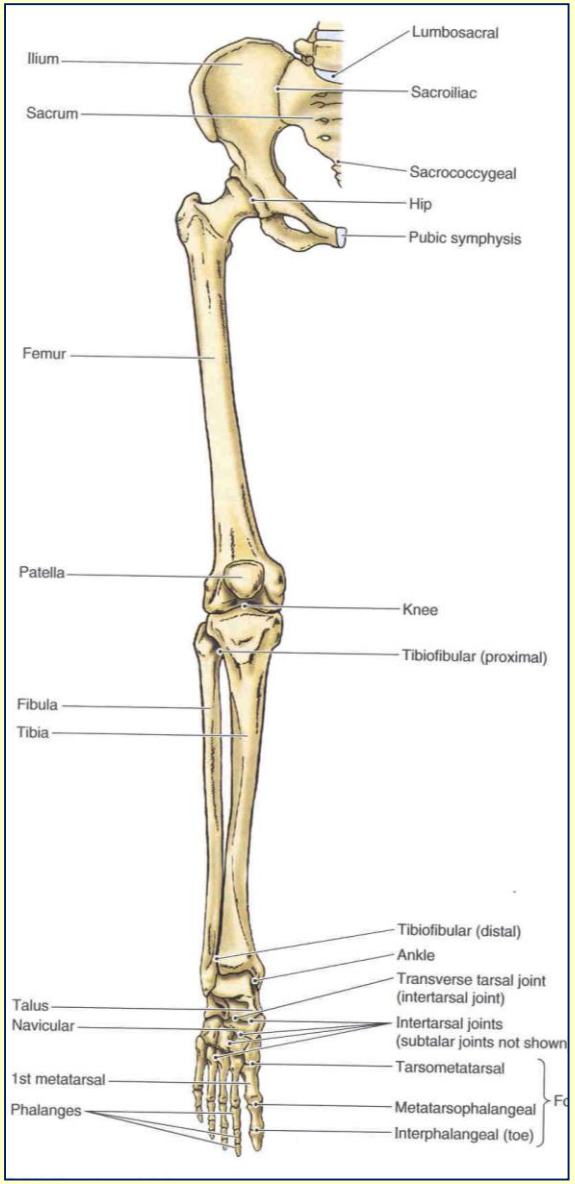
The Lower Limb

Sevda LAFCI FAHRİOĞLU, MD.PhD.



The Lower Limb

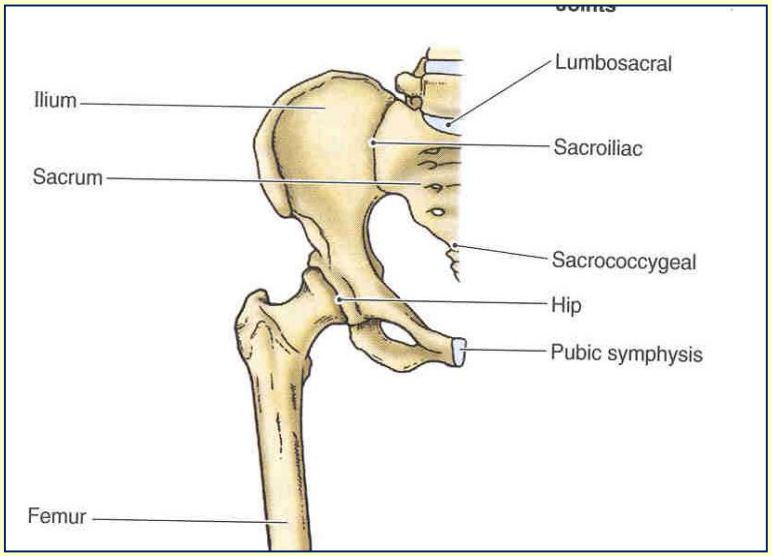
- The bones of the lower limb form the inferior part of the appendicular skeleton
- the organ of locomotion
- for bearing the weight of body
  - stronger and heavier than the upper limb
- for maintaining equilibrium

The Lower Limb

- 4 parts:
  - The pelvic girdle (coxae)
  - The thigh
  - The leg (crus)
  - The foot (pes)

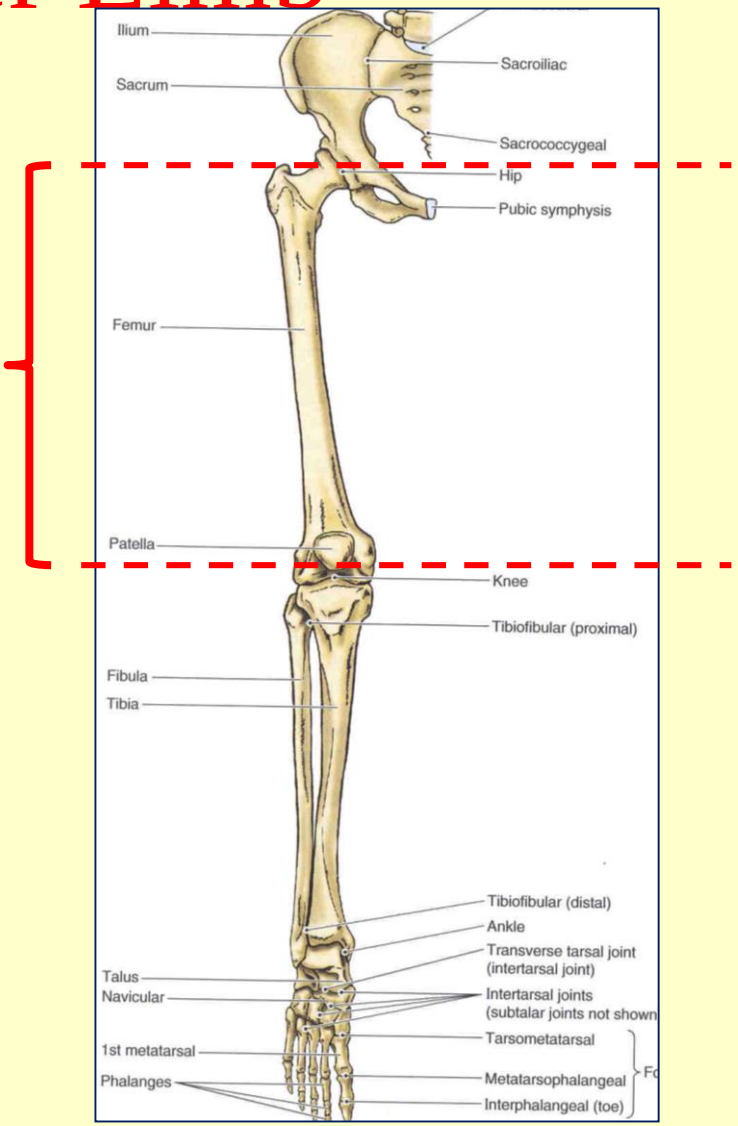
The Lower Limb

- The pelvic girdle:
  - formed by the hip bones (innominate bones-ossa coxae)
  - Connection: the skeleton of the lower limb to the vertebral column



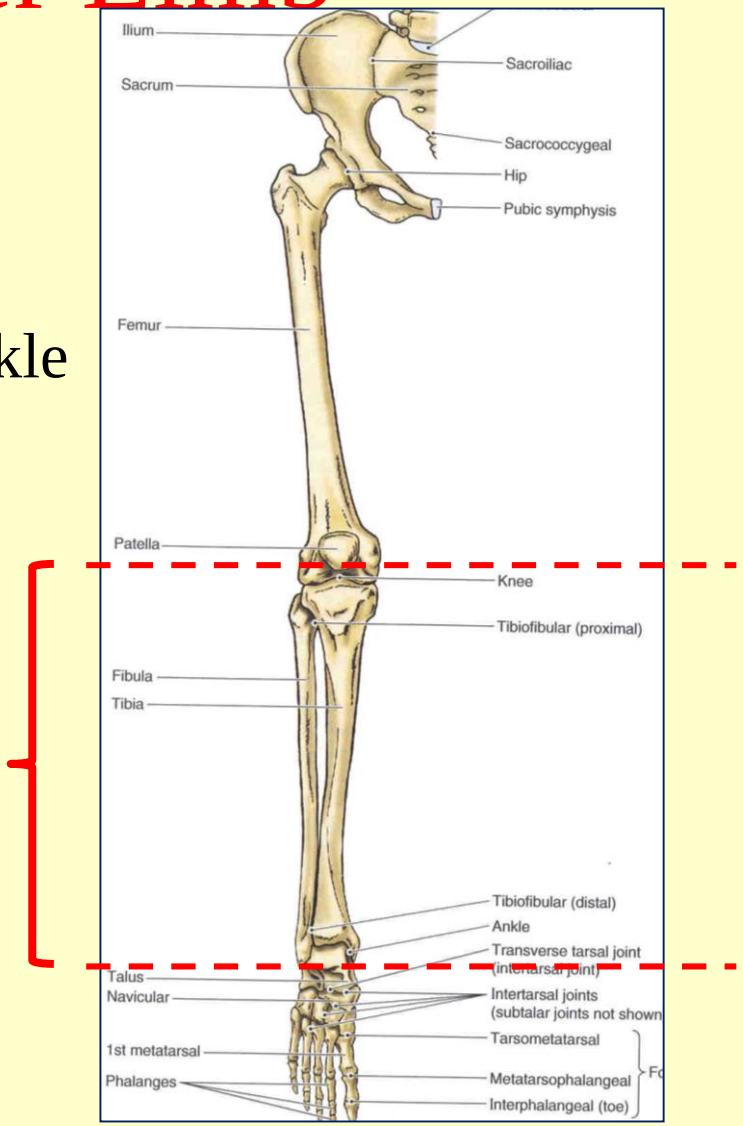
The Lower Limb

- The thigh
  - the femur
  - connecting the hip and knee



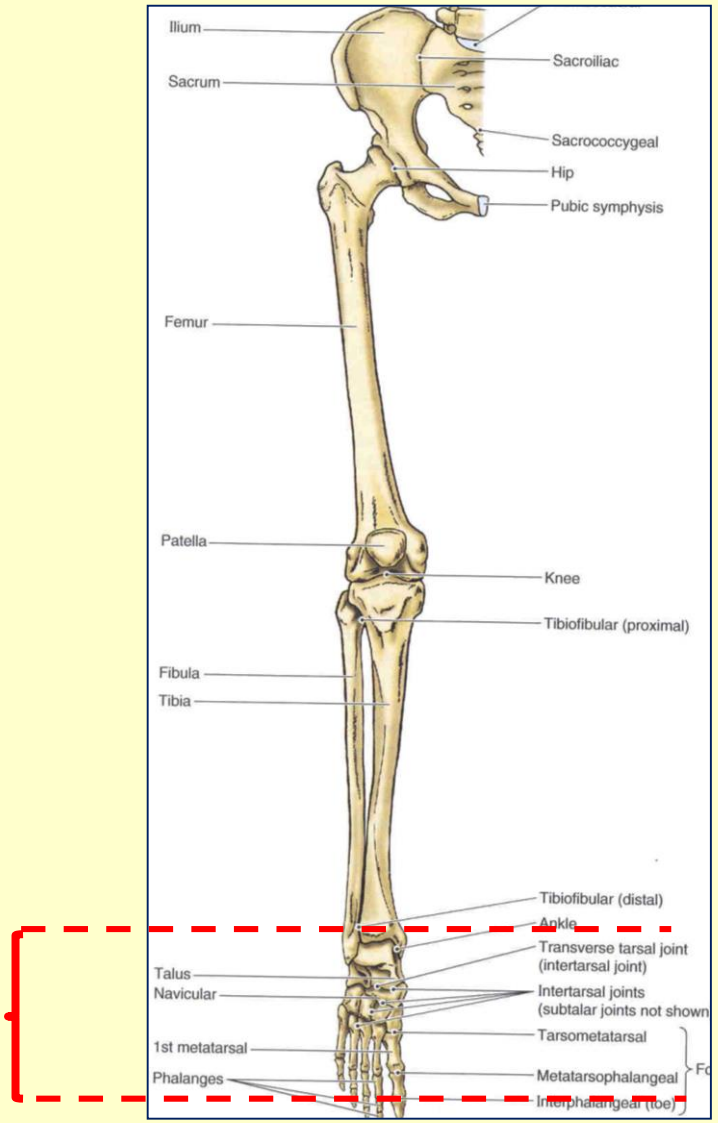
The Lower Limb

- The leg
  - the tibia and fibula
  - connecting the knee and ankle



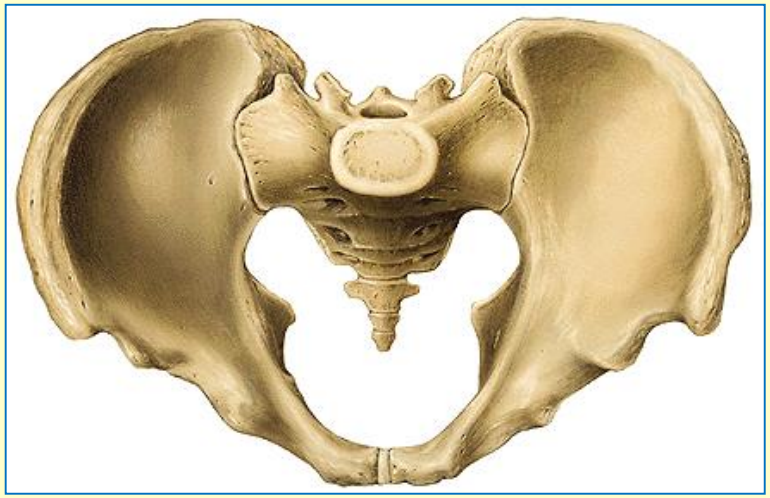
The Lower Limb

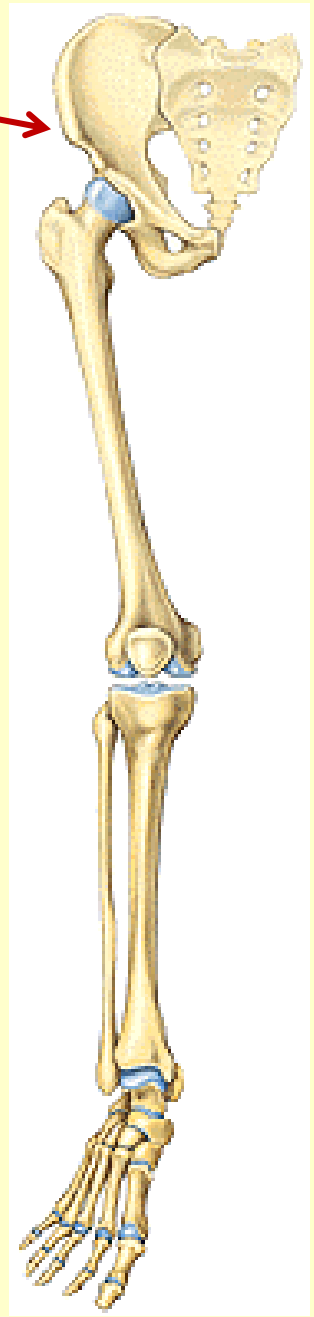
- The foot
  - distal part of the ankle
  - the tarsal bones, metatarsal bones, phalanges



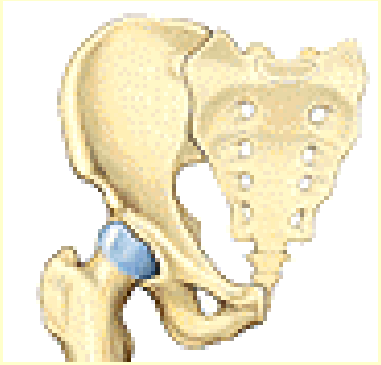
The Lower Limb

- 4 parts:
  - The pelvic girdle
  - The thigh
  - The leg
  - The foot

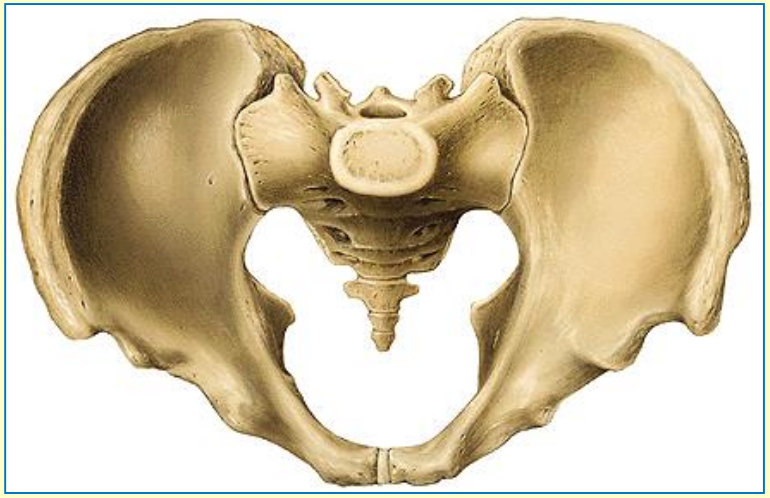




The pelvic girdle
Hip



- the area from the iliac crest to the thigh
- the region between the iliac crest and the head of the femur
- formed by the innominate bones-ossa coxae



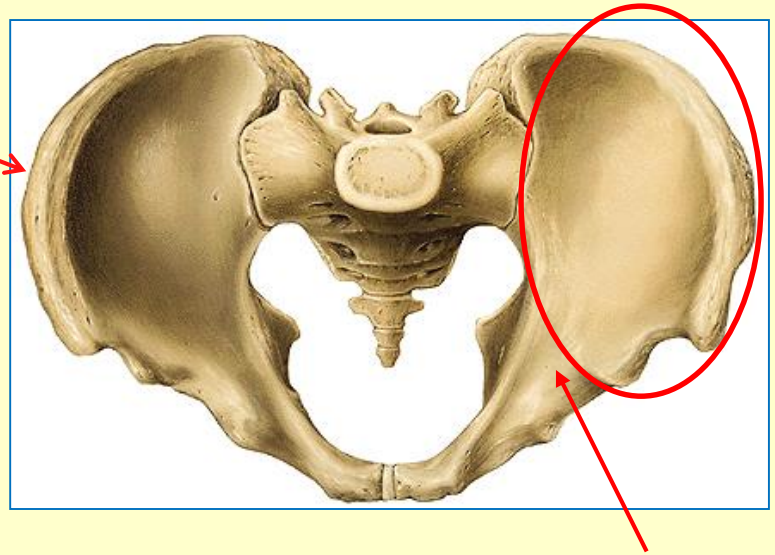
The hip bone
os coxae

- large and irregular shaped
- consists of three bones in childhood:
  - ilium
  - ischium
  - pubis

•fuse at 15-17 years
•joined in adult

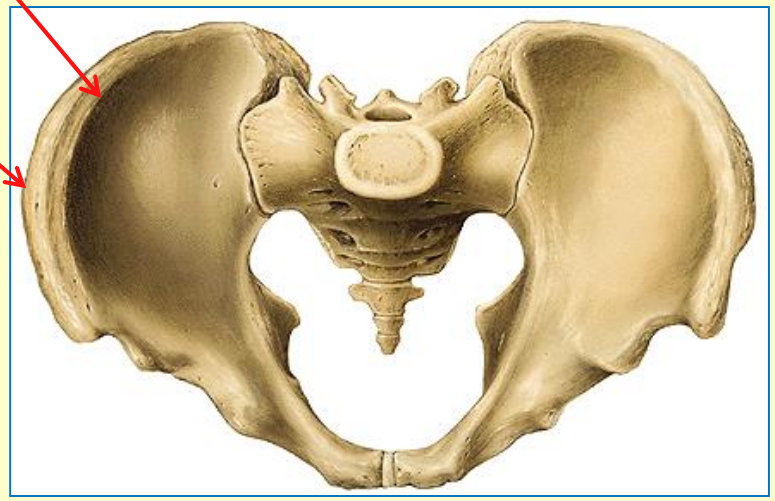
The hip bone
1.The ilium

- forms the superior 2/3 of the hip bone
- has ala (wing), is fan-shaped
- its body representing the handle
- iliac crest: superior margin of ilium



The hip bone
the ilium

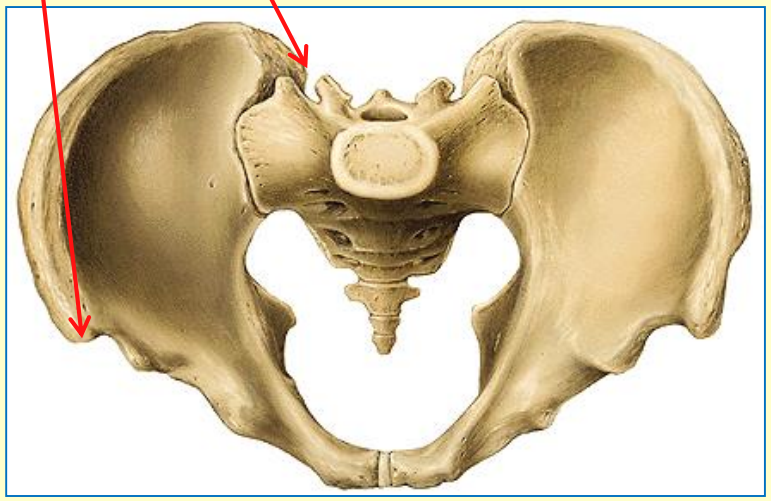
- iliac crest
  - internal lip (labium internum)
  - external lips (labium externum)



The hip bone
the ilium

- iliac crest end posteriorly “posterior superior iliac spine” at the level of the fourth lumbar vertebra bilat.*
- iliac crest end anteriorly “anterior superior iliac spine
  - easily felt
  - visible if you are not fatty

- *: it is important for lumbar puncture



The hip bone
the ilium

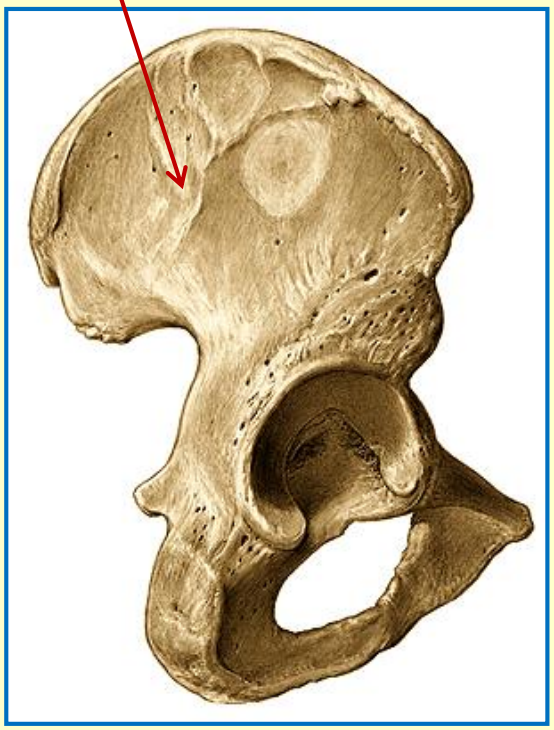
- *Tubercle of the crest* is located 5cm posterior to the anterior superior iliac spine
- *ant. inf. iliac spine*
- *post. inf. iliac spine*

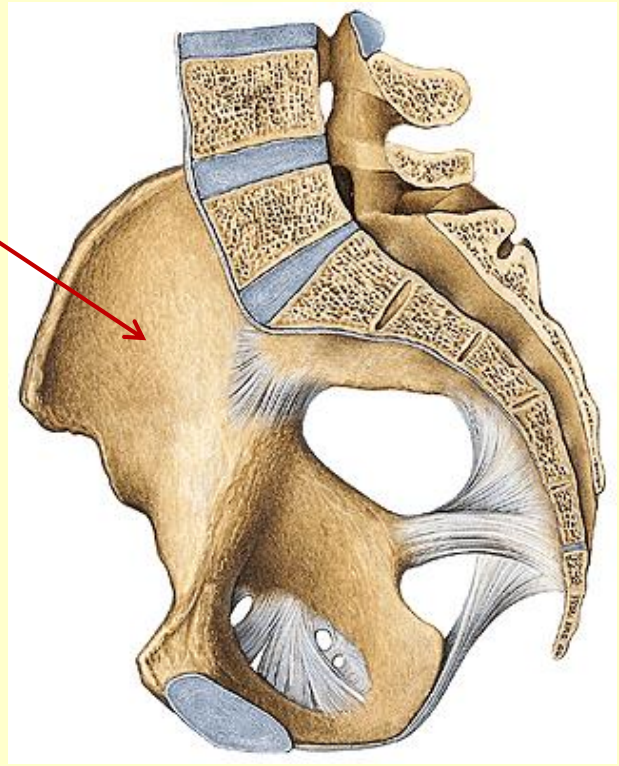
} difficult to identfy by palpation

The hip bone
the ilium

Gluteal face

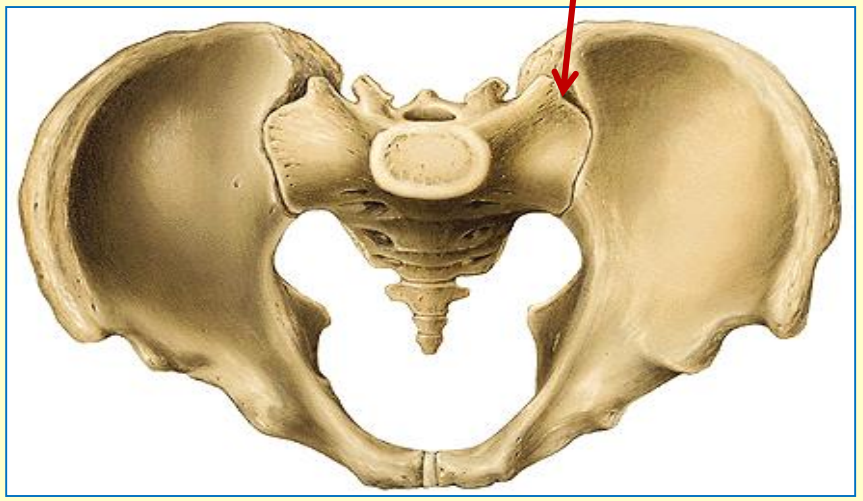
Pelvic face





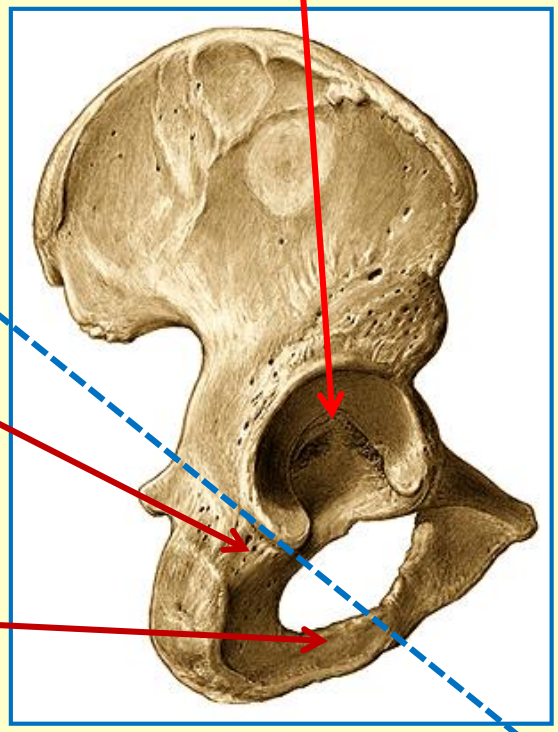
The hip bone
the ilium

- At the medial side
  - auricular surface for the sacroiliac joint



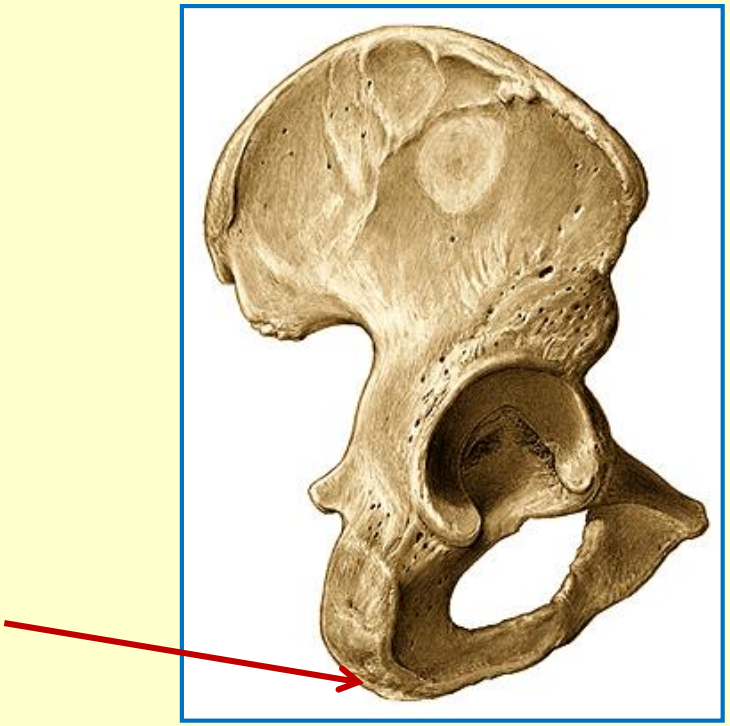
The hip bone
2.The ischium

- it forms the posteroinferior part of hip
- L-shaped
- which passes inferiorly from the acetabulum
- turns anteriorly to join the pubis
  - body
  - ramus



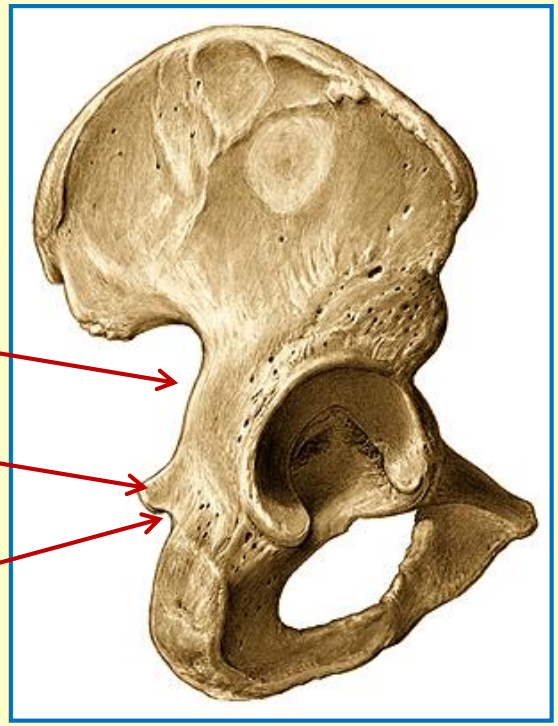
The hip bone
the ischium

- at the inferior end of the body
  - ischial tuberosity
    - » is covered by gluteus muscles when the thigh is extended



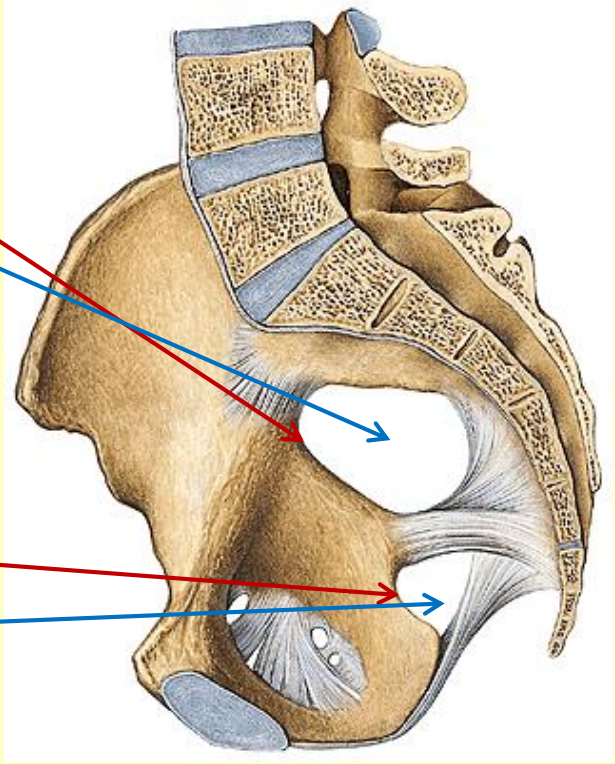
The hip bone
the ischium

- at the posterior part of the ischium
  - ischial spine (spina ischiadica)
    separates the
    - » greater sciatic notch (sup.)
    - » lesser sciatic notch (inf.)



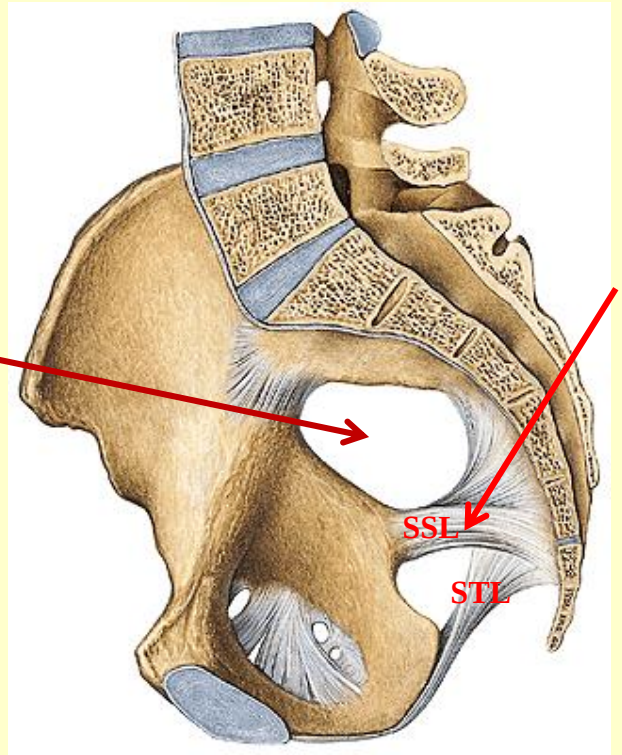
The hip bone
the ilium

- greater sciatic notch
- greater sciatic foramen
- lesser sciatic notch
- lesser sciatic foramen



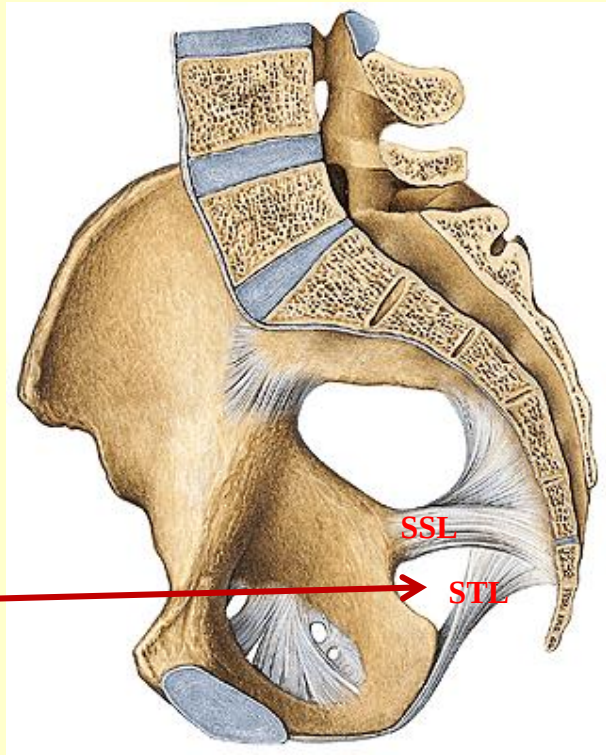
The hip bone
the ischium

- the greater sciatic notch
  - is converted “greater sciatic foramen” by the sacrospinous ligament
  - pass the
    - » the priformis muscle
    - » the vessels and nerves of gluteal region



The hip bone
the ischium

- The lesser sciatic notch
  - is converted “lesser sciatic foramen” by the sacrospinous and sacrotuberous ligament
  - contains:
    - » obtrator internus muscle
    - » pudendal nerve
    - » internal pudendal vessels

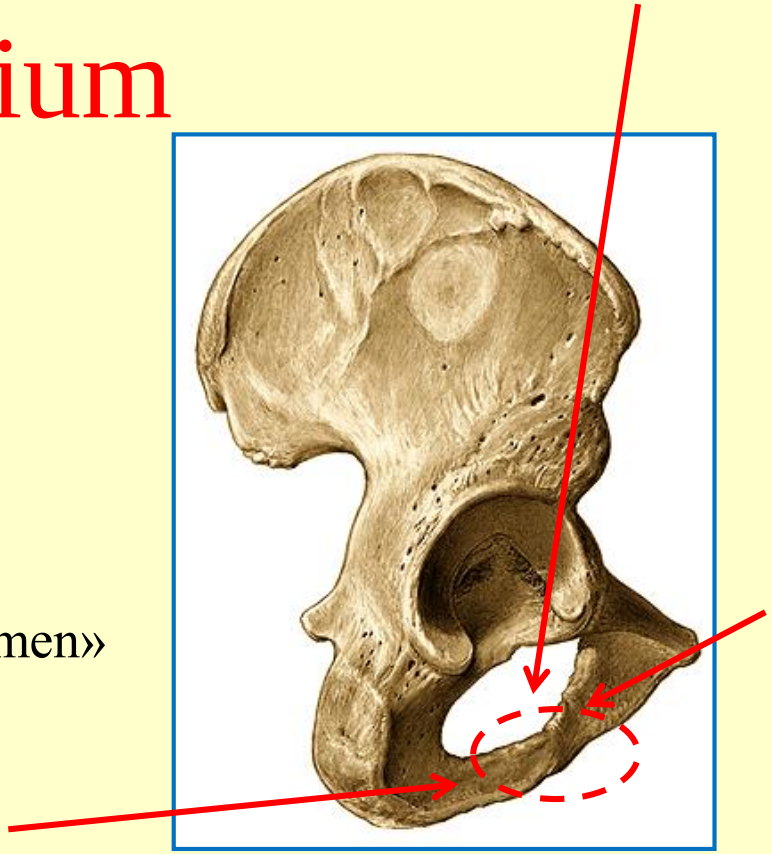


L

The hip bone
the ischium

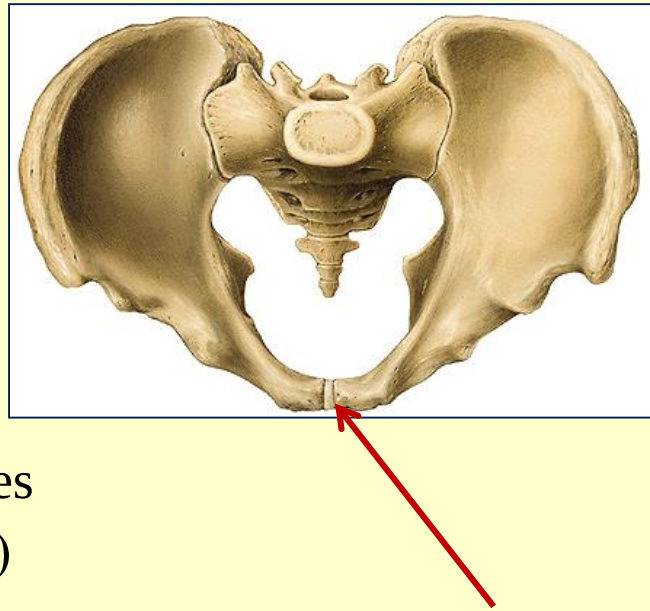
- ramus
  - » extends medially from the body
  - » joins the inf. ramus of the pubis
  - » form “ischiopubic ramus”

  which completes the «obturator foramen»



inf. ramus of pubis+ramus of ischium=ischiopubic ramus

The hip bone
the pubis



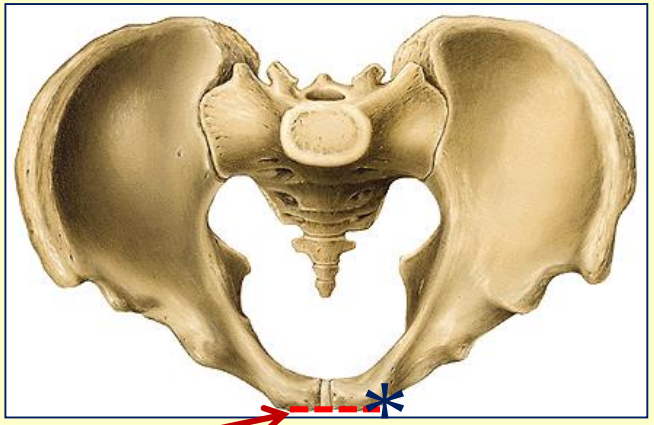
- forms anterior part of the hip bone
- **body,** lies medially, joins body of the other ones
- it's called symphysis pubis (cartilaginous joint)
- **ramus (2)**
  - » *superior ramus* passes superiolaterally to the acetabulum
  - » *inferior ramus* passes posteriorly, inferiorly, laterally

  to joins ramus of ischium

  to form *ischiopubic ramus*

The hip bone
the pubis

– the anterior border of the body is thickened
"pubic crest"
– its lateral ends, pubic tubercule*
*: main pubic attachment for the inguinal ligament-
bony landmark

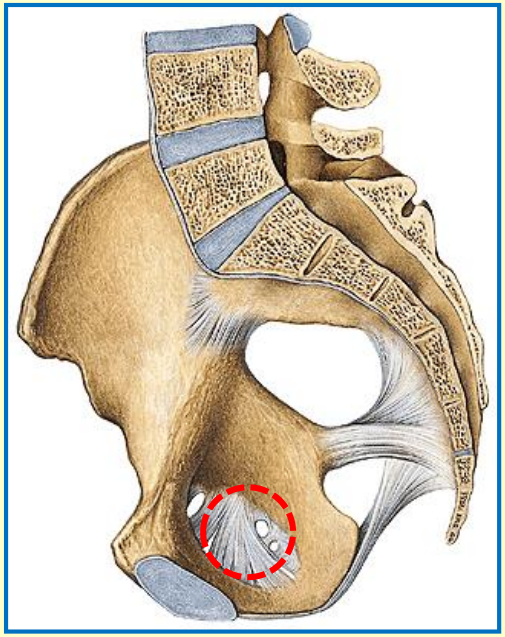


The hip bone
the obturator foramen

- oval aperture
- surrounded by the bodies and rami of the pubis and ischium
- it lies inferomedial to the acetabulum

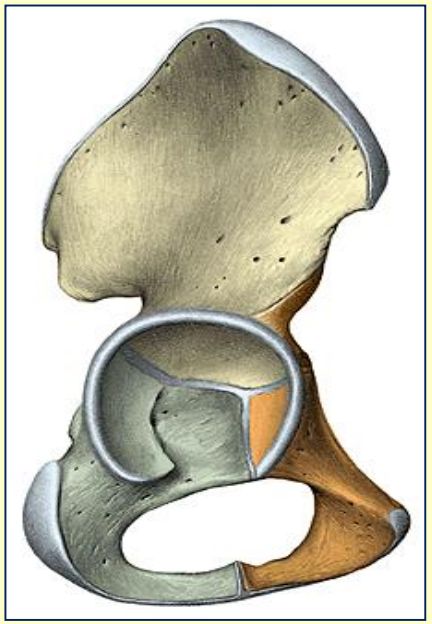
The hip bone
the obturator foramen

– is nearly closed by the ‘’obturator membrane’’



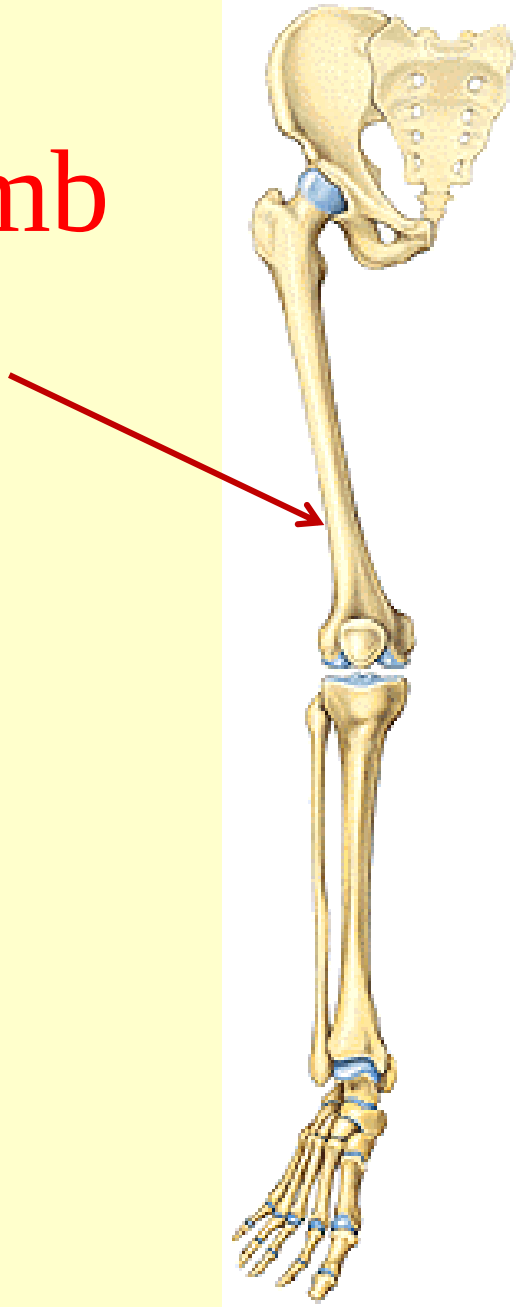
The hip bone
the acetabulum

- cup shape cavity
- articulates with the head of femur
- it's names from Roman vinegar cup, it is called acetabulum
- Until puberty the ilium, ischium and pubis are united by a "Y" shaped hyaline cartilage
- At 15-17 years these bones fuse to form the hip bone (cartilage is replaced by bone)



The Lower Limb

- 4 parts:
  - The pelvic girdle
  - The thigh
  - The leg
  - The foot



The thigh
Femur

- thigh bone is femur
  - longest
  - strongest
  - heaviest bone

- articulates with acetabulum and tibia

The thigh
Femur

- body (shaft)
- ends (extremities)

  <u>Proximal end:</u>

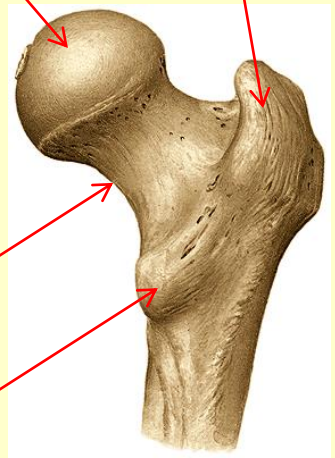
  – head

  – neck

  – greater trochanter

  – lesser trochanter

  – articulates with acetabulum



posterior aspect

medial aspect

The thigh
Femur

- Distal end:
  - broadened
  - articulates with tibia and patella

medial aspect

anterior aspect

The thigh
Femur

- Proximal end:
  - head
  - neck
  - greater trochanter
  - lesser trochanter

posterior aspect

medial aspect

The thigh
Femur

- Proximal end:
  - Head
    - forms about 2/3 of a sphere
    - to fit deeply into the acetabulum
    - sometimes palpable

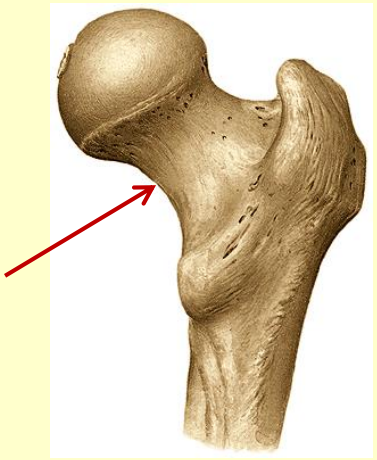
    when the thigh

    is rotated laterally in thin male

posterior aspect medial aspect

The thigh
Femur

- Proximal end:
  - head
  - neck
  - greater trochanter
  - lesser trochanter



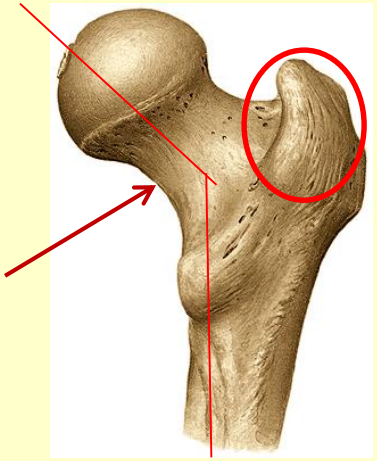
posterior aspect

The thigh
Femur

– neck
  - between head and body
  - to meet the body

  neck runs inferolaterally with angle of 125˚
  - limited laterally

  greater trochanter



posterior aspect

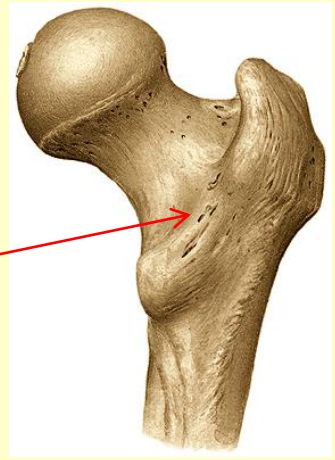
The thigh
Femur

– Intertrochanteric line
  - between greater and lesser trochanter, anteriorly
  - is produced by the attachment of the iliofemoral ligament (massive lig.)

anterior aspect

The thigh
Femur

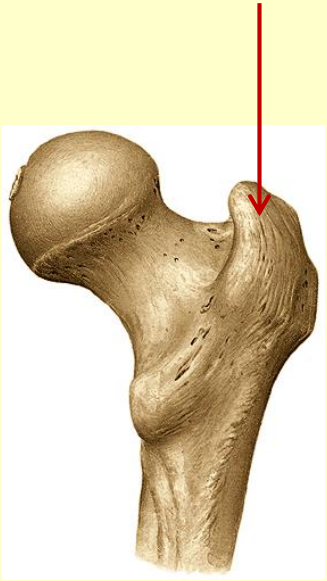
– Intertrochanteric crest
  - unites greater and lesser trochanter, posteriorly



posterior aspect

The thigh
Femur

- Proximal end:
  - head
  - neck
  - greater trochanter
  - lesser trochanter

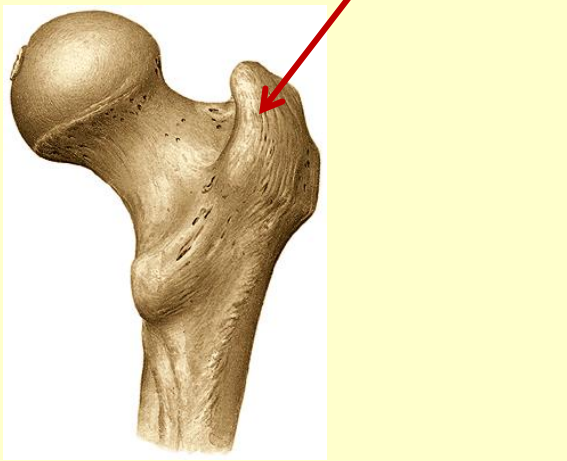


posterior aspect

The thigh
Femur

– greater trochanter
  - is large, rectangular projection

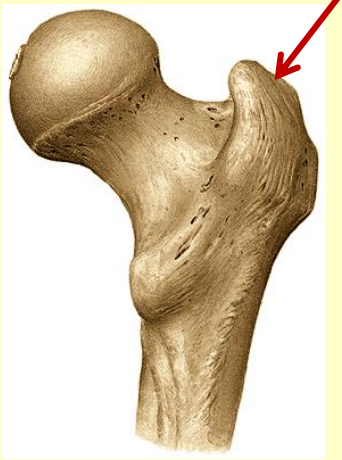
  from the junction of the neck and the body.



posterior aspect

The thigh
Femur

– greater trochanter
  - is insertion for muscle of gluteal region
  - the most lateral point of the hip region

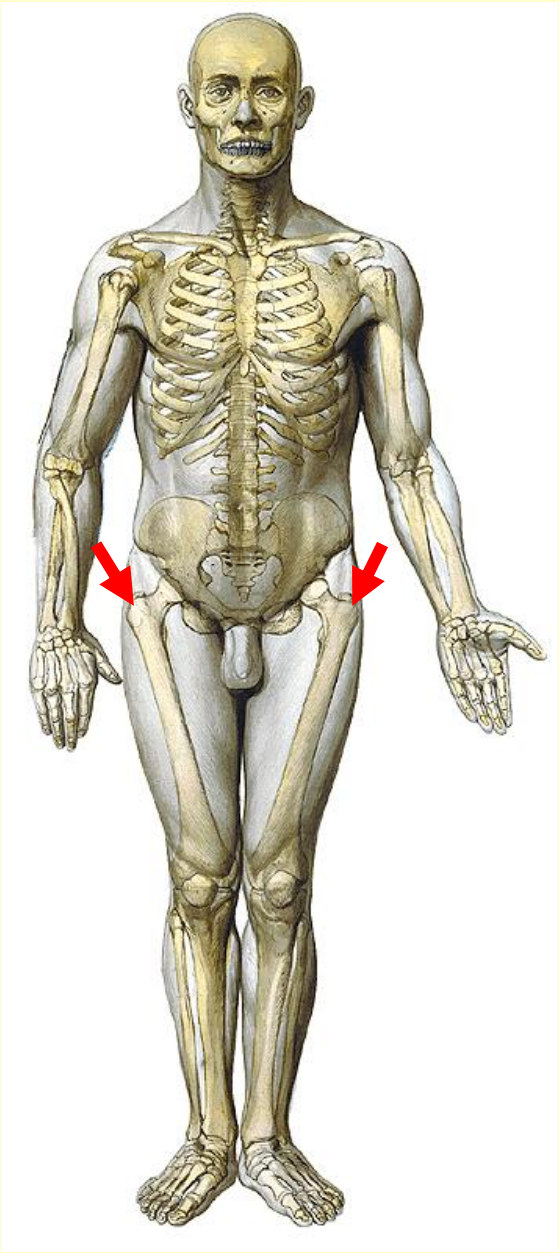


posterior aspect

The thigh
Femur

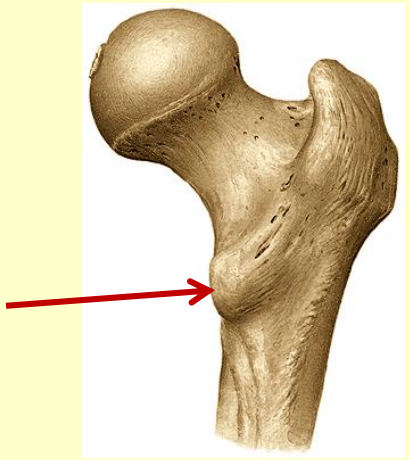
– greater trochanter
  - can be easily palpated on the lateral side of the thigh
  - the most lateral point

  of the hip region



The thigh
Femur

- Proximal end:
  - head
  - neck
  - greater trochanter
  - lesser trochanter



posterior aspect

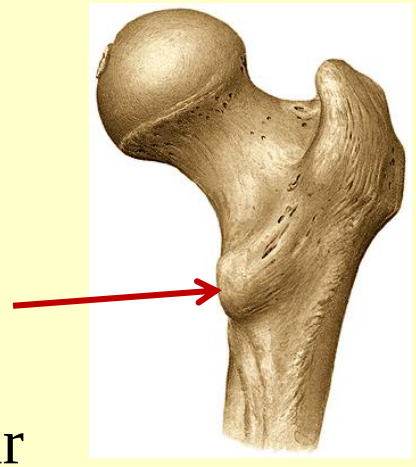
The thigh
Femur

- lesser trochanter
  - is located in the

  posteromedial surface
  - at the inferior end of

  the intertorachanteric crest
  - in the angle between

  the neck and body of the femur



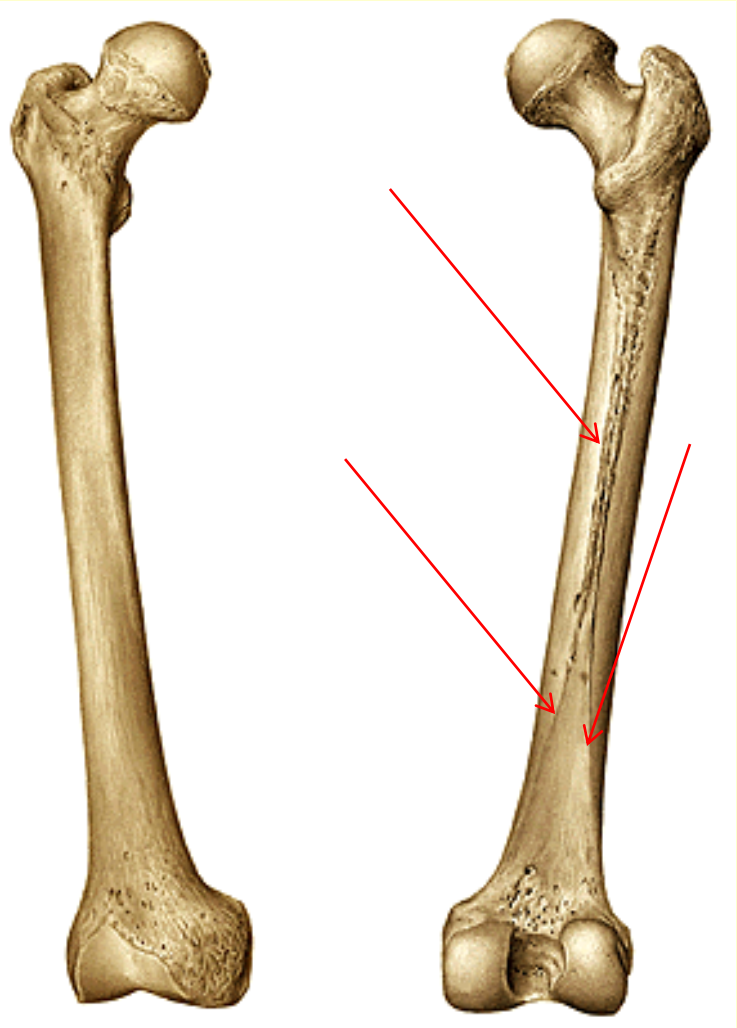
posterior aspect

The thigh
Femur

- Body (shaft)
- Linea aspera
  - in the middle of its posteriorly
  - has medial and lateral lips
  - Diverge inferiorly

  to form the supracondylar lines
  - not palpable, covered with

  large muscle



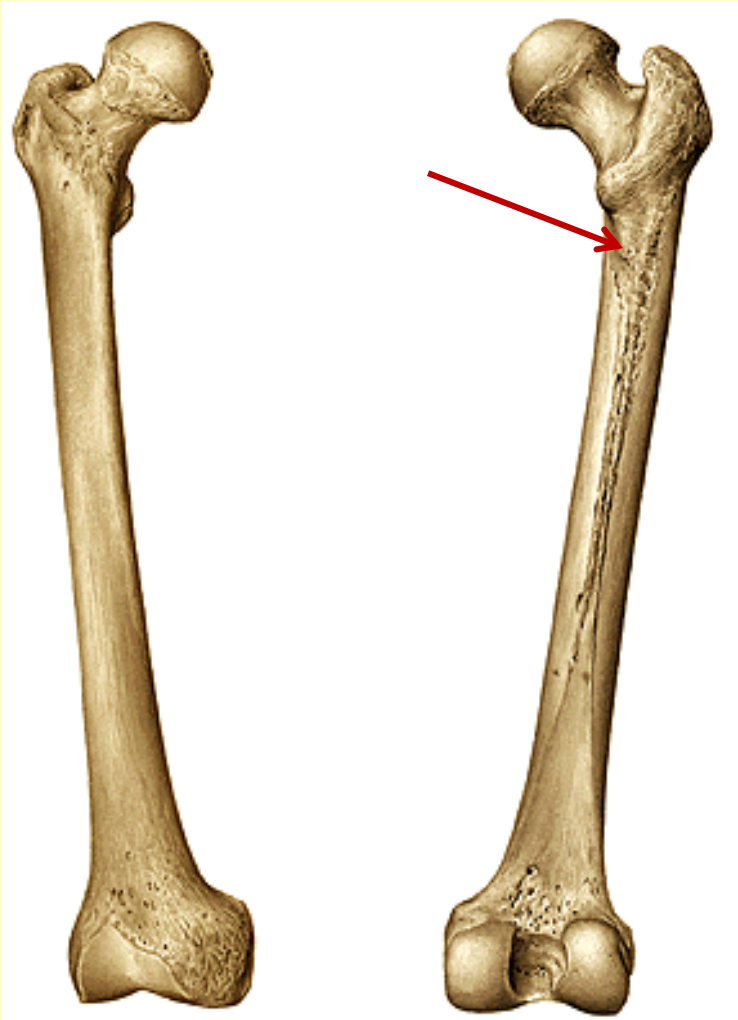
The thigh
Femur

Body (shaft)

- Pectineal line
  - runs from the

  lesser torachanter to the medial lip
  - tendon of the pectineal muscle

  inserts into it

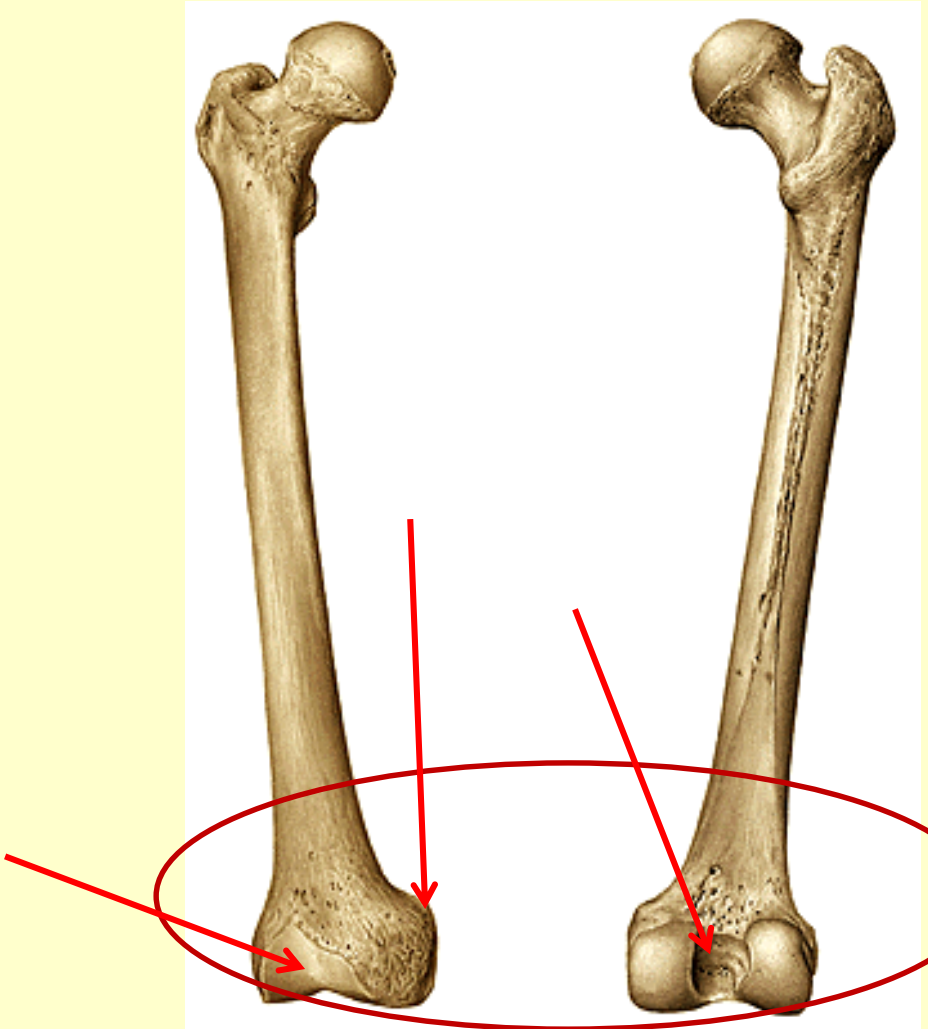


The thigh
Femur

- Distal end:

The thigh
Femur

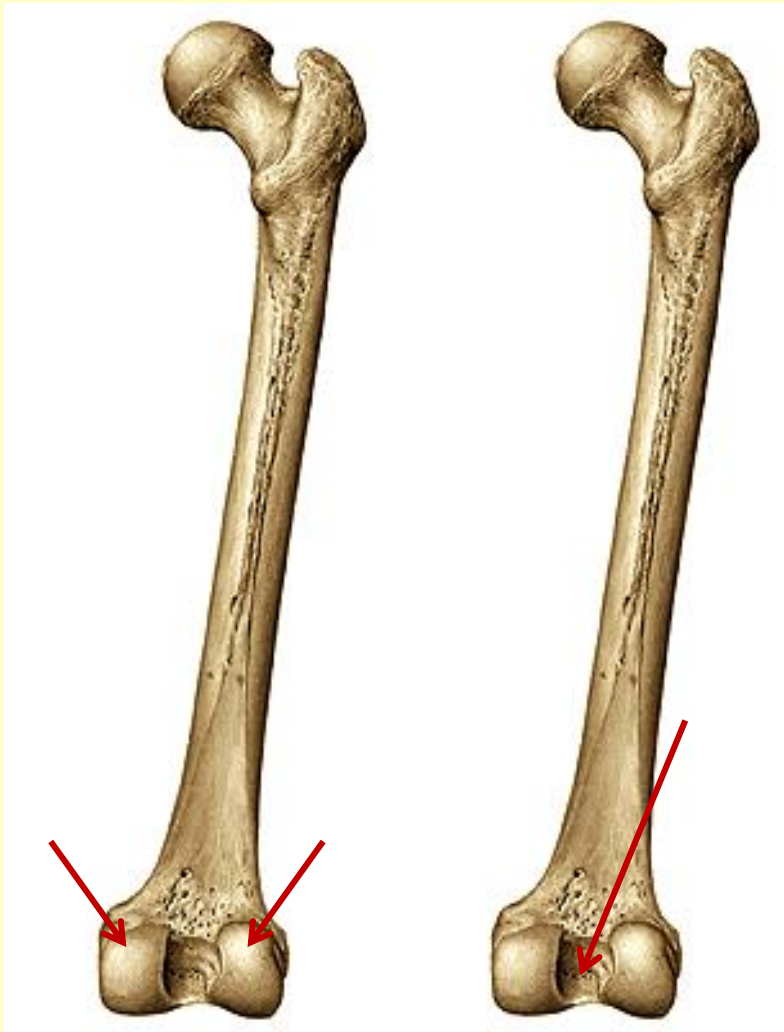
- Distal end:
  - Condyle, epicondyle
  - intercondylar notch
  - patellar surface
  - adductor tubercle



The thigh
Femur

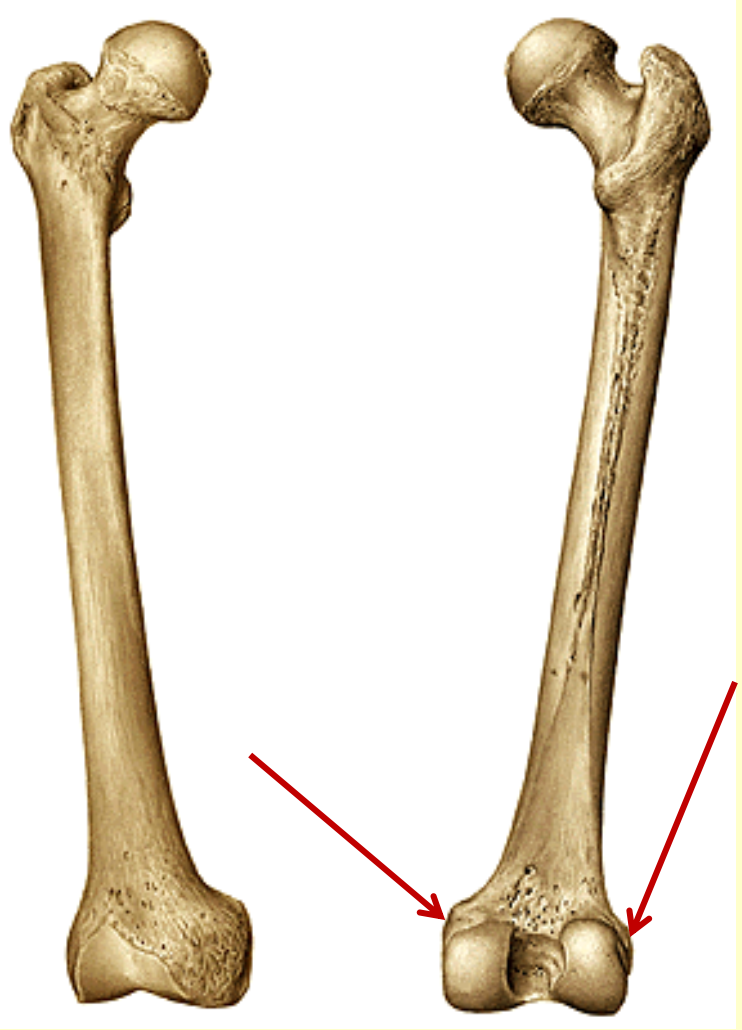
- Distal end:
  – broadened for articulation with tibia
  – 2 large “condyle” project posteriorly
    - are subcutaneous
    - easily palpable

  Covered by articular surface of condyle
  – separated by a deep U-shaped “intercondylar notch”



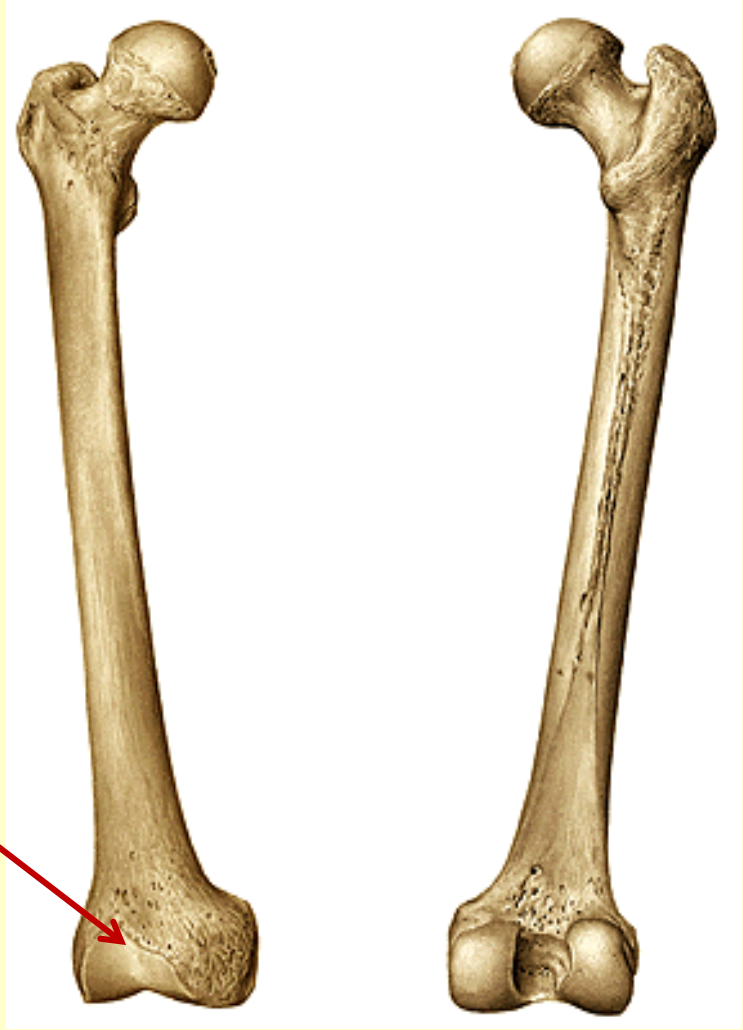
The thigh
Femur

- Distal end:
  - at the center of the each condyle is a prominent “epicondyle”
  - tibial and fibular collateral ligaments are attached to the epicondyles



The thigh
Femur

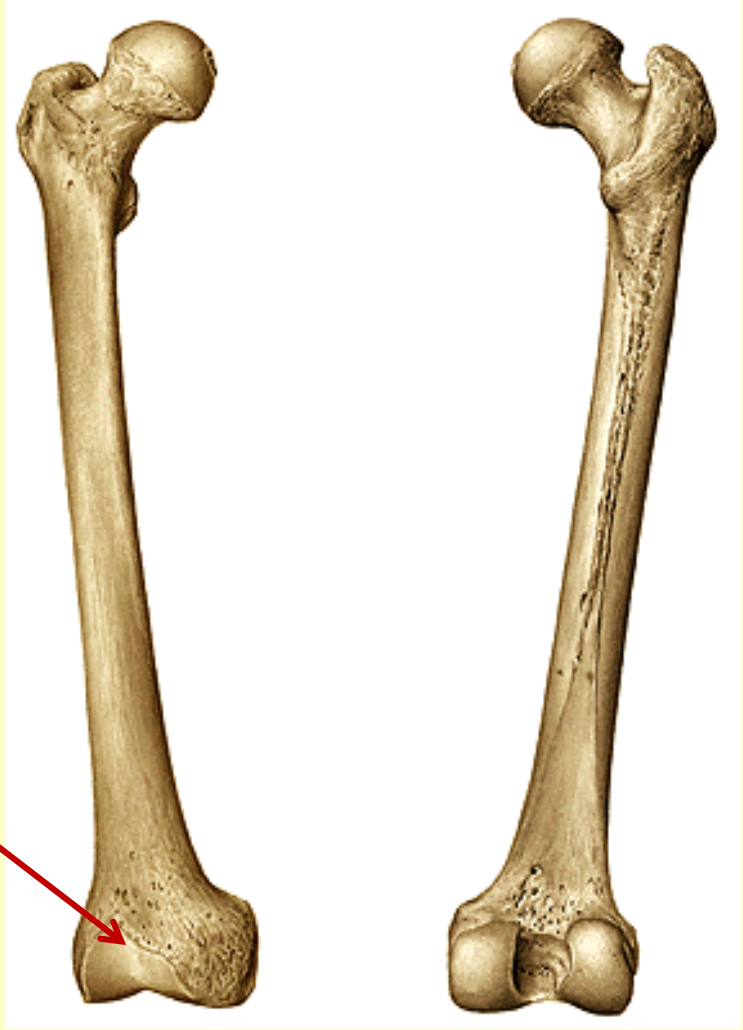
- Distal end:
  - articular surfaces of condyle are confluent anteriorly
  - patellar surface



The thigh
Femur

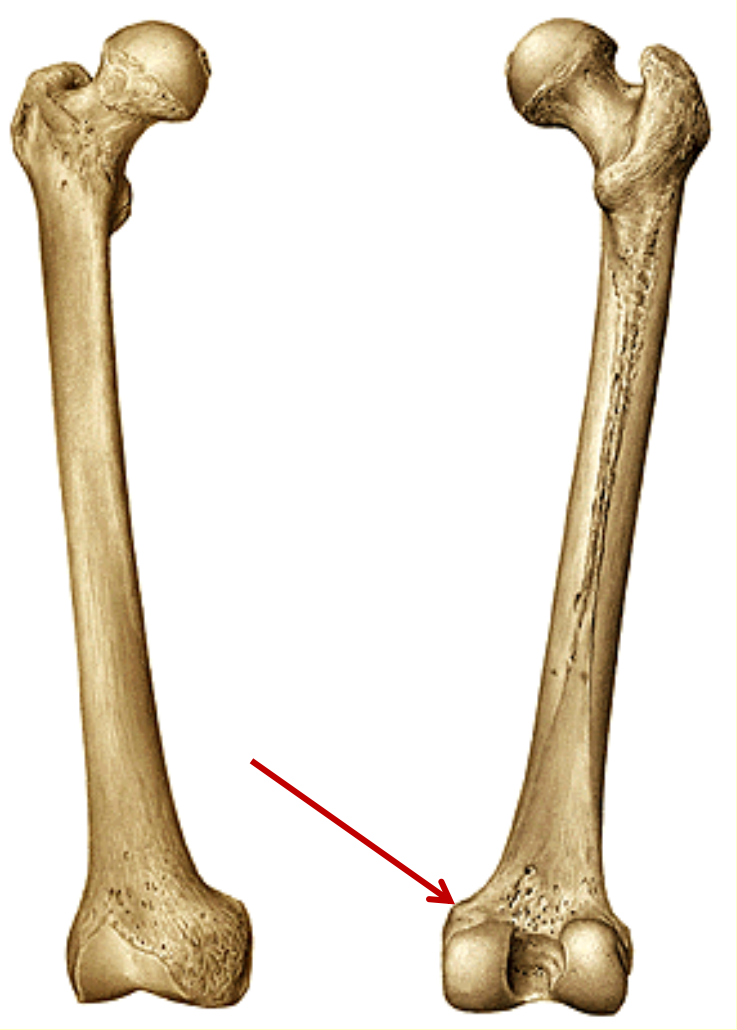
- Patellar surface can be palpated when the leg is flexed.

– Patella (kneecap)
  - slides during flexion and extension of the leg



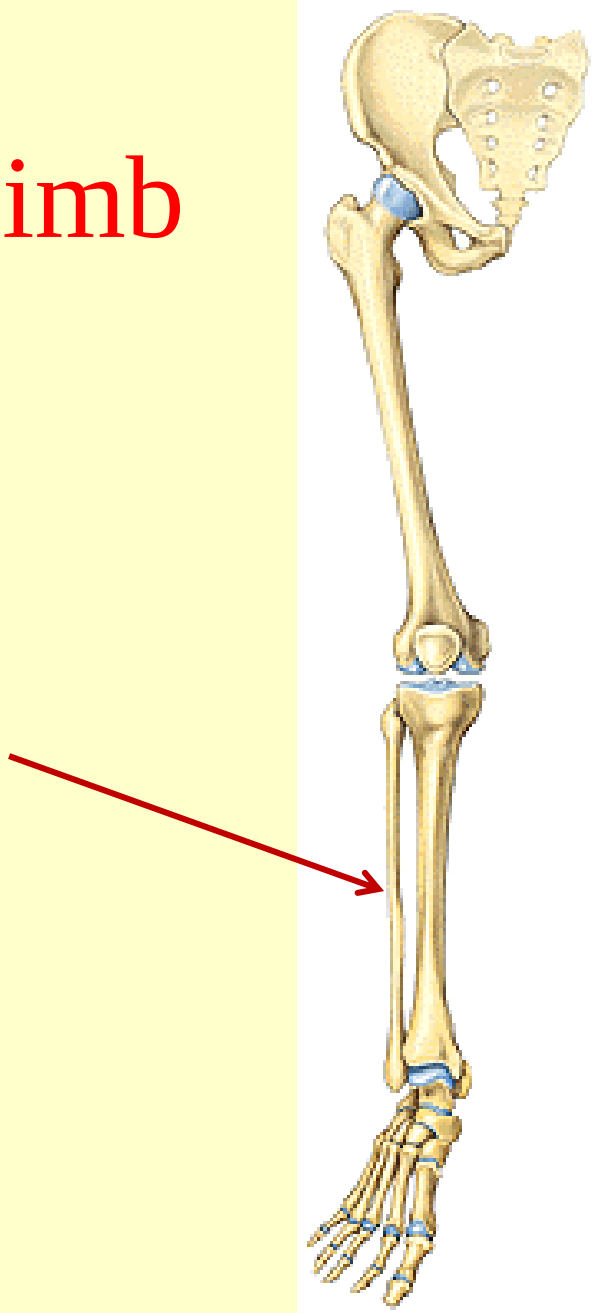
The thigh
Femur

- The ‘’adductor tubercle’’
  - located in the medial side



The Lower Limb

- 4 parts:
  - The pelvic girdle
  - The thigh
  - The leg
  - The foot



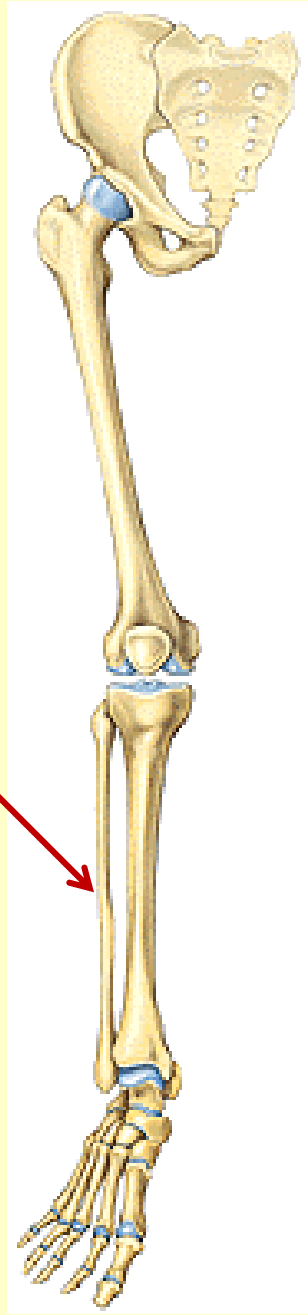
The Lower Limb

- The leg (crus)

- Between knee and ankle
  - tibia
  - fibula

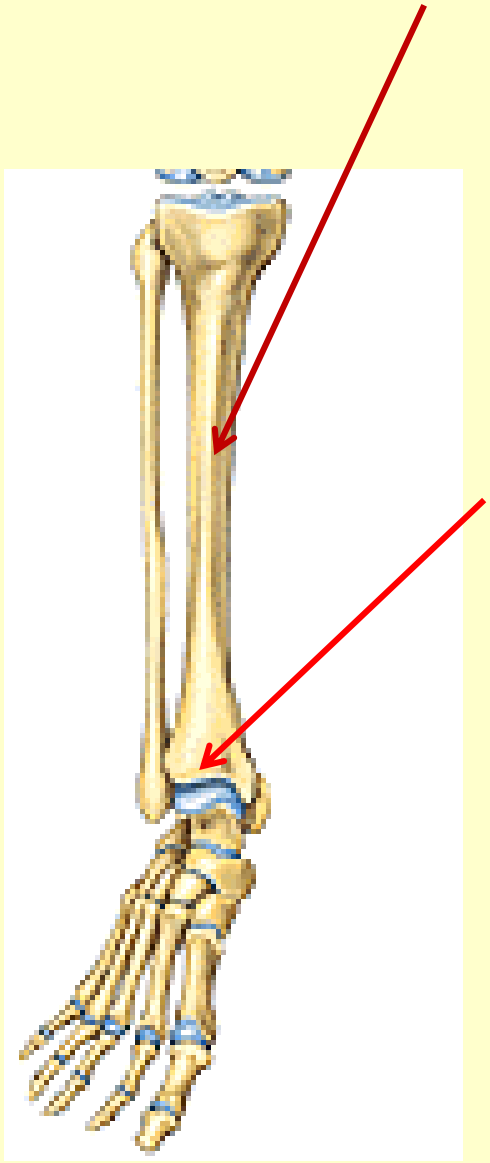
  are connected by an "interosseous membrane"

  » it is composed of strong oblique fibers



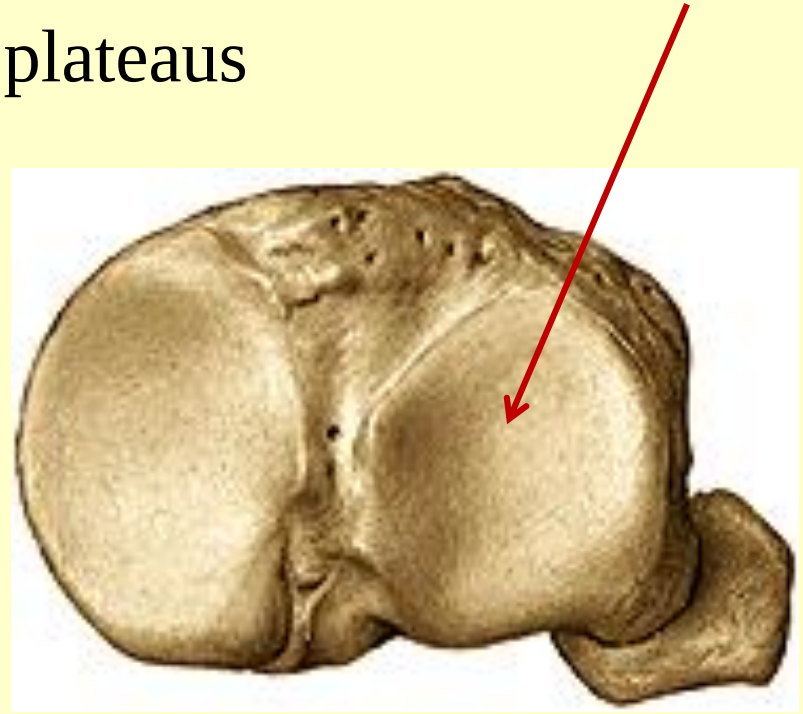
The Lower Limb

- Tibia (shine bone)
  - supports most of the weight
  - articulates with the condyle of femur superiorly and the talus inferiorly
- proximal end of tibia is large
- superior surface of tibia almost flat
- Medial-lateral condyles of tibia articulate with the condyles of femur



The Lower Limb

- sup. surface is flat
- consists of med-lat. tibial plateaus



The Lower Limb

- lat. condyle has facet inferiorly

for the head of fibula

The Lower Limb

- Tibial tuberosity is located superior part of anterior surface
  - patellar ligament is attached to the tibial tuberosity

The Lower Limb

distal end of tibia;

- is small
- facet for the *fibula* and *talus*
- project medially and inferiorly

“medial malleolus”

The Lower Limb

- “medial malleolus”
- has facet for articulation with talus

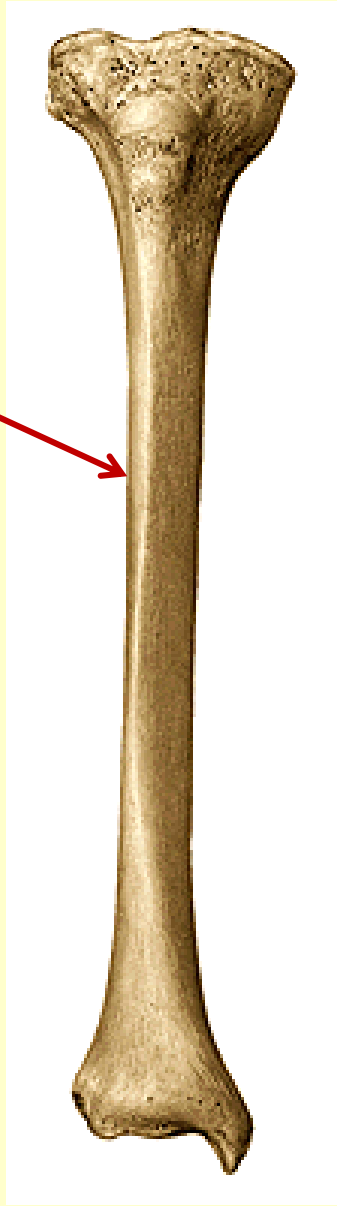
The Lower Limb

- body (corpus)
  - Medial surface
  - Lateral surface
  - Posterior surface
  - Medial border
  - Lateral (interosseous border)* border
  - Anterior border

anterior aspect

The Lower Limb

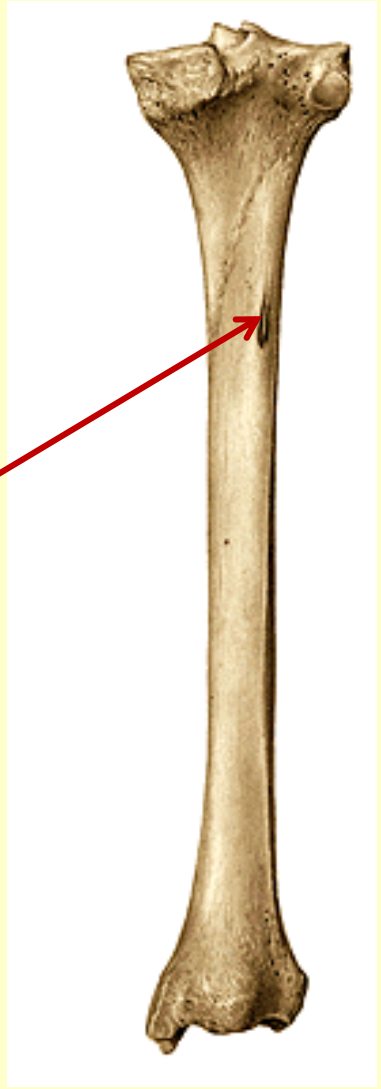
- body (corpus)
- *:lat. border is sharp
- it gives attachment to the "interosseous membrane"
  - uniting the tibia and fibula



The Lower Limb

- At the posterior surface of tibia
  - Observe a rough diagonal ridge known

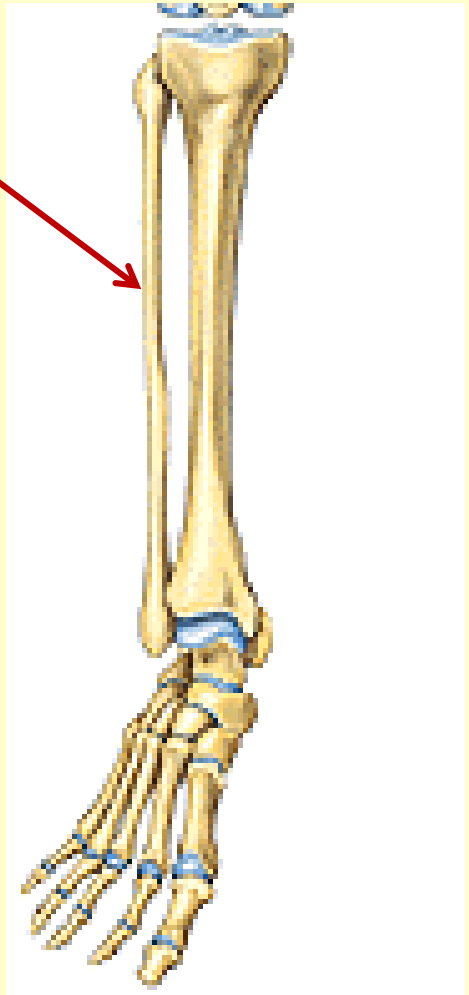
  as the “soleal line” (soleus muscle is attached)
  - runs inferioromedially to the medial border
  - The nutritient foramen is located



posterior aspect

The Lower Limb

- Fibula (calf bone)
  - Pin-like bone
  - lies posterolateral to the tibia
  - little /no function in weight hearing
  - providing support for tibia
  - also provides stability to the ankle joint
  - mainly for the attachment of muscle



The Lower Limb

- Fibula (calf bone)
  - neck is constricted part
  - interosseous border

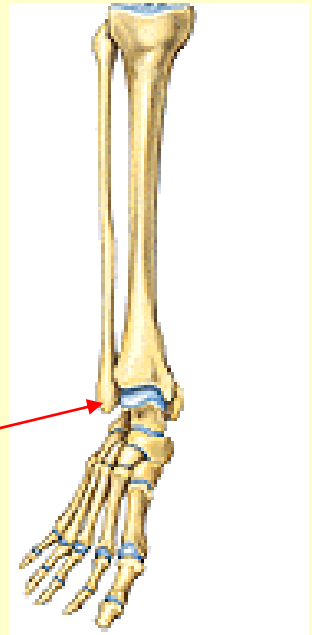
  for attacment to the interosseous memb.
  - nutricient foramen is usually present

  at the post. side
  - head of fibula is irregular
    - facet for articulation

    with the lat. tibial condyle of tibia

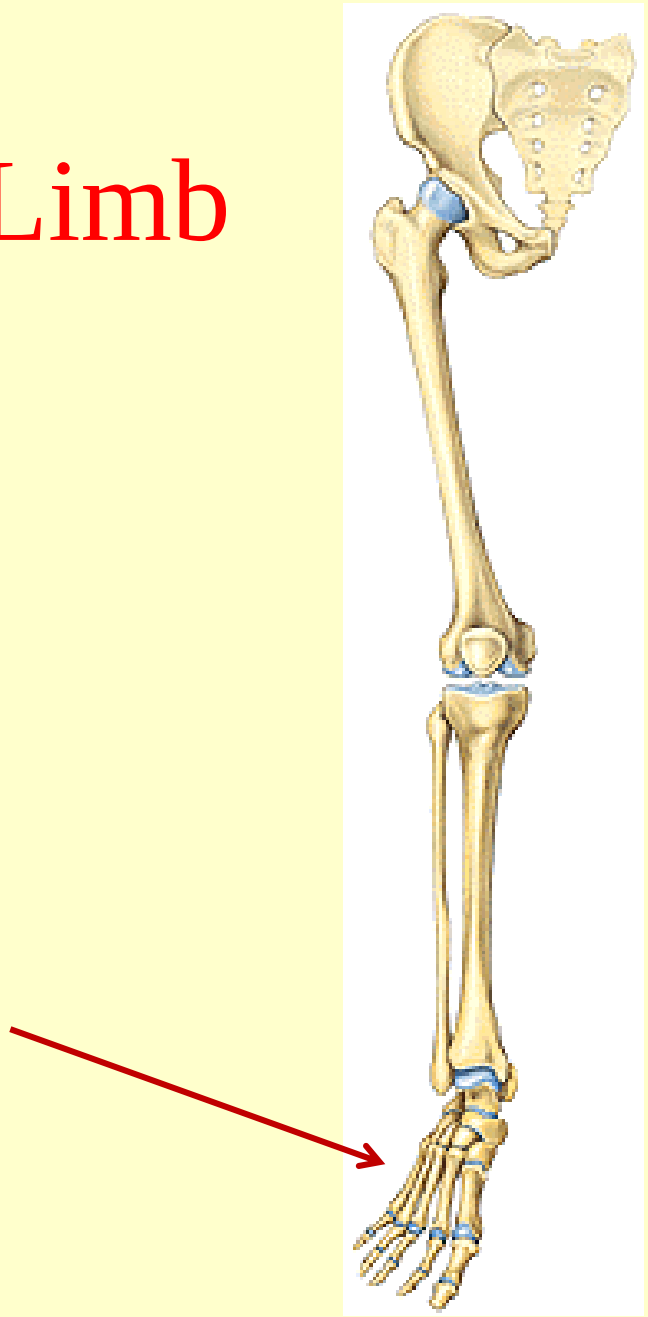
The Lower Limb

- on the distal end project medially and inferiorly forms “lateral malleolus”
  – lies more inferior and posterior than does medial malleolus



The Lower Limb

- 4 parts:
  - The pelvic girdle
  - The thigh
  - The leg
  - The foot



The Lower Limb

- The foot comprise the
  - tarsus
  - metatarsus
  - phalanges

The Lower Limb

- The foot comprise the
  - tarsus
  - metatarsus
  - phalanges

The Lower Limb

- tarsus
  - talus*
  - calcaneus
  - cuboid
  - navicular
  - 3 cuneiforms

*:articulates with the tibia

The Lower Limb

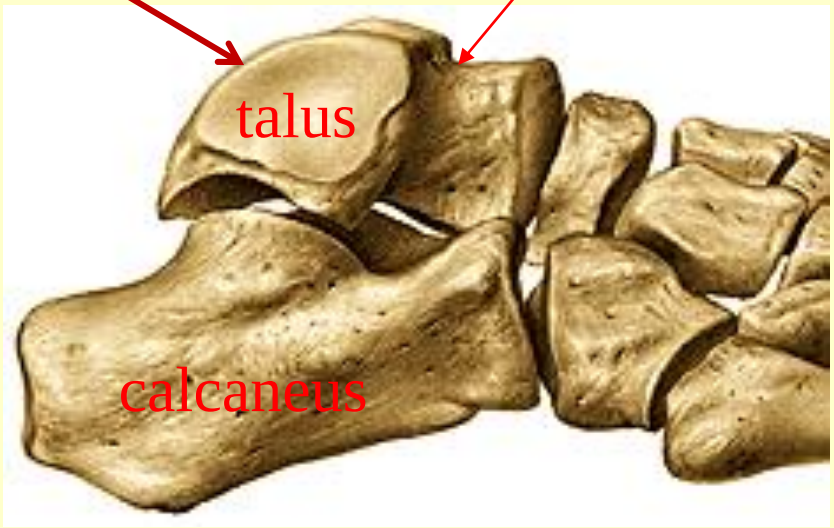
- talus
  - body-cuboidal shape
  - on the superior side

  it has “trochlea”

  it is pulley shaped

  part of talus
  - The inferior surface of

  the body of talus has an oval area for the articulation with the calcaneus



The Lower Limb

- talus
  - posterior part of body has posterior process
    - has med-lat tubercle
  - 2 tubercle to consist of the groove for the tendon of the flexor hallucis longus muscle

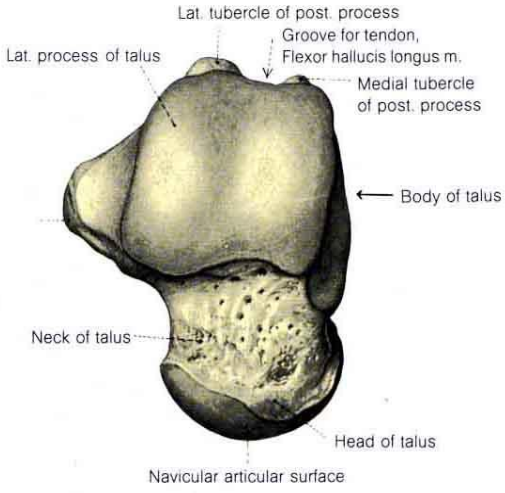


Fig. 522. The right talus. Proximal or dorsal view.

The Lower Limb

- talus
  - head of talus has articular surface for naviculare bone

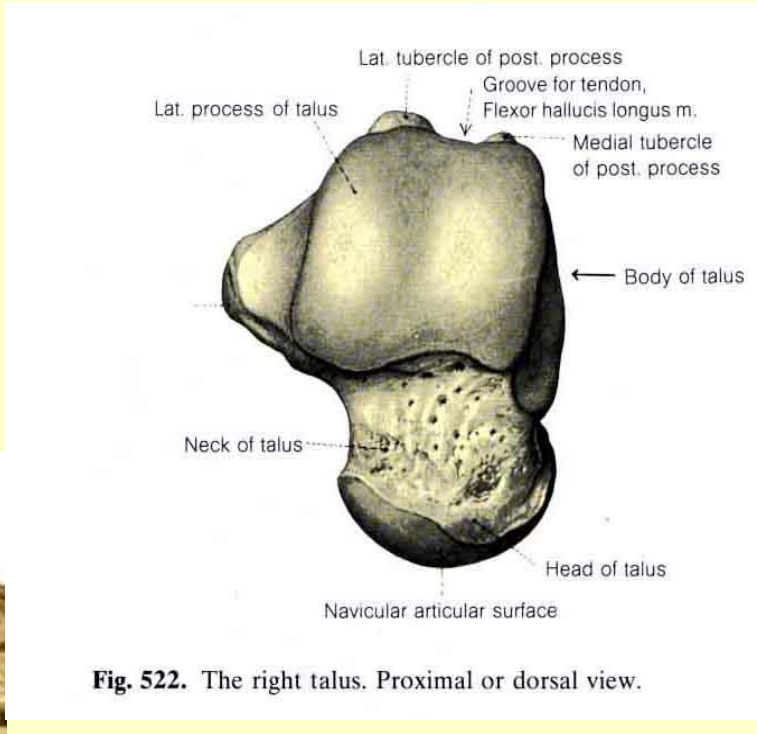


Fig. 522. The right talus. Proximal or dorsal view.

The Lower Limb

- talus
  - at the medial side of the calcaneus shelf-like projection of calcaneus
  - “Sustentaculum tali”

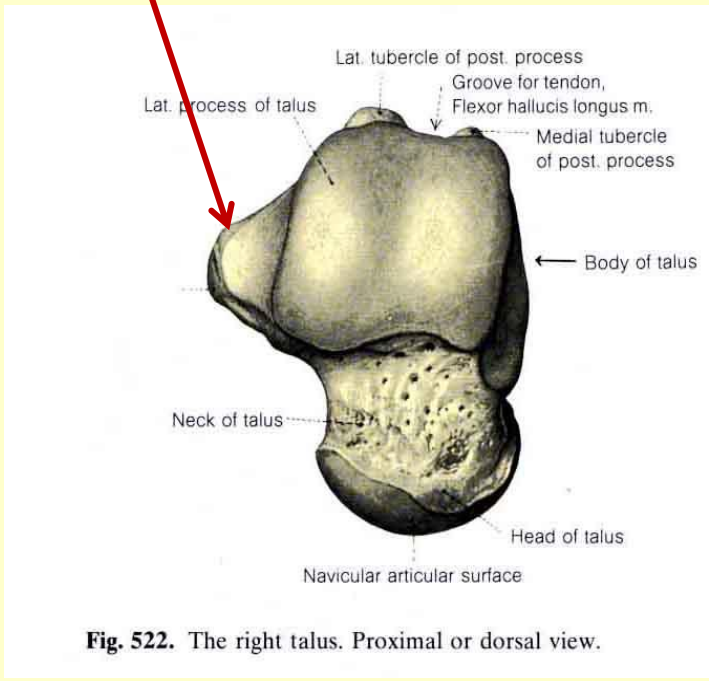
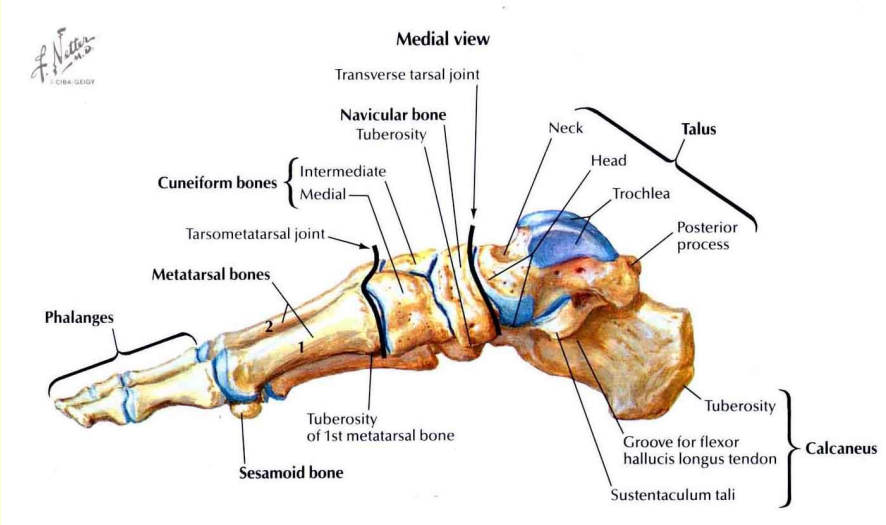


Fig. 522. The right talus. Proximal or dorsal view.



The Lower Limb

- talus

  the neck is slightly constricted

  inferiorly there is a groove

  called the “sulcus tali”

  for the interosseous lig.

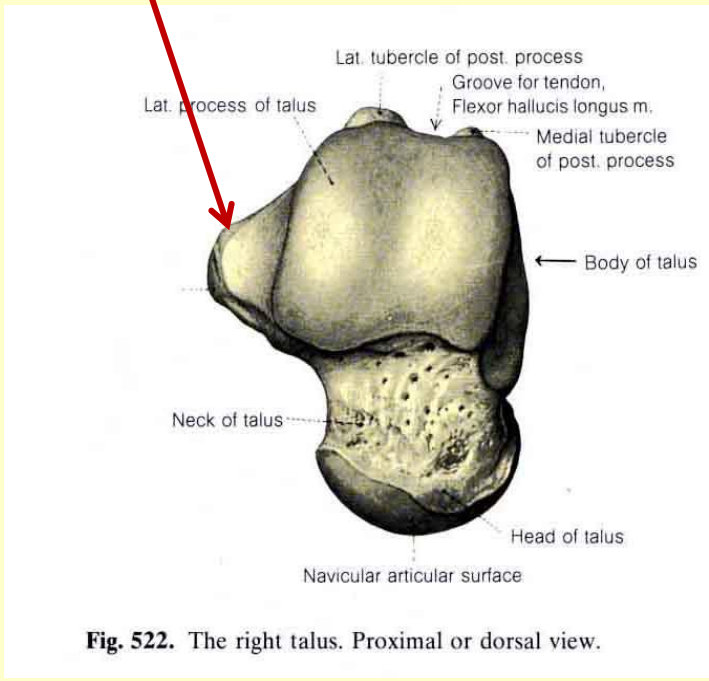
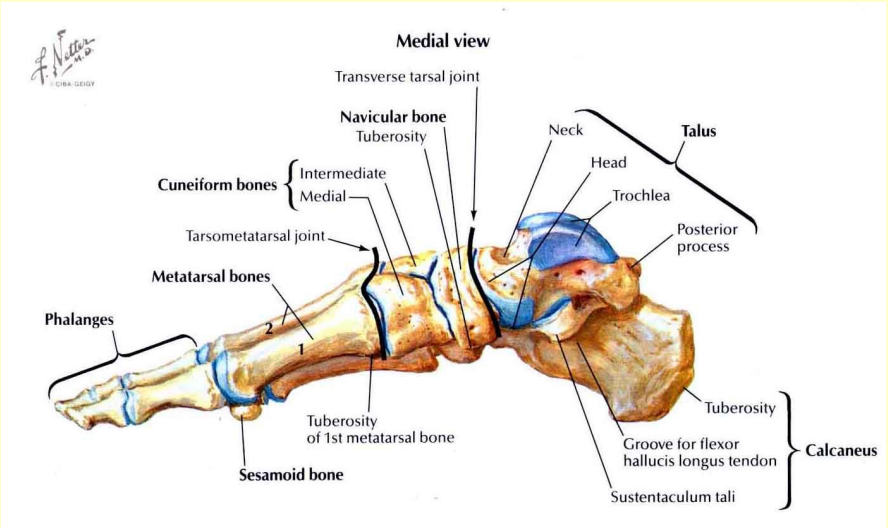
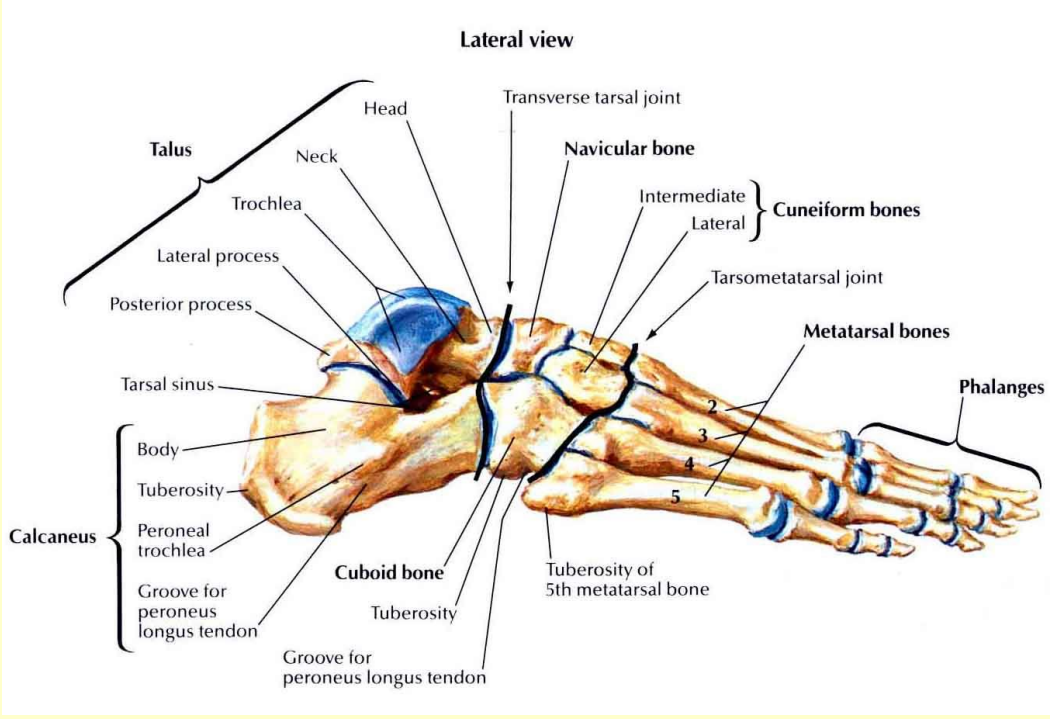
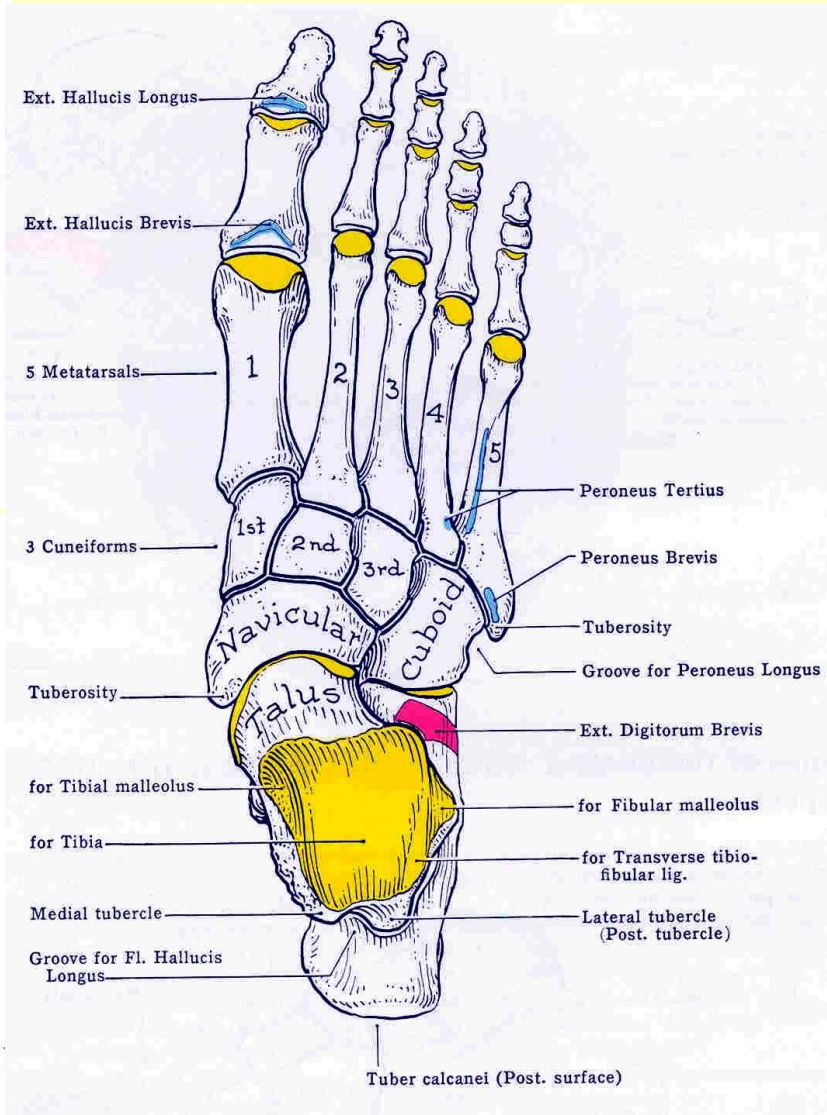
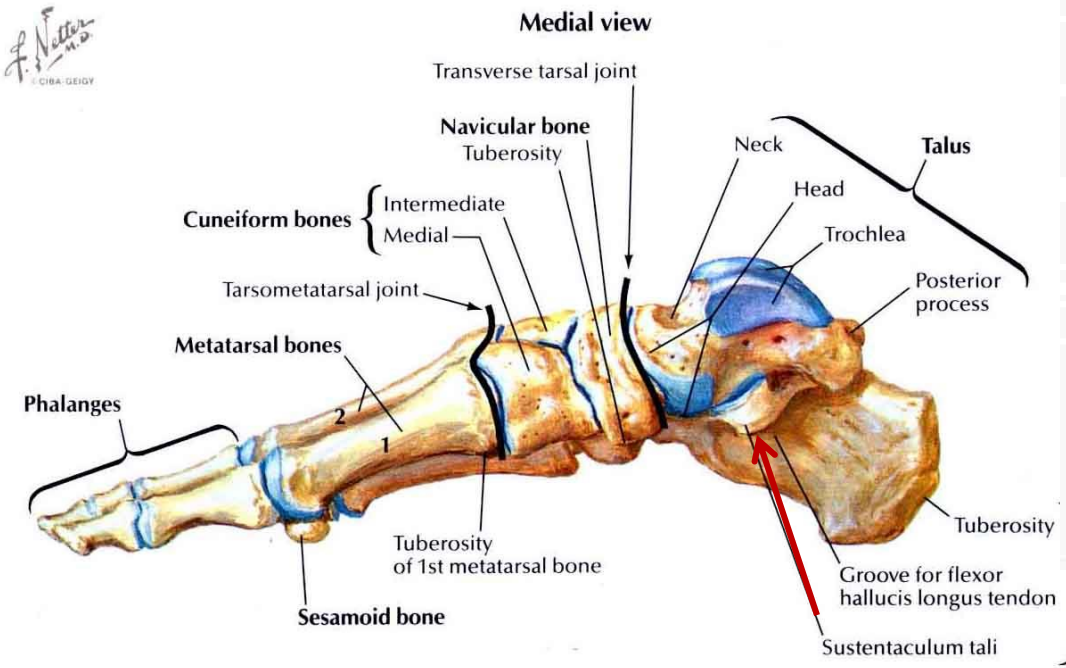


Fig. 522. The right talus. Proximal or dorsal view.



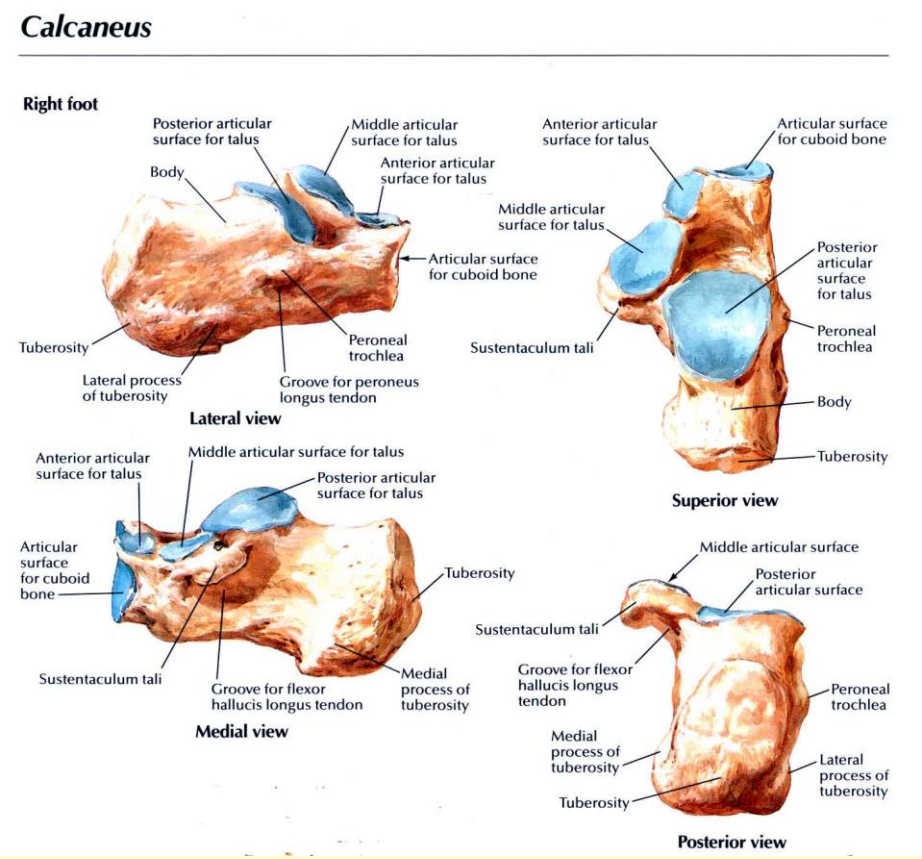

Lateral view
Talus
Head
Neck
Trochlea
Lateral process
Posterior process
Transverse tarsal joint
Navicular bone
Intermediate
Lateral
Cuneiform bones
Tarsometatarsal joint
Metatarsal bones
Phalanges
Tarsal sinus
Calcaneus
Body
Tuberosity
Peroneal trochlea
Groove for peroneus longus tendon
Cuboid bone
Tuberosity
Groove for peroneus longus tendon
Tuberosity of 5th metatarsal bone
1
2
3
4
5


Ext. Hallucis Longus
Ext. Hallucis Brevis
5 Metatarsals
3 Cuneiforms
Tuberosity
Tuberosity
for Tibial malleolus
for Tibia
Medial tubercle
Groove for Fl. Hallucis Longus
Tuber calcanei (Post. surface)
Peroneus Tertius
Peroneus Brevis
Tuberosity
Groove for Peroneus Longus
Ext. Digitorum Brevis
for Fibular malleolus
for Transverse tibio-fibular lig.
Lateral tubercle (Post. tubercle)
1
2
3
4
5
1st
2nd
3rd
Navicular
Cuboid
Talus


Medial view
F. Netter M.D.
CIBA-GEIGY
Transverse tarsal joint
Navicular bone
Tuberosity
Neck
Talus
Head
Trochlea
Cuneiform bones
Intermediate
Medial
Tarsometatarsal joint
Posterior process
Metatarsal bones
Phalanges
Tuberosity
Tuberosity of 1st metatarsal bone
Sesamoid bone
Groove for flexor hallucis longus tendon
Sustentaculum tali
Calcaneus
1
2

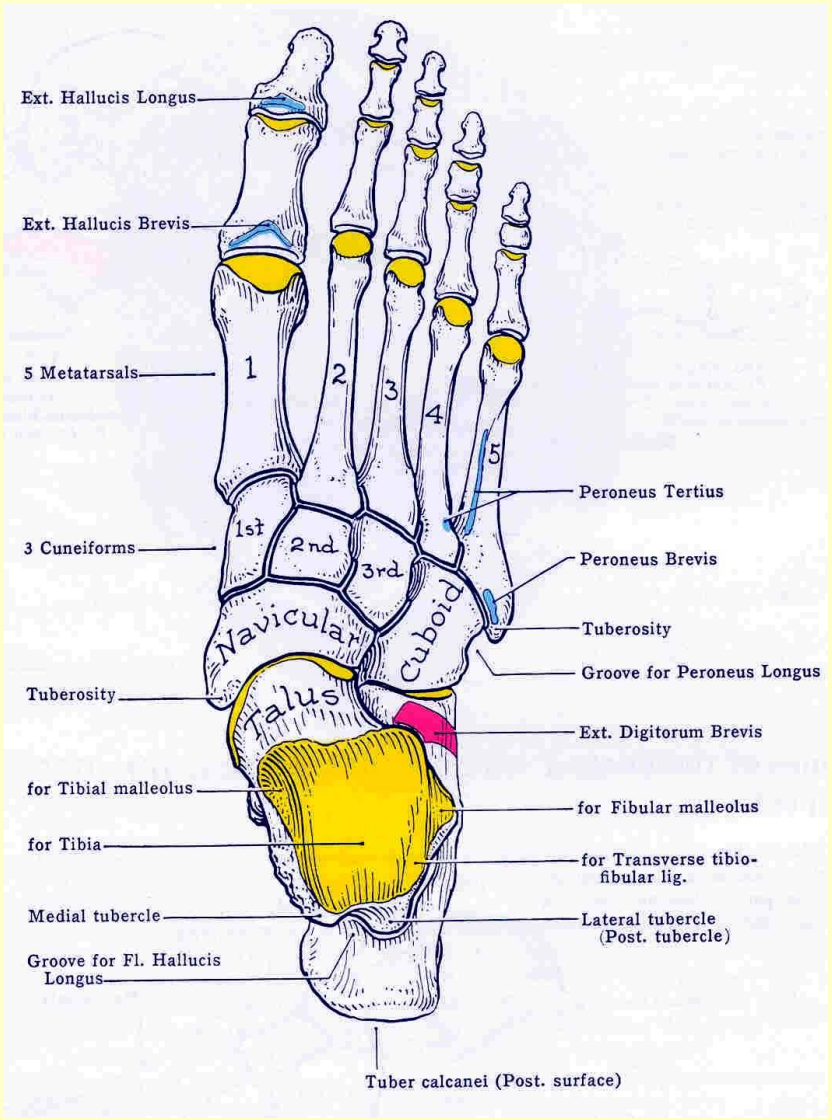
Calcaneus

- Largest-strongest
- 6 surfaces
  - Sup :joins talus
  - Inf :calcaneal tuber
  - Ant :joins cuboid
  - Post :forms heel
  - Lat :fibular trochlea
  - Med :sustentaculum tali



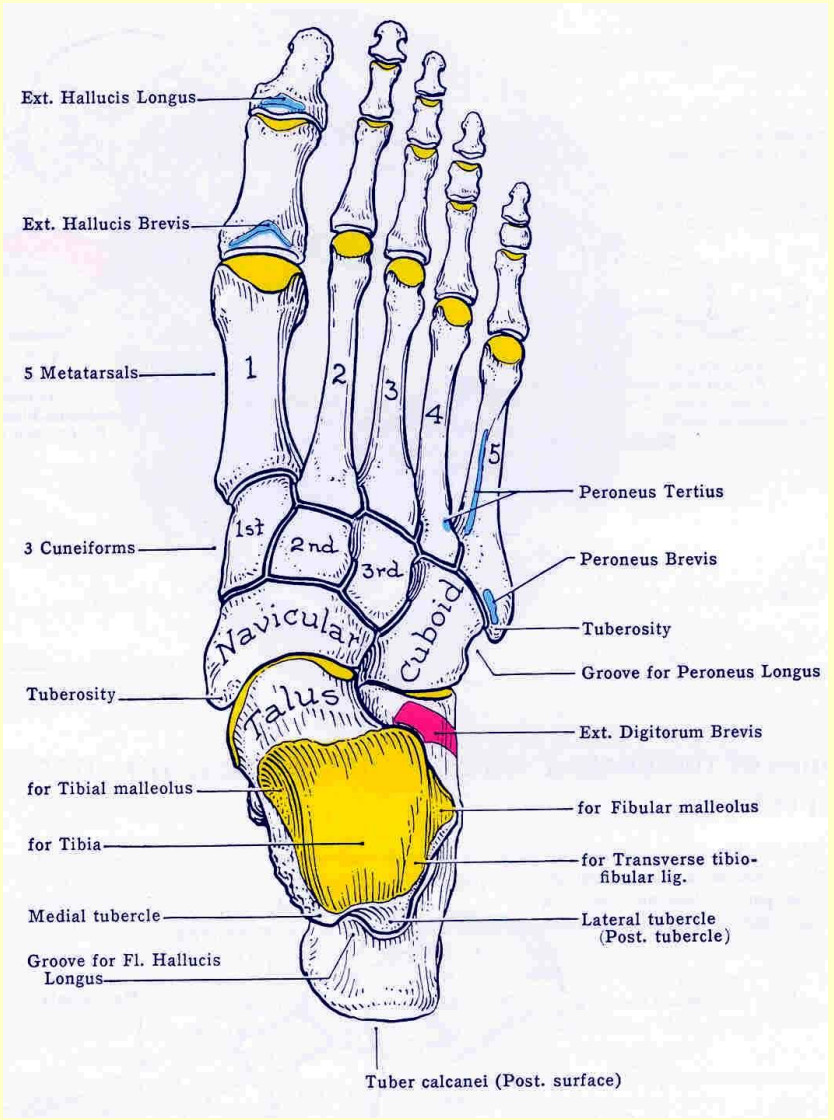
Navicular

- 3 facets
  - Ant → cuneiform
  - Post → talus
  - Lat → cuboid
  - Med → tuberosity of navicular



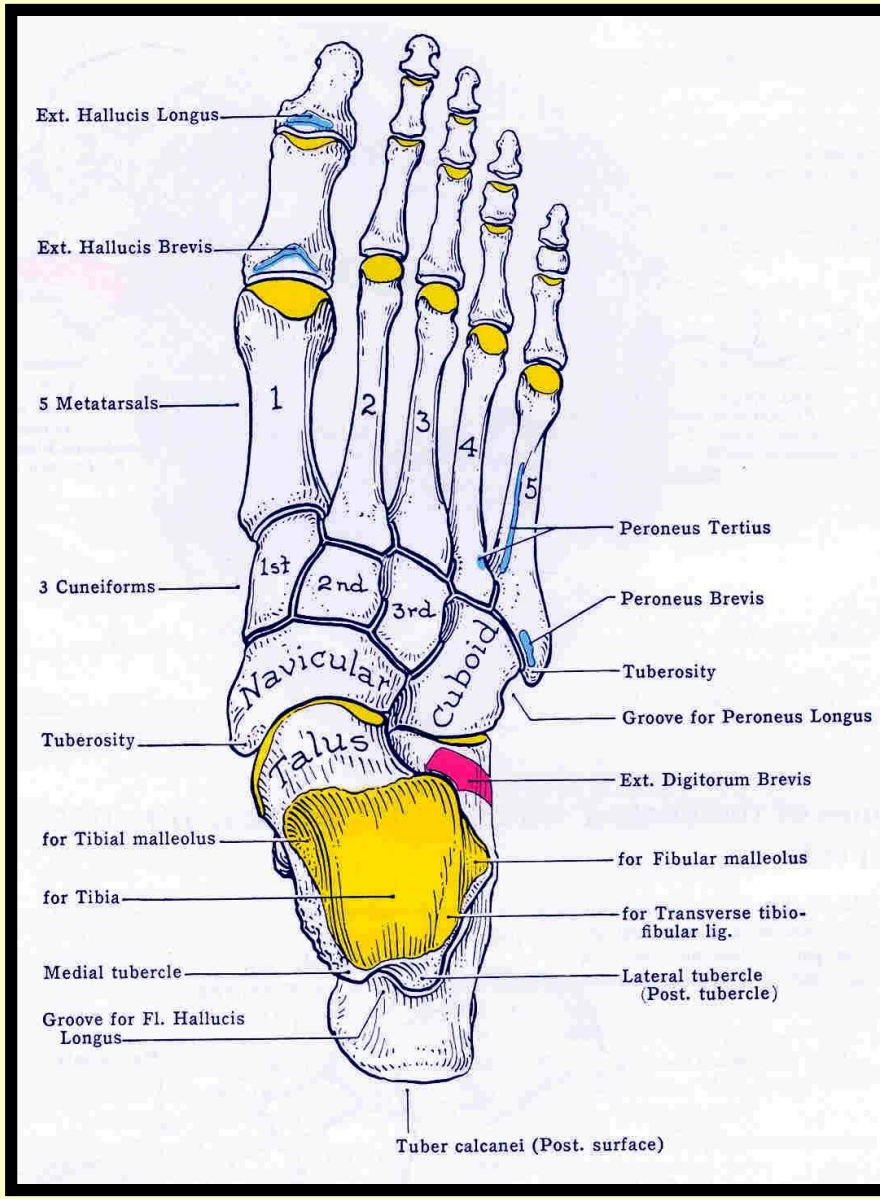
Cuboid

- Most lat. bone distal tarsus
- Ant → base of metatarsals 4-5
- Post → calcaneus
- Med → lat cuneiform & navicular
- Inf → groove for fibularis longus



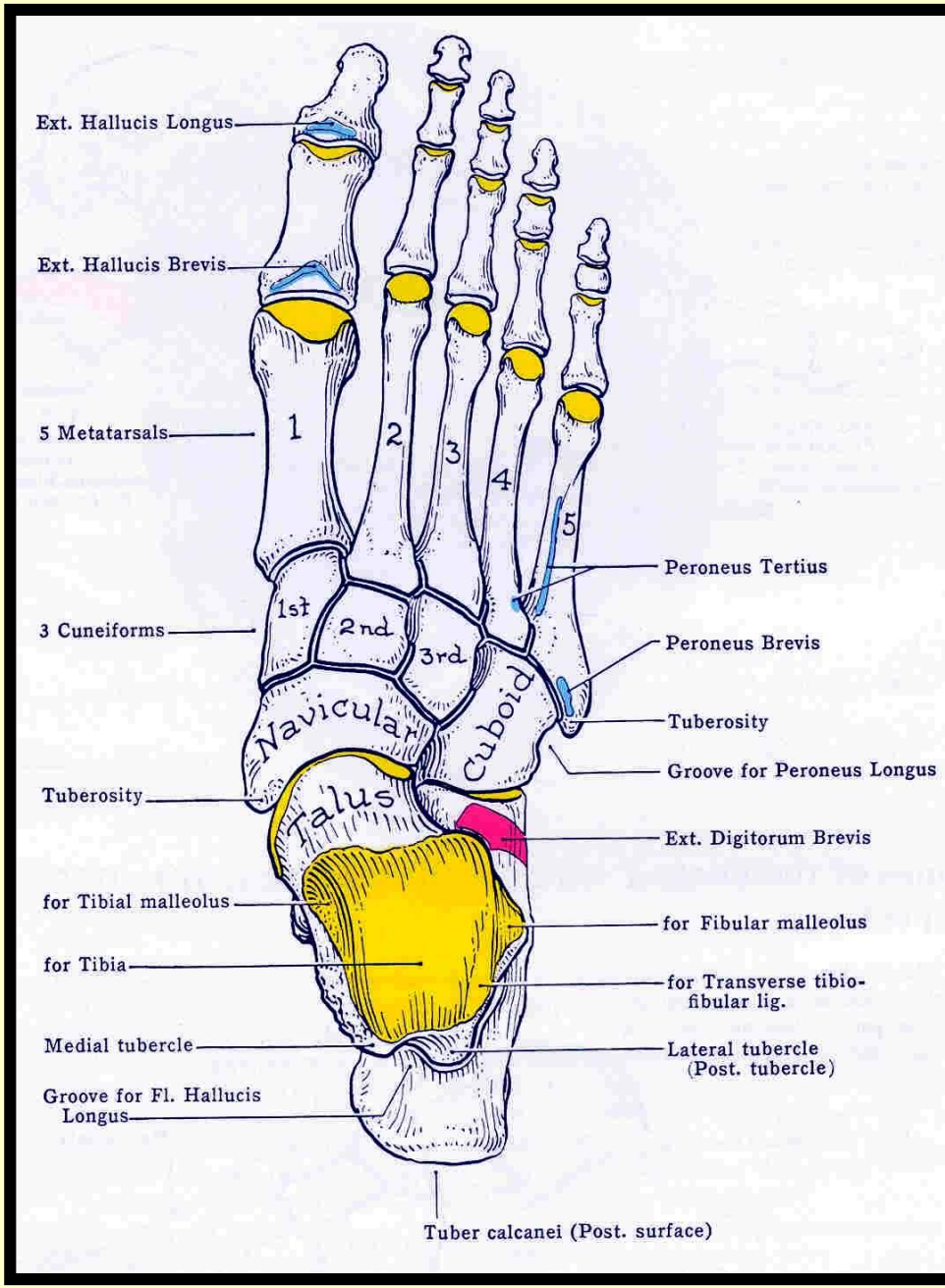
Cunieform

- Medial (largest)
- Lateral
- Intermedium (smallest)
- Ant → base of metatarsals 1-4
- Post → Navicular



Metatarsal

- 5 bones
- Base
- Head
- Body
- I → shortest & thickest
- II → longest



Digital

- 14 bones
- Base
- Head
- Body
- Proximal, middle & distal phalanges