

كلية المستقبل الجامعة قسم هندسة الطب الحيوي  
المرحلة الثانية

**ANATOMY**

**Introduction of Human Anatomy**

**(L1)**

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## Introduction of Human Anatomy

**Human anatomy** is one of the basic essential sciences of medicine, concerned with the study of the structure of organisms and their parts including their systems, organs and tissues. Anatomy mean cutting apart

**It includes** 1-The appearance

2-Position of the various parts.

3-The materials from which they are composed.

4- Their locations .

5-Their relationships with other parts.

**Methods** used include **dissection**, in which a body is opened and its organs studied, and **endoscopy**, in which a video camera-equipped instrument is inserted through a small incision in the body wall and used to explore the internal organs and other structures. **Angiography** using X-rays or magnetic resonance angiography are methods to visualize blood vessels.

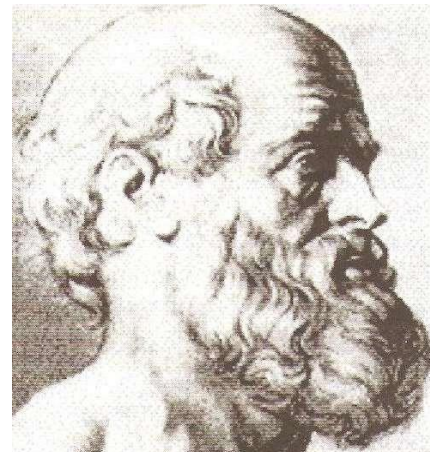
In addition to visual, there are three other methods by which anatomy is studied: **palpation**, which is physical contact ;**Auscultation**, such as when a doctor listens to your breathing; and **percussion**, such as when a doctor taps on your chest. Medical devices such as CT scans or magnetic resonance imaging (MRI), and dissection can also be used to assist in the study of anatomy.

## The Pioneers of Anatomy

### **HIPPOCRATES(460-377BC)**

Greek physician ....Father of Medicine

His name is memorialized in the *Hippocratic oath*



## **HEROPHILUS (about 325BC)**

### **Father of Anatomy**

Performed:

vivi-sections (dissections of living humans) and dissection of human cadavers, regarded brain as seat of intelligence described cerebrum, cerebellum, fourth ventricle first to identify nerves as sensory or motor.



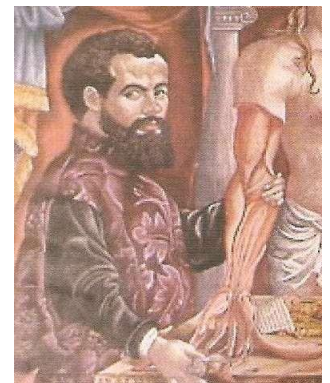
## **VESALIUS(1514- 1654)**

His work *De humani corporis fabrica* written in 7 volumes

His work revolutionised the teaching of anatomy and ruled for two centuries

Chose not to have his name attached to the parts of body he described unlike anatomists Sylvius, Fallopius, Eustachius.

**Father of Modern Anatomy 'Reformer of Anatomy.**



**Anatomy = Ana (Gr) = Apart      Tome (Gr) = To Cut**

**Dissection = Dissecare (Latin) = To cut apart**

## **Types of anatomy**

**Comparative anatomy** description and comparison of the form and structure of different animals.

**Developmental anatomy** the changes in form from fertilization to adulthood, including embryology, fetology and postnatal development.

**Gross anatomy( Macroscopic anatomy)** that dealing with structures visible with the unaided eye. Called also macroscopic anatomy.

**Microscopic anatomy** anatomy revealed by microscopy; includes histology and cytology.

**Morbid anatomy or Pathological anatomy** anatomy of diseased tissues.

**Tissue cells** : All organisms, from the simplest to the most complex, are composed of cells—whether the single cell of a bacterium or the trillions of cells that constitute the human body. These cells are responsible for all structural and functional properties of a living organism.

**Cytology**, is the science deal with the study of cell structure and function, is therefore indispensable to any true understanding of the workings of the human body, the mechanisms of disease, and the rationale of therapy.

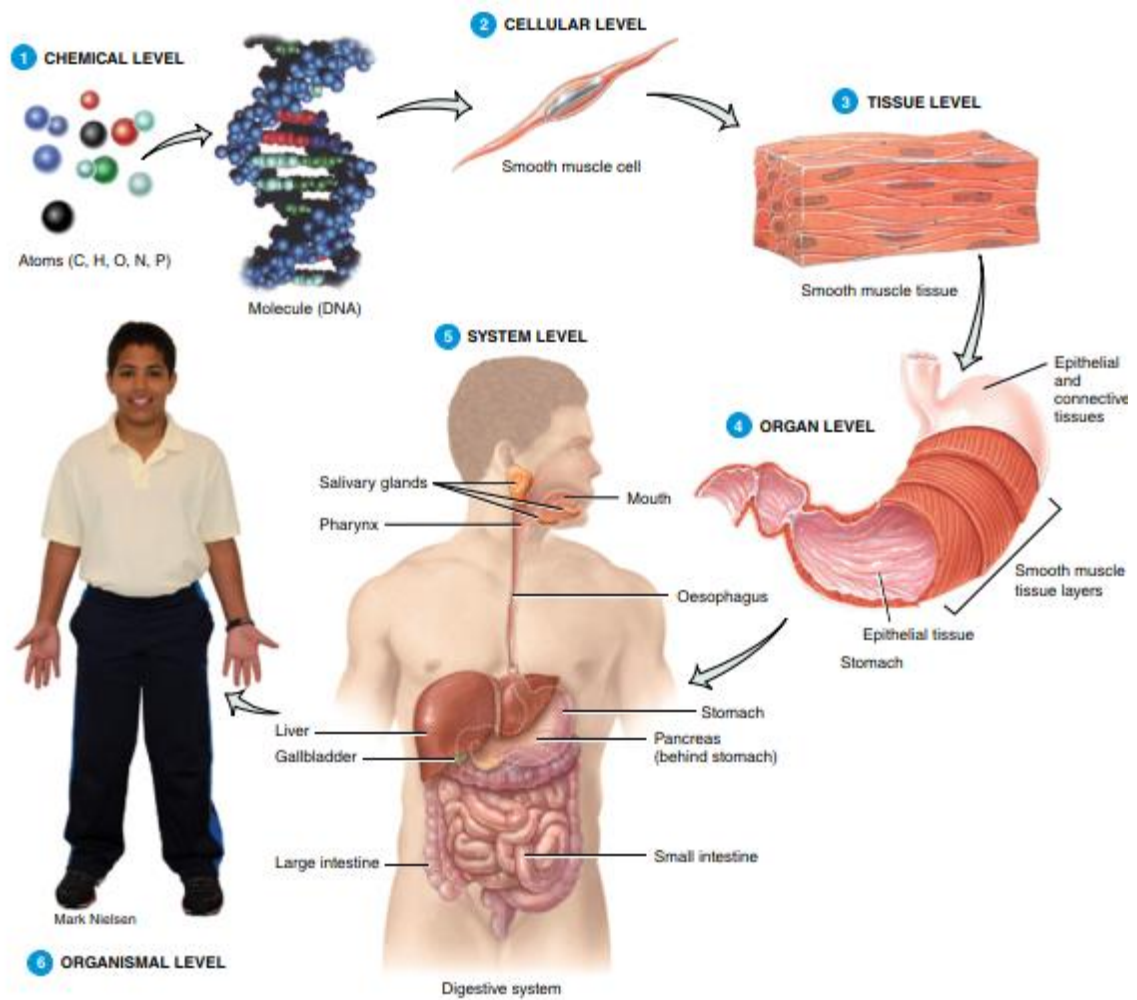
## **Levels of organization**

The body is a very complex organism that consists of many components, starting with the

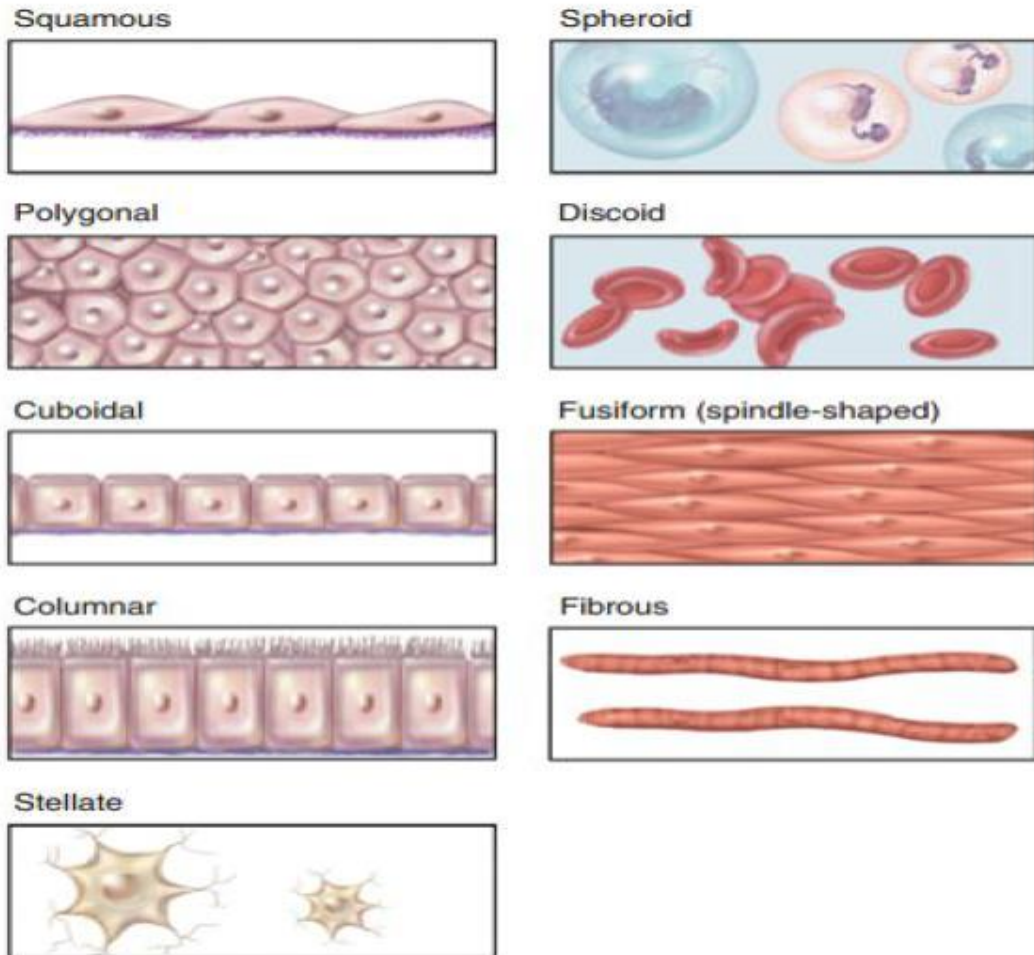
smallest of them ,the atom – and concluding with the organism itself (Figure). Starting from the smallest component and working towards the largest, the body is organised in the following way:

- The atom – for example, hydrogen, carbon.
- The molecule – for example, water, glucose.
- The macromolecule (large molecule) – for example, protein, DNA.
- The organelle (found in the cell) – for example, nucleus, mitochondrion.
- The tissues – for example, bone, muscle.

- The organs – for example, heart, kidney.
- The organ system – for example, skeletal, cardiovascular, respiratory, renal.
- The organism – for example, mouse, dog, elephant, and, of course, human

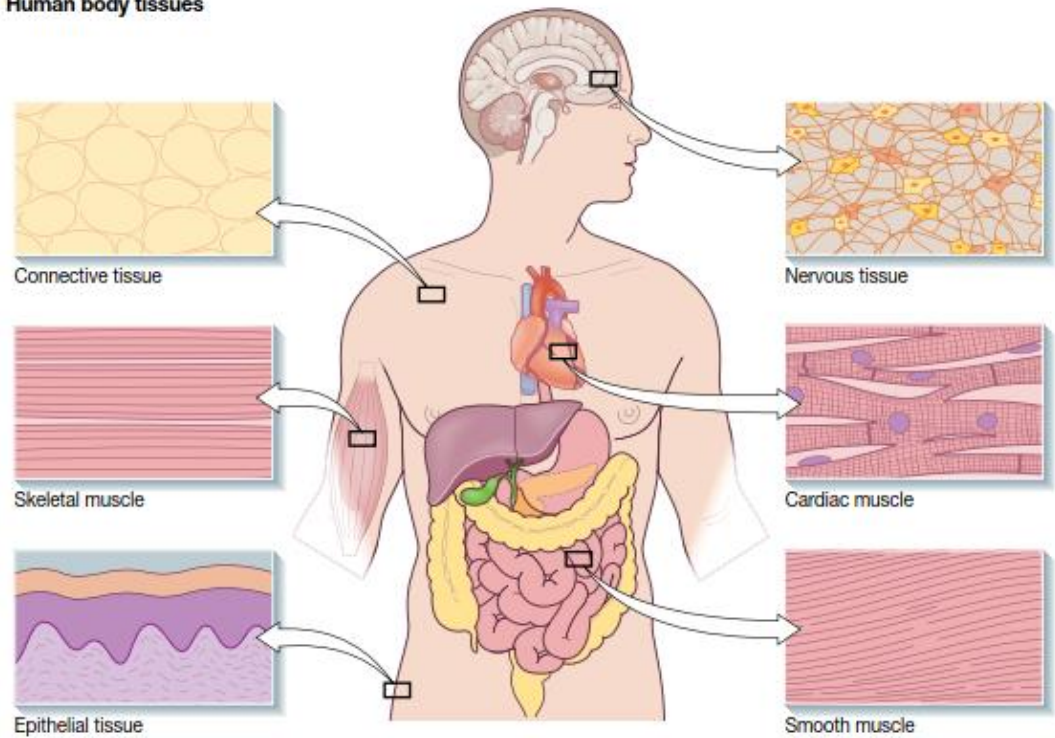


**Cell Shapes and Sizes** : Most human cells range from 10 to 15 micrometers (um) in diameter.  
(The human egg cell, an exceptionally large 100 um in diameter.)



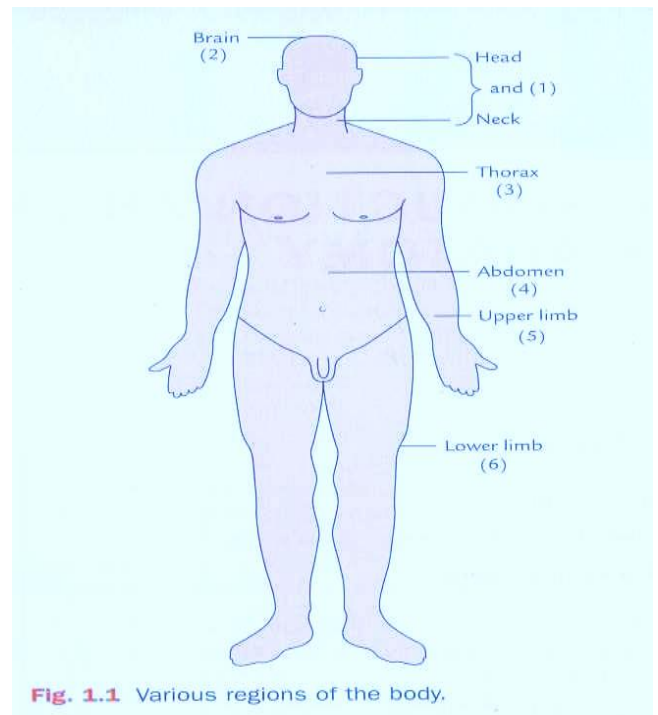
A group of cells that have a similar structure and function are called **tissue**, and within the human body there are four distinct types of tissue : epithelial tissue, connective tissue, muscle tissue and nervous tissue. **Epithelial tissue** covers or lines structures and organs. It specialises in absorption, secretion, protection, excretion, filtration and sensory reception. Almost every substance that passes in and out of the body travels through epithelial tissue. **Connective tissue** not only connects tissues, it also protects, supports and insulates them. Connective tissue is dense and strong; examples include cartilage and bone. **Muscle tissue** provides movement and posture, whereas **nervous tissue** forms the major part of the nervous system. Tissue has the ability to regenerate and renew itself; however, epithelial and connective tissues have a greater capacity for repair than other tissues.

## Human body tissues



**REGIONAL ANATOMY :** Head and neck, Brain, Thorax, Abdomen, Upper Limb, Lower limb

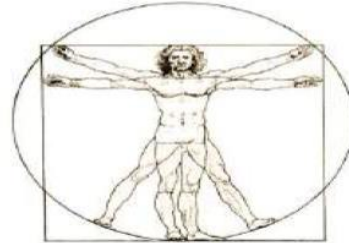
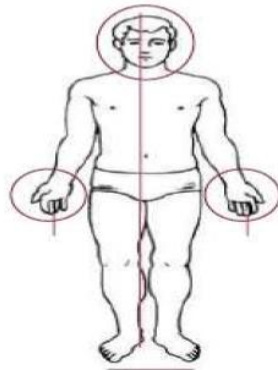
**SYSTEMIC ANATOMY :** Integumentary system, Skeletal system, Muscular system, Nervous system, Cardiovascular system, Lymphatic system, Endocrine system, Digestive system, Respiratory system, Urogenital system



**Fig. 1.1** Various regions of the body.

# ANATOMICAL POSITION

- ◉ Standing position with the body erect facing forward, feet slightly apart, arms hanging and palms also facing forward.



## DIRECTIONS

**Superior** means above. **Inferior** means below.

**Anterior** refers to the front of the body. A commonly-used substitute word is **Ventral**.

**Posterior** refers to the back of the body. A commonly-used substitute word is **Dorsal**.

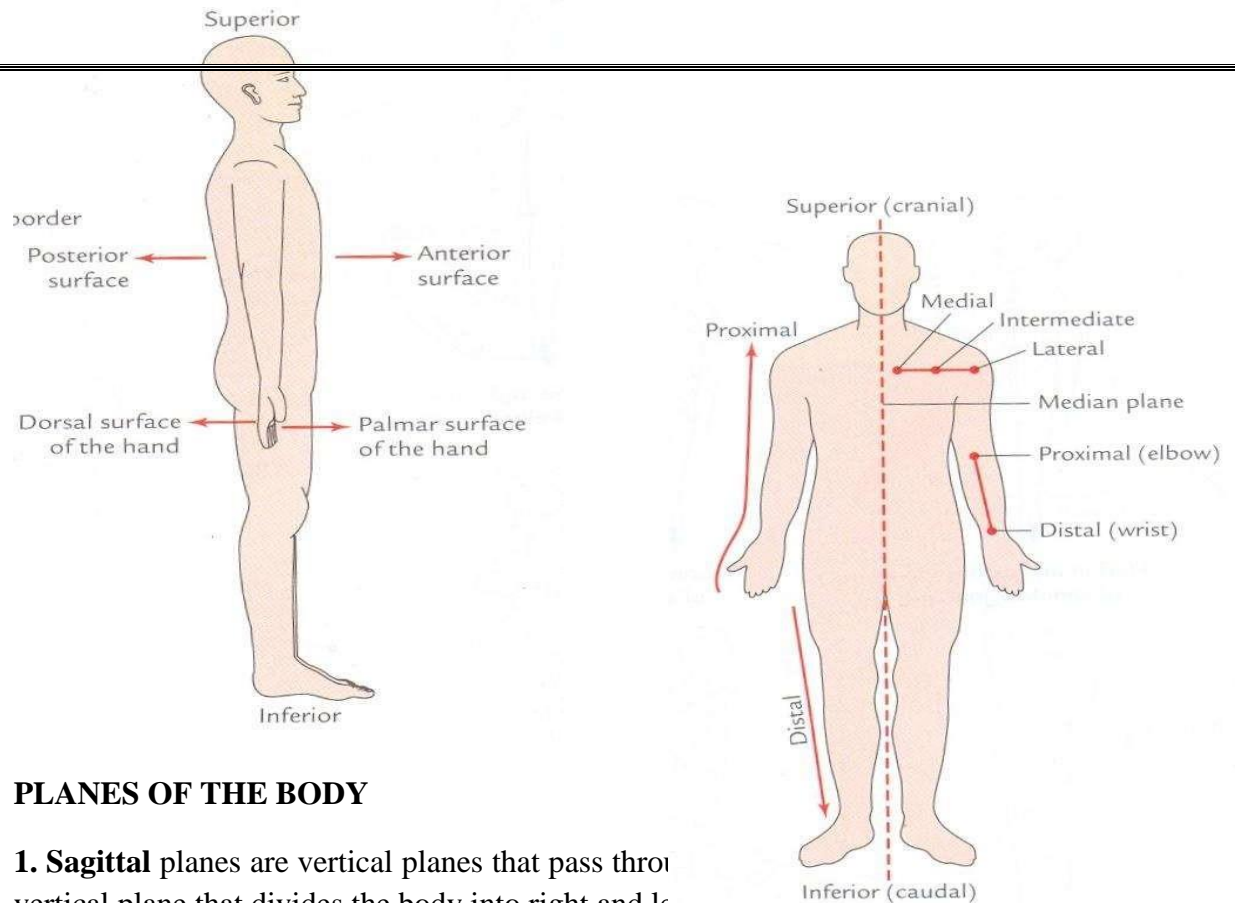
**Medial** means toward or nearer the midline of the body.

**Lateral** means away from the midline or toward the side of the body.

**Superficial** means closer to the surface of the body. **Deep** means toward the center of the body or body part.

Proximal and distal are terms applied specifically to the limbs. **Proximal** means nearer to the shoulder joint. **Distal** means further away from the shoulder joint. Sometimes proximal and distal are used to identify the "beginning" and "end" of the GI tract--that portion closer to the stomach being **proximal** while that further away being **distal**.





## PLANES OF THE BODY

1. **Sagittal** planes are vertical planes that pass through a vertical plane that divides the body into right and left parts.
2. **Horizontal** (transverse) planes are parallel to the floor. They are perpendicular to both the sagittal and frontal planes. It divides the body into upper and lower parts.
3. **Frontal** (coronal) planes are vertical planes which pass through the body from side to side. It divides the body into anterior and posterior parts.

## Planes and Sections

- A plane is an imaginary flat surface that passes through the body.
- A section is one of the 2 surfaces (pieces) that results when the body is cut by a plane passing through it.

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Sagittal plane (median plane)      Transverse plane (horizontal plane)      Coronal plane (frontal plane)

# HUMAN ANATOMY

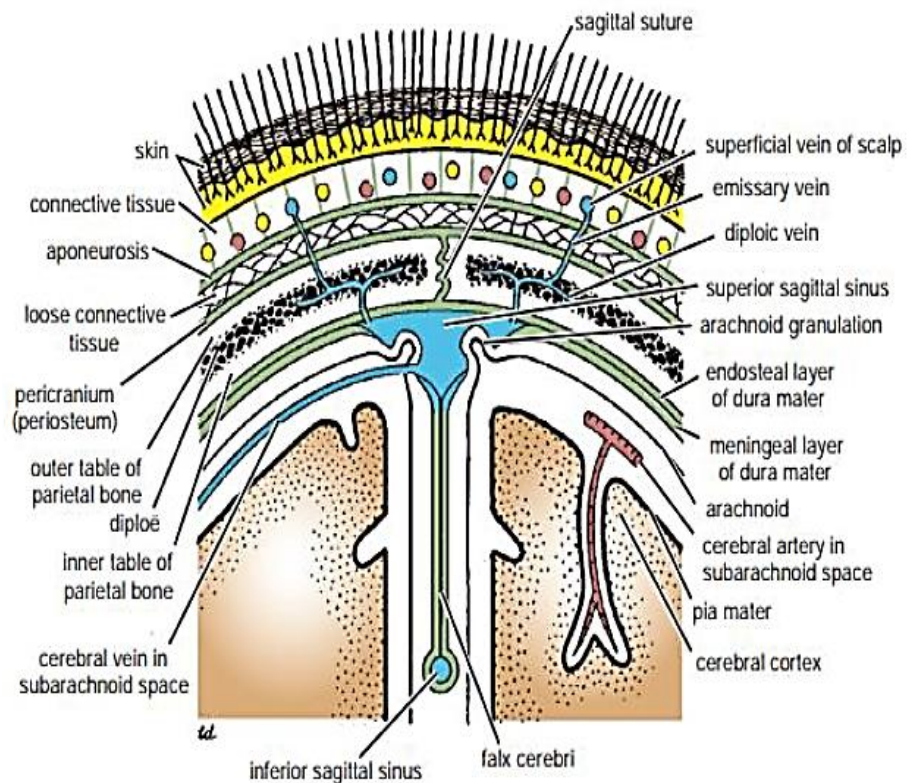
## HEAD & NECK

### OVERVIEW

The head and neck region of the body contains many important structures compressed into a relatively small area. The skull, with the enclosed brain and meninges, forms most of the head. The special senses (the eye, ear, olfactory area, taste receptors) lie within the skull bones or in the cavities bounded by them. The brain gives rise to 12 pairs of cranial nerves, which leave the brain and pass through foramina and fissures in the skull. All the cranial nerves are distributed to structures in the head and neck, except the 10th, which also supplies structures in the chest and abdomen. The digestive and respiratory systems begin in the head and traverse the neck to reach the thorax and abdomen. Additionally, key endocrine organs are located in the head and neck.

### OSTEOLOGY : ( Bones of the Skull )

**Composition** : The skull is composed of several separate bones united at immobile joints called **sutures**. The connective tissue between the bones is called a **sutural ligament**. **The mandible** is an exception to this rule, for it is united to the skull by the mobile **temporomandibular joint**. The bones of the skull can be divided into those of **the cranium** and those of **the face**. **The vault** is the upper part of the cranium, and **the base of the skull** is the lowest part of the cranium (Fig.2). The skull bones are made up of external and internal tables of compact bone separated by a layer of spongy bone called **the diploë** (Fig.1). The internal table is thinner and more brittle than the external table. The bones are covered on the outer and inner surfaces with **periosteum**.



**FIG 1** Coronal section of the upper part of the head showing the layers of the scalp, the sagittal suture of the skull, the falx cerebri, the superior and inferior sagittal venous sinuses, the arachnoid granulations, the emissary veins, and the relation of cerebral blood vessels to the subarachnoid space.

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

■ Frontal bone: 1

■ Parietal bones: 2

■ Occipital bone: 1

■ Temporal bones: 2

■ Sphenoid bone: 1

■ Ethmoid bone: 1

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

■ Zygomatic bones: 2

■ Maxillae: 2

■ Nasal bones: 2

■ Lacrimal bones: 2

■Vomer: 1

■Palatine bones: 2

■Inferior conchae: 2

■Mandible: 1

## External Views of the Skull

### Anterior View of the Skull

The frontal bone, or forehead bone, curves downward to make the upper margins of the orbits (Fig. 2).

**The superciliary arches** can be seen on either side, and **the supraorbital notch**, or **foramen**, can be recognized. Medially, **the frontal bone** articulates with the **frontal processes of the maxillae** and with **the nasal bones**. Laterally, **the frontal bone** articulates with **the zygomatic bone**.

**The orbital margins** are bounded by **the frontal bone** superiorly, **the zygomatic bone** laterally, **the maxilla** inferiorly, and **the processes of the maxilla and frontal bone** medially.

Within the **frontal bone**, just above **the orbital margins**, are two hollow spaces lined with mucous membrane called **the frontal air sinuses**. These communicate with the nose and serve as **voice resonators**.

**The two nasal bones** form the bridge of the nose. Their lower borders, with the maxillae, make **the anterior nasal aperture**. The nasal cavity is divided into two by **the bony nasal septum**, which is largely formed by **the vomer**. **The superior and middle conchae** are shelves of bone that project into the nasal cavity from the ethmoid on each side; **the inferior conchae** are separate bones.

**The two maxillae** form the upper jaw, the anterior part of the hard palate, part of the lateral walls of the nasal cavities, and part of the floors of the orbital cavities. The two bones meet in the midline at the **intermaxillary suture** and form the lower margin of the nasal aperture. Below the orbit, the maxilla is perforated by **the infraorbital foramen**. **The alveolar**

process projects downward and, together with the fellow of the opposite side, forms the alveolar arch, which carries the upper teeth. Within each maxilla is a large, pyramid-shaped cavity lined with mucous membrane called **the maxillary sinus**. This communicates with the nasal cavity and serves as a **voice resonator**.

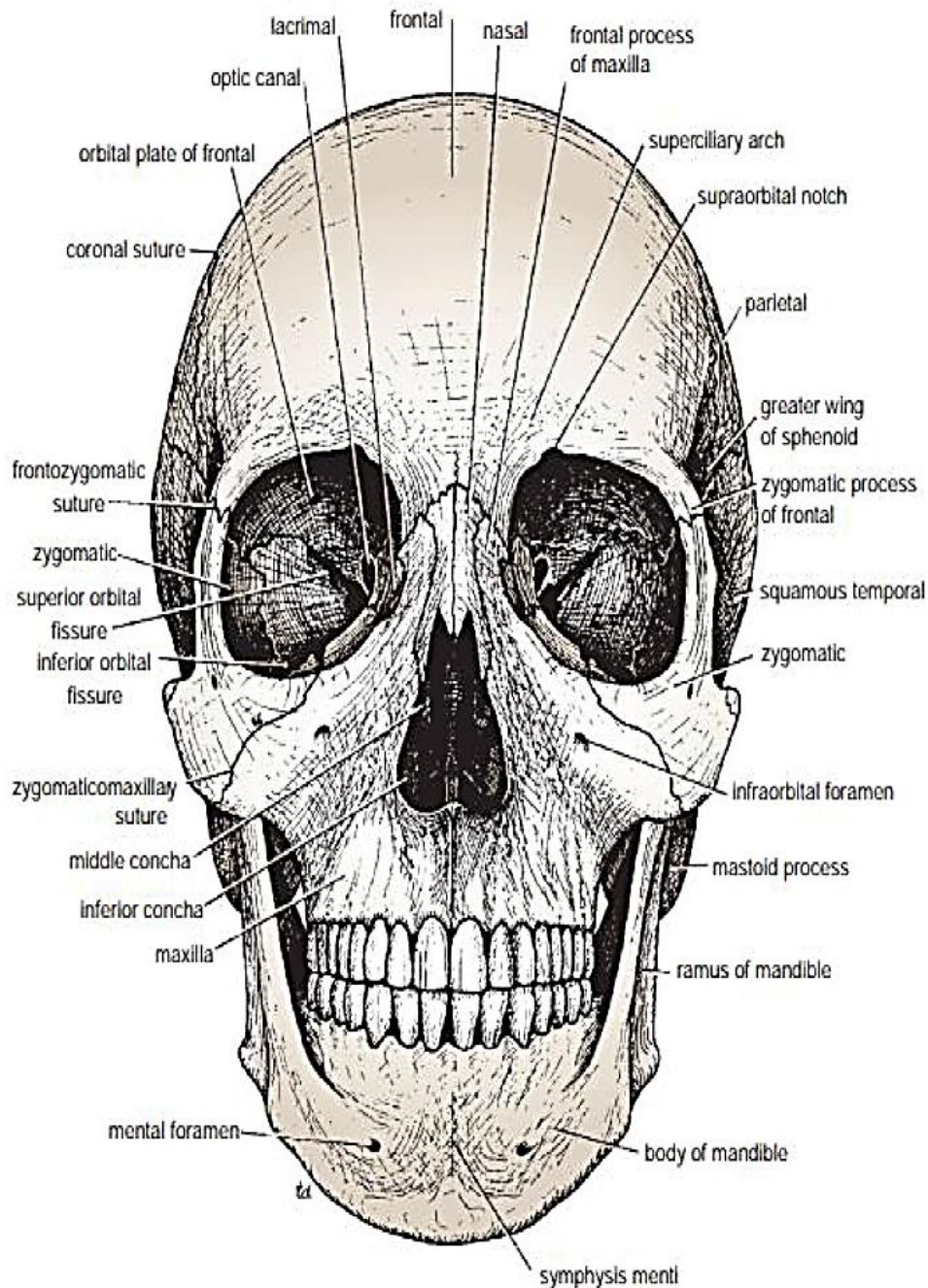


FIG 2 Bones of the anterior aspect of the skull.

**The zygomatic bone** forms the prominence of the cheek and part of the lateral wall and floor of the orbital cavity. Medially, it articulates with **the maxilla** and laterally it articulates with **the zygomatic process of the temporal bone** to form **the zygomatic arch**. The zygomatic bone is perforated by two foramina for **the zygomaticofacial and zygomaticotemporal nerves**.

**The mandible**, or lower jaw, consists of a horizontal body and two vertical rami.

### **Lateral View of the Skull**

**The frontal bone** forms the anterior part of the side of the skull and articulates with the parietal bone at the coronal suture (Fig.3). **The parietal bones** form the sides and roof of the cranium and articulate with each other in the midline **at the sagittal suture**. They articulate with the **occipital bone** behind, at **the lambdoid suture**.

The skull is completed at the side by **the squamous part of the occipital bone**; parts of the temporal bone, namely, **the squamous, tympanic, mastoid process, styloid process, and zygomatic process**; and the **greater wing of the sphenoid**. Note the position of **the external auditory meatus**.

**The ramus and body of the mandible** lie inferiorly. Note that the thinnest part of the lateral wall of the skull is where **the anteroinferior corner of the parietal bone** articulates with **the greater wing of the sphenoid**; this point is referred to as **the pterion**. **Clinically**, the pterion is an important area because it overlies **the anterior division of the middle meningeal artery and vein**.

Identify **the superior and inferior temporal lines**, which begin as a single line from the posterior margin of **the zygomatic process of the frontal bone** and diverge as they arch backward. **The temporal fossa** lies below the inferior temporal line. **The infratemporal fossa** lies below the infratemporal crest on the greater wing of the sphenoid. The **pterygomaxillary fissure** is a vertical fissure that lies

within the fossa between the pterygoid process of the sphenoid bone and back of the maxilla. It leads medially into the **pterygopalatine fossa**. The inferior orbital fissure is a horizontal fissure between the greater wing of the sphenoid bone and the maxilla. It leads forward into the orbit. The **pterygopalatine fossa** is a small space behind and below the orbital cavity. It communicates laterally with the **infratemporal fossa** through **the pterygomaxillary fissure**, medially with the nasal cavity through the **sphenopalatine foramen**, superiorly with the skull through the foramen **rotundum**, and anteriorly with the orbit through the **inferior orbital fissure**.

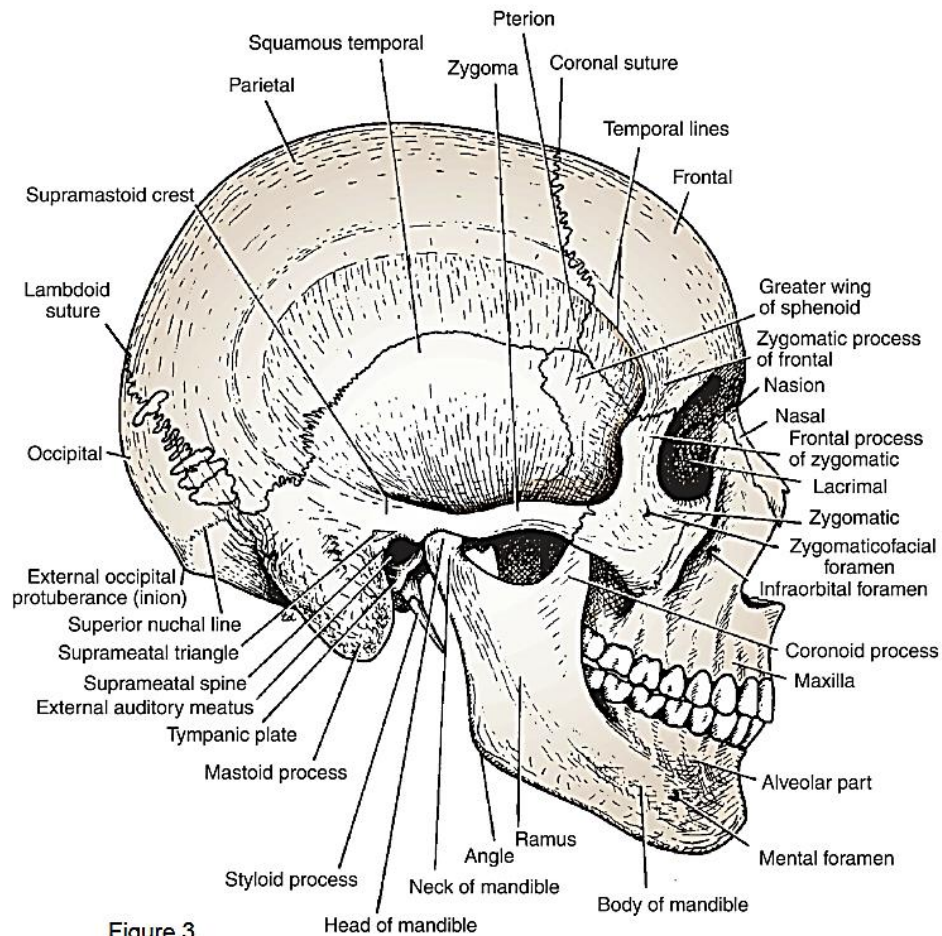
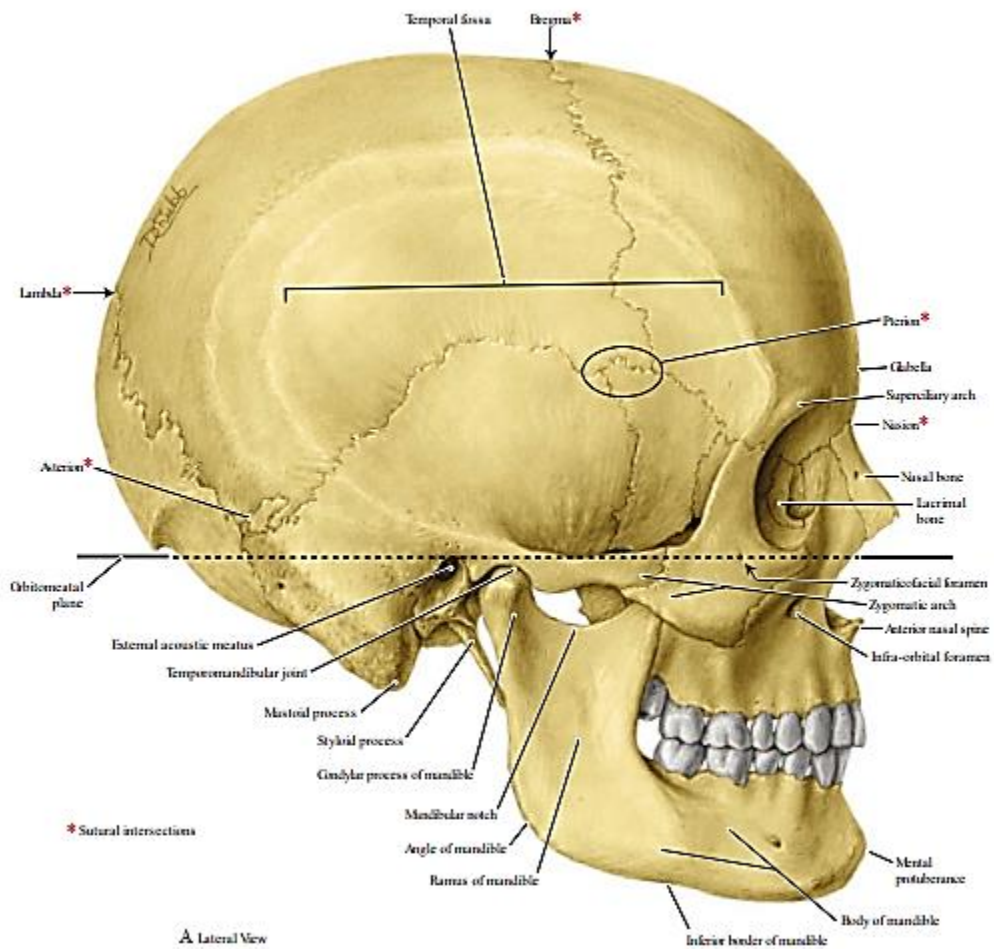


Figure 3  
Bones of the lateral aspect of the skull.



A Lateral View



