لجان الدفعات

ANATOMY

MORPHINE ACADEMY

The Skeletal System

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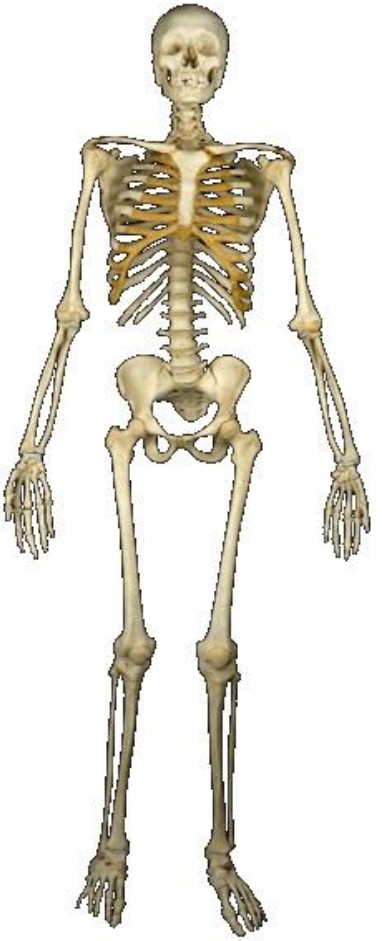
(2021)



Divisions of the Skeletal System

- The human skeleton consists of ***206 bones***
- Bones of the skeleton are grouped into two principal divisions:
  - **Axial skeleton**
    - Consists of the bones that lie around the longitudinal axis of the human body: Skull bones, auditory ossicles (ear bones), hyoid bone, ribs, sternum (breastbone), and bones of the vertebral column.
    - The primary function is protection of vital organs.
  - **Appendicular skeleton**
    - Consists of the bones of the **upper** and **lower limbs (extremities)**, plus the bones forming the **girdles** that connect the limbs to the axial skeleton. The primary function of this division is movement.

Bone Tissue

النسيج العظمي

Bone is a structural type of connective tissue characterized by the presence of a calcified extracellular matrix (called bone matrix) and three types of cells: Osteoblasts, Osteocytes and Osteoclasts.

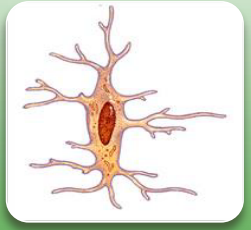
Functions of bones:

1) Support fleshy structures.
2) Protect vital organs (example: the skull protects the brain).
3) Assist in movement.
4) Synthesis of blood elements.
5) Storage of fat.
6) Storage of minerals (calcium and phosphate).

Cells of bones:

Osteoblasts

- Responsible for the synthesis of the bone matrix
- Responsible for the calcification of bone matrix



Osteocytes

- Maintain the bone
- Located inside spaces called lacunae

Osteoclasts

- Responsible for the resorption (destruction) of bone
- A type of macrophage

هوعبارةعن فايبرز بيكون نوعها organic كولاجين و بتحتوي على inoganic molec.

Bone matrix:

- Bone matrix is formed of various organic and inorganic molecules (mainly Ca^{2+} compounds).
- Collagen fibers is abundant in bone matrix.

الي بغيط من برا covers

Periosteum:

- A thick connective tissue layer that covers the bone.
- It's important in (1) the nourishment بتغذي of bones, (2) the formation of bones and in (3) fracture repair.

اذا صار عنا فراكشن بحطله ريبير

من جوا lines

Endosteum:

- A thin tissue layer that lines the cavities inside the bone.

Tetracycline and Bones

- Tetracycline is a fluorescent substance and it binds with great affinity with Ca^{2+} in recently deposited bone matrix.

Tetracycline must not be given to a pregnant or lactating women or to a child whose teeth are erupting, because it may bind to Ca^{2+} of the newly forming teeth of the child leading to the permanent discoloration of the teeth.

Fig.1: Teeth with brownish discoloration due to use of tetracycline.

Classification of bones

According to Gross Morphology:

- In a section of bone we have:

1. **Compact bone:** part of the bone appear as a dense area with generally no cavities.

2. **Spongy bone:** part of bone that have several, small, interconnected cavities.

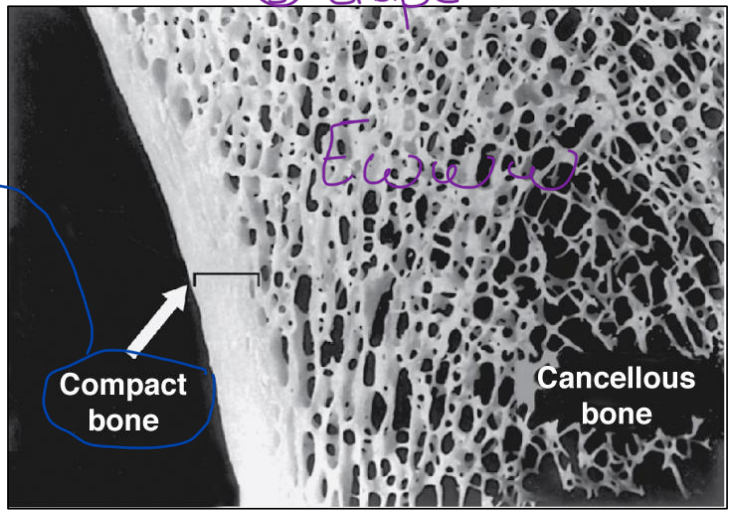


Fig.2: Compact and cancellous bone.

According to Histological Features:

1. **Primary (woven) bone** in which the collagen fibers of the matrix have no specific arrangement.

2. **Secondary (lamellar) bone** in which the collagen fibers are arranged in layers called lamellae.

- In secondary bone, the lamellae usually form concentric circles around a central cavity in what's called Osteons. In the osteons, osteocytes are found in spaces called lacunae connected to each by canaliculi.

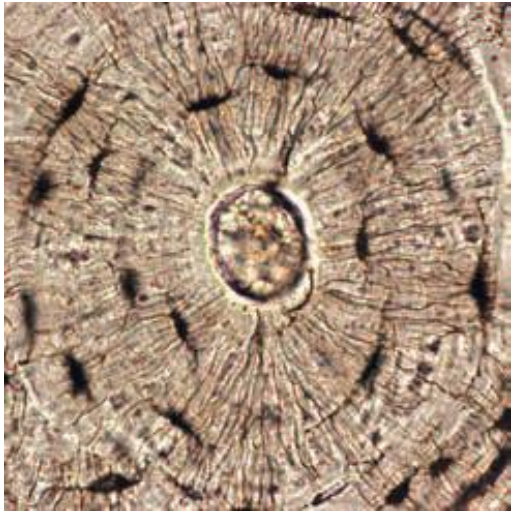


Fig.3: Osteon.

According to Shape:

1. Long Bones

- Greater length than width and are slightly curved for strength.
- Has two expanded ***epiphyses*** formed mainly of spongy bone surrounded by a thin layer of compact bone.
- The middle tube-like shaft is called ***diaphysis*** and is formed of mainly compact bone with a thin layer of spongy bone surrounding a central cavity, the ***medullary cavity***.
- Femur, tibia, fibula, humerus, ulna, radius, phalanges.

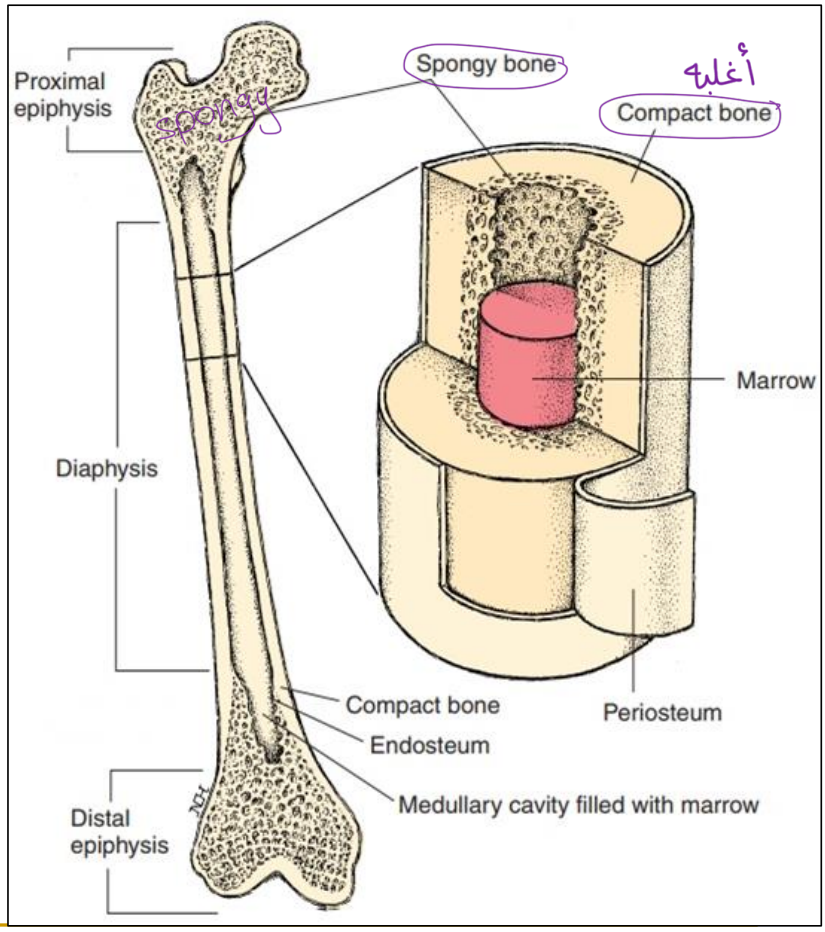


Fig.4: Parts of long bones.

2. Short bones

- Cube-shaped and are nearly equal in length and width
- Carpal bones, navicular, cuboid

Short bone (trapezoid, wrist bone)

3. Flat bones

- Thin and composed of two nearly parallel plates of compact bone tissue enclosing a layer of spongy bone tissue
- Cranial bones, sternum, ribs, scapulae

Flat bone (sternum)

4. Irregular bones

- Complex shapes and cannot be grouped into any of the previous categories
- Vertebrae, hip bones, some facial bones, calcaneus

Irregular bone (vertebra)

5. Sesamoid bones

- Found within tendons. Protect the tendons from excessive wear
- Patellae

Sesamoid bone (patella)

هخول حفظ وموجودين بالسلايدات
لقدام بس هيهم للمستجل

SCAPHOID

TRAPEZIUM

LUNATE

TRAPEZOID

TRIQUETRUM

CAPITATE

PISIFORM

HAMATE

Bone Growth

- Increase in length of bones occur at site of epiphyseal plate (made of hyaline cartilage) before they're closed. After closure of the plates during adulthood, no further increase in bone length can occur. The time of closure of the plate is specific for the bone. This can be used to determine the age of the person.
- Increase in width of bone can occur throughout life.
- Bone growth is affected by several hormones in the body, like growth hormone.

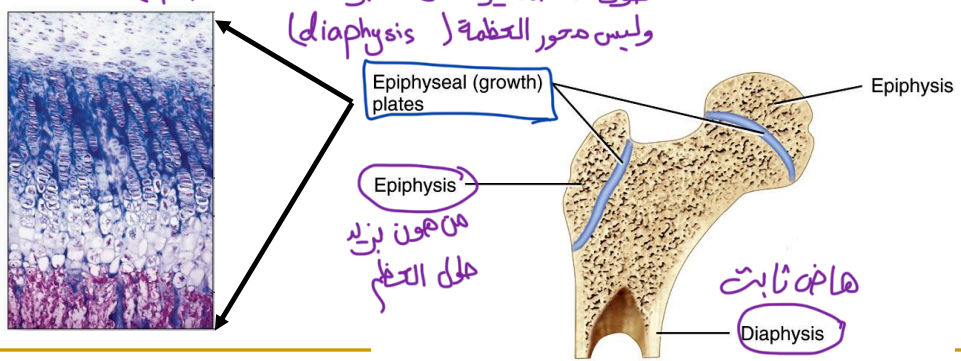


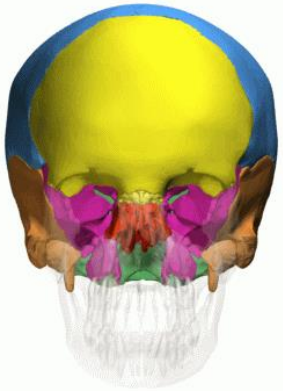
Fig.5: Epiphyseal growth plate.

The Axial Skeleton

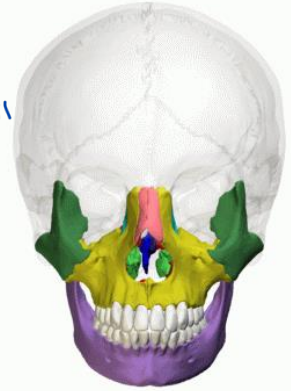
The Skull

- The skull is the bony framework of the head. It's formed of 22 bones divided into two sets:

1. **Cranial bones**
   - Eight cranial bones that form the cranial cavity which encloses the brain.
   - Frontal bone, two parietal bones, two temporal bones, the occipital bone, the sphenoid bone and the ethmoid bone.

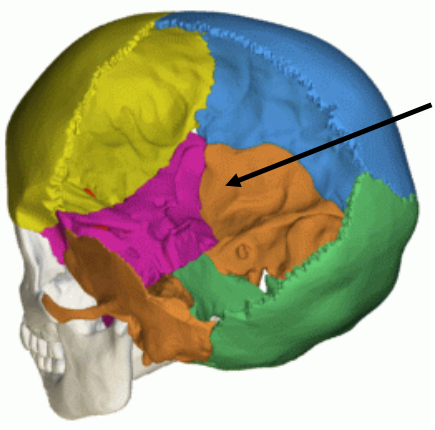


2. **Facial bones**
   - Fourteen facial bones that form the face.
   - Two nasal bones, two maxillae, two zygomatic bones, two lacrimal bones, two palatine bones, two inferior nasal conchae, vomer and the mandible.

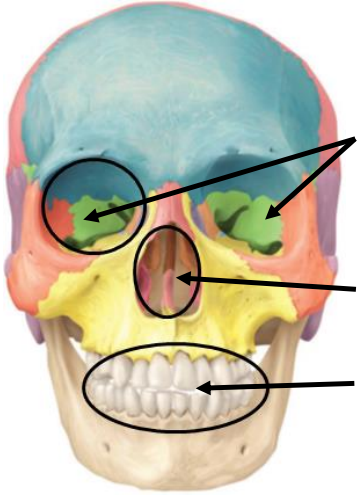


Features of the Skull

- The cranial and facial bones protect the brain and special sense organs.
- Bones of the skull are attached to each other by immovable joints called suture, except the mandible which is attached to the skull by a movable joint.
- Cavities of the skull:



(1) The cranial cavity



(2) The orbits (eye sockets)

(3) Nasal cavity

(4) Oral cavity

(5) Paranasal sinuses الجيوب الأنفية

(6) Middle and inner ear cavities within the petrous part of the temporal bone بالأذن

Cranial Bones:

Temporal Bones

- Form the lateral aspects and floor of the cranium.
- Consists of 5 parts: squamous part, petrous part, tympanic part, mastoid part, and the styloid process.

Occipital Bone

- Forms the posterior part and most of the base of the cranium.
- The perceptible protrusion on the back of the head is the *external occipital protuberance*.
- The *foramen magnum*, the largest foramen in the skull, is located in this bone.

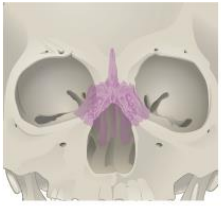
Sphenoid Bone

- Called the '*Keystone*' bone because it's attached to all other cranial bones.
- Has a body and two wings – *butterfly bone*.

- **Ethmoid Bone** شكلها زي الحوزة
- Located in the midline between the two orbits
- Has a transverse (cribriform) plate that forms the roof of the nasal cavity
- Contains two projections on each side called the superior and middle nasal conchae. These form part of the lateral wall of the nasal cavity
- Has a perpendicular plate

* 3 levels لنا هون-
1+2 → Ethmoid جاي من
3 → Eth. مش من الـ

بتشكل جزء من الانف



هي الها سطح من فوق وسطوح عالجنب
↓
اسمه
Cribriform Plate
وطالع عليه بروز للأعلى باتجاه اليمين اسمه Crista galli

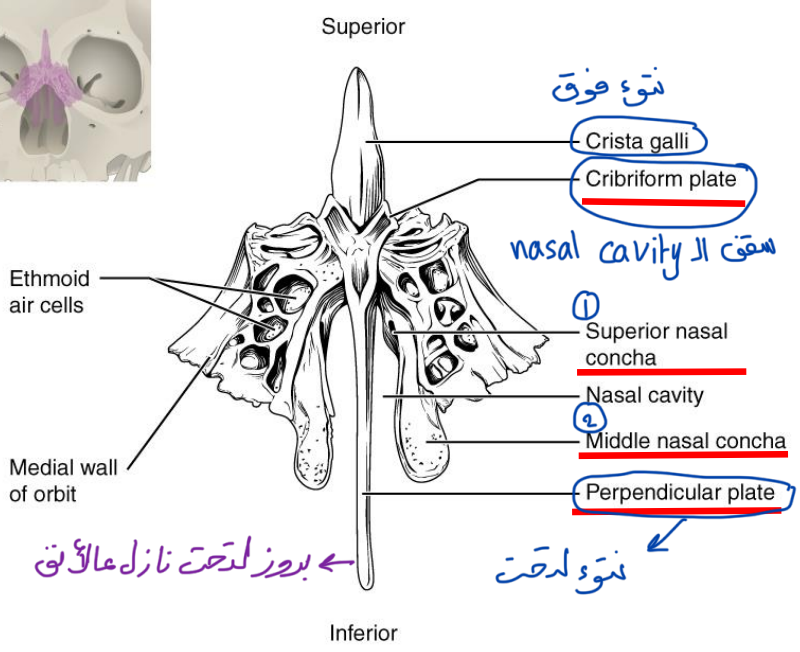


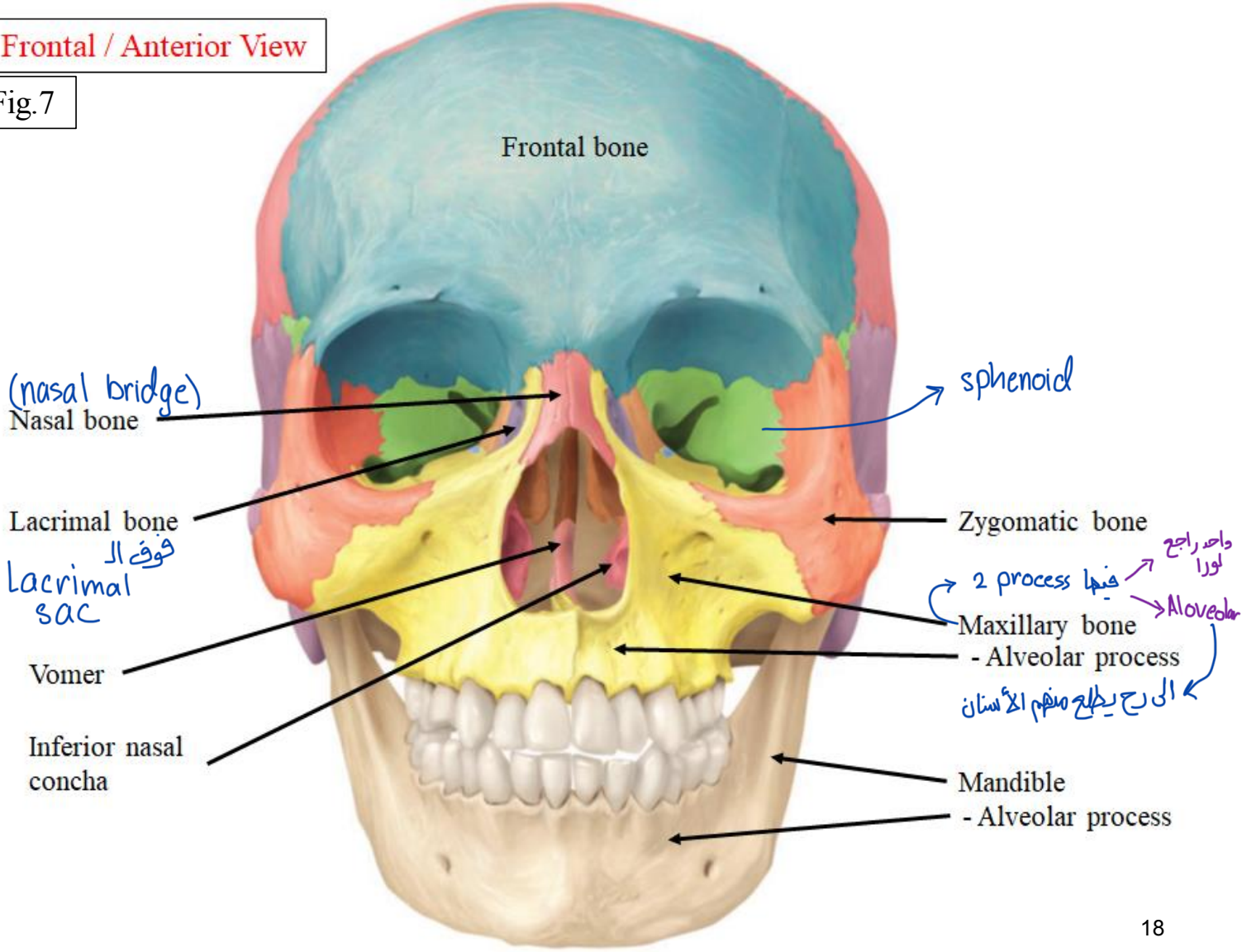
Fig.6: The ethmoid bone.

Facial Bones:

- **Nasal Bones → bridge of the nose**
- **Maxillae (the upper jawbone)**
  - Has processes: (1)Palatine process which forms the hard palate with the palatine bones, (2)Alveolar process which contains teeth sockets.
- **Zygomatic Bones → Cheekbones**
- **Inferior Nasal Conchae**
  - Form part of the lateral wall of the nasal cavity.
- **Lacrimal bone**
  - Forms part of the medial wall of the orbit. Related to lacrimal sac.
- **Mandible (lower jawbone)**
  - The largest, strongest facial bone. The only movable skull bone.
  - Has alveolar process that contains sockets for the teeth.

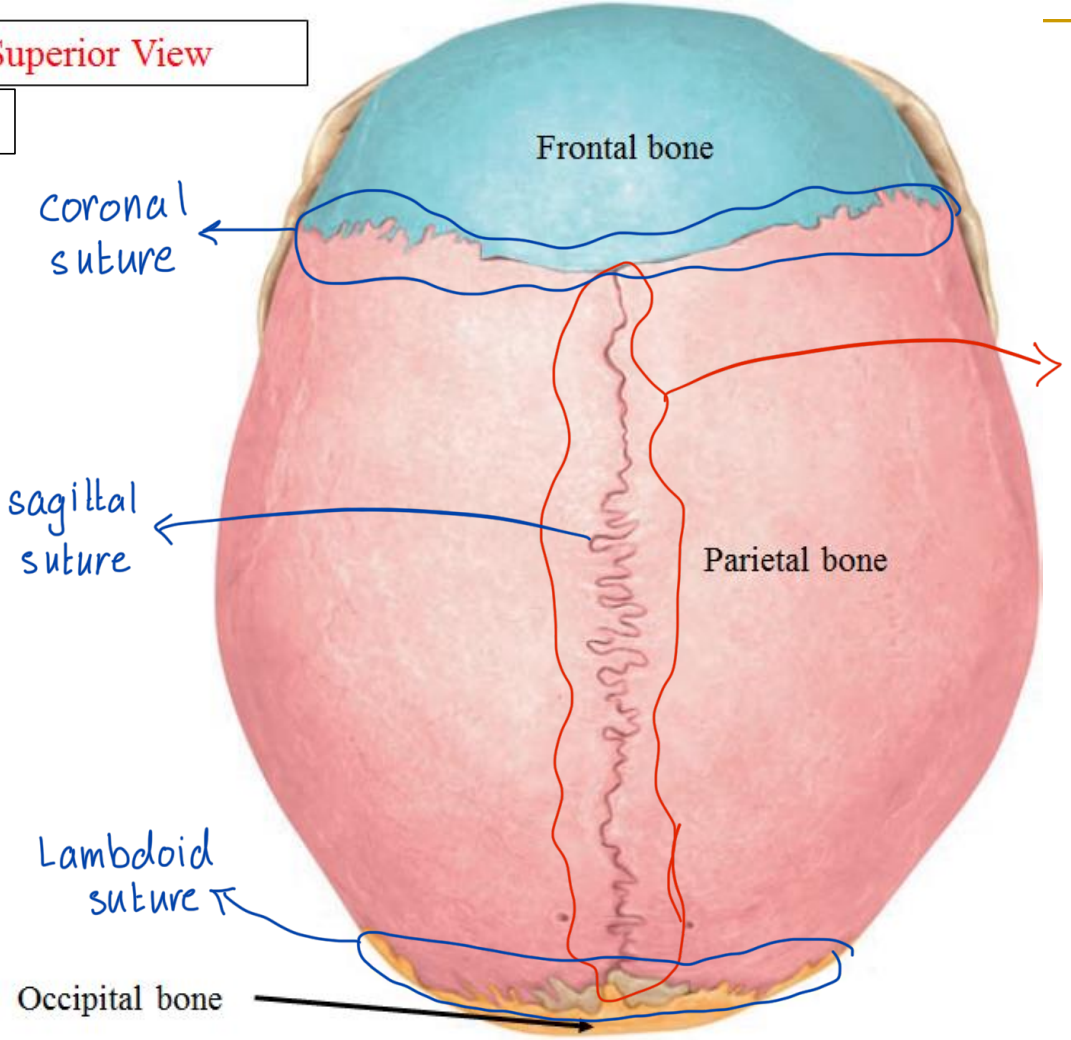
Frontal / Anterior View

Fig.7



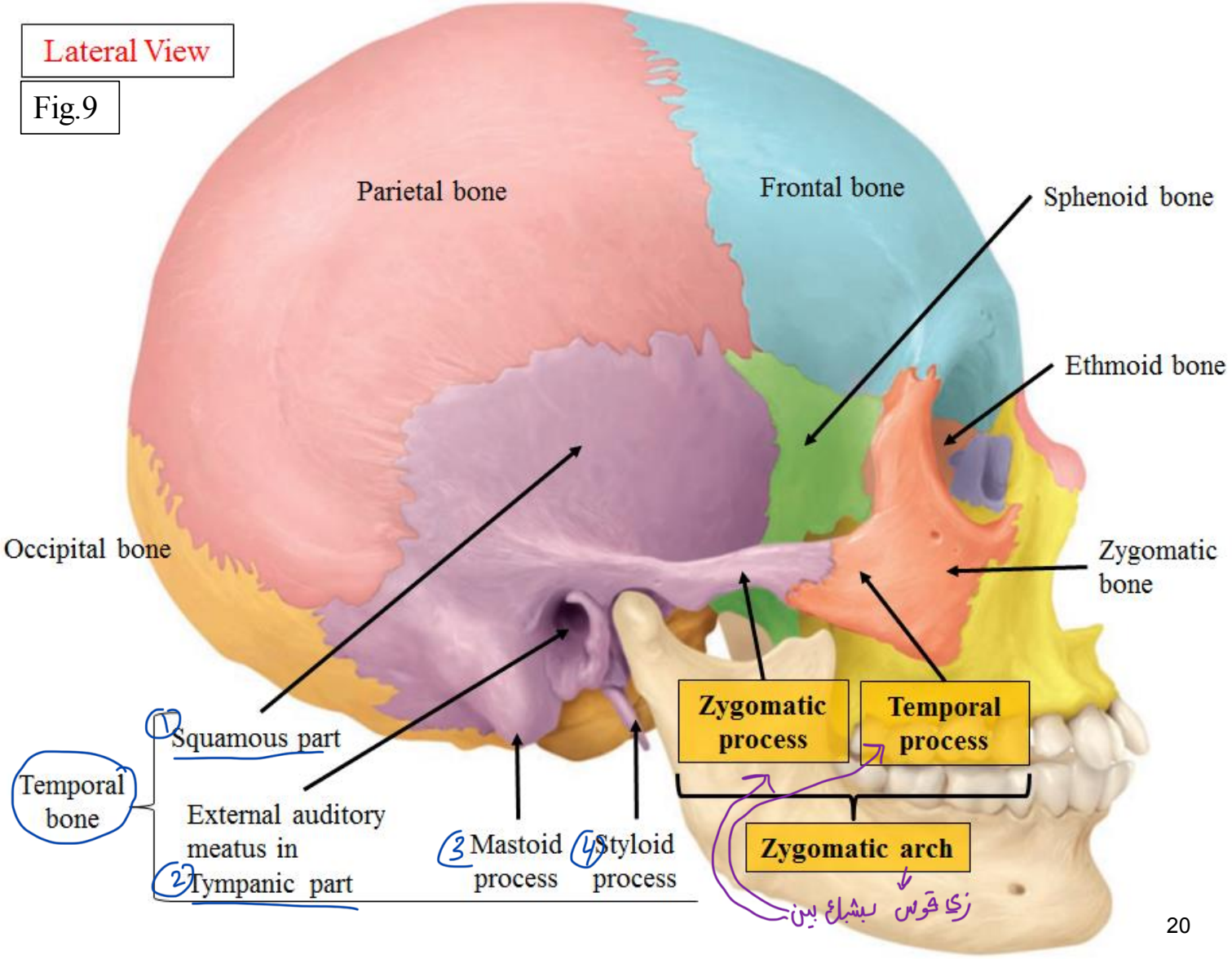
Superior View

Fig.8



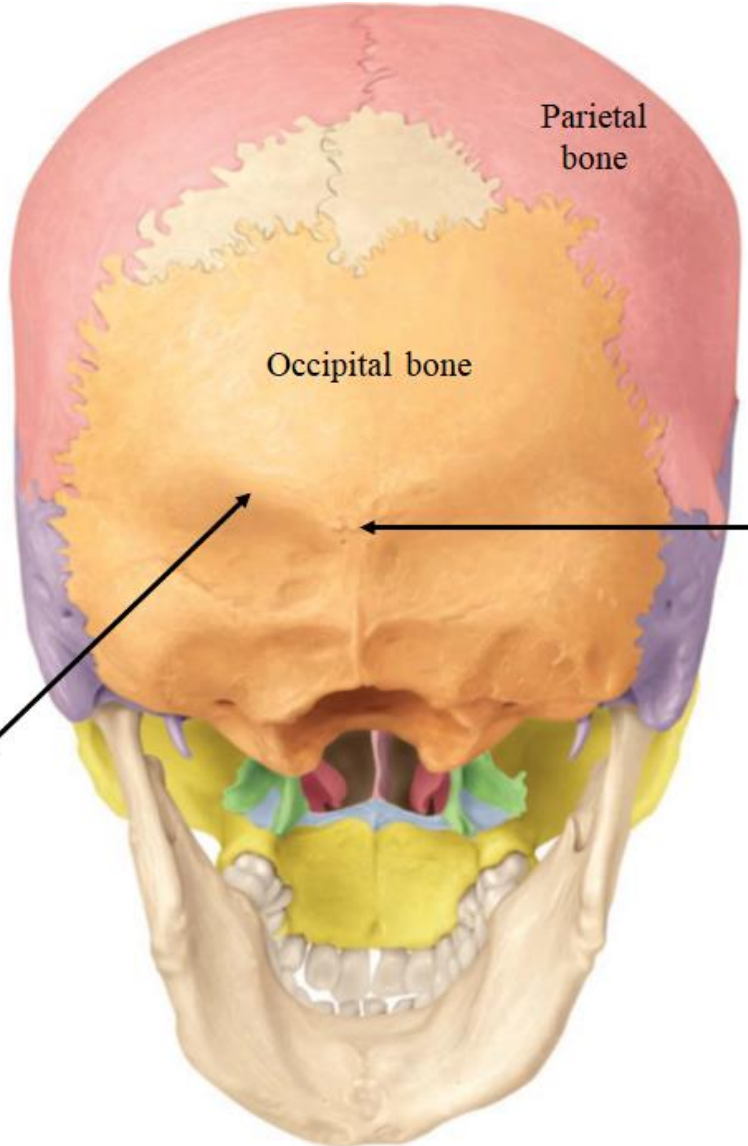
Lateral View

Fig.9



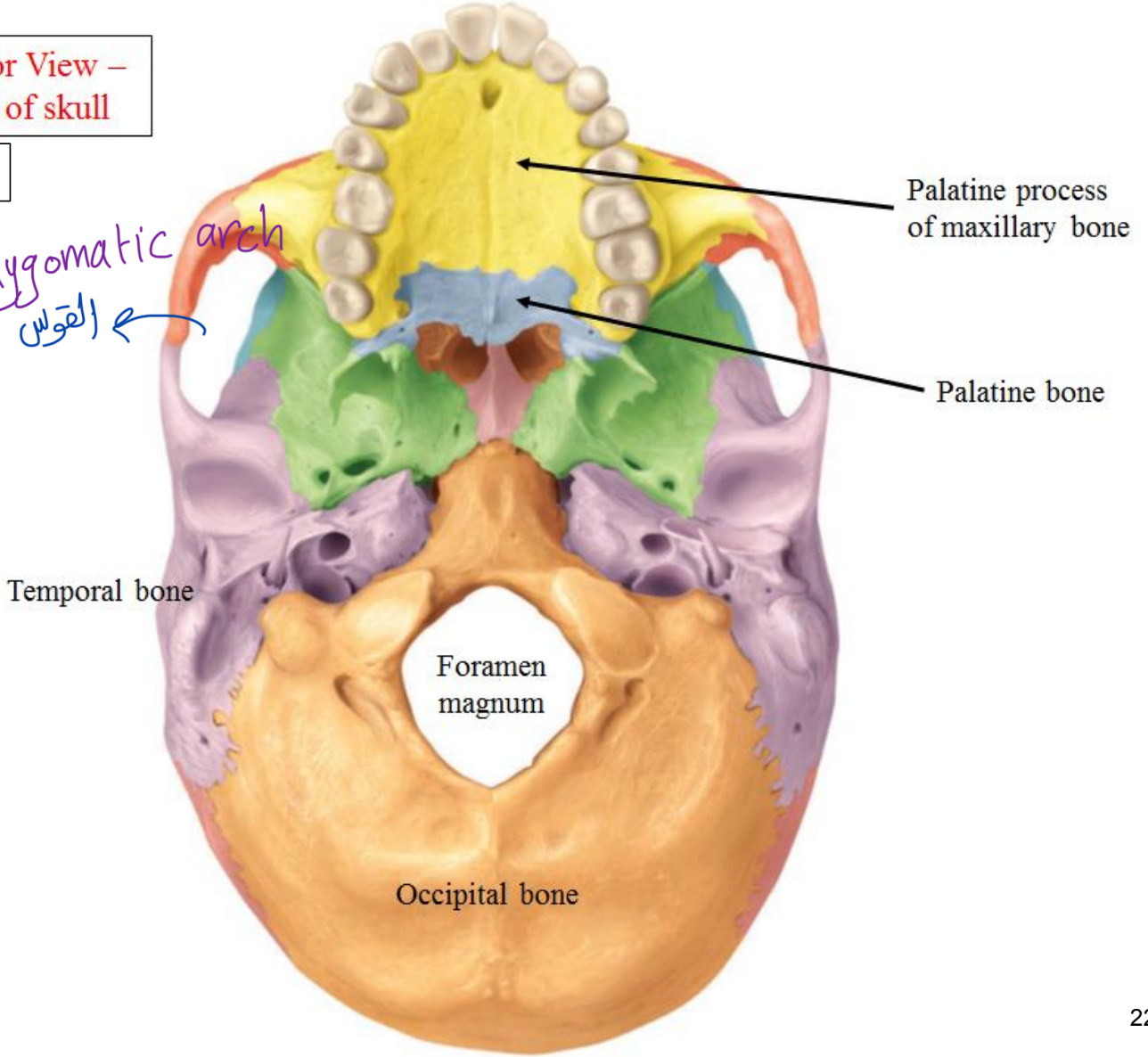
Posterior View

Fig.10



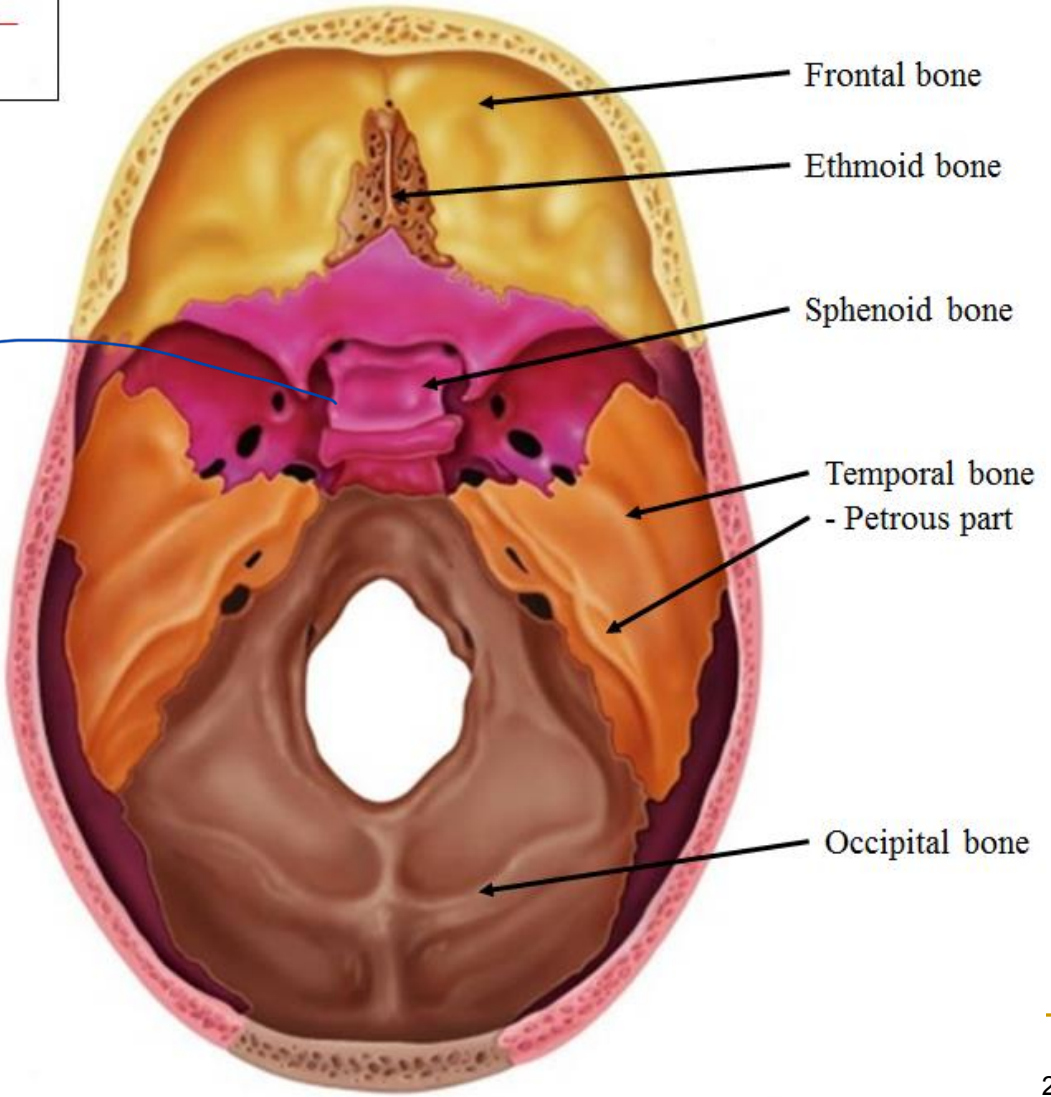
Inferior View – Base of skull

Fig.11



Interior of the skull – Cranial cavity

Fig.12



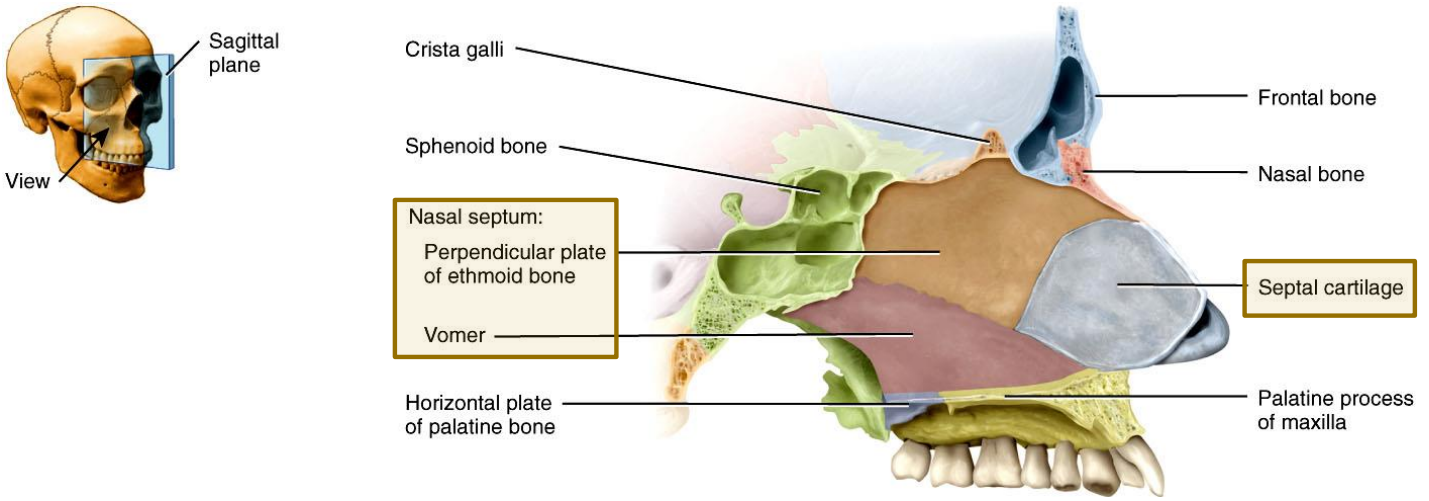
التجويف إلى بالسفينويد

اسمه sella turcica

بالتجويف تتقعر الـ Hypophyseal

The Nasal Septum:

Fig.13: The nasal septum.



- A partition that divides the nasal cavity into right and left parts.
- It's formed of:

1. The perpendicular plate of the ethmoid bone and the vomer bone posteriorly.
2. Septal cartilage anteriorly.

Main Sutures:

1) Coronal Suture: between the frontal and the two parietal bones.
2) Sagittal Suture: between the two parietal bones.
3) Lambdoid Suture: between the two parietal and the occipital bones.

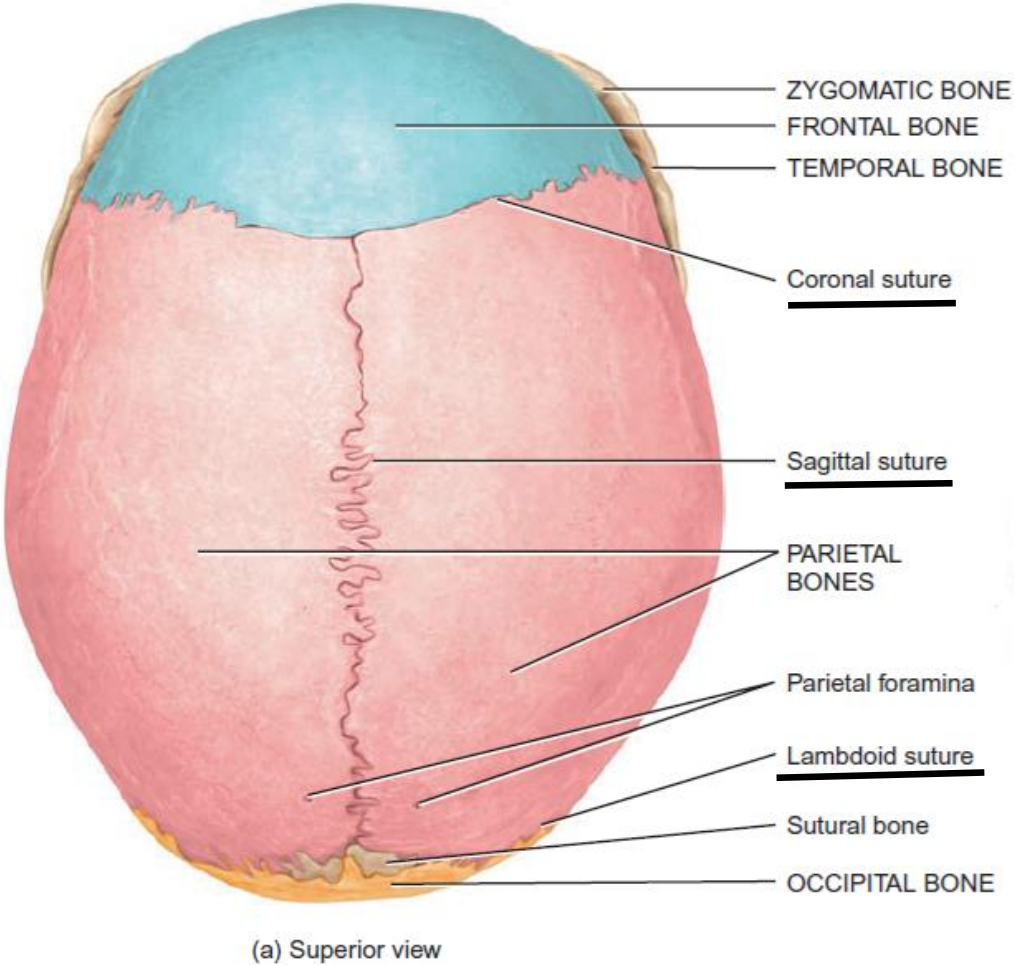


Fig.14: Some of the main sutures of the skull.

Paranasal Sinuses:

- Cavities within cranial and facial bones near the nasal cavity.
- Secretions produced in the sinuses drain into the nasal cavity.
- Serve as resonating chambers that intensify and prolong sounds.
- Found in the Frontal, ethmoid, sphenoid and maxillary bones.

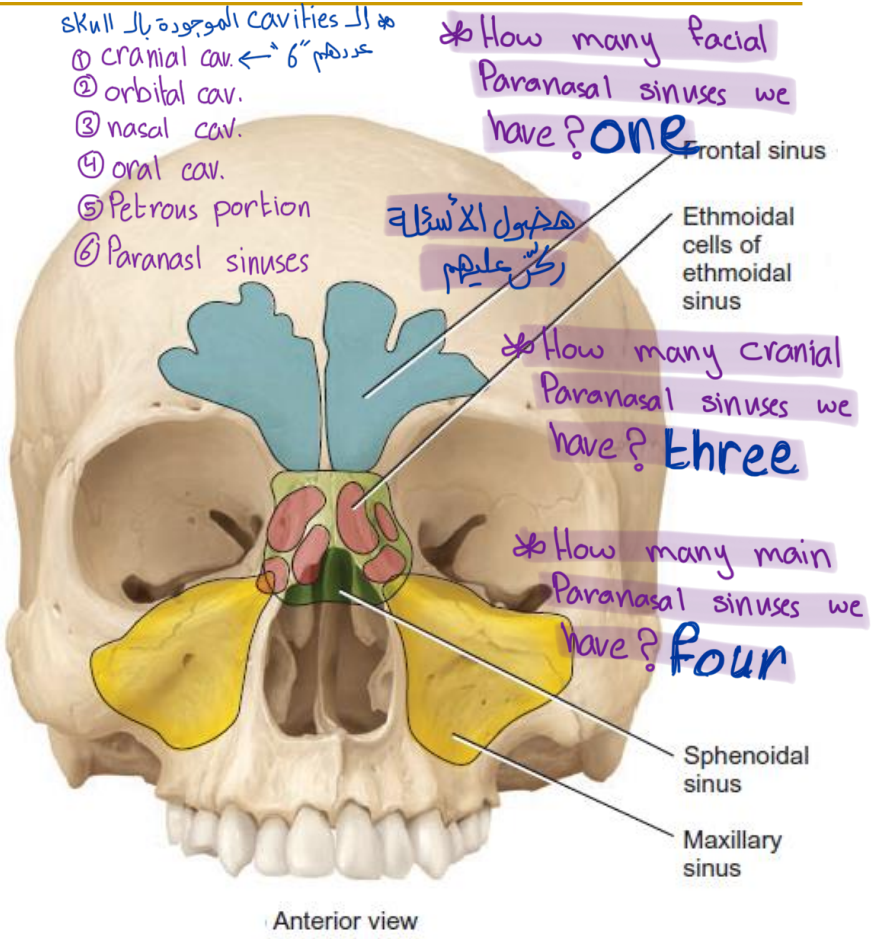


Fig.15: Paranasal sinuses.

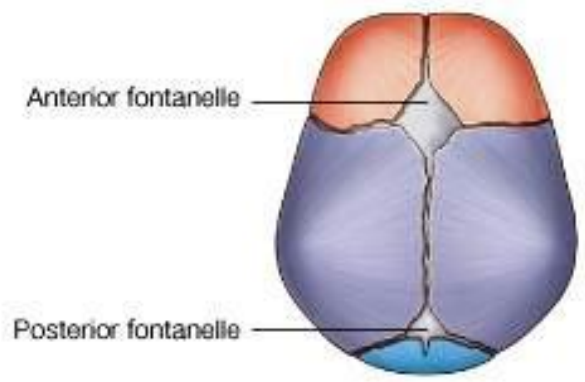
Fontanelles:

إلى هو الناقوخ
الفتحة الى براس الجنين

هو عبارة عن عظام الـ skull بس مش ملزقين ببعض (ما في sutures)

- Areas of unossified tissue that link the cranial bones at birth.
- Eventually, they are replaced with bone to become sutures.
- Provide flexibility to the fetal skull, allowing the skull to change shape as it passes through the birth canal.
- The largest of these fontanelles are the anterior and posterior fontanelles.

function



ربنا خلق الناقوخ عشان يخلي العظام يركبوا فوق بعض ليقدر يطلع من عنق الرحم، عشان هيك راس المولود بكون مطاول

Fig.16: Anterior and posterior fontanelles.

اذا كان الناقوخ نازل لتحت هاض دليل انه البيبي عنده جفاف وحالته خطيرة

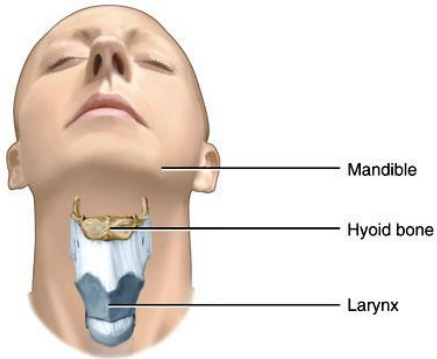
The Hyoid Bone

- Located in the upper part of the neck

العظمة الوحيدة اللي ماتتصل مع أي عظمة ثانية

The only bone in the body that does not articulate with any other bone

- Supports the tongue, providing attachment sites for some tongue muscles and for muscles of the neck and pharynx (اللعوم) and some ligaments (الحبايل). It's also attached to the larynx.



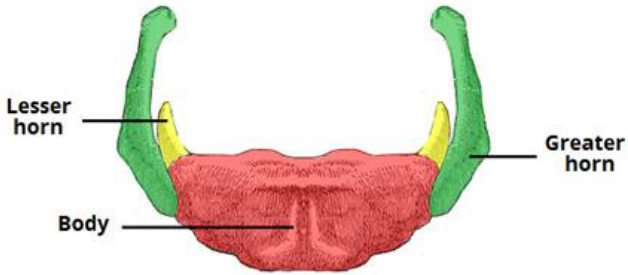


Fig.17: The hyoid bone.

The Vertebral Column

- Also called the spine, backbone, or spinal column
- Functions to:
  - Protect the spinal cord
  - Support the head
  - Serve as a point of attachment for the ribs, pelvic girdle, and muscles
- Composed of a series of bones called **vertebrae** (Adult=26)
  - 7 **cervical,** in the neck region
  - 12 **thoracic,** to which the ribs are attached
  - 5 **lumbar,** support the lower back
  - 1 **sacrum,** triangular in shape and consists of five fused sacral vertebrae
  - 1 **coccyx,** triangular in shape and consists of four fused coccygeal vertebrae

- The vertebral column is curved to varying degrees in different locations
  - Curves increase the column strength
  - Help maintain balance in the upright position
  - Absorb shocks during walking, and help protect the vertebrae from fracture

- These curves are:
  - Cervical
  - Thoracic
  - Lumbar
  - Sacral

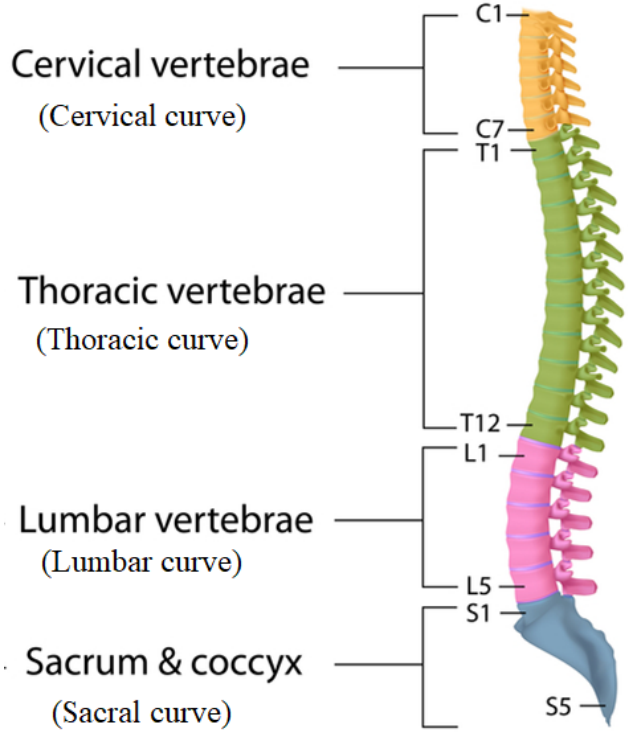
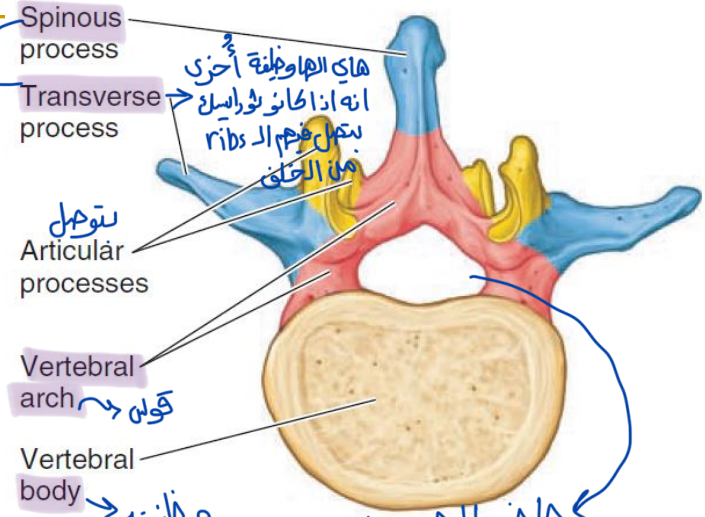
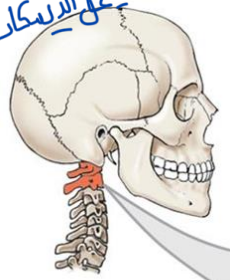


Fig.18: Curves of the vertebral column.

The Vertebrae:

- Each vertebra has: (1) Body that bears weights, (2) Vertebral arch that protect the spinal cord, (3) One spinous and two transverse processes for muscle attachment, and (4) Joints for articulation with ribs and other vertebrae.
- The first cervical vertebra (atlas) articulates with the occipital bone of the skull. The second cervical vertebra (axis) has a process (dens) that articulates with atlas.





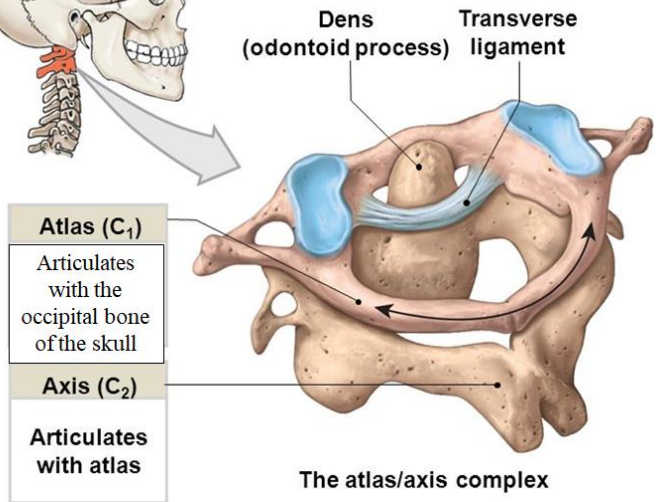


Fig.19: Above, parts of vertebra. Below, atlantoaxial joint.

- The body and the vertebral arch surrounds a foramen called the *vertebral foramen*. When the vertebrae are stacked on each other, the vertebral foramina will align together to form the *vertebral canal* through which the spinal cord passes.

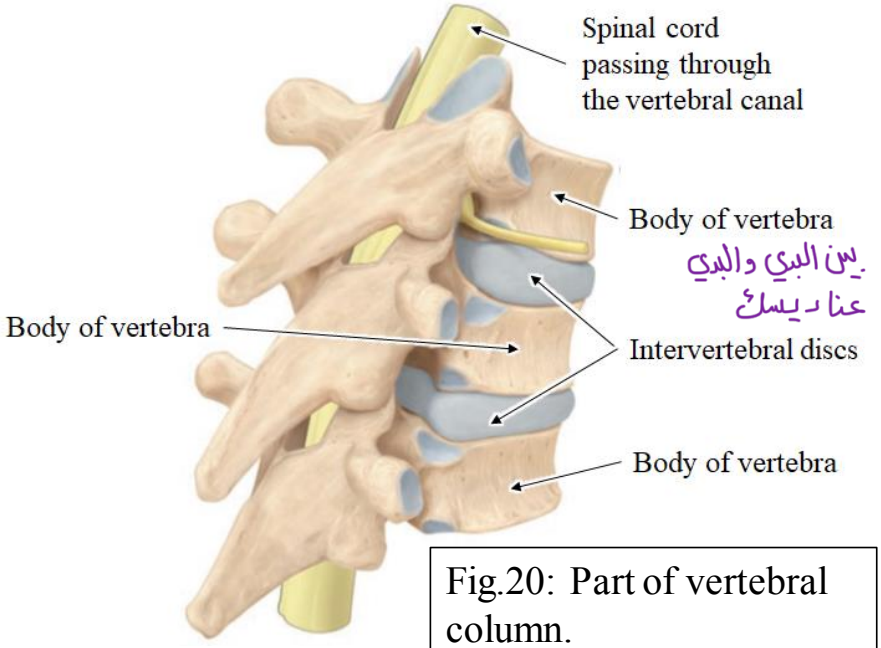


Fig.20: Part of vertebral column.

- Found between the bodies of adjacent vertebrae are the Intervertebral Discs (formed of fibrocartilage). The function of these discs is to:
  - Form strong joints عشان يعمل الهبنخط
  - Permit various movements of the vertebral column
  - Absorb vertical shock

The Thoracic Cage

- Thoracic cage is formed by the:
  - Sternum
  - Ribs
  - Costal cartilages (attach ribs to sternum)
  - Thoracic vertebrae

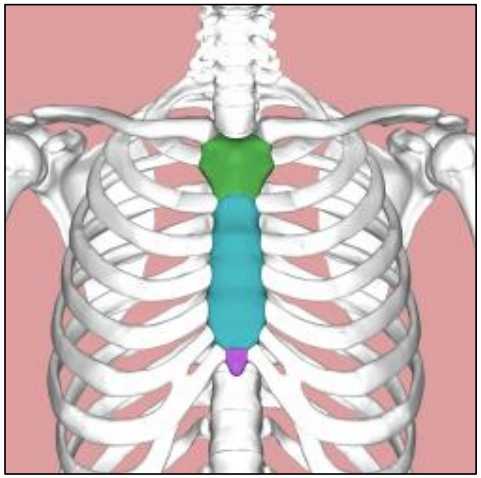
- Functions:
  - Enclose and protect the organs in the thoracic and abdominal cavities
  - Provide support for the bones of the upper limbs
  - Play a role in breathing

The Sternum (Breastbone):

عظمة القص

- Located in the midline of the anterior aspect of the thoracic cage.
- Consists of the manubrium, body and xiphoid process.
- The manubrium is attached to the body at an angle called the sternal angle.
- To it are attached the clavicles and the costal cartilages.

عندها 2 notch



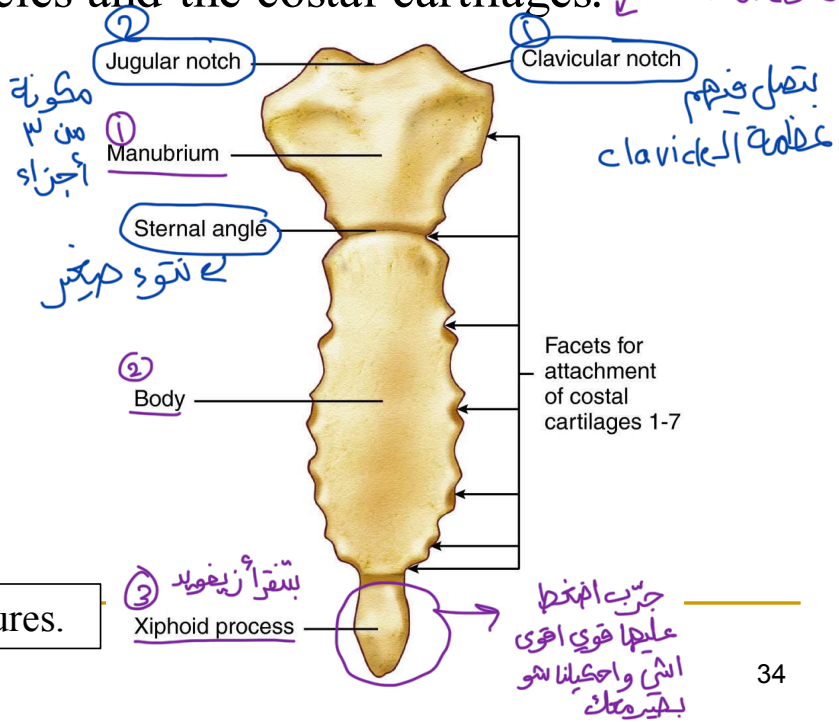


Fig.21: The sternum. Position and features.

The Ribs:

- Twelve pairs of ribs give structural support to the sides of the thoracic cavity.
- The upper seven pairs are called *true ribs* because they're attached to the sternum by their own costal cartilages.
- Pairs 8-10 are called *false ribs* because their costal cartilages are attached, anteriorly, to the costal cartilages of the 7th rib.
- Pairs 11 and 12 are called *floating ribs* because they have no anterior attachment.
- Each rib articulates with the body and transverse process of the thoracic vertebrae.

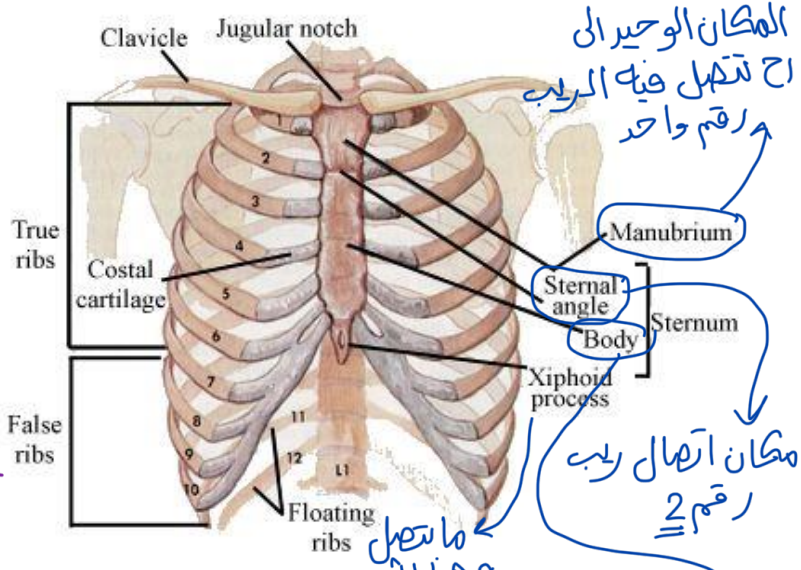


Fig.22: Above, types of ribs. Below, articulation of a rib to a vertebra.

The Appendicular Skeleton

The Upper Limb

- Each upper limb has 32 bones
- Two separate regions

1. The *pectoral (shoulder) girdle* which attaches upper limb to trunk → 2 bones in each: Clavicle and Scapula
2. The *free part (30 bones):*
   - 1 Humerus (arm)
   - 1 Ulna + 1 Radius (forearm)
   - 8 Carpal bones (wrist)
   - 5 Metacarpals and 14 Phalanges (hand)

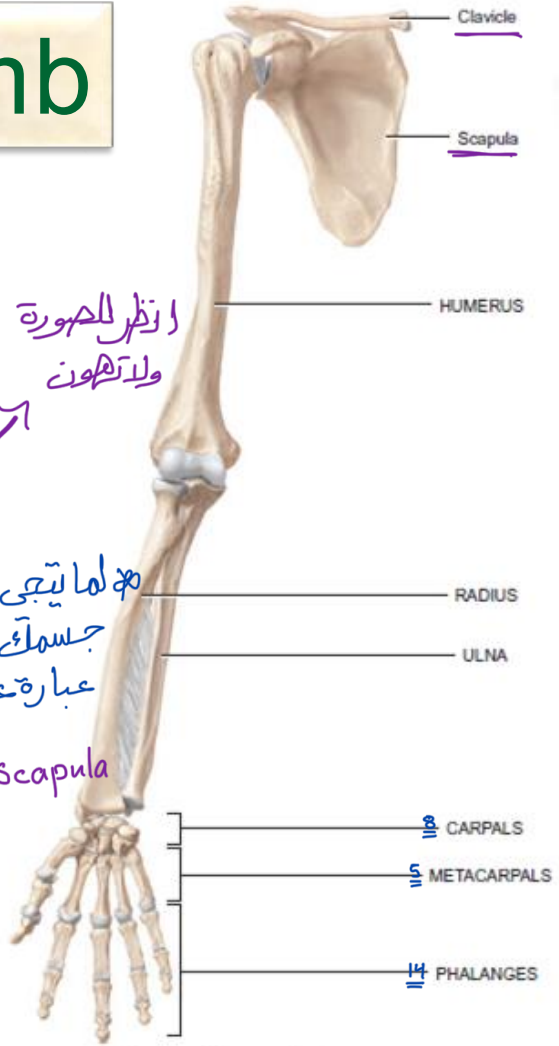


Fig.23: Anterior view of the upper limb bones.

The Pectoral (Shoulder) Girdle:

The Clavicle (Collarbone):

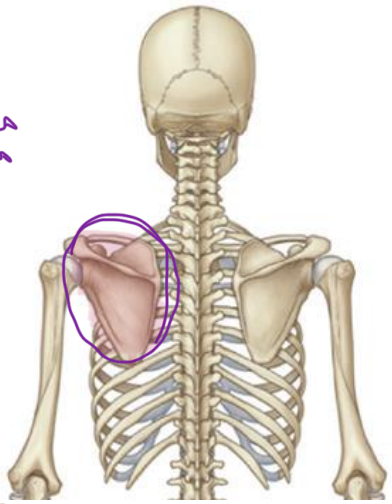
- The anteriorly located clavicle is "S" shaped
- The medial end articulates with the sternum
- The lateral end articulates with the acromion of the scapula

Fig.24: Superior view of the clavicle.

- Functions of the clavicle:

1. Keeps the limb away from the trunk.
2. Transmits force from the upper limb to the trunk.
3. The only bony attachment of upper limb with the trunk. Therefore, if the clavicle is fractured, the limb will fall (Dropped limb).

(2) The Scapula (Shoulder blade):



- Triangular in shape and located on the posterior aspect of the rib cage level with the 2nd to 7th ribs.
- 2 surfaces: anterior (costal) surface featuring the subscapular fossa. Posterior surface divided by the spine into upper supraspinous fossa and lower infraspinous fossa.
- 3 border and 3 angles. The lateral angle presents the glenoid cavity for articulation with the head of the humerus.
- 3 processes:

1. Spine - a large process on the posterior surface of the scapula that ends laterally as the acromion.
2. Acromion - the flattened lateral end of the spine of the scapula. Articulates with the clavicle.
3. Coracoid process - a protruding projection on lateral end of the superior border.

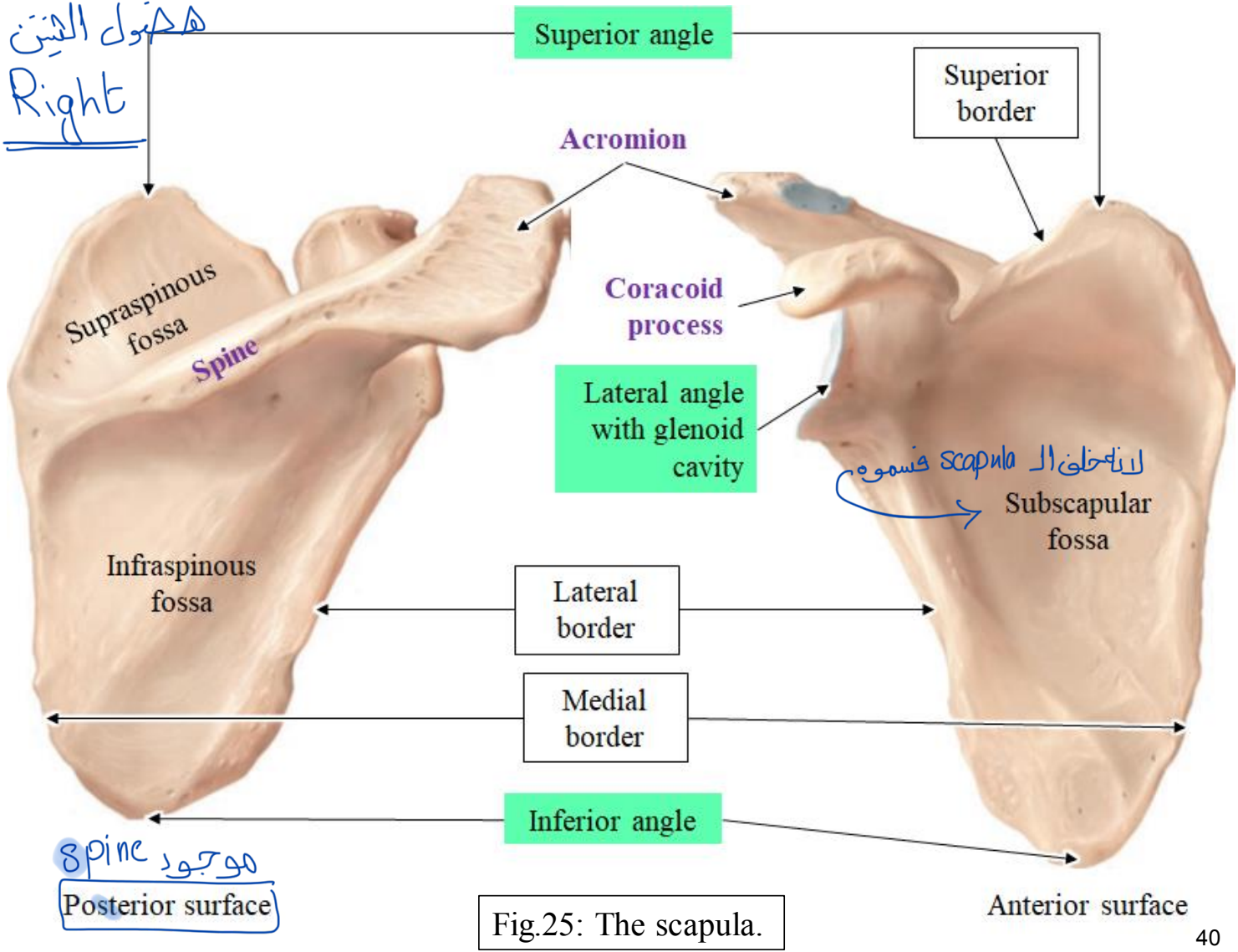
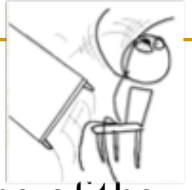


Fig.25: The scapula.



بسم الله نبدأ بمقالة الدم

The Humerus:

- Longest and largest bone of the upper limb. Formed of an upper end, a shaft, and a lower end.

- **The proximal end** features:
  - Rounded **head** that articulates with the glenoid cavity of the scapula to form the shoulder joint.
  - (1) The **anatomical neck**.
  - Distal to the neck, we have the **greater** and **lesser** **tubercles**. Between these tubercles, we have the **intertubercular (bicipital) groove** for the tendon of the long head of the biceps muscle.
  - (2) The **surgical neck** (the most common site of humerus fracture) separates the upper part from the shaft.

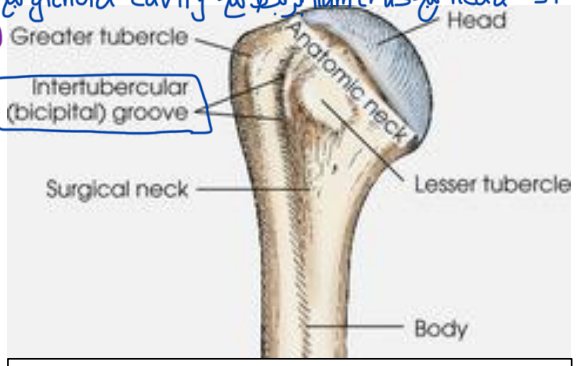
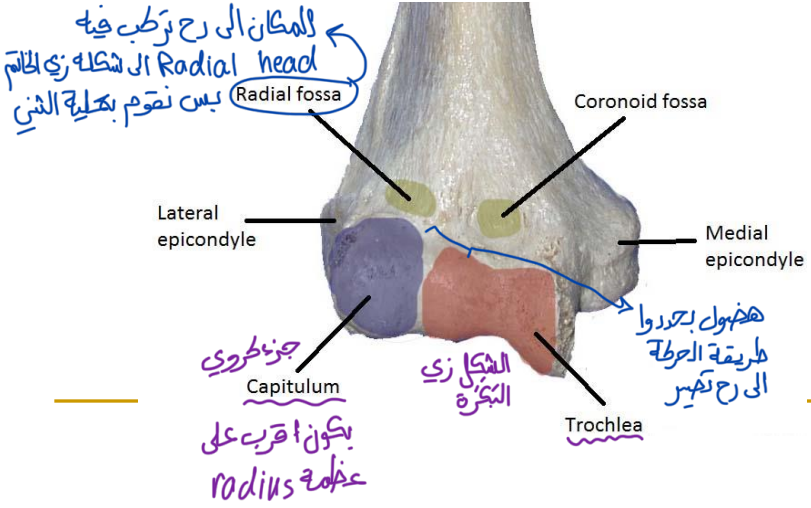


Fig.26: The proximal end of the humerus.

- **The shaft**: to which muscles are attached and several nerves are related.
- **The distal end** features the round **capitulum** which articulates with the head of the radius and the spool-shaped **trochlea** which articulates with the ulna. Also we have two **epicondyles** for muscle attachment. The medial epicondyle is more prominent.



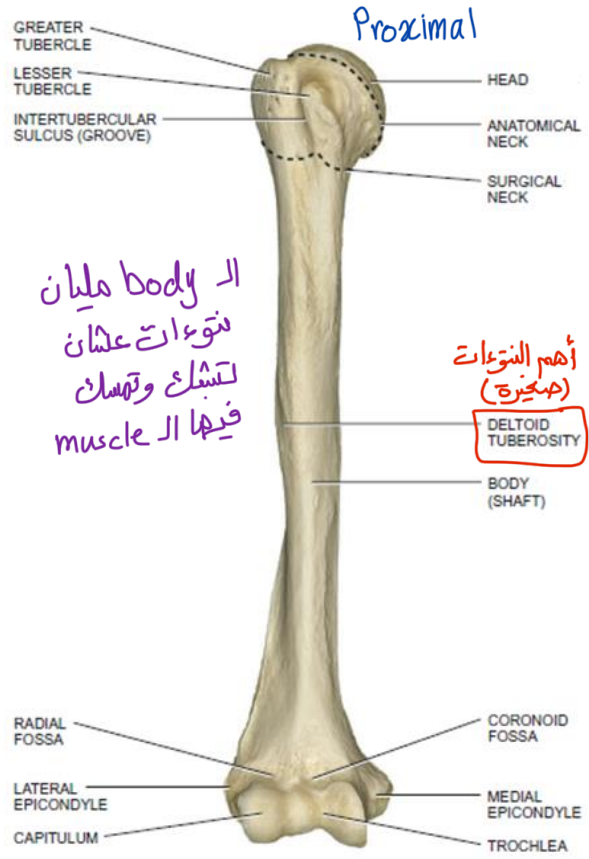


Fig.27: Above: anterior view of the humerus. To the left: the distal end of the humerus.

The Ulna and Radius:

Feature	Ulna	Radius
Position	• Medial	• Lateral
Proximal end	• Ulnar notch • Olecranon process • Coronoid process • Articulates with trochlea	• Disc-shaped head • Articulates with capitulum
Shaft	• Triangular	• Triangular • Radial tuberosity for tendon of biceps
Interosseous border	• Lateral	• Medial
Distal end	• Head of ulna • Posteriorly located Styloid process	• Laterally located Styloid process
Wrist joint	• Not involved	• Involved

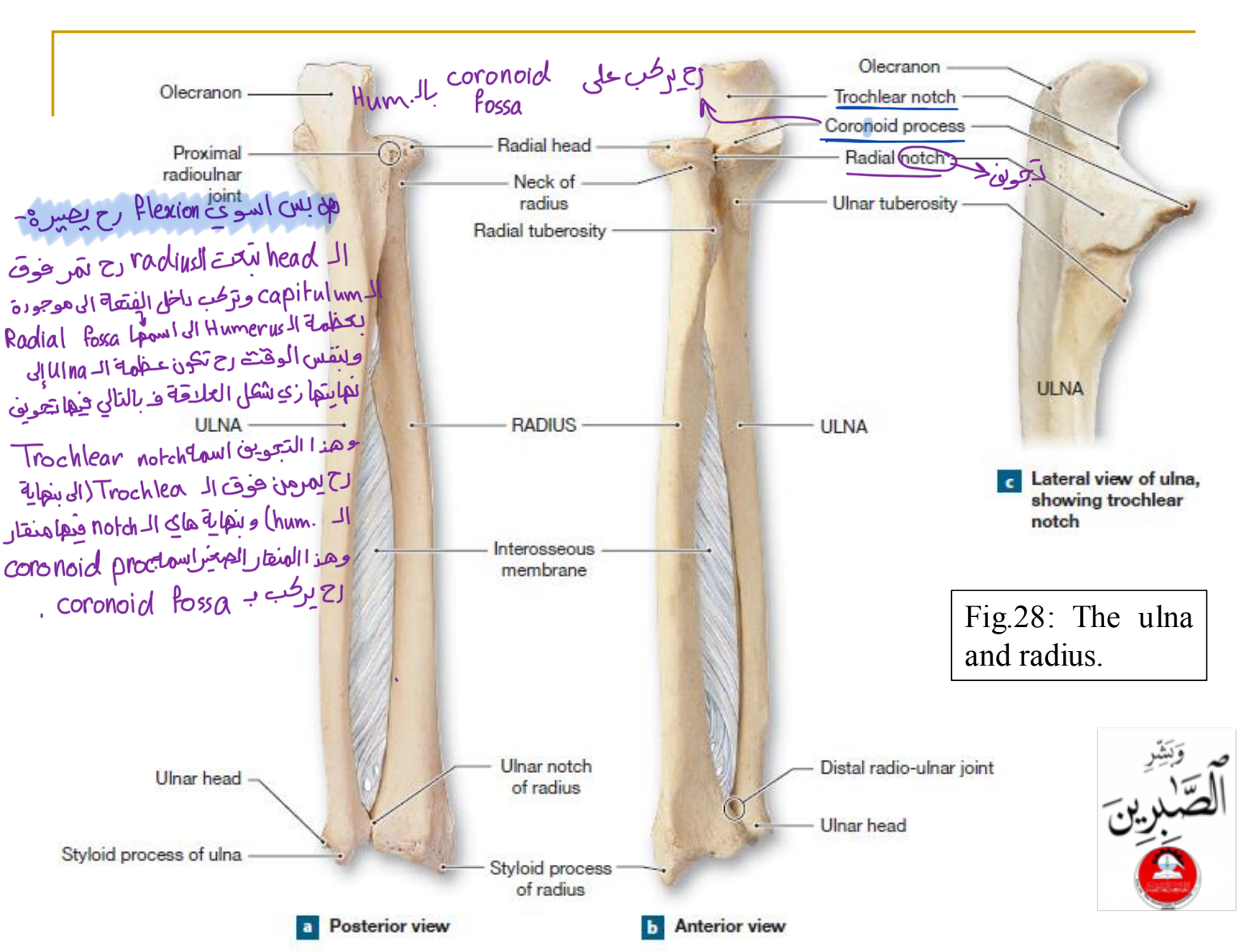


Fig.28: The ulna and radius.

The Carpal Bones (Carpus):

- Consists of 8 small bones (carpals).
- Arranged in two rows.

The Bones of the Hand:

- Five metacarpals.
- 14 phalanges - two in the thumb (pollex) and three in each of the other fingers.

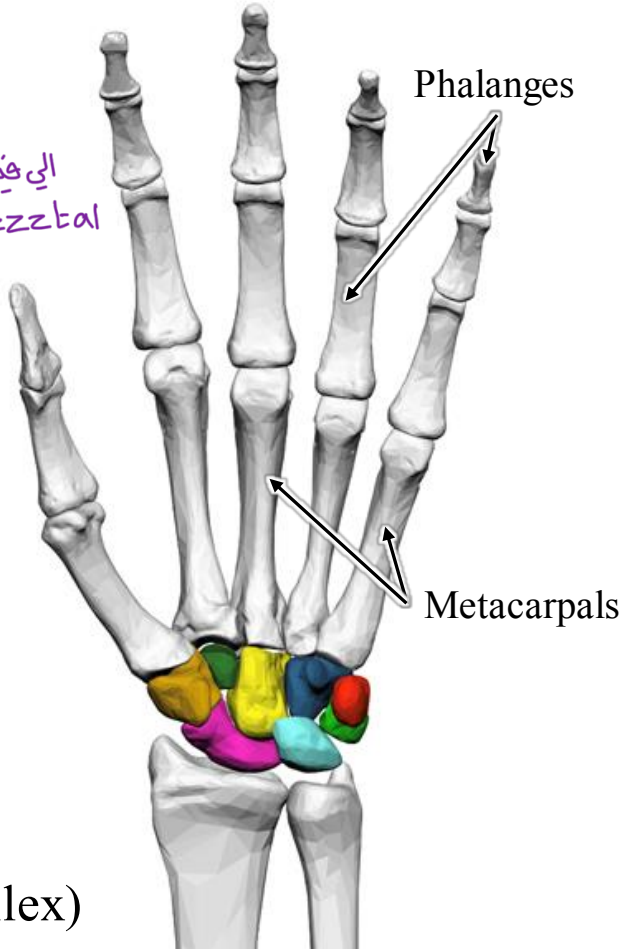


Fig.29: The bones of the wrist and hand.

The Lower Limb

- Each lower limb has 31 bones
- Two separate regions

1. The *pelvic girdle* witch attaches lower limbs to trunk → 1 hip bone on each side
2. The *free part (30 bones)*:

- 1 Femur (thigh)
- 1 Patella
- 1 Tibia + 1 Fibula (leg)
- 7 Tarsal bones
- 5 Metatarsals and 14 Phalanges (foot)

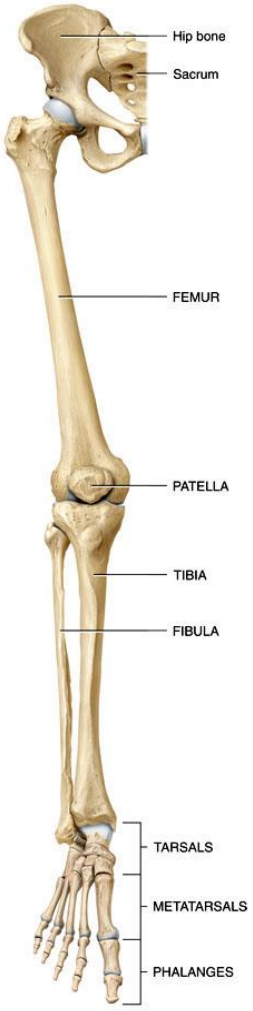


Fig.30: Anterior view of the lower limb bones.

The Hip (Coxal) Bone:

- Each hip bone consists of three bones that fuse together: ilium, pubis, and ischium
- The two hip bones are joined anteriorly at the pubic symphysis and they're joined posteriorly to the sacrum at the sacroiliac joints

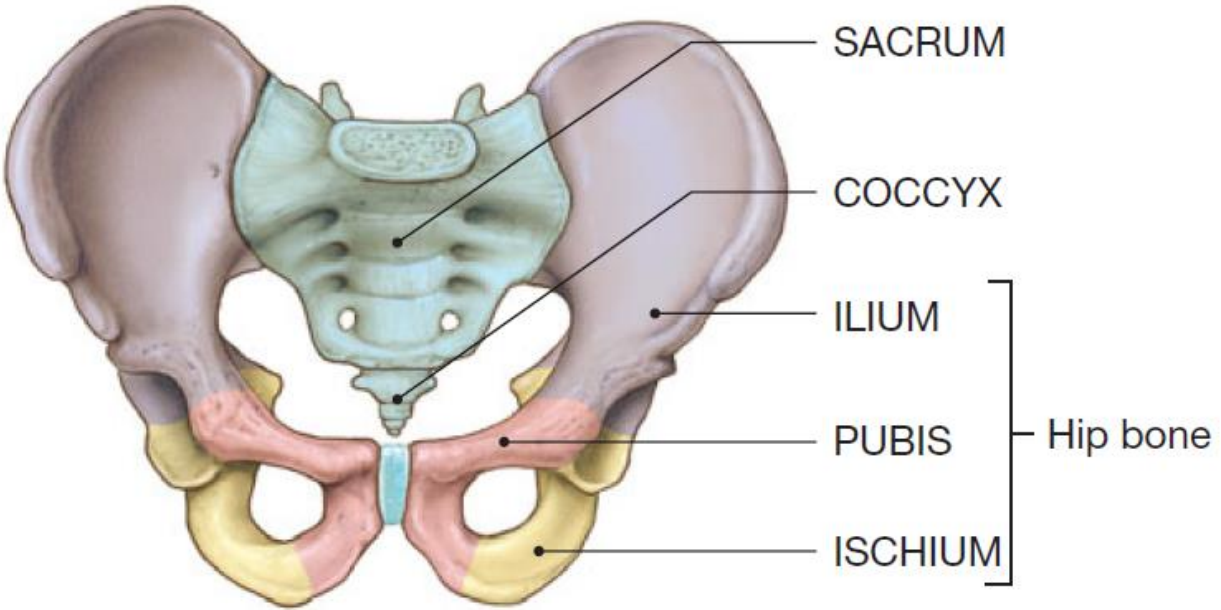


Fig.31: Anterior view of the pelvic girdle.

The Ilium:

- Largest and most superior of the three hip bones.
- Superior border - iliac crest. Possess a tubercle
- Has four prominent projections: the superior and inferior anterior and posterior iliac spines
- Greater sciatic notch is located between the posterior inferior iliac spine and the ischial spine. Through it pass the sciatic nerve

The Pubis:

- Pubis - inferior and anterior part of the hip bone
- The two pubic bones meet at the pubic symphysis. The angle below this joint is called the pubic arch

The Ischium:

- Ischium - inferior and posterior part of the hip bone
- Most prominent feature is the ischial tuberosity, it is the part that meets the chair when you are sitting
- Ischial spine – a prominent projection. Below the spine we have the lesser sciatic notch

- The 3 bones fuse at and participate in the formation of the acetabulum which is the site of articulation with the head of femur.
- The obturator foramen is bounded by the pubis and ischium. It's the largest foramen in the body.

- Differences exist between the male and female pelvis. The features of the female pelvis permit easier process of child birth.

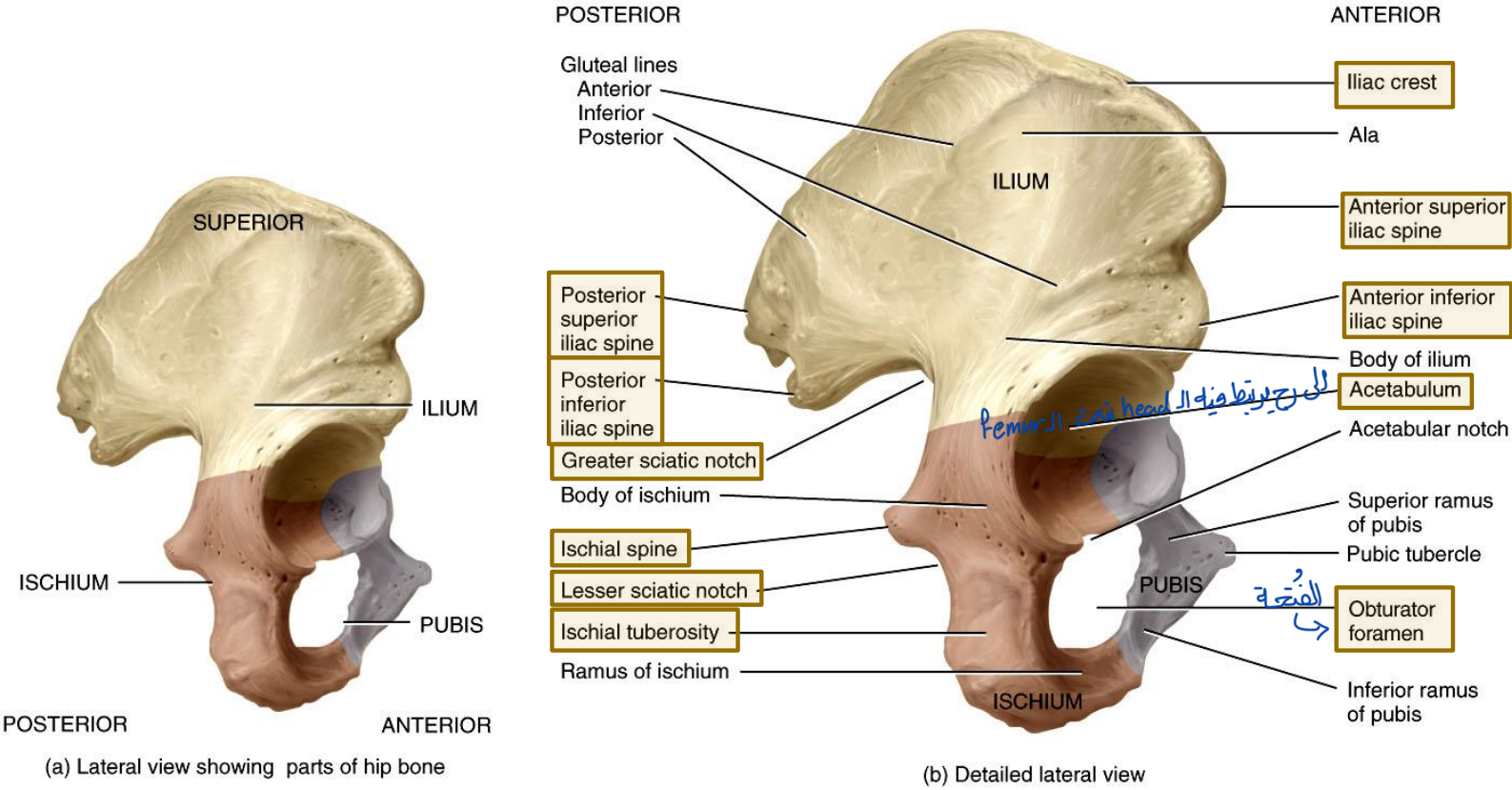


Fig.32: Features of the three pelvic bones.

The Femur:

- Femur - longest, heaviest, and strongest bone in the body
- **Proximal end**: Features a **head** witch articulates with the acetabulum to form the hip joint. The head has a small depression called the **fovea capitis** for attachment of a ligament. Distal to the head is the **neck** and distal to it are the **greater and lesser trochanters**.

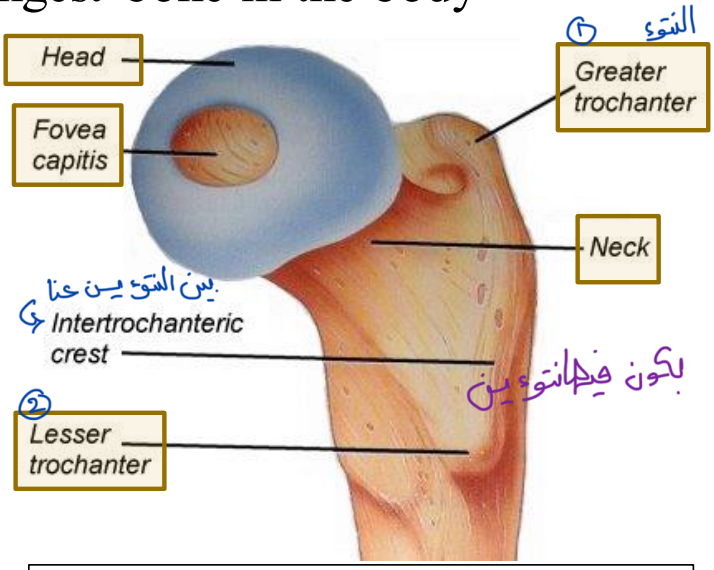
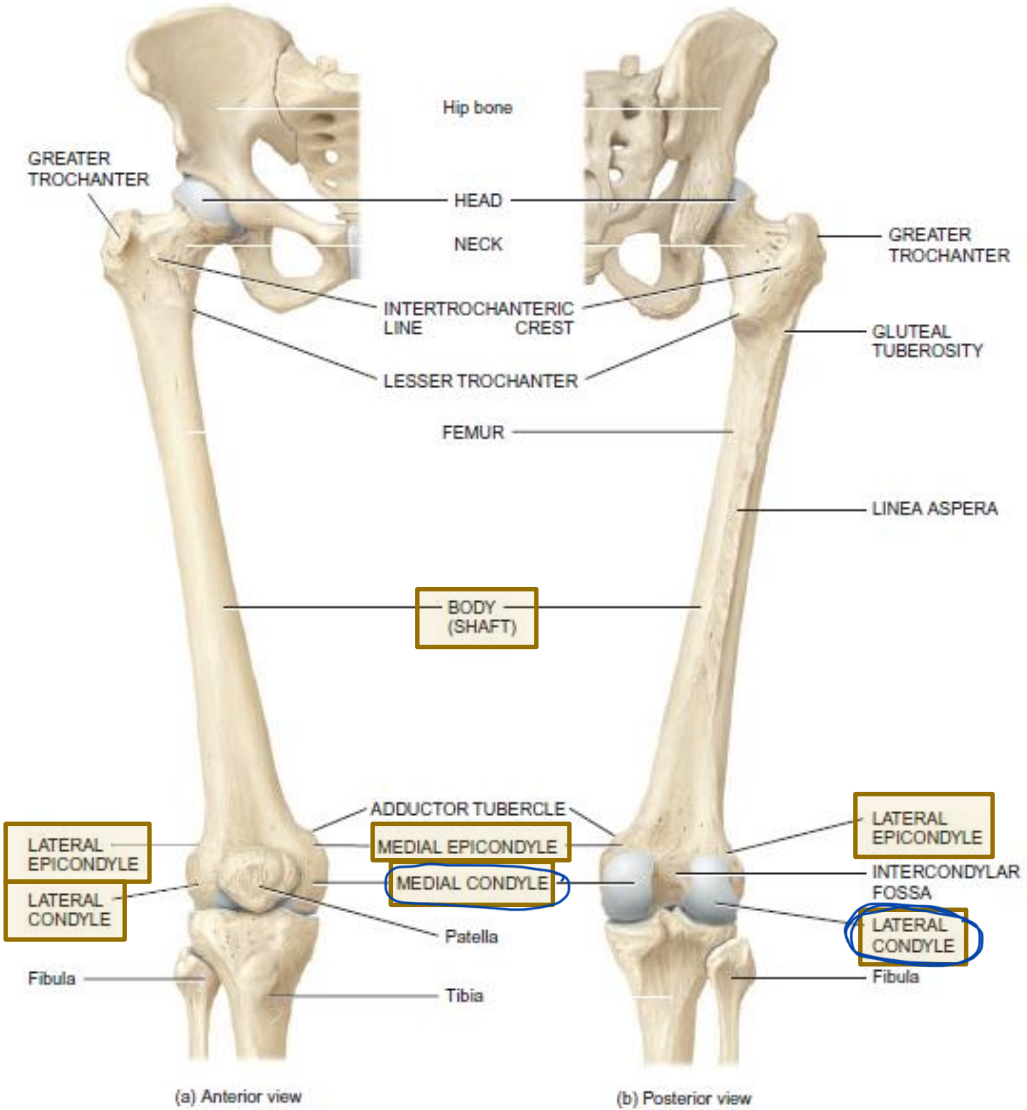


Fig.33: The proximal end of the femur.

- **Shaft**: for attachment of muscles.
- **Distal end**: Two **condyles** that articulate inferiorly with the tibia and anteriorly with the patella. Proximal to the condyles are the medial and lateral **epicondyles** for muscle attachment.

Fig.34: Features of the femur bone.



The Patella:

- Largest sesamoid bone in the body
- Forms the patellofemoral joint
- Triangular in shape. The base is superior. The narrow apex is inferior
- Increases the leverage of the quadriceps femoris muscle

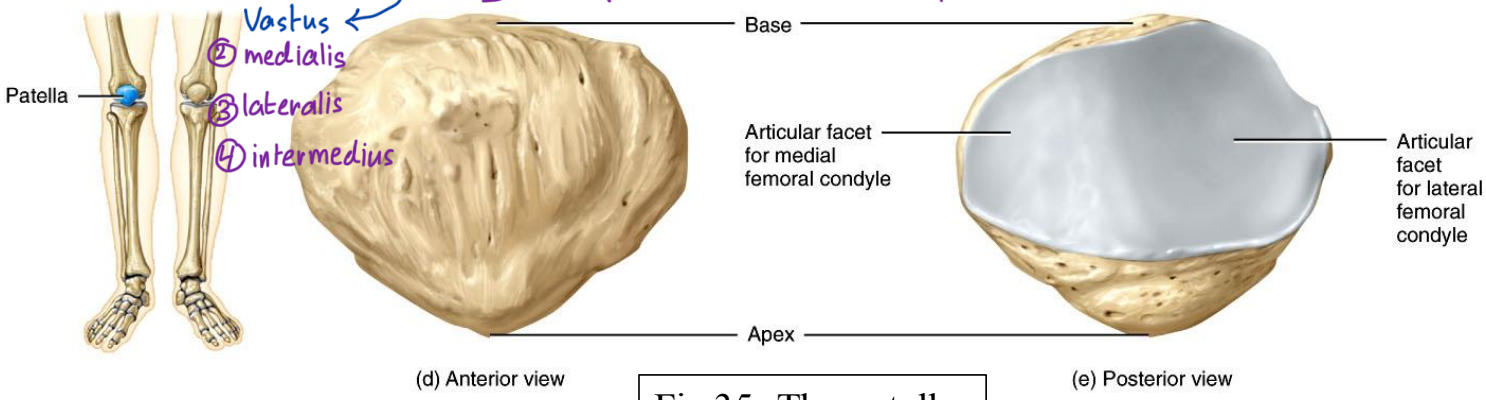


Fig.35: The patella.

The Tibia (Shin Bone):

The strongest bone in the lower limb

- The larger, medial weight-bearing bone of the leg
- **Proximal end**: The **lateral and medial condyles** on the superior surface which articulates with the condyles of the femur to form the knee joint.
- **Shaft**: Exhibits the **tibial tuberosity** for attachment of the patellar ligament. The lateral border of the shaft is the sharp **interosseous border**.
- **Distal end**: It articulates distally with the talus at the ankle joint. Features the **medial malleolus**.

The Fibula:

- The smaller, laterally placed bone of the leg
- Non-weight bearing. Serve for muscle attachment
- Shaft – medial interosseous border
- Distal end, articulates with the tibia and the talus. Features the lateral malleolus.

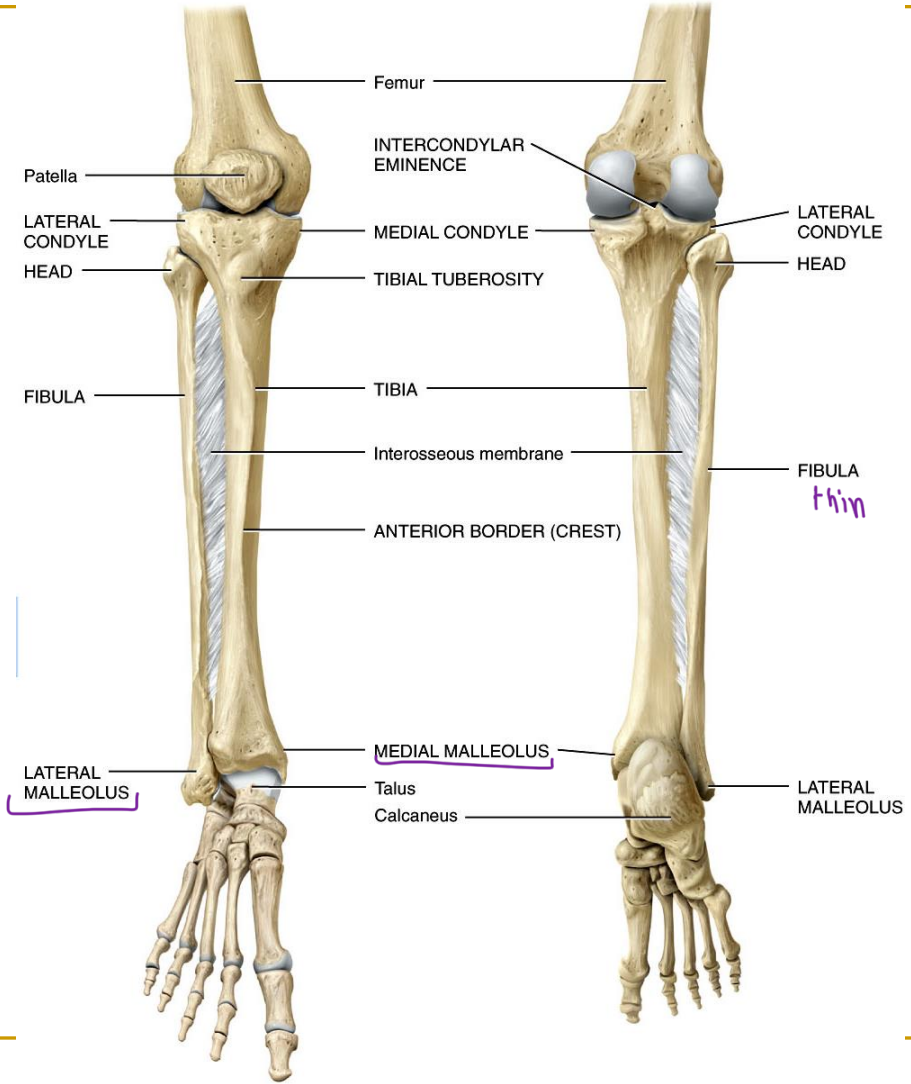
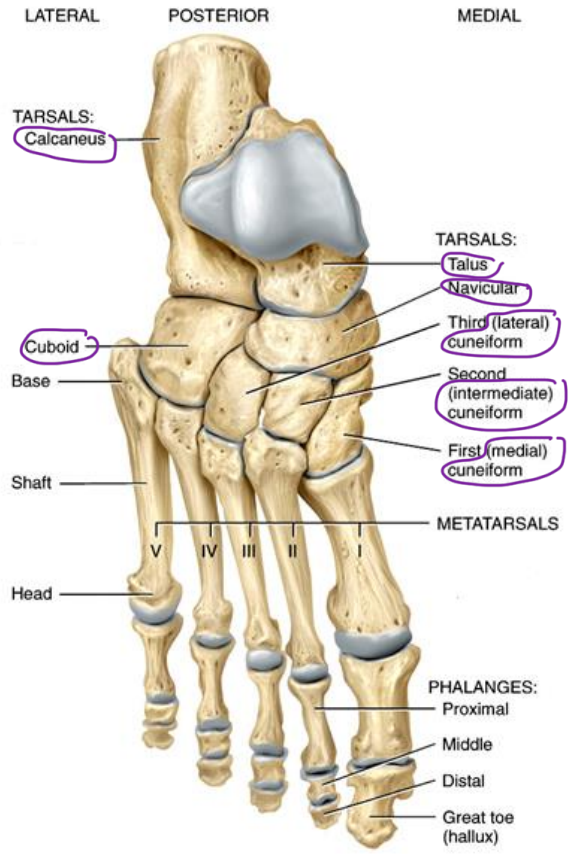


Fig.36: The tibia and fibula.

The Skeleton of the Foot:

- Seven tarsal bones - talus (articulates with tibia and fibula), calcaneus (the heel bone, the largest and strongest tarsal bone), navicular, cuboid and three cuneiforms
- Five metatarsals
- 14 phalanges - two in the big toe (hallux) and three in each of the other toes
- Two longitudinal and one transverse arches support the weight of the body and assist in walking. When the arches decrease, we'll have a flat foot.



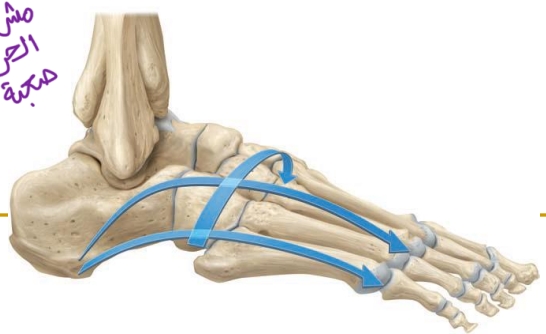


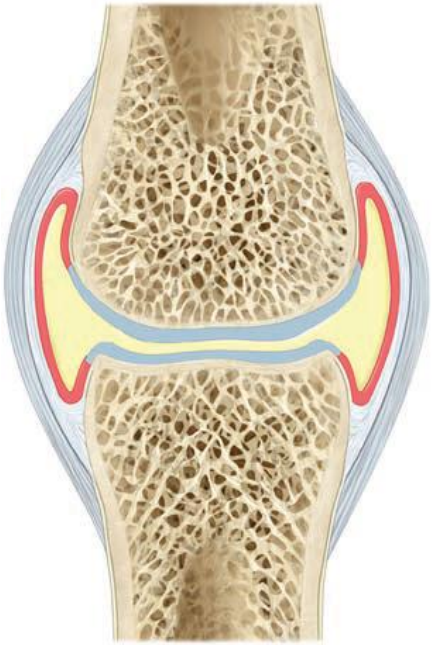
Fig.37: Above: bones of the ankle and foot. Left: arches of the foot.

المفاصل

Joints

هو ما في bone بتتصل مع bone الا للزوم يكون في Joint

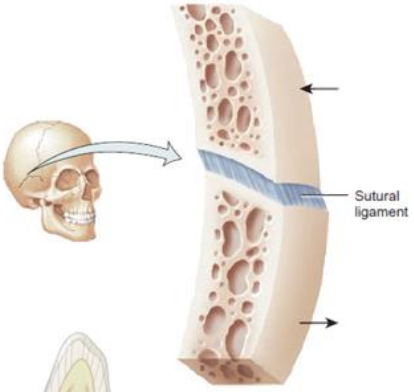
عنا 3 types من الـ Joints

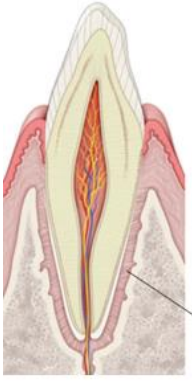


Joints are sites where two or more bones meet

1 Fibrous Joints:

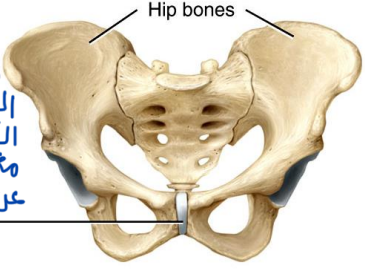
- Bones are held together by dense collagenous irregular connective tissue with no cavity. Example: (1) Sutures between most skull bones and (2) Gomphoses in which a cone-shaped peg fits into a socket (like joints between teeth and their sockets).





2 Cartilaginous Joints:

- Bones are held together by cartilage with no cavity. Symphyses are joints in which articulating bones are covered by hyaline cartilage with a disc of fibrocartilage between the bones. Example: symphysis pubis and the intervertebral joints.



③ Synovial Joints:

1) A ***synovial cavity*** allows the joint to be freely movable.
2) Articular surfaces of bones are covered by hyaline ***articular cartilage***.
3) Surrounded by ***articular capsule*** which is formed of an outer fibrous capsule and an inner synovial membrane.
4) The cavity contains ***synovial fluid*** secreted by the synovial membrane. This fluid (1)lubricates the joint, (2)absorbs shocks, and (3)maintain the cartilage.

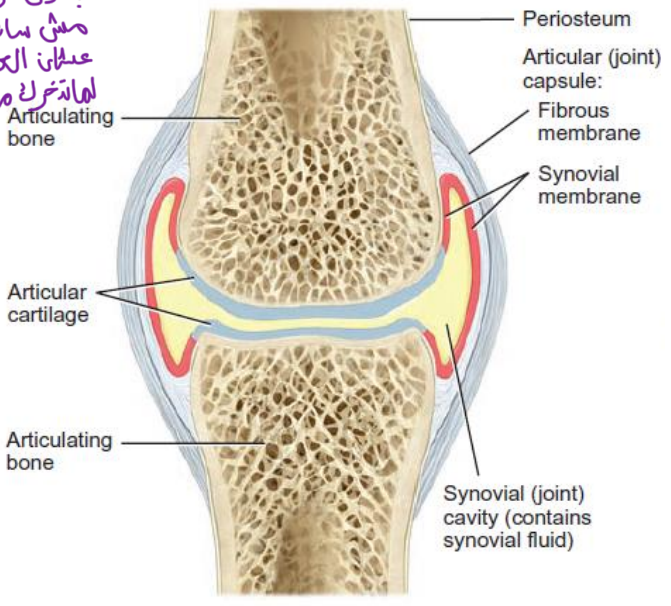


Fig.38: Features of synovial joints.

5) ***Ligaments and articular discs***

6) ***Nerve and Blood Supply***

- Branches from different arteries anastomose around a joint to ensure sufficient blood supply to the joint.

7) ***Bursae and Tendon Sheaths***

- Bursae
  - Sac-like structures containing fluid similar to synovial fluid
  - Located between tendons, ligaments and bones
  - Cushion the movement of these body parts
- Tendon sheaths
  - Tube-like bursae that wrap around tendons
  - Reduce friction at joints

Types Synovial Joints:

عناك أنواع كل واحد منهم مطلوب تعرفوا عنه ؟
* الأمثلة عليه
* طبيعة الحركة تبعته

- Synovial joints are classified according to type of movement and the shape of the articulating bones into:

1) Planar Joints

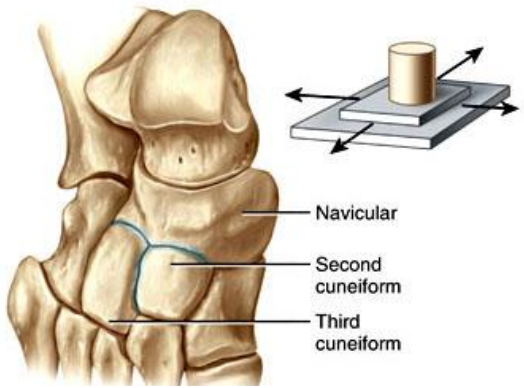
سطحي

(ازاحة) Primarily طبيعة الحركة تبعته

هون بس وانت مكانك بتعمل ازاحة لا بتطلع ولا بتنزل

- Primarily permit gliding movements.
- Intercarpal joints.

المثال



لم نستخدم بناءً على الحركة نتحكم اذا الـ bones كيف راكبة على بعض

2) Hinge Joints

طبيعة الحركة تبعته Flexion & extension

- Produce an opening and closing motion like that of a hinged door.
- Permit only flexion and extension.
- Knee, elbow, and the interphalangeal joints.

شكلها زي إيد الباب

المثال

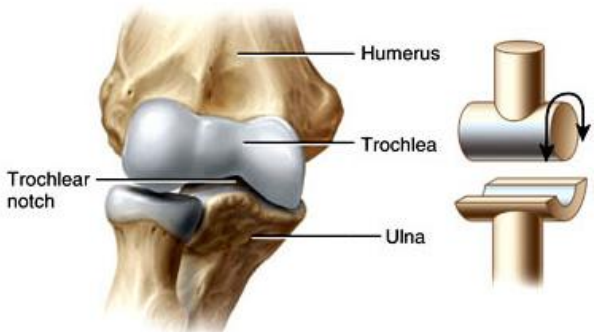


Fig.39: Planar (top) and hinge (bottom) joints.

3) Pivot Joints

- Surface of one bone articulates with a ring formed partly by another bone.
- Only rotation can occur
- Altlantoaxial and radioulnar joints

4) Condyloid Joints

- Oval projection of one bone fits into the oval-shaped depression of another bone.
- Flexion, extension, abduction and adduction are allowed
- Wrist

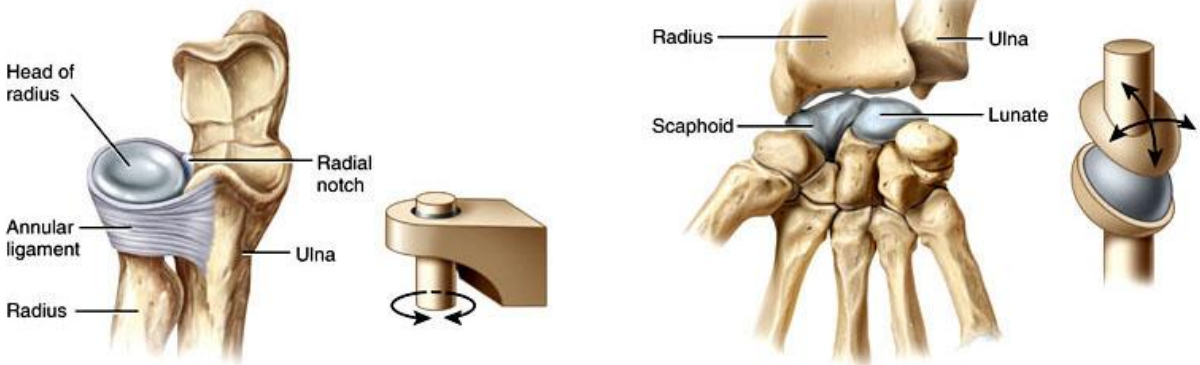


Fig.40: Pivot (left) and condyloid (right) joints.

5) Saddle Joints

- Articular surface of one bone is saddle-shaped, and the articular surface of the other bone fits into the "saddle"
- Flexion, extension, abduction and adduction الحركات
- Carpometacapal joint of the thumb

6) Ball-and-Socket Joints

- Ball-like part of one bone fitting into a cup-like depression of another bone Range of mov. كبير عالي
- الحركة Flexion, extension, abduction, adduction, circumduction and rotation are allowed
- مثال Shoulder and hip

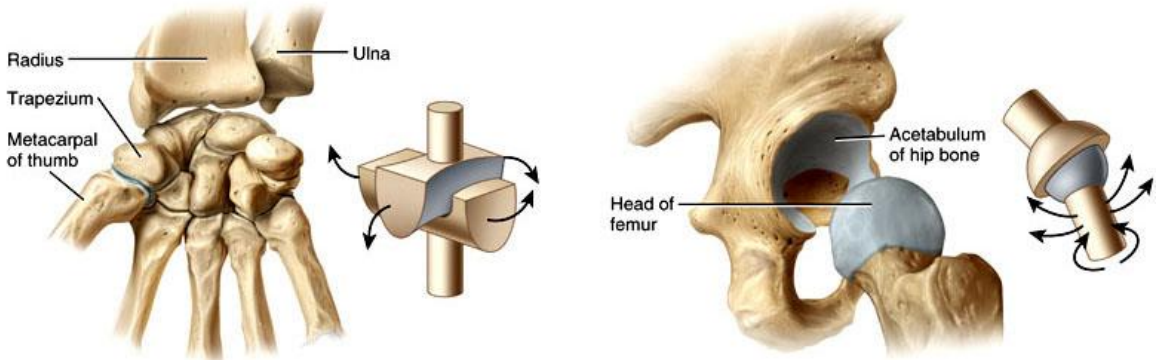


Fig.41: Saddle (left) and ball-and-socket (right) joints.

The Shoulder (Glenohumeral) Joint:

- Synovial ball-and-socket joint formed by the head of the humerus and glenoid cavity of the scapula
- **Movements**: Flexion, extension, abduction, adduction, circumduction, and medial and lateral rotation.

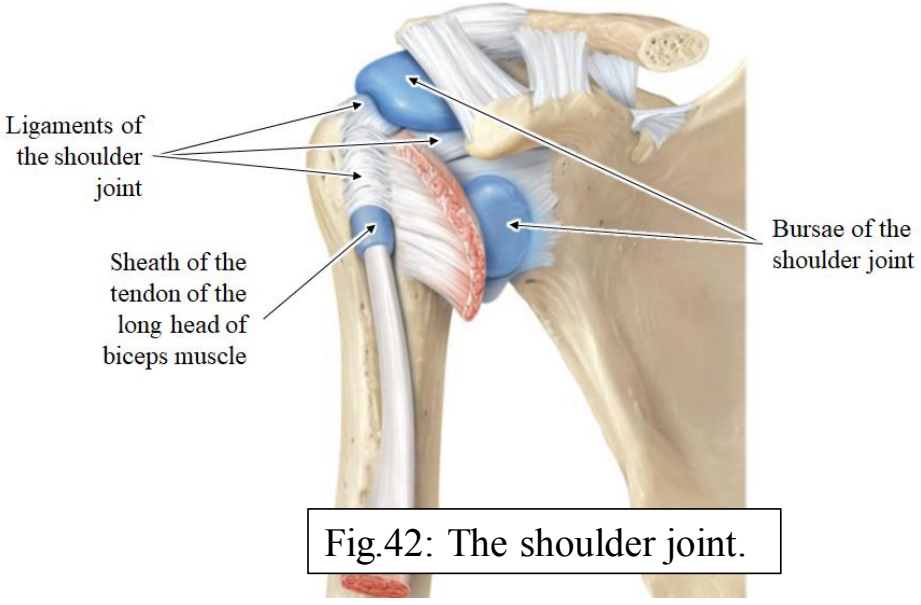


Fig.42: The shoulder joint.

- ***More freedom of movement than any other joint of the body which comes at the expense of stability***
- **Rotator Cuff**: a group of muscles that surrounds and stabilizes the shoulder joint. They keep the head of humerus in position.

4 muscles عبارة عن هم :- ① supraspinatus ② Infraspinatus ③ subscapularis ④ Teres minor هاي بتجي تحت الـ subscapularis

scapular بتحت Glenoid cavity داخل Humerus تبع Head بتشوا الـ muscles الـ تبع هدول Ligaments الـ الأربطة

The Hip (Coxal) Joint:

- Synovial ball-and-socket joint formed by the head of the femur and the acetabulum of the hip bone.
- A very stable joint on the expense of decreasing range of movement.
- Movements: Flexion, extension, abduction, adduction, circumduction, and medial and lateral rotation.

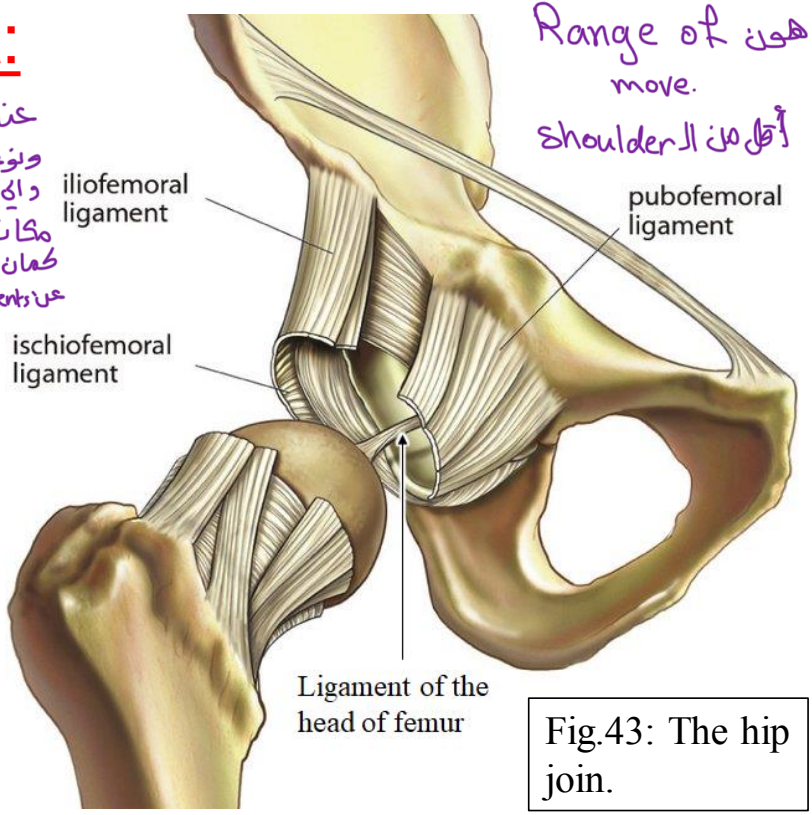


Fig.43: The hip join.

- Ligaments outside the joint help stabilize it. The *ligament of the head of femur* is found within the joint and keep the head of the femur in its place inside the acetabulum.

The Knee Joint:

- Synovial modified-hinge joint formed by the femur, tibia and patella.
- Movements: Flexion, extension, and slight medial and lateral rotation of the leg when flexed.
- Ligaments outside and inside the joint help stabilize it.
- Menisci: Two fibrocartilage discs between the tibial and femoral condyles help compensate for the irregular shapes of the bones.

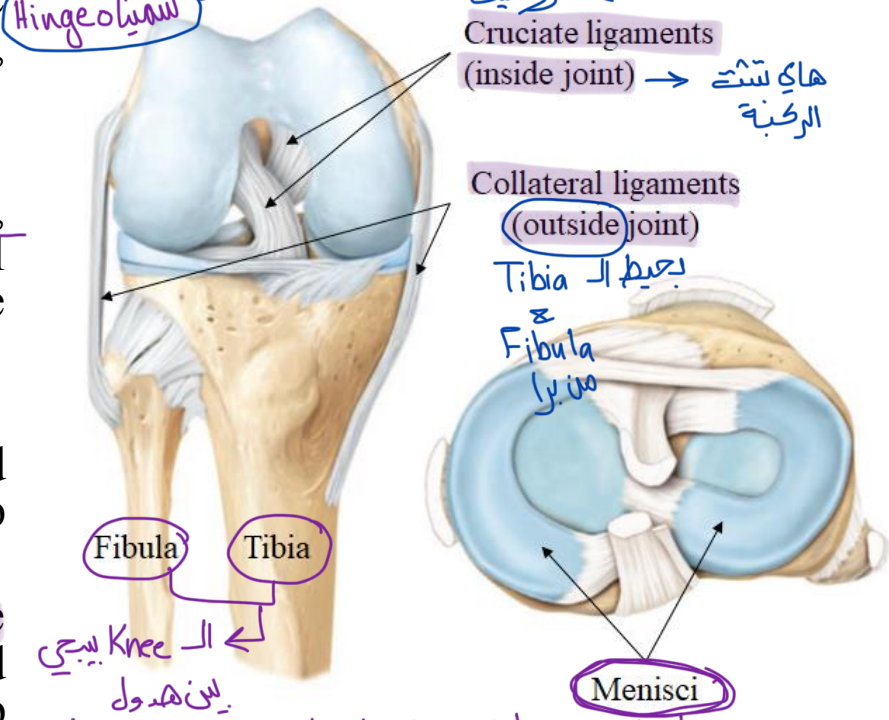


Fig.44: Knee joint: ligaments and menisci.