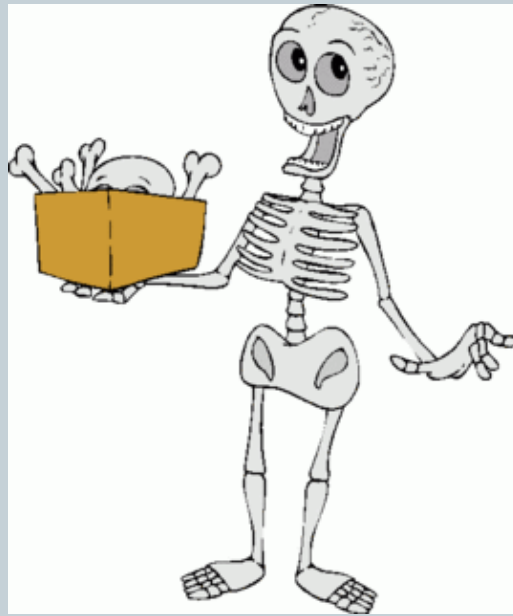
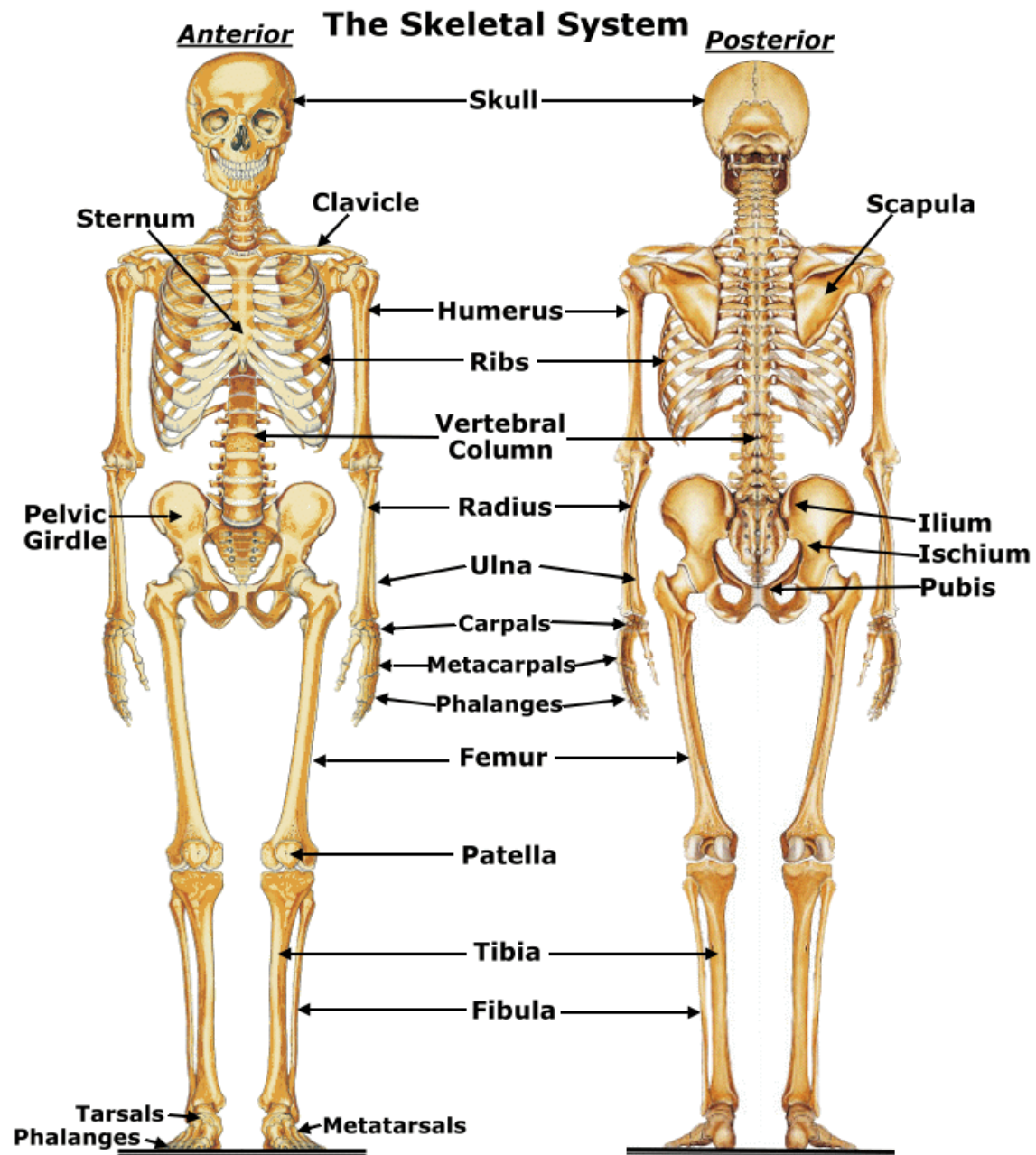


Osteology

1

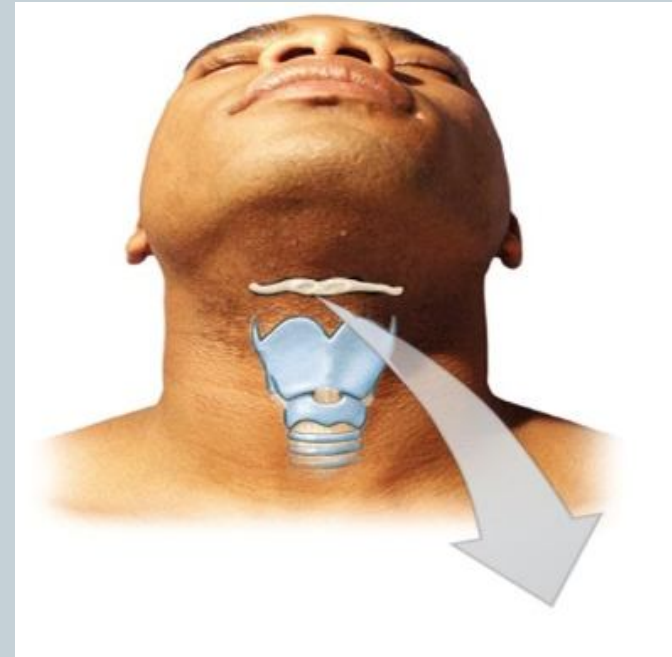
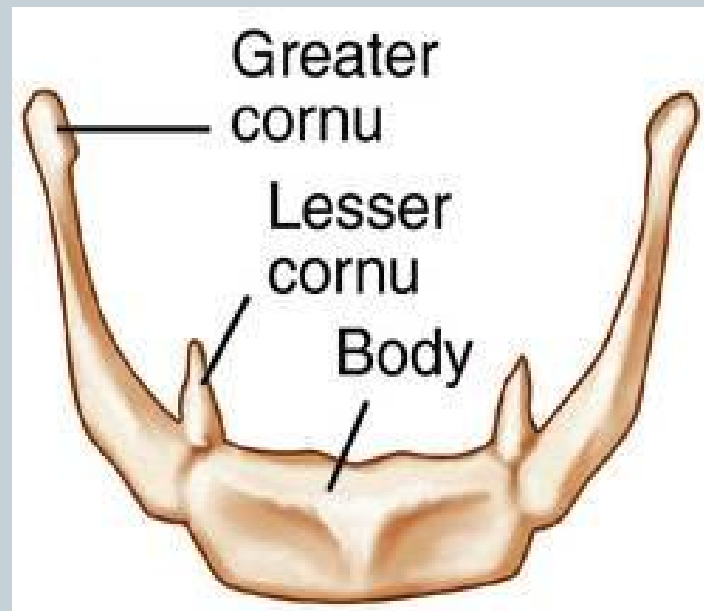
BONES & CARTILAGES





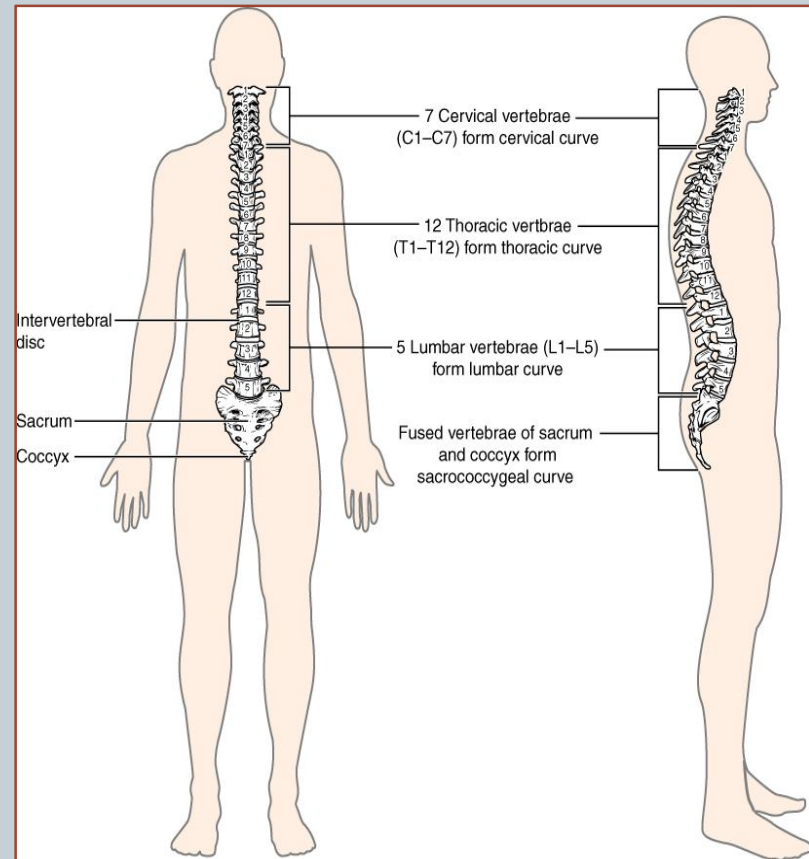
Hyoid

- U shape
- C3
- Mandible base & thyroid cartilage sup. border
- Body
- Great cornu
- Lesser cornu



Vertebral Column

- 33 (26)
- 7 Cervical
- 12 Thoracic
- 5 Lumbar
- Sacral
- Coccygeal
- Male (60cm)
- Female (50cm)

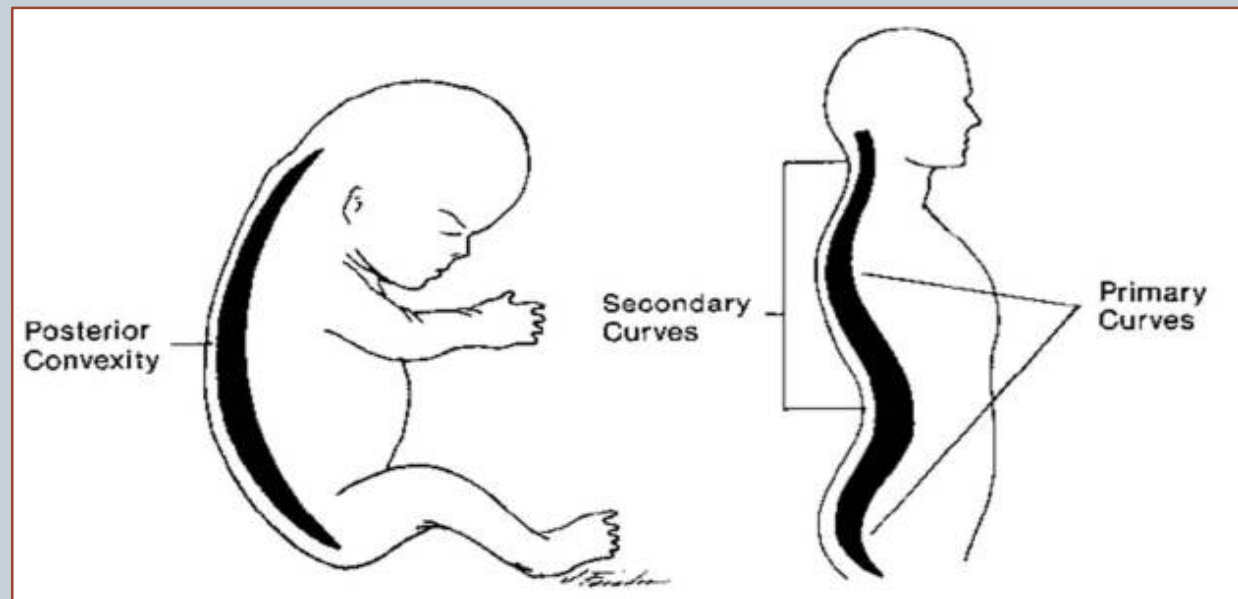


Vertebral Column curves

Curves:

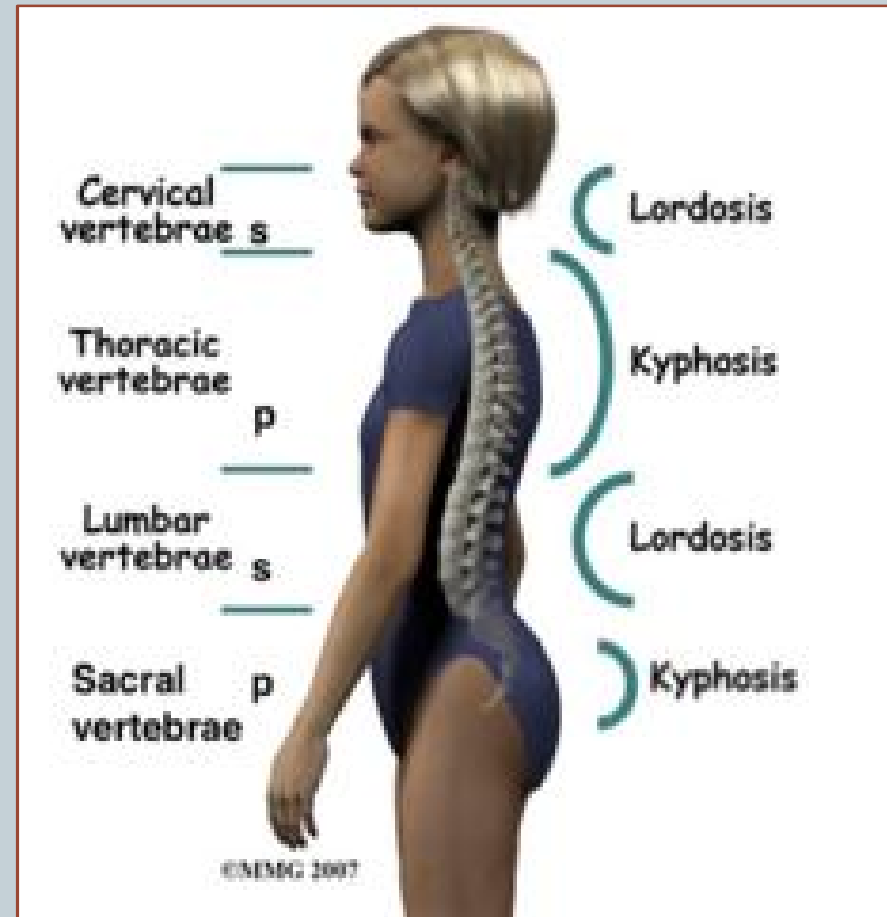
- Primary
 1. Thoracic
 2. Sacral (5th month)

- Secondary
 1. Cervical (5-9th month)
 2. Lumbar (12-18th month)



Clinical points

- Scoliosis (left or right)
- Lordosis or hollow back (lumbar)
- Kyphosis (thoracic)



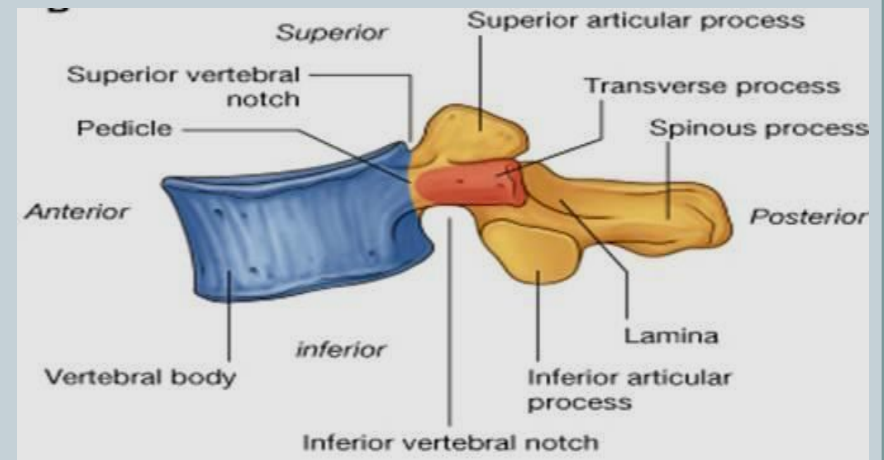
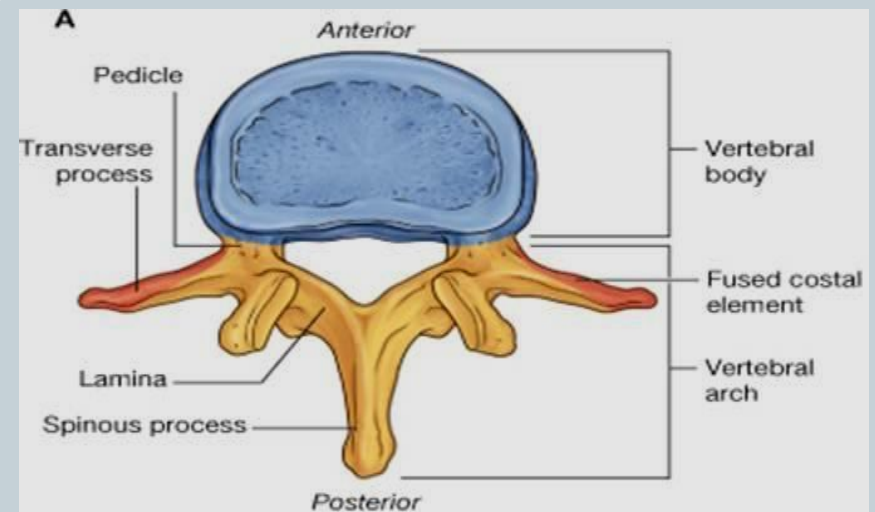
A typical vertebra

- Body
 - Vertebral Arch
- Pedicle (intervertebral foramen)
Lamina

Vertebral Foramen

Vertebral Arch

- 2 Transverse processes
- 2 sup. Articular processes
- 2 inf. Articular processes
- Spinous processes



Cervical vertebra



- Typic (C3-C6)
- Atypic (C1, C2, C7)
- All cervical vertebra

Transverse foramen in transverse process

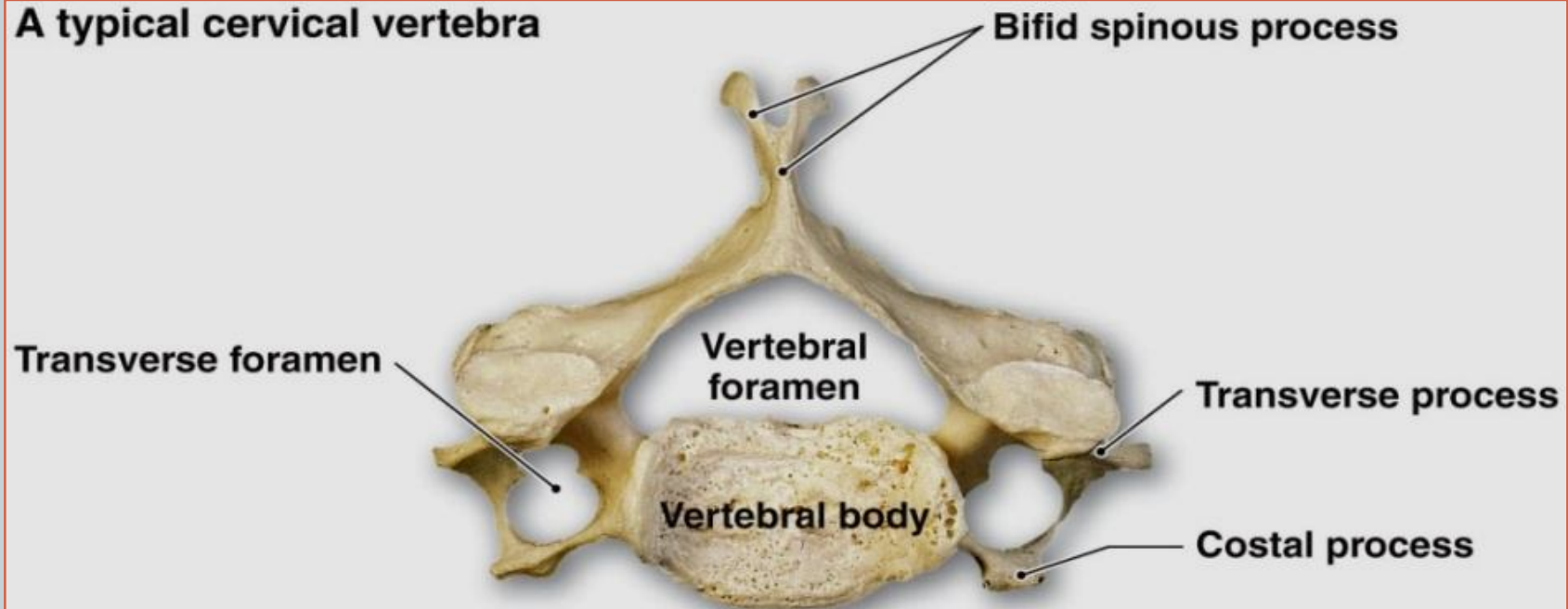
Typical Cervical vertebra

- Typical (c3-c6)

Large & triangular vertebral foramen

Bifid spinous process

A typical cervical vertebra



Atypical Cervical vertebra



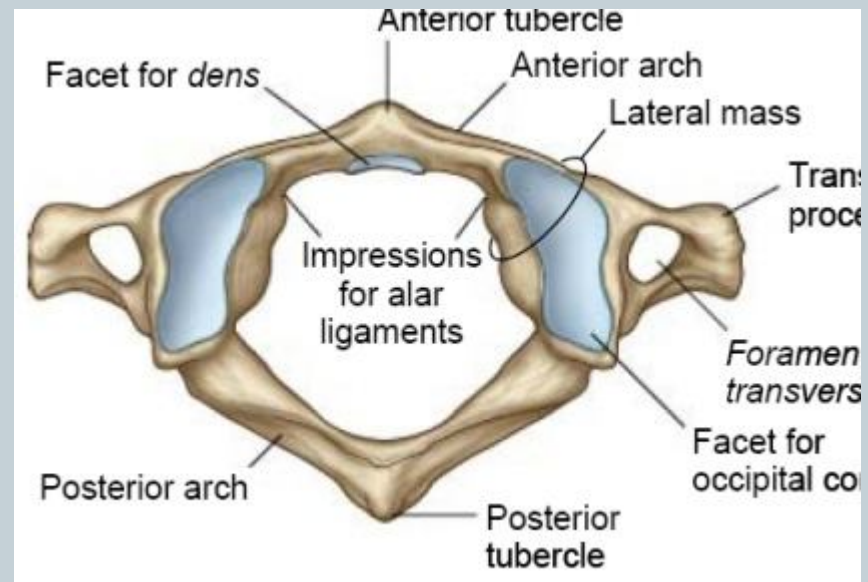
Atypical

- C1: Atlas
- C2: Axis
- C7: Prominentce vertebra

Atlas (C1)

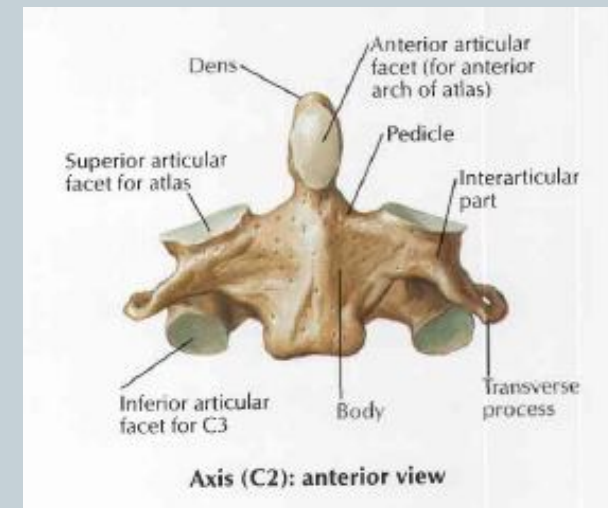
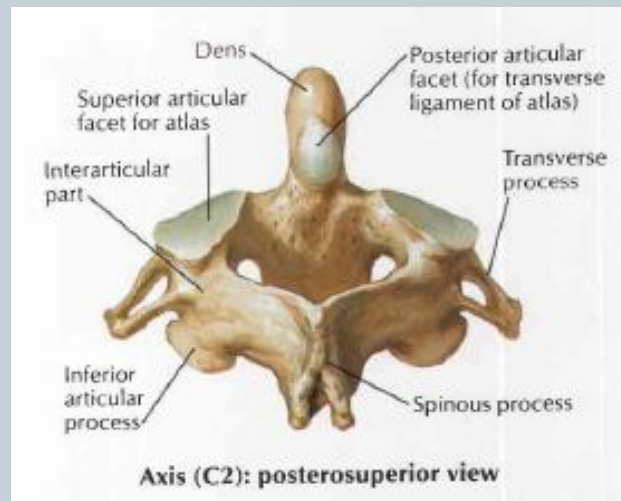


- NO body
- NO pedicle
- NO lamina
- 2 lateral masses
- ant. & pos arch
- Posterior tubercle
- Lat. Masses Sup. Surface: 2 facets for occipital condyle
- Lat. Masses inf. Surface: C2 (axis) superior articular facets



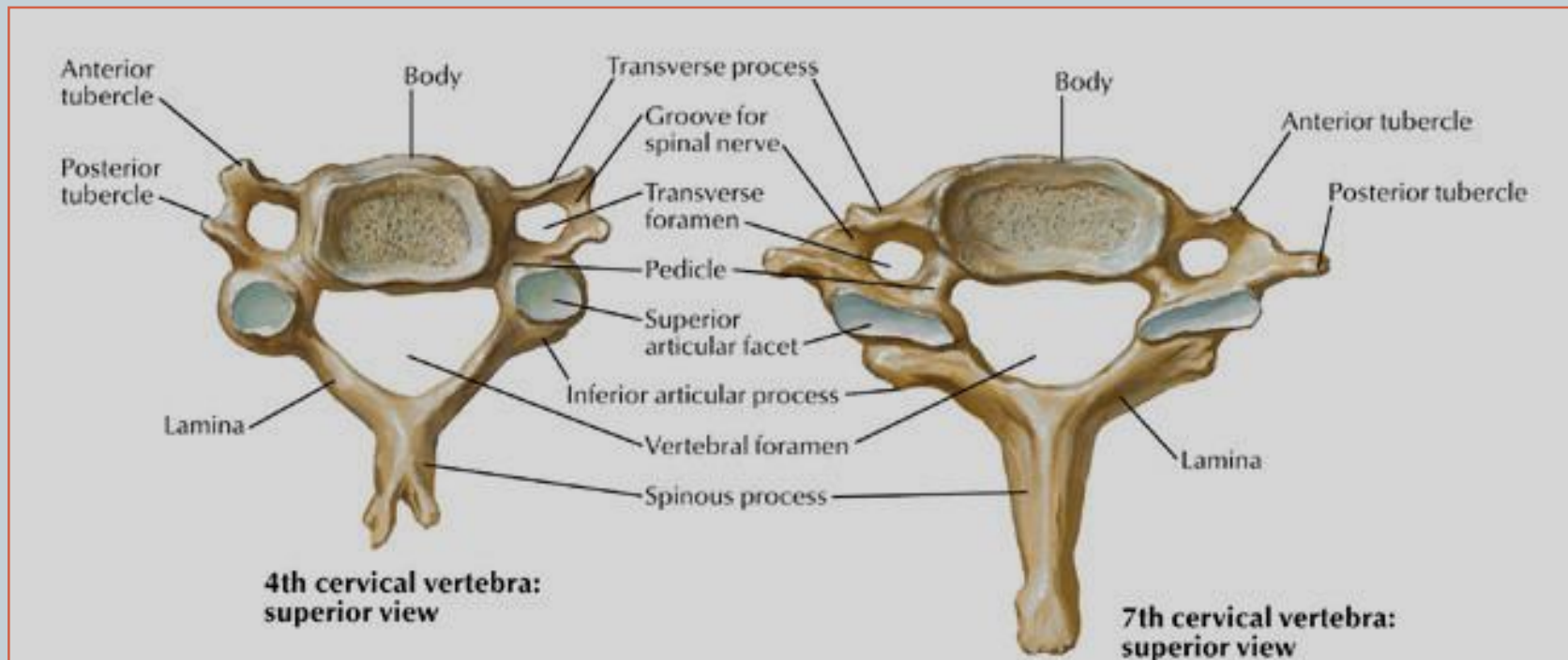
Axis (C2)

- Odontoid (dens) process
- Sup. Articular processes: atlas inf. Articular processes
- Thick bifid spinous process
- Very thick lamina
- Small transvers processes



Vertebra prominece (C7)

- Long spinous process
- unispinous process
- Touchable spinous process

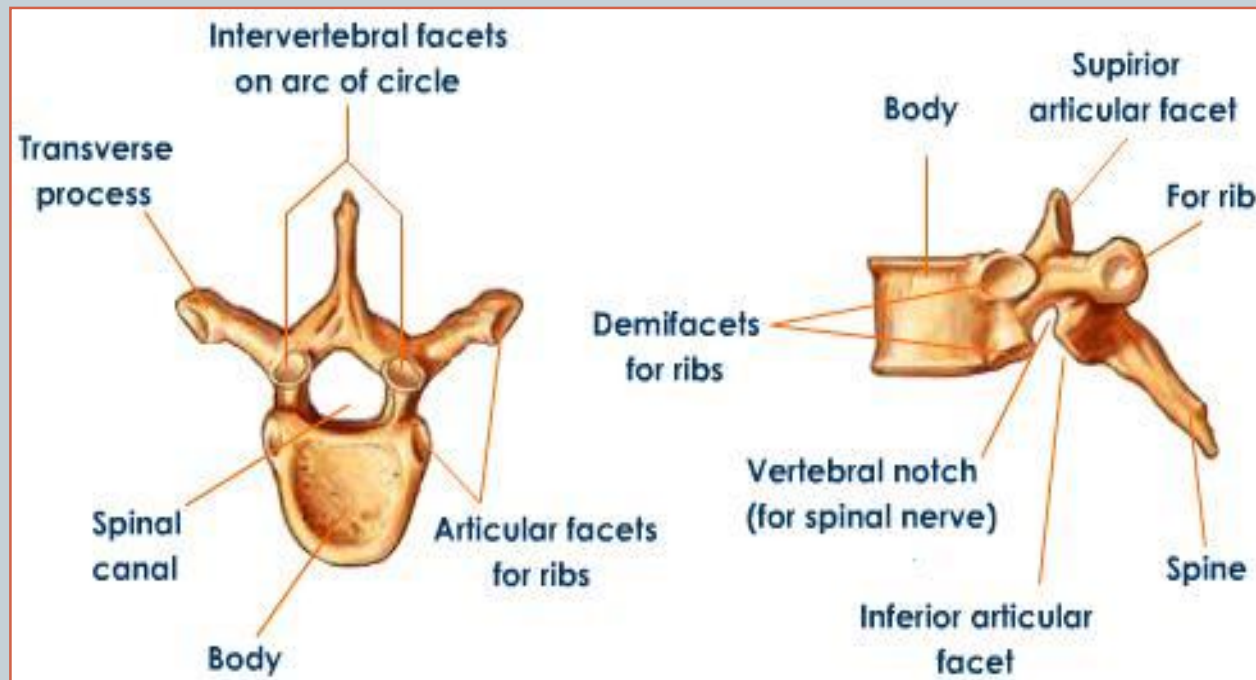


Thoracic vertebra



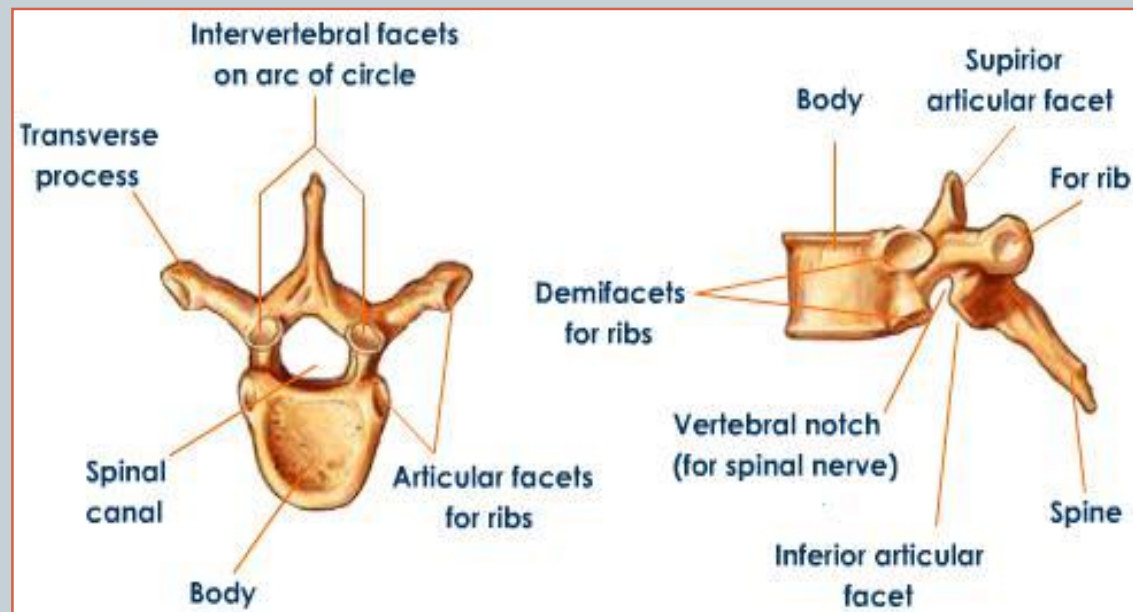
Articular facets on lateral surface of body for ribs

- Typical (T2-T8)
- Atypical (T1, T9-T12)



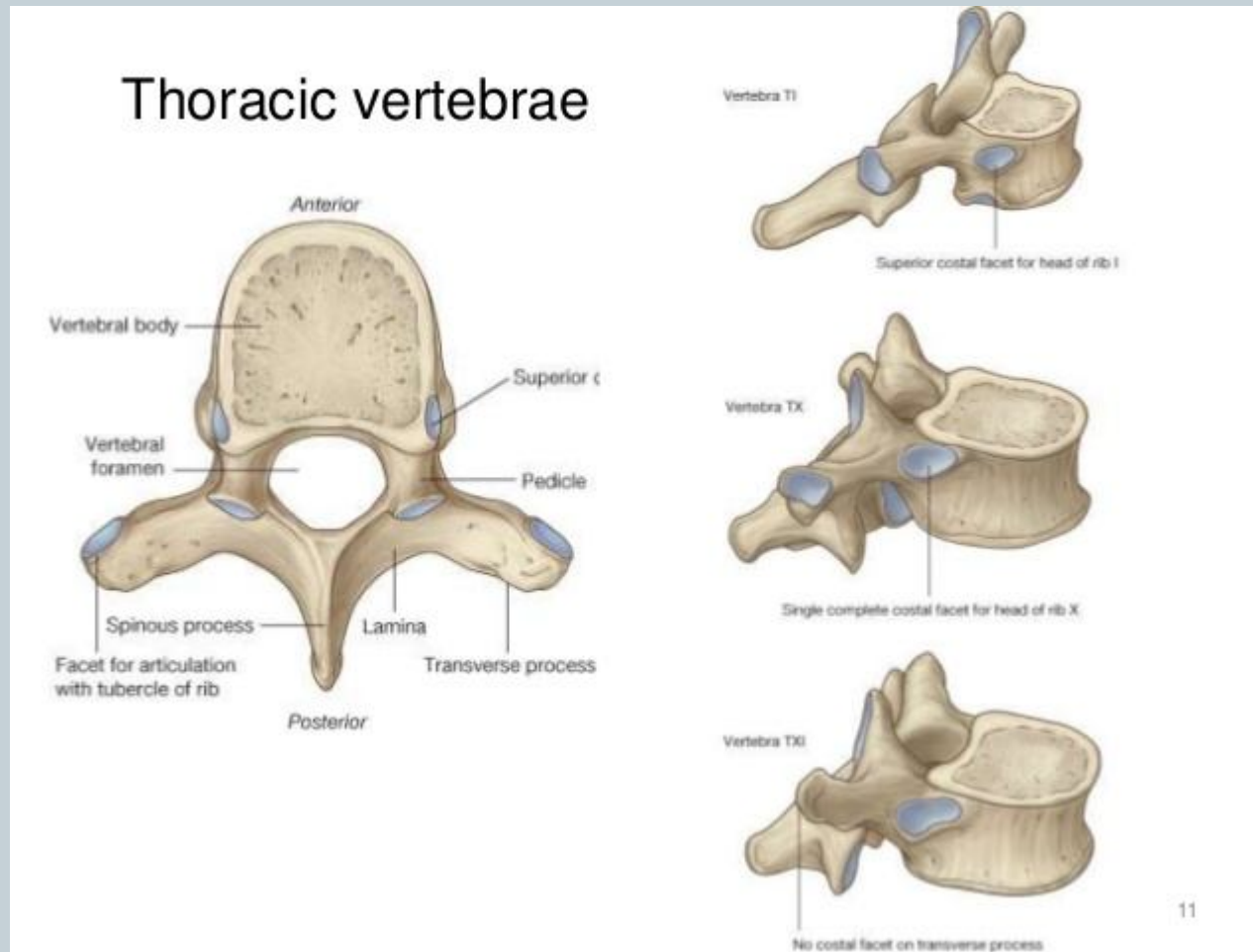
Typical Thoracic vertebra

- Typical (T2-T8)
- Large superior articular processes
- Small inferior articular processes
- Long spinous process
- Transvers anterior surface facet for rib tubercle



Atypical Thoracic vertebra

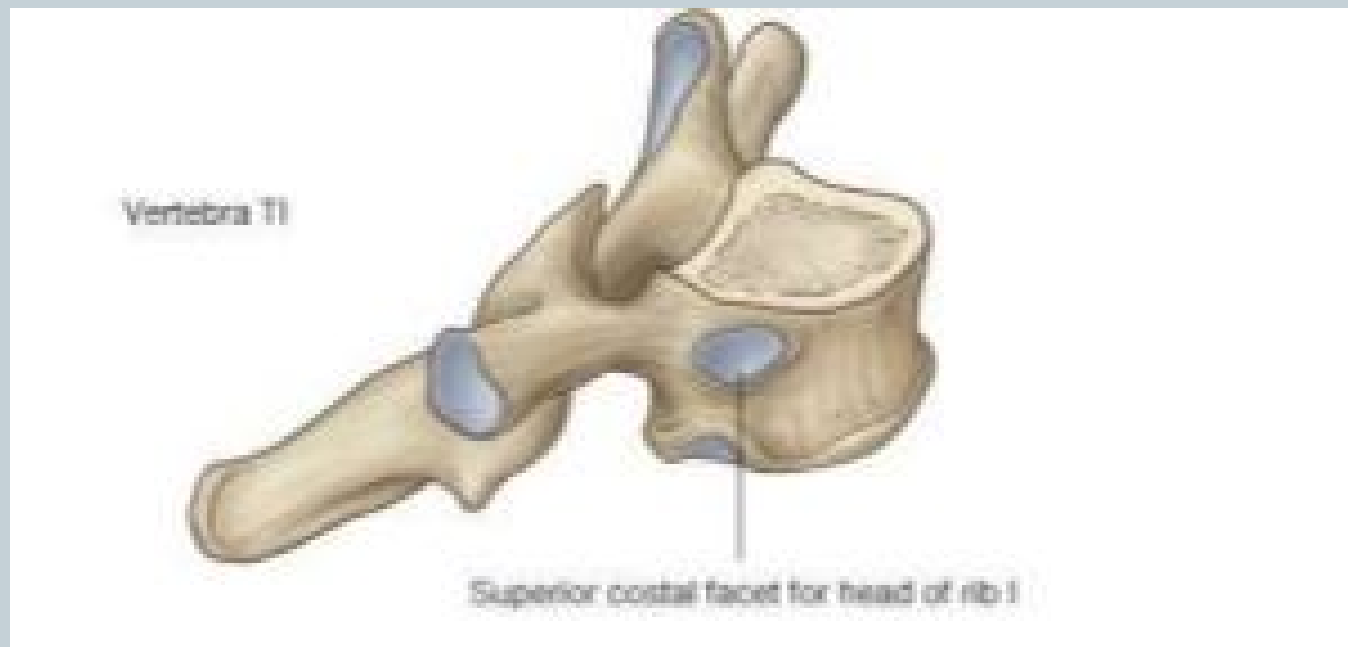
- T1
- T9
- T10
- T11
- T12



T1



- Complete superior articular facet for first rib head
- Incomplete inferior articular facet for second rib head



T9



- Incomplete articular facet for 9th rib head

T10



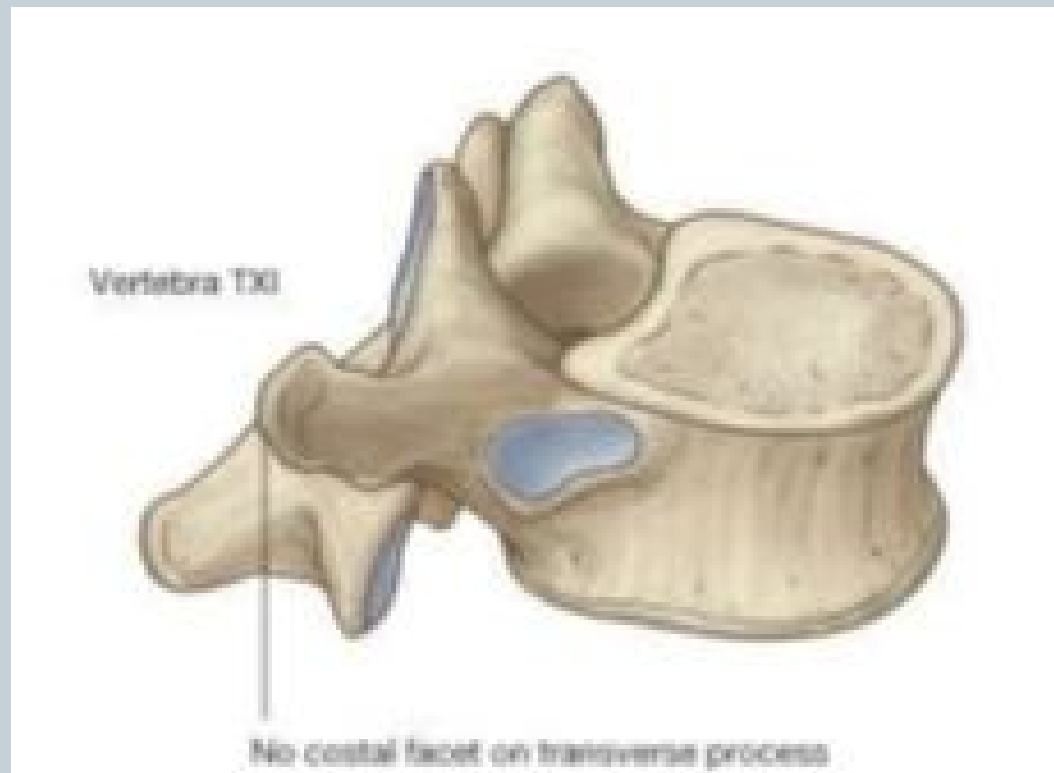
- Complete articular facet for 10th rib head on



T11



- Complete articular facet (sup. pedicle) for 11th rib head
- NO articular facet for rib tubercle



T12

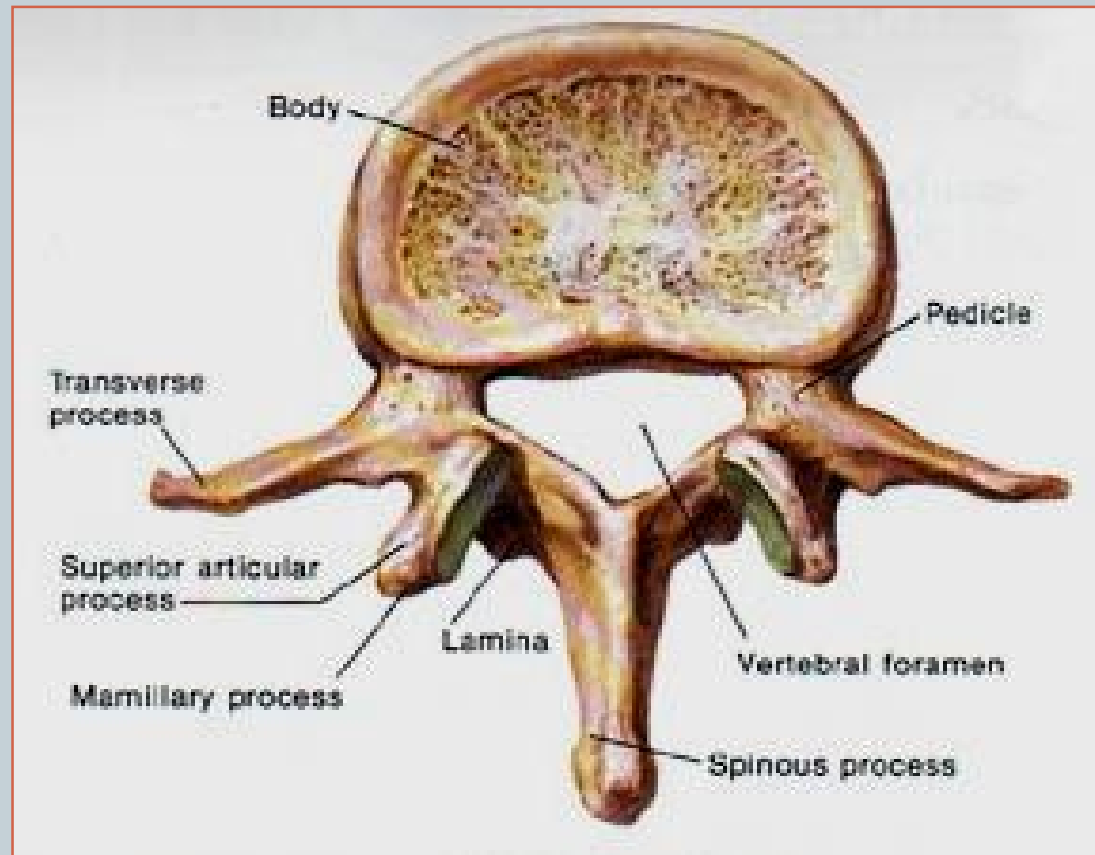


- Complete articular facet (inf. pedicle) for 11th rib head
- NO articular facet for rib tubercle
- Short transverse processes
- Sup., middle, inf. Tubercle on transverse pro.

Lumbar vertebra



- Accessory process (transverse pro. pos. root)
- Mamillary process (pos. border of sup. Articular facet)
- Typical (L1-L4)
- Atypical (L5)



Typical vertebra



- Kidney like body
- Spinous process

Short

Thick

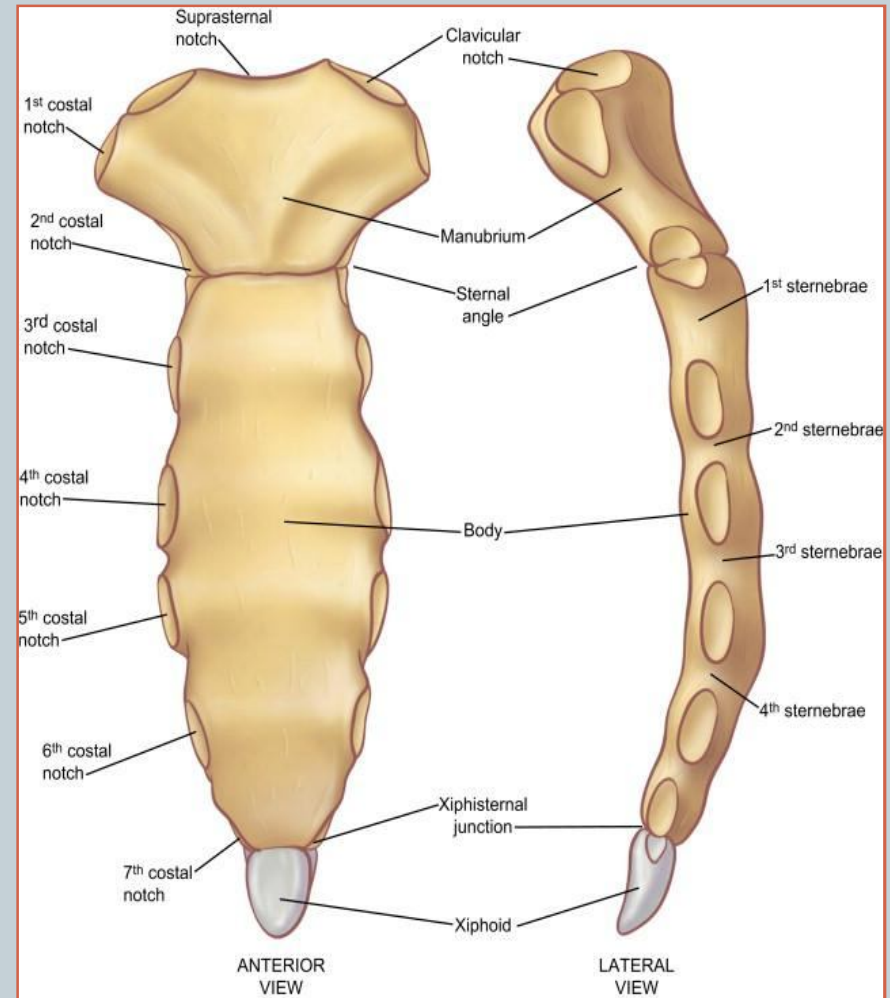
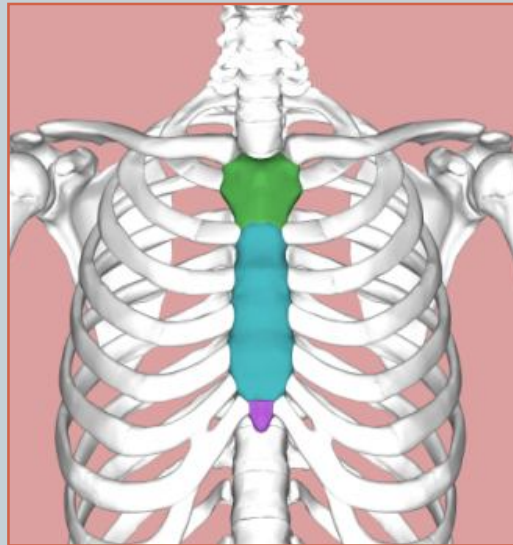
- Triangular vertebral foramen

Sternum

1. Manubrium
2. Body
3. Xiphoid rprocess

Supra sternal notch

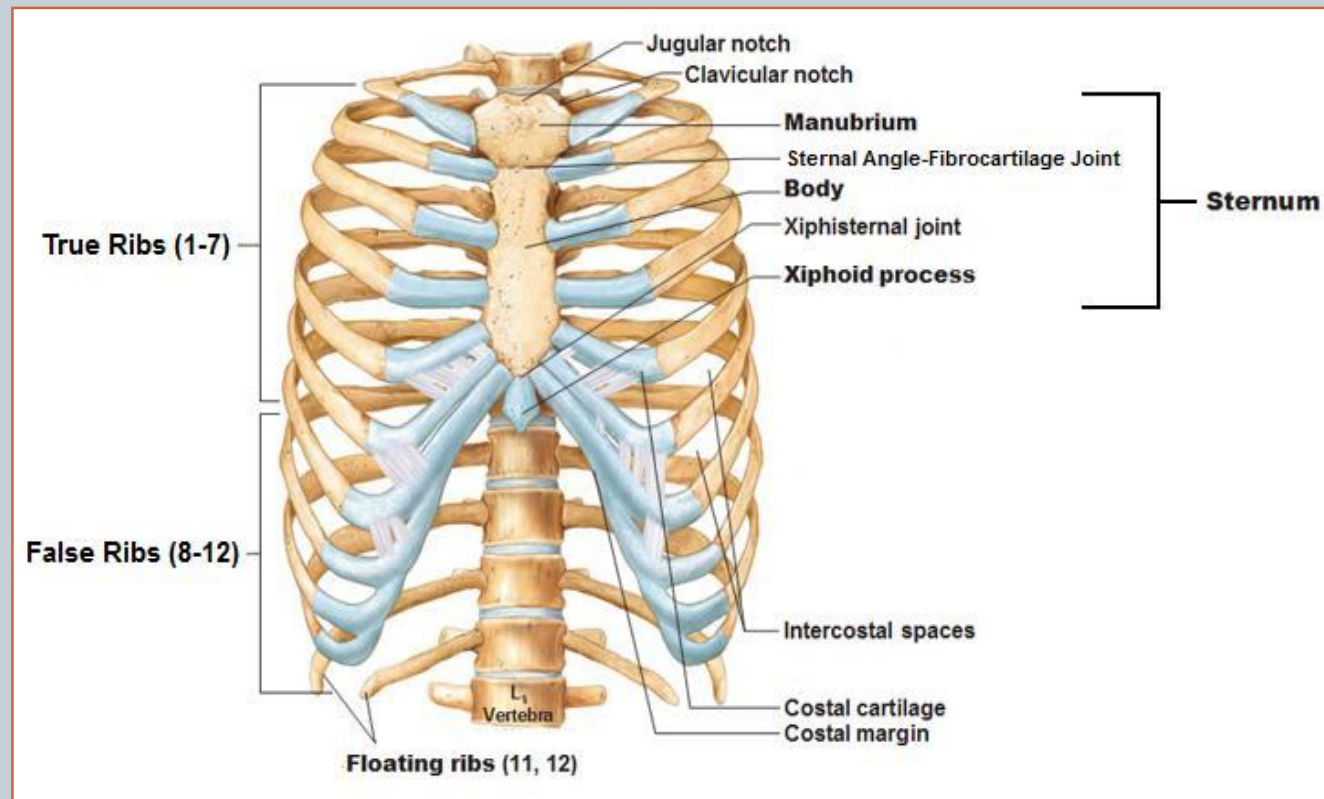
Sternal angle (second rib)



Rib



- Typical (3-9)
- Atypical (1, 2, 10, 11, 12)



Ribs classification

1. True ribs (1-7)
2. False ribs (8-12)

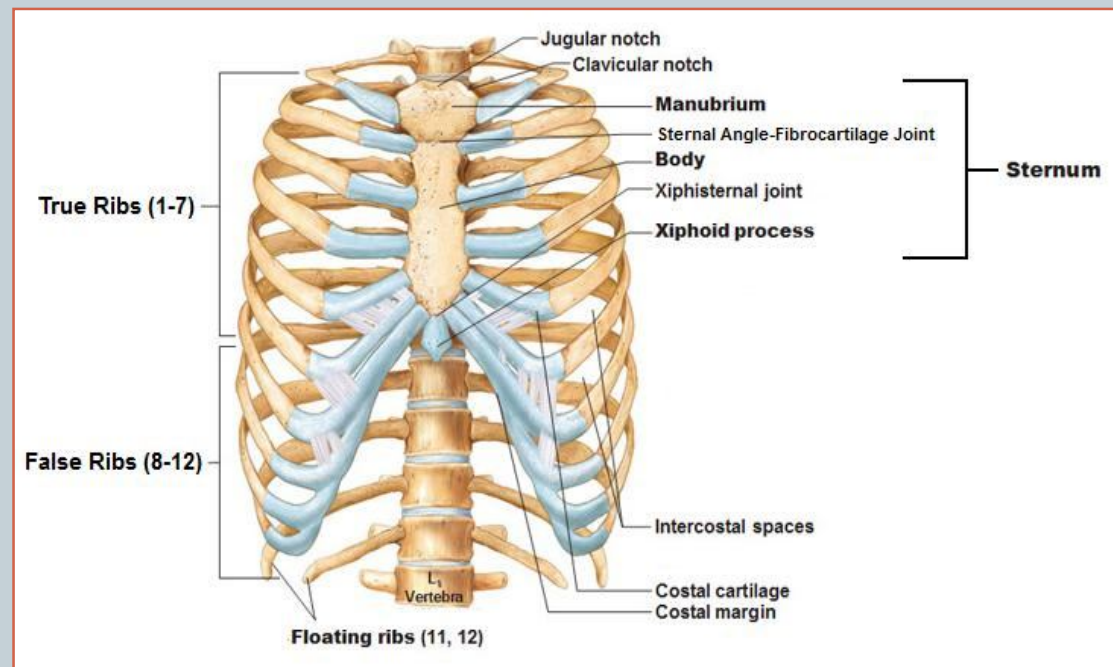
Vertebro sternal ribs

Vertebro chondral ribs (8-10)

Floating ribs (11 & 12)

7th rib: tallest rib

9th rib: the most



Typical rib

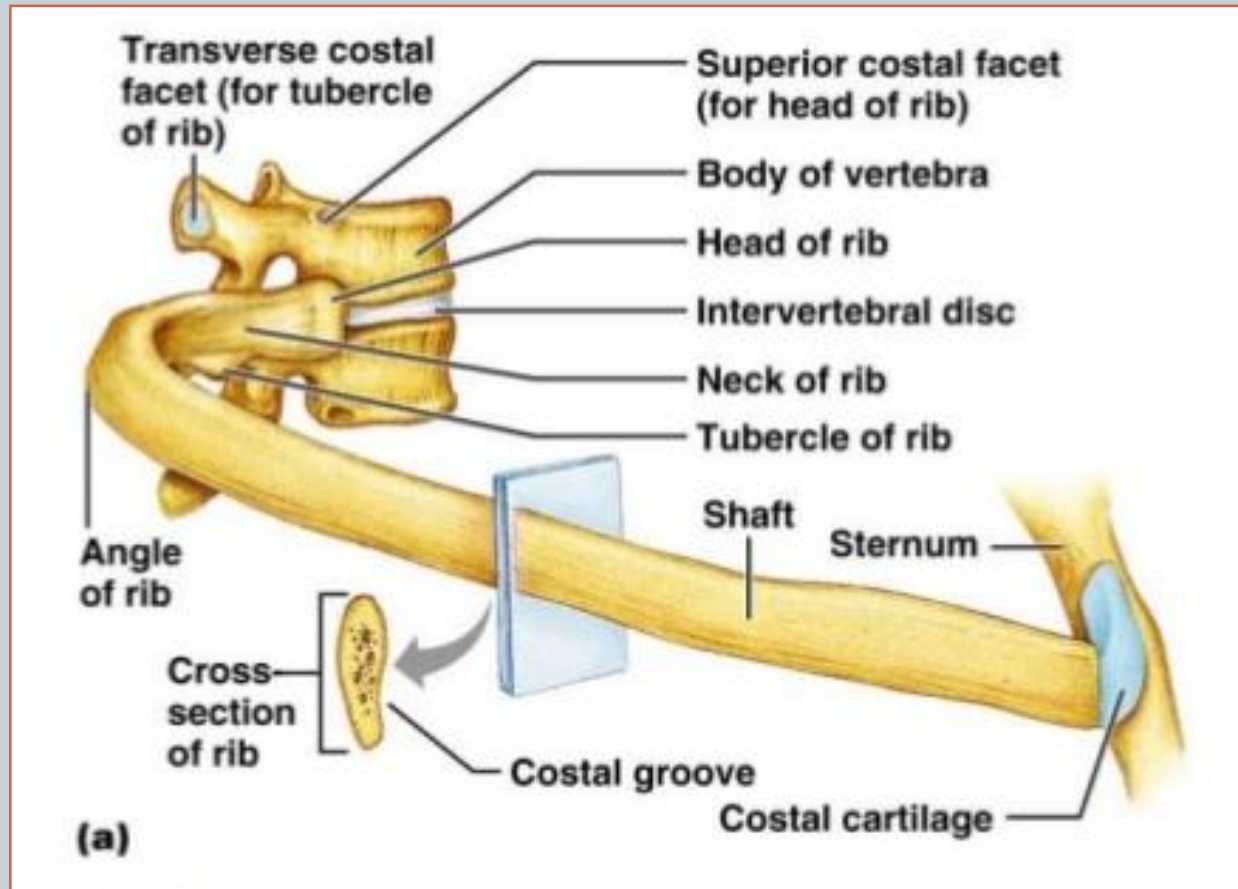
Posterior end

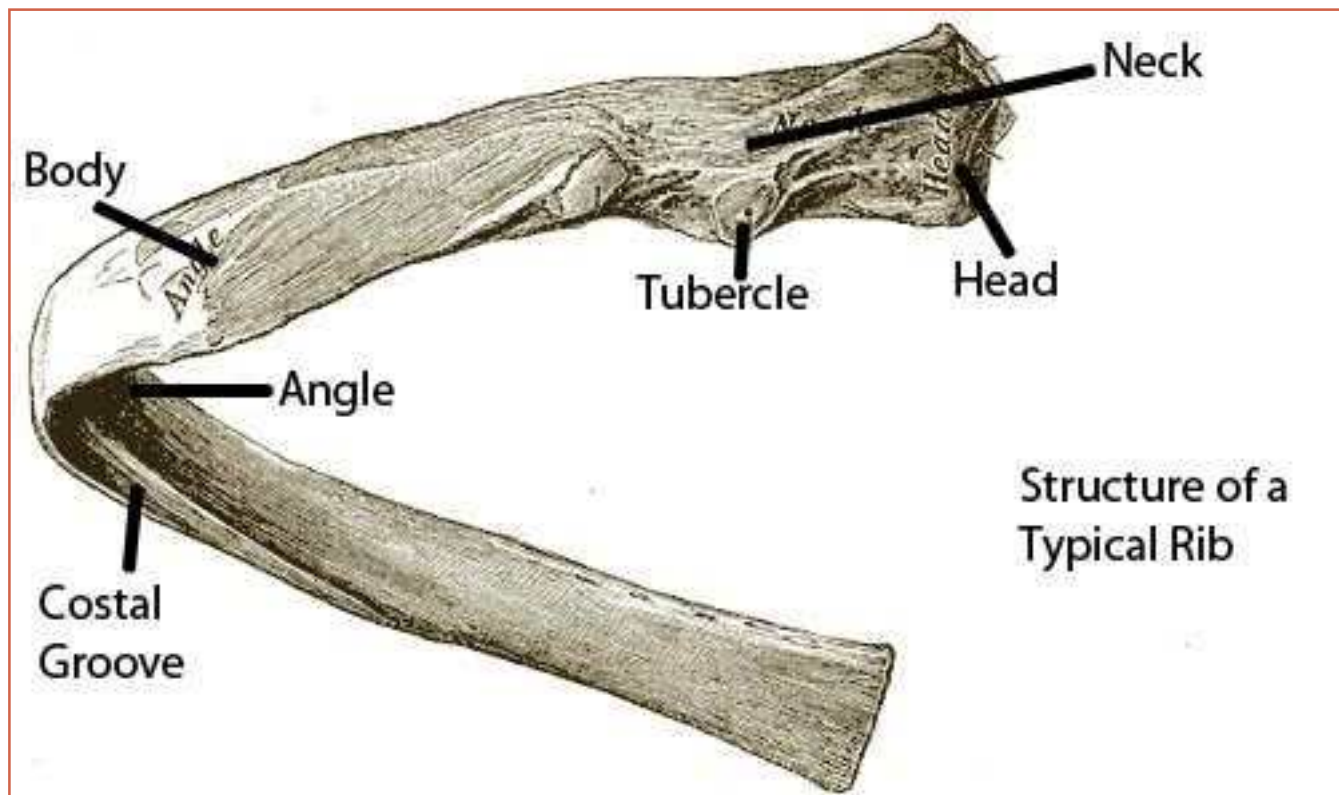
- Head
- Neck
- Tubercle

Body (shaft)

- Thin & flat
- Surface (int. & ext.)
- Border (sup. & inf.)
- Costal groove

Anterior end





First rib



- Shortest, widest & most circular rib
- No costal groove
- Surface

Sup. & inf

- Border
- Ant. & pos.

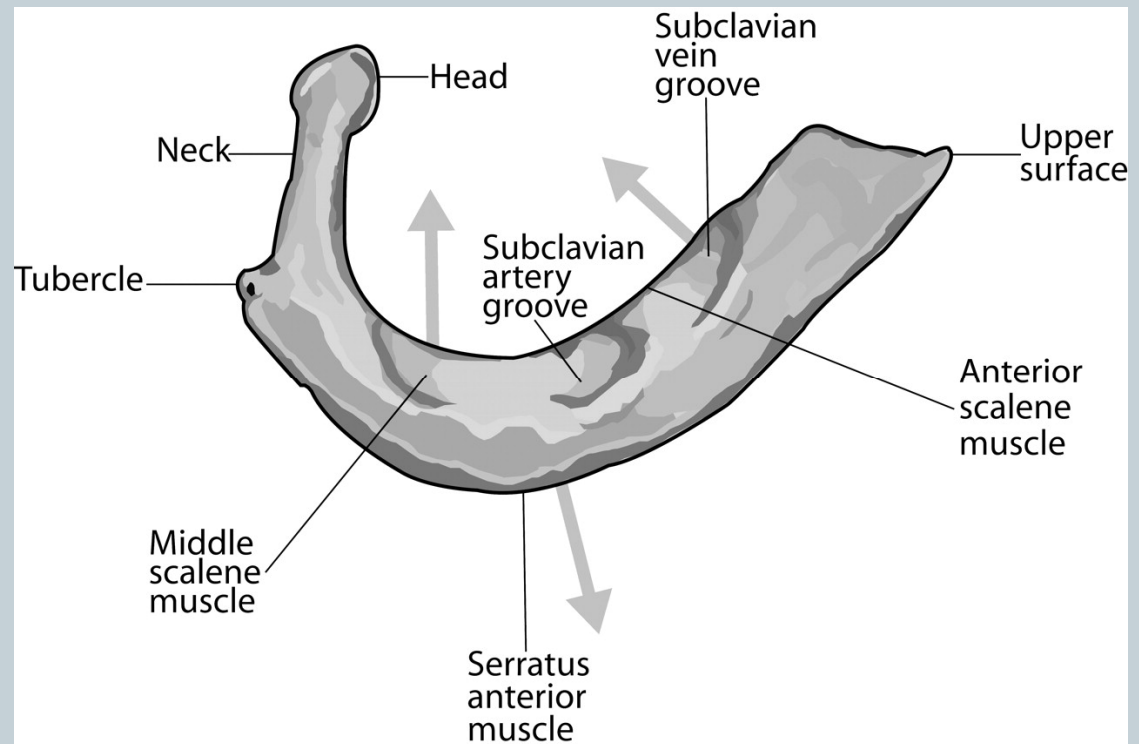
Scalene tubercle

2 grooves:

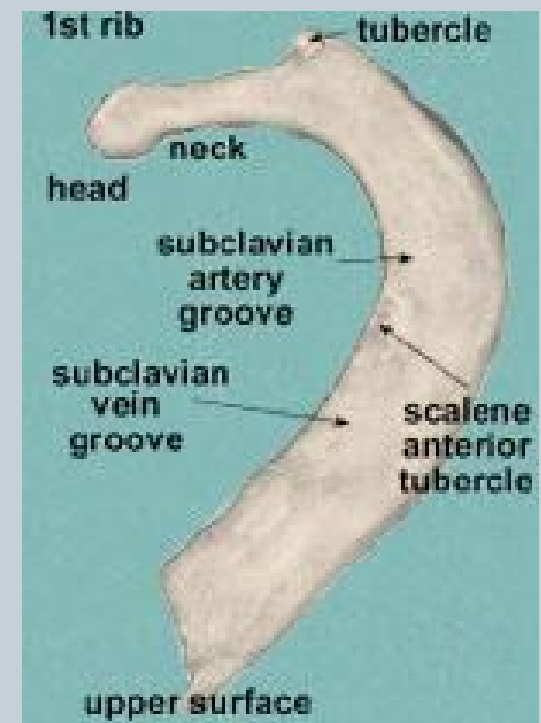
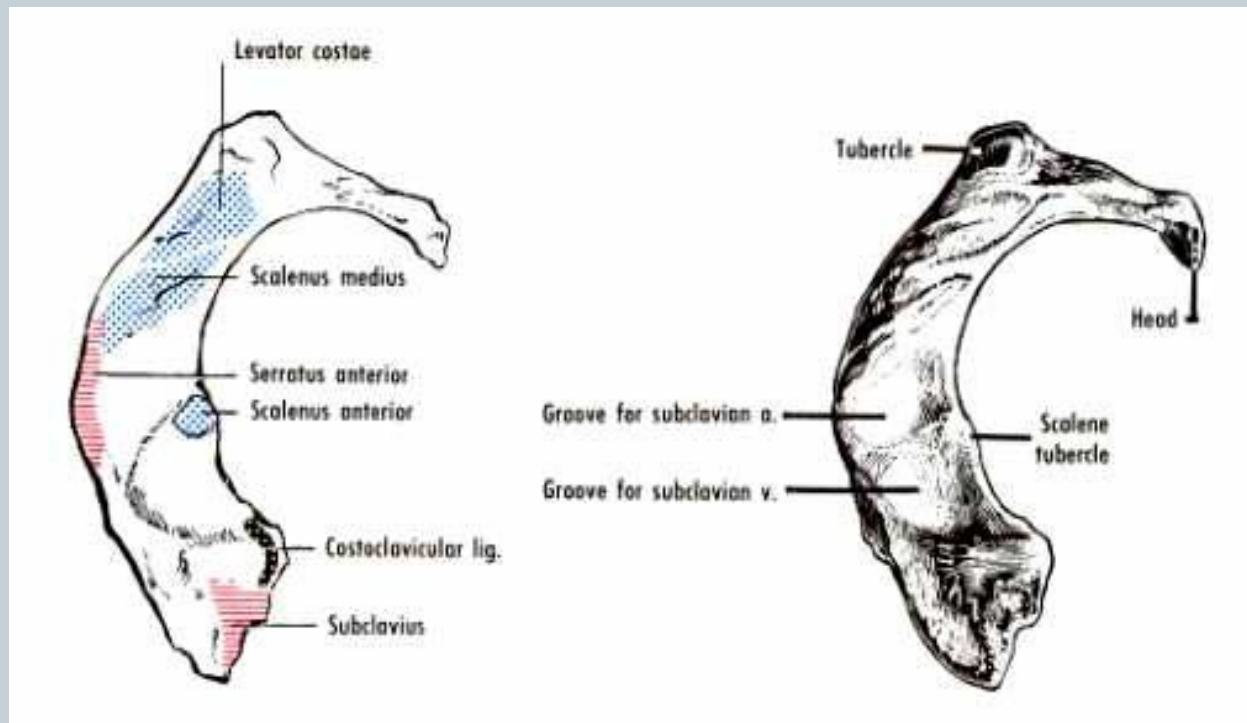
Anterior: subclavian vein

Posterior: subclavian artery

Complete facet for T1



First rib



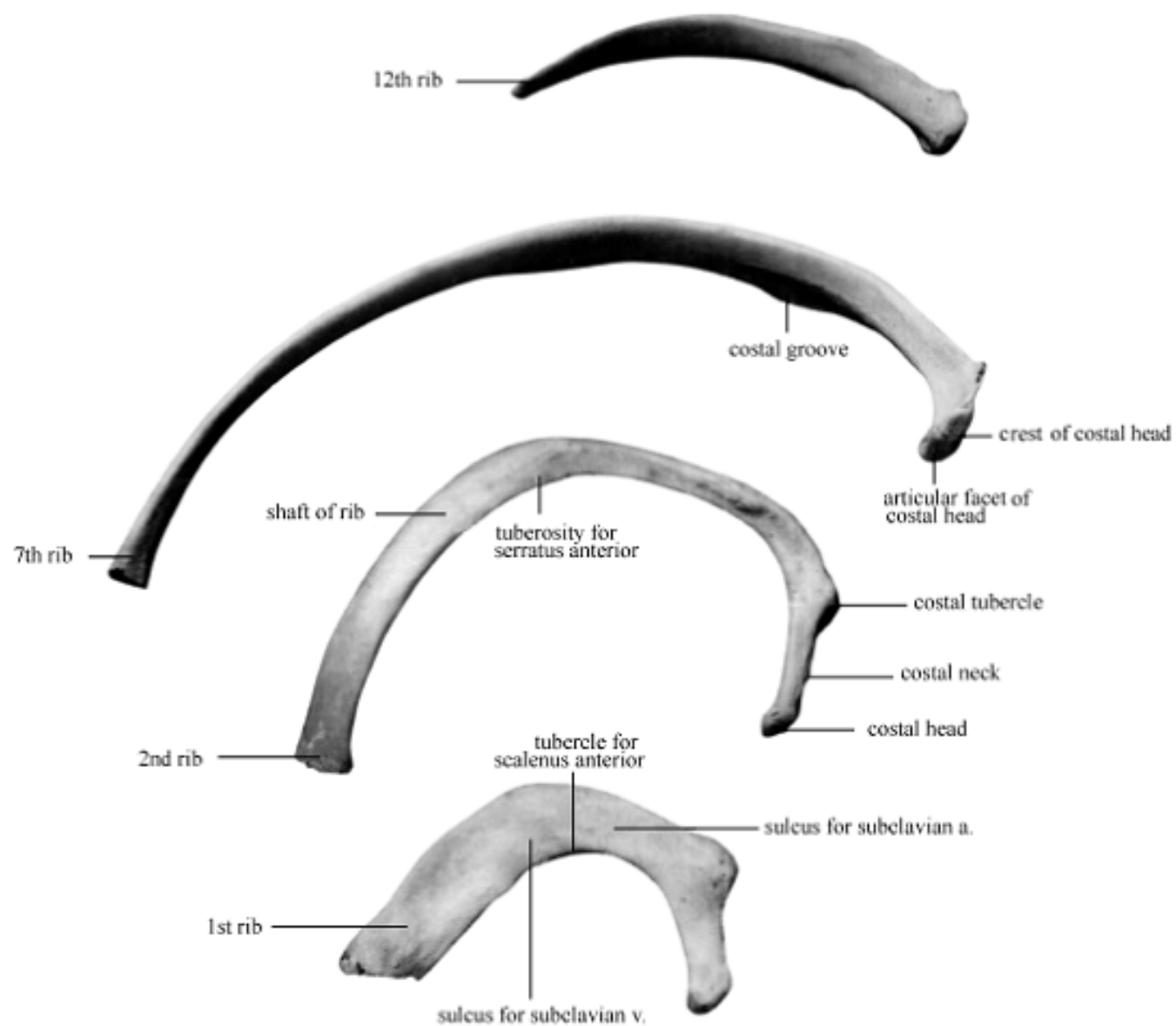
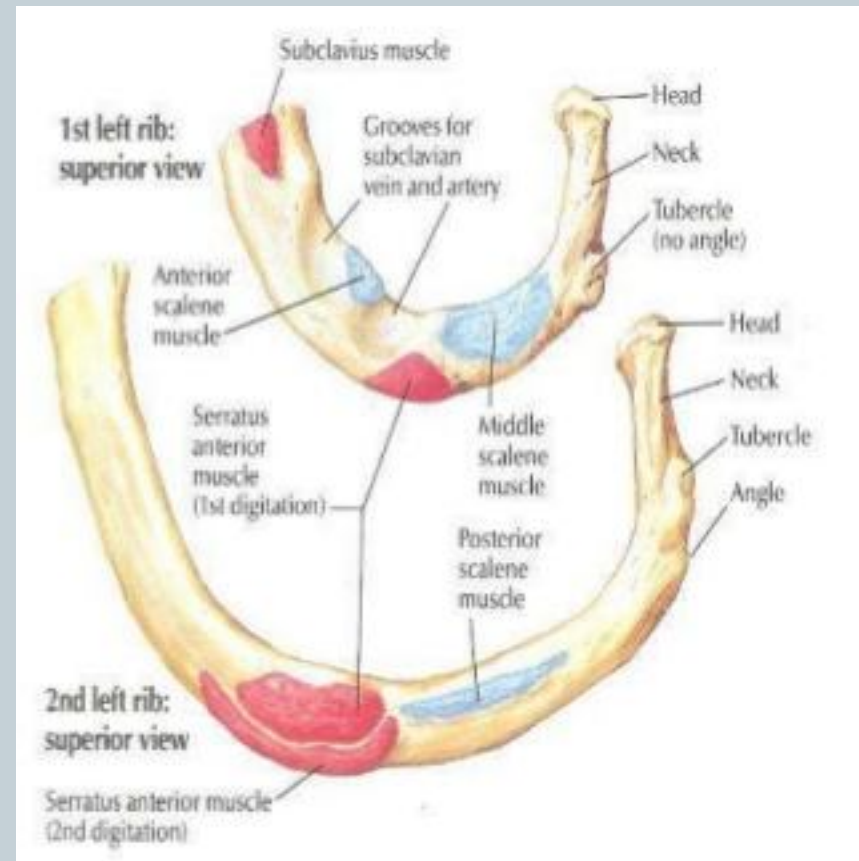


Fig. I-1-31 The ribs (1st, 2nd, 7th, and 12th rib)

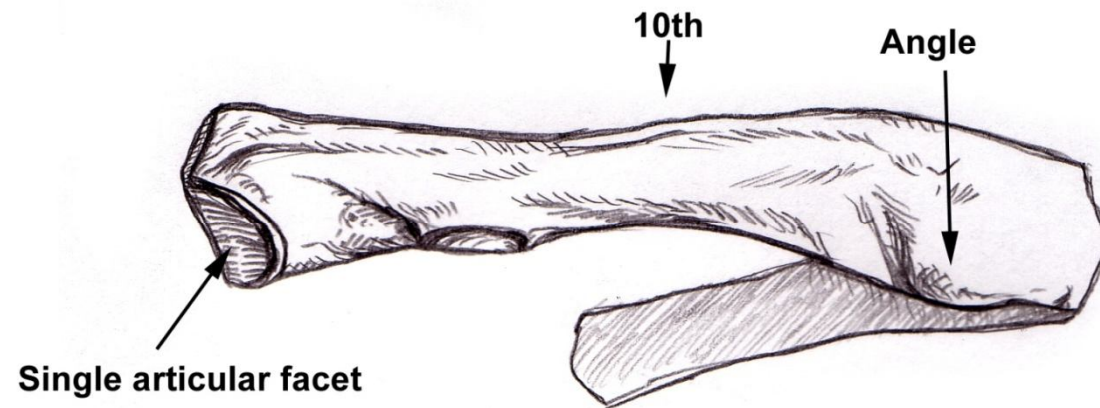
Second rib

1. 2 incomplete facets for T1 & T2
2. 2 times taller than first rib
3. Surfaces:
4. Superioexternal
5. Inferiointernal



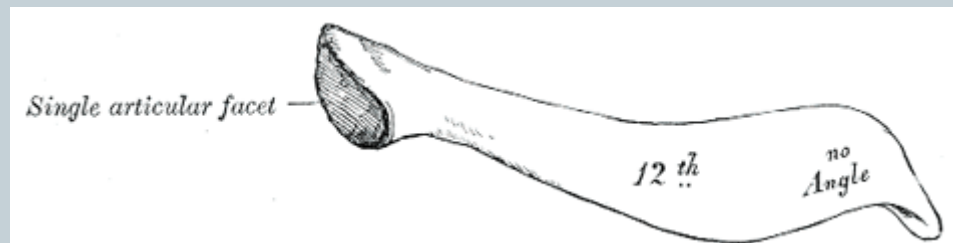
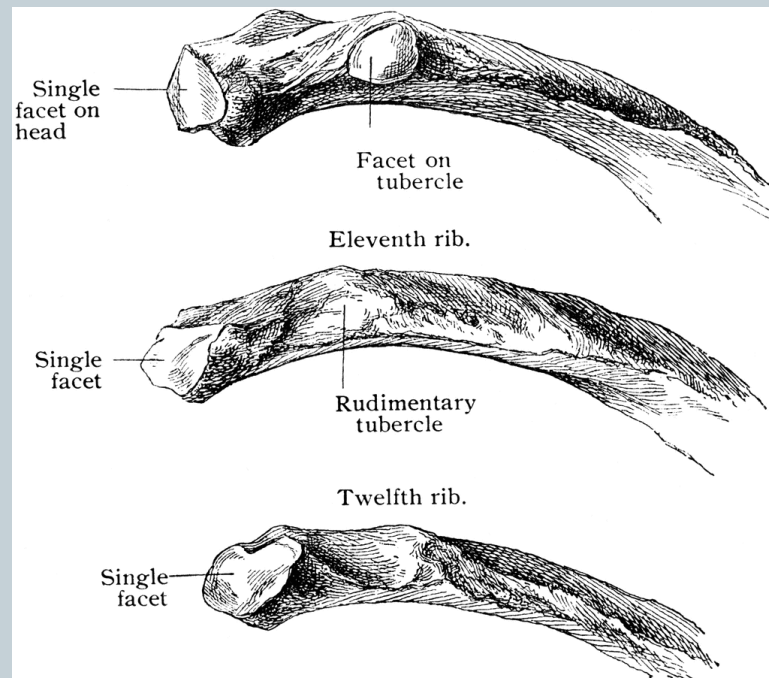
10th rib

- Complete facet for T10



11th & 12th ribs

- No tubercle
- No costal groove



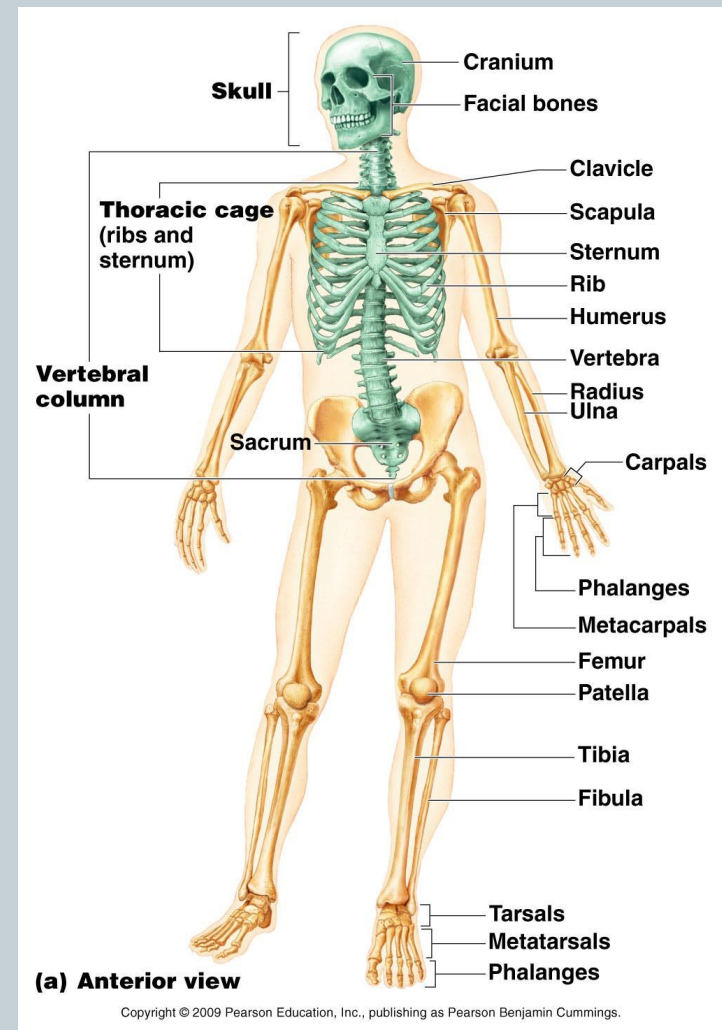
Appendicular skeleton

- **Upper limbs**

Pectoral Girdle (clavicle & scapula)

- **Lower limbs**

Pelvic Girdle (hip bone)

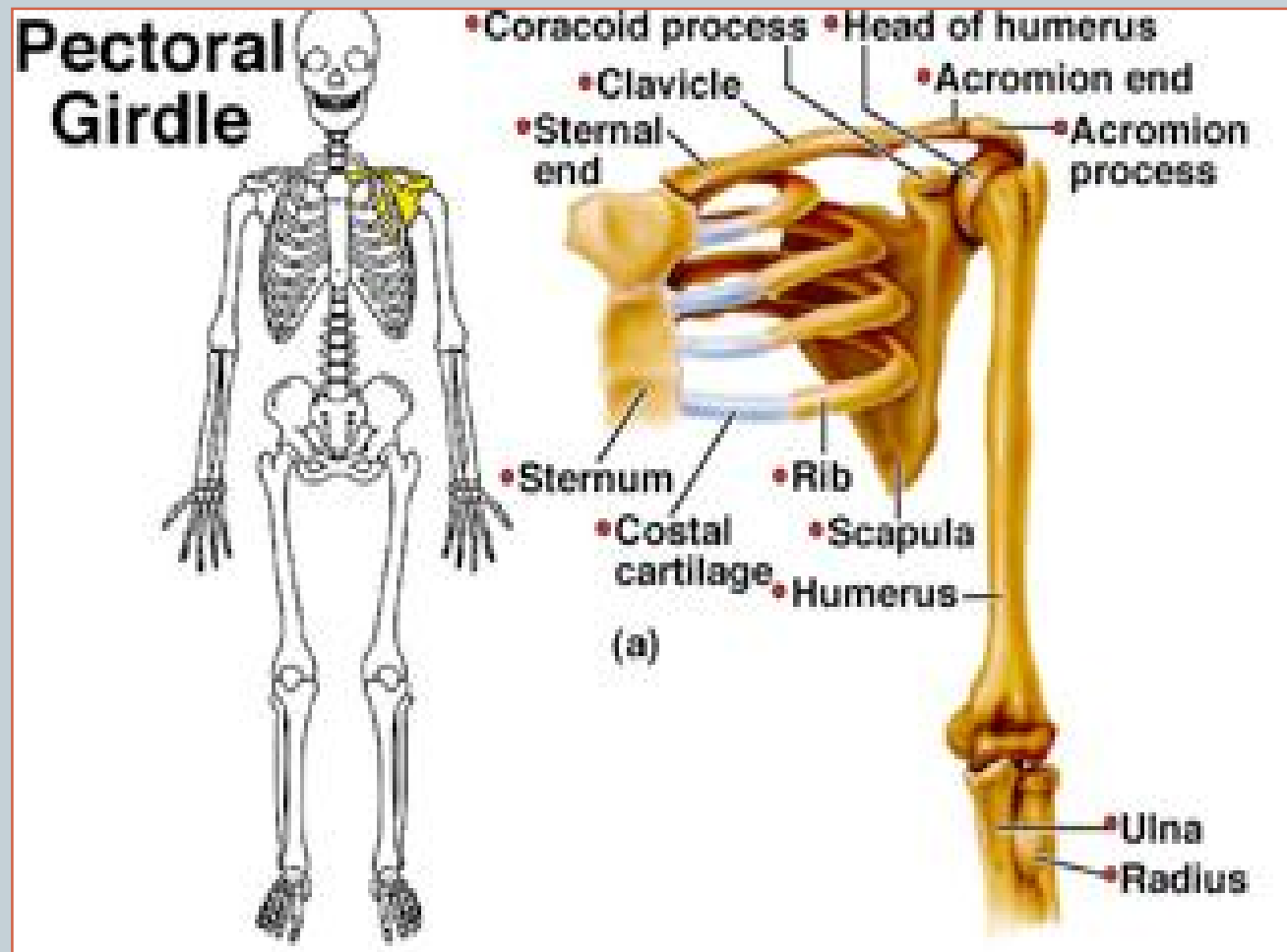


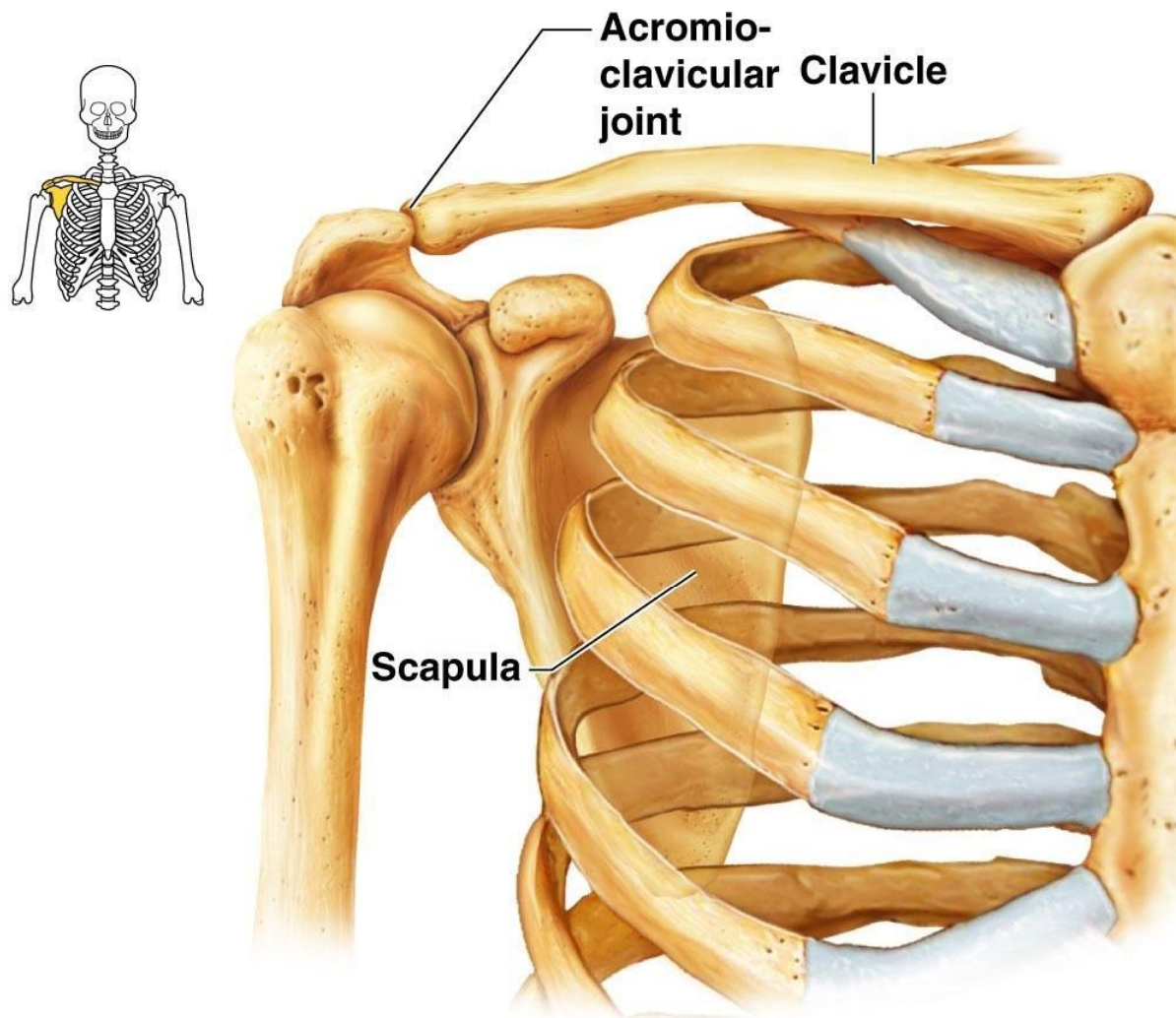
pectoral & pelvic girdles differences



Pectoral (shoulder) girdle	Pelvic girdle
Scapula & clavicle bones	Hip bones (Ilium, ischium, pubis)
No joint with vertebral column	Joint with vertebral column (sacrum)
No anterior joint between clavicles	Anterior joint (pubis symphysis)
No deep joint with humerus (free movement)	Deep joint with femur (no free movement)
Small joint between clavicle & sternum	Big joint between hip & sacrum

Pectoral girdle (shulder)

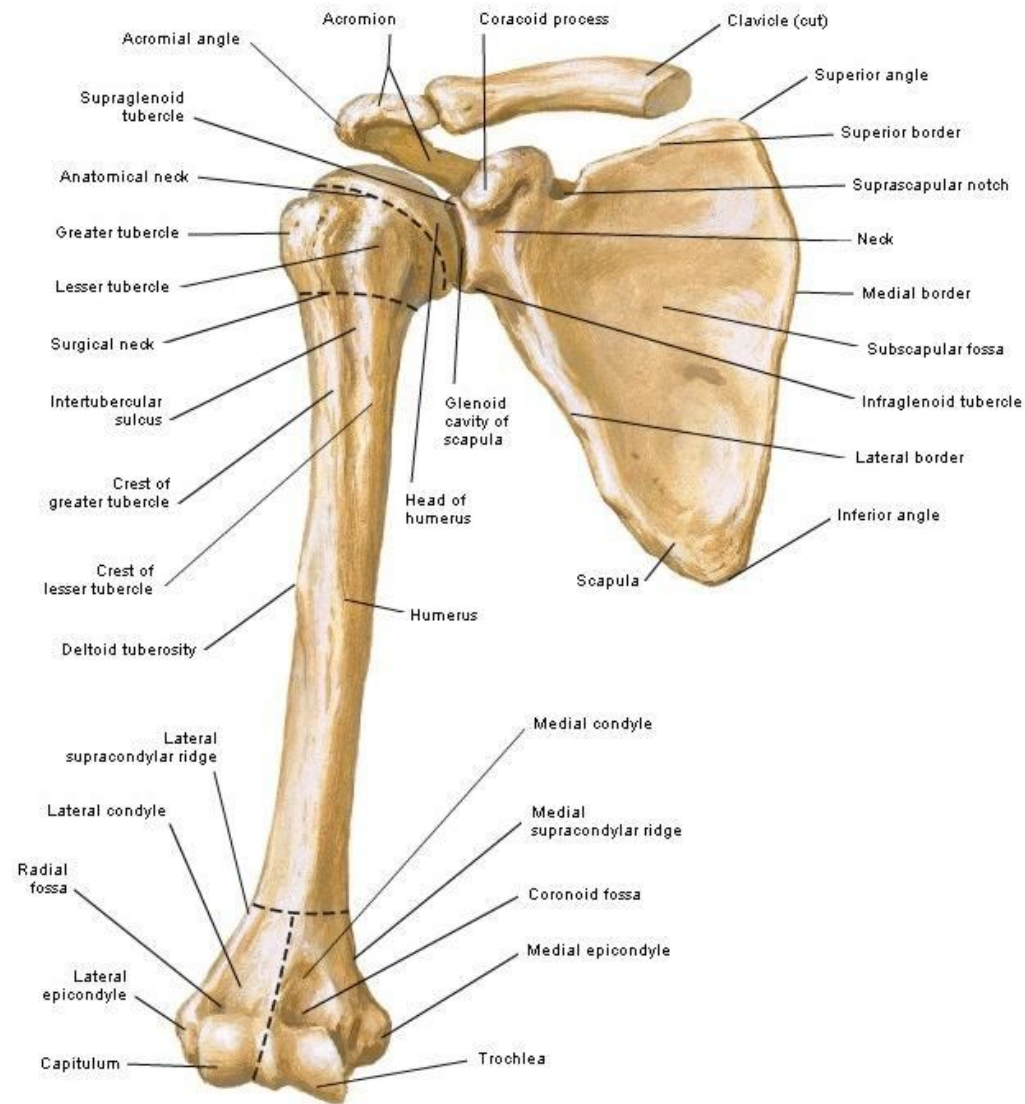




(a) Articulated right shoulder (pectoral) girdle showing the relationship to bones of the thorax and sternum

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Humerus and Scapula: Anterior Views



Scapula

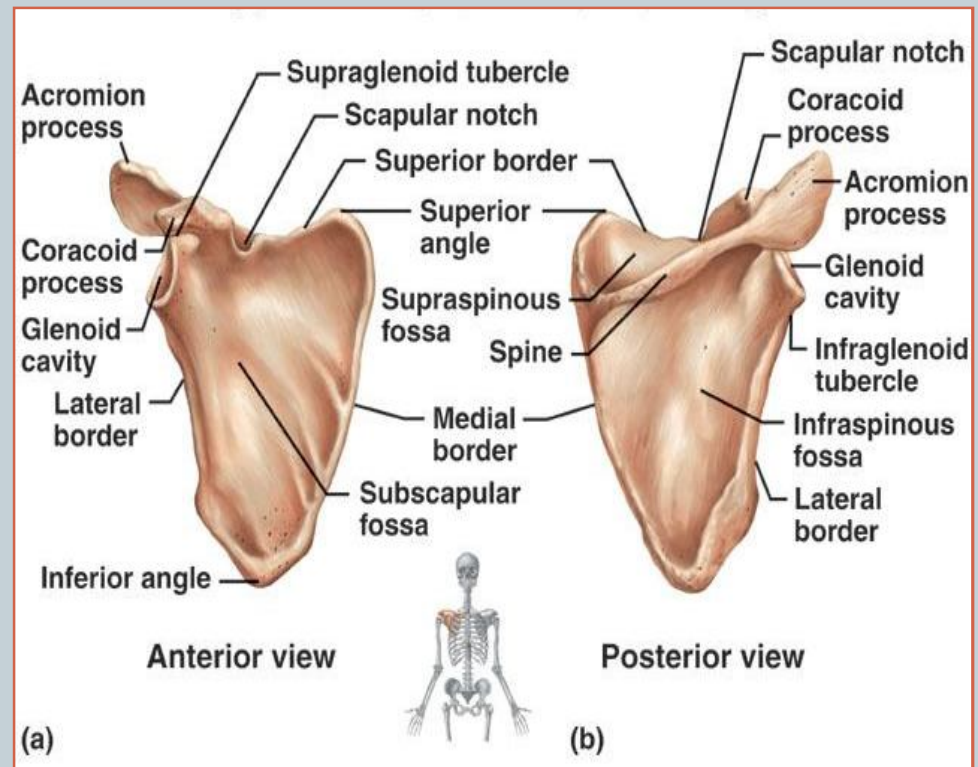
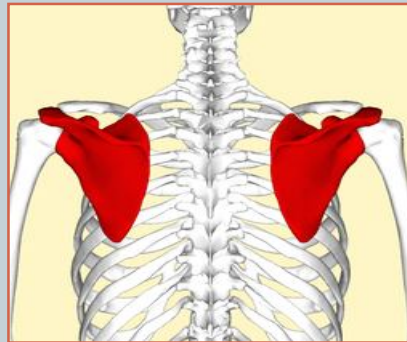
- Triangular flat bone
- Lateroposterior part of thorax
- 2-7 rib

- Surface

1. Anterior
2. Posterior

- Borders:

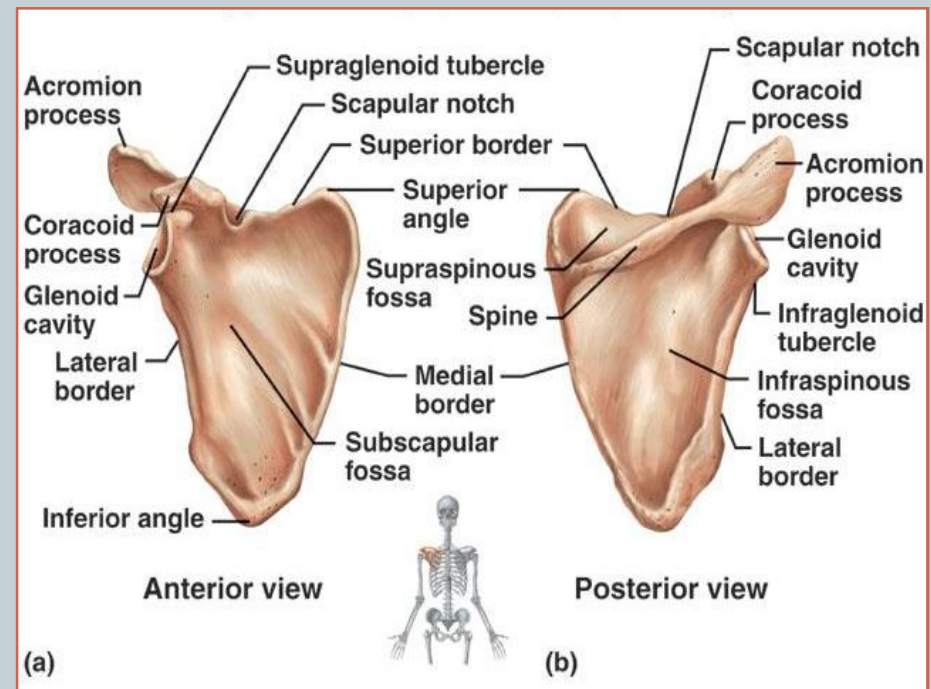
1. Superior
2. medial
3. lateral



Scapula

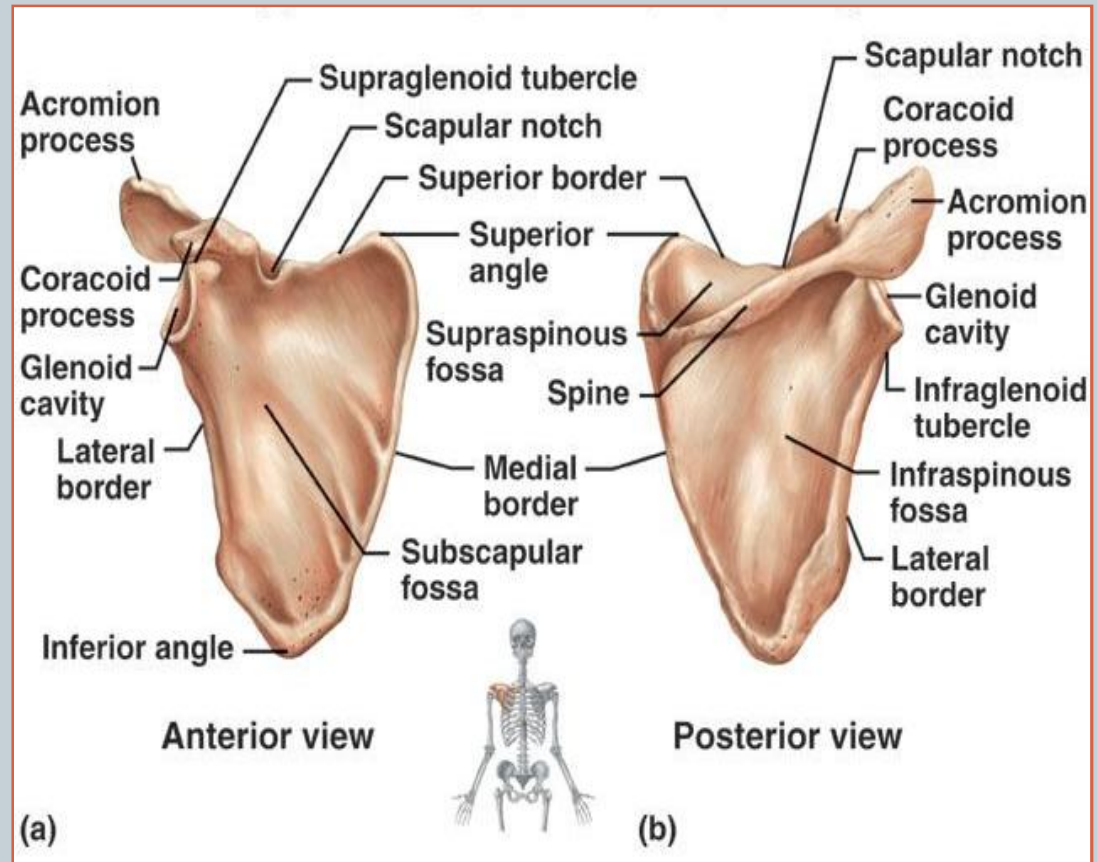
- Angles
 1. Superior
 2. inferior
 3. Lateral (head glenoid fossa by humerus bone)

- Processes
 1. Spinous p.
 2. Coracoid p.
 3. Acromion p.
- lateral end of clavicle



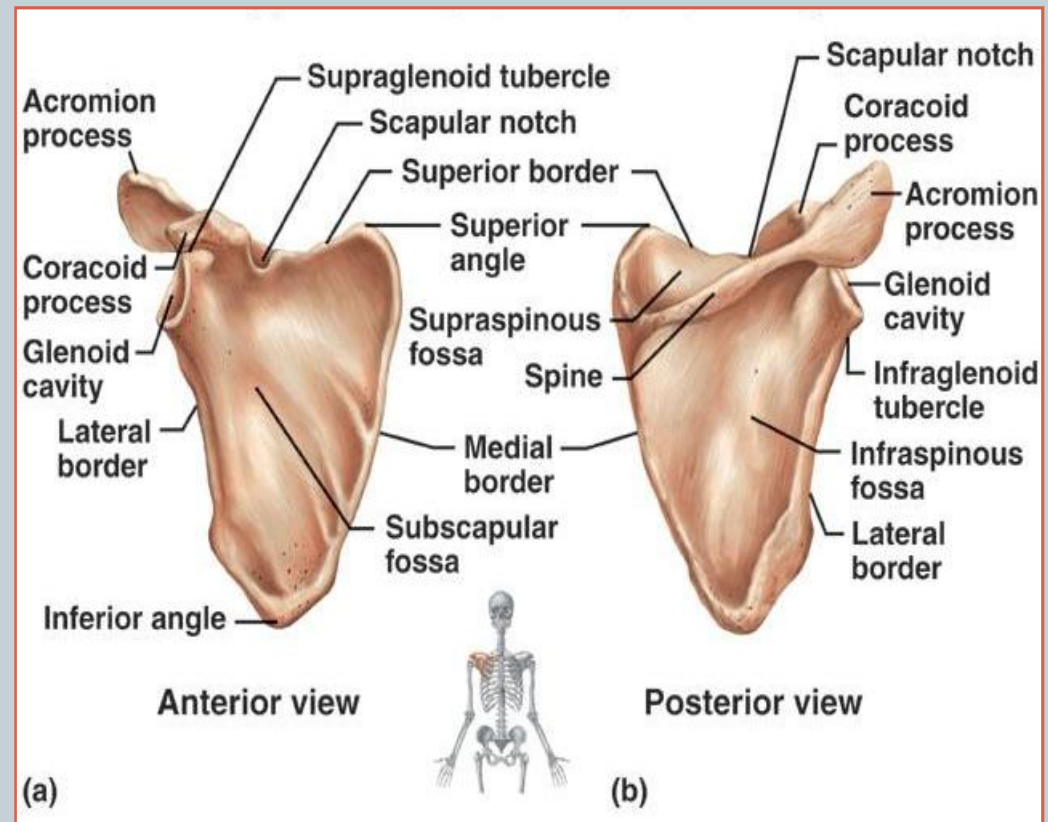
Anterior Surface

- Curves & longitudinal lines
 - Subscapular fossa
- Subscapular muscle
- Internal border
- Serratus anterior



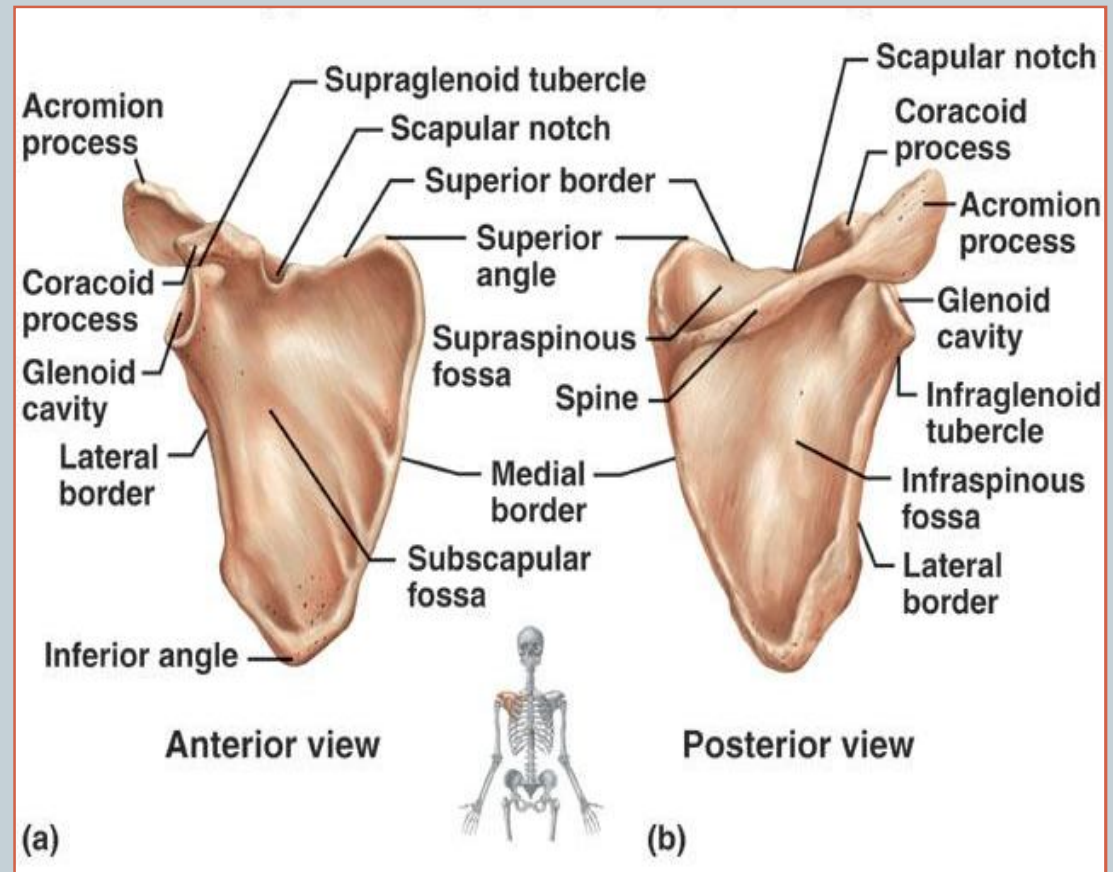
Posterior surface

- Spinus process
- Supra & infra spinus fossa
- Supra & infra spinus muscles
- Lateral border
- Tres minor & major muscles



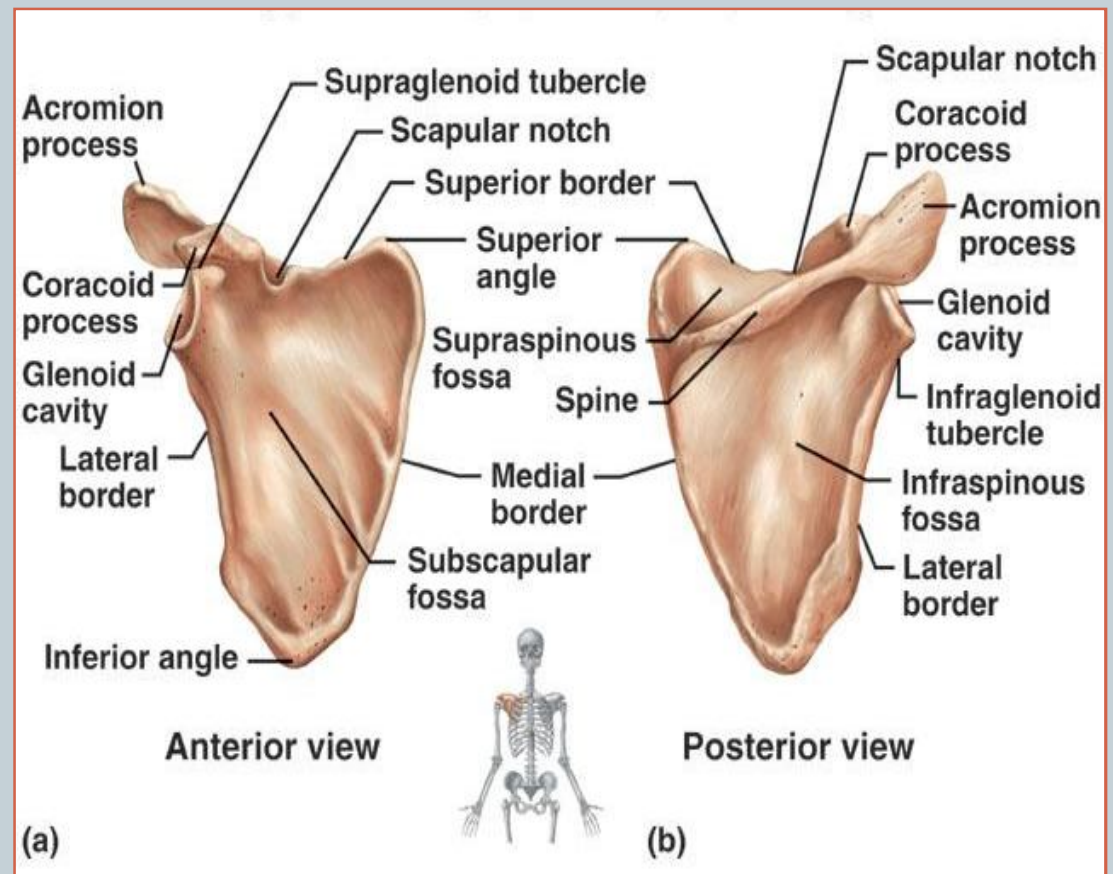
Superior Border

- Shortest
- Suprascapular notch
- Transvers ligament
- Suprascapular foramen



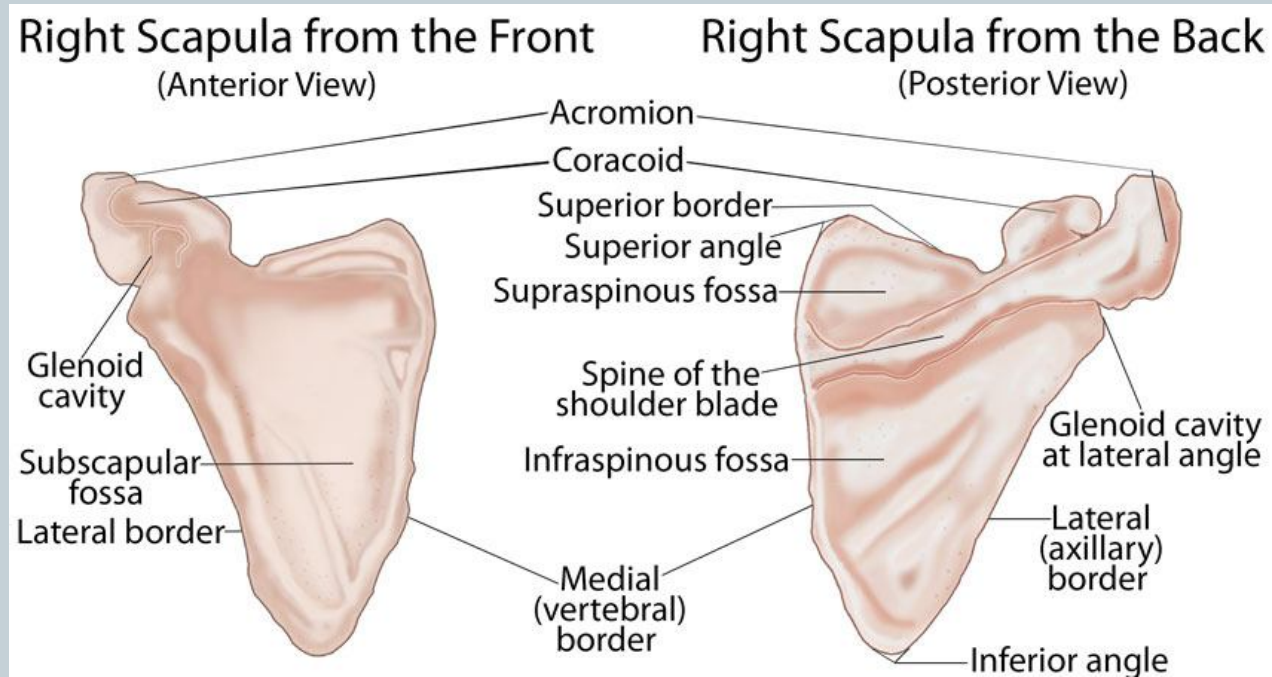
Lateral border

- Thick
 - Superior part
- Infraglenoid tubercle
Long head of triceps muscle



Internal border

- Longest border
- Levator scapula muscle
- Rhomboid minor muscle
- Rhomboid major muscle



Angles

- ***Lateral(head bone)***

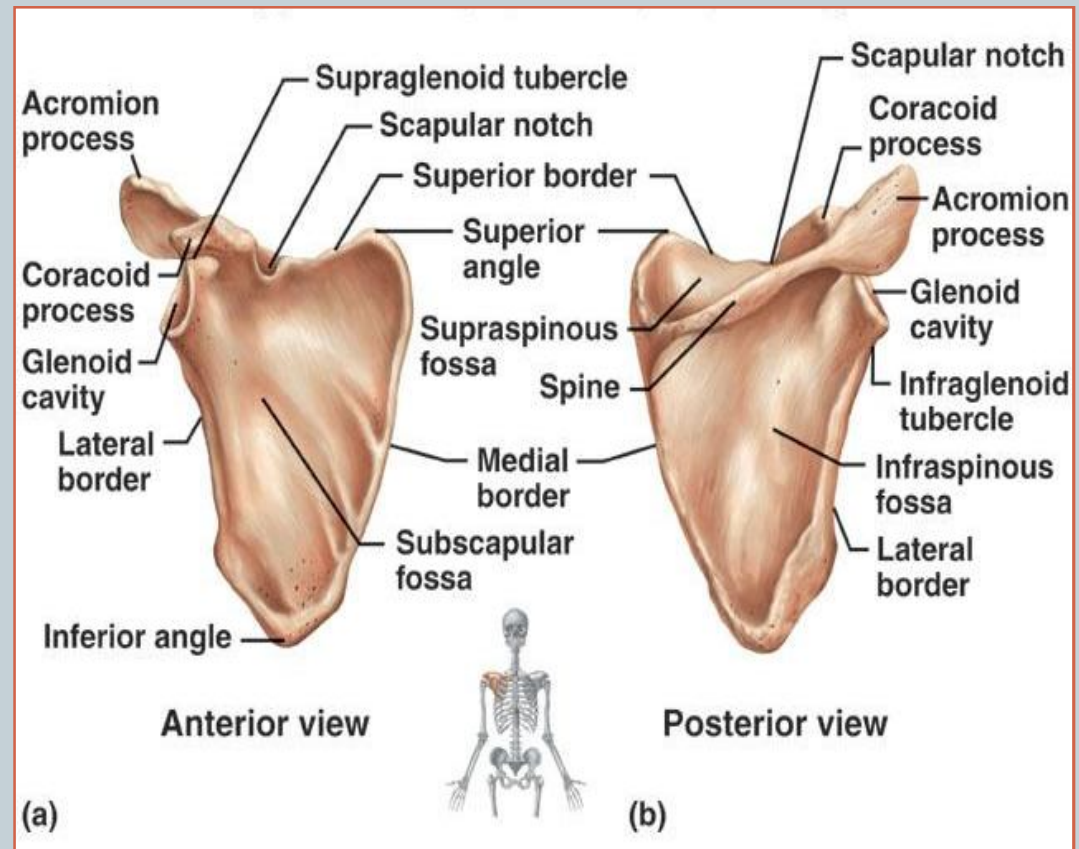
Glenoid fossa for humerus bone

Supraglenoid tubercle

Long head of biceps m.

- ***Inferior***

- ***Superior***



Clavicle

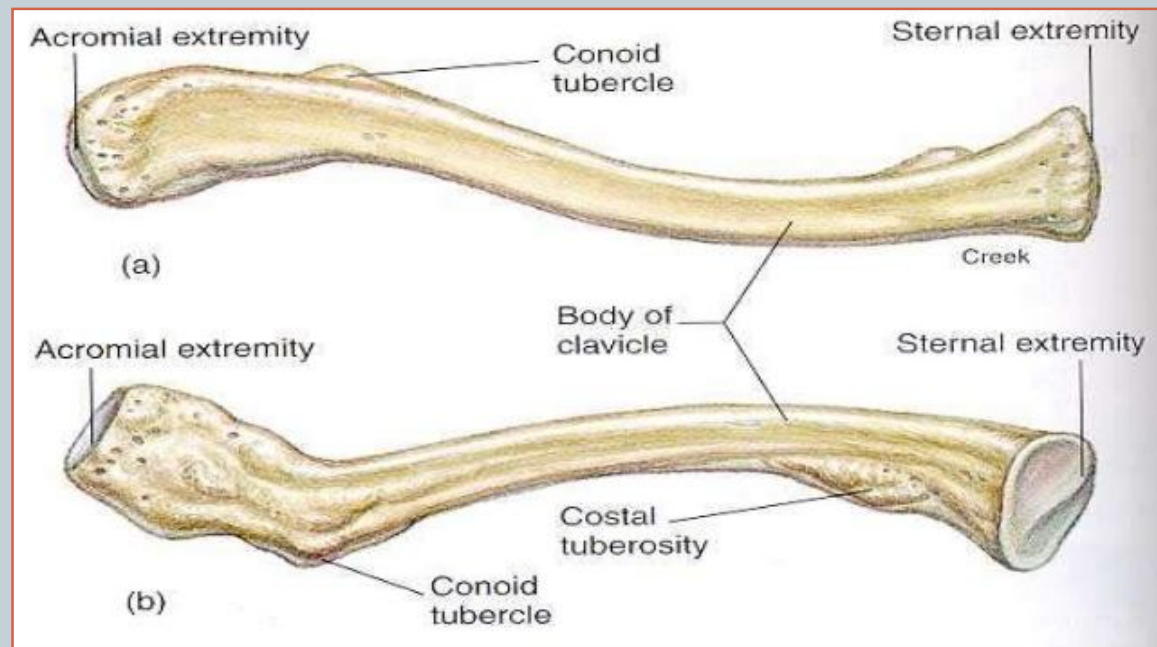
- Only bone that bind Body to upper limb
- Completely touchable
- S shape

- Body

1/3 Lateral part is:
flat

Sup. & inf surfaces

Ant. & pos. borders



2/3 internal part is cylindrical

Clavicle

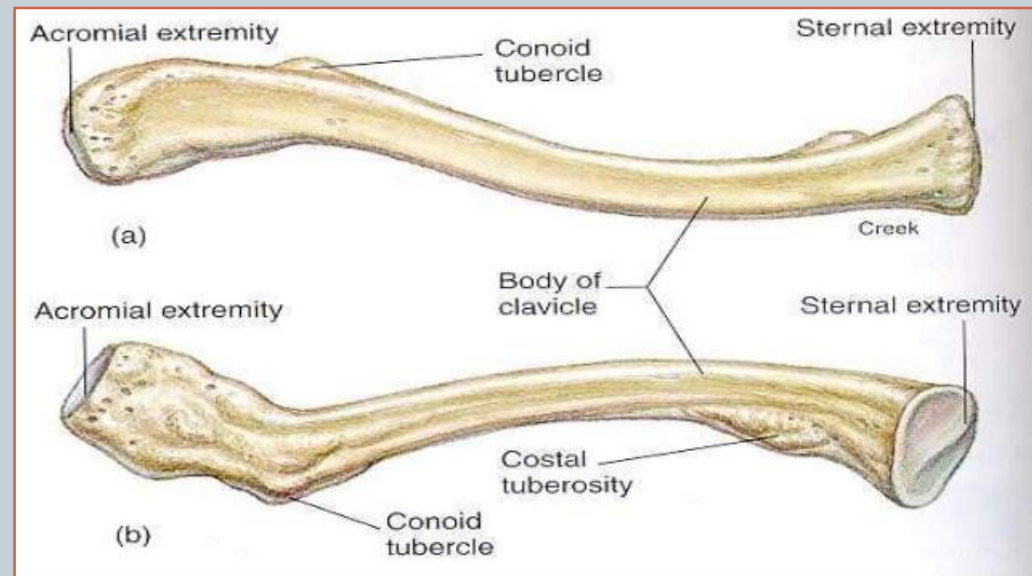


- 1/3 lateral Inf. Surface(conoid tubercle & trapezoid line)
- 1/3 middle part of inf. Suurface (groove for subclavian muscle)
- lateral end (flat & bind to acromion)
- Medial end (supra scapular notch of sternum)

- Clinical point:

Fracture

2/3 med. End & 1/3 lat. end



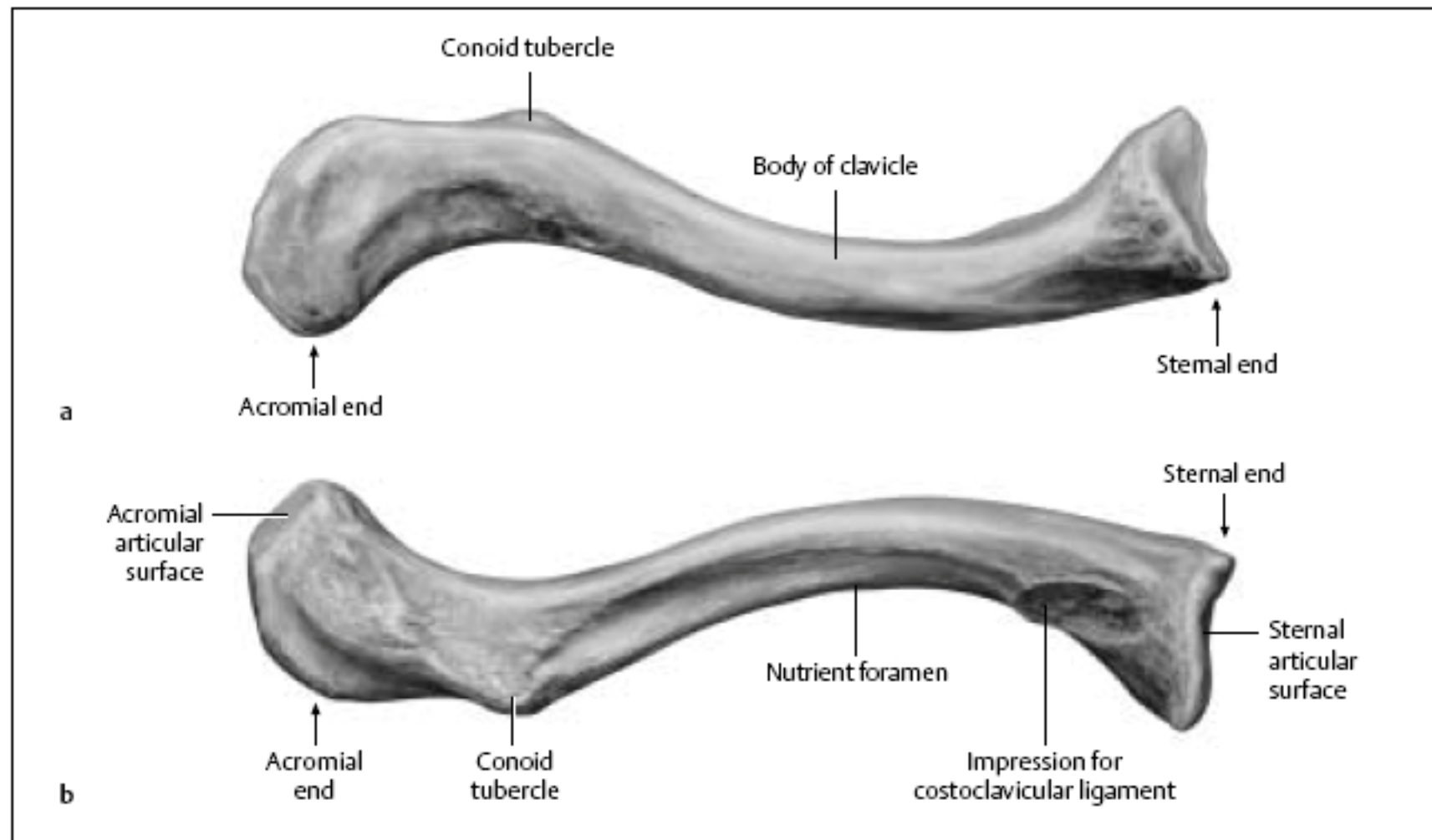


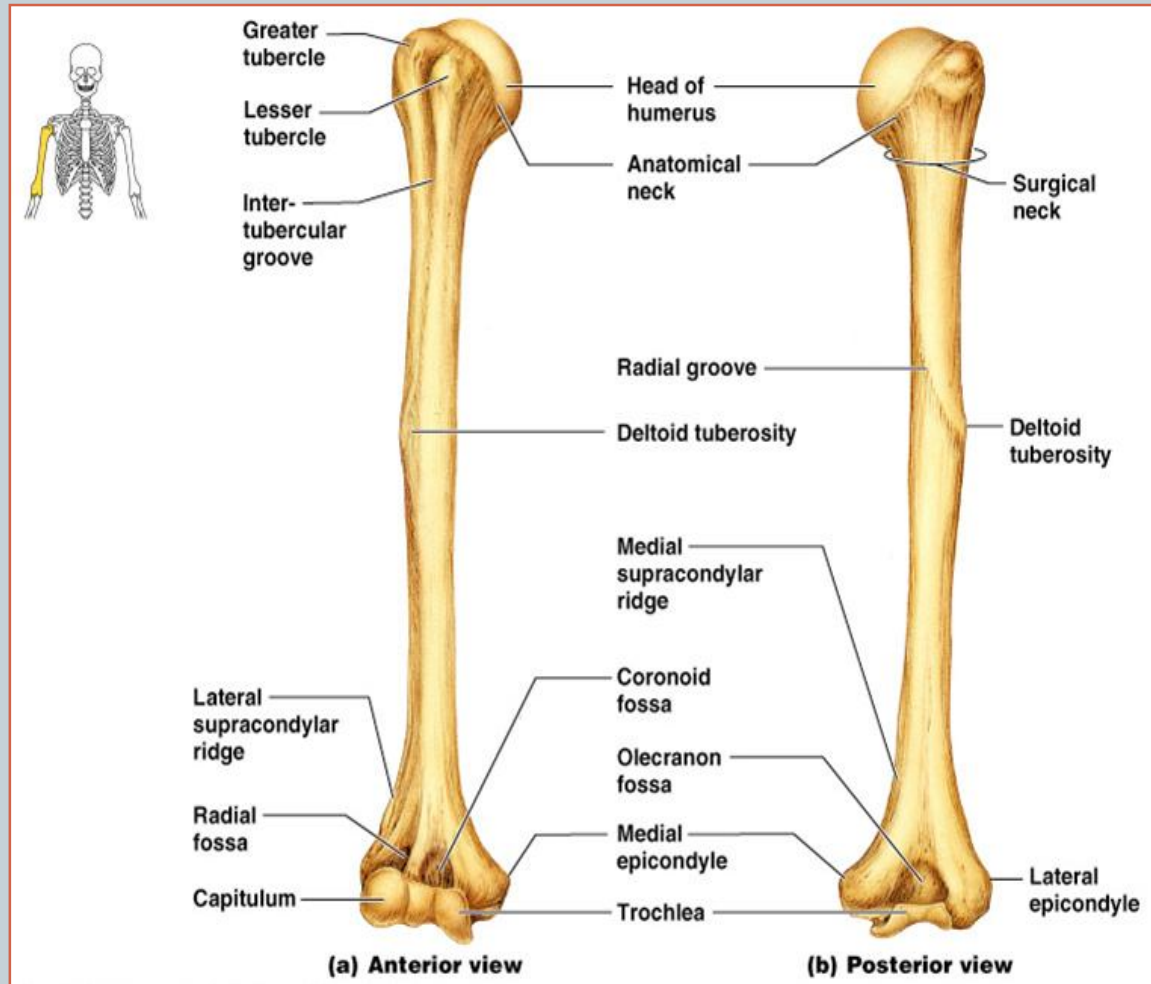
Fig. 3.75 a,b Anatomy of the clavicle.
 a Superior aspect.
 b Inferior aspect.

Note the pronounced S-shaped curvature of the clavicle and the configuration of the medial articular end.

Humerus



- Long bone
- Body
- Superior end
- Inferior end



Humerus Superior end

Head (Glenoid fossa)

Neck

1. anatomical
2. Surgical

- Greater Tubercle

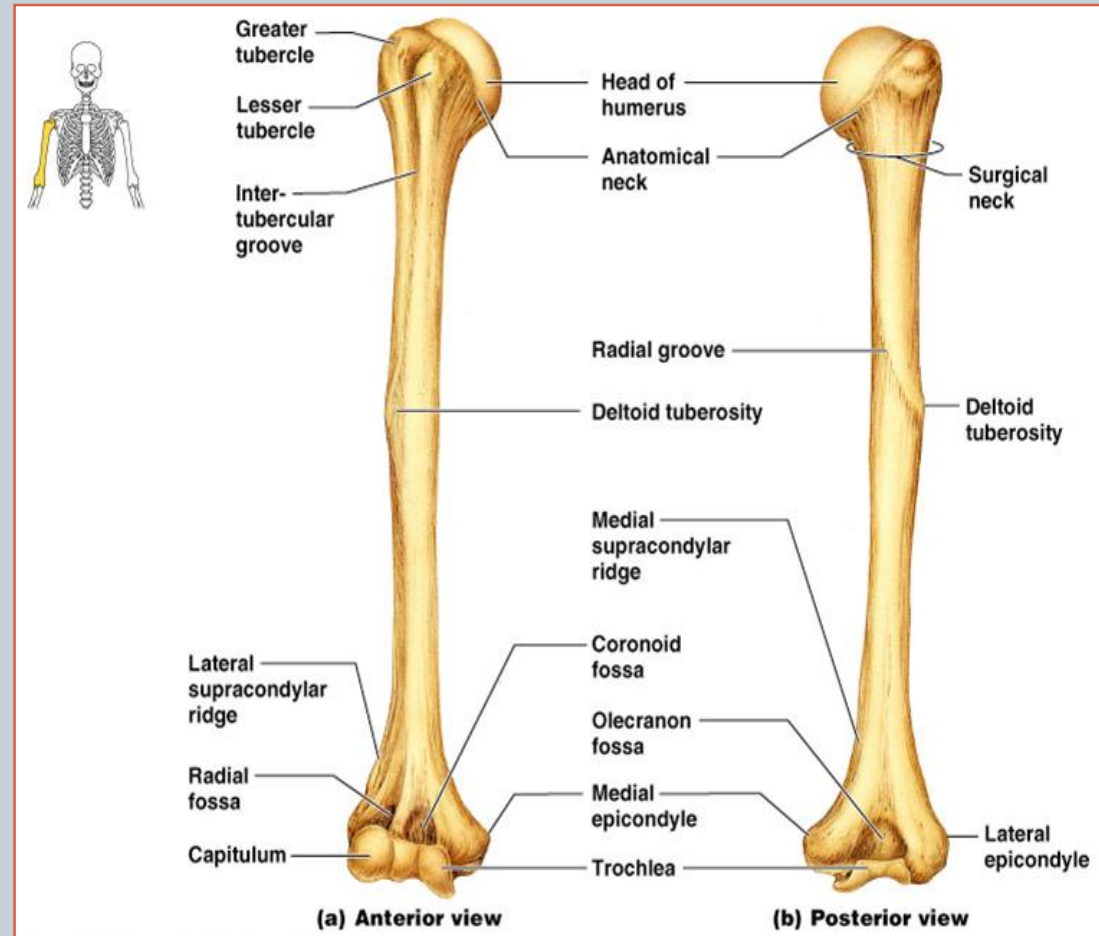
External part of superior end

- Lesser Tubercle

Anterior & medial part

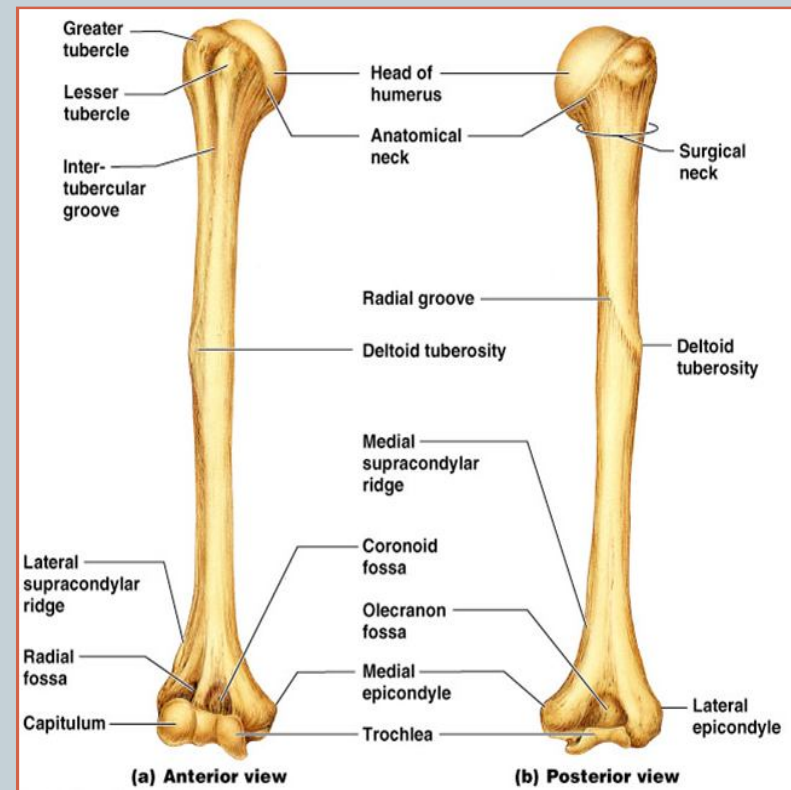
Intertubercular (biceps) groove

Groove for long biceps tendon



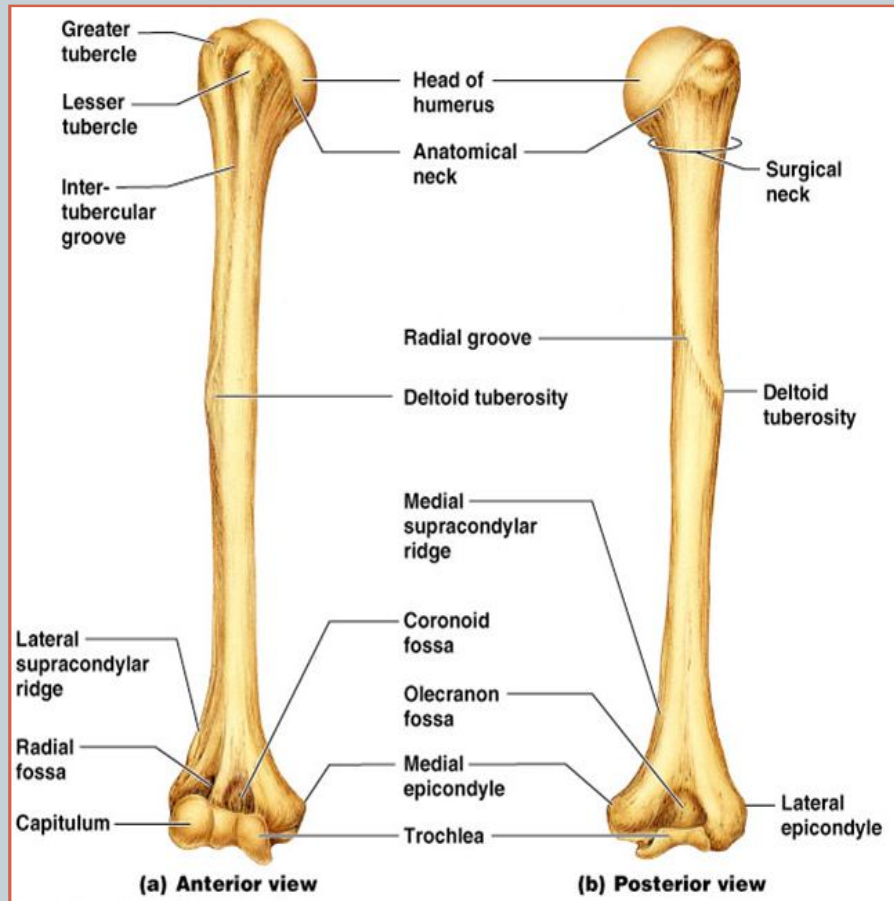
Humerus Body

- Superior part is Cylindrical
- inferior part is triangular
- Surfaces
 1. Anteromedial (coracobrachialis m.)
 2. Anterolateral (Deltoid tuberosity)
 3. Posterior (radial groove)
radial n. & deep brachial A.)
- Inferior end
 - Medial condyle (ulna)
 - Lateral condyle (radius)



Humerus Inferior end

- Flat & Triangular
- Condylar
- Noncondylar
- **Condylar part**
Trochlea (ulna)
Capitulum (radius)
- **Noncondylar part**



Humerus Noncondylar part

- Medial epicondyle (larger & anterior muscles of forearm)
- Lateral epicondyle (lateral of capitulum & posterior muscles of forearm)

- Med. & lat. Supra condylar ridge

Fossa:

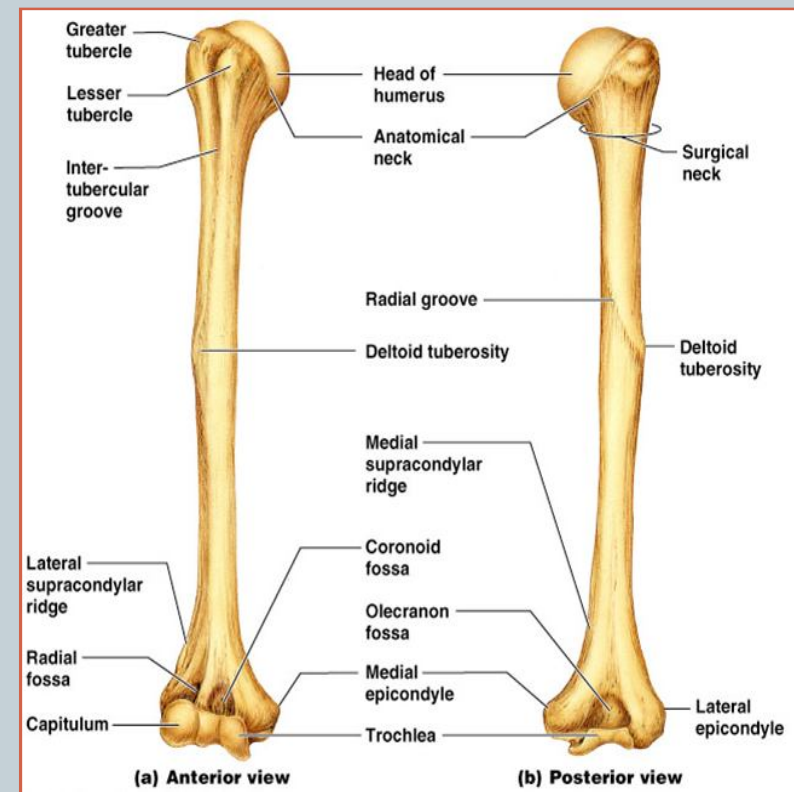
- Olecranon fossa
(large & pos. surface & superior of trochlea)

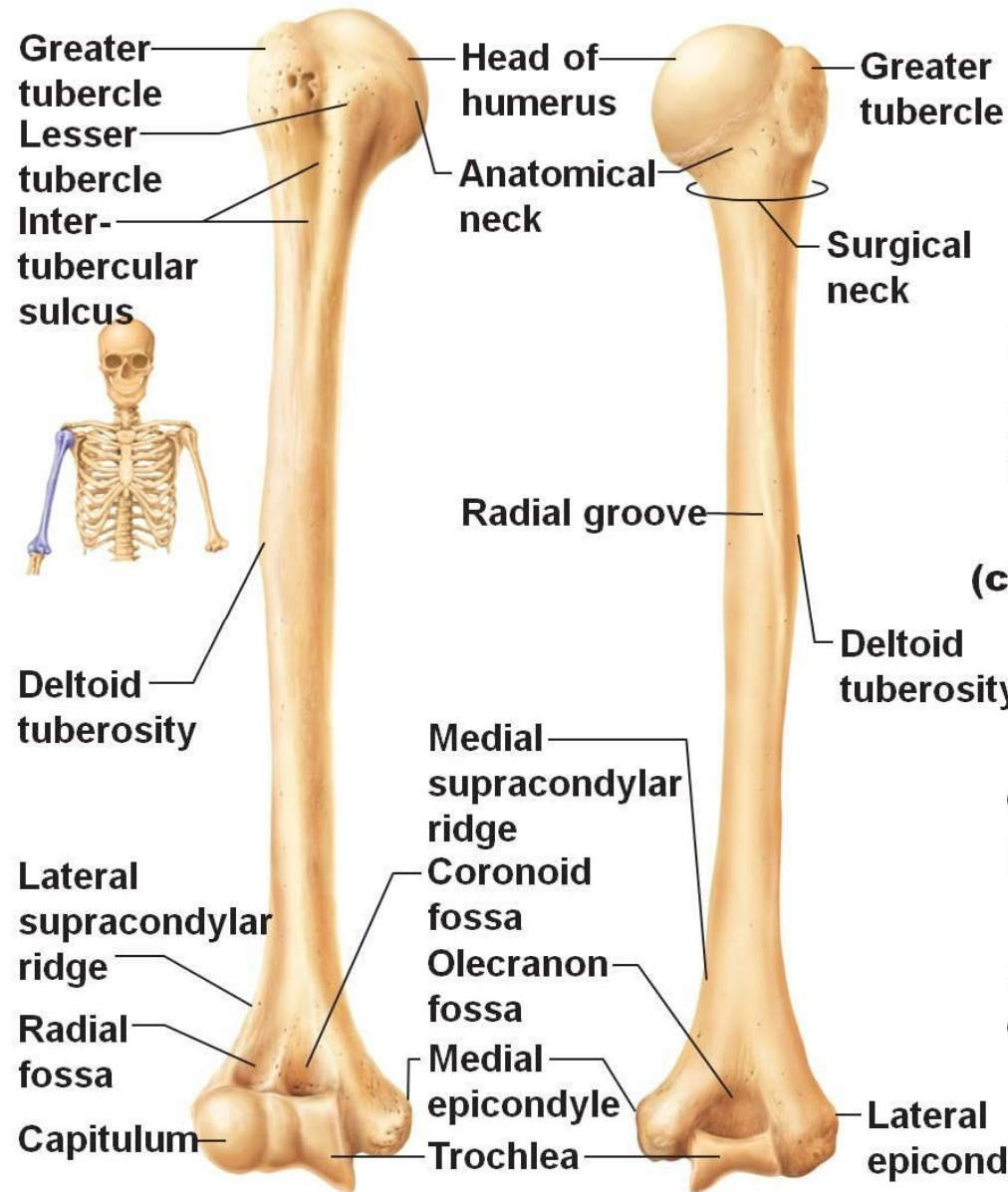
- Radial fossa

Ant. Surface & superior of capitulum

- Coronoid fossa

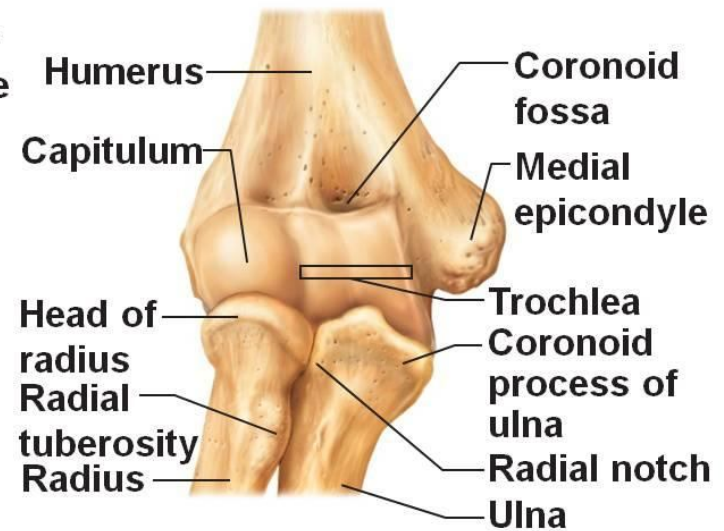
Medial to radial fossa & superior of trochlea



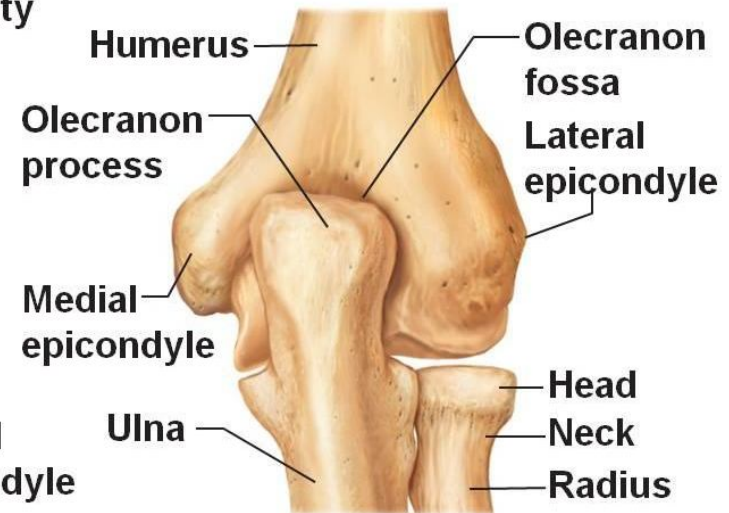


(a) Anterior view

(b) Posterior view



(c) Anterior view at the elbow region



(d) Posterior view of extended elbow

Clinical point

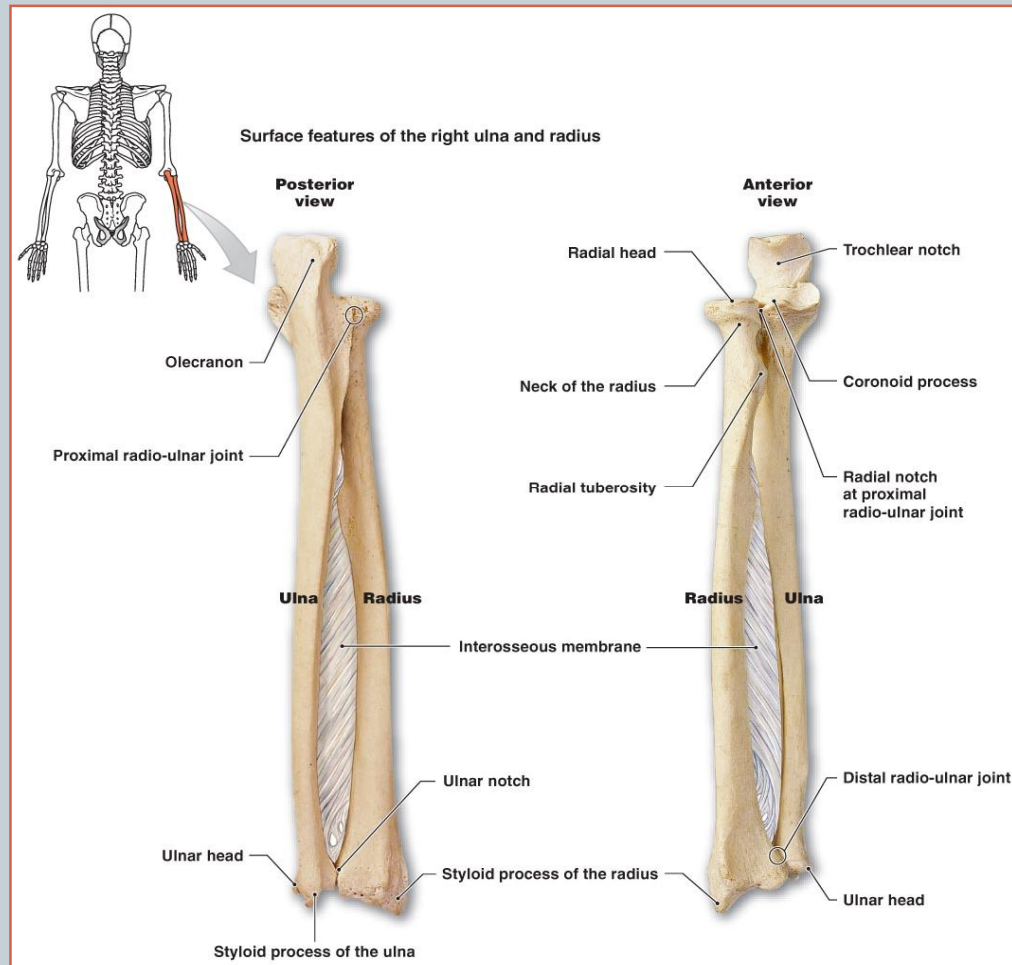


Fracture

1. Surgical neck (old women)
2. Body
3. Supracondylar (childhood)

Forearm bones

- Radius
- ulna



Radius

- Long bone
- Lateral part of forearm

- Superior end

Head (circular, joint with capitulum)

Neck (cylindrical, bind head to body)

Radial tuberosity biceps m. attachment

- Body

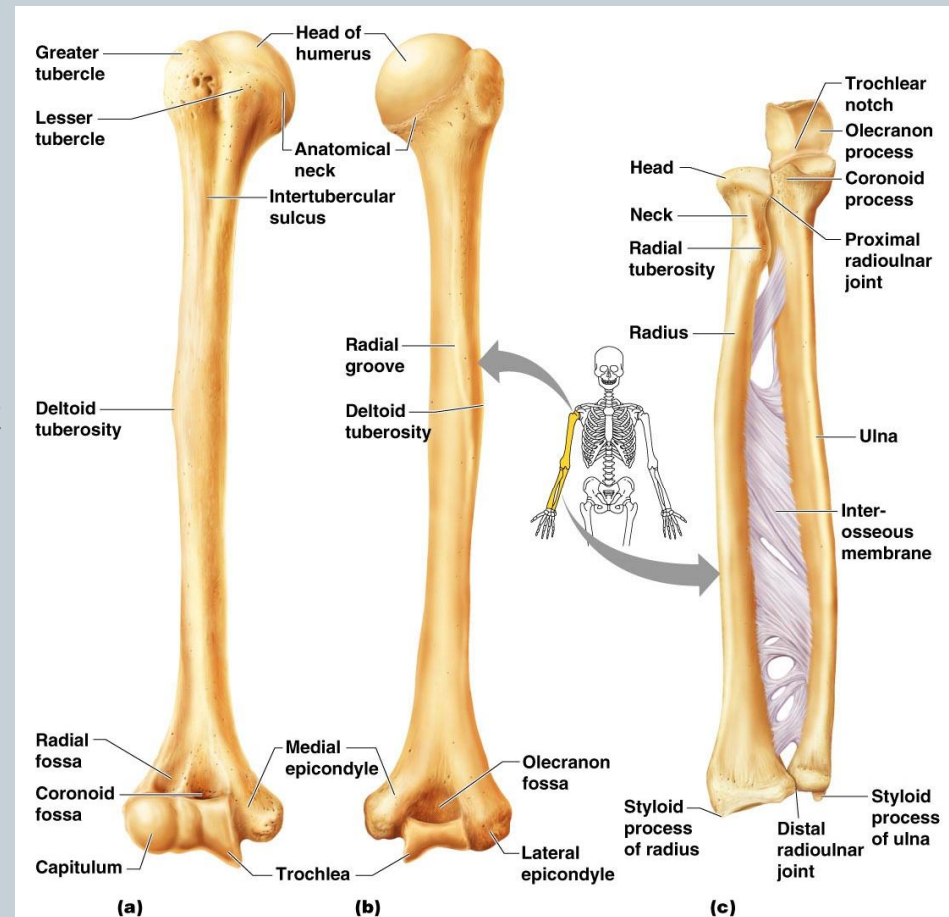
Triangular

Surfaces: Anterior, posterior & lateral

Borders: medial, Anterior & posterior

- Inferior end

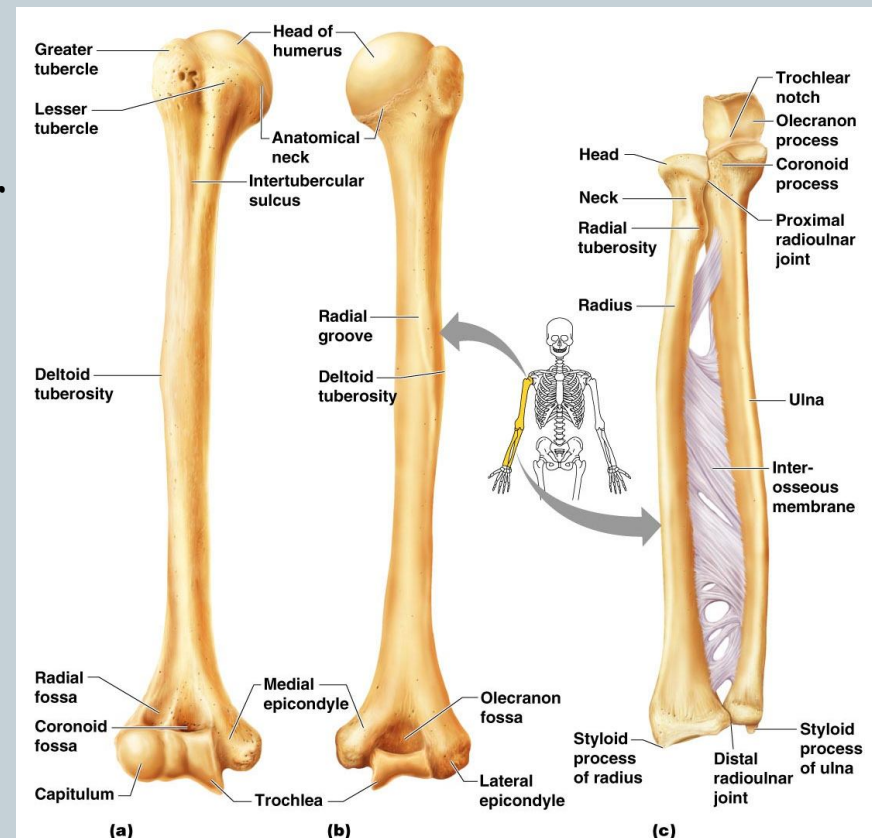
Wrist Proximal bones



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Radius

- Inferior end
Larger than superior end
- Surfaces
Anterior, posterior, medial, lateral & inferior
- Inferior surface 2 facets
Medial (lunate)
Lateral (scaphoid)
- Lateral surface (Styloid process)
- Medial surface (ulnar notch)
- Posterior surface (dorsal tubercle)
- Anterior surface anterior wrist ligament



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Ulna

- Long bone
- Medial part of forearm

- Superior end
2 processes

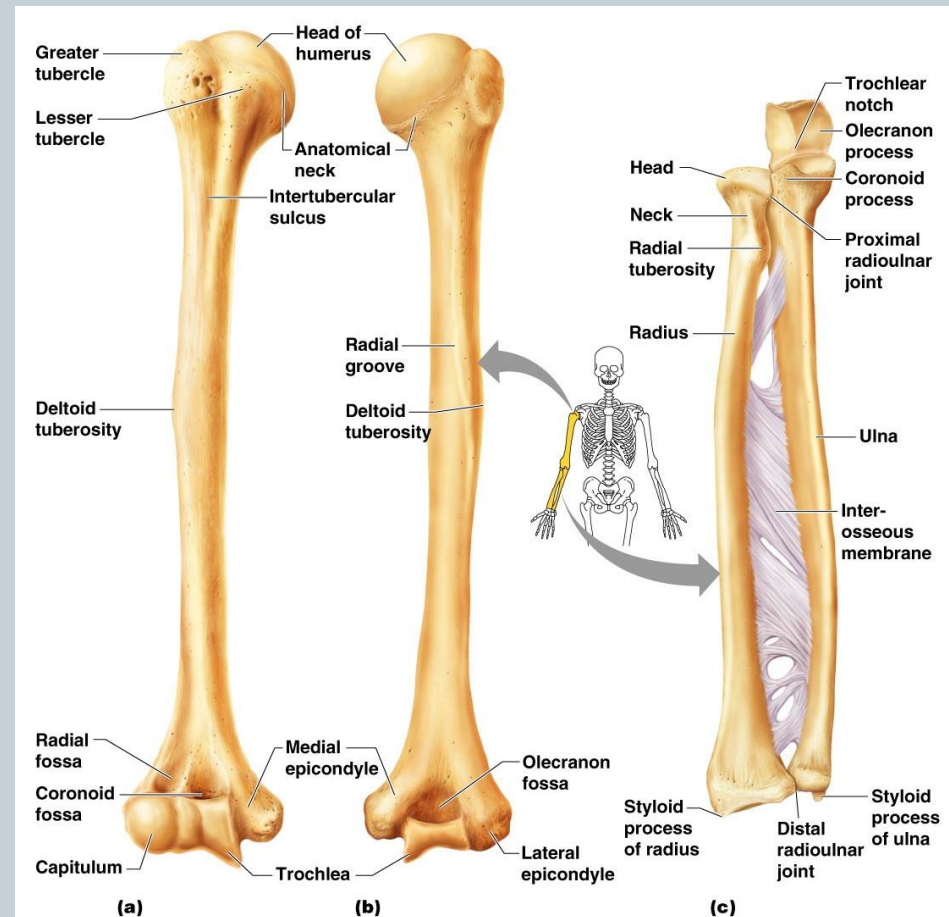
1. Olecranon
2. Coronoid

2 notches

1. Trochlear notch
2. Radial notch

- Inferior end

Wrist Proximal bones



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Ulna

- Body

Triangular shape

3 surfaces:

Anterior, posterior, medial

3 borders:

Anterior, posterior, lateral

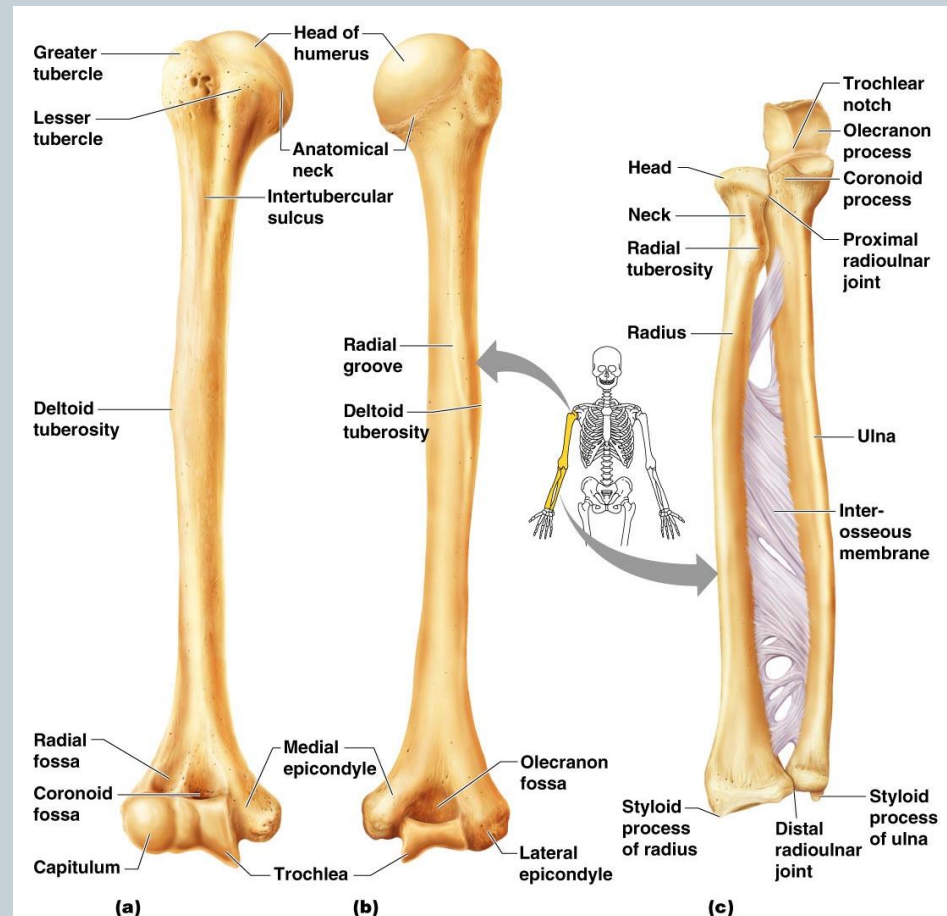
(lateral border to radius posterior border)

- Inferior end

- Smaller than superior end

Head

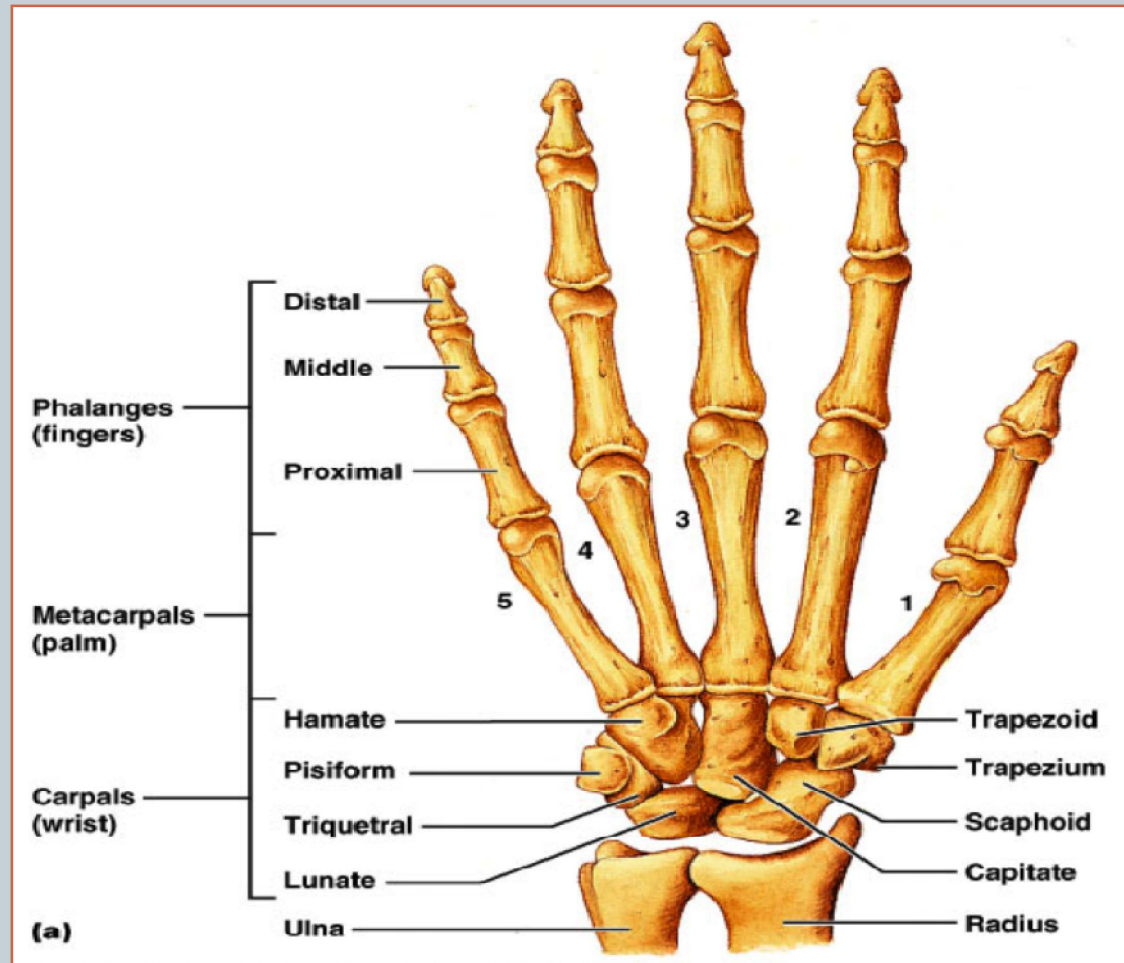
Styloid process



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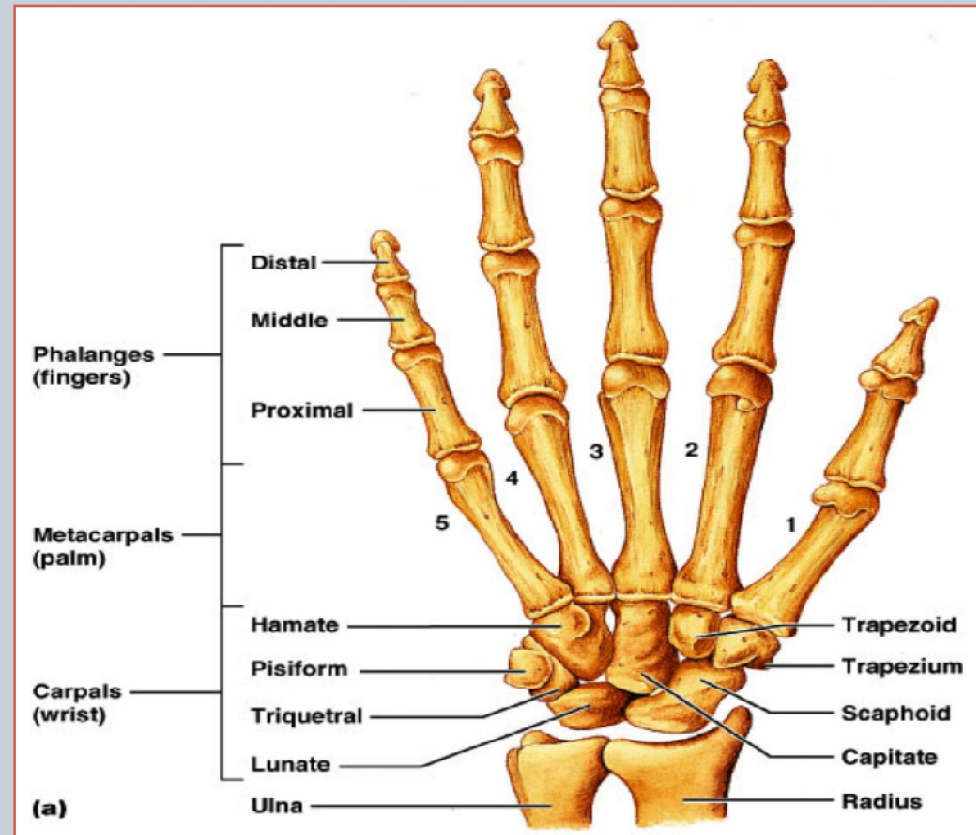
Hand

- Carp or Wrist bones
Proximal part (4)
Distal part (4)
- Metacarpals (5)
- Phalanges (14)



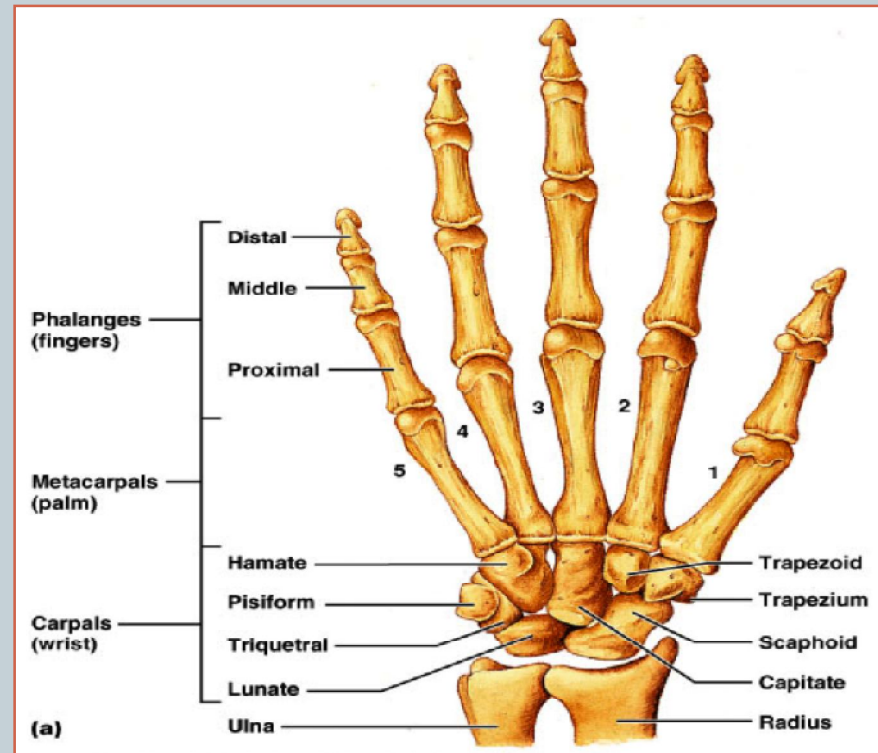
Wrist

- Proximal layer
Scaphoid (fracture)
Lunate (dislocation)
Triquetrum
pisiform
- Distal layer
Tapezium
Trapezoid (small bone of distal L.)
Capitate (largest)
hamate



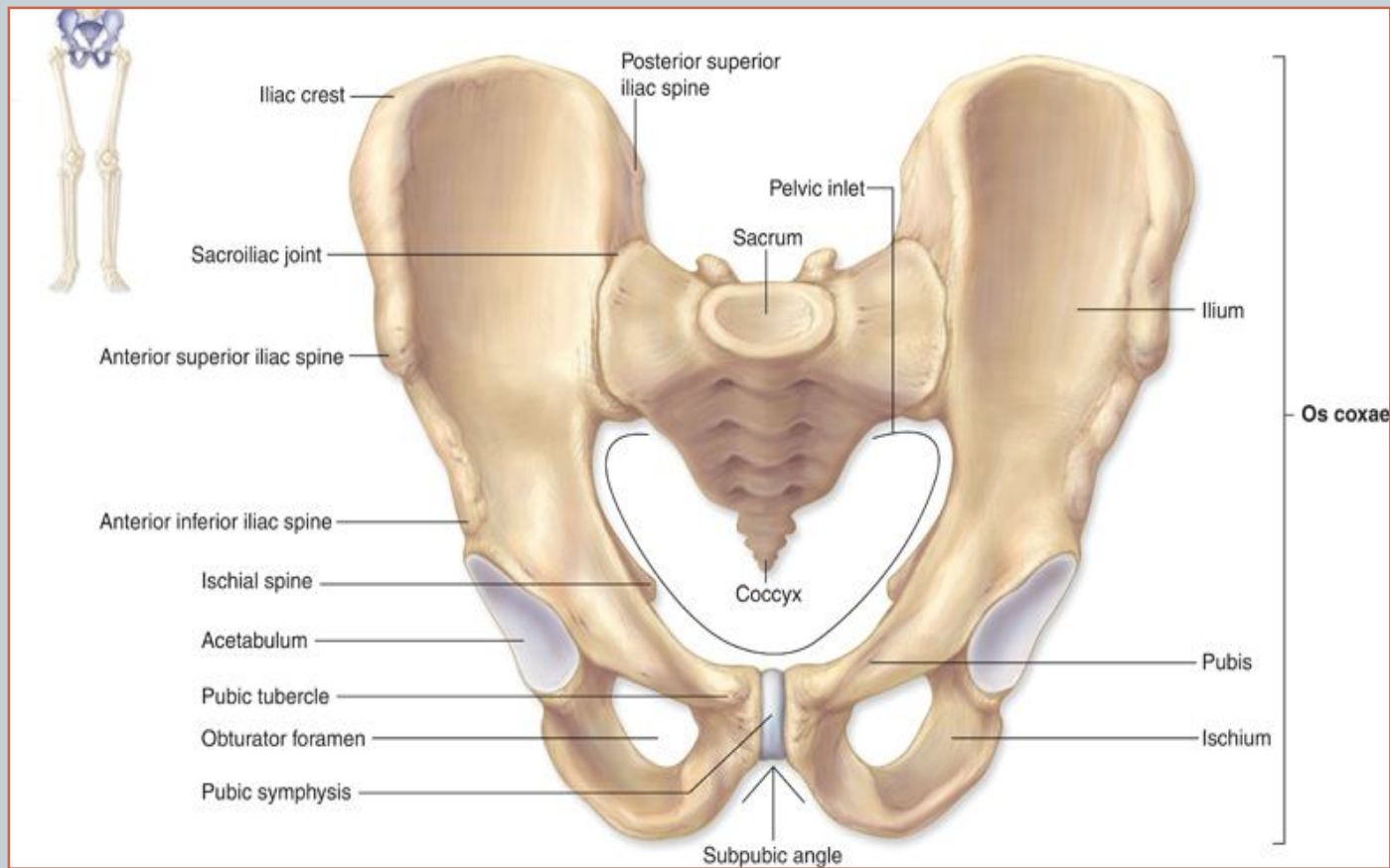
Metacarpal & phalange bones

- metacarp
 - 5 miniature long bones
 - Proximal & distal end with body
 - First metacarp: shortest & thickest
 - Second metacarp: longest
- phalange
 - Proximal inter phalangeal (PIP)
 - Distal inter phalangeal (DIP)



Pelvis

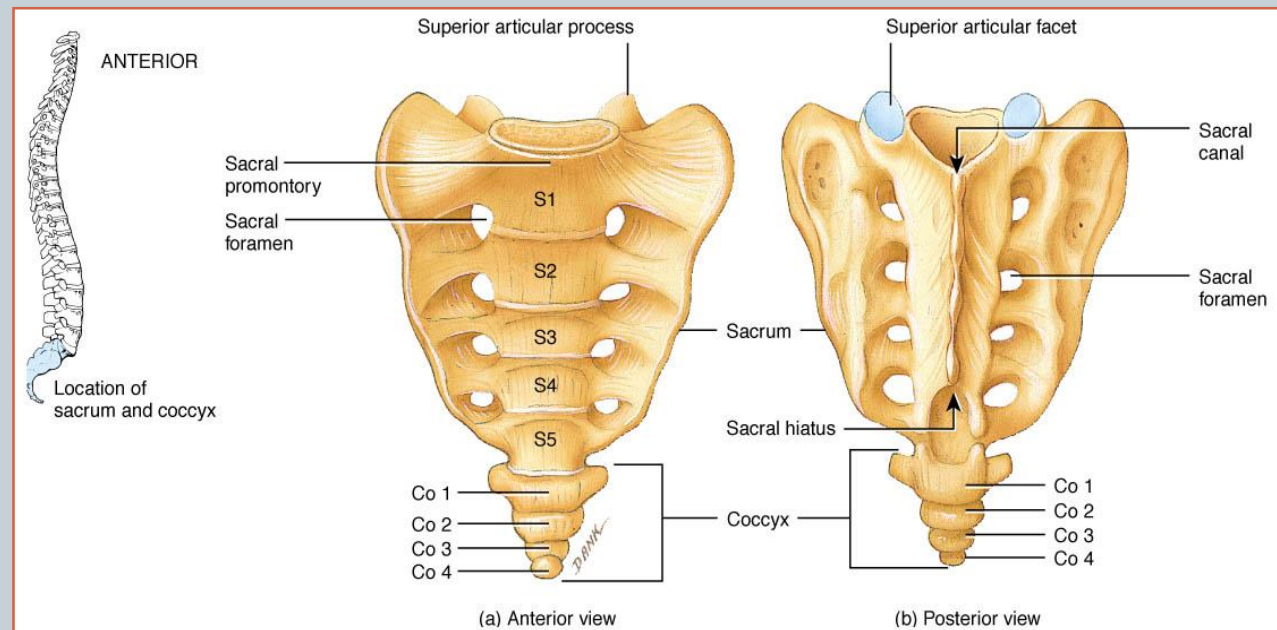
- Hip bones
- Sacrum
- Coccyx



Sacrum

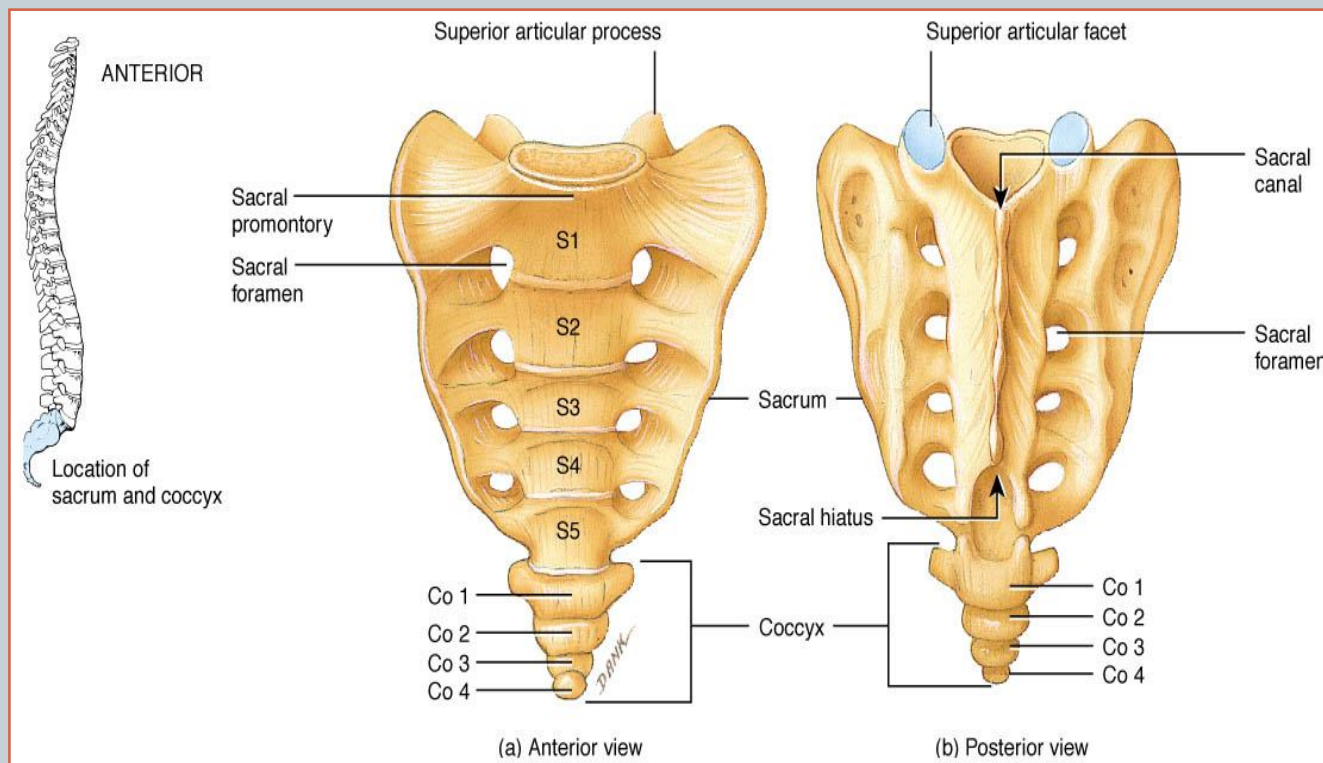
- Flat & triangular bone
- Posterior wall
- 5 embryonic vertebra
- Sacroiliac joint

- Apex
- Base
- 4 surfaces
- Canal
- Sacral nerve



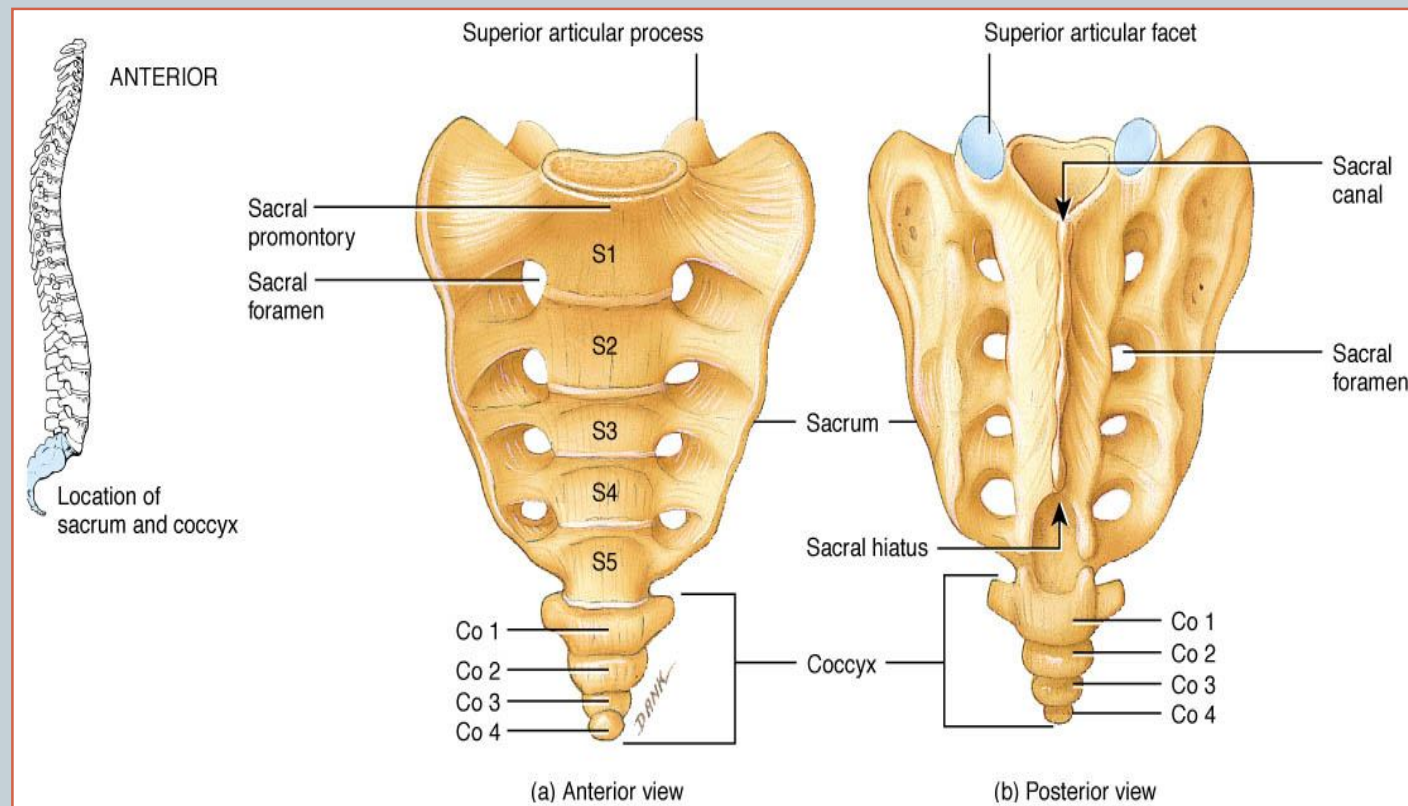
Base of Sacrum

- Superior surface of S1
- Anterior border makes promontorium
- Mixed pedicle & tran. Processes make ala sacralis



Apex of sacrum

- Inferior surface of S5



Surfaces

- ***Anterior or pelvic***

4 lines

Ant. Sacral foramen

Link with Sacral canal

- ***Posterior***

Median sacral crest

(mixed spinous process)

Intermediate sacral crest

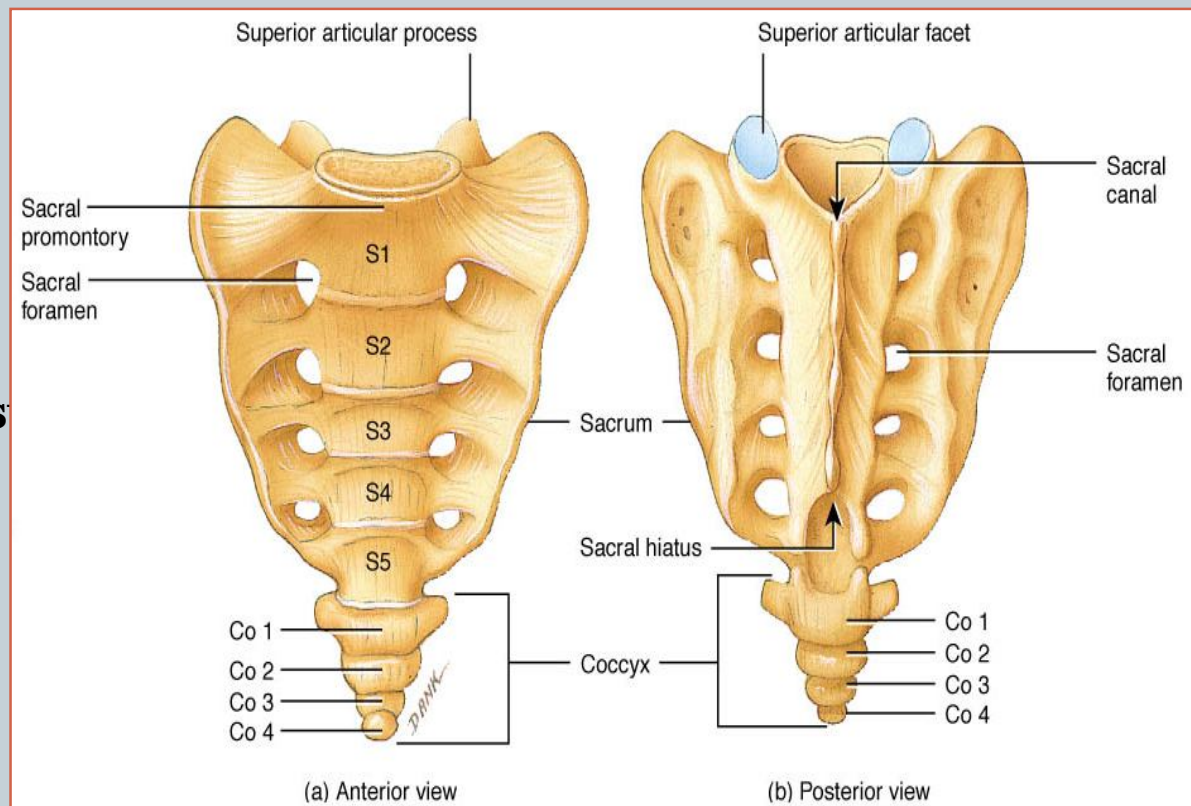
(mixed articular pro.)

Post. Sacral foramen

Lateral sacral crest

(mixed transverse proc.)

Sacral hiatus



Surfaces

- ***Lateral surfaces***

Triangular shape

Base on superior

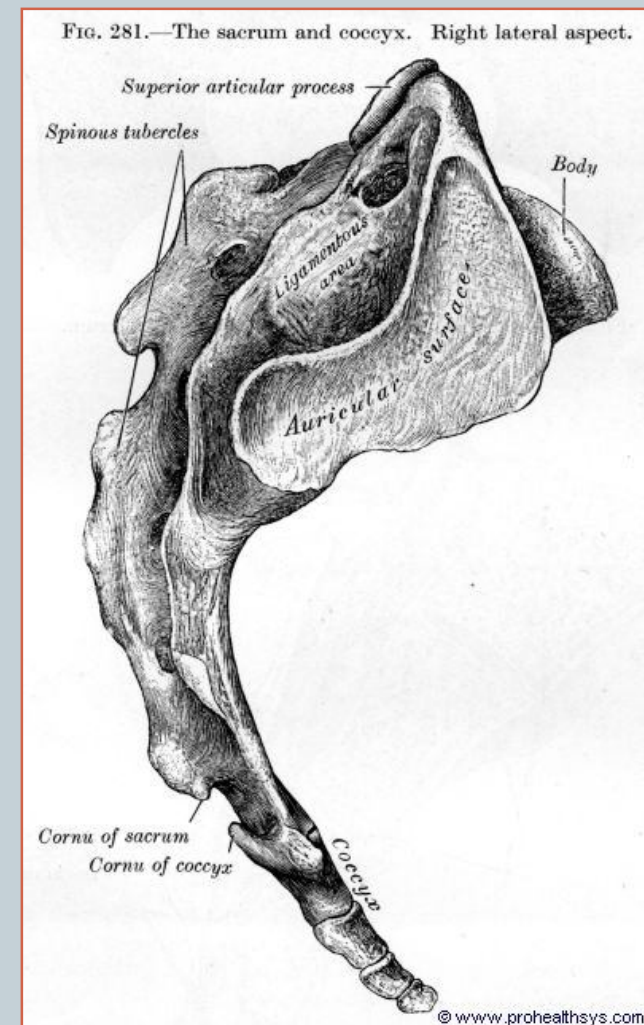
Auricular facet for:
sacroiliac joint

- ***Sacral canal***

Vertebral foramen

Sacral nerves

Meninges



Clinical points



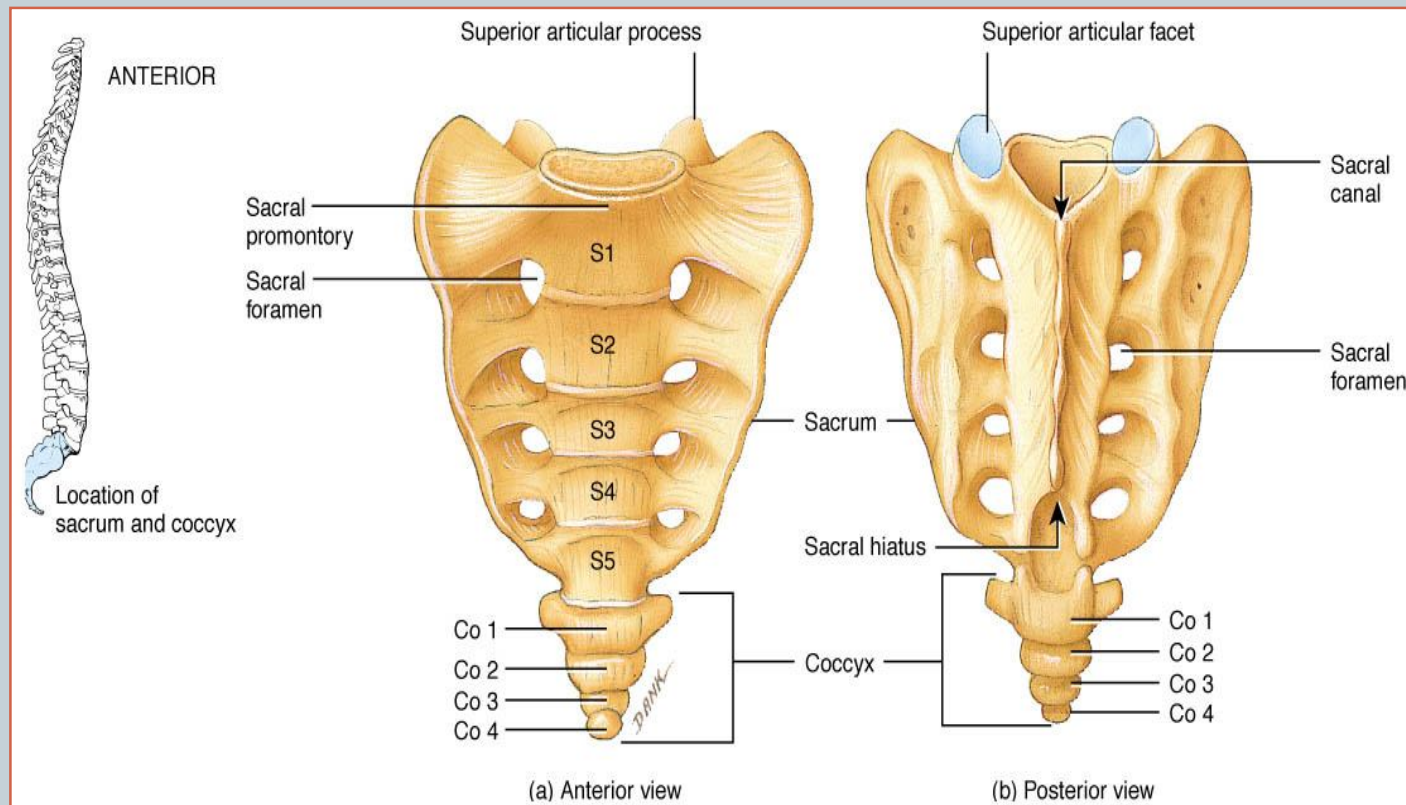
- Lumbarization
- S1 to L5
- Sacralization
L5 to Sacrum

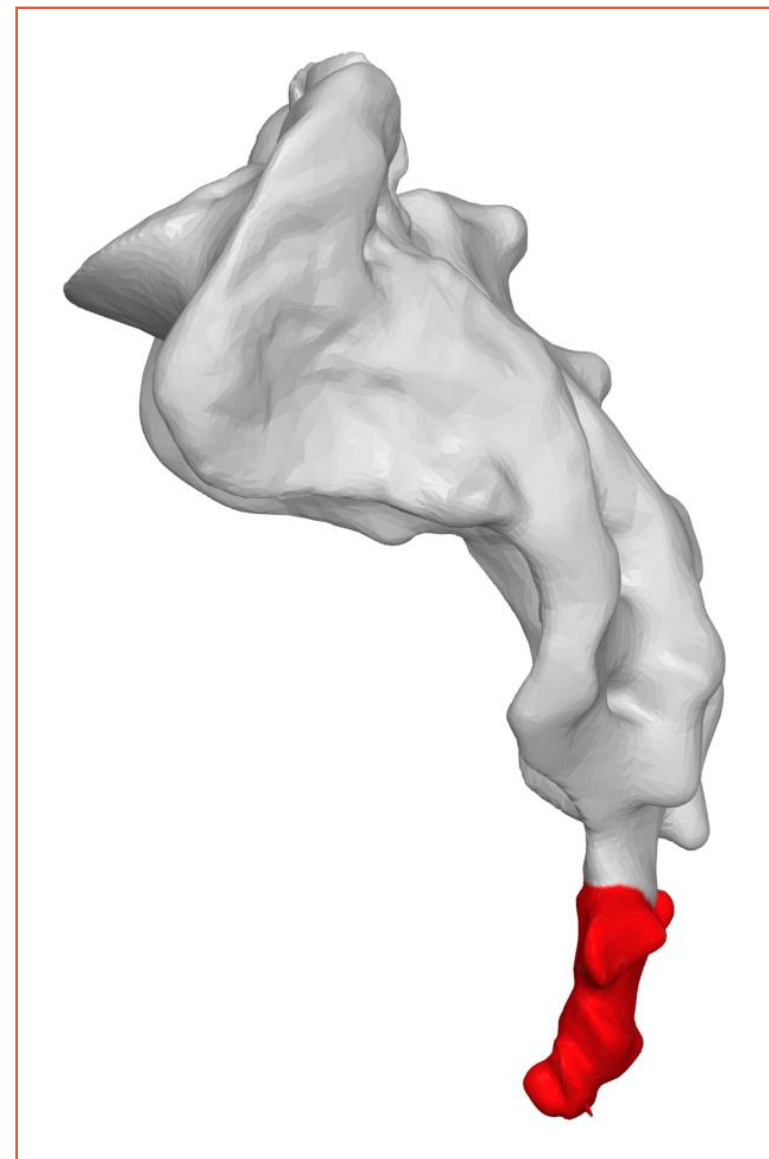
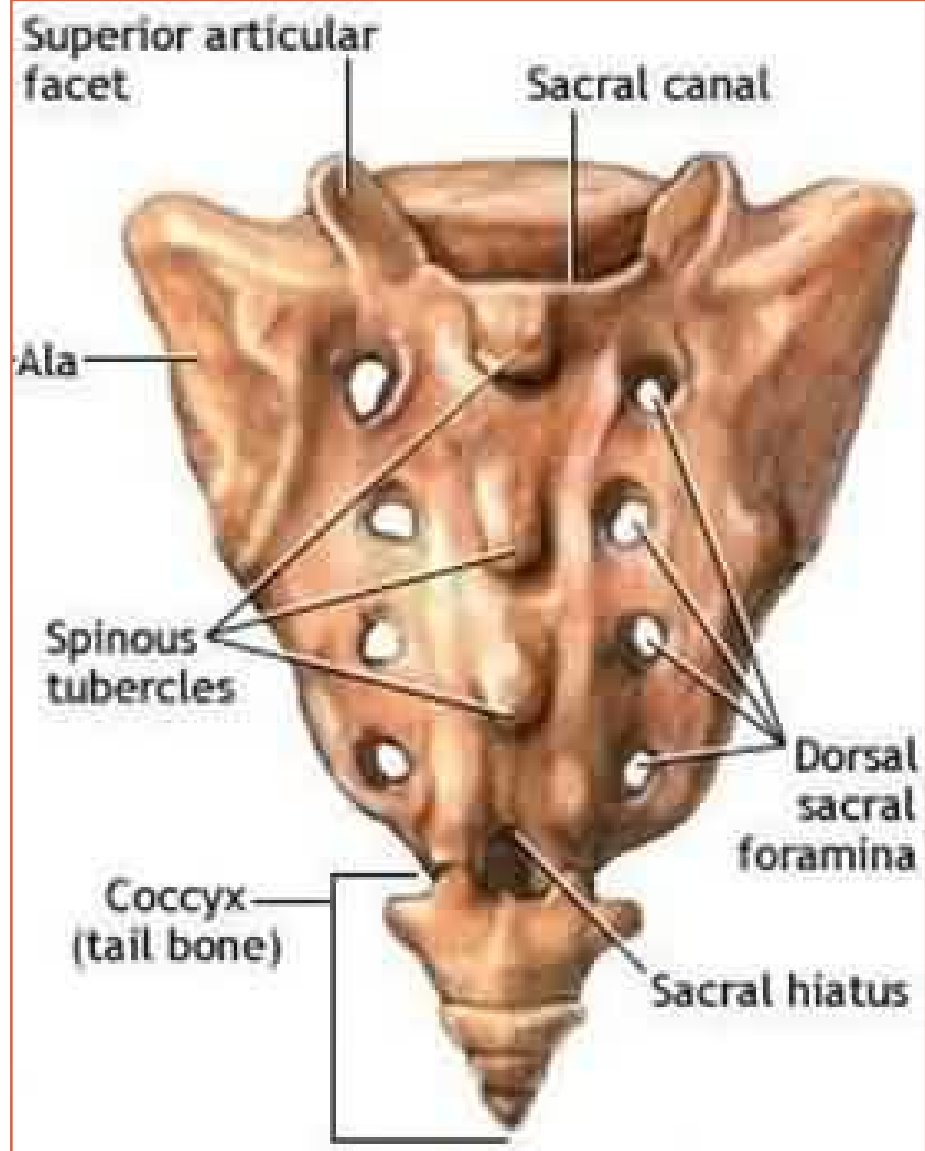
Low back pain

Coccyx

- Small triangular bone
- 4-5 embryonic vertebra

- Base
- Apex





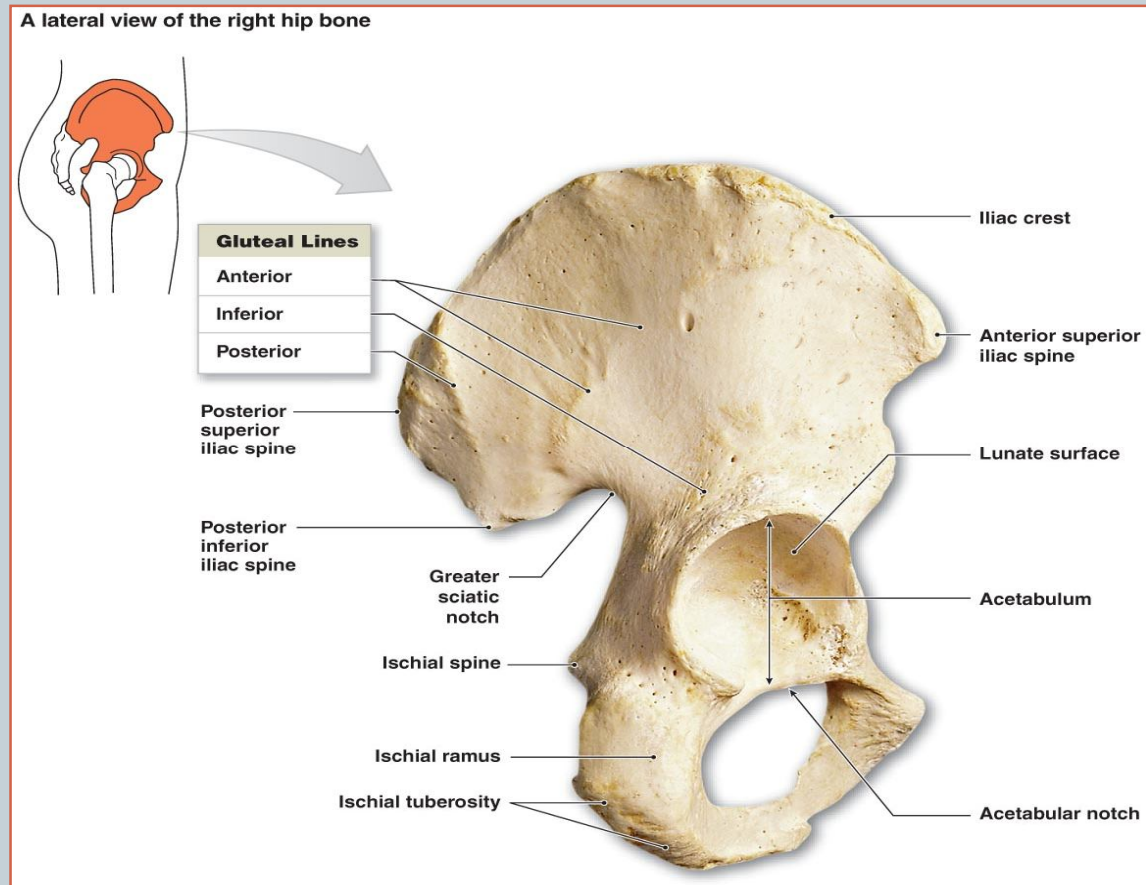
Hip



- Ilium
- Pubis
- Ischium
- Obturator
- Acetabulum

• 2 surfaces
Interior & exterior

• 5 borders
Sup., inf., ante., pos. & interior



Exterior surfacce

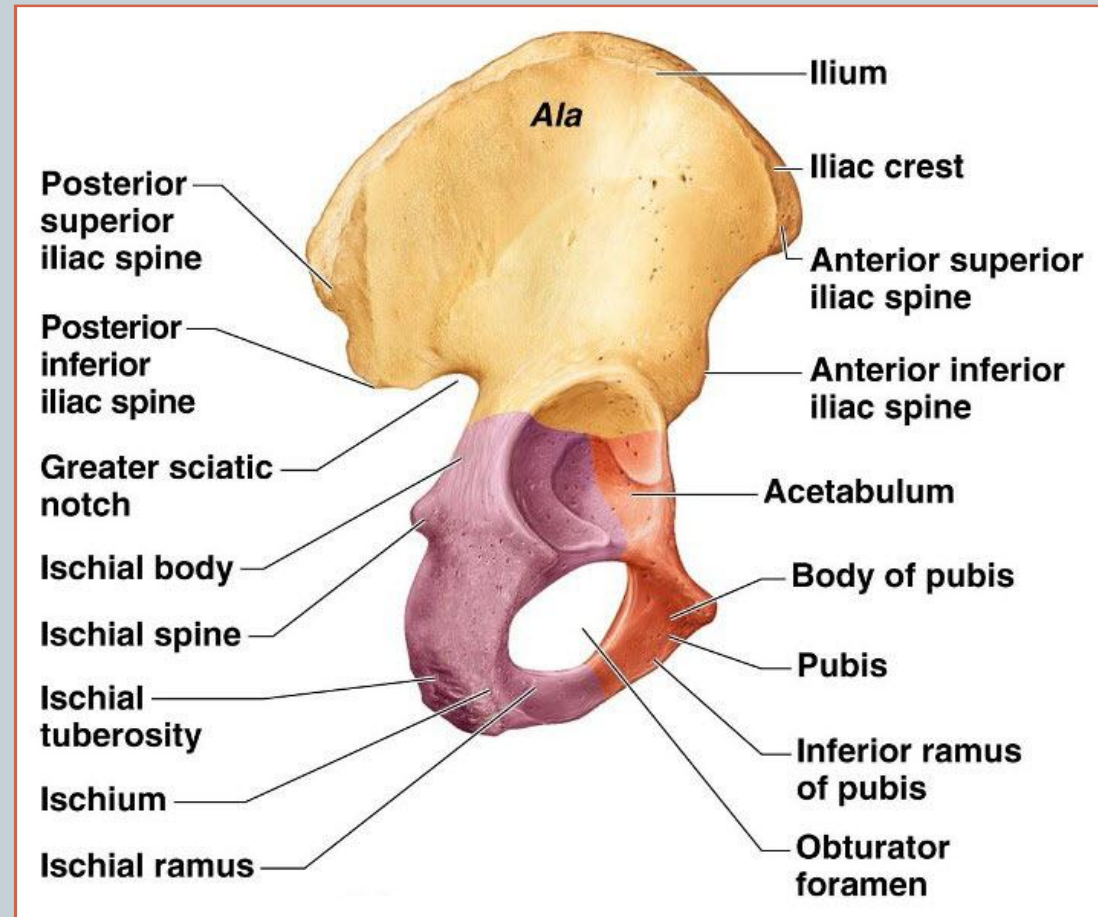
- Obturator
- Acetabulum
- Gluteal surface
- Women ▲ & men ●
- Obturator membrane
- Obturator vessele & nerve

Acetabular notch

Acetabular fossa

Lunate surface

- Gluteal surface
- External surface of ilium
- 3 Gluteal lines



Interior surface

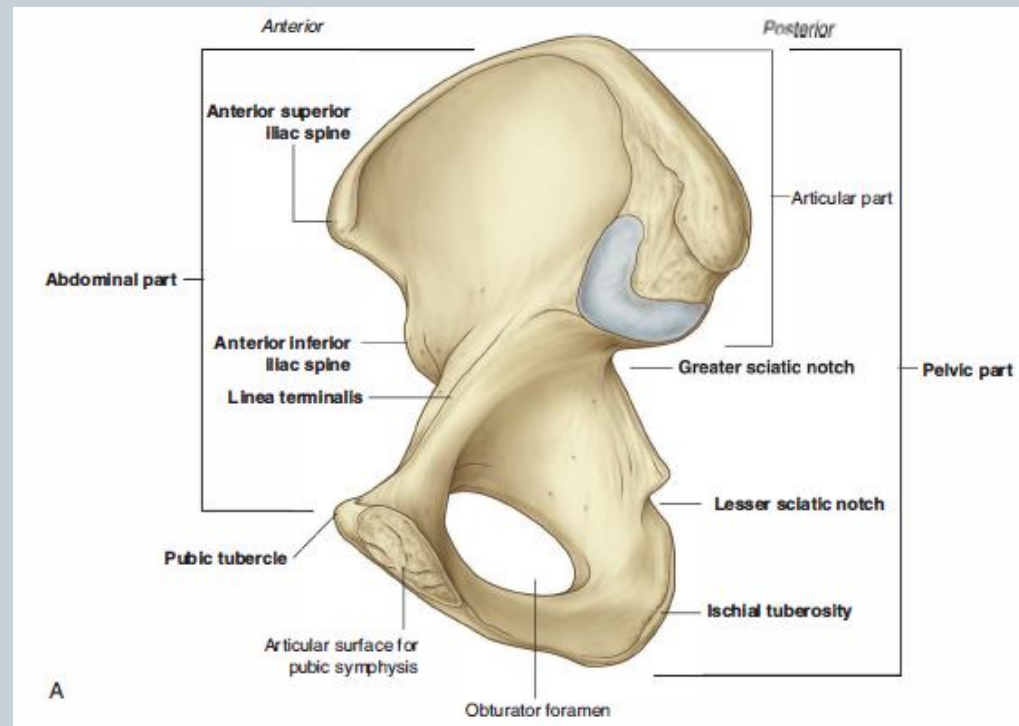
- **Superior** (iliac fossa)

Iliacus m.

- **Inferior** (sacropelvic & obturator part)

Sacropelvic

1. Iliac tuberosity
2. Auricular surface
3. Pelvic surface



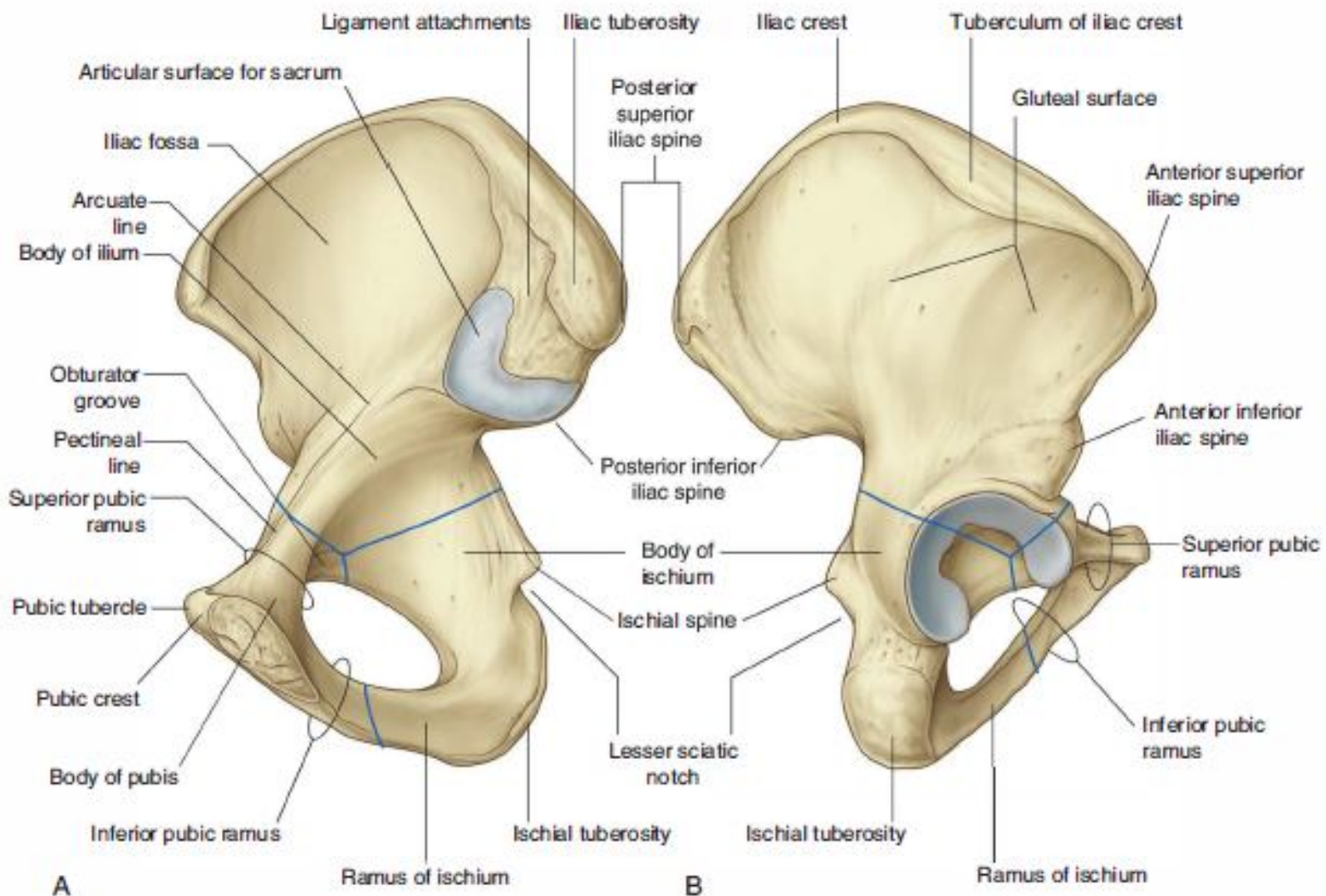


Fig. 5.21 Components of the pelvic bone. **A.** Medial surface **B.** Lateral surface.

Borders

- **Superior**

Iliac crest (abdominal muscle)

- **Inferior**

Ischiopubic ramus

- **Anterior**

ASIS

AIIS

pectineal tub. & line
pubic tubercle

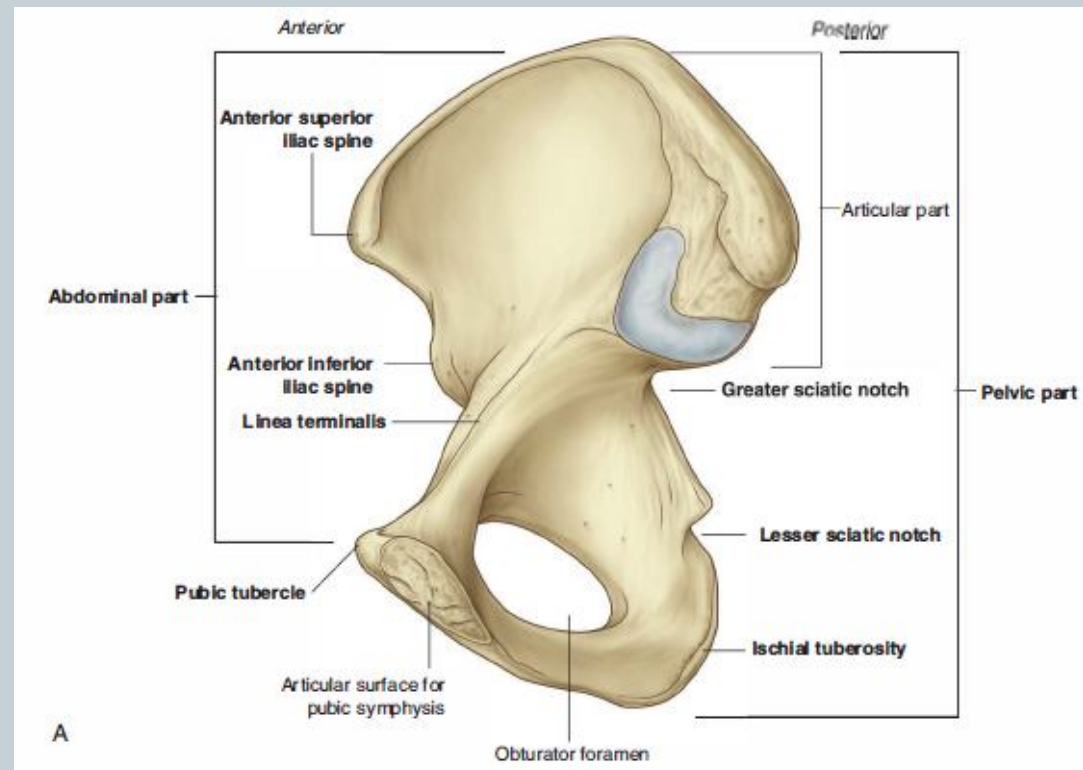
- **Posterior**

PSIS, PIIS,

Greater & Lesser sciatic notch

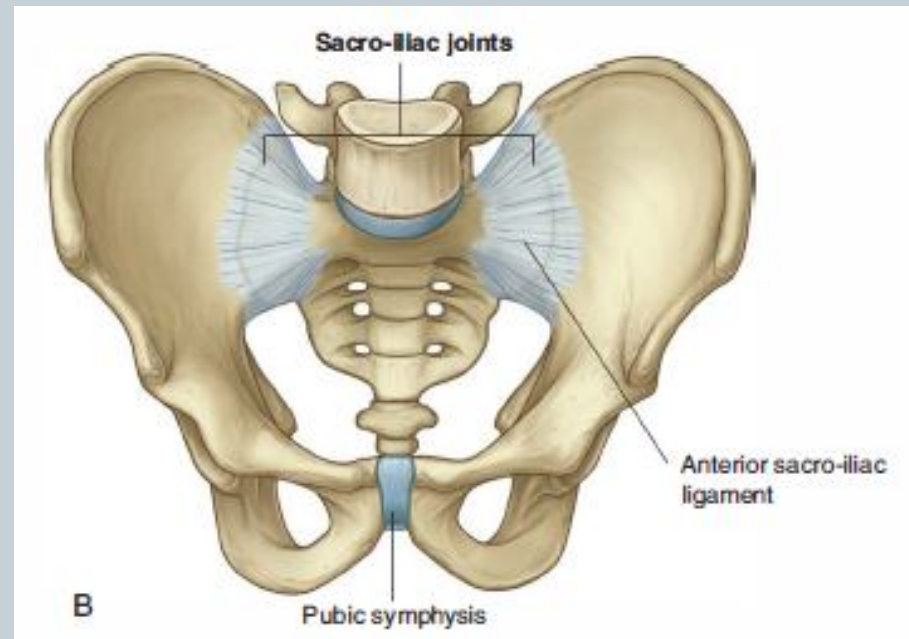
Ischial spine & tuberosity

- **Interior**



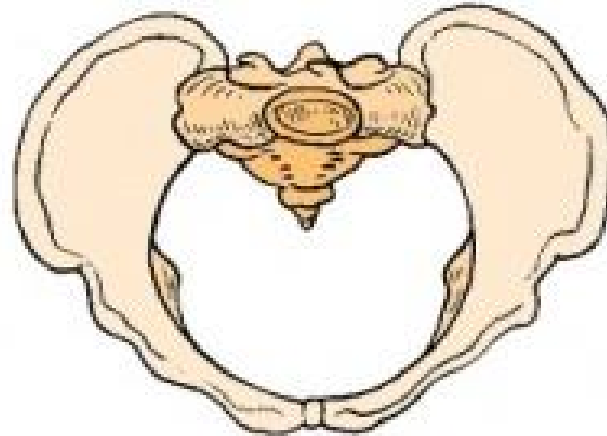
Pelvic fossa

- False pelvis
 - True pelvis
-
- Superior aperture
50°-60°
 1. Sacral: S1 & alae sacralis
 2. Iliac: Arcuate line
 3. Pubic:
Pectineal line
Pubic crest
Superior border of pubis symphysis

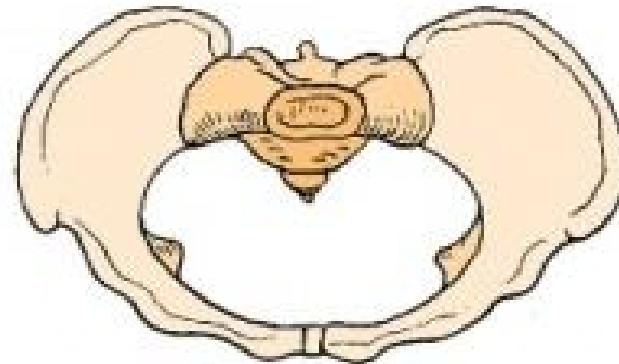


Hip classification

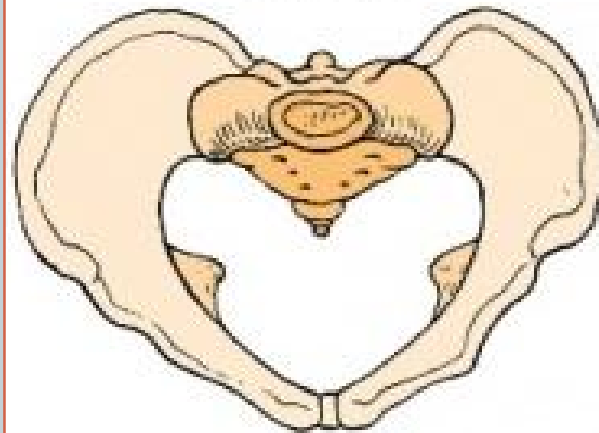
- Gynecoid
- Android
- Anthropoid
- platypelloid



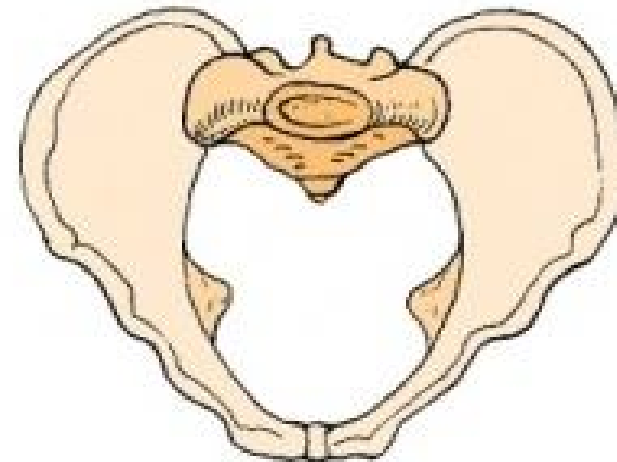
Gynecoid



Platypelloid

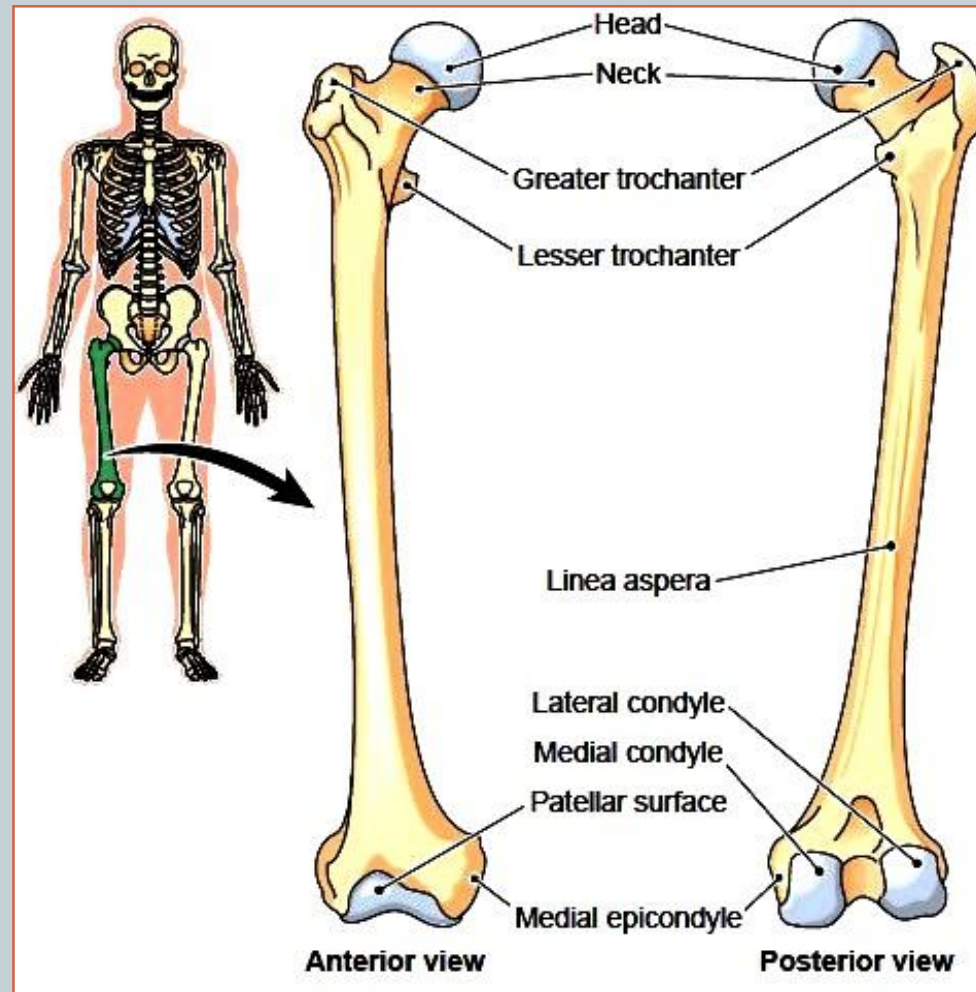


Android



Anthropoid

Femur



Femur

- Longest
- Strong

- Superior end
- Shaft (body)
- inferior end

- ***Superior end***

Head (fovea centralis)

Neck (4cm, 125°)

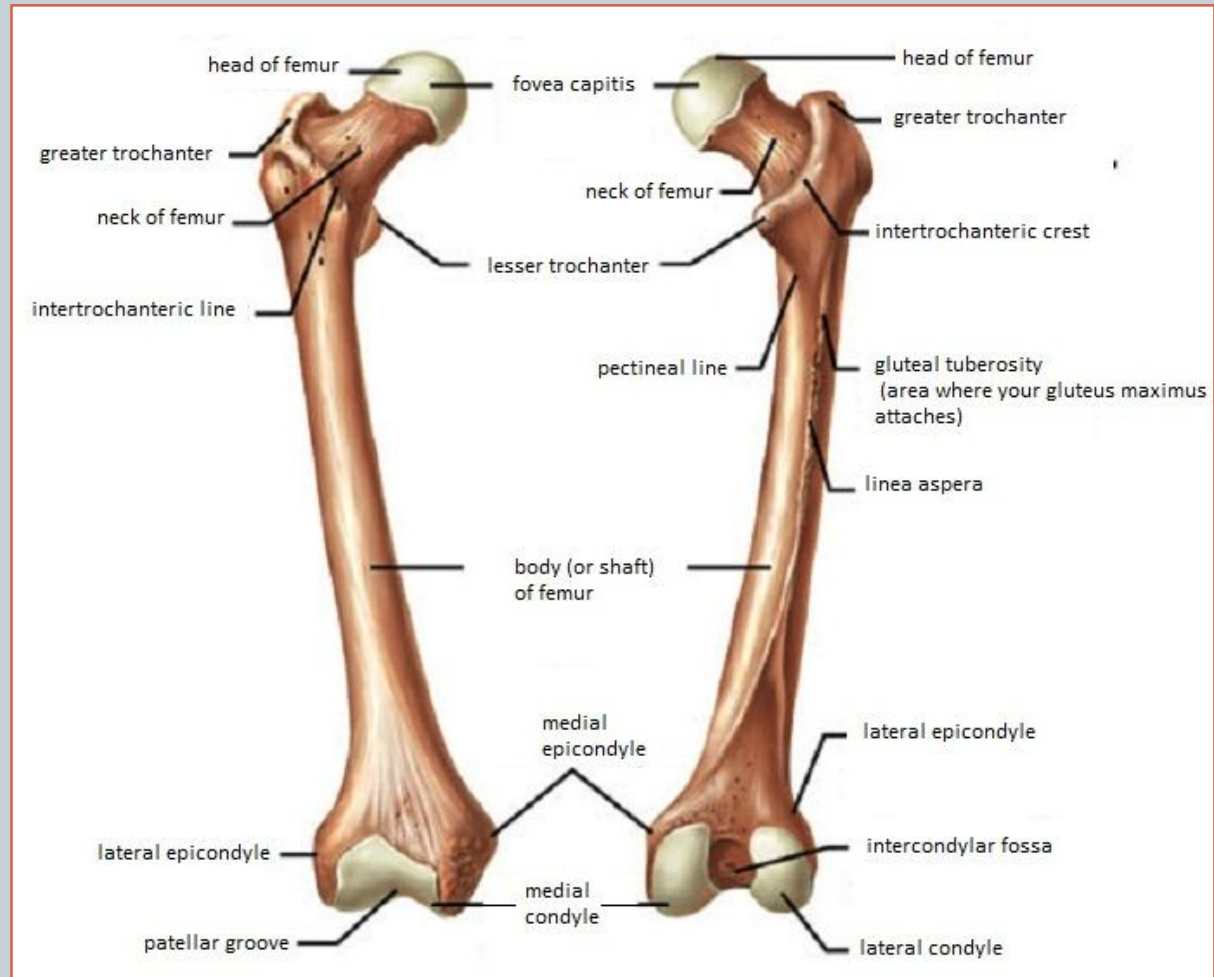
greater trochanter

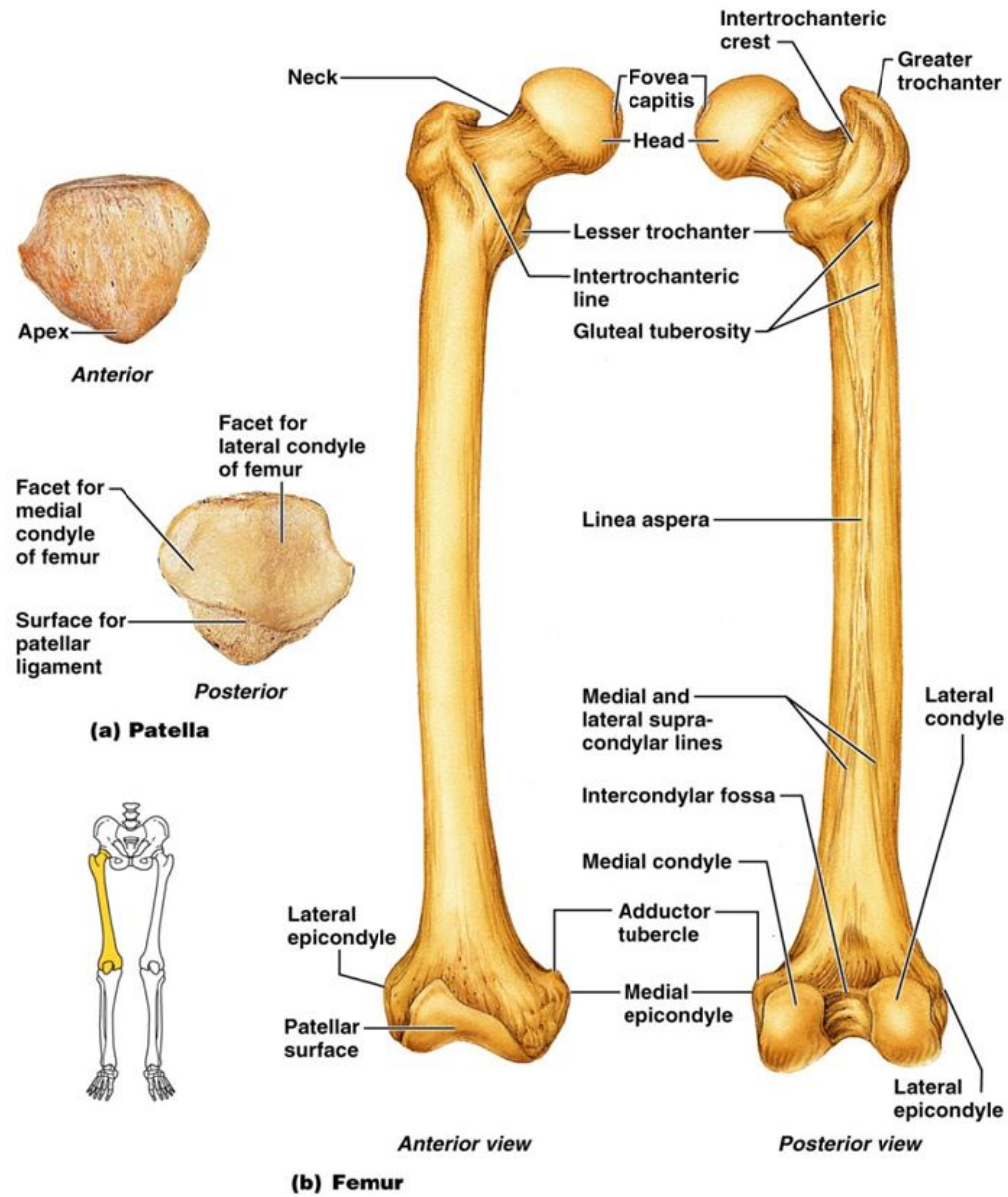
Lesser trochanter

Intertrochantric line

Intertrochantric crest

Quadrous tubercle





Femur shaft (body)

Surfaces:

1. Anterior
2. Medial
3. Lateral

Borders

1. Medial
2. Lateral
3. Posterior

1/3 median of posterior border:

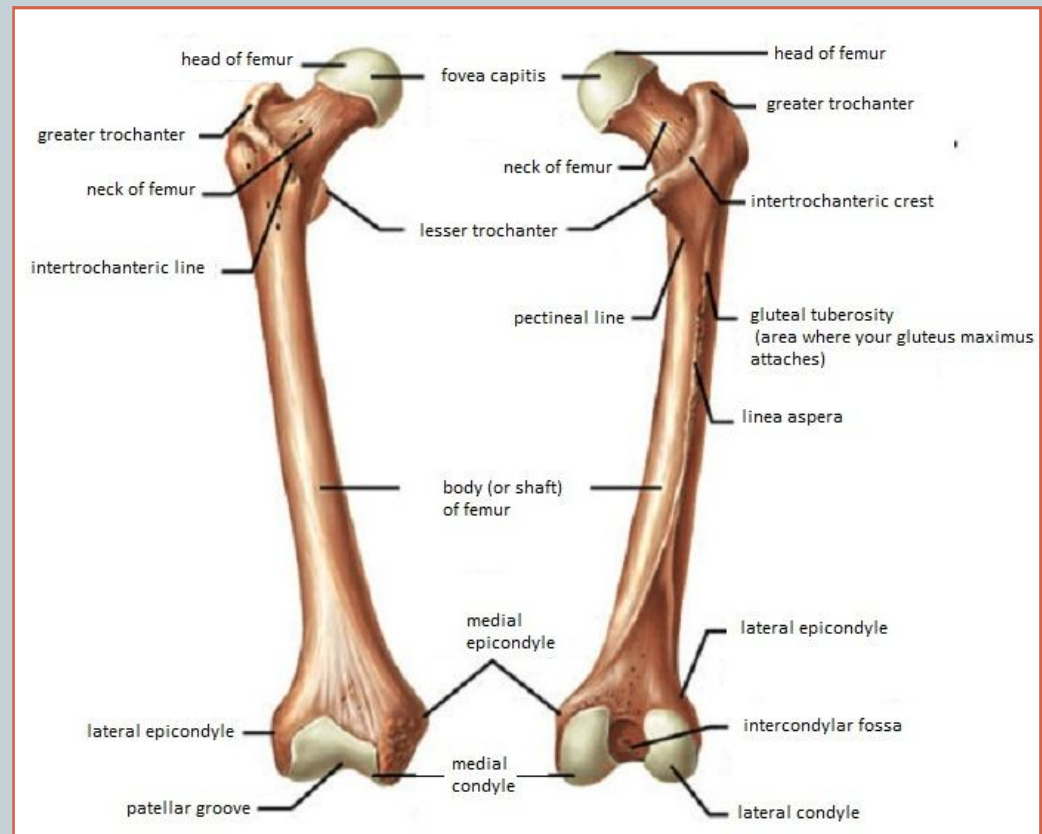
Linea aspera

Spiral line to lesser trochanter

Gluteal tuberosity to greater trochanter

Supracondylar lines

Popliteal surface



Femur

- ***Inferior end***

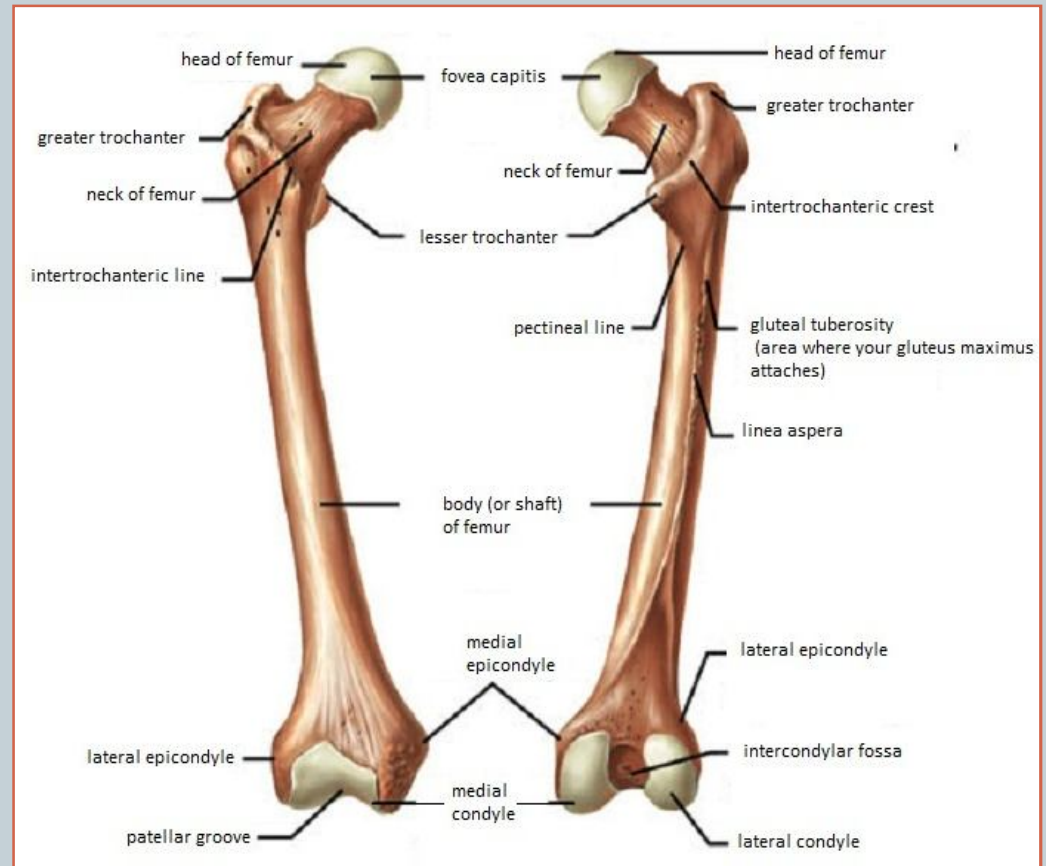
Medial condyle

Lateral condyle

Facet for Patella

Intercondylar fossa (postrior)

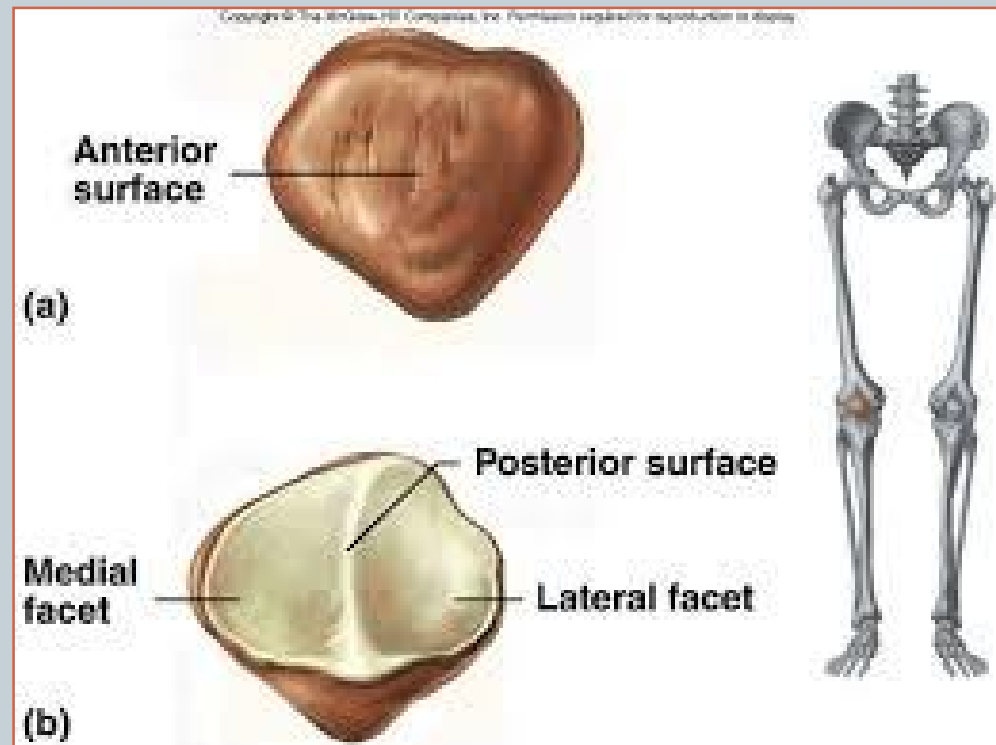
Med. & lat. Epicondyle (ligament)



Patella

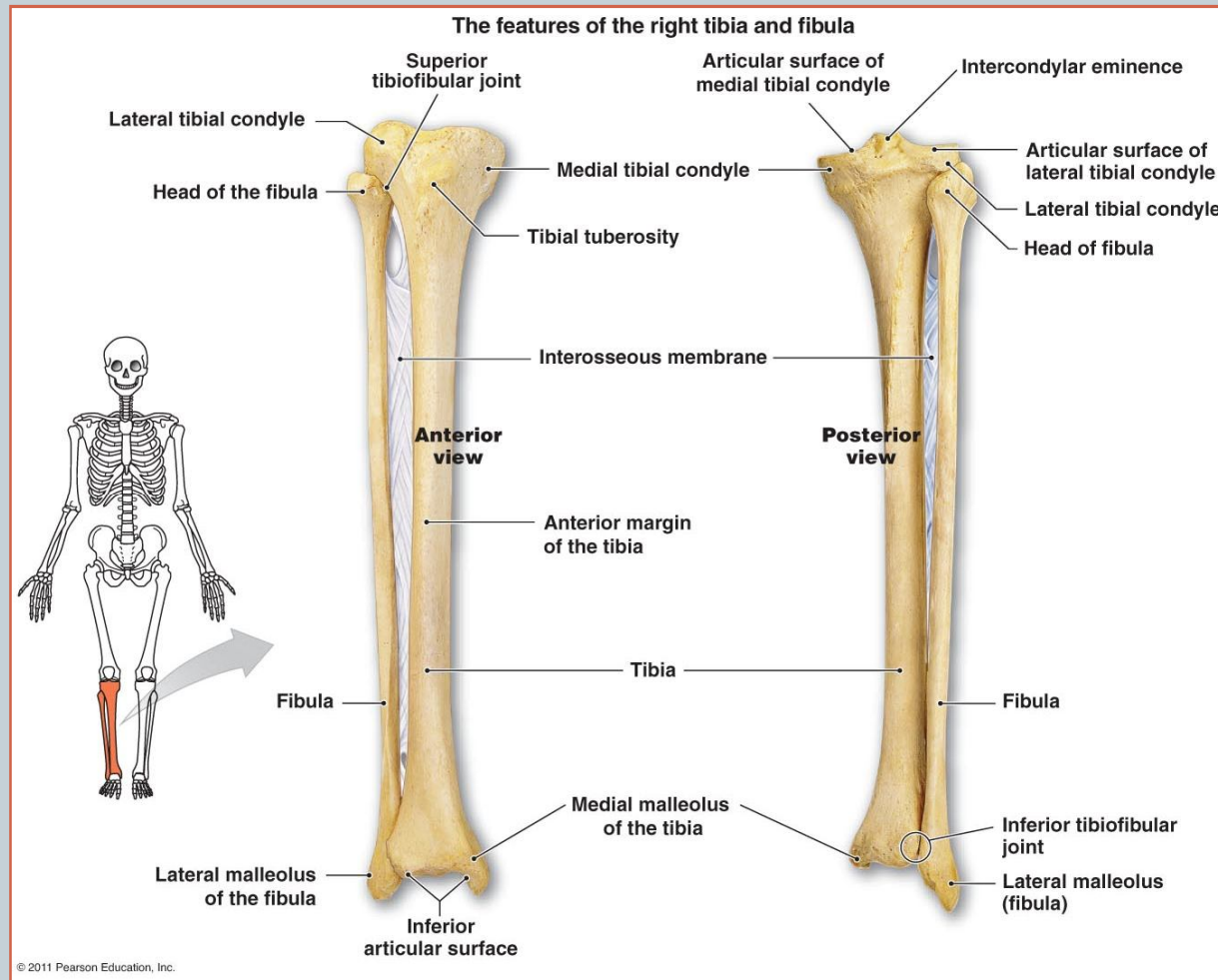


- Sesamoid bone
 - Quadriceps femoris tendon
 - Triangular shape
-
- Surfaces:
 1. Anterior
 2. Posterior (articular facet)
-
- Base
 - apex



Tibia

- Superior end
- Shaft
- Inferior end



Tibia Superior end

Medial condyle (Larger)

Lateral condyle

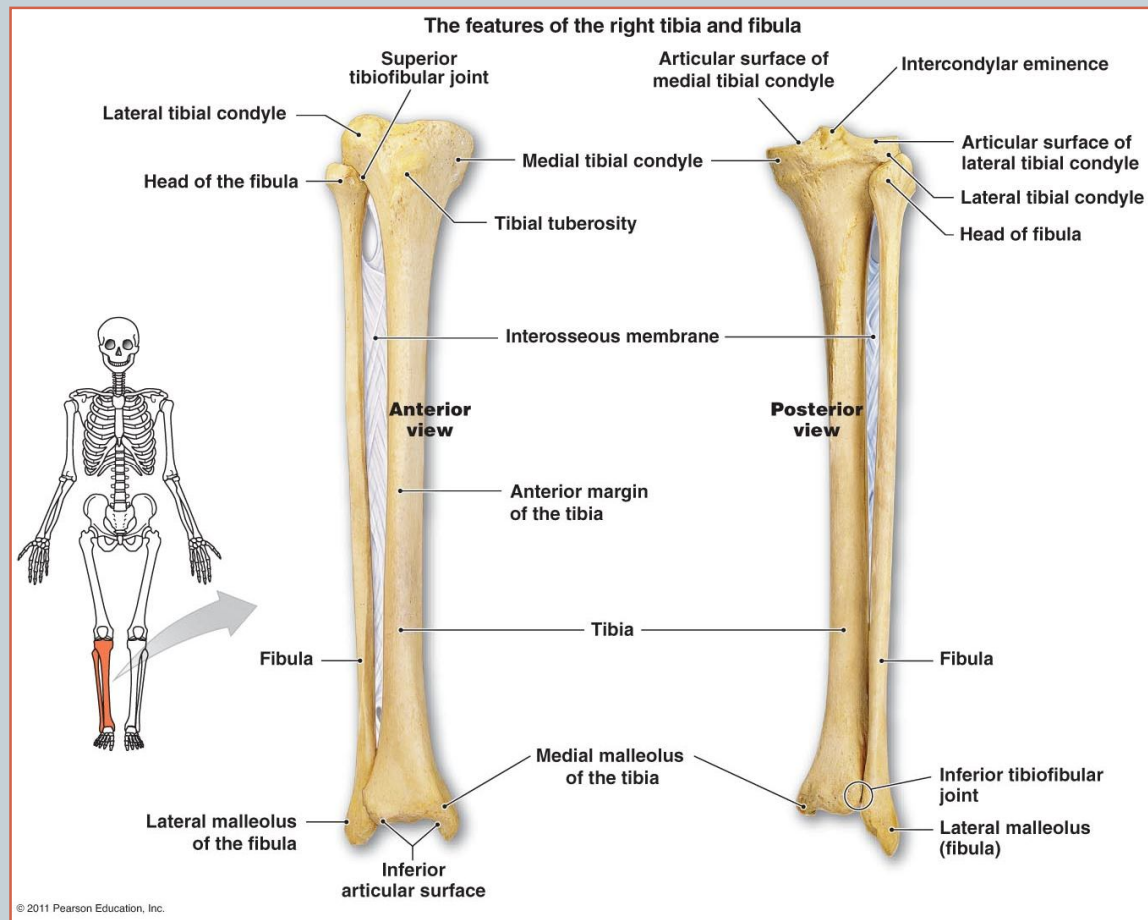
Meniscs

Tibial tuberosity (anterior)

Intercondylar area

(superior, cruciate lig.)

Intercondylar tuberosity



Tibia Shaft

- Surfaces:

Medial

Lateral

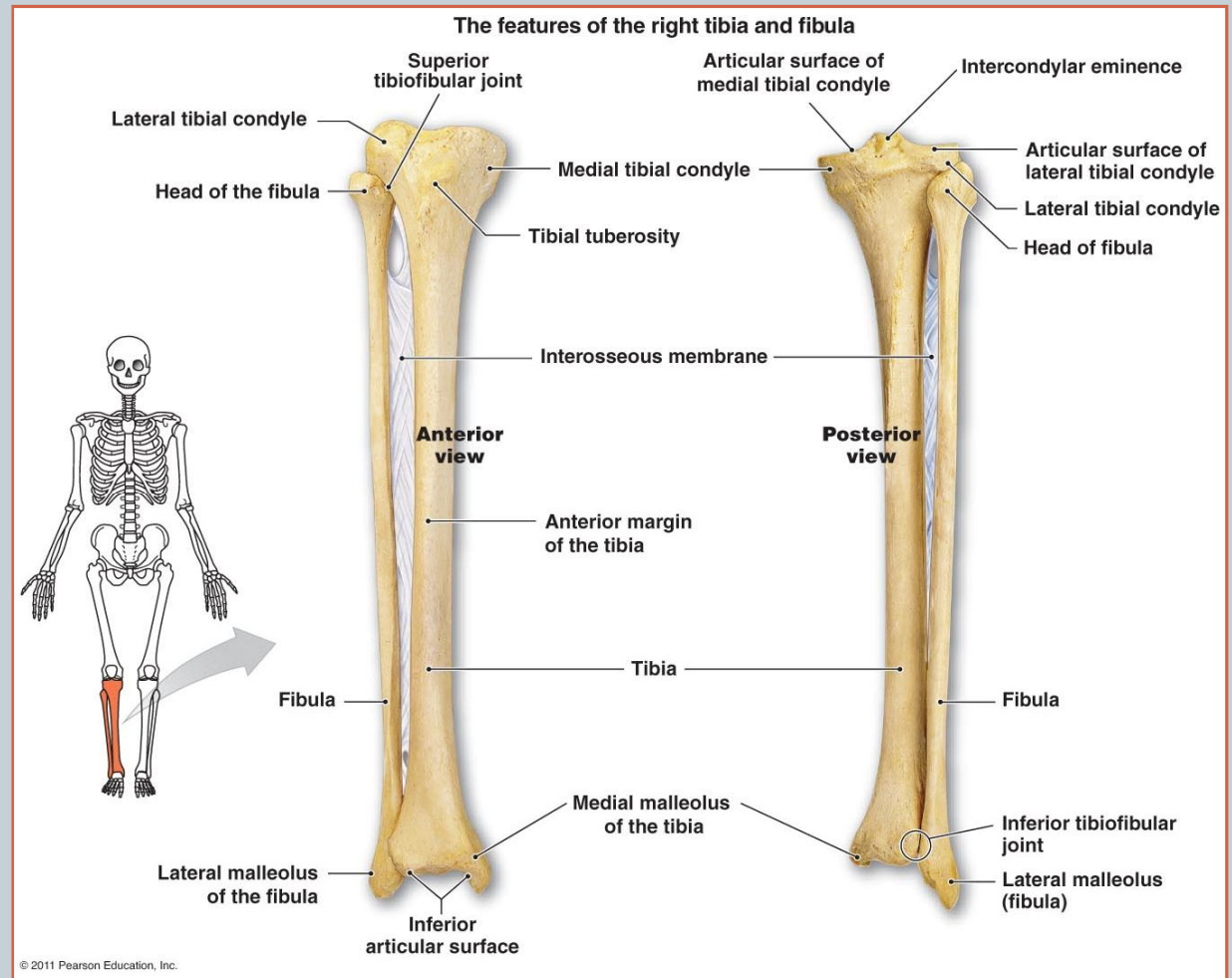
Posterior (Soleal line)

- Borders:

Medial

Lateral

Anterior



Tibia Inferior end

- 5 surfaces:

Anterior

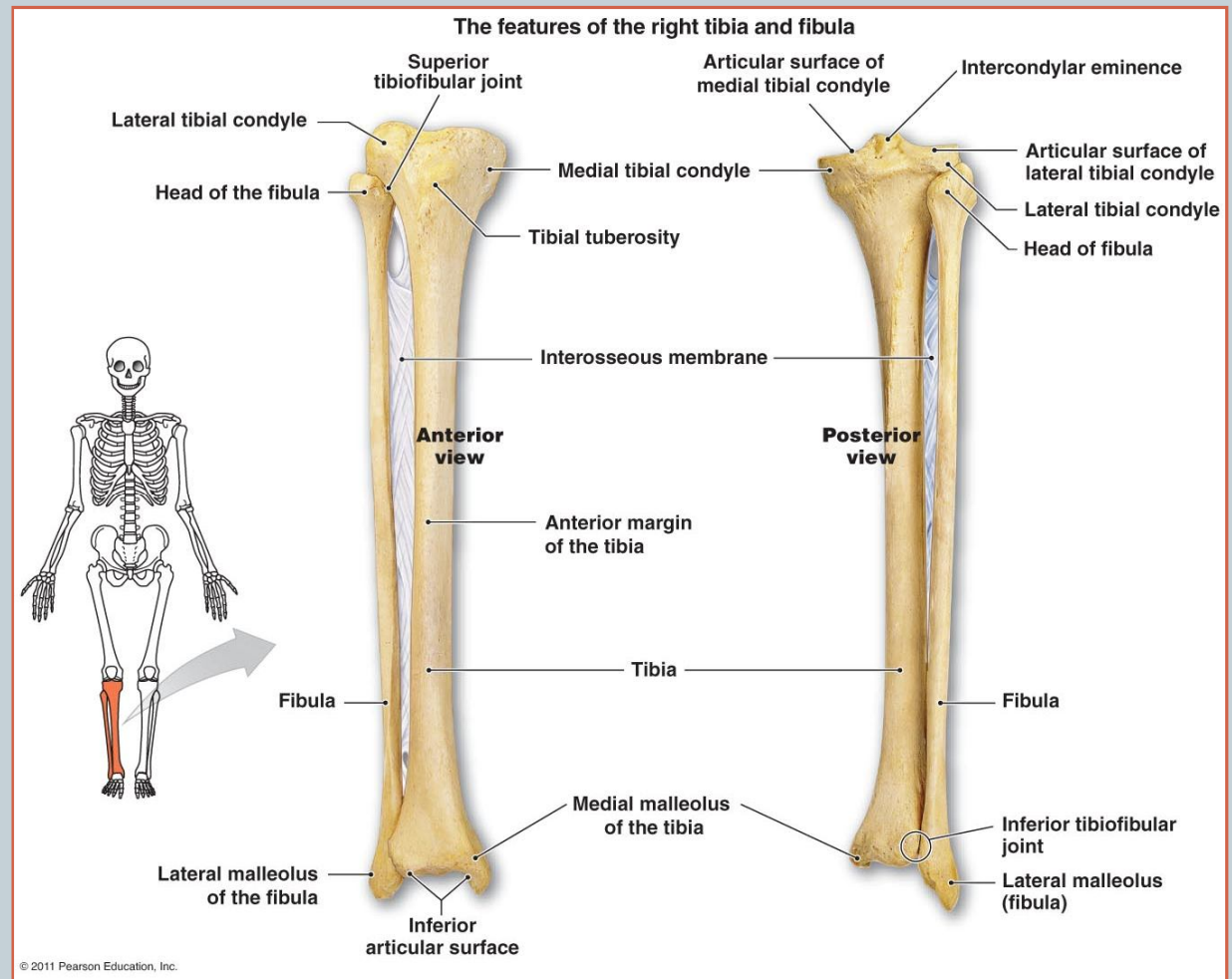
Posterior

Medial

Lateral (fibular notch)

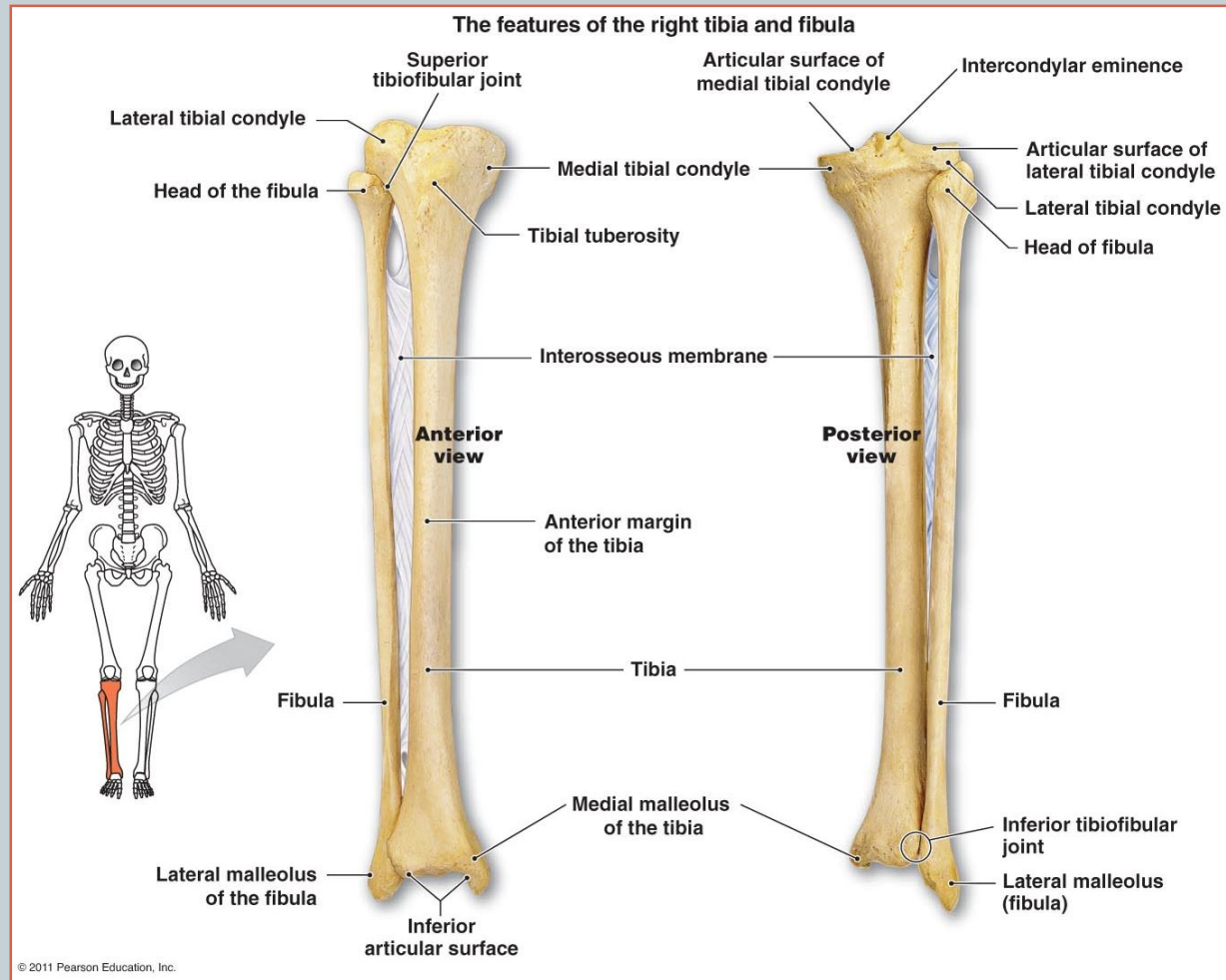
Inferior

- Medial malleolus



Fibula

- Superior end (head)
- Articular facet for:
tibia lateral epicondyl
Apex or styloid process
- Shaft
- Inferior end
Lateral malleolus
Surfaces:
Anterior
Posterior
Medial
lateral



Foot

- ***Tarsus***

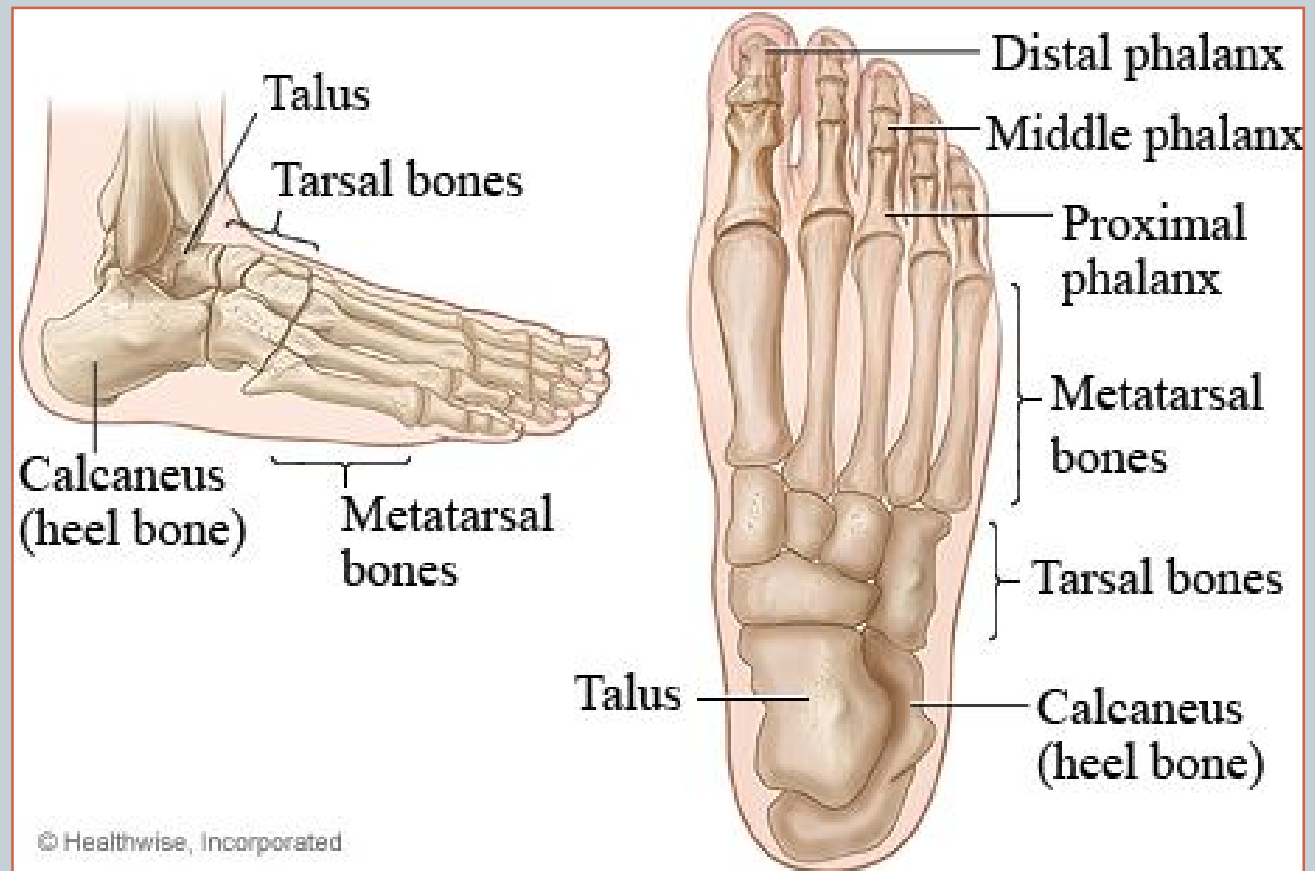
7 bones

2 proximal layer

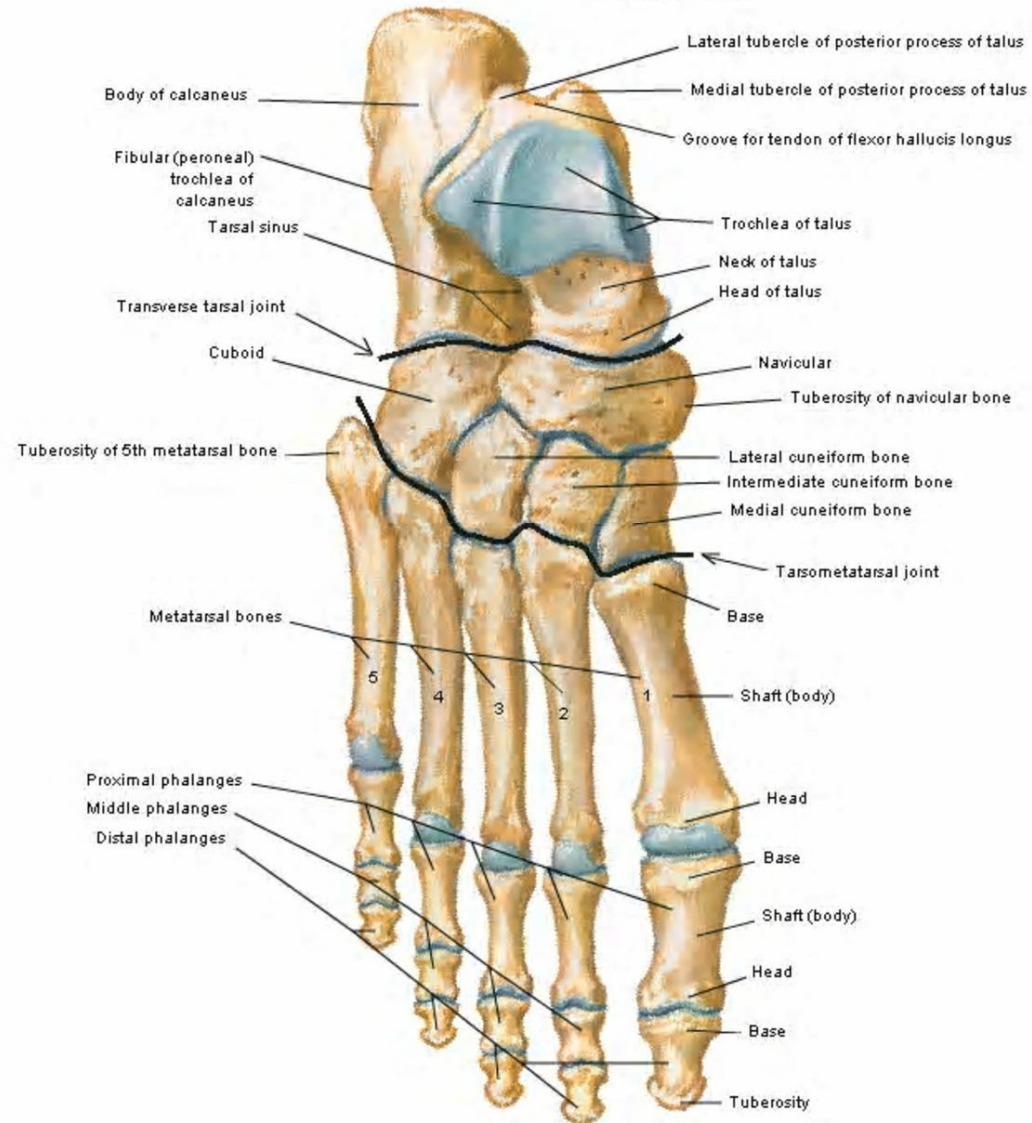
5 distal layer

- ***5 Metatarsus***

- ***14 Phalanges***

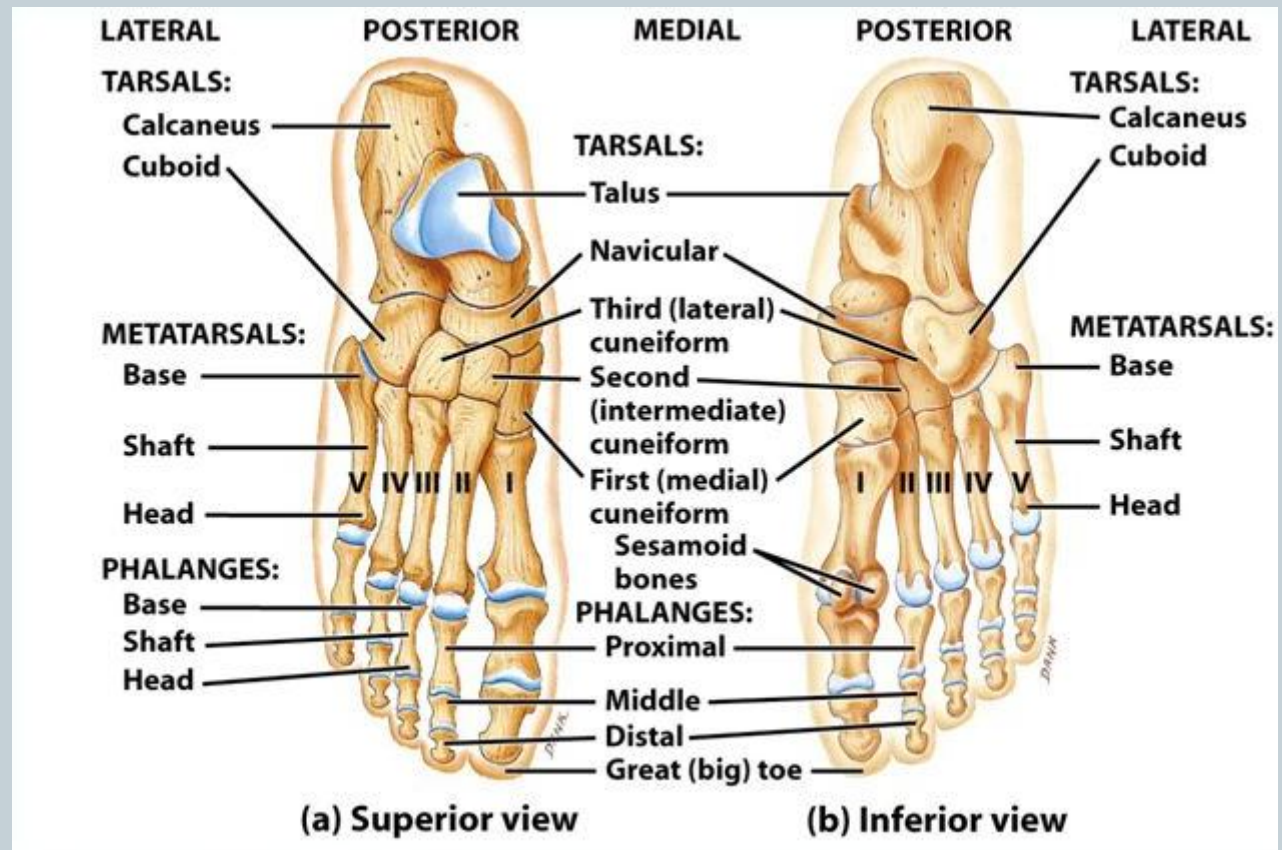


Bones of Foot Dorsal View



Tarsus

- Proximal layer
Talus (turtle shape)
Calcaneus (largest)
- Distal layer
Cuneiforms
Navicular
cuboid



Talus

- Head (circular)

Navicular

Calcaneus

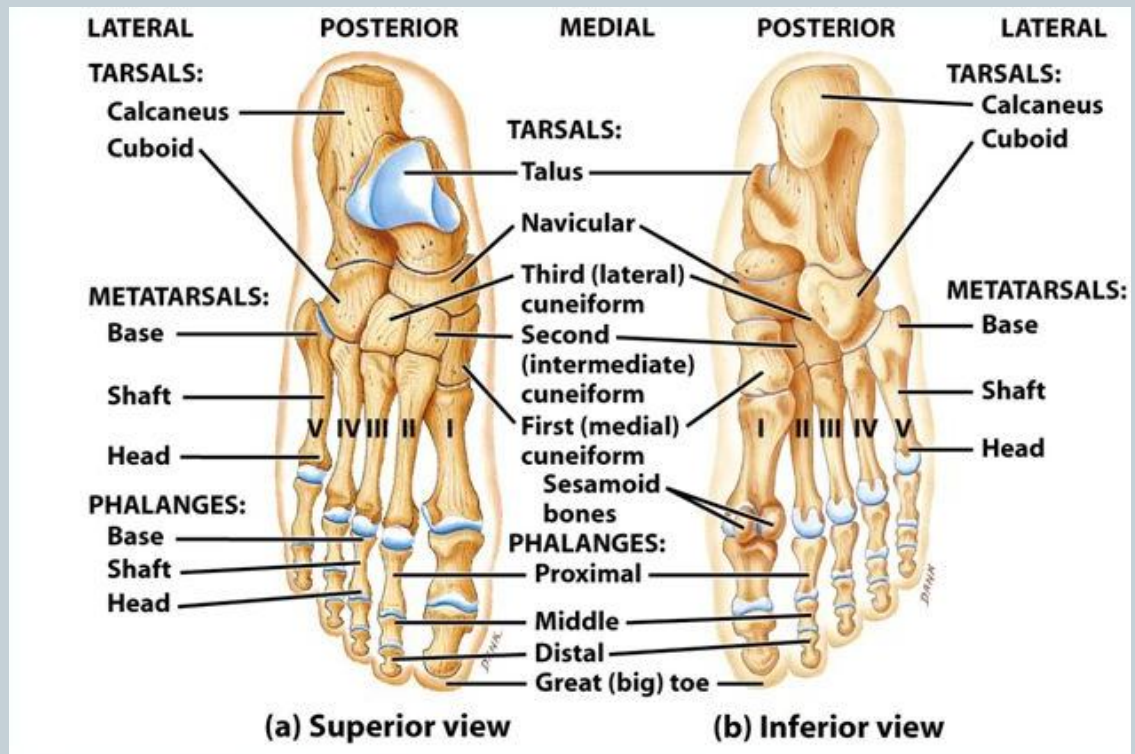
- Neck

- Body (cuboidal)

Tibia

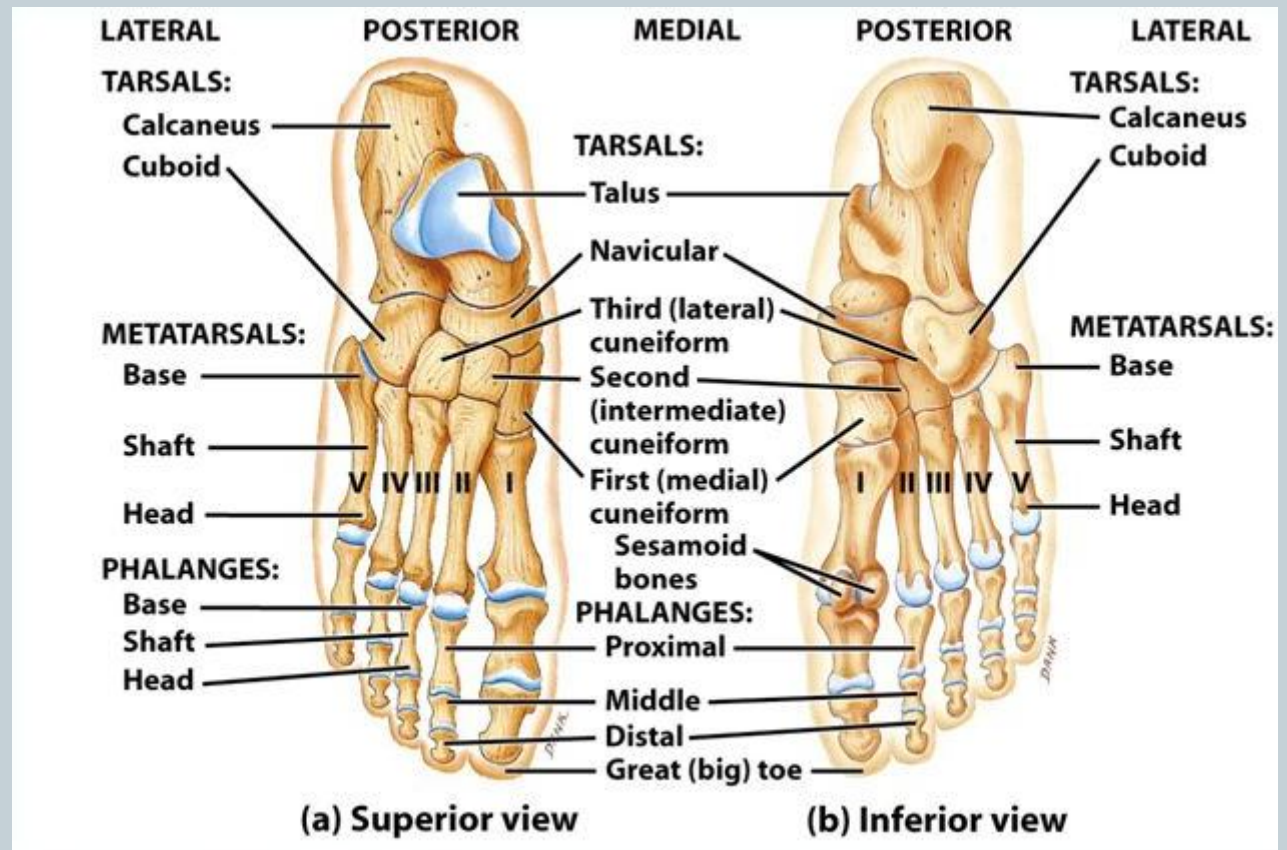
Medial malleolus

Lateral malleolus



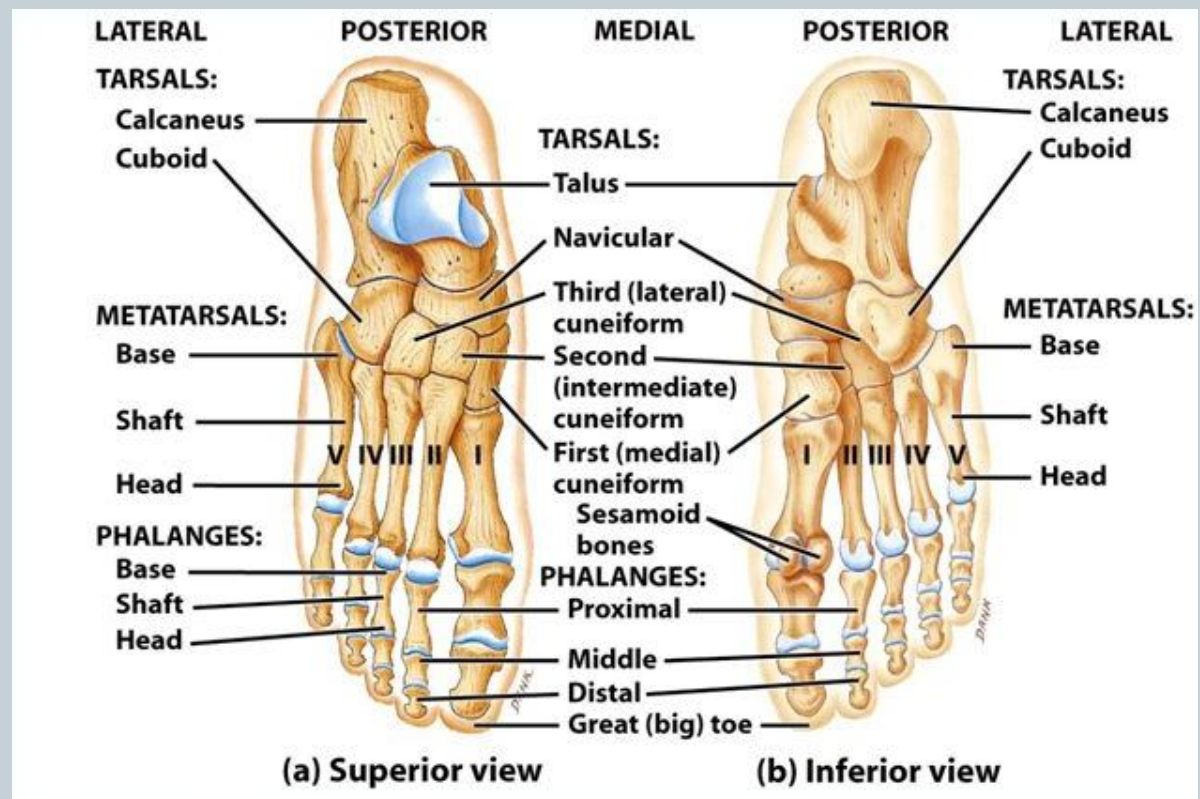
Calcaneus

- Largest bone of tars
- Sustentaculum tali
Talus support



Navicular

- Boat shape
- 6 surfaces
 - Anterior (cuneiforms)
 - Posterior (talus)
 - Lateral (cuboid)



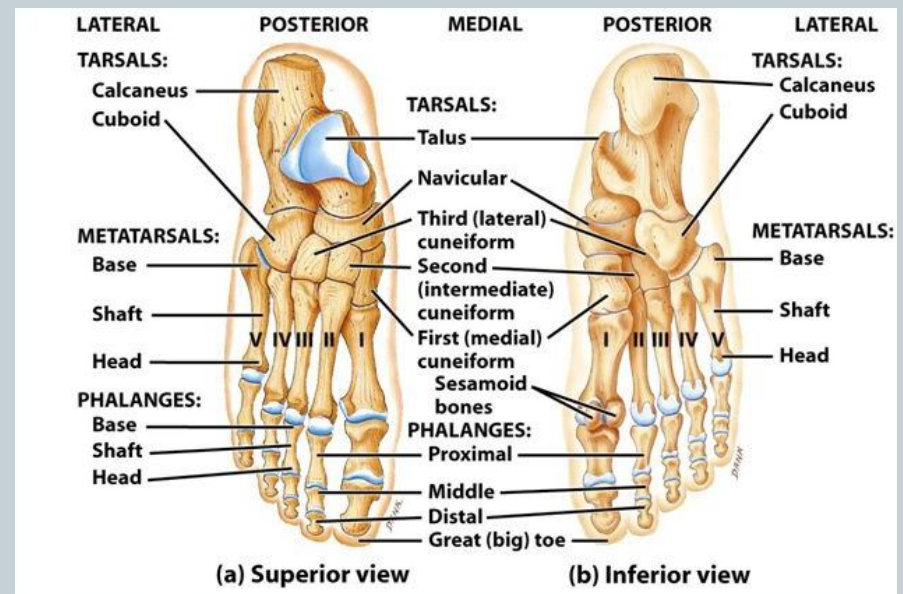
Cuneiforms

Medial

Intermediate

Lateral

- Posterior (navicular)
- Anterior (1th ,2th ,3th metatarsal)

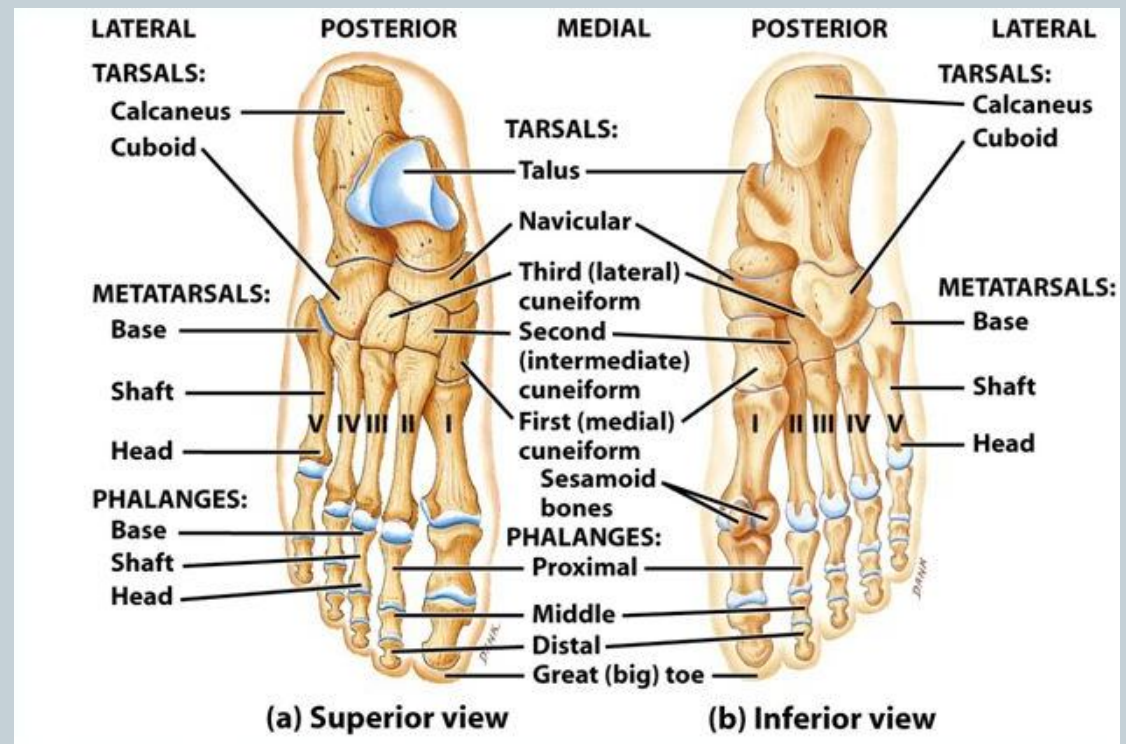


Cuboid



Posterior (calcaneus)

Anterior (4th & 5th metatarsal)



Metatarsal & phalanges bones

- **Metatarsal bones**

5 miniature long bones

- First metatars

Shortest & thickest

- Second metatars

Longest

- **phalanges**

