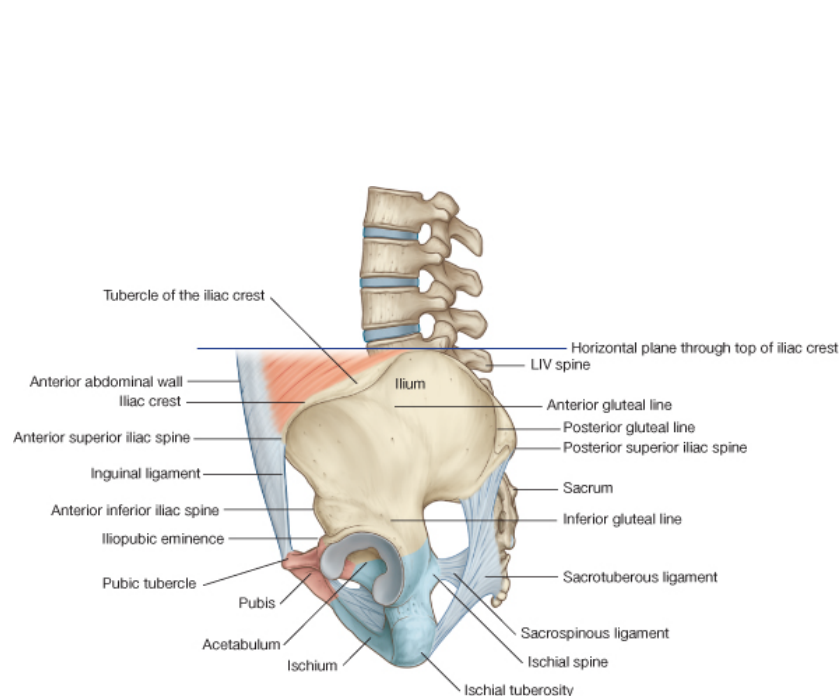
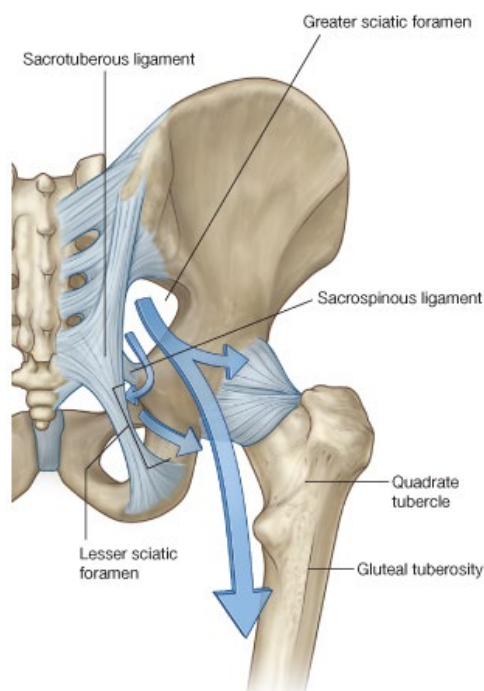
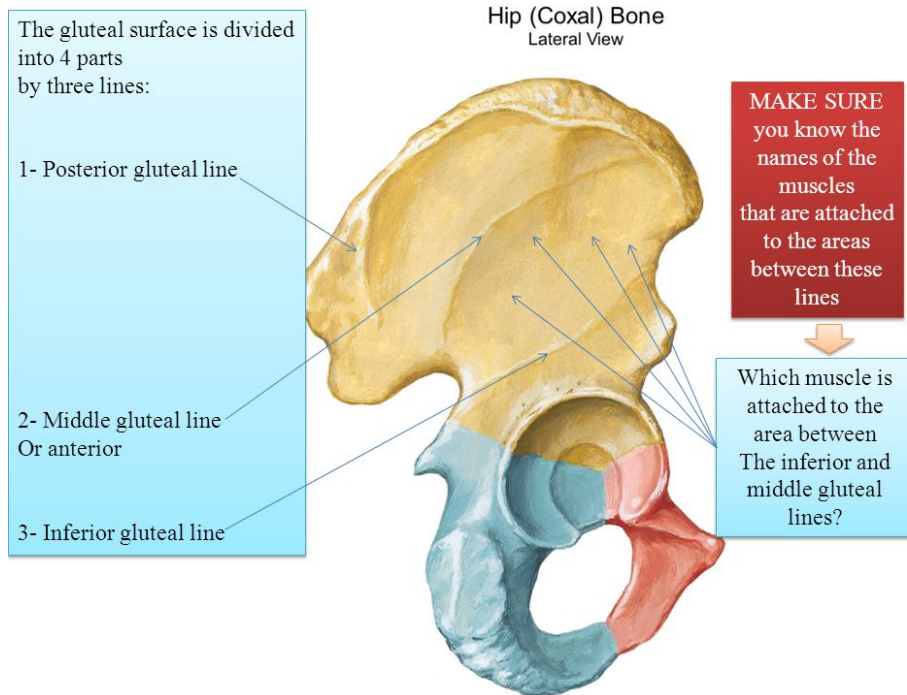


THE GLUTEAL REGION

- Muscle which makes up the buttocks / gluteal region takes origin above and behind the hip joint
- Gluteal muscle lies above and behind the hip joint
- Bones of the gluteal region comprise of posterior aspects of:
 - **Sacrum**
 - **Pelvis**
 - **Proximal femur**
- **Sacrotuberous ligament:**
 - Extends from ischial tuberosity →
 - Posterior iliac spine
 - Margins of sacrum & coccyx.
- **Sacrospinous ligaments:**
 - Behind the sacrotuberous ligament
 - Fibrous part of functionless coccygeus muscle
 - Extends from ischial spine → pelvic surface of sacrum & coccyx
- **Greater sciatic foramen:**
 - Upper foramen
 - Passing through it are:
 - Terminal branches of sacral plexus
 - Piriformis muscle
 - Nerves leaving the greater sciatic foramen are destined to supply back of the leg and buttock.
- **Lesser sciatic foramen:**
 - Lower foramen
 - Exiting through it is the:
 - Obturator internus muscle to the hip joint
 - Point of entry to the perineum
 - Nerves and vessels of the perineum leave the greater sciatic foramen, curl around the ischial spine and enter the perineum through the lesser sciatic foramen.

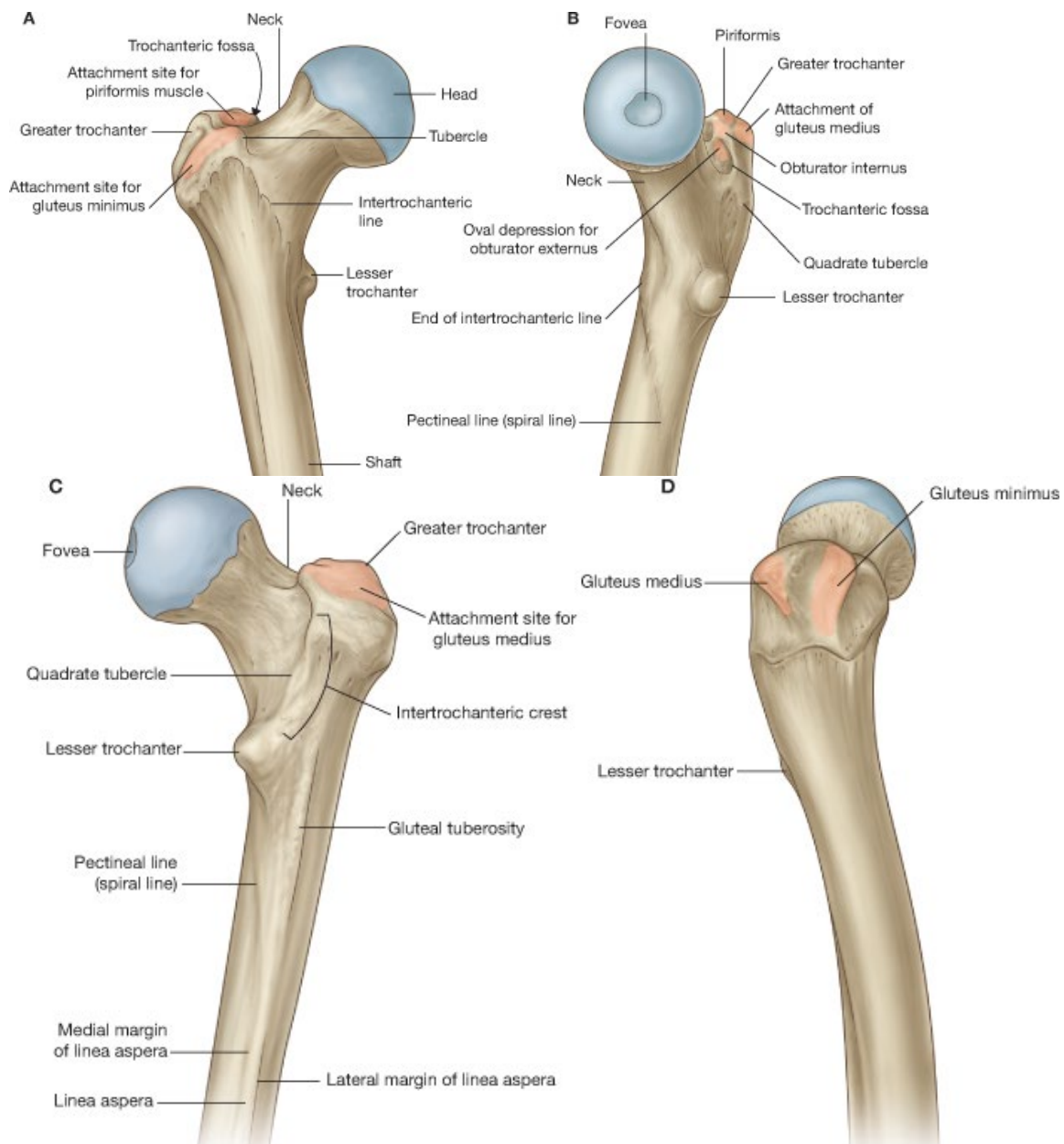




- Outer surface of the ileum is marked by 3 roughened bony lines:
 - Inferior gluteal line (nearest acetabulum)
 - Anterior gluteal line
 - Posterior gluteal line
- The gluteal lines form the origins of the gluteal muscles

- Upper end of the femoral shaft has 2 bony prominences: **greater & lesser trochanters**
- Anteriorly, the **intertrochanteric line** links the 2 trochanters.
- Posteriorly, the trochanters are linked by a more marked **intertrochanteric crest**.
- **Trochanteric fossa** exists in the **medial aspect of the greater trochanter**, medial to the intertrochanteric crest (site of insertion of obturator internus & S+I glemellus)

- No bony landmarks on the front of the shaft of the femur
- Back of the shaft has long rough crest of bone – **linea aspera**
- Above, the linea aspera divides into:
 - Medially: **spiral line**
 - Laterally: **gluteal tuberosity**
- Below, the linea aspera divides into:
 - **2 supracondylar lines**



Greater trochanter:
 Front – gluteus minimus
 Back – gluteus medius

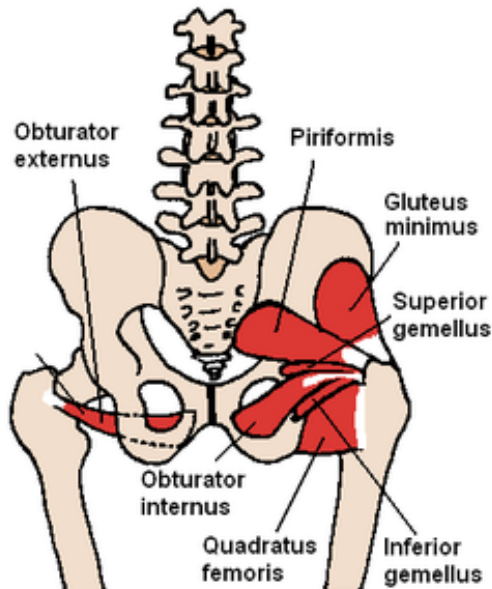
MUSCLES OF THE GLUTEAL REGION:

- 3 FUNCTIONAL GROUPS:

1) 6 muscles which clothe the posterior aspect of the hip joint – lateral rotators

- Lateral rotators of the femur at the hip joint
- **Piriformis**: arises from the pelvis, entering gluteal region through the *greater sciatic foramen*.
- **Obturator internus**: arises from the side wall of the perineums, entering gluteal region through the *lesser sciatic foramen*.
- **Superior gemellus**
- **Inferior gemellus**

- **Quadratus femoris**
- **Obturator externus**



Piriformis:

- Origin: pelvic surface of middle 3 fused sacral segments
- Passes through greater sciatic foramen
- Tapers to tendon in gluteal region
- Insertion: high up on greater trochanter of the femur
- Innervation: branches of the sacral plexus
- Action: lateral rotation of hip.

Obturator internus:

- Origin: internal surface of obturator membrane and bone surrounding obturator foramen.
- Hooks around lesser sciatic notch – tendon turns at a right angle around the notch
- There is a bursa separating the tendon from the bone at this point
- Insertion: tendon travels laterally in gluteal region to insert into the inner surface of the greater trochanter (trochanteric fossa)
- Innervation: branches of the sacral plexus (anterior divisions)
- Action: lateral rotation of hip.

Superior and inferior gemellus:

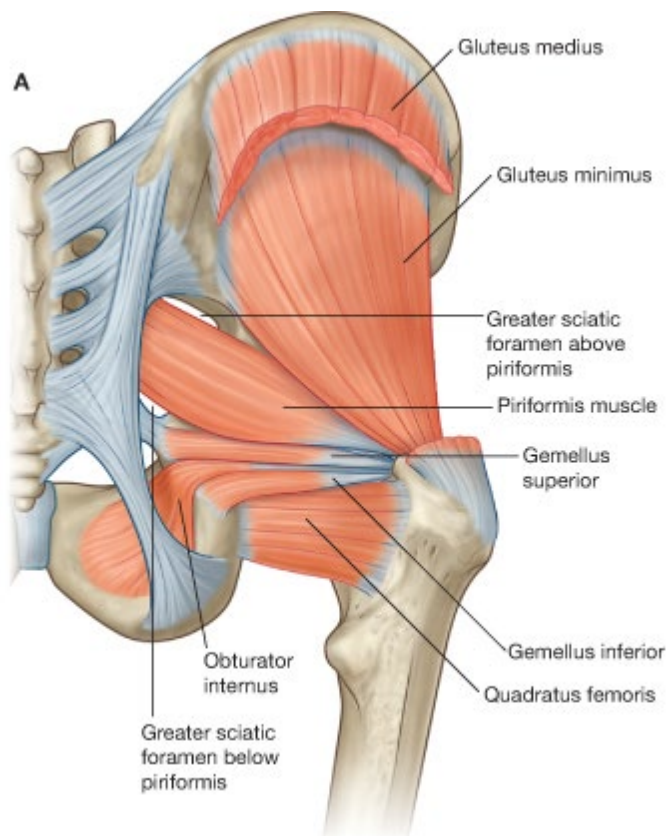
- Superior arises from ischial spine
- Inferior arises from ischial tuberosity
- Flank the obturator internus
- Insert into the obturator internus muscle (common insertion into trochanteric fossa)
- Same function as obturator internus.
- Nerve supply:
 - Superior: nerve to obturator internus
 - Inferior: nerve to quadratus femoris

Quadratus femoris:

- Below the obturator internus
- Origin: ischial tuberosity
- Passes horizontally
- Insertion: quadrate tubercle of intertrochanteric crest
- Insertion creates a raised area – the **quadrate tubercle**
 - Innervation: nerve to quadratus femoris (L-S plexus)
 - Action: lateral rotation of hip.

Obturator externus:

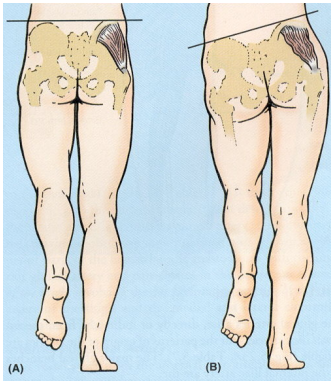
- Origin: outer surface of obturator membrane and surrounding bone
- Sweeps behind capsule of hip joint
- Insertion: trochanteric fossa
- Innervation: obturator nerve
- Action: lateral rotation of hip



2) 2 muscles which stabilise the pelvis during locomotion

- **Gluteus minimus**
- **Gluteus medius**
- The action of the gluteus minimus and medius is to stabilise the pelvis.
- When a foot is raised off of the ground, as in walking, contraction of the gluteus minimus and medius on the contralateral side maintains the pelvis in a horizontal plane.

- If these muscles are ineffective, the pelvis falls as the leg is raised:



- Action of these 2 muscles is tested clinically by asking the patient to raise one leg – if muscles are paralysed the pelvis will fall on the side of the raised leg.
- Patient has '**positive Trendelenburg sign**'
- May be due to either non-function gluteus minimus/medius, or hip deformity preventing action of these muscles.
- Gluteus minimus and medius can also abduct the leg at the hip joint.

Gluteus minimus:

- Origin: lower part of outer aspect of iliac blade
- Insertion: greater trochanter
- Fan-shaped
- A bursa lies between the gluteus minimus and the iliac bone beneath.
- Innervation: superior gluteal nerve (branch of posterior sciatic nerve)
- Action: stabilises the pelvis

Gluteus medius:

- Fanshaped stabiliser of pelvis
- More massive and powerful than the gluteus minimus
- Covers the gluteus minimus
- Origin: area of iliac blade between the iliac crest above and the origin of the minimus below (i.e. bone between anterior and posterior gluteal lines).
- Insertion: upper lateral aspect of greater trochanter
- Innervation: superior gluteal nerve (branch of posterior sciatic nerve)
- Action: stabilises the pelvis

3) 1 muscle which extends the hip joint

- **Gluteus maximus** covers both the lateral rotators and stabilisers of the hip joint
- It is a powerful extensor of the hip joint

Gluteus maximus:

- Origin:
 - Posterior of iliac crest
 - Posterior of sacrum & coccyx
 - Sacrotuberous ligament
- Coarse muscle fibres pass oblique downwards & forwards

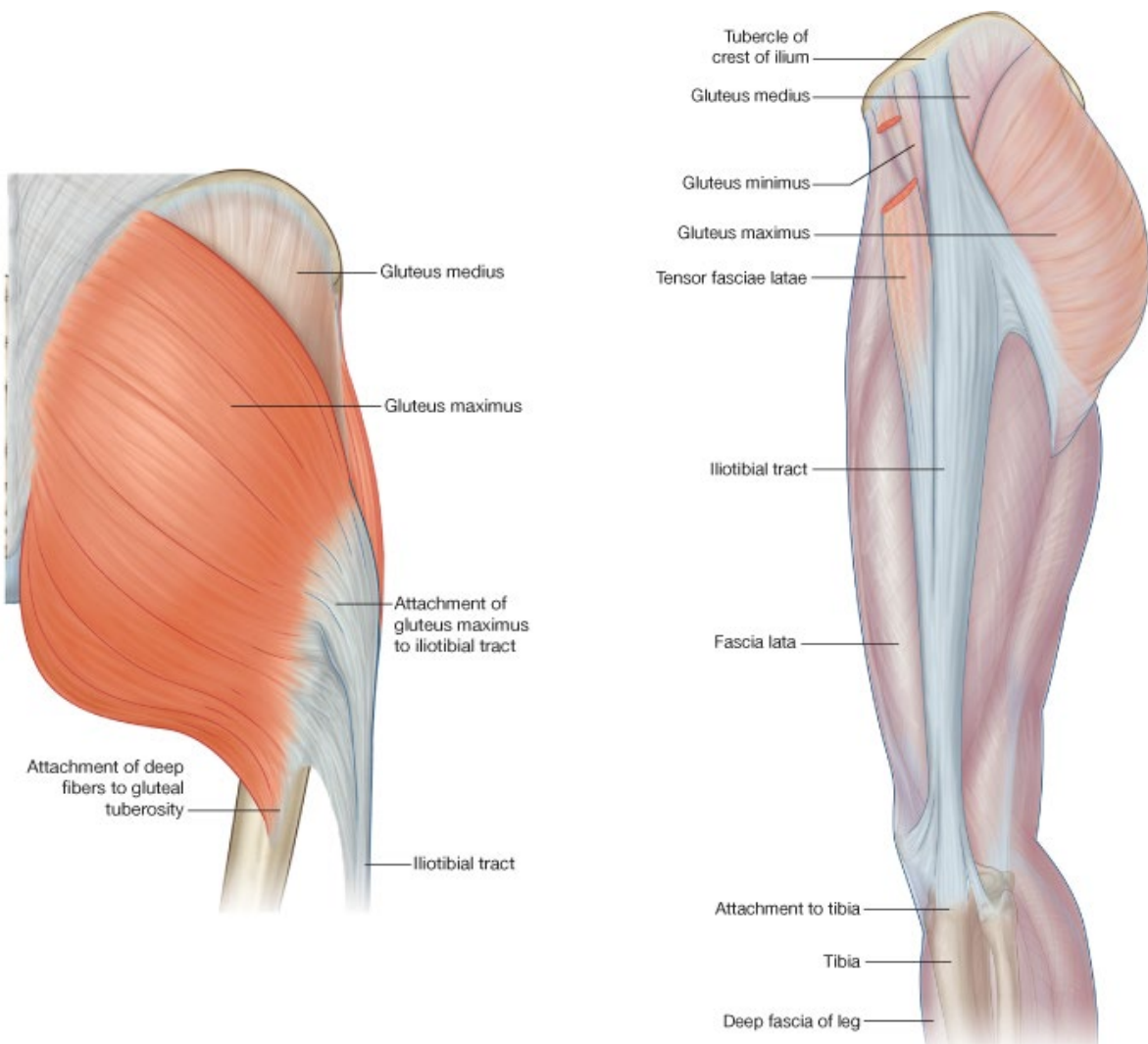
- Insertion
 - **Deep fibres:** gluteal tuberosity of the femur
 - **Superficial fibres** (main mass of the muscle): iliotibial tract
- Innervation: inferior gluteal nerve
- There are usually several bursa deep to the gluteus maximus
 - A large bursa between the gluteus maximus and the ischial tuberosity
 - Between the muscle and the greater trochanter
 - More lateral, between muscle and vastus lateralis (muscle of quad)

What is the iliotibial tract?

- A thickening in the deep fascia of the thigh
- *Above:* iliotibial tract attached to tubercle of iliac crest
- *Below:* iliotibial tract attached to lateral condyle of tibia
- In its course, the iliotibial tract passes vertically downwards over the lateral side of the knee.
- A few fibres pass into the patella.
- Gluteus maximus inserts into the iliotibial tract from behind.
- **Tensor fasciae latae** is a small muscle which inserts into the iliotibial tract from in front.
- Tensor fasciae latae arises from the iliac crest in front of the tract
- Innervation: superior gluteal nerve

Functions of the iliotibial tract:

- 1) Long tendon for the insertion of the gluteus maximus and tensor fasciae latae into the lateral condyle of the tibia.
- 2) Stabilises the pelvis on the femur in the standing position
- 3) Helps to keep the knee joint straight and locked.

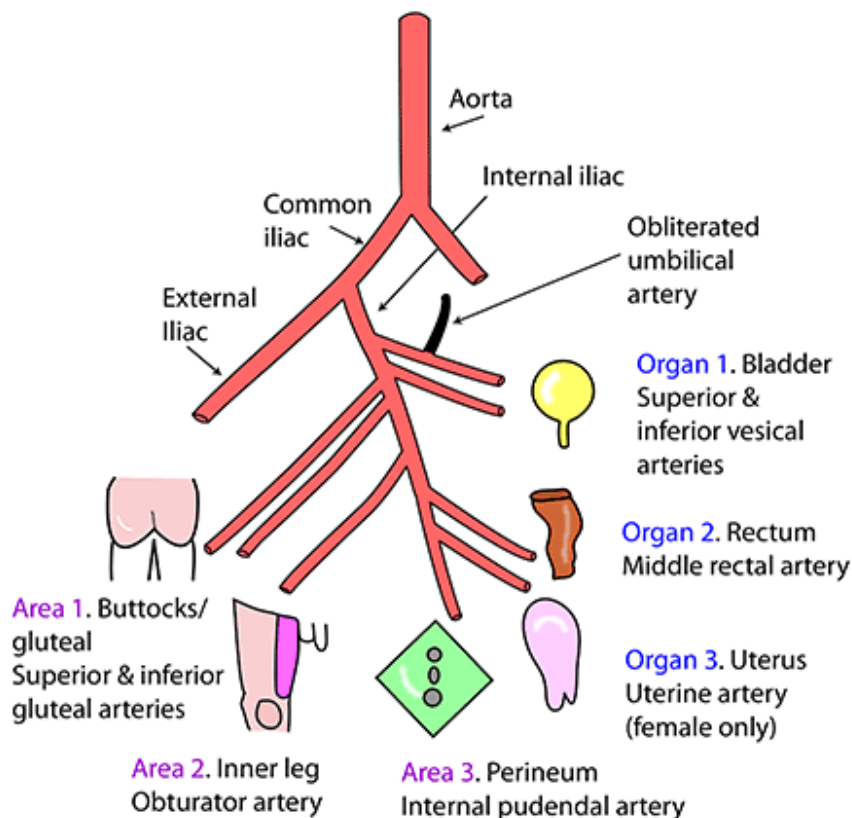


NEUROVASCULAR STRUCTURE OF THE GLUTEAL REGION:

- Greater sciatic foramen: pelvis \leftrightarrow gluteal region
 - Piriformis
 - Terminal branches of sacral plexus.
 - Nerves are sensory and motor to the back of leg and buttocks.
 - Terminal branches of the internal iliac artery
 - Provide rich blood supply to gluteal region

- Another neurovascular bundle from the sacral plexus and internal iliac artery also exits the greater sciatic foramen, but then curls around the ischial spine to enter the perineal region through the lesser sciatic foramen.

BRANCHES OF THE INTERNAL ILIAC ARTERY



A simple representational diagram of the branches of the internal iliac artery. An easy way to remember them is to think of them in 2 groups, each with 3 branches. **Group 1** has 3 branches to organs (bladder, rectum and uterus) and **Group 2** has 3 branches to areas (buttocks/gluteal, adductor compartment and perineum).

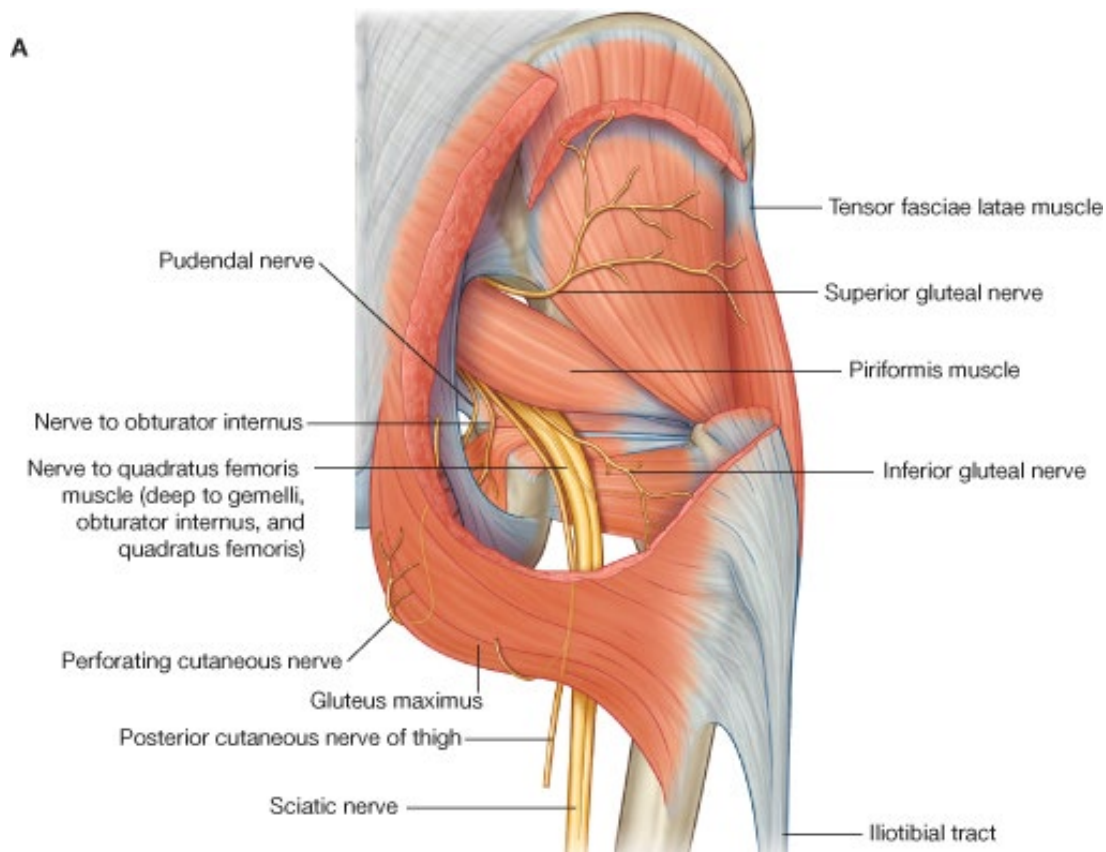
- ILIO LUMBAR:** Passes laterally, behind obturator nerve & psoas. Lumbar branch to psoas, quadratus lumborum & spine. Iliac branch to iliacus, iliac bone, anastomosis at anterior superior iliac spine
- LATERAL SACRAL:** Passes inferiorly, lateral to anterior sacral foramina & anterior to nerve roots & piriformis
- ARTERY TO VAS:** Usually off superior vesical (or inferior vesical)
- UTERINE ARTERY:** In female it largely replaces middle rectal (or inferior vesical)

Internal iliac supplies:

- **Organs of the pelvis**
- **Perineum**
- **Gluteal + lateral rotator muscles (S+I gluteal arteries)**
- **Adductor muscles of internal thigh (obturator artery)**

NERVES SUPPLYING THE MUSCLES OF THE GLUTEAL REGION:

- **Superior gluteal nerve**
 - Travels above the piriformis
- **Inferior gluteal nerve**
 - Travels below the piriformis
- **Nerve to quadratus femoris**
 - Travels below the piriformis
- **Nerve to obturator internus**
 - Travels below the piriformis but then curls round the ischial spine and inserts into obturator internus before passing through the lesser sciatic foramen.
- **Posterior cutaneous nerve of the thigh** supplies sensation to skin on the back of the thigh, and is visible in the gluteal region.



The only one which goes above the piriformis is the **superior gluteal nerve**

SACRAL PLEXUS

L4,5,S1,2,3,4,5

Lies on piriformis on posterior wall of pelvis, deep to the vessels & covered by parietal pelvic fascia

6 BRANCHES OFF THE SACRAL ROOTS BEFORE THEY DIVIDE INTO ANTERIOR & POSTERIOR DIVISIONS

They all begin with the letter "P"

1. Posterior femoral cutaneous nerve (S1,2,3)
2. Pudendal nerve (S2,3,4)
(1 & 2 - leave via greater sciatic foramen)
3. Perforating cutaneous nerve (S2,3)
(3 - perforates sacrotuberous ligament)
4. Nerve to piriformis (S1,2)
5. Perineal branch of S4 (to levator ani)
6. Pelvic splanchnics (S2,3,4)
Parasympathetic motor to bladder, hind gut, erection.
Sensory for distension & pain of bladder, lower uterus, lower colon & rectum
(4,5,6 - all remain in pelvis)

FROM ANTERIOR DIVISIONS

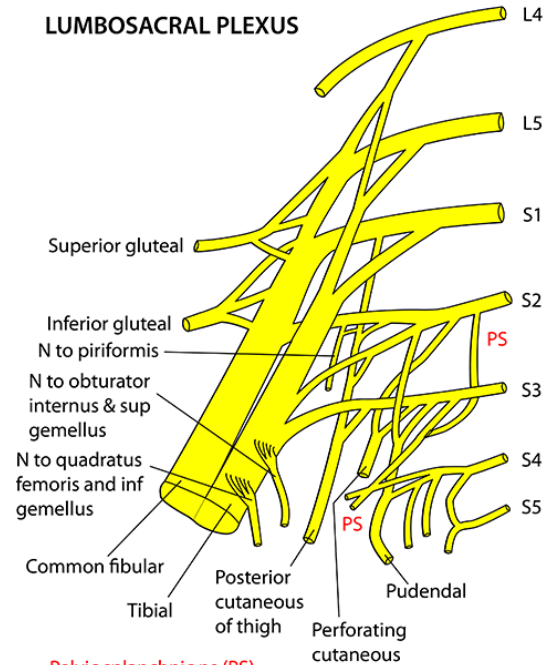
- Nerve to quadratus femoris (L4,5,S1)
- Nerve to obturator internus (L5,S1,2)
- Tibial portion of sciatic nerve (L4,5,S1,2,3)
(see sciatic nerve in leg section)

FROM POSTERIOR DIVISIONS

- Superior gluteal (L4,5,S1)
- Inferior gluteal (L5,S1,2)
- Common fibular portion of sciatic nerve (L4,5,S1,2)
(see sciatic nerve in leg section)

For more details & illustrations, please see page 132 in the book - Instant Anatomy, by R H Whitaker & N R Borley, 4th edition. Wiley-Blackwell 2010

LUMBOSACRAL PLEXUS



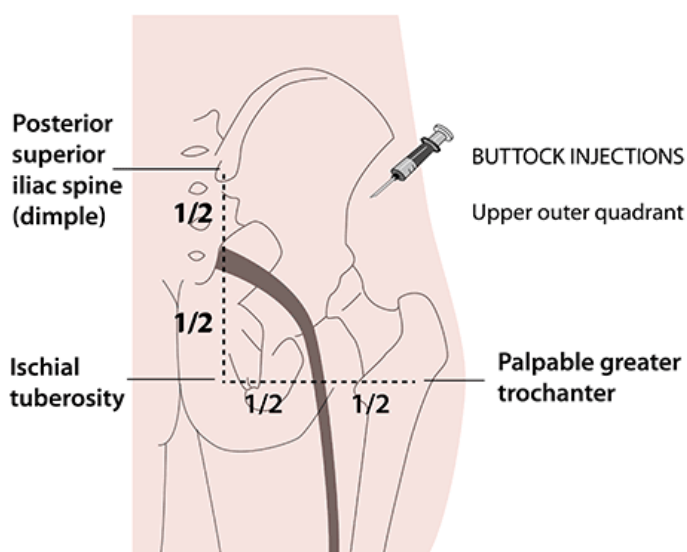
Pelvic splanchnic ns (PS)
(parasympathetic)

SCIATIC NERVE:

- Largest branch of lumbar & sacral plexus (mixed)
- Ventral rami of:
 - L4 + L5
 - S1 + S2 + S3
- Passes through greater sciatic foramen
- Passes below the piriformis
 - Covers the nerve to the quadratus femoris
 - Posterior cutaneous nerve of the thigh passes beneath it
- **Position of sciatic nerve midway between the ischial tuberosity & greater trochanter.**

Sciatic nerve

Feel for anterior superior iliac spine, greater trochanter, ischial tuberosity & posterior superior iliac spine (dimple)



- Sciatic nerve then passes down the back of the thigh:
 - Initially:
 - Superficial to the lateral rotators
 - Enclosed in condensation of fascia and accompanied by a 'companion artery' (a small branch of the inferior gluteal artery).
 - Covered by gluteus maximus.
 - Passes down back of thigh:
 - Passes onto posterior surface of **adductor magnus**
 - Divides into 2 branches – usually on back of thigh, but can be in gluteal or pelvic region:
 - **Common peroneal nerve**
 - **Tibial nerve**

Nerves of the perineum, passing briefly through the gluteal region:

- Remember, the neurovascular bundle to the perineum passes out through the greater sciatic foramen into the gluteal region, but then curls immediately around the sacrospinous ligament to enter the perineal region.
- Thus the **pudendal nerve** curls around the sacrospinous ligament
- The **internal pudendal artery** + its venae comitantes curls around tip of ischial spine.

BLOOD SUPPLY TO THE GLUTEAL REGION:

- Large mass of musculature Δ extensive blood supply
- NOTE: no equivalent of the femoral artery of the anterior compartment.
- **Profunda femoris** supplies back of thigh (and front)
- **Superior gluteal artery & inferior gluteal artery** are both branches of the internal iliac artery
- Enter the gluteal region in company with the corresponding nerves.

- Great veins accompany these arteries and drain into the internal iliac vein.
- **Some of the blood supply to the gluteal region comes up from branches of the lateral and medial circumflex arteries (themselves branches of the profunda femoris).**
- These circumflex vessels anastomose with the:
 - *Superior + inferior* gluteal artery above
 - Perforating branches below (branches of profunda femoris)
- This forms the **cruciate anastomosis**

APPLIED ANATOMY OF THE GLUTEAL REGION:

BLOOD SUPPLY & ANASTOMOSIS

- Rich anastomosis between: profunda femoris (circumflex) \leftrightarrow vessels of the trochanteric + cruciate anastomosis \leftrightarrow inferior gluteal artery (internal iliac)
- Δ if femoral artery is blocked *proximal* to origin of the profunda, blood can flow from:
 - vessels of the cruciate anastomosis \rightarrow the profunda \rightarrow femoral artery (the “wrong way”)
- Thus perfusing the leg.
- More serious is when the femoral artery is blocked *distal* to the origin of the profunda femoris
- In this situation, no blood can reach the femoral artery via anastomosis with the profunda
- Leads to ischaemic gangrene and necrosis in the foot, as no blood reaches it through the femoral artery.

SCIATIC NERVE:

- Most important structure of the gluteal region
- Neurons of ventral rami:
 - L4 + L5
 - S1 + S2 + S3
- **Herniation of intervertebral discs** usually occurs between L4-L5, or L5-S1
- Δ disc trouble often leads to **sciatica** – pain somewhere along the course of the sciatic nerve
 - Pain can be localised in the buttock
 - Usually passes down the back of the leg
 - Anaesthesia of skin in lower leg (if sensory neurons damaged by disc herniation).
- The sciatic nerve can also be injured locally in the buttock
- To avoid damage of the sciatic nerve when giving intramuscular injections into the buttock, injections are given deeply into the upper outer quadrant of the buttock
- It is safer still to give injections into the vastus lateralis mass in thigh

