



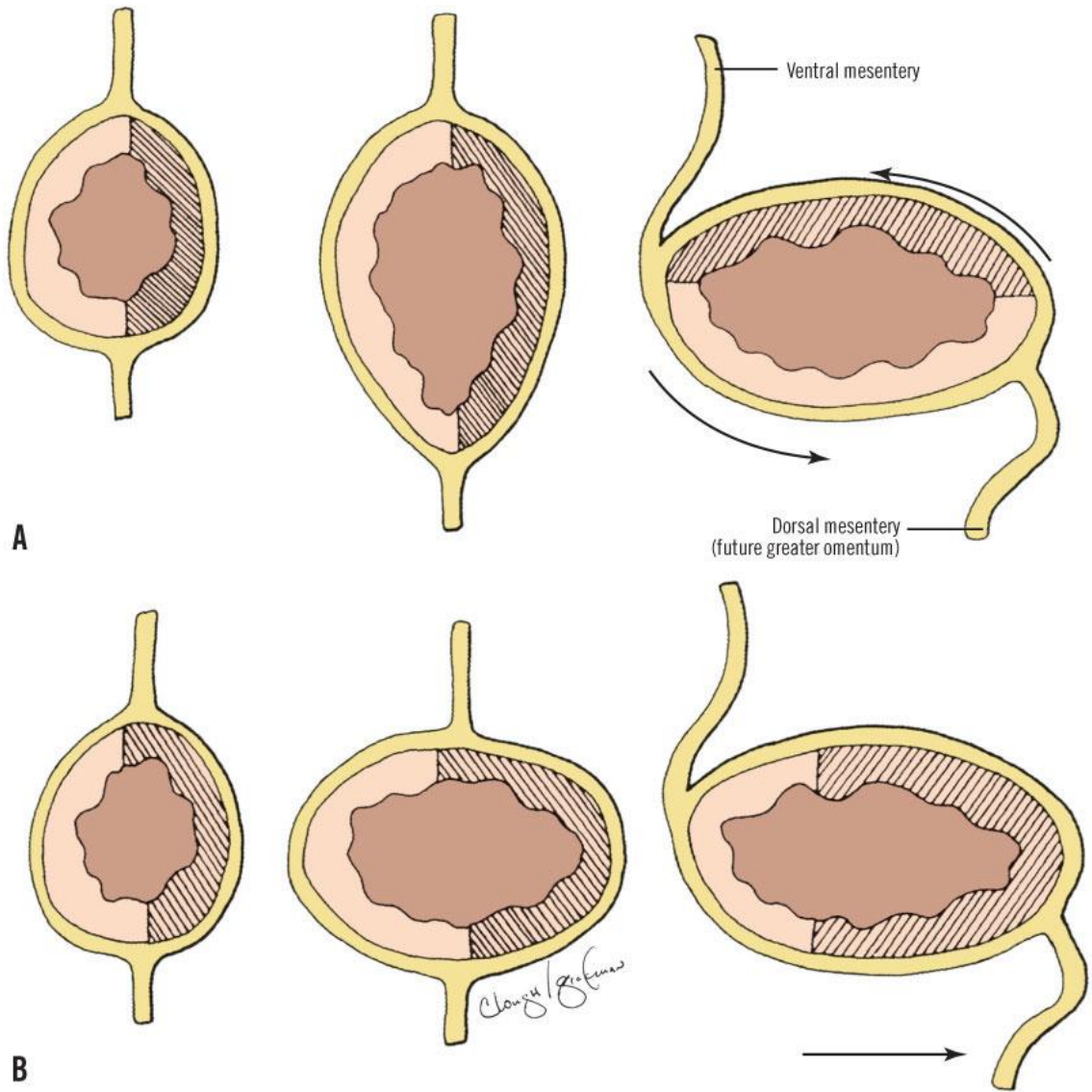
PERITONEUM AND STOMACH

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EMBRYOLOGY

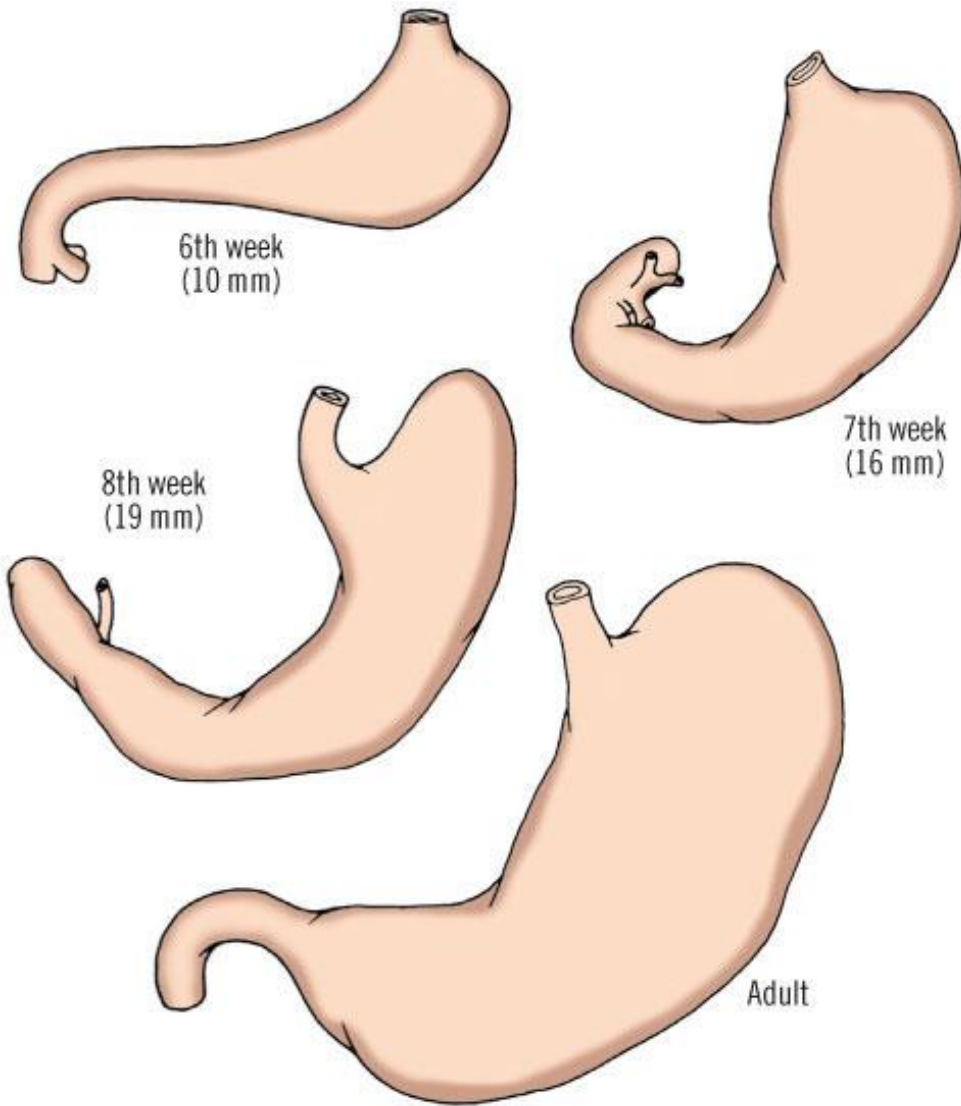


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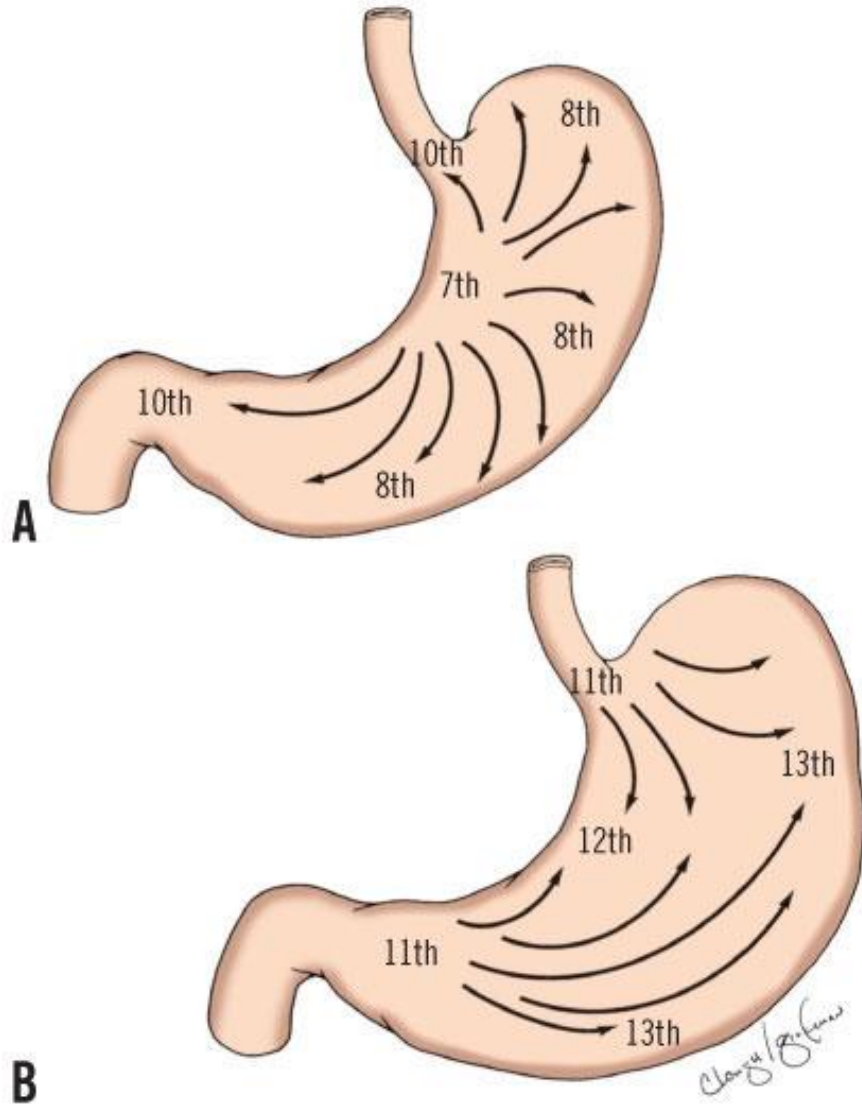
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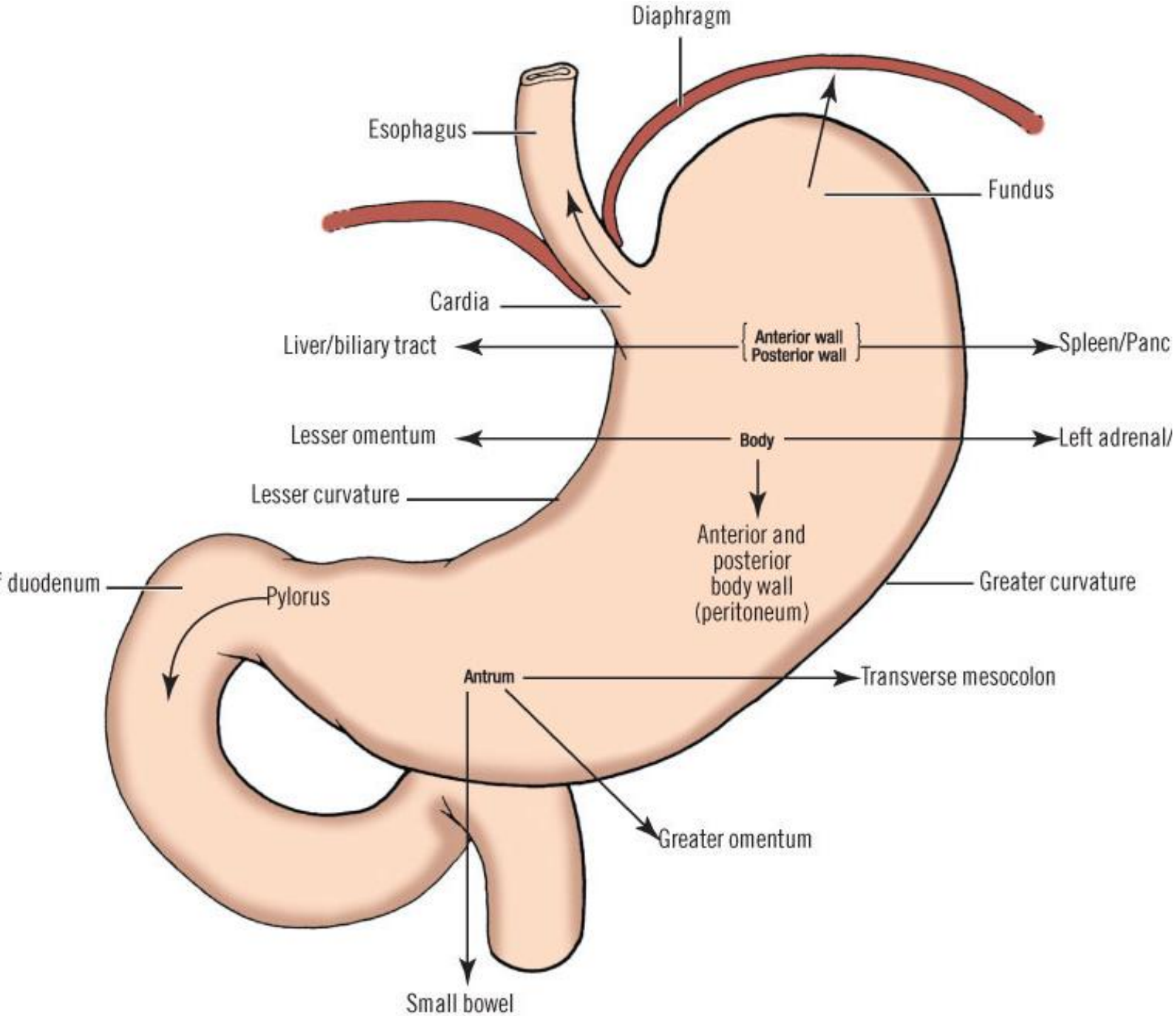


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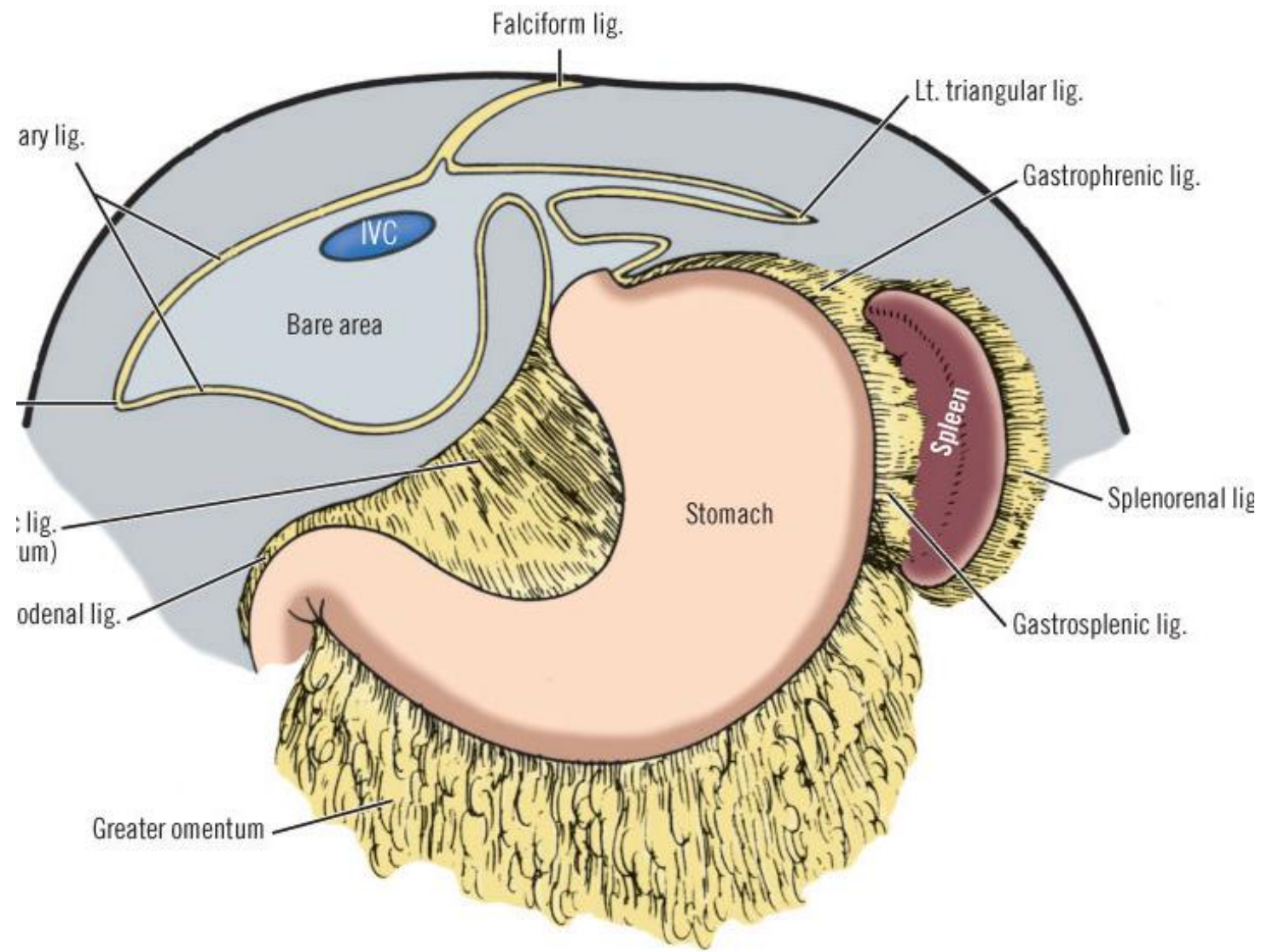
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GENERAL ANATOMY

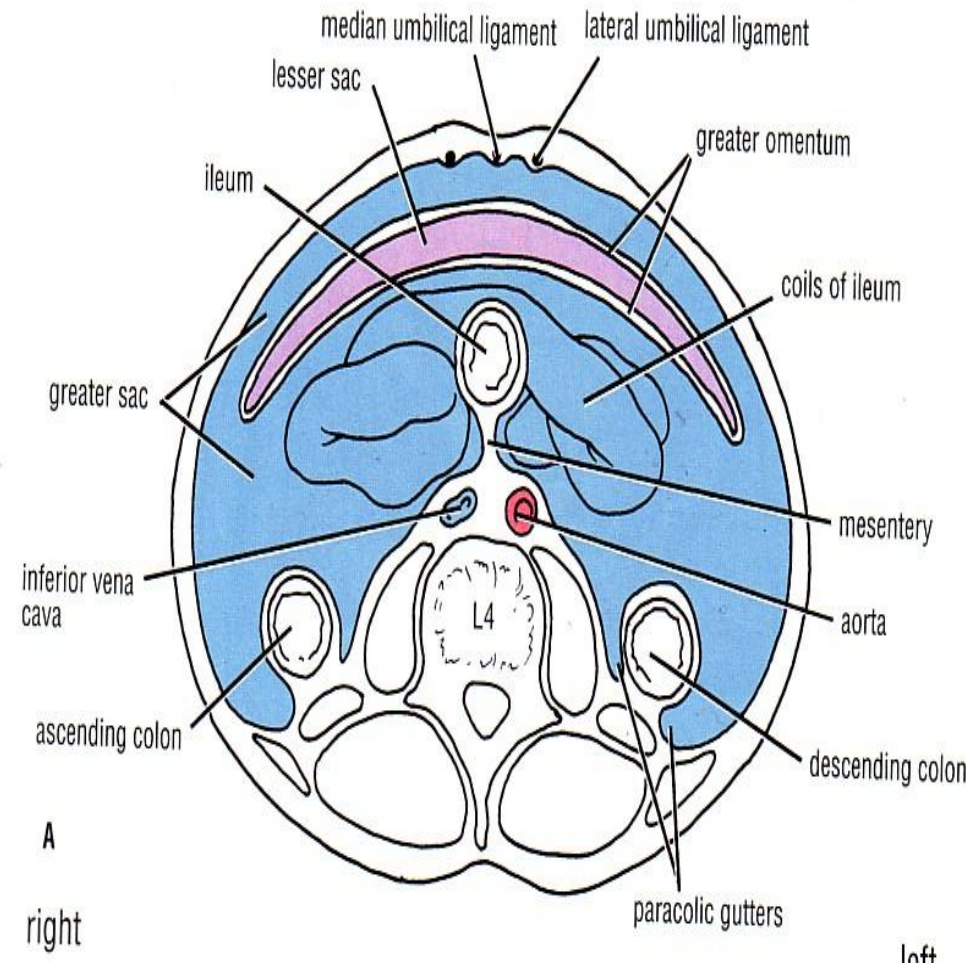


PERITONEAL REFLECTIONS AND LIGAMENTS

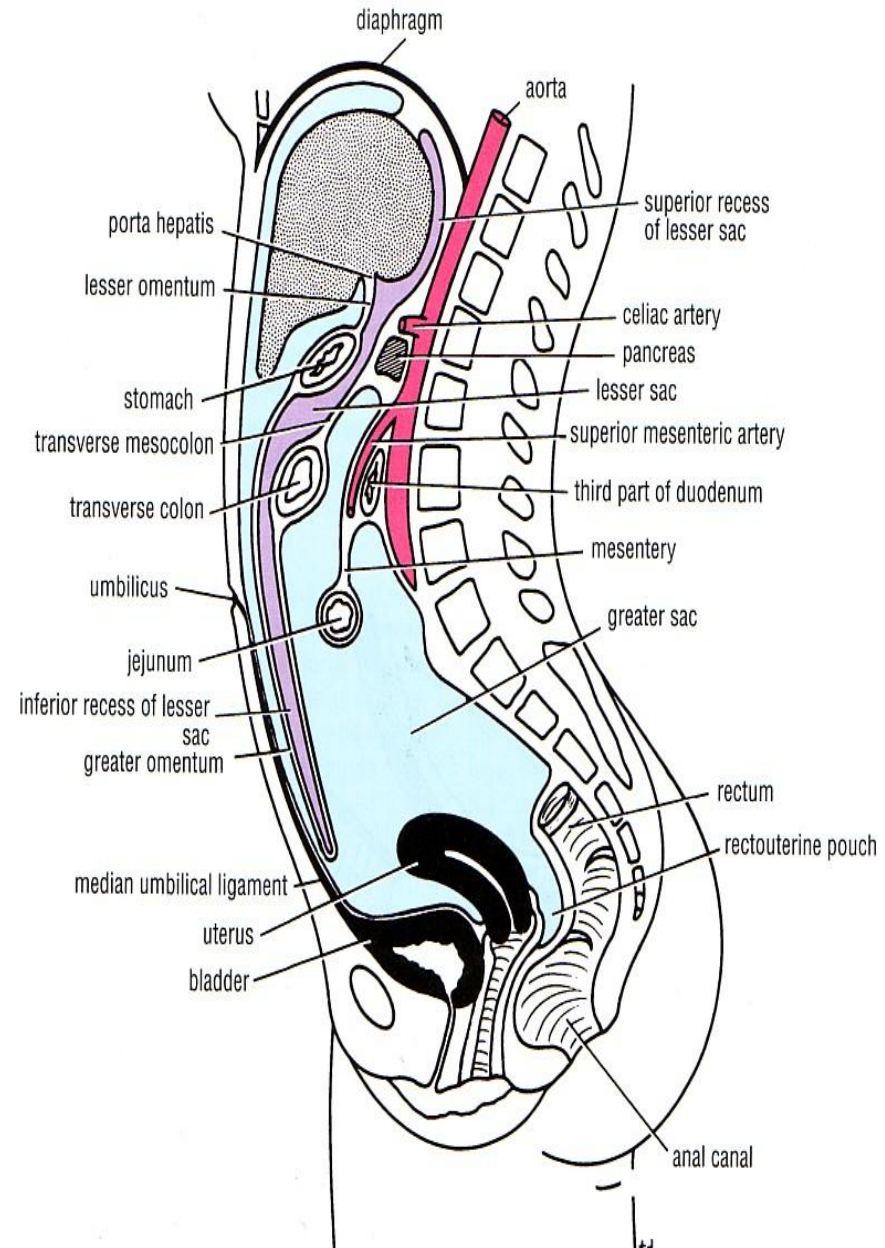


• Peritoneum:

- Thin, serous, continuous glistening membrane lining the abdominal & pelvic walls and clothing the abdominal and pelvic viscera.
- **Parietal layer** lines the wall & **visceral layer** covers the organs.
- The potential space between the two layers is filled with ***very thin*** film of ***serous fluid*** to facilitate the movement of the abdominal organs.
- Peritoneal cavity is the largest cavity in the body.
- The surface area of parietal & visceral layers is enormous.



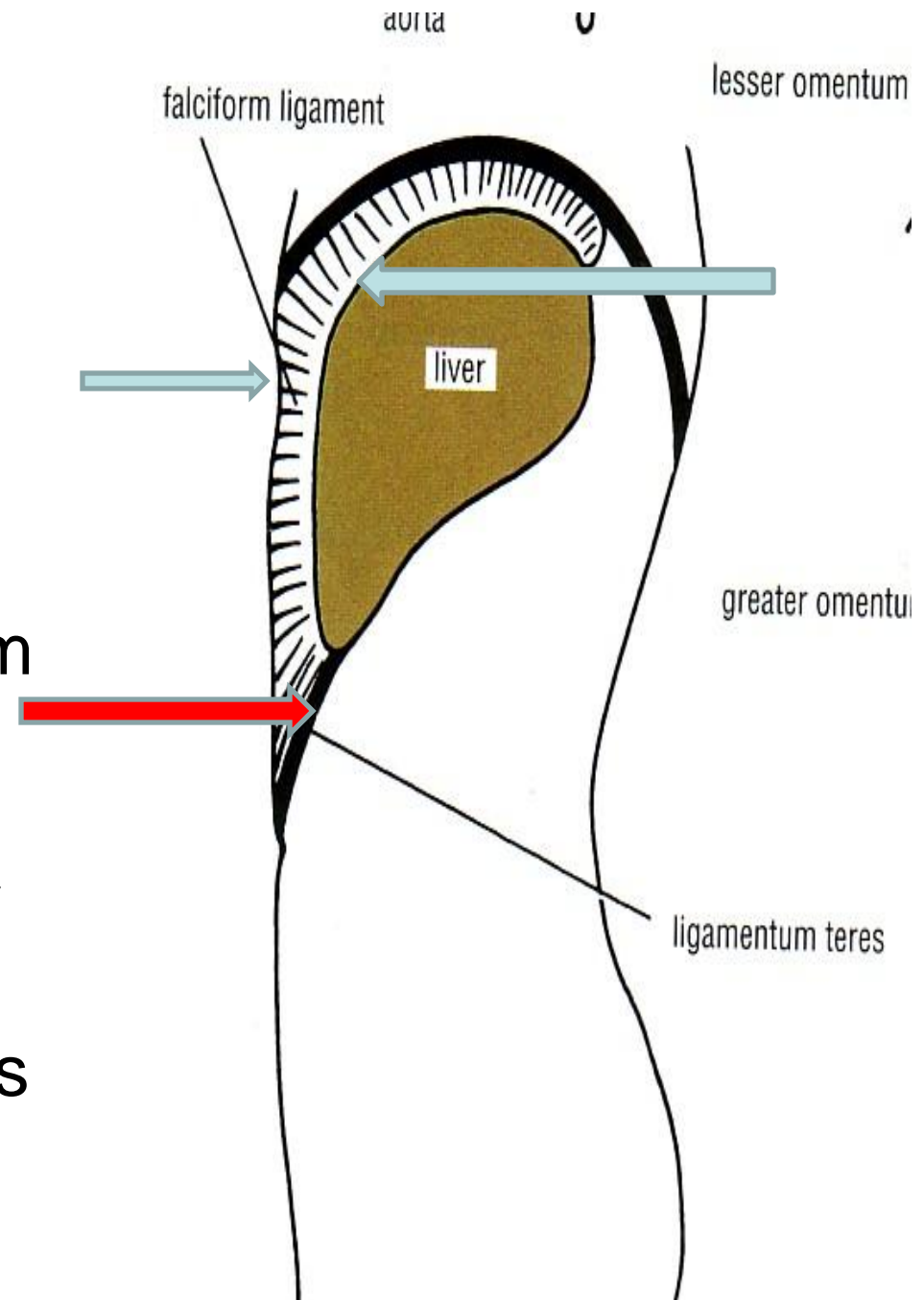
- **The peritoneal cavity**
- It is divided into two main sacs:
- 1- Greater sac.
- 2- Lesser sac or omental bursa.
- These two sacs are interconnected by a single oval opening called the epiploic foramen or opening into lesser sac or foramen of Winslow



- **Falciform Ligament**

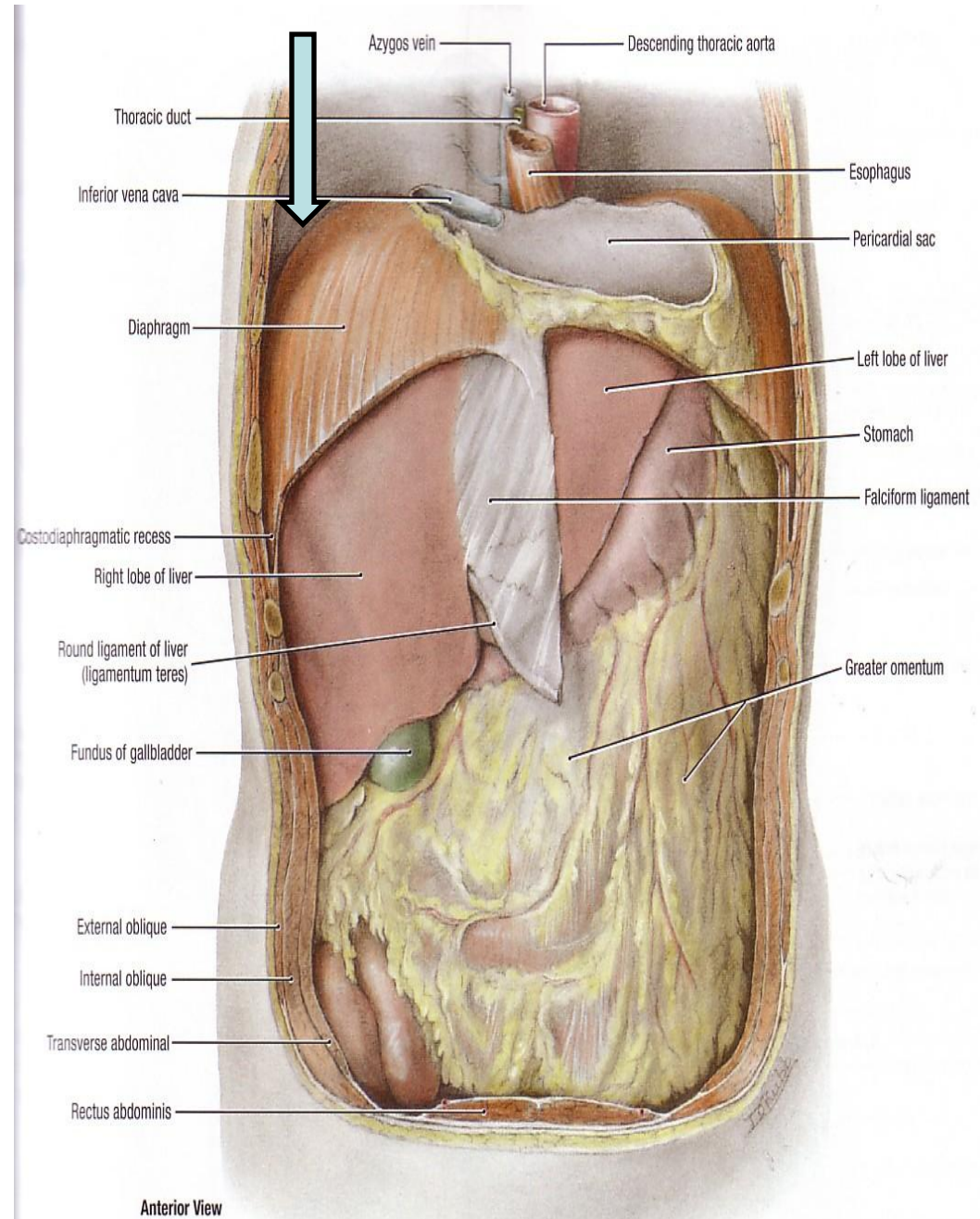
A sickle-shaped fold of peritoneum connects the AAW with the liver slightly to the right of the median plane.

- **Ant border**: Attached to under surface of diaphragm & AAW
- **Post border**: Attached to sup & ant surfaces of liver
- **Free margin** connects the umbilicus to liver it contains the round ligament of the liver or Ligamentum teres.

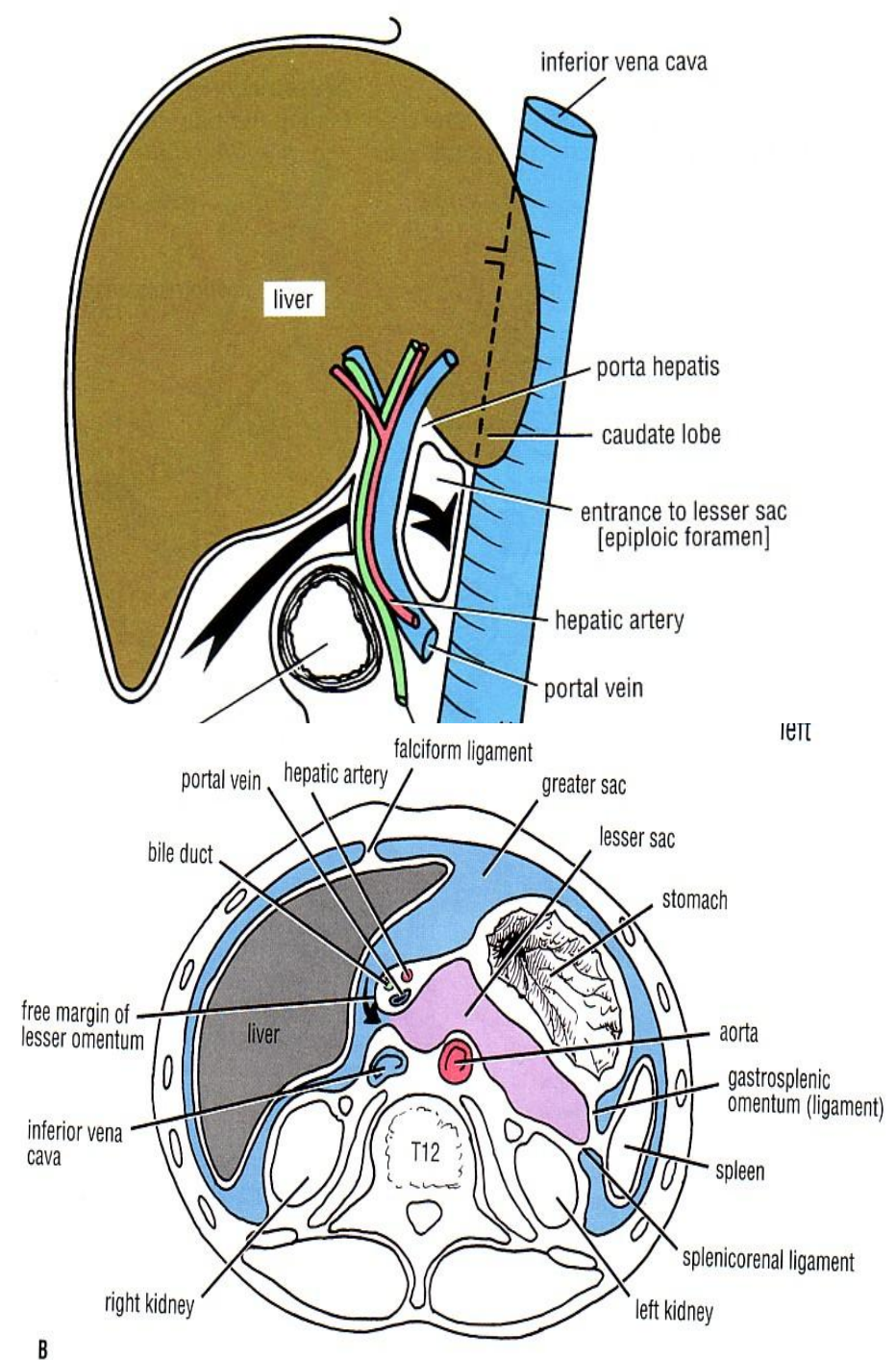


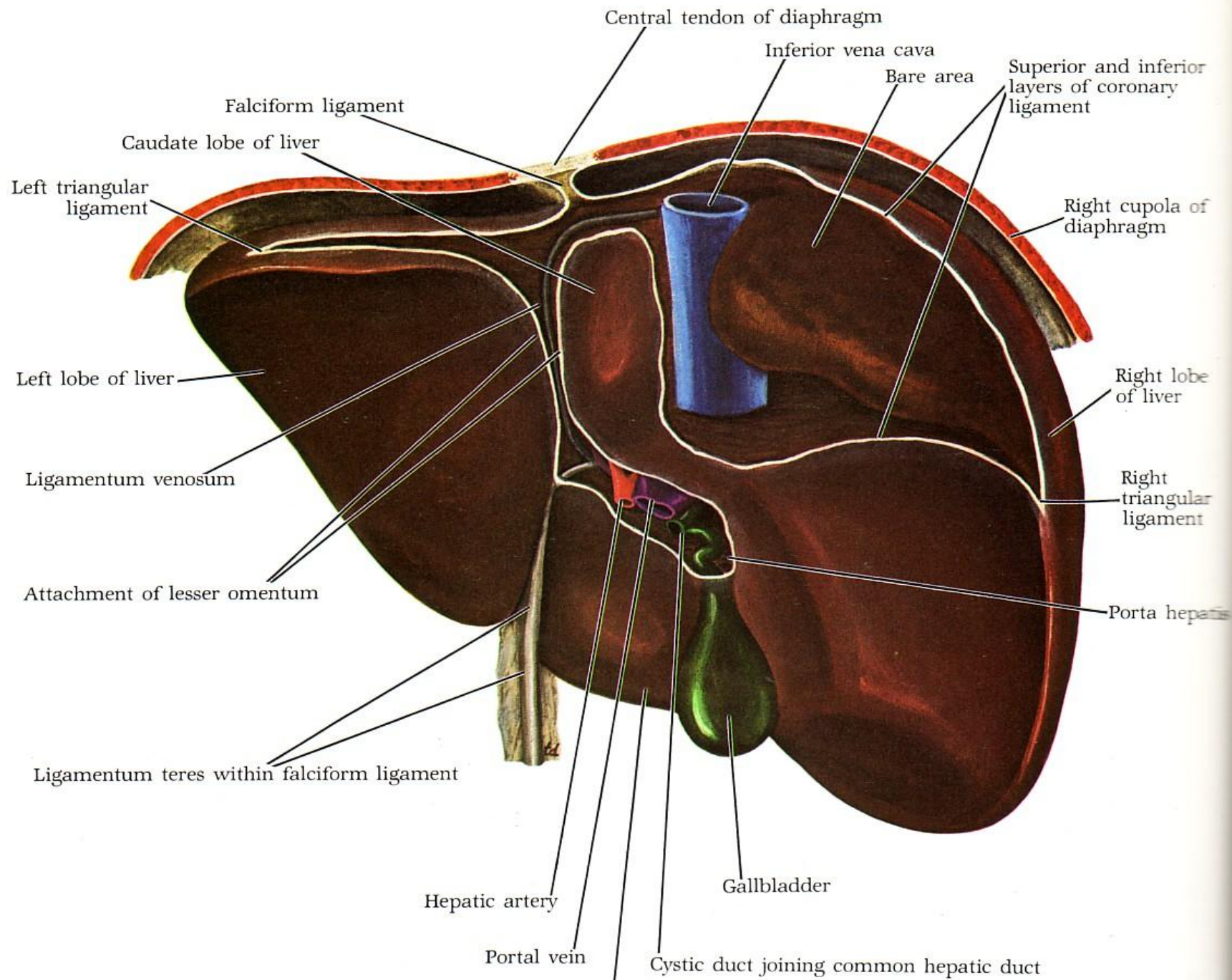
- **Greater sac**

- It is the part of peritoneal cavity which lies behind the anterior abdominal wall.
- Peritoneum lines the AAW then the under surface of diaphragm, from where it is reflected on to superior surface of liver forming the **upper layer of coronary ligament**

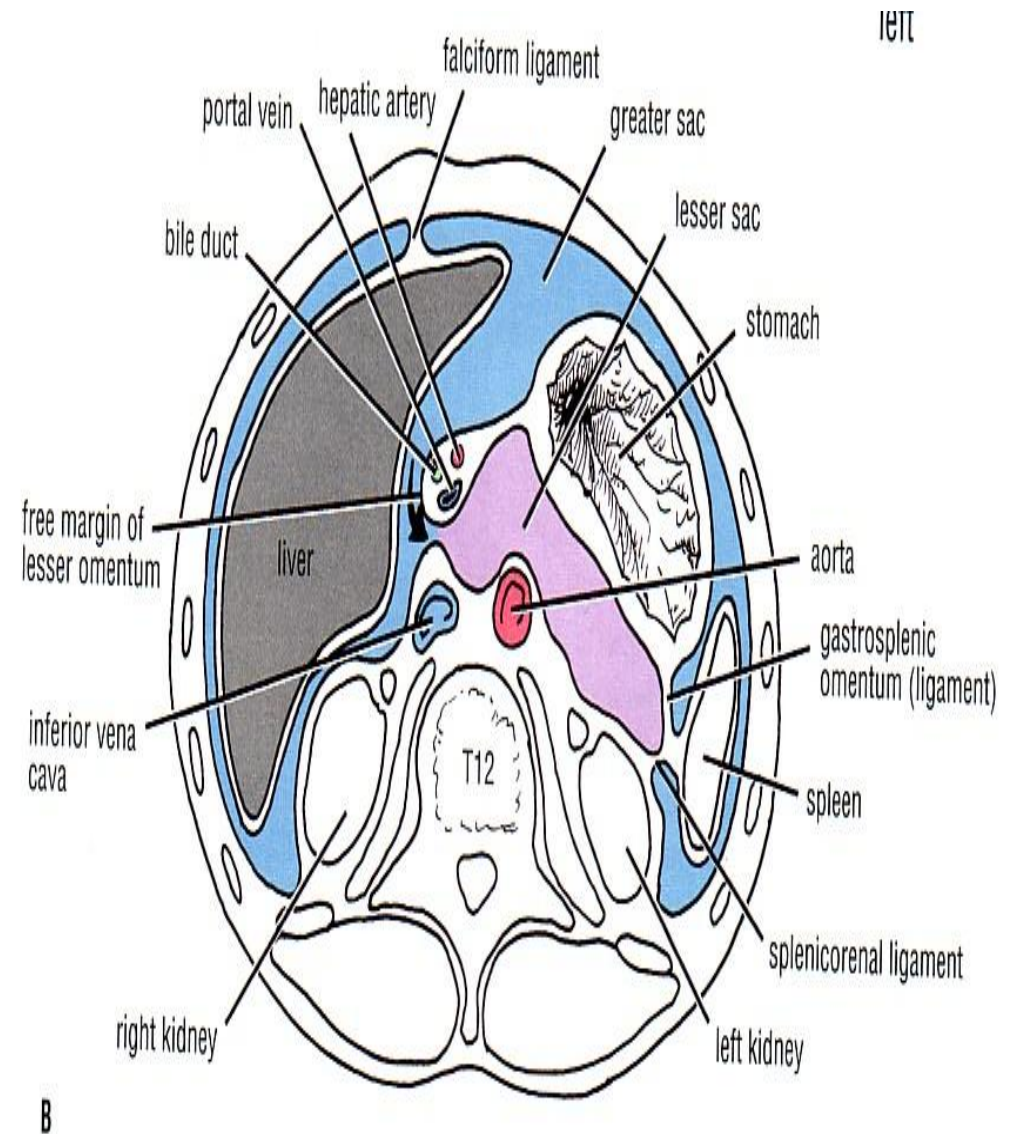


- Then, it descends from sup surface of liver to ant surface then inferior surface of liver.
- From post part of inferior surface peritoneum reflected on to front of right kidney & rt suprarenal gland forming the **lower layer of coronary ligament**.
- The lower & upper layers of coronary ligament bound a large area on the post surface of the liver called **bare area** of the liver which has no peritoneal covering.





- **Intraperitoneal** organ means that the organ is completely covered by visceral layer of peritoneum e.g. stomach, jejunum, ileum & spleen.
- **N.B. No organ lies inside the peritoneal cavity.**
- **Retroperitoneal** organ means that the organ lies behind the peritoneum and partially covered by visceral peritoneum e.g. pancreas, ascending & descending colon.



- **Peritoneal ligaments**

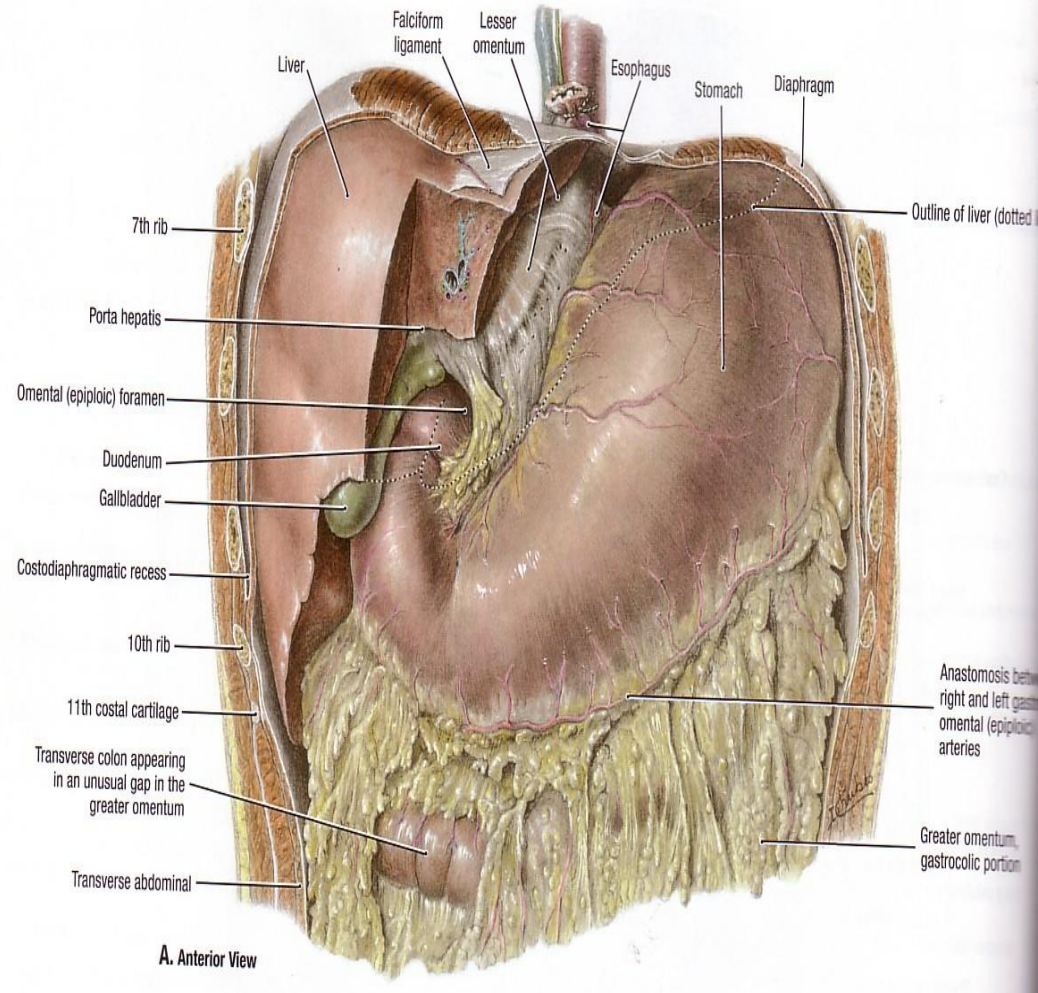
- Two layers of peritoneum that connect viscera to abdominal walls.
- Falciform, coronary, right & left triangular ligaments

- **Omenta**

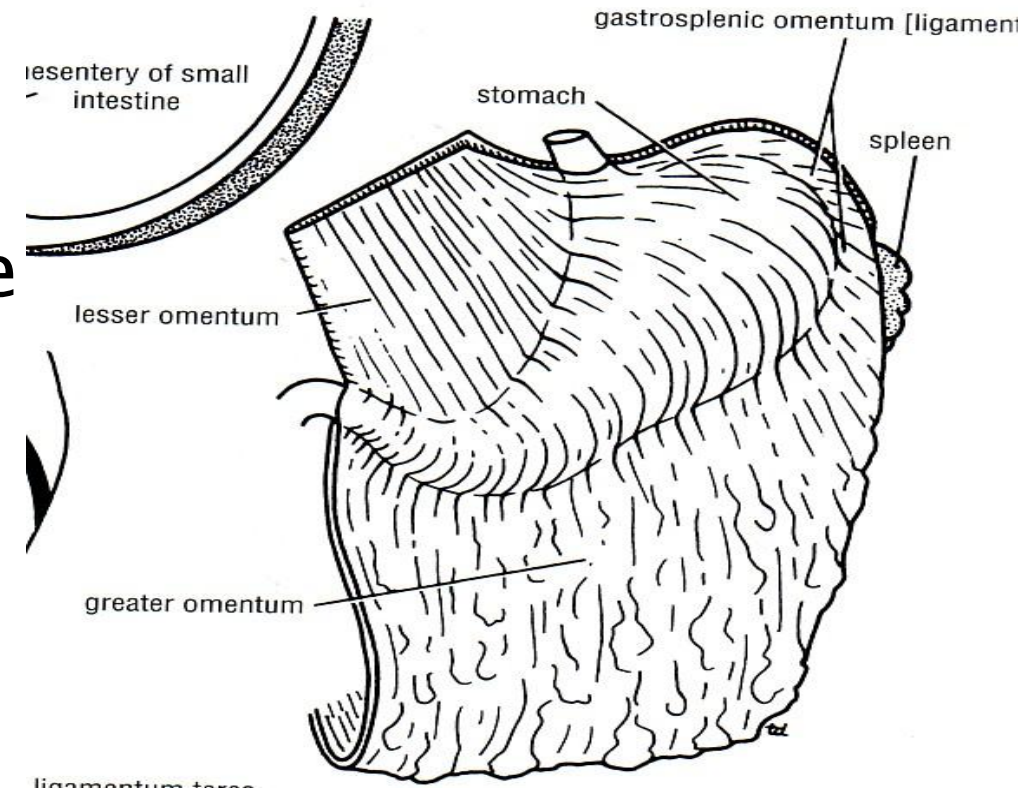
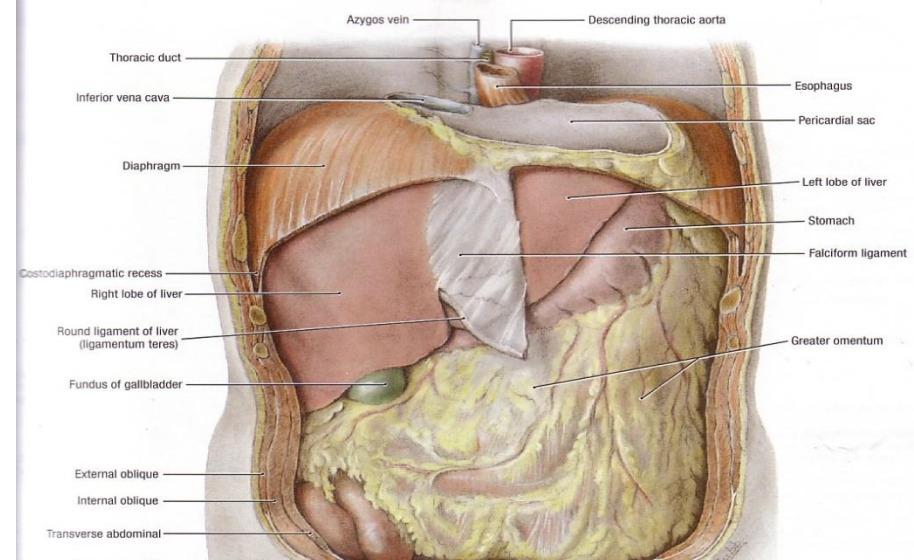
- Two layers of peritoneum that connect stomach to another viscus.
- **Lesser & greater omenta and gastrosplenic omentum (ligament).**

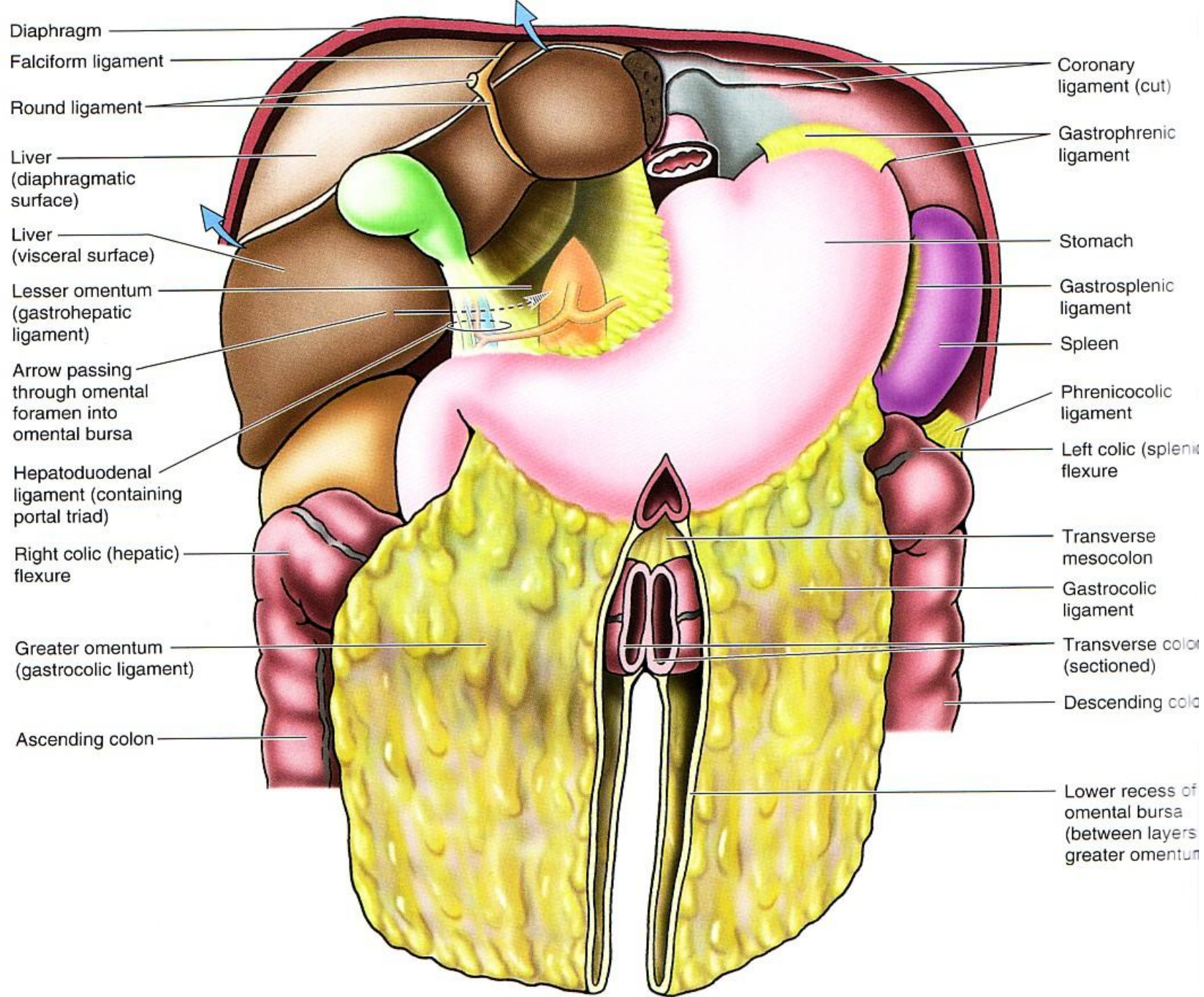
- **Mesenteries**

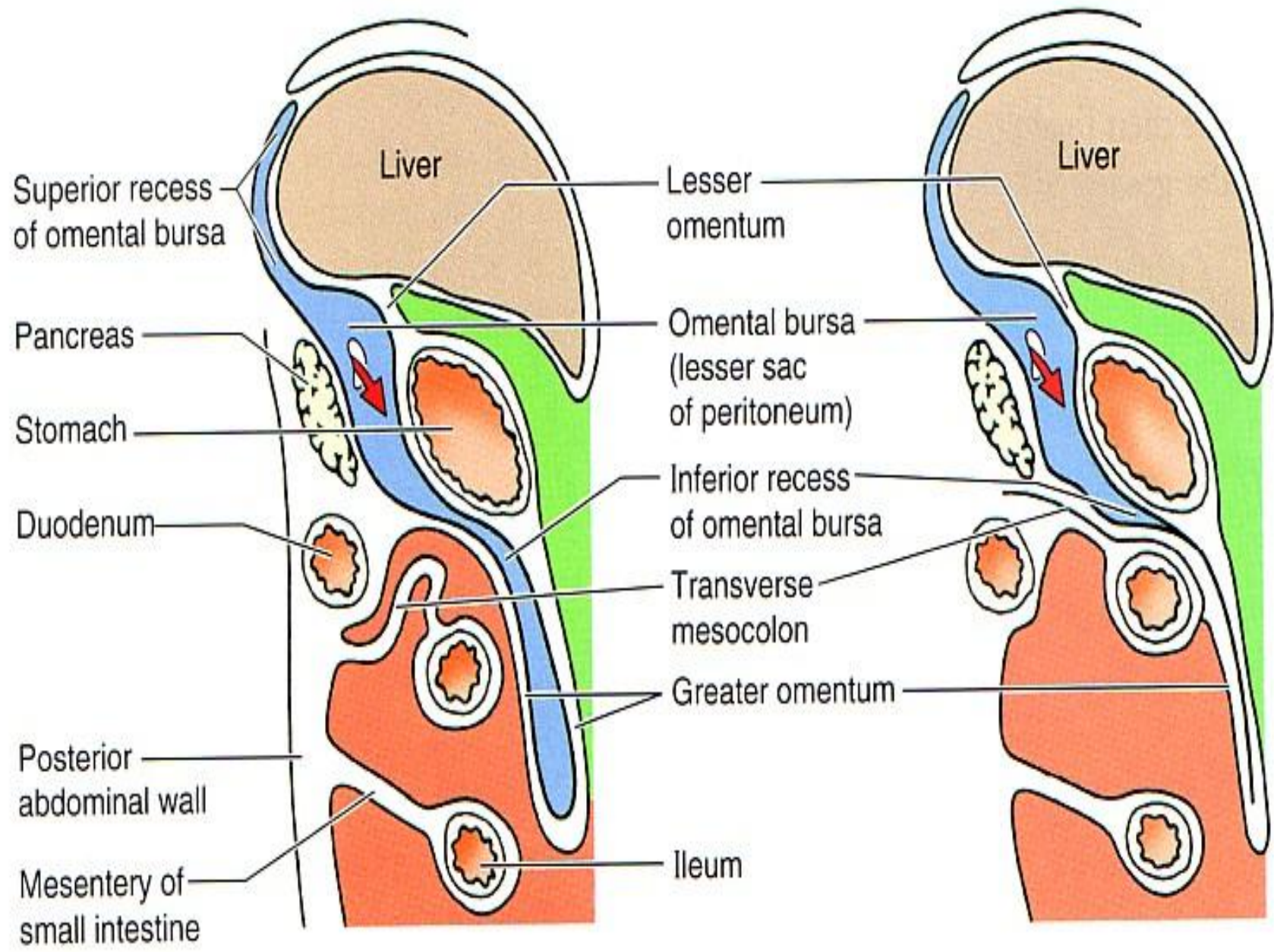
- Two layers of peritoneum connecting small intestine to the post abdominal wall.



- **Greater Omentum**
- Connects the greater curvature of the stomach to transverse colon.
- It hangs like an apron in front of the small intestine
- It is folded back on itself to be attached to the transverse colon.

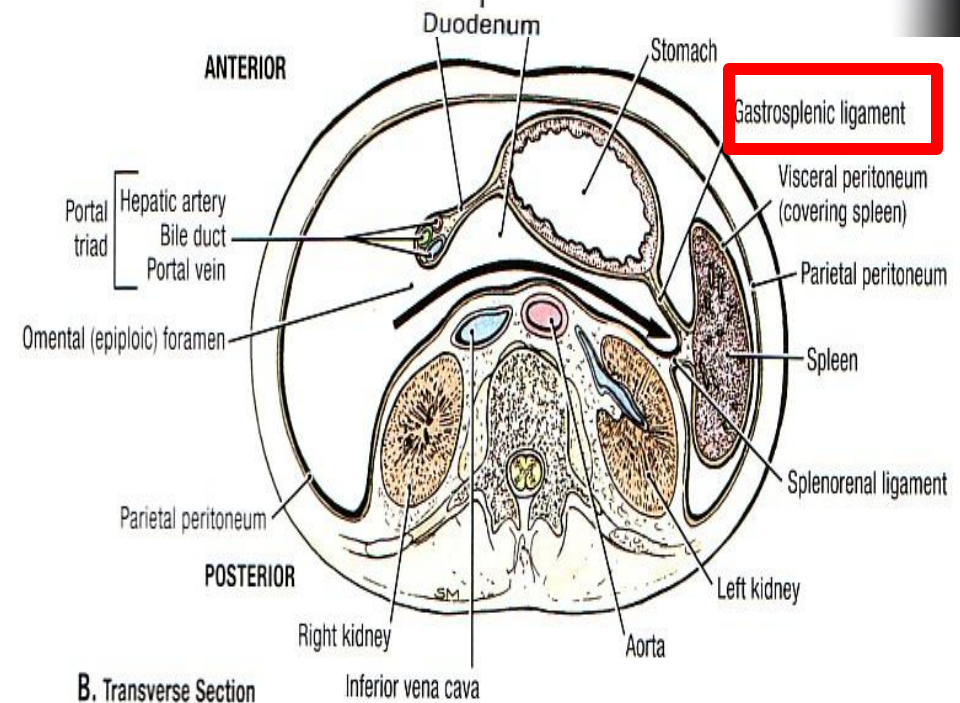
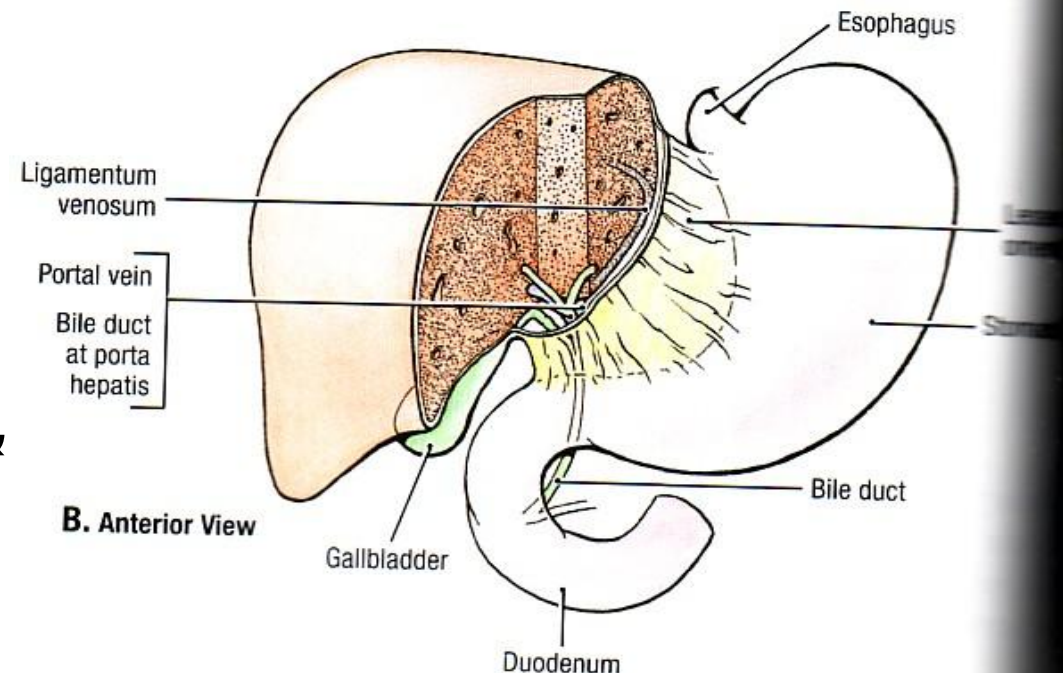


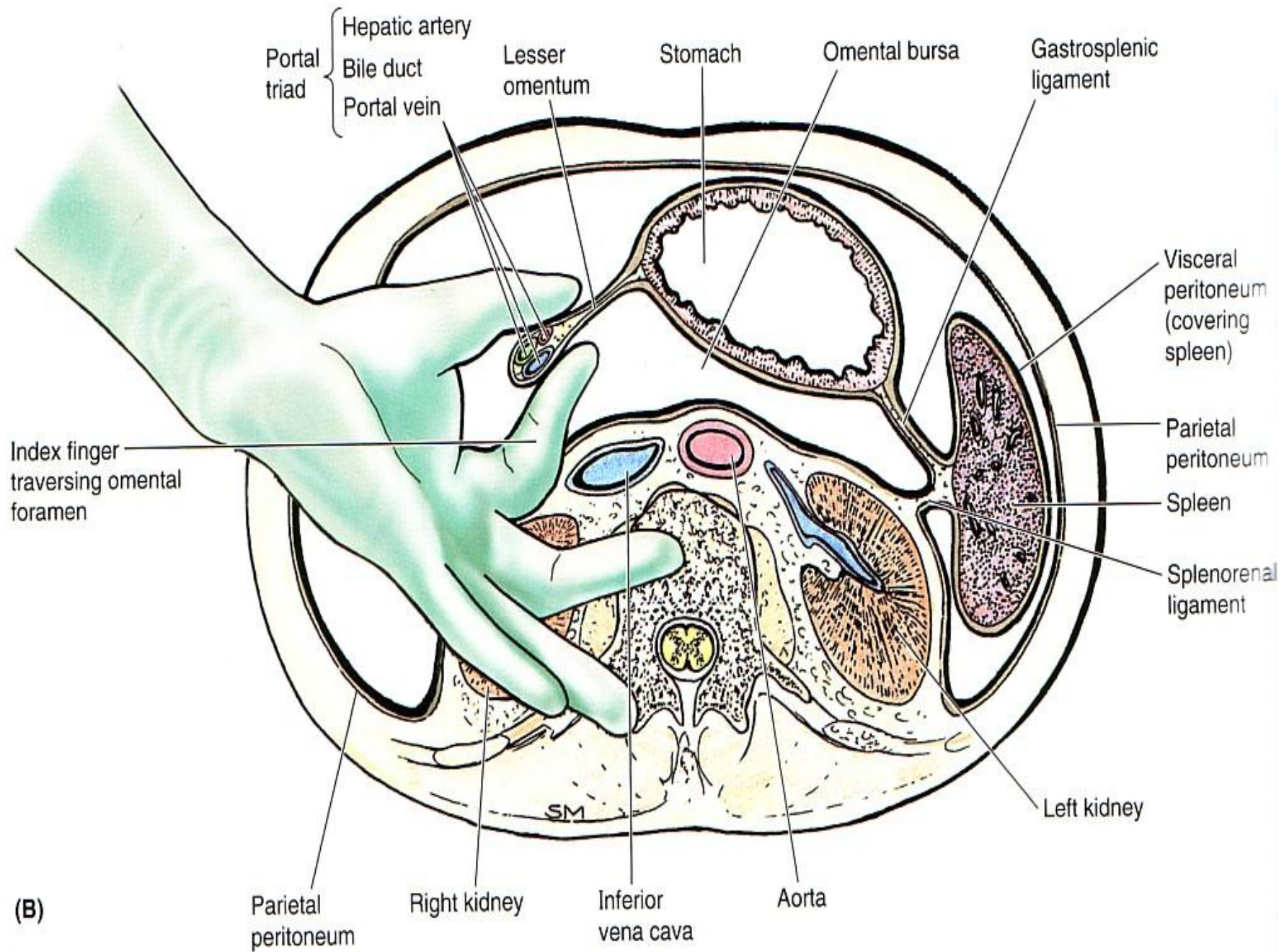




• Lesser Omentum

- Connects liver to stomach attached above to porta hepatis & fissure for ligamentum venosum inferiorly to lesser curvature of the stomach, & 1st inch of duodenum.
- Its free margin contains:
 - Portal vein: Posterior
 - Bile duct : Anterior & right
 - Hepatic artery: anterior & left
- **Gastrosplenic ligament**
- Connects the stomach to the hilum of the spleen
- **Splenicorenal or lienorenal ligament**
- Connects the hilum of spleen to front of the left kidney.





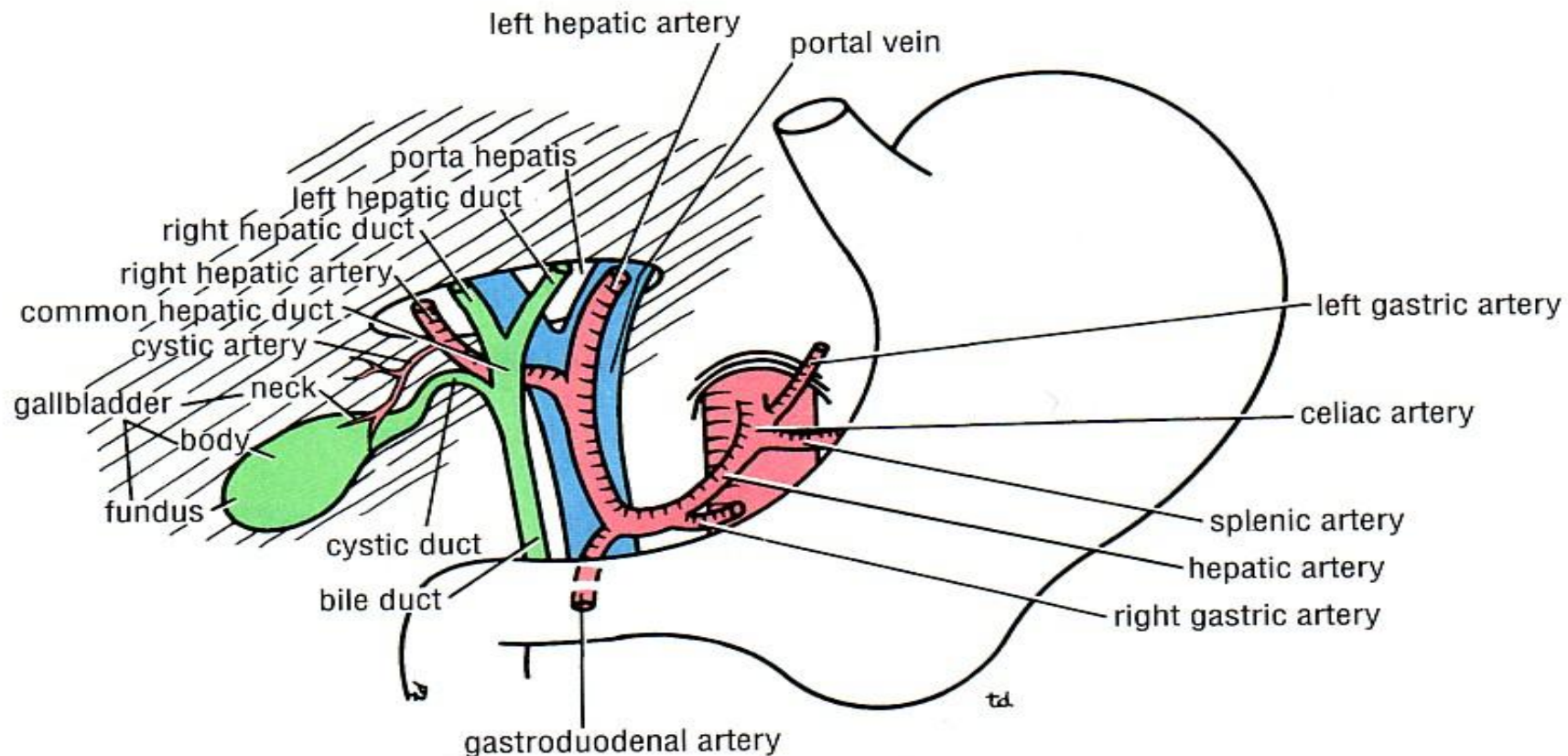
Epiploic Foramen: Boundaries

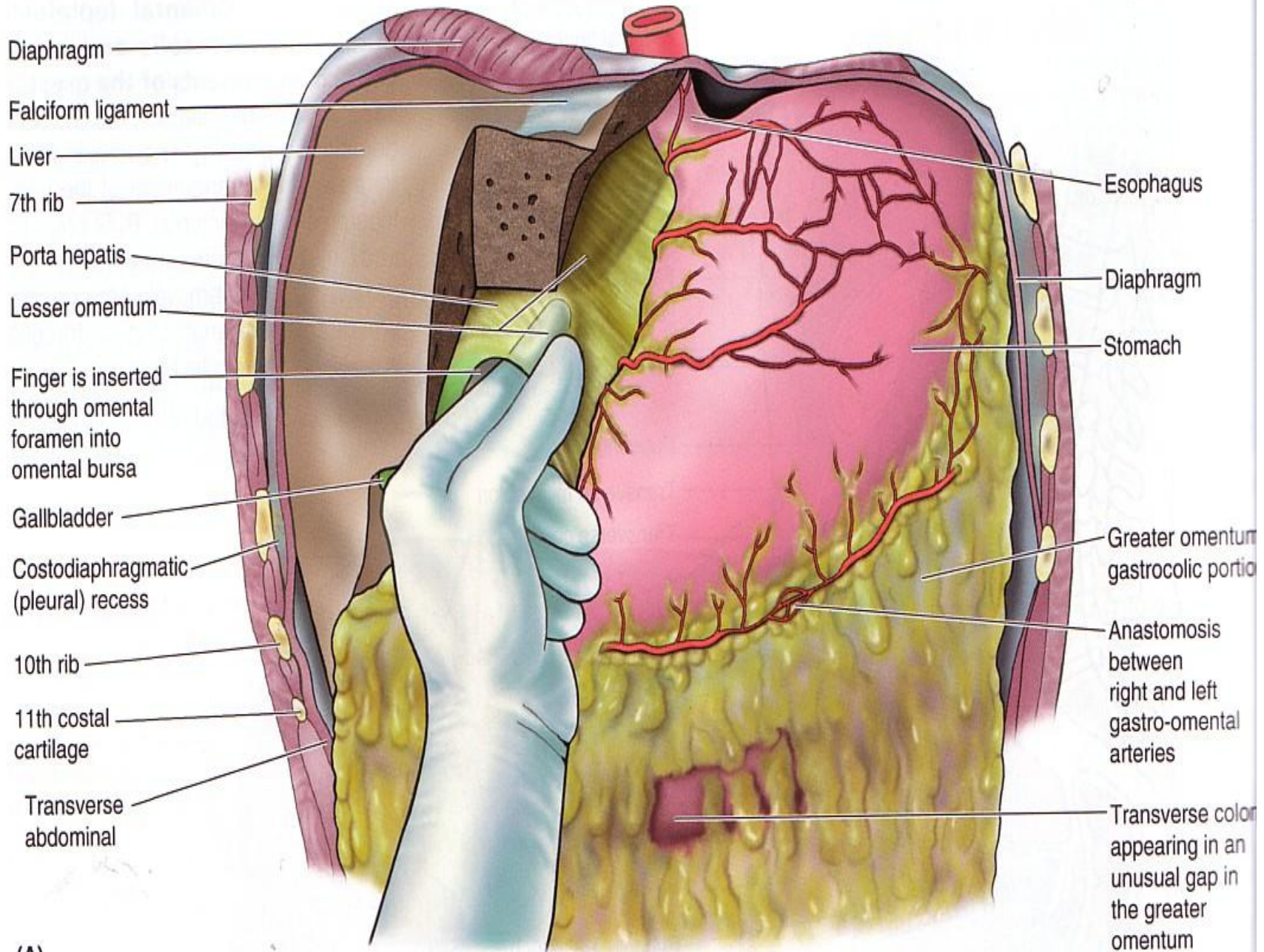
Anterior: free margin of lesser omentum, containing (hepatic artery, bile duct and portal vein)

Posterior: peritoneum covering IVC.

Superior: Caudate process of the caudate lobe of the liver.

Inferior: 1st inch of the 1st part of duodenum.





Diaphragm

Falciform ligament

Liver

7th rib

Porta hepatis

Lesser omentum

Finger is inserted through omental foramen into omental bursa

Gallbladder

Costodiaphragmatic (pleural) recess

10th rib

11th costal cartilage

Transverse abdominal

Esophagus

Diaphragm

Stomach

Greater omentum gastrocolic portion

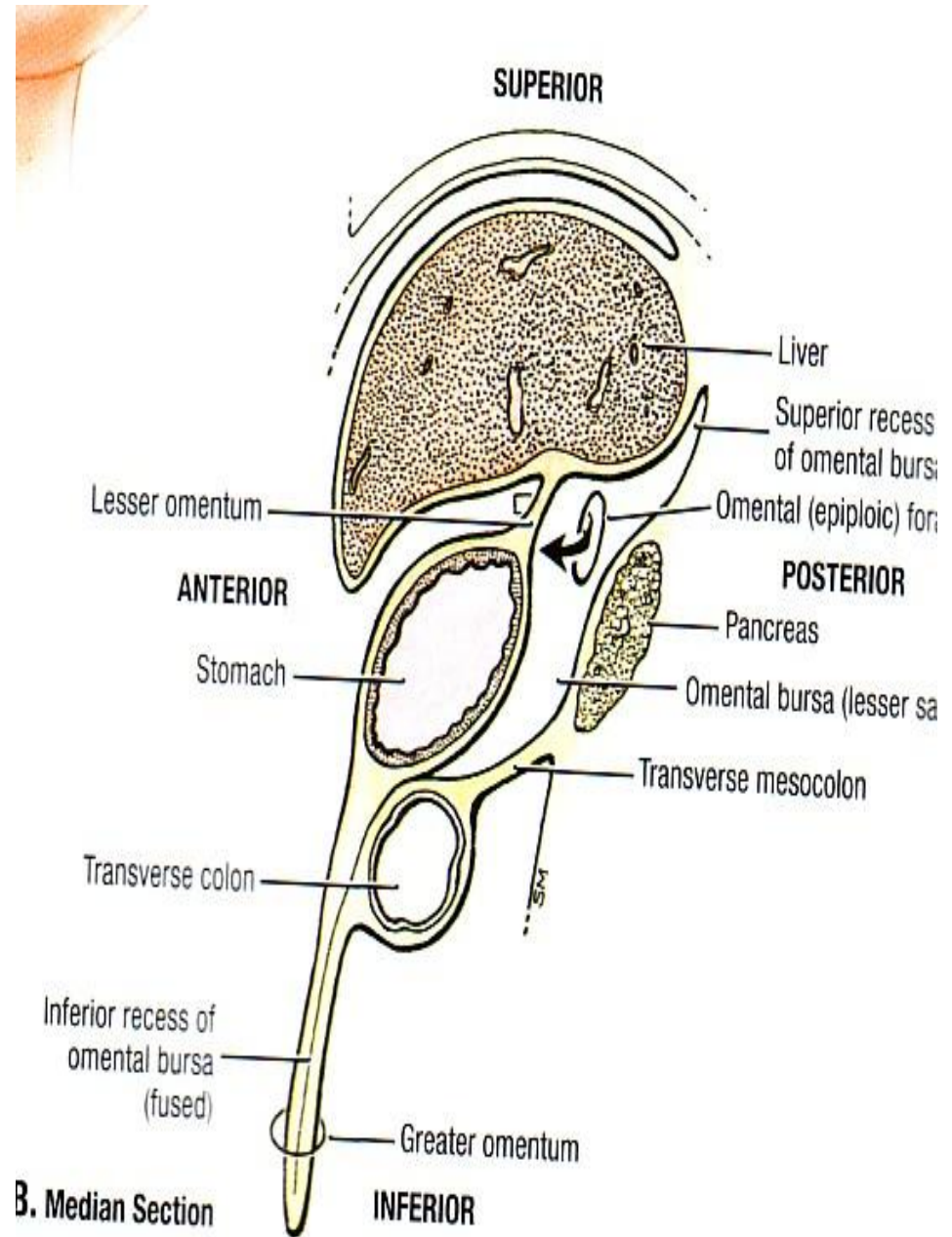
Anastomosis between right and left gastro-omental arteries

Transverse colon appearing in an unusual gap in the greater omentum

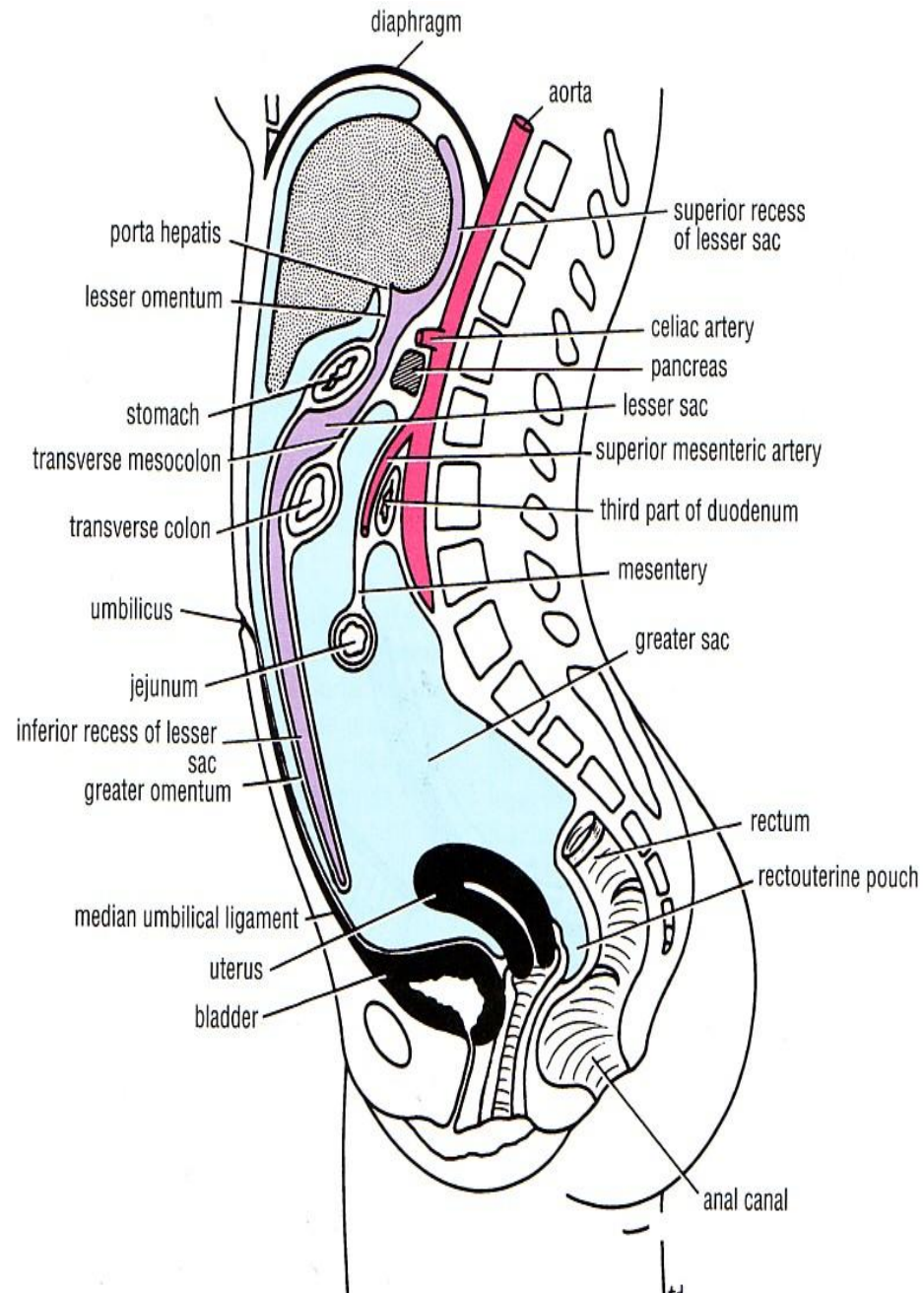
(A)

- **Lesser sac**

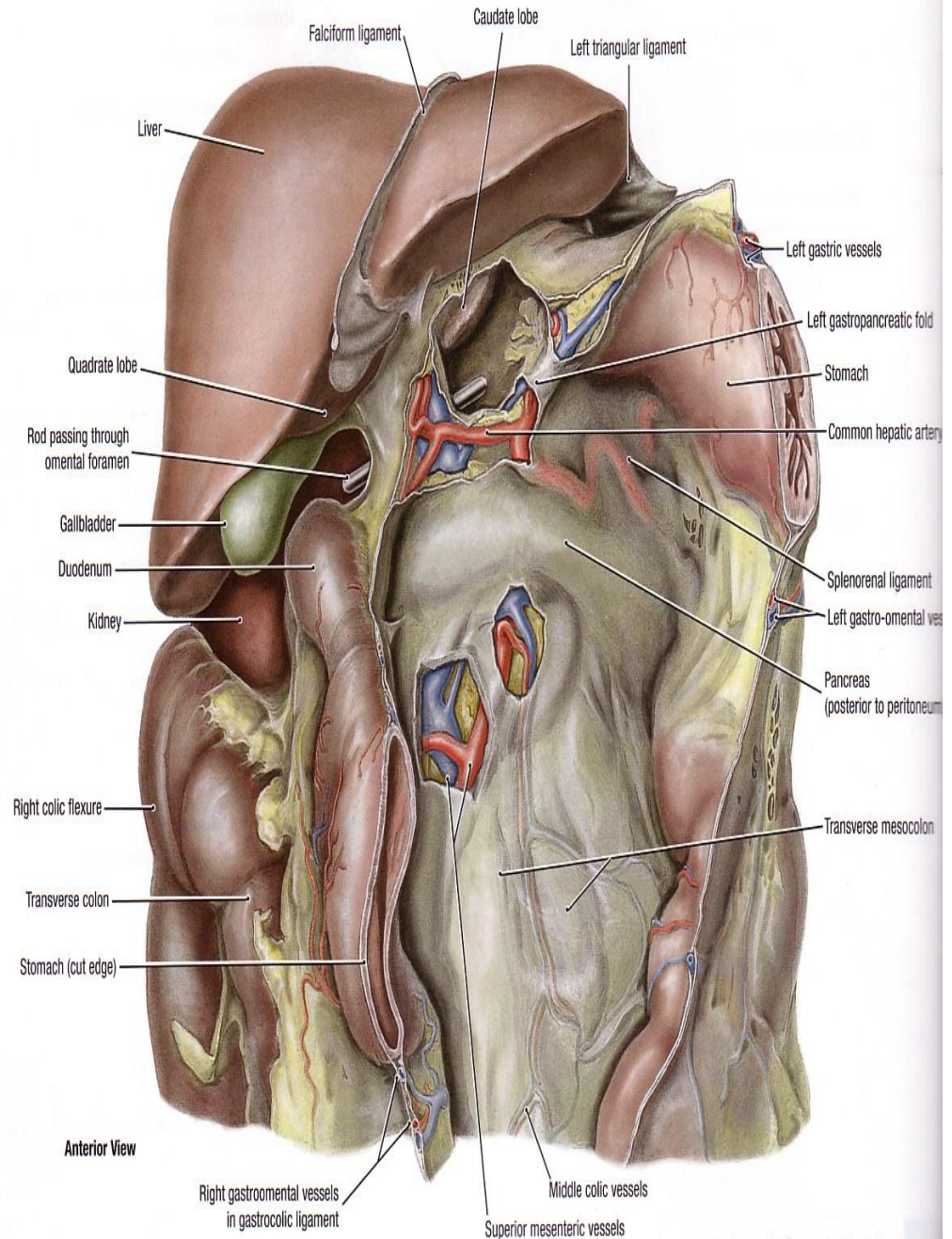
- A peritoneal pouch lies behind stomach & lesser omentum
- It projects upwards as far as the diaphragm.
- Inferiorly it lies within the folding of the greater omentum.
- Its lower part is usually obliterated due to fusion of the anterior & post layers of the greater omentum.



- **Ant wall:** from above downward
- lesser omentum, back of stomach & ant 2 layers of greater omentum.
- **Post wall:** From below upwards, post 2 layers of greater omentum, then the peritoneum which covers many structures on post abdominal wall
 - **These structures are:**
 - 1- Body of pancreas.
 - 2- Part of abdominal aorta
 - 3- Coeliac artery & its branches (splenic, Lt gastric & hepatic arteries)



- 4- Lt crus of diaphragm.
- 5- Lt kidney.
- 6- Lt suprarenal gland.
- 7- Part of inferior phrenic artery.
- **Upper border**: Extends from porta hepatis, fissure for ligamentum venosum to lower end of esophagus.
- **Lower border**: Inferior margin of greater omentum.
- **Lt border**: Lt margin of greater omentum, gastrosplenic & lienorenal ligaments.
- **Rt border**: Rt. Margin of greater omentum, opening into lesser sac.



- **Mesentery**

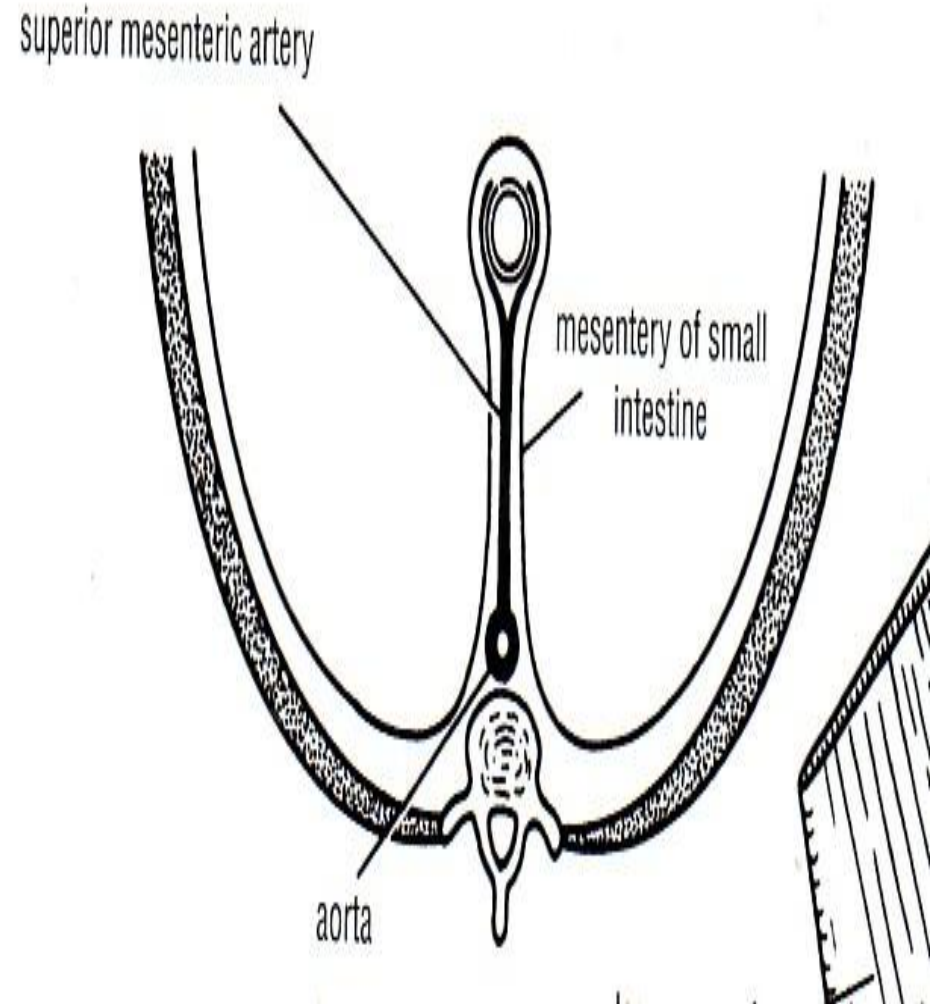
Two layers of peritoneum connecting small intestine to post abdominal wall.

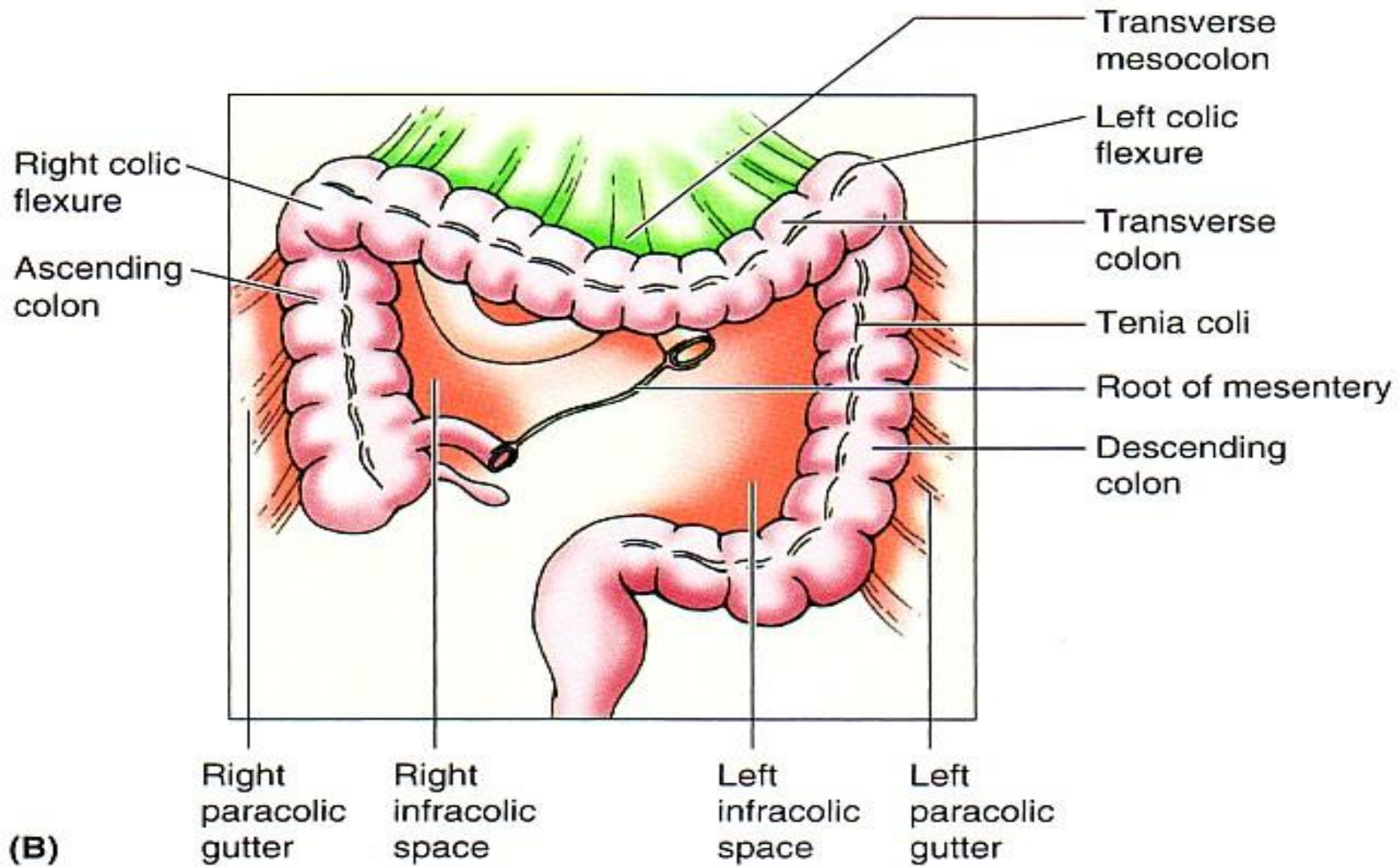
It has 2 borders

1- Attached border: to post abdominal wall &

2- Free border: which encloses the jejunum & ileum.

- Vessels, nerves.
Lymphatic enter small intestine between the two layers.





- **Function of peritoneum**

It suspend the organs within the peritoneal cavity.
It fixes some organs within the abdominal cavity.

Storage of large amount of fat in the peritoneal ligaments (e.g.. Greater omentum)

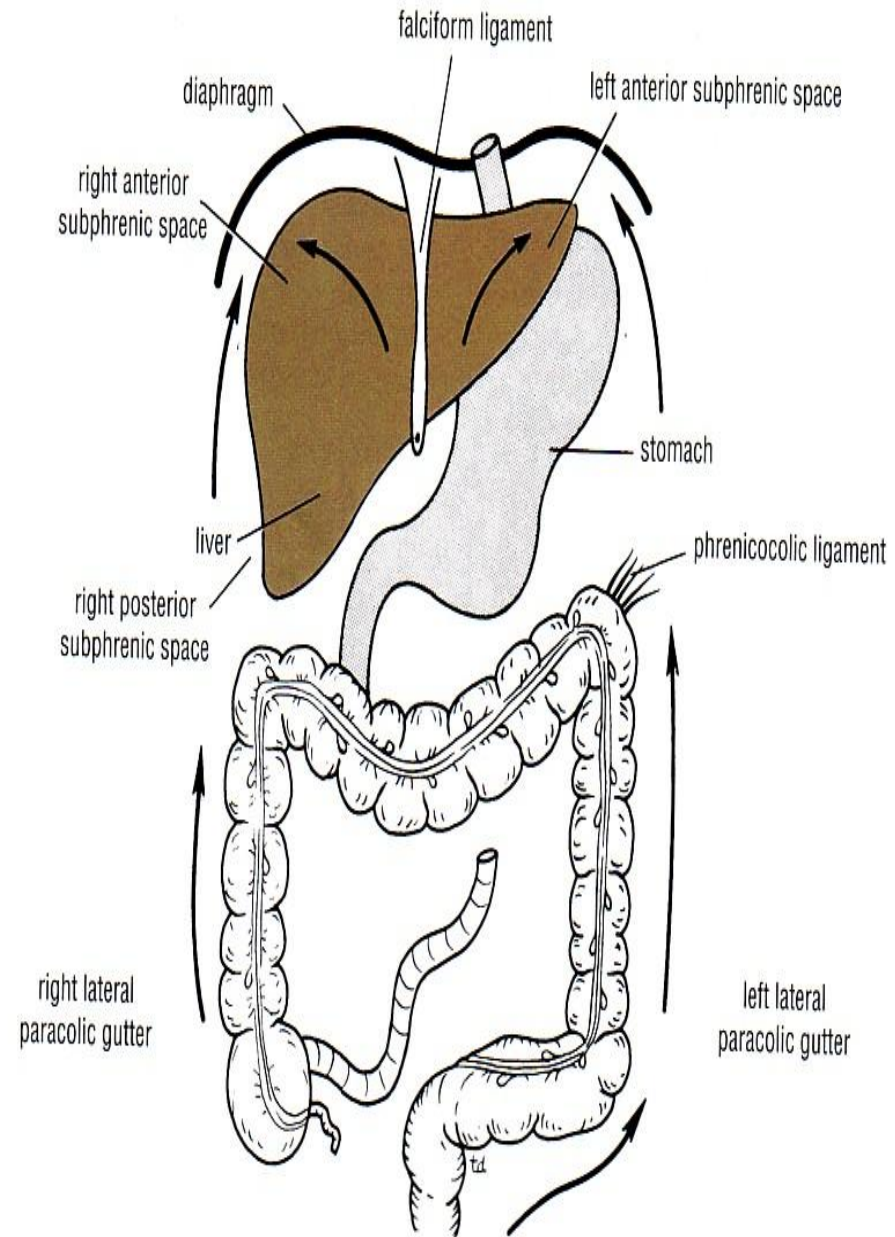
Peritoneal covering of intestine tends to stick together in infection

Greater omentum is called the **policeman** of abdomen to prevent spread of infection

It secretes the peritoneal fluid

• Peritoneal fluid

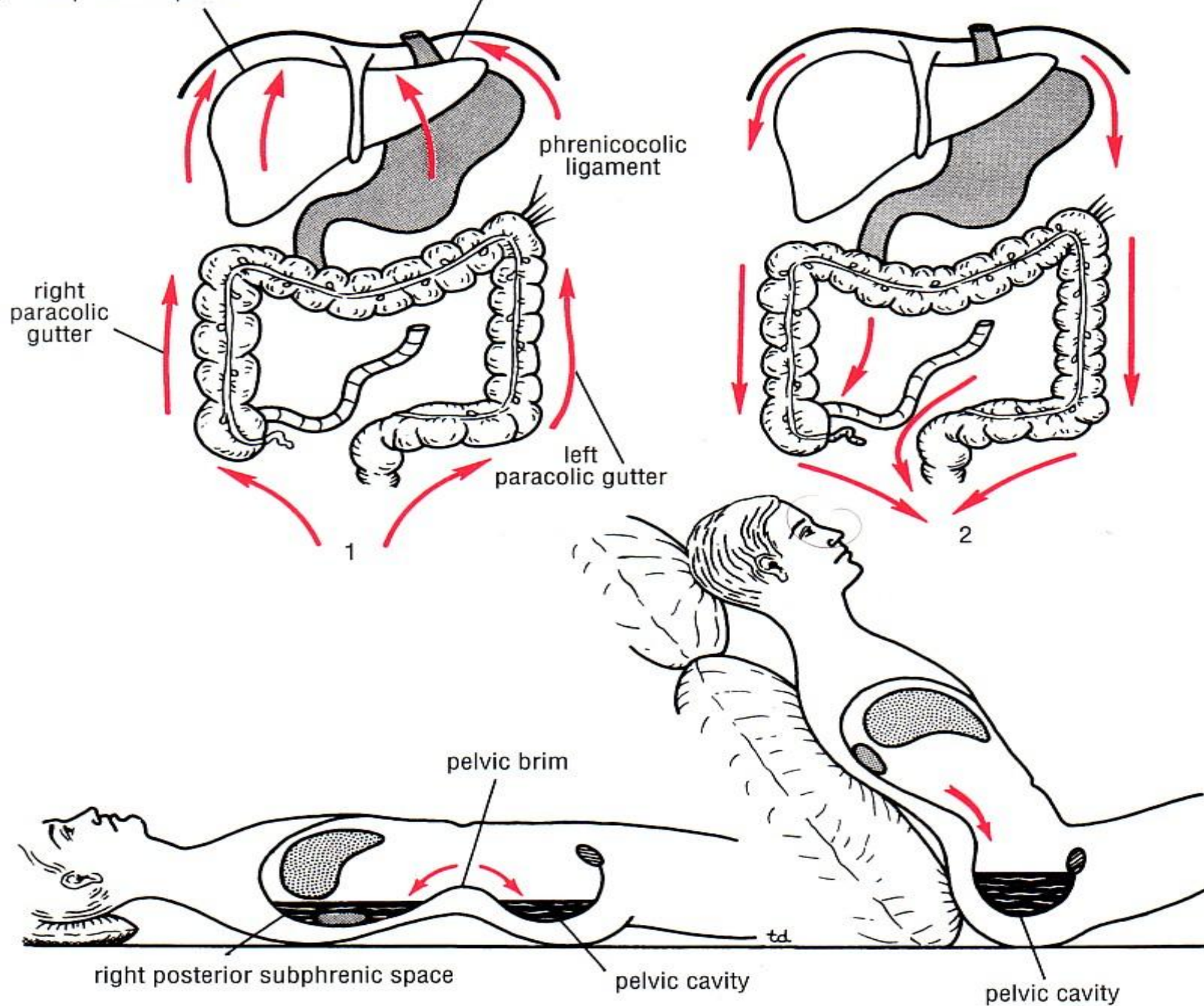
- Peritoneal fluid is pale yellow fluid rich in leukocytes
- Mobile viscera glide easily on one another.
- Peritoneal fluid moves upward towards subphrenic spaces- whatever the position of the body- by:
 - 1- Movements of diaphragm.
 - 2- Movements of abdominal muscles
 - 3- Peristaltic movements.
- Peritoneum is extensive in the region of diaphragm.



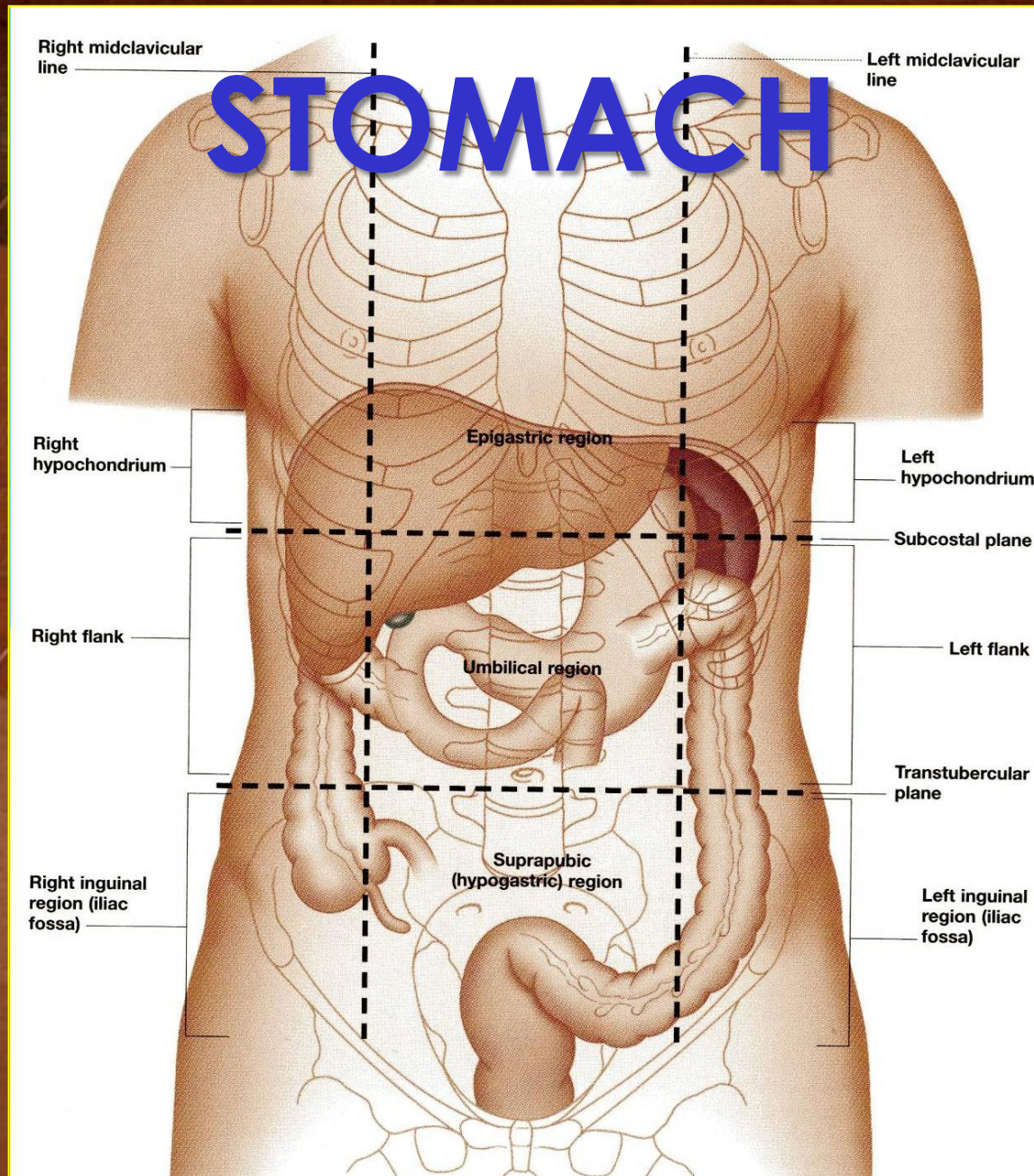
- **Innervation of peritoneum:**
- Parietal peritoneum is sensitive to pain, pressure, temperature & touch, (pptt)
- Parietal peritoneum is supplied by:
 - *Lower 6 thoracic nerves (T7-- T12)*
 - *First lumbar nerve (L1)*
 - *Central part of diaphragmatic parietal peritoneum is supplied by phrenic nerve.*
- Visceral peritoneum is sensitive to stretch & tearing.
- It is supplied by autonomic afferent nerves which supply the viscera.
- NB. Parietal peritoneum of the pelvis is supplied by Obturator nerve.

anterior and posterior
right subphrenic spaces

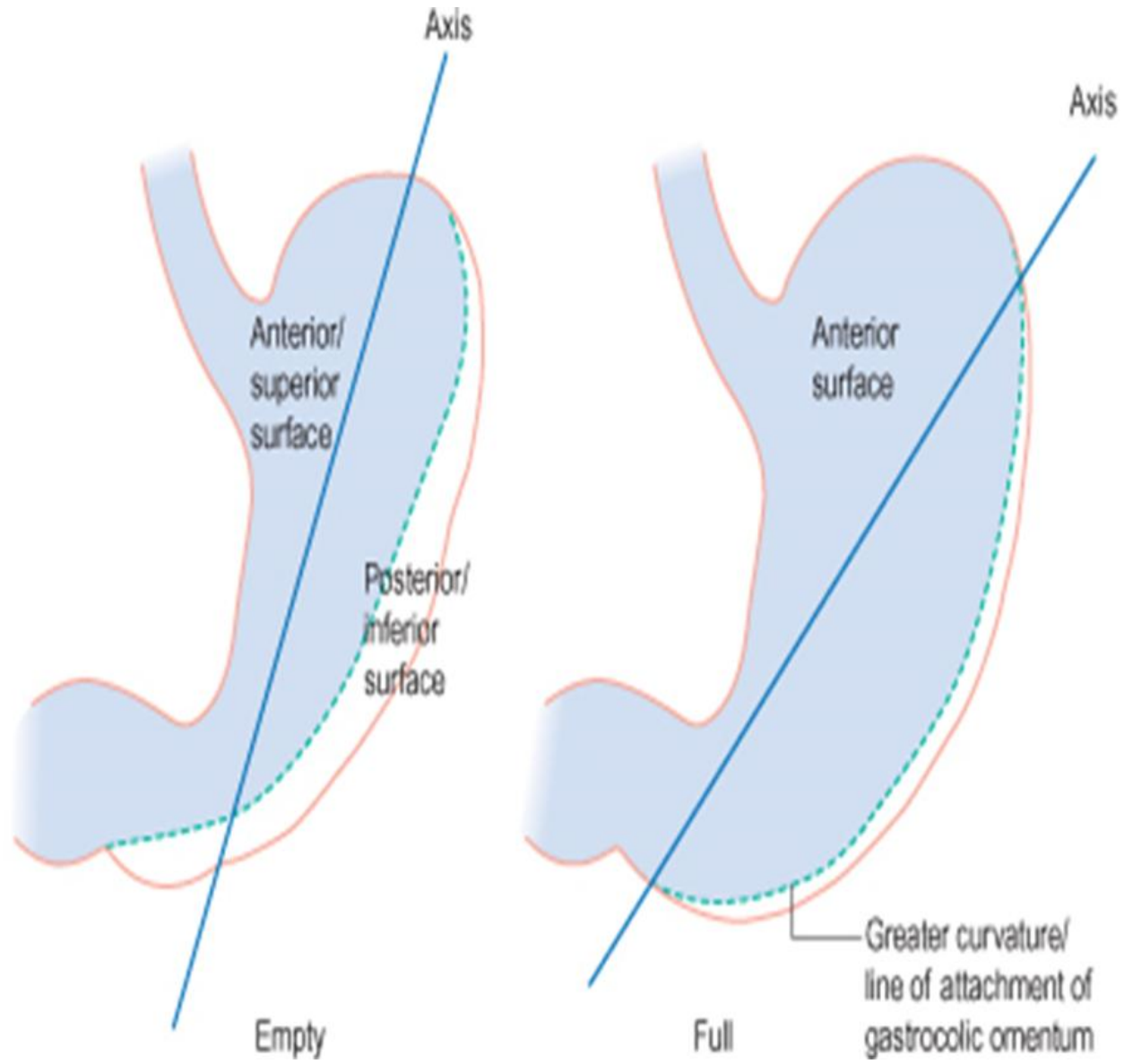
anterior left subphrenic space



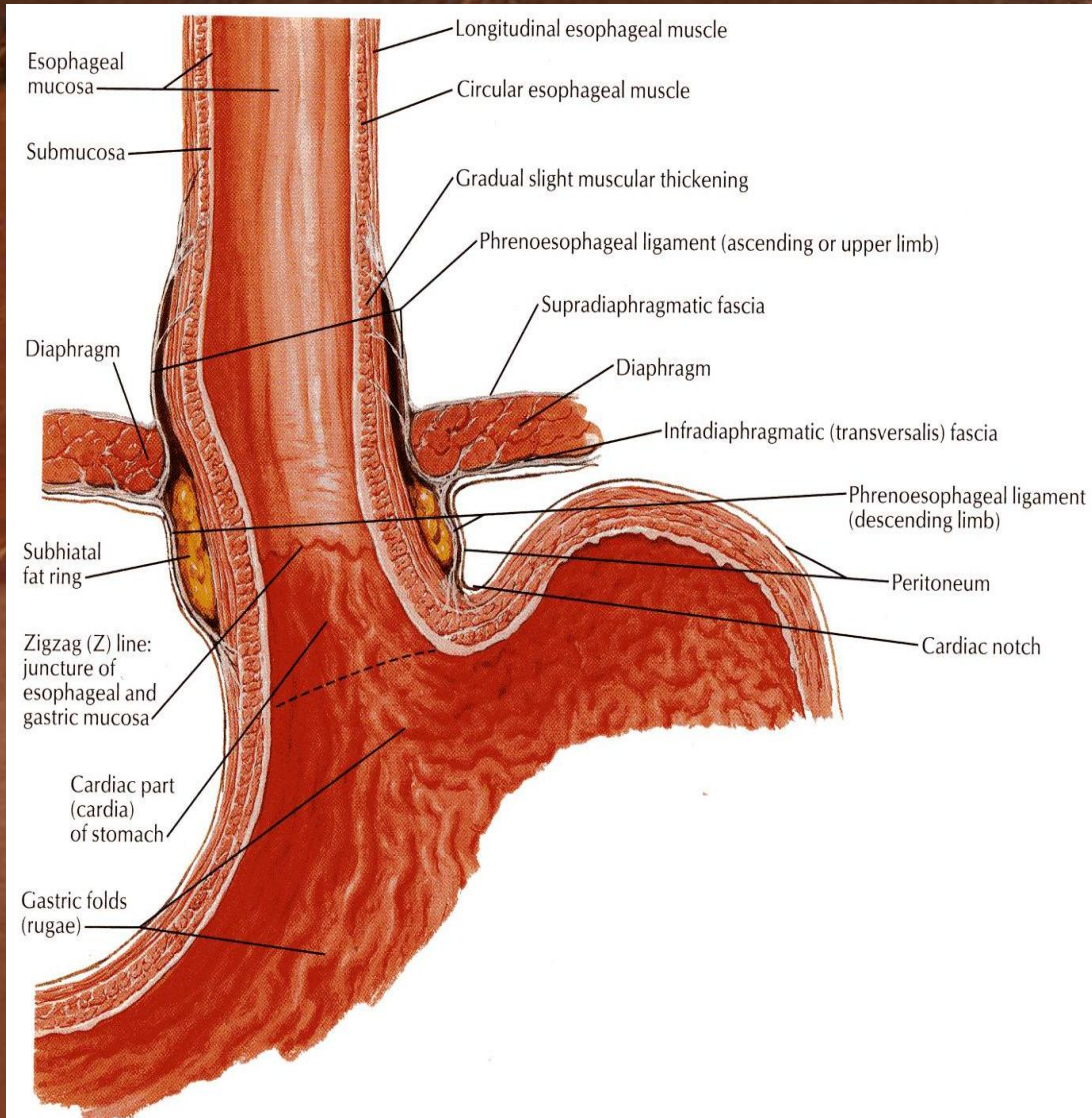
LOCATION



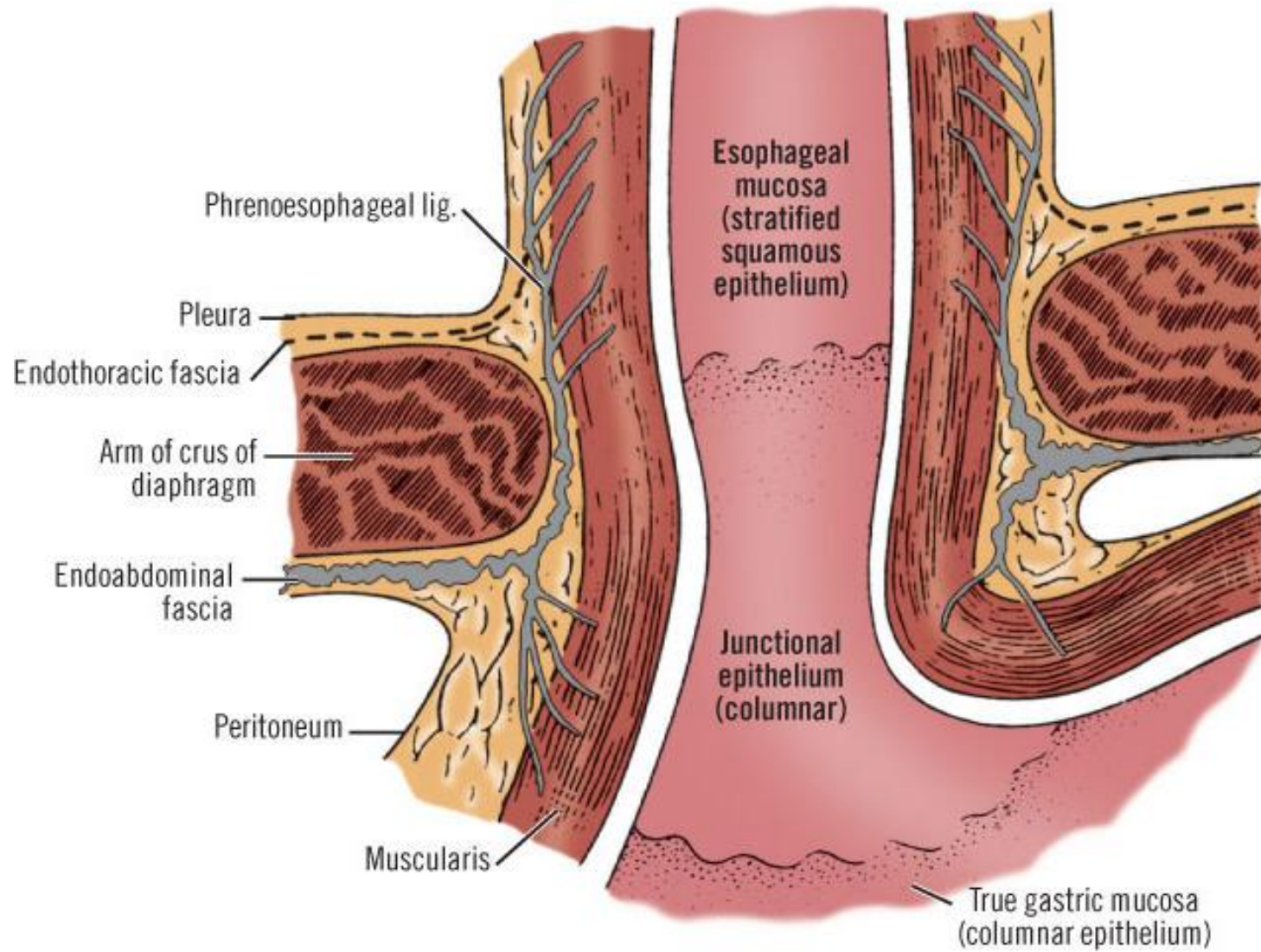
- The stomach is the dilated part of the alimentary canal.
- It is located in the upper part of the abdomen.
- It extends from behind the left costal region to the epigastric and umbilical regions.
- Much of the stomach is protected by the lower ribs.
- It is roughly J-shaped.

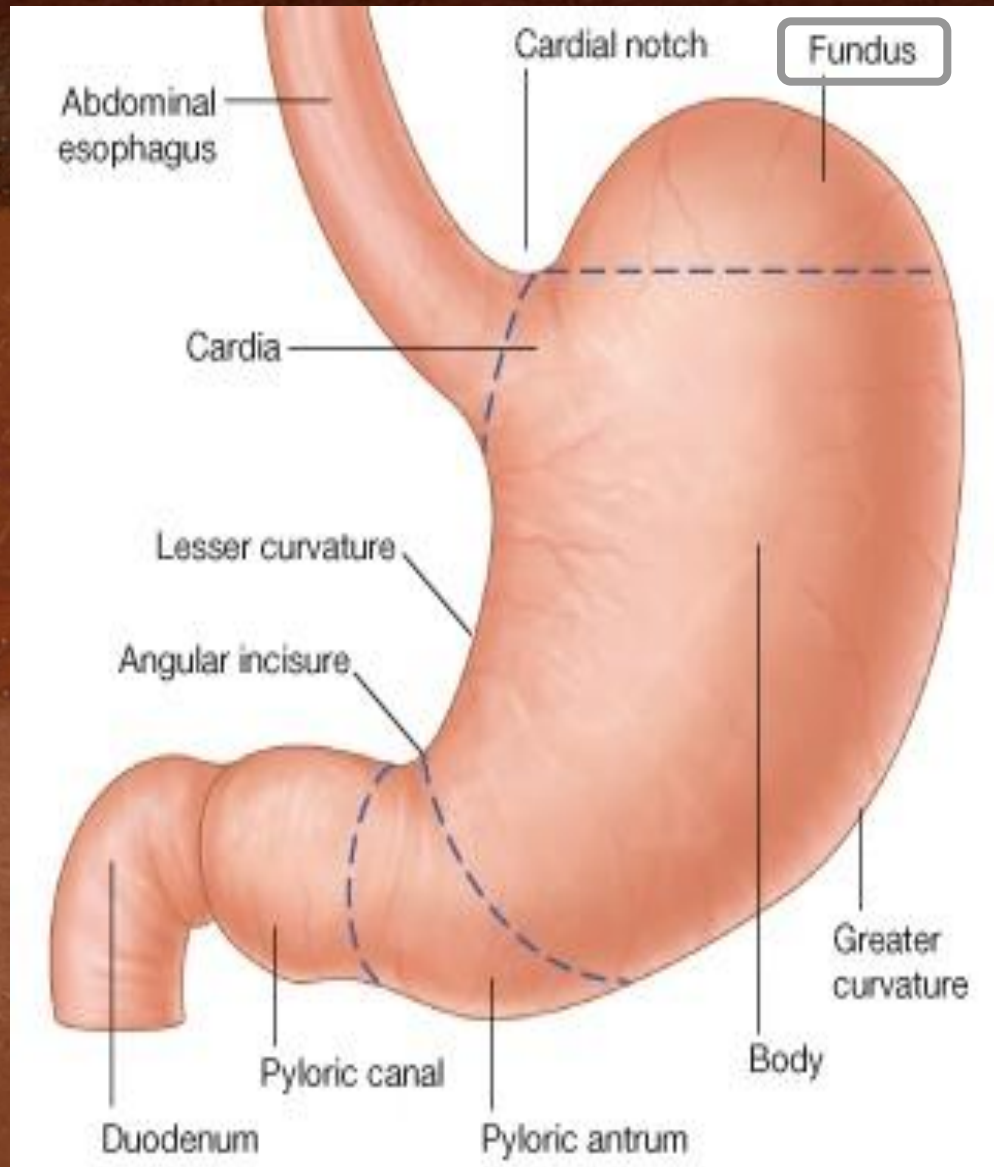


CARDIAC ORIFICE



- It is the site of the **gastro- esophageal sphincter**.
- It is a physiological but not an anatomical, sphincter.
- Consists of **circular layer** of smooth muscle (under vagal and hormonal control).
- **Function:**
- Prevents regurgitation (reflux)

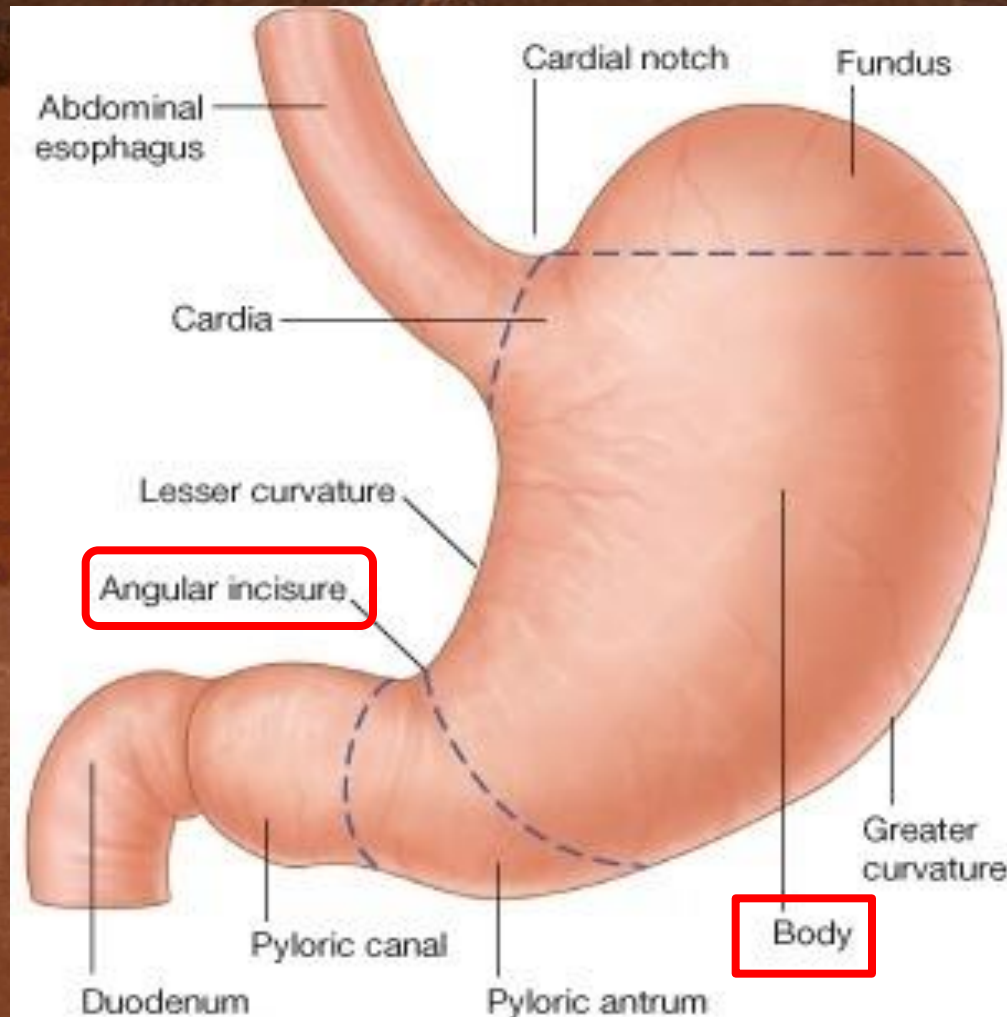




FUNDUS

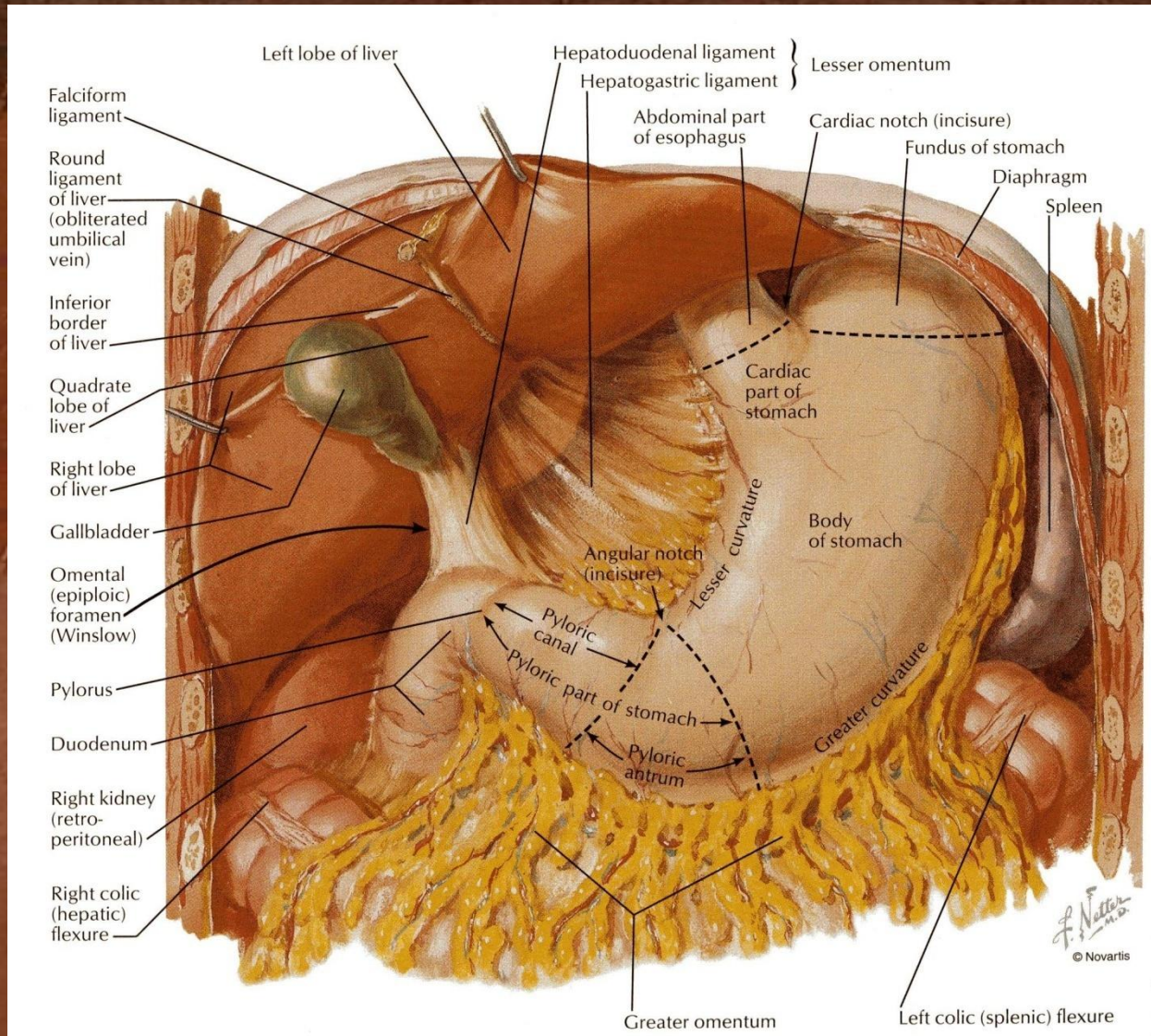
- Dome-shaped
- Located to the left of the cardiac orifice
- Usually full of gases.

BODY



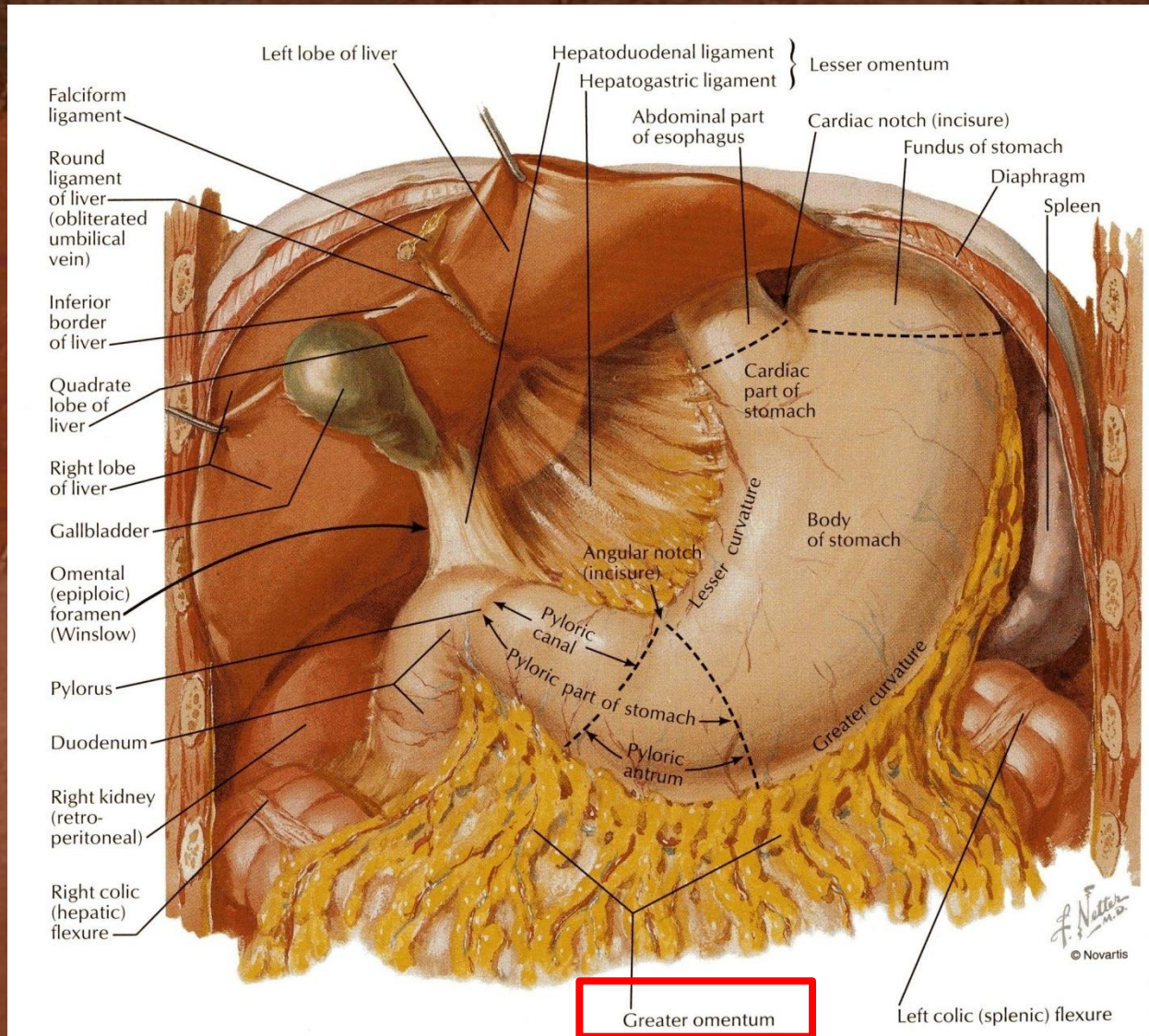
- Extends from:
 - The level of the fundus to
 - The level of Incisura angularis
- **Incisura angularis:**
- a constant notch on the lesser curvature

LESSER CURVATURE



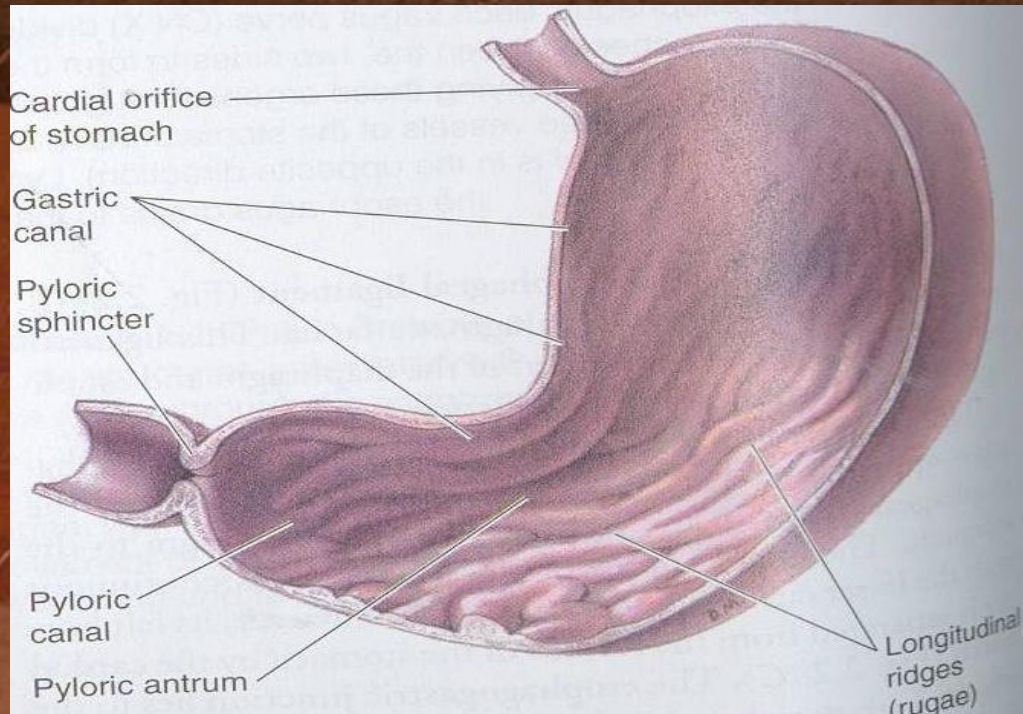
- Forms the right border of the stomach.
- Extends from the cardiac orifice to the pylorus.
- Attached to the liver by the **lesser omentum.**

GREATER CURVATURE

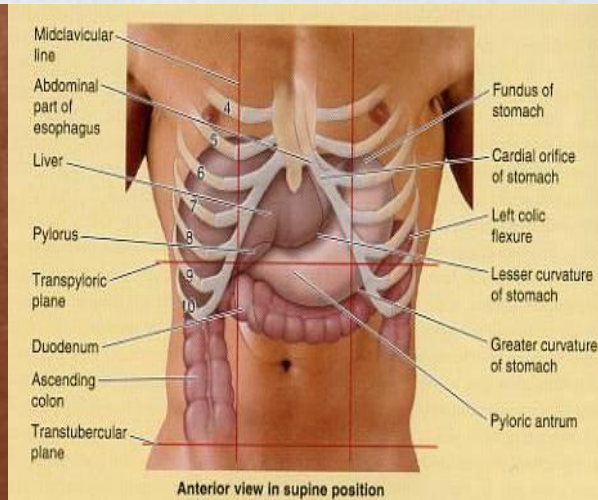


- Forms the left border of the stomach.
- Extends from the cardiac orifice to the pylorus.
- Its upper part is attached to the spleen by **gastrosplenic ligament**
- Its lower part is attached to the transverse colon by the **greater omentum**.

PYLORIC ANTRUM AND PYLORUS



- The **pyloric antrum** extends from Incisura angularis to the pylorus
- The **pylorus** is a tubular part of the stomach
- It lies in the **transpyloric plane**
- It has a thick muscular end called **pyloric sphincter**.
- The cavity of the pylorus is the **pyloric canal**.



George Slavunos (1869-1954): Anatomical Insights and his contribution into the “Magenstrasse of Waldeyer”

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Abstract

The purpose of this article is to present a well-known physician and highlight his contribution into an essential, but neglected anatomical feature. George Slavunos (1869-1954) was a 20th century Greek physician, whose scientific work was a significant milestone in global medical knowledge. In 1899 he became Professor of Anatomy and Head Director of the Department of Anatomy. In 1906 Slavunos G. published the first volume of the three volume book “Human Anatomy” (1906-1926), which is characterized by its unparalleled illustrations. For more than a century it was the most important book of medical literature in Greece. In 1926 he became a Full Member of the Academy of Athens and was named Life Partner of the International Anatomical Society. His interests included Anatomy, Physiology, Histology, as well as Osteology and Syndesmology. In his book “Human Anatomy”, he described for first time the “Sialine Groove of the Stomach”, which was described by Waldeyer-Hartz almost at the same time as the “Magenstrasse”, a German word that means “stomach road”. It is a ribbon-like path that extends along the lesser curvature of the stomach from the gastric cardia to the antrum and releases the gastric content directly into the small intestine. Its importance is confirmed by its association not only with drug delivery, but also with anti-obesity surgical techniques. The old German term has come back into common medical usage in view of the commonly performed Magenstrasse and Mill procedure, a form of bariatric surgery. Conclusion: Slavunos G. managed to observe an anatomical structure that has remained of great importance until today.

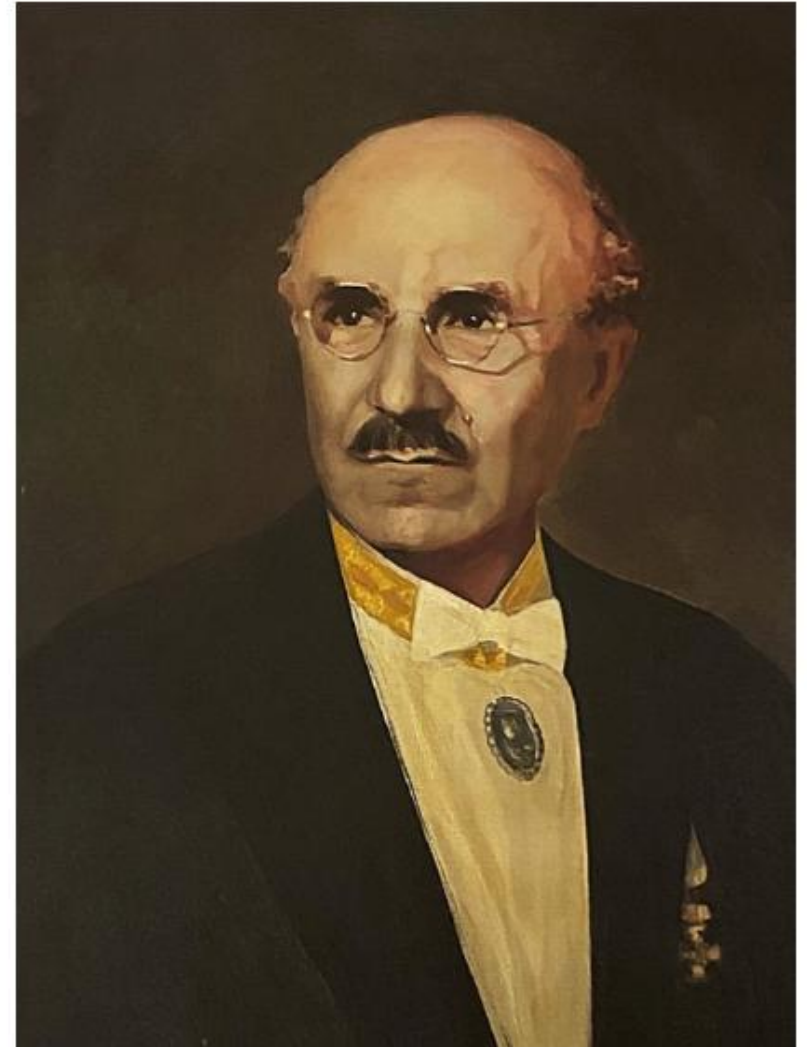
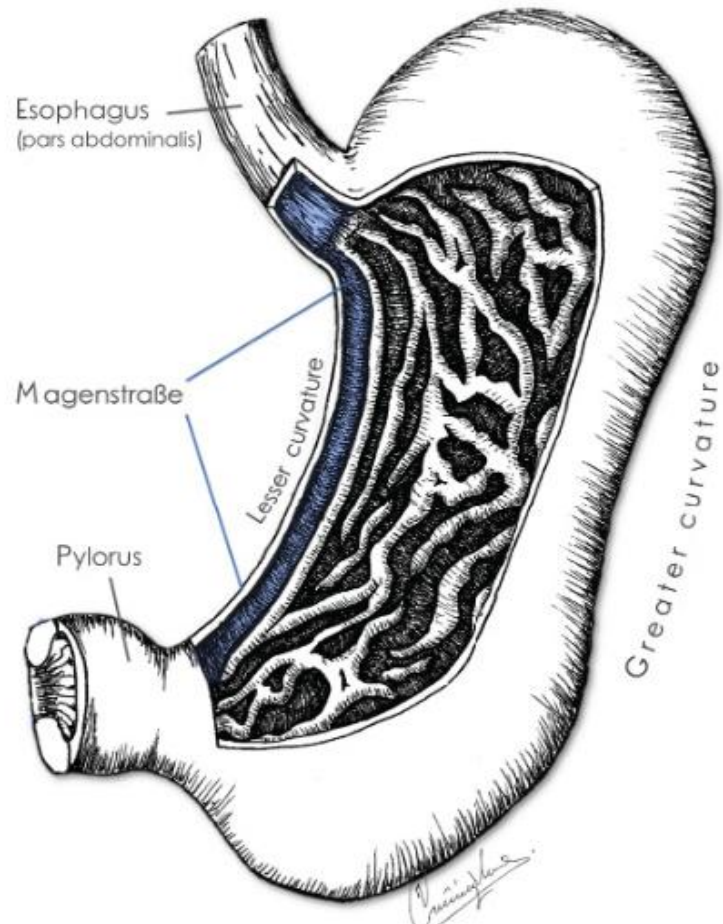


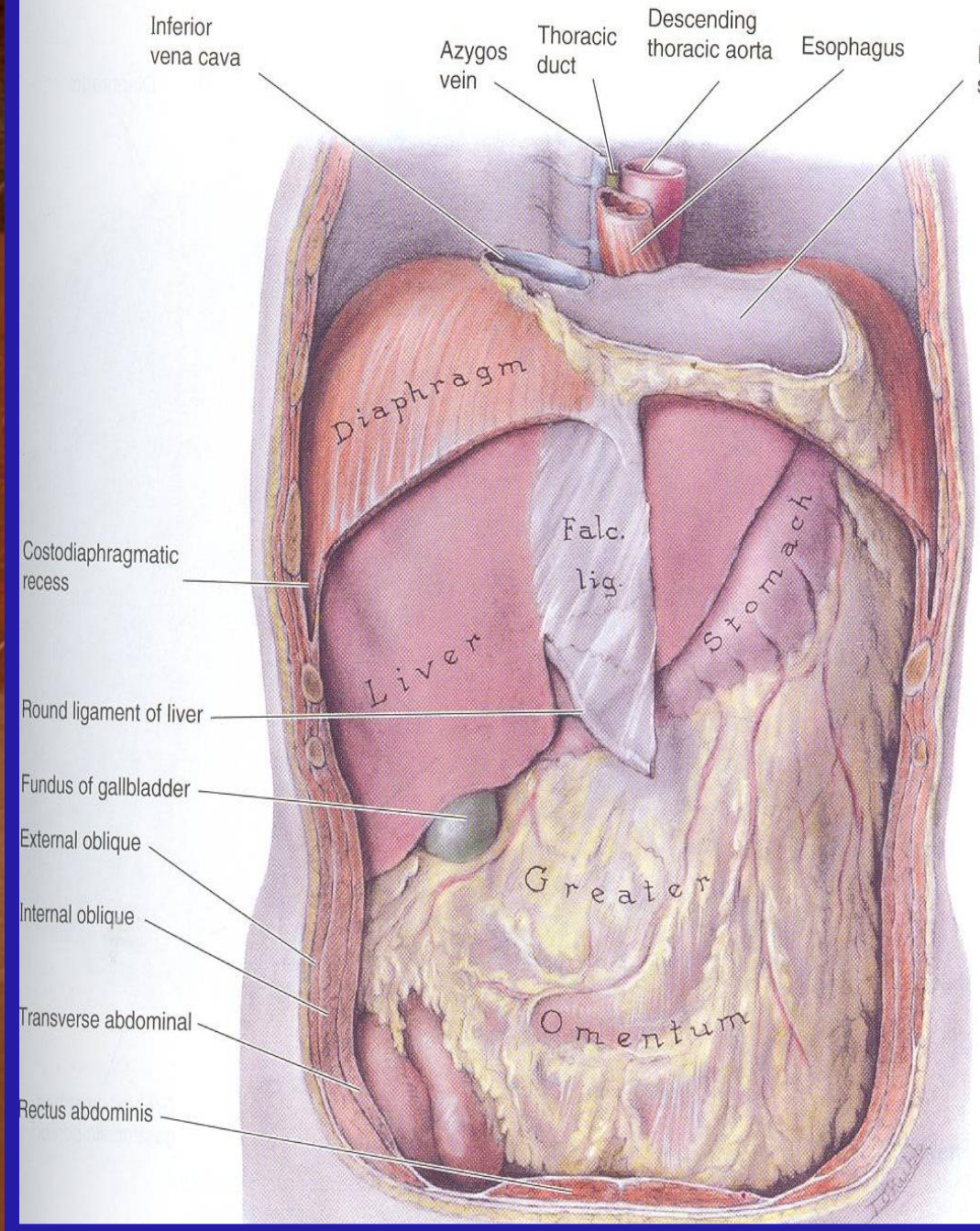
Figure 1. George Slavunos. Oil painting of Slavunos G. by an unknown artist. Adapted from the Department of Anatomy of the National and Kapodistrian University of Athens.



- Gastric content released into the

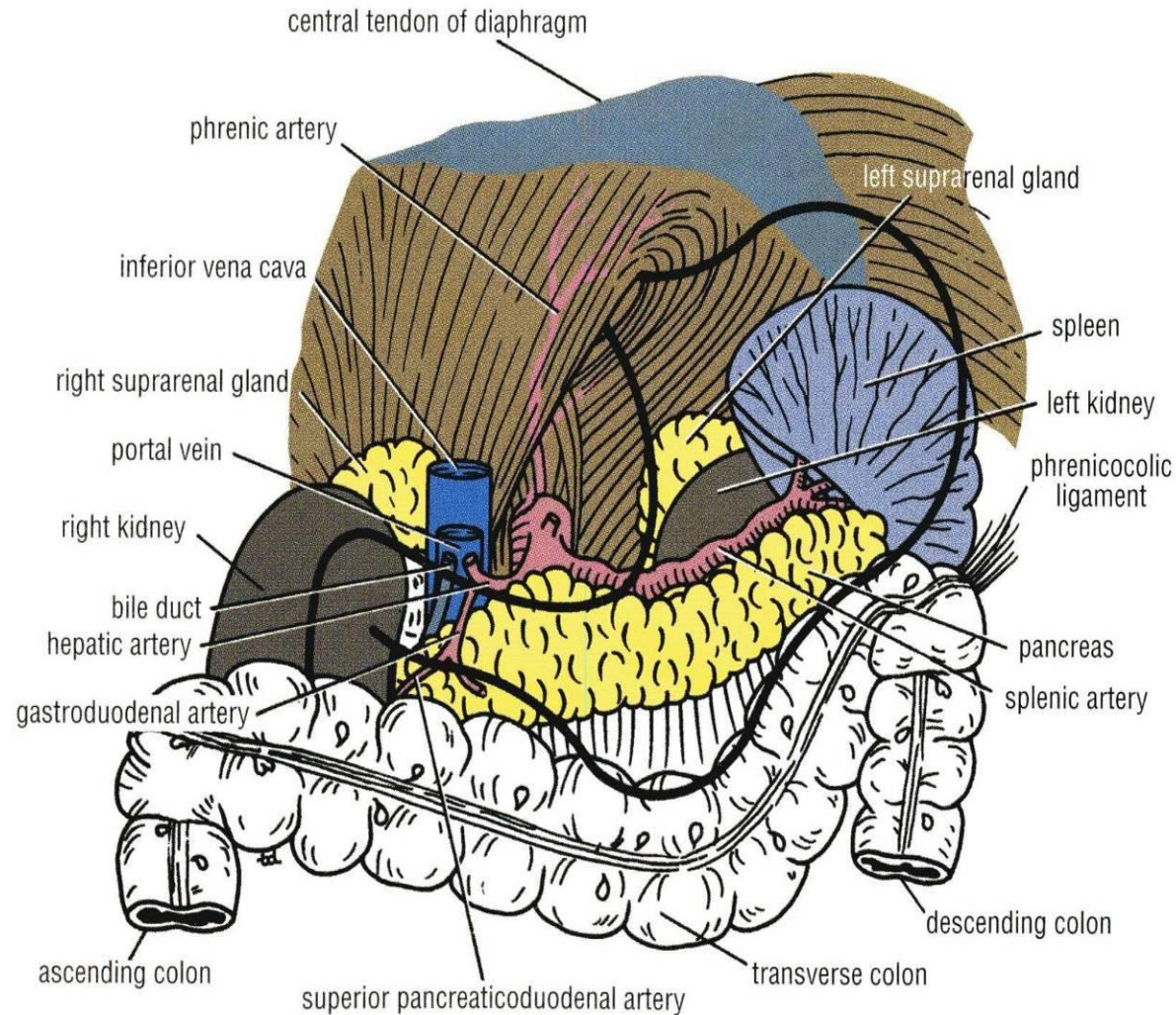
upper stomach from the esophagus can take hours to enter the small intestine. This happens because the content stored in the fundus is delivered to the antrum from above and then empties from the antrum into the duodenum. In contrast to the traditional description of gastric emptying, a new path was discovered which was none other than the “stomach road”, or “Magenstrasse” that Slavunos first described (9).

ANTERIOR RELATIONS



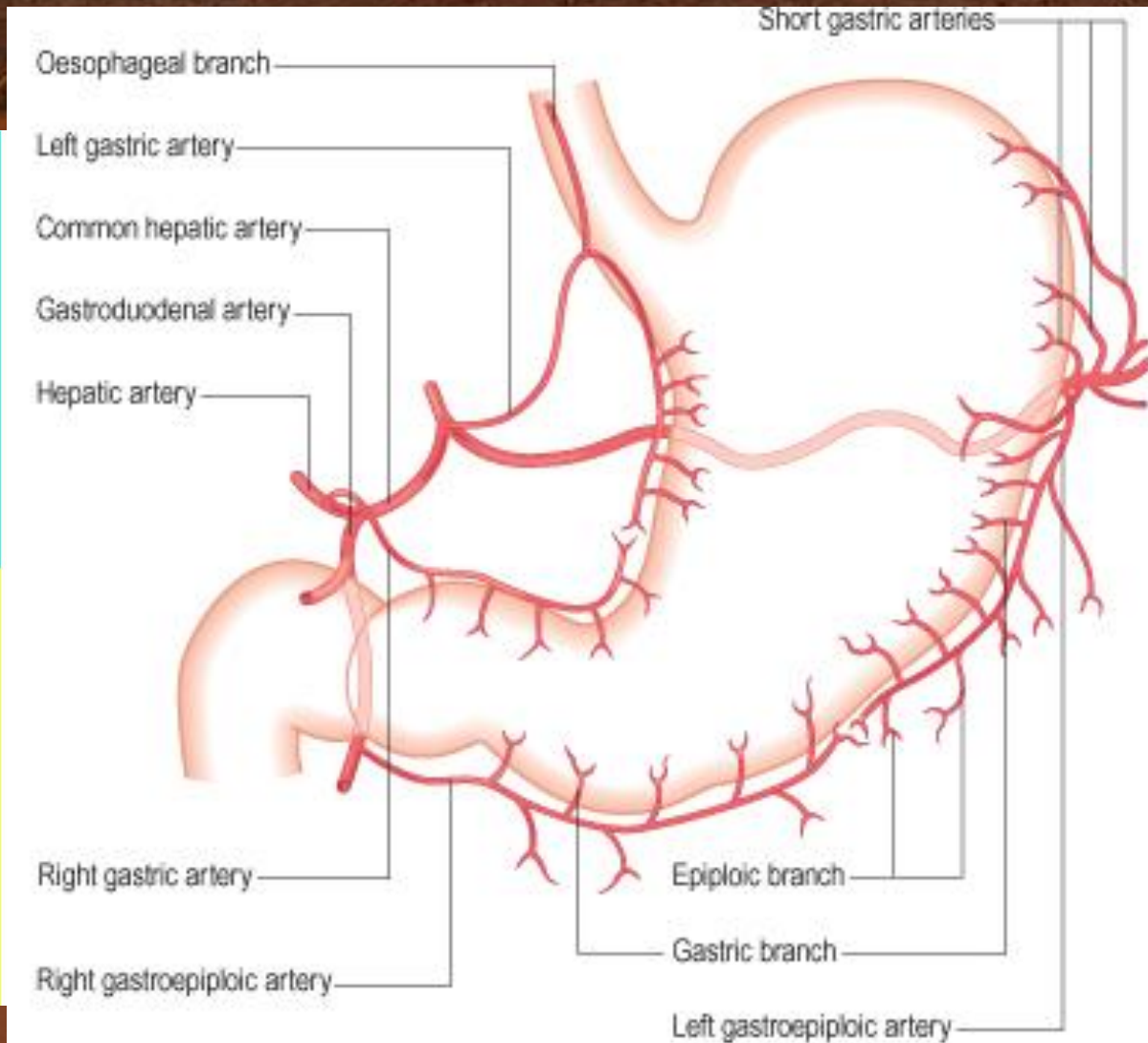
1. Anterior abdominal wall.
2. Left costal margin.
3. Left pleura & lung.
4. Diaphragm.
5. Left lobe of the liver.

POSTERIOR RELATIONS



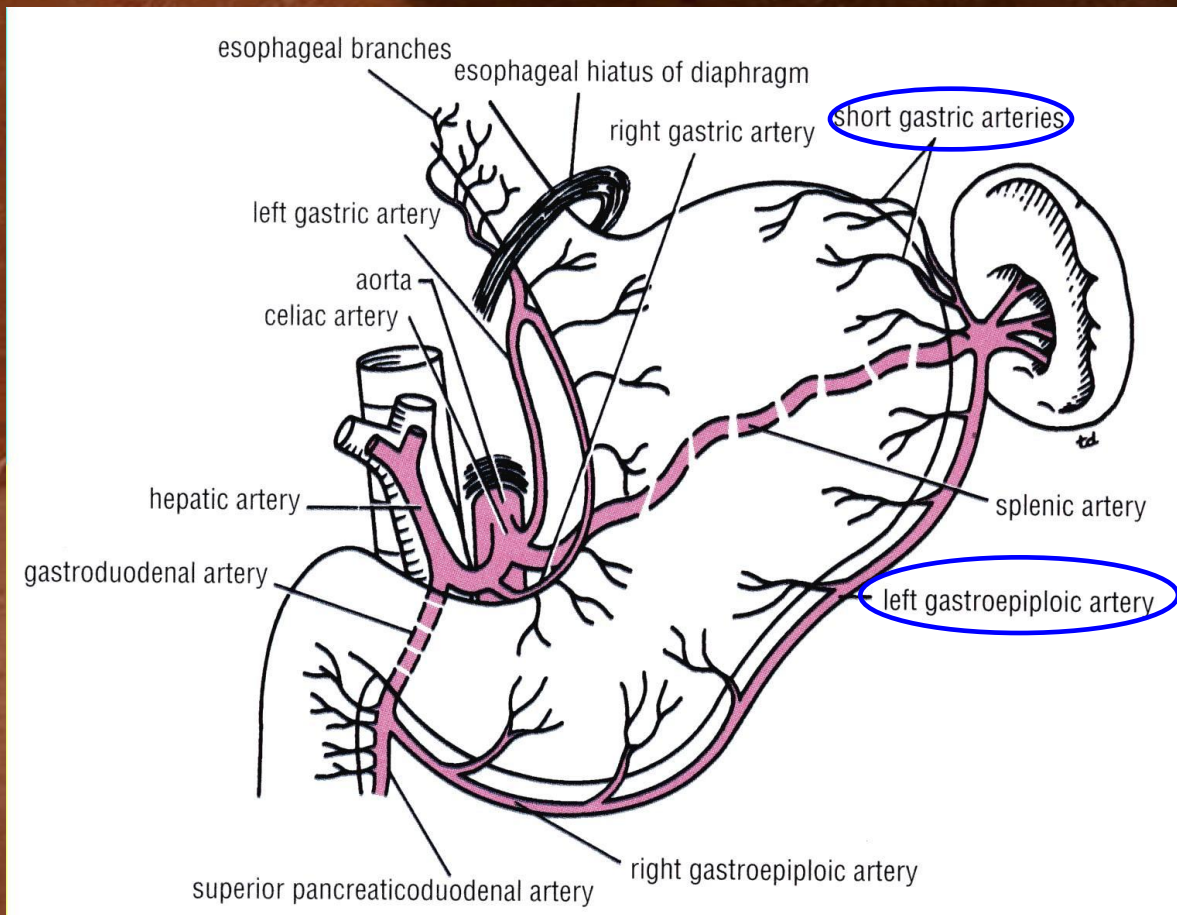
1. Lesser sac, (omental bursa).
 2. Left crus of the diaphragm.
 3. Left suprarenal gland.
 4. Part of left kidney.
 5. Spleen.
 6. Splenic artery.
 7. Pancreas.
 8. Transverse mesocolon.
 9. Transverse colon.
- All these structures form **the stomach bed**.

ARTERIES



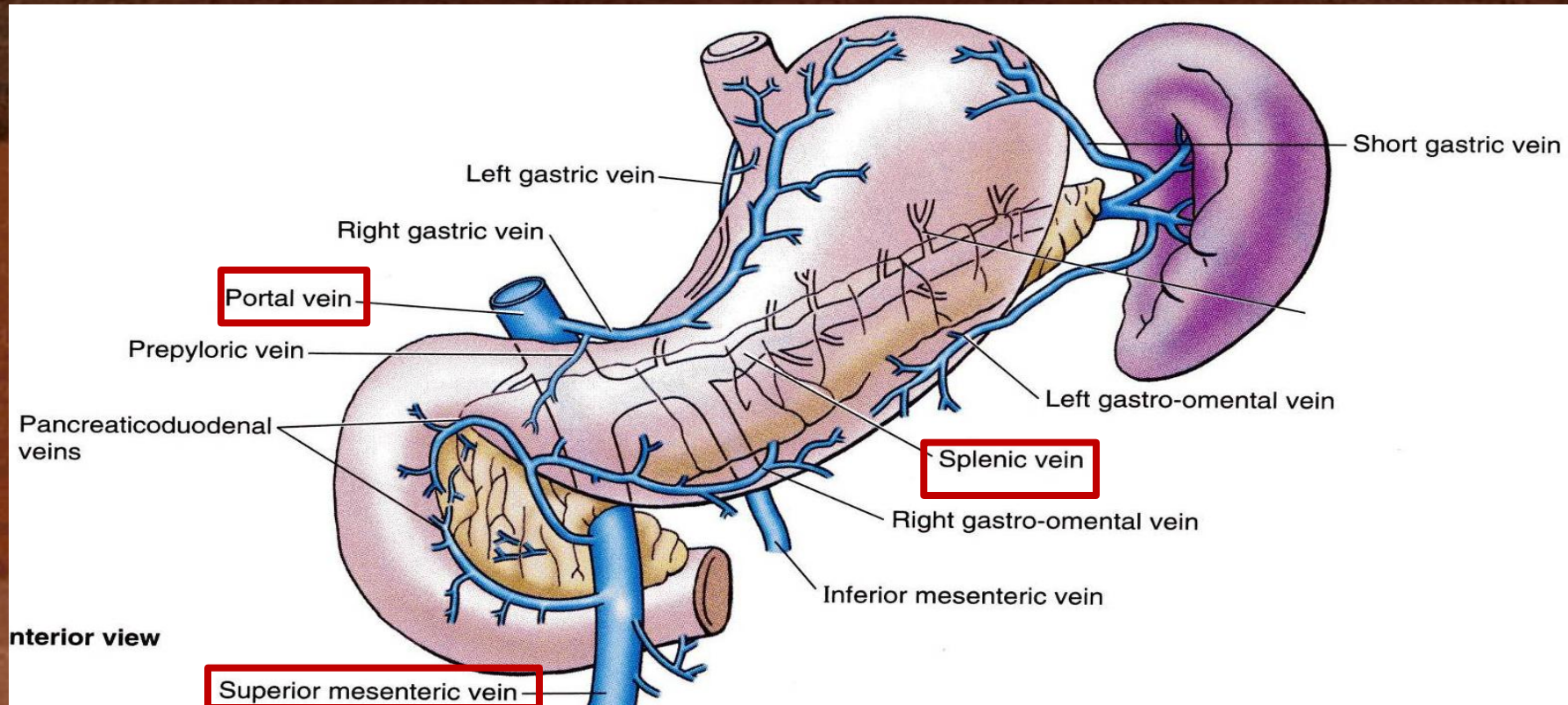
- Left gastric artery:
 - **It is a** branch of celiac artery.
 - Ascends along the lesser curvature.
 - Right gastric artery:
- From the **hepatic** artery of the celiac trunk.
- Runs to the left along the lesser curvature.

ARTERIES



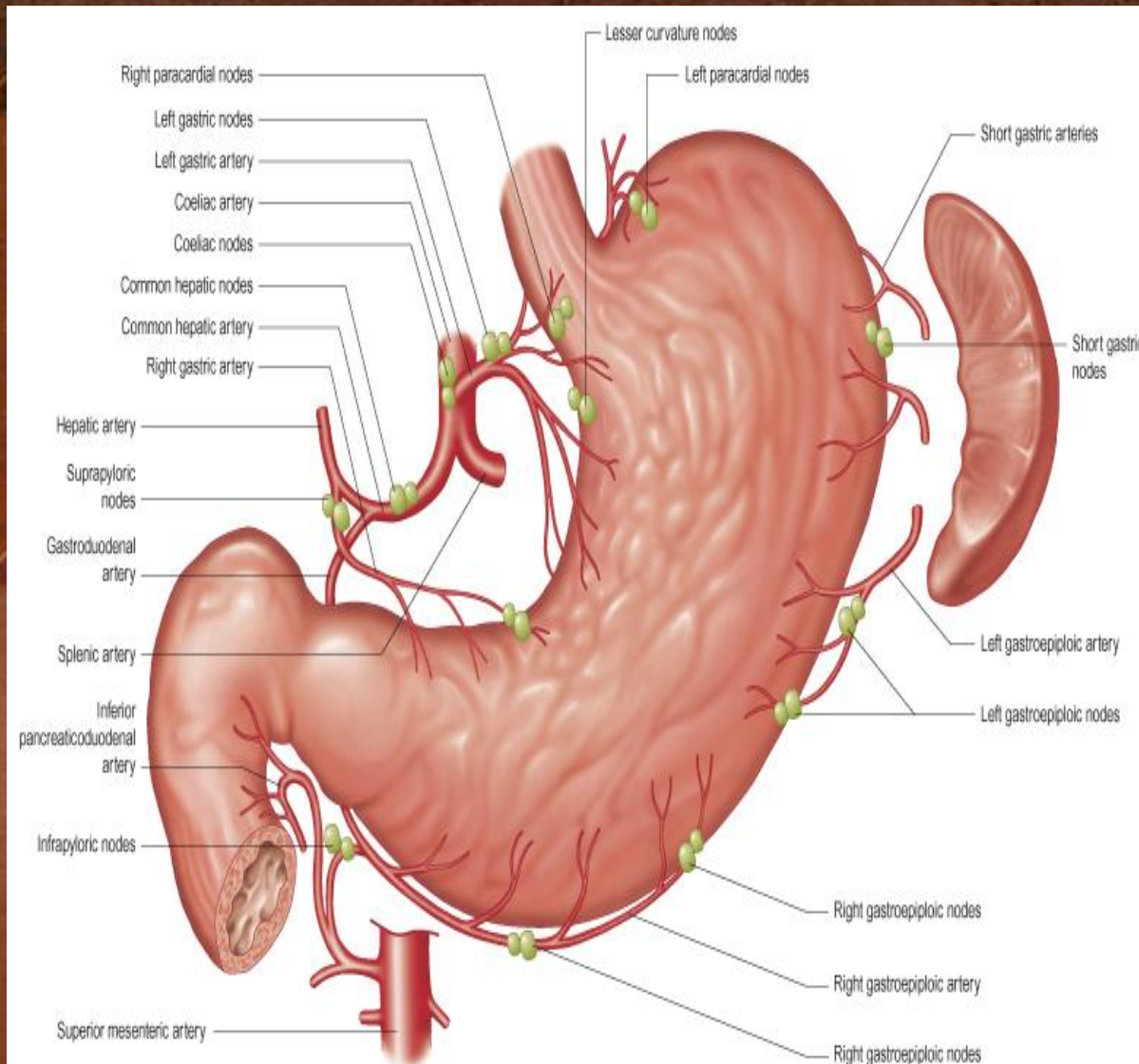
- Short gastric arteries
 - arise from the splenic artery.
 - Pass in the **gastrosplenic ligament**.
- Left gastroepiploic artery:
 - from splenic artery
 - Pass in the **gastrosplenic ligament**.
- Right gastroepiploic artery:
 - from the gastrooduodenal artery of hepatic .
 - Passes to the left along the greater curvature.

VEINS

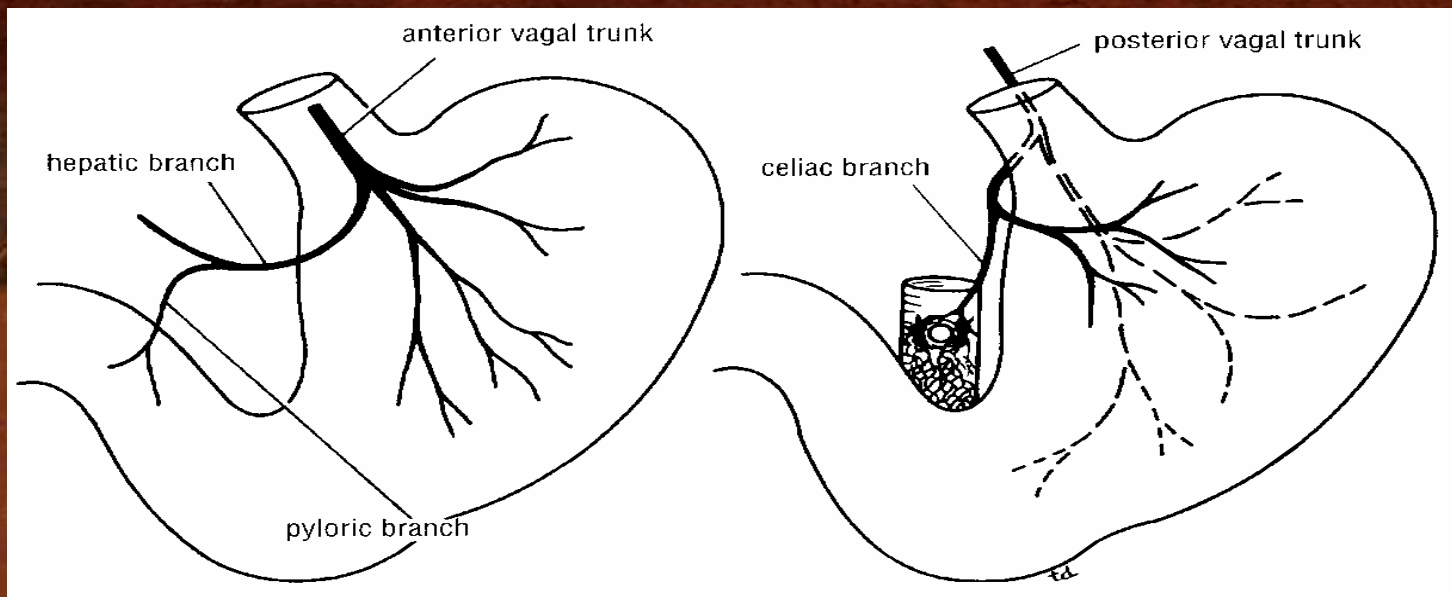


- All of them drain into the **portal circulation**.
- The **right** and **left gastric veins** drain directly into the **portal vein**.
- The **short gastric veins** and the **left gastroepiploic vein** join the splenic vein.
- The **right gastroepiploic vein** drain in the superior mesenteric vein.

LYMPH DRAINAGE



- The lymph vessels follow the arteries.
- They first drain to the:
 - **Left and right gastric nodes**
 - **Left and right gastroepiploic nodes** and the
 - **Short gastric nodes**
- Ultimately, all the lymph from the stomach is collected at the **celiac nodes**.



NERVE SUPPLY

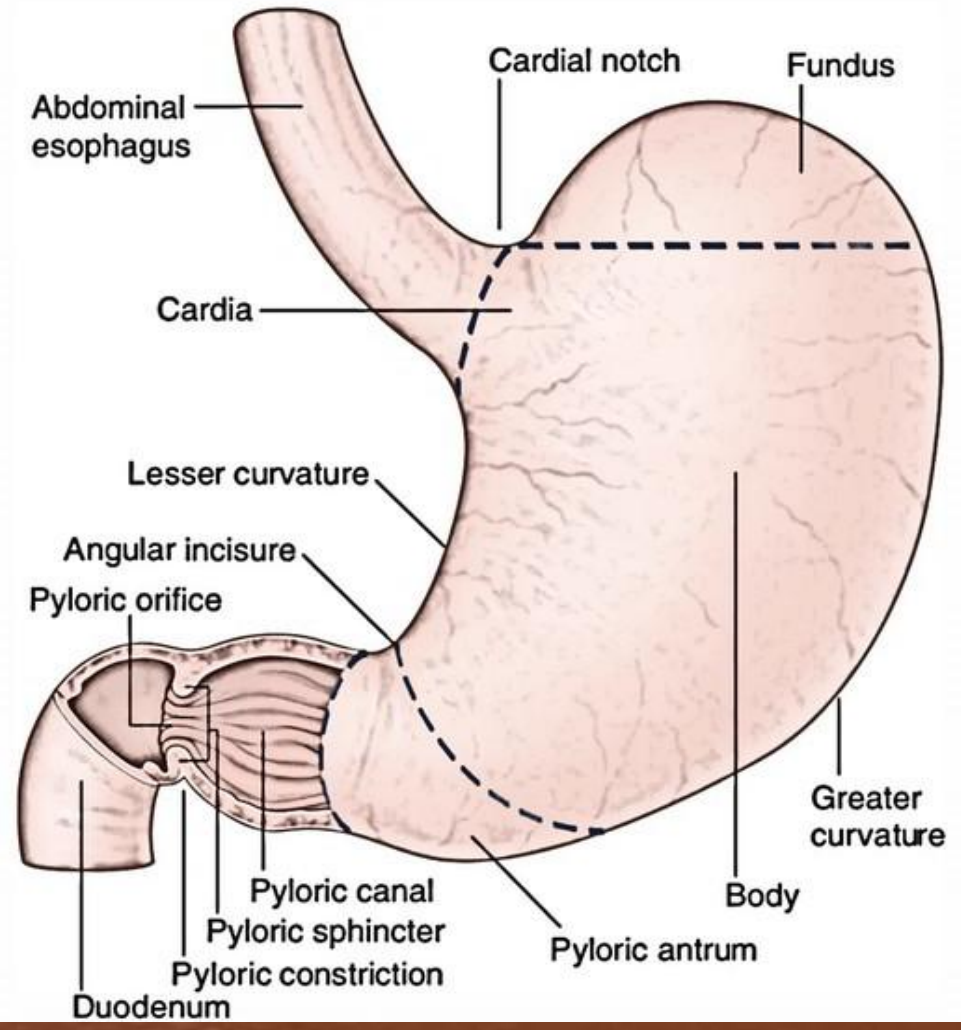
- **Sympathetic fibers** are derived from the **celiac plexus**.
- **Parasympathetic fibers** from **both vagi**.
- **Anterior vagal trunk:**
 - Formed from both vagi mainly from the **left** vagus
 - Supply the **anterior** surface of the stomach
 - Gives a **hepatic branch**, from which a **branch to the pylorus**.
- **Posterior vagal trunk:**
 - Formed from both vagi mainly from the **right** vagus
 - Supply the **posterior** surface of the stomach
 - Gives off a large branch to the celiac and the superior mesenteric plexuses.

Location

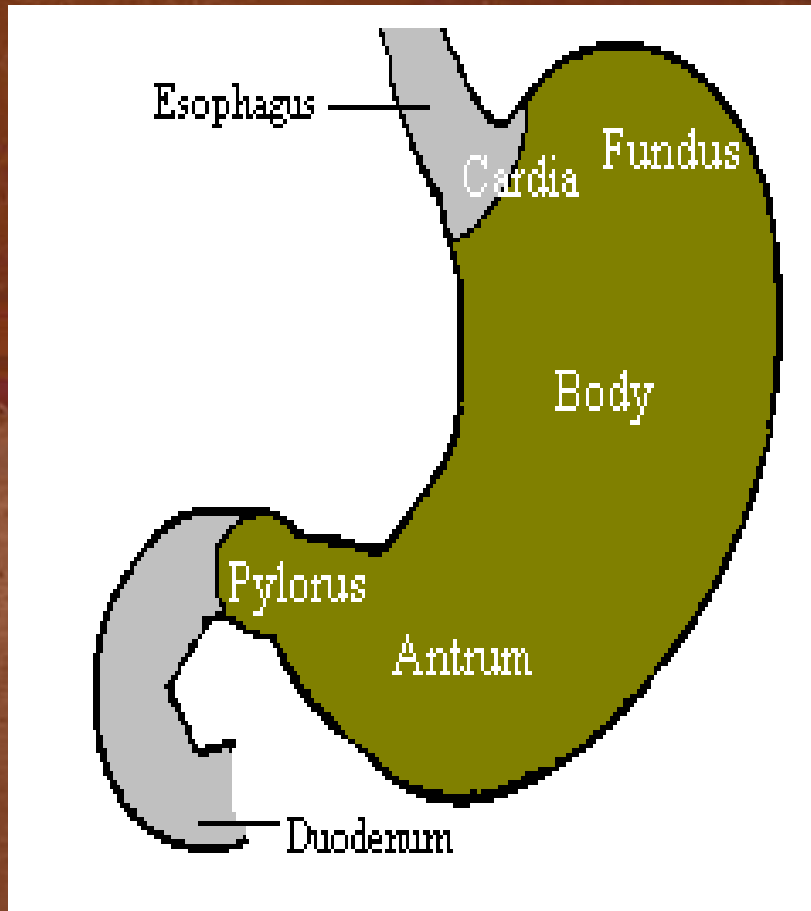
- Upper and left part of abdomen
- Epigastric, umbilical and left hypochondrial region

Stomach

- In adult life, stomach located T10 and L3 vertebral segment
- Can be divided into anatomic regions based on external landmarks
 - 4 regions
 - Cardia
 - Fundus
 - Corpus (body)
 - Antrum

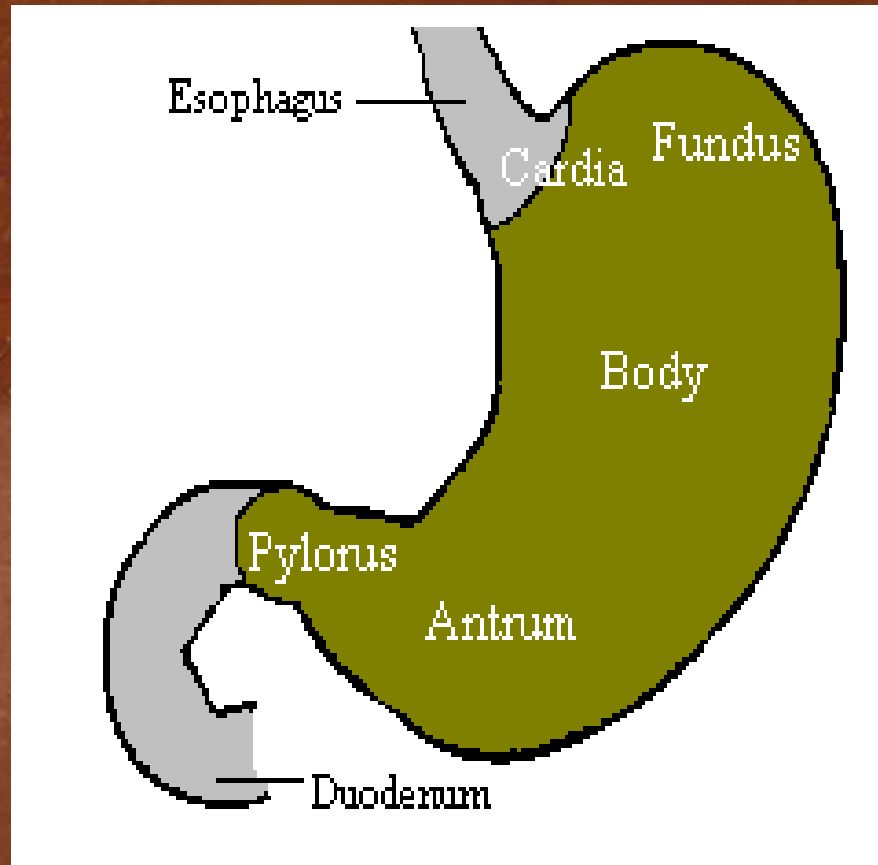


Anatomy



- Cardia- region just distal to the GE junction
- Fundus- portion above and to the left of the GE junction

Anatomy



- Corpus- region between fundus and antrum
 - Margin not distinctly external, has arbitrary borders
- Antrum- bounded distally by the pylorus
 - Which can be appreciated by palpation of a thickened ring of smooth muscle

shape

- Depends on degree of distension and surrounding viscera
- Empty - J shape
- Partly distended - piriform
- Obese - horizontal - steer horn stomach

size

- Distensible
- 10 in. long

Capacity

- 30 ml - birth
- 1 l - puberty
- 1 ½ l – 2 l or more - adult

External features

- Cardiac orifice - 7th costal cartilage, T 11 vertebra
 - Pyloric orifice - lower border of L 1
- Pyloric constriction - circular groove
- Pylorus = gate guard
- PrePyloric vein in front of constriction
- Lesser curvature, lesser omentum, incisura angularis

External features...

- Greater curvature
- cardiac notch

Anterior surface - forward upward

Posterior surface -backward downward

Sub divisions

- Cardiac ,Pyloric parts

Cardiac – fundus , body

Pyloric – pyloric antrum (3 in.), pyloric canal(1 in.)

Relations

Peritoneal

- Lesser omentum
- Greater omentum
- Gastrosplenic ligament
- Gastrophrenic ligament
- Bare area

Relations.....

Visceral

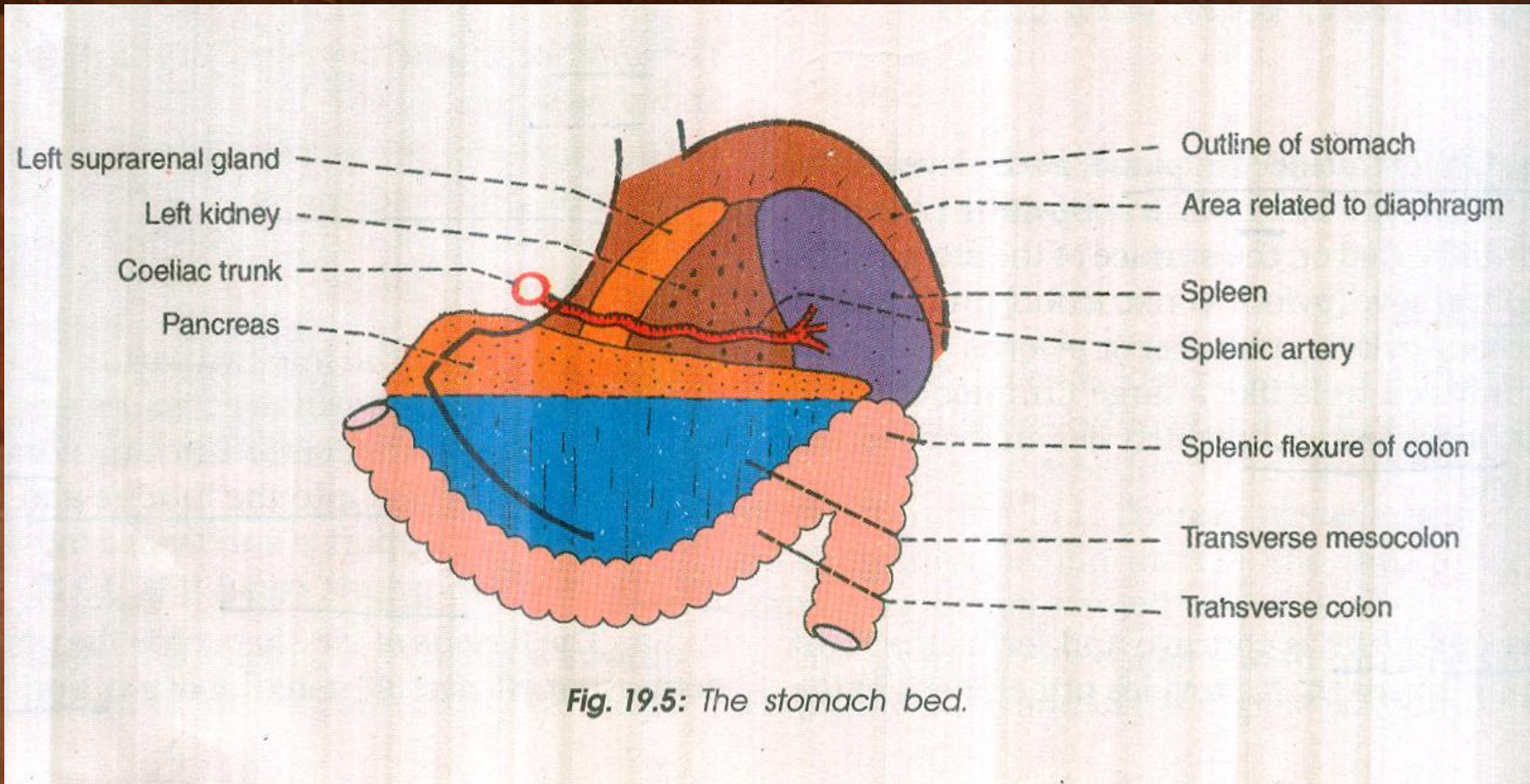
- Anterior surface

Liver, diaphragm, ant. Abd.wall

- Posterior surface

Diaphragm, Lt. kidney, Lt. supra renal gland, pancreas, transverse mesocolon, splenic flexure of colon, splenic artery -
stomach bed

Stomach Bed



Interior of stomach

- Gastric rugae

Longitudinal along lesser curvature – gastric canal, irregular elsewhere.

- Gastric pits

Gastric glands opens

Vasculature

- Well vascularized organ
- Arterial flow mainly derived from Celiac Artery
 - 3 Branches
 - Left Gastric Artery
 - Supplies the cardia of the stomach and distal esophagus

- Splenic Artery

- Gives rise to 2 branches which help supply the greater curvature of the stomach

- » Left Gastroepiploic

- » Short Gastric Arteries

- Common Hepatic or Proper Hepatic Artery

- 2 major branches

- » Right Gastric- supplies a portion of the lesser curvature

- » Gastroduodenal artery

- Gives rise to Right Gastroepiploic artery

- helps supply greater curvature in conjunction with Left Gastroepiploic Artery

Blood supply

- Left gastric artery- br of coeliac trunk
- Right gastric artery- br of common hepatic artery
- Right gastro epiploic artery- br of gastroduodenal artery
- Left gastro epiploic artery- br of splenic artery
- 5-7 short gastric arteries -br of splenic artery

Arterial Supply

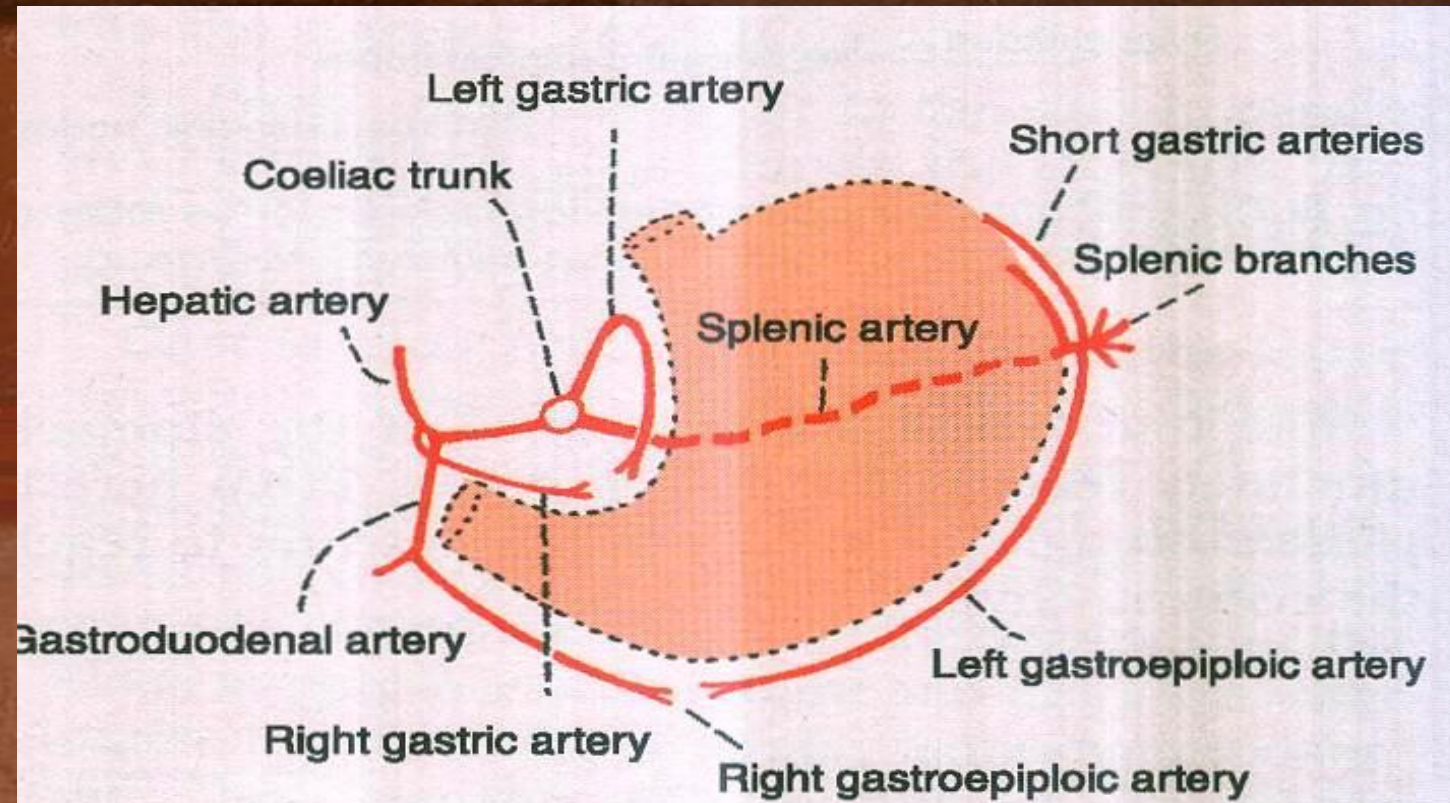
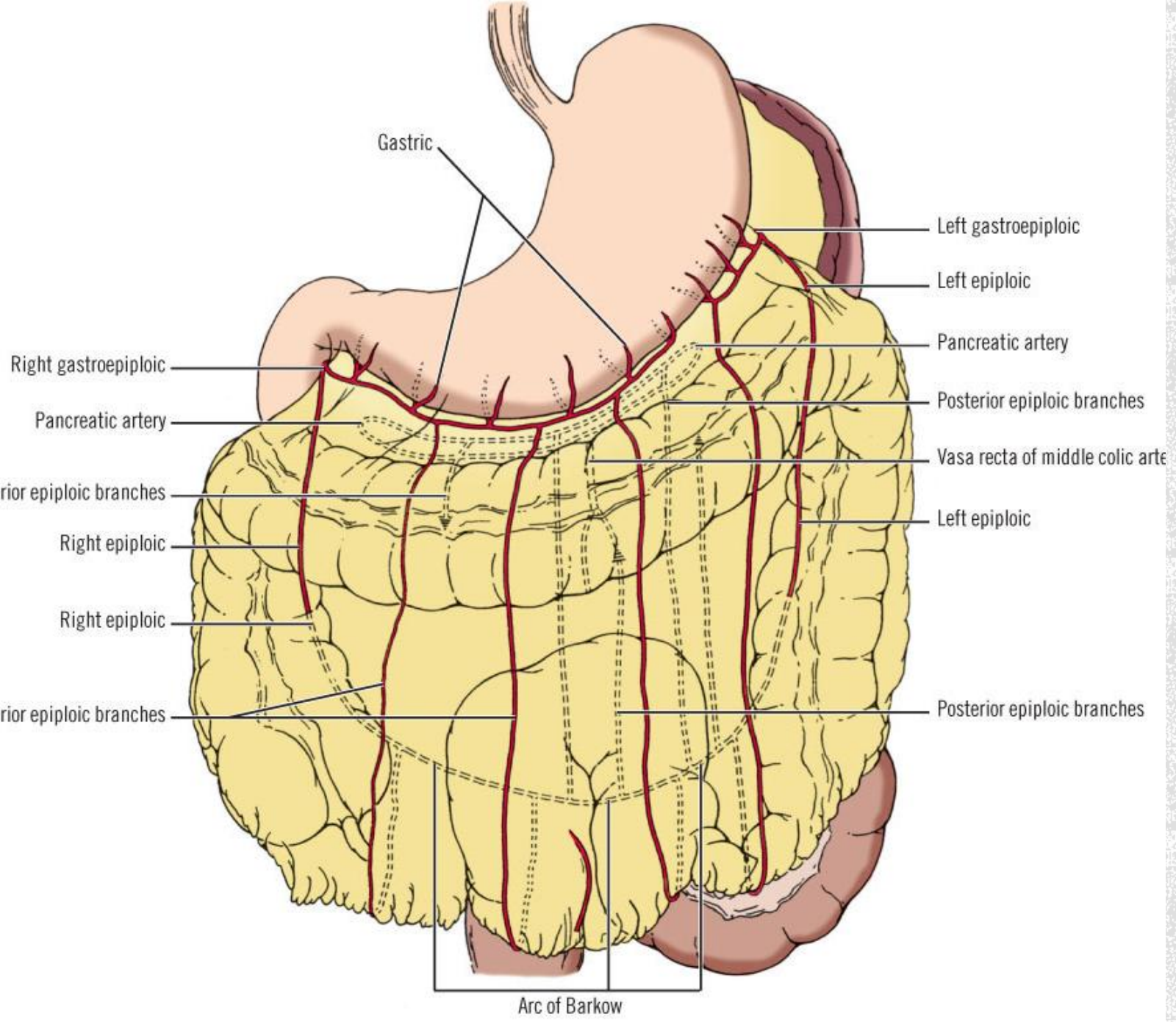
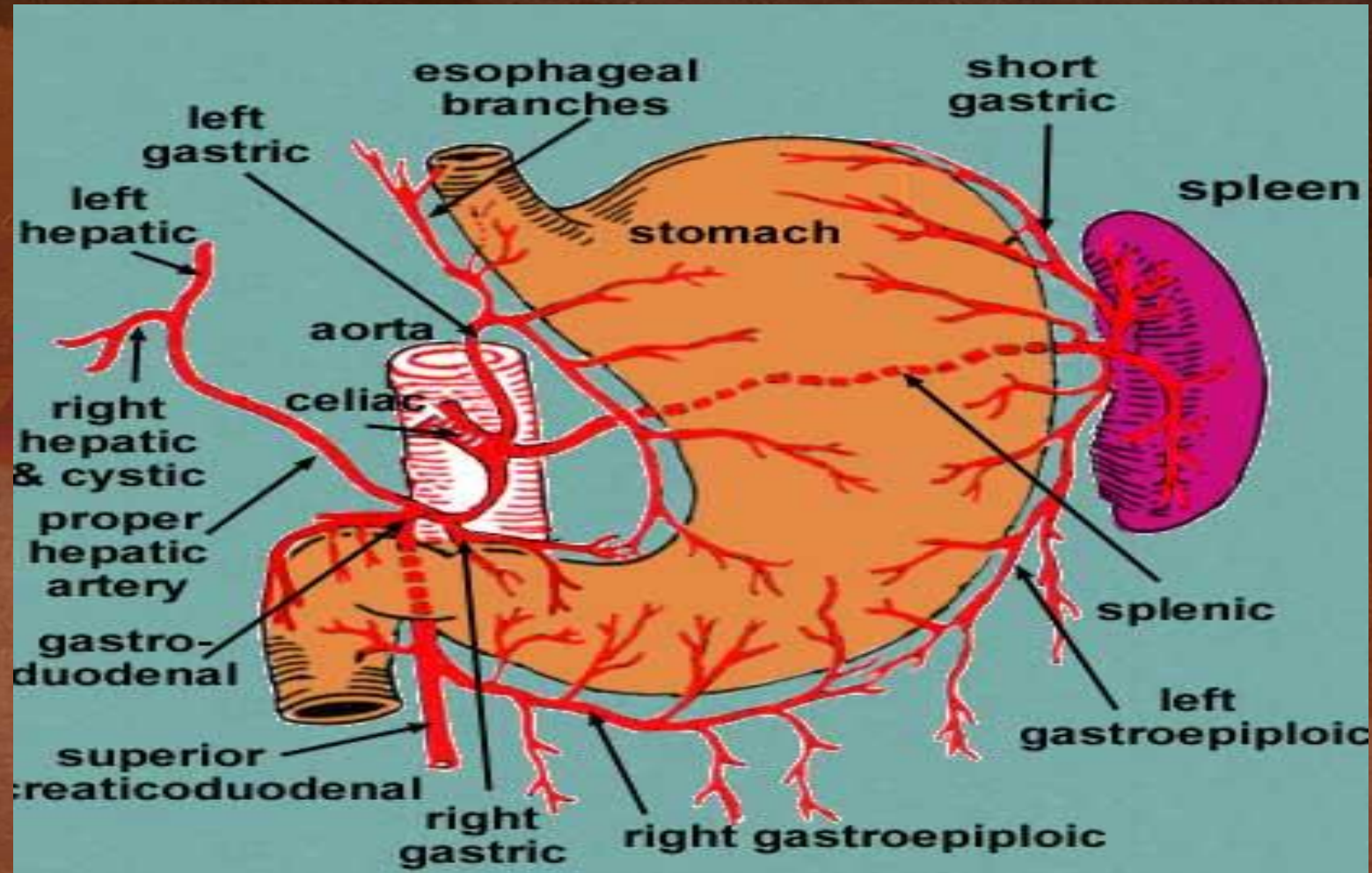


Fig. 19.6: Arteries supplying the stomach.



Vasculature



Blood supply

- **Veins**

Portal vein

Superior mesenteric vein

Splenic vein

Venous drainage

- Right & left gastric veins -> hepatic portal vein.
- Left gastroepiploic & short gastric veins -> hepatic portal vein via the splenic vein.
- Right gastroepiploic vein join superior mesenteric vein.

Lymphatic drainage

- Area A pancreatosplenic
- Area B left gastric
- Area C right gastroepiploic sub pyloric hepatic
- Area D diff directions into pyloric, hepatic, left gastric
- Coeliac trunk cisterna chyli

Lymphatic Drainage

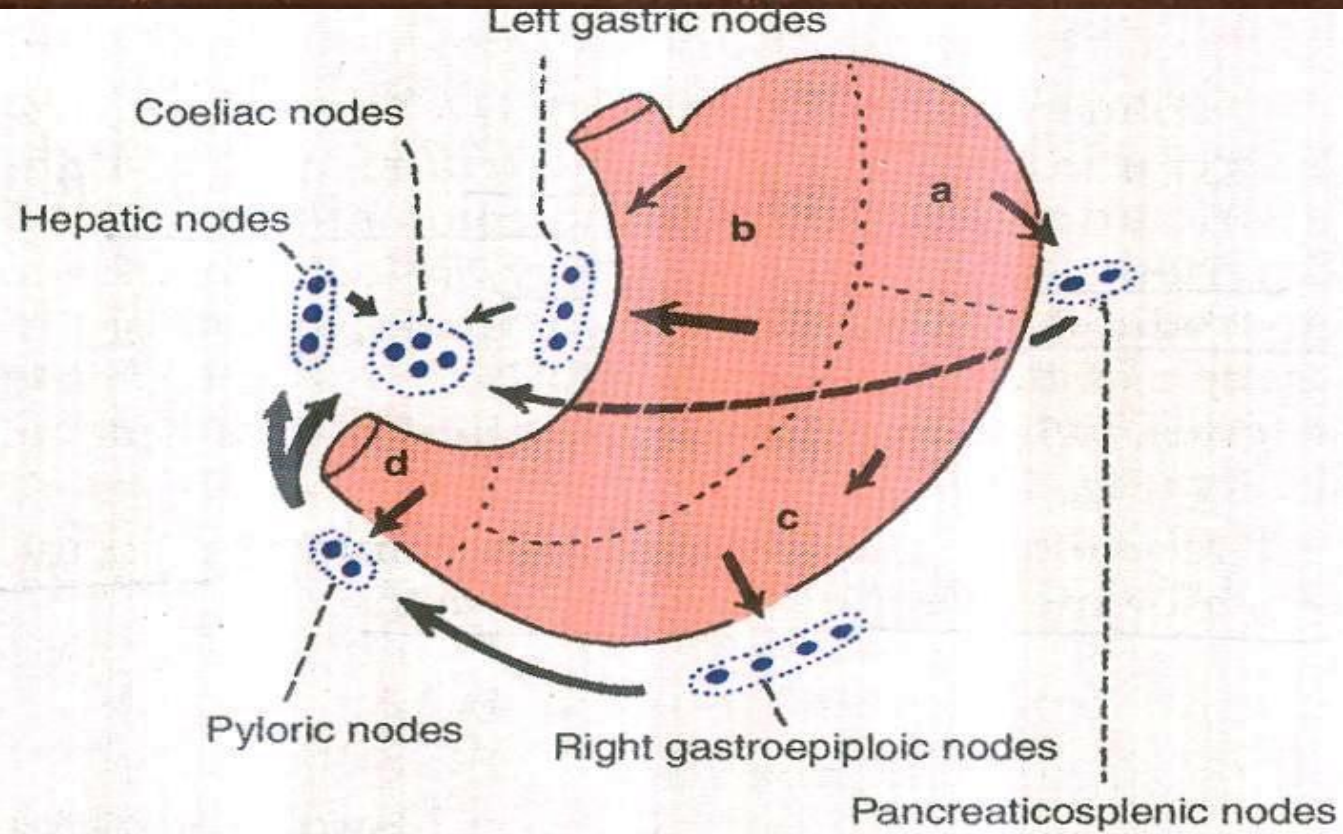


Fig. 19.7: Lymphatic drainage of the stomach. Note the manner in which the organ is subdivided into different territories.

Anatomy

- Lymphatic drainage
 - Lymph from *the proximal portion* of the stomach drains along the lesser curvature first drains into *superior gastric lymph nodes* surrounding the Left Gastric Artery
 - *Distal portion* of lesser curvature drains through the *suprapyloric nodes*
 - *Proximal portion* of the greater curvature is supplied by the lymphatic vessels that traverse the *pancreaticosplenic nodes*
 - *Antral portion* of the greater curvature drains into the *subpyloric and omental nodal groups*

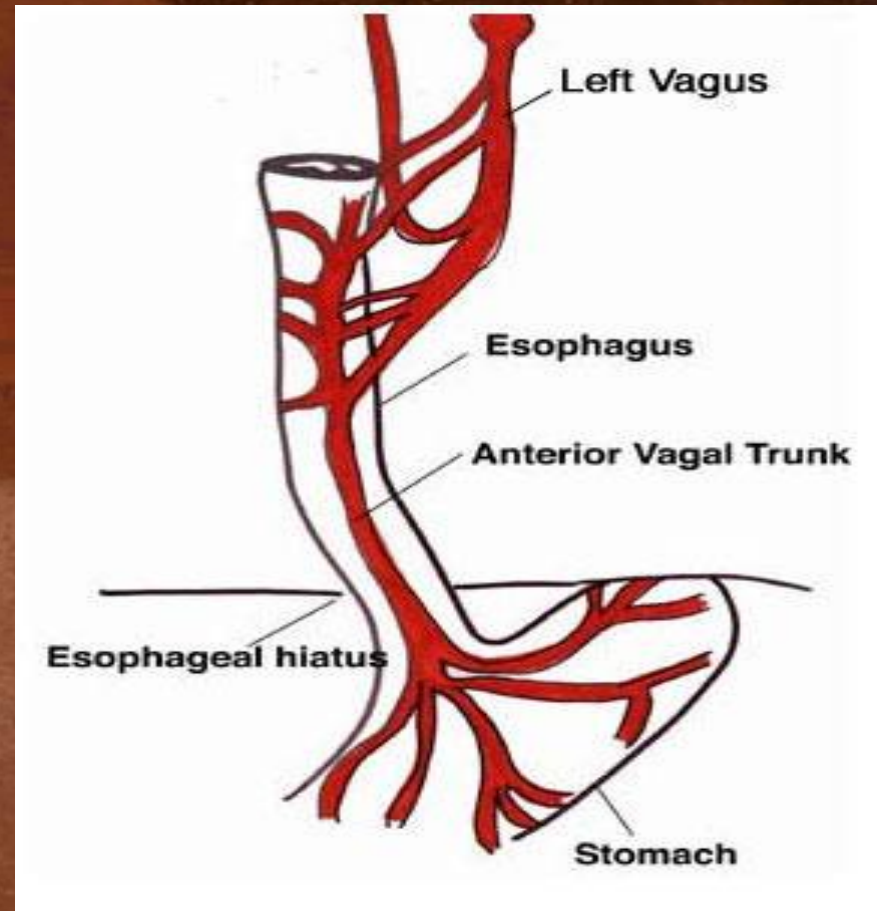
Anatomy

- Nerve Supply

- Left and Right Vagus Nerves descend parallel to the esophagus within the thorax before forming a peri-esophageal plexus between the tracheal bifurcation and the diaphragm
- From this plexus, two vagal trunks coalesce before passing through the esophageal hiatus of the diaphragm

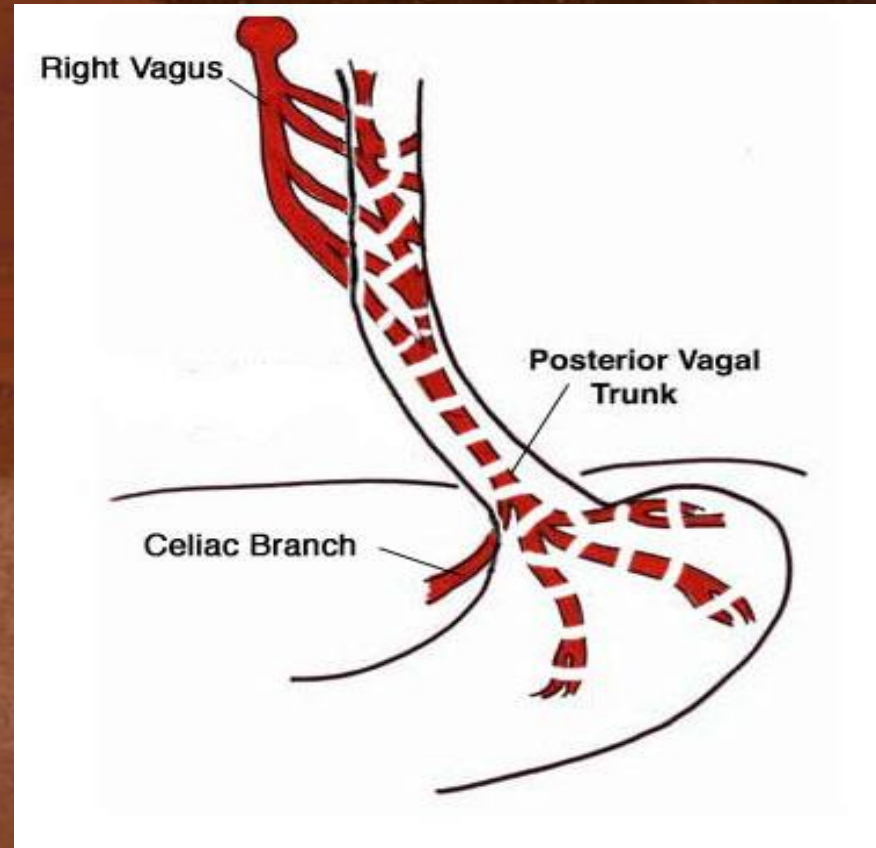
Anatomy

- Left (anterior) Vagus Nerve
 - Left of the esophagus
 - Branches
 - Hepatic Branch
 - » Supplies liver and Biliary Tract
 - Anterior gastric or Ant. Nerve of Latarget



Anatomy

- Right (posterior) Vagus Nerve
 - Right of the esophagus
 - Branches
 - Celiac
 - » Innervates posterior gastric wall



Anatomy

- Parasympathetic innervation of Stomach- Vagus Nerve
 - 90% of fiber in vagal trunk is afferent (info transmitting from stomach to CNS)
- Sympathetic innervation of Stomach- Splanchnic Nerve
 - Derived from spinal segment T5-T10

Nerve supply

- Sympathetic T5 - T10

Via splanchnic nerves, coeliac and hepatic plexes

- Vasomotor
- Motor to pyloric sphincter only
- Pain sensation from stomach

Nerve supply

- Parasympathetic

From vagi through oesophageal plexus and gastric nerves

➤ Motor and secretomotor

Innervation

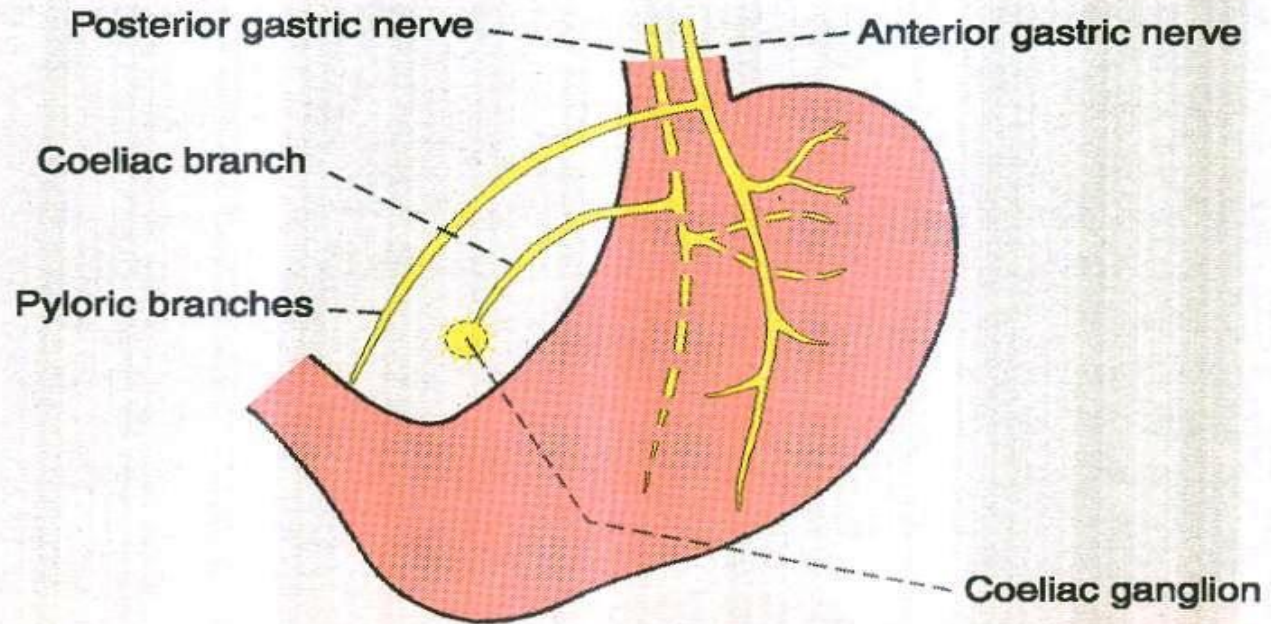
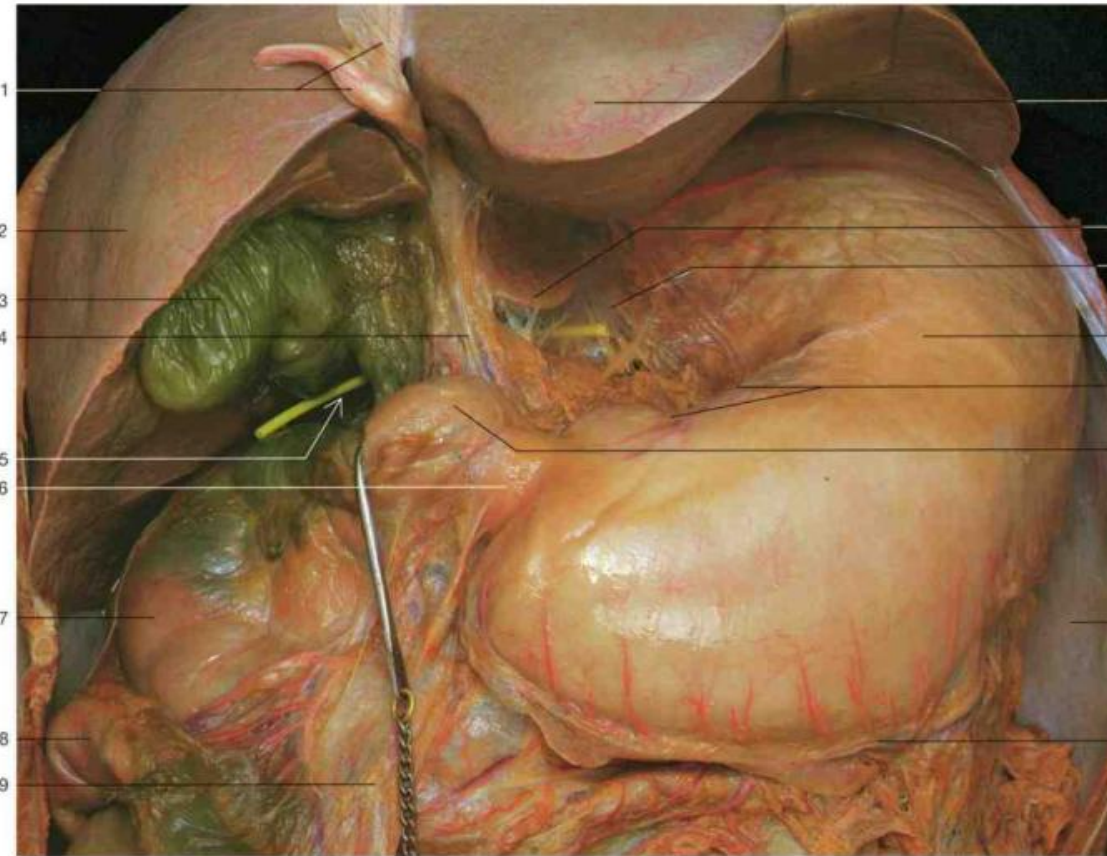


Fig. 19.8: Nerve supply of the stomach.

functions

- Reservoir of food
- Peristaltic movements
- Gastric glands gastric juice, HCL
- Mucous
- absorption

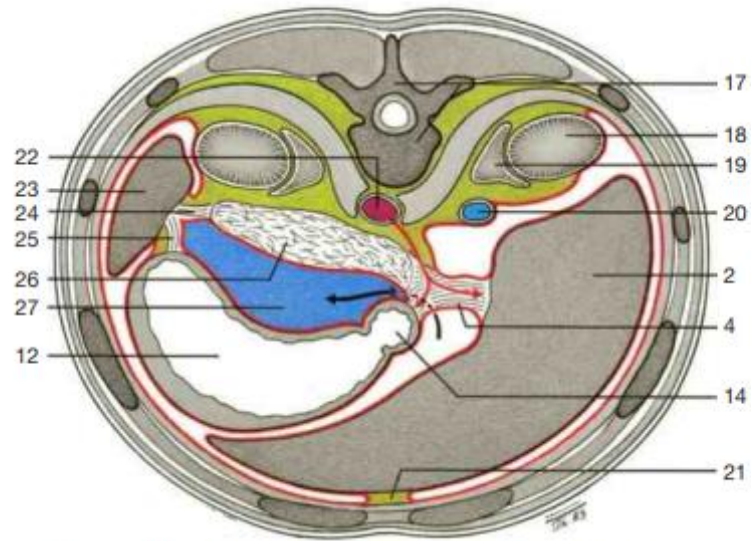


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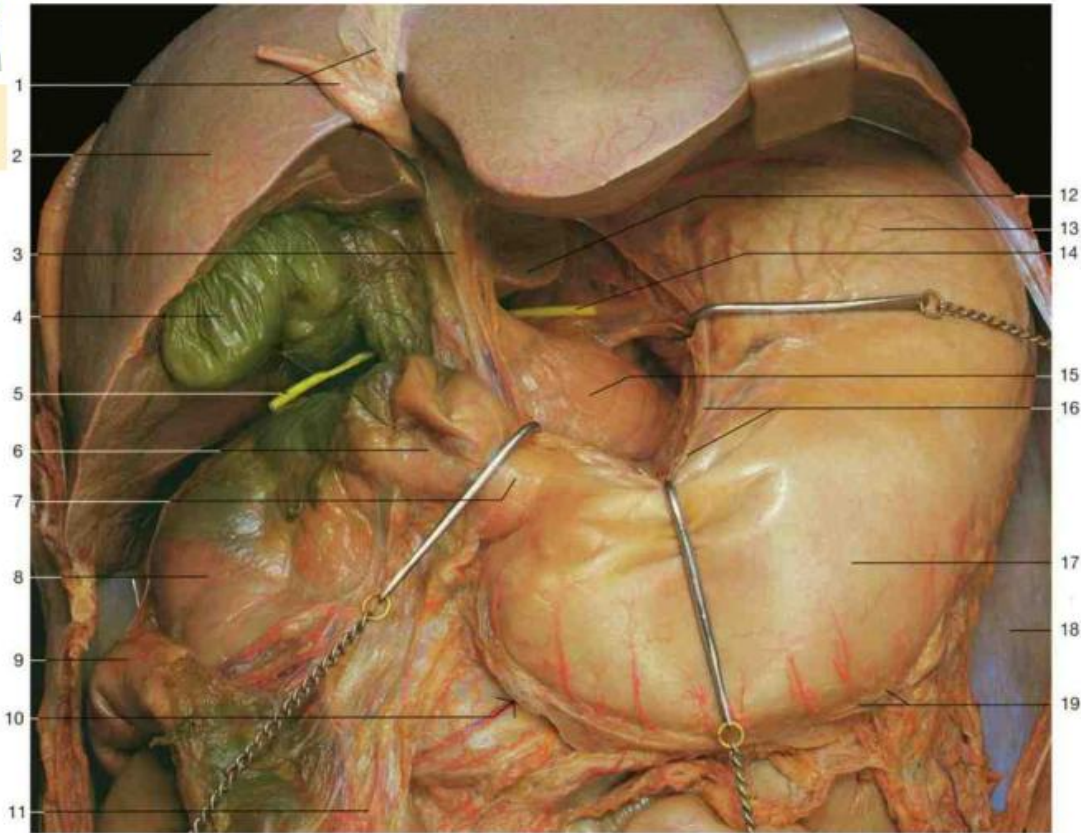
Upper abdominal organs (anterior aspect). Thorax and anterior part of diaphragm have been removed and the liver raised to display the lesser omentum. A probe has been inserted into the epiploic foramen and lesser sac.

- 1 Falciform ligament and ligamentum teres
- 2 Liver
- 3 Gallbladder (fundus)
- 4 Hepatoduodenal ligament
- 5 Epiploic foramen (probe)
- 6 Pylorus
- 7 Descending part of duodenum
- 8 Right colic flexure
- 9 Gastrocolic ligament
- 10 Caudate lobe of liver (behind lesser omentum)
- 11 Lesser omentum
- 12 Stomach
- 13 Lesser curvature of stomach
- 14 Superior part of duodenum
- 15 Diaphragm
- 16 Greater curvature of stomach with gastro-omental vessels
- 17 Twelfth thoracic vertebra
- 18 Right kidney
- 19 Right suprarenal gland
- 20 Inferior vena cava
- 21 Falciform ligament of liver
- 22 Abdominal aorta
- 23 Spleen
- 24 Lienorenal ligament
- 25 Gastrosplenic ligament
- 26 Pancreas
- 27 Lesser sac (omental bursa)

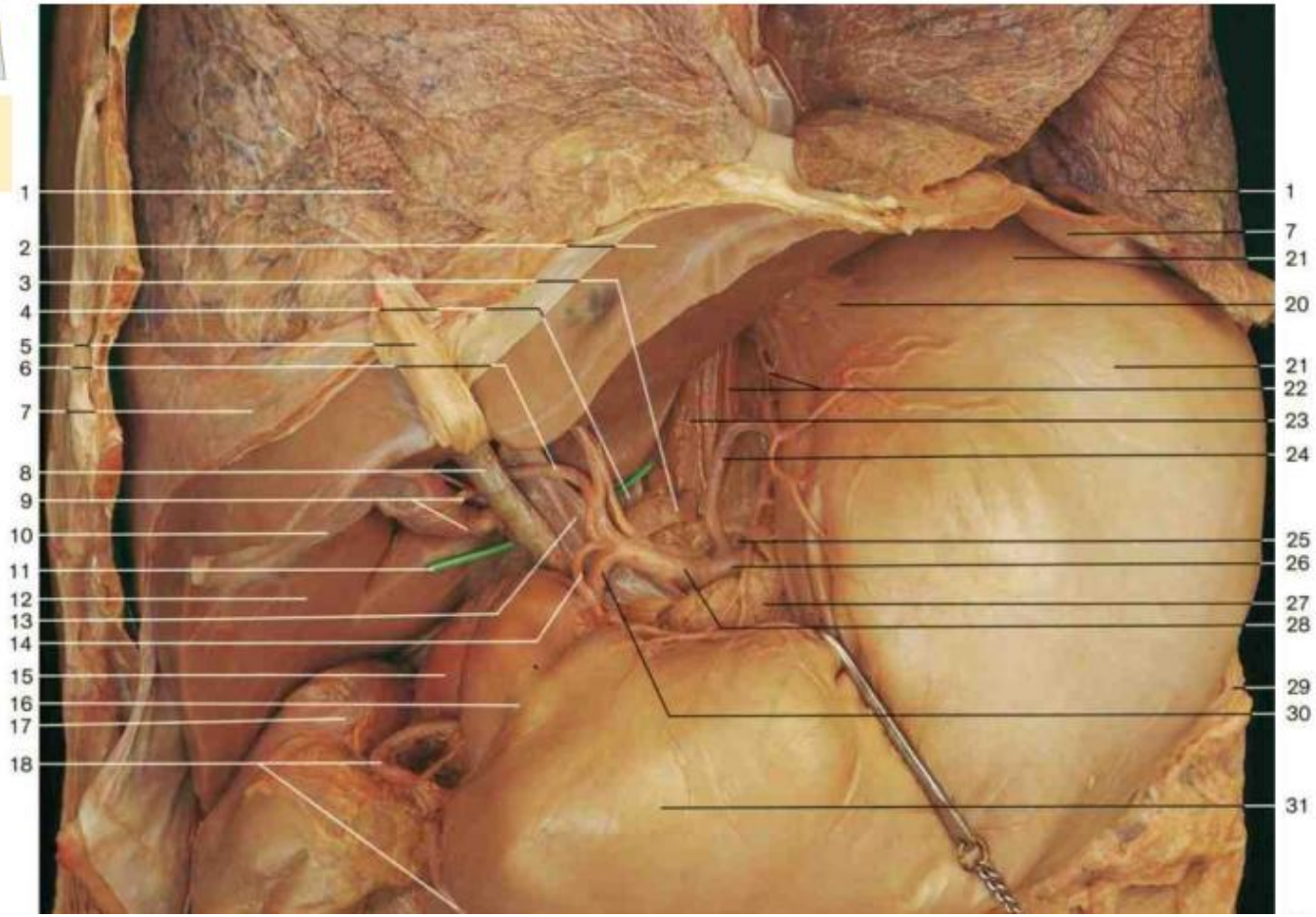


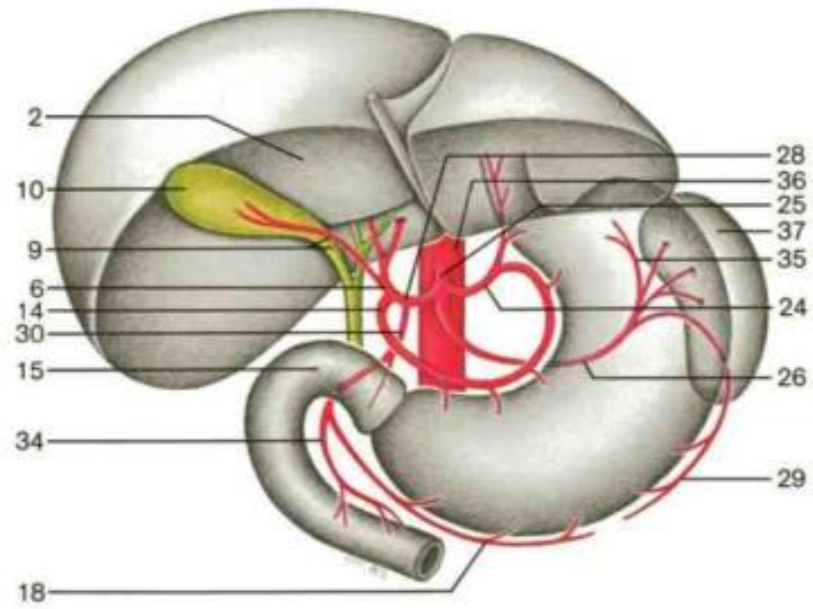
Horizontal section through the lesser sac above the level of epiploic foramen (black arrow). Viewed from above. Red arrows: routes of the arterial branches of celiac trunk to liver, stomach, duodenum, and pancreas (posterior aspect).

312 Dissection of the Abdominal Organs: Upper Abdominal Organs



Upper abdominal organs (anterior aspect). Lesser sac. Lesser omentum partly removed, liver and stomach slightly reflected.





Branches of celiac trunk (schematic drawing).

Applied anatomy

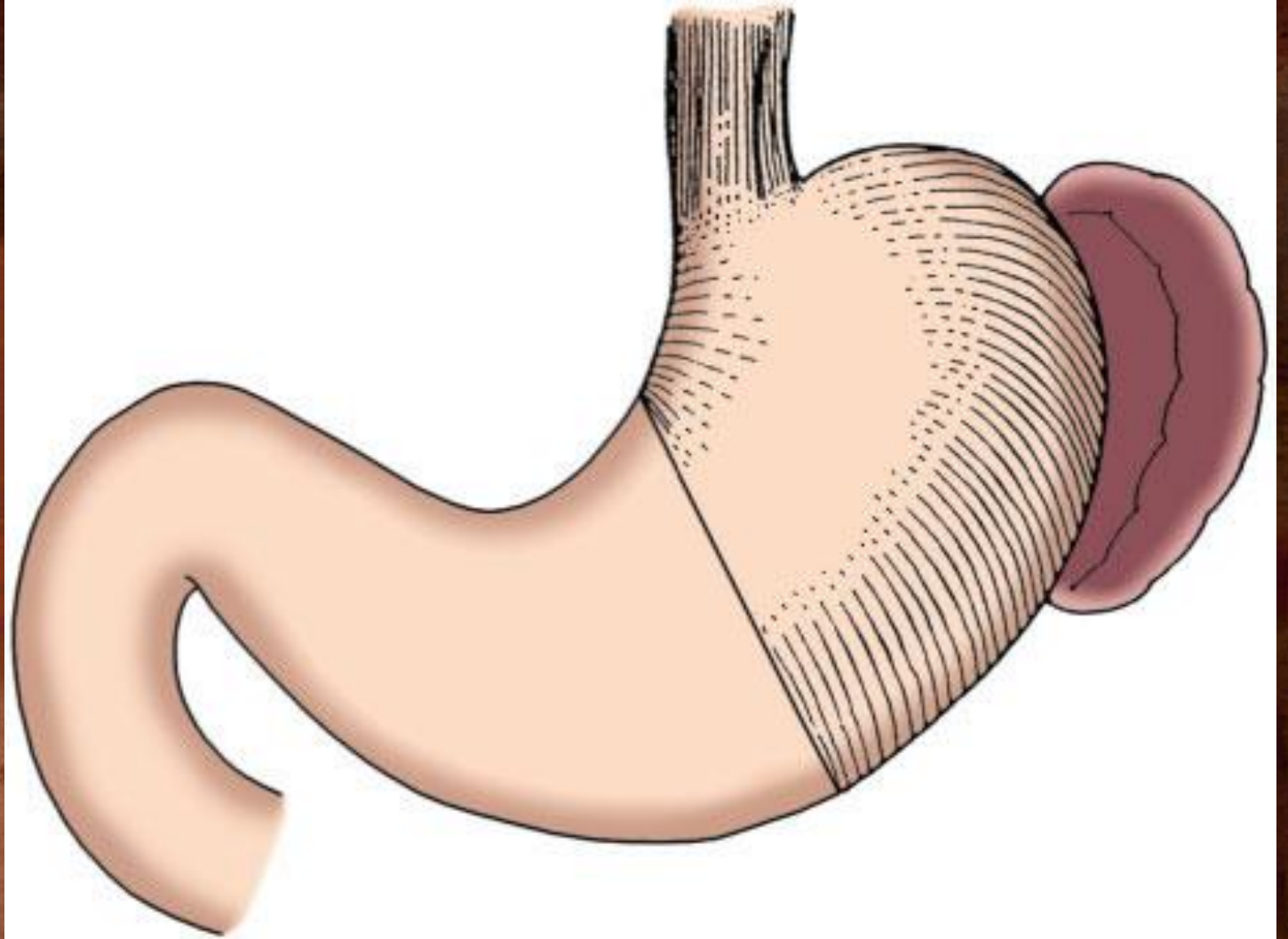
- Displacement of stomach
- Hiatus hernia
- Congenital diaphragmatic hernia
- Pyloro spasm
- Congenital hypertrophic pyloric stenosis
- Gastrectomy – ca stomach

Applied anatomy

- Ulcers, helico bacter pylori and vagotomy
- Gastric pain felt in epigastium
- Barium meal x ray, gastroscop

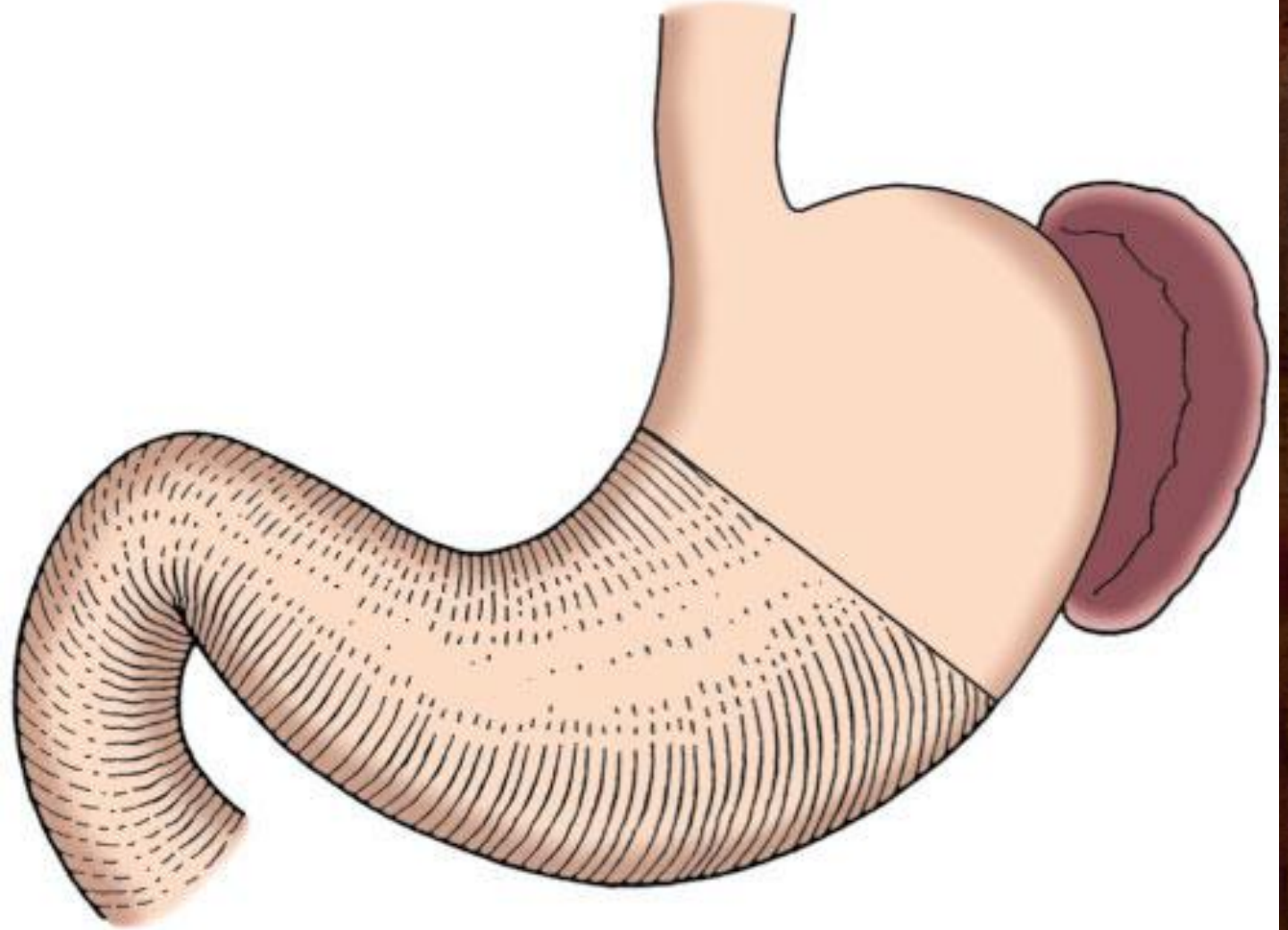


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