GI Anatomy

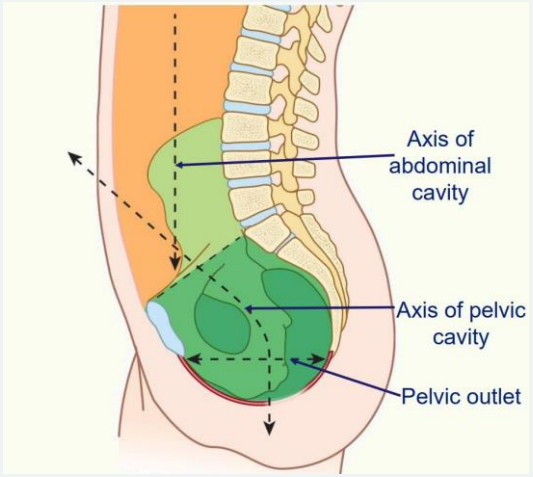
LOs

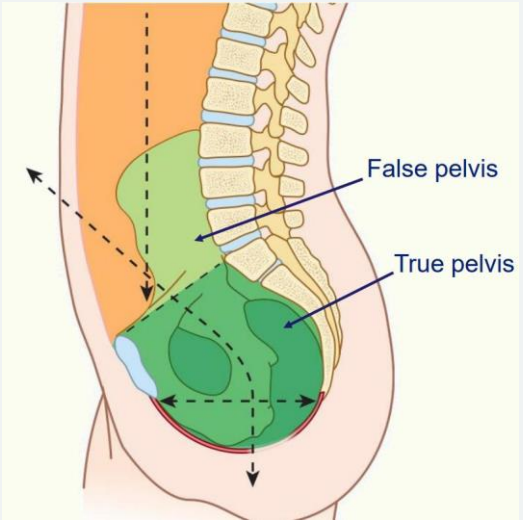
- Abdominopelvic cavity
- Upper GI tract – mouth, tongue, pharynx, oesophagus
- Lower GI tract – stomach, small intestine, large intestine and anal canal
- Accessory organs – liver, pancreas, gallbladder
- Peritoneum and Embryology

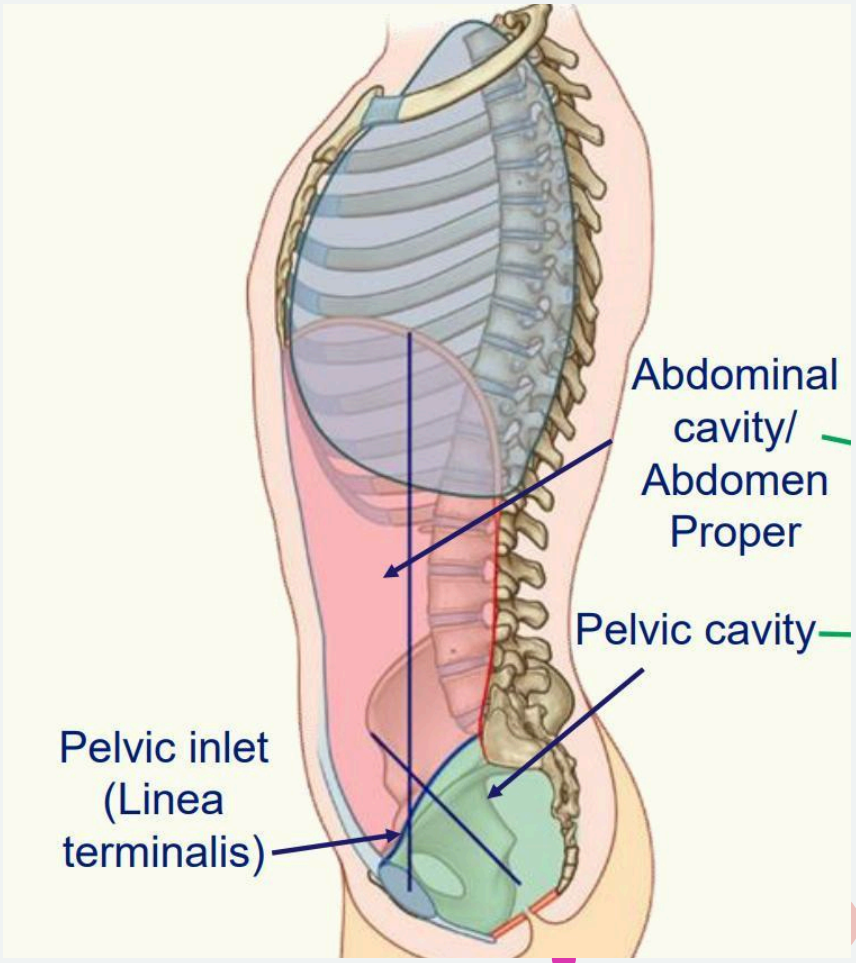
The Abdominopelvic cavity

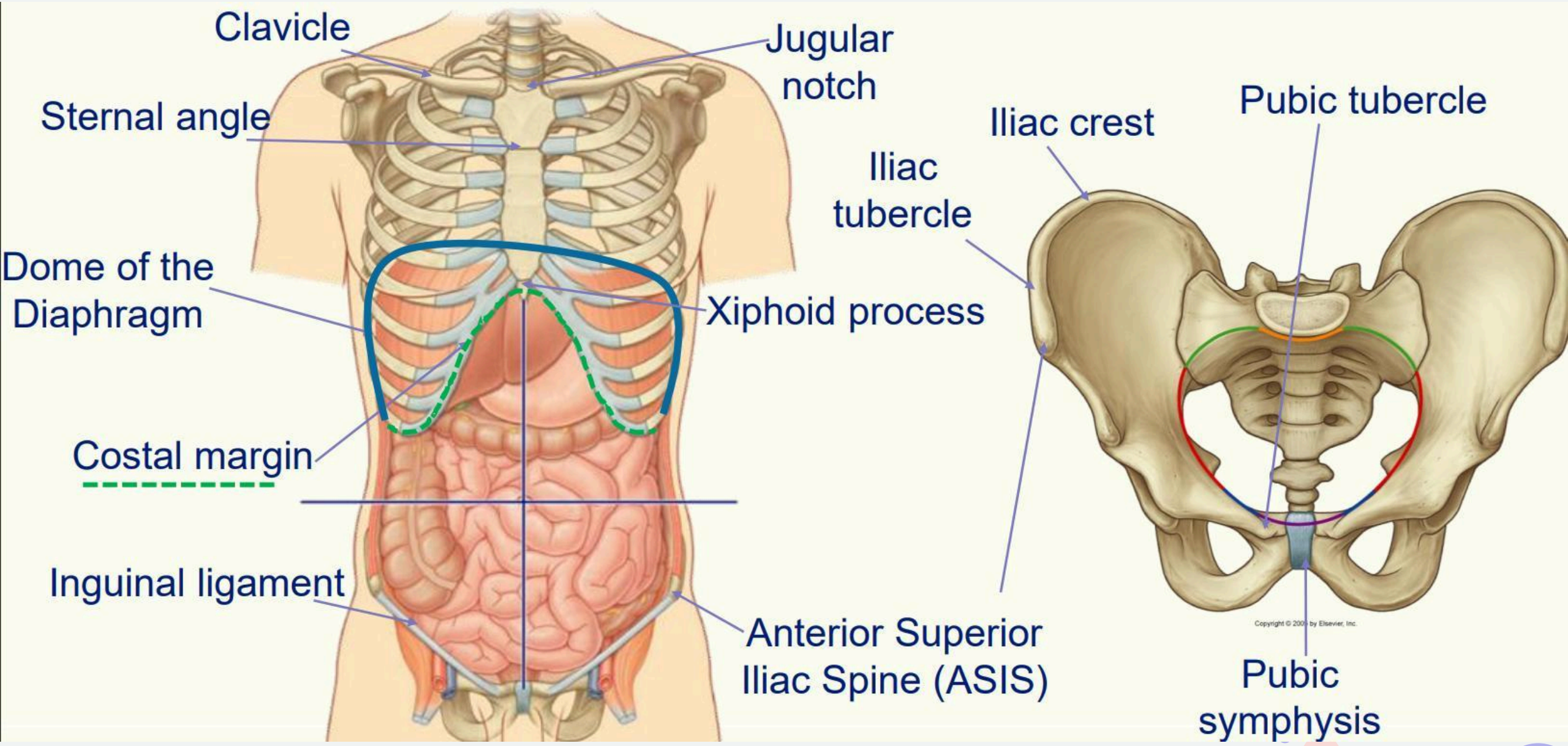
- Abdomen and the pelvic cavity are continuous with each other
- Both cavities are separated by the linear terminalis (pelvic inlet)
  - Which also splits the pelvis in to true pelvis and the false pelvis

  - Axis of the abdominal cavity = vertical
  - Axis of the pelvic cavity = oblique
    - Important for child birth (allows into pass through) and gait cycle (to distribute the weight)

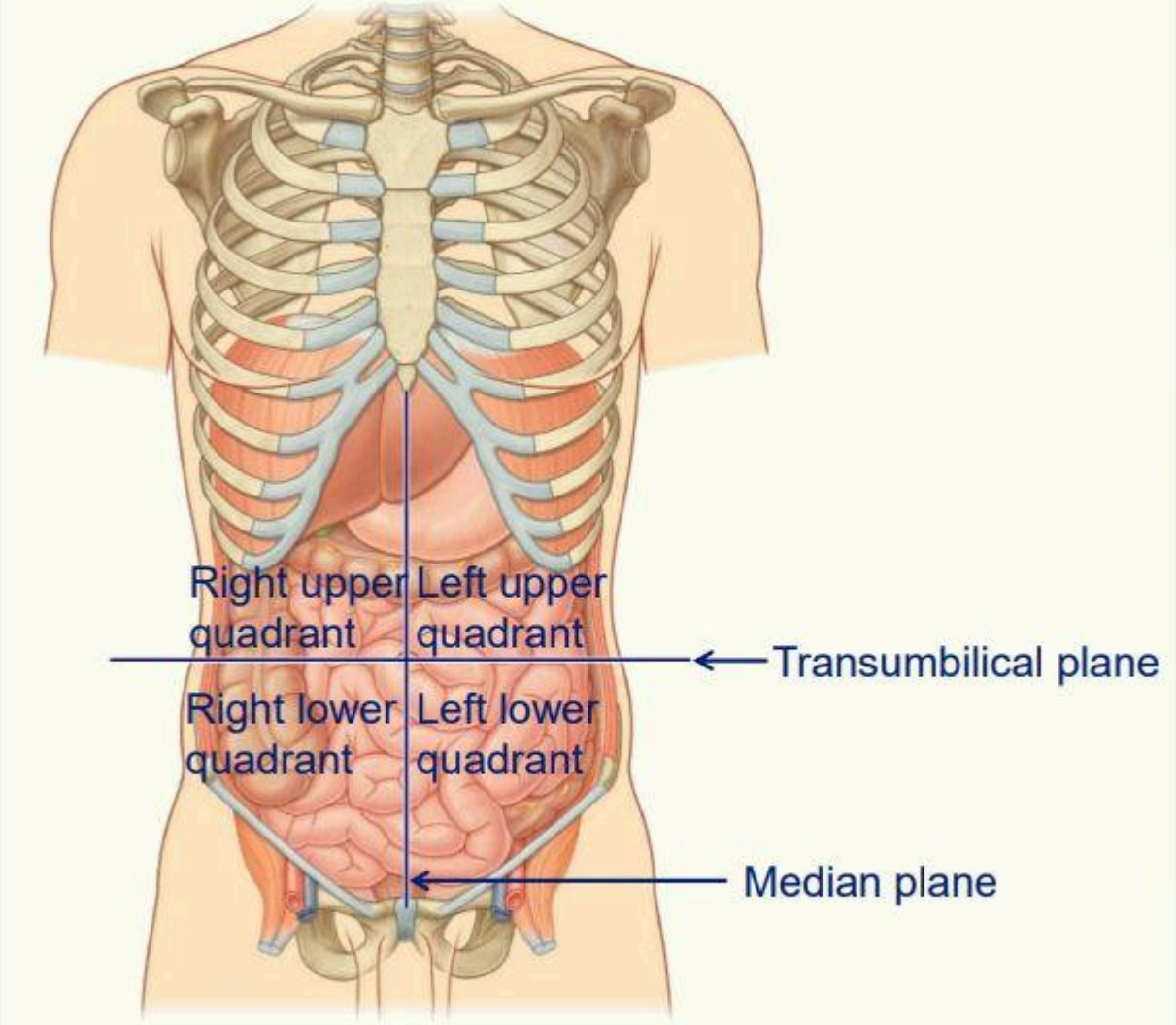







Clavicle
Jugular notch
Sternal angle
Dome of the Diaphragm
Xiphoid process
Costal margin
Inguinal ligament
Anterior Superior Iliac Spine (ASIS)
Iliac crest
Pubic tubercle
Iliac tubercle
Pubic symphysis

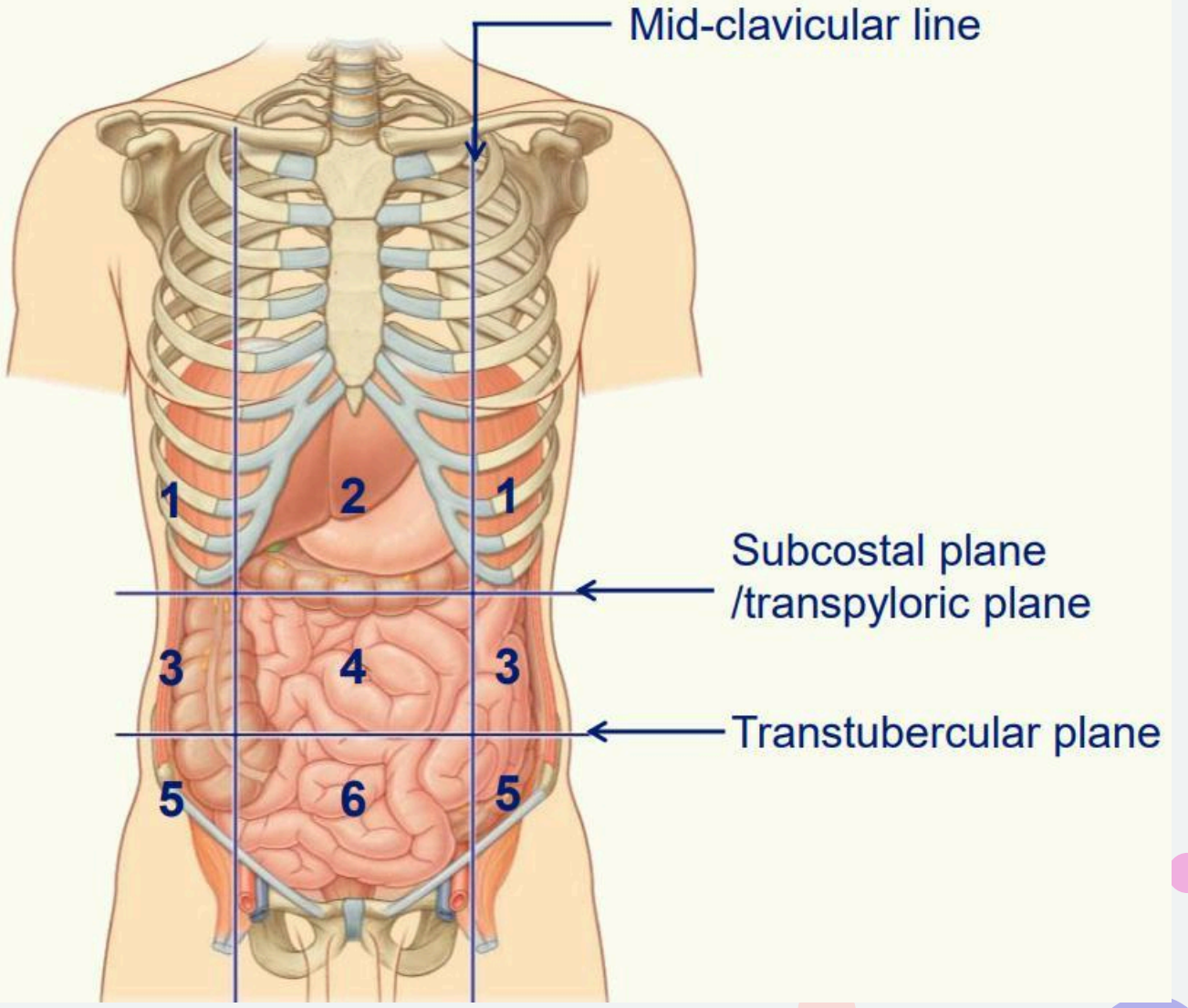
Quadrants in the Abdominal Cavity



Why these quadrants/regions are important?

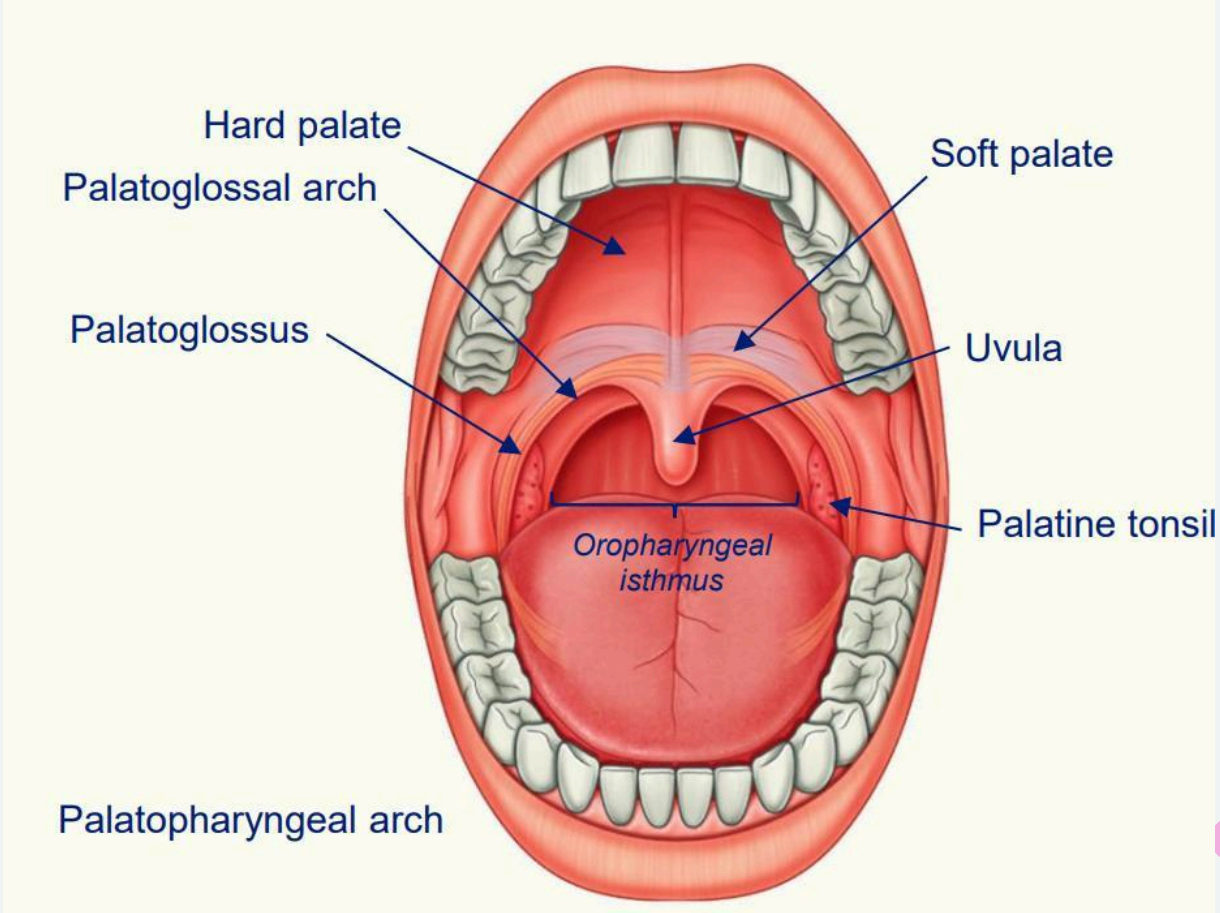
- Describing localisation of pain
- Describing location of a mass
- Reference position of abdominal organs

1. Hypochondriac/hypochondrium
2. Epigastric
3. Lumbar/flank
4. Umbilical
5. Iliac/groin
6. Hypogastric/pubic



Upper GI Tract – Mouth, Pharynx, Oesophagus

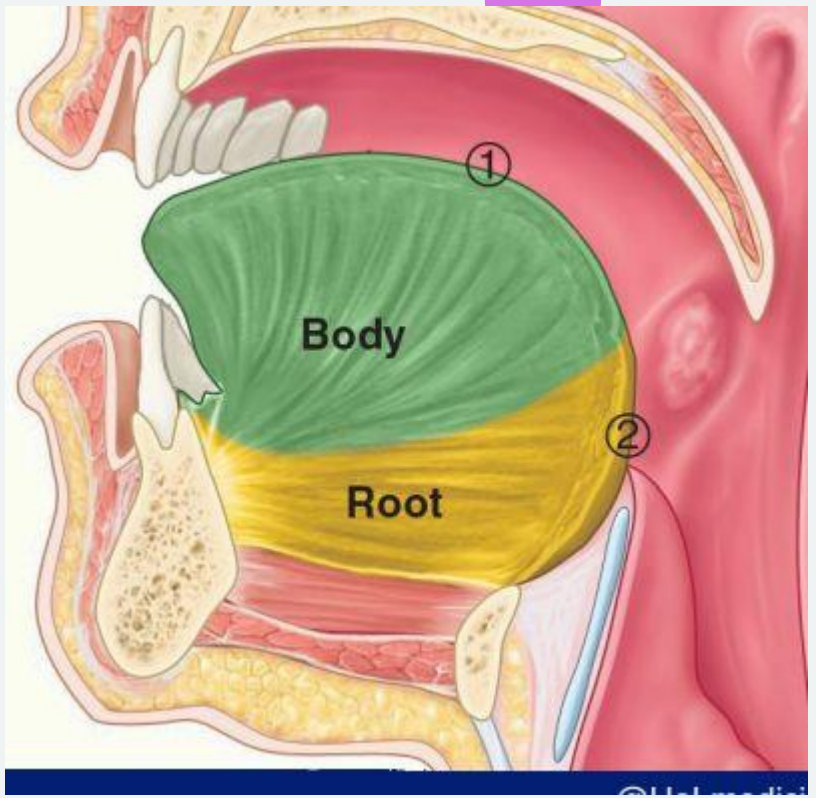
Anterior 2/3 of palate is hard palate and the
Posterior 1/3 of the palate is soft palate

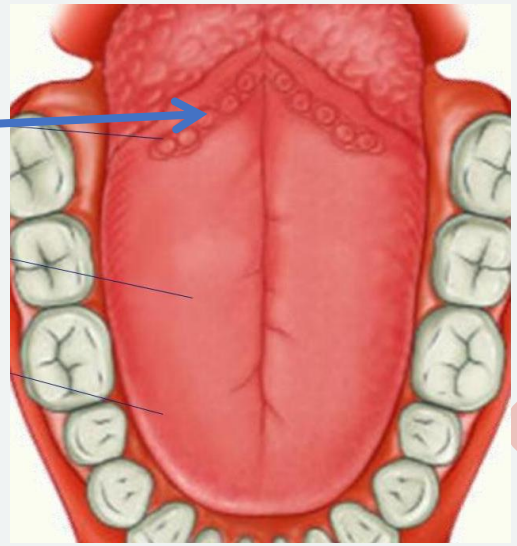


Palatoglossal arch - Border between mouth and pharynx marked
Palatoglossus – Closure of oropharyngeal isthmus via palatoglossus (muscles of soft palate) to separate oral cavity from oropharynx
Oropharyngeal isthmus – lies between the soft palate and the dorsum of the tongue, and is bounded on both sides by the palatoglossal arches

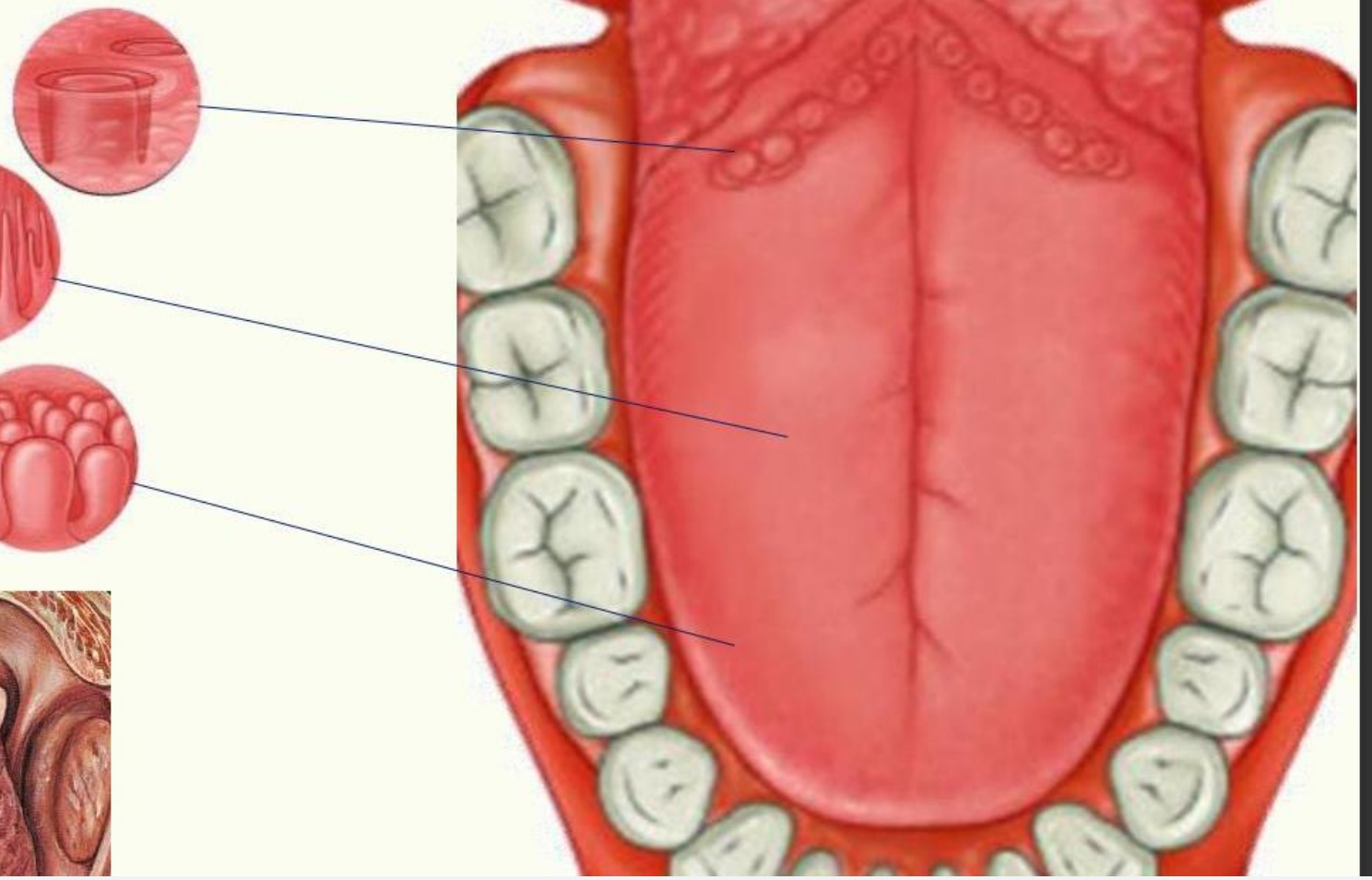
Tongue

- High muscular organ – deglutition, taste and speech
- Attached by its muscles to the hyoid bone, mandible, styloid process, soft palate and pharyngeal wall
- PARTS : root, apex, curved dorsum, inferior surface
- Muscles: Intrinsic muscle fibres are arranged in a complex interlacing pattern of longitudinal, transverse, vertical and horizontal fasciculi, and this allows great mobility
- Split up into the Anterior (oral) and Posterior (pharyngeal) part – divided by the V shaped sulcus terminal

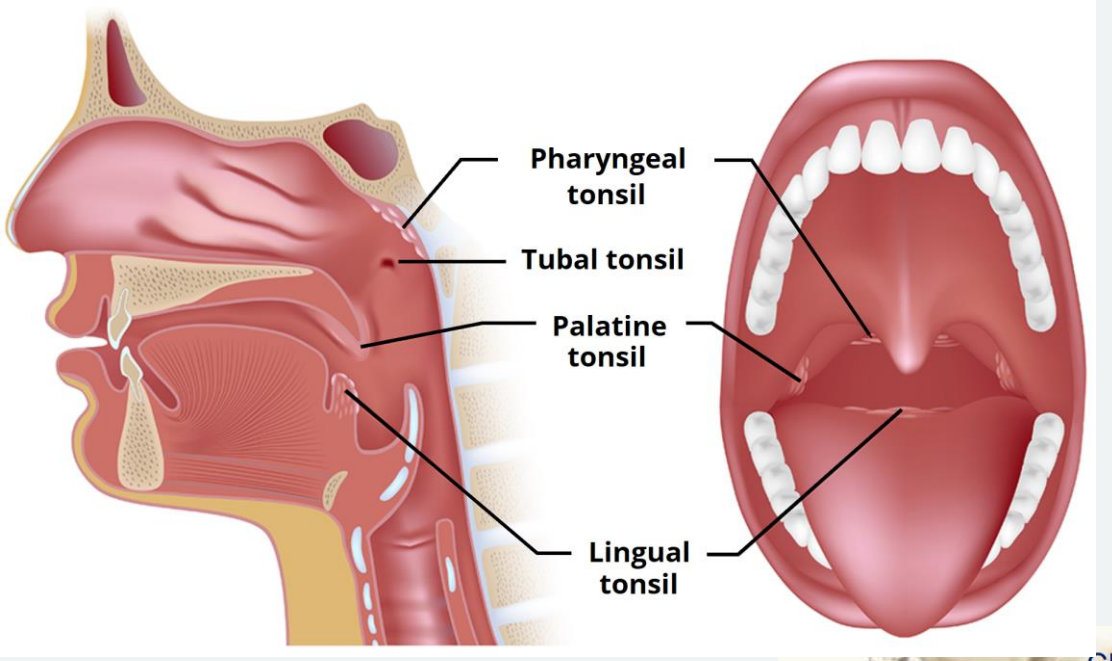


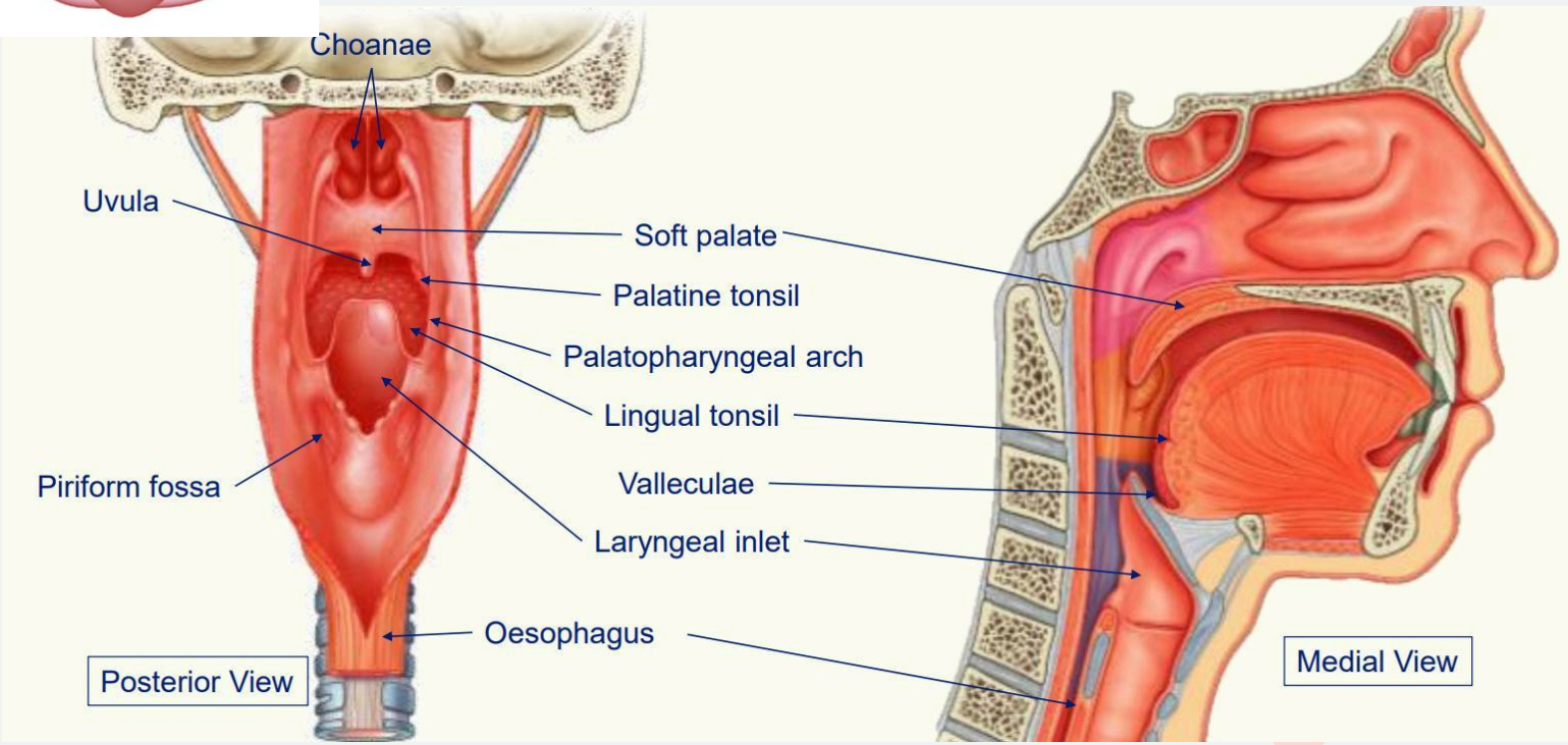


- Vallate – Blunt ended, largest, 8-12, V shape anterior to terminal sulcus
- Filiform – Small cone shaped, mucosal projections
- Fungiform – Round, large along margins of tongue
- Foliate – Line folds of mucosa, sides of tongue



All have taste buds except the filiform

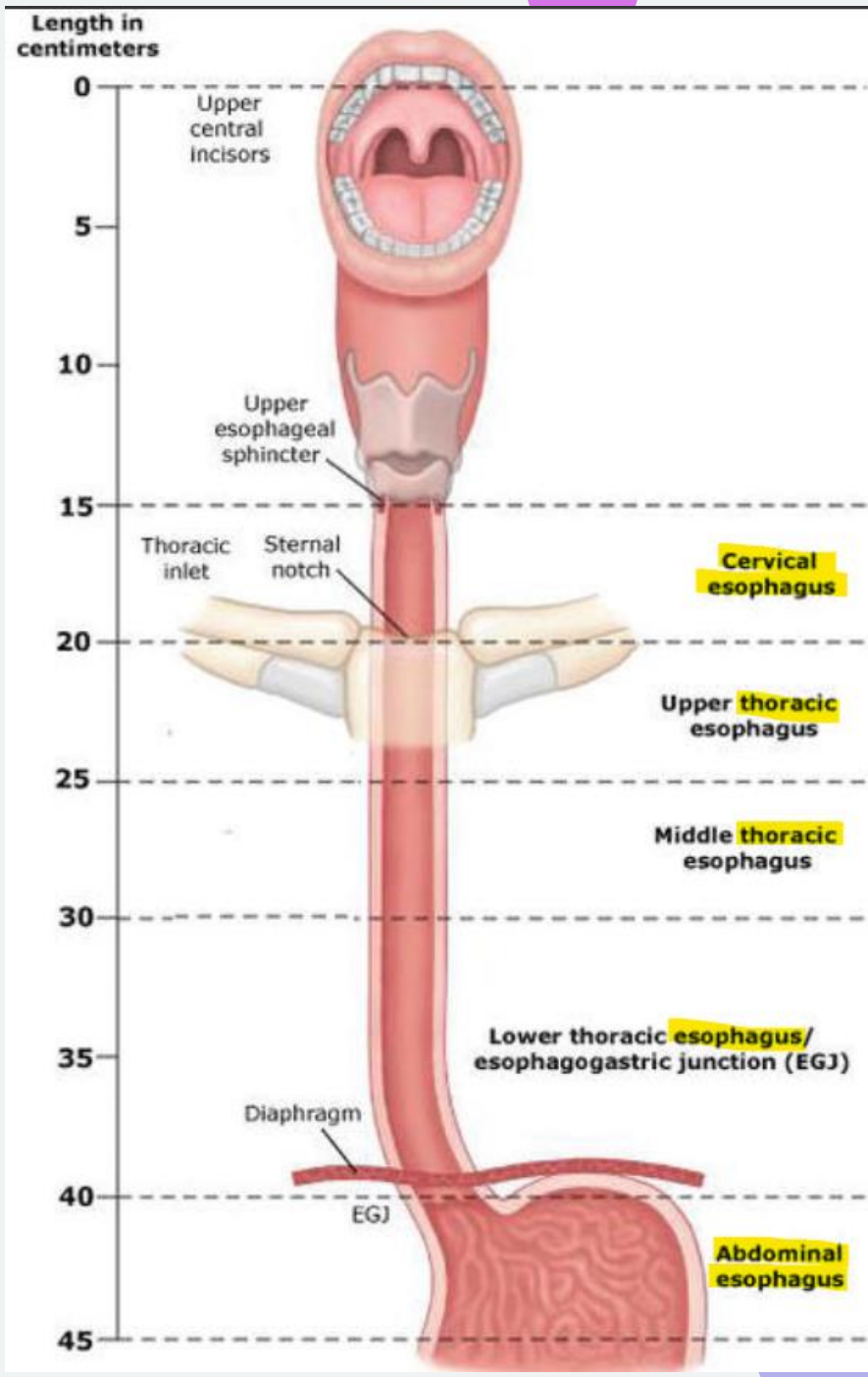

Pharyngeal tonsil
Tubal tonsil
Palatine tonsil
Lingual tonsil


Choanae
Uvula
Soft palate
Palatine tonsil
Palatopharyngeal arch
Lingual tonsil
Piriform fossa
Valleculae
Laryngeal inlet
Oesophagus
Posterior View
Medial View

Oesophagus - Muscular tube; 23-37cm

- 3 parts –
  - Cervical: continuous with oropharynx
  - Thoracic (T1-T10)
  - Abdominal (oesophageal hiatus to cardia of stomach)
- 3 constrictors –
  - Cervical (C5/C6) due to cricoid cartilage
  - Thoracic due to aortic arch
  - Abdominal at oesophageal hiatus

  - Upper 1/3 = striated muscle
  - Lower 2/3 = smooth muscle

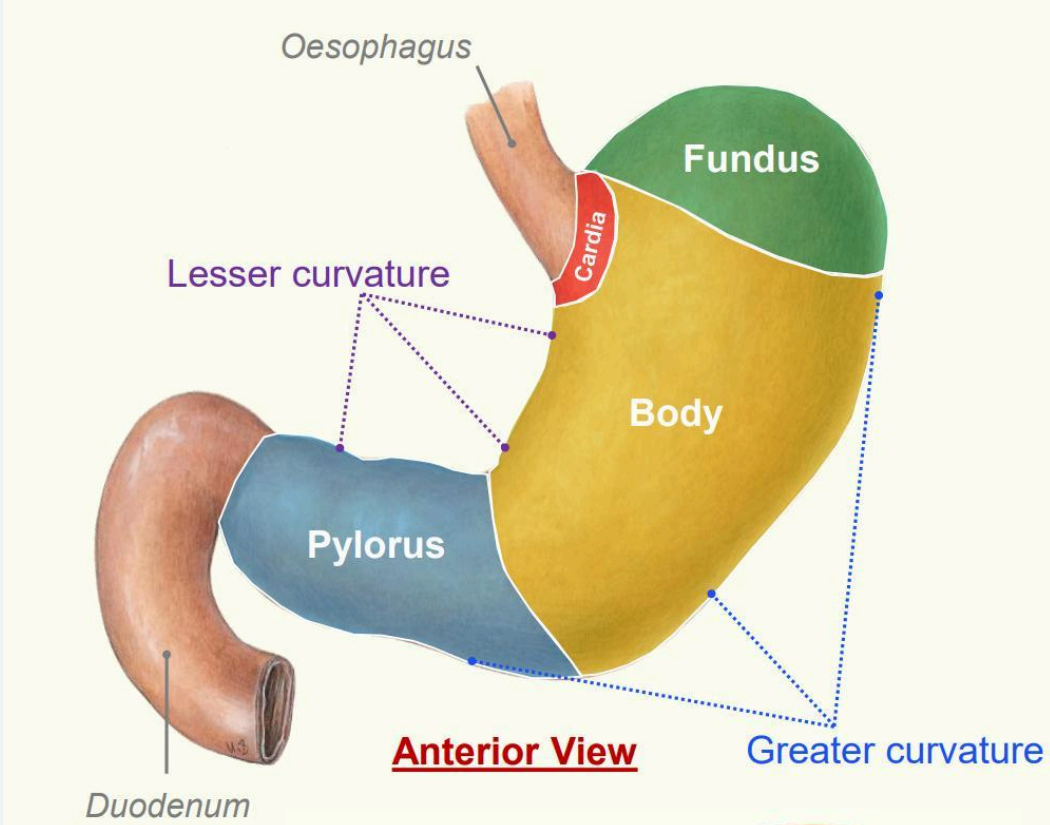


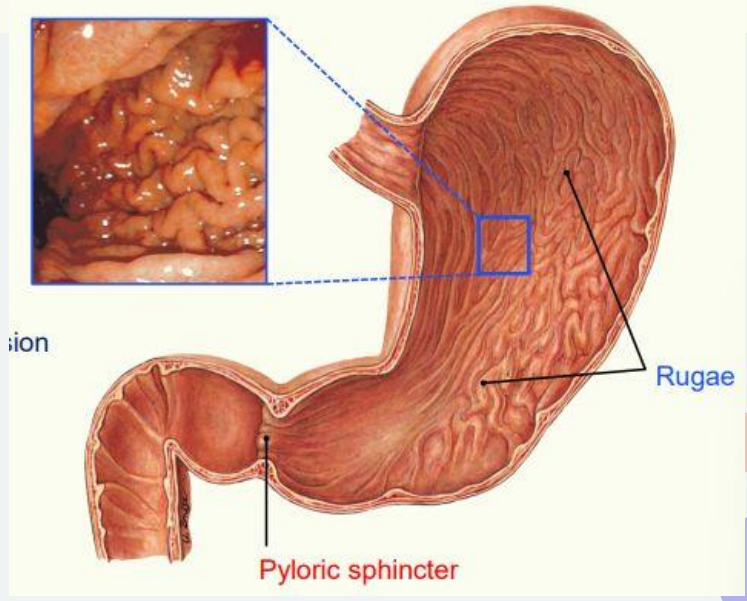
Stomach

Rugae
- Folds in mucosa
- Increase surface & allow for stomach expansion

3 Layers of Smooth Muscle
  - Longitudinal
  - Circular
  - Oblique

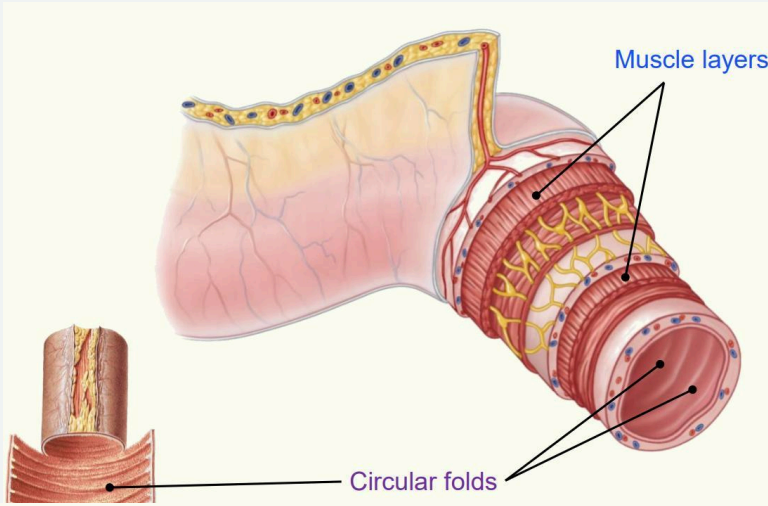
Function:
- Releases chyme into duodenum
- Chyme = semifluid of partially digested food
- Controlled by pyloric sphincter





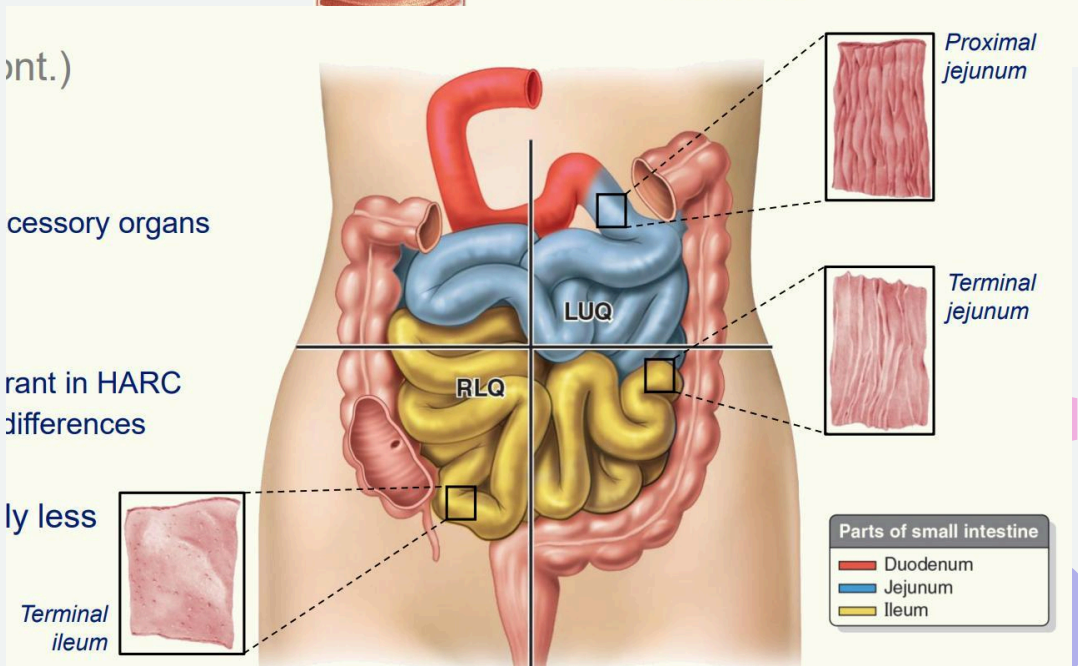
Small Intestine - 3 parts: Duodenum, jejunum & ileum

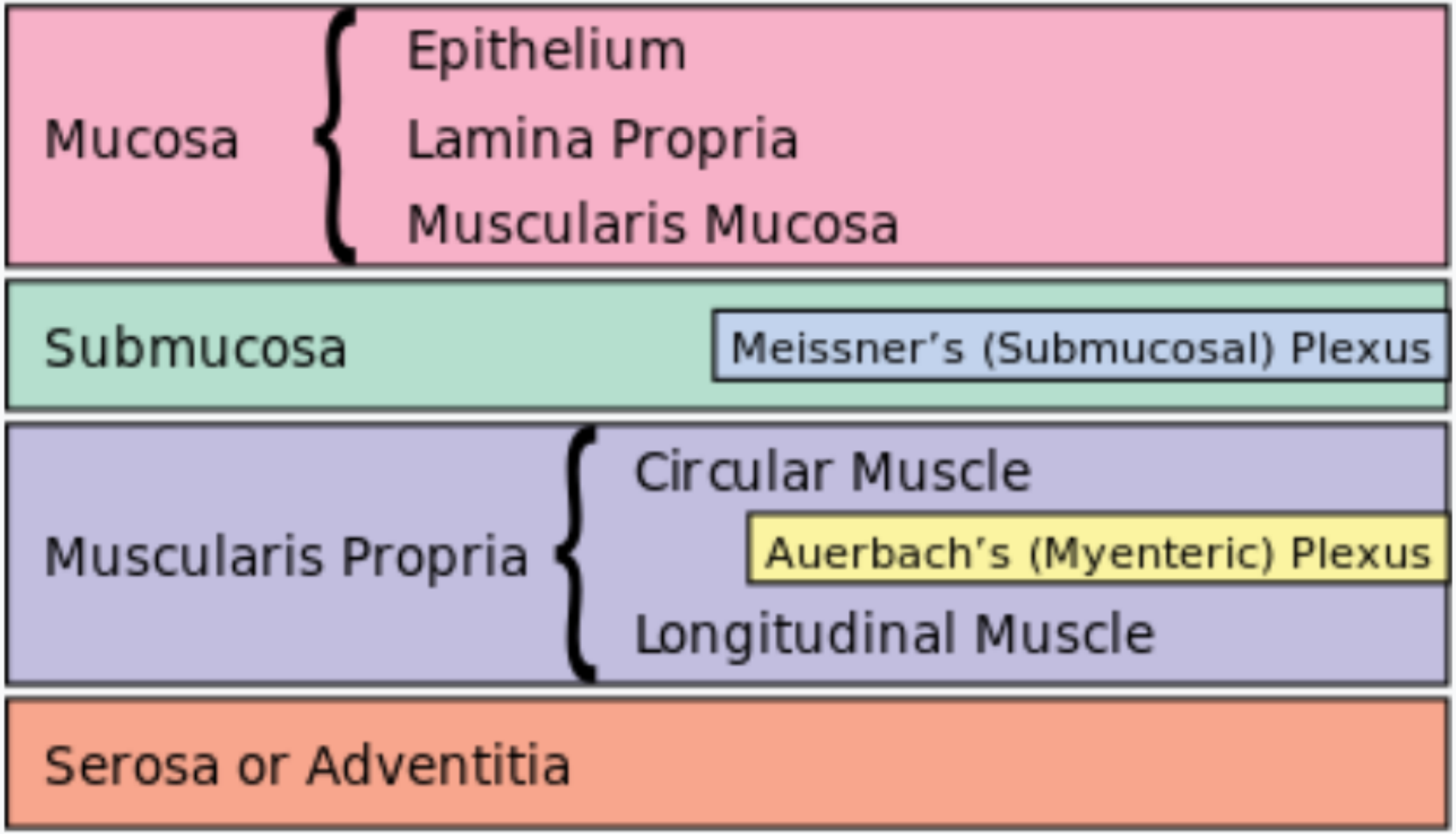
- Jejunum makes up 2/5, and ileum 3/5 of small intestine.
- Longer and straighter like ‘church windows in the jejunum. In the ileum the arterial arcades have a more honeycomb appearance



Contains the Myenteric plexus, Submucosal plexus

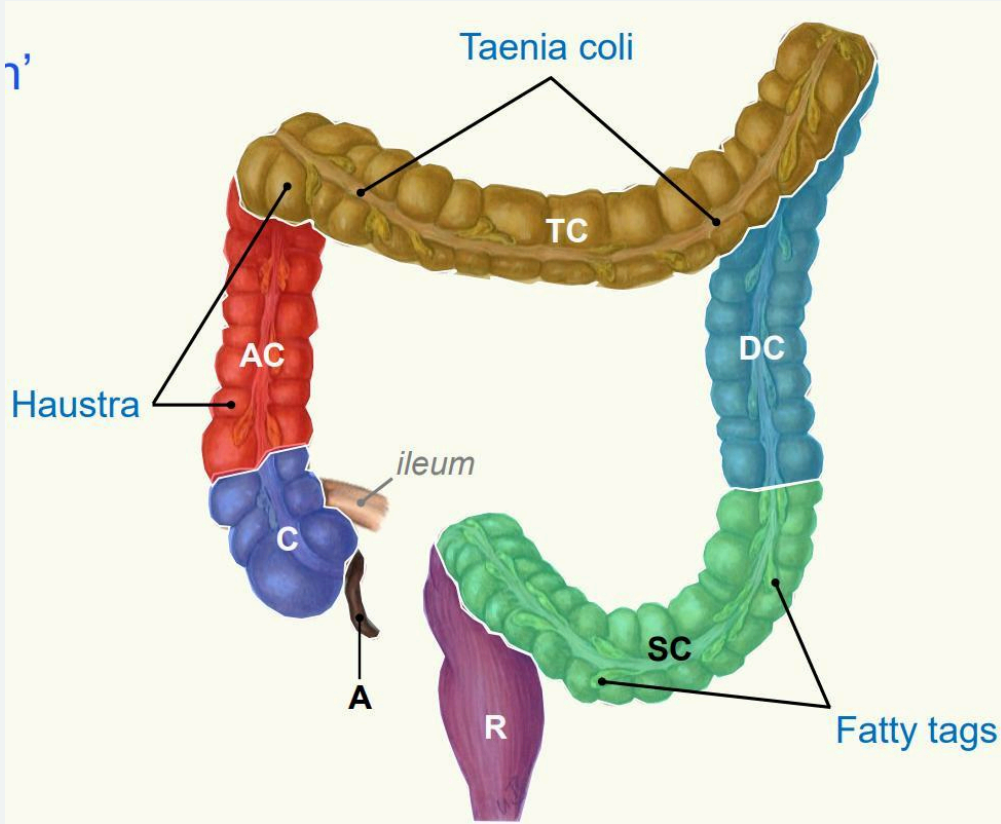
- Submucosal/Meissner’s plexus **between submucosa and circular muscular layers. –** needed for secretions
- Myenteric/Auerbach’s plexus **between circular and longitudinal muscle layers.** – needed for muscle control




Mucosa
Epithelium
Lamina Propria
Muscularis Mucosa
Submucosa
Meissner's (Submucosal) Plexus
Muscularis Propria
Circular Muscle
Auerbach's (Myenteric) Plexus
Longitudinal Muscle
Serosa or Adventitia

Large Intestine

- From ileocaecal junction to rectum - Caecum & appendix, ascending colon, transverse colon, descending colon, sigmoid colon, rectum
- 3 unique features: Haustra (large pouches), Taenia coli (band of muscle), Fatty tag
- Function: Primarily reabsorption of water to create & excrete

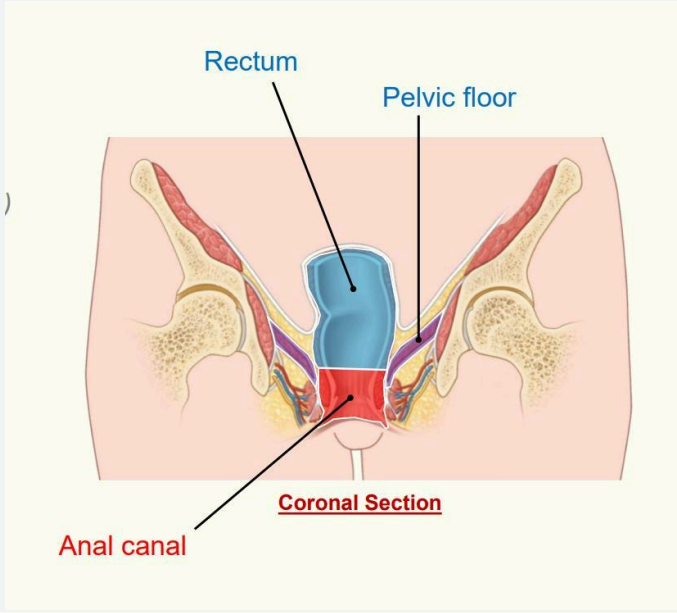


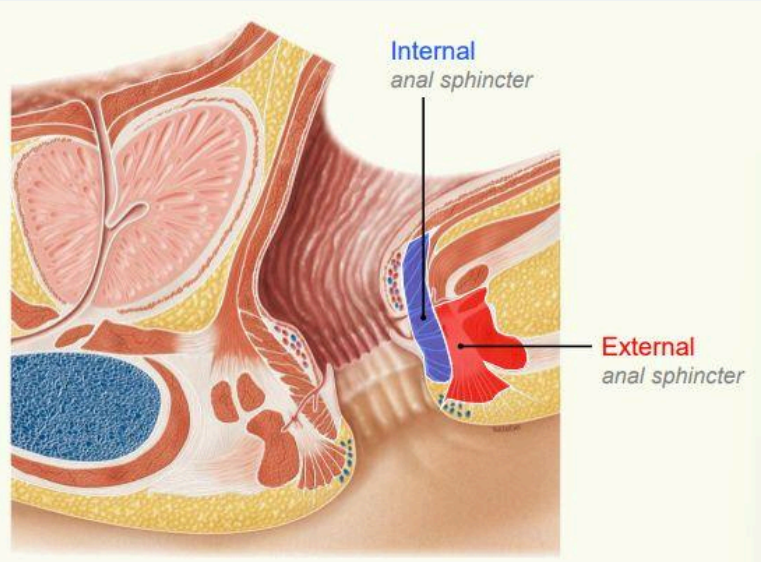
Anal Canal - between pelvic floor and anus

- Has 2 anal sphincters
  - Internal anal sphinter - Unconscious (autonomic) control - S2-S4
  - External anal sphincter - Conscious (somatic) control - S2-S4 – pudendal nerve

- Features:
  - Pectinate line - Divided upper and lower portions of canal
  - Anal columns - Vertical folds in mucosa AND Anal sinuses lie between them
  - Anal valves - Horizontal folds in mucosa
  - White line - Keratinized to non-keratinized epithelia

- Pathology – Damage to the S2 – s4 = incontenence

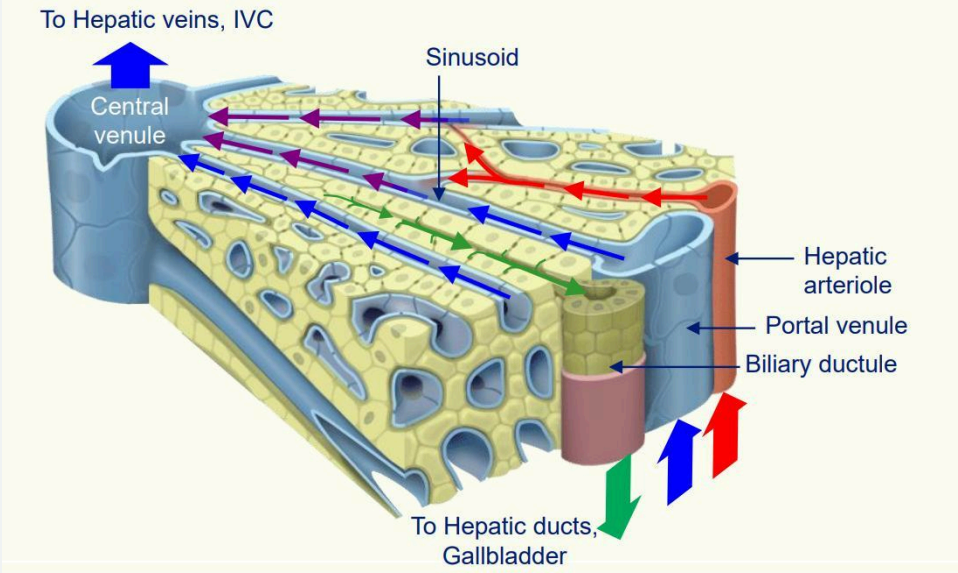


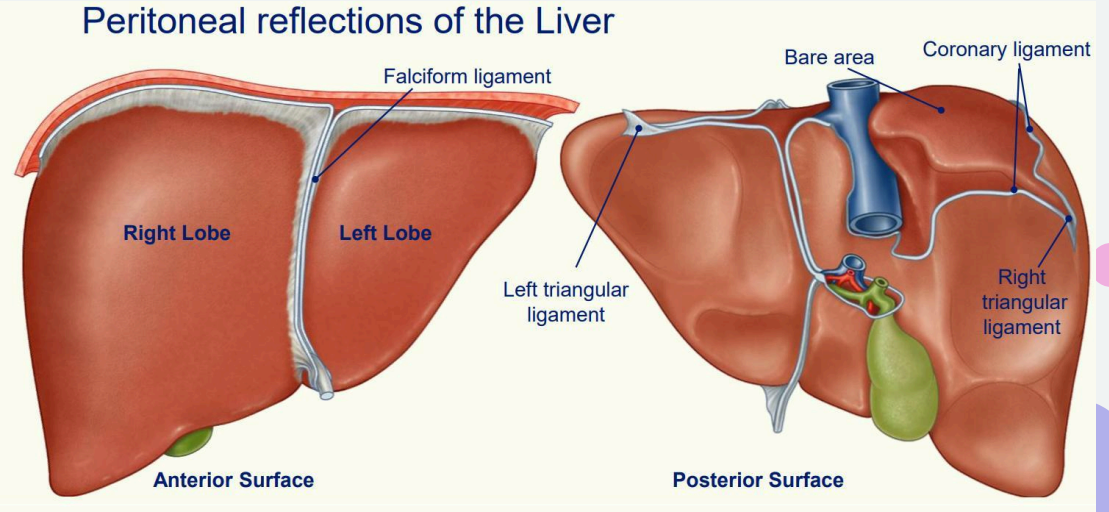


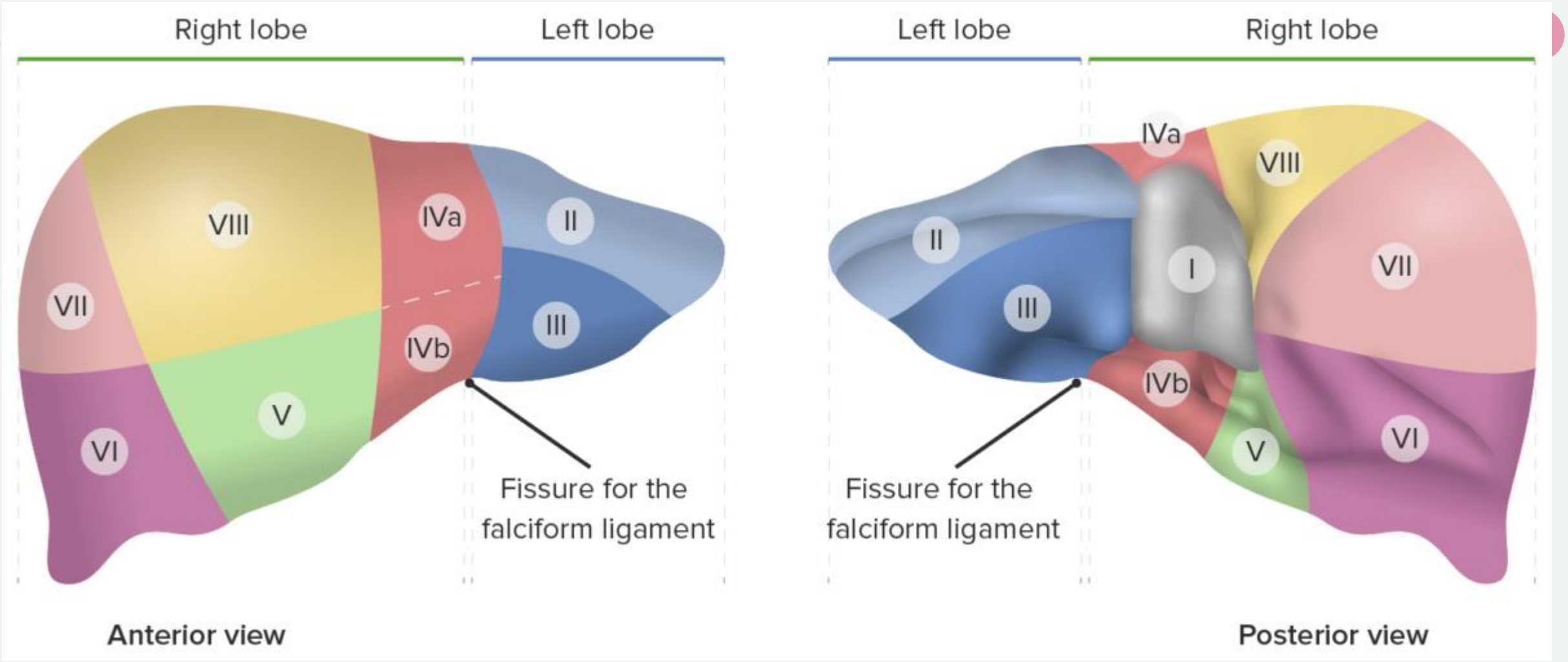
Liver

- Largest gland in the body
- 2 surfaces
  - Diaphragmatic: anterior, superior and posterior
  - Visceral: inferior
- Divided into left and right lobes by the IVC
- The quadrate and caudate lobes are described as arising from the right lobe
  - they are said to be related to the left lobe in relation to their blood supply, venous drainage and the hepatic duct

- Function
  - Production and secretion of bile
  - Metabolism
  - Filtration of blood – removal of bacteria and foreign particle
  - Synthesis of heparin (anticoagulant)

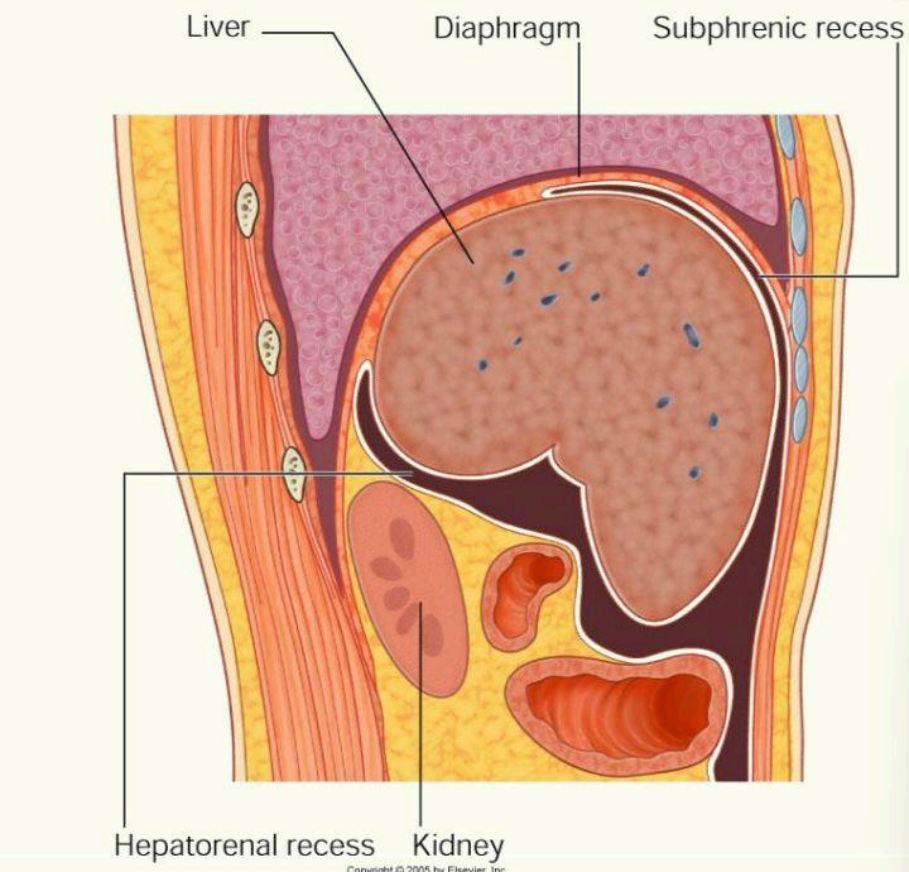





Right lobe
Left lobe
VIII
IVa
II
VII
IVb
III
V
VI
Fissure for the falciform ligament
Anterior view
Left lobe
Right lobe
IVa
VIII
II
I
VII
III
IVb
V
VI
Fissure for the falciform ligament
Posterior view

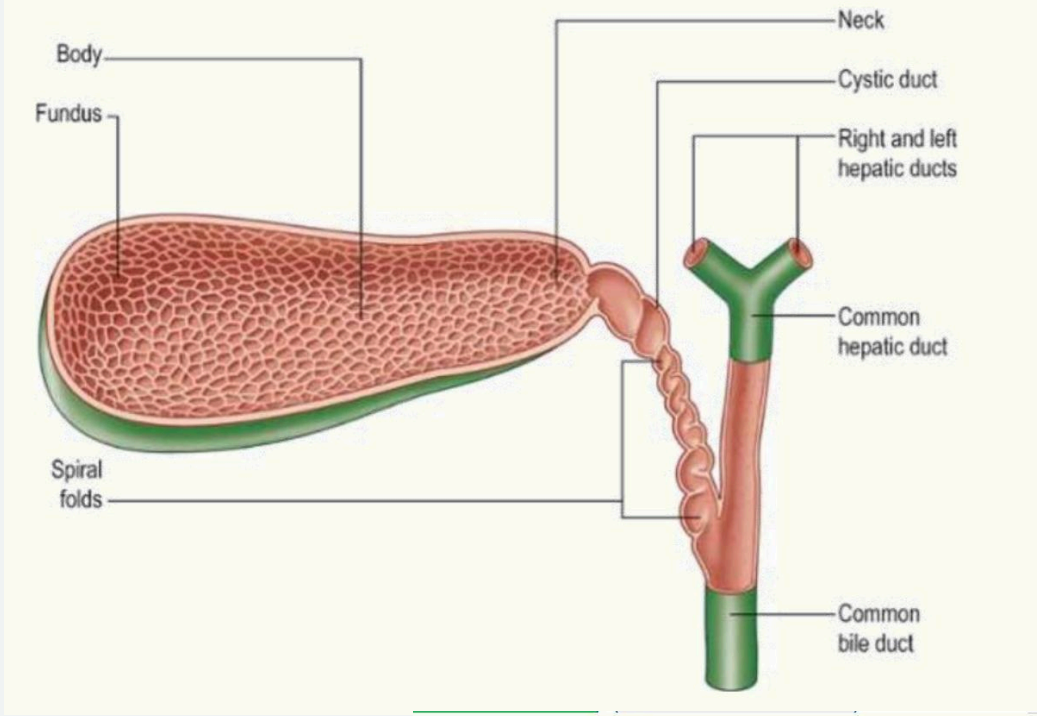
Diaphragmatic Surface

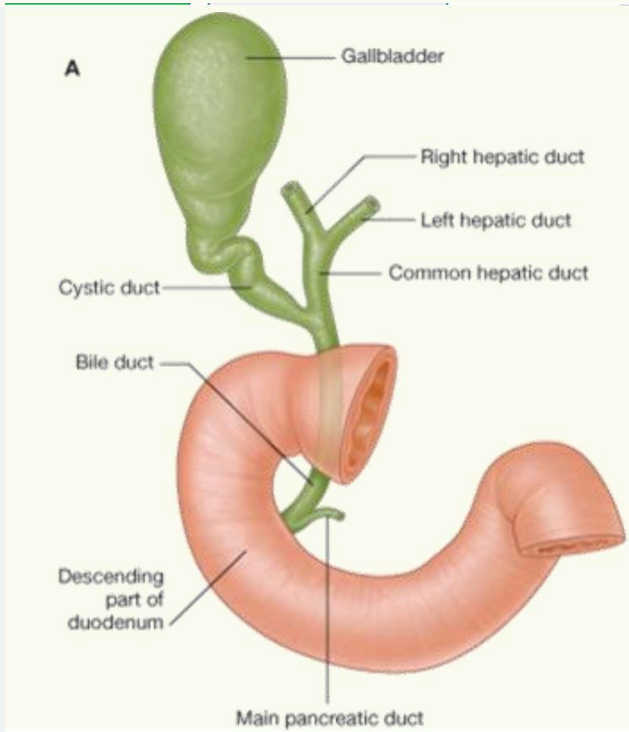
- The diaphragmatic surface is smooth and domed, lying against the inferior surface of the diaphragm
- Associated with it are the subphrenic and hepatorenal recesses



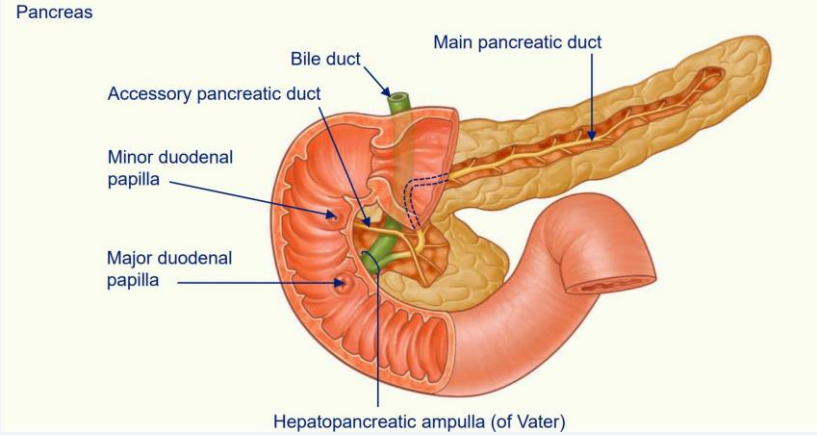
Gallbladder

- Stores Bile
  - hepatocytes at a constant rate of about 40ml per hour
  - Hepatocytes secrete bile into canaliculi which flows into bile ducts
  - Bile acts to digest and absorb fat and fat-soluble vitamins in the small intestine and eliminate waste products, including bilirubin



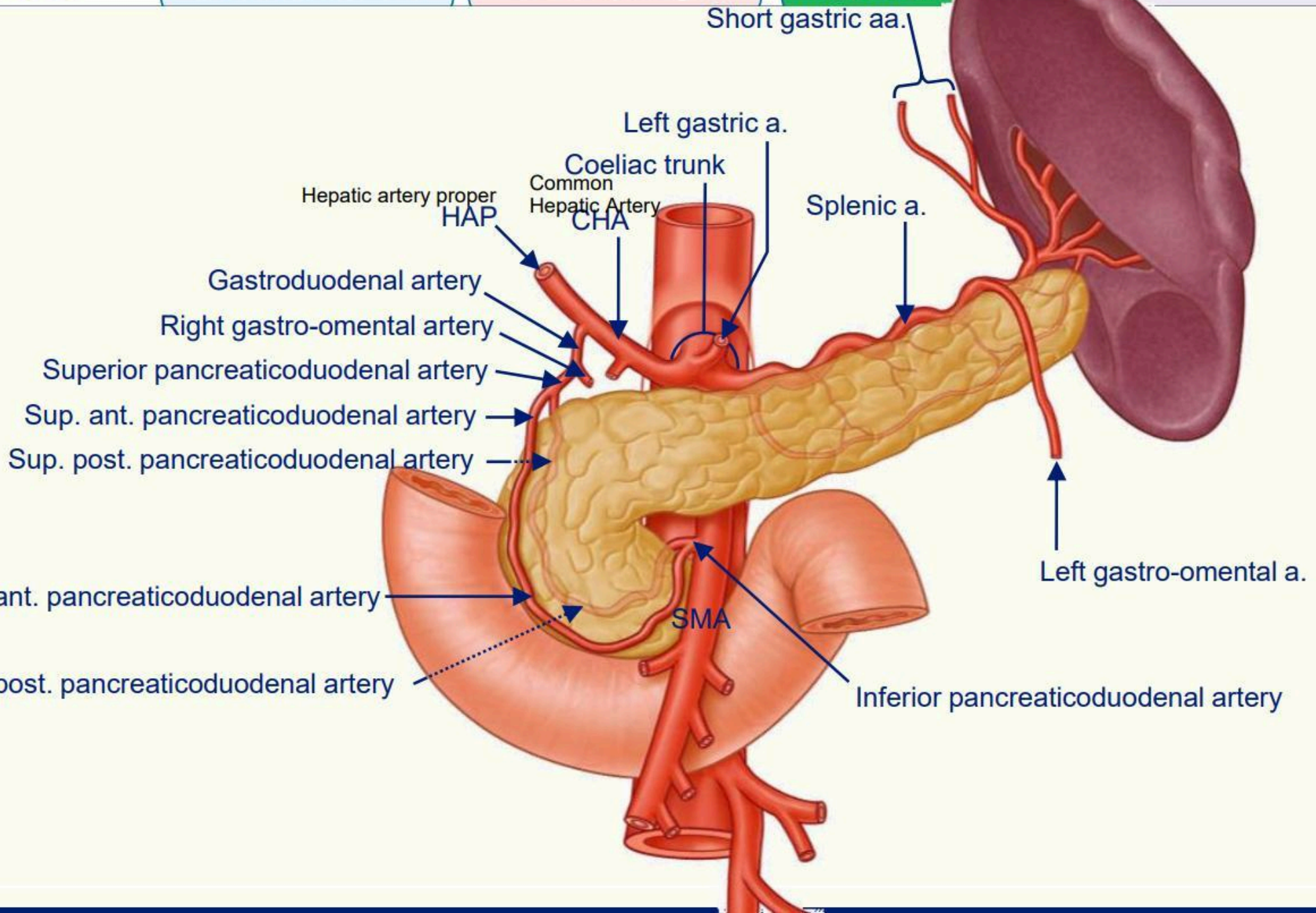


Pancreas



- Gland – exocrine(>95%) and endocrine(<5%)
  - Exocrine portion secretes enzymes capable of hydrolysing proteins, fats and carbohydrates
  - Endocrine portion (pancreatic islets/islets of Langerhans), produces the hormones insulin and glucagon, which play a key role in carbohydrate metabolism
- Lies in epigastrium
- Main pancreatic duct – begins at tail and runs to head, receiving numerous tributaries
  - Opens into 2nd part duodenum with bile duct on the major duodenal papilla
- Accessory duct – when present – drains upper part of head and opens into duodenum, above main duct, on minor duodenal papilla
  - frequently communicates with the main duct

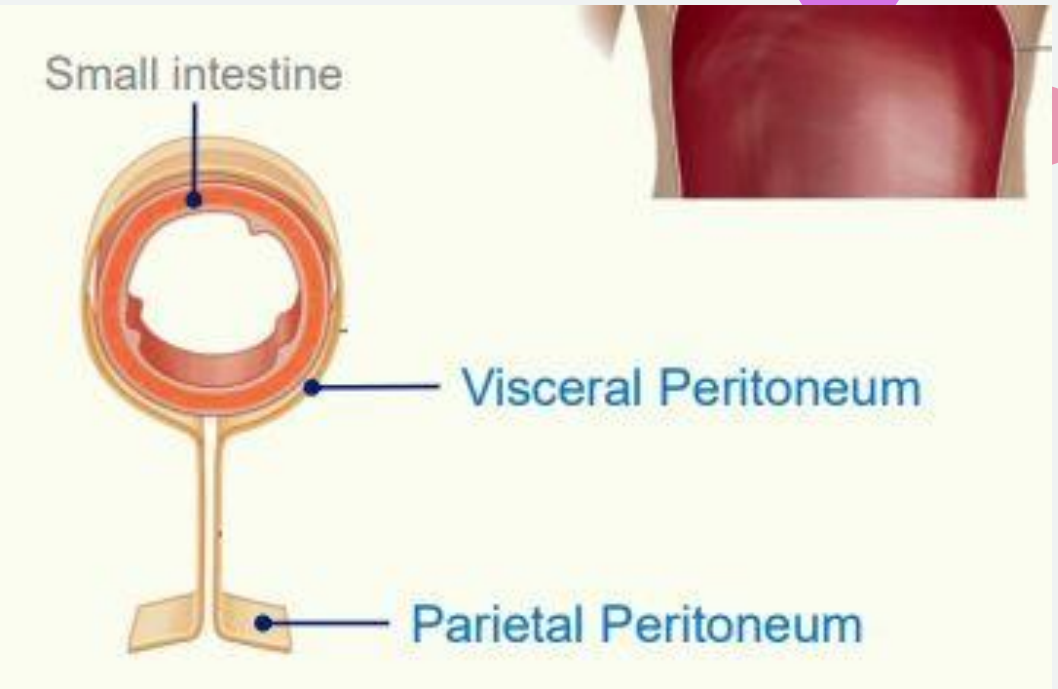
ncreas


Short gastric aa.
Left gastric a.
Coeliac trunk
Hepatic artery proper
HAP
Common Hepatic Artery
CHA
Splenic a.
Gastroduodenal artery
Right gastro-omental artery
Superior pancreaticoduodenal artery
Sup. ant. pancreaticoduodenal artery
Sup. post. pancreaticoduodenal artery
Left gastro-omental a.
Inf. ant. pancreaticoduodenal artery
SMA
Inf. post. pancreaticoduodenal artery
Inferior pancreaticoduodenal artery

Peritoneum

- Continuous structure which has parietal & visceral laye
  - Parietal – on walls
  - Visceral – on organs
- Mesentery – 2 parallel layers of peritoneum
- 2 function
  - Produces serous fluid to lubricate mobile organs
  - Offers a safe passageway for nerves/blood/lymph

- Retroperitoneal (“behind the peritoneum”)
  - Covered only anteriorly by peritoneum
- Intraperitoneal (“surrounded by peritoneum”)
  - Suspended by a mesentery



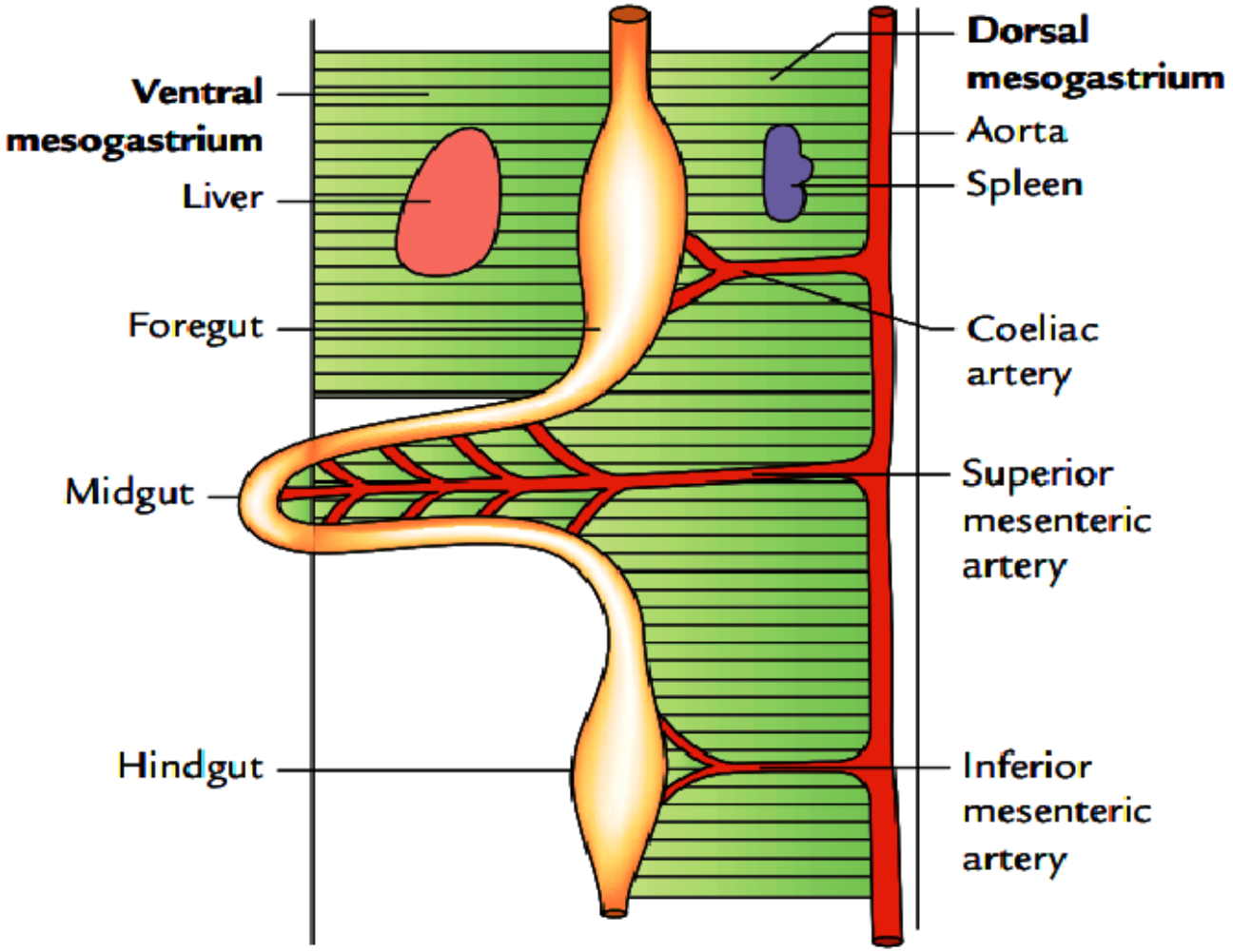
What is the another difference between the retroperitoneum and intraperitoneal??

retroperitoneum is immobile whereas intraperitoneal is mobile

Embryology

- Endoderm -> Gut Tube – 3 part: Foregut, Midgut, Hindgut
  - The tube becomes hollow GI tract
  - Accessory organs develop as buds (‘diverticulae’) which stem from the tube
- Foregut = Lower oesophagus, stomach, first ½ duodenum,
  - Diverticular = liver, gallbladder & pancreas (forms from two diverticula which later fuse.)
- Midgut = Rest of small intestine, caecum, ascending colon & ¾ transverse colon
  - Massive increase in length -> begins to fold in the midline of the body, it herniates out of the body through umbilicus -> undergoes 270° anticlockwise in total around SMA. The bowel returns back to abdomen
- Hindgut = Final ¼ TC, descending & sigmoid colon, rectum

Part	Derivatives
Foregut	• Esophagus • Stomach • Upper half of the duodenum (up to the opening of common bile duct)
Midgut	• Lower half of the duodenum (distal to the opening of common bile duct) • Jejunum • Ileum • Appendix • Caecum • Ascending colon • Right two-third of the transverse colon
Hindgut	• Left one-third of the transverse colon • Descending colon • Sigmoid colon • Rectum • Upper part of the anal canal



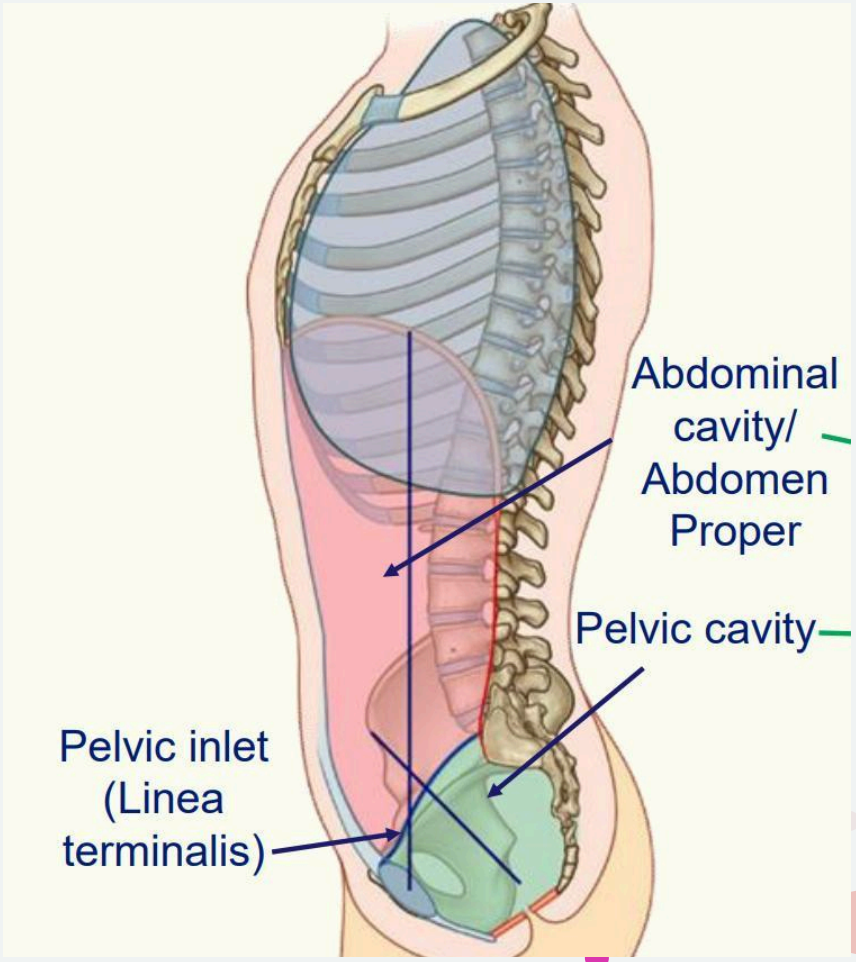
MCQ time

What separates the abdominal and pelvic cavities?

1. Midclavicular line
B. Pectinate line
C. Linea terminalis
D. Linea alba
E. Pelvic floor muscles

What separates the abdominal and pelvic cavities?

A. Midclavicular line – middle cliavicle
B. Pectinate line – in the rectum
C. Linea terminalis
D. Linea alba – splits the rectus abdominal muscles
E. Pelvic floor muscles



Which papillae don’t have taste buds?

A. Filiform
B. Vallate
C. Fungiform
D. Foliate
E. All of them do

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What is the correct order?

A. Ileum , duodenum, jejunum, ascending colon
B. Duodenum, jejunum, ileum, transverse colon
C. Jejunum, duodenum, ileum, transverse colon
D. Ilium, duodenum, jejunum, ascending colon
E. Duodenum, jejunum, ileum, ascending colon

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What part of the pancreas is not retroperitoneal?

A. Tail
B. Head
C. Body
D. neck
E. Uncinate process

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Which of these organs are derived from the Midgut?

A. Stomach
B. Liver
C. First ½ of duodenum
D. Caecum
E. Rectum

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What layers is the circular smooth muscle between?

A. The submucosa and the mucosa

B. The serosa and muscularis propria

C. The myenteric plexus and submucosal plexus

D. The submucosa and muscularis mucosa

E. The serosa and the longitudinal muscle

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Which of the following structures is NOT part of the foregut?

A. Oesophagus

B. Stomach

C. Duodenum

D. Liver

E. Jejunum

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Which of the following statements about the liver is FALSE?

A. It is the largest gland in the body.

B. It produces bile.

C. It stores glycogen.

D. It filters blood.

E. It secretes digestive enzymes.

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The sphincter that controls the flow of bile from the gallbladder into the duodenum is called the:

A. Pyloric sphincter

B. Ileocecal valve

C. Sphincter of Oddi

D. Anal sphincter

E. Cardiac sphincter

The sphincter that controls the flow of bile from the gallbladder into the duodenum is called the:

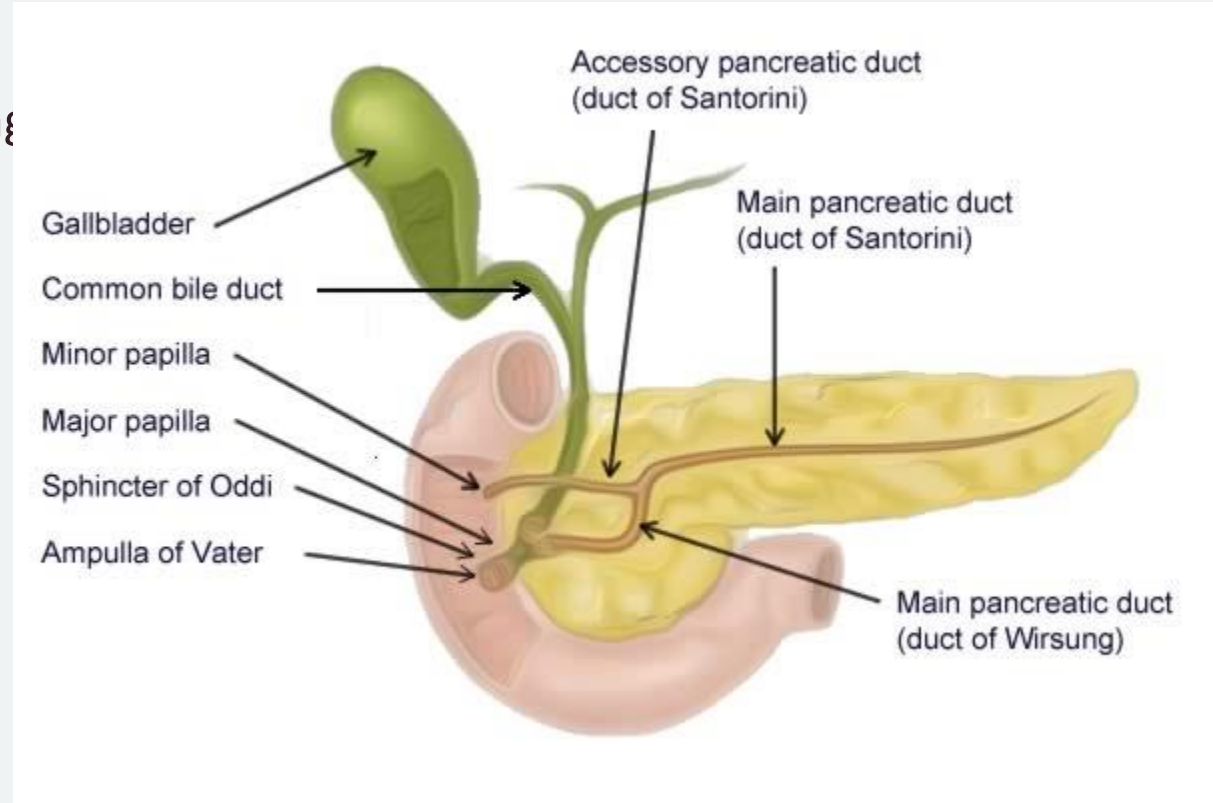
A. Pyloric sphincter – between stomach and duodenum

B. Ileocecal valve

C. Sphincter of Oddi

D. Anal sphincter – in the anus

E. Cardiac sphincter – between stomach and oesophag



The ileocecal valve is located between:

A. Oesophagus and stomach

B. Stomach and duodenum

C. Duodenum and jejunum

D. Jejunum and ileum

E. Ileum and cecum

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The appendix is a small pouch attached to the:

A. Cecum

B. Ascending colon

C. Transverse colon

D. Descending colon

E. Sigmoid colon

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The rugae are folds in the lining of the:

A. Esophagus

B. Stomach

C. Small intestine

D. Large intestine

E. Rectum

The rugae are folds in the lining of the:

A. Oesophagus

B. Stomach

C. Small intestine

D. Large intestine

E. Rectum

Which of the following statements about the large intestine is FALSE?

A. It absorbs water and electrolytes.

B. It houses gut microbiota that aid in digestion and immune function.

C. It stores fecal matter before defecation.

D. It has a muscular layer responsible for peristalsis.

E. It secretes digestive enzymes for further breakdown of food.

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