



تشفااء

✖ قَائِمَةٌ - شِفَاءٌ

The fourth practical lab of the 3rd week Sun 11/04

- 1. The Peritoneum.**
- 2. Stomach**
- 3. Duodenum**
- 4. Jejunum and Ileum**

✦ The Peritoneum.

- The students should know and identify the :
 1. Parietal peritoneum
 2. Visceral peritoneum
 3. The relationship between viscera and peritoneum
 4. The peritoneal reflection :
(omenta, mesentery and ligaments)

General features

- The peritoneum is a thin serous membrane

- Consisting of:

1-Parietal peritoneum which surrounds the abdominal cavity (anterior and posterior abdominal wall) like a balloon

-lines the ant. Abdominal wall

2-Visceral peritoneum which surrounds the viscera (complete coverage of the organ)

Ex: stomach, small intestine, transverse colon, sigmoid colon etc.

-covers the viscera

-Peritoneum is continuous below with parietal peritoneum lining the pelvis

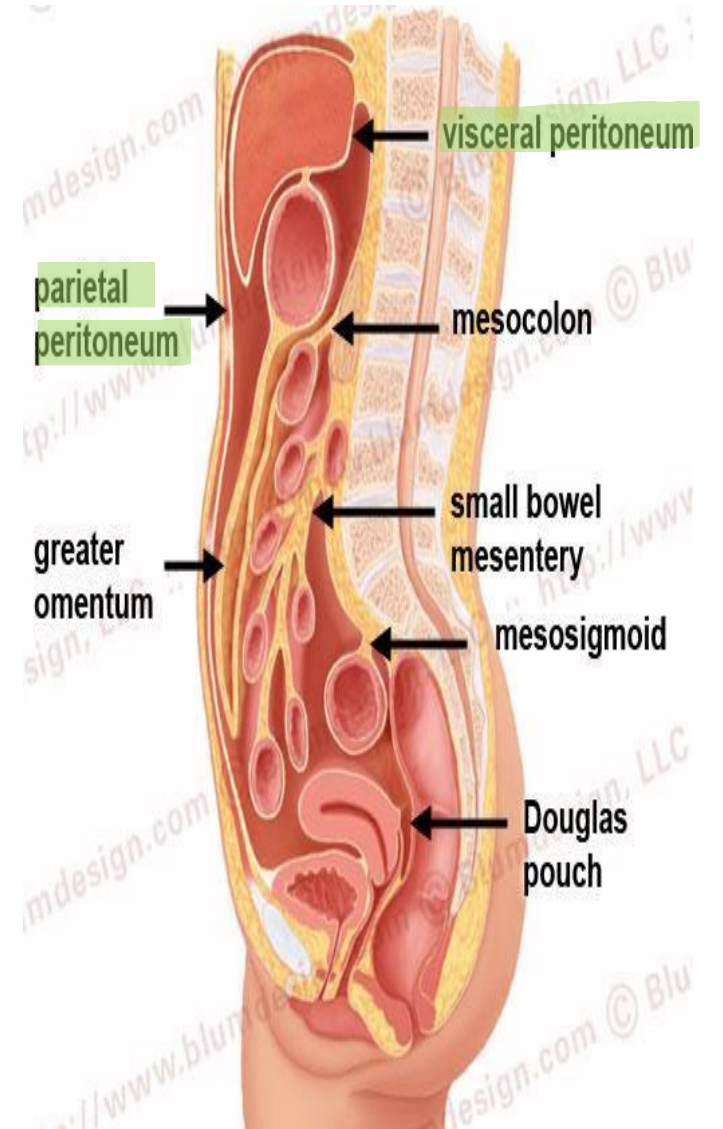
3-Peritoneal cavity

-the potential space between the parietal and visceral layer of peritoneum **they are attached to each other but if some air enters the space will appear and become bigger**

-in male, is a closed sac

-but in the female, there is a communication with the exterior through the uterine tubes, the uterus, and the vagina

There are always secretions (serous fluid) between visceral and parietal layers for lubrication to prevent friction or injury



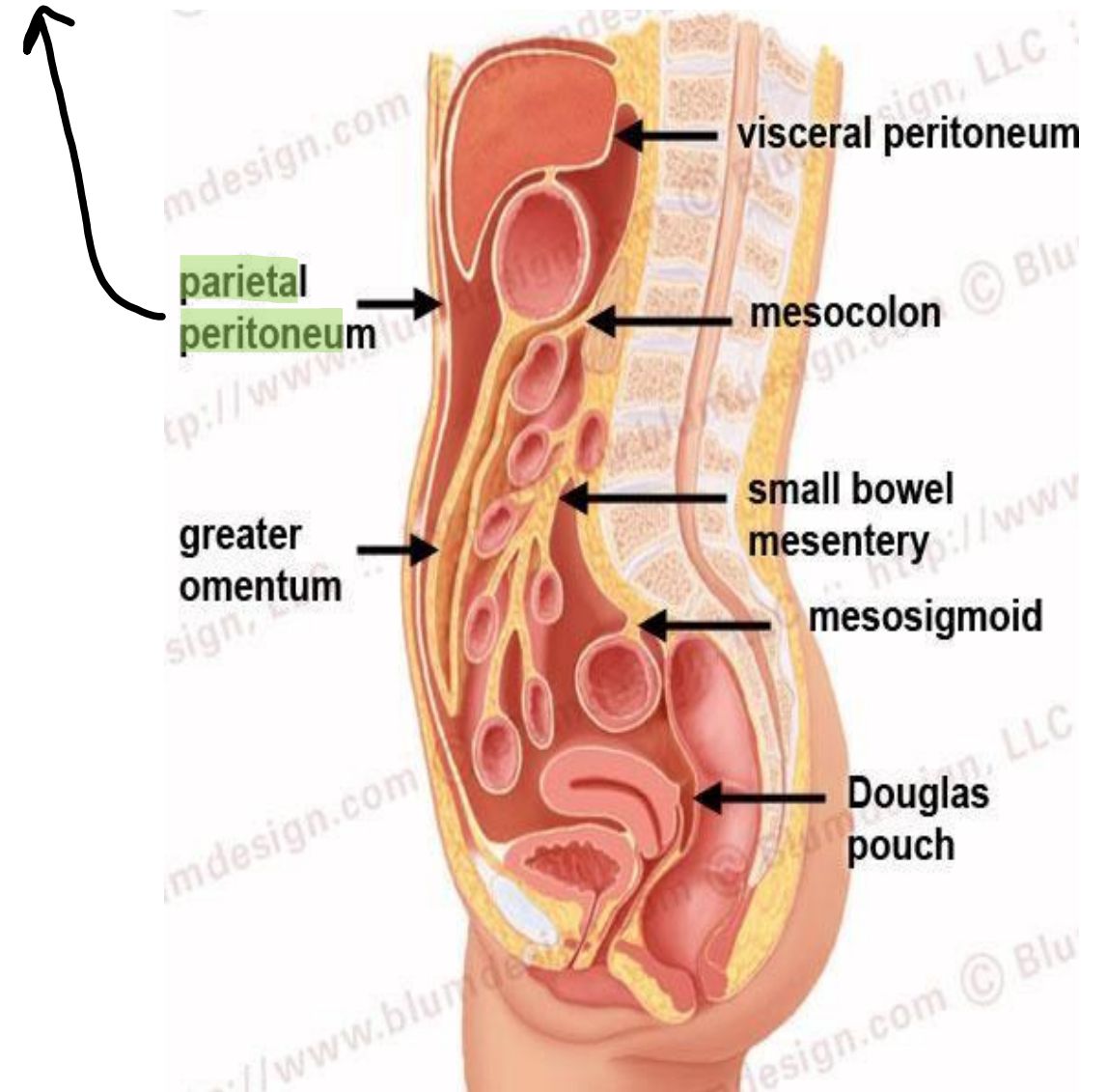
-->Parietal peritoneum makes invagination to cover the organs
So it converts from parietal to visceral *we will discuss about this later in the lecture*

Follow the image:

Parietal peritoneum starts above the **liver** below the diaphragm and then descends -covering the anterior abdominal wall- down to reach the **pelvis** where it covers the upper surface of **urinary bladder** then it covers the **uterus**
Then ascends again -covering the **posterior abdominal wall**- then covers the **small intestine** then back **again** to cover the posterior abdominal wall

Type of epithelium:

Simple squamous epithelium (mesothelium)



The peritoneum covers some organs in the abdominal cavity completely (we call these organs intraperitoneal) ex: transvers colon and stomach....

Other organs are covered by peritoneum thus at their anterior surface only (we call these organs retroperitoneal) ex: duodenum ,pancreas, kidneys and ascending colon....



*note there is difference between male & female peritoneal cavity.

Female have open cavity, bcz the fallopian tube which emerge from uterus need to enter abdomen cavity.

Male have closed cavity, no fallopian tube.

Peritoneum.....cont

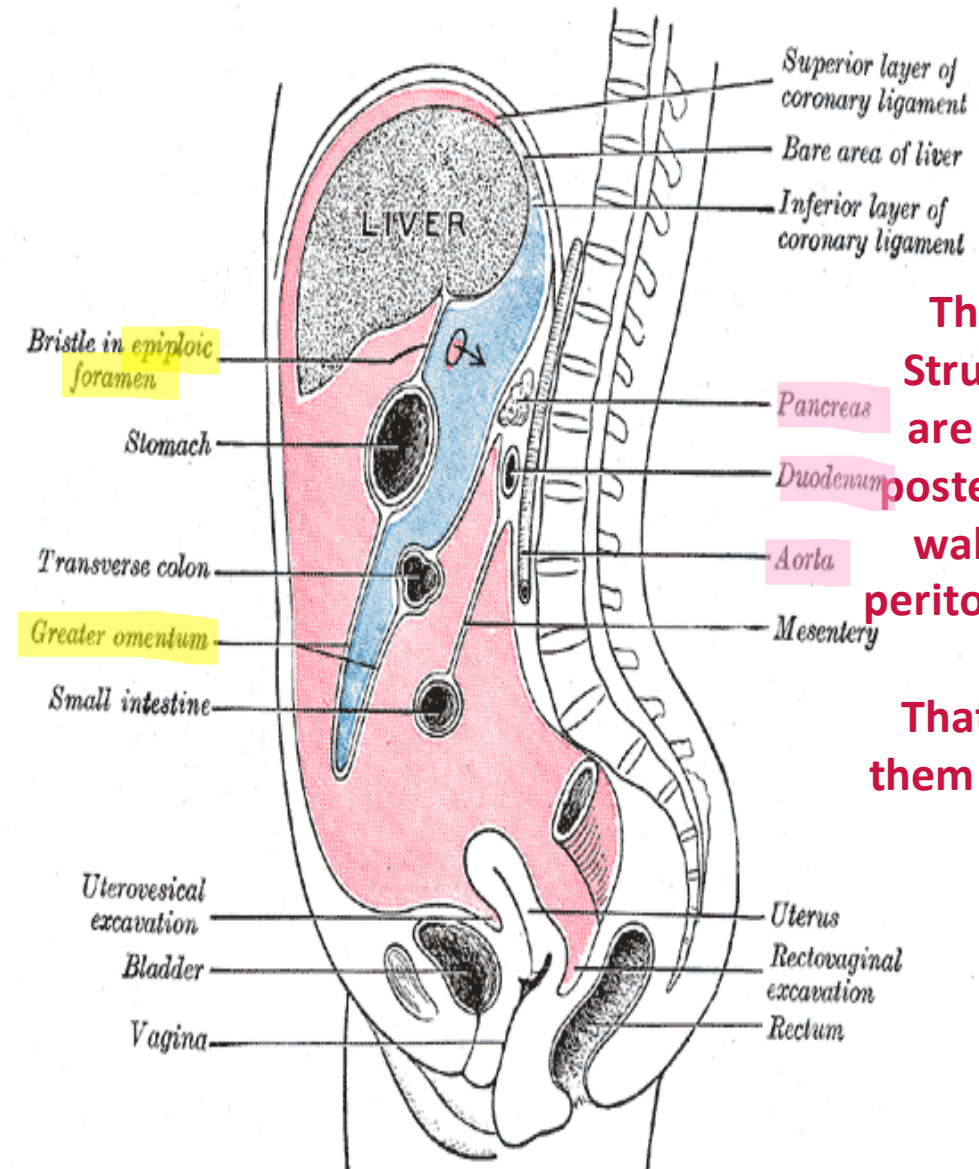
- Peritoneum cavity(sac) divided into
1-Greater sac (in pink) **above the liver**
then deep to the anterior abdominal wall, in front of the stomach and greater omentum, between the small intestine
2-Lesser sac (in blue)

Located behind the liver, below the diaphragm, behind the stomach, then between the layers of greater omentum (which is 2 layers descending from the greater curvature of the stomach then ascends upward and surround the transverse colon then ends anterior to pancreas that's why it is considered intraperitoneal)

The 2 layers of peritoneum when they reach the transverse colon they split, one anterior to it and one posterior and rejoin again

- Communication between them (greater and lesser sacs) by the epiploic foramen (omental foramen or Winslow)

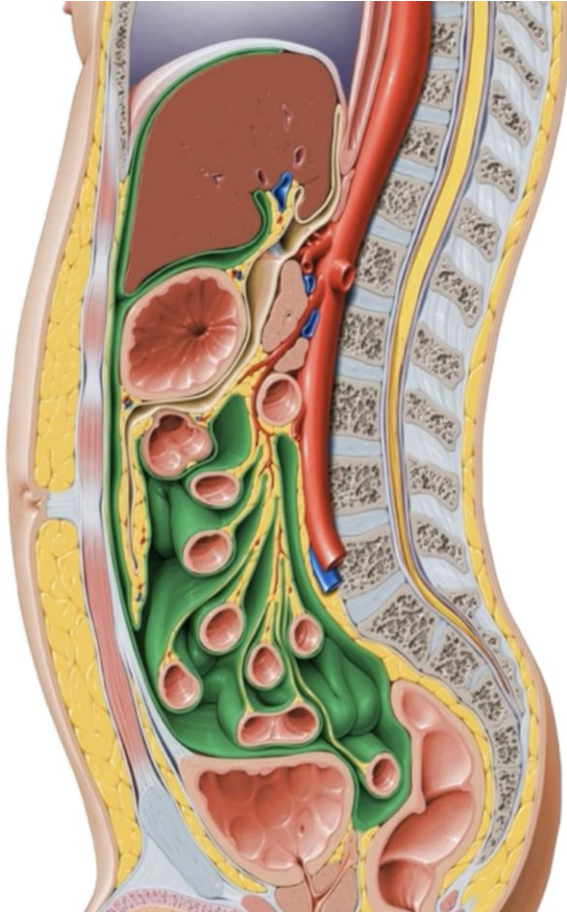
we will discuss this foramen in details later in the lecture



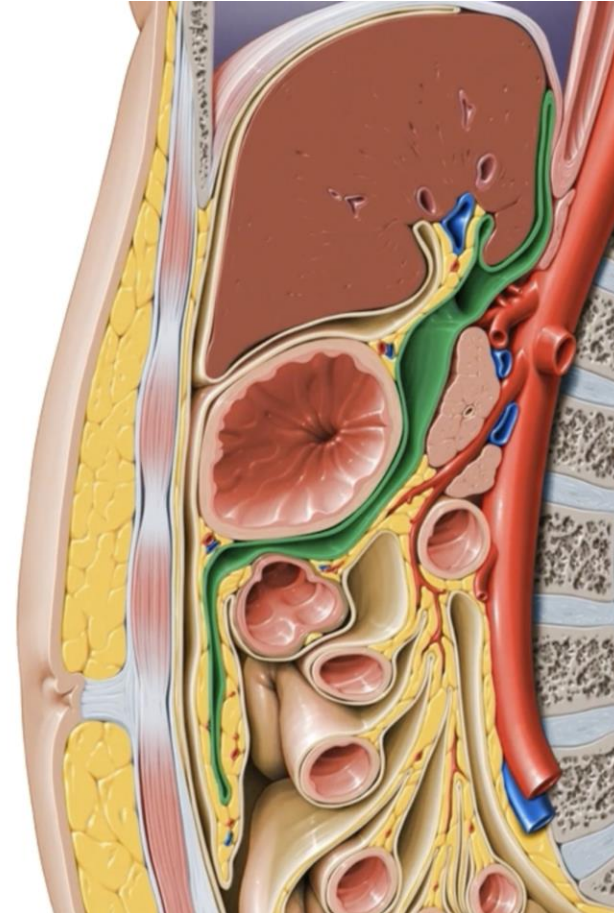
The highlighted Structures (in pink) are located at the posterior abdominal wall, the parietal peritoneum is in front of them. That's why we call them retroperitoneal organs

Additional for further understanding

Peritoneal cavity (sac)



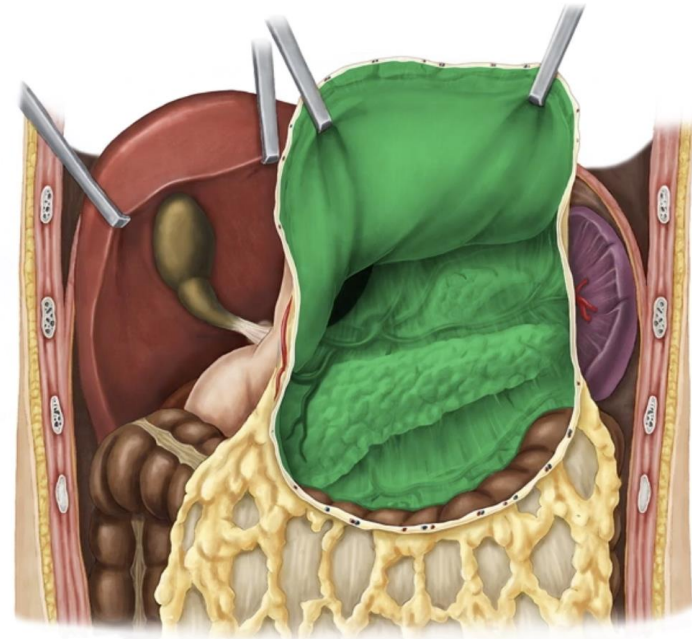
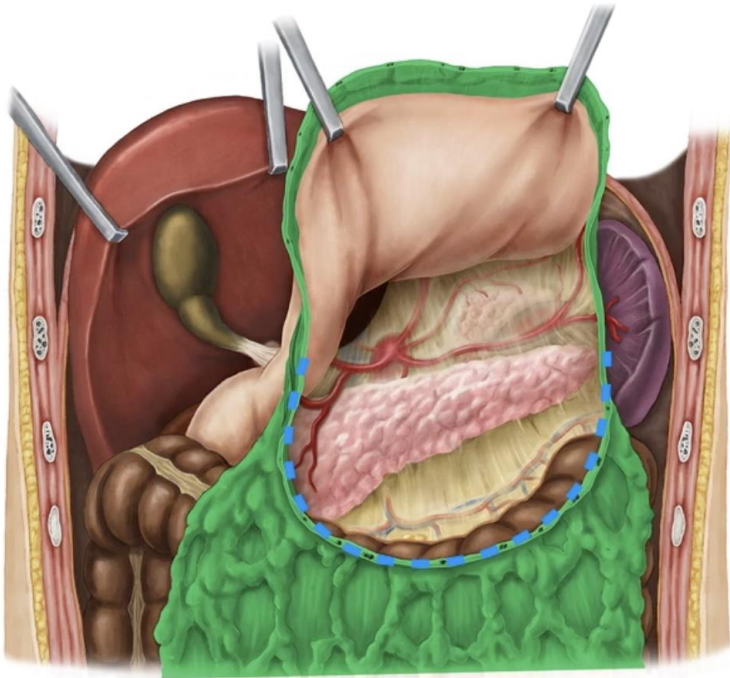
Greater sac



Lesser sac

Additional for further understanding

Firstly ,we will discuss in details about lesser sac then the greater sac



If we cut the greater omentum as in the left image we will find the lesser sac -anterior view- (the image on the right will help you to imagine the relations)

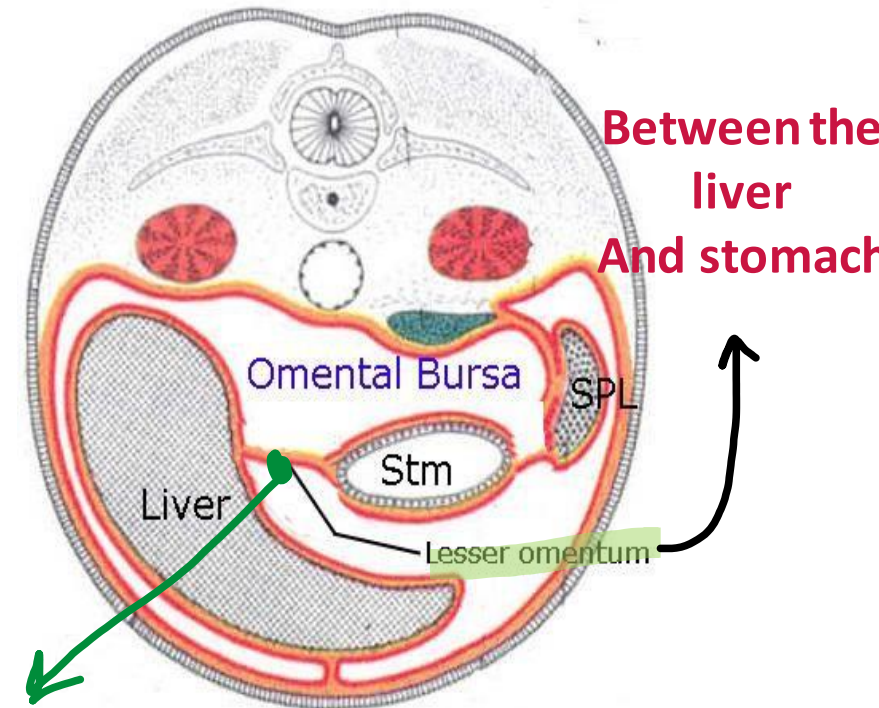
Lesser sac = omental bursa

First structure in the stomach bed

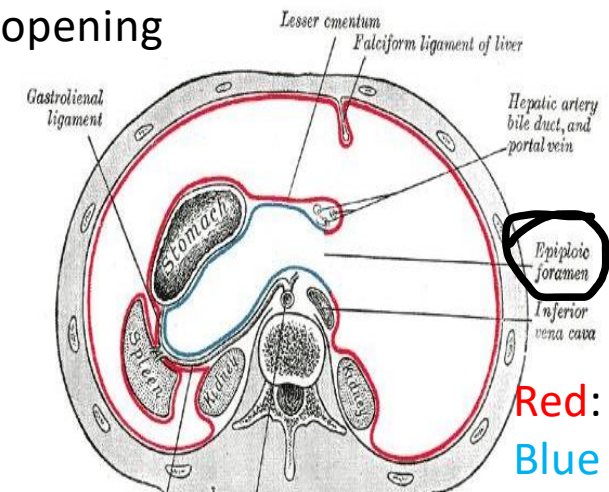
- Deep to lesser omentum
- Located Behind the stomach (any surgery for the pancreas or duodenum or stomach we will work in this sac by entering the foramen of Winslow)
- Between two layers of greater omentum (inferiorly)
- Under the diaphragm and liver (starting point)
- Deep to lesser opening (Epiploic opening or foramen of Winslow) if we are in the greater sac we can reach the lesser sac by this foramen
- **We call the lesser sac in embryo -> omental bursa**
- **Most lateral structure in the lesser sac is the spleen and its ligament (lienorenal or splenorenal ligament) between kidney and spleen**

The Dr mentioned Q here: if we have tumor led to adhesion between stomach and pancreas, which structure will not be affected? Spleen, bc it is the most lateral.

- **Between stomach and the spleen there is gastrosplenic ligament which is 2 layers of peritoneum and its strong --> fixation of spleen**

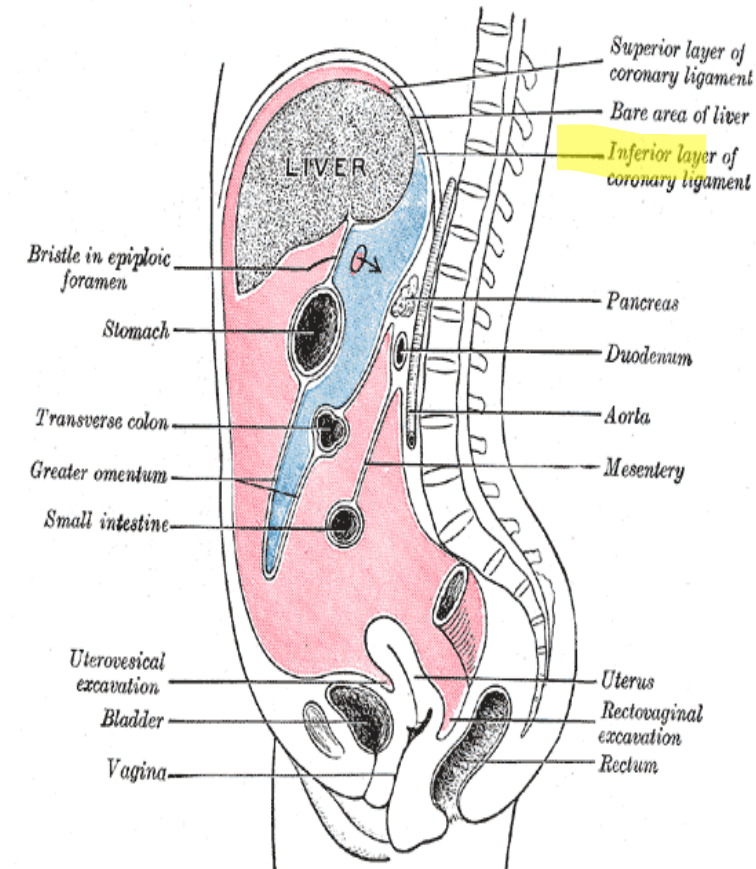


Epiploic opening



Greater sac

- Deep to ant. Abdominal wall
- Below the diaphragm
- Above pelvic viscera
- Out to:
- Liver is completely surrounded by peritoneum except bare area
Bare area(dull area) is a point on the upper surface of liver which is not covered by peritoneum (all the liver will be glistening and shiny because the lining visceral peritoneum except this area)
- Stomach is completely surrounded by peritoneum
- Transvers colon (completely surrounded by peritoneum)
- Greater omentum: two layers of peritoneum from greater curvature of stomach
- Duodenum: just the anterior surface is covered by peritoneum(it is retroperitoneal organ except first inch which is covered by the peritoneum surrounding the stomach and last inch which is covered by the peritoneum surrounding the jejunum)
- Small intestine : peritoneum surrounds all the intestine & form mesentery



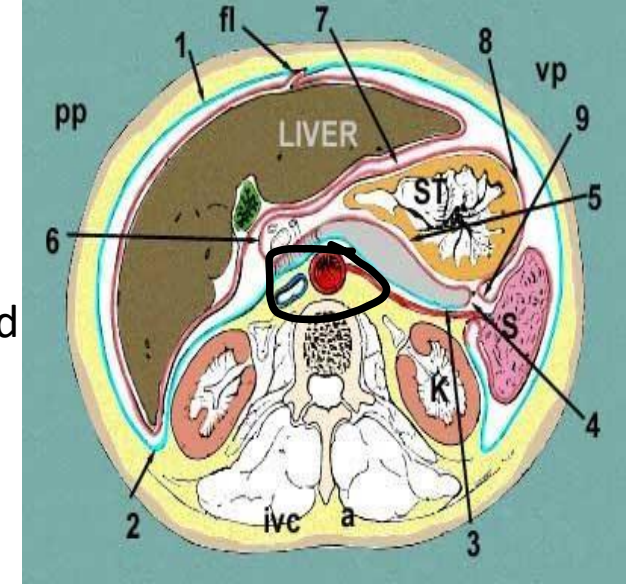
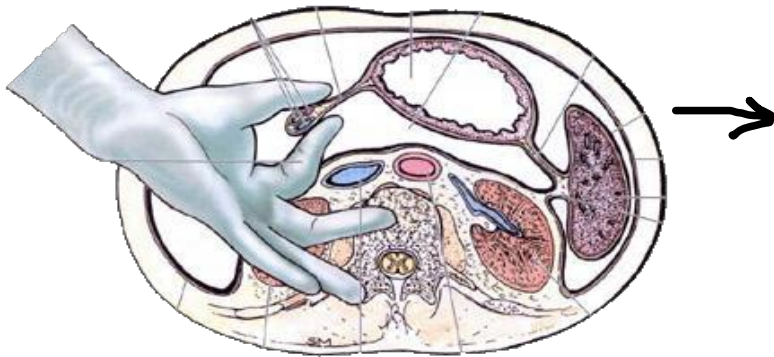
Epiploic foramen

important

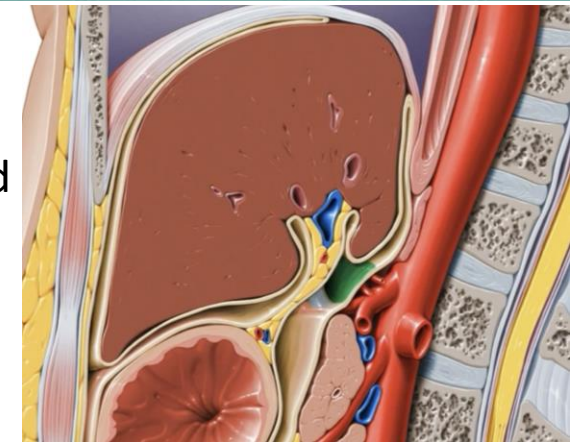
- Boundaries
- Anteriorly: Free border of lesser omentum(6) which contains:
 - 1 Bile duct(Rt & ant)
 - 2 Hepatic artery(Lt & anT)
 - 3 Portal vein(post.)
- Posteriorly: I.V.C
- Superiorly
Caudate process of caudate lobe of liver
- Inferiorly: First part of duodenum

These 3 structures are important to Stop bleeding of liver during surgery after trauma, by using clamp.

بستعمل ملقط بسكر هم كلهم



To understand Posterior boundary



To understand superior boundary



To understand anterior and inferior boundaries

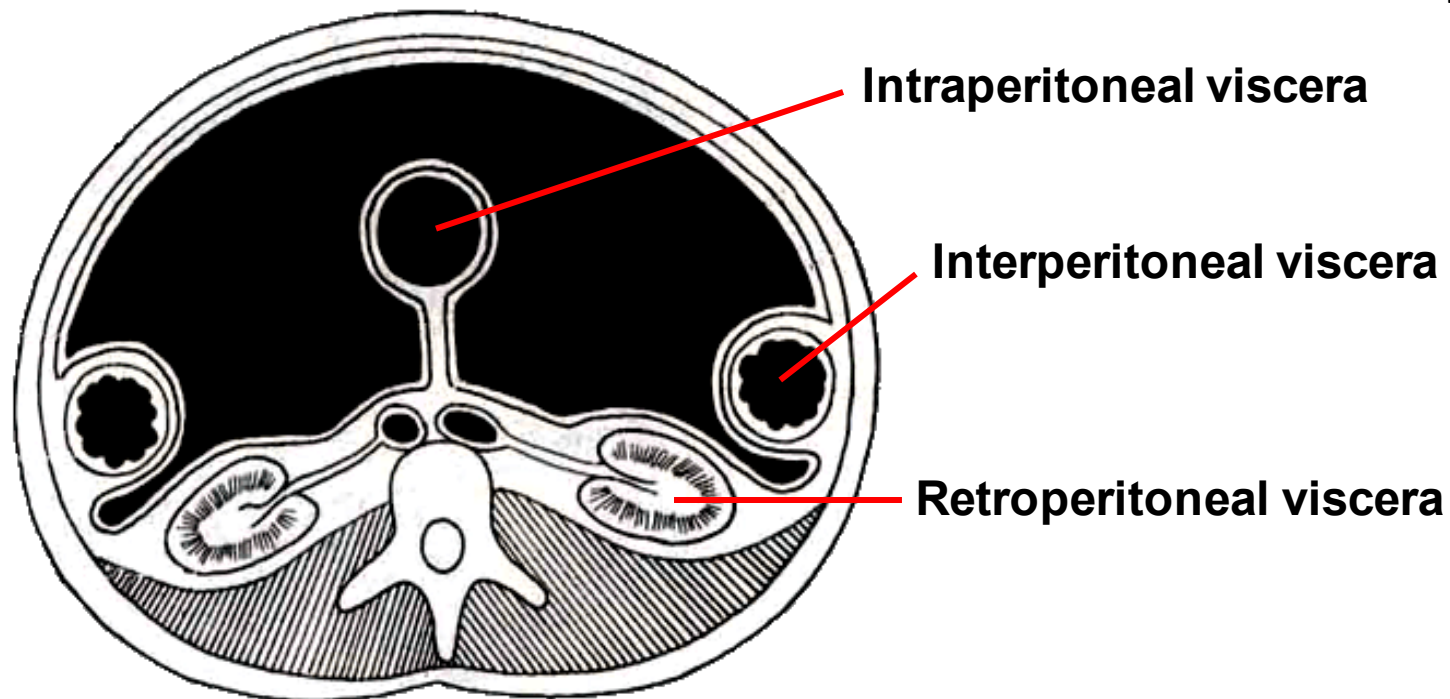
The relationship between viscera and peritoneum

- **Intraperitoneal viscera**
- viscera is almost totally covered with visceral peritoneum
- example, stomach, 1st & last inch of duodenum, jejunum, ileum, cecum, vermiform appendix, transverse and sigmoid colons, spleen and ovary

Question: all of the following are intraperitoneal structures except :

- a. stomach
- B. jejunum
- c. ileum
- d. first inch of duodenum
- e. first part of duodenum

Ans: **E** because the first part is 2 inches



The relationship between viscera and peritoneum

Retroperitoneal viscera

- some organs lie on the posterior abdominal wall
- Behind the peritoneum (peritoneum is in front for support)
- they are partially covered by peritoneum on their anterior surfaces only

● **Example**

kidney, suprarenal gland, pancreas, descending and ascending colon, upper 3rd of rectum

duodenum, and ureter, aorta and I.V.C

The relationship between viscera and peritoneum...cont

Interperitoneal viscera

- Such organs are not completely wrapped by peritoneum **(from the upper surface only for example)**
- one surface attached to the abdominal walls or other organs.
- **Examples:**
 - Liver **(bare area is not covered by peritoneum)**,
gallbladder **(covered by peritoneum on the upper surface , peritoneum also covers the anterior surface of the gallbladder because its embedded in the liver)**, urinary bladder and uterus
(Uterus is covered anteriorly then peritoneum covers the fundus of uterus then it continue in the posterior abdominal wall)

● The peritoneal reflections or folds

● **Parietal peritoneum converts into visceral peritoneum to surround the viscera which will form the folds that we will discuss now: mesentery and mesocolon**

● Certain terms, often arbitrary, are commonly used for the peritoneal reflections.

● A peritoneal reflection that connects the intestine and body wall is usually named according to the part of the gut to which it is attached.

● For example, the reflection to jejunum and ileum is termed the **mesentery**, that to the transverse colon is the **transverse mesocolon**. *check next slide to understand*

● Some peritoneal reflections between organs or between the body wall and organs, are termed ligaments or folds such as gastrosplenic ,splenicorenal and the ligaments of liver . Most of such ligaments or folds contain blood vessels. Broad peritoneal sheets associated with stomach are termed omenta.

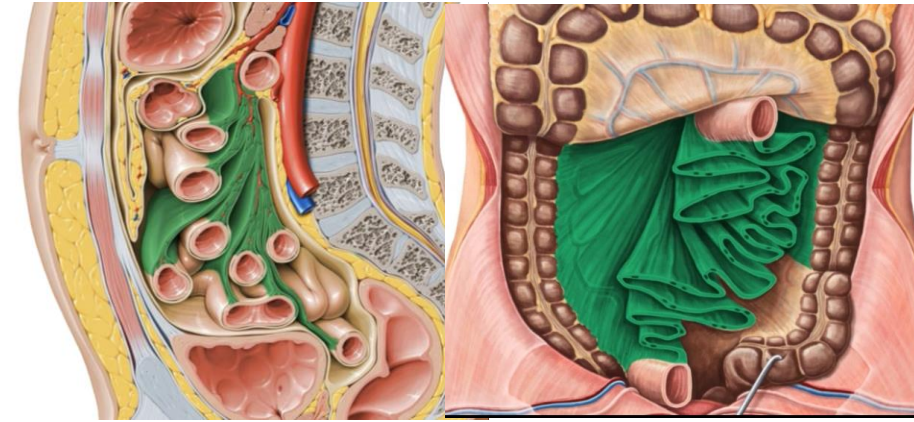
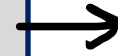
-Ligaments are 2 layers of peritoneum attached to organs for fixation .In between these 2 layers there are fatty tissue ,lymphatic tissue ,nervers -sympathatic and parasympathatic- and lymph nodes.

-Ligaments contribute in blood supply to the organs of attachment and venous drainage from these organs too

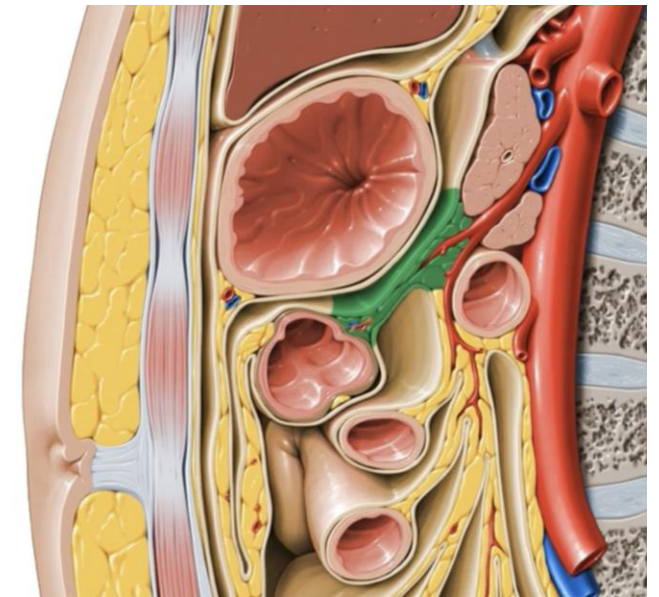
-Additionally ,there are some folds which result from the formation of these ligaments and mesentery .They have disadvantages ,for example around the duodenum they forms recesses or pouches which can cause internal hernia(part of small intestine in the pouch)

Mesentery of small intestine : 2 layers of peritoneum that extends from posterior abdominal wall surrounding jejunum and ileum (which are located in the free edge of mesentery)

So the root of mesentery is the posterior abdominal wall and its free edges contain jejunum and ileum .



Transverse mesocolon : 2 layers of peritoneum (the ascending 2 layers of greater omentum after covering the transverse colon they rejoin and forms the mesocolon and ends in the anterior border of pancreas)



Omenta(greater and lesser)formed by reflection of peritoneum similar to mesentery and mesocolon ,but the difference that it contains excess of fatty tissue and this is our next topic

1- Omenta :

-Two-layered fold of peritoneum that extends from stomach to adjacent organs

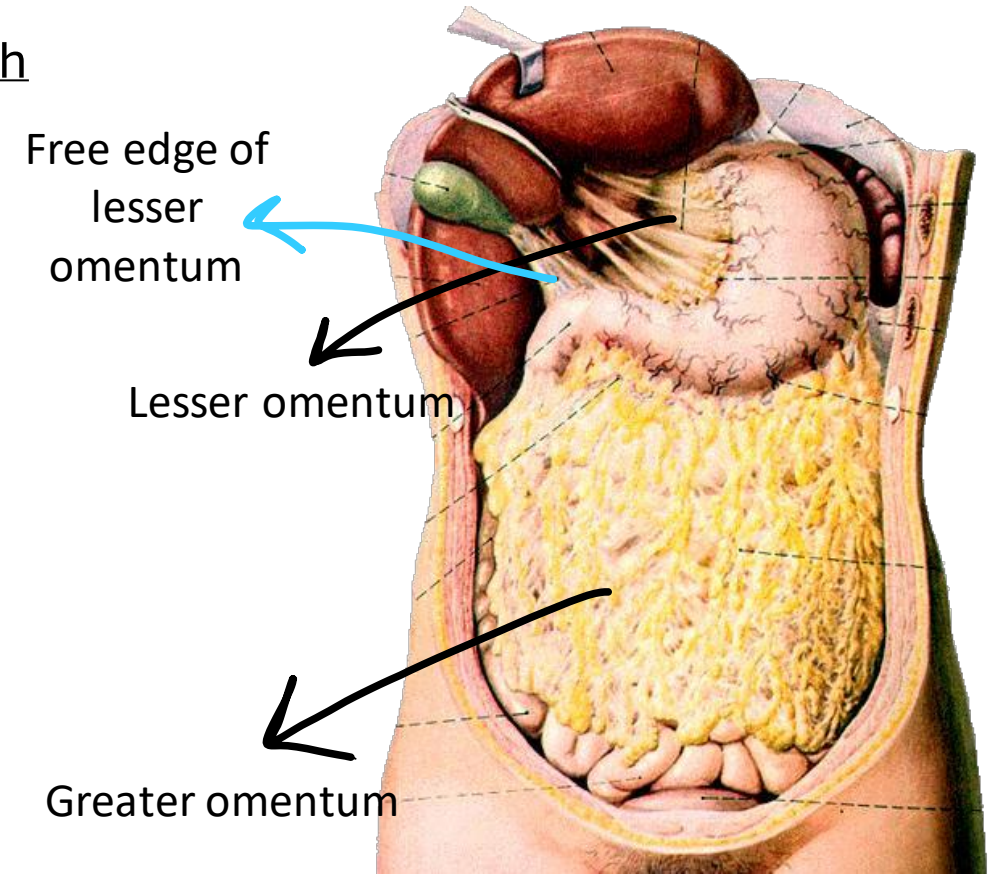
-Two types of omenta : Lesser omentum and Greater omentum

First lets discuss everything about greater omentum that doctor mentioned then we will discuss the lesser omentum

-Greater omentum: From the greater curvature and first part of duodenum (descends as 2 layers in abdominal cavity and ascends as 2 layers to surround the transverse colon). Lesser sac is between these 4 layers (2 double layers).

-Contents between the descended layers:

- ❖ Right and left Gastroepiploic vessels
- ❖ Lymph nodes & lymphatic vessels
- ❖ Fat
- ❖ Autonomic N.S → **sympathetic + parasympathetic (vagus nerve)**

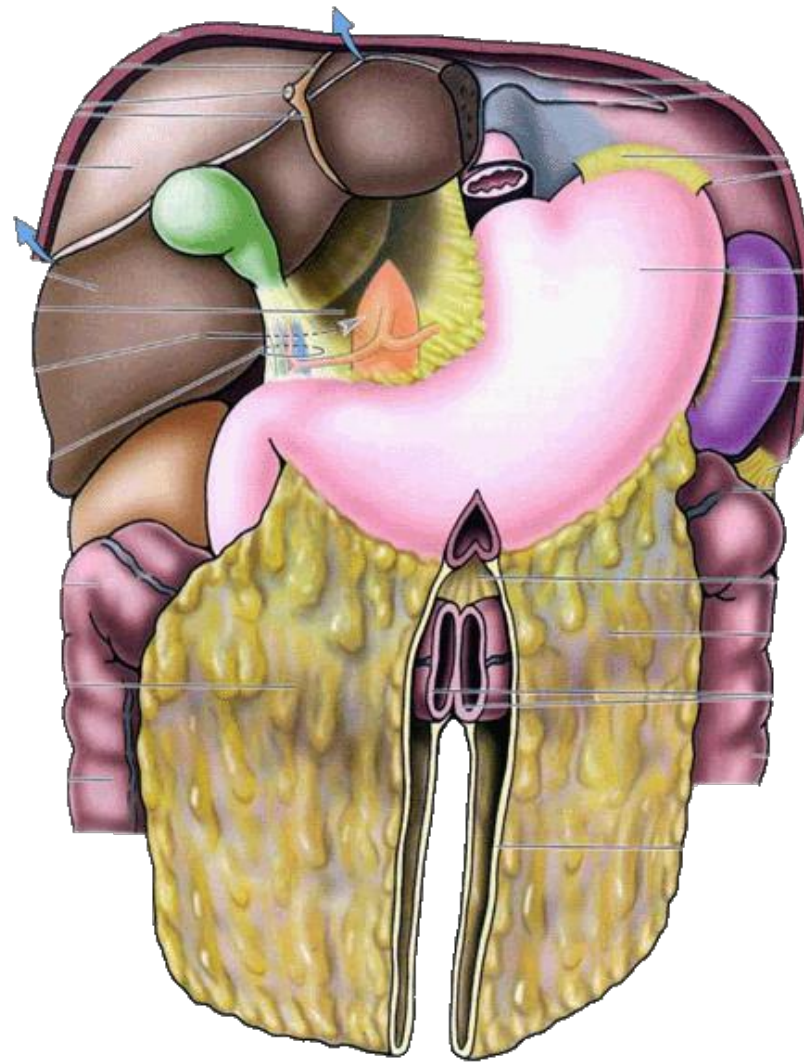


Greater omentum

- It is the largest peritoneal fold.
- It consists of a double sheet, folded on itself so that it is made up of four layers.

The anterior two layers descend from the greater curvature of stomach and superior part of duodenum and hangs down like an apron in front of coils of small intestine then turn up on the back of itself, and ascend to the transverse colon

- the two layers are separated to cover the anterior and posterior surfaces of transverse colon. **Then they form the transverse mesocolon**

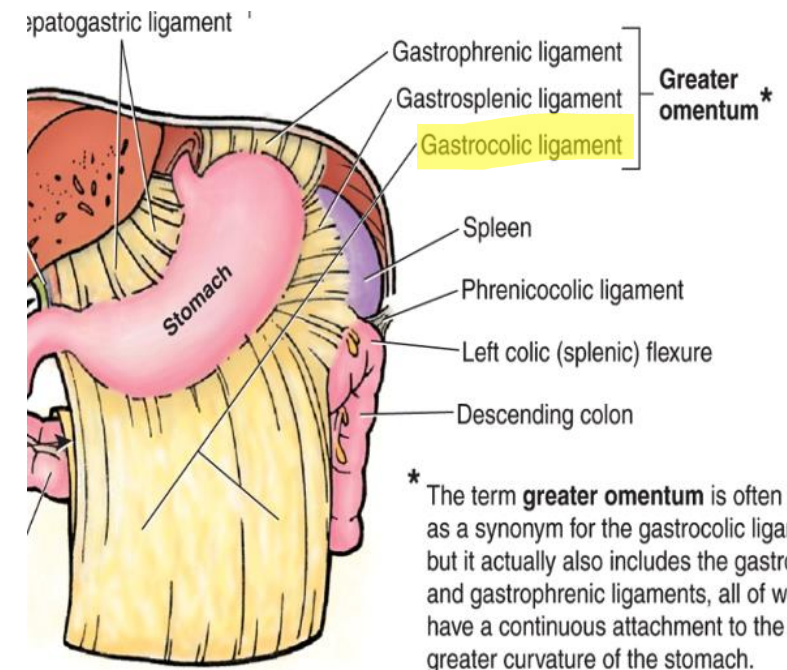


Transverse colon

Lesser sac

-Doctor repeated many times that 2 layers of greater omentum descend in the abdominal cavity and ascend again to cover the transverse colon **and when they rejoin again they form the mesocolon** and end at the anterior border of pancreas

- The upper part of the greater omentum which extends between the stomach and the transverse colon is termed the **gastrocolic ligament**.
- In adult, the four layers of greater omentum are frequently adhered together, and are found wrapped about the organs in the upper part of the abdomen



Functions of greater omentum

- ❖ protective function: The greater omentum contains numerous fixed macrophages, which performs an important protective function.
- ❖ storehouse (storage) for fat: The greater omentum is usually thin, and presents a cribriform appearance, but always contains some adipose tissue, which in fatty people is present in considerable quantity. **(fat is important for energy)**
- ❖ migration and limitation (localization of the infection): The greater omentum may limit spread of infection in the peritoneal cavity. Because it will migrate to the site of any inflammation in the peritoneal cavity and wrap itself around such a site, the greater omentum is commonly referred to as the “policeman” of the peritoneal cavity. ***we mentioned this point earlier***

Lesser omentum

- Two-layered fold of peritoneum
- Extends from porta hepatis, fissure of ligamentum venosum and the diaphragm to lesser curvature of stomach and superior part of duodenum

Lesser omentum : from the porta hepatis of the liver and lesser curvature of the stomach

It has free edge which contains the 3 structure we have mentioned earlier.

-Contents:

- ❖ **Blood vessels: Rt. & Lt. gastric vessels**
- ❖ **Lymph nodes & lymphatic vessels**
- ❖ **Fat**
- ❖ **Autonomic N.S: sympathetic + parasympathetic (right and left vagus nerve)**

Lesser omentum

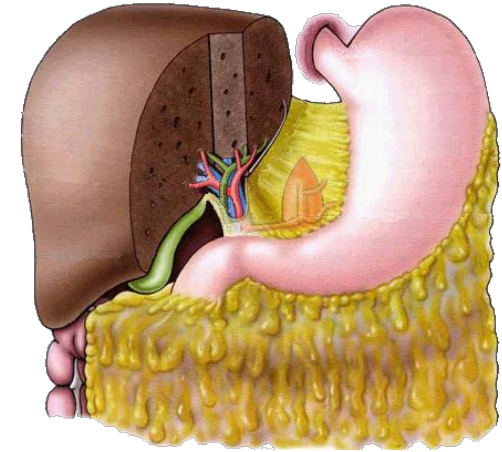
Some books separate lesser omentum into 2 ligaments

1-Hepatogastric ligament(lesser curvature)

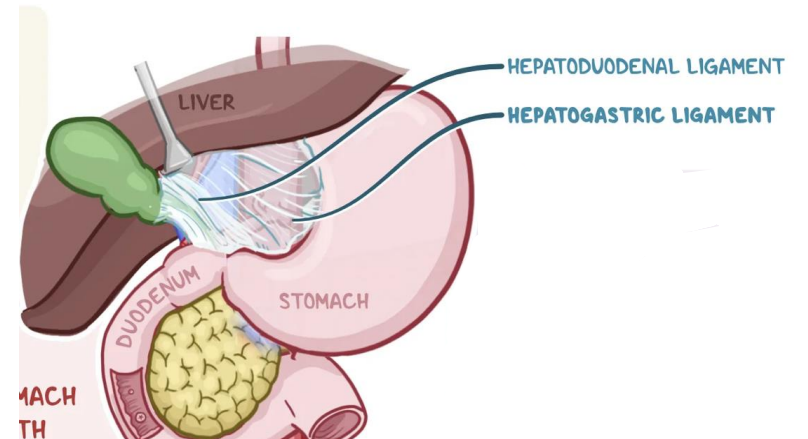
from porta hepatis to lesser curvature of stomach

2-Hepatoduodenal ligament(first inch of duodenum)

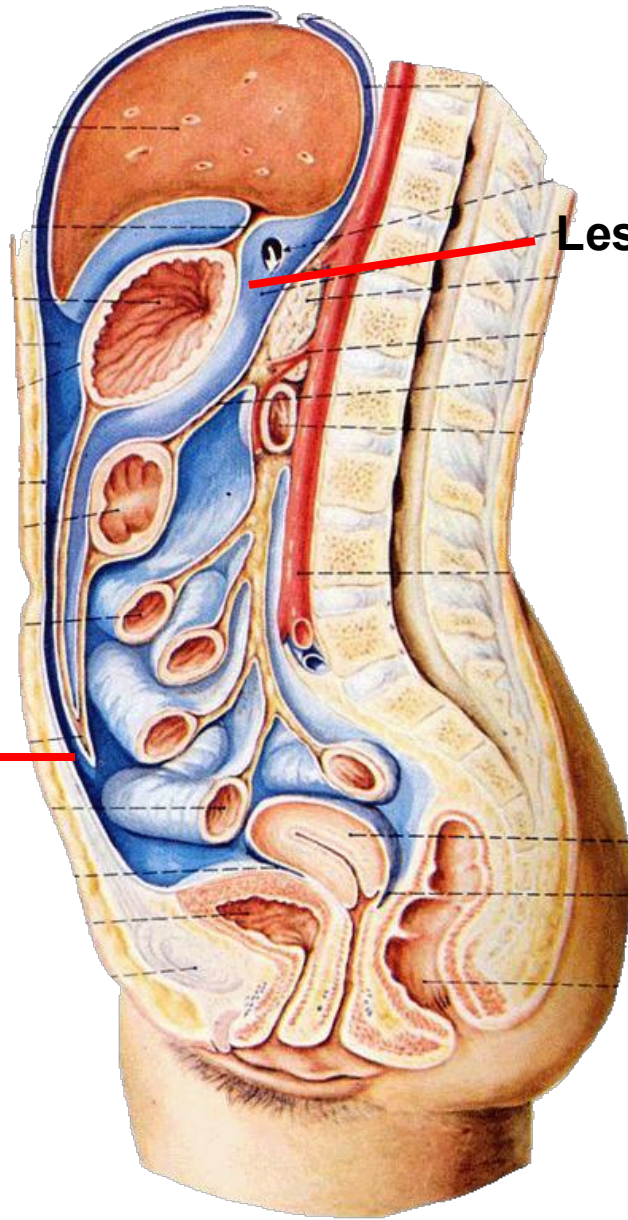
Both ligaments form lesser omentum



- Extends from porta hepatis to superior part of duodenum,
- at its free margin enclose 3 structures(3 key structures) **common bile duct** Ant.
proper hepatic a At the Lt. of the common bile duct
hepatic portal v post.



Greater omentum



Lesser omentum

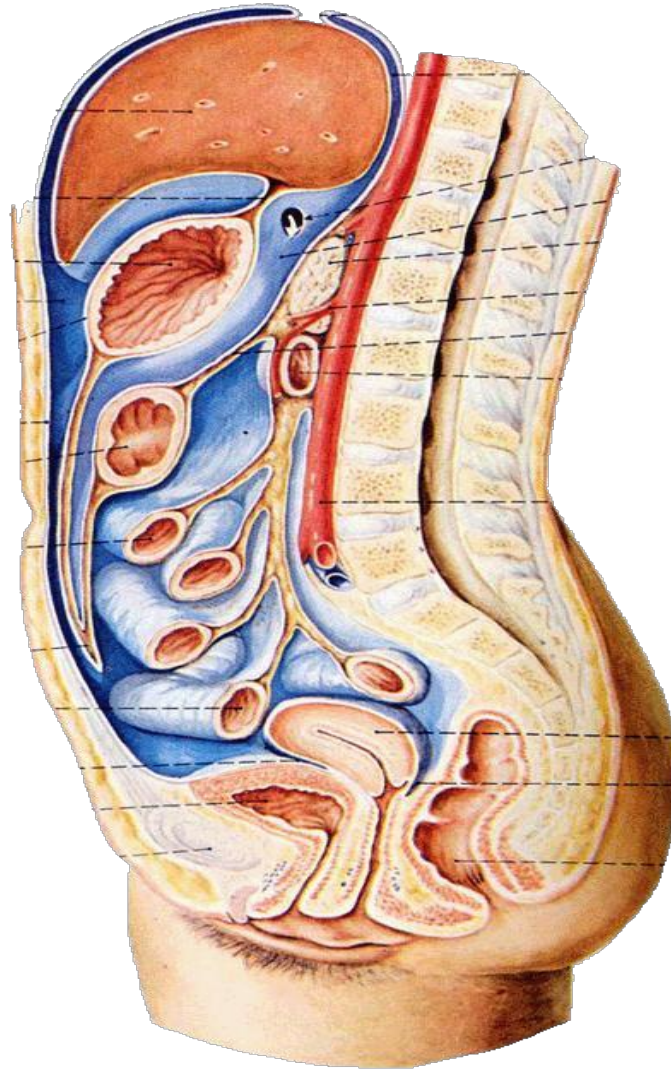
2- Mesenteries of the peritoneum

Two-layered fold of peritoneum that attach the intestines to the posterior abdominal wall

The root of the mesentery (6 inches, 15 cm) it starts as 2 layers of peritoneum, attach to the posterior abdominal wall at the duodenojejunal junction exactly at L2 one inch to the left, and ends at ileocecal junction in front of right sacroiliac joint.

Contain jejunum & ileum.

- The breadth, width is about 8 inches.
- The free edge is 6 meters, Contain jejunum & ileum.



1- Mesentery of small intestine

suspends the small intestine from the posterior abdominal wall

-Broad and a fan-shaped

◎ Root of mesentery

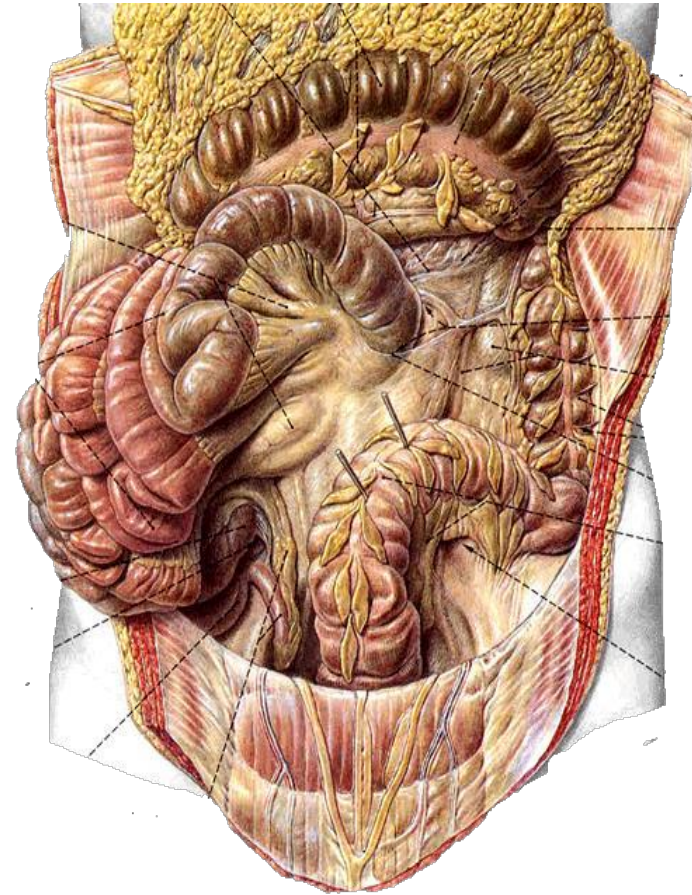
- 15 cm long
- Directed obliquely from left side of L2 vertebra to right sacroiliac joint



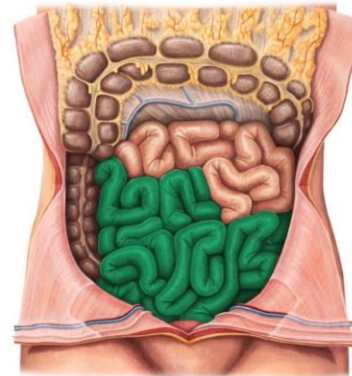
Mesentery of small intestine....cont

Contents of the mesentery

- the jejunal and ileal branches of the superior mesenteric artery & veins (make vasa recta & arcades)
- nerve plexuses
- lymphatic vessels
- the lymphatic nodes,
- connective tissue
- fat

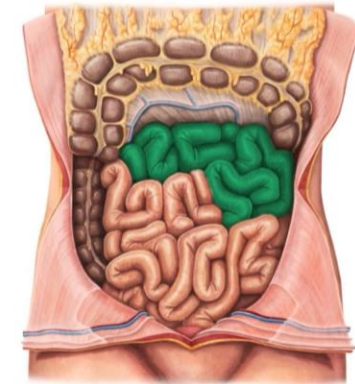


Ileum



2.5 m long

Jejunum

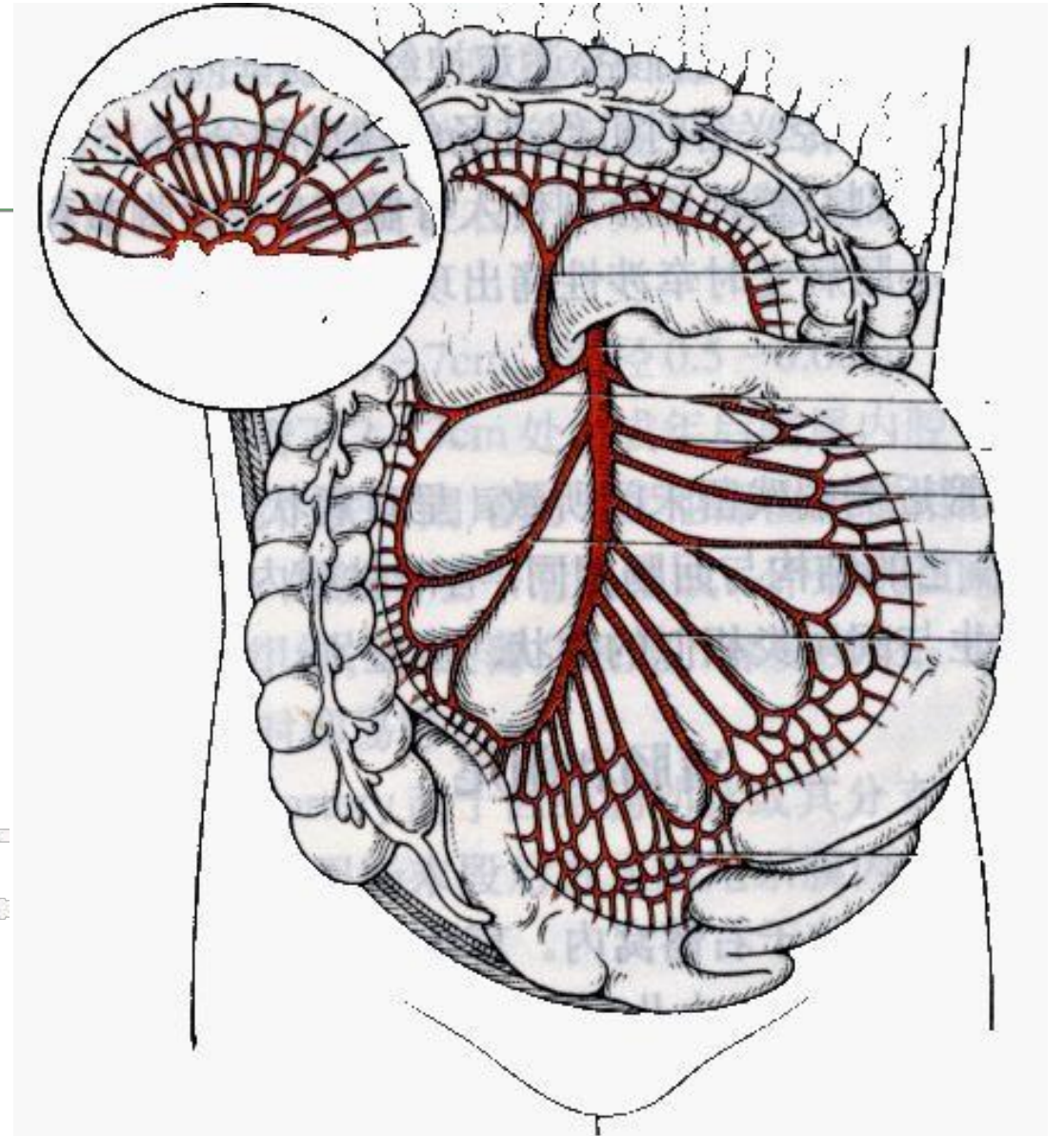
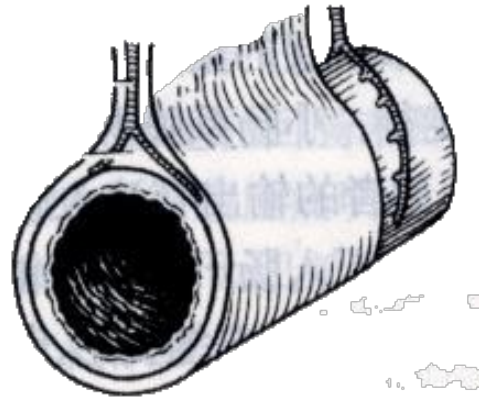


simple arcades, long
vasa recta in
jejunum

Complicated
arcades, short vasa
recta in **ilium**

*Arcades: spaces formed by the
connection between vesseles.(شبابيك)

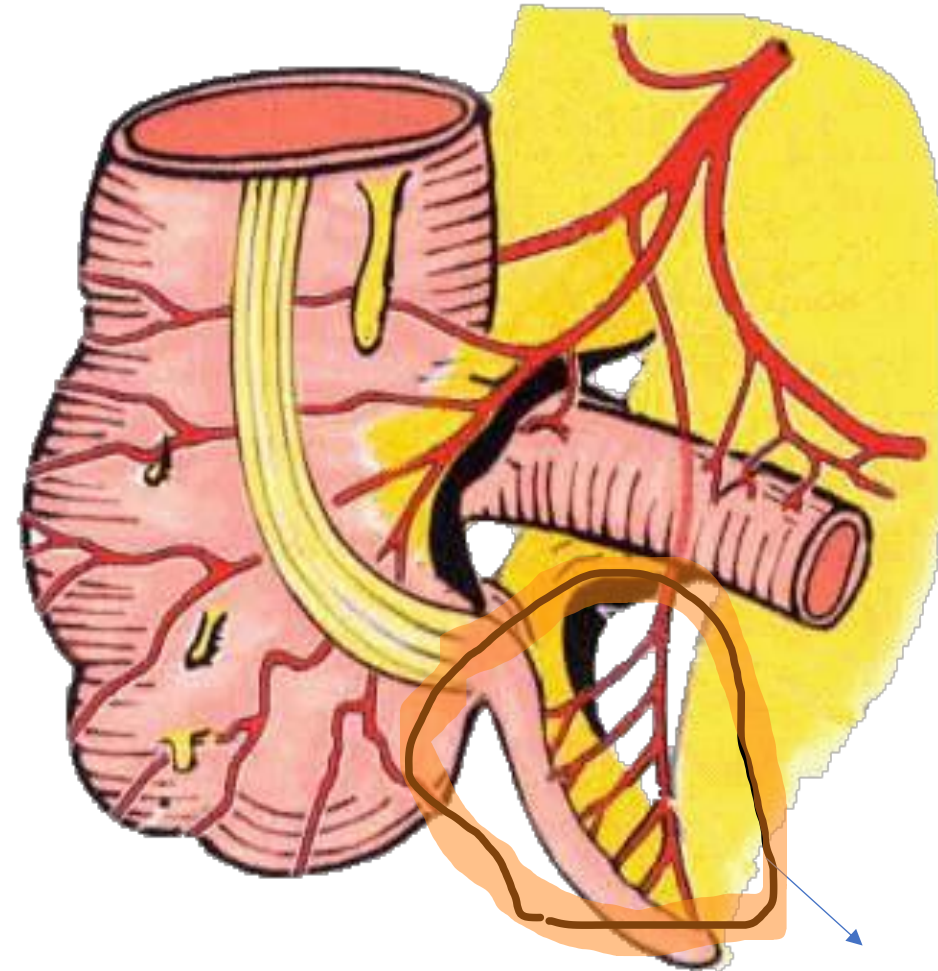
*Vasa recta: terminal branches to the
small intestine.



Mesoappendix

- ① Triangular mesentery extends from terminal part of ileum to appendix
- ② Appendicular artery runs in free margin of the mesoappendix

Have a branch from posterior cecal artery of superior mesentery called appendicular artery and opposite to it there is vein, these vessels be ligated in appendectomy.



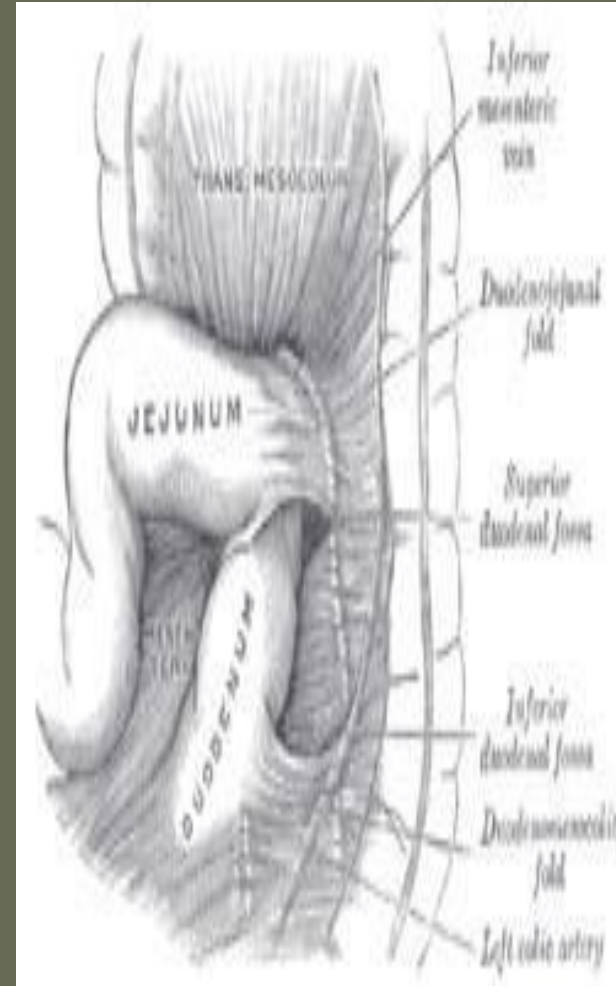
Mesoappendix in the edge of mesentery

3. The transverse mesocolon

- It is a broad fold
Connects the transverse colon
to the anterior border
of the pancreas.
From greater omentum

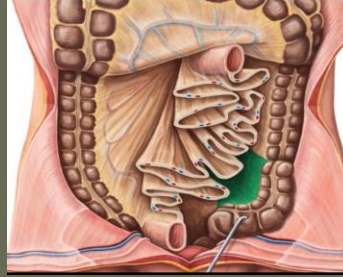
Contents

- The blood vessels
- Nerves
- lymphatic's of the transverse colon.



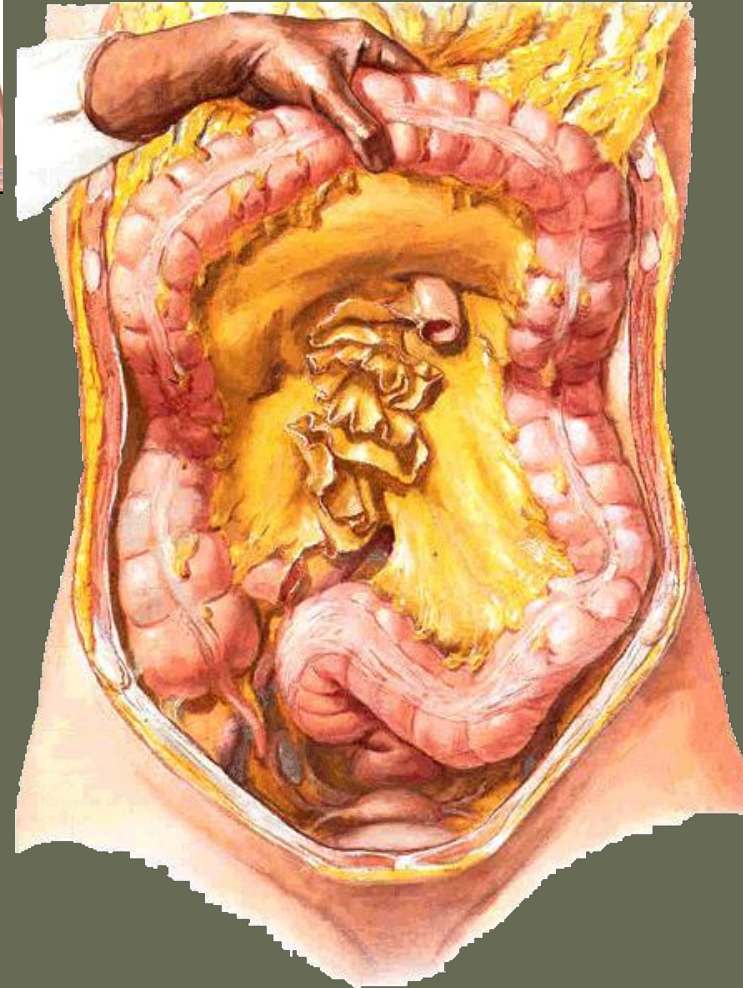
4- Sigmoid mesocolon

- It is a fold of peritoneum
attaches the sigmoid colon
to the pelvic wall.



Contents

- The sigmoid vessels
 - Lymphatic vessels
 - Nerves
-
- The left Ureter descends into the pelvis behind its apex.



ligaments of the peritoneum

*Ligament: 2 layers of peritoneum but stronger than mesentery.

1. The ligaments of the liver

- ① The falciform ligament of liver
- ② The ligamentum teres hepatis
- ③ The coronary ligament
- ④ The right triangular ligament
- ⑤ The left triangular ligament
- ⑥ The hepatogastric ligament
- ⑦ The hepatoduodenal ligament

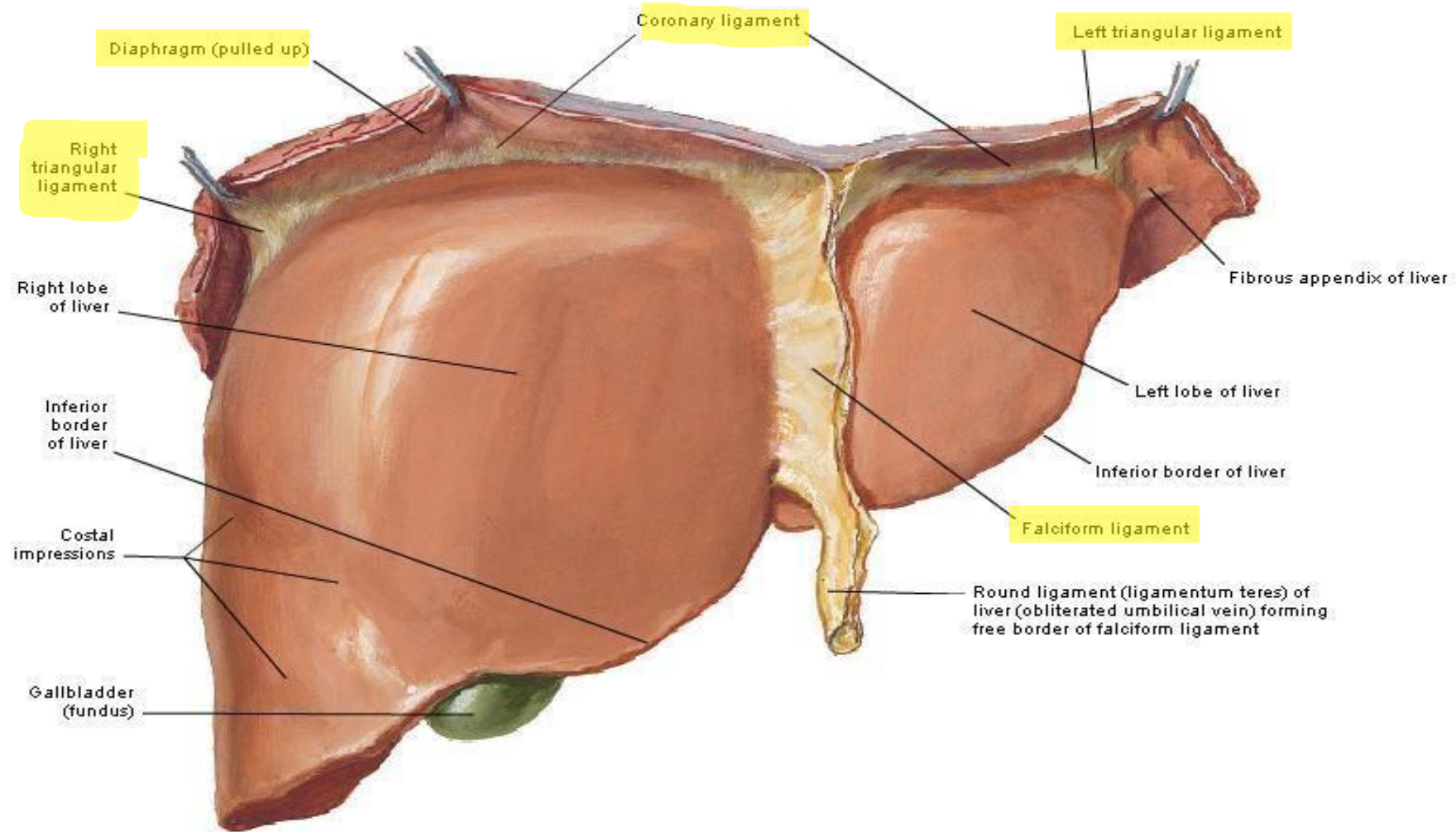


Together form lesser omentum

*These ligaments will be discussed during liver lec

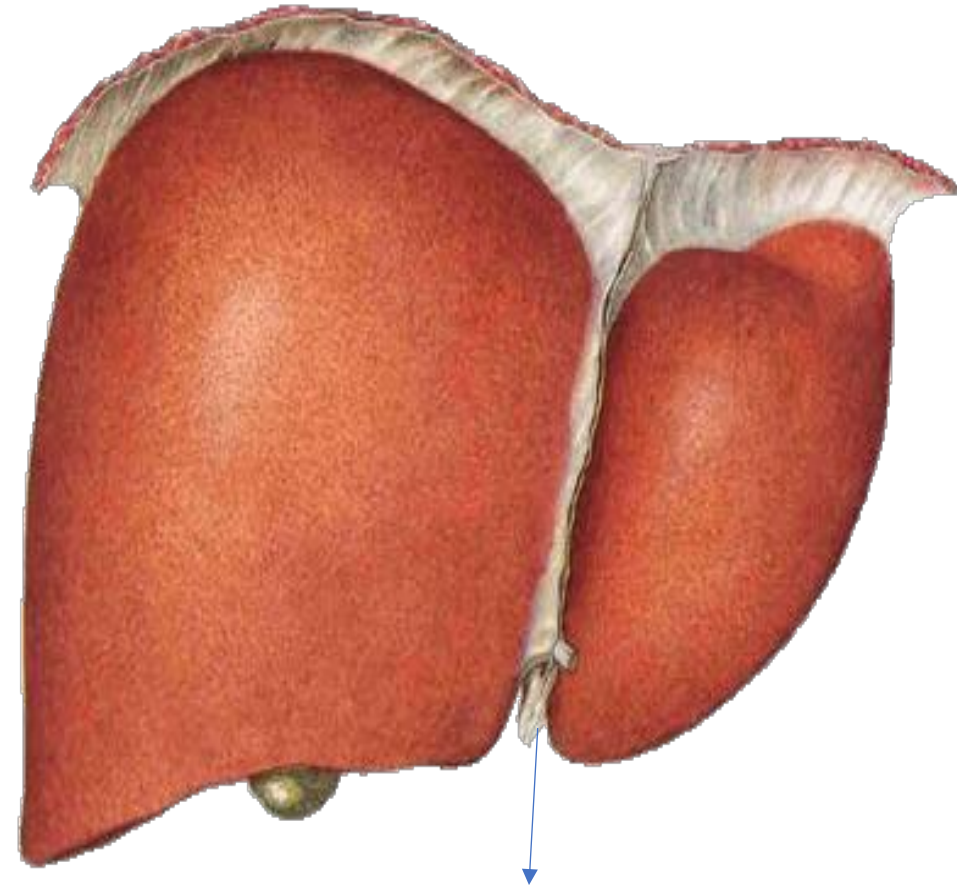
Surfaces and Bed of Liver

Anterior View



● **Falciform ligament of liver**

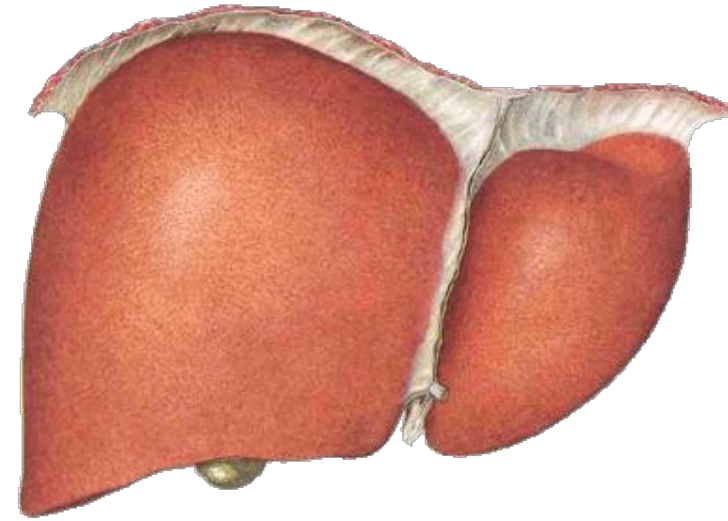
- Consists of double peritoneal layer
- Sickle shape
- Extends from anterior abdominal wall (umbilicus) to liver
- Free border of the ligament contains
Ligamentum teres
(obliterated umbilical vein) in the lower part between Lt & Rt lobes



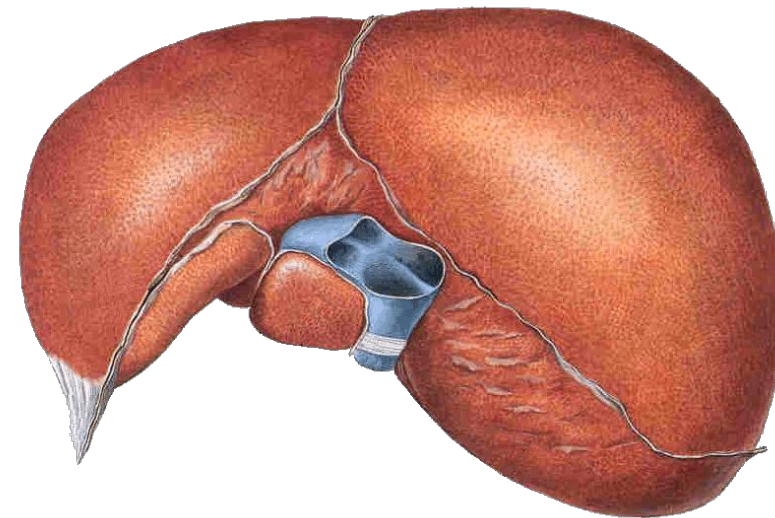
Ligamentum
teres

● **Coronary ligament**

the area between upper and lower layer of the coronary ligament is the bare area of liver which contract with the diaphragm.

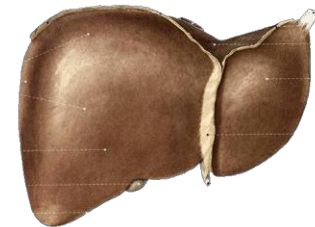
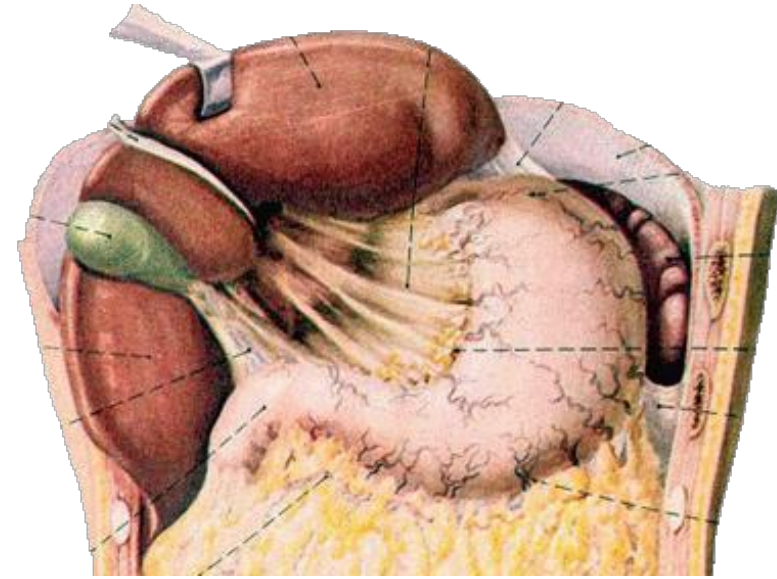


- **Left and right triangular ligaments** formed by left and right extremity of coronary ligament



- **Hepatogastric ligament**
- **Hepatoduodenal ligament**

(make Lesser omentum)



2- Ligaments of spleen

● **Gastrosplenic ligament**

- Connects the fundus of stomach to hilum of spleen.

- **Contents**

the short gastric & left gastroepiploic vessels pass through it.

■ **Splenorenal ligament (or lienorenal)**

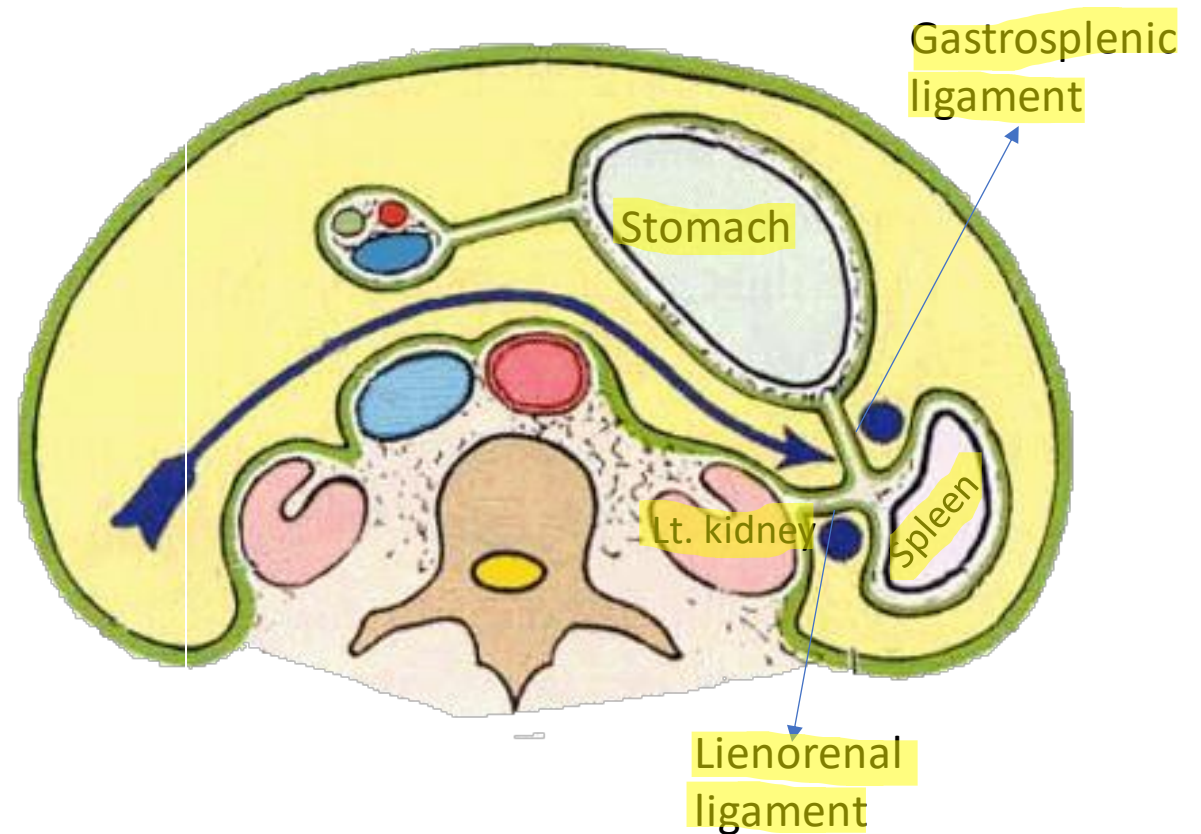
- extends between the hilum of spleen and left kidney.

- **Contents**

The splenic vessel

Lymphatic vessels , nodes & nerve

the tail of pancreas



Important note !!

Any trauma on the left side can lead to fracture of ribs especially 9 & 10 & 11 , beneath these ribs there is the spleen which is a high vascular organ, the trauma lead to spleen rupture and then bleeding.

The treatment is splenectomy, but how this happens?

By cutting the splenic vessels in the splenorenal ligament (2 ligation and cut between them) then we can remove the spleen easily.

So splenorenal ligament considered important surgical point.

But note : when we do splenectomy you should preserve the tail of pancreas, any trauma on it make secretion of pancreas and cause infection in the abdomen(peritonitis: infection of all peritoneum)

① **Phrenicosplenic ligament** Between diaphragm & spleen

① **Splenocolic ligament** Between spleen & transverse colon

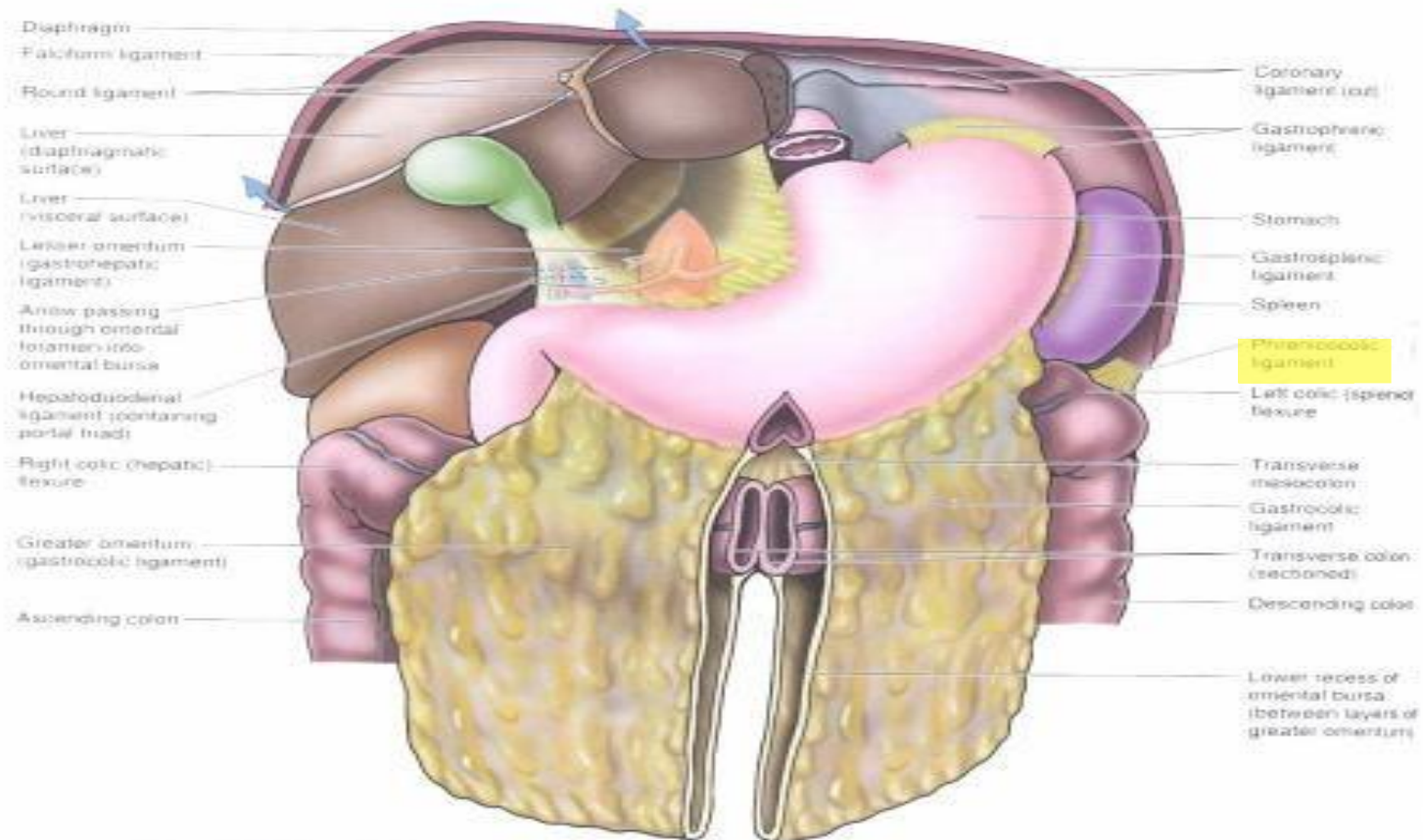
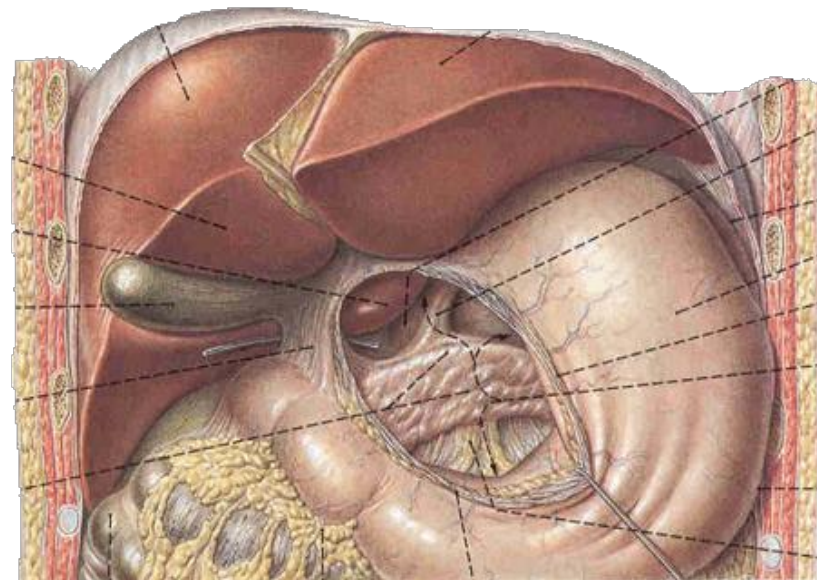
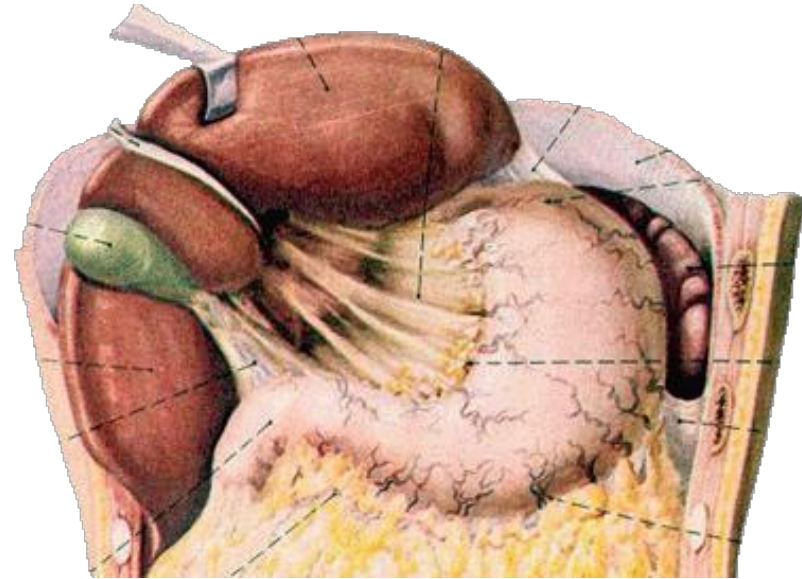
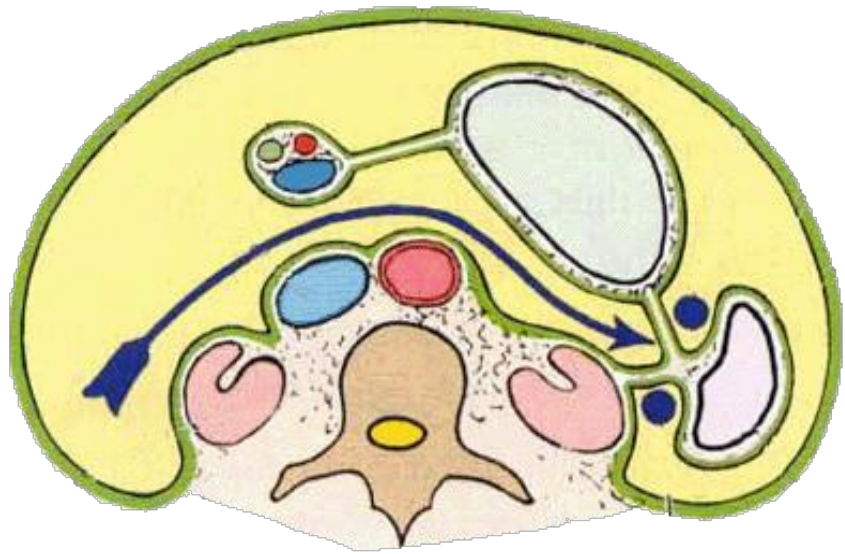


Figure 2.22. Parts of the greater and lesser omenta.

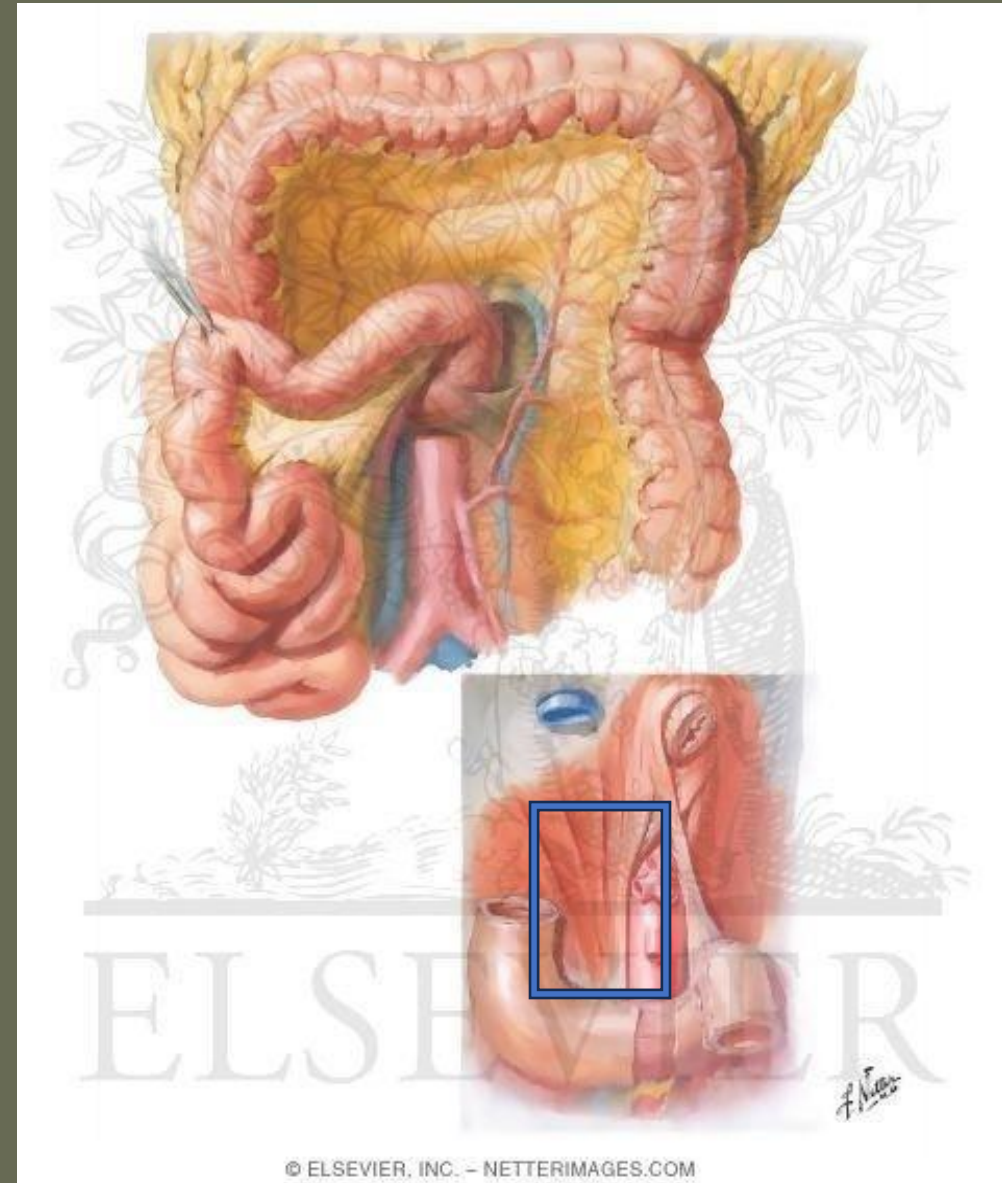
3- Ligaments of stomach

- Hepatogastric ligament
- Gastrosplenic ligament
- Gastrophrenic ligament
- Gastrocolic ligament
- **Gastropancreatic ligament**



The **suspensory ligament of duodenum in embryo** Sometimes named Treitz ligament at the junction between duodenum(**retroperitoneal**) & Jejunum (**intrperitoneal**) This ligament attach to the right crus of diaphragm.

It is a landmark for the surgeon that this area between duodenum & jejunum



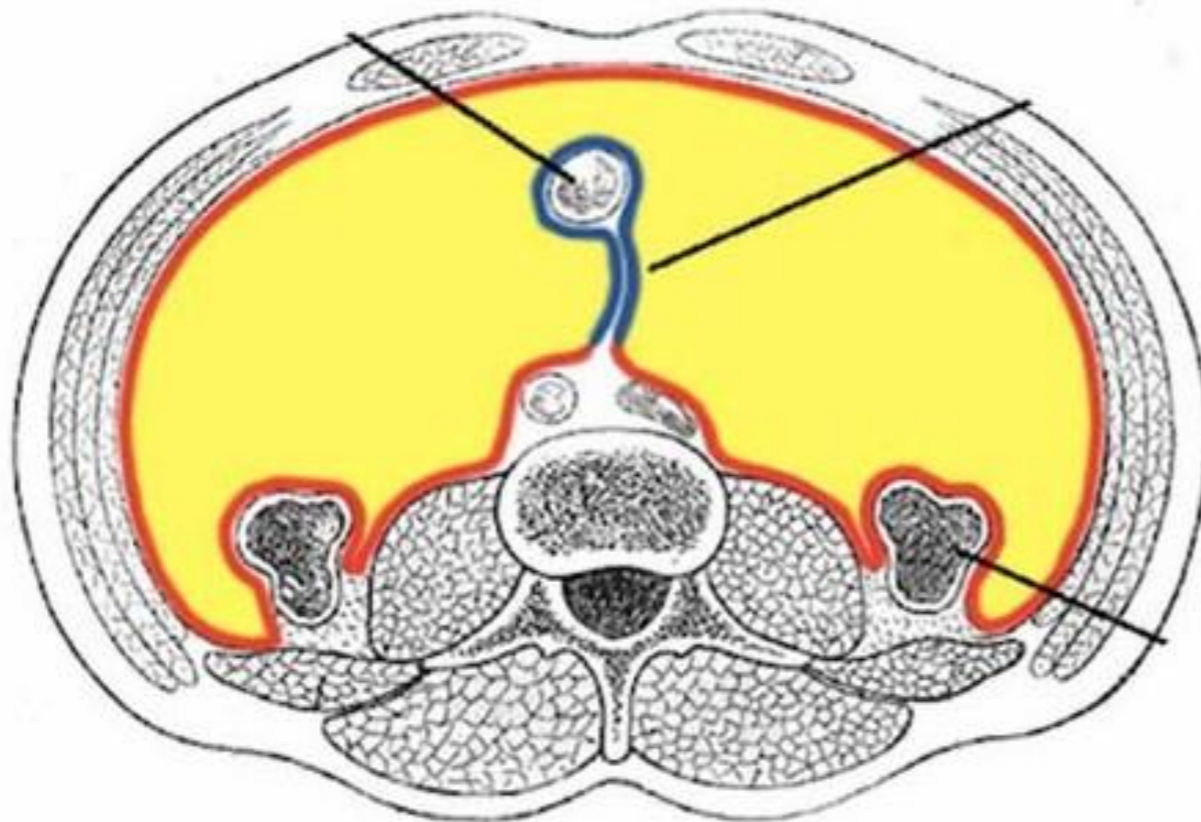
5. The phrenicocolic ligament

It is a fold of peritoneum which is continued from the left colic flexure to the diaphragm opposite the 10th and 12th ribs.

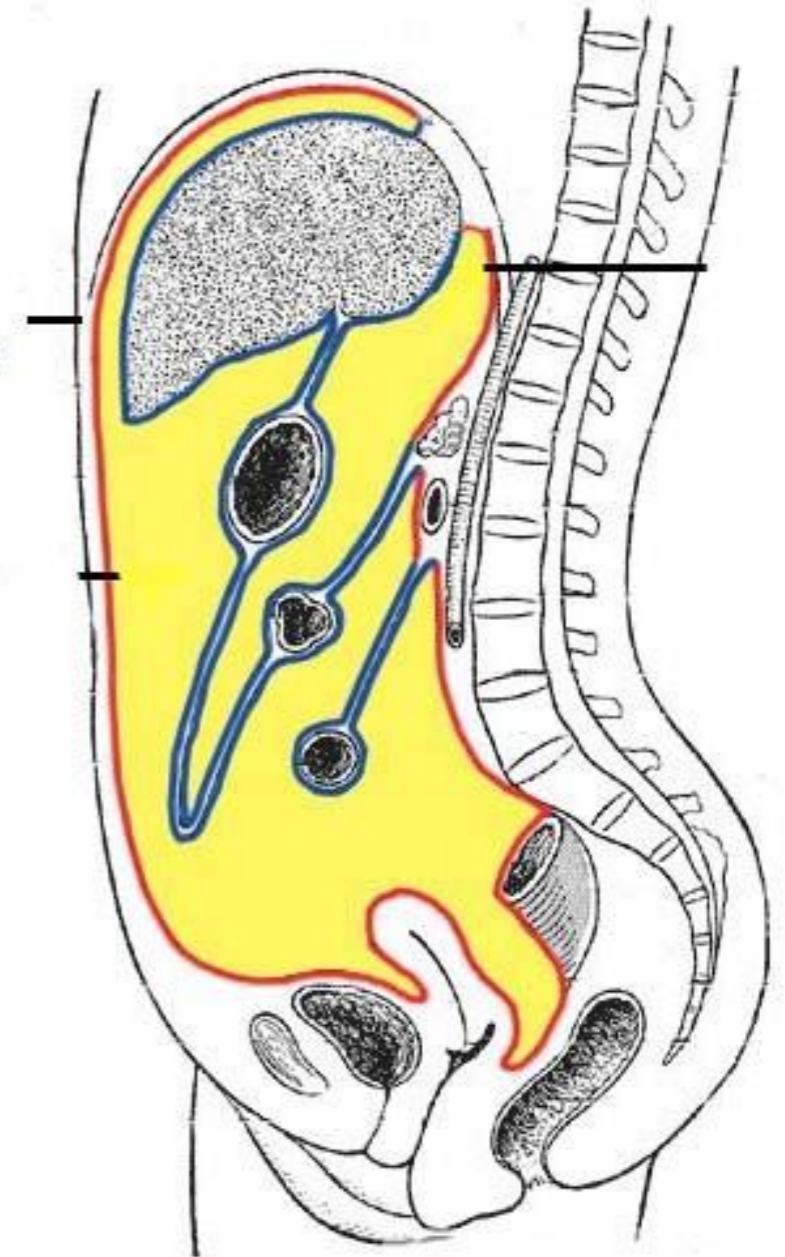
This ligament separate between lower & upper abdomen to prevent the spread of infection only in the left side .

1. Parietal peritoneum

- The students should know the following :
 1. It line the Ant. Abdominal wall.
 2. covers the pelvic viscera
 3. line the diaphragm superiorly
 4. line and attached to post Abdominal wall

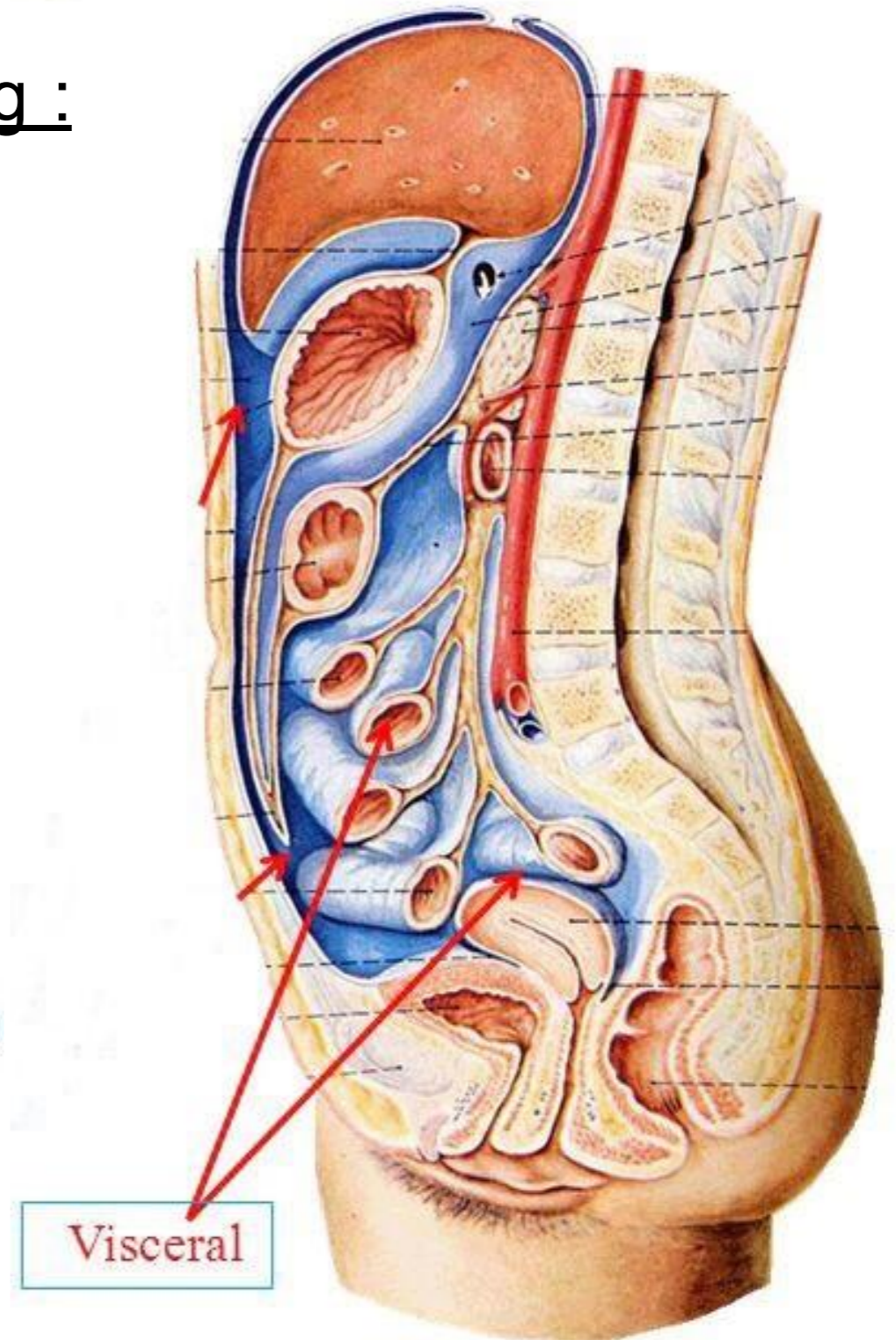
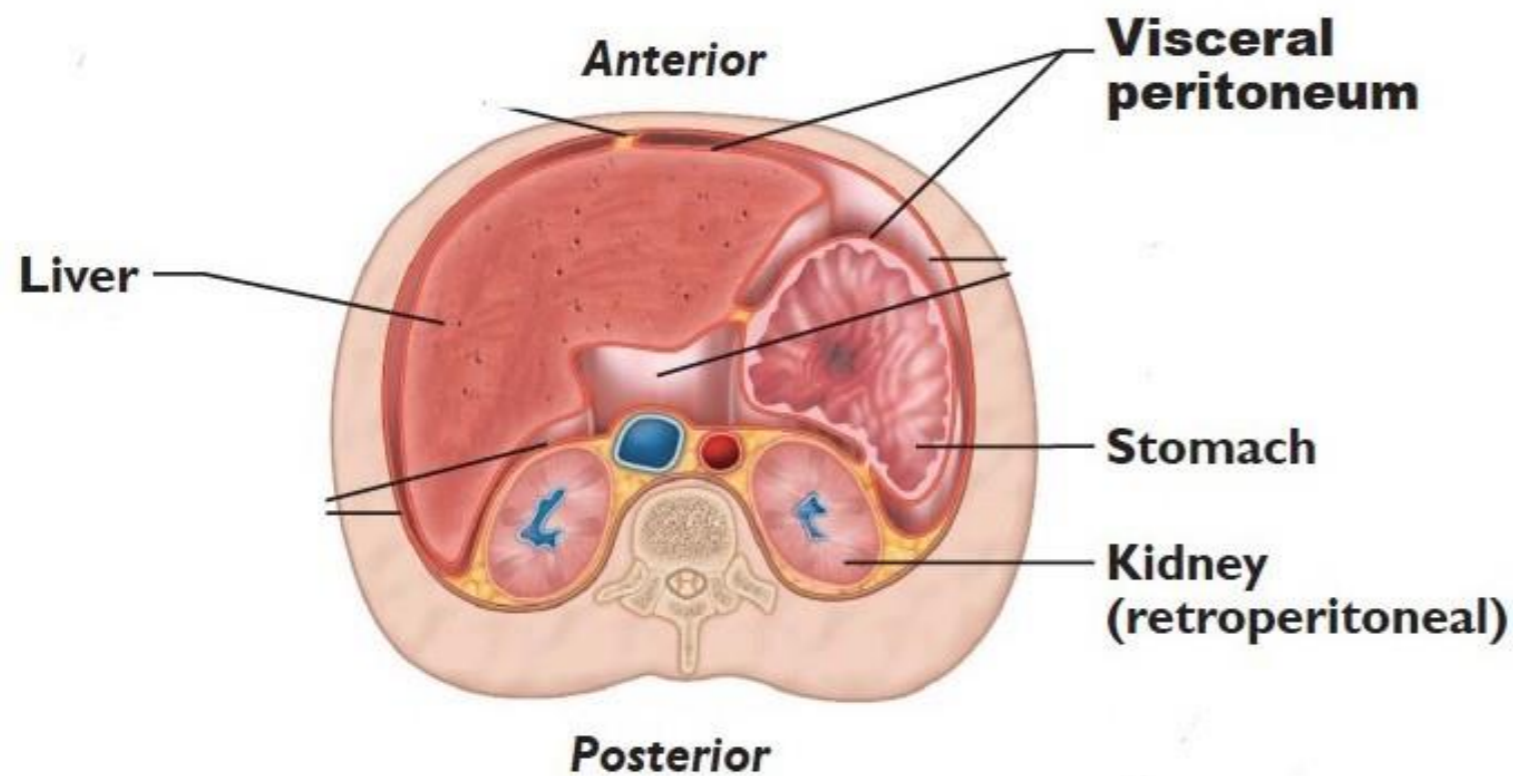


Parietal Peritoneum



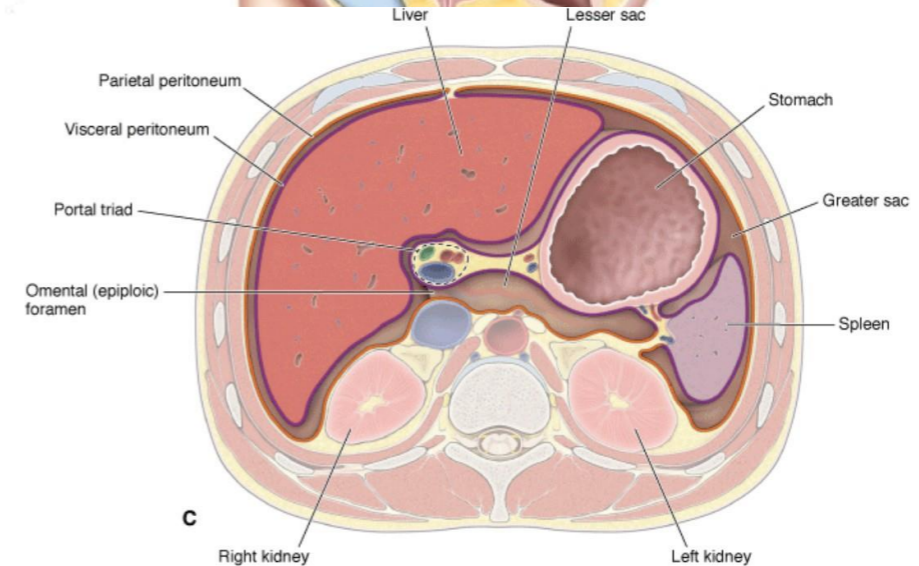
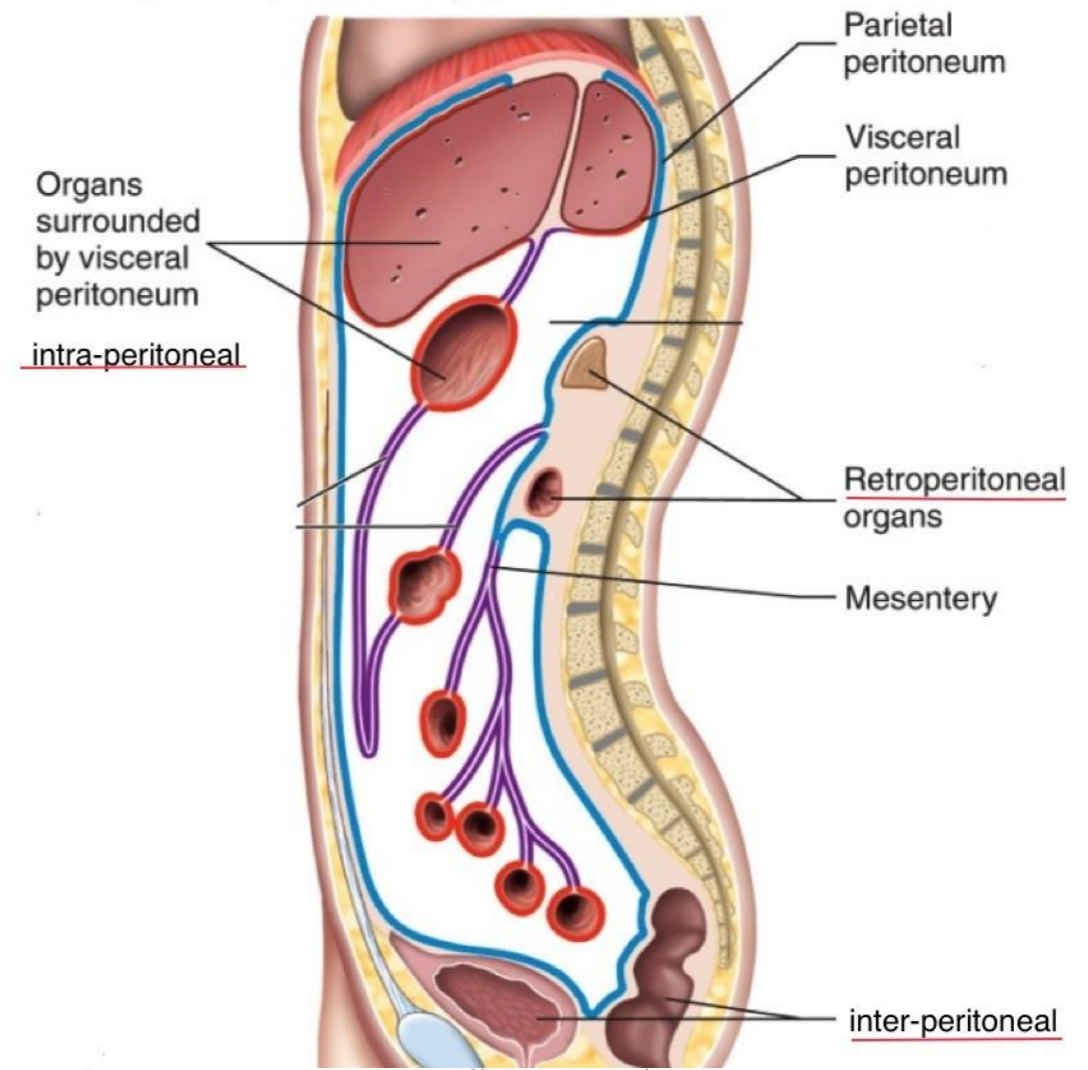
2. Visceral peritoneum

- The students should know the following :
 1. it cover the abdominal viscera



3. The relationship between viscera and peritoneum

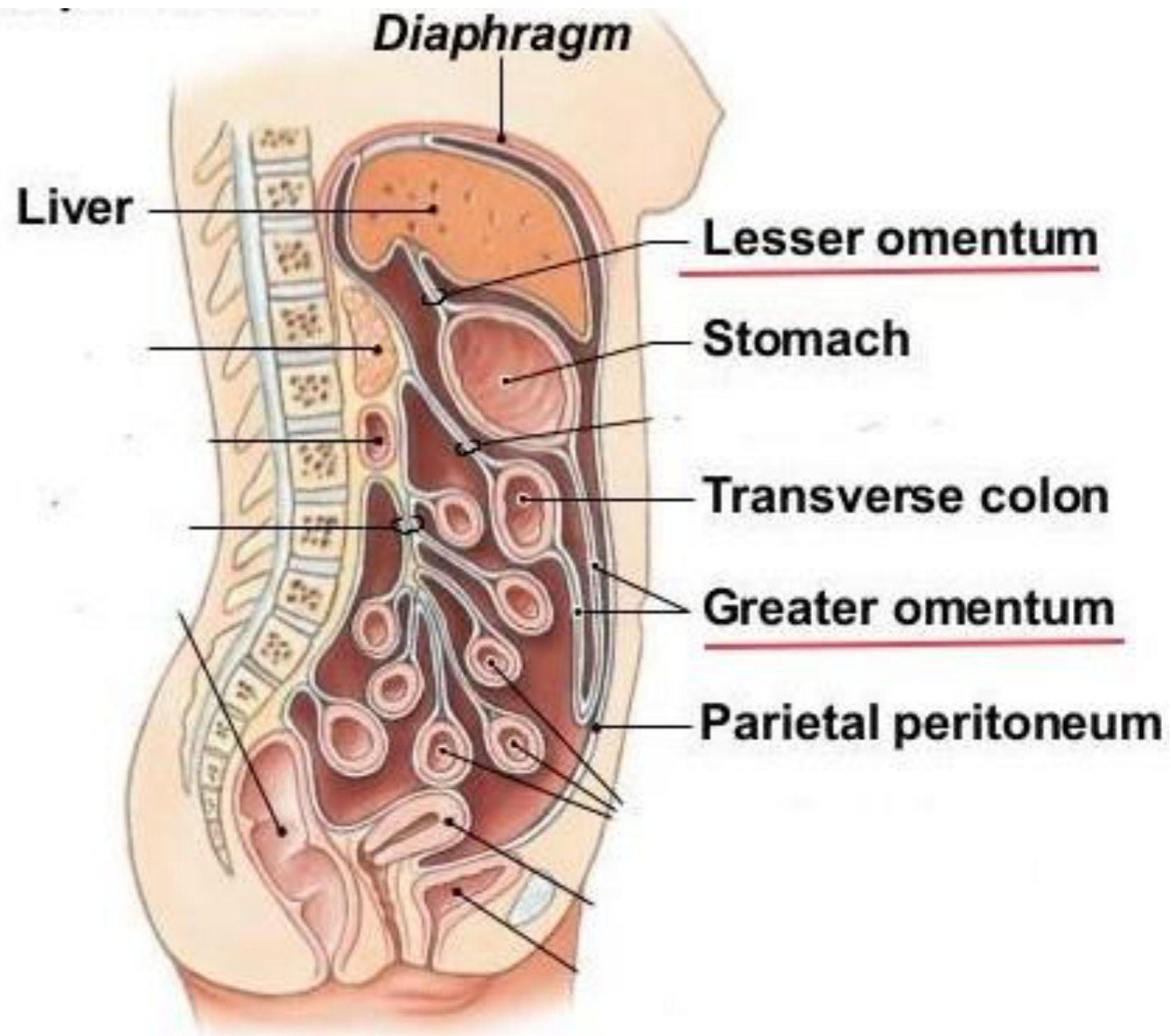
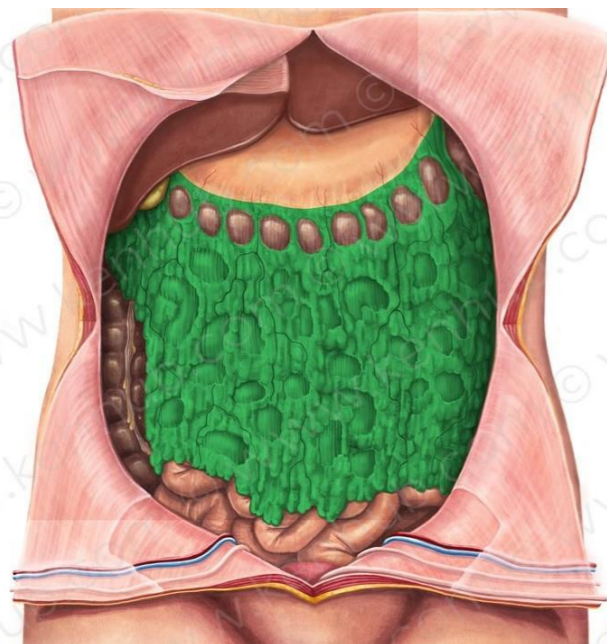
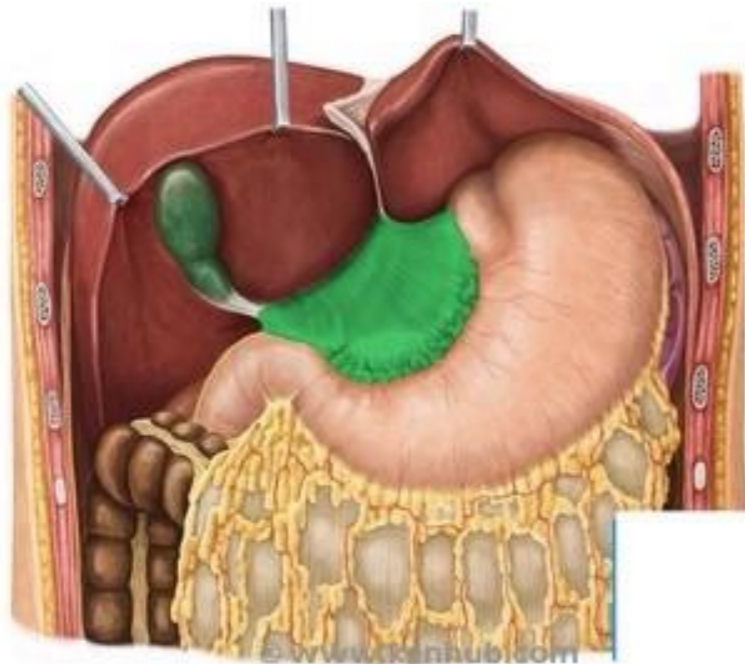
- The relationship between viscera and peritoneum classified as :
 1. Intraperitoneal viscera
 - example: stomach, jejunum, ileum
 2. Retroperitoneal viscera
 - example: kidney, pancreas
 3. Interperitoneal viscera
 - example: liver, gallbladder, urinary bladder



4. The peritoneal reflection

A. Omenta

- The students should observe the following :
 1. Attachment and content of Lesser omentum
 2. Attachment and content of Greater omentum



4. The peritoneal reflection

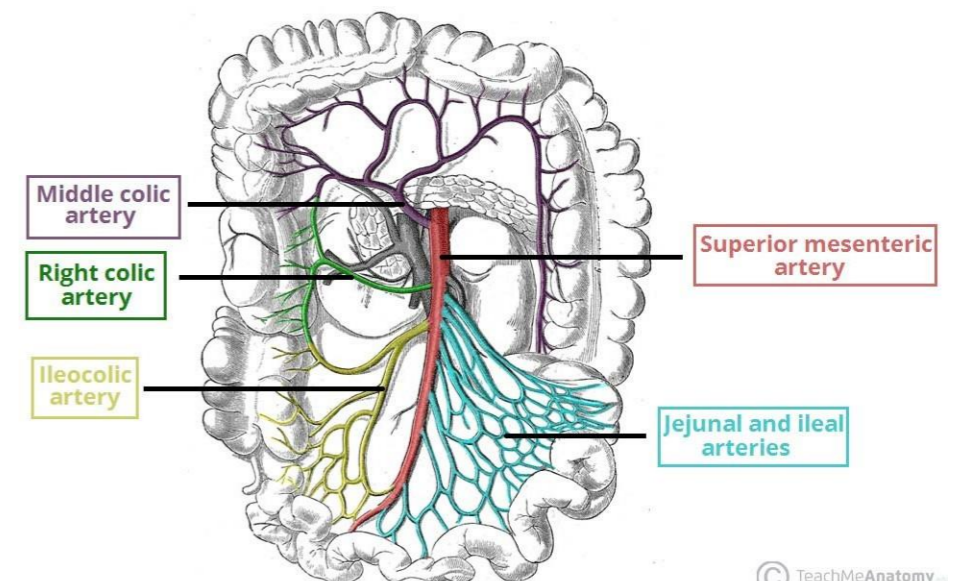
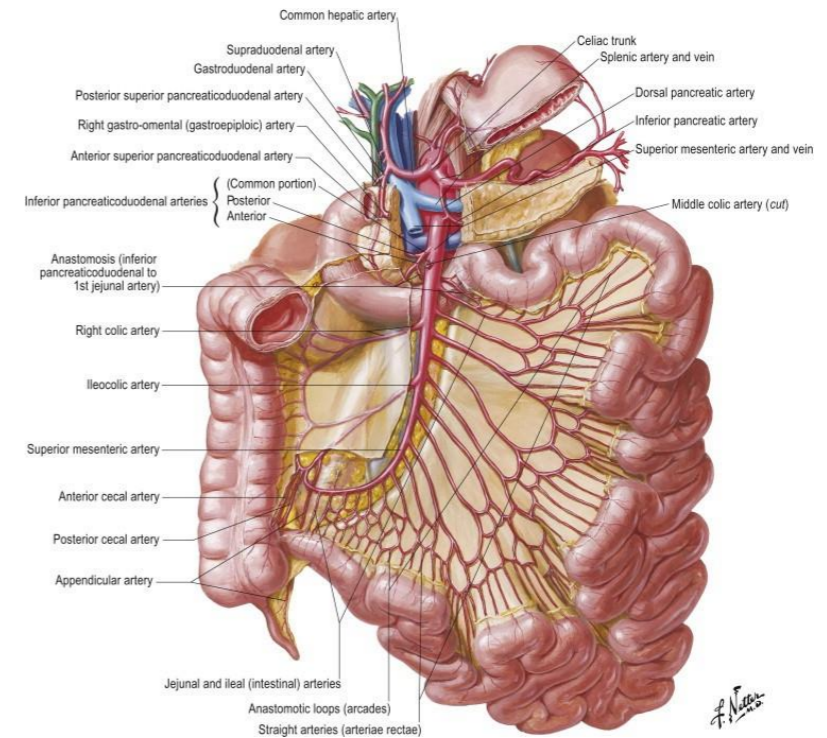
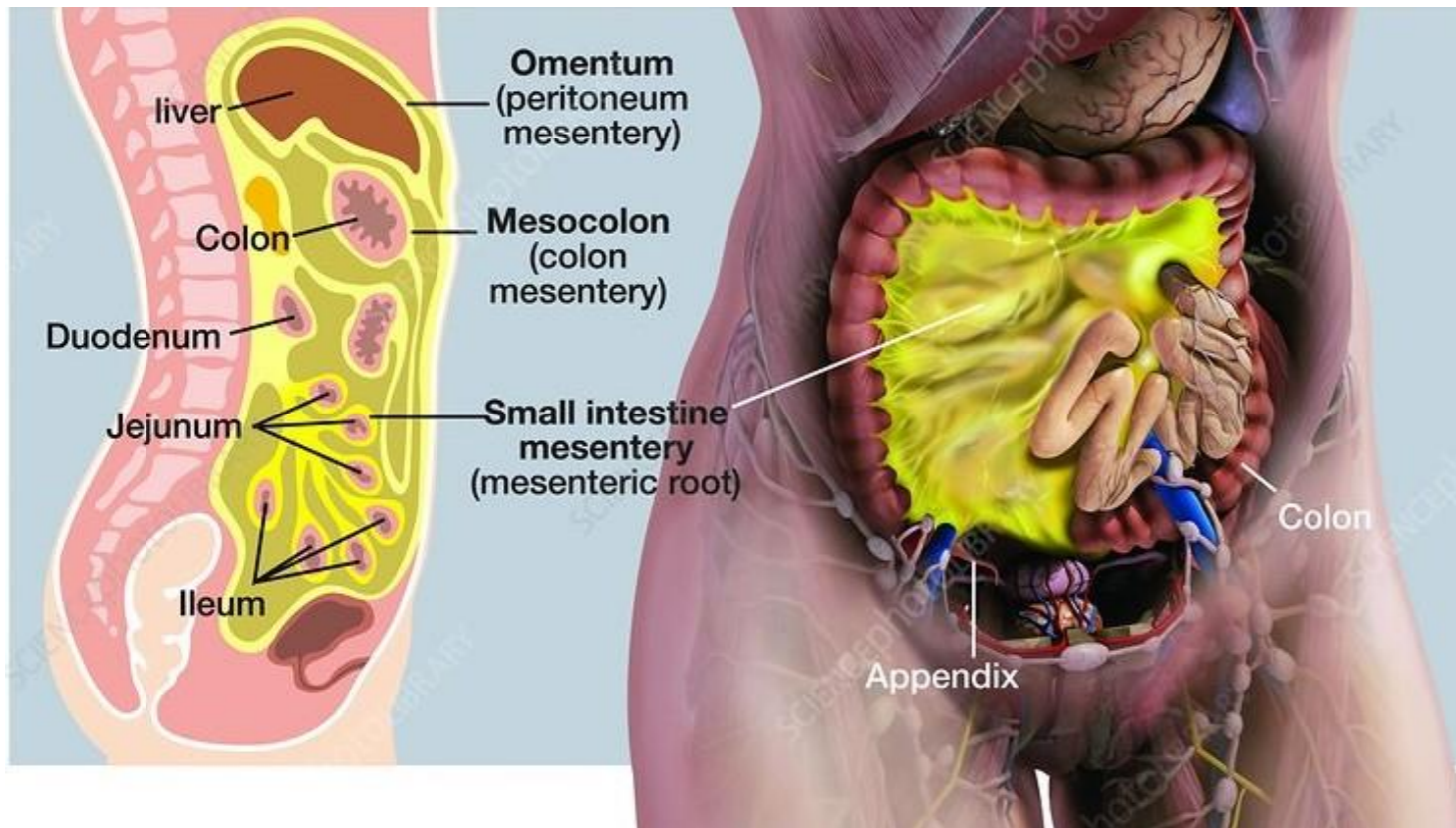
B. Mesentery

- The students should observe the following :
 1. Attachment and content of Mesentery of small intestine
 2. Attachment and content of Mesoappendix
 3. Attachment and content of Mesocolon
(transverse and sigmoid)

4. The peritoneal reflection

B. Mesentery

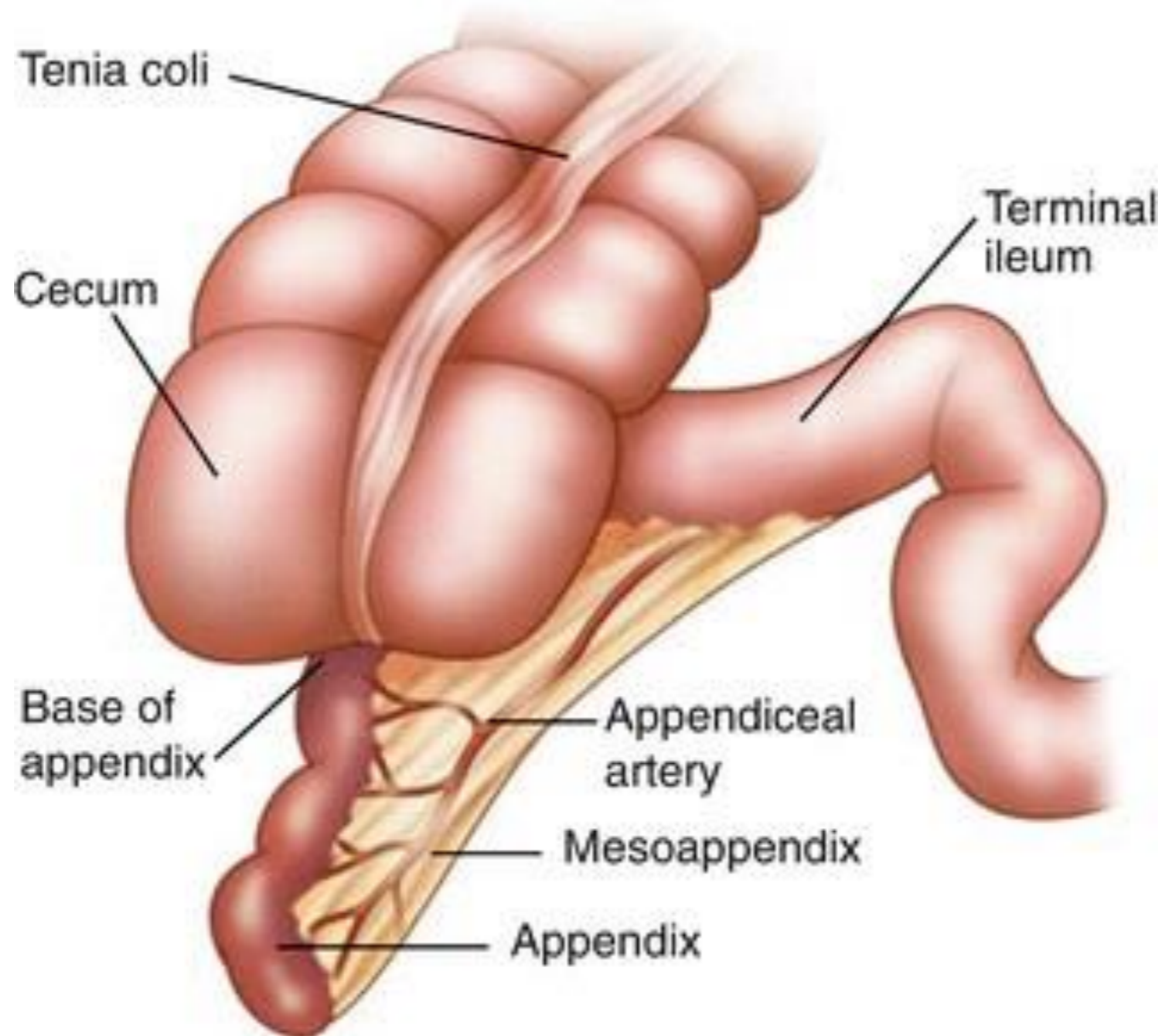
1. Attachment and content of Mesentery of small intestine



4. The peritoneal reflection

B. Mesentery

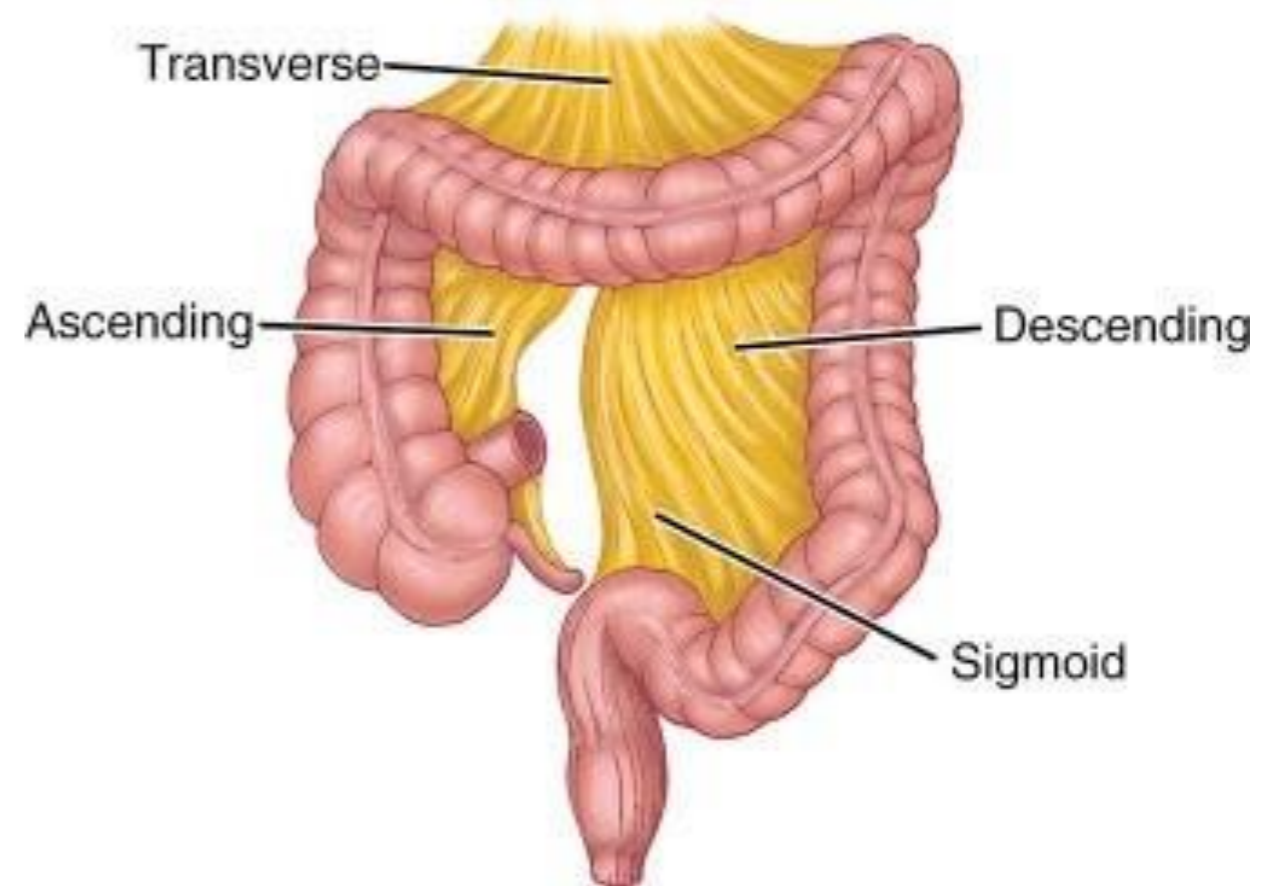
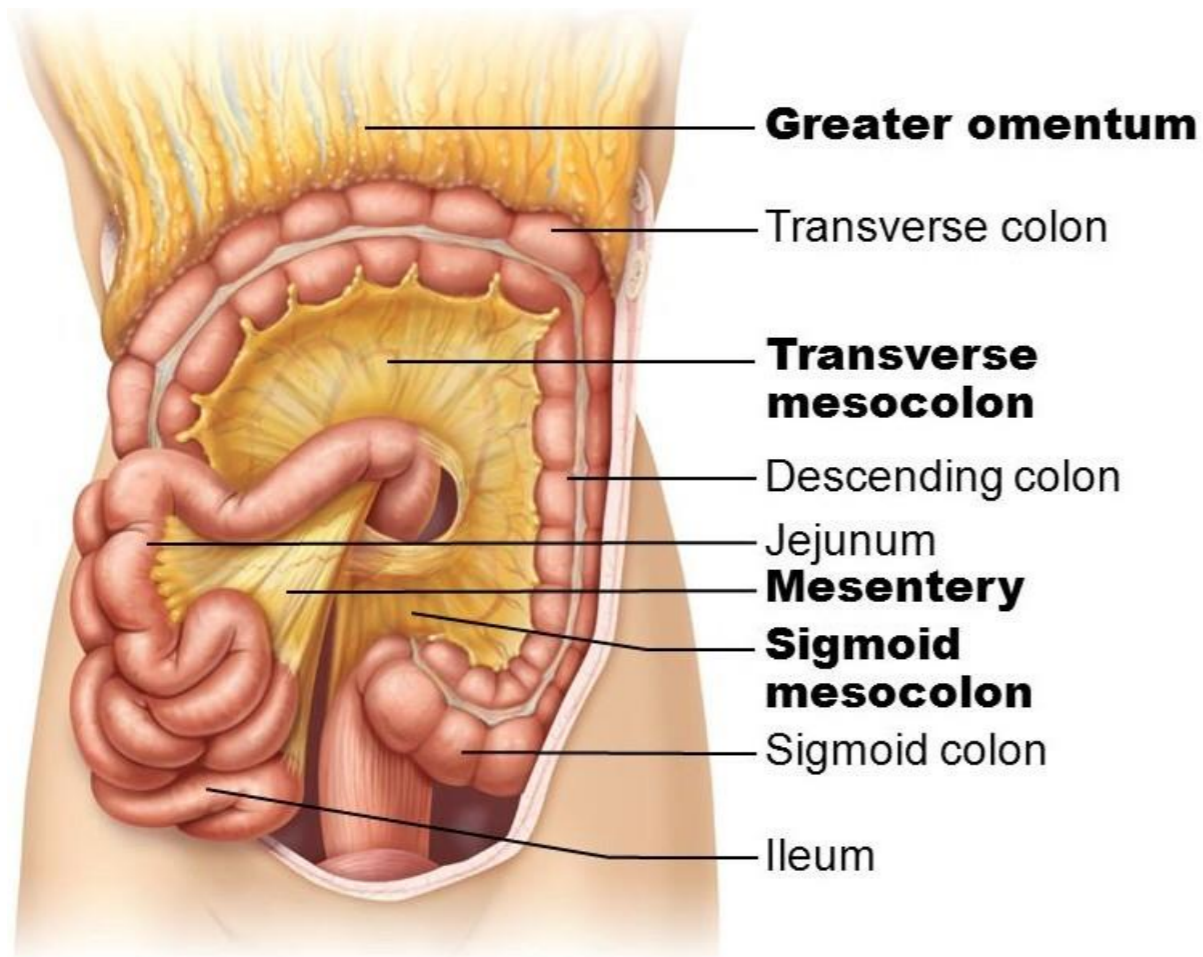
2. Attachment and content of Mesoappendix



4. The peritoneal reflection

B. Mesentery

3. Attachment and content of Mesocolon (transverse and sigmoid)



4. The peritoneal reflection

C. Ligaments

- The students should observe the following :
 1. The ligaments of the liver.
 2. The ligaments of the stomach.
 3. The ligaments of the spleen.
 4. The suspensory ligament of duodenum.

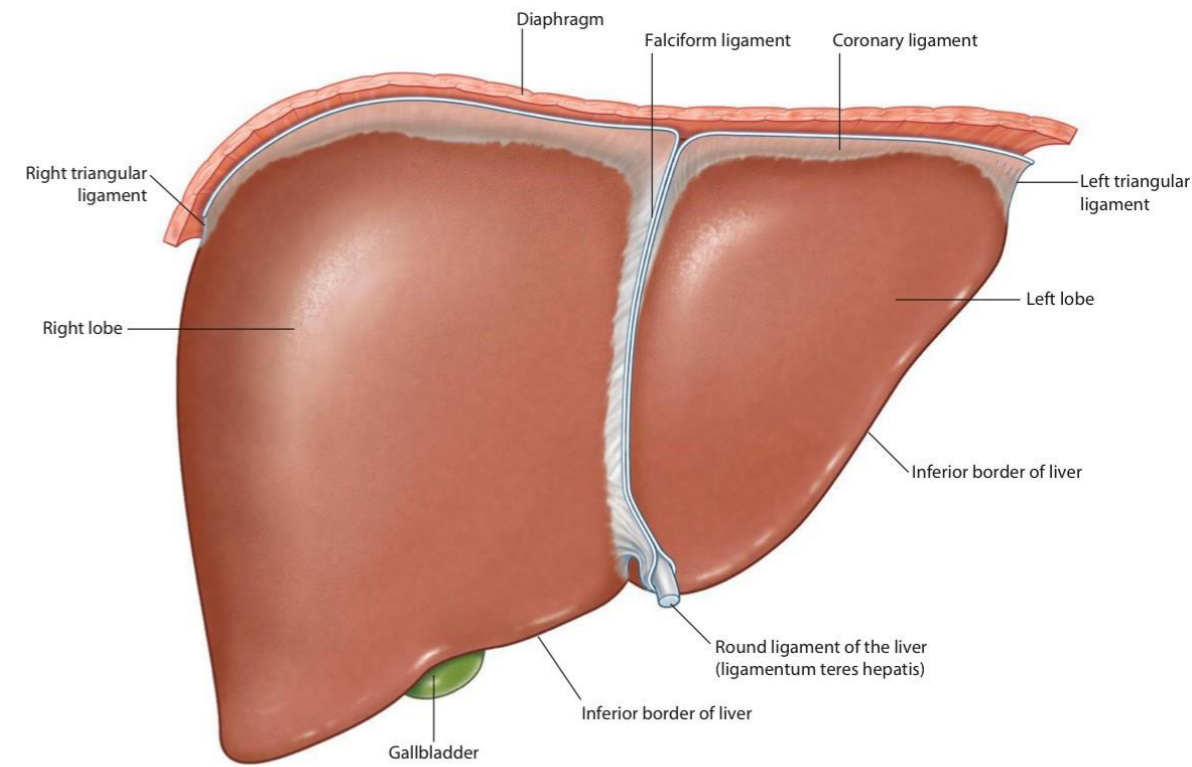
4. The peritoneal reflection

C. Ligaments

1. The ligaments of the liver.

- The students should observe the following :

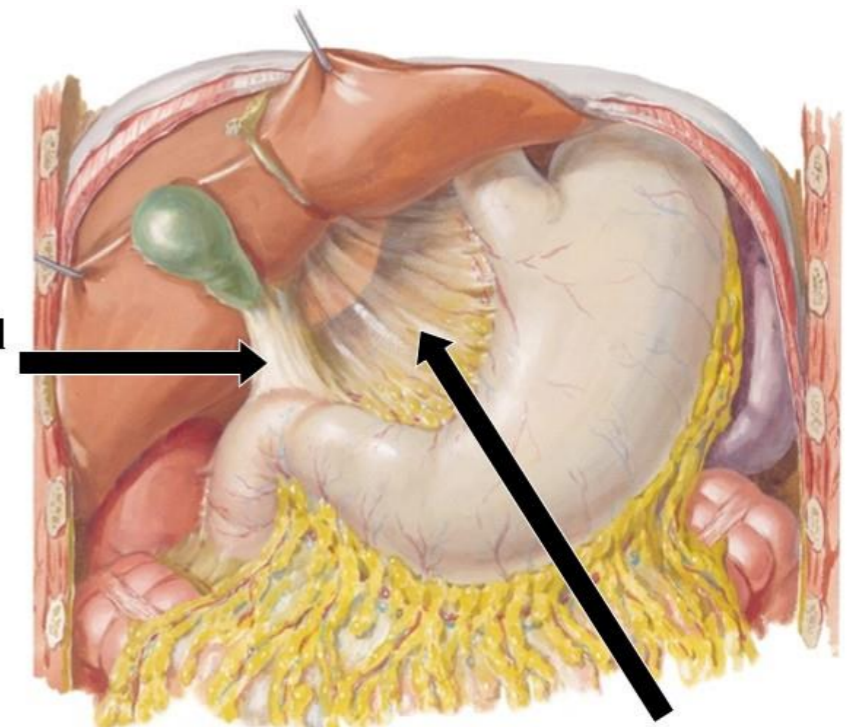
1. The falciform ligament of liver
2. The ligamentum teres hepatis
3. The coronary ligament
4. The right triangular ligament
5. The left triangular ligament



Anterior surface of liver

6. The hepatogastric ligament
7. The hepatoduodenal ligament

Hepatoduodenal Ligament



Hepatogastric Ligament

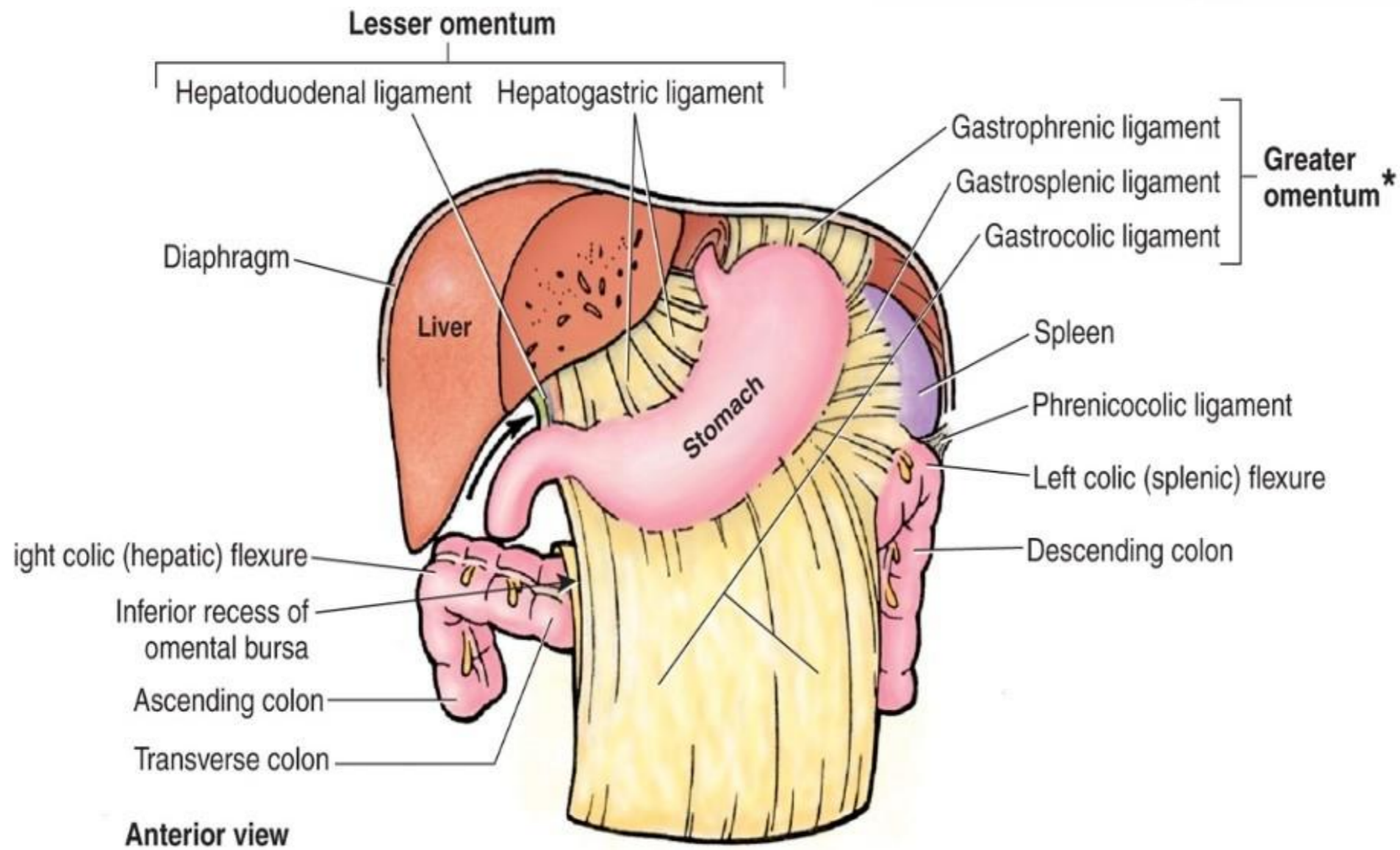
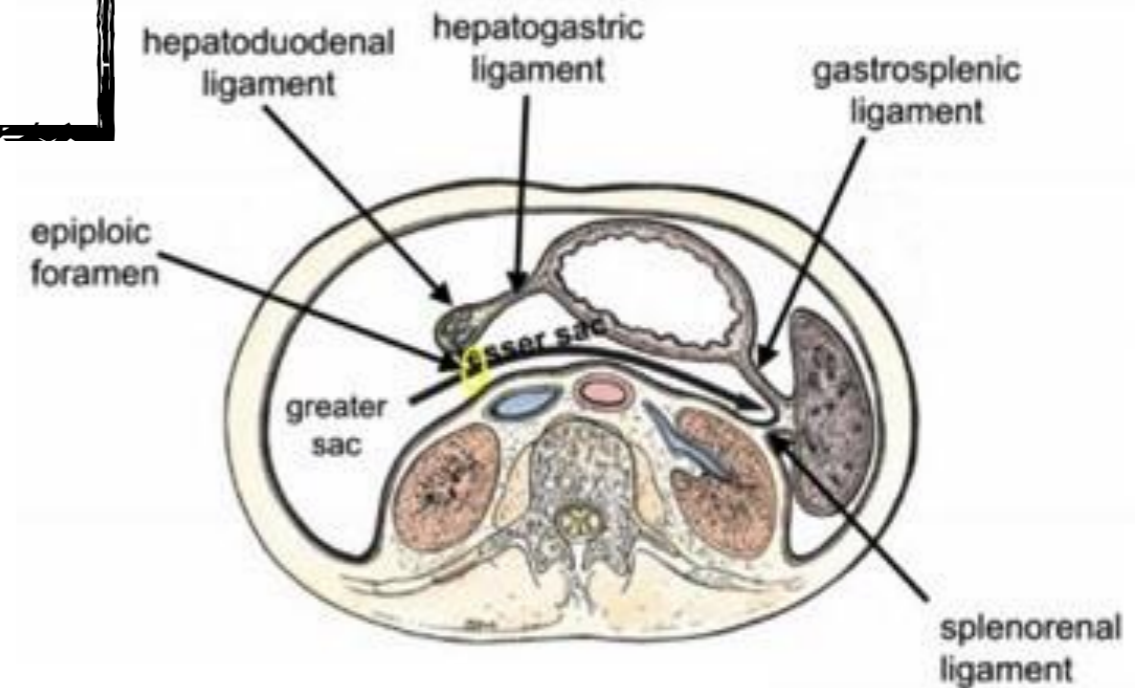
4. The peritoneal reflection

C. Ligaments

2. The ligaments of the stomach.

- The students should observe the following :

1. Hepatogastric ligament
2. Gastrosplenic ligament
3. Gastrophrenic ligament
4. Gastrocolic ligament
5. Gastropancreatic ligament



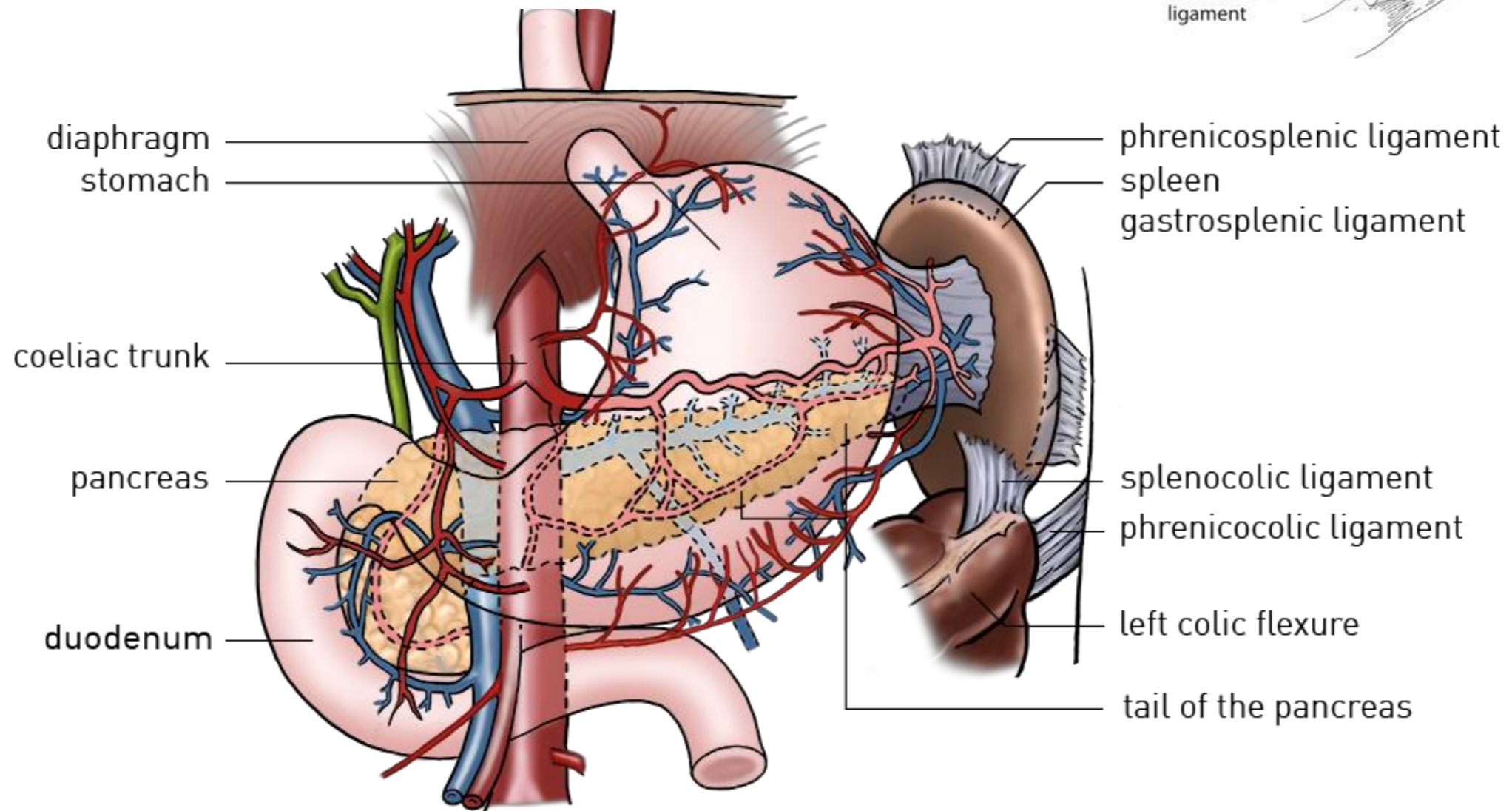
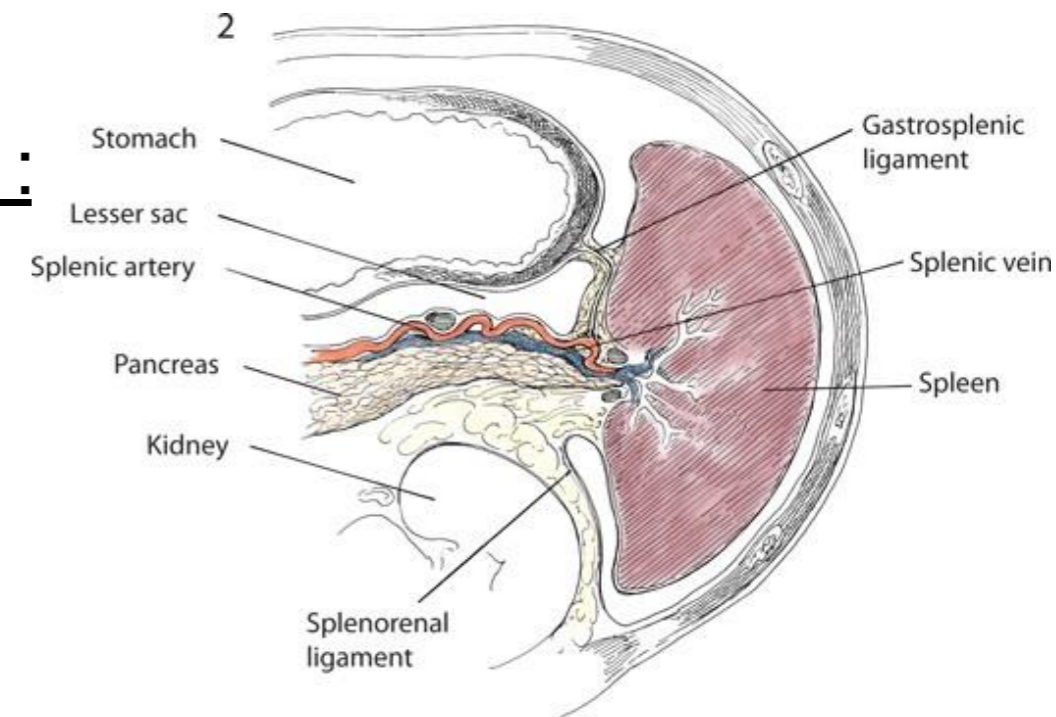
4. The peritoneal reflection

C. Ligaments

3. The ligaments of the spleen.

- The students should observe the following :

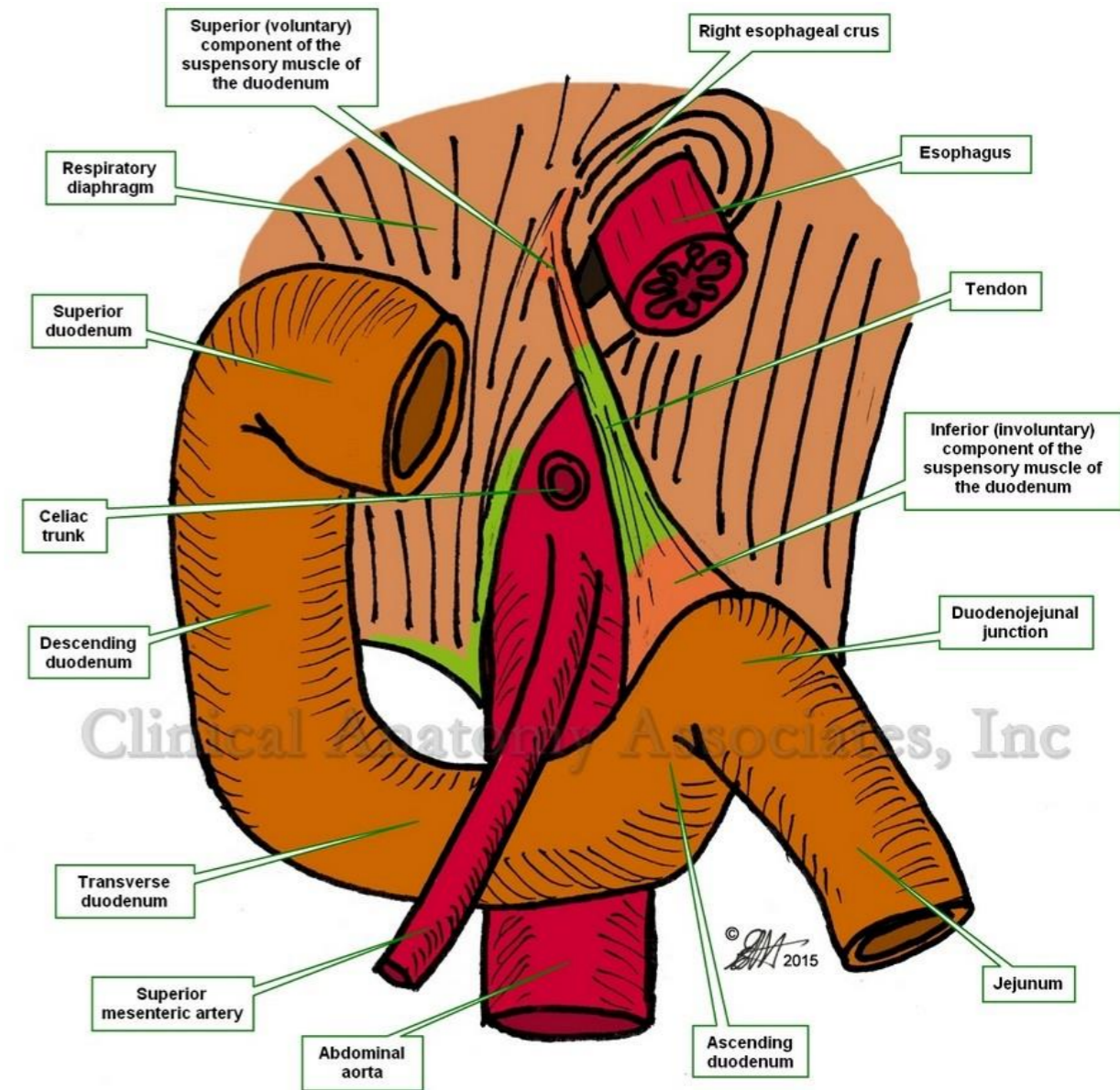
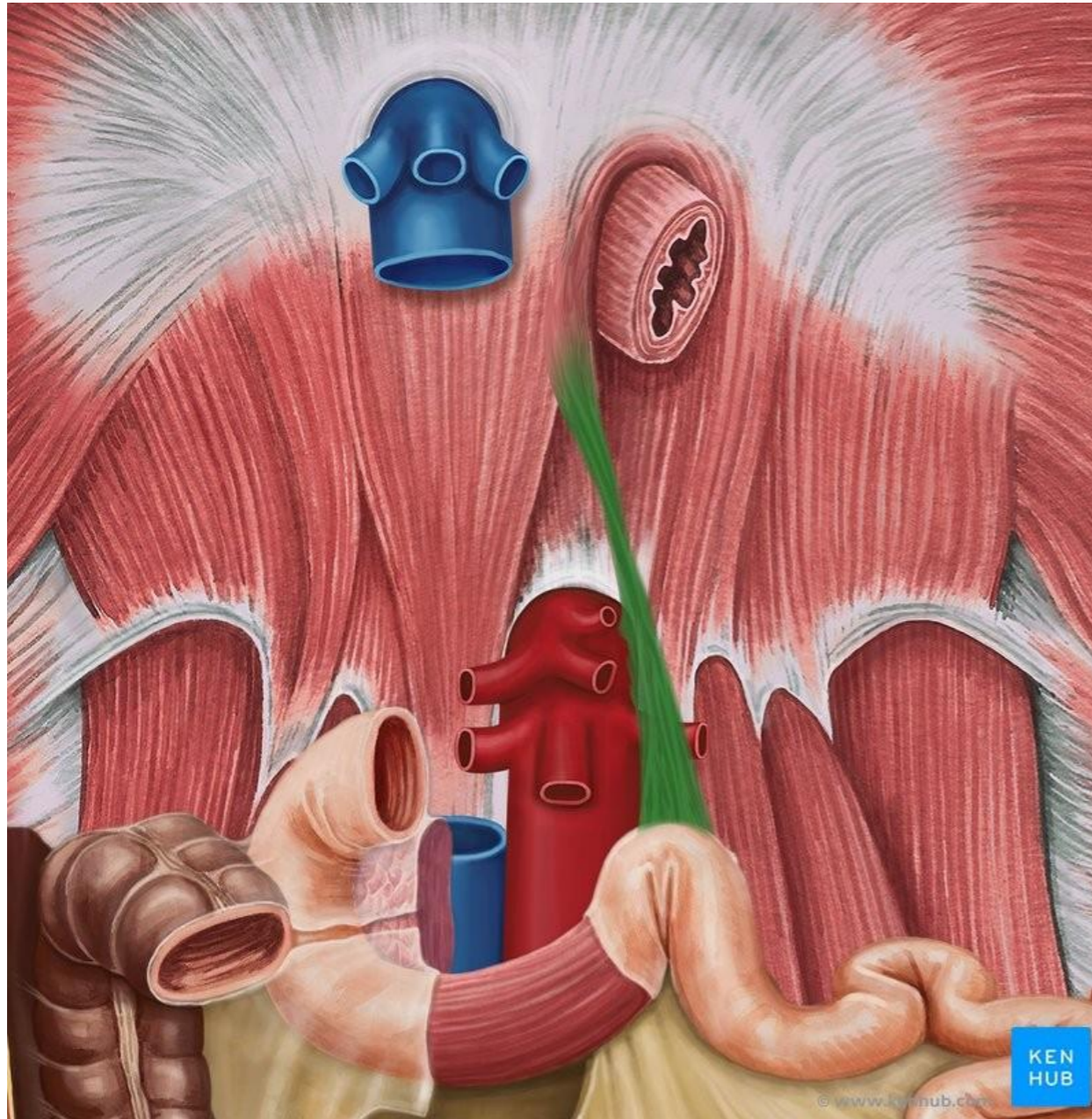
1. Gastrosplenic ligament
2. Splenorenal ligament
3. Phrenicosplenic ligament
4. Splenocolic ligament



4. The peritoneal reflection

C. Ligaments

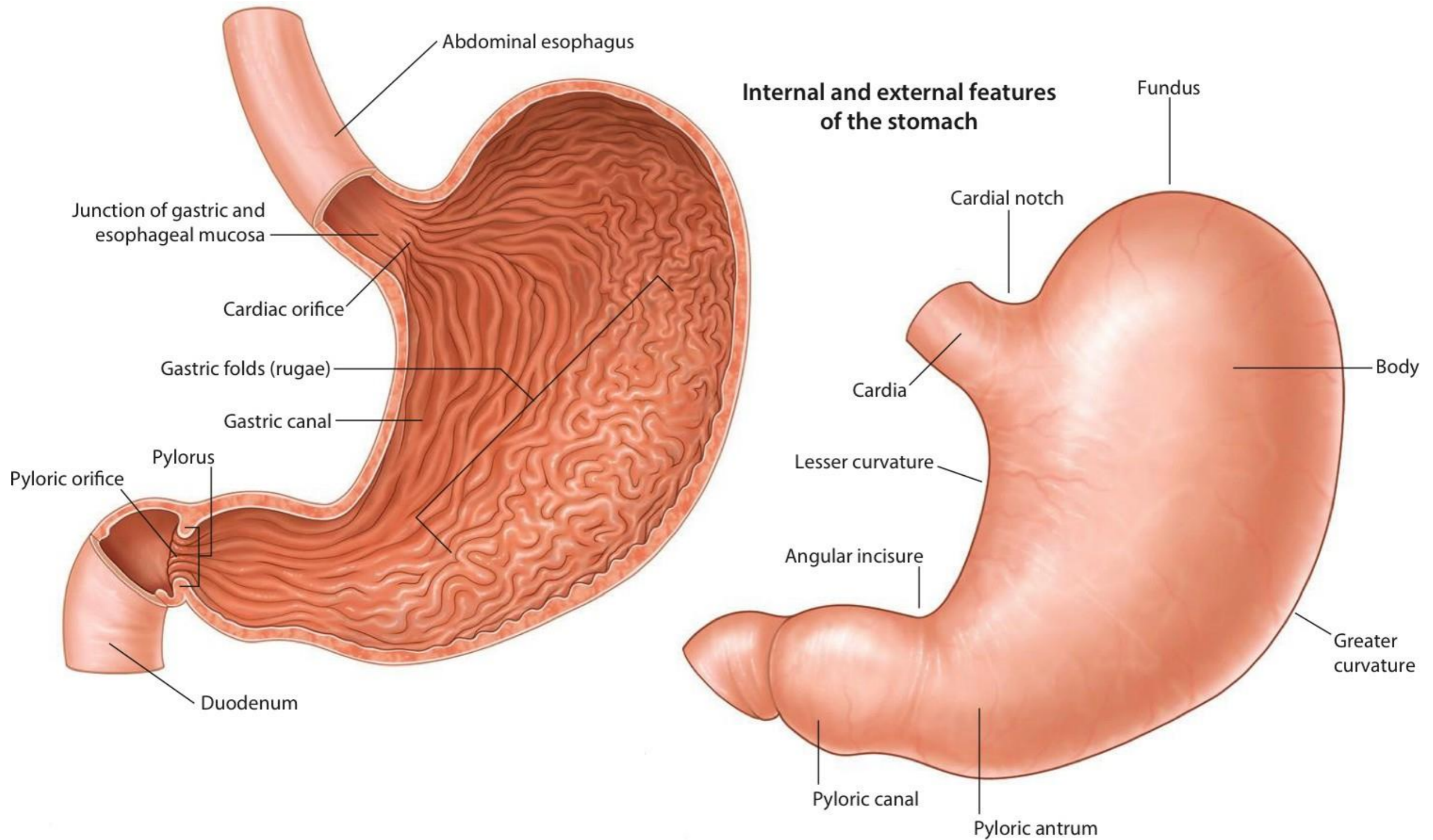
4. The suspensory ligament of duodenum(Treitz)



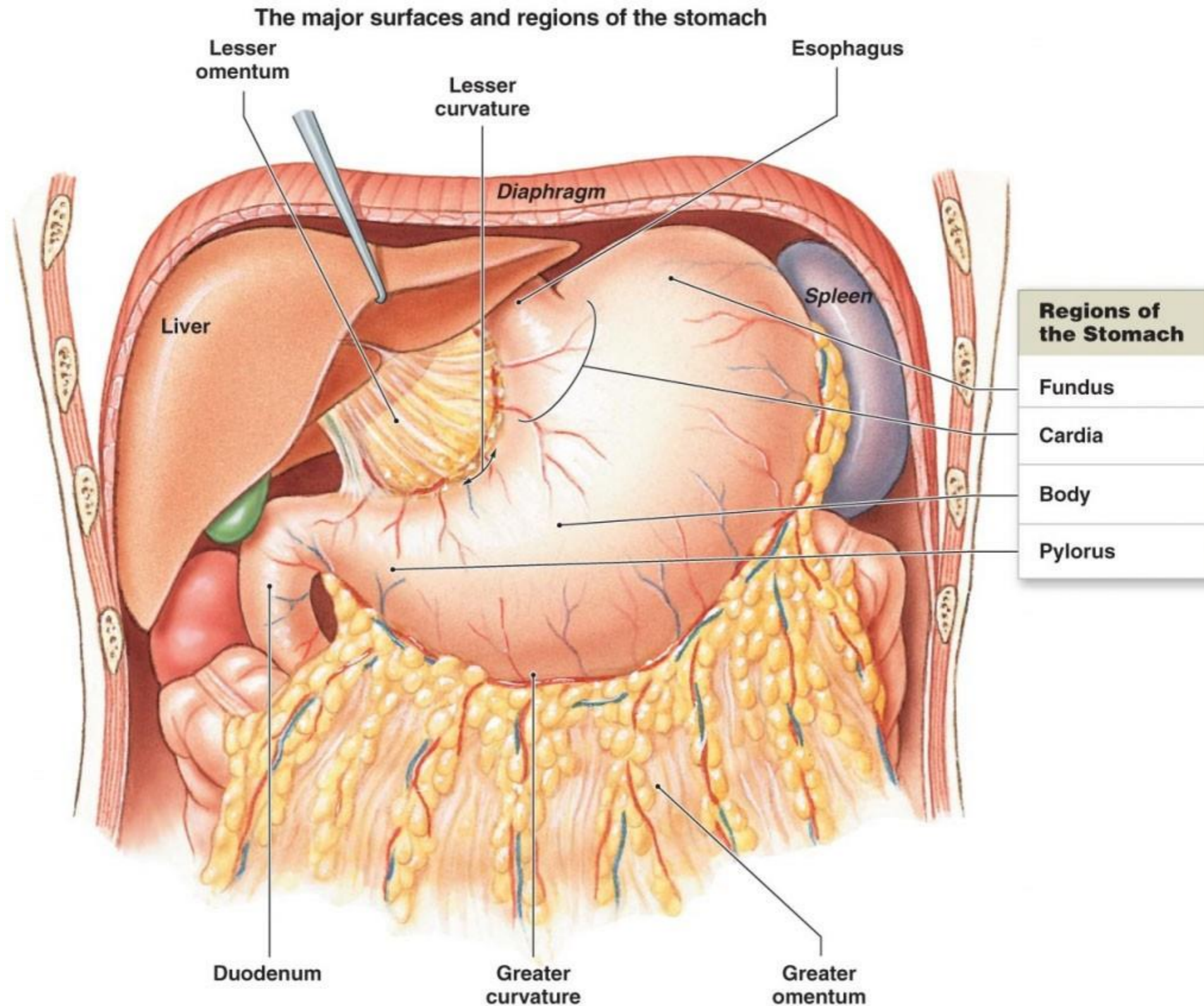
✱ Stomach.

- The students should know and identify :
 1. Parts, Surfaces, curvature and Orifices. of the stomach
 2. Omenta of the stomach
 3. Relations of the stomach
 4. Blood supply of the stomach
 5. Venous and lymphatic drainage of the stomach
 6. Nerve supply of the stomach

1. Parts, Surfaces, curvature and Orifices of the stomach



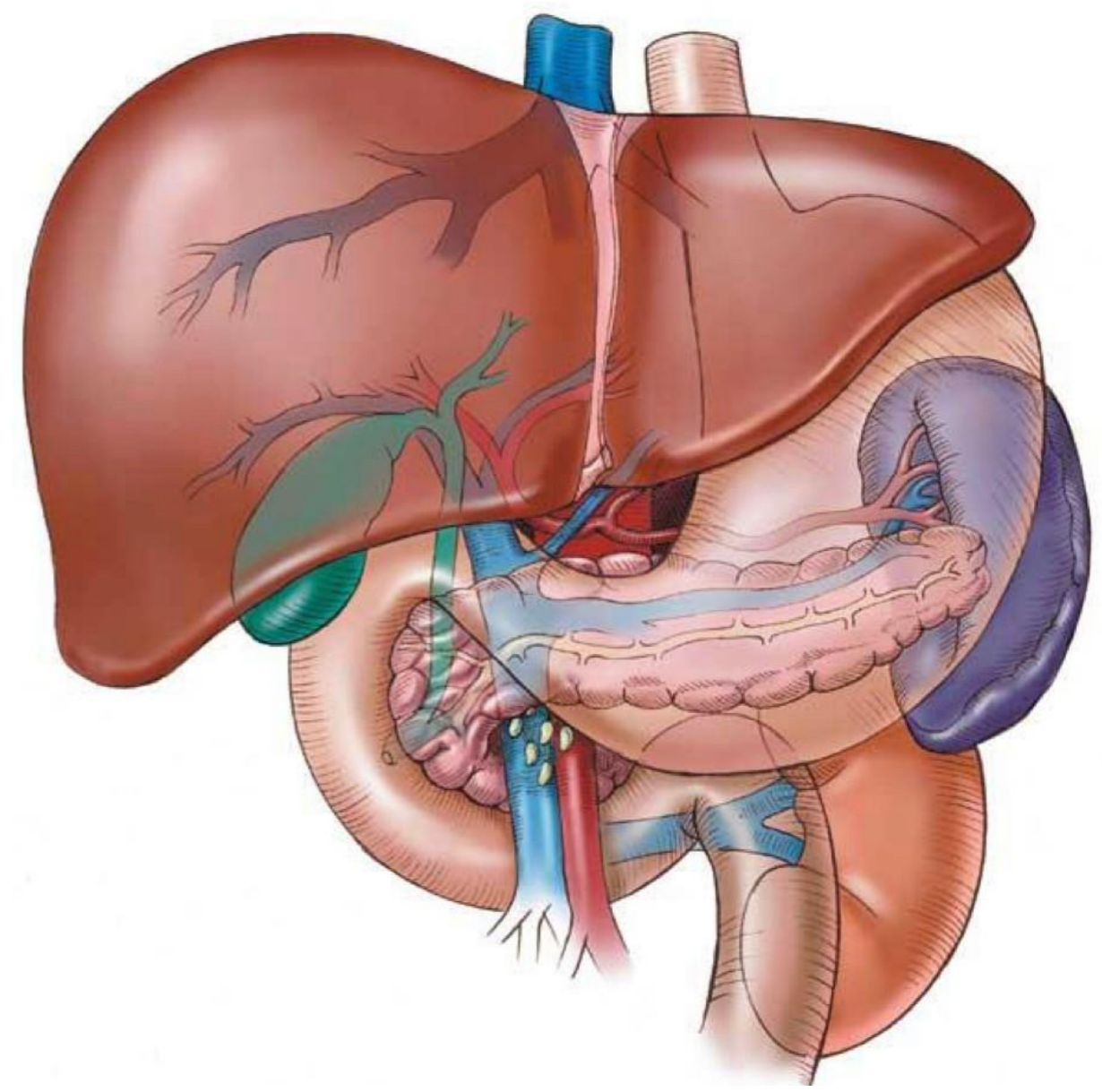
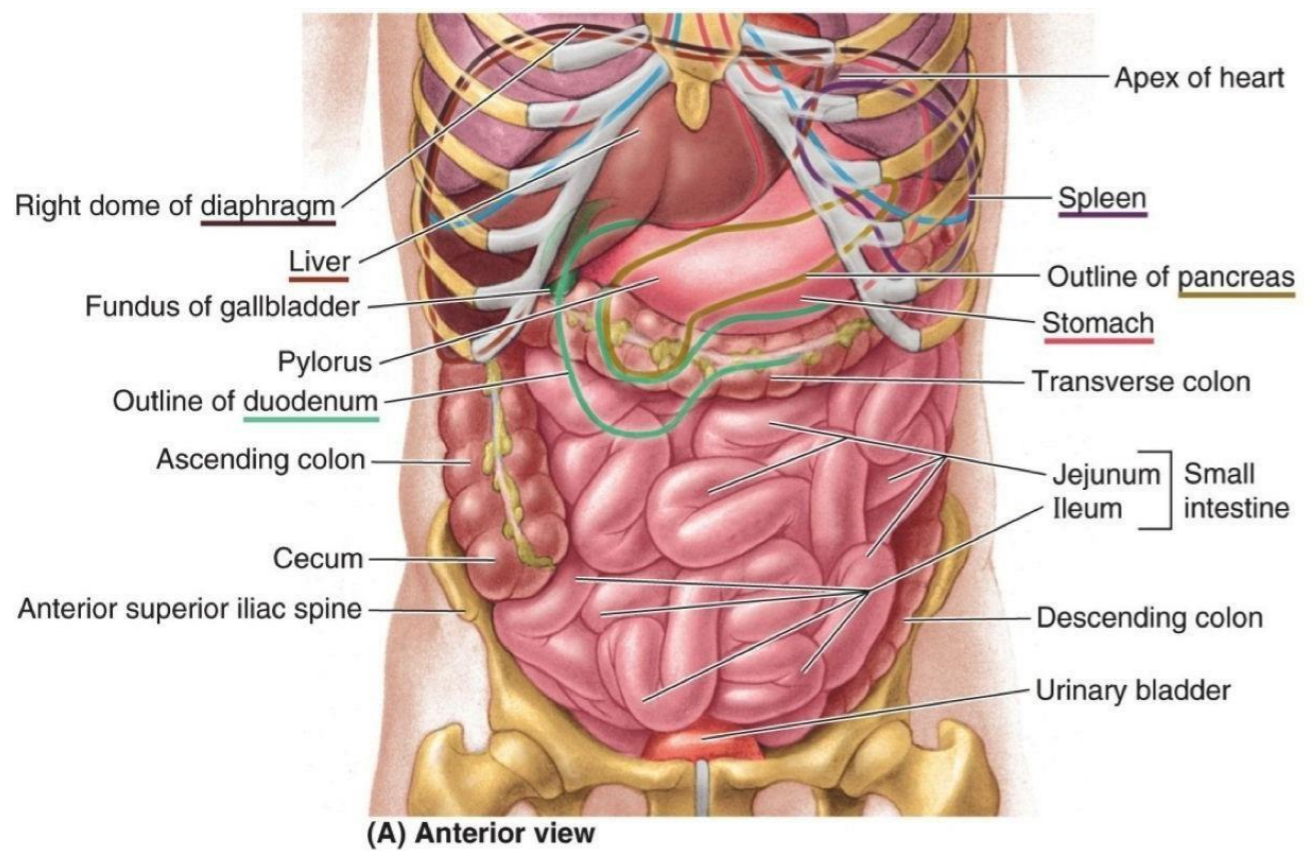
2. Omenta of the stomach



3. Relations of the stomach

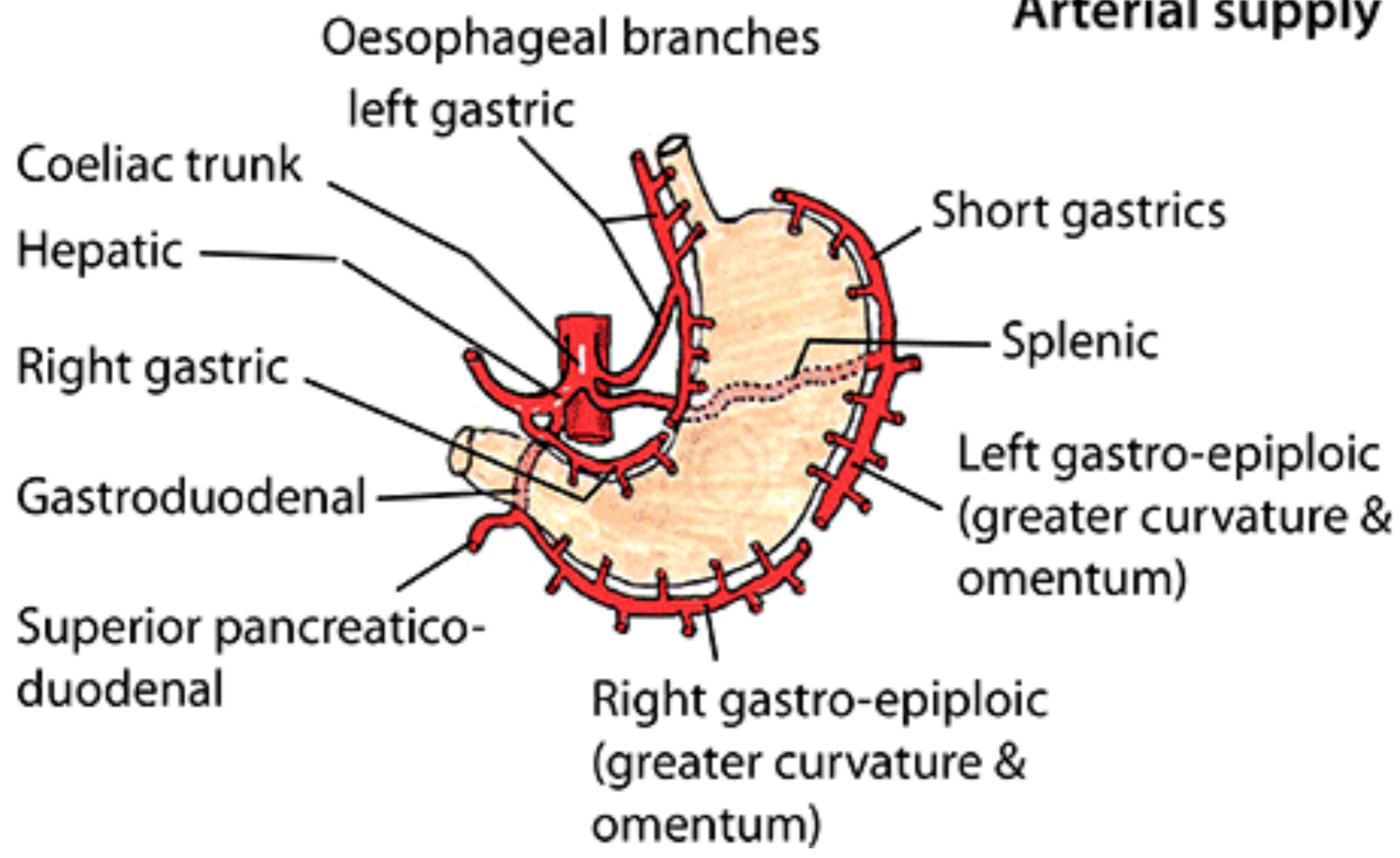
- Anterior- superior

- Posteriorly = stomach bed



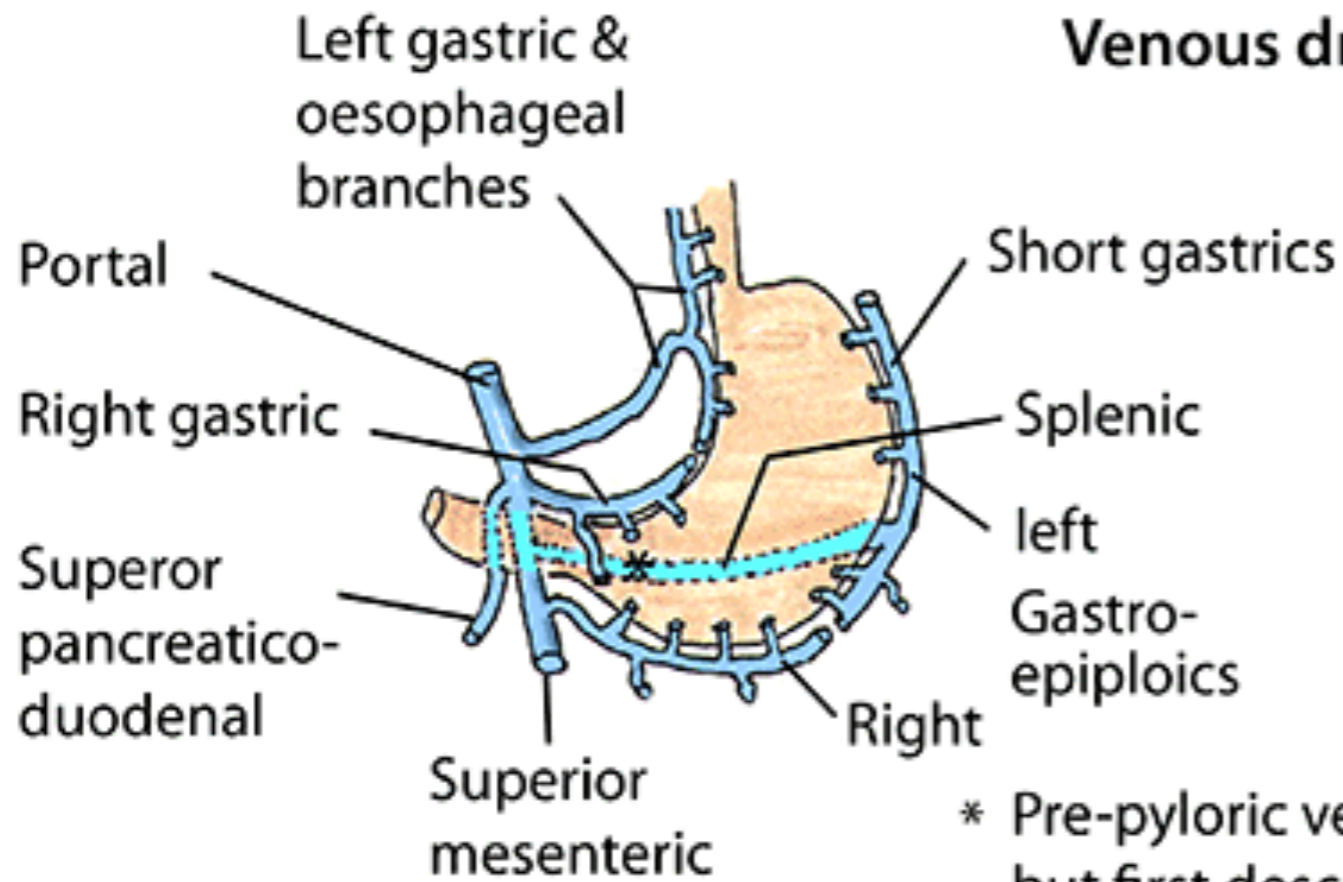
4. Blood supply of the stomach

Arterial supply

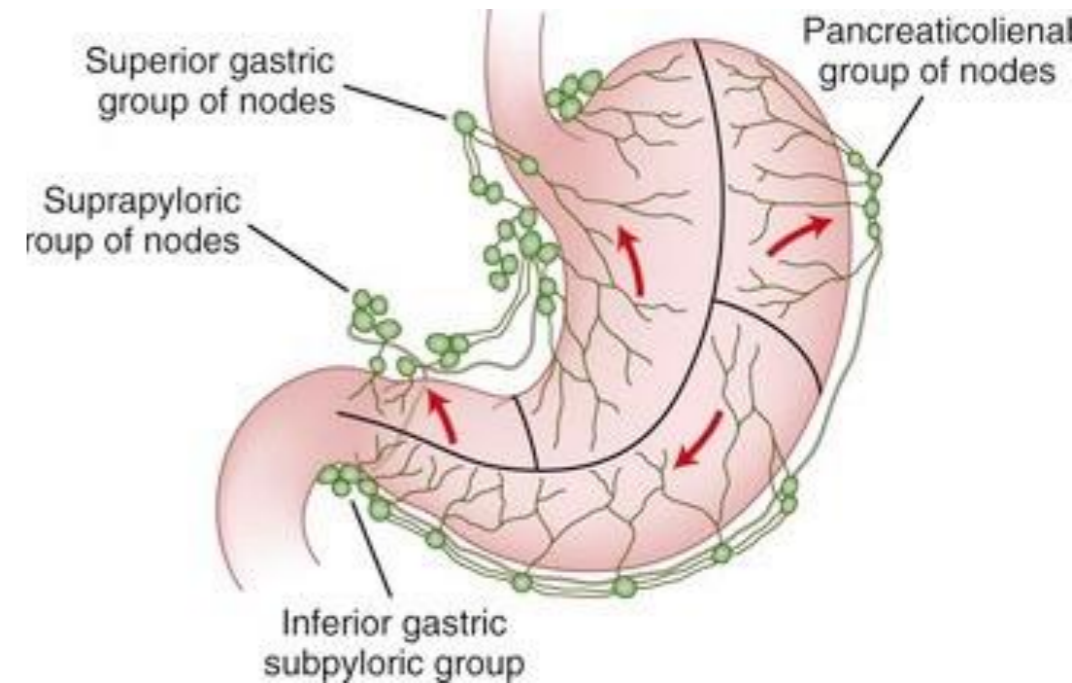


5. Venous and lymphatic drainage of the stomach

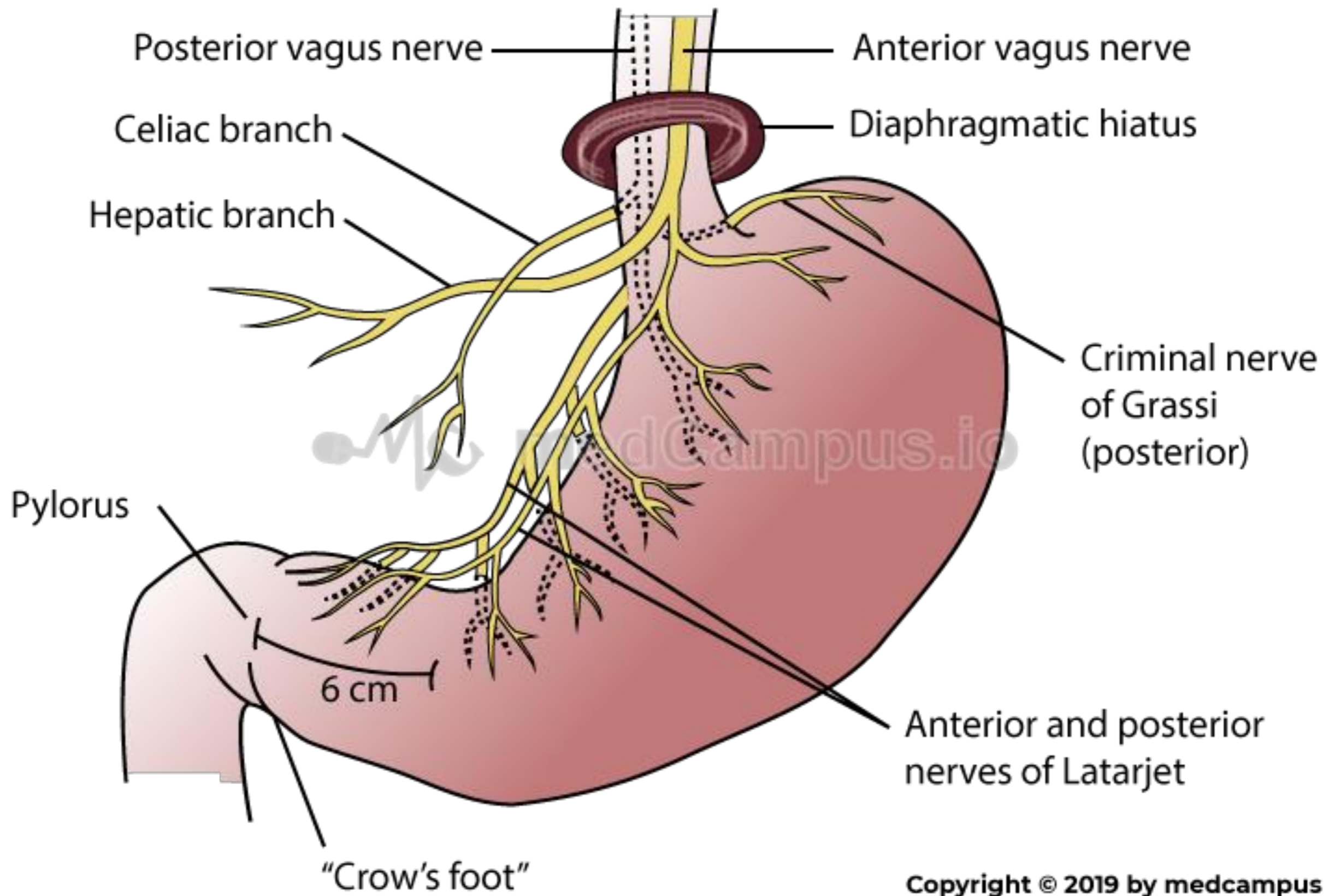
Venous drainage



* Pre-pyloric vein of Mayo but first described by Laterjet

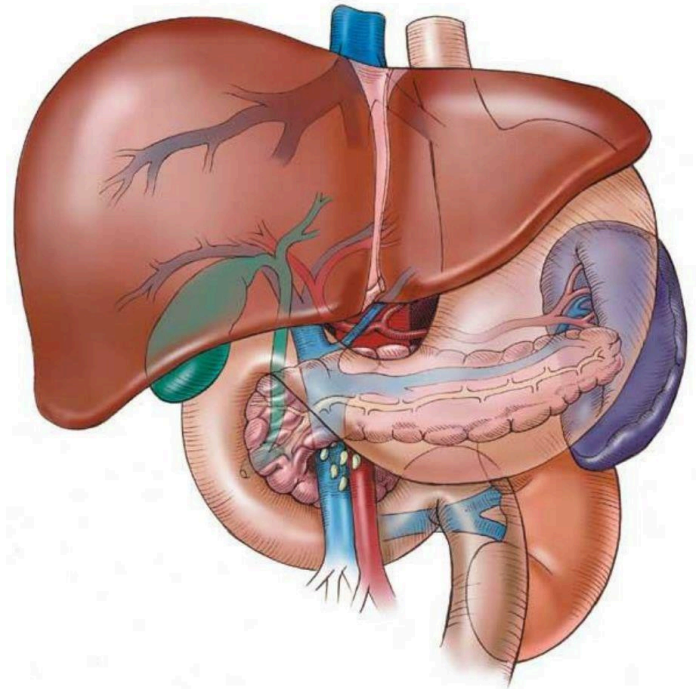


6. Nerve supply of the stomach



2- Posteriorly = stomach bed

- ◆ **The lesser sac** (When we eat a lot it will bloat to back because there is a space)
- ◆ **The Lt. crus of diaphragm.** (Origin of diaphragm)
- ◆ **The spleen.** (The most lateral organ behind the stomach, that's why it has anterior and Posterior relations)
- ◆ **The left suprarenal gland.**
- ◆ **The upper part of the left kidney.**
- ◆ **The splenic artery.** (Because it is on the upper border of pancreas)
- ◆ **The body of pancreas.**
- ◆ **The transverse mesocolon.**
- ◆ **The transverse colon.**



BLOOD SUPPLY

◆ The blood supply of the stomach comes from celiac trunk which is a branch of abdominal aorta at the level of T12 or L1.

◆ It gives 3 branches:

1- Left gastric artery (in lesser Omentum) that gives esophagus and supplies the stomach.

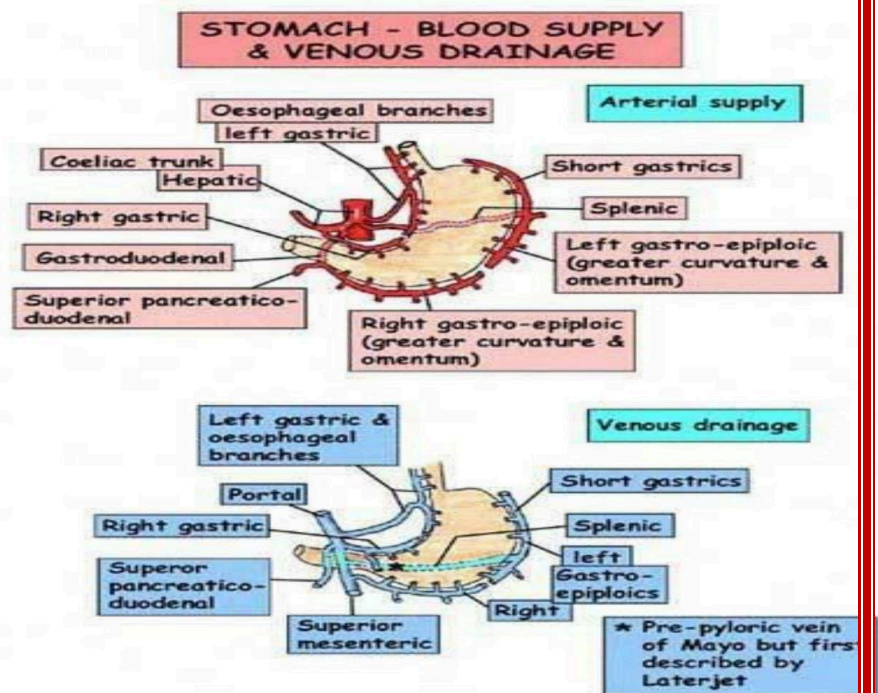
2- Splenic artery "Tortuous", Go to spleen, gives Short gastric and left gastroepiploic.

tortuous means that the artery has a winding or twisting course rather than running in a straight line.

3- Hepatic artery gives right gastric, gastroduodenal, and right gastro – epiploic.

Summary

The blood supply of the stomach: Two gastric artery (L,R), Two Gastro-epiploic(L,R), short gastric, all of them originate from Celiac trunk



THE VENOUS DRAINAGE (WE WILL TALK ABOUT IT IN NEXT SLIDES)

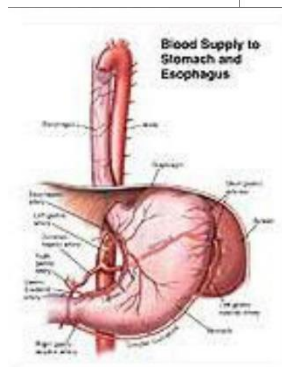
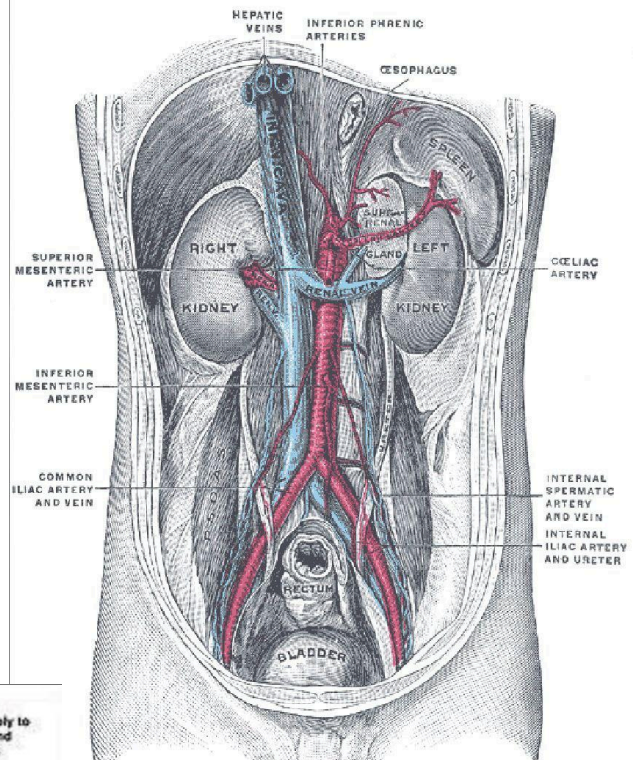
- ◆ All of them go to portal vein (look at the upper picture carefully).

BLOOD SUPPLY

- ◆ The arteries are derived from the branches of the celiac artery.
- ◆ The celiac trunk arises from the front of the abdominal aorta, and it's located at the level of T12 to L1 above the pancreas.
- ◆ Its 1 cm long.

Relations of celiac artery

- ◆ On each side : celiac ganglia+ lymphatic nodes
- ◆ Crus of diaphragm and lumbar nerves
- ◆ Its Branches for foregut
- ◆ Main distribution:
- ◆ Lt.gastric.a
- ◆ Splenic.a
- ◆ Hepatic.a



Important!!!

Left and right gastric both in lesser omentum

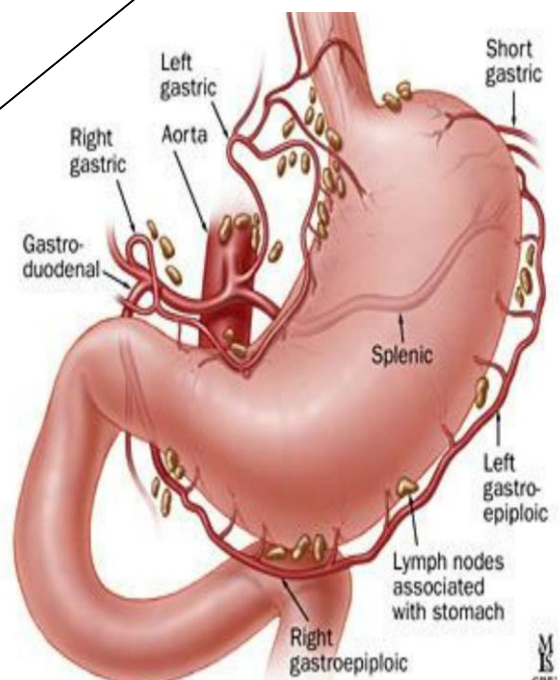
BLOOD SUPPLY FOR STOMACH

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

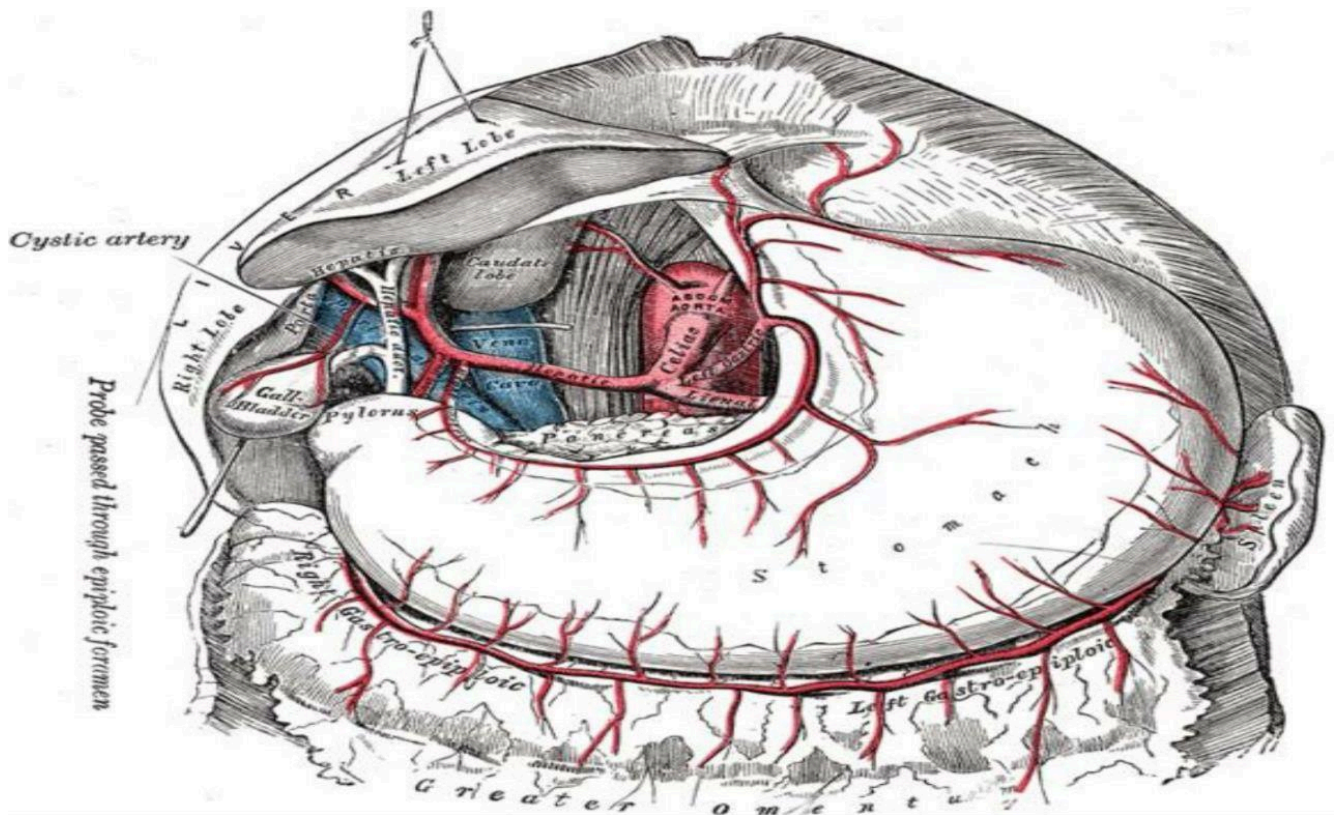
2- The right gastric artery

- ◆ 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.



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



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

Important!!!

5- The right gastroepiploic artery

Left and right gastroepiploic both in greater omentum

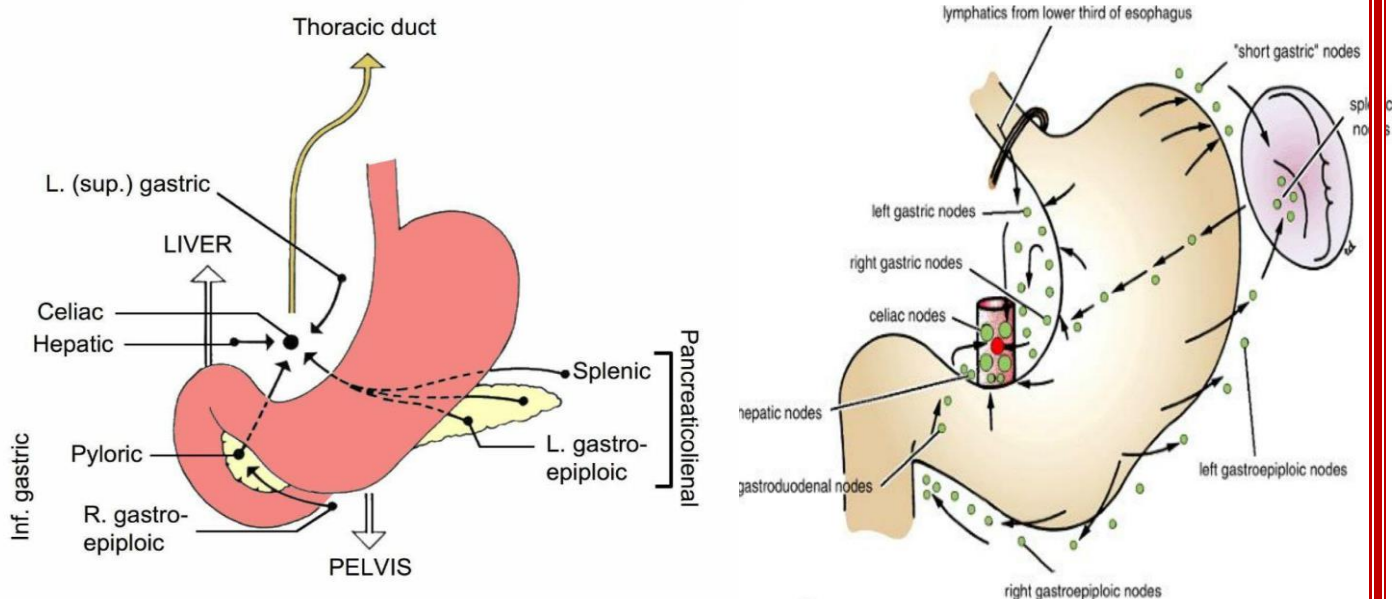
- ◆ arises from the gastroduodenal branch of the hepatic artery
- ◆ It passes to the left and supplies the stomach along the lower part of the greater curvature in the greater omentum.

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.



NERVE SUPPLY FOR THE STOMACH

- ◆ 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 the stomach comes from vagus (anterior and posterior)
- ◆ 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

◆ The posterior vagal trunk

◆ mainly from the right vagus nerve

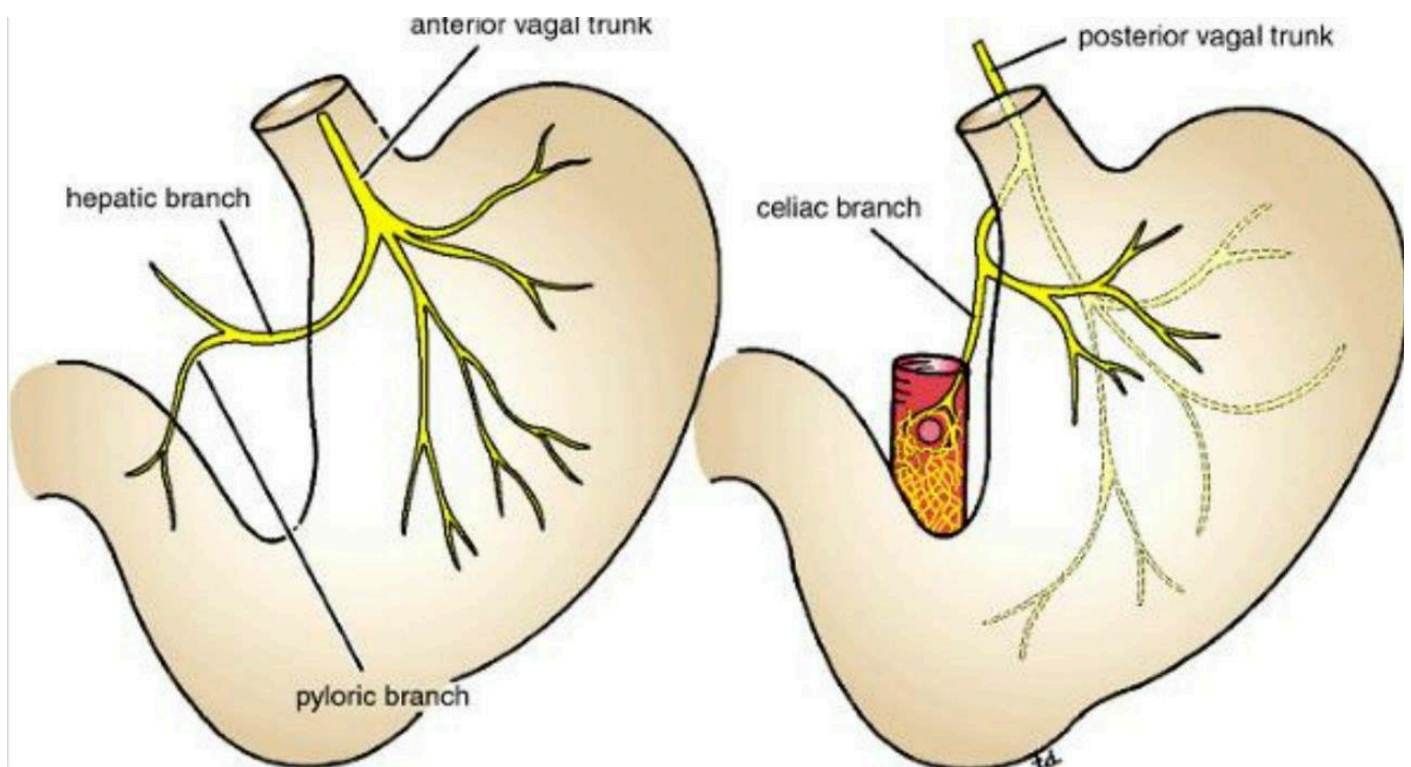
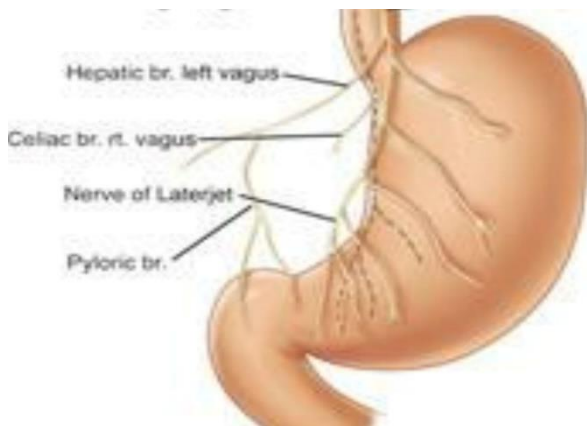
◆ **Distribution :**

1- mainly the posterior wall of the stomach.

2- Ant. Wall of body of stomach

3- Celiac branch → small (and large) intestine to the distal third of the transverse **colon**
+ as far as to splenic flexure+ pancreas

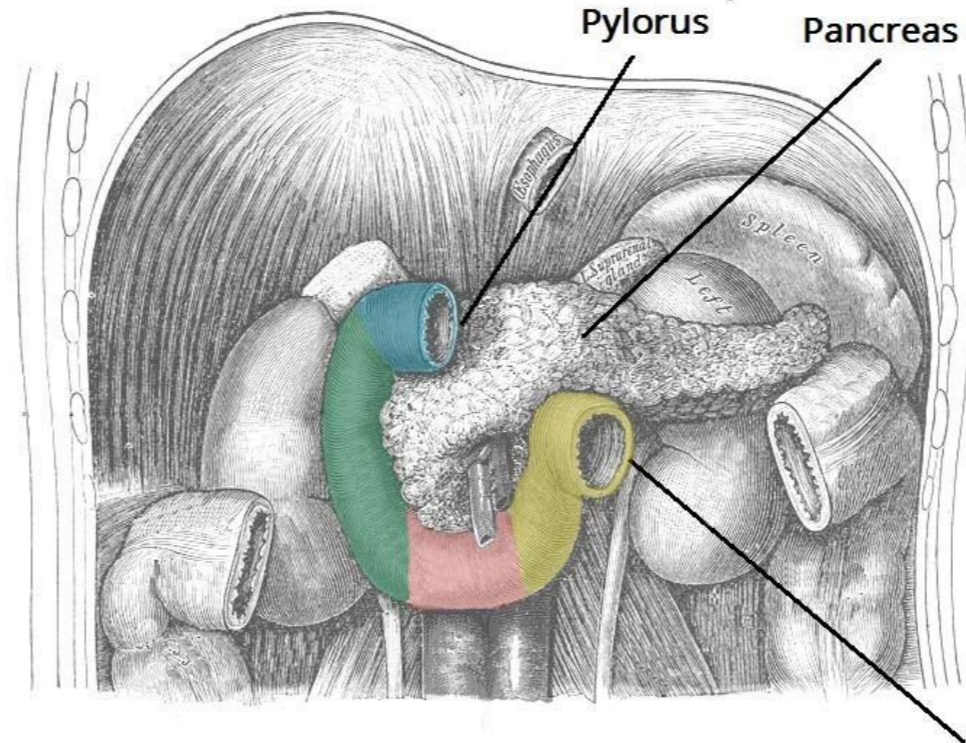
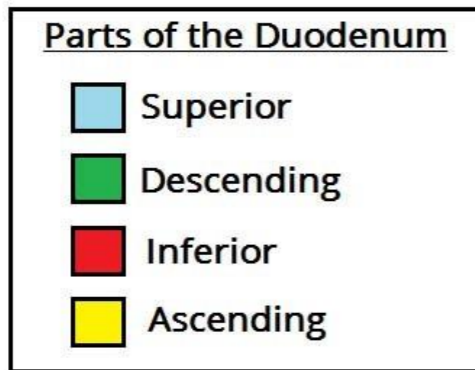
4- post. Nerve Laterjet → pylorus



✦ Duodenum.

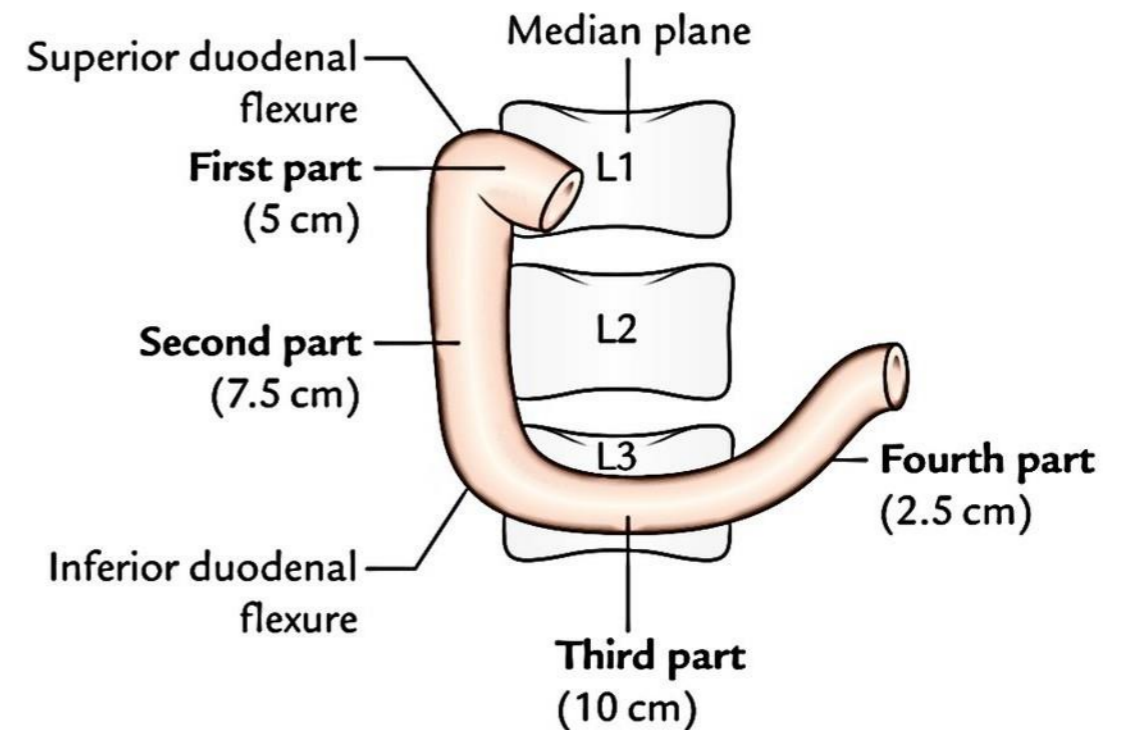
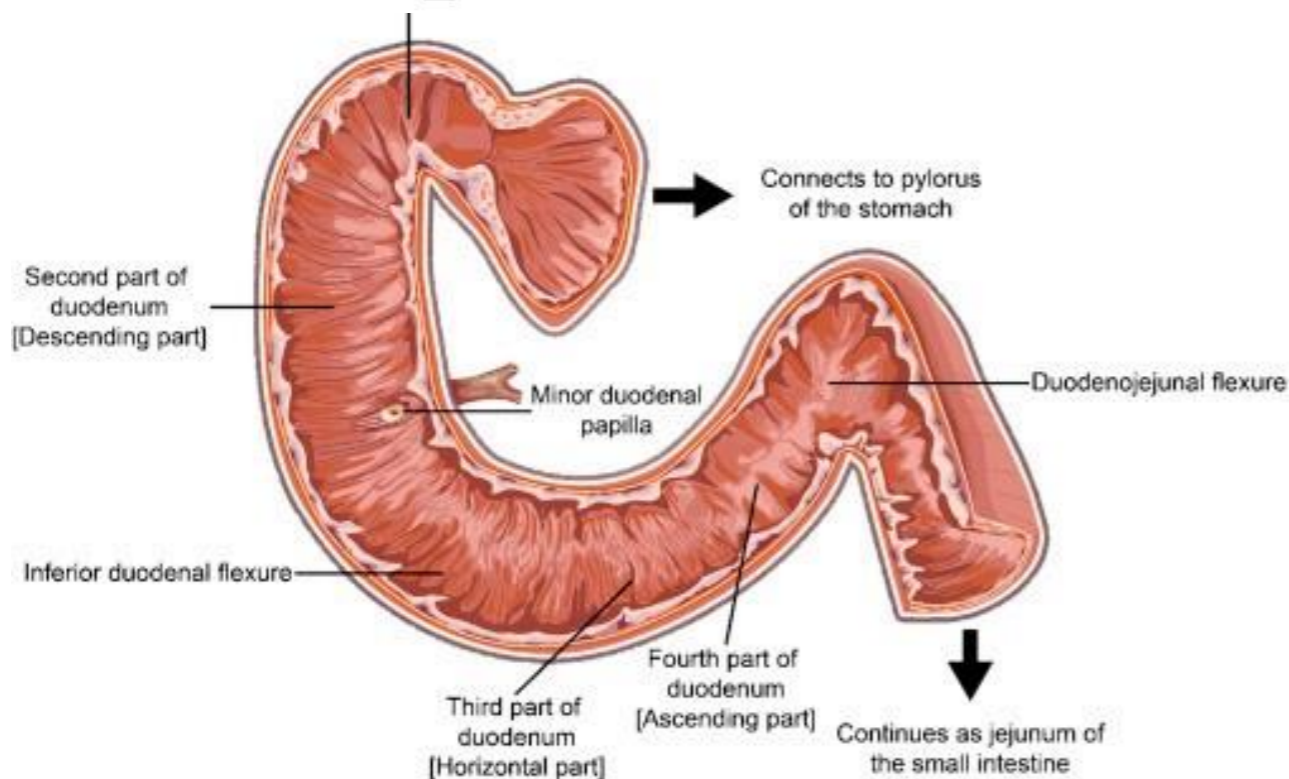
- The students should know and identify :
 1. Parts, Site and length of the duodenum
 2. Relations of the duodenum
 3. Blood supply of the duodenum
 4. Venous and lymphatic drainage of the duodenum

1. Parts, Site and length of the duodenum



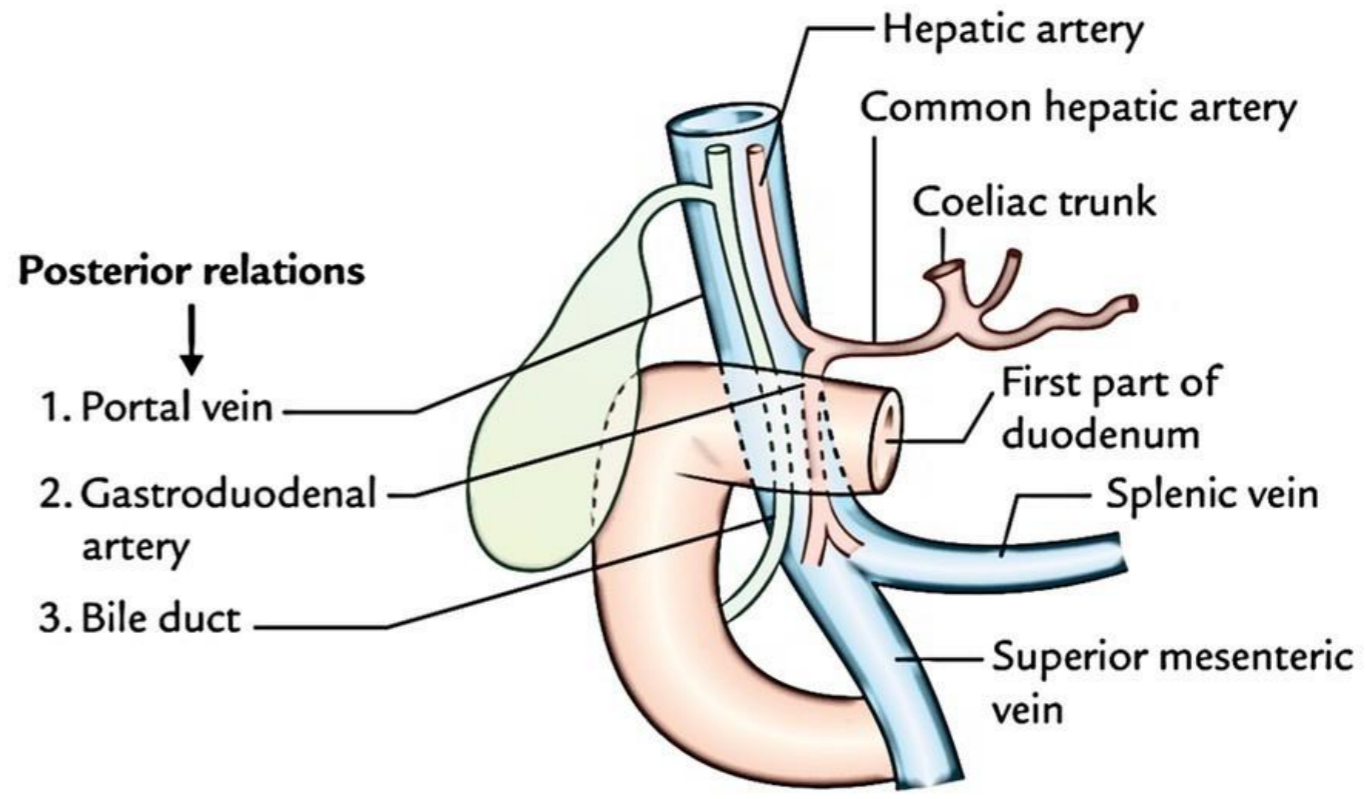
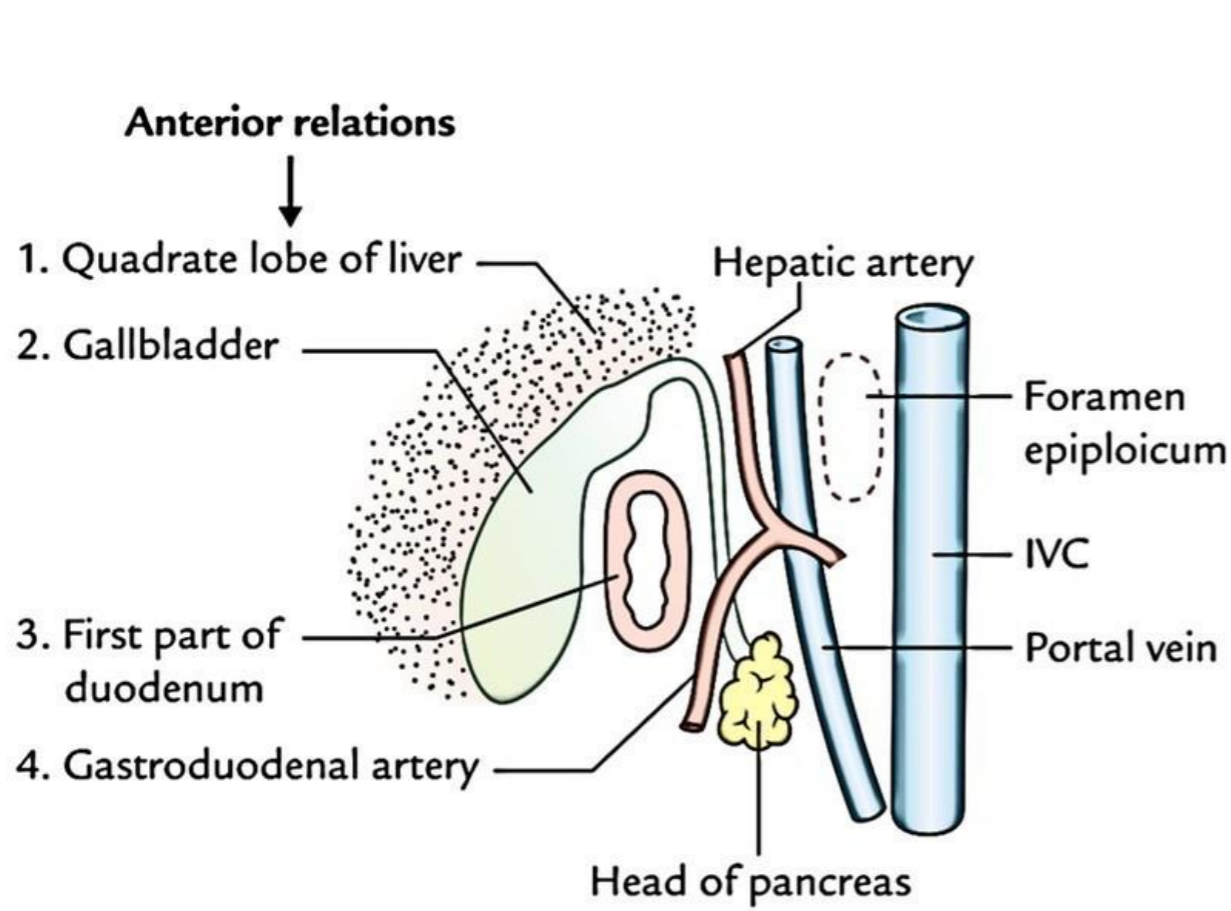
Duodenojejunal Junction

Superior duodenum
First part of duodenum
© teachmeanatomy
The #1 Applied Human Anatomy Site on the Web.



2. Relations of the duodenum

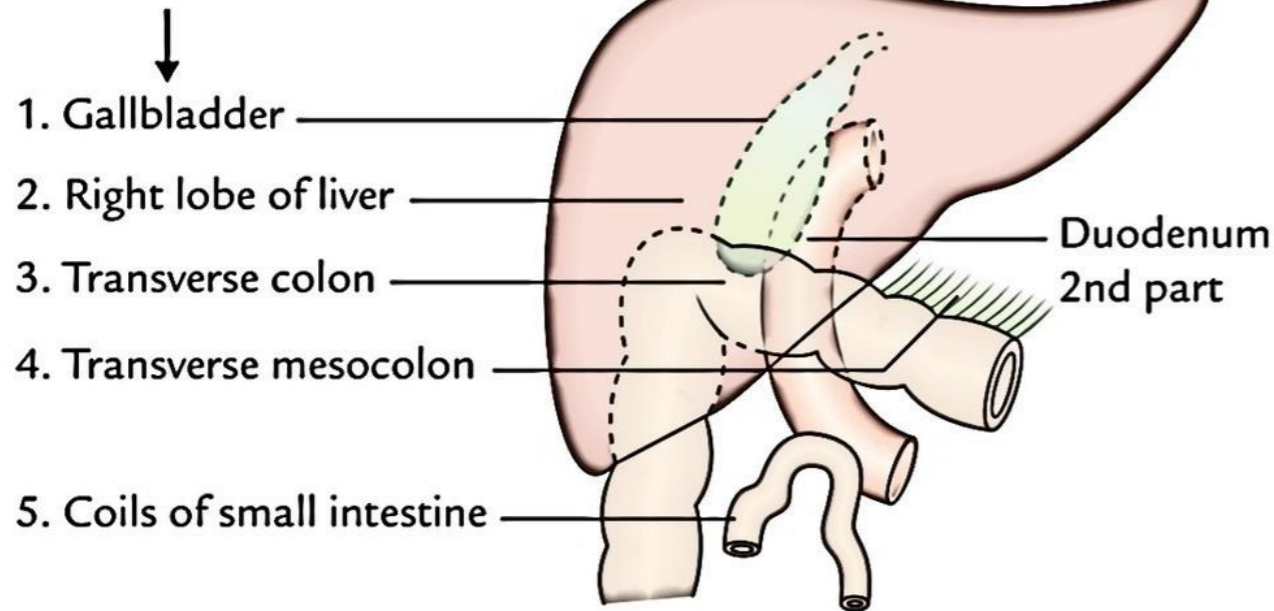
- Relations of the First Part of the Duodenum



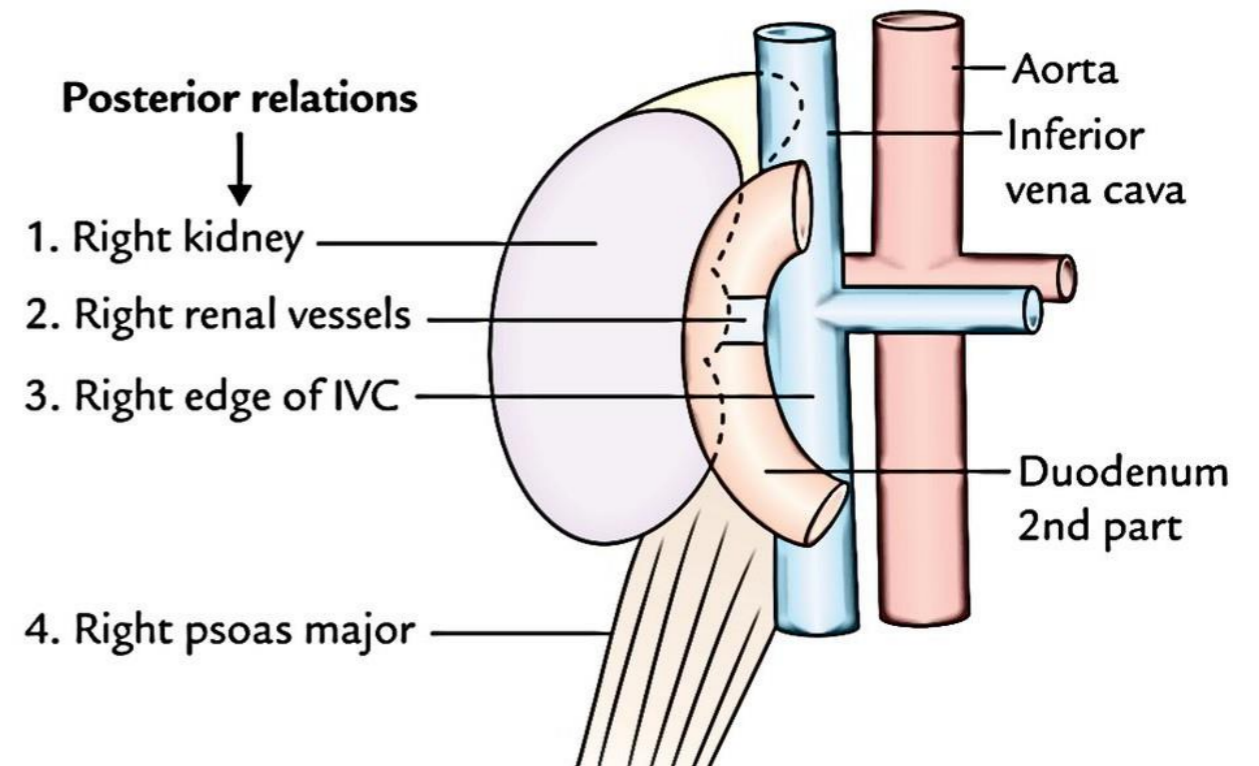
2. Relations of the duodenum

- Relations of the Second Part of the Duodenum

Anterior relations

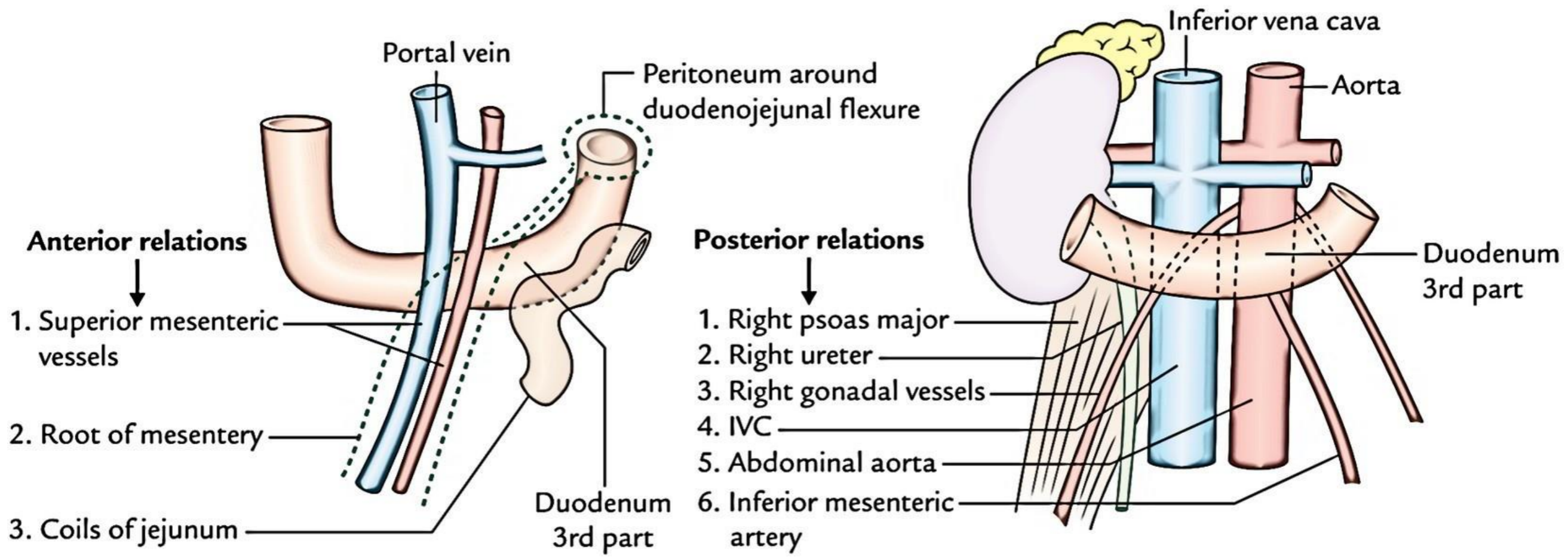


Posterior relations



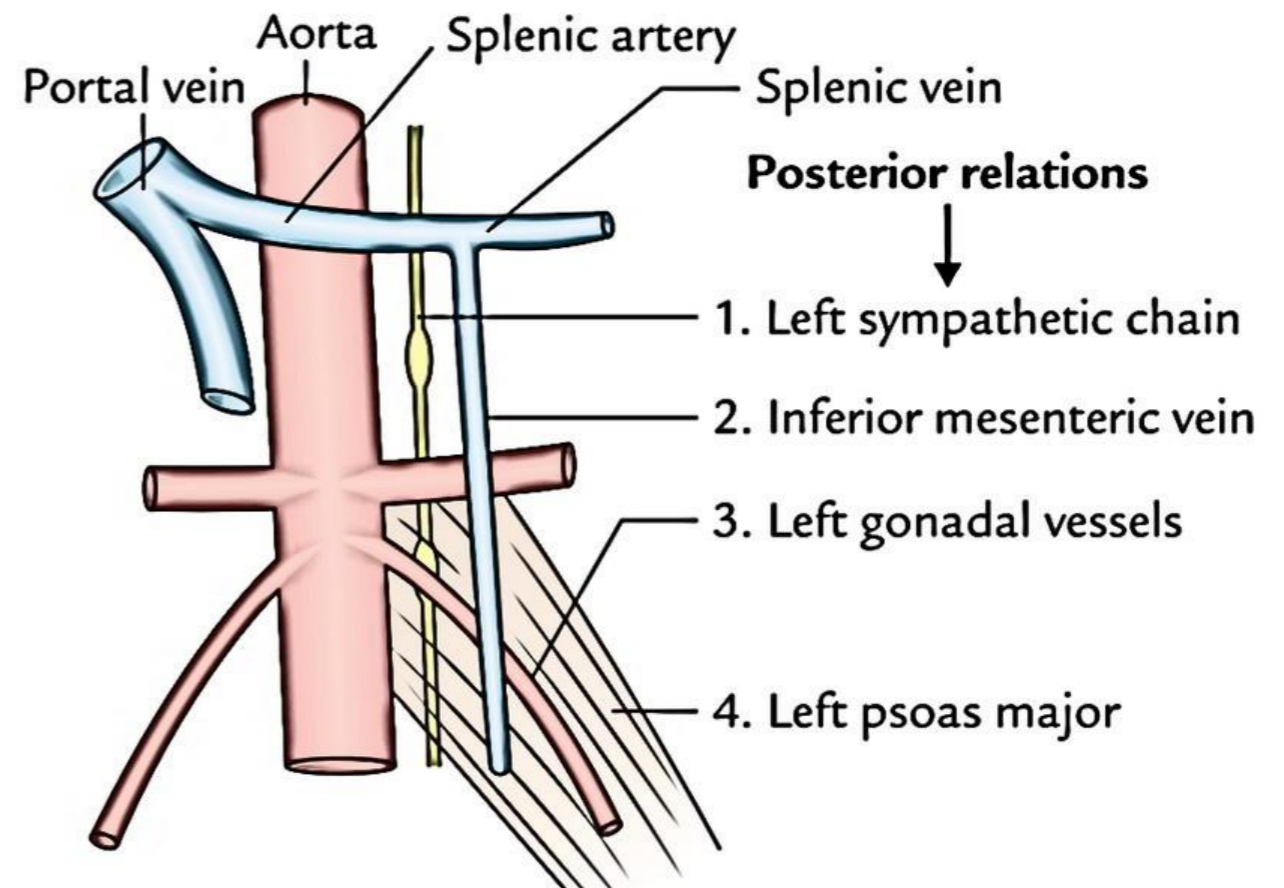
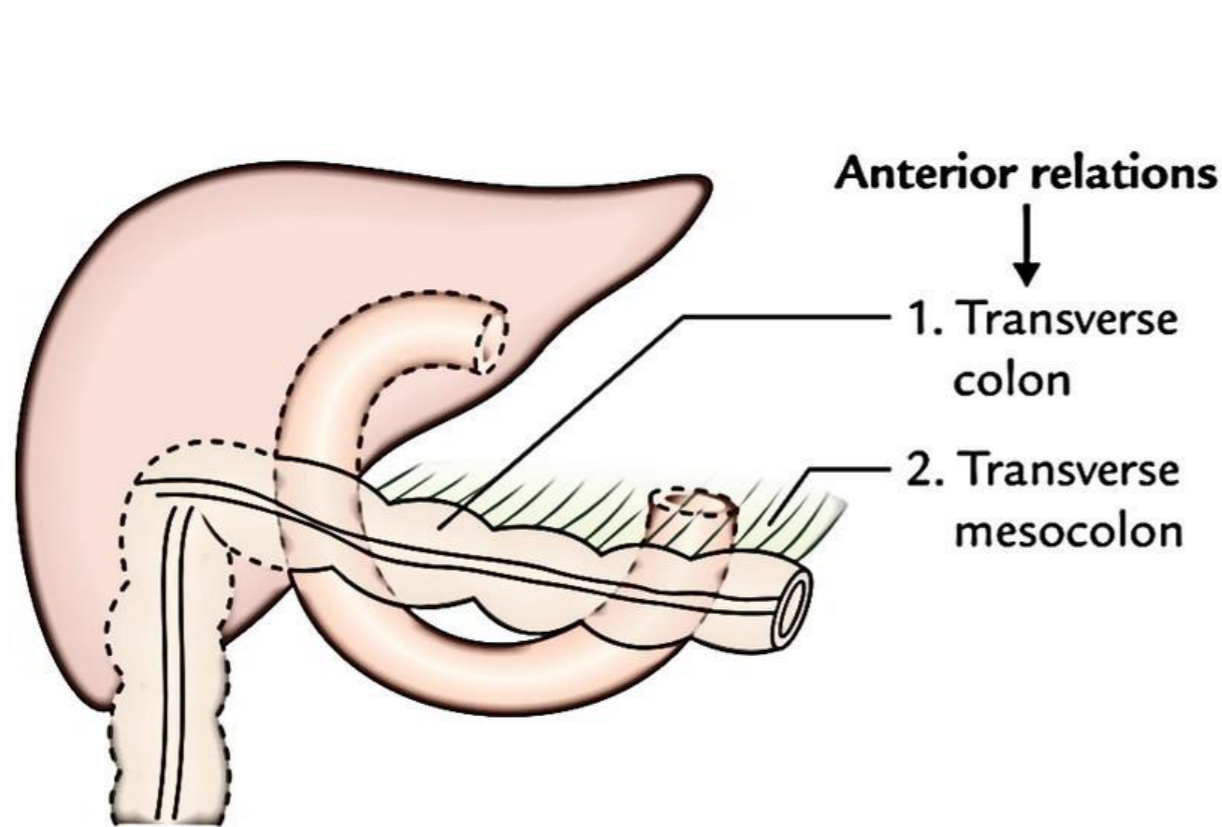
2. Relations of the duodenum

• Relations of the Third Part of the Duodenum



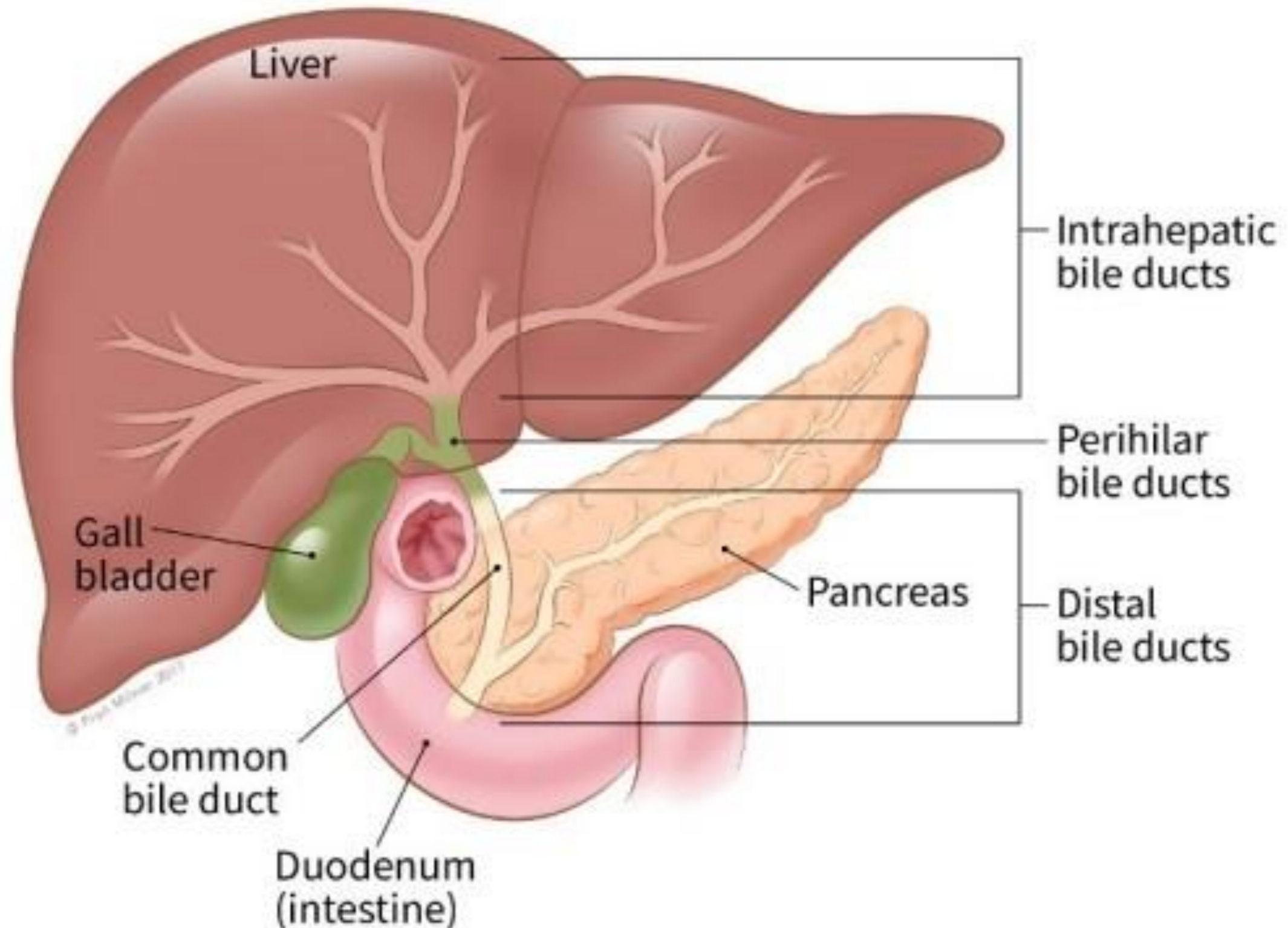
2. Relations of the duodenum

- Relations of the Fourth Part of the Duodenum

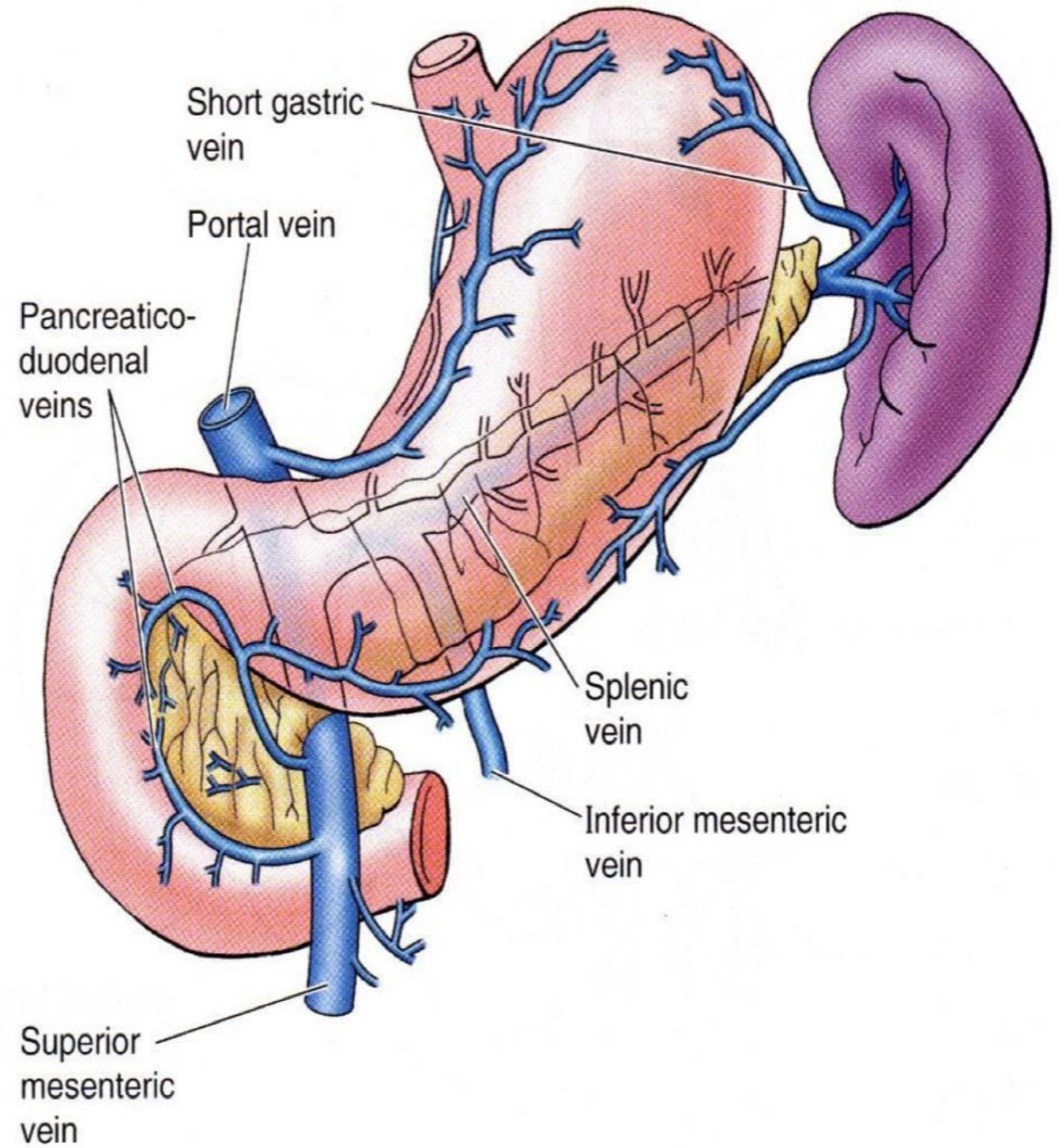
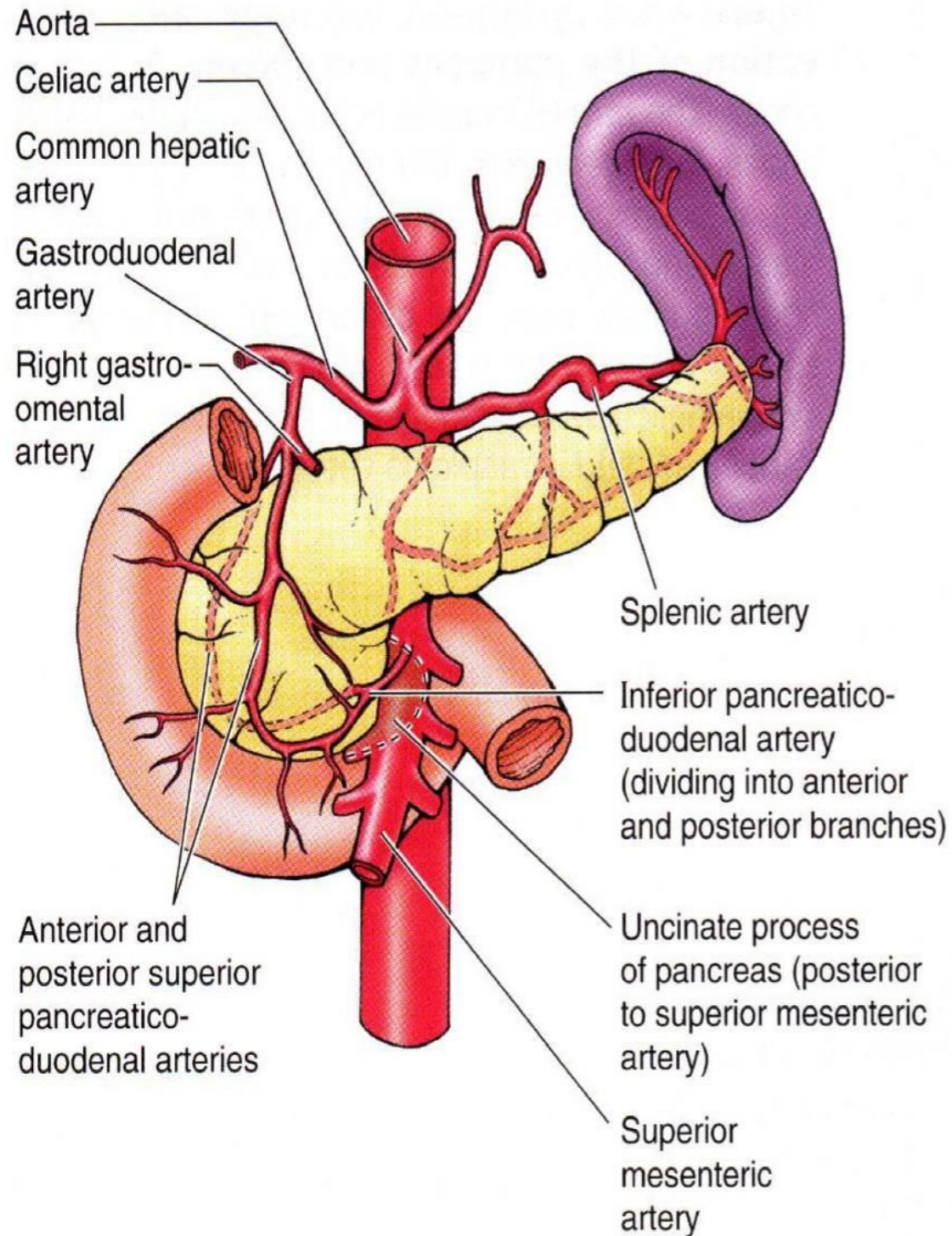


2. Relations of the duodenum

- Relations of pancreas and bile ducts to the Duodenum



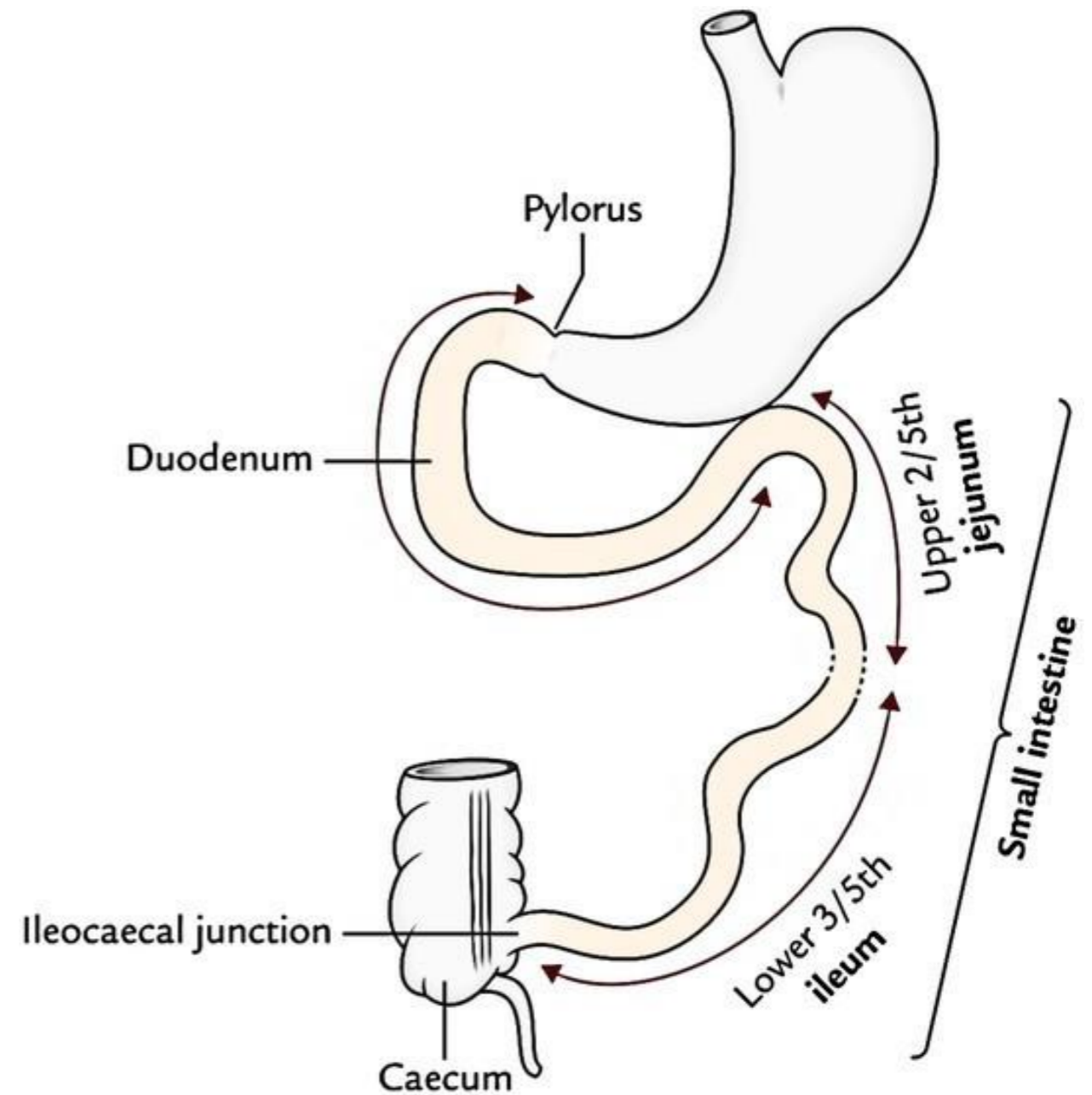
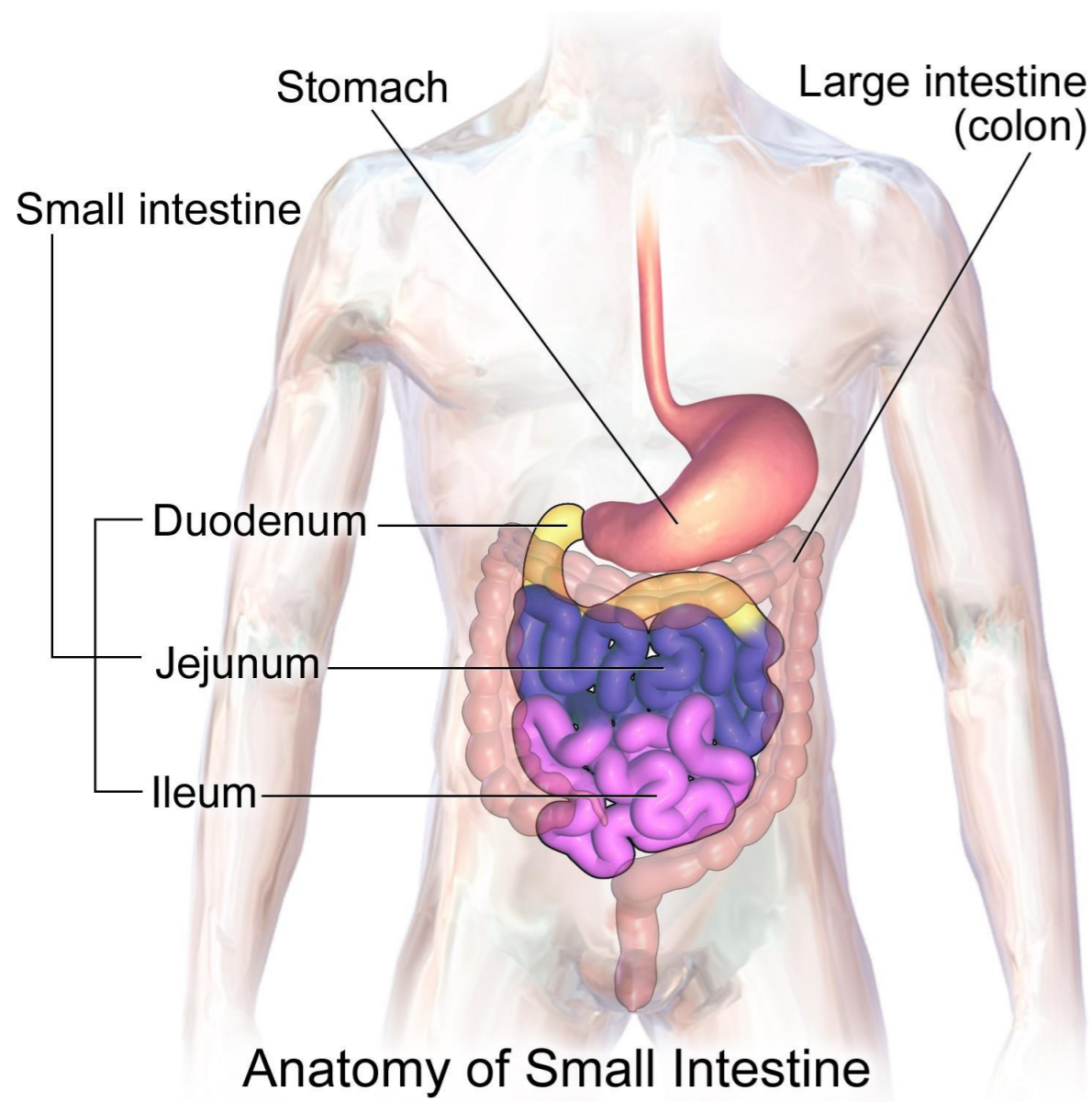
3. Blood supply and Venous drainage of the duodenum



✦ Jejunum and Ileum.

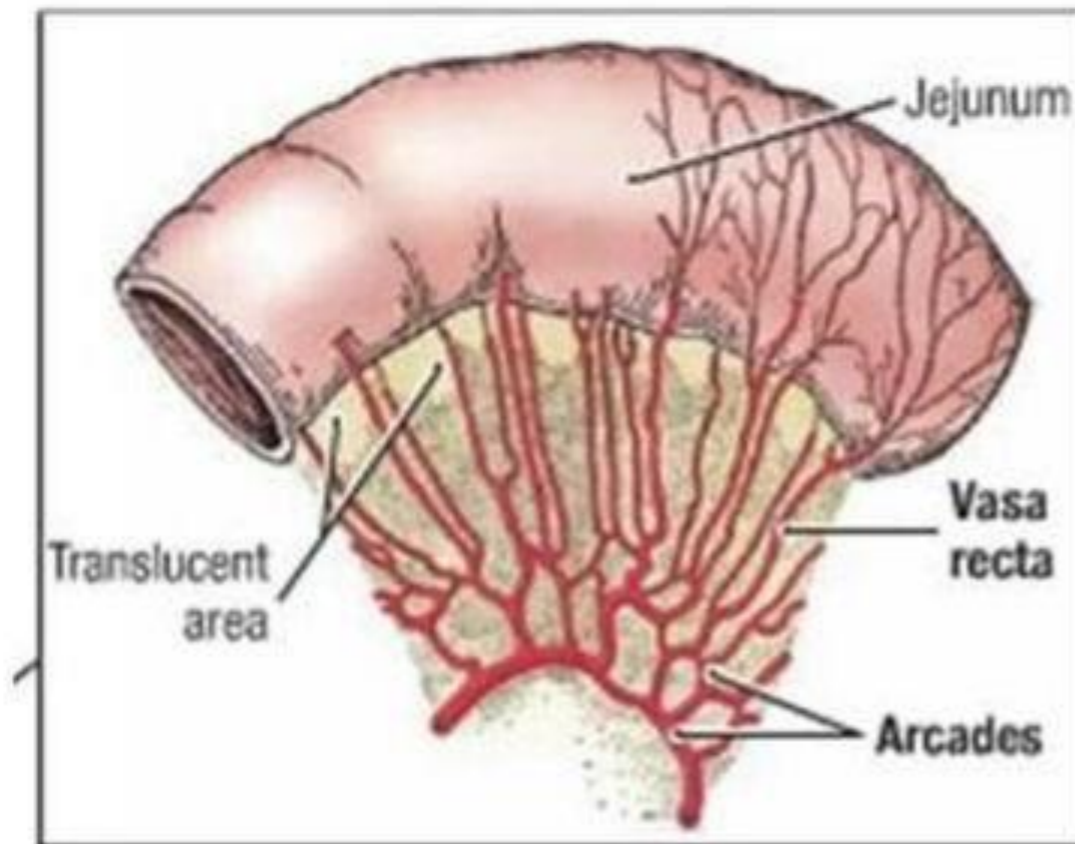
- The students should know and identify :
 1. Site and length of the Jejunum and Ileum.
 2. Differences between the Jejunum and Ileum.
 3. Blood supply of the Jejunum and Ileum.
 4. Venous and lymphatic drainage of Jejunum and Ileum.

1. Site and length of the Jejunum and Ileum



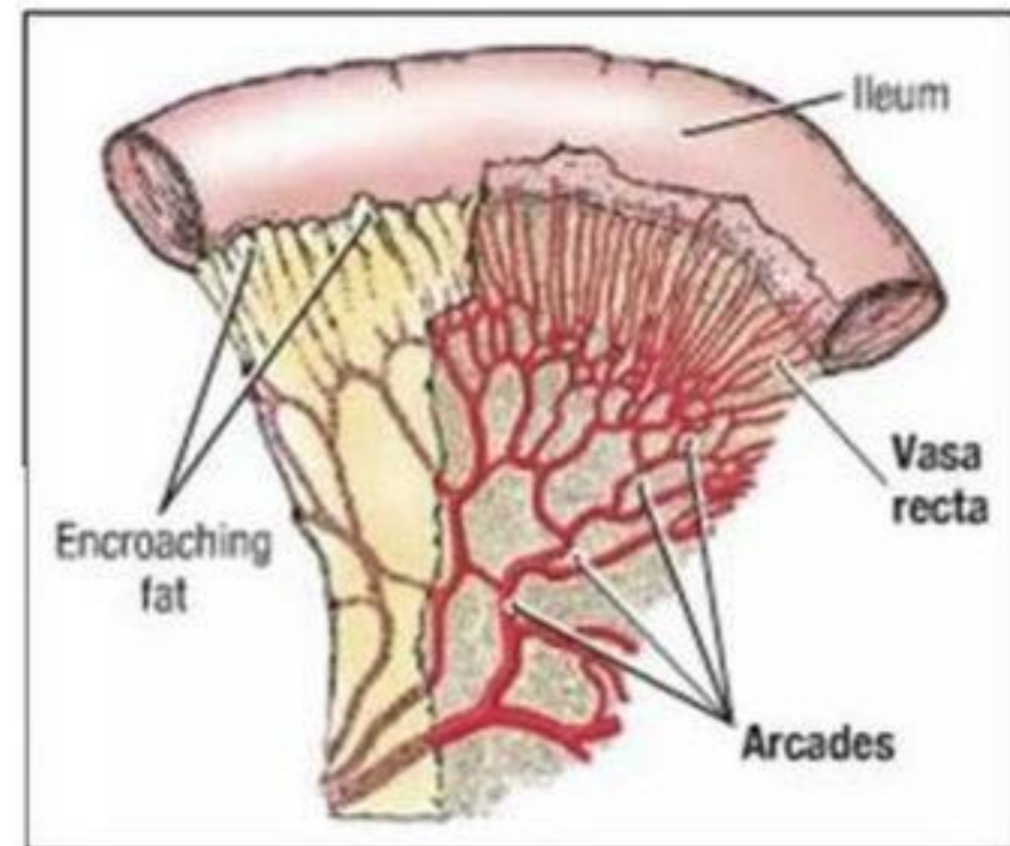
2. Differences between the Jejunum and Ileum

Jejunum



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

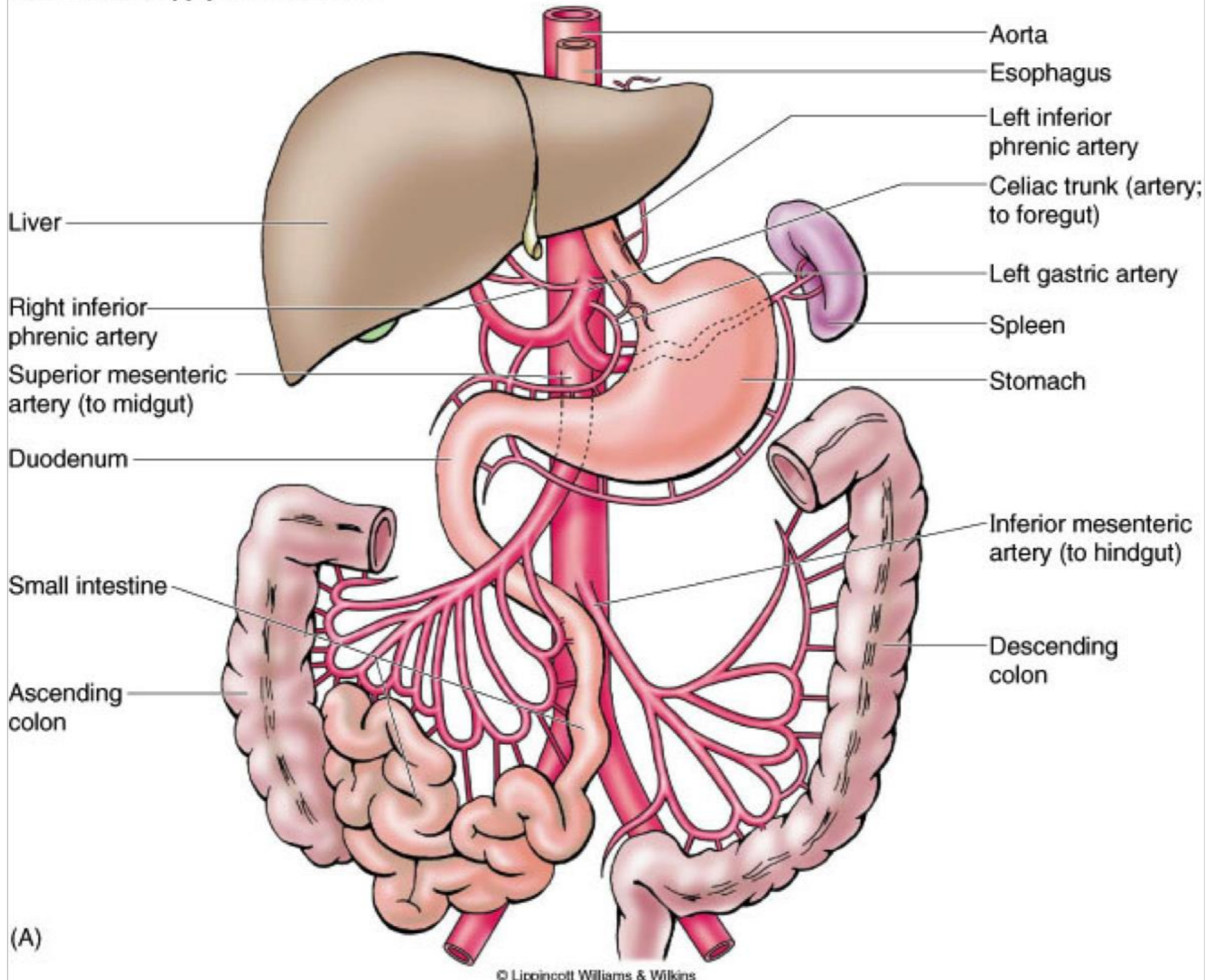
Ileum



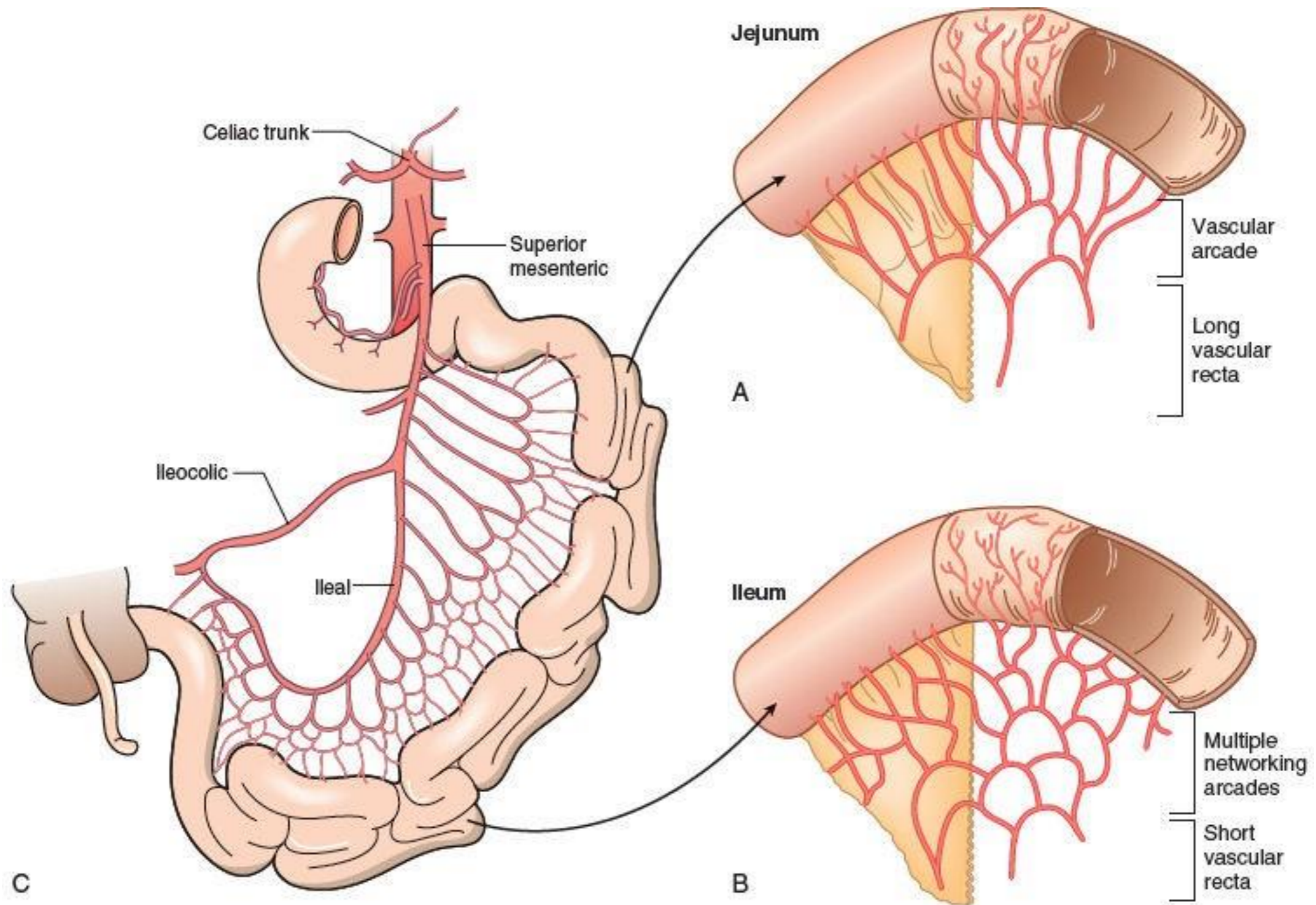
- More complex arterial arcades
- Shorter Vasa Recta
- Less plicae circulares, thinner less folded
- Fat present in mesentery

3. Blood supply of the Jejunum and Ileum

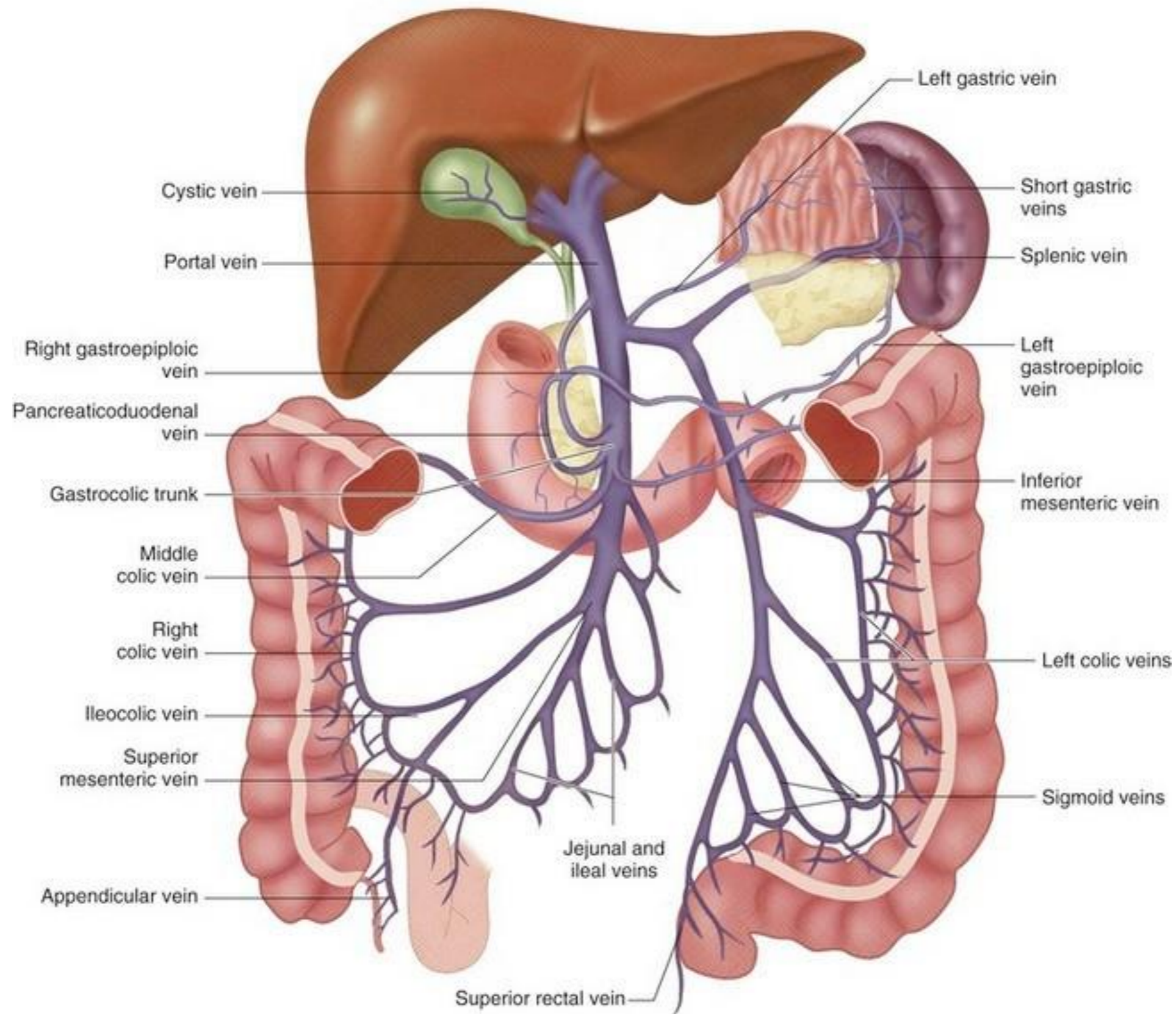
2.28. Arterial supply of the GI tract.



3. Blood supply of the Jejunum and Ileum



4. Venous drainage of the Jejunum and Ileum

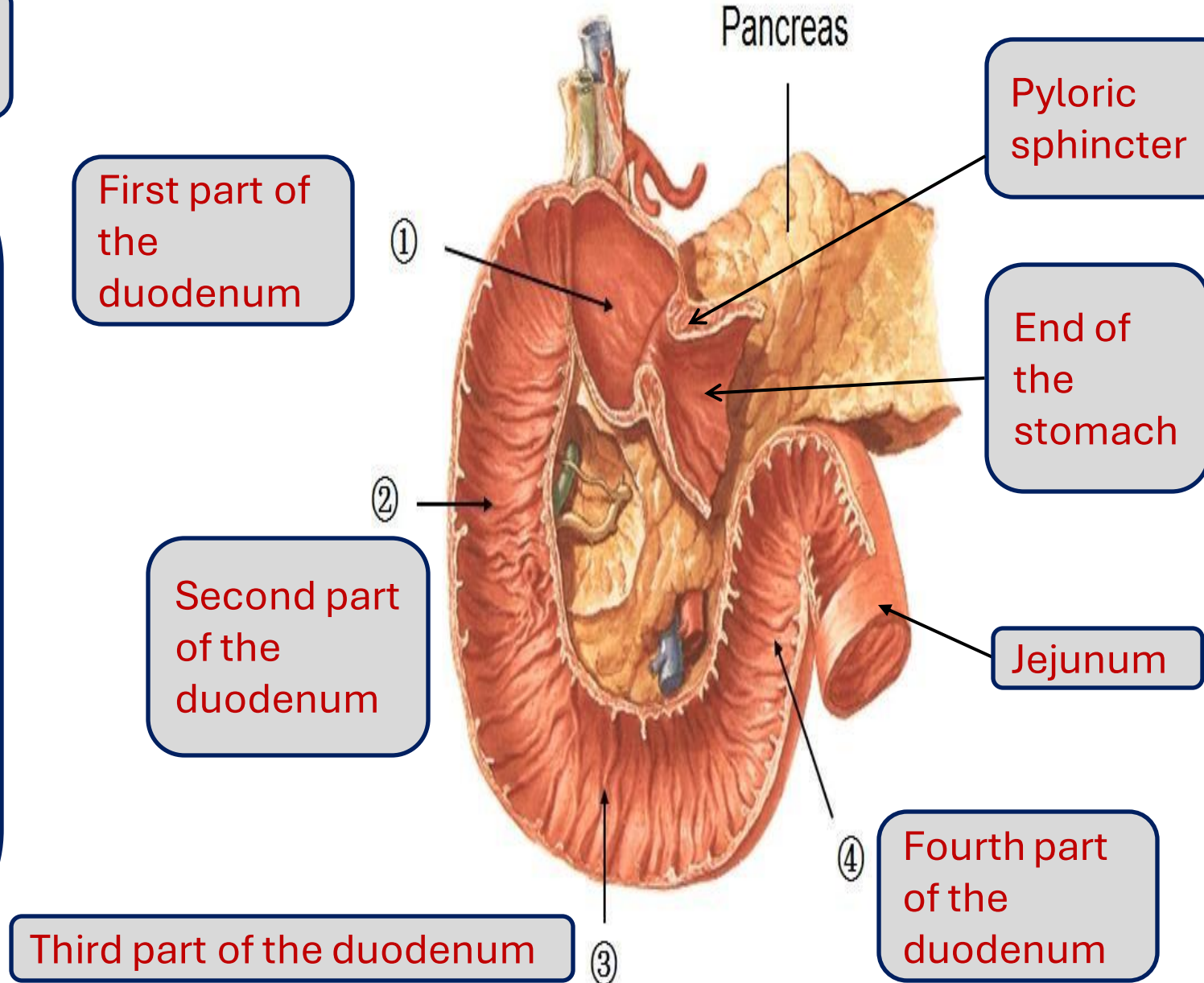


Duodenum

The duodenum is divided into 4 parts: the first, second, third and the fourth part.

We can notice from the picture on the right that:

- 1) The first part of the duodenum is running upwards and to the right.
- 2) The second part of the duodenum is vertical and descending.
- 3) The third part of the duodenum is horizontal.
- 4) The fourth part (last part/ last inch) of the duodenum continues downwards as the jejunum.



- The duodenum is a c-shaped
- Concave tube
- About 10 inches (about 25 cm) in length.
- It joins the stomach to the jejunum.
- It curves around the head of the pancreas to the left and backwards.
- It is important because it receives the opening of the bile and pancreatic ducts.

The concavity is directed backwards to the left

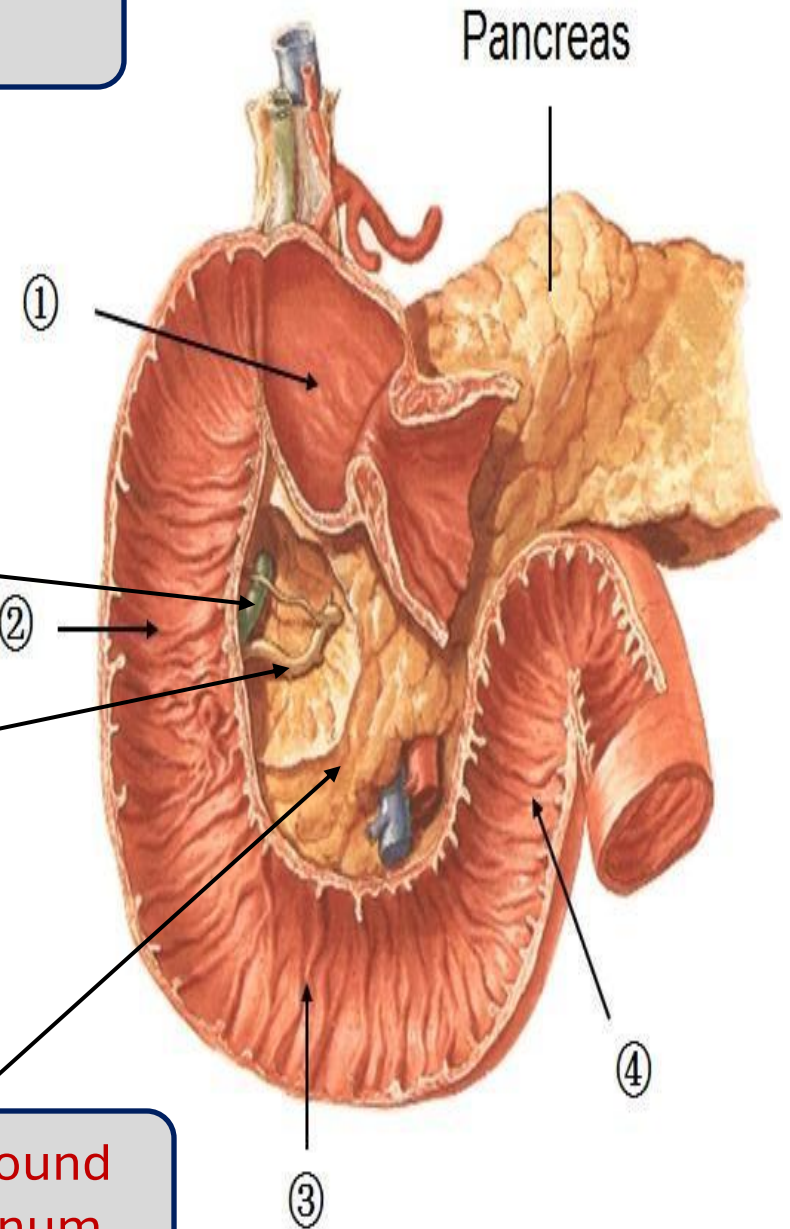
But the length of the small intestine as a whole is 6 meters

Common bile duct

Pancreatic duct

The common bile duct and the pancreatic duct converge into one duct → Which opens in the 2nd part of the duodenum

The head of the pancreas is found in the concavity of the duodenum



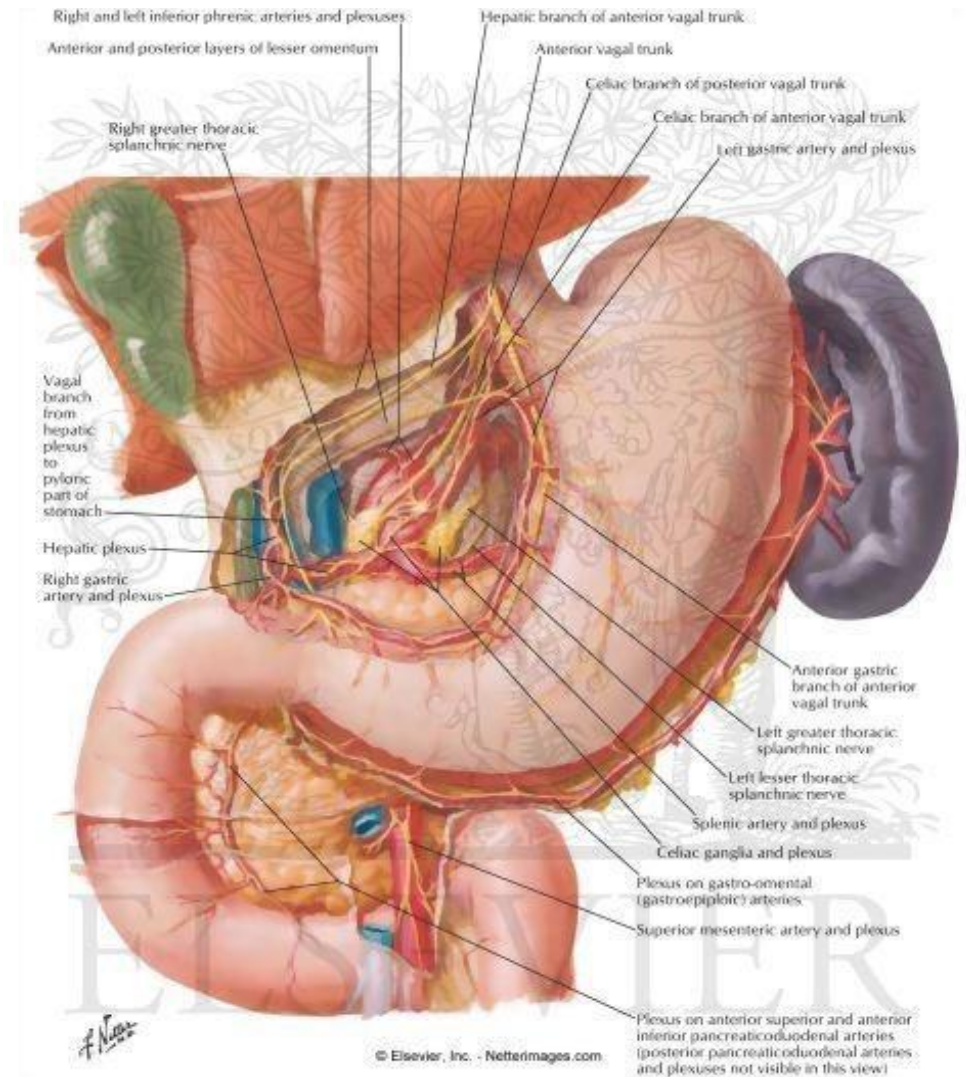
- Most of the duodenum is retroperitoneal except the 1st inch & last inch.

Be careful!

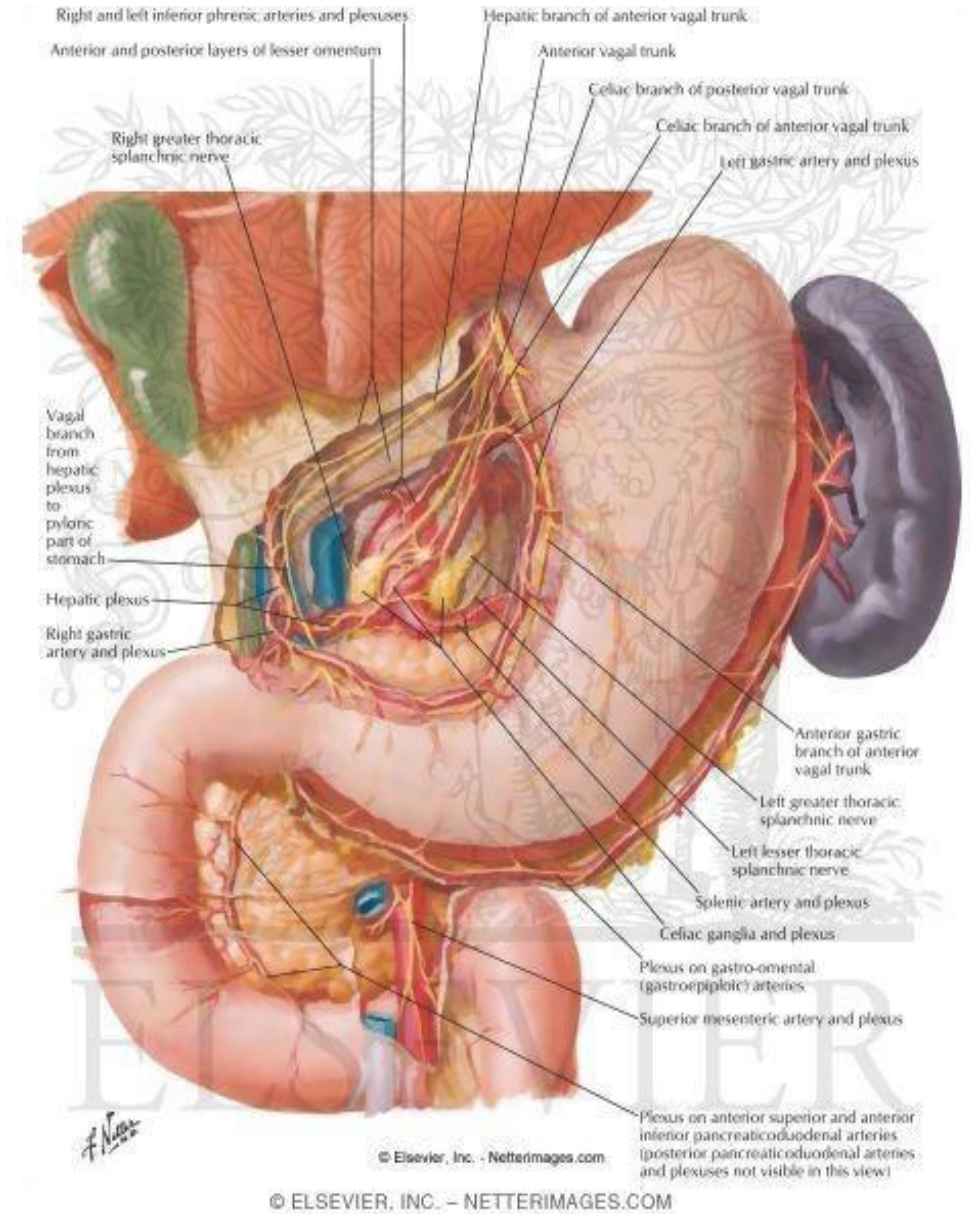
The first and the last inches of the duodenum are intraperitoneal not the first and last parts!!

Why are the 1st and the last inches of the duodenum intraperitoneal?

- ➔ The 1st inch of the duodenum is intraperitoneal because it is a direct continuation of the pylorus of the stomach (which is an intraperitoneal organ) as the 1st inch of the duodenum is surrounded by the extension of the lesser & the greater omentum (part of the peritoneum).
- ➔ The last inch of the duodenum directly continues downwards as the jejunum (which is an intraperitoneal organ). Also, the peritoneum surrounding the jejunum has extensions which surround the last inch of the duodenum.



- This short segment (1st inch) has the lesser omentum on its upper border, the greater omentum on its lower border, and the lesser sac posterior to it.
- The duodenum extends from the pylorus to the jejunum.
- It is divided into 4 parts.

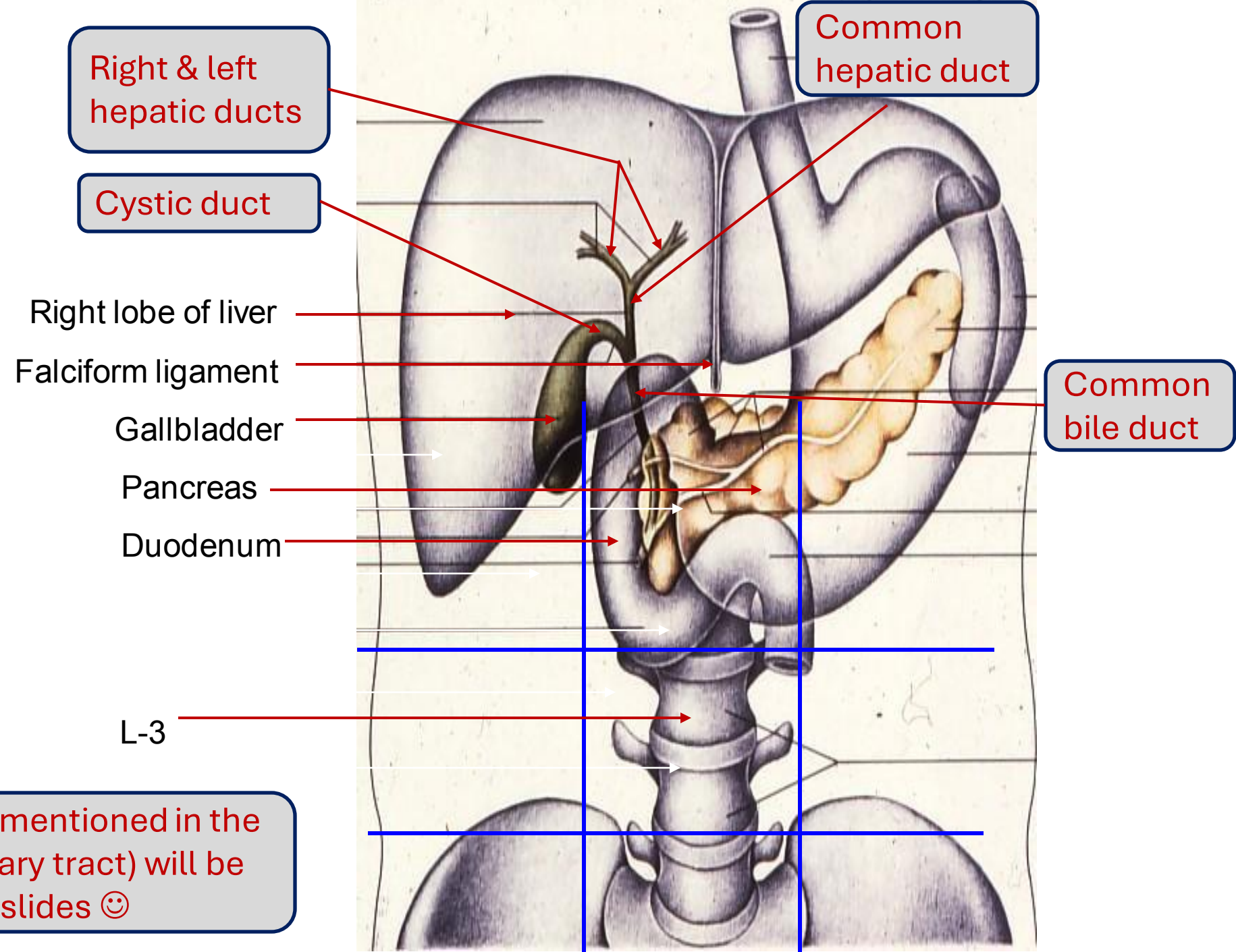


Site of duodenum

- The duodenum is situated in the **epigastric and umbilical regions**.
- For purposes of description, it is divided into four parts.

The doctor advised to pay attention to the anatomical relations between the pancreas, duodenum and the liver!

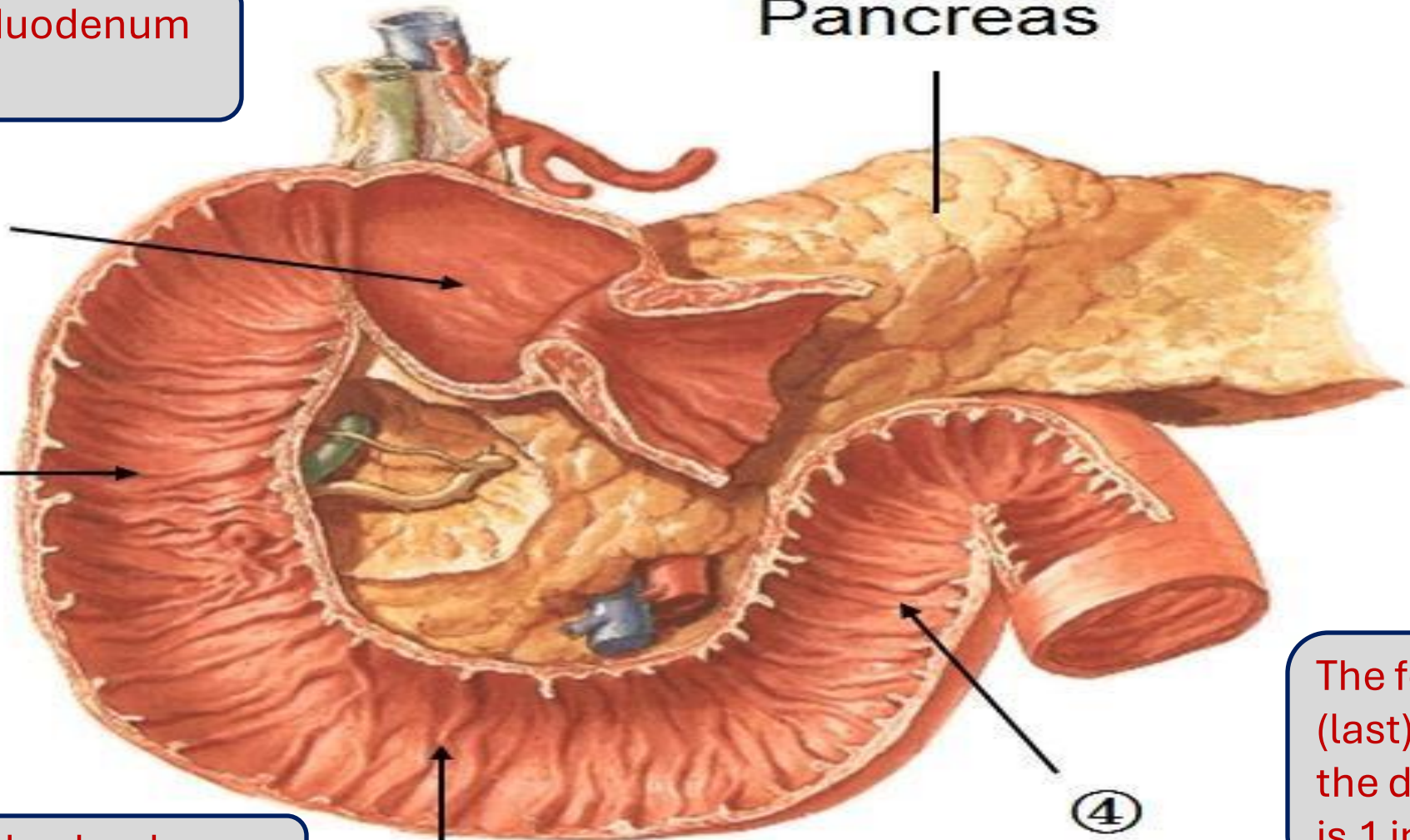
The structures the doctor mentioned in the image on the right (the biliary tract) will be explained in the following slides 😊



Parts of the duodenum & Their relations

The first part of the duodenum is 2 inches in length

①



Pancreas

The second part of the duodenum is 3 inches in length

②

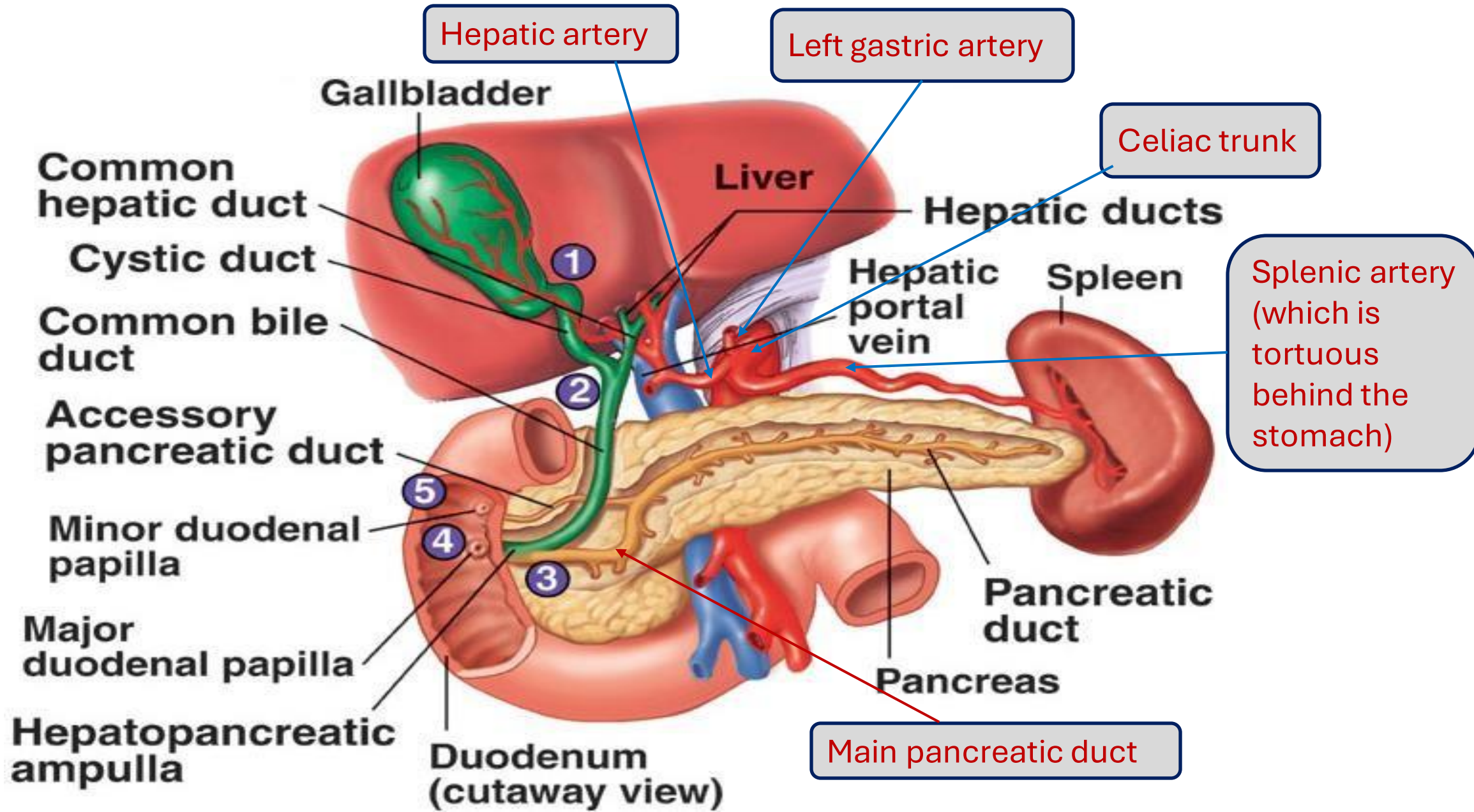
The third part of the duodenum is 4 inches in length

③

The fourth (last) part of the duodenum is 1 inch long

④

Parts of the duodenum & Their relations

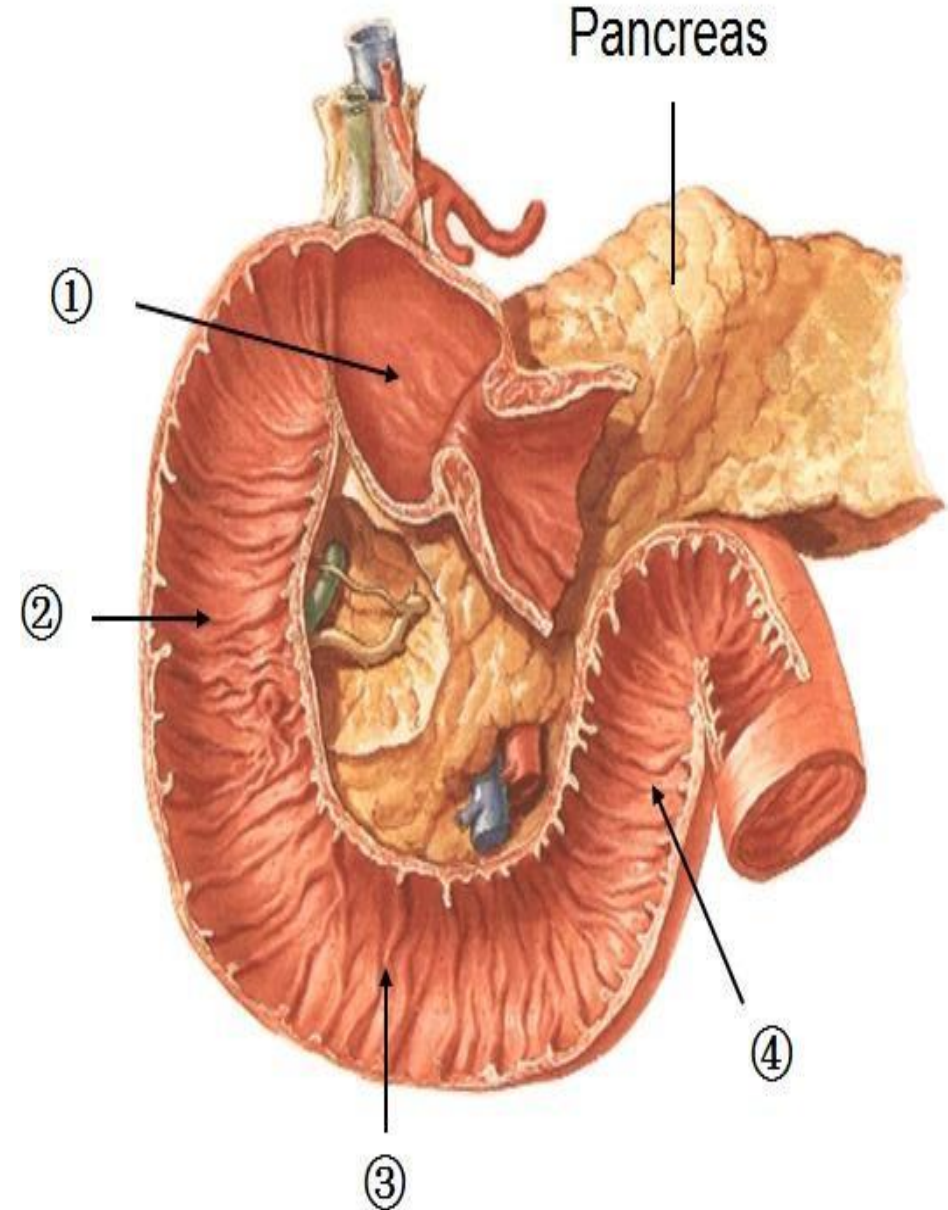


1st part of the Duodenum

The part directly after the pyloric sphincter

- The first part is 2 inches long.
- It begins from the pyloduodenal junction at the level of the transpyloric line.
- It runs upwards and backwards at the level of the 1st lumbar vertebra 1 inch to the right.

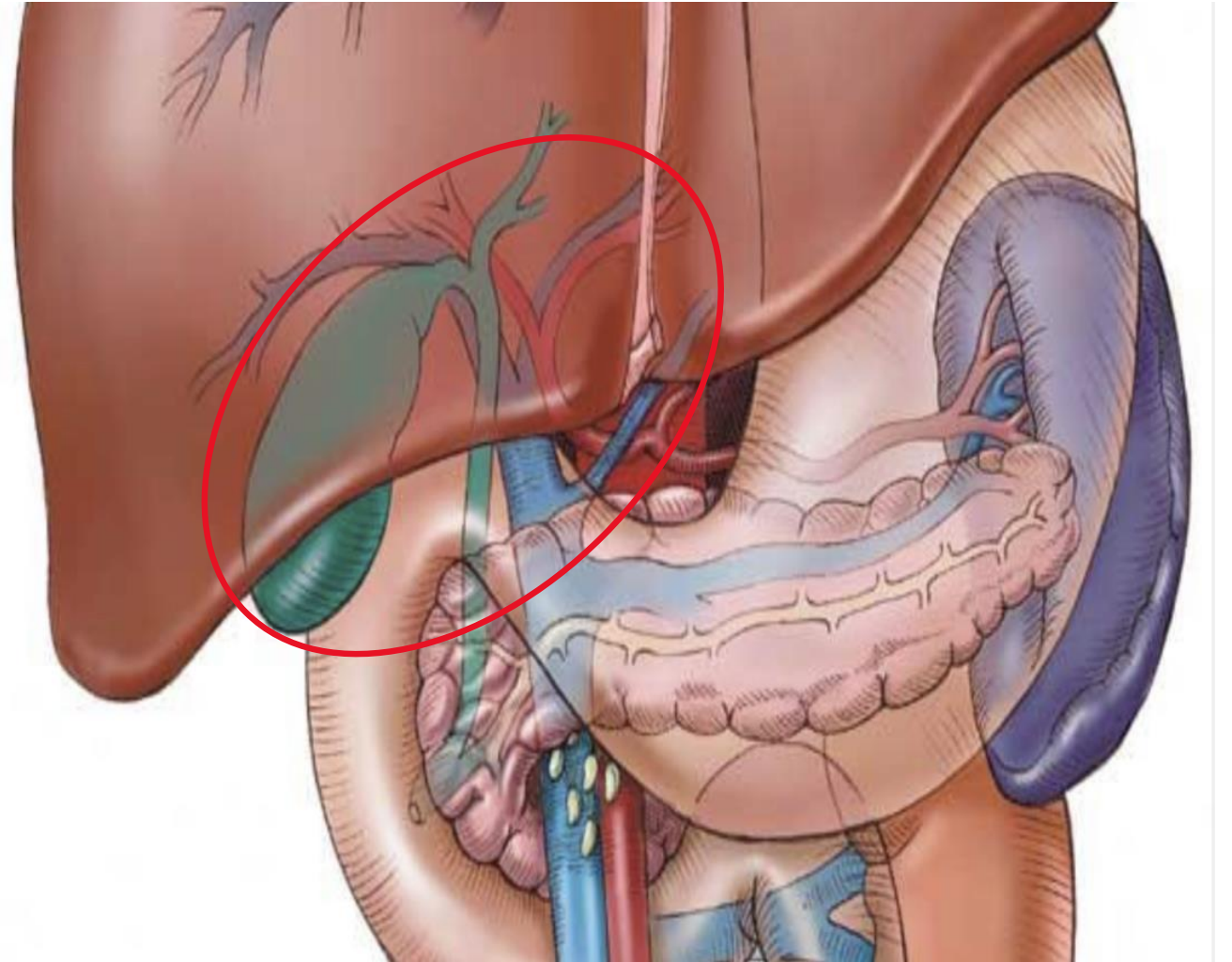
It reaches the neck of the gallbladder



Relations of the 1st part of the Duodenum

Anteriorly:

- 1) The liver (quadratus lobe)
- 2) The gallbladder



Liver in Situ

Superiorly:

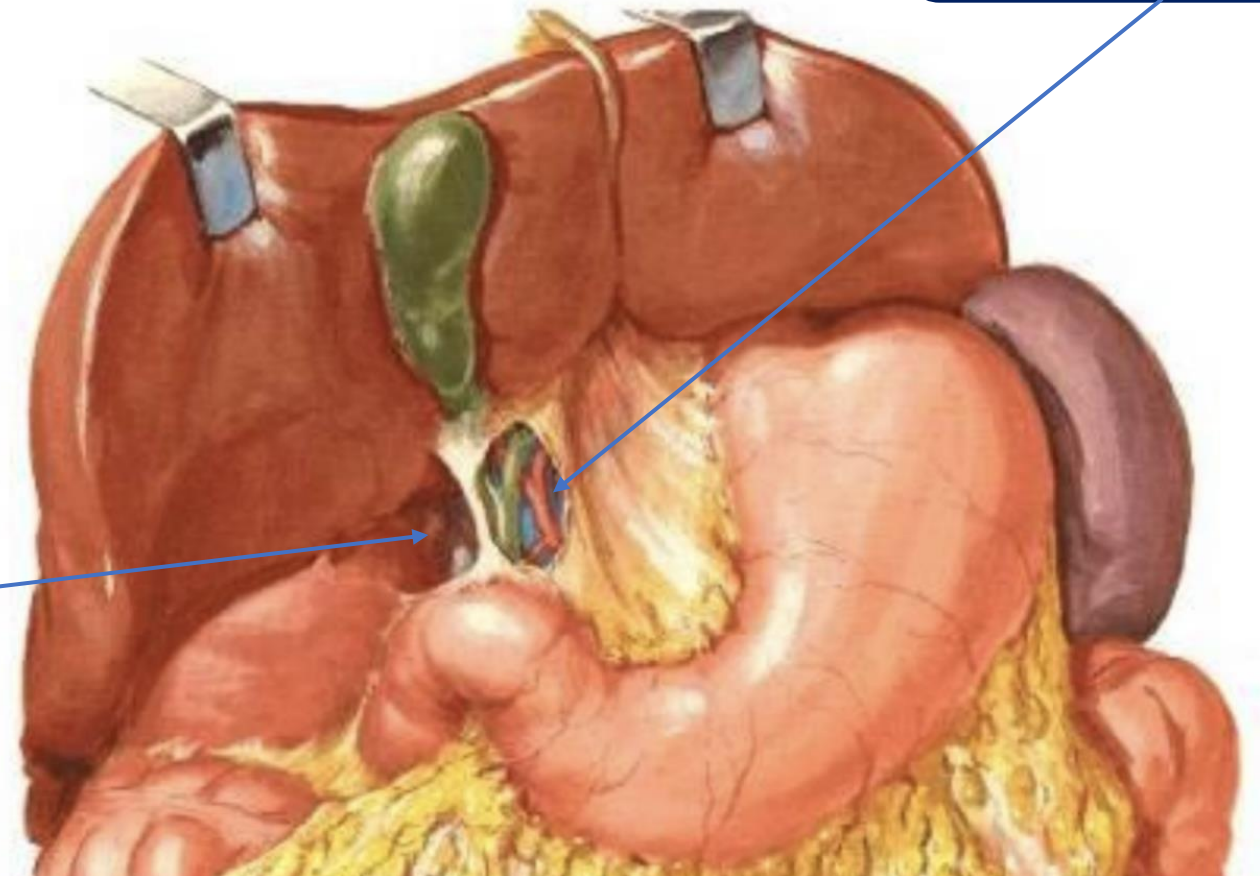
1) The epiploic foramen (also called foramen of Winslow)

The free edge of the lesser omentum

Epiploic foramen

The epiploic foramen is surgically significant as the surgeon can clamp blood vessels through it to prevent bleeding in the liver.

The epiploic foramen also forms an entry into the lesser sac and the structures behind the stomach → the epiploic foramen is anterior to the stomach bed organs.



The bile duct

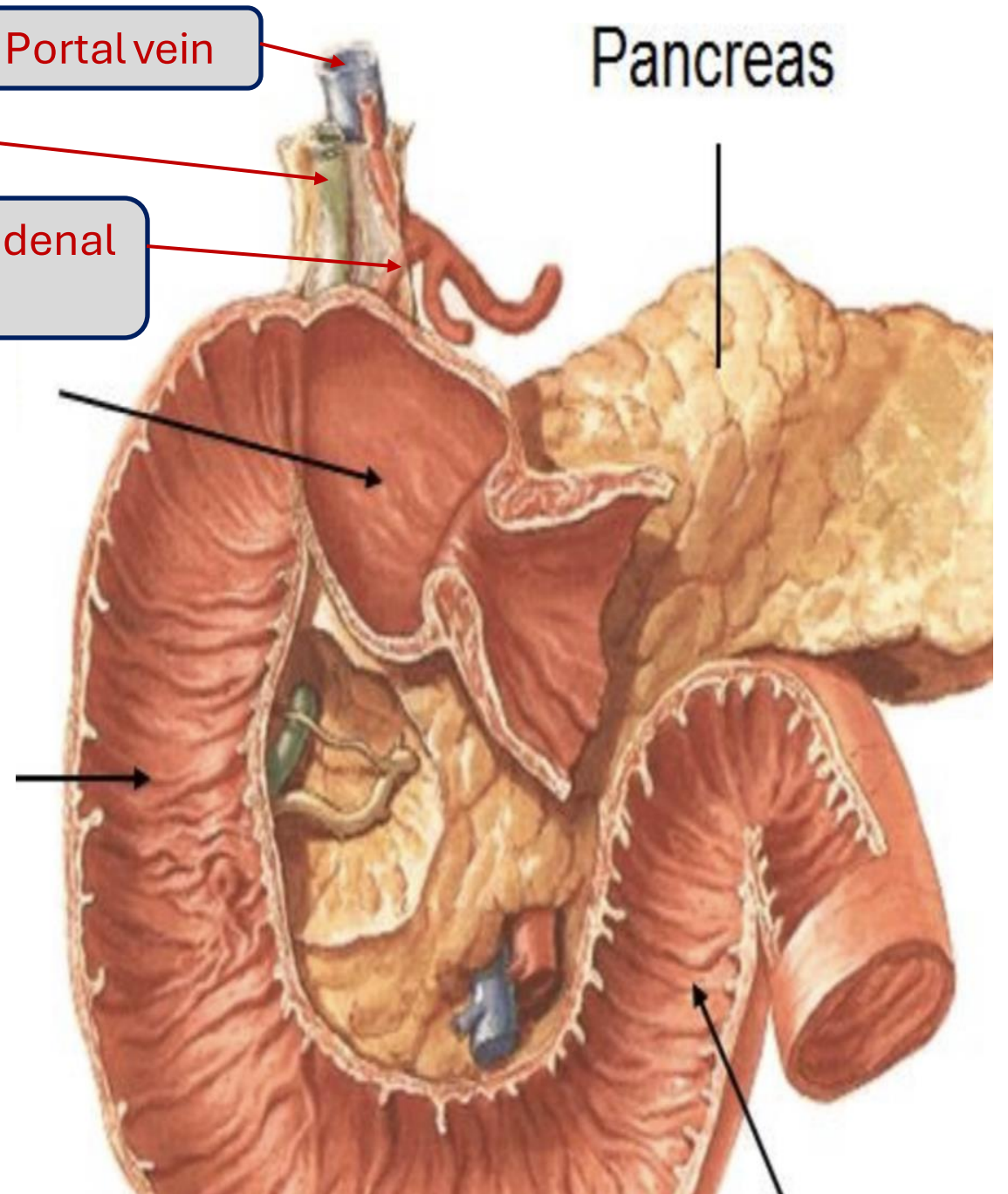
Portal vein

Gastroduodenal
artery

Pancreas

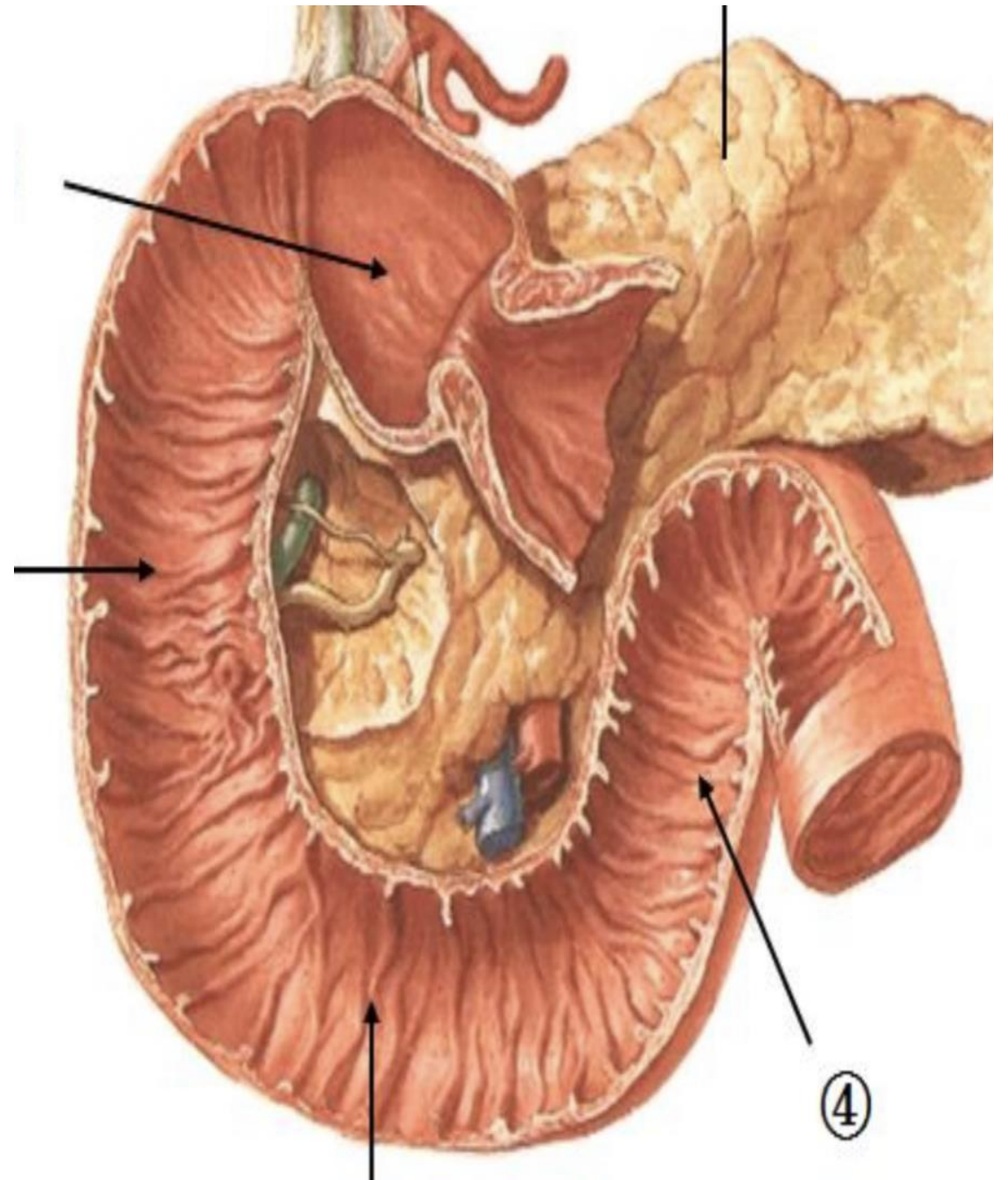
Posteriorly:

- 1) The lesser sac
- 2) Gastroduodenal artery
- 3) The bile duct
- 4) Portal vein
- 5) I.V.C (Inferior Vena Cava)



Inferiorly:

1) The head of the Pancreas



2nd part of the Duodenum

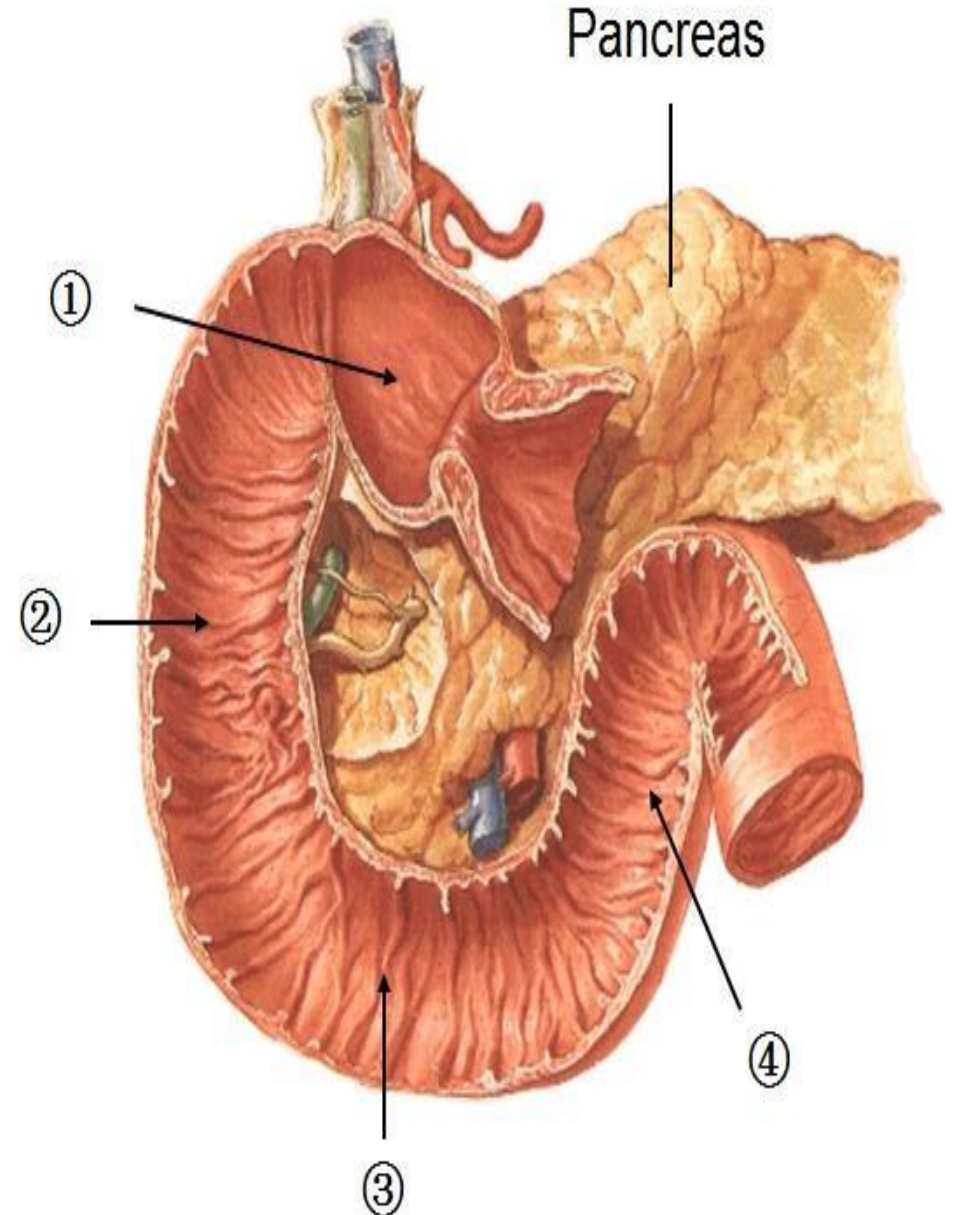
- It is 3''(3 inches) long.
- It runs downward vertically on the right side
- In front of the Rt.kidney
- next to the 3rd and 4th lumbar vertebrae.

Halfway of it, the bile duct and the main pancreatic duct pierce the medial wall, and then form the **ampulla** that opens in the **major duodenal papilla.**

- The accessory pancreatic duct (if present) opens in the **minor duodenal papilla** more superiorly.

This part descends vertically until its lower part reaches the L3 or L4 vertebra.

Its importance is that it receives the secretions from the common bile duct & the pancreatic duct.



Remember:

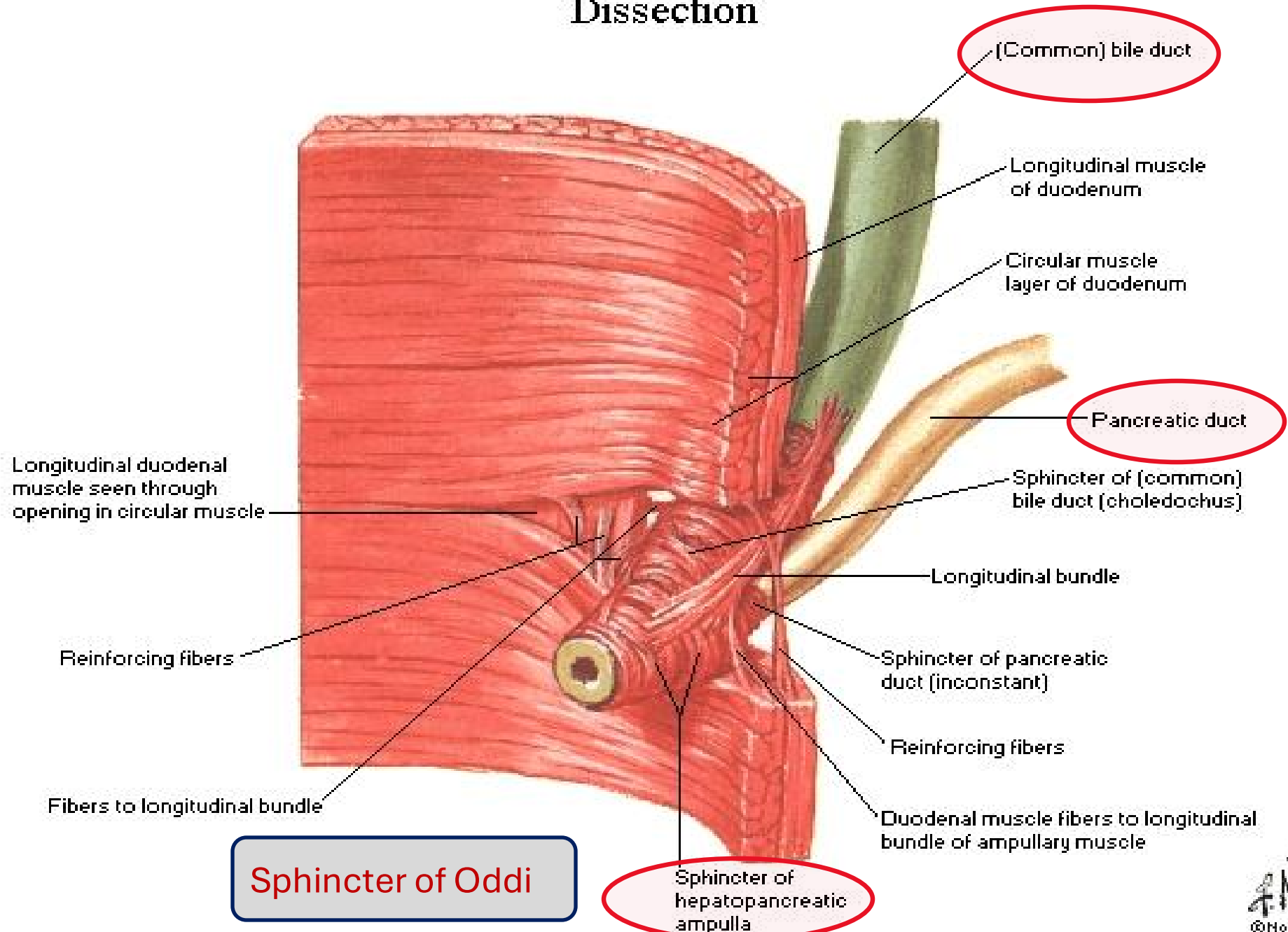
- The common bile and pancreatic ducts form:
 - Outside the duodenal lumen: the ampulla of vater.
 - Inside of the duodenal lumen: the major duodenal papilla.

- If the pancreatic accessory duct is present, it forms the minor duodenal papilla inside the duodenum.

- The minor duodenal papilla (if present) is 1 inch above the major duodenal papilla.

Junction of Bile Duct and Duodenum

Dissection



- The sphincter of Oddi is always contracted closing the opening of the common bile & pancreatic ducts into the 2nd part of the duodenum.
- But why? This so that the bile secretions through the common bile duct won't be able to enter the duodenum and they will return to be stored & concentrated in the gallbladder.
- The gallbladder does not only store bile, but it also concentrates it (increases its concentration inside it) by absorbing most of the water from the liver secretions that couldn't enter the duodenum.
- The concentration of bile in the secretions of the liver is diluted and is of low concentrations compared to the concentration of the bile in the secretions of the gallbladder.
- For example, when you have a meal rich in fat (زي الكوارع), a high concentration of bile must be secreted into the duodenum for optimal digestion, and this certain high concentration of the bile can be achieved by low volumes of gallbladder secretions (2 mL) compared to the volumes of the liver secretions that must be way higher (20 L) in order to digest the same amount of fats.
- In simple words, the same amount of fat requires low volumes of gallbladder secretions & high volumes of liver secretions in order to be digested because the gallbladder absorbs water & concentrates the bile in it, which makes the bile concentration in its secretions way higher than the bile concentration in the liver secretions.

Nowadays, we have a technique called ERCP (Endoscopic retrograde cholangiopancreatography) in which an endoscope is used retrogradely from the oral cavity until it reaches the major duodenal papilla. And then, a microscope can be entered in that opening and it can enter either the pancreatic duct or the common bile duct. So it can be used to view, treat and deal with pathological conditions involving these two ducts (example: stone obstruction).

The use of ERCP in pathological conditions concerning the common bile duct:

In the case of stone obstructing the common bile duct (and causing obstructive jaundice), it can be removed by a small basket associated with the endoscope via pulling the stone from the duct towards the duodenum; so it leaves the body with the stool.

In the old ways, obstructive jaundice caused by stones obstructing the common bile duct was treated by open surgery. But nowadays it is treated by an ERCP, and within 6 hours the patient can go home, and the jaundice goes away along with all the other symptoms.

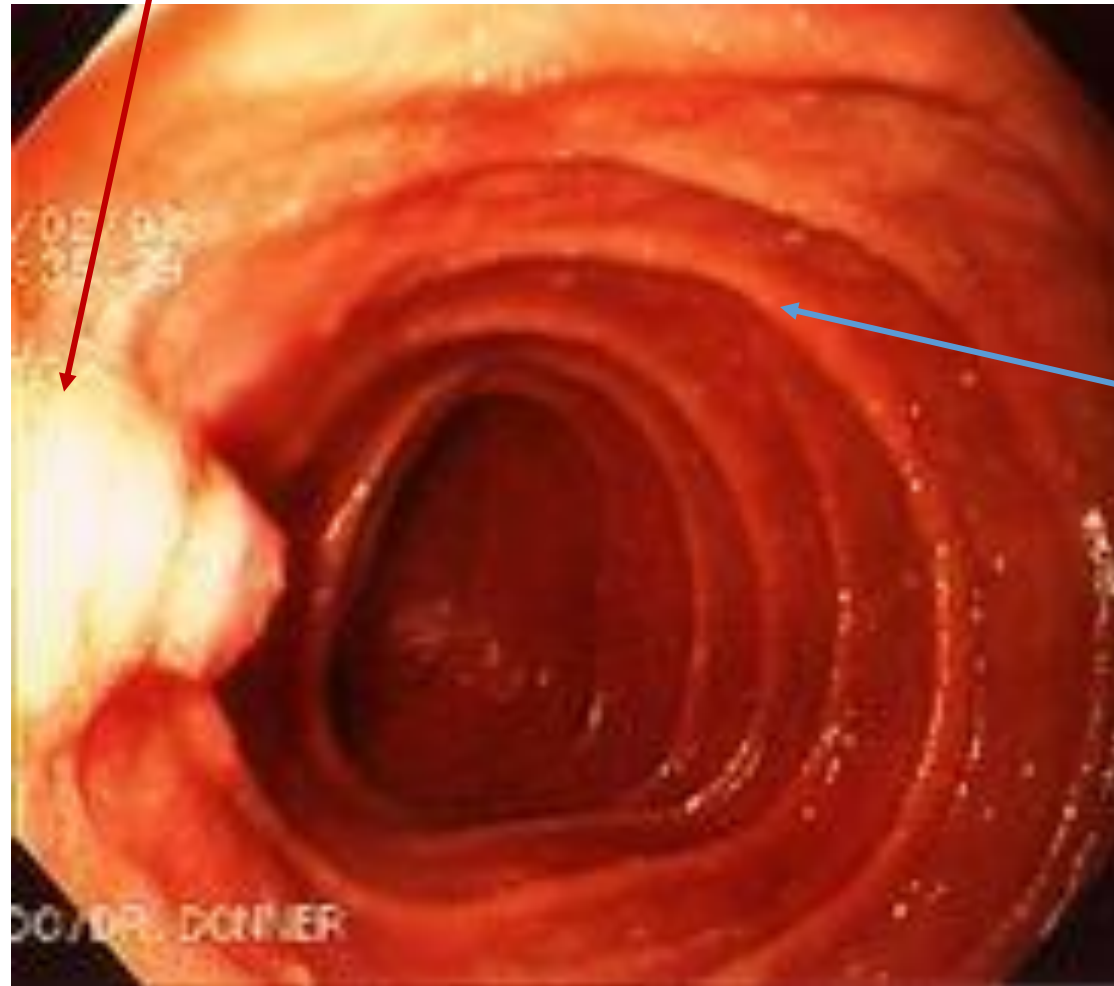
The use of ERCP in pathological conditions concerning the pancreatic duct:

In the case of pancreatitis or stones obstructing the pancreatic duct, it can be treated the same way as the common bile duct obstruction is treated through the ERCP.

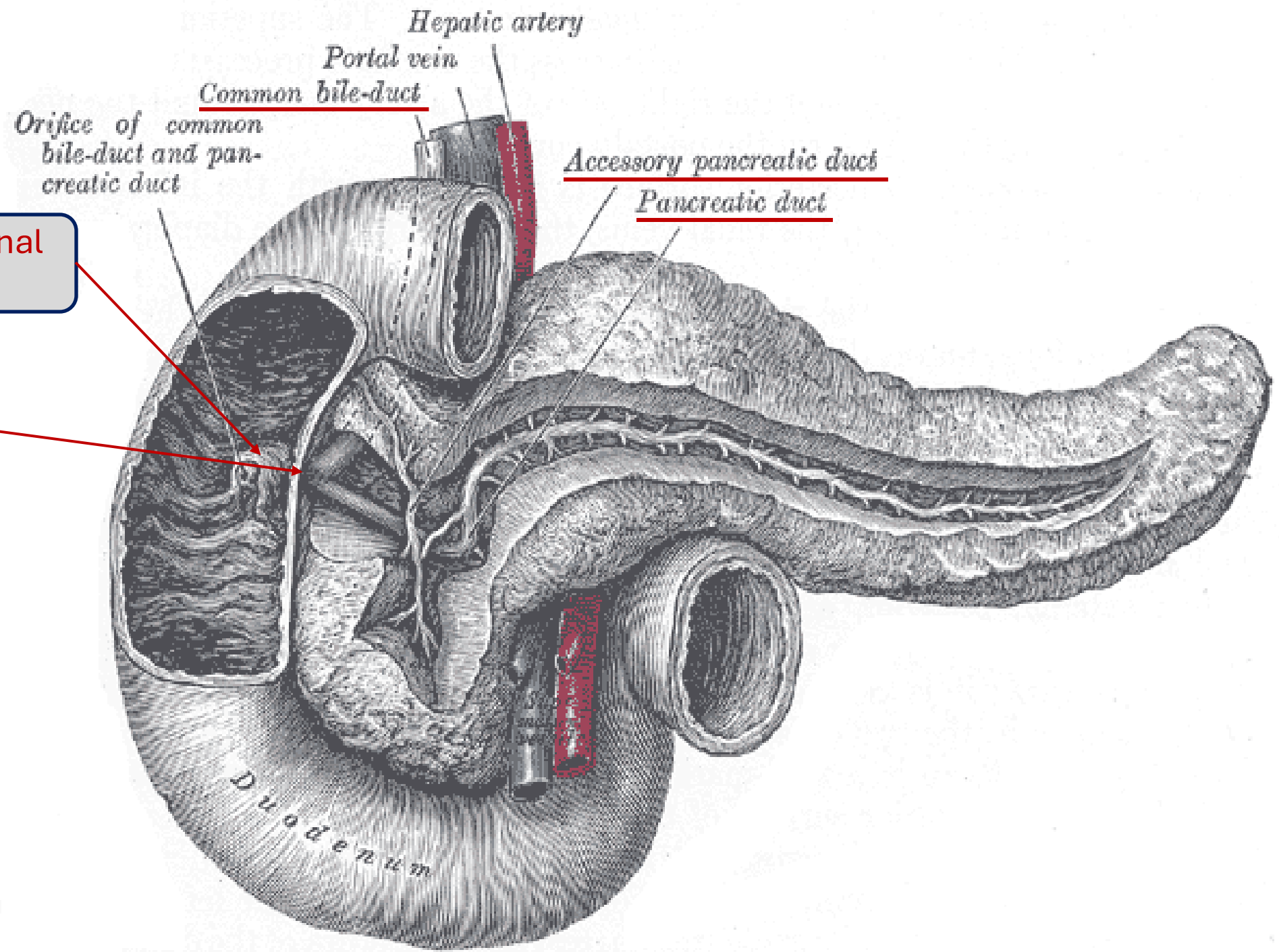
Hepaticopancreatic ampulla (Ampulla of Vater)

The image is showing the lumen of the duodenum

In the wall of the duodenum sparing its interior lumen



These foldings in the mucosa of the duodenum are called plicae circularis. They are a series of permanent spiral or circular folds.



Major duodenal papilla

Ampulla of Vater

Relations of 2nd part of the Duodenum

Ant.

- The gallbladder (fundus)
- Right lobe of the liver
- Transverse colon
- Coiled part of small intestine.

Post.

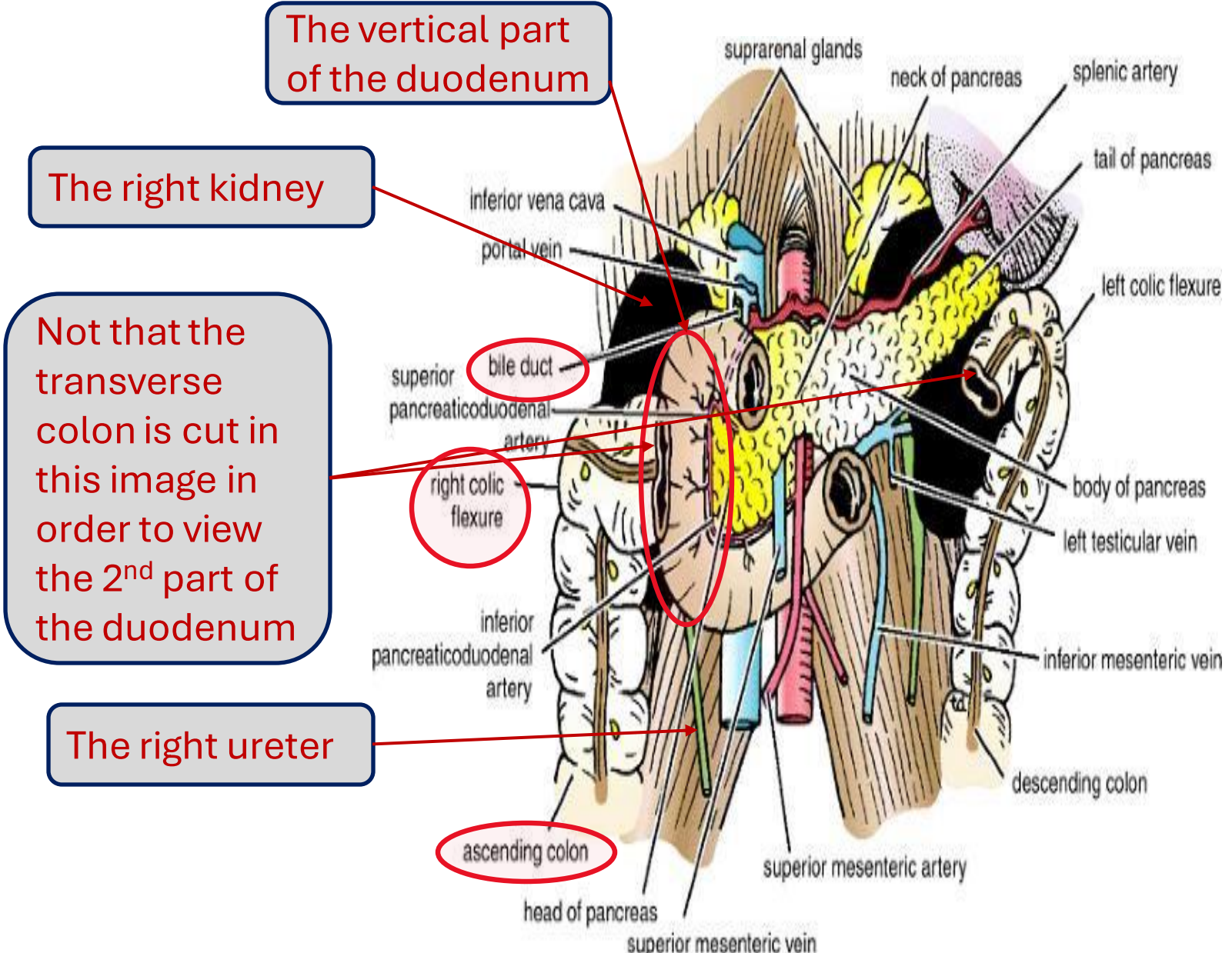
- Hilum of Rt. Kidney
- Rt. Ureter.

Lateral.

- Right colic flexure
- Ascending colon
- Right lobe of the liver.

Medial.

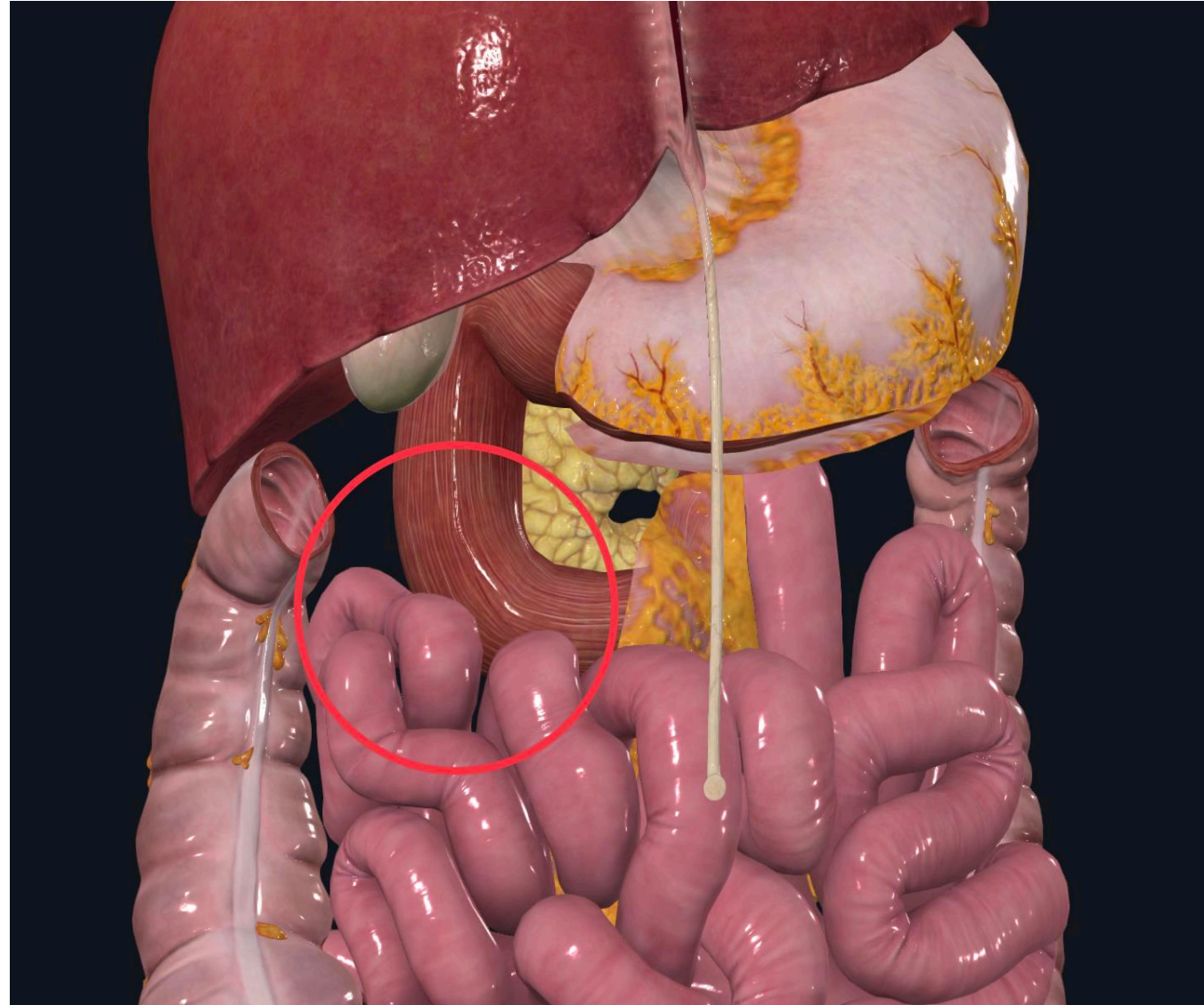
- Head of pancreas
- Bile and pancreatic ducts & their opening in the duodenum.



The hilum of the kidney is a notch on the medial side of the kidney where the nerves, ureters and blood vessels enter and exit the kidneys.

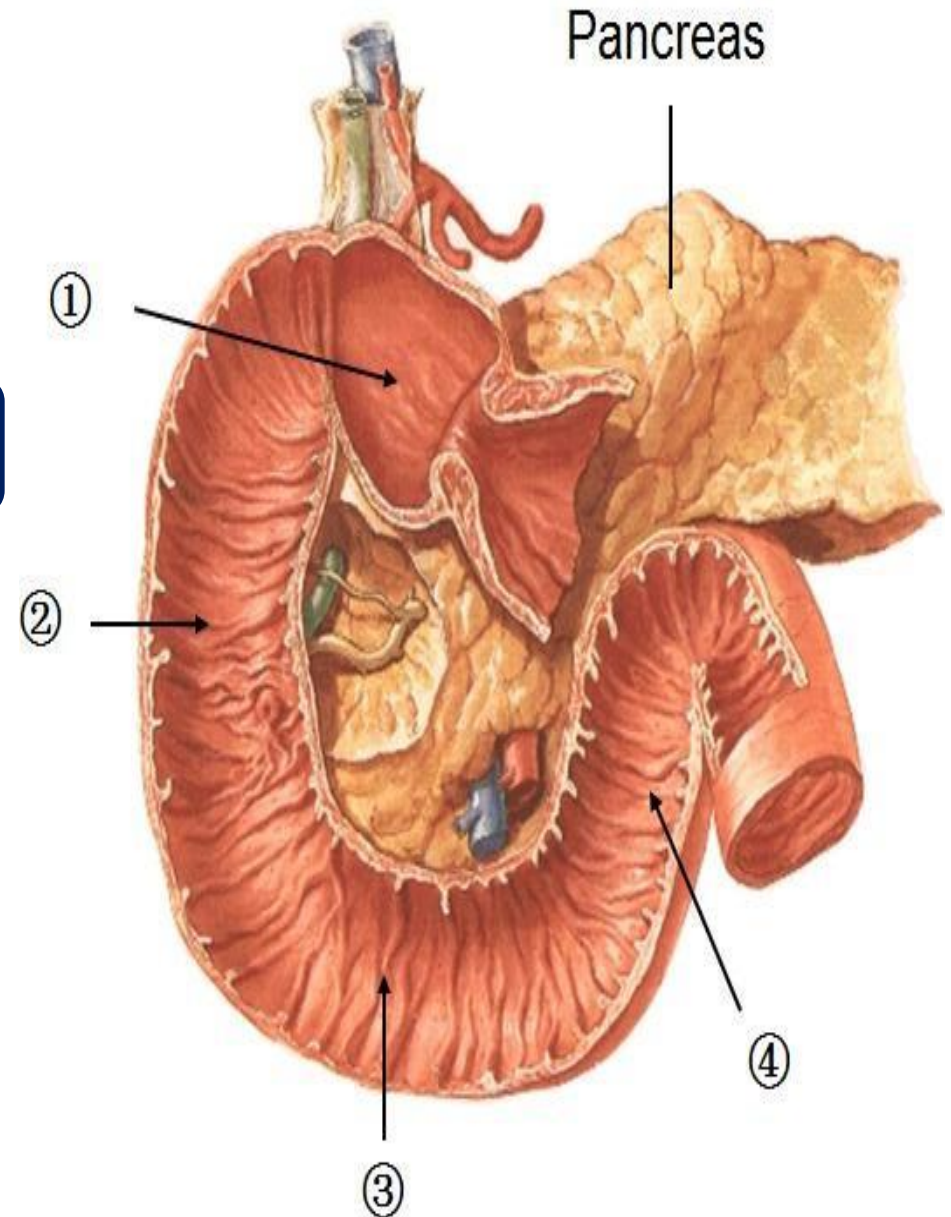
Here, notice the coiled region of the small intestine located anterior to the 2nd part of the duodenum (the transverse colon is cut).

Also note that the coils of the jejunum are related to the 3rd part of the duodenum anteriorly and inferiorly and to the 4th part anteriorly.



3rd part of the Duodenum

- 4" (inches) long.
- Runs horizontally to the left. It is the horizontal part of the duodenum
- On the subcostal plane. In contrast to the 1st part which begins at the level of the transpyloric plane
- Runs in front of the vertebral column. In front of the lumbar vertebra
- Under the lower margin of the head of pancreas.
- Above the coils of the Jejunum.



Relations of 3rd part of the Duodenum

Anteriorly:

- The root of the mesentery of the small intestine
- The Superior Mesenteric vessels (the Superior Mesenteric artery and vein) contained within the mesentery
- Coils of the Jejunum

Posteriorly:

- The Right Ureter
- The Right Psoas muscle
- The Inferior Vena Cava
- The Aorta

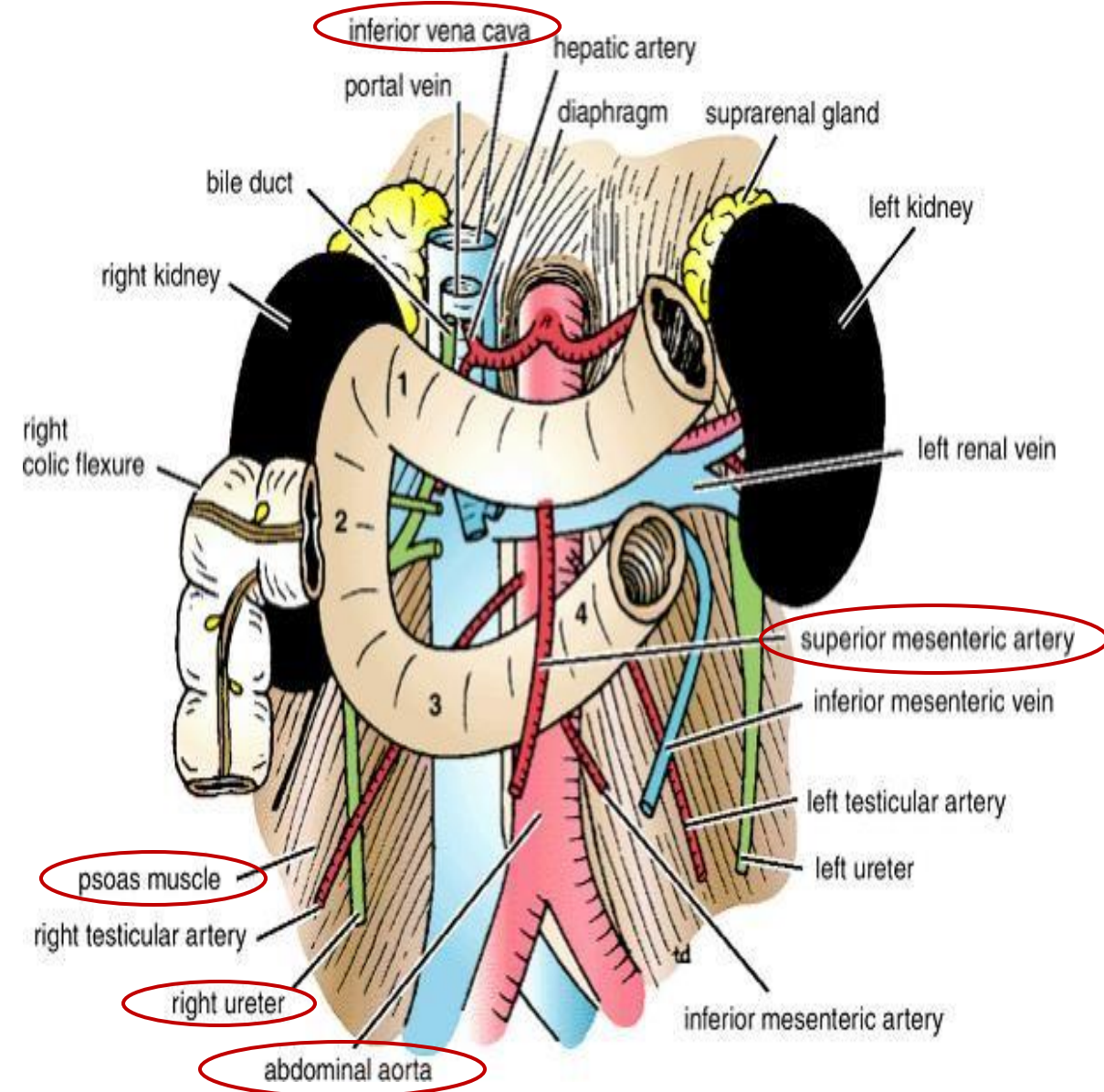
Superiorly:

The Head of the Pancreas

Inferiorly:

Coils of the Jejunum

The short root of the mesentery extends obliquely downward and to the right, starting from 1 inch to the left of the second lumbar vertebra passing anteriorly to the 3rd part of the duodenum, and ending in the region of the right sacroiliac joint.



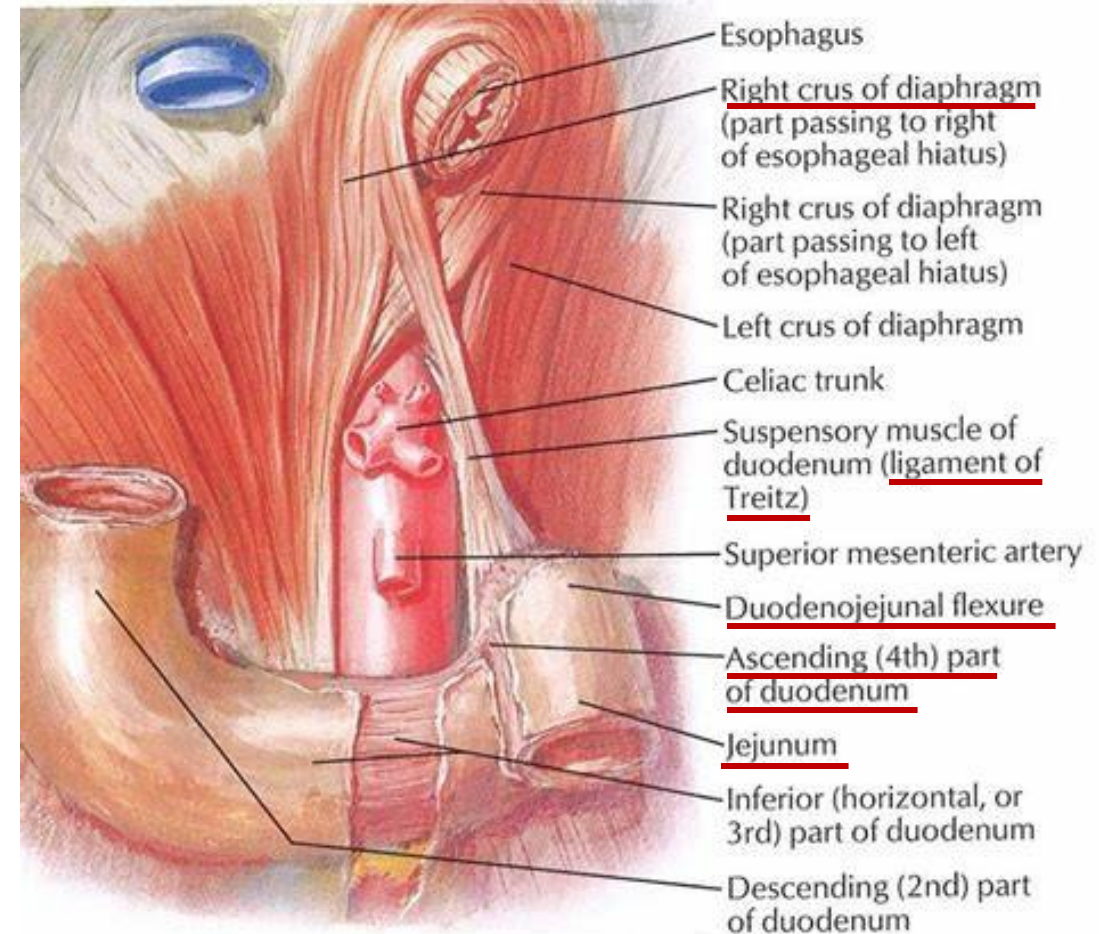
4th part of the Duodenum

- 1" (inch) long.
- Runs upward to the left.
- Ends in the duodenojejunal junction (the connection between the duodenum and jejunum) at the level of the 2nd lumbar vertebrae 1" inch to the left.
- The junction (flexure) is held in position by the ligament of Treitz, which is attached to the right crus of the diaphragm (duodenal recess).

Duodenal recesses are folds of peritoneum that surround the duodenum. They are mostly found surrounding the 4th part of the duodenum.

The ligament of Treitz is an important landmark that anatomically separates the duodenum from the jejunum. While the jejunum is intraperitoneal and therefore moves freely, the duodenum is mostly retroperitoneal and is therefore fixed (except for the first inch). This landmark aids in the fixation of the last inch of the duodenum.

The ligament of Treitz extends from the duodenojejunal junction to the right crus of the diaphragm.



Relations of 4th part of the Duodenum

Anteriorly

- The beginning of the root of the mesentery
- Coils of the Jejunum

The same anterior relations as the 3rd part (except for the mesenteric vessels)

Posteriorly

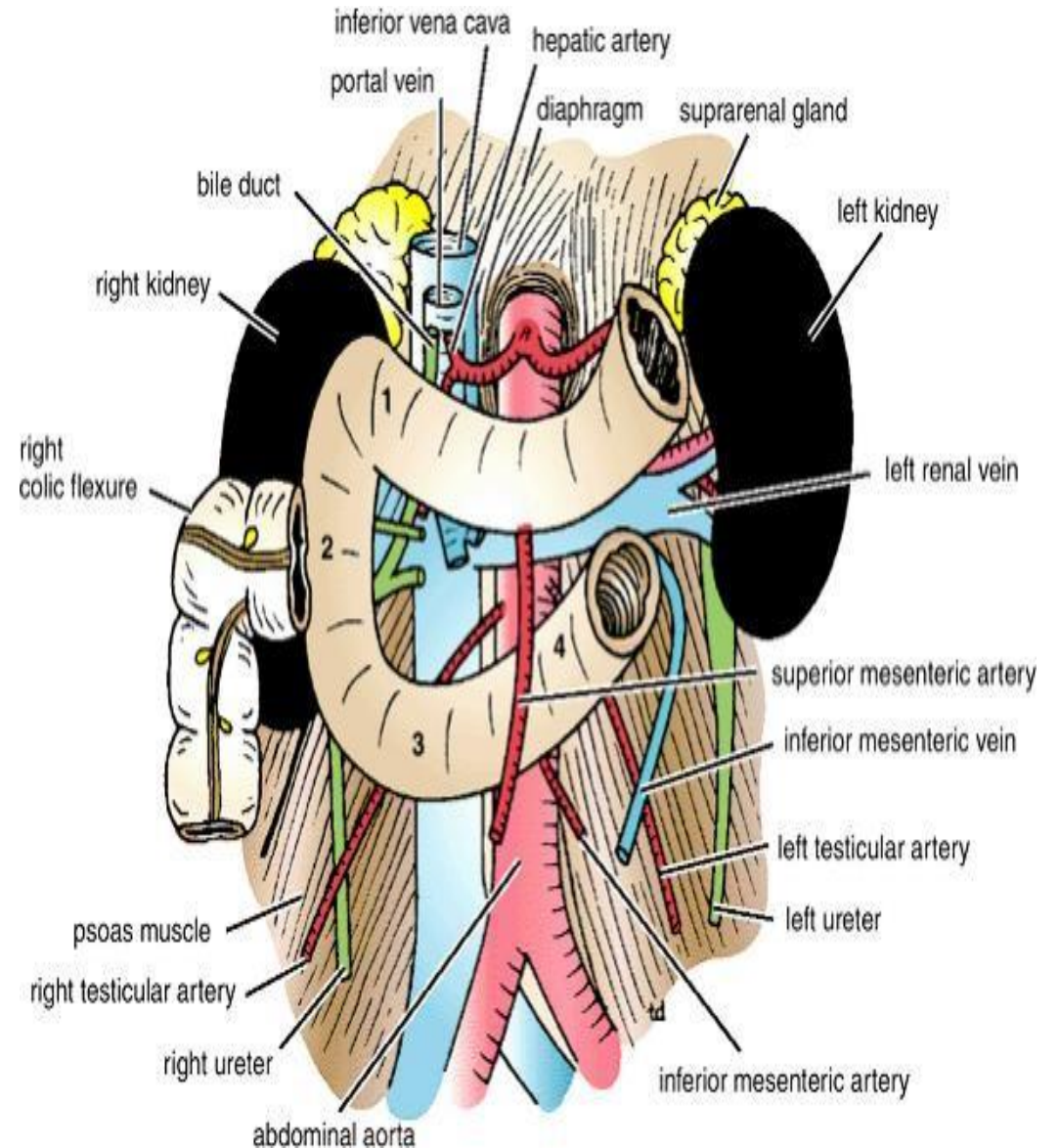
- Left Psoas major
- The Sympathetic Chain
- Left margin of the Aorta

Not the right Psoas major as is the case with the 3rd part

Superiorly

- Uncinate process of the Pancreas

The Uncinate process is an extension of the Head of the pancreas that bends backwards to the left side and beneath the body of the pancreas.



Blood supply of the Duodenum

- **Arteries**

1- The upper half (1st part + upper 1/2 of 2nd part) is supplied by the **superior pancreaticoduodenal artery**, a branch of the gastroduodenal artery, a branch of the common hepatic artery from the celiac trunk.

2- The lower half (lower ½ of 2nd part + 3rd + 4th part) is supplied by the **inferior pancreaticoduodenal artery**, a branch of the superior mesenteric artery.

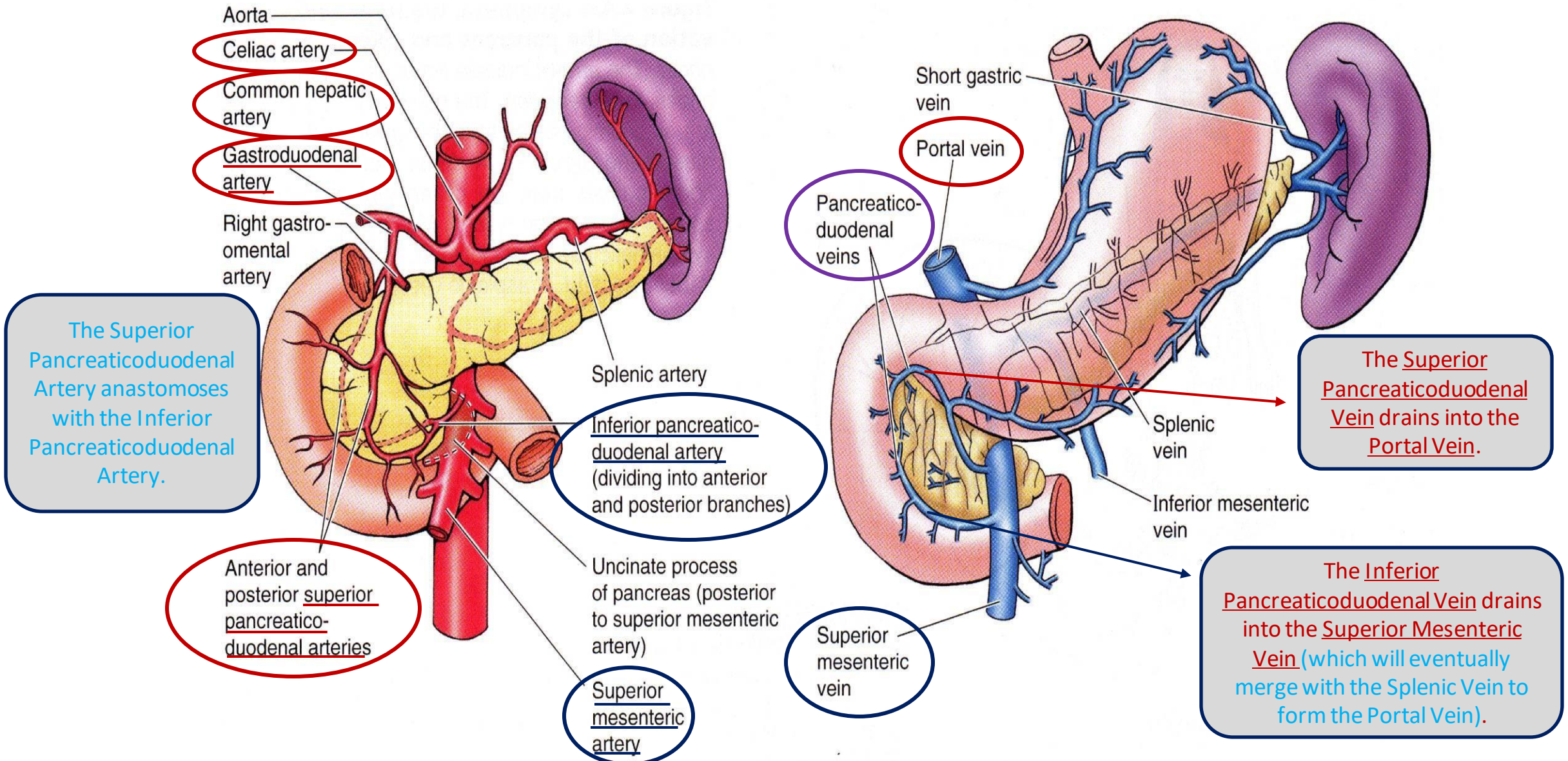
The duodenum is always divided into an upper half and a lower half; since it has two separate embryonic origins: the foregut and the midgut.

- During embryonic development, the **primitive gut tube** matures to form 3 distinct sections; foregut, midgut, and hindgut.
- The foregut gives rise to the **esophagus**, stomach, the upper half of the duodenum, **as well as the liver, gall bladder, and pancreas**. These structures are mainly supplied by branches from the celiac trunk.
- The midgut gives rise to the lower half of the duodenum, the jejunum and ileum of the small intestine, and a portion of the large intestine, and is mainly supplied by the superior mesenteric artery.
- The hindgut gives rise to rest of the large intestine up until the rectum and is supplied by the inferior mesenteric artery.

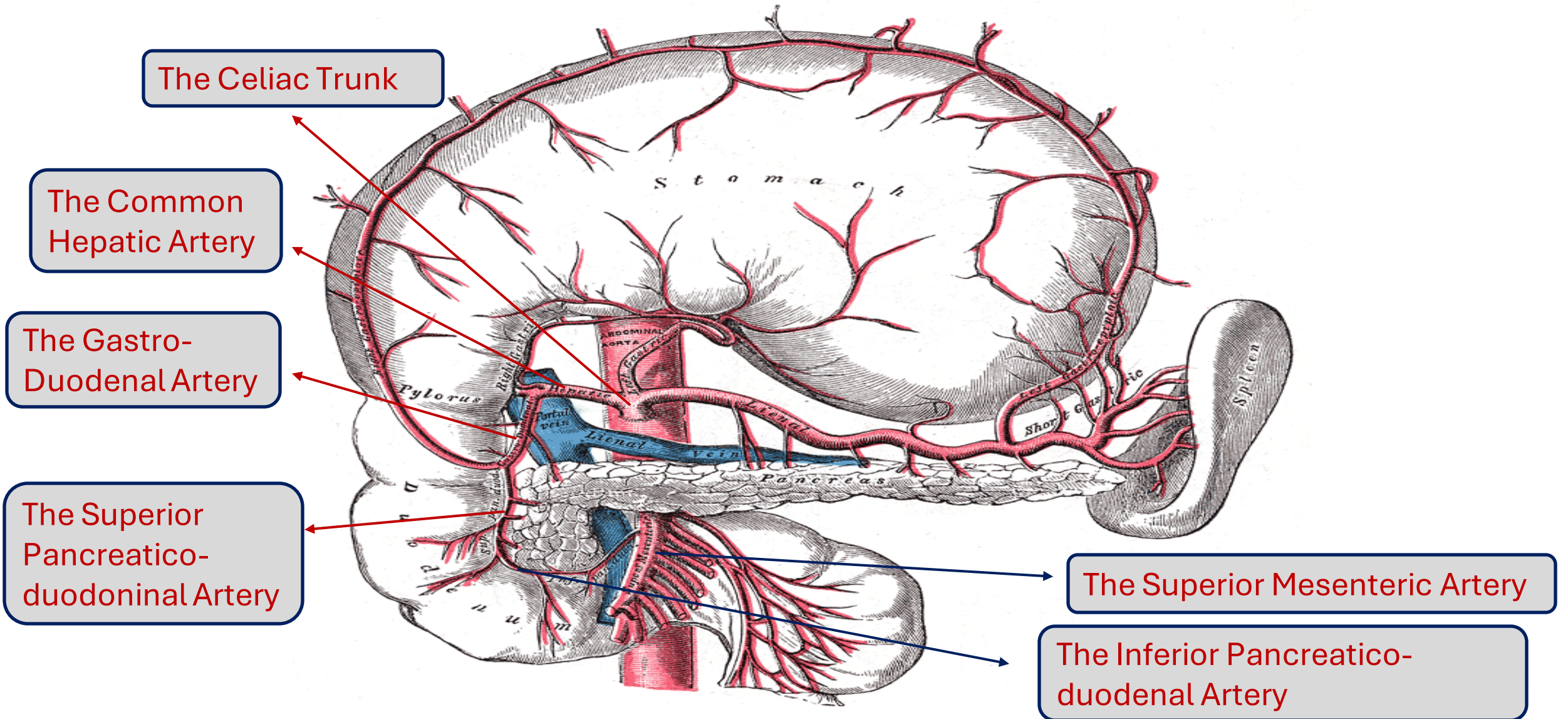
In order to summarize the arterial blood supply of the duodenum:

- The upper part: Abdominal Aorta → Celiac trunk → Common Hepatic Artery → Gastroduodenal Artery → Superior Pancreaticoduodenal Artery.
- The lower part: Abdominal Aorta → Superior Mesenteric Artery → Inferior Pancreaticoduodenal Artery.

Arterial supply and venous drainage of the Duodenum



Blood supply for the Duodenum

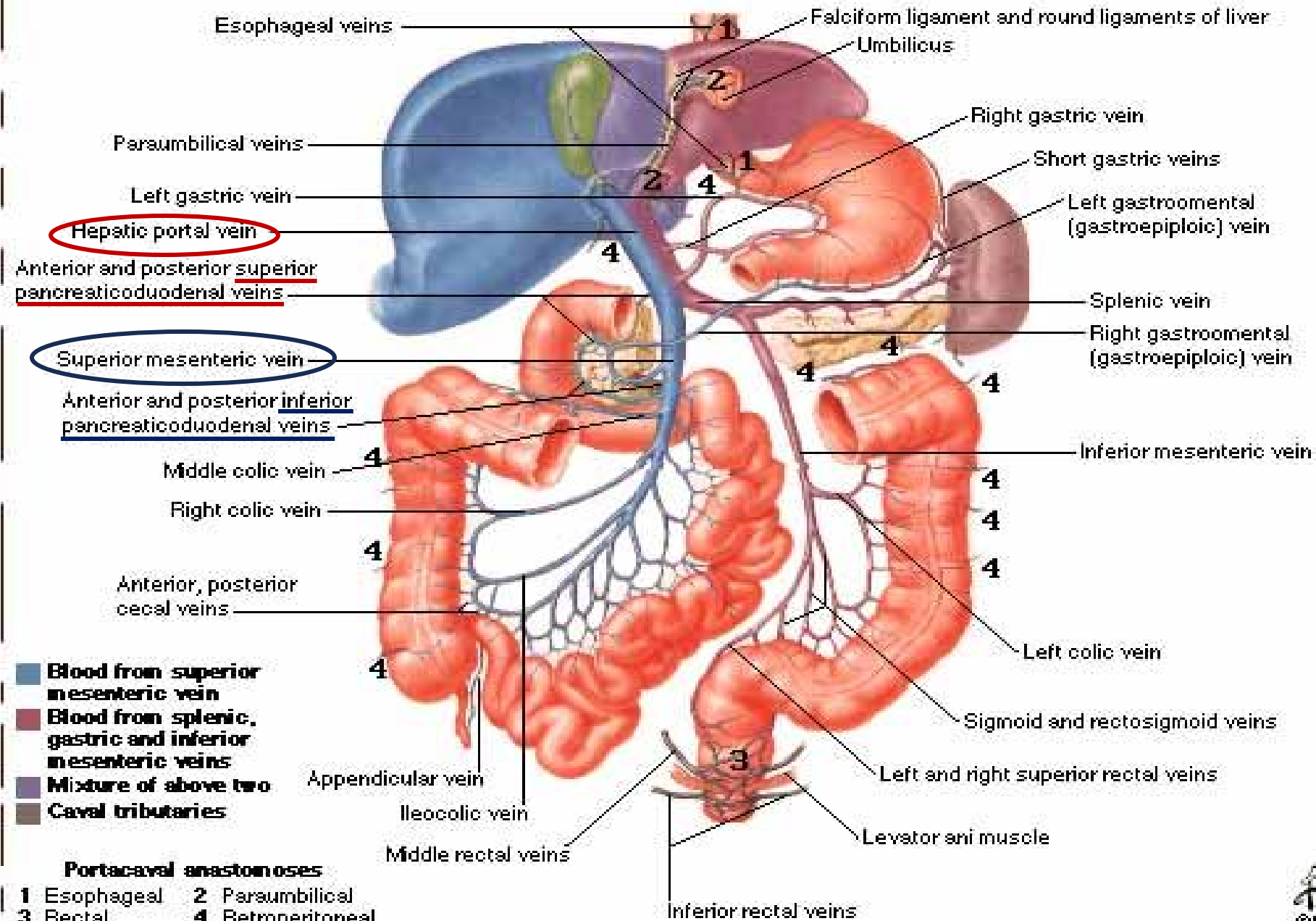


Veins of the Duodenum

- The superior pancreaticoduodenal vein drains into the portal vein.
- The inferior pancreaticoduodenal vein joins the superior mesenteric vein.

Hepatic Portal Vein Tributaries

Portocaval Anastomoses



Lymphatic drainage

- The lymph vessels follow the arteries:
- **Lymph that drain from the upper half** → via Pancreaticoduodenal nodes → the Gastroduodenal nodes → the Celiac lymph nodes. Anything Celiac is related to the Foregut.
- **Lymph that drain from the lower half** → via Pancreaticoduodenal nodes → the Superior mesenteric lymph nodes around the origin of the Superior mesenteric artery.

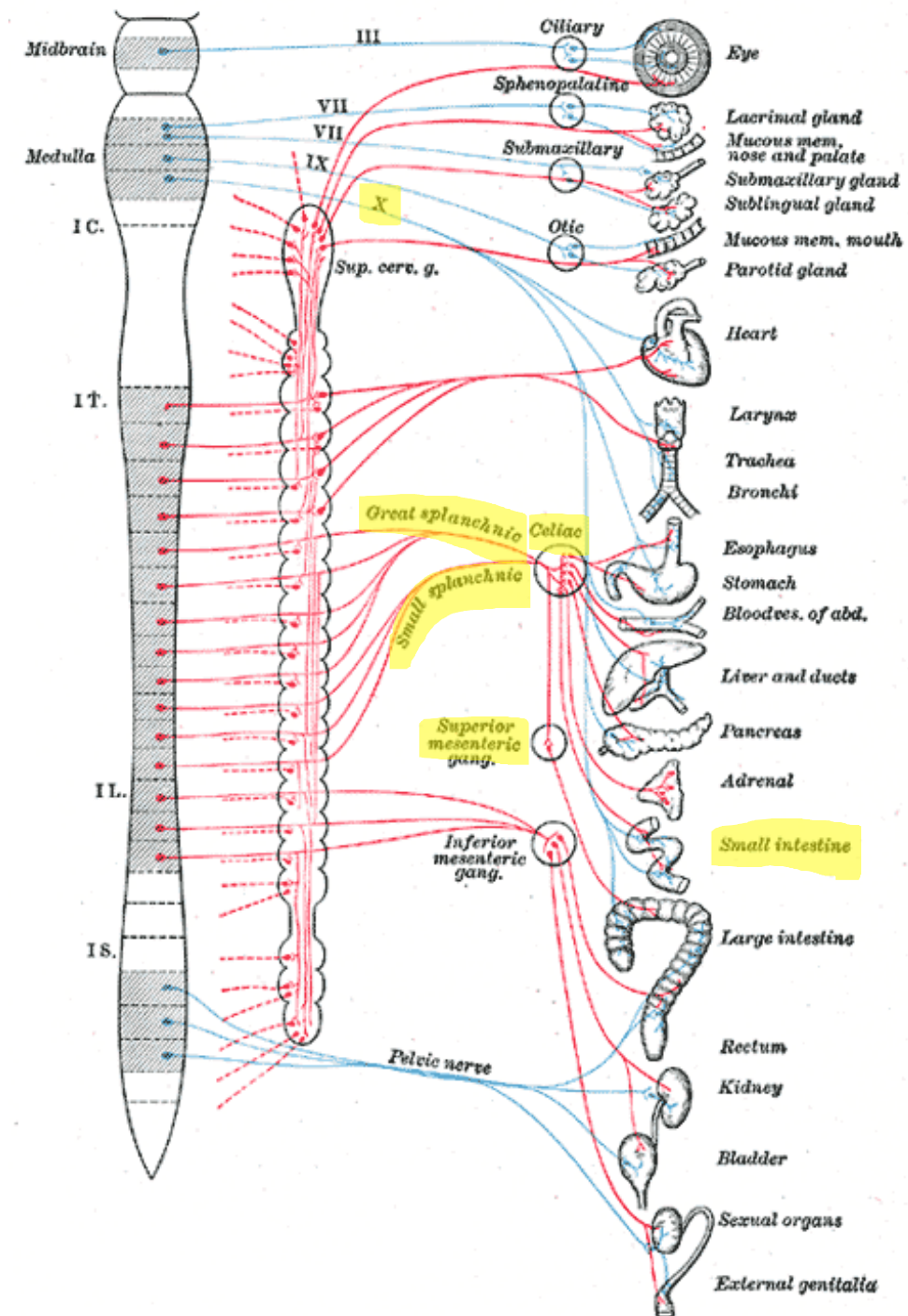
Nerve supply

- Parasympathetic nerves from: →
- Sympathetic nerves: →
- These parasympathetic and sympathetic nerves join to form:
 - 1- The celiac plexus.
 - 2- The superior mesenteric plexus.

Originally come from the Vagus nerve.

They originally come from the preganglionic sympathetic neurons from the spinal cord in the chest region, more specifically, from the Thoracic Splanchnic Nerves.

- The sympathetic nerves that supply the duodenum originally come from the preganglionic sympathetic neurons of the Thoracic Splanchnic Nerves. These nerves pass the sympathetic chain ganglia (the Paravertebral ganglia), without synapsing, and afterwards synapse in the celiac and superior mesenteric collateral (prevertebral) ganglia.
- The postganglionic axons of these splanchnic nerves form the celiac and superior mesenteric plexuses.
- These plexuses are joined by preganglionic parasympathetic nerves from the vagal trunks.
- The celiac plexus surrounds the celiac trunk and its branches. This allows nerves to follow the arteries to their target organs in the foregut including the proximal portion of the duodenum.
- The superior mesenteric plexus contributes autonomic innervation to the vascular territory of the superior mesenteric artery to reach components of the midgut. This includes the distal portion of the duodenum.



Jejunum and Ileum Location and Description

- The jejunum and ileum measure about 20 ft (6 m) long. While the duodenum is only 10 in / 25 cm.
The upper two fifths is the jejunum & the lower 3/5 is the ileum.
- Each has distinctive features.
- There is a gradual change from one to the other. →
- The jejunum begins at the duodenojejunal flexure/junction.
- The ileum ends at the ileocecal junction.
- The coils of jejunum and ileum are freely mobile and are attached to the posterior abdominal wall by a fan-shaped fold of peritoneum known as the mesentery of the small intestine

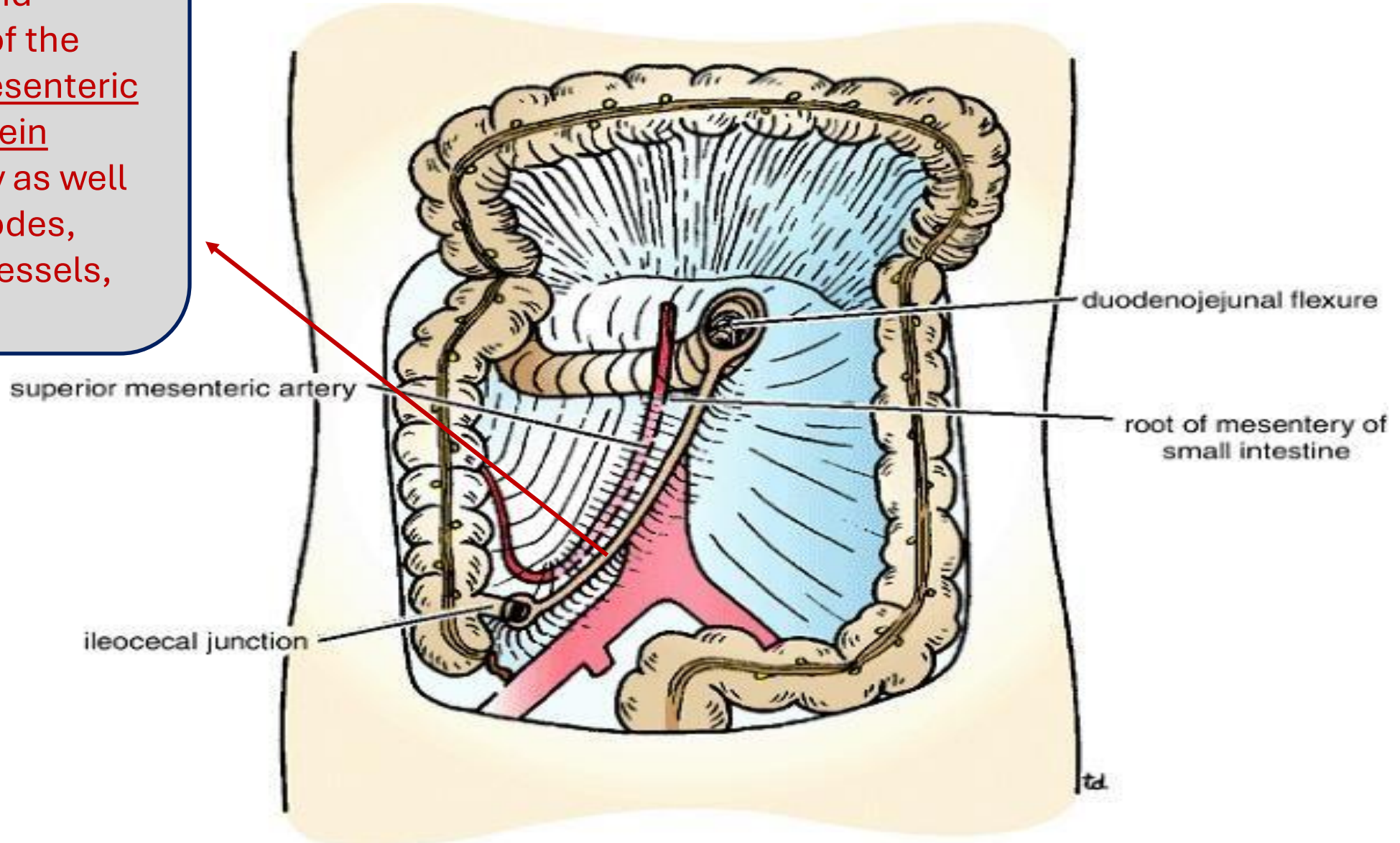
The jejunum and ileum aren't well demarcated (there isn't a clear border, landmark, or junction between the two to separate them and tell them apart). We can only generalize that the upper part is the jejunum and the lower part is the ileum.

Mesentery of the small intestine

- Fan-shaped fold of peritoneum.
- The long free edge of the fold encloses the mobile intestine (the jejunum and ileum).
- The short root of the fold is continuous with the parietal peritoneum on the posterior abdominal wall:
Along a line that extends **obliquely** downward and to the right, from **1 inch to** the left side of the second lumbar vertebra to the region of the right sacroiliac joint (in front of the right SI joint) in the pelvis.

Root of the mesentery

The short root of mesentery running obliquely. It contains branches and tributaries of the superior mesenteric artery and vein respectively as well as lymph nodes, lymphatic vessels, and fat.



Contents of the mesentery

- The branches of the superior mesenteric artery and vein.
- Lymphatic vessels & lymphatic nodes.
- Nerves.

The Mesentery contains bloods vessels (especially the superior mesenteric artery and vein), as well as nerves, lymph nodes, lymphatic vessels, and fat.

Difference between Jejunum & Ileum

	Jejunum	Ileum
Length	<u>Proximal 2/5</u>	<u>Distal 3/5</u>
Site	In the upper part of the peritoneal cavity below the left side of the transverse mesocolon	In the lower part of the cavity and in the pelvis towards the right side .
Wall	Thicker wall & more reddish	Thinner & less red in color
Arcades in mesentery <div data-bbox="402 758 774 1043" style="border: 1px solid black; border-radius: 15px; padding: 10px; margin: 10px 0;"> <p>The arcades will be further explained in the upcoming slides</p> </div>	<ul style="list-style-type: none"> -<u>Simple</u>, only one or two arcades -With long infrequent branches -<u>Long vase recta</u> 	<ul style="list-style-type: none"> -Numerous and complex -<u>Short</u> terminal vessels that arise from a series of three or four or even more Arcades. - <u>Short vase recta</u>
Fat in mesentery	<ul style="list-style-type: none"> -The fat is deposited near the root -It is scanty (in small amounts) near the intestinal wall -Less in amount → apparent windows 	<ul style="list-style-type: none"> -The fat is deposited throughout mesentery - Big amount - No windows apparent

Difference between Jejunum & Ileum

	Jejunum	Ileum
Diameter	<u>Wider</u>	<u>Smaller</u>
Villi	<u>Numerous</u>	<u>Less numerous</u>
Plicae circularis (the permanent enfolding of the mucous membrane & submucosa in the small intestine) *Characteristic of the <u>duodenum</u> and <u>jejunum</u>	They are: <ol style="list-style-type: none">1. larger2. more numerous3. closely set	They are: <ol style="list-style-type: none">1. smaller2. more widely separated3. in the lower part they are absent.
Lymphatic follicles *Characteristic of the <u>ileum</u> in particular	<u>No or few</u>	Aggregations of lymphoid tissue (<u>Peyer's patches</u>) are present in the mucous membrane.

Blood supply of Jejunum & Ileum

Arteries:

- The arterial supply is from branches of the **superior mesenteric artery** .
- The intestinal branches arise from **the left side** of the artery and run in the mesentery to reach the gut.
- They anastomosis with one another to form a series of **arcades**.
- The lowest part of the ileum is also supplied by **the ileocolic artery**.

Veins:

- The veins correspond to the branches of the superior mesenteric artery.
- Drain into the superior mesenteric vein.

The tributaries of the jejunum and ileum drain into the superior mesenteric vein that ends up as the hepatic portal vein, and from there to the Liver.

Lymphatic Drainage of jejunum & ileum

- The lymph vessels pass through many intermediate mesenteric nodes.
- Finally reach the superior mesenteric nodes → around the origin of the superior mesenteric artery.

Nerve Supply of jejunum & Ileum

- The nerves are derived from the sympathetic and parasympathetic (vagus).
- **Sympathetic** nerves from the superior mesenteric plexus (**from the superior mesenteric ganglion as well as from the celiac ganglion**).