscles seriously interferes with the ability of the patient to tilt the pelvis when walking.

## Sacral plexus



- ✓ A part of L4 joins the L5 anterior rami to form the **lumbosacral trunk**.
- ✓ Lumbosacral trunk descends to join the **anterior rami of the upper four sacral nerves** to form the sacral plexus
- ✓ located on the posterolateral wall of the lesser pelvis. rests upon piriformis
- ✓ sacral nerves give off certain branches and then divide, as does the lumbosacral trunk, into anterior and posterior divisions which there upon branch and reunite to form nerves for supply of flexor and extensor compartments of the lower limb.

Branches of sacral plexus	Ventral divisions	Dorsal divisions
Nerve to quadratus femoris and gemellus inferior	L4, 5, S1	
Nerve to obturator internus and gemellus superior	L5, S1, 2	
Nerve to piriformis		S(1), 2
Superior gluteal		L4, 5, S1
Inferior gluteal		L5, S1, 2
Posterior femoral cutaneous	S2, 3	S1, 2
Tibial (sciatic)	L4, 5, S1, 2, 3	
Common fibular (sciatic)		L4, 5, S1, 2
Perforating cutaneous		S2, 3
Pudendal	S2, 3, 4	
To levator ani, coccygeus and sphincter ani externus	S3,S4	
Pelvic splanchnic	S2, 3, (4).	



## Gluteal Region Nerves

All the following nerves of the gluteal region originate from the sacral plexus.

### Sciatic Nerve

The sciatic nerve (L4 and 5; S1, 2, and 3) emerges from the pelvis through the lower part of the greater sciatic foramen. It is the largest nerve in the body and consists of **the tibial** and **common fibular (peroneal) nerves** bound together with fascia. The nerve appears below the piriformis muscle and curves downward and laterally, lying successively on the root of the ischial spine, the superior gemellus, the obturator internus, the inferior gemellus, and the quadratus femoris to reach the back of the adductor magnus muscle. It is related posteriorly to the posterior cutaneous nerve of the thigh and the gluteus maximus. It leaves the buttock region by passing deep to the long head of the biceps femoris to enter the back of the thigh.

Occasionally, the common fibular nerve leaves the sciatic nerve high in the pelvis and appears in the gluteal region by passing above or through the piriformis muscle.

The sciatic nerve usually gives **no branches** in the gluteal region

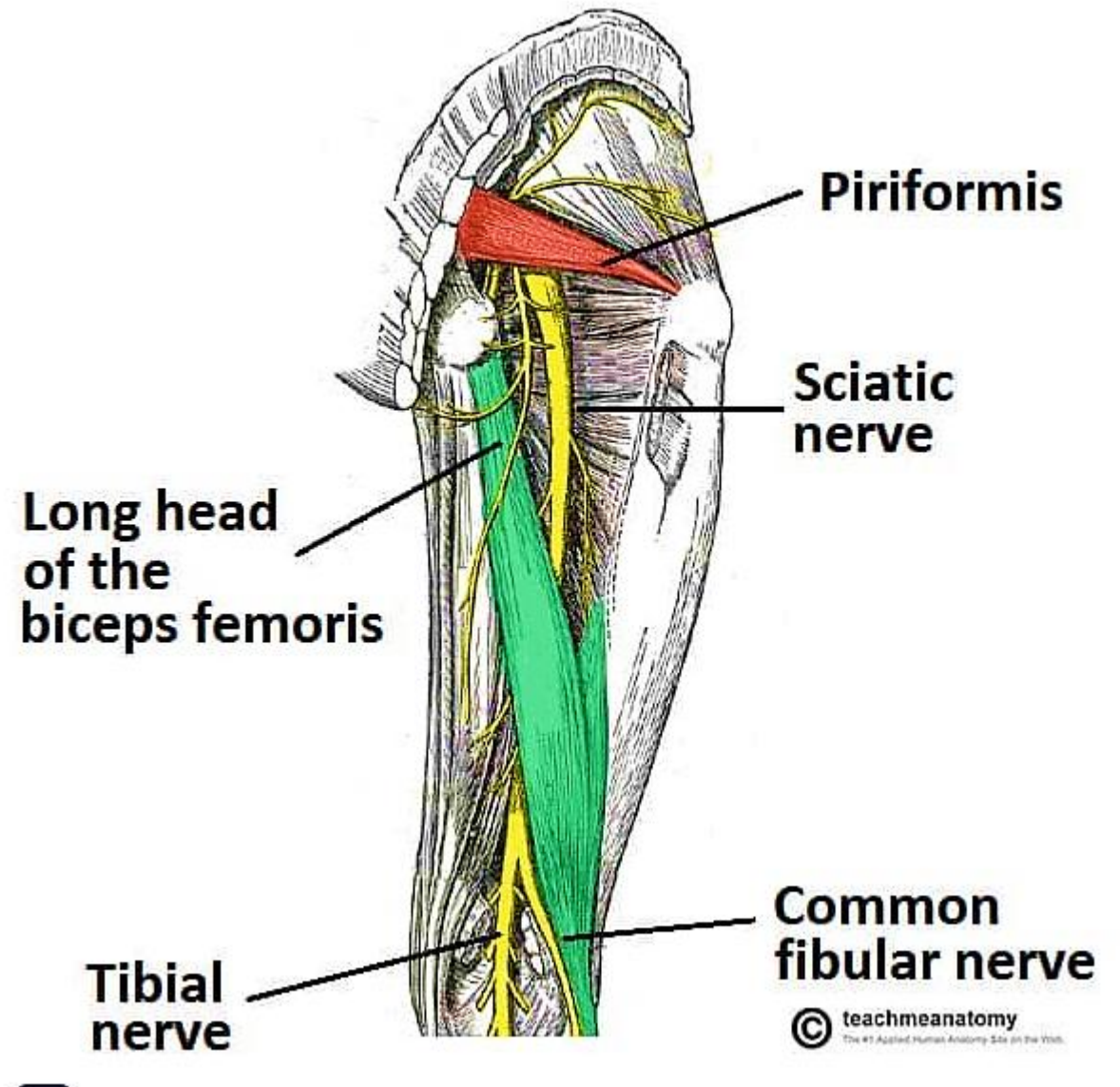
## Anatomical and Clinical Relations

**Piriformis Muscle:** This muscle is the key landmark of the sacral plexus; the relationship of nerves (especially the sciatic) to this muscle is critical for understanding gluteal anatomy.

**Intragluteal Injections:** Because the sciatic nerve runs through the center of the gluteal region, injections are typically administered in the upper outer quadrant of the buttock to avoid nerve damage.

**Sciatica:** This clinical condition involves pain along the distribution of the sciatic nerve (posterior thigh, lateral leg, and foot). It can be caused by pressure on the sacral plexus from intrapelvic tumors or herniated intervertebral discs pressing on the nerve roots.

**Fibular Nerve Vulnerability:** While the sciatic nerve is protected deep in the gluteal region, its common fibular branch is highly vulnerable to injury where it winds around the neck of the fibula, which can lead to "footdrop"



View of the posterior thigh. The gluteus maximus and minimus have been removed to expose the sciatic nerve and underlying anatomical structures

## Posterior Cutaneous Nerve of the Thigh

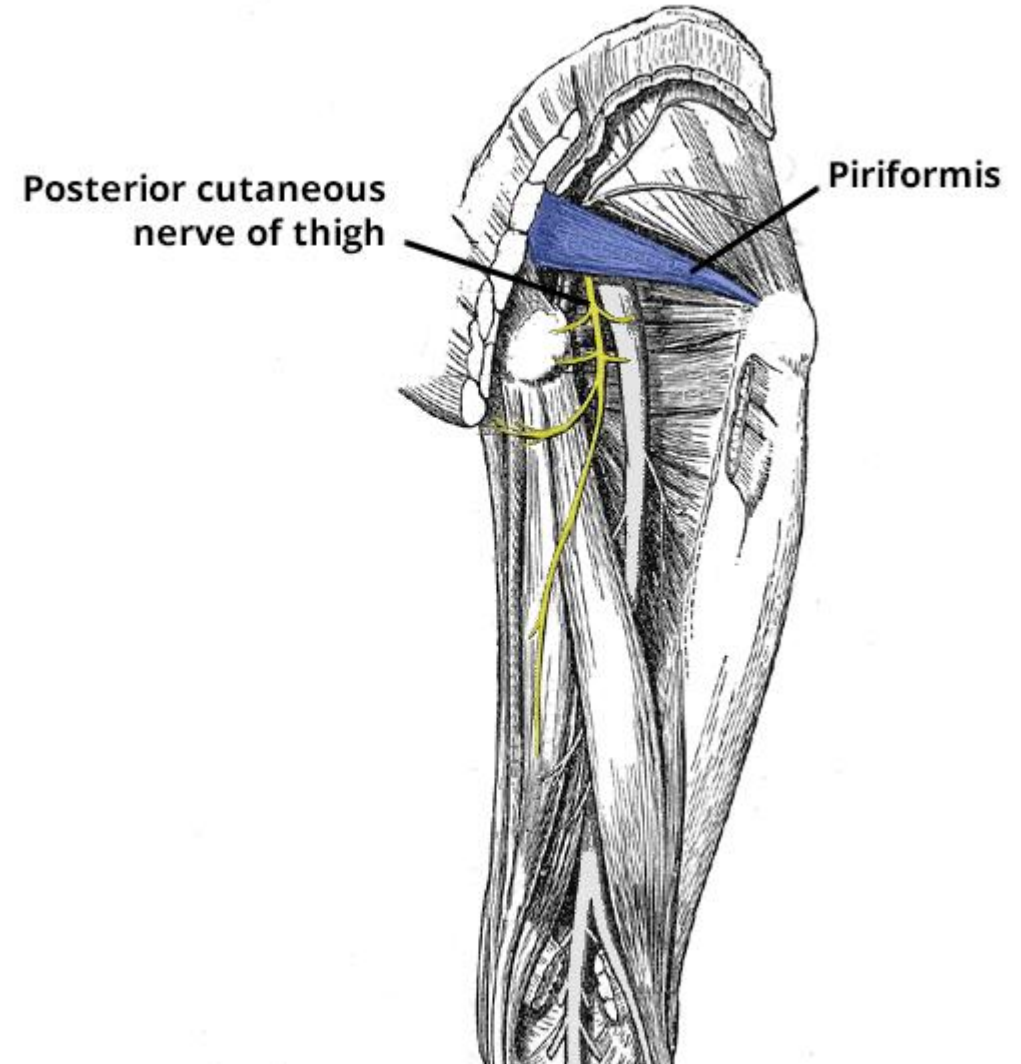
The posterior cutaneous nerve of the thigh enters the gluteal region through the lower part of the greater sciatic foramen below the piriformis muscle. It passes downward on the posterior surface of the sciatic nerve and runs down the back of the thigh beneath the deep fascia. It supplies the skin in the popliteal fossa.

### Branches

**Gluteal branches** to the skin over the lower medial quadrant of the buttock.

**Perineal branch** to the skin of the back of the scrotum or labium majus.

**Cutaneous branches** to the back of the thigh and the upper part of the leg.



## **Superior Gluteal Nerve**

The superior gluteal nerve leaves the pelvis through the upper part of the greater sciatic foramen above the piriformis. It runs forward between the gluteus medius and minimus, supplies both, and ends by supplying the tensor fasciae latae.

## **Inferior Gluteal Nerve**

The inferior gluteal nerve leaves the pelvis through the lower part of the greater sciatic foramen below the piriformis. It supplies the gluteus maximus muscle.

## **Nerve to Quadratus Femoris**

The nerve to the quadratus femoris leaves the pelvis through the lower part of the greater sciatic foramen. It ends by supplying the quadratus femoris and the inferior gemellus.

## **Pudendal Nerve and Nerve to Obturator Internus**

The pudendal nerve and nerve to the obturator internus leave the pelvis through the lower part of the greater sciatic foramen, below the piriformis. They cross the ischial spine with the internal pudendal artery and immediately reenter the pelvis through the lesser sciatic foramen. They then lie in the posterior aspect of the ischioanal fossa. The pudendal nerve supplies structures in the perineum. The nerve to the obturator internus supplies the obturator internus muscle on its pelvic surface.

## Gluteal Region Arteries

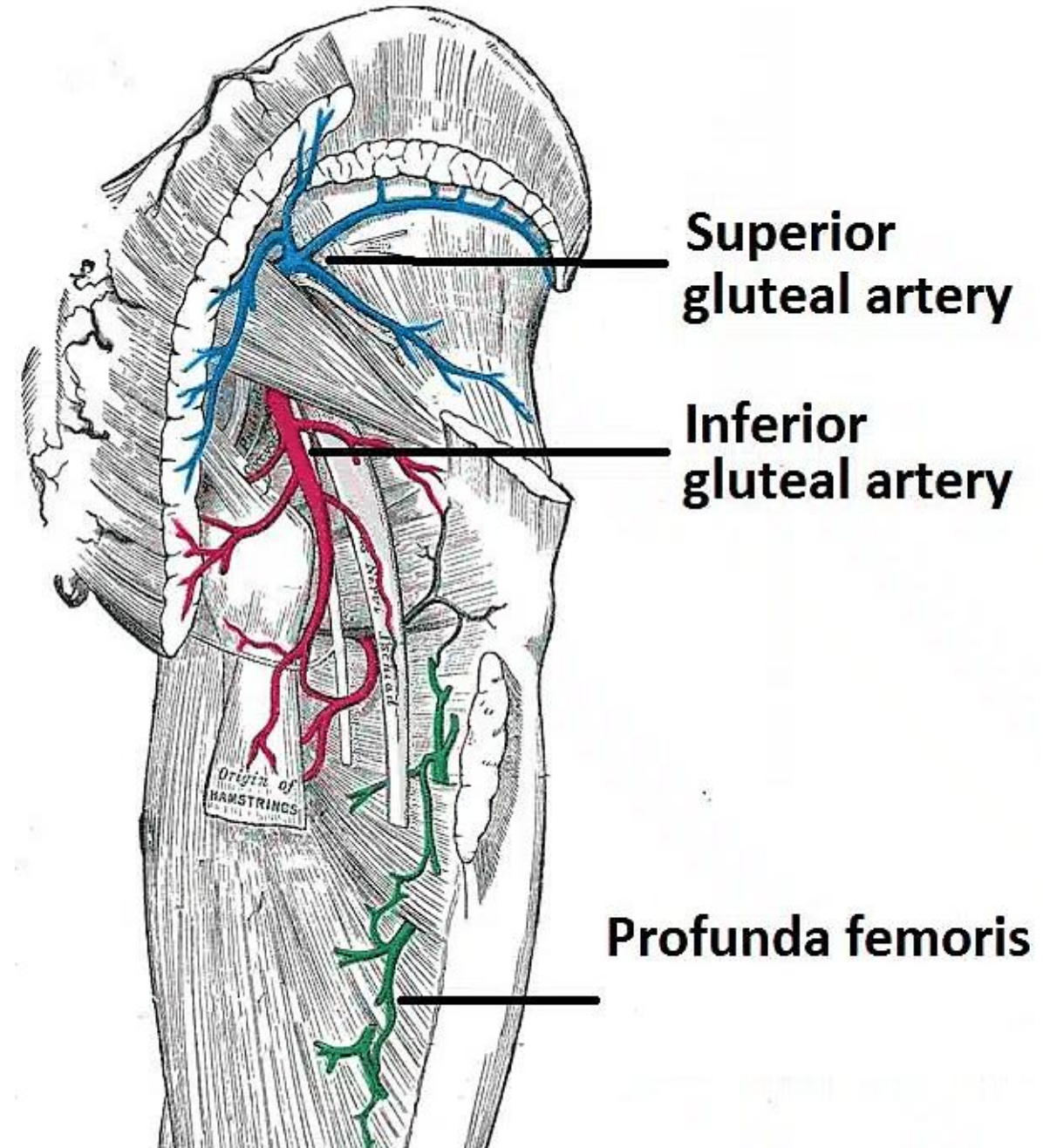
The **superior and inferior gluteal arteries** are the primary vessels supplying the gluteal region. Both are branches of the internal iliac artery within the pelvic cavity. Both contribute to major collateral networks around the hip.

### Superior Gluteal Artery

The superior gluteal artery enters the gluteal region through the upper part of the greater sciatic foramen above the piriformis. It divides into branches that distribute throughout the gluteal region, but has a primary flow through the fascial space between the gluteus medius and minimus muscles.

### Inferior Gluteal Artery

The inferior gluteal artery enters the gluteal region through the lower part of the greater sciatic foramen, below the piriformis. It distributes branches that run throughout the gluteal region, including a major supply to the gluteus maximus muscle.

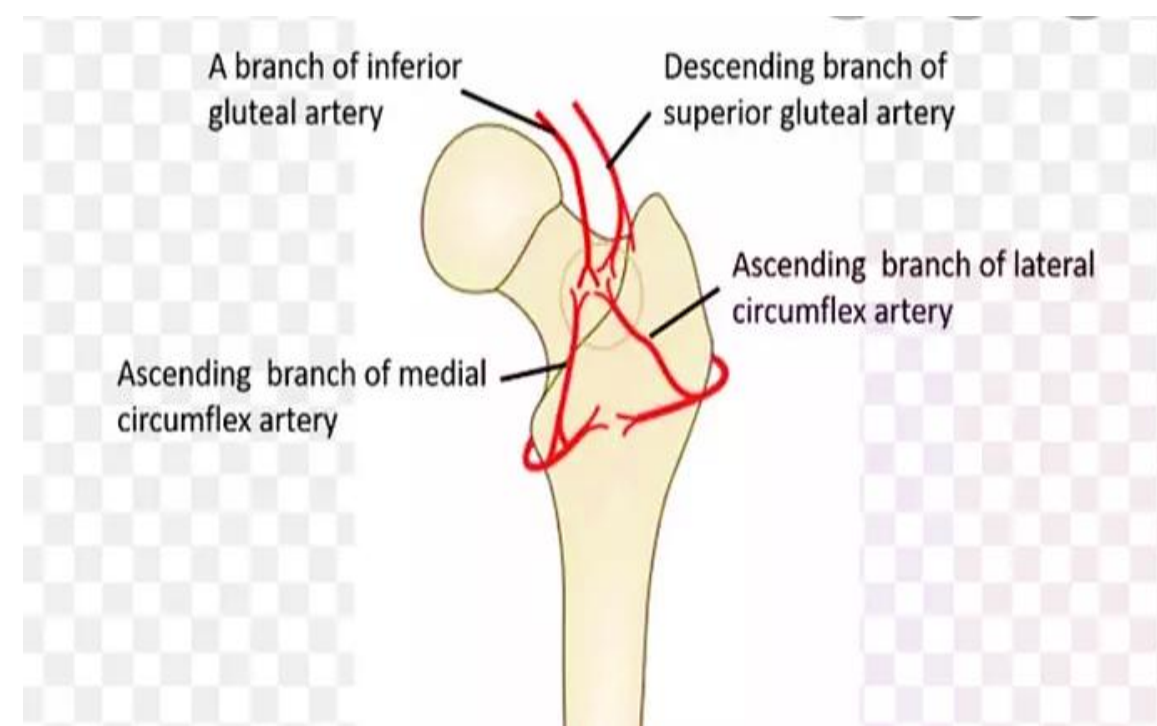


## Trochanteric Anastomosis

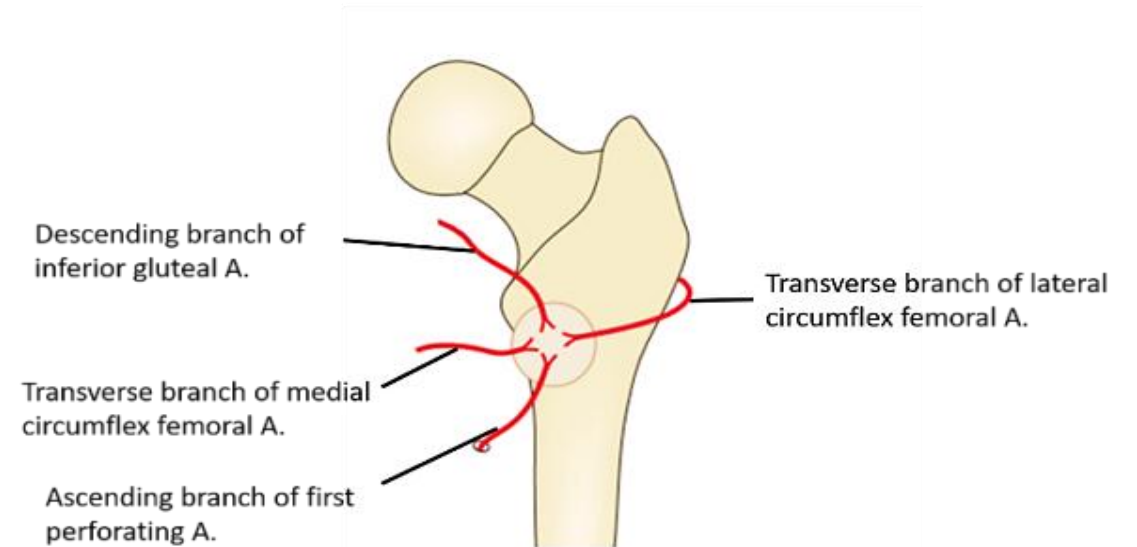
The trochanteric anastomosis provides the main blood supply to the head of the femur. The nutrient arteries pass along the femoral neck beneath the capsule. The following arteries take part in the anastomosis: the superior gluteal artery, the inferior gluteal artery, the medial femoral circumflex artery, and the lateral femoral circumflex artery.

## Cruciate Anastomosis

The cruciate anastomosis is situated at the level of the lesser trochanter of the femur and, together with the trochanteric anastomosis, provides a collateral connection between the internal iliac and the femoral arteries. The following arteries take part in the anastomosis: the inferior gluteal artery, the medial femoral circumflex artery, the lateral femoral circumflex artery, and the first perforating artery, a branch of the profunda artery.

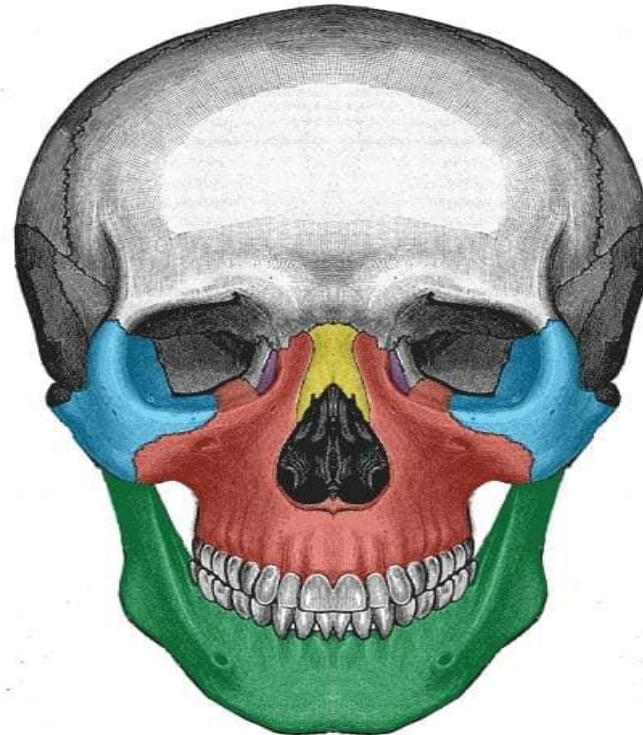


**Cruciate Anastomosis**





# THANK YOU!



-  Zygomatic
-  Maxilla
-  Nasal
-  Lacrimal
-  Mandible