

الجهاز الهضمي

علم التشريح

رقم المحاضرة : 3



الكتاب: ليان العودات ، سارة عمر

المدقق: بشار جادالله

الدكتور: محمد المحتسب

Liver & Gallbladder

Red: professor's explanation

Underlined: what the professor has mentioned from the slides

Purple: important lines

Blue: additional details

Parts the doctor explains on images will be highlighted

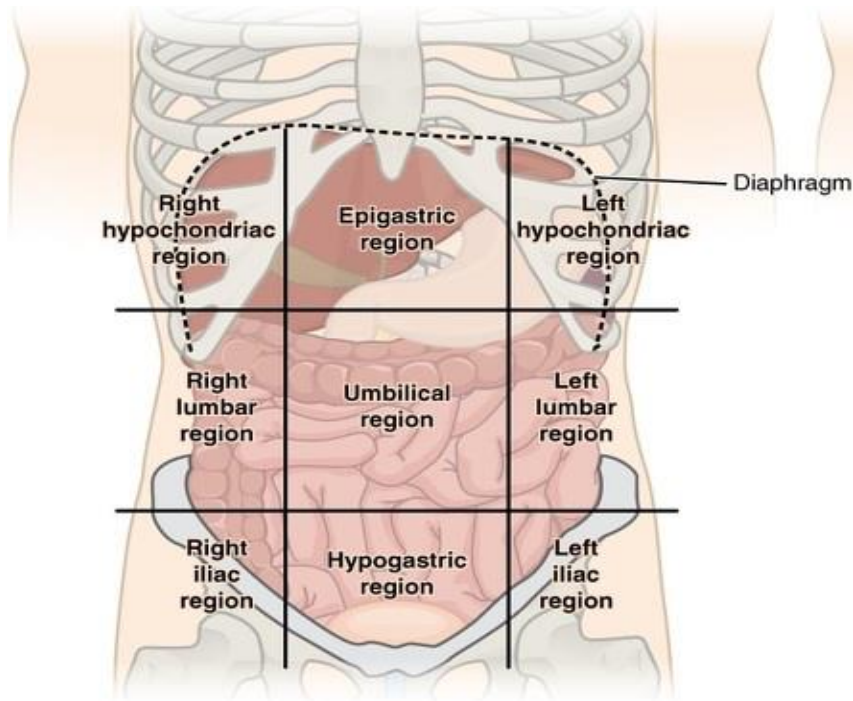
Liver

- The liver is the largest gland in the body and has a wide variety of functions.
- Weight: 1/50 of body weight in adult & 1/20 of body weight in infant **because it is more active in infants.**
- It is exocrine (bile and bile salts that are released into the second part of duodenum through the common bile duct) & endocrine organ (Albumin, globulin, prothrombin & fibrinogen).

- **Functions of the liver:**
- Secretion of bile & bile salt
- Metabolism of carbohydrate, fat and protein
- Formation of heparin as anticoagulant & other substances important in coagulation
- Detoxication **the drugs we take are toxic materials that the body needs to excrete through the liver or the kidneys**
- Storage of glycogen and vitamins **important for energy**
- Activation of vit .D

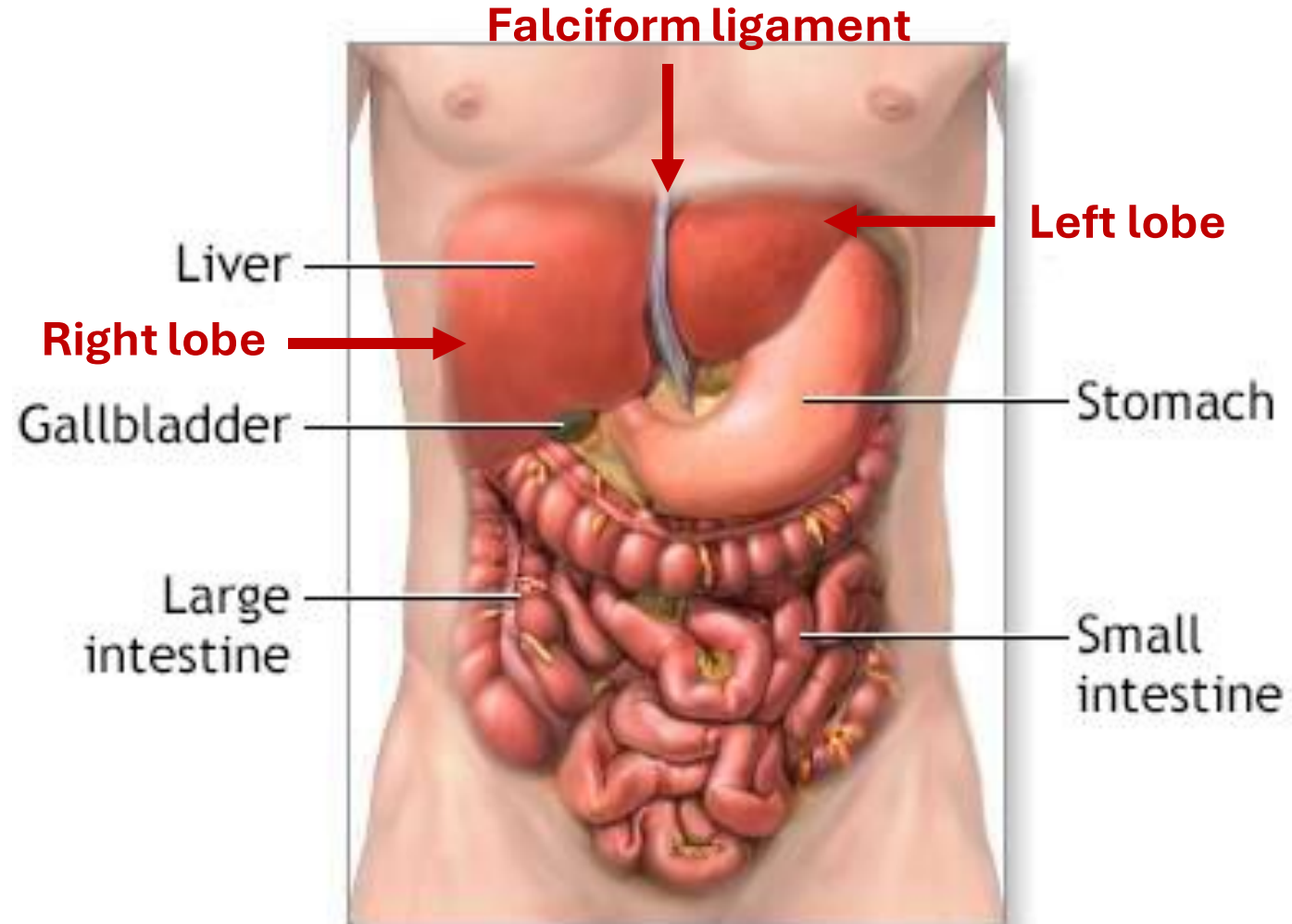
Location ...

- Occupies right hypochondrium + epigastrium & extends to left hypochondrium (left lobe).



(a) Abdominopelvic regions

[Additional image](#)

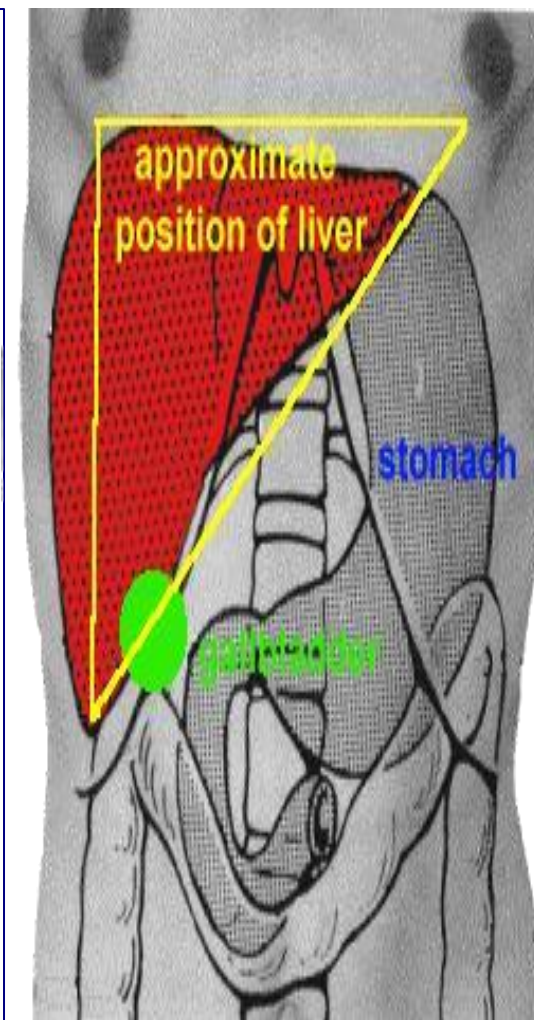
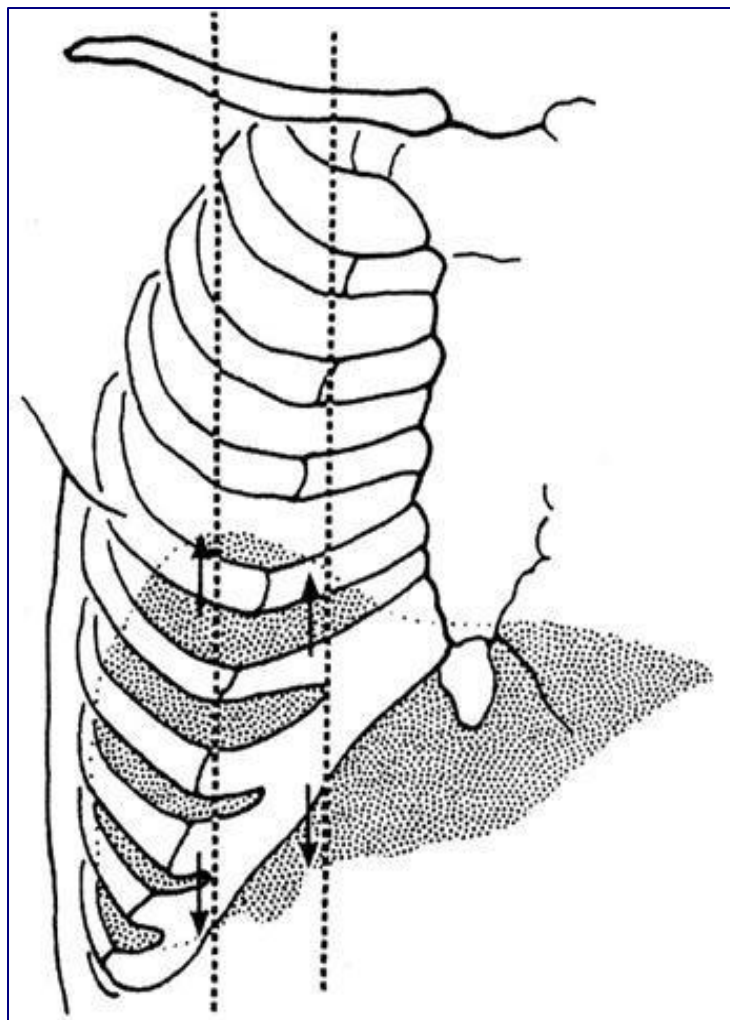


Surface anatomy of the liver

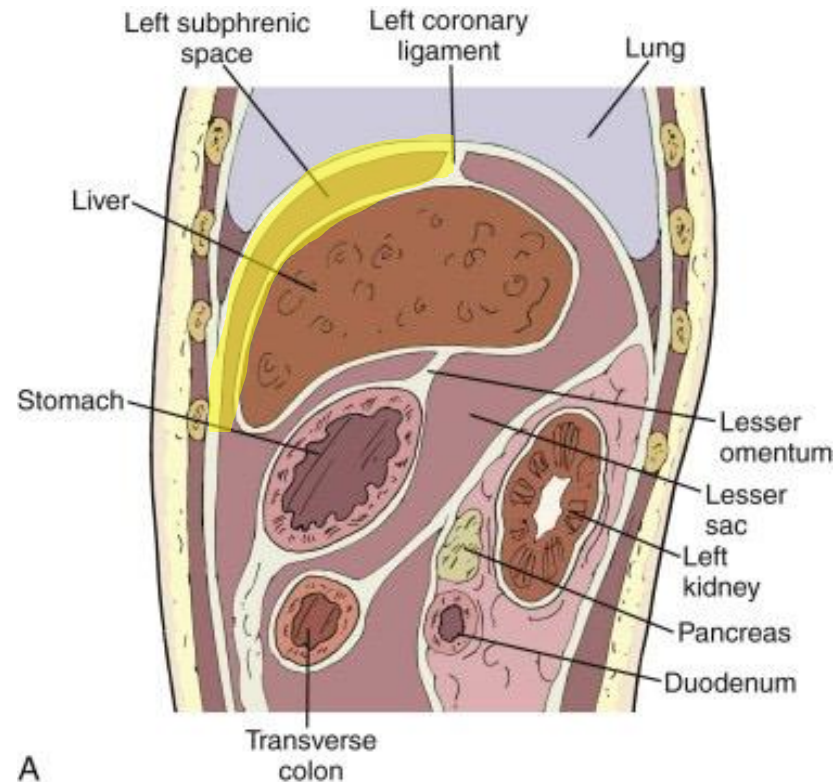
-The greater part of the liver is situated under cover of the right costal margin

(Right side of the liver reaches the 5th costal cartilage.)

- Diaphragm separates it from the pleura, lungs, pericardium, and heart.

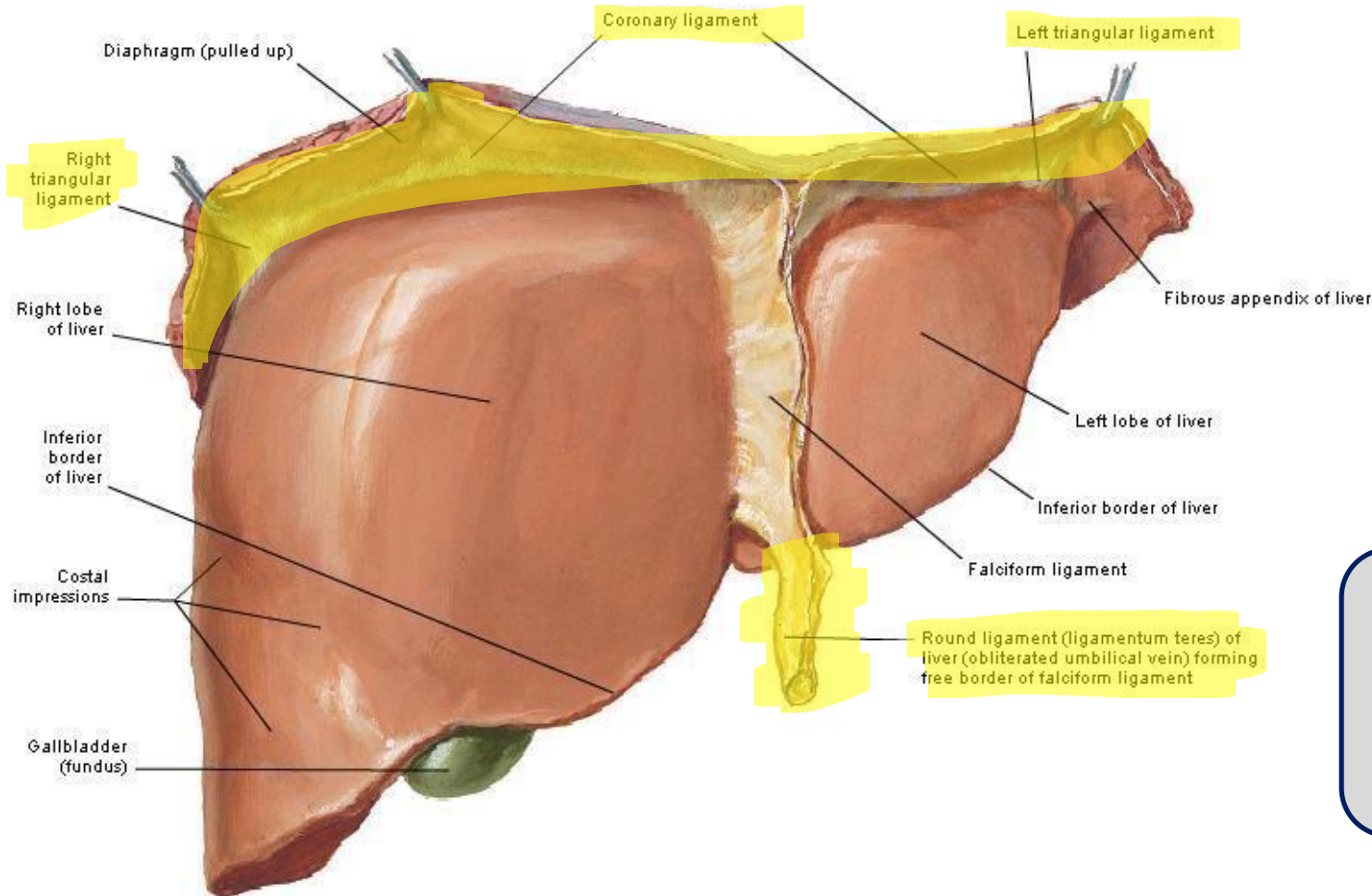


The liver consists of right and left lobes separated by falciform ligament, which is attached to anterior abdominal wall anteriorly and diaphragm superiorly. Between the anterior abdominal wall and the diaphragm lie the right and left subdiaphragmatic spaces, with the falciform ligament located between them.



additional image

Coronary ligament is the reflection of peritoneum between the diaphragm and upper surface that extends horizontally to form right and left triangular ligaments.



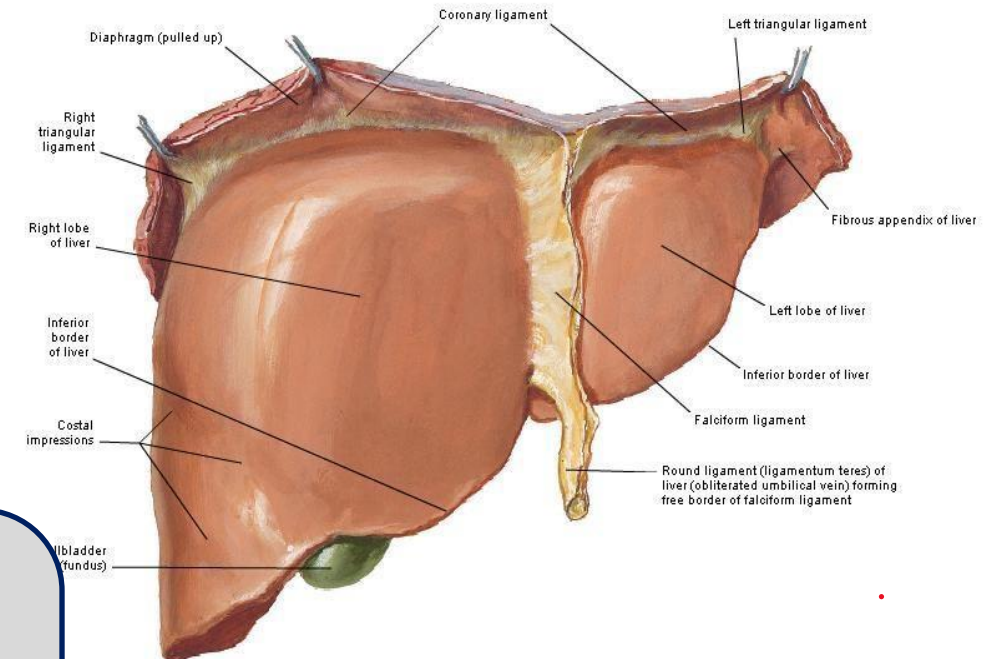
By the end of falciform ligament is ligamentum teres, which is an obliterated umbilical vein.

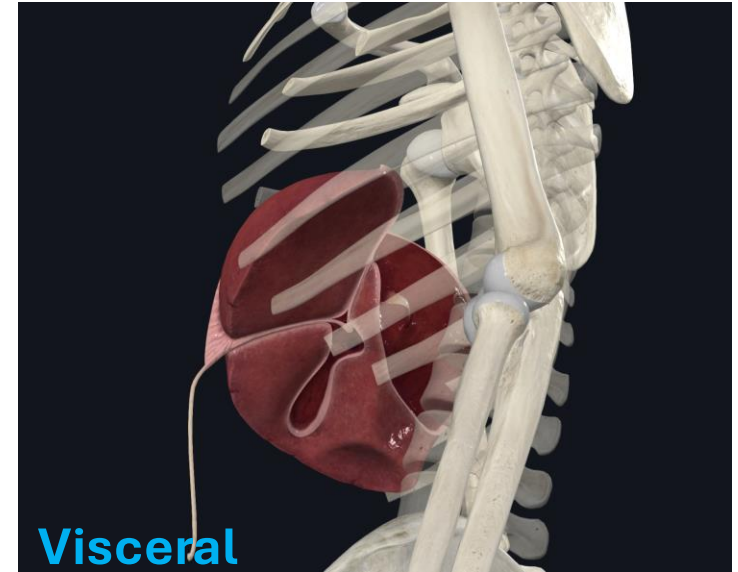
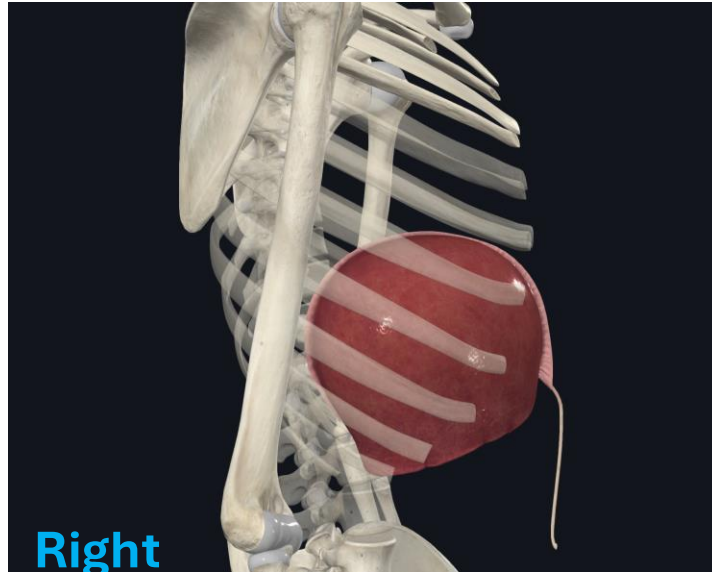
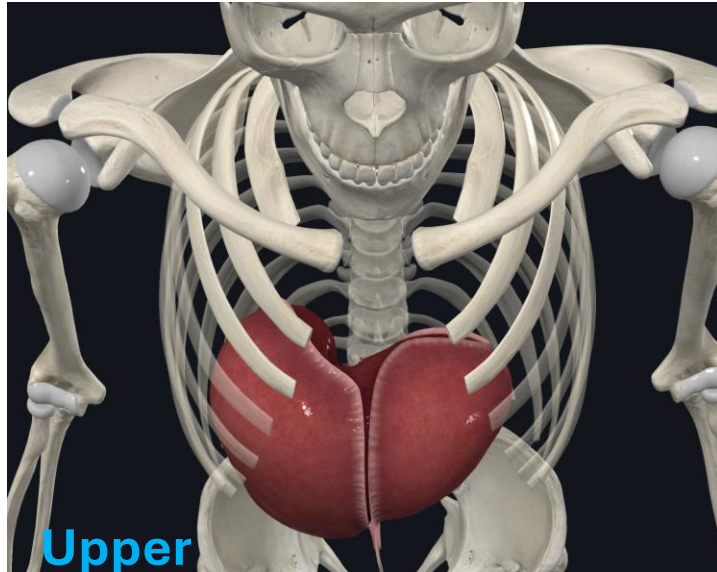
Surfaces of the liver, their relations & impressions

- **Postero-inferior surface=visceral surface**
- **Superior surface =Diaphragmatic surface**
- **Anterior surface**
- **Posterior surface**
- **Right surface**

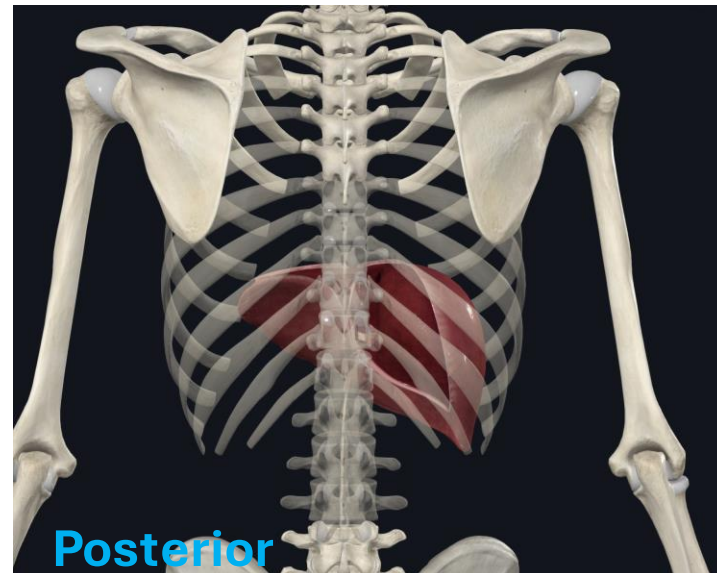
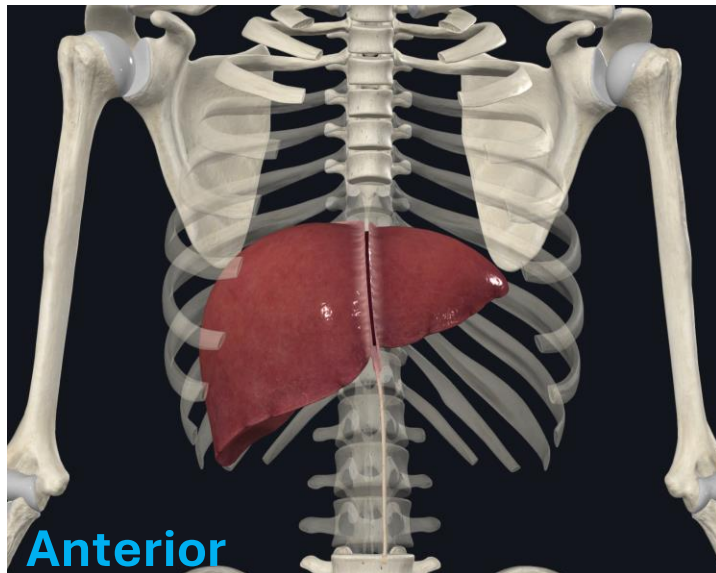
- **The liver has five surfaces; upper, anterior, posterior, right and visceral.**
- **Visceral: related to viscera; directed towards the abdomen.**
- **Right kidney, right suprarenal gland, stomach, esophagus and duodenum are all viscera that make impressions on this surface**

Surfaces and Bed of Liver
Anterior View



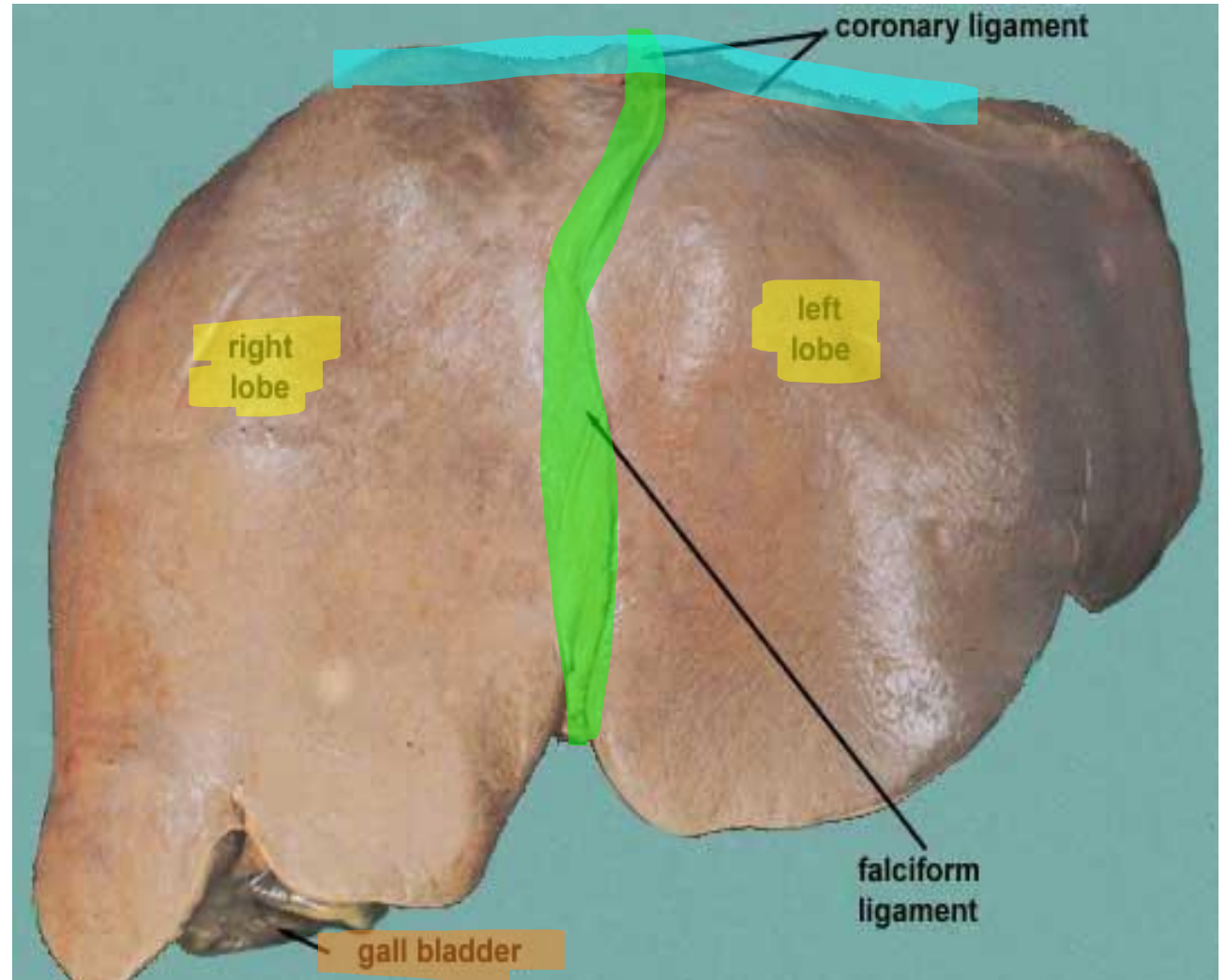


(Additional images)



Ant. View of the liver

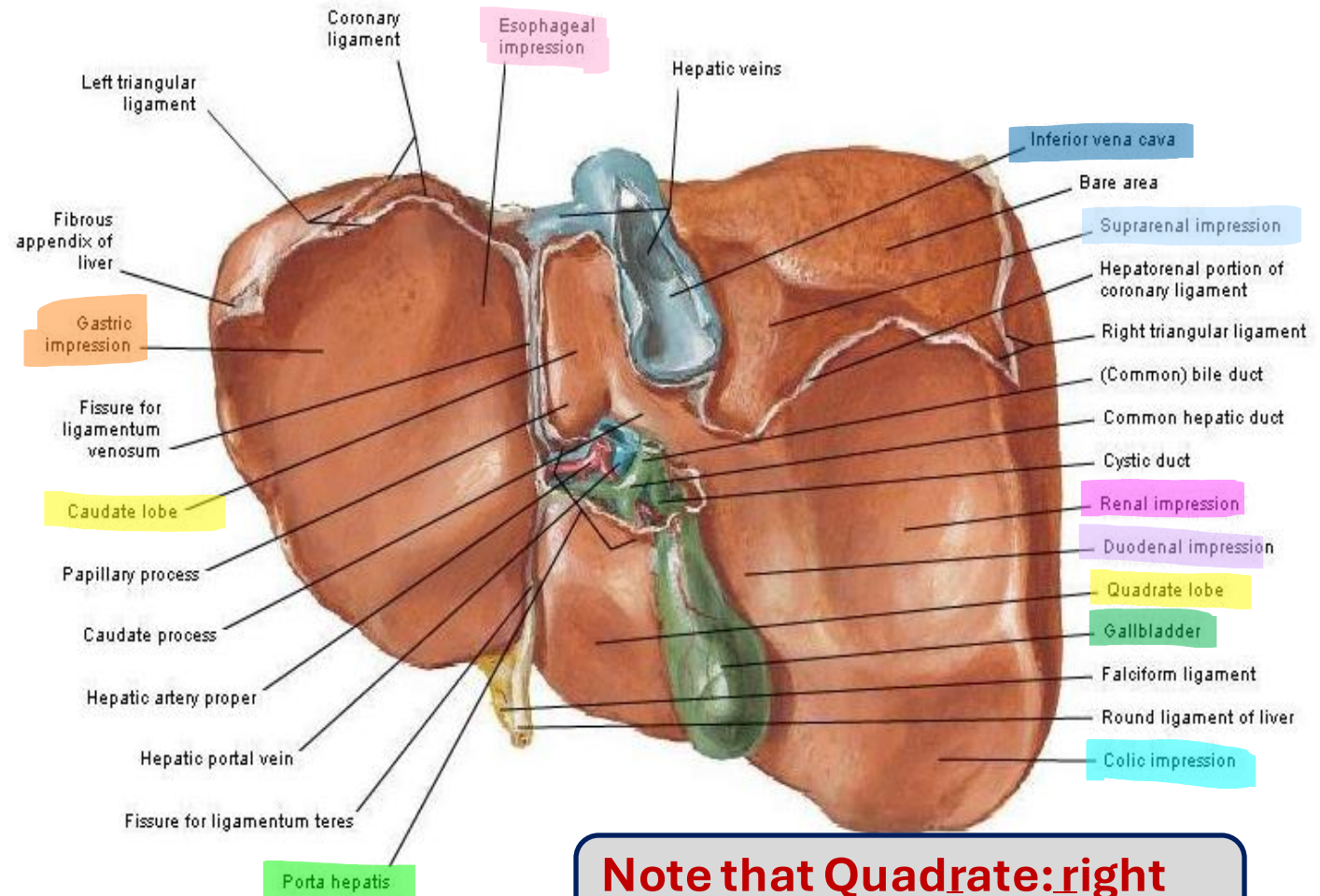
- Right lobe
- Cut edge of the falciform ligament
- Left lobe
- Diverging cut edges of the superior part of the coronary ligament
- Fundus of the gall bladder



Postero- infero surface= visceral surface

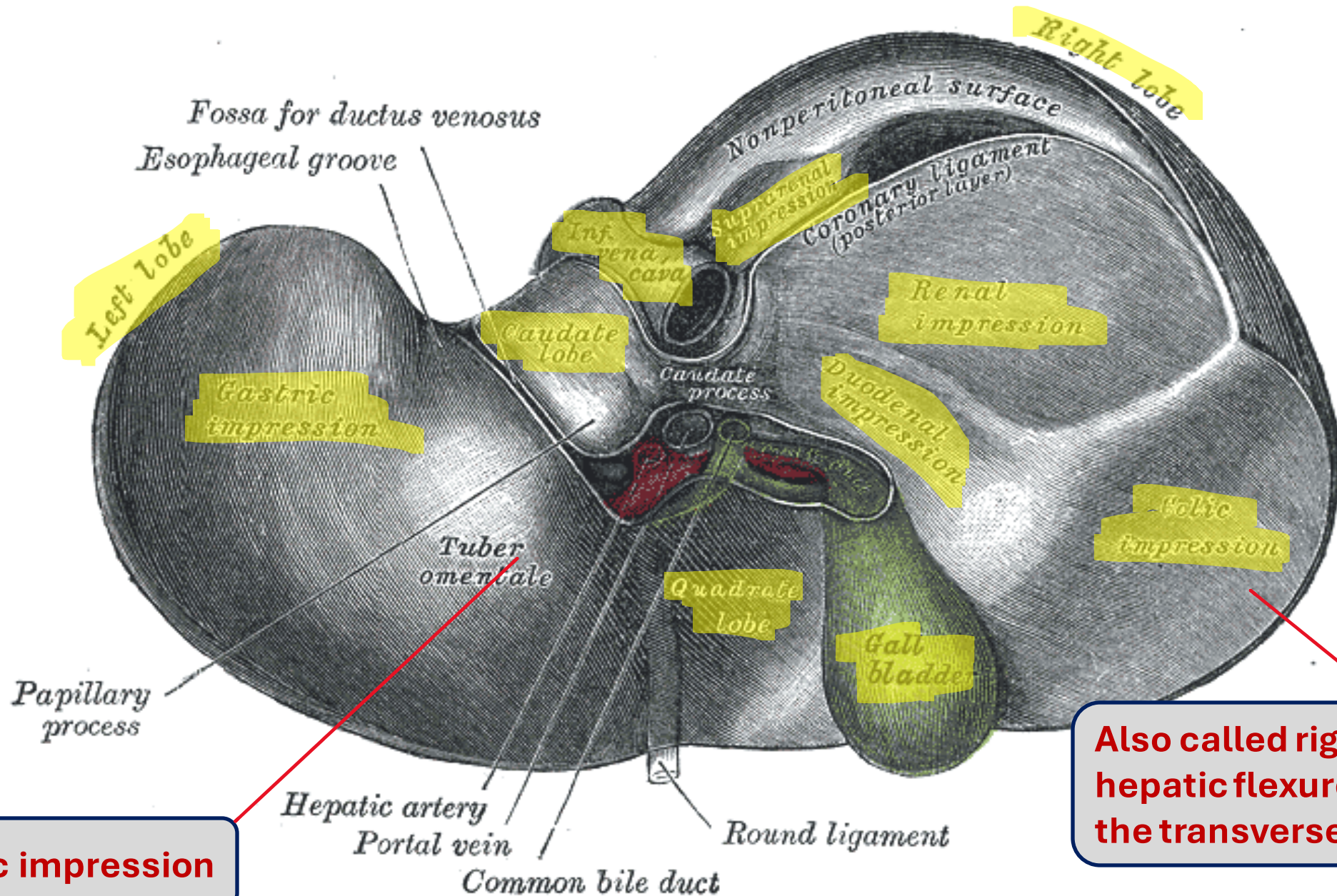
Relations

- **I.V.C**
- **the esophagus**
- **the stomach and pylorus**
- **the duodenum**
- **the right colic flexure**
- **the right kidney**
- **Transverse colon**
- **Rt. Suprarenal gland**
- **the gallbladder.**
- **Porta hepatis: entry of (Hepatic artery, Hepatic vein) and exit of common bile duct**
- **Fissure for lig. Venosum & lesser omentum**
- **Tubular omentum**
- **Lig.teres**



**Note that Quadrate:right
Caudate:left**

Postero-inferior surface of the liver

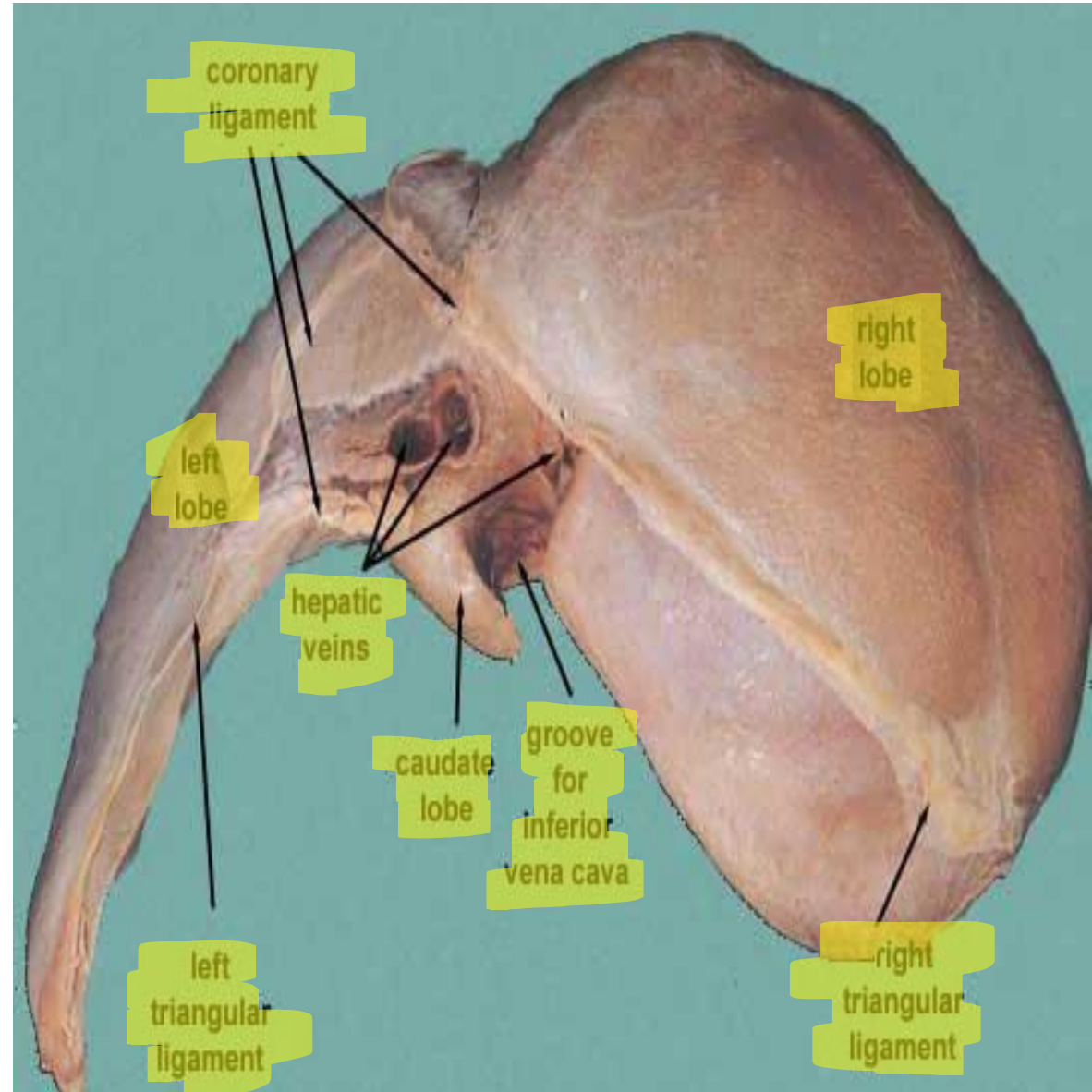


Pyloric impression

Also called right or hepatic flexure, here ends the transverse colon

Sup. Surface of the liver

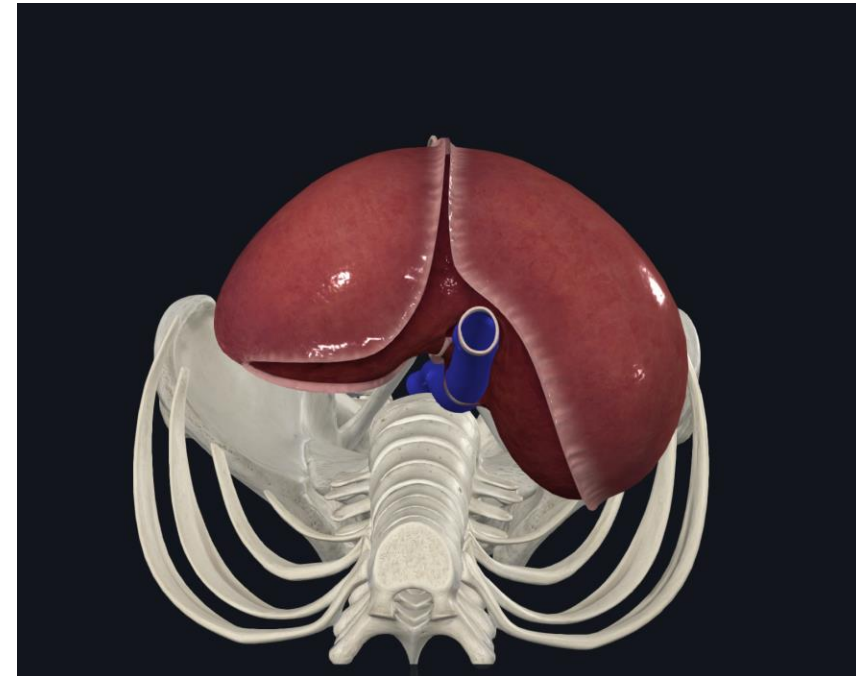
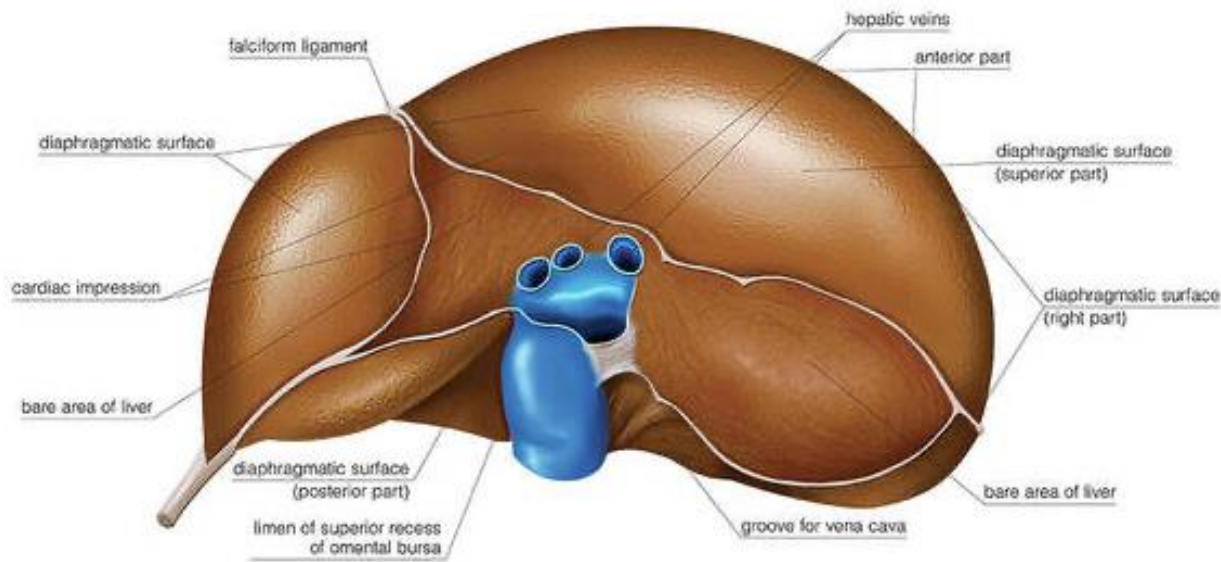
- Right & left lobes
- Cut edge of the Falciform ligament
- The cut edges of the superior and inferior parts of the coronary ligament
- The left triangular ligament
- The right triangular ligament
- Bare area of the liver (where there is no peritoneum covering the liver)
- Groove for the inferior vena cava and the hepatic veins
- **Hepatic veins: veinous drainage of the liver, drain into inferior vena cava**
- **Caudate lobe of the liver more or less wrapping around the groove of the inferior vena cava**
- **Fundus of gall bladder**
- **Lig.teres**



Coronary ligaments exist as two lips: anterior and posterior. They meet at the sides to form right and left triangular ligaments.

The impression for inferior vena cava is located in the bare area of the liver.

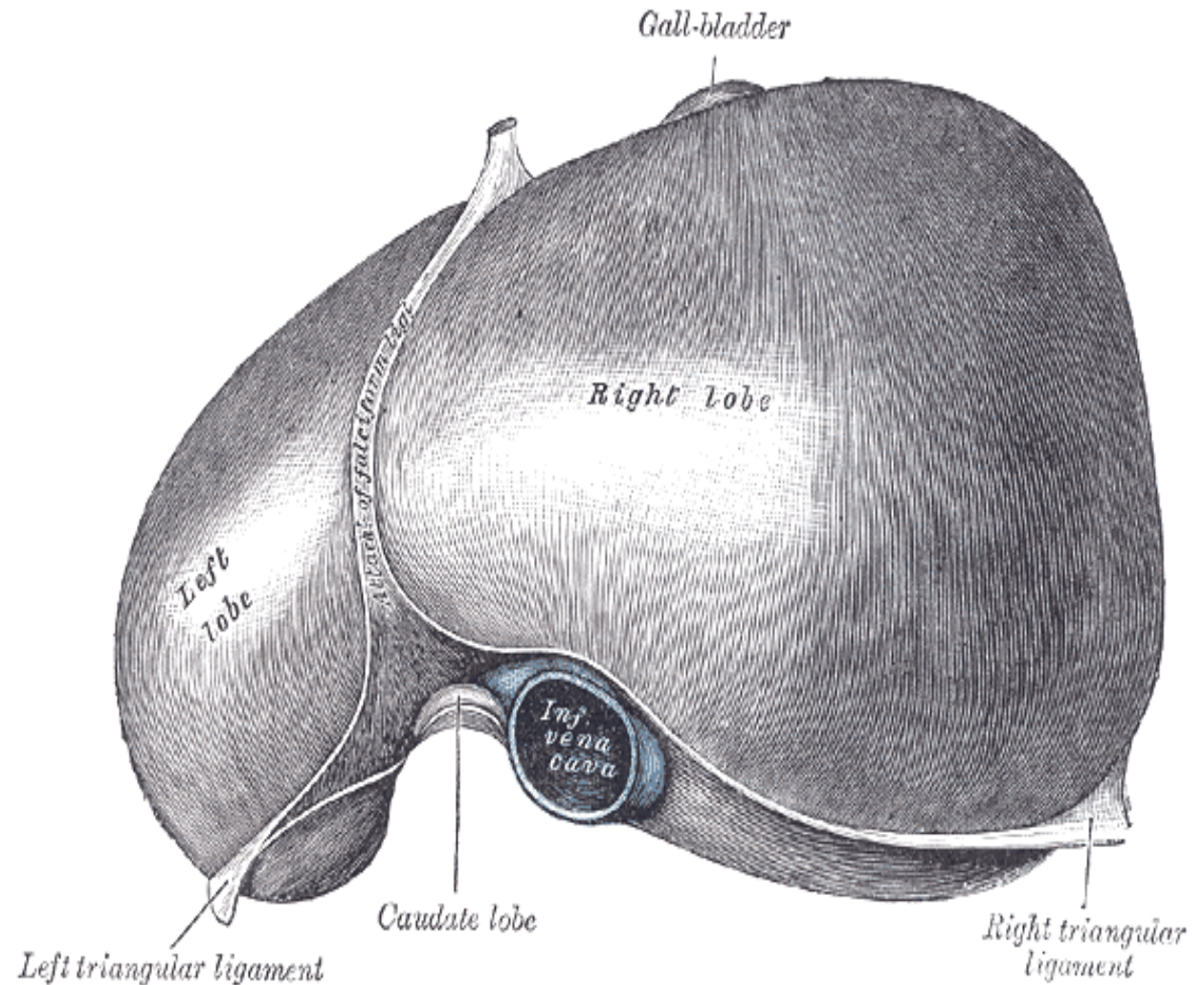
Bare area: the area between anterior and posterior coronary ligaments.

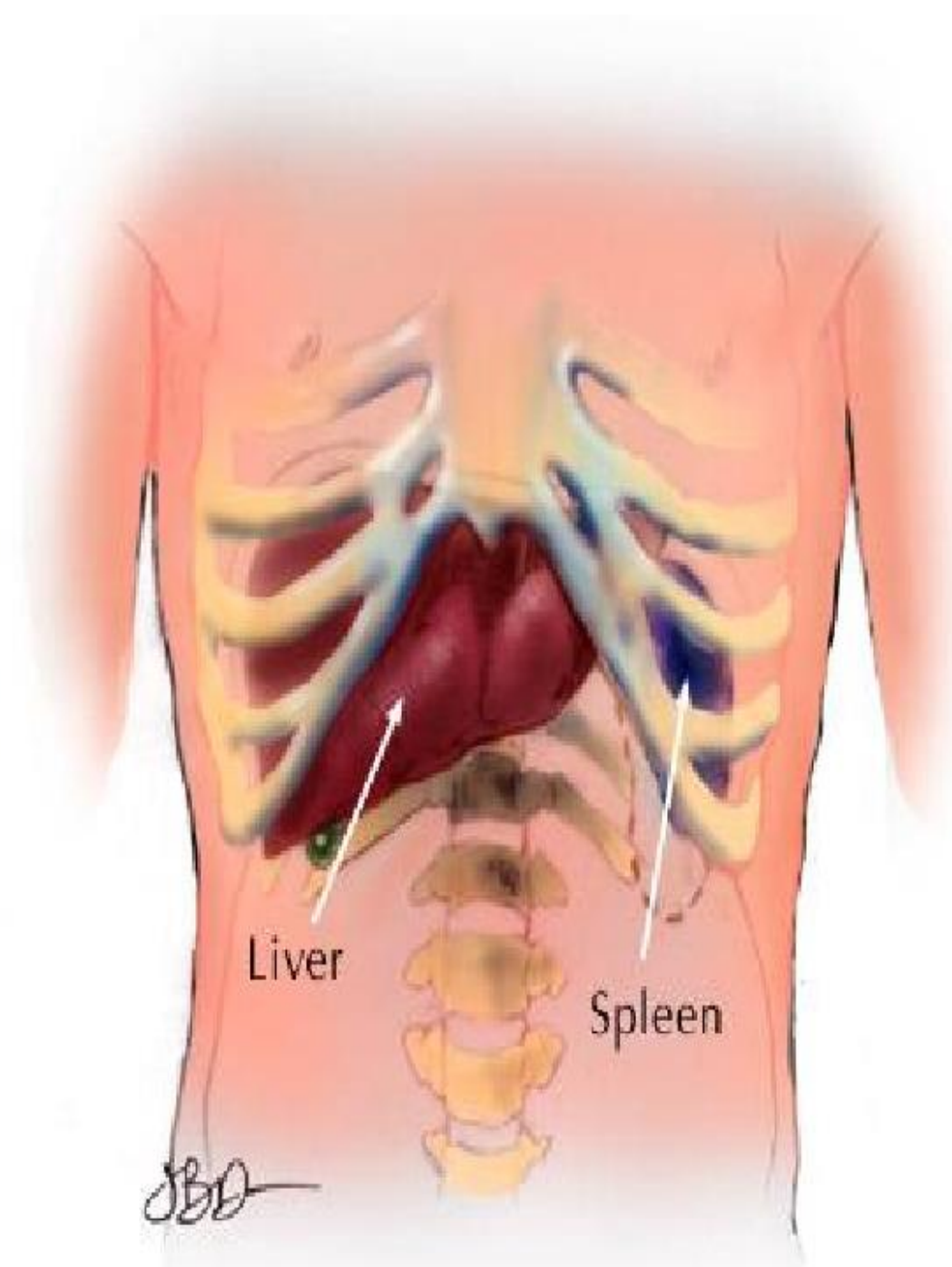
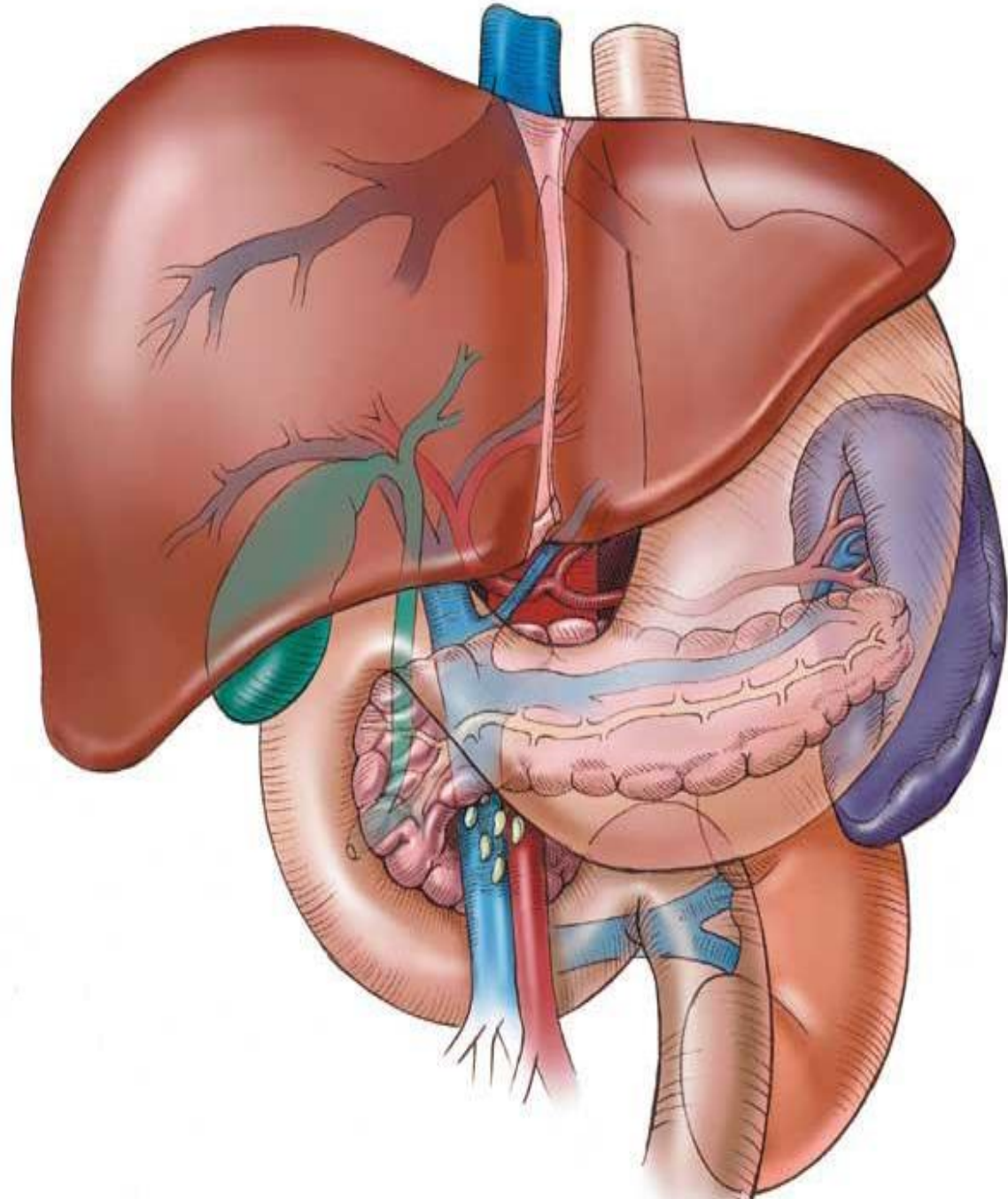


Additional images

Relations of Sup . surface of liver

- **Diaphragm covers 4 surfaces of the liver: anterior, superior, posterior and right (all except visceral). And separates the liver from Pleura & lung and Pericardium & heart in the middle.**





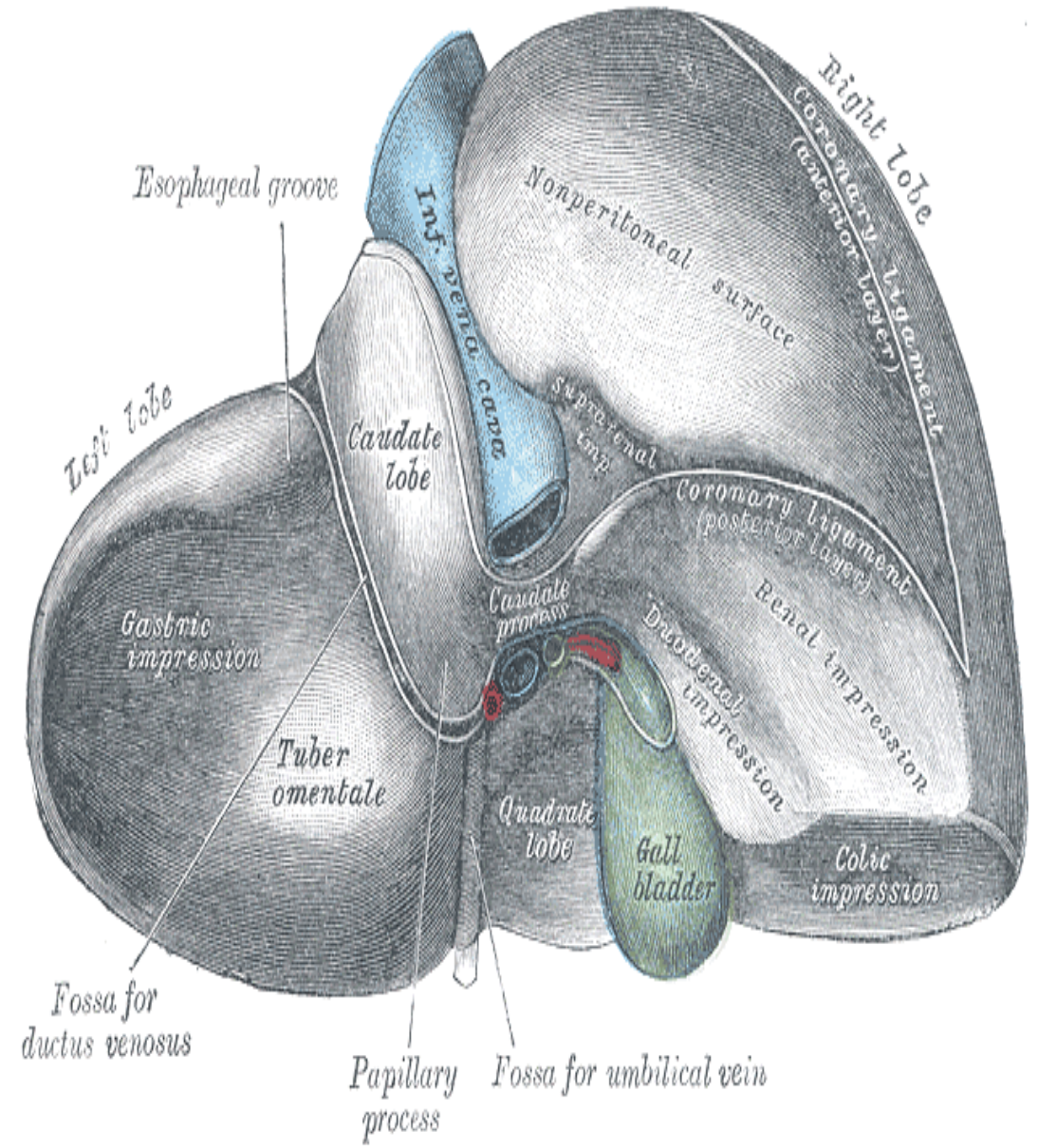
Posterior and visceral relations of the liver

Posterior surface is related to diaphragm only

Posterior: Diaphragm

Visceral:

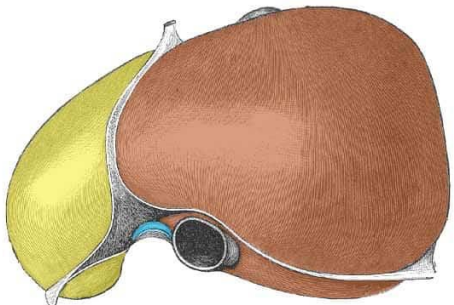
- Rt. Kidney
- Supra renal gland
- T.colon (hepatic flexure)
- Duodenum
- Gall bladder
- I.V.C
- Esophagus
- Fundus of stomach



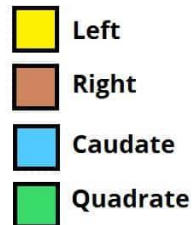
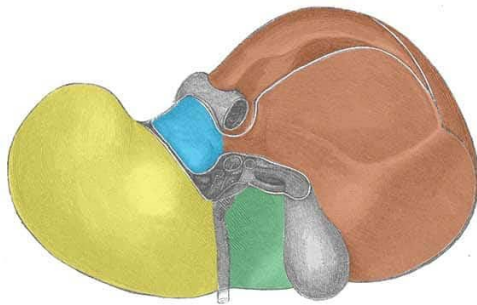
Lobes of the liver

In general, the liver is commonly described as having two lobes: the right and left lobes. However, anatomically, it comprises four lobes: the right lobe, left lobe, quadrate lobe, and caudate lobe. The quadrate lobe is positioned adjacent to the gallbladder, while the caudate lobe is located near inferior vena cava. (Physiological classification) = Functionally and physiologically, the quadrate and caudate lobes are often classified as part of the left lobe. For instance, in porta hepatis, the hepatic artery divides into right and left branches, with the right branch supplying blood to the right lobe and the left branch supplying blood to the left, quadrate, and caudate lobes. The same principle applies to bile secretion. Secretions from the right lobe of the liver enter the right hepatic duct, while those from the left lobe, caudate lobe, and quadrate lobe are transported by the left hepatic duct.

Superior Surface



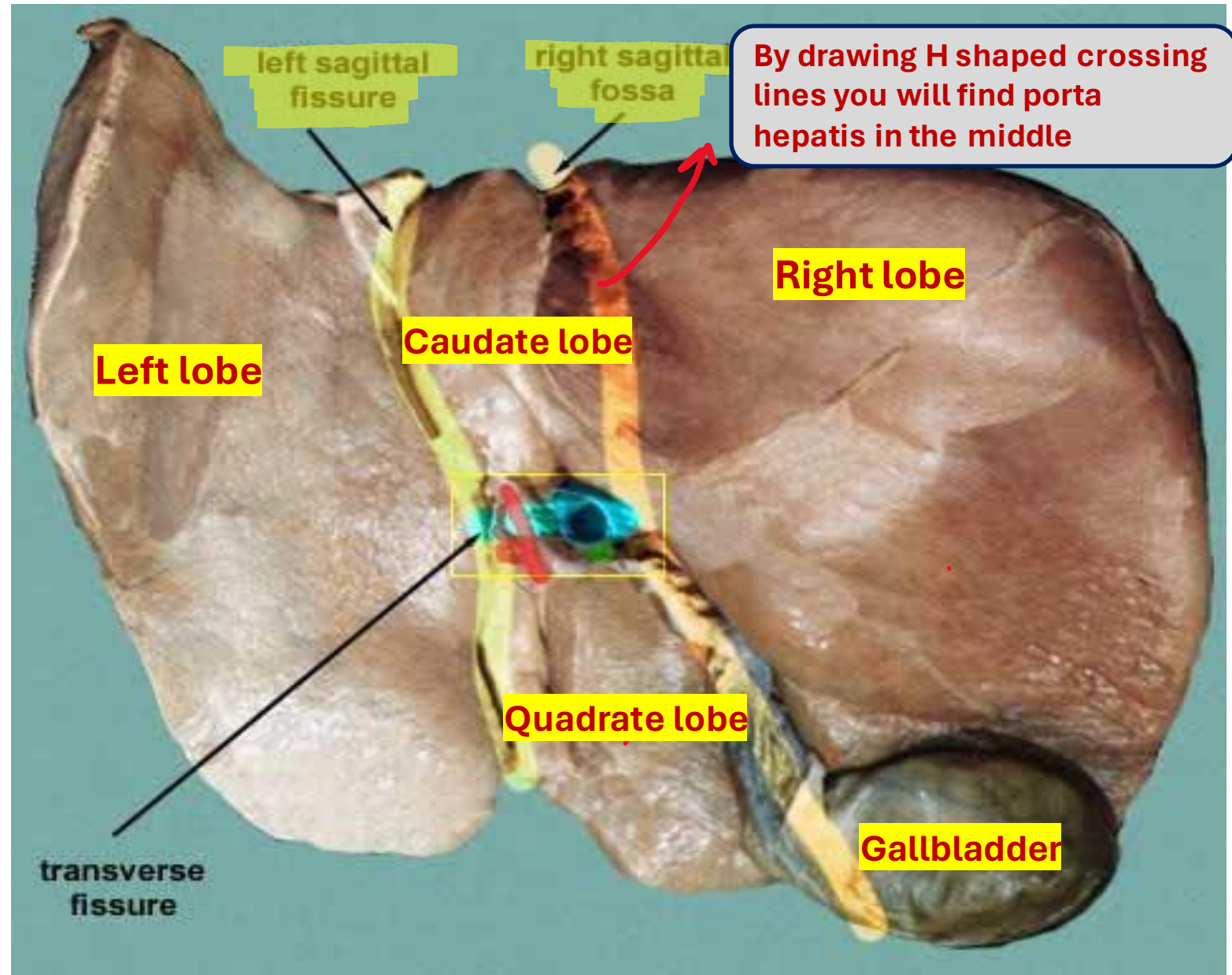
Inferior Surface



- Rt. Lobe
- Lt .lobe
- Quadrate lobe
- Caudate lobe

Separation of the four lobes of the liver:

- Right sagittal fossa- groove for inferior vena cava and gallbladder
- Left sagittal fissure contains the Ligamentum Venosum and round ligament of liver
- Transverse fissure (also porta hepatis)- bile ducts, portal vein, hepatic arteries

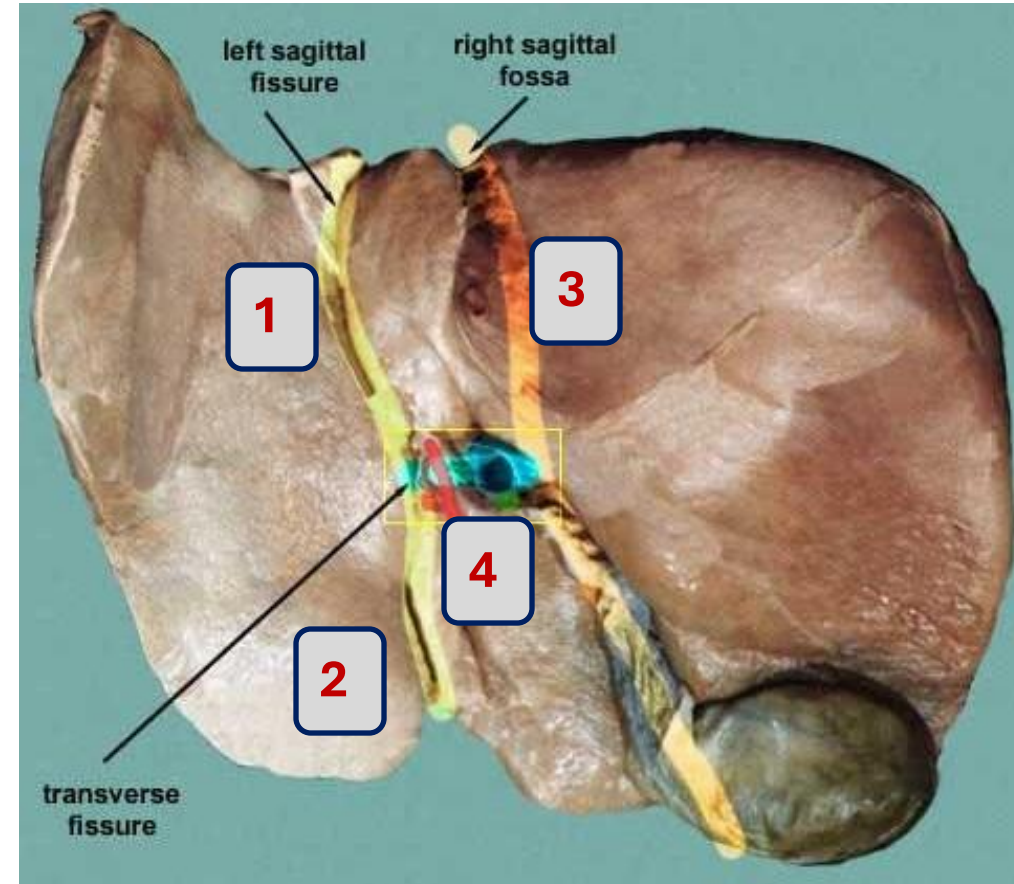


1. Attached to the left sagittal fissure, we find ligamentum venosum. During embryonic development, ligamentum venosum was known as ductus venosus. Over time, it undergoes obliteration, transforming into a ligament.

2. Here lies ligamentum teres, which is an obliterated umbilical vein.

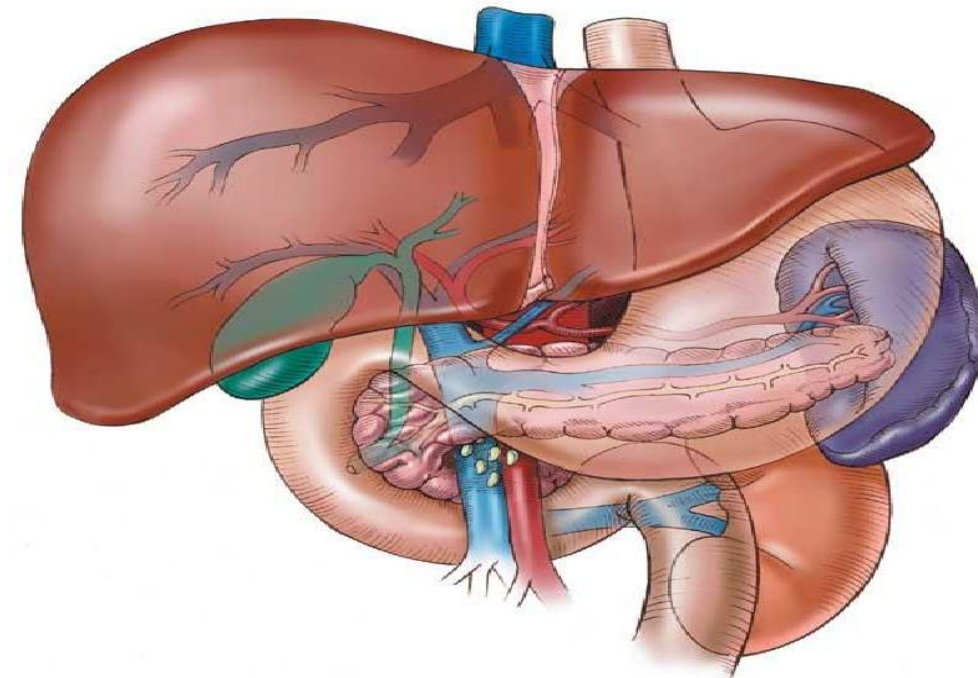
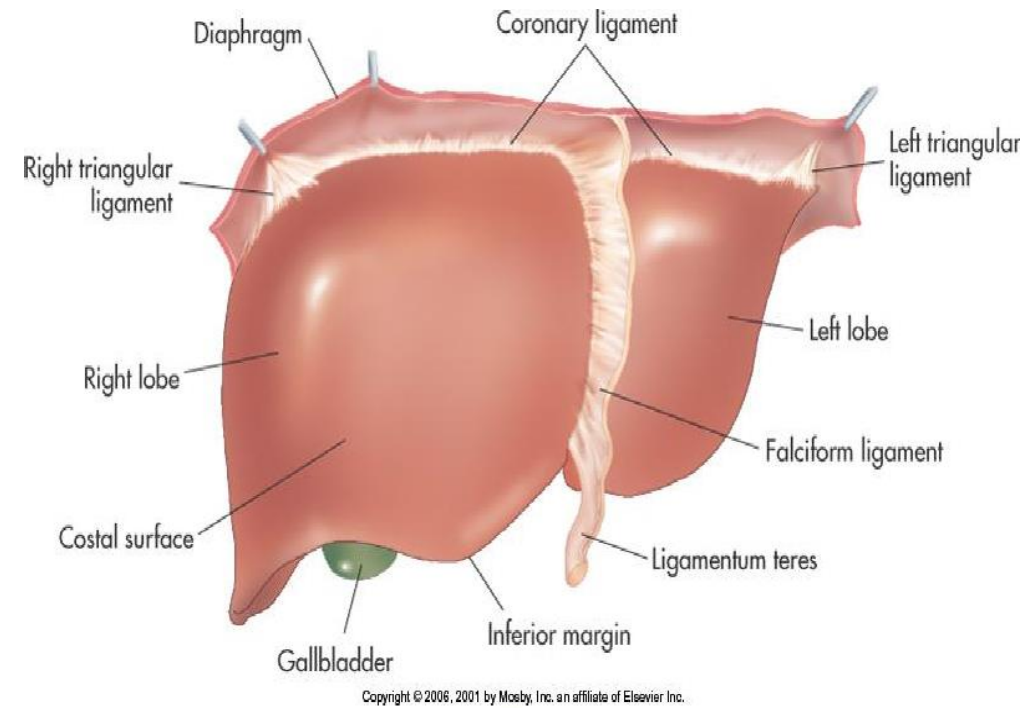
3. This fissure is for inferior vena cava.

4. At porta hepatis, you can find the portal vein, hepatic artery, and common bile duct, along with lymph nodes, lymphatic vessels, and nerves.



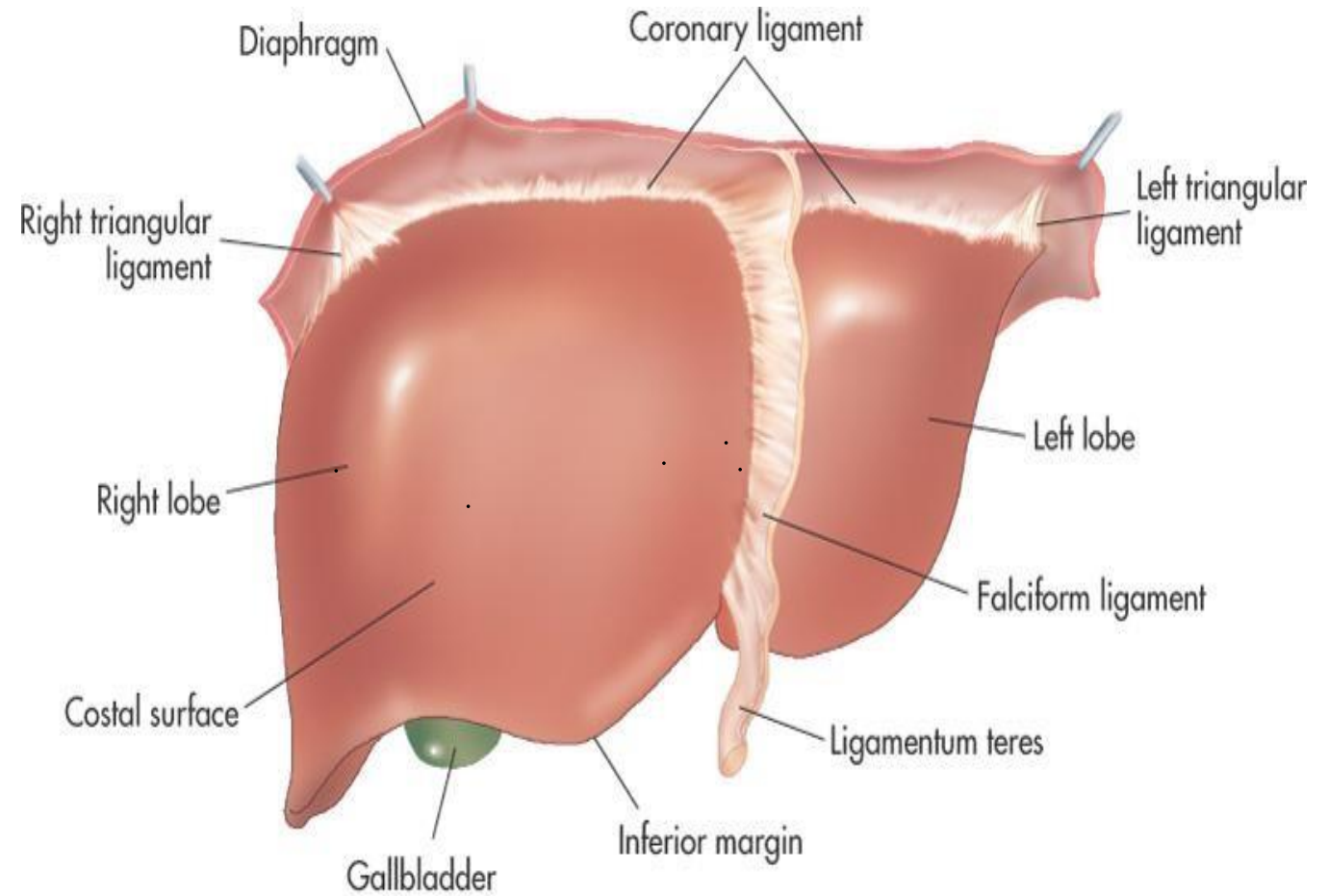
Right Lobe

- Largest lobe
- Occupies the right hypochondrium
- Divided into anterior and posterior sections by the right hepatic vein
- Reidel's Lobe extend as far caudally as the iliac crest



Left Lobe

- **Varied in size**
- **Lies in the epigastric and left hypochondriac regions**
- **Divided into lateral and medial segments by the left hepatic vein**



Lobes of the liver

Right and Left lobes are separated by:

- **Falciform ligament**
- **Ligamentum Venosum**
- **Ligamentum teres**

Caudate Lobe

-present in the posterior surface
from the Rt. Lobe

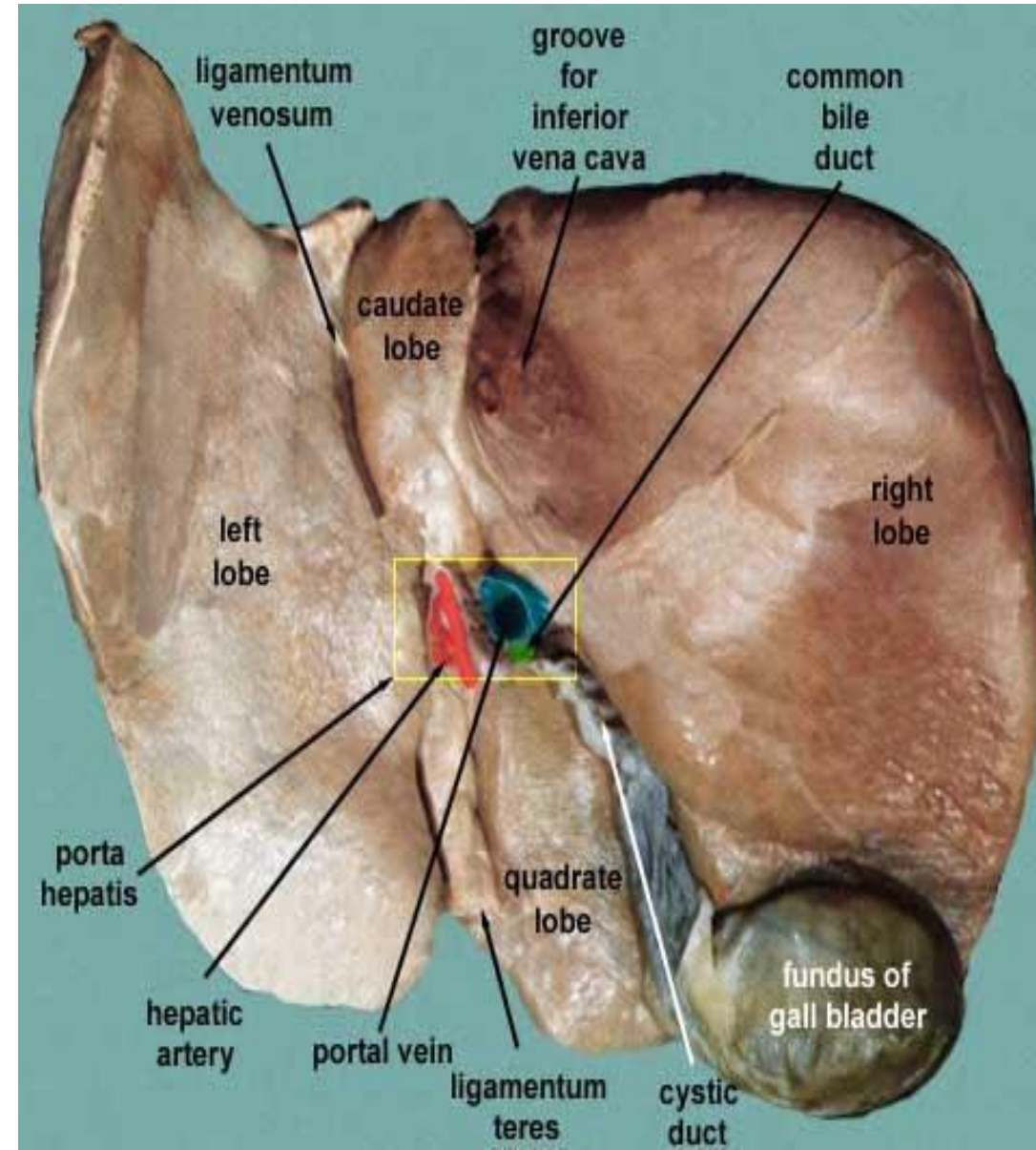
Two processes

1 c- process

2 papillary process

Relations of caudate lobe

- Inf. the porta hepatis
- The right the fossa for the inferior vena cava
- The left the fossa for the lig.venosum.

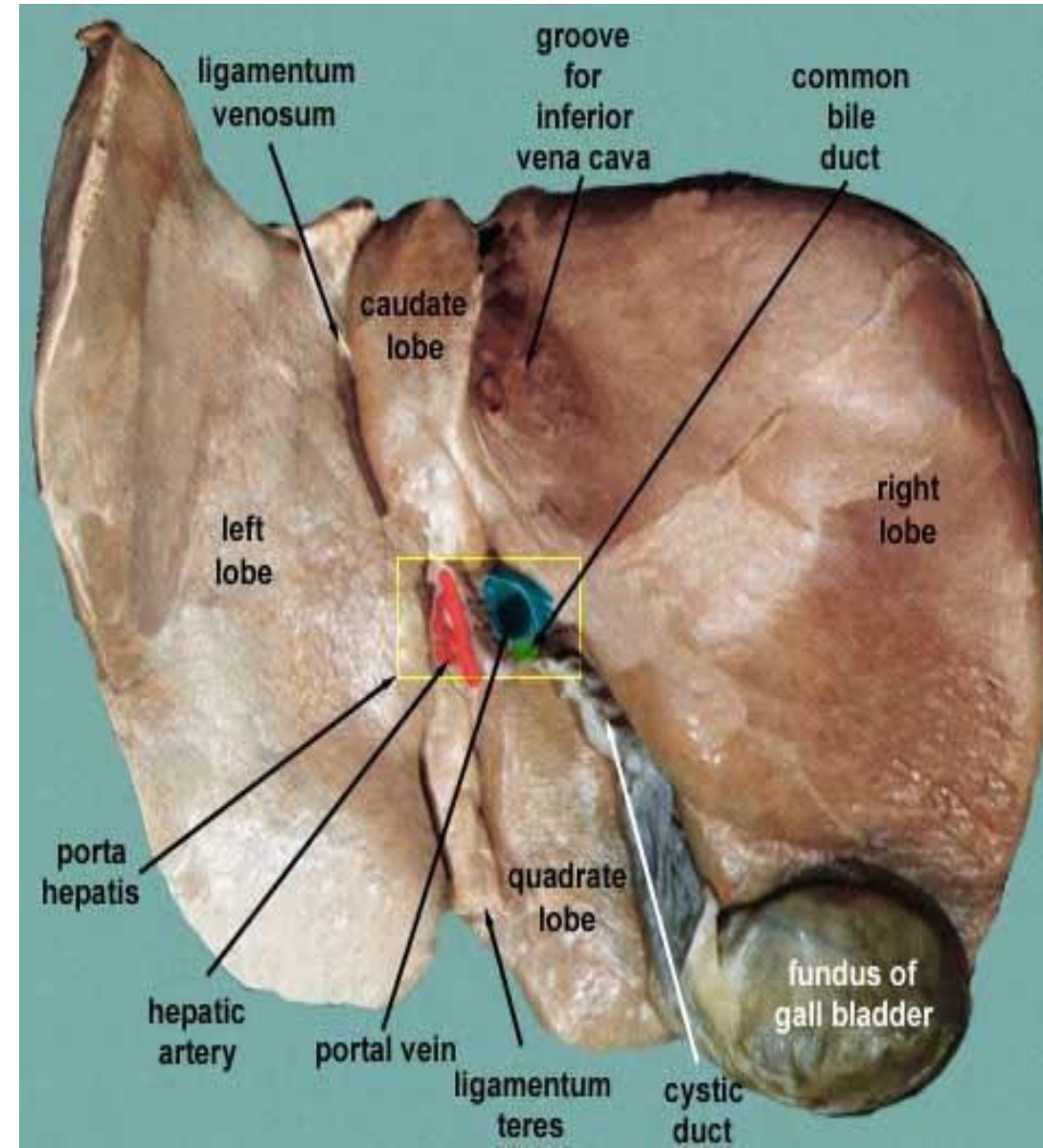


Quadrato lobe

Present on the inferior surface from the Rt. Lobe

Relation

- **Ant.** → anterior margin of the liver
- **Sup.** → porta hepatis
- **Rt.** → fossa for the gallbladder
- **Lt** → by the fossa for lig.teres

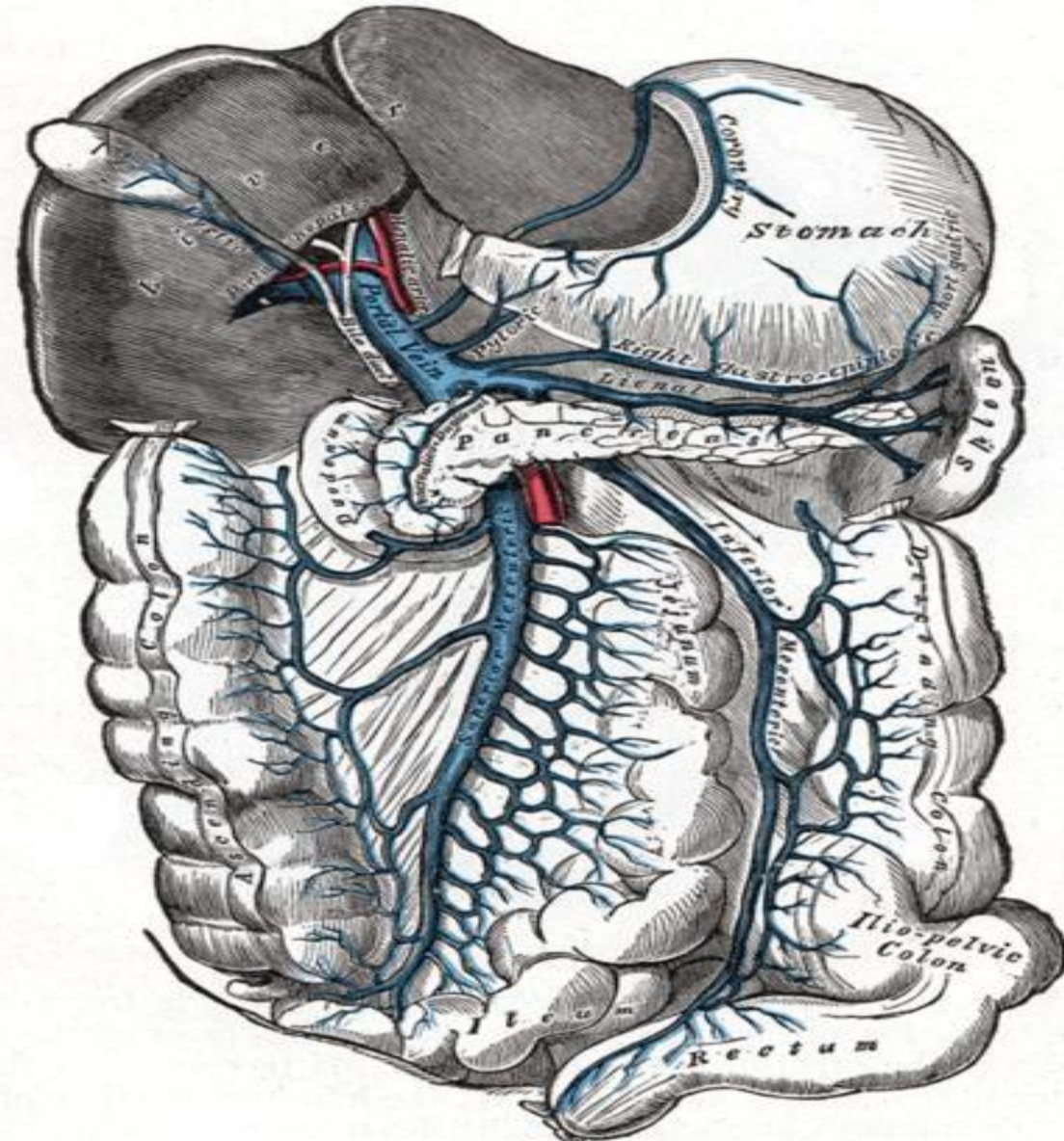


Porta hepatis

- It is the hilum of the liver
- It is found on the posteroinferior surface
- lies between the caudate and quadrate lobes
- Lesser omentum attach to its margin

Contents

- Gallbladder → ant.
- Hepatic. Art + nerve + lymphatic node → middle.
- Portal vein → post.

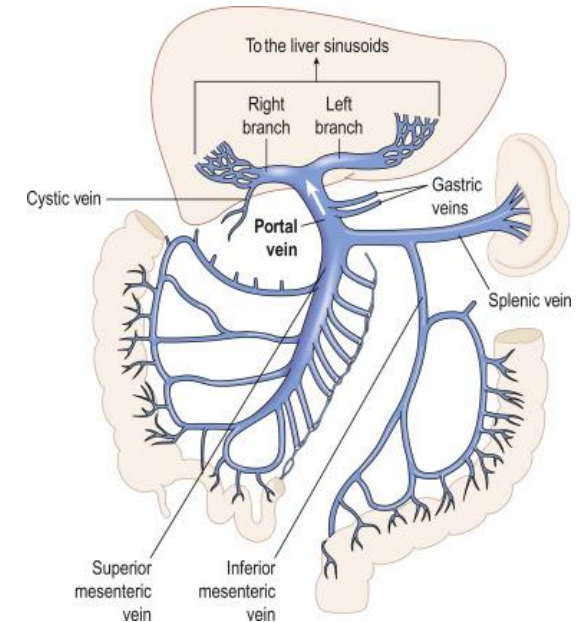
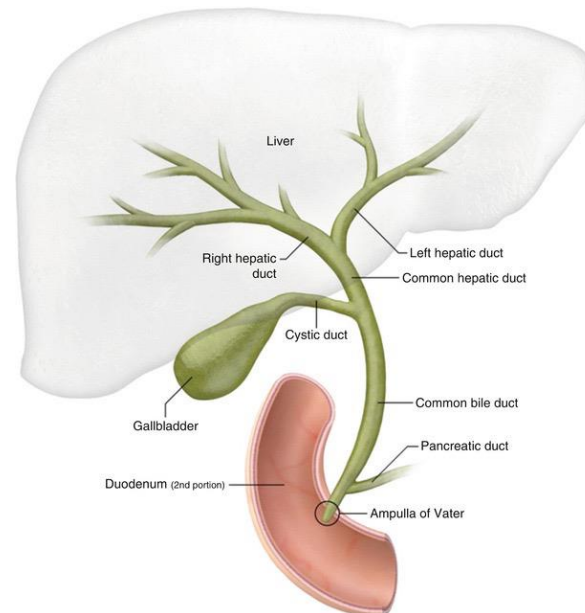


The portal vein is formed by the union of the splenic and superior mesenteric veins behind the neck of the pancreas. Upon reaching porta hepatis, it divides into the right and left portal veins. The right portal vein receives the cystic vein from the gallbladder.

The hepatic artery originates from the celiac trunk. Similarly, it divides into the right and left hepatic arteries at porta hepatis. The right hepatic artery provides the cystic artery to the gallbladder before continuing to the left.

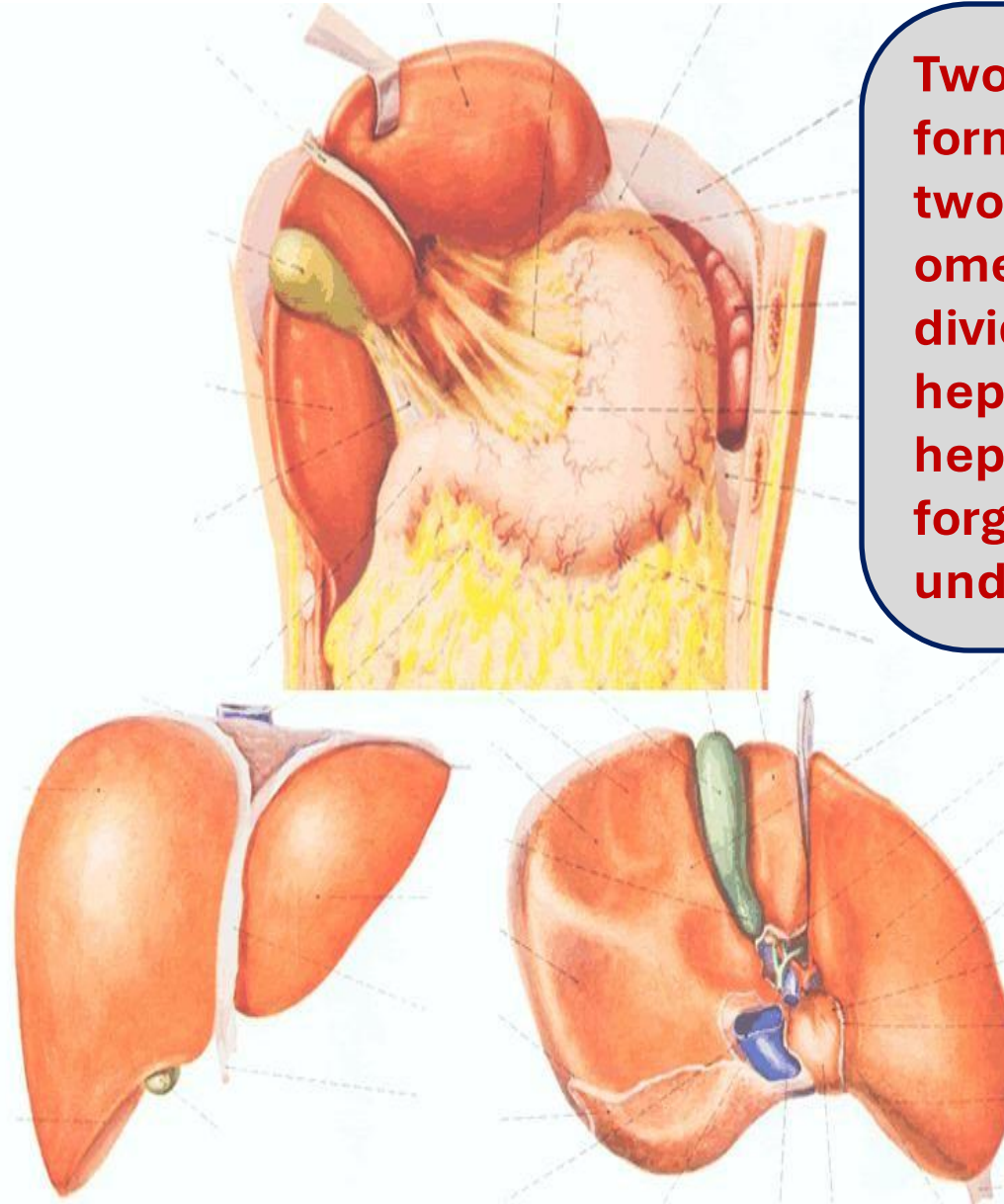
Regarding the bile ducts, the left bile duct drains the left, caudate and quadrate lobes, while the right bile duct drains the right lobe. The right and left hepatic ducts merge to form the common hepatic duct. At porta hepatis, the common hepatic duct receives the cystic duct from the gallbladder, forming the common bile duct.

Additional images:



Peritoneum of the liver

- The liver is covered by peritoneum (intraperitoneal organ) except at bare area (it is origin from septum transversum)
- Inferior surface covered with peritoneum of greater sac except porta hepatis, G.B & Lig.teres fissure
- Rt. Lateral surface covered by peritoneum, related to diaphragm which separate it from Rt. Pleura , lung and the Rt Ribs (6-11)



Two layers of peritoneum form a ligament between two organs. Lesser omentum for example is divided into two ligaments: hepatogastric and hepatoduodenal. Don't forget the epiploic foramen under the free edge.

The ligaments of the liver

1. The Falciform ligament of liver

2. The Ligamentum teres hepatis

3. The coronary ligament

4. The right triangular ligament

5. The left triangular ligament

6. The Hepatogastric ligament

7. The hepatoduodenal ligament

8. The Ligamentum Venosum (ductus venosum)

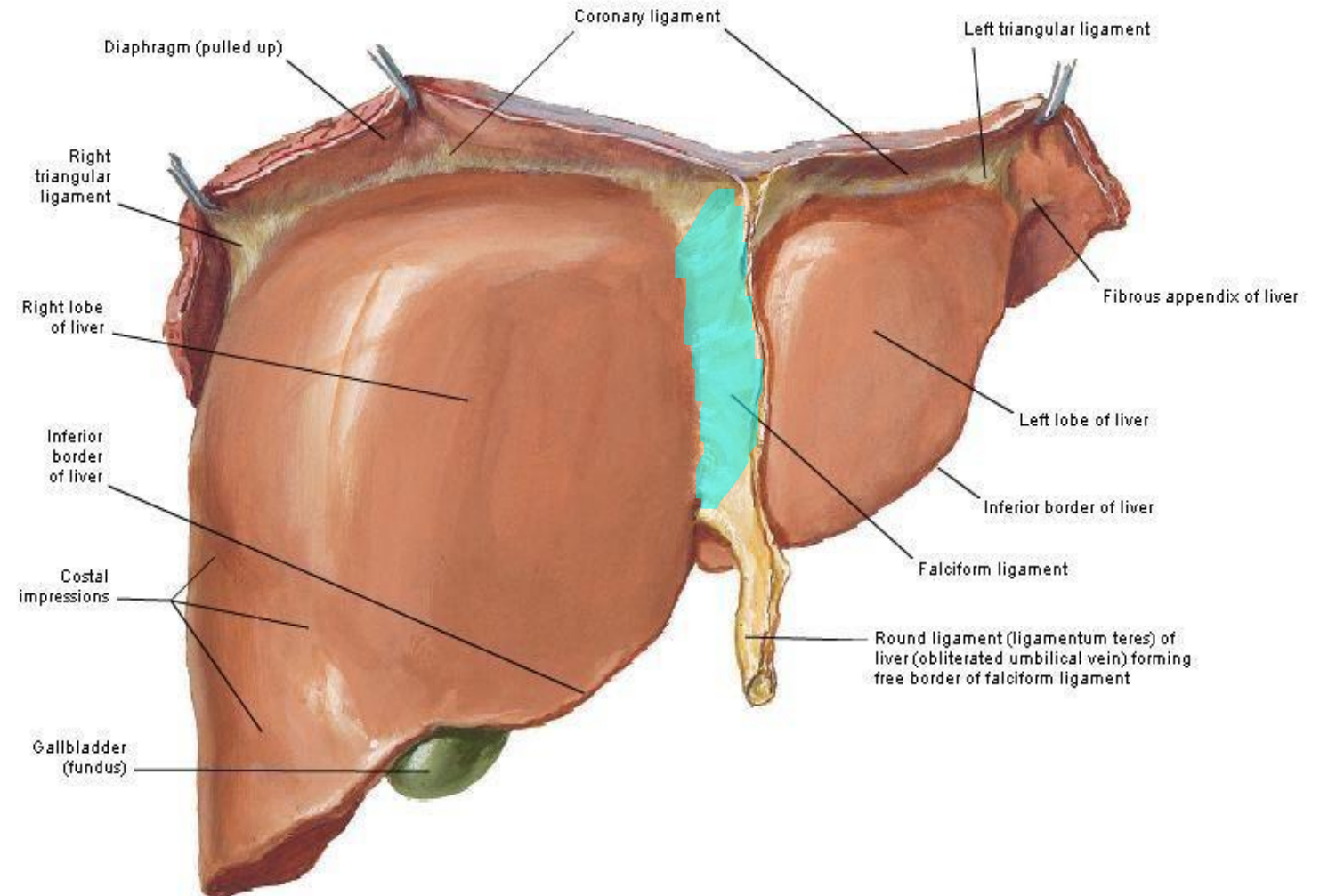
Lesser omentum

Surfaces and Bed of Liver Anterior View



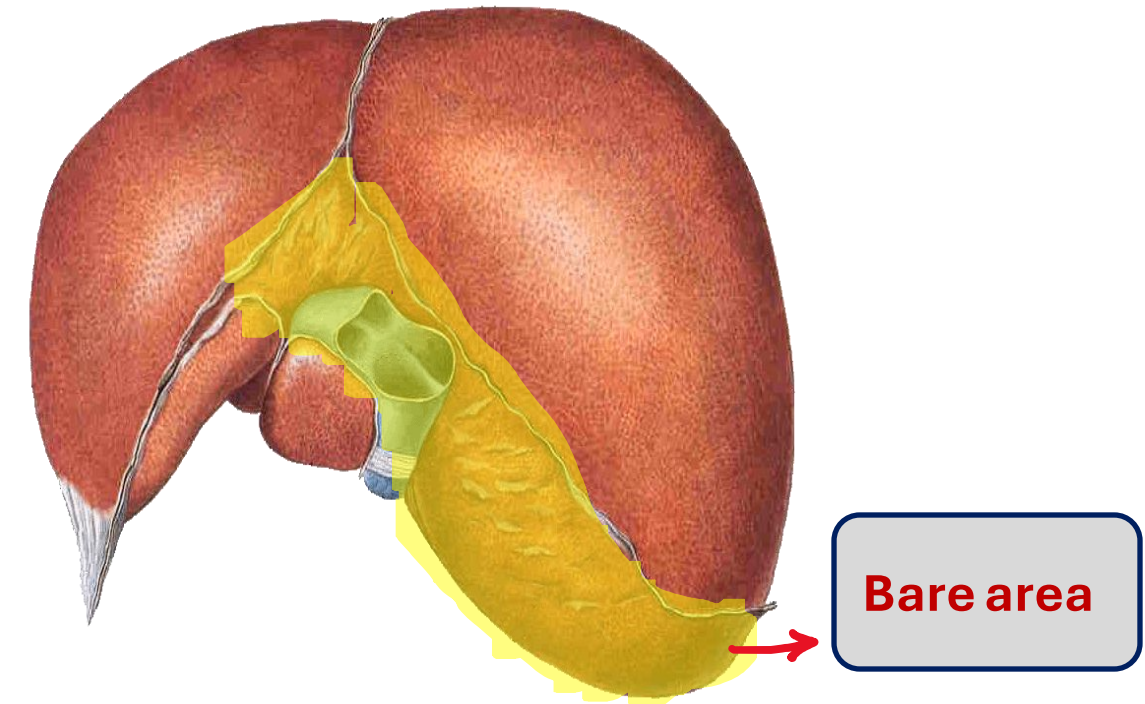
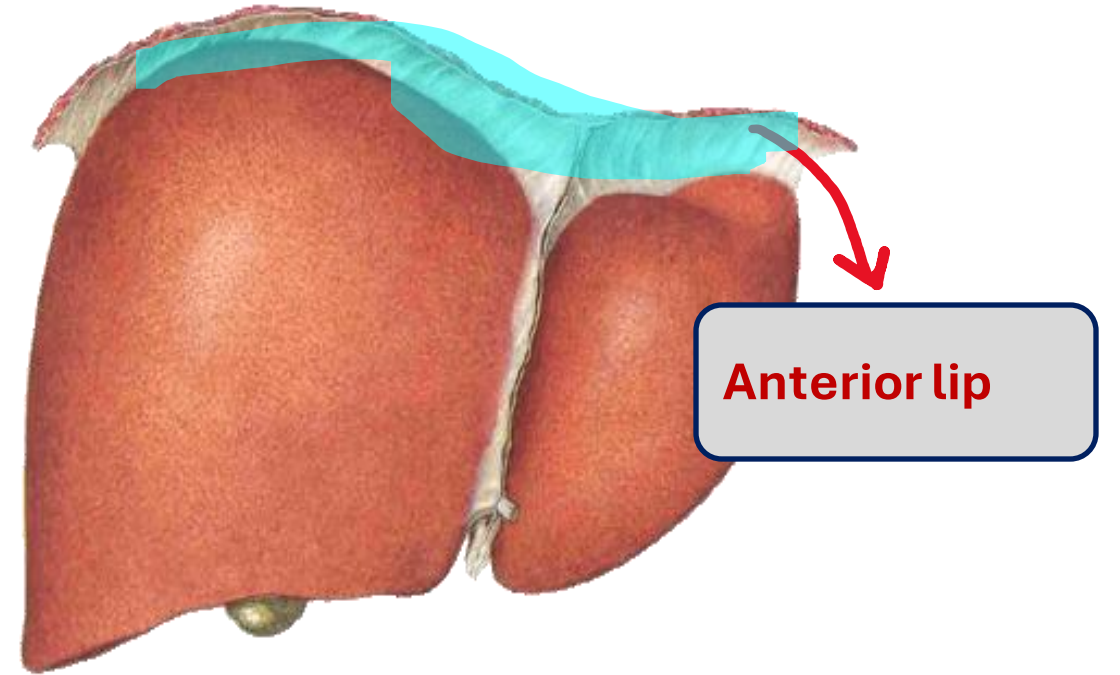
Falciform ligament of liver:

- 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)

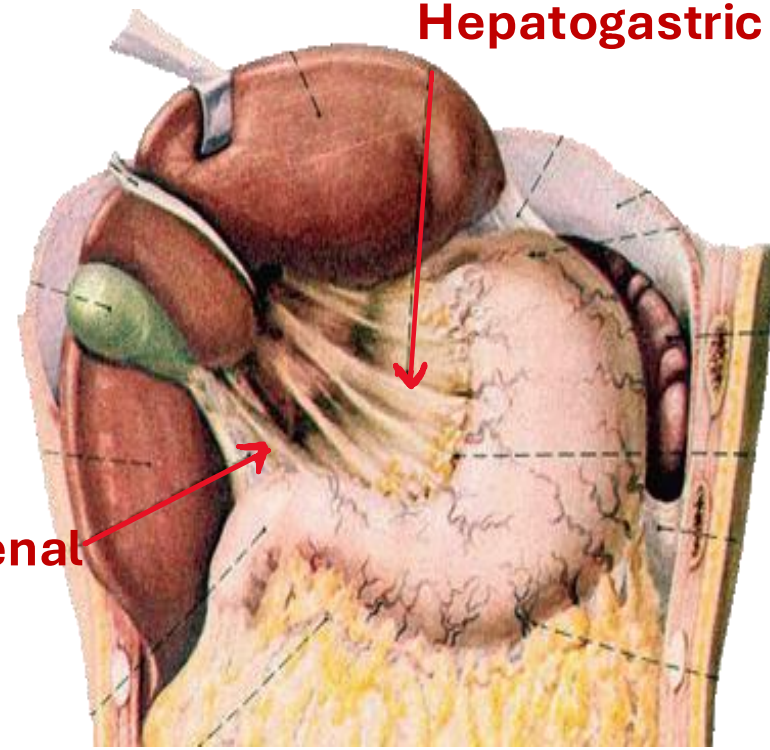


- **Coronary ligament:**
- the area between upper (anterior) and lower (posterior) layer of the coronary ligament is the bare area of liver which contract with the diaphragm;

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

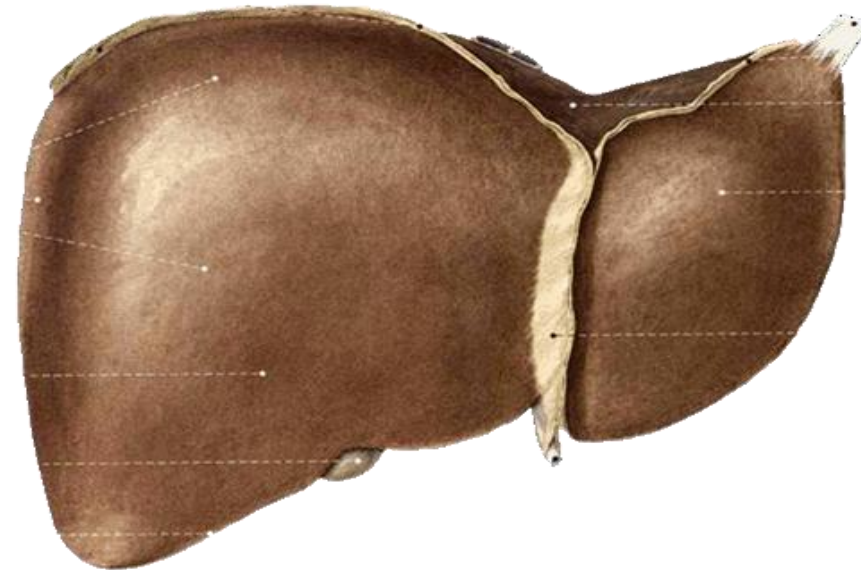


Hepatogastric



Hepatoduodenal

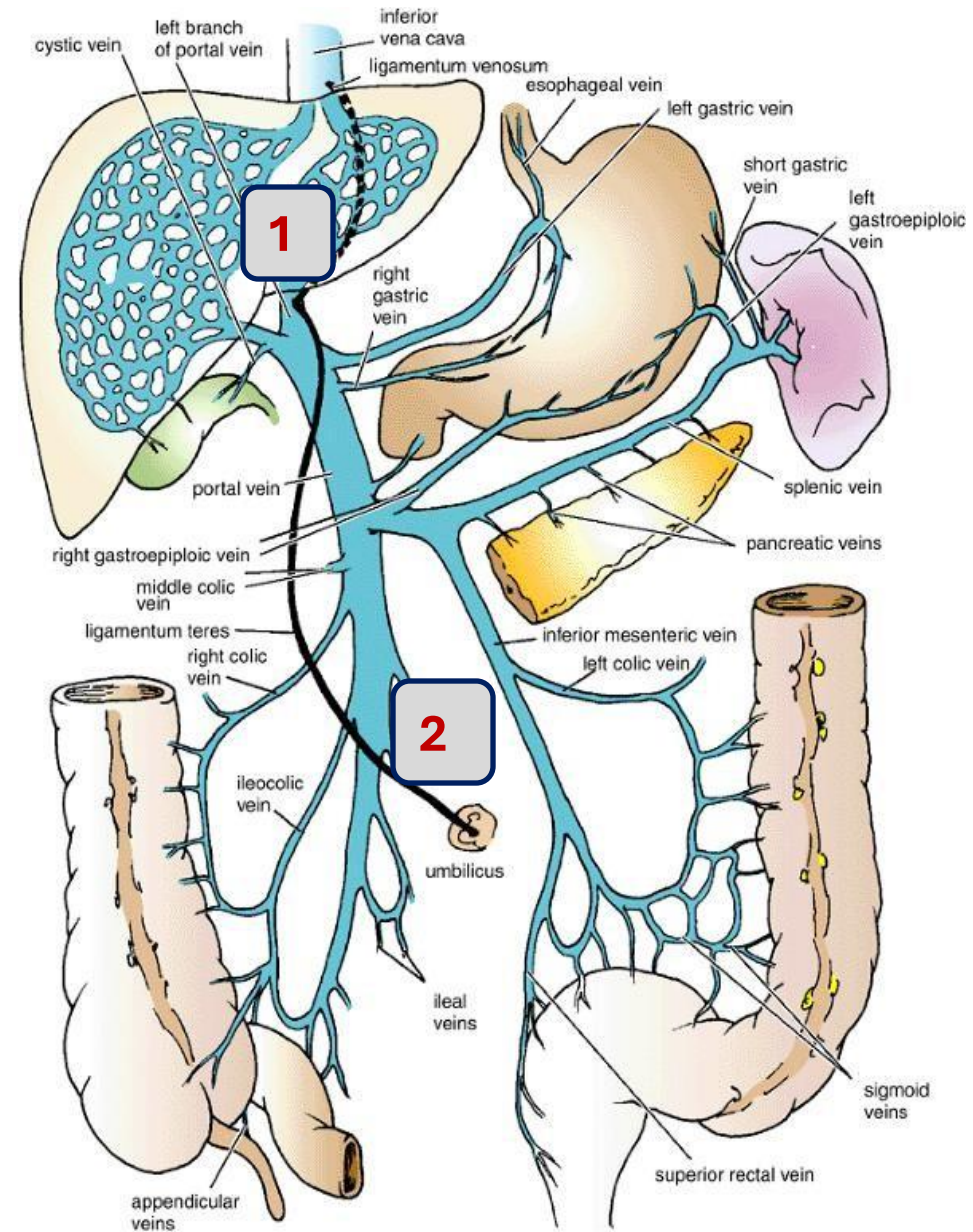
- **Hepatogastric ligament**
- **Hepatoduodenal ligament**



The Ligamentum Venosum

- Fibrous band that is the remains of the ductus venosus
- Is attached to the left branch of the portal vein and ascends in a fissure on the visceral surface of the liver to be attached above to the inferior vena cava

1. Ductus venosum, which serves as a connection between inferior vena cava and the left portal vein, remains open during fetal development but is obliterated after birth, becoming the ligamentum venosum. 2. Similarly, the umbilical vein, known as the ligamentum teres after birth, experiences a similar transformation



LIVER Histology

- lobules >> roughly hexagonal structures consisting of hepatocyte.

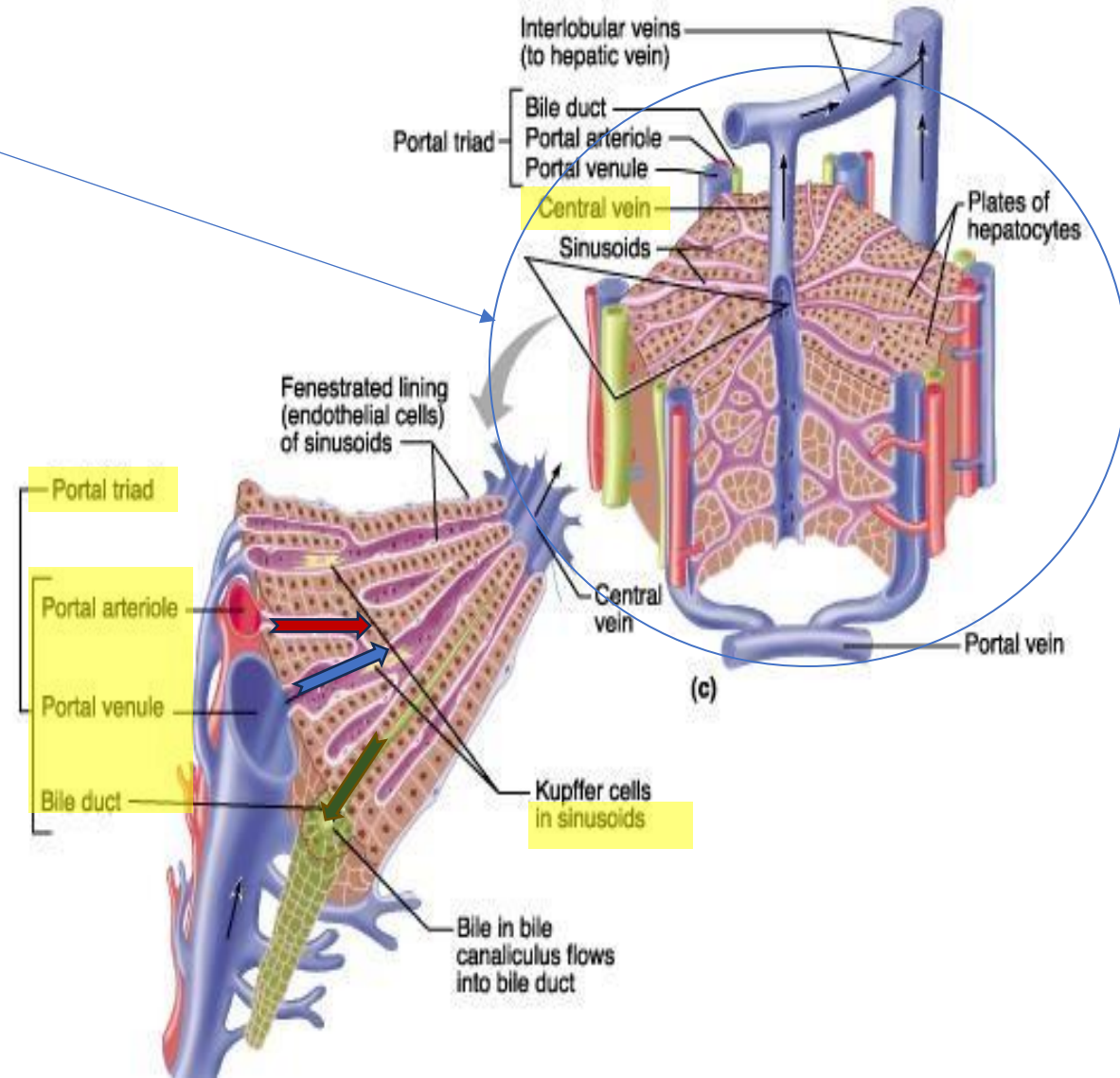
Radiate outward from a central vein.

Central vein is the venous drainage of each lobule
Central vein → Hepatic vein → Inferior Vena Cava

- At each of the six corners of a lobule is a portal triad (portal* arteriole, portal venule & bile duct)

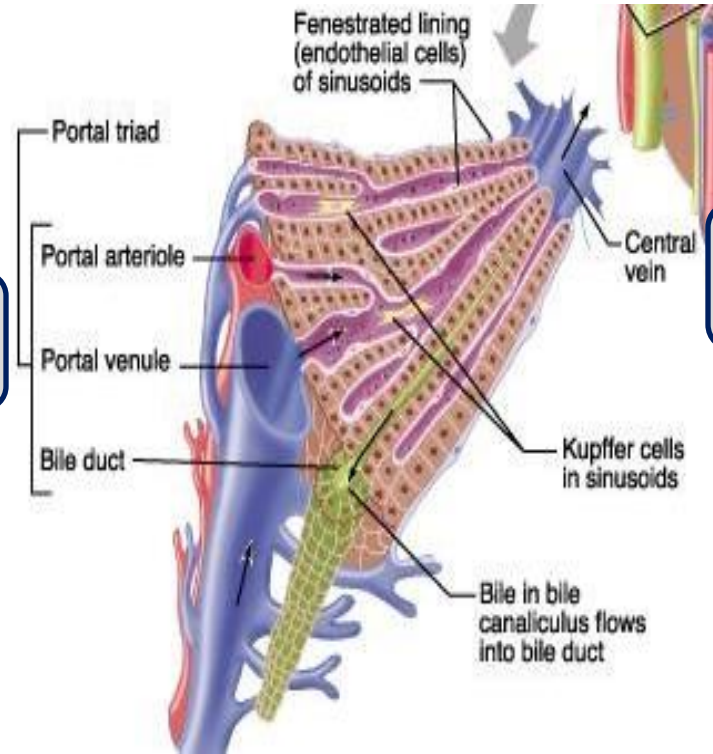
- Blood spaces Between the hepatocytes are the liver sinusoids

Hepatic* artery & portal vein enter the lobule the blood of both of them get mixed in blood sinusoid
bile duct exit the lobule carrying bile salts



1. Hepatic artery carries
50-25% oxygenated blood

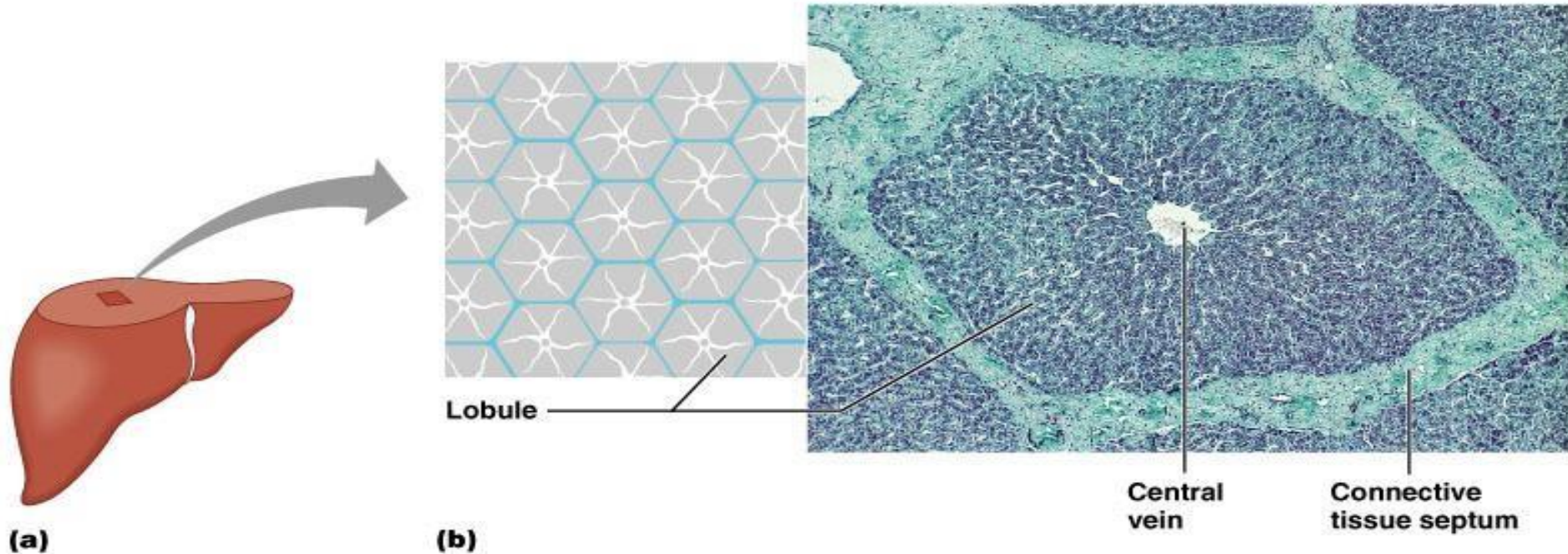
2. Portal vein carries
75-80% absorptive materials



4. The waste will go to the central vein

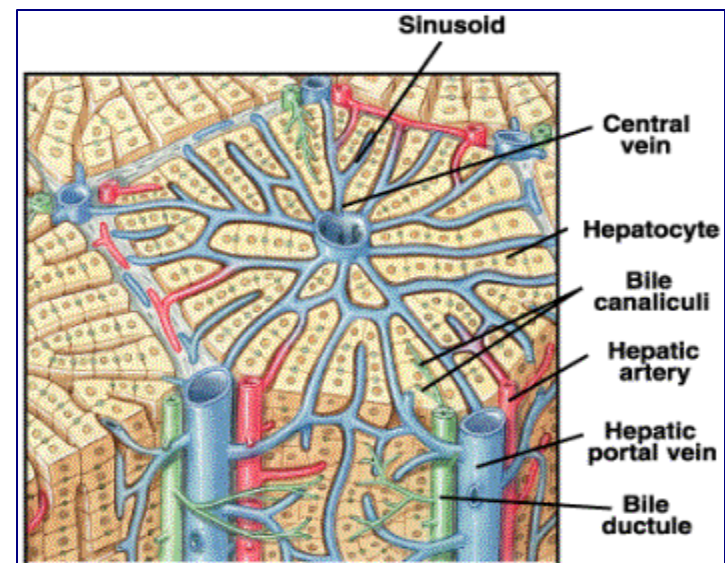
3. Mixing means that liver takes both
oxygen and absorbed materials to
make hormones, bile salts ...etc

Where do the two blood supplies mix?



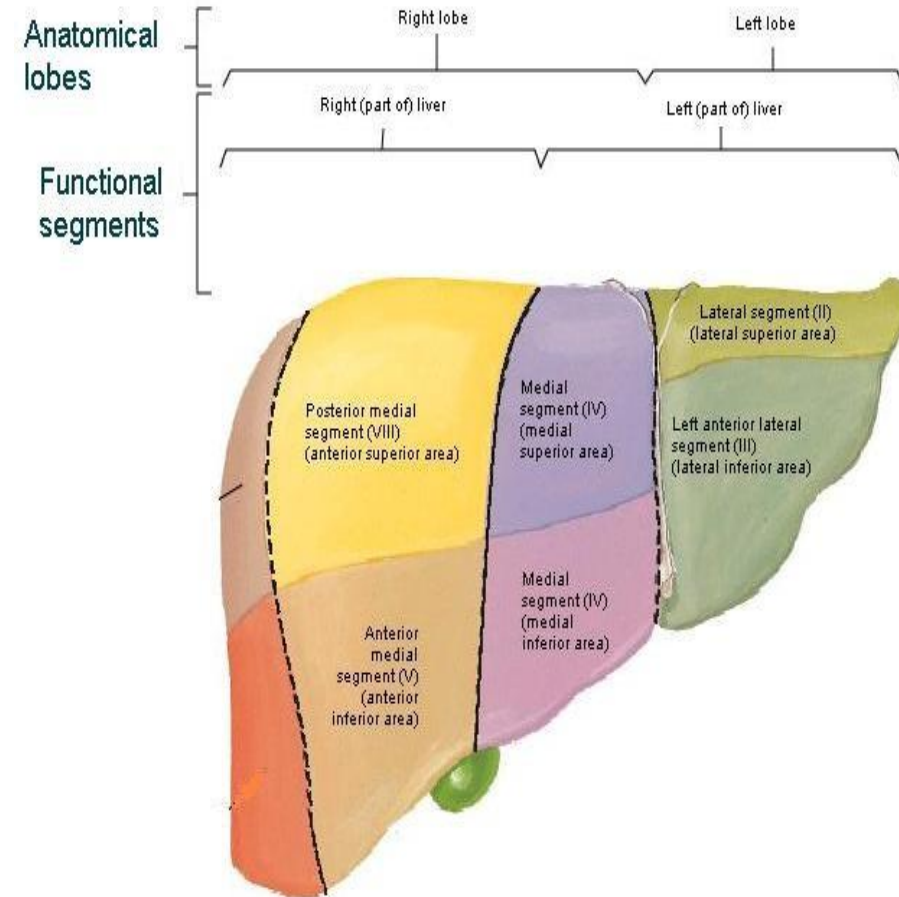
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- Liver surrounded by a thin capsule at portahepatic(it is thick) → Glisson's capsule invests the liver and send septa into liver subset subdivide the parenchyma into lobules



Segmental anatomy of the liver

- Rt .& Lt. lobes anatomically no morphological significance. Separation by ligaments (Falciform, lig. Venosum & Lig.teres)
- True morphological and physiological division by a line extend from fossa of GD to fossa of I.V.C each has its own arterial blood supply, venous drainage and biliary drainage
- No anastomosis between divisions
- 3 major hepatic veins → Rt, Lt & central
- 8 segments based on hepatic and portal venous segments



Segmental anatomy of the liver

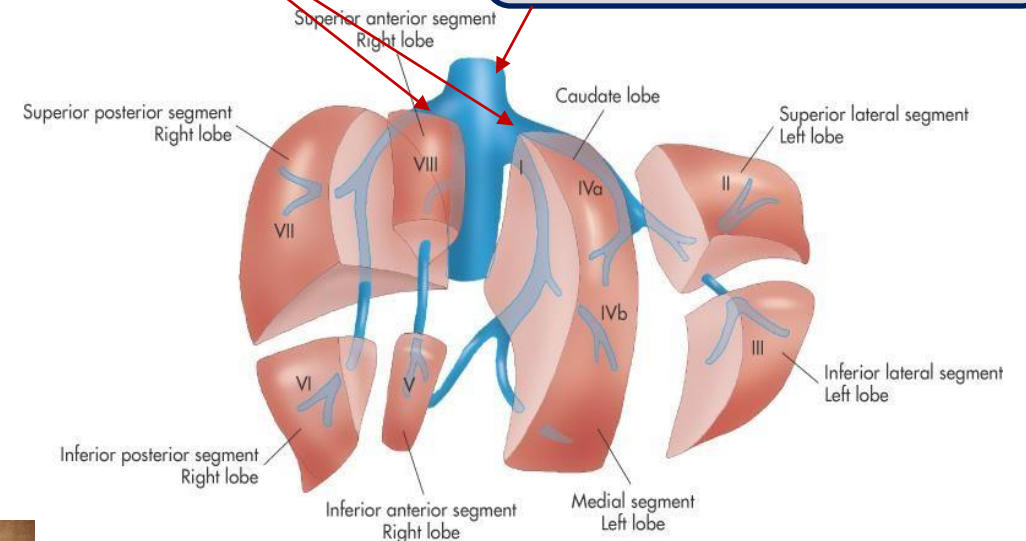
– Liver segments are based on the portal and hepatic venous segments

LIVER TRANSPLANTATION

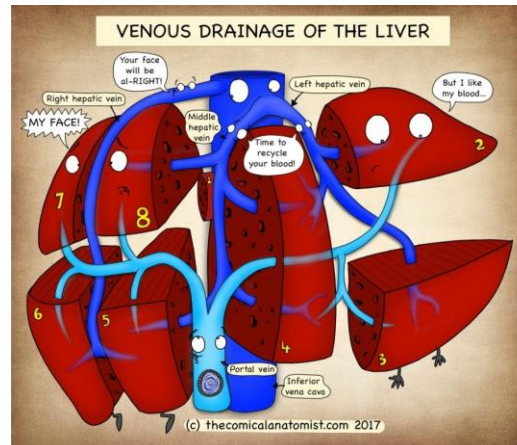
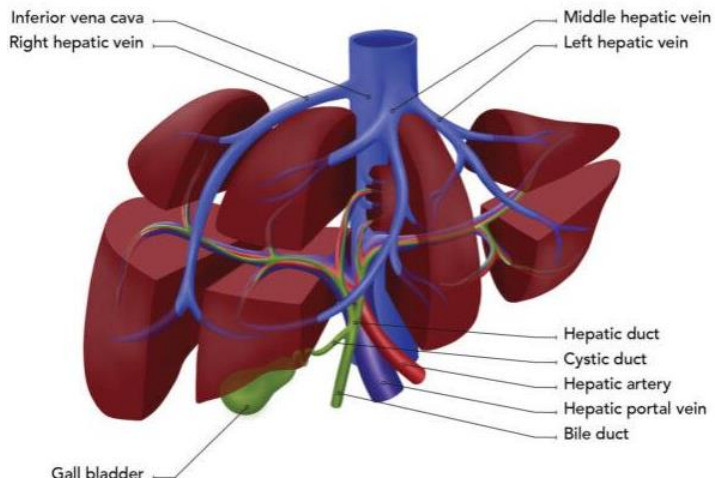
- 1/8 of the liver is enough to do its function ,
- liver transplantation depends on liver segmentation
- 2 segments are enough for transplantation
- Liver has 8 segments , each segment has its vein, artery, nerve, lymphatic drainage
- Check the additional figures down

(2-3) Hepatic veins

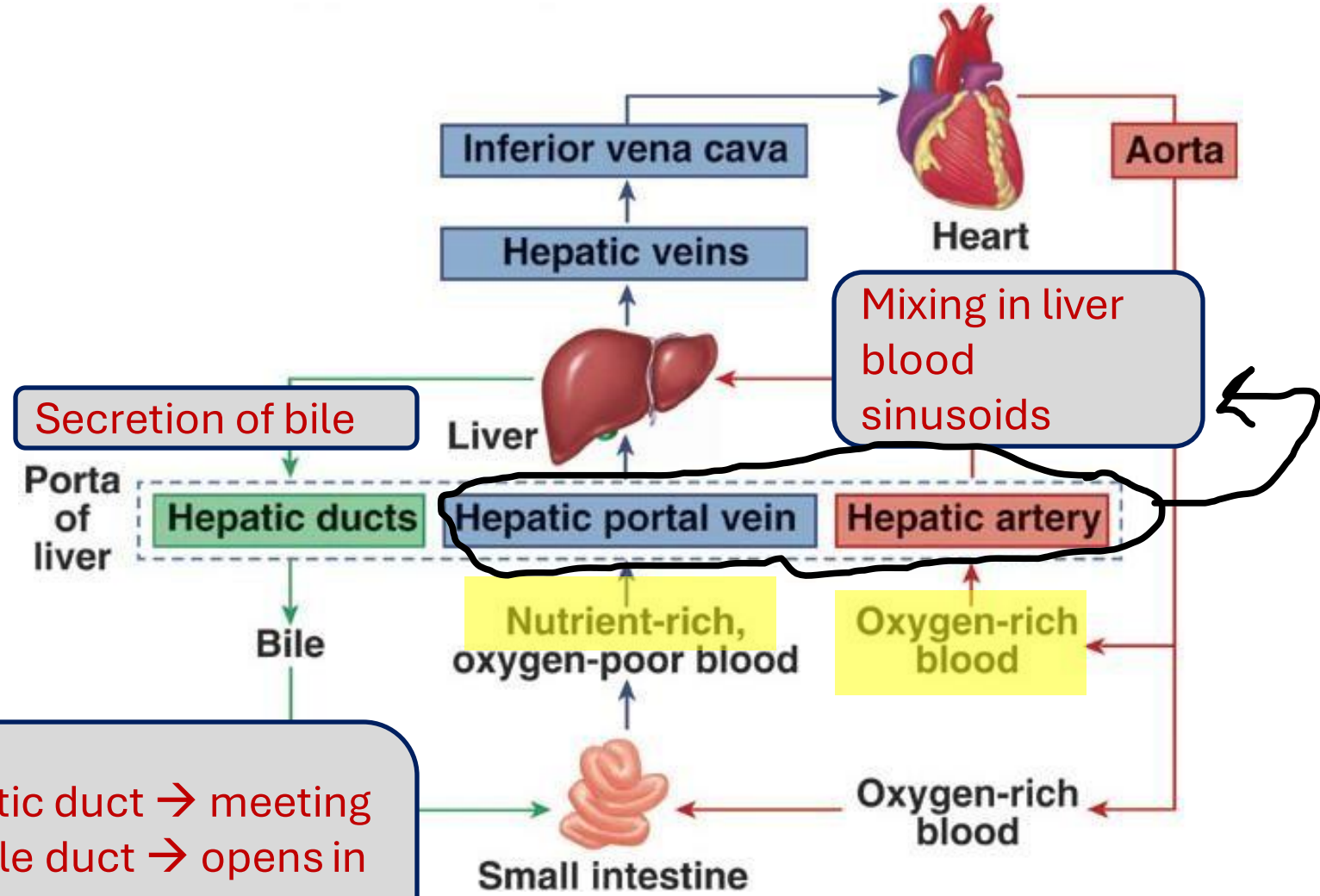
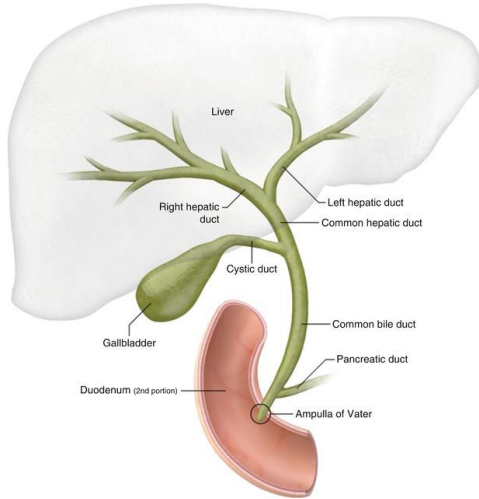
Inferior Vena Cava



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Blood supply of the liver



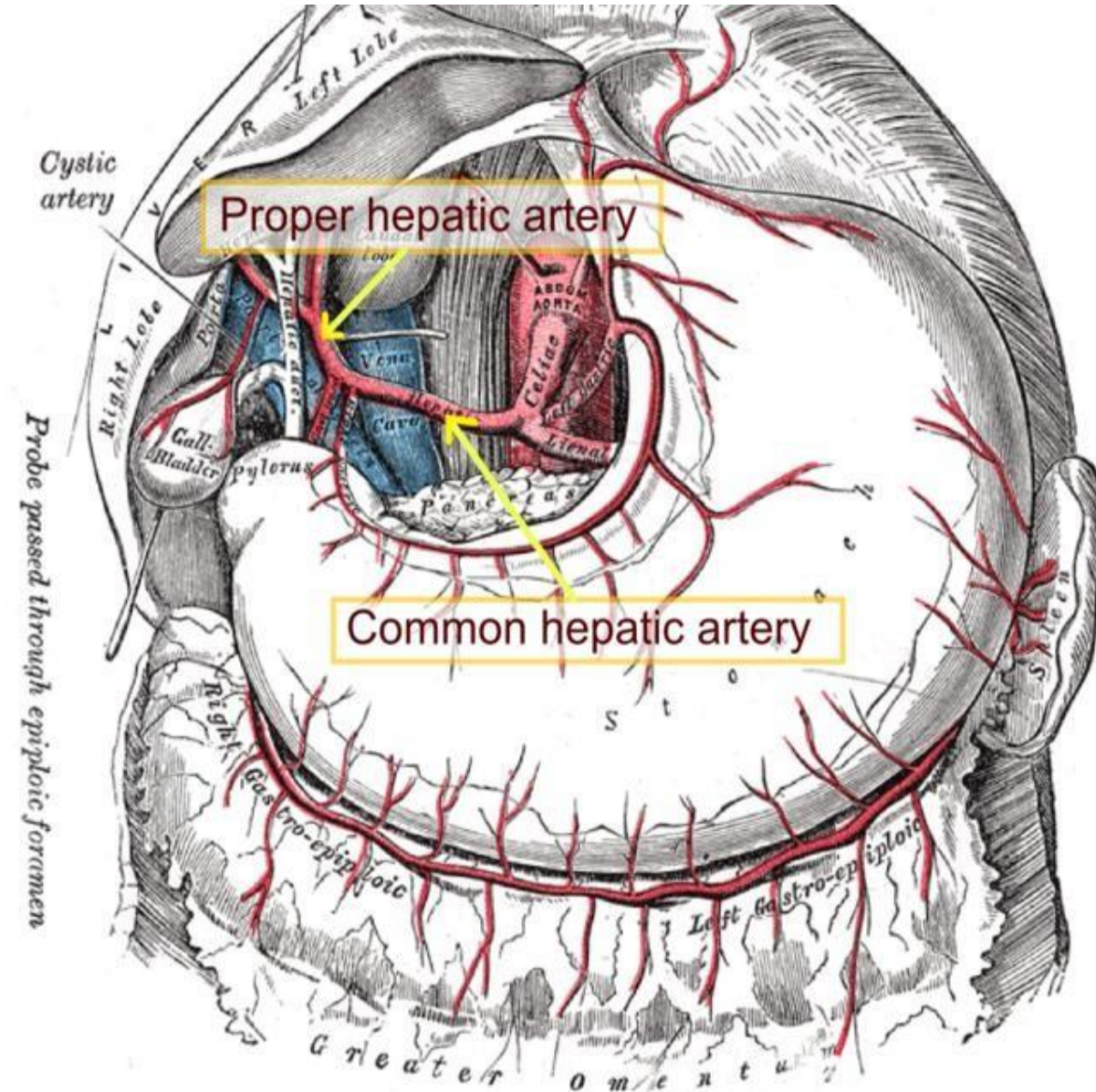
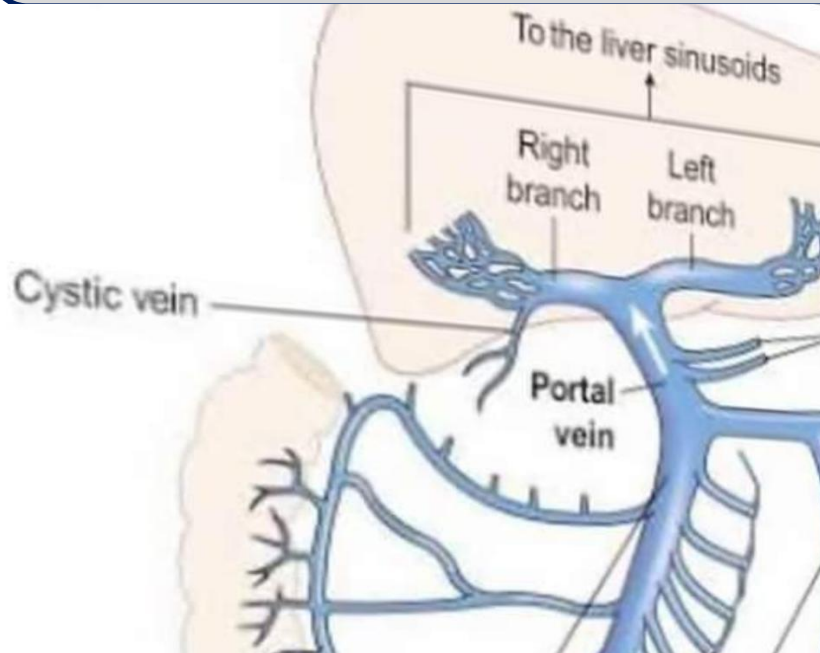
Hepatic duct → common hepatic duct → meeting cystic duct forming common bile duct → opens in the second part of duodenum

Check the additional image above

Blood supply of the liver

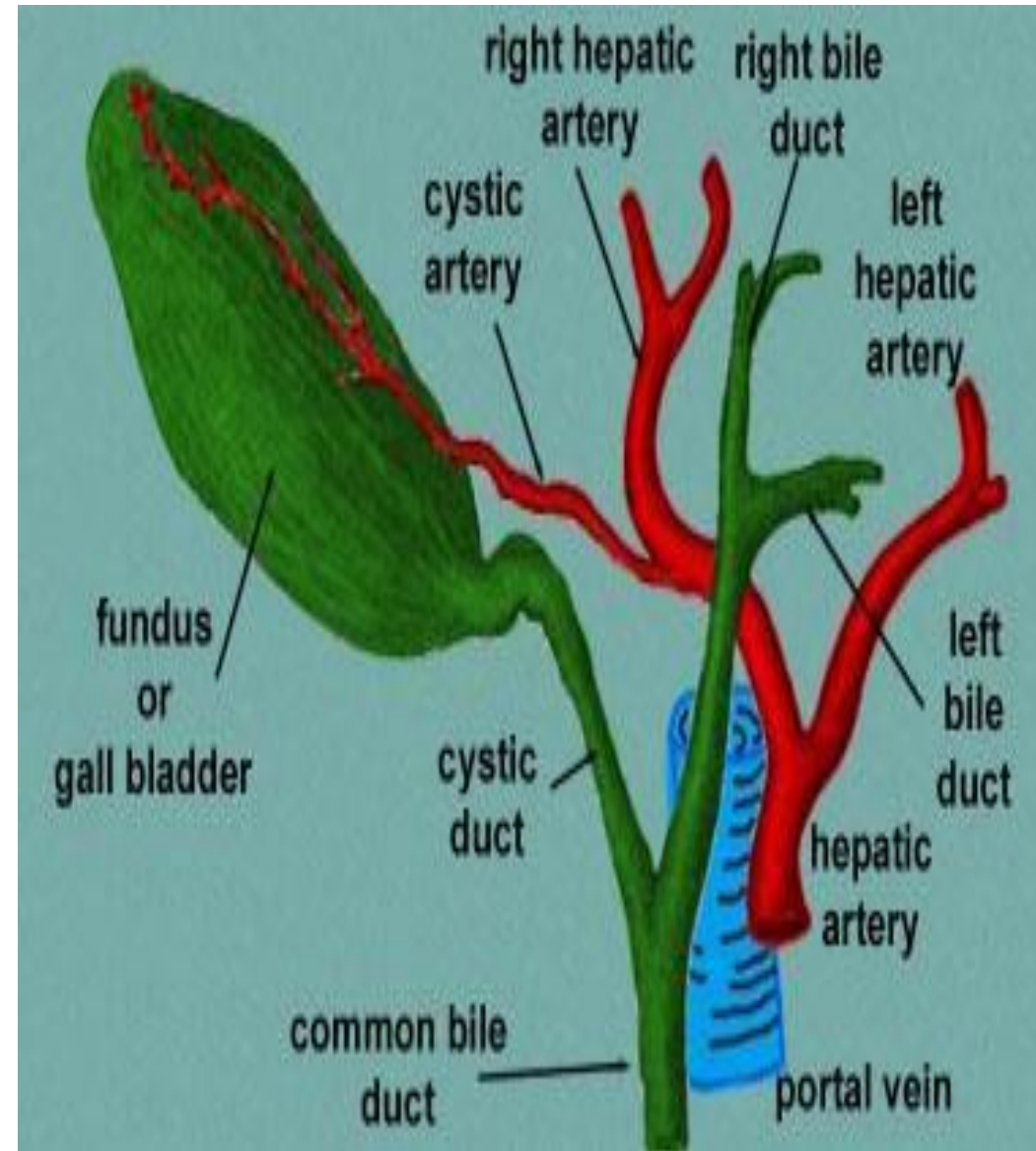
- Proper **hepatic artery** → **devided into** The right and left hepatic arteries enter the porta hepatis.
The right hepatic artery usually gives off the cystic artery, which runs to the neck of the gallbladder.

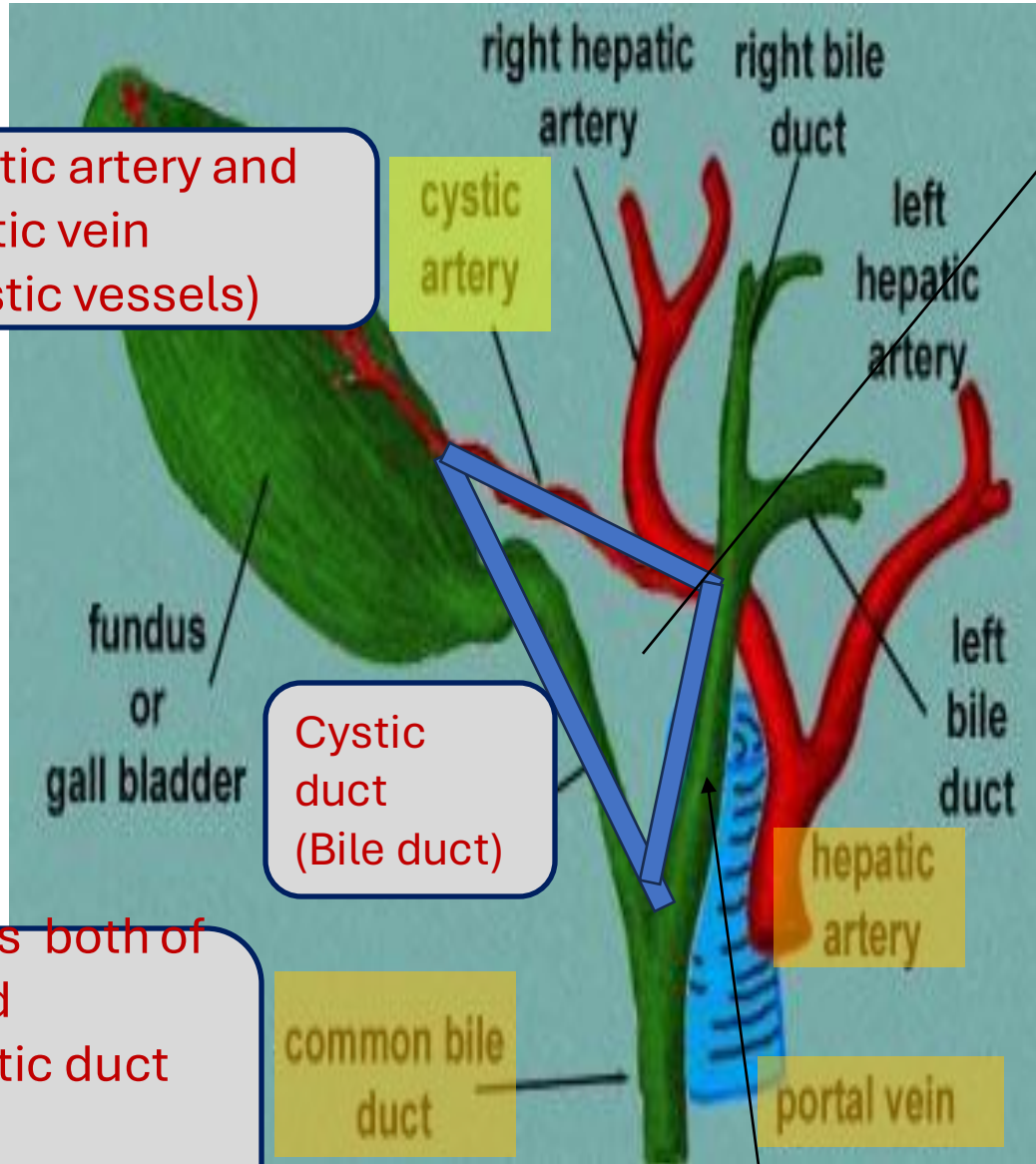
However cystic vein goes to the right portal
check the additional image below



Blood Circulation through the Liver

- The blood vessels conveying blood to the liver are the hepatic artery (30%) and portal vein (70%).
The hepatic artery brings oxygenated blood to the liver, and the portal vein brings venous blood rich in the products of digestion, which have been absorbed from the gastrointestinal tract.
- The arterial and venous blood is conducted to the central vein of each liver lobule by the liver sinusoids.
- The central veins drain into the right and left hepatic veins, and these leave the posterior surface of the liver and open directly into the inferior vena cava.





Cystic artery and cystic vein (cystic vessels)

Cystic duct (Bile duct)

In porta hepatis both of cystic duct and common hepatic duct meet and forms common hepatic duct

Common hepatic duct (Bile duct)

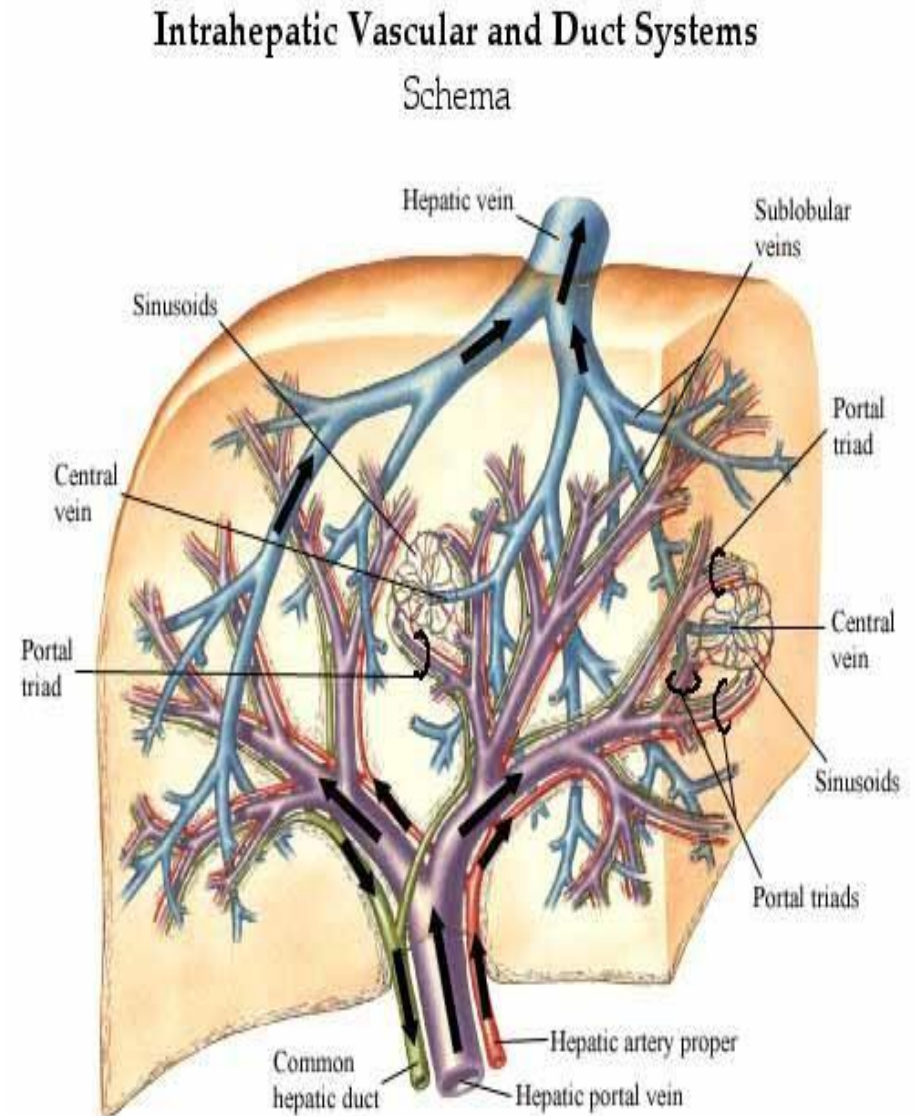
Callot's triangle:

- Margins: between the two bile ducts and cystic vessels.
- Important surgically in cholecystectomy: cutting and ligations (to prevent bleeding) of blood vessels and Removing the gallbladder

- Need to take the location of the cystic vessels into consideration: in 90% of cases, the blood vessels are located anteriorly to the common hepatic duct and 10 % posteriorly

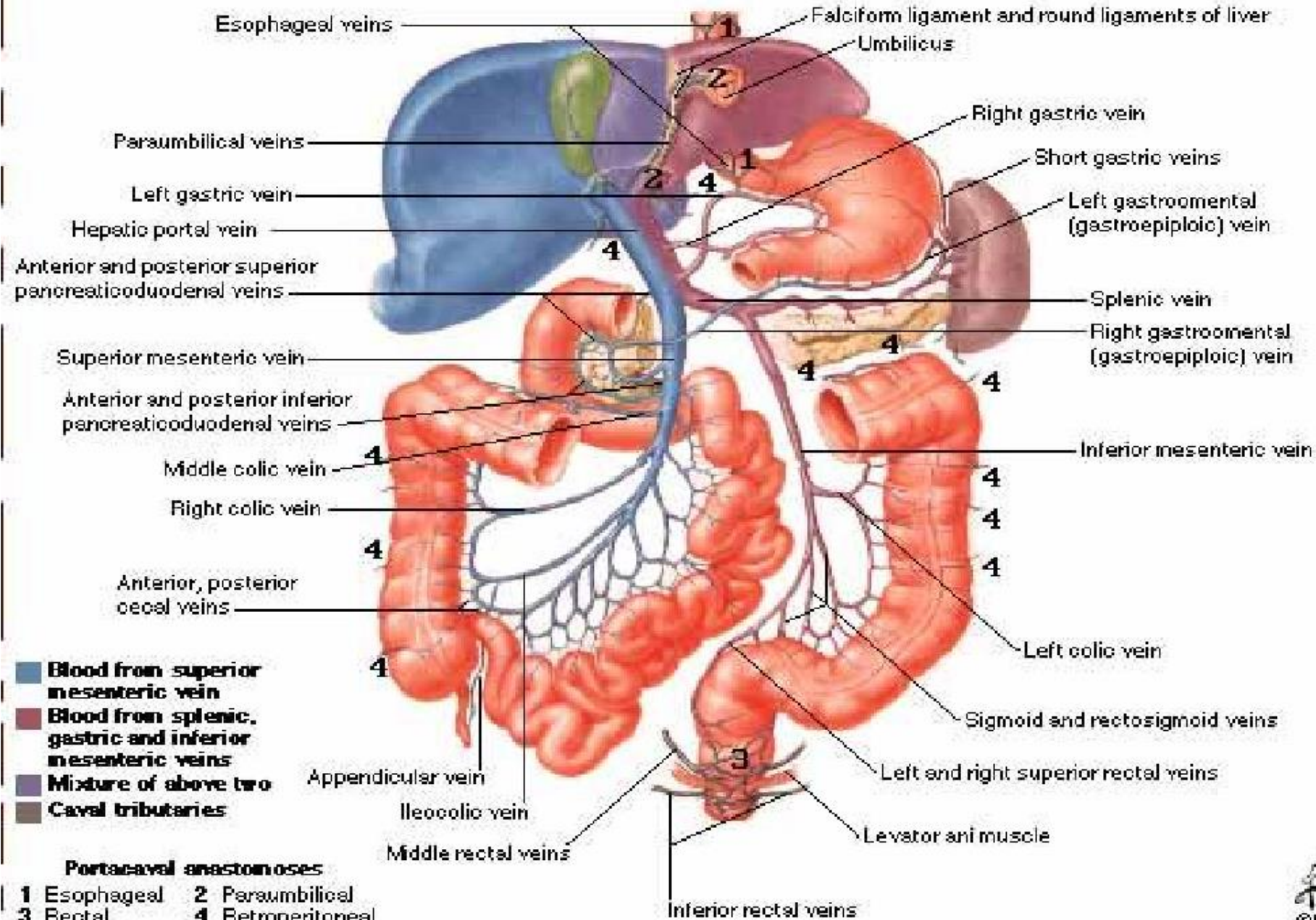
Vein drainage of the liver

- The portal vein divides into right and left terminal branches that enter the porta hepatis behind the arteries.
- The hepatic veins (three or more) emerge from the posterior surface of the liver and drain into the inferior vena cava.



Hepatic Portal Vein Tributaries

Portocaval Anastomoses

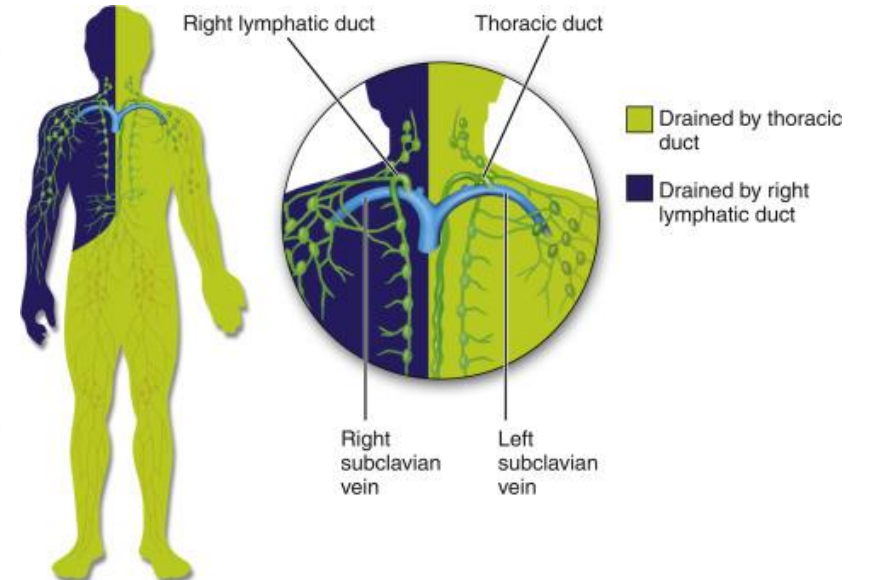
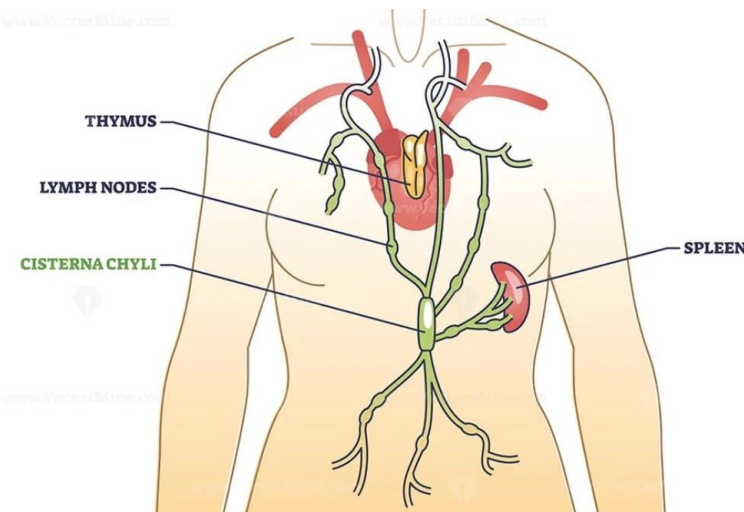
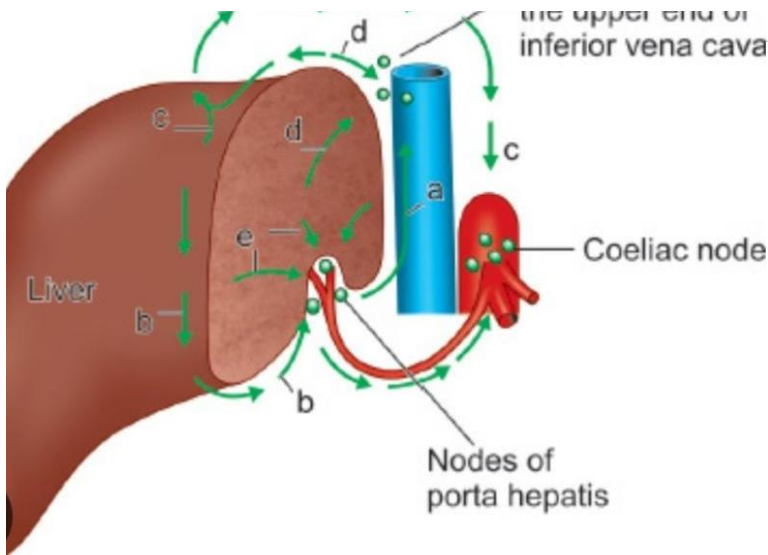


Lymphatic drainage of the liver

- Liver produce large amount of lymph~ one third – one half of total body lymph
- Lymph leave the liver and enters several lymph nod in porta hepatis → efferent vessels pass to celiac nodes
- A few vessels pass from the bare area of the liver through the diaphragm to the posterior Mediastinal lymph nodes.

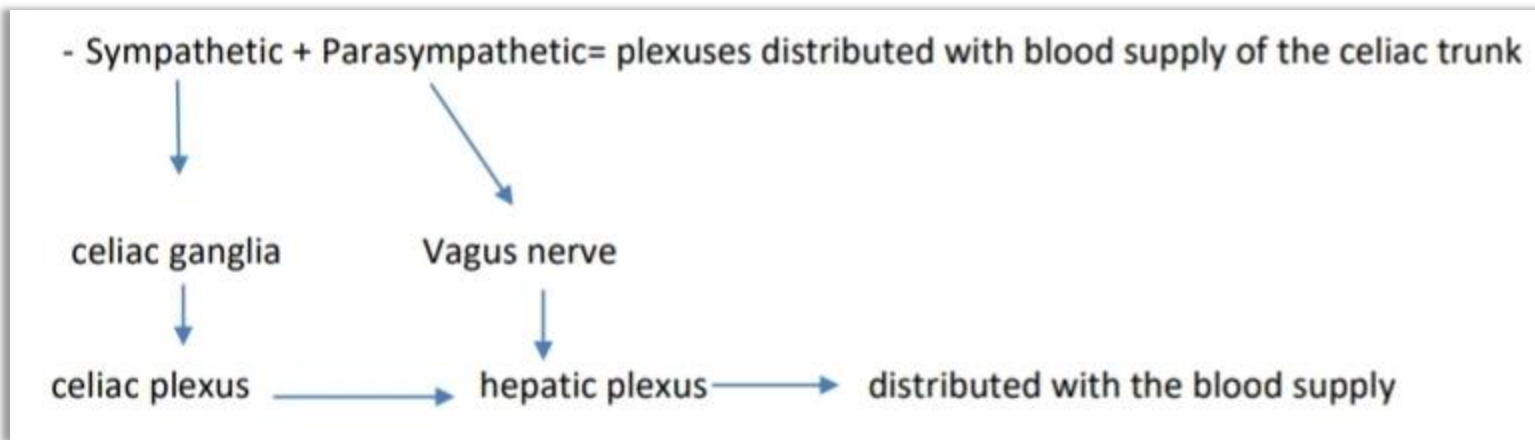
- Most of the liver drain lymph to the hepatic nodes in porta hepatis → celiac nodes → cisterna Chyli in the opening of abdominal aorta → thoracic duct
- However, the bare area which's located under the diaphragm drains lymph to right lymphatic duct through the diaphragm

Additional images



Nerve supply

- **Sympathetic** → hepatic plexus>>> celiac plexuses → thoracic ganglion chain T1-T12
- **Parasympathetic** → vagous nerve(anterior part)
- **Sympathetic and parasympathetic** nerves form the celiac plexus.
- The anterior vagal trunk gives rise to a large hepatic branch, which passes directly to the liver
- **Additional from 021**



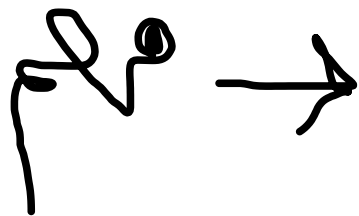
Endoscopic retrograde cholangiopancreatography (ERCP)

- It is a technique that combines the use of endoscopy and fluoroscopy to diagnose and treat certain problems of the biliary or pancreatic ductal systems. Through the endoscope, the physician can see the inside of the stomach and duodenum, and inject dyes into the ducts in the biliary tree and pancreas so they can be seen on X-rays.

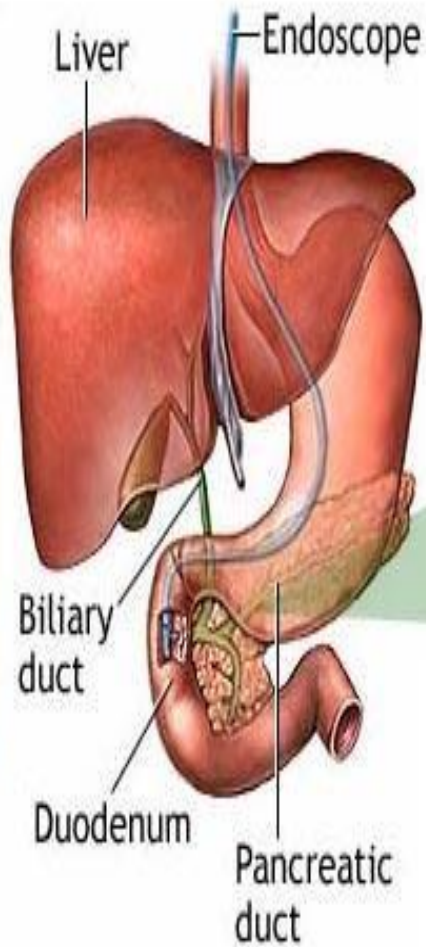
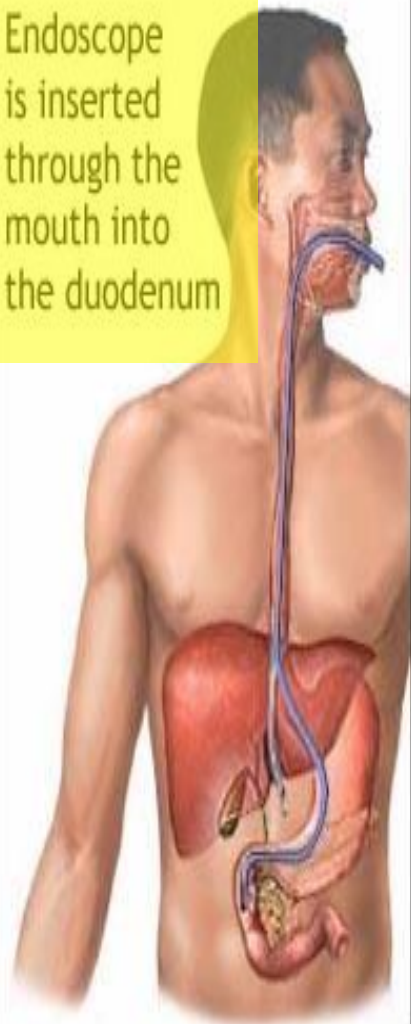
ERCP is used primarily to diagnose and treat conditions of the bile ducts, including gallstones, inflammatory strictures (scars), leaks (from trauma and surgery), and cancer.

ERCP

The catheter inserted retrogradely into the pancreatic or biliary ducts.



Endoscope is inserted through the mouth into the duodenum

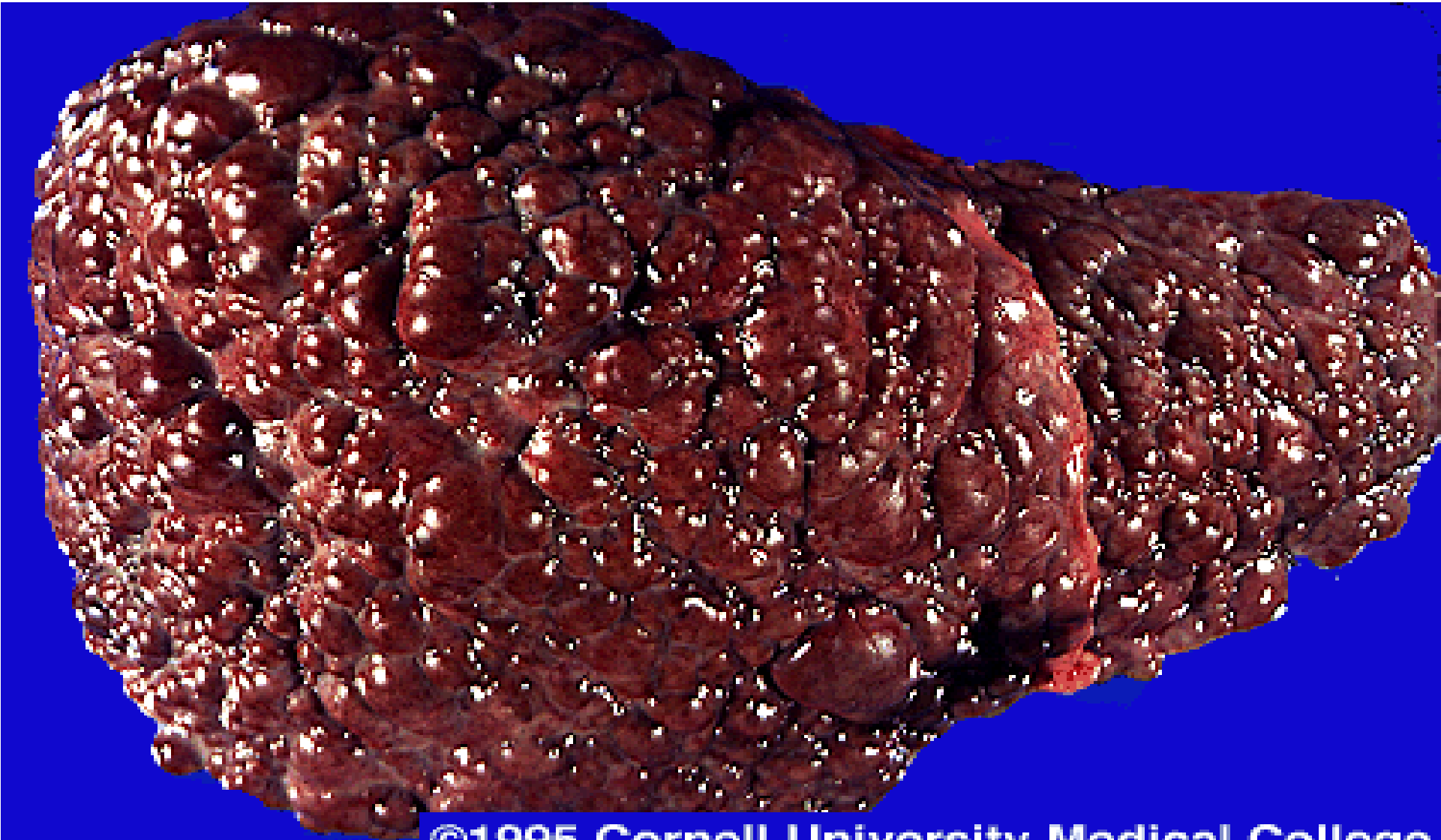


Dye is injected through a catheter into the pancreatic or biliary ducts

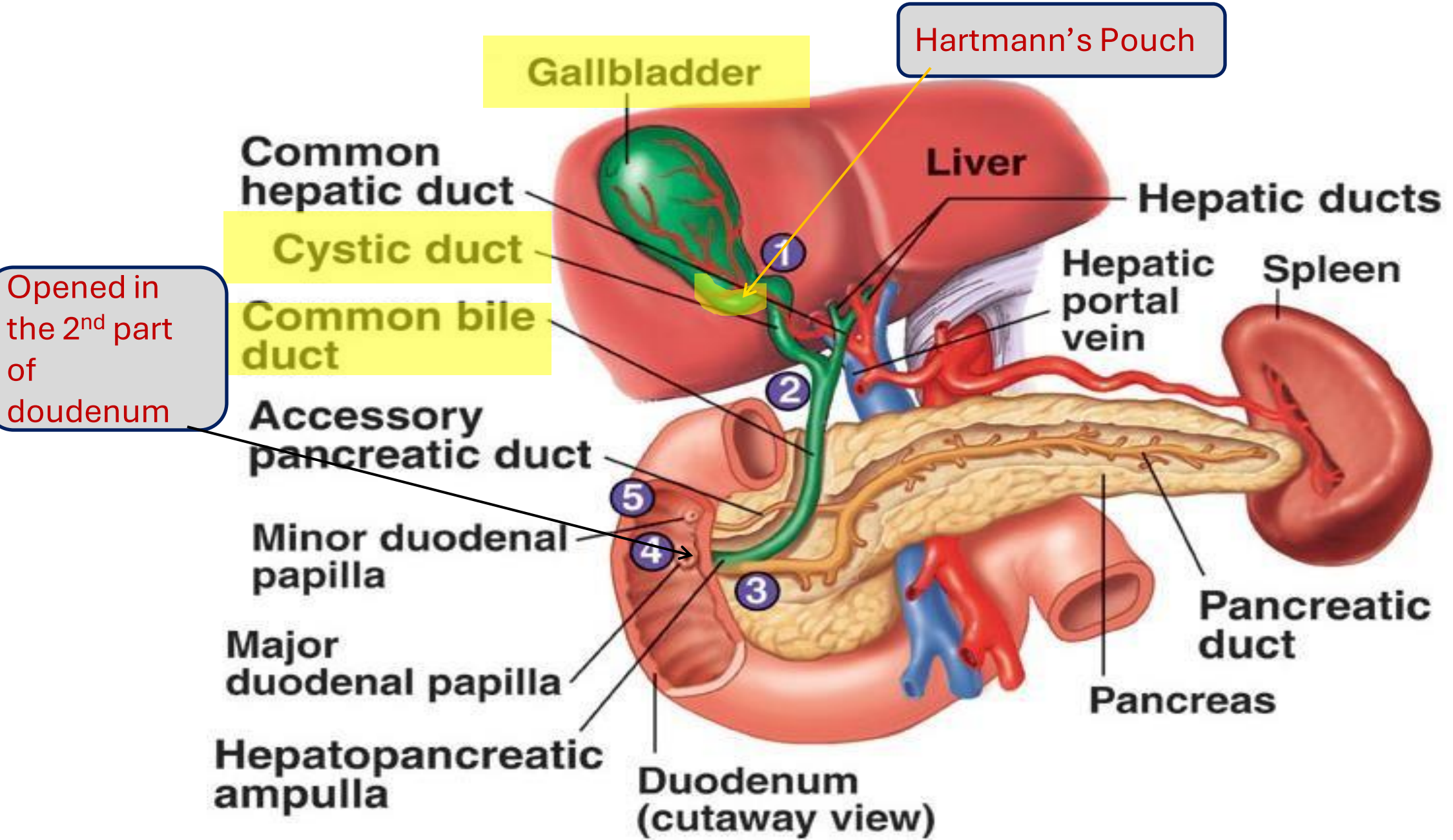
ADAM.



Liver cirrhosis
تشمع الكبد



GALLBLADDER



Anatomical position of GB

The function of gallbladder is concentration of bile (20 times concentrated),
When the Oddi sphincter is closed the bile will go from the liver to the gall bladder where the water will be absorbed, and bile get concentrated

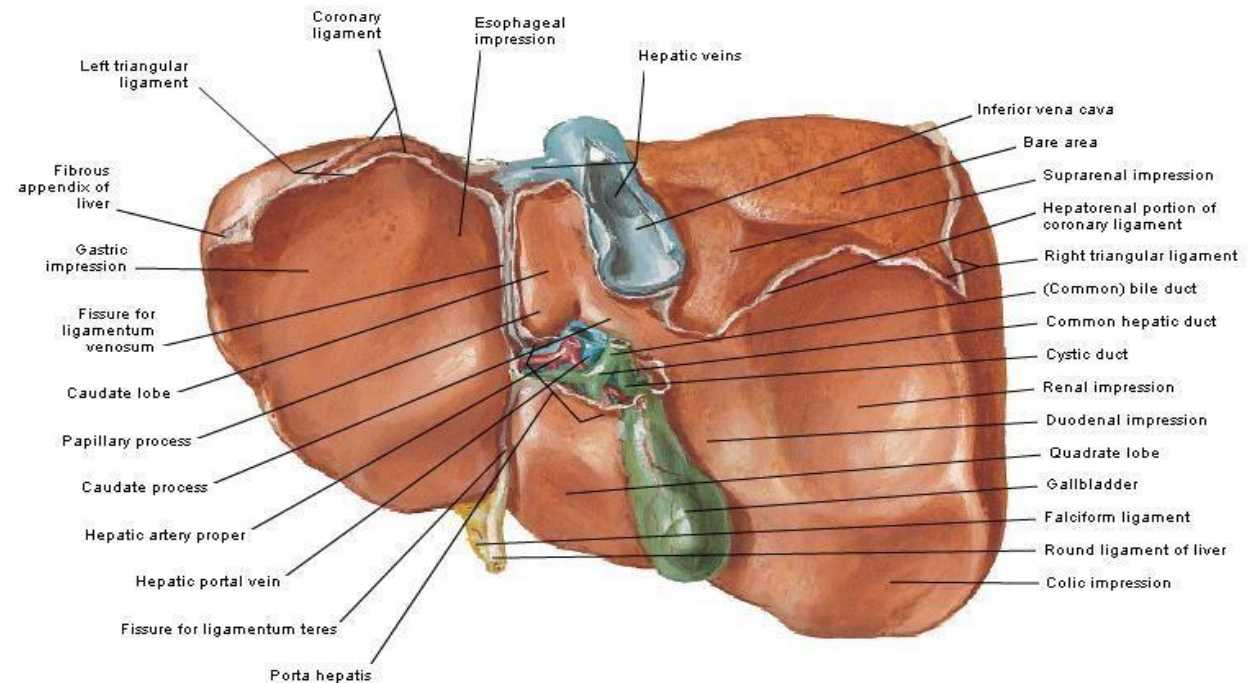
How is bile secreted ?

When it is stimulated it contracts, and in the sphincter of Oddi opens

- Epigastric - Right hypochondrium region
- At the tip of the 9th RT . C.C
- Green muscular organ
- Pear-shaped, hollow structure
- On inferior surface of liver
- Between quadrate and right lobes
- Has a short mesentery
- Capacity 40- 60 cc
- Body and neck

Directed toward porta hepatis

Surfaces and Bed of Liver
Visceral Surface



Structure of GB

Pear shape 

Fundus

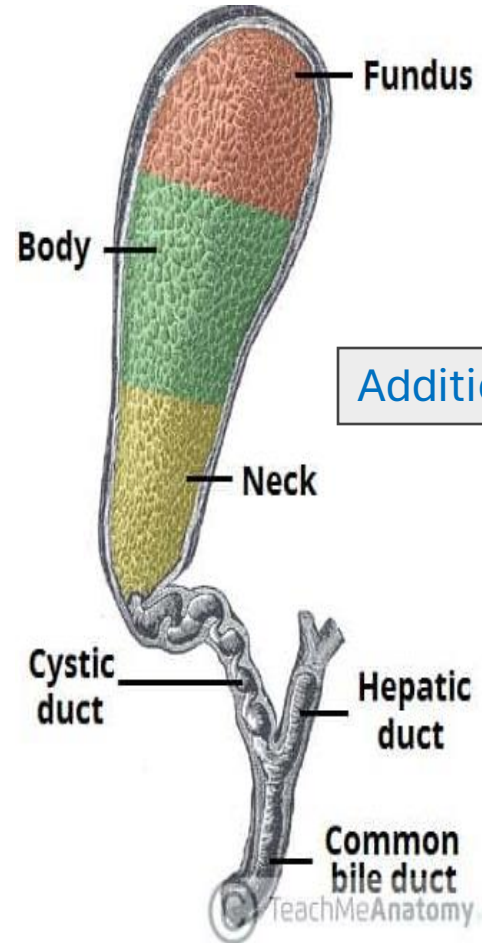
- Ant: ant. abdominal wall
- Post.inf: transvers colon

Body

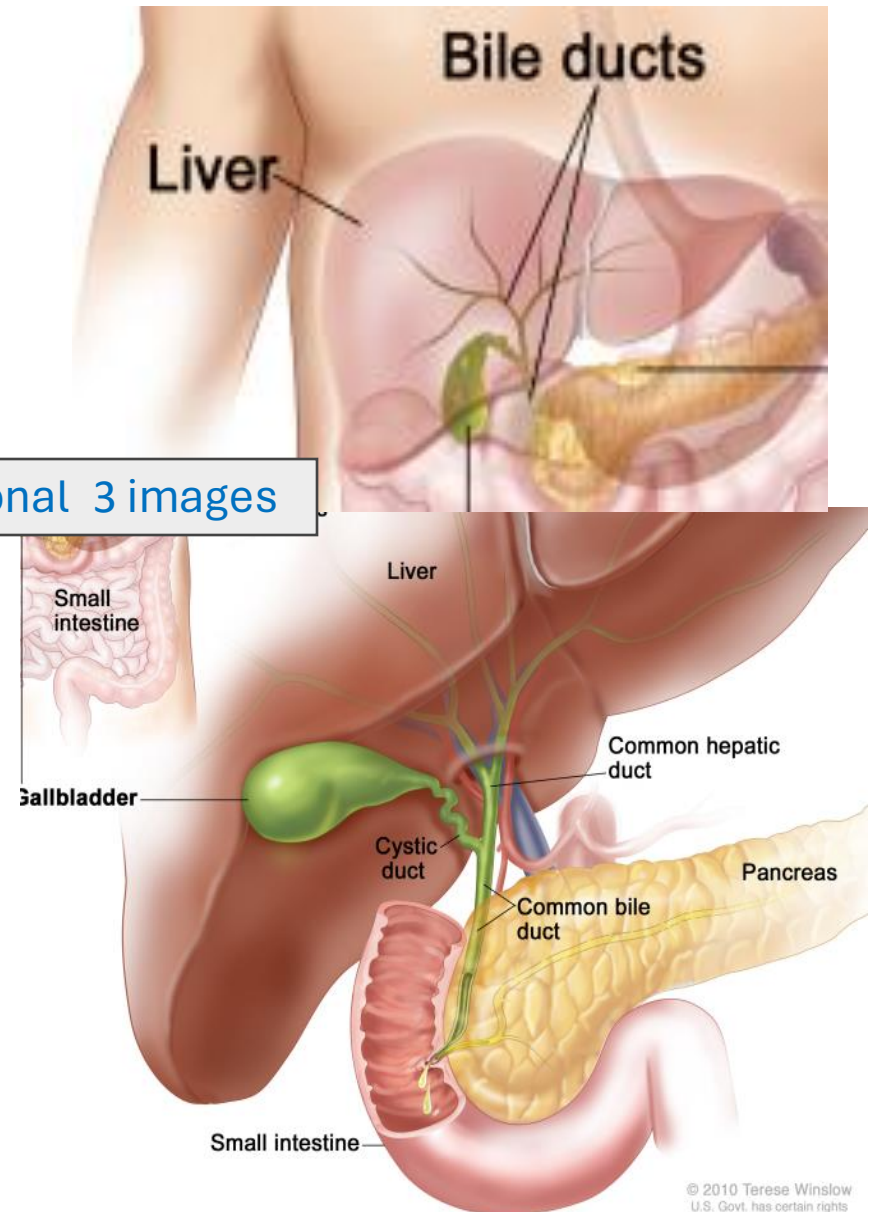
- sup: liver
- post.inf: Tr. colon. End of 1st part of duodenum , begins of 2nd part of duodenum

Neck

- Form the cystic duct, 4cm



Additional 3 images

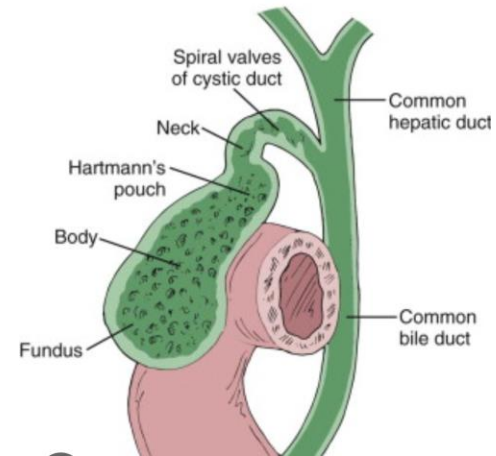


Structure of GB

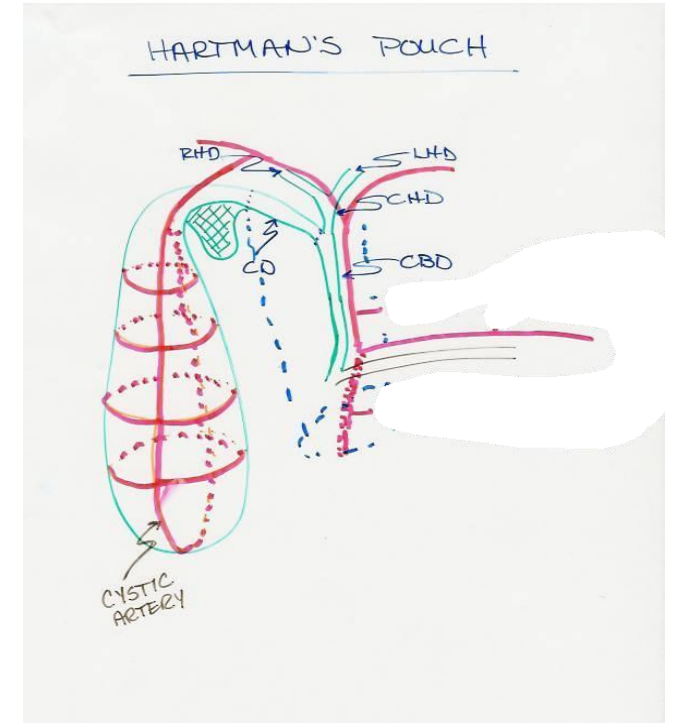
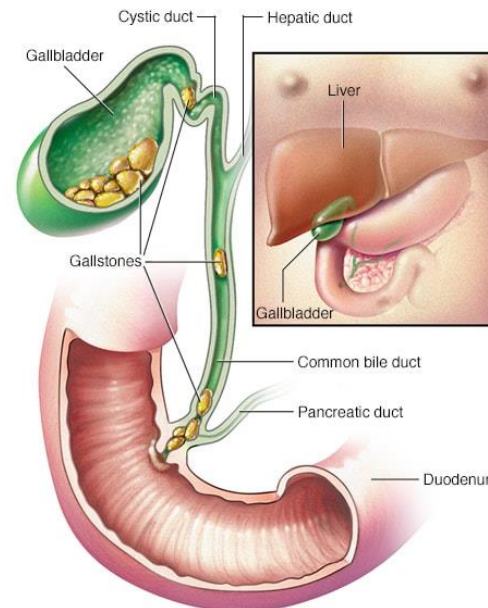
Hartmann's Pouch

1. Lies between body and neck of gallbladder
2. A normal variation
3. May obscure cystic duct
4. If very large, may see cystic duct arising from pouch

A downward bulge called Hartman's pouch. Secretions of the gallbladder can accumulate in this bulge and get stuck (stasis), which will then accumulate and lead to the formation of a single stone. This stone is removed by Cholecystectomy



Additional 2 images



Gall Bladder

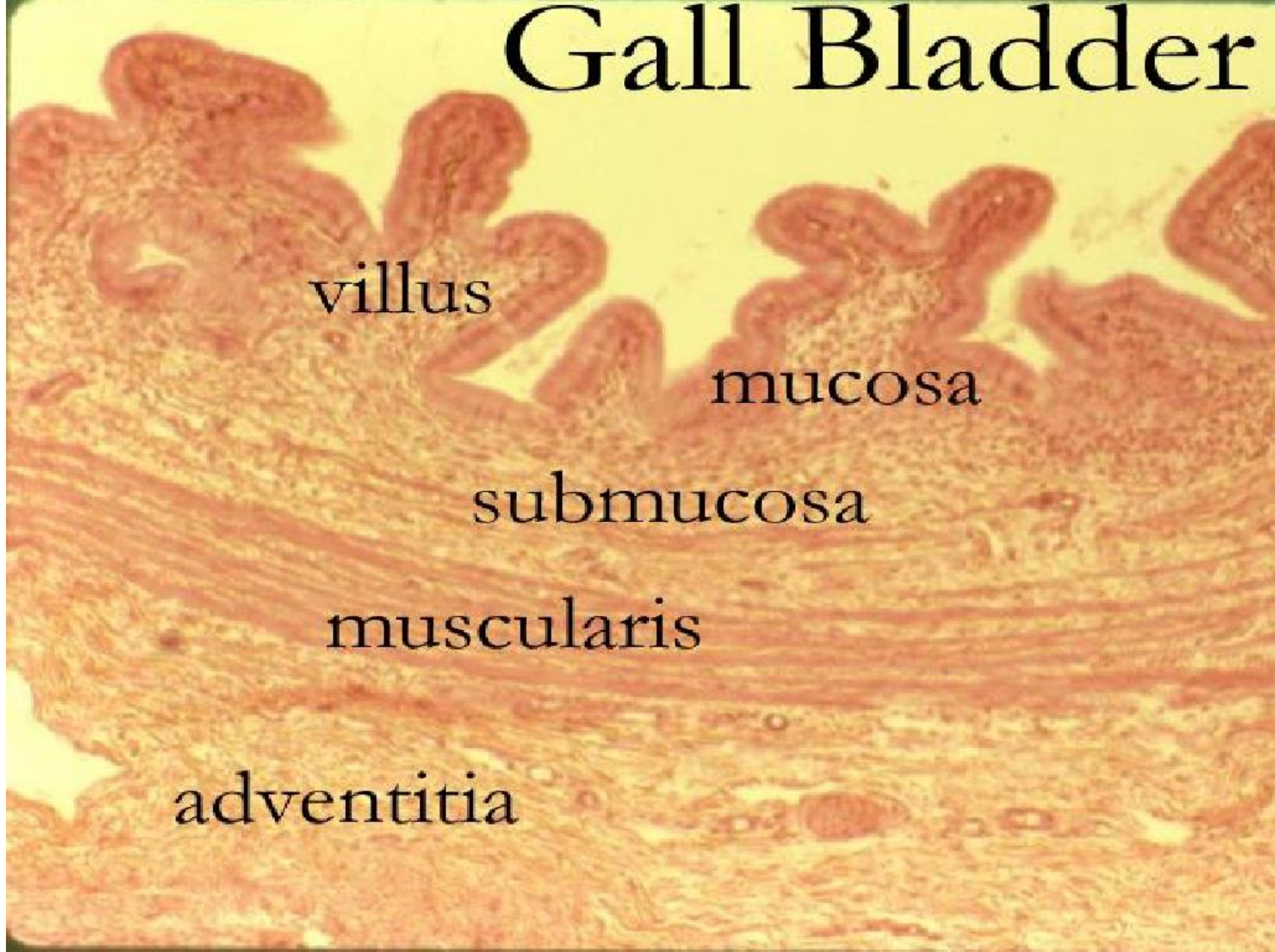
villus

mucosa

submucosa

muscularis

adventitia



Gall Bladder H&E

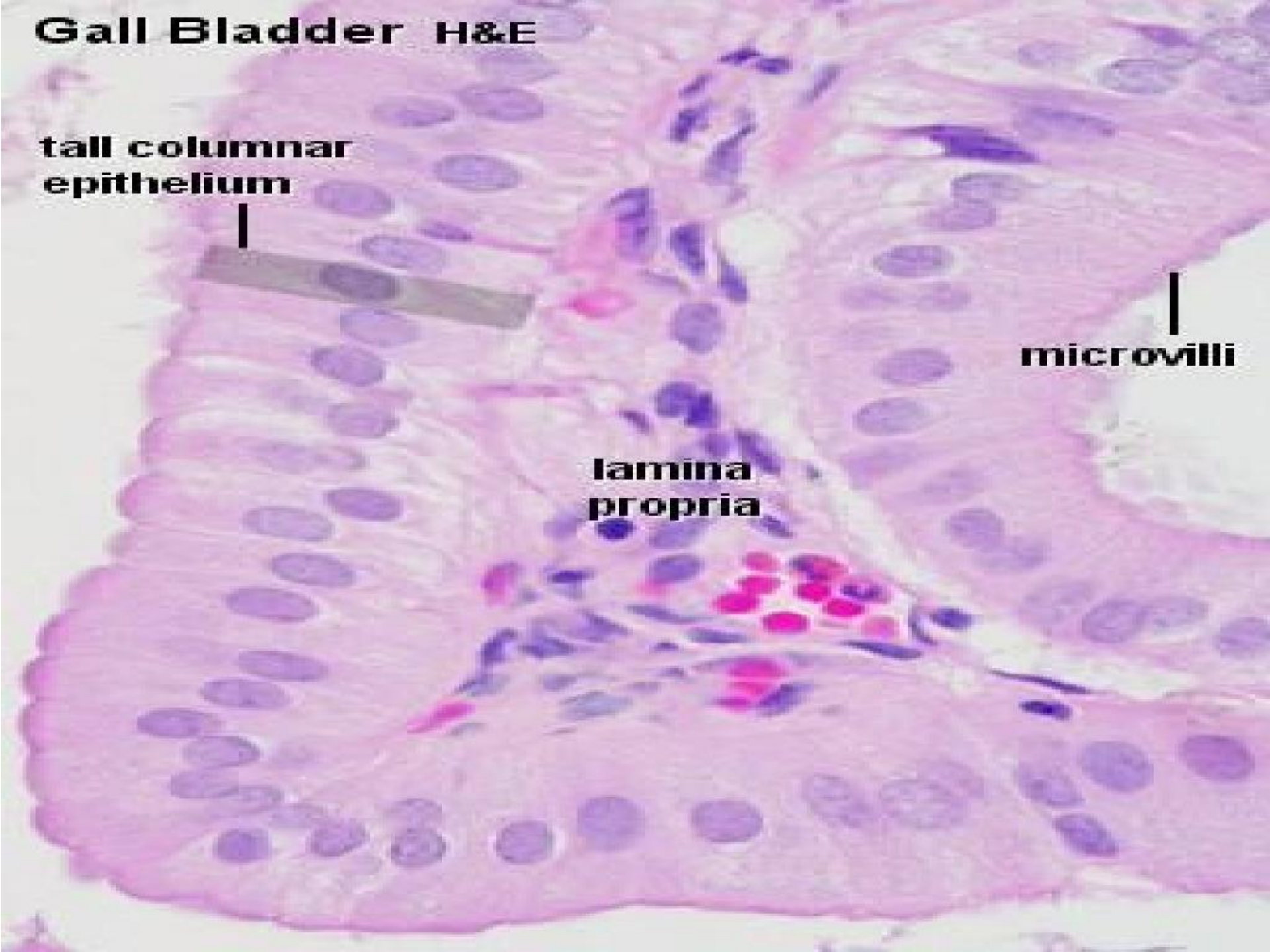
tall columnar epithelium



microvilli



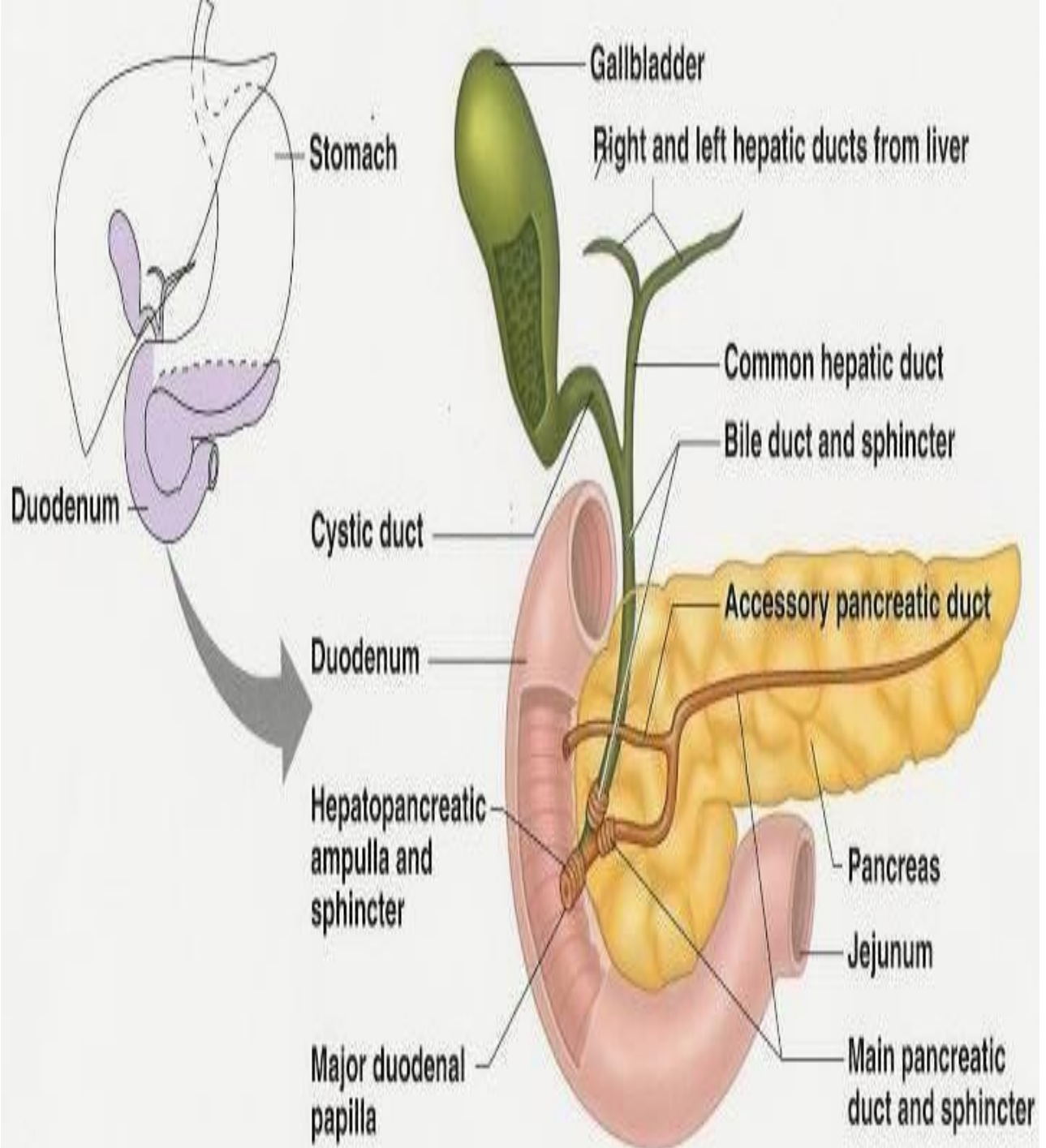
lamina propria



Cystic duct

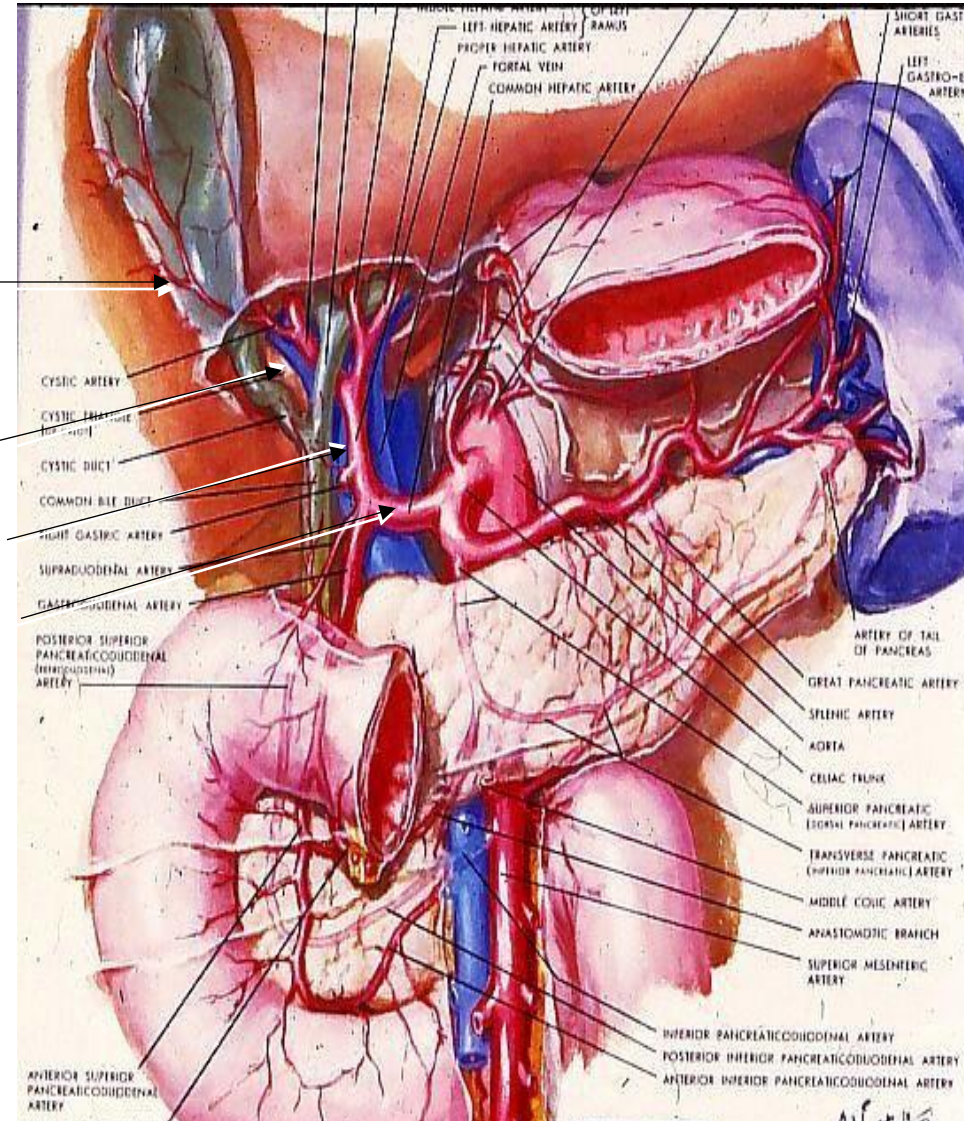
- It joins common hepatic duct and form common bile duct

4 cm long



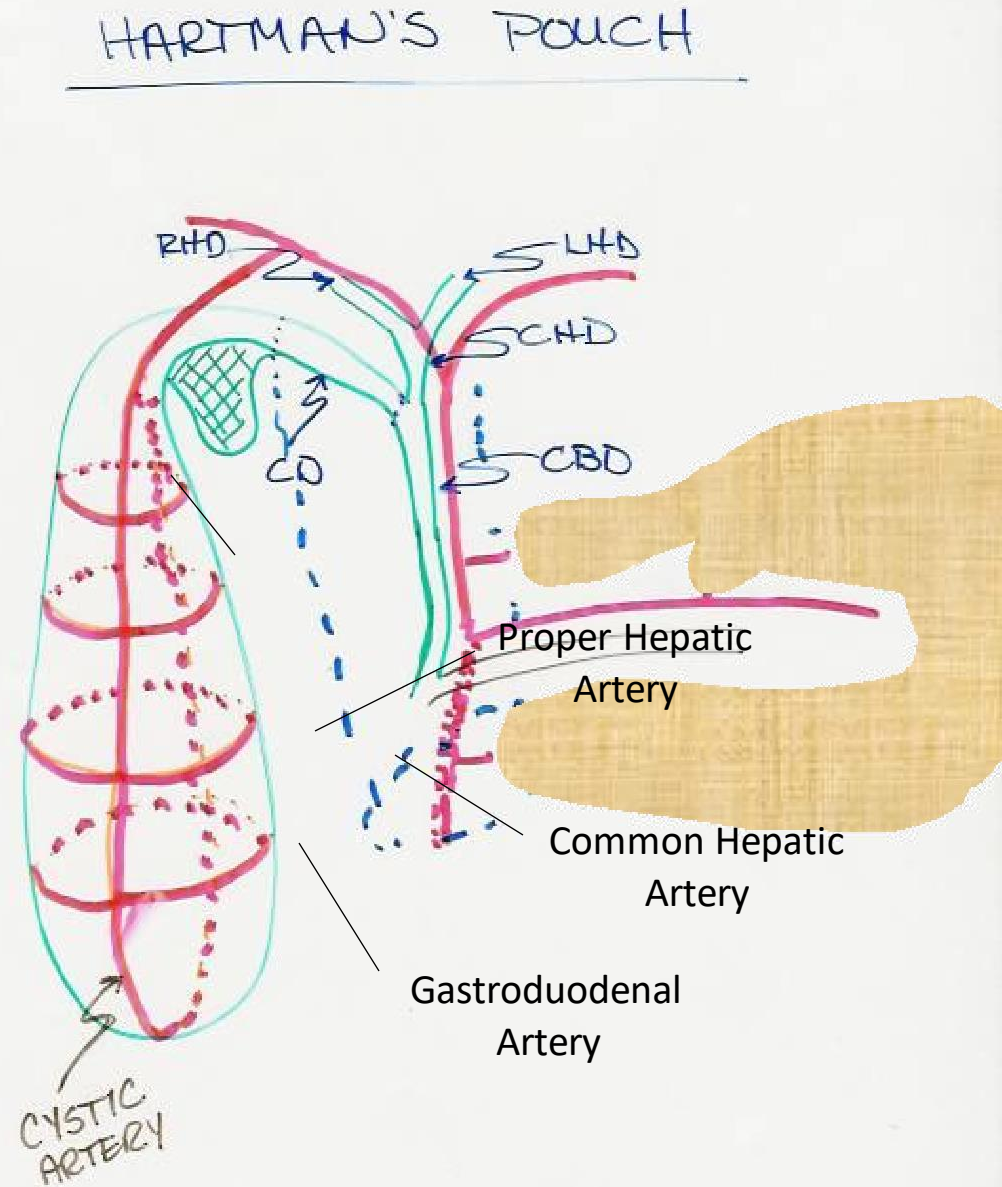
Arterial Supply to the Gallbladder

- Cystic artery
- Right hepatic artery
- Proper hepatic artery
- Common hepatic artery



Blood supply of GB:

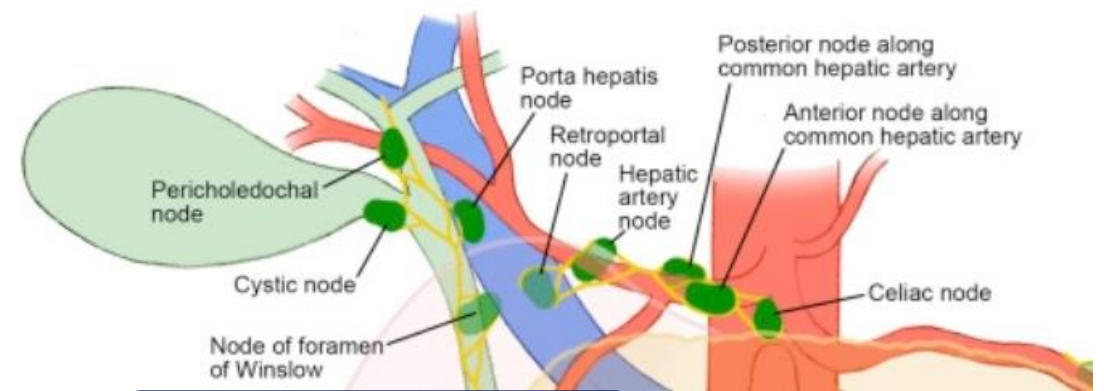
- Cystic artery → branch of Rt. Hepatic artery
- Cystic vein → Rigt portal → end in portal vein
- Small branches (arteries and veins run between liver and gall bladder)



Lymphatic drainage of GB

Cystic nodes & hepatic nodes → celiac nodes → thoracic duct

1. Terminate @ celiac nodes
2. Cystic node at neck of GB
 - a. Actually a hepatic node
 - b. Lies at junction of cystic & common hepatic ducts
3. Other lymph vessels also drain into hepatic nodes

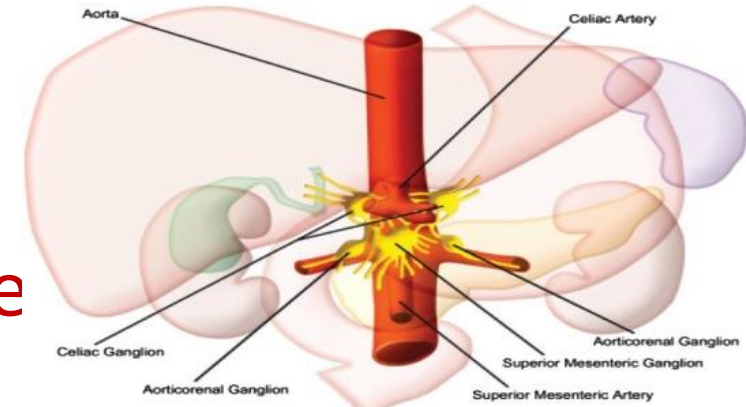


Additional image

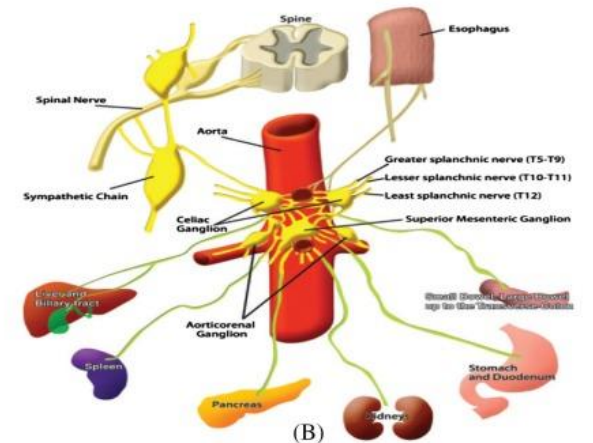
Nerve supply

- Sympathetic and parasympathetic from celiac plexus
- Parasympathetic ---- vagous nerve
- Hormone → cholecystokini **which stimulates the gallbladder to contract** → duodenum

Additional image



(A)



(B)

Common bile duct

Extra hepatic biliary system

Rt. hepatic duct

+

Lt hepatic duct

↓

Common hepatic duct

+

Cystic duct

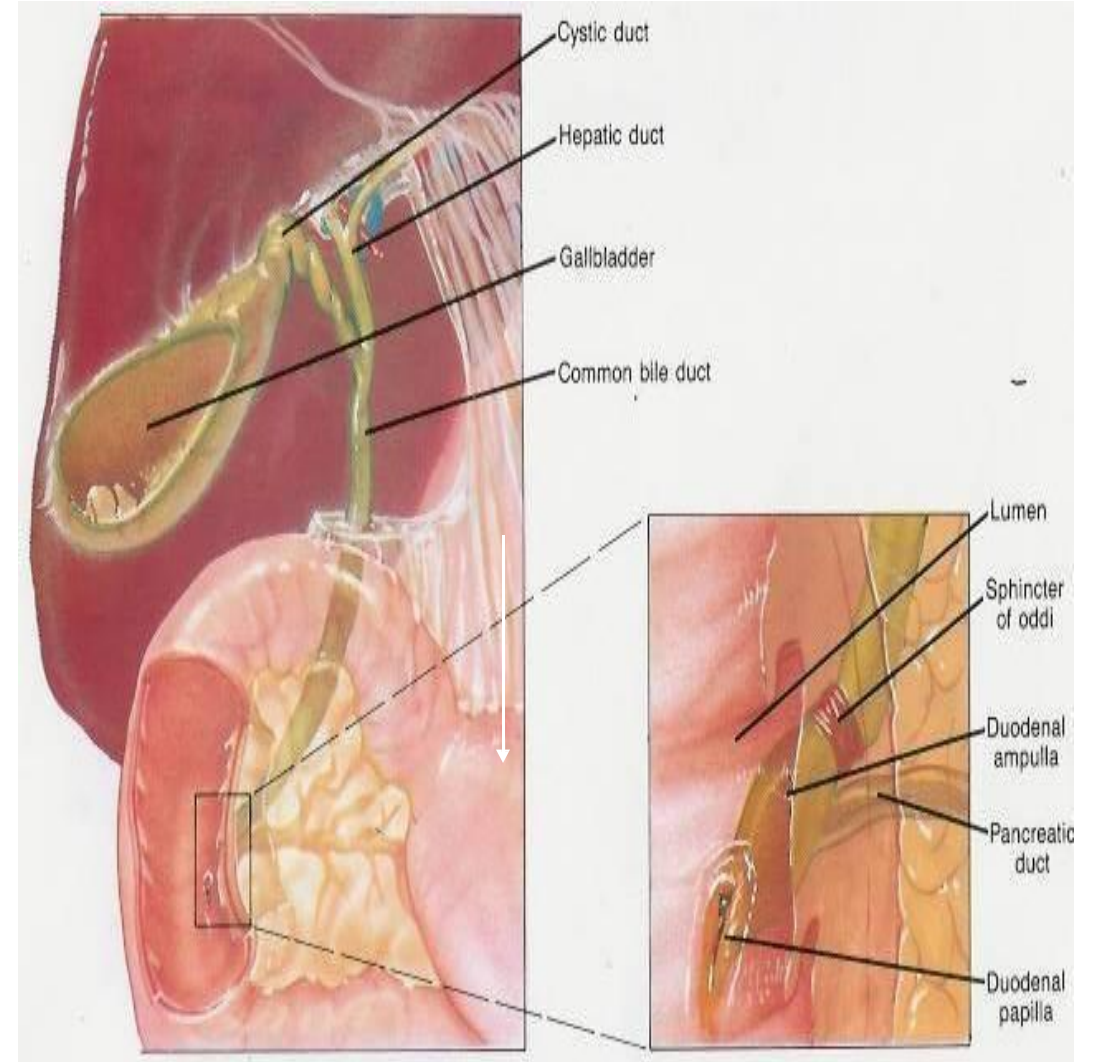
↓

Common bile duct

- 4cm

- Descend in free edge of lesser omentum

- Supra duodenal part
- Retro duodenal part
- Retro pancreatic part



Bile duct..... parts and relations

-3 inc long

-1st part

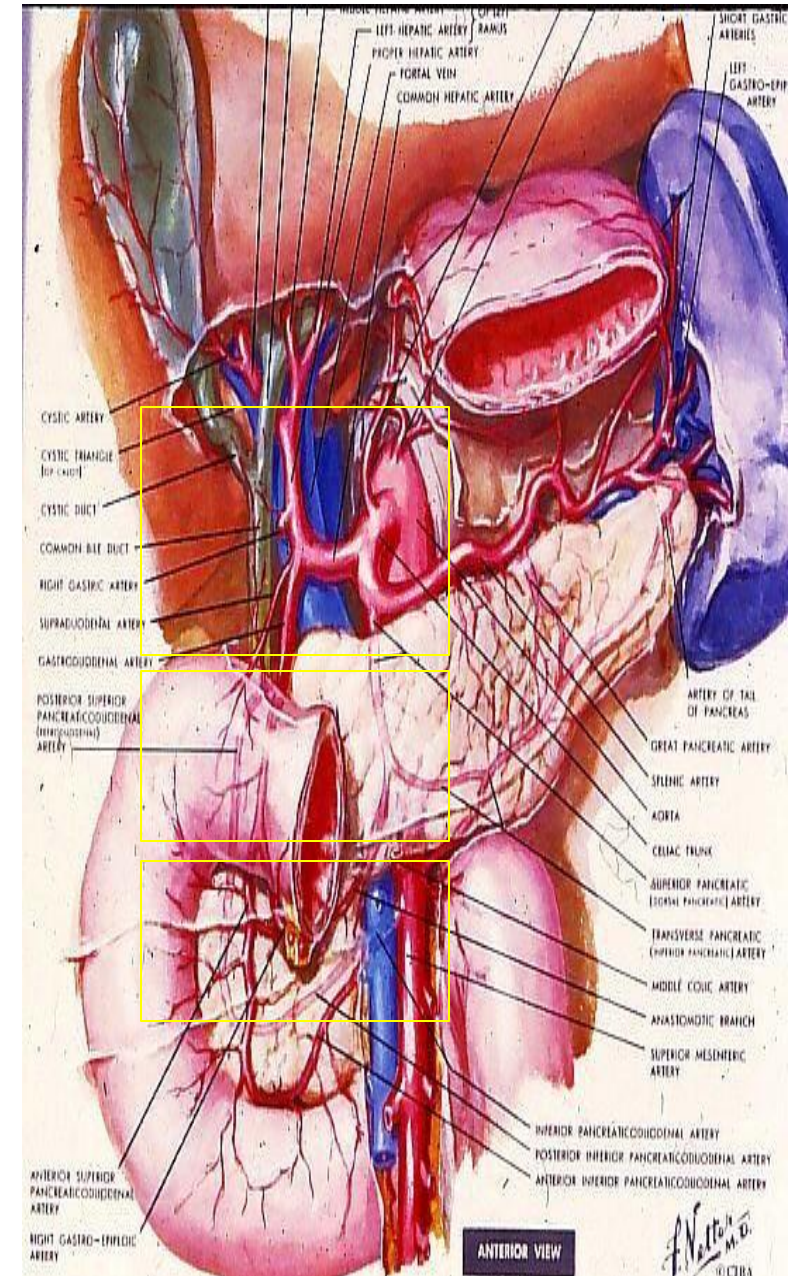
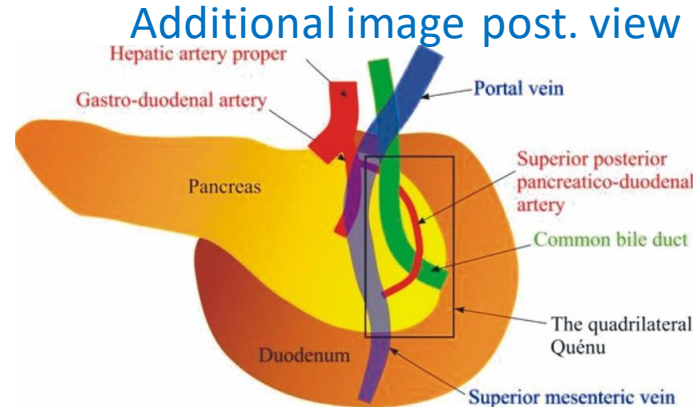
- Located in right free margin of lesser omentum
- in front of the opening into the lesser sac (Epiploic opening)
- Rt to hepatic artery and portal vein

- 2nd part

- Behind the 1st part of the duodenum
- Rt to the gastroduodenal artery

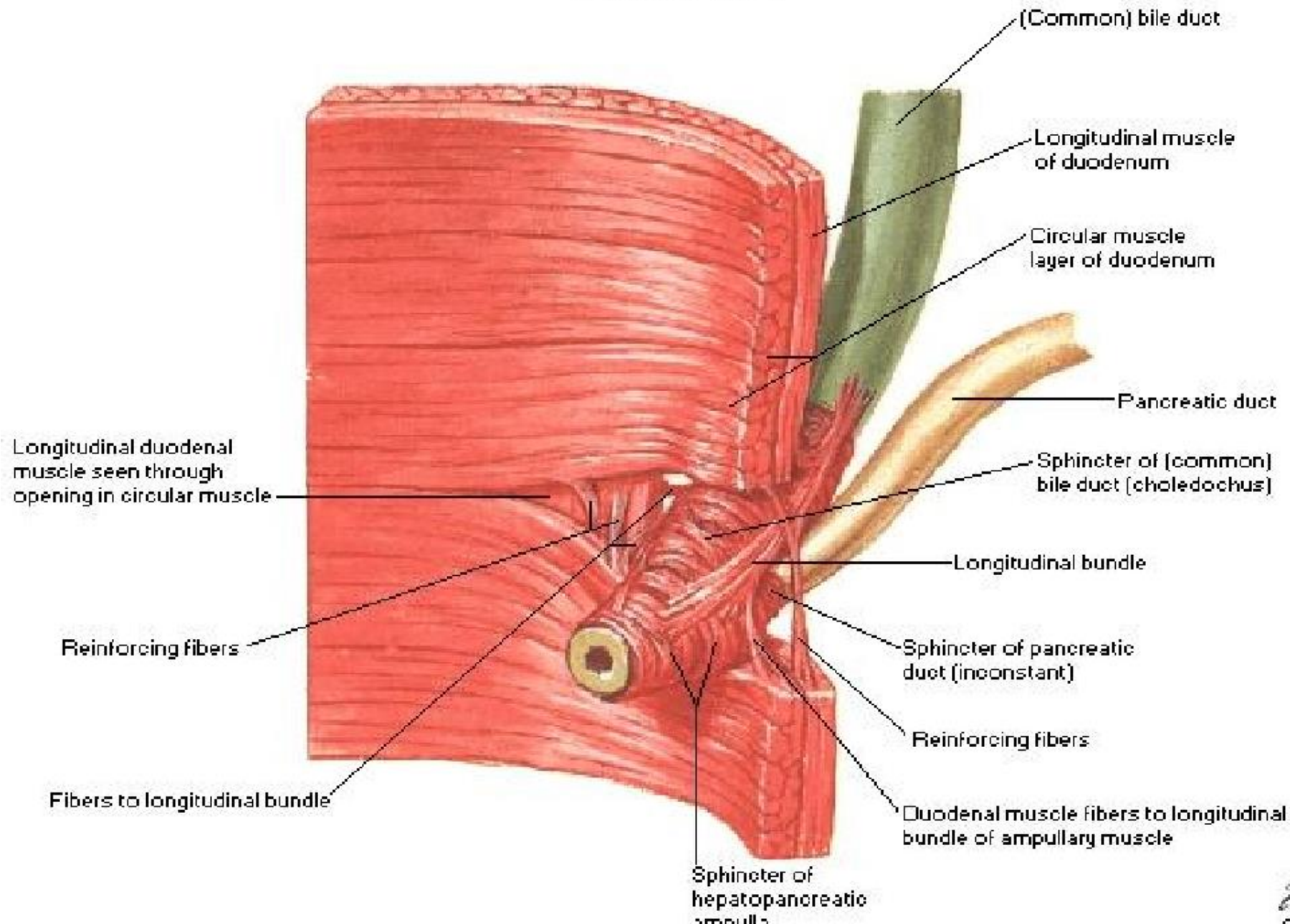
-3rd part

- Posterior surface of the head of the pancreas
 - Contact with main pancreatic duct
 - Related with IVC, gastroduodenal artery, portal vein
- End in the half second part of duodenum at ampulla of Vater



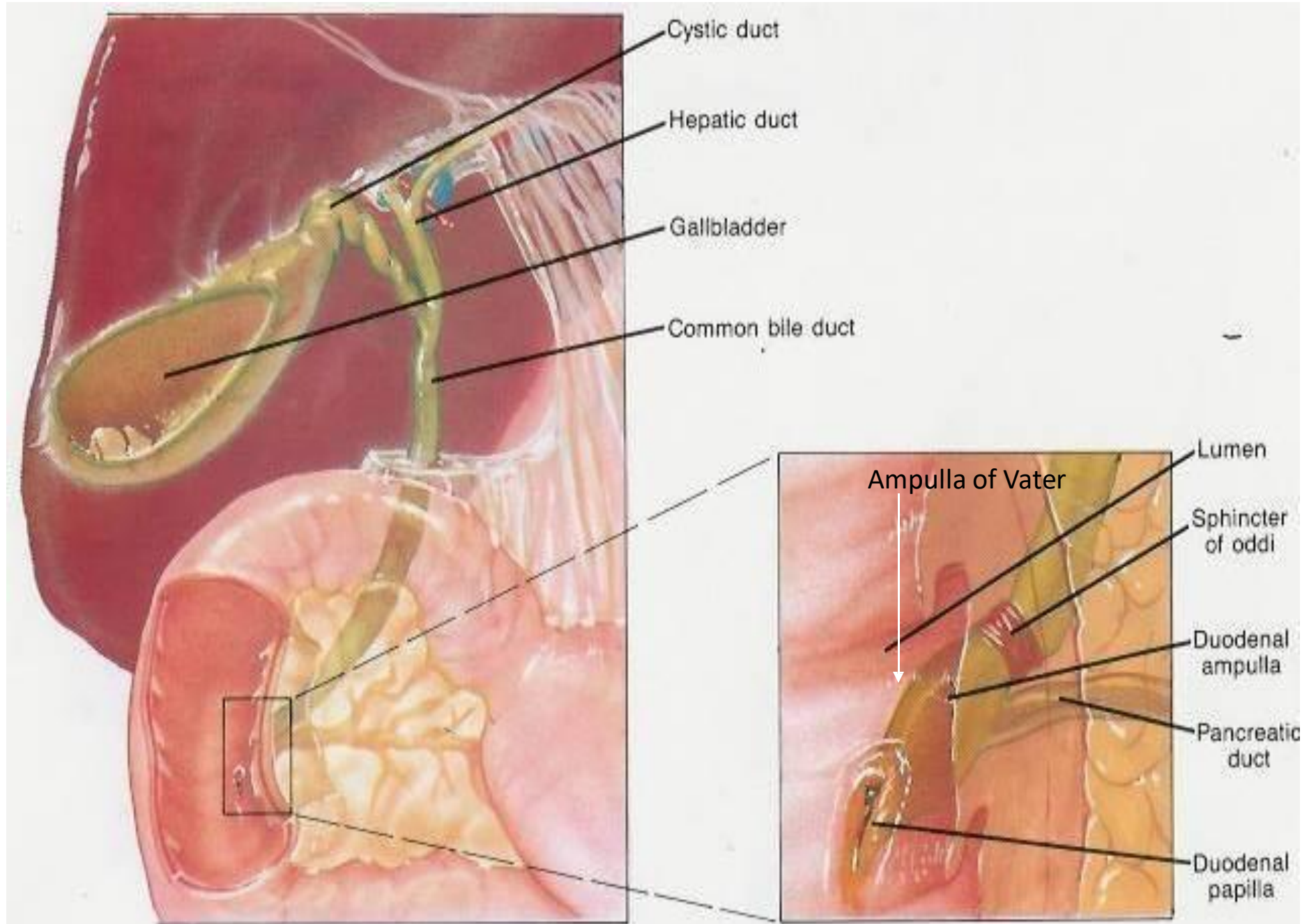
Junction of Bile Duct and Duodenum

Dissection



F. N. N.

Ampulla of Vater with CBD and Pancreatic Duct



Hepaticopancreatic ampulla (Ampulla of Vater)



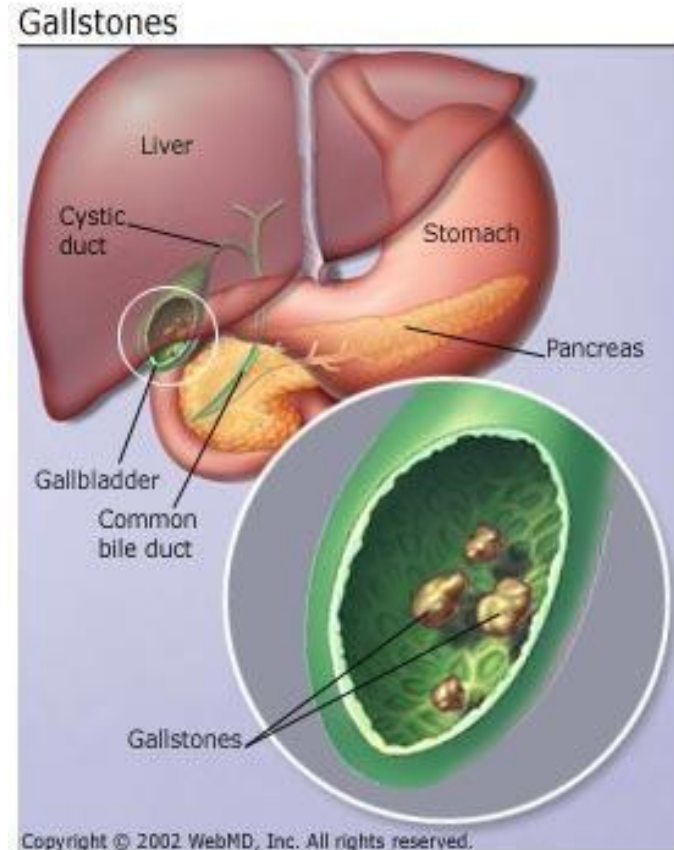
Blood supply of CBD

Small arteries supplying CBD

- a. Arise from cystic artery
Posterior branch of superior
pancreaticoduodenal artery

What is bile?

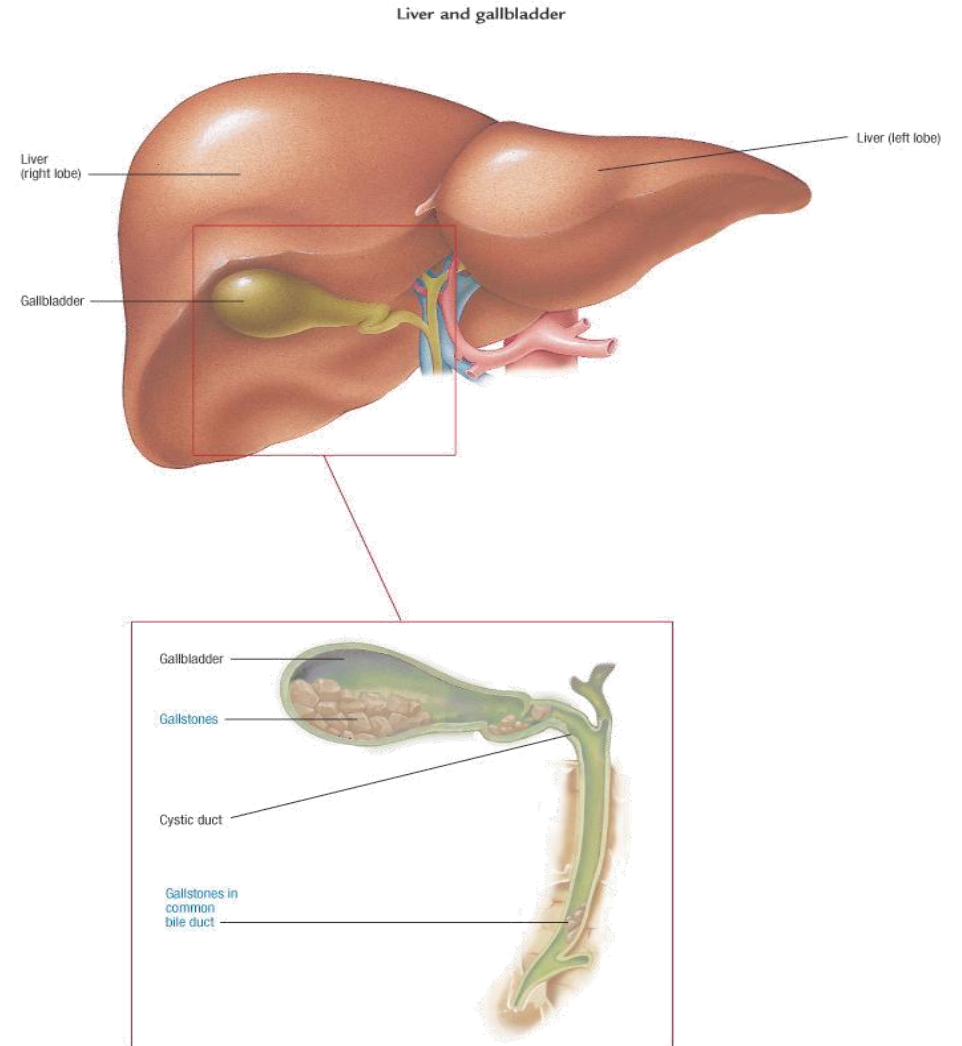
- Bile composed of water, ions, bile acids, organic molecules (including cholesterol, phospholipids, bilirubin)
- Gallstones are mostly cholesterol
- Acids and salts emulsify fats for absorption across wall of small intestines into lacteal lymph capillaries (review)
- Contains waste products from RBC breakdown and other metabolic processing (color of feces from bilirubin in bile)(review)
- Ions buffer chyme from stomach (review)



Cholelithiasis

Treated by cholecystectomy!!
If not it may lead to cancer

- GB shows likely sites of stone formation/deposition
- Gangrene of gallbladder is rare
- Stone in C.B.D obstruct jaundice & pancreatitis



Gallbladder Diseases

1 Cholelithiasis & Cholecystitis

Cholecystitis = inflammation of GB

Cholelithiasis= Stone(s) in GB

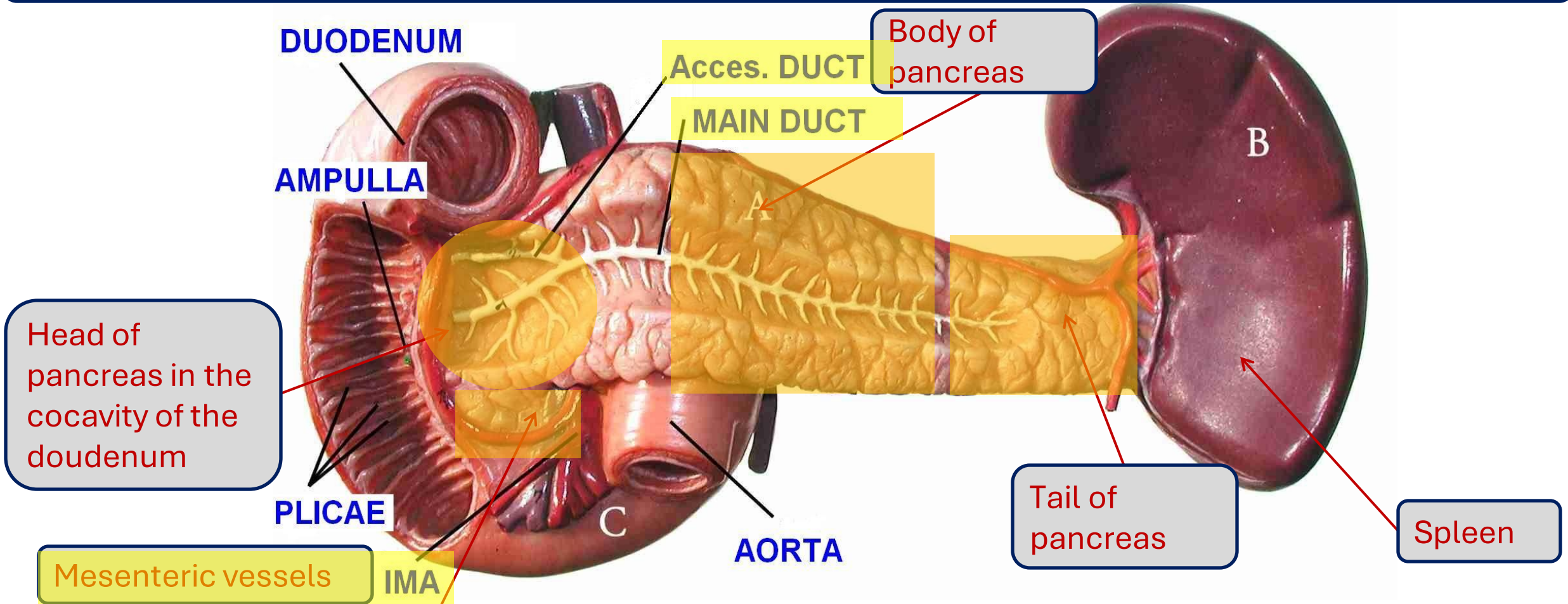
2- Obstructive jaundice: liver patterns

3- Gangrene of gall bladder rare

4- Congenital defects

PANCREAS

Retroperitoneal organ, located in the epigastric region, The tail has an impression in the spleen



Head of pancreas in the cocavity of the doudenum

Uncinate process which is an extention of the head posterior to the superior mesenteric vessels

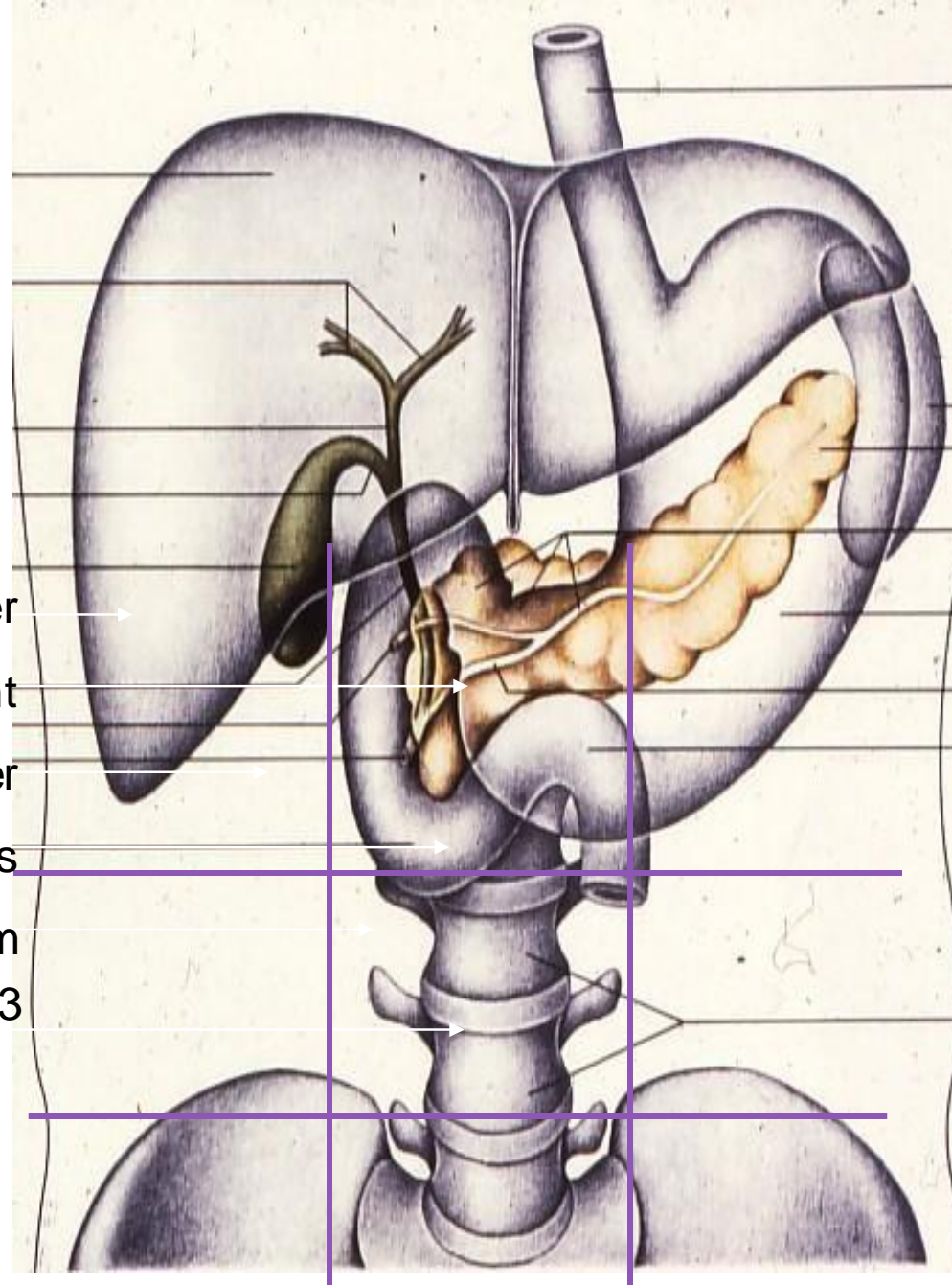
Anatomical position

- Epigastric
- left upper hypochondrium region

It is a mixed gland has exocrine (acini cells) and endocrine (Islet of Langerhans) part

Exocrine part secretes pancreatic enzymes which go through the pancreatic duct to the 2nd part of duodenum

Right lobe of liver
Falciform ligament
Gallbladder
Pancreas
Duodenum
L-3



Recall stomach bed
 Splenic artery a content of stomach bed located in the upper border of pancreas while splenic vein is not because it is behind the pancreas

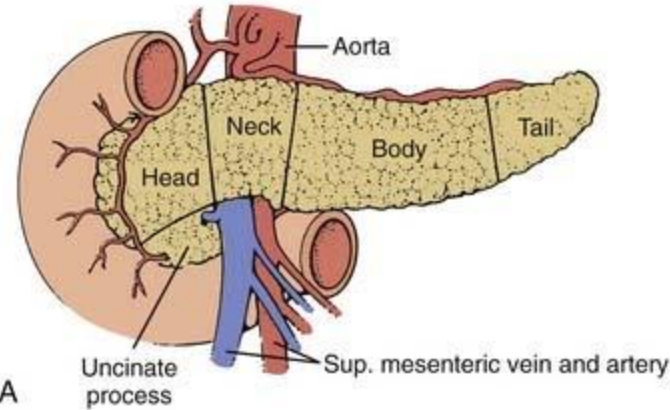
Common relation

Anterior

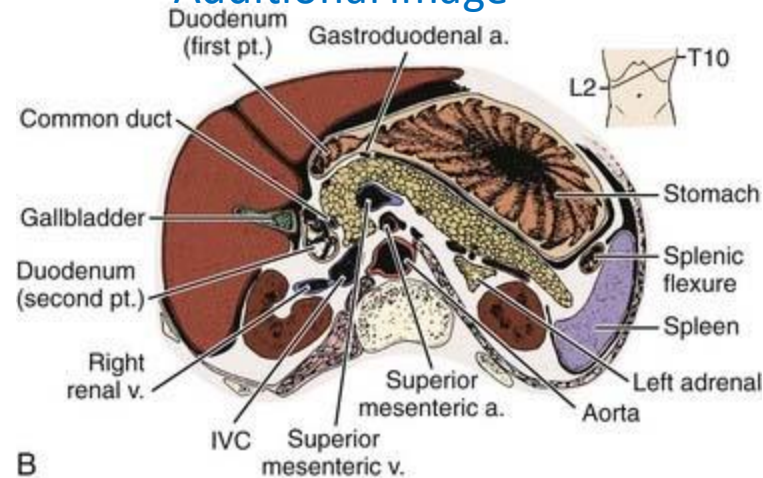
- Transverse colon
- Transvers mesocolon
- Lesser sac
- Stomach

-Posterior

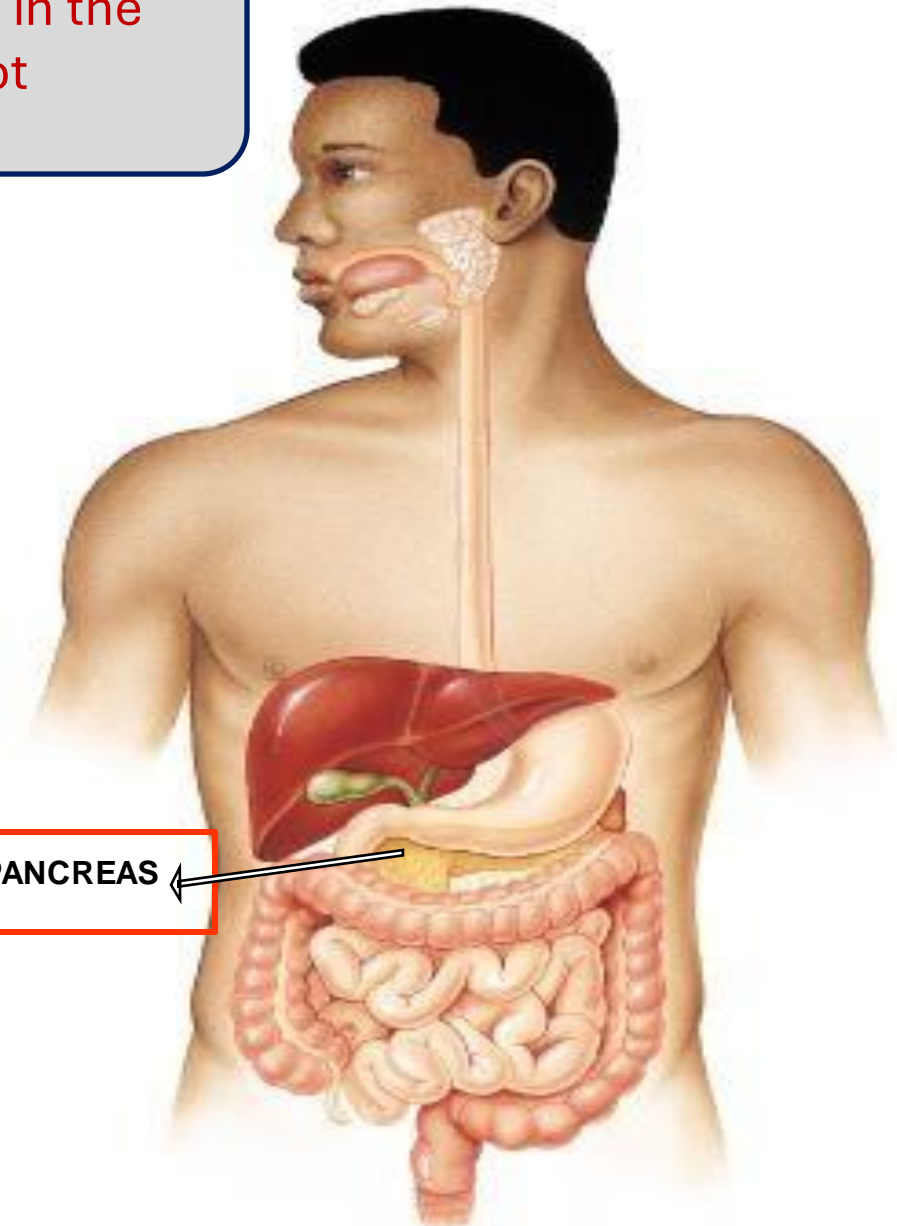
- Bile duct
- Portalvein
- Splenic vein
- IVC
- Aorta
- origin of Sup.mesentric.a
- Lt.Psoas muscle
- Lt.Suuprarenal gland
- Left kidney
- Hilum of the spleen



Additional image



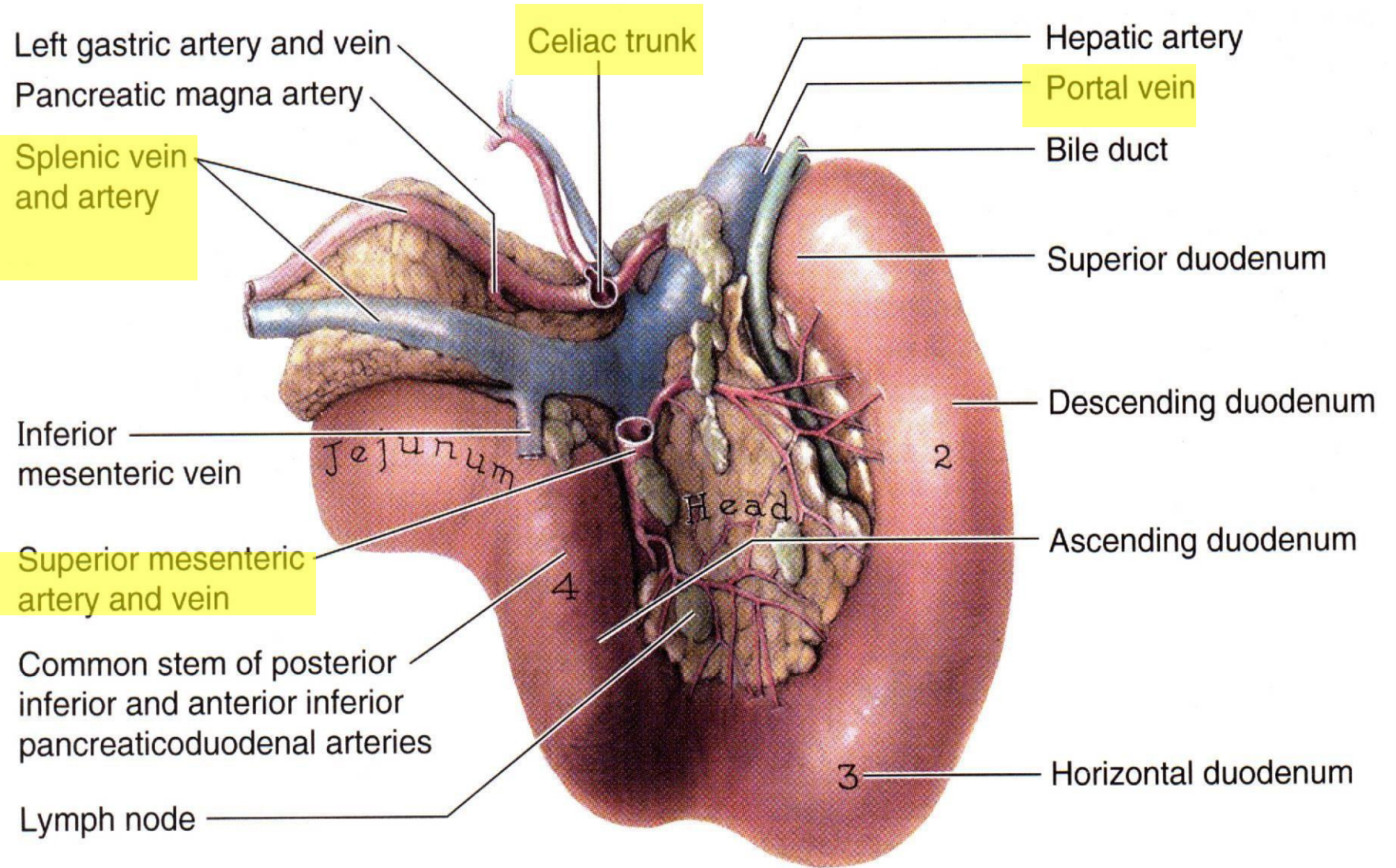
PANCREAS ←



Posterior view of duodenum/pancreas

Splenic vein + superior mesenteric = portal vein

Splenic artery (torsos) branch from celiac trunk goes to spleen



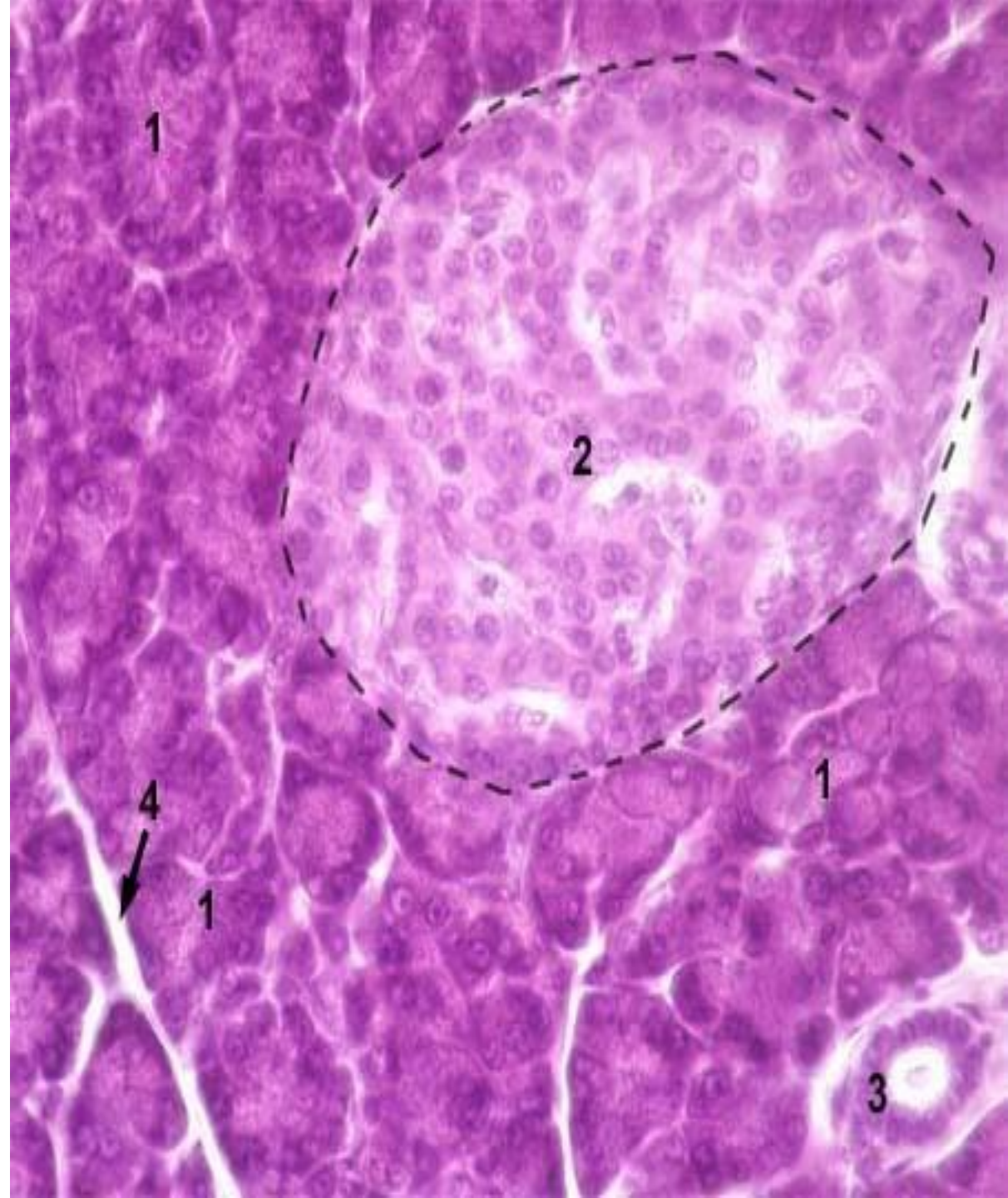
Histology of pancreas

Exocrine part

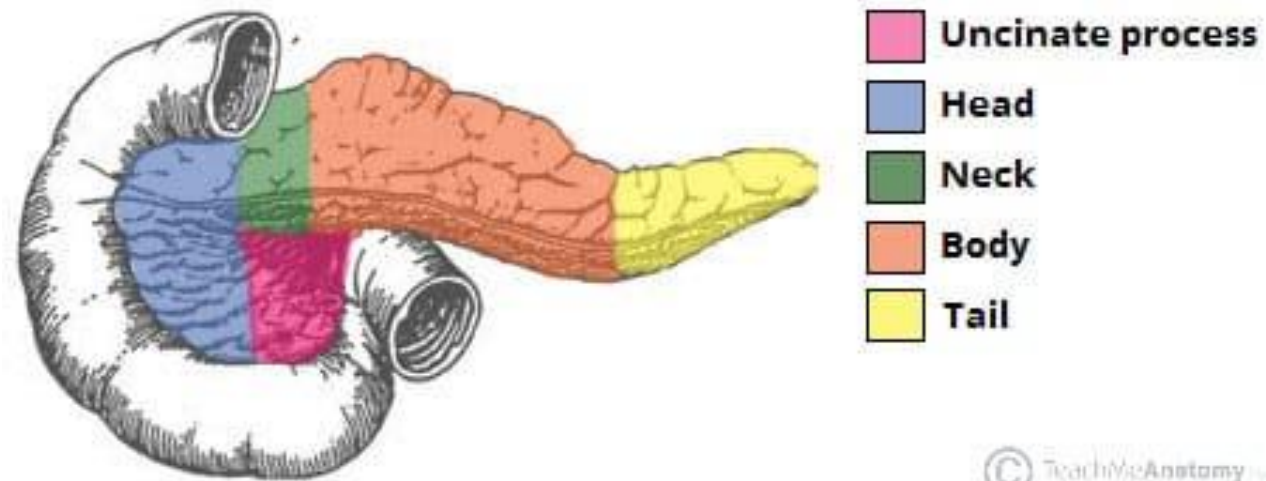
→ Pancreatic juice

Endocrine part

→ Insulin, glucagon and somatostatin



Parts of the pancreas



[Additional image](#)

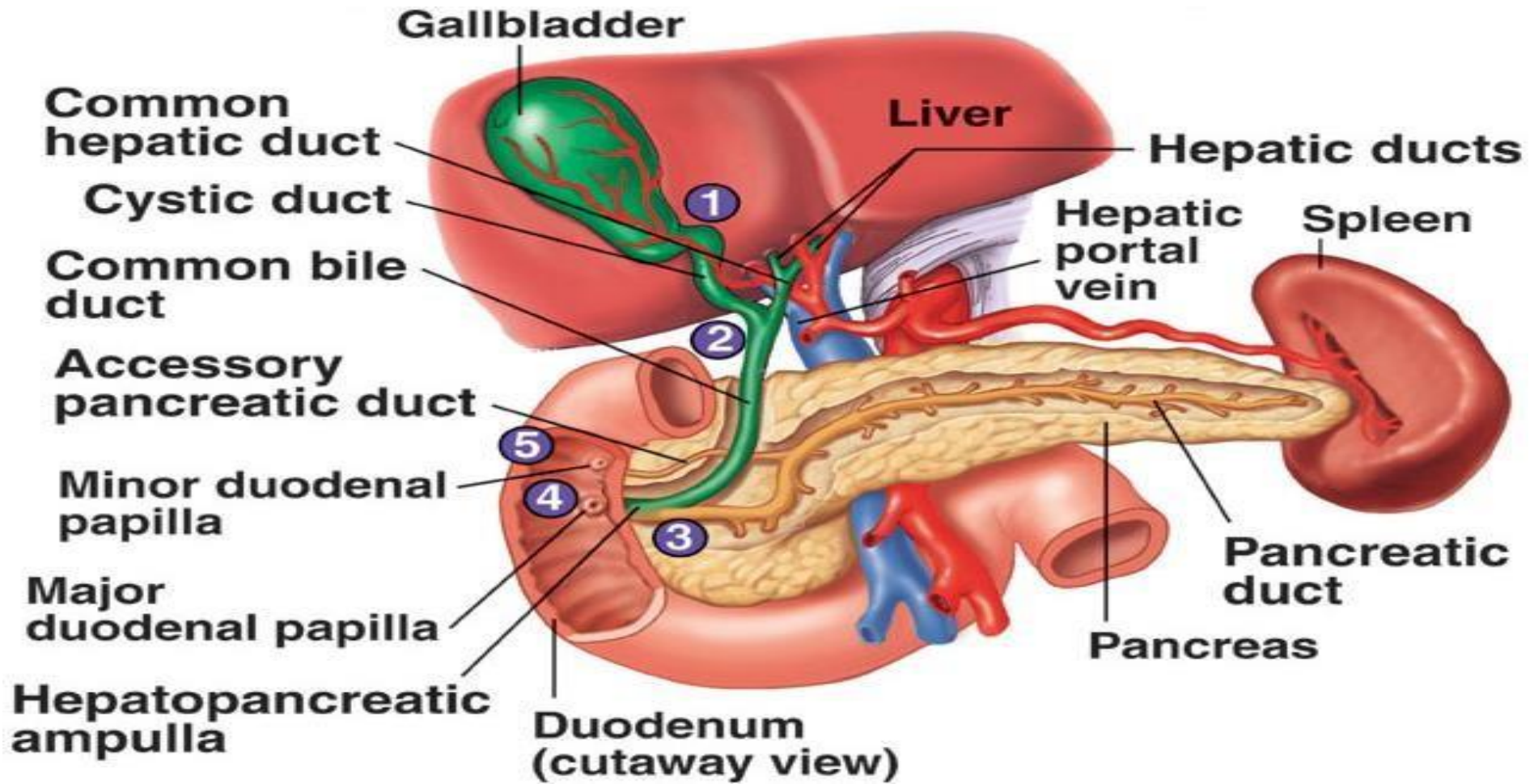
Parts

Head + **uncinate process**

Neck

body

Tail

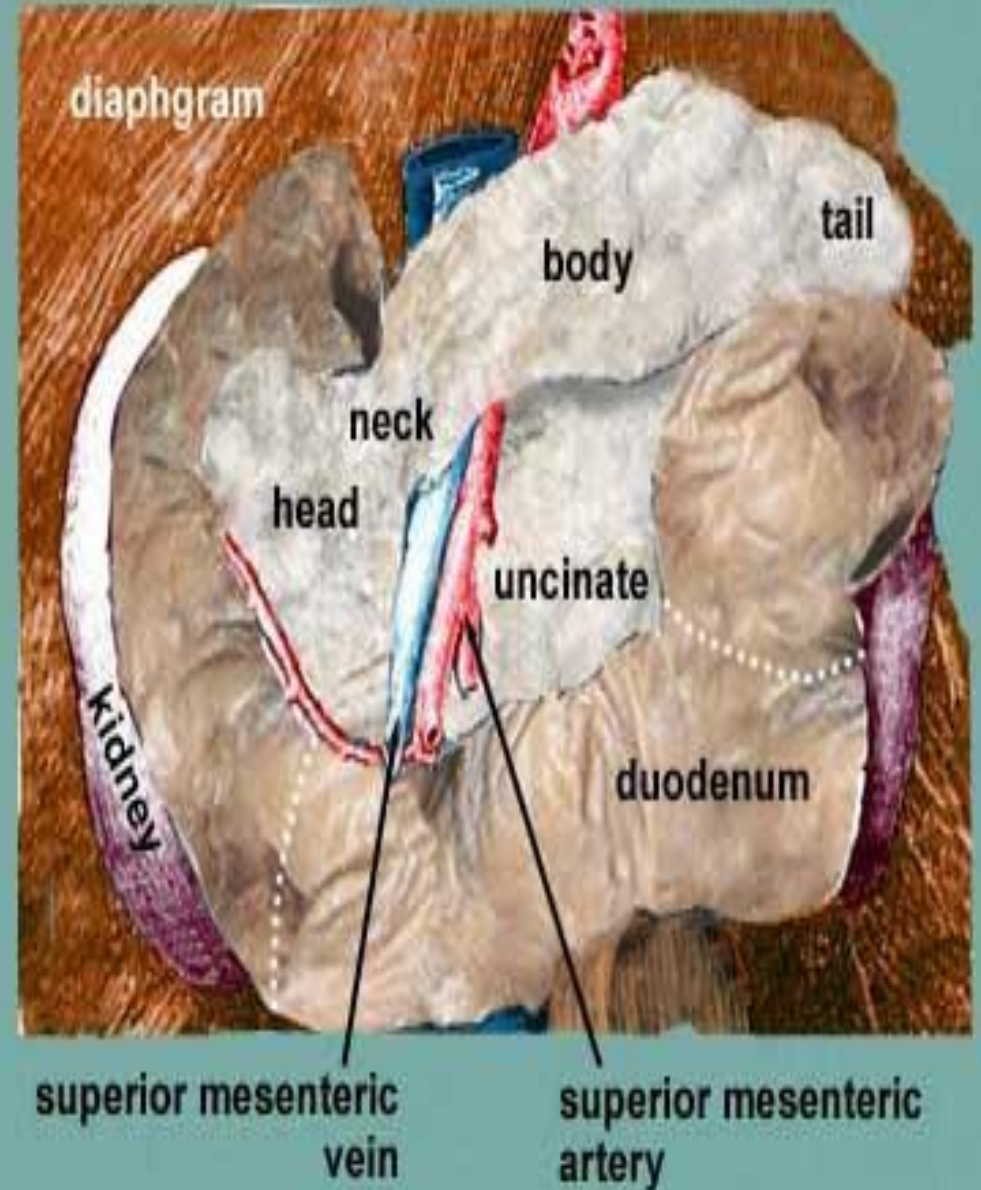
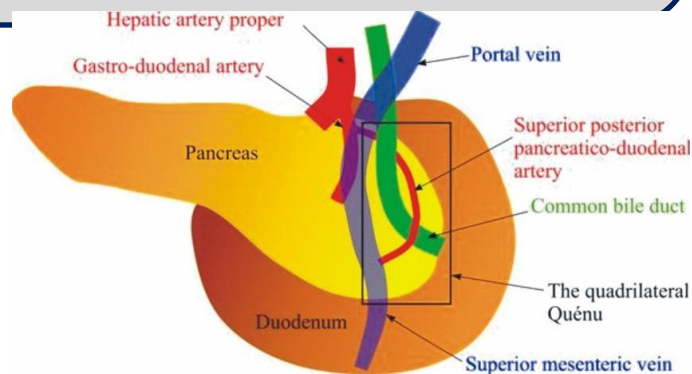


The head

- It is disc shaped
- lies within the concavity of the duodenum
- A part of the head extends to the left behind the superior mesenteric vessels and is called the **Uncinate process.**

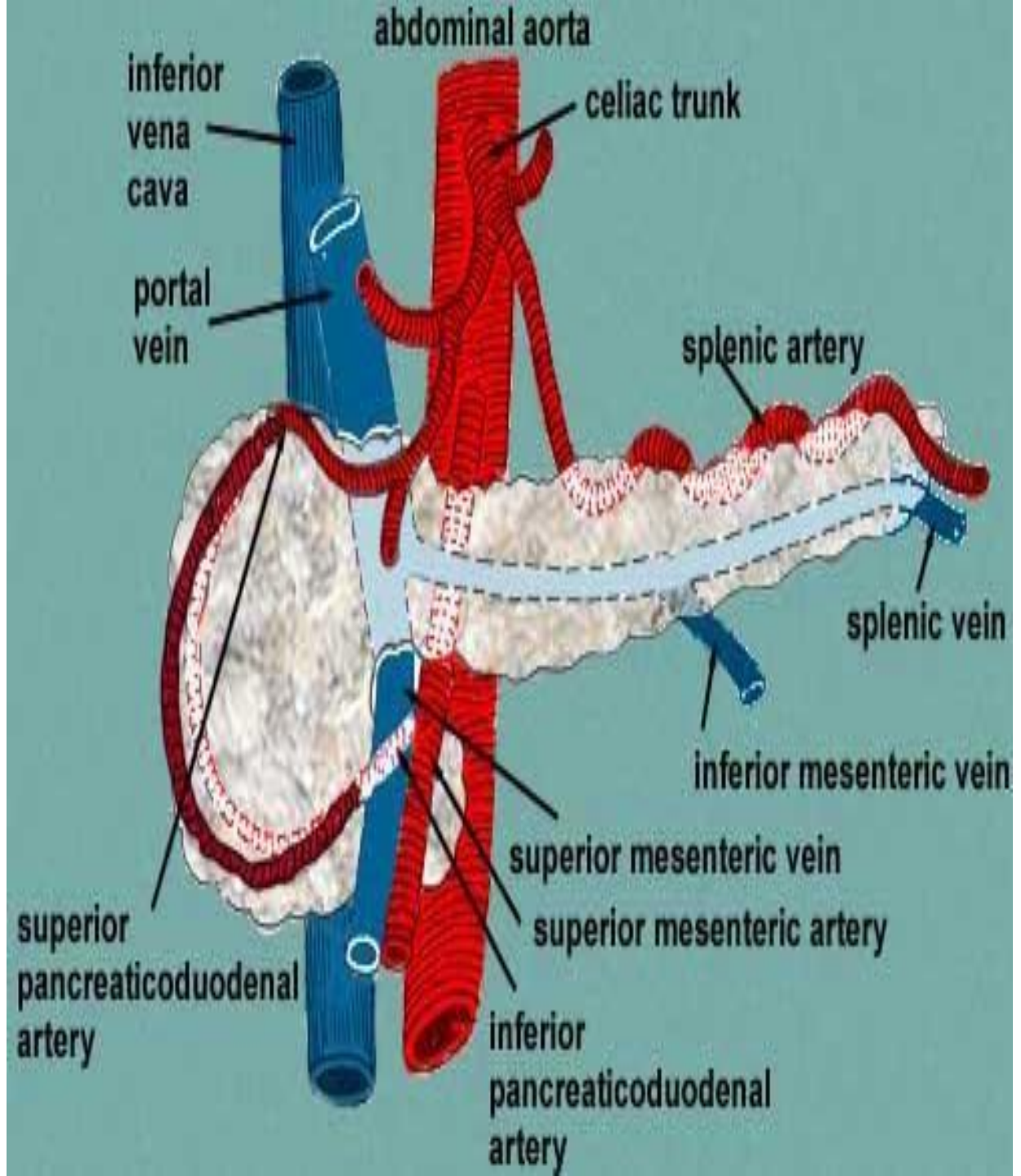
Bile duct crosses the head of pancreas posteriorly, This is important clinical note, when there is cancer head of pancreas , it causes obstructive jaundice due to the obstruction of the bile duct

Additional image



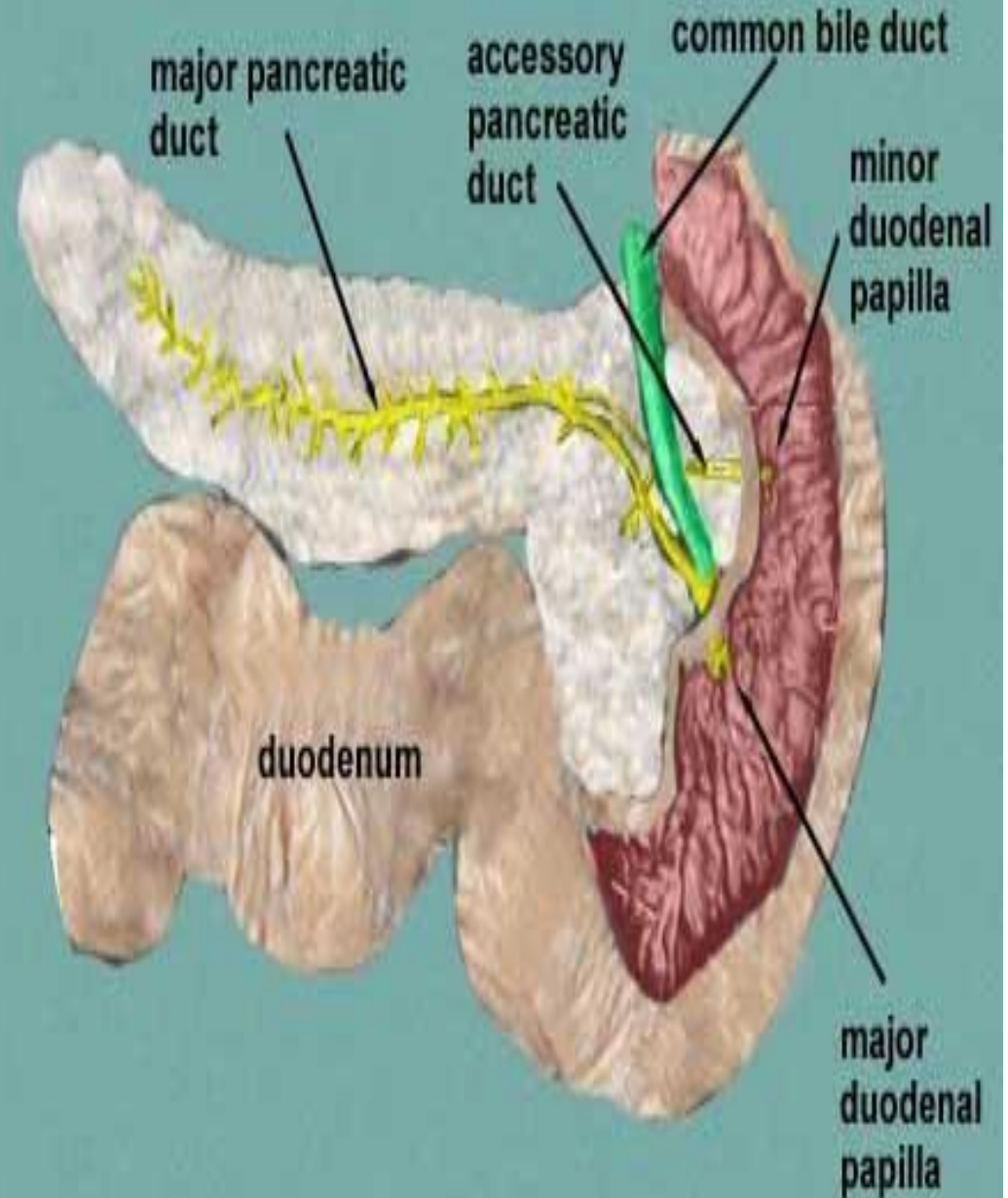
The neck

- It is the constricted portion of the pancreas
- connects the head to the body.
- It lies in front of the beginning of the portal vein the origin from splenic vein and superior mesenteric



The body

- Runs upward and to the left across the midline
- It is somewhat triangular in cross section.



The body of the pancreas, when observed in cross-section, presents three surfaces and three borders.

Surfaces:

- 1. Anterior Surface: close proximity to the stomach bed.**
- 2. Posterior Surface: descends along the posterior abdominal wall.**
- 3. Inferior Surface: related to the greater sac of the peritoneum.**

Borders:

- 1. Superior Border: traversed by the splenic artery.**
- 2. Anterior Border: related to the transverse mesocolon.**
- 3. Posterior Border.**

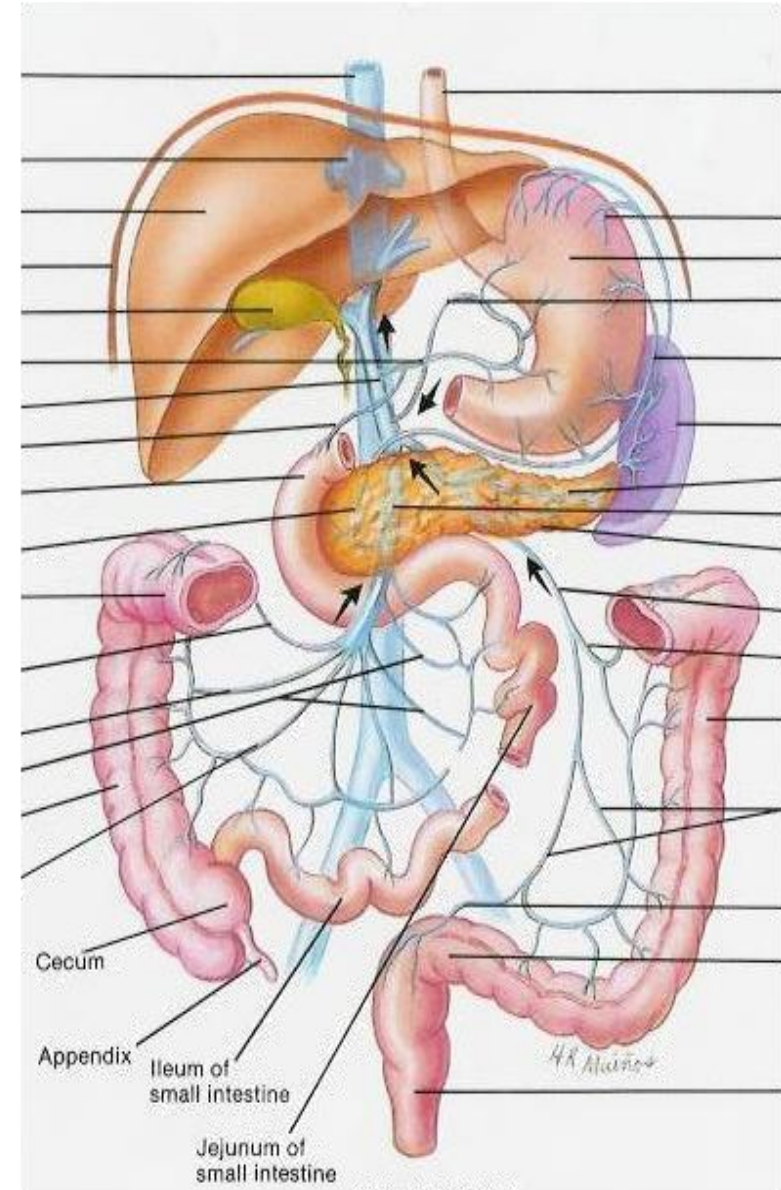
Body of pancreas...cont

- Three surfaces: anterior, posterior, and inferior.
- Three borders: ant, post & inf

The anterior surface

- 1 Covered by peritoneum of post. Wall of lesser sac
- 2 Tuber omental :*where the ant. surface of pancreas join the neck*

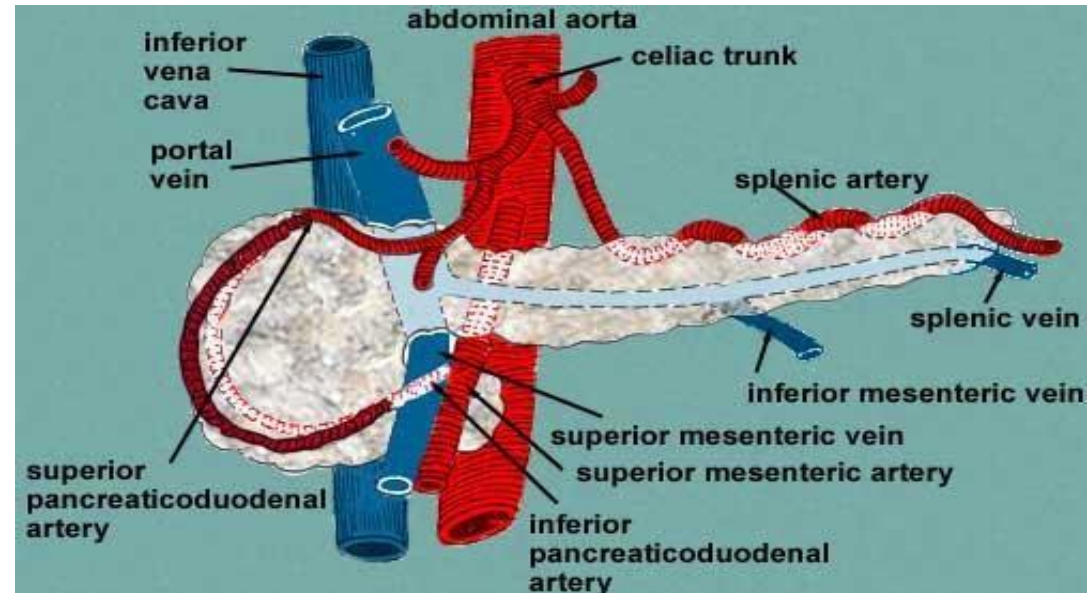
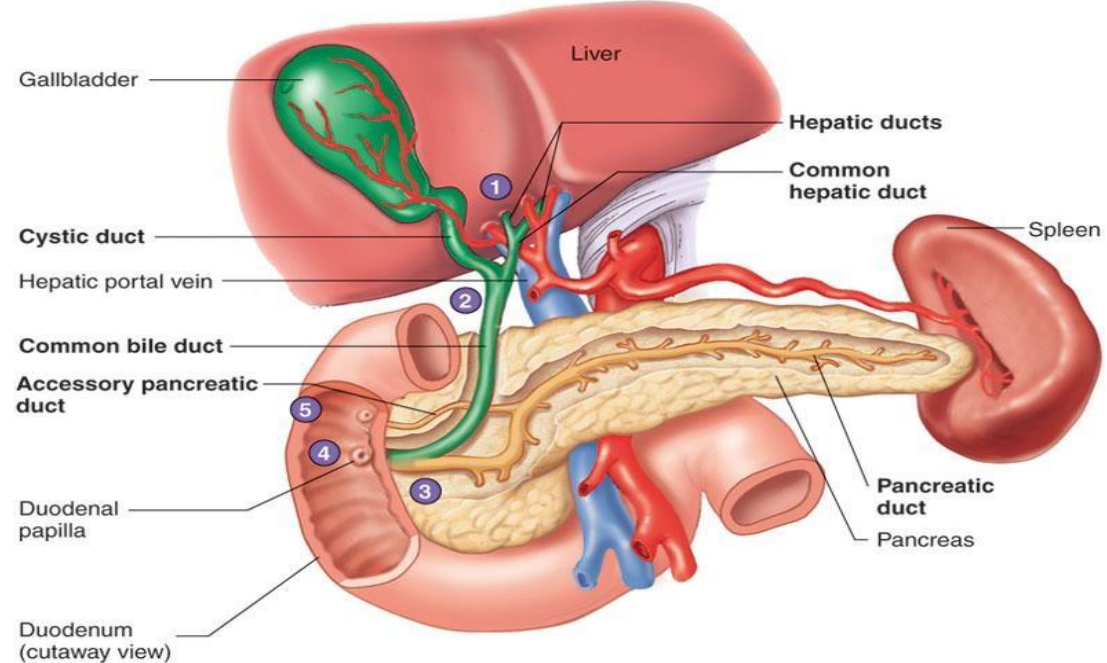
Important!!



Body of pancreas...cont

The posterior surface

- devoid of peritoneum
- in contact with 1- the aorta
- 2 the splenic vein
- 3 the left kidney and its vessels
- 4 the left suprarenal gland
- 5 the origin of the superior mesenteric artery
- 6- and the crura of the diaphragm.



Important!!

Body of pancreas...cont

- **The inferior surface**

- Narrow on the right but broader on the left
- Covered by peritoneum of greater omentum
- lies upon the duodenojejunal flexure
- Some coils of the jejunum
- its left extremity rests on the left colic flexure

- **The superior border**

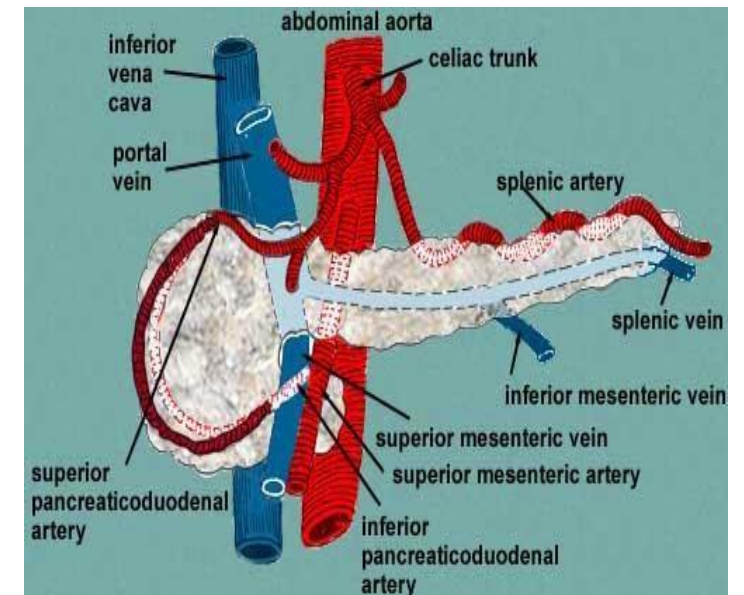
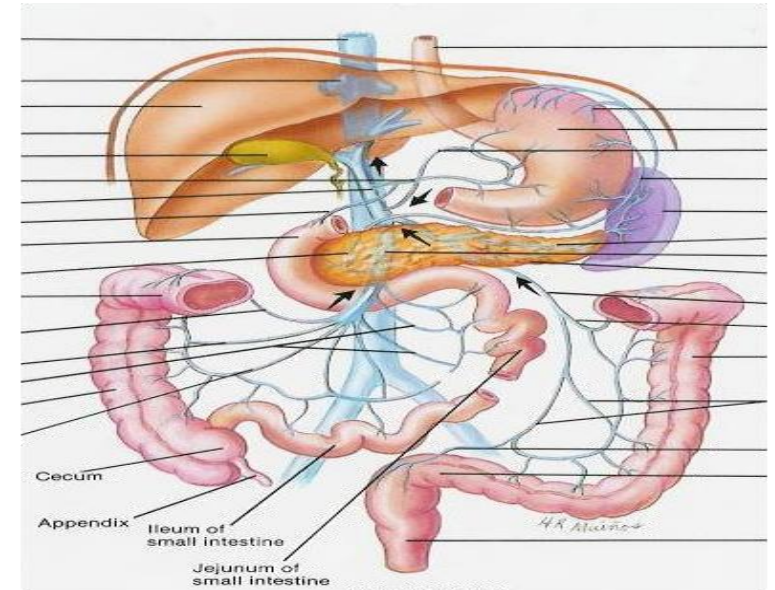
- Blunt and flat to the right;
- Narrow and sharp to the left near the tail
- It commences on the right in the omental tuberosity
- In relation with

- 1 The celiac artery

- 2 Hepatic artery

- 3 The splenic artery runs toward the left in a groove along this border.

Important!!



Body of pancreas...cont

The anterior border

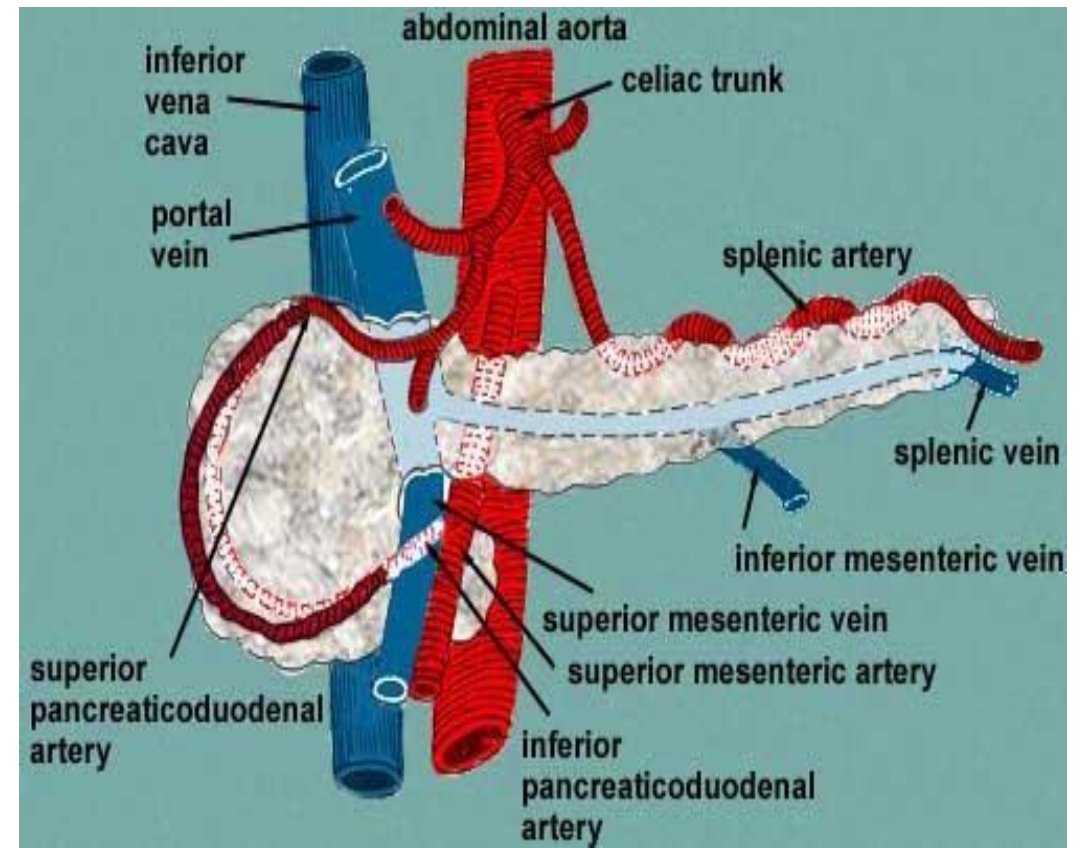
- separates the anterior surface from the inferior surface
- along this border the two layers of the transverse mesocolon diverge from one another; one passing upward over the anterior surface, the other backward over the inferior surface.

Important!!

Body of pancreas

The inferior border

- separates the posterior from the inferior surface
the superior mesenteric vessels emerge under its right extremity.



Important!!

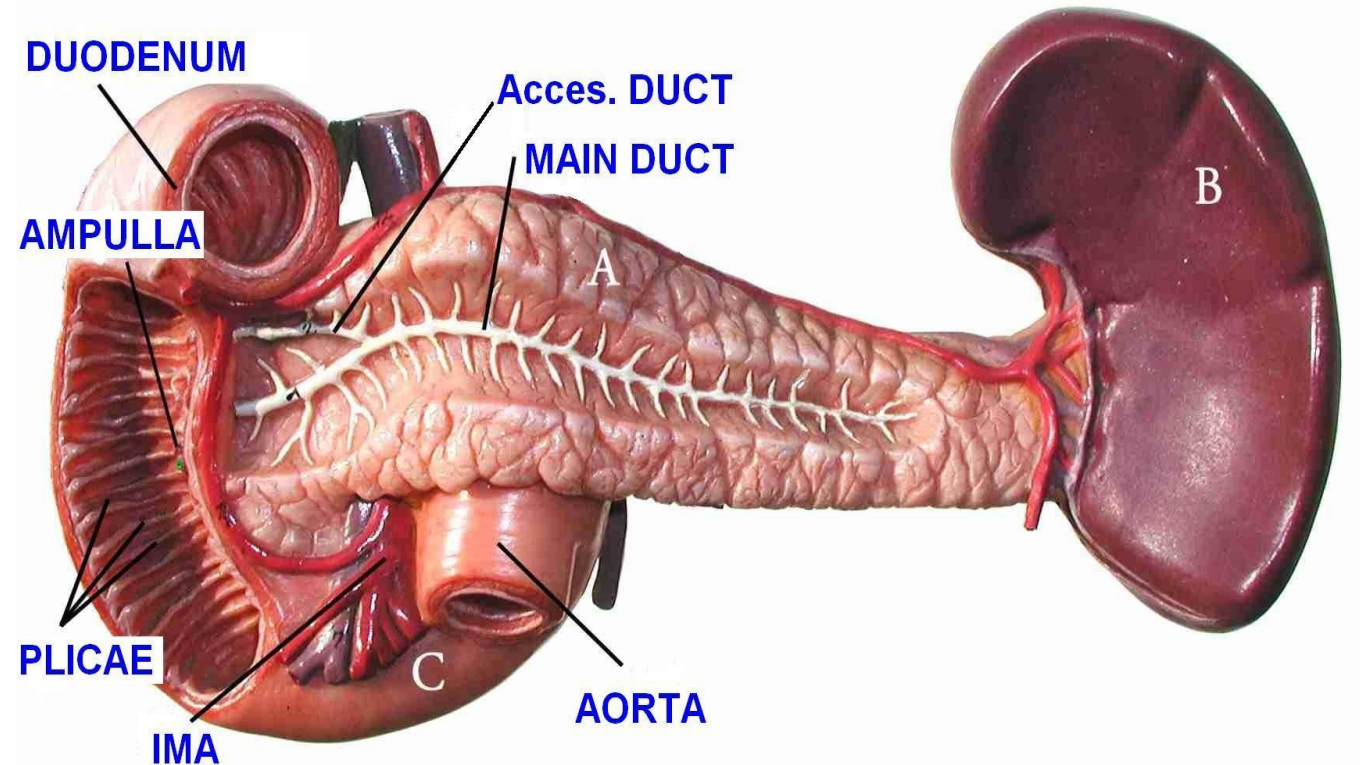
The Tail

- Passes forward in the **splenicorenal** ligament and comes in contact with the hilum of the spleen

Most of the endocrine part is numerous in the tail

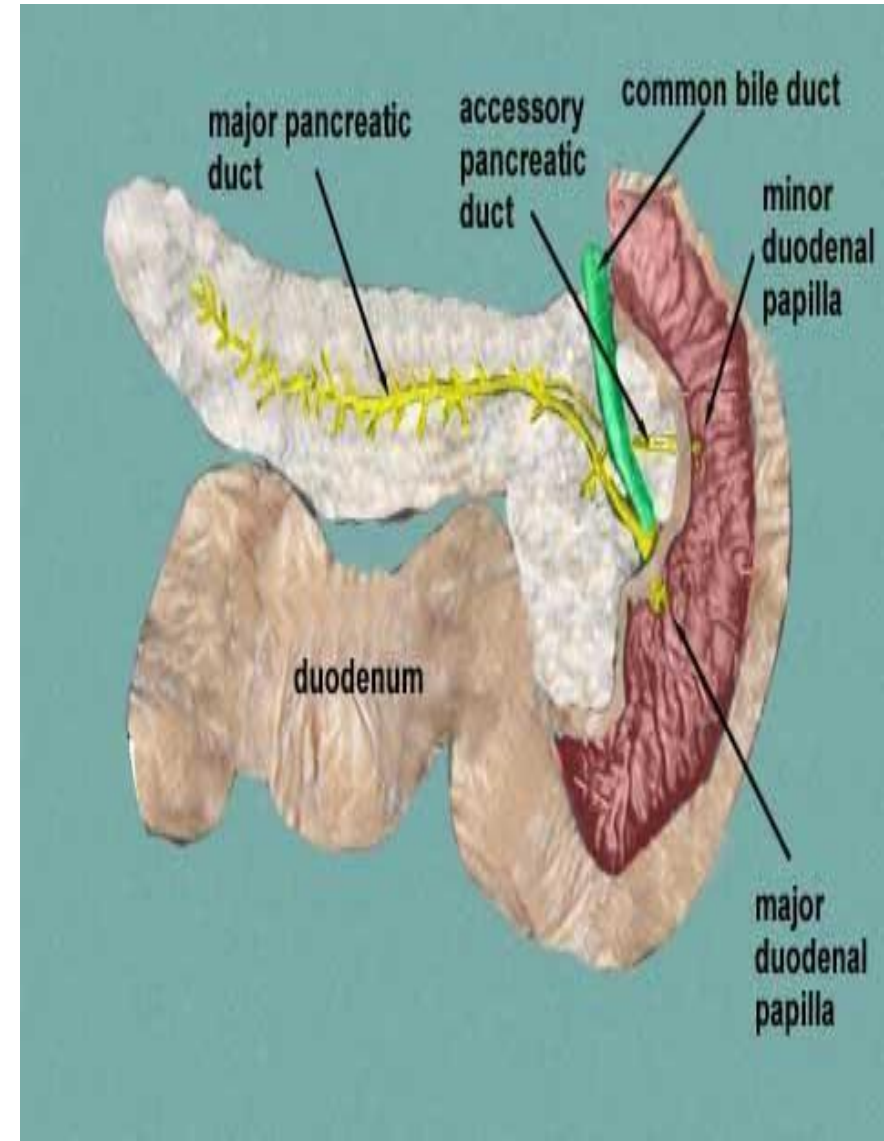
***endocrine cells:**

- **Alpha (secretes glucagon)**
- **, beta (secretes insulin) ,**
- **gamma ,**
- **delta**



Pancreatic ducts

- **The main duct**
 - Begins in the tail and runs the length of the gland
 - Receiving numerous tributaries on the way .
It opens into the second part of the duodenum at about its middle with the bile duct on the major duodenal papilla
- **Accessory duct**
 - When present, drains the upper part of the head
 - Then opens into the duodenum a short distance above the main duct on the minor duodenal papilla .
 - The accessory duct frequently communicates with the main duct



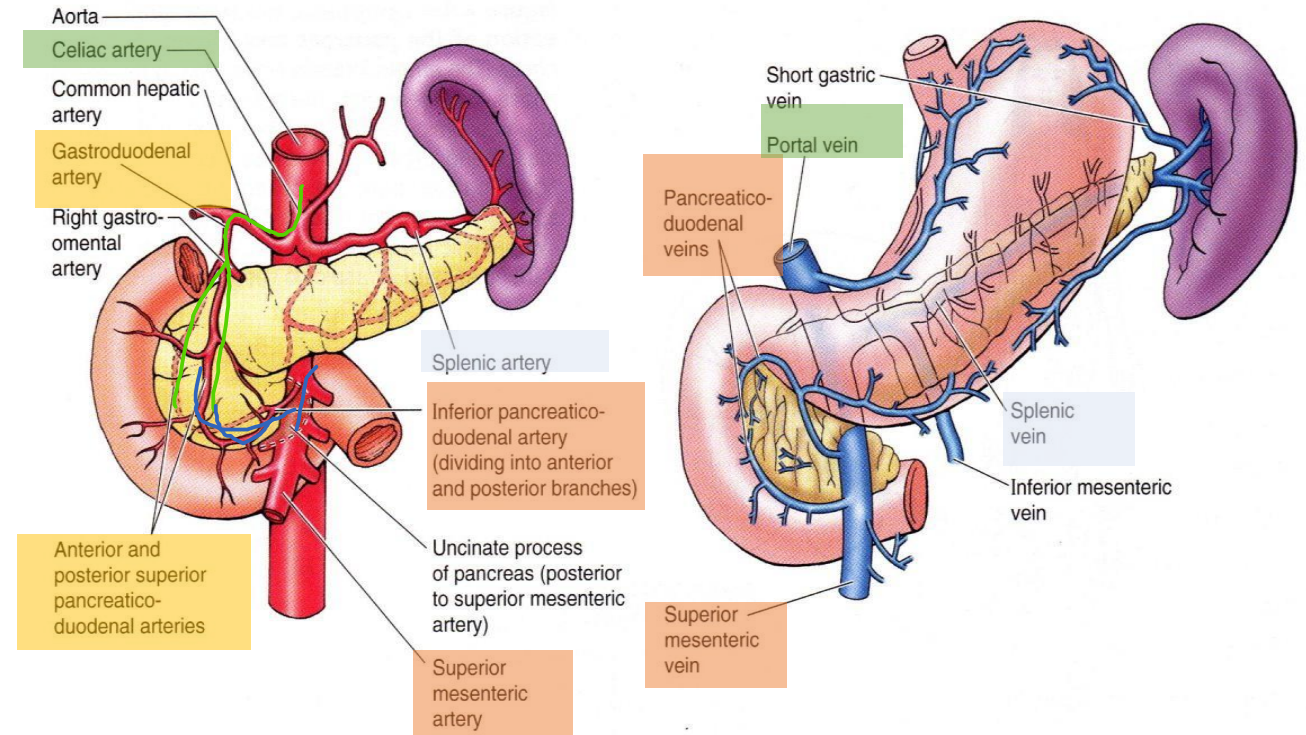
Blood Supply of pancreas

Arteries

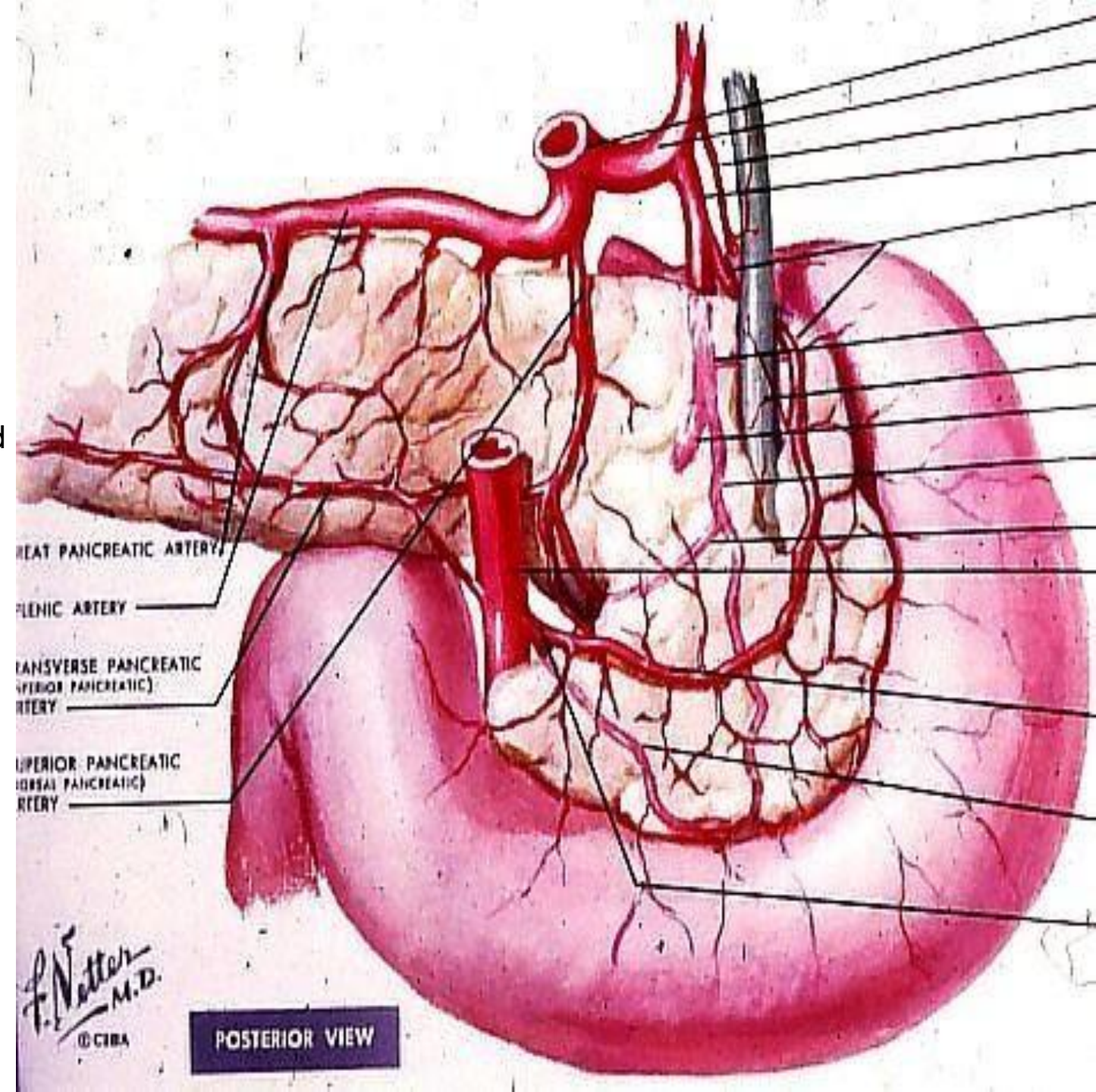
- The splenic.a
The superior pancreaticoduodenal. A
Branch from gastroduodenal from celiac trunk
- Inferior pancreaticoduodenal arteries. A
Branch from superior mesenteric artery

Veins

- The corresponding veins drain into the portal system.
- The superior pancreaticoduodenal & splenic veins drains into portal vein directly
- Inferior pancreaticoduodenal vein drains into superior mesenteric vein



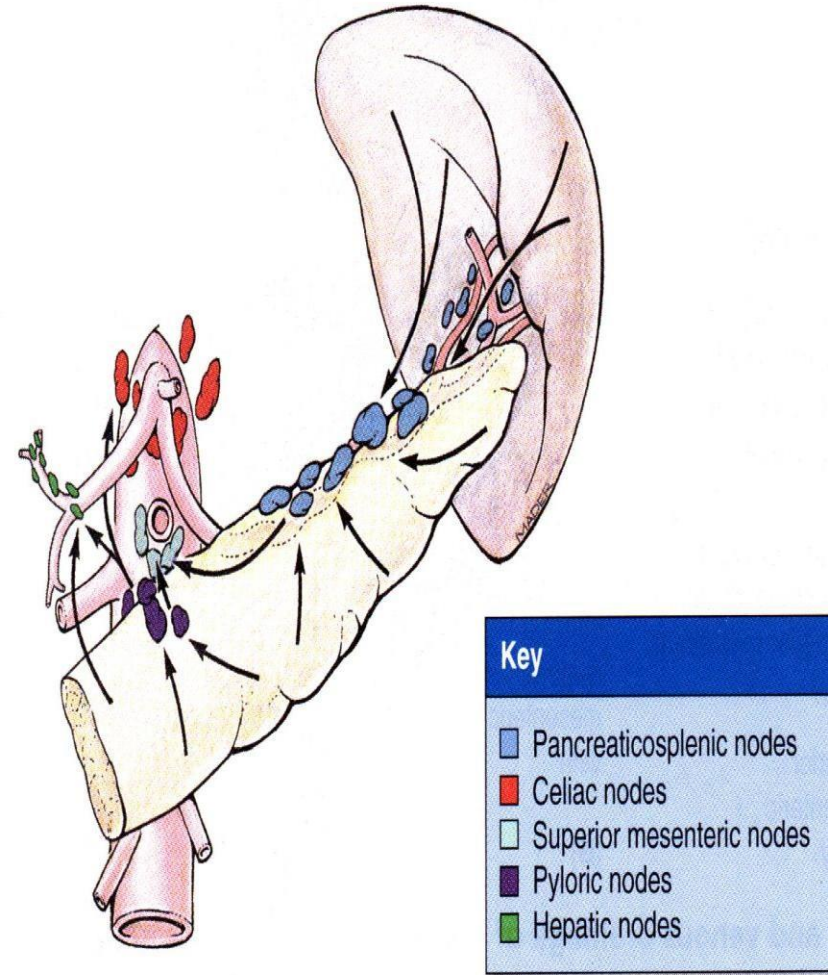
pancreaticoduodenal artery and its branches



Lymphatic drainage of pancreas

- Lymph nodes are situated along the arteries that supply the gland
- The efferent vessels ultimately drain into the celiac and superior mesenteric lymph nodes.

Pancreatic nodes → Celiac → superior
mesenteric nodes → cisterna chyli → thoracic
duct



Nerve supply

- Sympathetic and parasympathetic chain
- Parasympathetic = vagus nerve

Sympathetic from celiac ganglia

Congenital defects of pancreas

- **Annular Pancreas** (**pancreas encircles duodenum**) (rare)
- **Ectopic Pancreas** (very common)= Outside the gastrointestinal tract

Embryology

Clinical notes

- Cancer head of pancreas → Obstruction jaundices
- Cancer body of pancreas → pressure → I.V.C & portal vein
- Acute pancreatitis= inflammation of pancreas

Spleen

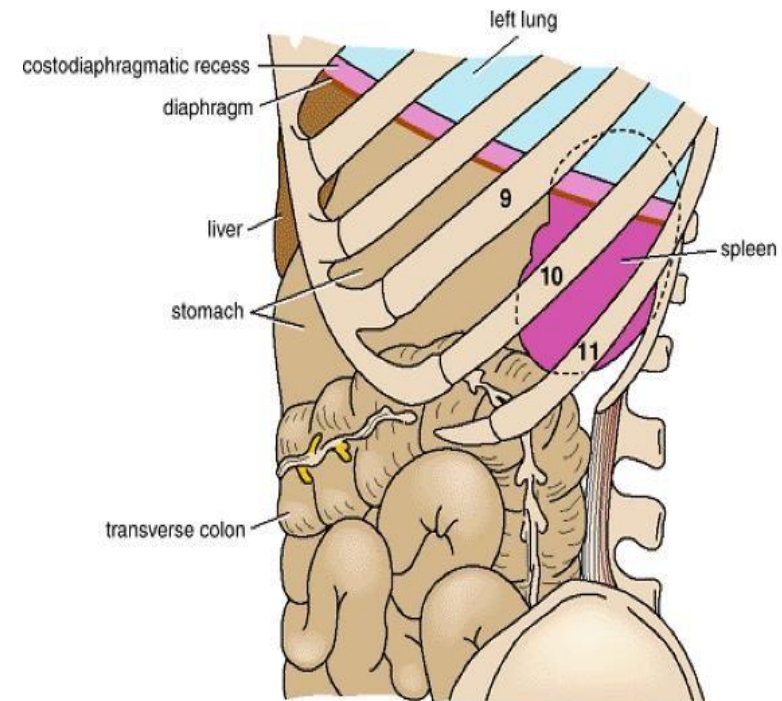
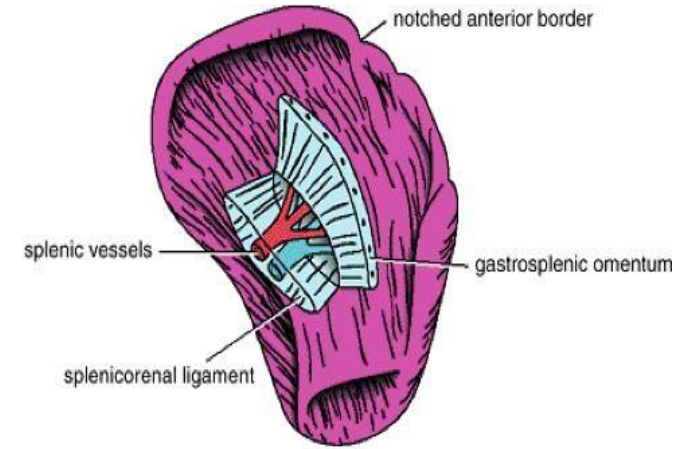
مطلوب مادة العملي فقط لهذه
الجزئية
الشرائح المتبقية قراءة ذاتية

- What you should know about spleen !!
- it is a lymphoid tissue located in the abdomen has many relations with other organs in abdomen
- Location: under the left 9th, 10th, and 11th ribs., its long axis parallel to the 10th rib
- Intrapertoneal organ , completely covered by peritoneum except the hilum
- Surfaces : outer surface >costal surface>
 - Visceral surface has relations>impressions >with stomach , left kidney , left colic flexure , tail of pancreas
- Hilum: where splenic vessels enter the the spleen <splenic vein and artery > related to the tail of pancreas
- Lienorenal ligament content: splenic artery , splenic , vein , tail of pancreas , lymph nodes and vessels
- Clinical notes _ stab wounds / fractures of the left ribs in may cause rupture in spleen which will need splenectomy , remember : ligation of the origin of splenic vessels located in the the lienorenal ligament paying attention to pancreas tail,
- Borders : anterior , posterior , superior angle

Spleen

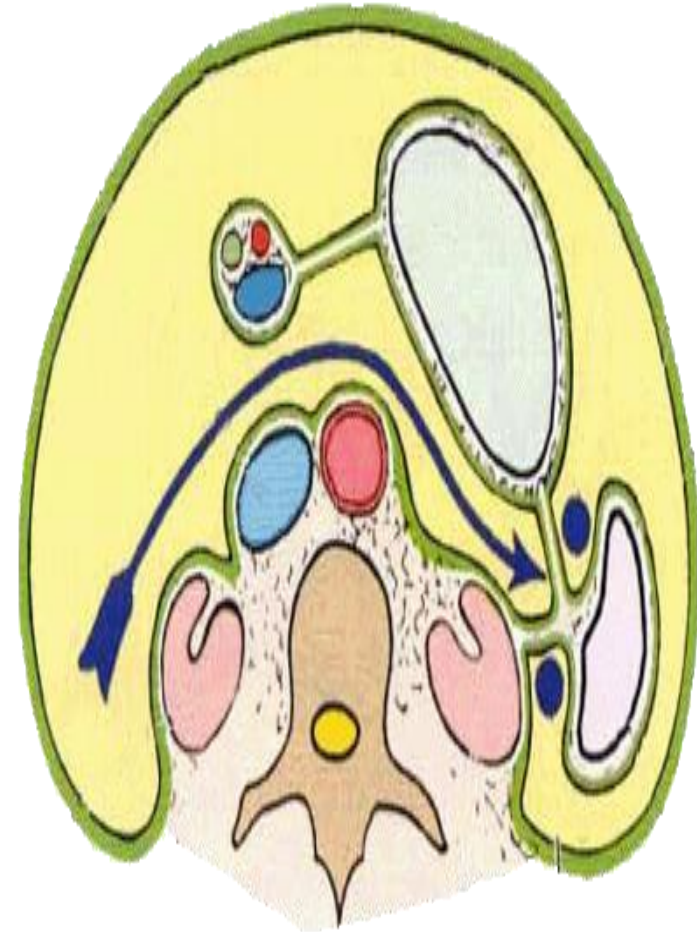
Location and Description

- it is reddish & oval shaped
- the largest single mass of lymphoid tissue in the body.
- and
- has a notched anterior border.
- location:
 - Lt hypochondrium
 - It lies just beneath the left half of the diaphragm
 - under the 9th, 10th, and 11th ribs.
 - Its long axis parallel to the 10th rib
 - Medial end is 4 cm away from mid line post
 - Lat.end is in left mid axillary line



Spleen

- **Peritoneum**
- The spleen is completely covered with peritoneum → **intraperitoneal** organ
- **Two ligaments**
 - 1- **the gastrosplenic omentum** (ligament) → between the spleen & the greater curvature of the stomach (carrying the short gastric and left gastroepiploic vessels)
 - 2- **splenicorenal ligament** → between spleen & kidney (carrying the splenic vessels and the tail of the pancreas).



Spleen.....cont

Size

- 1 inch thick
- 3 inch broad
- 5 inch long

Weight

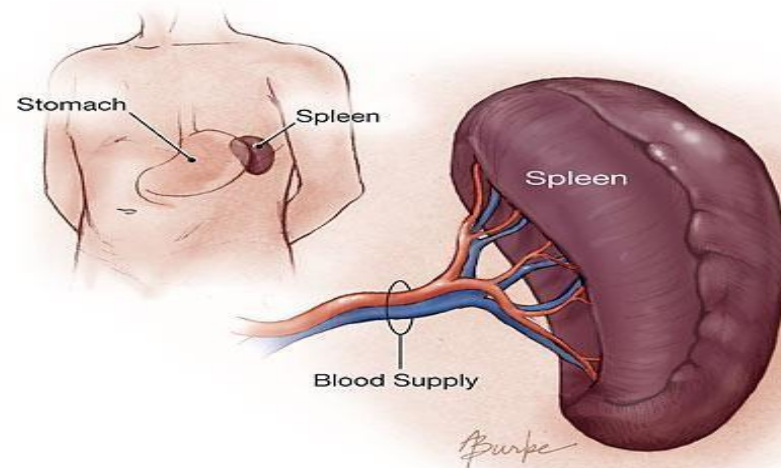
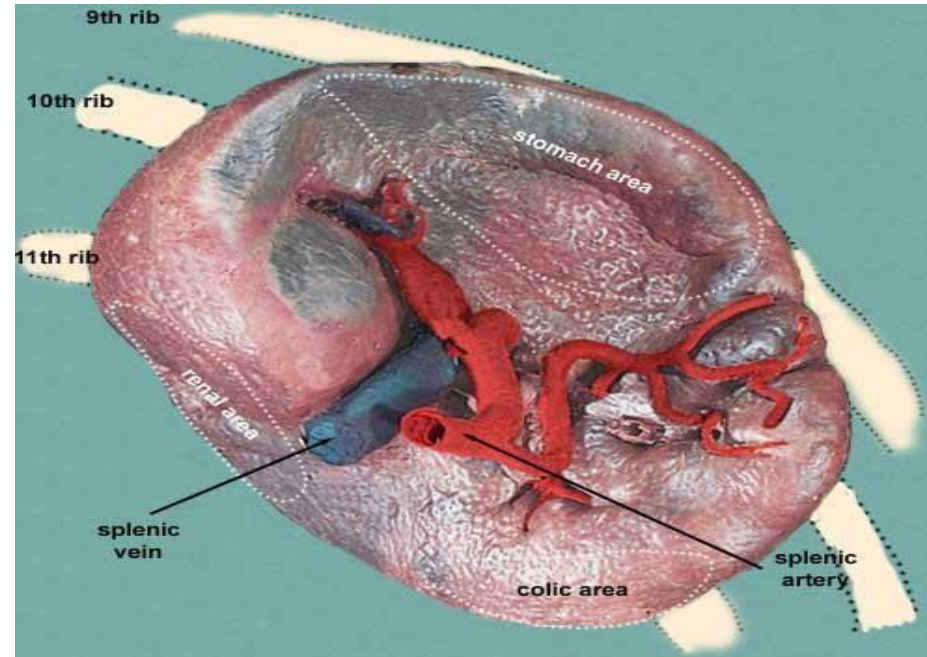
- 7 ounce

Shape → variable

- 2 ends
- 2 borders
- 2 surfaces

Notched

- Due to lobulation in embryo



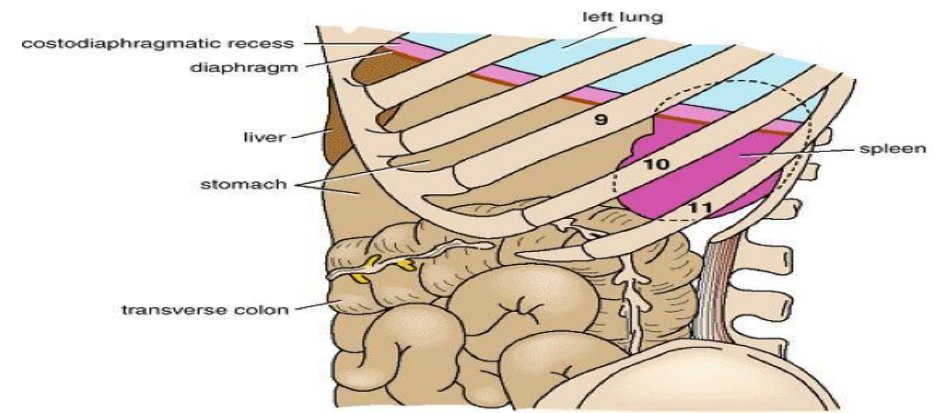
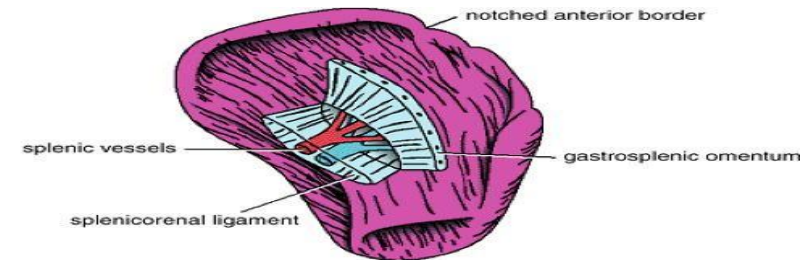
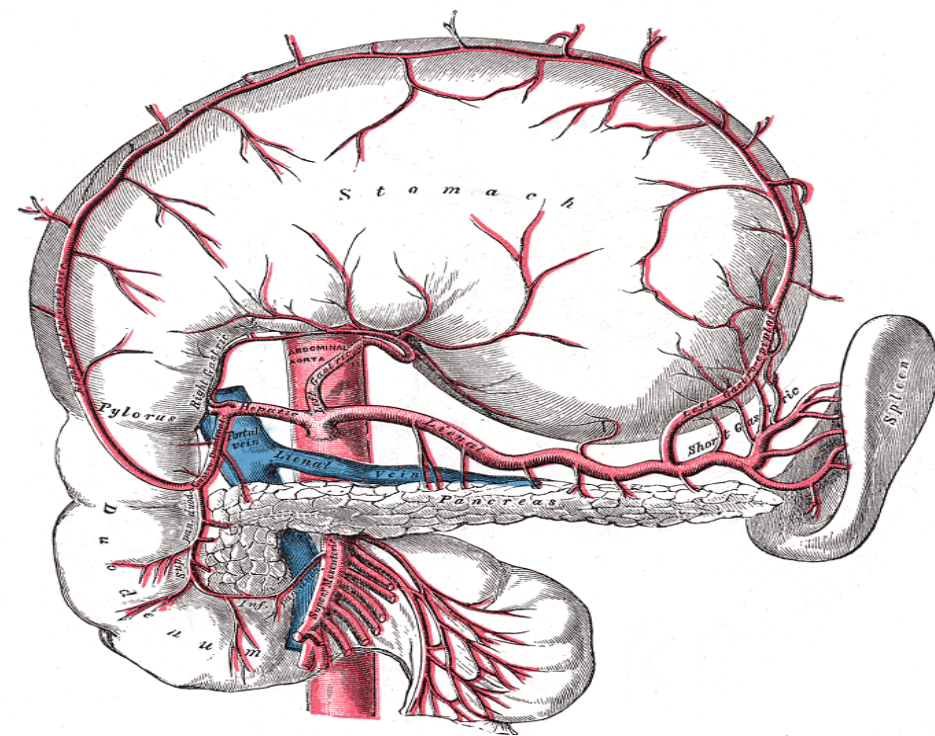
Surfaces of spleen

2 surfaces

- Diaphragmatic surface
- Visceral surface

1- Diaphragmatic surface

- Has Post- lat. relation
- Convex
- Smooth
- Diaphragm separates it from
 - Pleura & lung
 - Ribs 9,10 ,11



Spleen....cont

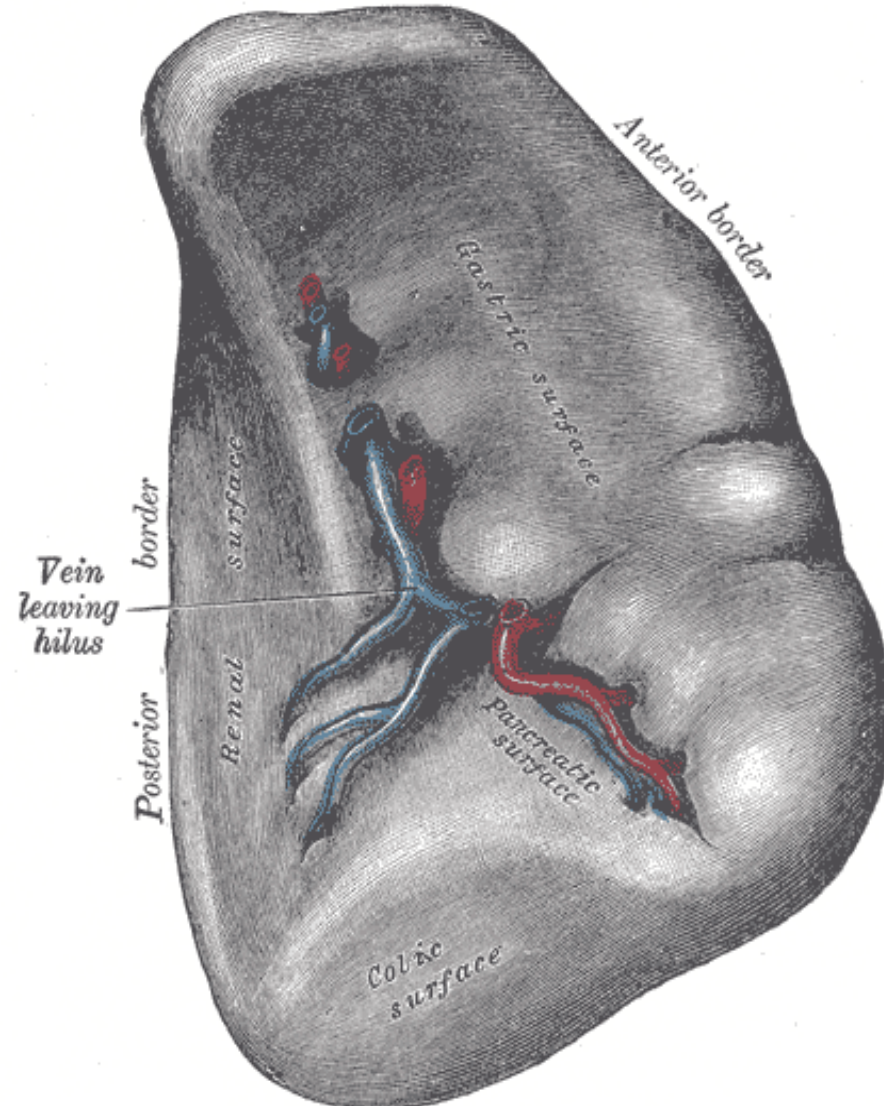
It has relations with stomach & left kidney & left colic flexure (splenic)

2- Visceral surface

- Has Ant- med. Relations
- **It** is divided by a ridge into
 - 1- An anterior or gastric
 - 2- A posterior or renal portion.

Lower extremity has

- Colic surface
- Pancreatic surface



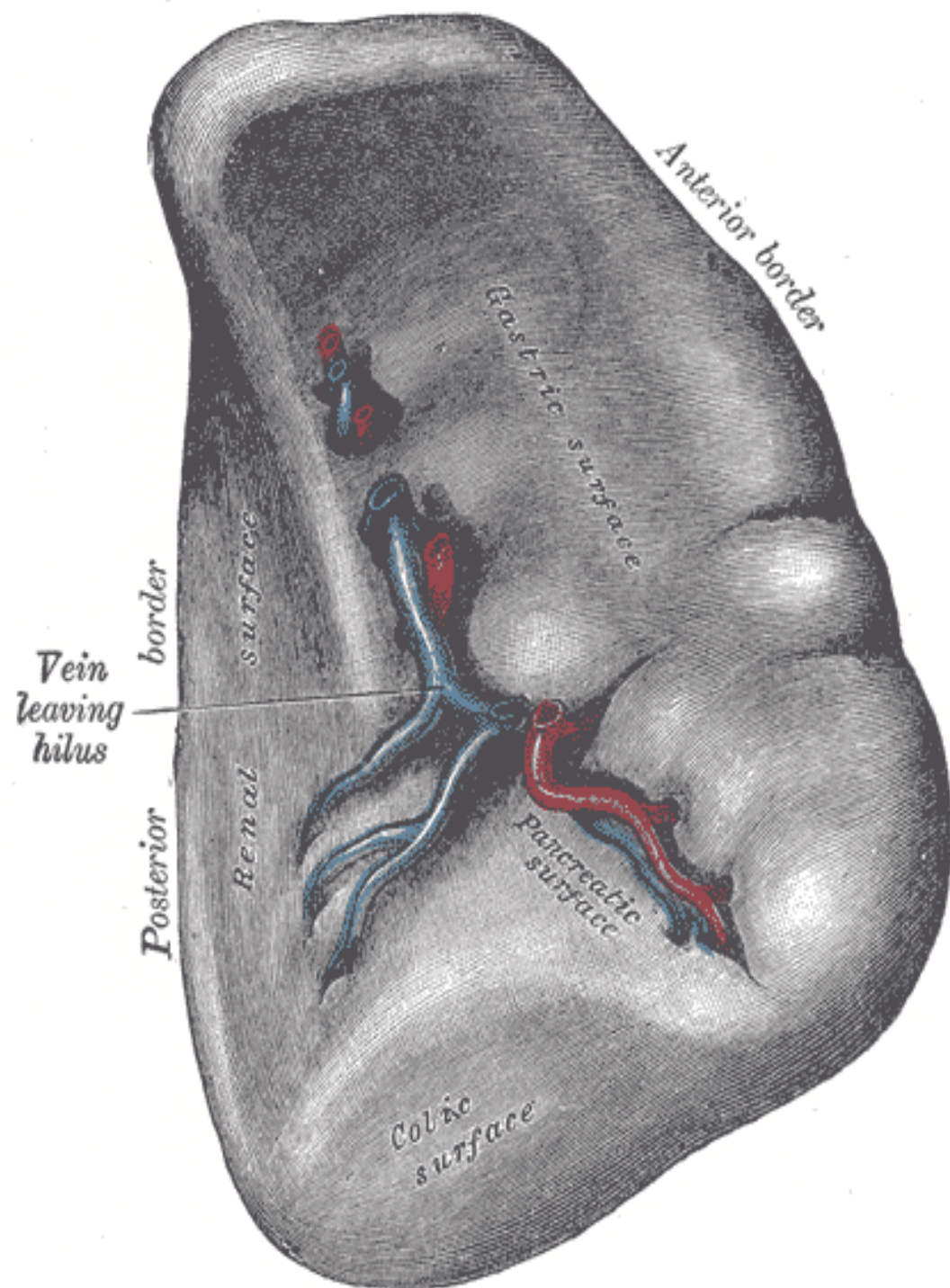
Spleen.....cont

Gastric surface

- Extends forward, upward, and medialward
- Broad and concave
- Related to stomach

Renal surface

- Directed medialward and downward.
- It is somewhat flattened
- Related to Lt.kidney



Spleen.....cont

The **lower extremity** or **colic surface**

- It is flat
- Triangular in shape

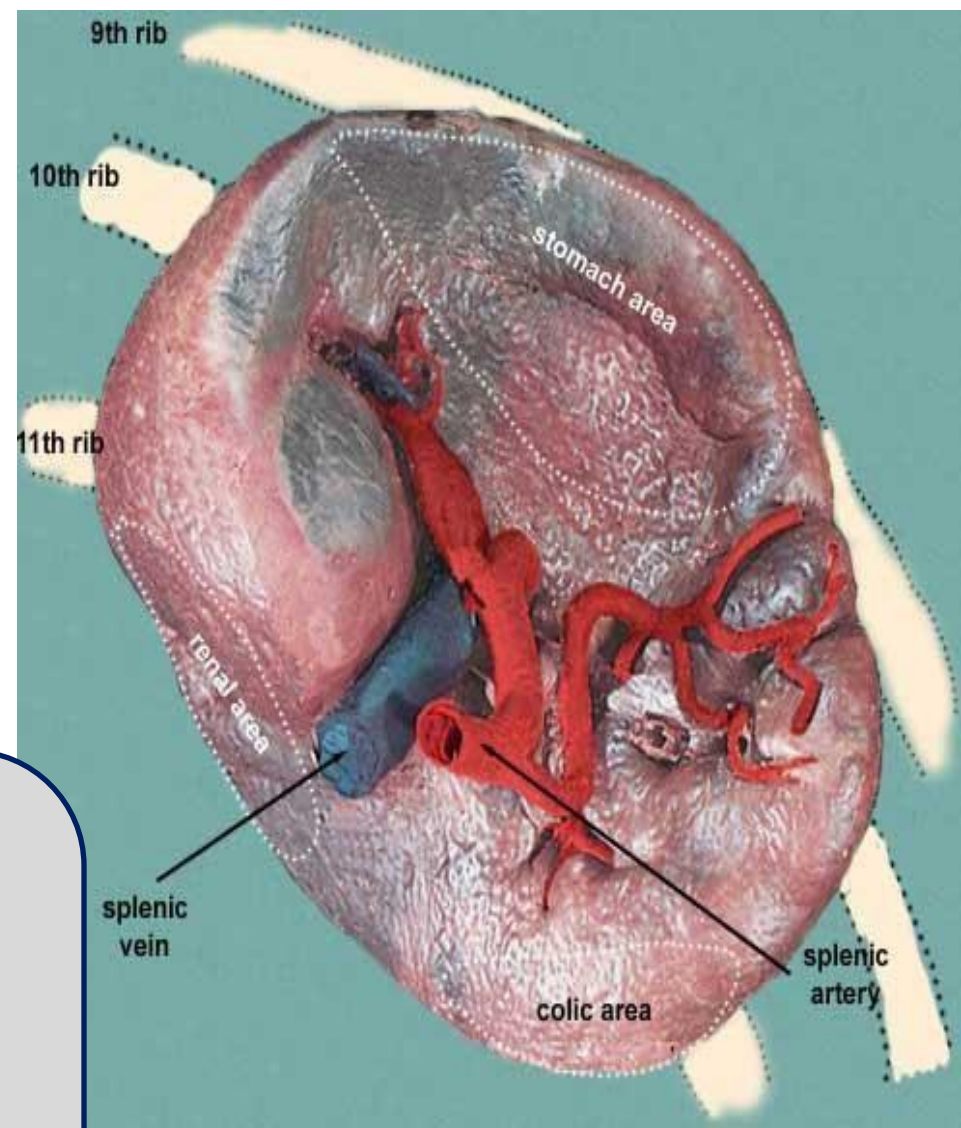
Rests upon the left flexure of the colon and the phrenicocolic ligament, and is generally in contact with the tail of the pancreas(**pancreatic surface**)

Spleen...cont

- Hilum of spleen
- Splenic . A → ant
- Splenic . v → post
- Tail of pancreas

It's crucial to note that the splenic vessels and tail of the pancreas are present before they reach the hilum within ligament known as the lienorenal ligament or splenicorenal ligament. During a splenectomy, when we ligate the blood vessels (both the artery and veins), we must preserve the tail of the pancreas. This is because any trauma to it can lead to the secretion of enzymes, potentially causing peritonitis. Thus, it's essential to safeguard the tail of the pancreas.

The ligation of the splenic vessels occurs immediately after their origin.



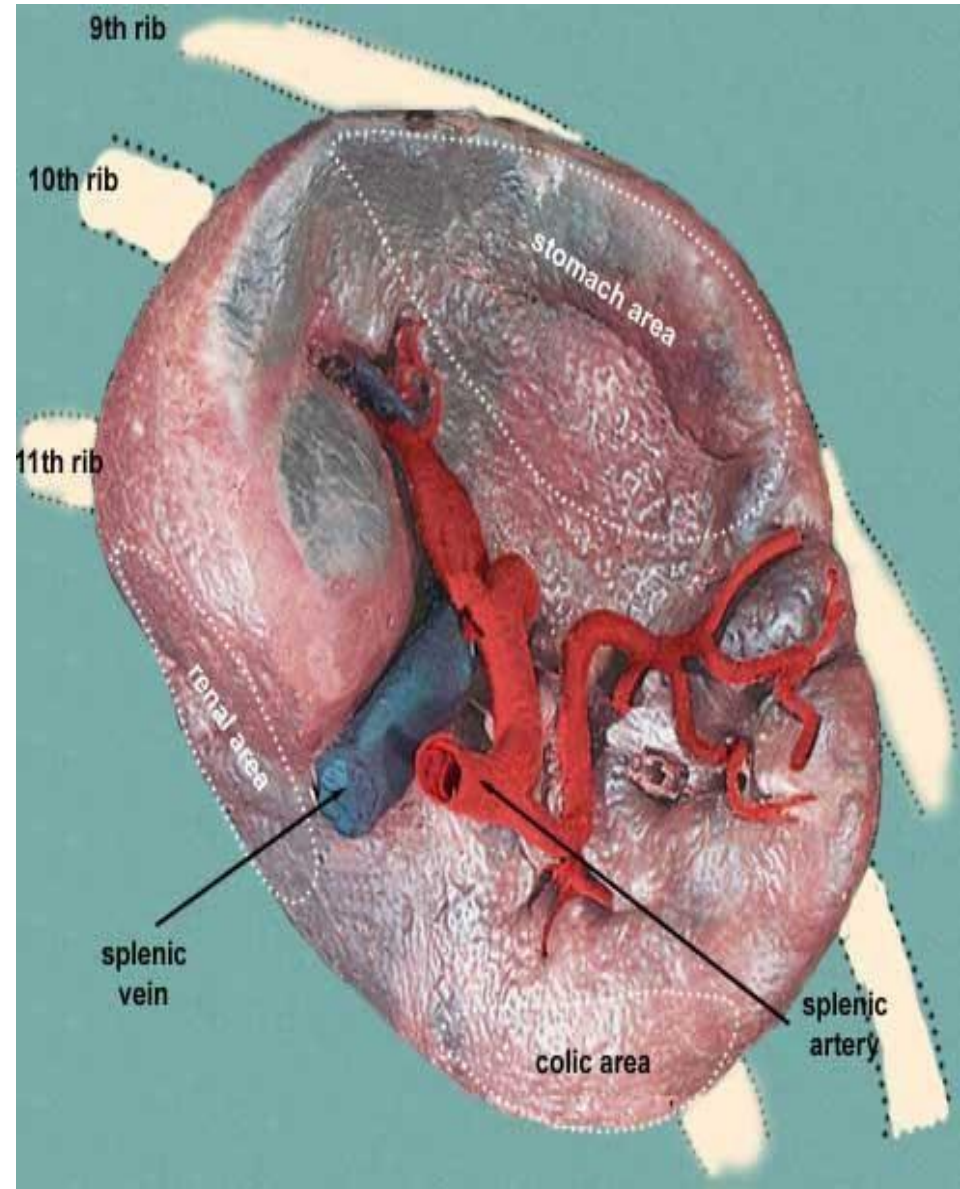
Spleen..cont

• Borders of spleen

1- sup. Border

- It is free
- Sharp
- Thin
- Often notched (sup. notch)
, especially below

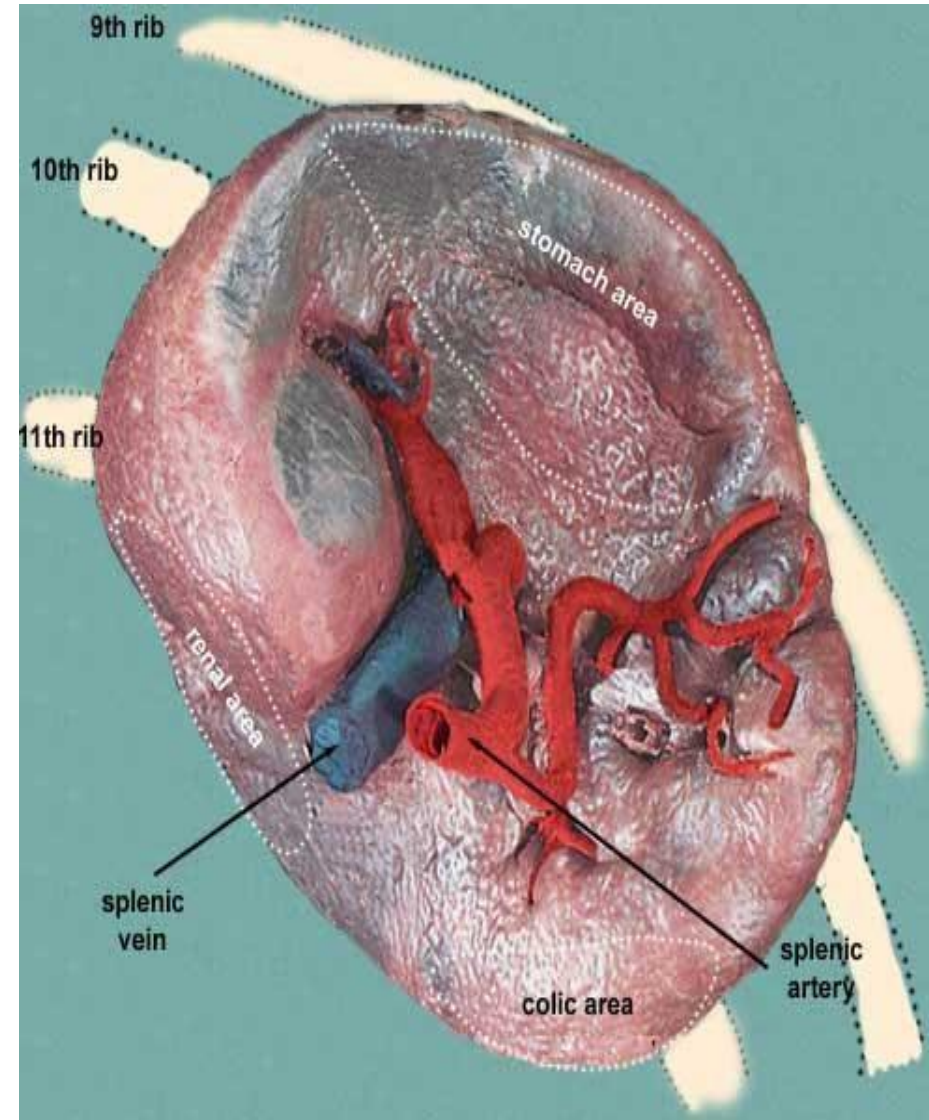
It separates the
diaphragmatic surface
from the gastric surface



Spleen.....cont

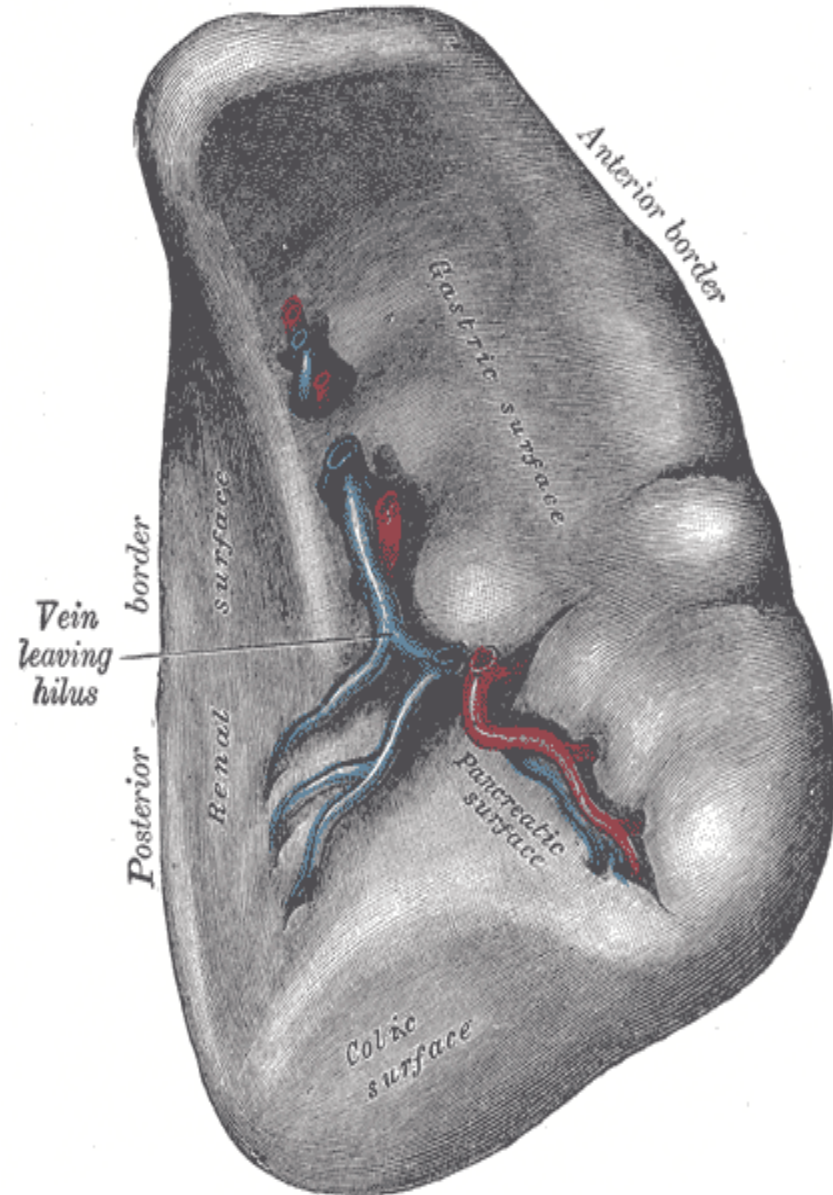
2- inferior border

- More rounded and blunter
- Separates the renal from the diaphragmatic surface;
- It corresponds to the lower border of the eleventh rib
- lies between the diaphragm and left kidney. The



Spleen....cont

- Intermediate margin is the ridge which separates the renal and gastric surfaces.
- Internal border separates the diaphragmatic from the colic surface.



Blood supply

- The large splenic artery is the largest branch of the celiac artery.
- It has a tortuous course
It runs along the upper border of the pancreas
- The splenic artery then divides into about six branches, which enter the spleen at the hilum

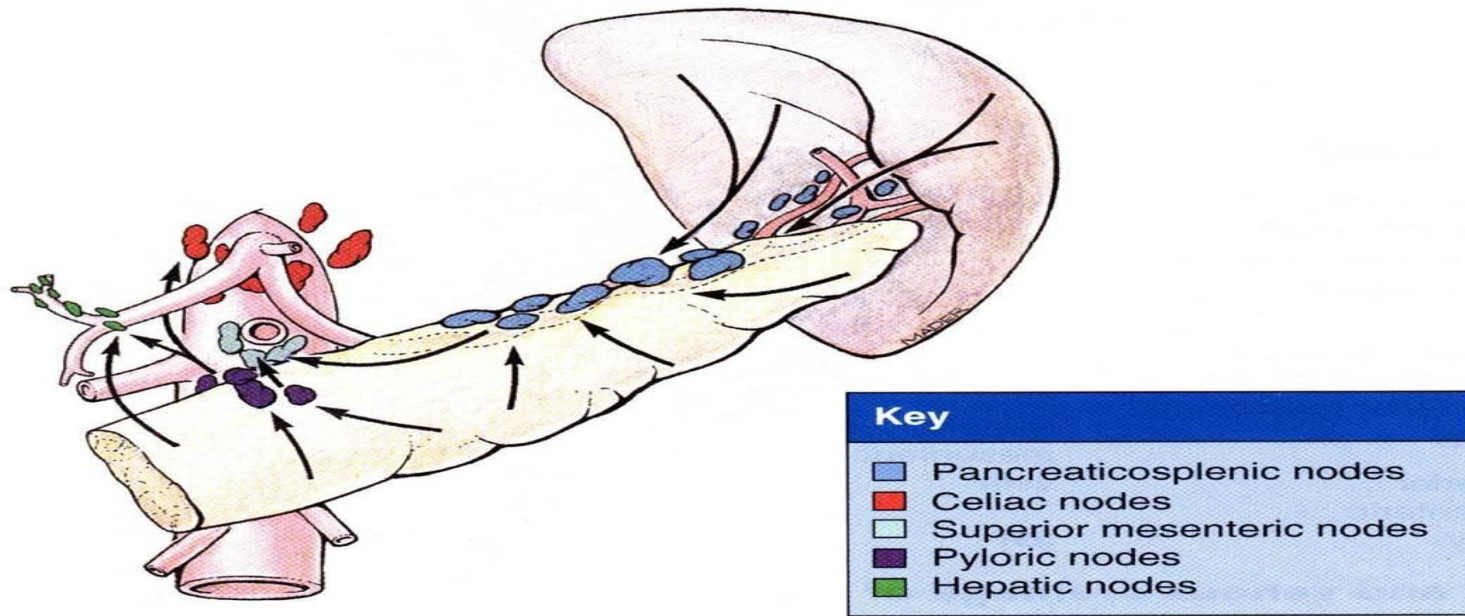
Blood supply of spleen

- Veins

- The splenic vein leaves the hilum and runs behind the tail and the body of the pancreas.
- Behind the neck of the pancreas, the splenic vein joins the superior mesenteric vein to form **the portal vein.**

Lymphatic Drainage of spleen

- The lymph vessels emerge from the hilum and pass through a few lymph nodes along the course of the splenic artery and then drain into the celiac nodes.



Nerve Supply of spleen

- The nerves accompany the splenic artery and are derived from the celiac plexus.

