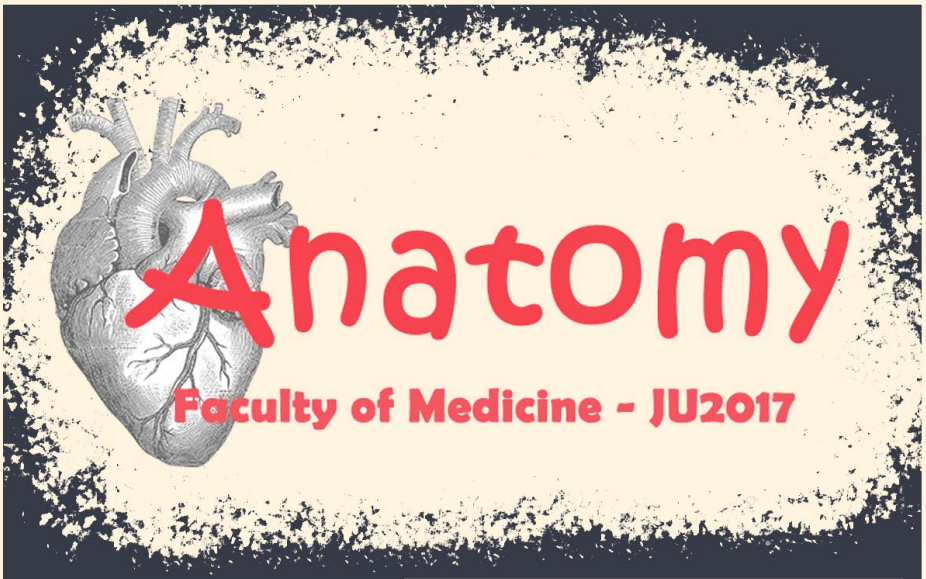

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Done By	Faisal Nimri
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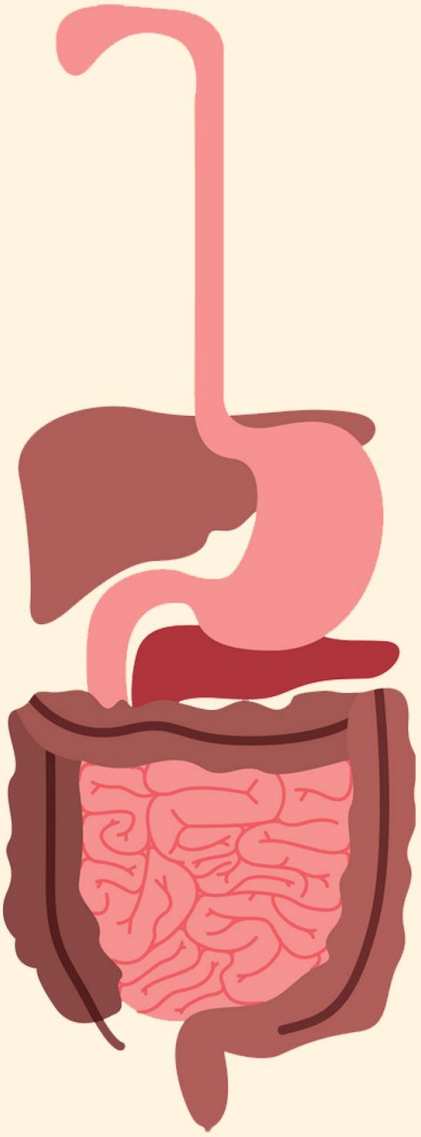


2nd system - GI

→ *The peritoneal recesses and fossae*

In certain parts of the abdomen (At the junction between intraperitoneal and retro peritoneal organs) the transition from retroperitoneal organ to an intraperitoneal one creates a fold of peritoneum; this fold may have a **recess** or **fossa** beneath it.

From a surgical point of view the omental bursa can be considered to belong to this category, with its opening at the epiploic foramen, bounded in front by the free border of the lesser omentum.

These recesses are of surgical importance since they may become the site of ***internal hernia***, that is, a piece of intestine may enter a recess or fossa and if there is pressure on the walls of the intestine, internal hernia will become ***strangulated hernia*** (the intestine is constricted or *strangulated* by the peritoneal fold granding the entrance to the recess).

The cut of the blood supply in strangulated hernia will cause *gangrene (degeneration of cells)* in the part of the small intestine that is herniated, and this requires urgent surgical intervention where we remove the gangrenous part of the small intestine and connect the two healthy parts together.

A person with internal hernia (especially kids) will have a feeling of discomfort and slight pain but if it progresses to strangulated hernia there will be severe pain.

The recesses are sometimes found in relation to the duodenum (retroperitoneal except first and last inches so there are recesses around it), cecum (cecum is retro ileum is intra) and sigmoid colon (intraperitoneal but the descending colon is retro so recesses may form).

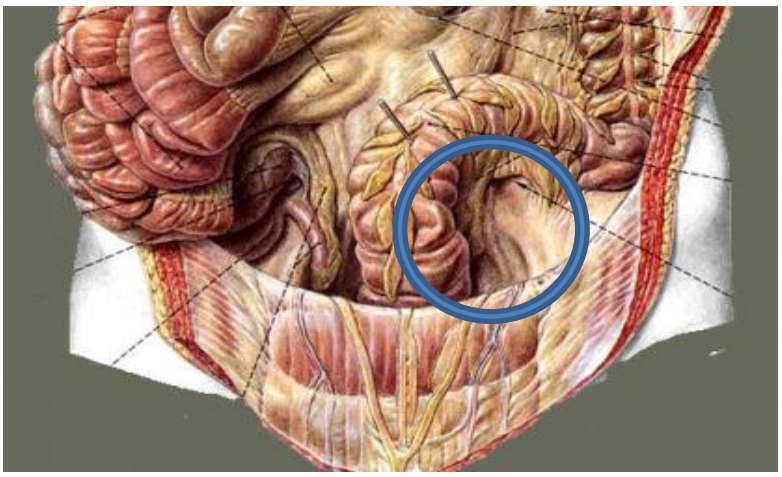
1- Duodenal recesses or fossae

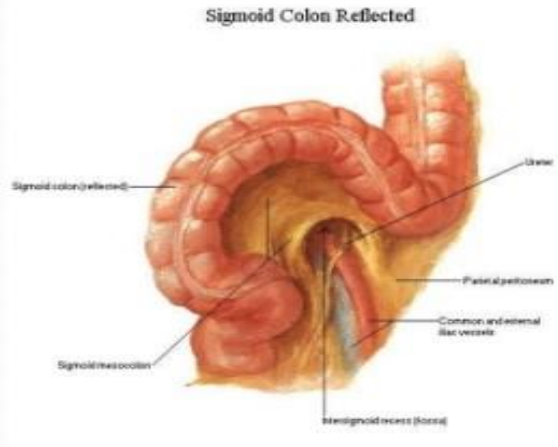
- The superior duodenal recess or fossa
- The inferior duodenal recess or fossa
- The paraduodenal recess or fossa
- The duodenojejunal recess or fossa

2- Cecal recesses

- The superior ileocecal or fossa
- The inferior ileocecal or fossa
- The retrocecal recesses or fossa (most important one and where we frequently find the appendix)
- The rectocolic recess or fossa

3. The Intersigmoid Recess (formed by the inverted V attachment of sigmoid mesocolon)





Folds and recesses of posterior abdominal wall:

superior duodenal fold and recess

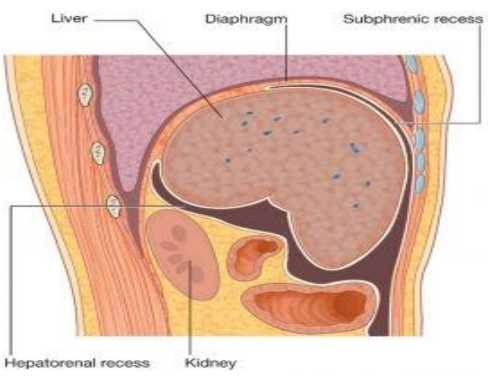
inferior duodenal fold and recess

Intersigmoid recess.

4- Hepatorenal recess (Morison's pouch)

lies between the right lobe of liver, right kidney, and right colic flexure, and is the lowest parts of the peritoneal cavity when the subject is supine.

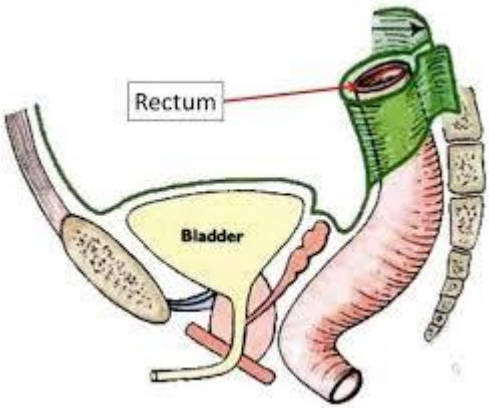
Sometimes in the case of appendicitis, if rupture occurs the pus may gather there, and abscess will form (we have to drain the abscess).



→ *Pouches*

In the lesser pelvis, the peritoneum dips downwards forming *a larger fossa*, named pouch, the clinical importance of the pouches is the fact that they are a potential site for internal abdominal hernia.

In males



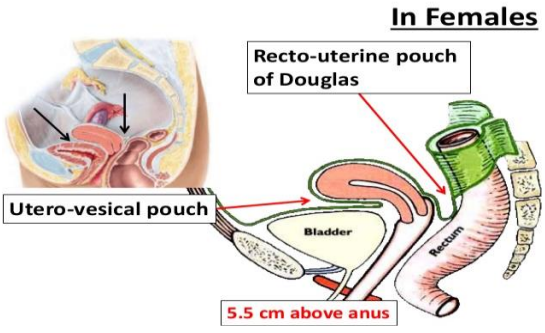
Rectovesical pouch (between the rectum and urinary bladder or the seminal vesicles and ampulla ductus deferents)

Remember that the peritoneum covers the upper 3rd of the rectum completely (except posterior wall) and covers the rest of the rectum anteriorly then it covers the upper surface of the urinary bladder creating a pouch between the rectum and the urinary bladder.

Internal hernia may happen here but not as common because it is wide.

The retrovesial pouch is the lowest part of the peritoneal cavity in anatomical position in male.

In females



2 pouches

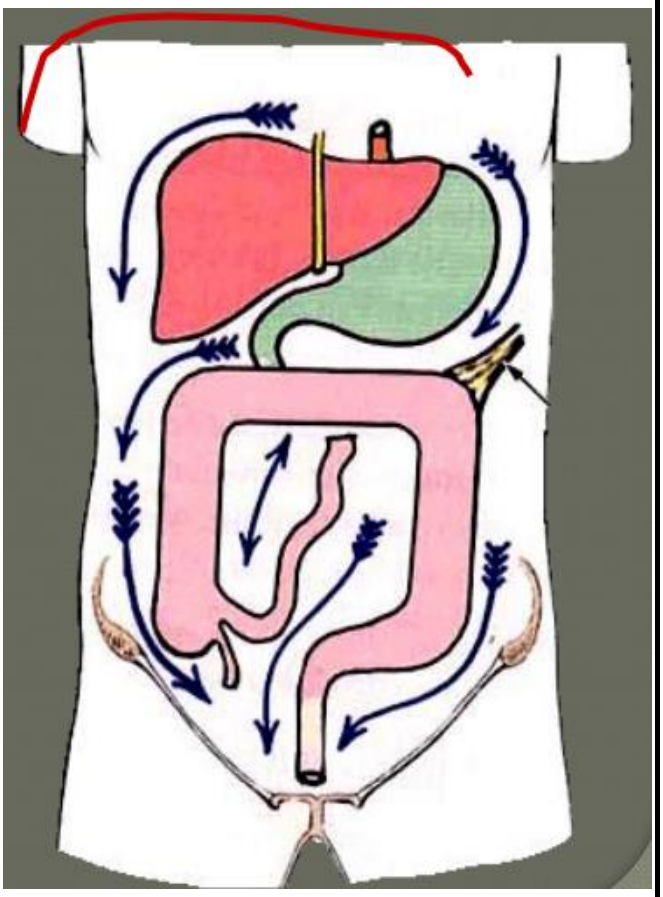
1- **Rectouterine pouch or Douglas pouch** (between rectum and uterus)

2- **Vesicouterine pouch** (between bladder and uterus)

- The rectouterine pouch is formed between the anterior surface of the rectum and the posterior surface of the uterus and the upper part of vagina.

- The Vesicouterine pouch is formed between the anteroinferior surface of the uterus and the superior surface of the urinary bladder.

→ *Peritoneal subdivision*



The transverse colon and transverse mesocolon (remember that it is bound to the anterior border of the pancreas) divides the greater sac into

- Supracolic compartments (above transverse colon and mesocolon).

- Infracolic compartments (below transverse colon and mesocolon).

- Rt.extraperitoneal space (bara area of liver & diaphragm).

Supracolic compartments

Divided to:

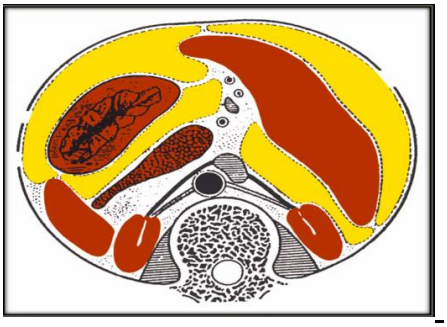
- Subphrenic space

- Subhepatic space

Remember what we said above about appendicitis and Morison's pouch (which is between the liver, right kidney and right colic flexure)

If acute appendicitis progresses to chronic, abscess formation will occur and in case of rupture the pus could reach Morison's pouch or to the right subdiaphragmatic (subphrenic) space further spreading the infection and formation of other abscesses in these spaces will occur which <u>have to be treated via drainage</u> (notice in the picture above the arrows and how there is a connection between the location of the appendix and the aforementioned spaces).

The patient in this case would have unstable temperature that goes up and down and sleep on his right side and on his back and wouldn't eat. You could diagnose the issue based on his history if he had untreated acute appendicitis.



Subphrenic space (subdiaphragmatic).

*(The **subphrenic space** is a peritoneal **space** between the anterior part of the liver and the diaphragm, separated into right and left by the falciform ligament, and postero-superiorly bounded by the coronary ligament.)*

Divided by the attachment of Falciform ligament into

 Right subphrenic space (abscess formation is more common here than in the left space because it is more open, check the picture with the arrows above)

 Left subphrenic space

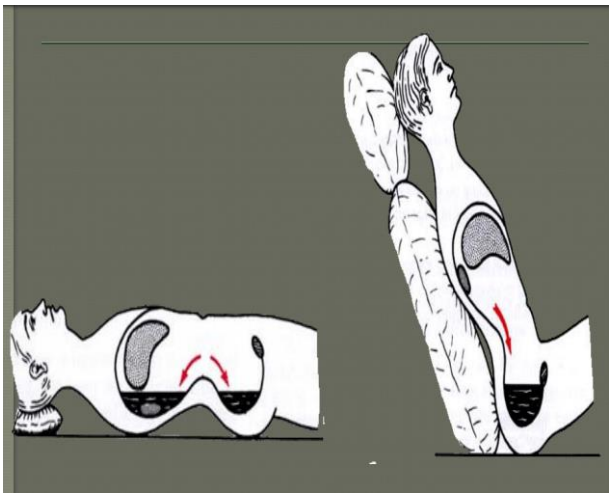
Subhepatic space

divided into:

Right subhepatic space (Morison's pouch)

Left subhepatic space (lesser sac)

Infracolic compartments



When a person is sleeping on his back fluid in the abdomen will gather in 2 cavities, one in the abdomen and one in the pelvis.

If the person is setting up fluid will gather in the pelvis.

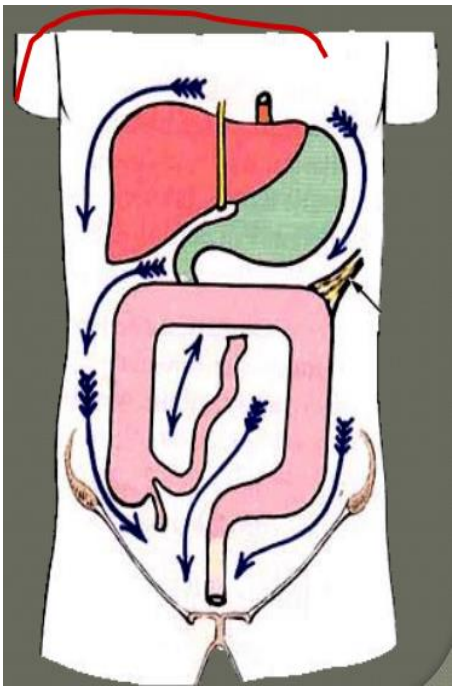
The reason why the fluid descends to the pelvis is the presence on *paracolic gutters* (more details below)

The infracolic compartment lies below the transverse colon and transverse mesocolon.

Divided by root of the mesentery of small intestine into:

- Rt. Infracolic compartment (closed from the pelvis by the mesentery)

- Lt. infracolic compartment (open to the pelvis)



We know that the ascending and descending colons are retroperitoneal, but the peritoneum not only covers their anterior surfaces but also covers their sides and fixes them to the posterior abdominal wall, and the attachment of the peritoneum to the post. abdominal wall creates the *gutters* or *sulcus* on the sides of the colons, and these gutters or grooves are what allow movement of fluid in the abdominal cavity (think of them like rivers).

Right paracolic sulcus (gutter)

Subdivided into:

- Right medial paracolic gutter (closed from above and below)

- Right Lateral paracolic gutter (Open, communicates with the hepatorenal recess and the pelvic cavity and provides a route for the spread of infection between the pelvic and the upper abdominal region, notice the arrows in the picture).

Left paracolic sulcus (gutter)

Subdivide into:

- Left medial paracolic gutter

- Left Lateral paracolic gutter

Left lateral paracolic gutter separated from the area around the spleen by the *phrenicocolic ligament* (a fold of peritoneum that passes from the colic flexure to the diaphragm), and this ligament prevents the spreading of infection upwards.

Left medial paracolic gutter is also separated from that area by the transverse colon and mesocolon which they prevent the separation of infection upwards (again, notice the arrows in the picture above).

Both of those gutters communicate with the pelvis and are open to the outside through it.

Small Intestine

The small intestine is made up of 3 parts

- duodenum which is 25cm (10 inches) and is retroperitoneal except 1st and last inches.

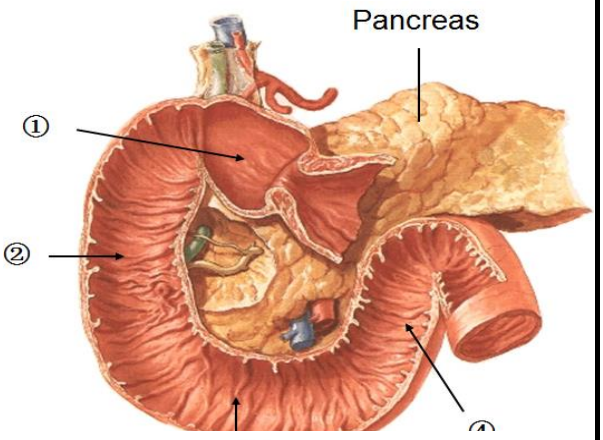
- jejunum and ileum which are 6 meters long and are intraperitoneal (they have a mesentery).

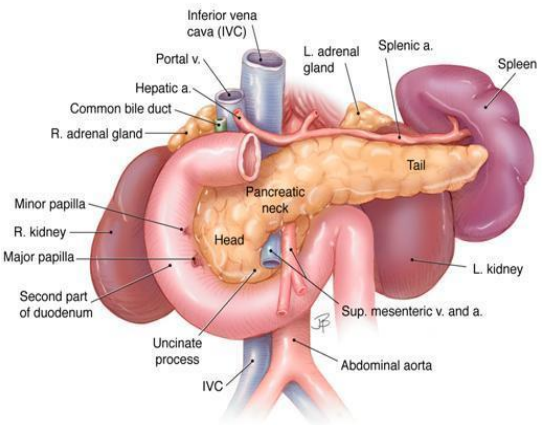
Duodenum

The duodenum is a c-shaped *concave* tube about 10" in length.

(has 4 parts the 1st is 2 inches, 2nd is 3 inches, 3rd is 4 inches and the 4th is 1 inch.

It joins the stomach to the jejunum.





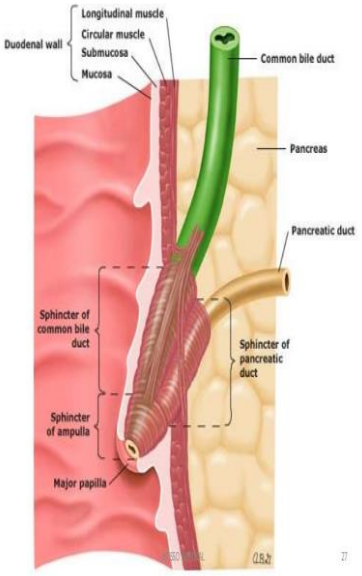
The pancreas has a tail, body, neck (the portal vein forms behind the neck, from splenic and superior mesenteric veins and continues to the liver) and head and the duodenum curves around the *head of the pancreas* <u>*to the left and backwards.*</u>

(notice the location of the Uncinate process of the head, left of the duodenum and the superior mesenteric artery and veins pass in front of this process).

Most of the duodenum is retroperitoneal except the 1st inch & last inch, 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 begins at *the pyloric sphincter* and ends at the *ligament of Treitz* which continue as jejunum.

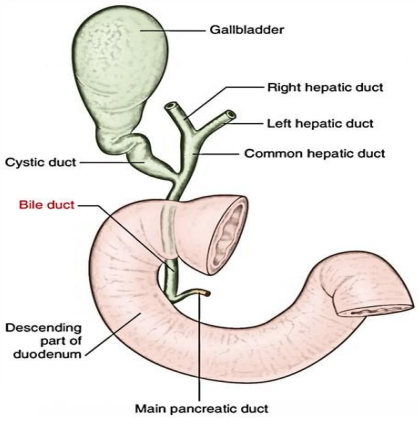
The duodenum is important because the 2nd part of it receives the opening of the common bile and pancreatic ducts (that secrete substances to complete the digestion of fat which happens in the duodenum).

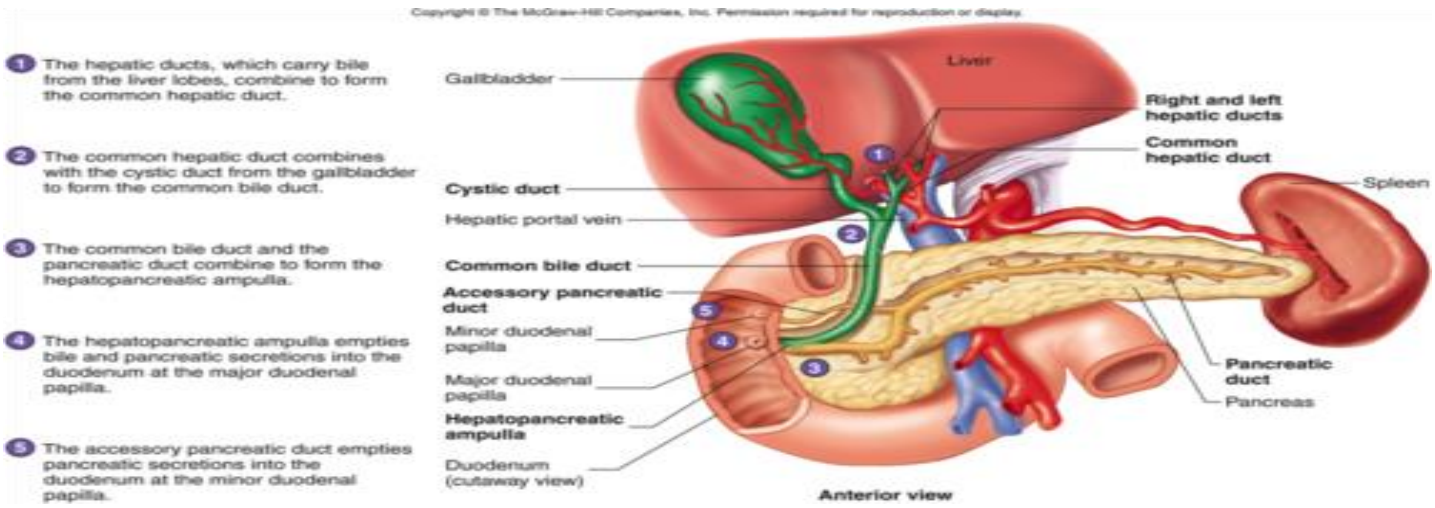


The common bile duct and the pancreatic duct have the same opening in the duodenum. When they meet, they form a bulge in the duodenal wall called **ampulla of vater,** around it a sphincter called **sphincter of Oddi** (a smooth muscle)**,** and we call the opening from inside the **major duodenal papilla,** sometimes there is another opening 1 inch above the major papilla for *accessory pancreatic ducts* called **minor duodenal papilla**.

The duodenum is situated in ***the epigastric and umbilical regions****.*

The liver has left and right lobes, and the left and right hepatic ducts form the common hepatic duct which meets with the cystic duct of the gallbladder to form the common bile duct.





1st part of the duodenum

The first part is 2 inches long, and is divided into two parts

**The first inch* (intraperitoneal, common site of peptic\duodenal ulcers)

Note: duodenal ulcers are more common than gastric ulcers and happen because the chyme that comes from the stomach is acidic (the duodenal secretions are alkaline and work to neutralize that acidity, but ulcers could still happen if the acidity was too high), the posterior wall of duodenum is affected most.

**The second inch* (retroperitoneal)

- It begins from the pyloduodenal junction.

- At the level of the transpyloric line.

- Runs *upwards* and *backwards* at the level of the 1st lumbar vertebra 1 inch *to the right*.

Some histology

The GI track has 4 layers (mucosa, submucosa, muscular layer and adventitia or serosa)

The folds on the inside of the duodenum are called *plicae circulares*.

The lining epithelium of the duodenum is *simple columnar epithelium with goblet cells*.

In the submucosa of duodenum there are glands called *Brunner's glands* that produces the alkaline secretion that neutralizes the acidity of the chyme when it comes from the stomach.

Note: In the entirety of the GI track only 2 organs have glands in their submucosa, and they are the *esophagus* and *duodenum*.

In the mucosa of the duodenum (which is like mentioned above simple columnar with goblet cells) there is *lamina propria* (is a thin layer of loose (areolar) connective tissue, which lies beneath the epithelium, and together with the epithelium and basement membrane constitutes the mucosa, from the web) which also contains glands called ***crypts of Lieberkühn***.

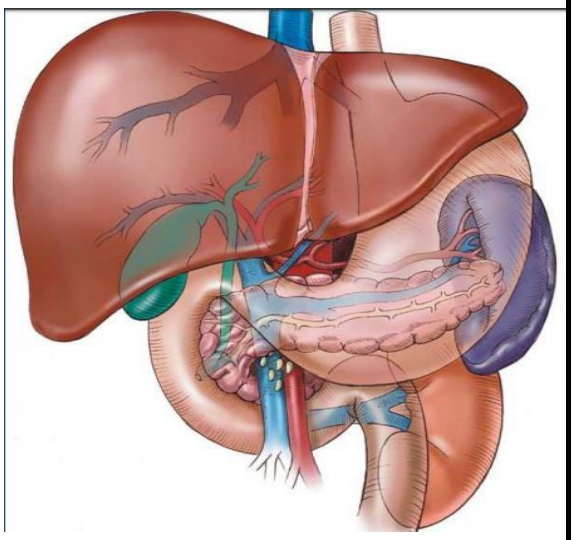
The doctor discussed ***ERCP (Endoscopic retrograde cholangiopancreatography)***

This is a new technique where an endoscope is placed through the mouth and proceeds retrogradely through the pharynx, esophagus, stomach and duodenum and then you find the major duodenal papilla and you cut the sphincter of oddi and you enter either the pancreatic or common bile ducts based on what you want to do.

This technique is used in treatment of stones that form in the common bile duct and block it and this causes jaundice (yellow sclera, yellow and itchy skin) which was treated with surgery in the past, when you find the stone with the endoscope you use a *basket* and remove the stone and leave it in the duodenum and it gets out with the stool.

Sometimes stasis of the secretion of pancreas happens and it becomes like mud or forms stones and closes the pancreatic duct and may cause pancreatitis which is very dangerous, and it is treated with ESRP, by entering the duct with the endoscope and adding saline with will dissolve the stones.

→ *Relations of the 1st part of the duodenum*



Anterior relations

The liver (quadratus lobe)

gall bladder

Superior relations

Epiploic foramen (anterior to it there is a free edge of lesser omentum contains common pyloric duct, hepatic artery and portal vein)

Posterior relations

- The lesser sac

- the Bile duct

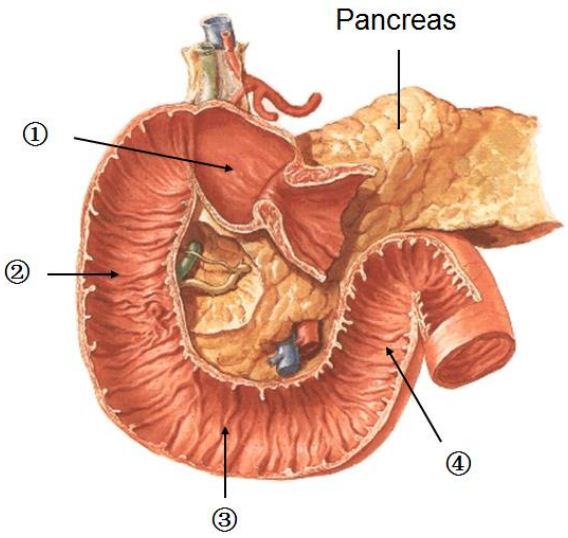
- portal vein

- I.V.C

- gastroduodenal Artery (if there is a peptic ulcer on the posterior wall of the 1st inch perforation and infiltration o may occur along with bleeding from the artery)

Inferior relations

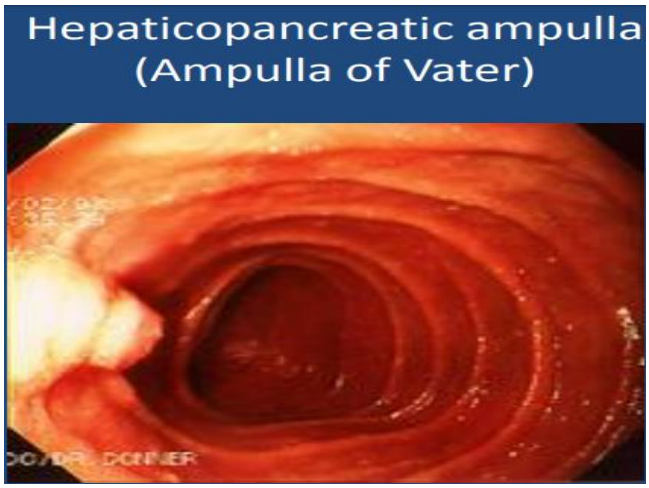
The head of the pancreas

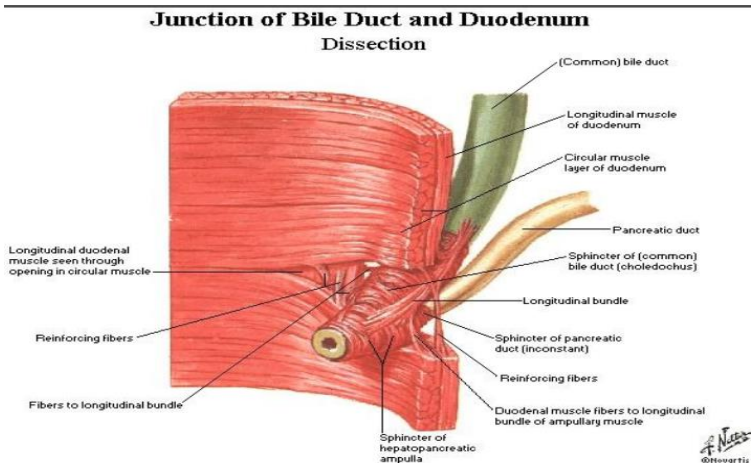


2nd part of the duodenum

It is 3 inches long, runs downward vertically on the right side in front of the Right kidney and right ureter and ends 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.





→ *Relations of the 2nd part*

Anterior relations

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

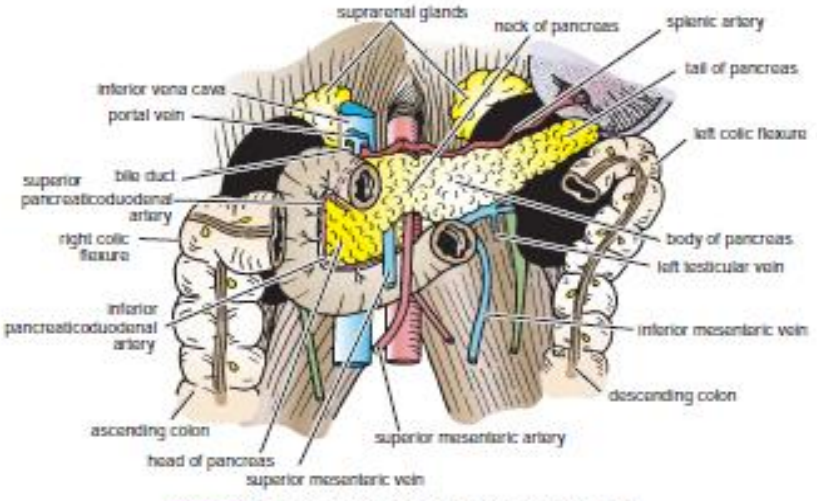


FIGURE 5.26 Pancreas and anterior relations of the kidneys.

Posterior relations

• Hilum of Right Kidney

• Right Ureter.

Lateral relations

• Right colic flexure

• Ascending colon

• Right lobe of the liver.

Medial relations

- Head of pancreas

- Bile and pancreatic ducts.

3rd part of the duodenum

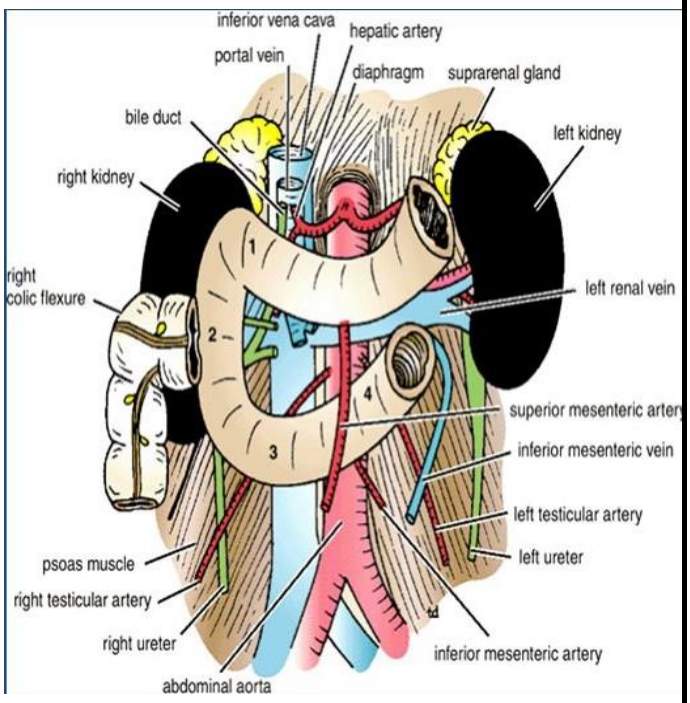
4 inches long

• Runs horizontally to the left, in front of the vertebral column

• On the subcostal plane.

• Under the lower margin of the head of pancreas

• Above the coils of the jejunum.



→ *Relations of 3rd part of duodenum*

Anteriorly:

The root of the mesentery of the small intestine

the superior mesenteric vessels contained within the mesentery coils of jejunum

Posteriorly:

The right ureter

The right psoas muscle

The inferior vena cava

The aorta

Superiorly:

The head of the pancreas

Inferiorly:

Coils of jejunum

4th part of duodenum

1 inch long

Runs upward to the left

Ends in the duodejejunal junction 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).

→ *Relation of 4th part of duodenum*

Anterior

- The beginning of the root of the mesentery

- coils of the jejunum.

Posterior

- Lt. psoas major

- the sympathetic chain on the left margin of the aorta.

Superior

- Uncinate process of the pancreas.

Blood supply of the duodenum

Arteries

1- T*he upper half* (1st part + upper 1/2 of 2nd part) is supplied by the ***superior pancreaticoduodenal*** artery, a branch of the *gastroduodenal artery* (from 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*.

What separates the upper from lower half?

- The major duodenal papilla and sphincter of Oddi.

*Remember that in embryology the GI track is divided to the:

- foregut (esophagus (lower part), stomach and upper half of duodenum)

Blood supply of foregut → Celiac trunk of abdominal aorta

- midgut (from lower half of duodenum to lateral\distal third of transverse colon)

Blood supply of midgut → Superior mesenteric artery

- hindgut (from distal third of transverse colon to rectum)

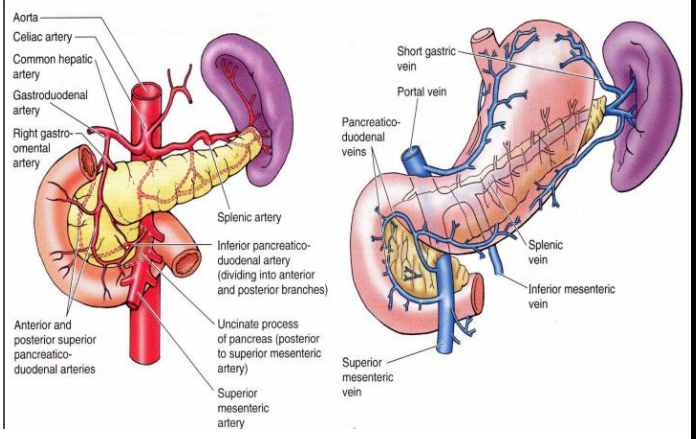
Blood supply of hindgut → Inferior mesenteric artery

Veins

The superior pancreaticoduodenal vein drains into the portal vein.

The inferior vein joins the superior mesenteric vein.

Arterial supply and venous drainage of the duodenum



Lymphatic drainage

• The lymph vessels follow the arteries

• drain upward → via pancreaticoduodenal nodes → the gastroduodenal nodes → *the celiac nodes.*

• drain downward → via pancreaticoduodenal nodes → the *superior mesenteric nodes* around the origin of the superior mesenteric artery.

Nerve supply (will be discussed in detail with the rest of the small intestine)

• Sympathetic nerves

• parasympathetic nerves from:

1- The celiac plexus.

2- Superior mesenteric plexus.