Gastrointestinal System- Anatomy

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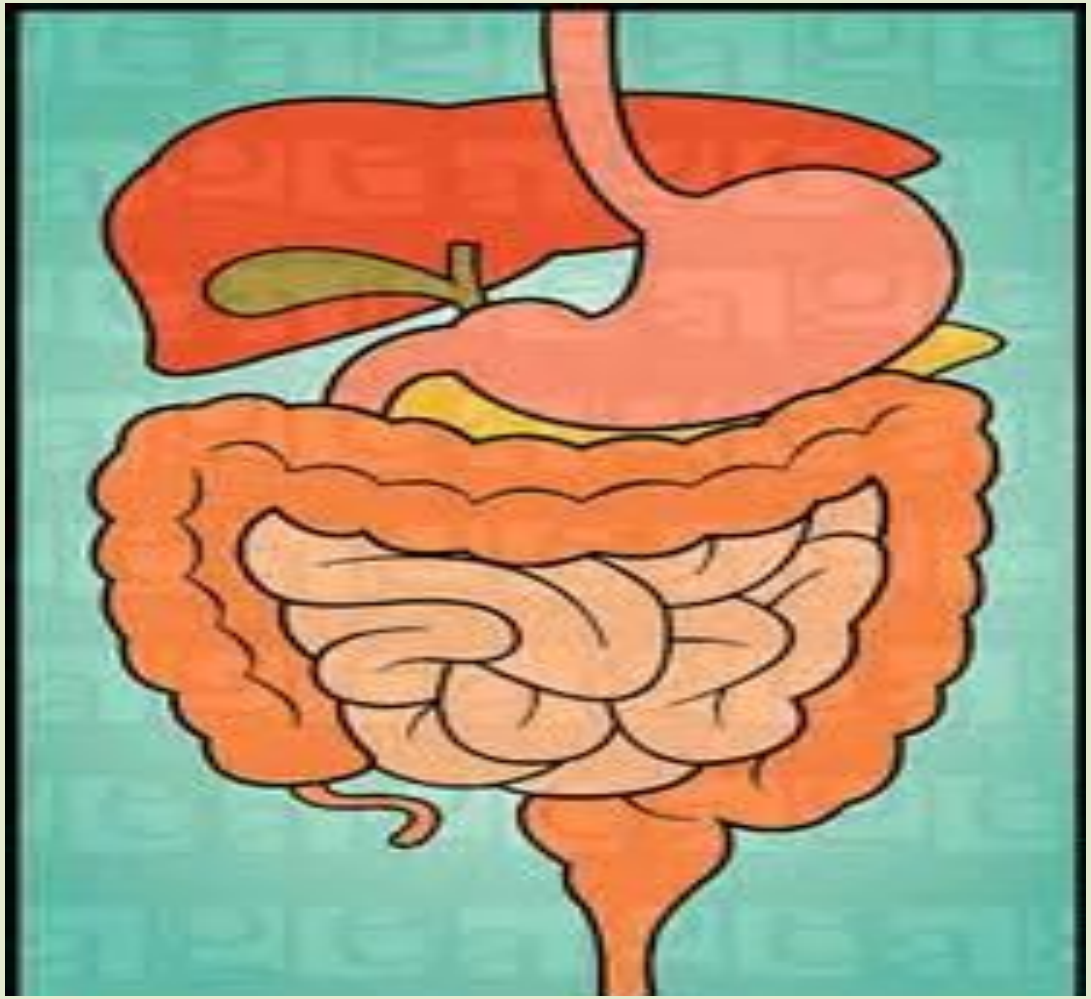


Topics

- Introduction
- GI Tract
- Gross anatomy of each part
- Microscopic anatomy of each part
- Congenital Anomalies

GI system/Digestive system

- Process by which food break down into simple chemical substances that can be absorbed and used as a nutrients in the body.
- Activities
  - Ingestion
  - Propulsion
  - Digestion
  - Absorption
  - Elimination

Digestive system/GI system

- The digestive system is a continuous tube that begins at the mouth and ends at the anus
- Measuring about 30 feet long in the average adult, it is known as the alimentary canal or gastrointestinal tract.

It has 3 functions:

- the digestion of food into nutrients,
- the absorption of nutrients into the bloodstream,
- and the elimination of solid wastes

Gastrointestinal system

- **Alimentary canal;**

-Long tube ; from mouth to anus; around 8-10 meters in length

- Mouth

- Pharynx

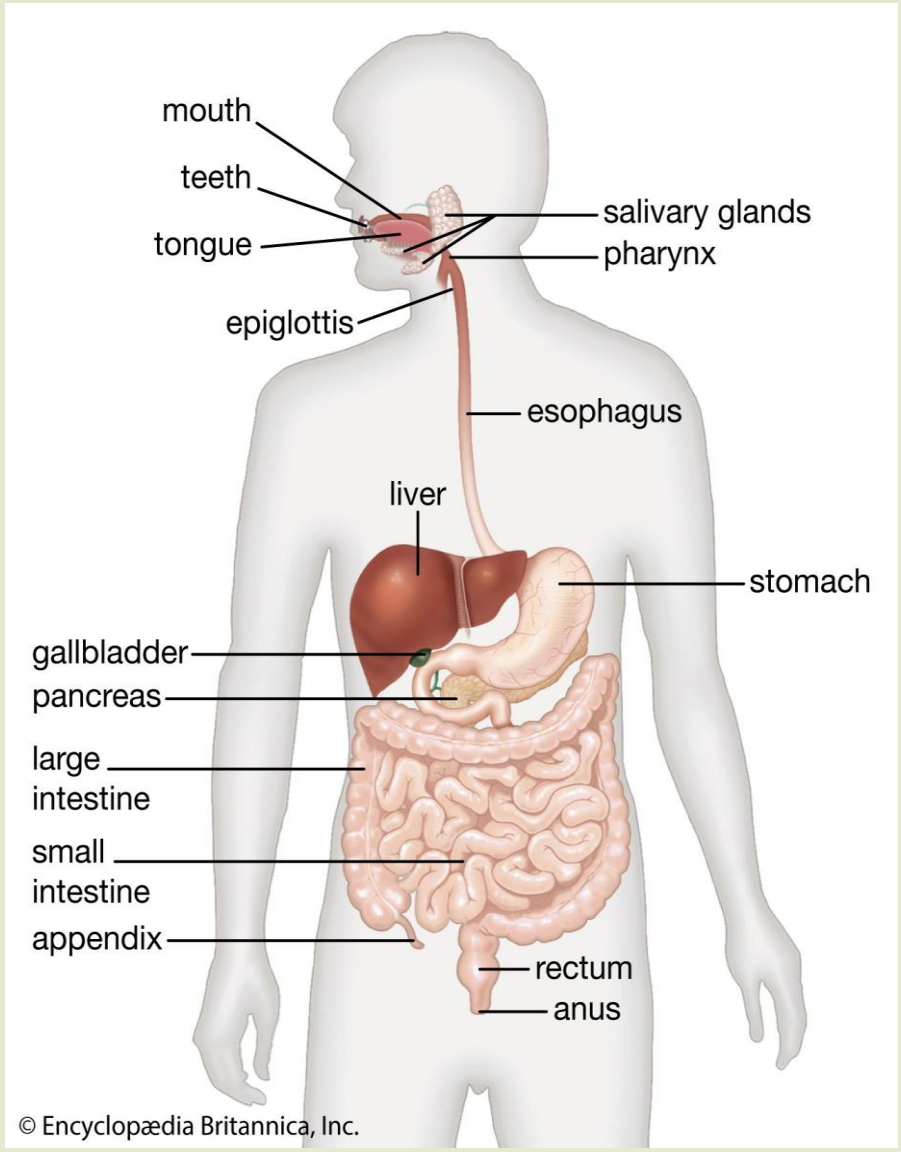
- Esophagus

- Stomach

- Small Intestine

- Large Intestine

- Rectum and anal canal



- **Accessory organs;**

-Salivary glands

-Pancreas

-Liver and biliary tract

Teeth tongue

Gall bladder

Gut

- Fore gut- extend from mouth to upper half of the second part of the duodenum(opening of bile duct)
- Mid gut- lower half the second part of duodenum to right 2/3rd of the transverse colon
- Hind gut- left 1/3rd of the transverse colon to anal canal

Mouth

- Constituents; Oral cavity, Tongue, Teeth

Oral Cavity

- Formed by muscles and bones
- Lined with mucous membranes
- Boundaries;

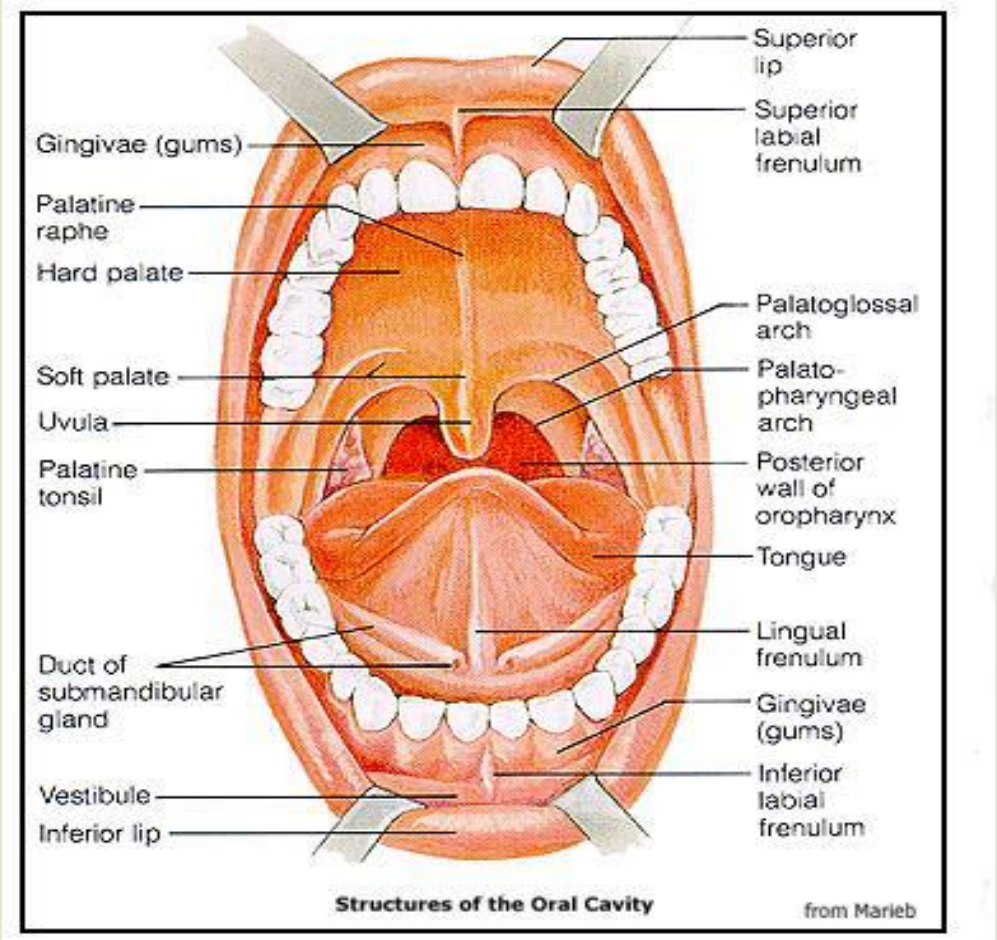
-Anteriorly - Lips

-Posteriorly- oropharynx

-Laterally-muscles of cheeks

-Superiorly- Bony hard palate and muscular soft palate

-Inferiorly- Muscular tongue, soft tissue of floor of mouth



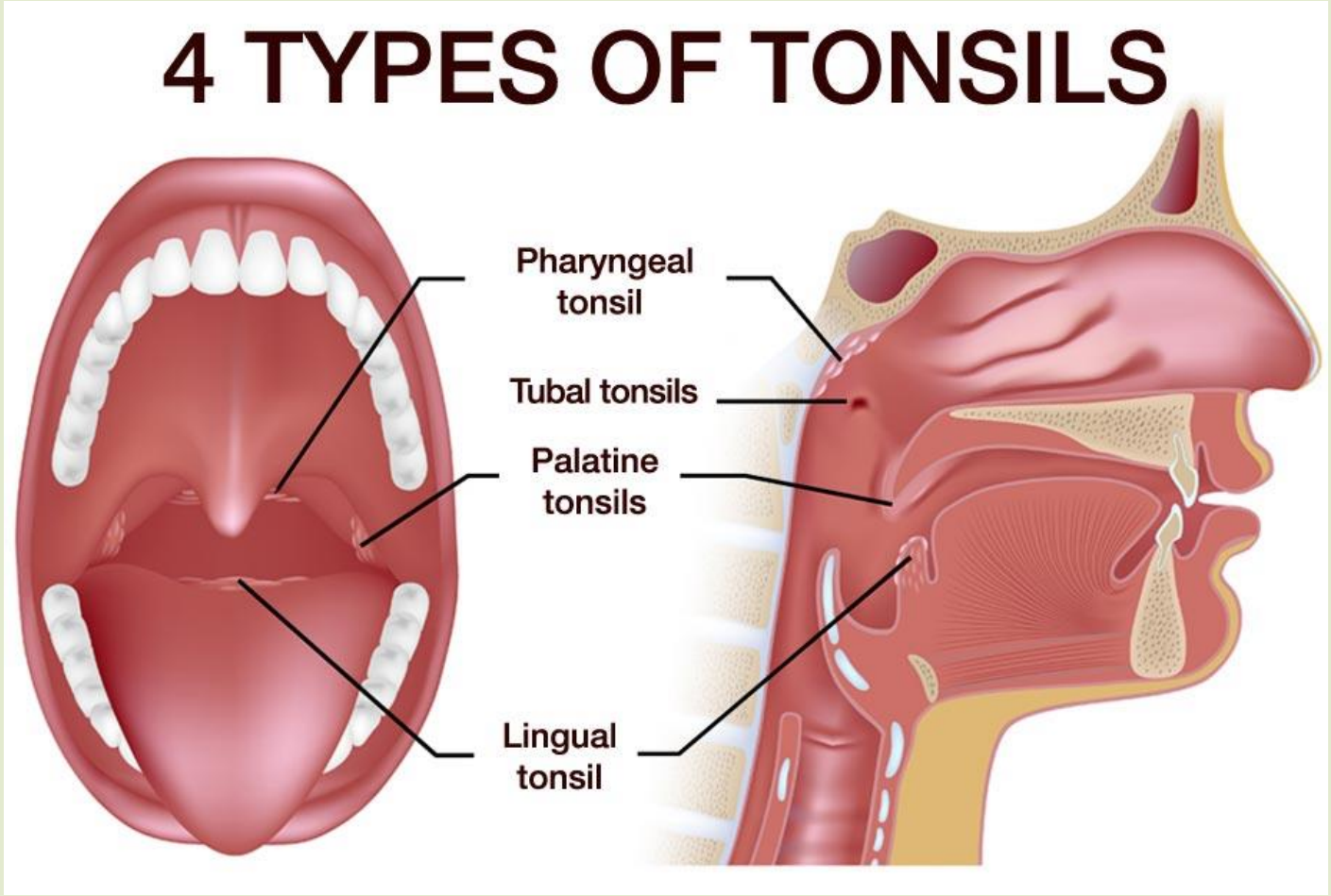
- Vestibule; Space between Gums and cheeks
- Hard palate; Maxilla and palatine bones
- Soft palate- muscular part of the roof of the mouth
- Uvula; Curve fold of muscle, part of soft palate;

Tonsils

- small mass of lymphatic tissue located in the wall of the pharynx
- play a key role in our immune system.
- They act as a front-line defense forming the initial immunological response to inhaled or ingested pathogens
- filter out bacteria and viruses
- also produce white blood cells and antibodies

Types of tonsils

- Adenoid tonsil- roof of pharynx
- Two tubal tonsils- roof of pharynx
- Two palatine tonsils-sides of oropharynx between palatoglossal and palatopharyngeal arches
- Lingual tonsil- behind the tongue


4 TYPES OF TONSILS
Pharyngeal tonsil
Tubal tonsils
Palatine tonsils
Lingual tonsil

Tongue

- **The tongue is a muscle covered with a mucous membrane. It has the root, the tip, and the central body.**
- Composed of voluntary muscle
- Parts; Tip and base attached to hyoid bone and to floor by fold of mucous membrane; Frenulum
- Surface; Superior, Inferior
- Superior surface; Numerous projections called papillae
- Contains; sensory receptors-specialized nerve endings for sense of taste

Muscle of tongue

Intrinsic muscle

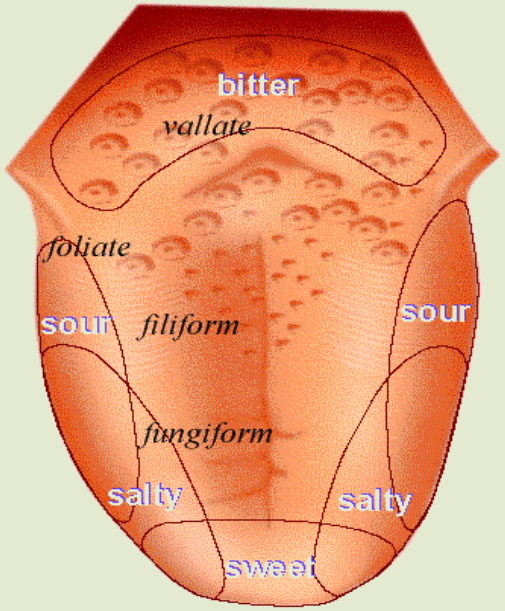
- Superior longitudinal muscle
- Inferior longitudinal muscle
- Transverse muscle
- Vertical muscle

Extrinsic muscle

- Genioglossus
- Hyoglossus
- Styloglossus
- Palatoglossus

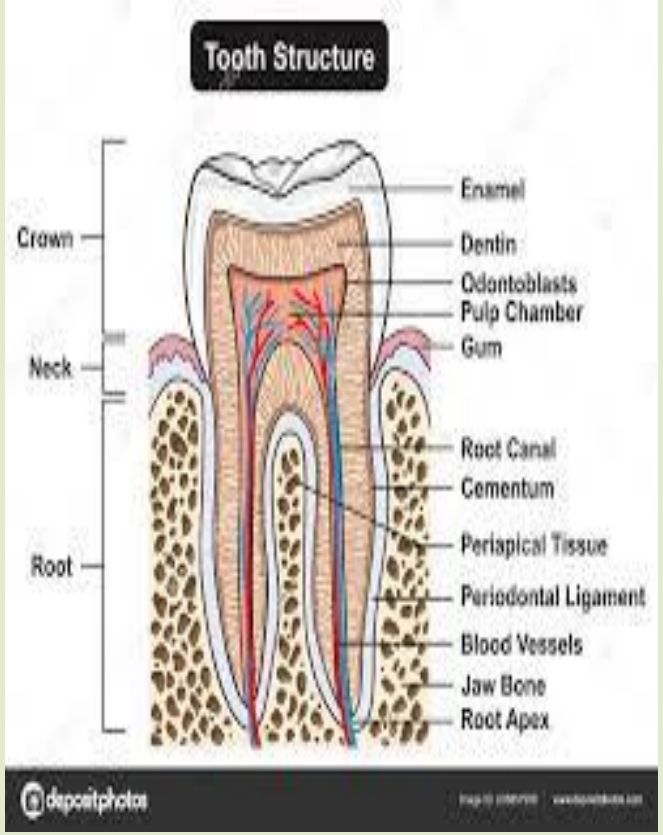
Tongue

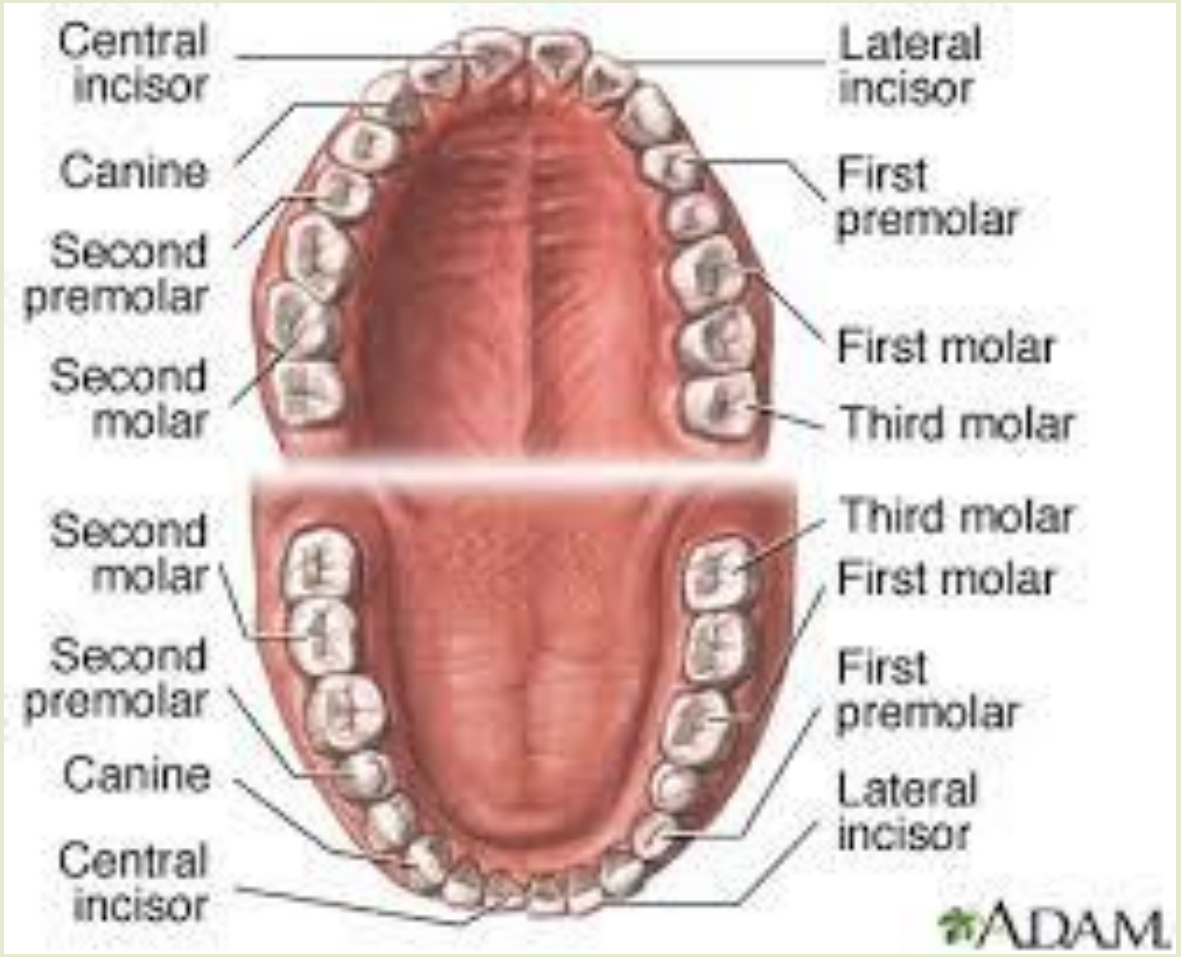
- Blood supply-Lingual artery- branch of external carotid artery
- Venous drainage; Lingual vein-Internal Juglar vein
- Nerve supply; Hypoglossal nerve, Lingual branch of mandibular nerve, Facial and glossopharyngeal nerve
- It is covered with taste buds and raised elevations called papillae
- **The taste buds taste sweet, sour, salt, bitter**



Teeth

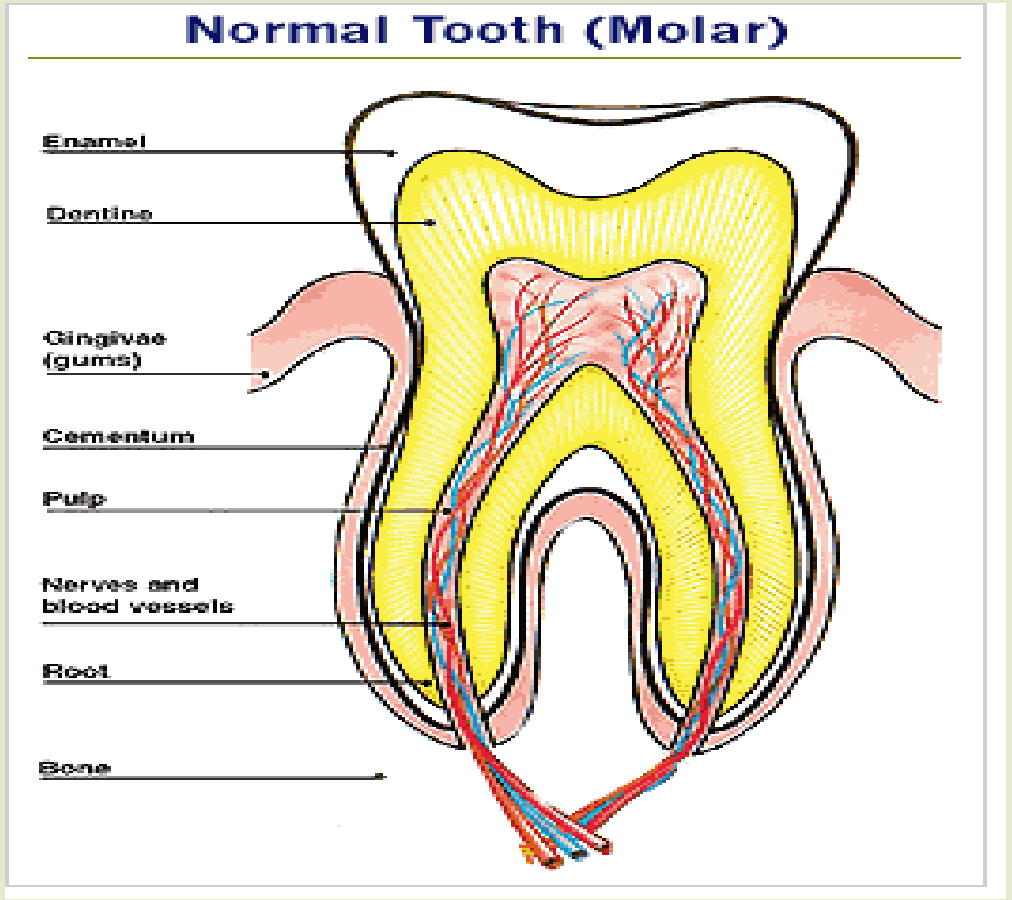
- **The teeth are used for chewing the food .**
- Embedded in the sockets of the alveolar ridges of mandible and maxilla
- 20 temporary teeth, 10 in each jaw-usually begin to erupt at about 6 mths and should present by 24 mths
- Permanent replace deciduous teeth between age 6-13 years; 32 teeth; last to erupt- third molar (wisdom teeth)
- Parts; crown, root and neck
- Pulp cavity; blood vessel, lymph vessel and nerve, surrounded by dentine-then enamel
- Cementum- Secures the root of the tooth in its socket.




Central incisor
Canine
Second premolar
Second molar
Second molar
Second premolar
Canine
Central incisor
Lateral incisor
First premolar
First molar
Third molar
Third molar
First molar
First premolar
Lateral incisor
ADAM.

- Blood supply; Branches of maxillary artery and venous drainage in the Internal Juglar vein

- Nerve supply; Branches of trigeminal nerve



Salivary gland

- Submandibular gland;

-Lie on each side, under the angle of jaw

-2 ducts open on each side of frenulum of tongue

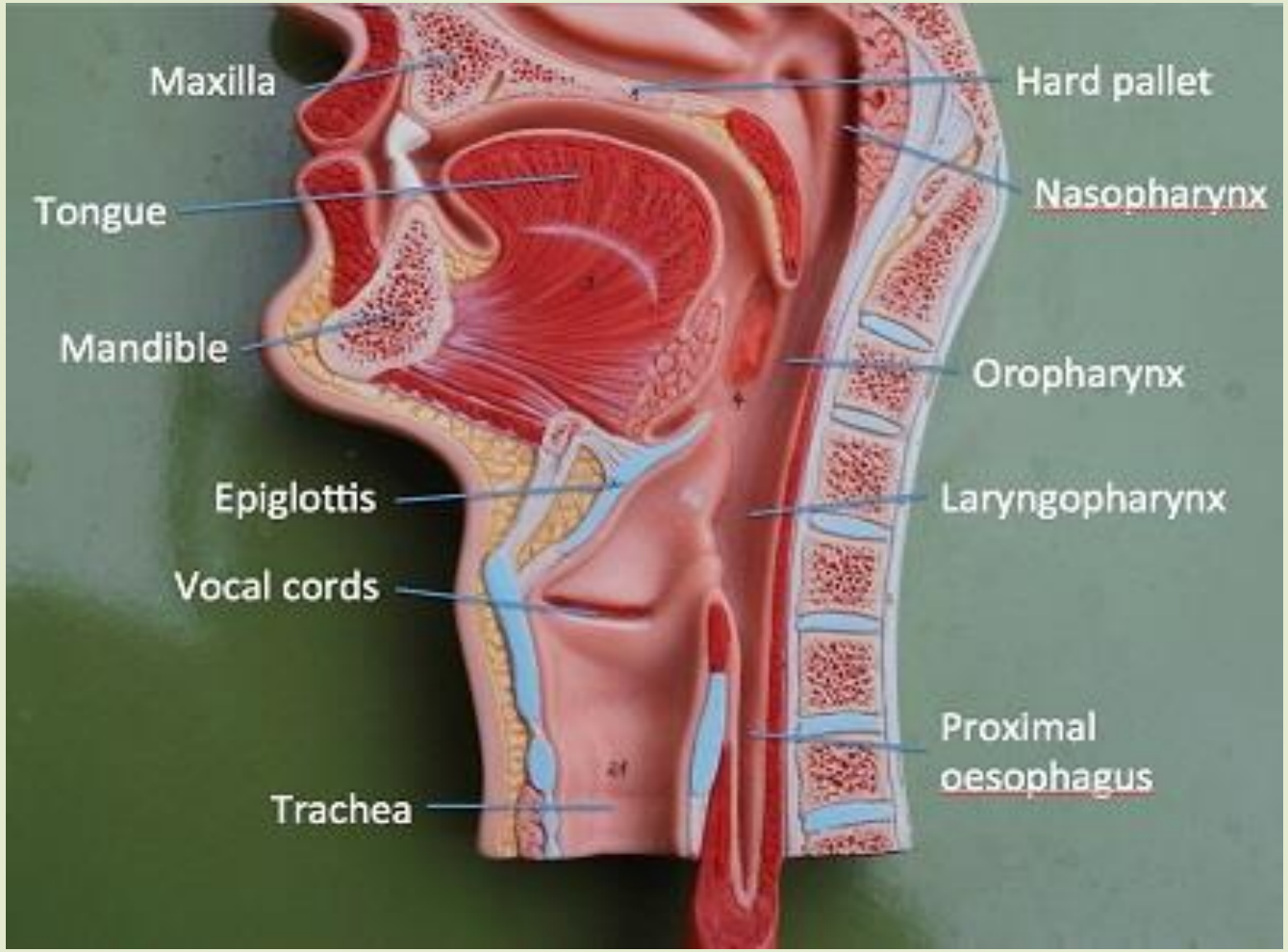
- Sublingual glands

-Under the mucous membrane of floor of mouth, Infront of submandibular glands

-Numerous small ducts open on floor of mouth

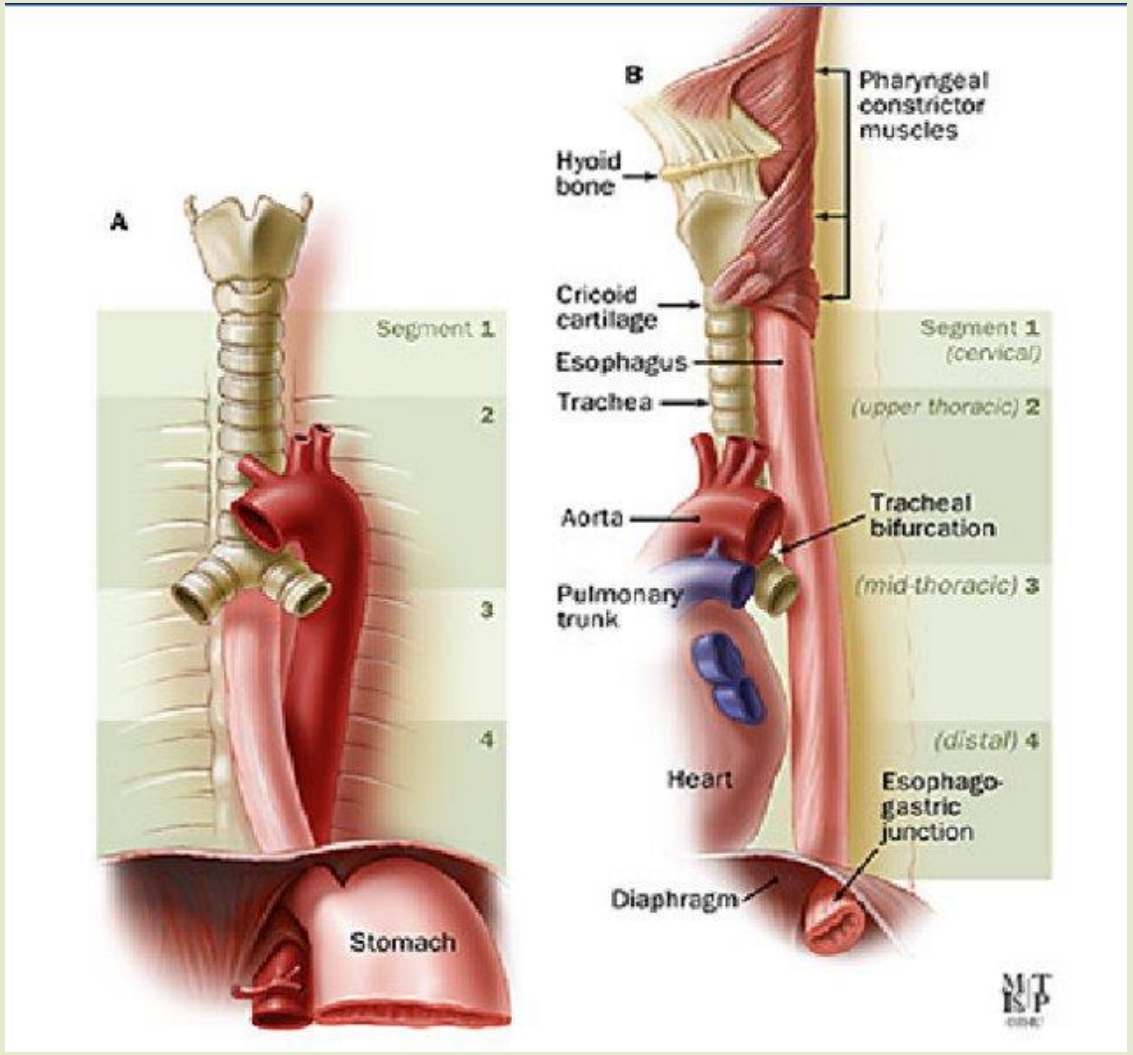
Pharynx

- Nasopharynx, oropharynx and laryngopharynx
- Continues with esophagus below

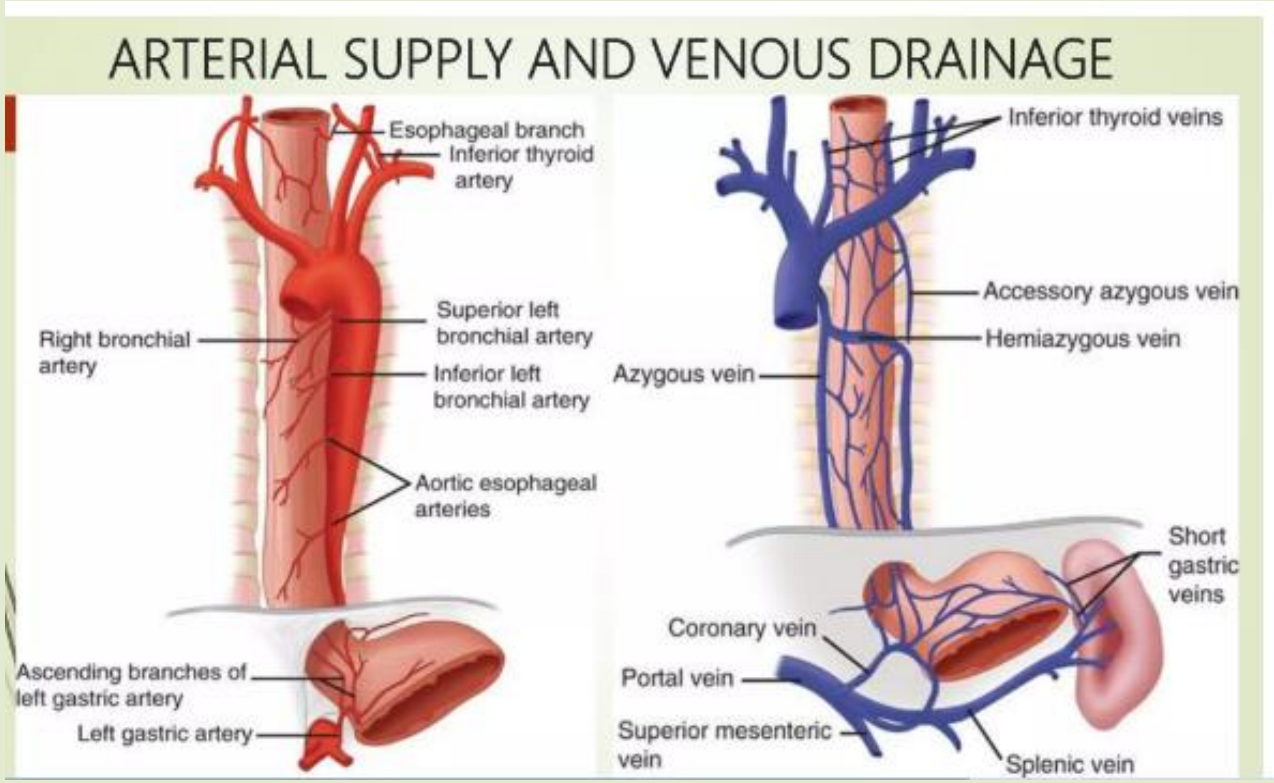


Esophagus

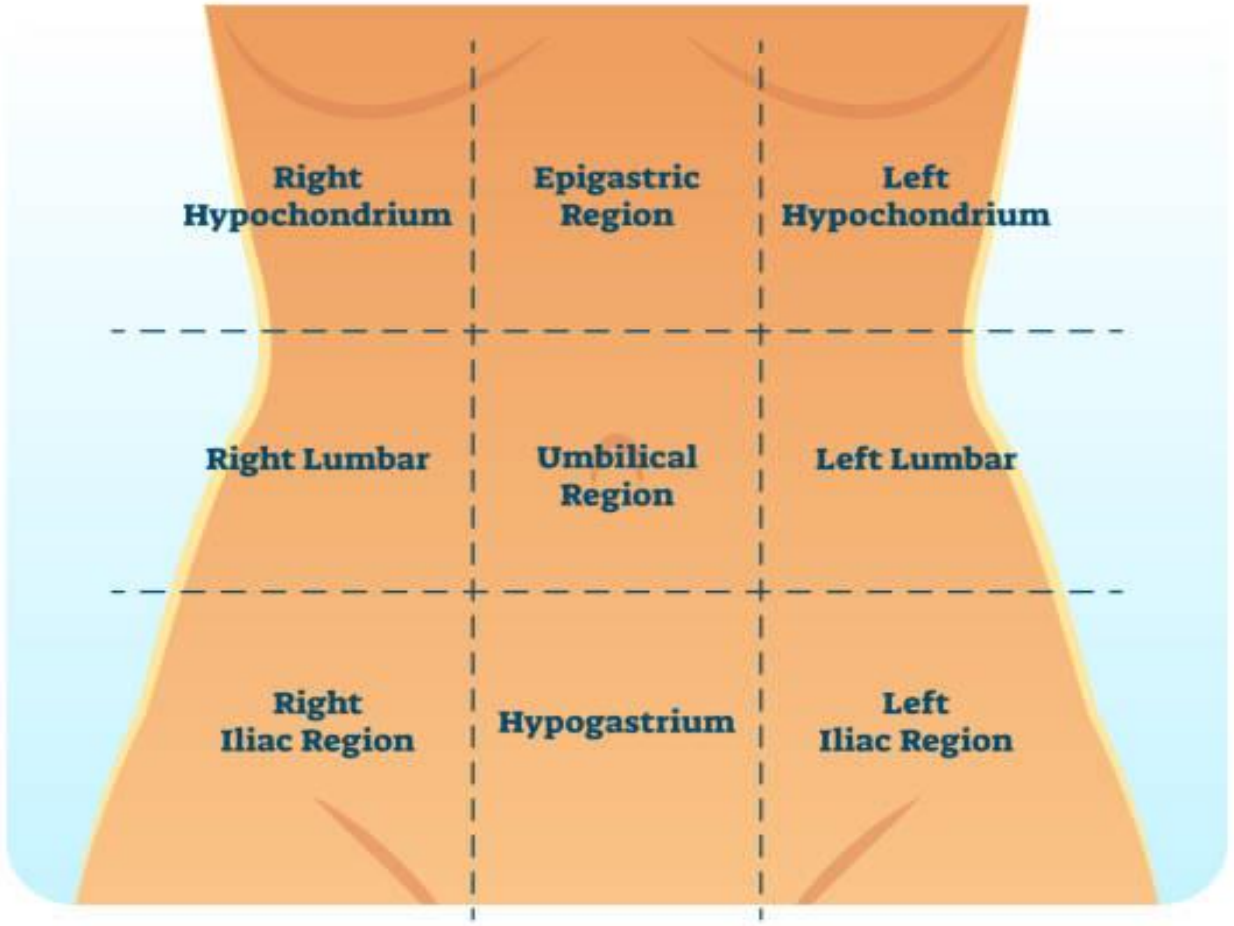
- Tube; 25 cm long, 2 cm in diameter,
- 3 parts; cervical ,thoracic and abdominal
- Continuous with pharynx above and below it stomach, beneath the diaphragm
- Pierces the diaphragm at the level of 10th thoracic vertebra

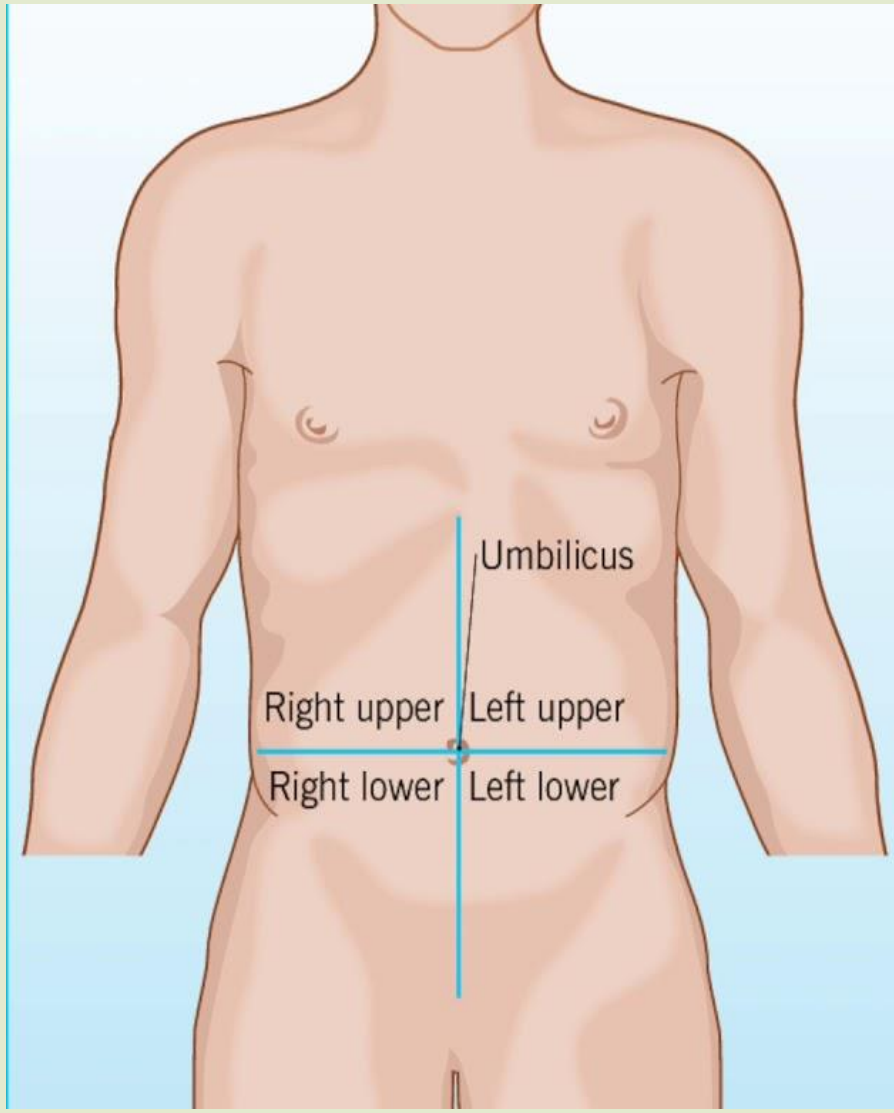


- Blood supply; paired esophageal arteries-branches from thoracic aorta, inferior phrenic and left gastric branch of coeliac artery
- Venous drainage; Azygous and hemiazygos vein, Left gastric vein



ABDOMINAL REGIONS





Peter Lamb

Right upper

- Liver.
- Gallbladder.
- Duodenum.
- Head of pancreas.
- Right kidney and adrenal gland.
- Hepatic flexure of colon.
- Part of transverse and ascending colon.

Left upper

- Stomach.
- Spleen.
- Left lobe of liver.
- Body of pancreas.
- Left kidney and adrenal gland.
- Splenic flexure of colon.
- Parts of transverse and descending colon.

Right lower

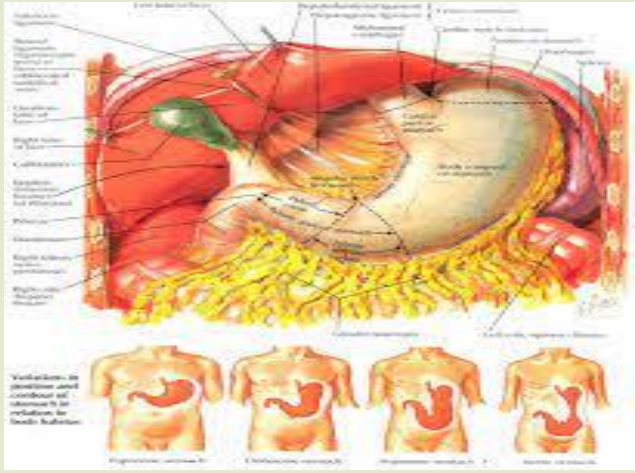
- Caecum.
- Appendix.
- Right ovary and tube.
- Right ureter.

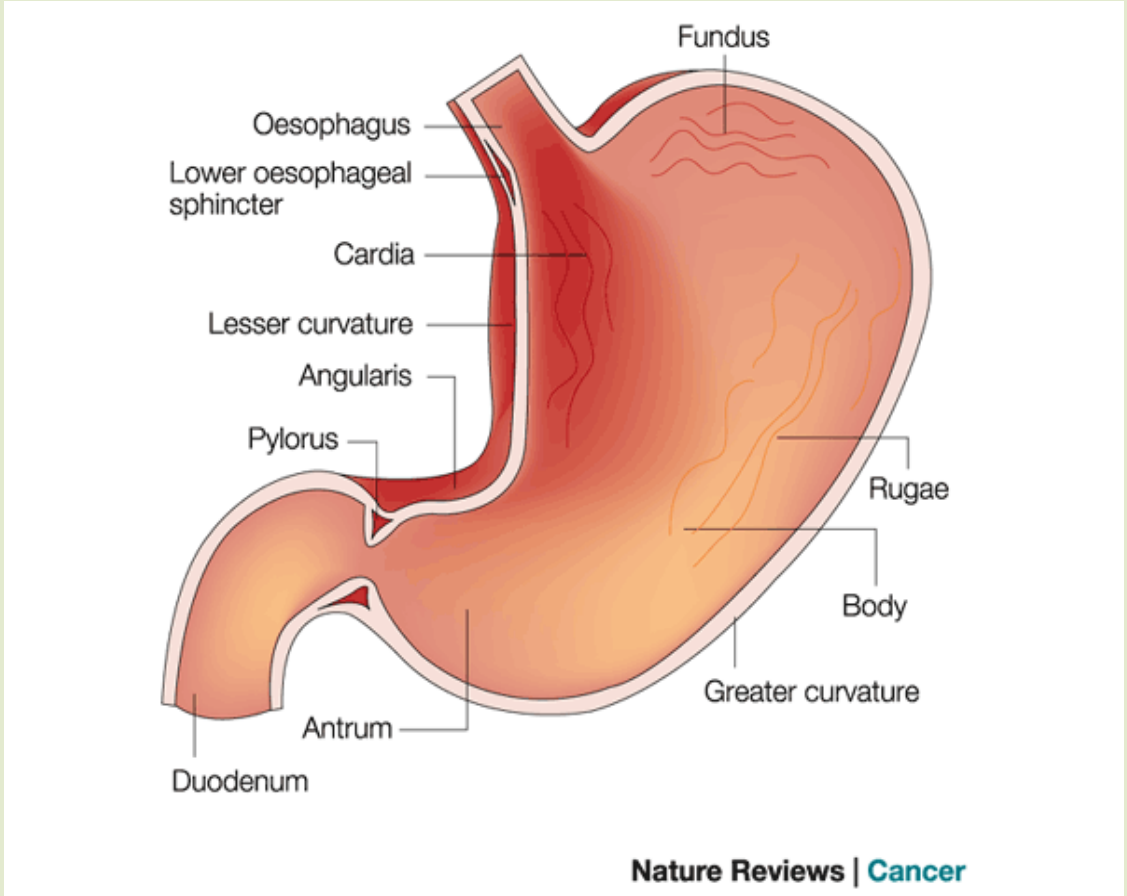
Left upper

- Part of descending colon.
- Sigmoid colon.
- Left ovary and tube.
- Left ureter.

Stomach

- J shaped dilated portion, situated in epigastric, umbilical and left hypochondriac region
- Region; Fundus, body and pylorus
- Lower esophageal sphincter (cardiac) and pyloric sphincter
- 2 curvature; Lesser and greater





Layer of Stomach

1.Mucosa- Inner most layer and secretes mucus (absorption)

3 lining - Epithelial propria- inner lining of mucosa

Lamina Propria- middle layer present lymphoid tissues(kills micro organism)

Muscularis Mucosa- smooth muscle layers (villi present) help in absorption

2.Sub muscularis- layer between mucosa and muscularis layer

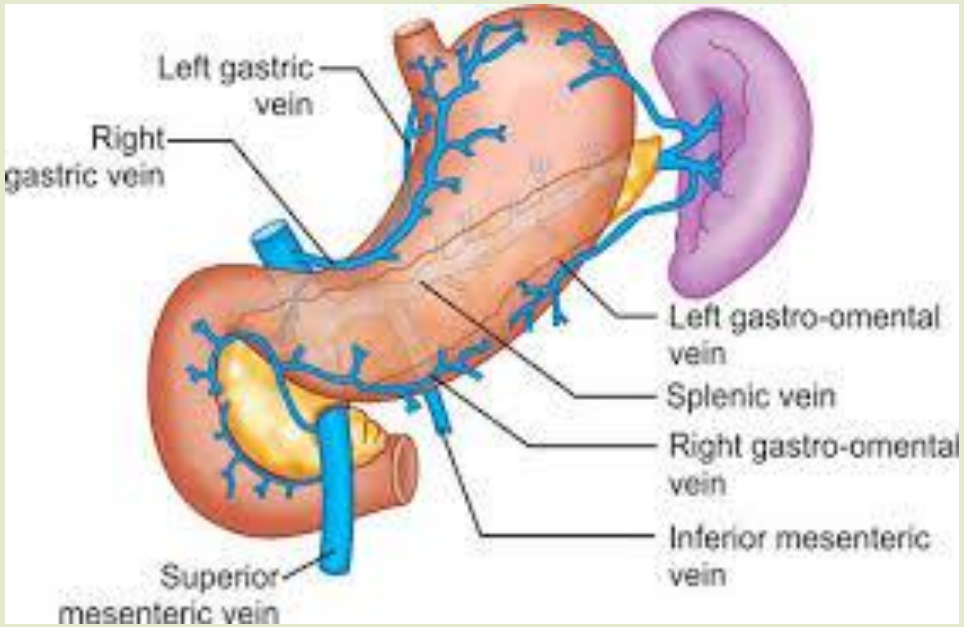
present blood vessels, lymphatic and nerves presents

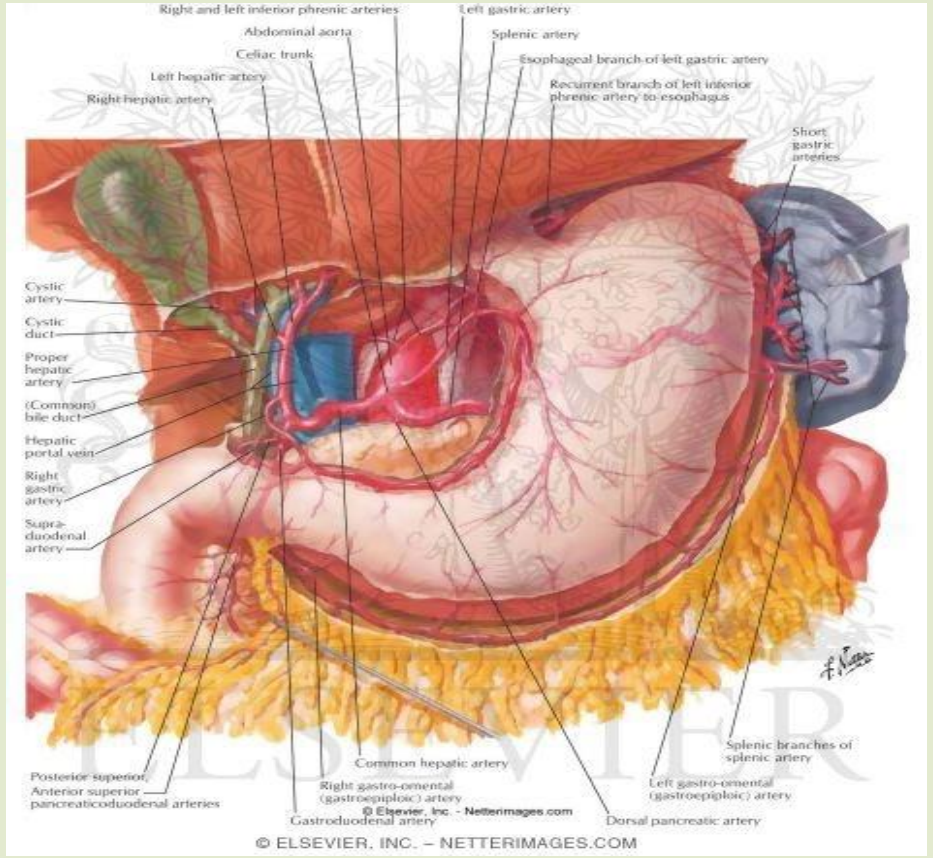
3.Muscularis- 3 types of muscles(outer -longitudinal ,middle -circular, inner -oblique)

Help in peristalsis movement of food . Spintcher wall

4. Serosa- outer layer ,Fibrous layer, Serosa adventia ,protection of GI tract.

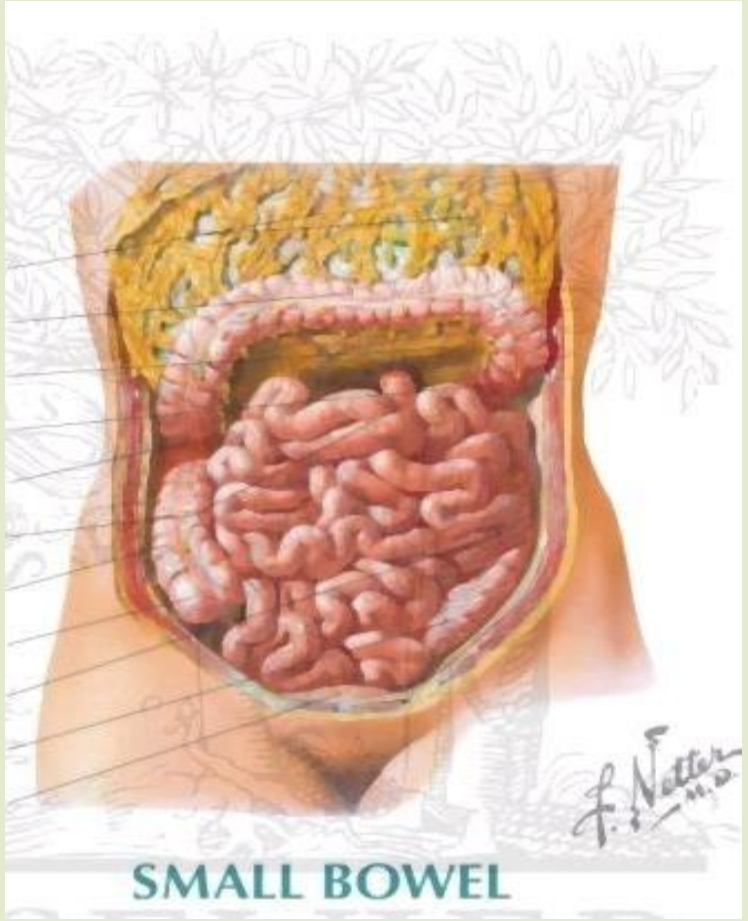
- Arterial ; Left gastric artery, right gastric artery and gastroepiploic artery
- Venous drainage- corresponding veins- portal vein





Small Intestine

- Present between stomach and large intestine.
- Around 5 meters long and 2.5 cm in diameter
- Joins with large intestine at the ileocecal valve- prevents backflow
- Lies in the abdominal cavity and is surrounded by large intestine



- 3 continuous parts;
- Duodenum -25 cm long,, curve around the head of pancreas
- Jejunum- middle section and about 2 meters long
- Ileum- 3 meters long
- Small peristalsis movement
- Blood supply; Superior mesenteric artery and venous drainage in to superior mesenteric vein

Function

- Absorption of nutrients and digestion of carbohydrate, protein and fat

Large intestine,

- 1.5 meters long, terminates at rectum and anal canal, 6.5 cm in diameter
- Caecum, colon, rectum and anal canal
- Caecum; Vermiform appendix- fine tube, closed at one end, about 8-9 cm long
- Colon; 4 parts; ascending , transverse, descending and sigmoid

Blood supply of large Intestine

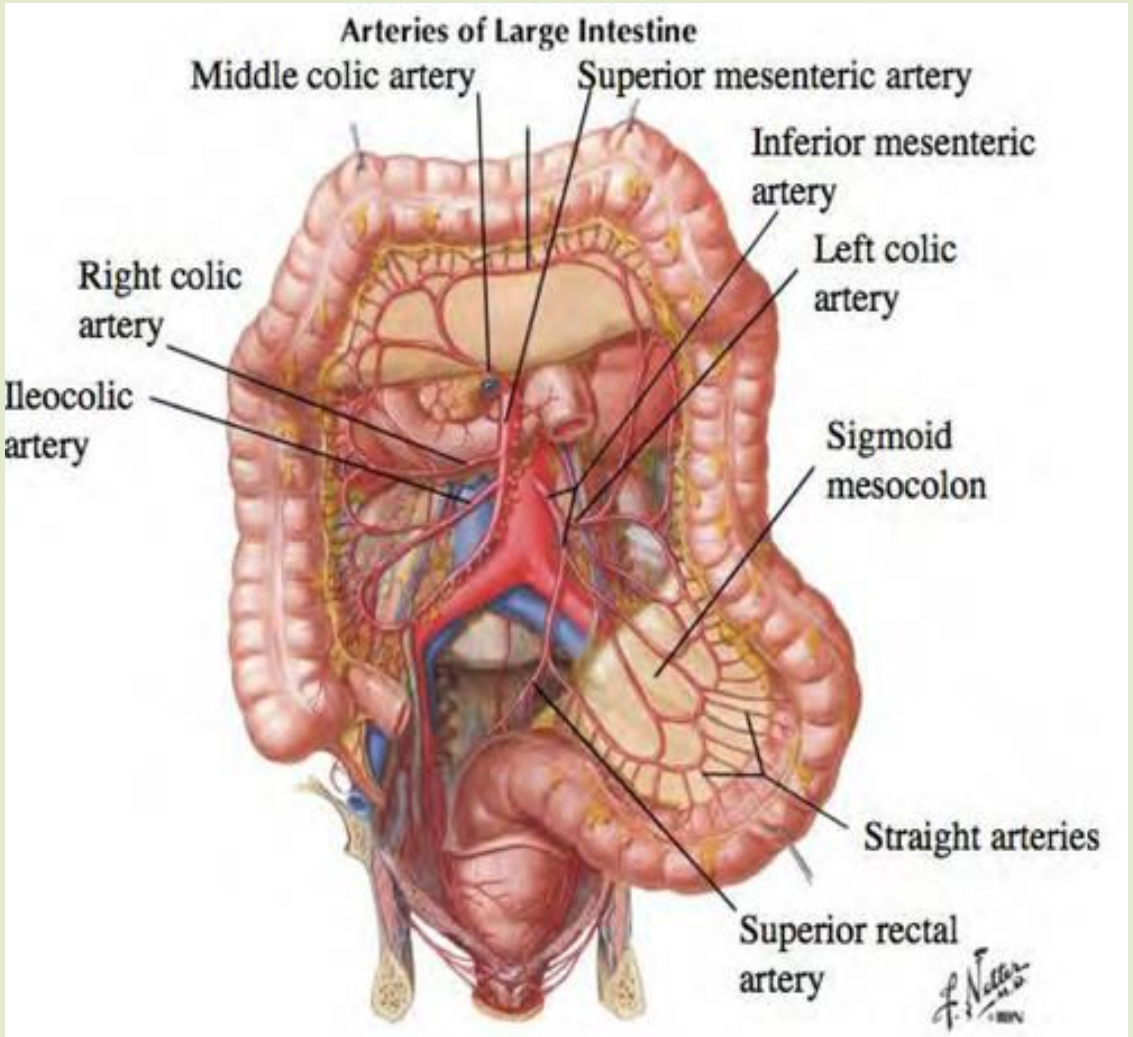
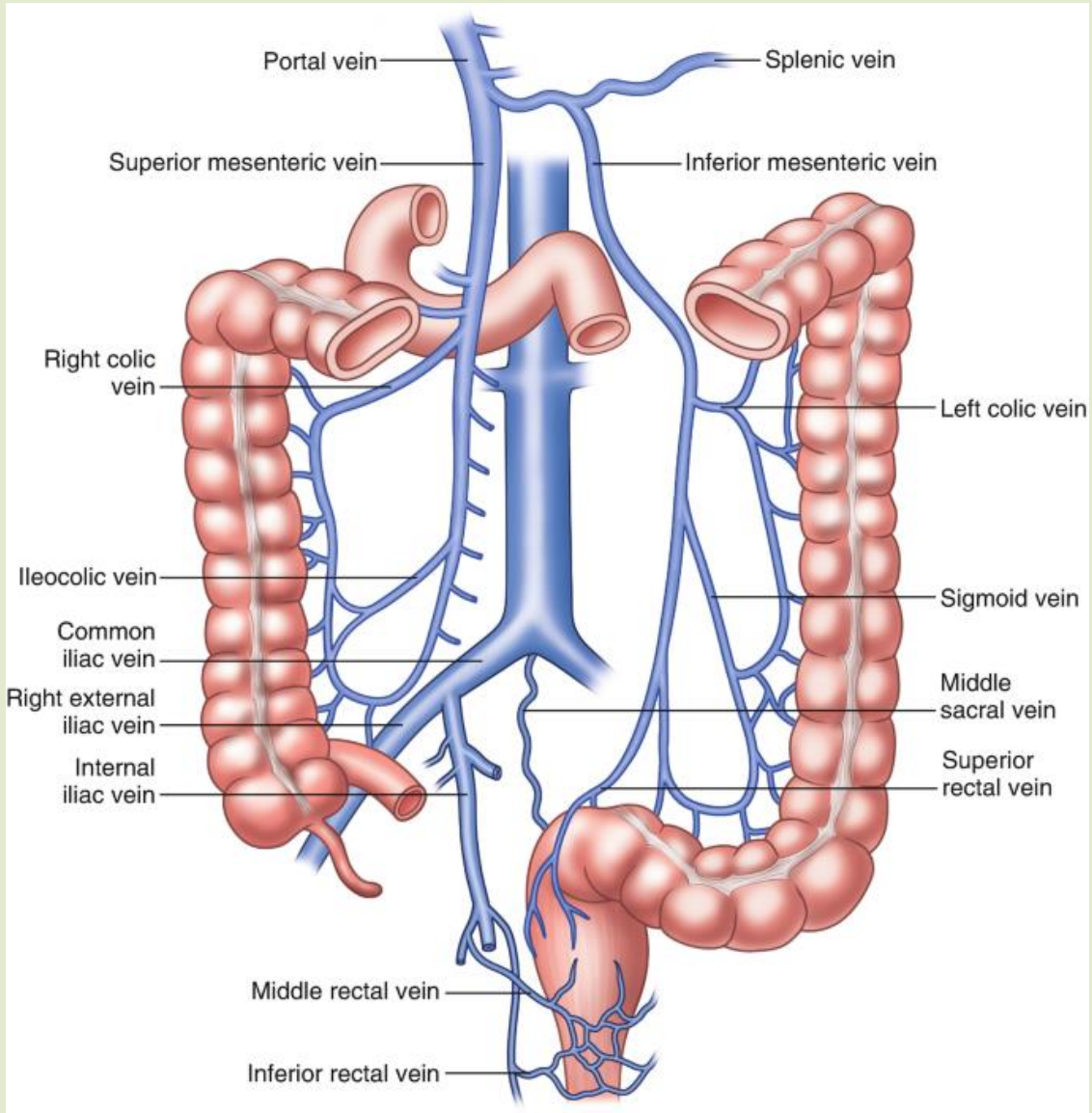
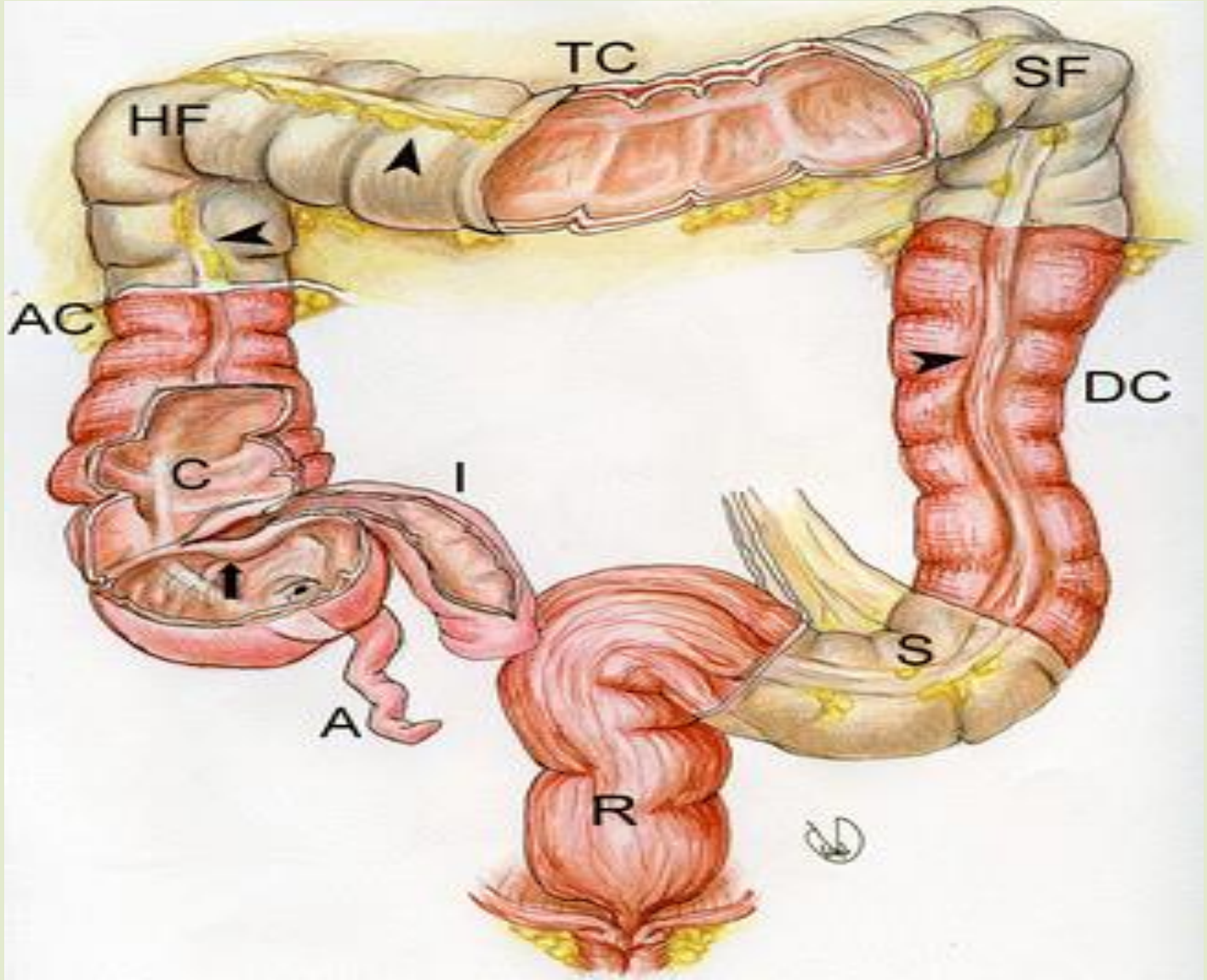


Figure 13. *The superior mesenteric artery supplies the midgut viscera; the inferior mesenteric artery supplies the hindgut viscera (Netter 5th: Plate 288; 4th: Plate 307).*



- Rectum; Slightly dilated portion, 13 cm long
- Anal canal; short; about 3.8 cm long ;internal and external sphincter; Internal- smooth muscle and external- Skeletal muscle
- Blood supply and venous drainage; Superior and inferior mesenteric arteries, inferior rectal arteries, branches of internal iliac artery: Venous drainage in to respective named veins and that of rectum into internal iliac vein


TC
SF
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Function

- Absorption of water and electrolytes and salt.

Structure; (inner to outer)

- Muscular layer - longitudinal muscle fiber- Ribbon like Band like structure present – Taeniae coli- Give sac like appearance

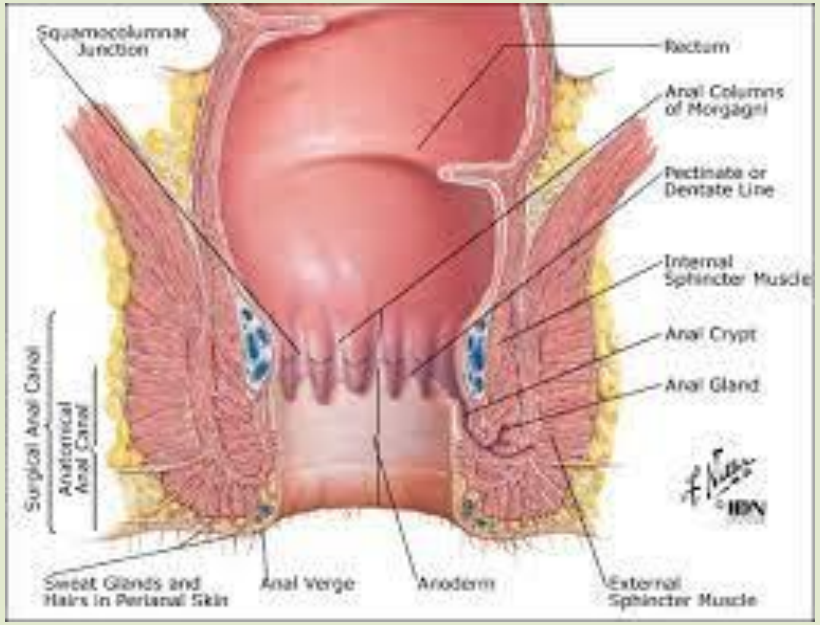
Helps in absorption of water

- **Submucosa**-more lymphoid tissue than other part

- **Mucosal lining**-colon and upper rectum- large number of mucus secreting goblets cells

- Mucosal lining-stratified squamous epithelium-Merges with skin beyond external anal sphincter

- Upper third of anal canal-mucus membrane arranged in 6-10 vertical folds



Difference between small and large intestine

Large Intestine	Small Intestine
1. Has relatively larger diameter	Has relatively smaller diameter
2. Greater part of it is fixed	Greater part of it is mobile
3. Longitudinal muscle coat forms 3 ribbon like bands called Taenia Coli	Taenia Coli are absent
4. Presence of appendix	Appendix is absent
5. Intestinal Juice absent	Intestinal juice present
5. Hormones absent	CCK and secretin hormones present
6. Villi are absent	Villi are present

Congenital Disorders

- Cleft palate and cleft lip
- Esophageal atresia
- Tracheoesophageal fistula
- Congenital pyloric stenosis

Cleft Lip and Cleft palate

- Normally, during embryonic development, the roof of mouth i.e. hard palate develop as two separate halves, from lips anteriorly to the uvula posteriorly
- Before birth, these two halves normally fuse along the midline
- If fusion is incomplete- cleft remains
- Cleft lip; minor notching upper lip to more extensive, where lip is completely split and nose is also involved

- Cleft palate; Gap between two halves of the palate, thus channel is created between mouth and nasal cavity
- Contributing factors; Genetic abnormality, certain drugs or poor nutrition in early pregnancy
- Difficulty in drinking , eating and development of speech

Esophageal atresia

- One of the common congenital disorder of esophagus
- Here, the esophageal lumen is narrow or blocked
- Coughing, choking , neonate turns blue when trying to feed
- Unable to pass the feeding tube all the way into the child stomach through the nose or mouth

Tracheoesophageal fistula

- There is an opening between the esophagus and the trachea, through which milk or regurgitated gastric contents are aspirated
- Cause- usually unknown
- May be associated with esophageal atresia

Congenital Pyloric Stenosis/Infantile hypertrophy Pyloric Stenosis

- Rare condition in infant that blocks food entering from stomach to small intestine
- Most common in male child
- Age – 0 to 6 month
- Projectile vomiting of non bilious , partially digested food , soon after eating
- H/o frequent pain in the upper abdomen (which is temporarily relieved after vomiting)


Thank You