Nursing College

Lecture - *Dr.Mohammed A.hayawi*

Anatomy

Nervous System

The nervous system

The Nervous System controls and coordinates all the functions of the body
It is the major controlling and communicating system of the body.

- The Nervous System consists of two main sub-divisions:
  - Central Nervous System (CNS): consist of **brain** and **spinal cord**
  - Peripheral Nervous System (PNS)

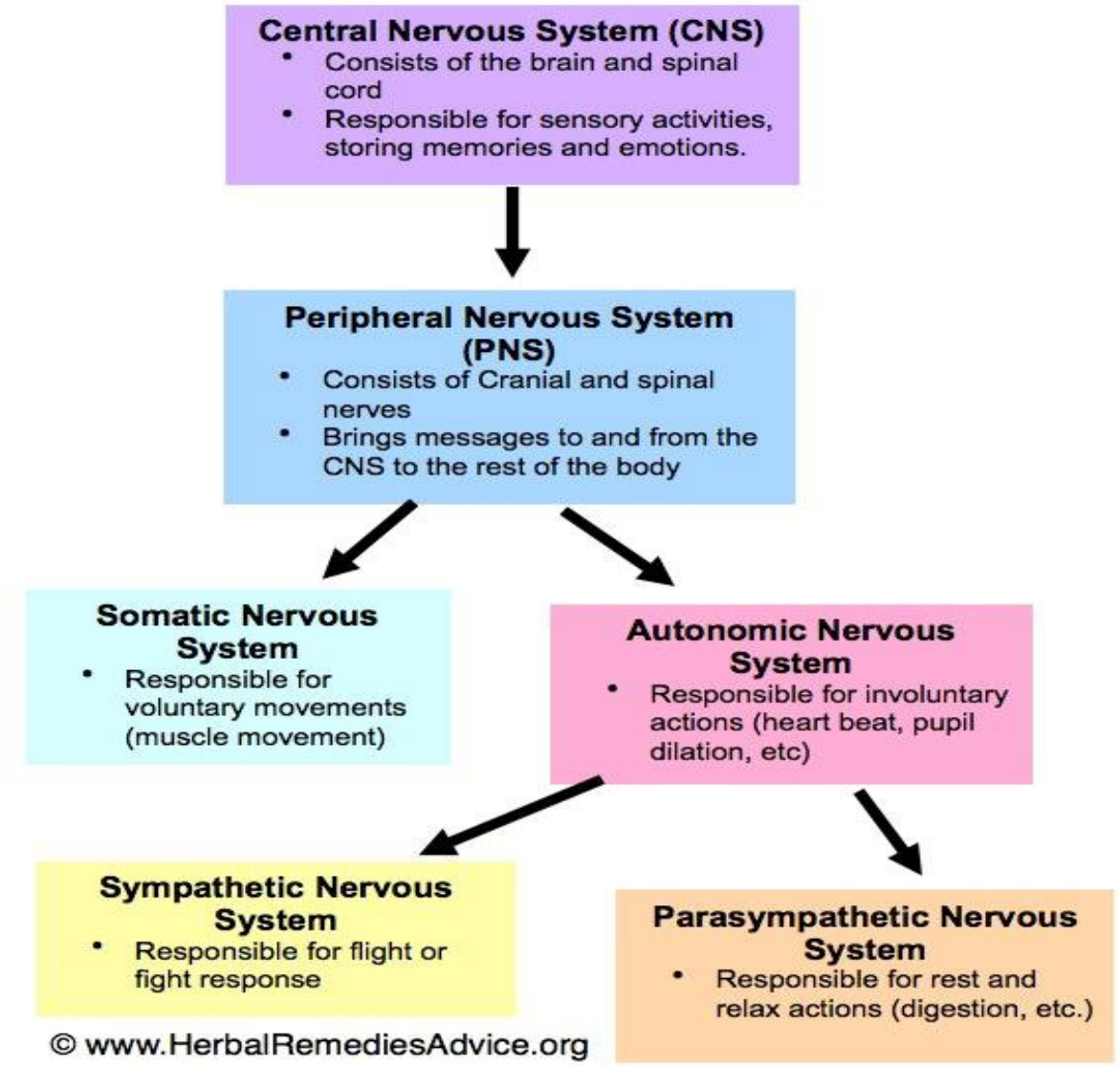
- The **Peripheral Nervous System** -- is the nerves outside the brain and spinal cord divided into two sub-divisions:
  - Somatic - voluntary (sensory and motor)
  - Autonomic - involuntary (sympathetic and parasympathetic)

Somatic ------ convey messages from the sense organs to the CNS
and from the CNS to the muscles and glands

Autonomic -----a set of neurons that control the heart, the intestines, and other organs

- ## Type of neurons :

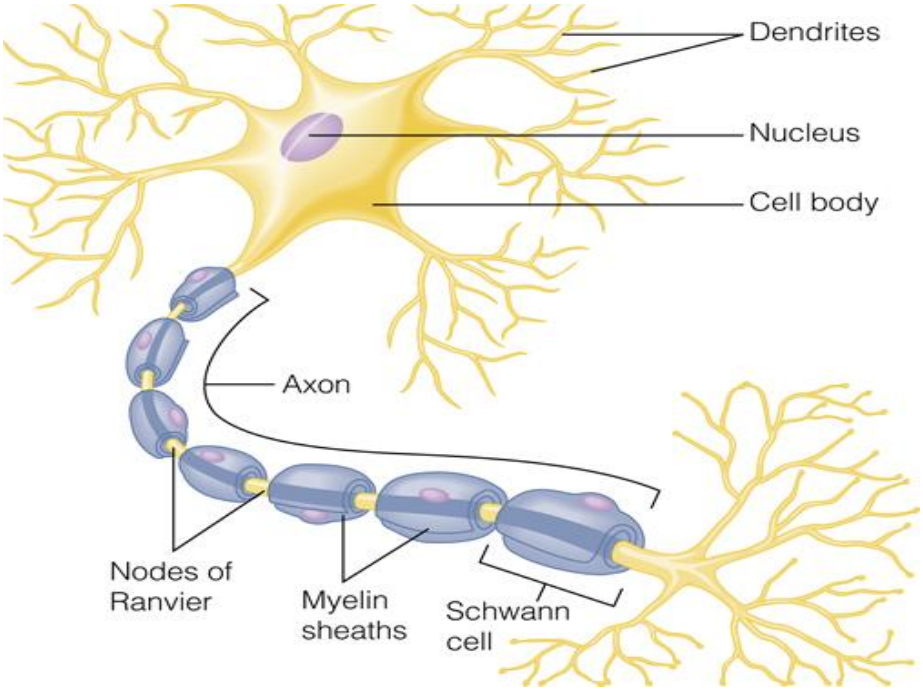
1. **Sensory neurons (afferent)**: send information from sensory receptors (e.g., in skin, eyes, nose, tongue, ears) TOWARD the central nervous system
2. **Motor neurons (efferent)**: carries impulses from the CNS to organs, muscles and glands.
3. **Interneurons:** send information BETWEEN sensory neurons and motor neurons. Most interneurons are located in the central nervous system



Neurons : Also it called nerve cells.

Anatomical structures:

- **Cell body**: which contains the nucleus and is the metabolic center of the cell.
- **Dendrites**: highly branched processes
- **Axon**: a long process extending out from the neuron cell body.
- **Myelin**: It is a wax like membrane that covers the longest nerve fibers.
- **Schwann cells**: Specialized supporting cells that wrap tightly around the axon .
- **Myelin sheath**: encloses the axon



Brain ventricles:

It is a system of four communicating cavities within the brain and continuous with the central canal of the spinal cord.

The four ventricles consist of the **a. two lateral ventricles**,

b. Third ventricle

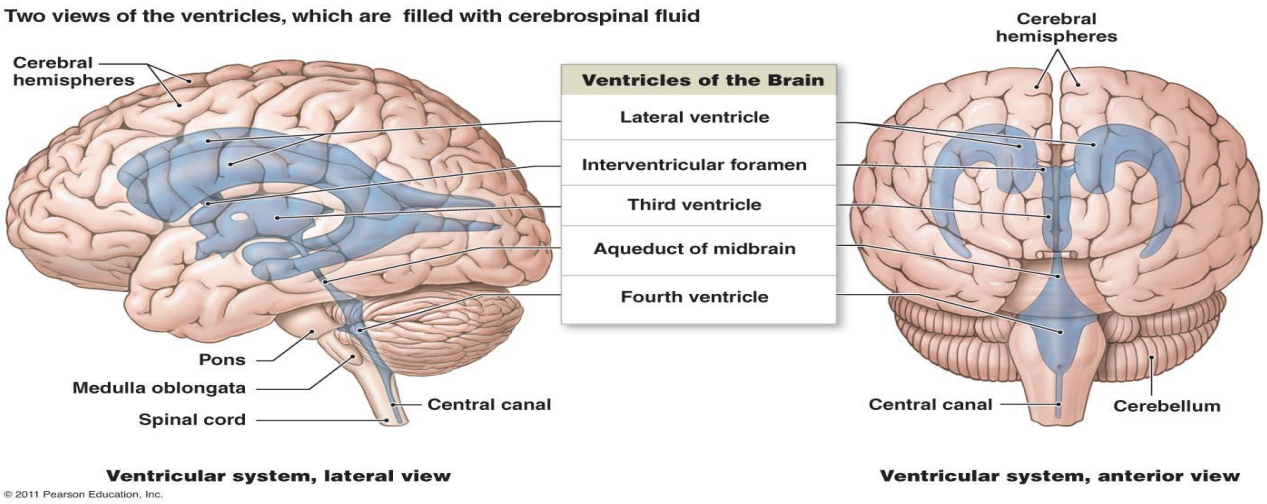
c. Fourth ventricle:

- **Lateral ventricles** The lateral ventricles are two cavities located within the cerebrum. The lateral ventricles communicate with the third ventricle through the interventricular foramen (opening).

- **The third ventricle** is a median (midline) cavity in the brain that is bounded by the thalamus and hypothalamus on either side. The third ventricle is a narrow cavity located between the two hemispheres

- **The fourth ventricle** is the most inferior (lowest) of the four ventricles of the brain.
- The fourth ventricle has a characteristic diamond shaped cavity located behind the Pons and medulla oblongata.

The ventricles are filled with cerebrospinal fluid, which is formed by structures called choroid plexuses located in the walls and roofs of the ventricles.



Cerebrum (Cerebral Hemispheres): Cerebrum is the largest part of the human brain, which consists of two hemispheres separated by longitudinal fissure. It covers the superior part of the brain.

Diencephalons (interbrain)

The major structures of the diencephalons are the

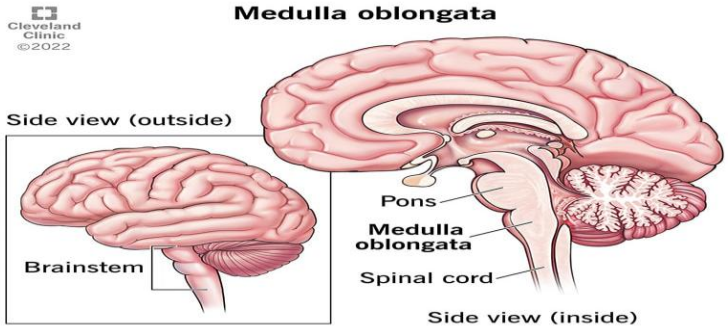
1. Thalamus:
2. Hypothalamus
3. Epithalamus

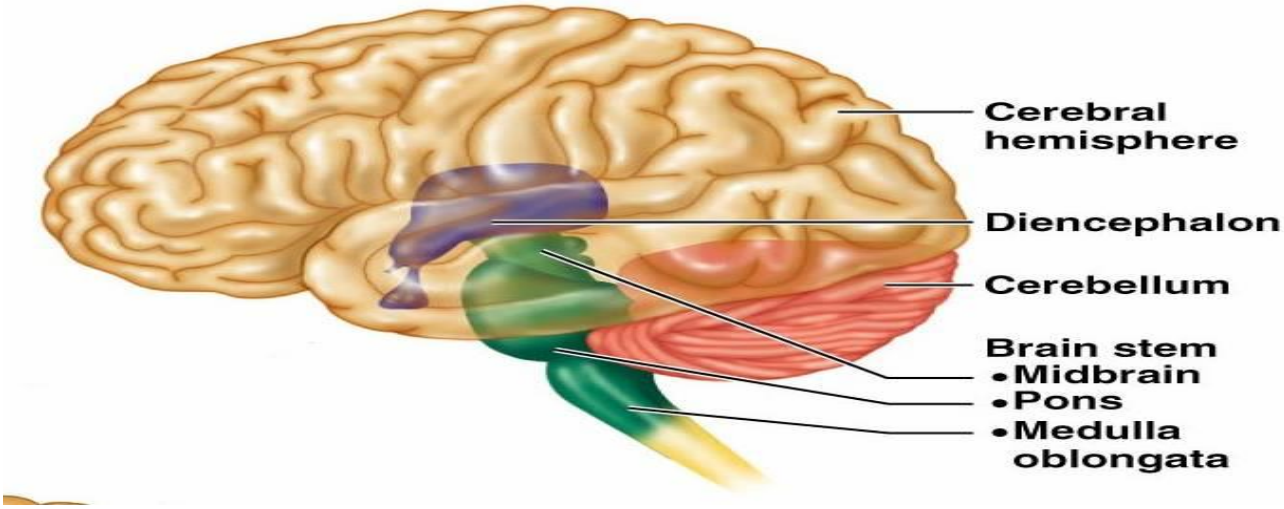
Brain stem

It is about the size of a thumb in diameter and approximately 3 inches long. Its structures are

1. **Midbrain الدماغ المتوسط**
2. **Pons (الجسر)**
3. **Medulla oblongata**:

, Medulla oblongata is a part of brainstem, which connects brain to spinal cord. That makes medulla a major connection point in nervous system.





Cerebellum

The large cauliflower like structure, projects dorsally from under the occipital lobe of cerebrum.

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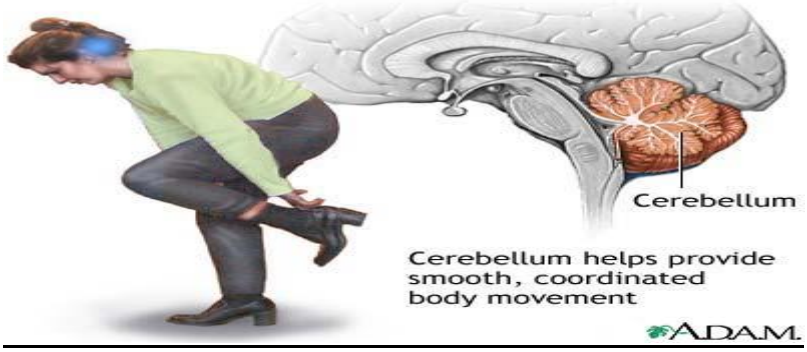
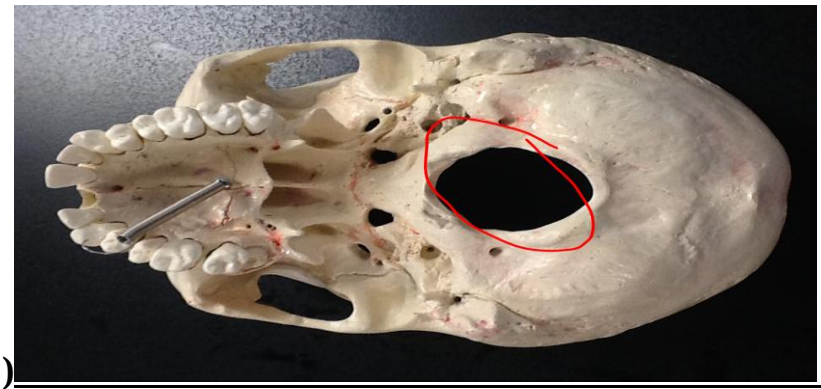


Spinal cord: is a continuation of brain stem. It extends from the large opening (foramen magnum) in the base of skull down to the lower back (1st lumbar vertebrae). It is a cylindrical shaped structure about 42 cm long and about 2.5 cm in diameter.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Cranial nerves

The 12 pairs of cranial nerves primarily supply the head and neck.

Only one pair (vagus nerves) extends to the thoracic and abdominal cavities.

Classification

Sensory nerves S 821	**Motor nerves 12, 11,643**	**Mixed nerves 1975**
I Olfactory	III Oculomotor	V Trigeminal
II Optic	IV Trochlear	VII Facial
VIII Vestibulo-cochlear	VI Abducens	IX Glossopharyngeal
	XI Spinal accessory	X Vagus
	XII Hypoglossal	

Spinal nerve and nerve plexus

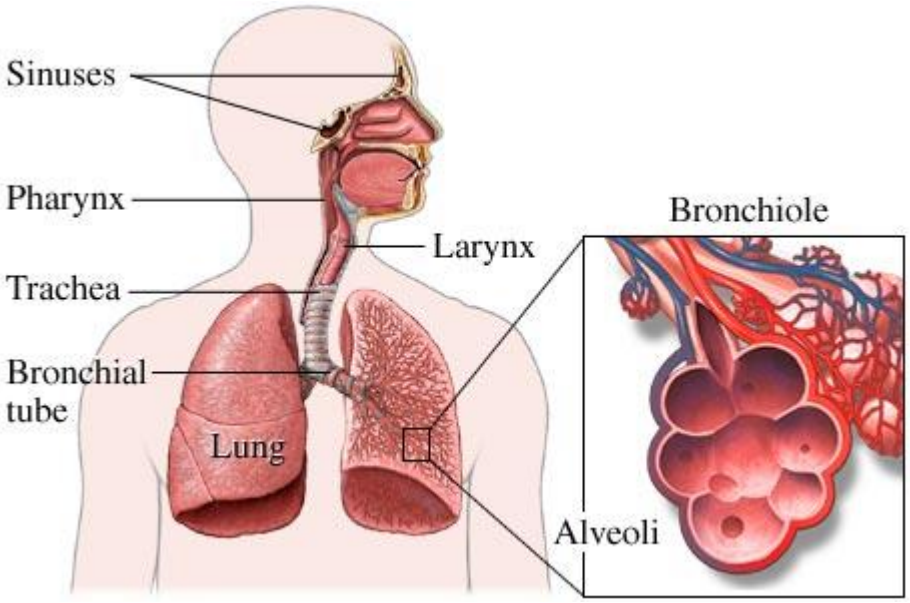
The 31 pairs of human spinal nerves are formed by the combination of the ventral and dorsal roots of the spinal cord.

- Cervical nerves – 8 pairs (C1: emerges between the skull and the 1st vertebrae)
- Thoracic nerves – 12 pairs
- Lumbar nerves – 5 pairs
- Sacral nerves – 5 pairs
- Coccygeal nerves – 1 pair

Anatomy

Respiratory System

The respiratory system consists of the :
Nose , mouth , pharynx , larynx , trachea , bronchi , bronchiole & alveoli .



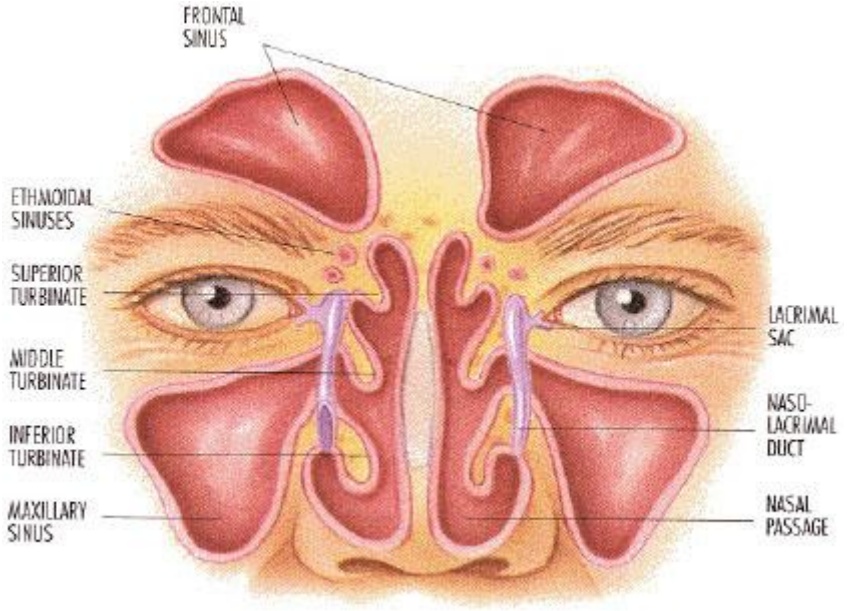
Nasal Cavity

Nose: It's the only externally visible part of the respiratory system, during breathing; the air enters the nose by nostrils.

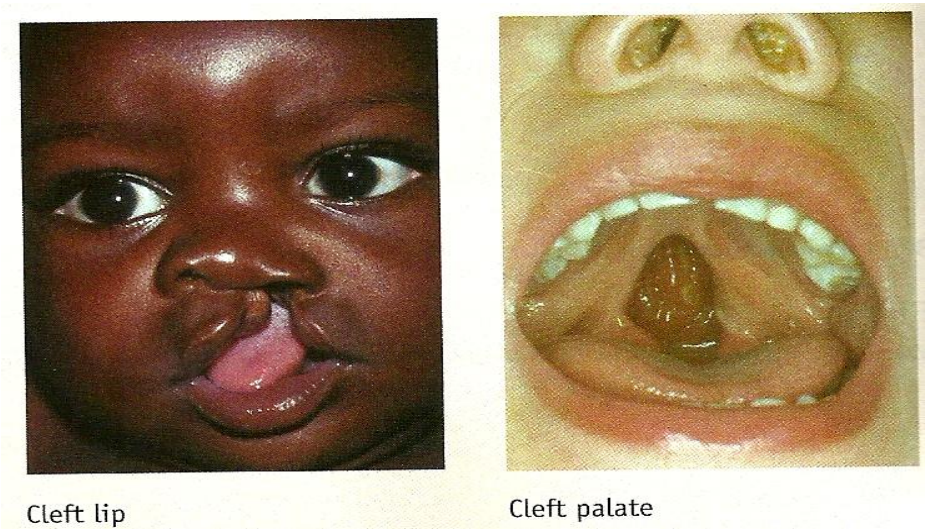
- The nasal cavities are separated into right & left by nasal septum .
- The sticky mucosa produces by the mucus glands moisten the air and traps incoming bacteria and other foreign bodies.
- The posterior nares are situated at the back of the nasal cavity & constitute the entrance to the nasopharynx .

Structures of Nasal Cavity

1. Superior, middle, and inferior concha (تقعر بين ارتفاعين).
2. Superior, middle, and inferior turbinate (عظم ملفوف)
3. Soft palate .
4. Nasopharynx.



- The nasal cavity is separated inferiorly from the oral cavity by the palate :
    1. **Hard palate**: the palate supported by bone.
    2. **Soft palate**: the unsupported posterior part (not contain bone).

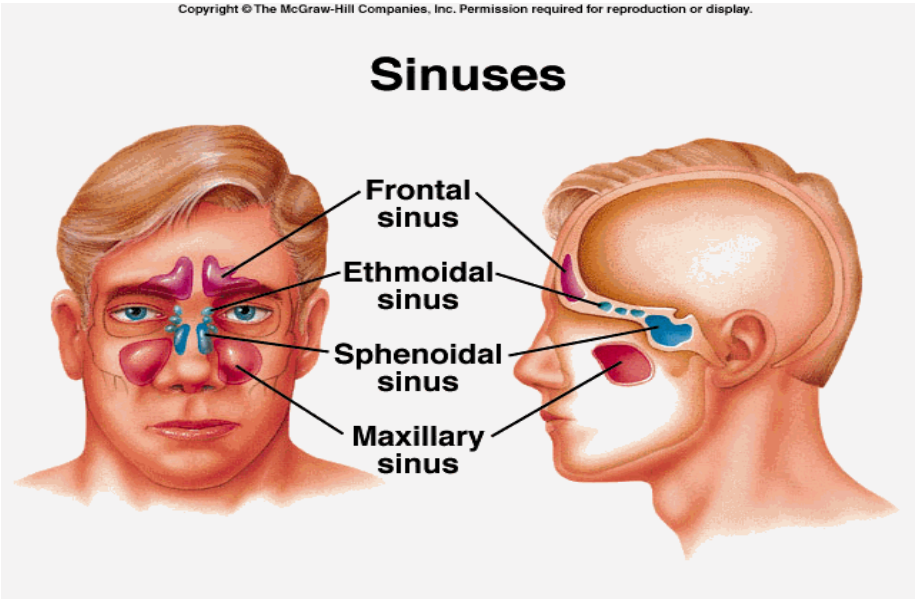


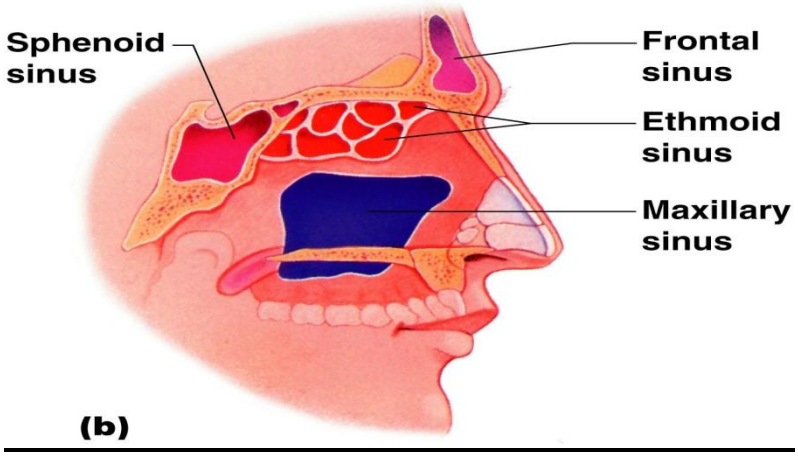
Cleft palate: it is a genetic defect, characterized by the failure of the bones forming the palate to fuse medially, results in breathing difficulty.

- **The roof of the mouth (palate) is formed between the sixth and ninth weeks of pregnancy.**
- **The lip forms between the fourth and seventh weeks of pregnancy**

Nasal sinuses: The nasal cavity is surrounded by a ring of Para nasal sinuses as the following: -

1. Frontal sinuses
2. Sphenoid sinuses(الجيب الوتدي الاسفيني)
3. Ethmoid sinuses (الجيب المصفوي)
4. Maxillary sinuses





LARYNX

Larynx (Voice Box):

The larynx or voice box, play a role in speech. It is located inferior to the pharynx.

- It has special function of voice production
- It has situated in the midline of the neck between the pharynx above & the trachea below .
  - It's formed by eight rigid hyaline cartilages
  - The largest of cartilage is the thyroid cartilage, which protrudes anteriorly and is commonly called the Adam's apple.
  - The epiglottis protects the superior opening of the larynx. It's closes the opening of the larynx during eating and drinking preventing the food and fluids to enter the larynx.

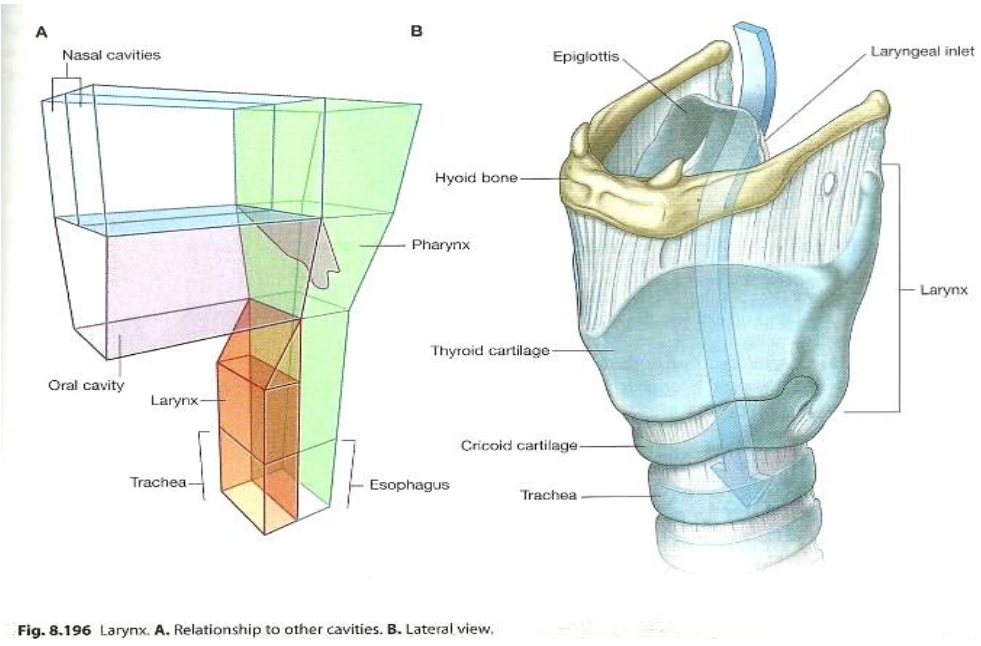


Fig. 8.196 Larynx. **A.** Relationship to other cavities. **B.** Lateral view.

Trachea :

- It is 12 cm long , 2.5 cm in diameter .
- It divided into two main bronchi.
- The trachea consists of number of C – shaped rings of hyaline cartilage. Air entering the trachea from the larynx travels down, its length (10 – 12 cm) to the level of the fifth thoracic vertebrae. The trachea is lined with a ciliated mucosa.
- These cartilages keep the trachea permanently open, so that its wall do not collapse like those of the esophagus.

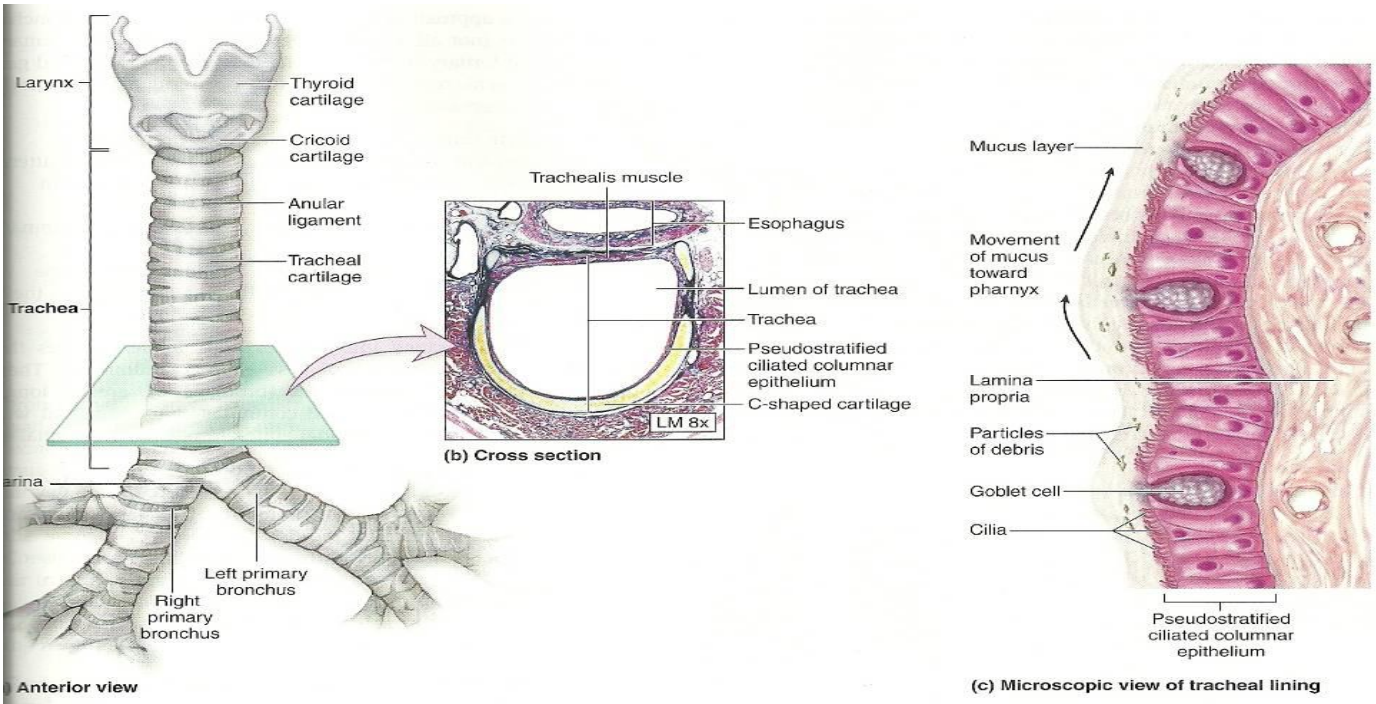
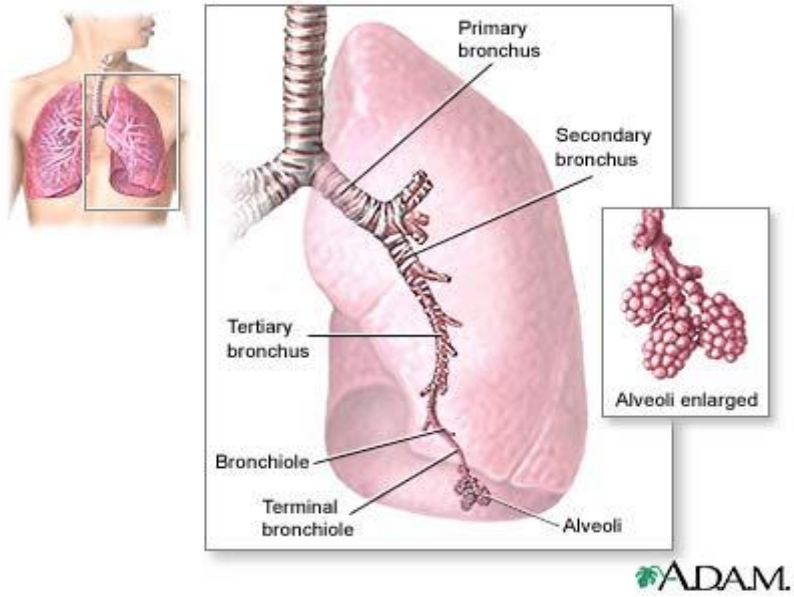


Figure 25.7

Trachea. *(a)* The trachea connects the larynx superiorly and the primary bronchi inferiorly. *(b)* A cross-sectional photomicrograph shows the relationship of the trachea (anteriorly) and the esophagus (posteriorly). The wall of the trachea is supported by C-shaped rings of cartilage. *(c)* The trachea is lined with a pseudostratified ciliated columnar epithelium that propels mucus and debris away from the lungs and toward the pharynx.

Bronchi :

- The trachea ends by dividing or bifurcating into two main bronchi (right & left) , each bronchus passes to the corresponding lung .
- From each main bronchus numerous smaller bronchi are given off , like branches of tree & the smallest bronchial tubes are called bronchioles .



Lungs :

1. **Right lung** composed from 3- lobes
   a. Superior lobe. b. Middle lobe. c. Inferior lobe.

2. **Left lung** is smaller than the right and composed from 2- lobes.

   a. Superior lobe.
   b. Inferior lobe

- The lungs are pair of conical- shaped organs , each enveloped in a serous membrane (pleura) .
- The apex of the lung rises into the root of the neck for about one inch above the clavicle .
- The base is concave & is related to the upper surface of the diaphragm .

- **The lungs contain about 3 million alveoli, each alveolus composed of the following**

  a. Simple Squamous epithelium (type I pneumocytes)

  b. Surfactant secreting cells (type II pneumcytes)

  c. Macrophages which are responsible for removing debris and microbes from the alveoli

- **Pleural Membrane:**
- The covering membranes of the lung consists from:
- 1. **Parietal pleura** lines the inner surface of the thoracic cavity.
- 2. **Visceral pleura** cover the outer surface of the lungs.

- **Pleural Cavity:**
- The thin space between parietal pleura and visceral pleura called pleural cavity. Both pleura secrete a small amount of pleural fluid .
- Pleural fluid gives a moist, slippery coating that provides lubrication, thereby reducing friction between the parietal and visceral surfaces as you breath.

Figure 13.4a: Anatomical relationships of organs in the thoracic cavity.

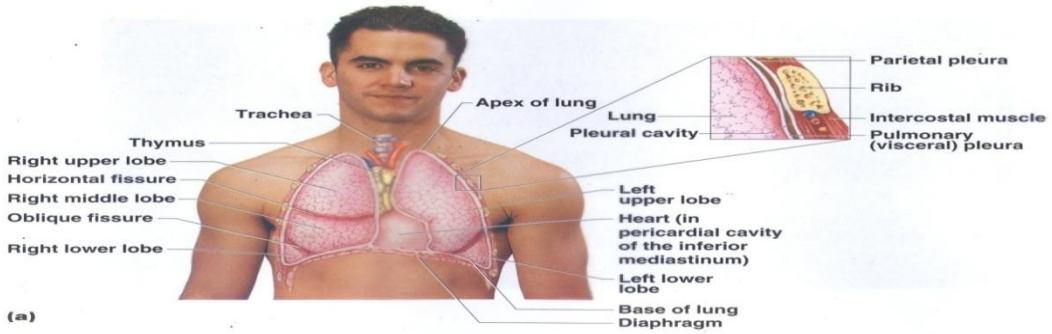
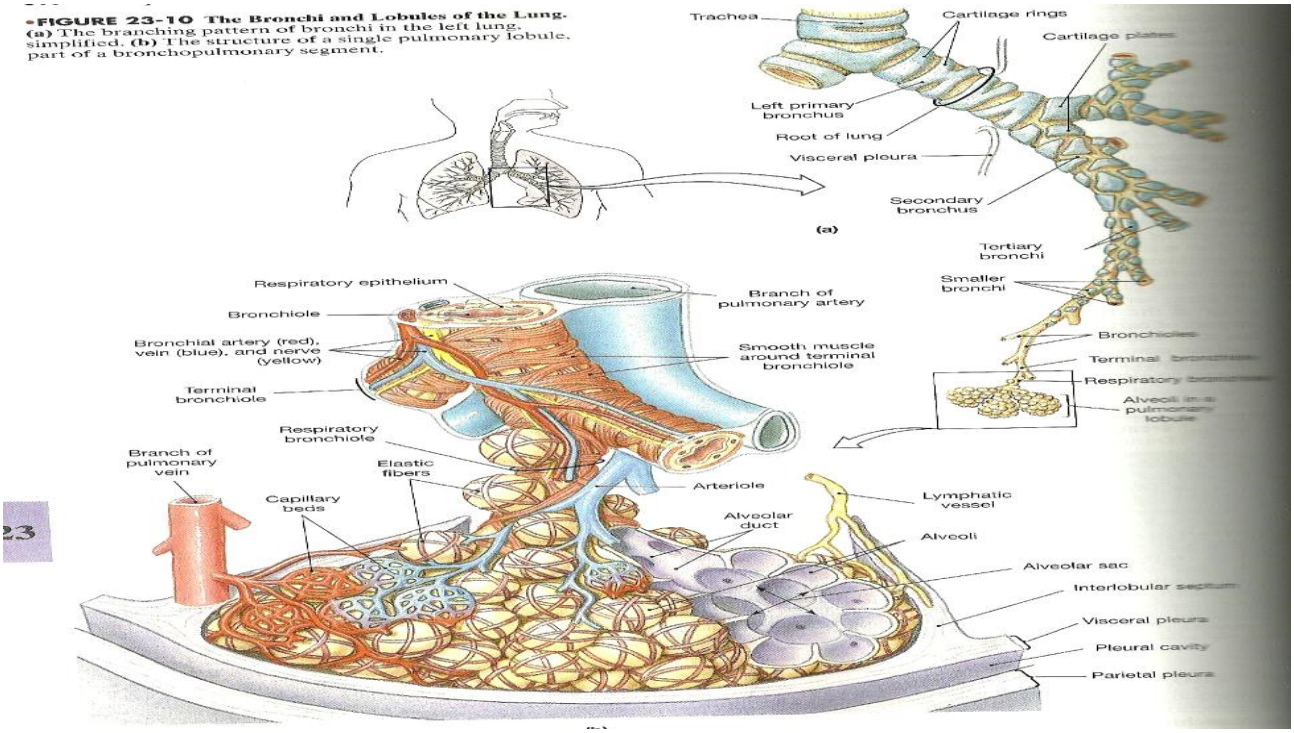
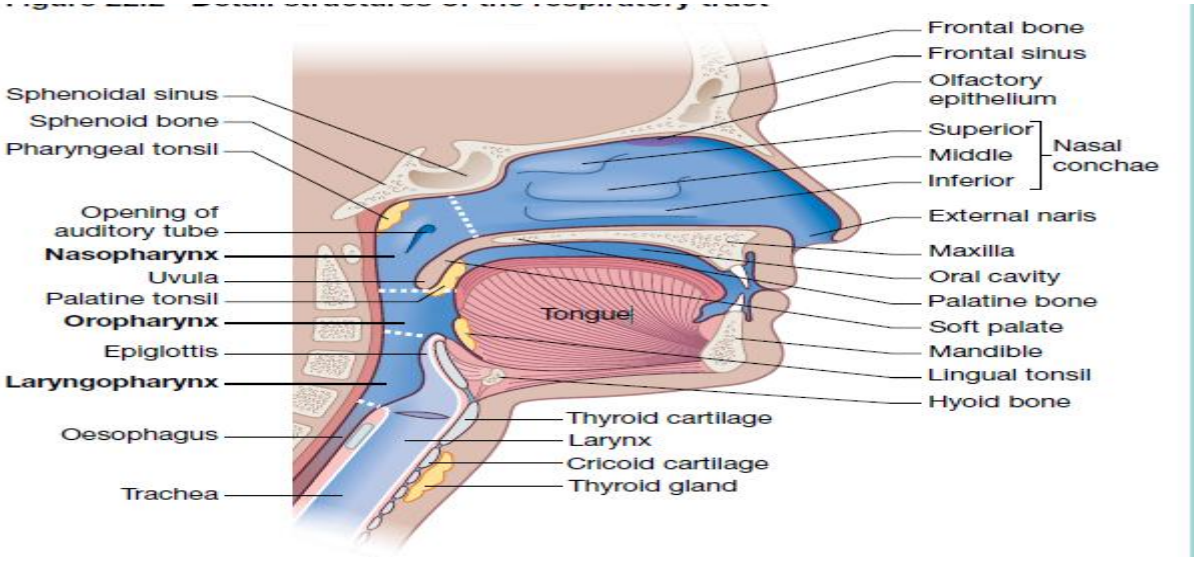


FIGURE 23-10 The Bronchi and Lobules of the Lung. **(a)** The branching pattern of bronchi in the left lung, simplified. **(b)** The structure of a single pulmonary lobule, part of a bronchopulmonary segment.





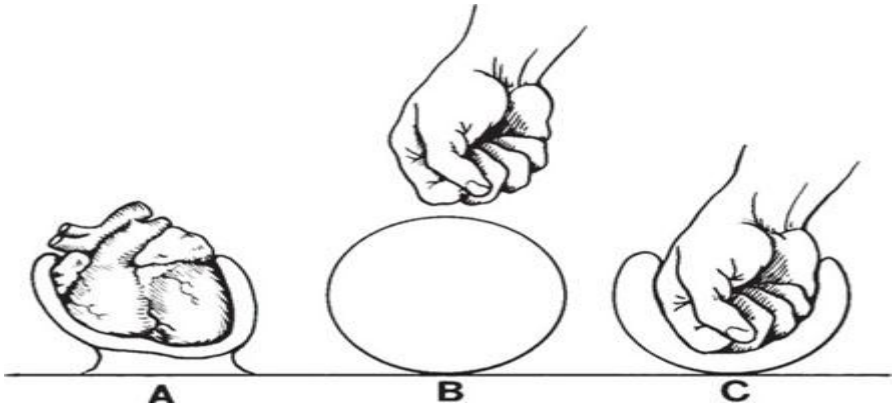
Nursing College

Lecture - 4 *Dr.Mohammed A.hayawi*

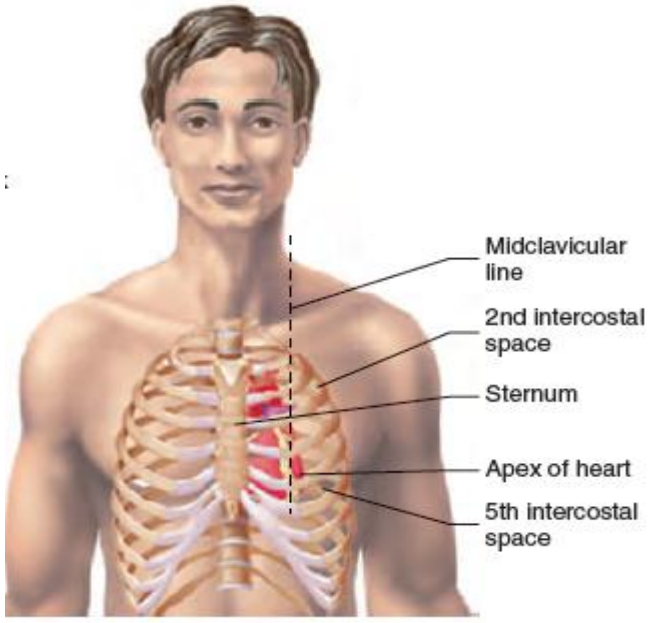
Anatomy of Heart

Anatomy of the heart

- **Location & size:**
- The size of the heart is approximately the size of a person's fist.



- The heart is located within the bony thorax.
- Its apex is directed towards the left hip and rests on the diaphragm at the end of the fifth intercostal space.
- The base of the heart is directed towards the right shoulder and lies beneath the second rib.



Covering layers of the heart :

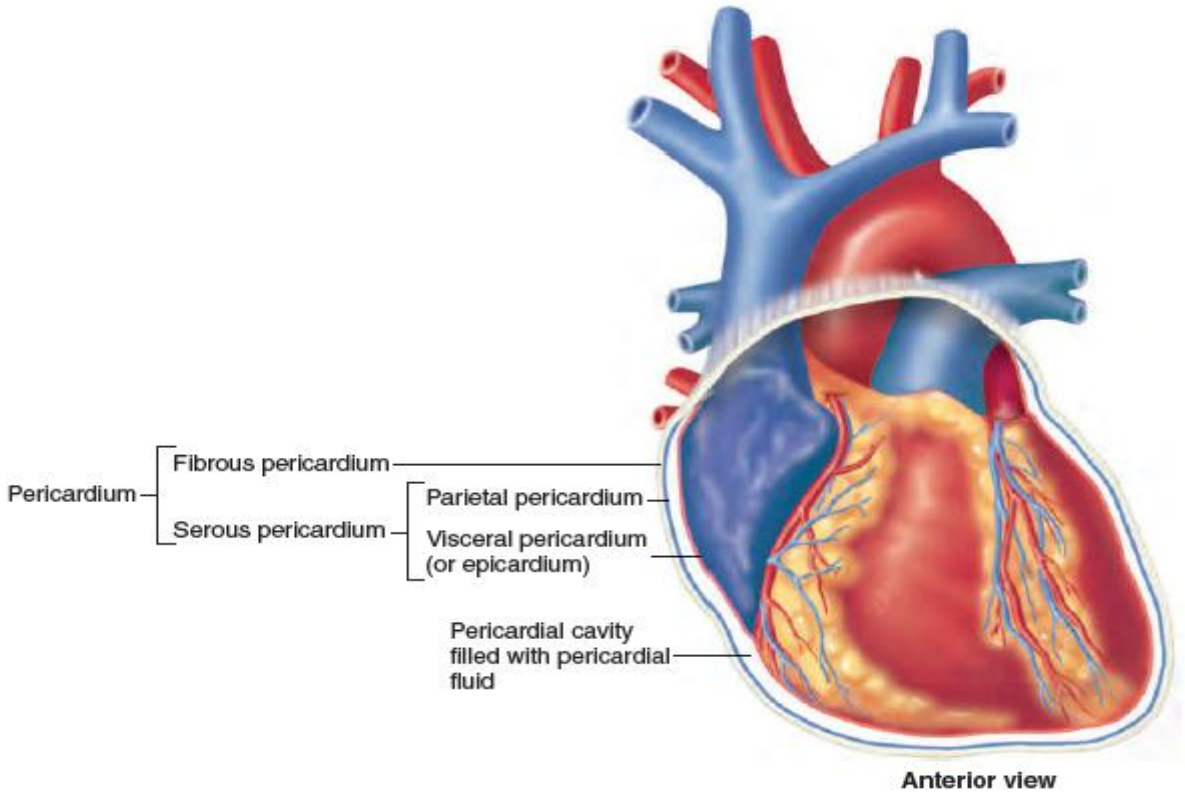
The heart is surrounded and covered by its own cavity, the **pericardial cavity** (*peri*, around +*cardio*, heart)

Covering: The pericardium is the double layer membrane that surrounds the heart.

1. Parietal pericardium, which is **fibrous pericardium,**(outer layer)

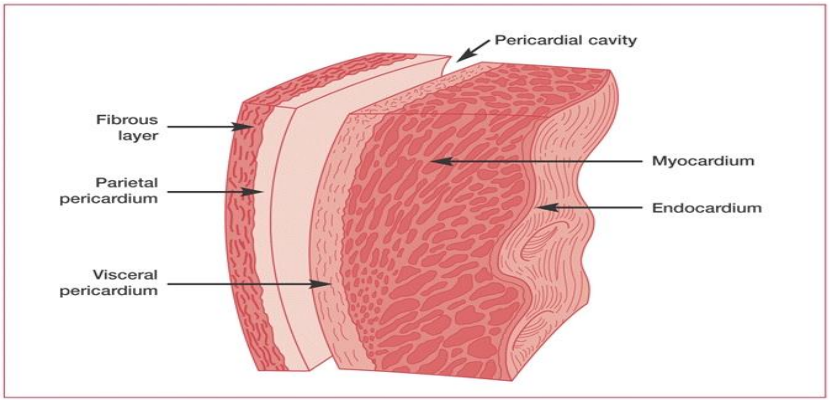
2. Visceral pericardium : which the inner layer of the heart consist of flat epithelial cells called the **serous pericardium.**.

Between the parietal and visceral pericardial membranes is **serous fluid**, which prevents friction as the heart beats and allows the heart to beat easily.



Walls of the heart: The heart walls are composed of three layers:

1. Epicardium (outer layer)
2. Myocardium (middle layer), which is actually contract.
3. Endocardium (inner layer), it's a thin layer that lines the heart chambers.



Chambers and associated Great walls

The heart has four chambers or cavities.

1. **Two atria (auricles)**
2. **Two ventricles**

- The **superior atria(upper)** are primarily the receiving chambers.
- The **inferior ventricles(lower)** are discharging chambers.
- The **left ventricle** forms its apex.

Valves :

The heart has four valves, which allow blood to flow in only one direction and prevent back flow into the atria when the ventricles contract.

A. Atrio - ventricular valves:

- (**Mitral valve**) **(Bicuspid valve)** separates the left atrium from the left ventricle.
- **Tricuspid valve** separates the right atrium from the right ventricles.

Function;

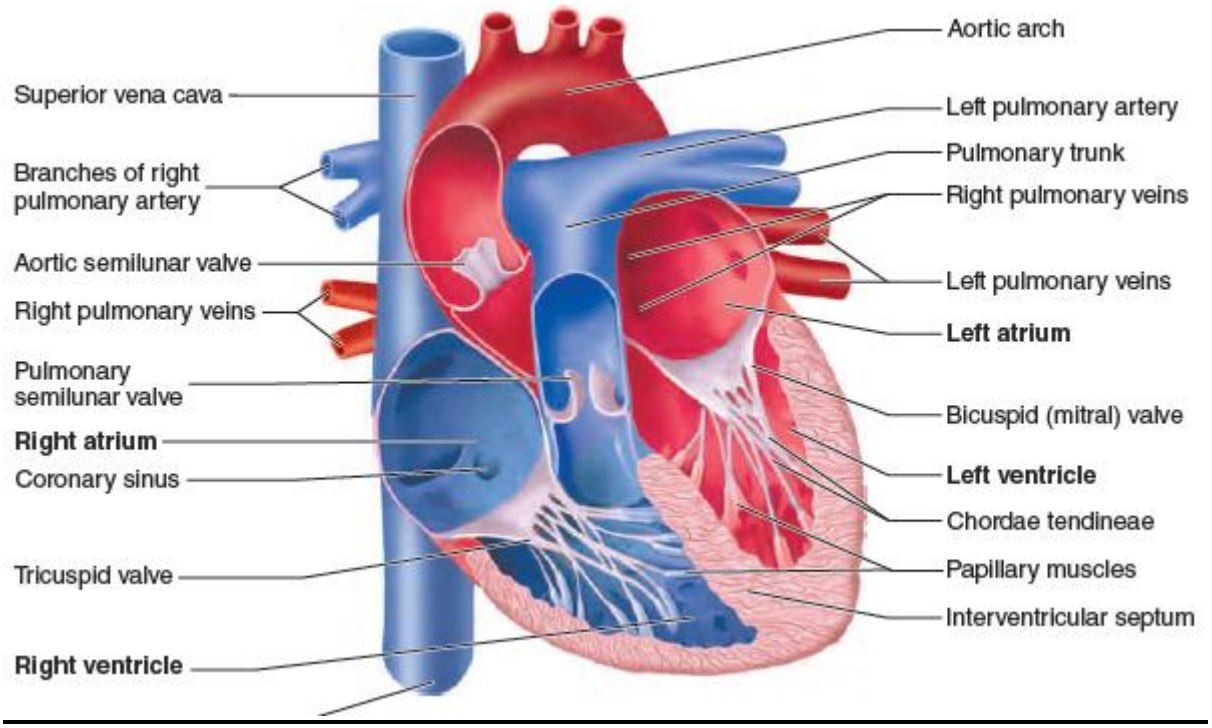
Prevent backflow into the atria when the ventricles are contracting.

B. Semi lunar valves:

- **Aortic valve** separates the left ventricle from the aorta.
- **Pulmonary valve** separates the right ventricle from the pulmonary artery (trunk).

Function:

- Prevent backflow into a ventricle when the heart is relaxed.



Coronary circulation(Cardiac) :

The heart receives about **5%** of the body's blood supply.

The heart receives the oxygenated blood & is nourished by the right and left coronary arteries . The coronary arteries branch from the ascending aorta and encircle the heart like a crown.

Blood flow to the myocardium occurs **during the relaxation phase**, this is the opposite of every other part of the body

1.***Right coronary artery supplies***:

(i) **lateral** wall & **posterior** wall of the right ventricle.
(ii) **Inferior** wall of the left ventricle.

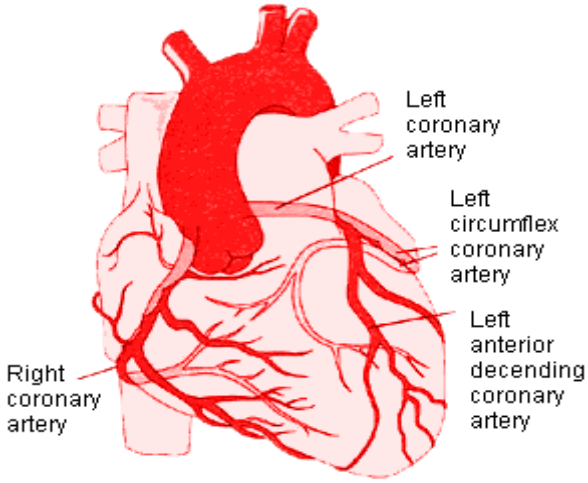
3. ***The left coronary divides into*** :
   a. . Left circumflex artery
   b. left anterior descending artery(LAD)

a. Circumflex artery supply:

(i) The left atrium
(ii) The **posterior** & **lateral** wall of the **left** ventricle

b. LAD supply:

(i) The antero-lateral wall of the **left** ventricle
(ii) The interventricular septum
(iii) The anterior wall of the **right** ventricle



Systemic circulation: (from left ventricle to right atrium).

Systemic circulation which carries oxygenated blood away from the heart to the body, and returns deoxygenated blood back to the heart.

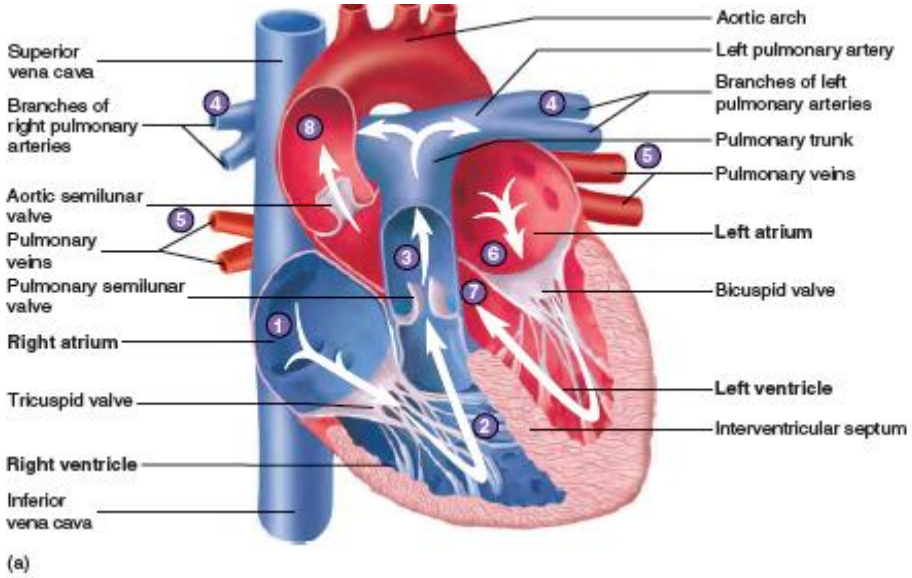
In systemic circulation the blood leaves the heart, through the

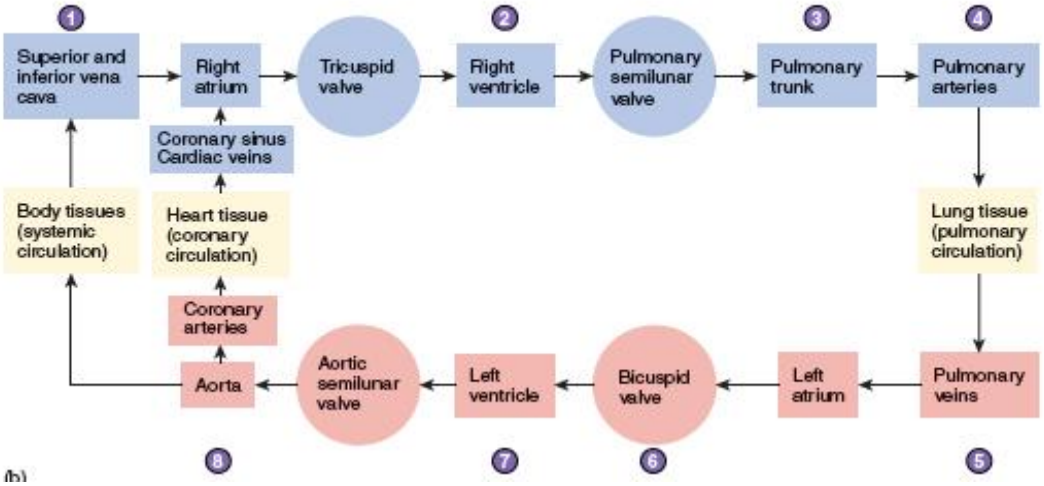
left ventricle –to **aorta** - to **smaller arteries**,- to **arterioles**, and finally **capillaries**,

oxygen in the blood diffuses into the cell.. Waste and carbon dioxide diffuse out of the cell into the blood which then moves to venious side, and then to the inferior and superior vena cava, through which the blood re-enters the heart at the right atrium.

Arteries and veins that connect with the heart and their functions :

1. **Superior vena cava** returns deoxygenated blood to the right atrium from the head and upper extremities.
2. **Inferior vena cava** returns deoxygenated blood to the right atrium from the trunk and lower extremities
3. **Pulmonary arteries** (two) carry blood from right ventricle to the lungs.
4. **Pulmonary veins** (four) carry blood from lungs to the left side of the heart.
5. **Aorta** carries blood from the left side of the heart to the organs of the body.


Superior vena cava
Branches of right pulmonary arteries
Aortic semilunar valve
Pulmonary veins
Pulmonary semilunar valve
Right atrium
Tricuspid valve
Right ventricle
Inferior vena cava
Aortic arch
Left pulmonary artery
Branches of left pulmonary arteries
Pulmonary trunk
Pulmonary veins
Left atrium
Bicuspid valve
Left ventricle
Interventricular septum
(a)


1
Superior and inferior vena cava
Right atrium
Tricuspid valve
2
Right ventricle
Pulmonary semilunar valve
3
Pulmonary trunk
4
Pulmonary arteries
Lung tissue (pulmonary circulation)
5
Pulmonary veins
Left atrium
6
Bicuspid valve
Left ventricle
7
Aortic semilunar valve
Aorta
8
Coronary arteries
Heart tissue (coronary circulation)
Coronary sinus Cardiac veins
Body tissues (systemic circulation)
(b)

Digestive system

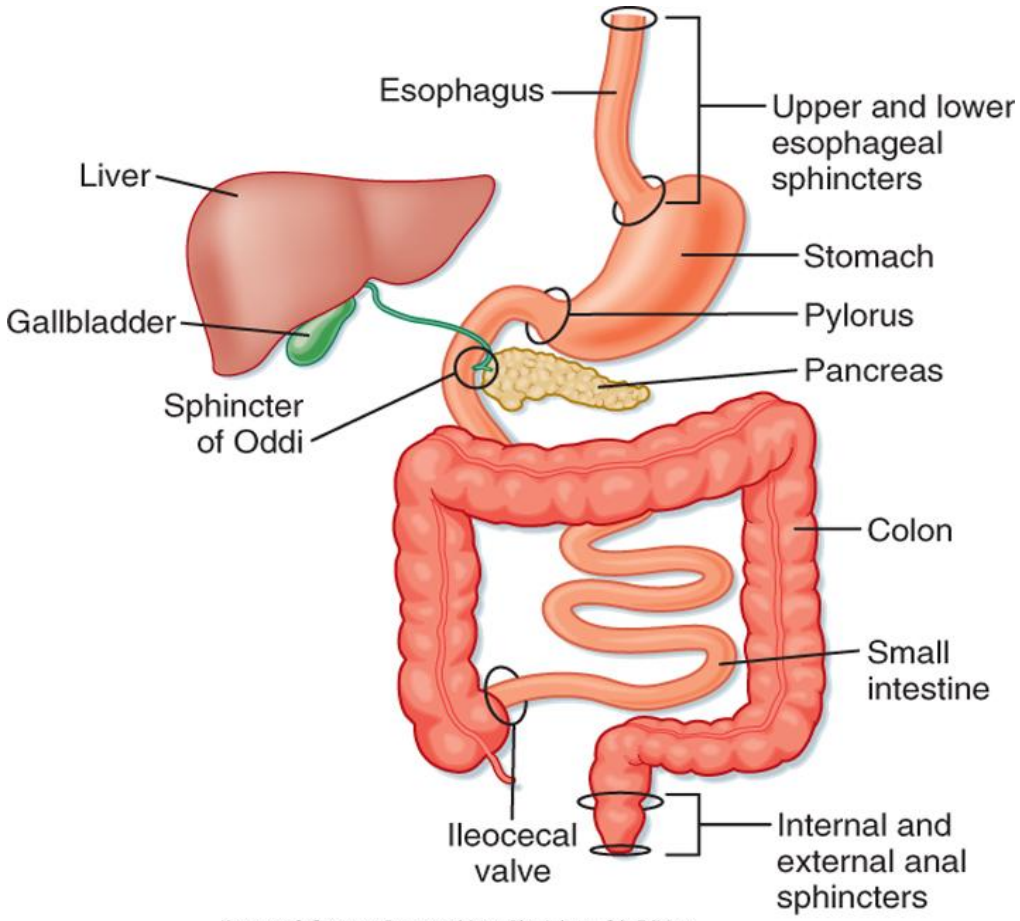
Anatomy of Digestive System

Digestive system consists of:

1. Gastrointestinal Tract (GIT).

2. Accessory organs.

GIT is a digestive tract consists of oral cavity, pharynx, esophagus, stomach, small intestinal, large intestinal, and anus.



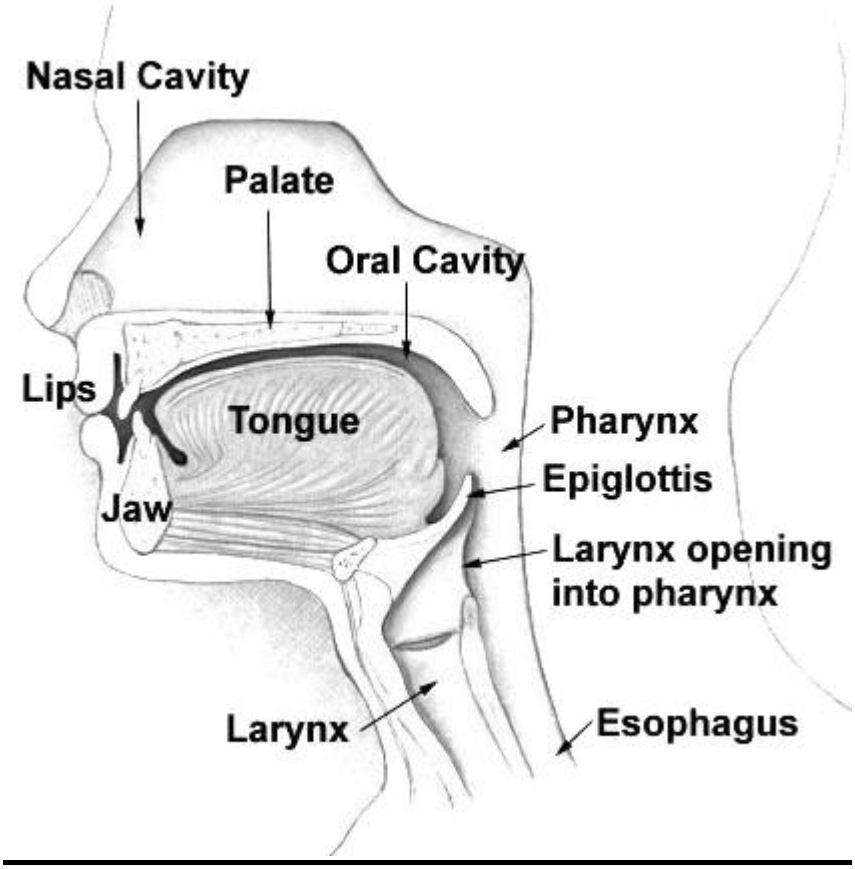
ORAL CAVITY

Structures of Oral Cavity are:

1. Lips: It is a mucous membrane protecting the anterior opening of the mouth. It's also called labia.

2.Lymphoid tissue (Tonsils) :

a. **Palatine tonsils** are in the oropharynx, at the end of the soft palate.
b. **Pharyngeal tonsil (adenoids when enlarge).** Often-called adenoids are located high in the nasopharynx.
c. **Lingual tonsil:** are at the base of the tongue.



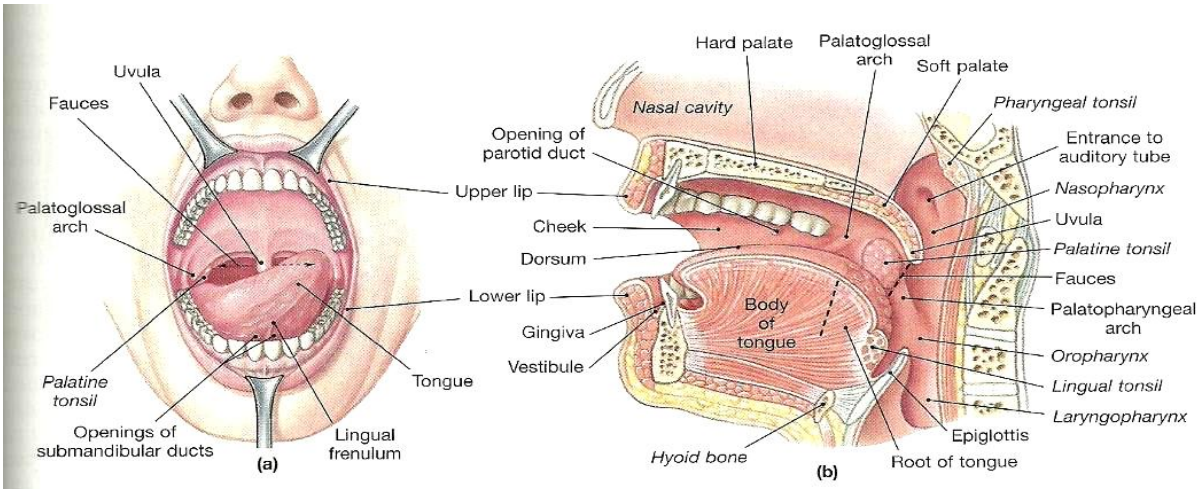


FIGURE 24-6 The Oral Cavity. (a) An anterior view of the oral cavity, as seen through the open mouth. **(b)** A sagittal section.

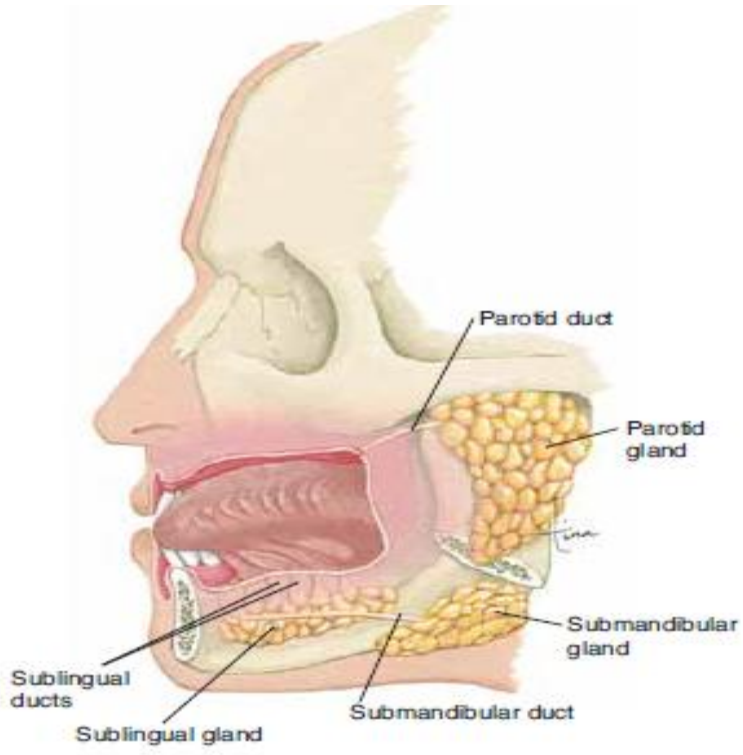
3. Hard palate. It is forms the anterior roof of the mouth.

4. Soft palate. It is forms the posterior roof of the mouth.

5. Uvula. Is a fleshy finger like projection of the soft palate which extends downward from its posterior edge

<u>6. Salivary glands:</u> 3- pairs of salivary glands empty their secretions into the mouth:

- **The parotid glands (large glands lies anterior to the ear)**
- **The submandibular gland**
- **Small sublingual gland**



Pharynx:

From the mouth, food passes posterior into the oropharynx and laryngopharynx.

The pharynx is subdivided into:

- **Nasopharynx,** is a part of respiratory passageway.
- **Oropharynx,** is posterior to oral cavity.
- **Laryngopharynx,** which continuous with the esophagus.

Alternating contractions of the pharynx's skeletal muscles propel food through the pharynx into the esophagus below. This propelling mechanism is called peristalsis.

Esophagus (gullet):

It runs from the pharynx through the diaphragm to the stomach, about 25cm (10 inches) long, descends toward thoracic cavity posterior to the trachea, and then enters the abdominal cavity through the esophageal hiatus, an opening in the diaphragm, to empties into the stomach. It is essentially a passageway that conducts food to the stomach.

- **Esophagus Comprises:**
- 1. **Upper esophageal sphincter** just below the pharynx and composed **from skeletal muscle fibers**, to prevent air from entering esophagus.
- 2. **Middle third** of esophagus muscular layers compose from mixture of **skeletal fibers and smooth muscle cells**
- 3. **Lower esophageal sphincter (cardiac sphincter)** composed from **smooth muscle**, which normally remains in state of active contraction to prevent backflow of materials from the stomach into esophagus. Esophagus innervated by sympathetic and parasympathetic (esophageal plexus).

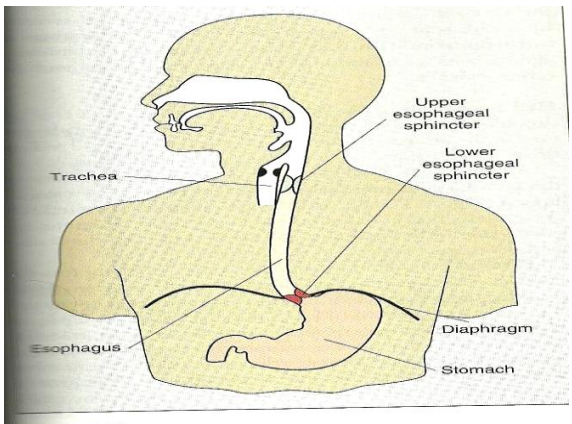


FIGURE 17-15
Location of upper and lower esophageal sphincters.

STOMACH

Stomach is Divided into Four Regions:

1.Cardiac region 3. Body of stomach.

2. Fundus . 4. Pylorus

The pylorus continuous with the small intestine through the pyloric sphincter or valve.

The stomach is approximately **25cm long**, but its diameter depends on how much food it contains when it's full. It can hold about 4 liters of food. Stomach is innervated by sympathetic and parasympathetic nerve fibers (esophageal plexus).

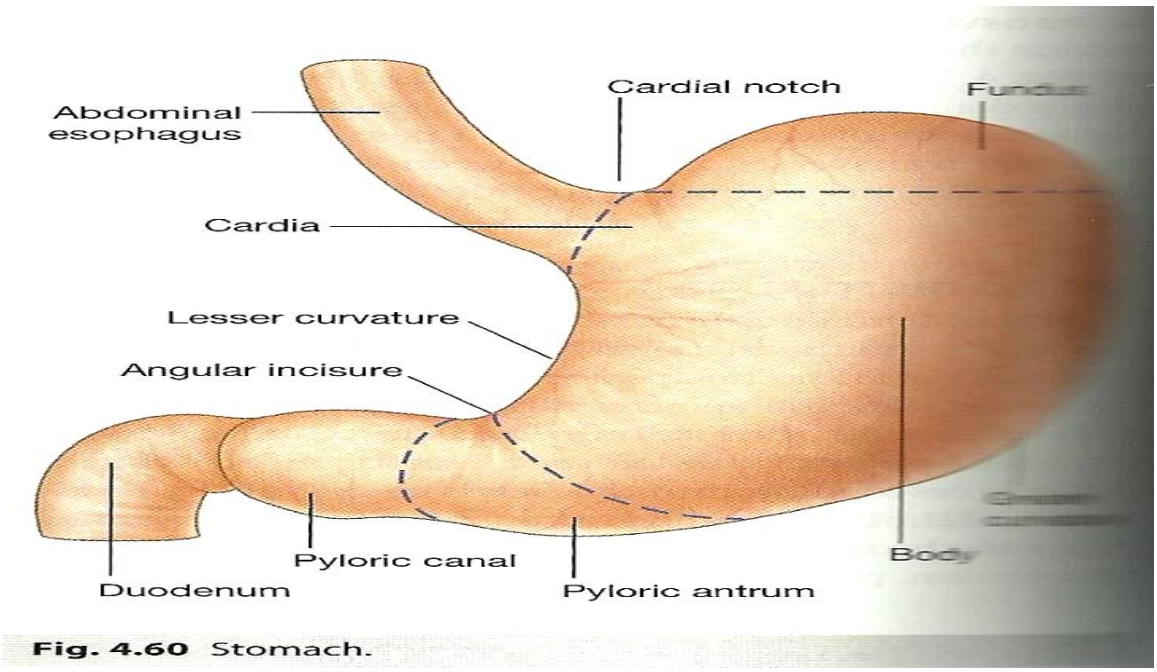
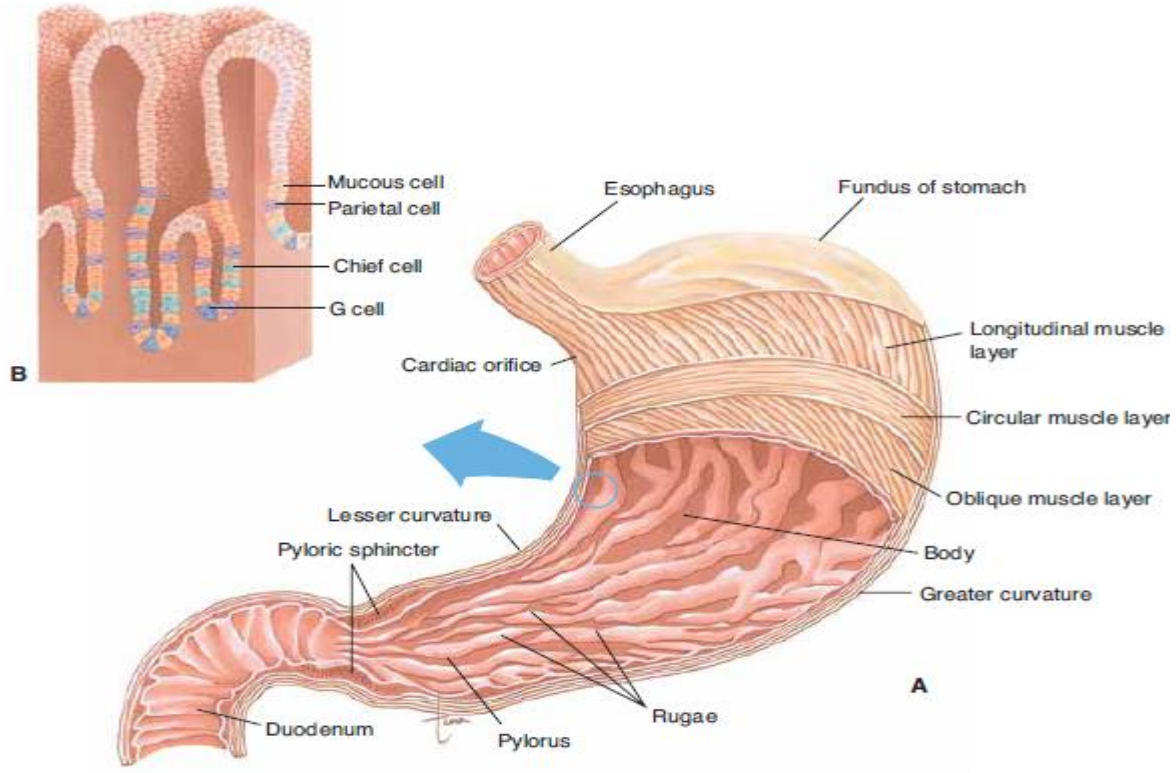
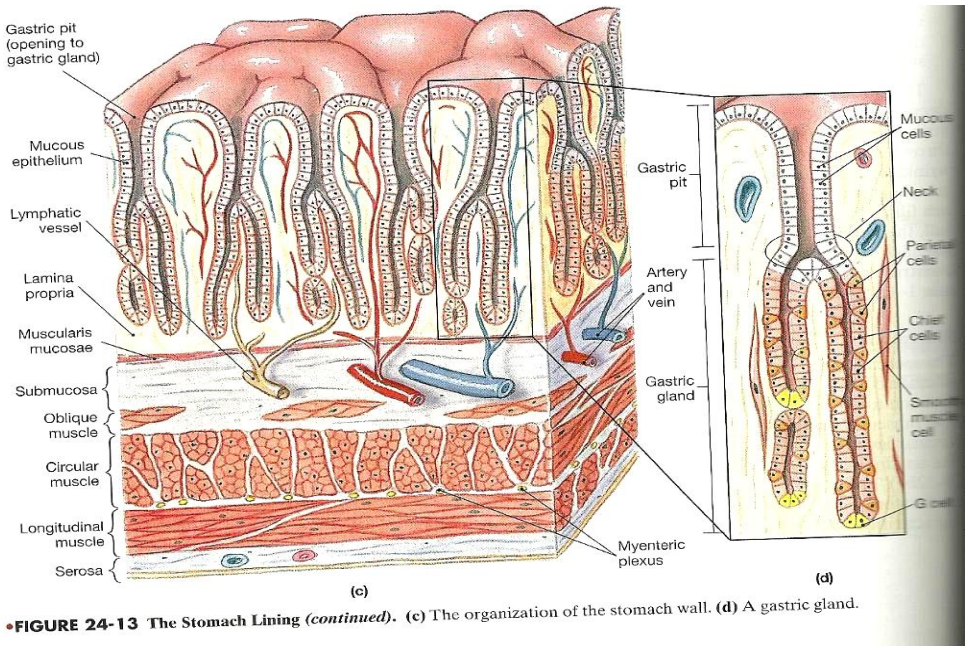


Fig. 4.60 Stomach.



Musculature of the Stomach:

- the Muscularis mucosa and Muscularis externa of the stomach contain extra layers of smooth muscle cells in addition to circular and longitudinal layers,
- The third layer called **oblique layer of smooth layer** which strength the stomach wall. Internally the stomach lining is composed of numerous gastric folds (rugae) these folds are observed only when the stomach is empty.



•**FIGURE 24-13** **The Stomach Lining** ***(continued)***. **(c)** The organization of the stomach wall. **(d)** A gastric gland.

SMALL INTESTINE

*** Anatomically ,** small intestine has three subdivisions**:**

1. Duodenum: 25 cm.

2. Jejunum:is about **2.5 meters**..

3. Ileum: about **3.5 meters**, It is joins the large intestine at the iliocecal valve.

***Histologically:** Structures of Small Intestinal

1.Plica: the intestinal lining show transverse folds called plica and this is a permanent feature that does not disappear when the small intestine fills, small intestine contains roughly 800 plica to increase the surface for absorption .

2.Villi: mucosa of small intestine is project into a series of fingerlike structures called intestine villi.

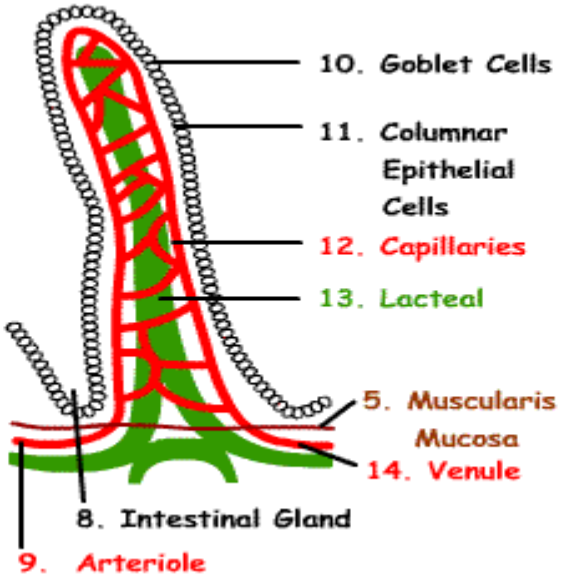
Structures of Villi:

a. epithelium (simple columnar epithelium)

b. capillary network

c. lacteal (lymphatic vessels)

d. nerves



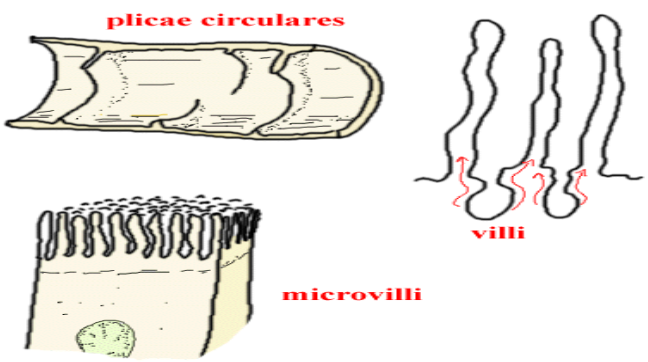
3. Payer's patches (aggregated lymphoid nodules):

Lamia propria of ileum contains 20-30 masses of lymphoid tissue (lymphoid nodules) called payer's patches to protect small intestine from bacteria.

4. Intestinal glands a. Goblet cells.

b. Intestinal glands or crypts of lieberkuhn.

c. Submucosal glands or Brunner's glands



LARGE INTESTINE

Large Intestine is Divided into Four Structures

1. Cecum and appendix. is the first part. It contains worm like **appendix**, a potential trouble spot, since it is usually twisted. It's an ideal location for bacteria to accumulate and multiply. Inflammation of the appendix – appendicitis is the usual result.

2. Colon: divided into: -

a. Ascending colon: travels up the right side of the abdominal cavity and makes a turn in the right side (hepatic flexure) toward left side .

b. Transverse colon: travels across the abdominal cavity.

c. Descending colon: turns at the left side and descend down to enter the pelvis.

d. Sigmoid colon: S-shaped, the part of colon that enters the pelvis.

The sigmoid colon, rectum and anal canal lie in the pelvis.

3. Rectum.

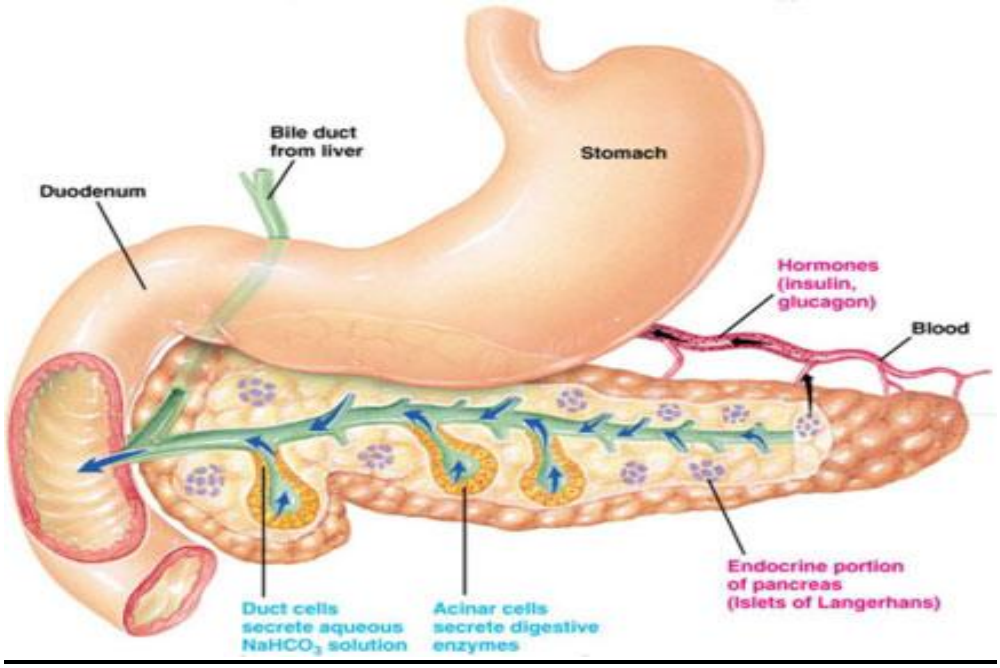
4. Anal canal: The anal canal ends at the anus, which opens to the exterior. The anal canal has an :

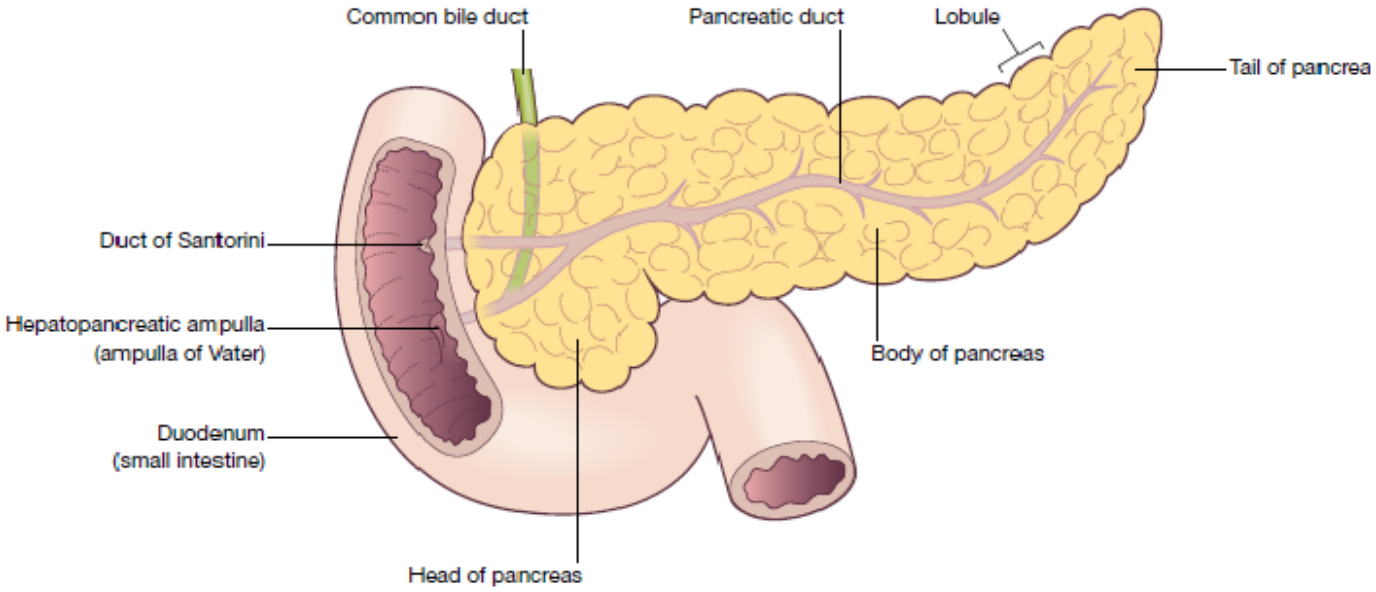
- External voluntary skeletal muscle (voluntary sphincter)
- Internal involuntary sphincter formed by smooth muscle.

PANCREAS

I. Structures of Pancreas : 1.Head 2.Body 3.Tail

The pancreas is approximately 12–15 cm long and 2.5 cm thick. It is situated across the back of the abdomen, behind the stomach. The head of the pancreas is on the right side of the abdomen and it is connected to the duodenum through the pancreatic duct. The narrow end of the pancreas, called the tail, extends to the left side of the body


Bile duct
from liver
Stomach
Duodenum
Hormones
(insulin,
glucagon)
Blood
Endocrine portion
of pancreas
(Islets of Langerhans)
Duct cells
secrete aqueous
$NaHCO_3$ solution
Acinar cells
secrete digestive
enzymes

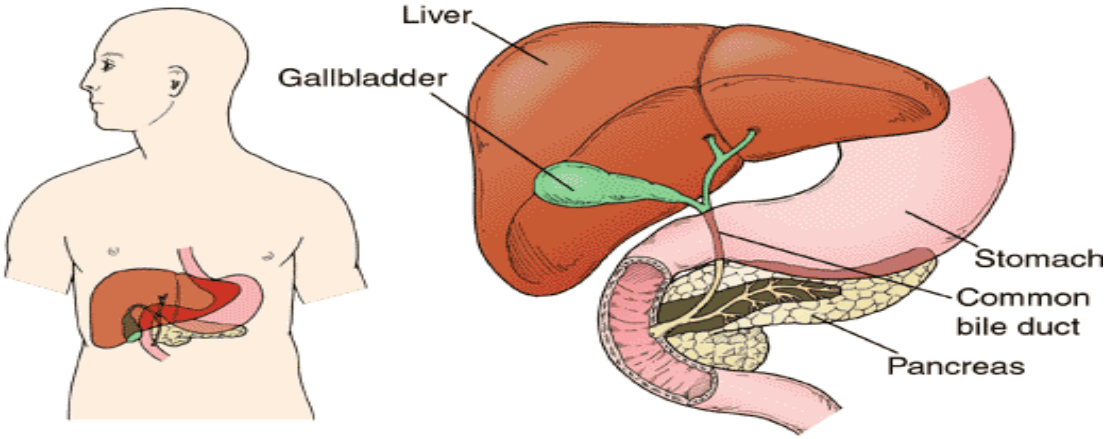

Common bile duct
Pancreatic duct
Lobule
Tail of pancrea
Duct of Santorini
Hepatopancreatic ampulla
(ampulla of Vater)
Body of pancreas
Duodenum
(small intestine)
Head of pancreas

LIVER

I. Structures of the Liver

The liver is the largest solid organ in the body. In adults, the liver can weigh up to 1.5 kg. It is in the upper-right abdomen, just under the rib cage and below the diaphragm (the thin muscle below the lungs and heart that separates the chest cavity from the abdomen.)

1. Right lobe , 2. left lobe ,3. Caudate lobe ,4. Quadrate lobe



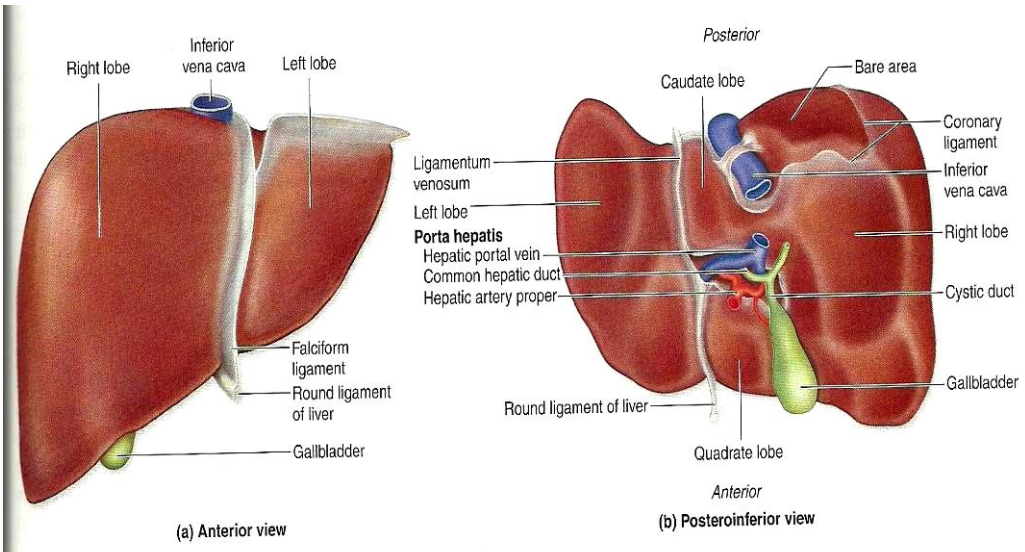


Figure 26.18
Gross Anatomy of the Liver. The liver is in the upper right quadrant of the abdomen. *(a)* Anterior and *(b)* posteroinferior views show the four lobes of the liver, as well as the gallbladder and the porta hepatis.

Liver and Gall bladder: The liver is the larger gland in the body. It is located under the diaphragm more to the right side of the body.

The liver has four lobes and is suspended from the diaphragm and abdominal wall by a delicate mesentery cord, the falciform ligaments.