VOLGOGRAD STATE MEDICAL UNIVERSITY

The lower extremity

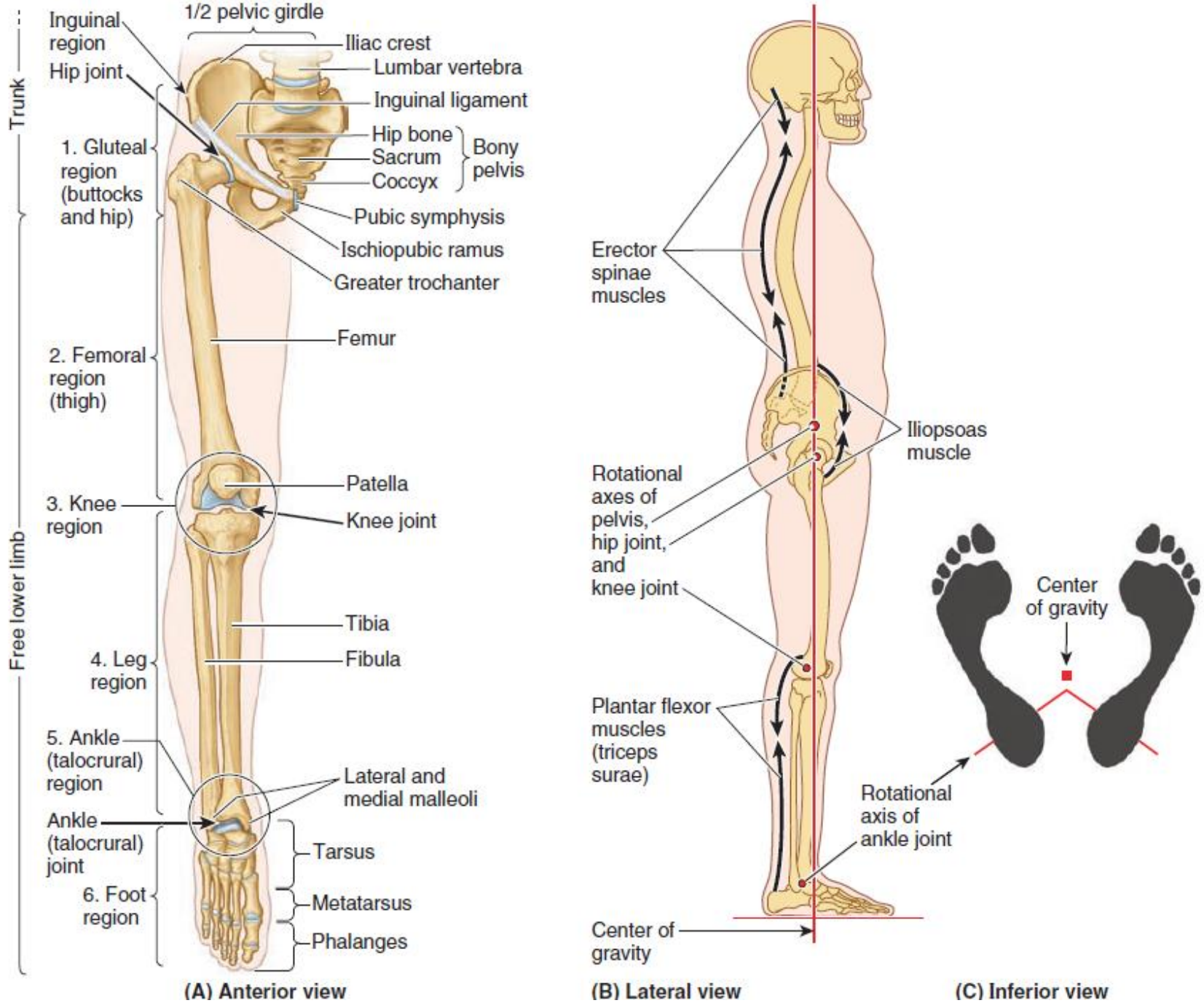
Introduction. Gluteal region and hip joint.

Department for the operative surgery and topographic anatomy, VSMU

O.D. Chulkov, A.S. Mazunov, E.E. Pisareva, E.A. Barinova

Regions of the lower limb

The lower extremities or lower limbs are built for support and propulsion. They are extensions from the trunk specialized to support body weight as well as maintain balance. The lower limbs are conventionally described to include transitional regions between the trunk and the free lower limbs

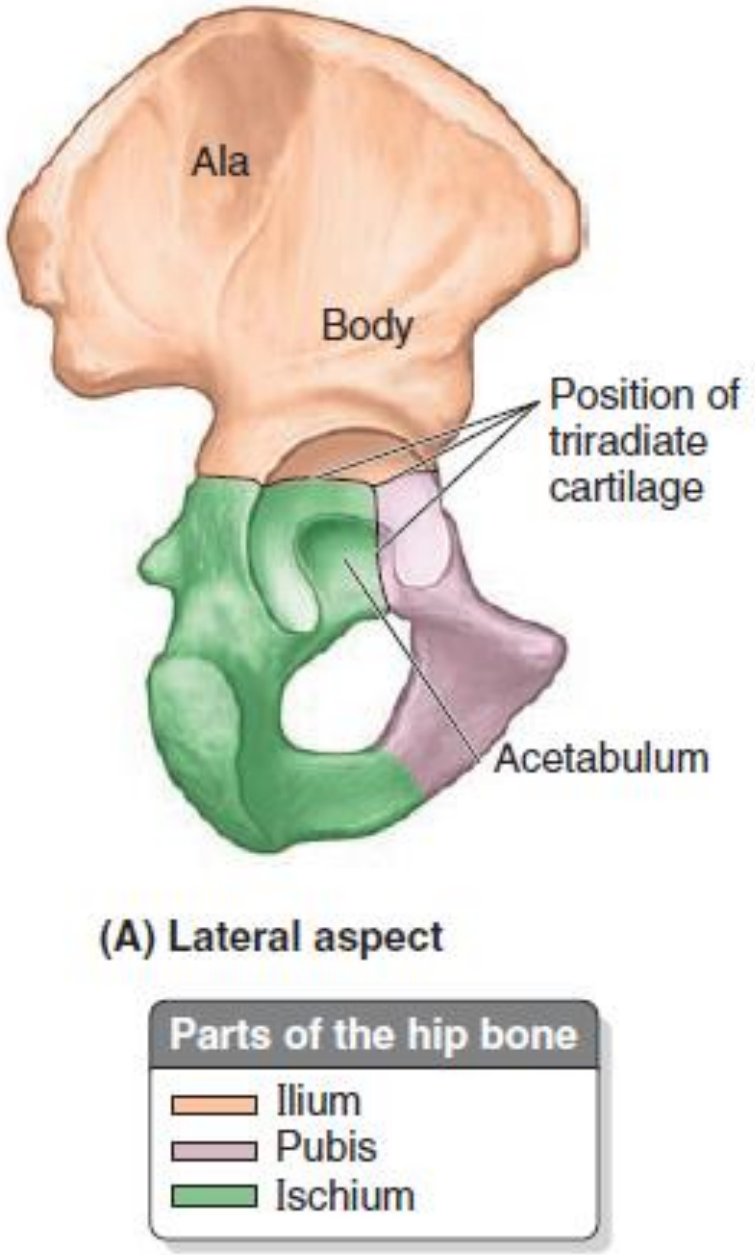

Trunk
Free lower limb
Inguinal region
Hip joint
1/2 pelvic girdle
Iliac crest
Lumbar vertebra
Inguinal ligament
Hip bone
Sacrum
Coccyx
Bony pelvis
1. Gluteal region (buttocks and hip)
Pubic symphysis
Ischiopubic ramus
Greater trochanter
Femur
2. Femoral region (thigh)
Patella
3. Knee region
Knee joint
Tibia
Fibula
4. Leg region
5. Ankle (talocrural) region
Lateral and medial malleoli
Ankle (talocrural) joint
Tarsus
6. Foot region
Metatarsus
Phalanges
(A) Anterior view
Erector spinae muscles
Iliopsoas muscle
Rotational axes of pelvis, hip joint, and knee joint
Plantar flexor muscles (triceps surae)
Center of gravity
(B) Lateral view
Center of gravity
Rotational axis of ankle joint
(C) Inferior view

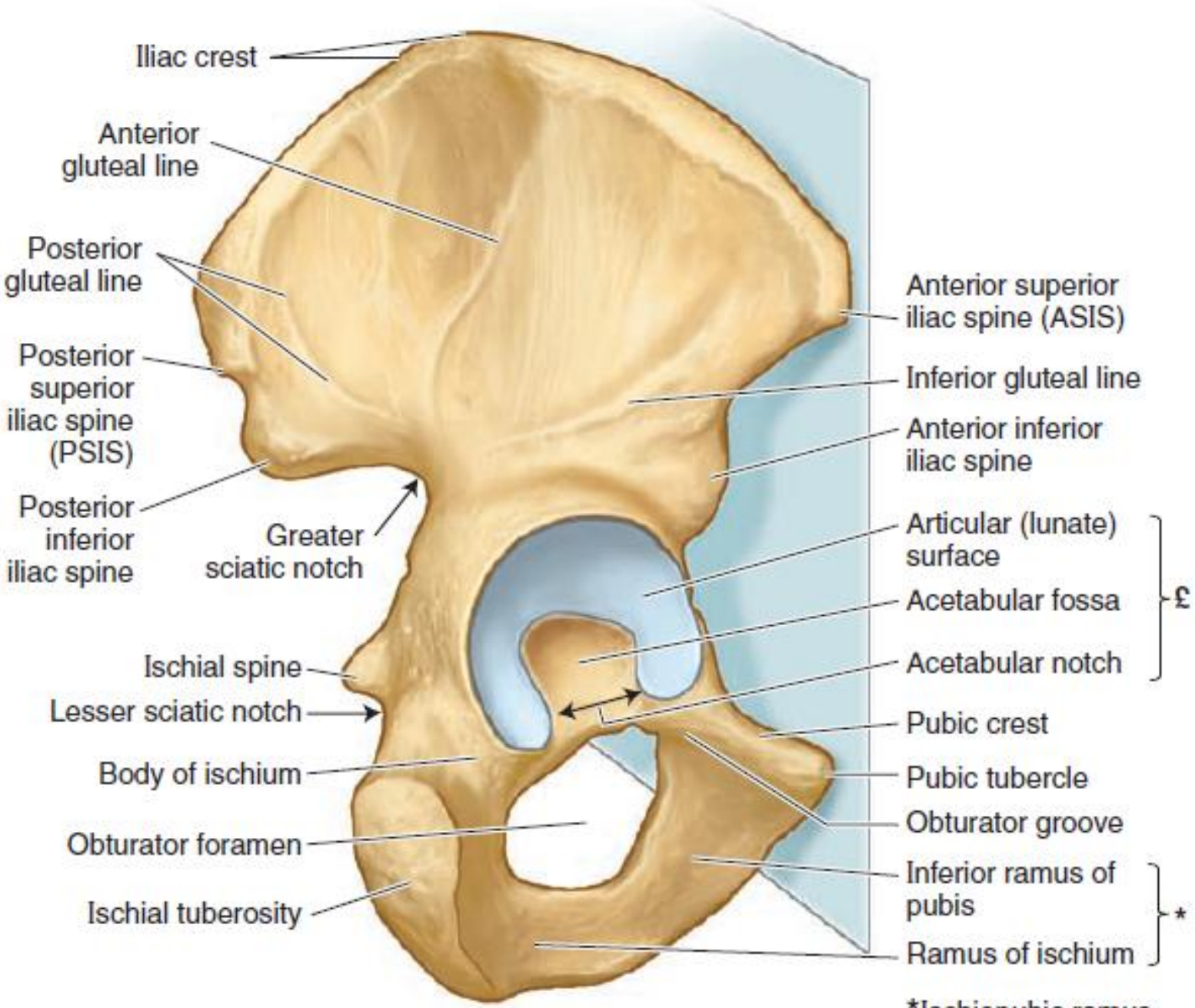
Bones of lower limb

Each mature **hip bone** is formed by the fusion of three primary bones: *ilium*, *ischium*, and *pubis*. At puberty, these bones are still separated by a **triradiate cartilage**. The cartilage disappears and the bones begin to fuse at 15 to 17 years of age; fusion is complete between 20 and 25 years of age.

Bones of lower limb

Parts of hip bone of a 13-year-old.

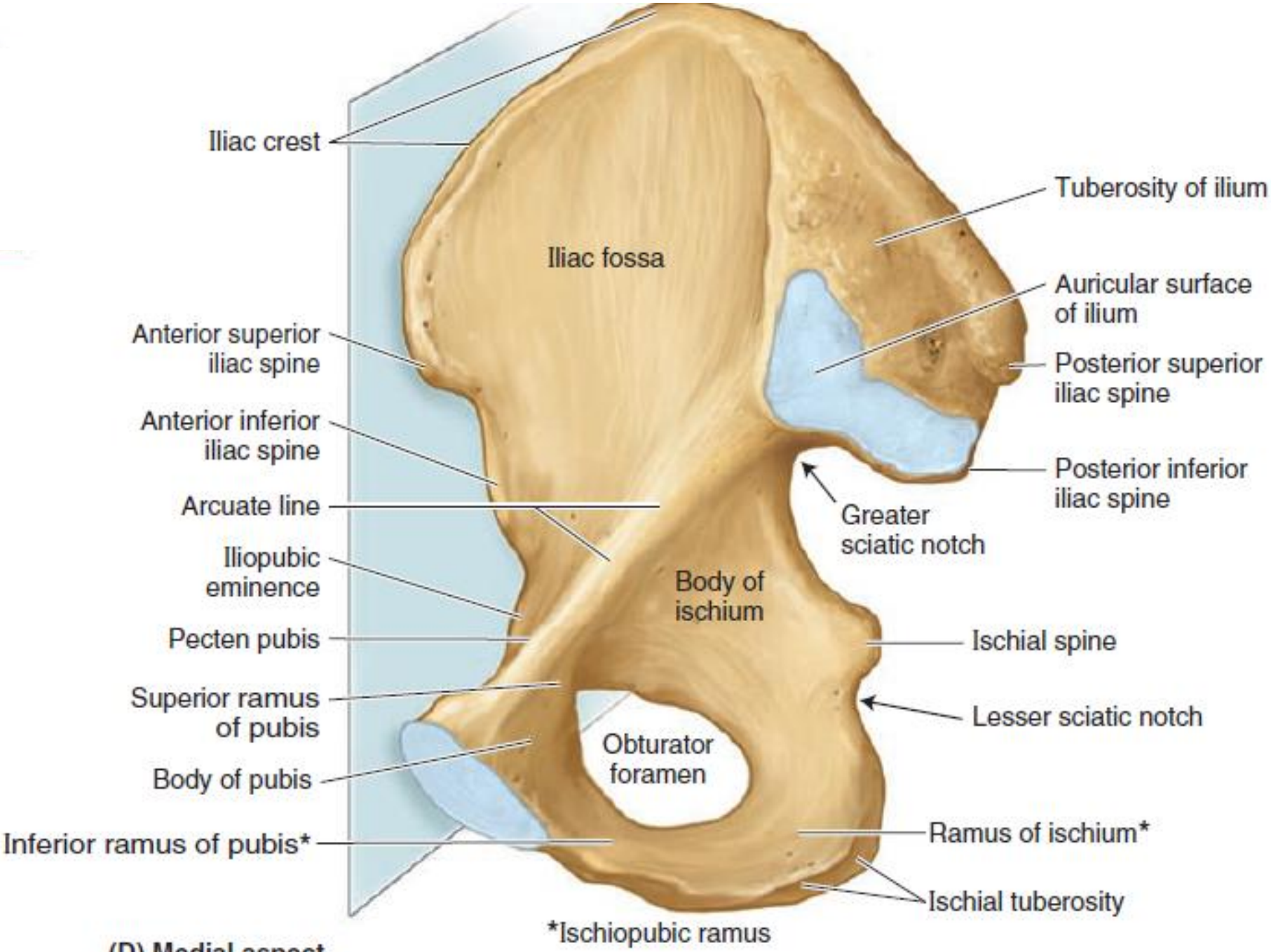




(C) Lateral aspect

*Ischiopubic ramus

£Acetabulum



(D) Medial aspect

Bones of lower limb

The femur is the longest and heaviest bone in the body. The femur consists of a shaft (body) and superior or proximal and

inferior or distal ends. Most of the shaft is smoothly rounded, except for a prominent double-edged ridge on its posterior aspect, the linea aspera, which diverges inferiorly.

The proximal end of the femur consists of a head, neck, and greater and lesser trochanters.

Bones of lower limb

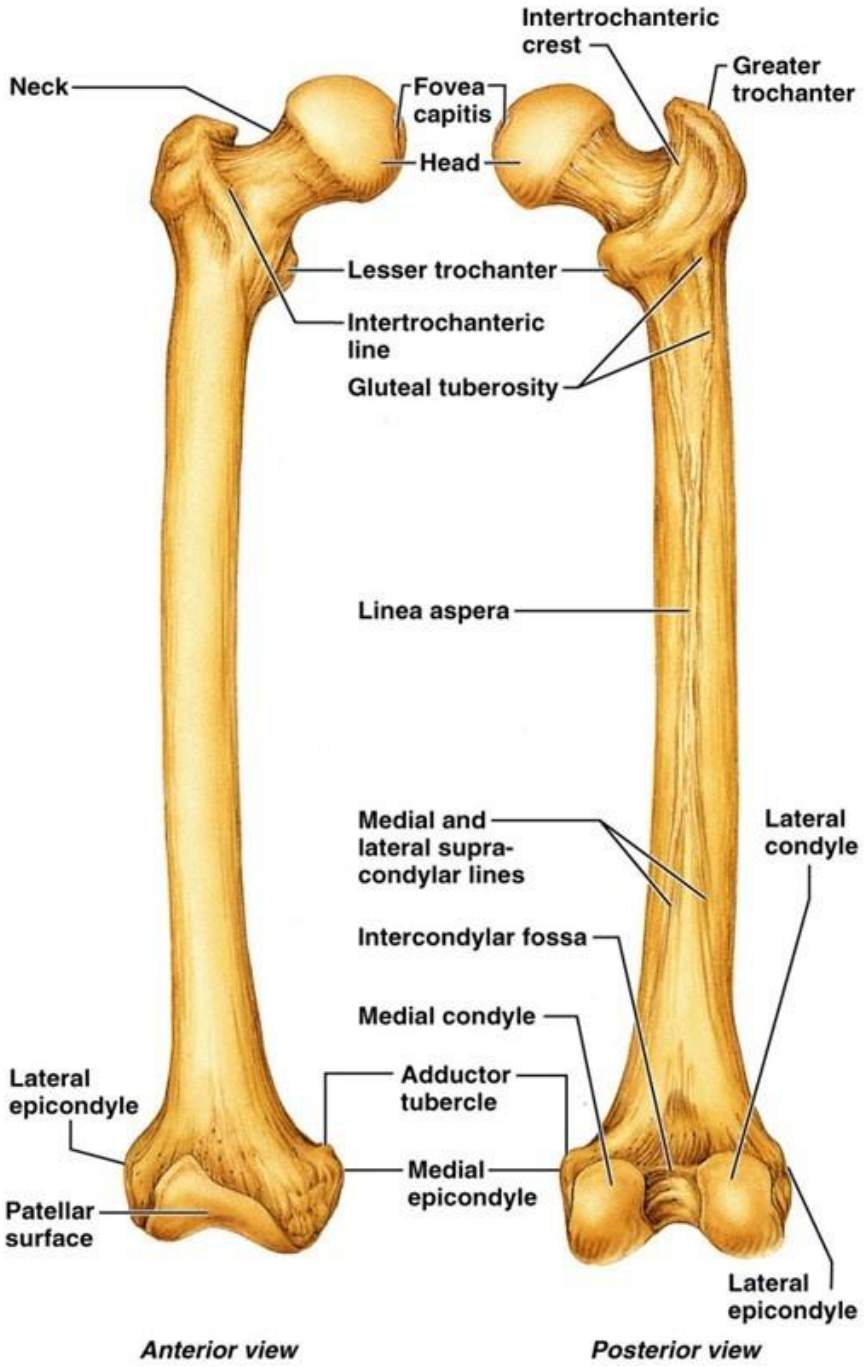
The head of the femur is covered with articular cartilage, except for a medially placed depression or pit, the fovea for the ligament of the head. The neck of the femur is trapezoidal; the narrow end supports the head and its broader base is continuous with the shaft. Where the neck joins the shaft are two large, blunt elevations— the trochanters.

Bones of lower limb

The **intertrochanteric line** is a roughened ridge running from the greater to the lesser trochanter. A similar but smoother ridge, the **intertrochanteric crest**, joins the trochanters posteriorly. The distal end of the femur ends in two spirally curved femoral condyles (medial and lateral). The femoral condyles articulate with the tibial condyles to form the knee joint.

Bones of lower limb

The femur



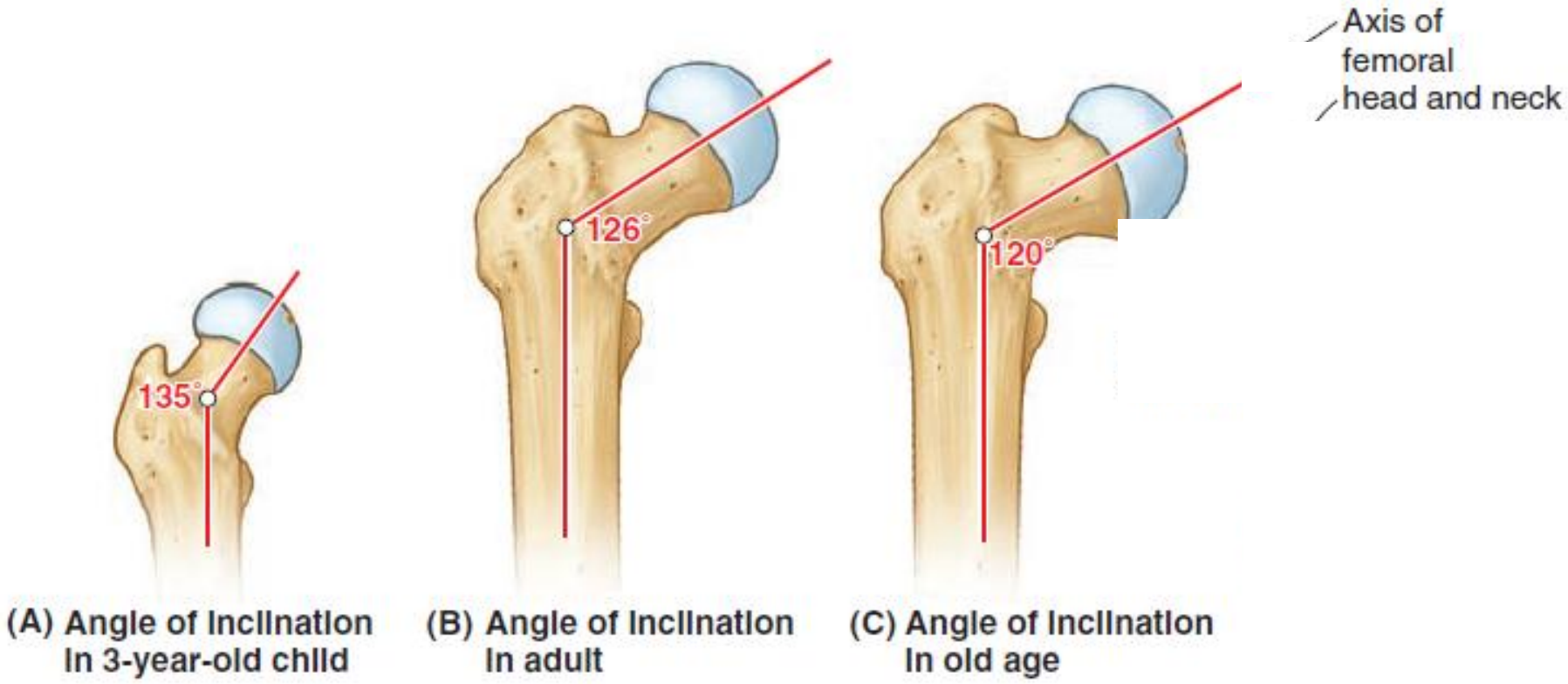
Bones of lower limb

The proximal femur is bent, making the femur L-shaped, so that the long axis of the head and neck project superomedially at an angle to that of the obliquely oriented shaft. This obtuse **angle of inclination** in the adult is 115 to 140 degrees, averaging 126 degrees. The angle is less in females because of the increased width between the acetabula and the greater obliquity of the shaft.

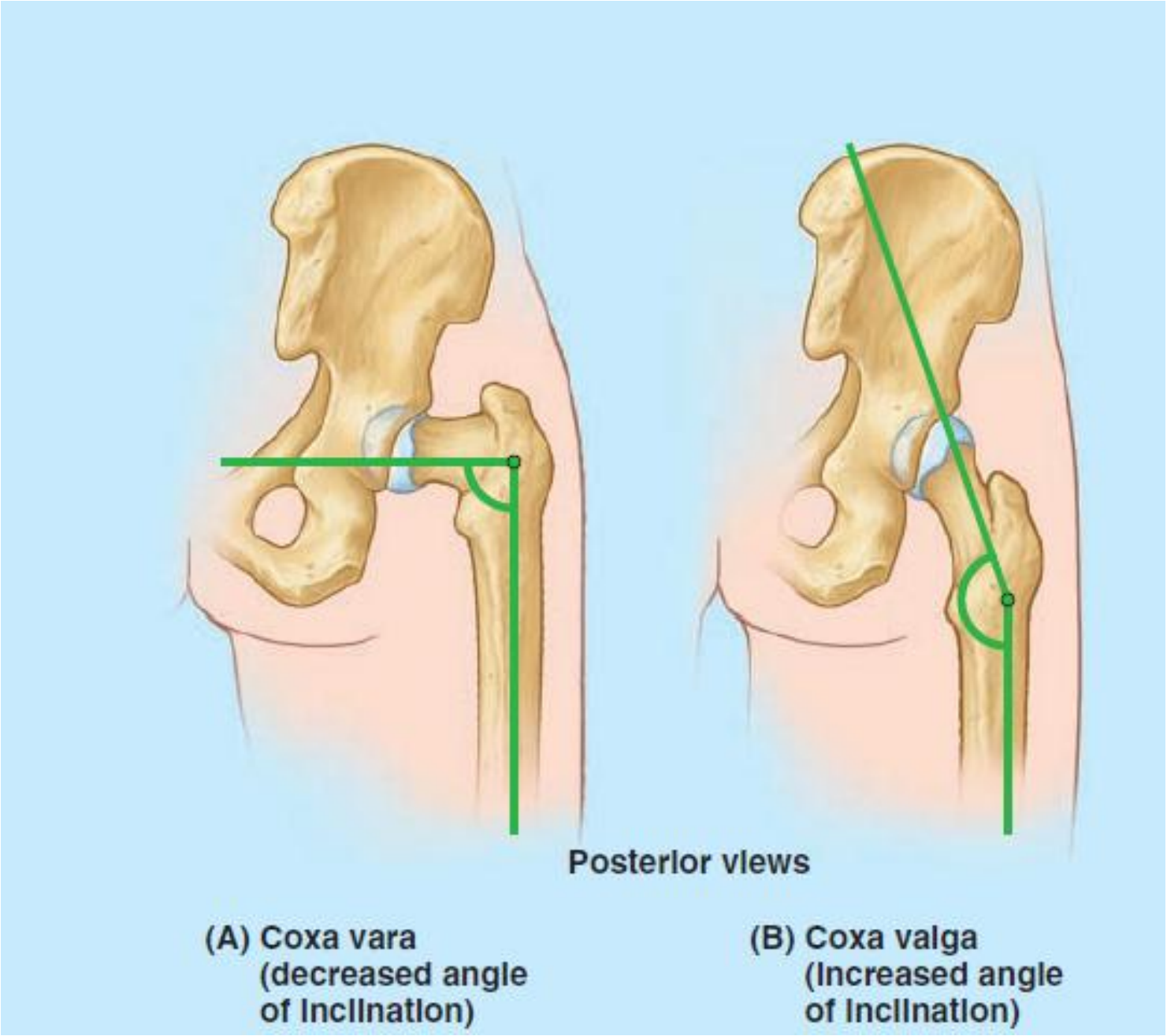
Bones of lower limb

The angle of inclination allows greater mobility of the femur at the hip joint because it places the head and neck more perpendicular to the acetabulum. This is advantageous for bipedal walking; however, it imposes considerable strain on the neck of the femur. Fractures of the neck may occur in older people as a result of a slight stumble if the neck has been weakened by osteoporosis.

The angle of inclination



The angle of inclination



The angle of inclination

The angle of inclination varies with age, sex, and development of the femur (e.g., consequent to a congenital defect in ossification of the femoral neck). It also may change with any pathological process that weakens the neck of the femur (e.g., rickets). When the angle of inclination is decreased, the condition is coxa vara; when it is increased, the condition is coxa valga. Coxa vara causes a mild passive abduction of the hip

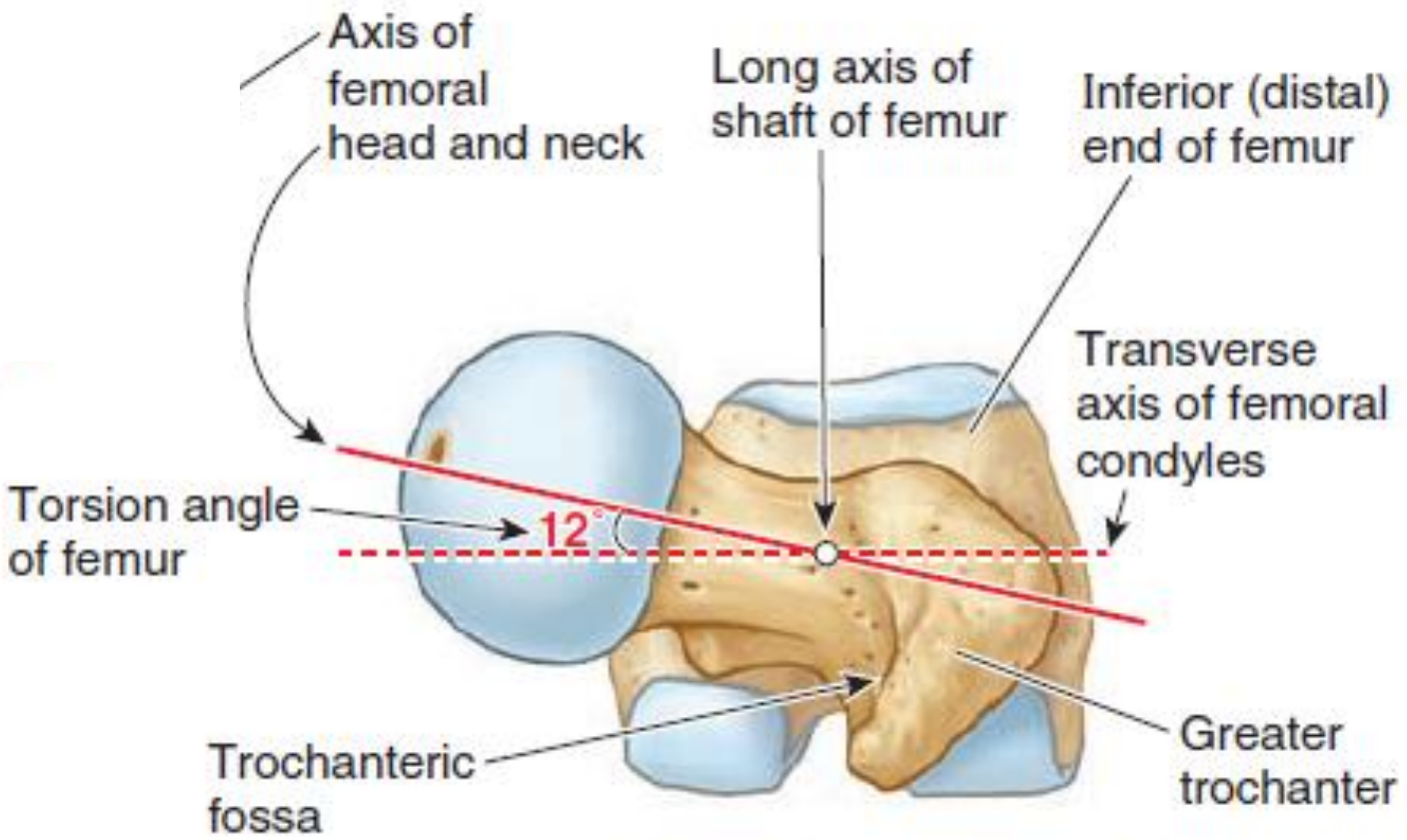
The torsion angle

When the femur is viewed superiorly, so that the proximal end is superimposed over the distal end, it can be seen that the axis of the head and neck of the femur and the transverse axis of the femoral condyles intersect at the long axis of the shaft of the femur, forming **the torsion angle,** or **angle of declination**. The mean torsion angle is 7 degrees in males and 12 degrees in females.

The torsion angle

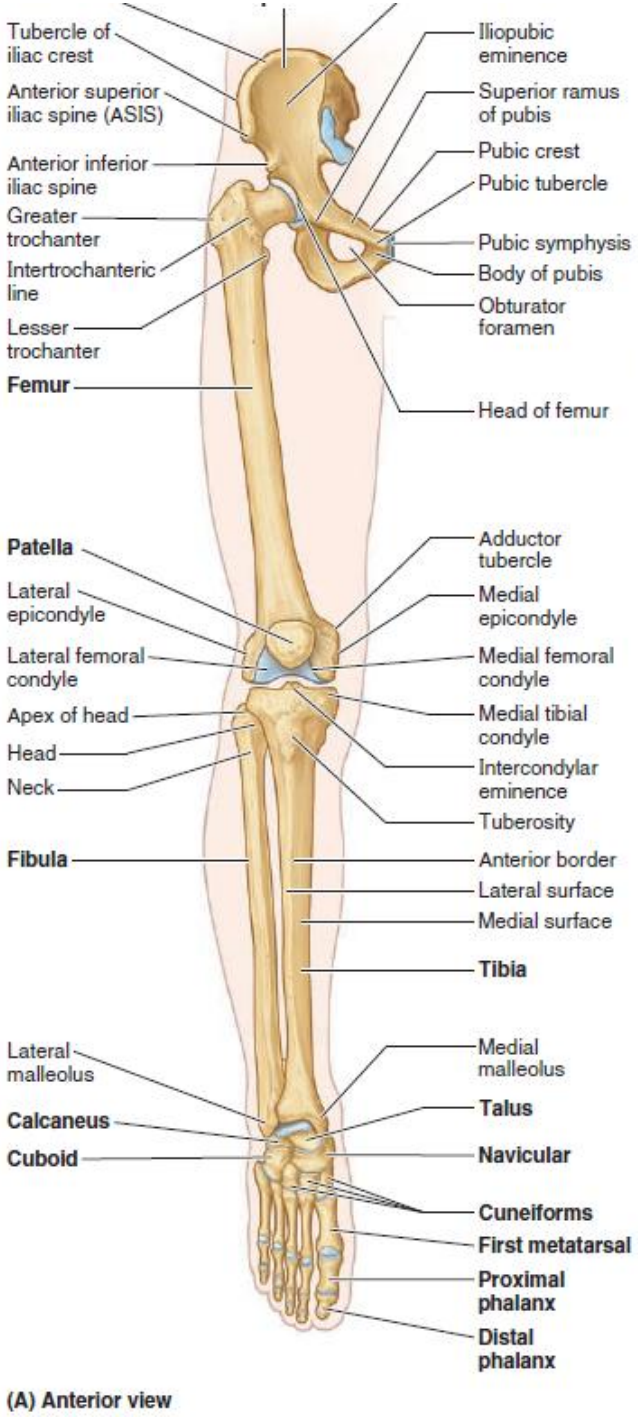
The torsion angle, combined with the angle of inclination, allows rotatory movements of the femoral head within the obliquely placed acetabulum to convert into flexion and extension, abduction and adduction, and rotational movements of the thigh.

The torsion angle

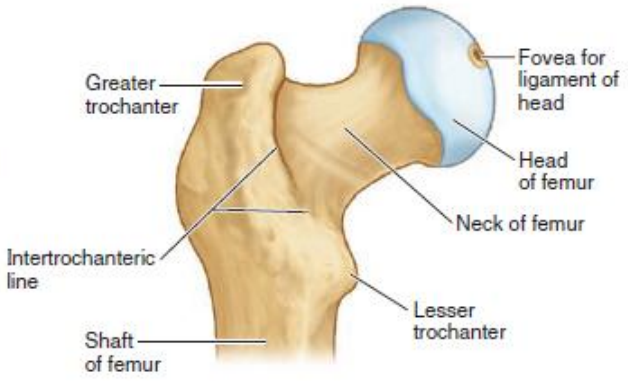


) Superior view demonstrating
torsion angle of femur

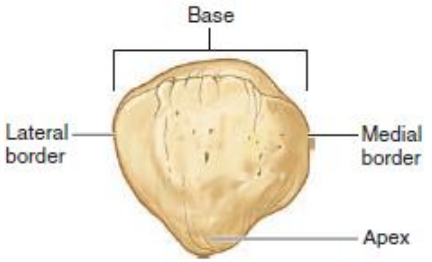
An overview of bones of the lower extremity



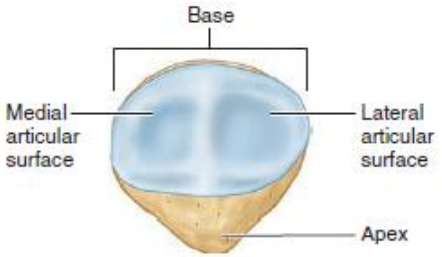
(A) Anterior view



(B) Anterior view of proximal femur

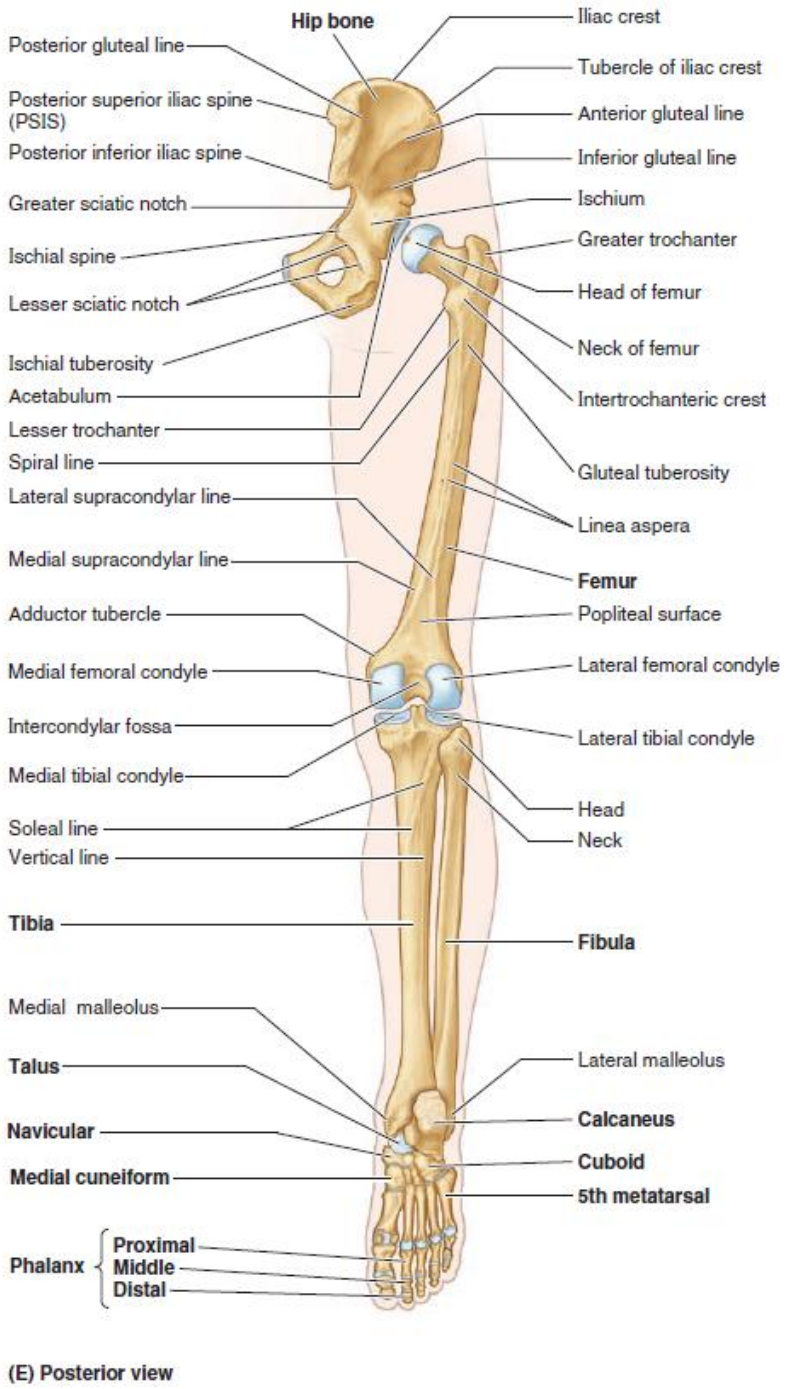


(C) Anterior view of patella



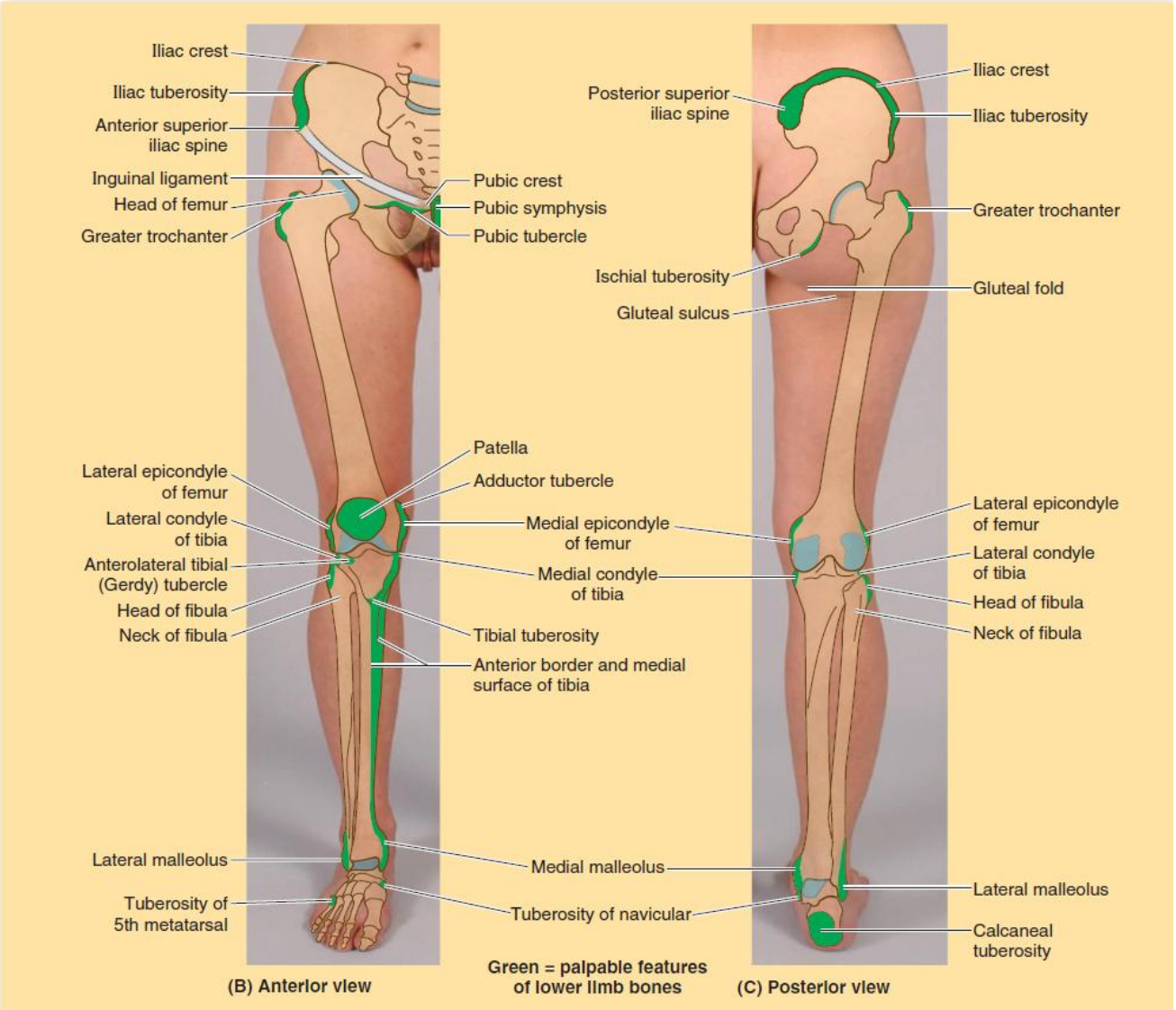
(D) Posterior view of patella

An overview of bones of the lower extremity



(E) Posterior view

The landmarks of the lower extremity



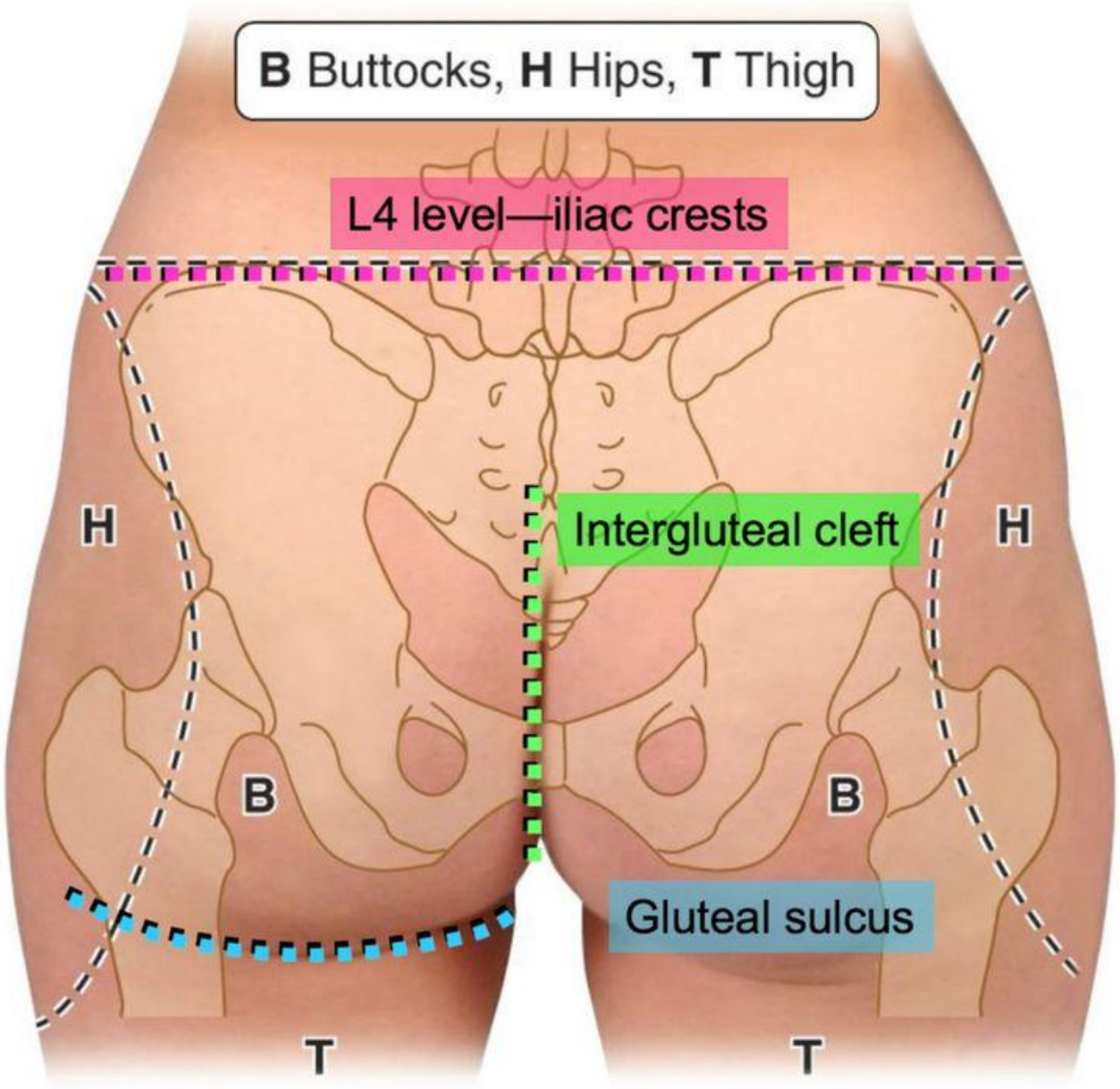
Regions of the lower limb

Therefore, the lower limbs comprise the following six regions:

- Buttock or gluteal region
- Thigh or femoral region
- Knee or knee region
- Leg or leg region
- Ankle or talocrural region
- Foot or foot region

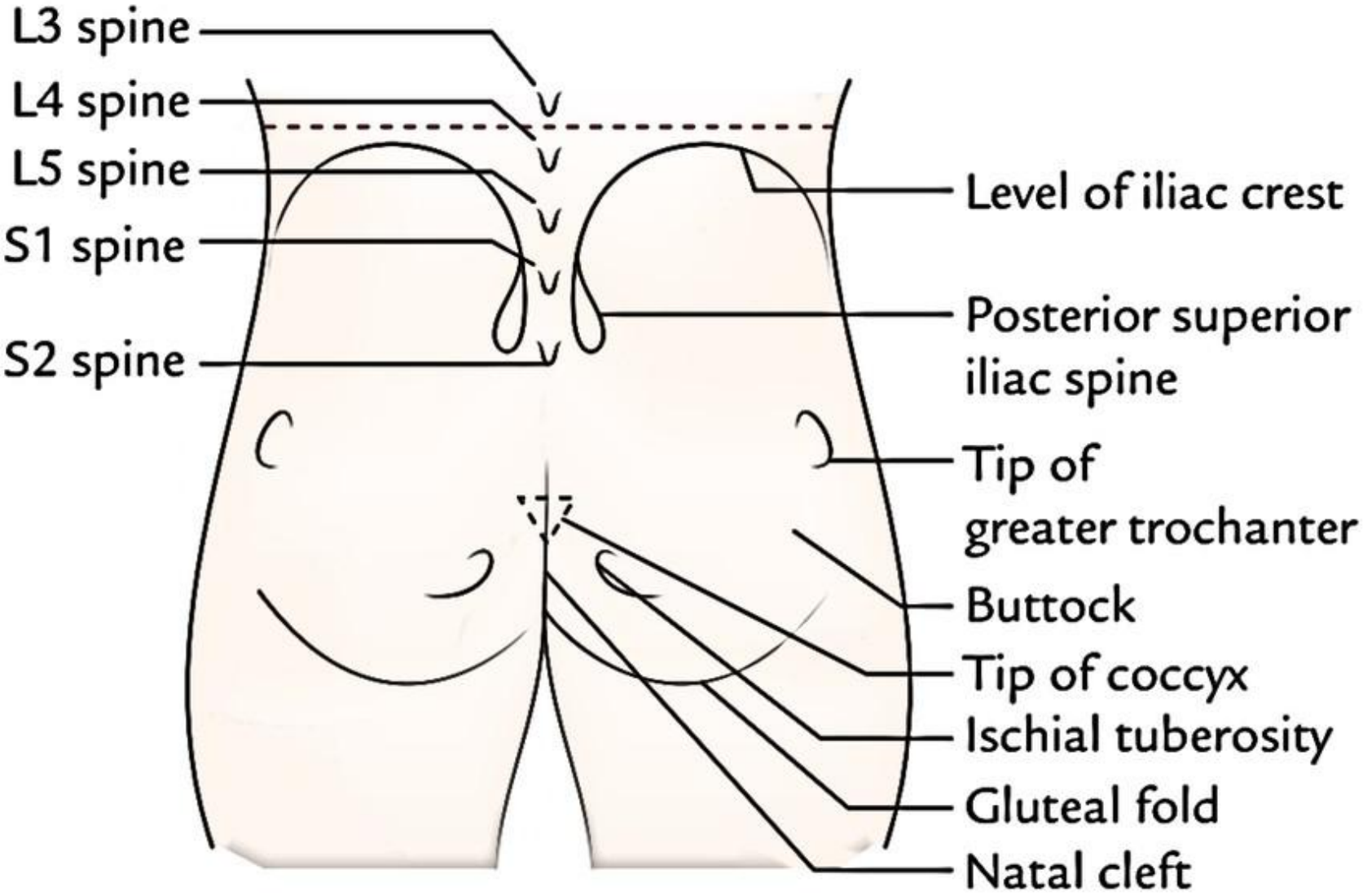
Gluteal region

Gluteal region



Gluteal region

Surface landmarks



Gluteal region

Surface landmarks

Buttock: It's a round bulge on the posterior aspect of the gluteal region.

Gluteal fold: It's a transverse skin crease, which creates the lower limit of the gluteal region. It's generated by a linear adherence of the skin to the deep fascia, obliquely across the inferior border of gluteus maximus.

Gluteal region

Surface landmarks

Natal cleft: It's a midline cleft between the 2 buttocks, which starts at the level of the third spine of the sacrum and deepens inferiorly with lower sacral spines and coccyx being located in its floor.

Coccyx: It is located just behind the anal orifice and can be recognized by its comparative freedom under pressure.

Gluteal region

Surface landmarks

Posterior superior iliac spine (PSIS): It is located in a skin dimple in the level of second sacral (S2) spine.

Ischial tuberosity: It's a rounded bony mass on which one sits. It is located below the PSIS in precisely the same vertical plane at a lower level in relation to the tip of coccyx. It can be felt by pressing your fingers upward into the medial part of the gluteal fold. It's 5 cm above the gluteal fold and about same distance from the midline.

Gluteal region

Surface landmarks

Tip of greater trochanter: It is located just in front of hollow on the side of hip, about 1 hand's width below the tubercle of iliac crest.

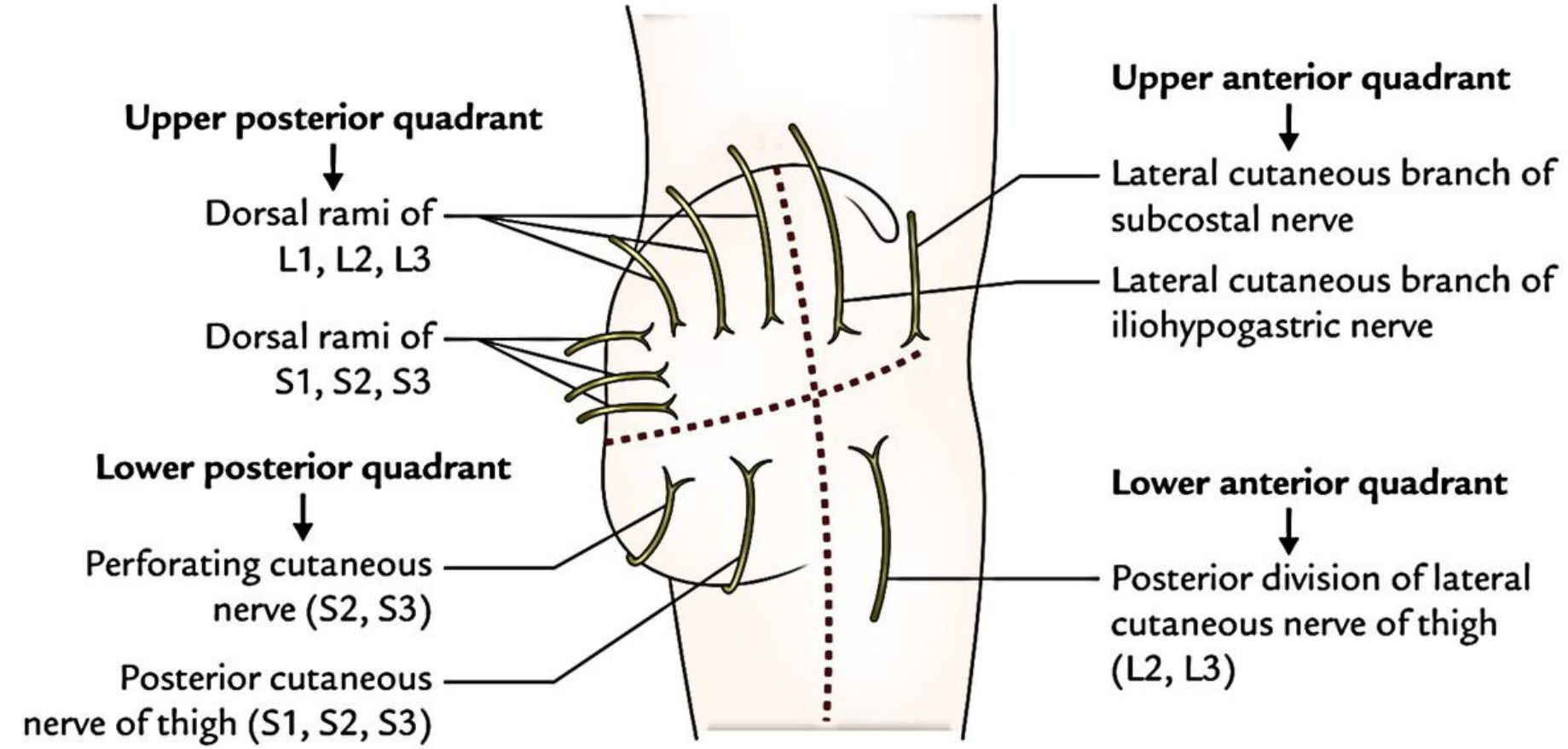
Iliac crest: It can be felt as a curved bony ridge in a groove at the lower limit/margin of the waistline. The maximum point of iliac crest corresponds to the interval between the spines of L3 and L4 vertebrae.

Gluteal region

The superficial fascia in the gluteal region is thick and includes considerable subcutaneous fat especially in adult females, that is responsible for a characteristic round contour of the buttock in them.

Gluteal region

Cutaneous nerves



Gluteal region

Cutaneous nerves

The cutaneous nerves of the gluteal region are originated from several sources, and converge in this region from all the directions. The cutaneous innervation of the gluteal region is split into 4 quadrants- upper anterior, upper posterior, lower anterior, and lower posterior.

Gluteal region

Cutaneous nerves

Upper anterior quadrant is supplied by the:

1. lateral cutaneous branch of subcostal nerve (T12), and

2. lateral cutaneous branch of iliohypogastric nerve (L1).

Upper posterior quadrant is supplied by the:

1. cutaneous branches from dorsal rami of upper 3 lumbar nerves (L1, L2, L3) and upper 3 sacral nerves (S1, S2, S3).

Gluteal region

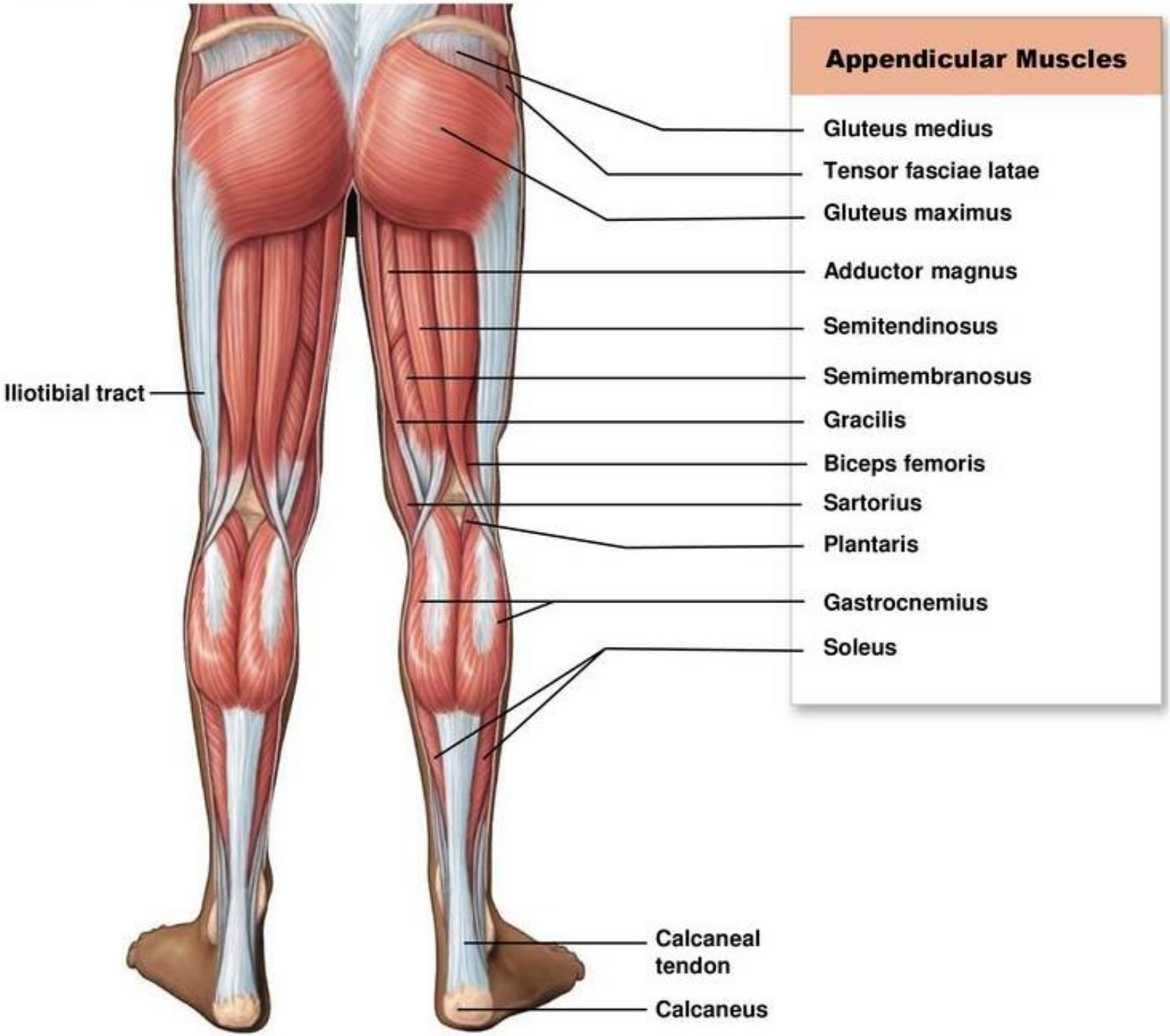
Cutaneous nerves

Lower anterior quadrant is supplied by the:

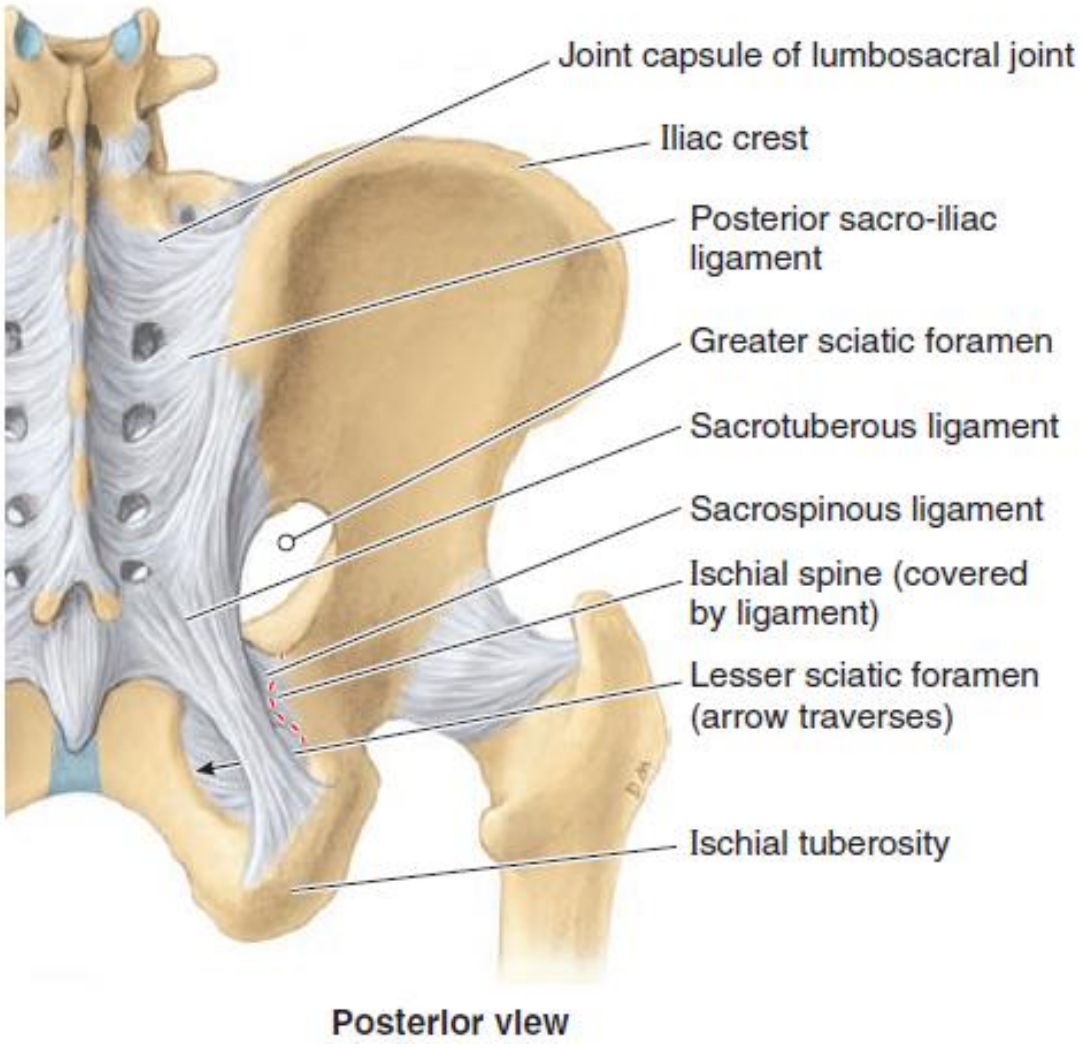
1. posterior section of lateral cutaneous nerves of the thigh (L2, L3).

Lower posterior quadrant is supplied by the:

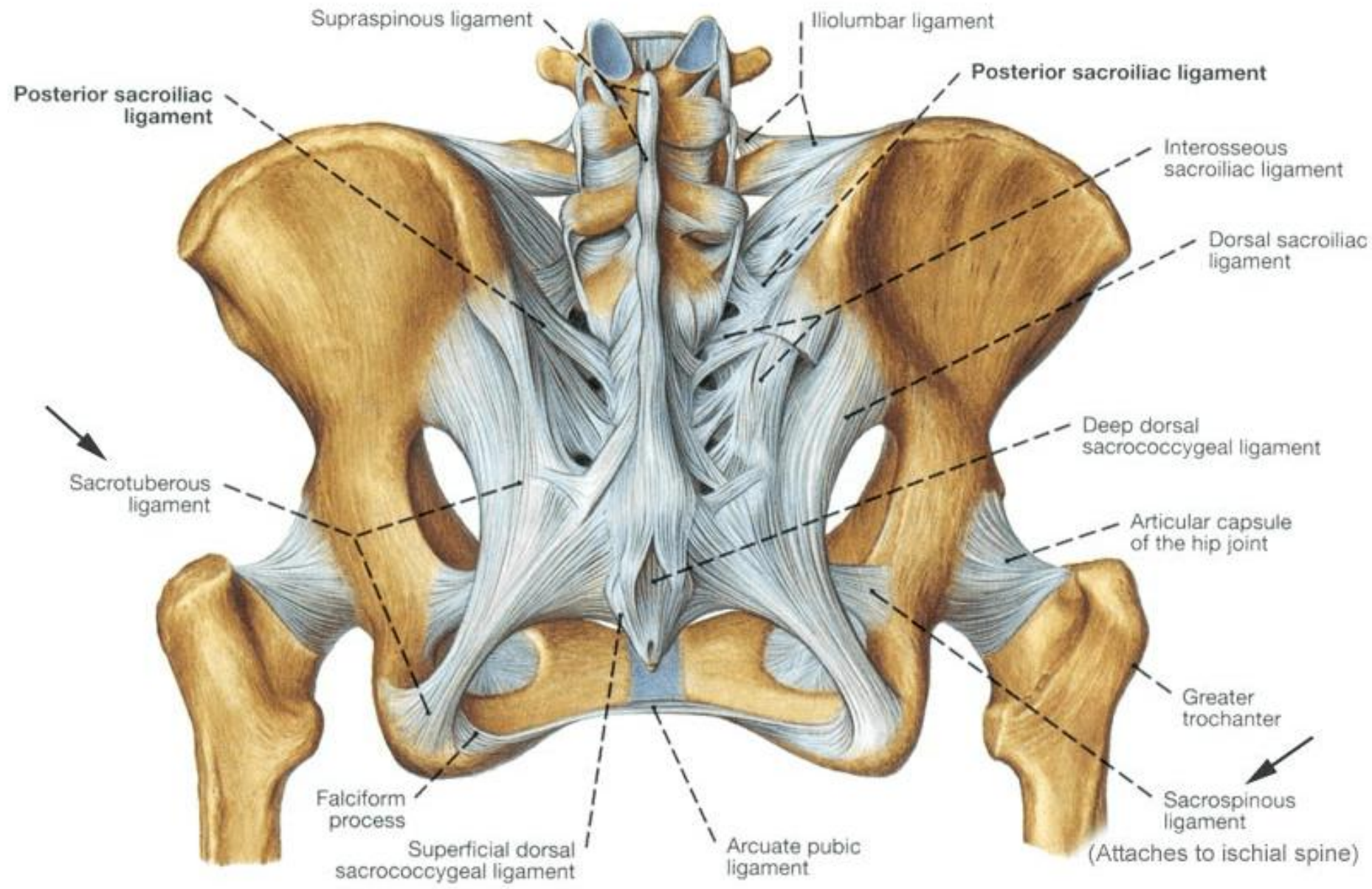
1. posterior cutaneous nerves of the thigh (S1, S2, S3), and
2. perforating cutaneous nerves (S2, S3).


Appendicular Muscles
Gluteus medius
Tensor fasciae latae
Gluteus maximus
Adductor magnus
Semitendinosus
Semimembranosus
Gracilis
Biceps femoris
Sartorius
Plantaris
Gastrocnemius
Soleus
Iliotibial tract
Calcaneal tendon
Calcaneus

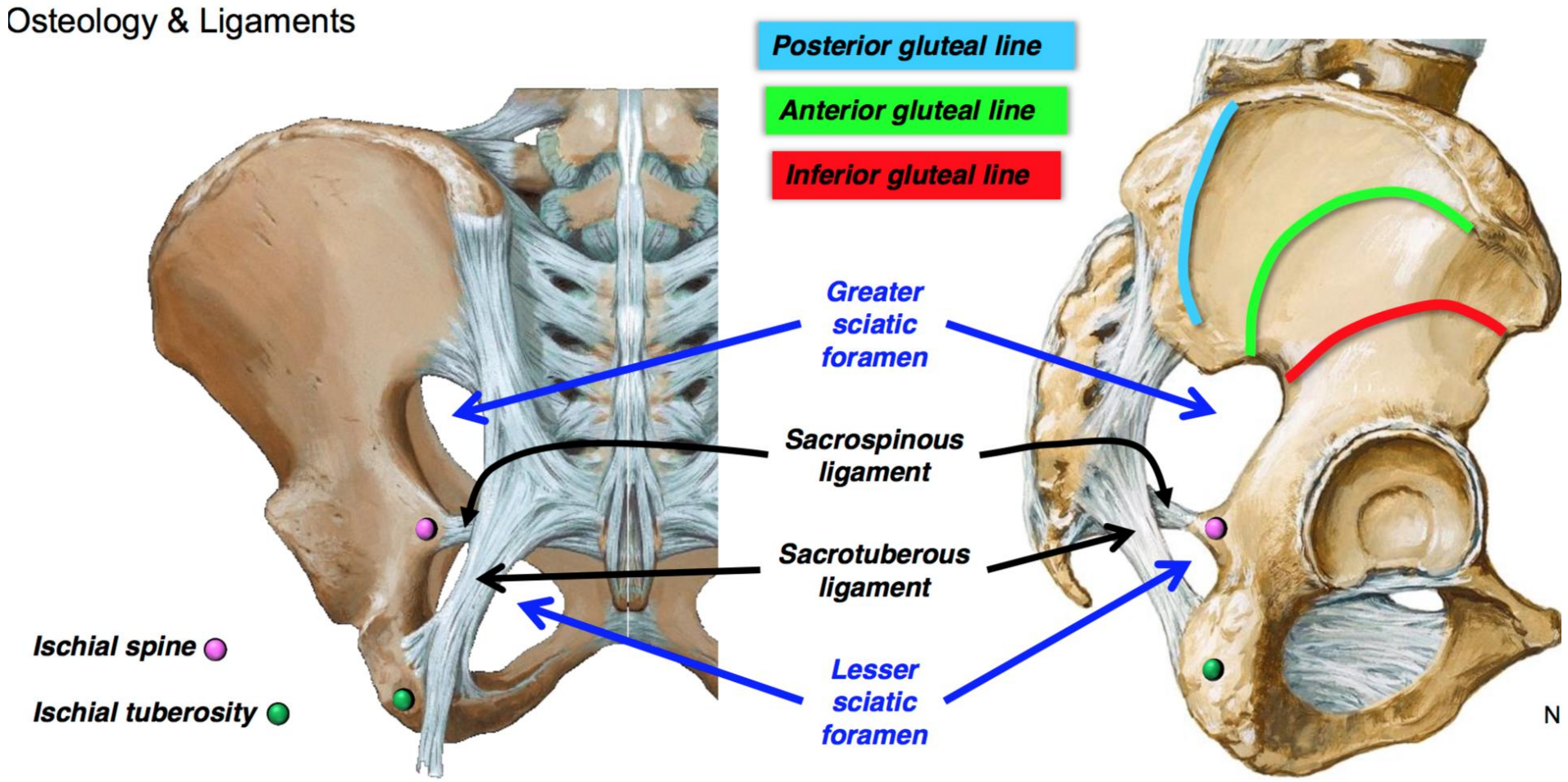
The parts of the bony pelvis—hip bones, sacrum, and coccyx—are bound together by *gluteal ligaments*. The **sacrotuberous** and **sacrospinous ligaments** convert the sciatic notches in the hip bones into the greater and lesser sciatic foramina



Gluteal ligaments



Gluteal ligaments



Gluteal region

The parts of the bony pelvis—hip bones, sacrum, and coccyx—are bound together by *gluteal ligaments*. The **sacrotuberous** and **sacrospinous ligaments** convert the sciatic notches in the hip bones into the greater and lesser sciatic foramina. The **greater sciatic foramen** is the passageway for structures entering or leaving the pelvis, whereas the **lesser sciatic foramen** is a passageway for structures entering or leaving the perineum.

Gluteal region

It is helpful to think of the greater sciatic foramen as the “door” through which arteries and nerves leave the pelvis and enter the gluteal region, with veins coursing in the opposite direction.

Gluteal region

The gluteal region lies behind the pelvis, and extends from the iliac crest to the gluteal fold (fold of the buttock), which is the posterior horizontal crease line of the hip joint. Various muscles, nerves, and vessels emerge from the pelvis to enter the lower limb in this region.

Gluteal region

The muscles of the region are the:

- three gluteal muscles – gluteus maximus, gluteus medius and gluteus minimus, which is the smallest of all three
- the deeply situated piriformis muscle, obturator internus muscle, superior gemellus, inferior gemellus, quadratus femoris muscle

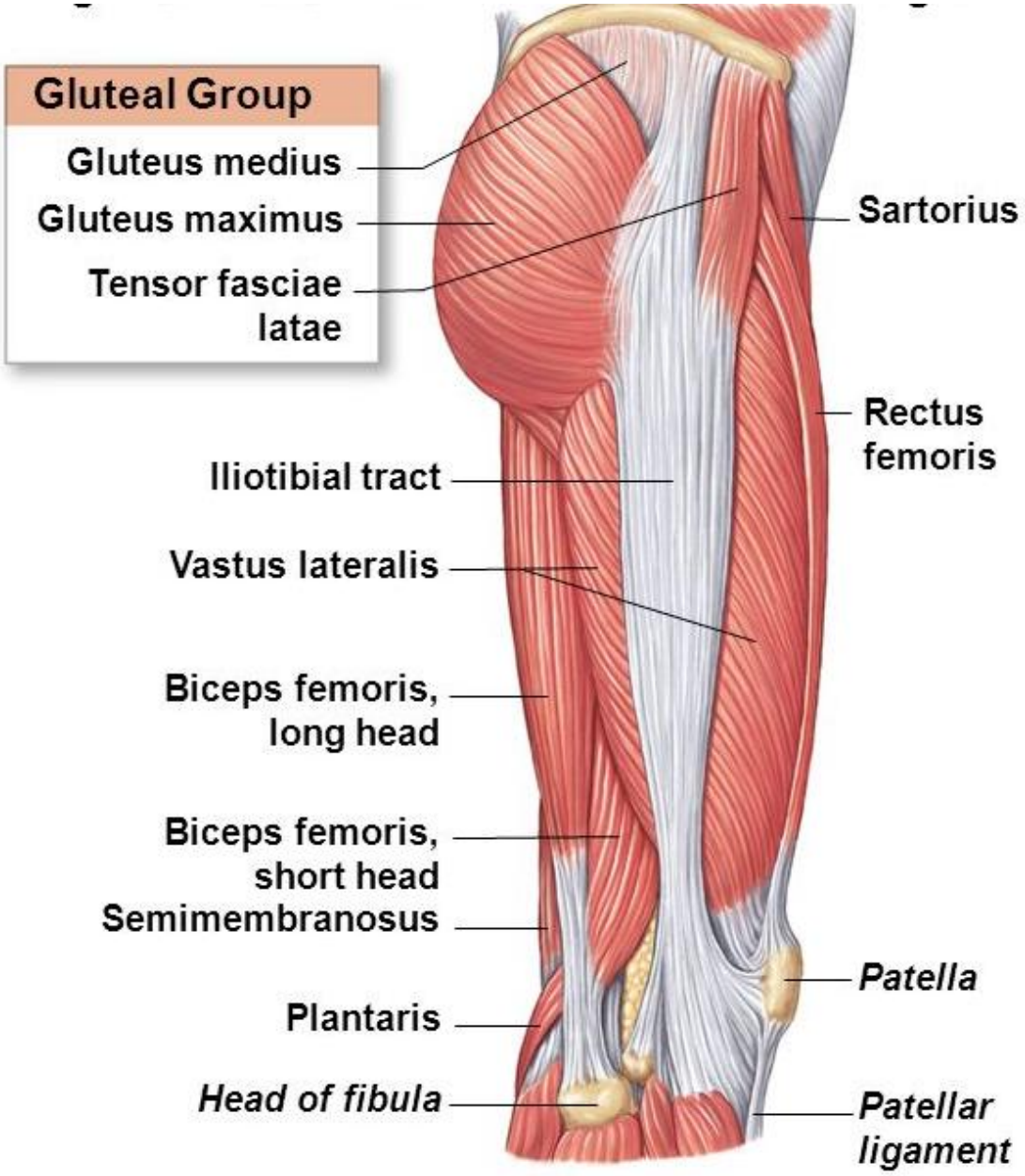
Gluteal region

- The bony and ligamentous features of the region include the back of the sacrum and hip bone, the upper end of the femur, and the sacrotuberous and sacrospinous ligaments. Thus, the gluteal muscles constitute the bulk of this region.
- Because of the location of the gluteal region, it is considered a transitional region between the trunk and the free lower limbs.

Gluteal region

The main actions of the gluteus maximus are extension and lateral rotation of the hip joint. It functions primarily between the flexed and the standing positions, as when rising from the sitting position, straightening from the bending position, walking uphill and upstairs, and running. The gluteus medius and minimus are abductors and medial rotators of the thigh.

Gluteal region



The tensor fasciae latae is an abductor and medial rotator of the hip joint; however, it generally does not act independently.

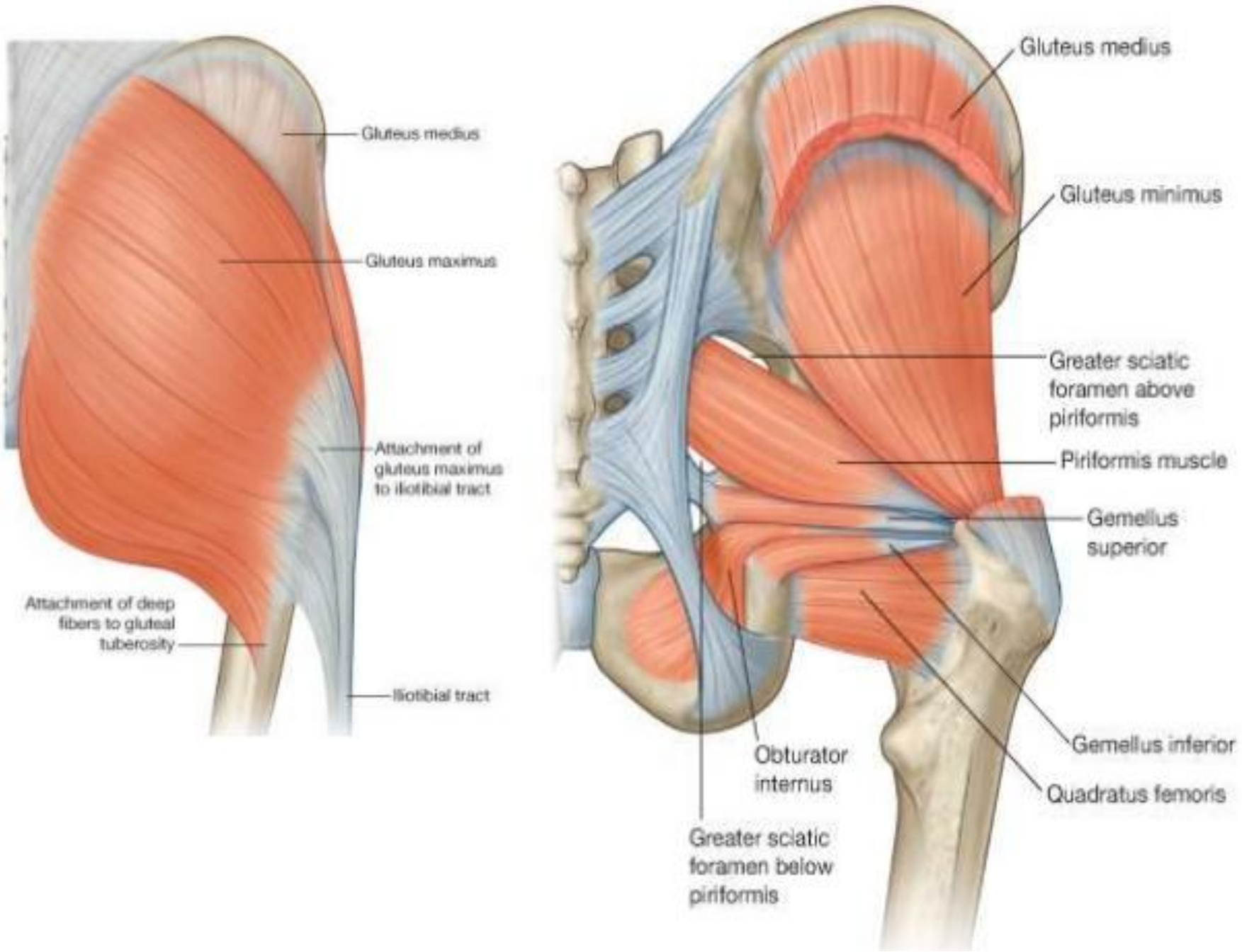
To produce flexion, it acts in concert with the iliopsoas and rectus femoris.

Gluteal region

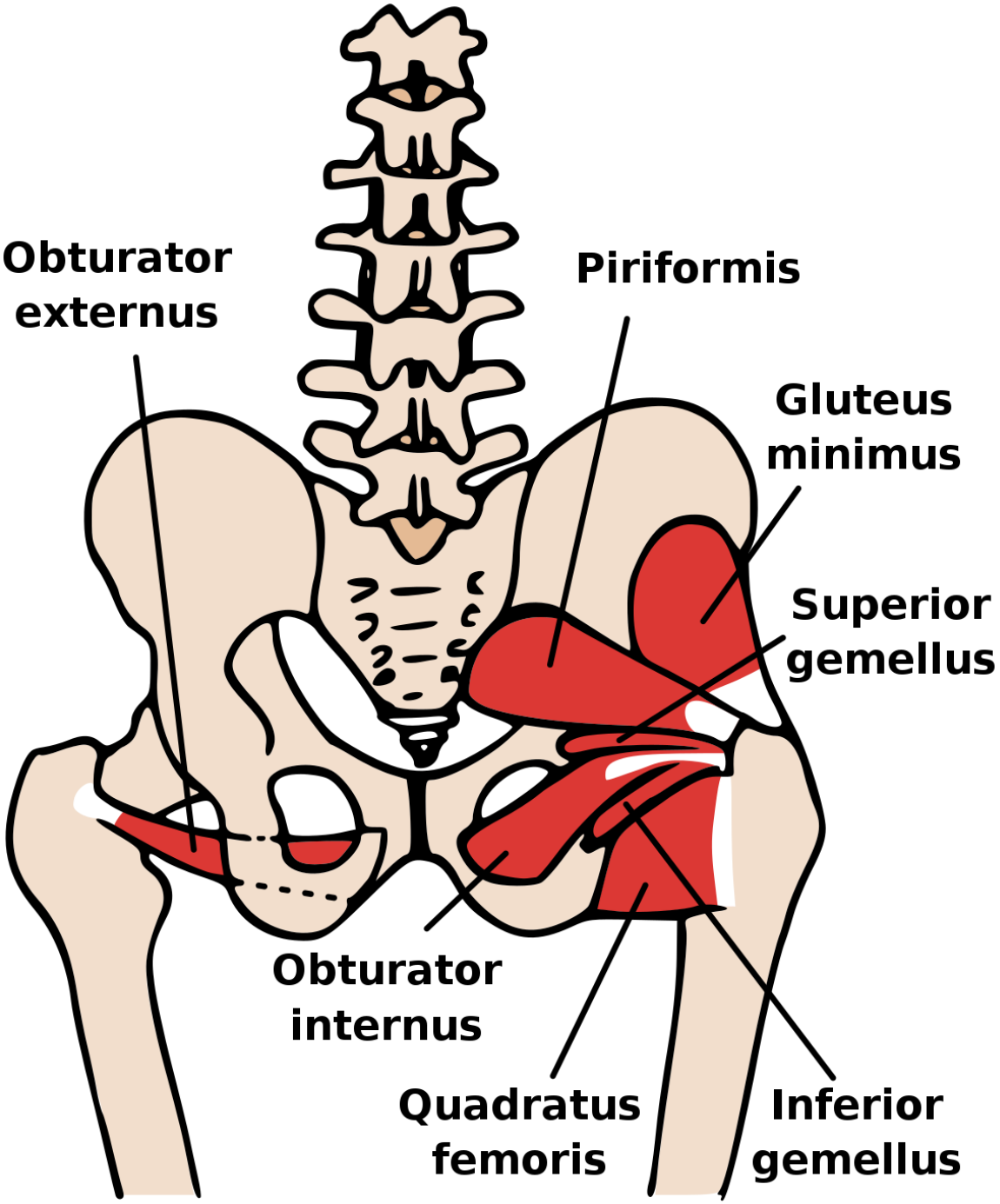
The piriformis, obturator internus, superior and inferior gemelli, and quadratus femoris muscles, covered by the inferior half of he gluteus maximus, are lateral rotators of the thigh, but they also stabilize the hip joint, working with the strong ligaments of the hip joint to steady the femoral head in the acetabulum.

Gluteal region

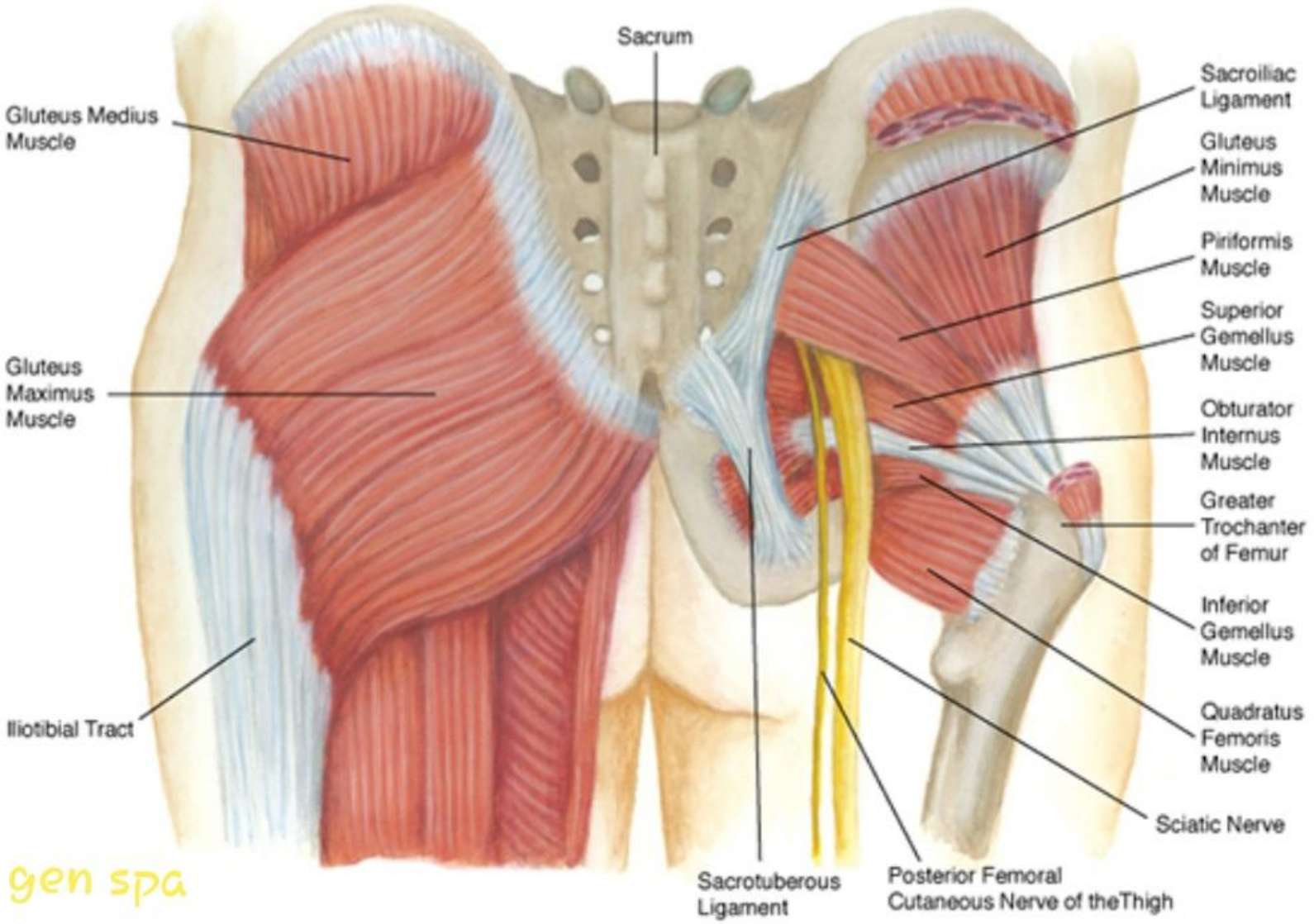
In evolution, the development of a prominent gluteal region is closely associated with the assumption of bipedalism and an erect posture. Modification of the shape of the femur necessary for bipedal walking allows the superior placement of the abductors of the thigh into the gluteal region.


Gluteus medius
Gluteus maximus
Attachment of gluteus maximus to iliotibial tract
Attachment of deep fibers to gluteal tuberosity
Iliotibial tract
Gluteus medius
Gluteus minimus
Greater sciatic foramen above piriformis
Piriformis muscle
Gemellus superior
Gemellus inferior
Quadratus femoris
Obturator internus
Greater sciatic foramen below piriformis

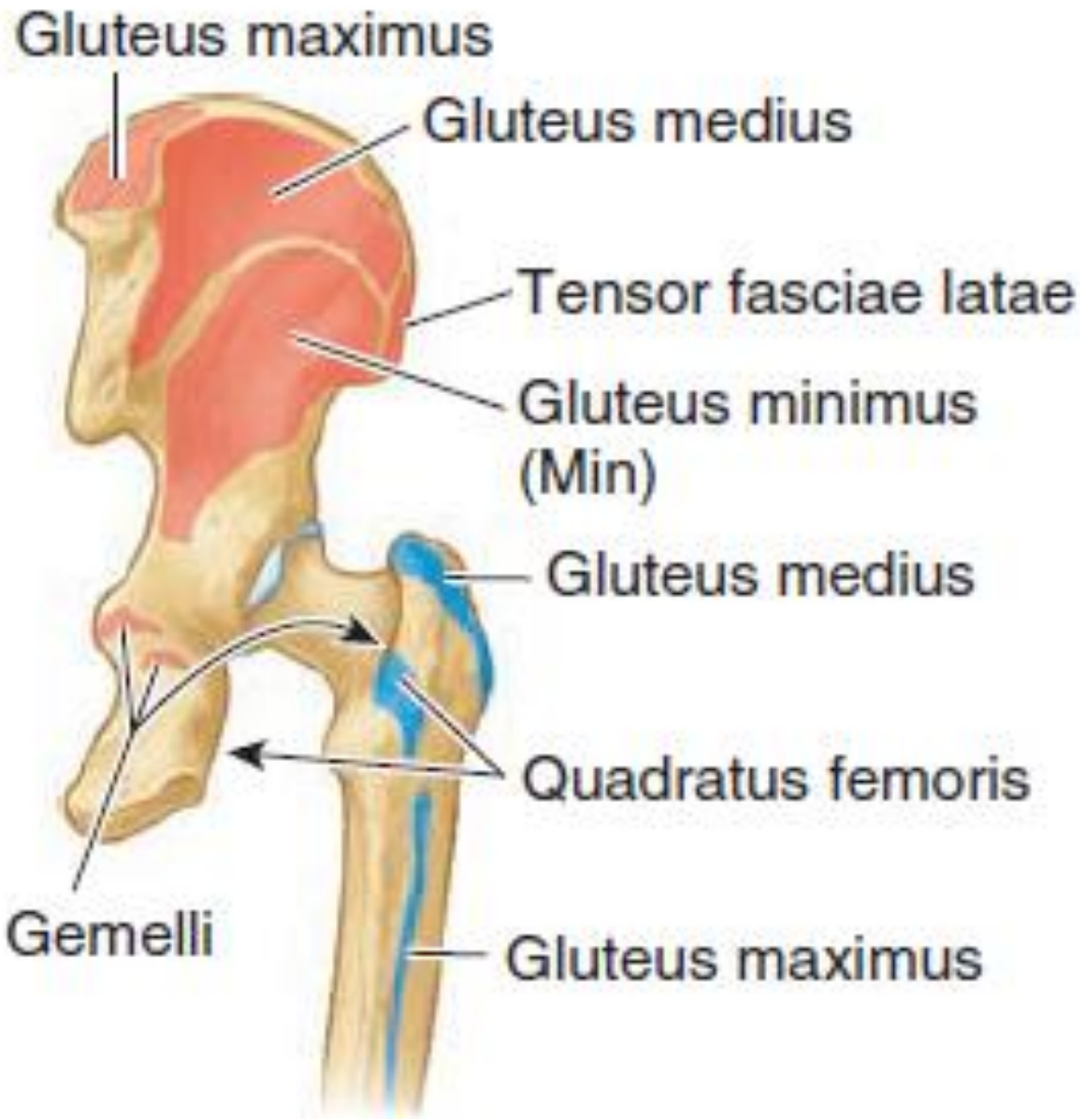
Gluteal muscles.
Second (part)
and third layers.
Posterior view

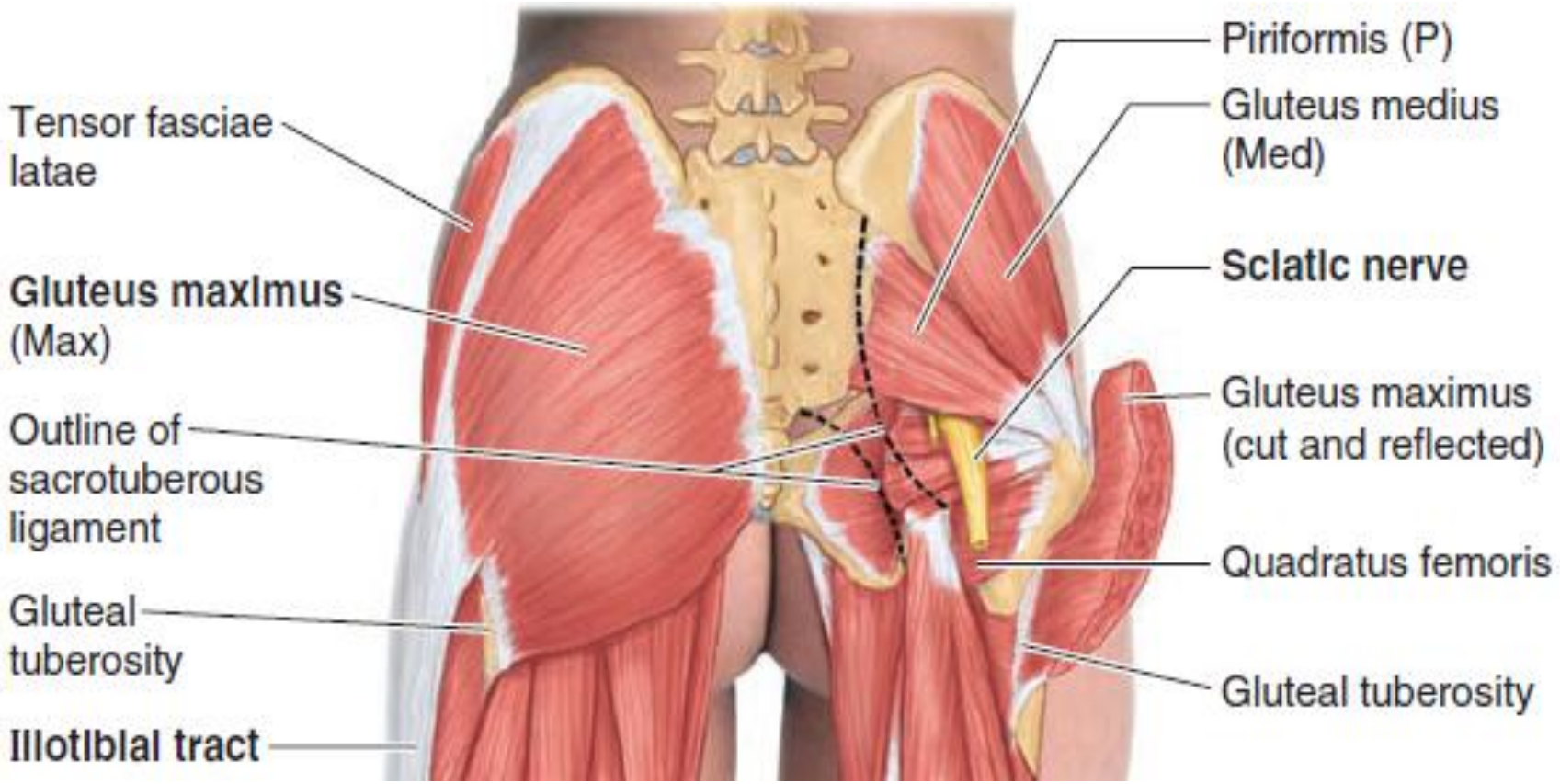


Superficial and Deep Dissection of the Gluteal Region

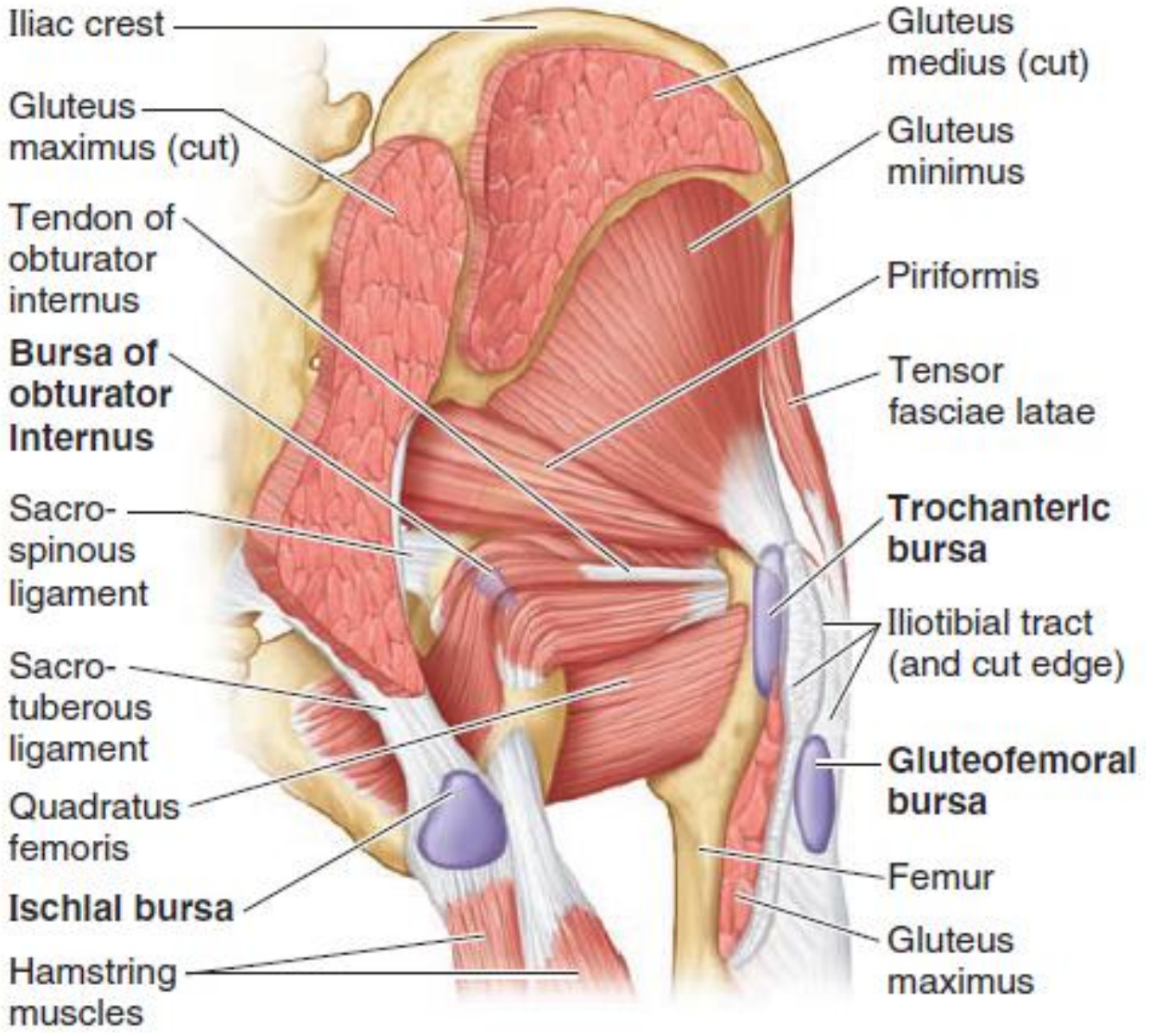


Gluteal muscles. Muscle attachments




Tensor fasciae latae
Gluteus maximus (Max)
Outline of sacrotuberous ligament
Gluteal tuberosity
Iliotibial tract
Piriformis (P)
Gluteus medius (Med)
Sciatic nerve
Gluteus maximus (cut and reflected)
Quadratus femoris
Gluteal tuberosity

Gluteal bursae, flattened membranous sacs containing a capillary layer of synovial fluid, separate the gluteus maximus from adjacent structures



Gluteal bursae

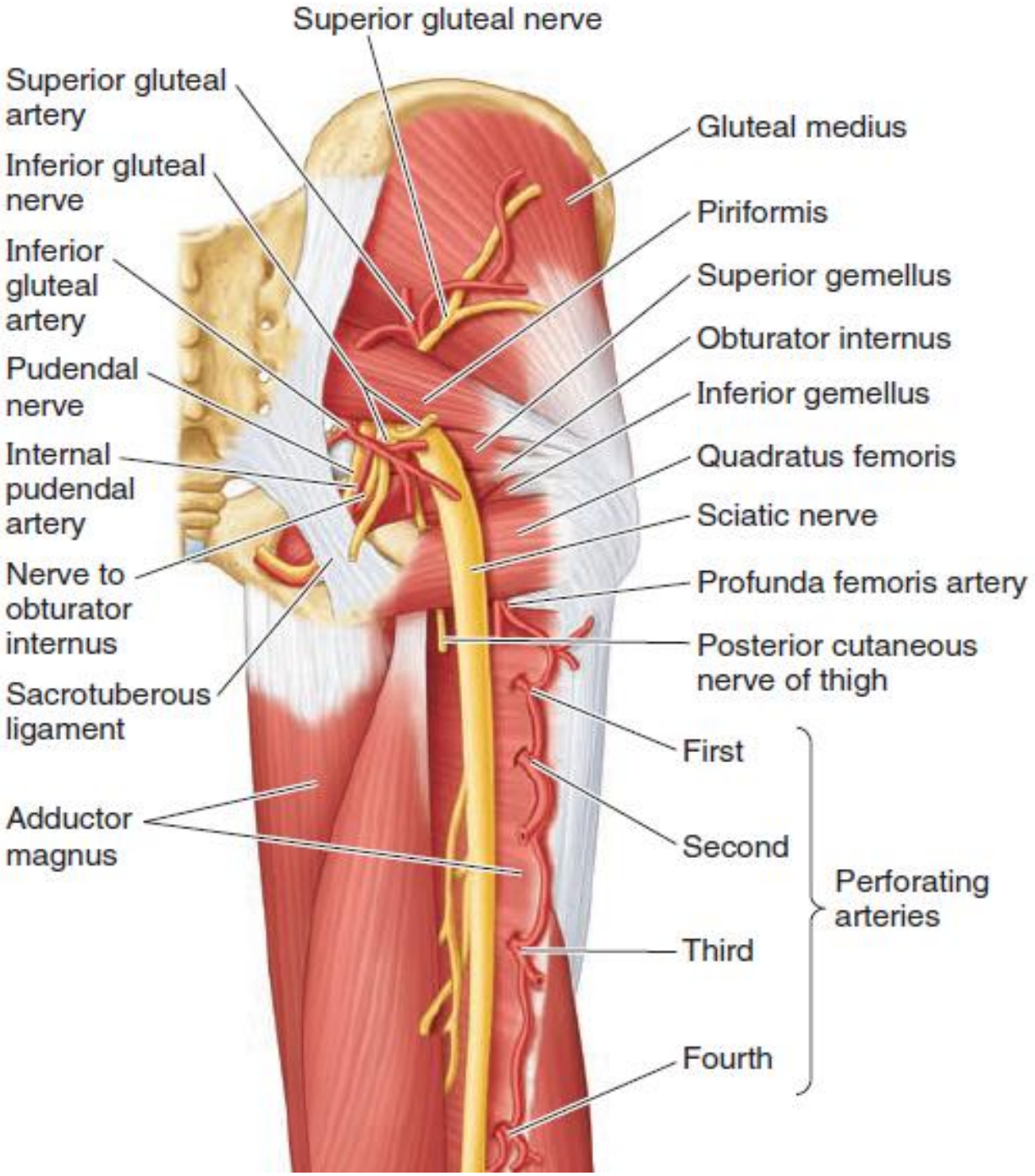
The bursae are located in areas subject to friction—for example, between a muscle and a bony prominence—to reduce friction and permit free movement.

Gluteal bursae

The bursae associated with the gluteus maximus are as follows:

- The **trochanteric bursa** separates the deep aspect of the gluteus maximus from the greater trochanter of the femur.
- The **ischial bursa** separates the inferior border of the gluteus maximus from the ischial tuberosity.
- The **gluteofemoral bursa** separates the iliotibial tract from the superior part of the proximal attachment of the vastus lateralis.

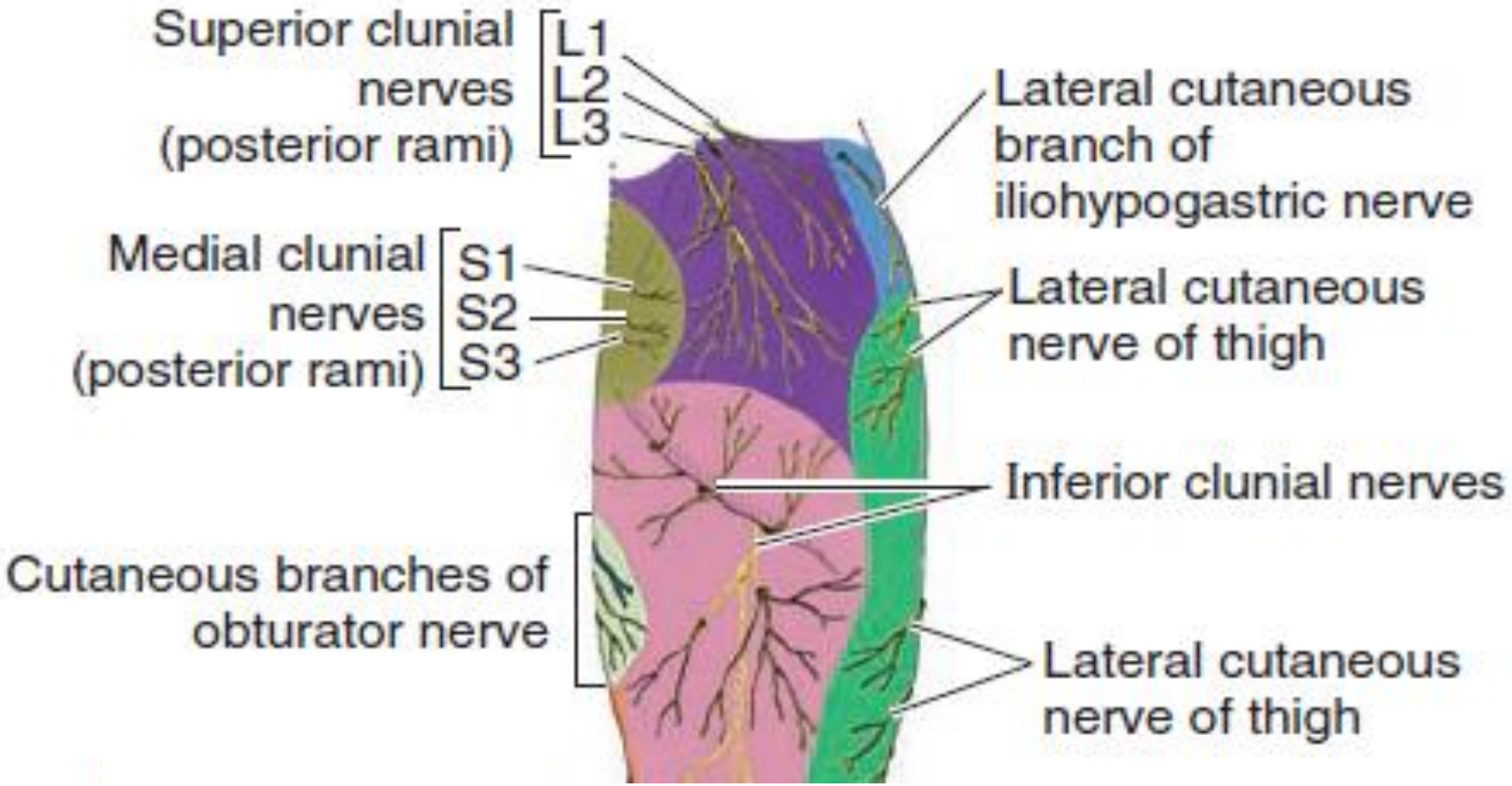
Course of arteries and nerves in gluteal region and posterior thigh



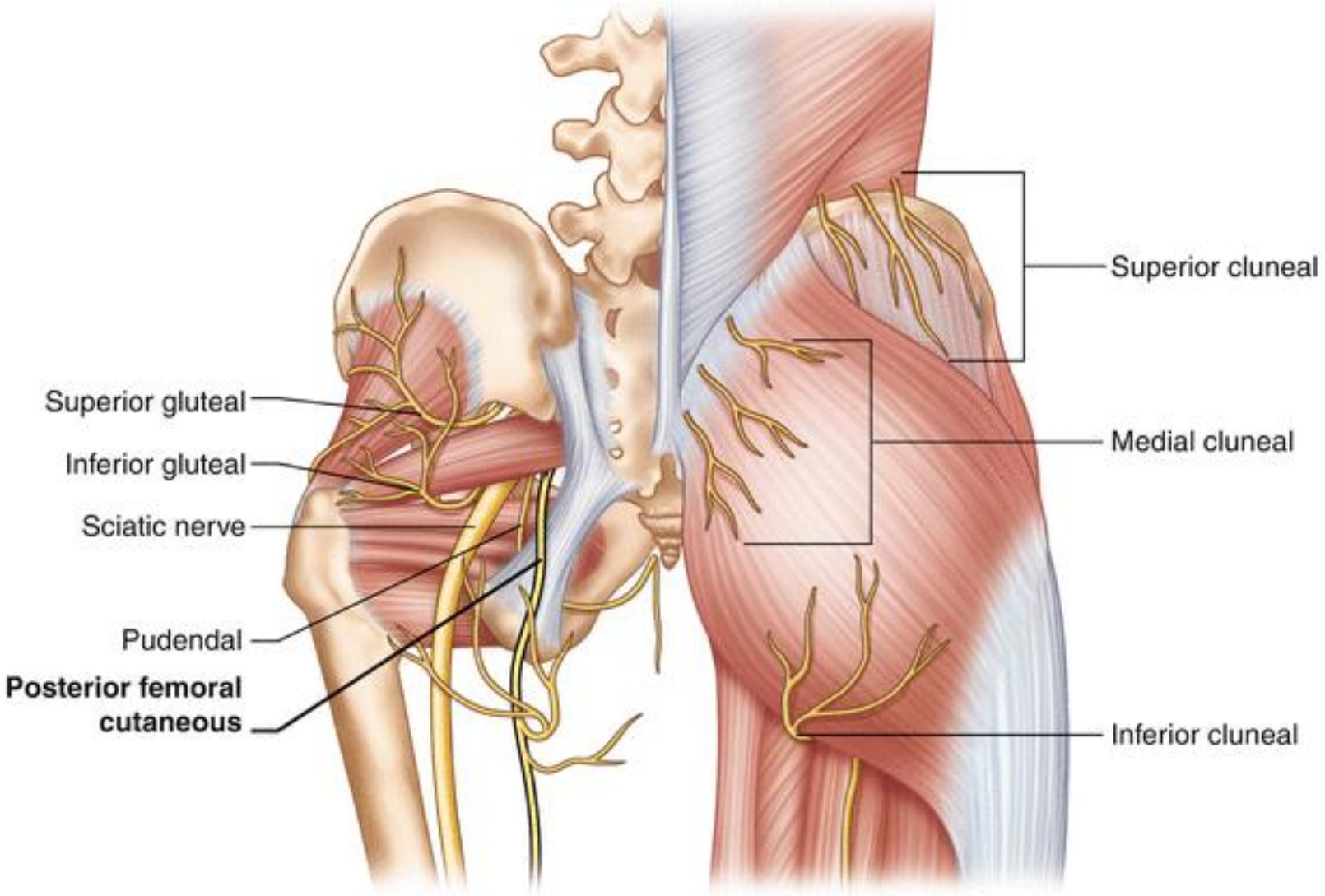
Arteries and nerves in gluteal region

Several nerves arise from the sacral plexus and either supply the gluteal region (e.g., superior and inferior gluteal nerves) or pass through it to supply the perineum (e.g., pudendal nerve) and thigh (e.g., sciatic nerve). The skin of the gluteal region is richly innervated by the superficial gluteal nerves: the superior, middle, and inferior clunial nerves

Nerves in gluteal region (superficial innervation)



Nerves in gluteal region (superficial innervation)



Arteries and nerves in gluteal region

The deep gluteal nerves are the **sciatic**, **posterior cutaneous nerve of the thigh**, **superior gluteal** and **inferior gluteal nerves**, **nerve to the quadratus femoris**, **pudendal nerve**, and **nerve to the obturator internus.**

Arteries and nerves in gluteal region

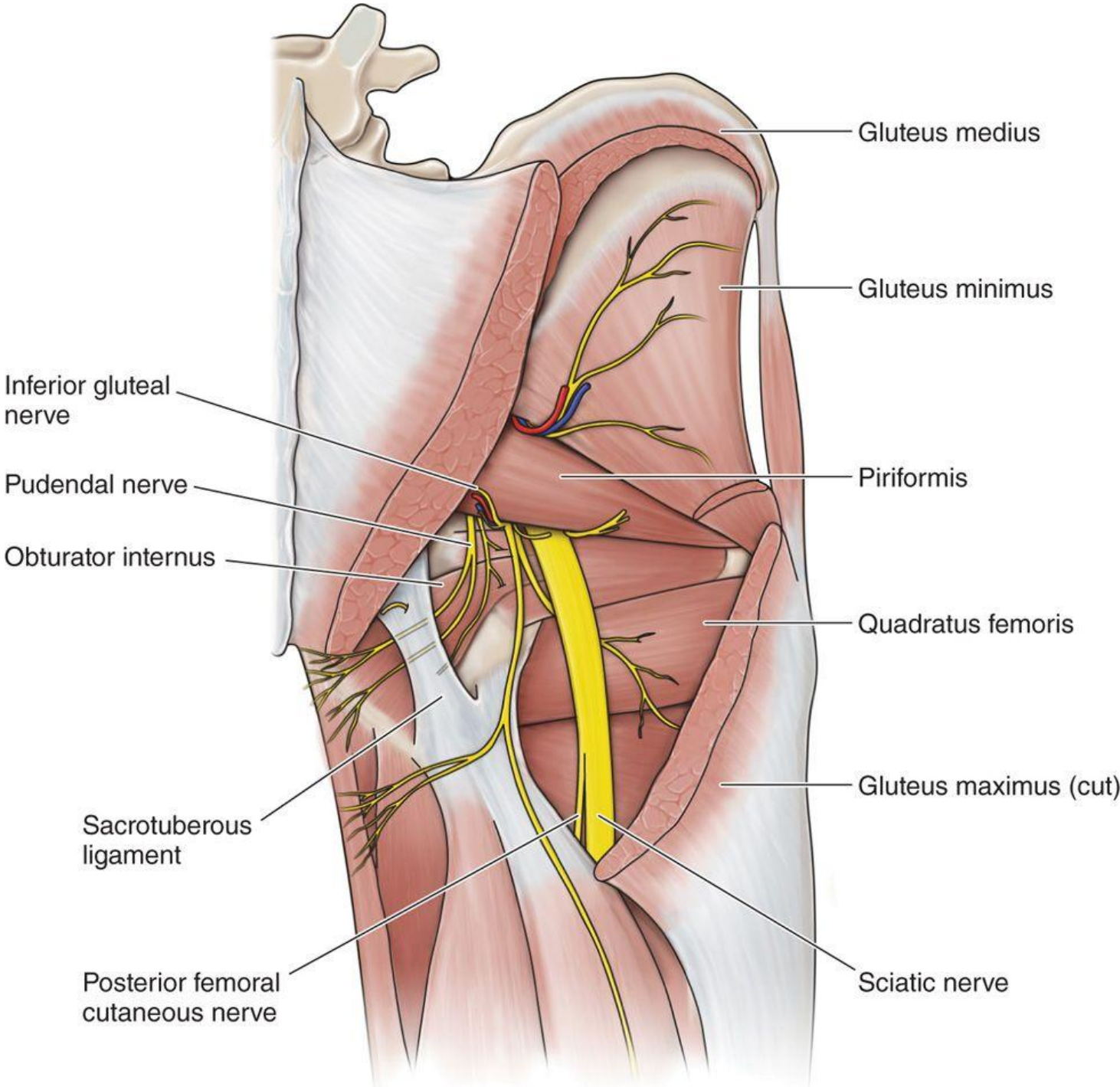
All of these nerves are branches of the sacral plexus and leave the pelvis through the greater sciatic foramen. Except for the superior gluteal nerve, they all emerge inferior to the piriformis muscle (infrapiriform foramen). The pudendal nerve supplies no structures in the gluteal region; it exits the region via the lesser sciatic foramen to supply structures in the perineum

Arteries and nerves in gluteal region

The sciatic nerve is the largest nerve in the body and is the continuation of the main part of the sacral plexus.

The sciatic nerve runs inferolaterally under cover of the gluteus maximus, midway between the greater trochanter and the ischial tuberosity

Arteries and nerves in gluteal region



Suprapiriform hiatus :

superior gluteal a., v., n.

Infrapiriform hiatus:

inferior gluteal a., v., n.

sciatic n. (committing a.)

posterior femoral cut. n.

internal pudendal a., v.

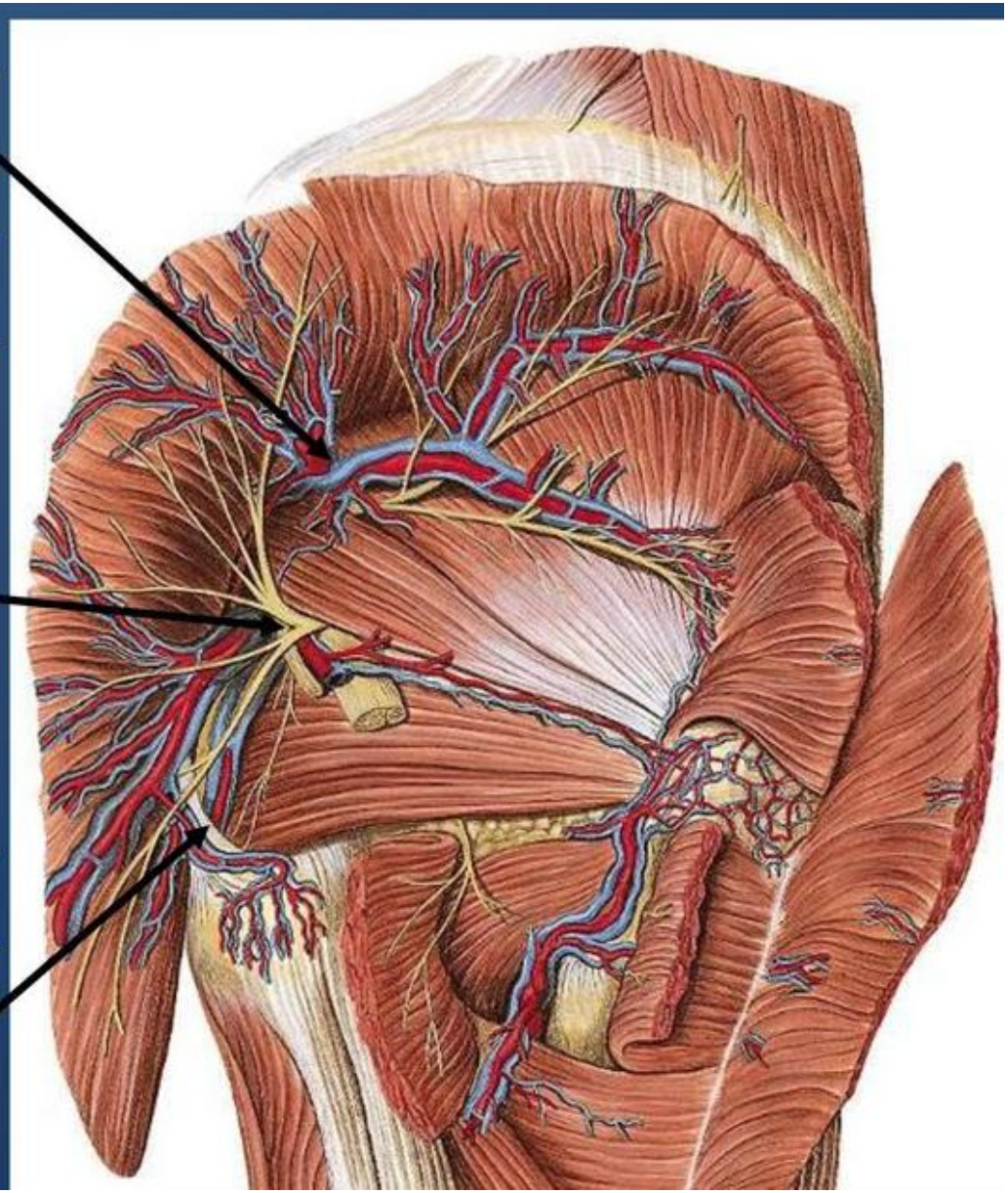
pudendal n.

Lesser sciatic foramen :

internal pudendal a., v.

pudendal n.

They enter the ischiorectal fossa!



Arteries and nerves in gluteal region

A pain in the buttock may result from compression of the sciatic nerve by the piriformis muscle **(piriformis syndrome)**. *Incomplete section of the sciatic nerve* (e.g., from a stab wound) may also involve the inferior gluteal and/or the posterior femoral cutaneous nerves. Recovery from a sciatic lesion is slow and usually incomplete.

Arteries and nerves in gluteal region

With respect to the sciatic nerve, the buttock has a side of safety (its lateral side) and a side of danger (its medial side). Wounds or surgery on the medial side may injure the sciatic nerve and its branches to the hamstrings. Paralysis of these muscles results in impairment of thigh extension and leg flexion.

Arteries and nerves in gluteal region

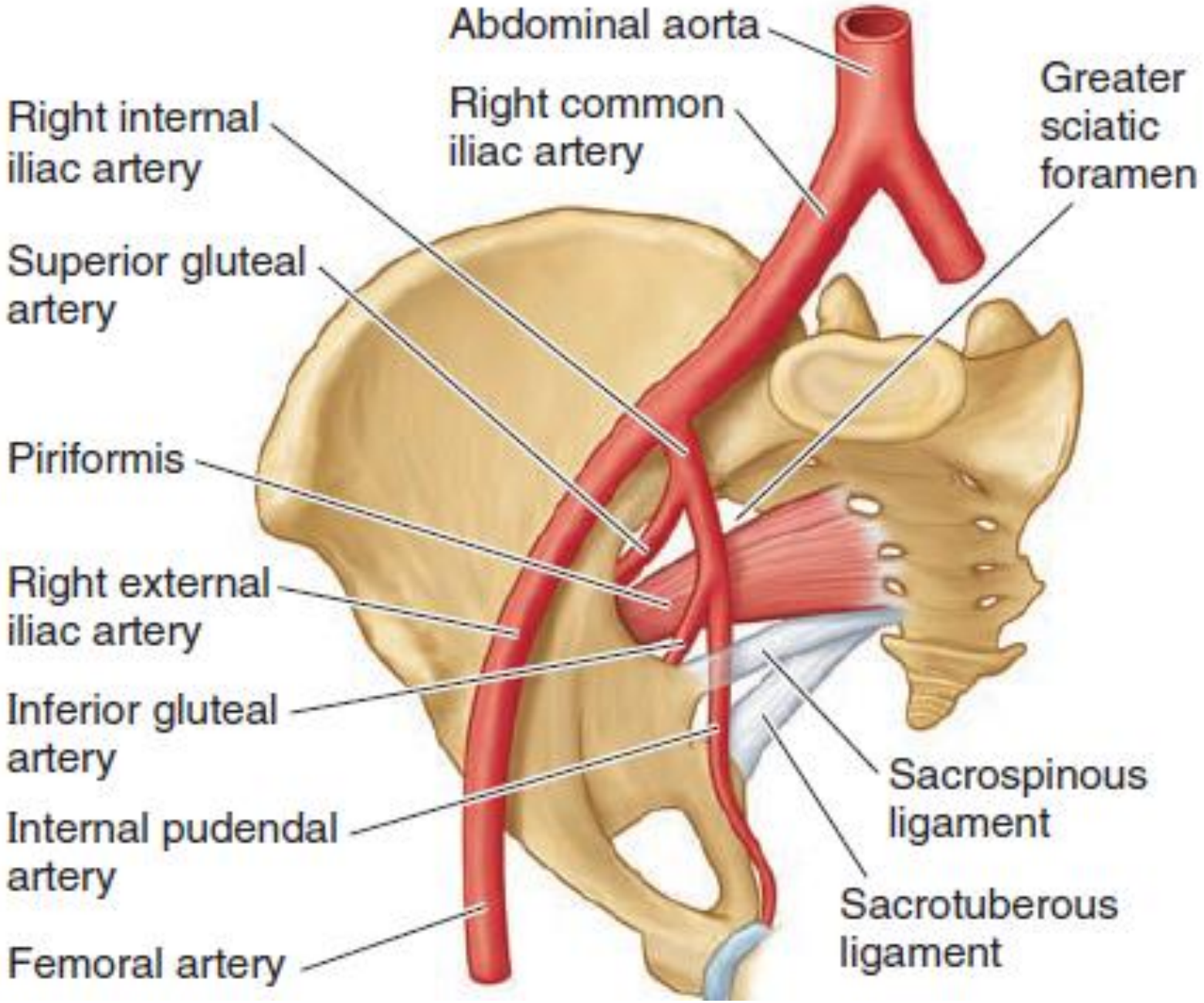
The arteries of the gluteal region arise, directly or indirectly, from the internal iliac arteries, but the patterns of origin are variable. The major gluteal branches of the internal iliac artery are the superior and inferior gluteal arteries and the internal pudendal artery.

Arteries and nerves in gluteal region

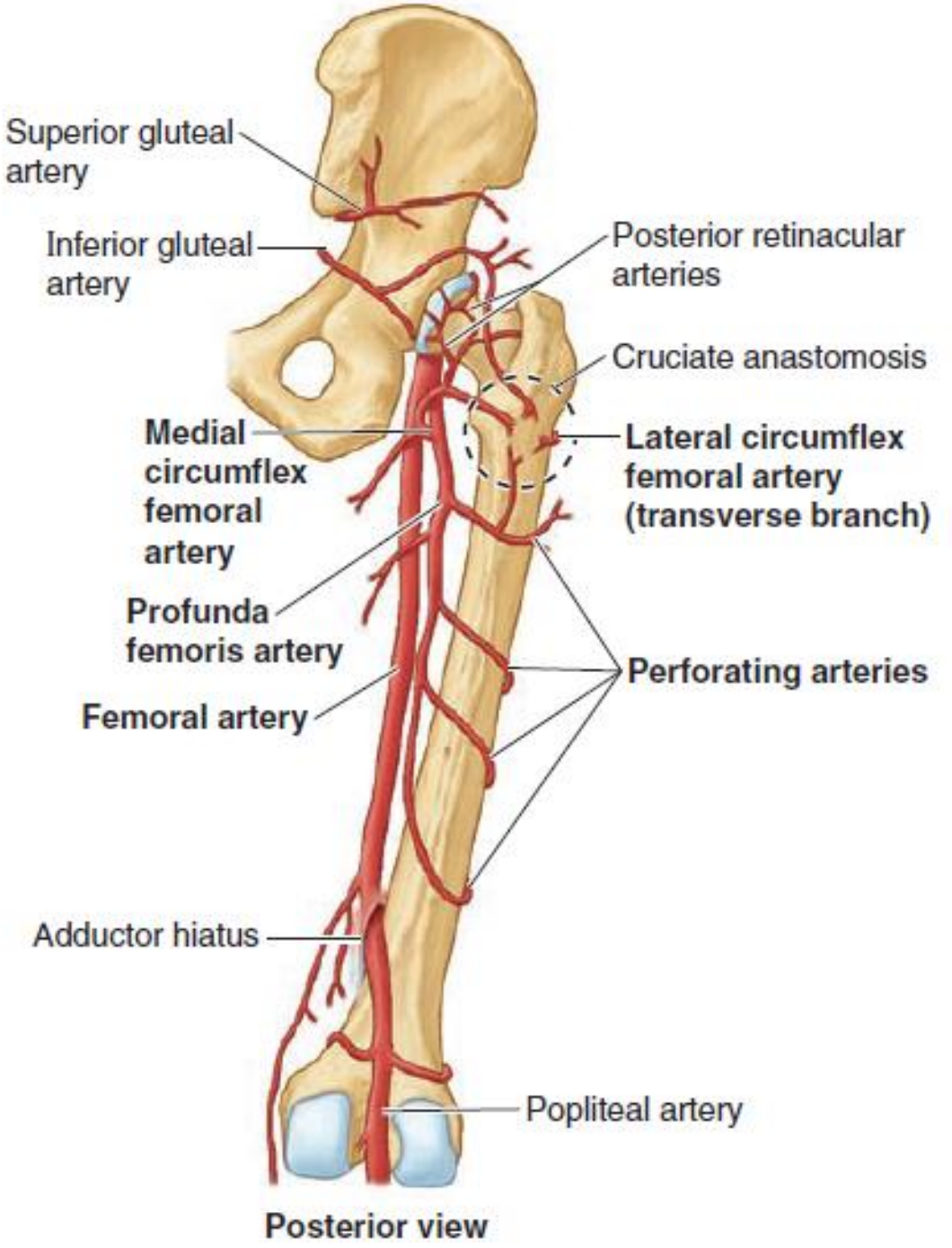
The superior and inferior gluteal arteries leave the pelvis through the greater sciatic foramen and pass superior and inferior to the piriformis, respectively. The internal pudendal artery enters the gluteal region through the greater sciatic foramen inferior to the piriformis and enters the perineum through the lesser sciatic foramen.

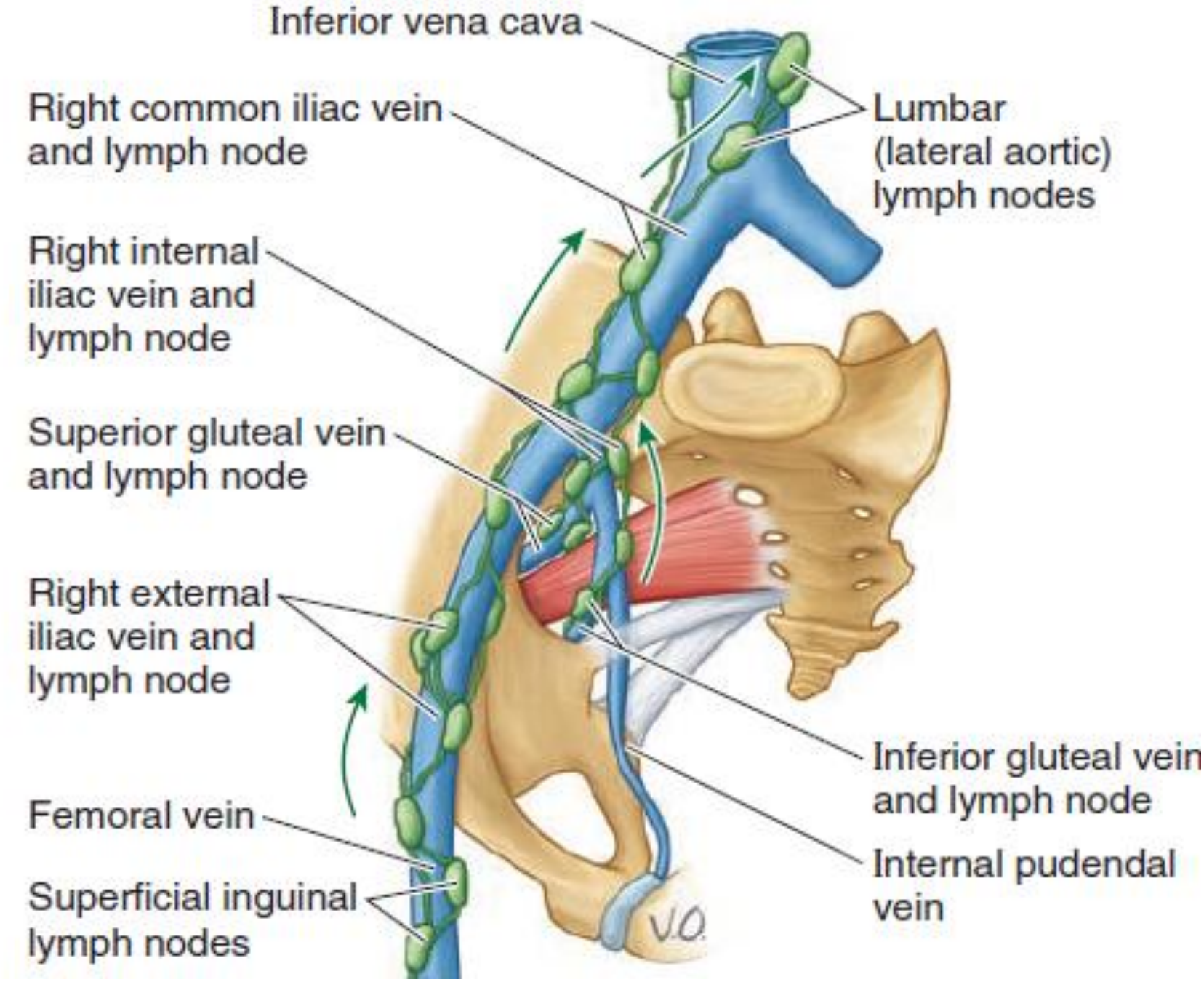
Vessels and nerves in gluteal region

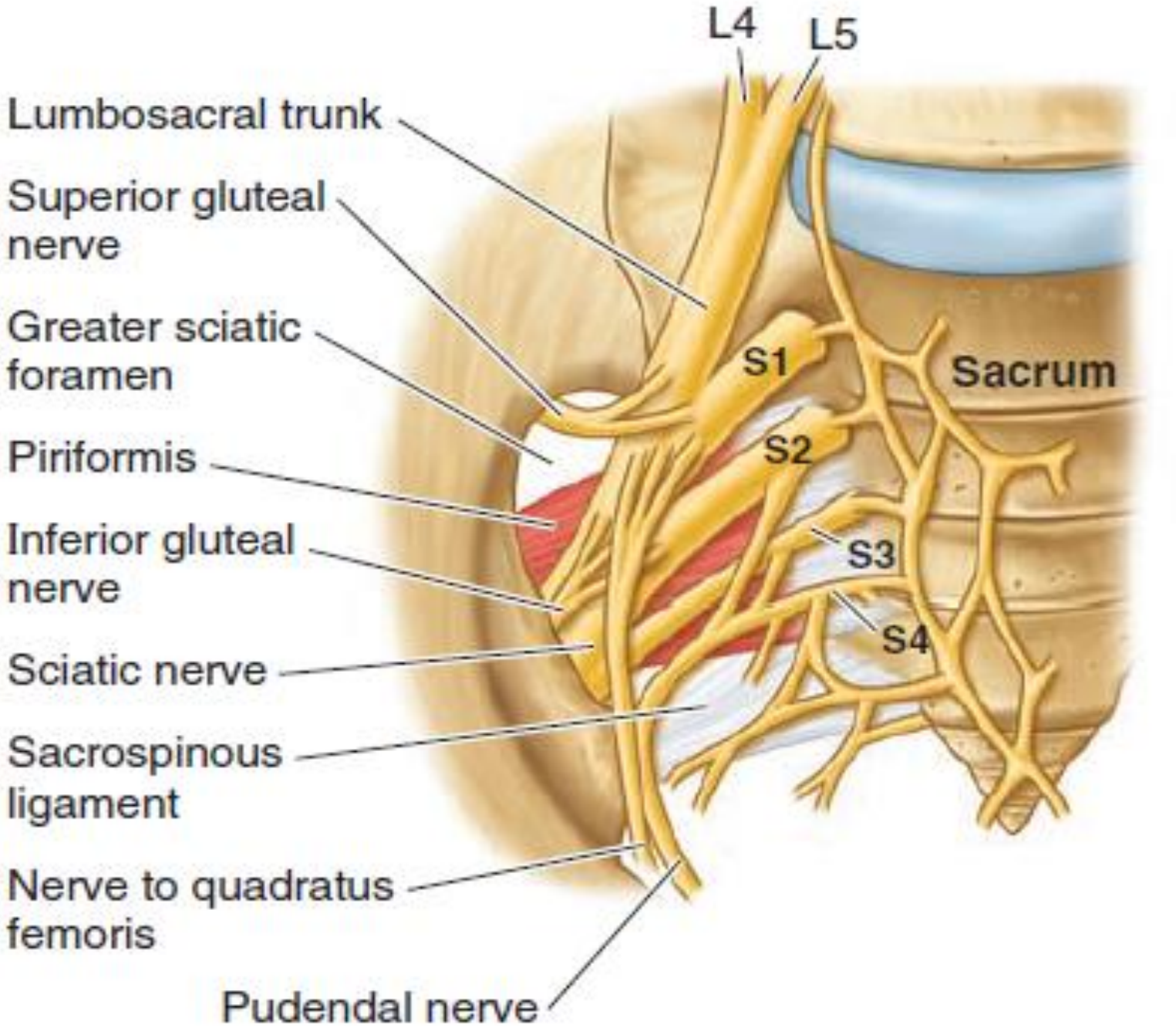
The veins of the gluteal region are tributaries of the internal iliac veins that drain blood from the gluteal region. The superior and inferior gluteal veins accompany the corresponding arteries through the greater sciatic foramen, superior and inferior to the piriformis, respectively. They communicate with tributaries of the femoral vein, thereby providing an alternate route for the return of blood from the lower limb.


Abdominal aorta
Right common iliac artery
Greater sciatic foramen
Right internal iliac artery
Superior gluteal artery
Piriformis
Right external iliac artery
Inferior gluteal artery
Internal pudendal artery
Femoral artery
Sacrospinous ligament
Sacrotuberous ligament

Arteries of gluteal and posterior thigh regions



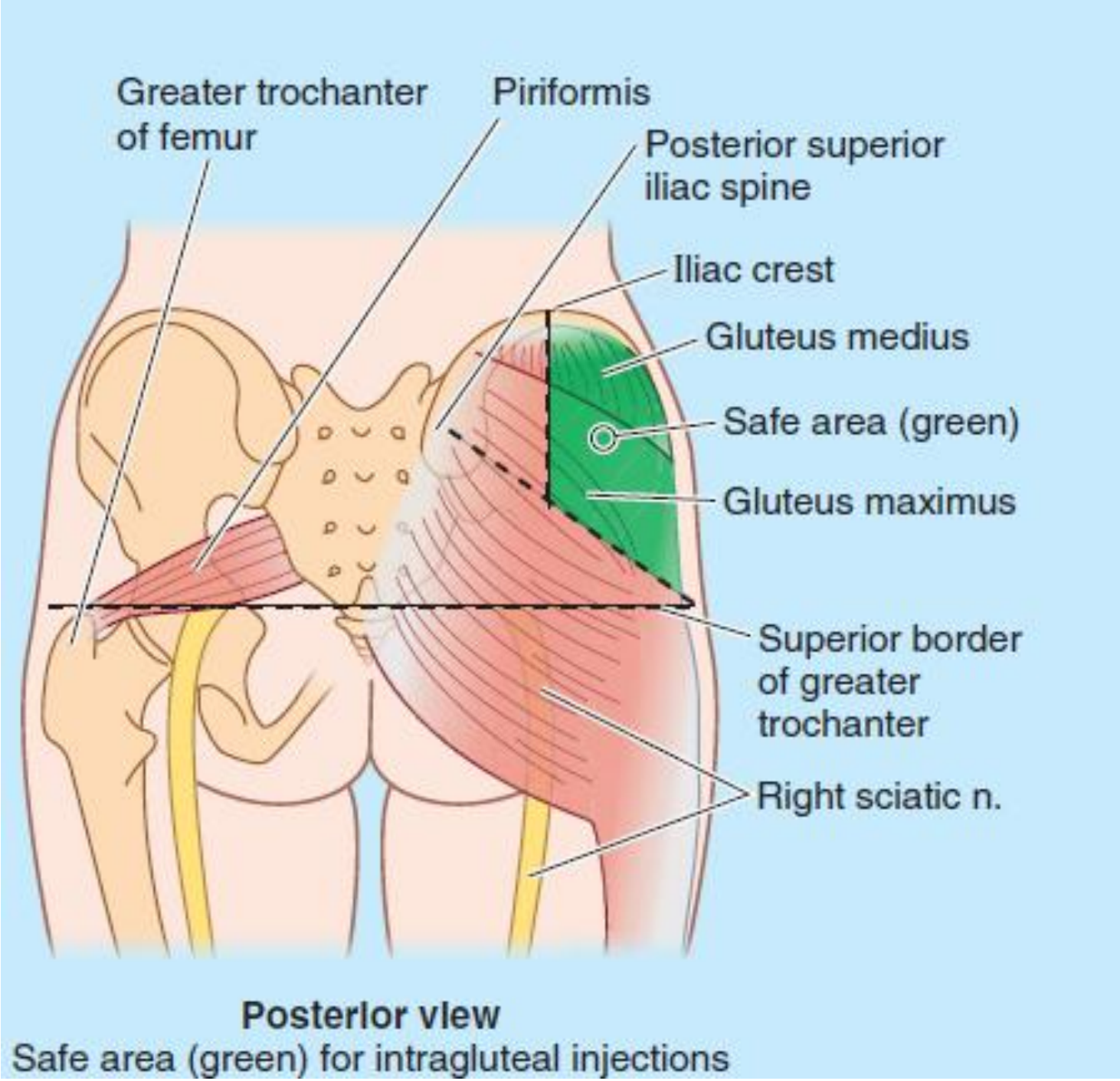

Inferior vena cava
Right common iliac vein and lymph node
Lumbar (lateral aortic) lymph nodes
Right internal iliac vein and lymph node
Superior gluteal vein and lymph node
Right external iliac vein and lymph node
Inferior gluteal vein and lymph node
Internal pudendal vein
Femoral vein
Superficial inguinal lymph nodes


L4
L5
Lumbosacral trunk
Superior gluteal nerve
Greater sciatic foramen
Piriformis
Inferior gluteal nerve
Sciatic nerve
Sacrospinous ligament
Nerve to quadratus femoris
Pudendal nerve
S1
S2
S3
S4
Sacrum

Intragluteal Injections

The gluteal region is a common site for intramuscular injection of drugs because the gluteal muscles are thick and large, providing a large area for venous absorption of drugs. Injections into the buttock are safe only in the superolateral quadrant of the buttock. Complications of improper technique include nerve injury, hematoma, and abscess formation.

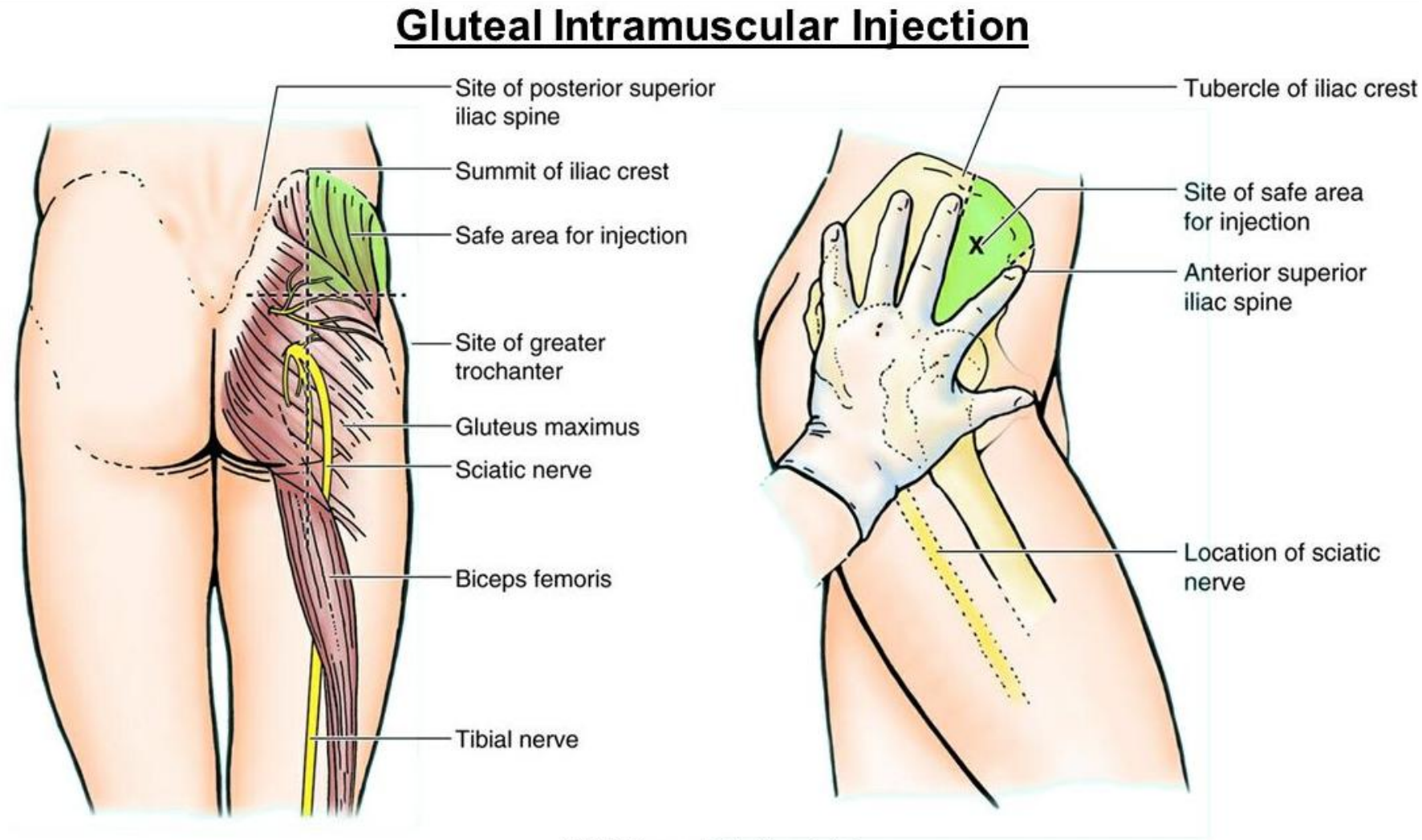
Intragluteal Injections



Posterior view

Safe area (green) for intragluteal injections

Dorsogluteal and ventrogluteal injections



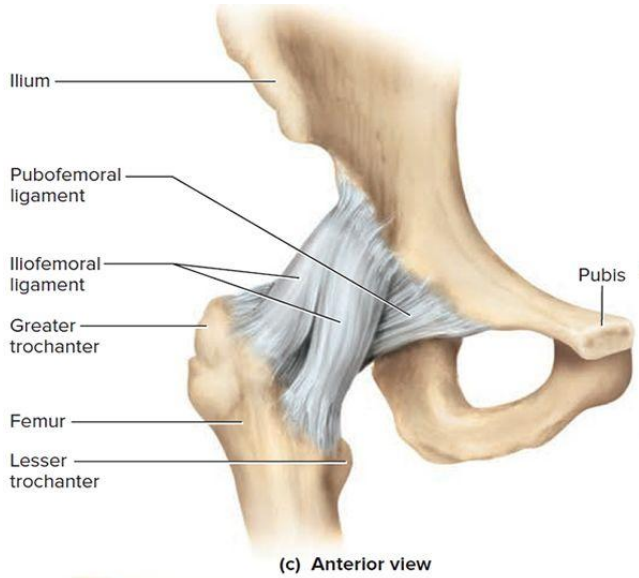
Hip Joint

The hip joint forms the connection between the lower limb and the pelvic girdle. It is a strong, stable multiaxial ball and socket type of synovial joint. The femoral head is the ball, and the acetabulum is the socket. This joint is designed for stability over a wide range of movement. During standing, the weight of the upper body is transferred through the hip bones to the heads of the femurs.

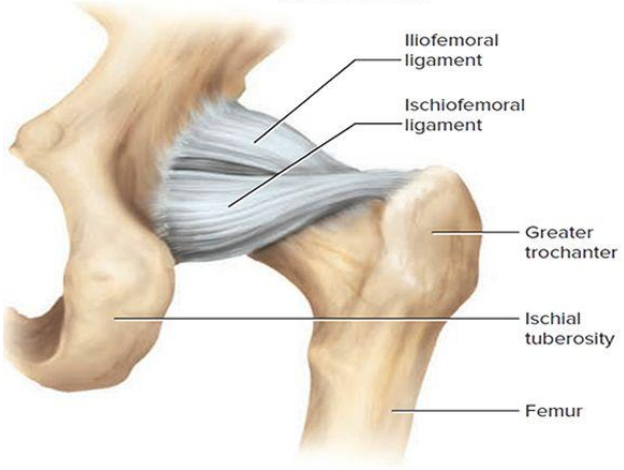
Hip Joint

Type	Synovial ball and socket; multiaxial
Articular surfaces	Head of femur, lunate surface of acetabulum
Ligaments	Capsular: iliofemoral, pubofemoral, ischiofemoral Intracapsular: transverse ligament of the acetabulum, ligament of the head of the femur
Innervation	Femoral nerve, obturator nerve, superior gluteal nerve, nerve to quadratus femoris
Blood supply	Medial and lateral circumflex femoral arteries, obturator artery, superior and inferior gluteal arteries
Movements	Flexion, extension, abduction, adduction, external rotation, internal rotation and circumduction

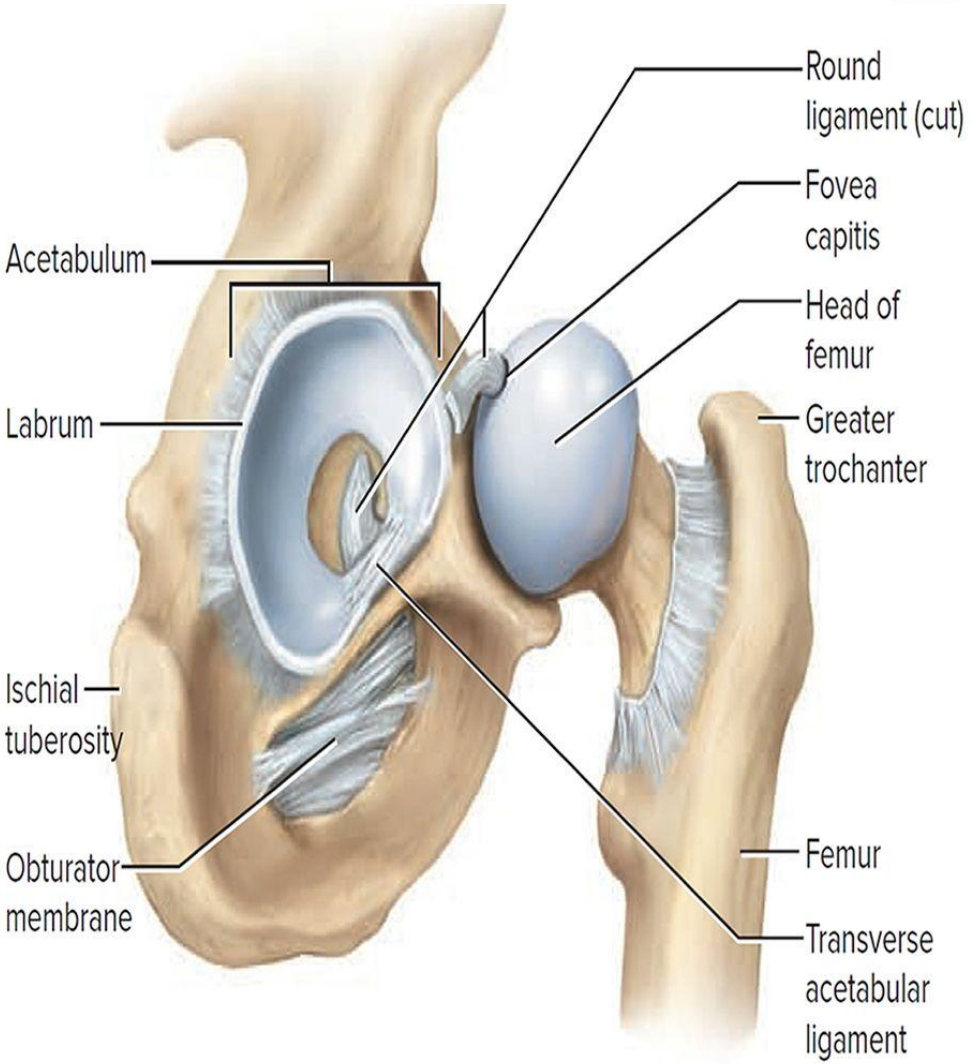
Hip Joint



(c) Anterior view



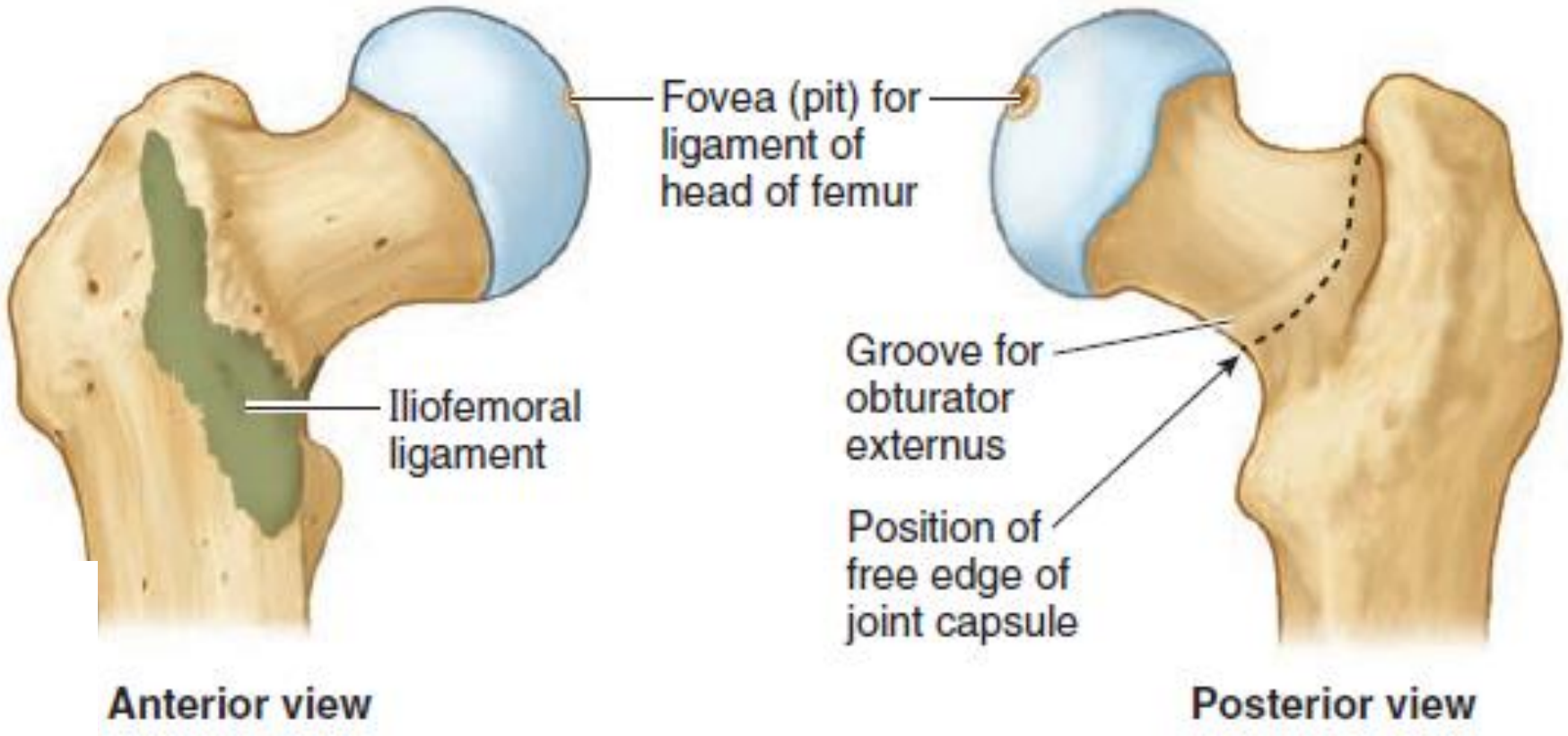
(d) Posterior view



Hip Joint

The rim of the acetabulum consists of a semilunar articular part covered with articular cartilage, the lunate surface of the acetabulum. Because the depth of the acetabulum is increased by the fibrocartilaginous acetabular labrum (L. labrum, lip) and the transverse acetabular ligament (bridging the acetabular notch), more than half of the head fits within the acetabulum. Centrally, a deep nonarticular part, the acetabular fossa, is formed mainly by the ischium.

Hip Joint

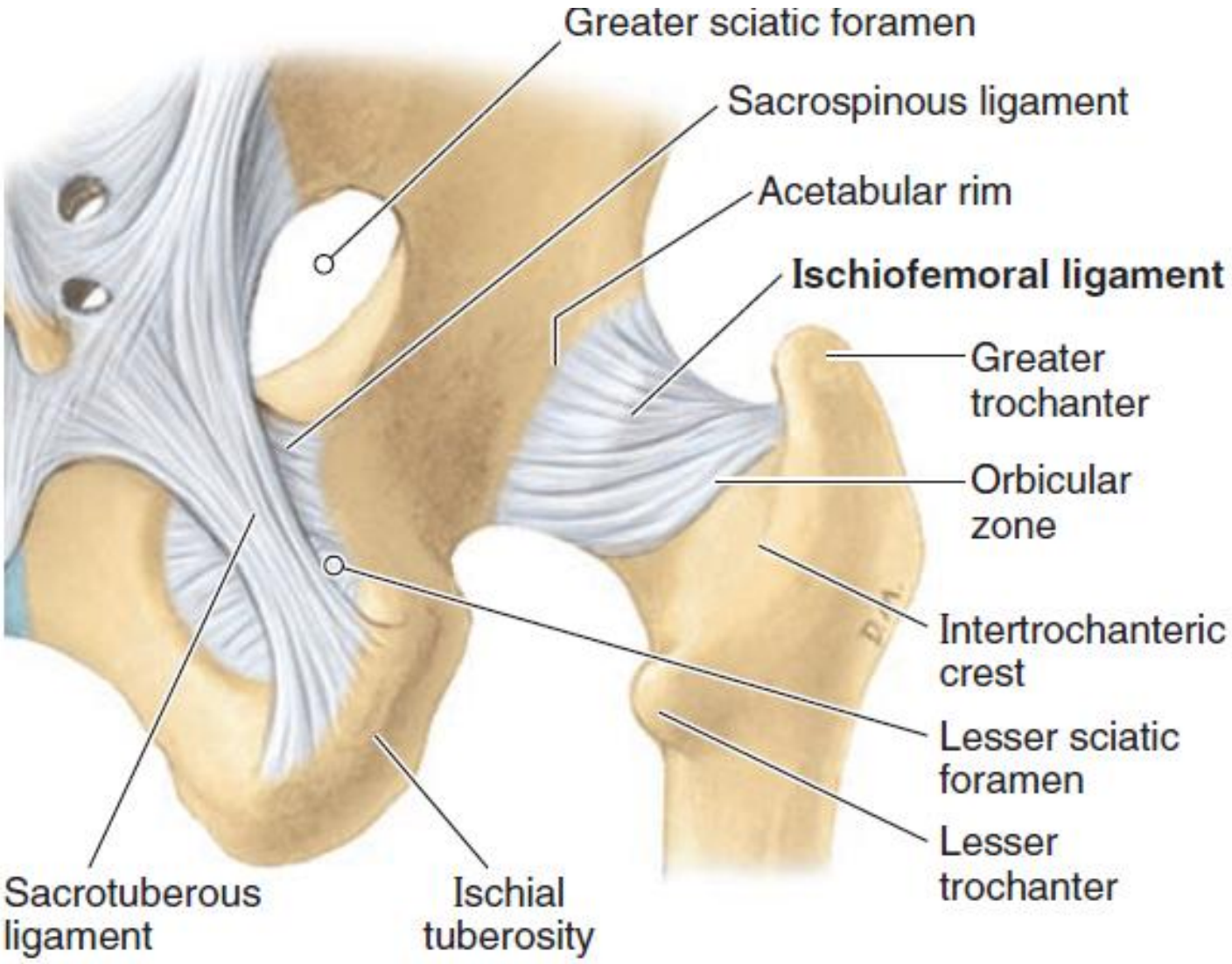

Fovea (pit) for ligament of head of femur
Iliofemoral ligament
Groove for obturator externus
Position of free edge of joint capsule
Anterior view
Posterior view

Hip Joint

The round head of the femur articulates with the cup-like acetabulum of the hip bone. The head is covered with articular cartilage, except for the pit or fovea for the ligament of the head of femur. The external fibrous layer of the joint capsule attaches proximally on the hip bone to the bony rim of the acetabulum and the transverse acetabular ligament.

Hip Joint

Distally, it attaches to the femoral neck only anteriorly at the intertrochanteric line and at the root of the greater trochanter. Posteriorly, the fibrous layer has an arched border that crosses the neck proximal to the intertrochanteric crest but is not attached to it. The joint capsule covers approximately the proximal two thirds of the neck of the femur posteriorly.



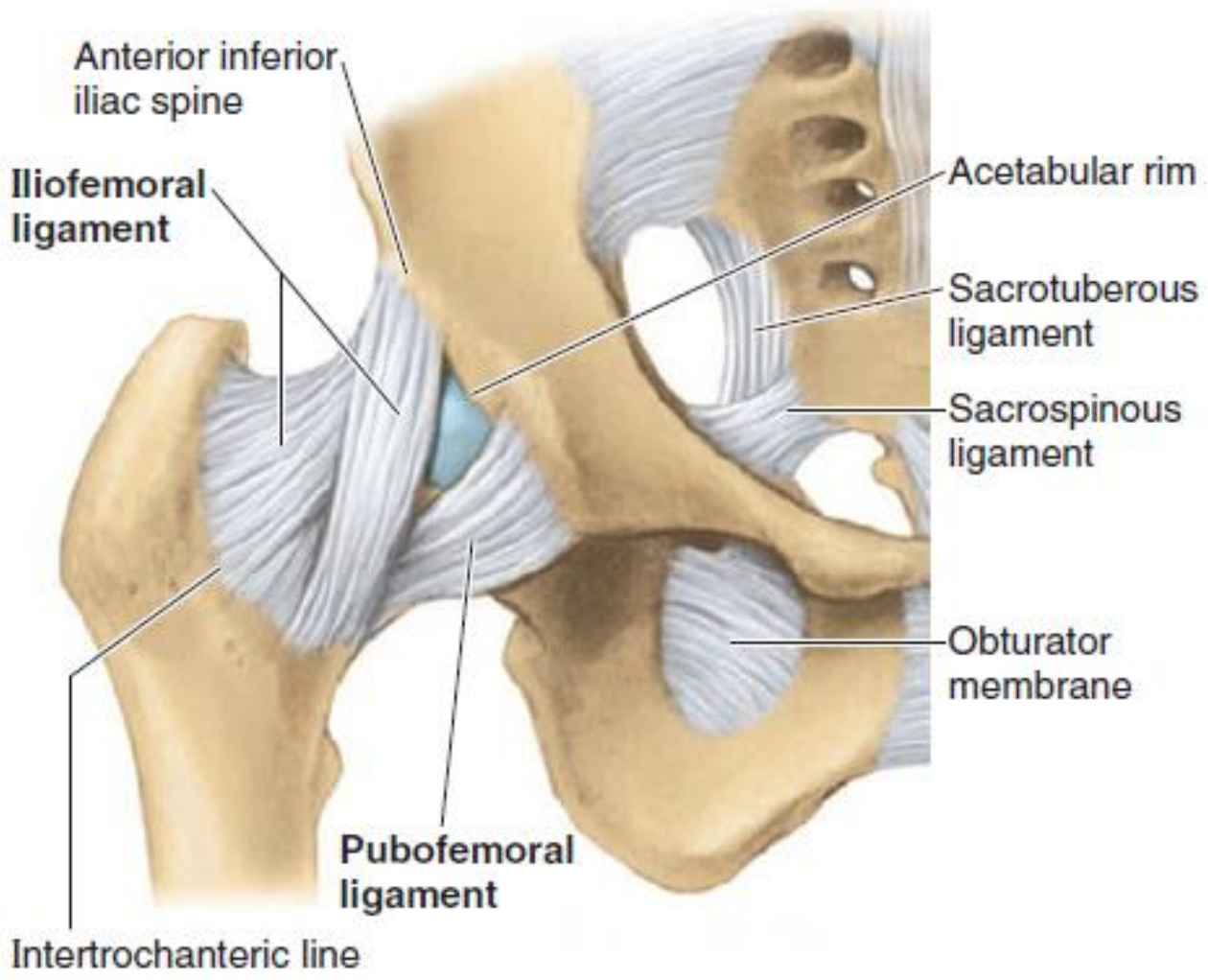
Most fibers of the fibrous layer take a spiral course from the hip bone to the intertrochanteric line; some deep fibers, most marked in the posterior part of capsule, wind circularly around the neck, forming an **orbicular zone**

Hip Joint

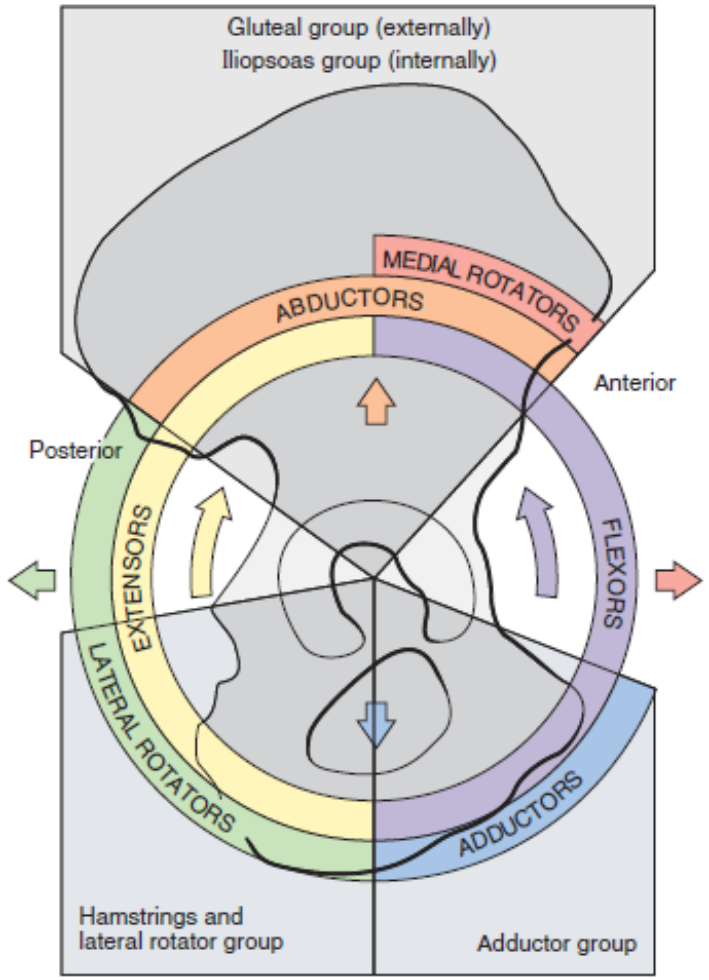
The hip joint is reinforced:

- Anteriorly and superiorly by the strong Y-shaped iliofemoral ligament (Bigelow ligament),
- Inferiorly and anteriorly by the pubofemoral ligament,
- Posteriorly by the weak ischiofemoral ligament

Hip Joint


Anterior inferior iliac spine
Iliofemoral ligament
Acetabular rim
Sacrotuberous ligament
Sacrospinous ligament
Obturator membrane
Pubofemoral ligament
Intertrochanteric line

Hip Joint



Diagrammatic lateral view

Circular Zones =
The zones represent the position of origin of functional groups relative to center of femoral head in acetabulum (point of rotation). Pull is applied on the femur (femoral trochanters or shaft) from these positions.

Colored Arrows =
The curved arrows show the direction of rotation of femoral head and neck caused by activity of extensors and flexors. The short arrows indicate the direction of movement of the femoral neck and greater trochanter caused by activity of the lateral/medial rotators and abductors/adductors.

Functional groups of muscles acting at hip joint

Flexors
- Iliopsoas
- Sartorius
- Tensor fasciae latae
- Rectus femoris tendon
- Pectineus
- Adductor longus
- Adductor brevis
- Adductor magnus—anterior part
- Gracilis

Adductors
- Pectineus
- Adductor longus
- Adductor brevis
- Adductor magnus
- Obturator externus
- Gracilis

Lateral rotators
- Obturator externus and internus
- Piriformis
- Gemelli
- Quadratus femoris
- Gluteus maximus
- (Gluteus medius and minimus)

Extensors
- Gluteus maximus
- Hamstrings:
  - Semitendinosus
  - Semimembranosus
  - Long head, biceps femoris
- Adductor magnus—posterior part

Abductors
- Gluteus medius
- Gluteus minimus
- Tensor fasciae latae

Medial rotators
- Gluteus medius } Anterior parts
- Gluteus minimus
- Tensor fasciae latae

Hip Joint

Hip movements

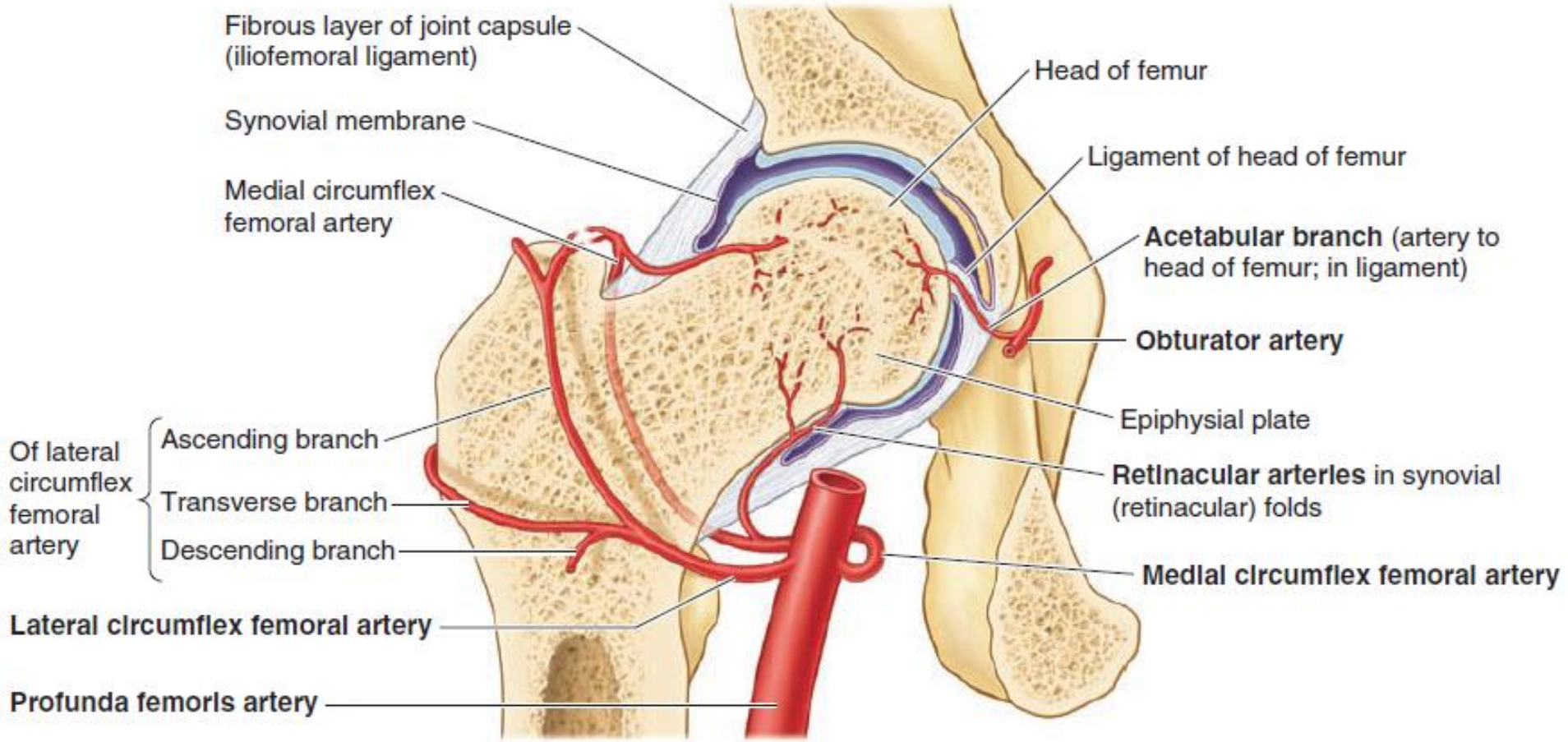
Hip movements are flexion–extension, abduction– adduction, medial–lateral rotation, and circumduction. Movements of the trunk at the hip joints are also important, such as those occurring when a person lifts the trunk from the supine position during sit-ups or keeps the pelvis level when one foot is off the ground.

Hip Joint. Blood supply

The arteries supplying the hip joint are the medial and lateral circumflex femoral arteries, which are usually branches of the profunda femoris artery but are occasionally branches of the femoral artery. The main blood supply is from the retinacular arteries arising as branches from the circumflex femoral arteries (especially the medial circumflex femoral artery).

Artery to the head of femur, a branch of the obturator artery that traverses the ligament of the head

Hip Joint. Blood supply



Anterior view of coronally sectioned hip joint

Hip Joint. Blood supply

Fracture of the neck of the femur often disrupts the blood supply to the head of the femur. The medial circumflex femoral artery supplies most of the blood to the head and neck of the femur. Its retinacular arteries often are torn when the femoral neck is fractured or the hip joint is dislocated. In some cases, the blood supplied to the femoral head through the artery to the ligament of the femoral head may be the only remaining source of blood to the proximal fragment.

Hip Joint. Blood supply

This artery is frequently inadequate for maintaining the femoral head; consequently, the fragment may undergo avascular necrosis (AVN—also called osteonecrosis), the result of deficient blood supply. These fractures are especially common in individuals older than 60 years of age, especially in women because their femoral necks are often weak and brittle as a result of osteoporosis.

Hip Joint. Innervation.

Hilton law states that the nerve supplying the muscles extending directly across and acting at a given joint also innervate the joint. Therefore, the nerve supply of the hip joint is from the

- Femoral nerve or its muscular branches, anteriorly
- Obturator nerve, inferiorly
- Superior gluteal nerve, superiorly
- Nerve to quadratus femoris, posteriorly

Dislocation of Hip Joint

Congenital dislocation of the hip joint is common, occurring in approximately 1.5 per 1,000 live births; it affects more girls and is bilateral in approximately half the cases. Dislocation occurs when the femoral head is not properly located in the acetabulum. The affected limb appears (and functions as if) shorter because the dislocated femoral head is more superior than on the normal side, resulting in a positive Trendelenburg sign (hip appears to drop to one side during walking). Inability to abduct the thigh is characteristic of congenital dislocation.

Positive Trendelenburg sign

a) Normal

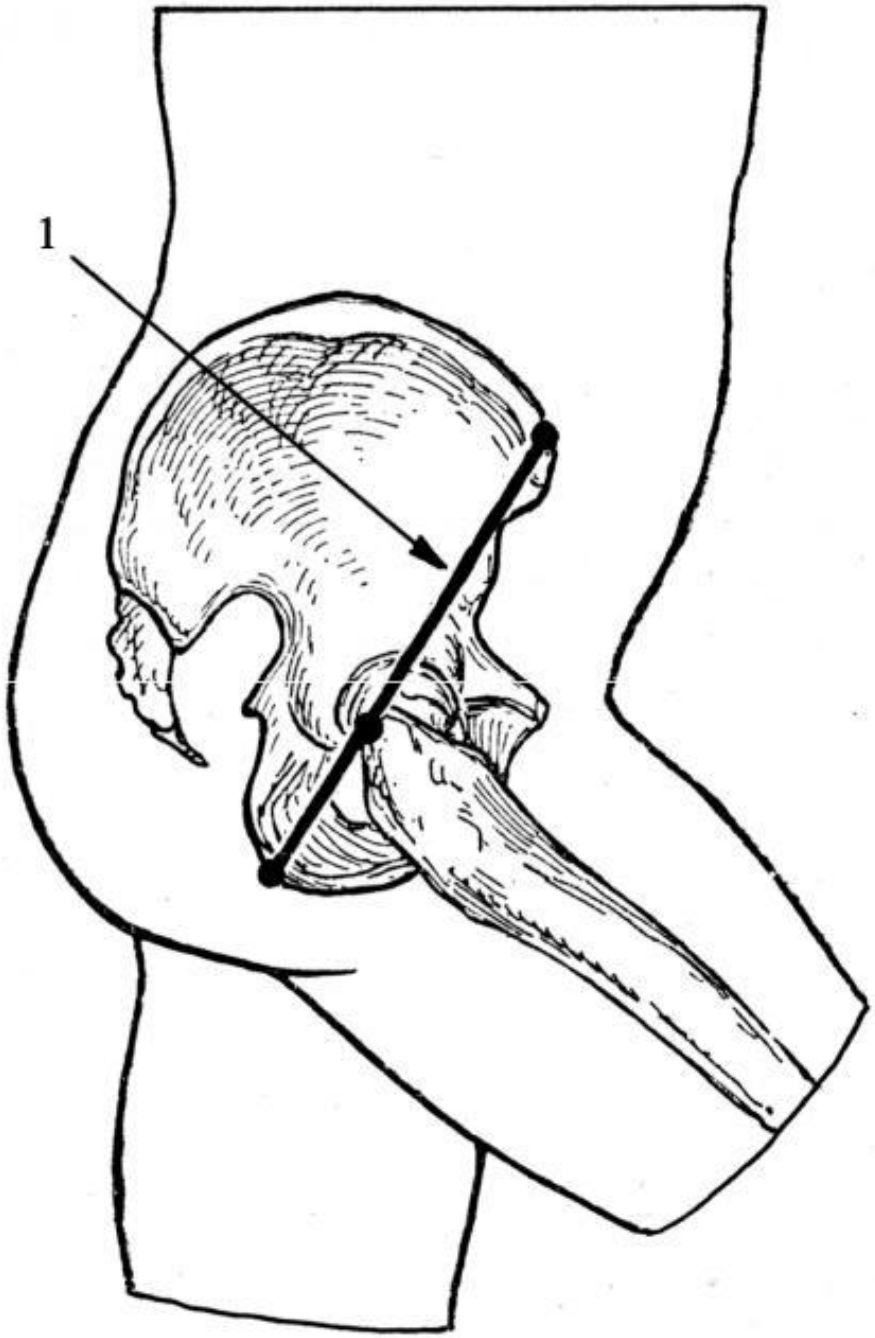
b) Positive Trendlenburg (Left side)

Roser-Nélaton line

In anatomy, the Nelaton's Line (also known as the Roser-Nélaton line) is a theoretical line, in the moderately flexed hip, drawn from the anterior superior iliac spine to the tuberosity of the ischium.

It was named for German surgeon and ophthalmologist Wilhelm Roser and French surgeon Auguste Nélaton.

Roser-Nélaton line

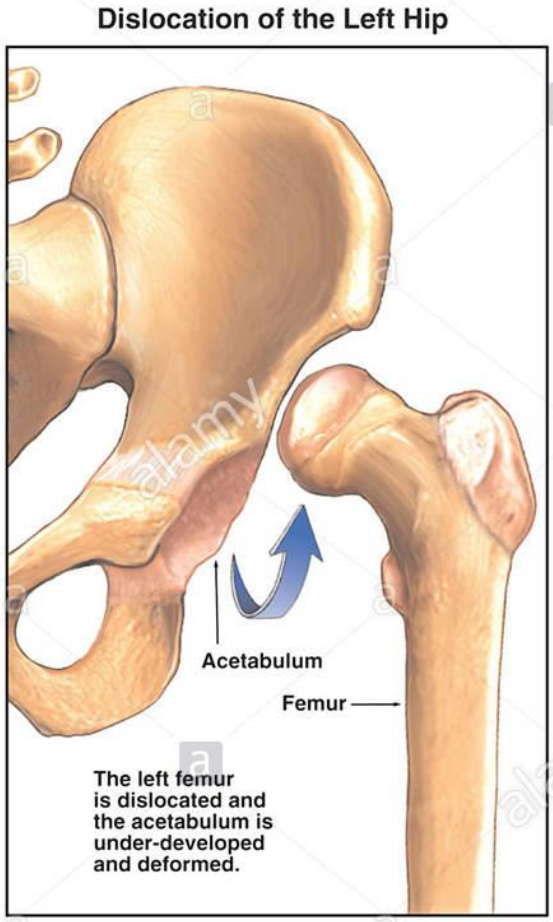


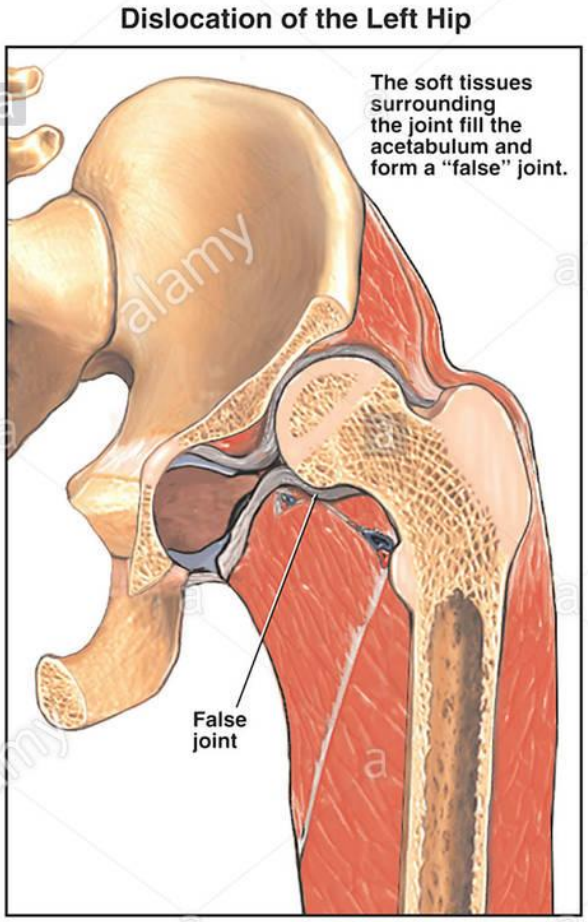
Roser-Nélaton line

Normally the greater trochanter of the femur lies below this line, but in cases of iliac joint dislocation of the hip or fracture of the neck of the femur the trochanter is felt above or in the line.

Though the line can be of help for diagnosis of fractures, its practical value is disputed.

Dislocation of Hip Joint

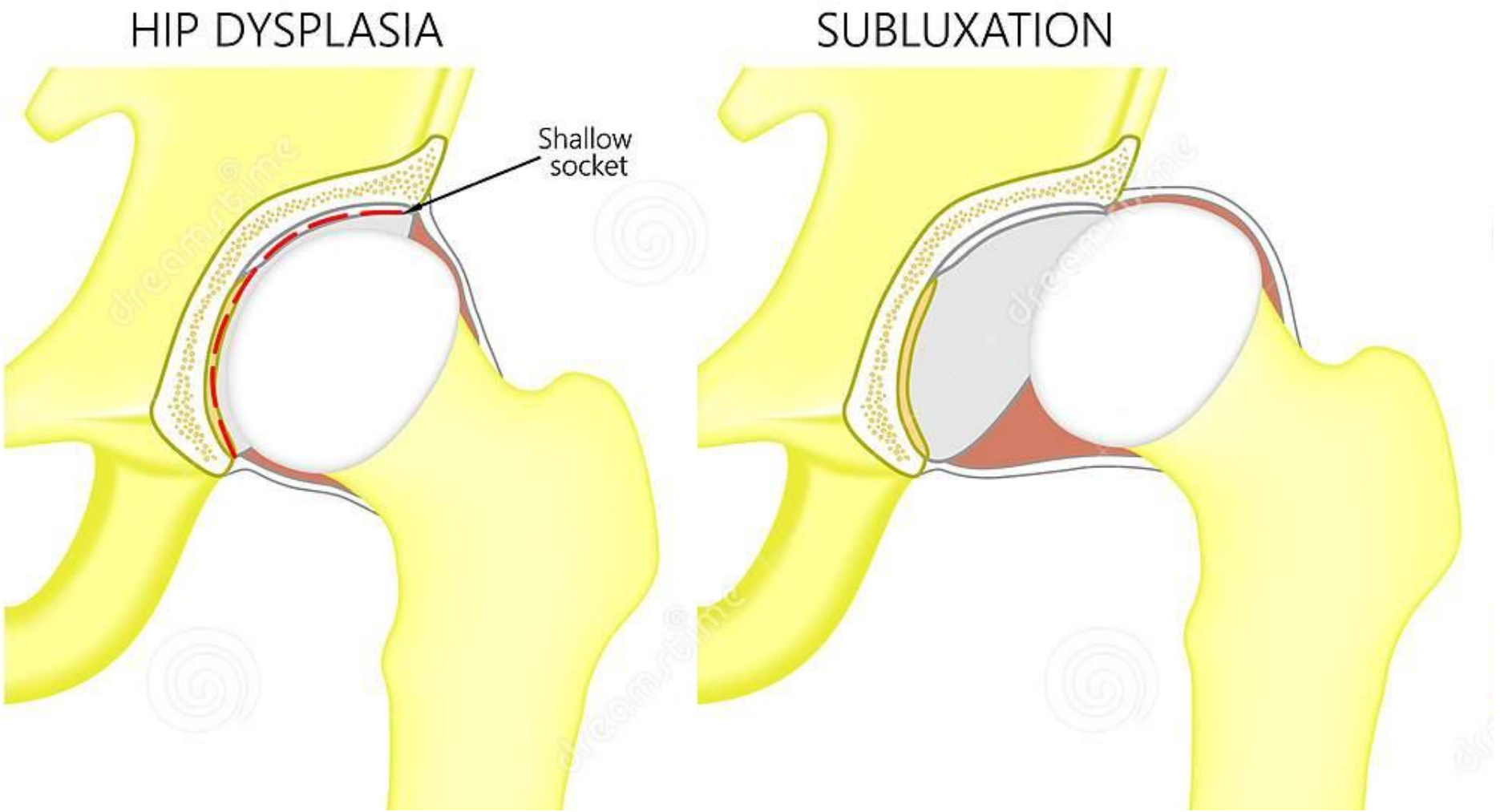




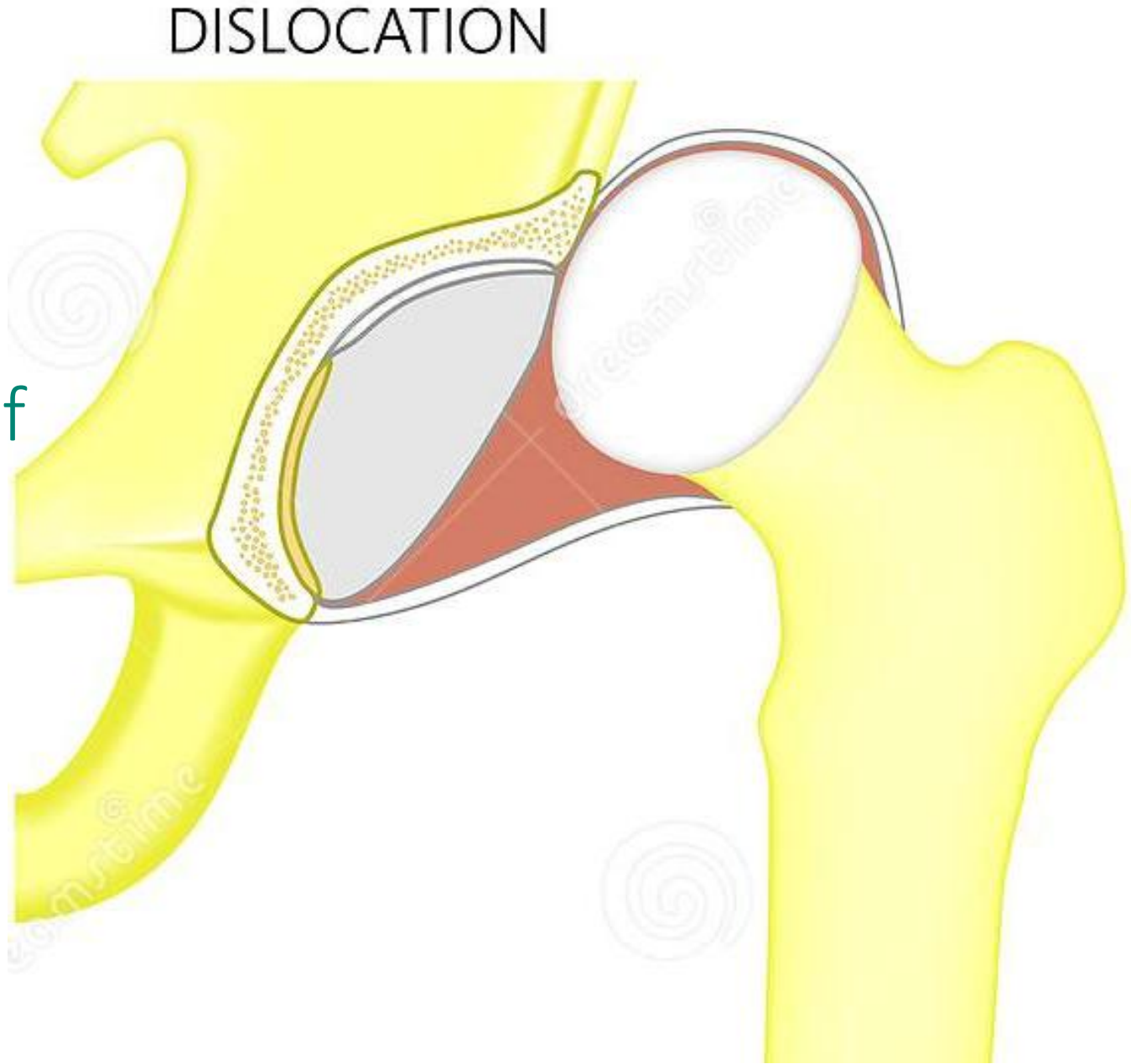
Dislocation of Hip Joint

Acquired dislocation of the hip joint is uncommon because this joint is so strong and stable. Nevertheless, dislocation may occur during an automobile accident when the hip is flexed, adducted, and medially rotated, the usual position of the lower limb when a person is riding in a car. Posterior dislocations are most common.

Dislocation of Hip Joint



Dislocation of Hip Joint



Surgical Hip Replacement

The hip joint is subject to severe traumatic injury and degenerative disease. Osteoarthritis of the hip joint, characterized by pain, edema, limitation of motion, and erosion of articular cartilage, is a common cause of disability. During hip replacement, a metal prosthesis anchored to the person's femur replaces the femoral head and neck and the acetabulum is often lined with a metal/plastic socket

Surgical Hip Replacement