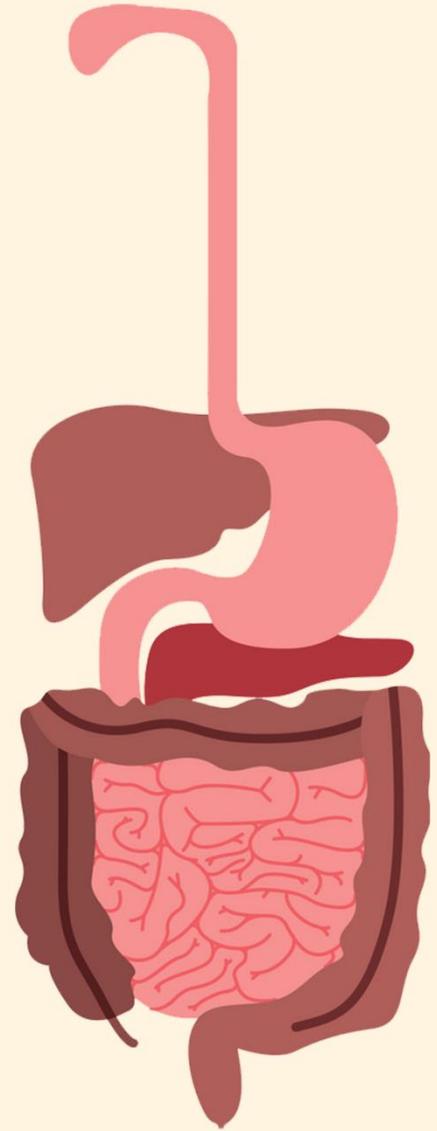


Anatomy

Faculty of Medicine - JU2017

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| Number >> | 6 |
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2nd system - GI



The Peritoneum

It is a thin serous membrane (a sac) that lines the abdominal cavity and covers the abdominal organs (viscera).

Consists of:

1- Parietal peritoneum: lines the anterior abdominal wall (it is the last layer of the ant. abdominal wall like we said before)

2- Visceral peritoneum: covers the abdominal viscera (it is adherent to the organs)

For example: the stomach inside the abdomen is completely covered by visceral peritoneum
However not all areas of the liver are covered.

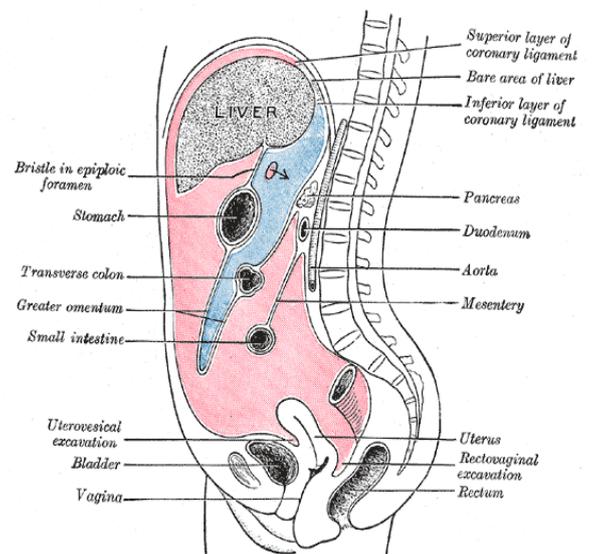
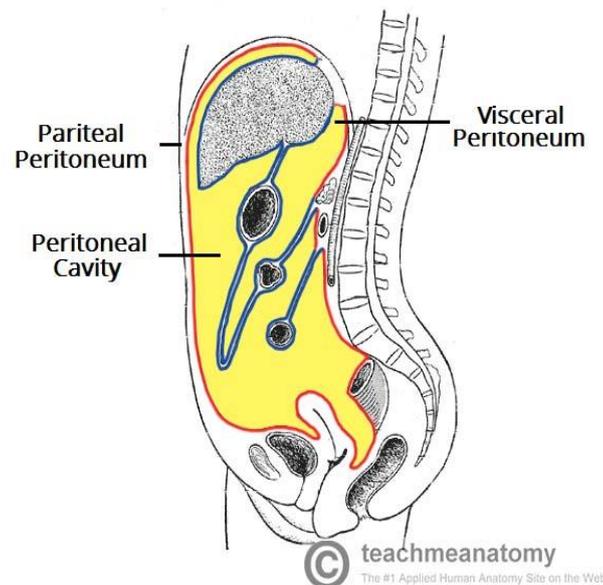
(peritoneum is continuous below with parietal peritoneum lining the pelvis)

3- Peritoneal cavity: the potential space between the parietal and visceral layer of peritoneum.

Potential means that this space is only visible when air or fluids enter it.

- In males it is a closed sac
- In females there is a communication with the exterior through the fallopian tubes, the uterus and the vagina.

The cavity is divided to the **Greater sac** (deep to the ant. wall and in front of the post. wall) and **lesser sac** (behind the stomach between the layers of greater omentum and anterior to pancreas).



The (parietal) peritoneum starts from underneath the diaphragm and descends downward lining the anterior abdominal wall until it reaches the pelvis and covers the upper surface of the urinary bladder, then it covers the fundus of the uterus and continuous posteriorly and is reflected on the rectum covering its anterior surface until reaching the posterior abdominal wall and continues upward facing the sigmoid

colon which it will surround and cover (the sigmoid colon in intraperitoneal), it continues upward facing the small intestine, which it will also cover, continuing upwards along the post. abdominal wall until it reaches the liver and diaphragm (on the posterior surface of the liver there is an area not covered by the peritoneum called *the bare area of the liver*, where the peritoneum ends).

Relationship between abdominal viscera and peritoneum:

1) Intraperitoneal (completely covered by (visceral) peritoneum)

They are the stomach, 1st and last inches of the duodenum, jejunum and ileum, cecum, vermiform appendix, transverse and sigmoid colons, spleen and ovary.

2) Retroperitoneal (behind the parietal peritoneum)

They are (*mnemonic: SAD PUCKER*):

S: Suprarenal glands.

A: Aorta.

D: duodenum (second and third part).

P: pancreas (except tail).

U: Ureters—not “uterus”.

C: colon (ascending and descending—the transverse and sigmoid colon are intraperitoneal).

K: Kidneys.

E: esophagus.

R: rectum (upper 3rd)

3) Interperitoneal (not completely covered or wrapped by peritoneum, one surface attached to abdominal walls or other organs)

Liver (remember the *bare area*), gallbladder (it lies in a fossa in the liver that side is not covered), urinary bladder and uterus (these are pelvic organs so only their superior surface is covered).

→ There is a connection between the greater and lesser sacs called the ***Epiploic foramen (foramen of Winslow)***

It is very important surgically, why?? because all operations on the pancreas or duodenum or the posterior wall of the stomach are done through this foramen.

What is an Omentum? An omentum is the fusion of two opposing layers of peritoneum—a layer from the lesser sac and a layer from the greater sac, and contains large amounts of fat as well as blood vessels, nerves, lymphatic vessels and lymph nodes.

Lesser Omentum—which is 2 layers of peritoneum that extend from the liver to the lesser curvature of the stomach, and that cover that stomach completely, so it becomes intraperitoneal.

When the anterior and posterior surfaces of the stomach have been covered completely, the 2 peritoneum linings meet in the greater curvature of the stomach and enlarge inferiorly to become the Greater Omentum, which is an apron-like structure that lies over the viscera in the abdominal cavity.

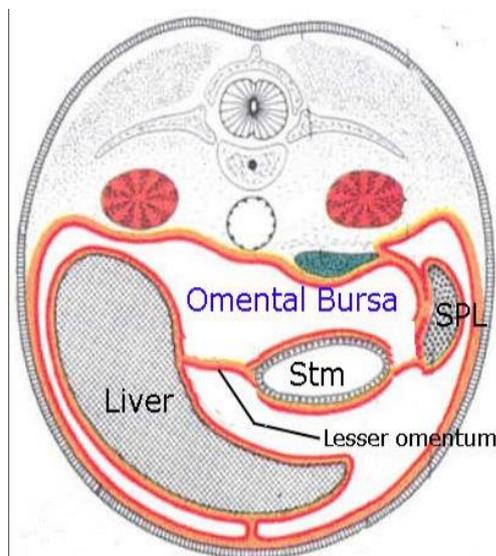
Greater omentum: is composed of 2 layers of peritoneum that descend from the greater curvature of the stomach and the first part of the duodenum in the greater sac passing in front of the small intestines and doubles back to ascend as 2 layers to the transverse colon and surround it before reaching to and binding to the anterior border of the pancreas (the pancreas is retroperitoneal, the peritoneum is bound to the anterior border of it only) and continue to post. abdominal wall.

(Check the picture above)

Lesser sac

In the embryo it is called “Omental bursa”

- Deep to lesser omentum
- Behind the stomach
- Between two layers of greater omentum
- Under the diaphragm and liver
- Deep to lesser opening (Epiploric opening) → (it is deep to the lesser omentum)



Boundaries of the lesser sac:

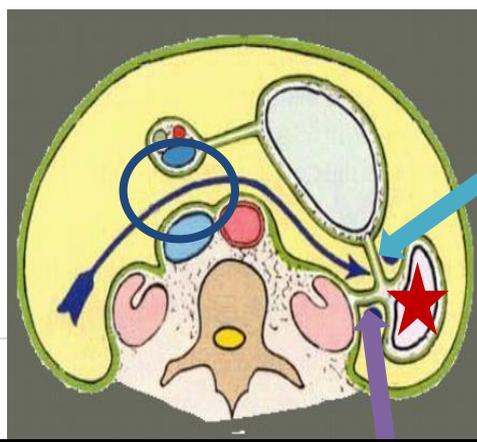
Superior: peritoneum which covers the caudate lobe of liver and diaphragm.

Anterior: lesser omentum, peritoneum of posterior wall of stomach, and anterior two layers of greater omentum.

Inferior: conjunctive area of anterior and posterior two layers of greater omentum.

Posterior: posterior two layers of greater omentum, transverse colon and transverse mesocolon, peritoneum covering posterior abdominal wall.

Left of the lesser sac there is the **spleen**, **gastrosplenic ligament** and **splenorenal ligament (lienorenal ligament)**.



Right of the sac is the **omental (epiploic) foramen**.

Note: in the abdomen a ligament is 2 layers of peritoneum, but it would also have strong fibrous tissue and it connects two organs together.

Boundaries of the Epiploic foramen:

Superiorly: caudate lobe of the liver

Inferiorly: the first part of the duodenum

Anteriorly: free edge of the lesser omentum

Posteriorly: Inferior Vena Cava.

The free edge of the lesser omentum contains 3 structures:

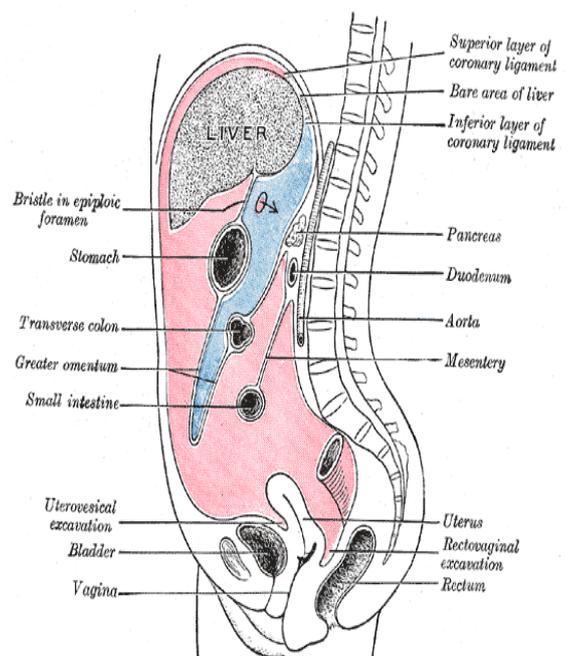
- Hepatic artery
- common bile duct
- portal vein



-surgeons hold the free edge of the lesser omentum during surgeries when they want to reach the lesser sac and that's important because the free edge contains three important structures; the hepatic artery, the common bile duct and the portal vein, which they need to protect to prevent bleeding from the two vessels and prevent leakage of the bile into the abdomen which can cause an infection.

Greater sac

- Below the diaphragm
- Deep to the anterior abdominal wall
- Above pelvic viscera
- Outside of
 - Liver (surrounds all liver except bare area)
 - Stomach (completely surrounded by peritoneum)
 - Transverse colon
 - Greater omentum
 - Duodenum (retroperitoneal except 1st inch, which is a continuation of the pylorus of the stomach and the last inch which would continue as jejunum which is intraperitoneal)



- *Small intestine* (jejunum and ileum, completely covered by peritoneum “mesentery”).

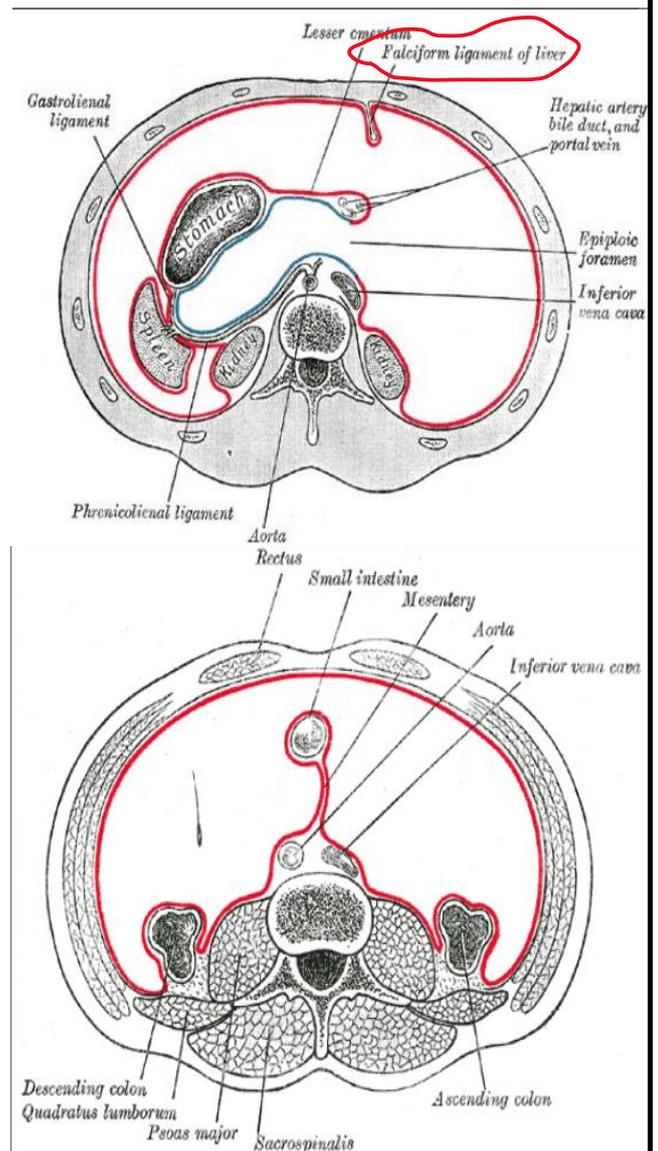
Mesentery: Begins at the posterior abdominal wall as parietal peritoneum and continues as 2 layers towards the small intestine and surrounds the jejunum and ileum (all 6 meters of them) and contains blood and lymphatic vessels, lymph nodes, fat, sympathetic and parasympathetic fibers (most important function is reaching the blood supply to the small intestine).

The Greater sac is subdivided by the greater omentum to:

- * Antero-superior part
- * Postero-inferior part

Antero-superior part is divided by the **Falciform ligament** of the liver into right and left parts.

Postero-inferior part is divided by the **mesentery** and **small intestine** into right and left parts.

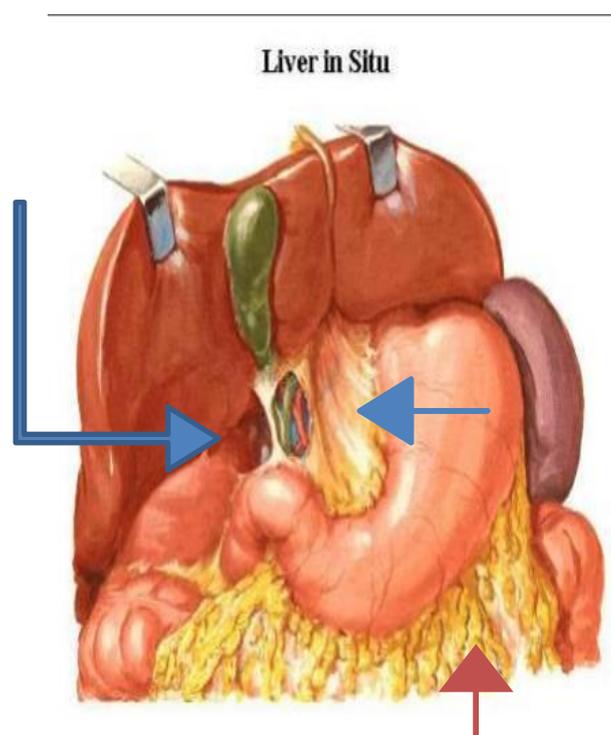


Epiploric foramen

(also, omental foramen and foramen of Winslow)

It is a short vertically flattened passage about 3cm in diameter that lies between the liver and duodenum (just above the first part of the duodenum) behind the lesser omentum, in front of the inferior vena cava. (we mentioned the boundaries above)

The Greater sac and lesser sac communicate through this foramen (we mentioned above its surgical importance)



Lesser omentum \ Greater omentum

Functions of the peritoneum

Secretes a lubricating serous fluid that continuously moistens the associated organs

Fat storage

Defense role → the presence of lymphatic vessels & nodes

Support viscera

The peritoneal reflections or folds

2 layers of the visceral peritoneum join together and form what is called either **omentum** or **mesentery**, between the 2 layers there would be blood vessels, lymphatic vessels, lymph nodes, nerves and fat that supply the organ so the function of these 2 layers is to connect the organs with that supply.

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.

- Mesentery: the reflection to the jejunum and ileum.
- Mesocolon: reflection to the transverse colon.
- Mesoappendix: to the appendix

Some peritoneal reflections between organs or between the body wall and organs, are termed **ligaments** or **folds**. Most of such ligaments or folds contain blood vessels and we mentioned above 3 examples (splenorenal, gastrosplenic and falciform ligaments)

Broad peritoneal sheets associated with *stomach* are termed **omenta**.

1) Omenta (some details mentioned above more here)

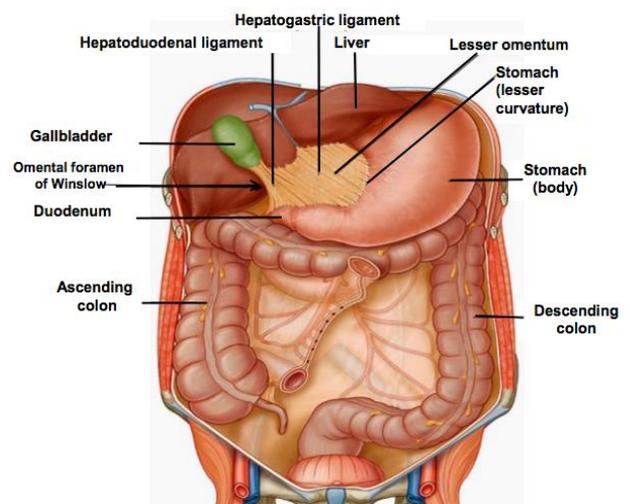
(two-layered fold of peritoneum that extends from the stomach to adjacent organs)

→ Lesser omentum

- extends from porta hepatis of the liver, fissure of ligamentum venosum and visceral surface of the liver and the diaphragm to the lesser curvature of the stomach and superior part of the duodenum.

Contents:

Blood vessels (left and right gastric artery and vein)



Drake et al, 2nd edition, Figure 4.57, page 296

Lymph nodes and lymphatic vessels

Parasympathetic (vagus n.) s and sympathetic fibers and Fat

Lesser omentum divided to 2 parts

1) Hepatogastric ligament (from porta hepatis to lesser curvature)

2) Hepatoduodenal ligament (from porta hepatis to superior part of duodenum, in its free margin, *free edge of lesser omentum*, encloses 3 key structures (again, mentioned above):

- common bile duct (ant.)
- proper hepatic artery (lateral of common bile duct)
- hepatic portal vein (post.)

→ **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* (extension as 2 layers of peritoneum from the transverse colon to the ant. border of the pancreas).

The upper part of the greater omentum which extends between the stomach and the transverse colon is termed the **gastrocolic ligament**.

The Greater omentum is called the “policeman of the abdomen”, Why?

Because in the case of an infection the greater omentum will surround the infection site and prevent it from spreading.

Contents:

Gastroepiploic vessels (right and left artery and vein)

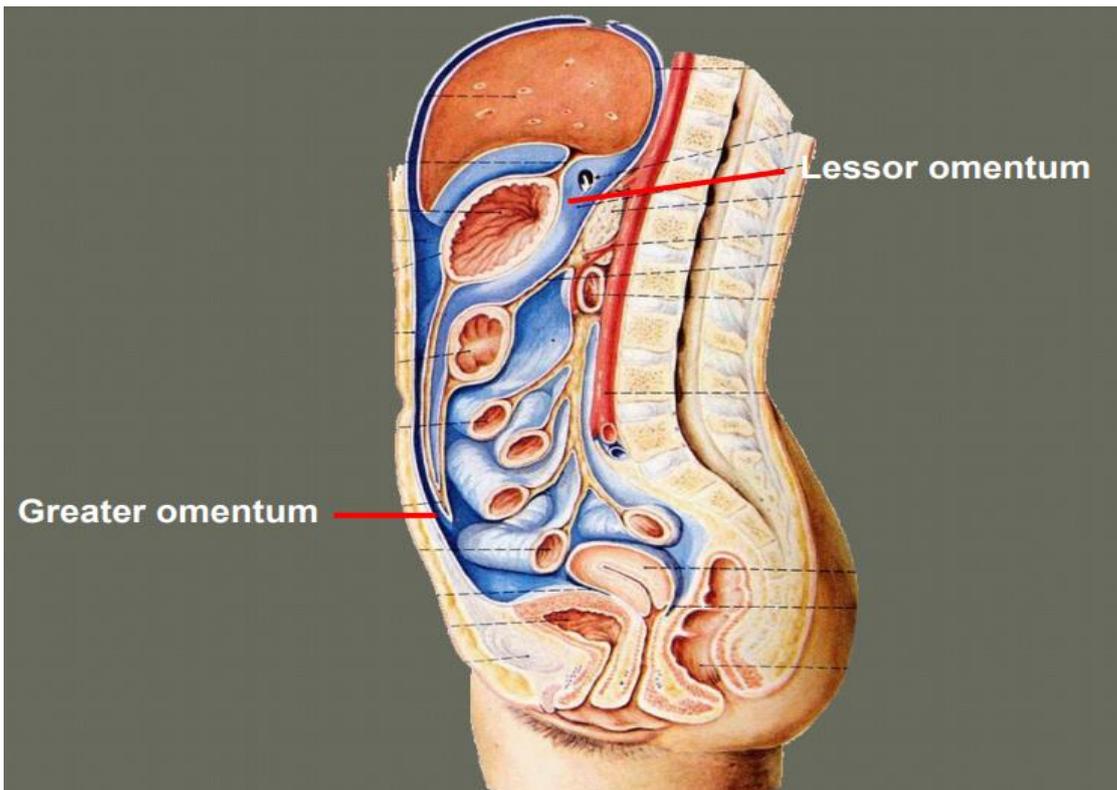
Lymph nodes & lymphatic vessels

Fat

Autonomic N.S → sympathetic + parasympathetic (vagus nerve)

Functions of Greater omentum

- ① *protective function*: The greater omentum contains numerous fixed macrophages, which performs an important protective function.
- ② *storehouse 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.
- ③ *migration and limitation*: 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.



2) Mesenteries of peritoneum

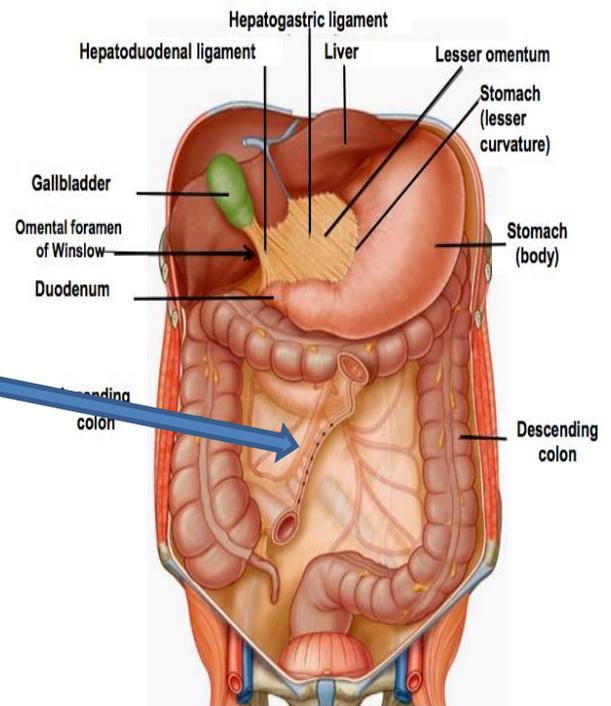
(Two-layered fold of peritoneum that attaches the intestines to the posterior abdominal wall).

→ Mesentery of the small intestine

suspends the small intestine from the posterior abdominal wall, it is broad, and fan shaped.

Root of mesentery

- 15 cm long
- Directed obliquely from the left side of L2 and ends in front of the sacroiliac joint.



Drake et al, 2nd edition, Figure 4.57, page 296

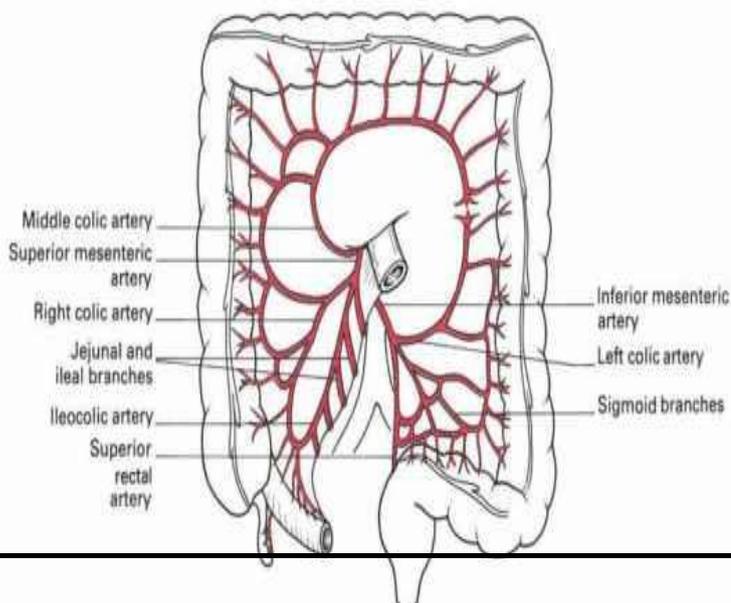
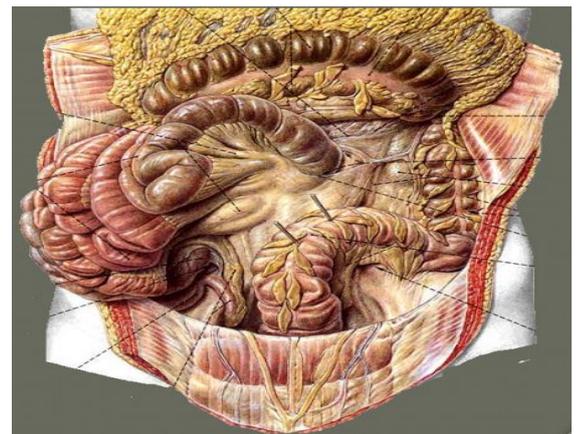
Contents

the jejunal and ileal branches of the superior mesenteric artery & veins

nerve plexuses

lymphatic vessels, lymphatic nodes

connective tissue and fat



The superior mesenteric artery will branch giving jejunal and ileal branches, it forms the *arcades* (they look like windows) and *vasa recta* (long arteries).

- The arcades are anastomoses of the jejunal and ileal arteries which are branches of superior mesenteric artery.

The arcades in the jejunum are simple (1-3 “windows”) however in the ileum they complicated (4-5)

- Vasa recta are straight arteries coming off from arcades in the mesentery of the jejunum and ileum and heading toward the intestines.

In the jejunum they are long but in ileum they are short.

(we use these characteristics to differentiate between jejunum and ileum)

→ **Mesoappendix**

Triangular mesentery — extends from terminal part of ileum to appendix.

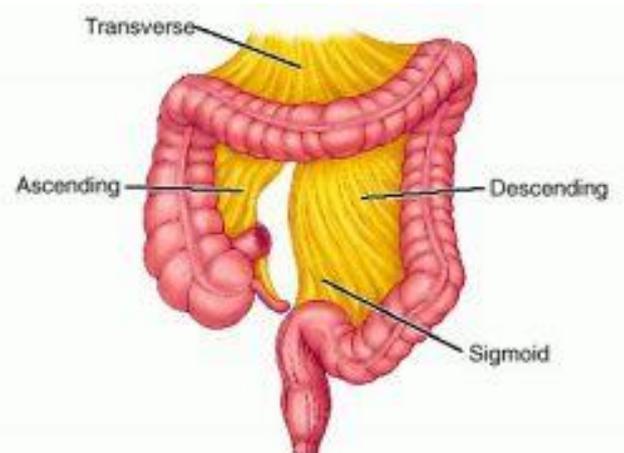
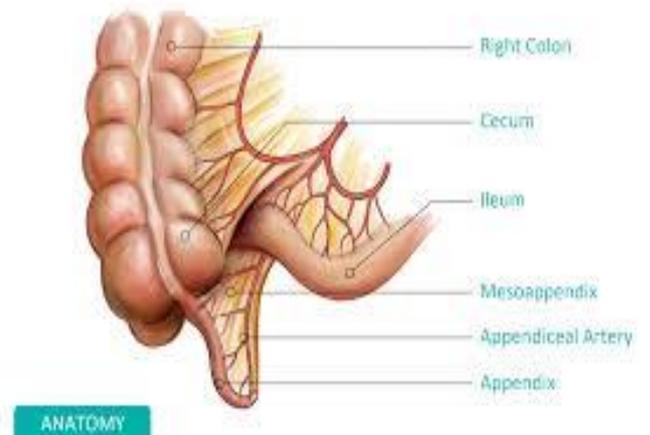
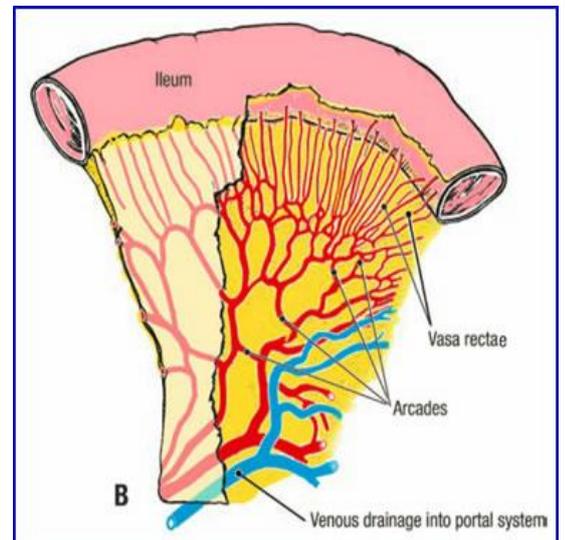
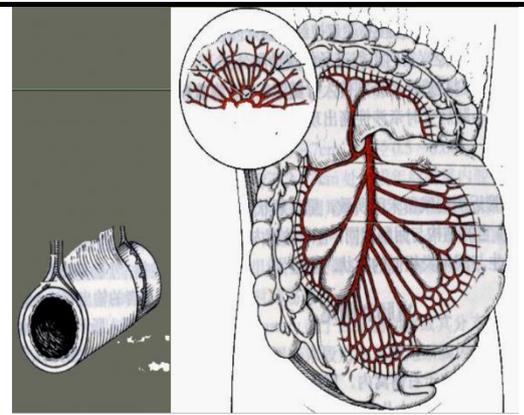
Contents

Appendicular artery and vein

Lymph nodes

→ **The Transverse mesocolon**

(It is a broad fold -2 layers of peritoneum- that connects the transverse colon to the anterior border of the pancreas).



Contents

The blood vessels

Nerves

lymphatics of the transverse colon.

→ **Sigmoid mesocolon**

(It is a fold of peritoneum that attaches the sigmoid colon to the pelvic wall)

Contents

The sigmoid vessels

Lymphatic vessels

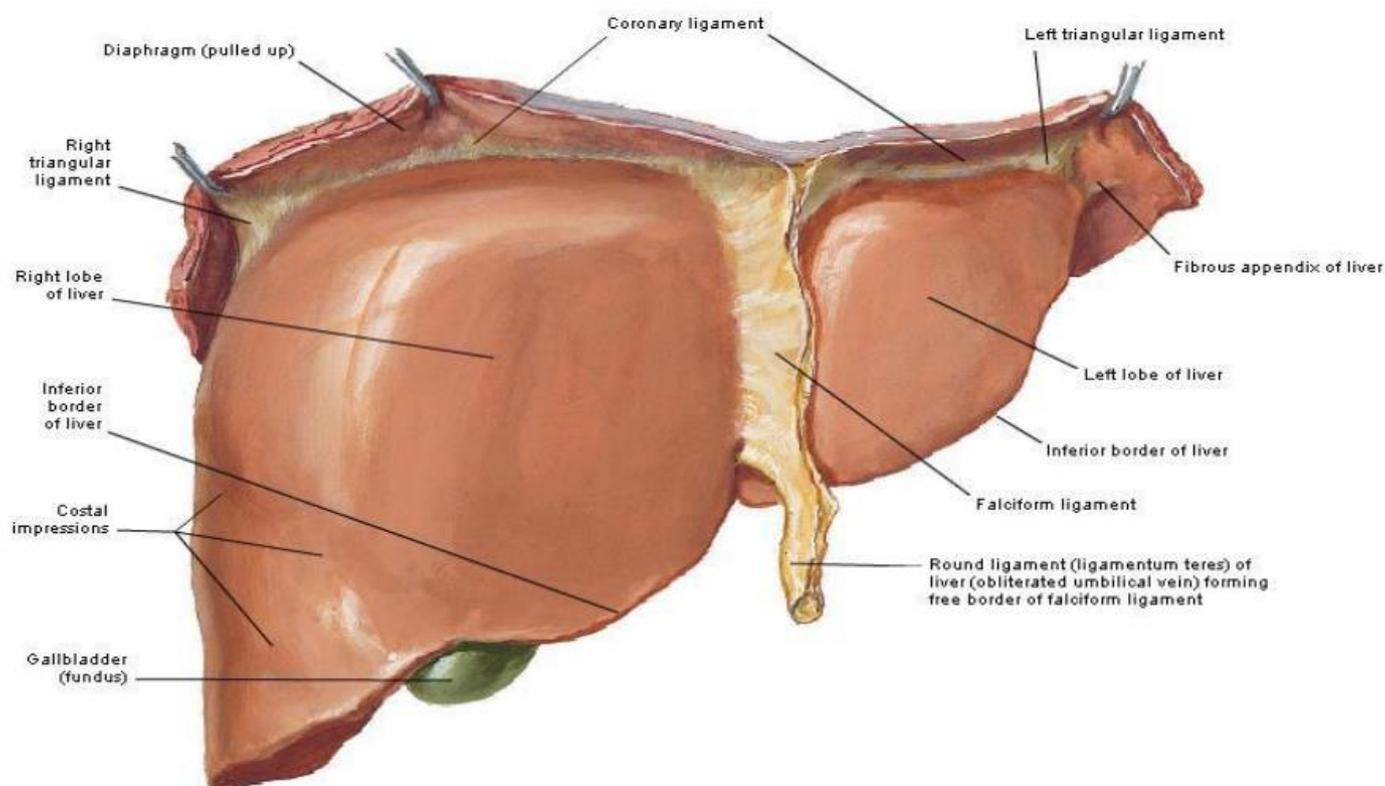
Nerves

The left Ureter descends into the pelvis behind its apex.

3) ligaments of the peritoneum

→ **Ligaments of the liver** (ligaments are also 2 layers of peritoneum that have fibrous tissue and thus are strong and connect two organs together)

- ① The falciform ligament of liver (connects the liver to ant. abdominal wall)
- ② The ligamentum teres hepatis (in the free edge of falciform ligament and it is an obliterated umbilical vein specifically the left umbilical vein)
- ③ The coronary ligament (on the edges of the bare area of the liver)
- ④ The right triangular ligament (the ending of the coronary ligament)
- ⑤ The left triangular ligament (same as above)
- ⑥ The hepatogastric ligament (part of lesser omentum)
- ⑦ The hepatoduodenal ligament (part of lesser omentum)



More details from slides

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)

Coronary ligament, the area between upper and lower layer of the coronary ligament is the bare area of liver which contracts with the diaphragm

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

(we mentioned the **Hepatogastric** and **Hepatoduodenal** ligaments above)

→ *Ligaments of the spleen*

1) *Gastrosplenic ligament*

Connects the fundus of stomach to hilum of spleen.

Contents

the short gastric & left gastroepiploic vessels pass through it.

2) *Splenorenal ligament (lienorenal ligament)*

extends between the hilum of spleen and left kidney.

Contents

- The splenic vessels
- Lymphatic vessels, nodes
- Nerves
- The tail of pancreas

This ligament is very important surgically, why?

Any injury to the left ribs (9, 10, 11) might cause a ruptured spleen (the spleen is a reservoir of blood) so there is bleeding, the treatment is *splenectomy*, during the operation you have to do ligation of the *splenic vessels*.

Another important thing is to avoid any injury to the *tail of pancreas* which is between the 2 layers of the ligament during splenectomy operations because that may cause peritonitis.

3) *Phrenicosplenic ligament* (between the diaphragm and spleen)

4) *Splenocolic ligament* (between spleen and colon)

→ ***Ligaments of the stomach***

Hepatogastric ligament

Gastrosplenic ligament

Gastrophrenic ligament (with diaphragm)

Gastrocolic ligament (with colon)

Gastropancreatic ligament

→ ***The suspensory ligament of duodenum***

Sometimes named Treitz ligament at the junction between duodenum & jejunum, it connects this junction with the right crus of diaphragm.

→ ***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.

Best of luck, if anything is unclear don't hesitate in asking any of us.