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الجامعة الهاشمية

MUSCULOSKELETAL SYSTEM

The Axial Skeleton
The Skull

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Lecture 1 – Axial Skeleton - Skull

1. Introduction to Skeletal System
2. Describe the general features of skull
3. Describe the feature of Norma Frontalis (anterior view) of skull
4. Describe the features of Norma Verticalis (superior view) of skull
5. Describe the features of Norma Lateralis (lateral view) of Skull
6. Describe the features of the skull of newborn baby

Divisions of the Skeletal System

- The human skeleton consists of ***206 named 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.

Bones of the Human Body

The Bones of the Adult Skeletal System

DIVISION OF THE SKELETON	STRUCTURE	NUMBER OF BONES
Axial Skeleton		
	Skull	
	Cranium	8
	Face	14
	Hyoid	1
	Auditory ossicles	6
	Vertebral column	26
	Thorax	
	Sternum	1
	Ribs	24
		Subtotal = 80
Appendicular Skeleton		
	Pectoral (shoulder) girdles	
	Clavicle	2
	Scapula	2
	Upper limbs	
	Humerus	2
	Ulna	2
	Radius	2
	Carpals	16
	Metacarpals	10
	Phalanges	28
	Pelvic (hip) girdle	
	Hip, pelvic, or coxal bone	2
	Lower limbs	
	Femur	2
	Patella	2
	Fibula	2
	Tibia	2
	Tarsals	14
	Metatarsals	10
	Phalanges	28
		Subtotal = 126
		Total in an adult skeleton = 206

Bones of the Skull

- Skull (cranium)
- Consists of 22 bones
- Bones of the skull are grouped into two categories:
  - **Cranial bones (Neurocranium)**
    - Eight cranial bones form the cranial cavity
      - Frontal bone, two parietal bones, two temporal bones, the occipital bone, the sphenoid bone, ethmoid bone
  - **Facial bones (Viscerocranium)**
    - Fourteen facial bones form the face
      - Two nasal bones, two maxillae, two zygomatic bones, the mandible, two lacrimal bones, two palatine bones, two inferior nasal conchae, vomer

The Skull

Unique Features of the Skull

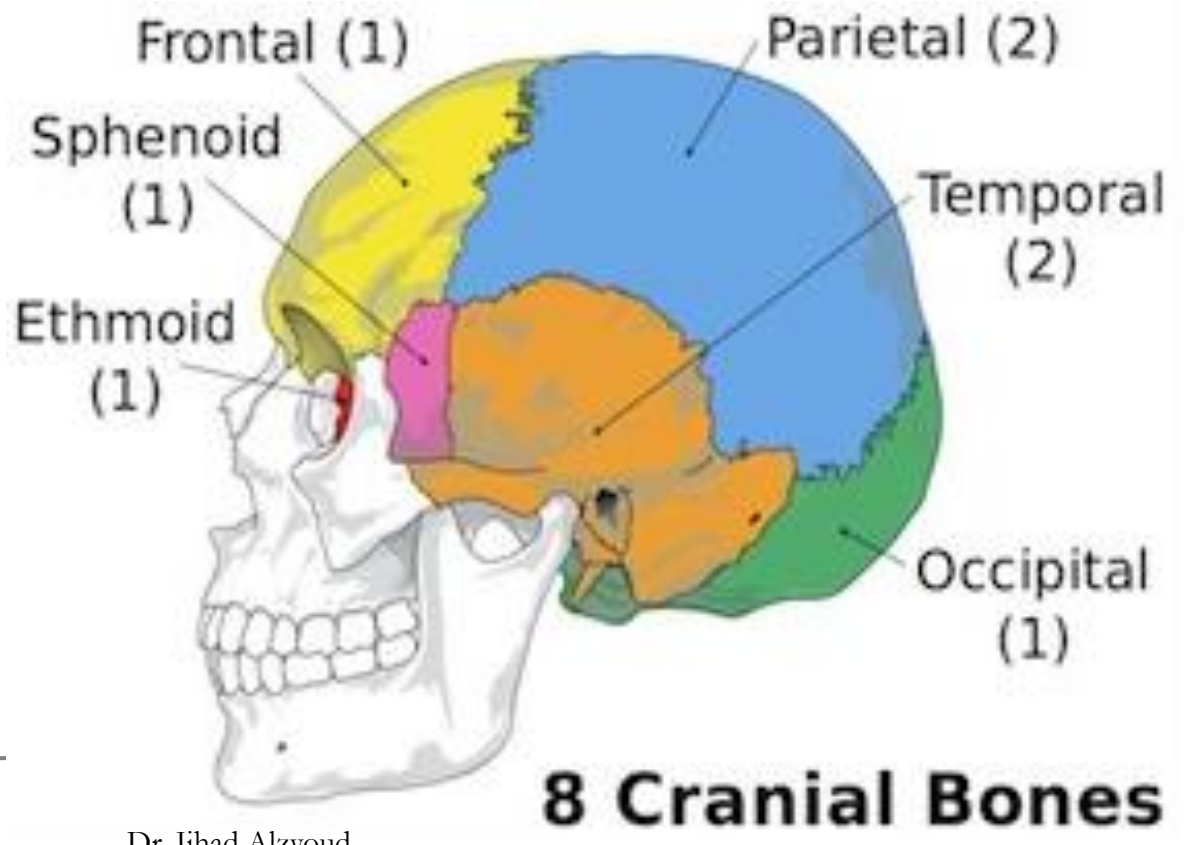
- Sutures, Paranasal sinuses, Fontanels

- **Sutures**
  - An immovable fibrous joints that holds most skull bones together
- **Paranasal Sinuses**
  - Cavities within cranial and facial bones near the nasal cavity
  - Secretions produced by the mucous membranes which line the sinuses, drain into the nasal cavity
  - Serve as resonating chambers that intensify and prolong sounds
- **Fontanels**
  - At birth, areas of unossified tissue, commonly called “soft spots” link the cranial bones
  - 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
  - Postnatal growth.

Bones of the Skull

The **cranium** consists of the following bones, two of which are paired

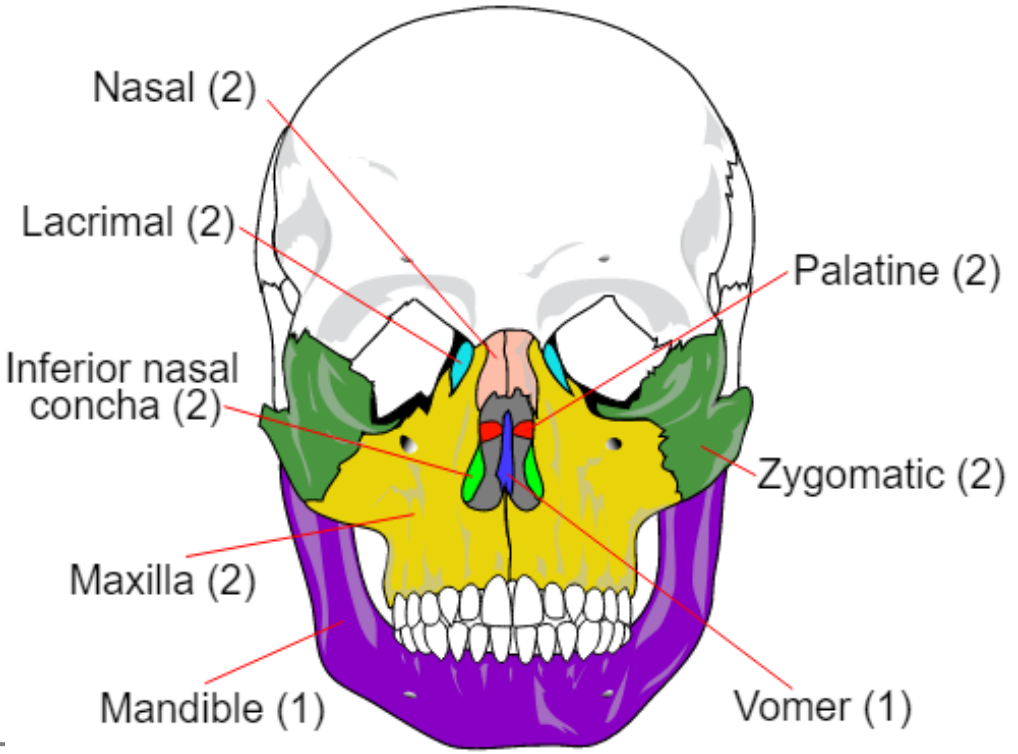
1. Frontal bone: 1
2. **Parietal bones: 2**
3. Occipital bone: 1
4. **Temporal bones: 2**
5. Sphenoid bone: 1
6. Ethmoid bone: 1



Bones of the Skull

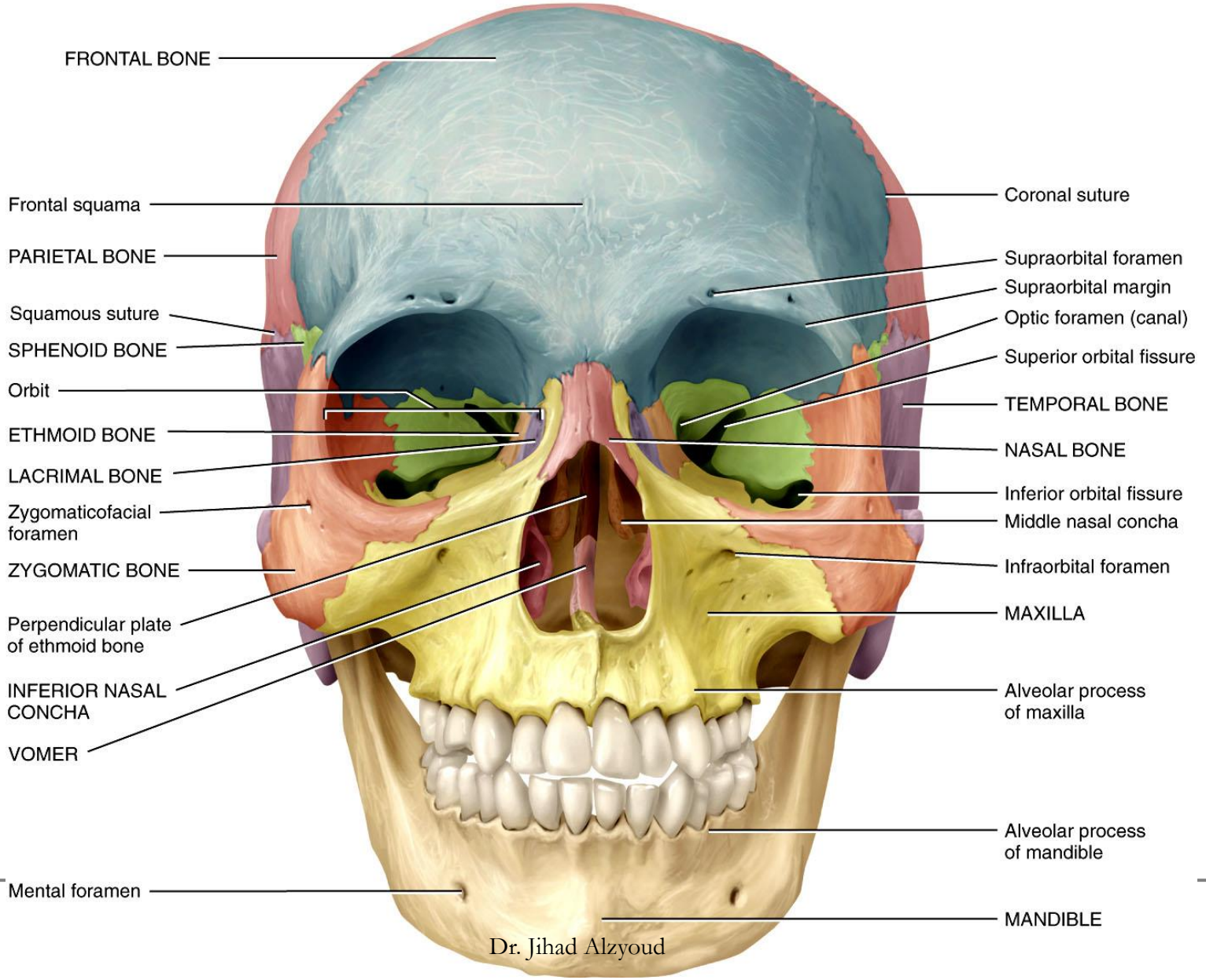
The **facial bones** consist of the following, two of which are single:

1. Zygomatic bones: 2
2. Maxillae: 2
3. Nasal bones: 2
4. Lacrimal bones: 2
5. **Vomer: 1**
6. Palatine bones: 2
7. Inferior nasal conchae: 2
8. **Mandible: 1**



14 facial bones

Norma Frontalis Anterior View



Norma Frontalis Anterior View

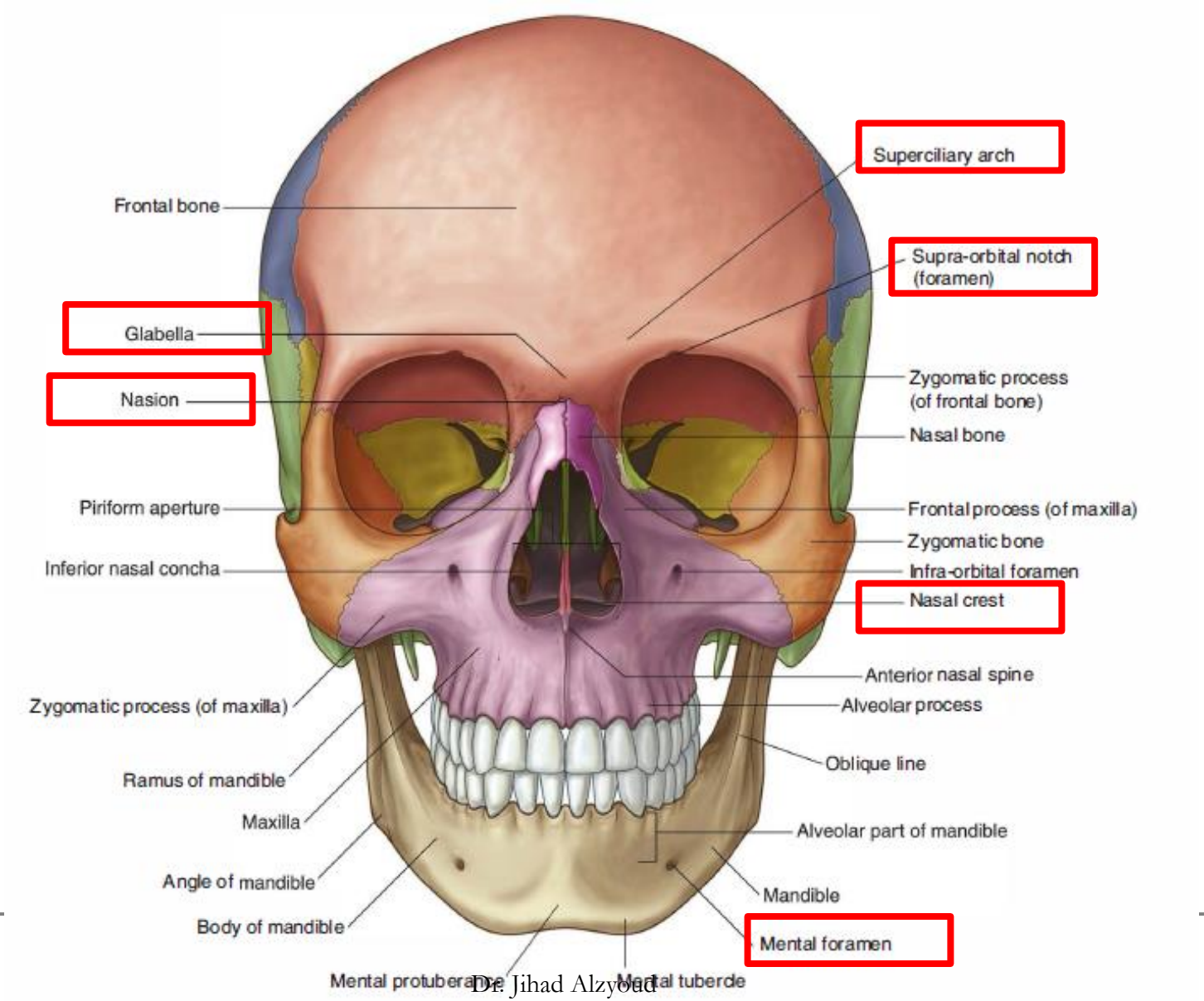
- **Frontal Bone**
  - Single cranial bone = forehead
  - Paranasal sinuses
  - Superior, lateral and medial parts of orbital rim
  - Superciliary arches (M&F)
  - **Glabella**
  - Supra-orbital foramen (supra-orbital notch)
  1. Supra-orbital Nerve - Ophthalmic Nerve - Trigeminal N
  2. Supra-orbital Artery - Ophthalmic Artery - Internal Carotid A
  - Zygomatic process
  - Frontonasal suture **Nasion**
- **The orbital margins**
  - Frontal bone superiorly
  - Zygomatic bone laterally (Frontal bone)
  - Maxilla inferiorly
  - Processes of the maxilla and frontal bone medially

Norma Frontalis Anterior View

- **Nasal Bones**
  - Form the bridge of the nose
  - The center of the frontonasal suture is the **nasion**.
  - Laterally, articulates with the frontal process of each maxilla.
  - **Piriform aperture (Nasal and Maxilla)**

- **Zygomatic bones**
  - Paired cranial bone
  - Commonly called cheekbones (prominences of the cheeks)
  - The lower lateral and the inferior rim (Lateral part) of the orbit
  - Temporal process of the Zygomatic bone (Zygomatic Arch)
  - Zygomaticofacial and Zygomaticotemporal foramina
    1. Zygomaticofacial N – Maxillary N - Trigeminal N
    2. Zygomaticotemporal N– Maxillary N - Trigeminal N

Norma Frontalis Anterior View



Norma Frontalis Anterior View

- **Maxillae**
  - Paired Facial bone
  - Upper jawbone
  - Alveolar Process
  - Inferior and medial rims of the orbit.
  - **Anterior nasal spine**
  - Infra-orbital foramen
    - Infra-orbital N - Maxillary N - Trigeminal N
    - Infra-orbital Artery - Maxillary A – External Carotid A
  - Maxillary paranasal sinus a large, pyramid-shaped

- **Anterior nasal aperture**

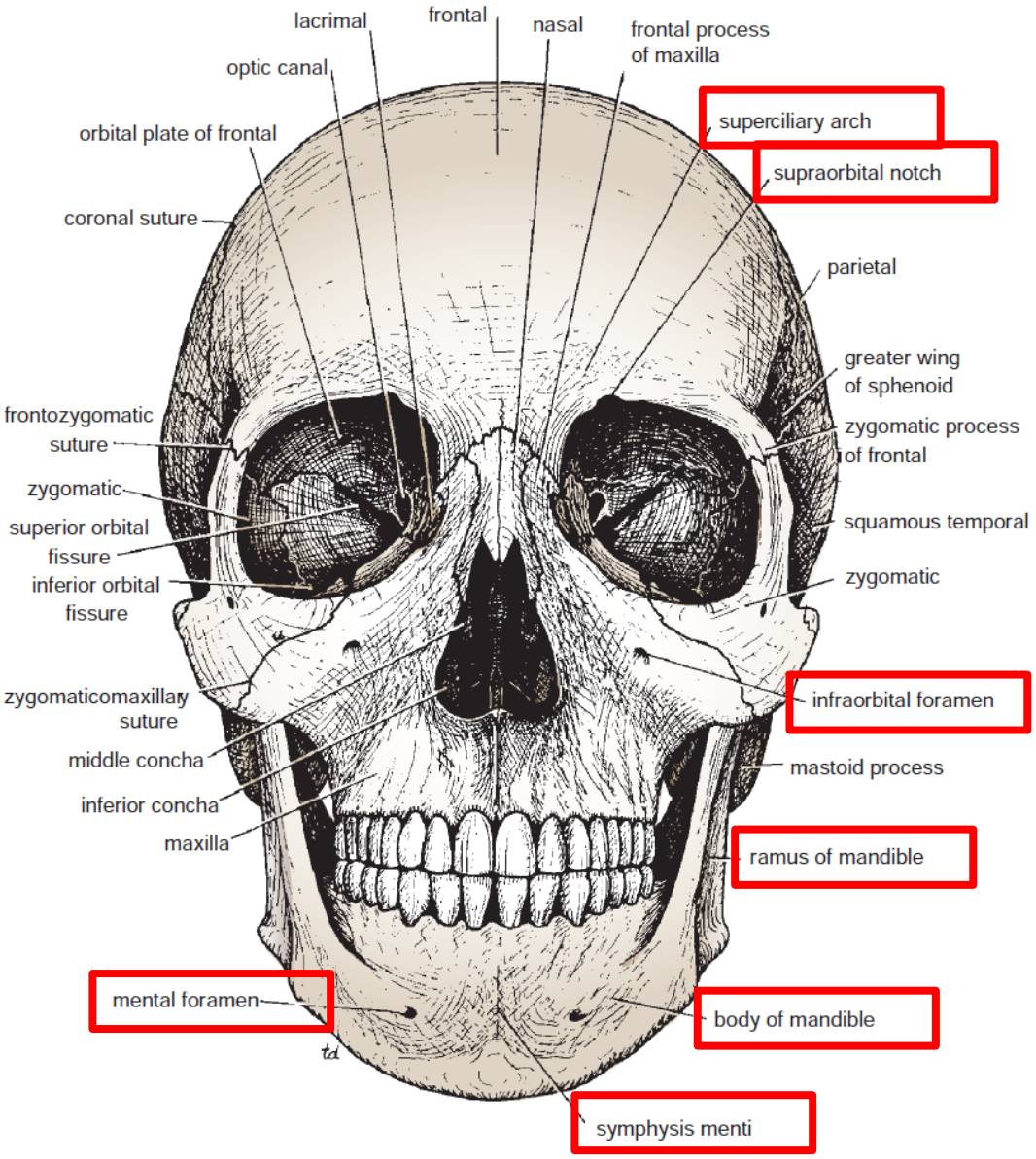
Norma Frontalis Anterior View

- **Inferior Nasal Conchae**
  - Paired Facial bone
  - Form a part of the inferior lateral wall of the nasal cavity
- **Vomer**
  - Single Facial bone
  - The inferior portion of the nasal septum
  - Nasal Crests

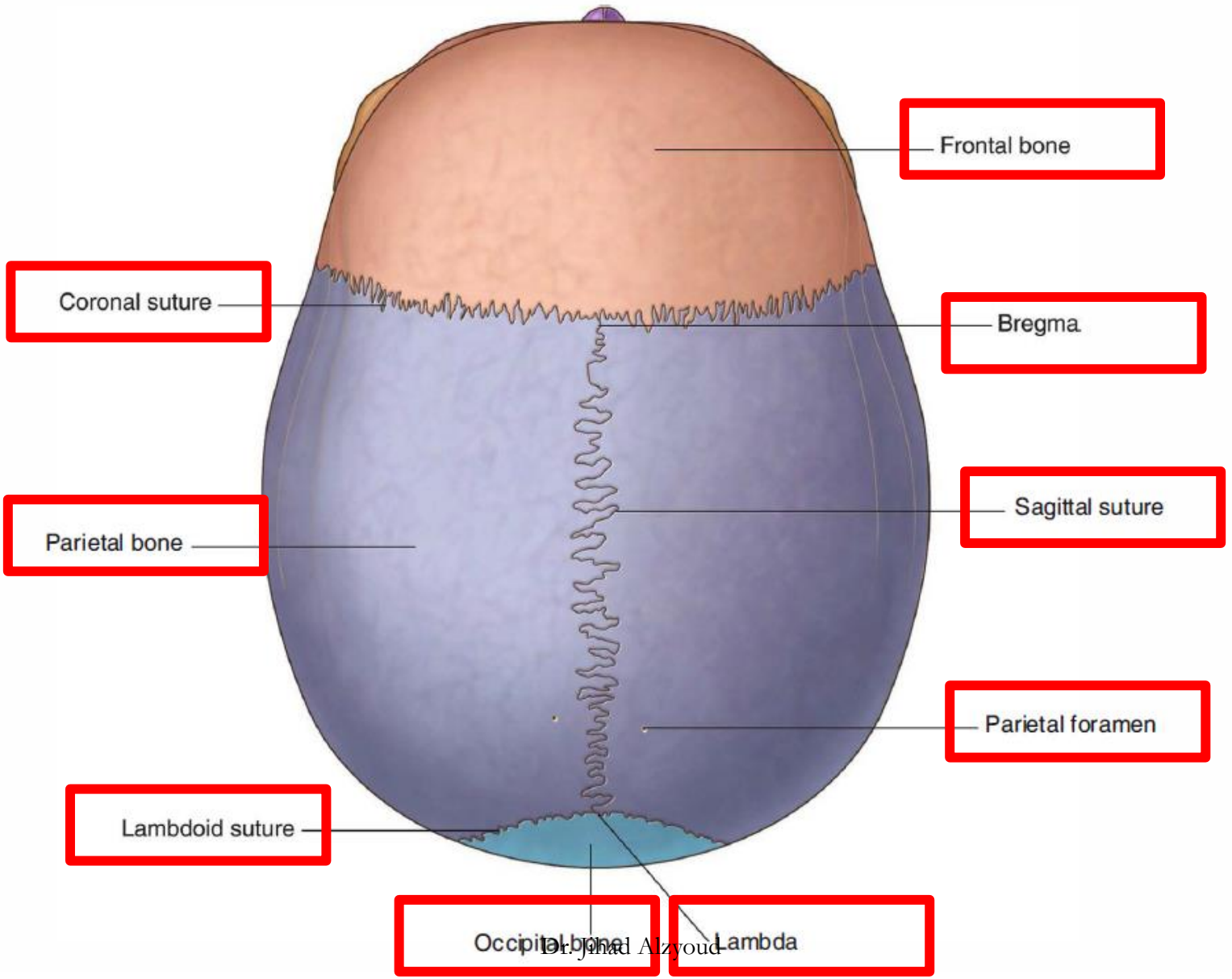
Norma Frontalis Anterior View

- **Mandible**
  - Single Facial bone = lower jawbone
  - The largest, strongest, movable facial bone
  - Alveolar process (carry lower teeth)
  - Body anteriorly (base and alveolar parts)
  - Ramus posteriorly
  - Angle (Ramus and Body)
  - Mental protuberance
  - Mental tubercle
  - Symphysis menti
  - Mental Foramen: second premolar tooth
    - Mental N – Mandibular N – Trigeminal N
    - Mental A – Maxillary A – External Carotid A
  - Oblique line: Muscles attachment

Norma Frontalis Anterior View



Norma Verticalis Superior View



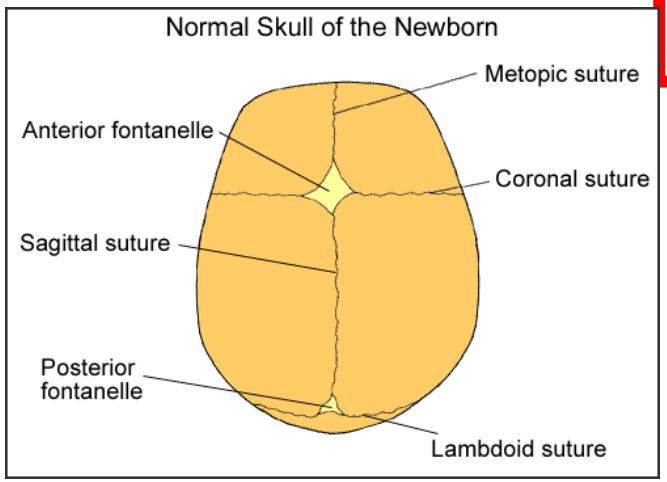
Norma Verticalis Superior View

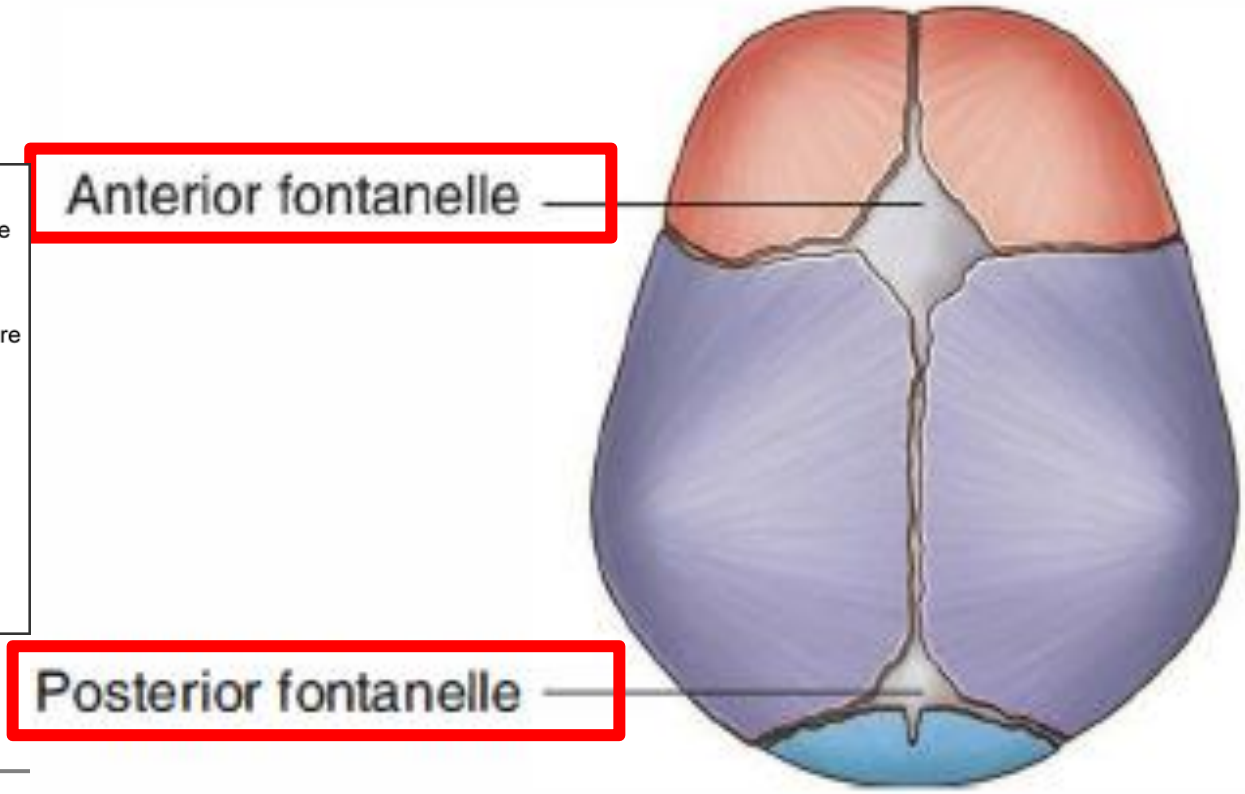
- The **Calvaria** (**skullcap**)

- The bones making up the **calvaria** are unique in their structure (**Flat Bone**), consisting of dense internal and external tables of **compact bone** separated by a layer of **spongy bone** (**the diploe**)
- **The bregma:** The junction of the sagittal and coronal sutures
- **The lambda:** The junction of the sagittal and lambdoid sutures
- **Metopic suture:** the two halves of the frontal bone fail to fuse
- **Parietal foramina:** emissary veins (inconstant)

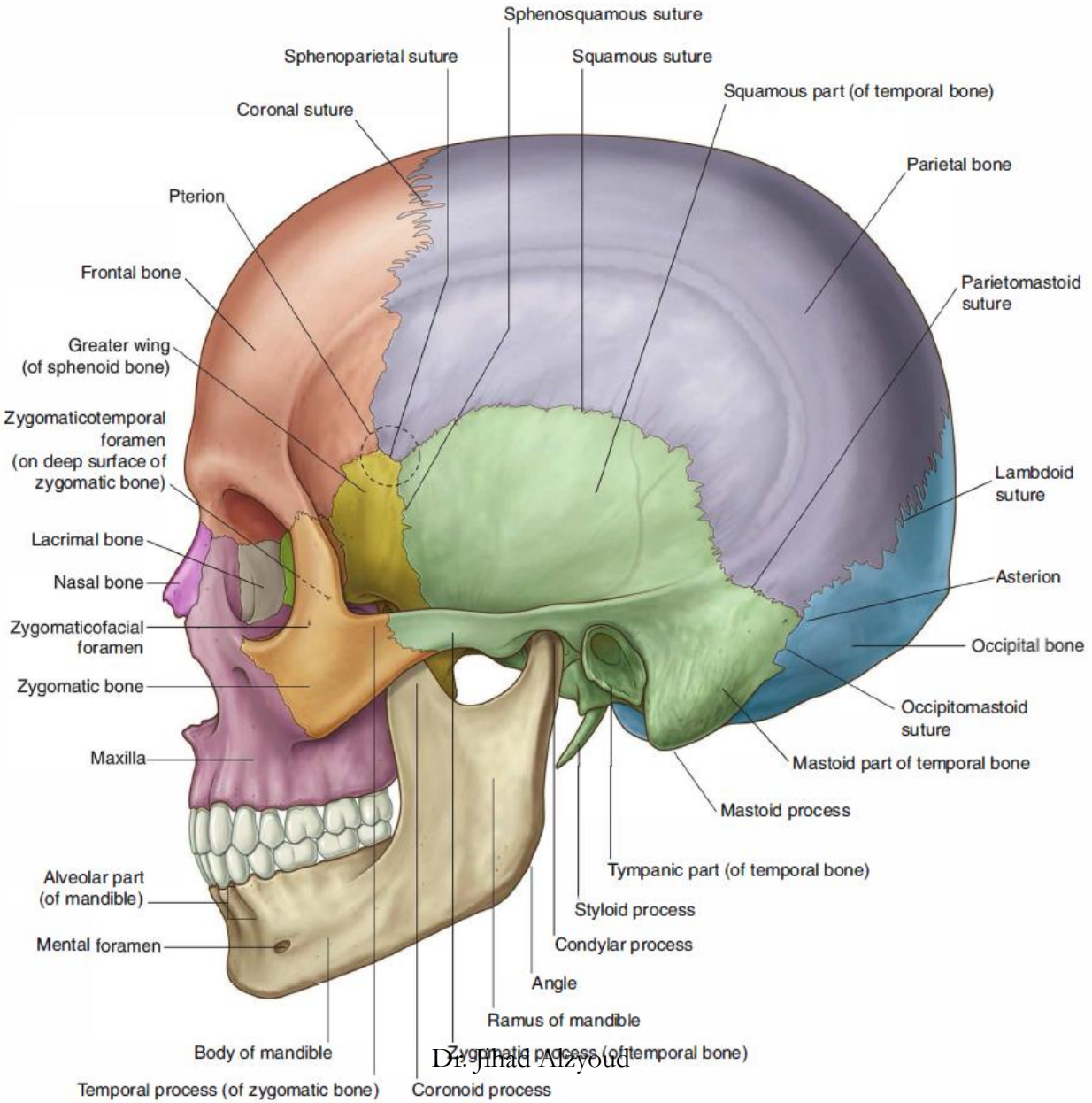
Norma Verticalis Superior View / Newborn

Fontanelles are large membranous and unossified gaps between the bones of the skull of the fetus and newborn, particularly flat bones of Skullcap





Norma Lateralis Lateral View



Norma Lateralis Lateral View

- Bones forming the lateral portion of **the calvaria** include the **frontal, parietal, occipital, sphenoid, and temporal bones.**
- Bones forming the visible part of the **facial skeleton** include the **nasal**, **maxilla**, and **zygomatic bones**.
- The **mandible** forms the visible part of the **lower jaw**
- The junction where the frontal, parietal, sphenoid, and temporal bones are in proximity is the **pterion**.
- The clinical consequences of a skull fracture: The bone in this area is thin and overlies **the anterior division of the middle meningeal artery**, which can be torn by a skull fracture in this area, resulting in an **extradural hematoma**.

Norma Lateralis Lateral View

- **The frontal bone** forms the anterior part of the side of the skull and articulates with the parietal bone at the coronal suture
- **The parietal bones** form the sides and roof of the cranium
  1. Articulate with each other in the midline at the sagittal suture.
  2. Articulate with the occipital bone behind, at the lambdoid suture.

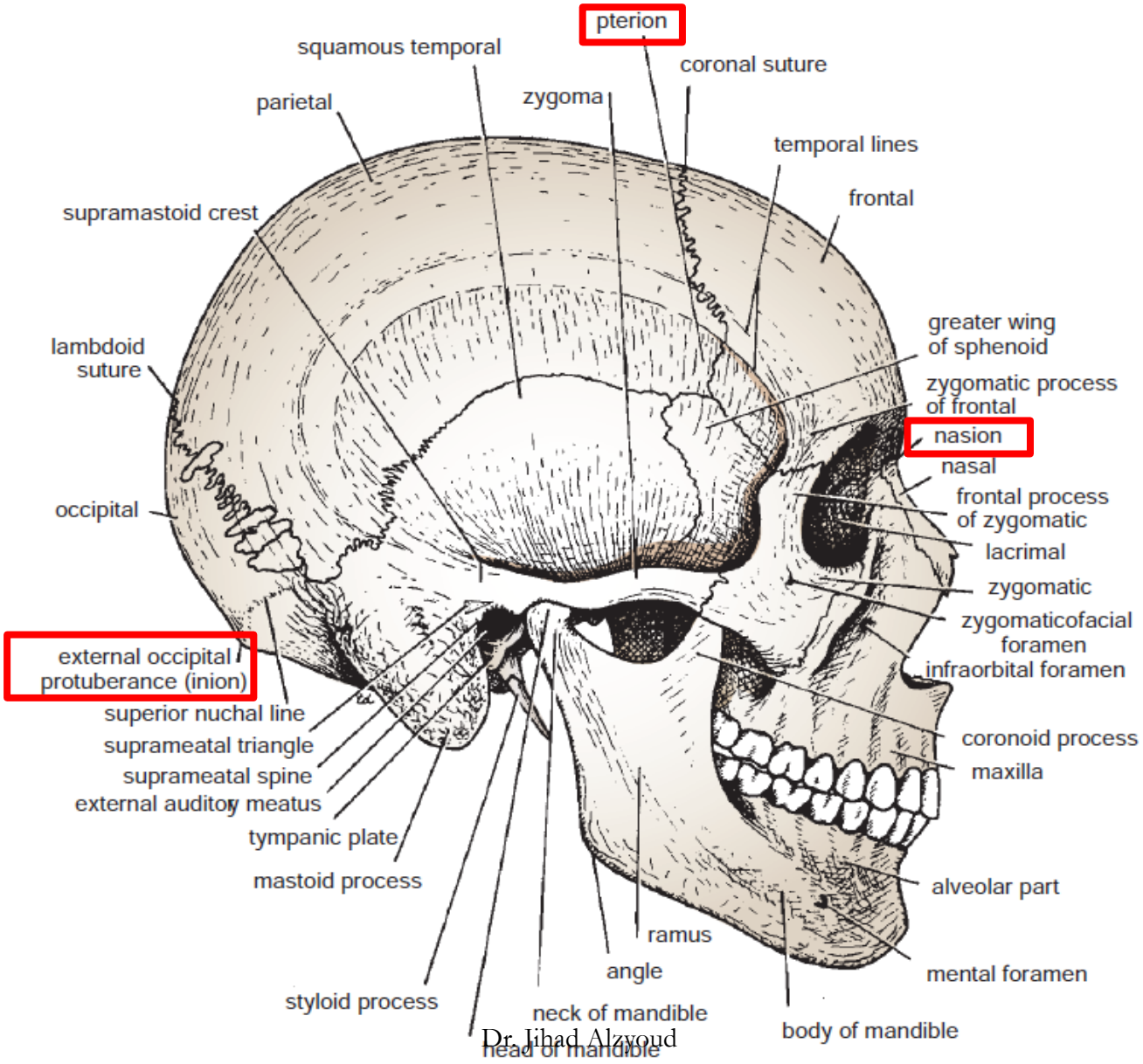
- **The squamous part of the occipital bone**

- **Parts of the temporal bone:** The squamous, tympanic, mastoid process, styloid process, zygomatic process, and external auditory meatus - superior and inferior temporal lines - Supramastoid crest

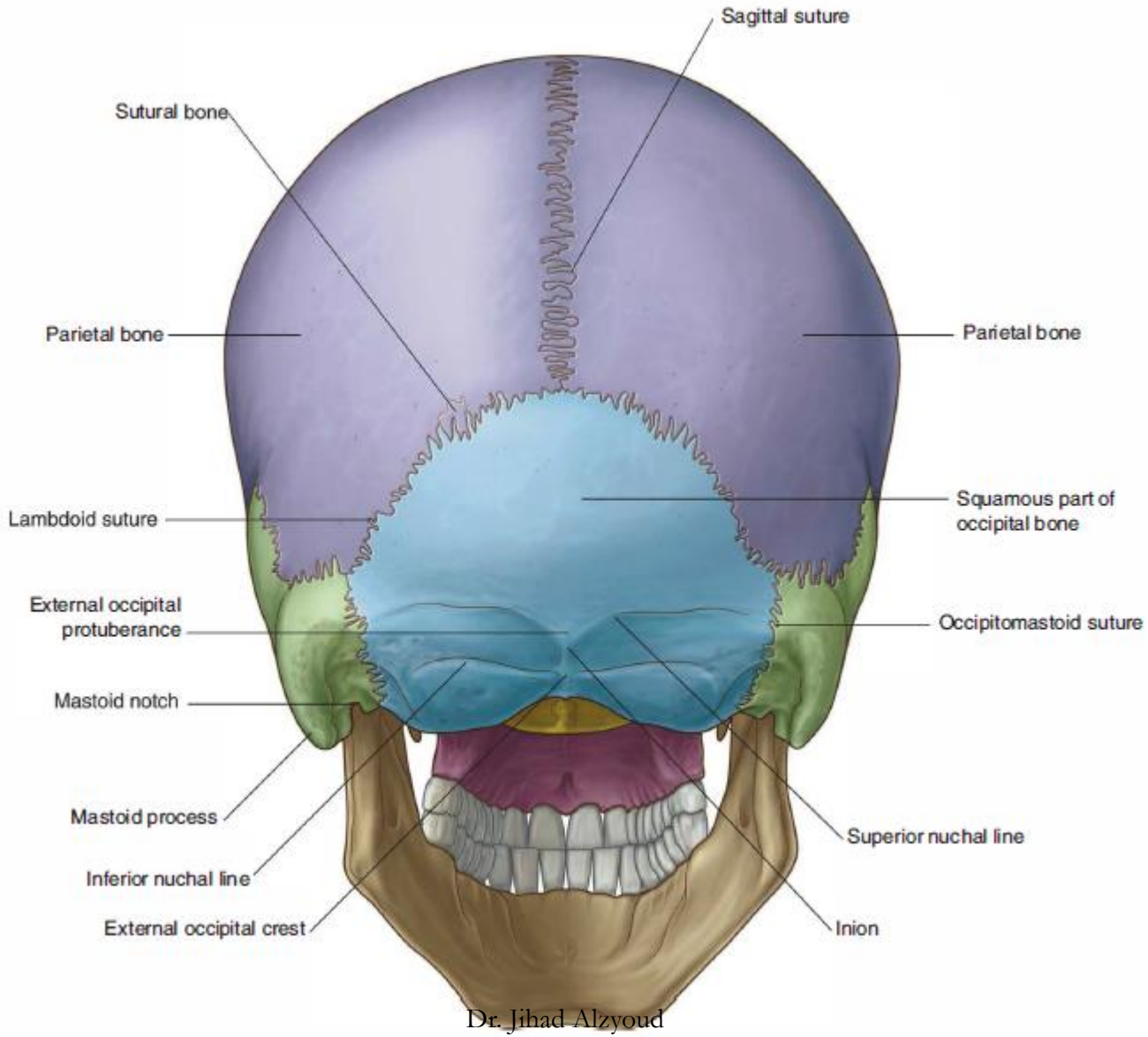
Norma Lateralis Lateral View

- **The sphenoid bone:** the greater wing
- **The mandible:** ramus and body
- **The temporal fossa:** above the zygomatic arch and below the inferior temporal line
- **The Infratemporal Fossa** lies deep and inferior to the zygomatic arch
- **The pterygomaxillary fissure:**
  - A vertical fissure between **the pterygoid process of the sphenoid bone** and **back of the maxilla**
  - Communicates between the infratemporal fossa laterally and the **Pterygopalatine Fossa** medially

Norma Lateralis Lateral View



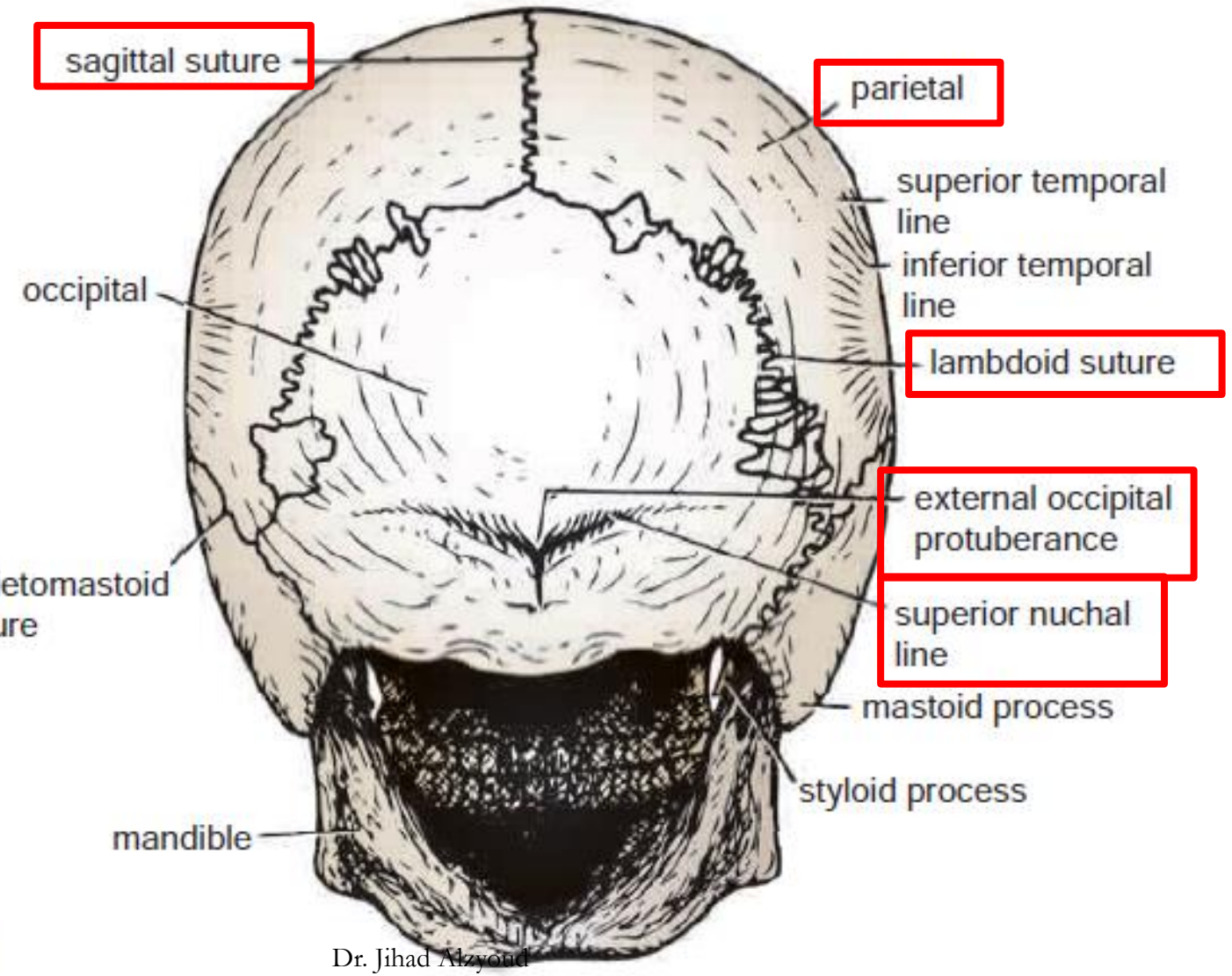
Norma Occipitalis Posterior View



Norma Occipitalis Posterior View

- **Sagittal suture:** between the posterior parts of the two parietal bones
- **Lambdoid suture:** between parietal bones and the squamous part of the occipital bone
- **Occipitomastoid suture:** Temporal and Occipital bones
- **External occipital protuberance:** a midline roughened elevation for muscles and ligamentum nuchae attachment **(inion)**
- **Superior and Inferior nuchal lines:**
- **External Occipital crest:**
- **Mastoid Processes**

Norma Occipitalis Posterior View



Squamous part of occipital

Neonatal Skull

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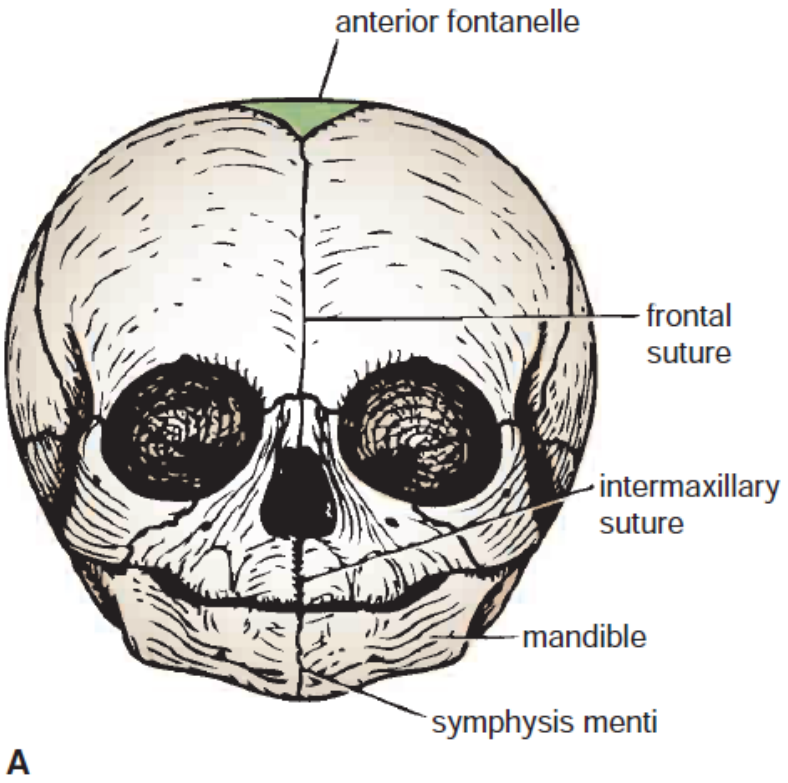
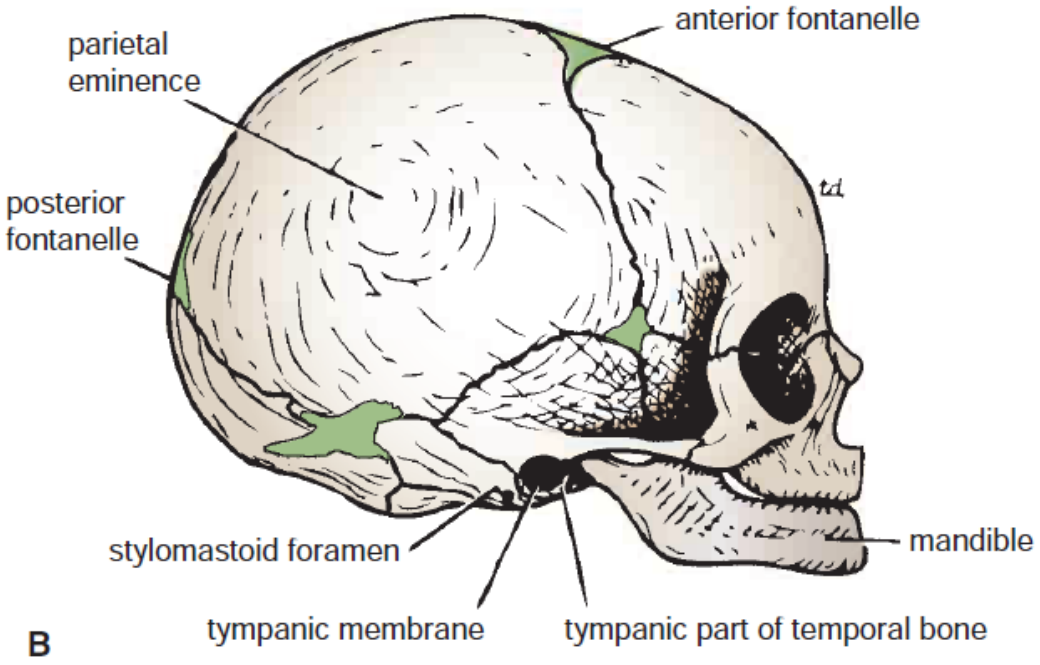
Neonatal Skull





Neonatal Skull

- The bones of the vault are ossified in membrane; the bones of the base are ossified in cartilage.

- The bone of the skull are smooth and unilaminar, there being no diploe present
- Large cranium relative to the Face

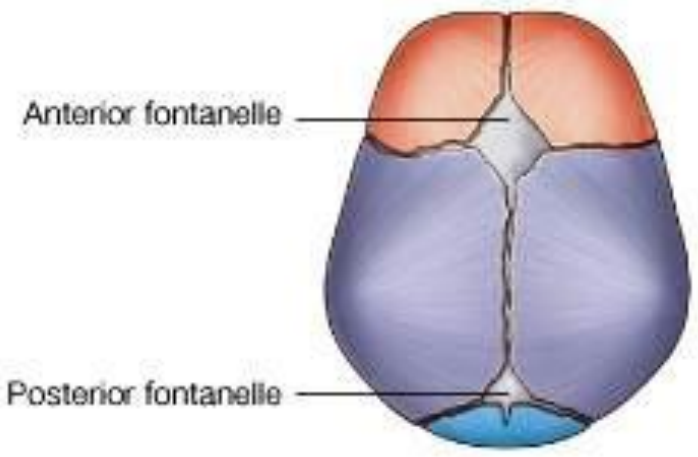
- The mandible has right and left halves at birth, united in the midline with fibrous tissue. The two halves fuse at the **symphysis menti** by the end of the 1st year.
- The angle of the mandible at birth is obtuse

- The mastoid process is not present at birth

- **Fontanelles**

Fontanels:

- ❑ 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



	Anterior Fontanel	Posterior Fontanel
Location	Between the frontal and parietal bones	Between the parietal and occipital bones
Shape	Diamond ♦	Triangular ▲
Size	Larger than the posterior	Smaller than the anterior
Closes	Later than the posterior (1.5 - 2 years)	Before the anterior (2 months)

Neonatal Skull – Clinical Notes

Tympanic Membrane

At birth, the tympanic membrane faces more downward and less laterally than in maturity; when examined with the otoscope, it therefore lies more obliquely in the infant than in the adult.

Forceps Delivery and the Facial Nerve

In the newborn infant, the mastoid process is not developed, and the facial nerve, as it emerges from the stylomastoid foramen, is close to the surface. Thus, it can be damaged by forceps in a difficult delivery.