IN THE NAME OF GOD

Musculoskeletal system

For

parasmedicine student

By

Dr. Saeednia

ANATOMY OF SKELETAL SYSTEM
LOWER LIMB

THE BONES OF THE LOWER LIMB :

THE HIP BONE :

It is a large bone □

It is formed of 3 bones : □

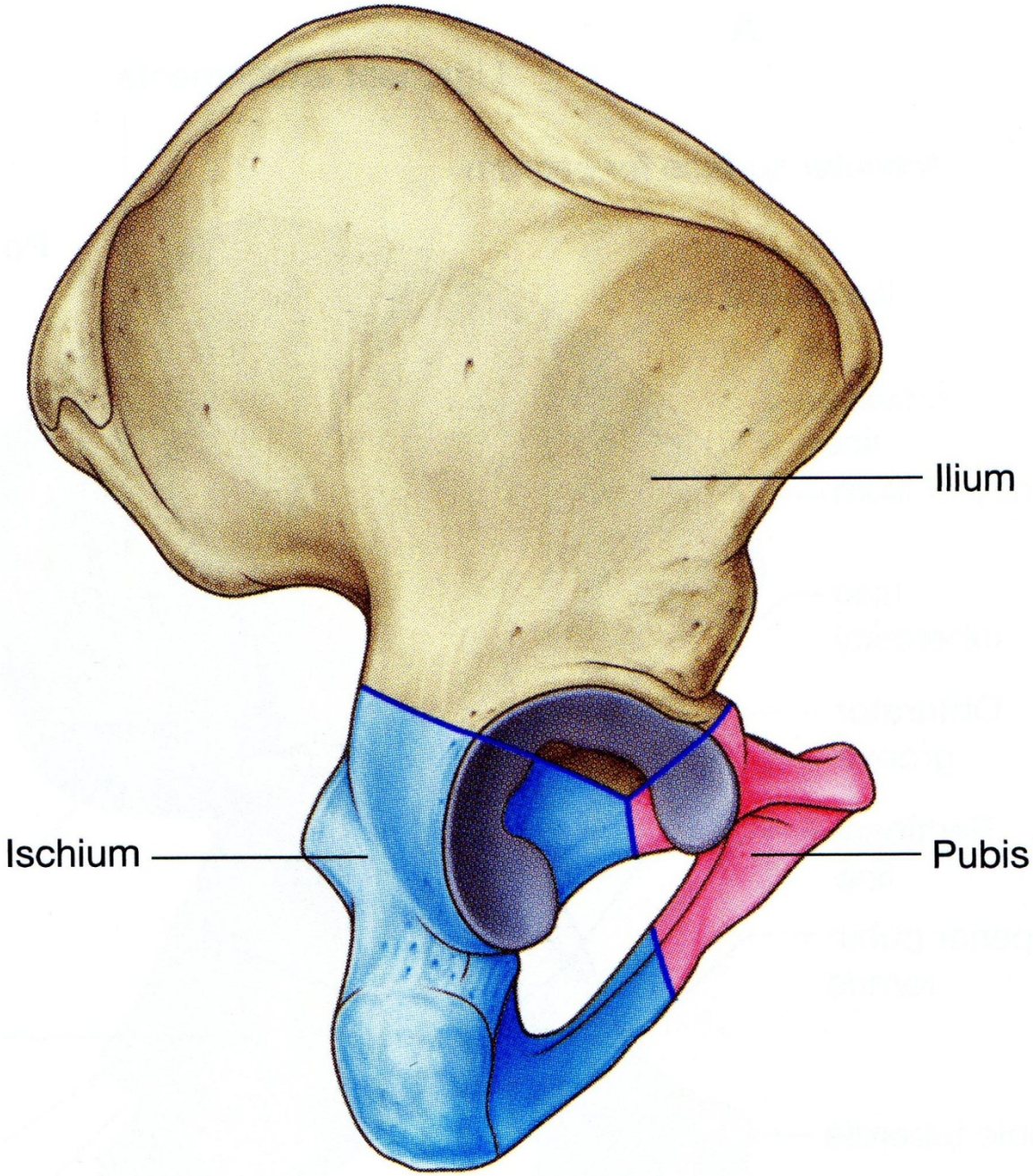
THE ILIUM □

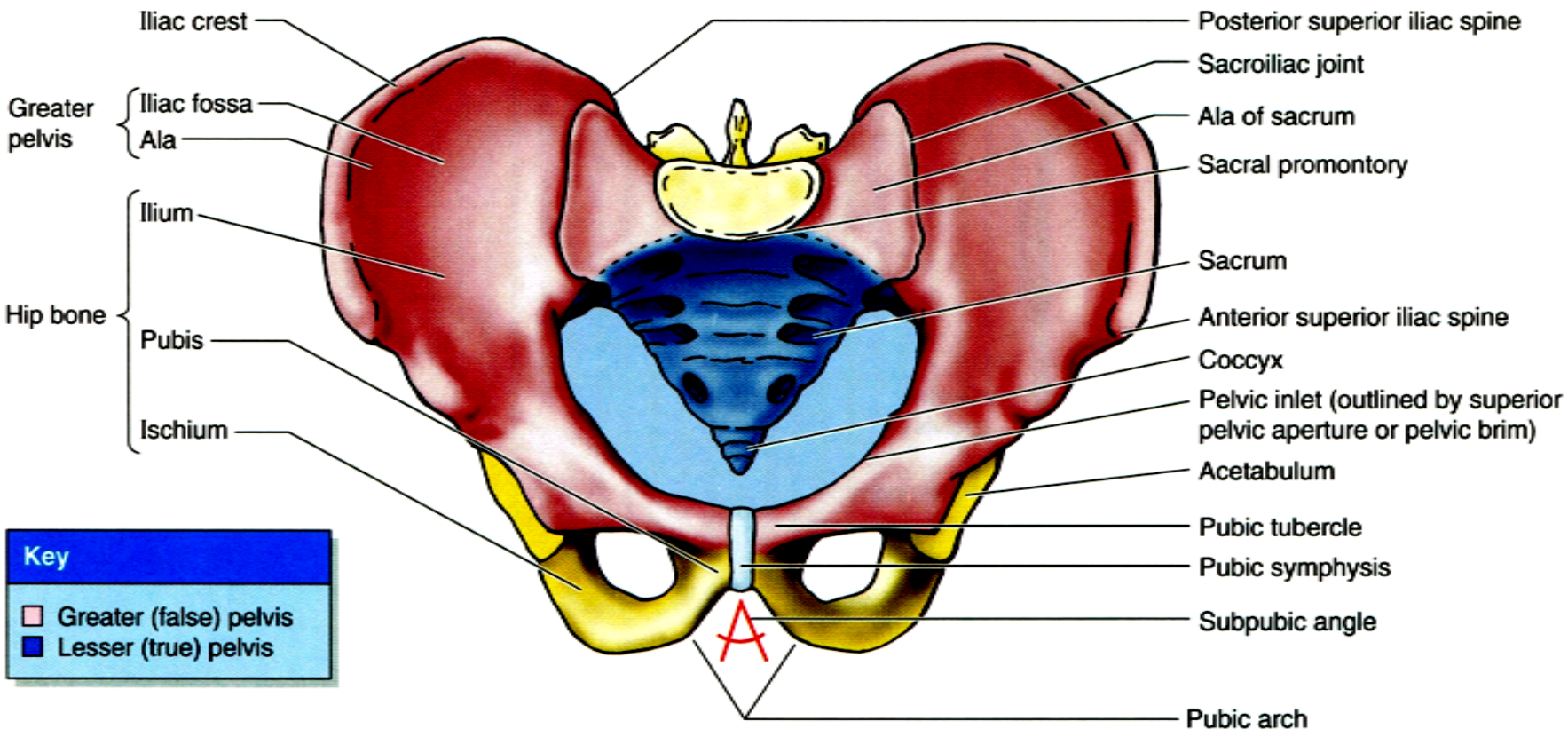
THE ISCHIUM □

THE PUPIS □

There is a large opening below the acetabulum called □ the obturator foramen

Anatomical position □


Ilium
Ischium
Pubis


Iliac crest
Greater pelvis
Iliac fossa
Ala
Hip bone
Ilium
Pubis
Ischium
Key
Greater (false) pelvis
Lesser (true) pelvis
Posterior superior iliac spine
Sacroiliac joint
Ala of sacrum
Sacral promontory
Sacrum
Anterior superior iliac spine
Coccyx
Pelvic inlet (outlined by superior pelvic aperture or pelvic brim)
Acetabulum
Pubic tubercle
Pubic symphysis
Subpubic angle
A
Pubic arch

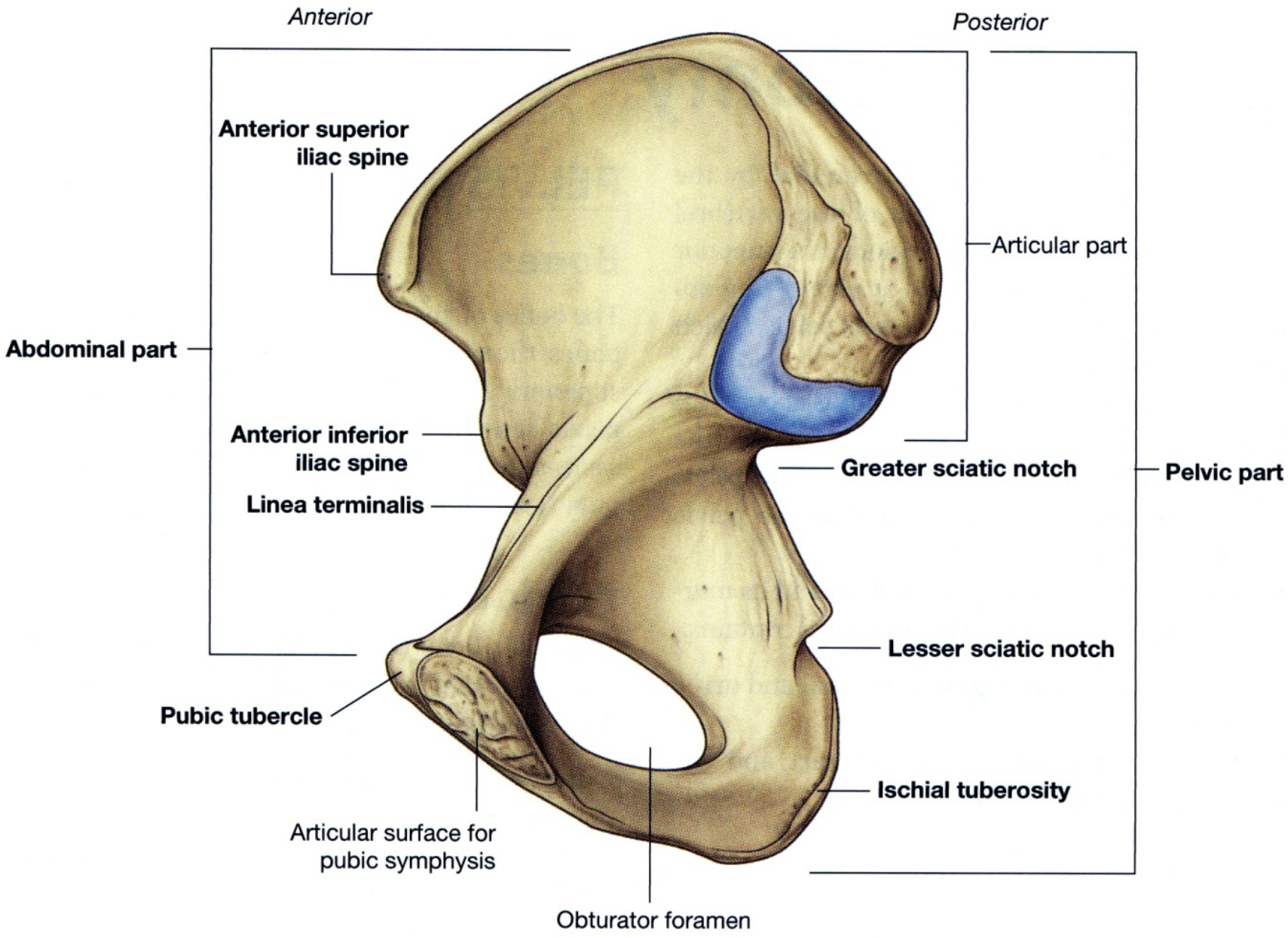
THE HIP BONE

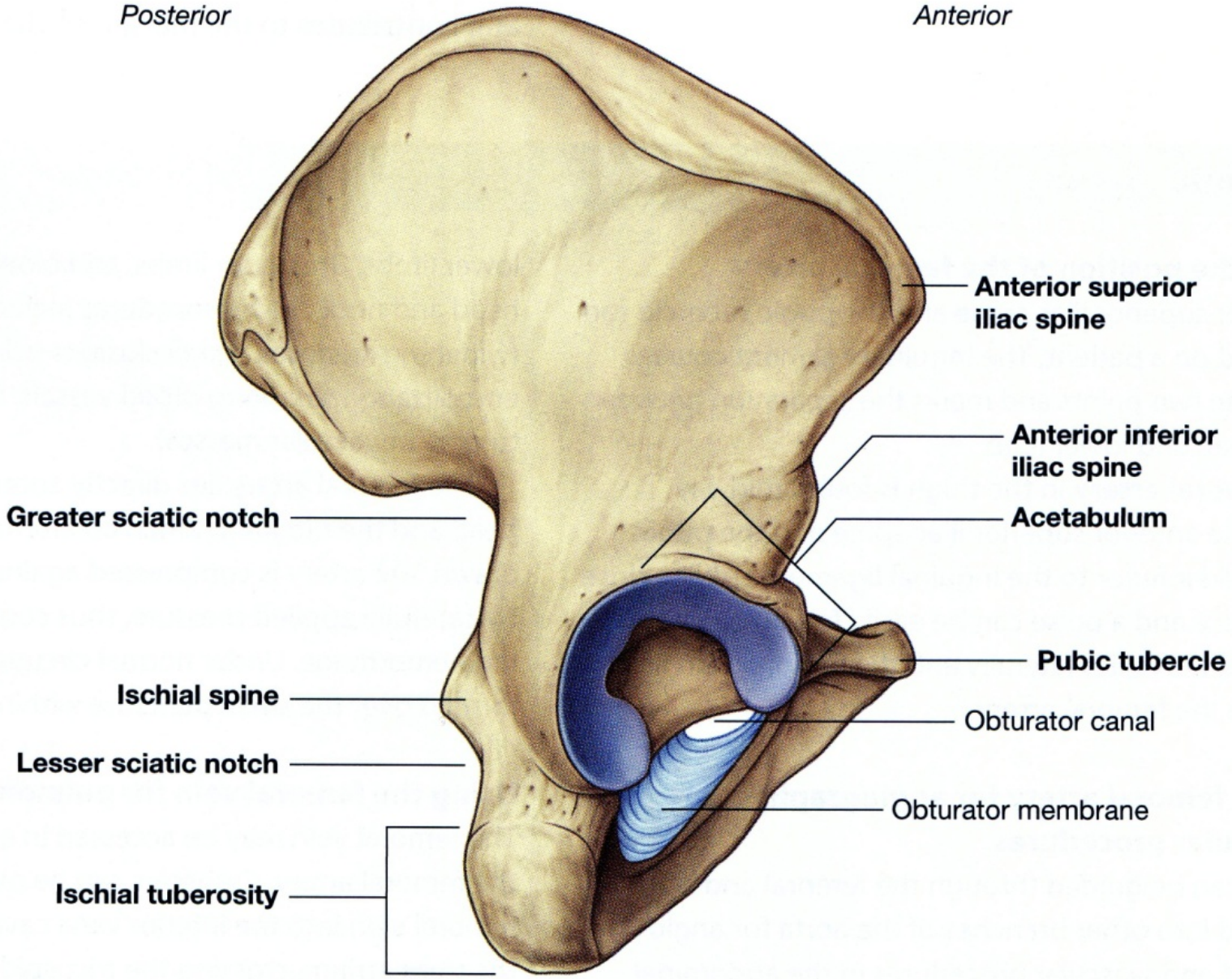
THE ILIUM:

is the upper expanded part of the hip bone

consists of:

- The sup. border called the **iliac crest**
- Small part that attach to pubis and ischum in acetabulum
- Ant. border
- post. border
- Med. Border
- Gluteal surface (**obturator foramen – acetabulum**)
- Iliac surface
- Sacropelvic serface


Anterior
Posterior
Anterior superior iliac spine
Articular part
Abdominal part
Anterior inferior iliac spine
Greater sciatic notch
Pelvic part
Linea terminalis
Lesser sciatic notch
Pubic tubercle
Ischial tuberosity
Articular surface for pubic symphysis
Obturator foramen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Anterior
Anterior superior iliac spine
Anterior inferior iliac spine
Acetabulum
Greater sciatic notch
Pubic tubercle
Ischial spine
Obturator canal
Lesser sciatic notch
Obturator membrane
Ischial tuberosity

The iliac crest

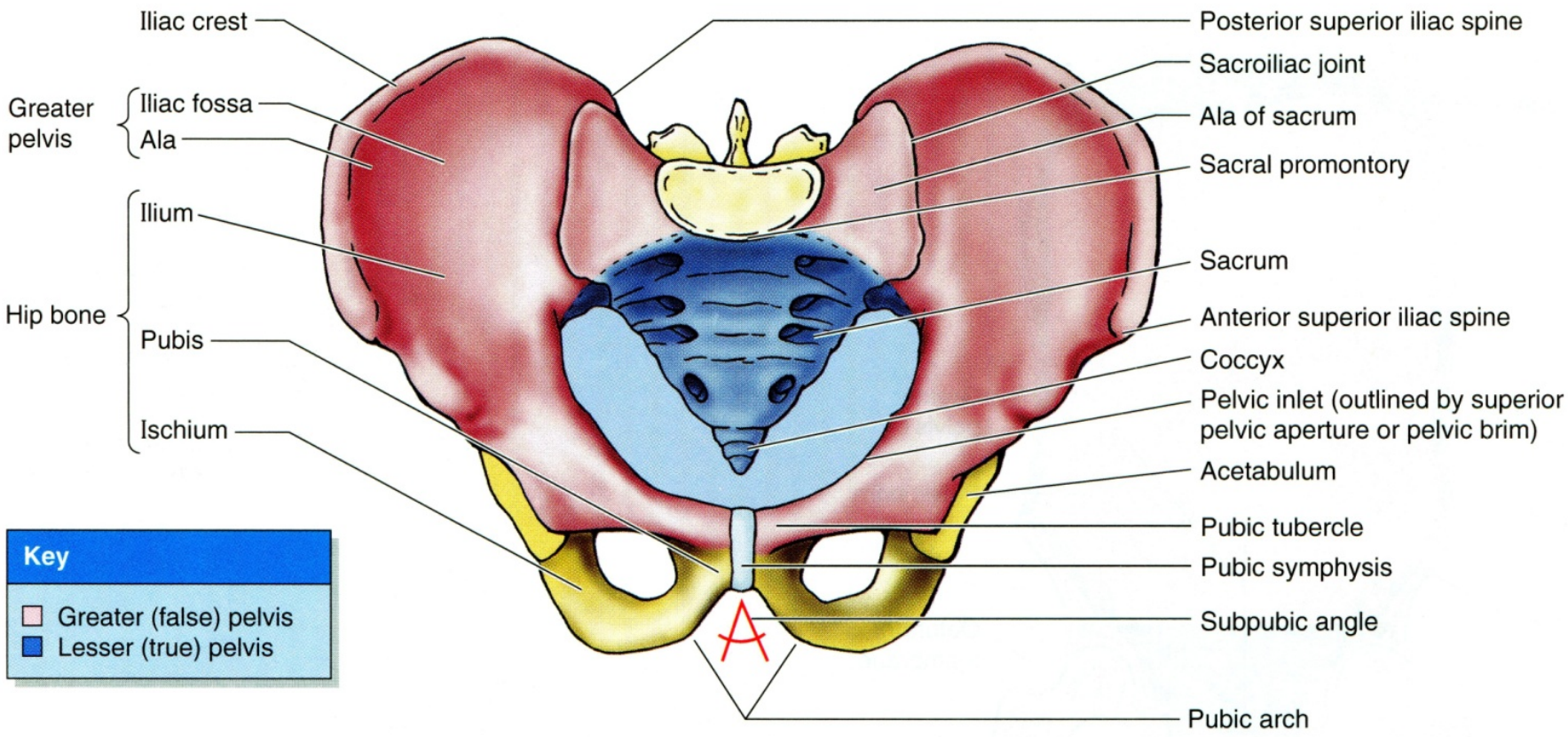
- lies between the Ant .Sup. Iliac Spine & the Post. Sup. Iliac Spine
- ant. 2/3 is thick & convex outward & has inner & outer lips with an intermediate rough area in between
- the post. 1/3 is thin & convex inward & has 2 sloping surfaces separated by bony ridge
- A bony prominence called the tubercle of the iliac crest is on the outer lip 5 cm behind the ant. Sup. Iliac spine.

The ant. border

From Ant .Sup. Iliac Spine to acetabulum

The post. border

From Post. Sup. Iliac Spine to Post. Inf. Iliac Spine then form the greater sciatic notch then be continuous with the post. border of the ischium.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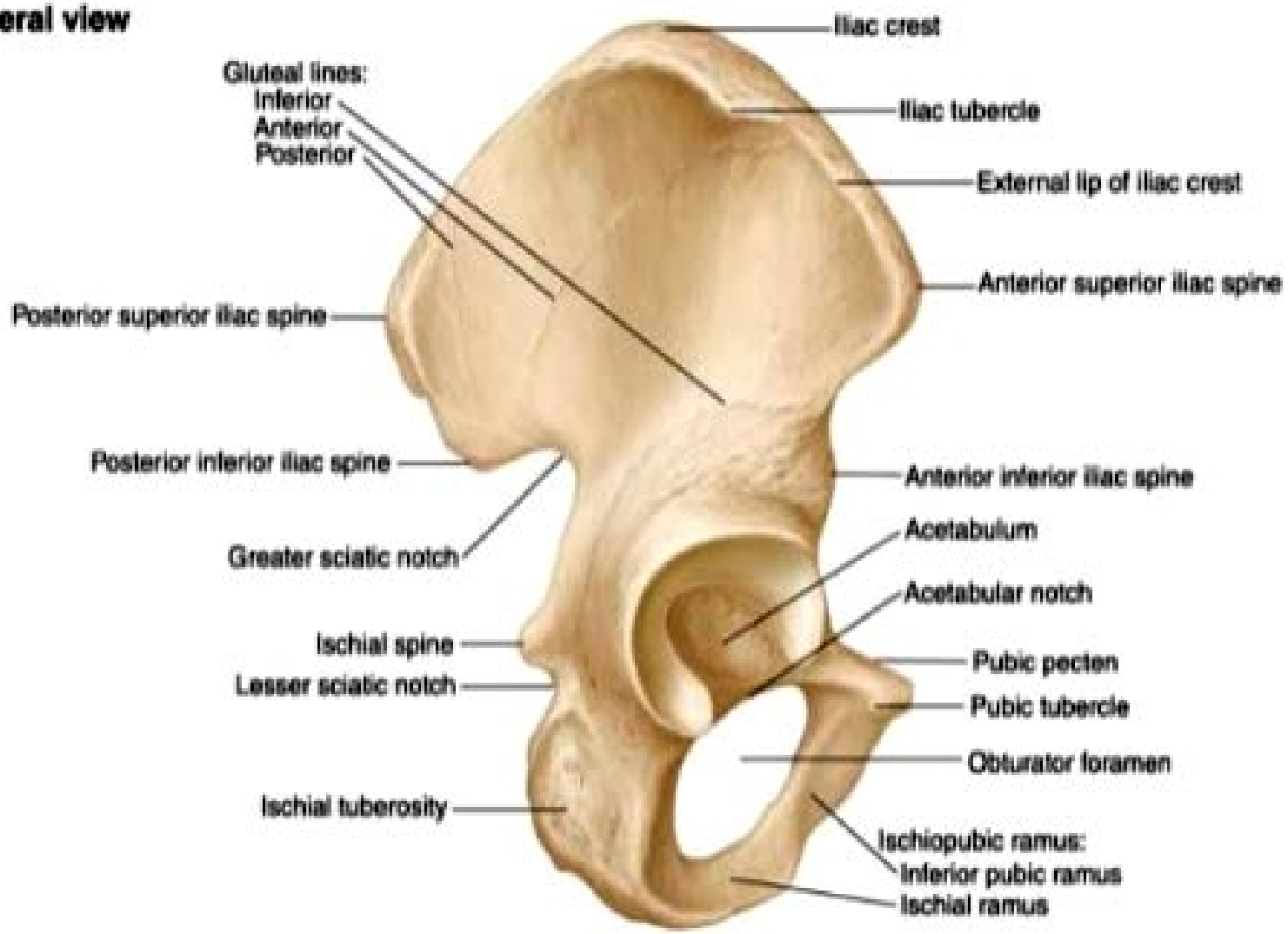
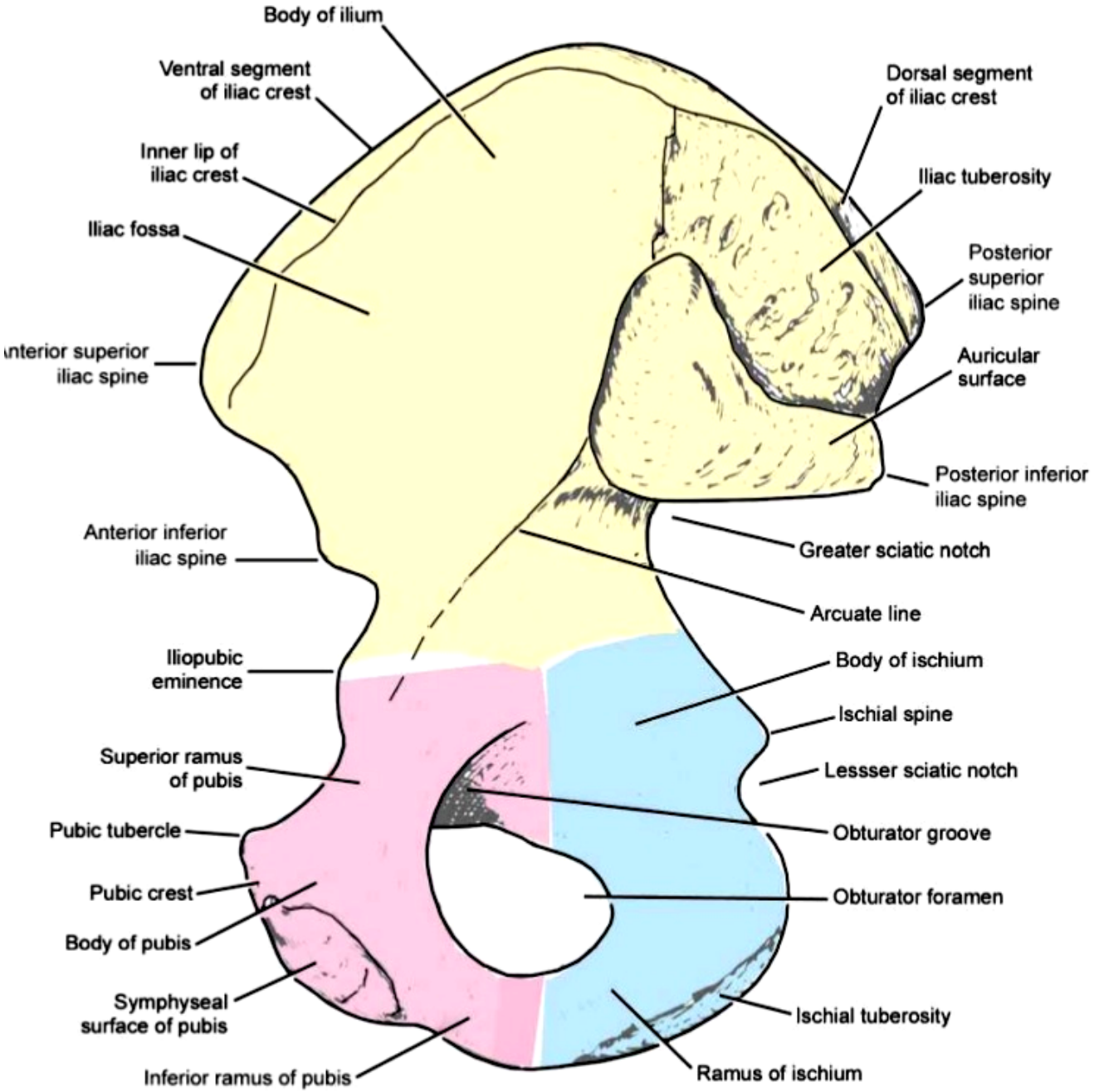
Pelvic inlet (outlined by superior pelvic aperture or pelvic brim)
Acetabulum
Pubic tubercle
Pubic symphysis
Subpubic angle
Pubic arch

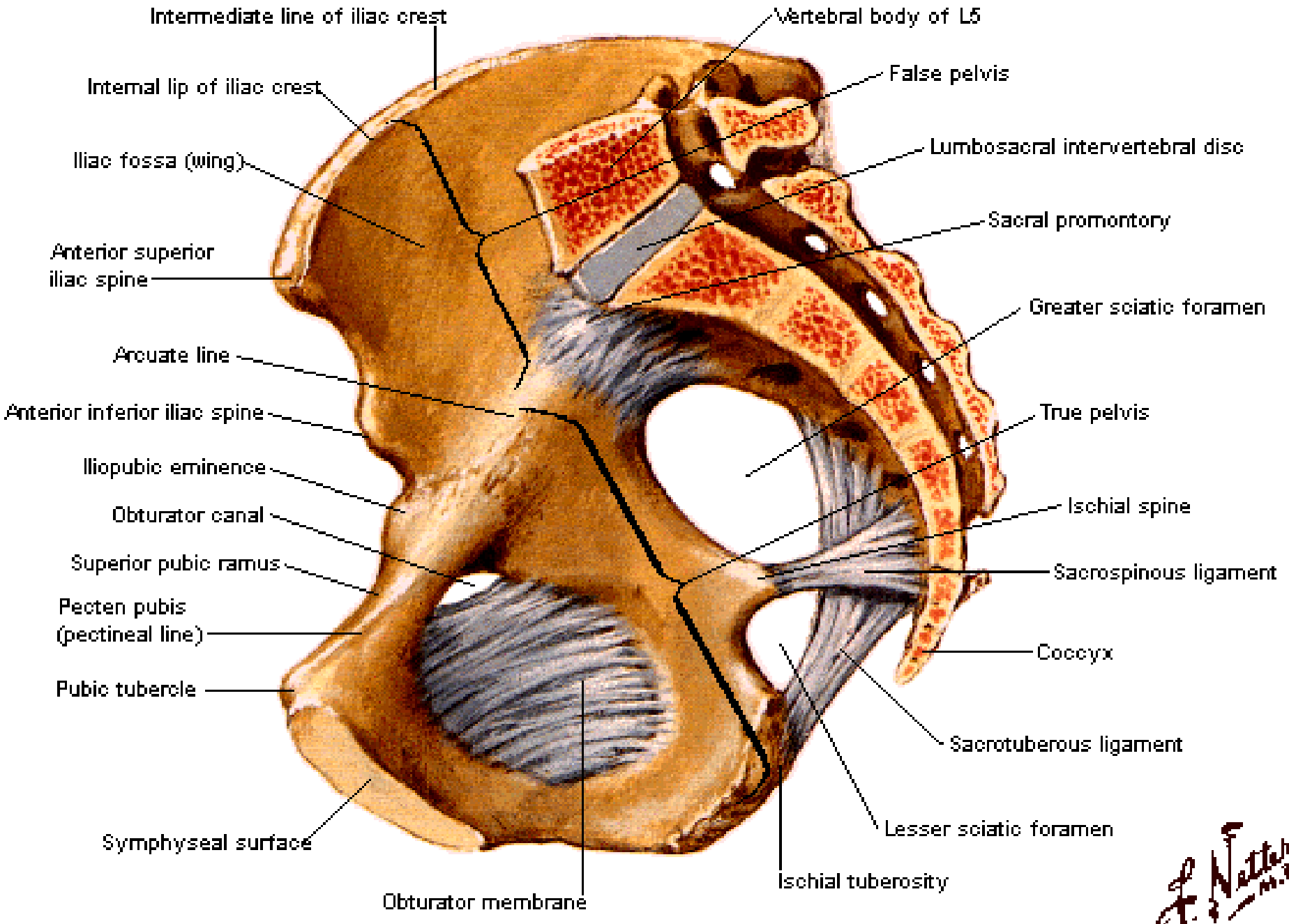
ateral view


Iliac crest
Gluteal lines:
Inferior
Anterior
Posterior
Iliac tubercle
External lip of iliac crest
Anterior superior iliac spine
Posterior superior iliac spine
Posterior inferior iliac spine
Anterior inferior iliac spine
Acetabulum
Greater sciatic notch
Acetabular notch
Ischial spine
Pubic pecten
Lesser sciatic notch
Pubic tubercle
Obturator foramen
Ischial tuberosity
Ischiopubic ramus:
Inferior pubic ramus
Ischial ramus



9.5: Right hip bone, internal aspect

Midsagittal Section

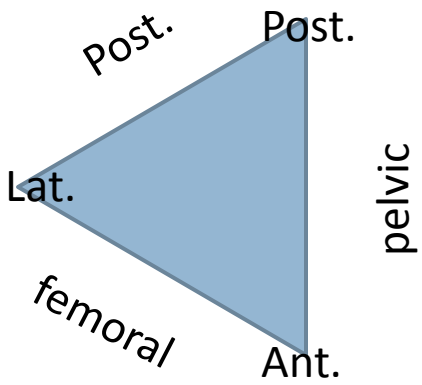


ISCHIUM :

forms lower & post. part of the hip bone

Consists:

- **body**
- **ramus**



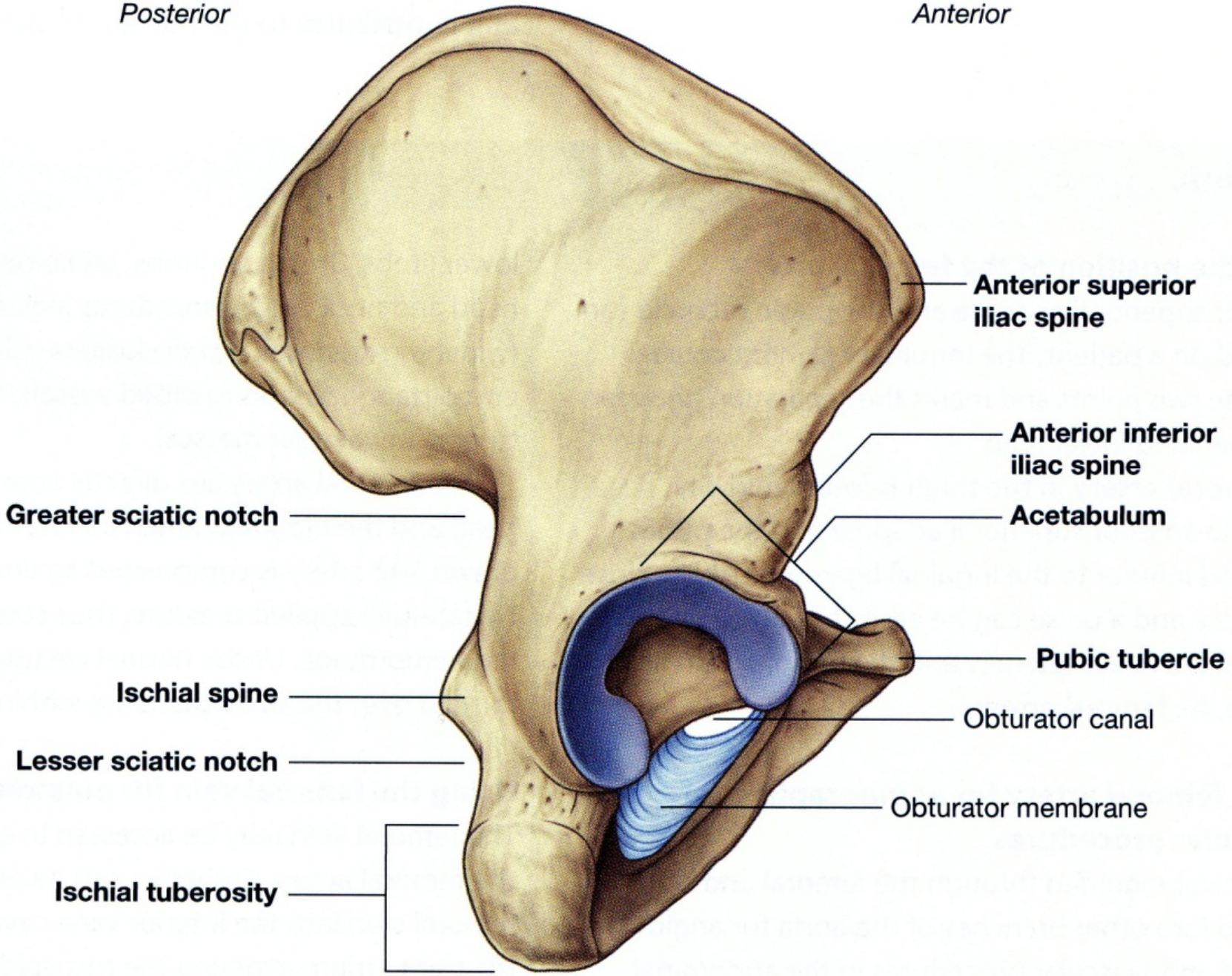
body

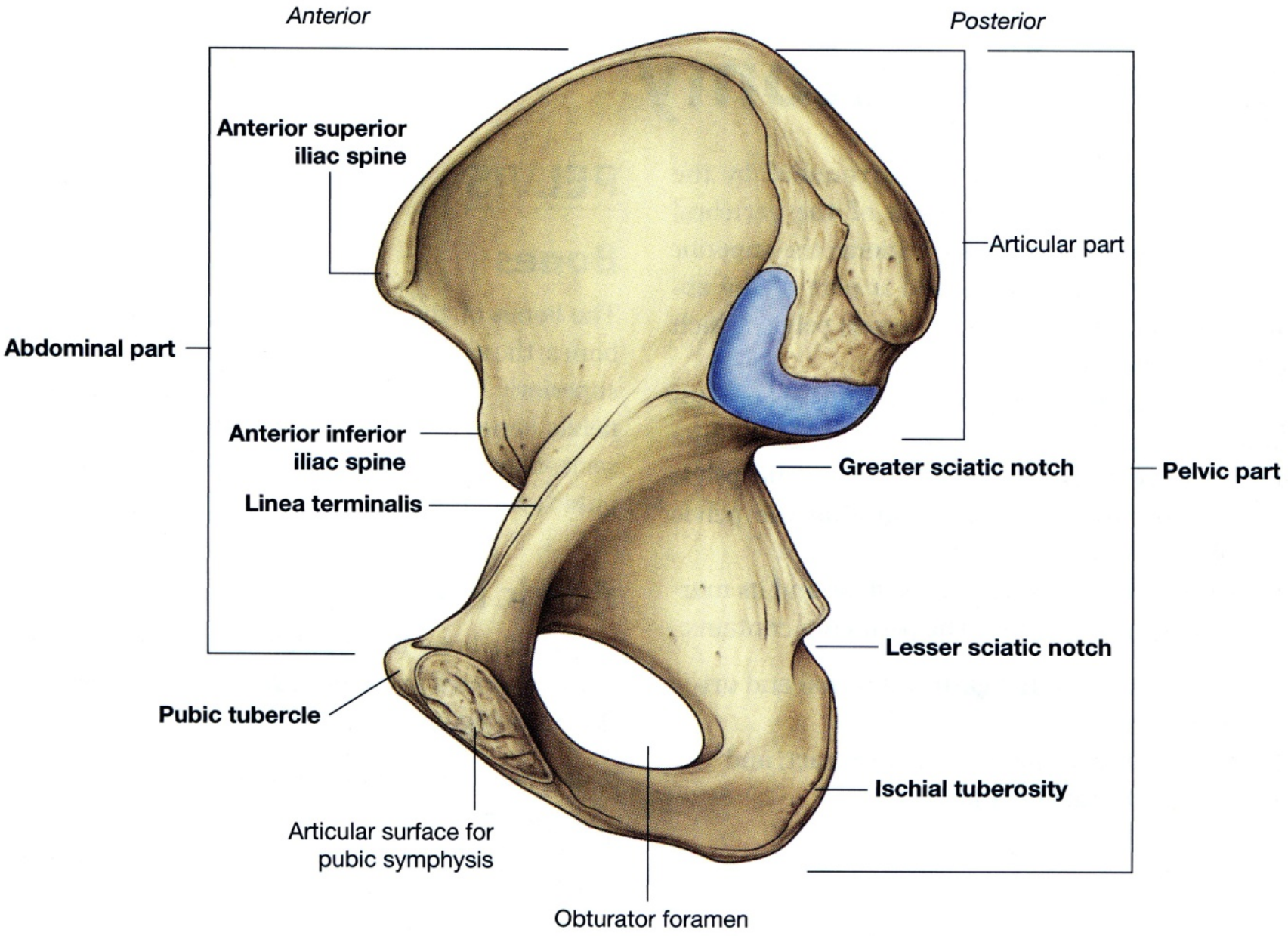
- Sup. (post. Part of acetabulum)
- Inf. (Ischial tubrosity)

post. border of the body is continuous above with the post border of the ilium forming the lower part of the greater sciatic notch, then project to form the ischial spine, & then form the lesser sciatic notch before it form the ischial tuberosity .

Ischial tuberosity:

- Sup. (med. / lat.)
- Inf. (**med.** / lat.) seating


Posterior
Anterior
Anterior superior iliac spine
Anterior inferior iliac spine
Acetabulum
Greater sciatic notch
Pubic tubercle
Ischial spine
Obturator canal
Lesser sciatic notch
Obturator membrane
Ischial tuberosity


Anterior
Posterior
Anterior superior iliac spine
Articular part
Abdominal part
Anterior inferior iliac spine
Greater sciatic notch
Pelvic part
Linea terminalis
Lesser sciatic notch
Pubic tubercle
Ischial tuberosity
Articular surface for pubic symphysis
Obturator foramen

The **ischial tuberosity** is a very strong piece of bone which project from the inf. pole of the body of the ischium .

It divided to 4 parts :

1- sup.lat: semimembransus M.

2-spu.med: semitendenosus & long head of biceps

3-inf. Lat: adductor magnus M.

4-inf. Med: we sit on& does not give origin to any muscles.

ischial ramus

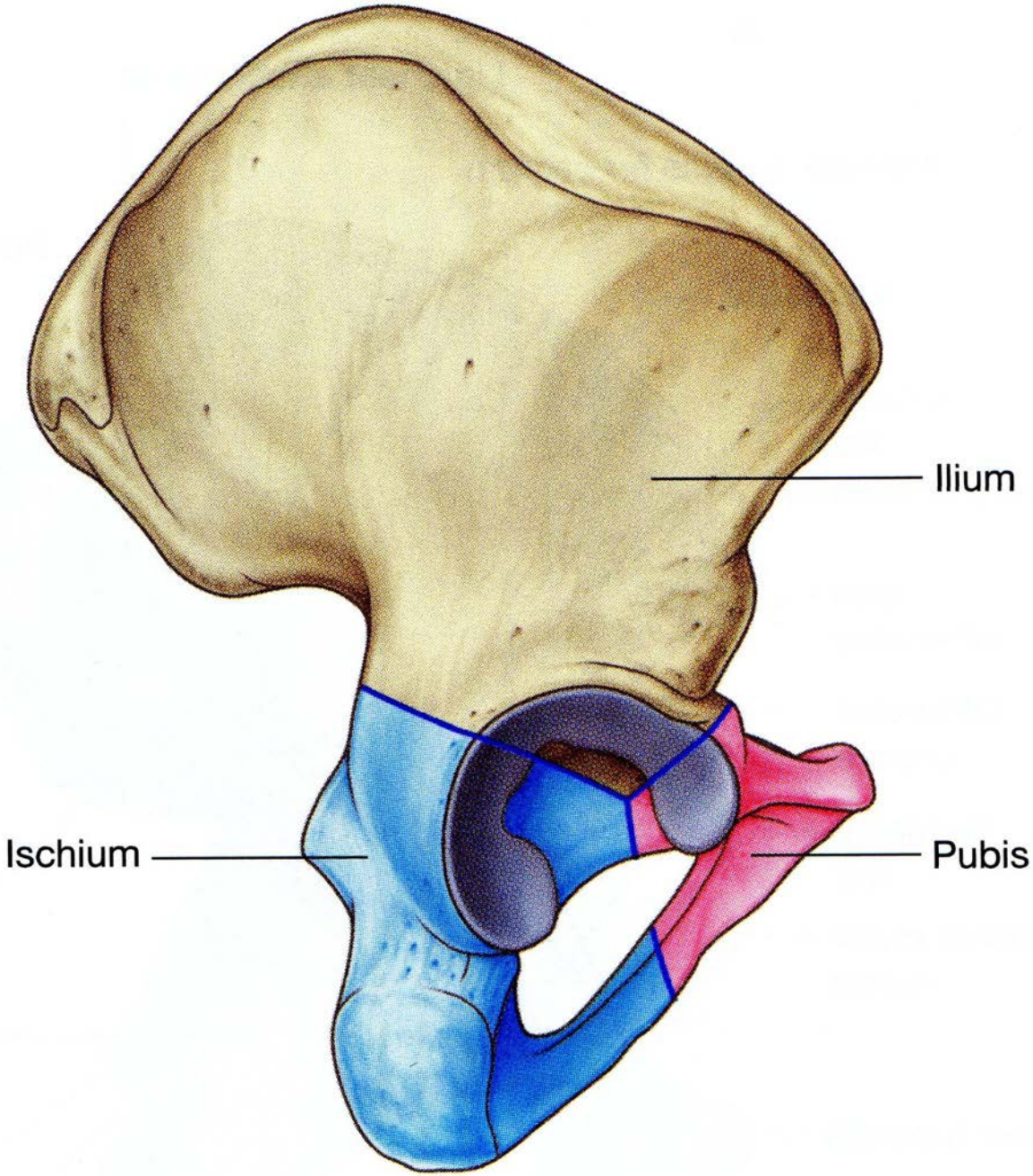
continuous in front with the inf. ramus of the pubis.

Sup. Border

Inf. Border

Int. surface

Ext. surface


Ilium
Ischium
Pubis

PUBIS

forms the lower & ant. Part of the hip bone

Body

Sup. ramus

Inf. Ramus

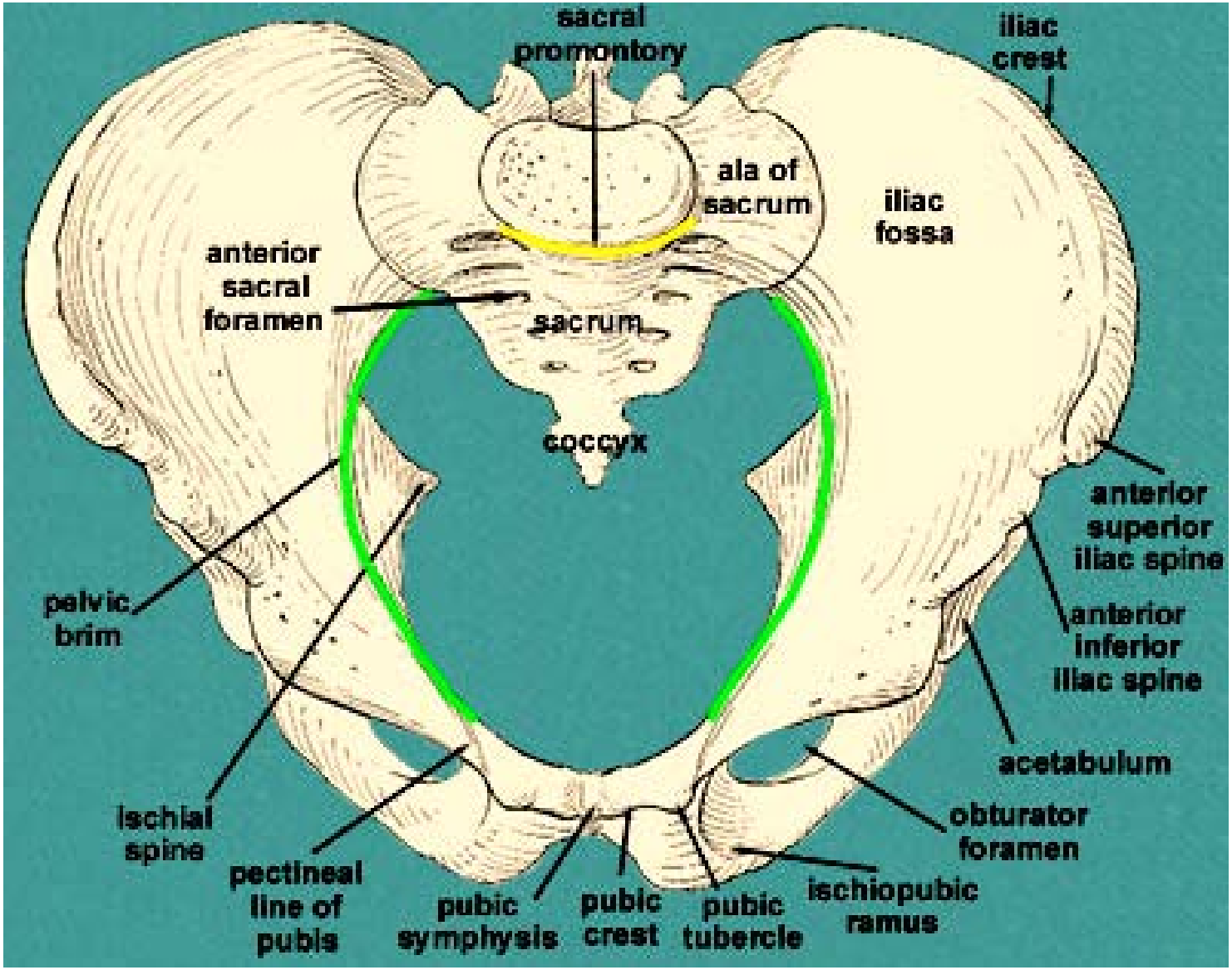
Body

Ant. Surface

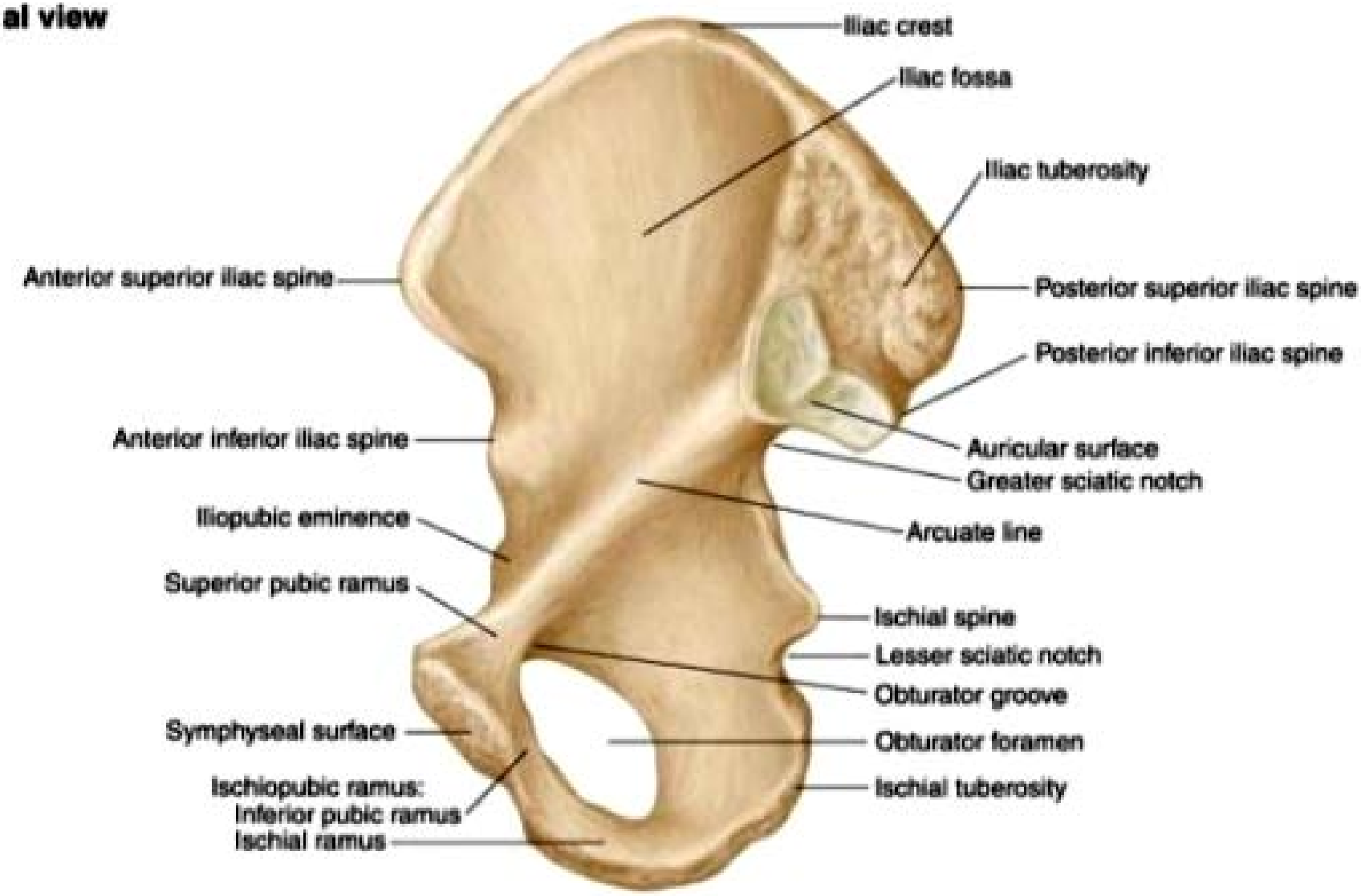
Pos. Surface

Med. Surface (symphysis pubis)

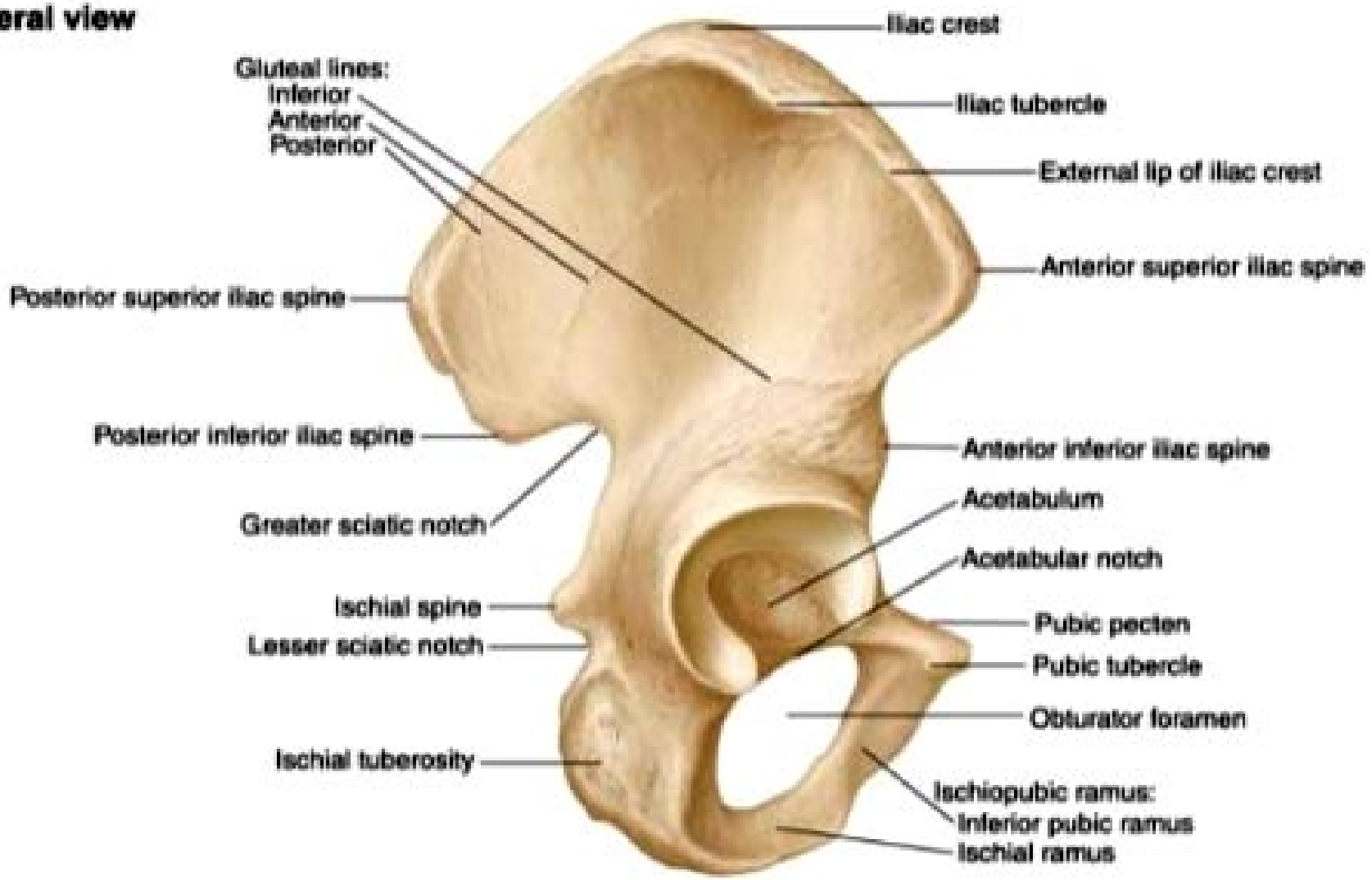
Sup. Border: called the pubic crest & it ends laterlaly by a projection called the pubic tubercle (clinical point).


sacral promontory
iliac crest
ala of sacrum
iliac fossa
anterior sacral foramen
sacrum
coccyx
anterior superior iliac spine
pelvic brim
anterior inferior iliac spine
acetabulum
ischial spine
obturator foramen
pectineal line of pubis
pubic symphysis
pubic crest
pubic tubercle
ischiopubic ramus

al view


Iliac crest
Iliac fossa
Iliac tuberosity
Anterior superior iliac spine
Posterior superior iliac spine
Posterior inferior iliac spine
Anterior inferior iliac spine
Auricular surface
Greater sciatic notch
Iliopubic eminence
Arcuate line
Superior pubic ramus
Ischial spine
Lesser sciatic notch
Obturator groove
Symphyseal surface
Obturator foramen
Ischiopubic ramus:
Inferior pubic ramus
Ischial ramus
Ischial tuberosity

.ateral view


Iliac crest
Gluteal lines:
Inferior
Anterior
Posterior
Iliac tubercle
External lip of iliac crest
Anterior superior iliac spine
Posterior superior iliac spine
Posterior inferior iliac spine
Anterior inferior iliac spine
Acetabulum
Greater sciatic notch
Acetabular notch
Ischial spine
Pubic pecten
Lesser sciatic notch
Pubic tubercle
Obturator foramen
Ischial tuberosity
Ischiopubic ramus:
Inferior pubic ramus
Ischial ramus

Sup. Ramus: is triangular in shape

Pectineal surface

Pelvic surface

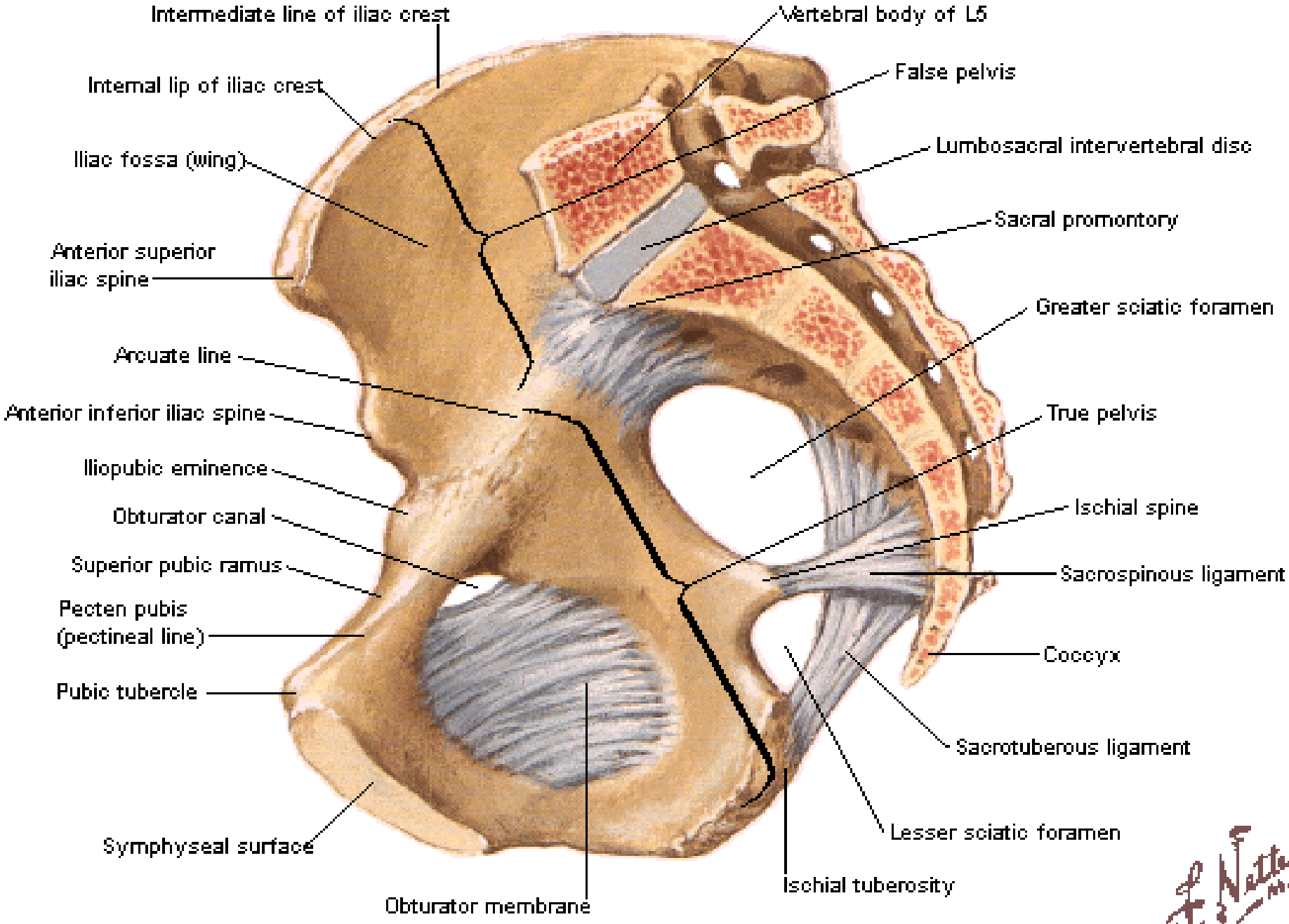
Obturator serface (obturator groove)

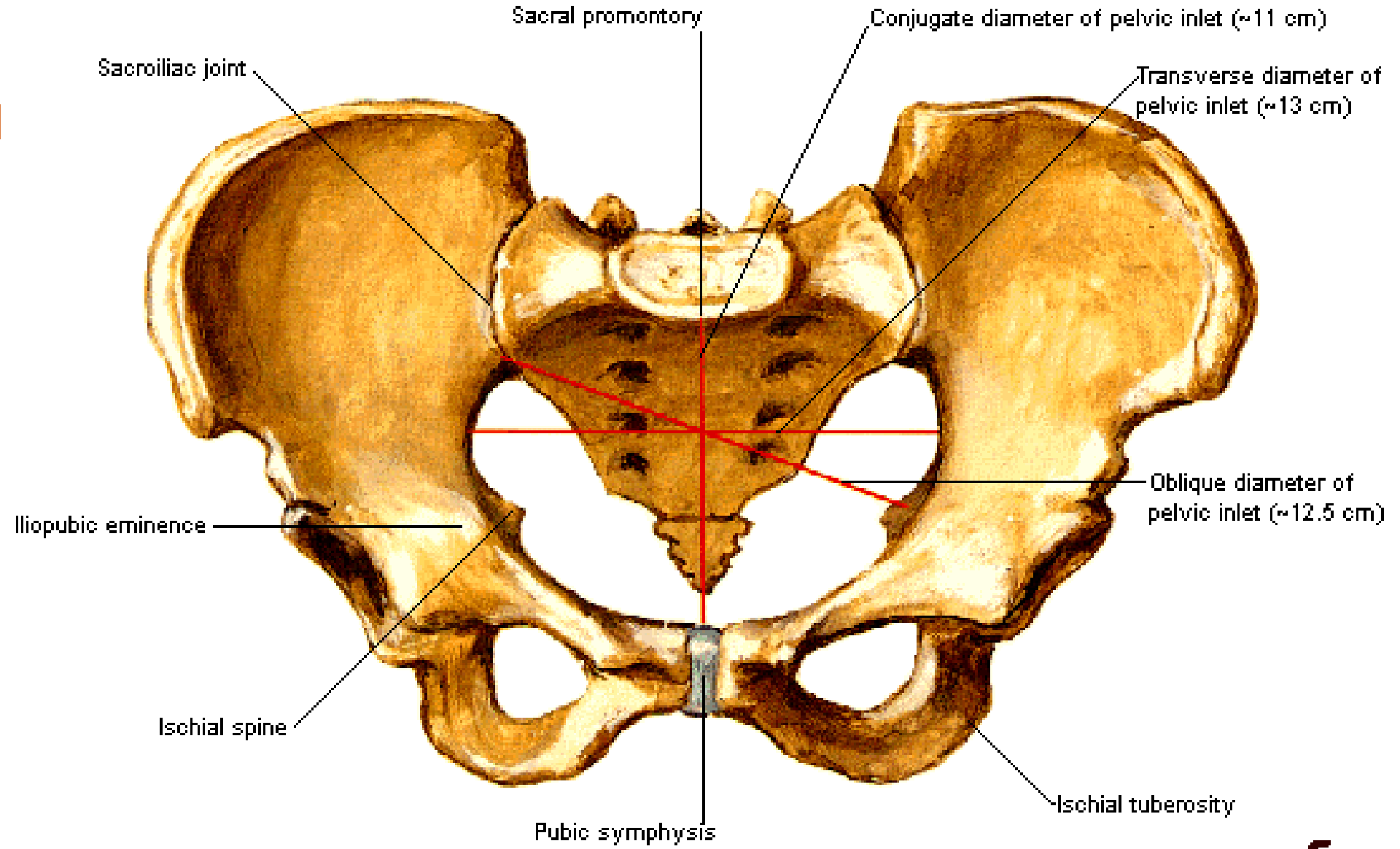
Inf. Ramus: starts at the symphysis pubis & run obliquely downwards & laterally to join the ischial ramus & form together the conjoint (ischio-pubic) ramus.

Int. surface

Ext. surface

Midsagittal Section




Sacral promontory
Conjugate diameter of pelvic inlet (~11 cm)
Sacroiliac joint
Transverse diameter of pelvic inlet (~13 cm)
Oblique diameter of pelvic inlet (~12.5 cm)
Iliopubic eminence
Ischial spine
Ischial tuberosity
Pubic symphysis

Ossification of hip

- Primary:

  - Ilium / 8 week
  - Ischum / 16 week
  - Pubis / 20 week

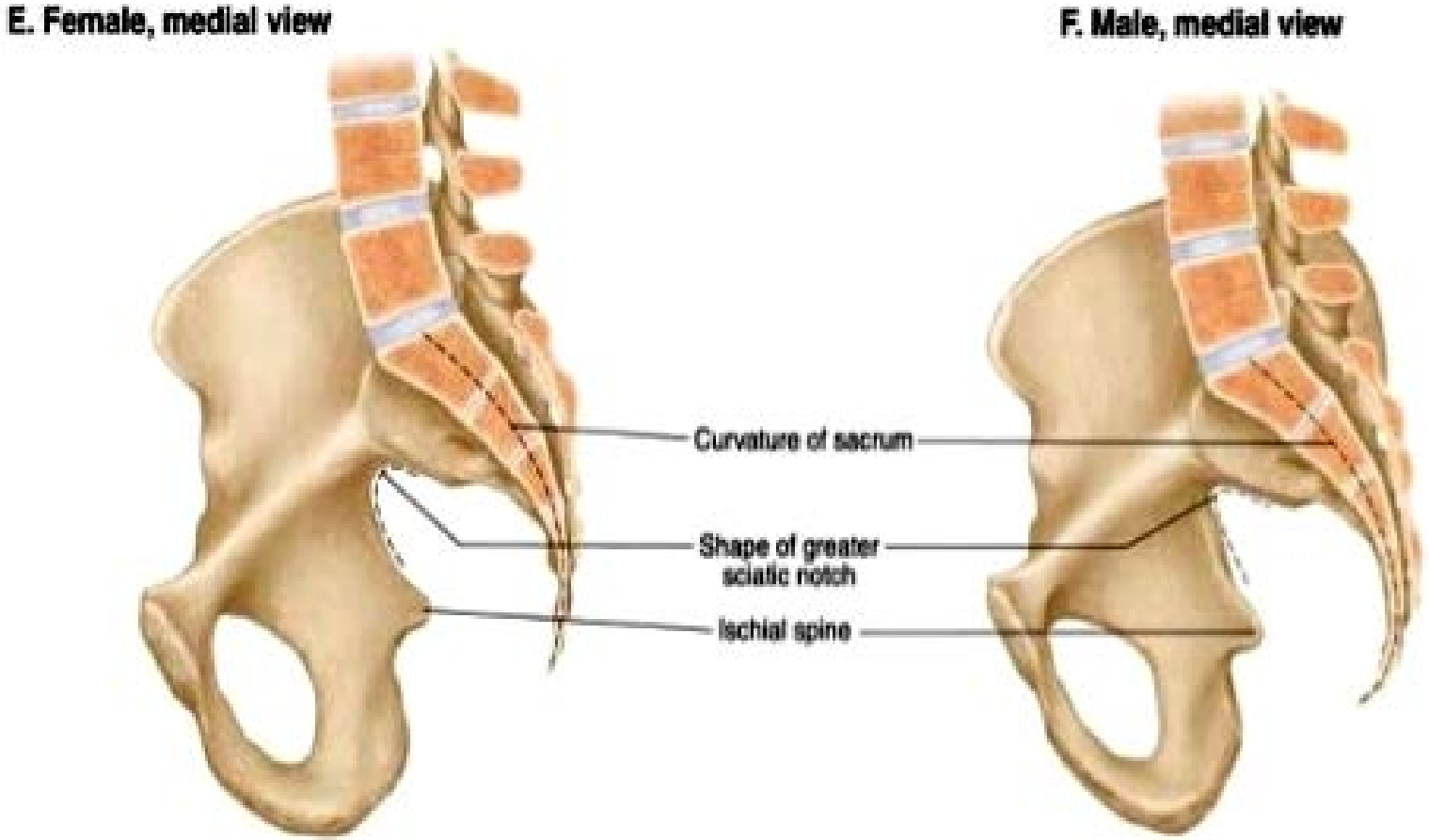
- Secondary: (puberty)

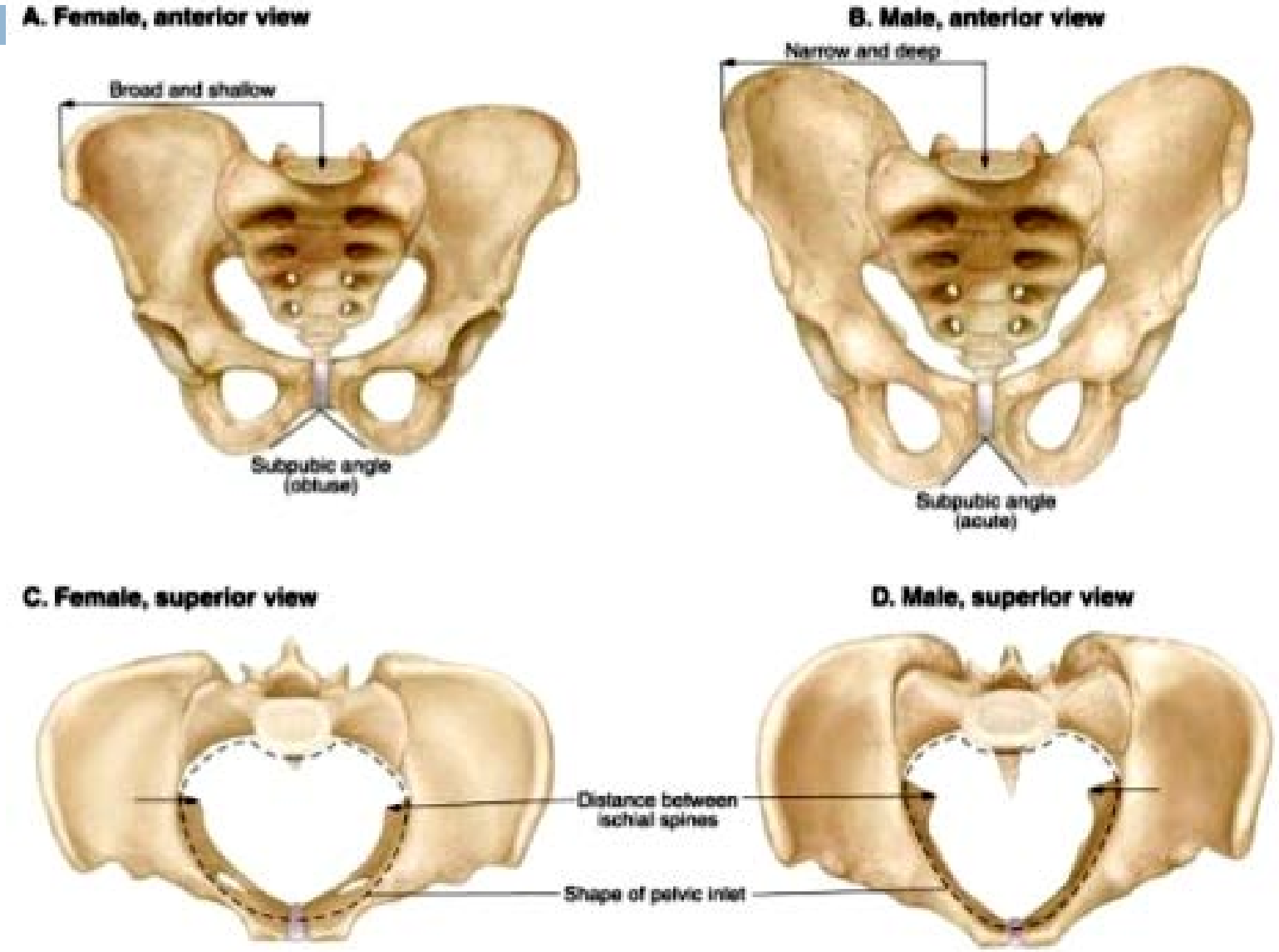
  - 2 center for iliac crest
  - 2 center for Y shape article os acetabulum
  - inf. Border of hip bone & Ischial tubrosity

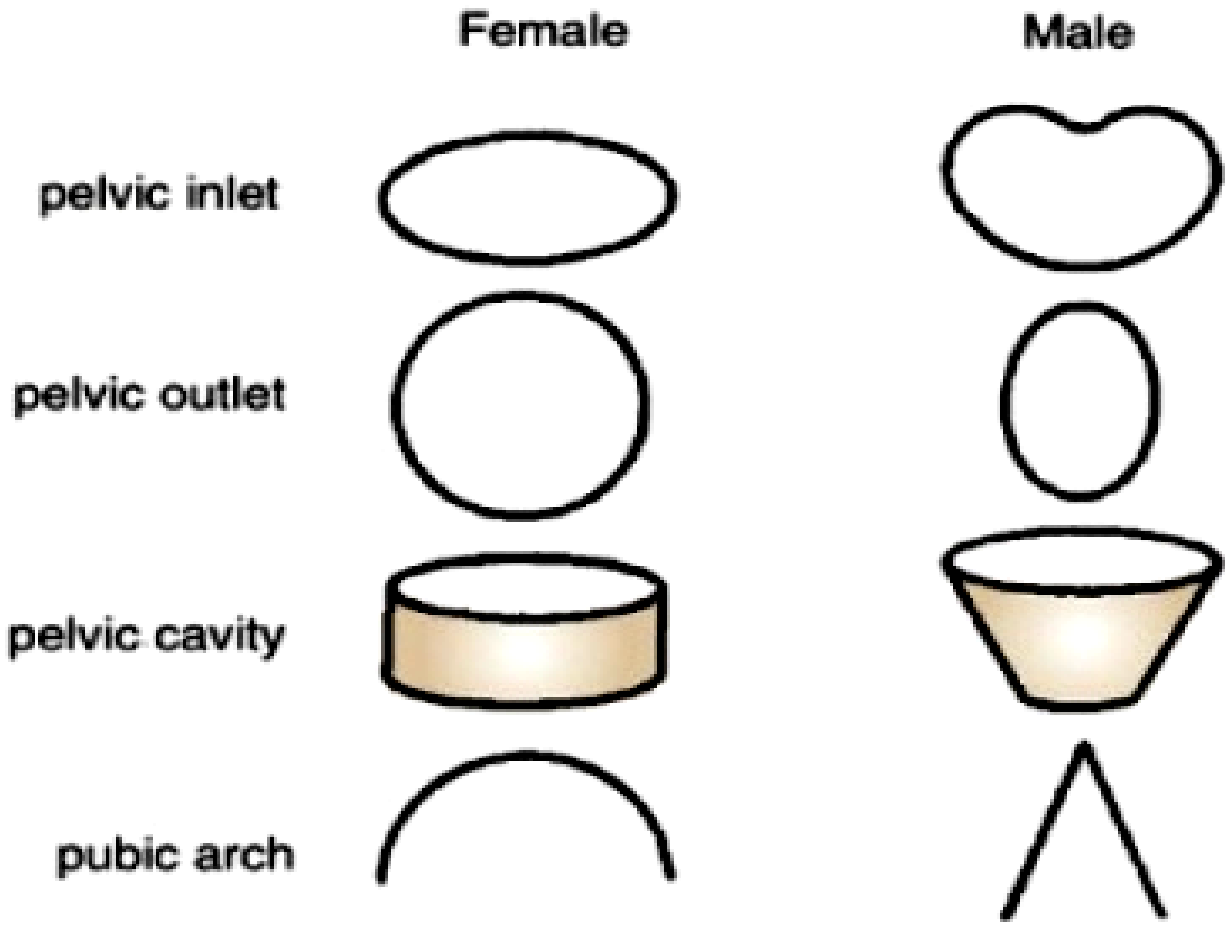
Identify the sex of human

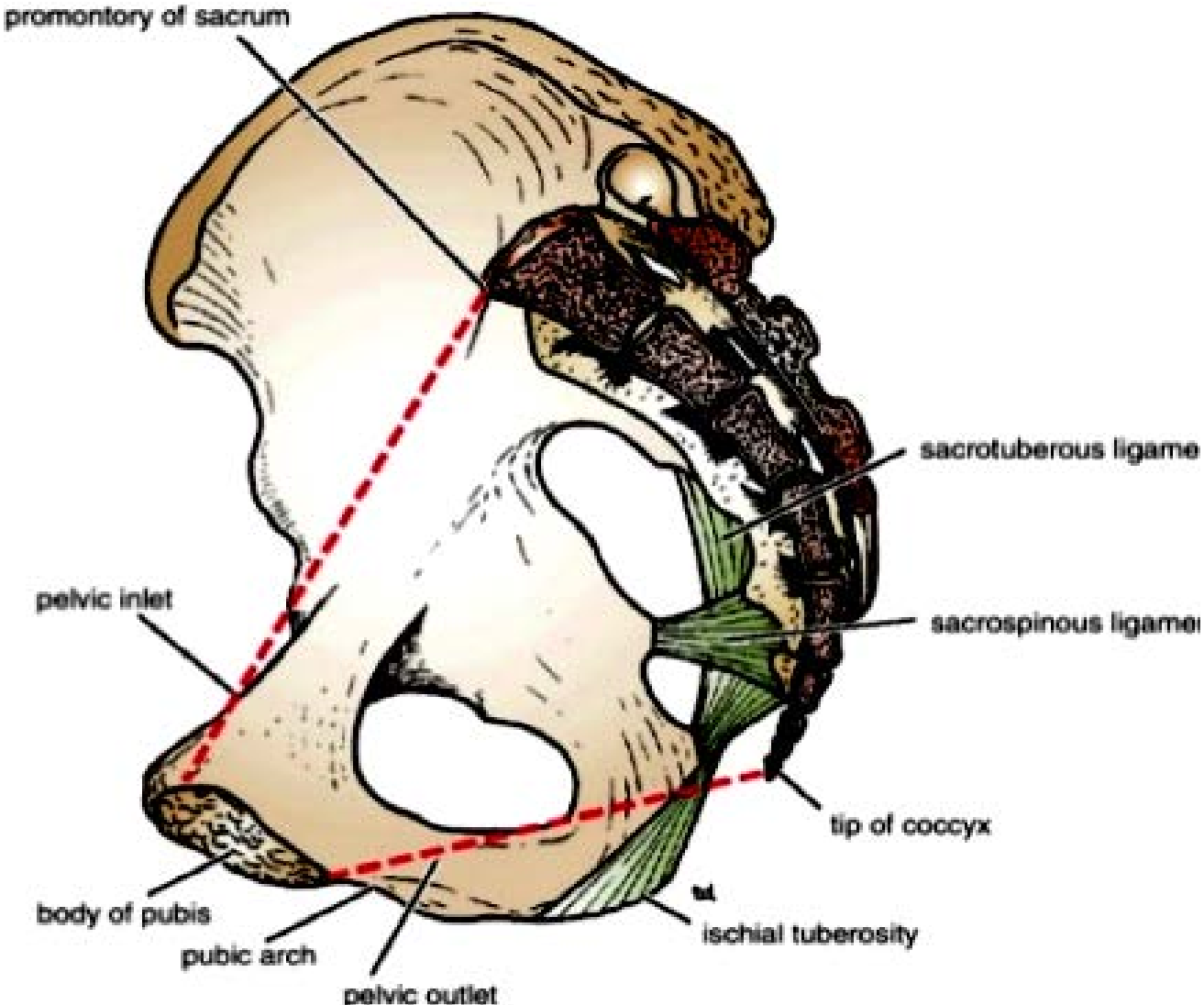
Greater sciatic notch
Acetabulum
Obturator foramen
Ischial spine
Pubic arch
Pelvic inlet
Pelvic outlet

Bony Pelvis	Male (♂)	Female (♀)
General structure	Thick and heavy	Thin and light
Greater pelvis (pelvis major)	Deep	Shallow
Lesser pelvis (pelvis minor)	Narrow and deep	Wide and shallow
Pelvic inlet (superior pelvic aperture)	Heart-shaped	Oval and rounded
Pelvic outlet (inferior pelvic aperture)	Comparatively small	Comparatively large
Pubic arch and subpubic angle	Narrow	Wide
Obturator foramen	Round	Oval
Acetabulum	Large	Small


E. Female, medial view
F. Male, medial view
Curvature of sacrum
Shape of greater sciatic notch
Ischial spine


A. Female, anterior view
Broad and shallow
Subpubic angle
(obtuse)
B. Male, anterior view
Narrow and deep
Subpubic angle
(acute)
C. Female, superior view
D. Male, superior view
Distance between
ischial spines
Shape of pelvic inlet


Female
Male
pelvic inlet
pelvic outlet
pelvic cavity
pubic arch


promontory of sacrum
sacrotuberous ligame
pelvic inlet
sacrospinous ligame
tip of coccyx
body of pubis
ischial tuberosity
pubic arch
pelvic outlet

Femur

- It is the longest & strongest bone in the body
- It is formed of:

  - upper end
  - shaft (body)
  - lower end.

- ***Anatomical position***

Upper end

Head

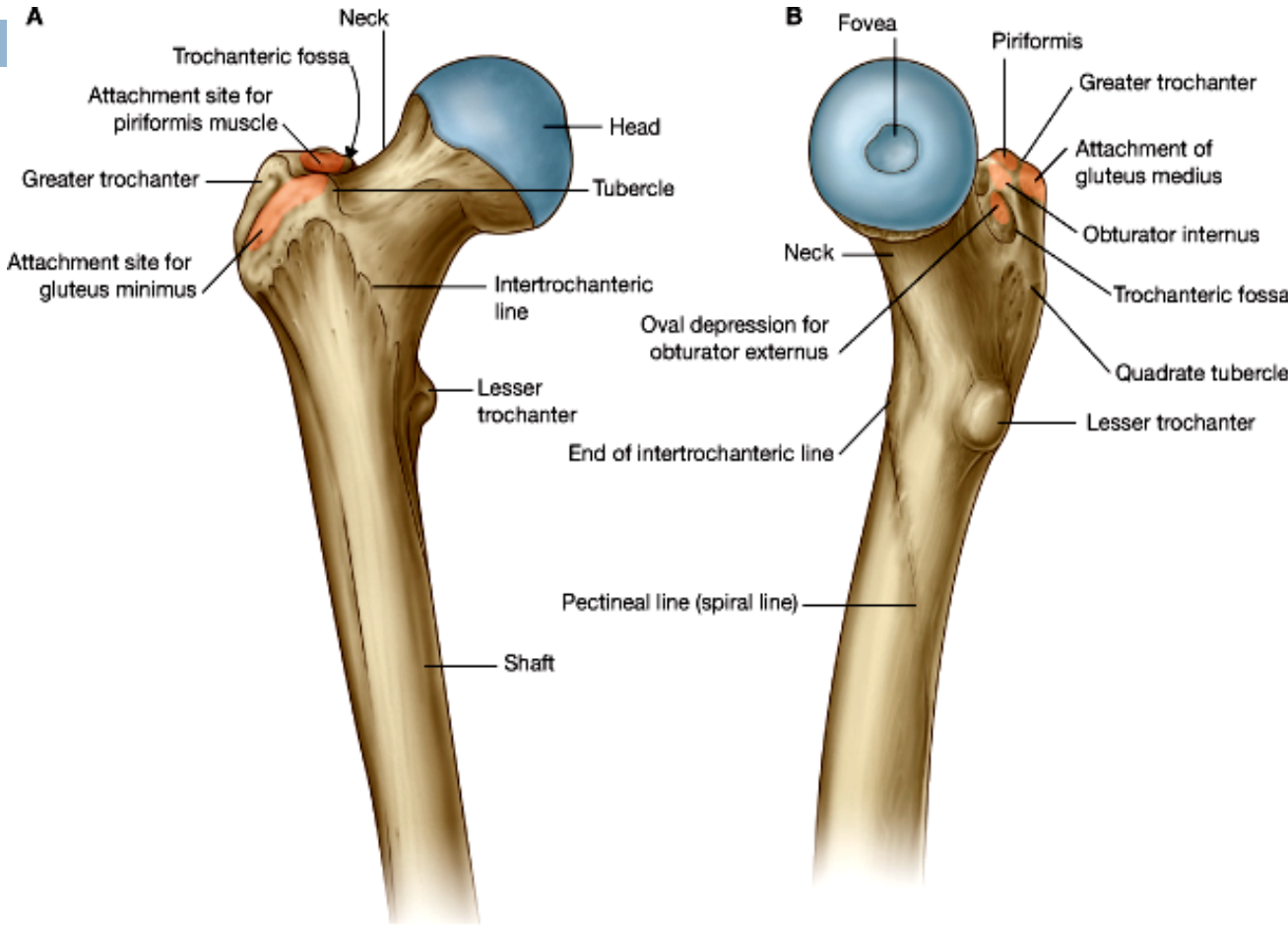
Neck

greater trochanter

lesser trochanter

Intertrochanteric line

Intertrochanteric crest

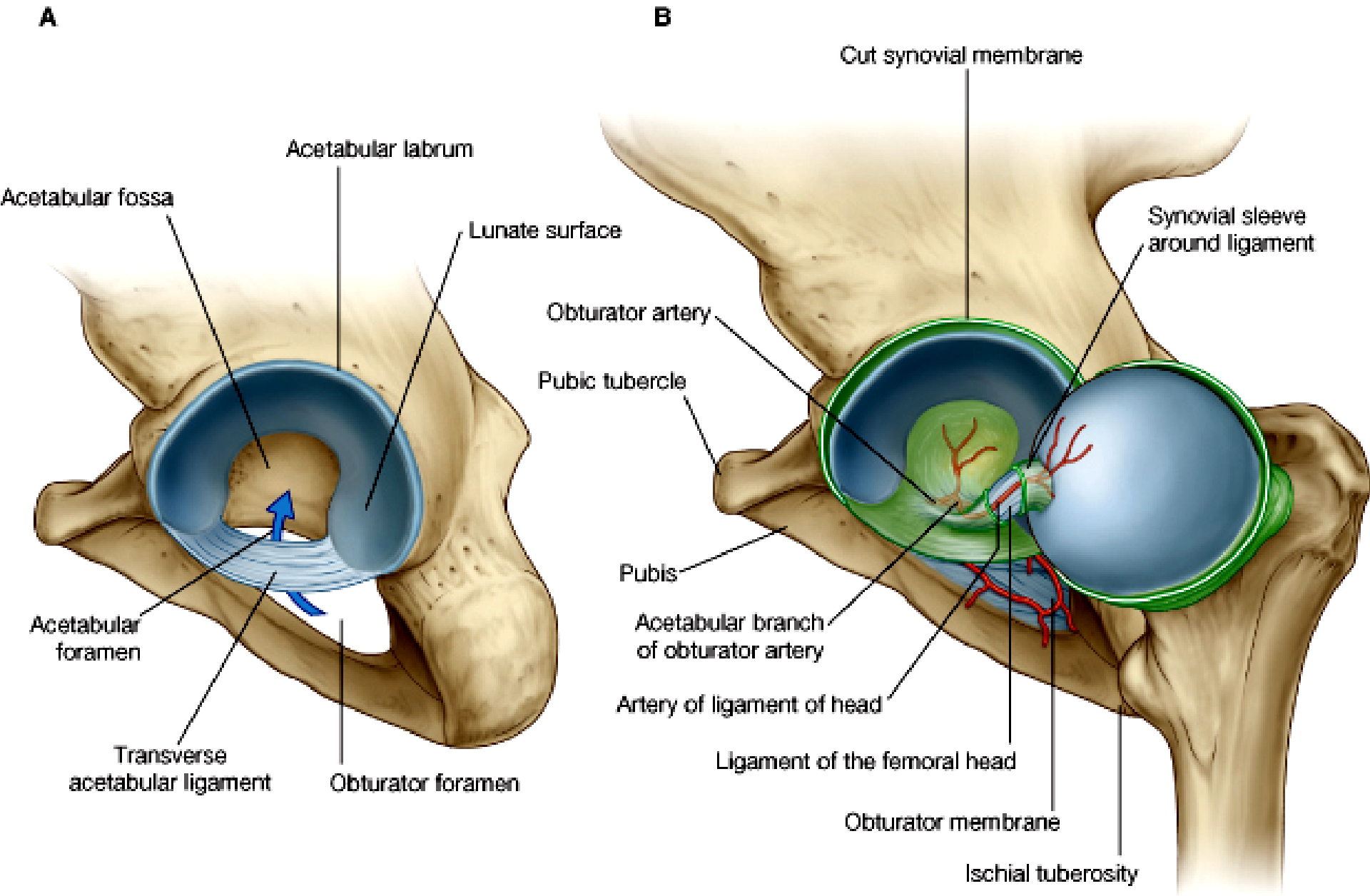


Head

- is less than 2/3 of sphere & faces upwards forwards & medially
- In life it is covered by a cartilage except with central depression called the fovea where the round lig. is attached.

Neck

- is 5 cm long & connect the head with the shaft
- It forms an angle 125 ° with the axis of the shaft
- This angle is smaller (i.e. more acute) in the female (who has wide pelvis) than in male
- In children this angle is 150°



Greater trochanter

is a large quadrangular piece of bone lies at the lateral & upper part of the junction between the neck & the shaft
In its medial surface there is deep depression called the trochantric fossa

Lesser trochanter

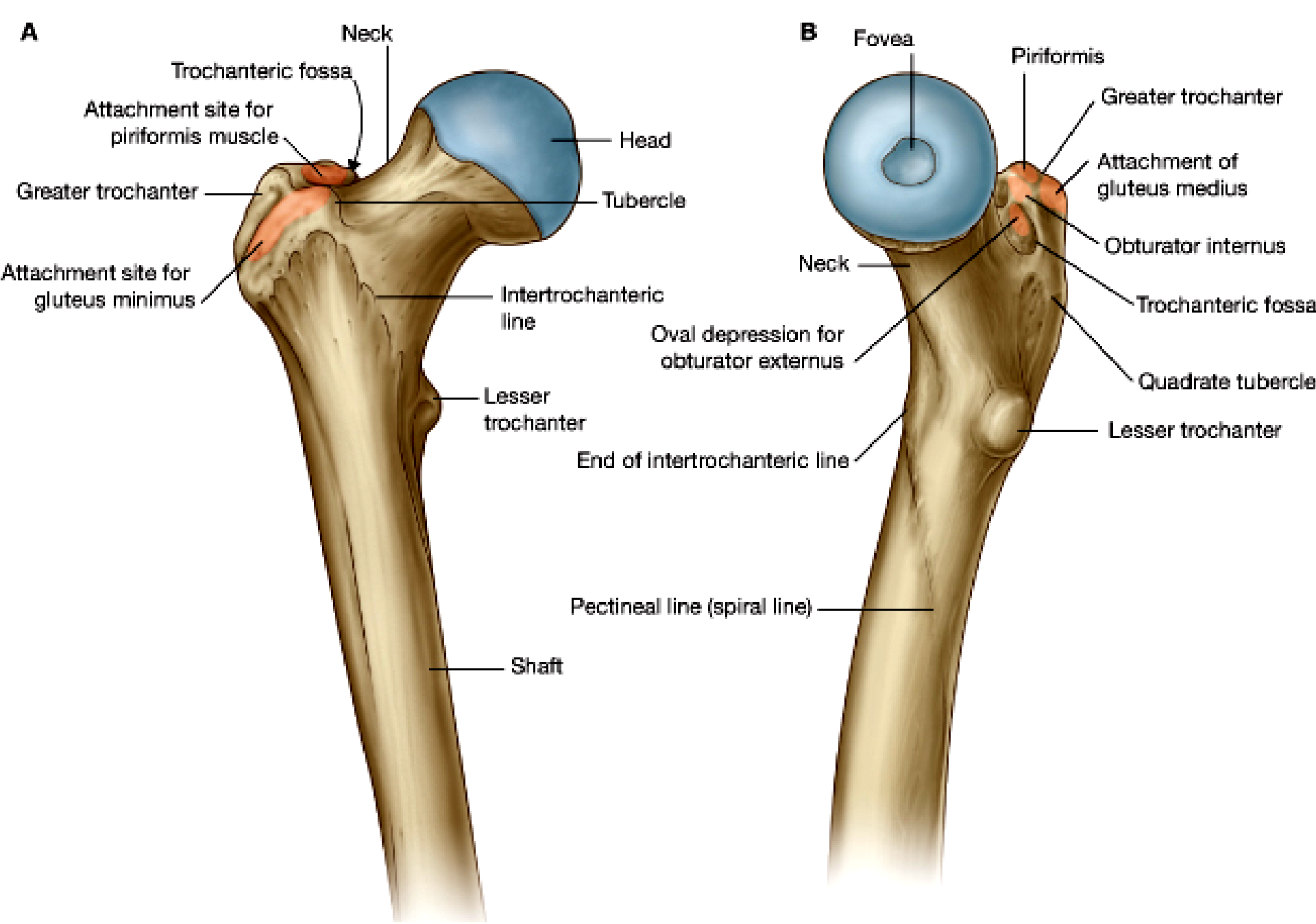
is a small pyramidal projection

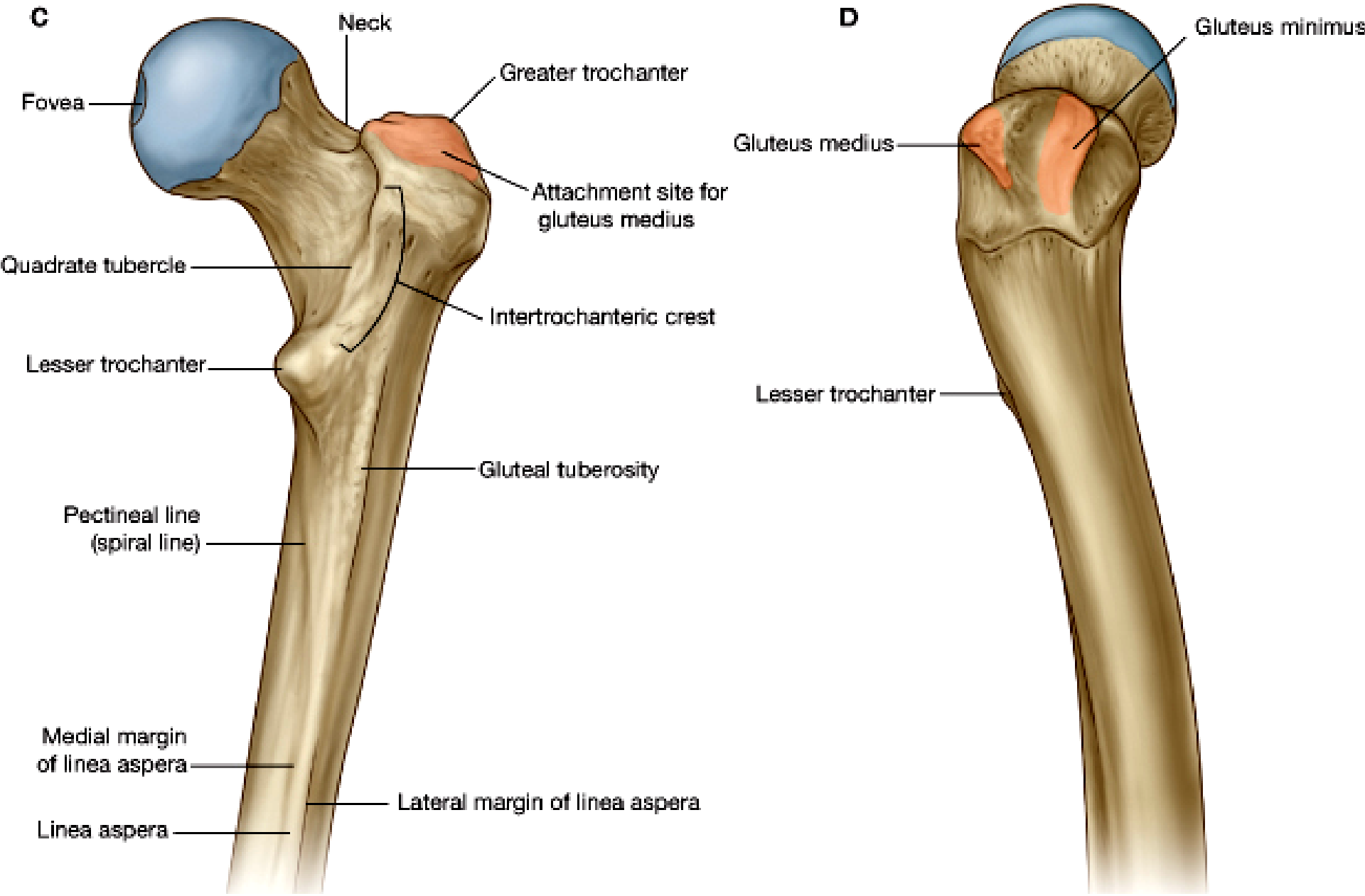
Intertrochanteric line

connects the greater & lesser trochanters in front & continues below as the spiral line on the upper part of pos. of the shaft

Intertrochanteric crest

is a rough ridge joins the 2 troch. in behind.
In the middle of the crest there is a bony prominence called the quadrate tubercle.



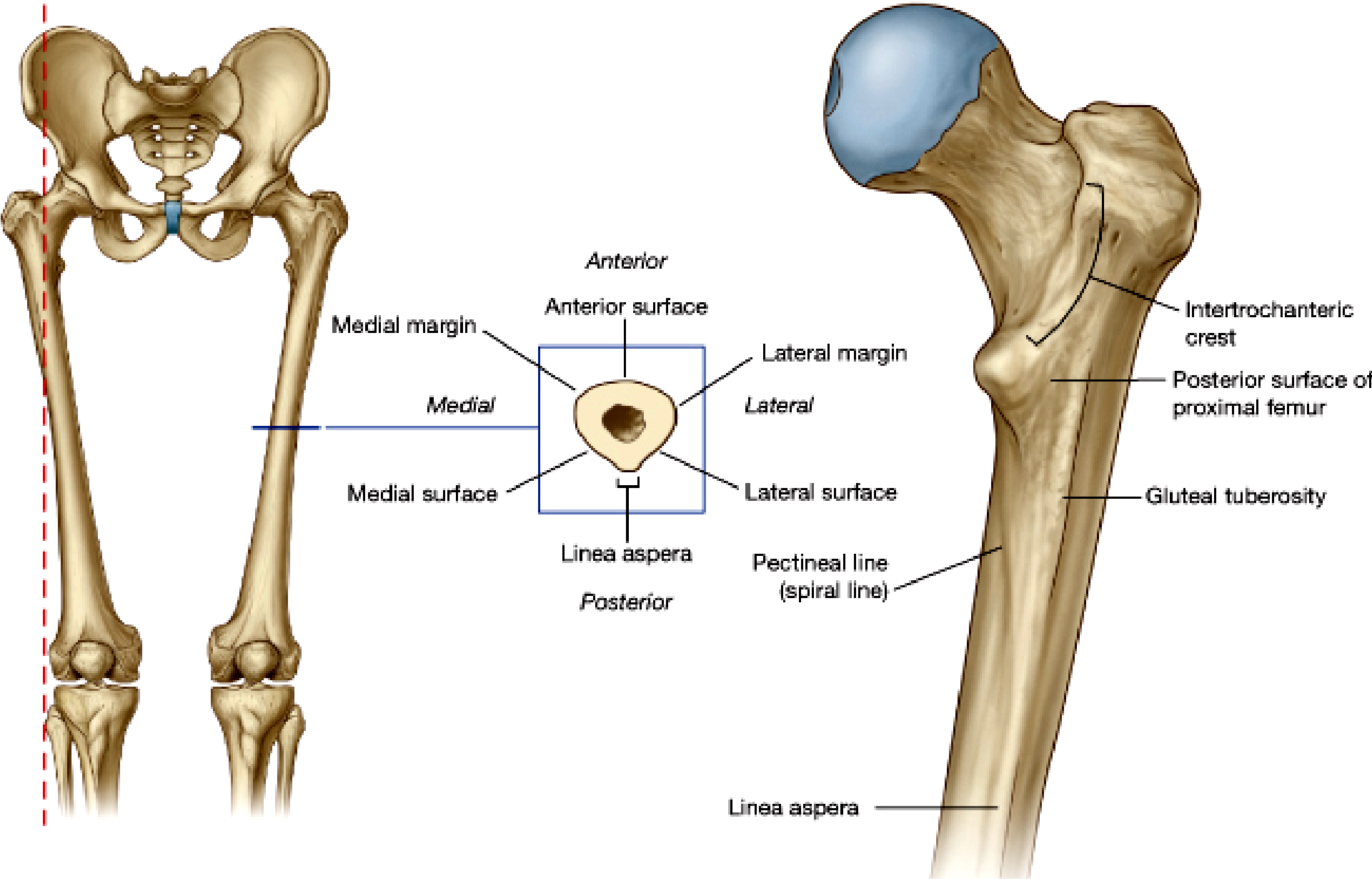


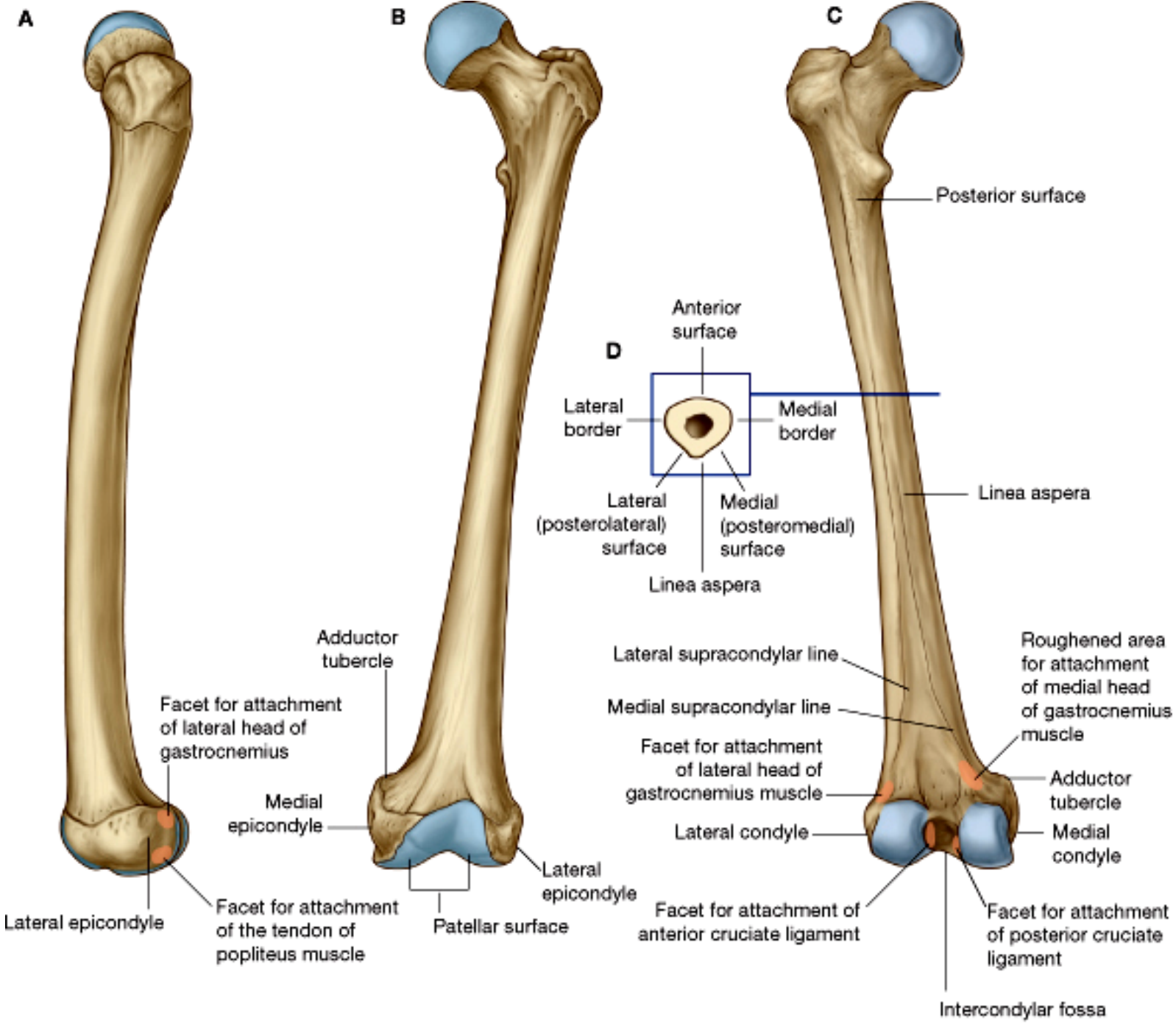
Shaft of femur

- It is very slightly curved(convex) anteriorly .
- Along the middle of the shaft posteriorly there is rough ridge called linea aspera with 2 lips (lat. & med.).

- The lateral lip of linea aspera superiorly join the gluteal tuberosity which extends upward to the base of greater troch.
- The medial lip of linea aspera passes above to form the spiral line & ends in the intertroch. Line.

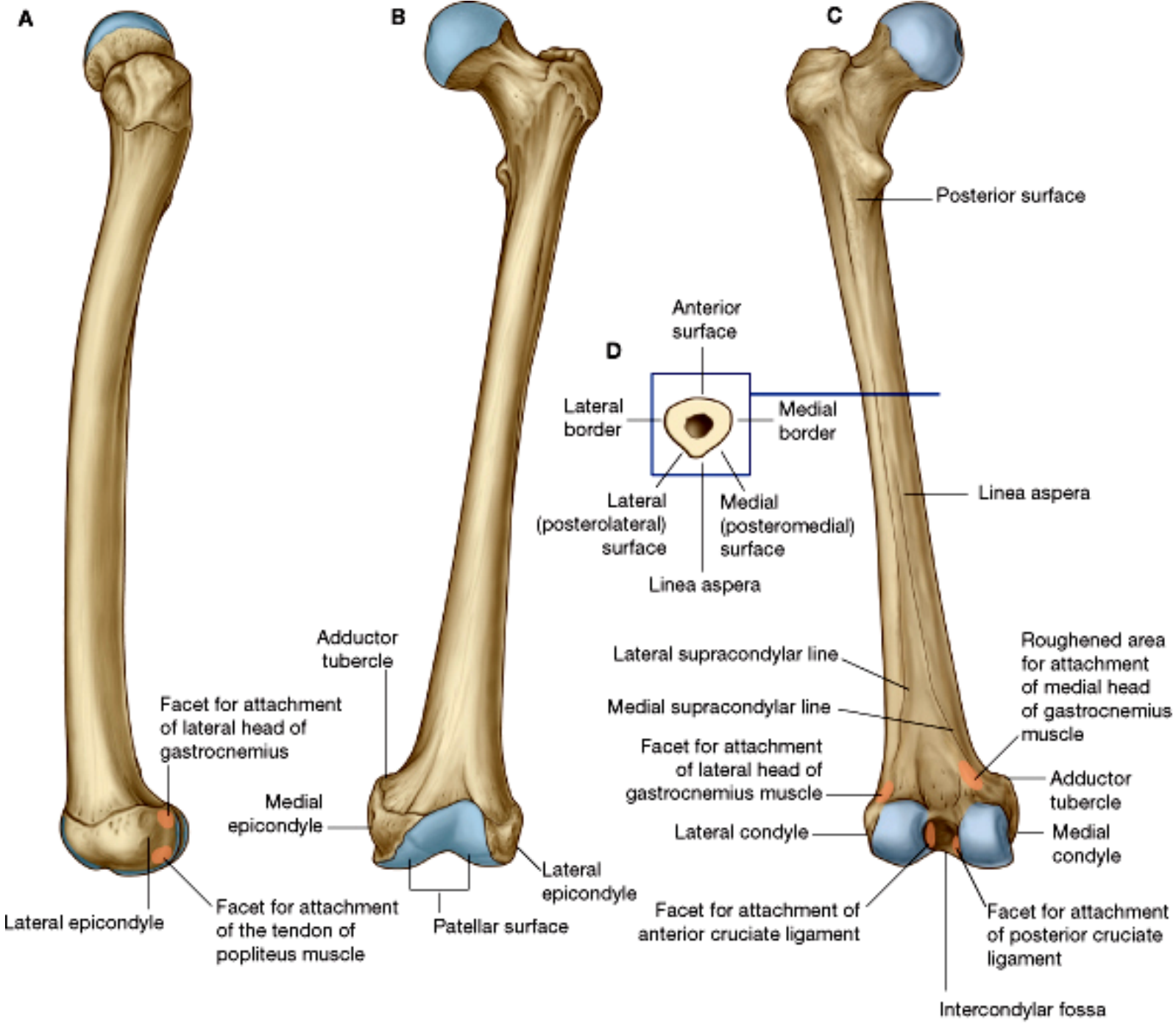
- In the lower 1/3 of the shaft the lat. & med. Lips diverge from each other & continue down as the lateral & medial supracondylar lines to the back of the lat. & med Condyles respectively
- leaving between them a flat triangular area called popliteal surface
- The med. Supracondylar line ends below in the adductor tubercle.





Lower end

- It consists of 2 condyles (med. & lat.) & 2 epicondyles(med. & lat.) .
- The condyles are large bony masses (the lat. Is stronger)
- Posteriorly the 2 cond. are separated from each other by a wide deep intercondylar fossa
- anteriorly the 2 cond. fused to form the articular (patellar) surface.
- Sup . of each condyles epicondyles is located



The joints of the femur

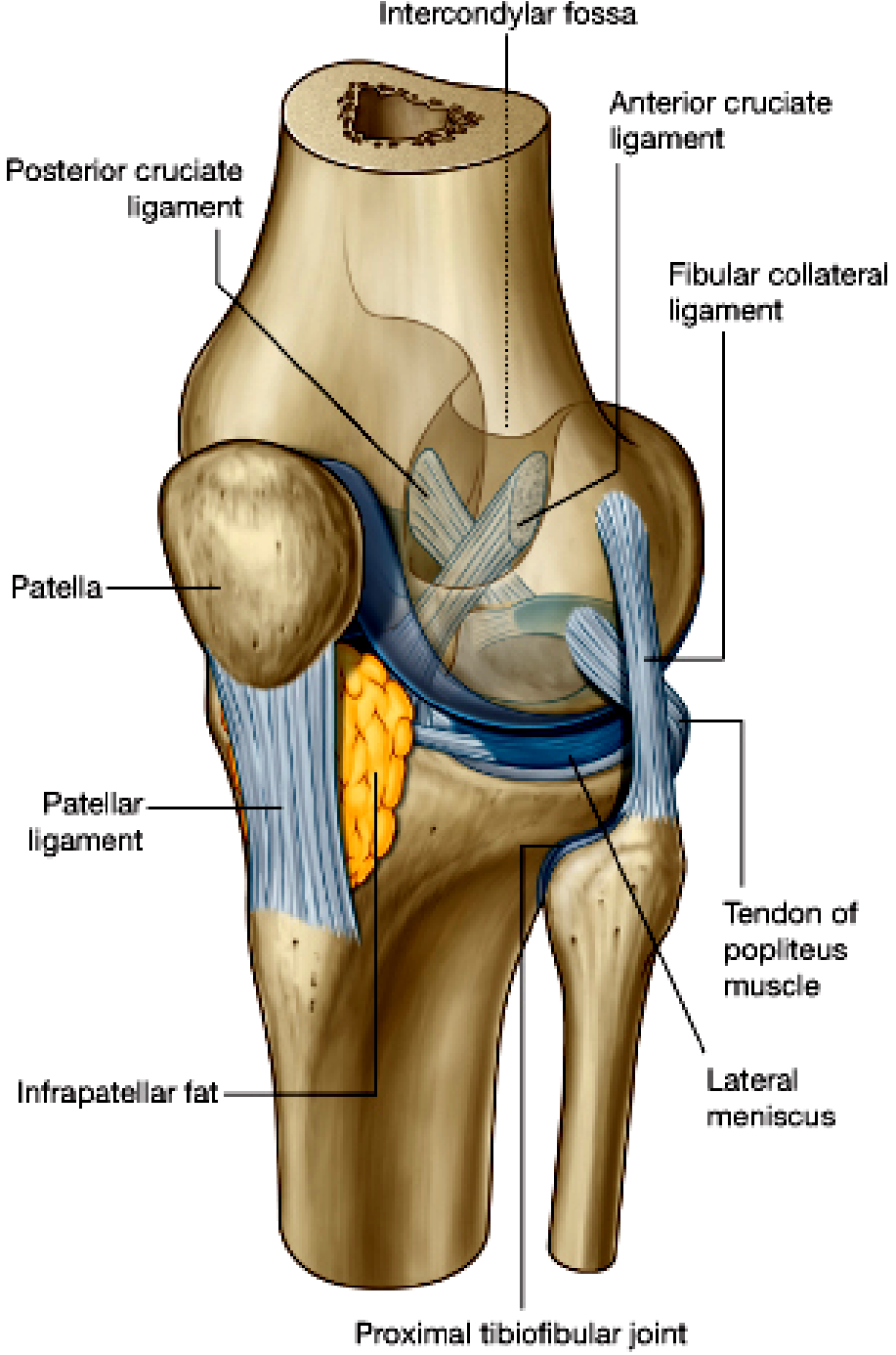
- articular surface of **upper end of femur**

The head of femur articulate with the acetabulum of hip bone to form the hip joint

- articular surface of **lower end of femur**

Patellar: The ant. surface of the lower end of femur articulates with the upper 3/4 sup. of the post. surface of the patella

Tibial: the inf. & post. Surface of the lower end of femur articulates with the 2 tibial condyles to form the knee joint



Ossification of femur

- Primary: body & neck / 7 week
- Secondary:
  - 1: lower end / 9 month
  - 2: head / first 6 month after birth
  - 3: grater trochonter / 4 years old
  - 4: lesser trochanter / 12 years old

How femur support body Wight

- Calcar femoral
- Linea aspera

Clinical anatomy

- femoral neck fracture

Patella

- It is a flat & the largest sesamoid bone in the body located in the tendon of quadriceps femoris M. in front of the lower end of the femur .
- It is triangular in shape with:

- base (upper border)
- apex (rounded lower tip)
- 2 borders (med. & lat.)
- 2 surfaces (ant. & post.).

Apex

- The patellar ligament is attached to the apex
- Infrapatellar pad of fat

Base

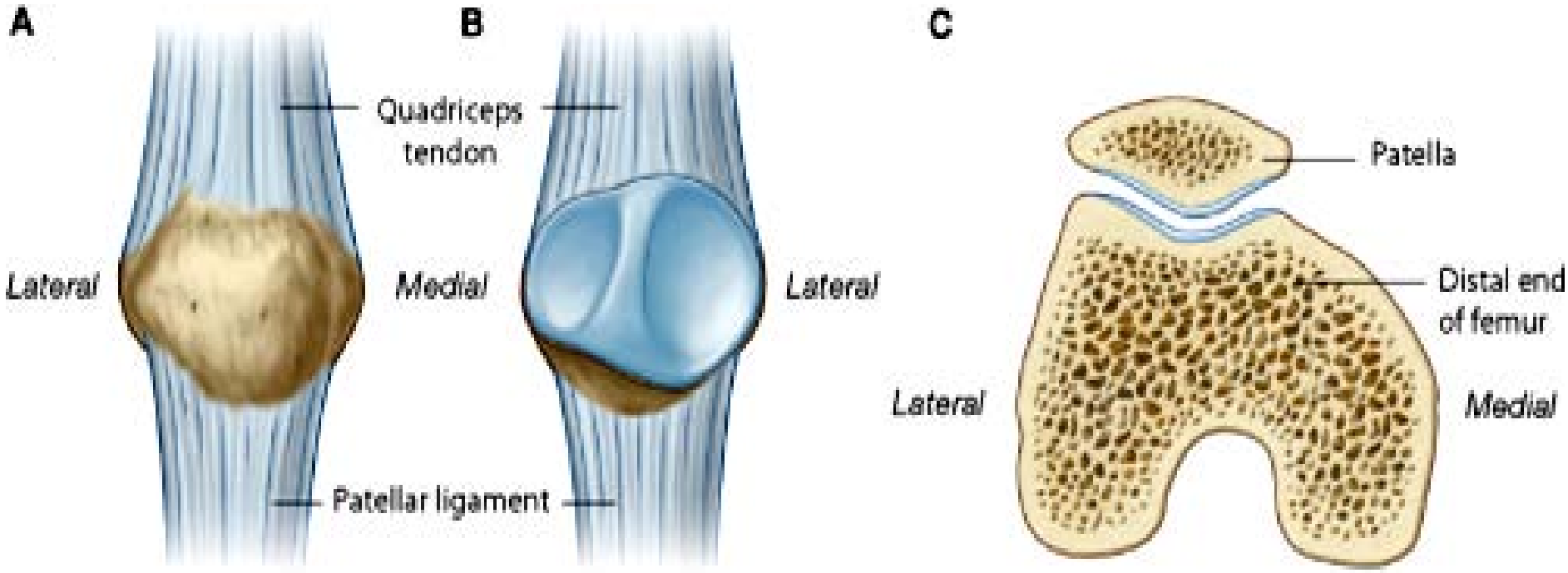
- Rough / convex / attachment of rectus femoris tendon anterioly & vastus intermedius tendon posterioly
- Separate by prepatellar bursa from skin

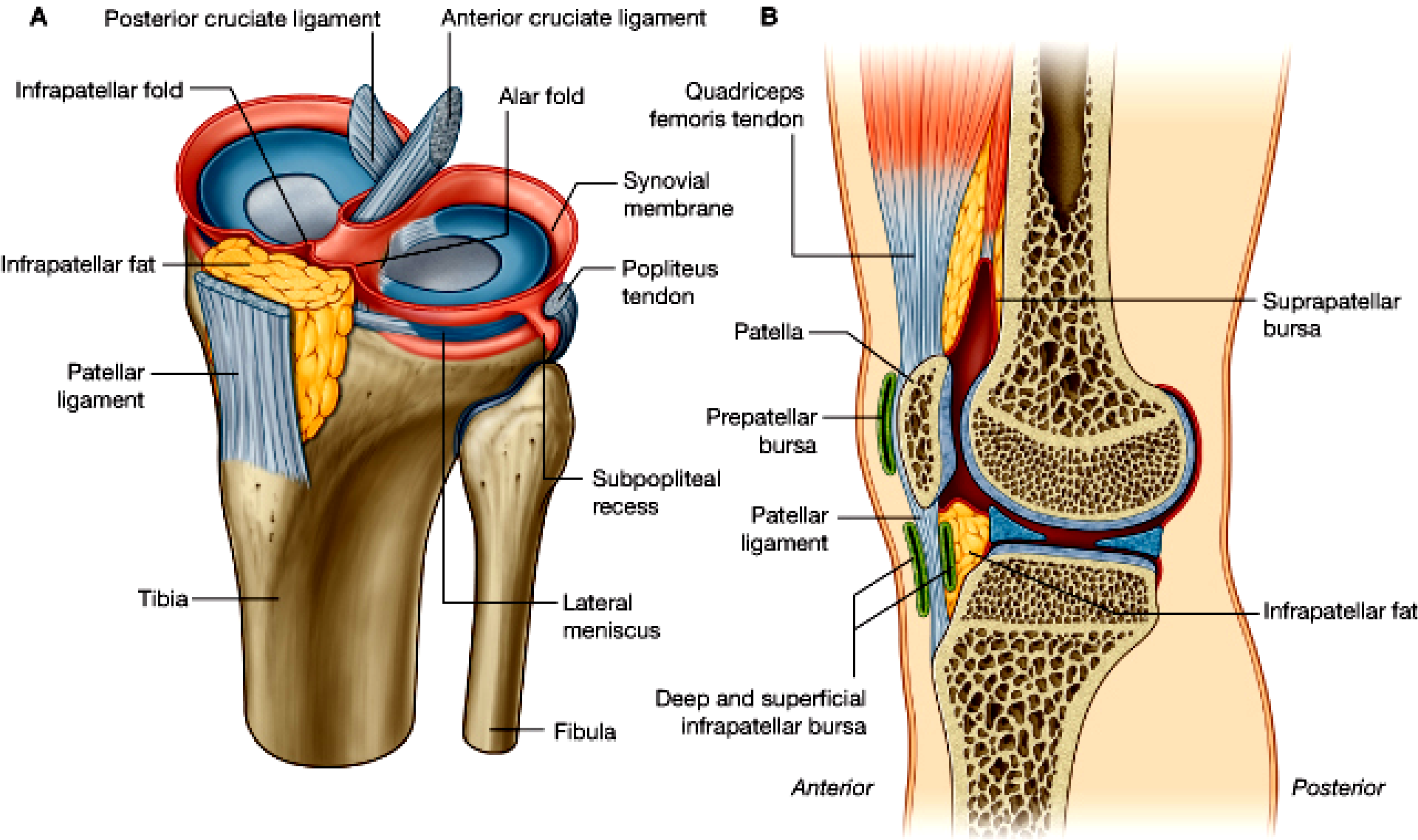
post. Surface

- 1/4 inf. (rough / origin of patellar lig.)
- 3/4 sup. (smooth / articular surface (med. & lat.) / articulates with the patellar surface of the femur

Ant. Surface

- The vastus medialis & vastus lateralis Mm are attached to the medial & lateral borders of the patella respectively
- the vastus intermedius (post.) & the rectus femoris (ant.) are attached to its upper border (the base)


A
B
C
Quadriceps tendon
Lateral
Medial
Lateral
Patellar ligament
Patella
Distal end of femur
Lateral
Medial



Knee movement

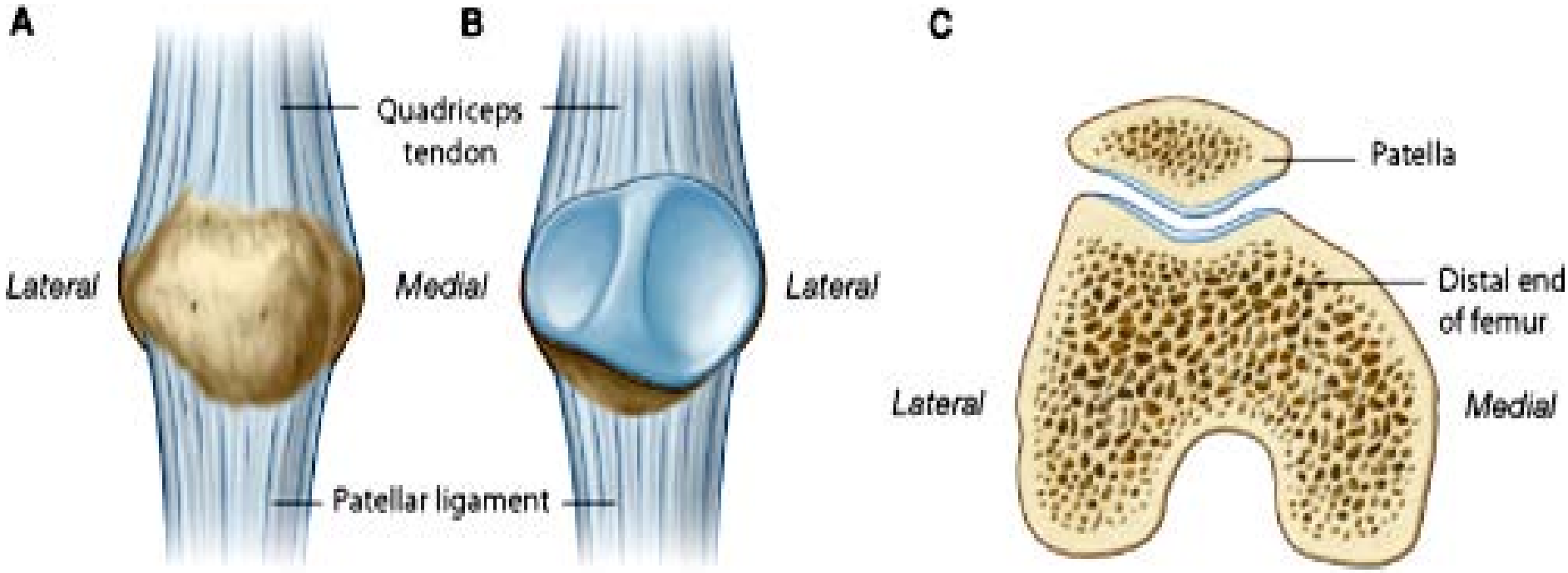
- Zone 1: extension
- Zone 2: slight flexion
- Zone 3: mid flexion
- Medial strip: full flexion

Ossification of patella

- few center / Start 3-6 years old
- Bipartite & tripartite patella / suprolateral angle

Clinical anatomy

- dislocation of patella

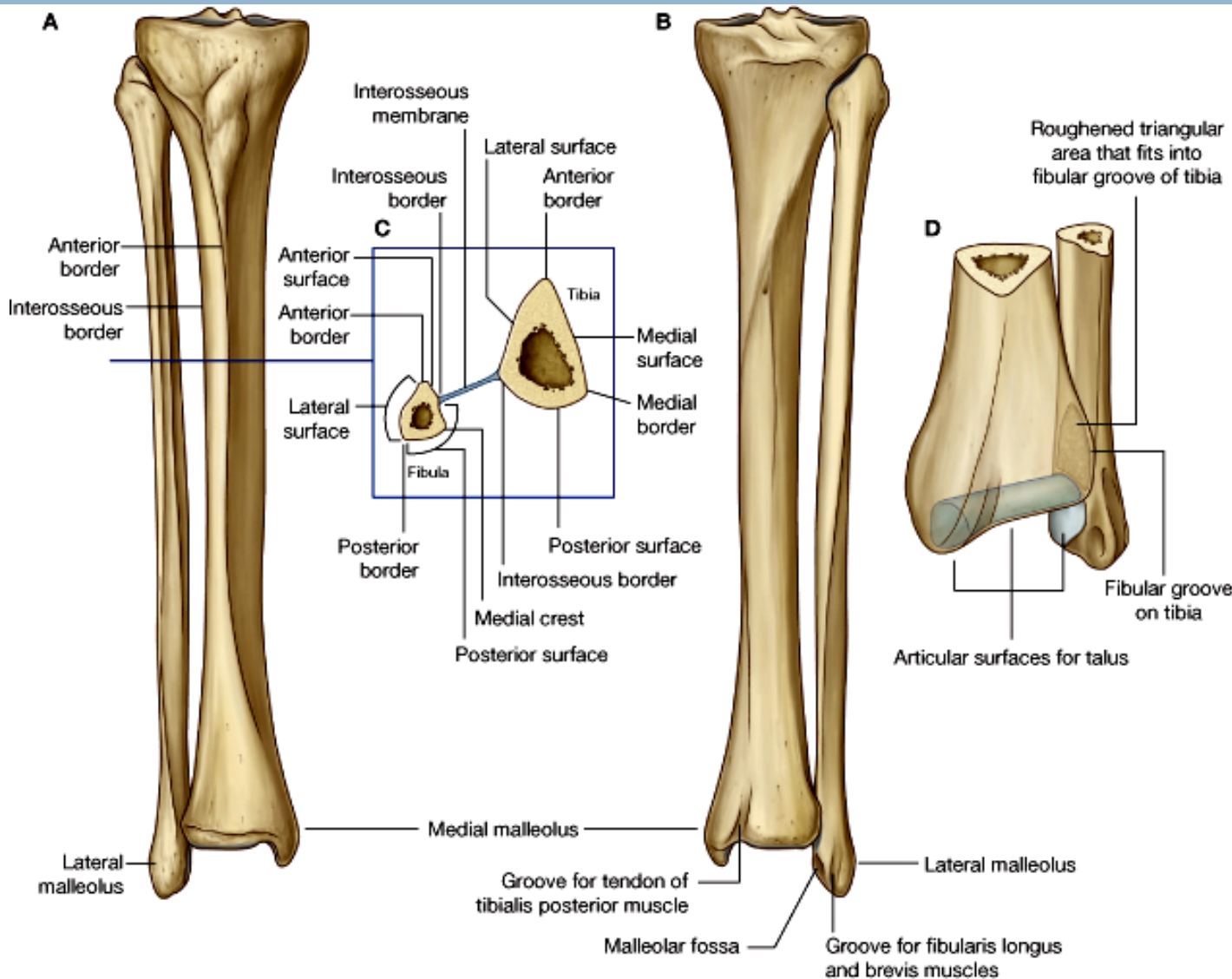

A
B
C
Quadriceps tendon
Lateral
Medial
Lateral
Patellar ligament
Patella
Distal end of femur
Lateral
Medial

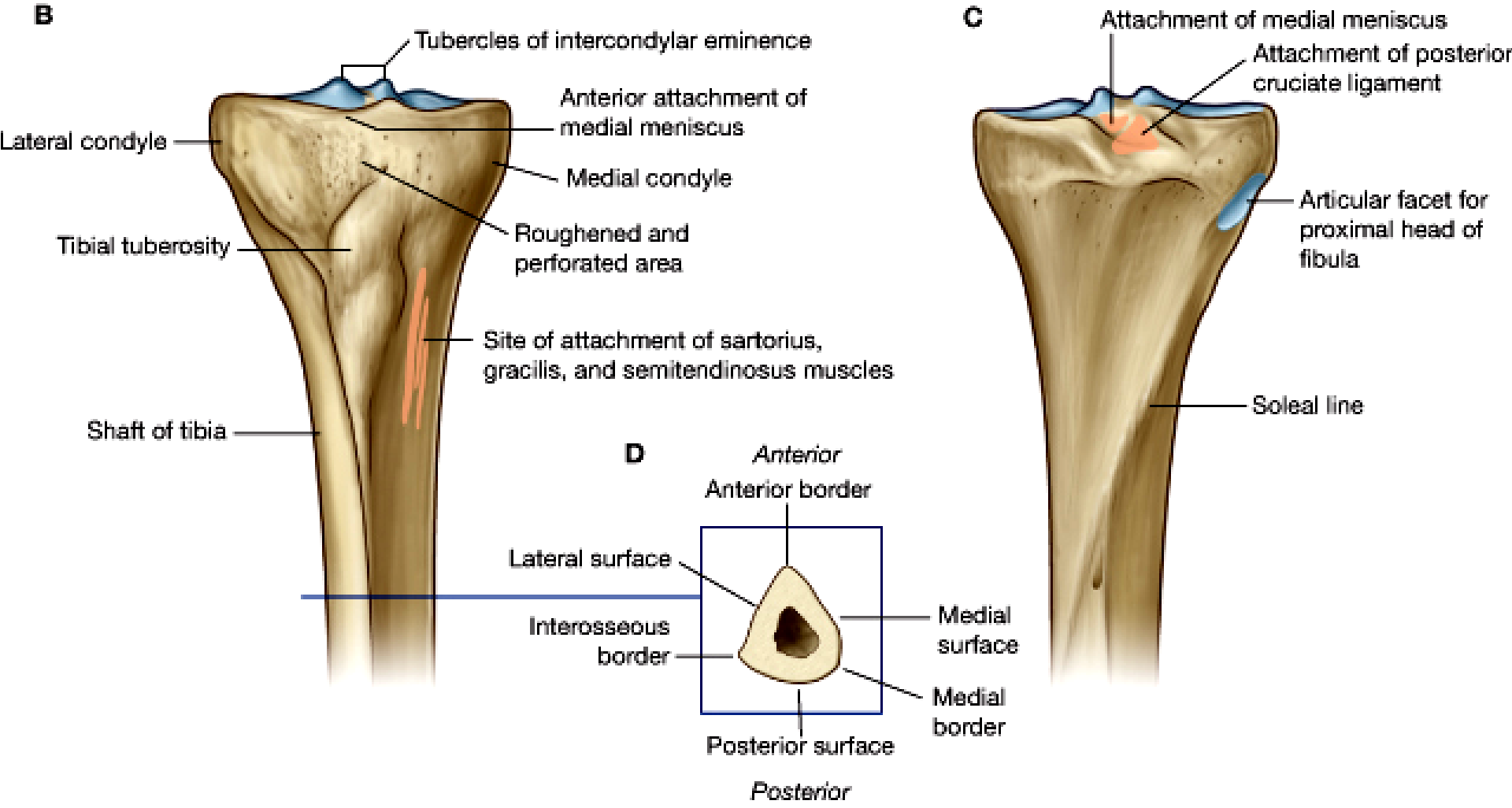
Tibia:

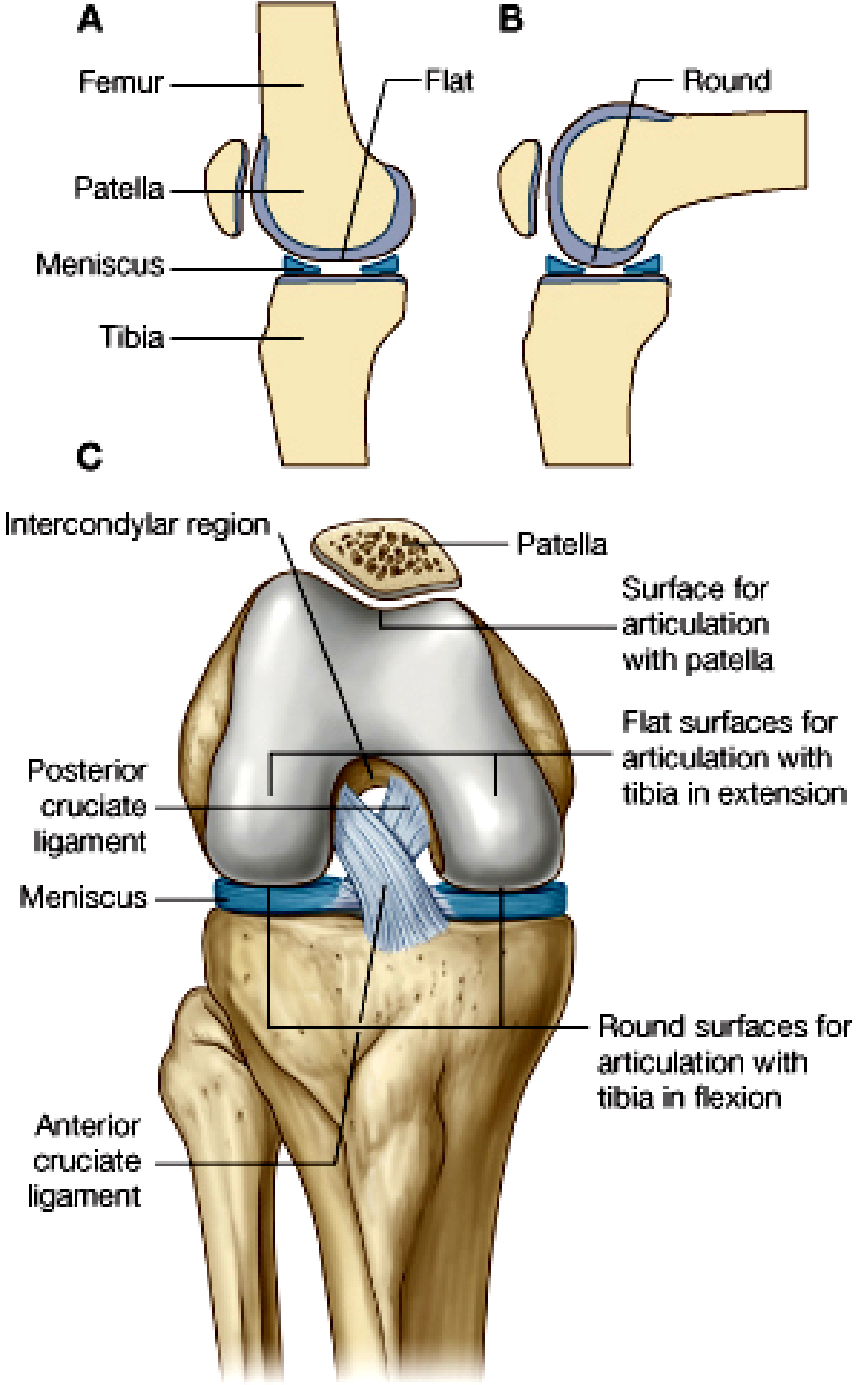
Upper end

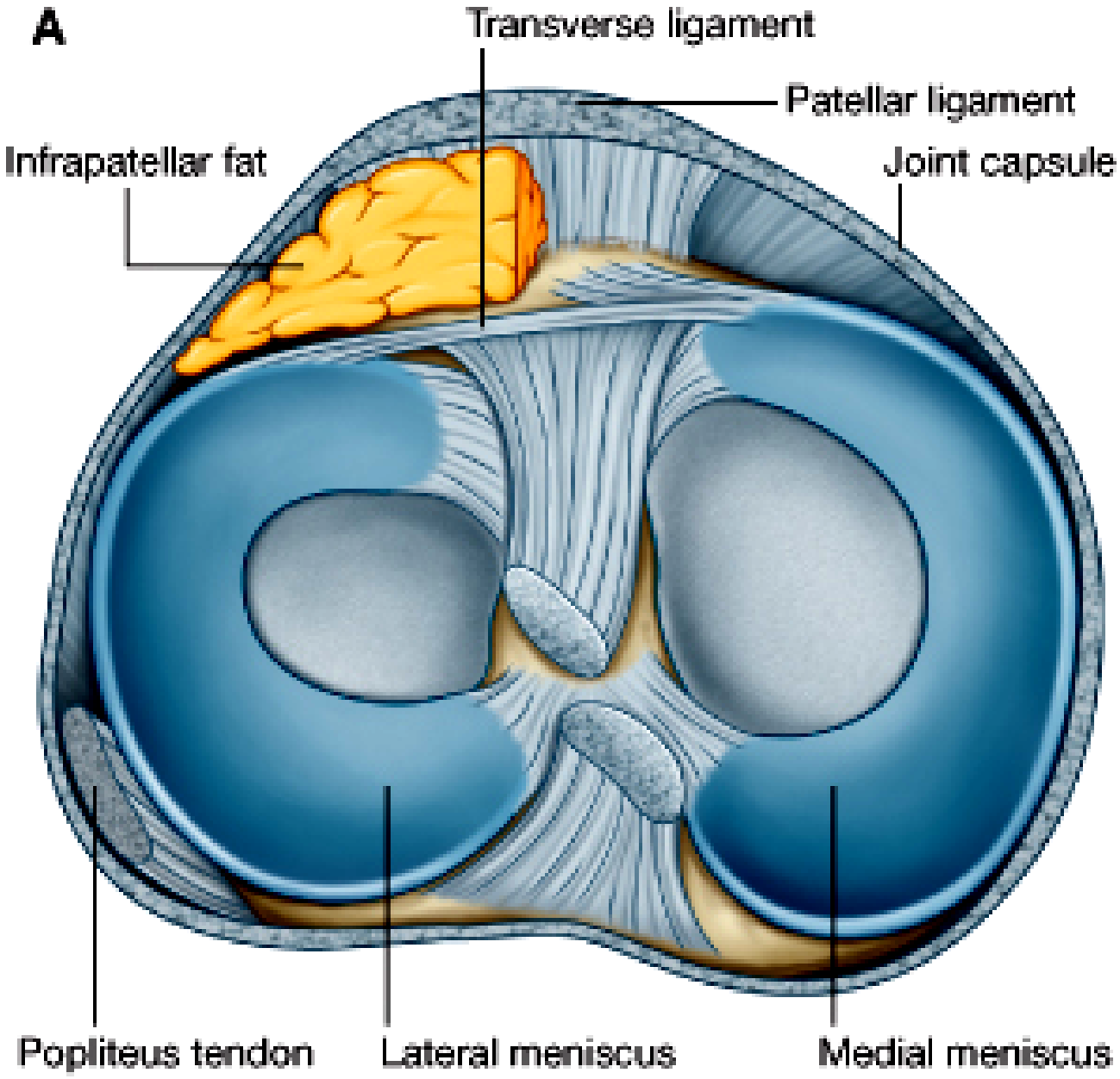
Shaft

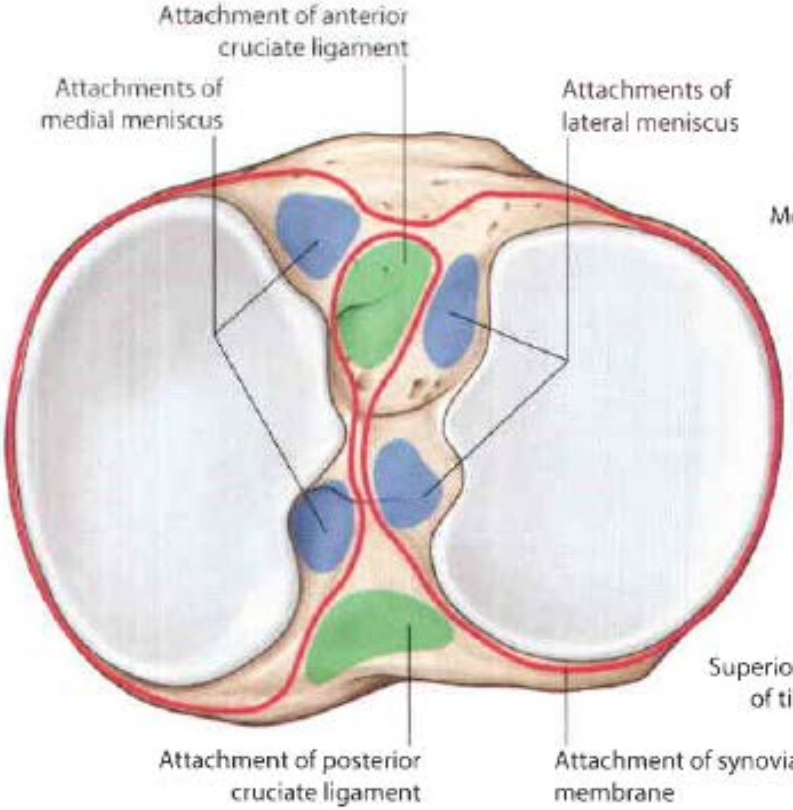
Lower end



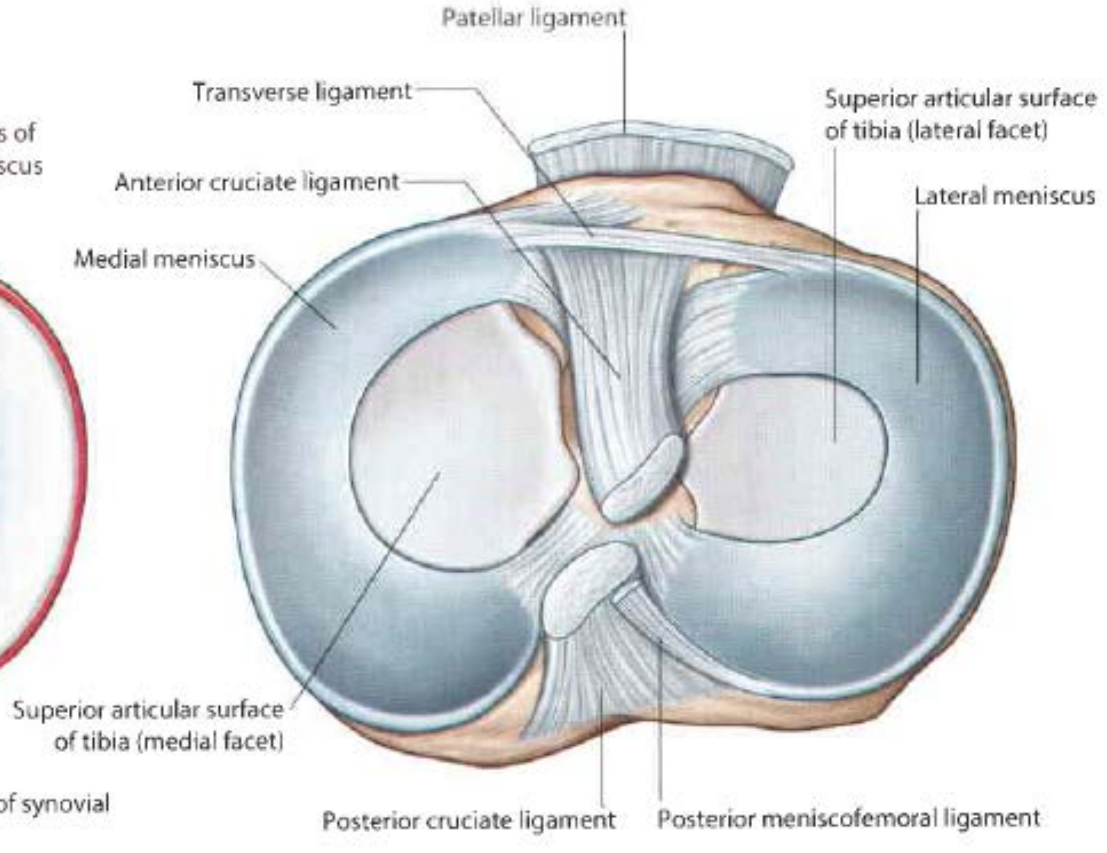




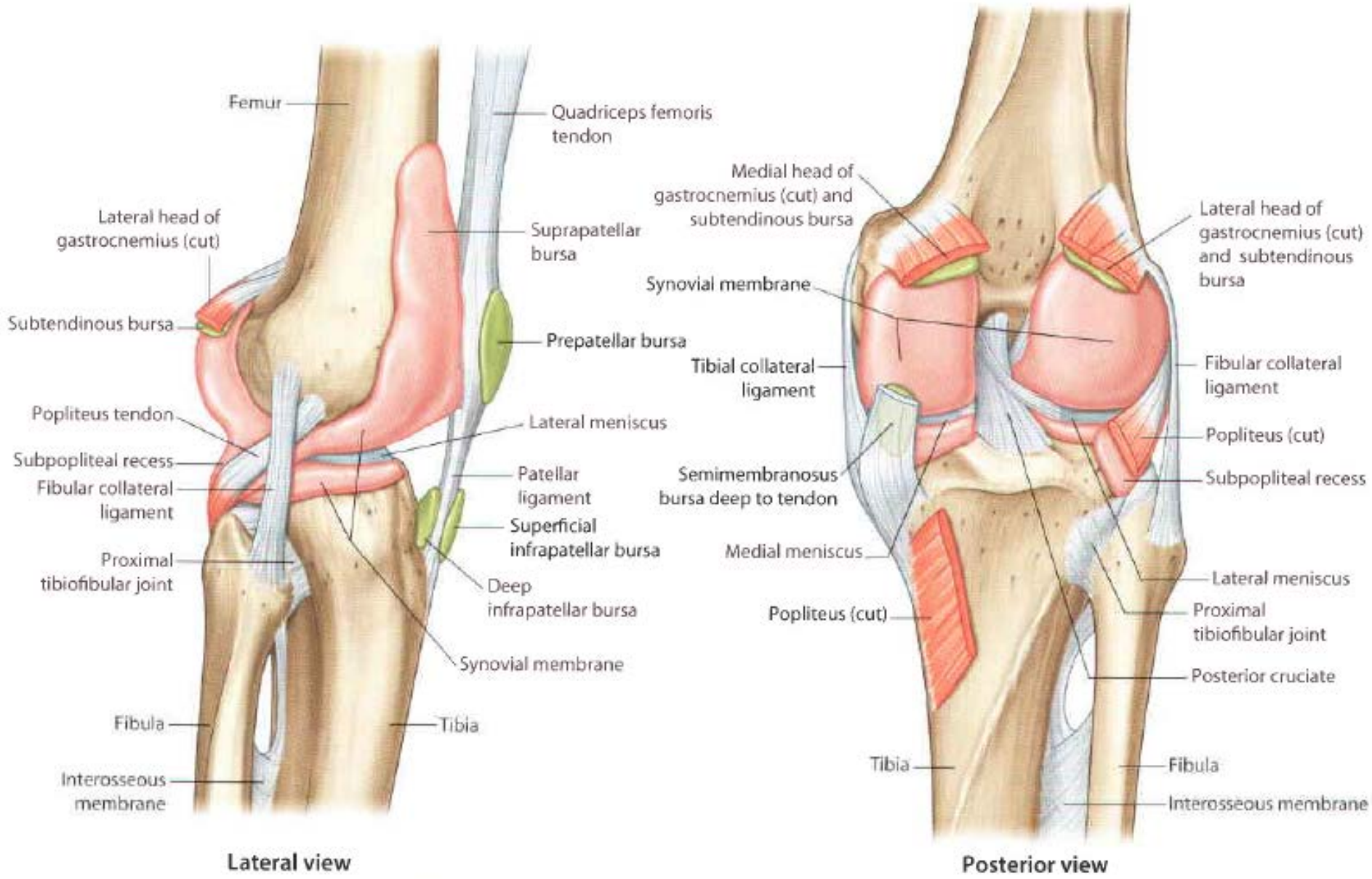


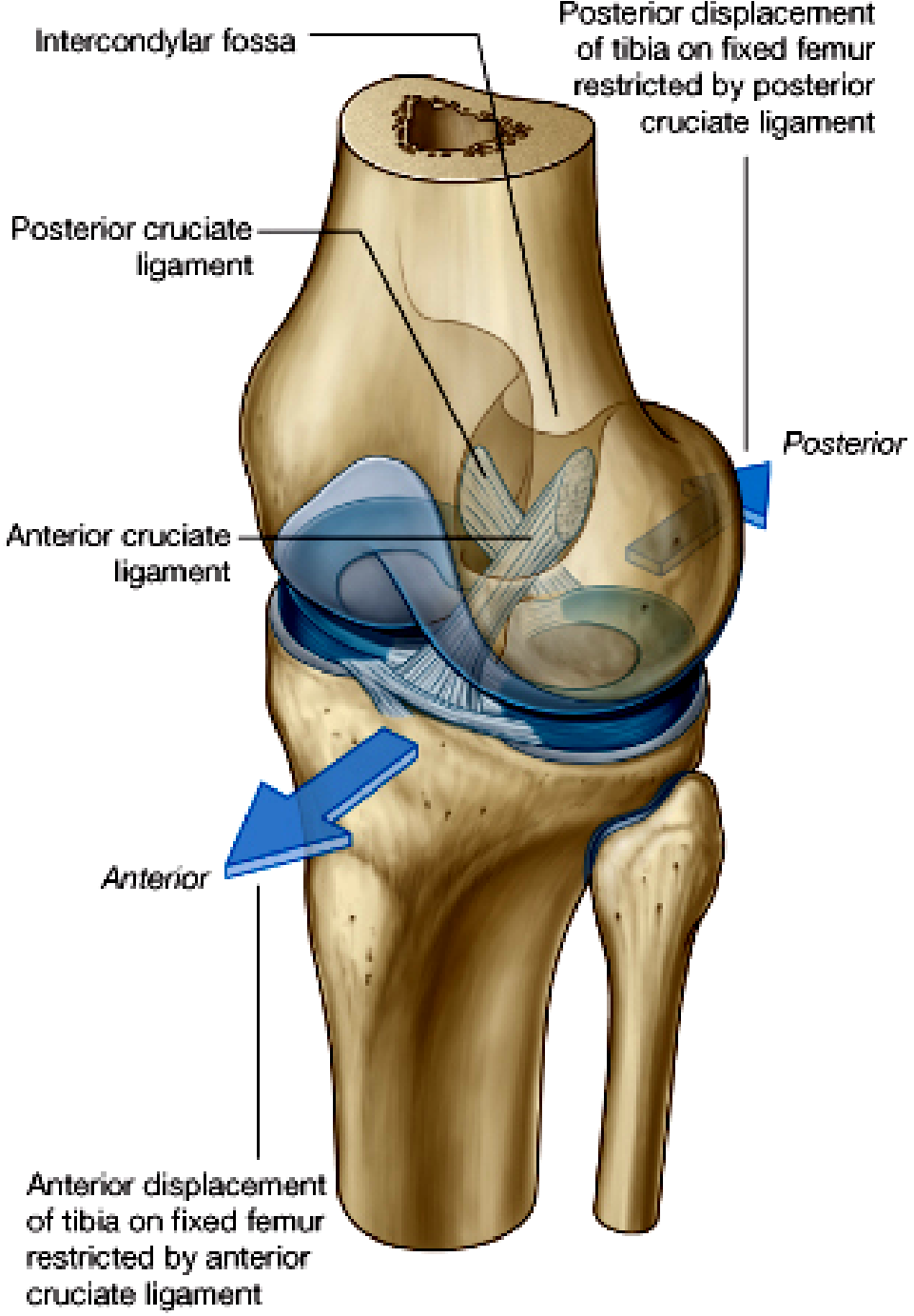


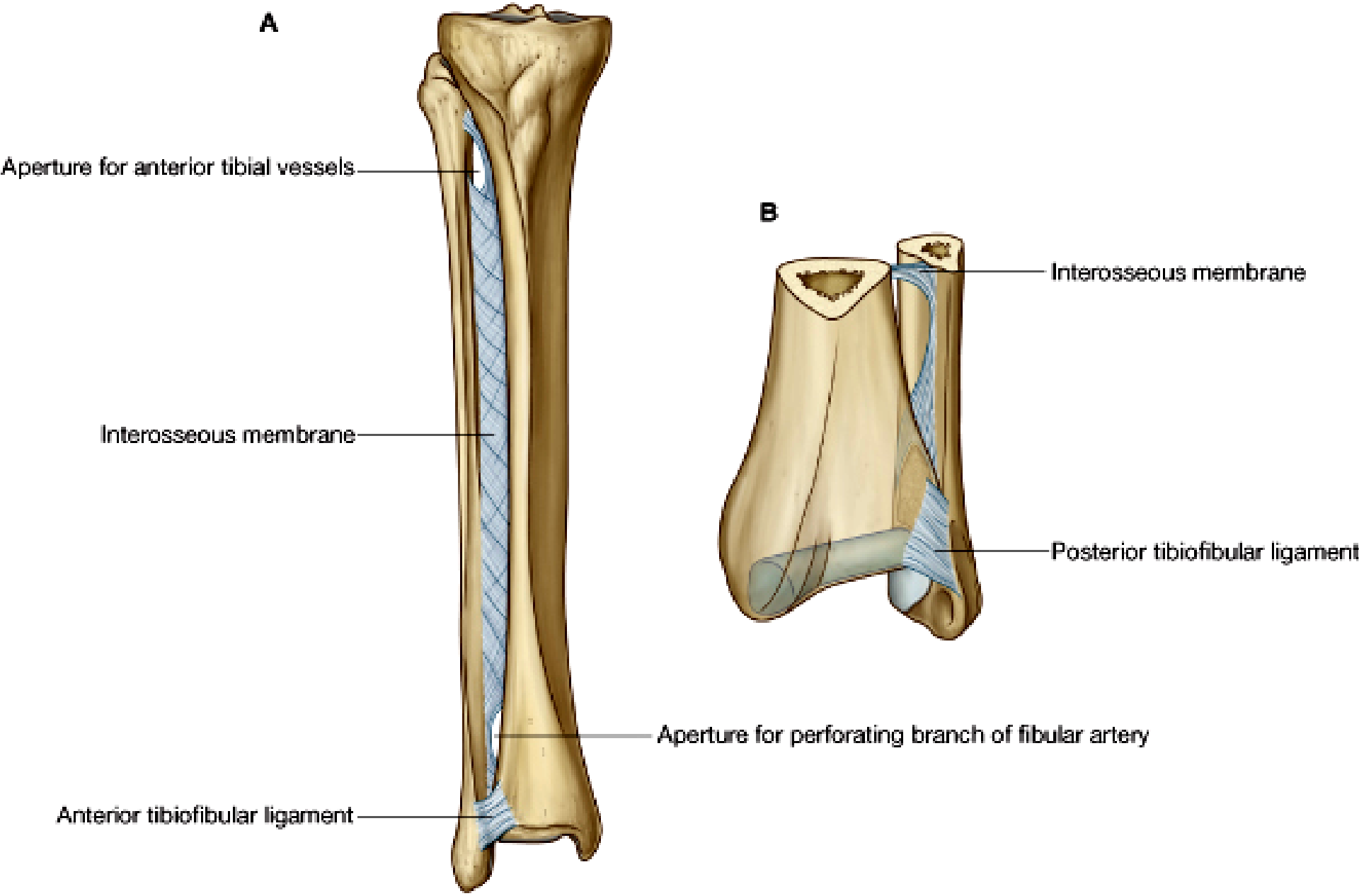
Attachments of menisci, cruciate ligaments, and synovial membrane of the right tibia. (superior view)



Menisci of the right knee joint. (superior view)

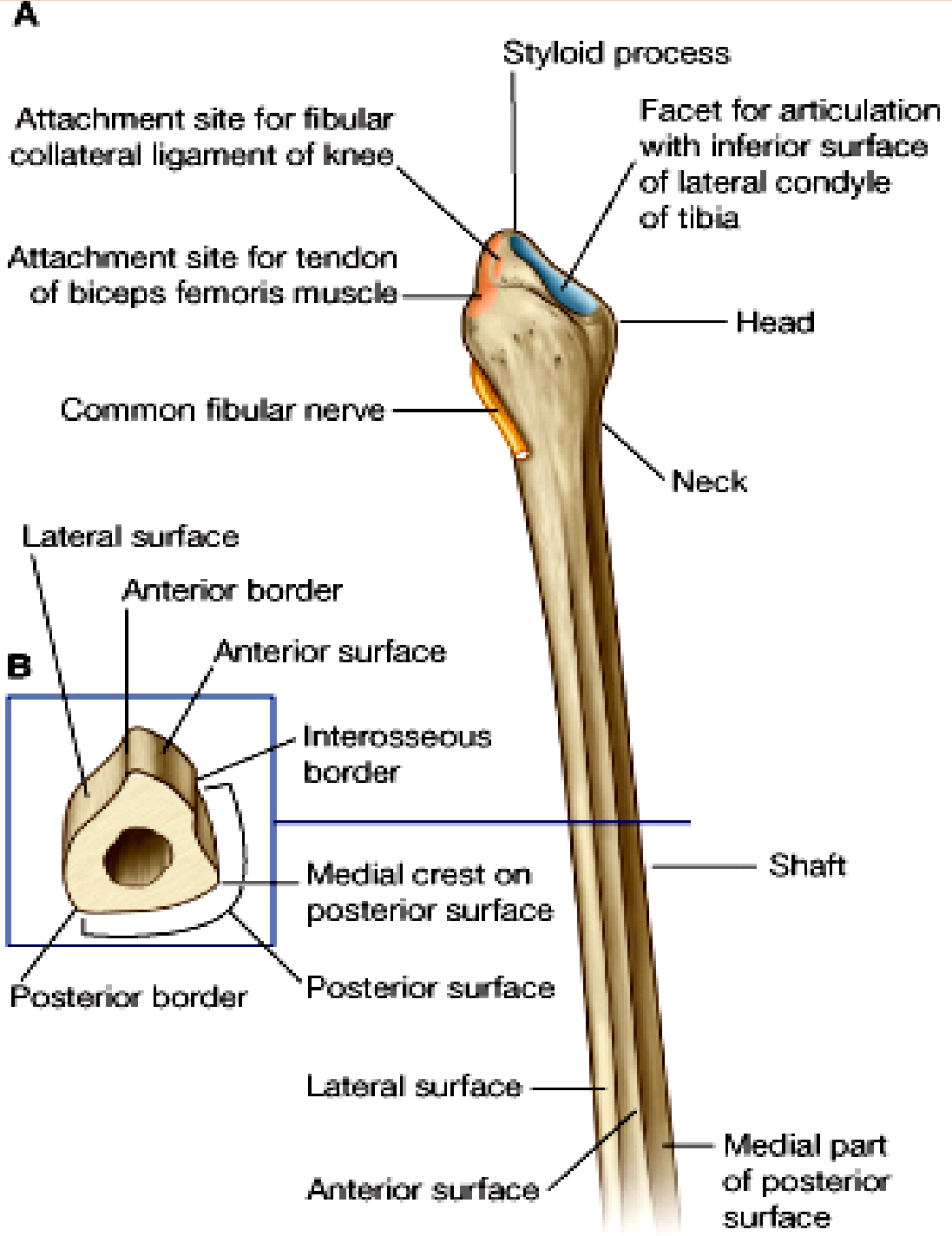

Femur
Quadriceps femoris tendon
Lateral head of gastrocnemius (cut)
Suprapatellar bursa
Subtendinous bursa
Prepatellar bursa
Popliteus tendon
Lateral meniscus
Subpopliteal recess
Fibular collateral ligament
Patellar ligament
Superficial infrapatellar bursa
Proximal tibiofibular joint
Deep infrapatellar bursa
Synovial membrane
Fibula
Tibia
Interosseous membrane
Lateral view
Medial head of gastrocnemius (cut) and subtendinous bursa
Lateral head of gastrocnemius (cut) and subtendinous bursa
Synovial membrane
Tibial collateral ligament
Fibular collateral ligament
Popliteus (cut)
Semimembranosus bursa deep to tendon
Subpopliteal recess
Medial meniscus
Lateral meniscus
Popliteus (cut)
Proximal tibiofibular joint
Posterior cruciate
Tibia
Fibula
Interosseous membrane
Posterior view

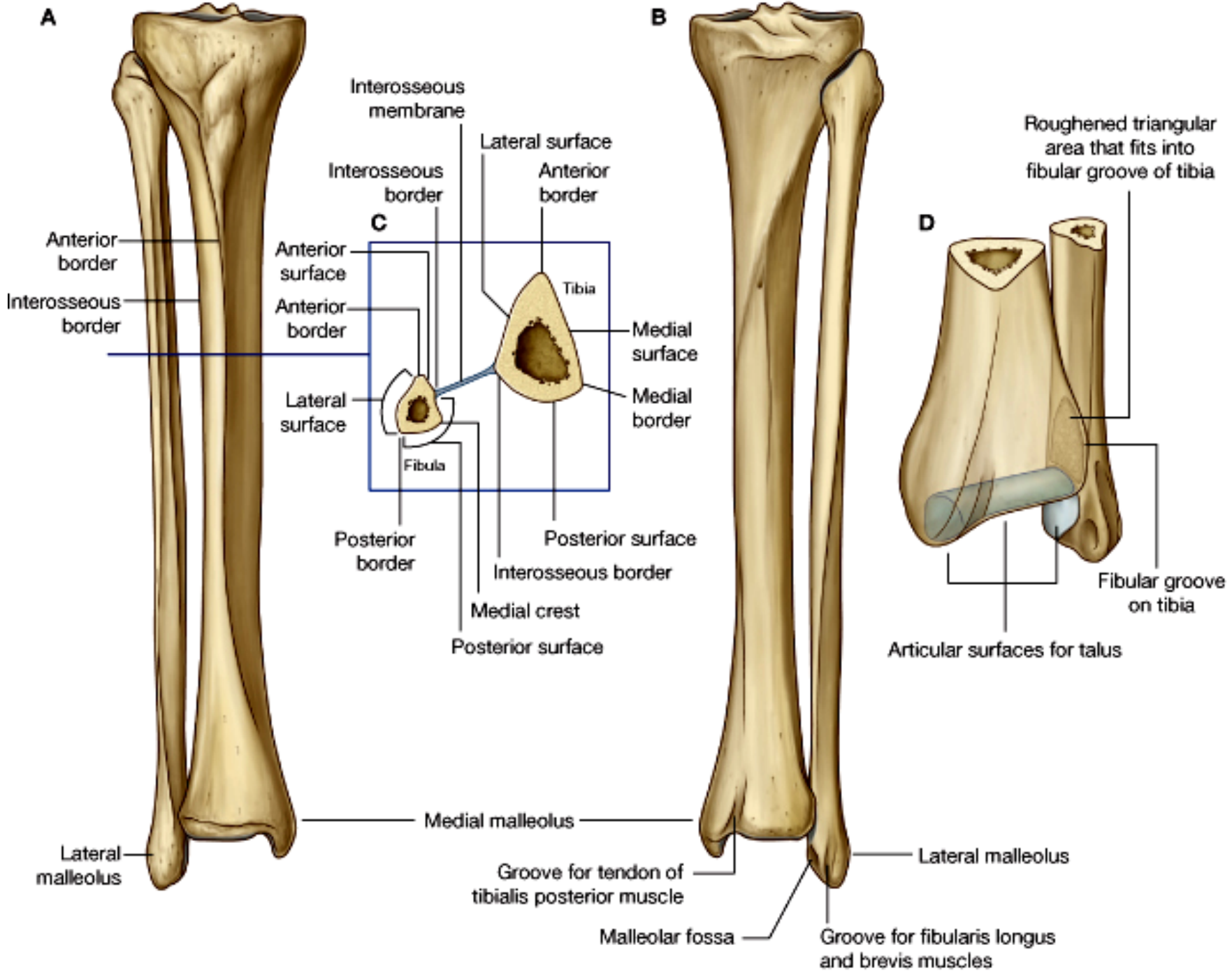


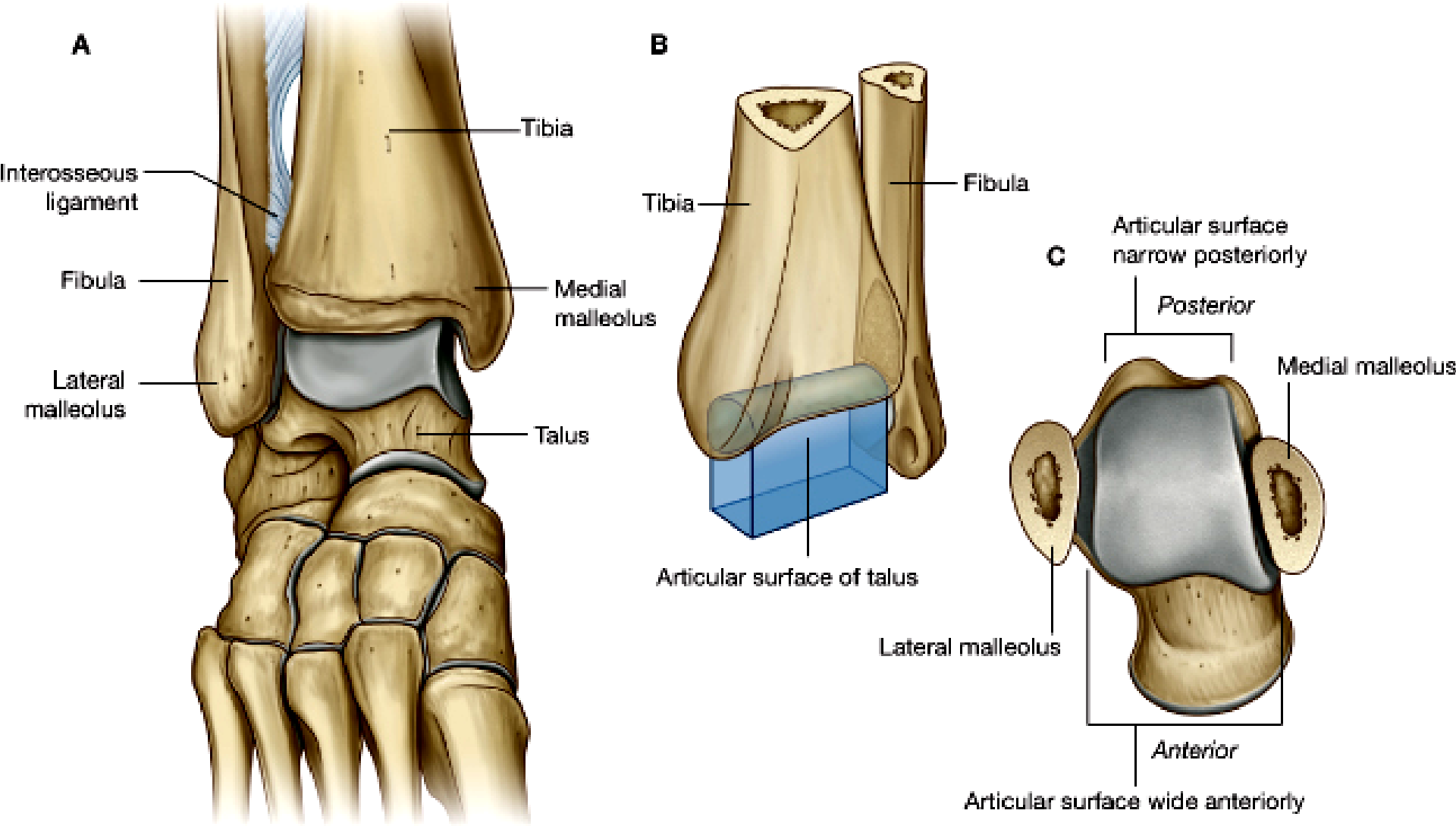


Fibula(prone):

- Head
- Shaft
- Lower end







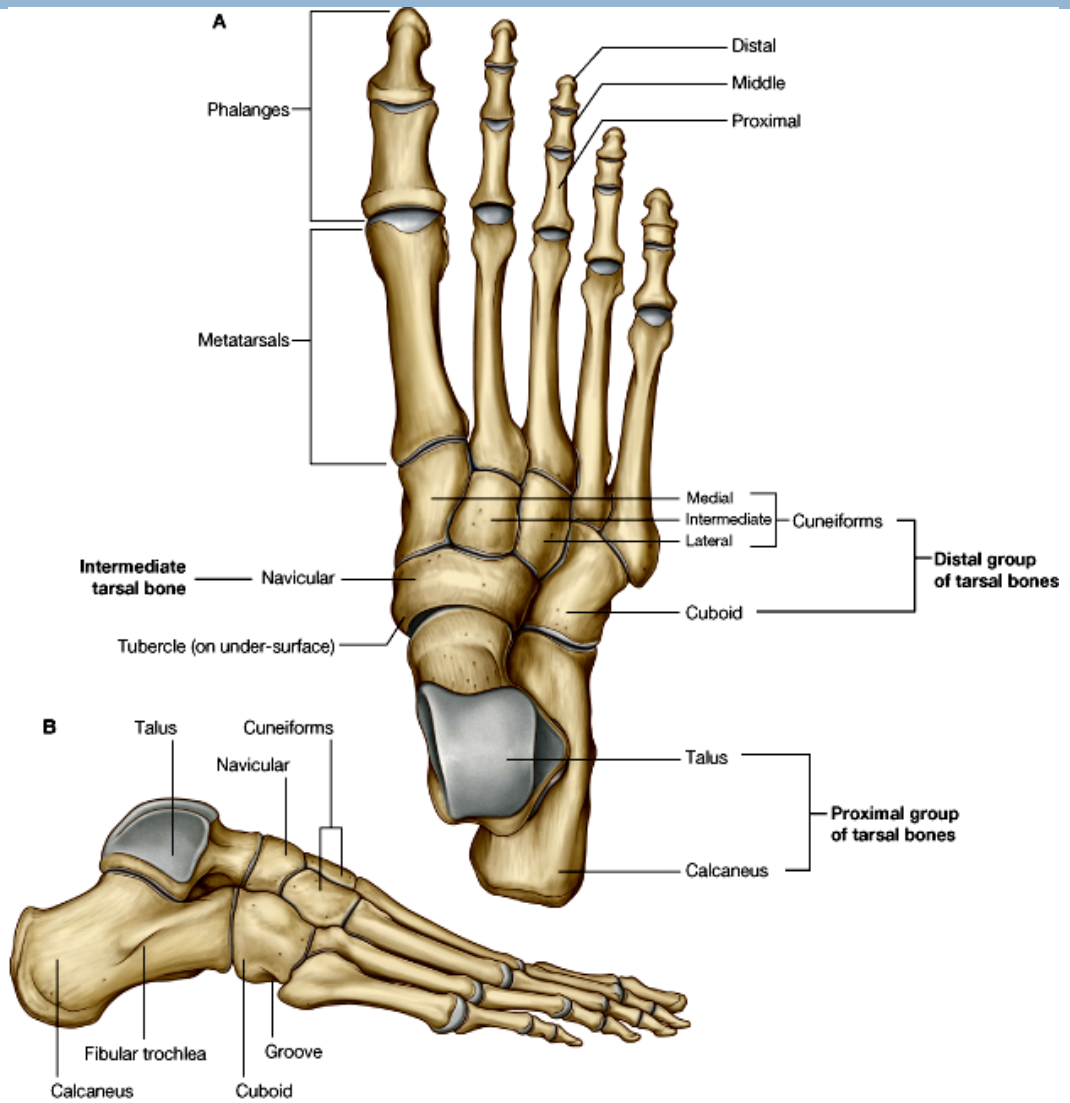
Tarsus:

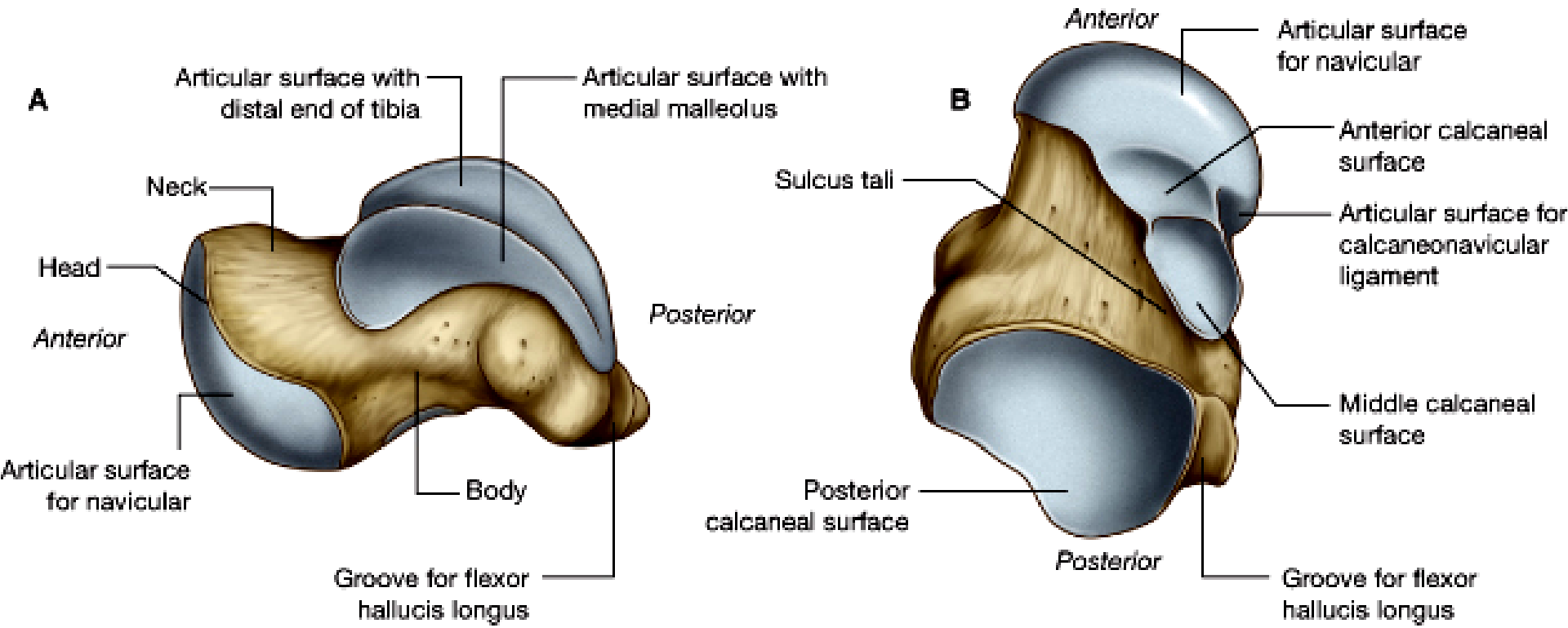
Proximal:

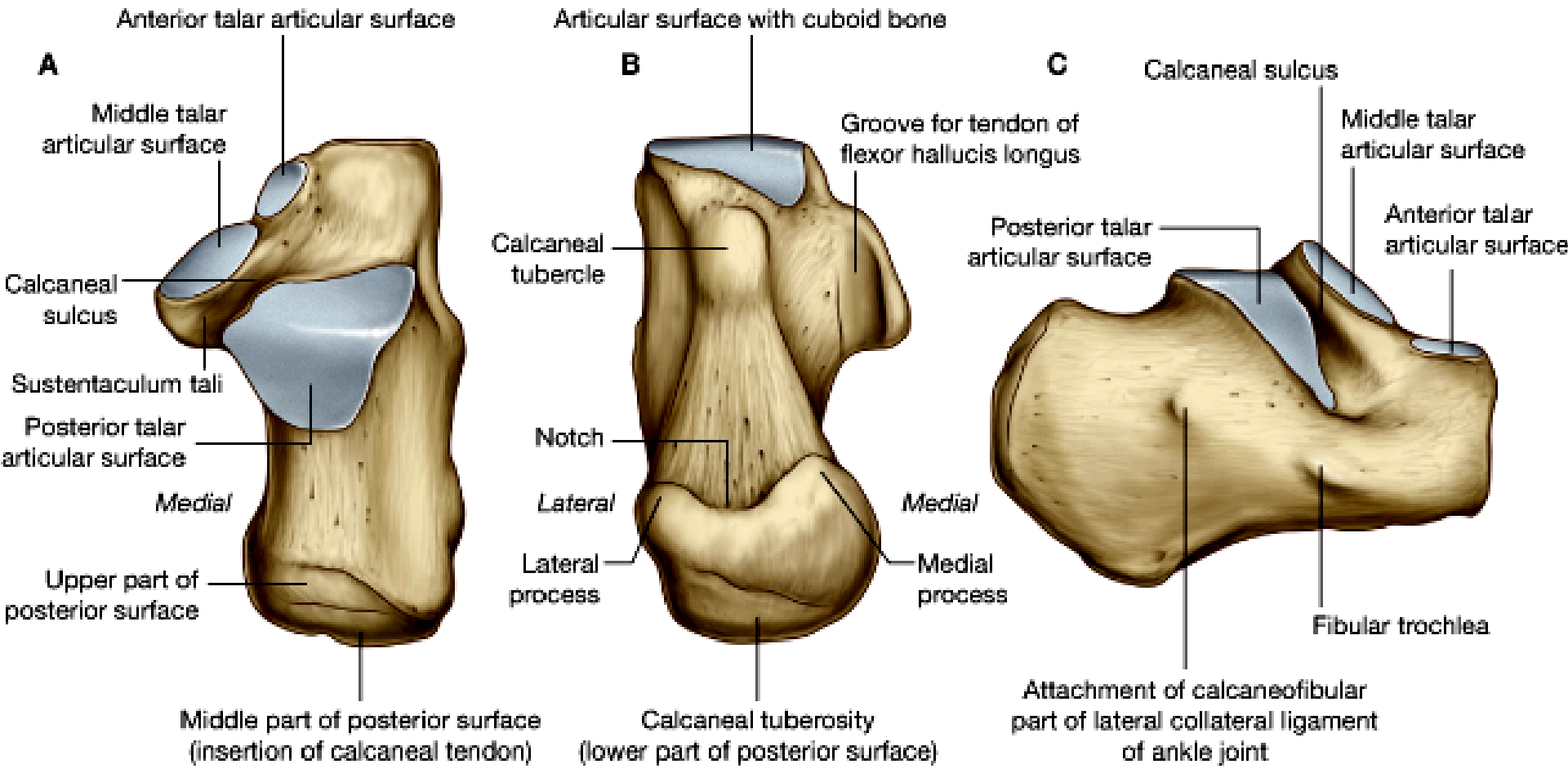
Talus
Calcaneus

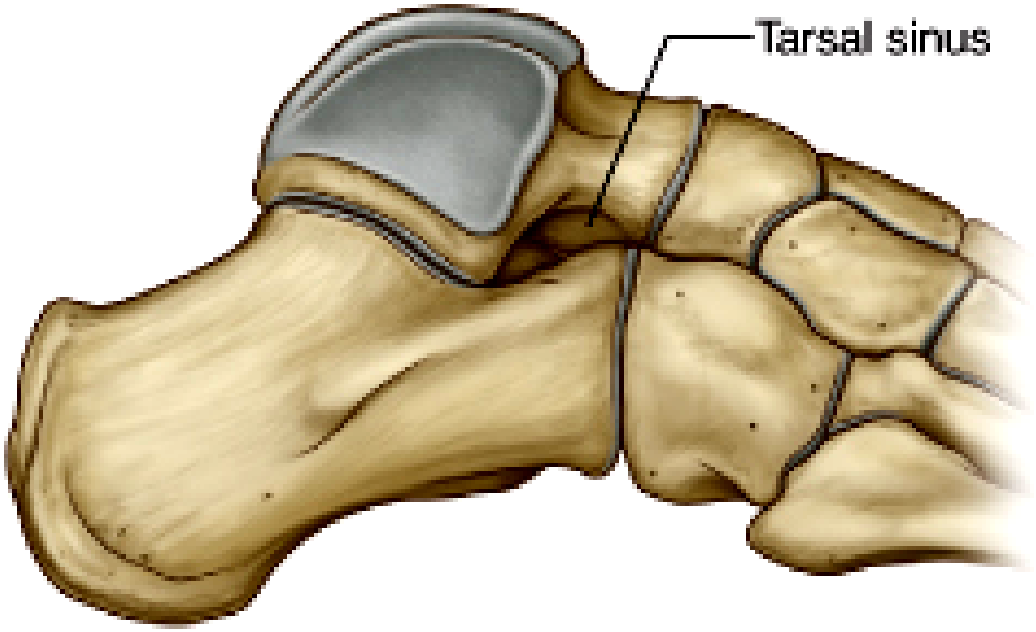
Distal:

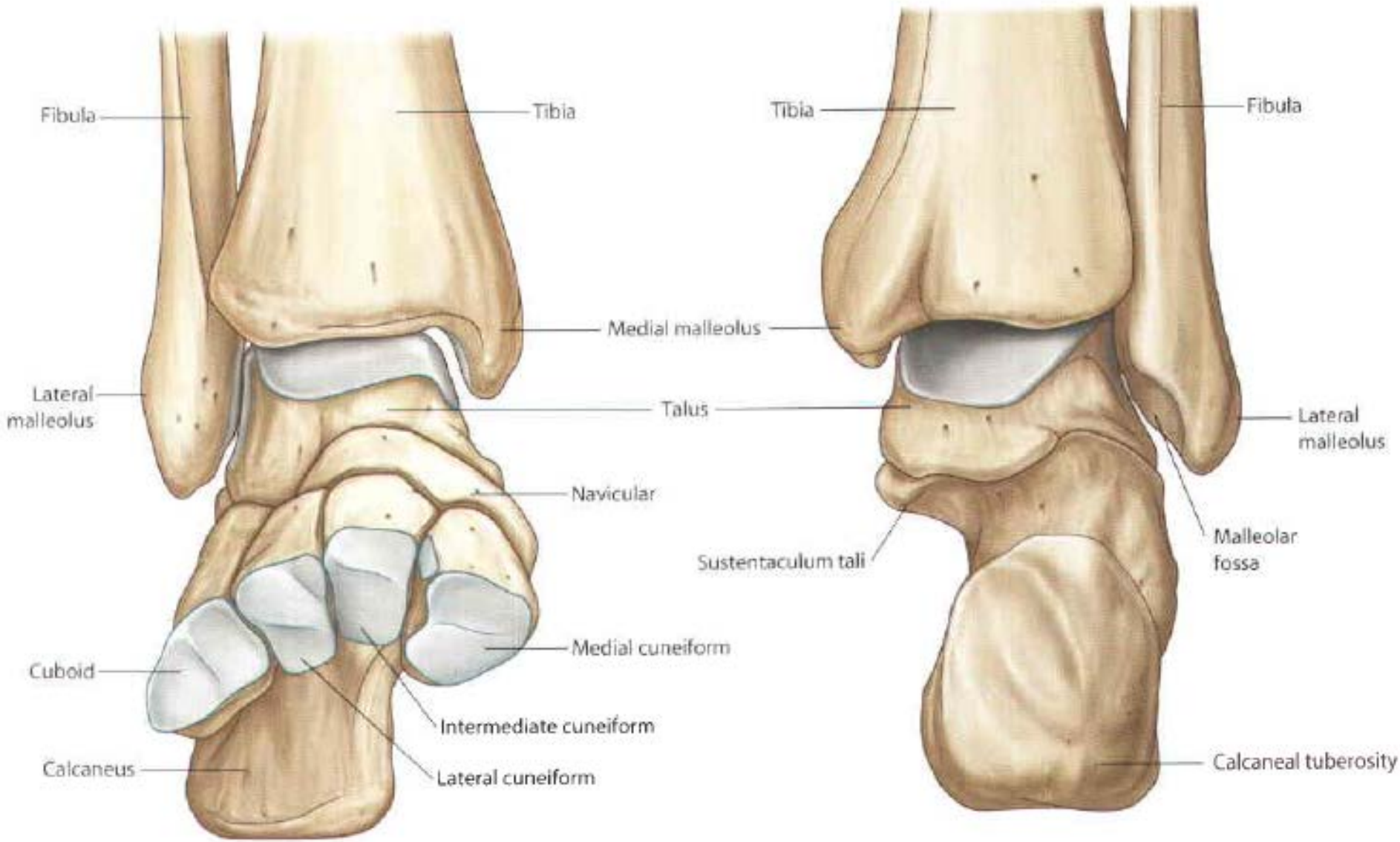
Navicular
Cuniform
Cuboid











Anterior view
(metatarsals and phalanges removed)

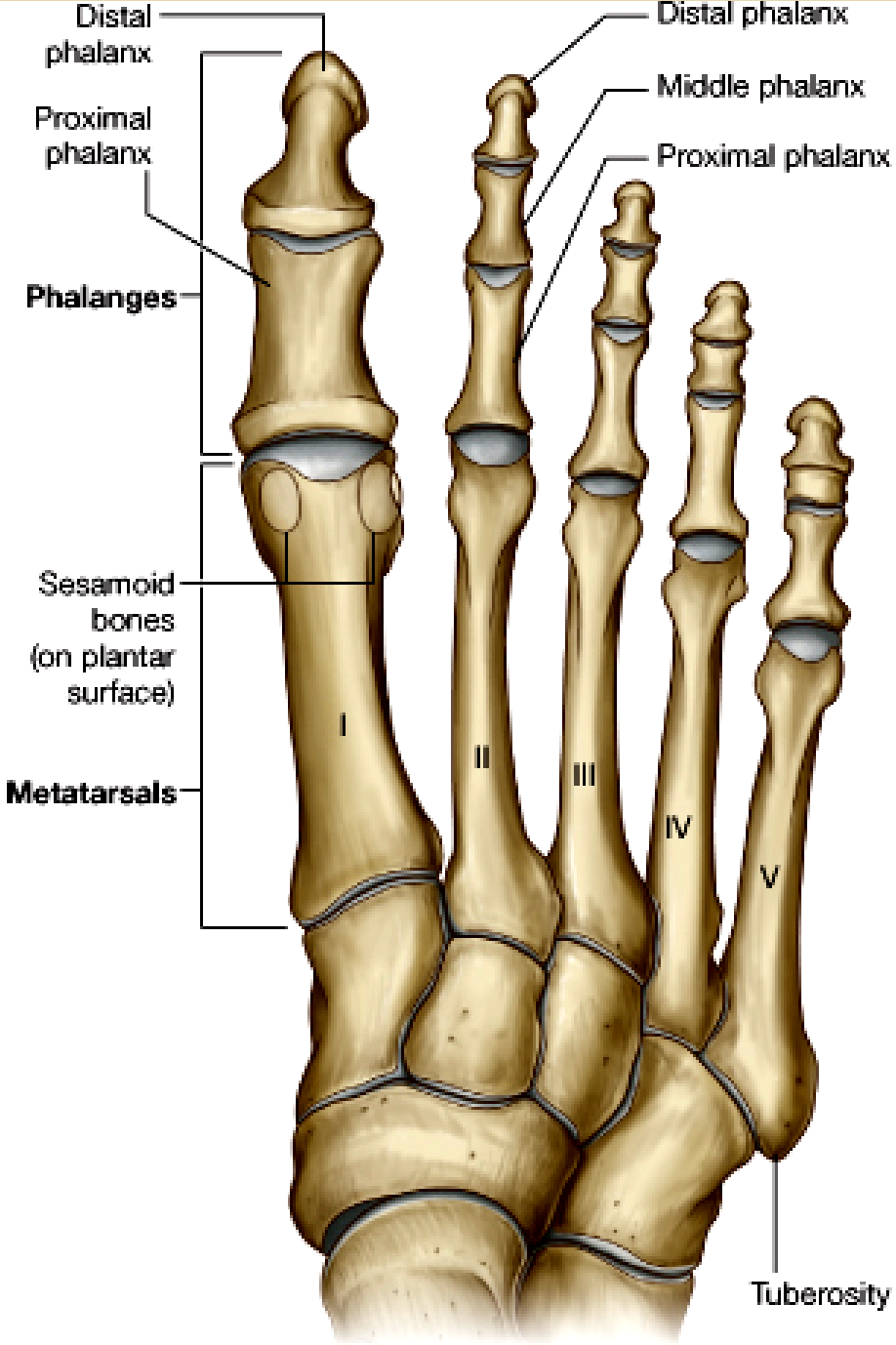
Posterior view

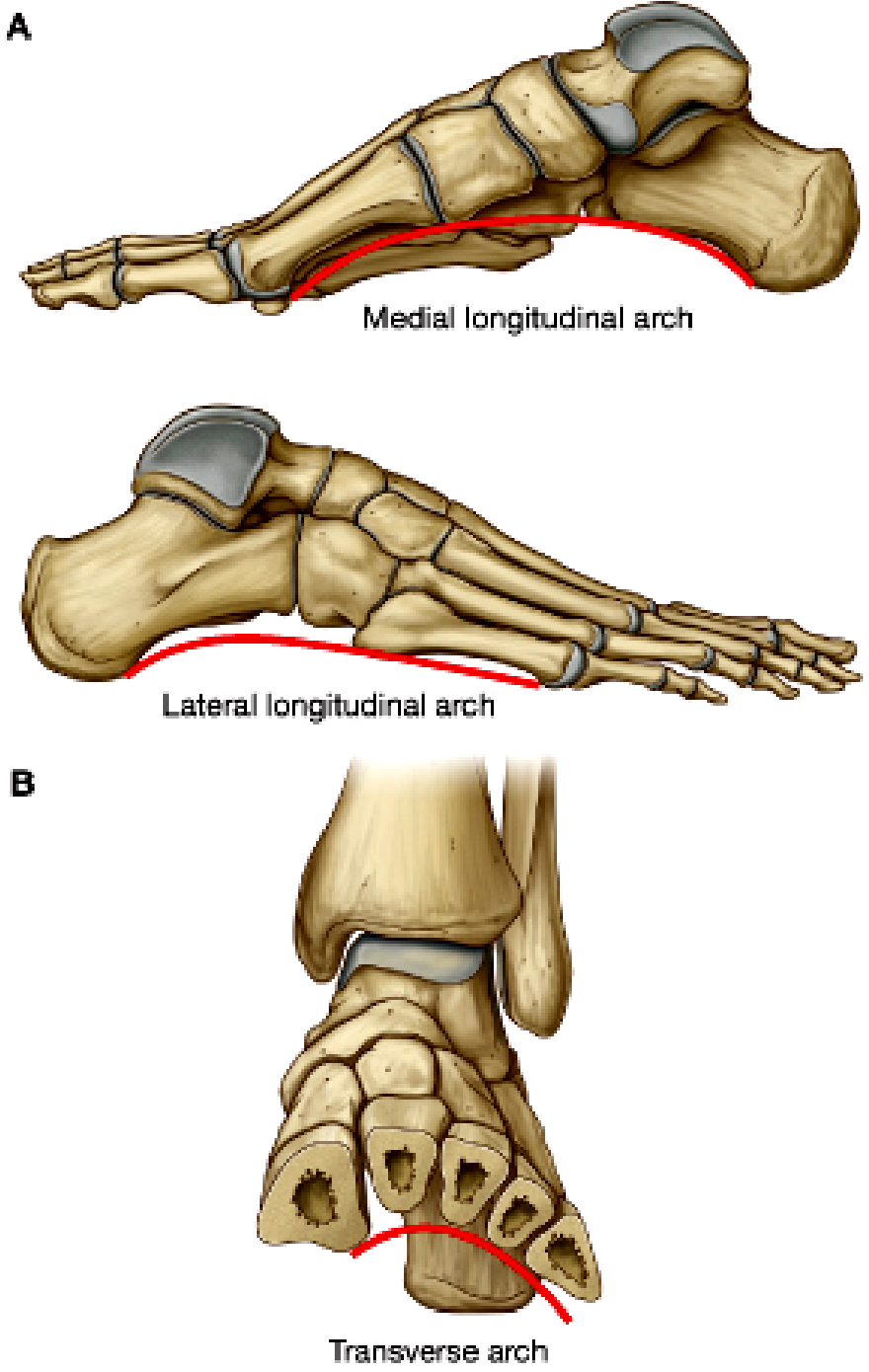
Metatarsal bones:

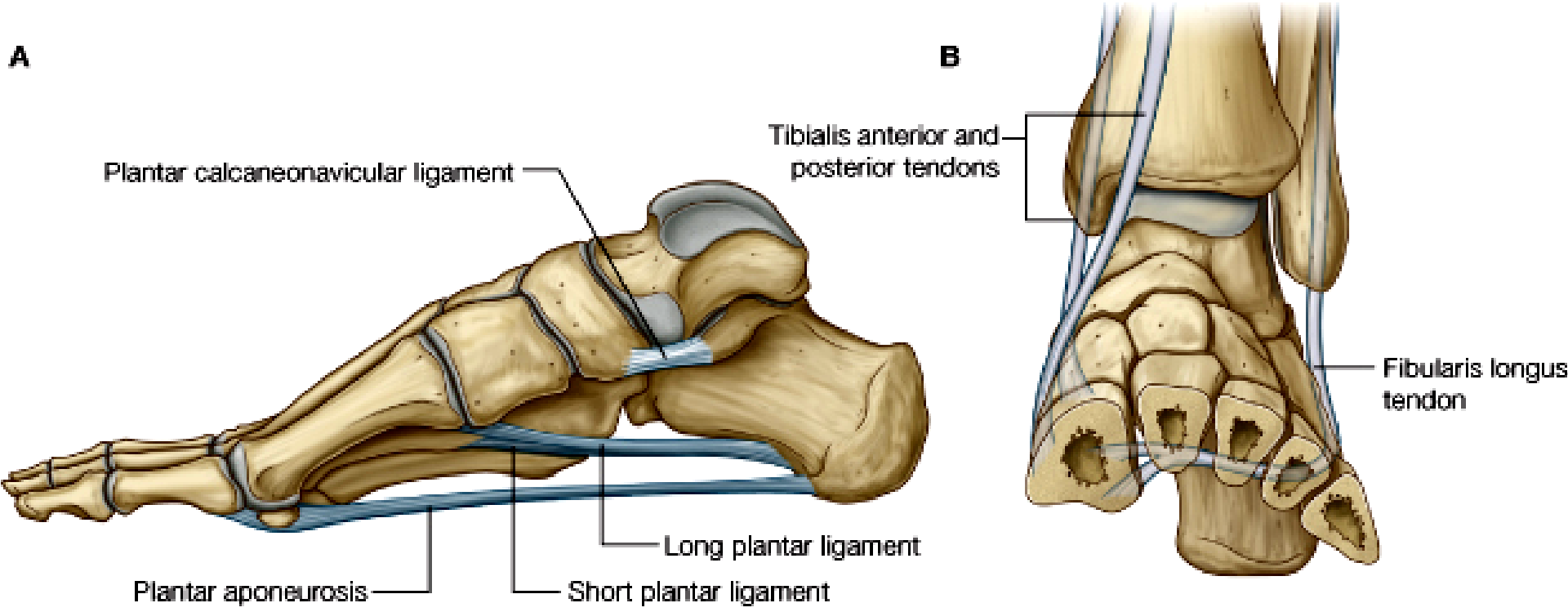
- Base
- Body
- Apex

Phalanges:

- Base
- Body
- Apex







Pott,s fracture