

# STOMACH AND ESOPHAGUS

Esophagus : completely muscular tube (25 cm)

remember, the pharynx opens anteriorly.

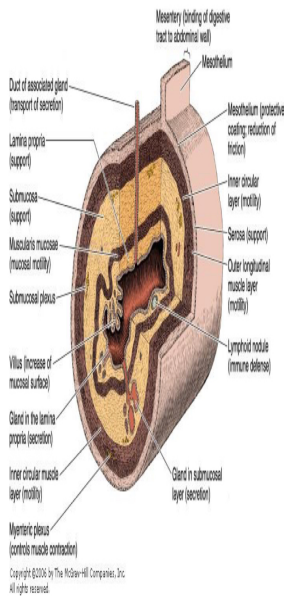
\* Continuation of pharynx.  
\* It starts from C6 and ends at cardia of stomach.

⇒ Function: peristaltic movement to push the food toward the stomach.

remember ⇒ If we take section from esophagus, we will see these layers:  
Prom histology lecture

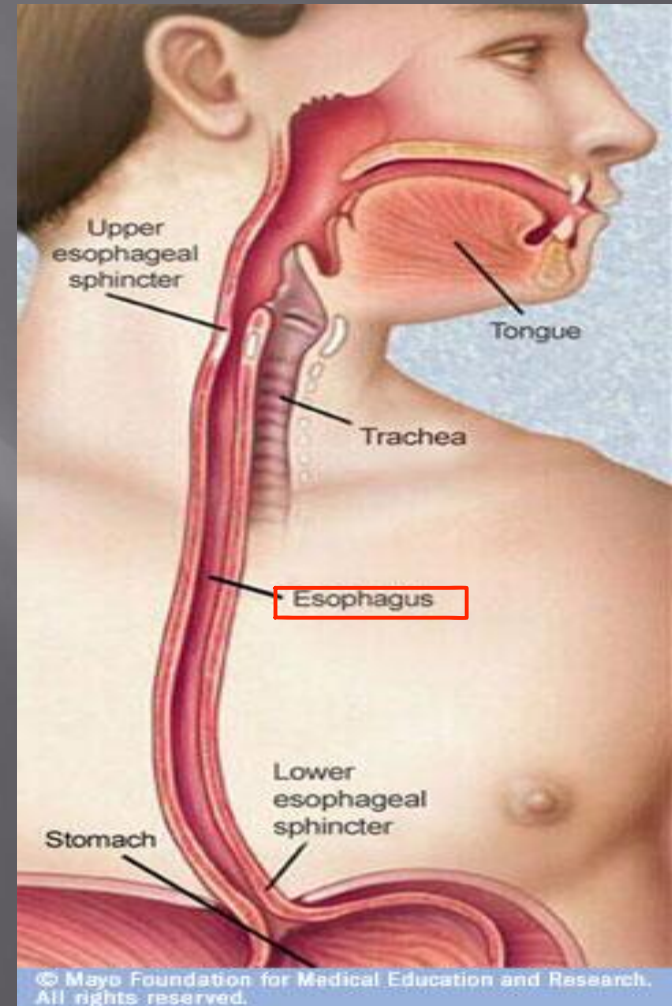
mucosa → submucosa → muscular layer.  
(stratified squamous epithelium non-keratinized)

↓  
Adventitia (Because the most of esophagus is located outside the abdomen).



# Esophagus

- ❑ The esophagus is a tubular structure (muscular, collapsible tube ) about 10 in. (25 cm) long that is continuous above with the laryngeal part of the pharynx opposite the sixth cervical vertebra
- ❑ The esophagus conducts food from the pharynx into the stomach. Wavelike contractions of the muscular coat, called peristalsis, propel the food onward.
- ❑ It passes through the diaphragm at the level of the 10th thoracic vertebra to join the stomach
- ❑ In the neck, the esophagus lies in front of the vertebral column; laterally, it is related to the lobes of the thyroid gland; and anteriorly, it is in contact with the trachea and the recurrent laryngeal nerves
- ❑ In the thorax, it passes downward and to the left through the superior and then the posterior mediastinum
- ❑ At the level of the sternal angle, the aortic arch pushes the esophagus over to the midline



Note: The difference between left and right recurrent laryngeal nerves ⇒  
 \* right (short, neck)  
 \* left (longer, chest)

□ The relations of the thoracic part of the esophagus:

□ Anteriorly: The trachea and the left recurrent laryngeal nerve; the left principal bronchus, which constricts it; and the pericardium, which separates the esophagus from the left atrium

→ branch from vagus nerve.  
 → especially left atrium.

esophagus is located in posterior mediastinum behind the thoracic vertebrae

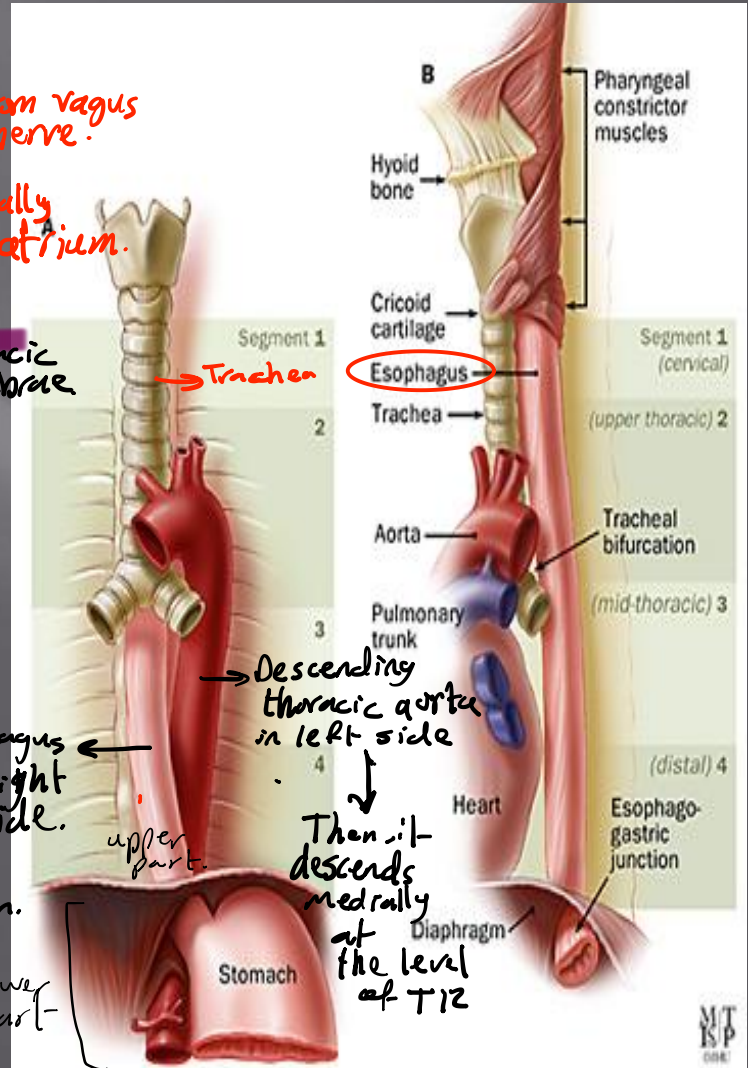
□ Posteriorly: The bodies of the thoracic vertebrae; the thoracic duct; the azygos veins; the right posterior intercostal arteries; and, at its lower end, the descending thoracic aorta

Branches from descending aorta

□ Right side: The mediastinal pleura and the terminal part of the azygos vein

□ Left side: The left subclavian artery, the aortic arch, the thoracic duct, and the mediastinal pleura

then descends for about 1 in. and enters the stomach. The name of opening is esophageal orifice.



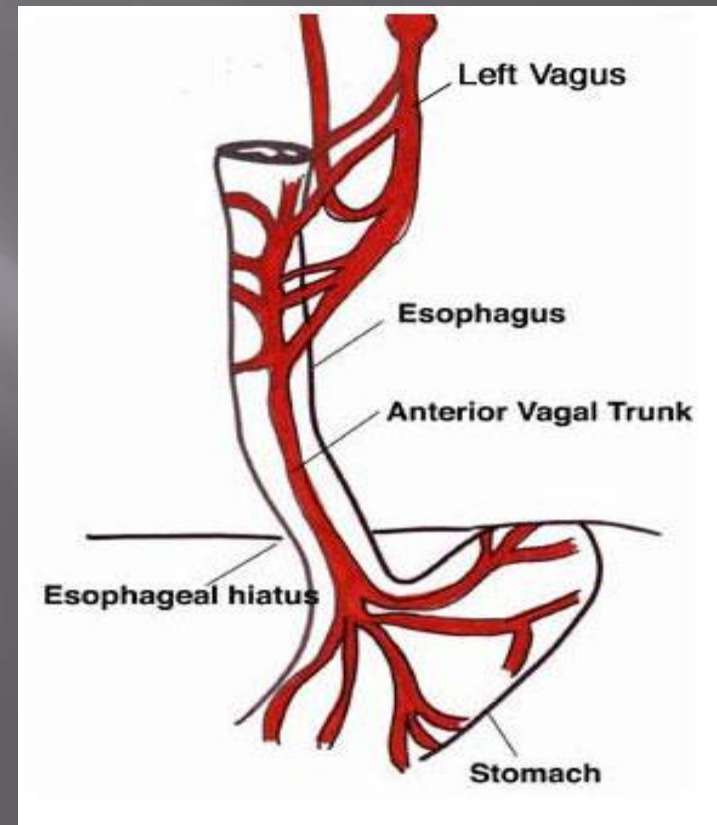
esophagus in right side.

Descending thoracic aorta in left side

Then it descends medially at the level of T12

lower part

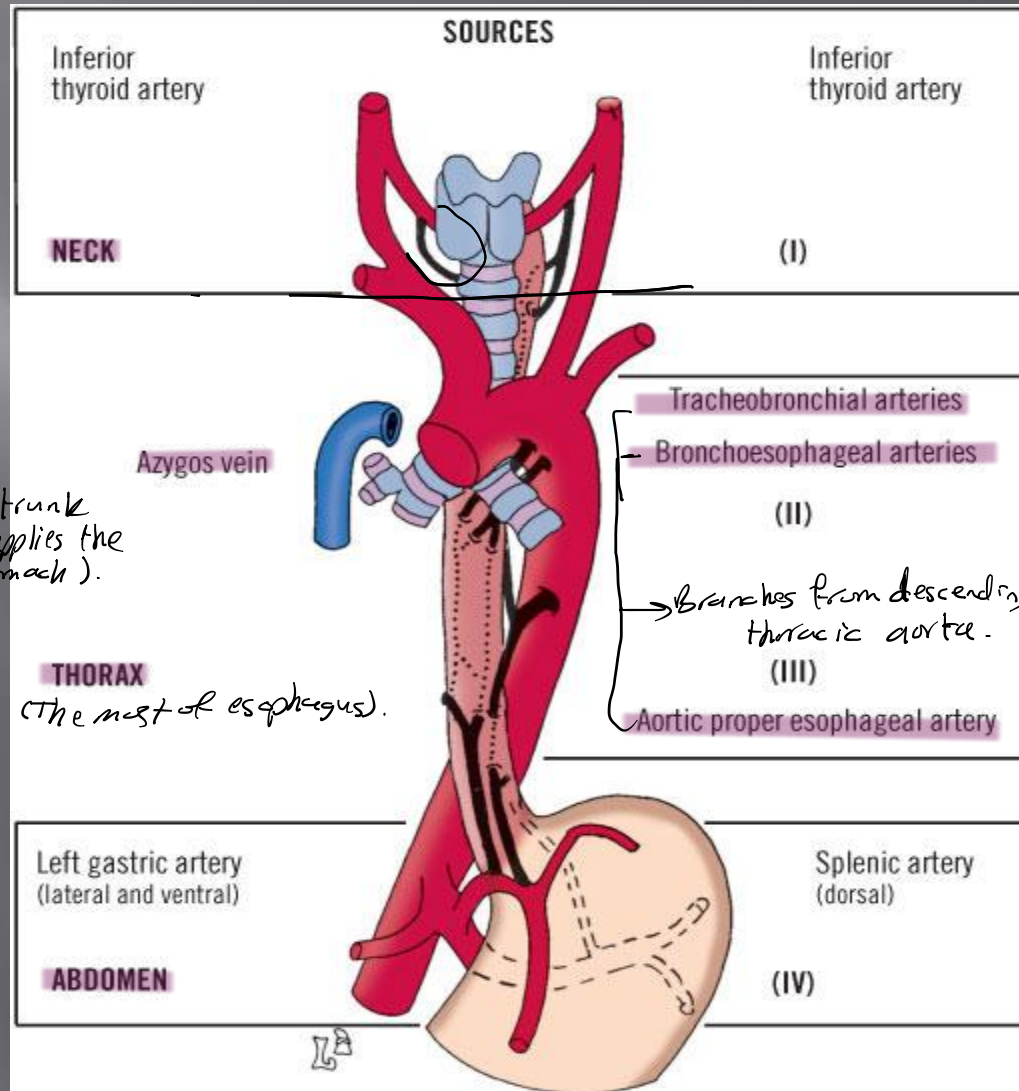
- Inferiorly to the level of the roots of the lungs, the vagus nerves leave the pulmonary plexus and join with sympathetic nerves to form the esophageal plexus
- The left vagus lies anterior to the esophagus and the right vagus lies posterior
- At the opening in the diaphragm, the esophagus is accompanied by the two vagi, branches of the left gastric blood vessels, and lymphatic vessels
- Fibers from the right crus of the diaphragm pass around the esophagus in the form of a sling.
- In the abdomen, the esophagus descends for about 0.5 in. (1.3 cm) and then enters the stomach
- It is related to the left lobe of the liver anteriorly and to the left crus of the diaphragm posteriorly.



# Blood Supply of the Esophagus

- The upper third of the esophagus is supplied by the inferior thyroid artery. (Neck)
- the middle third by branches from the descending thoracic aorta. (Thorax)
- and the lower third by branches from the left gastric artery. (Abdomen)
- The veins from the upper third drain into the inferior thyroid veins, from the middle third into the azygos veins, and from the lower third into the left gastric vein, a tributary of the portal vein.

↳ form celiac trunk (Also, it supplies the stomach).



□ Lymph vessels from the upper third of the esophagus drain into the deep cervical nodes,

□ from the middle third into the superior and posterior mediastinal nodes,

□ and from the lower third into nodes along the left gastric blood vessels and the celiac nodes → related to the stomach

□ The esophagus is supplied by parasympathetic and sympathetic efferent and afferent fibers via the vagi and sympathetic trunks (trunks).

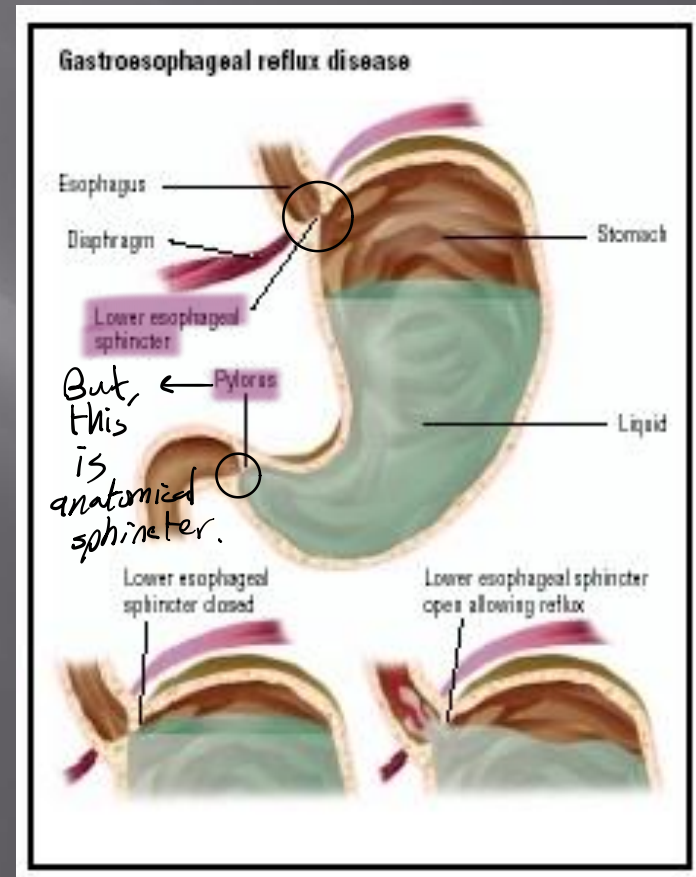
□ ~~In the lower part of its thoracic course, the esophagus is surrounded by the esophageal nerve plexus.~~

myenteric plexus → responsible of peristaltic movement and the gland secretion  
Auerbach plexus → sympathetic  
submucosal plexus → parasympathetic

It is not anatomic sphincter (No thickening in inner circular muscle), but it physiologic sphincter (It prevents food reflux from stomach to esophagus)

# Gastroesophageal Sphincter

- No anatomic sphincter exists at the lower end of the esophagus
- However, the circular layer of smooth muscle in this region serves as a physiologic sphincter
- As the food descends through the esophagus, relaxation of the muscle at the lower end occurs ahead of the peristaltic wave so that the food enters the stomach
- The tonic contraction of this sphincter prevents the stomach contents from regurgitating into the esophagus.
- The closure of the sphincter is under vagal control, and this can be augmented by the hormone gastrin and reduced in response to secretin, cholecystokinin, and glucagon.





## Important topic: lodge of foreign bodies in esophagus

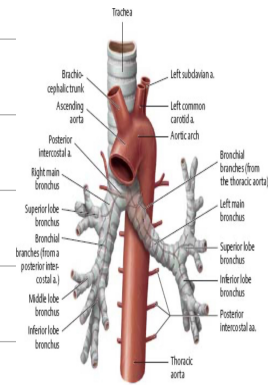
Potential sites (narrow sites):

① The beginning of esophagus  
(because the pharynx is dilated, then the esophagus will be narrow).

② When it passes through the diaphragm.

③ Cross of left main bronchus.  
(It contains cartilage, and passes front to esophagus).

④ Arch of aorta (anterior → left side)  
makes pressure.

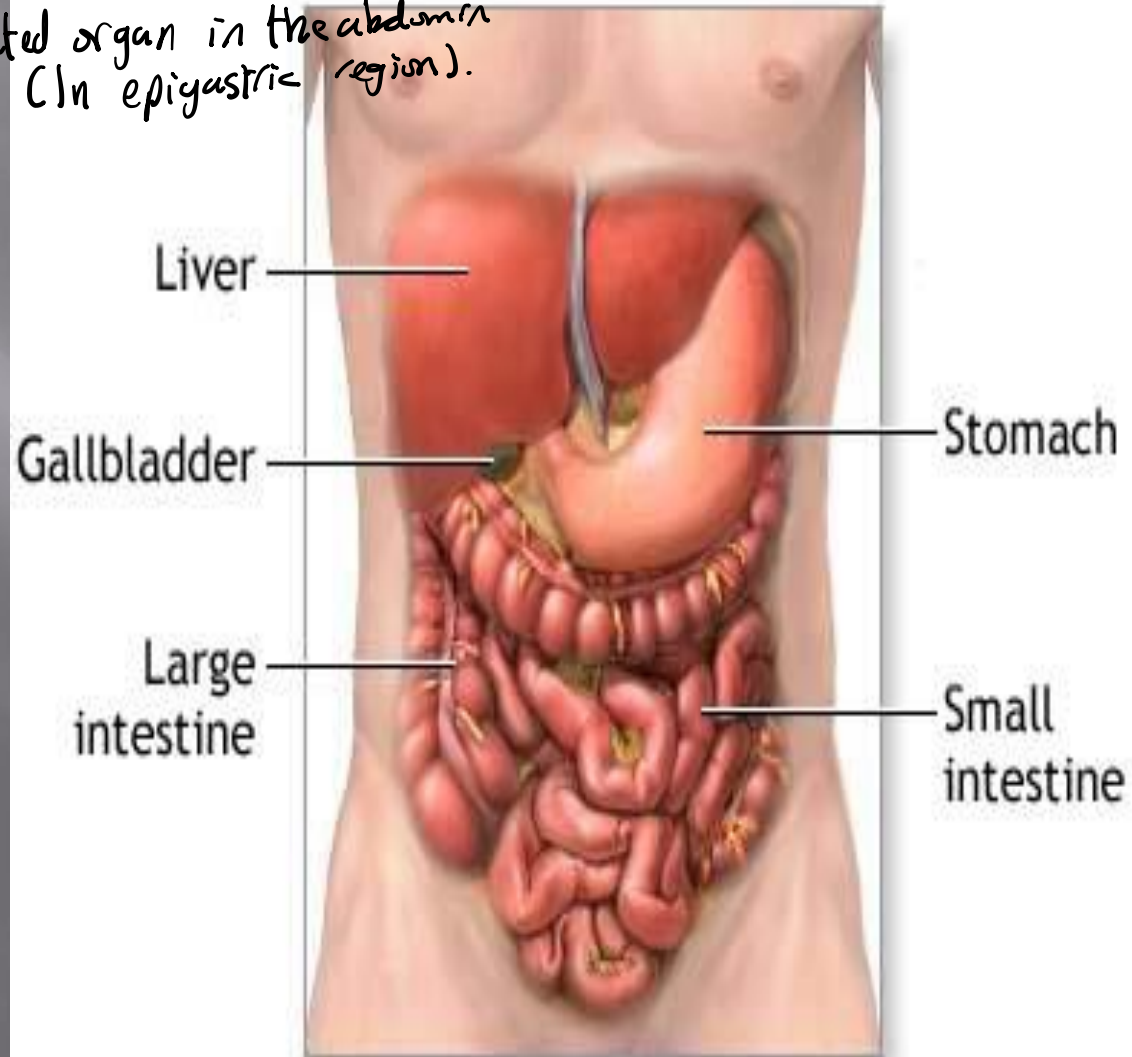


*stomach*

# Stomach

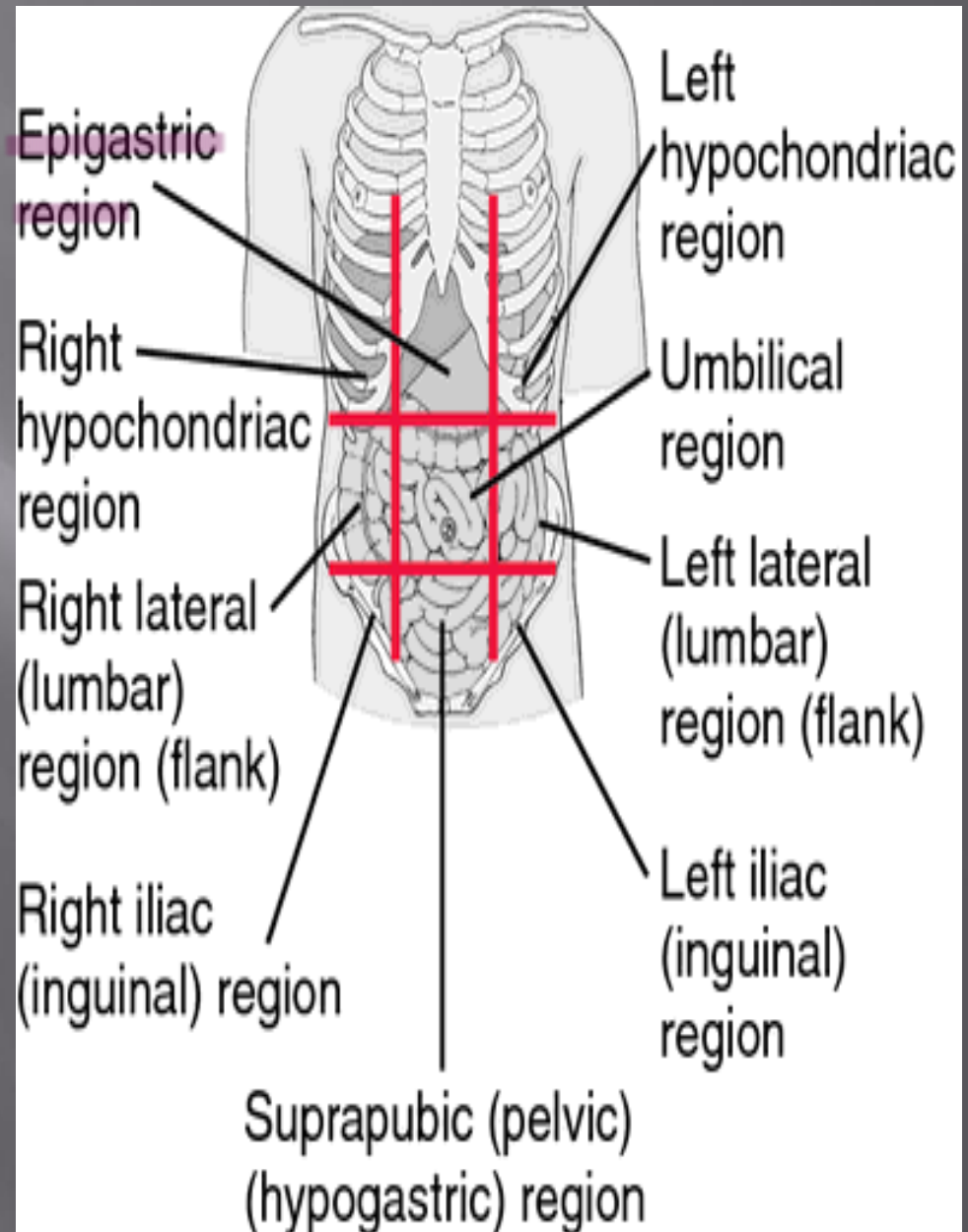
Dilated organ in the abdomen  
(In epigastric region).

- The stomach is a dilated part of the alimentary canal
- Between the esophagus and the small intestine



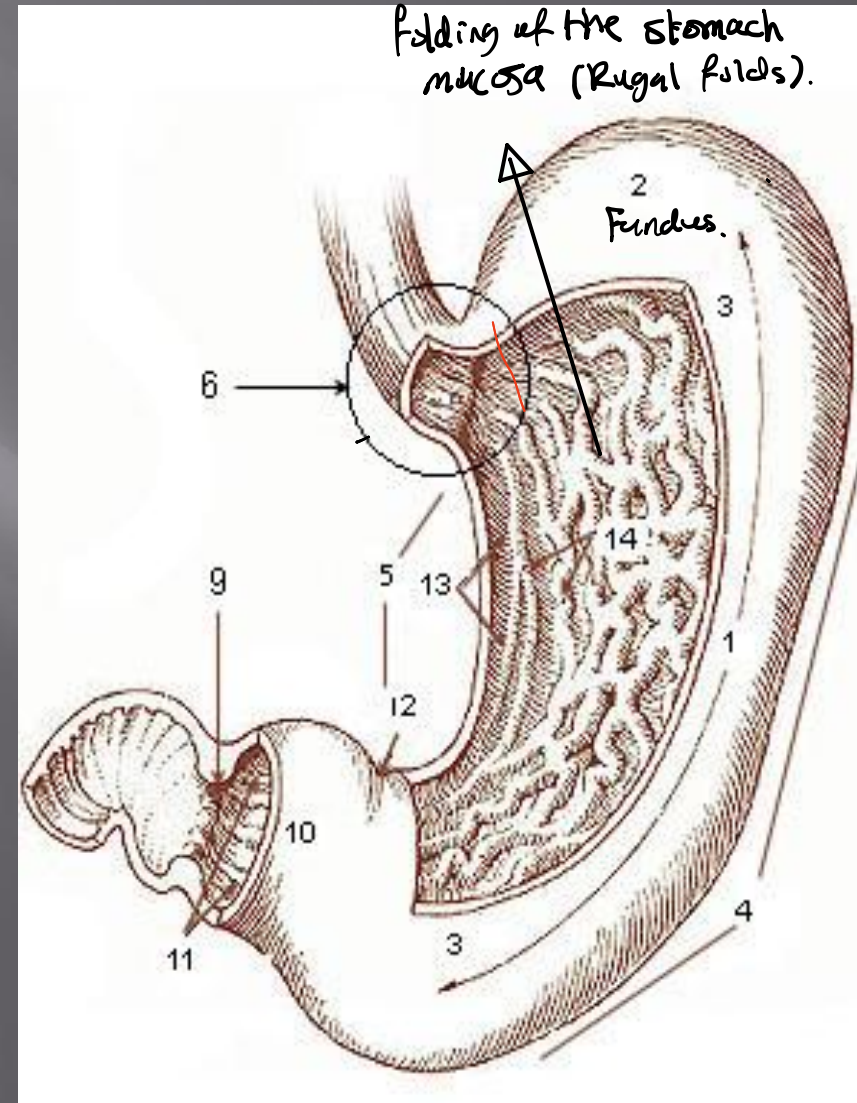
# Stomach site

- It occupies the left upper quadrant mainly in the epigastric region



# Shape of stomach

- It is roughly J-shaped
- *صلى البوق* Steer horn in obese person
- has two openings, the cardiac and pyloric orifices  
*(not anatomic)* *(anatomic)*
- Two curvatures, the greater and lesser curvatures
- Two surfaces, an anterior and a posterior surface



# Shape of stomach.....cont

- ▣ Its shape undergoes considerable variation in the same person and depends on
  - The volume of its contents
  - The position of the body
  - The phase of respiration.

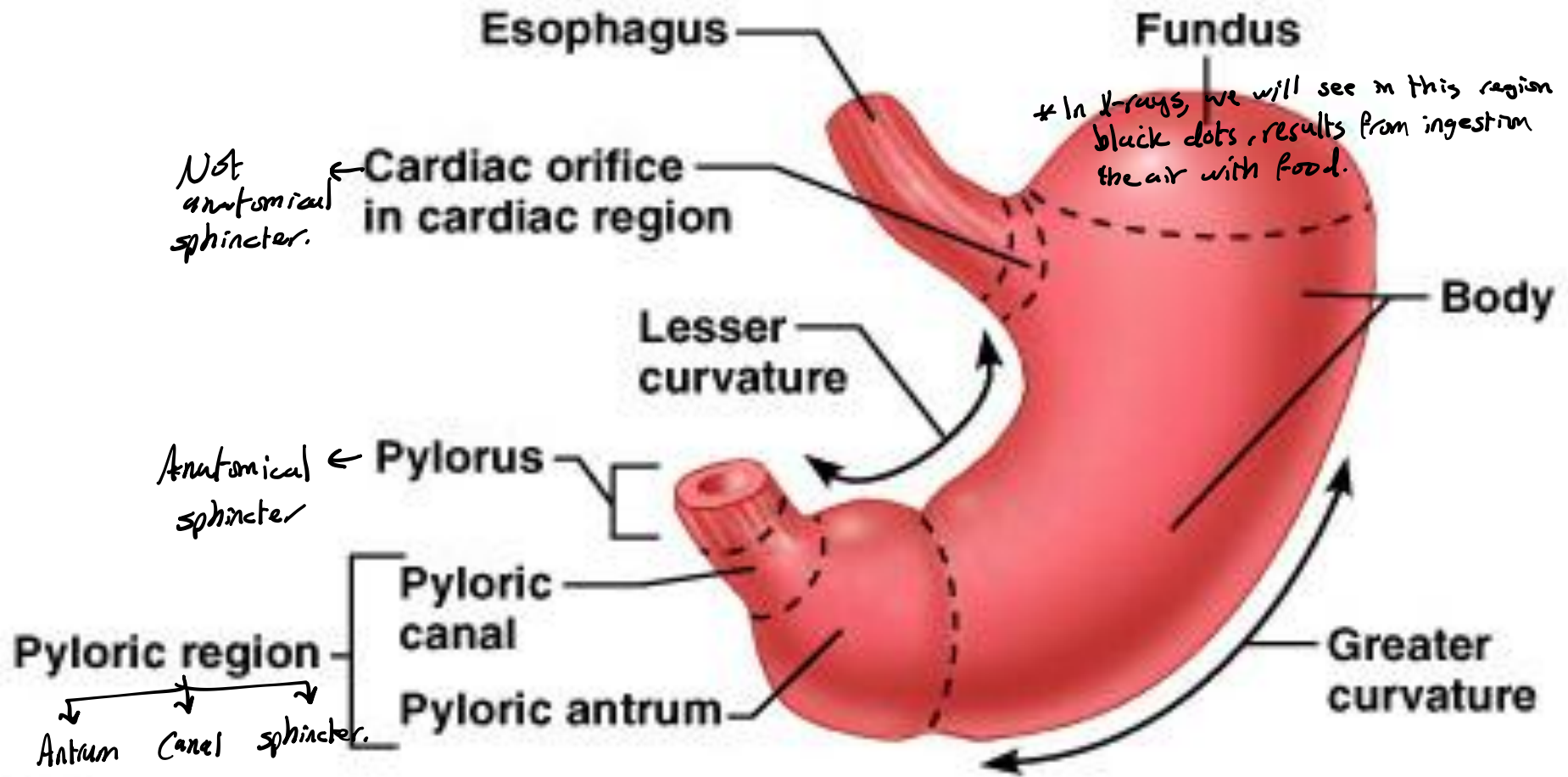
# Function OF stomach

Has three main functions:

- ▣ It stores food (in the adult it has a capacity of about 1500 mL )
- ▣ It mixes the food with gastric secretions to form a semifluid chyme
- ▣ It controls the rate of delivery of the chyme to the small intestine so that efficient digestion and absorption can take place.

Main functions: Digestion ( food → semifluid chyme ) → after two hours, the evacuation starts gradually → After (4) hours, the stomach will be empty.  
(push the food through pyloric sphincter to duodenum).

# Parts Stomach



(a)

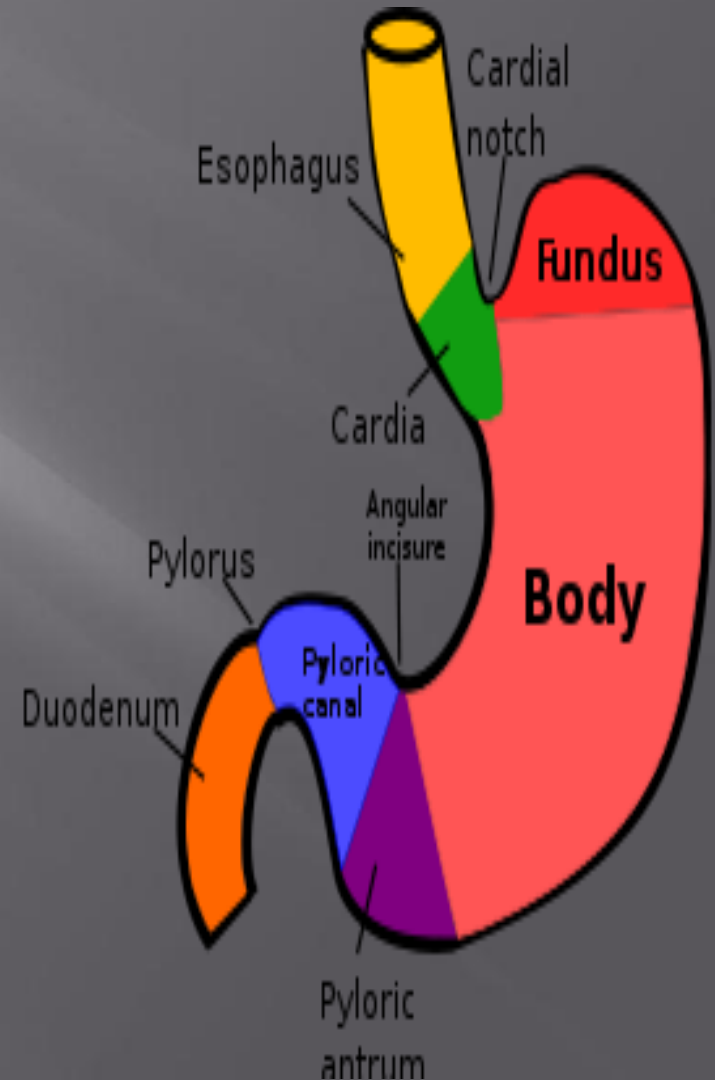


# Parts of stomach

The stomach is divided into the following parts :

## 1- Fundus:

- ▣ Dome-shaped
- ▣ Projects upward and to the left of the cardiac orifice
- ▣ It is usually full of gas.



## 2- Body:

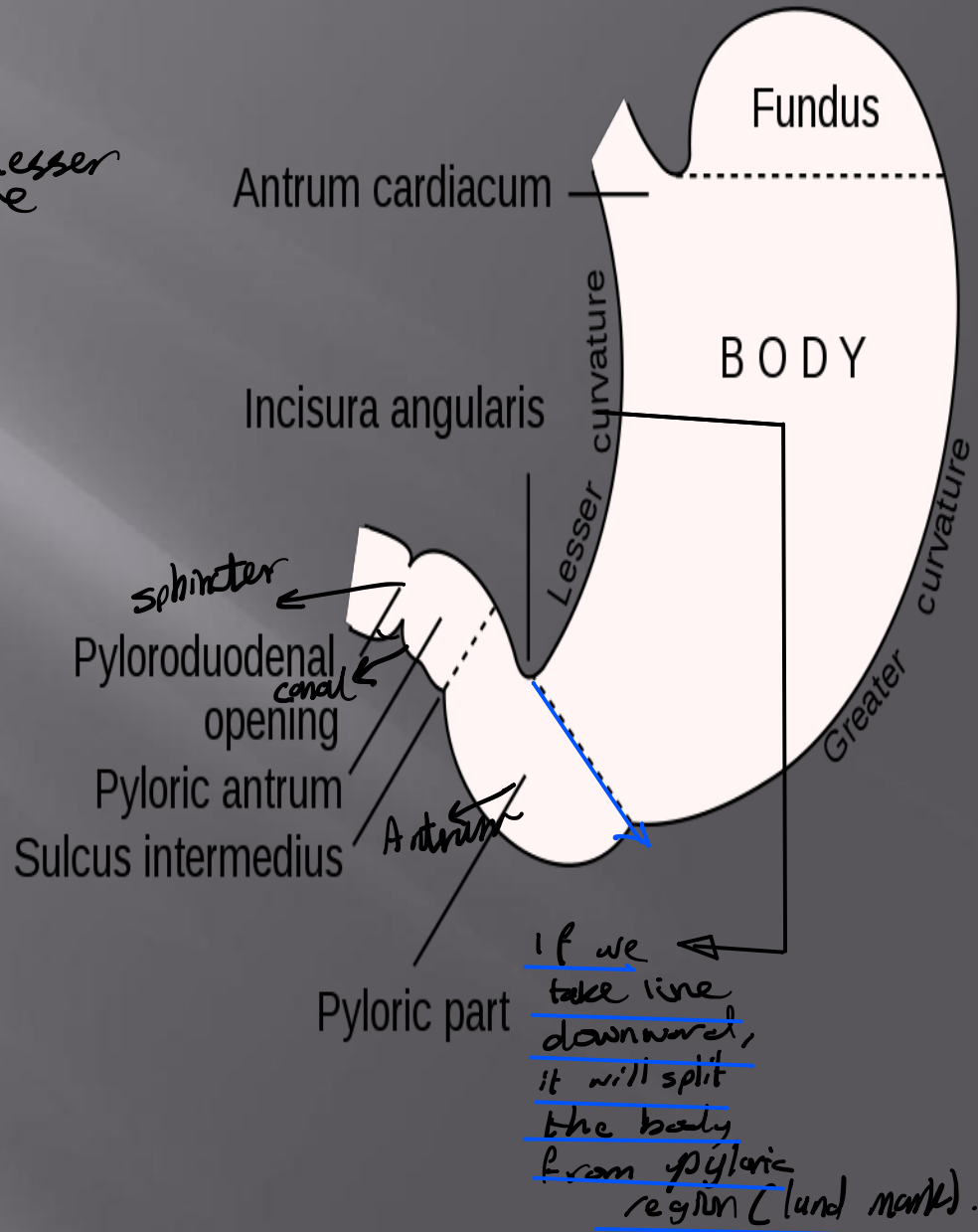
- Extends from the level of the cardiac orifice to the level of the **incisura angularis** (a constant notch in the lower part of the lesser curvature)

## 3- Pyloric region

divided into:

### a- Pyloric antrum:

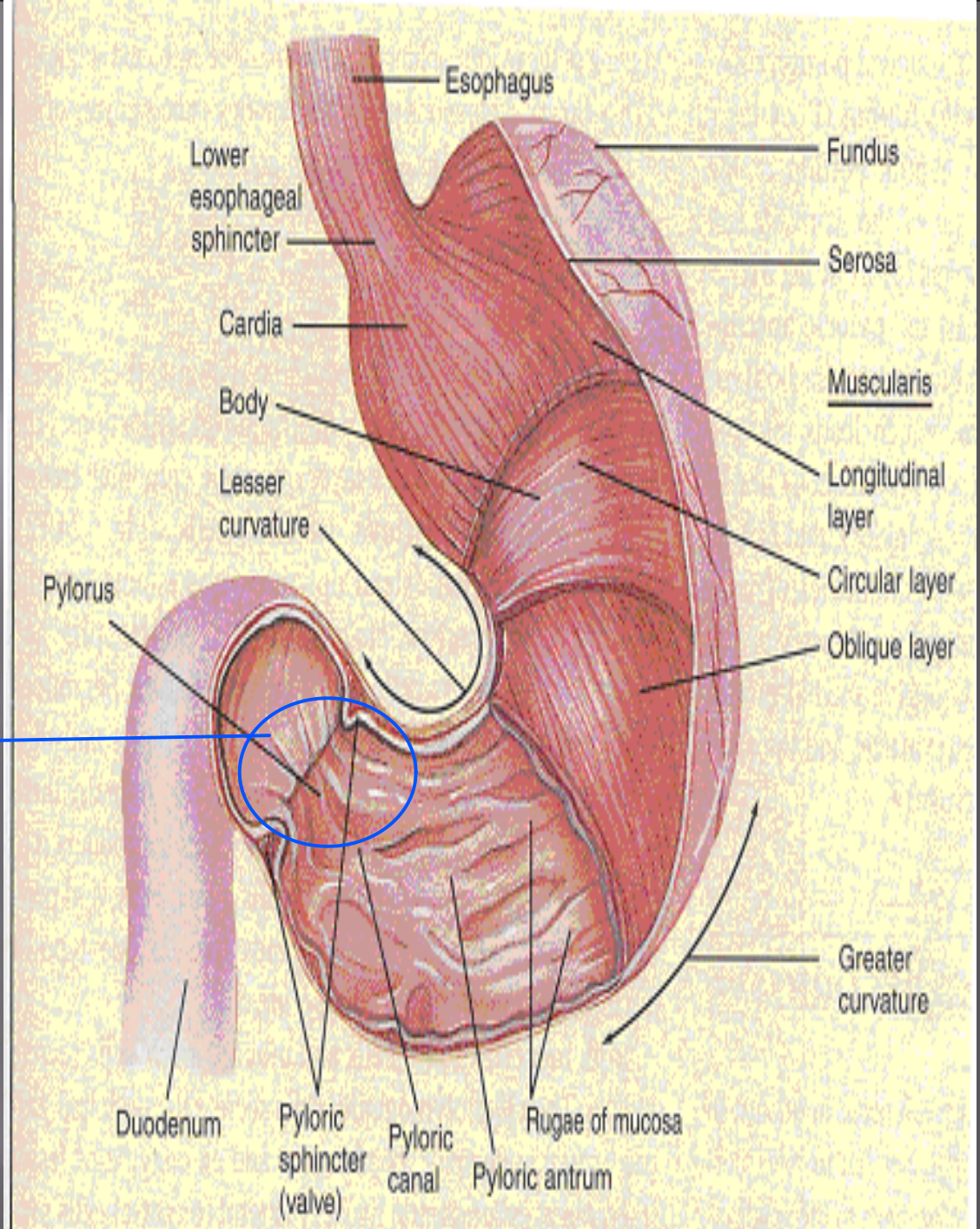
- This extends from the incisura angularis to the pylorus



## B- Pylorus:

- The most tubular part of the stomach
- The thick muscular wall is called the **pyloric sphincter**

*Thickening of inner circular smooth muscle.*



## *Orifices of the stomach*

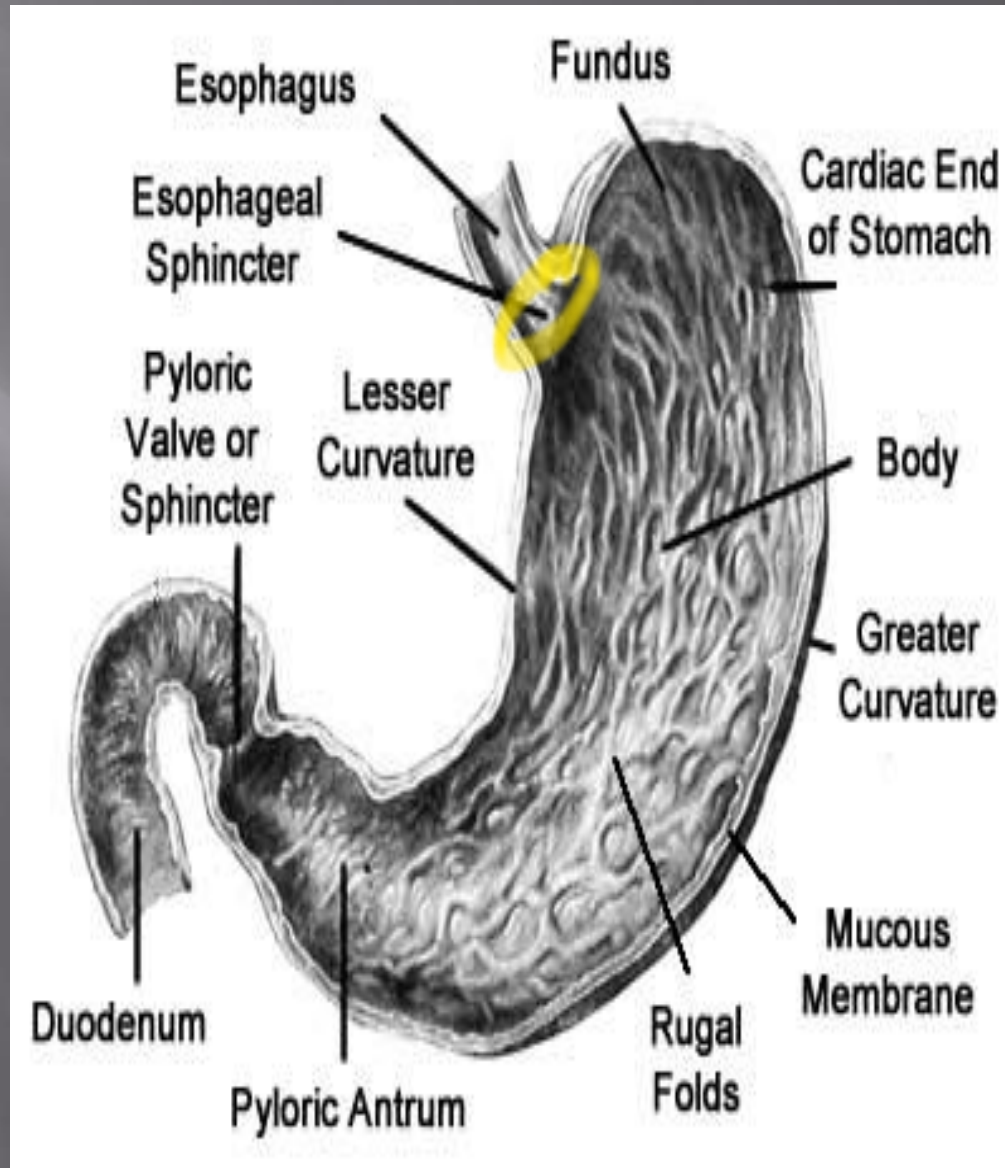
- *Cardiac orifice*
- pyloric orifice

# Cardiac orifice

-The cardiac orifice is where the esophagus enters the stomach

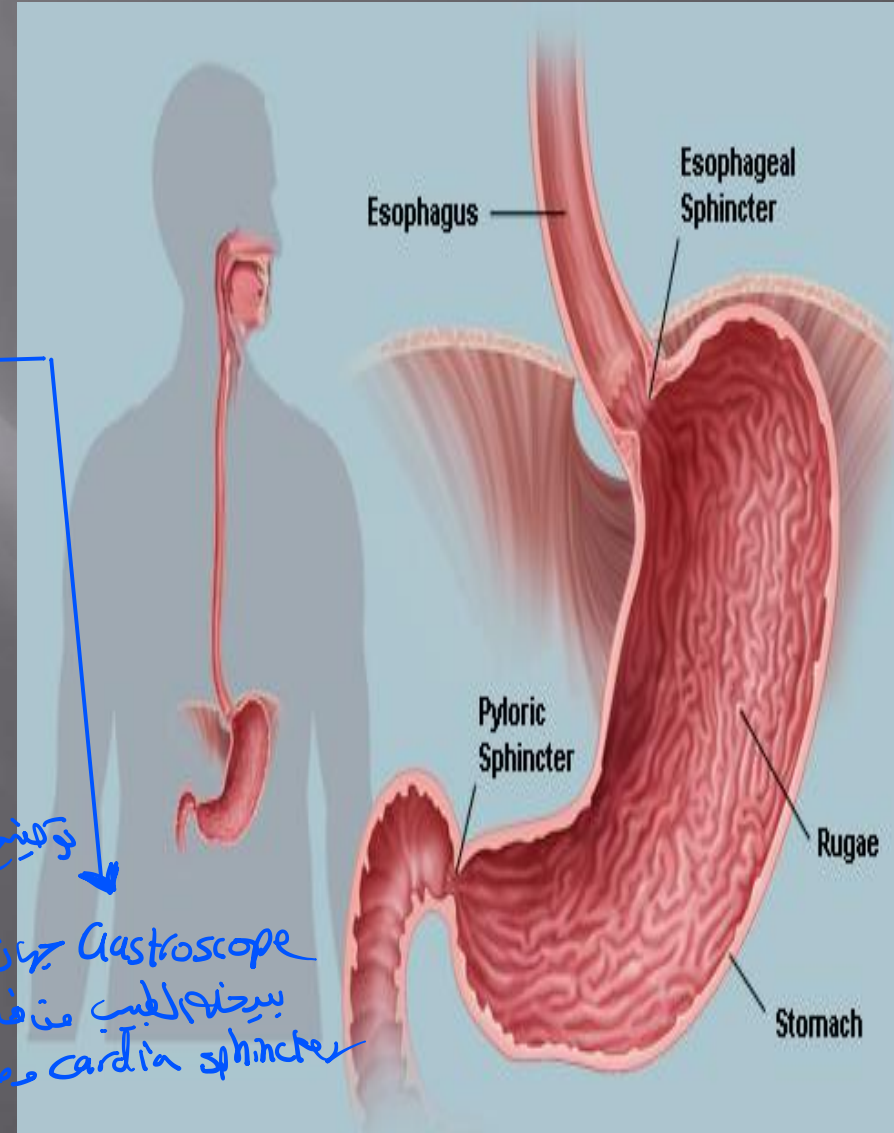
-No anatomic sphincter can be demonstrated here

-A physiological sphincter → physiological mechanism exists that prevents regurgitation of stomach contents into the esophagus



# The site of Cardiac orifice

- At the level of 7<sup>th</sup> Lt. costal cartilage (left).
- 1 inch to Lt. of midline
- 45 cm from incisors in the oral cavity.
- 10 cm from ant. abdominal wall



توكيخ

Gastroscope  
 ببيخند الطيب من فم المريض فكل يصل مكانه (45cm) يكون دخل من  
 Cardia sphincter وصل الحصة. إذا تجاوز هذه المسافة يكون دخل بالمعدة  
 (esophagus, stomach, duodenum)

Rugal folds → oblique.  
 ↳ longitudinal (lesser curvature)

Helps fluids  
 to pass directly to

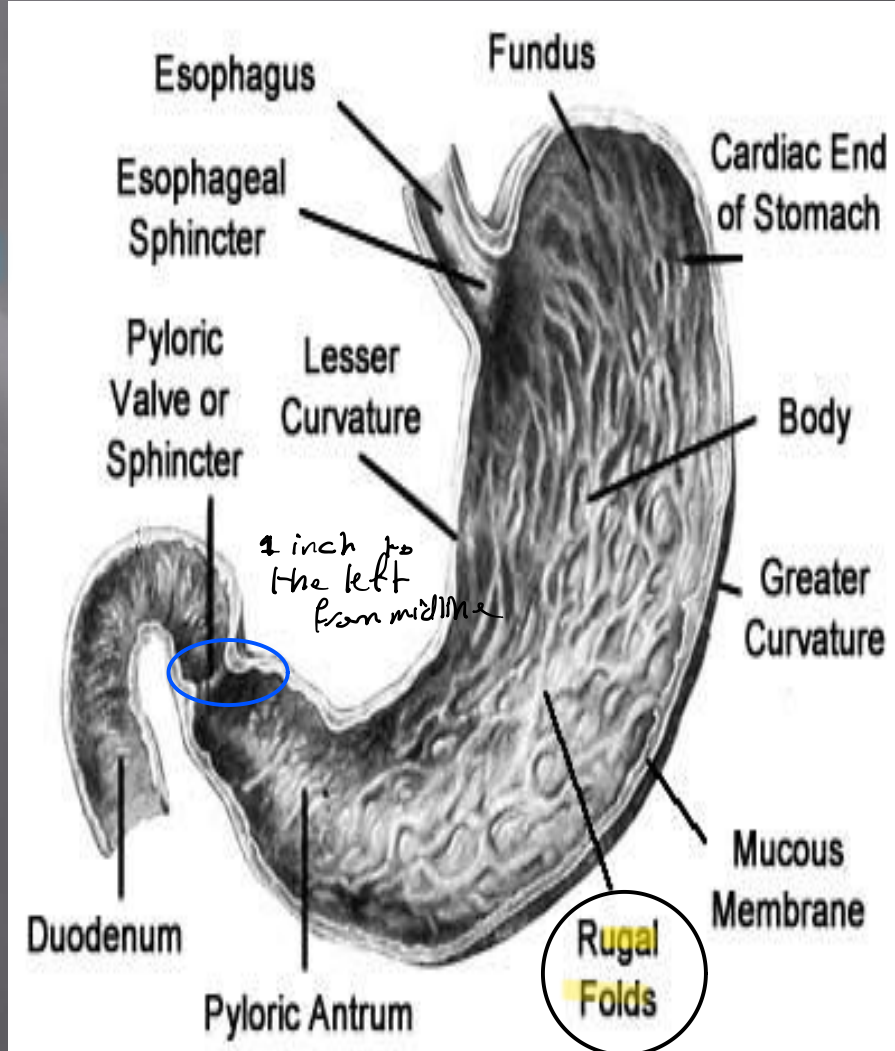
# pyloric orifice

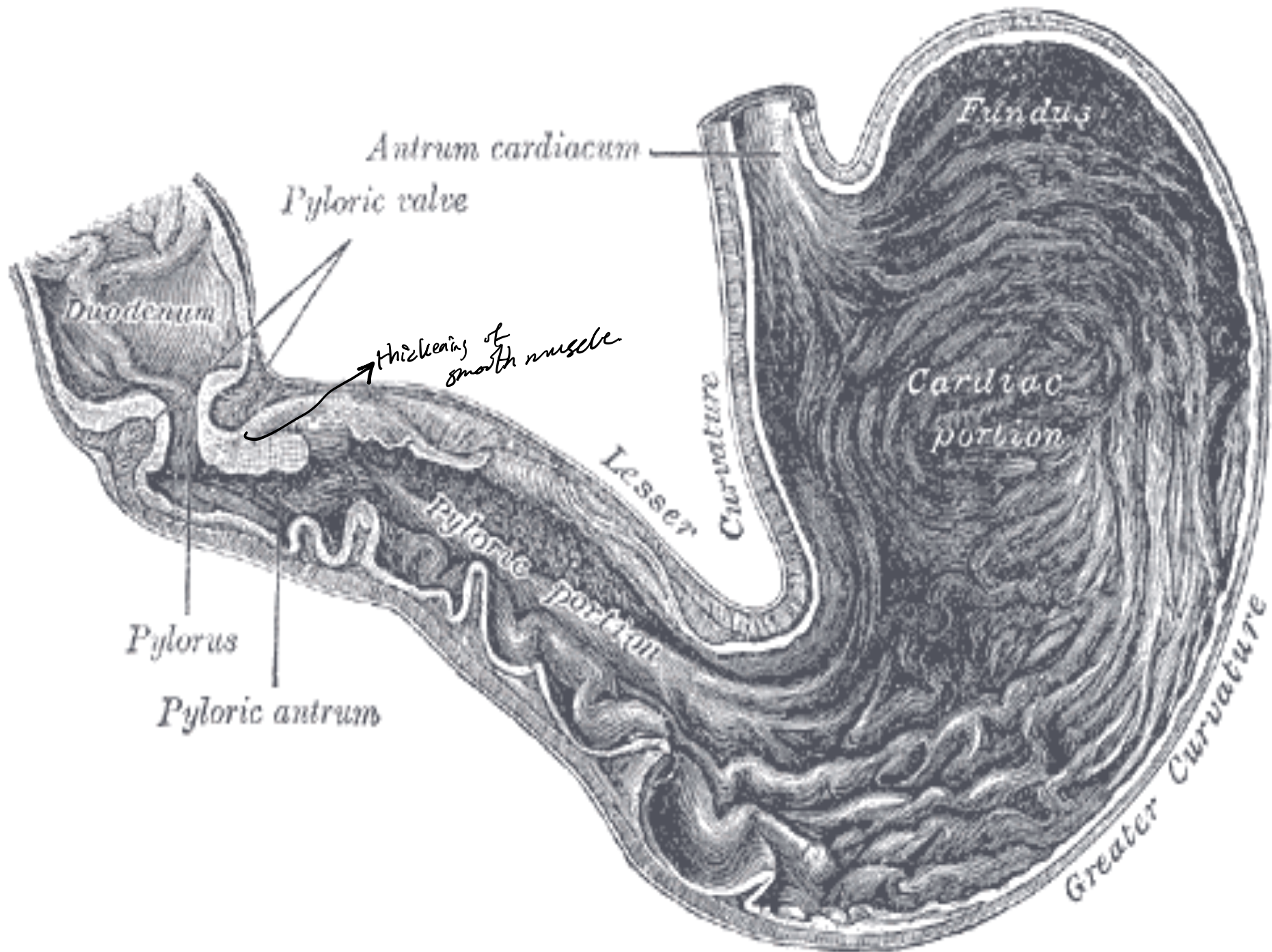
duodenum → بين الفلج من الكواكب يتقبل  
 mixing with food.

هذا السبب  
 ما يفسر  
 اذا شربت  
 الماء قبل  
 او بعد  
 الاكل  
 لان الماء  
 لا يسهل  
 الهضم

Present at end of the pyloric canal  
 On the level of L1  
 1" to the Rt. of the midline.  
 The circular muscle coat of the stomach is much thicker here and forms the **anatomic and physiologic pyloric sphincter**

Its position can be recognized by a slight constriction on the surface of the stomach (The pylorus lies on the transpyloric plane).





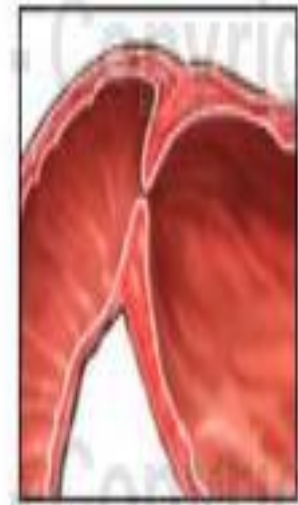
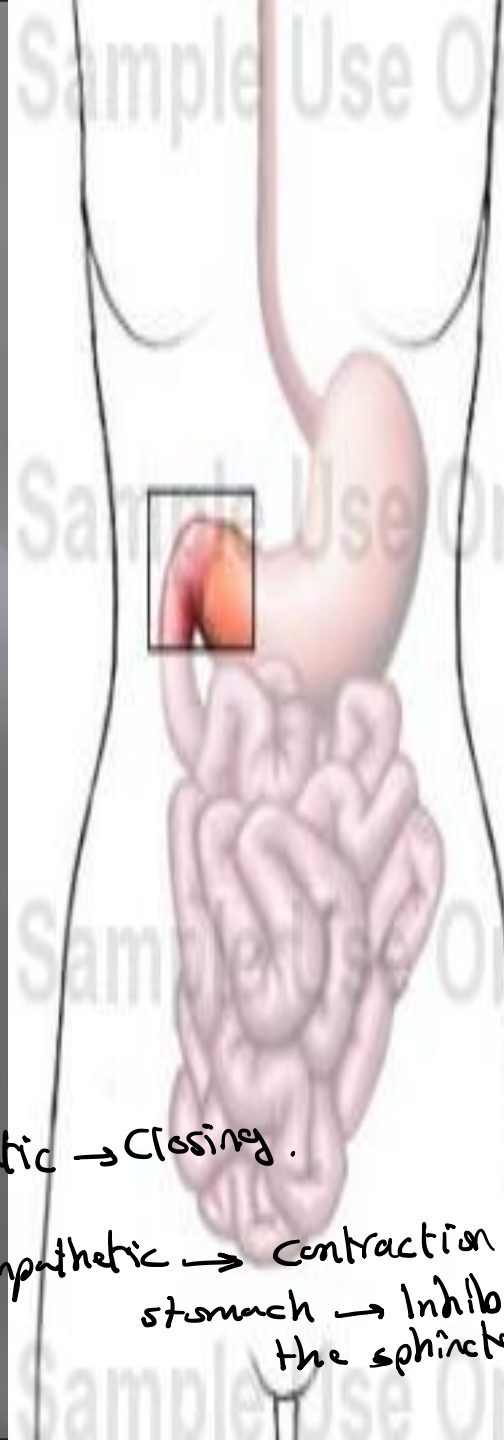


## Pyloric opening...cont

- The pyloric sphincter controls the outflow of gastric contents into the duodenum.

- The sphincter receives motor fibers from the sympathetic system and inhibitory fibers from the vagus nerve

pyloric sphincter → sympathetic → closing.  
pyloric sphincter → parasympathetic → contraction of stomach → inhibition the sphincter.



Pyloric sphincter



Pyloric sphincter after pyloroplasty

# Pyloric orifices.....cont

Function of pyloric opening control by:

1- Hormonal influences from stomach & duodenum

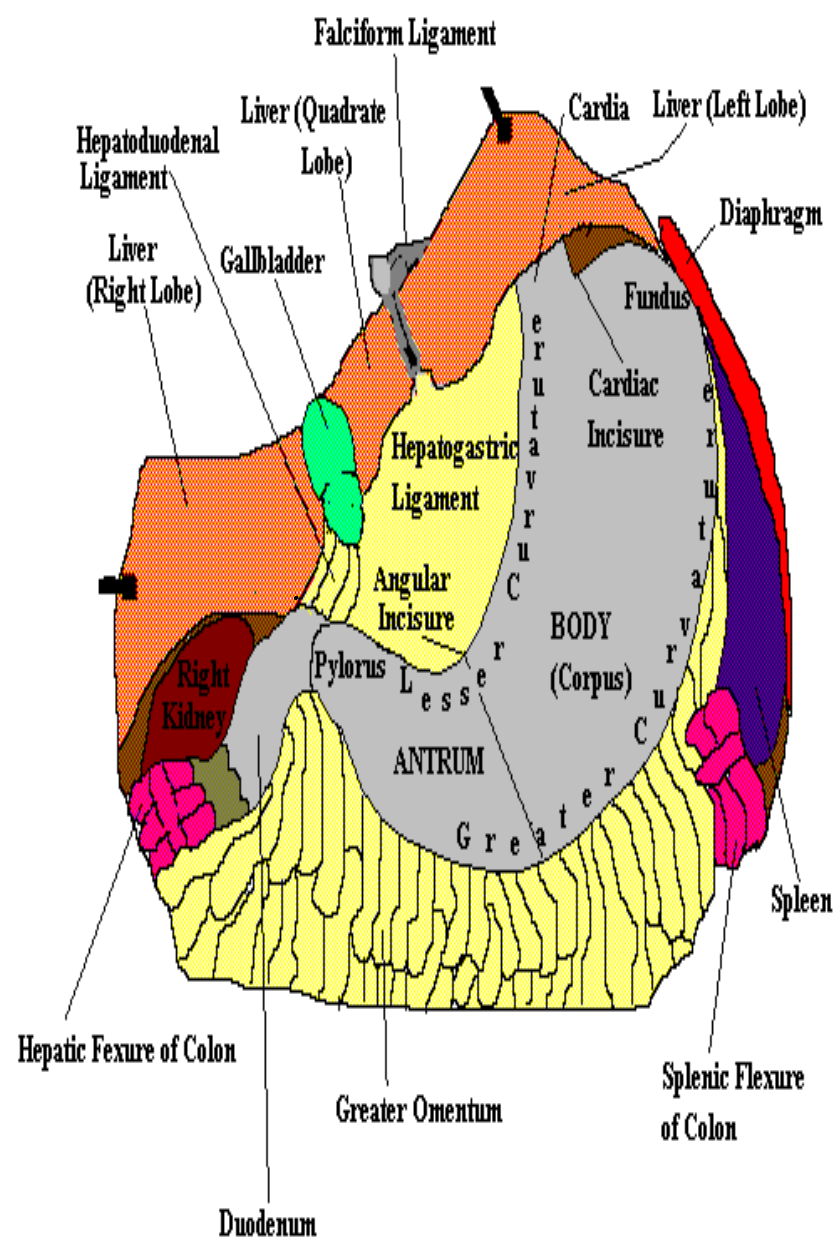
2- Nerve fibers

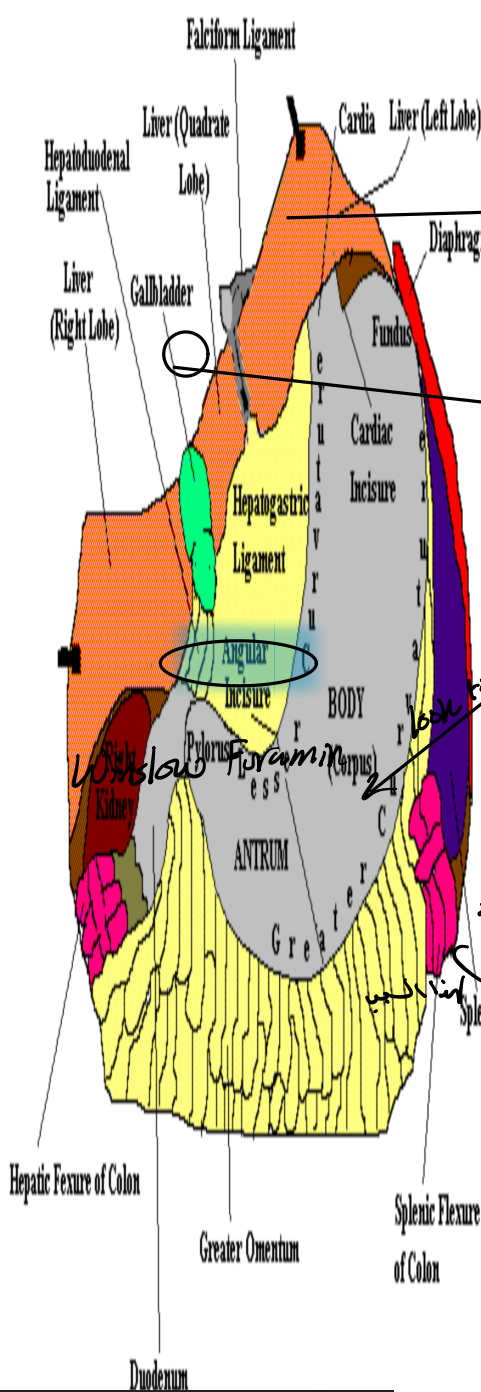
Filling stomach → Myenteric fibers → relaxation of sphincter

# Curvatures of stomach

## 1- The lesser curvature

- Forms the right border of the stomach
- Extends from the cardiac orifice to the pylorus

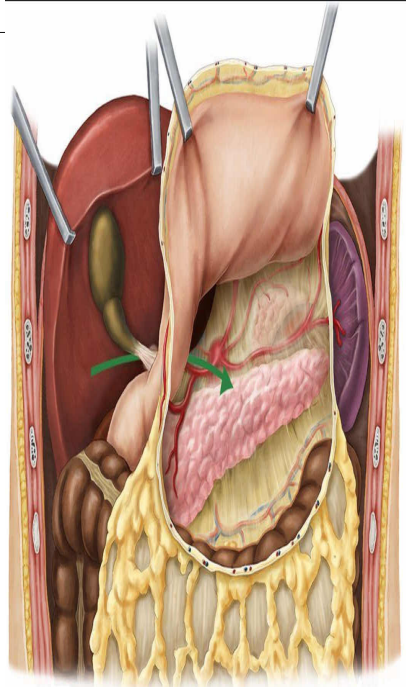




lesser omentum: two layers of peritoneum, connects the liver with stomach. And it contains fat, nerves, blood vessels and lymph nodes.

It is opening related to lesser omentum called **Winslow (epiploic) Foramen**, it continues deep to the lesser omentum → behind the stomach → front to pancreas. (There is a space behind the stomach & front to the pancreas is called lesser sac.)

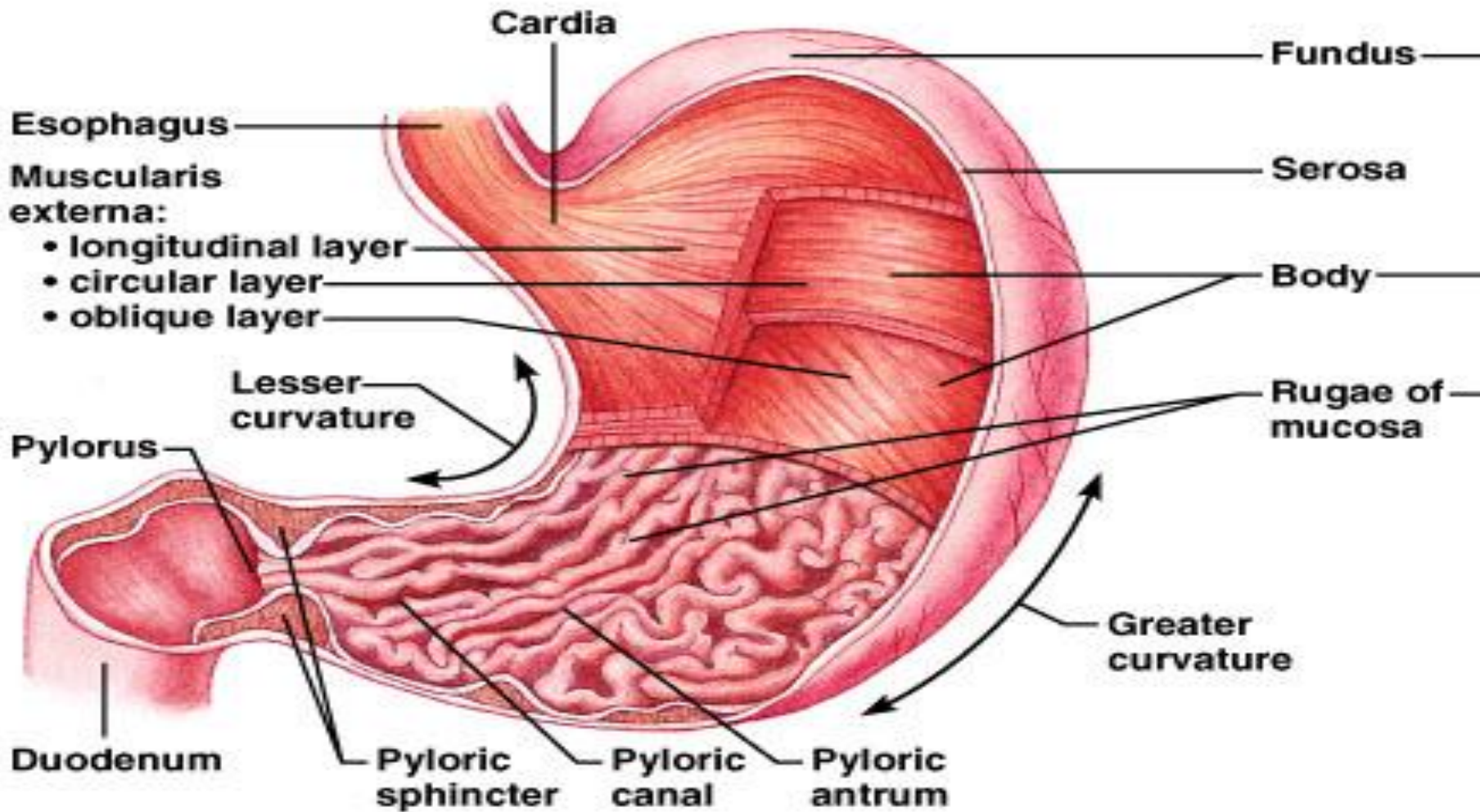
\*Greater omentum → It attaches to greater curvature, pylorus and first part of duodenum. It contains from two layers of peritoneum, passes through the abdominal cavity to reach the transverse colon, surround it and ends in transverse colon. Transverse colon → intraperitoneal organ. Ascending and descending colons are retroperitoneal organs.



## 2- The greater curvature

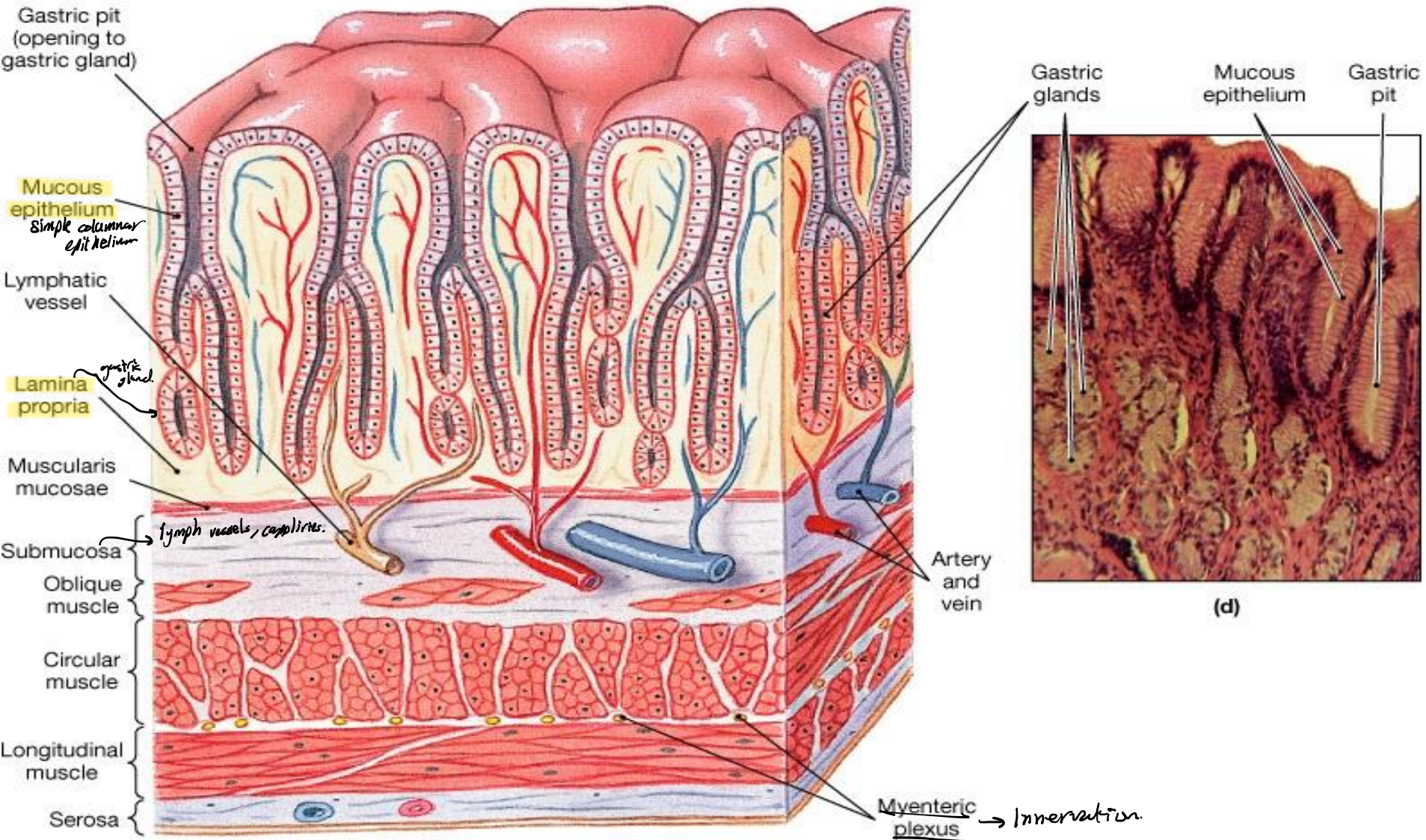
- Much longer than the lesser curvature
- Extends from the left of the cardiac orifice, over the dome of the fundus, and along the left border of the stomach to the pylorus

# Histology of the Stomach



(b)

# The Stomach – Microscopic Anatomy



(c)

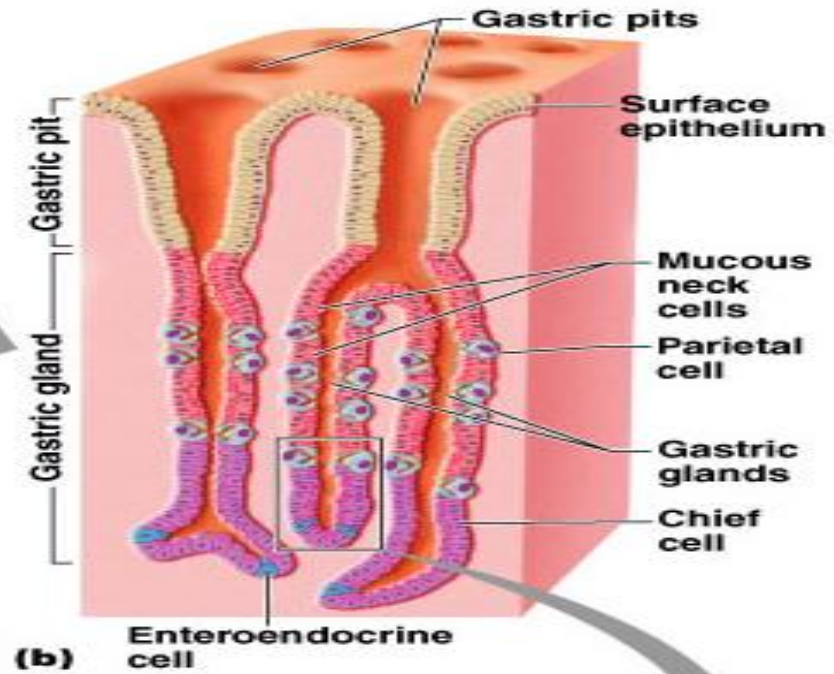
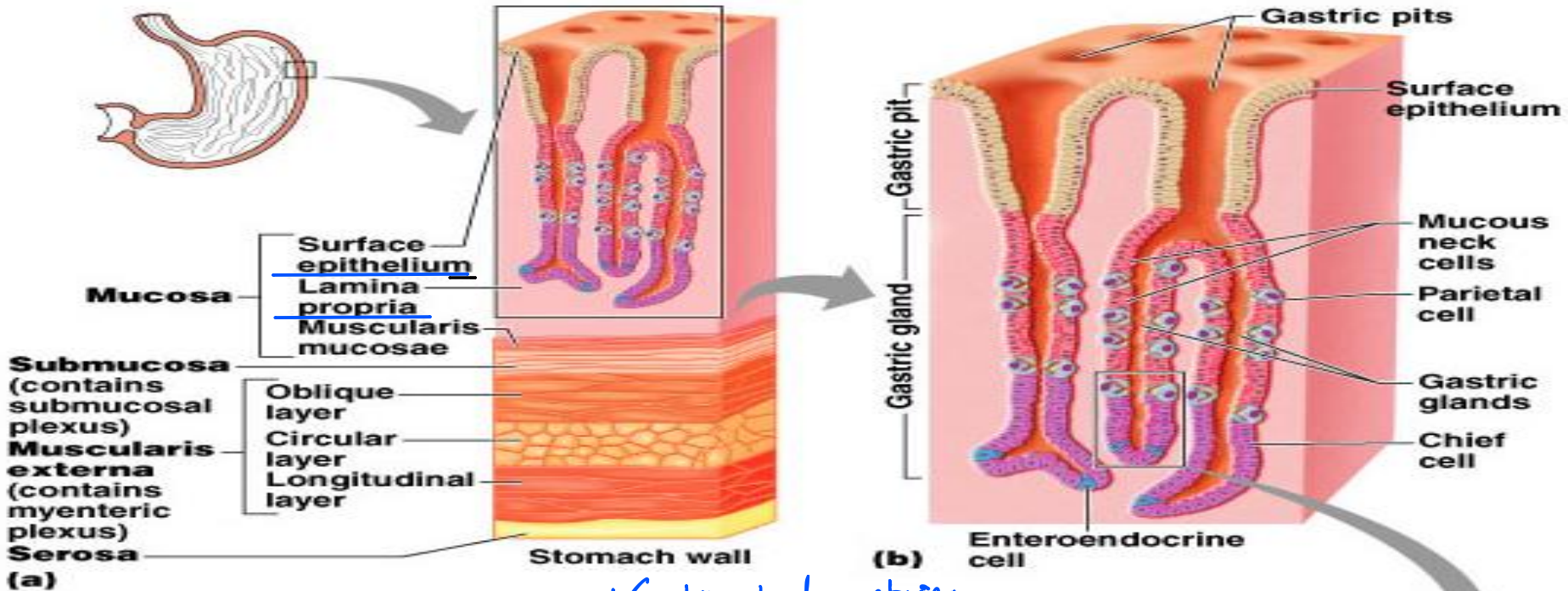
(d)

# Mucous membrane

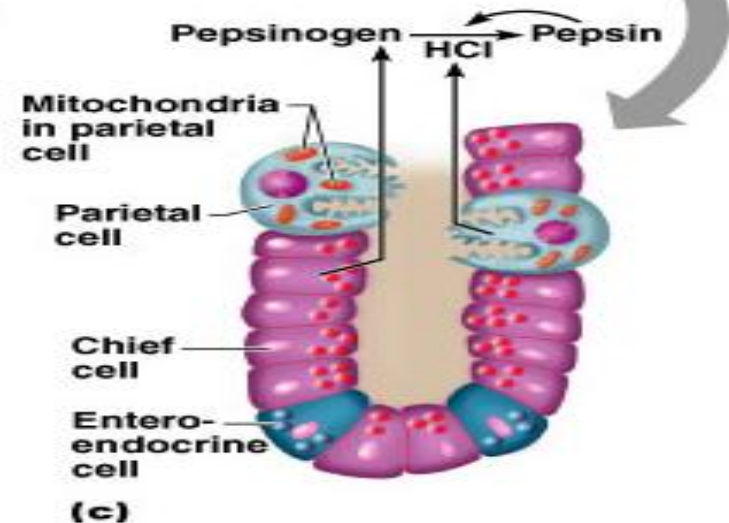
- ▣ The mucous membrane of the stomach is thick and vascular and is thrown into numerous folds, or *rugae* mainly longitudinal in direction
- ▣ The folds flatten out when the stomach is distended.



# Stomach - Microscopic Anatomy



\*Gastric gland contains mucus, parietal, chief & endocrine cells.



Stomach is the only organ in GIT that composed from three layers of muscles → Because stomach needs the strength to evacuate the food into duodenum.

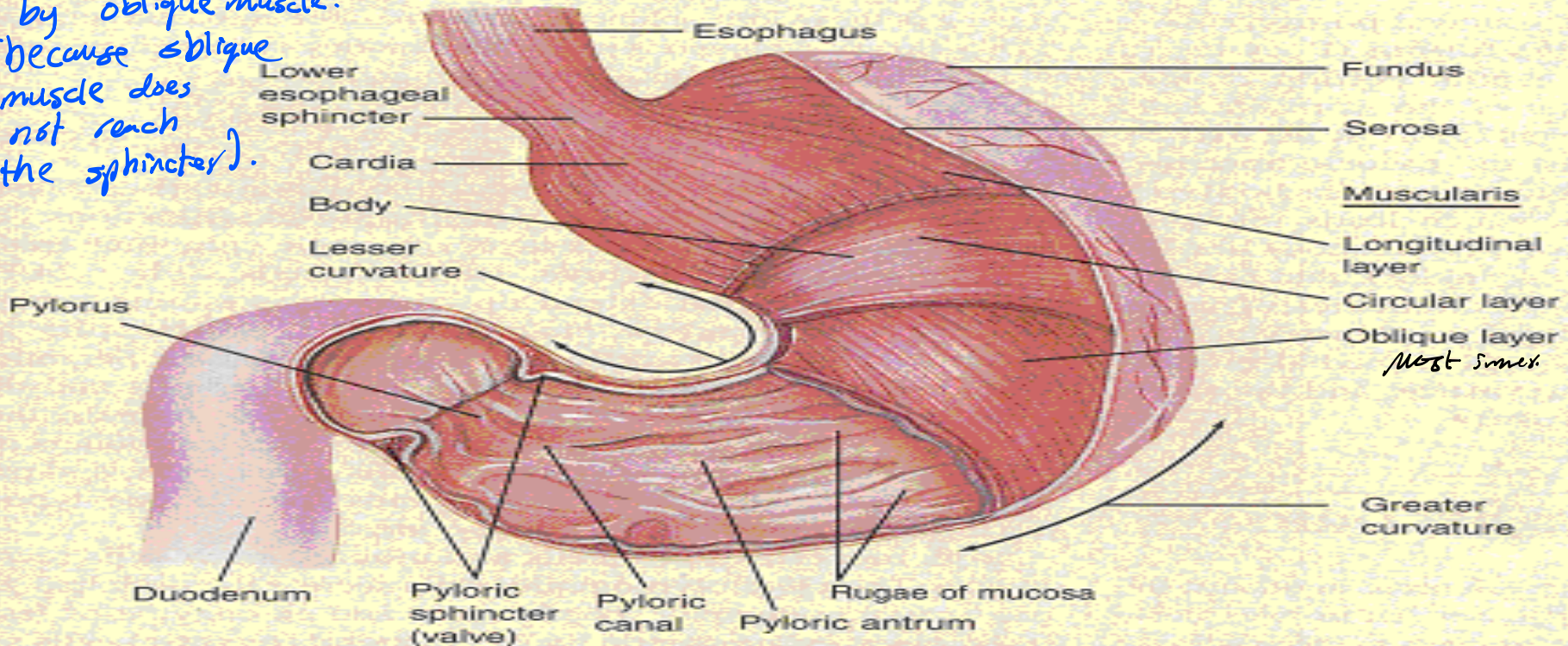
# muscular wall of stomach

- The muscular wall of the stomach contains longitudinal fibers (outer surface), circular fibers (inner surface), and oblique fibers

\*Pyloric sphincter is made by inner circular muscle, not

by oblique muscle.

(because oblique muscle does not reach the sphincter).



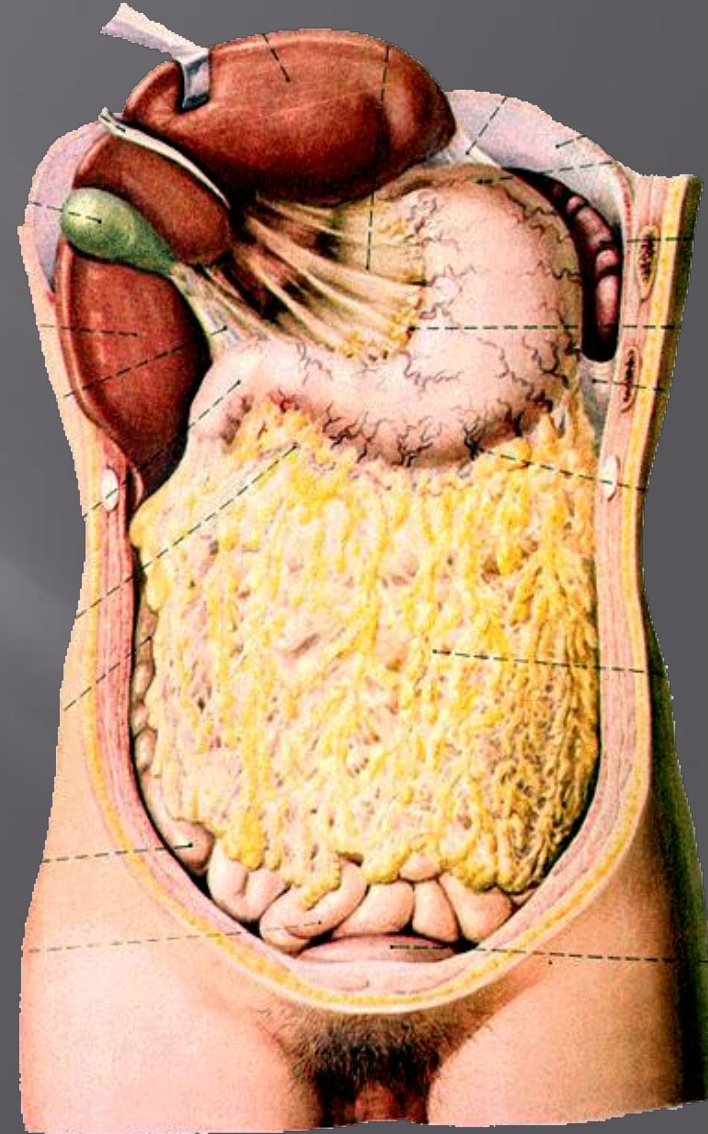
# Stomach - Microscopic Anatomy



# Peritoneum of stomach

- ▣ The peritoneum (visceral peritoneum) completely surrounds the stomach.
- ▣ It leaves the lesser curvature as the **lesser omentum**
- ▣ It leaves the greater curvature as the **gastrosplenic ligament** and the **greater omentum**
- ▣ The gastrosplenic ligament extends from the upper part of the greater curvature to the spleen, and the greater omentum extends from the lower part of the greater curvature to the transverse colon

\* ligament or omentum → composed from two layers and contain fat, blood vessels, nerves and lymph nodes.



- The lesser curvature is suspended from the liver by the lesser omentum
- Gastrophrenic ligament between the fundus and the diaphragm.

\* Free edge of lesser omentum  
(Appears like a window).  
It contains important structures.

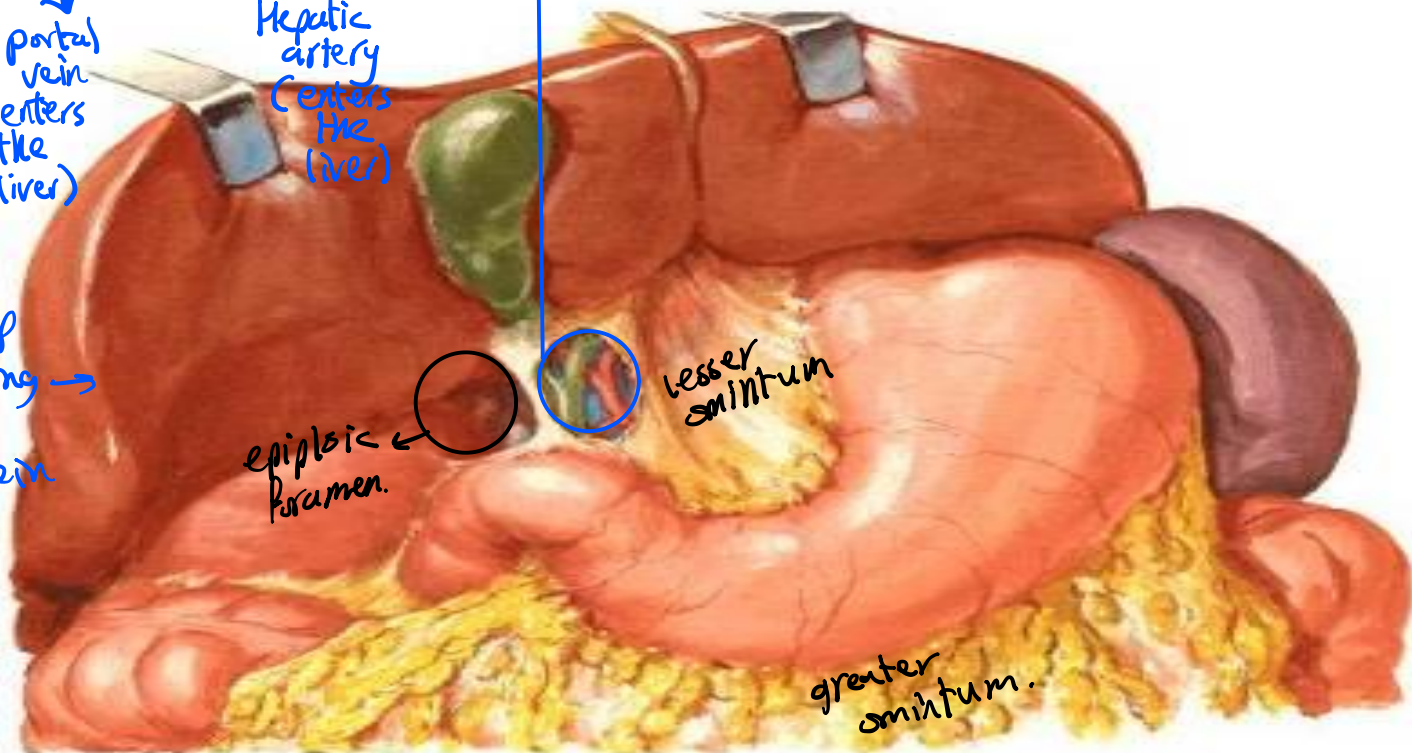
Common bile duct  
(enters the liver)

portal vein  
(enters the liver)

Hepatic artery  
(enters the liver)

So, to stop liver bleeding →  
closure to the portal vein and hepatic

Liver in Situ

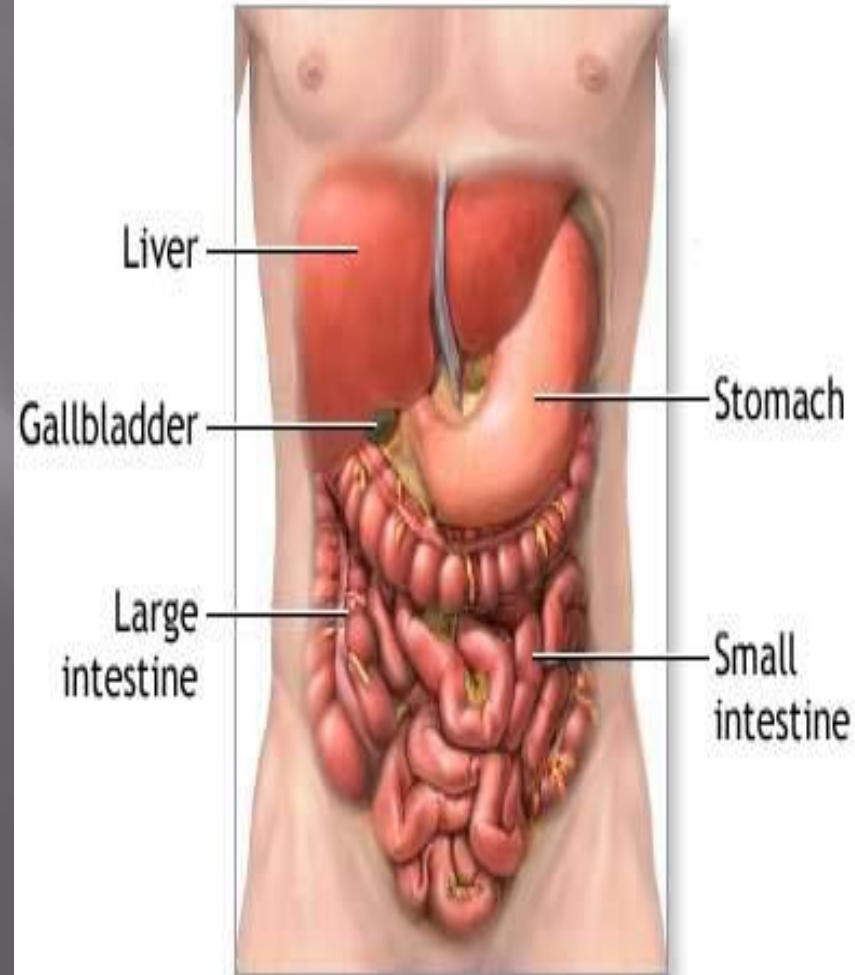


# Relations of stomach

Two surfaces

## ① Anterior- superior

- The anterior abdominal wall
- the left costal margin
- the left pleura and lung
- the diaphragm
- the left lobe of the liver

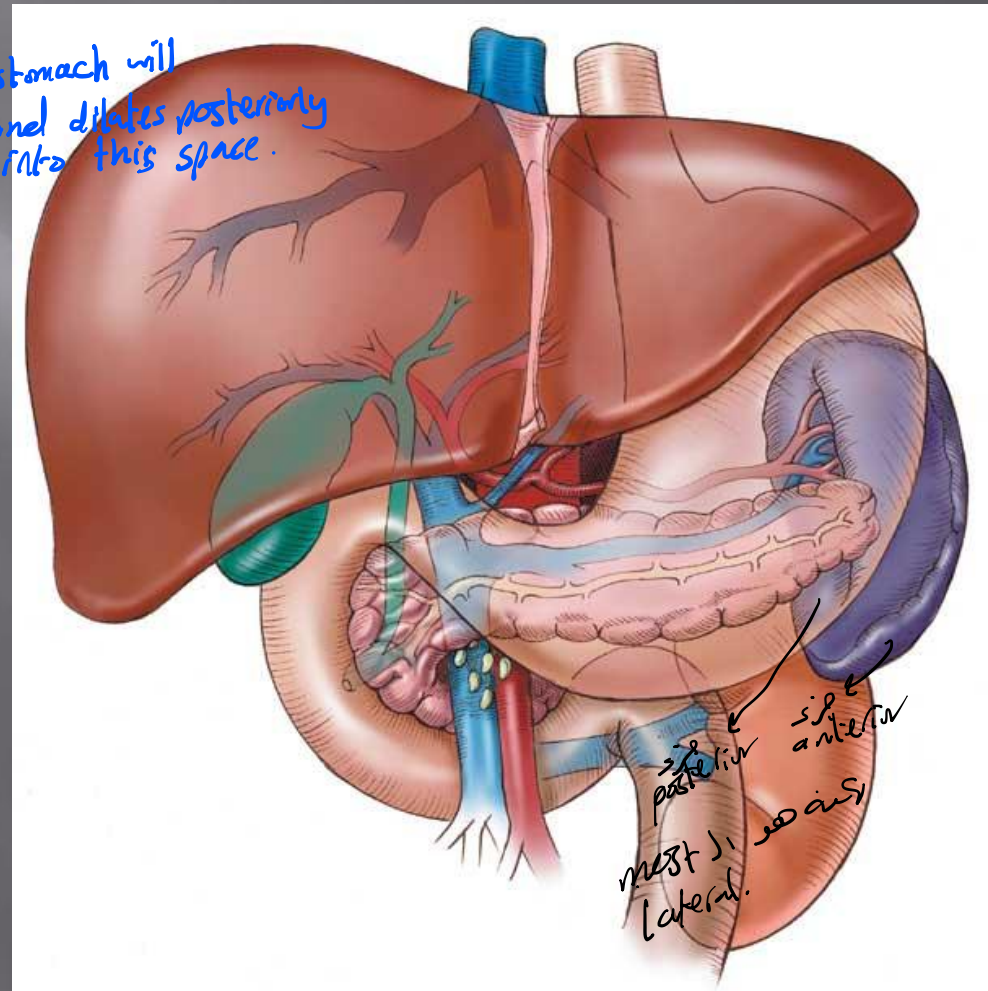


# Relations of stomach...cont

## ② Posteriorly = stomach bed

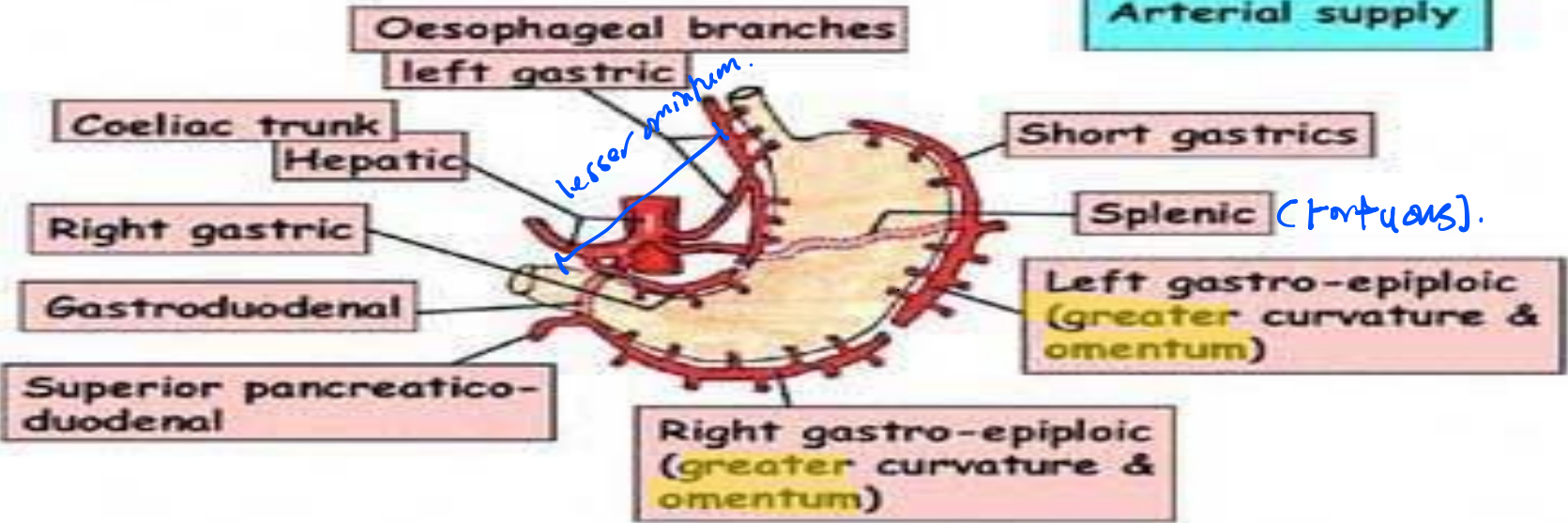
- The lesser sac → when you eat, your stomach will get bigger and dilates posteriorly into this space.
- the Lt. crus of diaphragm
- the spleen
- the left suprarenal gland
- the upper part of the left kidney found in upper border of pancreas.
- the splenic artery
- the body of pancreas
- the transverse mesocolon
- the transverse colon

→ The most lateral organ behind the stomach.

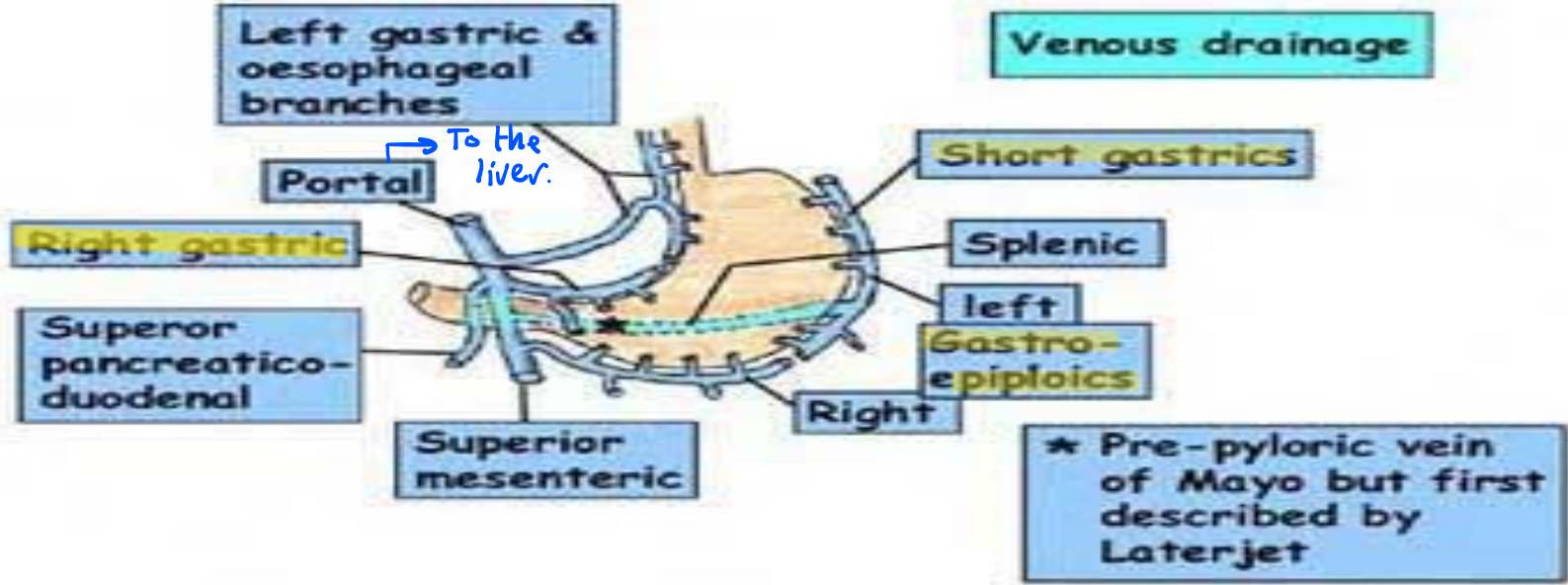


# STOMACH - BLOOD SUPPLY & VENOUS DRAINAGE

## Arterial supply



## Venous drainage





## Blood supply....cont

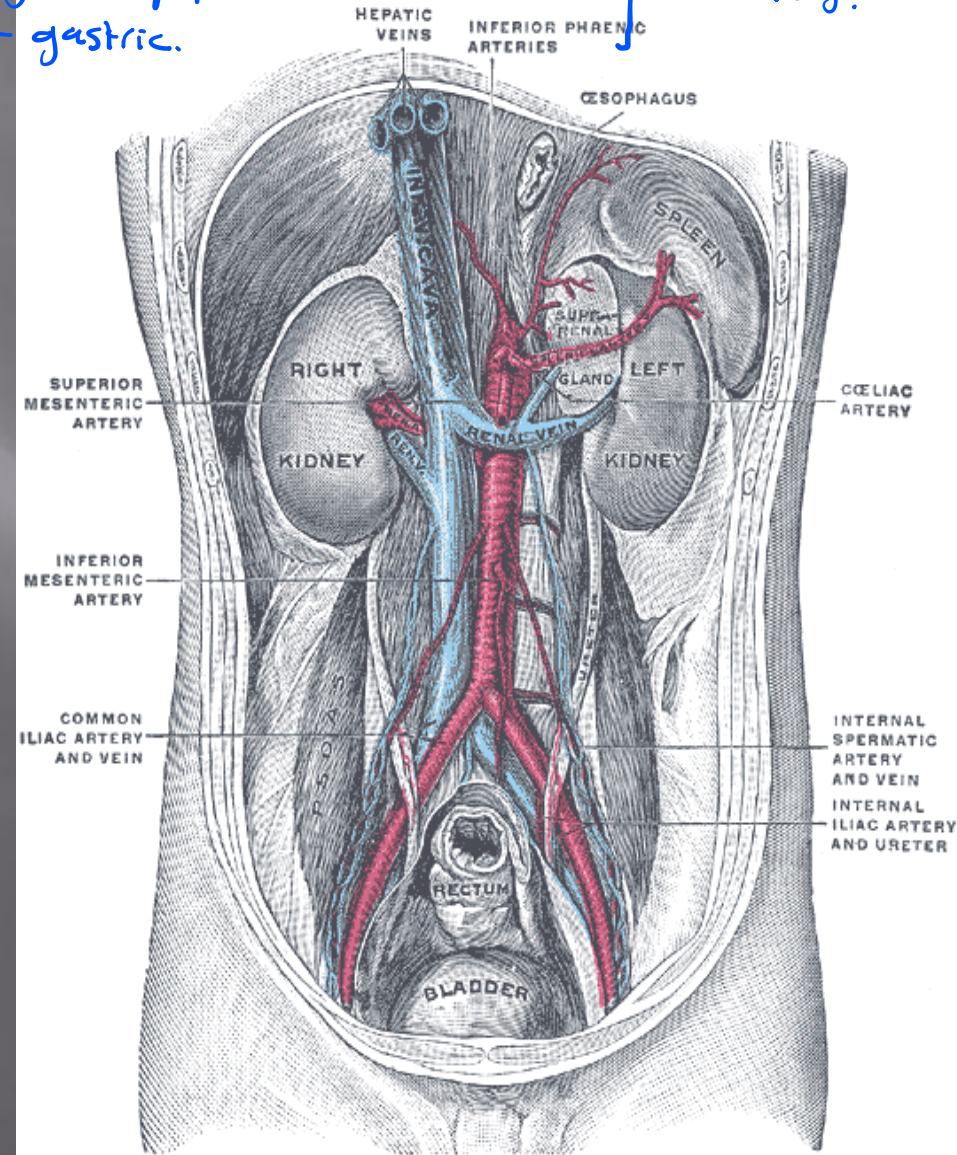
- The arteries are derived from the branches of the **celiac artery**

- The celiac trunk arise from the front of the abdominal aorta and its located at the level of T12 to L1 above the pancreas

- Its 1 cm long

- \*Blood supply of stomach:
- ① Two gastric arteries (right & left).
  - ② two gastroepiploic (left & right).
  - ③ Short gastric.

from celiac artery.



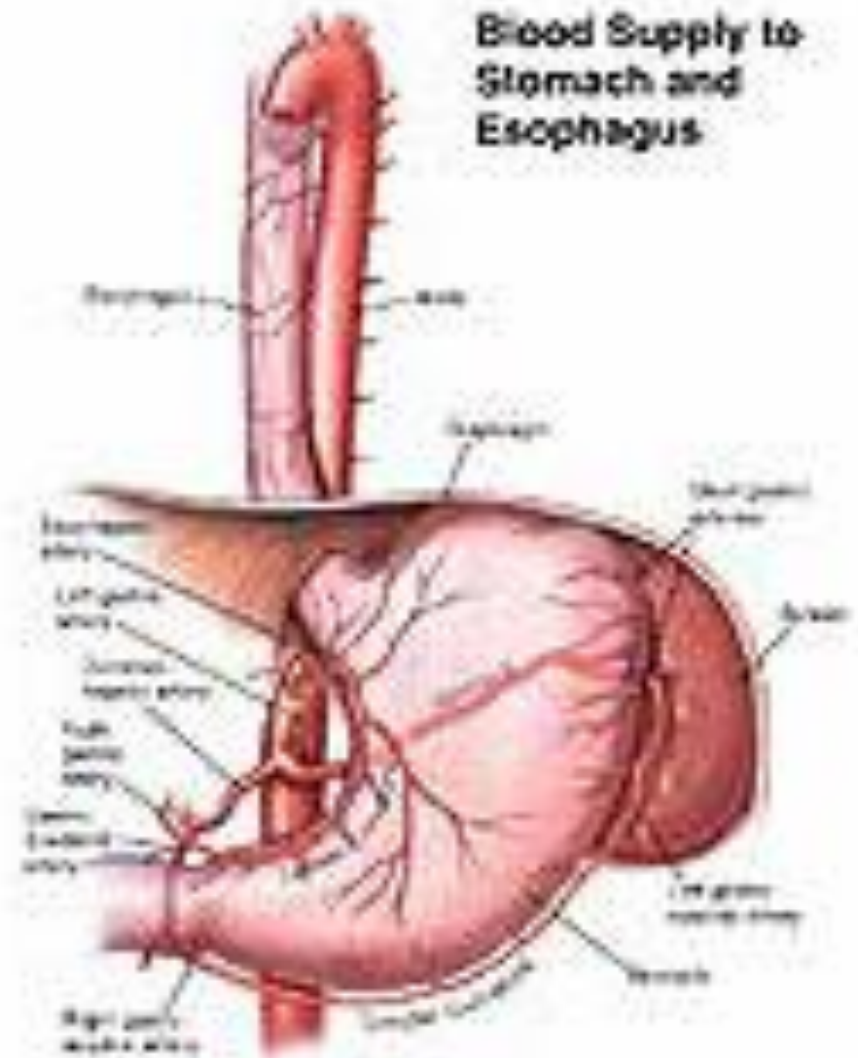
# Blood supply for stomach.....cont

## Relations of celiac artery

- On each side : celiac ganglia+ lymphatic nodes  
*sympathetic* ←
- Crus of diaphragm and lumbar nerves
- Its Branches for foregut

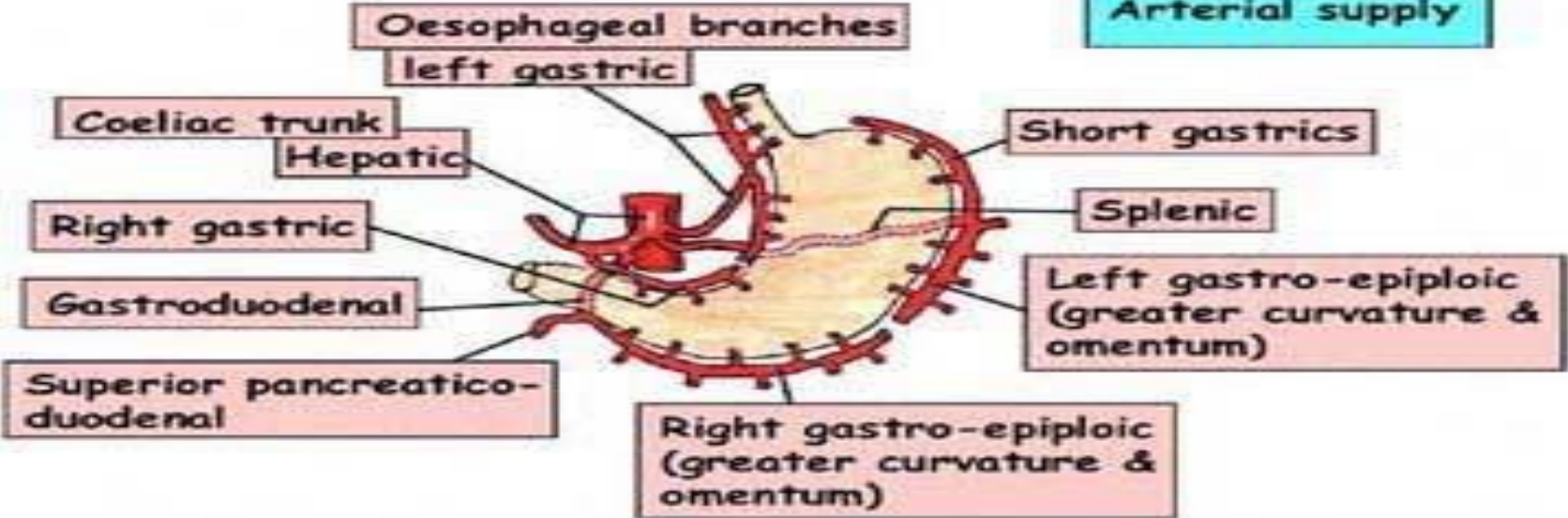
## Main distribution

- Lt.gastric.a
- Splenic.a
- Hepatic.a

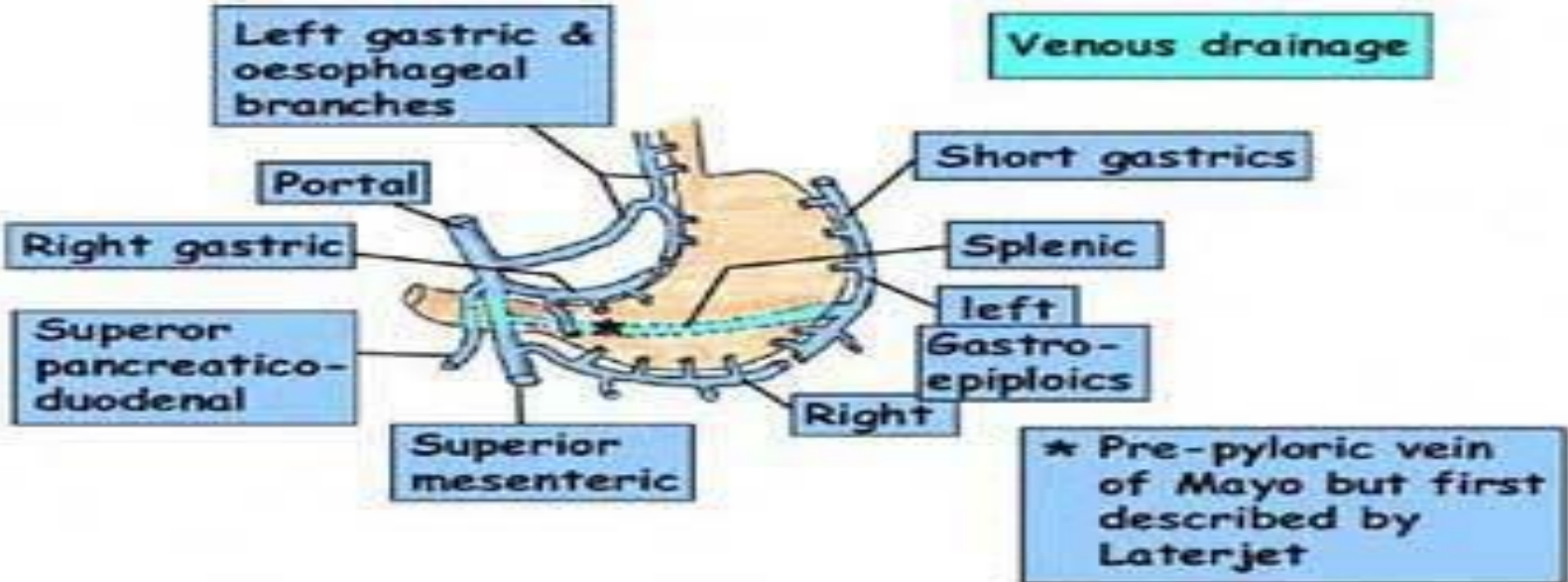


# STOMACH - BLOOD SUPPLY & VENOUS DRAINAGE

## Arterial supply



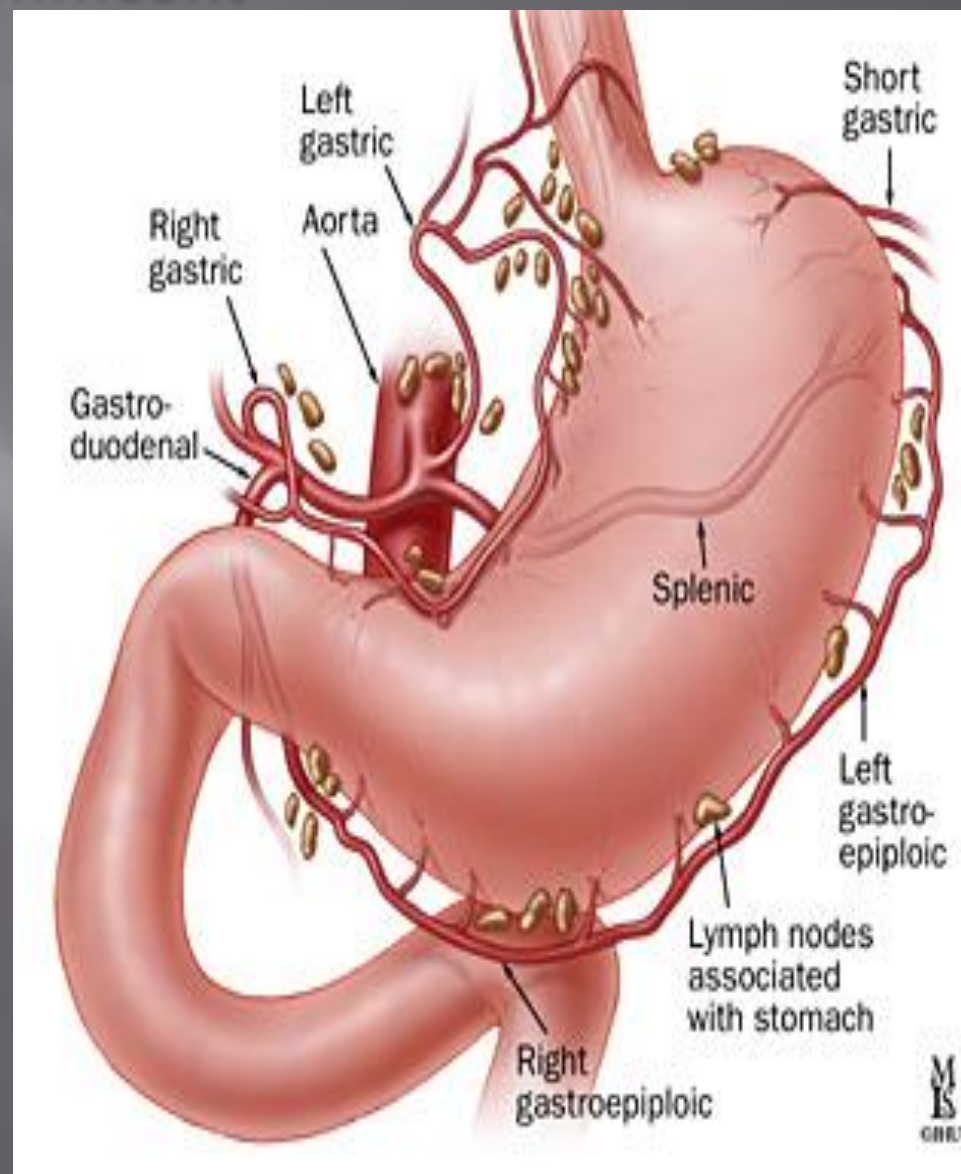
## Venous drainage



# Blood supply for stomach.....cont

## 1- The left gastric artery

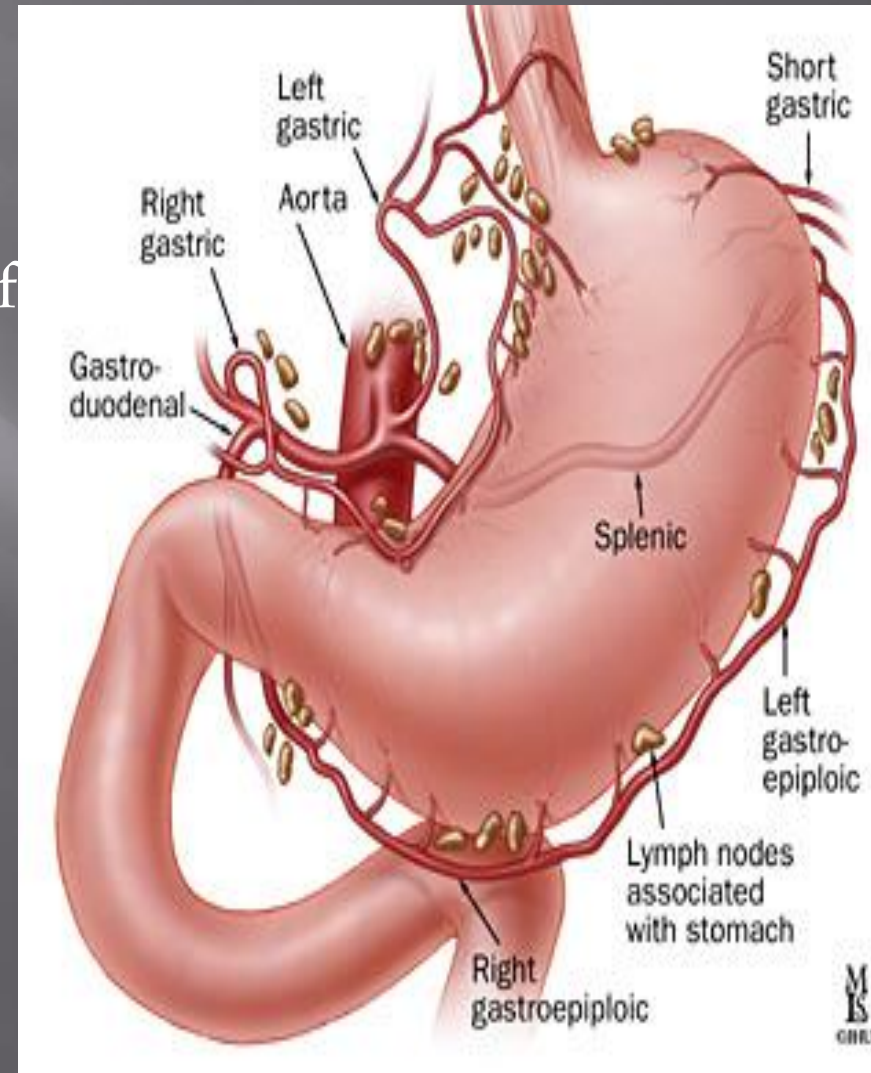
- Arises from the celiac artery
- It passes upward and to the left to reach the esophagus
- Then descends along the lesser curvature of the stomach
- It supplies the lower third of the esophagus and the upper right part of the stomach



# Blood supply.....cont

## 2- The right gastric artery

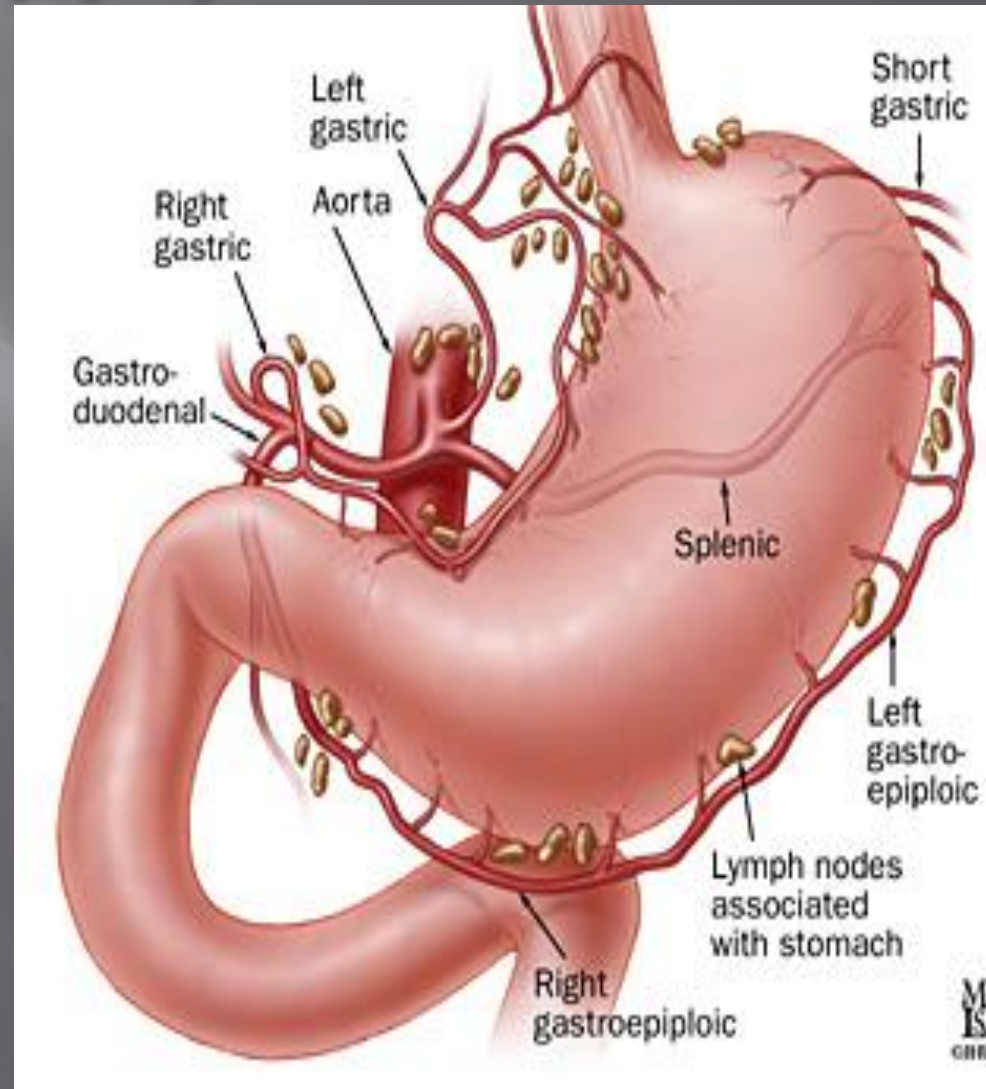
- arises from the hepatic artery at the upper border of the pylorus
- runs to the left along the lesser curvature.
- It supplies the lower right part of the stomach.



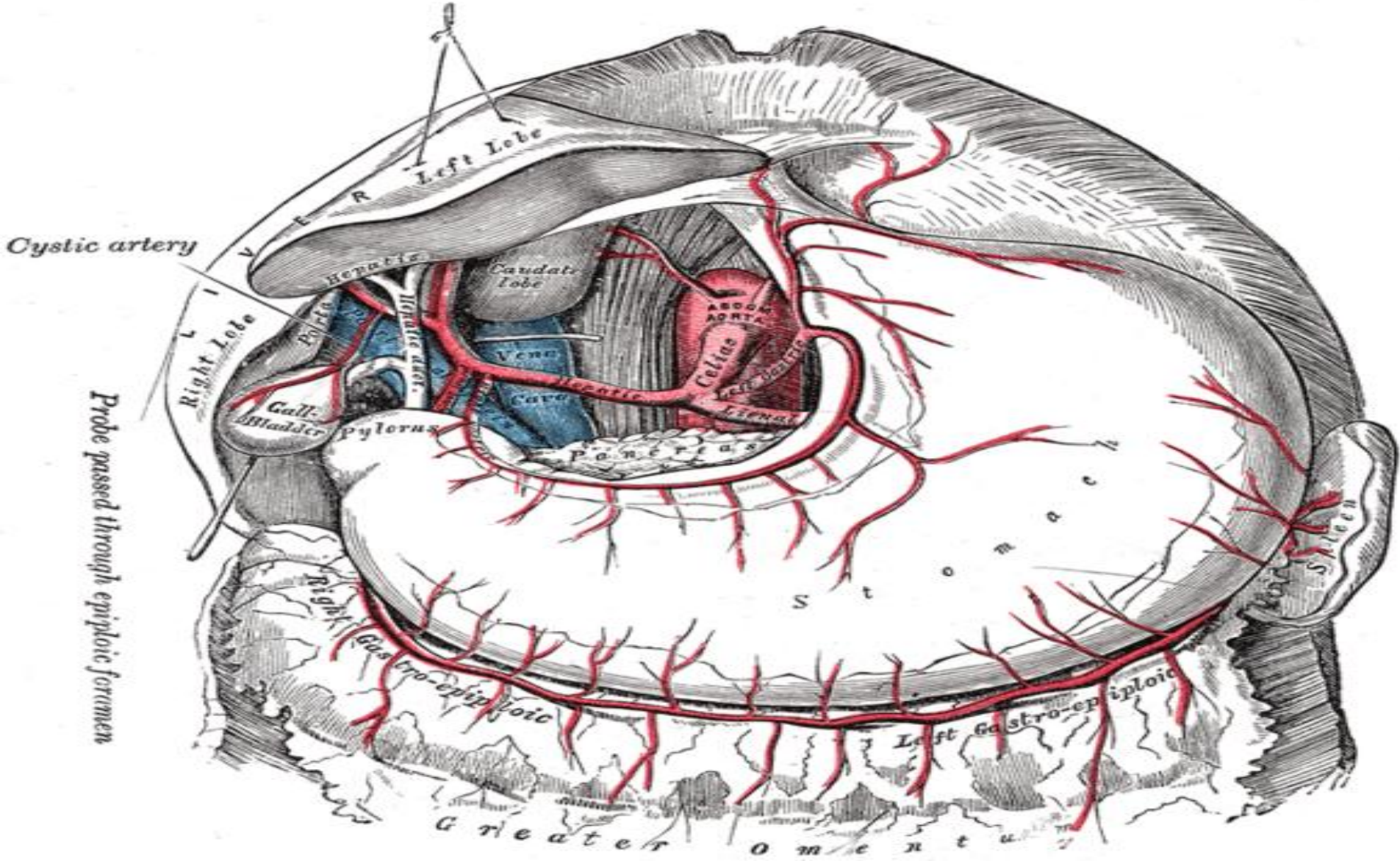
# Blood supply...cont

## 3- The short gastric arteries

- Arise from the splenic artery (5-7 arteries)
- Arises from **splenic artery in the gastrosplenic ligament**
- **pass upward in the gastrosplenic to supply the fundus**



# Blood supply of stomach



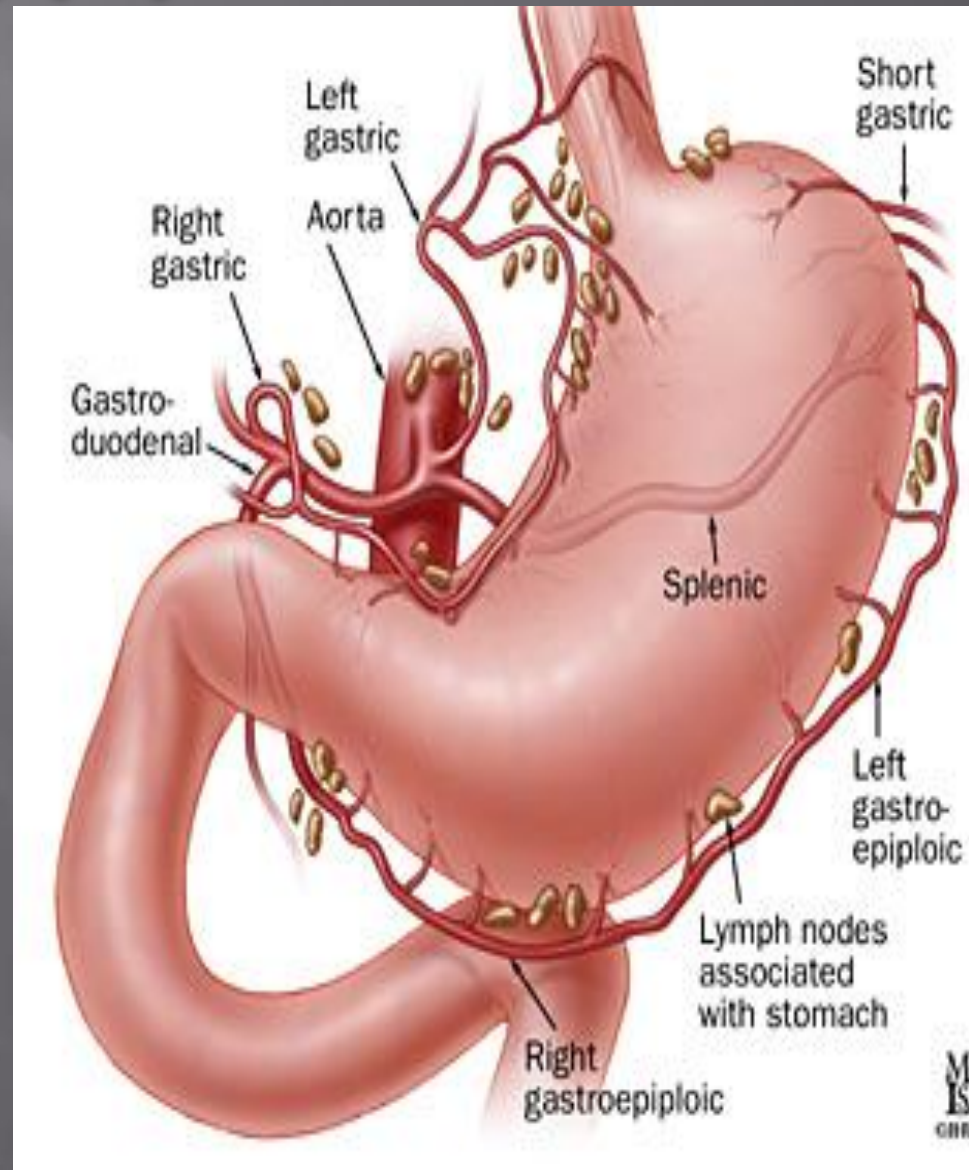
# Blood supply.....cont

## 4- The left gastroepiploic artery

- Arises from the splenic artery before the hilum of the spleen
- Passes forward in the gastrosplenic (ligament)
- Supply the stomach along the upper part of the greater curvature in the greater omentum

## 5- The right gastroepiploic artery

- arises from the gastroduodenal branch of the hepatic artery
- It passes to the left and supplies the stomach along the lower part of the greater curvature in the greater omentum.



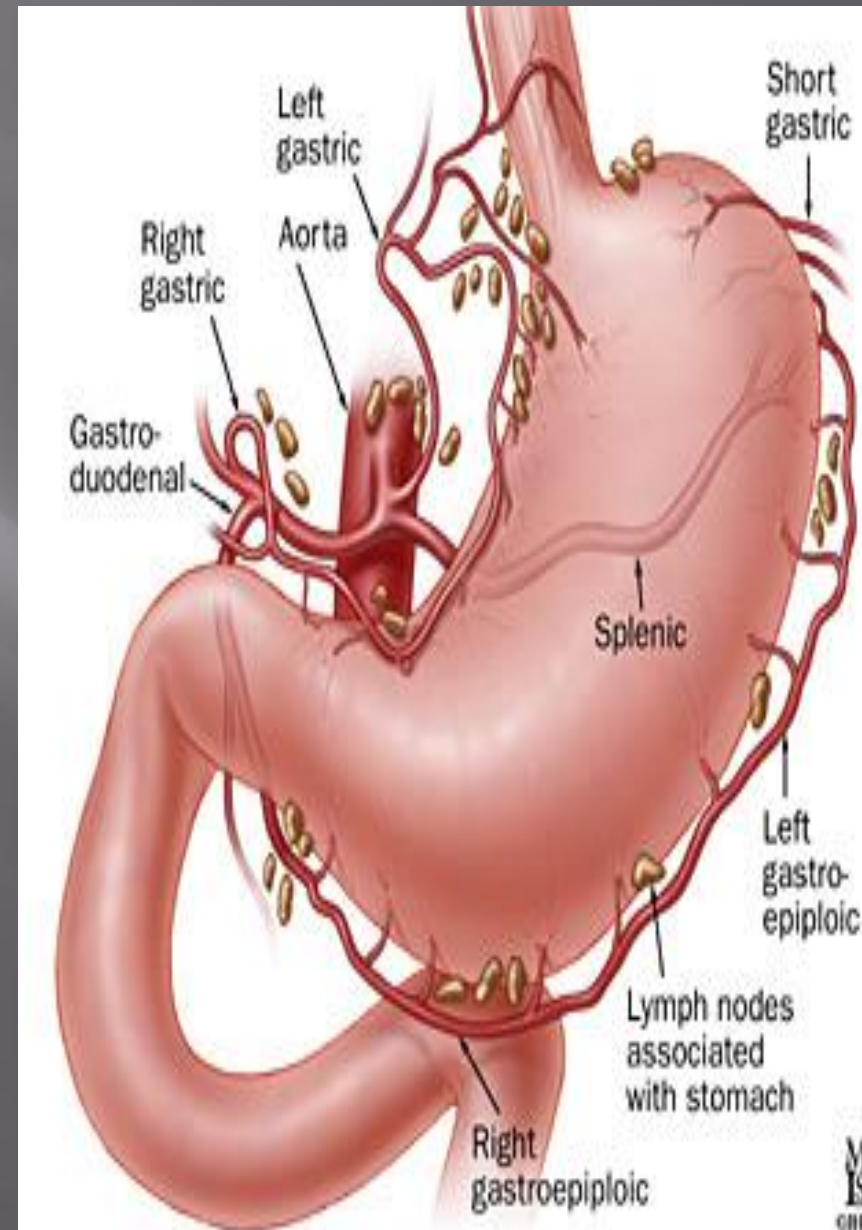


# Venous drainage

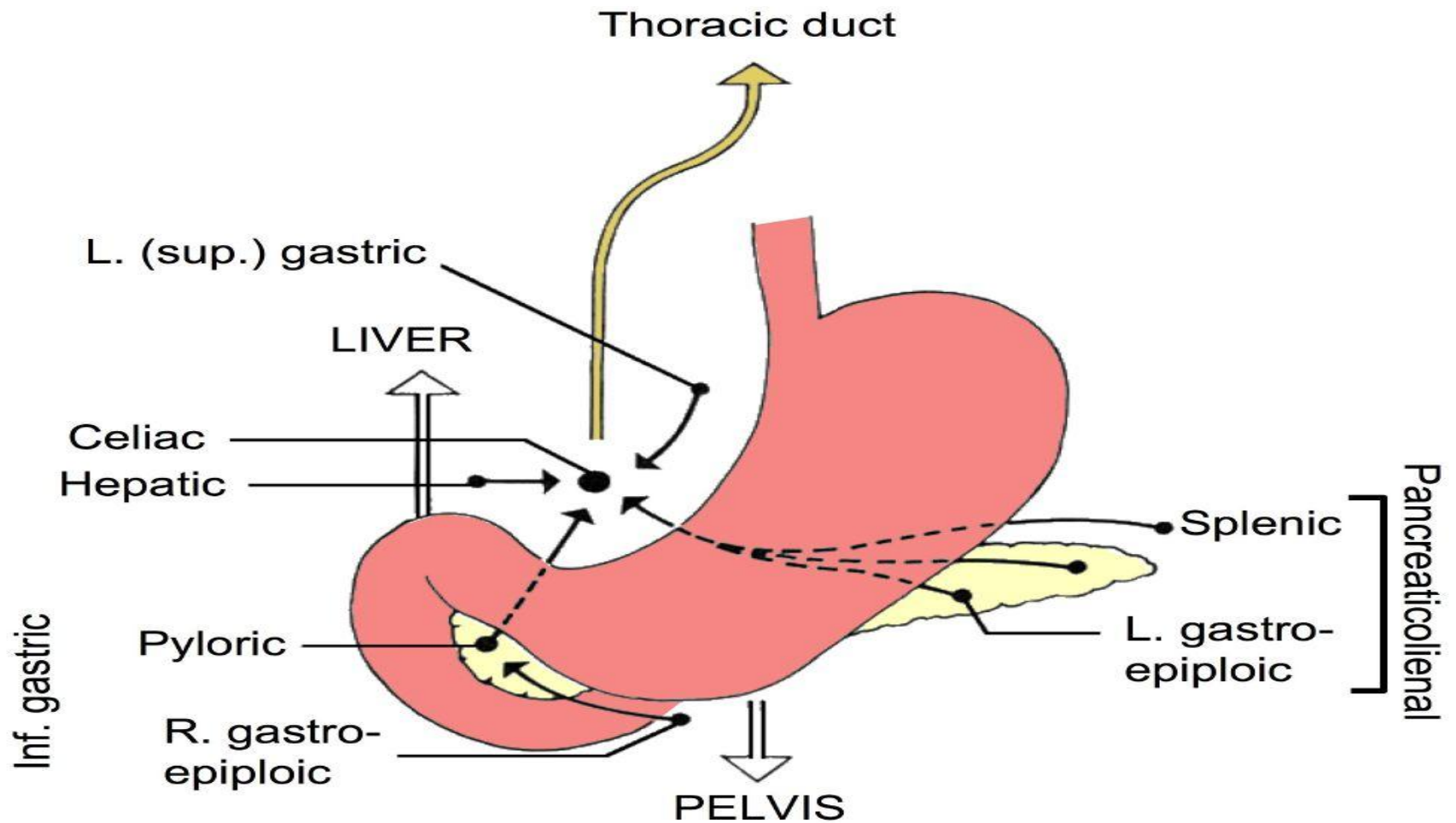
- ▣ The veins drain into the portal circulation
- ▣ The left and right gastric veins drain directly into the portal vein
- ▣ The short gastric veins and the left gastroepiploic veins join the splenic vein
- ▣ The right gastroepiploic vein joins the superior mesenteric vein (which meet the splenic vein behind the neck of pancreas to form the portal vein)

# Lymphatic drainage

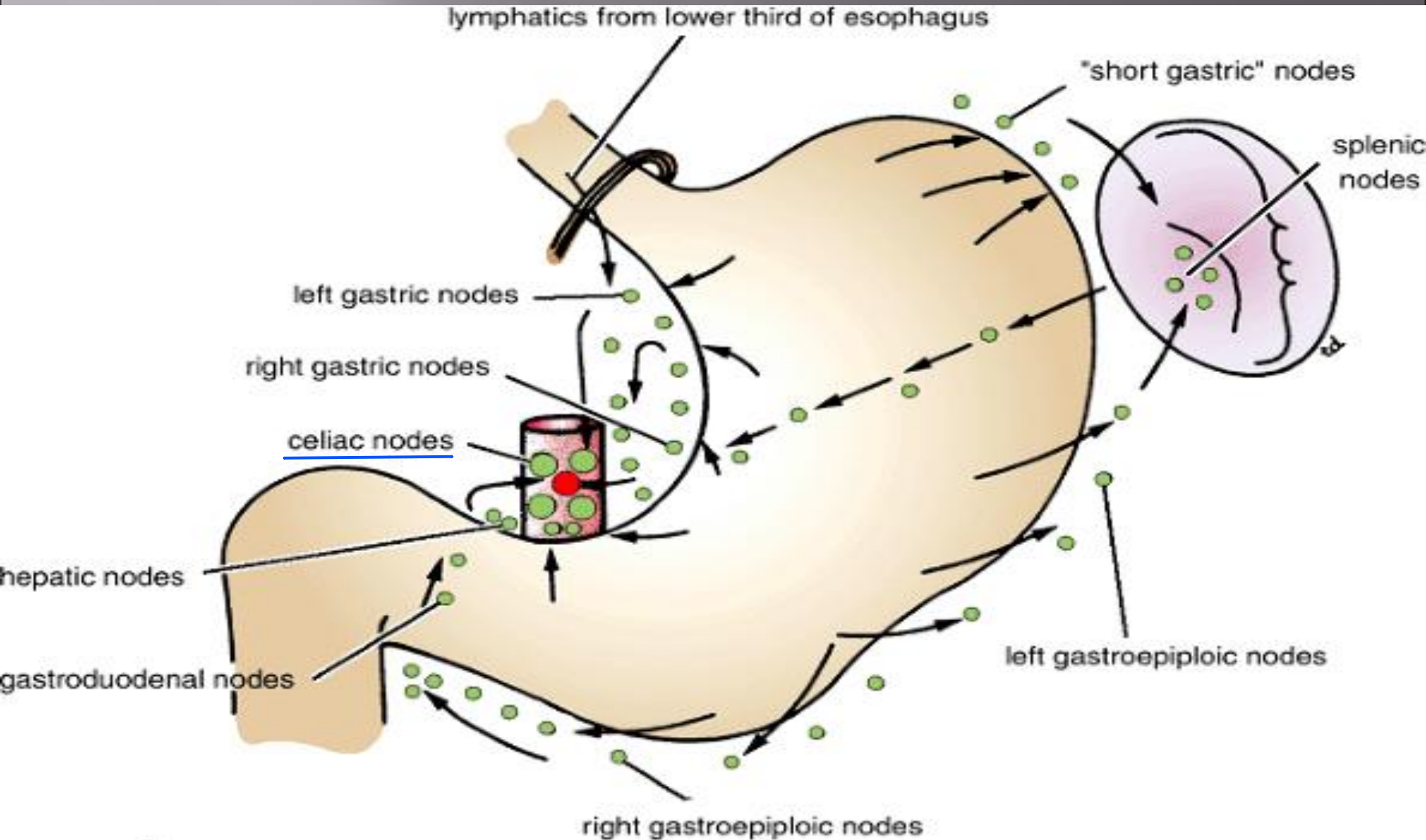
- Follow the arteries of stomach
- The left and right gastric nodes
- The left and right gastroepiploic nodes
- The short gastric nodes
- All lymph from the stomach eventually passes to the celiac nodes located around the root of the celiac artery on the posterior abdominal wall.



# Lymphatic drainage



# Lymphatic drainage....cont

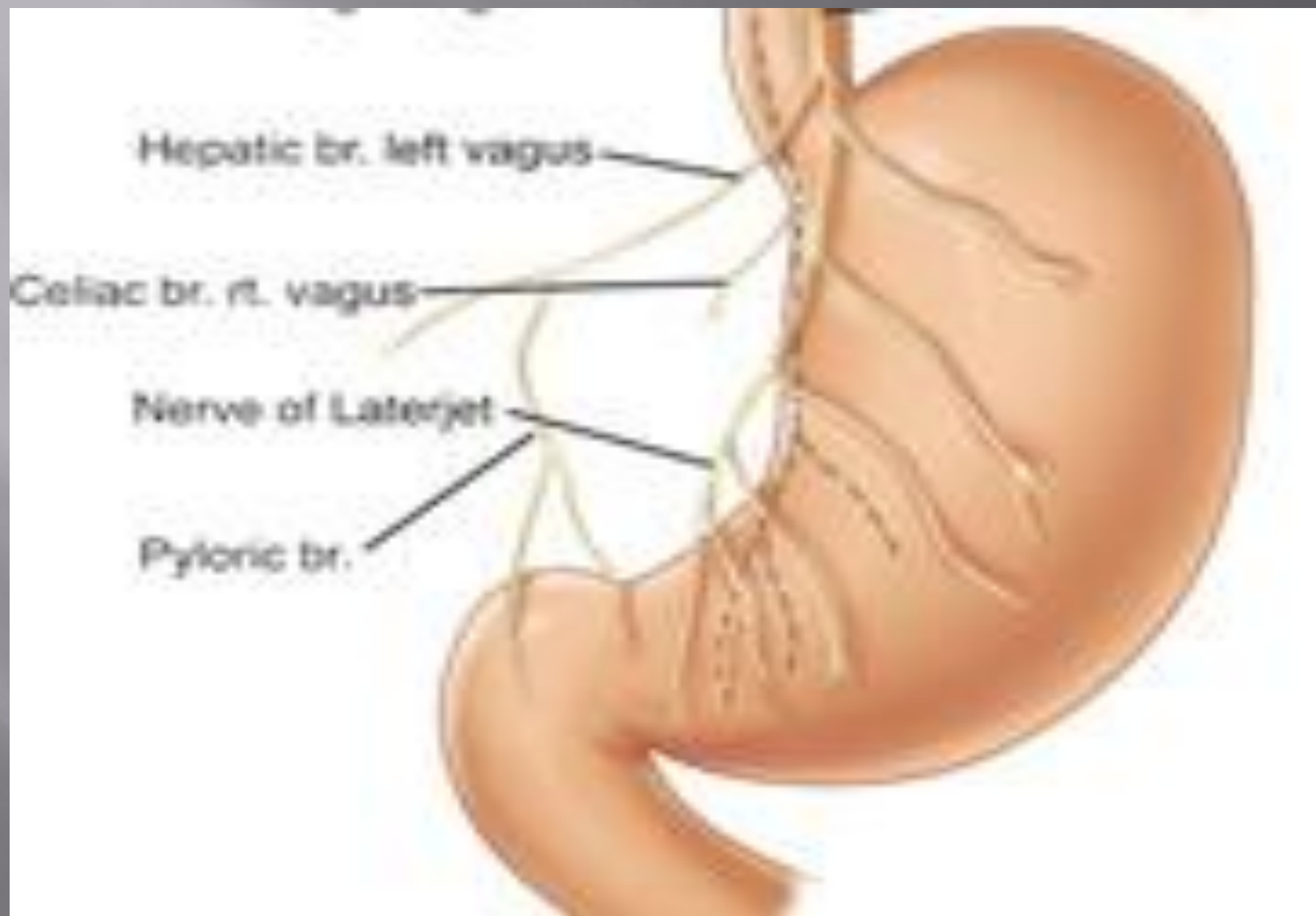


Distribution  
with  
blood  
vessels.

# Nerve supply for stomach

→ Sympathetic  
Celiac  
ganglion)  
(postganglionic)  
→ Parasympathetic  
(Vagus)  
(preganglionic)

- The nerve supply includes **sympathetic fibers** derived from the **celiac plexus**
- **parasympathetic fibers** from the right and left **vagus nerves**.
- The sympathetic innervation of the stomach carries a **proportion of pain sensation**
- The parasympathetic vagal fibers are **secreto-motor** to the **gastric glands** and **motor** to the muscular wall of the stomach( **peristaltic movement**)
- The pyloric sphincter receives **motor fibers** from the sympathetic system and **inhibitory fibers** from the **vagus.n.**



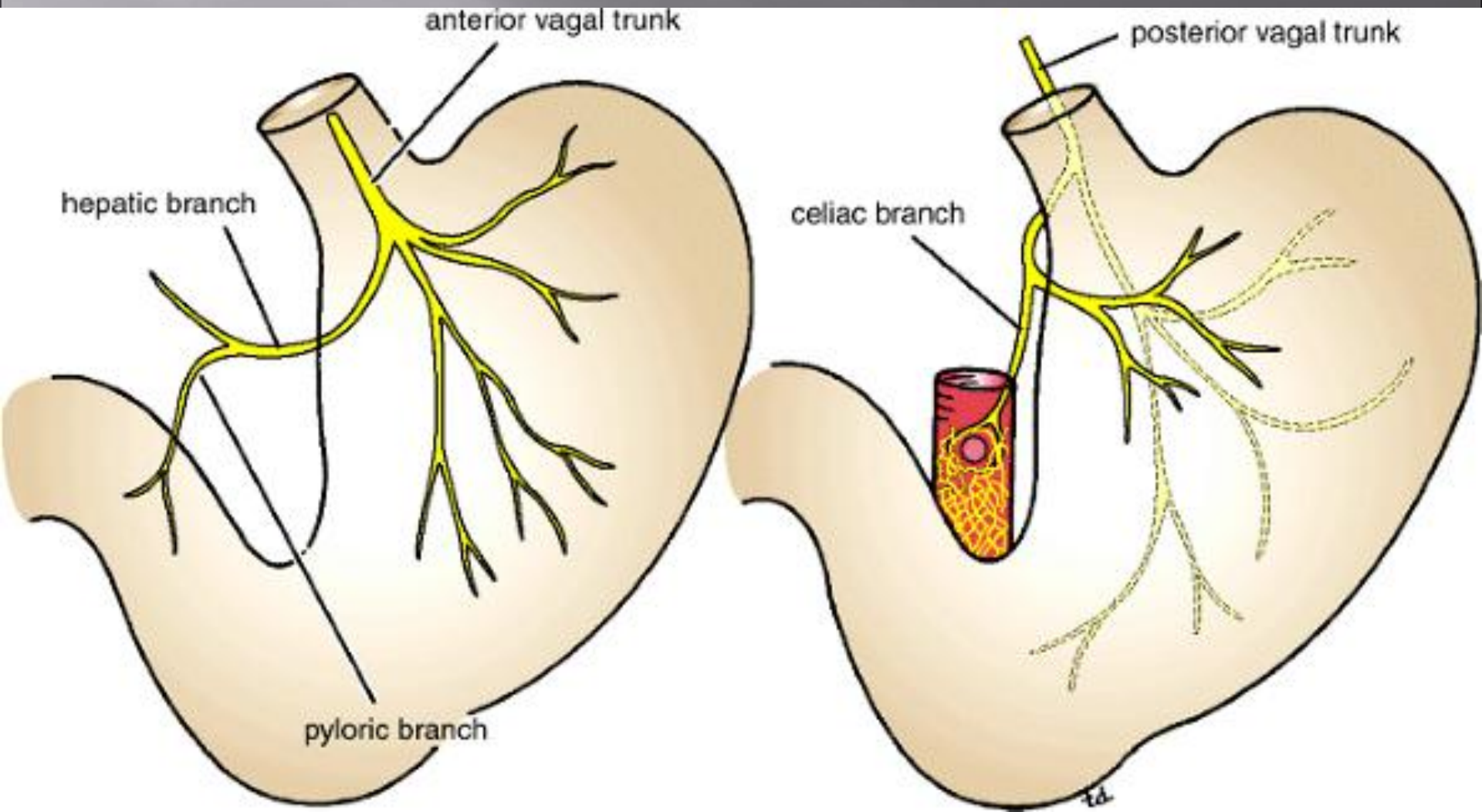
# Nerve supply of stomach.....cont

- ▣ The anterior vagal trunk
  - mainly from the left vagus nerve

## Distribution

- 1- The anterior surface of the stomach.
- 2- A large hepatic branch passes up to the liver
- 3- Ant. Nerve Laterjet → pylorus

# Nerve supply of stomach.....cont





# Nerve supply of stomach.....cont

## ▣ The posterior vagal trunk

- mainly from the right vagus nerve

## - Distribution

1- mainly the posterior wall of the stomach.

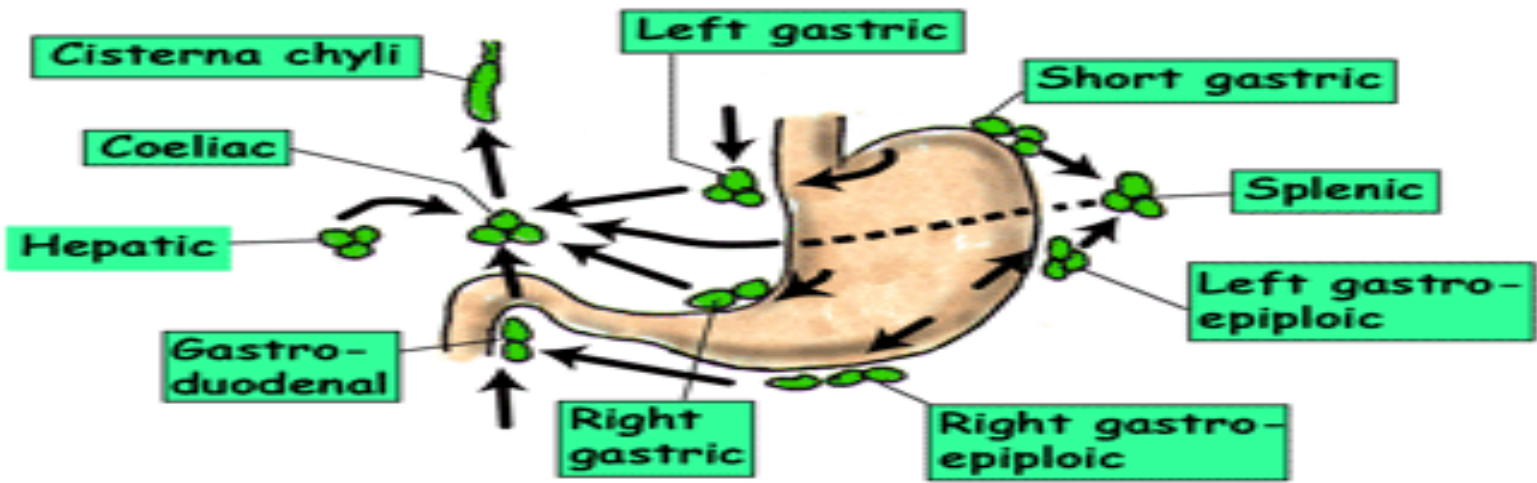
2- Ant. Wall of body of stomach

3- Celiac branch → small intestine + as far as to  
splenic flexure + pancreas

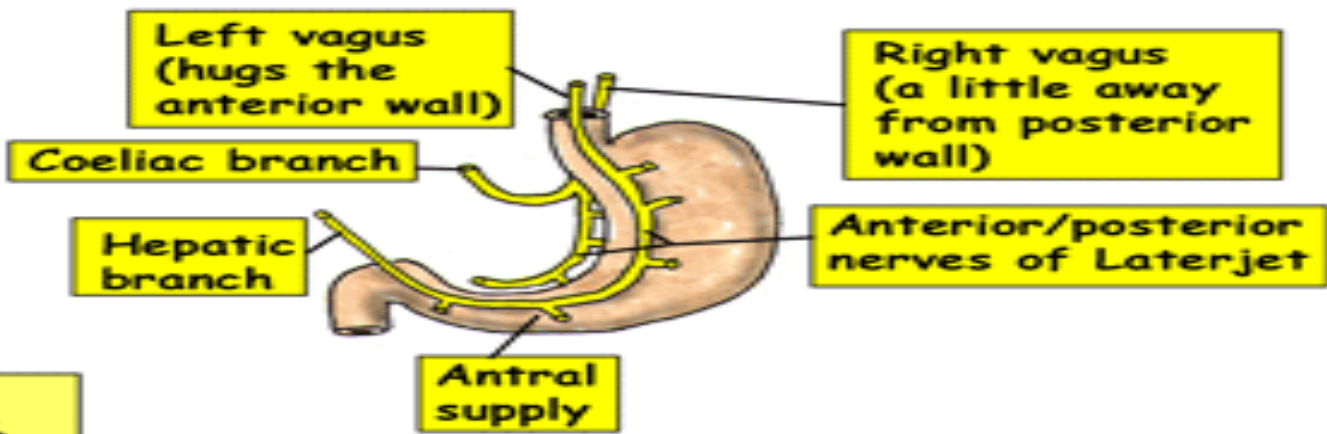
↳ small intestine → large intestine →  
Distal third of transverse  
colon.

4- post. Nerve latorjet → pylorus

# STOMACH - LYMPHATIC DRAINAGE & NERVE SUPPLY



**Sympathetics**  
 Greater splanchnic nerves (T5-9) for decreasing motility, vaso-constriction, closing pylorus & sensation



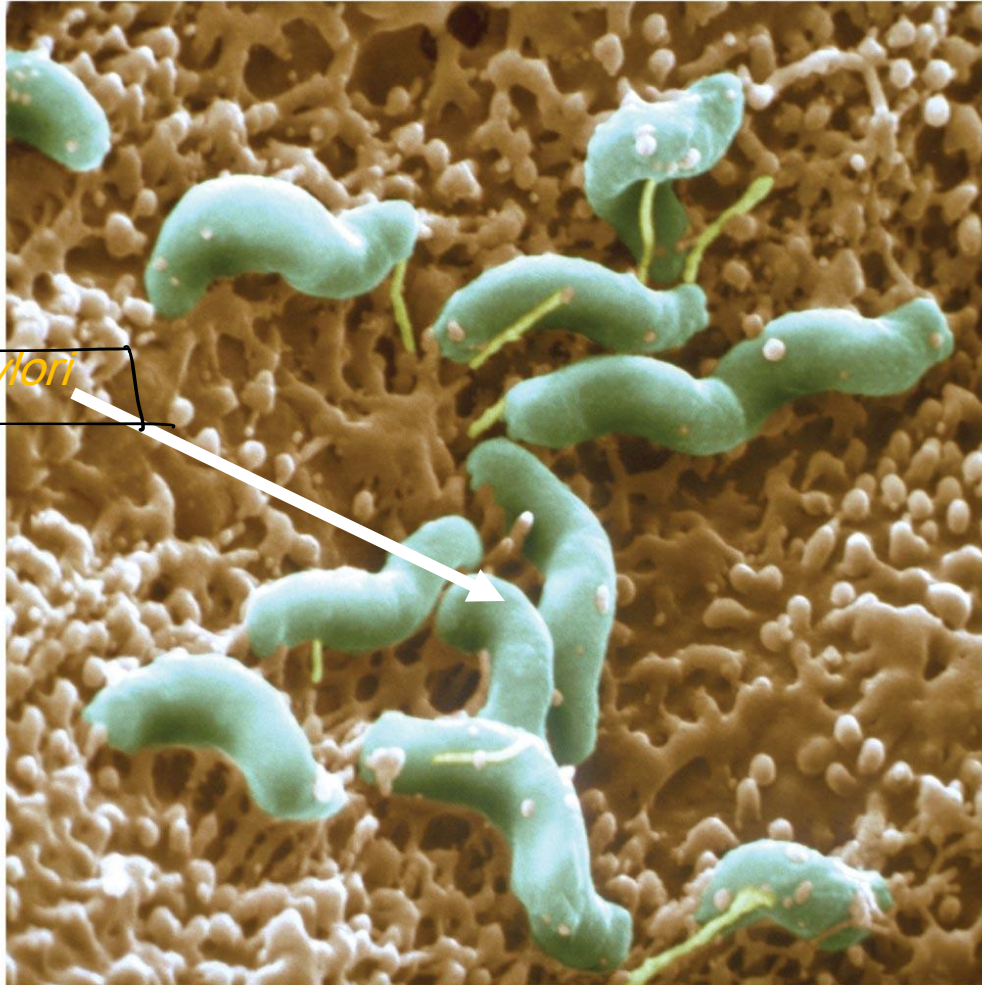
**Vagus nerves** are 80% sensory. 20% motor for increasing motility, opening pylorus & initiating secretions

**Note:** Highly selective vagotomy destroys vagus to fundus & body but preserves nerve to antral pump

# Clinical notes

- Gastric Ulcer (Stomach) (Mostly malignant)  
عالم مثبت الكس .
- Trunkal vagotomy → Sectioning the vagus nerves below the diaphragm around the esophagus.
- Highly selective vagotomy (cut all branches of the vagi except laterjet.n)
- Peptic ulcer (D.U) (duodenum) (Mostly peptic ulcer)  
عالم مثبت الكس .
- Gastroscopy (treatment & diagnosis).
- Pyloroplasty (drainage) = gastro-jejunostomy

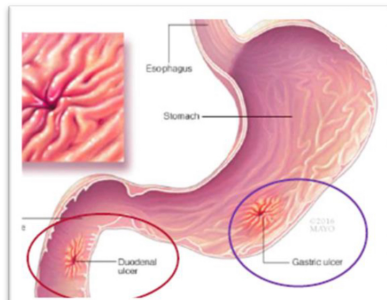
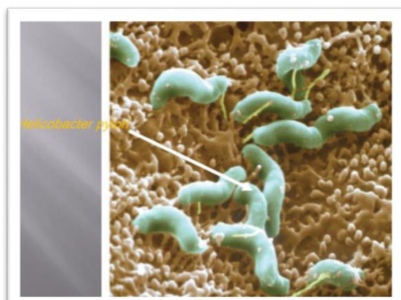
# Causes of Ulcers in stomach



*Helicobacter pylori*

## ❖ Clinical Notes:

- ◆ **Gastric Ulcer:** the most common site in stomach: anterior and posterior walls of lesser curvature. **The gastric ulcer is considered malignant until proven that it is not malignant.** So, a biopsy needs to be taken to prove malignancy.
- ◆ **Peptic Ulcer (duodenal ulcer):** the most common site for peptic ulcer is the first part of the duodenum especially in the first inch, since it receives **gastric acidity from stomach** which may result in irritation ulcer especially in post. Surface.
- ◆ **Trunkal Vagotomy** the rule said that hyperacidity meant peptic ulcer, and its treatment was surgery to the vagus nerve. **We used to cut the vagus nerve below the diaphragm around the esophagus**, so the stomach stopped receiving parasympathetic innervations, which resulted in bad drainage.
- ◆ Now, we perform a **highly selective vagotomy** where we cut all branches of vagi except the nerve of Latarjet (pylorus) so no secretion in body of stomach but we have evacuation of stomach contents to duodenum.
- ◆ Now, it has changed completely. **The real cause of peptic ulcer is a bacterium known as Helicobacter pylori.** **Its treatment by antibiotics and antiacidity.**
- ◆ **Gastroscopy:** where we enter an endoscope into the oral cavity until the second part of the duodenum to take biopsy and sometimes treatment.
- ◆ We can **drainage** of the stomach contents through the pyloric sphincter by **gastro-jejunostomy** which is a surgical procedure in which an anastomosis is created between the stomach and the jejunum or by pyloroplasty which is surgery to dilate the sphincter.



Notes from US1 sheet about clinical slide