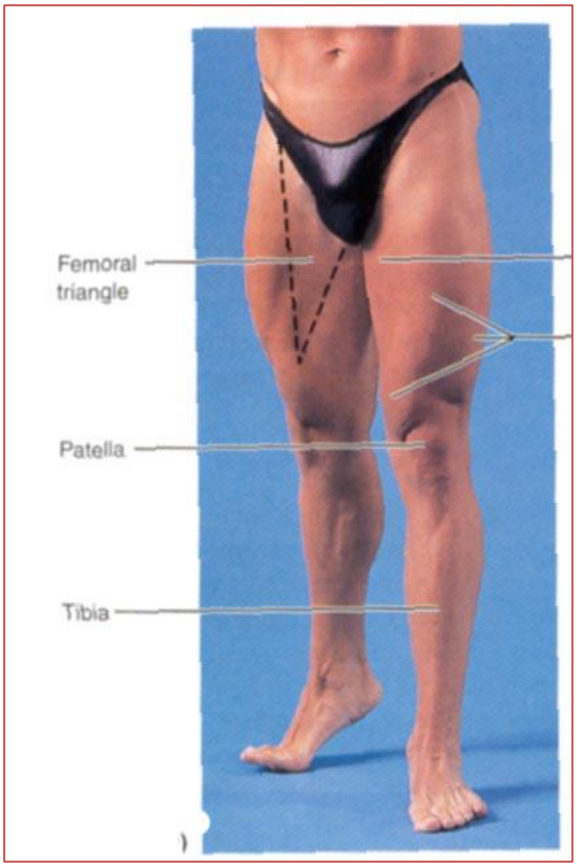
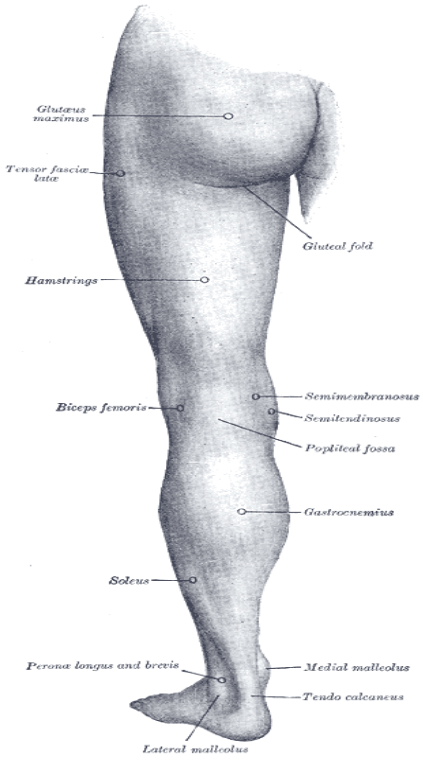
ANATOMY
The Gluteal Region

- The primary function of the lower limb is to *support the weight of the body* & *to provide a stable foundation in standing, walking & running.*



- They have become specialized for *locomotion*.
- The lower limbs although similar in structure in many aspect to the upper limbs ,have *less freedom of movement.*
- Where as the pectoral girdle of the upper limb is united to the trunk by only a small joint , *the sternoclavicular joint* , the two hip bones articulate posteriorly with the trunk at *the strong sacroiliac joint & anteriorly with each other at the symphysis pubis.*
- **The result** is that the lower limbs are *more stable* & *can bear the weight of the body* during standing ,walking&running.

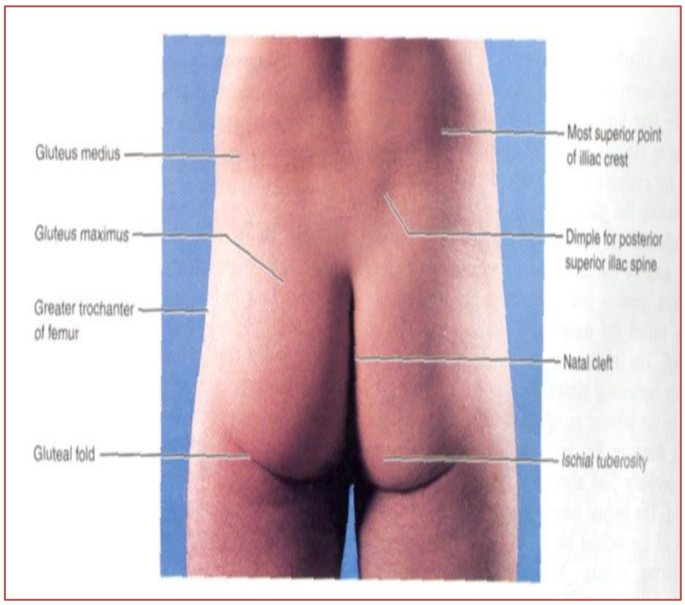


- **Each lower limb may be divided in to :**
  - Gluteal region
  - Thigh
  - Knee
  - Leg
  - ankle
  - Foot

Gluteal region (buttock)

- Lies behind thepelvis , is bounded *superiorly by the iliac crest* & *inferiorly by the fold of the buttock.*

- It is largely made up of the *gluteal muscles* and a *thick layer of superficial fascia* which overlies the (muscles ,nerves & vessels) which leaving the inside of the pelvis and passing to the lower limb.



Subcutaneous tissue

- The *panniculus adiposus* is well developed in the gluteal region and gives to the buttock its characteristic convexity.

- The *fold of the buttock* is the transverse skin crease for the *hip joint* & is not caused by the oblique lower border of the gluteus m.

Blood Supply

- ***The blood supply of the skin & fat :*** is derived from perforating branches of the *superior & inferior gluteal arteries.*

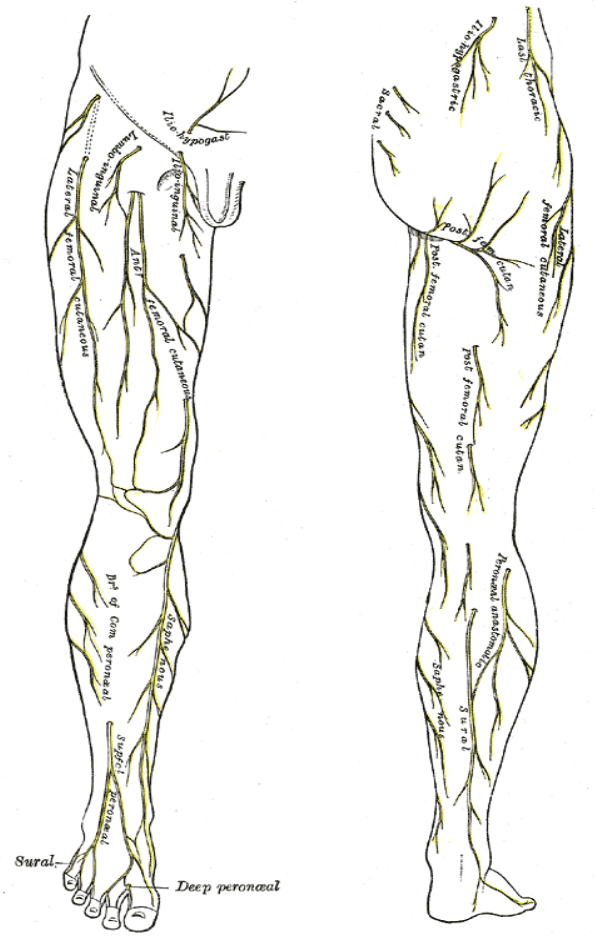
Lymphatic driange

- ***Lymphatic driange*** : drain into *lat.group of the superficial inguinal lymph node*

Cutaneous nerves

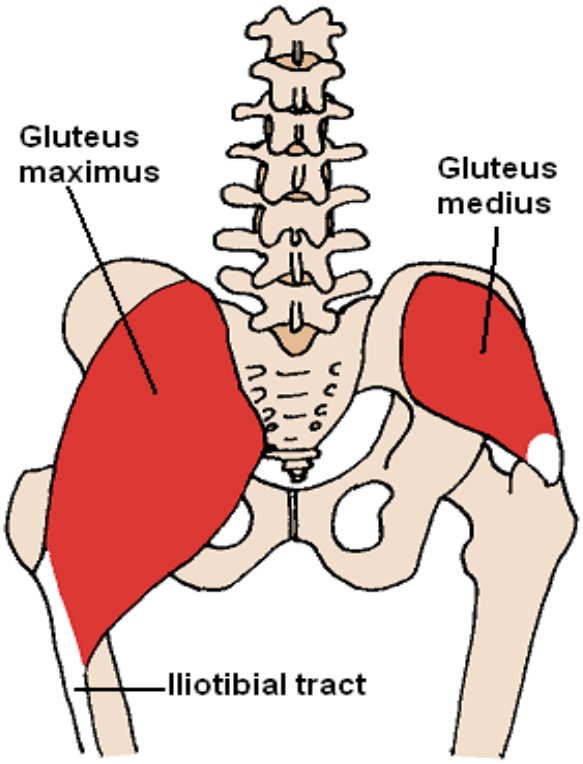
- are derived from *posterior & anterior rami* of spinal nerves as follow:

Upper medial quadrant	Post.rami of : upper 3 lumbar Ns upper 3 sacral Ns.
Lower medial quadrant	post cut. N. of the thigh (S1,2,3 ant.rami)
Upper lateral quadrant	lat.brach of iliohypogastric L1,T12 N.ant.rami.
Lower lateral quadrant	lat. Cut. N. of the thigh. (L2,3 ant.rami)
The skin over the coccyx in the floor of the natal cleft	is supplied by small branches of the lower Sacral & Coccygeal nerves.



The deep fascia

- Is continuous below with the *deep fascia or fascia lata of the thigh.*
- In the gluteal region it *split* to enclose the *gluteus maximus m*.
- Above it continues as a *single layer* that cover the outer surface of the *glut.med.* and is attached to the iliac crest.
- On the lat.surface of the thigh the fascia is thickened to form a strong wide band the *iliotibial tract*.
- This is attached above to the tubercle of the *iliac crest* and below to the *lateral condyle of the tibia*.
- The iliotibial tract form a sheath for the *tensor fascia lata m.* and receive the *greater part of insertion of the gluteus maximus* .



Muscles of the gluteal region

1- Gluteus maximus.

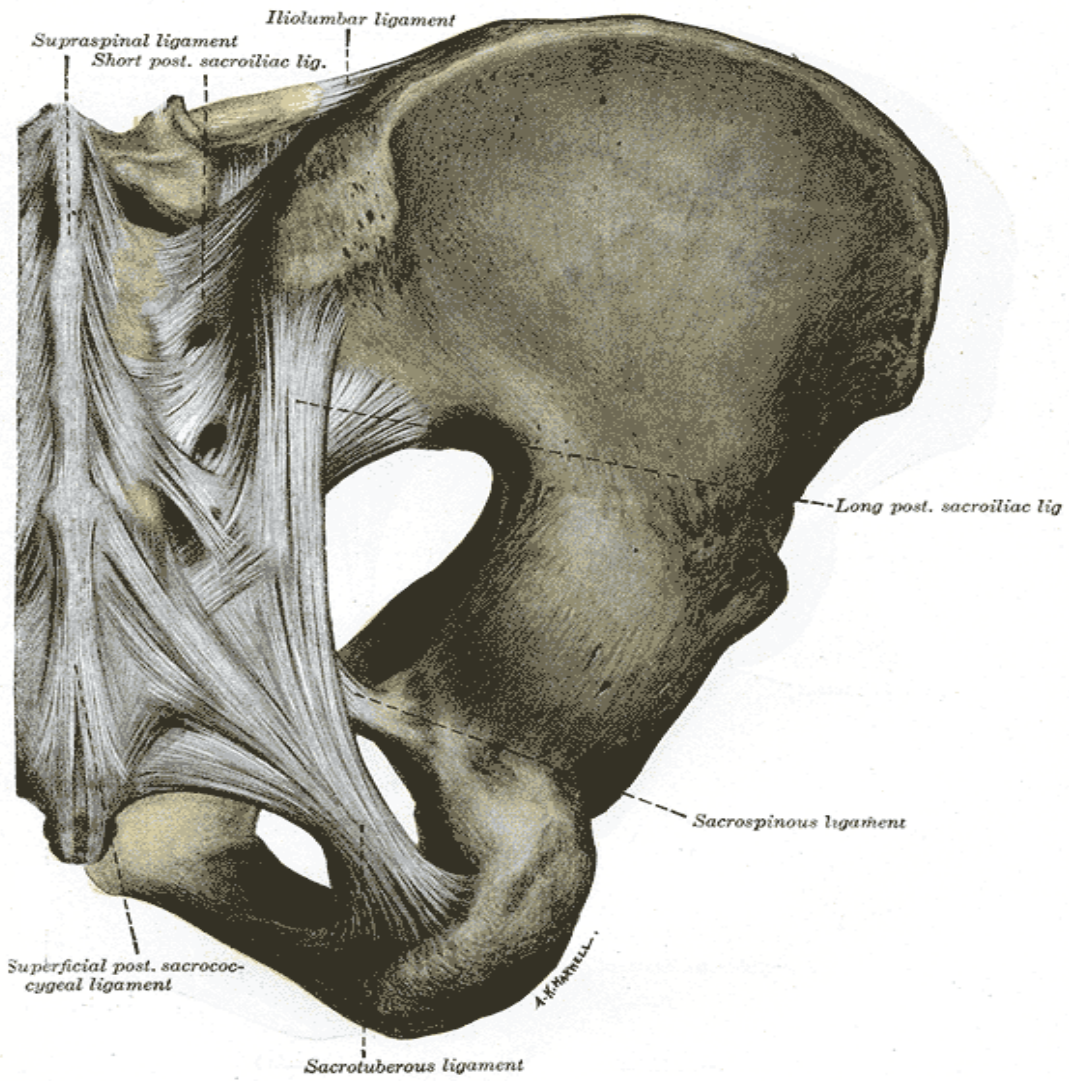
2- Gluteus medius.

3- Gluteus minimus.

4- Tensor fasciae latae.

5- (Short) lateral rotaters of the thigh at the hip joint

- Piriformis
- Gemellus superior
- Gemellus inferior
- Obturator internus
- Quadratus femoris



Gluteus maximus

- Is the most superficial of the group.
- It is a large flat quadrilateral forming the prominence of the buttock.

Origin

From an extensive area including :

- the gluteal surface of the ilium behind the posterior gluteal line
- the post. surface of the sacrum , coccyx & sacrotuberous ligament.

Insertion

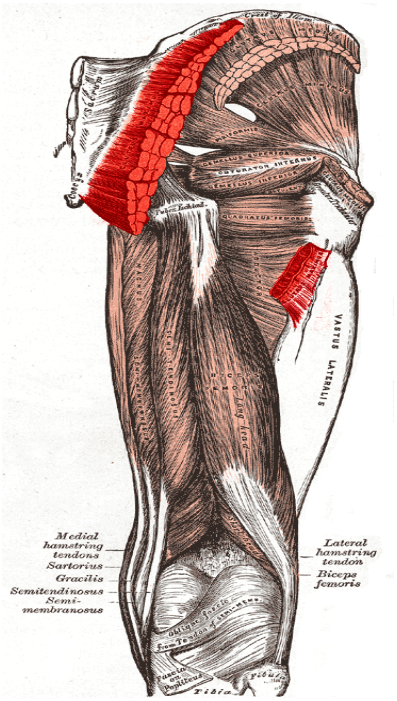
The fibers pass downward & laterally into the *iliotibial tract 3/4* and the *gluteal tuberosity of the femur 1/4rd*

N.supply

Inferior gluteal n.

Action

1- it is a *powerful lateral rotater & extensor* of the hip joint.
2- acting through the iliotibial tract it *extend & stabilize the knee joint*.



Tensor fascia lata

Origin: from the *outer edge of the iliac crest* between the ant.sup.iliac spine & the iliac tubercle.

Insertion: to the iliotibial tract.

N.supply: sup.gluteal n.

Action: extent & stabilise the knee joint.

Gluteus medius

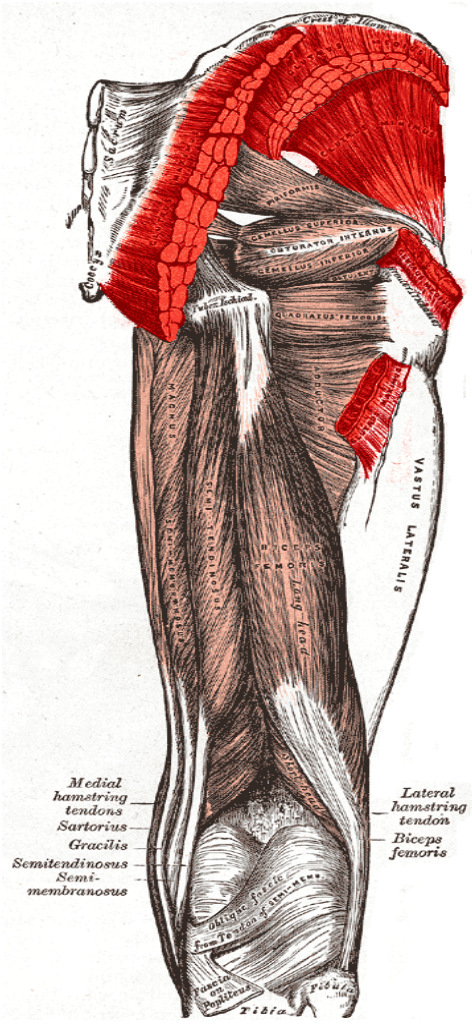
Origin; *gluteal surface of the ilium* between *middle & post.* gluteal line.

Insertion; lateral surface of greater trochanter.

Gluteus minimus;

Origin; *gluteal surface of the ilium* between *middle & inferior* gluteal line.

Insertion; anterior border of the greater trochanter.



For Each Two muscle

N.supply: sup.gluteal n.

Action;

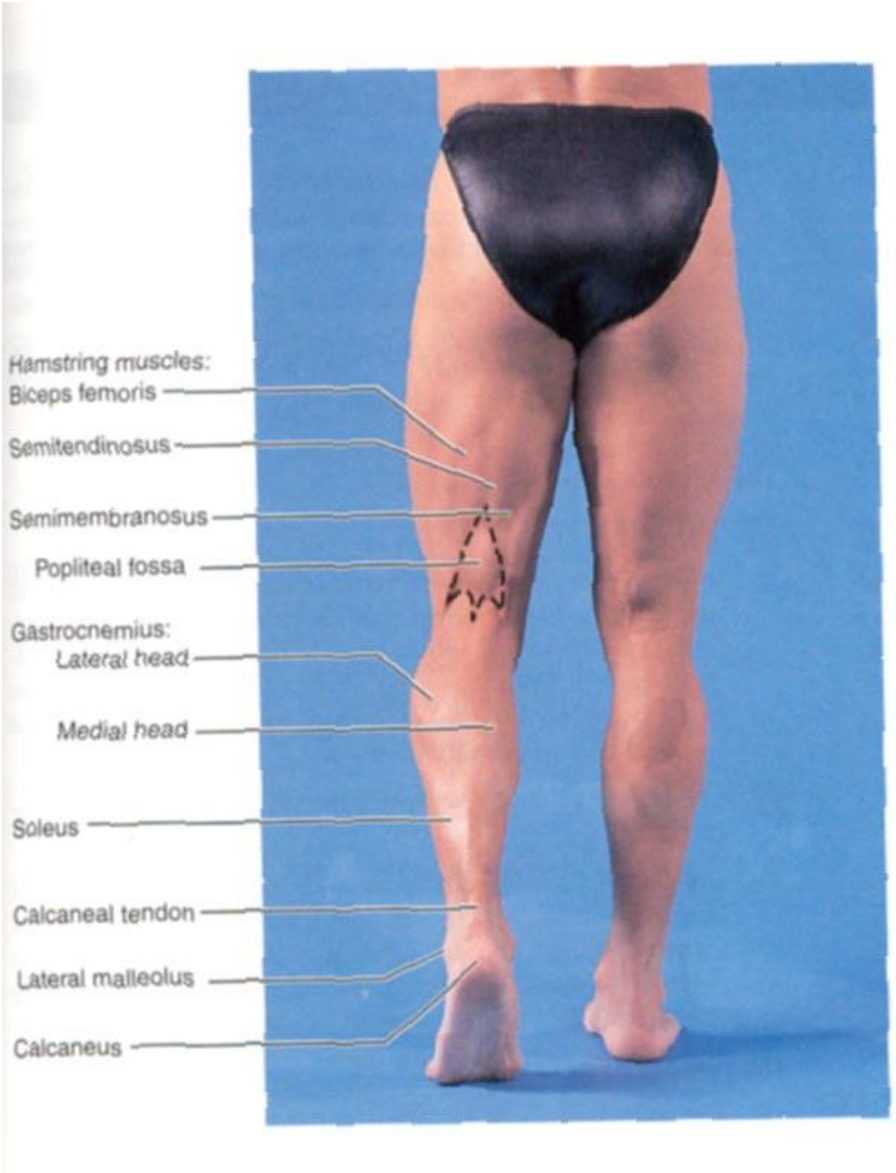
- powerful abductors at the hip joint
- weak medial rotators at the hip.

The most important action take place in walking or running.

- The muscles contract and steady the pelvis on the lower limb.
- When the foot of the opposite side is taken off the ground and thrust foreword , the pelvis is held in position and does not tilt downward on the unsupported side.

Note:

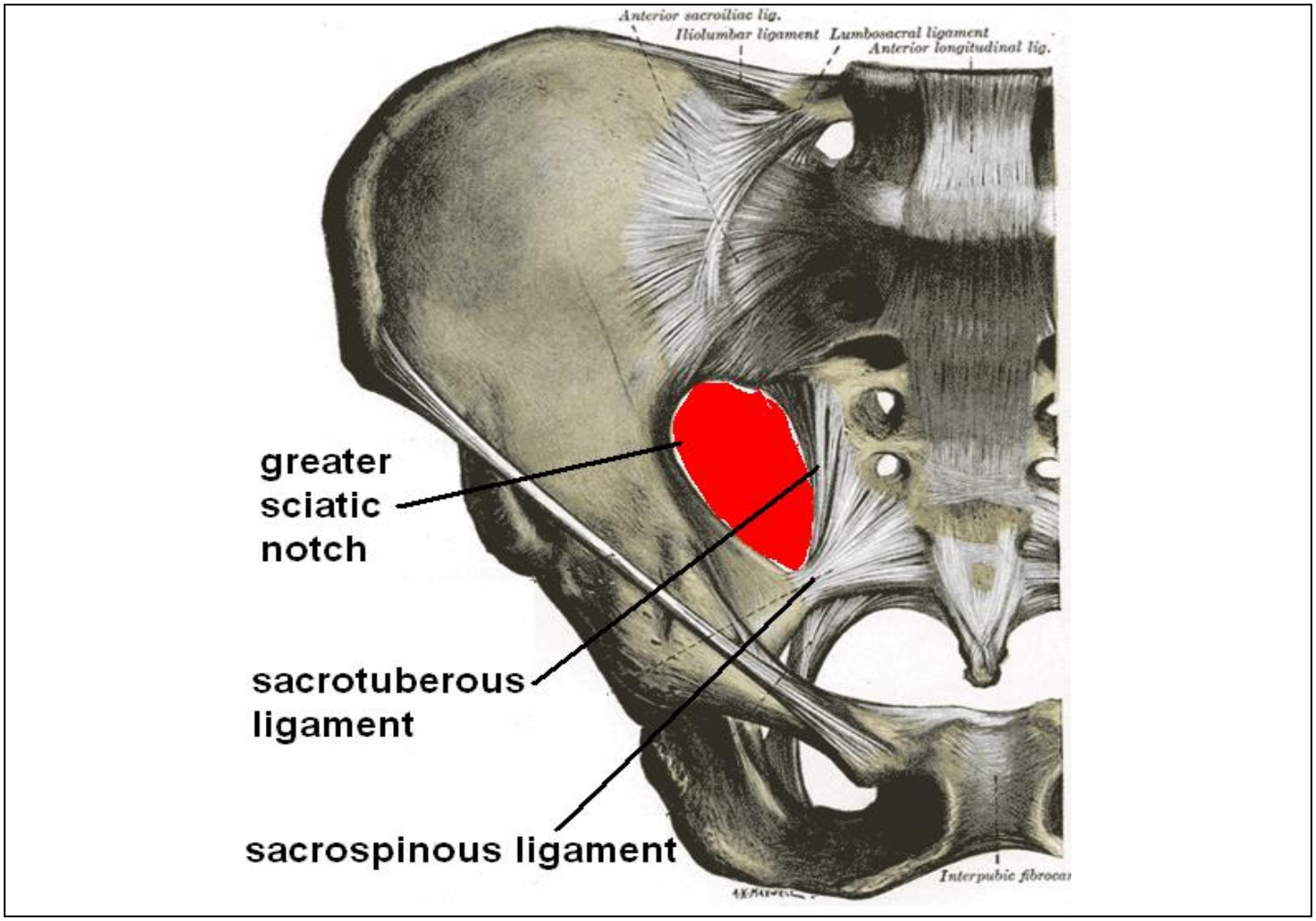
The gluteus maximus lies behind the hip joint and overlies ; gluteal muscles , short lateral rotaters of the hip and structures that passed through the greater and lesser sciatic foramen.



Vessels and nerves of the gluteal region.

A- The greater sciatic foramen

- is produced by the *sacro-spinous lig.* bridging the greater sciatic notch in the hip bone.
- The foramen is the *only conduit between* the pelvic cavity and the buttock.
- Number of structures emerge from the pelvis in to the gluteal region above or below the piriformis muscle in the greater sciatic foramen.
- The greater sciatic foramen is a major foramen of the pelvis

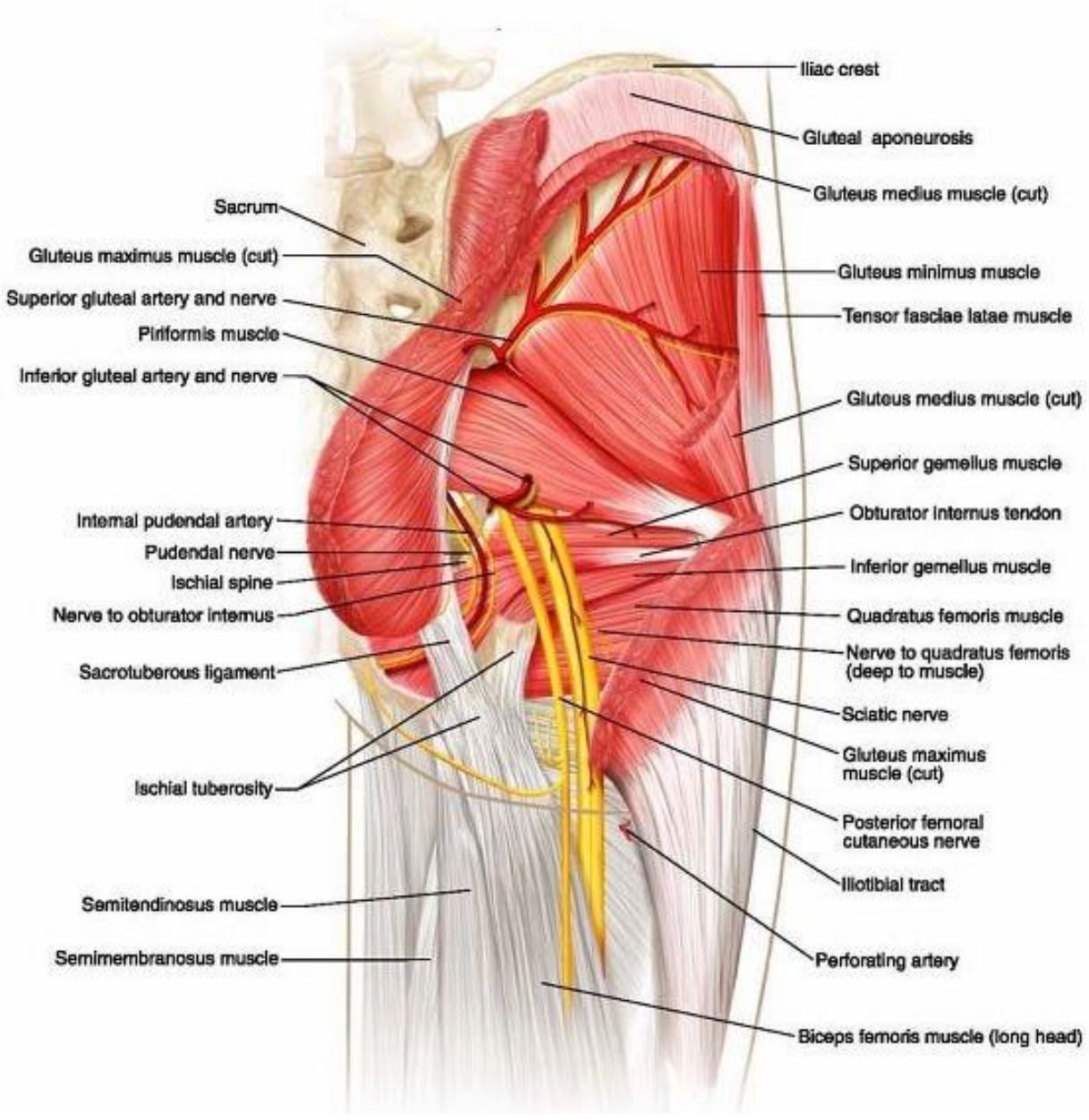


Boundaries It is bounded as follows:

Anterolaterally	the greater sciatic notch of the illium
Posteromedially	the sacrotuberous ligament
Inferiorly	the sacrospinous ligament and the ischial spine
Superiorly	the anterior sacroilliac ligament.

Contents

- It is partially filled up , by the Piriformis which leaves the pelvis through it.
- The following structures make their exit from the pelvis through the greater sciatic foramen.



Above Piriformis M.

The sup. gluteal A & N

- pass upward and lateraly between *gluteus medius & minimus*
- supplying these *muscles and tensor fascia lata.*
- The artery takes part in the anastomosis around the hip.
- It is branch of internal iliac artery.

Below Piriformis M.

1-Sciatic N.

- It is the largest nerve in the body (L4,5.S1,2,3) .
- emerge *lateral* to the ischial spine and lies successively on
  - the root of the ischial spine ,
  - superior gemellus m. ,
  - obturater intrenus m. ,
  - inferior gemellus m. ,
  - quadratusfemoris m.
- To reach the back of the *adductor magnus.*
- It is related posteriorly to the *post.cut.n.* of the thigh and the *gluteus maximus.*
- It lies about mid-way between the ischial tuberosity and the greater trochanter.
- It leaves the buttock region by *passing deep to the long head of the biceps femoris* to enter the back of the thigh.
- *The sciatic n.gives no branches* in the gluteal region.

The nerve is sometimes injured by :

- penetrating wounds pelvis
- dislocation of the hip joint
- badly placed intramuscular injection in the gluteal region

The injection should be placed in the upper outer quadrant of the buttock

2-Inferior gluteal n.

After a short course enter the substance of gluteus maximus.

3-inferior gluteal A.

- Ramifies in the lower part of the buttock and take part in an anastomosis around the hip joint.
- It is branch of internal iliac A.

4-Pudendal nerve, N.to the obturator internus and internal pudendal vessels.

- They cross the ischial spine and immediately re-enter the pelvis through the lesser sciatic foramen , they then lie in the ischiorectal fossa.

  - the pudendal N. supplies stractures in the perineum.
  - The N.to the obturater internus supplies the obturater internus m.on its pelvic surface.

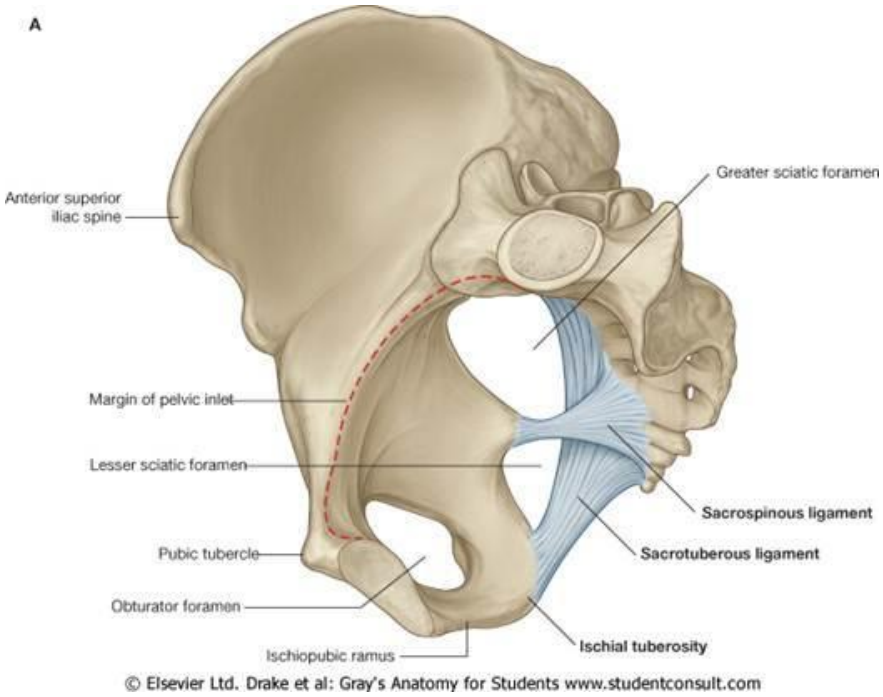
5-N.to the quadratus femoris m.

- A branch of the sacral plexus cross the root of the ischial spine deep to the sciatic N.and the tendon of obturater internus .
- It supply qudratus femoris and inferior gemellus.

6-post.cut.n.of the thigh.

- Emerge superficial to the sciatic n.and descend in the midline of the thigh beneath the deep fascia.
- it supplies the skin of the buttock , perineum and post.aspect of the thigh.

B- The lessor sciatic foramen



- An opening between the pelvis and the posterior thigh
- Lies between *Sacrotuberous and Sacrospinous ligament*

- Is bounded lateraly by the concave part of the ischium that lies between the ischial spine and ischial tuberosity.
- The *obturator internus m.* as it emerges from the lateral wall of the pelvis, plugs the lateral part of the foramen.
- The medial part of the foramen form a *tunnel shaped orfice* which leads foreward into *pudendal canal.*

- The *internal pudendal vessels and nerve* enter the foramen from the buttock and directed into the canal.

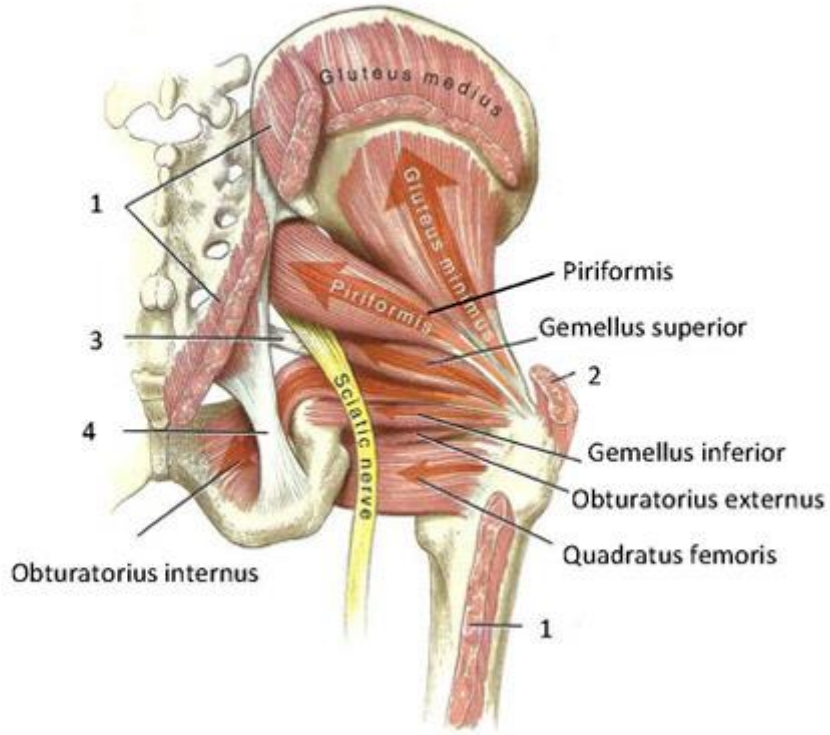
Boundaries The lesser sciatic foramen has the following boundaries:

Anterior: the tuberosity of the ischium
Posterior: the sacrotuberous ligament.
Superior: the spine of the ischium and sacrospinous ligament
laterally: by the concave part of the ischium that lies between the ischial spine and ischial tuberosity

Contents It transmits the following structures:

- the tendon of the Obturator internus
- internal pudendal artery
- internal pudendal vein
- pudendal nerve
- nerve to the obturator internus

Lateral rotaters of the thigh at the hip joint



PIRIFORMIS

Origin; from the ant. Surface of the 2nd,3rd and 4th Sacral vertebrae within the pelvis.

Insertion; the fibers pass downward and laterally through the *greater sciatic foramen* and are attached to the *upper border of the greater trochanter.*

N.supply; ant. Rami of the 1st and 2nd Sacral nerves.

GEMELLUS SUPERIOR.

Origin ; spine of the ischium.

N.supply; n.to the obturater internus.

GEMELLUS INFERIOR

Origin ; upper margin of the ischial tuberosity

Insertion ; with the tendon of the obturater internus.

N.supply; N.to the quadratus femoris from sacral plexus.

OBTURATOR INTERNUS

Origin; from the pelvic surface of the obturater membrane and the surrounding bones.

Insertion; the tendon pass through the lesser sciatic foramen and is joined by the tendon of sup.& inf.gemelli.The common tendon is inserted into the upper border of the greater trochanter.

QUADRATUS FEMORIS

Origin from the lateral border of the ischial tuberosity.

Insertion quadrate tubercle on the intertrochanteric crest of the femur.

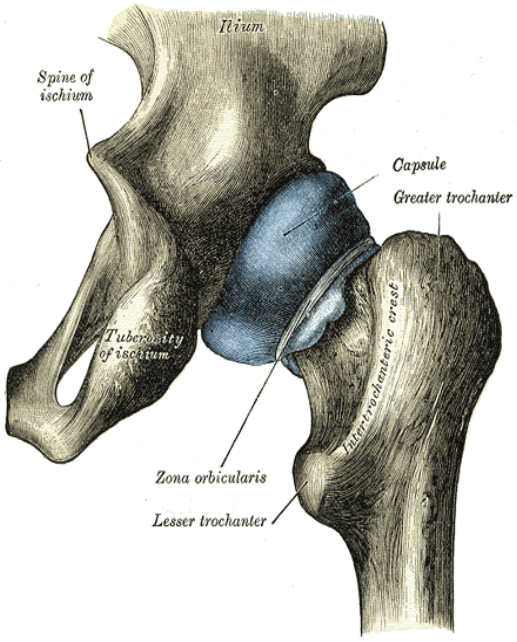
HIP JOINT

- Is a synovial joint of the ball and socket variety between the acetabulum of the hip bone and the head of the femur.
- The articular surface of the acetabulum is inverted u shaped being deficient inferiorly at the acetabular notch.
- The acetabulum is cupped and depened by the acetabular labrum, a rim of fibrocartilage attached to its borders .
- bridging the acetabular notch is the transverse acetabular ligament.

Ligaments :

A) capsule.

- strong and dense, attached *:*
  - ***proximally*** to the acetabular labrum and the edge of the notch.
  - ***distally*** it is attached to the femur along the intertrochanteric line infront and to the neck 1 cm above the intertrochanteric crest from behind.
- some of the capsular fibres turn back medially along the neck and are known as retincula,they carry blood vessels toward the head



B) Capsular thickening.

1-Iliofemoral lig.

is a strong inverted v shaped attached above to the A.I.I.S. and bifuricating inferiorly gain attachment to each end of the intertroghanteric line.

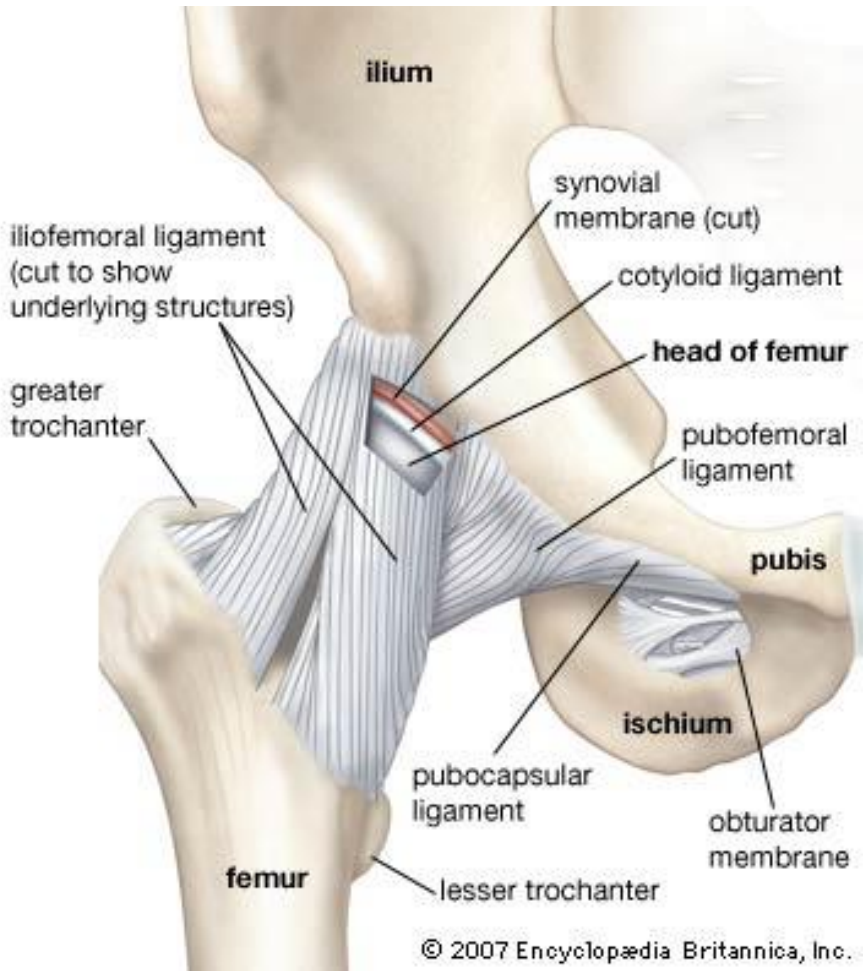
2-Pubofemoral lig.

passes from iliopubic eminence to the lower part of the capsule and under surface of the neck.

3-Ischiofemoral lig.

passes upward from the acetabular margin to the upper end of the intertroghanteric line and the adjacent upper surface of the neck.

The three ligaments are spiral in such away as to limit extension at the joint.

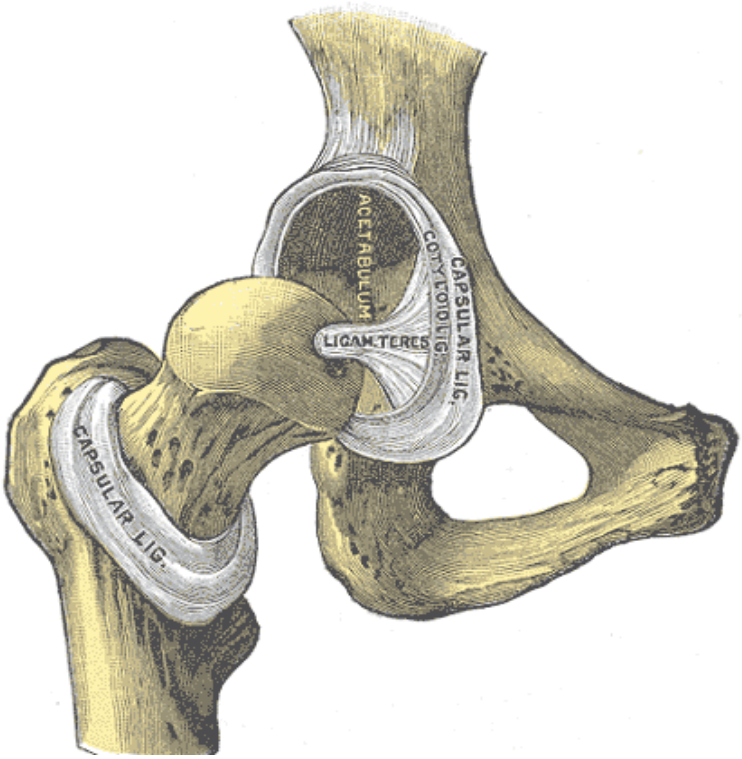


C) Accessory ligaments

1- lig.of the head of the femur (ligamentum teres)

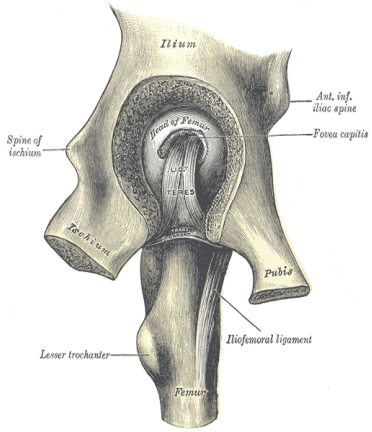
passes from the fovea to the articular notch .it is lax may contain some vessel of special importance in the child.

2-acetabular labrum and transverse acetabular ligament.



Intracapsular structure

- the synovial membrane lines the nonarticular surface of the joint and ensheath the ligamentum teres.
- The cavity of the joint communicate with the psoas bursa between the iliofemoraland pubofemoral lig.



MOVEMENTS The hip joint is capable of :

flexion , extension , abduction , adduction , circumduction , medial and lateral rotation.

- In the anatomical position the line of weight passes behind the axis of the joint and so gravity encourage extension of the joint.

FLEX.

iliopsoas , assisted by tensor fascia lata,rectus femoris , Sartorius , pectineus.

the movement is limited to about 90 degree when the knee is flexed and is much less when the knee is extended because of tension in the hamstring muscles.

EXTEN.

gluteus maximus , assisted by gravity , hamstringand tensor fascia lata.

limited by 3 capsular thickening.

ABDUCT.

gluteus medius and minimus.

ADDUCT.

adductor ms. Of the thigh , gracilis and gravity.

ROTAT.

Occur around an axis joining the center of the head of the femor to the intercondylar notch of the femur.

MED.

ant fibres of gluteus medius and minimus assisted by the iliopsoas.

LAT.

Short lateral rotaters assisted by glut.maximus

STABILITY

In spite of its great mobility it is very stable because :

1- deep cup of the acetabular clasping the femoral head.
2- strong capsule and its thickening particularly iliofemoral lig.
3- large no. of closely applied short articular muscles.

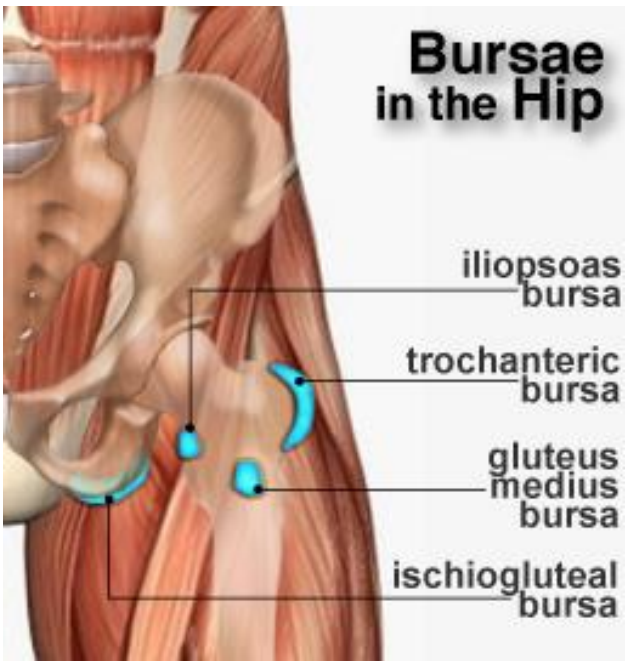
N.SUPPLY

Branches of femoral,obturater and sciatic n.

BURSA

- Three associated with glut.maximus
  1- between tendon of insertion and the greater trochanter.
  2- between tendon of insertion and vast.lateralis.
  3- overlying the ischial tuberosity

- Psoas bursa
  - separate the iliopsoas tendon from the iliac fossa and supr.pubic ramus.
  - it may communicate with the cavity of the hip joint between the iliofemoral and pubofemoral lig.



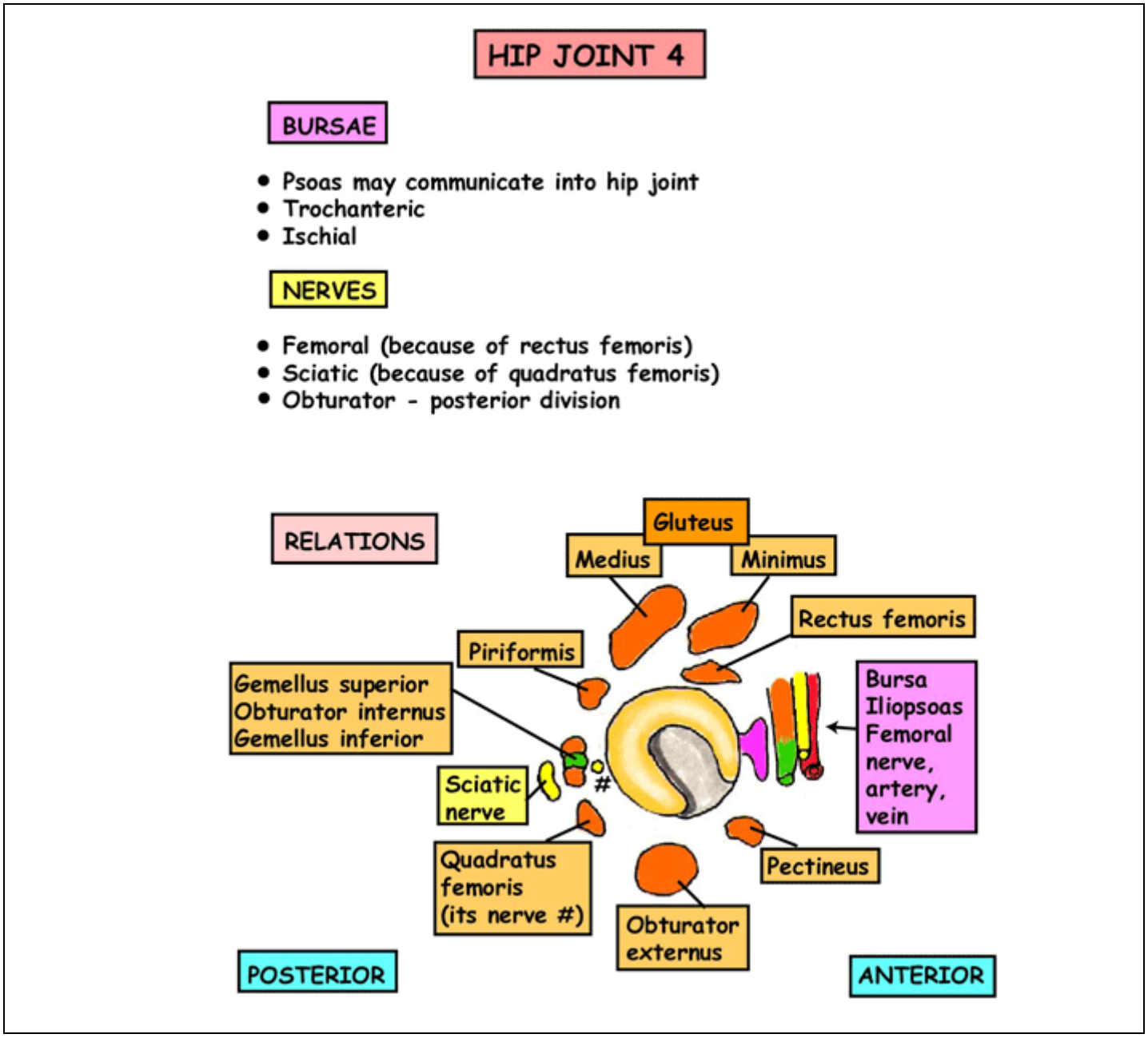
RELATIONS

ANT. iliopsoas,pectineus separate the joint from the femoral vessels and nerve.

POST. piriformis,obturater internus,quadratus femoris separate the joint from the sciatic n. and gluteus maximus.

SUP. gluteus minimus and reflected head of rectus femoris

INF. obturator externus.



BLOOD SUPPLY

- **The *capsule* and *synovial membrane* are supllied from nearby vessels.**

- **The *head* and *intracapsular part of the neck* receive their blood supply from two sources**.

  1-The ligament of the head contains an arterial twig from the *obturater artery*,this vessel supplies the head in the young bone. As age advanced it will supply only thin flake of bone.

  2-The major part of the head is supplied by *arteries in the retincula* which bind down the nuterient arteries that pass chiefly from the trochanteric anastomosis along the neck of the femur.

- Fracture of the femoral neck within the capsular attachment necessarily rupture the retincular fibers and the vessels causing *avascular necrosis of the head.*

ANASTOMOSIS

1. TROCHANTERIC ANASTOMOSIS

This provides the main source of blood supply of the head of the femur. It lies near the trochanteric fossa. It is formed by anastomosis of :

1- descending branch of sup. gluteal A.

2- ascending branches of both lat. and med. femoral circumflex As.

3- inferior gluteal A.

Branches from the anastomosis pass along the femoral neck beneath the retincular fibres of the capsule.

2. CRUCIATE ANASTOMOSIS.

Is situated at the level of the lesser trochanter of the femur. Together with the trochanteric anastomosis provide a connection between *internal iliac and femoral arteries* It is formed by anastomosis of :

1- Inf. gluteal A.

2- Transverse branch of medial circumflex A.

3- Lateral femoral circumflex A.

4- The first perforating artery –a branch of the profunda femoris A.