جامعة المستقبل

كلية التقنيات الصحية والطبية

قسم تقنيات البصريات

First Stage 2024-2025

Anatomy of the Head and Neck

Lecture Title

Bones of the Skull
Blood Vessels
Nervous System

Lecture Number: 3 / course 1

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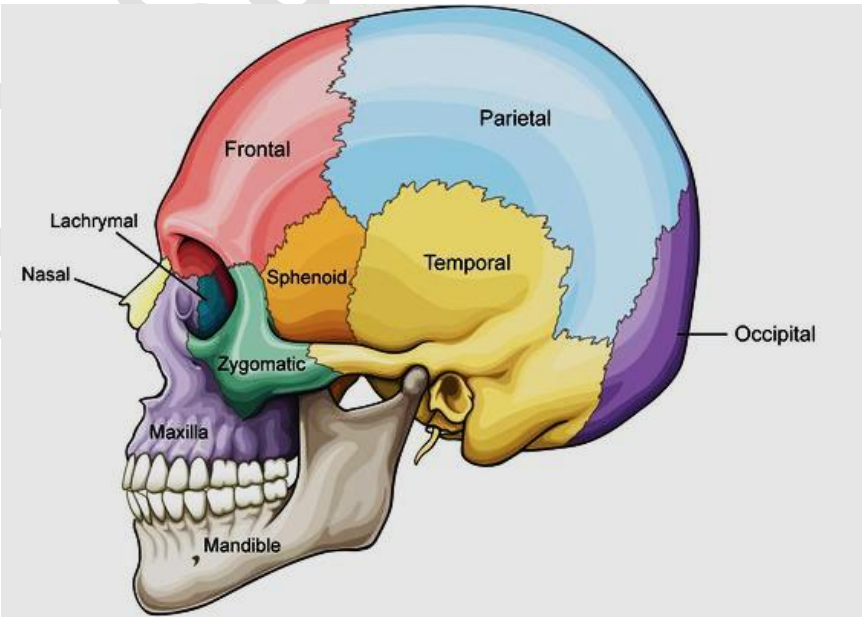
OPTOMETRIST

Bones of the Skull

The human skull is a complex structure that protects the brain, supports the sensory organs, and provides attachment points for muscles. It is composed of 22 bones, which are classified into cranial and facial bones. This lecture will explore the anatomy, function, and relationships of these bones, as well as their clinical significance.

Cranial Bones (8): These form the protective case around the brain and the cranial cavity.

1. Frontal Bone
2. Parietal Bones (2)
3. Temporal Bones (2)
4. Occipital Bone
5. Sphenoid Bone
6. Ethmoid Bone



Cranial Bones: Detailed Anatomy

1. Frontal Bone

- *Location*: Forehead and upper part of the orbits.

- *Features*: Supraorbital foramen, frontal sinus.

- *Function*: Protection of the frontal lobe, forming the roof of the eye sockets.

2. Parietal Bones

- *Location*: Upper sides and roof of the skull.

- *Features*: Sagittal suture, coronal suture.

- *Function*: Protection and structural integrity of the skull.

3. Temporal Bones

- *Location*: Sides and base of the skull.

- *Features*: External auditory meatus, mastoid process, styloid process, zygomatic arch.

- *Function*: Houses the structures of the ear and provides attachment for muscles.

4. Occipital Bone

- *Location*: Back and base of the skull.

- *Features*: Foramen magnum, occipital condyles.

- *Function*: Articulates with the cervical spine, allows passage of the spinal cord.

5. Sphenoid Bone

- *Location*: Middle of the skull base.

- *Features*: Sella turcica, greater and lesser wings, pterygoid processes.

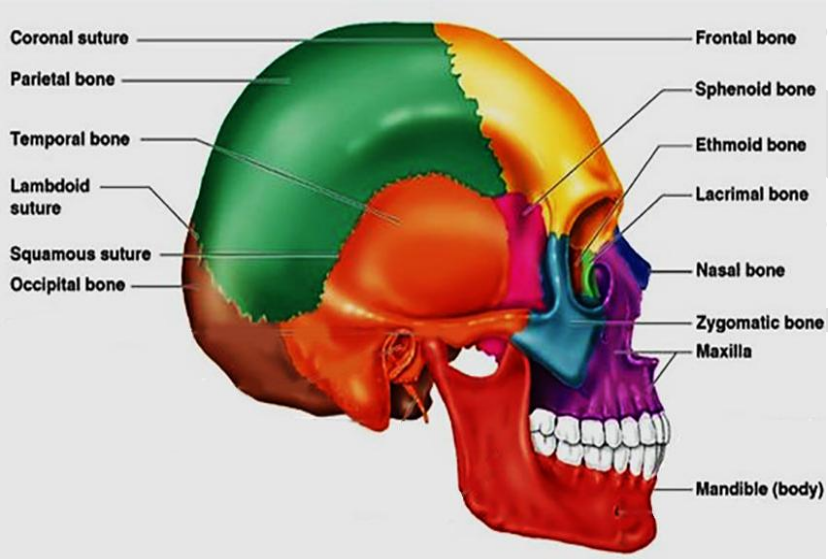
- *Function*: Acts as a keystone bone connecting several other bones.

6. Ethmoid Bone

- *Location*: Between the eyes, part of the nasal cavity.

- *Features*: Cribriform plate, perpendicular plate, ethmoidal sinuses.

- *Function*: Contributes to the nasal septum and orbital cavity.



Facial Bones (14): These provide the framework of the face, support the teeth, and form part of the orbits.

1. Nasal Bones (2)

2. Maxillae (2)

3. Zygomatic Bones (2)

4. Palatine Bones (2)

5. Lacrimal Bones (2)

6. Inferior Nasal Conchae (2)

7. Vomer (1)

8. Mandible (1)

Facial Bones: Detailed Anatomy

1. Nasal Bones

- *Location*: Bridge of the nose.

- *Function*: Support the cartilage that shapes the lower portion of the nose.

2. Maxillae

- *Location*: Upper jaw.

- *Features*: Infraorbital foramen, maxillary sinuses.

- *Function*: Houses the upper teeth, forms part of the orbit and nasal cavity.

3. Zygomatic Bones

- *Location*: Cheekbones.

- *Function*: Form part of the orbit and provide structure to the face.

4. Palatine Bones

- *Location:* Back of the oral cavity.

- *Function:* Form part of the hard palate and nasal cavity.

5. Lacrimal Bones

- *Location*: Medial walls of the orbits.

- *Features*: Lacrimal fossa.

- *Function*: Houses the lacrimal sac, part of the tear drainage system.

6. Inferior Nasal Conchae

- *Location*: Lateral walls of the nasal cavity.

- *Function*: Increase surface area for warming and humidifying air.

7. Vomer

- *Location*: Nasal septum.

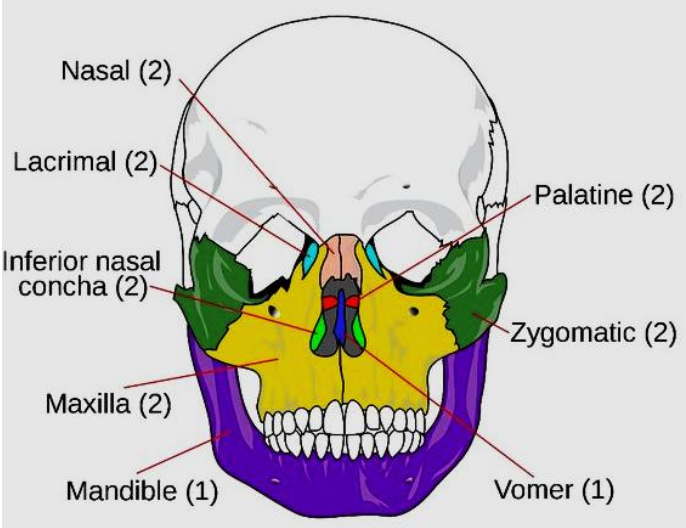
- *Function*: Separates the nasal cavity into left and right halves.

8. Mandible

- *Location*: Lower jaw.

- *Features*: Mental foramen, mandibular condyle.

- *Function*: Houses the lower teeth, allows for mastication and speech.



Sutures of the Skull

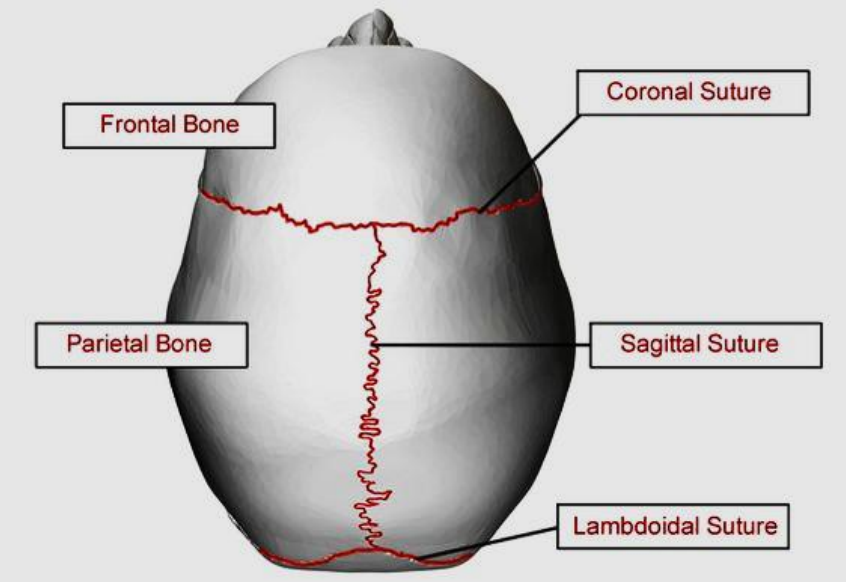
- Coronal Suture: Between frontal and parietal bones.

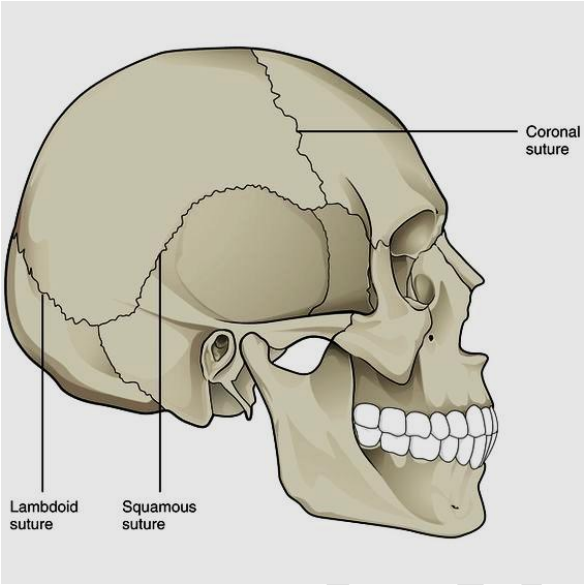
- Sagittal Suture: Between the two parietal bones.

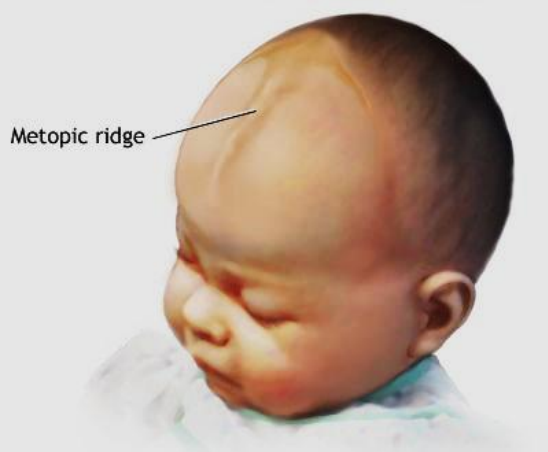
- Lambdoid Suture: Between parietal and occipital bones.

- Squamous Suture: Between parietal and temporal bones.

Metopic suture: Separates the right and left halves of the frontal bone. It allows lateral expansion of the forehead region during infancy and childhood development.







Clinical Significance

1. Fractures

- Commonly occur in the nasal bones, mandible, and zygomatic bones.

- Basilar skull fractures may involve the temporal bone.

2. Developmental Disorders

- Craniosynostosis: Premature closure of sutures affecting skull shape.

3. Sinus Infections

- Maxillary and frontal sinuses are prone to infections (sinusitis).

Questions for Review

1. Name the bones that form the cranial vault.

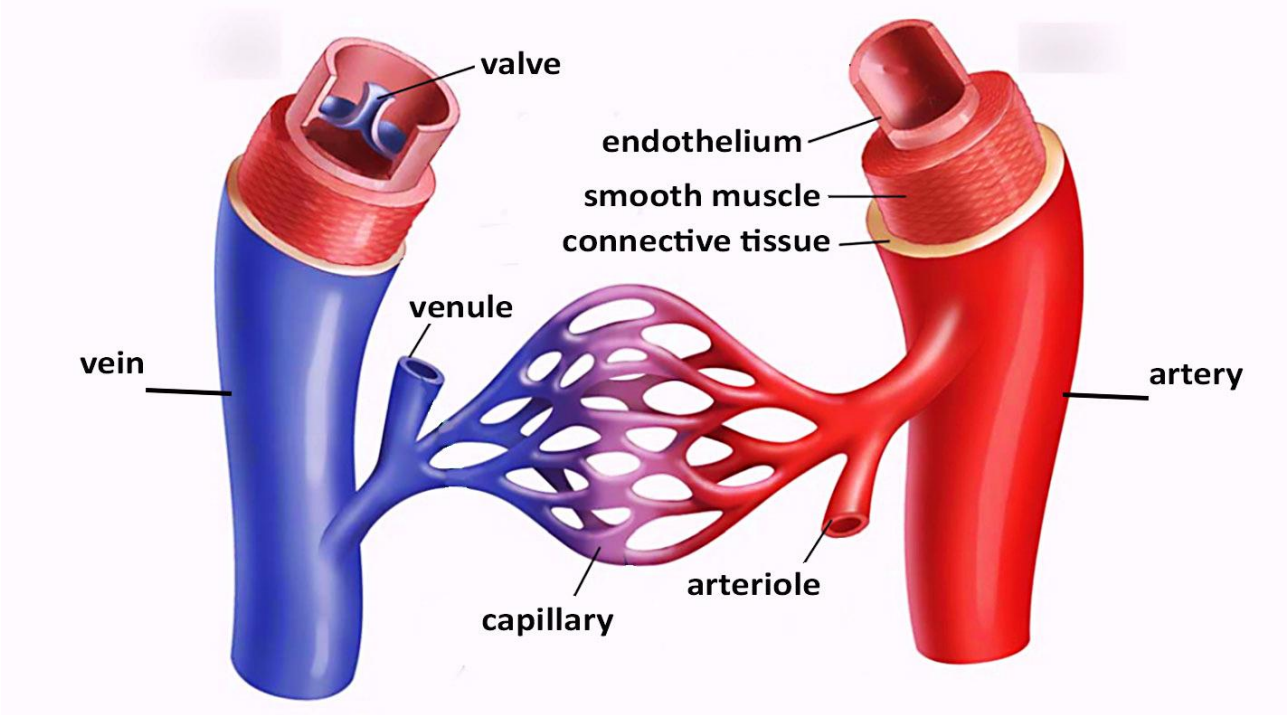
2. What are the main features of the sphenoid bone?

3. How do the nasal conchae contribute to respiratory function?

4. Discuss the clinical significance of the mandible in facial injuries.

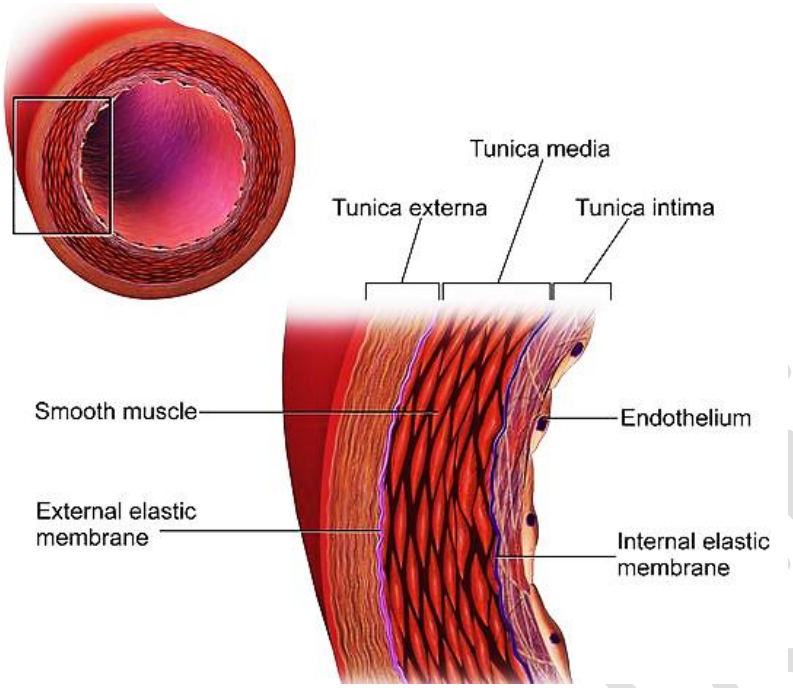
Blood Vessels الاوعية الدموية

Blood vessels are an essential part of the circulatory system in humans. They form a complex network of tubes that transport blood throughout the body, delivering oxygen, nutrients, hormones, and other vital substances to the tissues and organs. There are three main types of blood vessels: arteries, veins, and capillaries.

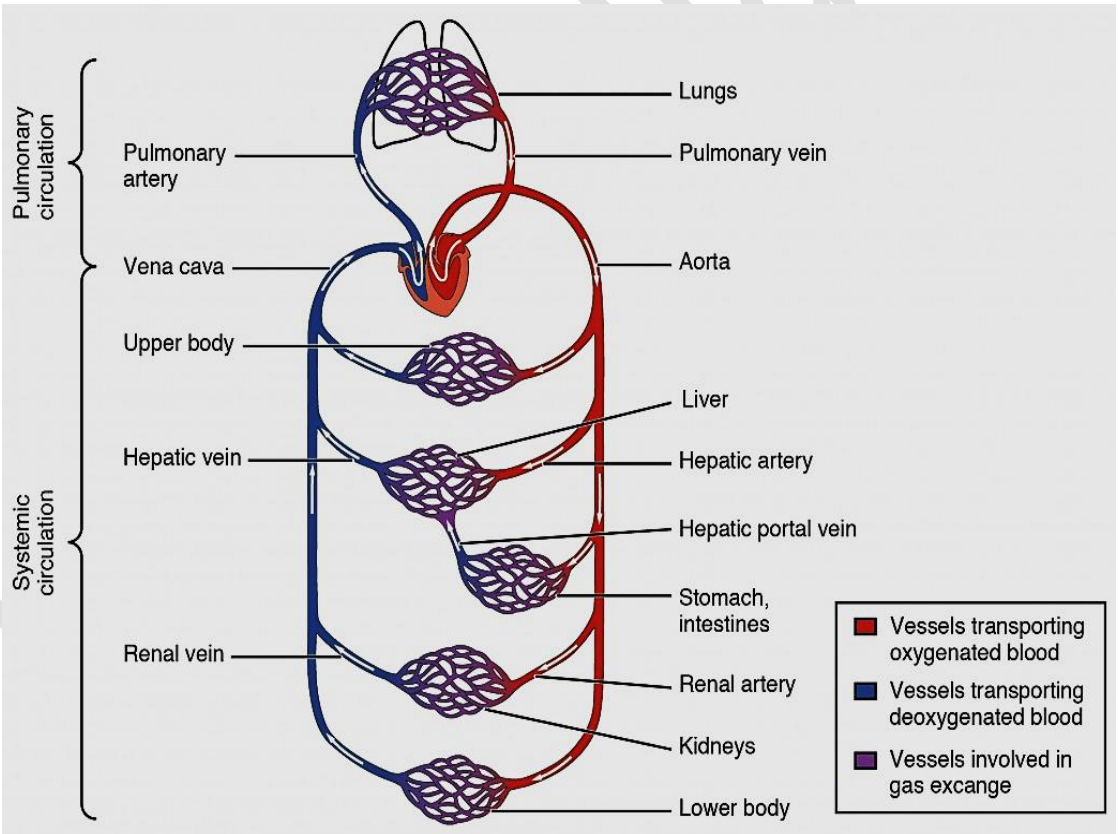


Arteries الشرايين

- Arteries are blood vessels that carry oxygenated blood away from the heart to the tissues and organs of the body. This allows oxygen and nutrients to reach the cells of the body.
- They have thicker, more elastic walls than veins to withstand the higher blood pressures coming directly from the heart. The walls are made up of:
  - ✓ outer layer (tunica externa): It is composed of connective tissue
  - ✓ middle layer (tunica media): It is composed of smooth muscle cells
  - ✓ inner layer (tunica intima): It is composed of a single layer of endothelial cells

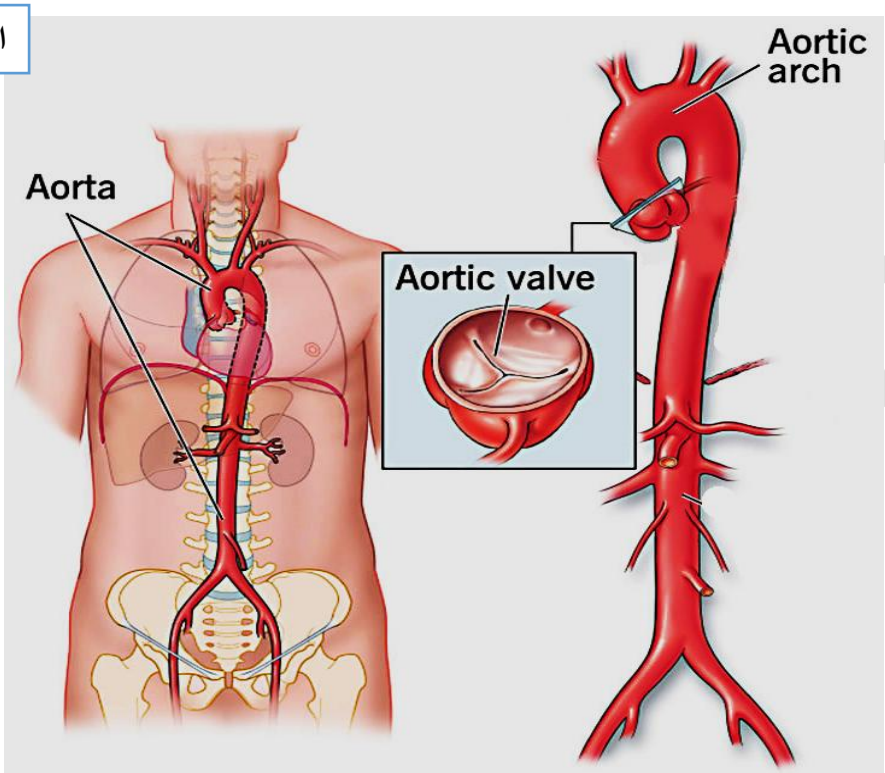


Types of arteries in the human circulatory system



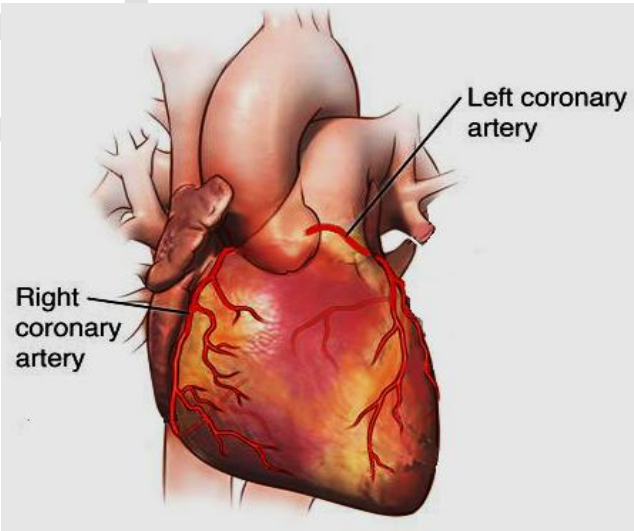
1. Aorta : the largest artery in the body, it carries oxygen-rich blood away from the heart to all parts of the body. The aorta starts at the left ventricle of the heart and runs down through the chest and abdomen, branching into smaller arteries along the way. The aorta is about (2.5 cm) in diameter.

الشريان الابهر



2. Coronary arteries : supply the heart muscle itself with oxygenated blood. The right and left coronary arteries branch off the aorta and spread over the surface of the heart. The diameter of the coronary arteries ranges about (0.5 – 4) mm

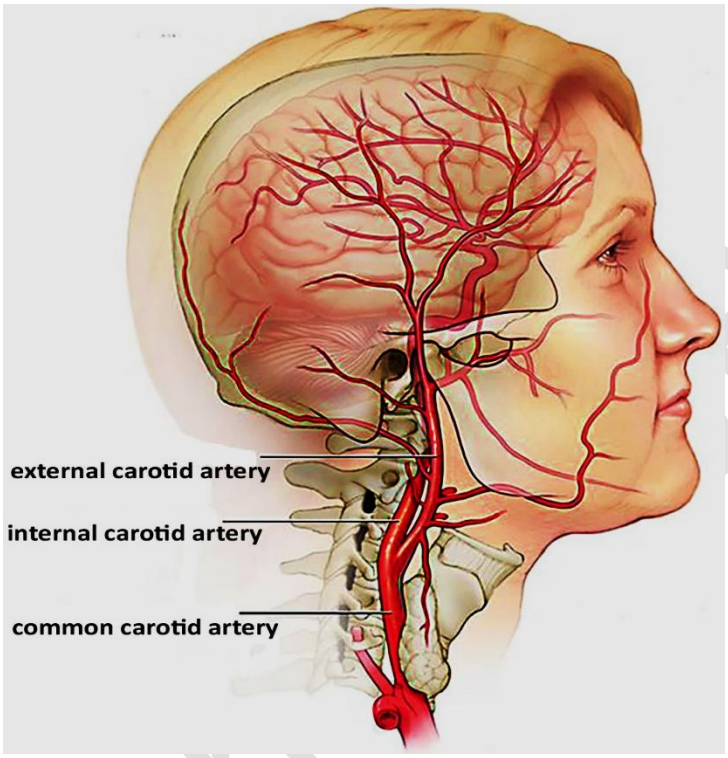
الشريان التاجي



3. Carotid arteries : there is a right and left common carotid artery on each side of the neck that carry blood to the head and brain. Each branches into the:

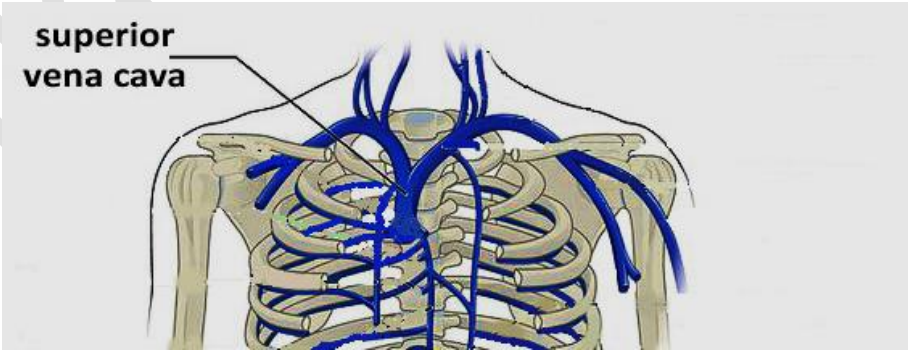
- ✓ **Internal carotid - supplies the brain**
- ✓ **External carotid - supplies face, scalp, skull and meninges**

الشريان السباتي



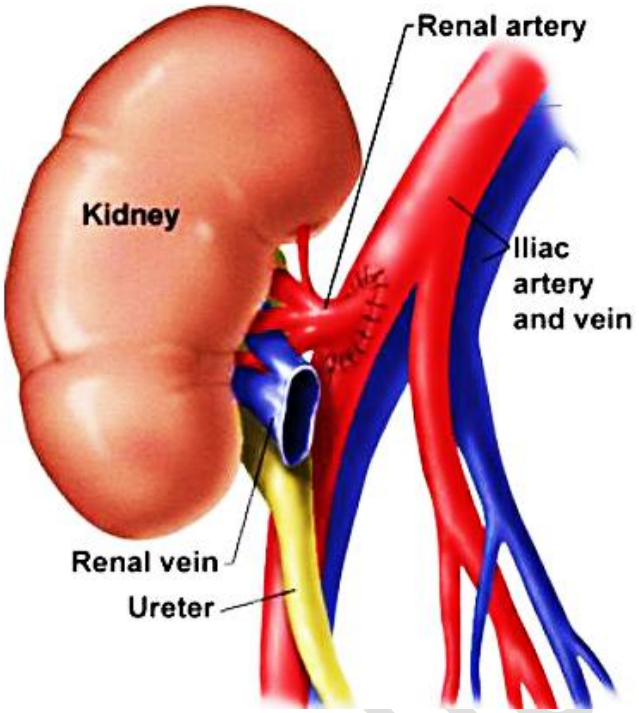
4. Subclavian arteries : a right and left subclavian artery that carries blood to the arms, shoulders and upper back.

الشريان تحت الترقوة



5. Renal arteries : branch off the abdominal aorta and carry blood to the kidneys.

الشريان الكلوي



6. Iliac arteries : branch off the descending aorta and take blood to the pelvis and legs.

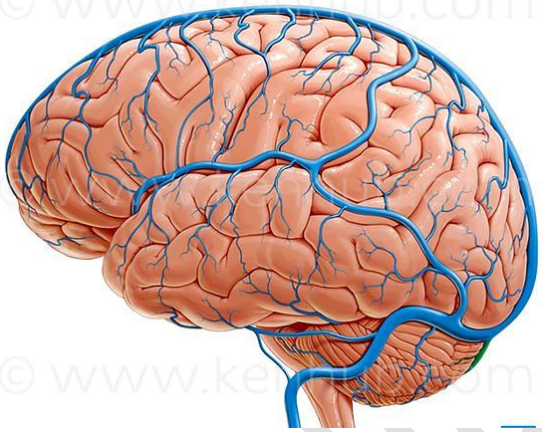
الشريان الحرقفي

Veins الاوردة

are blood vessels that carry deoxygenated blood from the body tissues back to the heart. Veins have thinner walls and valves that prevent backflow of blood and range from (1 – 30) mm in diameter. Some veins include:

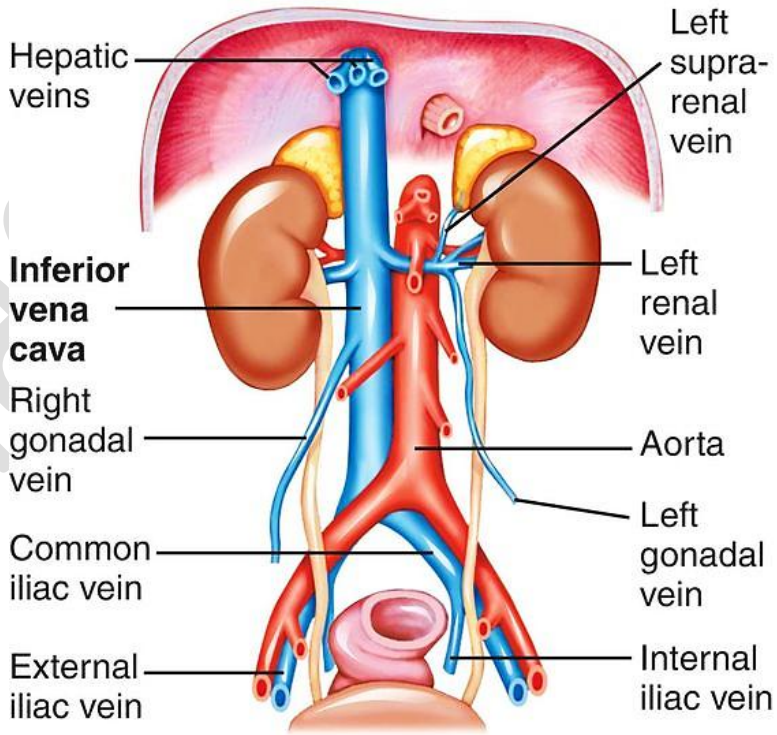
1. Jugular veins : return blood from the brain

الوريد الوداجي

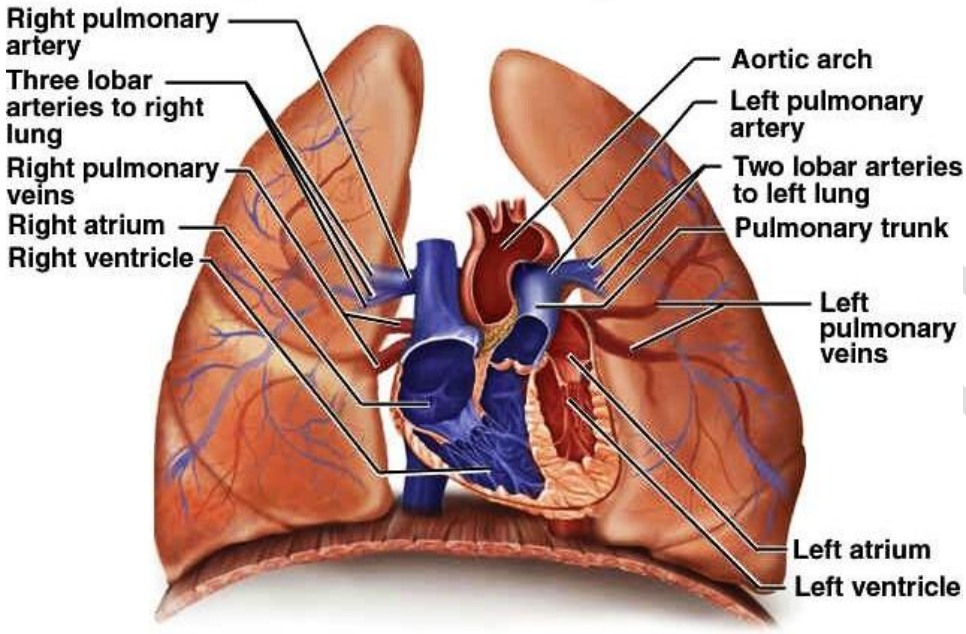


2. Vena cava : two large veins that return blood from the upper and lower parts of the body back to the heart.

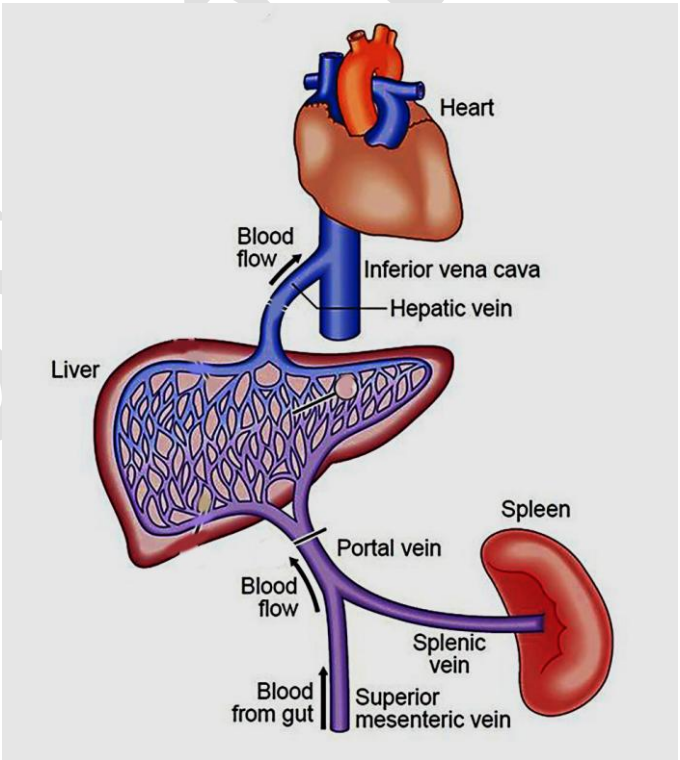
الوريد الاجوف



3. Pulmonary veins : carry newly oxygenated blood from the lungs back into the left atrium of the heart. الوريد الرئوي



4. Portal vein : transports blood from the gastrointestinal system to the liver for filtering before returning it to the heart. الوريد البابي



Capillaries الشعيرات الدموية

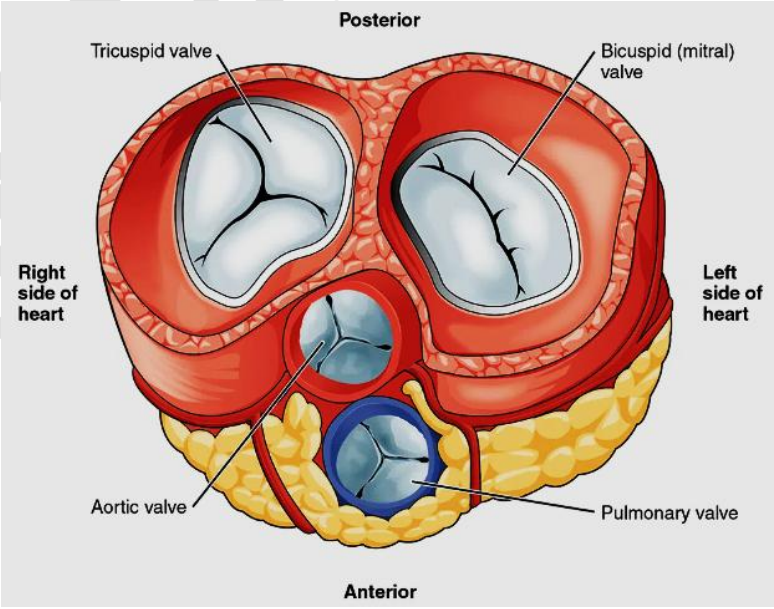
are the smallest and thinnest blood vessels in the body. They connect arteries and veins and are responsible for the exchange of gases, nutrients, and waste products between the blood and the tissues. Capillary walls are composed of a single layer of endothelial cells, which allows for easy diffusion of substances. They are about (5-10) µm in diameter.

Valves الصمامات

They open to allow blood to flow through and then close to prevent backflow.

Located between the chambers of the heart and at the exits. Ensure one-way blood flow through the heart. There are several types:

- ✓ **Tricuspid valve** - between right atrium and right ventricle
- ✓ **Bicuspid (Mitral) valve** - between left atrium and left ventricle
- ✓ **Pulmonary valve** - at the exit of the right ventricle to the lungs
- ✓ **Aortic valve** - at the exit of the left ventricle to the aorta
- ✓ **Venous Valves** - found in veins, especially in the legs and feet. Prevent backflow of blood.



Nervous System in Human Body

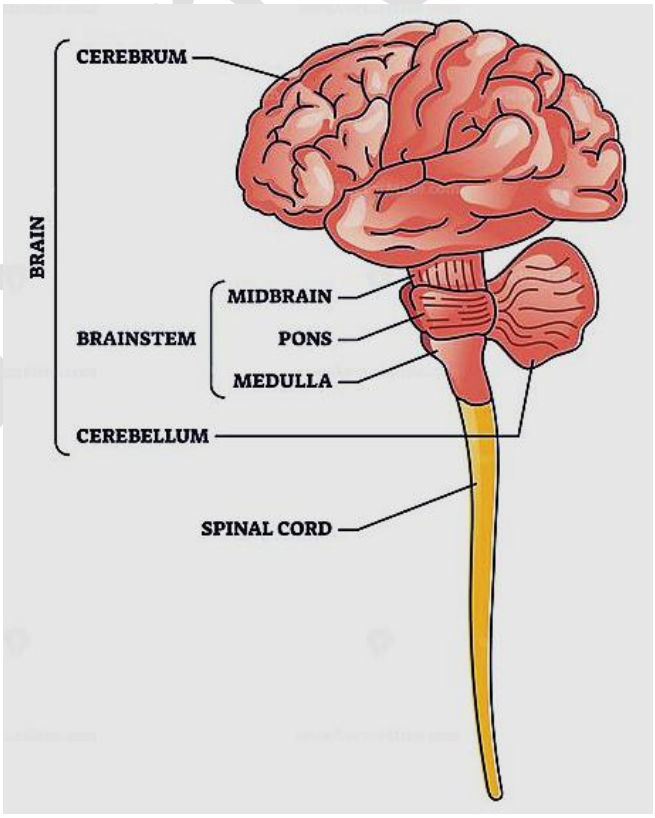
The nervous system consists of the central nervous system (CNS) and peripheral nervous system (PNS).

1. Central Nervous System (CNS)

- Consists of the brain and spinal cord

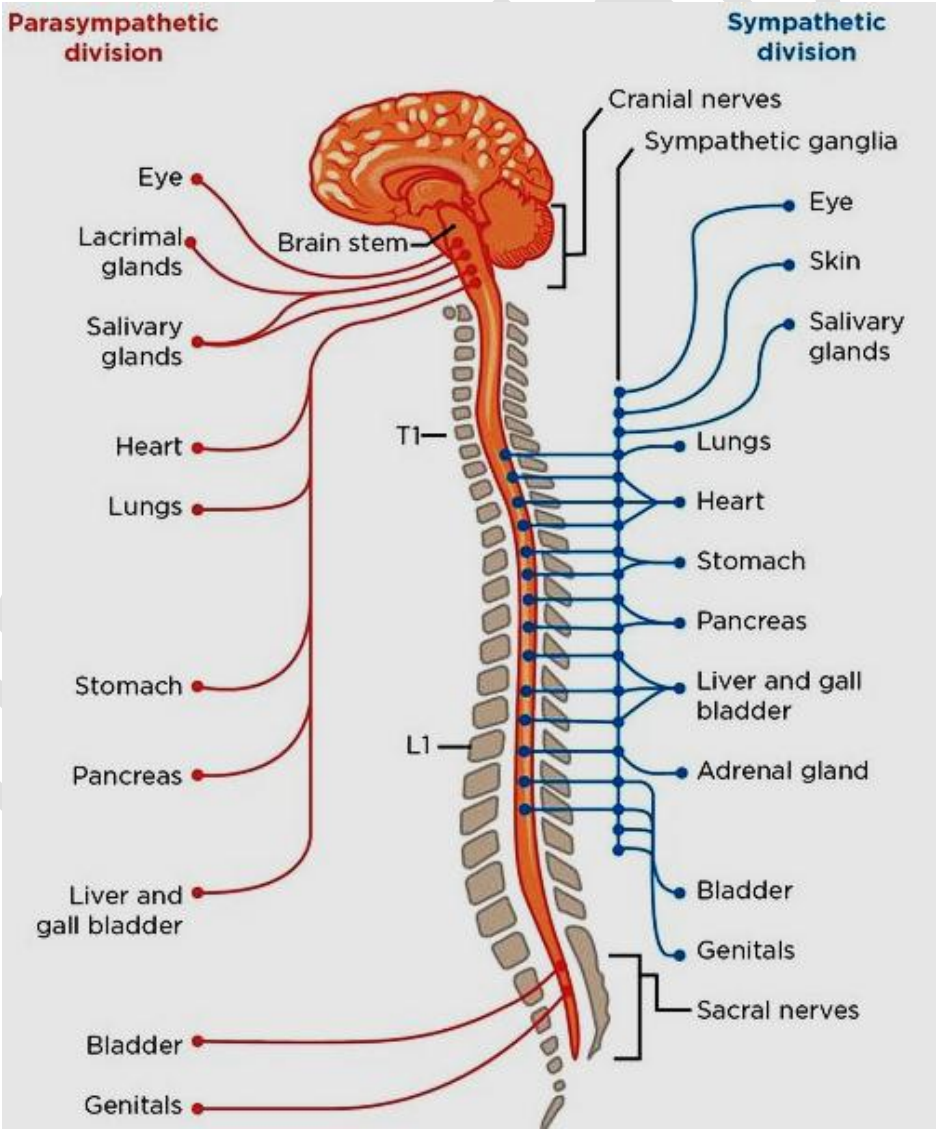
- Brain : is command center. It is divided into different regions, each with specific functions such as:
  - ✓ cerebrum (responsible for conscious thought, memory, speech and sensory processing)
  - ✓ cerebellum (responsible for coordination and balance)
  - ✓ brainstem (responsible for regulates breathing and heartbeat)
- Spinal Cord : is a long, cylindrical bundle of nerve fibers that extends from the base of the brain to the lower back. It serves as a communication pathway between the brain and the rest of the body.

الحبل الشوكي



2. Peripheral Nervous System (PNS)

- Consists of all nerves that lie outside brain and spinal cord
- Connect the CNS to the rest of the body
- It is further divided into two components:
  - Somatic nervous system: controls voluntary muscle movement
  - Autonomic nervous system:
    - ✓ Sympathetic: mobilizes body in times of stress. It increases heart rate, dilates blood vessels, and prepares the body for "fight-or-flight" responses.
    - ✓ Parasympathetic: helps the body to decrease stress, decrease heart rate, conserves energy and promotes digestion



The Neuron الخلية العصبية

is play a critical role in transmitting and processing information throughout the body. Neurons are composed of three main parts:-

- ✓ **Cell body (soma) : contains the nucleus and carries out essential cellular functions.**
- ✓ **Dendrites : are branch-like extensions that receive signals from other neurons or sensory receptors. They collect information and transmit it towards the cell body.**
- ✓ **Axon : is a long, cable-like projection that carries electrical signals, known as action potentials, away from the cell body to other neurons, muscles, or glands.**

Neurons also have a unique feature called the myelin sheath, which is a fatty substance that surrounds the axon and acts as an insulating layer. It helps to speed up the conduction of electrical signals along the axon.