GI

Anatomy

LEC no.4

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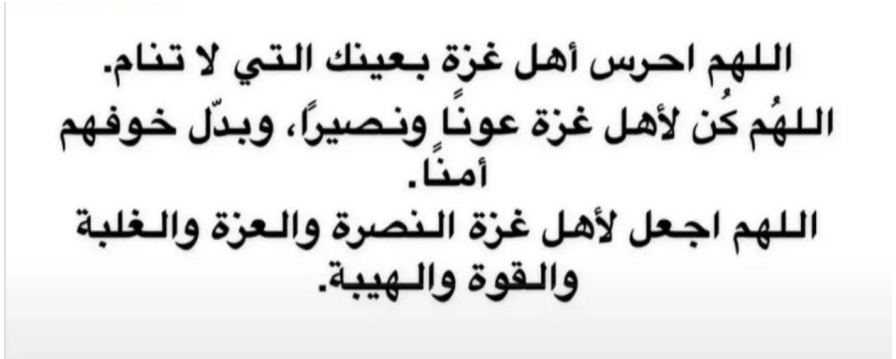
عدد السلايدات ما بخوف، السلايد الوحدة ما فيها كثير معلومات ومش مضغوطة، بالتوفيق.
لا تنسوا تدعوا لغزة ولأهلها بالنصر والفرج والتمكين.

The color code used for these modified slides:

Black: the text used by the professor in the original slides.
Red: what the professor mentioned during the lecture that isn't written in the original slides or what he made more clear.
Blue: additional information from authentic sources that may assist in better understanding.
Anything underlined or circled is of greater importance than the rest of the text (what the professor has focused on).



The small intestine

Additional info from Snell's Clinical Anatomy:

The small intestine is termed "small" because of its comparative diameter and not because of its length.

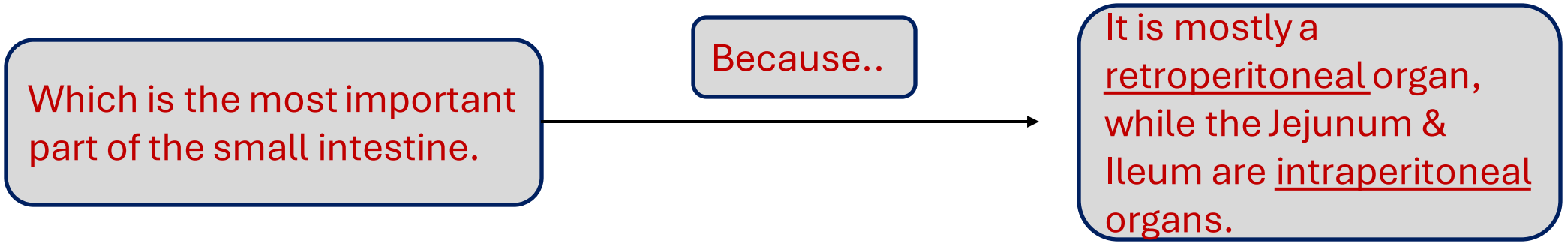
First of all, recall that the small intestine consists of 3 parts:

1- The first part: the duodenum
2- The second part: the jejunum
3- And the last part: the ileum

Side note that the doctor had mentioned:

Try to compare the differences between the small intestine and the large intestine when you study both lectures for better understanding.

DOUDENUM


Which is the most important part of the small intestine.
Because..
It is mostly a retroperitoneal organ, while the Jejunum & Ileum are intraperitoneal organs.

But, how is the fact that the duodenum is a retroperitoneal organ surgically/clinically significant?

Recall that:
Intraperitoneal organs have mesentery and they move inside the abdomen ➔ In surgical operations, the surgeon can manipulate them and remove them from the abdomen.
While the duodenum is fixed to the posterior abdominal wall.

➔ The jejunum and the ileum have mesentery as they are intraperitoneal organs.
(the mesentery consists of 2 folds of the Peritoneum).

➔ The jejunum and the ileum are present at the free edges of the Mesentery.

Duodenum

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

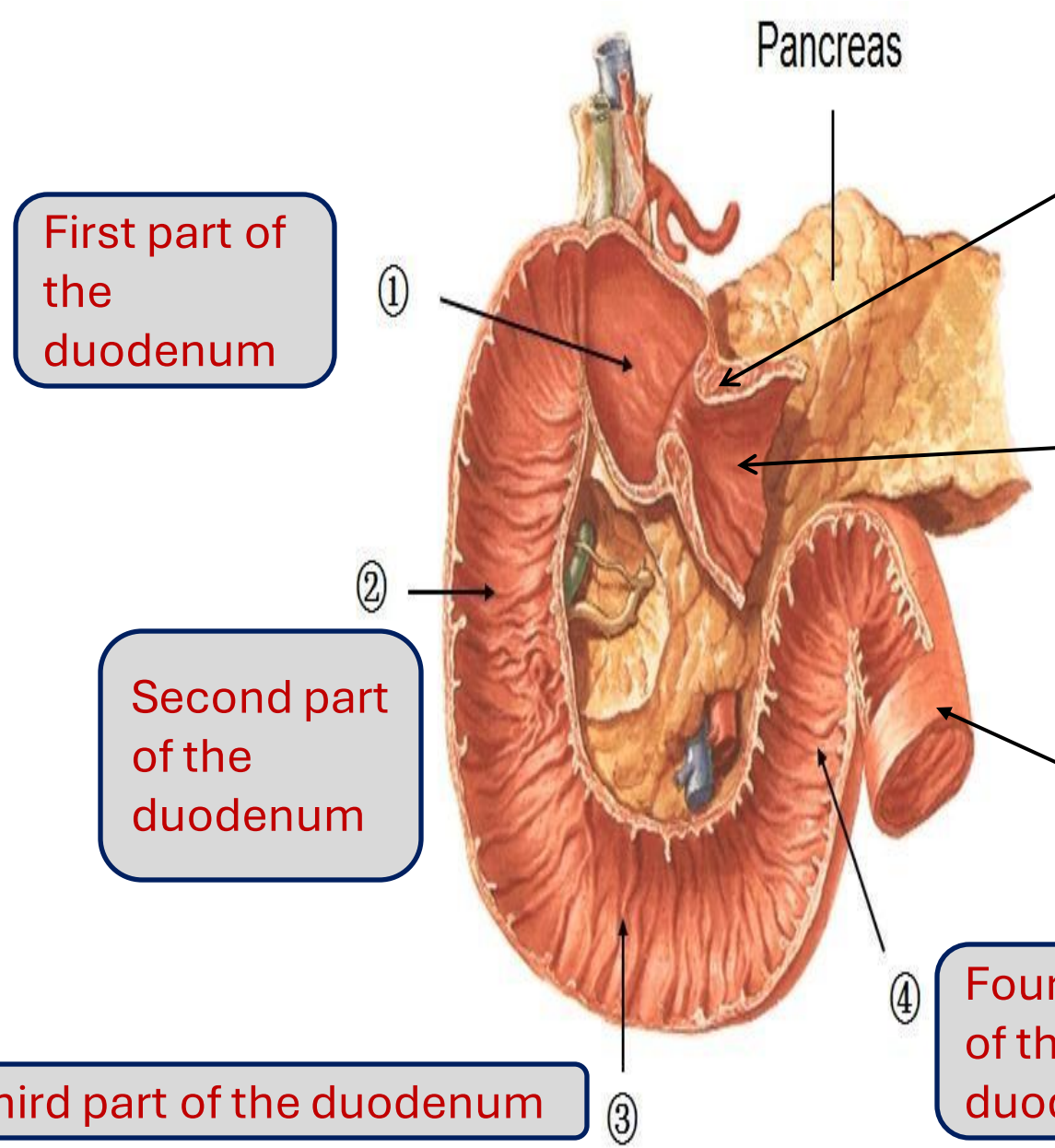
We can notice from the picture on the right that:

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.



First part of the duodenum

Pyloric sphincter

End of the stomach

Second part of the duodenum

Jejunum

Third part of the duodenum

Fourth part of the duodenum

- 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

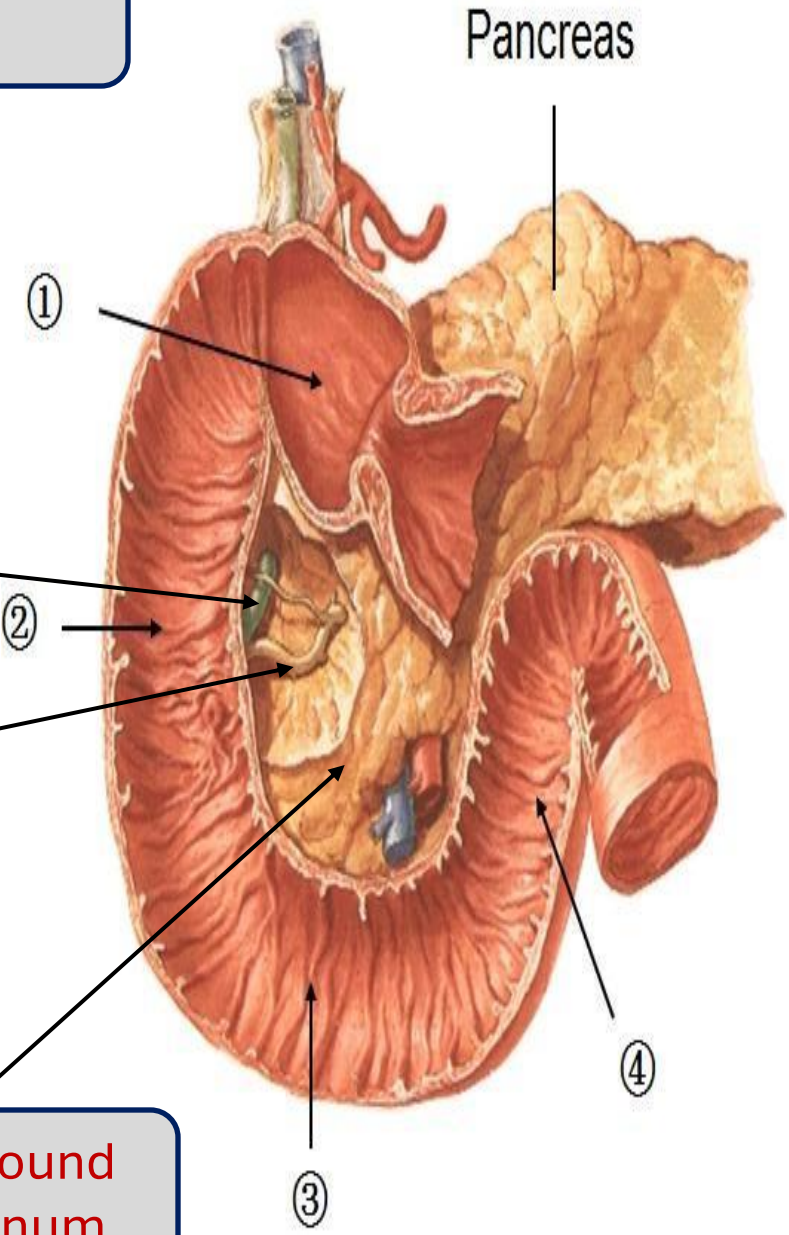
But the length of the small intestine as a whole is 6 meters

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



Now, lets put it this way for better understanding:

Why is it important that the head of the pancreas is found in the concavity of the duodenum?

Because the pancreatic duct and the common bile duct (of the liver & the gallbladder) assemble to open in the duodenum (the 2nd part of the duodenum specifically)

The convergence & assembly of the common bile duct and the pancreatic duct forms a bulge in the wall of the concave duodenum.

This bulge is known as the ampulla of vater.

But the opening itself inside the lumen of the duodenum is known as The major duodenal papilla.

Bulge inside the duodenal wall ➔ Ampulla of vater
Opening inside the duodenal lumen ➔ Major duodenal papilla

Extra information (NOT REQUIRED) from Gray's Anatomy textbook:

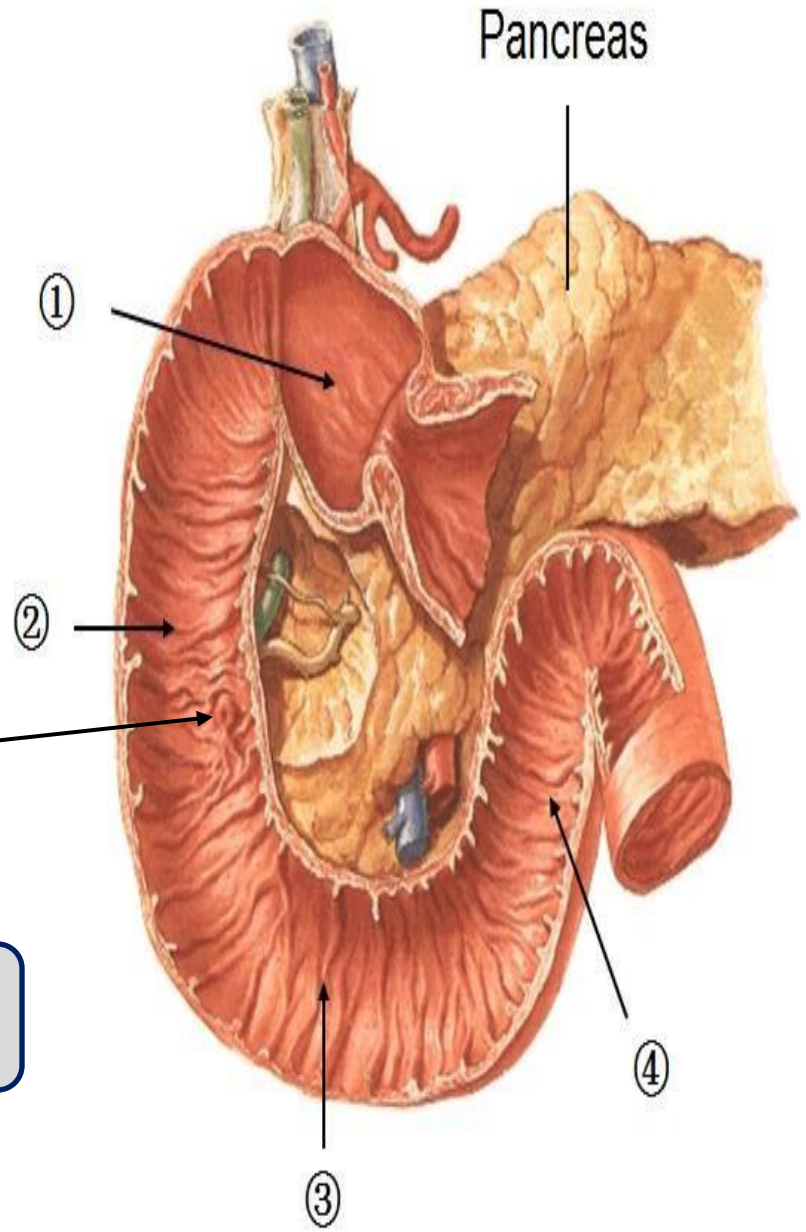
- The pancreatic & the common bile duct assemble & converge in a Y conformation as they enter the medial wall of the 2nd part of the duodenum forming a short common channel. And this common channel often contains a dilatation (which forms a bulge in the duodenal wall) & we call it the hepatopancreatic ampulla (a.k.a ampulla of vater)

- However, other scenarios are possible. Occasionally, the common bile duct and pancreatic duct unite outside the duodenal wall to form an abnormally long common channel or the two ducts are separated by a septum or drain into the duodenum separately.

- In clinical practice, the whole region containing the common bile duct & pancreatic duct, their assembly, ampulla of vater (if present) & the major duodenal papilla is called the pancreaticobiliary junction (PBJ).

Extra information (NOT REQUIRED) from Gray's Anatomy textbook:

- ➔ The pancreaticobiliary junction (PBJ) is clinically important as it is susceptible to various congenital & acquired disorders.
- ➔ Congenital disorders of PBJ: An anomalous (abnormal/ atypical) union between the bile and pancreatic ducts, particularly one resulting in an abnormally long common channel, may be associated with congenital bile duct dilation, recurrent pancreatitis, and/or gallbladder cancer.
- ➔ Acquired disorders of PBJ: Gallstone obstruction and peri-ampullary tumours.



The major duodenal papilla

(Which is present in the interior of the duodenum)

While the ampulla of vater is the bulge inside the wall of the duodenum

Furthermore, in the opening of the common bile duct & the pancreatic duct in the 2nd part of the duodenum (in the Major duodenal papilla), there is a sphincter which closes this opening, but opens it when there is release of the secretions from the gallbladder or the pancreas through their ducts into the duodenum.

This sphincter is known as the sphincter of Oddi.

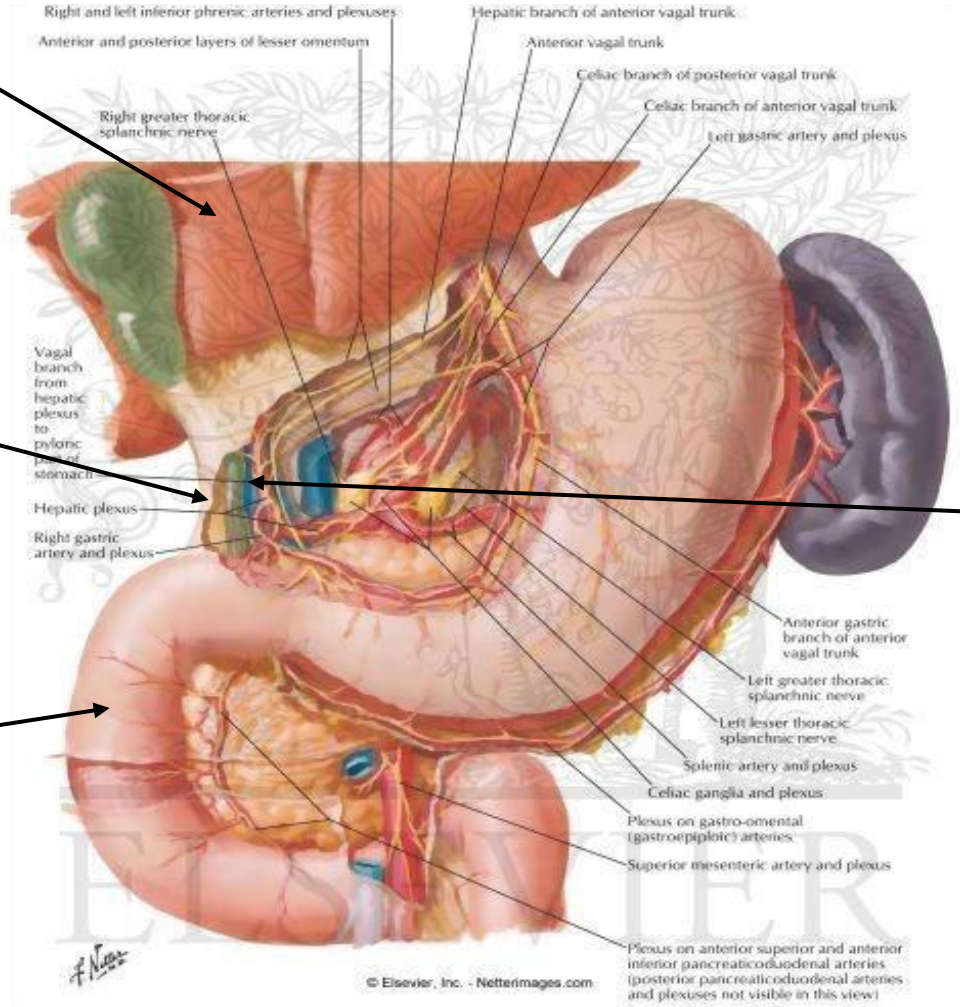
Sphincter of Oddi is a circular smooth mucle.

Quick Revision

Liver

Epiploic Foramen

Duodenum



The three structures in the free edge of the Lesser Omentum:

1) The Common Bile Duct
2) The Hepatic Artery
3) The Portal Vein

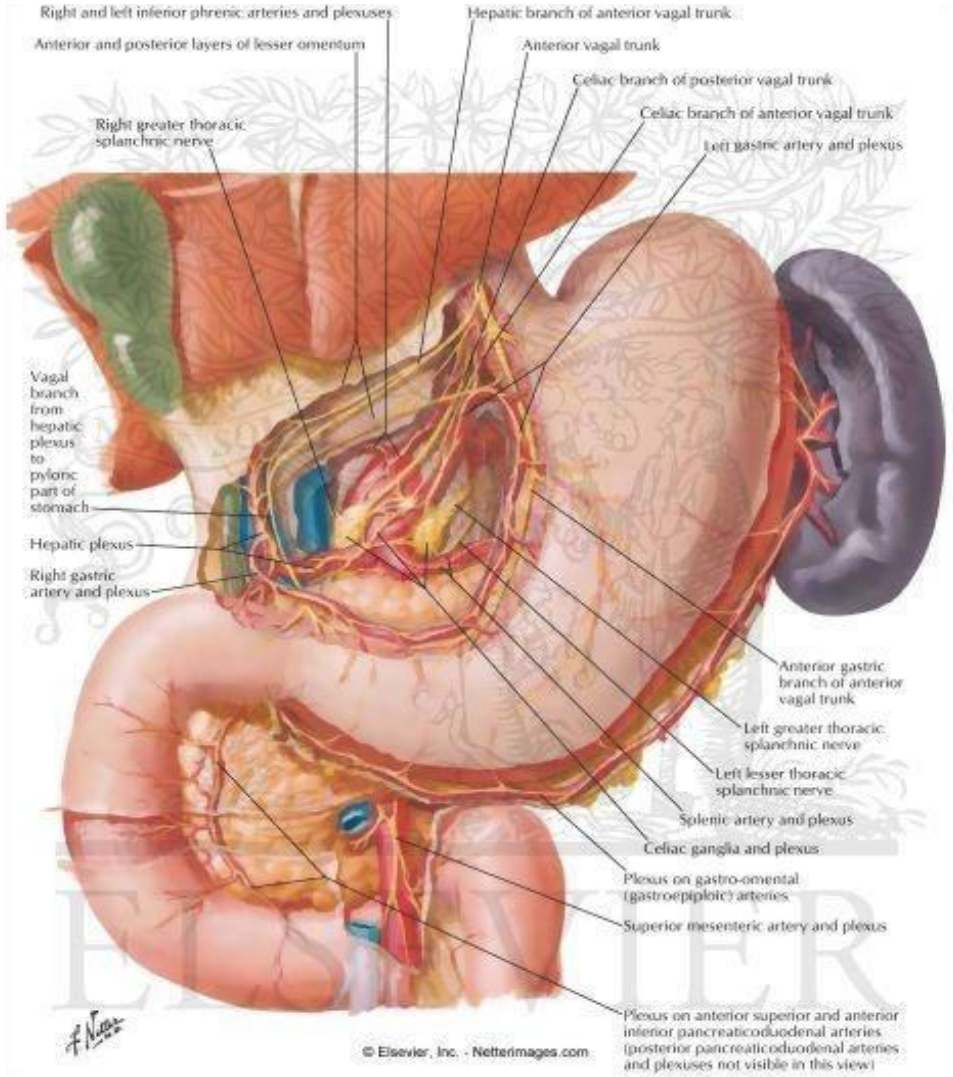
- Most of the duodenum is retroperitoneal except the 1st inch & last inch.

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

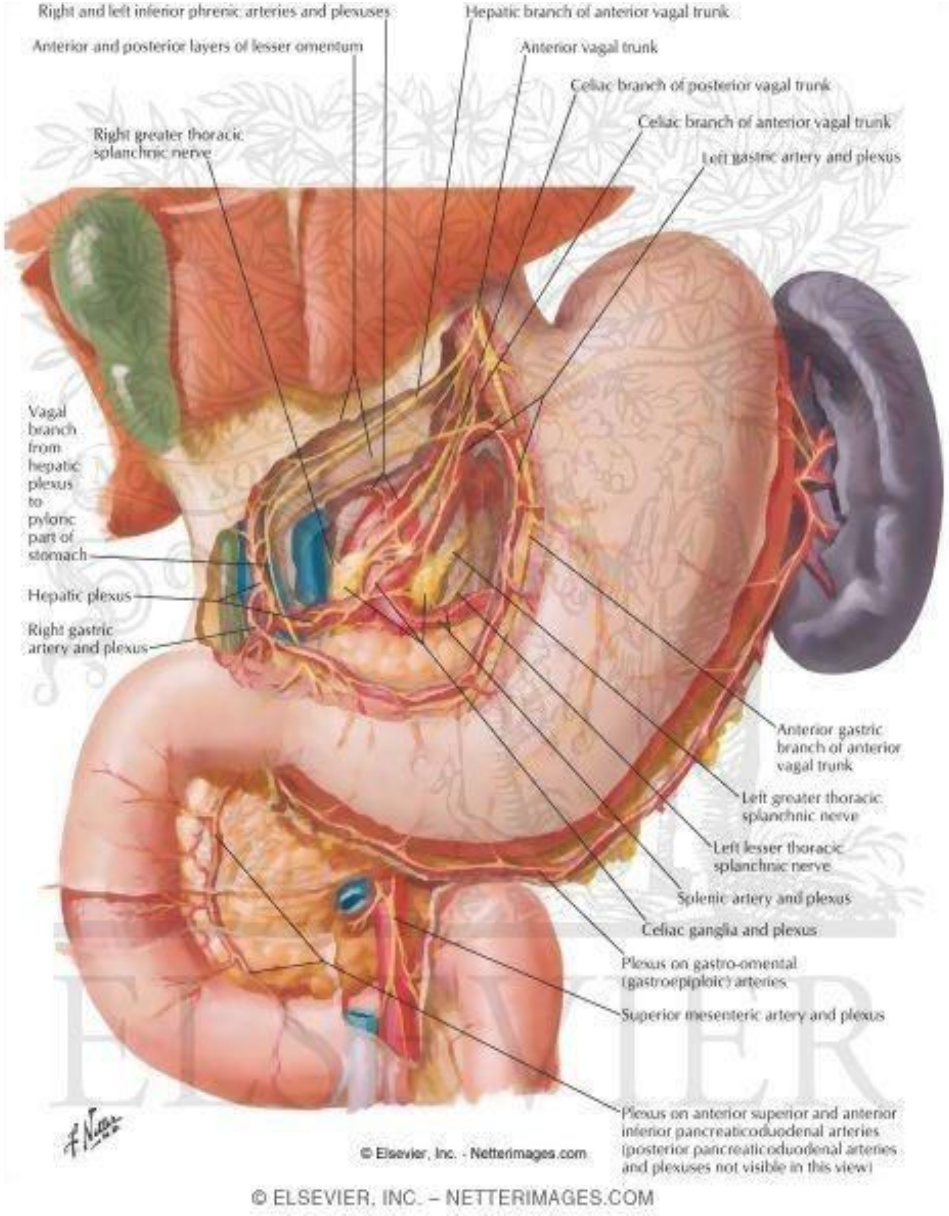
Why are the 1st and the last inches of the duodenum intraperitoneal?

➔ 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.



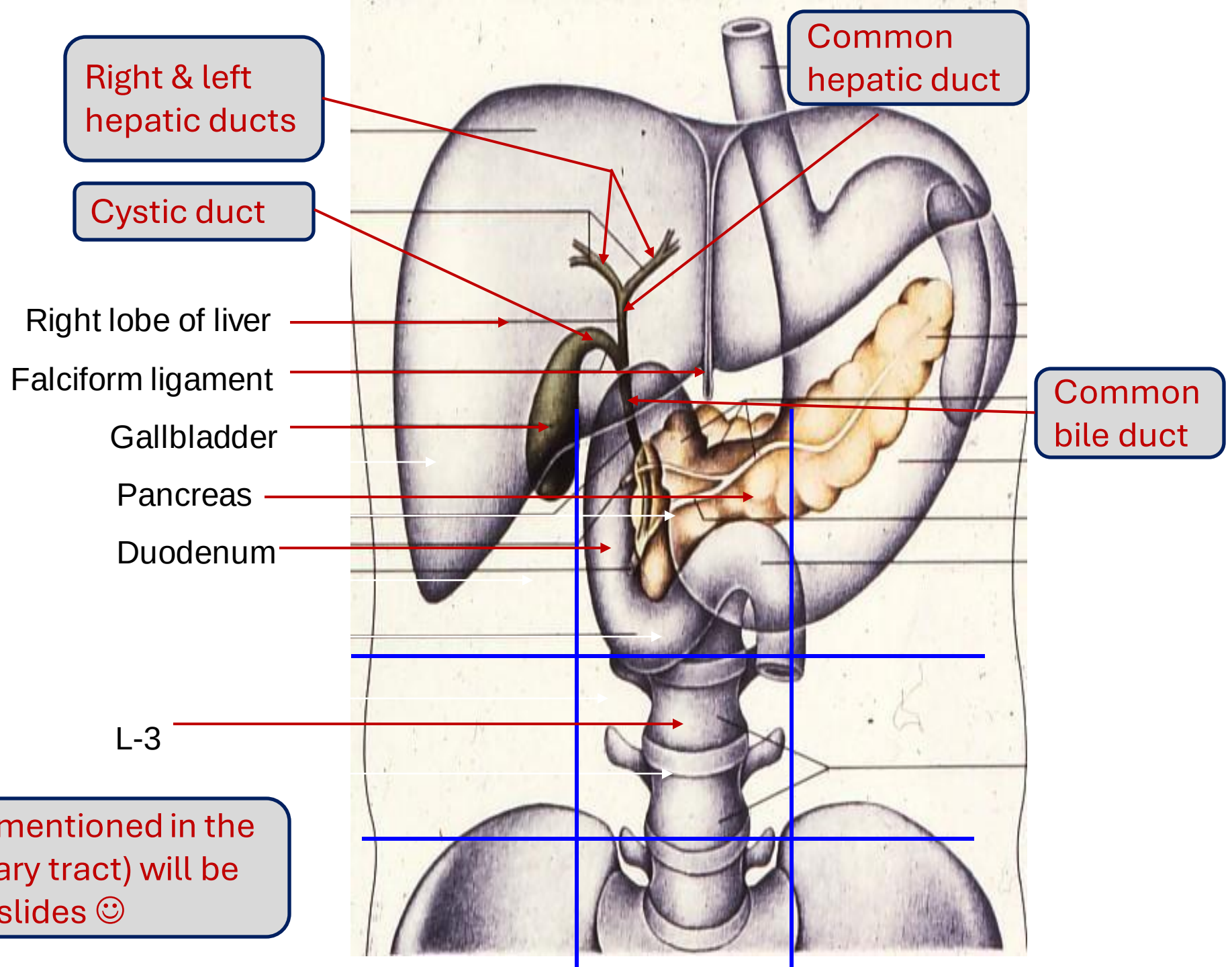
- This short segment (1st inch) has the lesser omentum on its upper border, the greater omentum on its lower border, and the lesser sac posterior to it.
- The duodenum extends from the pylorus to the jejunum.
- It is divided into 4 parts.



Site of duodenum

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

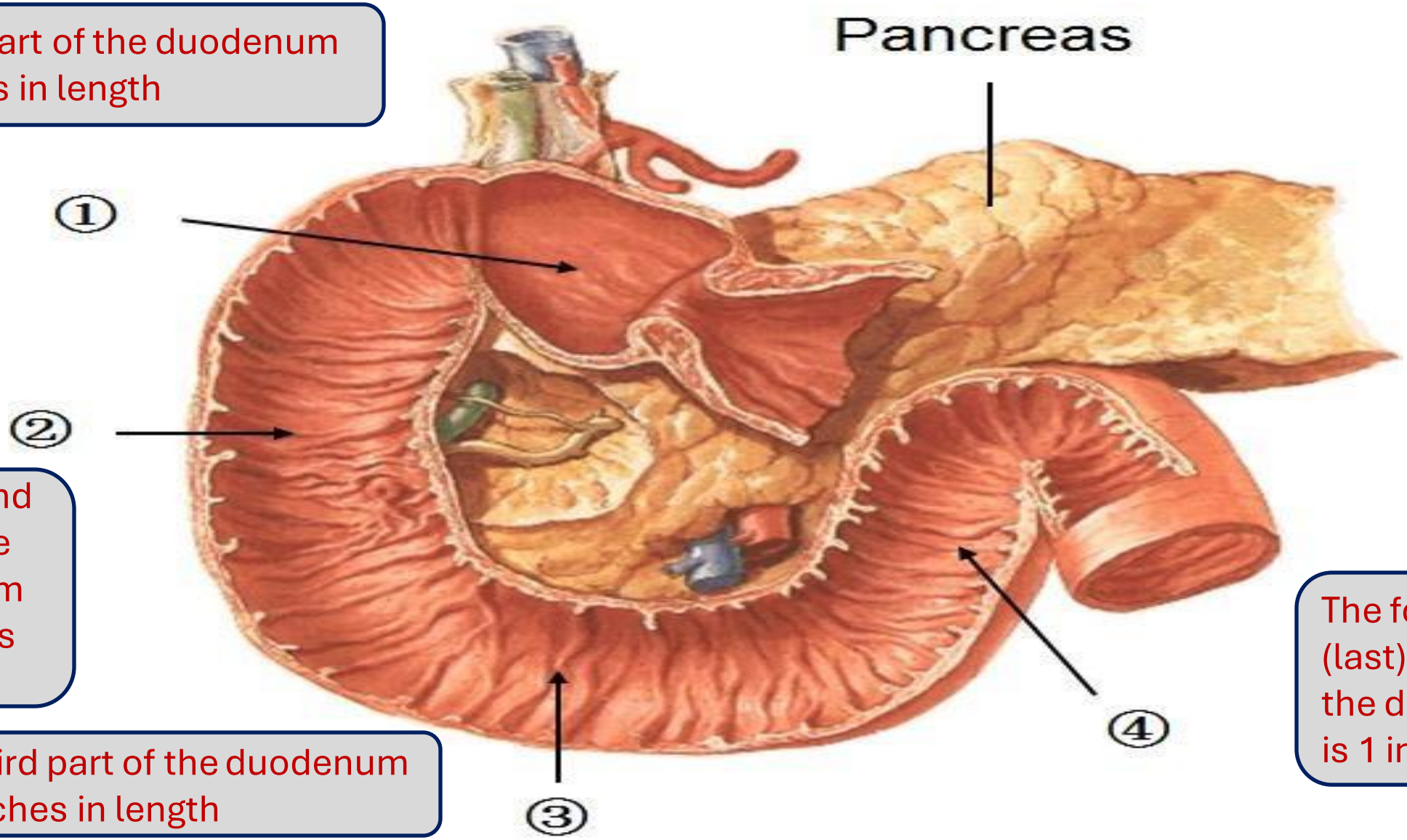
The doctor advised to pay attention to the anatomical relations between the pancreas, duodenum and the liver!



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



The second part of the duodenum is 3 inches in length

The third part of the duodenum is 4 inches in length

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

Remember!

The importance of the duodenum is that it receives the bile & the bile salts from the liver and the pancreatic secretions & enzymes from the pancreas.

Sometimes there is an extra duct emerging from the pancreas other than the pancreatic duct mentioned earlier, and it opens in the duodenum.

This duct is known as the accessory pancreatic duct.

The accessory pancreatic duct forms an opening in the interior of the lumen of the duodenum called minor duodenal papilla.

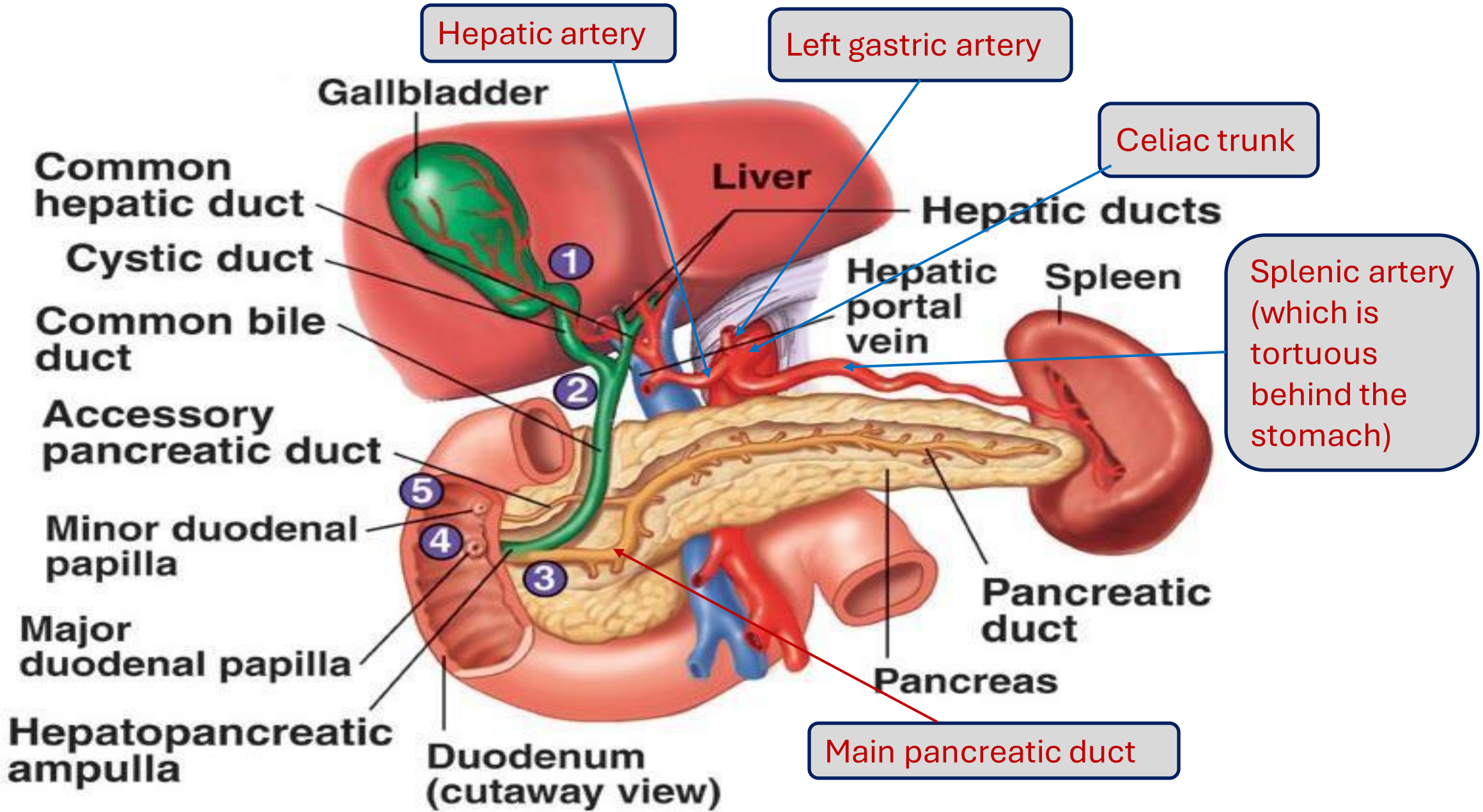
To summarize, we have two pancreatic ducts:

1) The Main Pancreatic Duct: which is normally found in every person. Also, it assembles with the common bile duct to open in the 2nd part of the duodenum to form in the interior of the duodenal lumen the major duodenal papilla.

2) The Accessory Pancreatic Duct: which is present in some people. Also, it opens in the duodenum to form in the interior of the duodenal lumen the minor duodenal papilla.

The minor duodenal papilla lies 1 inch above the major duodenal papilla.

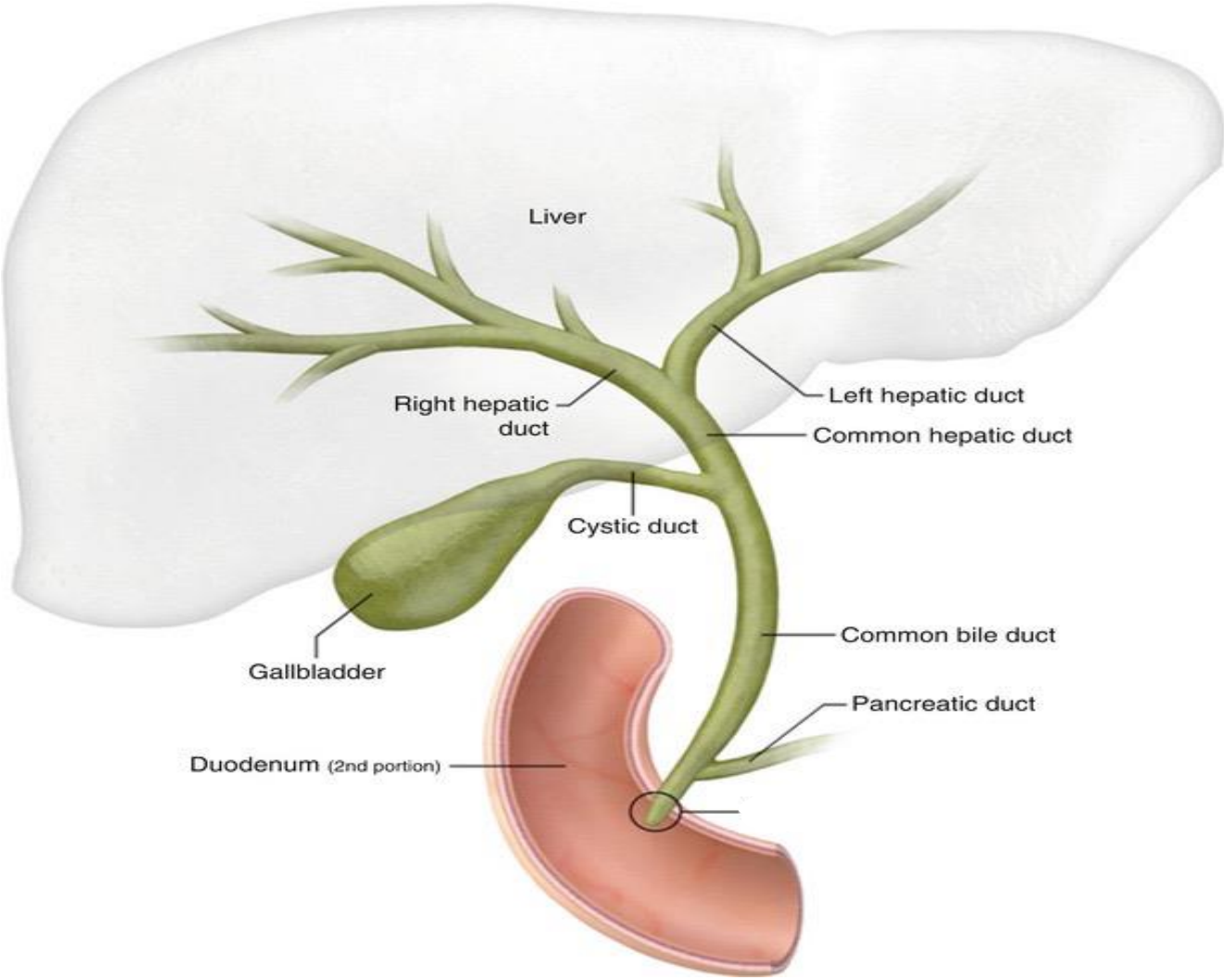
Parts of the duodenum &Their relations



Explanation of The Biliary Tract from the previous slide:

- ➔ Its purpose is to produce bile (by the liver), store it & concentrate it (inside the gallbladder) and secrete it (through the bile ducts).
- ➔ The bile is firstly produced in the liver, and then it leaves the liver through the left and right hepatic ducts.
- ➔ Then, the left and right hepatic ducts assemble and converge to form the common hepatic duct.
- ➔ Then, the common hepatic duct assembles with the cystic duct (which carries the bile from the gallbladder) to form the common bile duct.
- ➔ The bile stored in the gallbladder firstly pass through the cystic duct.
- ➔ Then, the common bile duct passes behind the 1st part of the duodenum.
- ➔ Then, it penetrates the head of the pancreas to assemble with the main pancreatic duct to open in the 2nd part of the duodenum to form the major duodenal papilla in the duodenal lumen.

The importance of the major duodenal papilla lies in the fact that it completes the digestion of fat.



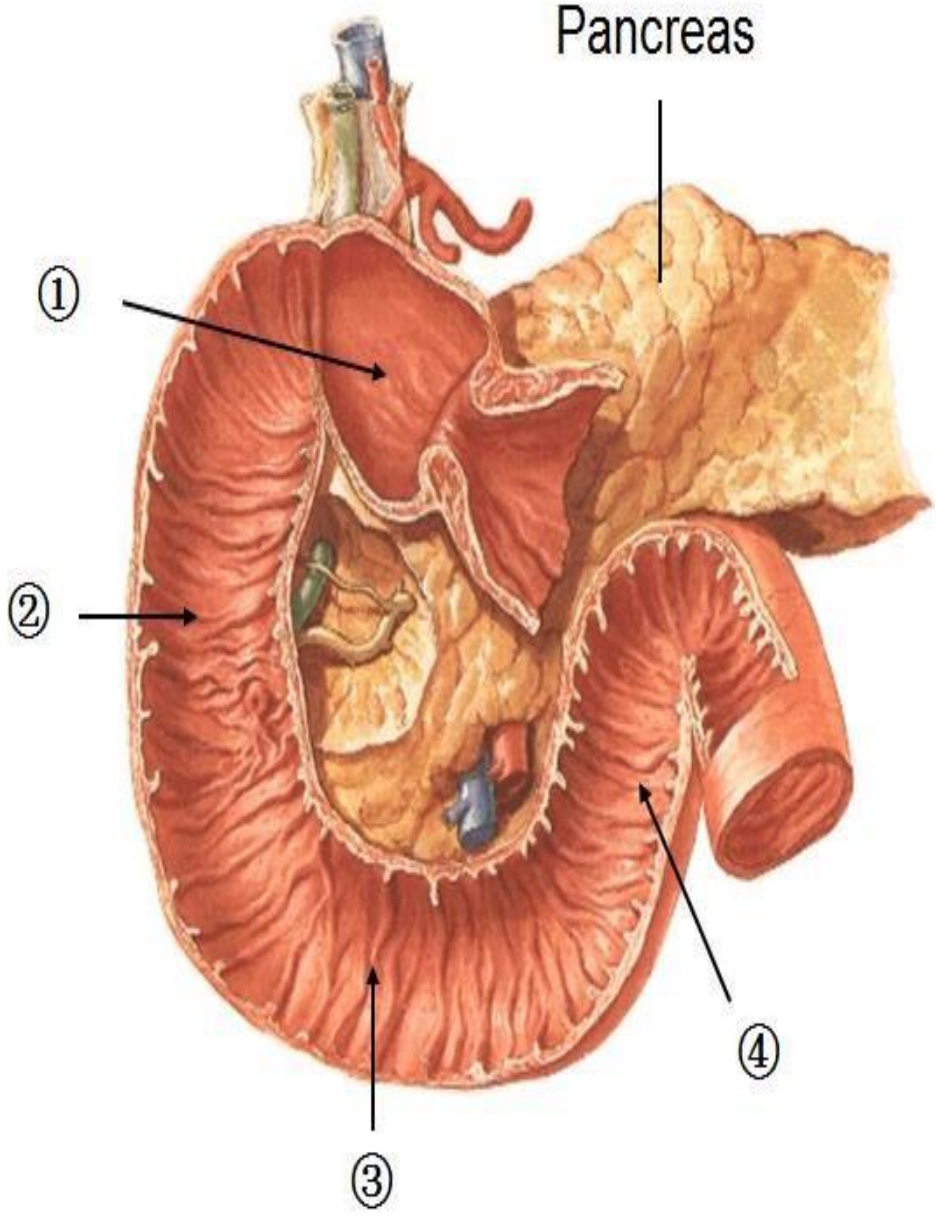
Extra image of the biliary tract for better understanding

1st part of the Duodenum

The part directly after the pyloric sphincter

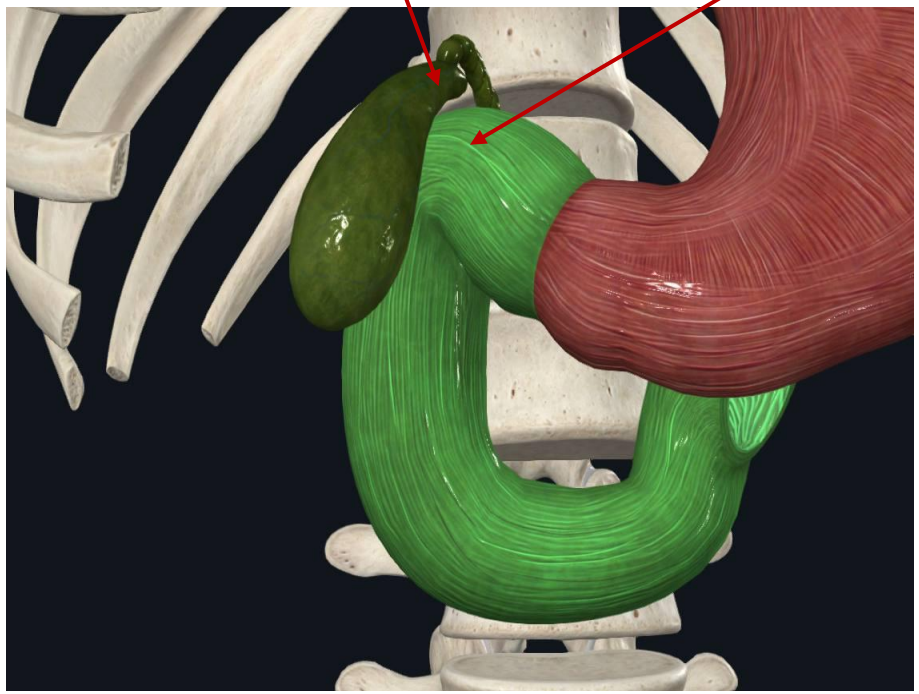
- The first part is 2 inches long.
- It begins from the pyloduodenal junction at the level of the transpyloric line.
- It runs upwards and backwards at the level of the 1st lumbar vertebra 1 inch to the right.

It reaches the neck of the gallbladder

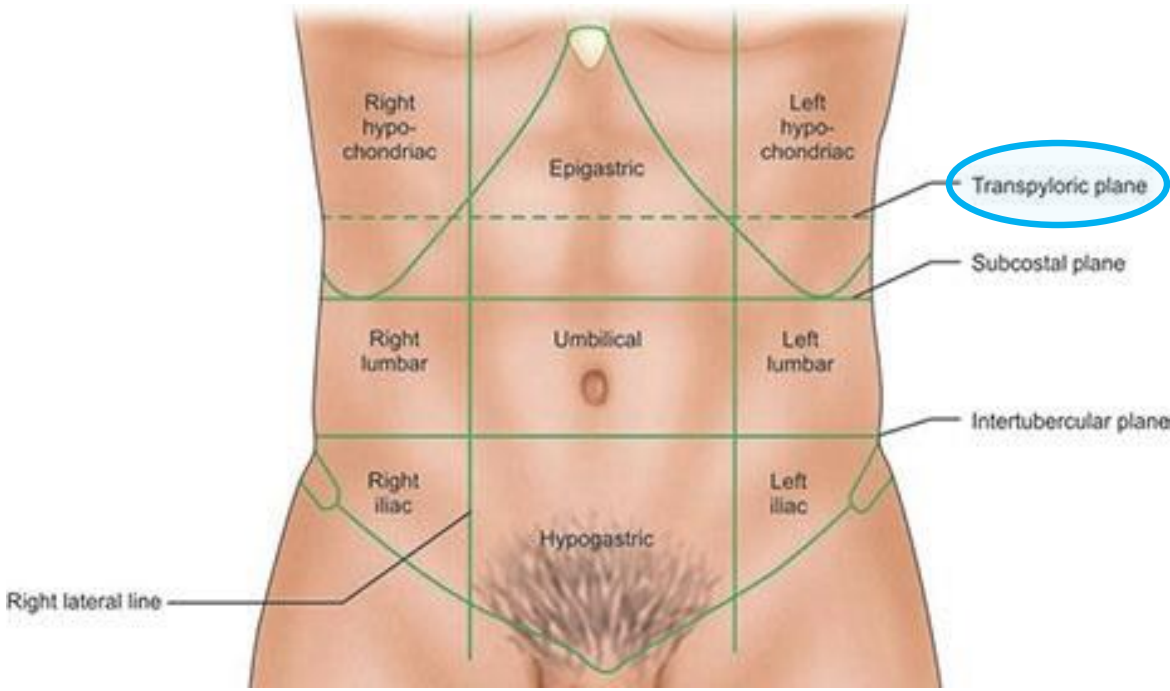


The neck of the Gallbladder

First part of the Duodenum



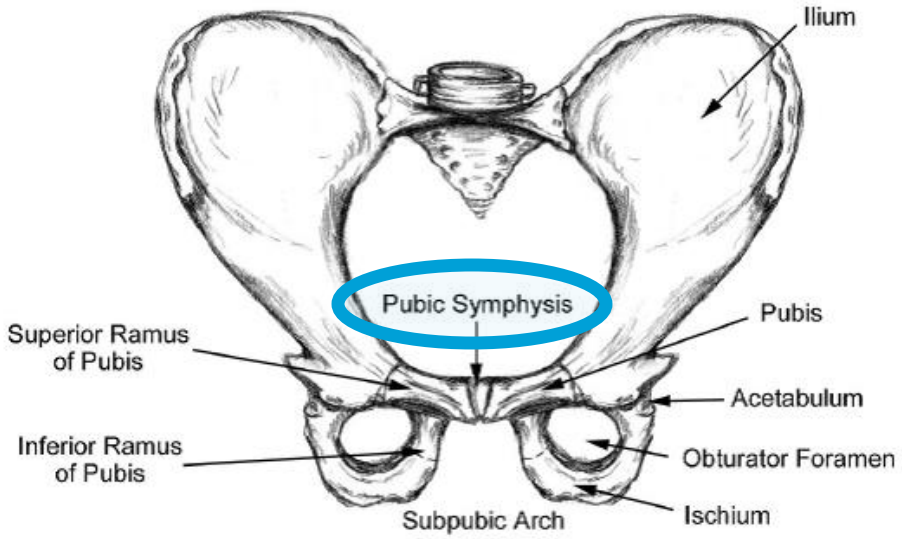
Extra image (anterior view) showing the first part of the duodenum reaching the neck of the gallbladder

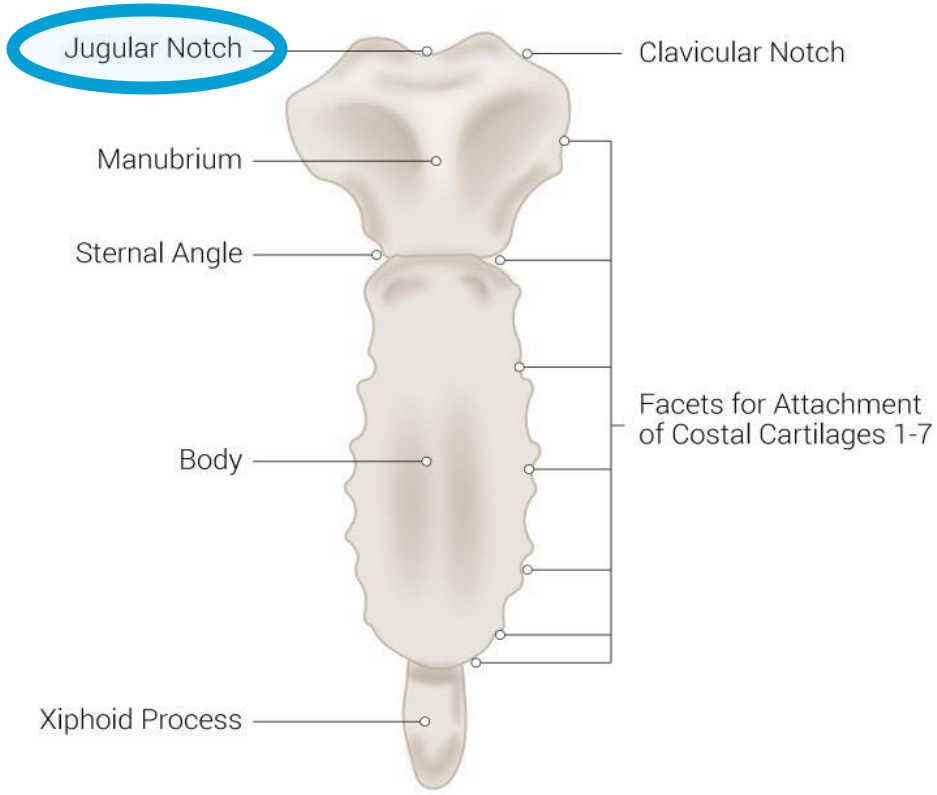


Extra image for showing the transpyloric line (or transpyloric plane)

Extra further explanation for the transpyloric line for better understanding ☺

The tranpyloric plane is an imaginary horizontal axial plane located midway between the jugular notch (also called suprasternal notch) and the superior border of pubic symphysis, at approximately the level of L1 vertebral body.

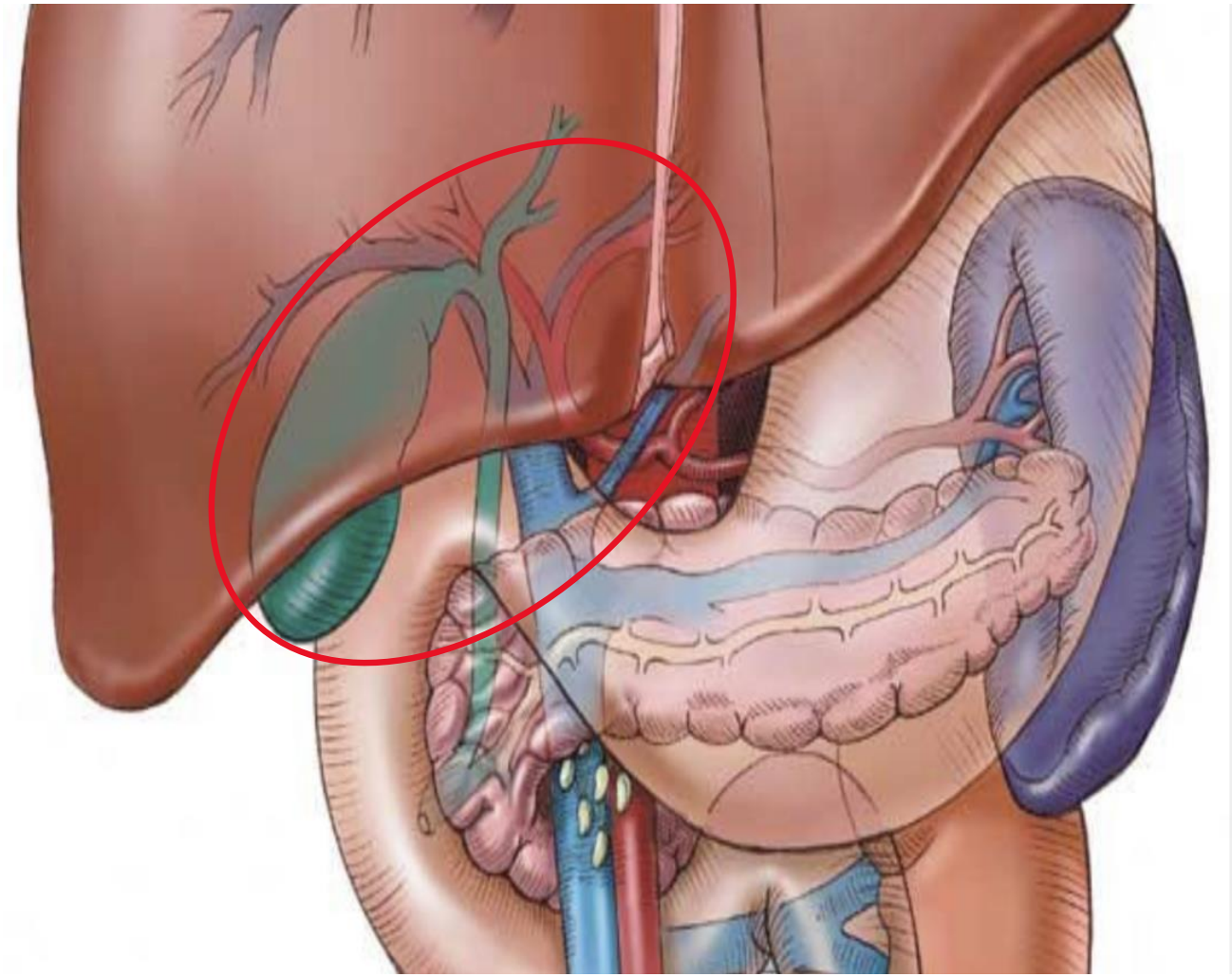




Relations of the 1st part of the Duodenum

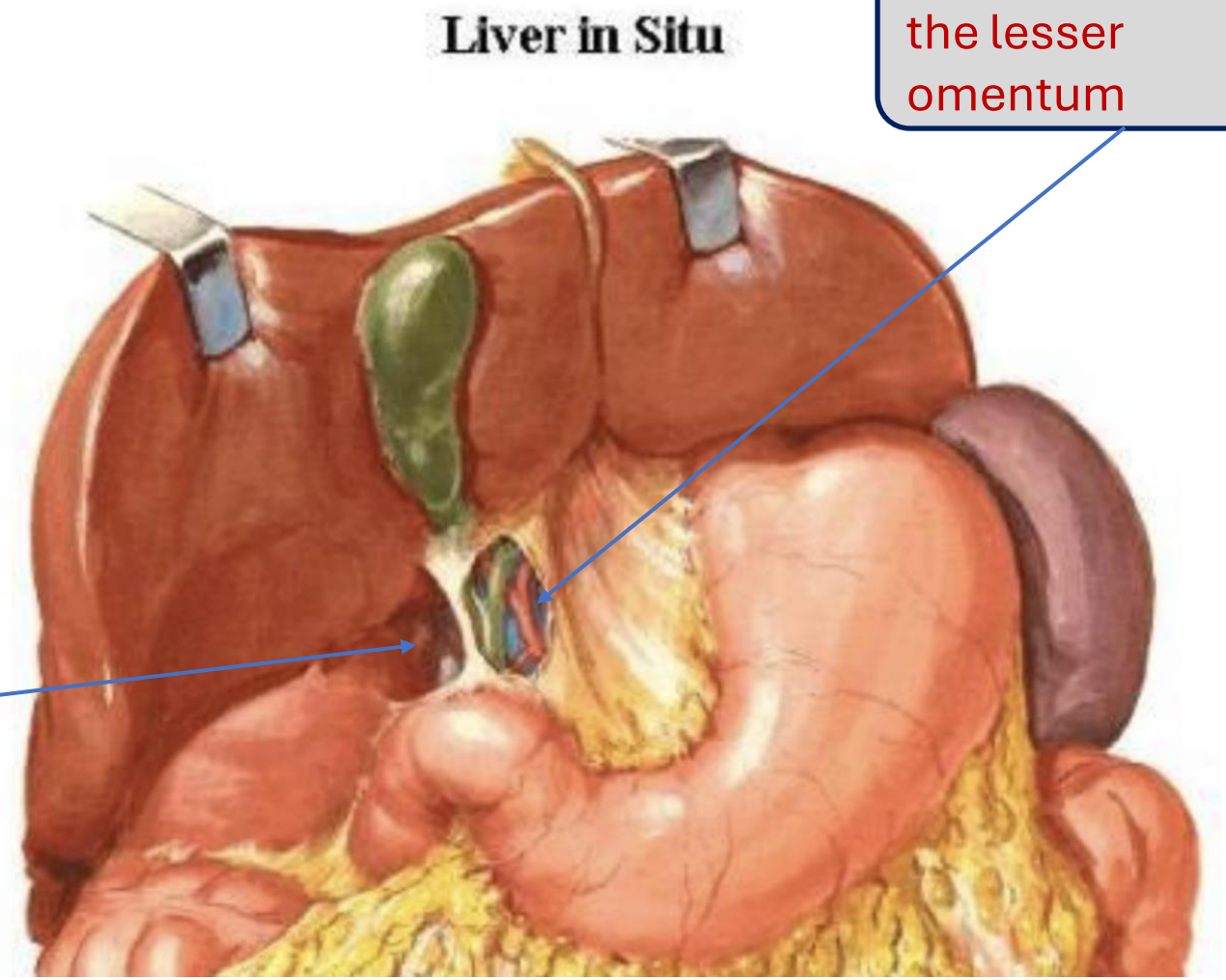
Anteriorly:

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



Superiorly:

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



The free edge of the lesser omentum

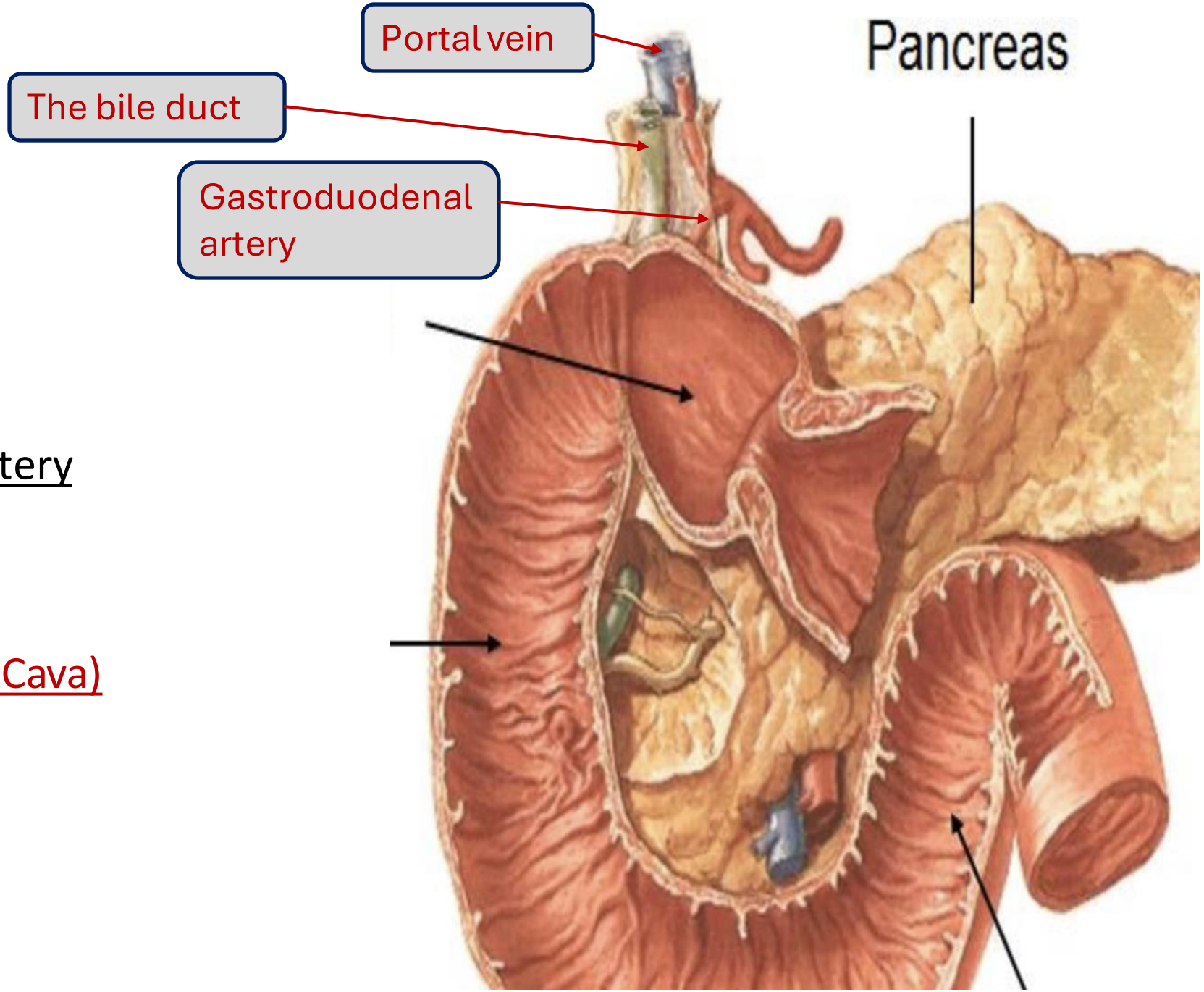
Epiploic formen

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.

Posteriorly:

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

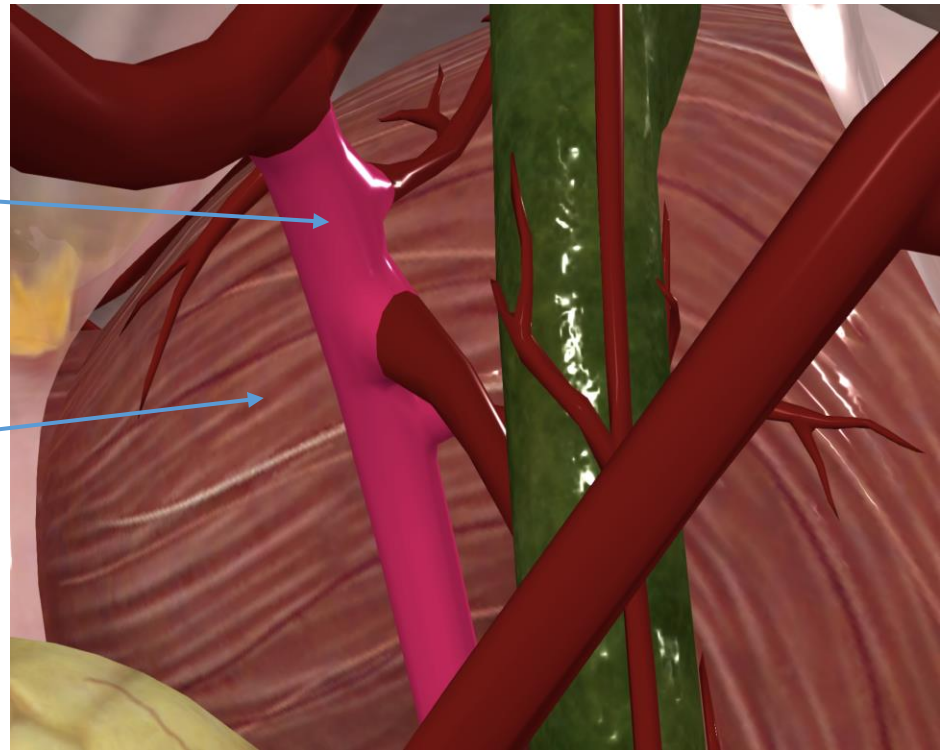


Note from the doctor on a pathological condition:

In some cases of peptic ulcers in the 1st part of the duodenum, complications occur such as perforation of the duodenum; which can injure the gastroduodenal artery because it runs posterior to the 1st part of the duodenum.

The gastroduodenal artery

First part of the duodenum

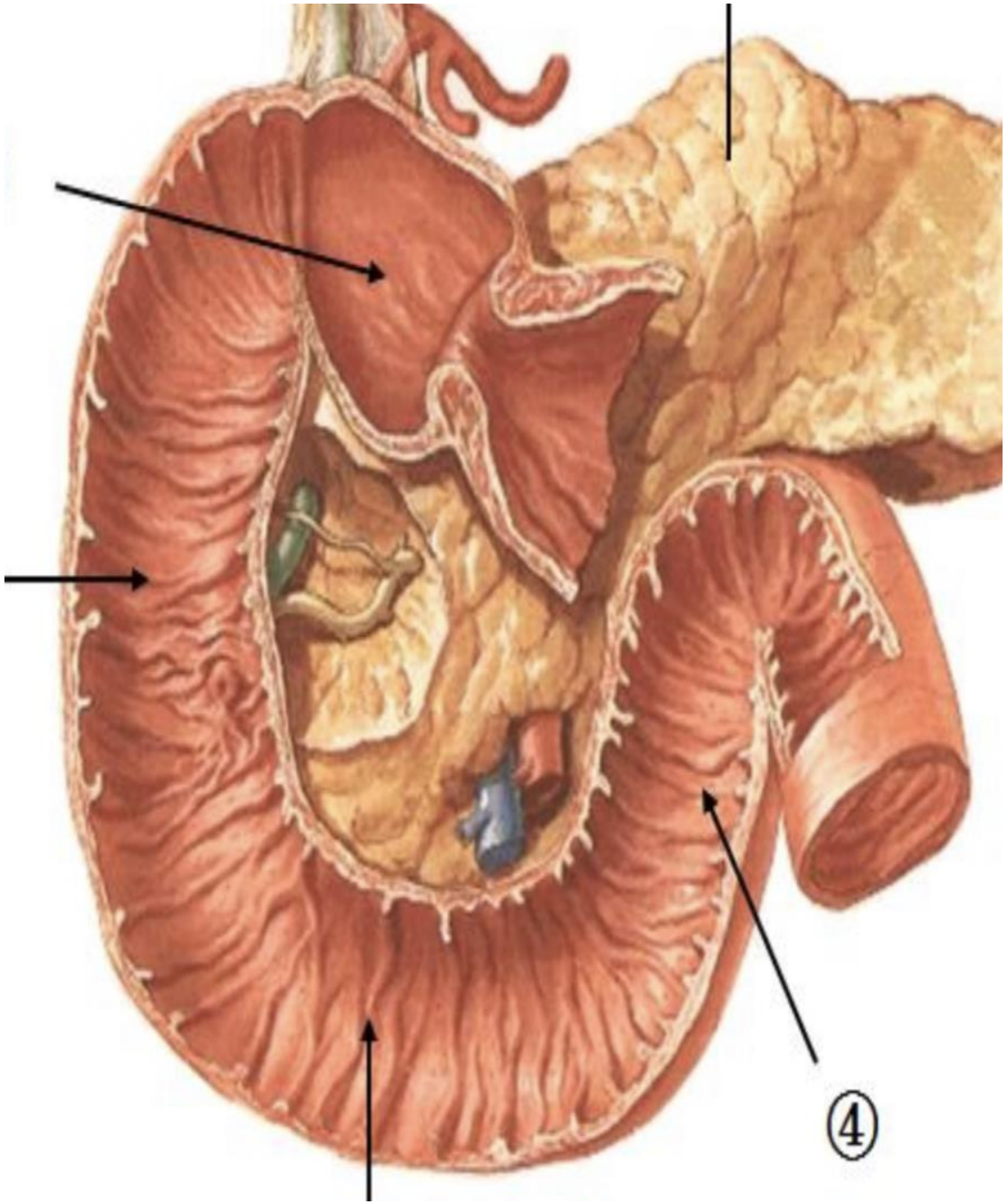


Extra image (posterior view) for better understanding and visualization:

Notice how the gastroduodenal artery is so close to the 1st part of the duodenum as it runs posterior to it, which makes it susceptible to injury if this part of the duodenum is perforated (perforation is a complication of peptic ulcers).

Inferiorly:

1) The head of the Pancreas



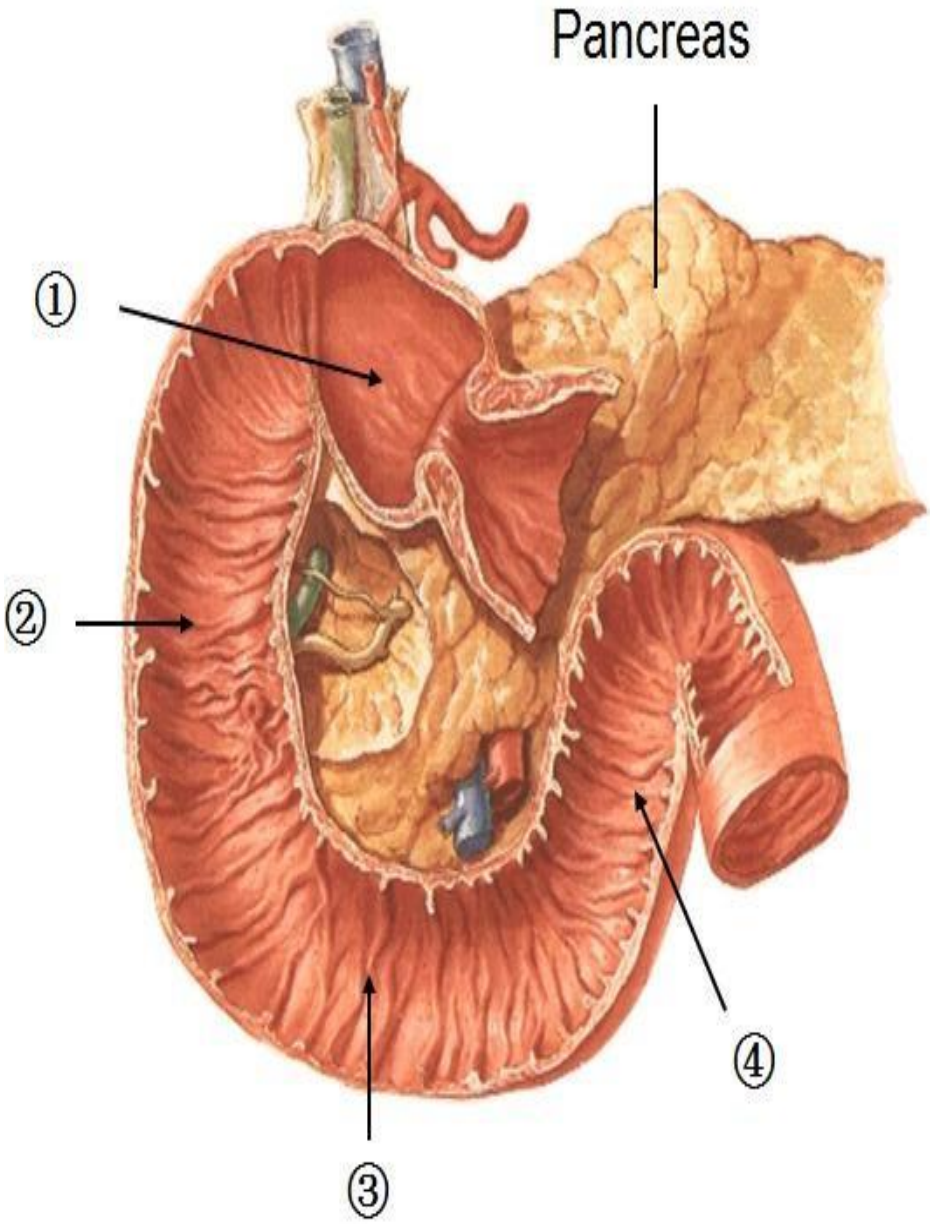
2nd part of the Duodenum

- 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:

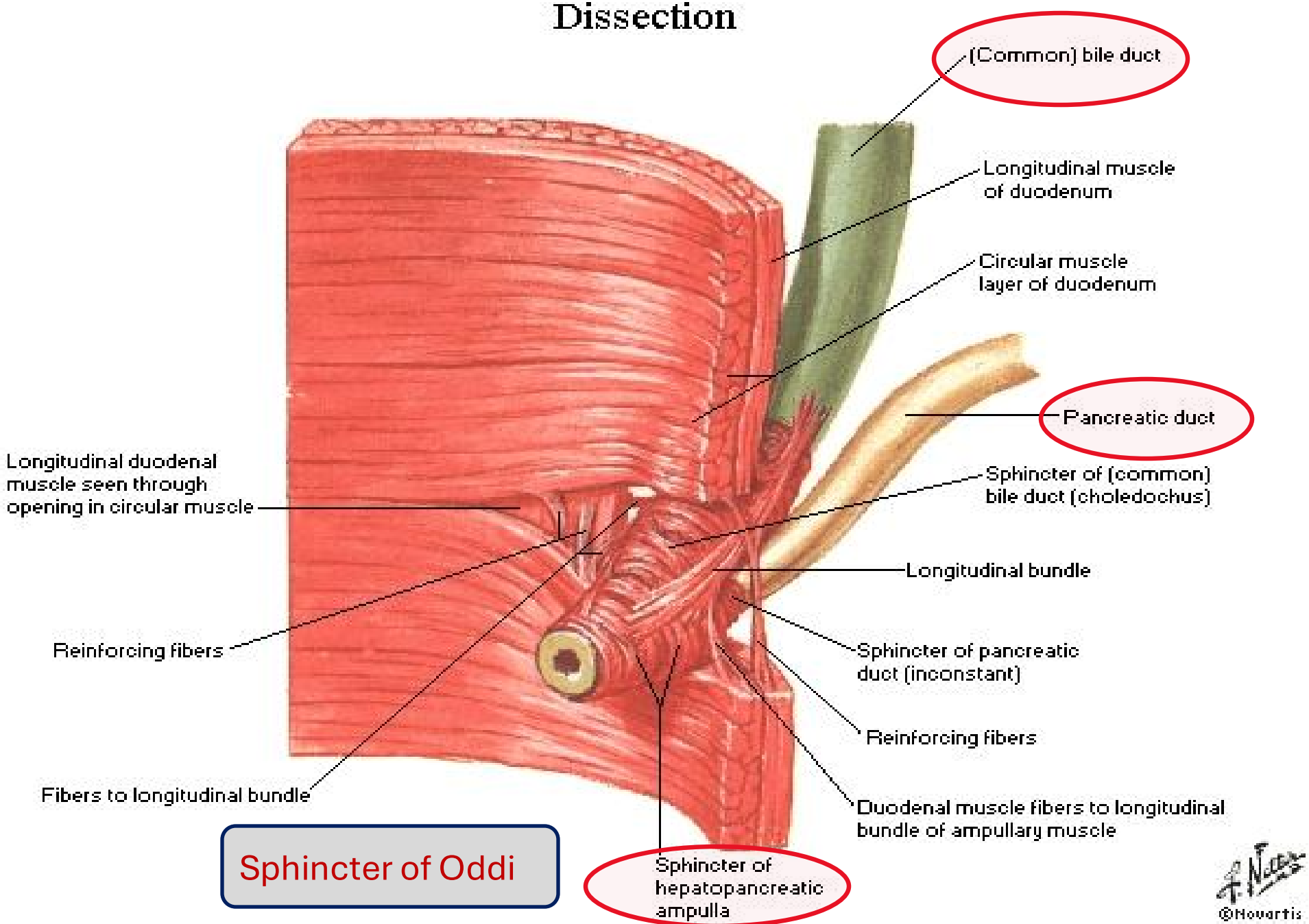
➔ The common bile and pancreatic ducts form:
- Outside the duodenal lumen: the ampulla of vater.
- Inside of the duodenal lumen: the major duodenal papilla.

➔ 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



Sphincter of Oddi

- 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.

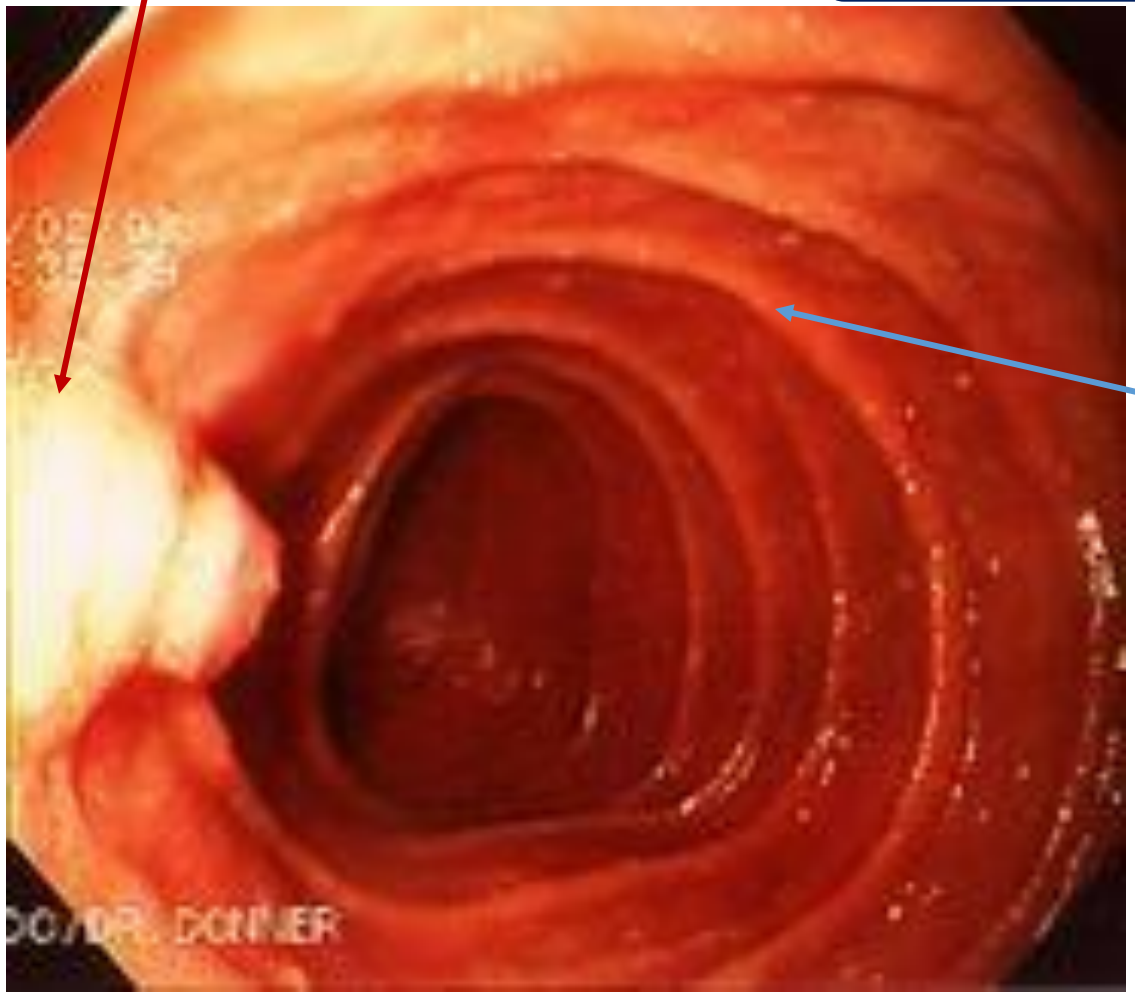
The use of ERCP in pathological conditions concerning the pancreatic duct:

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.

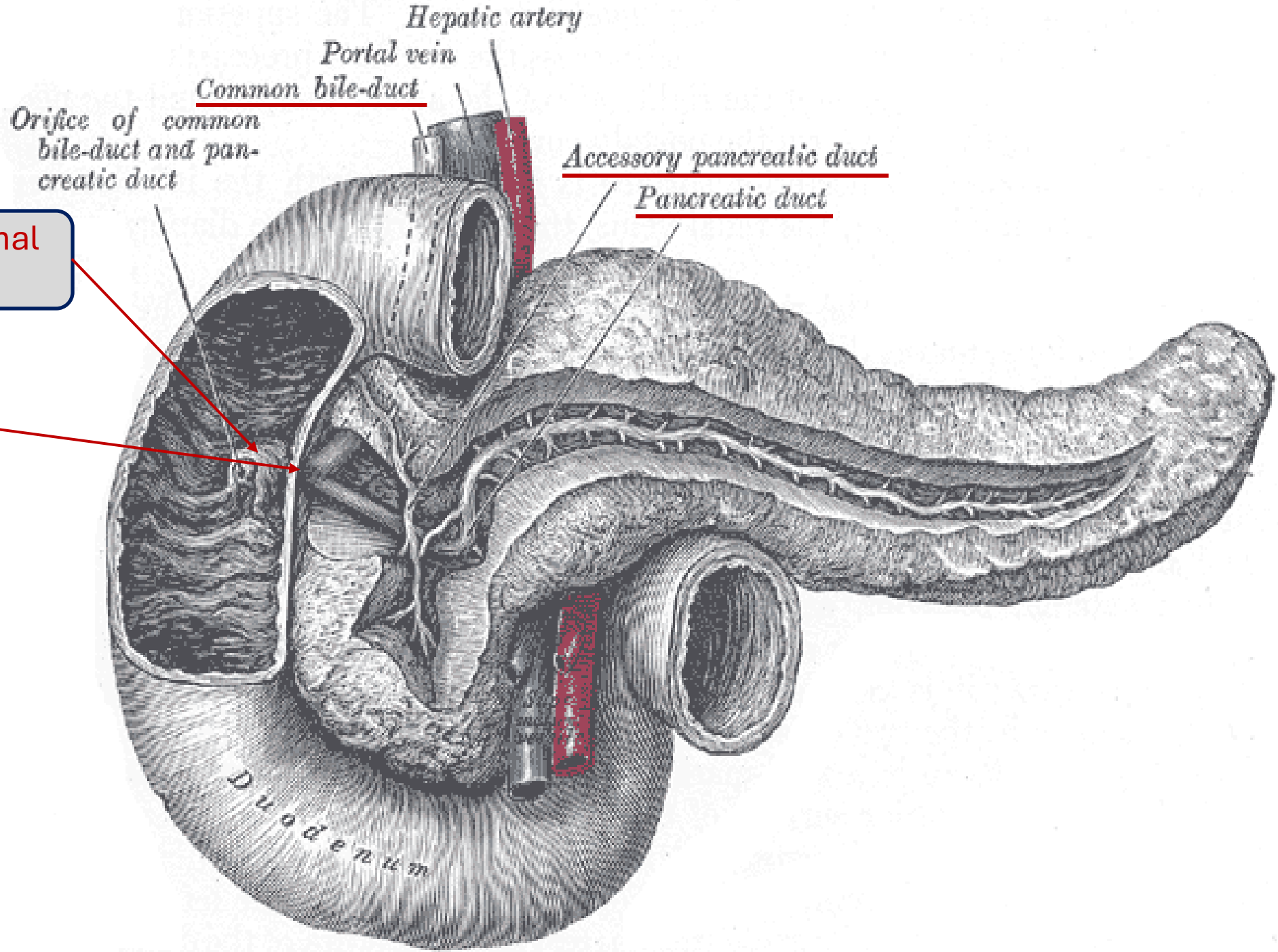
Hepaticopancreatic ampulla (Ampulla of Vater)

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 of2nd 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.

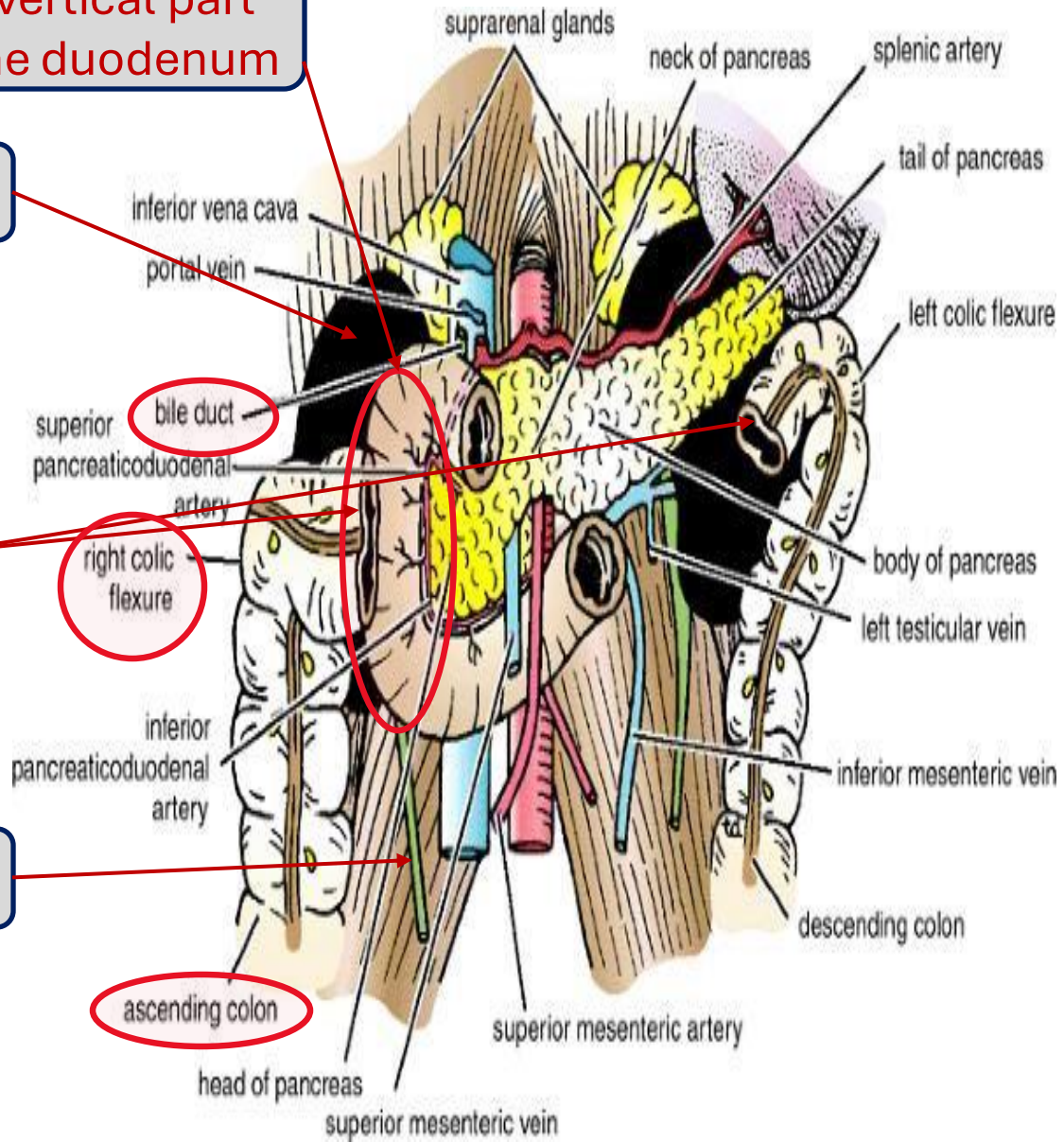
Medial.
- Head of pancreas
- Bile and pancreatic ducts & their opening in the duodenum.

The vertical part of the duodenum

The right kidney

Not that the transverse colon is cut in this image in order to view the 2nd part of the duodenum

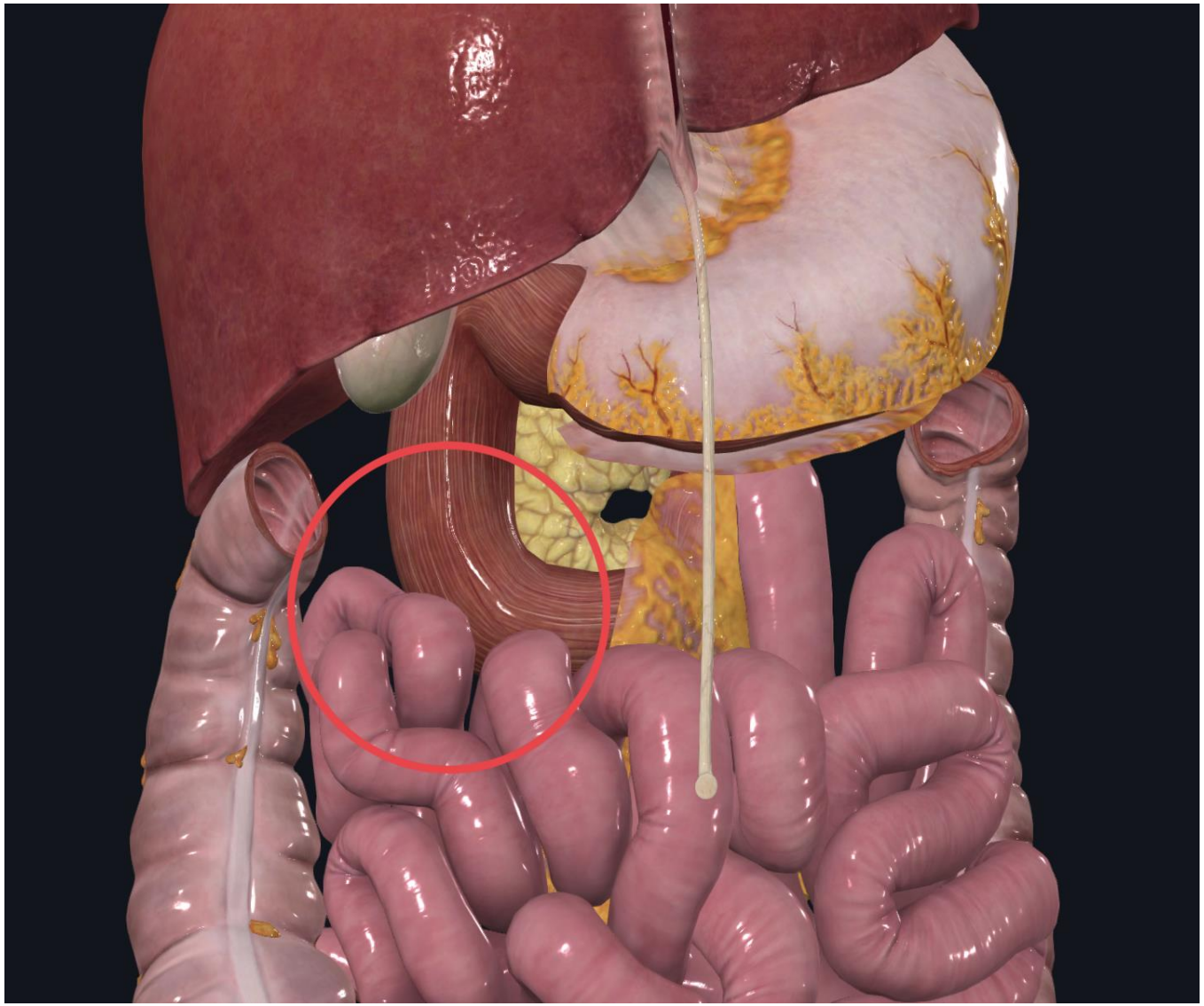
The right ureter



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.



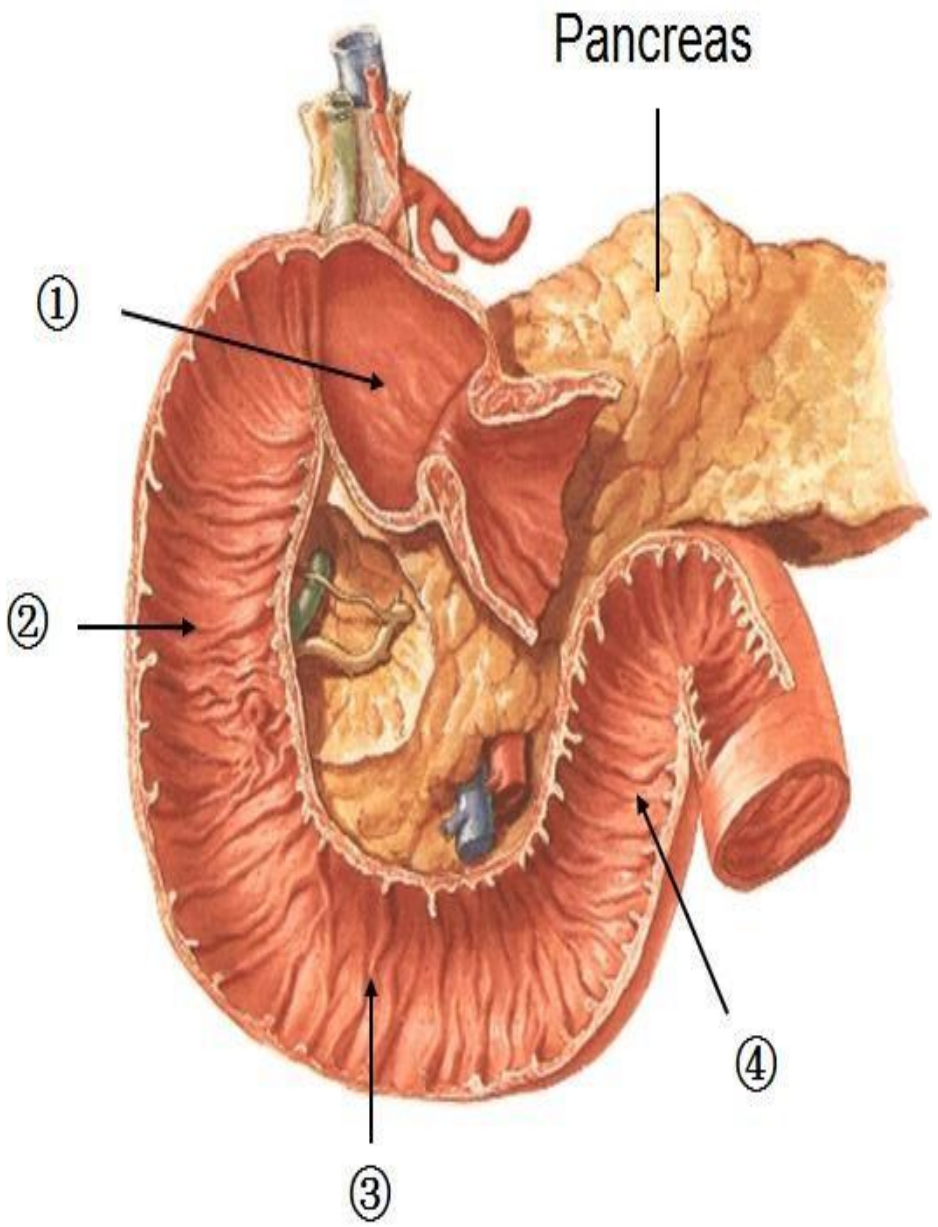
3rd part of the Duodenum

- 4” (inches) long.
- Runs horizontally to the left.
- On the subcostal plane.
- Runs in front of the vertebral column.
- Under the lower margin of the head of pancreas.
- Above the coils of the Jejunum.

It is the horizontal part of the duodenum

In contrast to the 1st part which begins at the level of the transpyloric plane

In front of the lumbar vertebra



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 mesentry
- Coils of the Jejunum

Posteriorly:

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

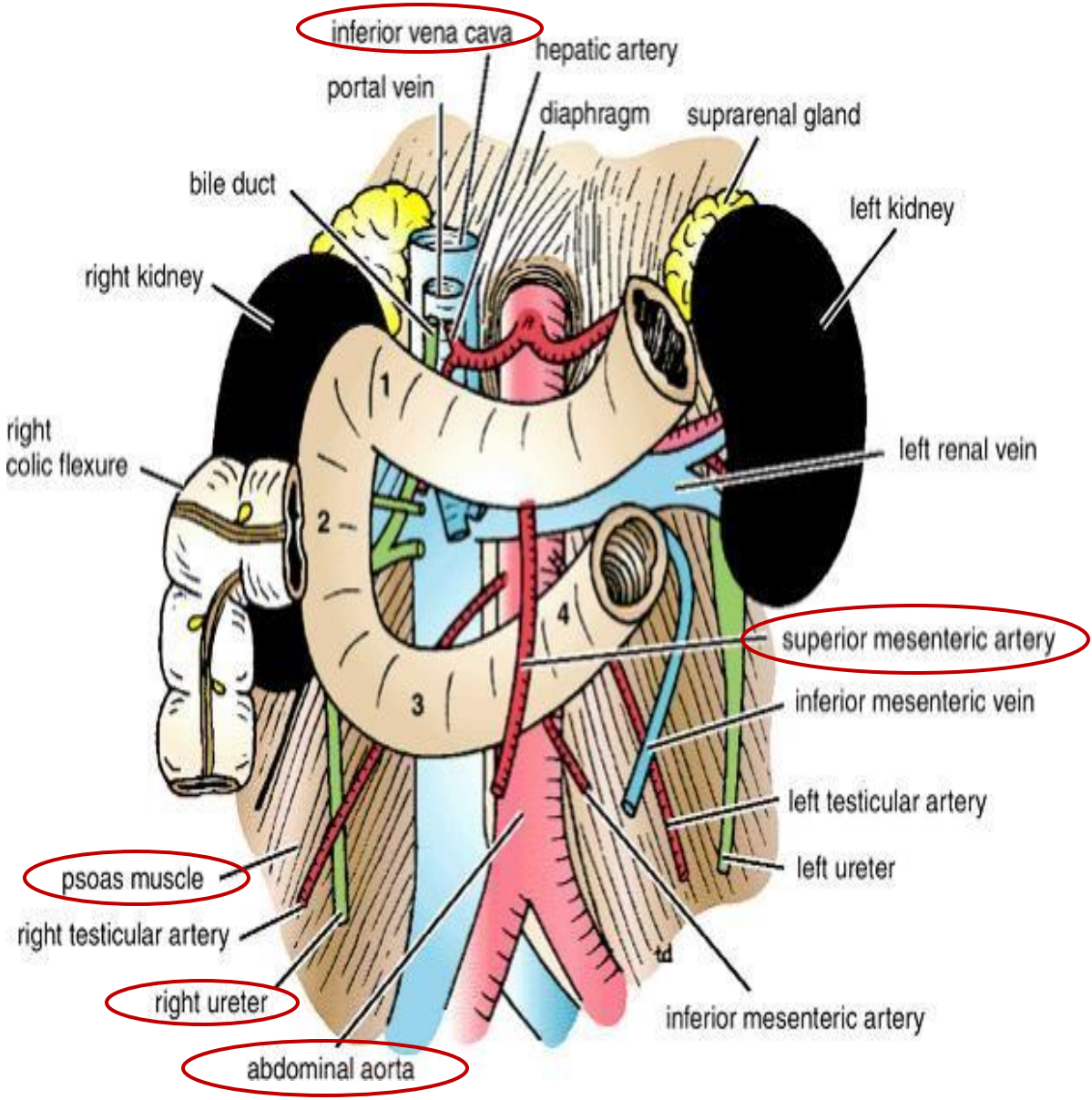
Superiorly:

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.



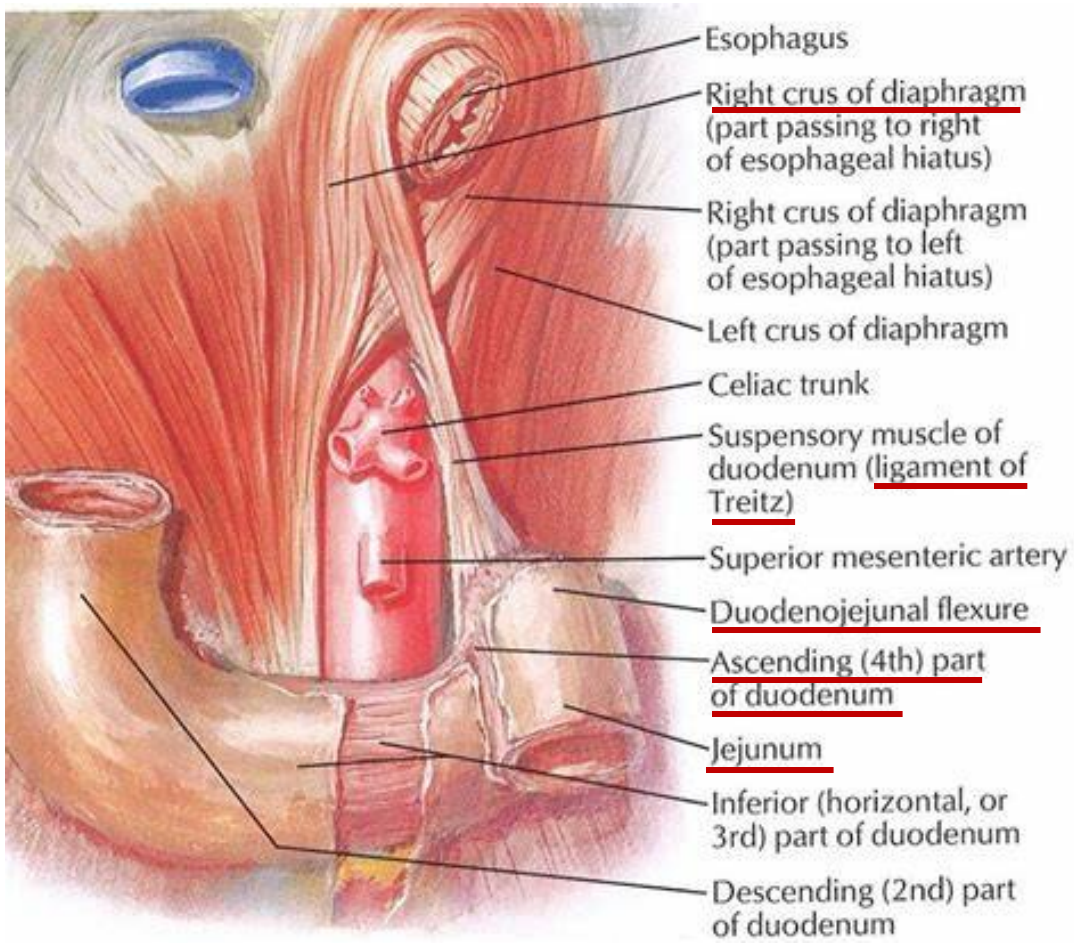
4th part of the Duodenum

- 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

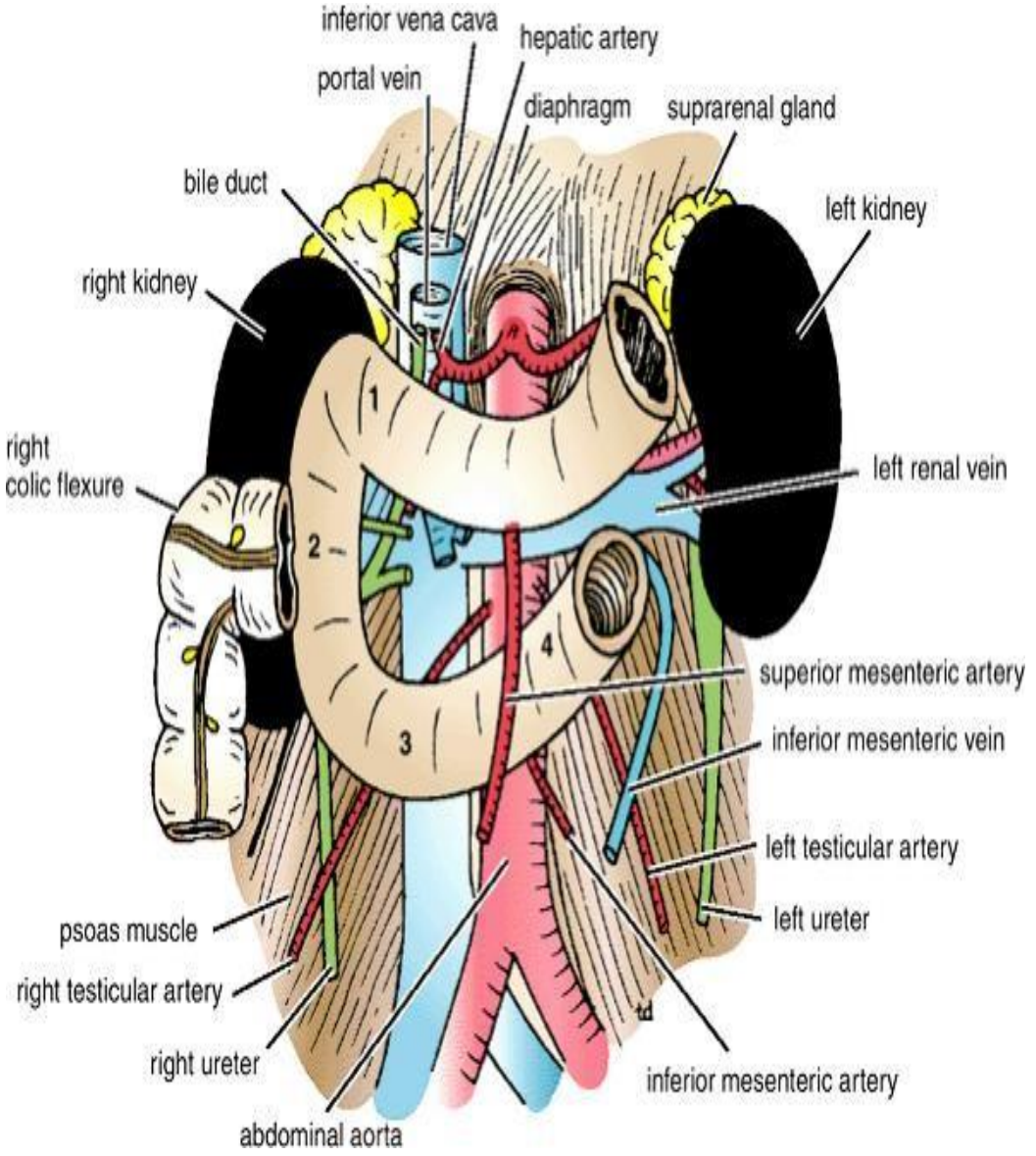
- Left Psoas major
- The Sympathetic Chain
- Left margin of the Aorta

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.

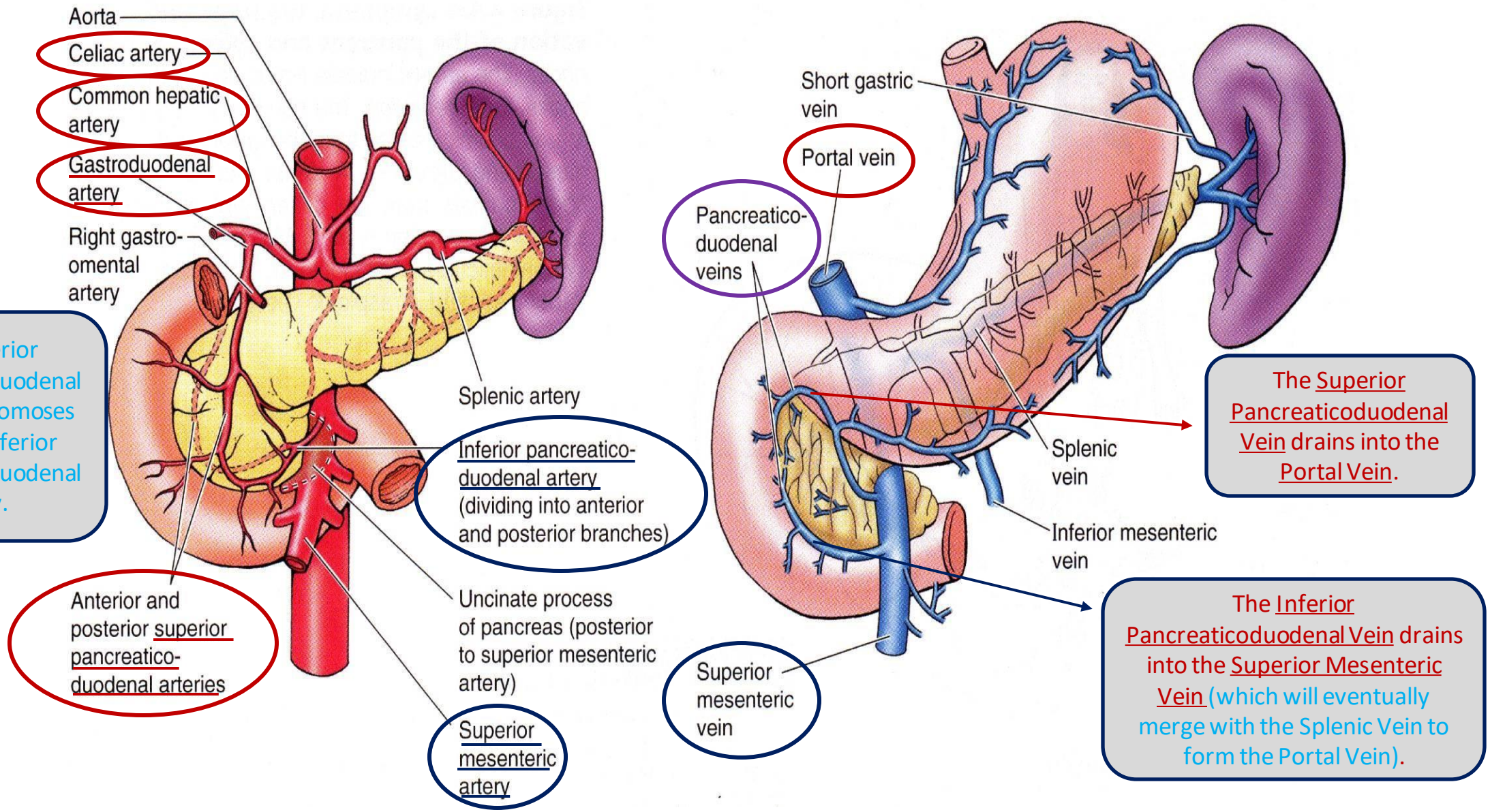
The duodenum is always divided into an upper half and a lower half; since it has two separate embryonic origins: the foregut and the midgut.

- 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

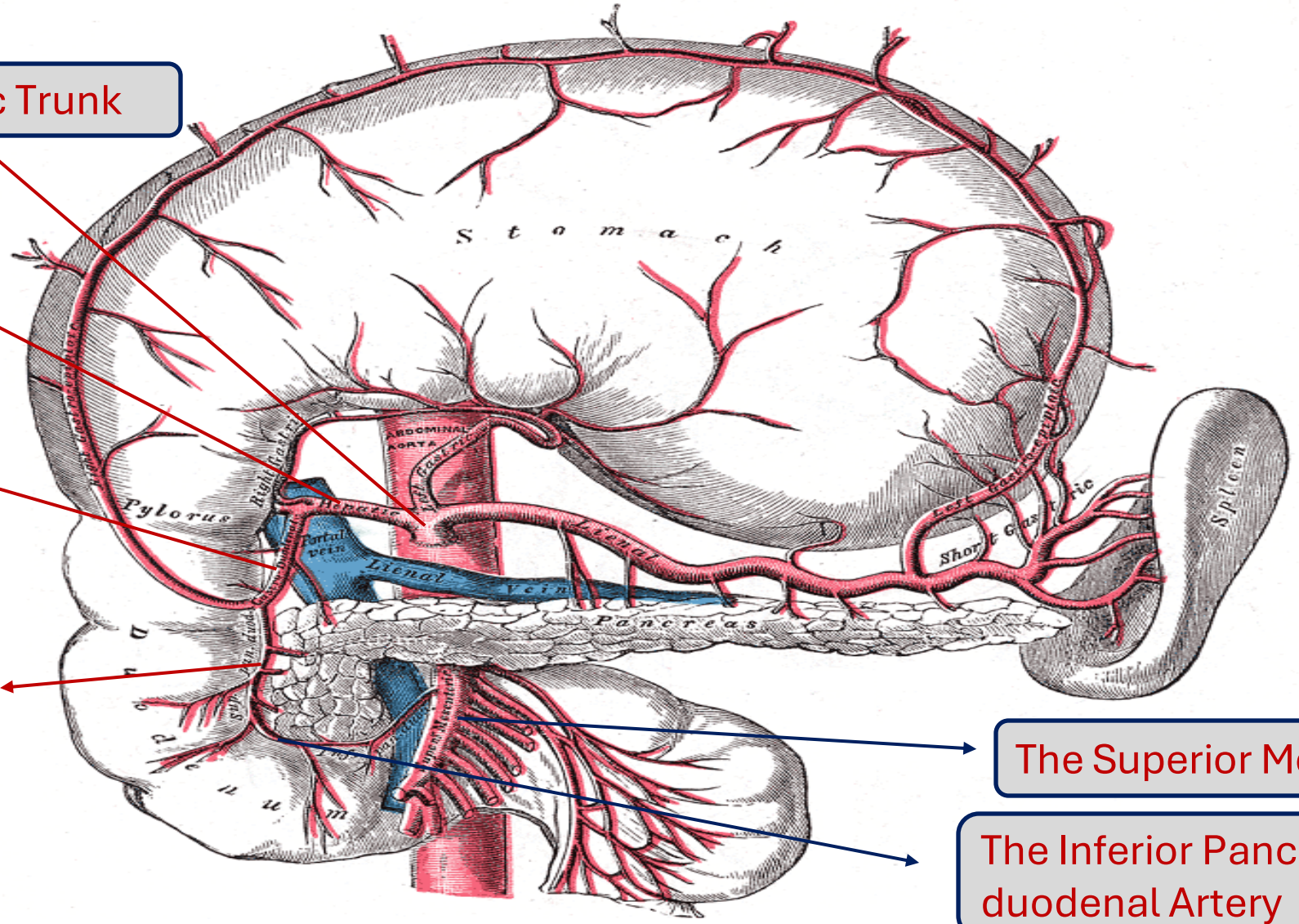


The Superior Pancreaticoduodenal Artery anastomoses with the Inferior Pancreaticoduodenal Artery.

The Superior Pancreaticoduodenal Vein drains into the Portal Vein.

The Inferior Pancreaticoduodenal Vein drains into the Superior Mesenteric Vein (which will eventually merge with the Splenic Vein to form the Portal Vein).

Blood supply for the Duodenum



The Celiac Trunk

The Common Hepatic Artery

The Gastro-Duodenal Artery

The Superior Pancreatico-duodoninal Artery

The Superior Mesenteric Artery

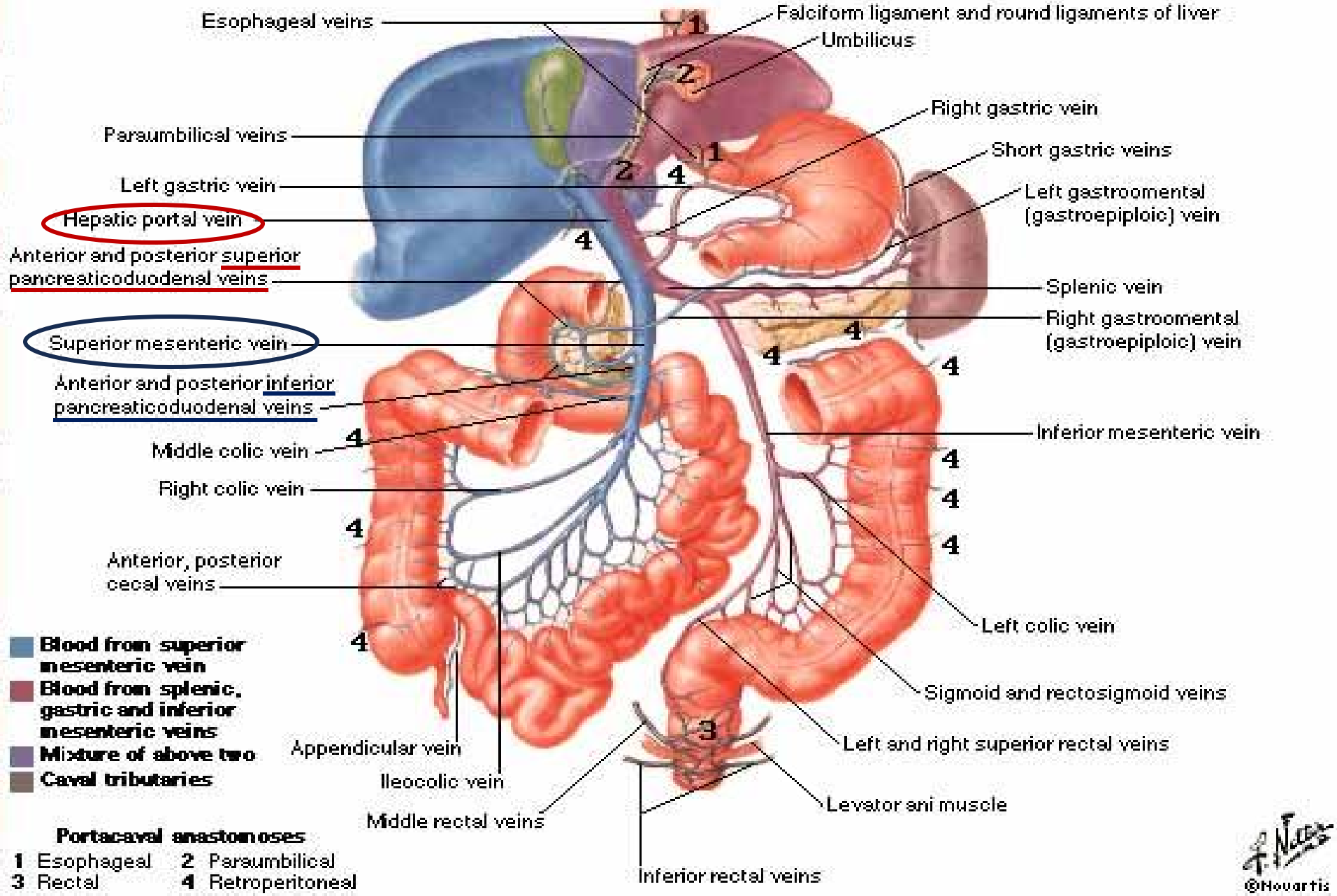
The Inferior Pancreatico-duodenal Artery

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.

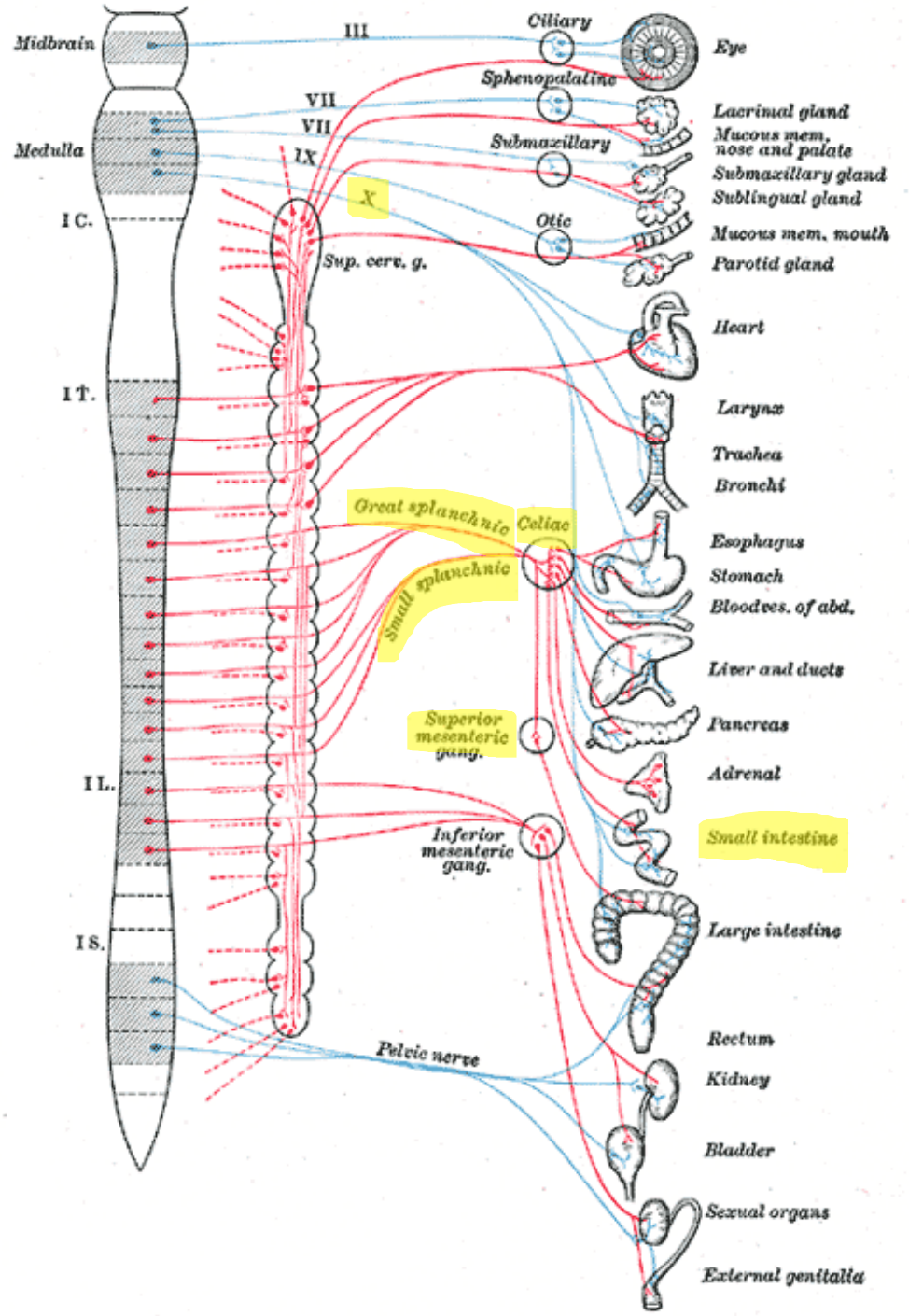
Nerve supply

- Parasympathetic nerves from: → Originally come from the Vagus nerve.
- Sympathetic nerves: → They originally come from the preganglionic sympathetic neurons from the spinal cord in the the chest region, more specifically, from the Thoracic Splanchnic Nerves.
- These parasympathetic and sympathetic nerves join to form:

1- The celiac plexus.

2- The superior mesenteric plexus.

- 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

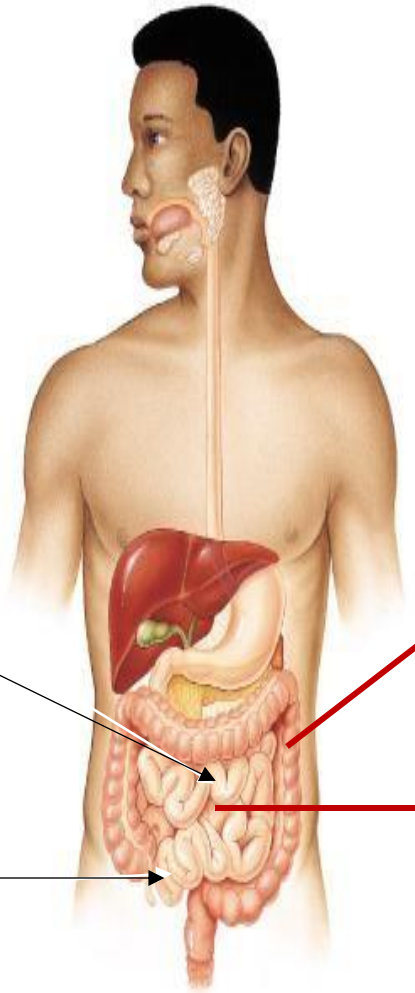
- The jejunum and ileum measure about 20 ft (6 m) long. While the duodenum is only 10 in / 25 cm.
  The upper two fifths is the jejunum & the lower 3/5 is the ileum.
- Each has distinctive features.
- There is a gradual change from one to the other. ⟶
- The jejunum begins at the duodenojejunal flexure/junction.
- 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.

SMALL INTESTINES ANATOMY

Jejunum

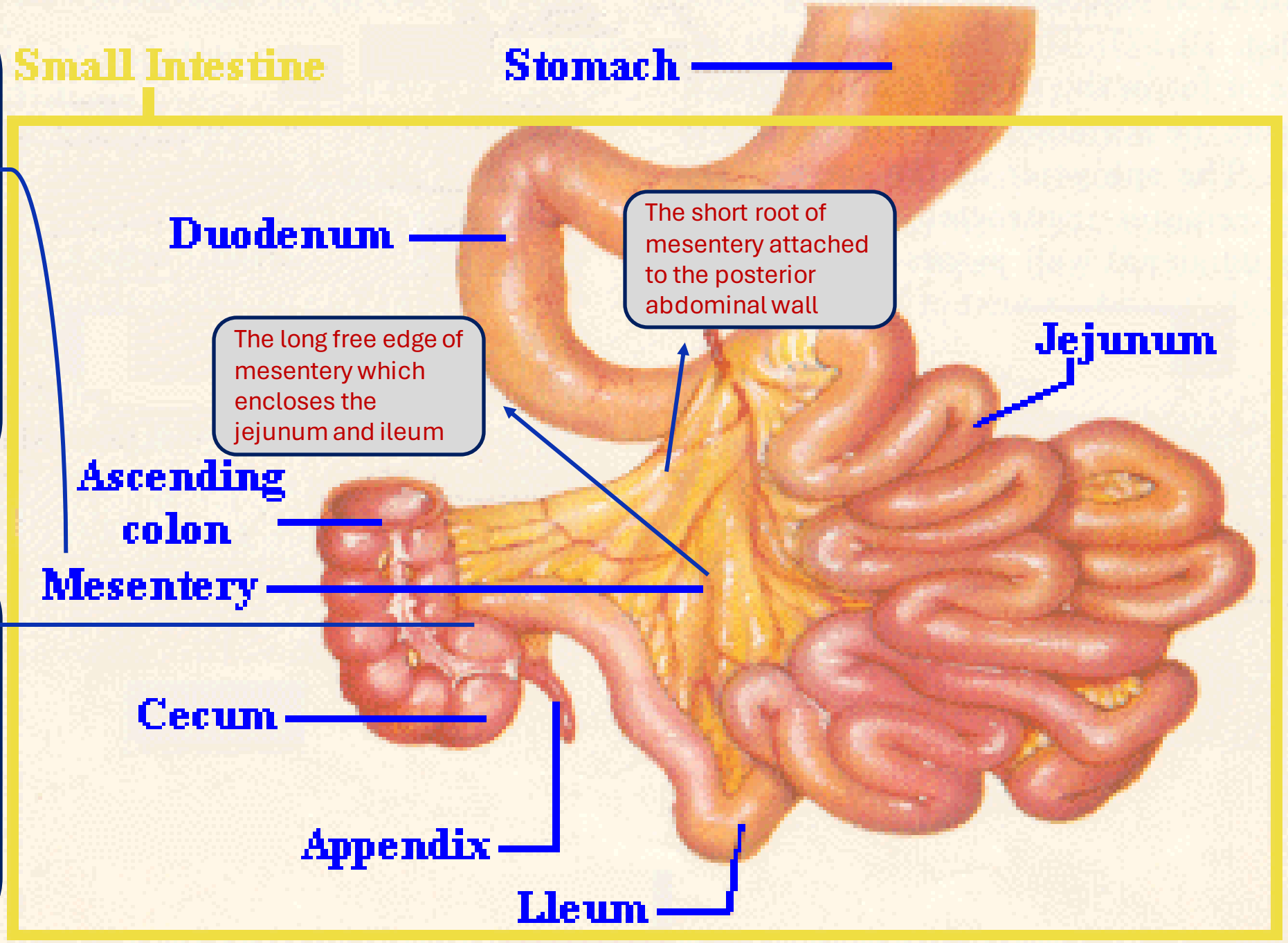
Ileum



The large intestine is placed at the peripheral borders of the abdominal cavity while the small intestine is present in the umbilical region.

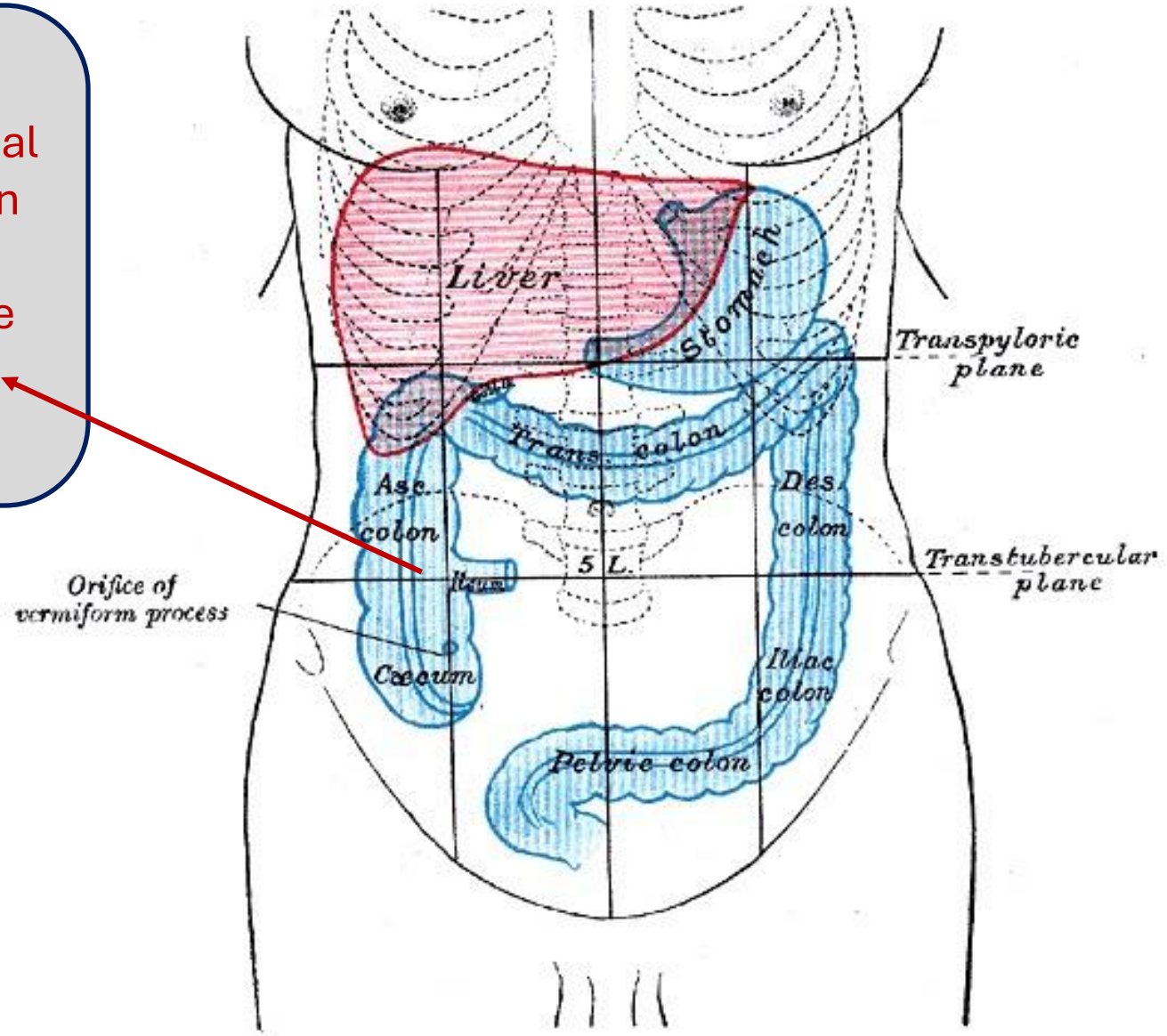
One of the things that distinguishes the jejunum and ileum is that they're surrounded by mesentery, which is 2 layers of peritoneum extending from the posterior abdominal wall where it is firmly attached.

The ileum opens into the cecum of the large intestine, approximately 1 inch above the appendix which projects downwards from the cecum.



Anatomical position of the small intestine

The small intestine is located in the umbilical region of the abdomen and ends with the ileum opening into the cecum of the large intestine.



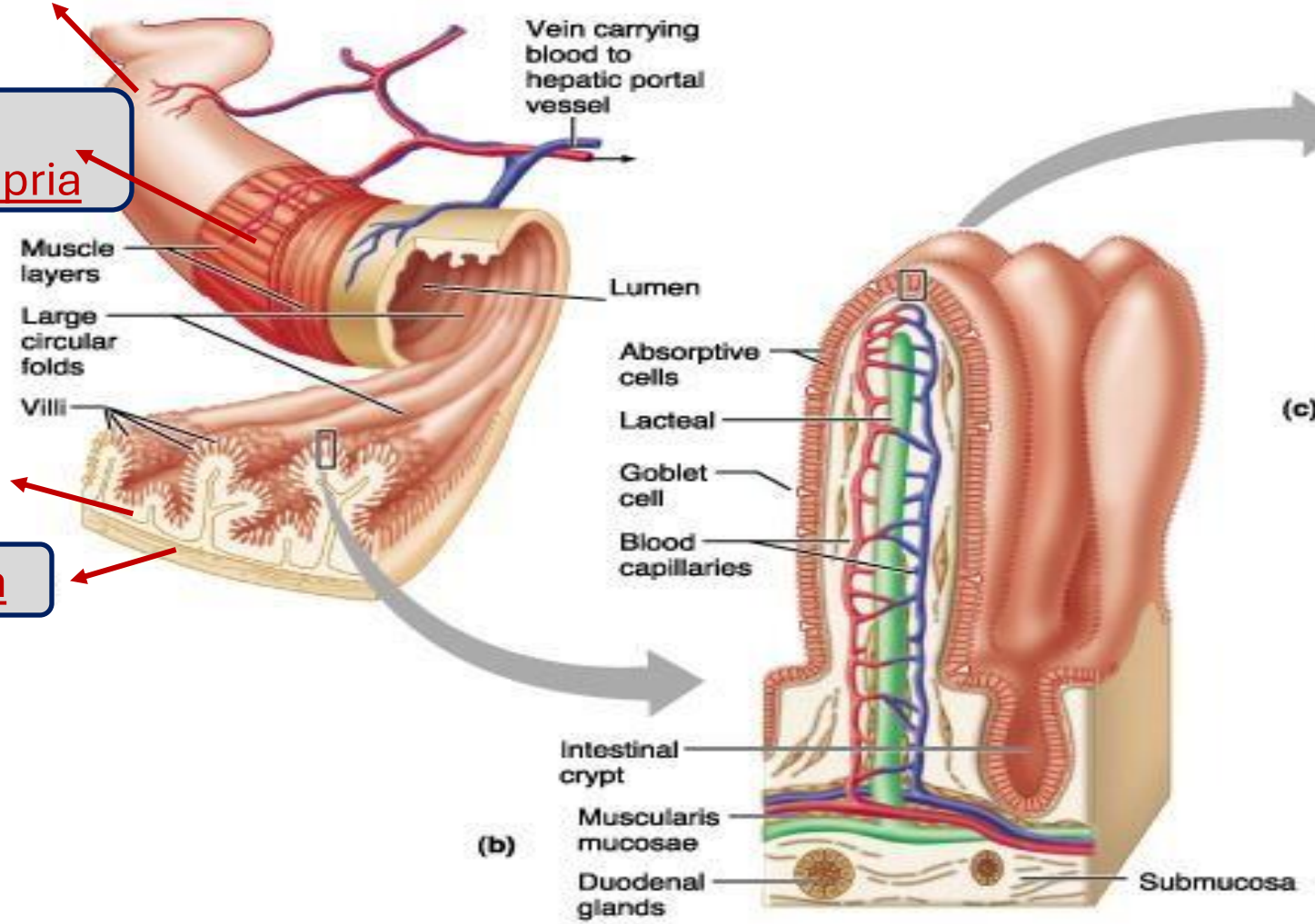
Structure of the Villi in the Small Intestine

Serosa covering the entirety of the jejunum and ileum externally because they are intraperitoneal structures, while only covering the anterior external surface of the duodenum because it is retroperitoneal (the rest of it is covered by adventitia).

Muscularis externa/propria

Mucosa

Submucosa



Notably, the lining mucosa of the small intestine has innumerable finger-like projections known as villi. These play a role in increasing the intestine's surface area to assist it in its function of absorbing nutrients.

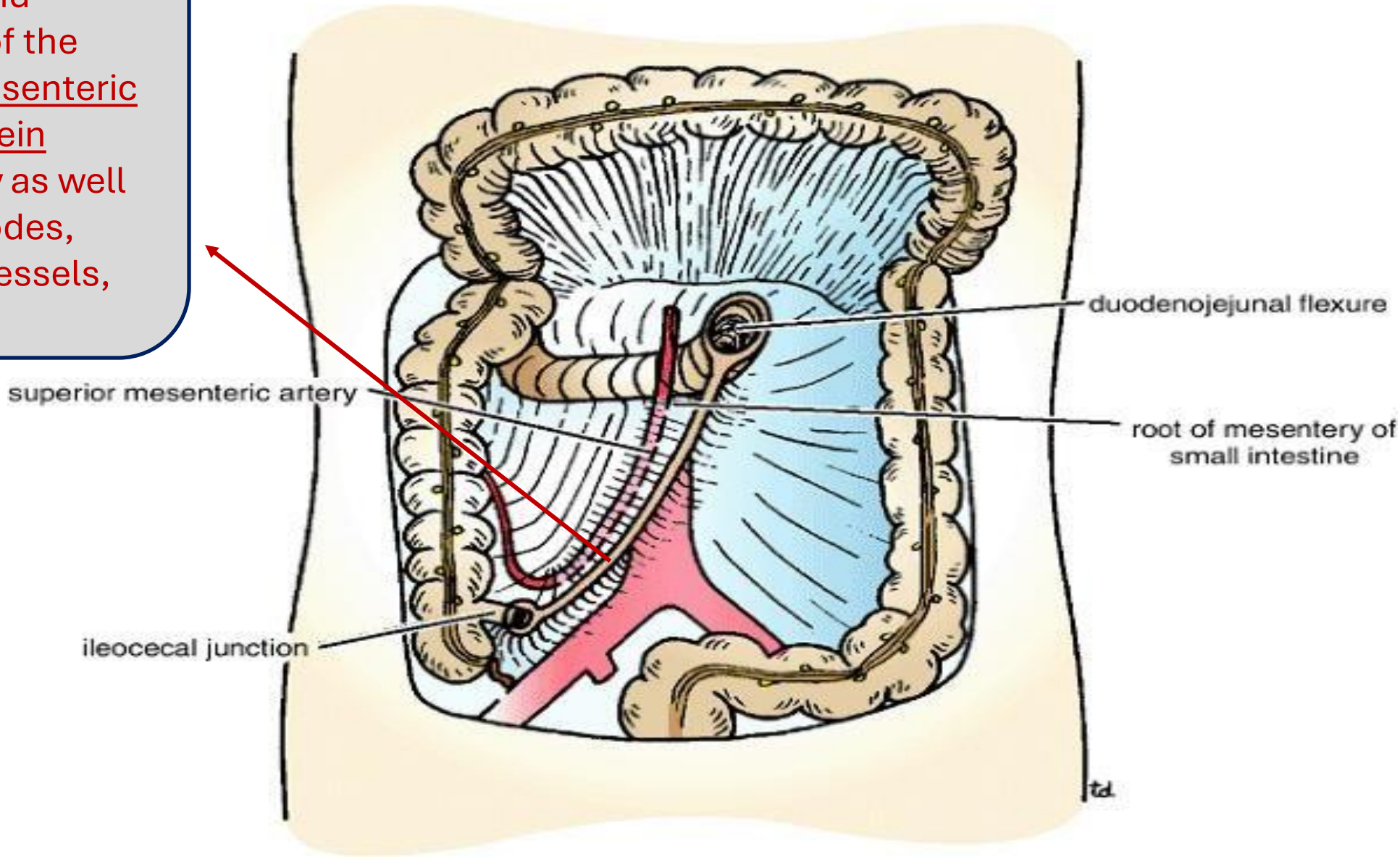
Mesentery of the small intestine

- 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:

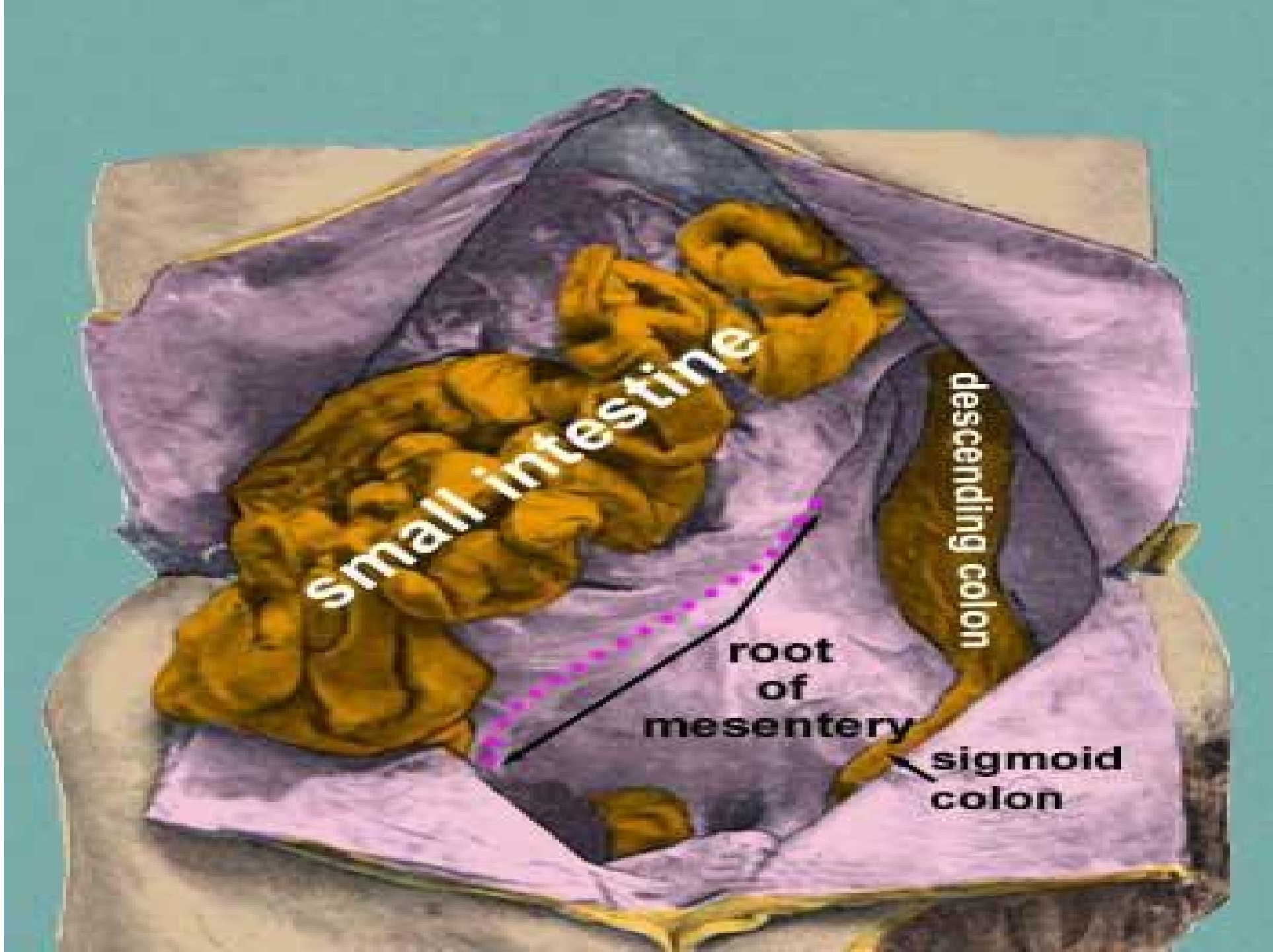
  Along a line that extends obliquely downward and to the right, from 1 inch to the left side of the second lumbar vertebra to the region of the right sacroiliac joint (in front of the right SI joint) in the pelvis.

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.



The short root of mesentery crosses the entire of the posterior abdominal wall. It crosses the Abdominal Aorta, the Inferior Vena cava, the right Psoas Major muscle, the right Ureter, and some blood vessels. (Recall that it also crosses the 3rd part of the duodenum.)



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	Proximal 2/5	Distal 3/5
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 The arcades will be further explained in the upcoming slides	-Simple, only one or two arcades -With **long infrequent** branches -**Long vase recta**	-**Numerous and complex** -Short terminal vessels that arise **from a series** of three or four or even more Arcades. - Short vase recta
Fat in mesentery	-The fat is deposited near the root -It is scanty (in small amounts) near the intestinal wall -Less in amount → apparent windows	-The fat is deposited throughout mesentery - Big amount - No windows apparent

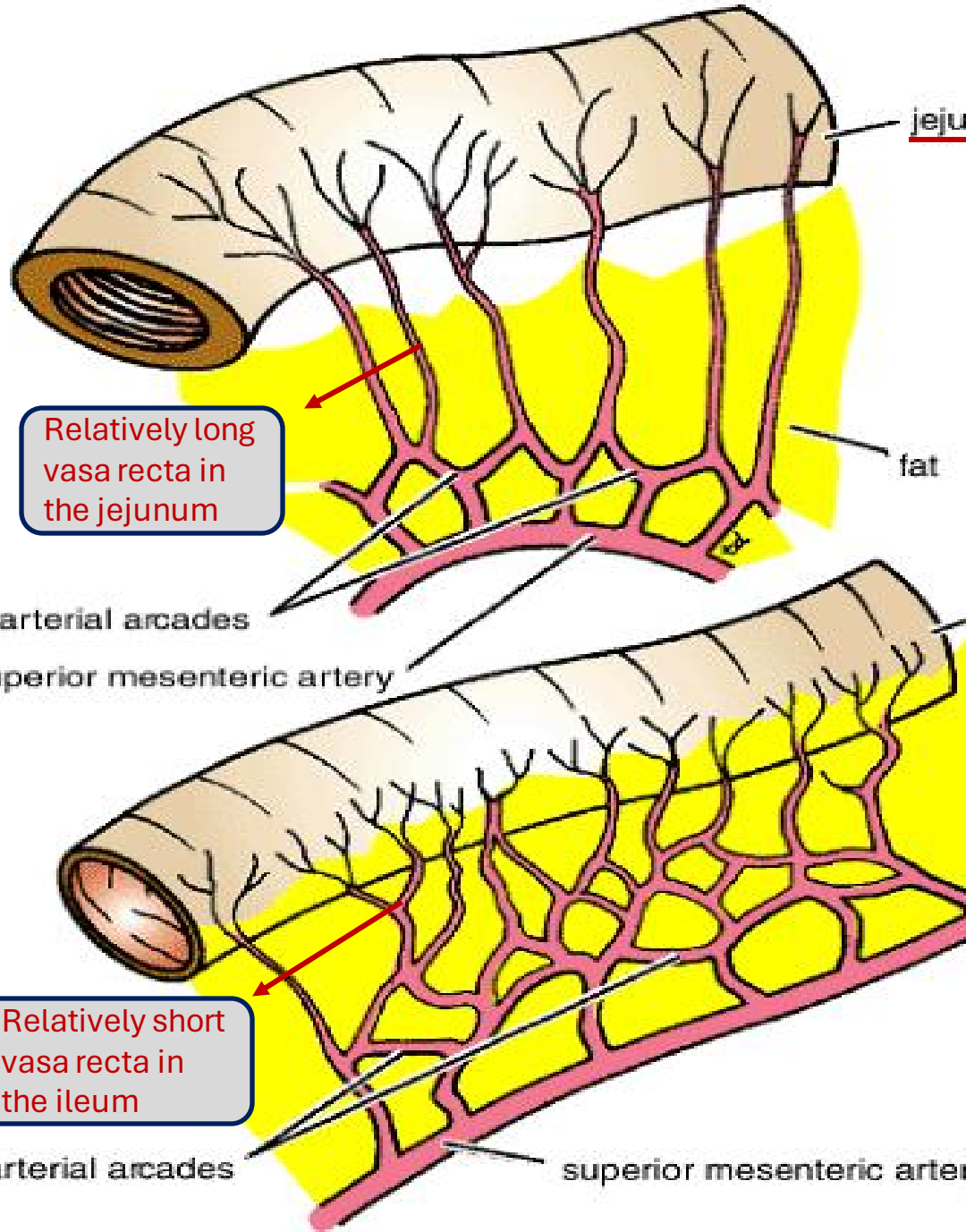
Difference between Jejunum & Ileum

	Jejunum	Ileum
Diameter	**Wider**	Smaller
Villi	**Numerous**	Less numerous
Plicae circularis (the permanent enfolding of the mucous membrane & submucosa in the small intestine) ***Characteristic of the duodenum and jejunum**	They are: **1. larger** **2. more numerous** 3. closely set	They are: 1. smaller 2. more widely separated 3. in the lower part they are absent.
Lymphatic follicles ***Characteristic of the ileum in particular**	No or few	Aggregations of lymphoid tissue (**Peyer's patches**) are present in the mucous membrane.

The branches of the superior mesenteric artery that supply the jejunum and ileum are known are arterial arcades. They appear as window rings due to the anastomosis between the branches. The arterial extensions that project from the arcades are known vasa recta.

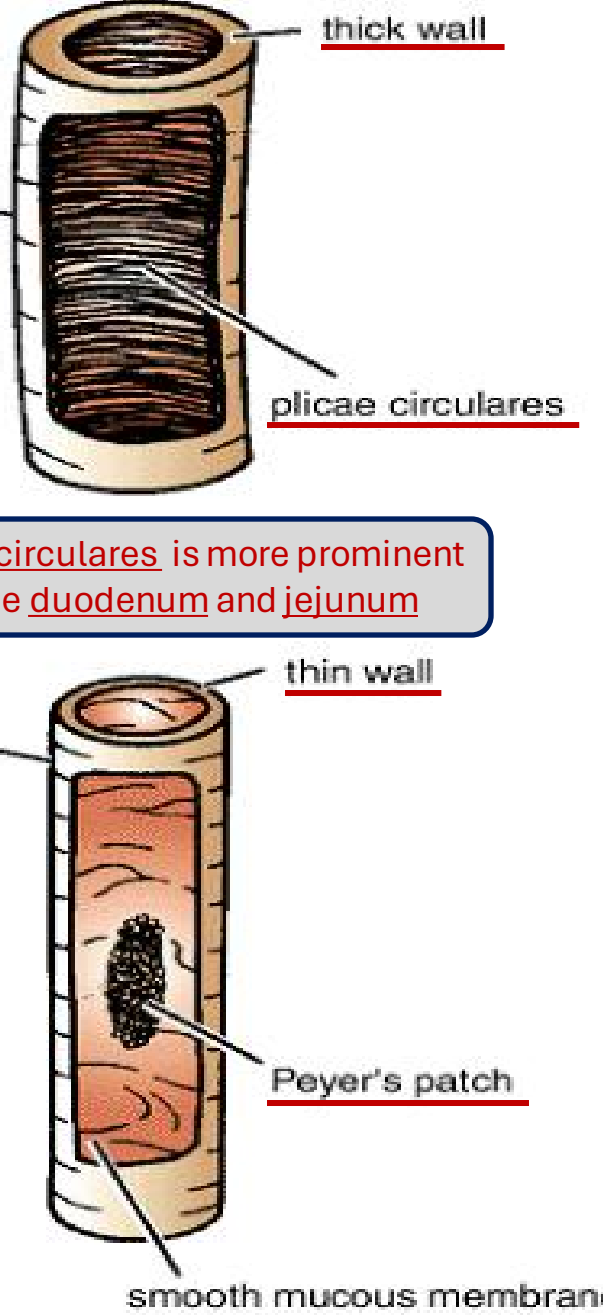
-In the jejunum, the arcades are simple and are composed of 1 to 2 layers, resulting in long vasa recta.

-In the ileum however, the arcades are more complicated resulting in short vasa recta.



Relatively long vasa recta in the jejunum

Relatively short vasa recta in the ileum



Plicae circulares is more prominent in the duodenum and jejunum

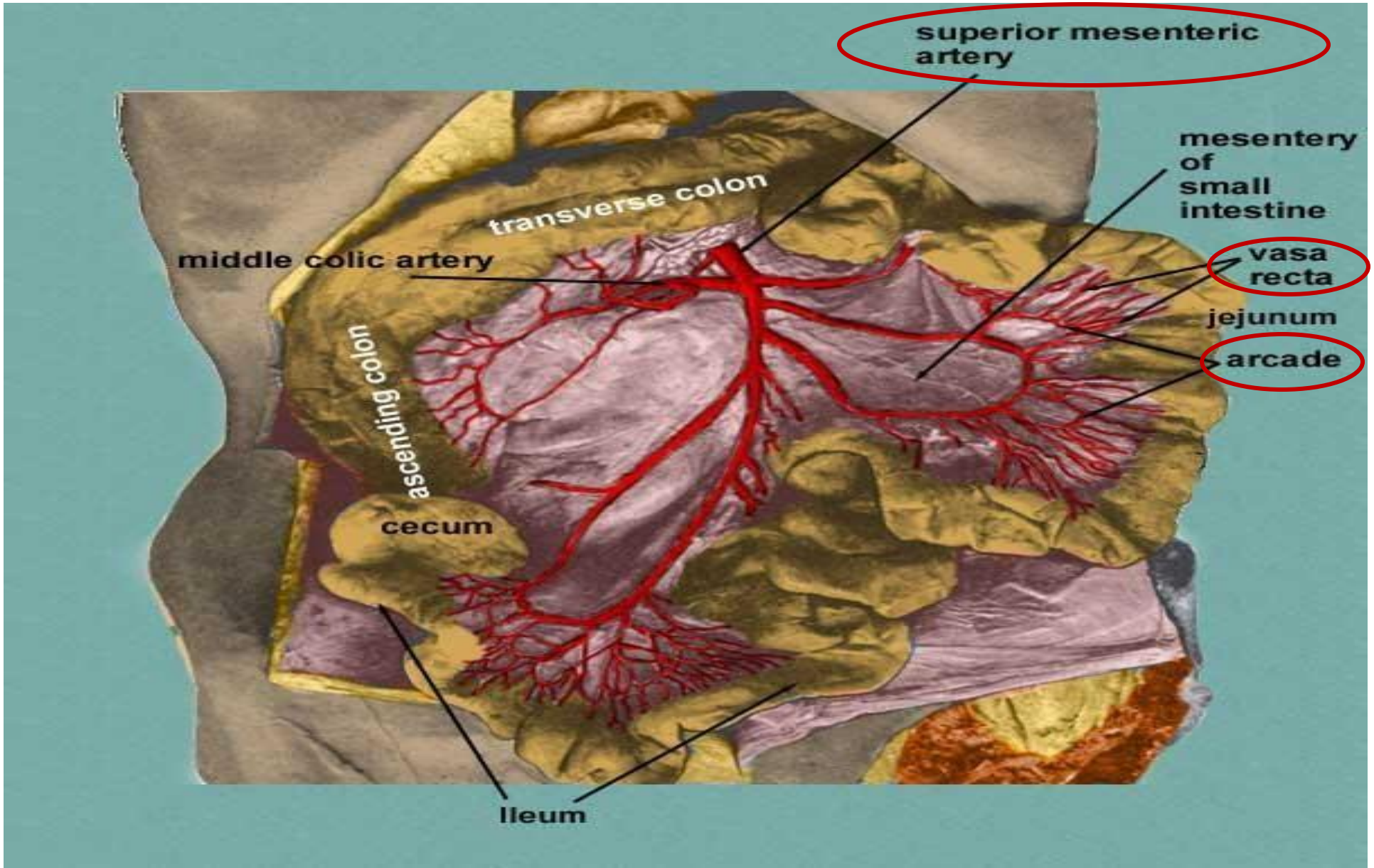
Peyer's patches (lymphatic vessels) are more prominent in the ileum

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.**

Blood supply for the Jejunum & Ileum



Veins:

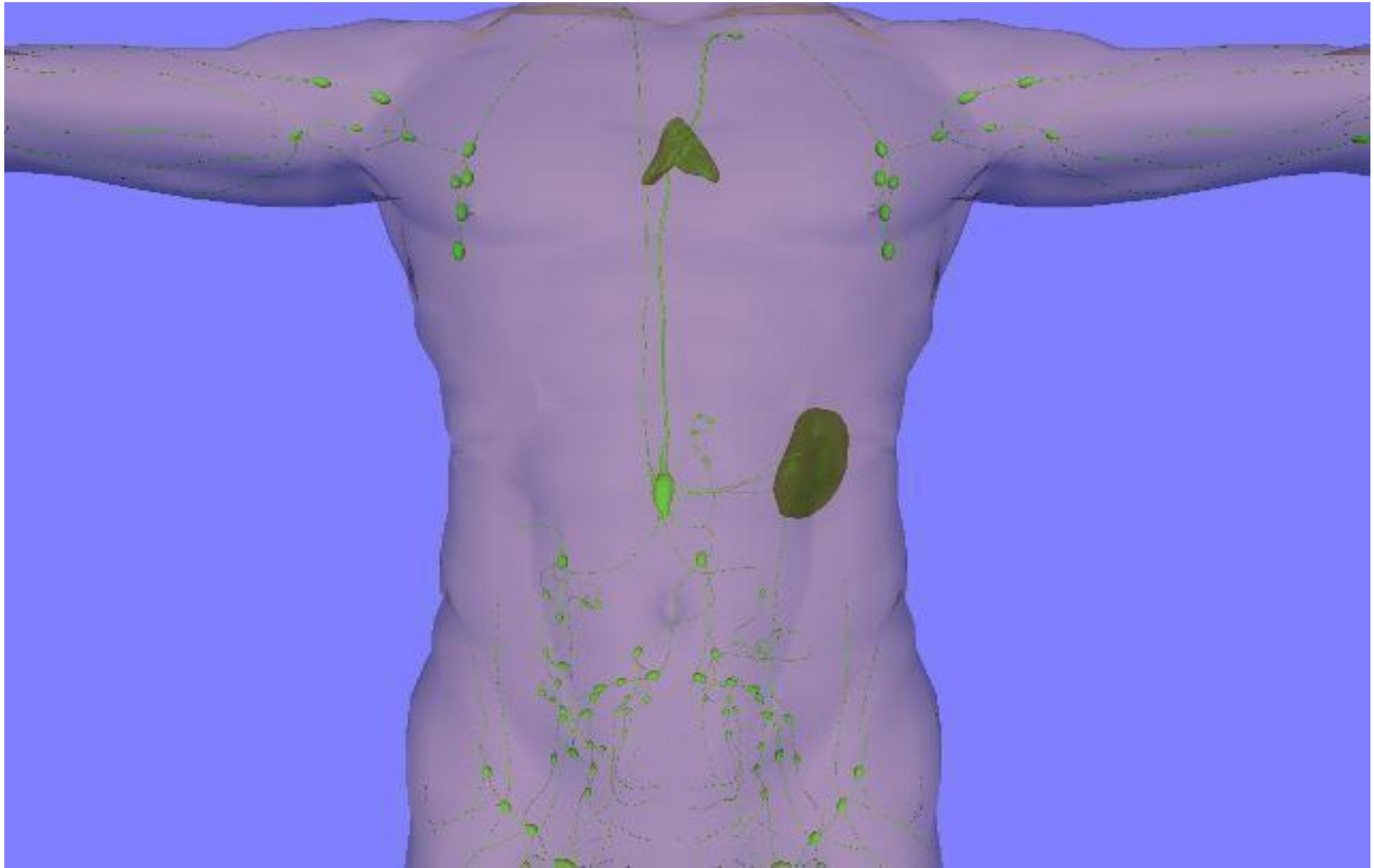
- The veins correspond to the branches of the superior mesenteric artery.
- Drain into the superior mesenteric vein.

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.

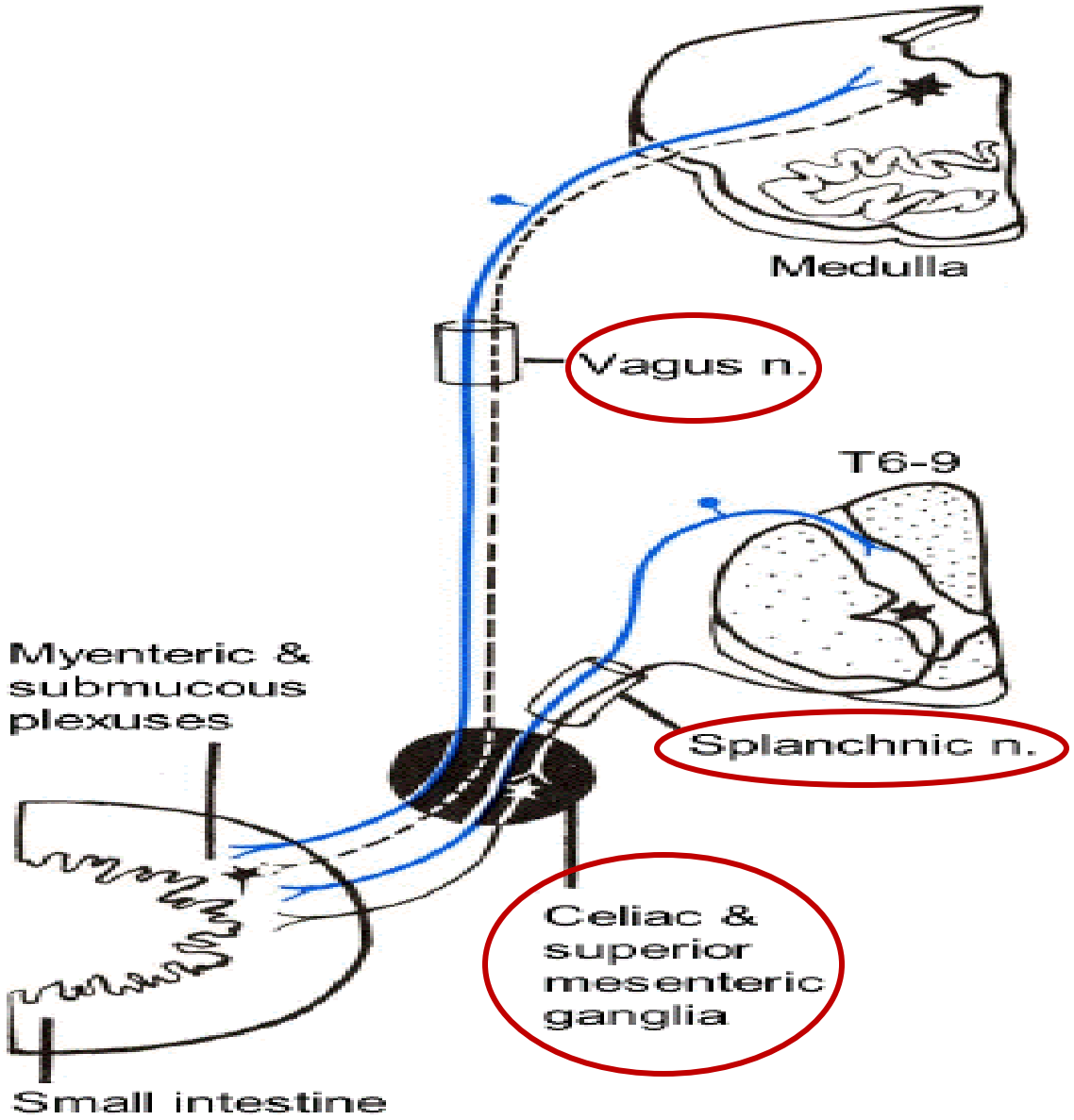
Lymph Drainage of jejunum & ileum



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).

Nerve supply for the small intestine



Congenital anomaly of small intestine

Meckel's Diverticulum:

- a congenital anomaly of the ileum
- Present in 2% of people
- 2 feet from iliocecal junction
- 2 inches long
- contains gastric or pancreatic tissue
- Remains of vitelline duct of embryo

Will be discussed in detail during the embryology lectures

Meckel's Diverticulum