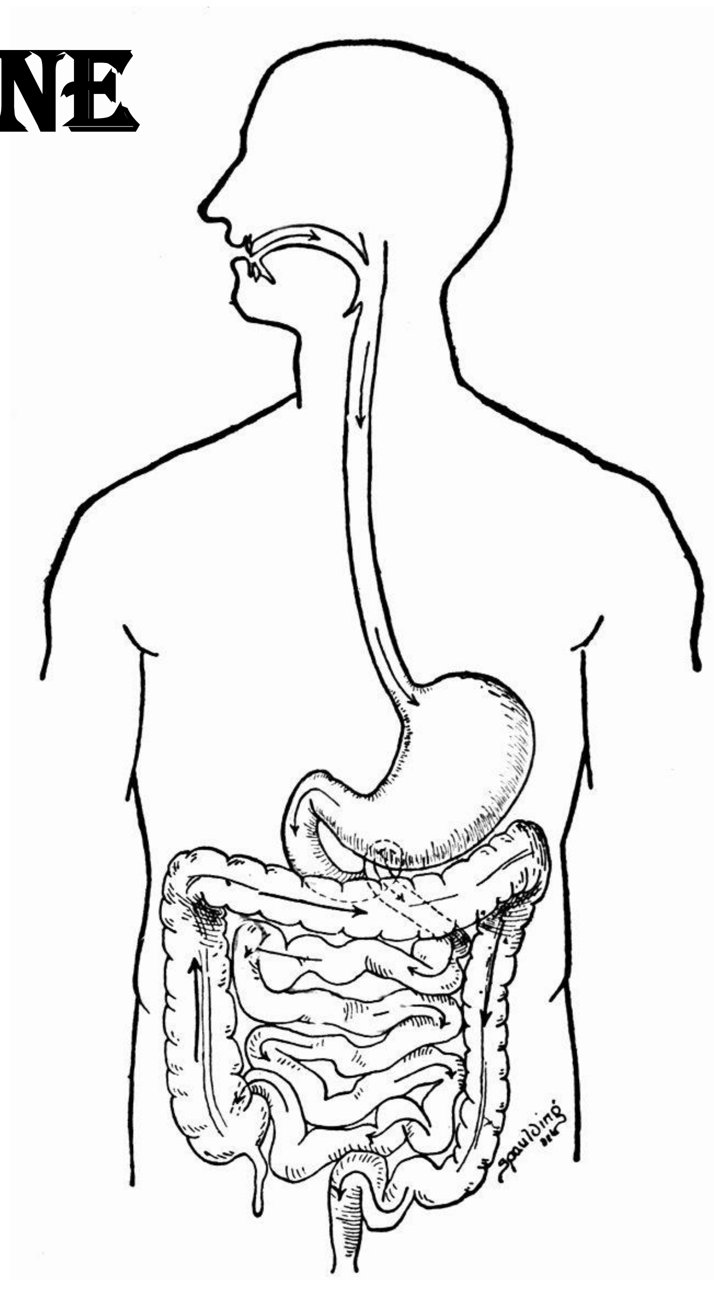
GIT: Esophagus-Stomach-Small Intestine

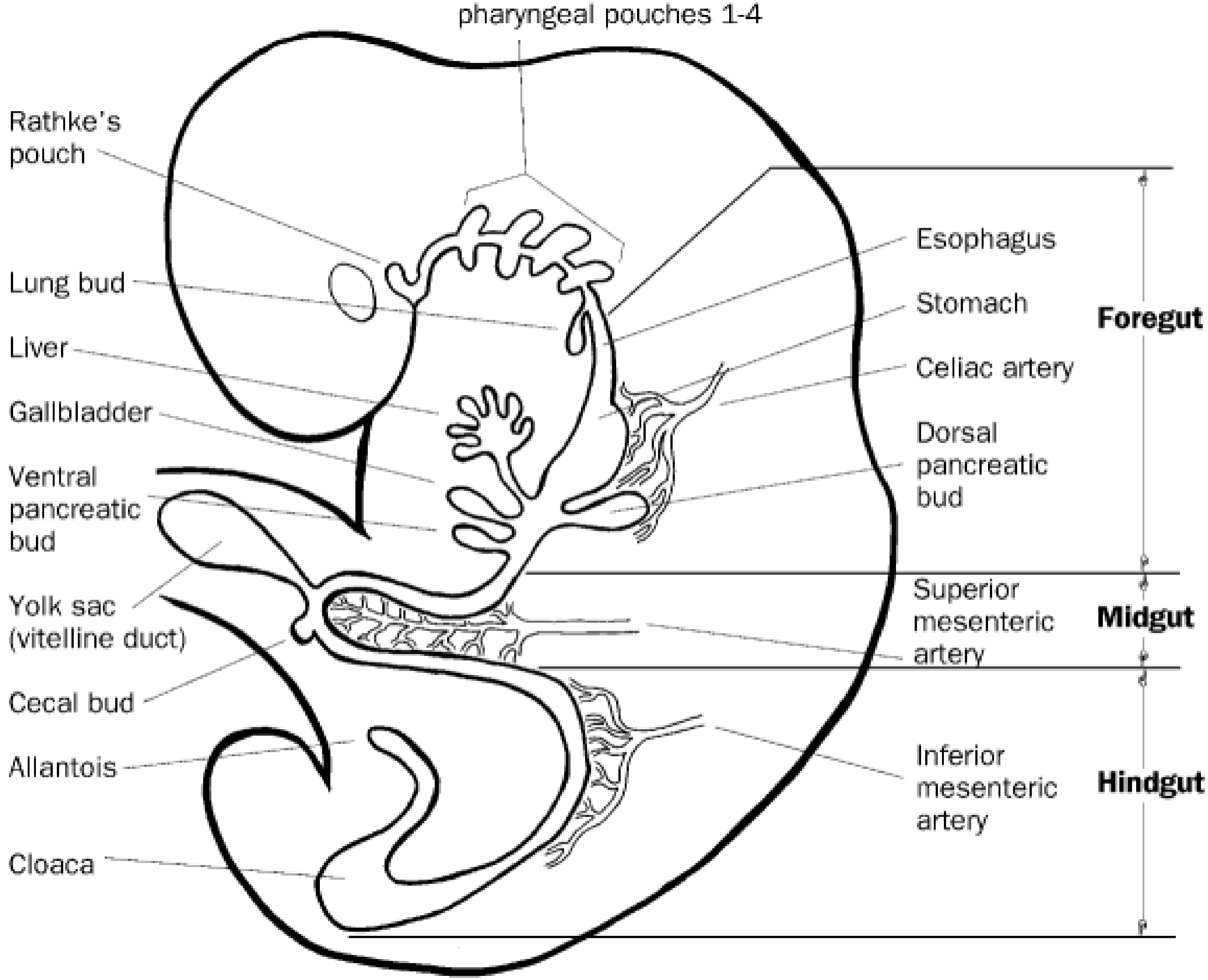


Department of Anatomy
Second Faculty of Medicine
Charles University

MUDr. Azzat Al-Redouan

Overview of the anatomical development

Primitive gut- 4 Weeks



Organs Derivatives

Foregut → **Esophagus**

↘

Duodenum

↗

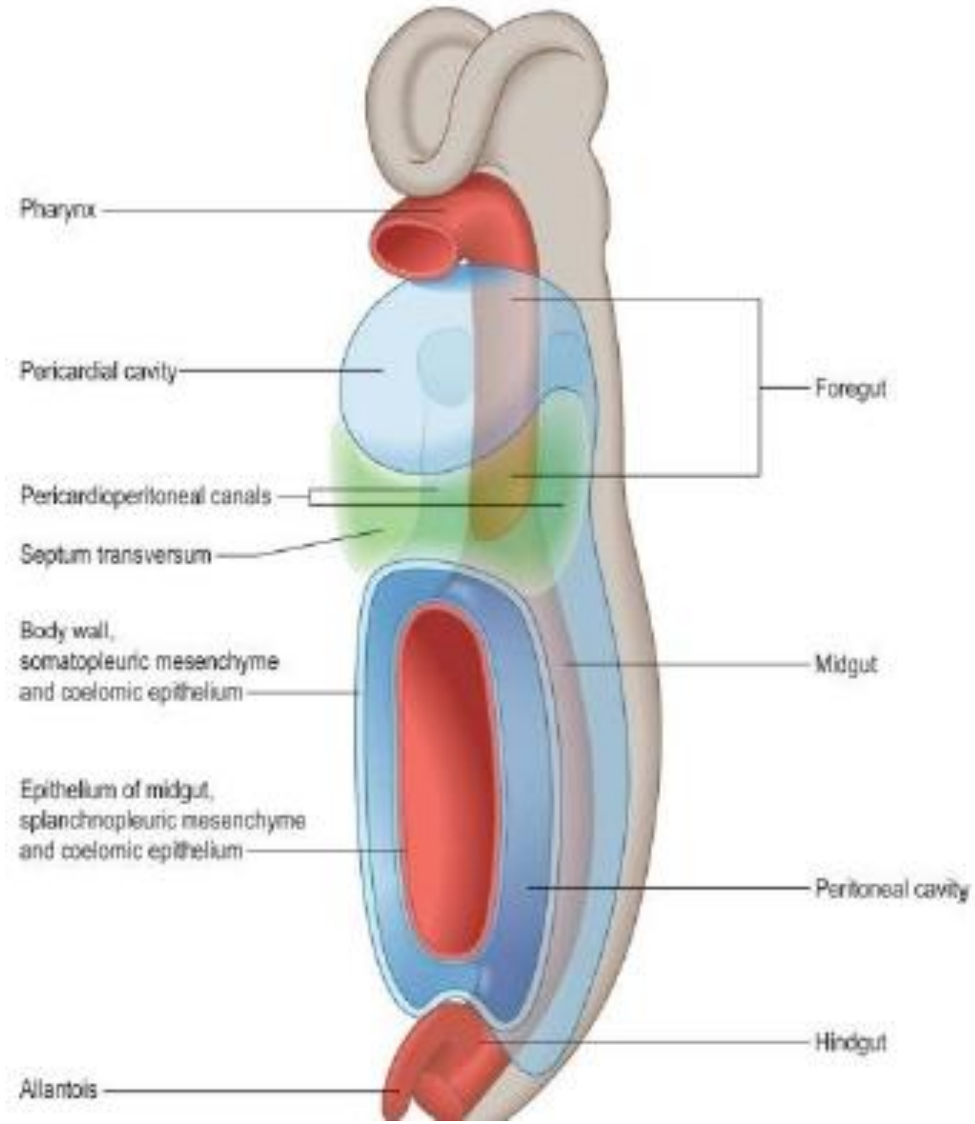
Midgut → **Small Intestine**

↘

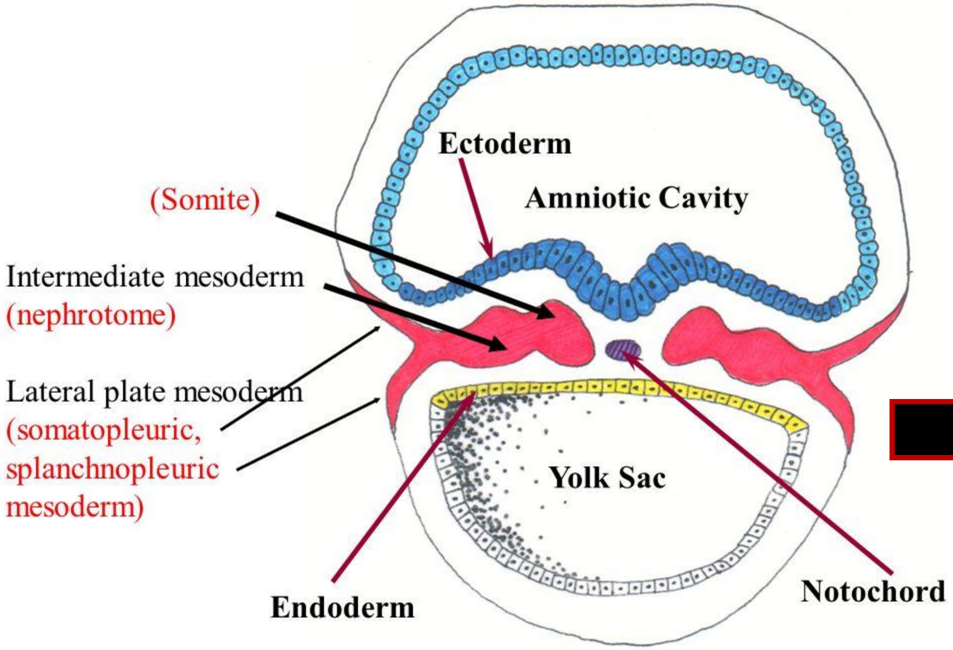
Large Intestine

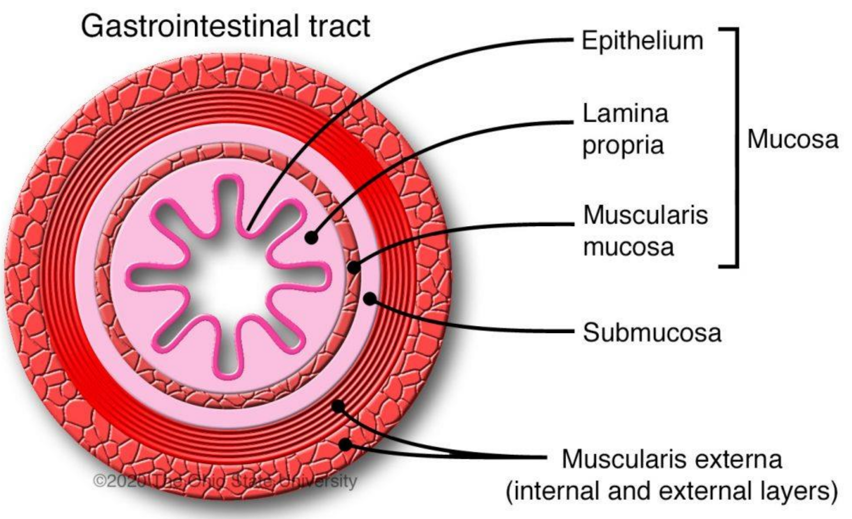
↗

Hindgut



Organ Differentiation and Proliferation

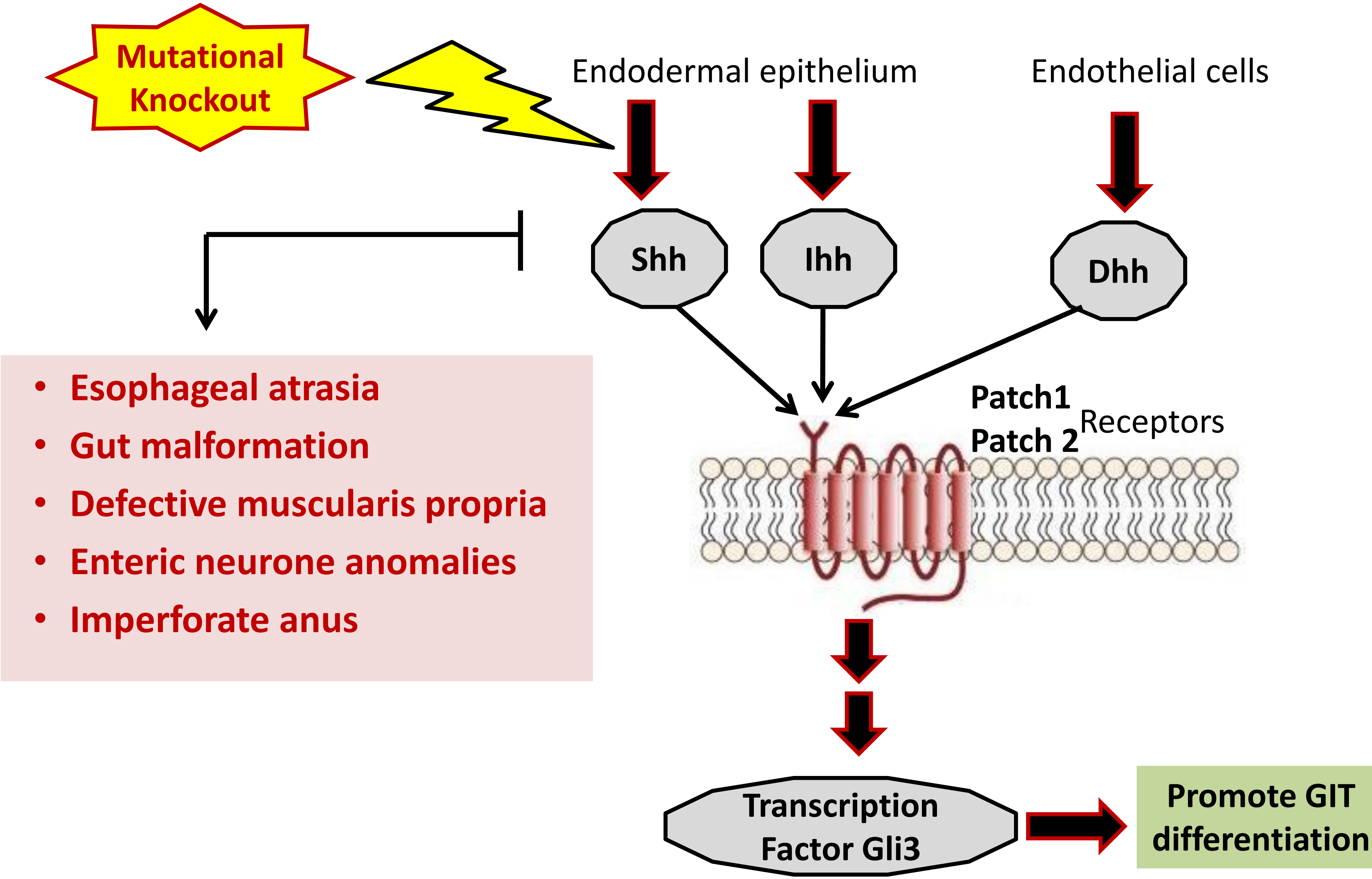




- Endodermal inner epithelium → endothelial layer of mucosa, ducts and glands.
- Splanchnopleuric mesenchyme → lamina propria and muscularis, submucosa, external muscles and connective tissue.
- Splanchnopleuric coelomic epithelium → outer peritonial epithelium.
- Local population of angiogenic mesenchyme → blood vessels and lymphatics.
- Neural crest → enteric and autonomic nervous system.

The sequential genetic expression basics

Hedgehog (Hh) Ligands



Esophagus
“*Oesophagus*”

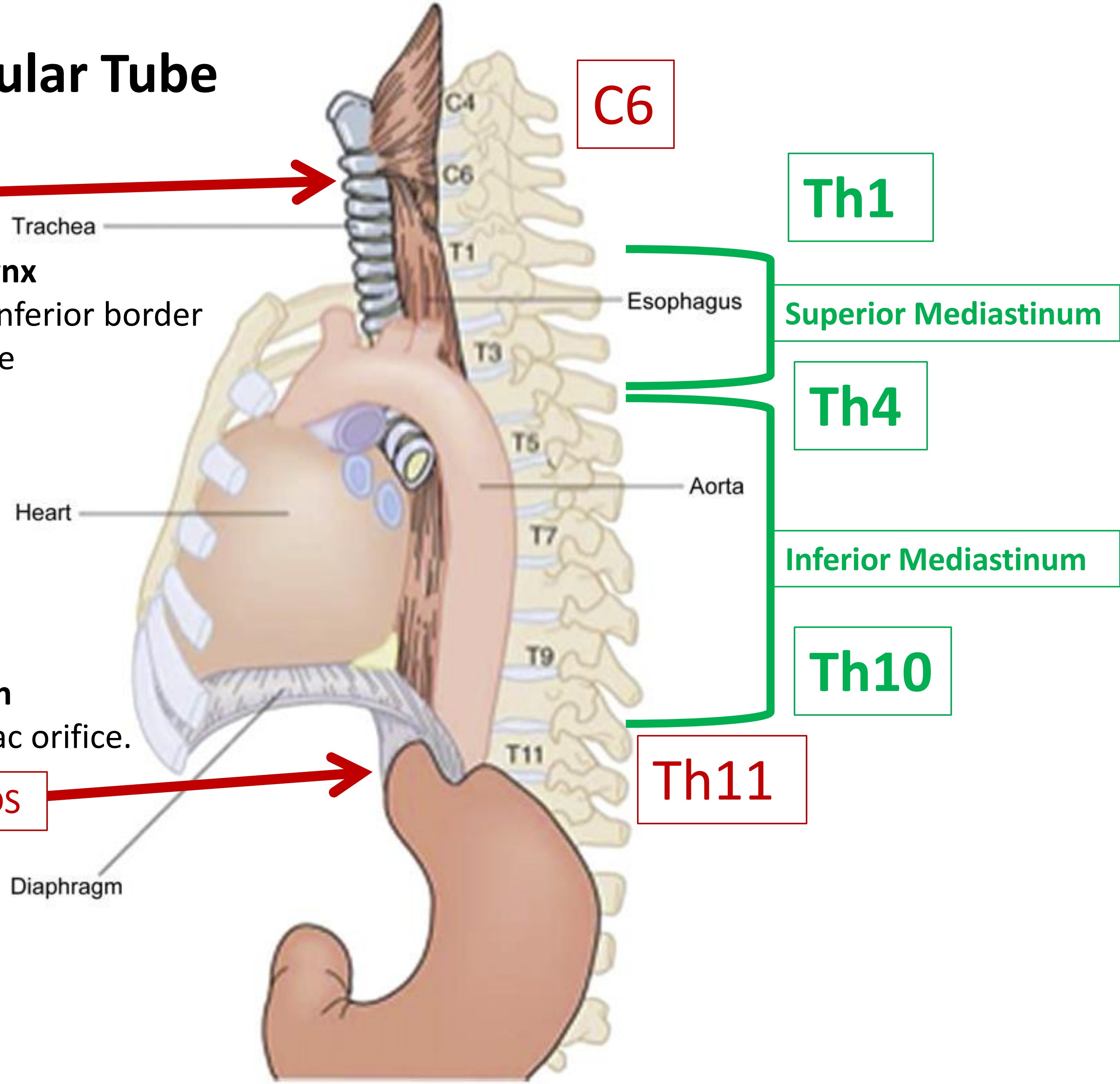
25cm Muscular Tube

Connects from Pharynx

➢ At the level of the inferior border of the cricoid cartilage

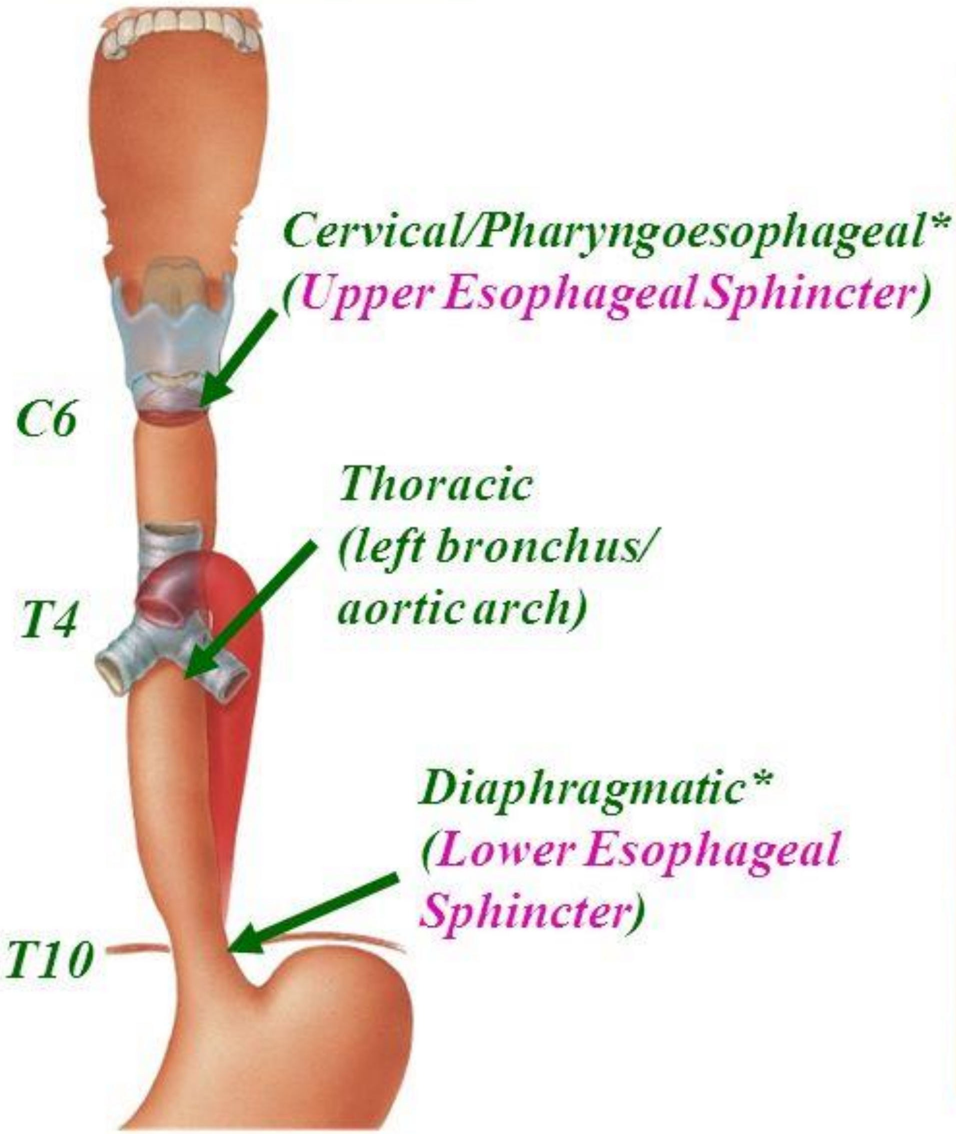
Connects to Stomach

➢ At the gastric cardiac orifice.

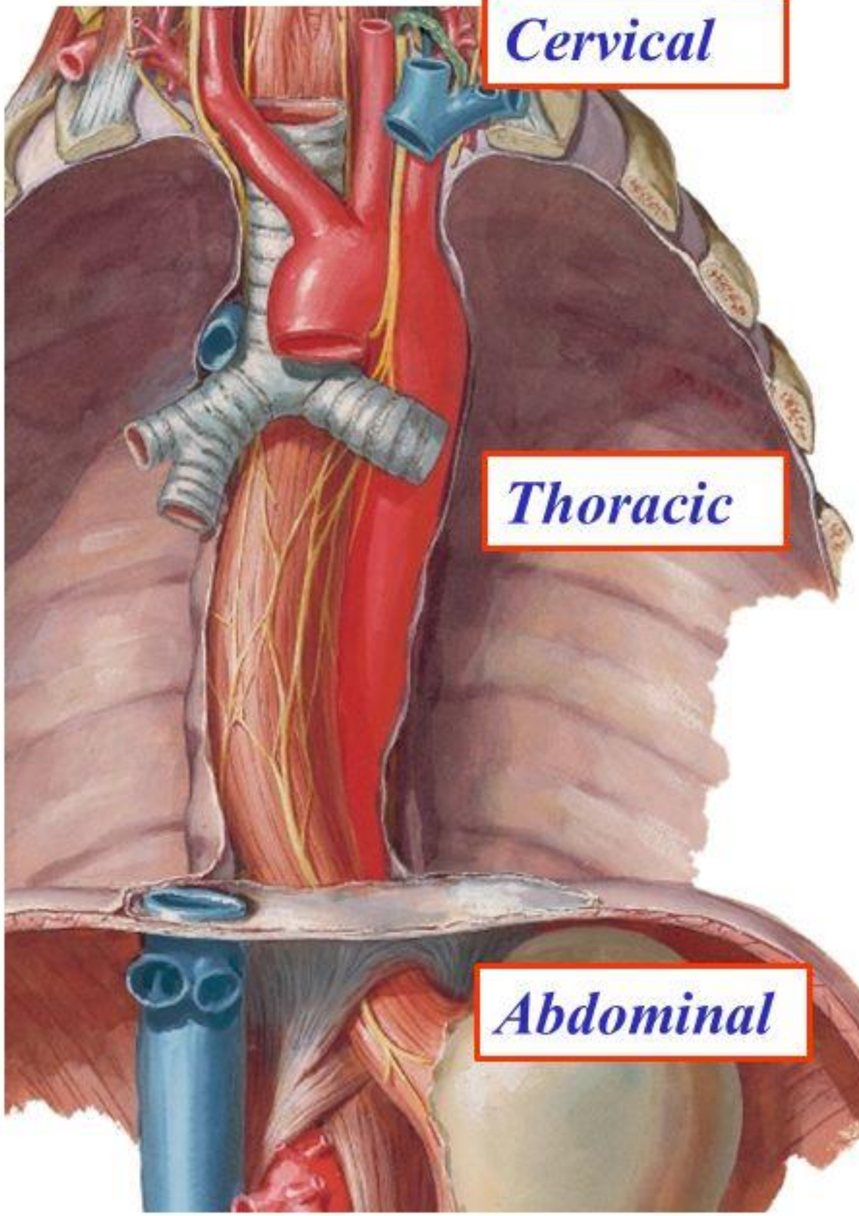


Esophagus Overview

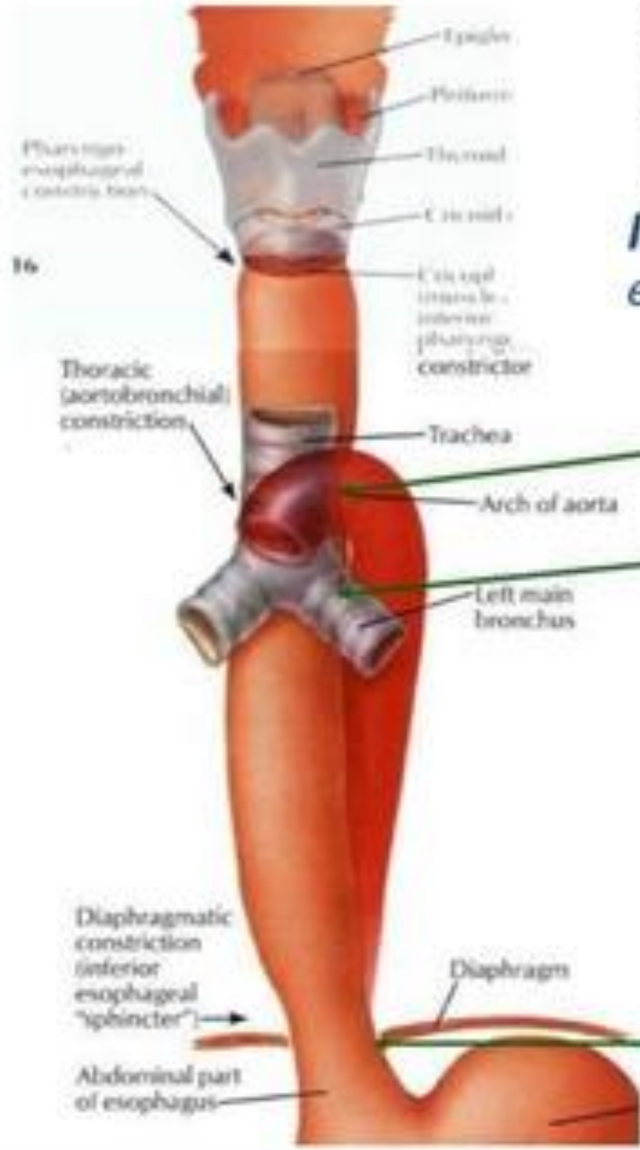
Three constrictions (Two sphincters*) :



Three parts:



Clinical Relevance:



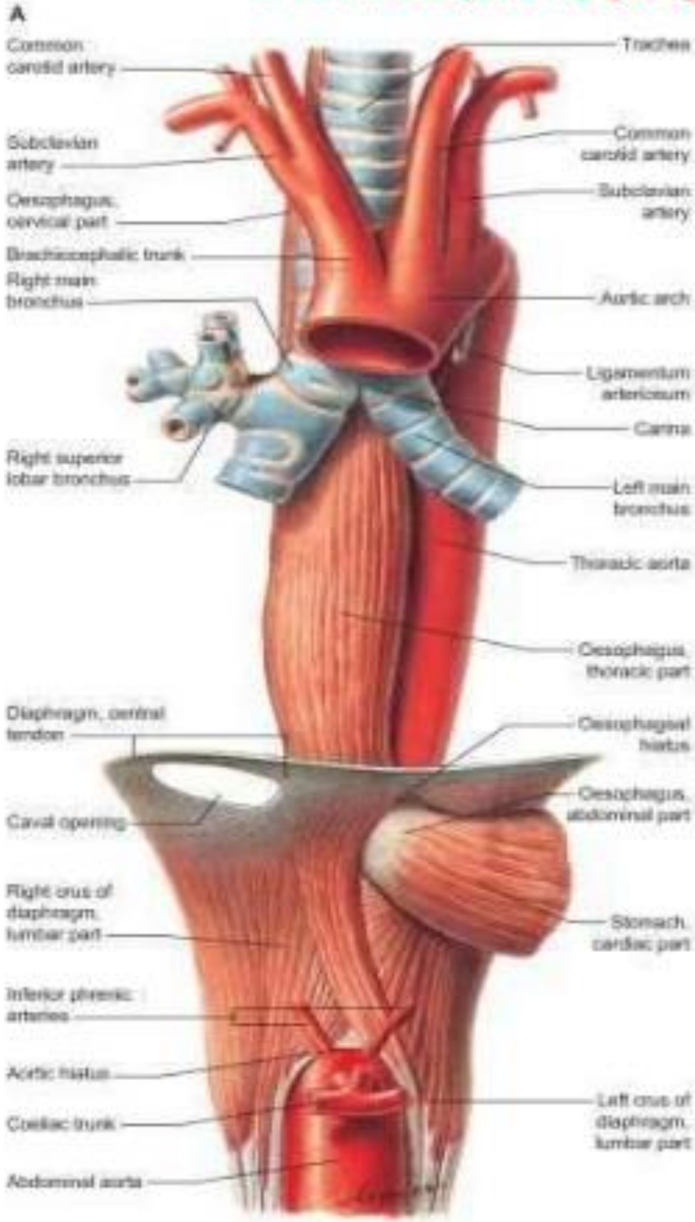
Esophageal constrictions sites

I. Cervical (upper esophageal sphincter)
II. Left main bronchus
III. Aortic arch
IV. diaphragmatic esophageal hiatus

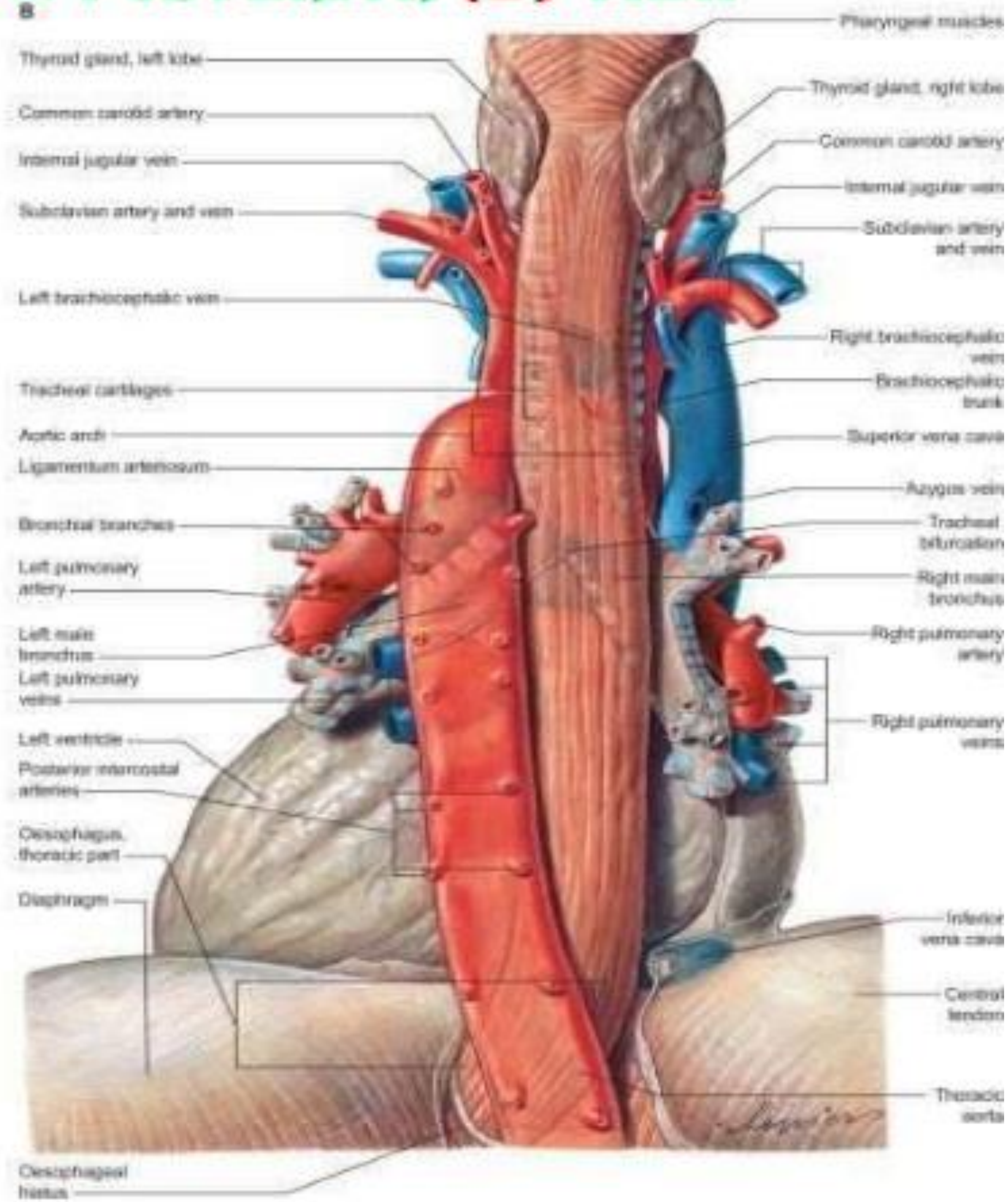
***Importance**- passing instruments through esophagus into stomach OR viewing radiographs*

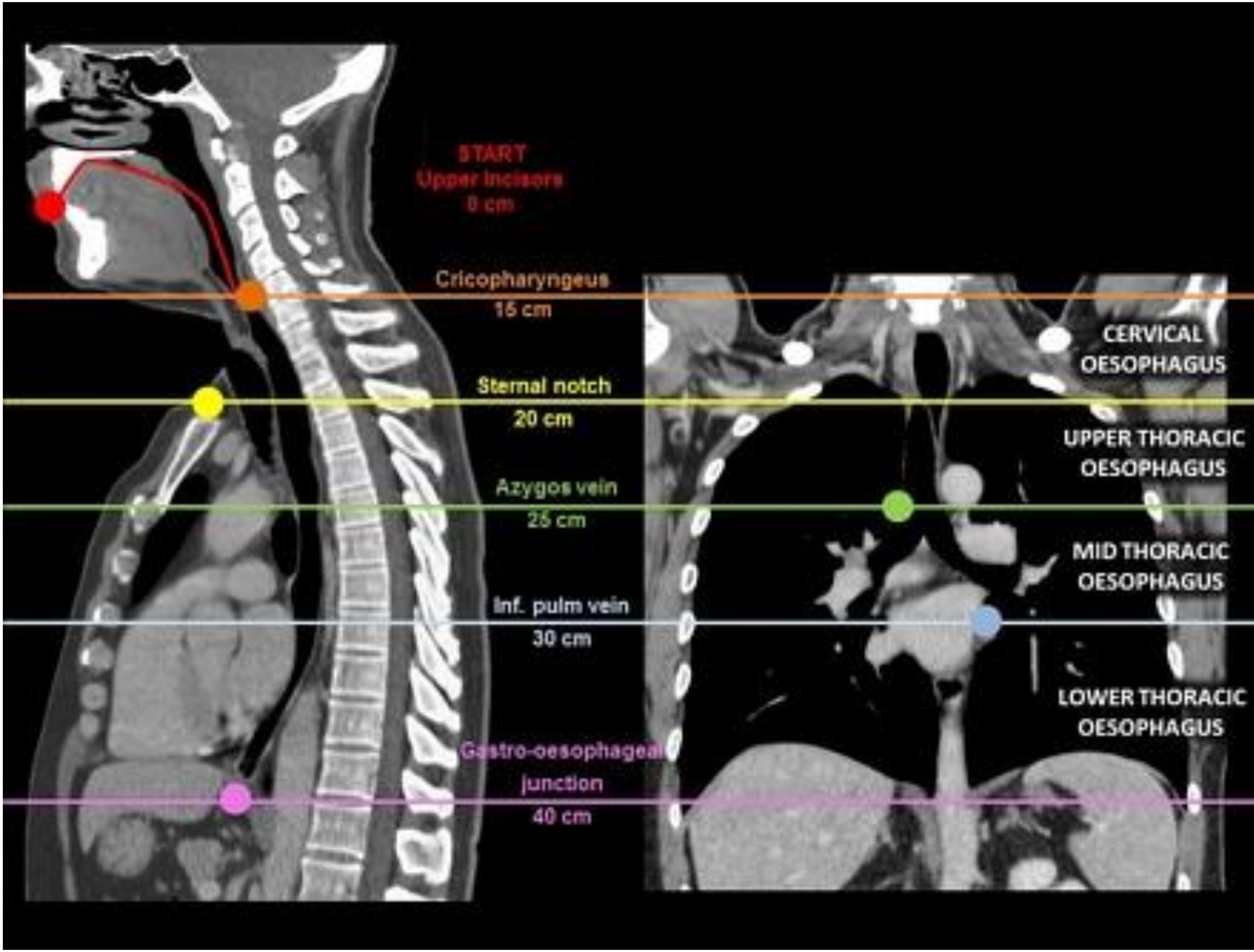
ANTERIOR(A) & POSTERIOR (B) VIEW

A



B




START
Upper Incisors
0 cm
Cricopharyngeus
15 cm
Sternal notch
20 cm
Azygos vein
25 cm
Inf. pulm vein
30 cm
Gastro-oesophageal
junction
40 cm
CERVICAL
OESOPHAGUS
UPPER THORACIC
OESOPHAGUS
MID THORACIC
OESOPHAGUS
LOWER THORACIC
OESOPHAGUS

Inferior Thyroid a.

Thoracic Aorta

Esophageal branches

Esophageal branches

Esophageal branches

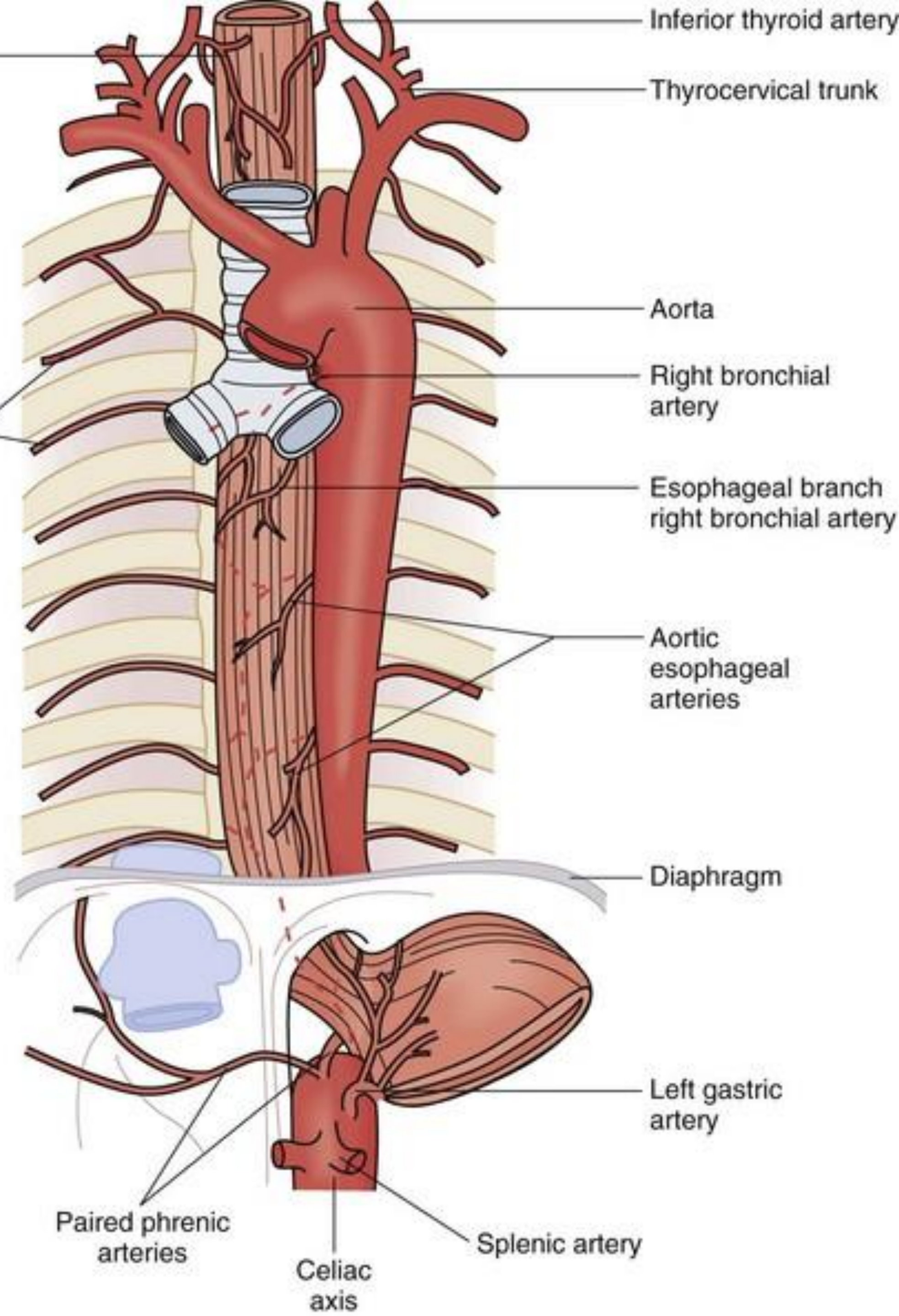
Esophageal branches

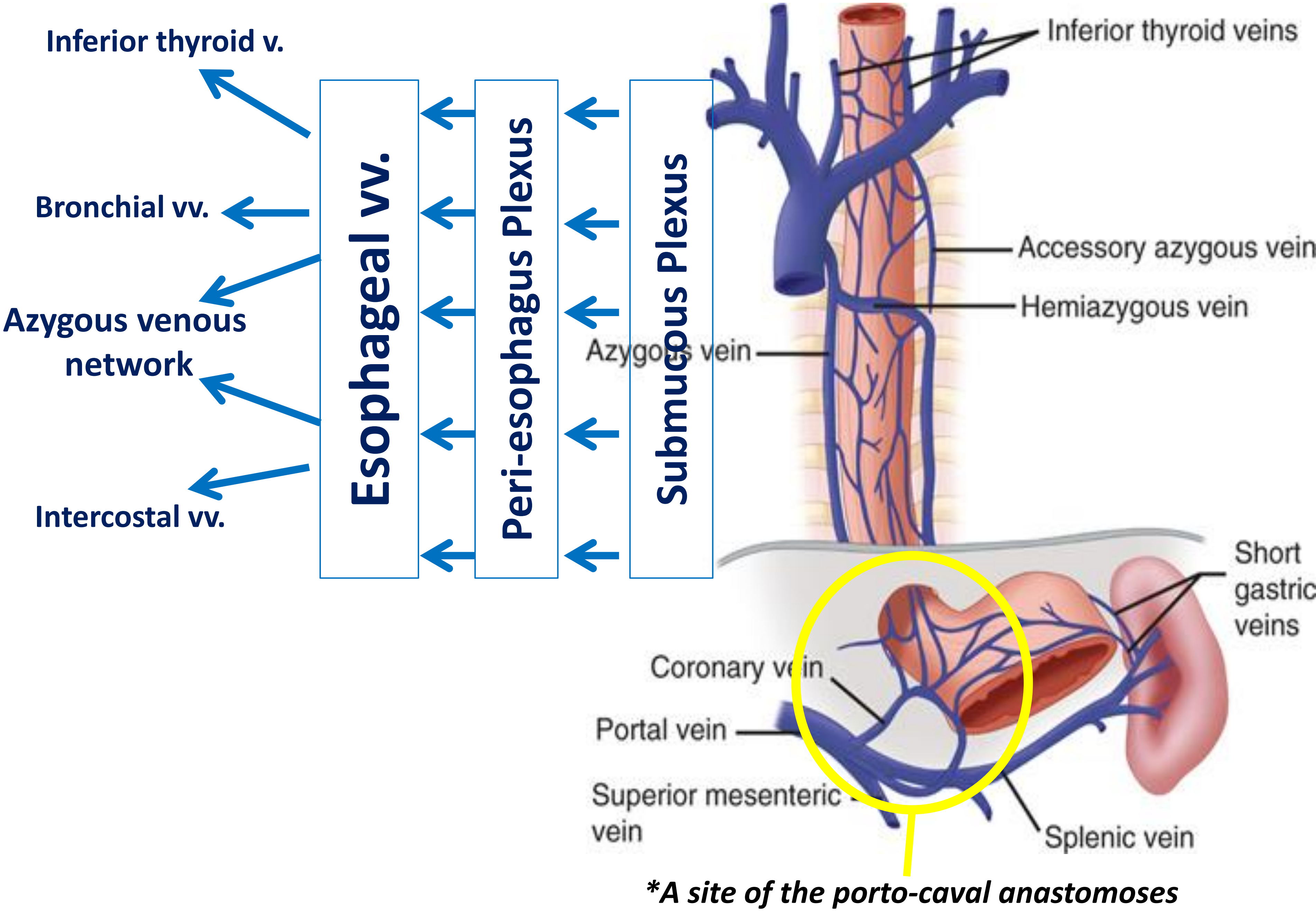
Vascular chain anastomoses

Ascending branches

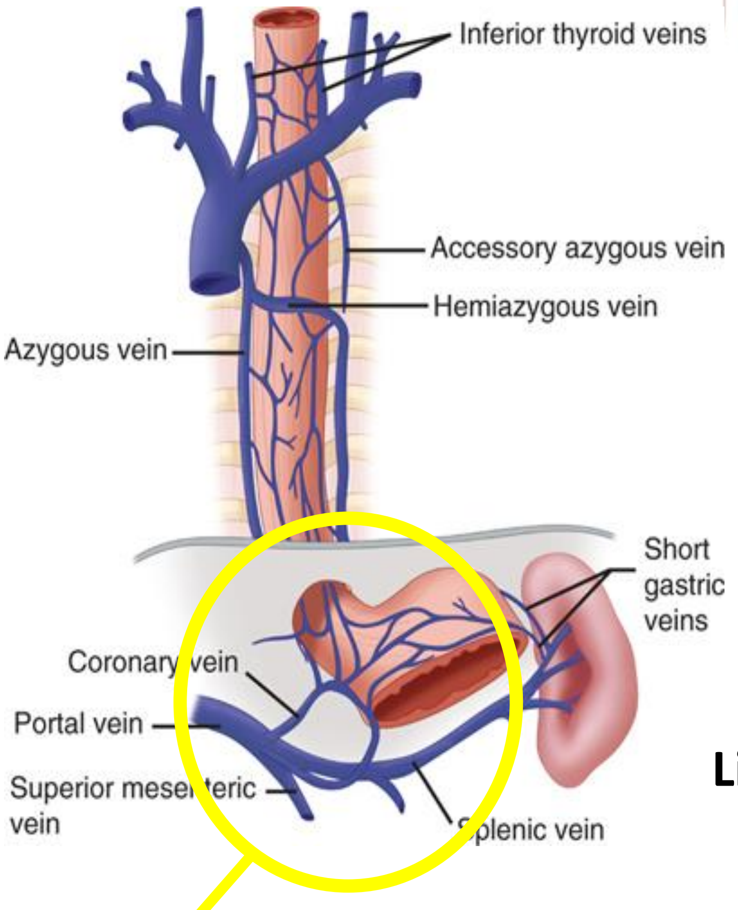
Inferior phrenic a.

Left gastric a.

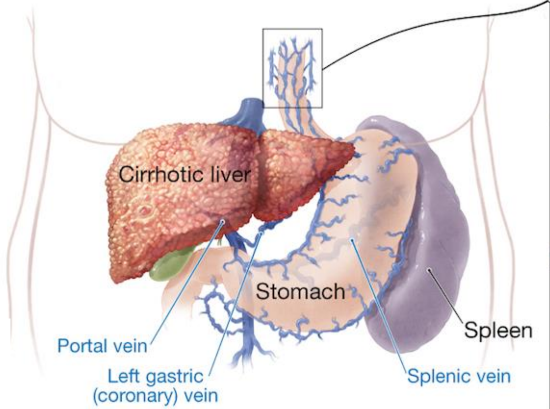


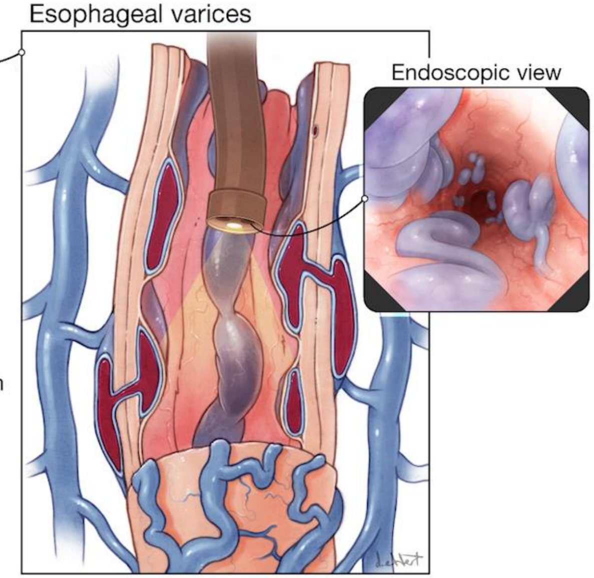

Inferior thyroid v.
Bronchial vv.
Azygous venous network
Intercostal vv.
Esophageal vv.
Peri-esophagus Plexus
Submucous Plexus
Inferior thyroid veins
Accessory azygous vein
Hemiazygous vein
Azygous vein
Short gastric veins
Coronary vein
Portal vein
Superior mesenteric vein
Splenic vein
*A site of the porto-caval anastomoses

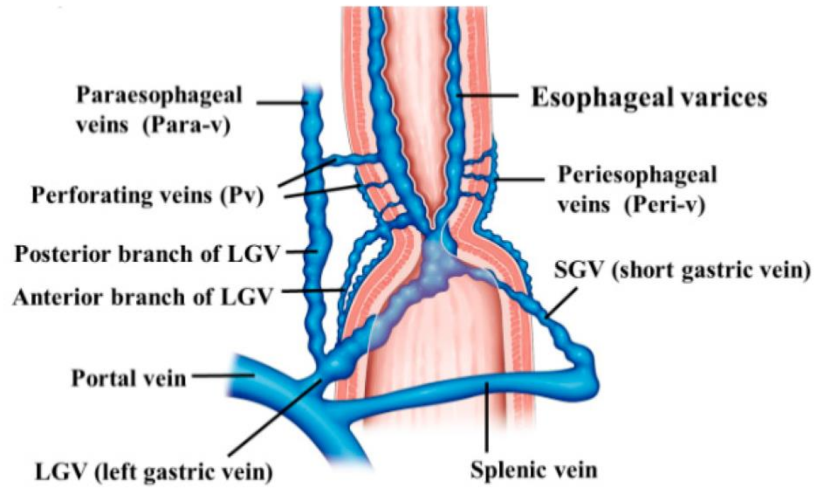
Oesophageal Varcies



**A site of the porto-caval anastomoses*







Liver disease → ↑Portal resistance

↓

Porto-systemic shunting

(short gastric coronary vv ↔ esophageal vv.)

Longitudinal continuous submucosal lymphatic system

Cervical esophagus → Deep cervical nn. l.

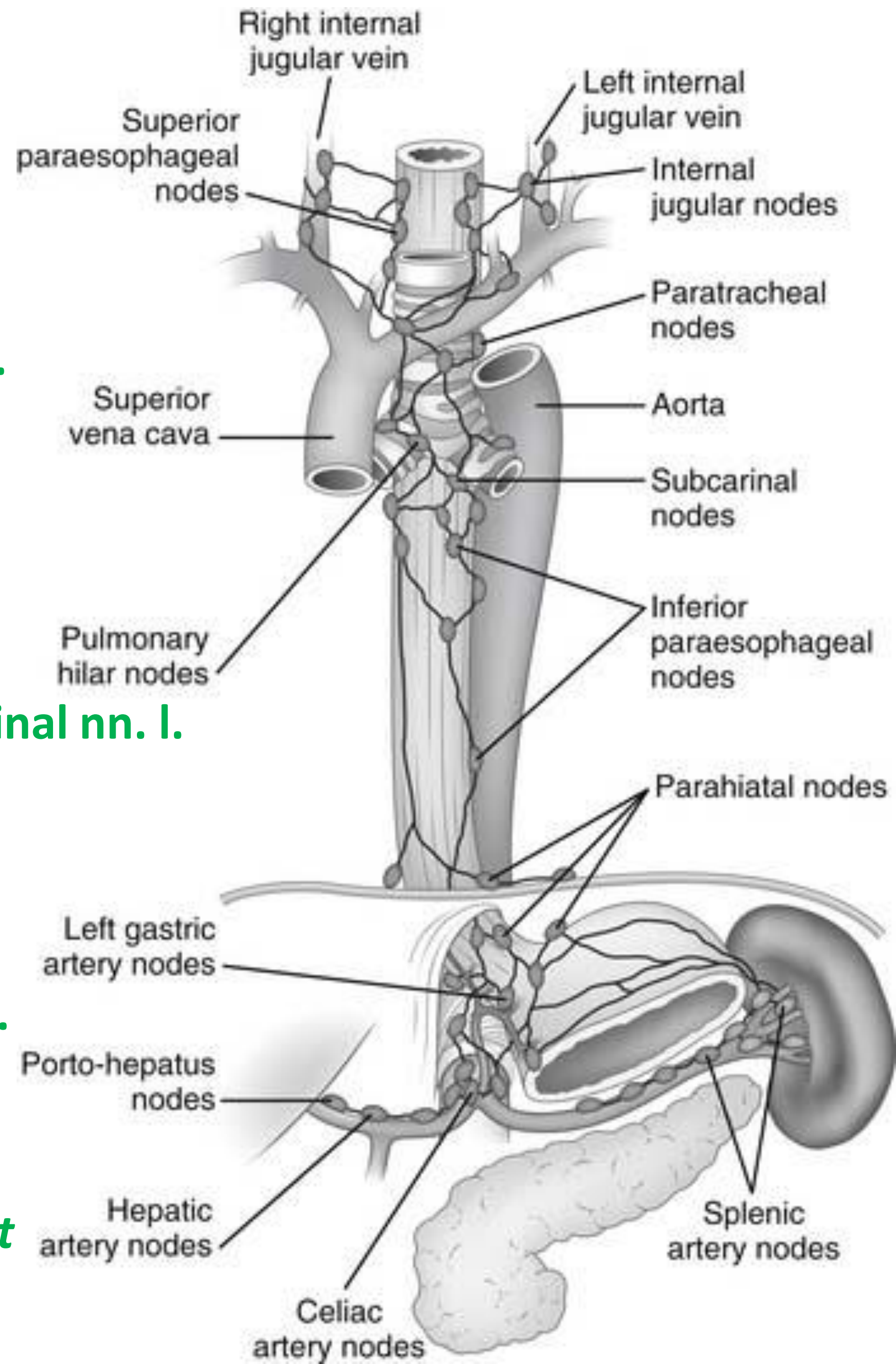
↘ ↑

Paratrachial nn. l. ↗

Thoracic esophagus → posterior mediastinal nn. l.

Abdominal esophagus → left gastric nn. l.

**** Some may pass directly → Thoracic duct***



ANS: Sympathetic trunk + Vagus n. (Parasympathetic)

n. X → rr. Recurrent laryngeal n.

↘

Cervical esophagus

↗

Sympathetic → inferior thyroid plexus

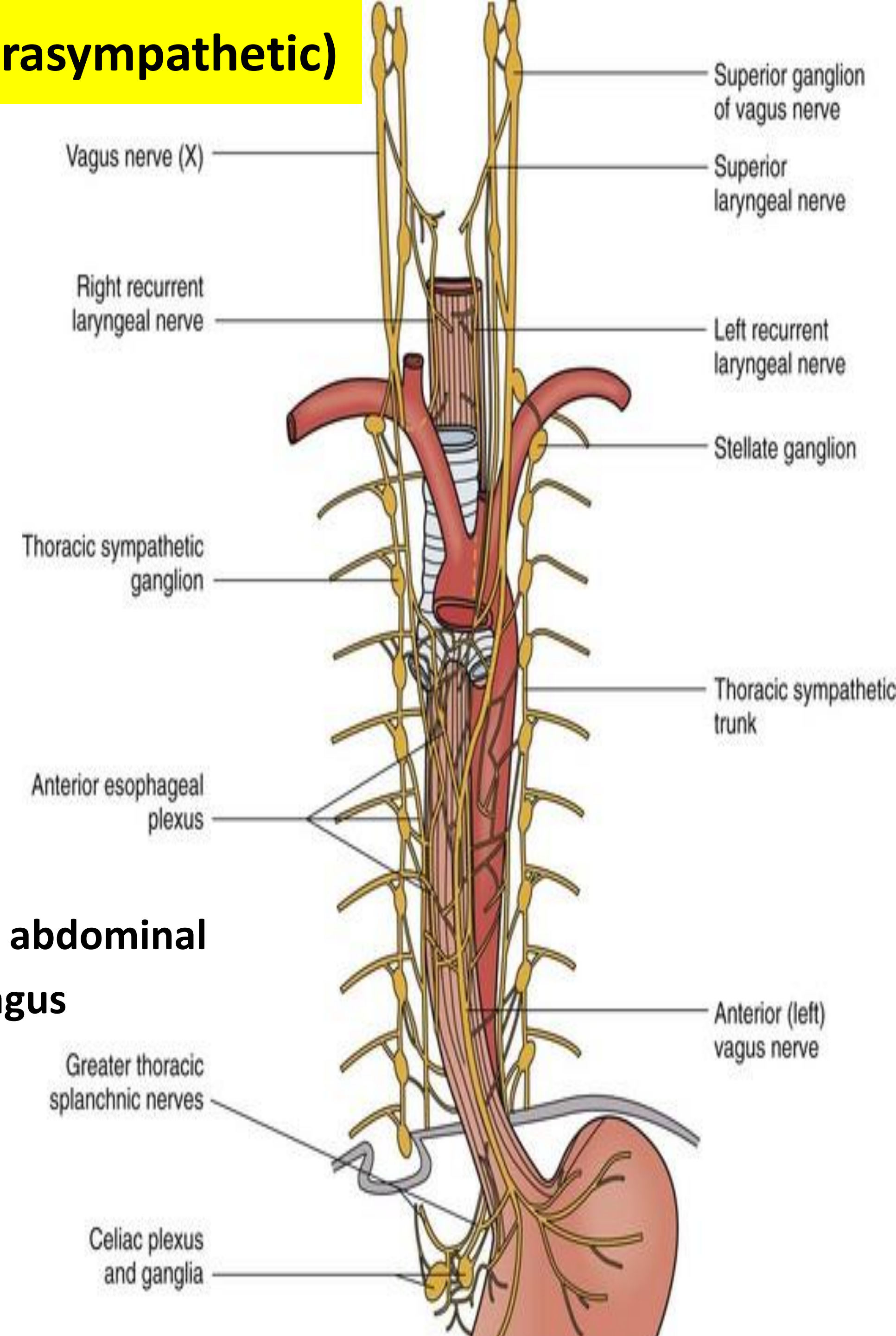
n. X → anterior and posterior vagal trunks

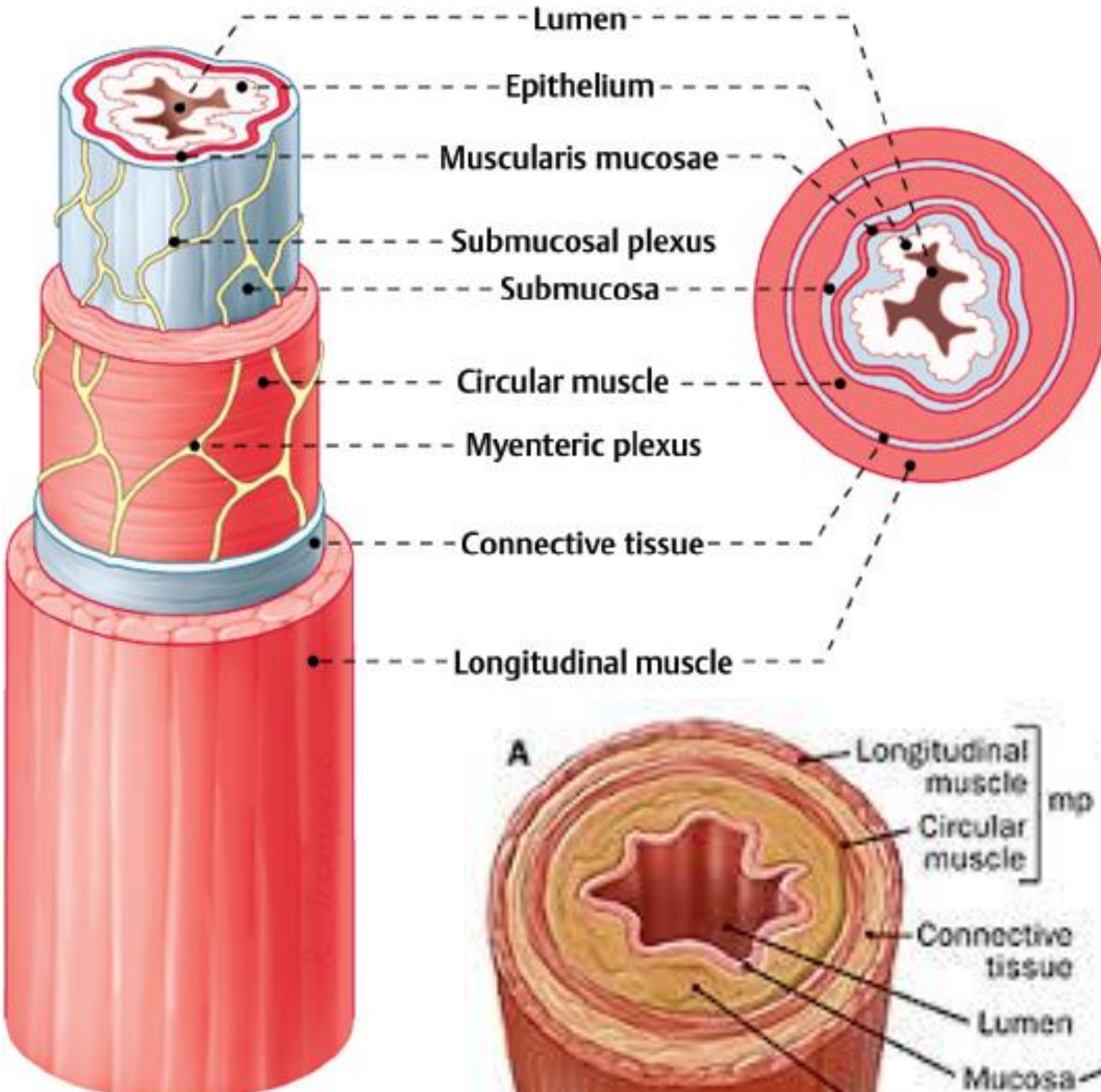
↘

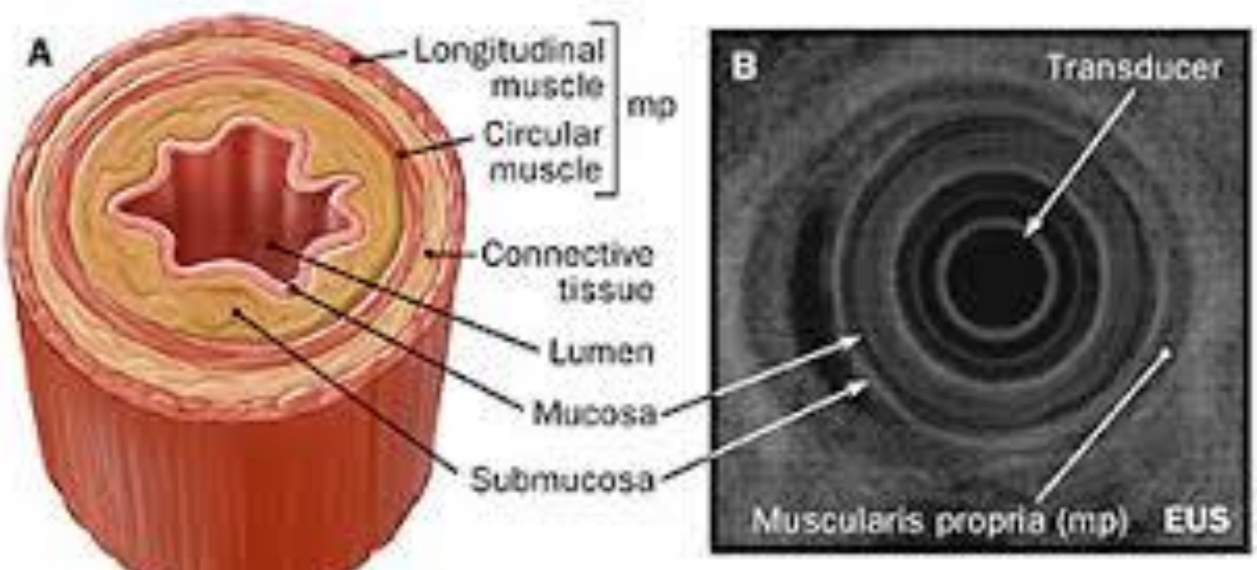
Esophageal plexus → **Thoracic & abdominal esophagus**

↗

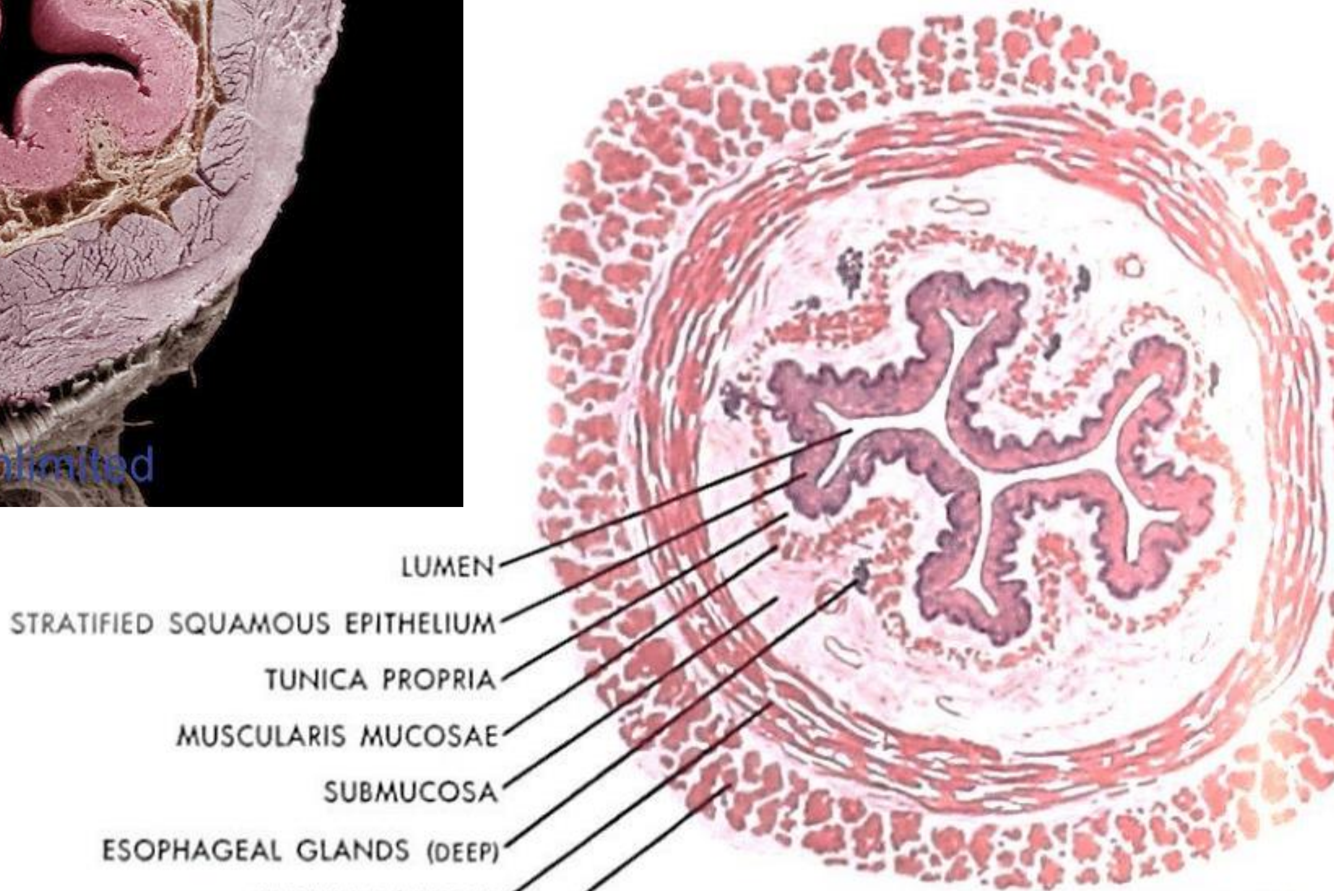
Sympathetic




Lumen
Epithelium
Muscularis mucosae
Submucosal plexus
Submucosa
Circular muscle
Myenteric plexus
Connective tissue
Longitudinal muscle

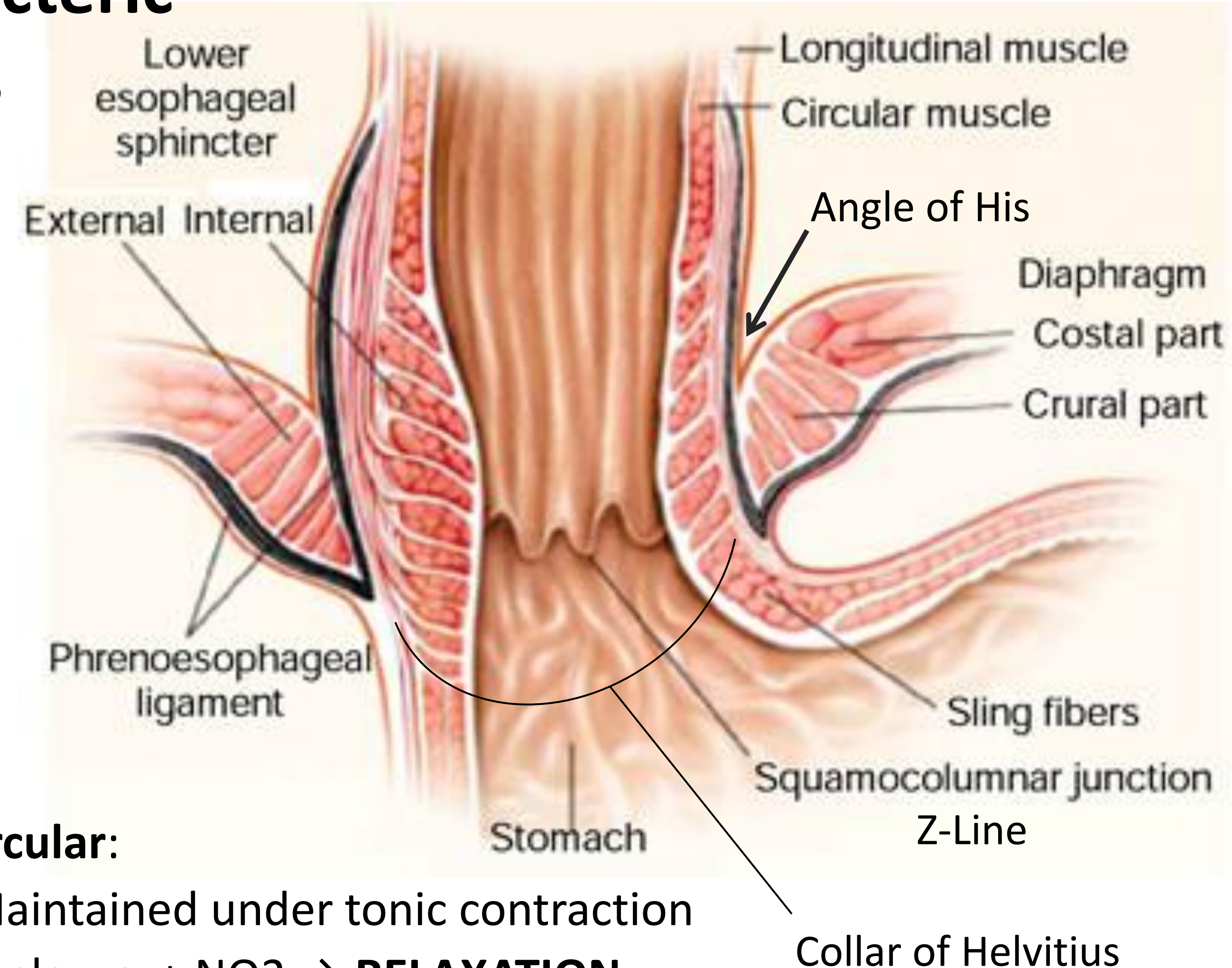

A
Longitudinal muscle
Circular muscle
mp
Connective tissue
Lumen
Mucosa
Submucosa
B
Transducer
Muscularis propria (mp)
EUS

Small tubule-acinar esophagus gl.
→ lysozyme



CROSS SECTION: LOWER THIRD OF ESOPHAGUS
(HEMATOXYLIN–EOSIN, X 5)

Osophageal Sphincteric Mechanisms



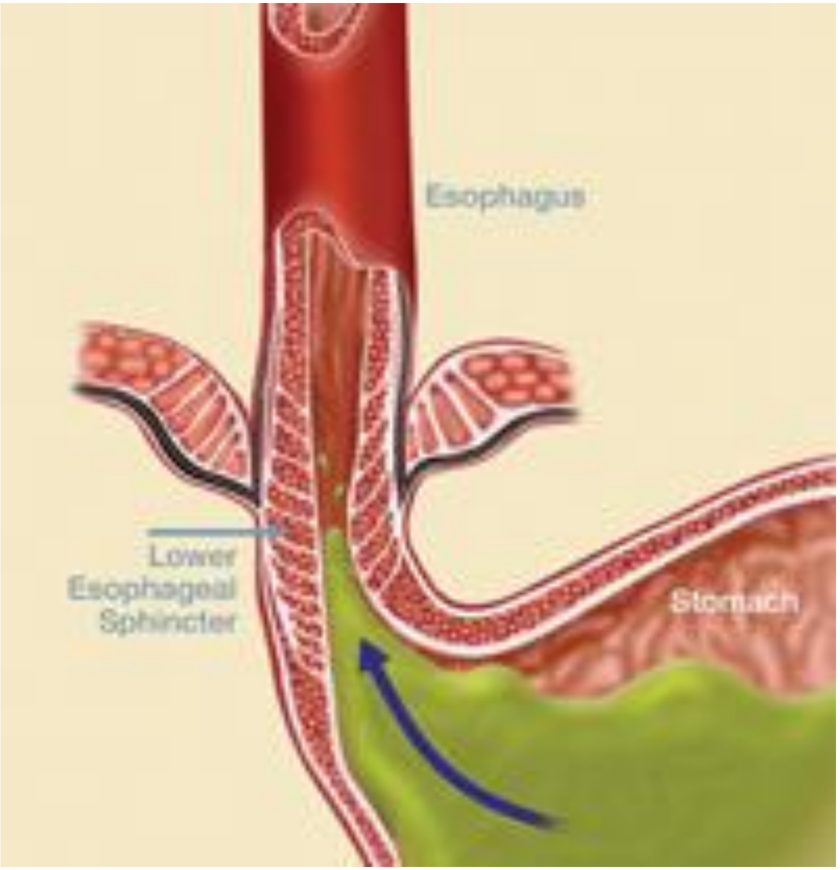
- **Specialized zone of circular**:
  - Smooth muscle Maintained under tonic contraction
  - Enteric intramural plexus + NO2 → **RELAXATION**
- **Functional external sphincter**:
  - Provided by the right crus of the diaphragm
  - Contracts during ↑intra-abdominal P → **PREVENT** regurgitation

Gastro-esophageal Reflux

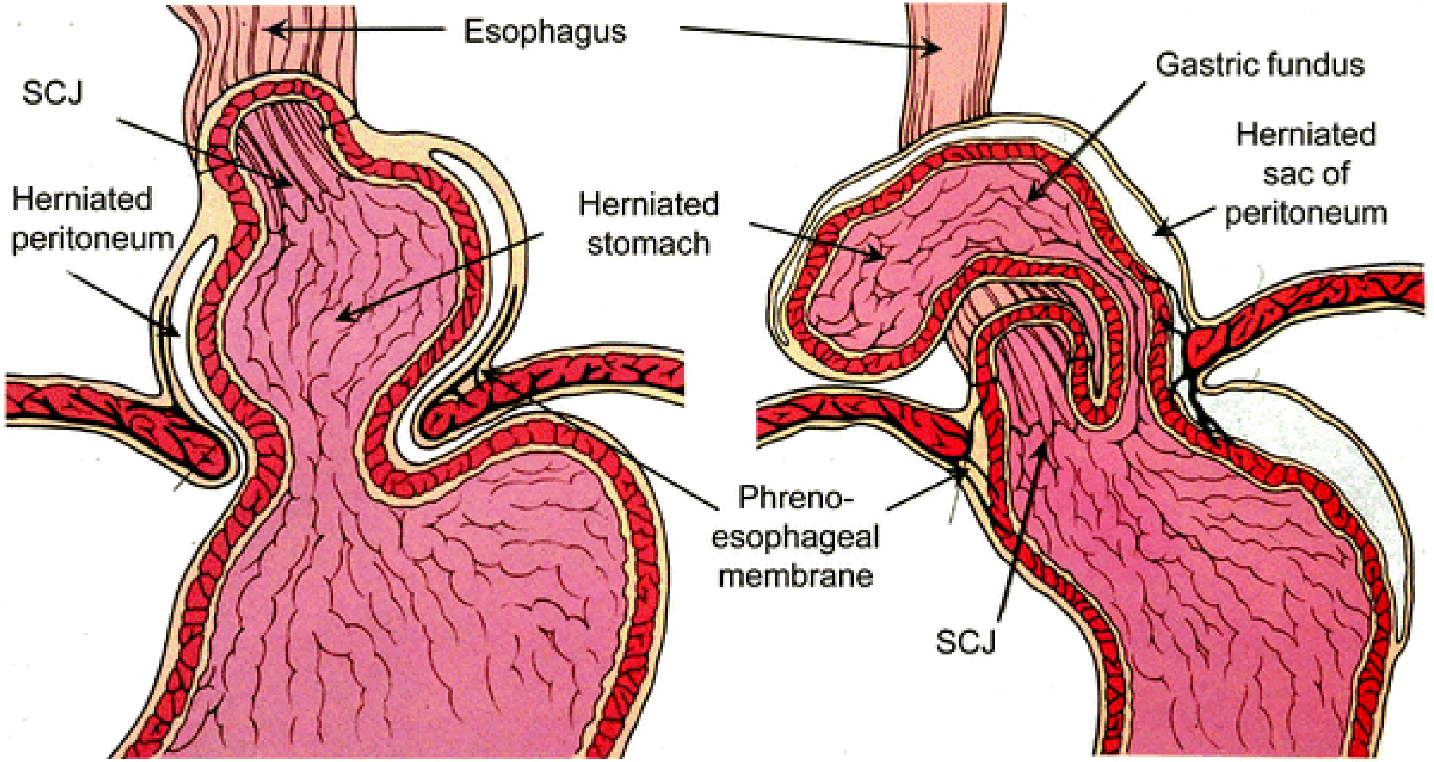
Gastric acid reflux into the esophagus due to poor closure of the lower esophageal sphincter.

Normal pH 7 (Neutral)

Abnormal pH < 6.5



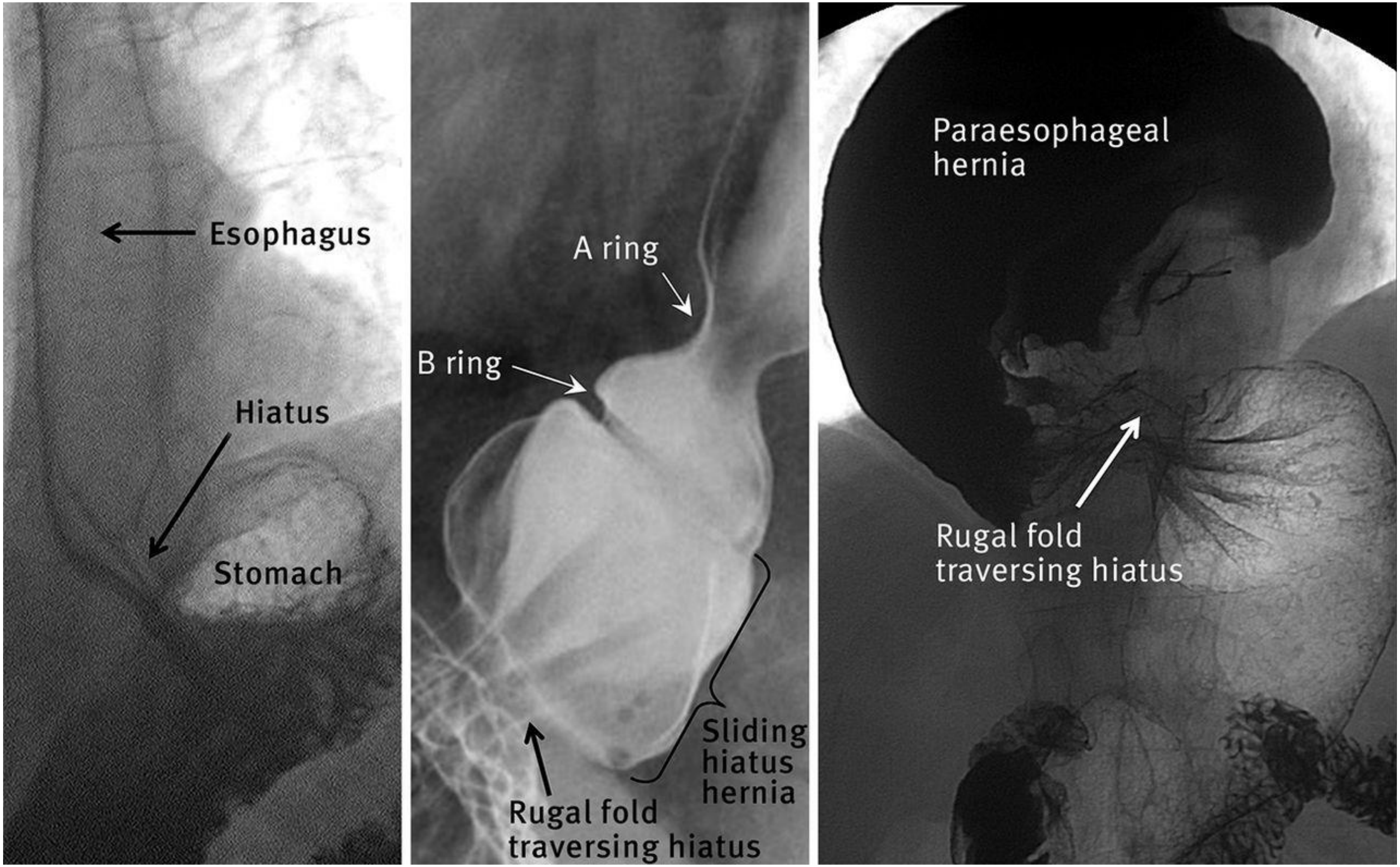
Hiatus Hernia



Sliding hernia (type I) Paraesophageal hernia (type II)

- **Disorder mechanisms:**
  a. Repeated stress → compromise hiatus integrity → Widening of the muscular tunnel
  b. Phrenco-esophageal lig. laxity → Widening of the muscular tunnel
- **Types of hiatus herniae:**
  a. Sliding- gastro-esophageal junction merges into the thorax
  b. Para-esophageal- stomach herniates into the thorax

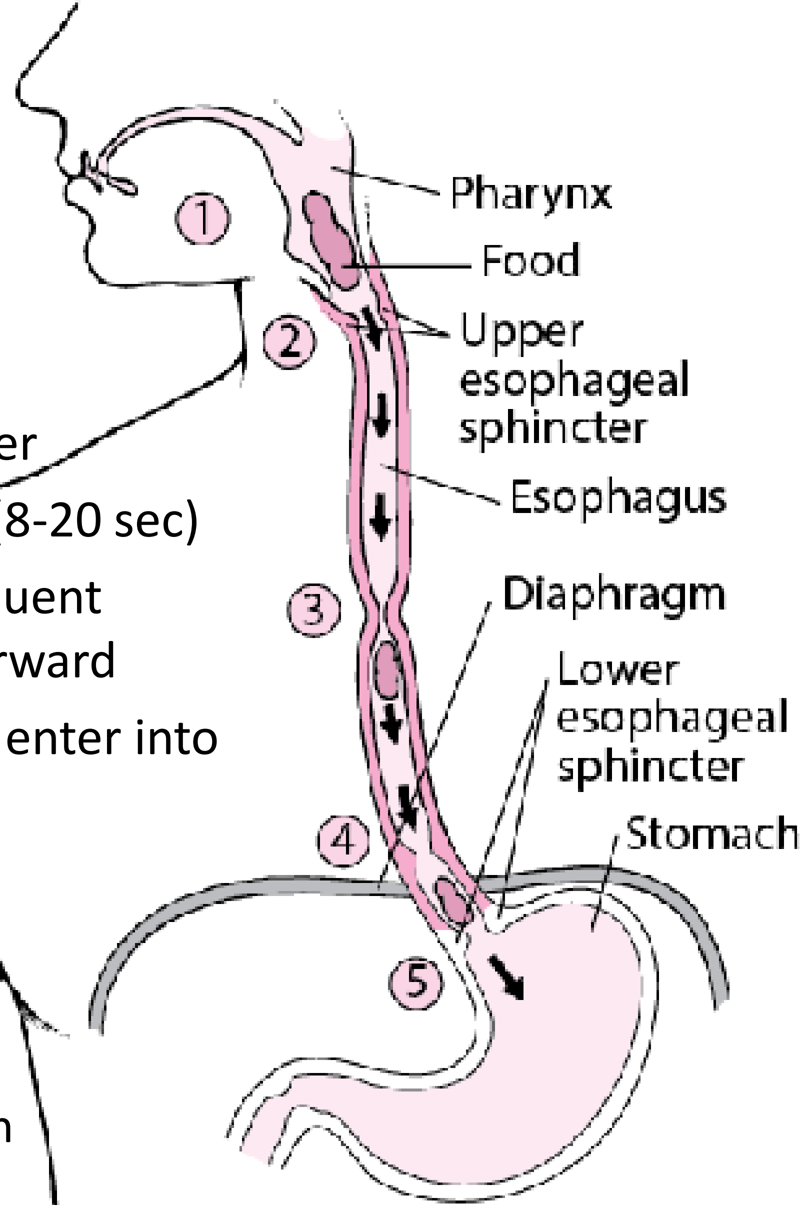
Hiatus Hernia



Esophageal phase of swallowing/deglutition

1. Upper esophageal sphincter relax → bolus enter
2. Peristaltic movement → wave of contractions (8-20 sec)

   muscular relaxation in front of bolus → subsequent constriction behind the bolus → push bolus forward
3. Lower esophagus opens momentarily → bolus enter into stomach



Swallowing pattern generator

- Pattern of timing of striated muscle contraction

  Generated at a brainstem level
- Pattern of activation in smooth muscles

  Generated locally in intramural plexuses driven by vagal autonomic

Esophageal Dysmotility

Encompasses disorders of the upper and lower esophageal sphincters, conginetal, and lose of muscular contractability

- **Achalasia**:

  Degenerated myenteric plexus → loss of peristalsis + gastroesophagus sphincter failure of relaxation

- **Dysphagia**:

  Dilation of esophagus → retention of food → regurgitation & aspiration

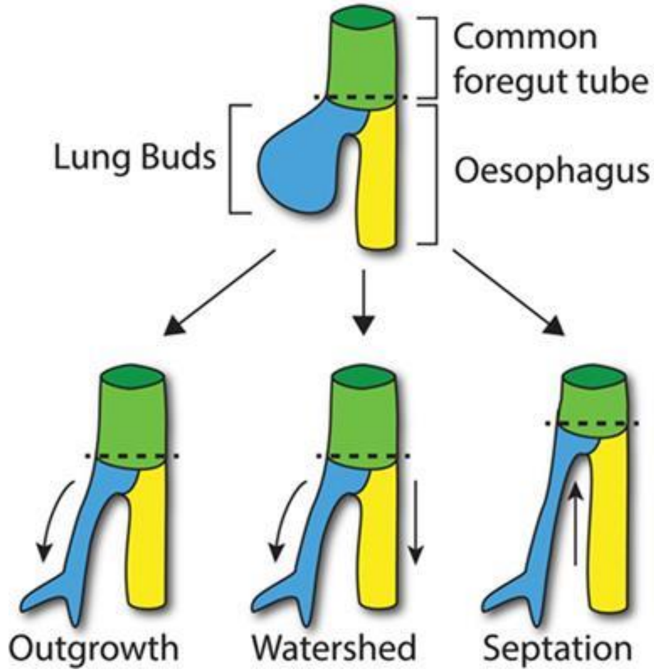
- **Diffuse esophagus spasm**:

  → simultaneous segmental contractions

- **Scleroderma**:

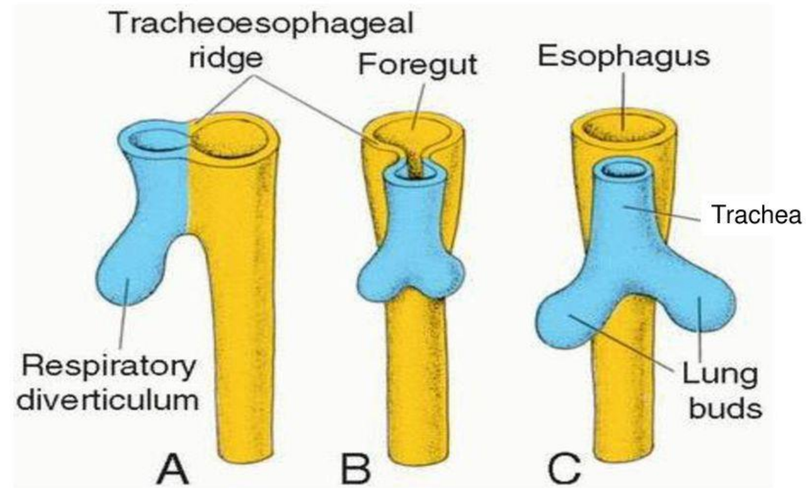
  connective tissue diseases → atrophic smooth muscles is replaced by fibrous tissue in the submucosa and lamina propria

Esophagus Organogenesis



Trachea, Bronchi & Lungs

- During separation from the foregut; the lung bud → Trachea; → Bronchial buds

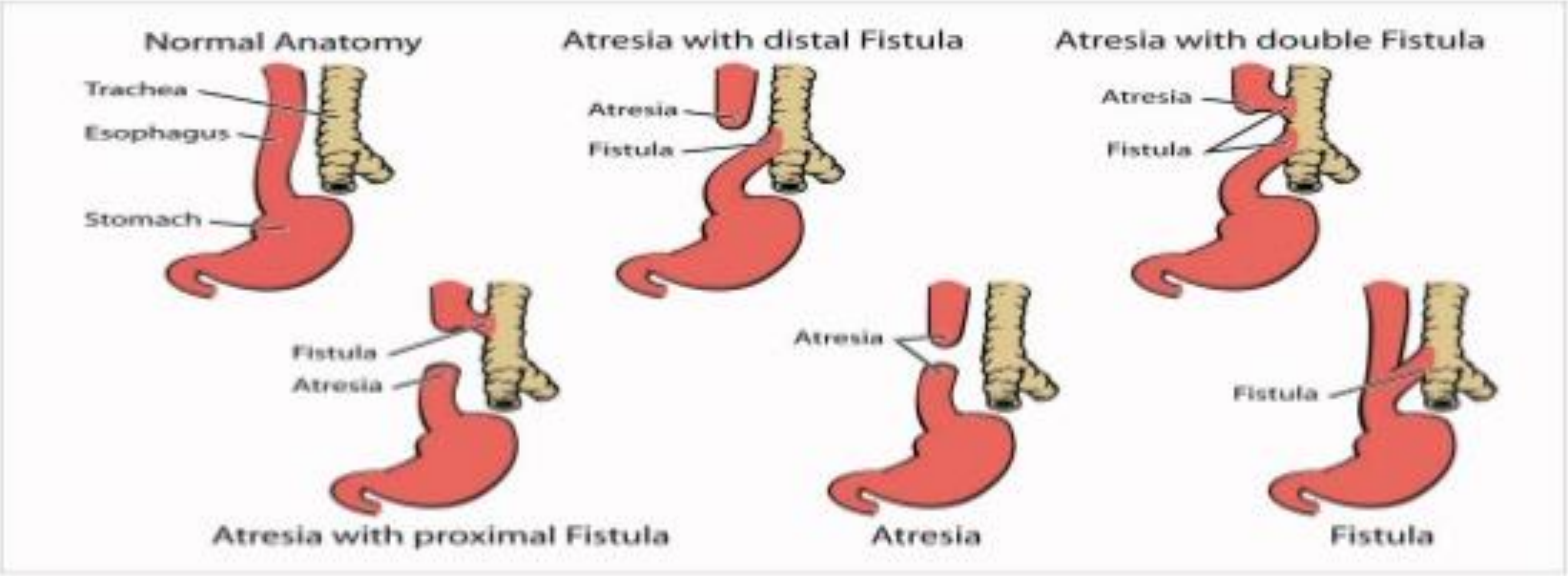


- Mucosa become ciliated at Week 10.
- Mucosa become stratified squamous epithelium at Month 5.
- Myenteric plexus have cholinesterase activity at Week 9.5.
- Defrentiated ganglion cells present at Week 13.
- Esophagus is capable of peristalsis in the 1st trimester.
- Periodic fetal swallowing can be seen on ultrasound at Week 16.
- 500ml/day of amniotic fluid ingested during the 3rd trimester.
- Maturation of the lower esophagus sphinster at Week 32.

Congenital Anomalies

Esophageal atrasia and tracheo-esophageal fistula

1 in 4425 live births.
Congenital esophageal atresia (EA) represents a failure of the esophagus to develop as a continuous passage. Instead, it ends as a blind pouch.
Tracheoesophageal fistula (TEF) represents an abnormal opening between the trachea and esophagus

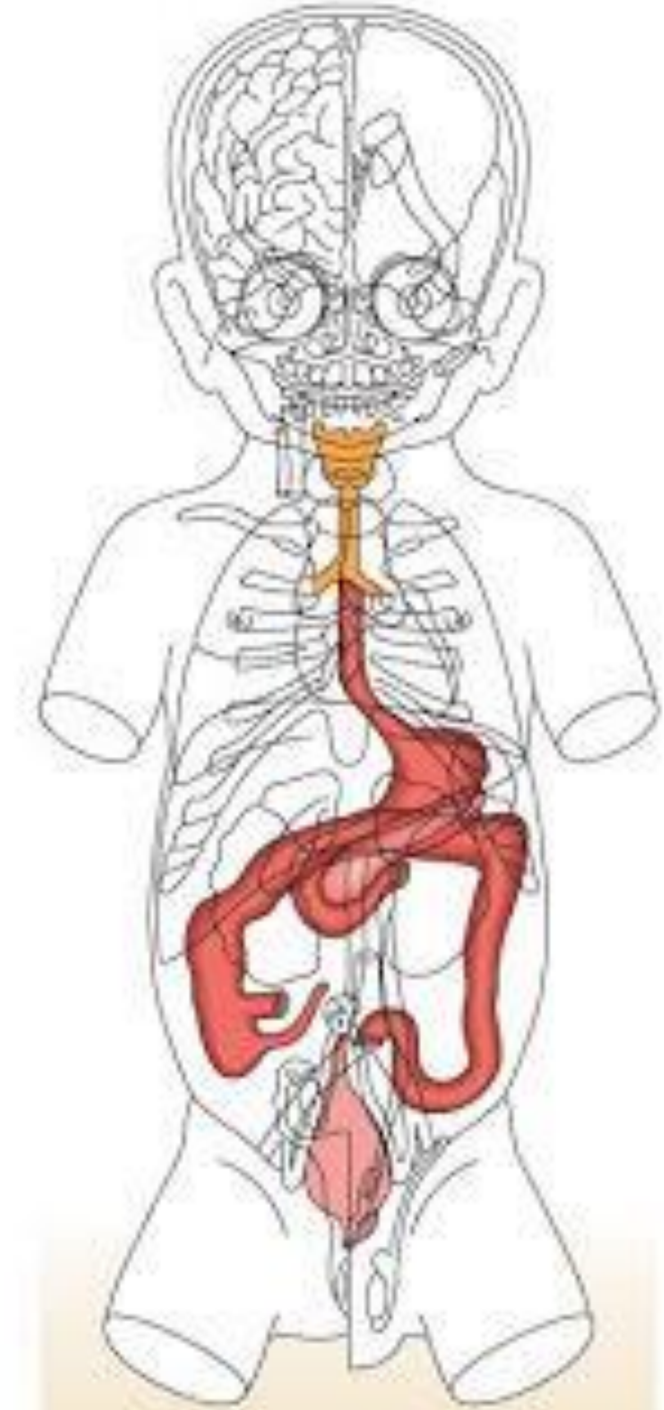


Neonatal Esophagus

- 8-10cm.
- Starts and ends 1-2 vertebrae higher than in Adults.

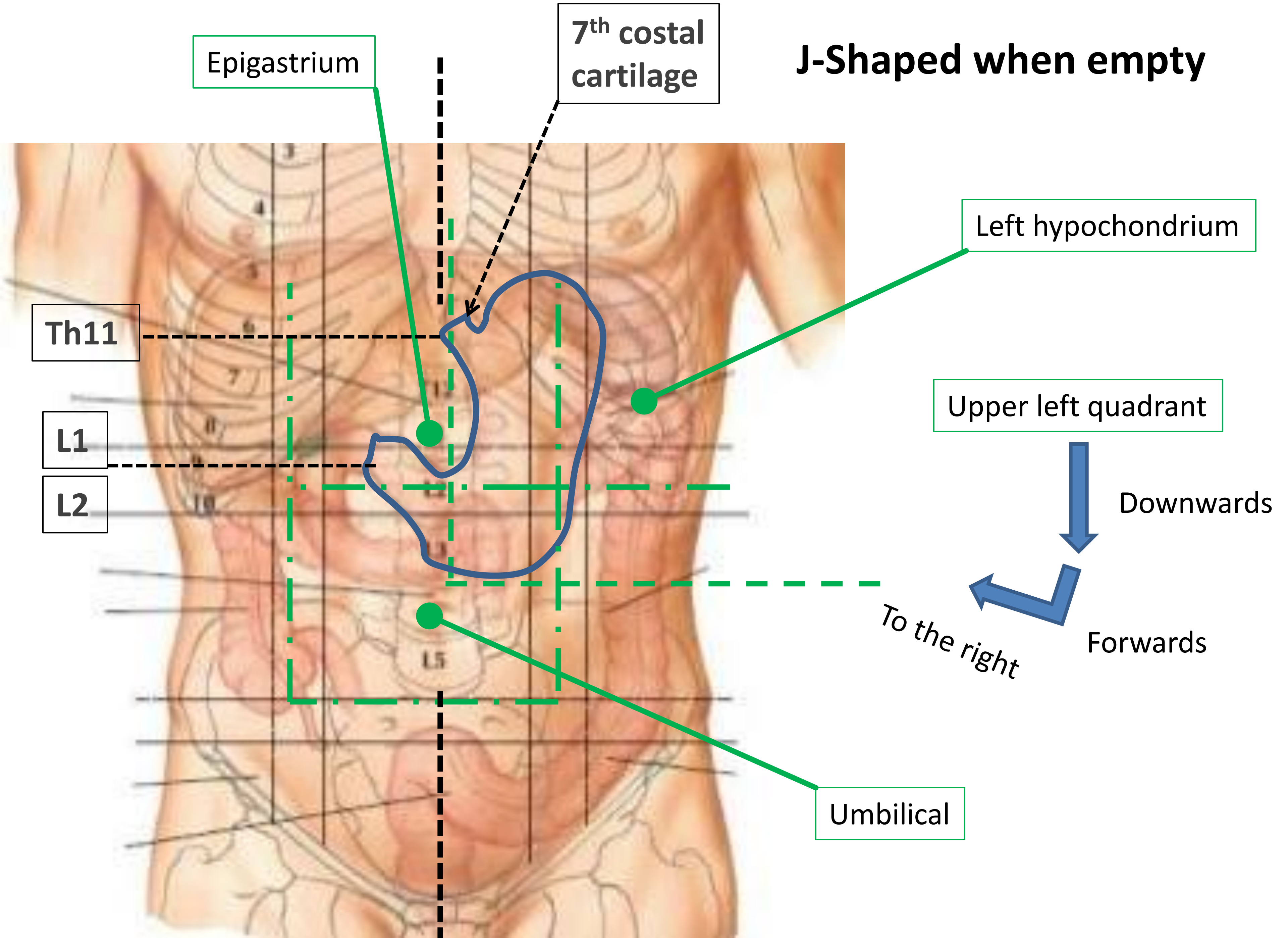
  C4/C6 ↔ Th9
- Pressure at the lower esophageal sphincter mature at Week 3-6 of age.

  → *Frequent physiologic regurgitation.*



Stomach "*Gaster*"

J-Shaped when empty

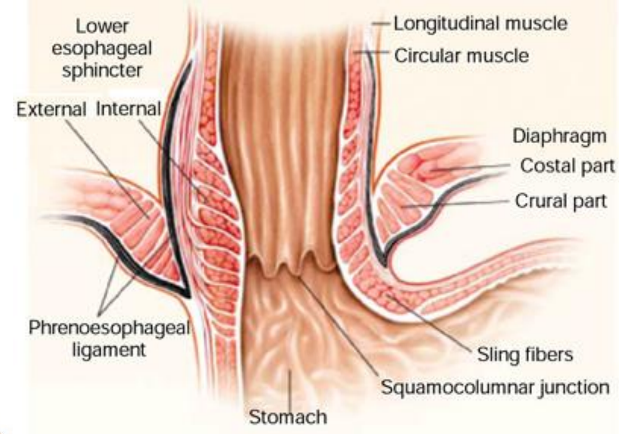


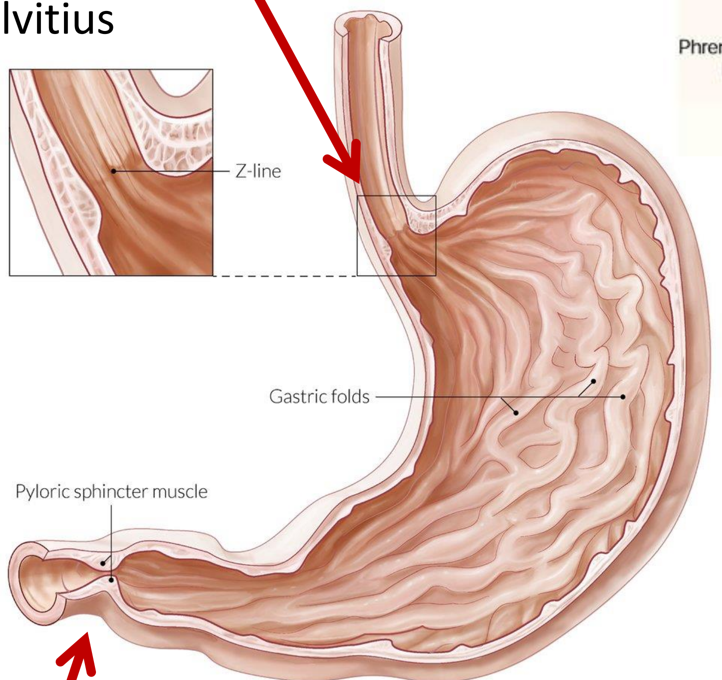
STARTS

Gastroesophageal Junction:

Internally → Z-Line

Externally → Collar of Helvitius



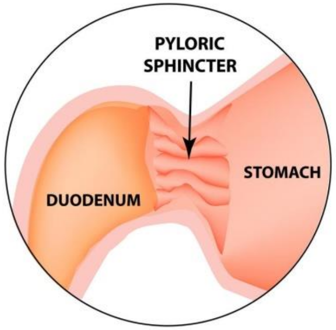


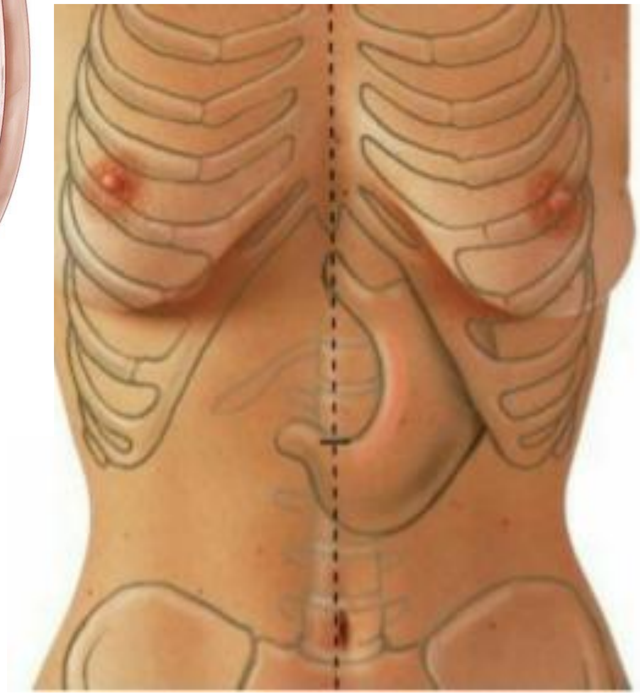
ENDS

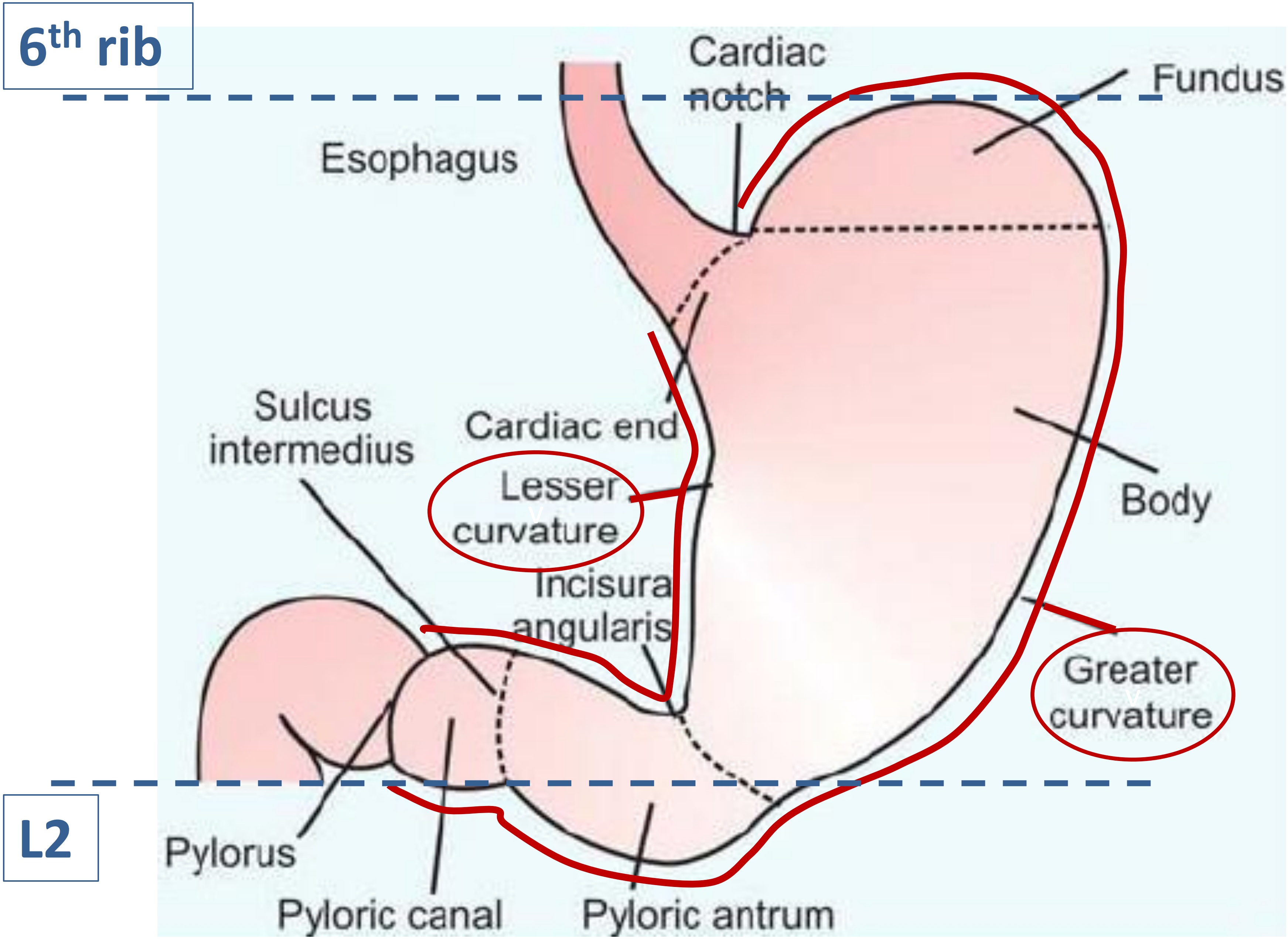
Gastroduodenal Junction:

Internally → Pyloric sphincter

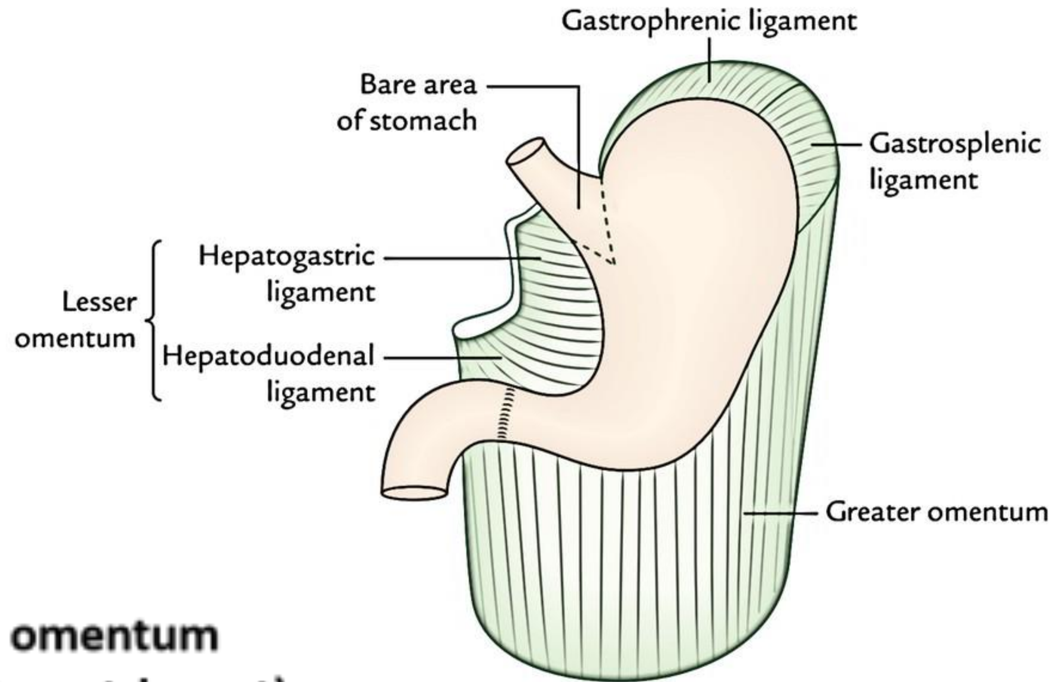
Externally → Pylorus

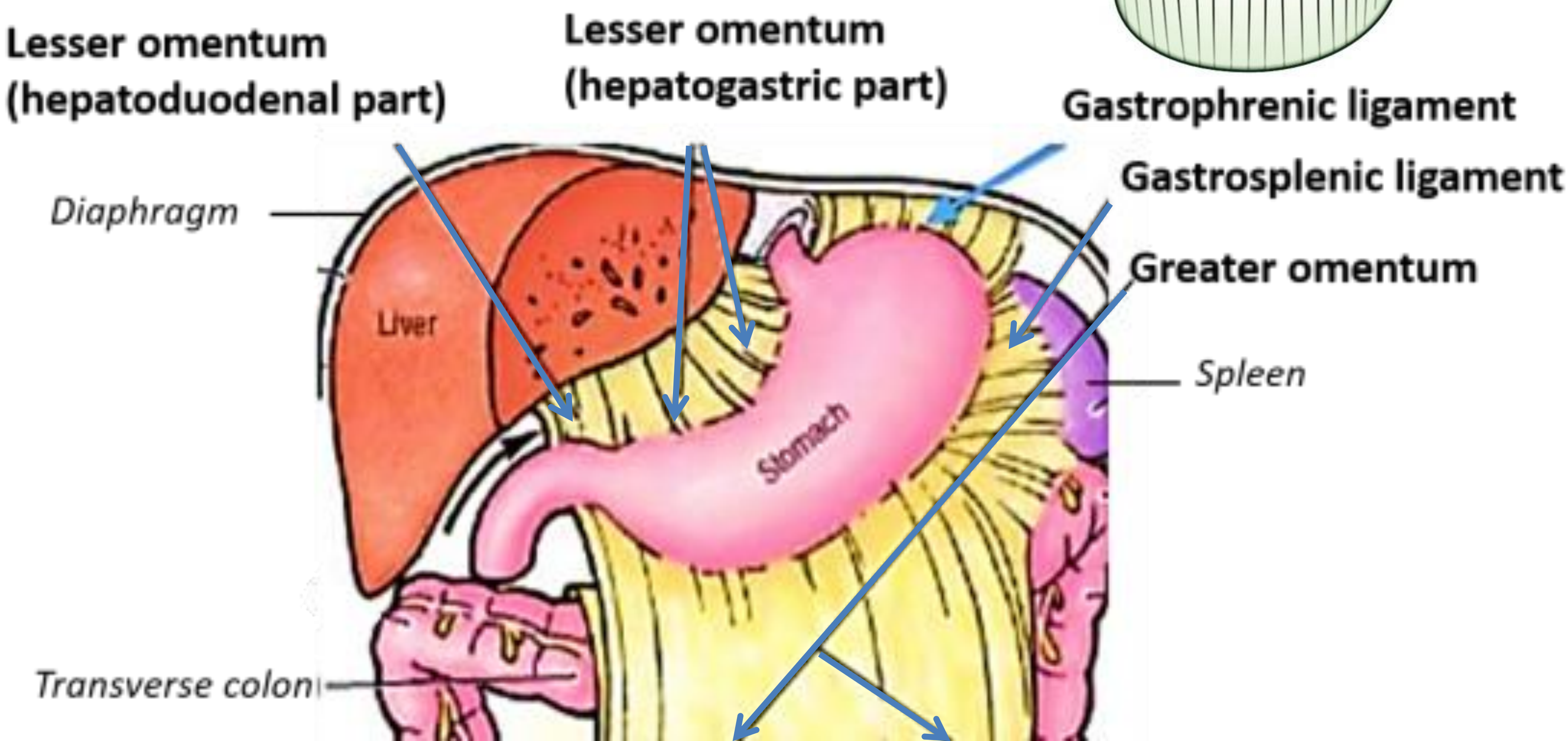




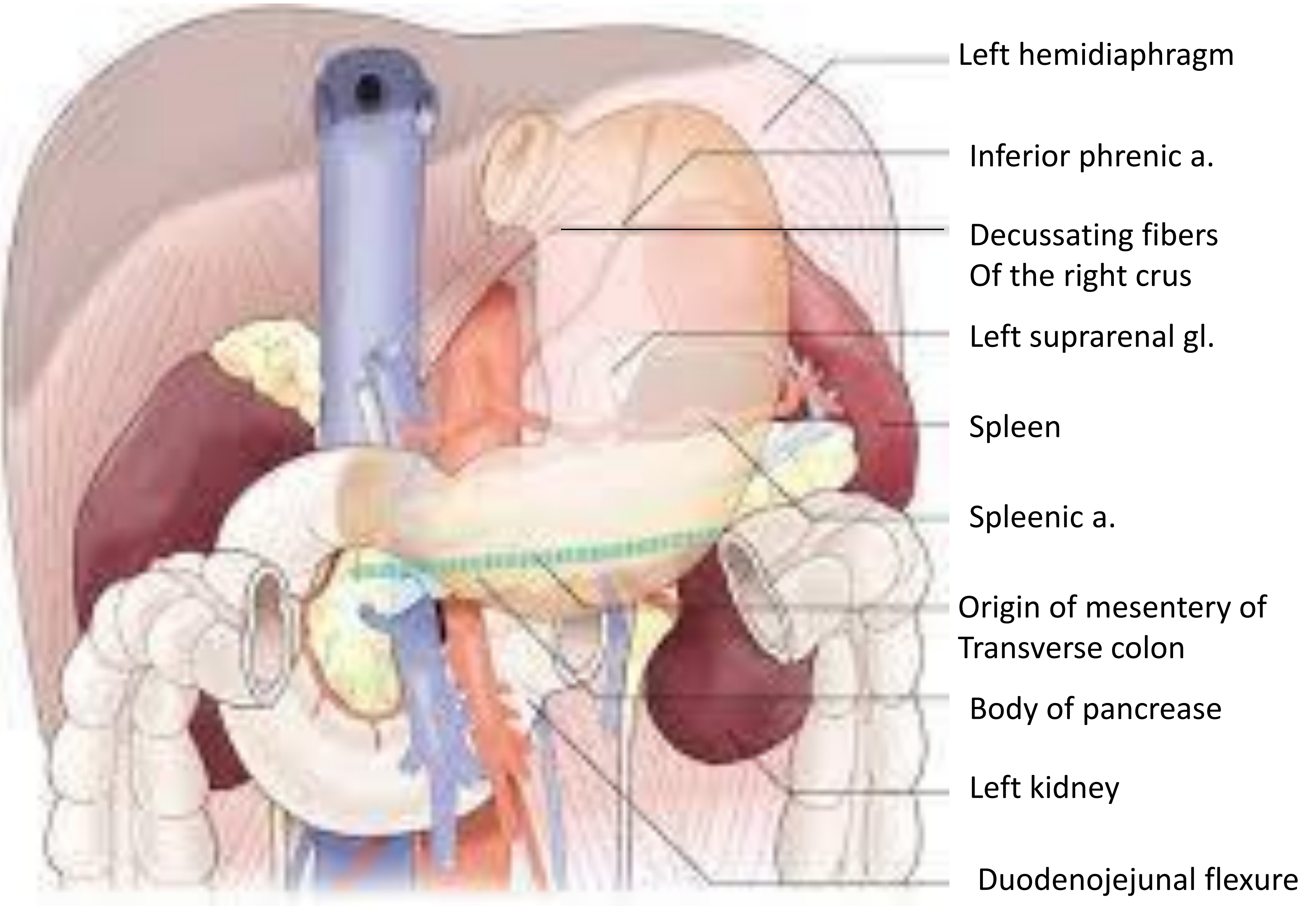

6th rib
Cardiac notch
Fundus
Esophagus
Sulcus intermedius
Cardiac end
Lesser curvature
Incisura angularis
Body
Greater curvature
L2
Pylorus
Pyloric canal
Pyloric antrum

Ligament fixatior

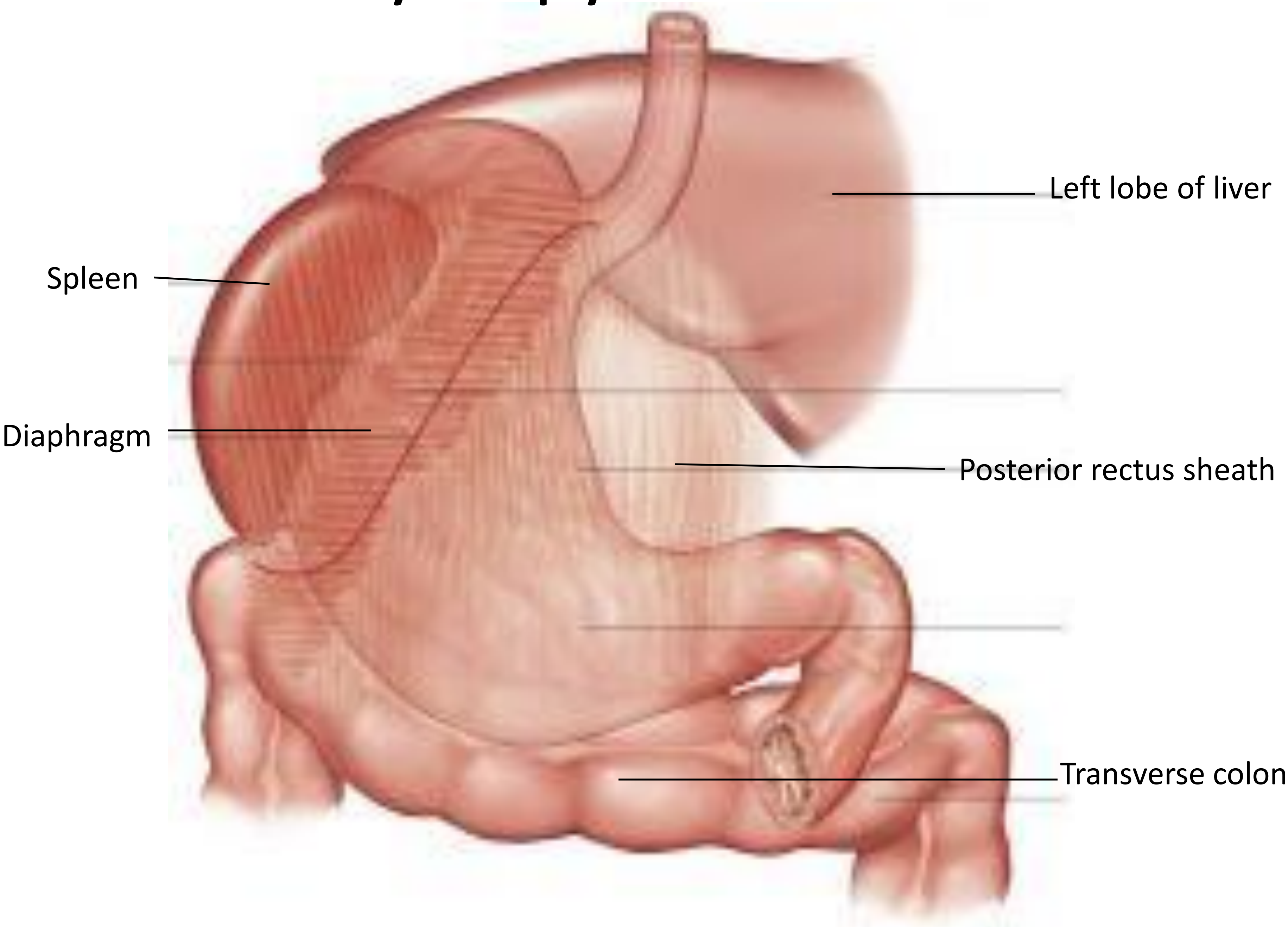




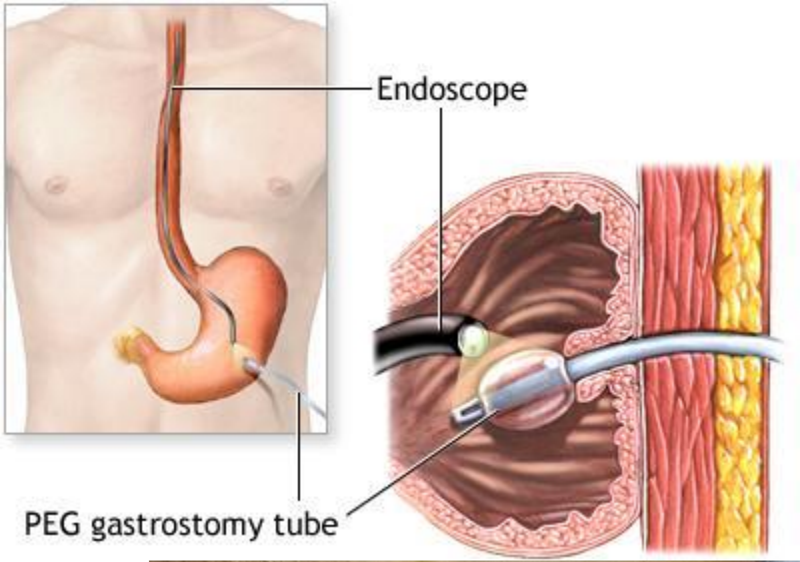
Posterior Syntopy of the Stomach

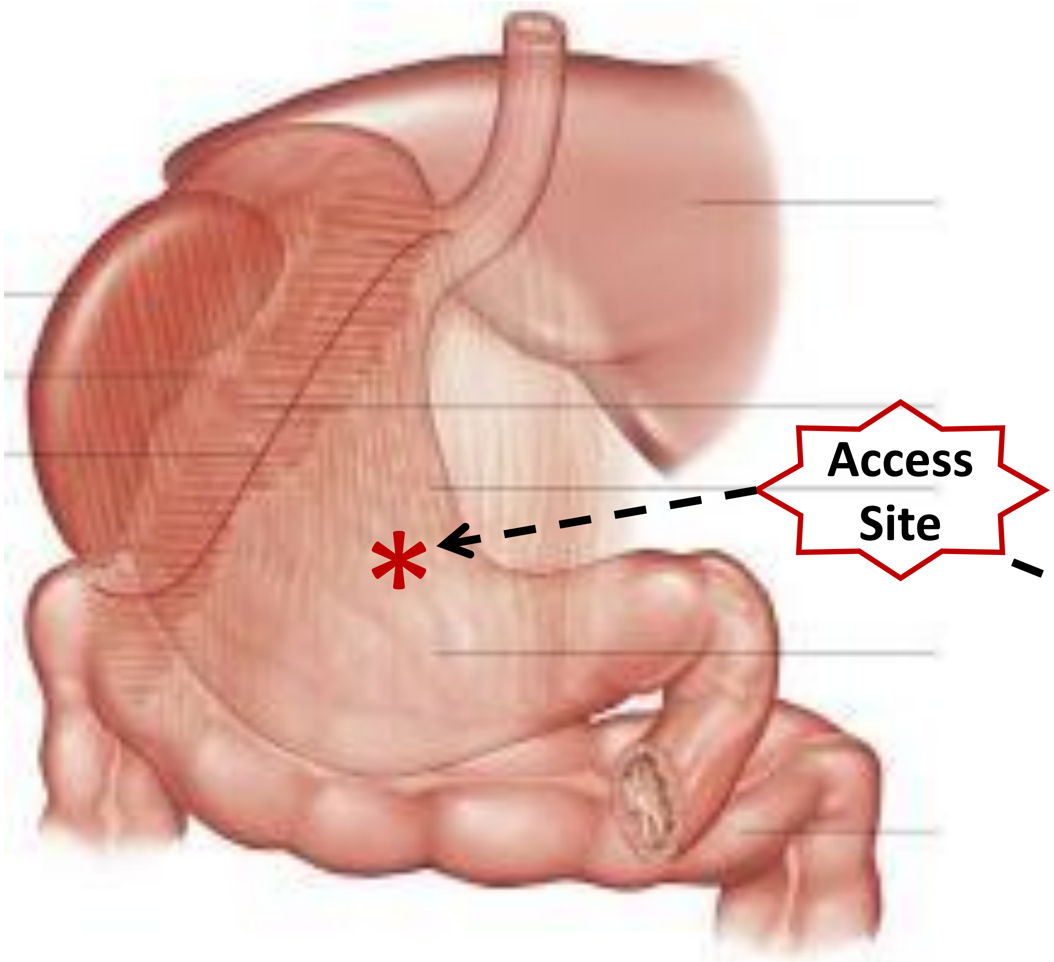


Anterior Syntopy of the Stomach



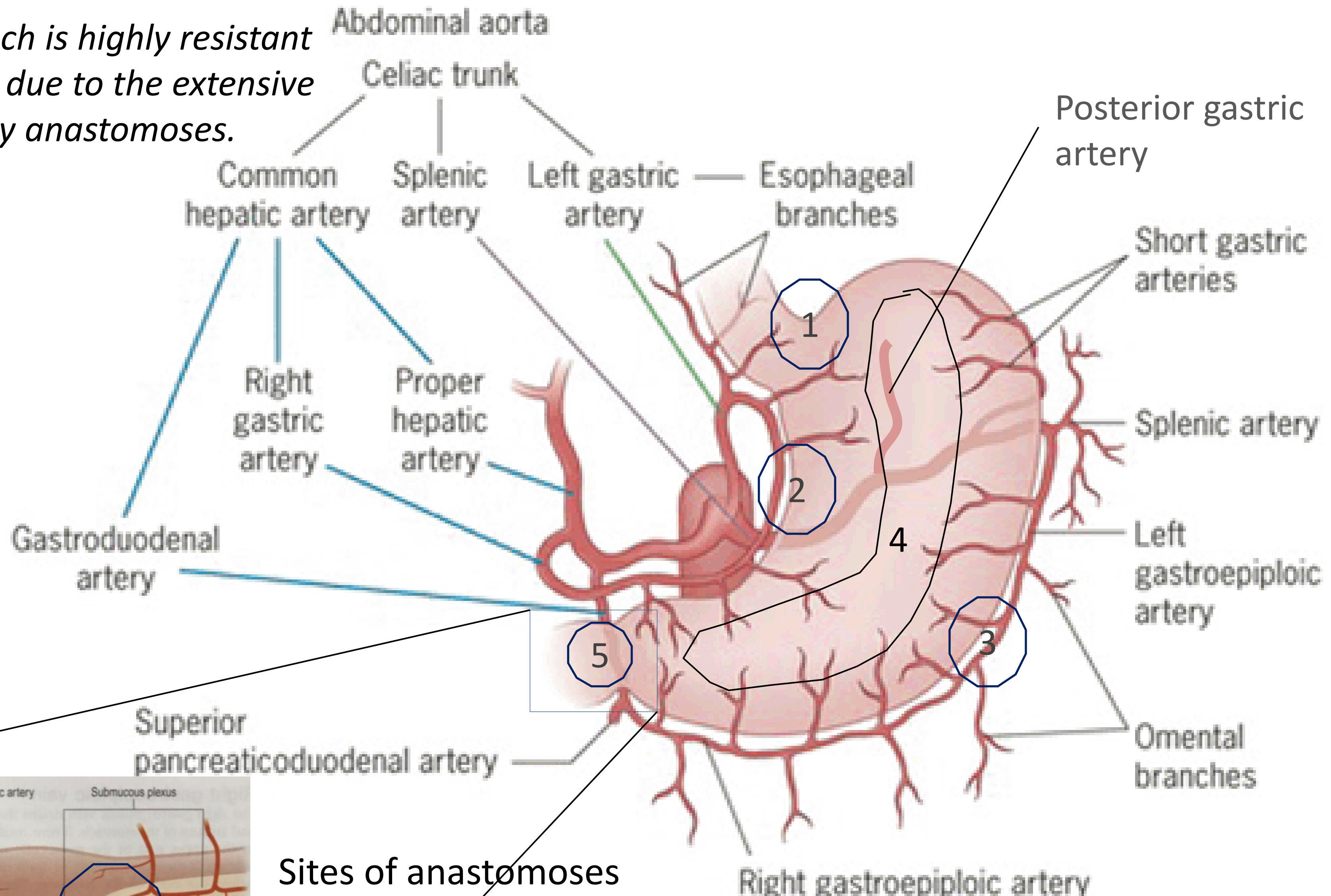
Gastrostomy tube

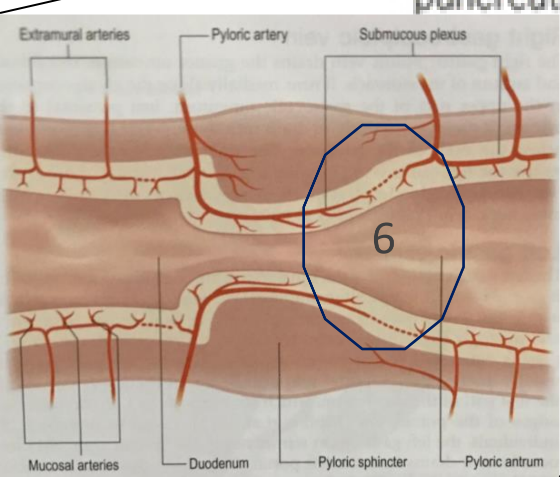




Instrumental access through the anterior abdomenal wall → **right inferior ½ gastric anterior surface**

**The stomach is highly resistant to ischemia due to the extensive blood supply anastomoses.*



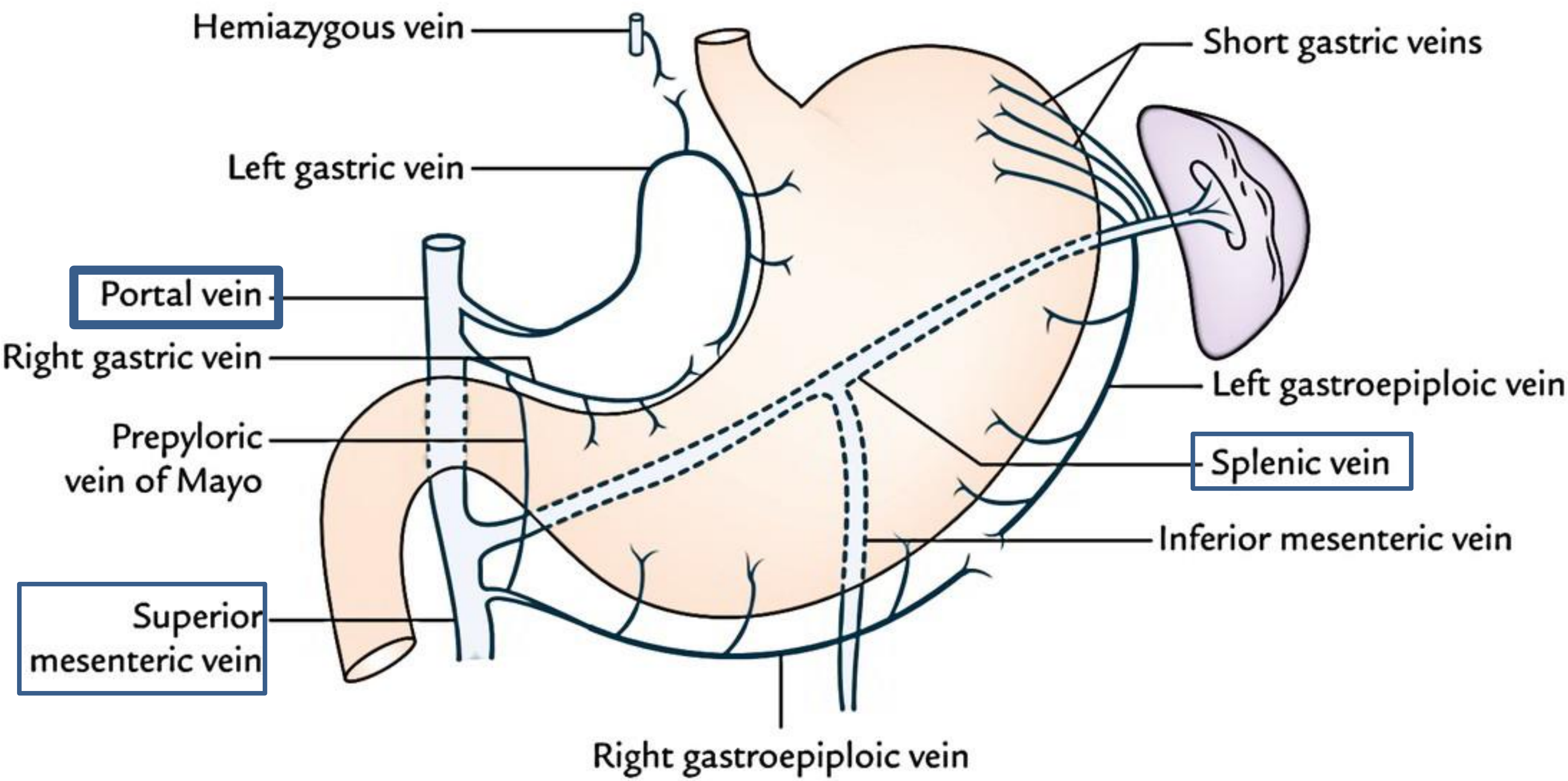


Sites of anastomoses

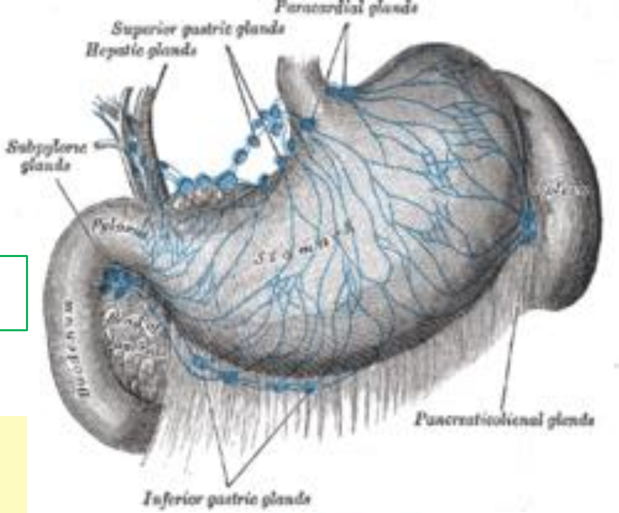
1) **At cardiac orifice**: esophageal aa. ↔ L. gastric a., short gastric a., (posterior gastric a.)
2) **At lesser curvature**: R. gastric a. ↔ L. gastric a.
3) **At grater curvature**: R. gastroomental a. ↔ L. gastroomental a.
4) **At the whole mid-length**: gastric aa. ↔ gastrooemntal aa.
5) **At the pylorus**: superior mesenteric a. ↔ pyloric a.
6) **Within the pyloric sphincter**: pyloric a. ↔ submucosal aa.

Most of the venous drainage → **Portal vein**

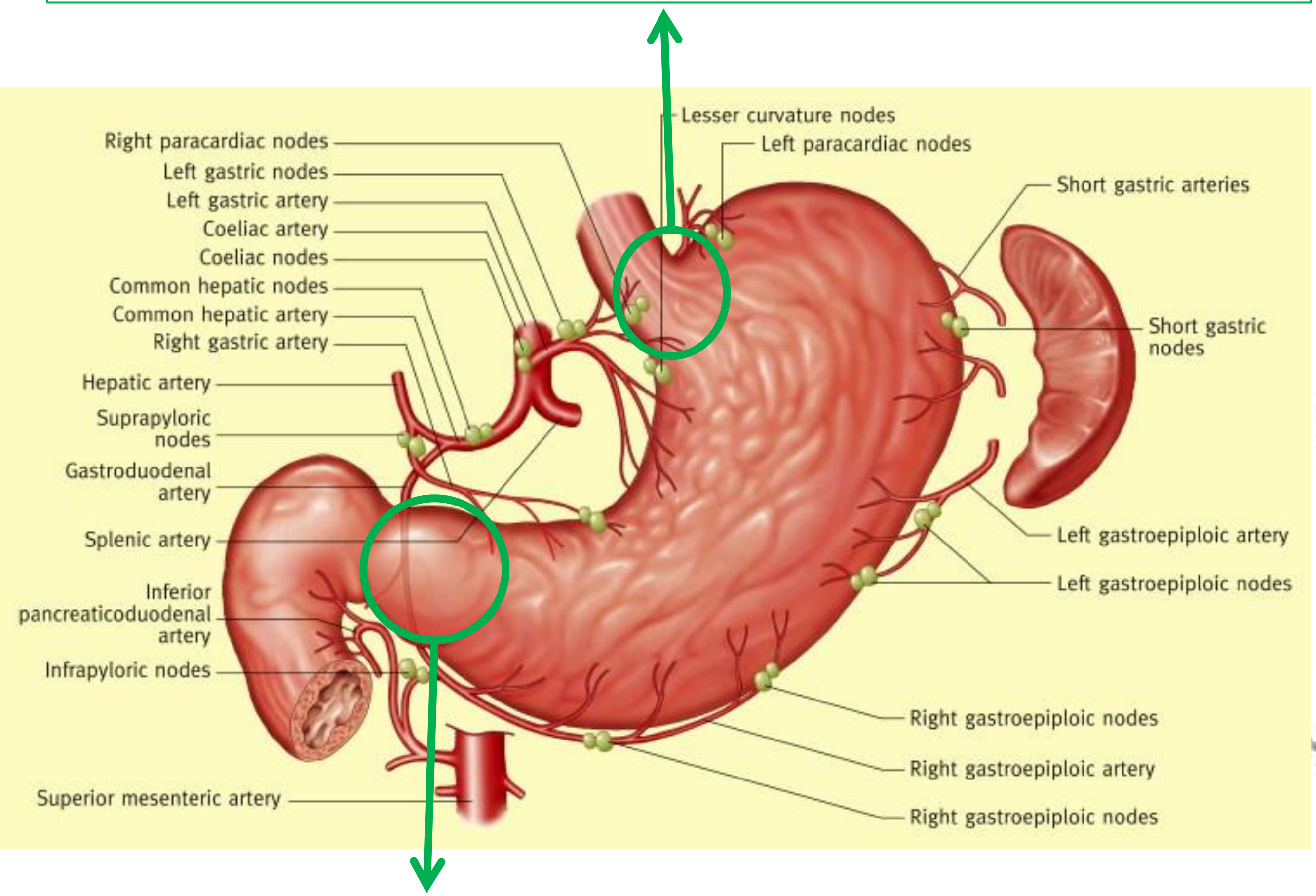
Some of the venous drainage → Inferior vena cava

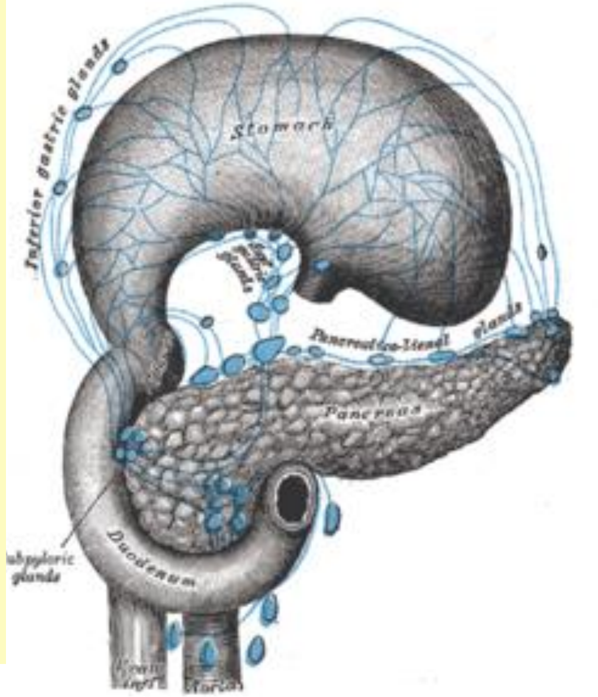


Lymphatics follow the course of the arteries



Gastroesophageal junction → follow lower esophagus drainage





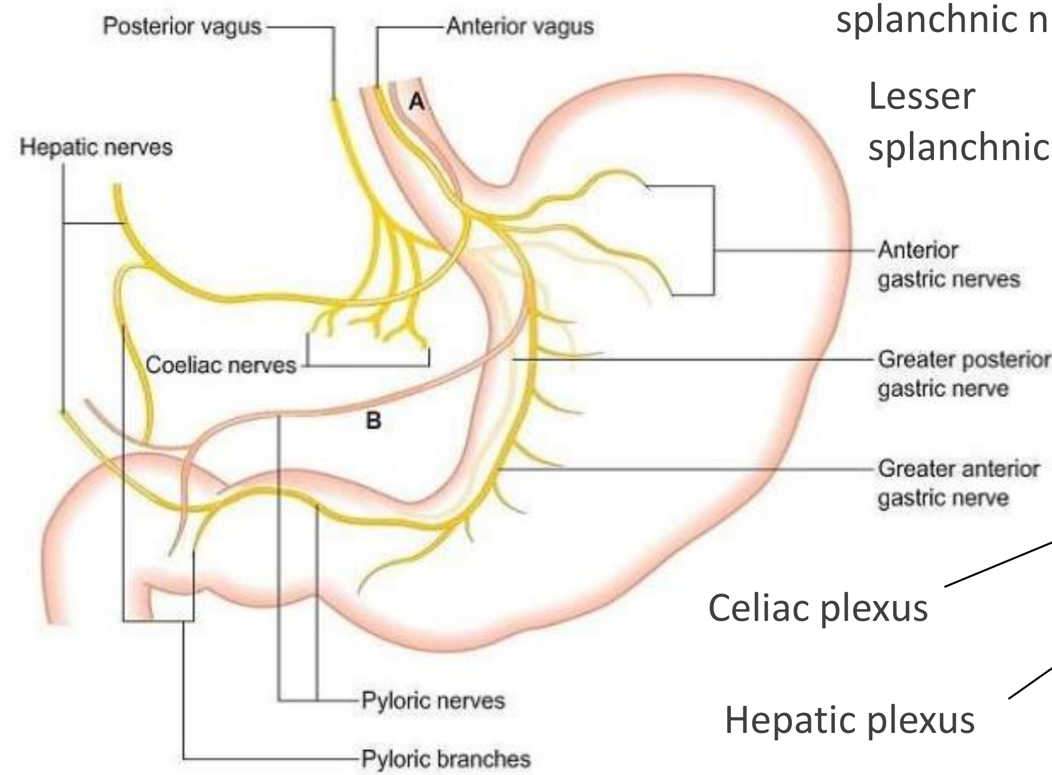
Pylorus → follow drainage of duodenum & pancreas

Sympathetic →

- Vasoconstriction
- Inhibits gastric motility
- Constricts the pylorus

Parasympathetic →

- Secretomotor to gastric mucosa
- Coordinate pyloric sphenciter relaxation during gastric emptying

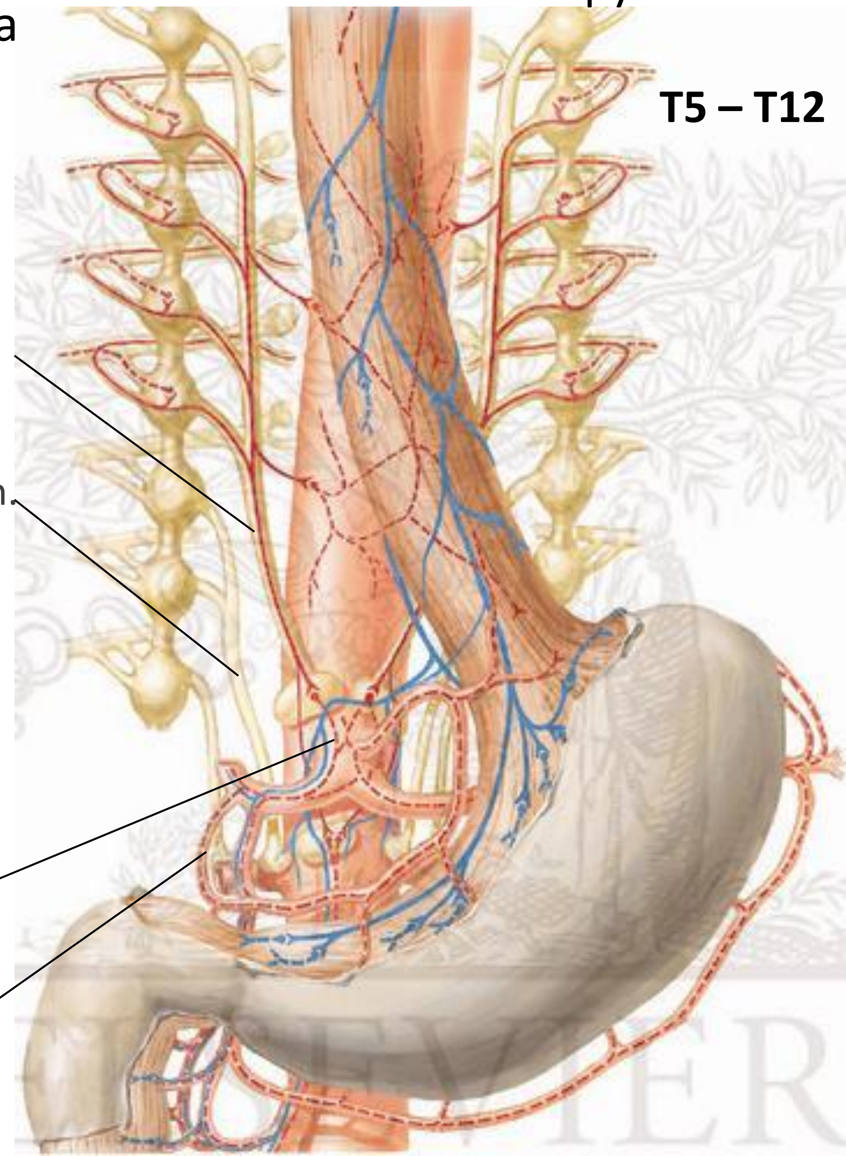


Greater splanchnic n.

Lesser splanchnic n.

Celiac plexus

Hepatic plexus



T5 – T12

Nausea: diffuse sensation of unease and discomfort perceived as an urge to vomit.

*ANS central triggered response

Vomiting: involuntary, forceful expulsion of the contents of one's stomach.

*vomiting reflex

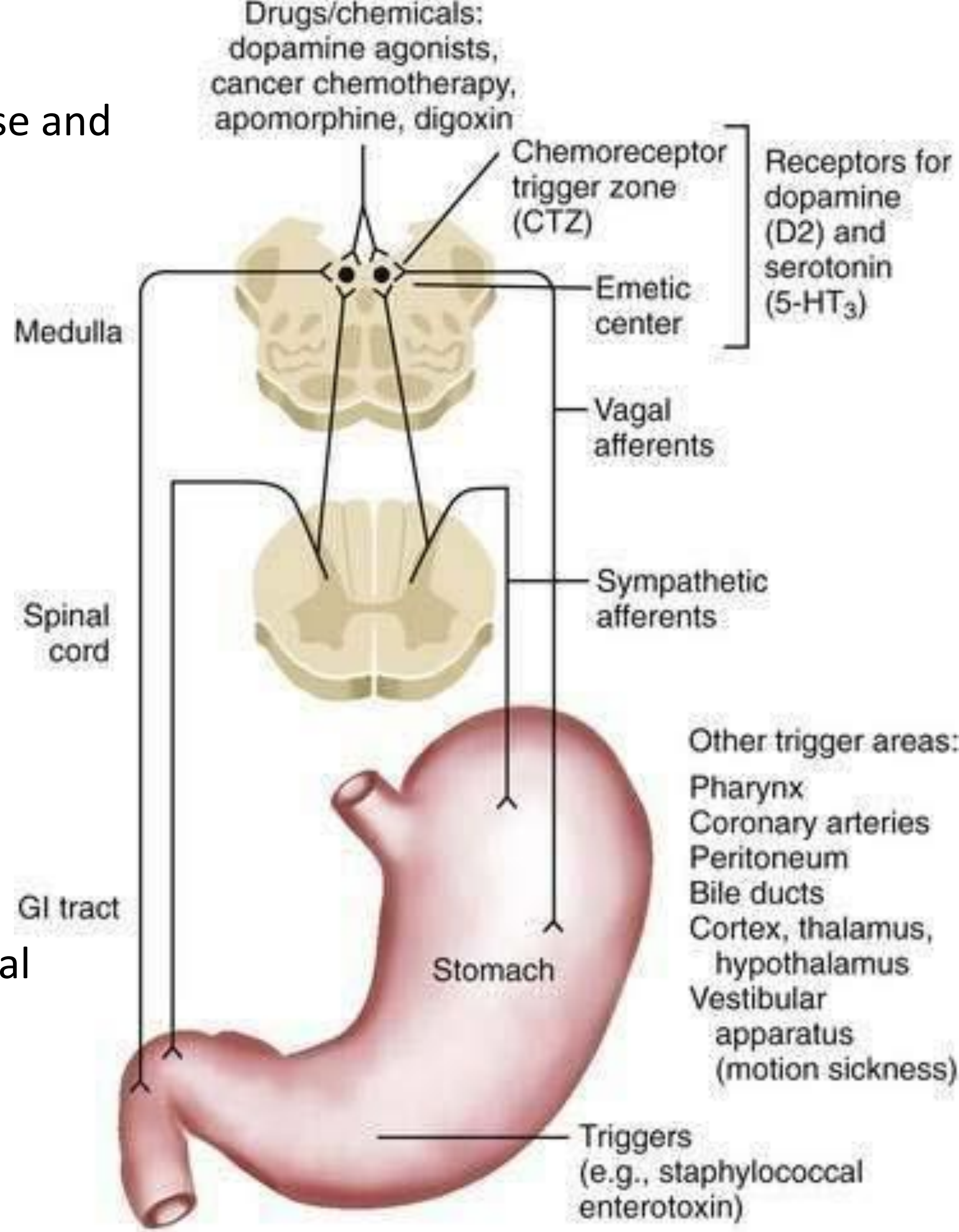
Initial Phase:

Lower esophagus sphincter & peri-esophagus crural fiber relax

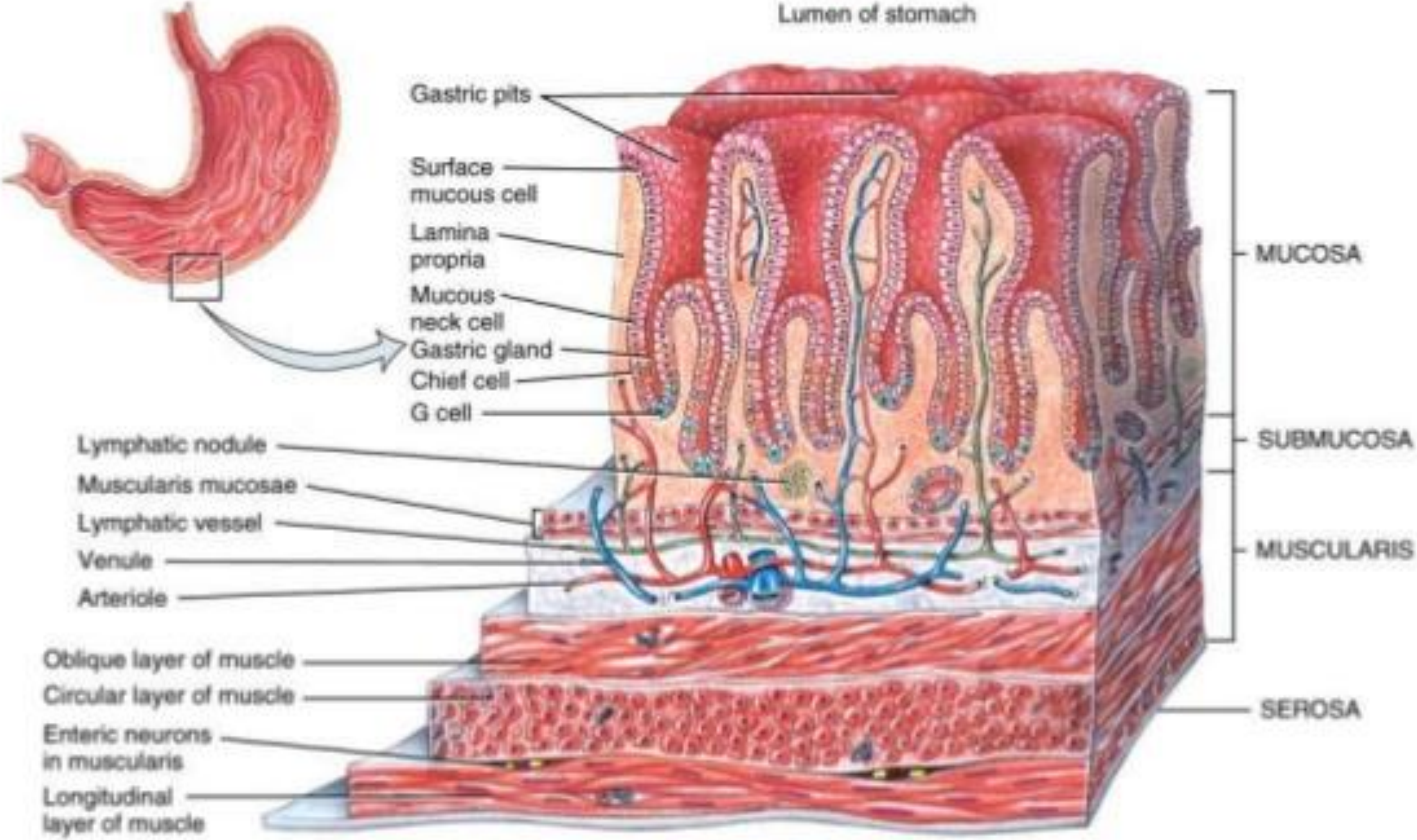
Following Phase:

Rapid diaphragmatic & abdominal muscle contract

→ **↑intrabdominal P**



Stomach Wall: Four Layers



Three-dimensional view of layers of the stomach

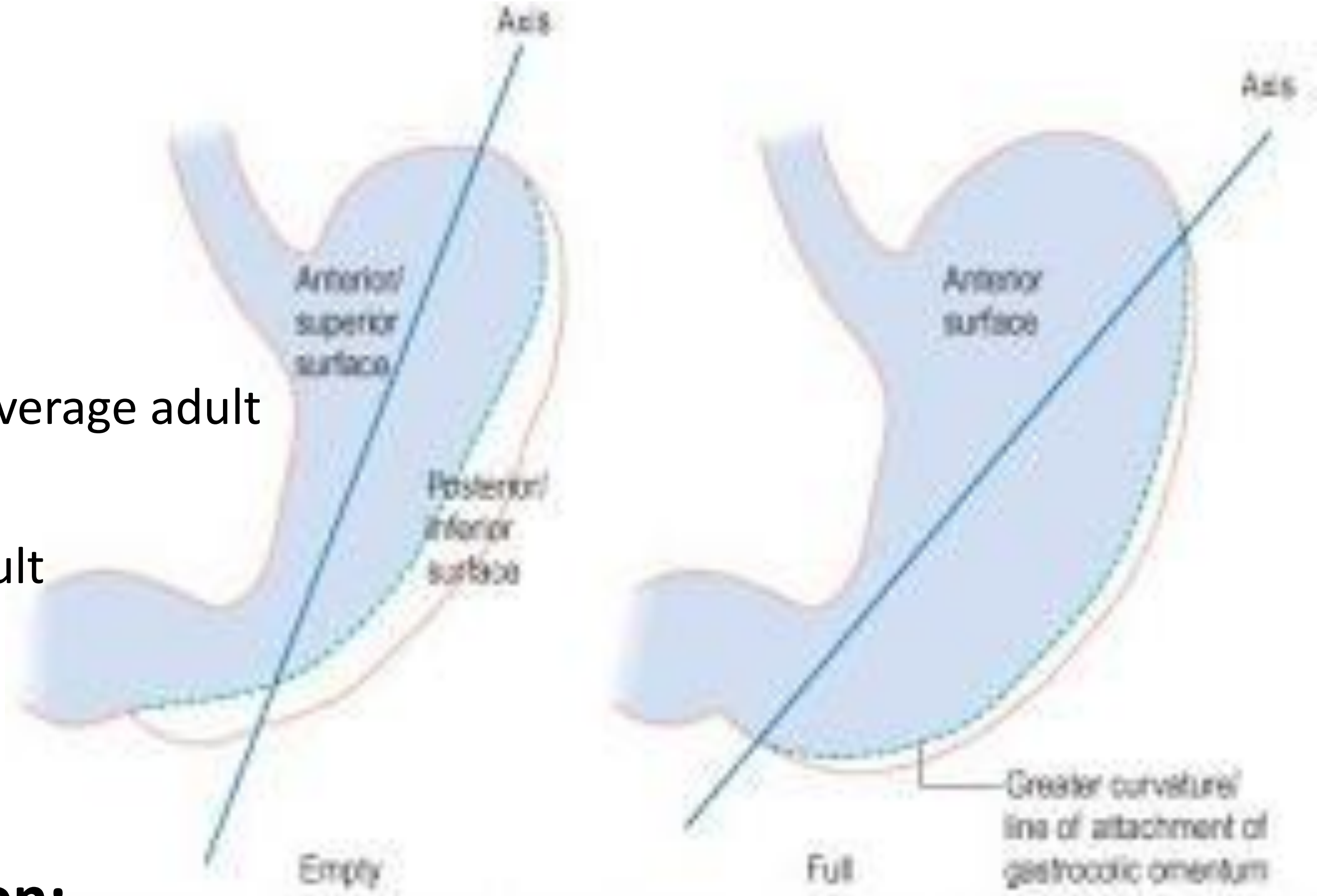
Main Function: 1) Temporary Storage

Mean Capacity

•Approx 1000-1500mL in average adult

Transient Time

•3-4 hr for solid food in adult



Receptive Relaxation:

Esophageal swallowing → ↓proximal stomache tone

Gastric Accomodation:

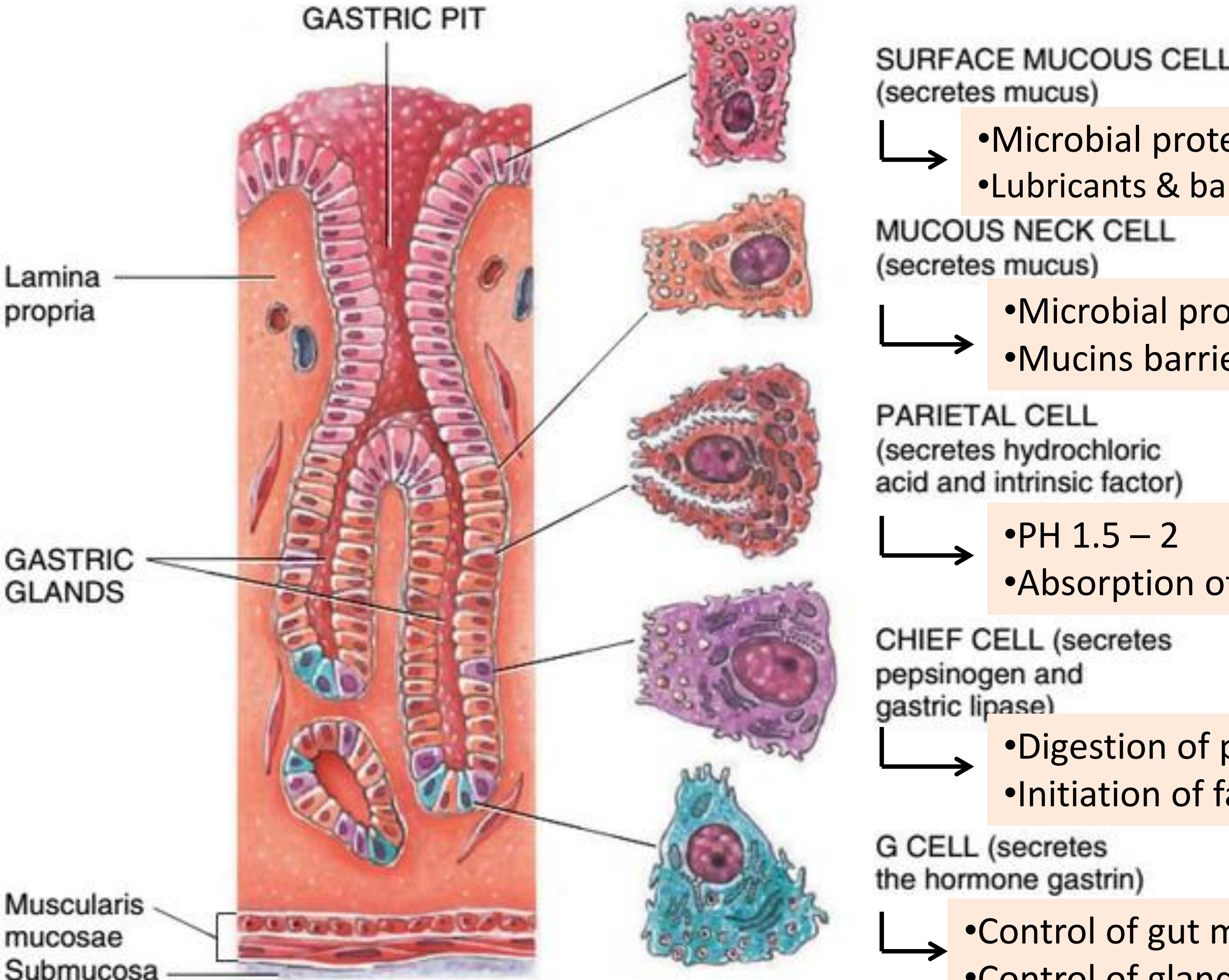
→ Stomach distends → greater curvature rolls downwards & anterosuperior surface comes to lie vertical

Main Function: 2) Digestion

3 times per min

20 -100 mL
pH 1.5-2 (acidic)

Gastric Glands & Chemical Secretions



- Microbial protection
- Lubricants & barrier protection

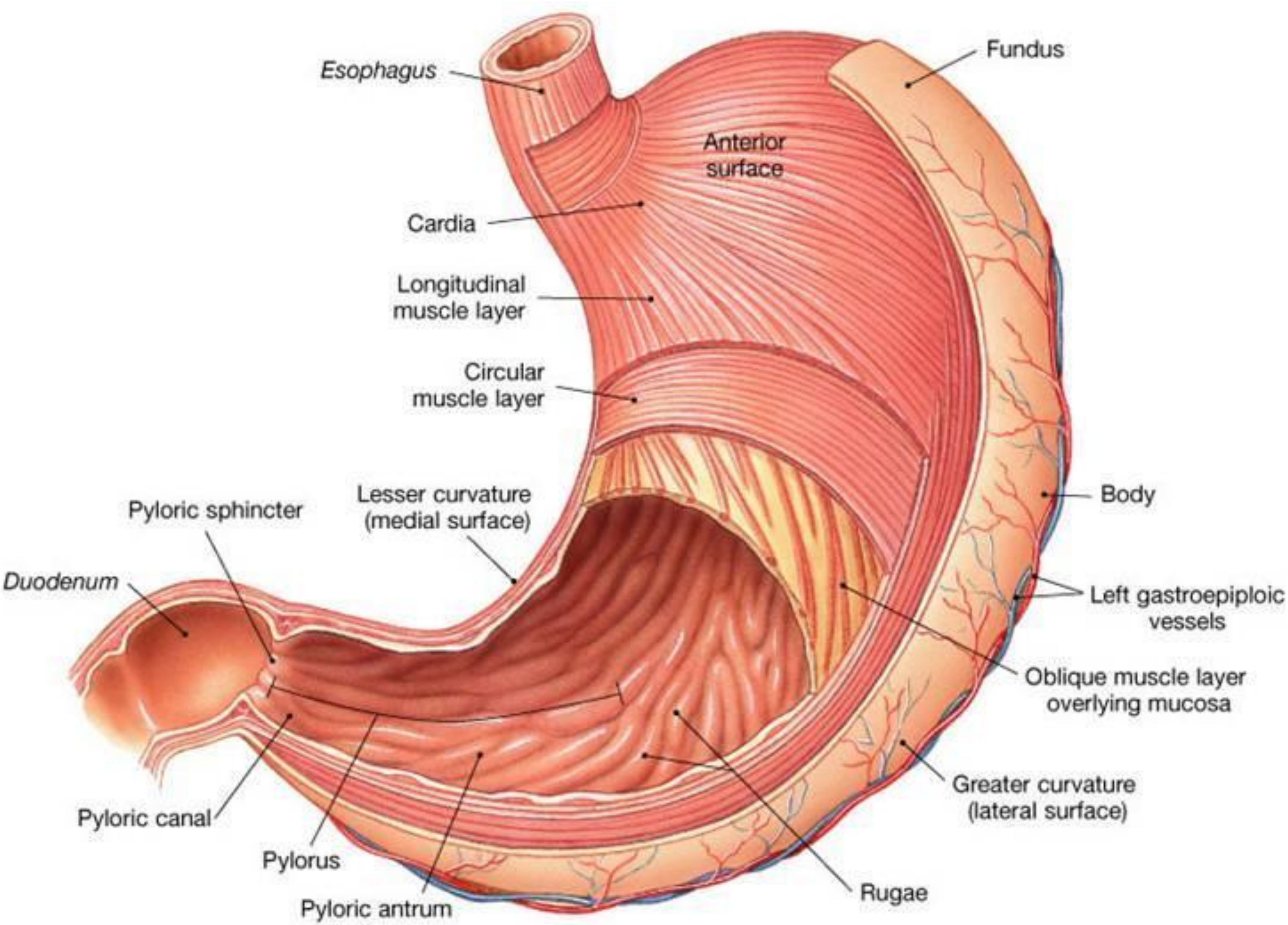
- Microbial protection
- Mucins barrier protection

- PH 1.5 – 2
- Absorption of vitamin B12

- Digestion of proteins
- Initiation of fat digestion

- Control of gut motility
- Control of glandular secretions

Mechanical breakdown



Mechanical passage of chyme into duodenum

**Occur simultaneously with the mechanical break down of food.*

Distal stomach exhibit phasic contraction

↑ contraction amplitude (3/min)

↓

Grind food mechanically

Propel food mechanically

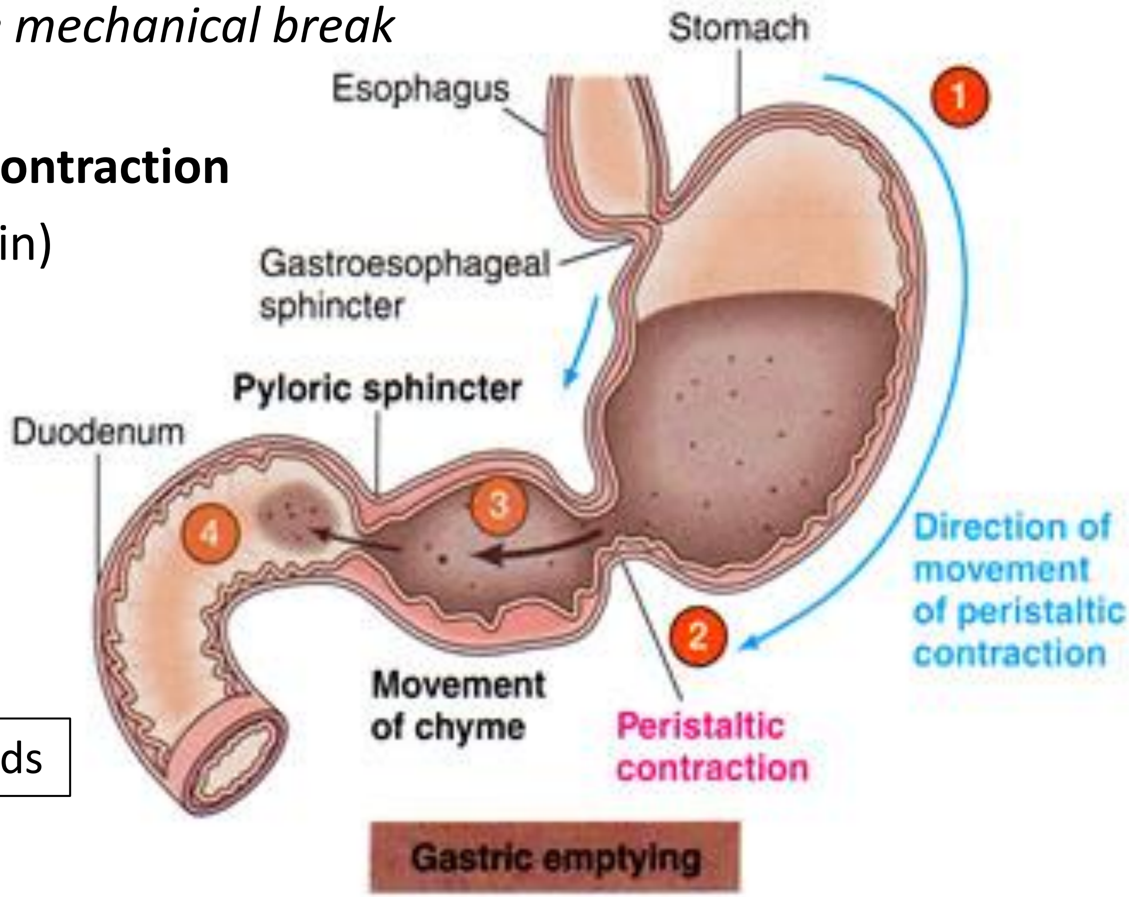
↓

Solid material lags behind liquids

↓

Liquid and semi-liquified solids expel into duoadenum

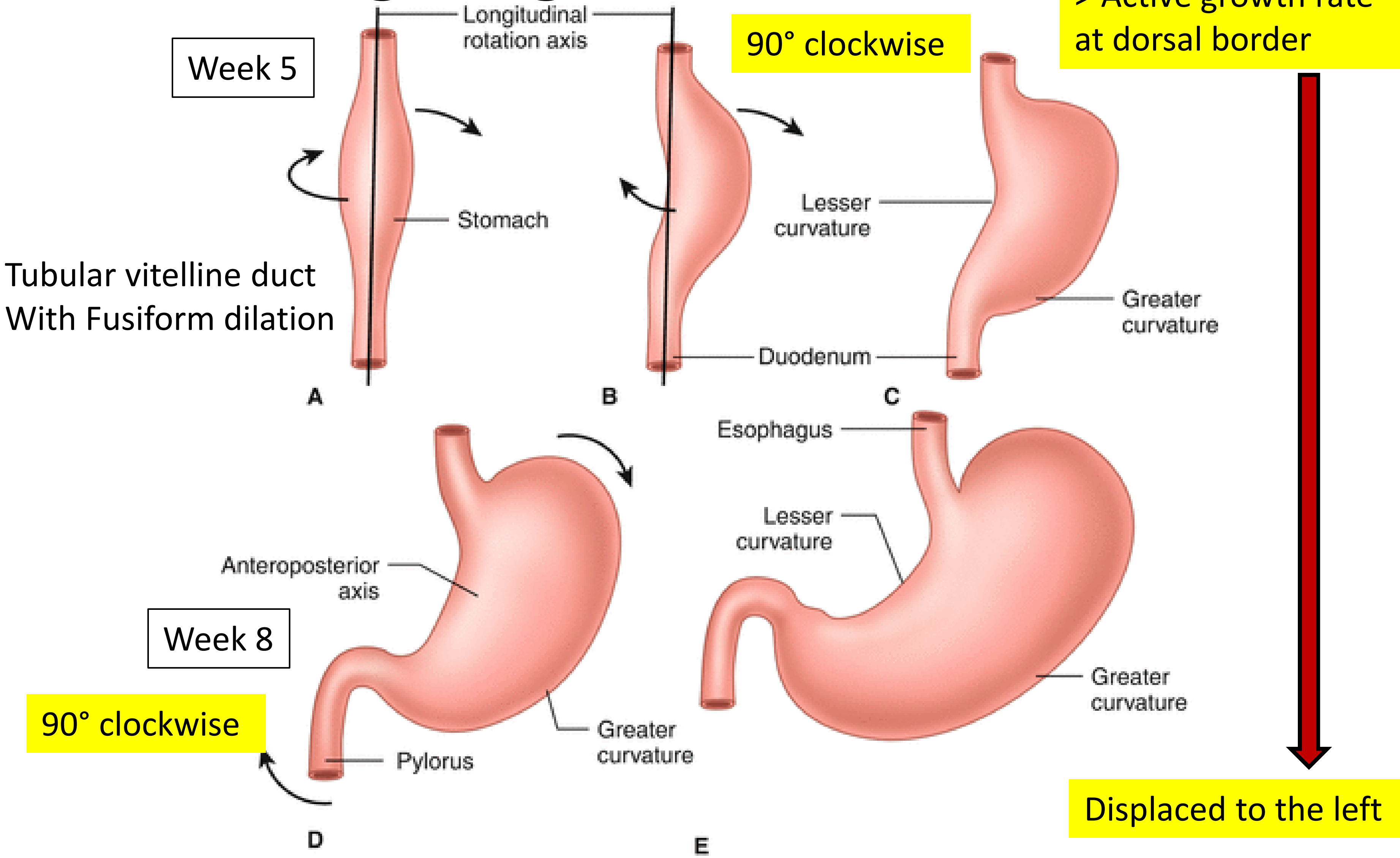
Large solid material retropulsed back from pyloric antrum into stomach body



Gastroparesis:

weak peristaltic muscular contractibility → delayed gastric emptying

Stomach organogenesis



Rotation of the stomach creates:

- placing L. vagus n. along its anterior and R. right vagus n. along its posterior.
- The omental bursa/lesser peritoneal sac.

Congenital Anomalies

Infantile Hypertrophic Pyloric Stenosis

- 1/150 male infants

  1/750 female infants

Overgrowth of the longitudinal muscle fibers of the pylorus

↓

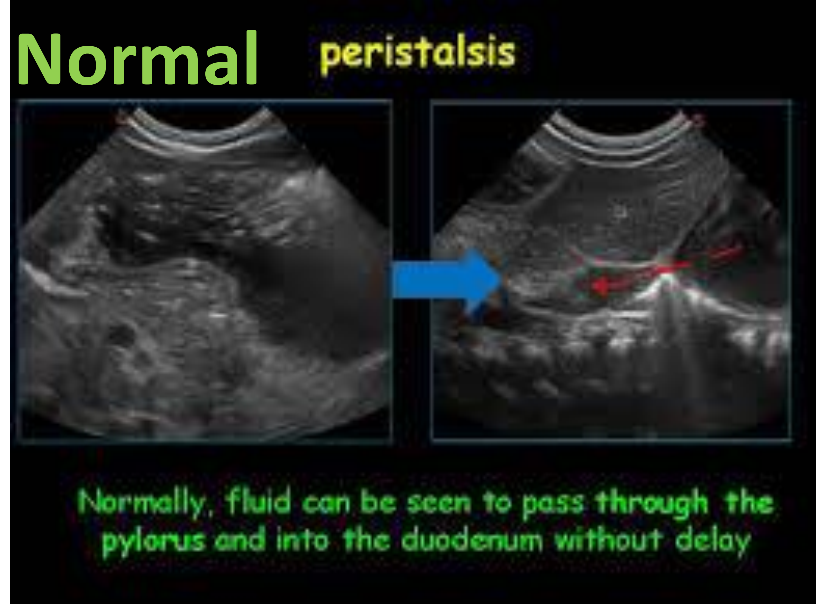
stenosis of the pyloric canal

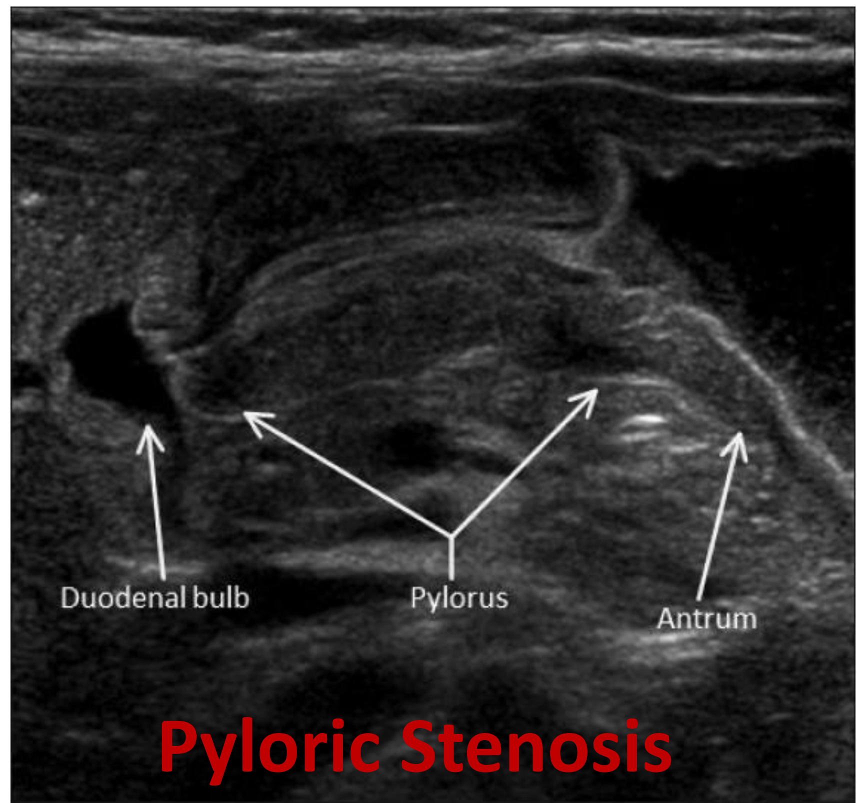
↓

Obstruction

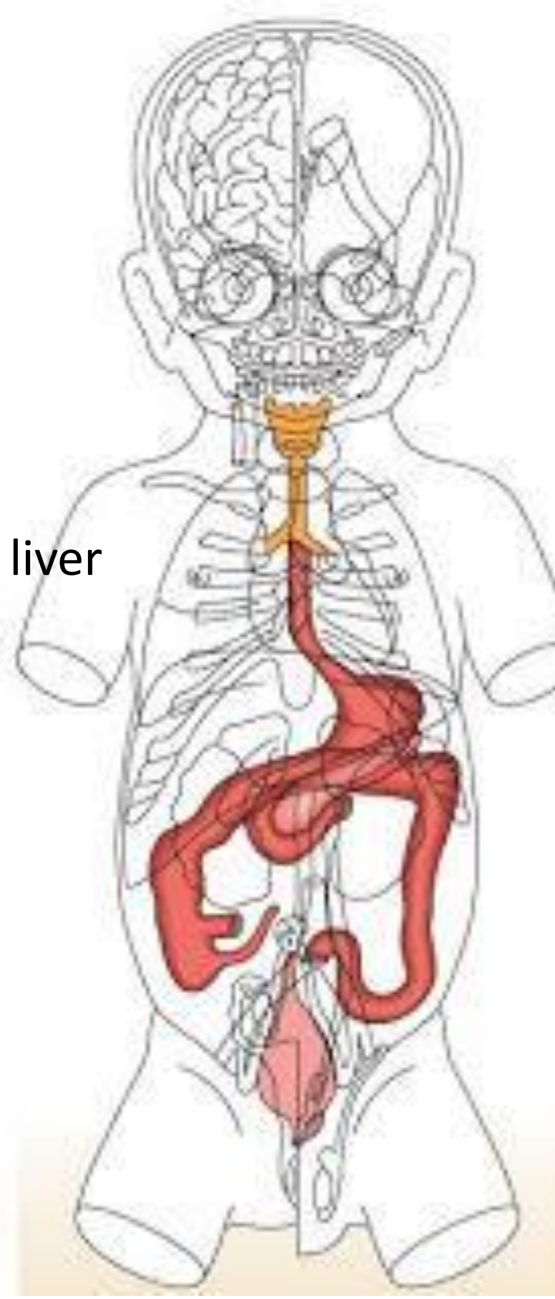
↓

infant expels the contents forcefully (projectile vomiting).





Neonatal Stomach



- Exhibit fetal characteristic at onset of birth.
  Initiation ventilation → coughing & swallowing reflexes
  → ingestion of air & fluid → 4-5 folds stomach destination

- Anterior surface is generally covered by the left lobe of the liver
  (liver extends nearly to the spleen)

- Capacity
  30-50mL → 70mL (2nd week) → 100mL (4th week)

- Peristaltic not yet coordinated → delayed gastric transient emptying → **frequent physiological constipation.**

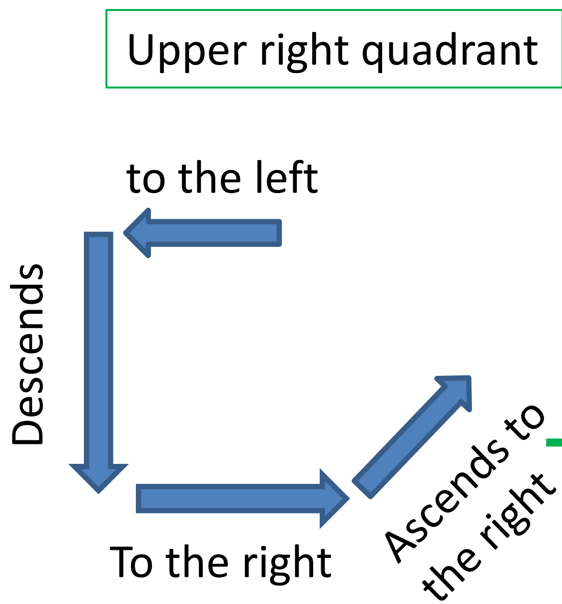
- Low gastric secretion for 10 days postnatally
  High pH 1st postnatal 12 hr → ↓pH after 1st feed

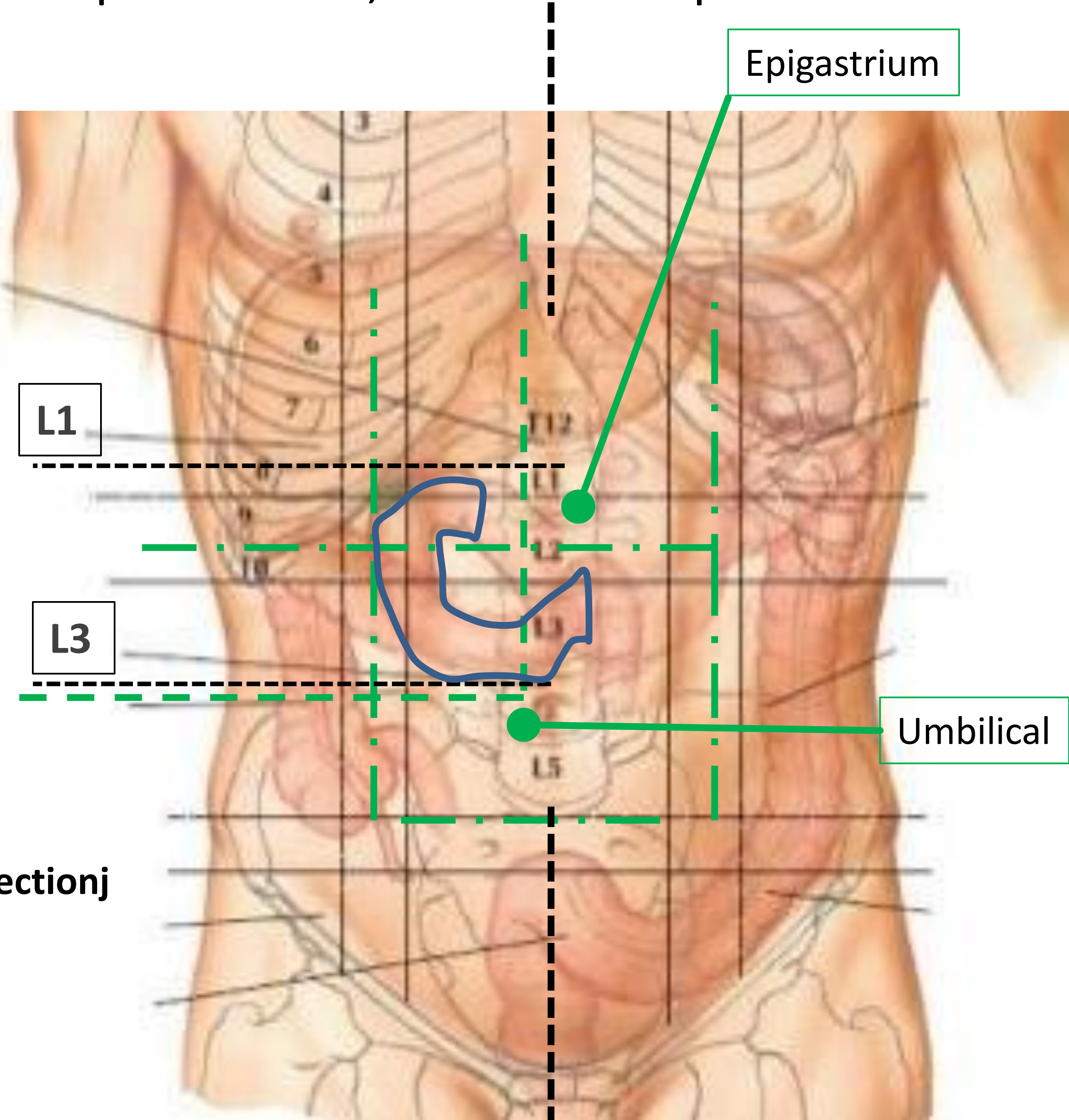
Small intestine "*Intestinum tenue*"

Duodenum "*Duodenum*"

25 cm (proximal 2.5cm intraperitoneum, 22.5cm retroperitoneum

Elonigated C-Shaped

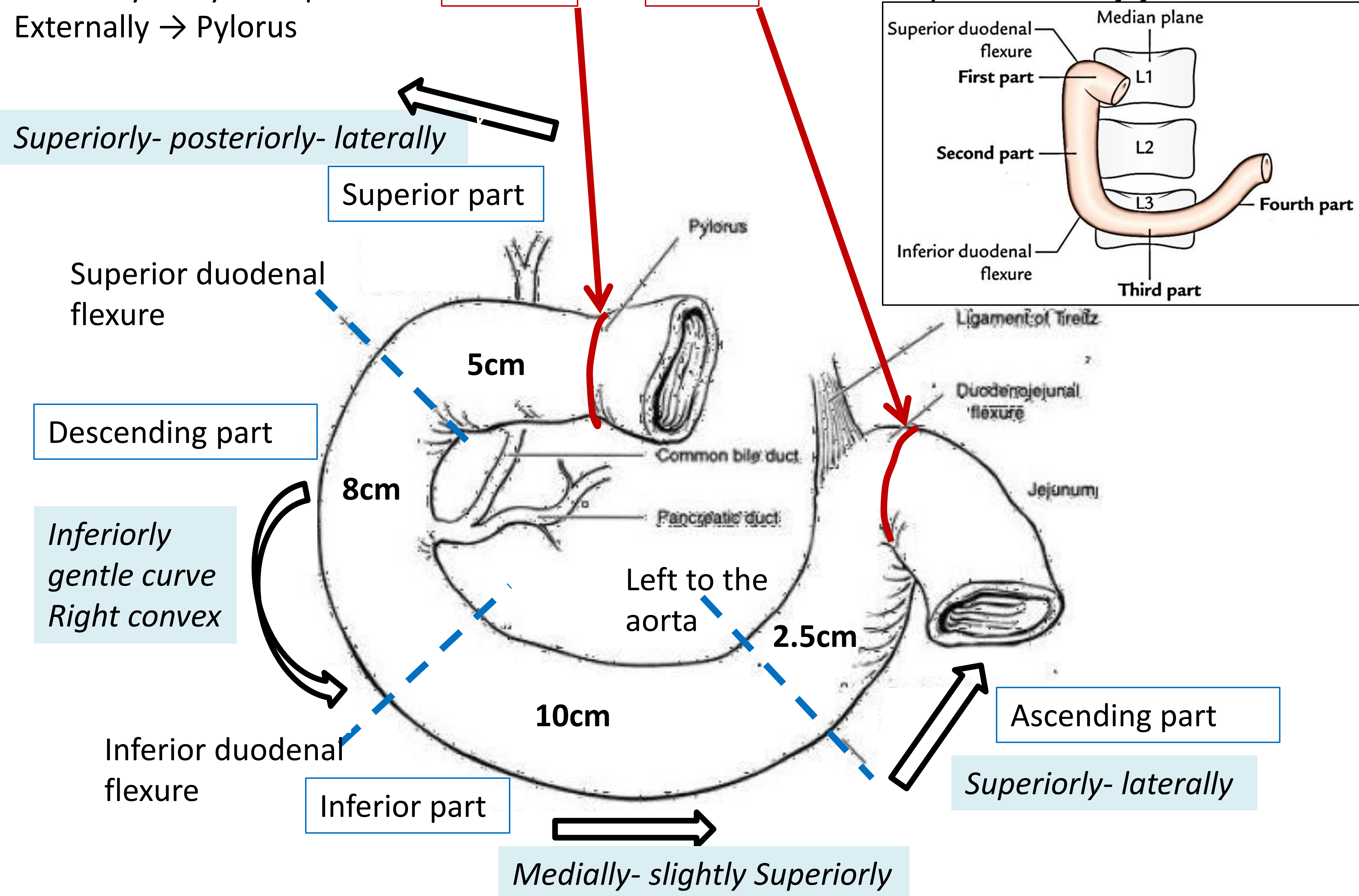




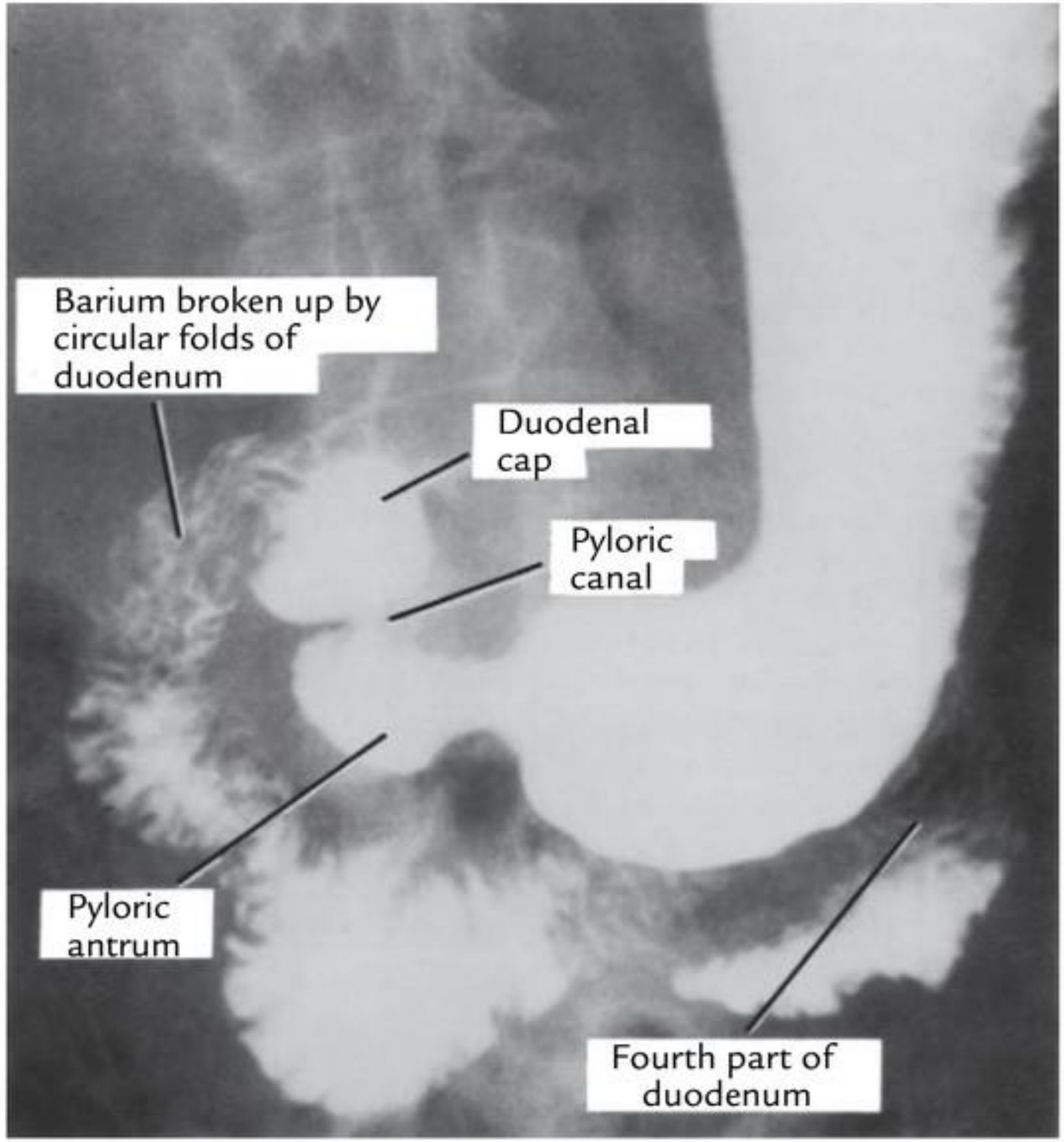
Curves into anterio-posterior directionj

Gastroduodenal Junction:
Internally → Pyloric sphincter
Externally → Pylorus

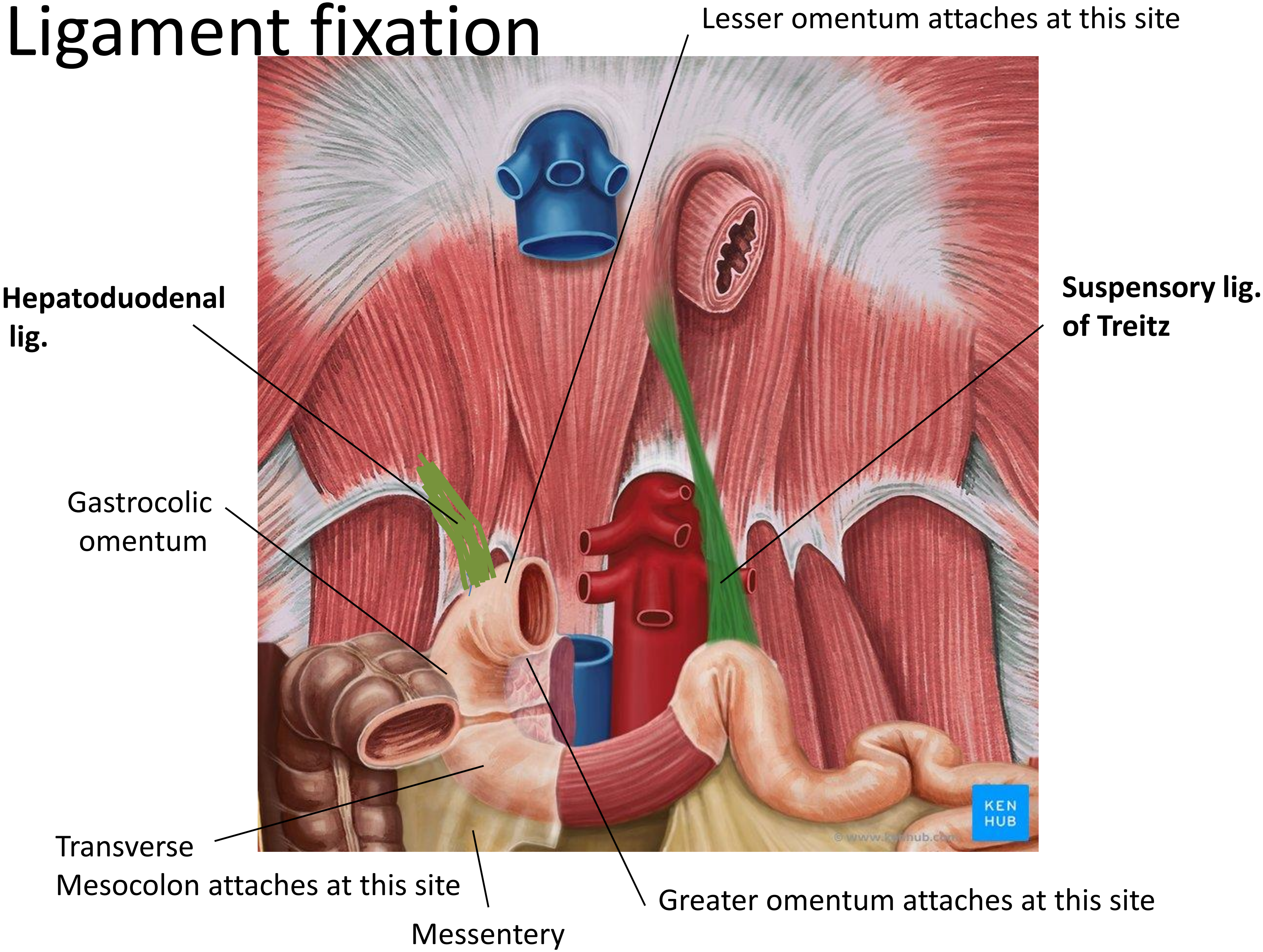
Duodenojejunal Junction:
Externally → Duodenojejunal flexure



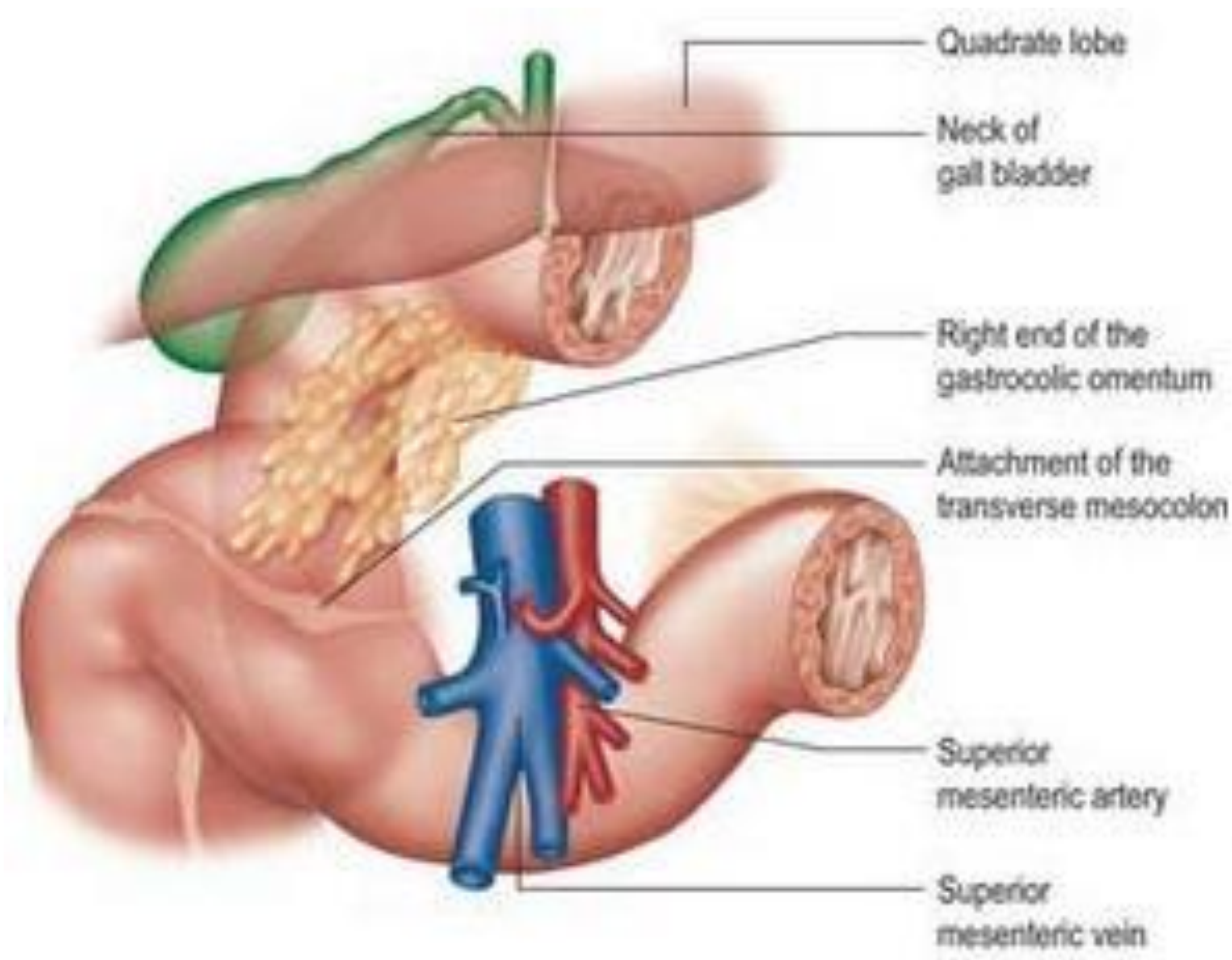
Duodenum contrast radiograph



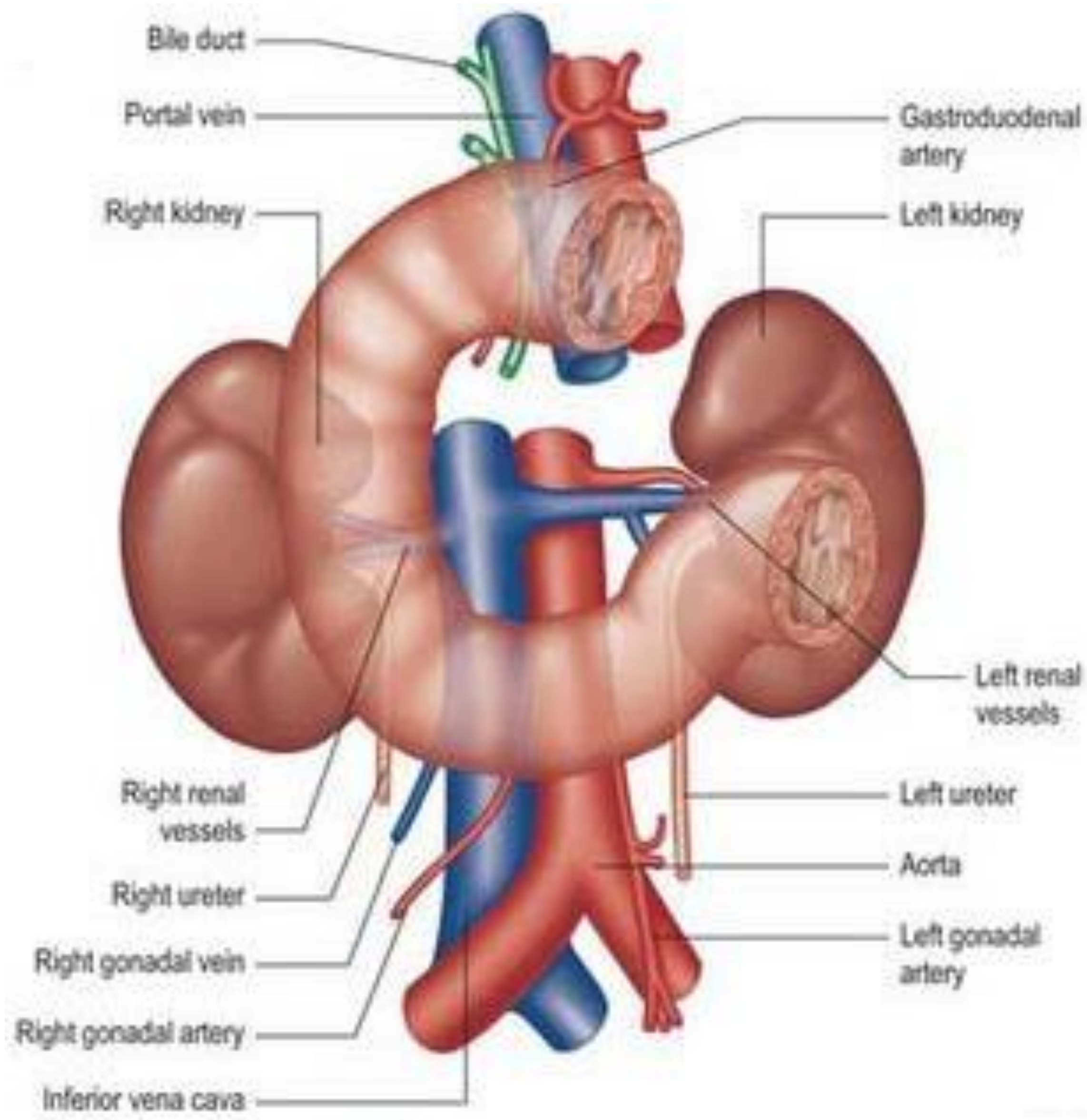
Ligament fixation

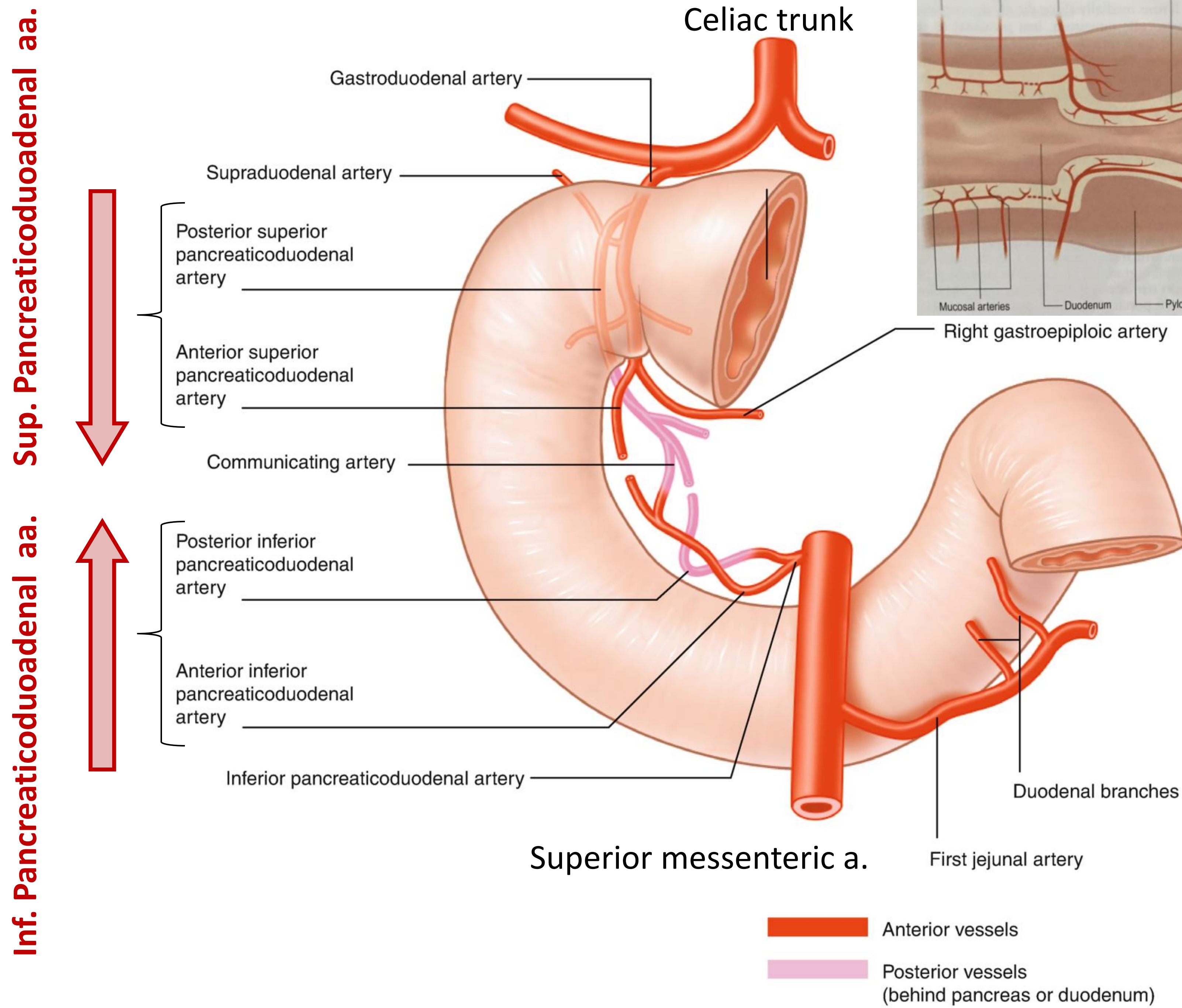


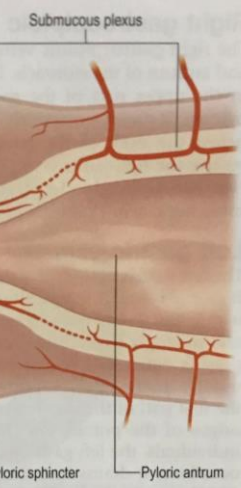
Anterior Syntopy of the duodenum



Posterior Syntopy of the duodenum




Sup. Pancreaticoduoadenal aa.
Inf. Pancreaticoduoadenal aa.
Celiac trunk
Gastroduodenal artery
Supraduodenal artery
Posterior superior pancreaticoduodenal artery
Anterior superior pancreaticoduodenal artery
Right gastroepiploic artery
Communicating artery
Posterior inferior pancreaticoduodenal artery
Anterior inferior pancreaticoduodenal artery
Inferior pancreaticoduodenal artery
Duodenal branches
Superior messenteric a.
First jejunal artery
Anterior vessels
Posterior vessels
(behind pancreas or duodenum)


Extramural arteries
Pyloric artery
Submucous plexus
Mucosal arteries
Duodenum
Pyloric sphincter
Pyloric antrum

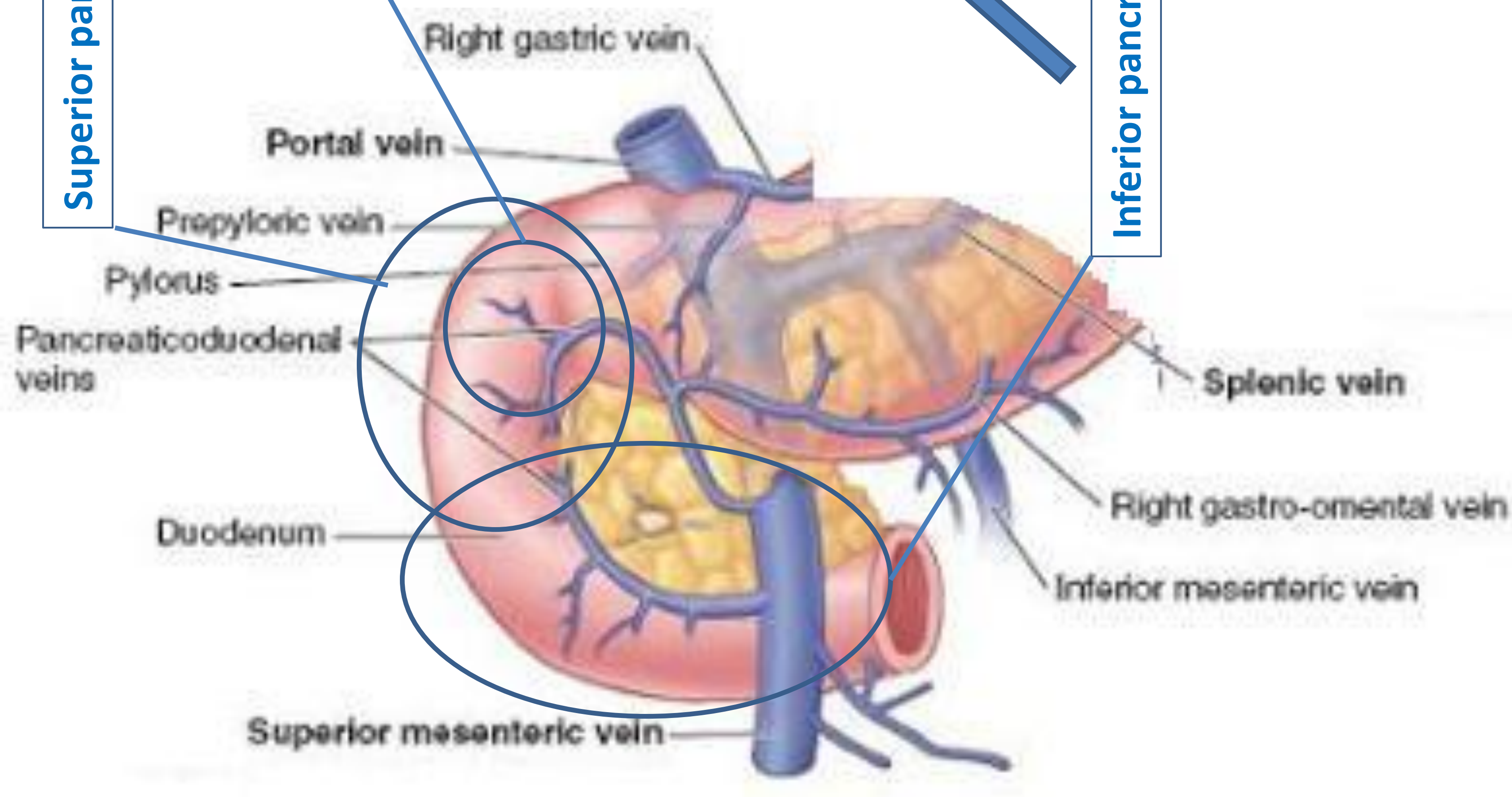
Portal vein

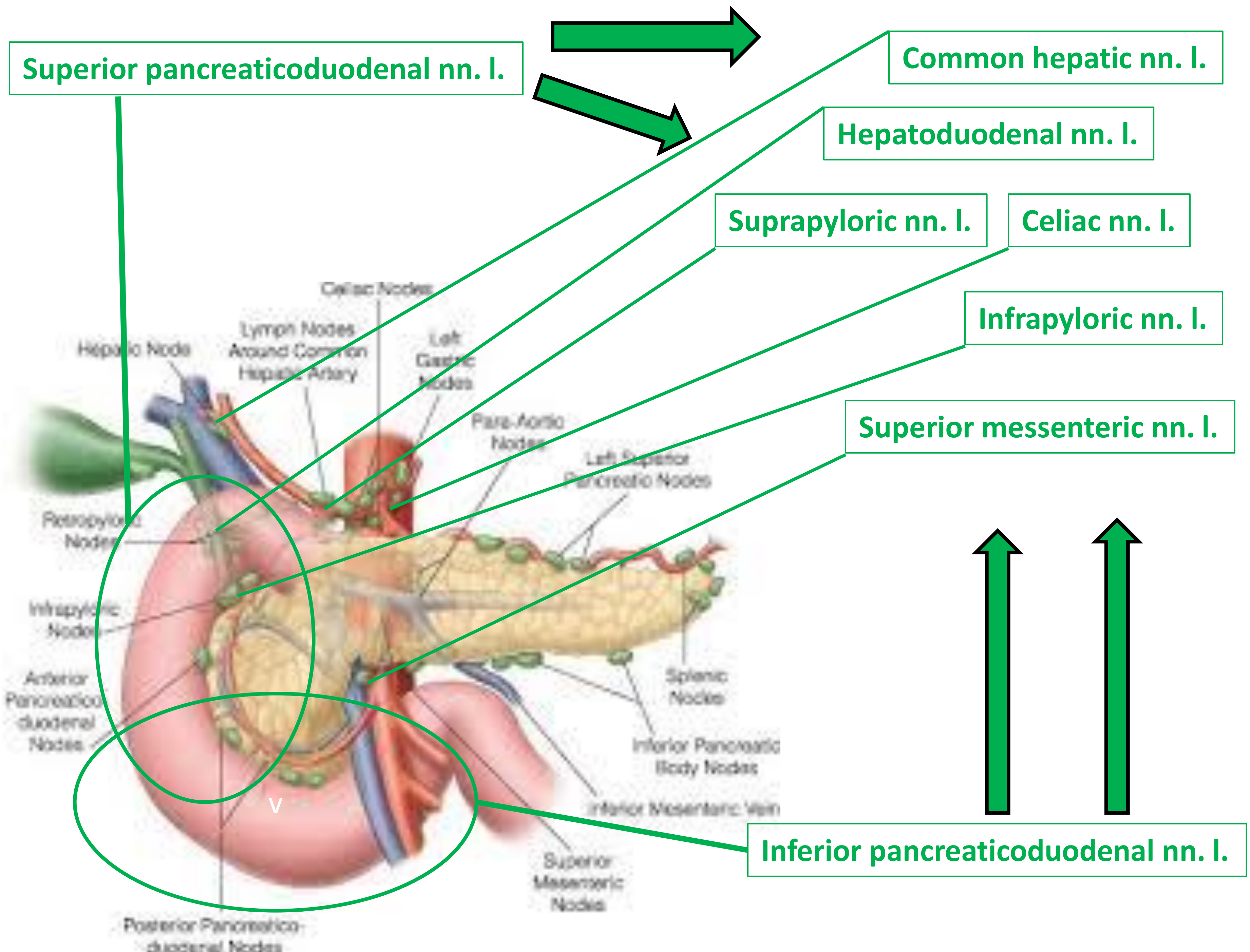
Superior pancreaticoduodenal v.

Small vv.

Superior messenteric v.

Inferior pancreaticoduodenal v.



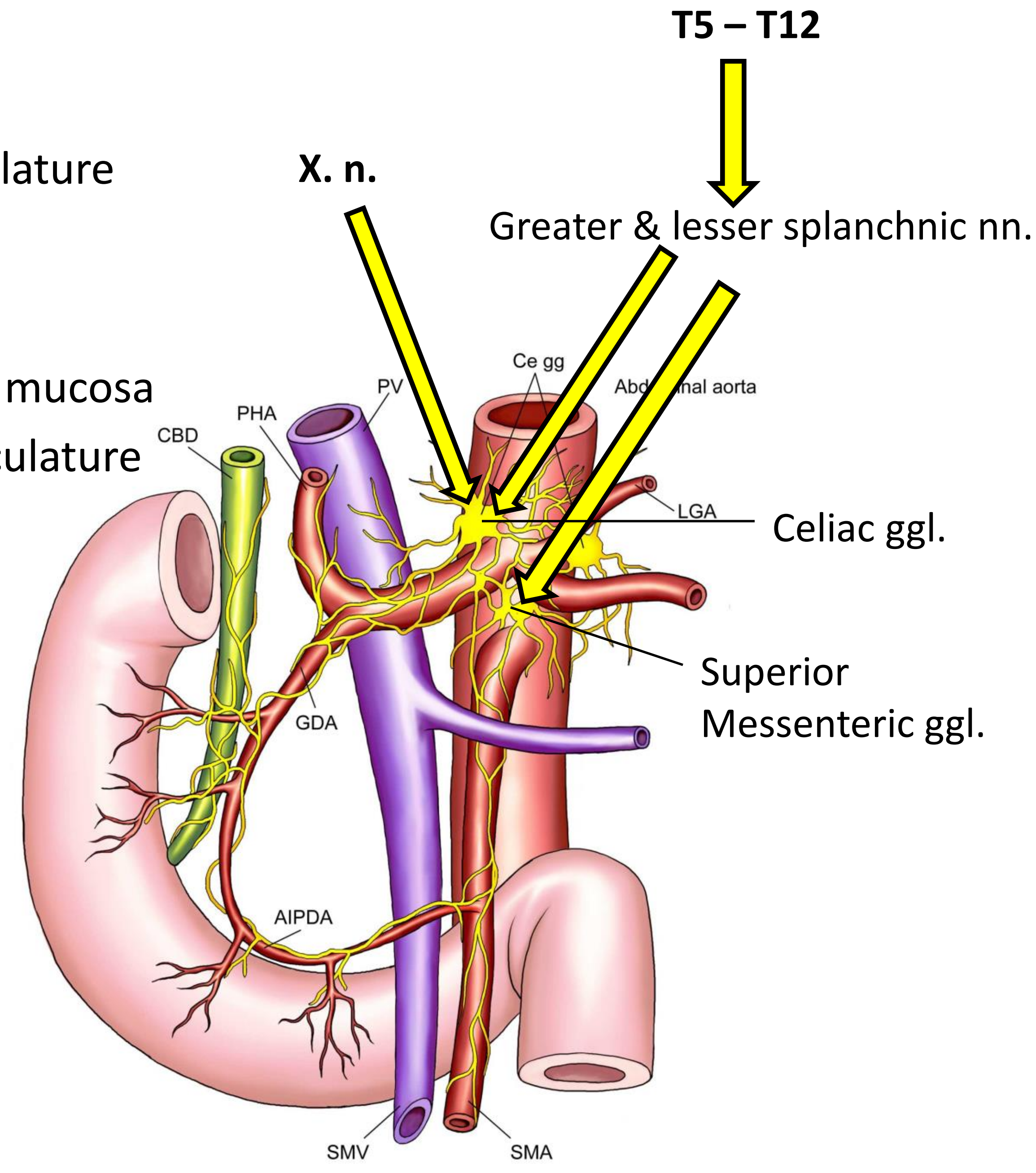

Superior pancreaticoduodenal nn. l.
Common hepatic nn. l.
Hepatoduodenal nn. l.
Suprapyloric nn. l.
Celiac nn. l.
Infrapyloric nn. l.
Superior messenteric nn. l.
Inferior pancreaticoduodenal nn. l.
Celiac Nodes
Hepatic Node
Lymph Nodes Around Common Hepatic Artery
Left Gastric Nodes
Para-Aortic Nodes
Left Superior Pancreatic Nodes
Retropyloric Nodes
Infrapyloric Nodes
Anterior Pancreaticoduodenal Nodes
Splenic Nodes
Inferior Pancreatic Body Nodes
Inferior Mesenteric Vein
Superior Mesenteric Nodes
Posterior Pancreaticoduodenal Nodes

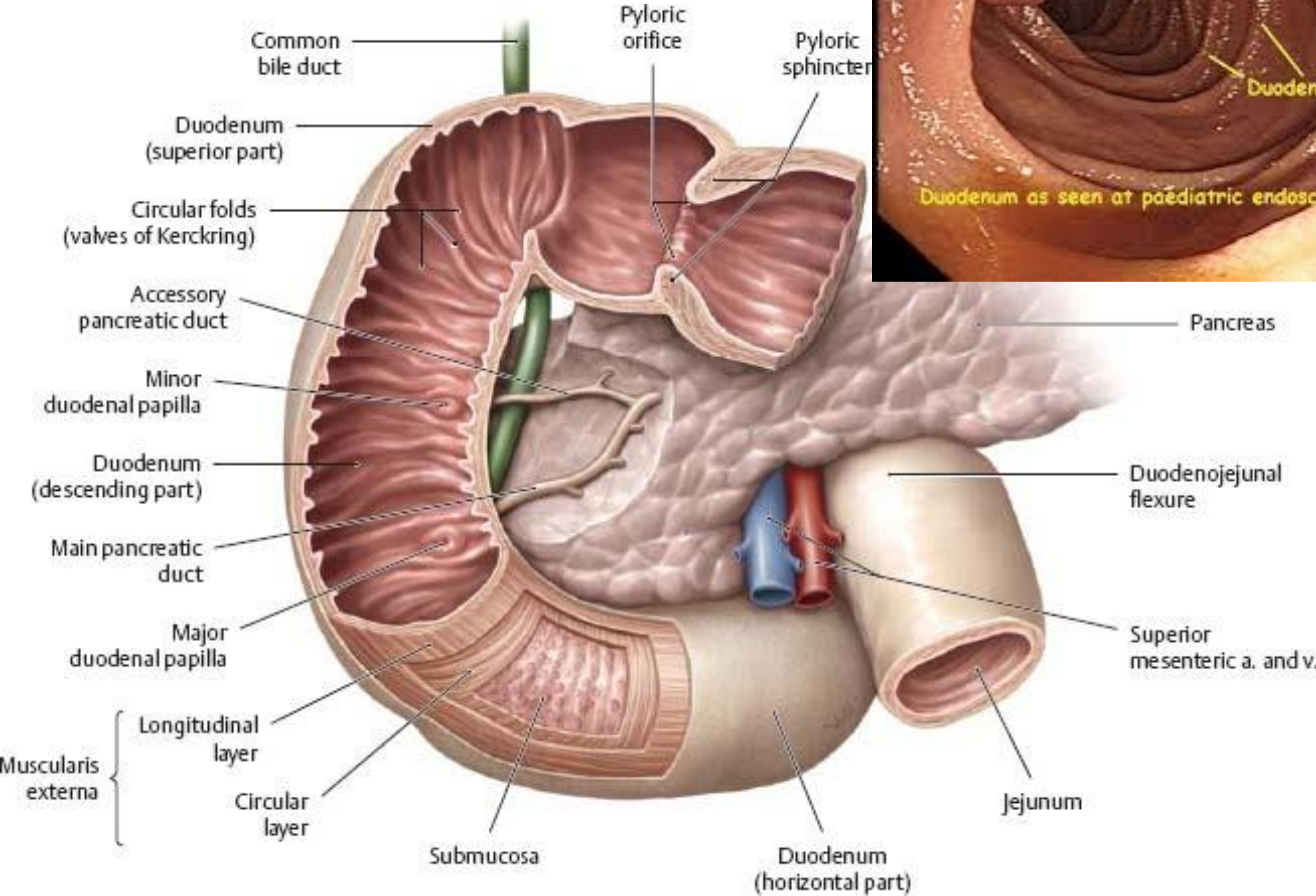
Sympathetic →

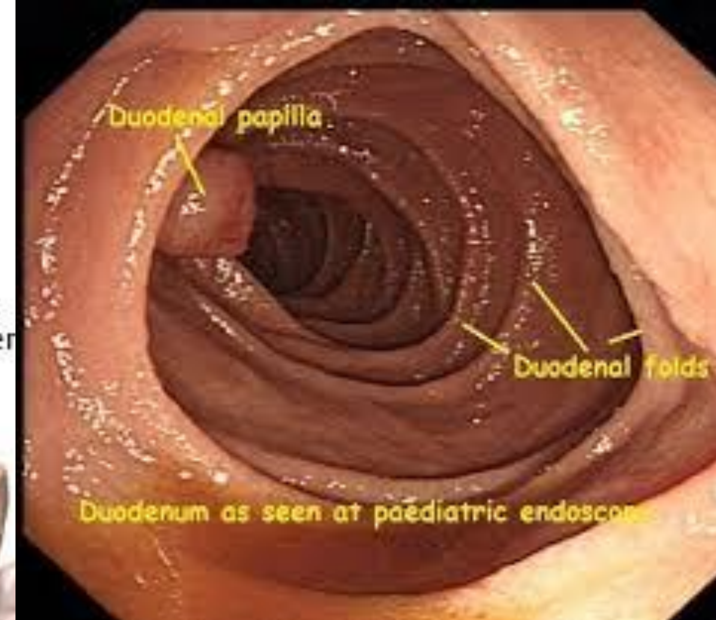
- Vasoconstriction
- Inhibits duodenum musculature

Parasympathetic →

- Secretomotor to duodenum mucosa
- Coordinate duodenum musculature

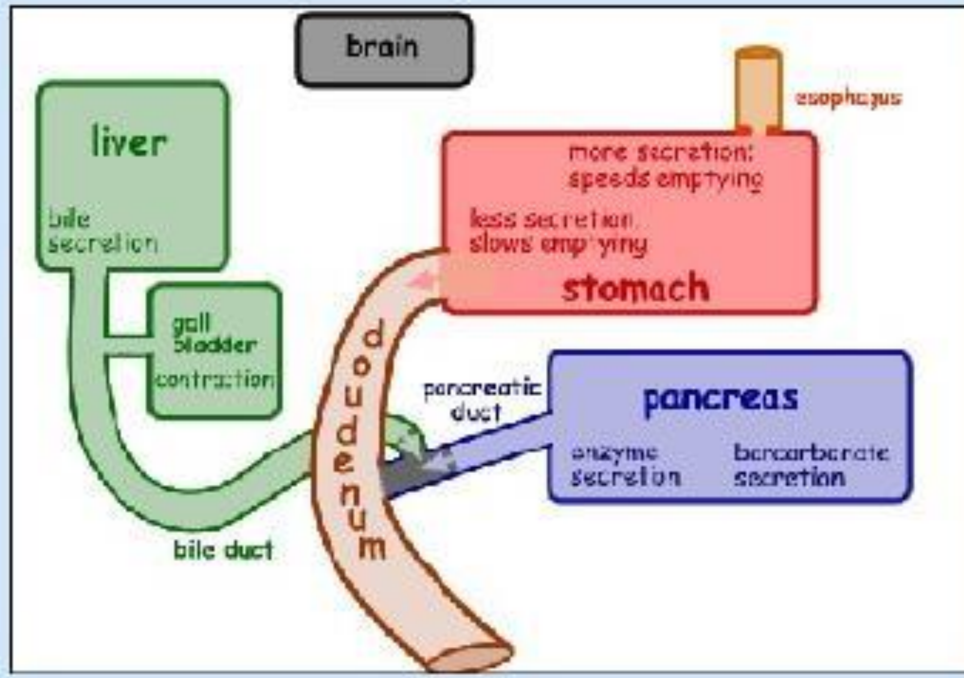



Common
bile duct
Pyloric
orifice
Pyloric
sphincte
Duodenum
(superior part)
Circular folds
(valves of Kerckring)
Accessory
pancreatic duct
Minor
duodenal papilla
Duodenum
(descending part)
Main pancreatic
duct
Major
duodenal papilla
Muscularis
externa
Longitudinal
layer
Circular
layer
Submucosa
Duodenum
(horizontal part)
Jejunum
Superior
mesenteric a. and v.
Duodenojejunal
flexure
Pancreas


Duodenal papilla
Duodenal folds
Duodenum as seen at paediatric endoscop

Function: 1) Enzyme secretion → breakdown of food

Secretions of the Duodenum

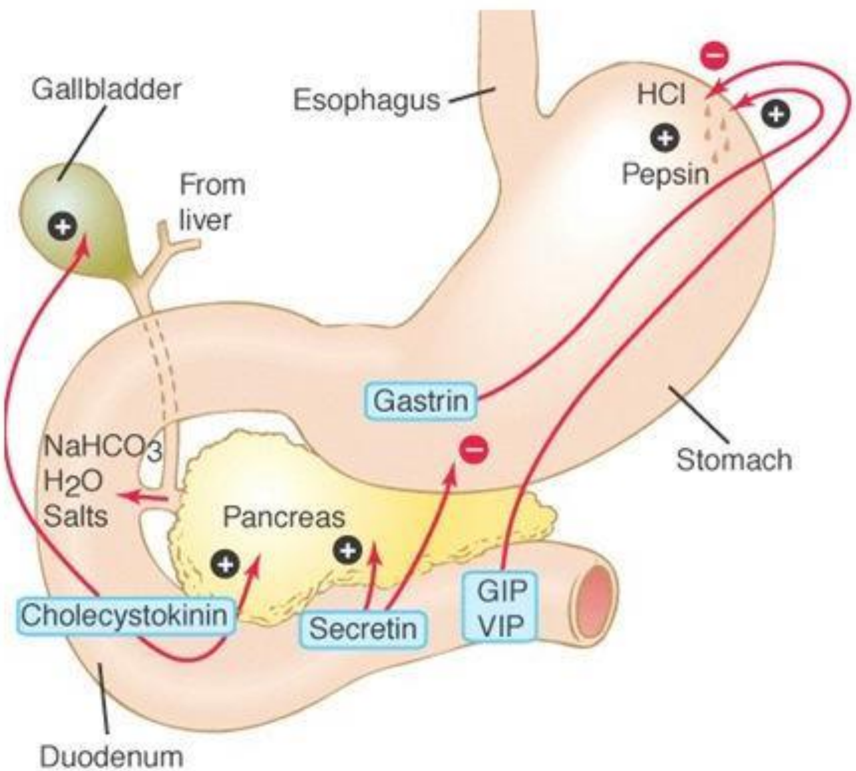


- Acid chyme from the stomach is combined with digestive juices from the pancreas, gallbladder, liver, and gland cells of the intestinal wall
- Hydrolytic enzymes from the pancreas are activated in the duodenum
- Bile is produced by the liver and secreted into the duodenum, aiding in fat digestion
- Digestive enzymes enter the duodenum from the epithelial lining

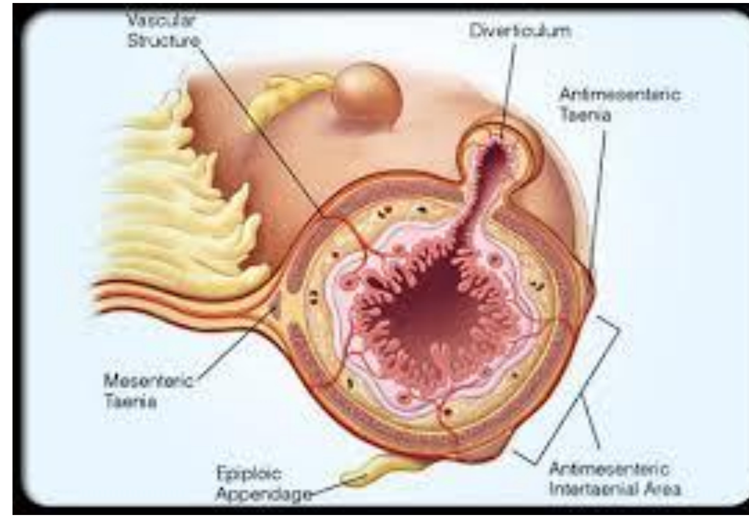
Function: 2) Hormonal regulation of gastric emptying

Gastric emptying - hormones

- Regulated by rate and composition of chyme entry into the duodenum



Duodenal divertiula

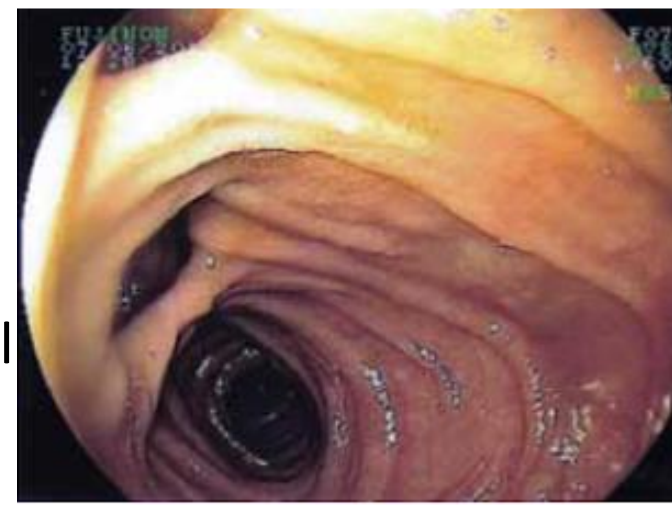


Divertiulum:

An outpouching of a hollow structure

Types:

- Congenital- contain duodenal wall layers.
- Acquired- protrusion of mucosa and submucosa through wall muscular defects.

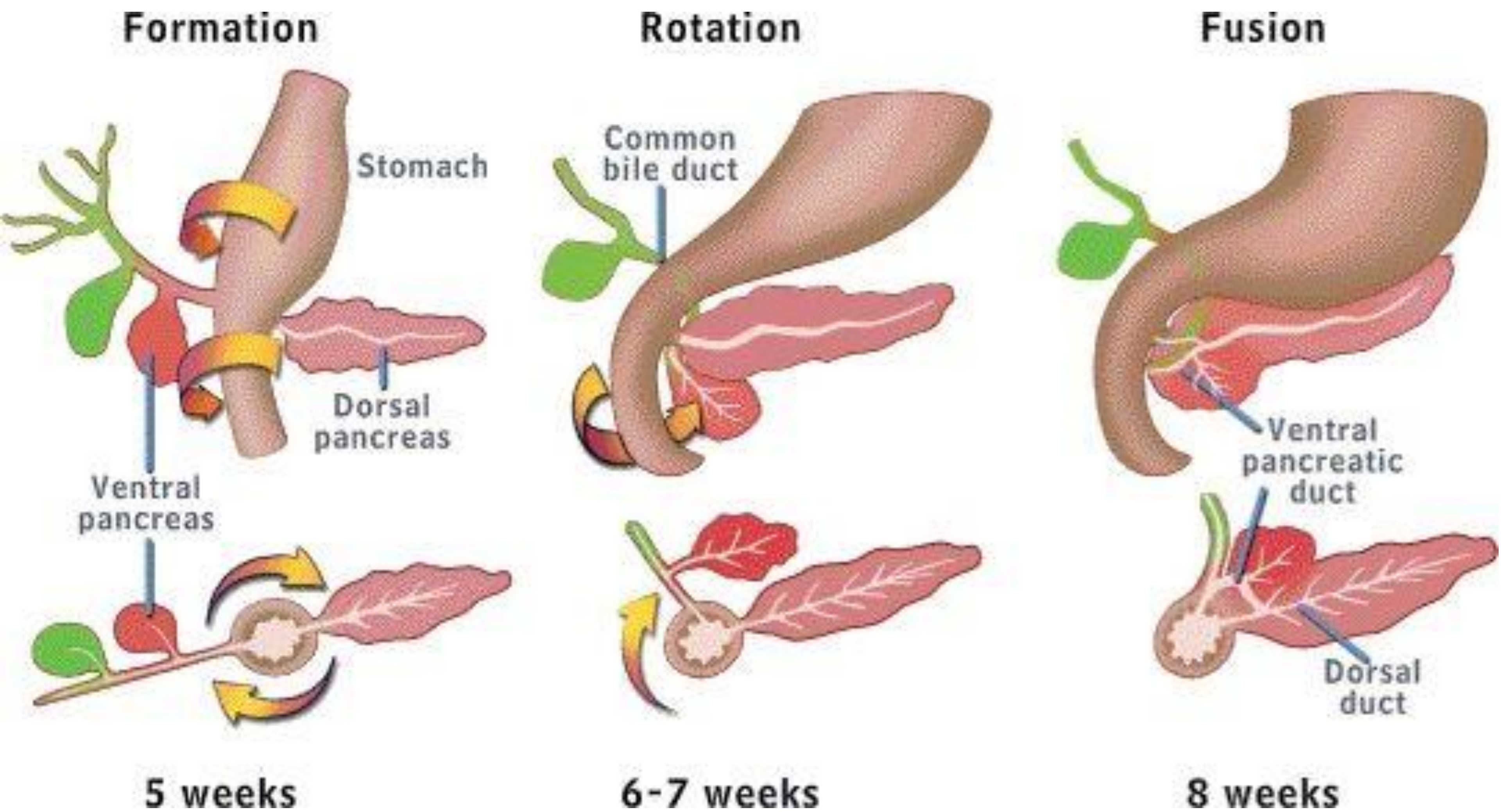


Typically location:

- Medial wall of the descending part.
- Close approximation to the major duodenal papilla.
- Mostly asymptomatic but can cause complications

Duodenum organogenesis

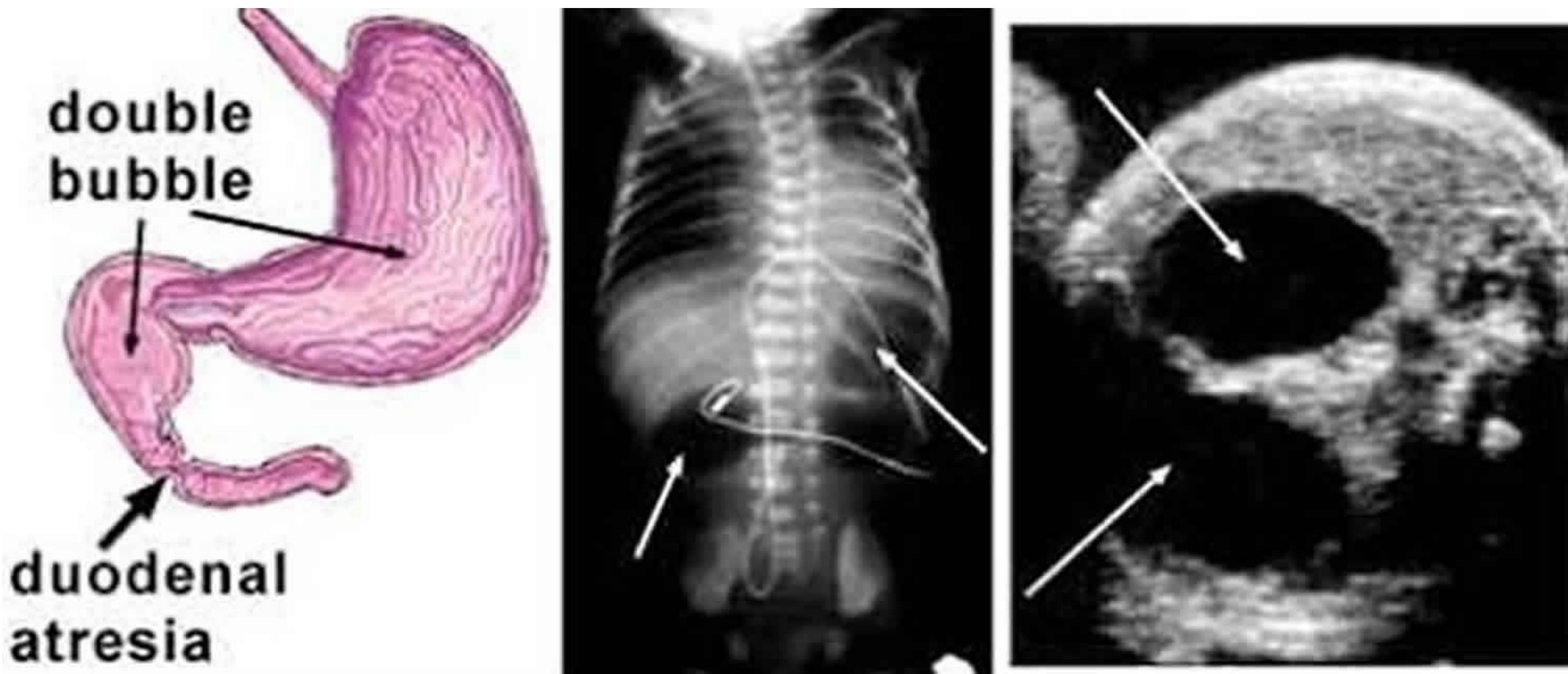
Rotation forms a loop directed to the right with its original right site now adjacent to the posterior abdominal wall



Congenital Defects

Duodenal atresia: absence or complete closure of a portion of the lumen of the **duodenum**.

→ obstruction → fluid enlargement in stomach & proximal duadenum



Small intestine “*Intestinum tenue*”

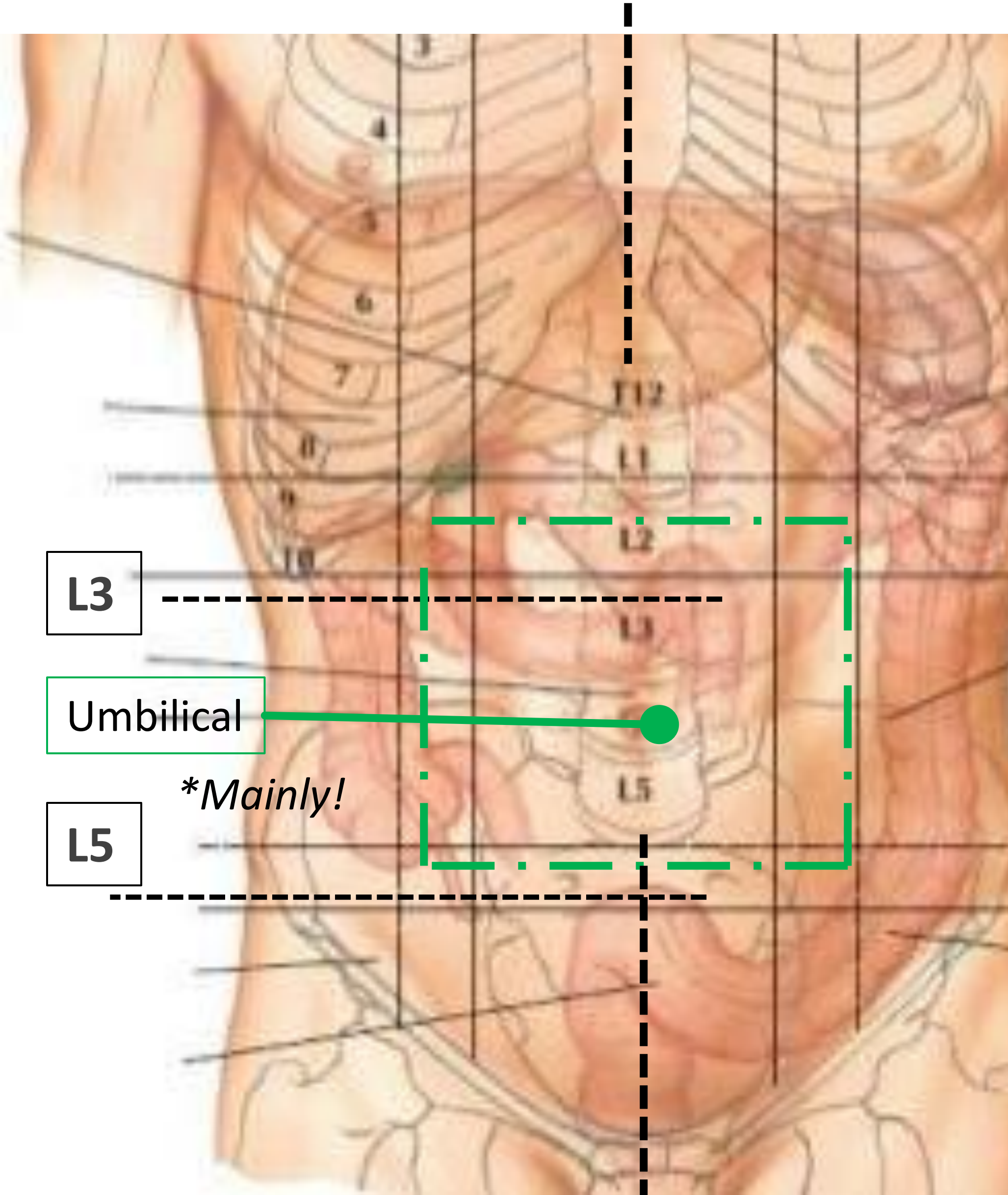
Jejunum “*Jejunum* ”

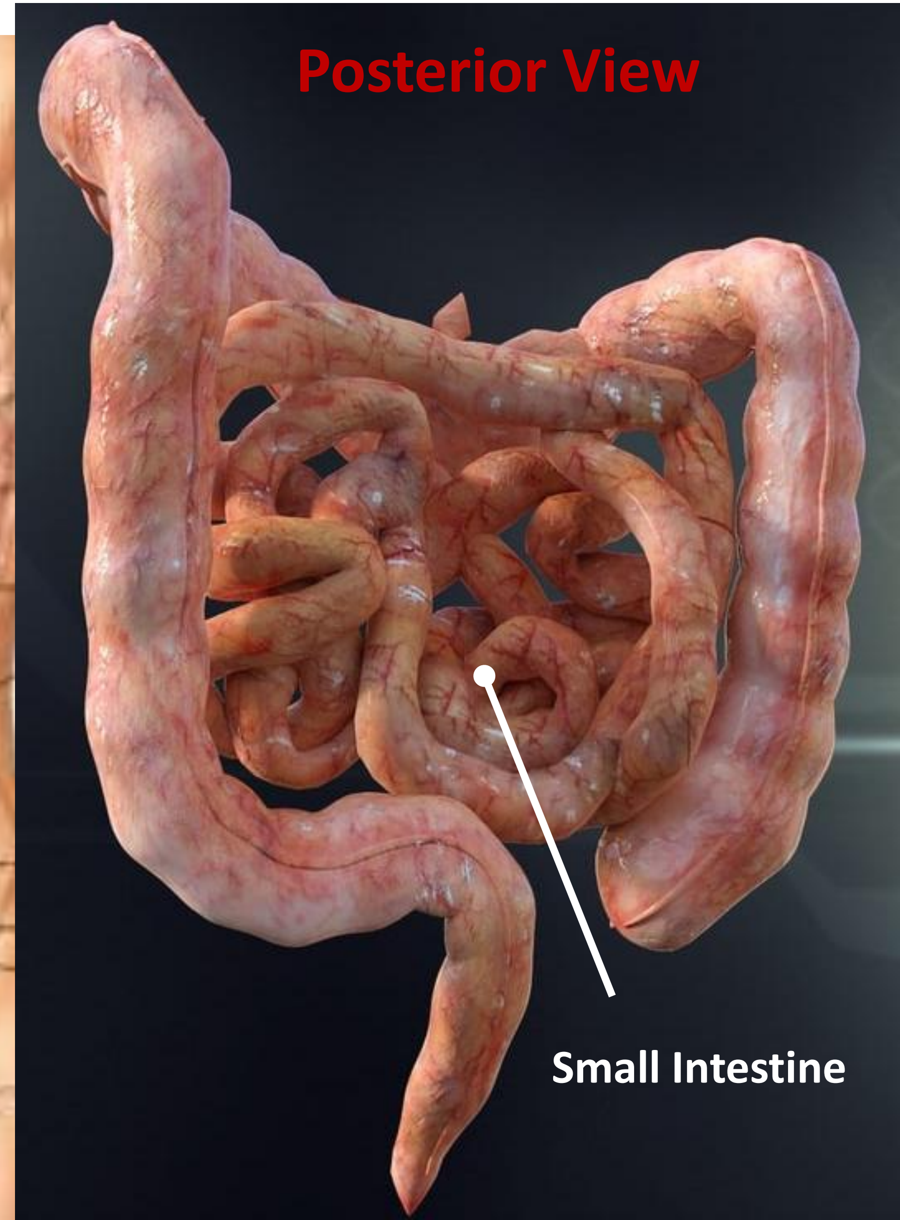
&

Ileum “*Ileum* ”

3-8 m (5 m)

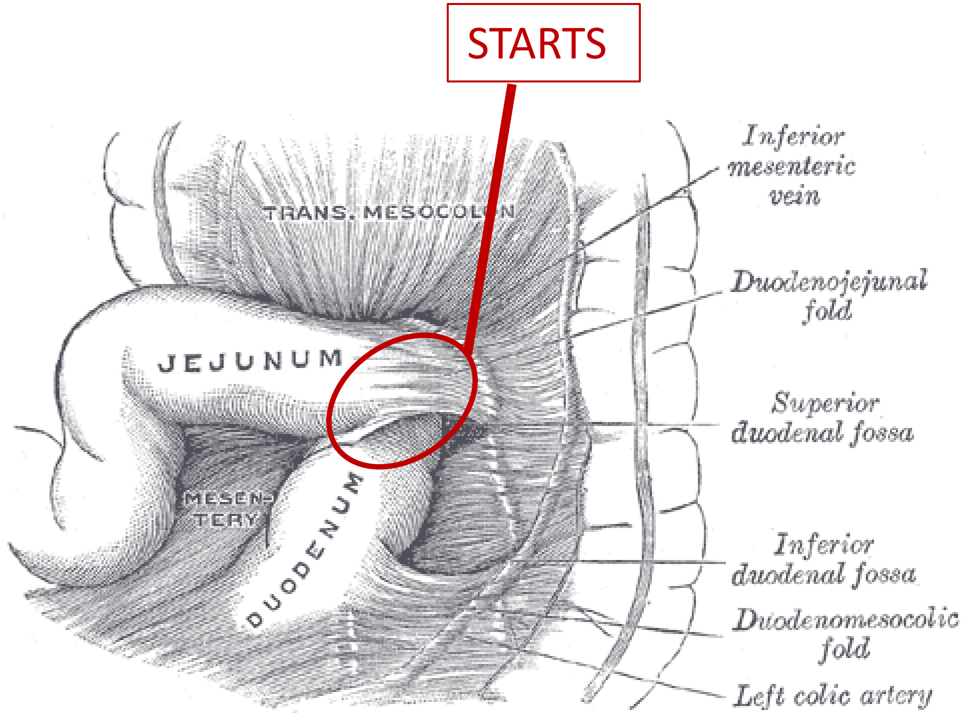
Proximal 2/5th – Jejunum → [gradual transition] → Distal 3/5th – Ileum





The jejunum

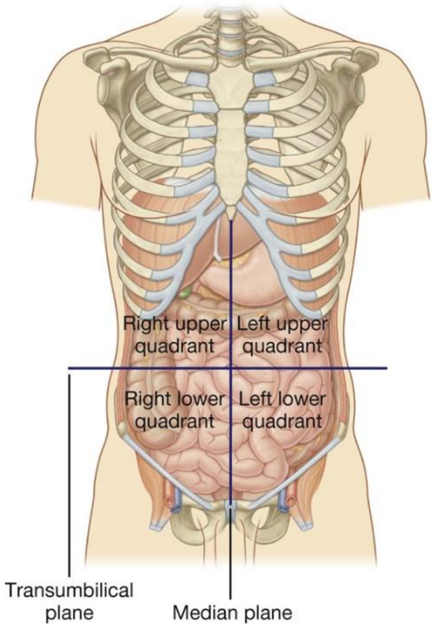
Duodenojejunal Junction:



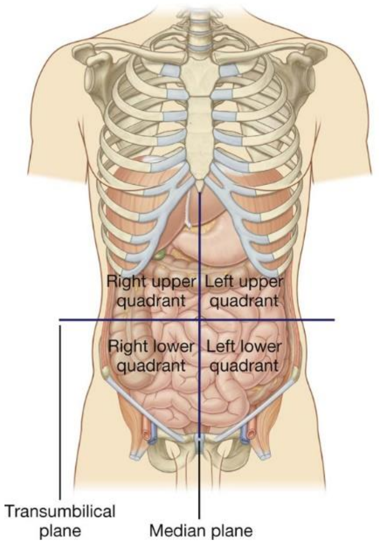
- External diameter = **4 cm**
- Internal diameter = **3 cm**

In supine Position

- It occupies the upper left infracolic compartment.
- Extending down to the umbilical region.
- The 1st two loops occupy the recess between the transverse mesocolon and the left kidney.

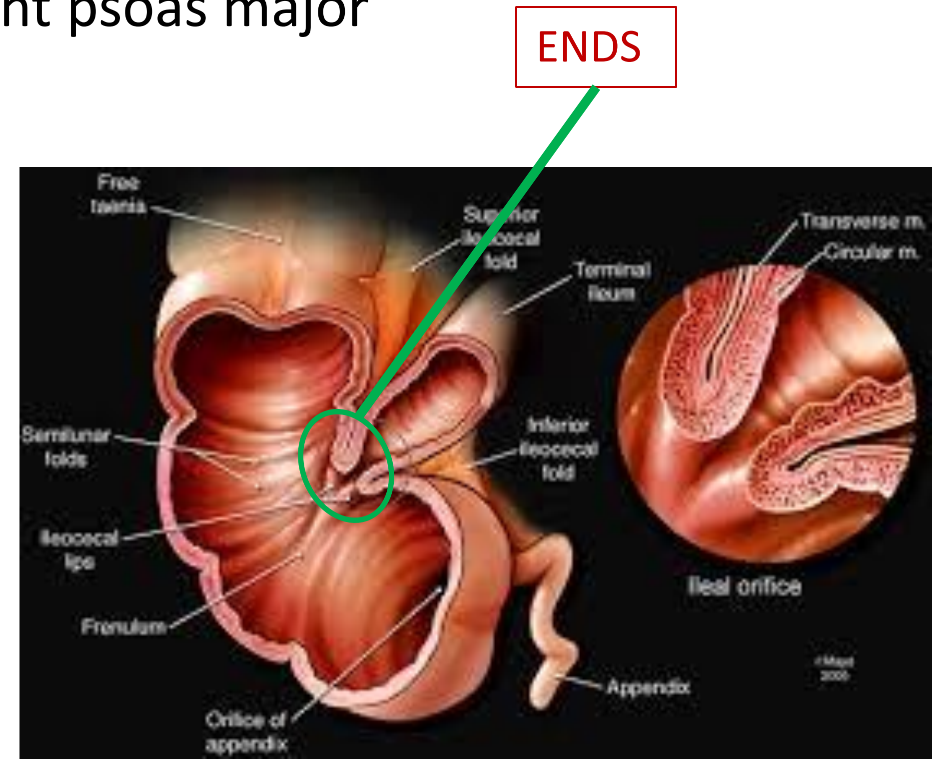


The Ileum



In supine Position

- It lies mainly in the hypogastric region and right iliac fossa.
- Terminal ileum (**last 30 cm**) frequently lies in the pelvis.
- Terminal ileum ascends over the right psoas major and right iliac vessels.

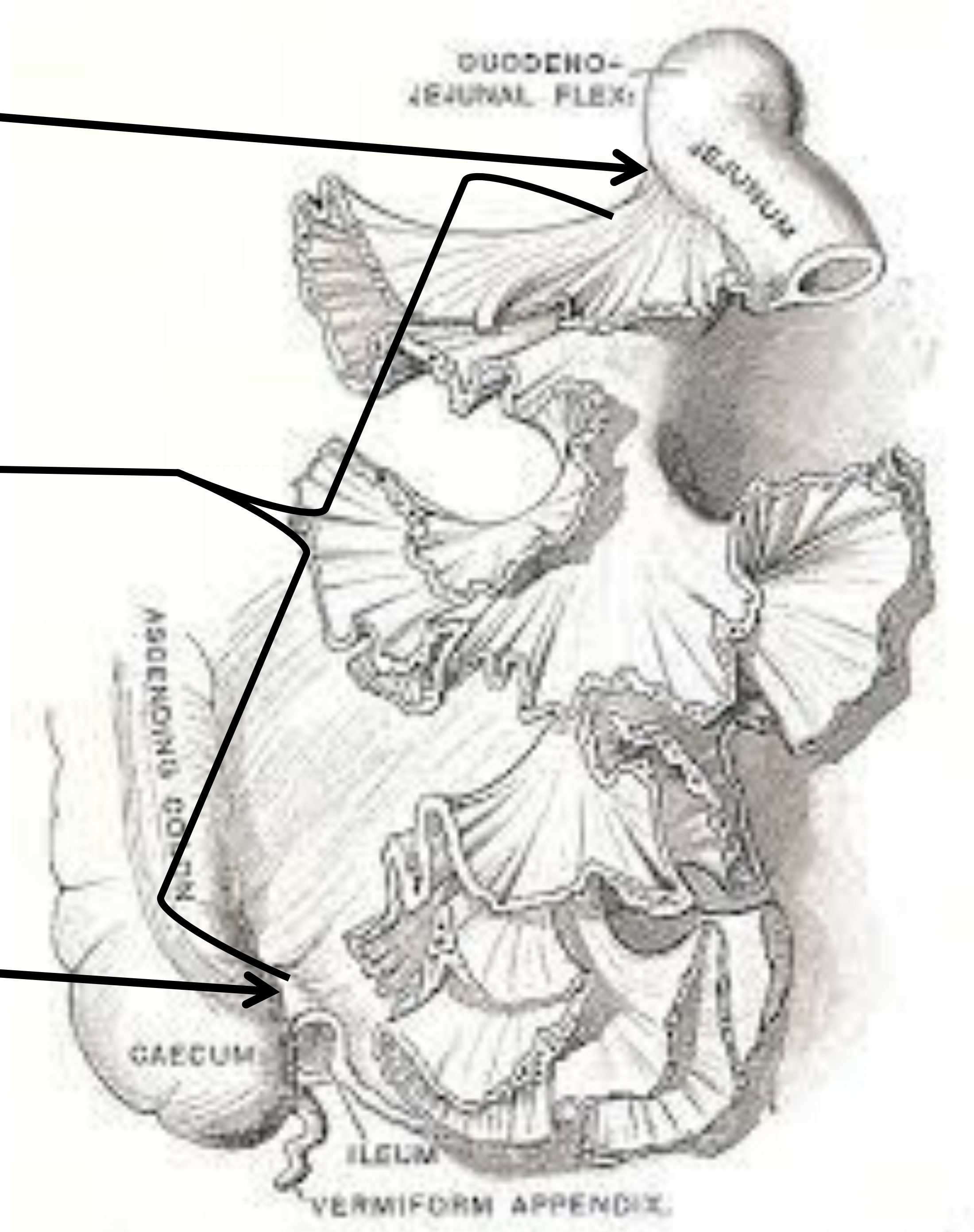


- External diameter = **3 cm**
- Internal diameter = **2.5 cm**

Ileocecal Junction:

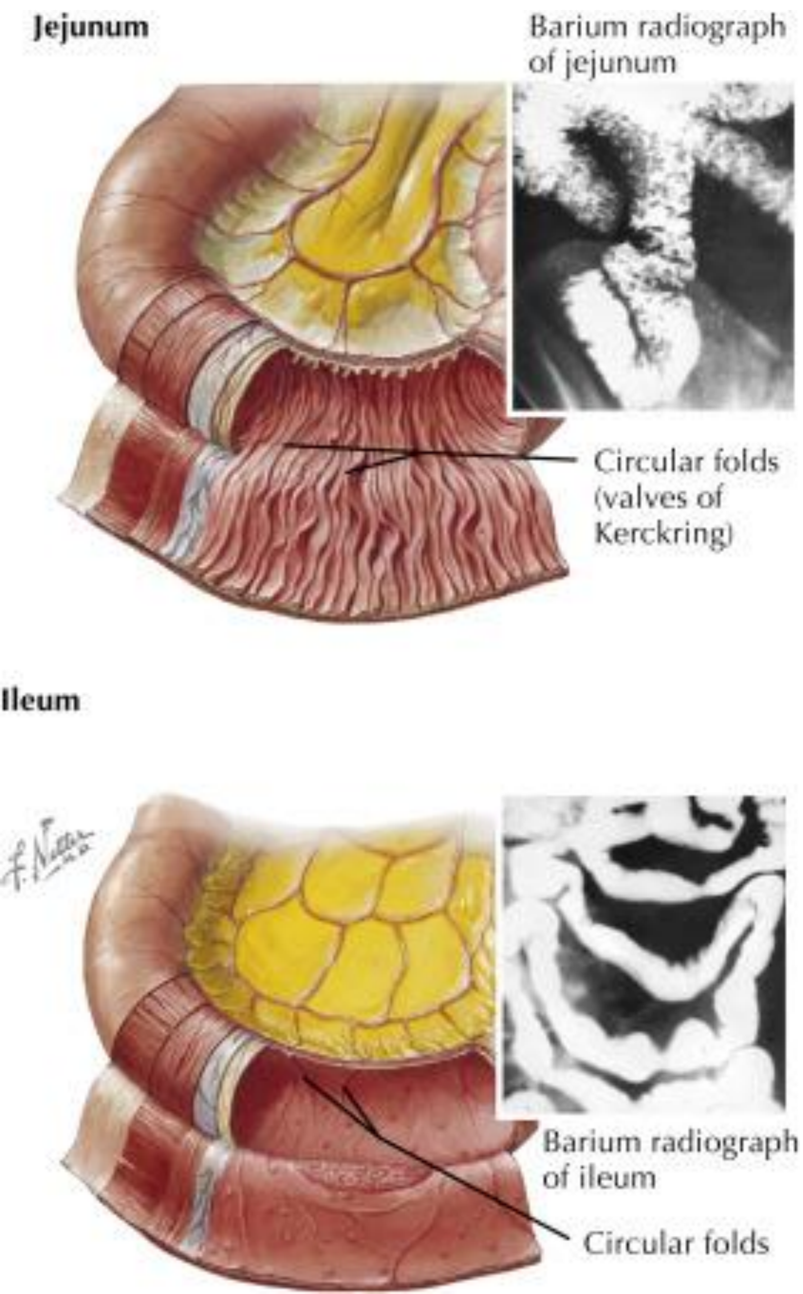
Proximal ttachment site at the Duodenojejunal Junction

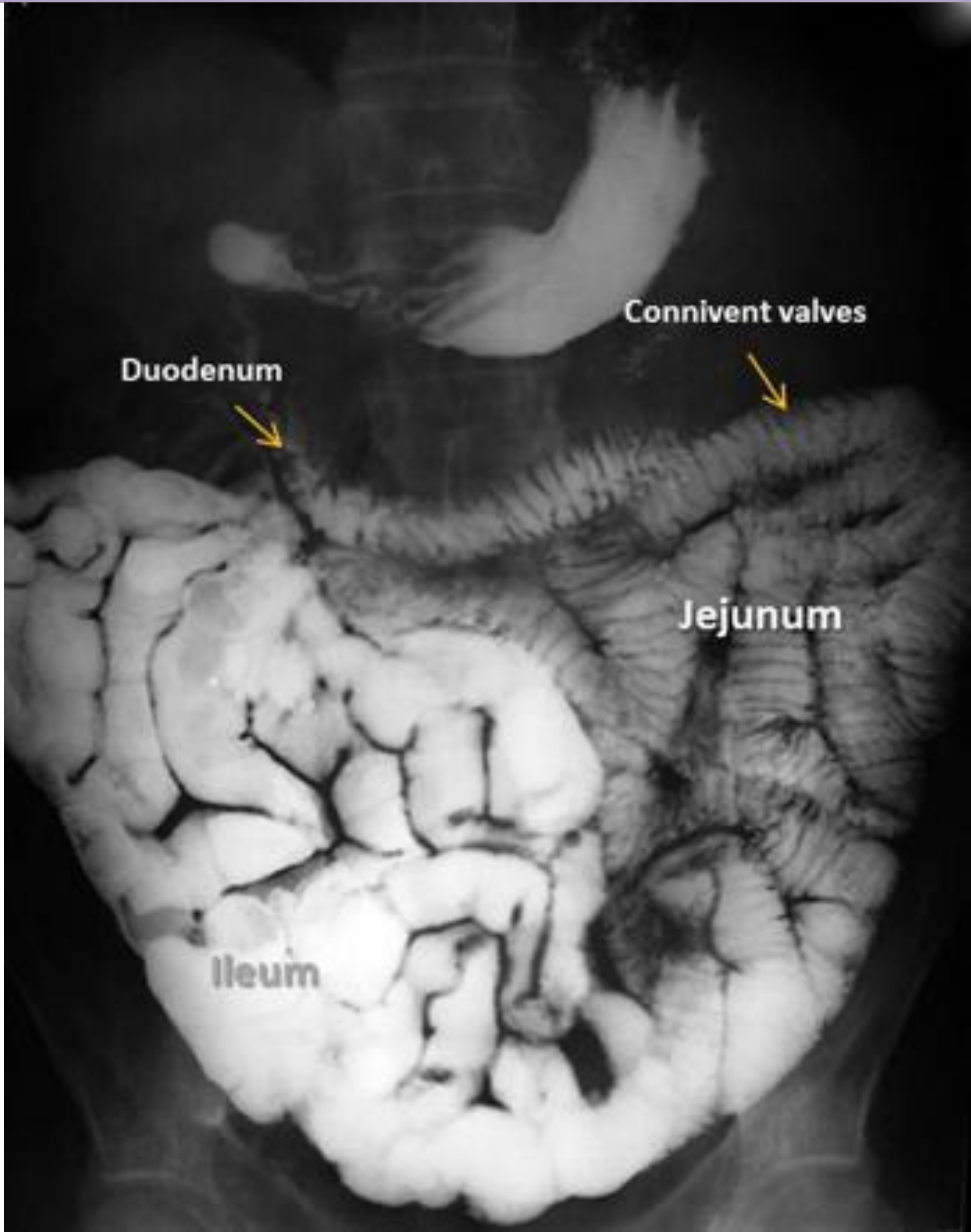
Root of Mesentery



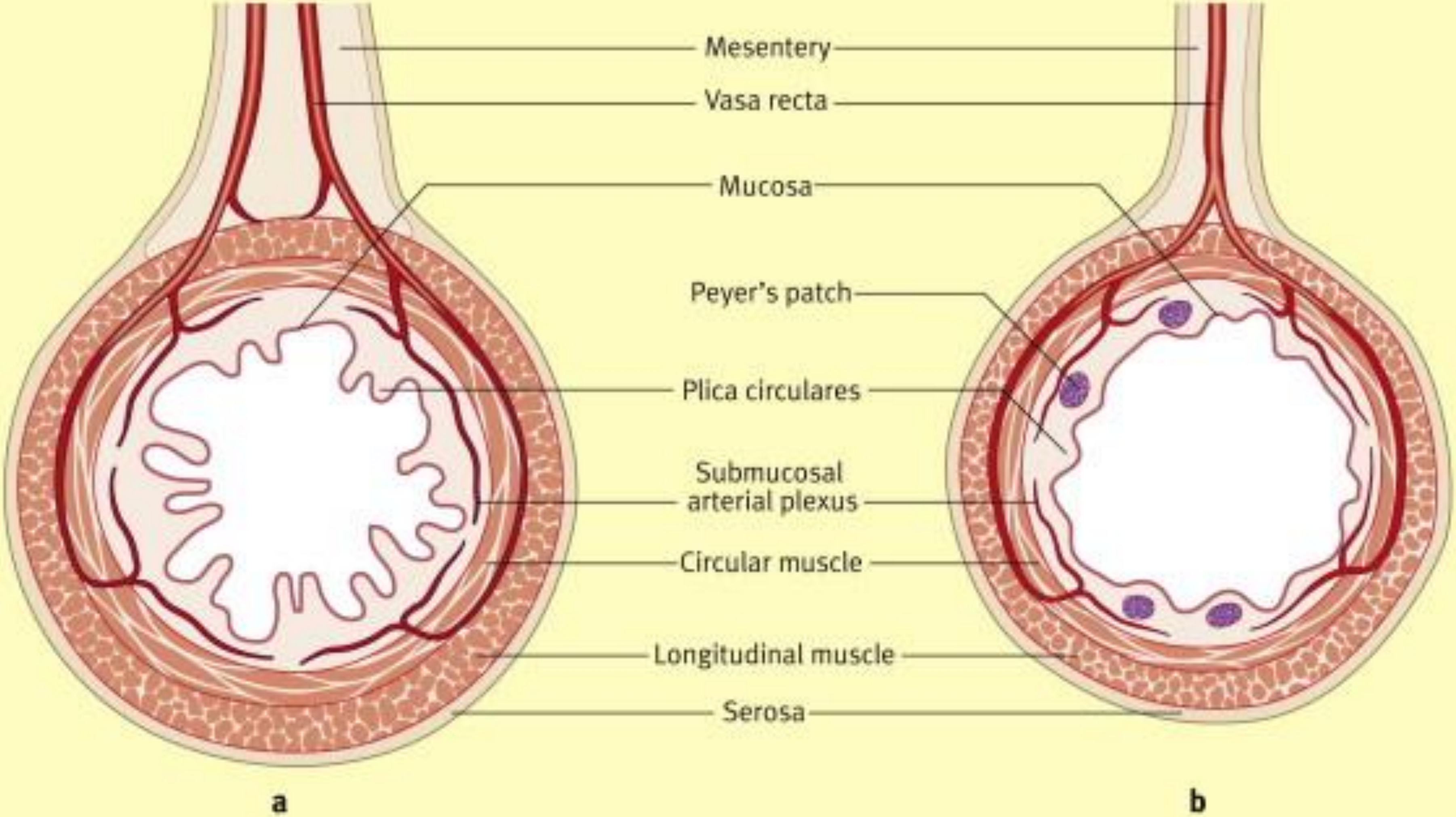
Distal attachment site at the Ileocecal Junction

Jejunum Vs Ileum





Jejunum Vs Ileum

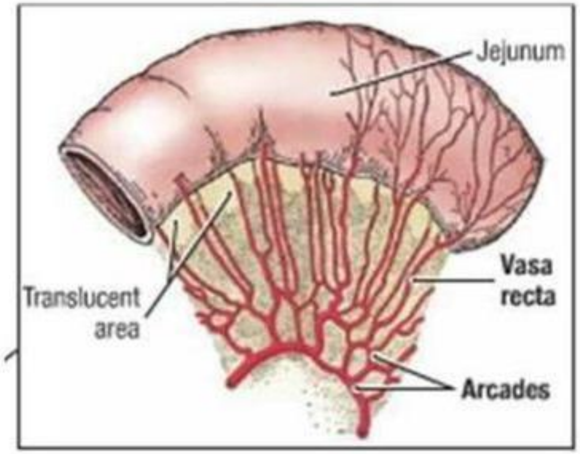


Proximal Jejunum **Distal Ileum**

Jejunum Vs Ileum

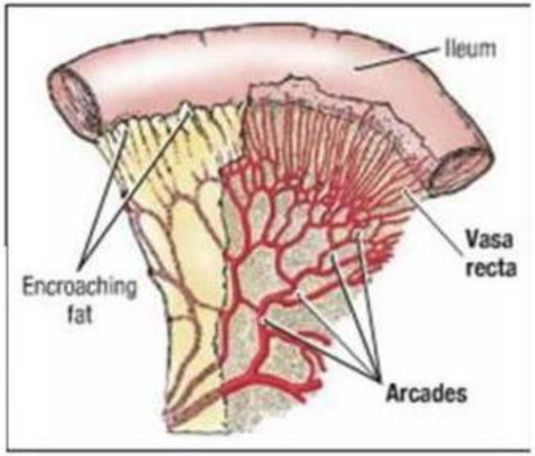
Jejunum

Jejunum

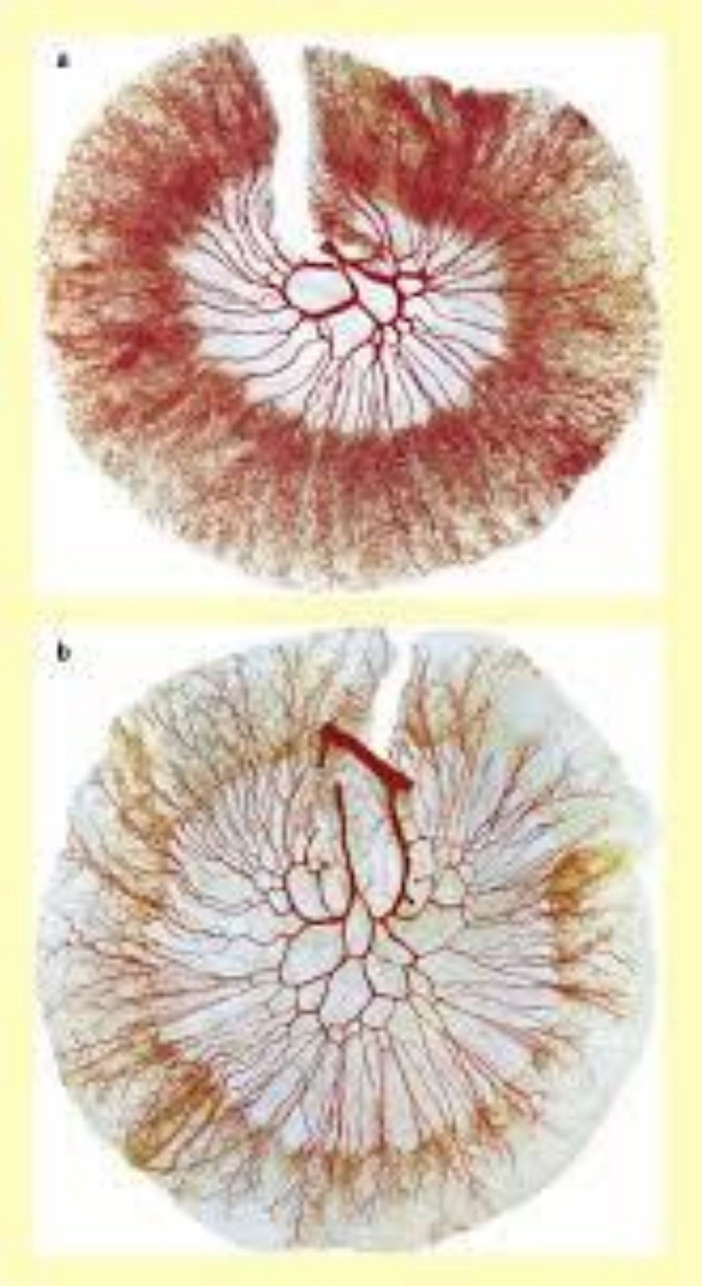


- Less complex arterial arcades
- Longer Vasa Recta
- More plicae circulares, thicker, more highly folded
- No fat in mesentery

Ileum

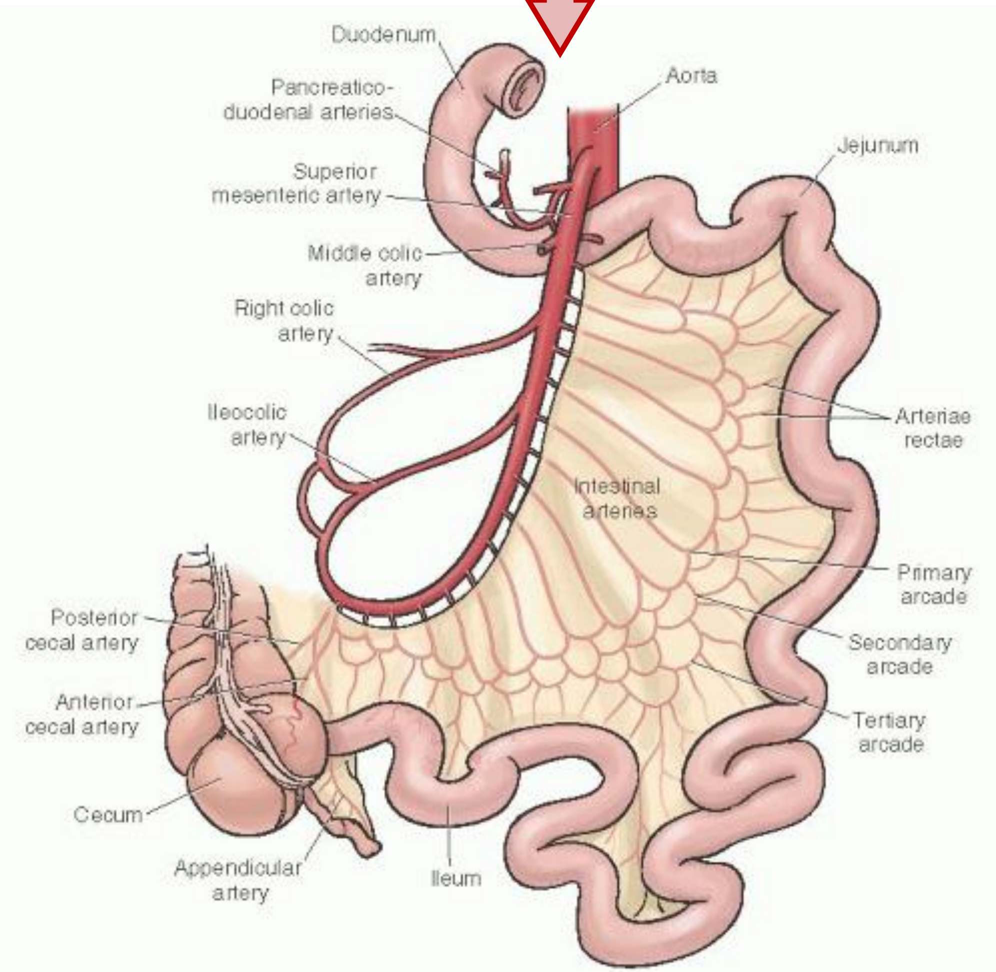


- More complex arterial arcades
- Shorter Vasa Recta
- Less plicae circulares, thinner less folded
- Fat present in mesentery



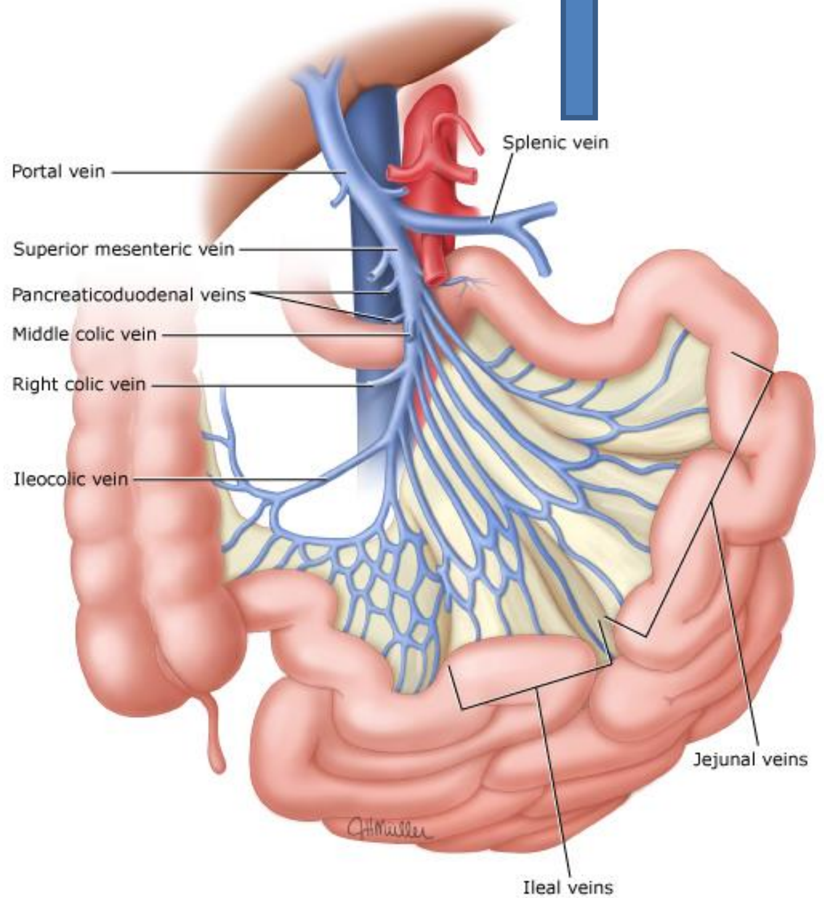
Ileum

Superior messenteric a.



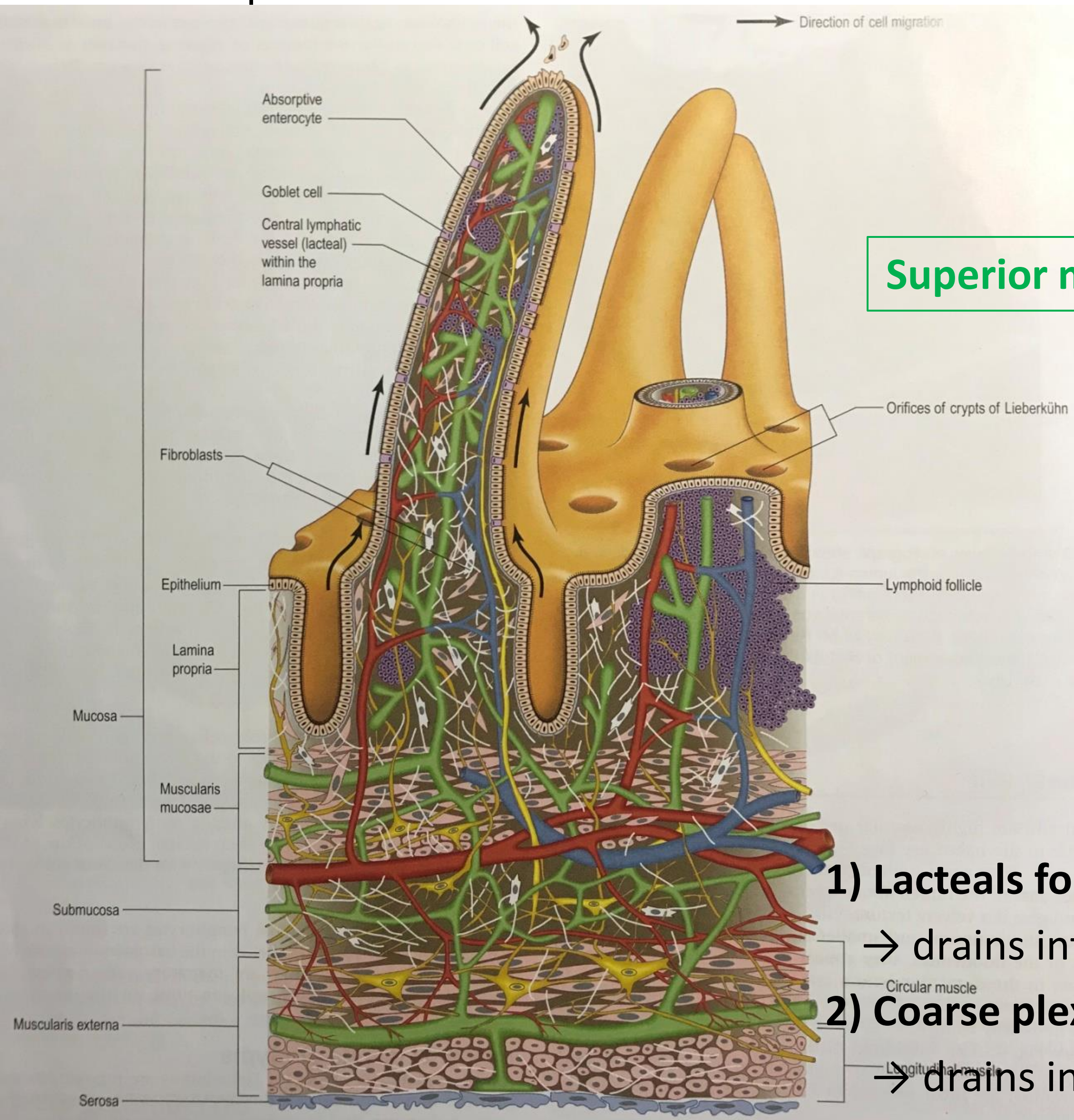
Portal vein

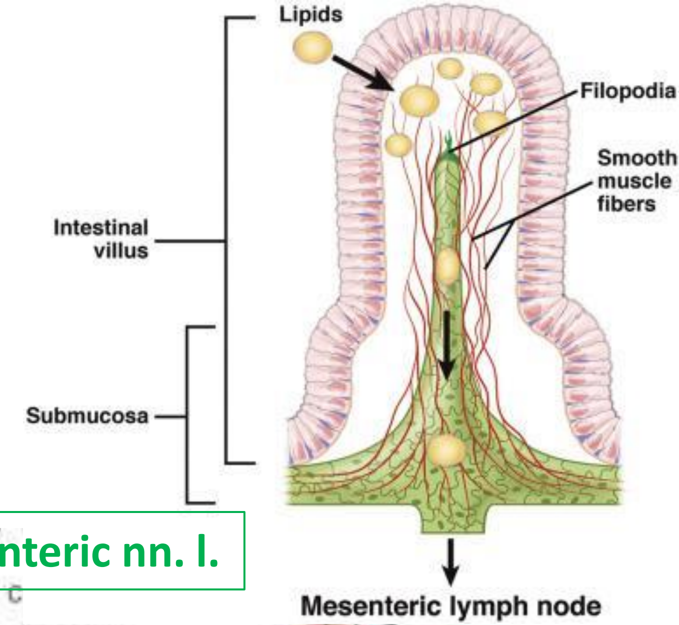
Superior messenteric v.



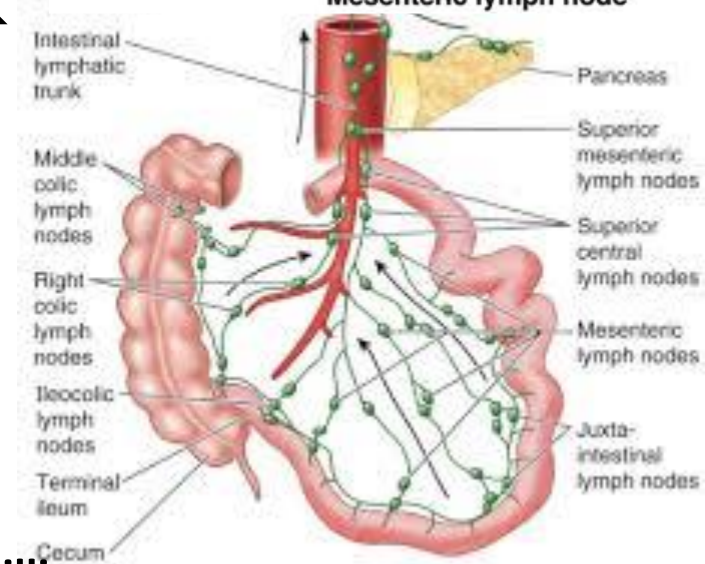
Lymphatic system additional function in the intestine:

- ➢Transports dietary fat and fat-soluble vitamins
- ➢Regulate tissue fluid homeostasis
- ➢Participate in immune surveillance





Superior messenteric nn. l.



1) Lacteals form villi

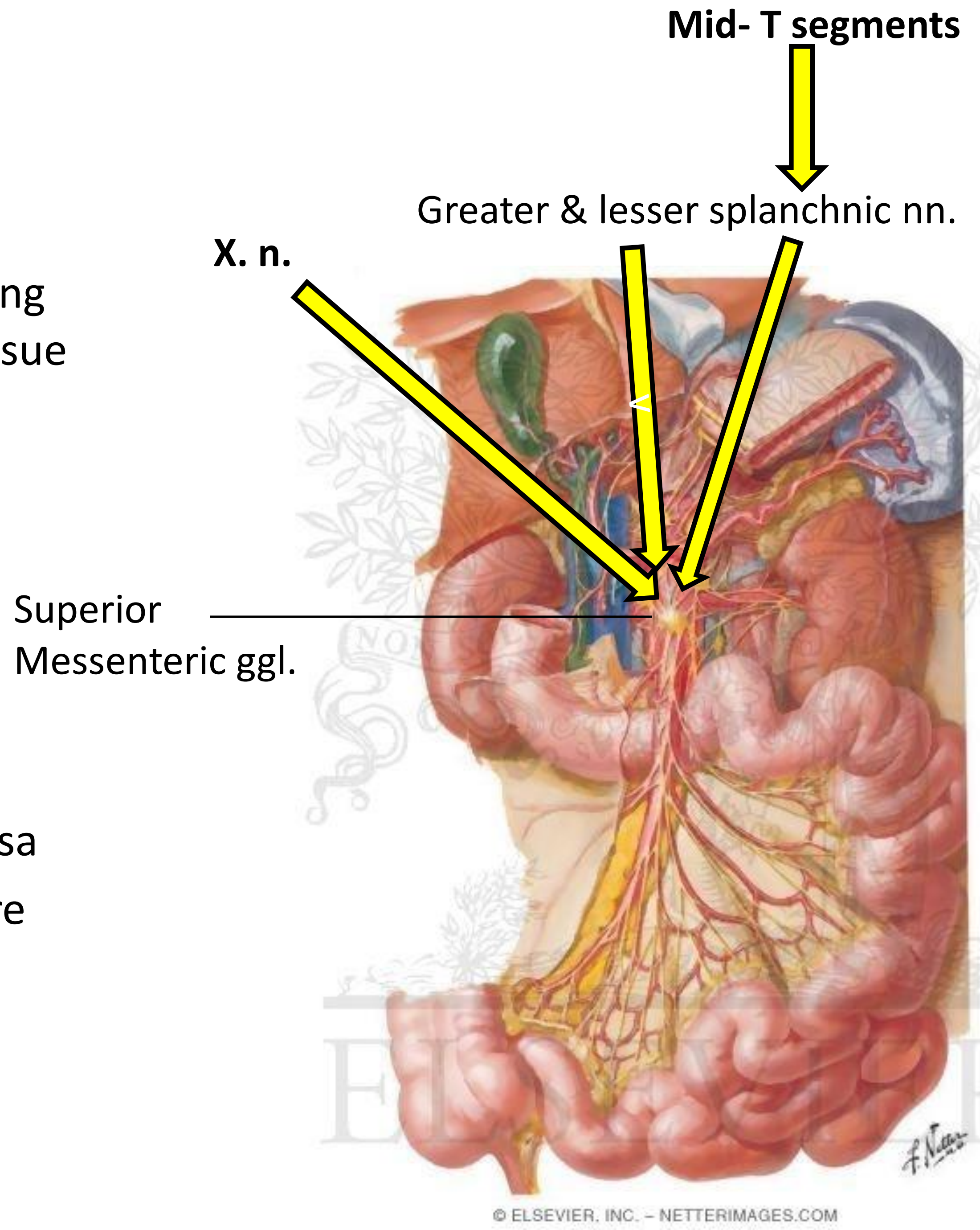
→ drains into lymphatics of the submucosa

2) Coarse plexus

→ drains into lymphatics of the muscularis externa

Sympathetic →

- Vasoconstriction
- Inhibits intestinal musculature
- Imunomodulatory role influencing mucosa-associated lymphoid tissue



Parasympathetic →

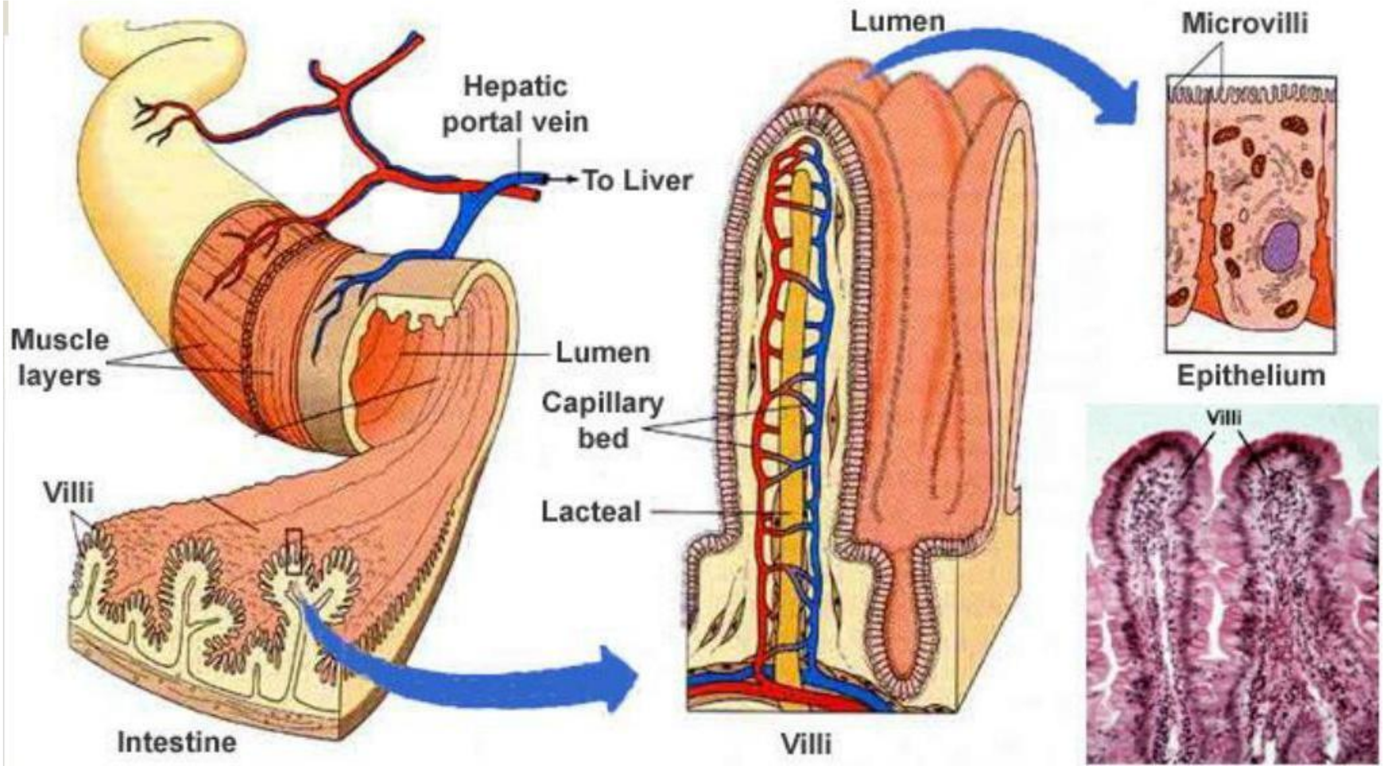
- Secretomotor to intestinal mucosa
- Coordinate intestinal musculature

Circular Folds: ↑ absorptive surface area & Enhance mechanical segmentation .

- Large folds of up to 8 mm in depth alternate with smaller ones.
- Begin to appear 2.5 – 5 cm post-pylorus .
- Relatively larger and closer together in distal duodenum and proximal jejunum.
- Diminish in size gradually until they disappear completely in the terminal ileum.

Intestinal Villi: highly vascular projection that ↑ absorptive surface area.

- Density = 10 – 40 / mm^2, Hieght = 0.5 – 1.0 mm
- Broad ridges numerous in duodenum and proximal jejunum, gradually decrease in number and shorten to finger-like form in distal jejunum and ileum.



Intestinal Motility ↔ peristaltic conraction

**Video demonstration*:

https://www.youtube.com/watch?app=desktop&v=hKQ8eFpUKLs

Main Function: 1) Digestion

- Transient Time of semi-liguified ingested material = 4 hr (2 – 6 hr)
- Internal environment = pH 6 – 7.4 (weak acidic ↔ weak alkaline)
- Enzymes produced by the small intestine:
  - **Maltase** → breakdown of carbohydrates
  - **Peptidase** → breakdown of proteins
  - **Sucrase** → breakdown of carbohydrates
  - **Lactase** → breakdown of dairy carbohydrates [common Enzyme deficiency → lactose intolerance]
- Enzymes released in the small intestine (Produced by the pancreas):
  - **Pancreatic amylase** → breakdown of carbohydrates
  - **Trypsin** → breakdown of proteins
  - **Lipase** → breakdown of lipids
- Other carbohydrates pass undigested into the large intestine and further handling by intestinal bacteria (normal flora).

Main Function: 2) Absorption

Majority of nutrients are absorbed in the jejunum, with the following notable exceptions:

- **Iron** ← duodenum.
- **Folate (Vitamin B9)** ← duodenum and jejunum.
- **Vitamin B12** ← terminal ileum.
- **Bile salts** ← terminal ileum.

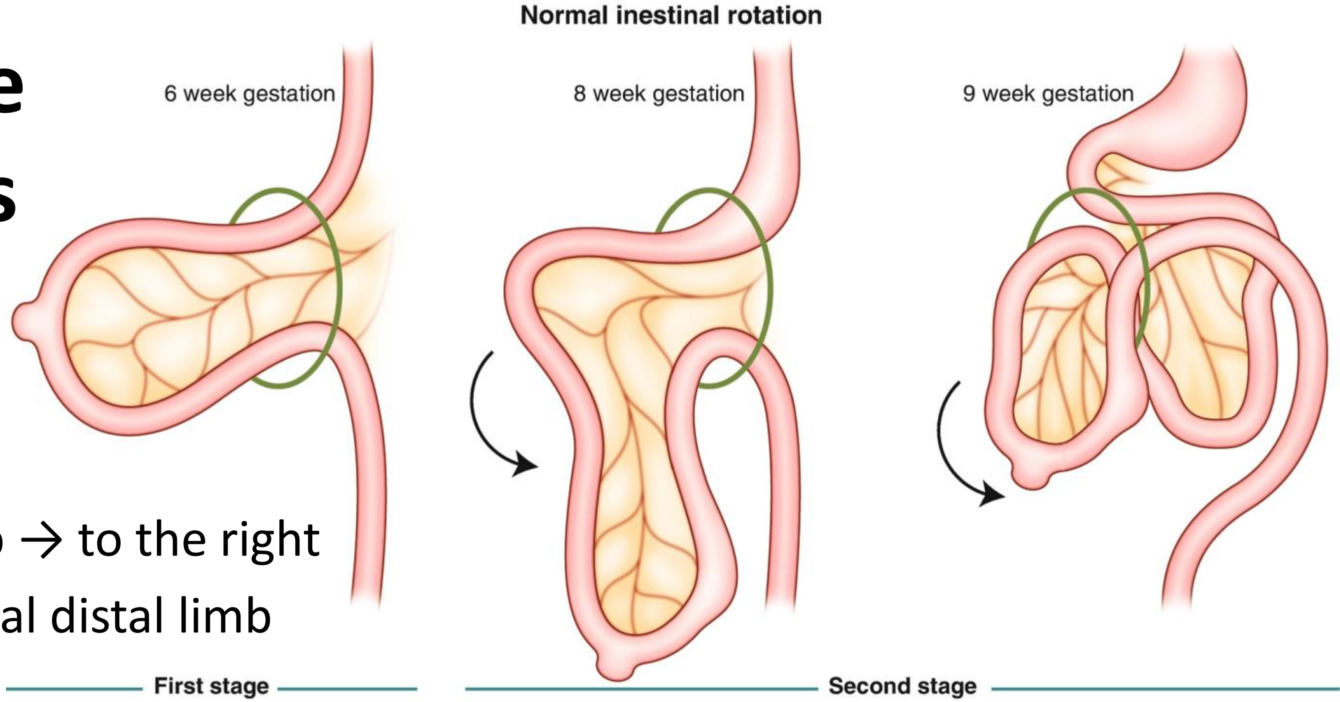
Means of physical absorption

- **Water-sloubles** → by osmosis
- **Lipids-sloubles** → by passive diffusion throughout the lymphatic channels.

Malabsorption: abnormality in absorption of food nutrients across the GIT.

→ State of malnutrition → anemias and growth delay

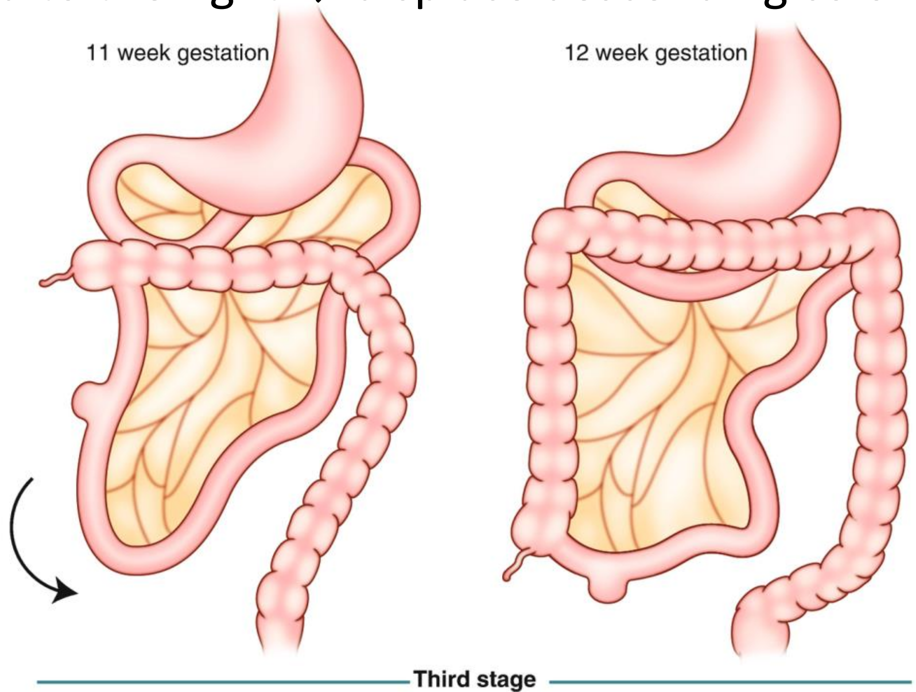
Small intestine organogenesis



Original proximal limb → to the right

To the left ← Original distal limb

Coils of jejunum & ileum → inward to the right → displace descending colon to the left



Congenital Anomalies

Malrotations of the Midgut

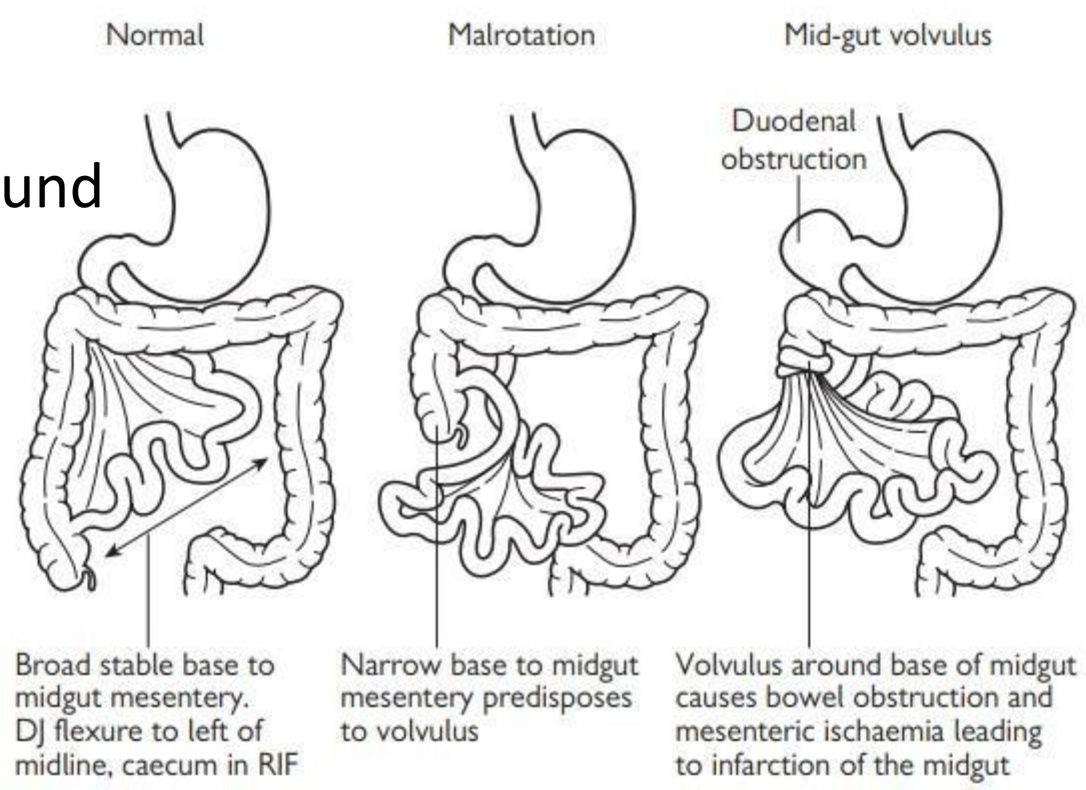
Occur when the midgut does not rotate normally as it retracts into the abdominal cavity.

→ presents as intestinal obstruction shortly after birth.

predisposes the infant to a **volvulus:** wherein the intestines bind and twist around a short mesentery.

→ block blood supply to a section of the intestines

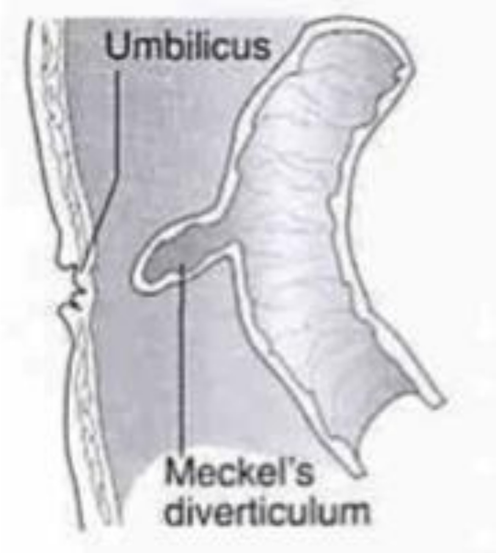
→ necrosis and gangrene.



Congenital Anomalies

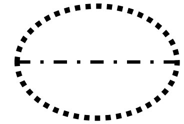
Meckel's Diverticulum (Ileum Diverticulum)

- 2-3%
- Remnant of the proximal part of the vitellointestinal duct.
- Projects from the anitmesenteric border of the terminal ileum.
- Commonly located 50-100cm from iliocecal junction.
- 2-5cm in adult patients.
- The apex is free but can connect to the umbilicus → congenital hernia
- Usually symptomatic but can get inflamed and consequently gangrenous.

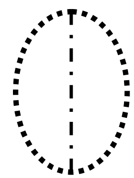


Neonatal Small Intestine

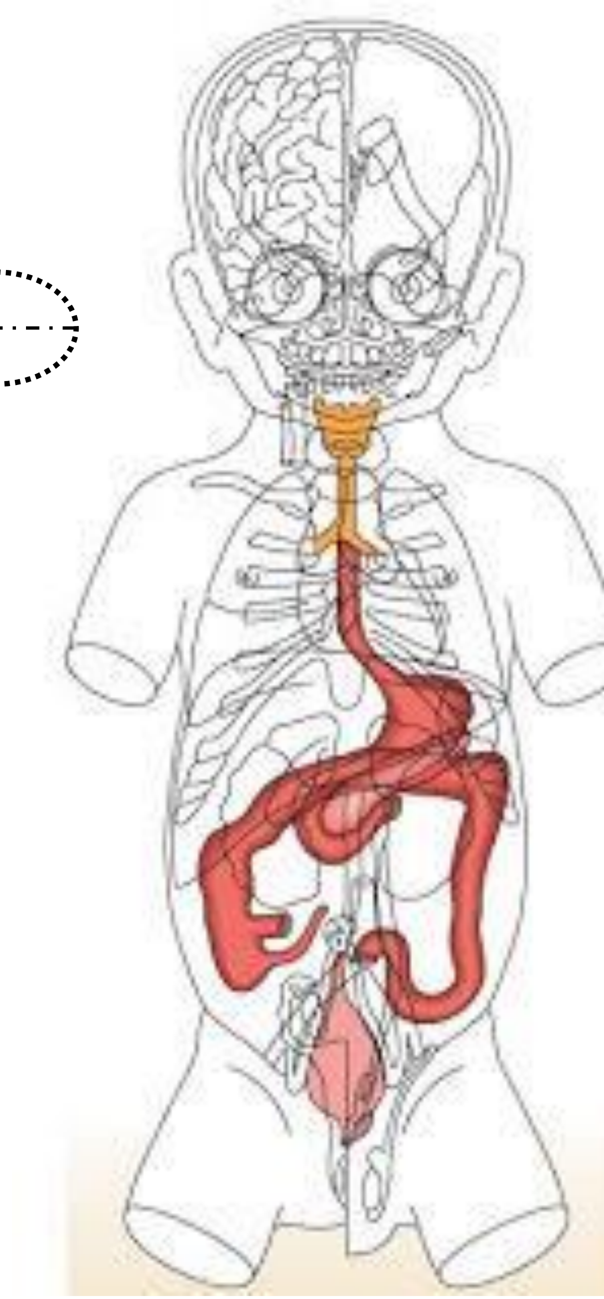
- Oval-shaped mass (greater diameter is horizontal)



Vs in adult (greater diameter is vertical)



- Compressed inferiorly by the urinary bladder
- 300 – 350 cm long; 1-1.5 cm width when empty.
- There are few or no circular folds.
- Little fat in the mesentery.



Key notes summary

- ✓ Overview of the anatomical development of the **primitive gut**.
- ✓ The topographical **position** of GIT organs and its starting to ending sites.
- ✓ Subparts and **divisions** of the GIT organs.
- ✓ **Ligament fixation** of the GIT organs in their anatomical position.
- ✓ **Syntopy** of the GIT organs.
- ✓ **Arterial blood supply** of the GIT organs.
- ✓ **Venous blood drainage** of the GIT organs.
- ✓ Local **lymphatic drainage** of the GIT organs.
- ✓ **Innervation** of the GIT organs and its autonomic nervous system coordination.
- ✓ Microscopic anatomy of the **GIT layers**.
- ✓ **Functional anatomy** of the GIT organs and its **basic anatomical dysfunctional defects**.
- ✓ **GIT organogenesis and maturation** into neonatal and adult form beside common anatomical **congenital defects**.

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