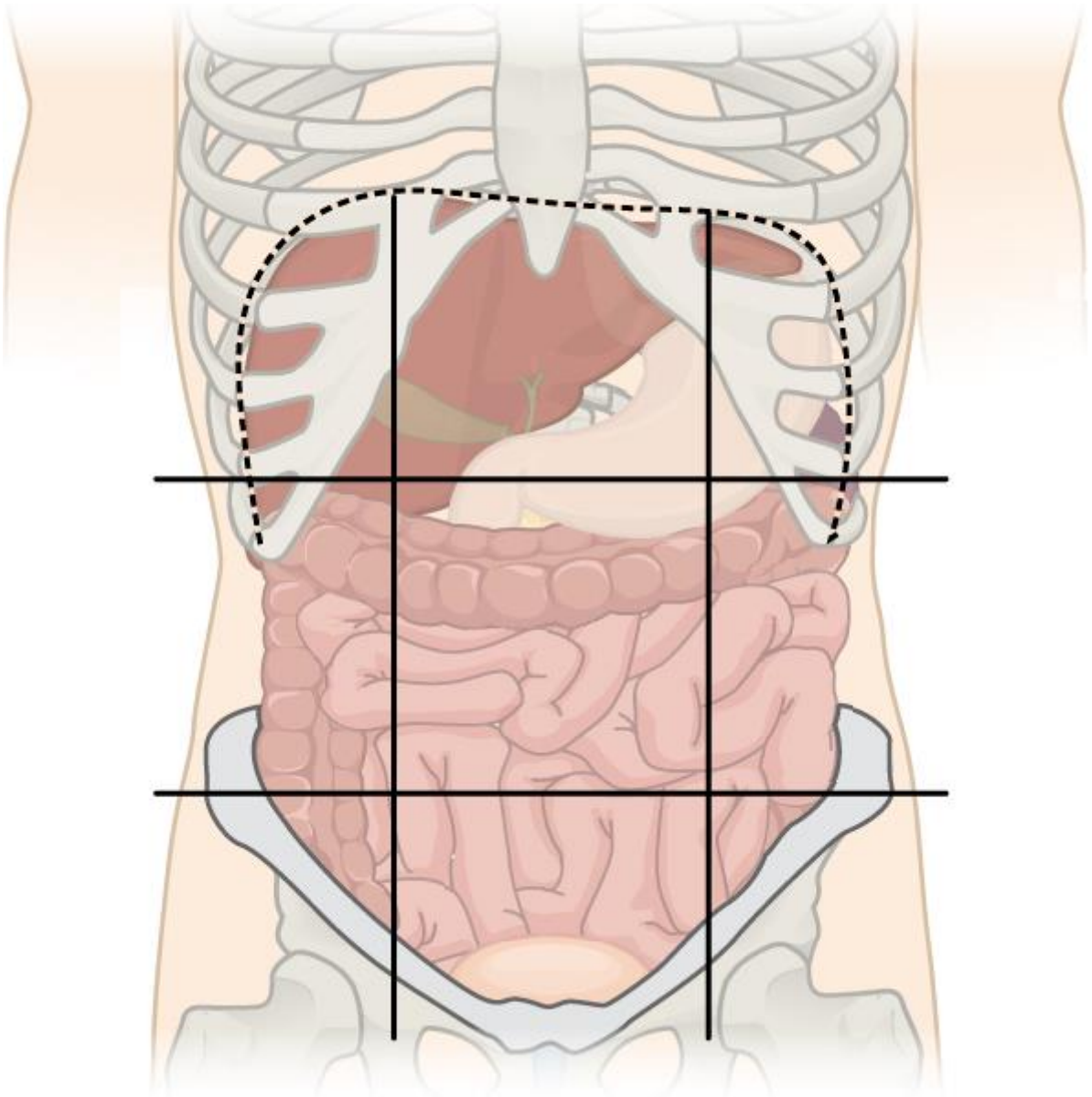


Stomach

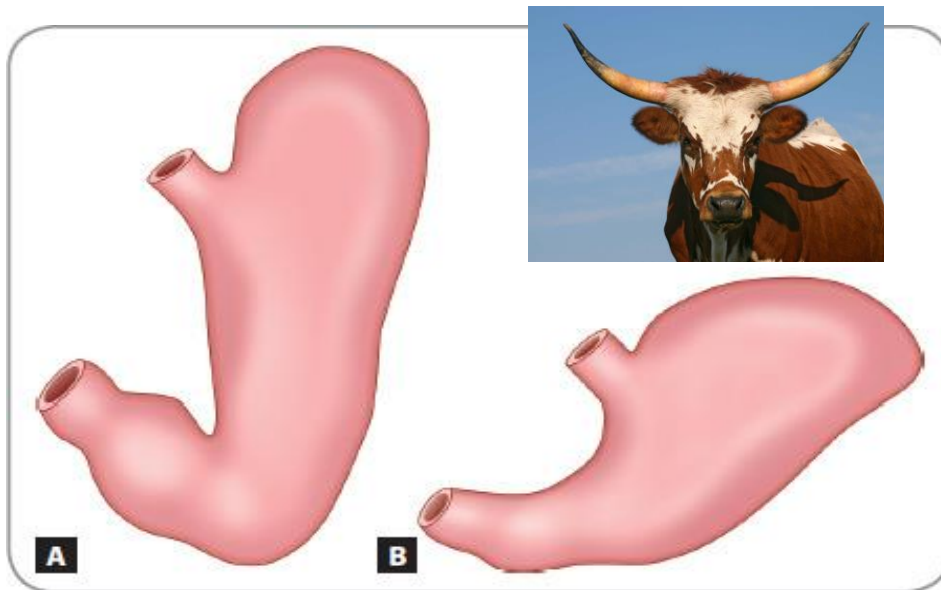
- **Site:** In the left hypochondrium , epigastric & umbilical regions.



- **Shape:**
 - The stomach may be :
 - J-shaped stomach which descends vertically.
 - Steer-horn stomach which pass transversely.

Stomach & Small Intestine

- It has **2 orifices, 2 borders and 2 surfaces:**



I) Orifice:

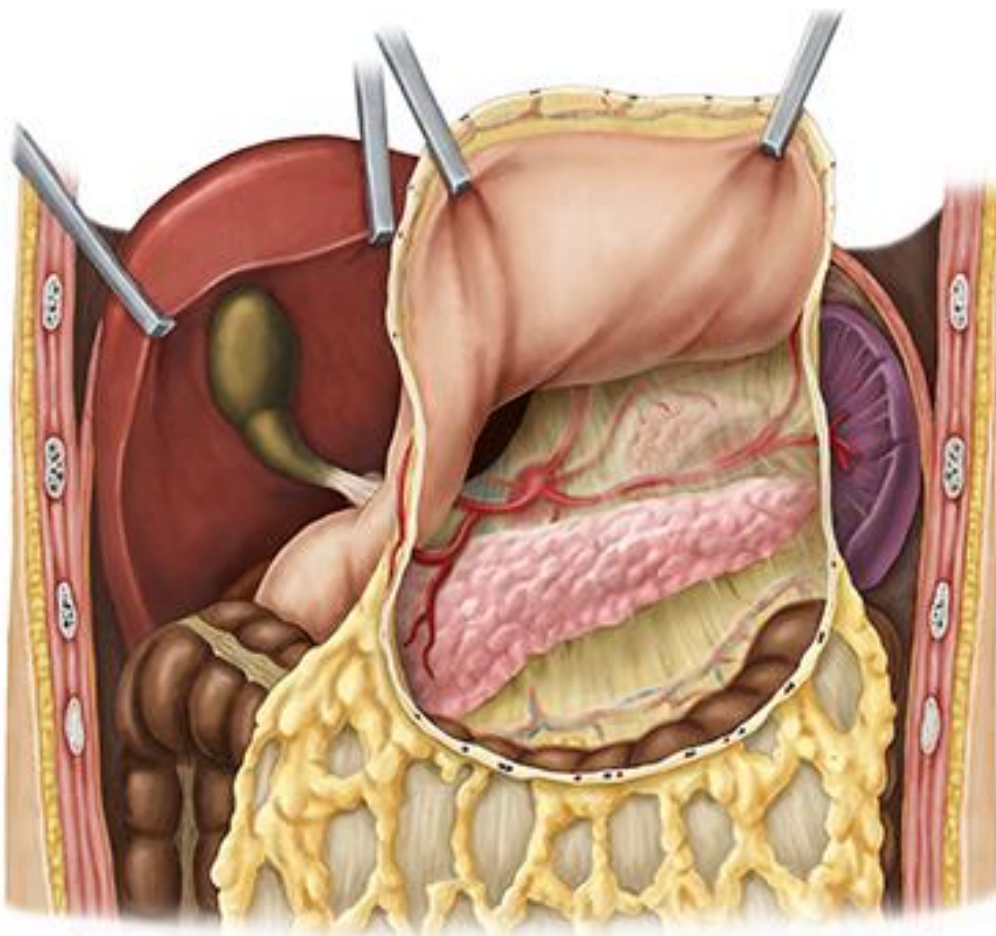
(A) Cardiac Orifice	(B) Pyloric Orifice
1. It is the upper orifice found at the junction of the stomach with the oesophagus.	1. It is the lower orifice found at the junction of the stomach with the duodenum.
2. It is one inch to the left of the median plane at the level of the left 7 th costal cartilage (11 th . thoracic vertebra).	2. It is found ½-1 inch to the right of the median plane at the level of the transpyloric plane (L ₁ vertebra)
3. It is controlled by a physiological sphincter.	3. It is controlled by the pyloric sphincter which is anatomical sphincter formed by thickening of the circular muscle fibers of the stomach.
4. It is related anteriorly to left lobe of liver .	4. It is related anteriorly to quadrate lobe of liver .

Stomach & Small Intestine

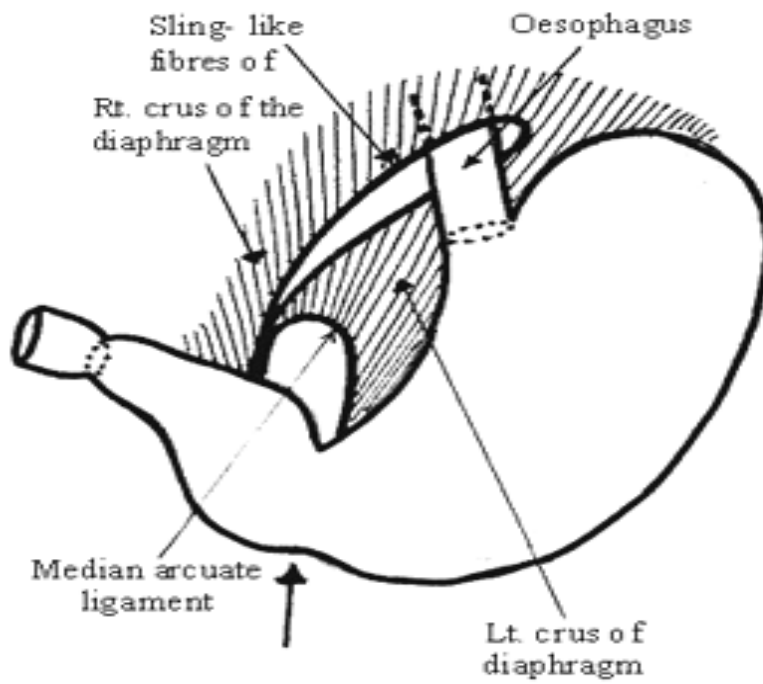
5. It is related posteriorly to the diaphragm.

4. It is related posteriorly to neck of pancreas with lesser sac in between.

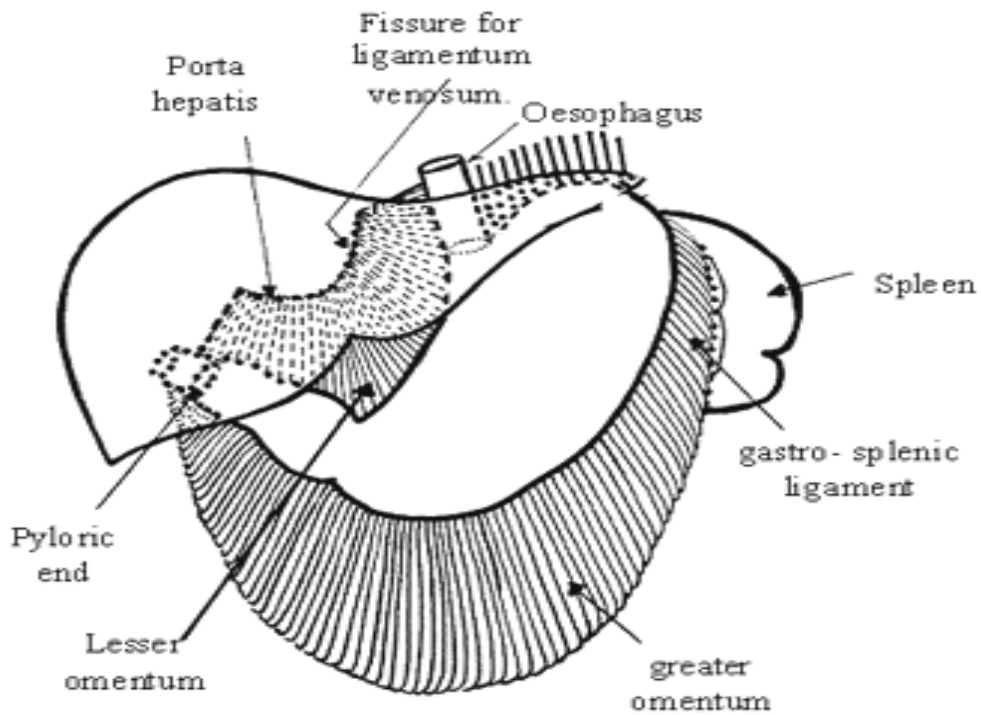
- Pyloric sphincter can be detected **during operation** by pyloric constriction , prepyloric vein & feeling the thickened pyloric sphincter.



Stomach & Small Intestine



*** Cardiac & Pyloric ends ***



*** Peritoneal ligaments of the stomach ***

Stomach & Small Intestine

II) 2 borders:

(A) The lesser curvature	(B) The greater curvature
1. It is the right border of the stomach.	1. It is the left border of the stomach..
2. It shows a notch at its right 1/3 called the incisura angularis (angular notch).	2. It shows a notch with the esophagus called incisura cardia (cardiac notch) .
3. It gives attachment to the lesser omentum.	3. It gives attachment to the gastrophrenic ligament, gastrosplenic ligament and greater omentum of the peritoneum.
4. Along it run the right and left gastric vessels .	4. Along it run the short gastric, left gastro-epiploic and right gastro-epiploic vessels .

III) Surfaces and relations:

a) Relations of antero-superior surface:

- The **greater sac** of peritoneum separating the stomach from :
 1. The inferior surface of the **liver** (left lobe and quadrate lobe) is related to the related to upper right part of stomach.
 2. The **diaphragm** is related to the upper left part of the stomach separating it from left lung , pleura and left 6-9 ribs.

Stomach & Small Intestine

3. The **anterior abdominal wall** is related to the lower part of the stomach.

B) Relations of postero-inferior surface: (stomach bed)

1- Left crus of **diaphragm**

2- Anterior surface of **left kidney** and left **suprarenal** gland above it.

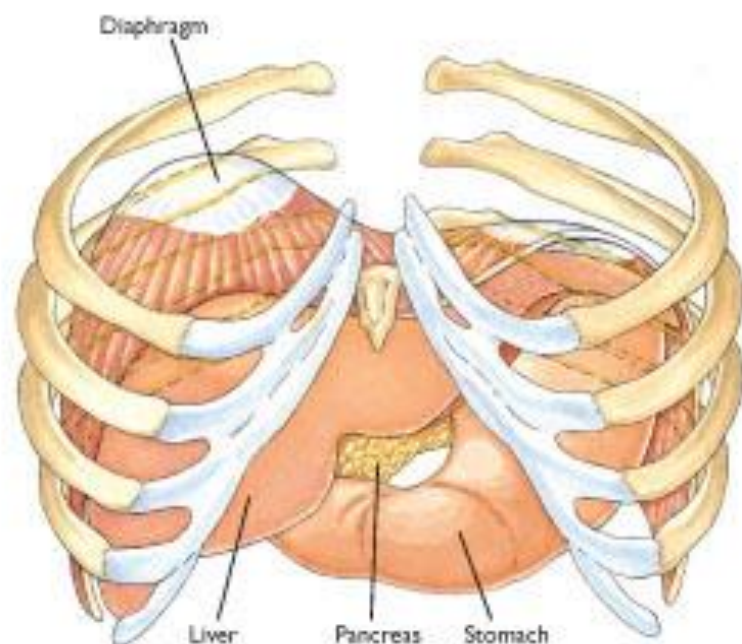
3- Anterior surface of body of **pancreas** and the splenic artery runs above upper border of pancreas.

4- **Transverse colon** and the **transverse mesocolon**, which attached to anterior border of pancreas, above it.

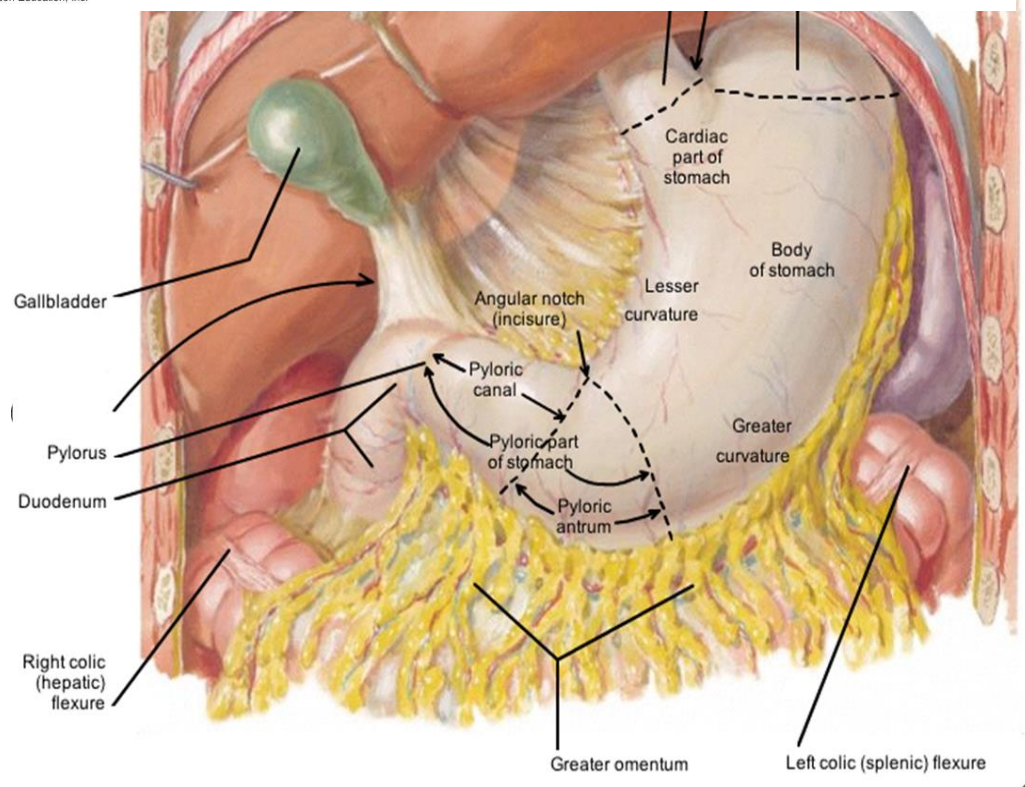
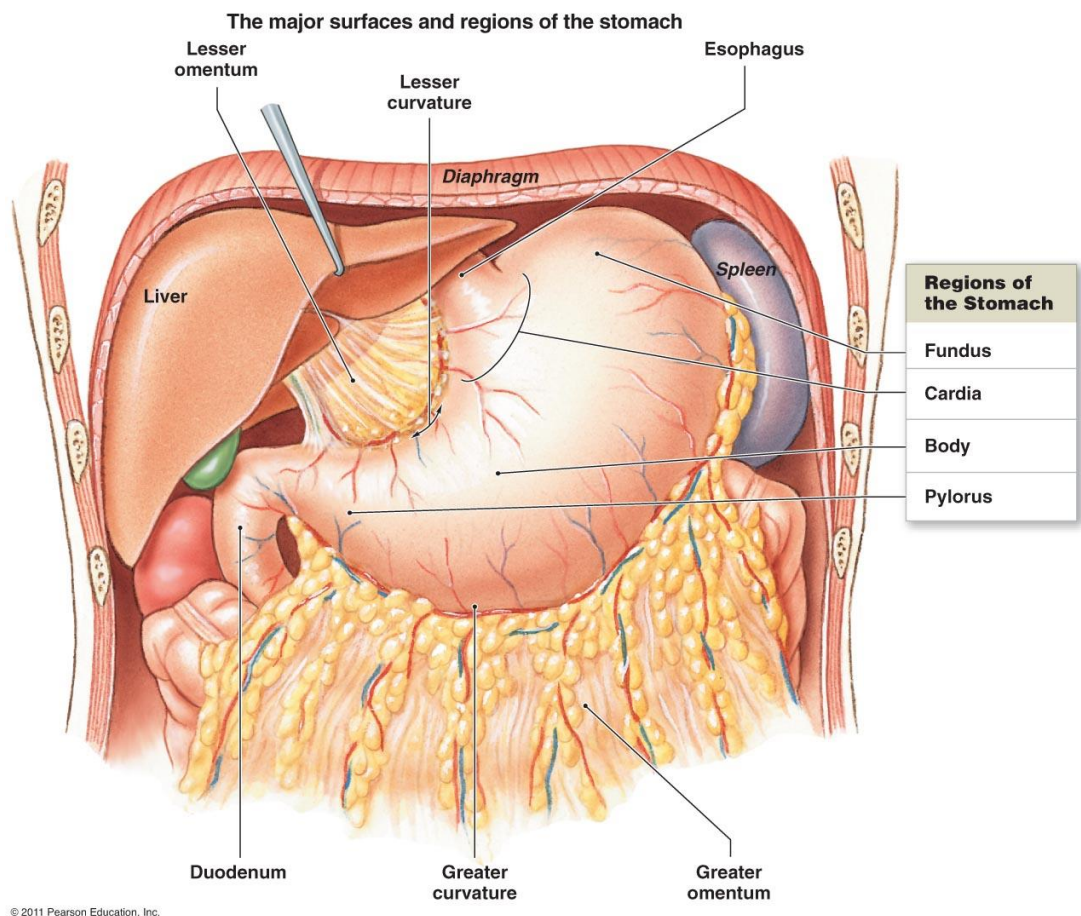
5- Gastric area of **spleen**

★ All the above mentioned structures are **separated from the stomach by** the lesser sac of peritoneum except the spleen which is separated from it by the greater sac.

Relations of Anterior Surface of Stomach



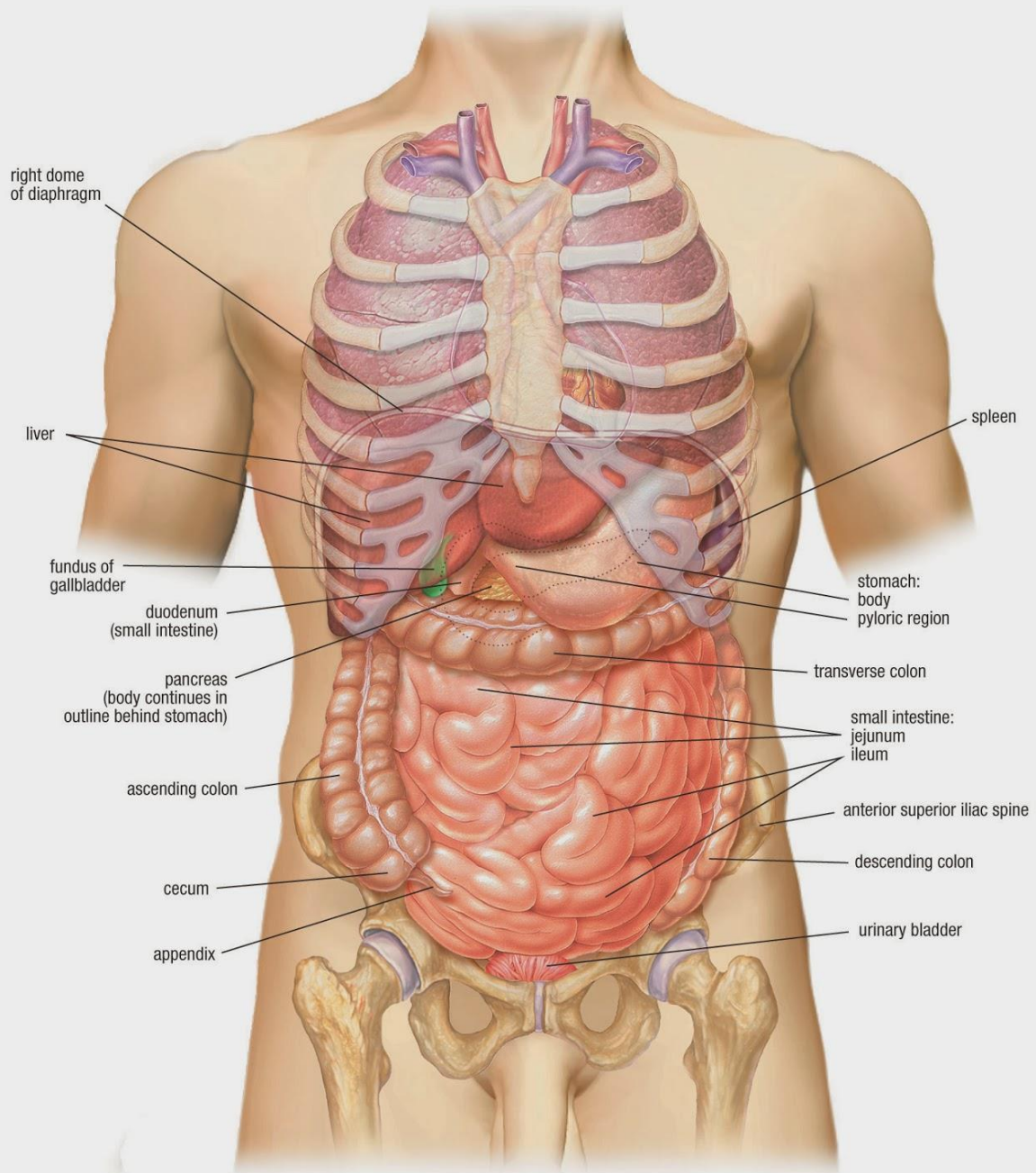
Stomach & Small Intestine



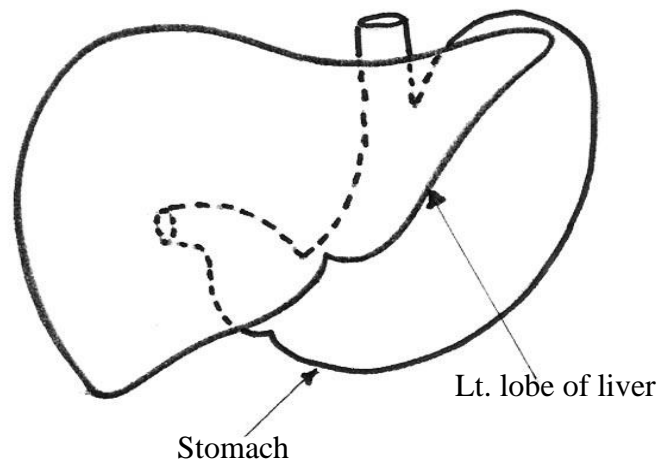
F. Netter M.D.

Stomach & Small Intestine

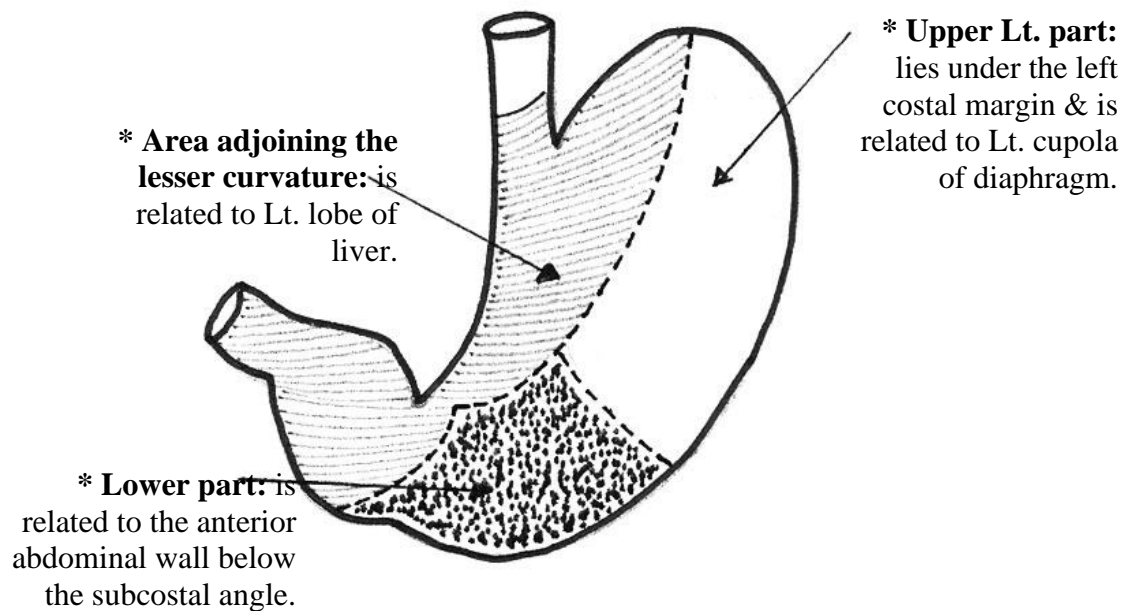
ABDOMINAL VISCERA (ANTERIOR VIEW)



Stomach & Small Intestine



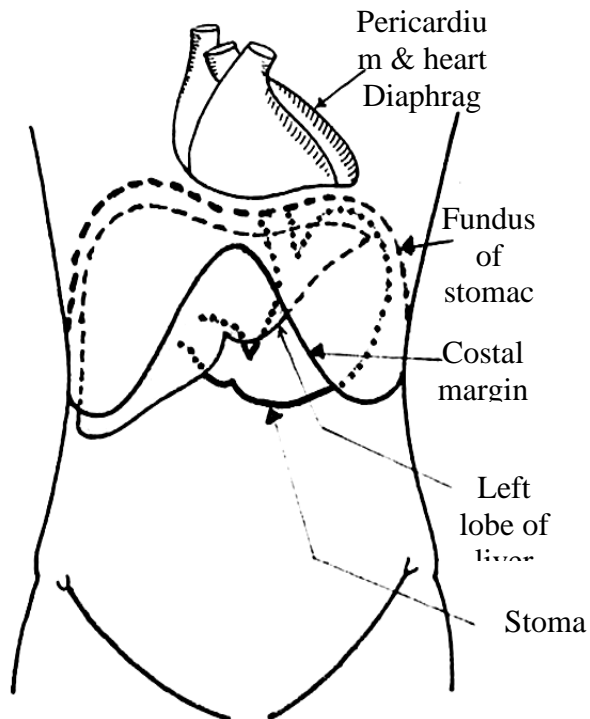
* Relation of liver to stomach *



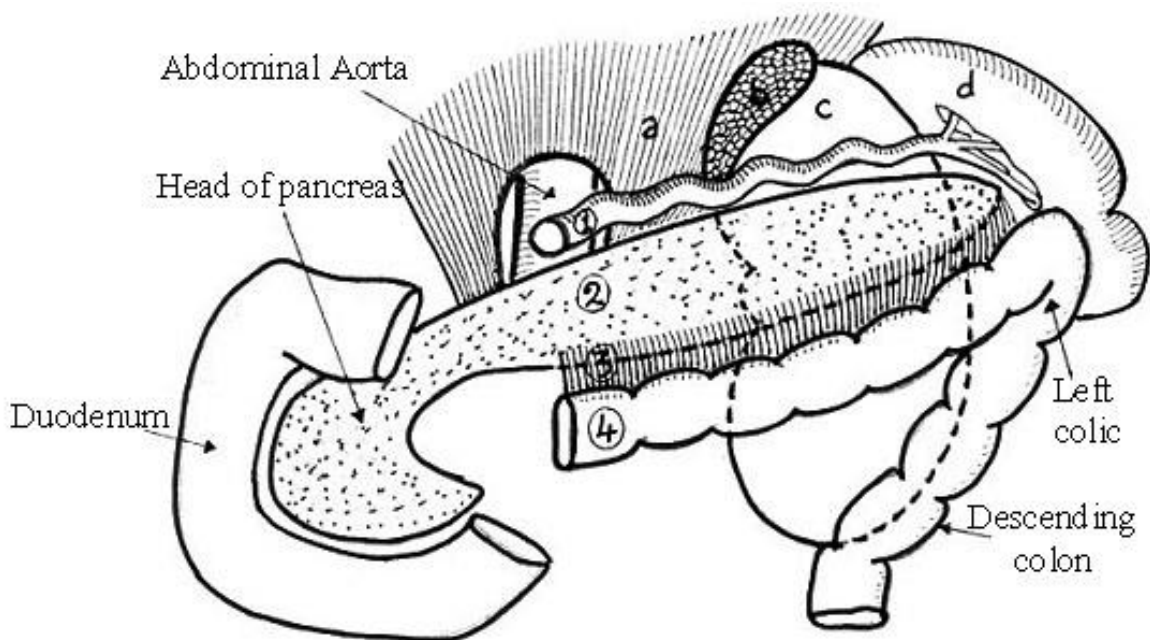
* Relations of Anterior surface of Stomach *

Stomach & Small Intestine

Relations of Stomach



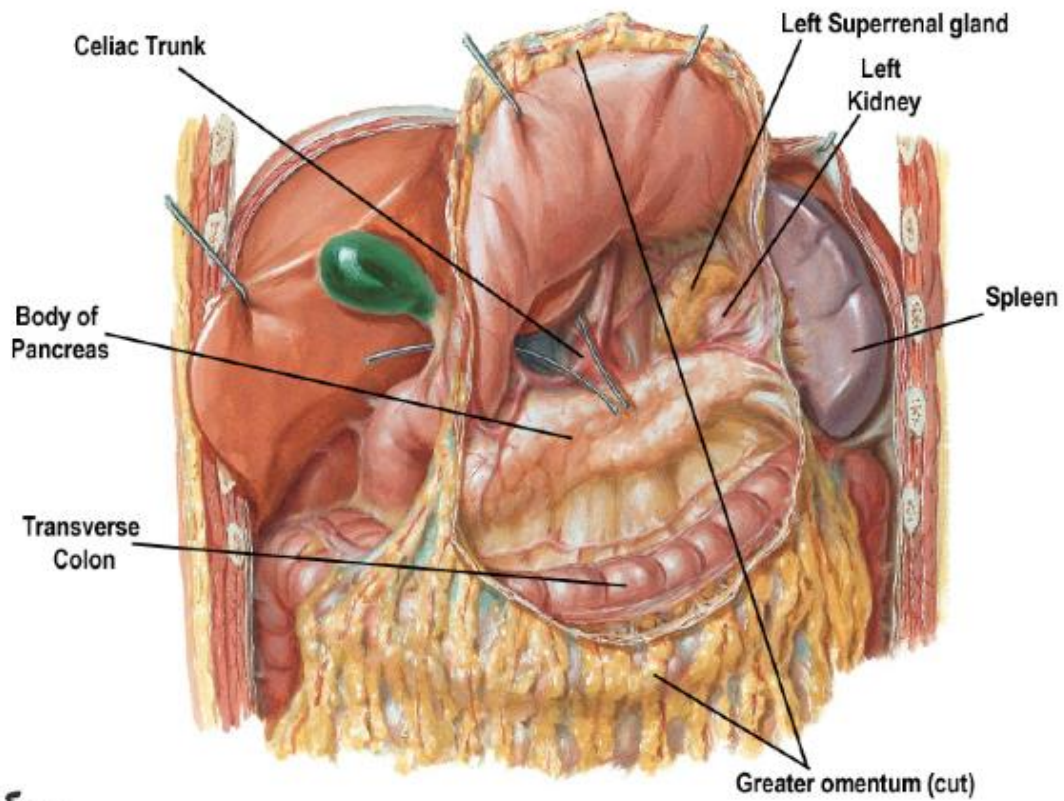
Relations of antero-superior surface



Stomach bed

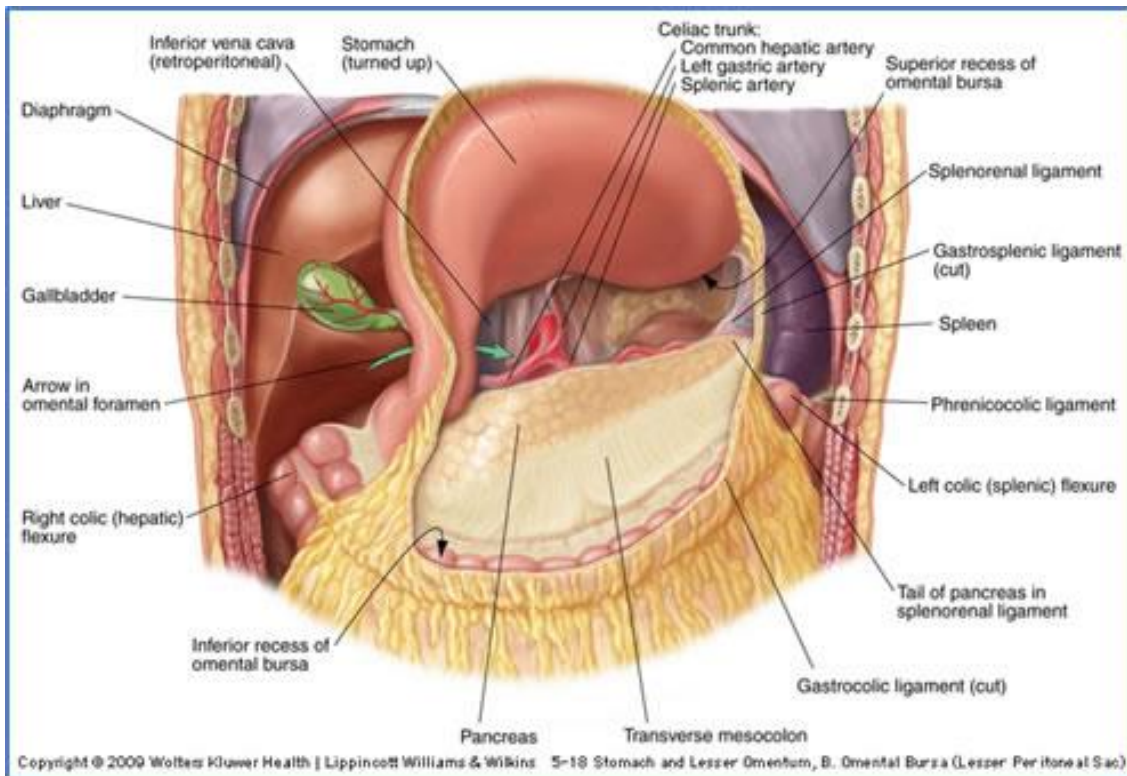
Stomach & Small Intestine

Bed of the Stomach



F. Netter M.D.
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Netter 264



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Stomach & Small Intestine

- **Parts of the stomach:**

a) Fundus : The dome shaped part , above level of cardiac orifice.

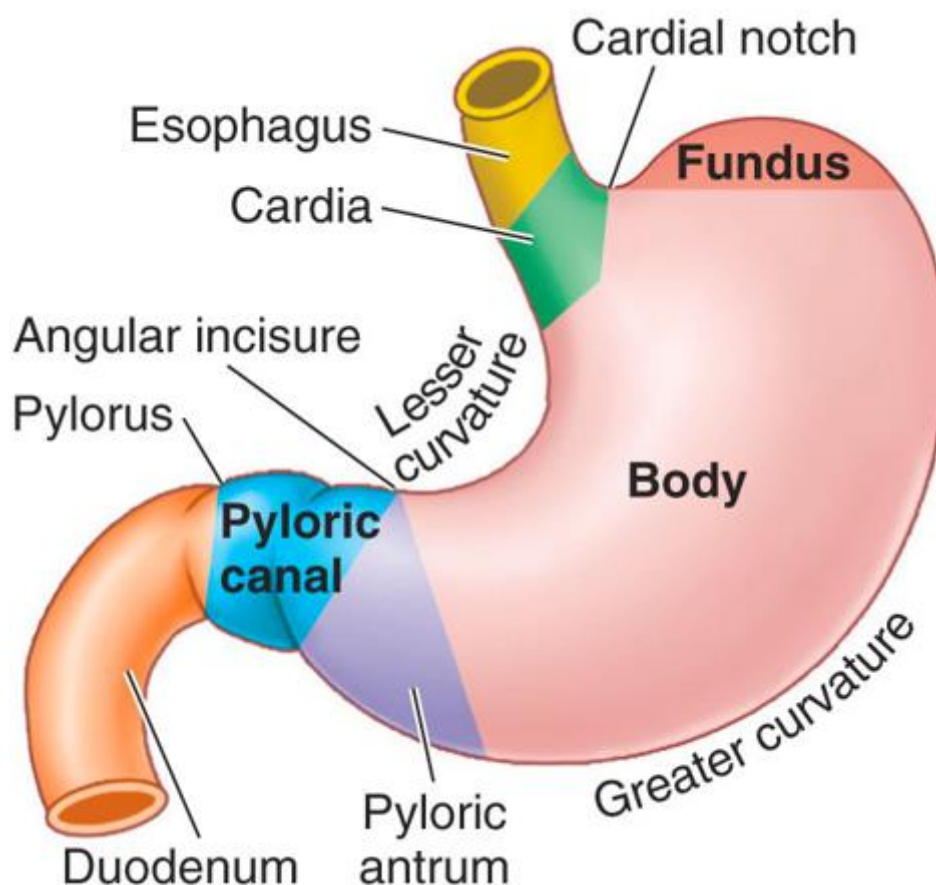
b) Body: Between level of cardiac opening & imaginary vertical line between angular notch & the corresponding point on the greater curvature.

c) Pyloric portion: 3 parts:

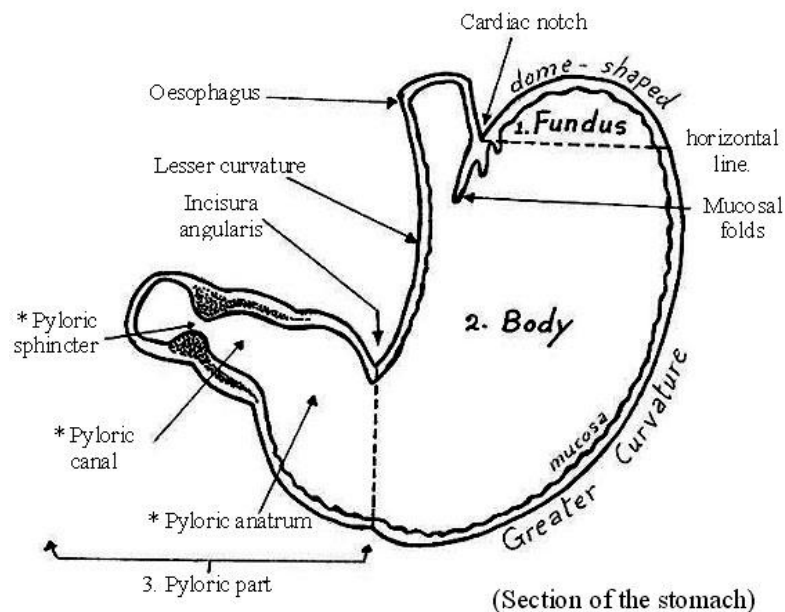
1. Pyloric antrum: Is a dilated part below the body.

2. Pyloric canal: Is the terminal one inch of stomach.

3. Pyloric sphincter.



Stomach & Small Intestine



Shape & Parts of Stomach

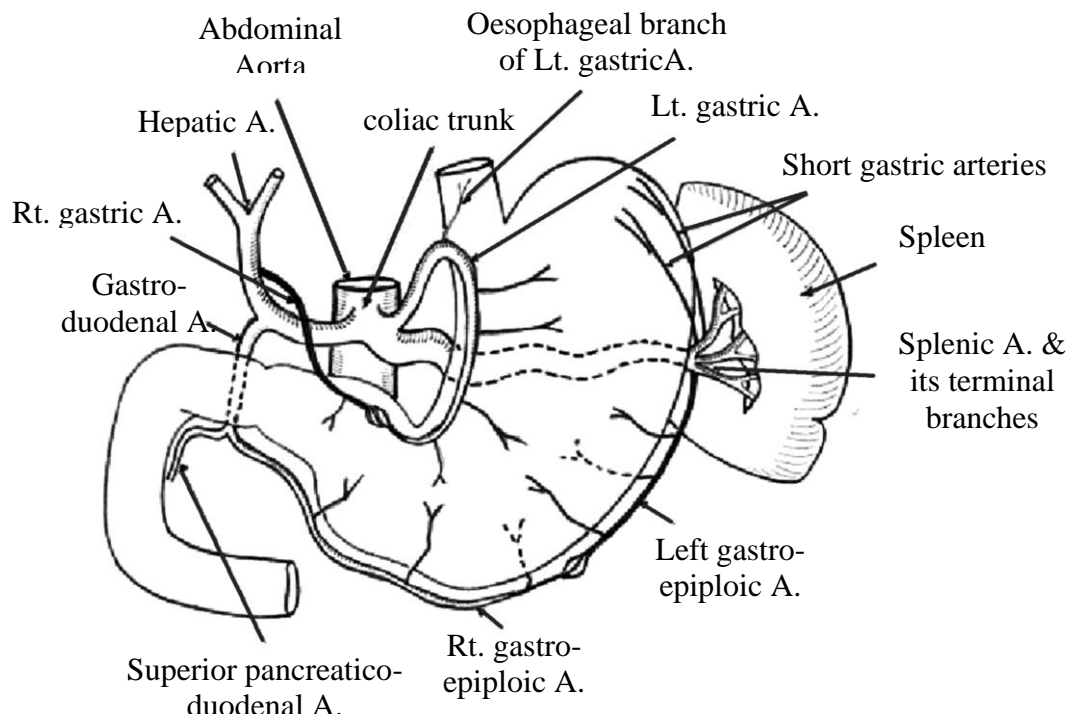
★ Arterial supply:

1. **Along greater curvature:** right gastroepiploic (from gastroduodenal artery), left gastroepiploic & short gastric arteries (from splenic artery)
2. **Along lesser curvature:** right gastric artery (from hepatic artery) & Lt. gastric artery (from coeliac trunk).

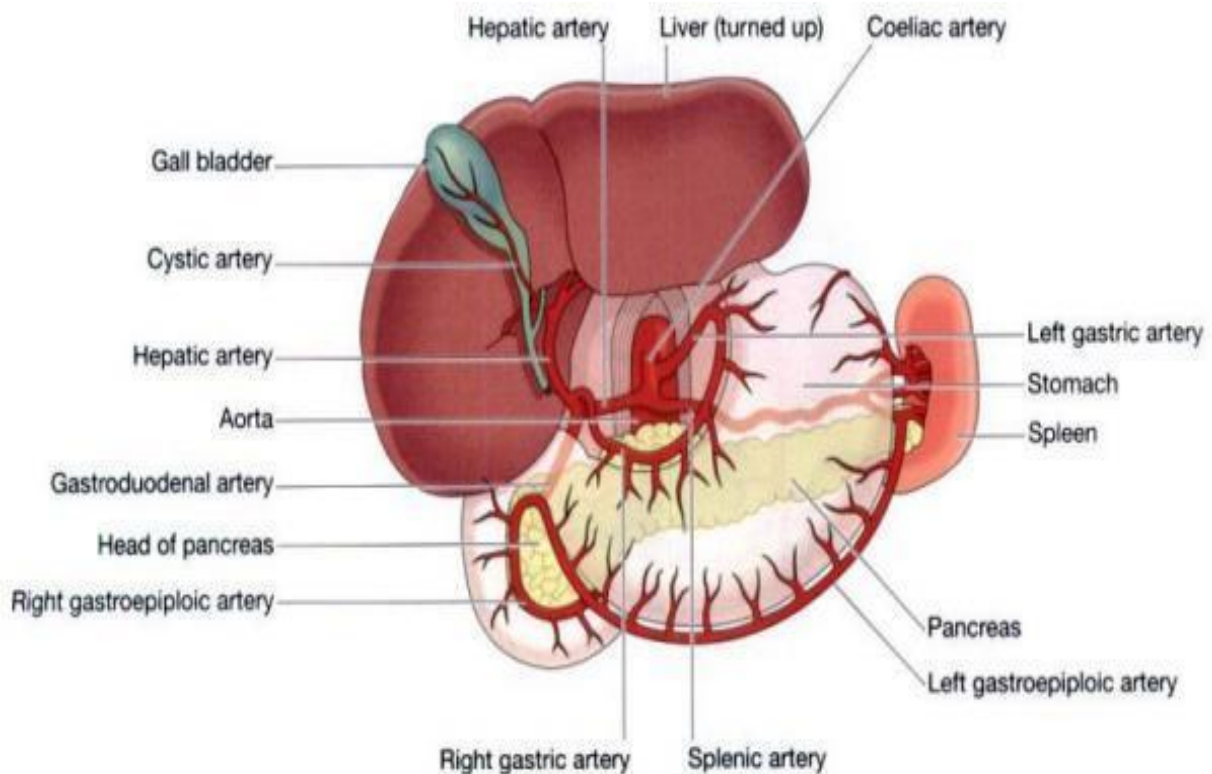
★ Venous drainage:

1. Right & left gastric veins: Drained into portal vein.
2. Left gastro-epiploic vein & short gastric veins: Drained into splenic vein.
3. Right gastro-epiploic vein: Drained into superior mesenteric vein.

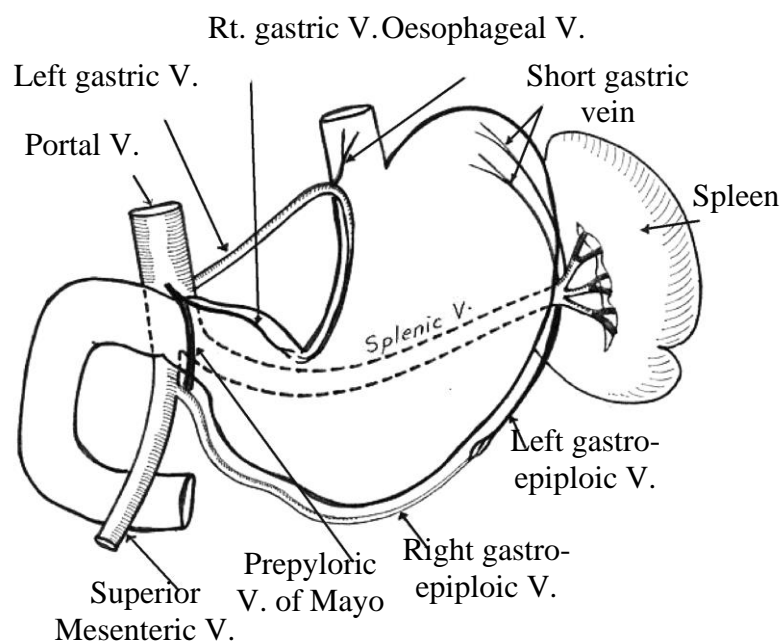
Stomach & Small Intestine



Arterial Supply of the Stomach.



Stomach & Small Intestine



Venous Drainage of the Stomach

•Applied Anatomy:

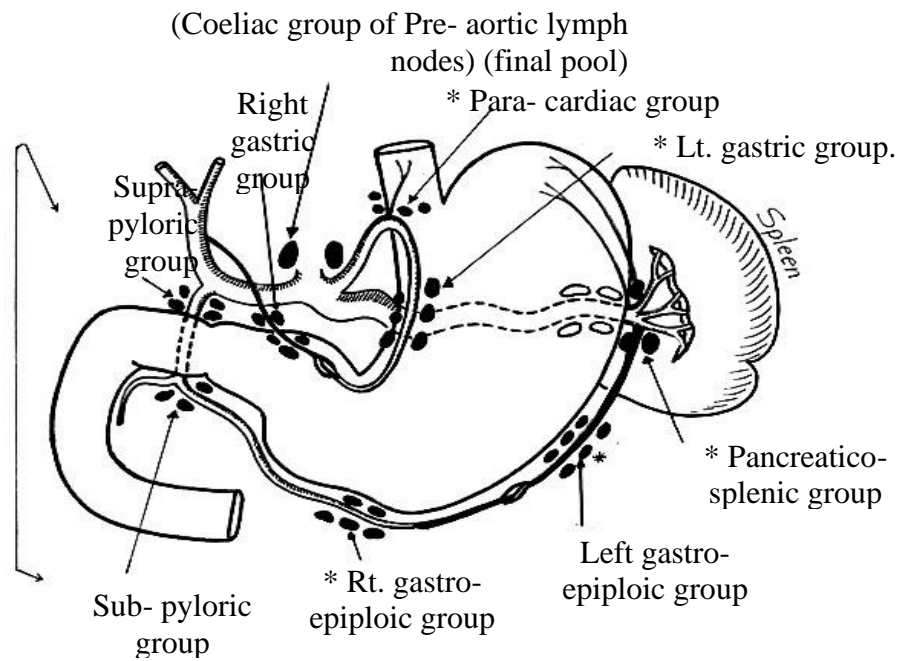
- 1) Left gastric and short gastric veins receiving oesophageal veins draining abdominal part of oesophagus (portal) which anastomose with oesophageal veins (tributaries of azygos veins) draining thoracic part of oesophagus (systemic). In portal hypertension, opening of porta- systemic anastomosis results in **gastric and oesophageal varices**.
- 2) The stomach has **very rich blood supply** and it is found that it can depend only on **right gastro-epiploic vessels**.

Stomach & Small Intestine

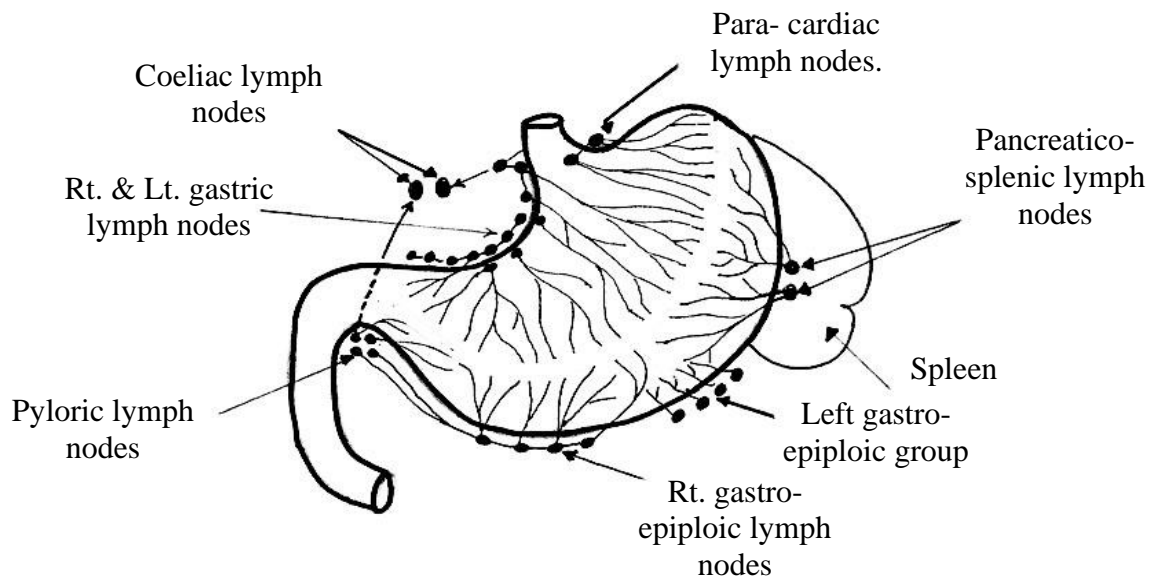
★ Lymphatic drainage:

- Afferent lymphatics **communicate** freely in the stomach wall.
- Lymphatics from the anterior and posterior surfaces of the stomach pass towards its curvatures where lymph nodes are located **along the arteries** supplying the stomach and **have the same names**.
- **The cardia** is drained by the **paracardiac** (Para-oesophageal) lymph nodes which lie around the cardia and lower end of the oesophagus.
- **Fundus** of the stomach is drained by **splenic lymph nodes** (which lie in the gastrosplenic ligament and hilum of the spleen) & **left gastroepiploic** .Efferent lymphatics from these lymph nodes pass to the **pancreatico- splenic lymph nodes** along the splenic artery and upper border of the pancreas.
- The remaining part of the **greater curvature** and adjoining part of the stomach are drained into the **left and right gastroepiploic lymph nodes**.
- The lesser curvature** and adjoining part of the stomach are drained by the **left and right gastric lymph nodes**.
- The pyloric region** is drained by **right gastric, right gastroepipoic, subpyloric, retropyloic and suprapyloic lymph nodes**.
- The previously groups, drain mainly into the **coeliac lymph nodes**. Some lymphatics may also pass to the **superior mesenteric lymph nodes**.

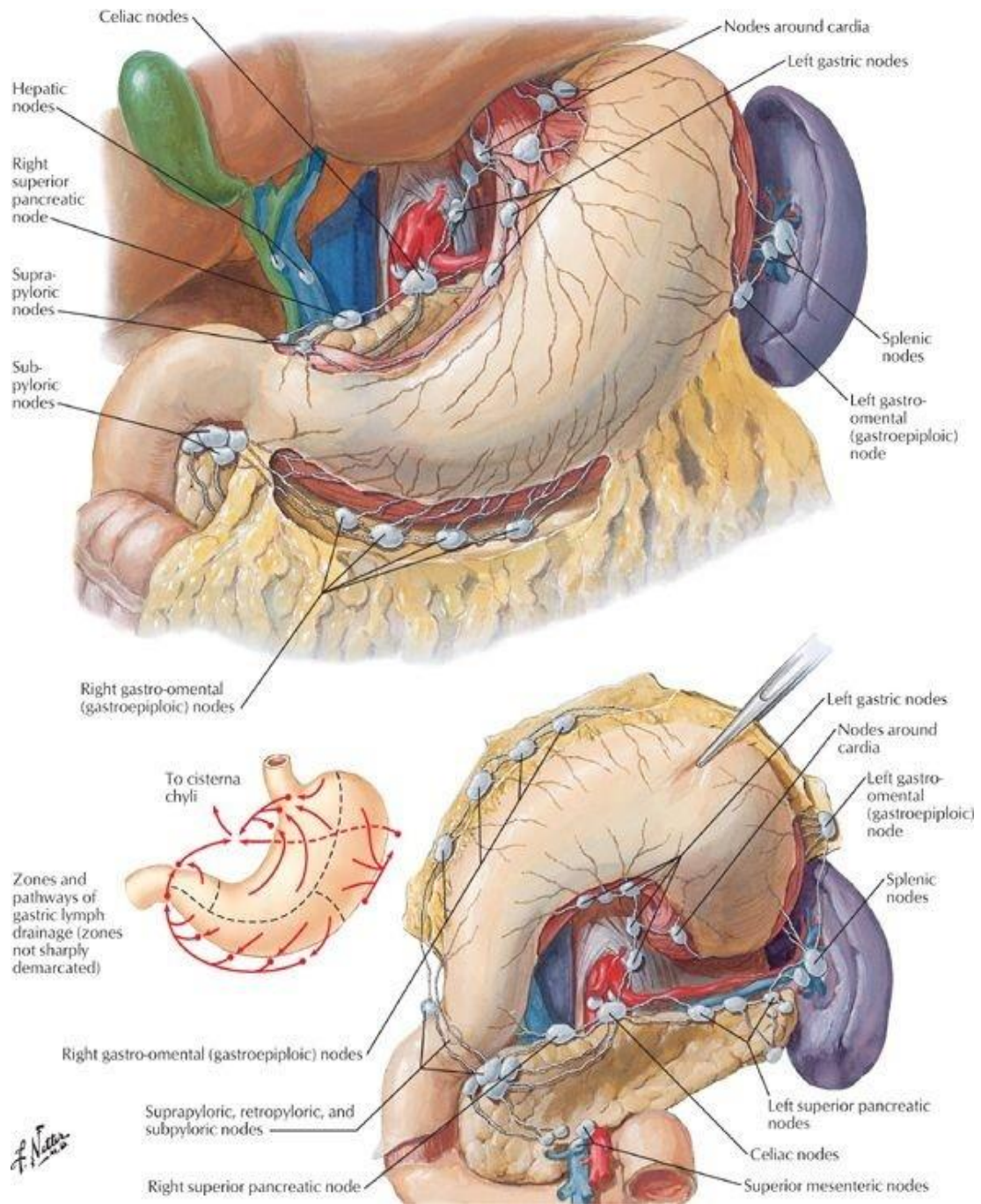
Stomach & Small Intestine



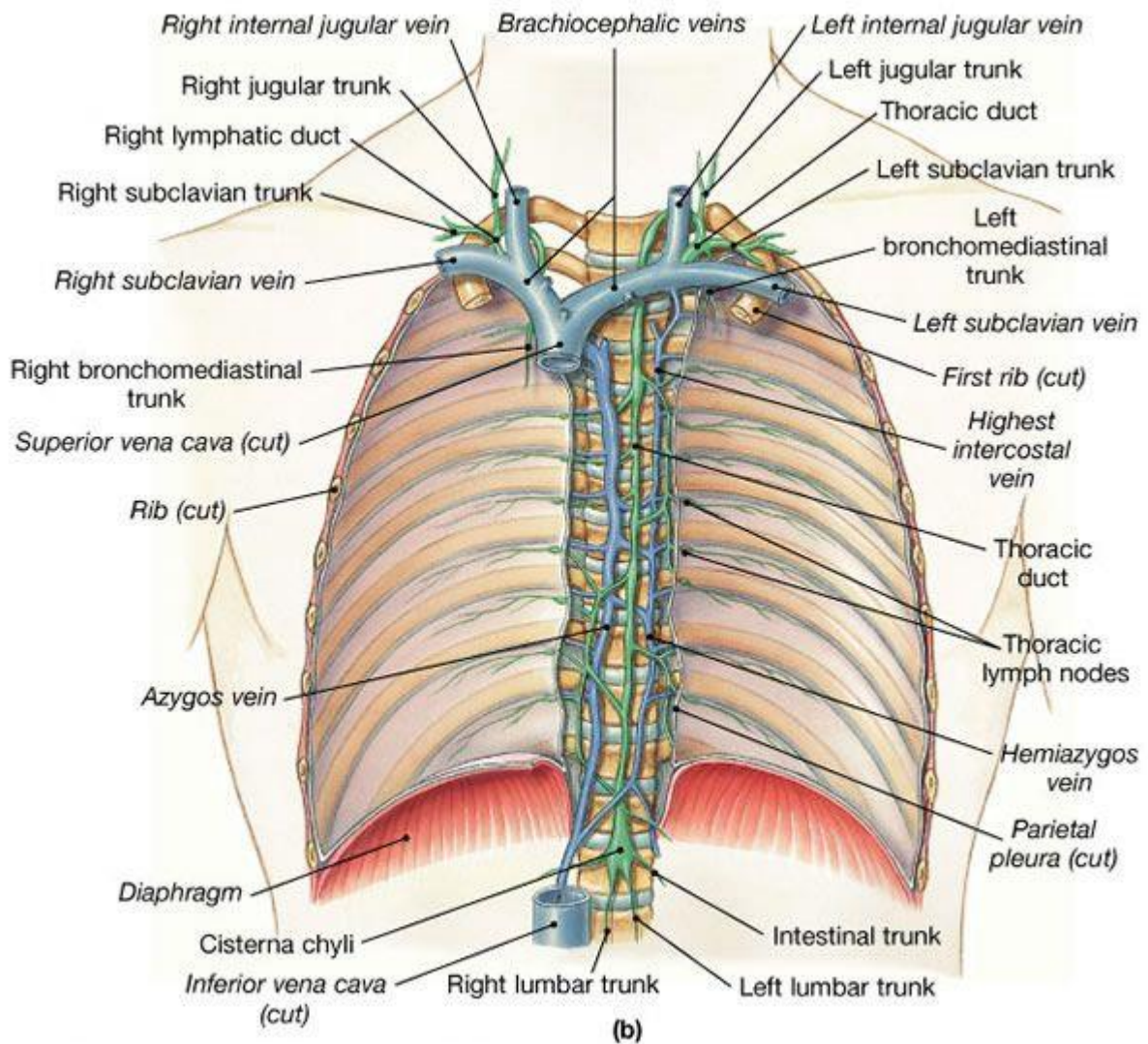
* Lymph Drainage of the Stomach *



Stomach & Small Intestine



Cysterna chyli & thoracic duct



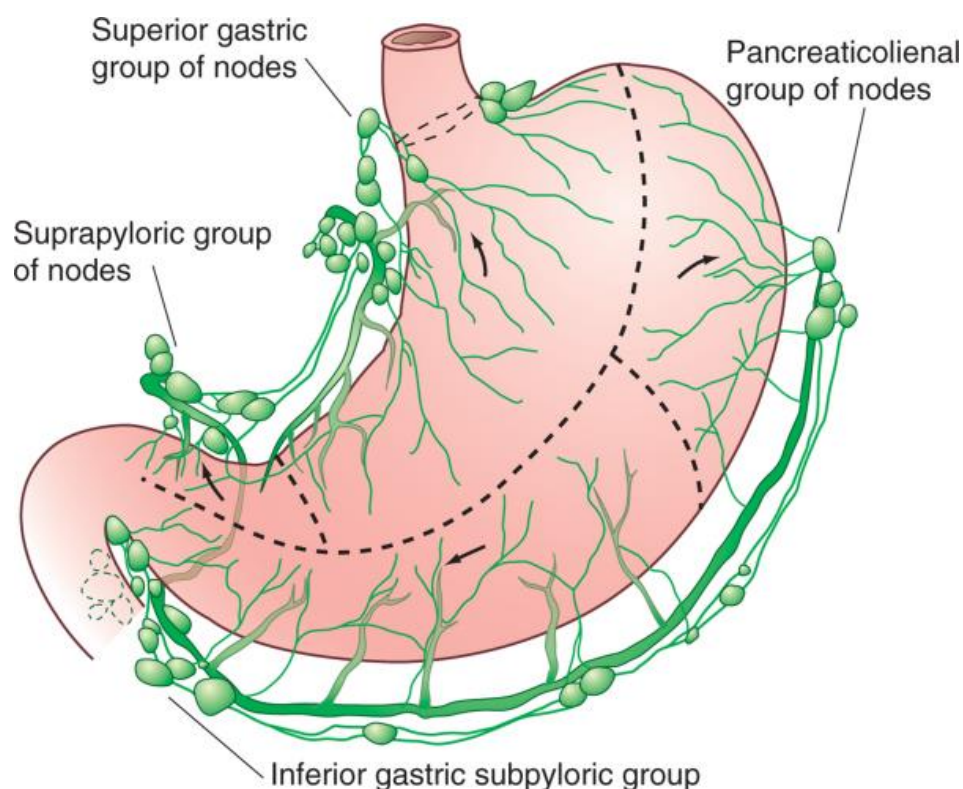
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• Applied anatomy:

- 1) From coeliac lymph nodes, malignant cells can spread to cysterna chyli → thoracic duct → retrograde lymphatic permeation may spread to left supraclavicular lymph nodes (**Virchow's glands**).

Stomach & Small Intestine

- 3) From coeliac lymph nodes, retrograde spread of malignant cells in the lymphatic around the hepatic artery leading to enlargement of **lymph nodes in the porta hepatis**.
- 4) Retrograde spread of malignant cells from lymph nodes in the porta hepatis may lead to liver metastases or spread in the lymphatics in the falciform ligament around the ligamentum teres → malignant nodule in the umbilicus called **sister Joseph nodule**.



★ Nerve supply:

- 1) **Parasympathetic supply:** Anterior & posterior vagi carry motor parasympathetic & secretory fibres to the stomach.
 - **Applied anatomy:** **Vagotomy** may be indicated in cases of peptic ulcer to diminish gastric acid secretion.

Stomach & Small Intestine

2) Sympathetic nerve supply:

- It is from the greater splanchnic nerves, then the coeliac ganglion.
- Postganglionic fibres reach the stomach along its arteries.

★ Peritoneal relations:

- ★ The stomach is **completely** covered by peritoneum except a small **bare area** found at the **posterior surface** of the fundus. It is related directly to the diaphragm.
- ★ The stomach is related anterior to **greater sac** and posterior to **lesser sac** .

❖ N.B:

- All folds of peritoneum are formed of 2 layers except greater omentum which is formed of 4 layers.
- All folds of peritoneum contain blood vessels , lymph vessels and nodes , autonomic nerves and extra-peritoneal fat.

- ★ **Peritoneal ligaments of the stomach:** These are folds of the peritoneum attaching the stomach to the surrounding organs:

1. **Lesser omentum: (Gastro- hepatic ligament):**

- **It extends** from the lesser curvature of the stomach, and upper border of the first inch of the duodenum to the hilum of the liver and the fissure for ligament venosum of the liver.
- Its **gastric attachment contains** the right and left gastric vessels (+ other structures in general).

Stomach & Small Intestine

- It has a right **free border containing portal vein** posteriorly , **CBD** anterior & to the right and **hepatic artery** anterior and to the left.

2. **Gastro-phrenic ligament:**

- **It extends** from the upper most part of the greater curvature & around the bare area to the diaphragm.

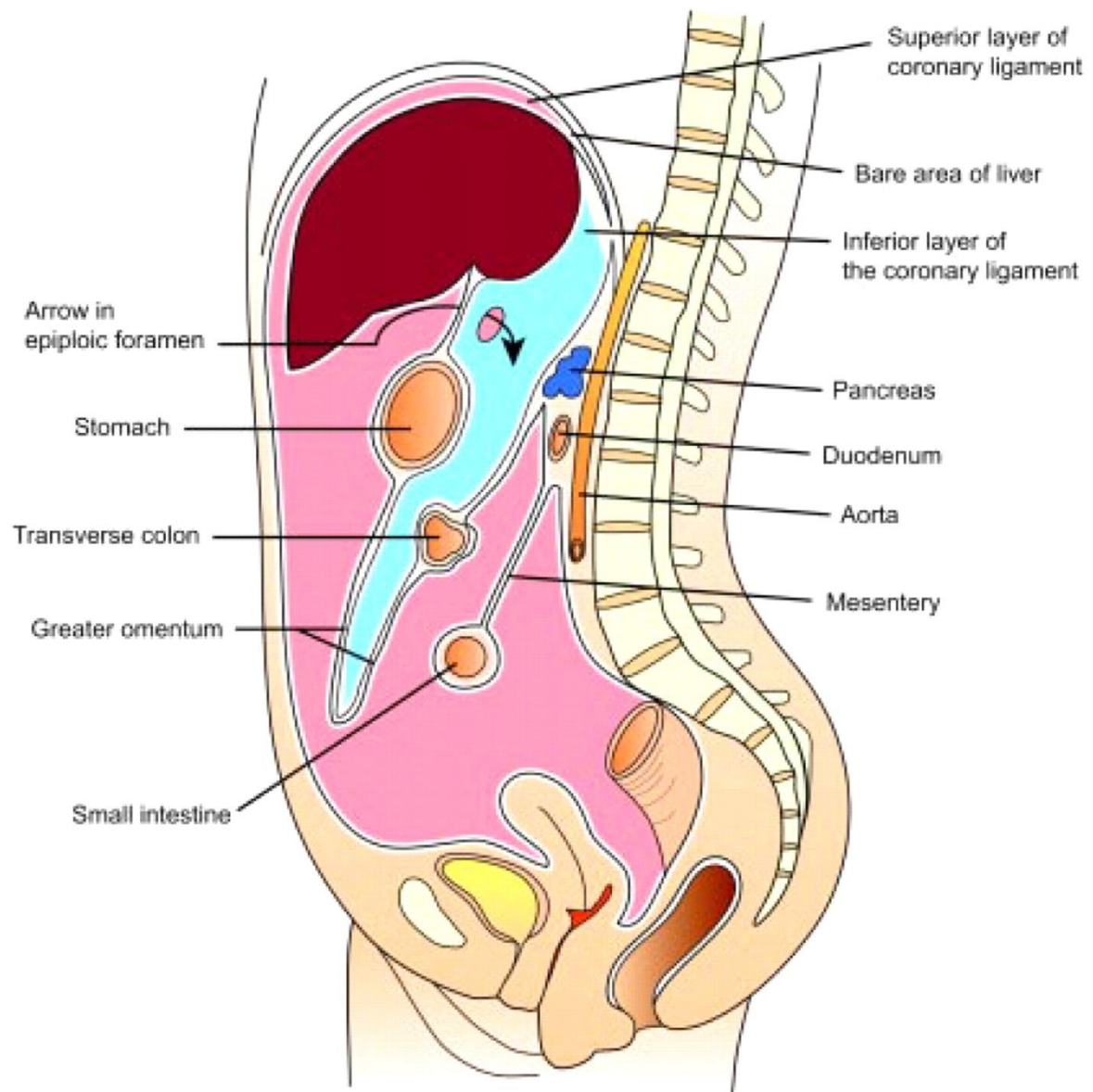
3. **Gastro-splenic ligament:**

- It **extends** from the upper left part of the greater curvature of the stomach to the hilum of the spleen.
- It **contains** short gastric vessels (+ other structures in general)

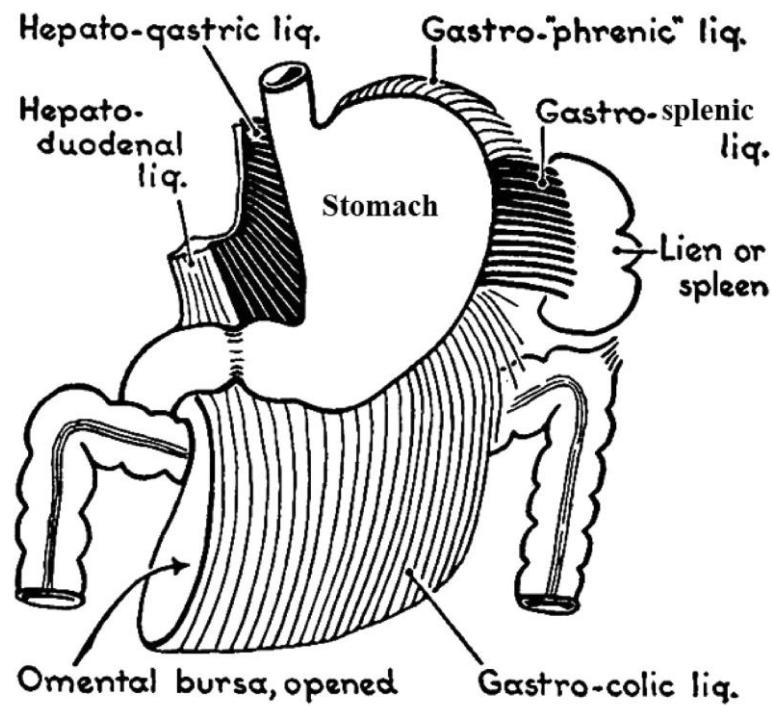
4. **Greater omentum: (gastrocolic ligament)**

- **It extends** from the lower 2/3 of the greater curvature of the stomach and the lower border of the first inch of the duodenum to the transverse colon.
- It has **anterior 2 layers** descend for variable distance in front of intestine , then **curves** upwards and backwards to **form posterior 2 layers.**
- The posterior 2 layers **enclose the transverse colon and continue** upwards to form the **transverse mesocolon.**
- The greater omentum **contains right and left gastro-epiploic vessels** ((+ other structures in general)).
- **Function:** It is the **policeman of the abdomen i.e** localize infections and prevent their spread and storage of fat.

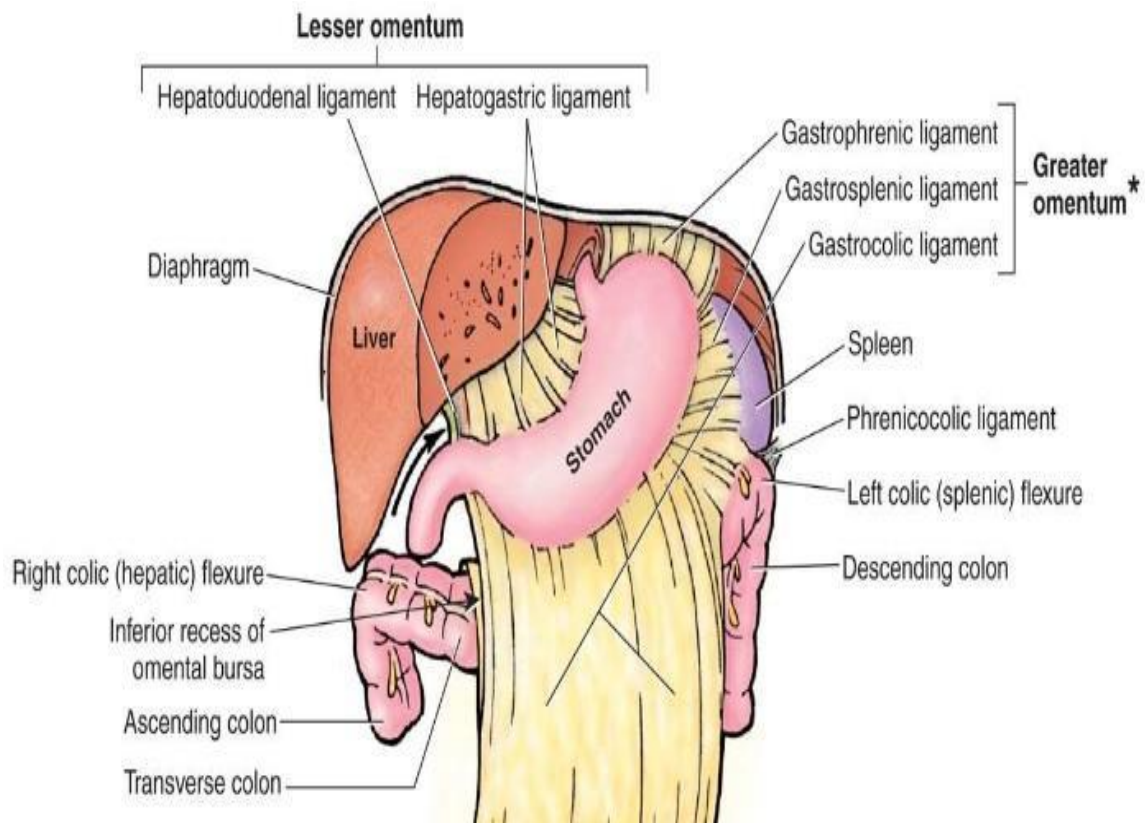
Stomach & Small Intestine



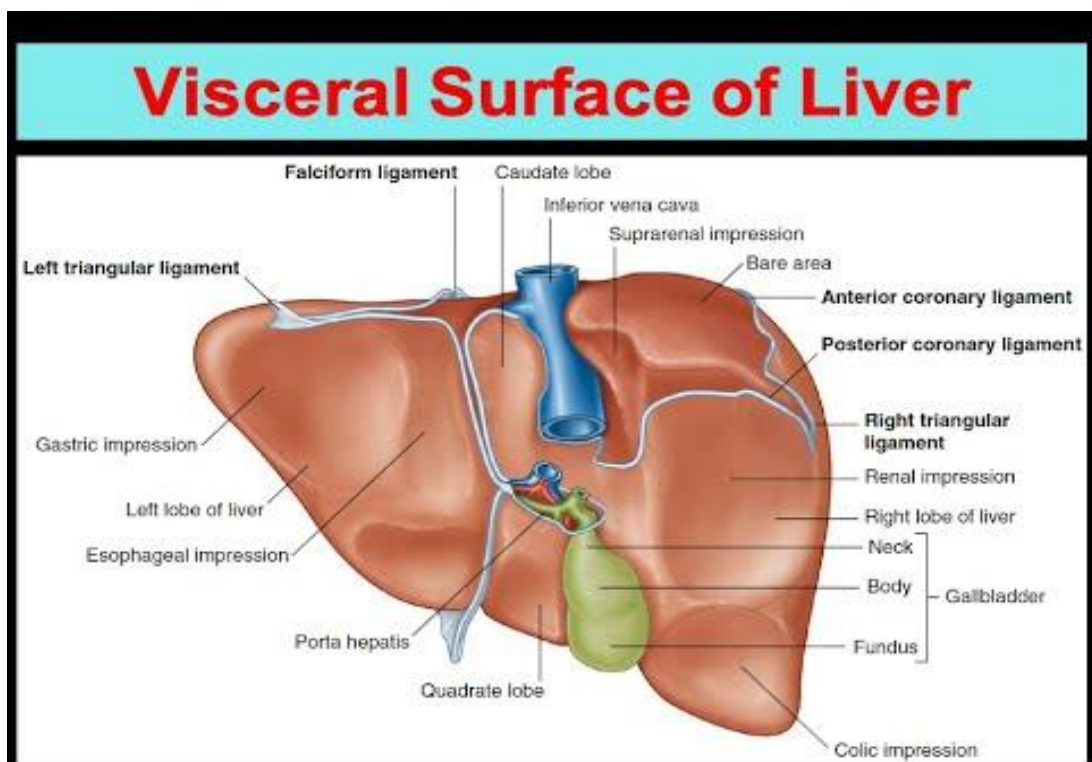
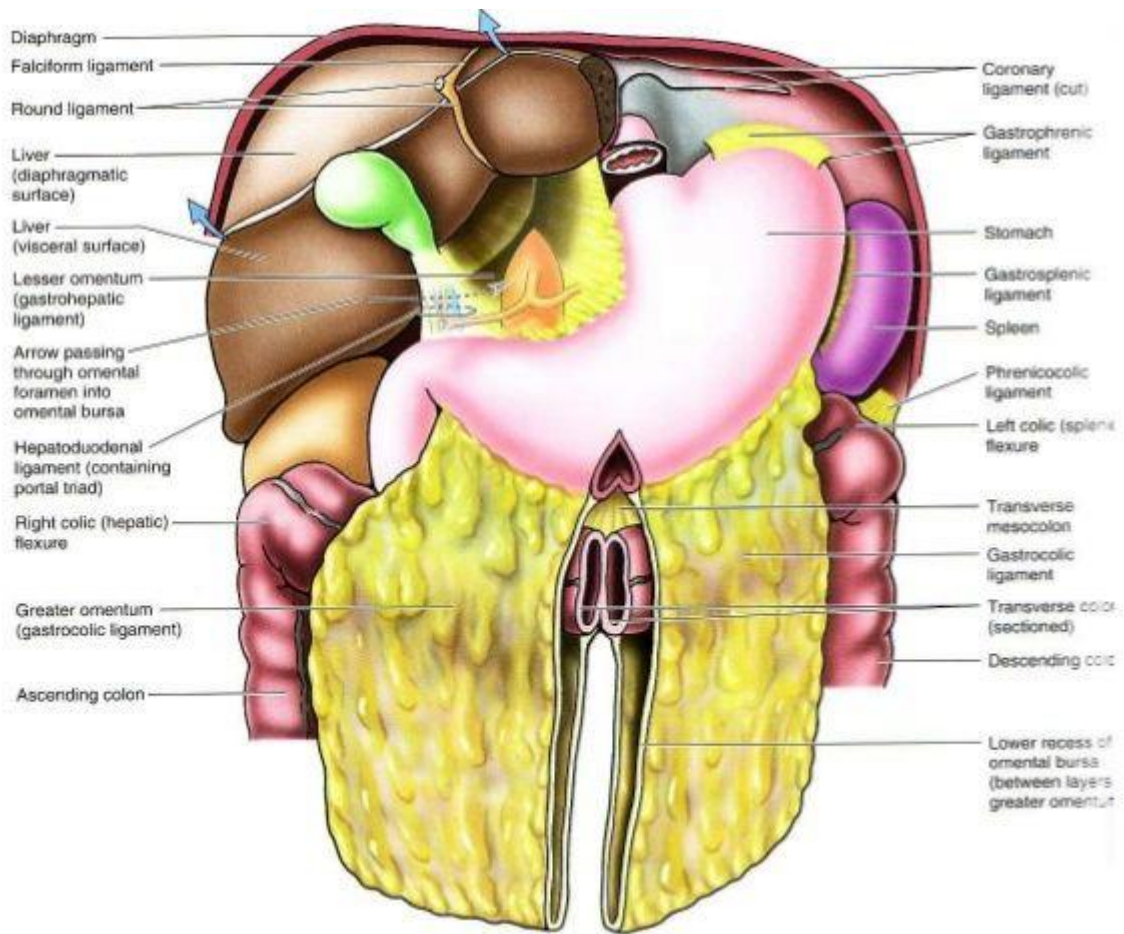
Stomach & Small Intestine



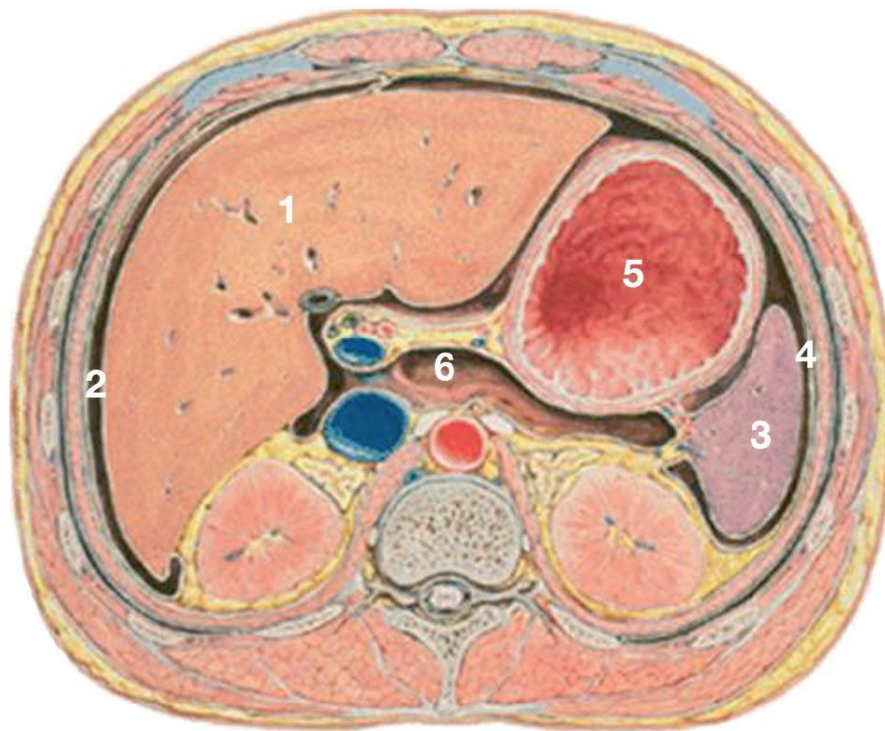
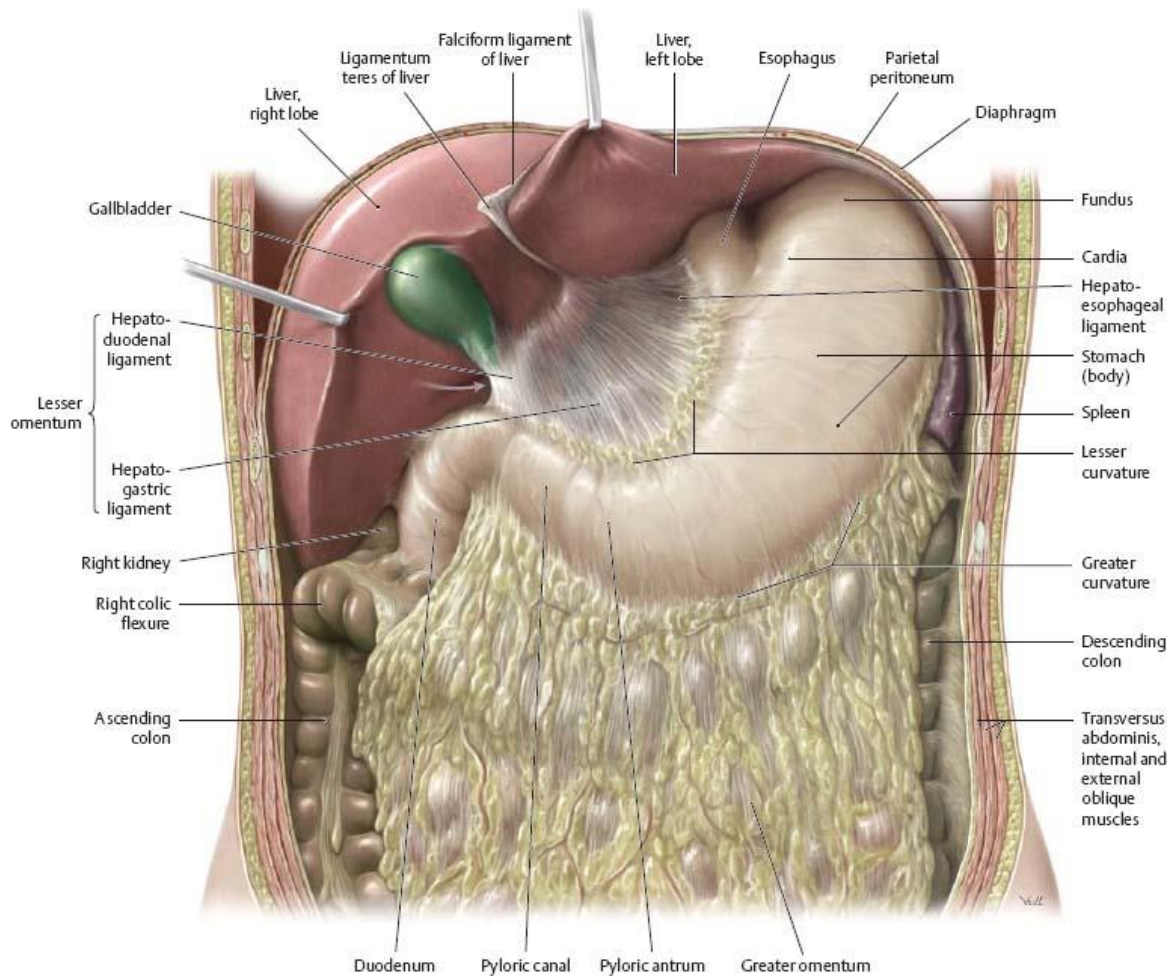
Peritoneal folds related to the stomach



Stomach & Small Intestine



Stomach & Small Intestine



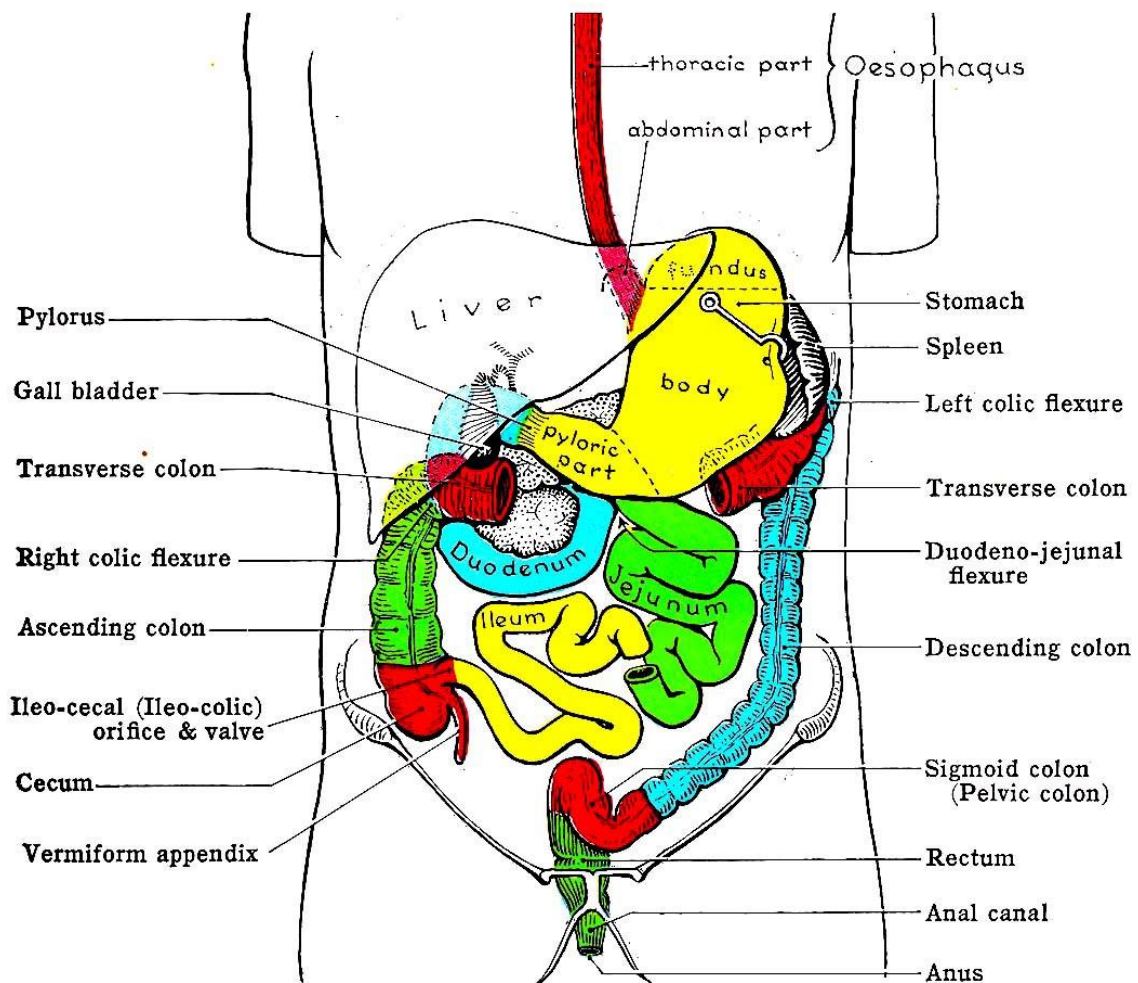
Transverse sections at the level of free border of lesser omentum

Small Intestine

★ The small intestine is divided into:

a) **Fixed part:** The duodenum .

b) **Mobile part:** It includes the jejunum & ileum.

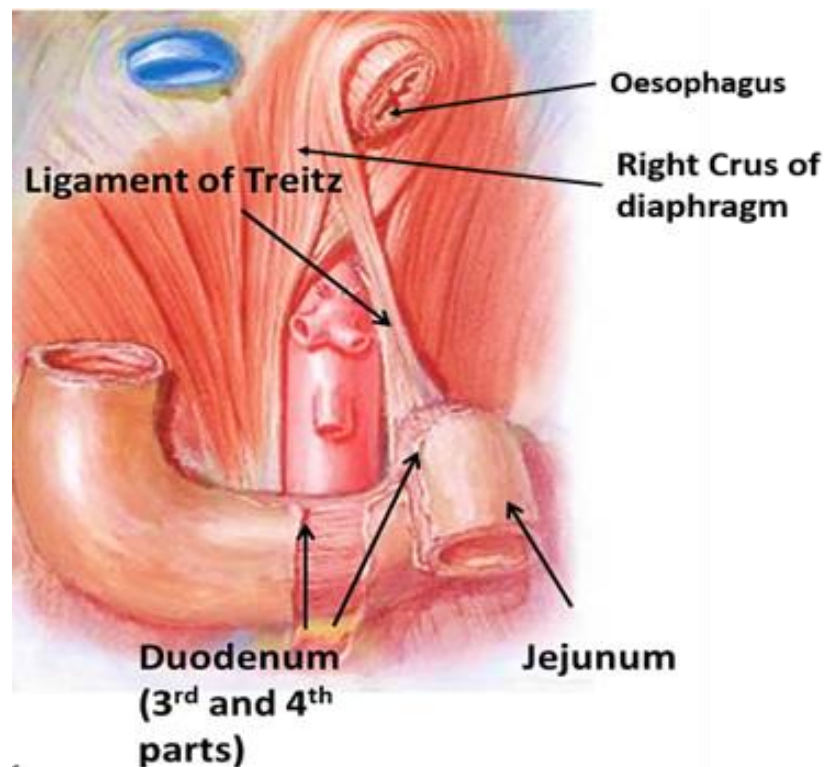


Gastrointestinal Tract

Duodenum

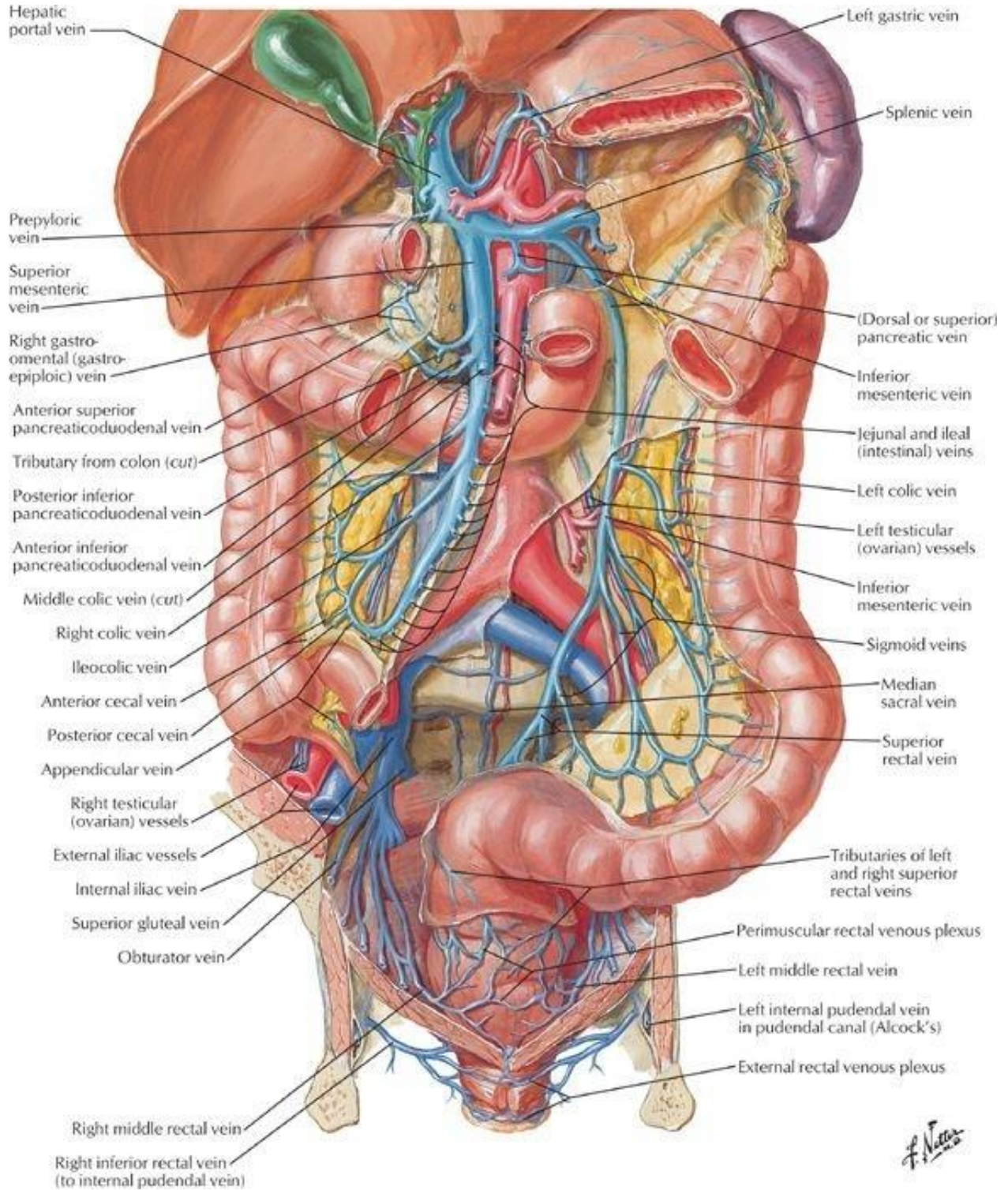
★ **Site:** (remember 1, 2, 3)

- It **begins** at the pyloro-duodenal junction at the level of transpyloric plane (L₁ vertebra), 1 inch to right side of midline.
- It **ends** at the level of L₂ vertebra 1 inch to left side of midline at the duodeno-jejunal flexure (marked by ligament of Treitz between this flexure & the right crus of diaphragm).
- Its **lowest part** lies at the level of L₃.

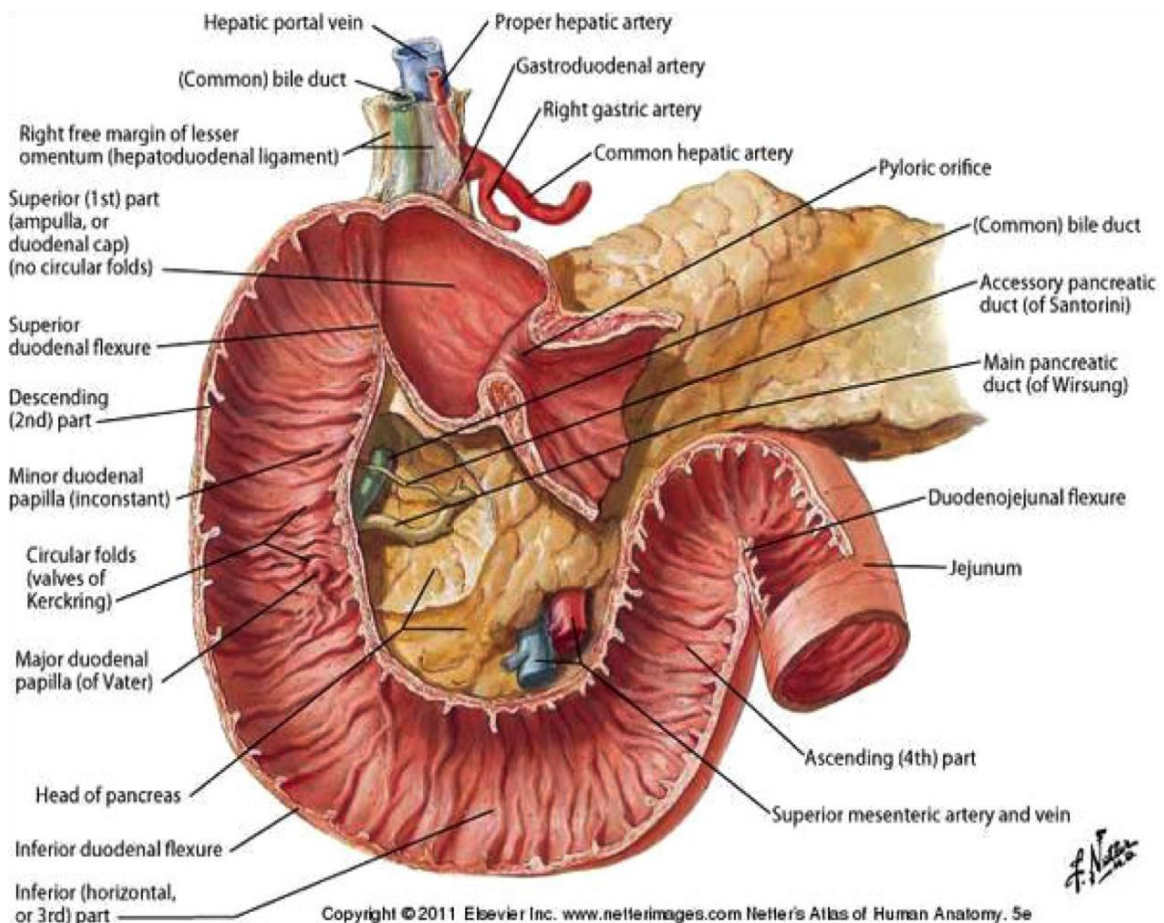


❖ **N.B:** The duodenum begins at the level of L₁ vertebra, ends at the level of L₂ vertebra and its lowest part (i.e 3rd part) lies at the level of L₃ vertebra.

Stomach & Small Intestine



Stomach & Small Intestine



★ **Size:** 10 inches long (like esophagus & ureter). It is the shortest, widest and most fixed part of small intestine

★ **Shape:** C shape with its concavity to the left, surrounding head of pancreas.

★ **Parts & relations:** (remember 1 , 2 , 3 , 4)

1. First (upper) part:

- It is 2 inches long
- It begins at pyloric sphincter and ends in relation to neck of GB.

• **Relations:**

a) 1st inch: (It similar to pyloric end of stomach i.e only movable part of duodenum and have same relations).

Stomach & Small Intestine

- **Anterior:** Quadrate lobe of liver.
- **Posterior:** Neck of pancreas
- **Superior:** lesser omentum & its free border.
- **Inferior.:** greater omentum.

❖ Remember the following structures are arranged from anterior to posterior:

- 1) Anterior abdominal wall.
- 2) Quadrate lobe of liver.
- 3) Pyloroduodenal junction and 1st inch of duodenum.
- 4) Neck of pancreas.
- 5) Union of splenic and superior mesenteric veins to form portal vein.
- 6) Inferior vena cava.

b) 2nd inch:

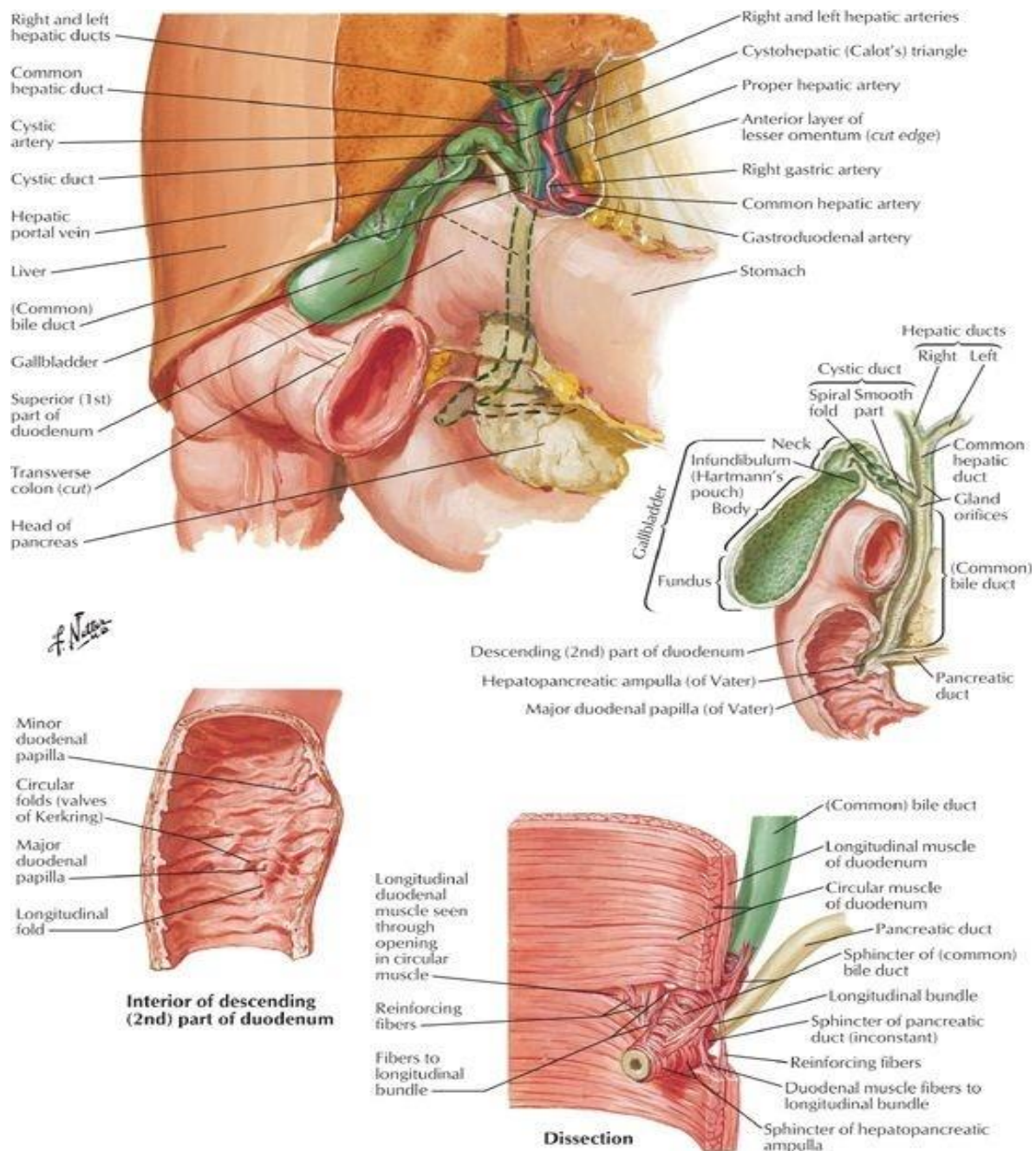
- **Anterior:** Quadrate lobe of liver & neck of G.B. (at the junction of 1st & 2nd part of duodenum).
- **Posterior:** retroduodenal part of C.B.D., gastroduodenal artery, portal vein & I.V.C.
- **Superior:** Opening to lesser sac (foramen of Winslow).
- **Inferior:** Head of pancreas.

❖ **Remember** the following structures are arranged from anterior to posterior:

- 1) Anterior abdominal wall.
- 2) Liver.

Stomach & Small Intestine

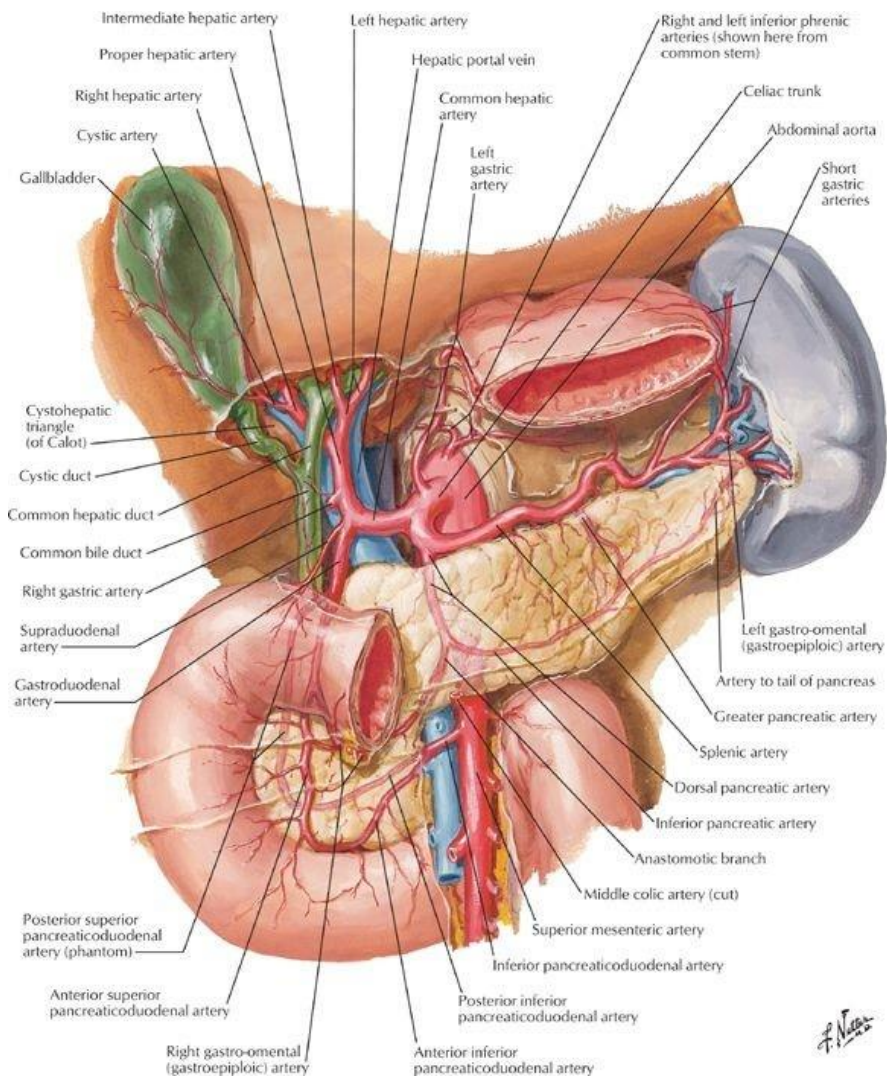
- 3) Neck of gall bladder.
- 4) 2nd inch of 1st. part of duodenum.
- 5) Gastroduodenal artery to the left and common bile duct on its right side.
- 6) Portal vein.
- 7) Inferior vena cava.



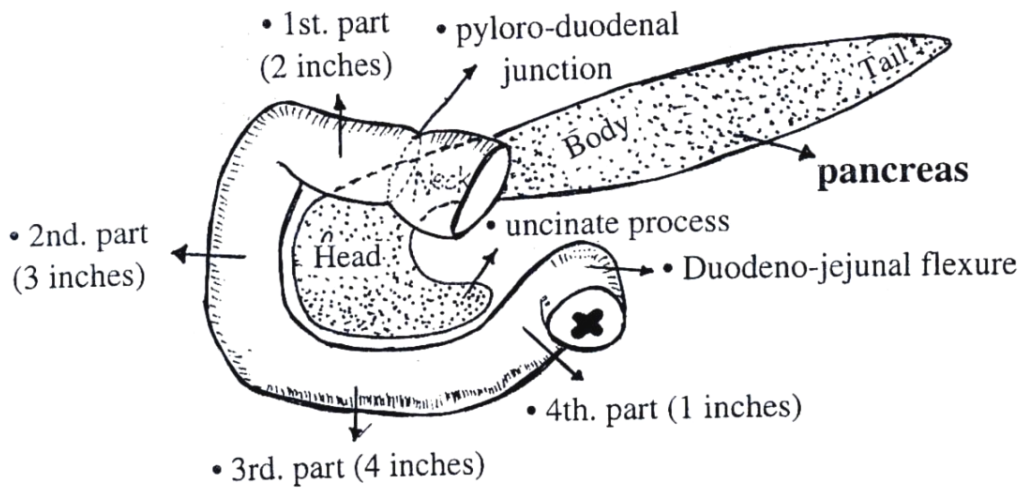
Stomach & Small Intestine

2. Second (descending) part:

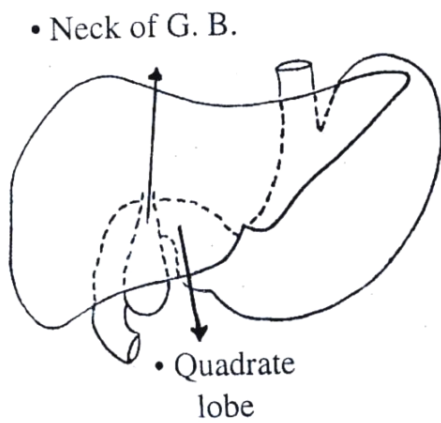
- It is 3 inches long.
- It extends vertically downwards from the neck of GB to end at the level of **L₃** vertebra.
- **Relations:**
 - **Anterior:** liver, transverse colon, coils of jejunum.
 - **Posterior:** Front of right kidney & its hilum.
 - **Medial:** Head of pancreas, pancreatico-duodenal vessels and ampulla of Vater open in the postero-medial aspect of the middle of 2nd part of duodenum.
 - **Lateral:** right lobe of liver & right colic flexure.



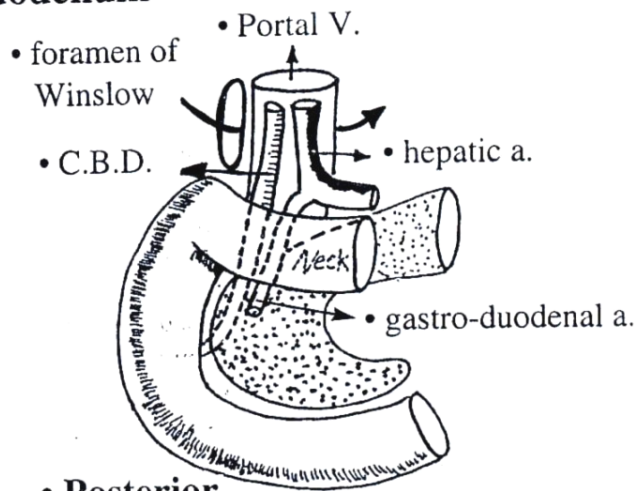
Stomach & Small Intestine



* Parts Of Duodenum *

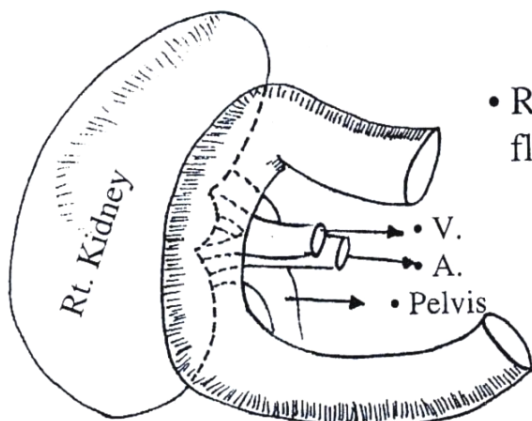


• Anterior

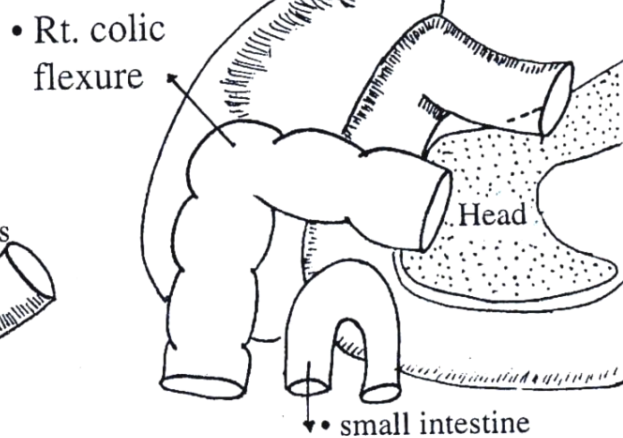


• Posterior

* Relations of 1st. Part *



• Posterior



• Anterior

* Relations of 2nd. Part *

Stomach & Small Intestine

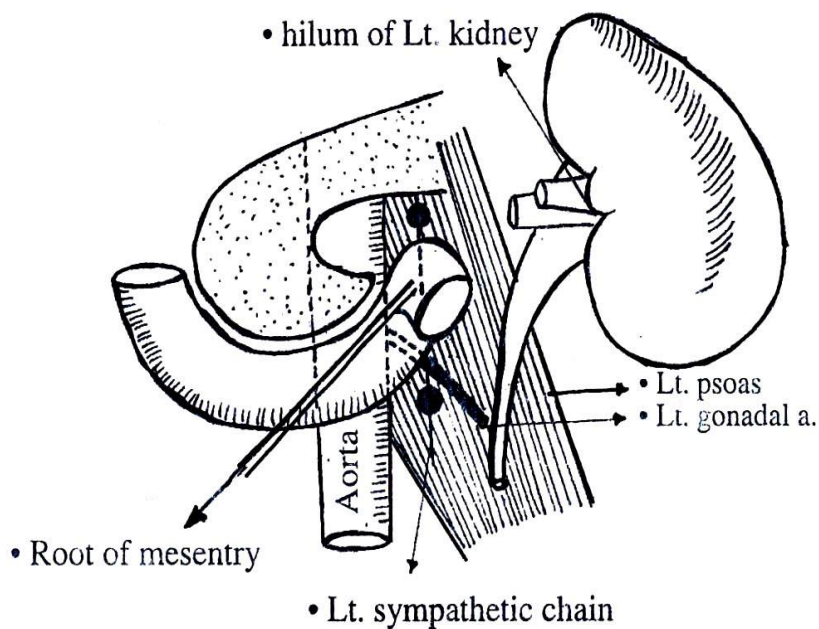
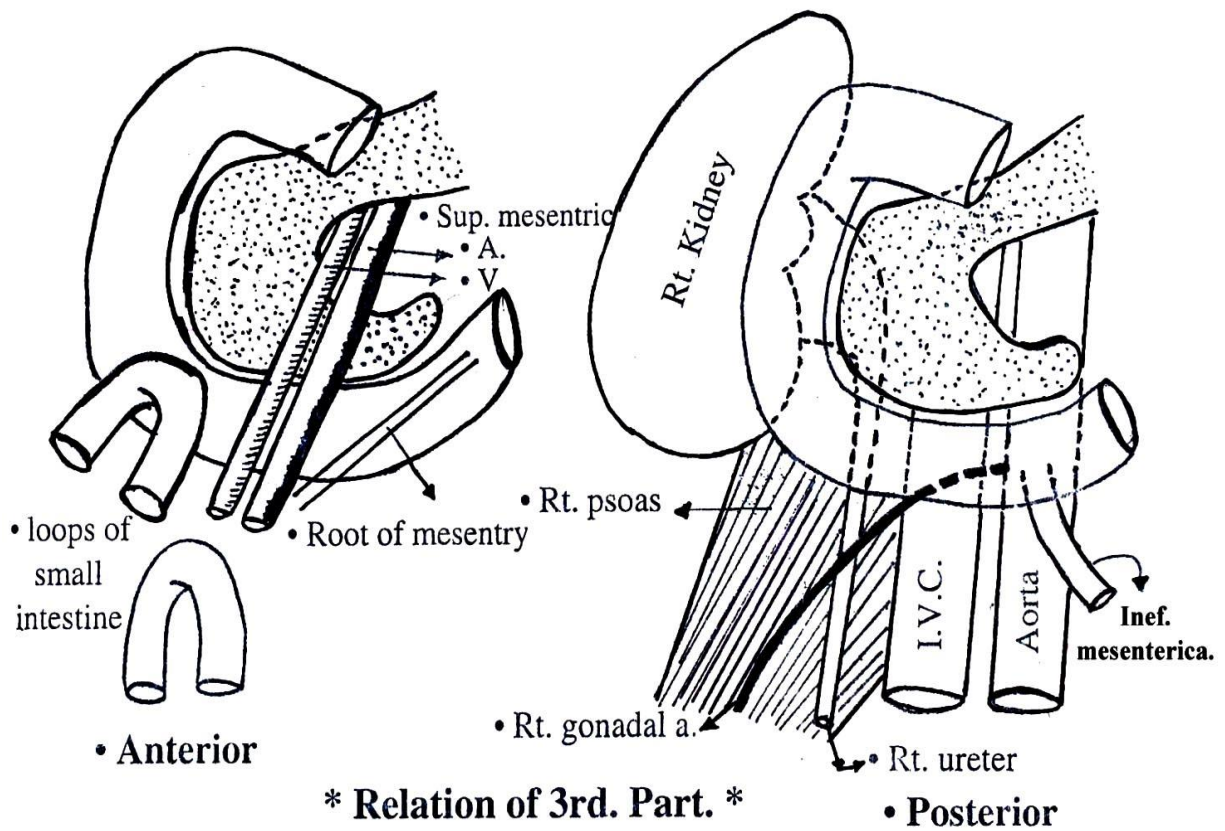
3. Third (horizontal) part:

- It is **4 inches** long and lies horizontal at the level of **L3** vertebra.
- **Relations:**
 - **Anterior:** small intestine, root of mesentery & sup. mesenteric vessels.
 - **Posterior:** Rt. ureter, Rt. Psoas major, I.V.C., Rt. gonadal vessels, aorta & origin of inf. mesenteric artery (3 separated from 3rd part by 3)
 - **Superior:** Head of pancreas
 - **Inferior:** Small intestine.

4. Fourth (ascending) Part:

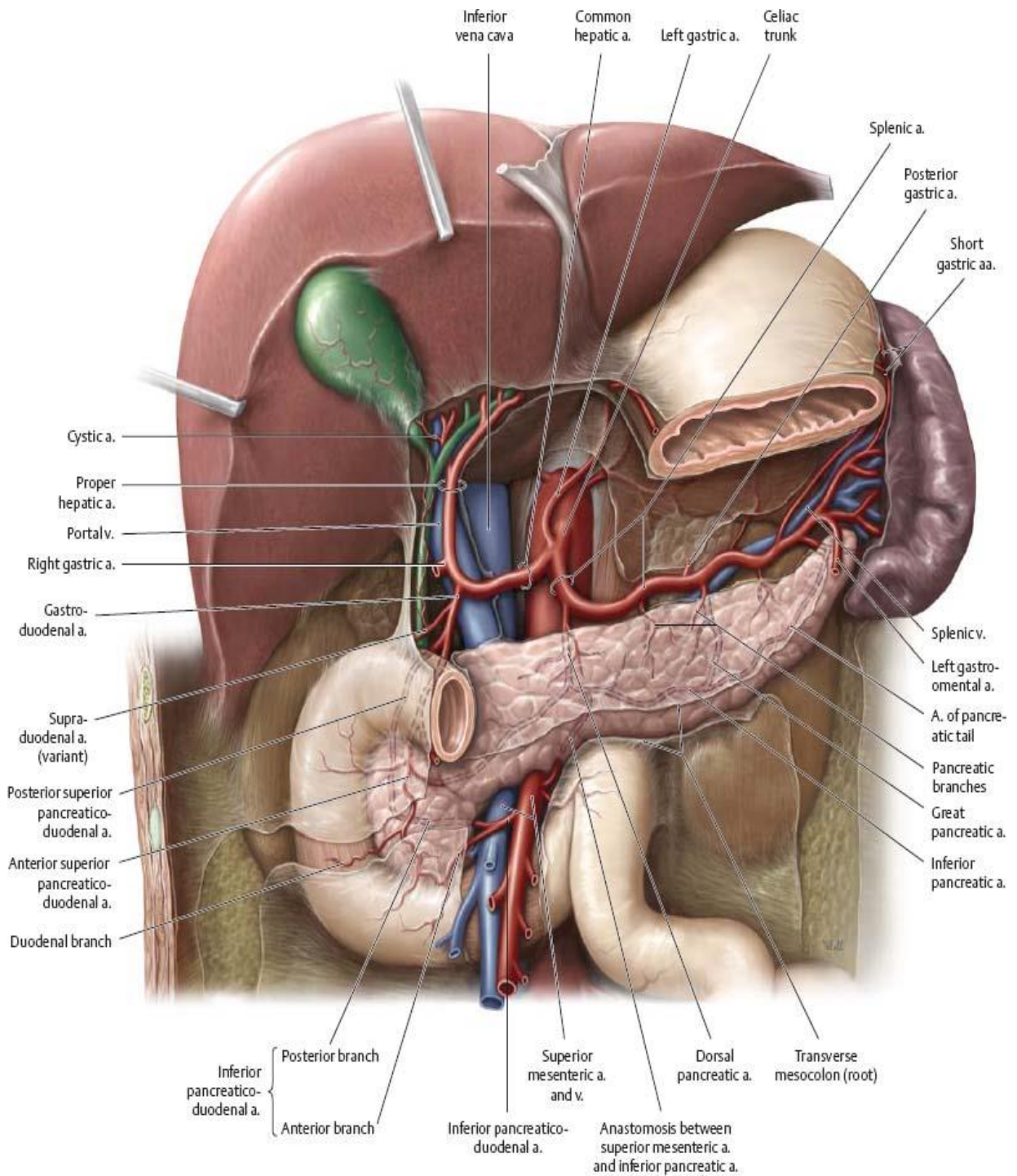
- It is 1 inch long , extends vertically upwards from the left end of the 3rd part to the **duodeno-jejunal flexure**.
- **Relations :**
 - **Anterior:** Duodeno-jejunal flexure, coils of jejunum & root of mesentery.
 - **Posterior:** left proas major & left sympathetic chain.
 - **Medial:** aorta & uncinat process of head of pancreas.
 - **Lateral:** hilum of left kidney.
- ★ **Duodenal papillae:** The common bile duct & main pancreatic duct unit to form **ampula of Vater** which open into the middle of the postero-medial aspect of the 2nd part of duodenum in the **major duodenal papilla** which is surrounded by **sphincter of Oddi**. The accessory pancreatic duct opens one centimeter to one inch above the main duct in the **minor duodenal papilla**.

Stomach & Small Intestine



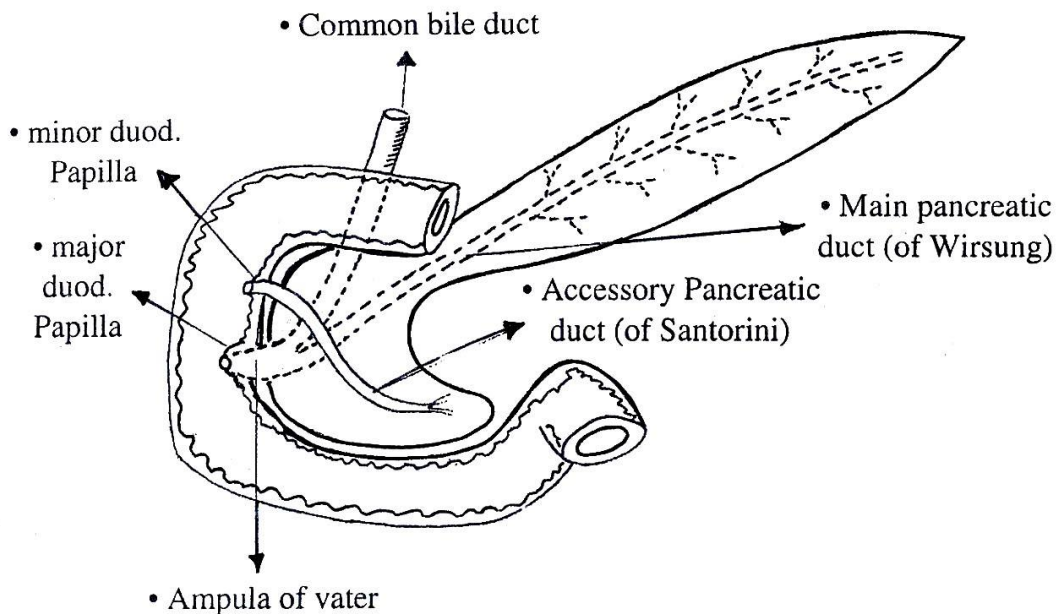
*** Relations of 4th. Part. ***

Stomach & Small Intestine

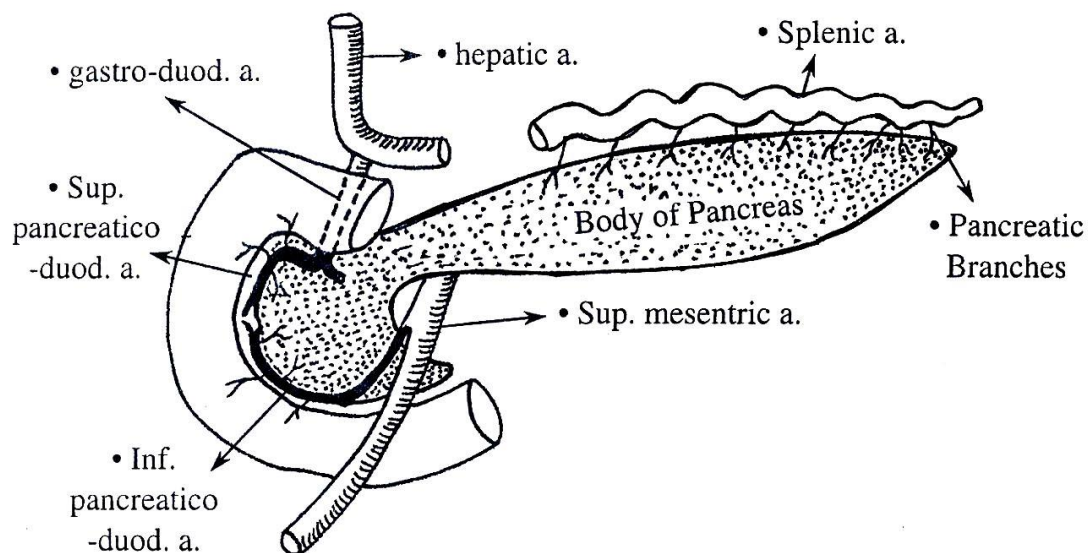


Stomach & Small Intestine

★ **Arterial supply:** the superior **pancreatico-duodenal** (from gastro-duoduodenal a.), inferior pancreatico-duodenal (from superior mesenteric a.) & **supraduoderal** (from hepatic).



* Opening Of Common Bile Duct And Pancreatic Ducts



* Arterial Supply Of Duodenum And Pancreas.

Stomach & Small Intestine

★ Relation to peritoneum :

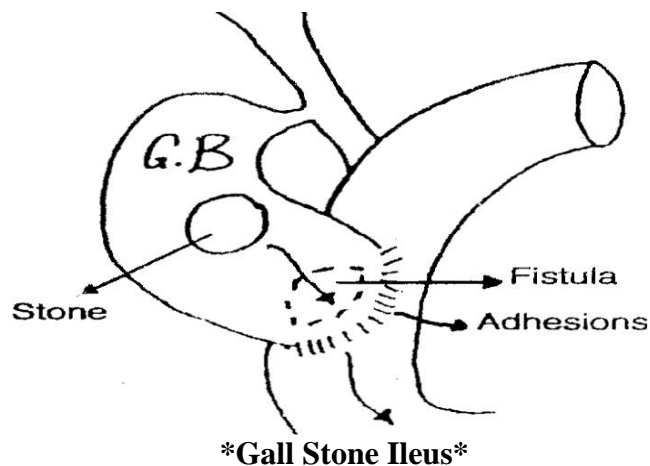
- The duodenum is a retroperitoneal fixed structure covered anteriorly only with peritoneum except the followings :
 - Its **1st. inch** is completely covered by peritoneum (mobile and its upper border gives attachment to lesser omentum & its lower border gives attachment to greater omentum)
 - The **middle of its 2nd part** is not covered with peritoneum due to passage of transverse colon between the duodenum and peritoneum.
 - **Middle of its 3rd part** is not covered with peritoneum due to passage of superior mesenteric vessels between the duodenum and peritoneum.

★ Applied anatomy:

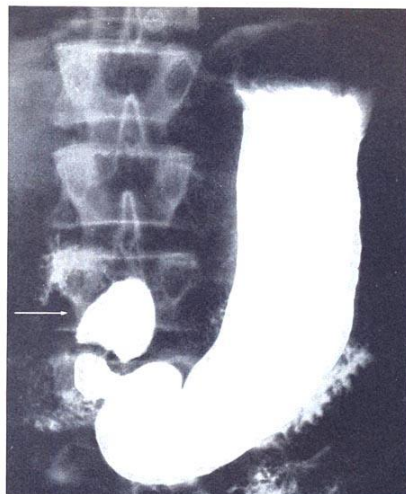
- 1) **The end** of the duodenum (i.e duodeno- jejunal junction) is marked at operation by the **ligament of Treitz** (between the junction and right crus of diaphragm).
- 2) The 1st. inch of the 1st. part of the duodenum (receiving gastric acidity) is the commonest site for **peptic ulcer**.
- 3) Duodenal ulcer usually occur in the **posterior wall of the first inch** of the duodenum which is the first part that receive gastric acidity.
- 4) **Bleeding** usually complicates **posterior** duodenal ulcer due to close relation to gastroduodenal artery.
- 5) **Perforation** usually complicates **anterior** duodenal ulcer because the anterior duodenal wall of 1st part is related to the greater sac and unsupported.
- 6) Anterior duodenal ulcer may **erodes** the liver while posterior duodenal ulcer may erodes the pancreas.
- 7) In chronic cholecystitis, adhesions usually occur between the gall bladder and the duodenum.

Stomach & Small Intestine

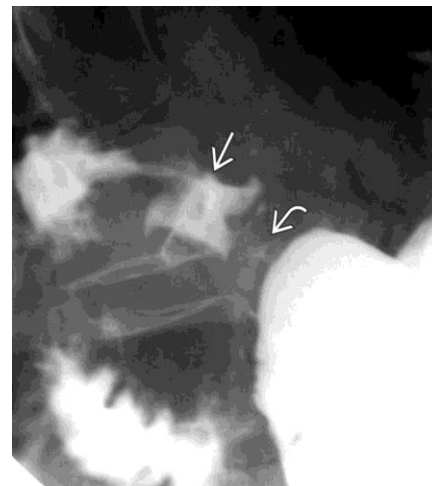
- 8) In acute cholecystitis, gangrene and perforation of gall bladder into the duodenum may occur leading to **fistula** between them with **passage of stones** from the gall bladder to the duodenum.



- 9) Radiological visualization of the duodenum by **barium meal**. It is not done nowadays as it is replaced by **gastro-duodenoscopy**
- 10) In barium meal, the 1st part of the duodenum appears triangular in shape and called **duodenal cap**. Persistent deformity of this cap suggest duodenal ulcer.



Radiograph of a normal stomach after a barium meal. showing normal duodenal cap (arrow)

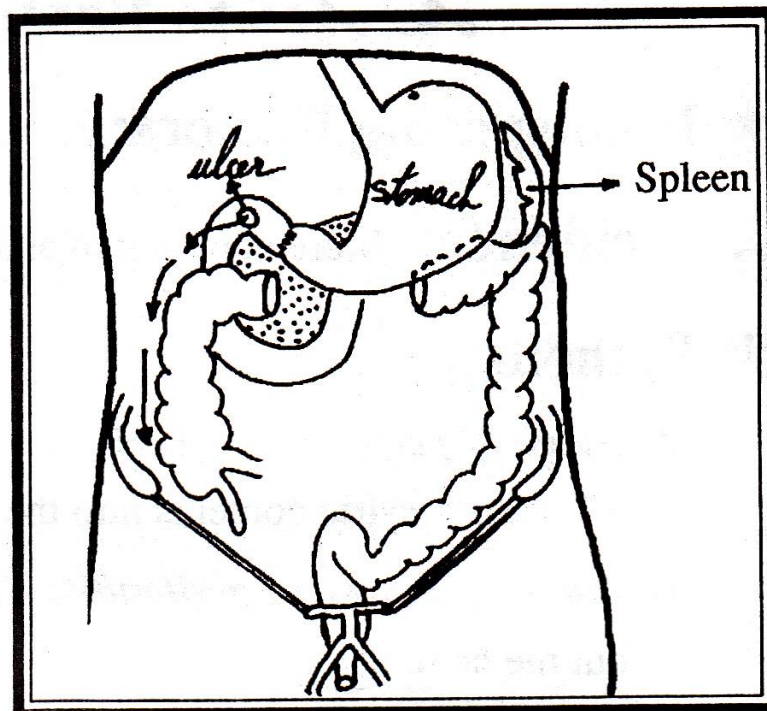


Deformed duodenal cap

- 11) **Gastroduodenoscopy** is the main investigation for any duodenal disease.

Stomach & Small Intestine

- 12) Due to close relation between 2nd. part of duodenum and right kidney, **nephroptosis** leading to severe traction on the duodenum with severe gastrointestinal disturbance or even obstructive jaundice.
- 13) In **perforated** duodenal ulcer, the leaking fluid passes to the right lateral paracolic gutter then to the right iliac fossa leading to clinical manifestations simulating **acute appendicitis**.



- 14) The duodenum and head of pancreas have the same blood supply and considered as **one surgical segment**.

Stomach & Small Intestine

Mobile part of small intestine

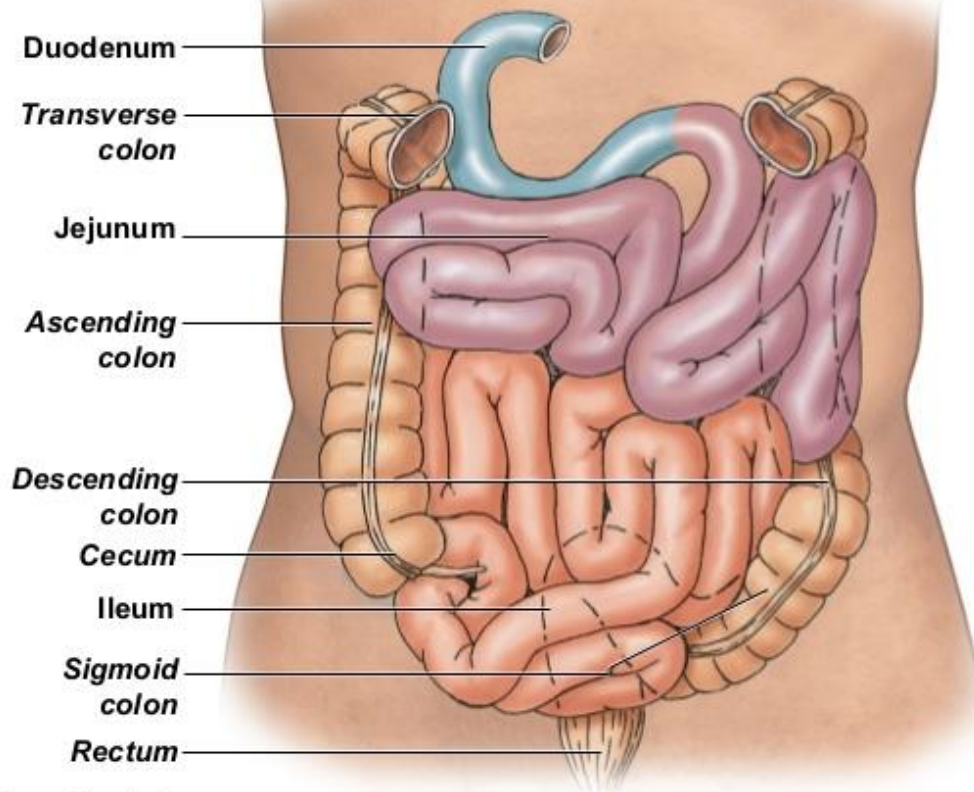
- ★ **Parts:** It is formed of the **jejunum** and the **ileum**.
- ★ **Beginning and end:** It starts at the duodeno-jejunal flexure and ends at the ileo-caecal junction.
- ★ **Length:** It is 6 meters (20 feet) in length.
- ★ It is arranged in a series of loops which are completely covered by peritoneum and found in the free border of the mesentery of small intestine.

★ Comparison Between the Jejunum and Ileum:

Jejunum	Ileum
<ul style="list-style-type: none"> • Proximal 2/5. 	<ul style="list-style-type: none"> • Distal 3/5 .
<ul style="list-style-type: none"> • It lies above the umbilicus. 	<ul style="list-style-type: none"> • It lies below the umbilicus.
<ul style="list-style-type: none"> • More mobile , usually empty with more active in digestion & absorption 	<ul style="list-style-type: none"> • Less mobile, usually contains the food with less digestion & absorption
<ul style="list-style-type: none"> • Wide lumen, thick wall, thick mucosa, thick musculosa . 	<ul style="list-style-type: none"> • Narrow lumen, thin wall, thin mucosa, thin musculosa
<ul style="list-style-type: none"> • Numerous mucosal folds. 	<ul style="list-style-type: none"> • Few mucosal folds.
<ul style="list-style-type: none"> • More vascularity & more red. 	<ul style="list-style-type: none"> • Less vascularity & pale red.
<ul style="list-style-type: none"> • No Payer's patches. 	<ul style="list-style-type: none"> • Many Payer's patches in the mucosa, along antimesentric border.
<ul style="list-style-type: none"> • At operation, it's felt as double layer. 	<ul style="list-style-type: none"> • At operation, it's felt as one layer.
<ul style="list-style-type: none"> • Small amount of fat in the mesentery. 	<ul style="list-style-type: none"> • Large amount of fat in the mesentery.
<ul style="list-style-type: none"> • The jejunal arteries form simple arterial arcades in the mesentery of jejunum. (1-2 arcades). 	<ul style="list-style-type: none"> • The ileal arteries form complicated arterial arcades in the mesentery of the ileum. (3-4 arterial arcades).
<ul style="list-style-type: none"> • Vessels appear clear in the mesentery with windows. 	<ul style="list-style-type: none"> • Vessels are not clear in the mesentery with no windows.

Stomach & Small Intestine

Figure 25.14 Regions of the Small Intestine



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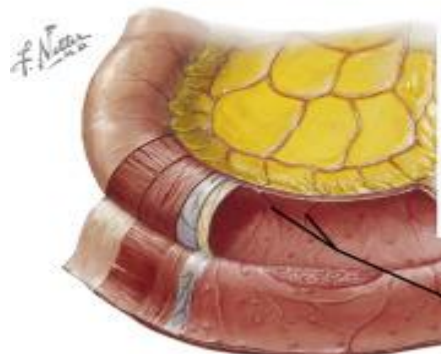
Jejunum

Barium radiograph of jejunum



Circular folds (valves of Kerckring)

Ileum



Barium radiograph of ileum

Circular folds

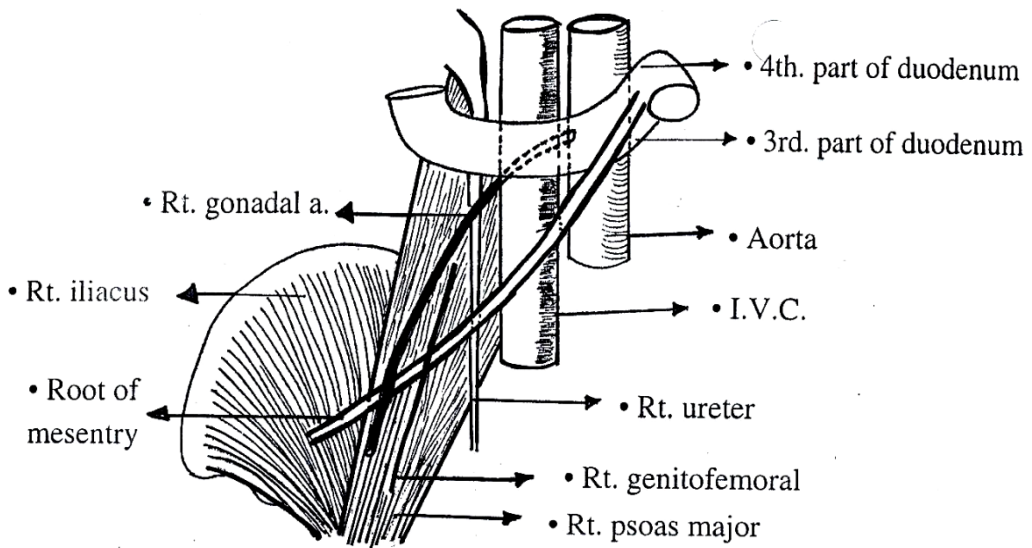
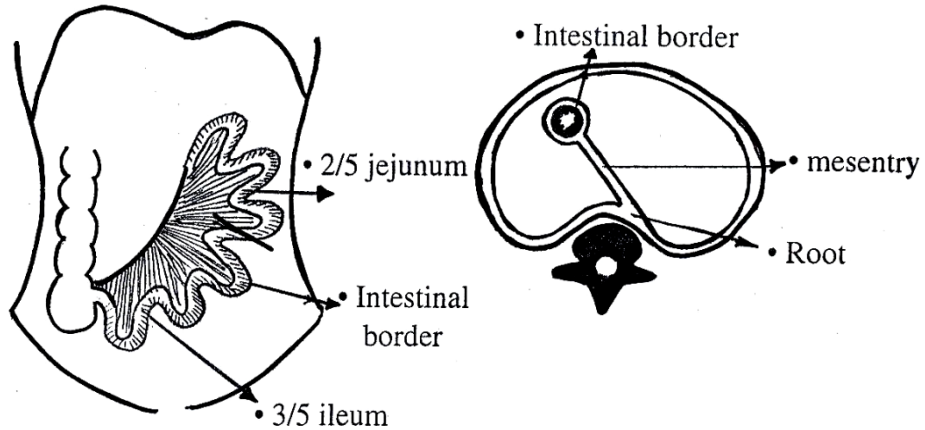
Stomach & Small Intestine

★ Mesentery of small intestine:

- It is fan shaped, peritoneal **fold formed of 2 layers** .
- It has a **free (intestinal) border** which is 6 meter long and a **root (attached border)** which is 6 inches long.
- The **width** of the mesentery in its center is 6 inches and decrease gradually towards its ends.
- **The root of mesentery passes obliquely** downwards and to the right from the duodeno-jejunal flexure to the ileo-caecal junction , **crossing** 4th. & 3rd part of duodenum, aorta, I.V.C., right psoas major, right ureter, right genitofemoral nerve and right gonadal vessels.
- **Contents of the mesentery:**
 - 1) Loops of **small intestine** in the free border of the mesentery.
 - 2) **Superior mesenteric** vessels run in the root of the mesentery and their **ileal and jejunal branches** run in between the 2 layers of the mesentery.
 - 3) Sympathetic and parasympathetic **plexuses**.
 - 4) **Extra-peritoneal** connective tissue and fat which are dense in the lower part of the mesentery.
 - 5) **Lymph vessels:** are called lacteals because they carry lymph which is milky in appearance and called chyle.
 - 6) **Mesenteric lymph nodes:**100-150 lymph nodes arranged in 3 rows:
 - **Small-sized nodes:** near the intestine in the free borders.

Stomach & Small Intestine

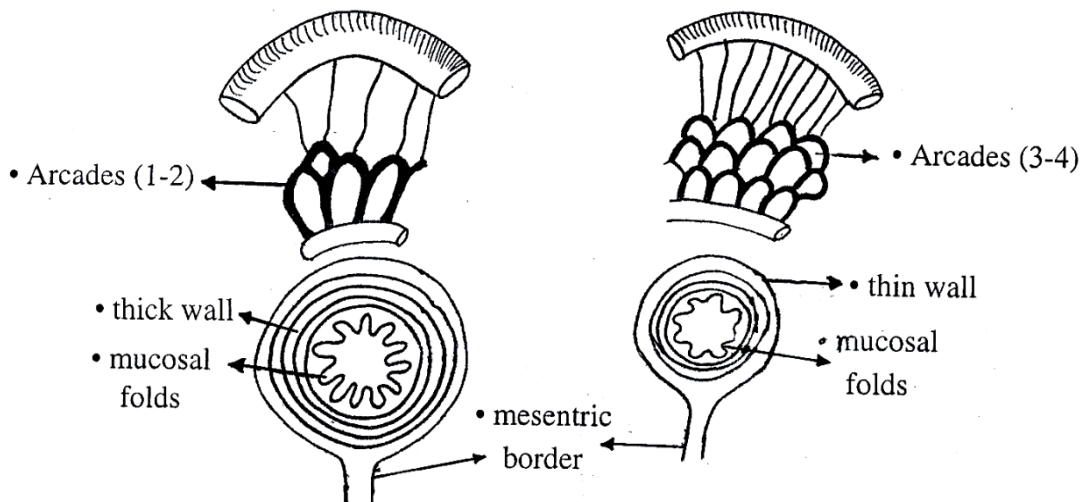
- **Medium-sized nodes:** midway between the free and attached borders.
- **Large-sized nodes:** along the superior mesenteric vessels.



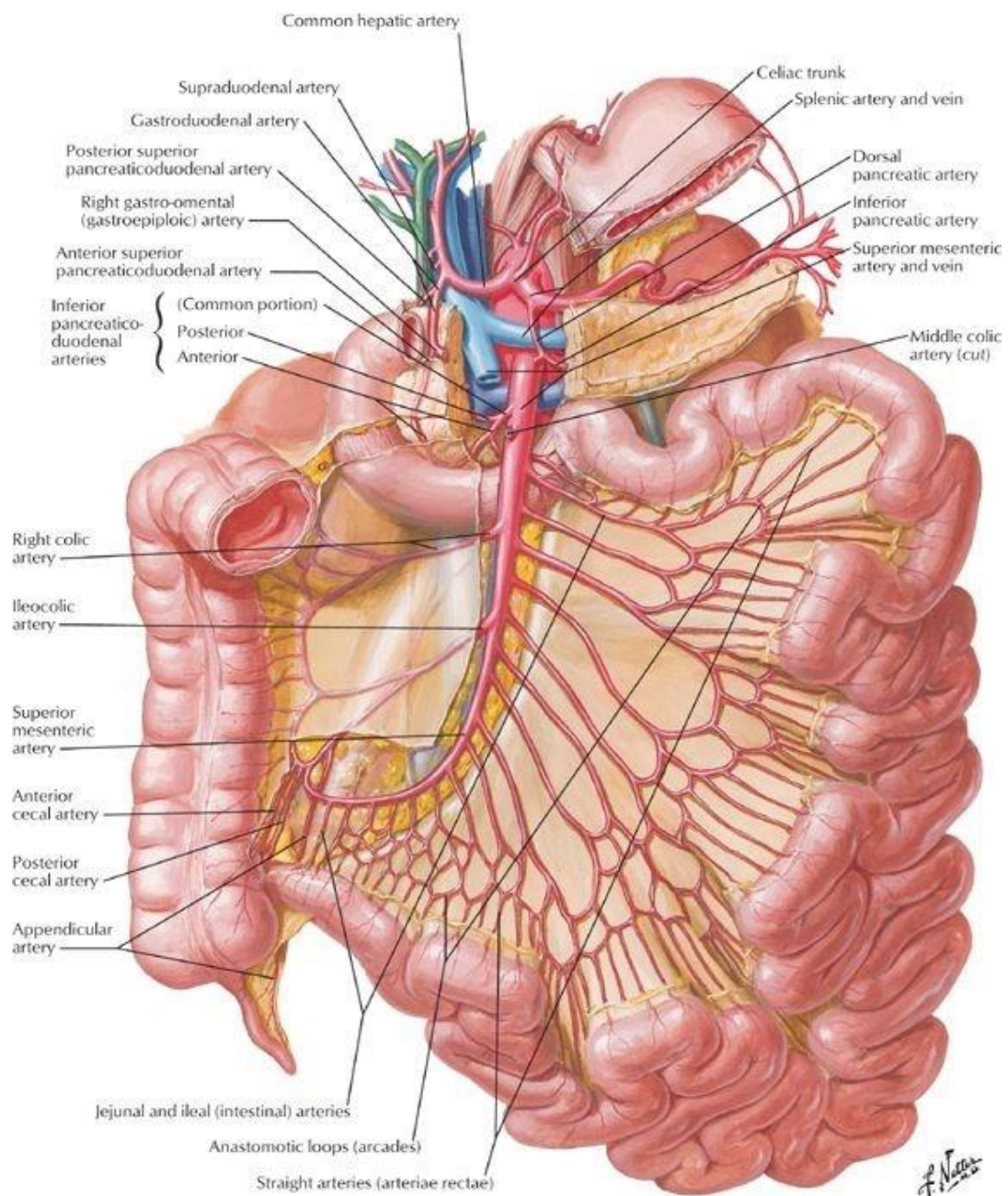
* Mesentery Of Small Intestine *

* Loop of Jejunum *

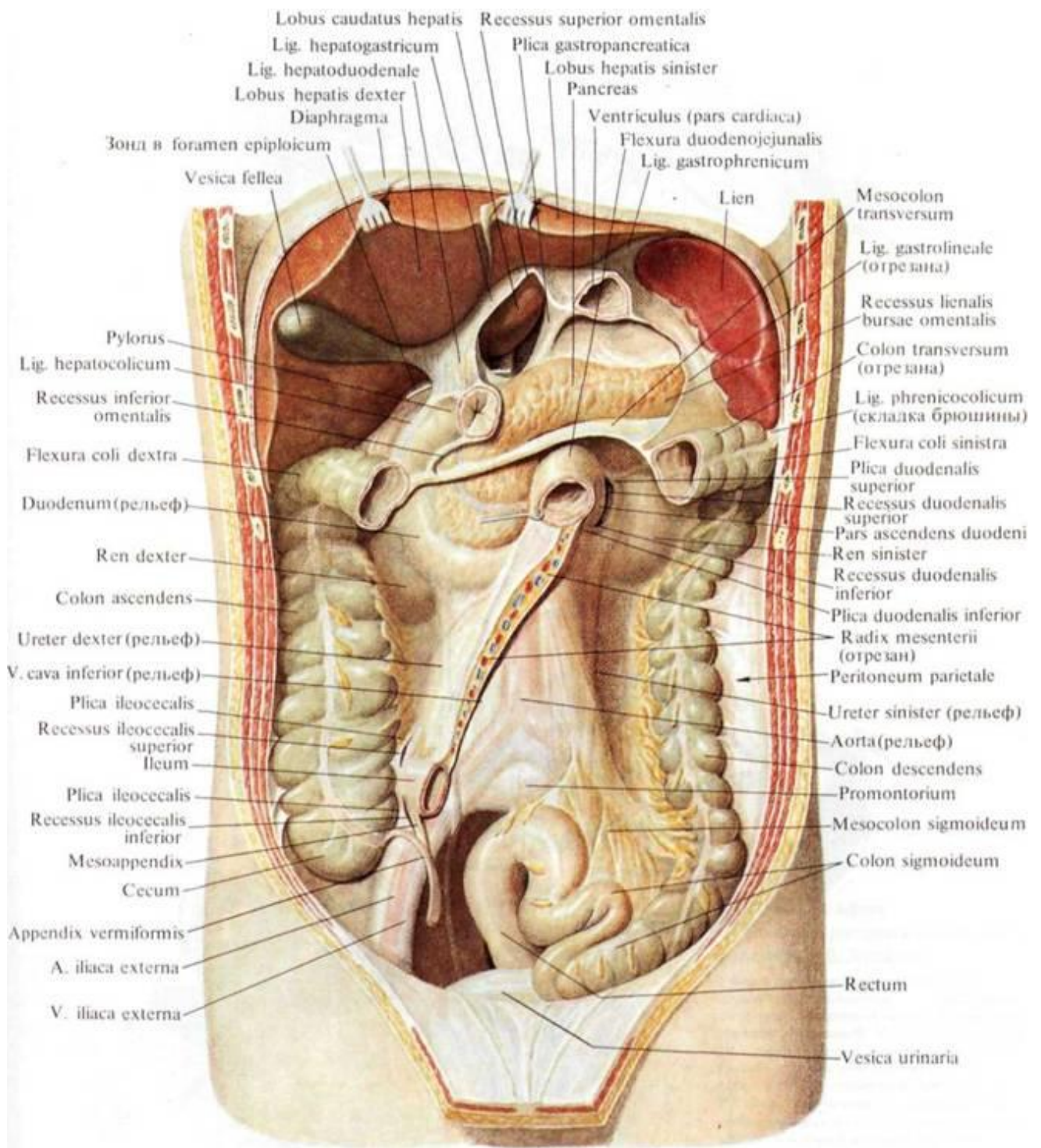
* Loop of ileum *



Stomach & Small Intestine



Stomach & Small Intestine



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