

Systemic Module

GIT

“Anatomy”

**Anatomy of Accessory Organs of GIT
(Solid Organs)**

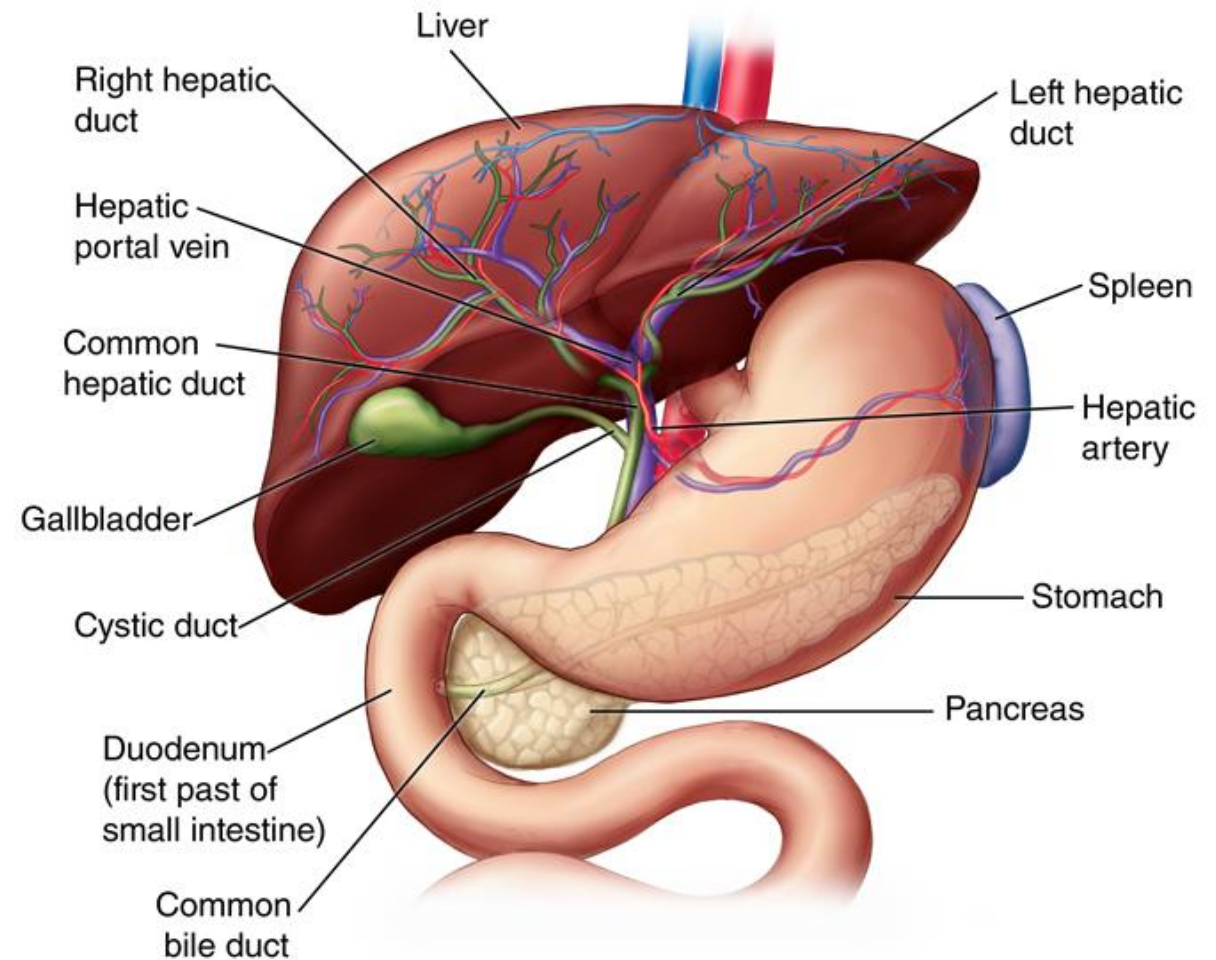
Dr. Ayman Alzubi

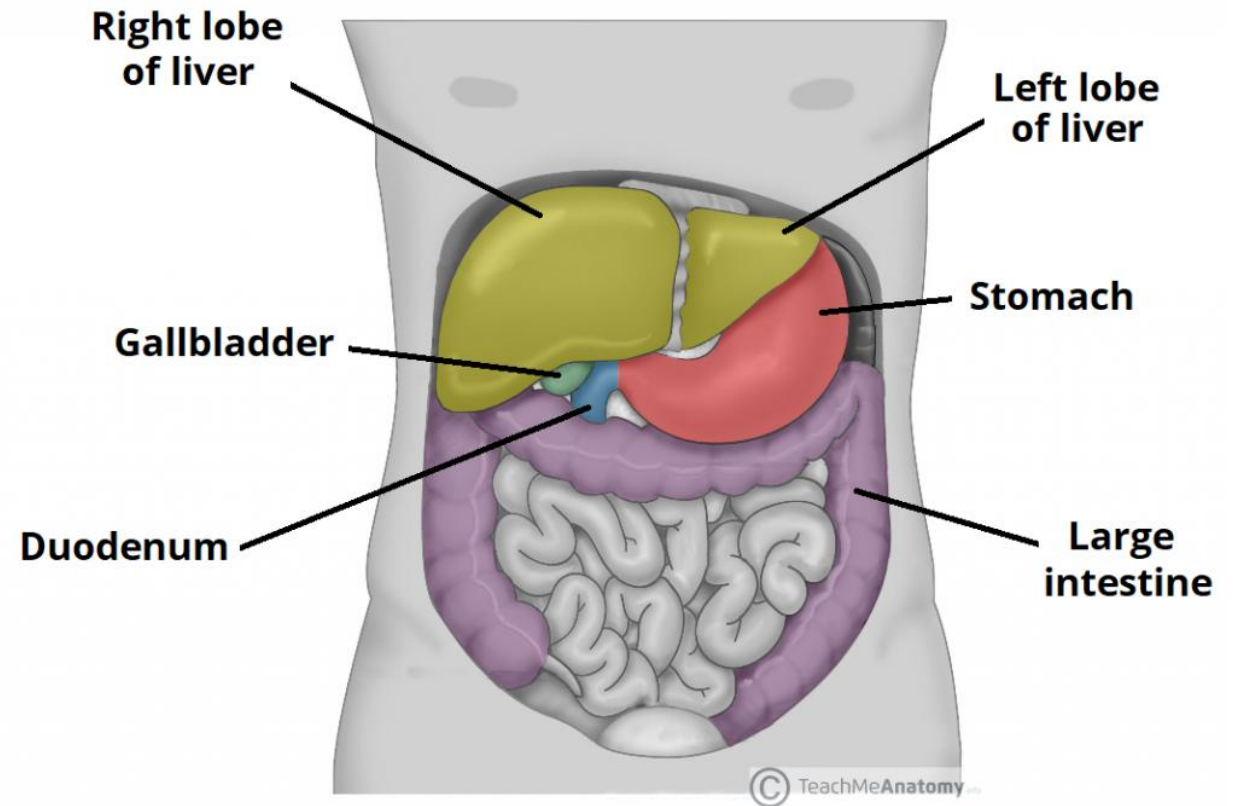
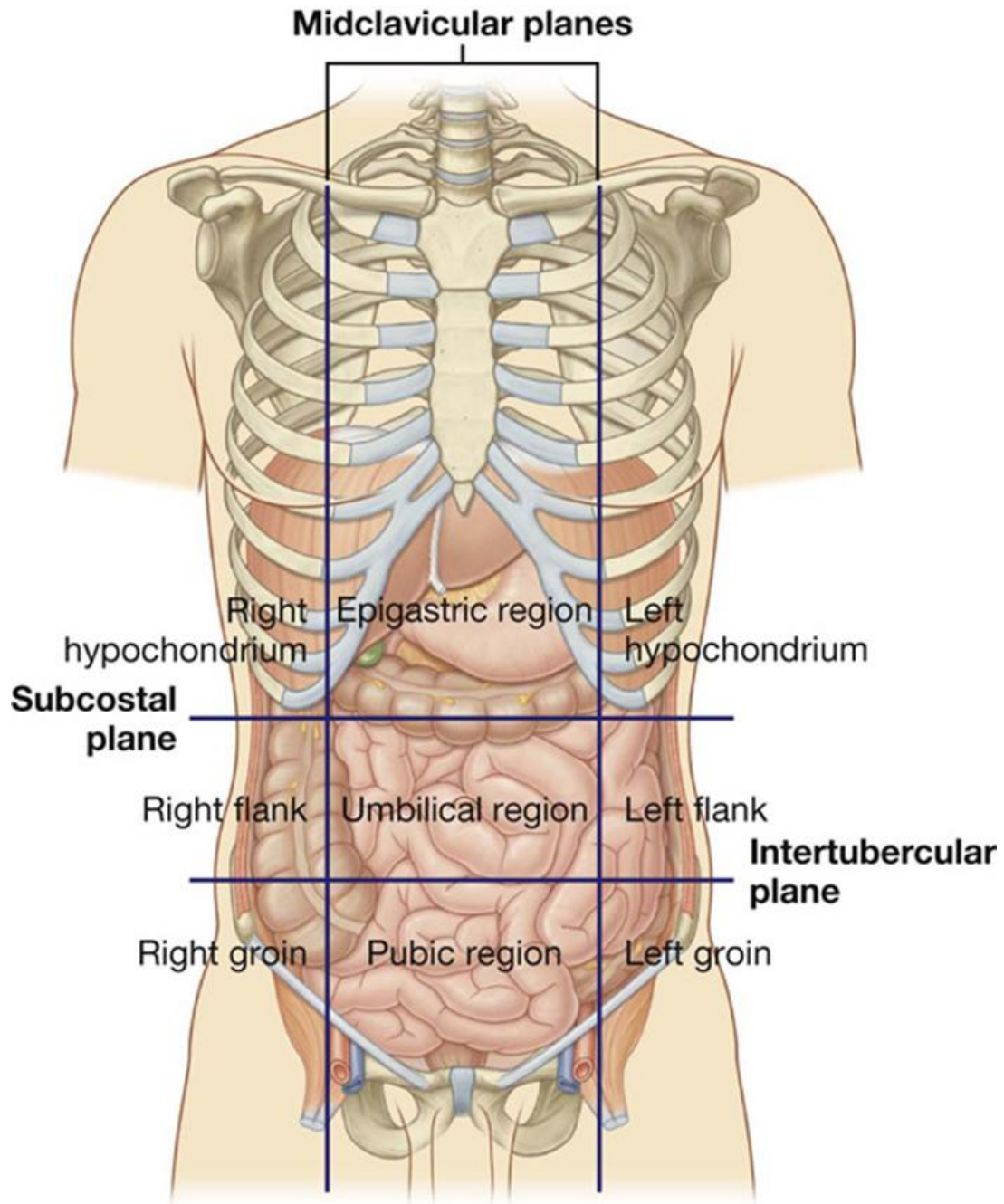
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The Liver

Liver

- 2nd largest organ of the body
- Largest gland
- Location ??
- About 1.5 KG
- Comprises 2% of body weight
- Receive blood from:
 - Hepatic artery (30%)- oxygenated blood
 - Portal vein (70%) – nutrients rich blood

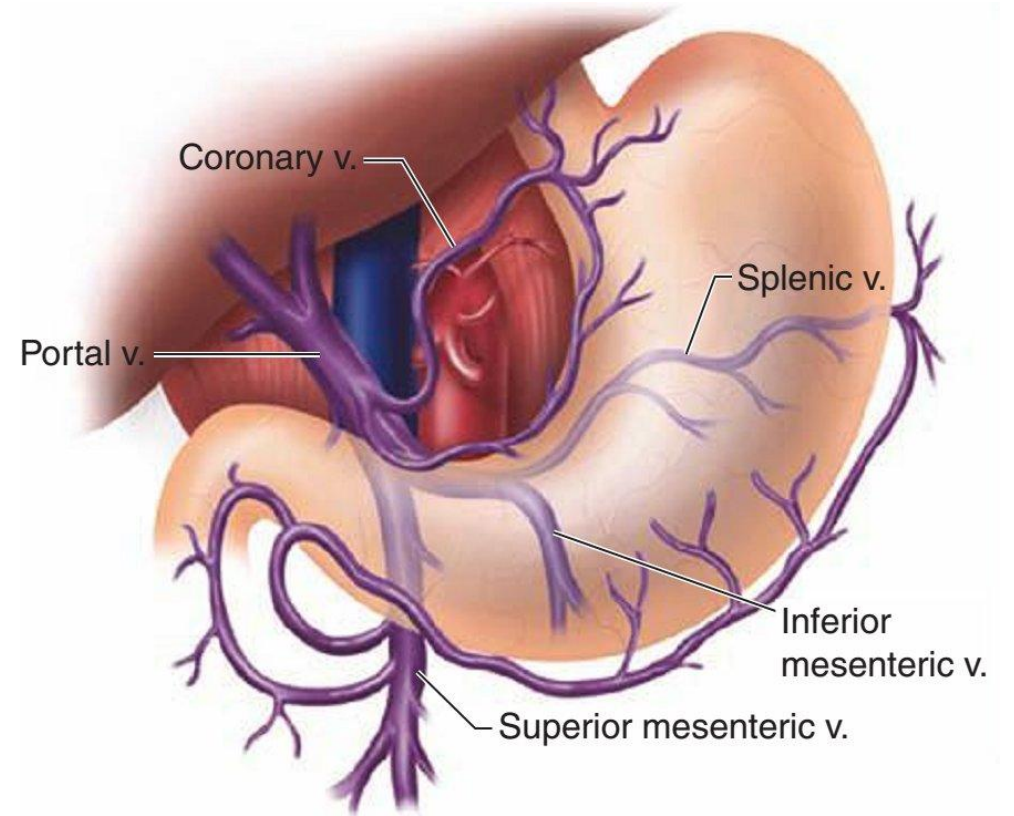
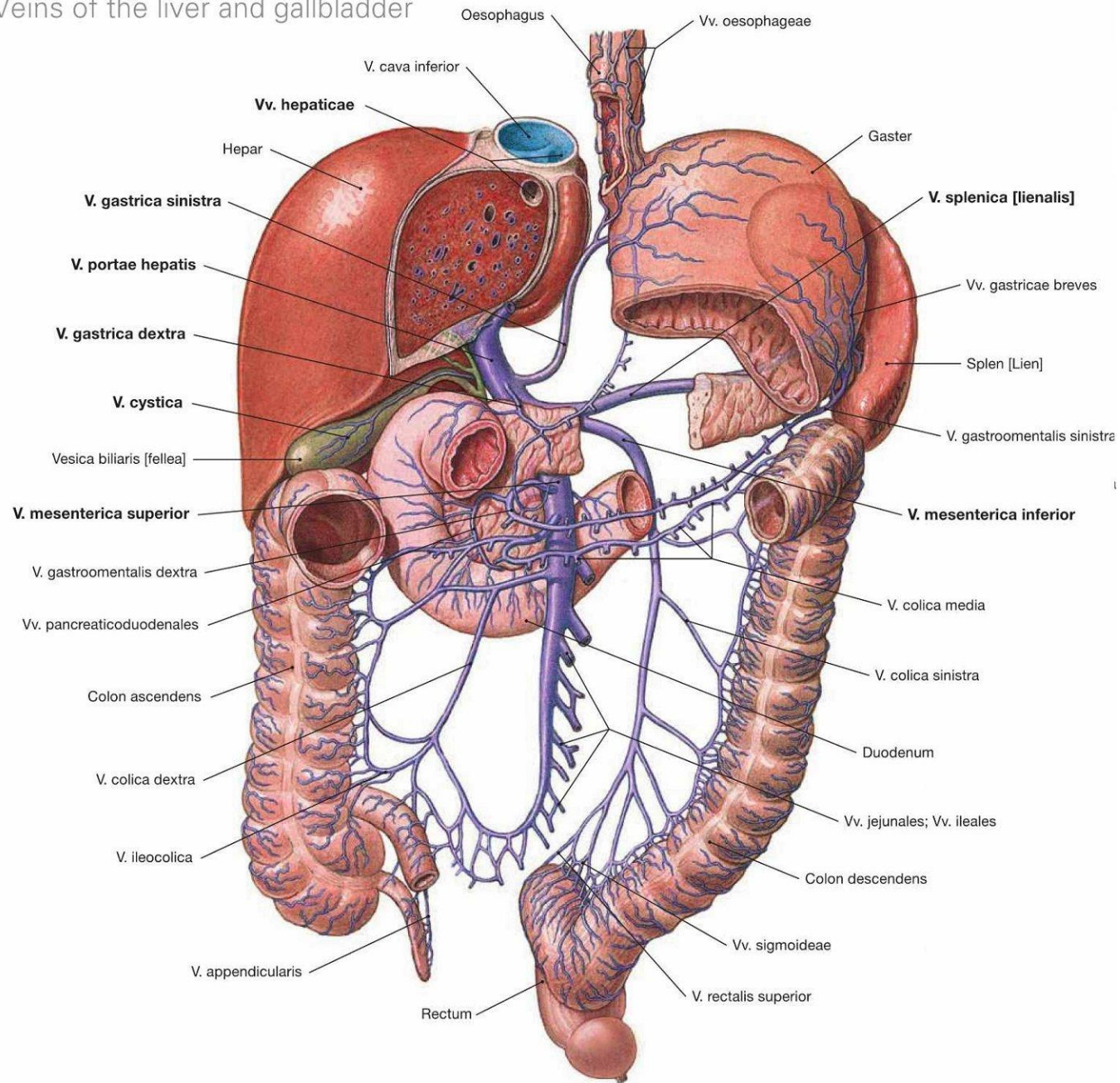




Portal System

- Liver is an interface between the digestive system and the blood
- All material absorbed via the intestine reach the liver through the **portal vein**,_ except the complex lipids (chylomicrons) which are transported by the lymph vessels
- Nutrients are accumulated and transformed in the liver and **toxic substances eliminated there.**

Veins of the liver and gallbladder



Functions of the liver

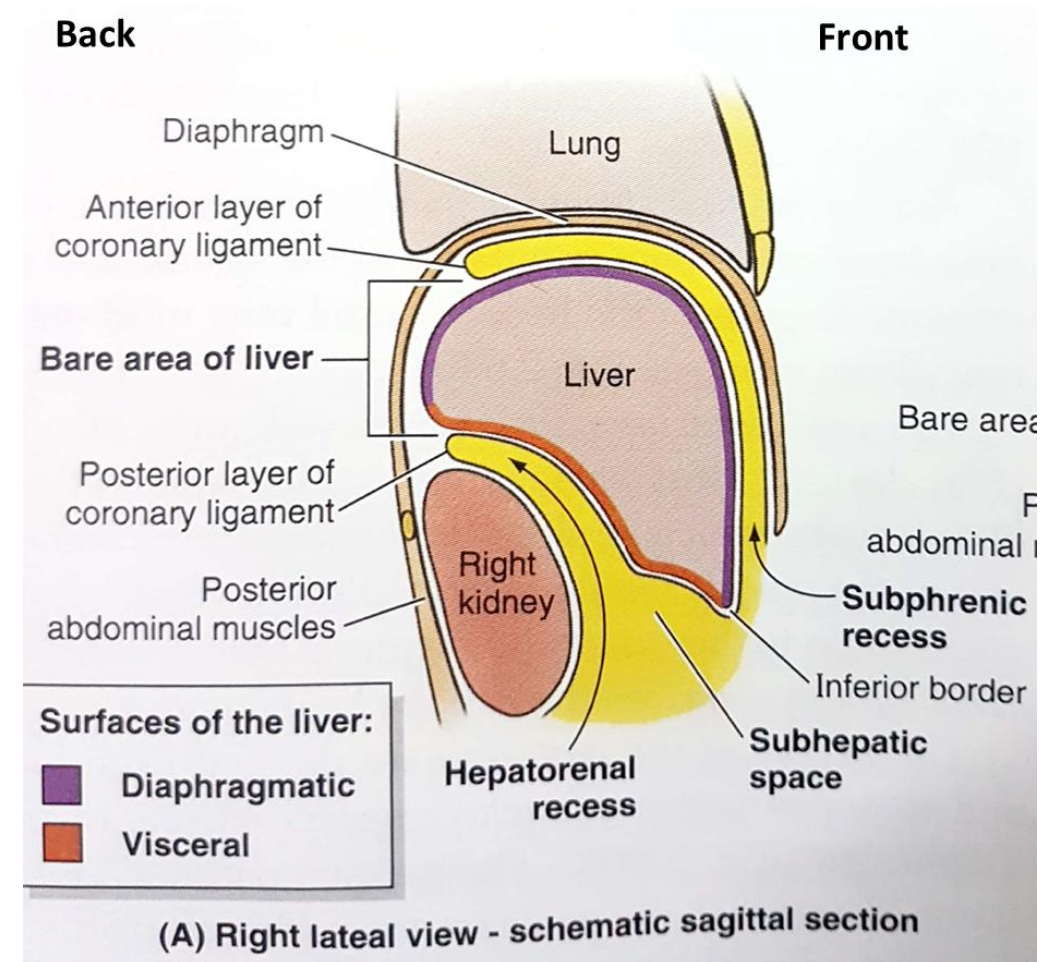
- Detoxification of metabolic waste products e.g. de-amination of amino acids to produce urea
- Destruction of spent RBC's
- Synthesis & secretion of bile
- Synthesis of plasma proteins including albumin & clotting factors
- Synthesis of plasma lipoproteins
- Metabolic functions e.g. glycogen synthesis, gluconeogenesis, storage of glycogen, some vitamins & lipids
- Detoxification of various drugs & toxins e.g. alcohol

Surfaces of Liver

- The external surfaces of the liver are described by *their location and adjacent structures*.

1. The diaphragmatic surface

2. The visceral surface



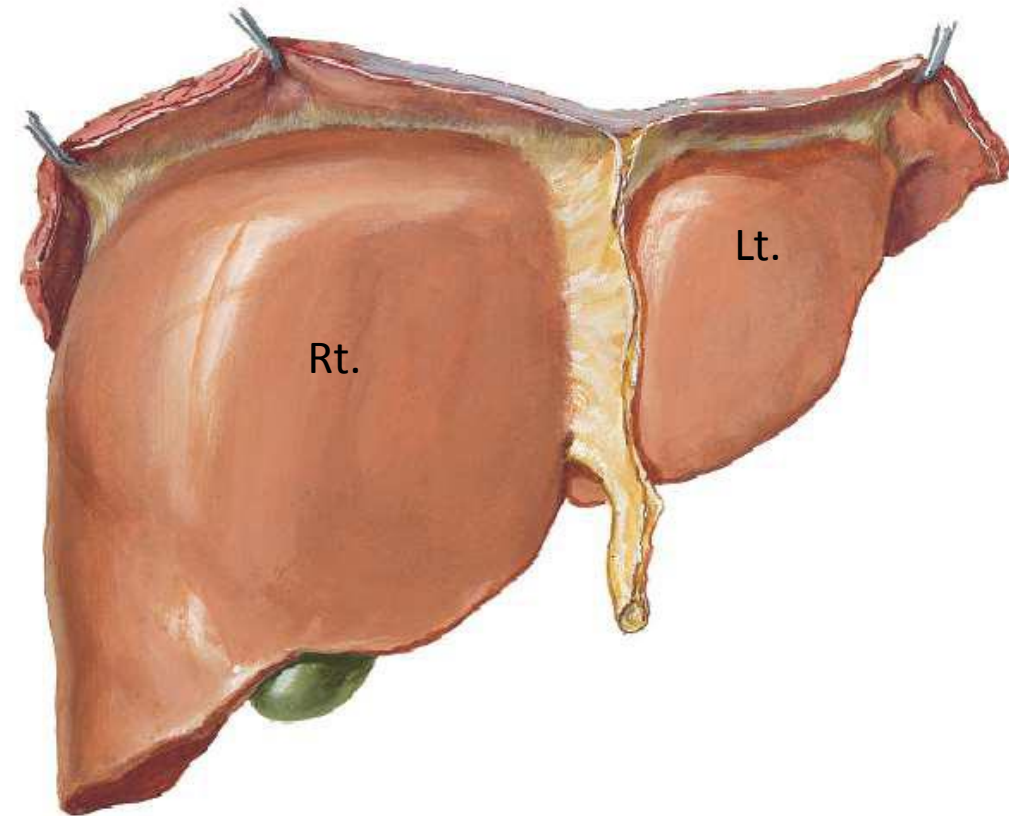
Diaphragmatic surface

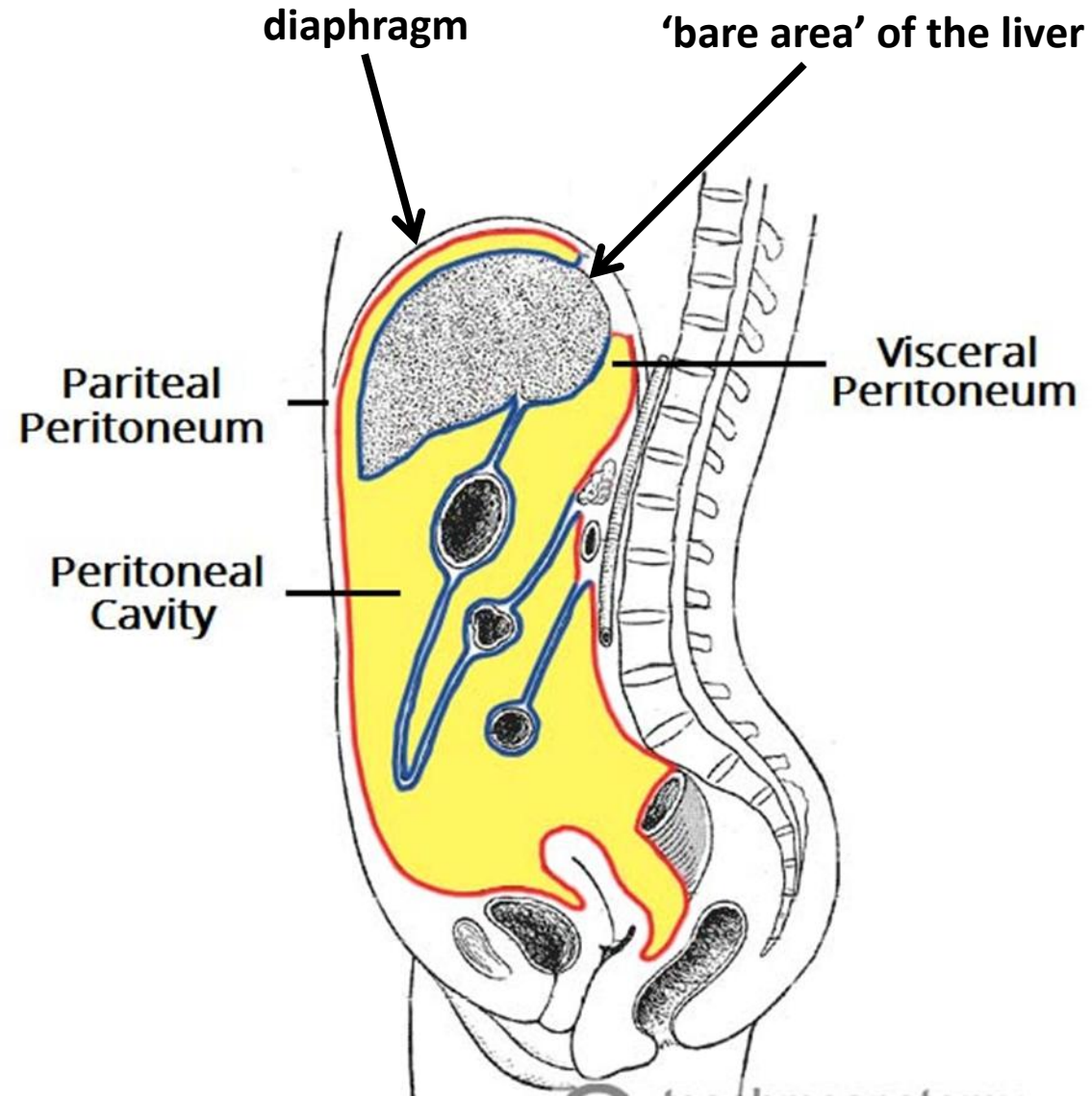
(the anterosuperior surface of the liver)

- It is smooth and convex
- Fitting closely beneath the curvature of the diaphragm
- The posterior aspect of the diaphragmatic surface is not covered by visceral peritoneum, and is in direct contact with the diaphragm itself (known as the '***bare area***' of the liver).

Antero-superior surface

Diaphragmatic surface





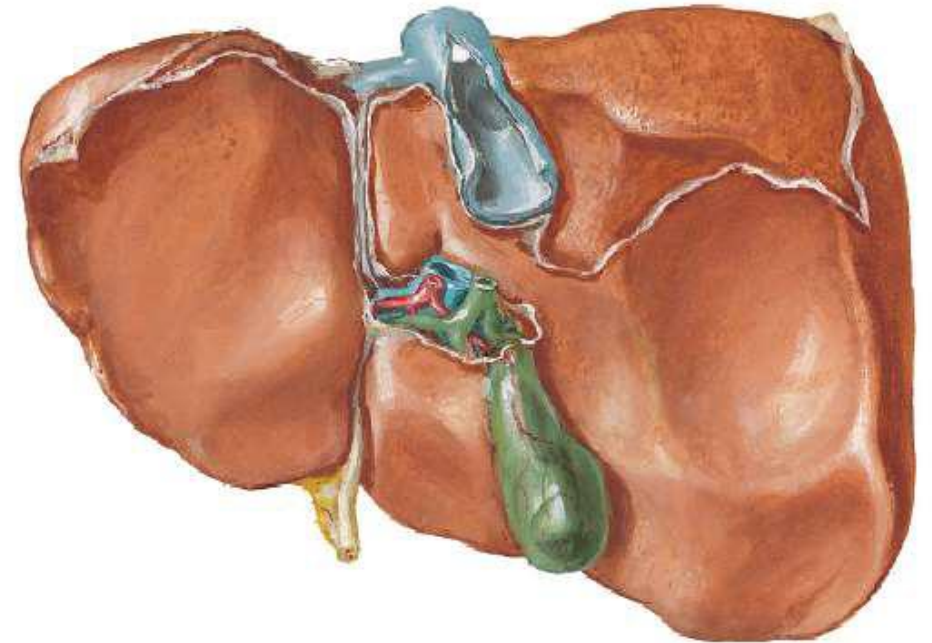
Visceral surface

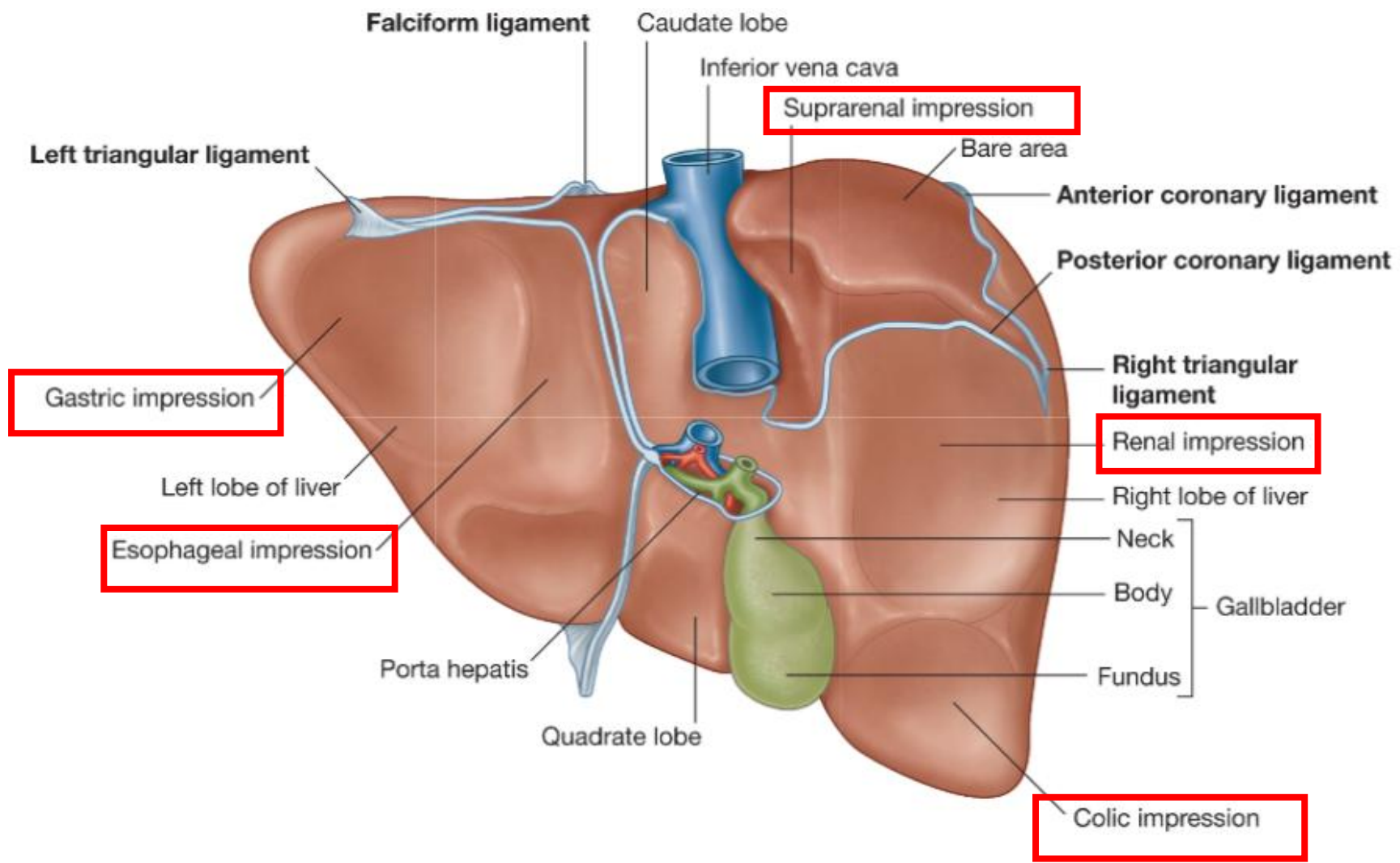
(the posteroinferior surface of the liver)

- Has multiple fissures and impressions from contact with other organs.
- It lies in contact with the **right kidney, right adrenal gland, right colic flexure, transverse colon, first part of the duodenum, gallbladder, esophagus** and the **stomach**
- With the exception of the fossa of the gallbladder and porta hepatis, it is covered with peritoneum.
- Attached to the lesser curvature of the stomach by the **lesser omentum**

Postero-inferior Surface

Visceral surface



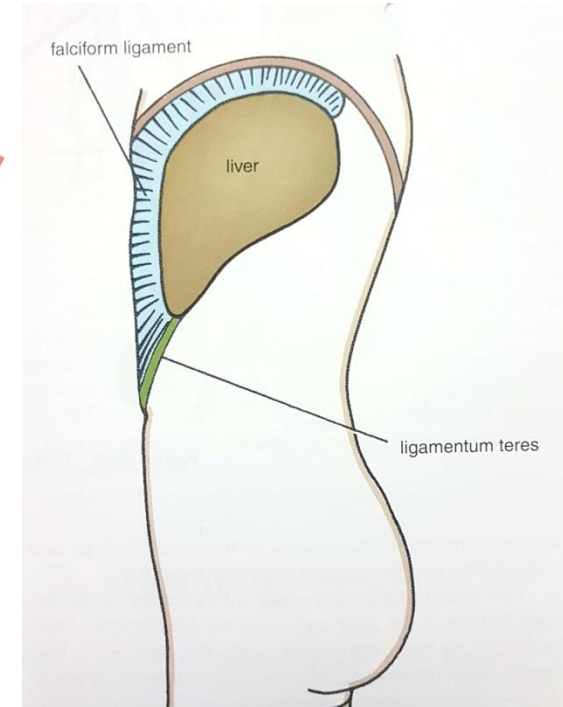
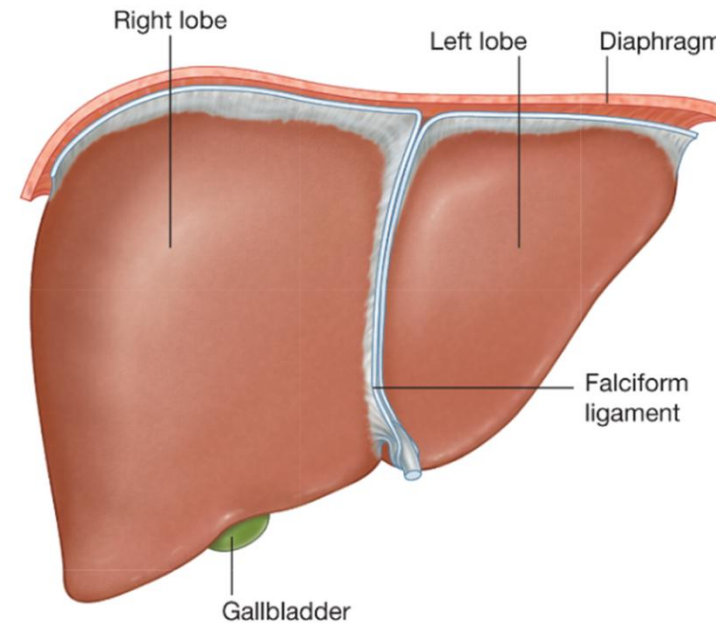


Ligaments of the Liver

- There are various ligaments that attach the liver to the surrounding structures.
- Formed by a double layer of peritoneum
 - 1. Falciform ligament**
 - 2. Coronary ligament (anterior and posterior folds)**
 - 3. Triangular ligaments (left and right)**
 - 4. Lesser omentum**

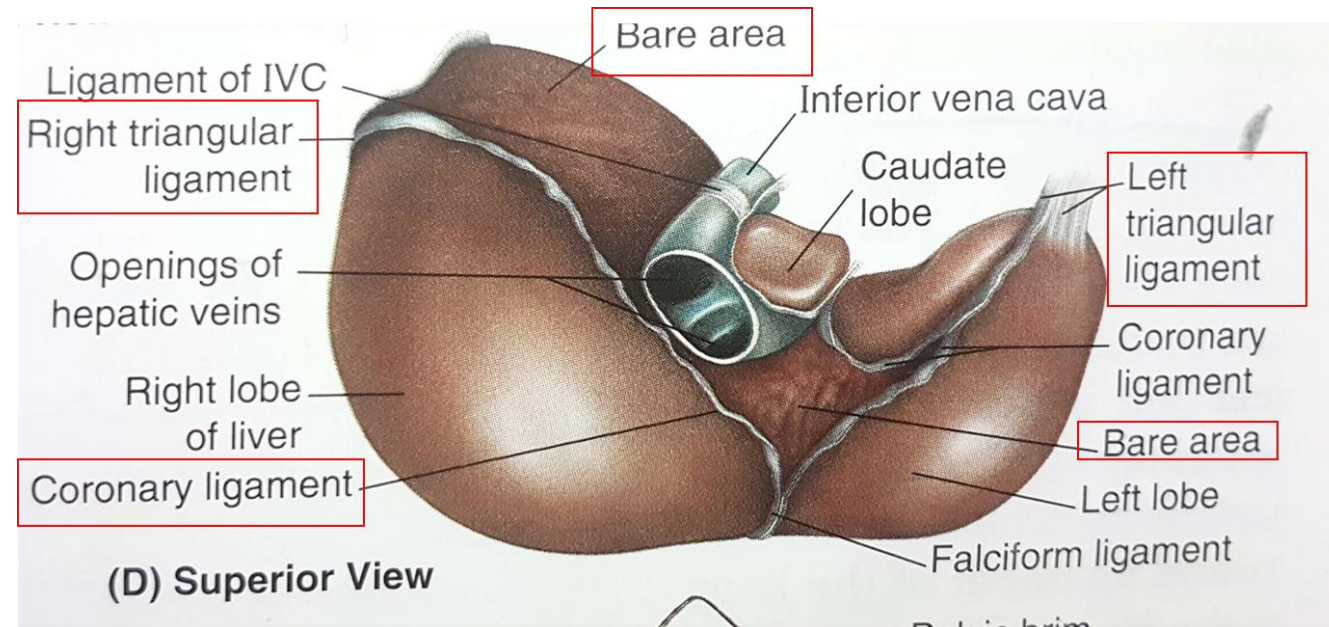
Falciform Ligament

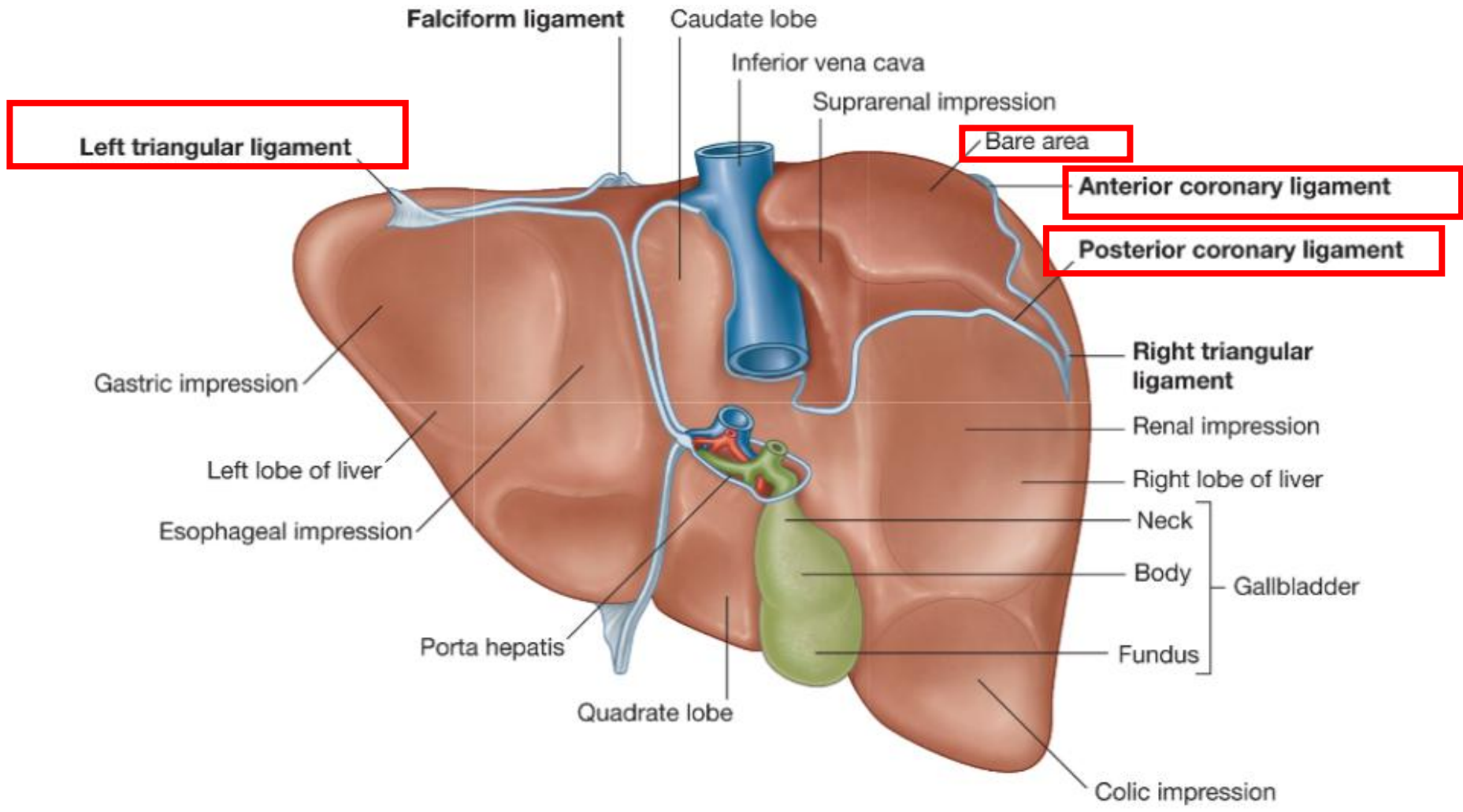
- Sickle-shaped ligament attaches the anterior surface of the liver to the anterior abdominal wall.
- Divide the liver into right and left lobes.
- The free edge of this ligament contains the **ligamentum teres**, a remnant of the **umbilical vein**.



Coronary ligament

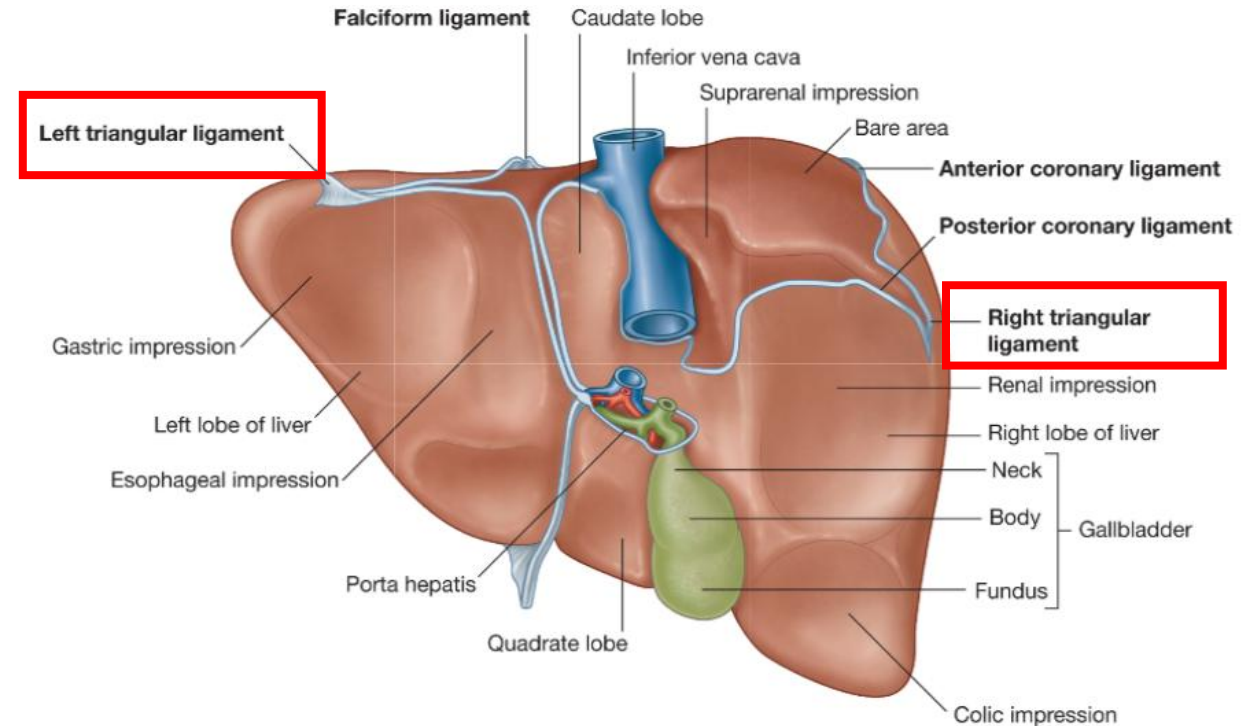
- Attaches the superior surface of the liver to the inferior surface of the diaphragm.
- Demarcates the “bare area” of the liver.
- The anterior and posterior folds unite to form the triangular ligaments on the right and left lobes of the liver.





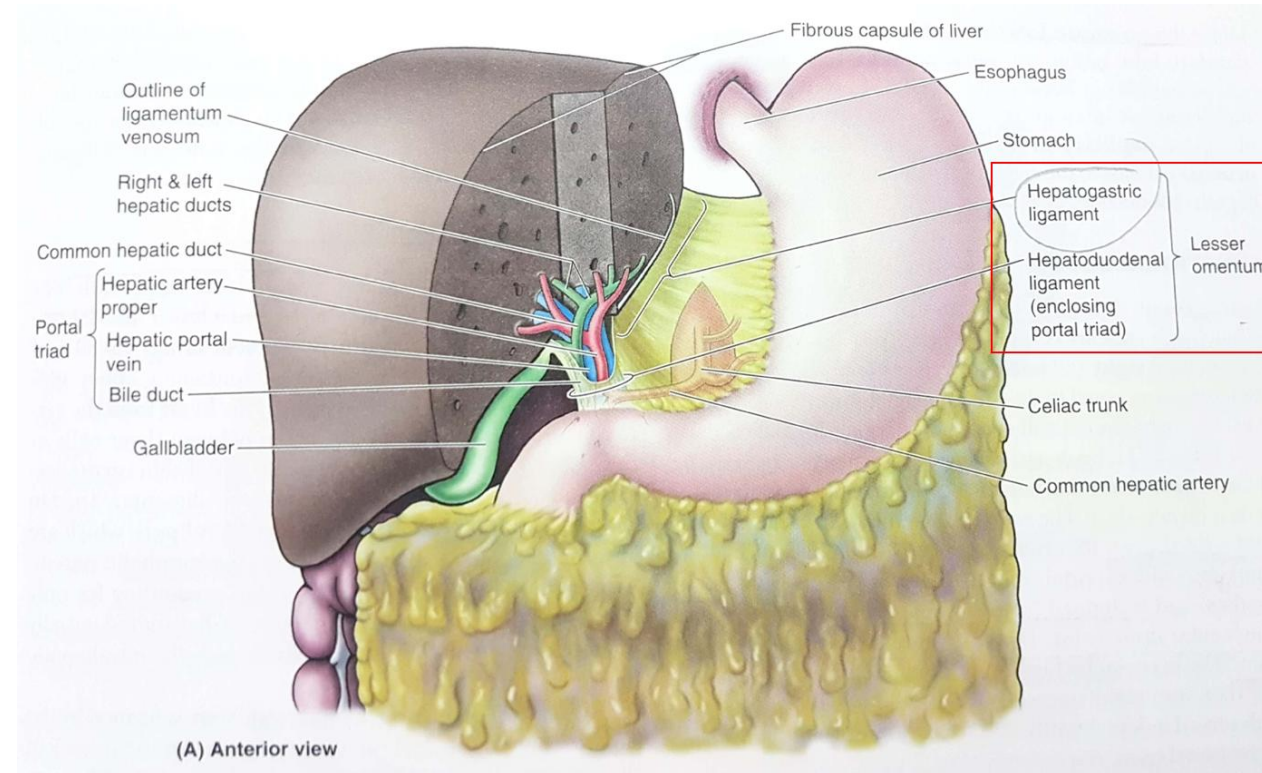
Triangular ligaments

- The left triangular ligament is formed by the union of the anterior and posterior layers of the coronary ligament at the apex of the liver and *attaches the left lobe of the liver to the diaphragm.*
- The right triangular ligament is formed in a similar fashion adjacent to the bare area and *attaches the right lobe of the liver to the diaphragm.*



Lesser omentum

- Attaches the liver to the lesser curvature of the stomach and first part of the duodenum.
- It consists of:
 1. The **hepatoduodenal ligament** - extends from the duodenum to the liver).
 2. The **hepatogastric ligament** - extends from the stomach to the liver.
- The hepatoduodenal ligament surrounds the *portal triad*.

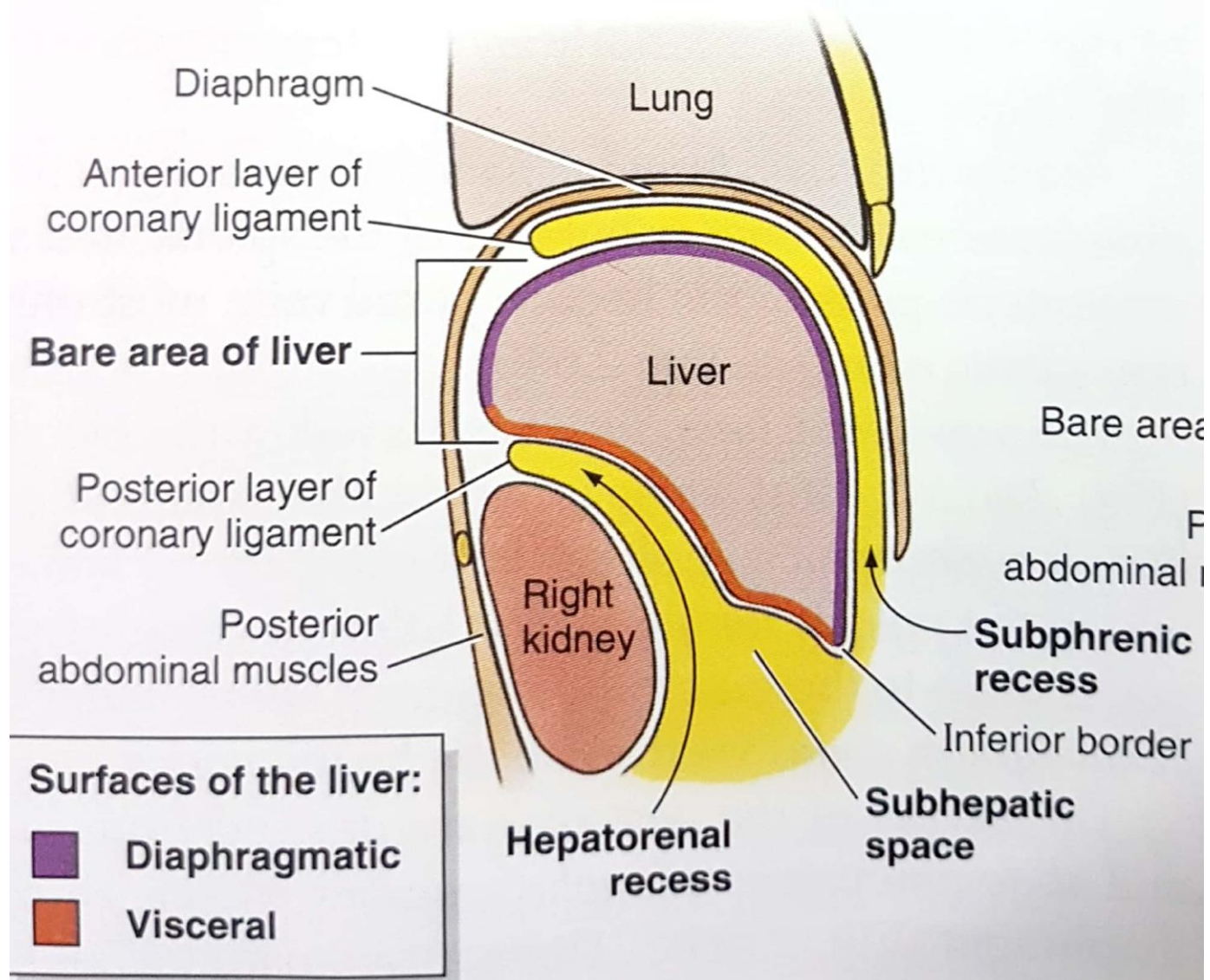


Hepatic Recesses

- The hepatic recesses are anatomical spaces between the liver and surrounding structures.
- They are of clinical importance as infection may collect in these areas, forming an abscess.
 - **Subphrenic recess** – located between the diaphragm and the anterior and superior aspects of the liver. They are divided into a right and left by the falciform ligament.
 - **Subhepatic recess** – this peritoneal space is located between the inferior surface of the liver and the transverse colon.
 - **Hepatorenal recess (Morison's pouch)** – a potential space between the visceral surface of the liver and the right kidney.
 - This is the deepest part of the peritoneal cavity when supine (lying flat), therefore pathological abdominal fluid such as blood or ascites is most likely to collect in this region in a bedridden patient.

Back

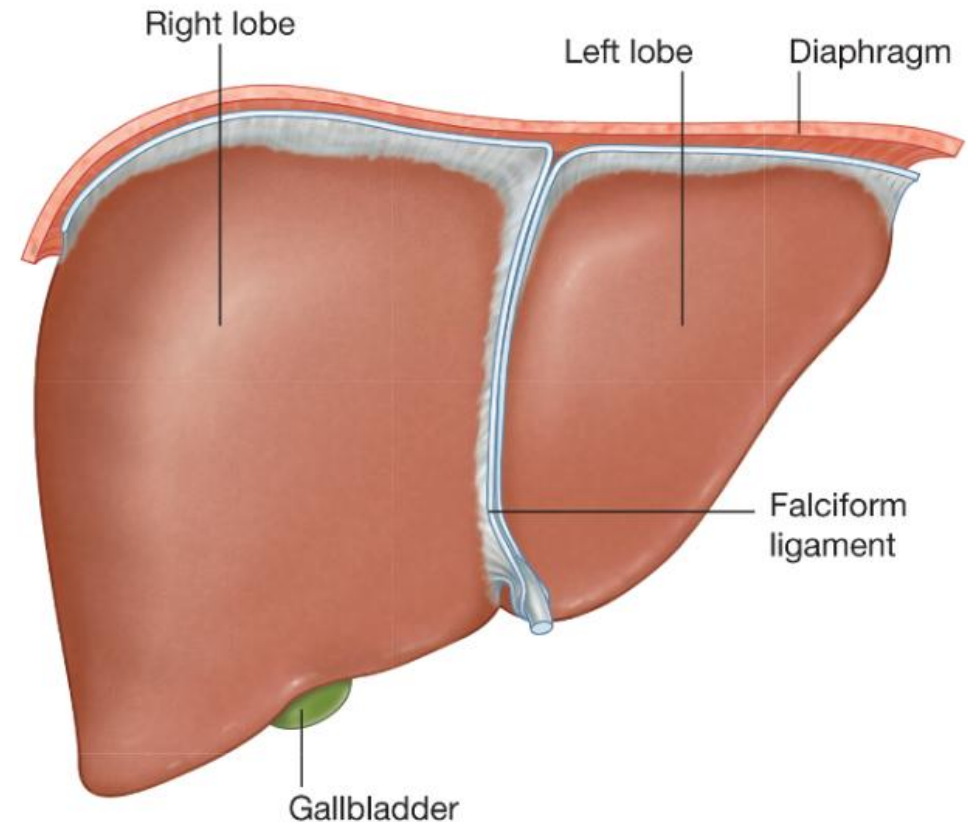
Front



(A) Right lateral view - schematic sagittal section

Anatomical Lobes of Liver

- The liver is divided into **right and left lobes** by the **falciform ligament**.
- Right lobe is the largest and the left is smaller
- The **quadrate** and **caudate** lobes are anatomically described as part of the right lobe of liver, but functionally are distinct:
 - **Quadrate lobe** – located on the lower aspect of the visceral surface. **It lies between the gallbladder and a fossa produced by the ligamentum teres** (a remnant of the fetal umbilical vein).
 - **Caudate lobe** – located on the upper aspect of the visceral surface. **It lies between the inferior vena cava and a fossa produced by the ligamentum venosum** (a remnant of the fetal ductus venosus).



Quadrante and Caudate lobes

Caudate Lobe

Inferior Vena Cava

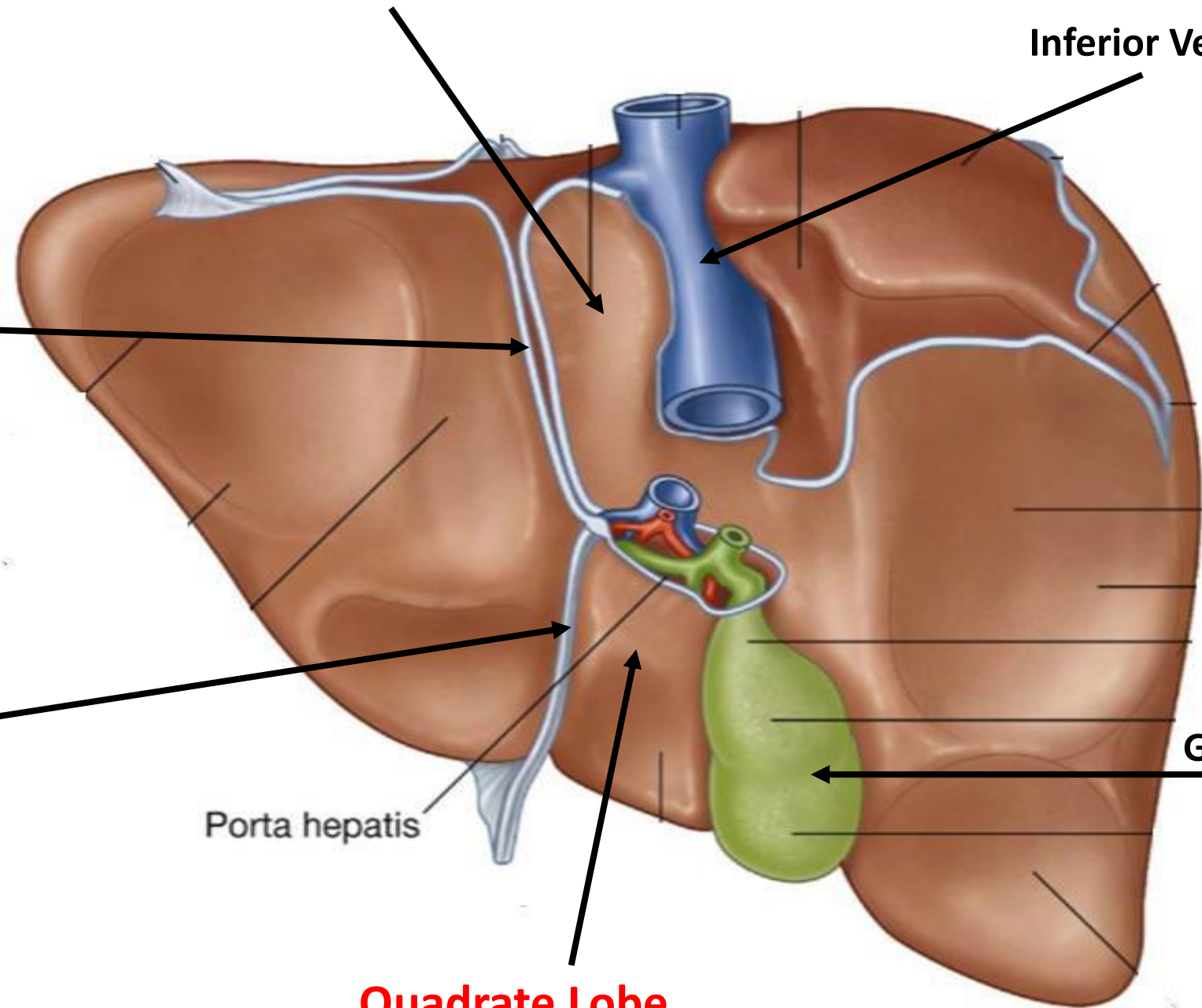
Ligamentum Venosum

Ligamentum Teres

Porta hepatis

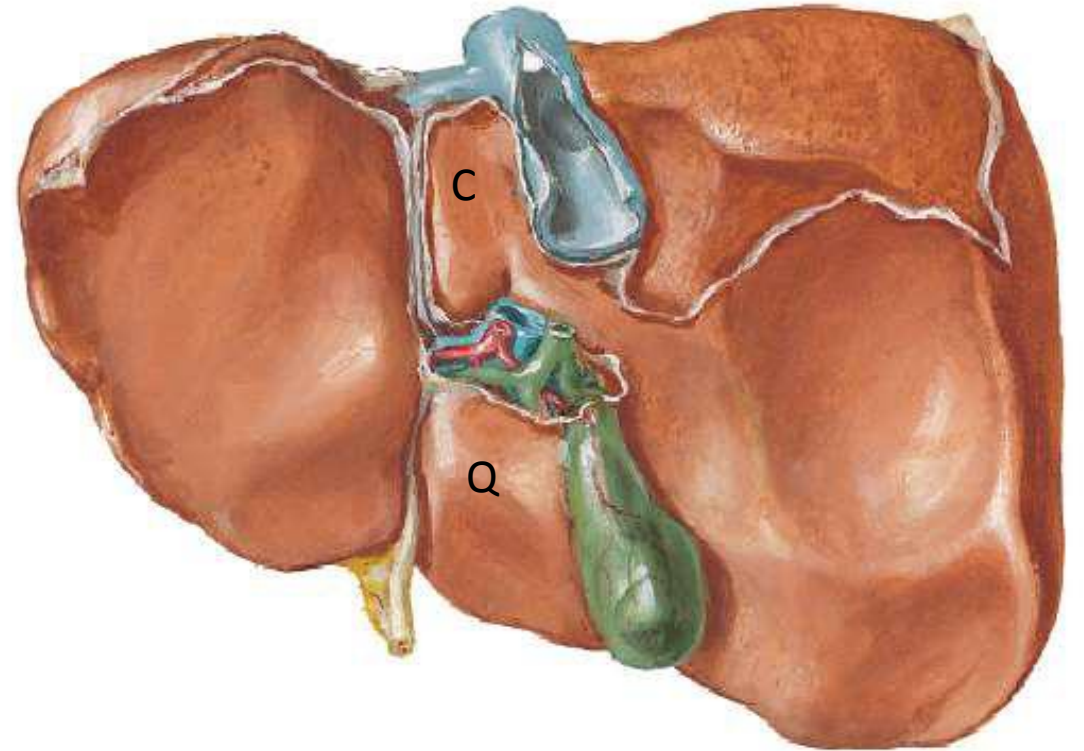
Quadrante Lobe

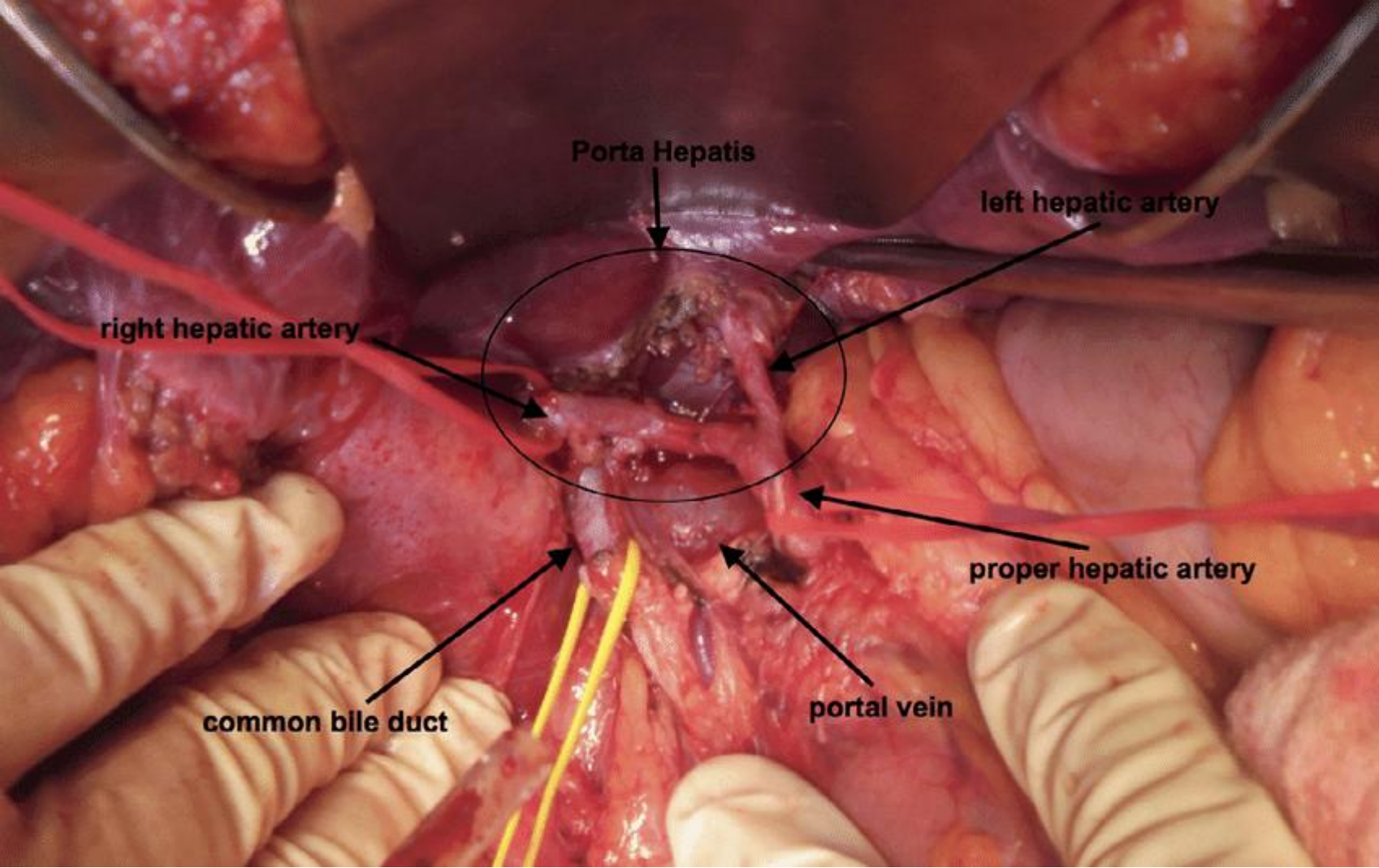
Gallbladder



Porta Hepatis (HILUM OF LIVER)

- Lies at the visceral surface.
- Between Caudate and Quadrate lobes.
- Serves as the point where the vessels (hepatic arteries and portal vein) enter the liver, and hepatic ducts leave it.

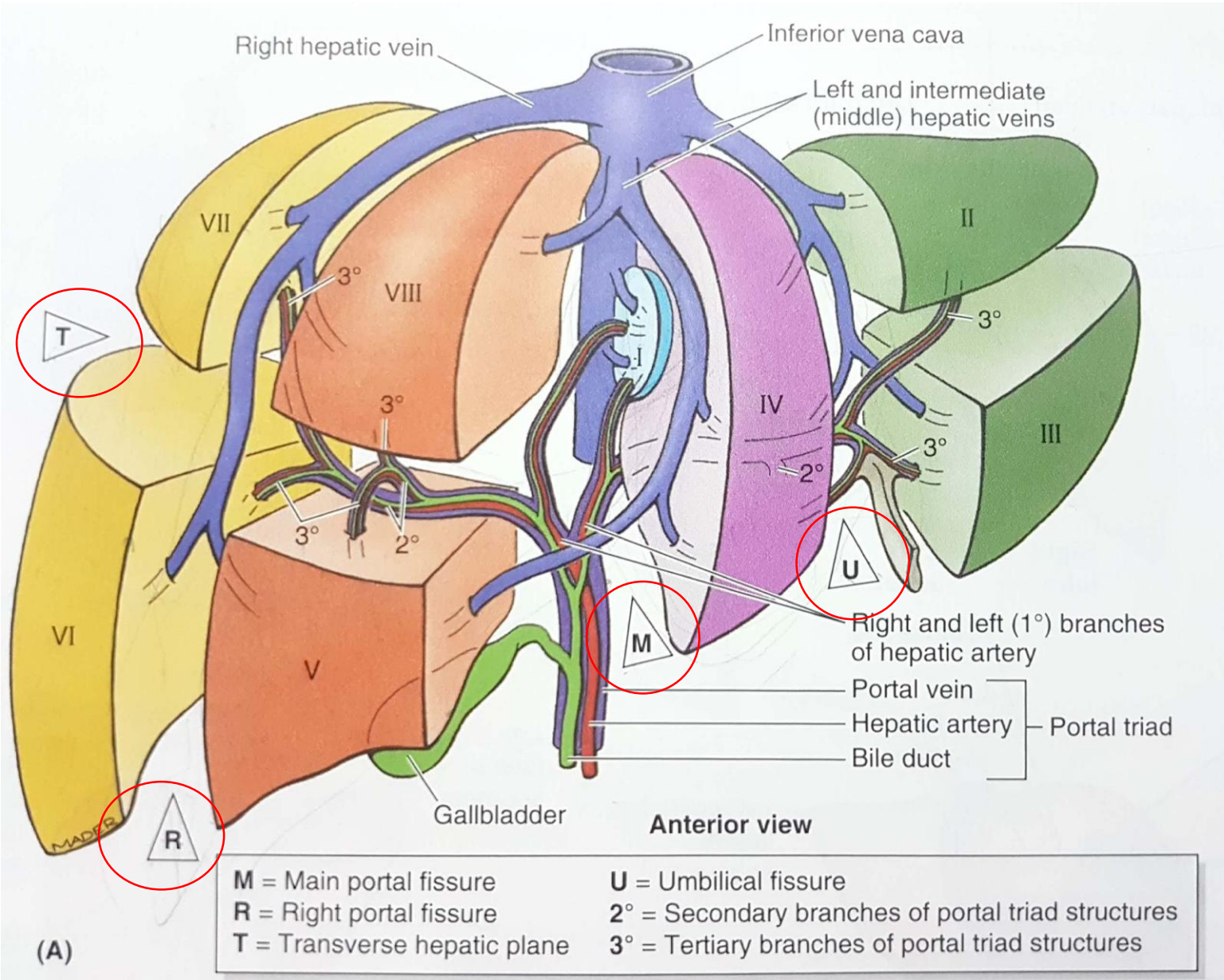




Functional Subdivision of Liver

- The liver has functionally independent **right and left livers** that are more equal in size than the anatomical lobes
- The liver is divided into based on the primary divisions of the portal triad into right and left branches, each receive its own primary branch of hepatic artery and portal vein, and is drained by its own hepatic duct.
- The caudate lobe is considered as a third liver, receive vessels from both bundles of primary branches.
- The right and left livers are vertically subdivided into lateral and medial divisions, each of the four divisions receive a secondary branch of the portal triad.
- All divisions (except medial left division) are horizontally subdivided into upper and lower hepatic segments, each of the six segments receive a tertiary branch of the portal triad.

Hepatic (surgical) Segments of Liver



Liver is divided by the **main portal fissure (M)** into right and left livers



The Right liver is divided **by the right portal fissure (R)** into lateral and medial divisions

The left liver is divided **by the umbilical fissure** into lateral and medial divisions

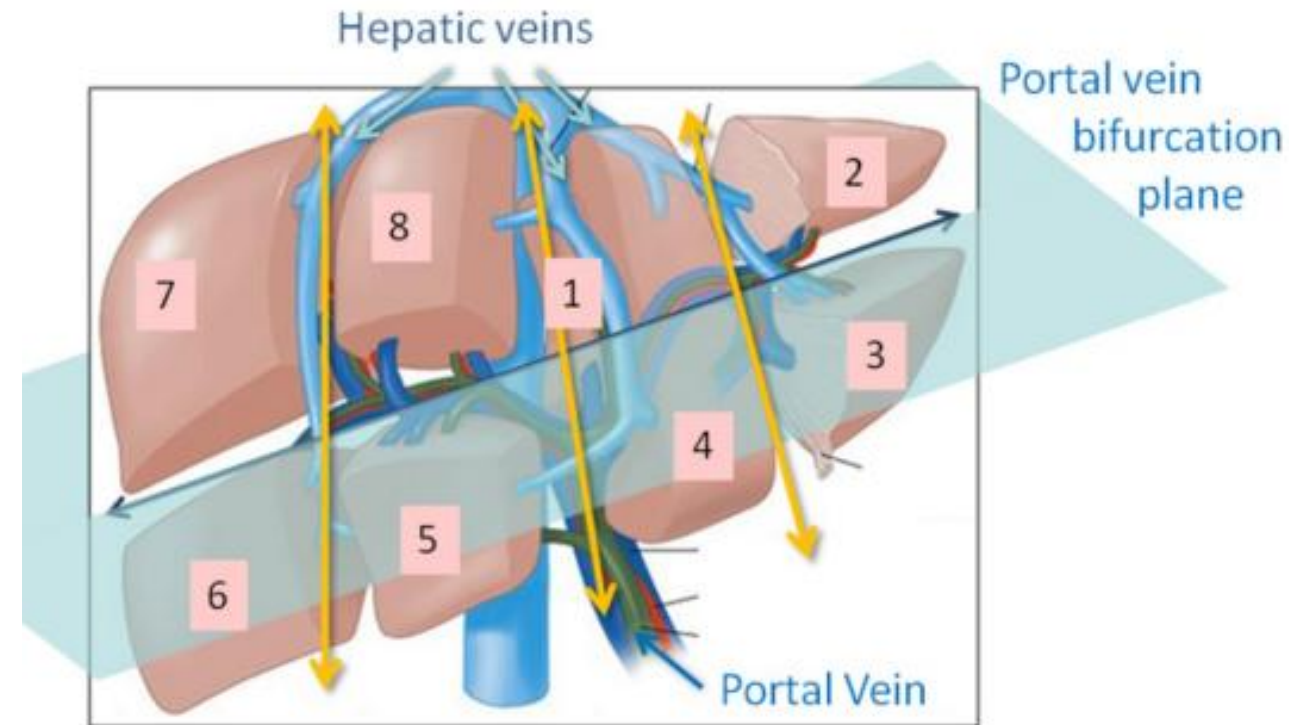


The lateral and medial divisions of right liver, and the lateral division of left liver are divided **by the transverse hepatic plane (T)** into six hepatic segments

Total number of segments is 8 ???

Hepatic segmentectomies

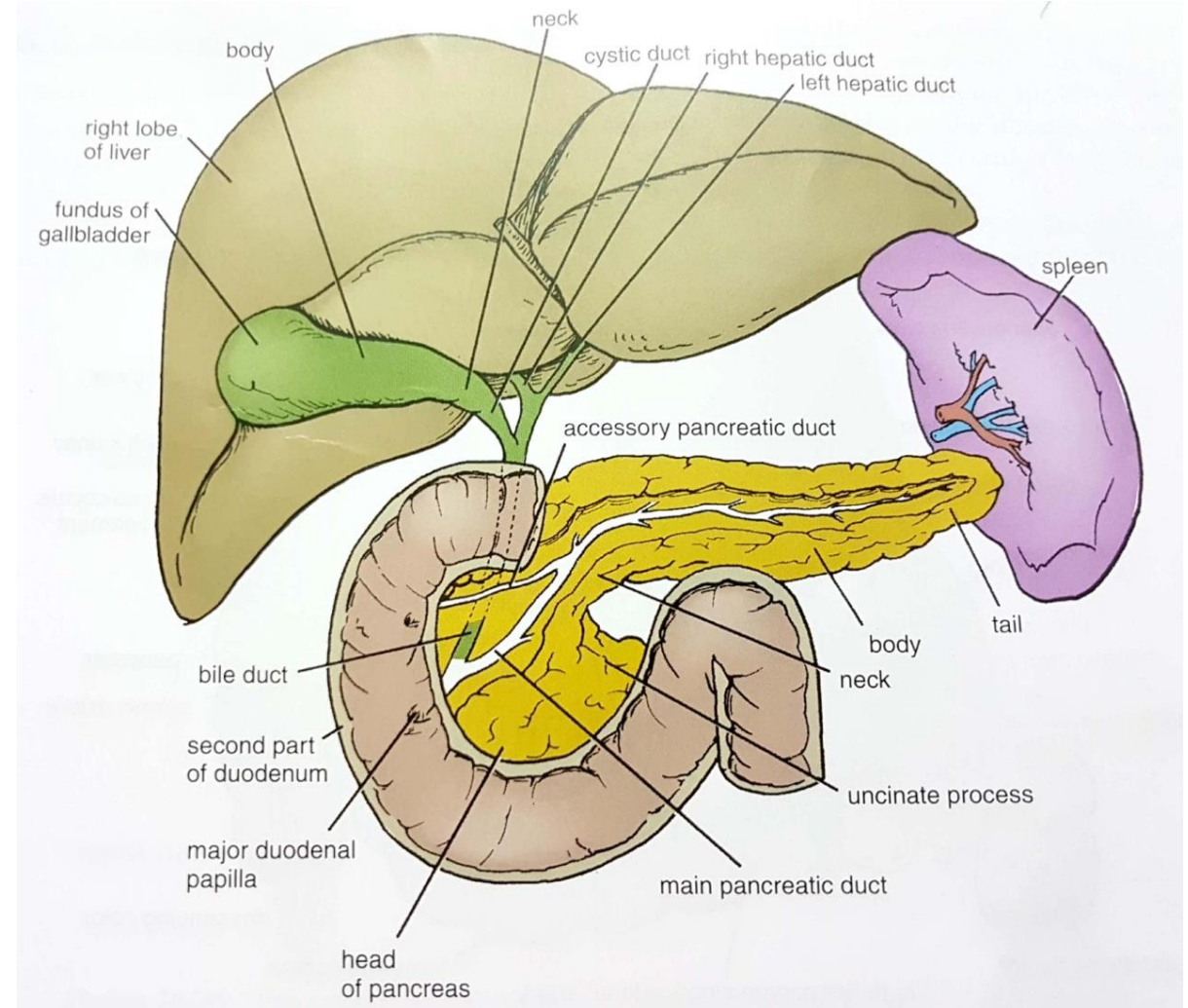
- By dividing the liver into self-contained units, it became possible to perform hepatic segmentectomies, a procedure that makes it possible to remove (resect) a specific segment without damaging those remaining.
 - Ex: The resection of segments that have sustained a severe injury or affected by a tumor
- The right, intermediate, and left hepatic veins serve as a guide to the planes (fissures) between the divisions



Gallbladder & Biliary Tree

The Gallbladder

- It is intraperitoneal, pear-shaped sac
- About 7-10 cm in length
- Lies in the fossa for gallbladder on visceral surface of the liver.
- **Function:** concentrate and store bile which is produced by the liver.
 - Can hold up 50 ml of bile.
 - The stored bile is released in response to cholecystokinin.

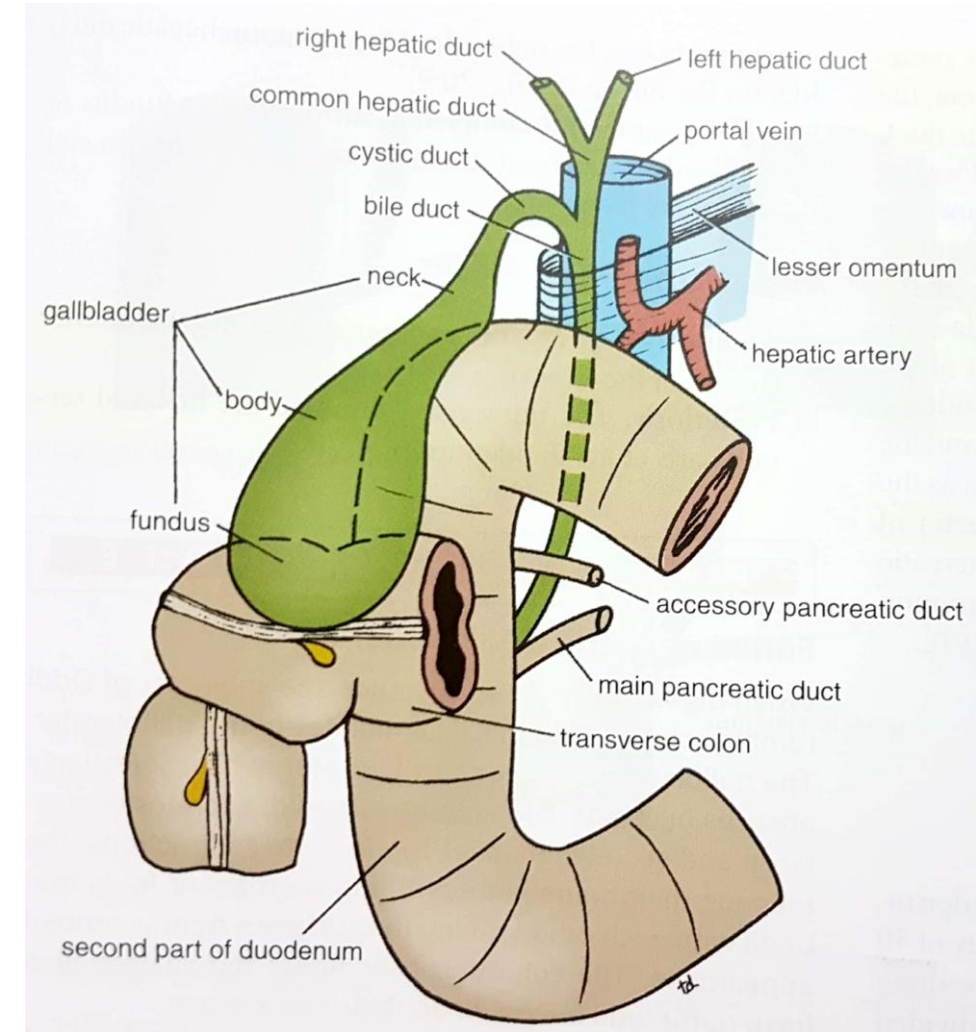


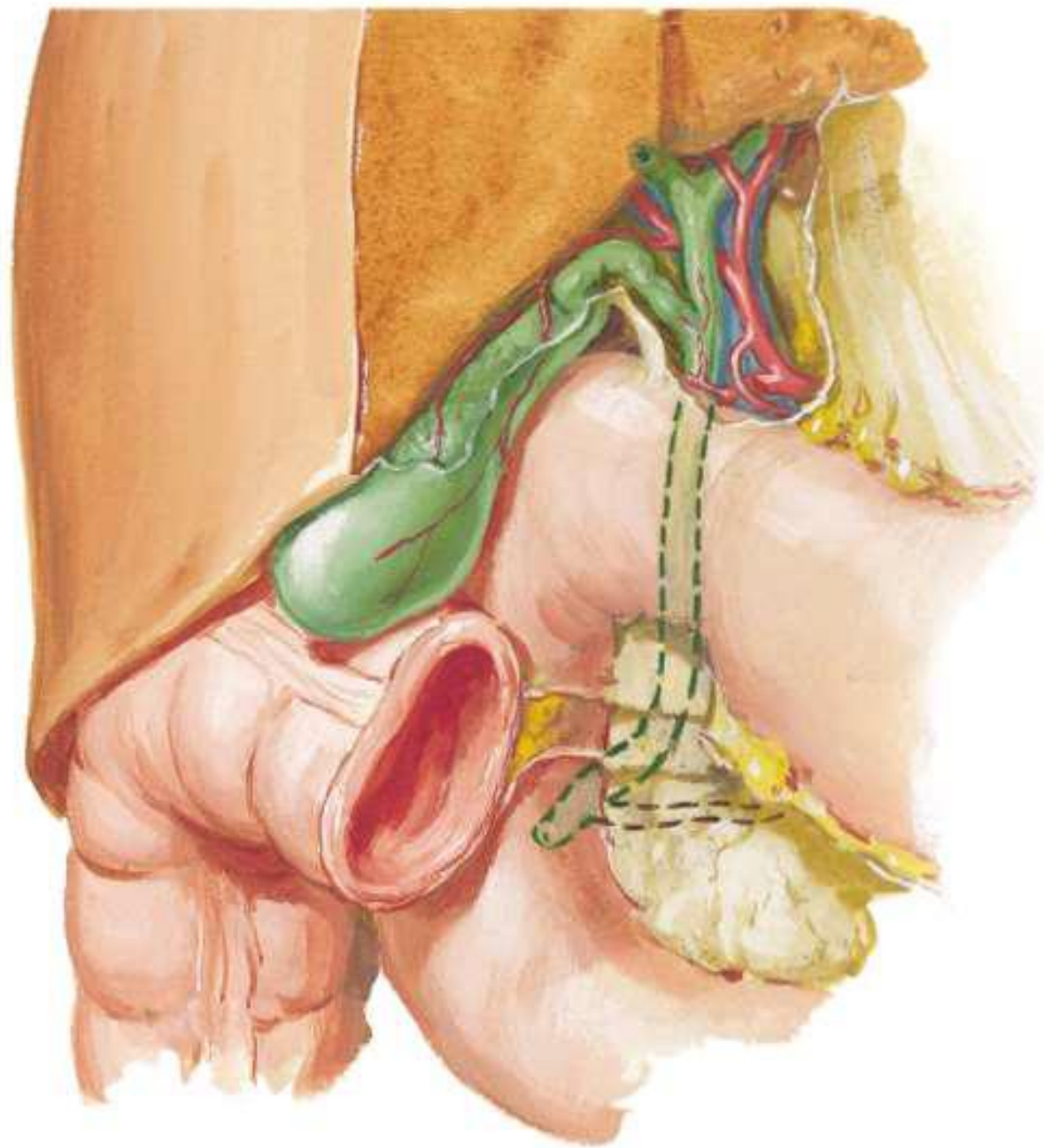
- It is divided into three parts:

- **Fundus:** the rounded end, projects from the inferior border of the liver and comes with contact with anterior abdominal wall at the tip 9th costal cartilage
- **Body:** is the central part connected to the visceral surface of the liver
- **Neck:** is the upper constricted part, which becomes continuous with the **cystic duct**.

- **Relations:**

- **Anteriorly:** the anterior abdominal wall and the inferior surface of the liver
- **Posteriorly:** transverse colon and the first part of the duodenum



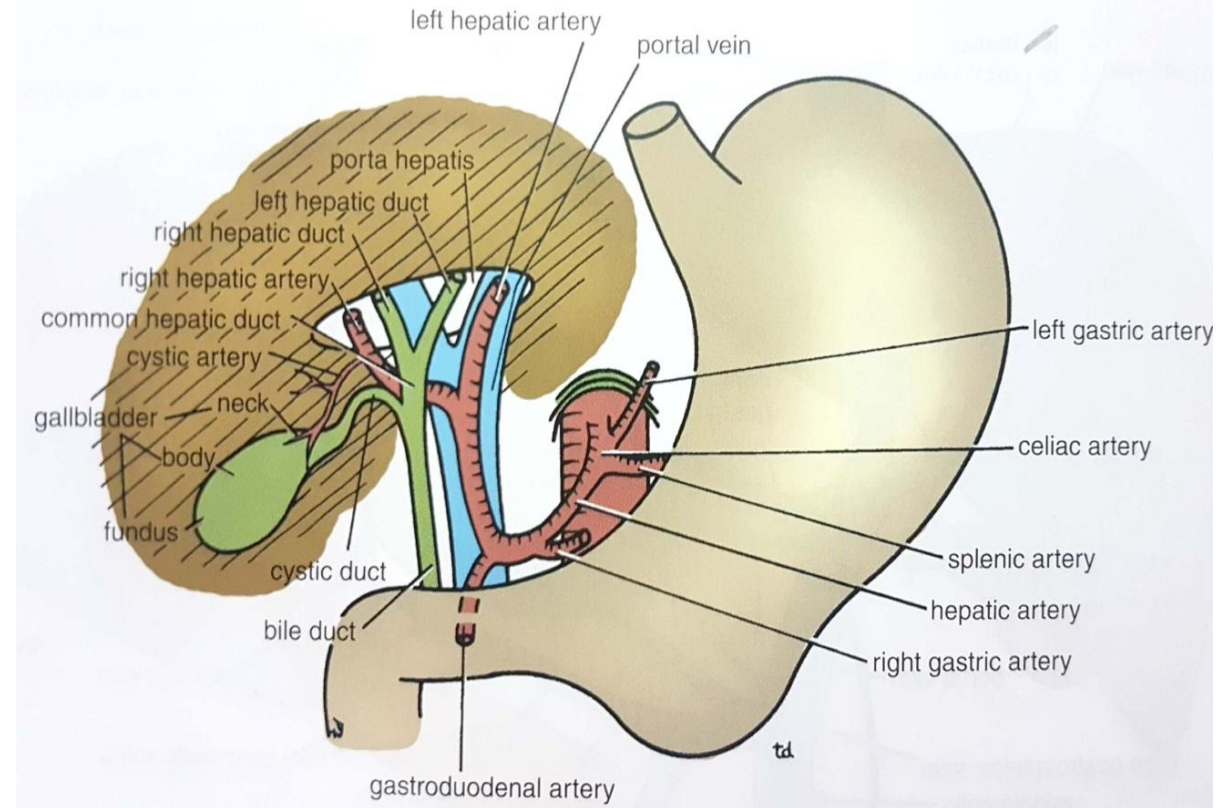


The Biliary Tree

- The biliary tree is a series of gastrointestinal ducts allowing newly synthesized bile from the liver to be concentrated and stored in the gallbladder and releasing it into the duodenum.
- Consists of:
 - **Right and left hepatic ducts**
 - **Common hepatic duct**
 - **Cystic duct**
 - **Common bile duct**

The Hepatic Ducts

- The **right and left hepatic ducts** emerge from the right and left lobes of the liver via the porta hepatis. They unite to form the **common hepatic duct**.
- The common hepatic duct is about **4 cm** in length and descends within the free margin of the lesser omentum.
 - It is joined on the right side by the **cystic duct** from the gallbladder to form **the common bile duct**.



Common Bile Duct

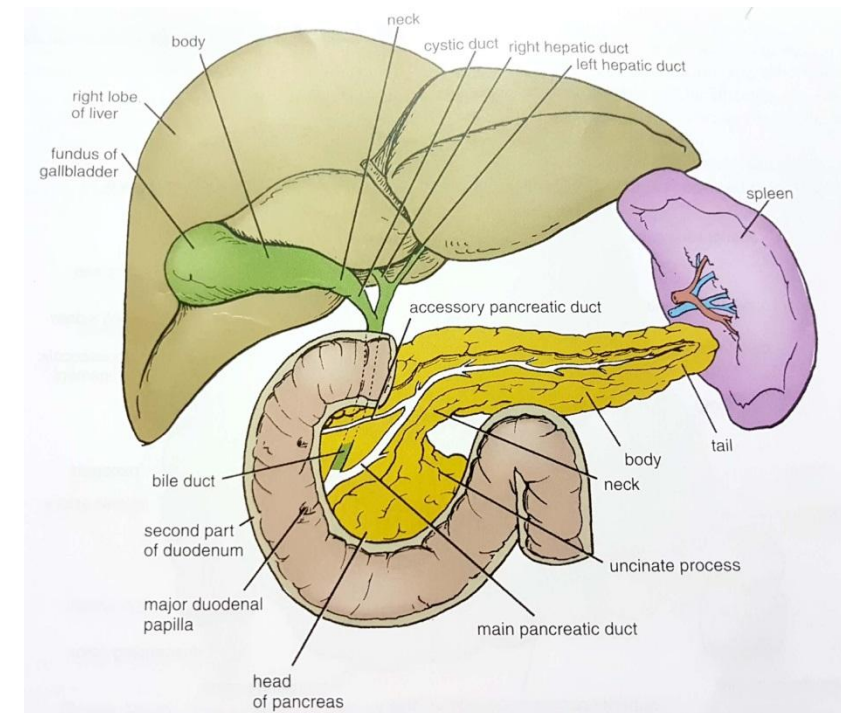
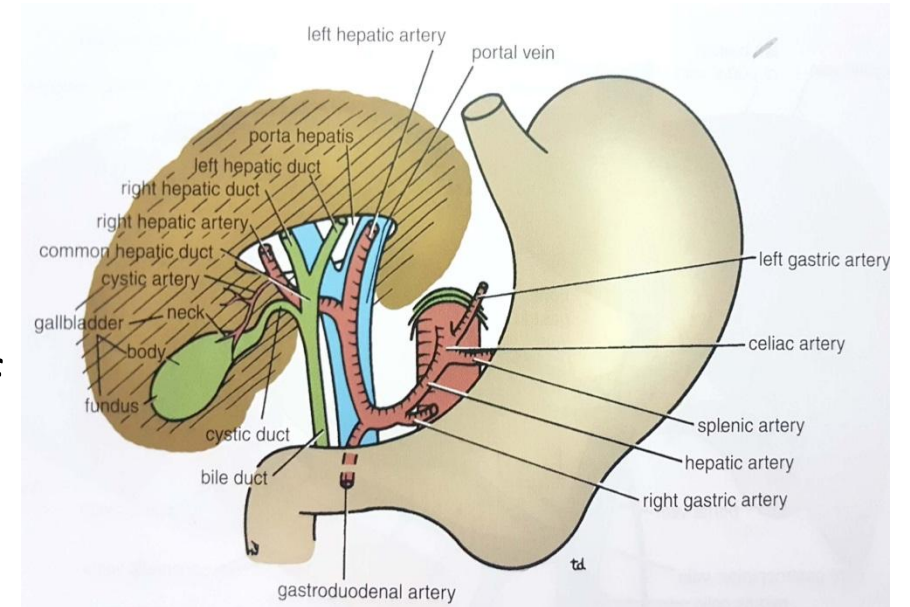
- The common bile duct, is 8 cm long:

1ST part of its course: lies in the right free margin of lesser omentum, in front the portal vein and right to the hepatic artery

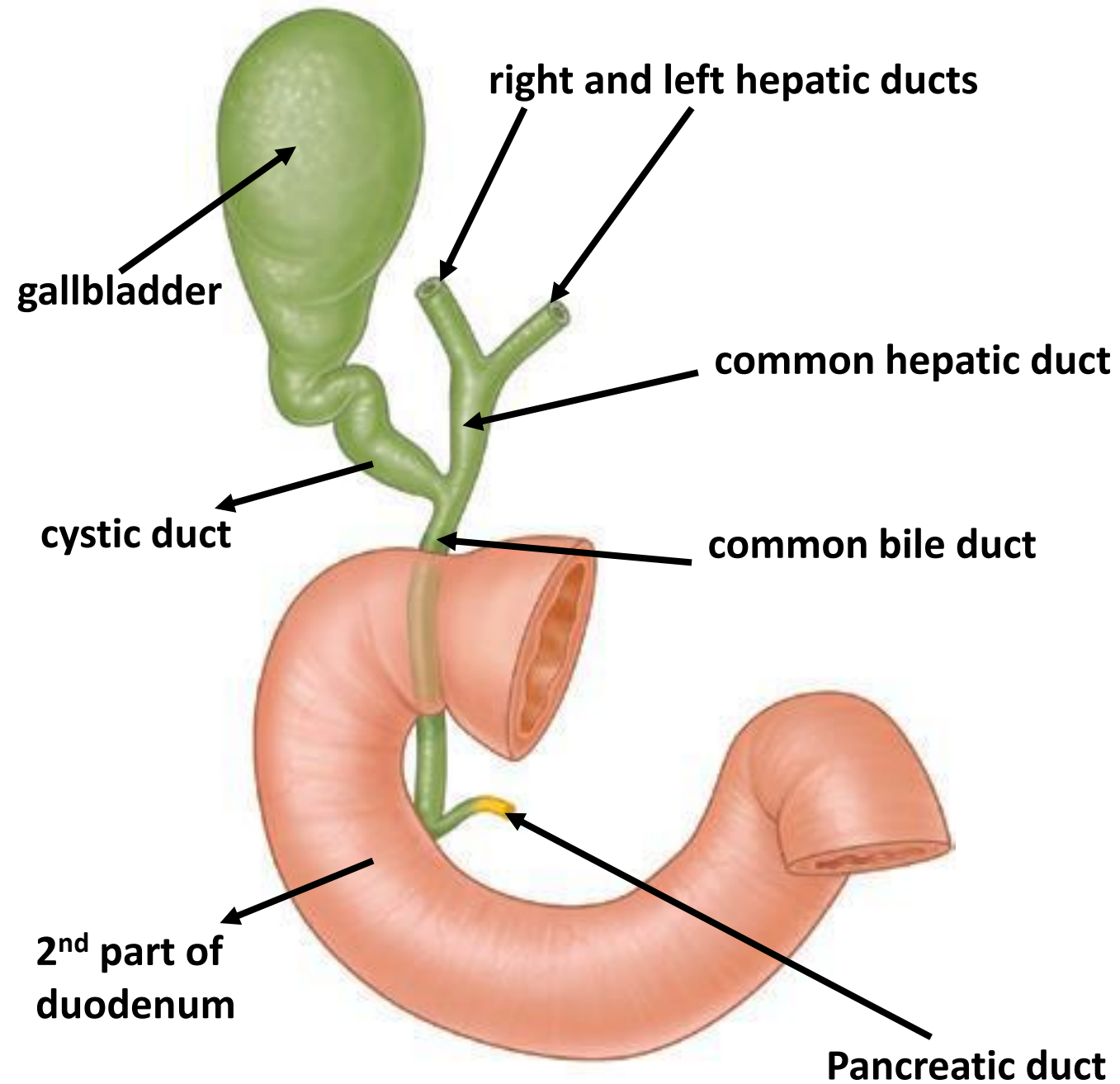
2nd part of its course: lies posterior to the first part of duodenum to the right of gastroduodenal artery.

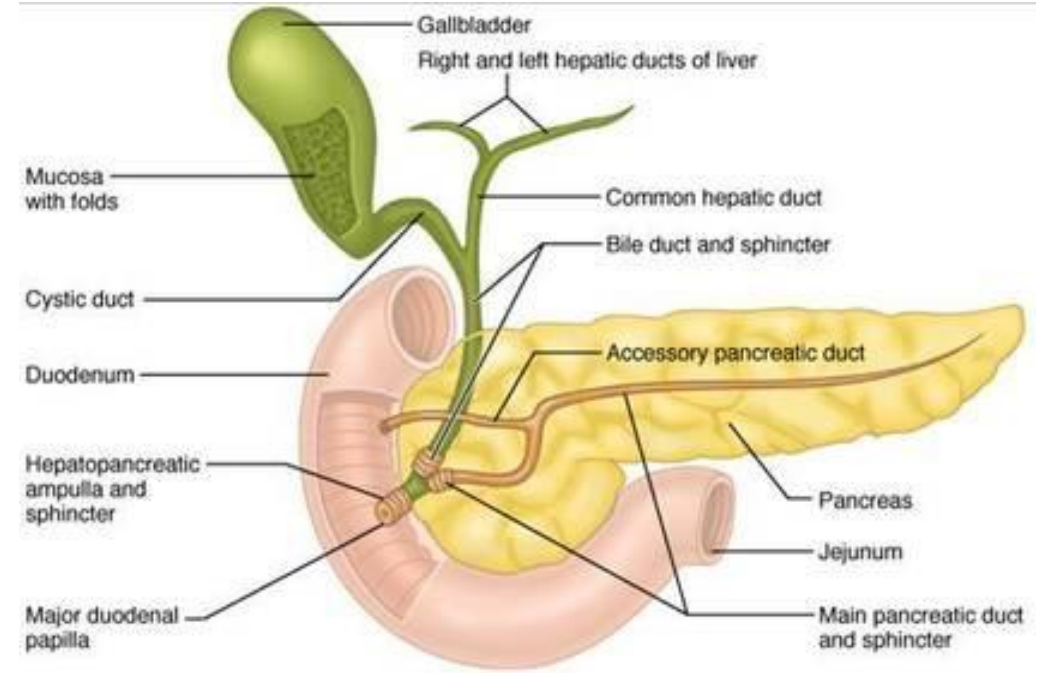
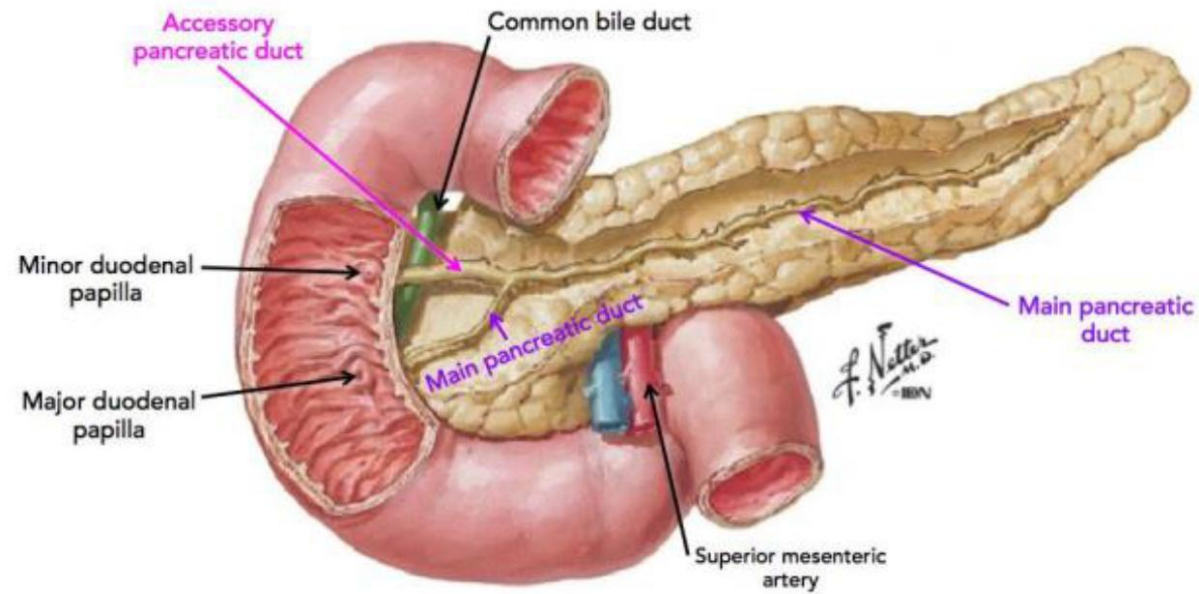
3rd part of its course: lies in a groove on the posterior surface of the head of pancreas. Where it is **joined by the main pancreatic duct**

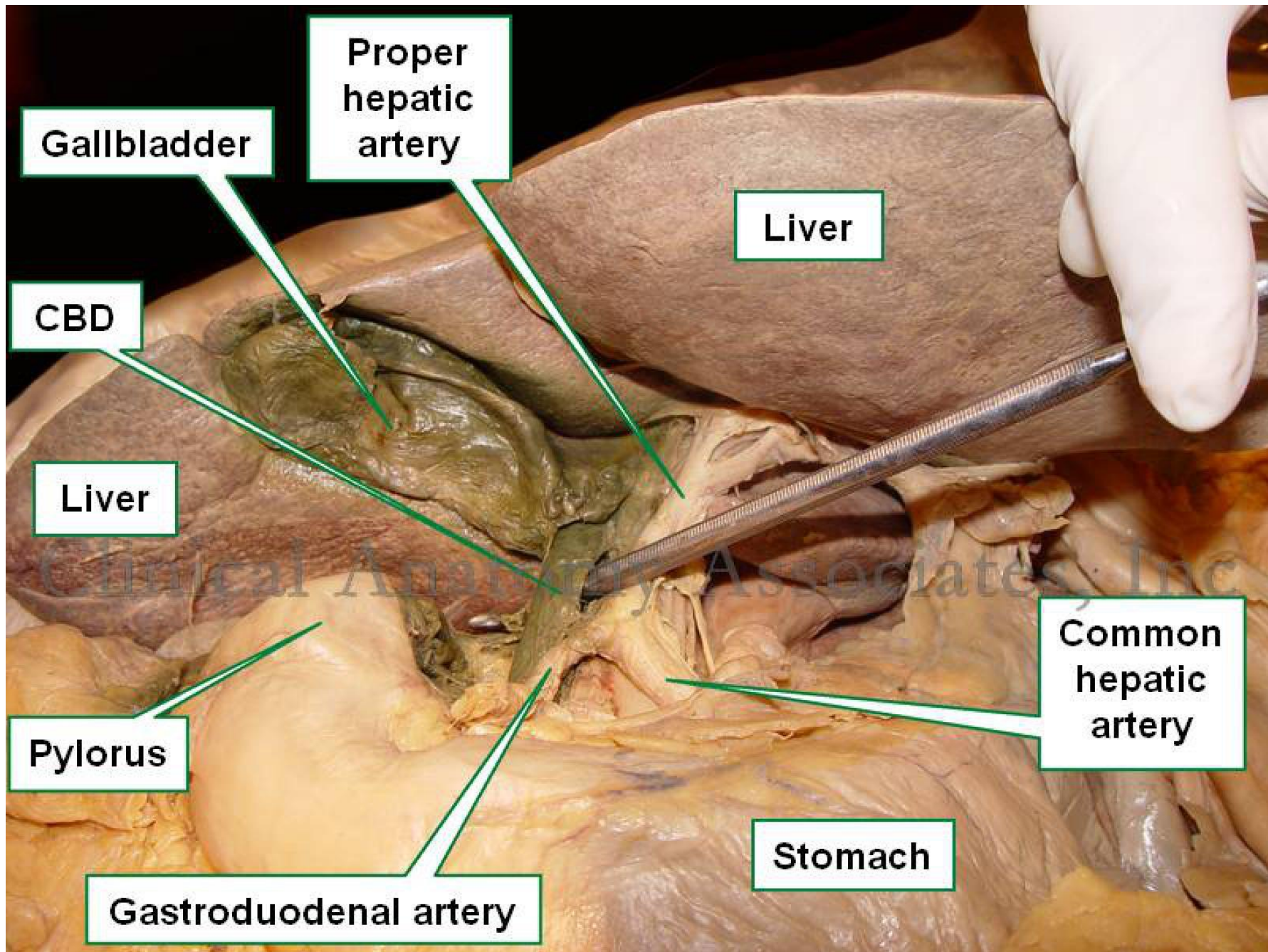
- Together they open into the **hepatopancreatic ampulla** in the wall of the 2nd part of the duodenum which opens into its lumen on the summit of the **major duodenal papilla**



Biliary system



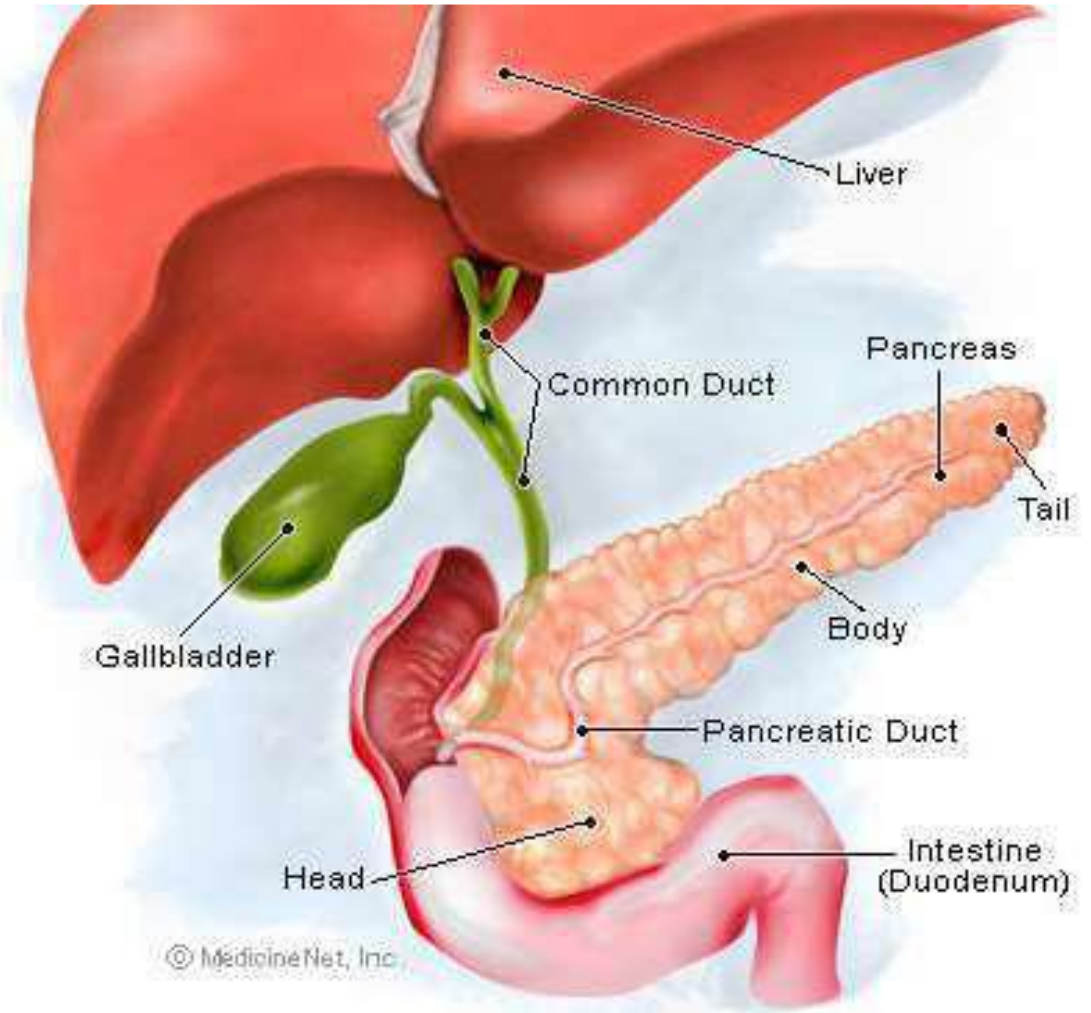




Pancreas

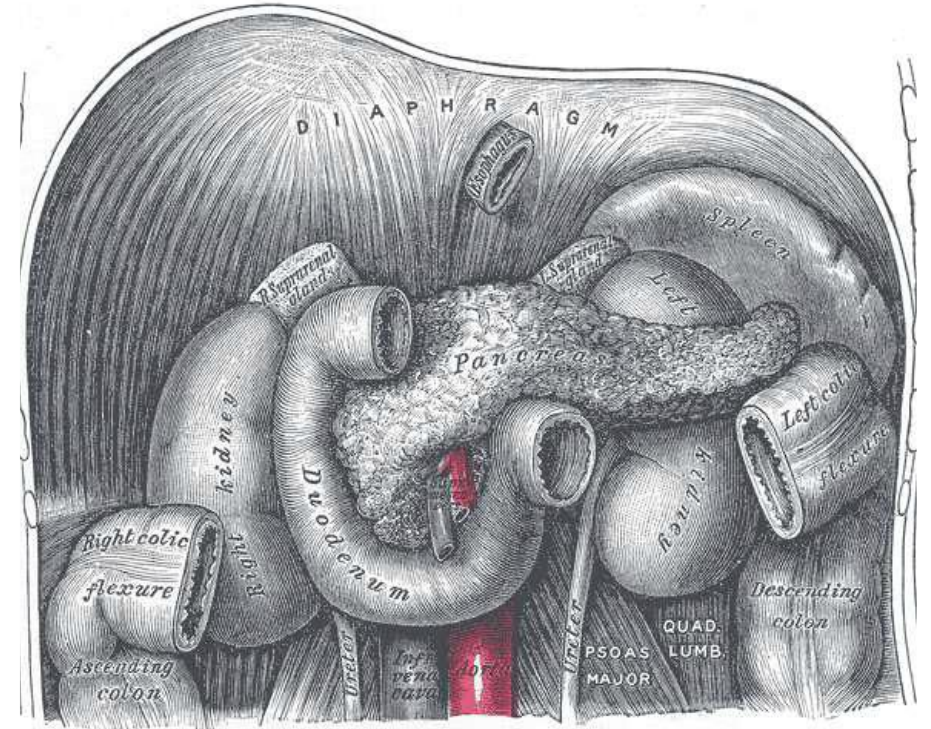
Pancreas

- Soft, lobulated elongated gland with both exocrine and endocrine functions
 - **Exocrine** – pancreatic juice
 - **Endocrine**- insulin, Glucagon
- Its measurement are:
 - Length: 12–15 cm.
 - Width: 3–4 cm.
 - Weight: 80–90 g.



Location of Pancreas

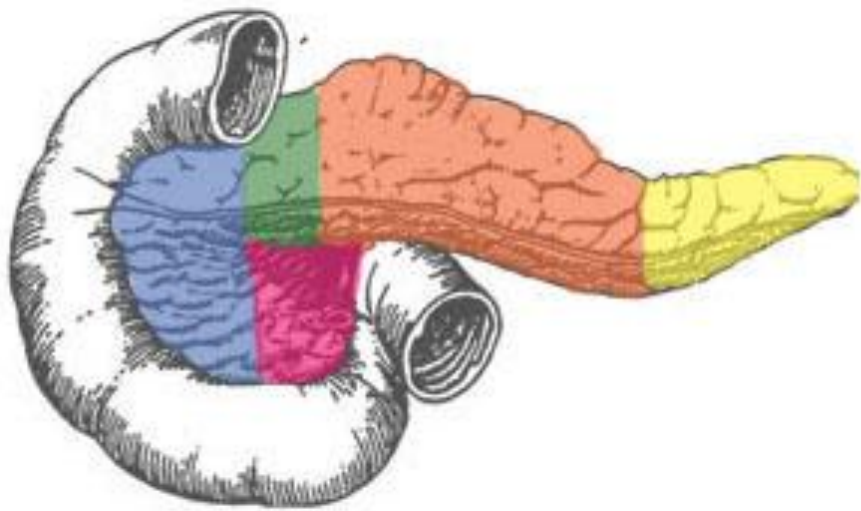
- In the epigastric and left hypochondriac regions.
- Retroperitoneal structure
- Lies almost horizontally across the posterior abdominal wall
- Extent: extends from concavity of the duodenum to the hilum of spleen opposite the level of L1– L3 vertebrae.



Anatomical Structure

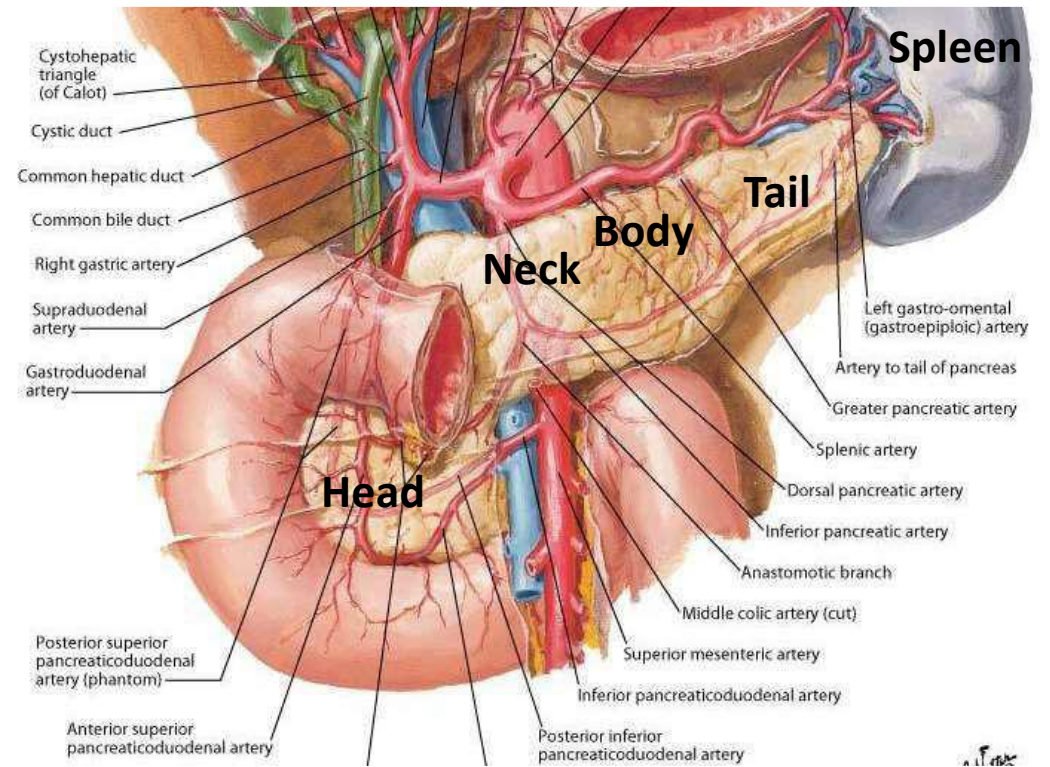
For descriptive purposes, the pancreas is subdivided into four parts:

- 1. Head** – the widest part of the pancreas. It lies within the C-shaped curve created by the duodenum. From its lower
 - **Uncinate process** – a projection arising from the lower part of the head and extending medially to lie posterior to the superior mesenteric vessels.
- 2. Neck** – located between the head and the body of the pancreas. It overlies the superior mesenteric vessels which form a groove in its posterior aspect.
- 3. Body** – centrally located, crossing the midline of the human body to lie behind the stomach and to the left of the superior mesenteric vessels.
- 4. Tail** – the left end of the pancreas that lies within close proximity to the hilum of the spleen. It is contained within the splenorenal ligament with the splenic vessels. This is the only part of the pancreas that is intraperitoneal.

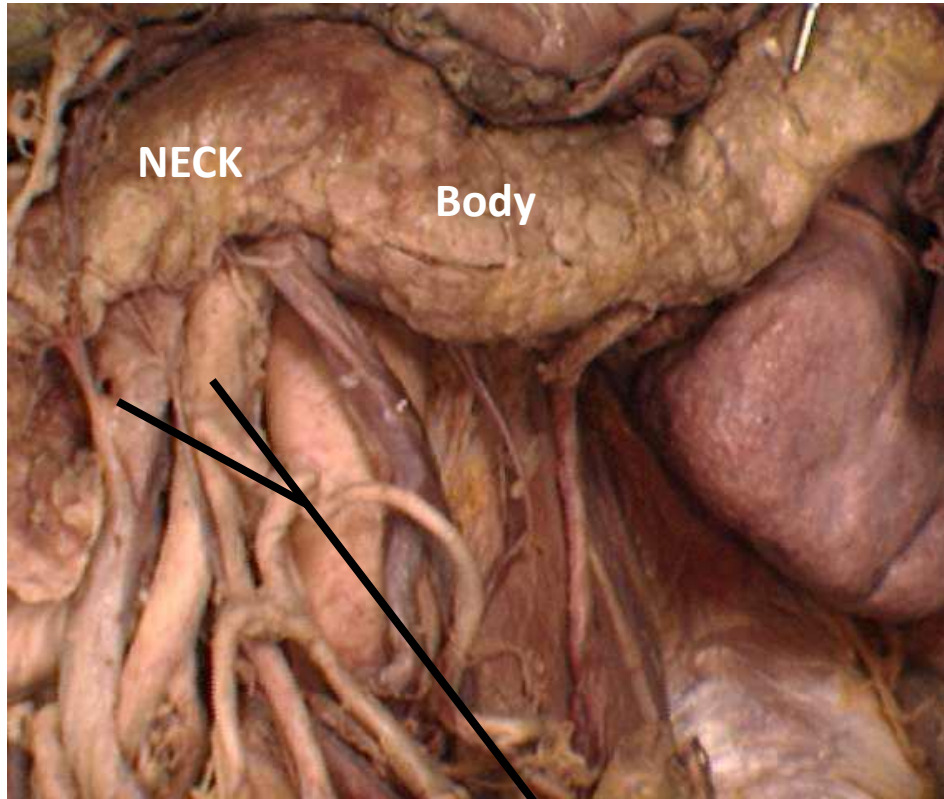


- Uncinate process**
- Head**
- Neck**
- Body**
- Tail**

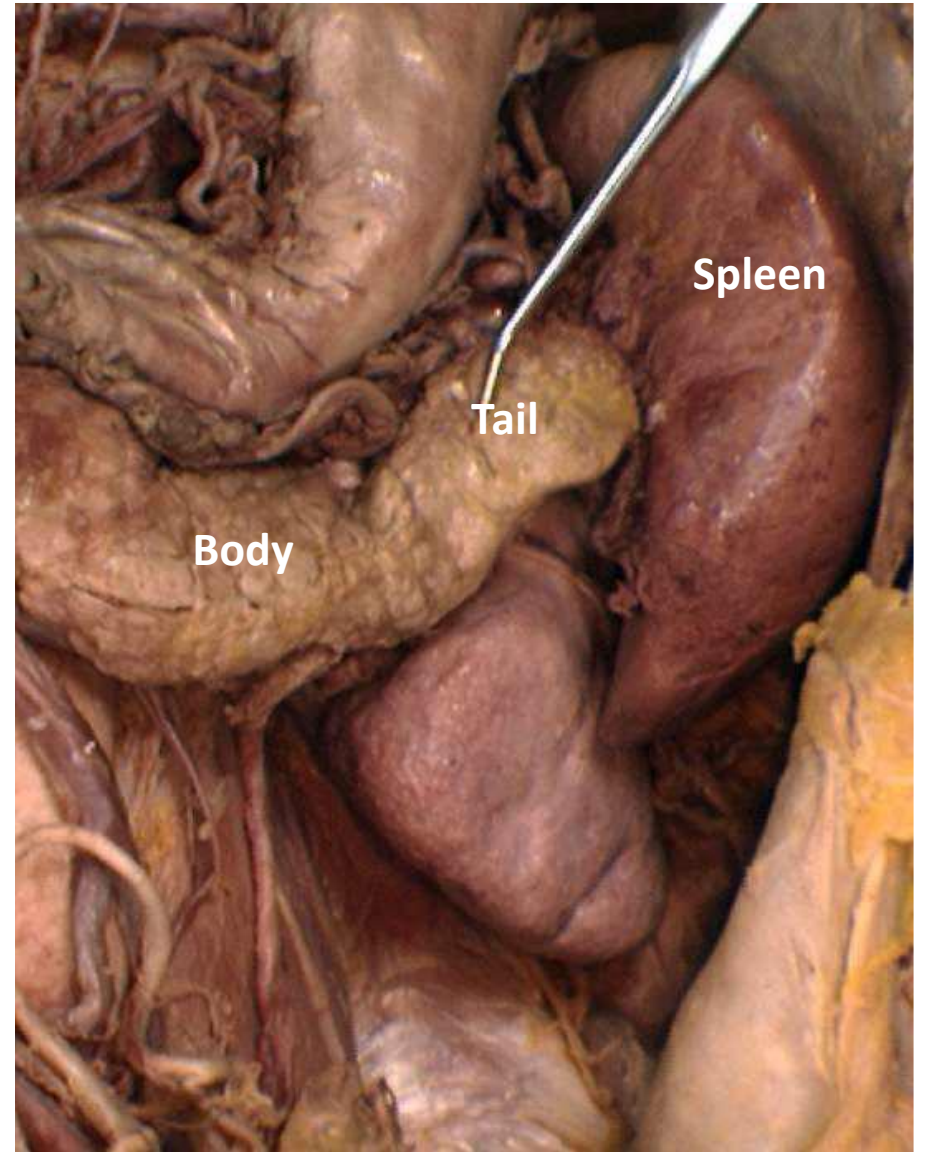
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Superior mesenteric vessels



The Relation of Pancreas

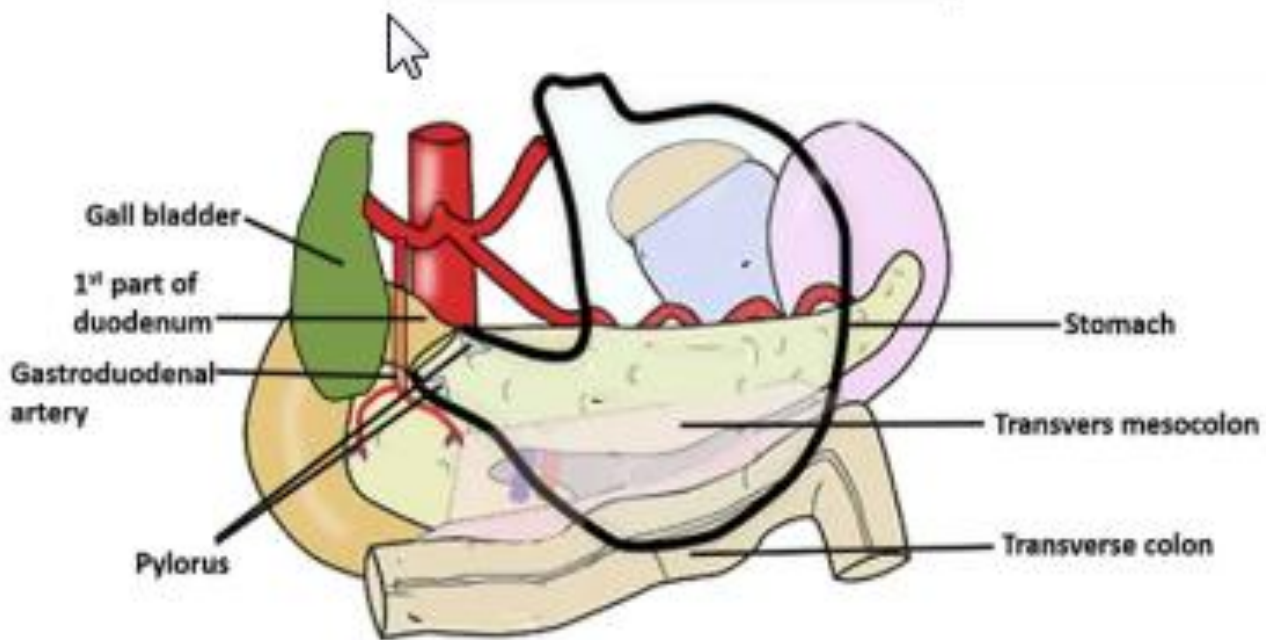
The pancreas has direct anatomical relations to several structures:

- **Stomach:** lie anterior to the pancreas separated from it by the lesser sac.
- **Duodenum:** The 1st part of the lies anterior to the head of pancreas, whereas the 2nd part lies laterally to the right of the pancreatic head.
- **Transverse mesocolon:** attaches to the anterior surface of the pancreas
- **Common bile duct:** Descends behind the head of the pancreas before opening into the second part of the duodenum alongside the major pancreatic duct through the major duodenal papilla
- **Spleen:** located postero-laterally.

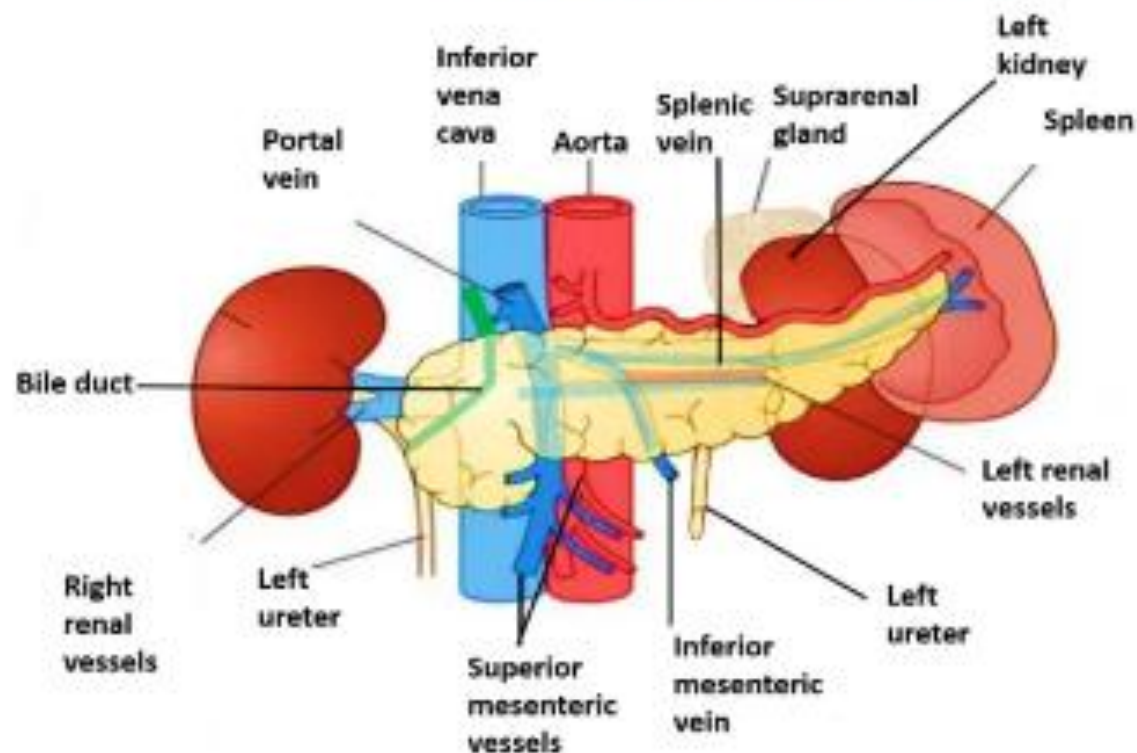
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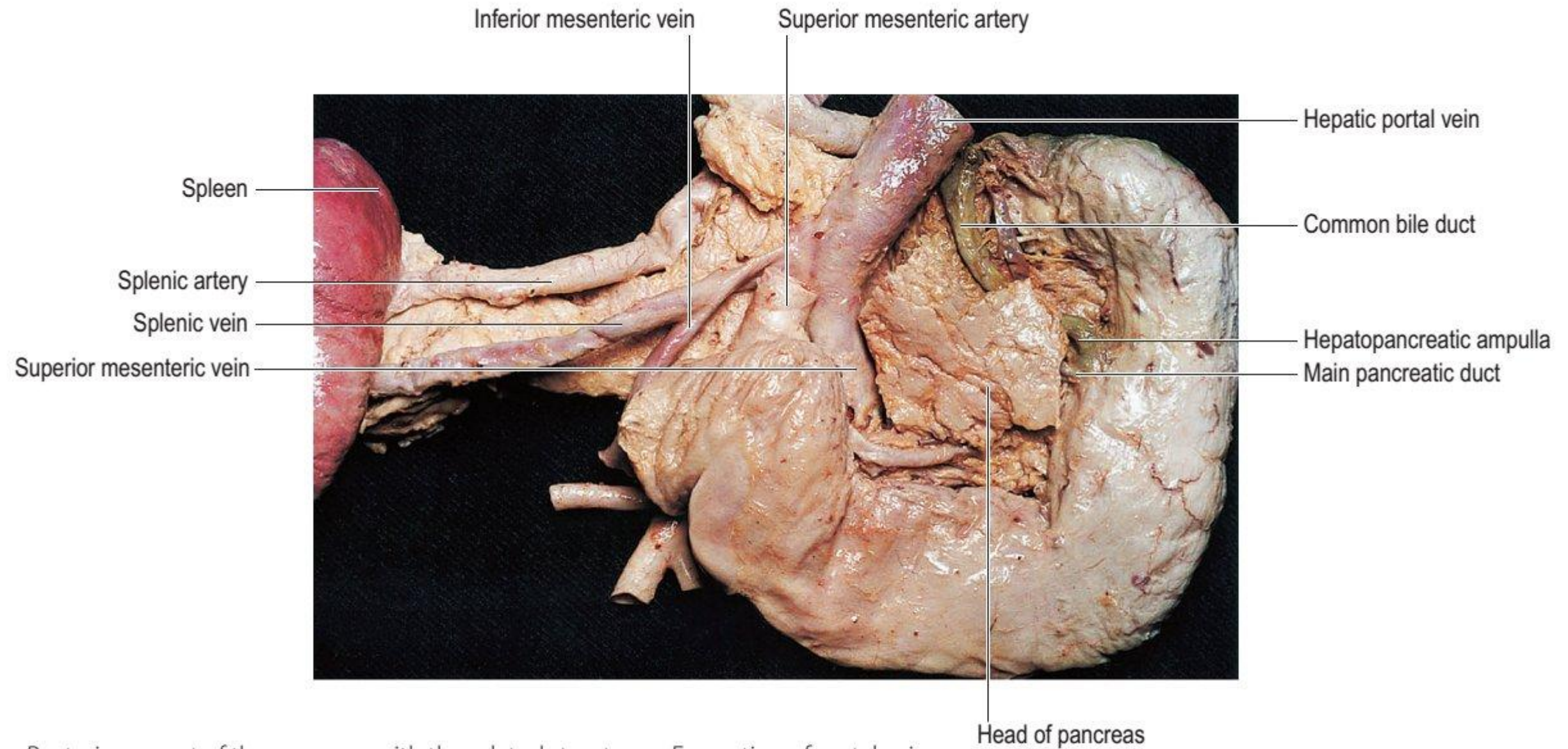
- **The aorta and inferior vena cava** pass posteriorly to the head of the pancreas
- **The superior mesenteric artery** lies behind the neck of the pancreas and anterior to the uncinate process.
- Posterior to the neck of the pancreas, **the splenic and superior mesenteric veins** unite to form the hepatic portal vein.
- As it journeys from its origin at the celiac plexus to the splenic hilum, **the splenic artery** pass on the superior border of the pancreas.

Anterior Relations of Pancreas



Posterior Relations of Pancreas

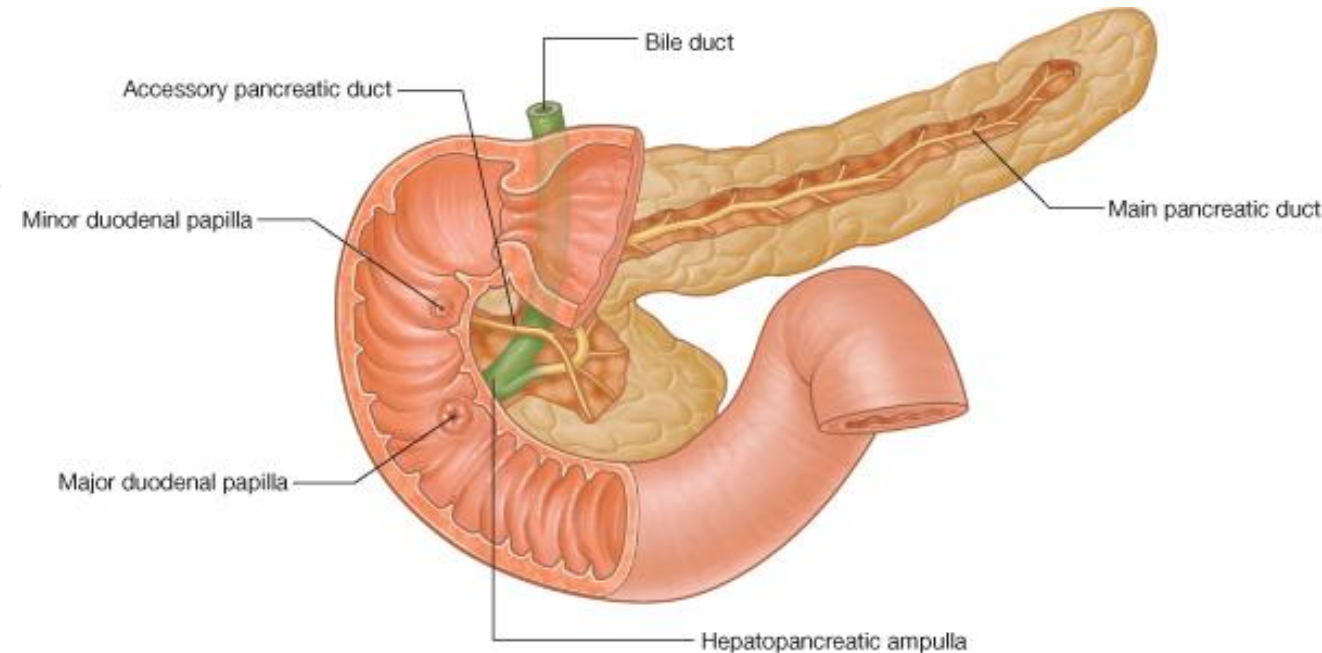




Posterior aspect of the pancreas with the related structures. Formation of portal vein.

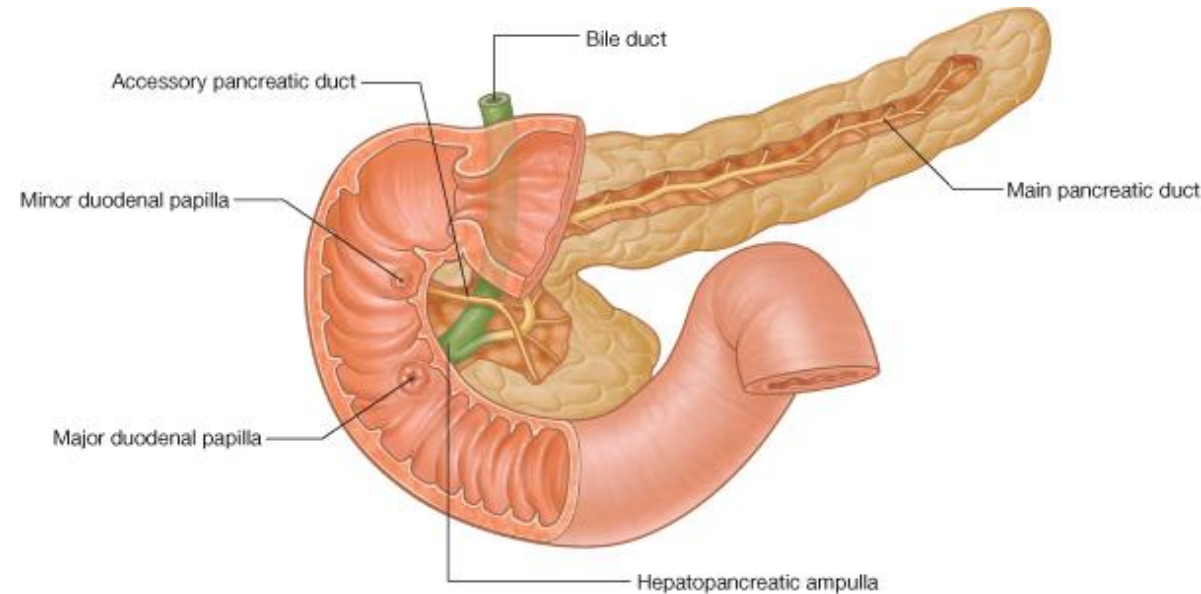
The Duct System

- Exocrine part of the pancreas pours its secretion through two ducts:
 - The main pancreatic duct
 - The accessory duct



The main Pancreatic duct :

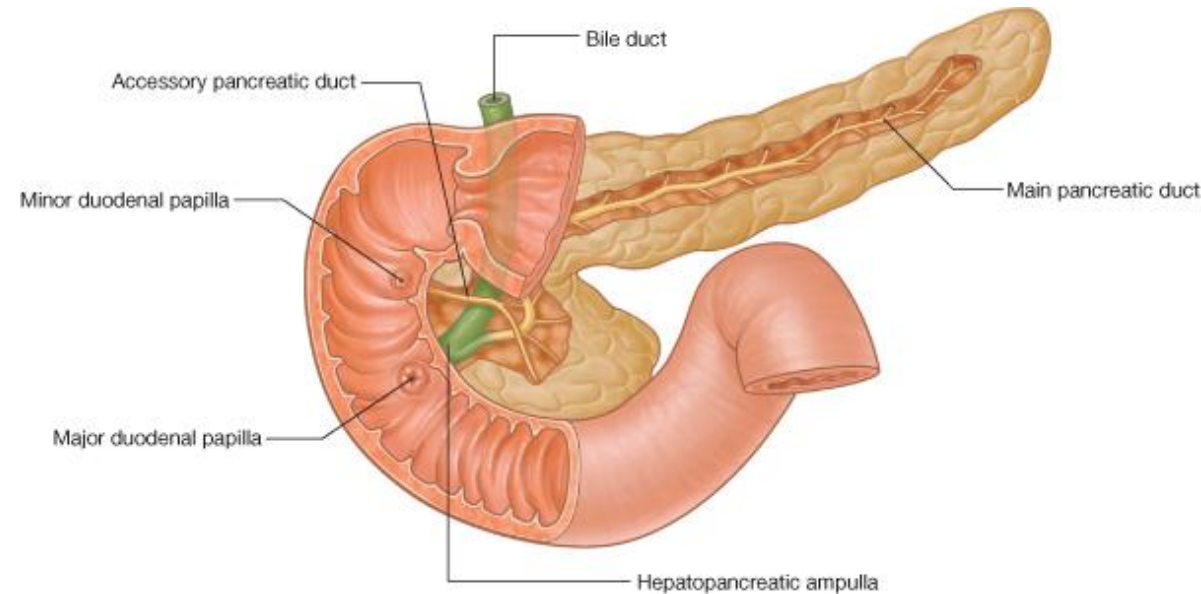
- Commence from the tail
- It then passes through the body of pancreas
- Following this it passes through the lower part of head.
- Then pierce the wall of **2nd part duodenum** and join the common bile duct to form **hepatopancreatic ampulla** that open at the **major duodenal papilla**



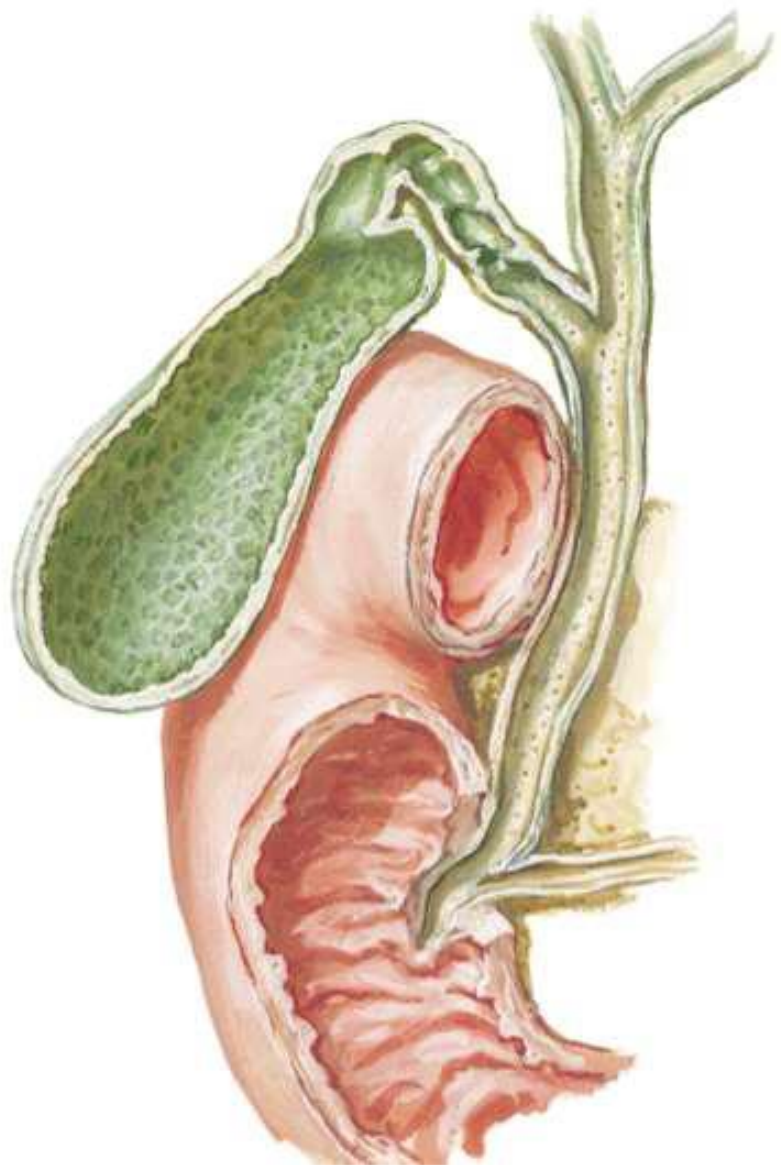
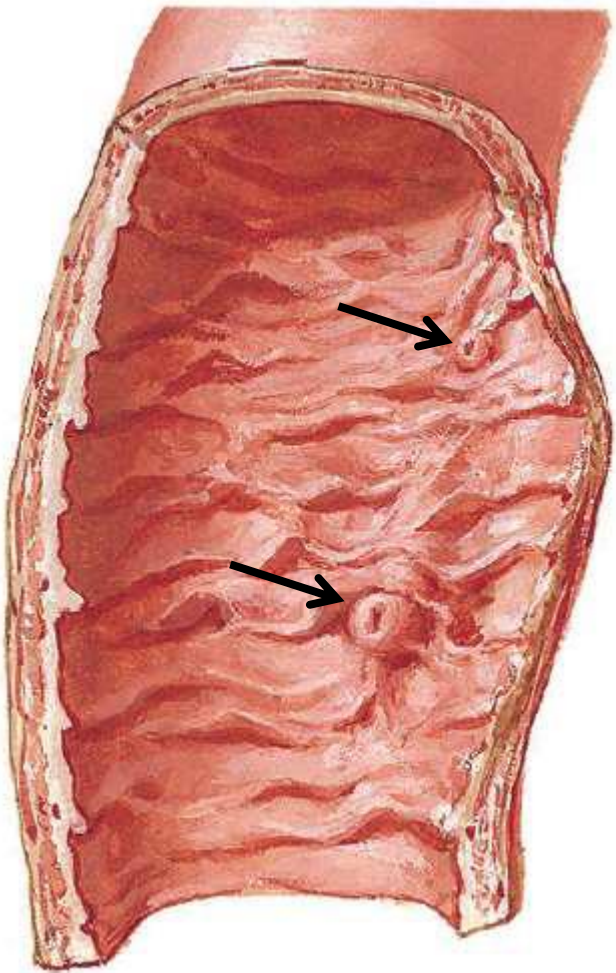
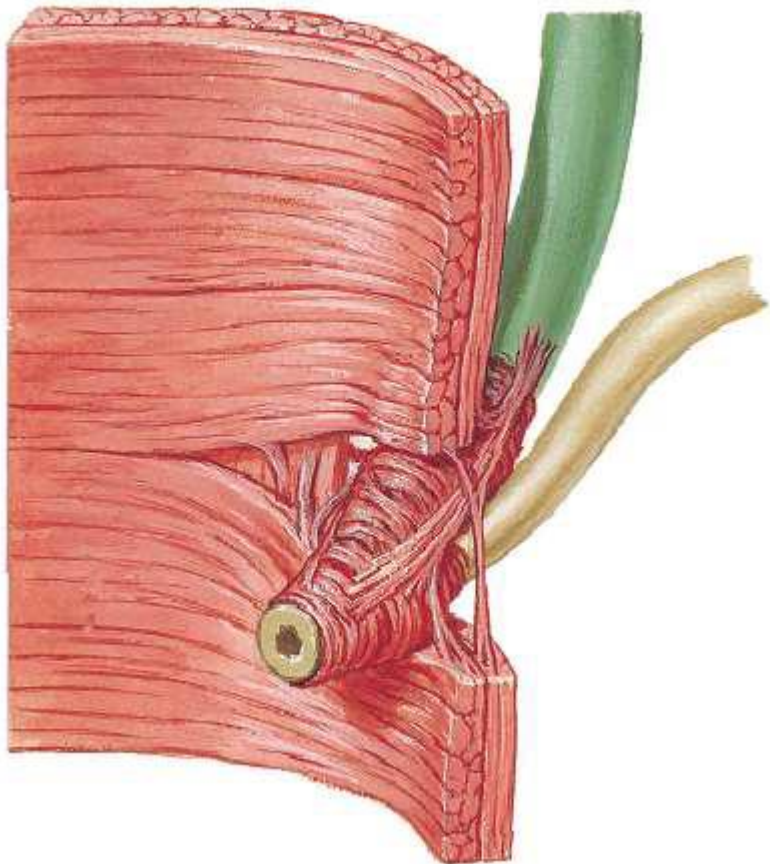
- Secretions into the duodenum are controlled by a muscular valve – **the sphincter of Oddi**. It surrounds the ampulla of Vater, acting as a valve.

The accessory Pancreatic duct :

- Commence from the uncinete process
- Pass upward to the right
- Cross the main pancreatic duct
- Open on the **2nd part duodenum** on the **minor duodenal papilla**



Hepatopancreatic ampulla of vater
Major duodenal papilla
Sphincter of Oddi



Thank you

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