

# Digestive System

University of Jordan  
Faculty of Medicine  
Batch of 2013-2019



Slide  Sheet  Handout  Other

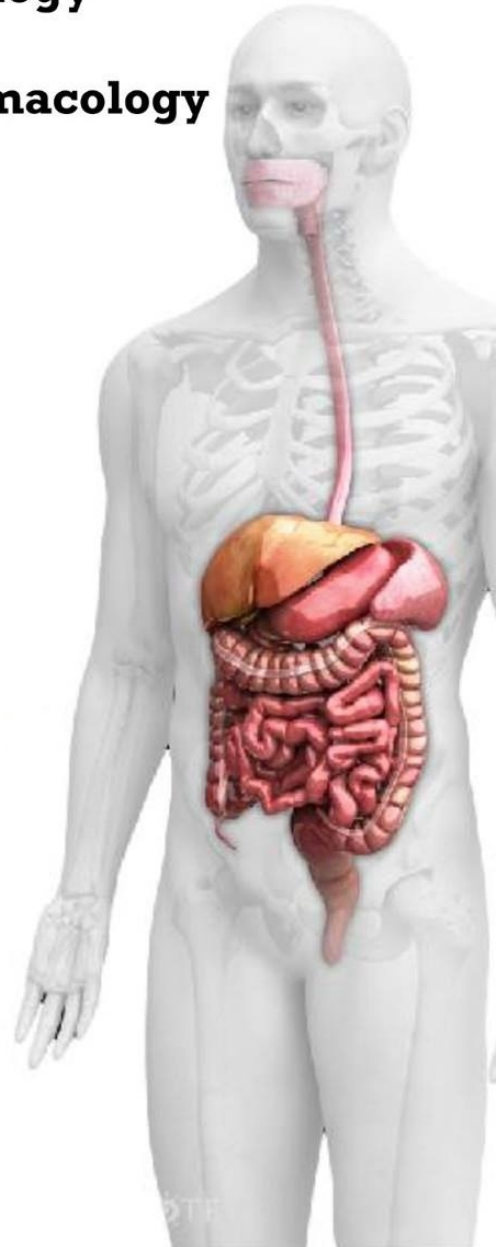
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**Sheet #: 9**

**Done by: Duha Naji**

**Date:**

**Price:**



## Liver, Gallbladder, and Pancreas

- This sheet was done on section 1's recording.
- There is no need to study this sheet along with the slides (except for some figures) as I've covered all the information mentioned by the doctor in addition to what's written in the slides.
- The sheet covers three topics:
  - 1- Liver.
  - 2- Gallbladder.
  - 3- Pancreas.

Note: regarding the topic of spleen, the Dr. gave us a brief introduction about it because it'll be explained further during the practical sessions and he told us to read it from the SLIDES.

Let's start,

## - Liver:

- The largest gland in the body and has a wide variety of functions.
- It's located in the right hypochondriac and epigastric regions and it extends to the left hypochondriac region as well .So, it occupies three regions.
- Weight: generally, we say that it's around 1.5 Kg, but relative to the body weight it depends:

In adults: it measures  $1/50$  of body weight .So for e.g.; if the weight of an adult is 50Kg, his/her liver weighs 1Kg. If the body weight equals 70Kg, then the weight of the liver is 1.4Kg, & so on

In infants: it measures  $1/20$  of body weight .So, if the infant weighs 20 Kg, the liver weight = 1 Kg.

\*\* Notice that the weight of infants' liver, concerning the body weight, is larger than that of adults. Why is that?  
Because the function is wider. Infants need the liver more than adults.

- Liver is an **exocrine** (secretes bile) and **endocrine** (produces albumen, prothrombin, and fibrinogen) organ.

### ➤ Functions of the liver :

- 1- Secretion of bile and bile salt.

- 2- Metabolism of carbohydrates, fat, and proteins.
- 3- Formation of heparin and anticoagulant substances.
- 4- Detoxication.
- 5- Activation of vitamin D.
- 6- Storage of glycogen and vitamins.

**Note:** 1/8 of the liver is sufficient to execute the functions mentioned above. But, the problem is that liver diseases spread very rapidly, especially liver cirrhosis and liver fibrosis.

There's a difference between these 2 diseases:

-**Liver Fibrosis:** Excessive connective tissue builds in the liver, usually as a result of injury. This disease is very common in people with **Bilharziasis**.

-**Liver Cirrhosis:** Scarring results in disruption of normal hepatic architecture & function. The most common cause is **alcoholism**

➤ **Surface anatomy of the liver :**

- It's located under the diaphragm, which separates it from the pleura, lungs, pericardium, and heart.

\*\* ***Site of the liver is very important.***

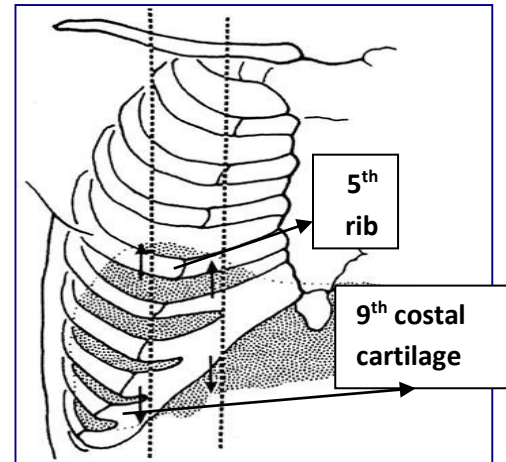
- On the right side, the liver pushes the diaphragm upwards to a degree that the diaphragm reaches the right 5<sup>th</sup> intercostal space and it might even reach the 4<sup>th</sup> rib (but usually the 5<sup>th</sup> rib).

➤ Notice that the greater part of the liver is situated under cover of the right costal margin .(see the figure below)

➤ The inferior border of the liver is situated below the level of the 9<sup>th</sup> Costal cartilage. When we take a deep inspiration the liver descends below this level.

➤ when you want to physically examine the liver with your finger,

Usually the index, you should direct your index below the 9<sup>th</sup> right costal cartilage, so that you would be able to touch the inferior border of the liver in that area.



➤ **The liver has five surfaces :**

1- Anterior surface.

2- Right surface (on the right side).

3- Superior surface (under the diaphragm).

4- Posterior surface.

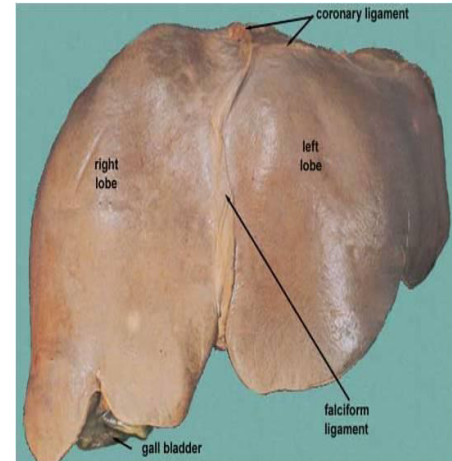
5- Visceral surface, where you find impressions for the gallbladder as well as for the right kidney.

Note: Impression of the kidney on the visceral surface of the liver forms what's called” **Morison Pouch**” between the liver and the right kidney (the space that separates the liver from the right kidney).

➤ **Anterior view of the liver :**

You can notice the following structures when you look at the liver anteriorly:

- The right lobe.
- The left lobe.
- Falciform ligament, which separates the right lobe from the left one, is attached to the diaphragm upwards and to the anterior abdominal wall anteriorly.
- Right & left coronary ligaments.
- Fundus of the gallbladder.



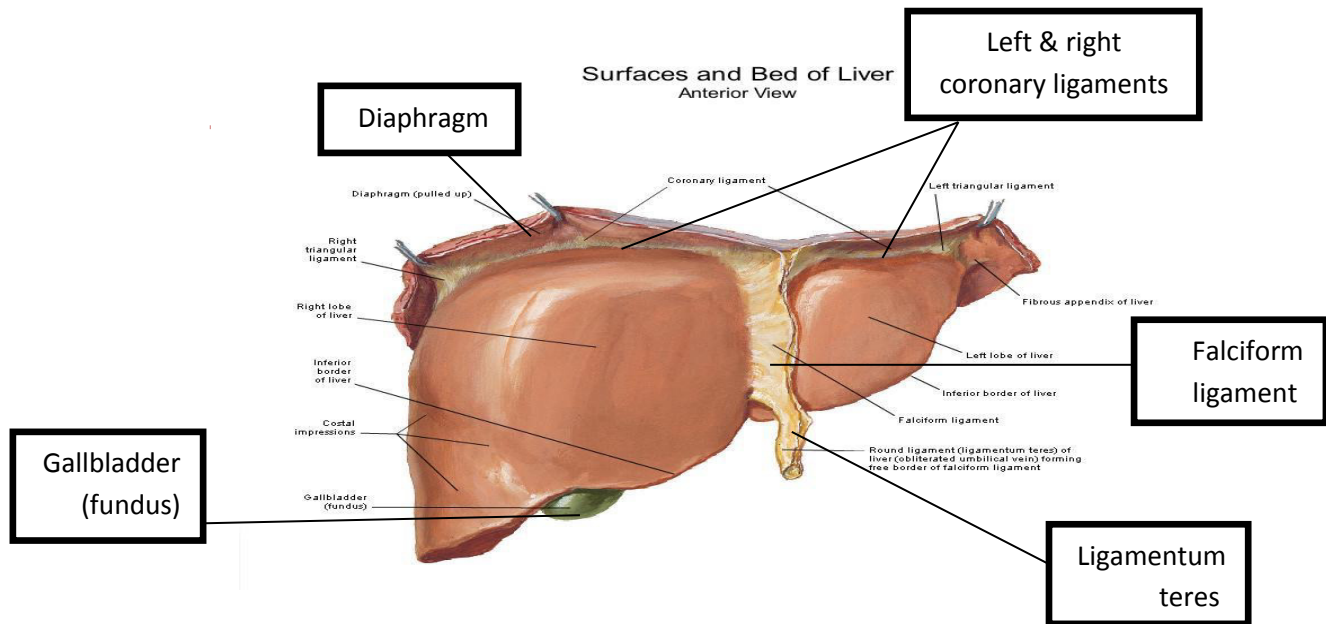
\*\* Between the right and left coronary ligaments we have an area called the **Bare Area** (so, coronary ligaments surround the bare area).

\*\*\*\*\*

➤ **Surfaces of the liver, their relations & impressions :-**

- Postero - inferior surface = Visceral surface.
  - Superior surface = Diaphragmatic surface.
  - Gallbladder is located on the visceral (postero-inferior) surface.
  - Above the coronary ligaments, you find the diaphragm, pleura, and lungs.
- The most important surface is the Visceral Surface because it's directed towards the abdominal cavity and it has many impressions related to the viscera.





➤ **Relations ( impressions ) on the visceral surface :**

1- Inferior vena cava.

2- The esophagus.

3- The stomach.

Both are found on the left lobe of the liver

4- Pylorus of the stomach which continues as duodenum (which lies in front of the neck of gallbladder).

5- Right colic flexure.

6- The right kidney.

7- Right suprarenal gland.

8- The gallbladder.

\*\*The impression of gallbladder prevents gallbladder's gangrene.

9- Tubular omentum, discussed later (on the junction of the nick of pancreas).

10- Ligamentum teres, aka, obliterated umbilical vein.  
11- Fissures for ligamentum venosum and lesser omentum.  
\*\* Ligamentum venosum was originally **ductus venosum** (in embryogenesis) which connects the inferior vena cava with the portal vein, then it (ductus venosum) gets obliterated and is transformed into ligaments (ligamentum venosum).

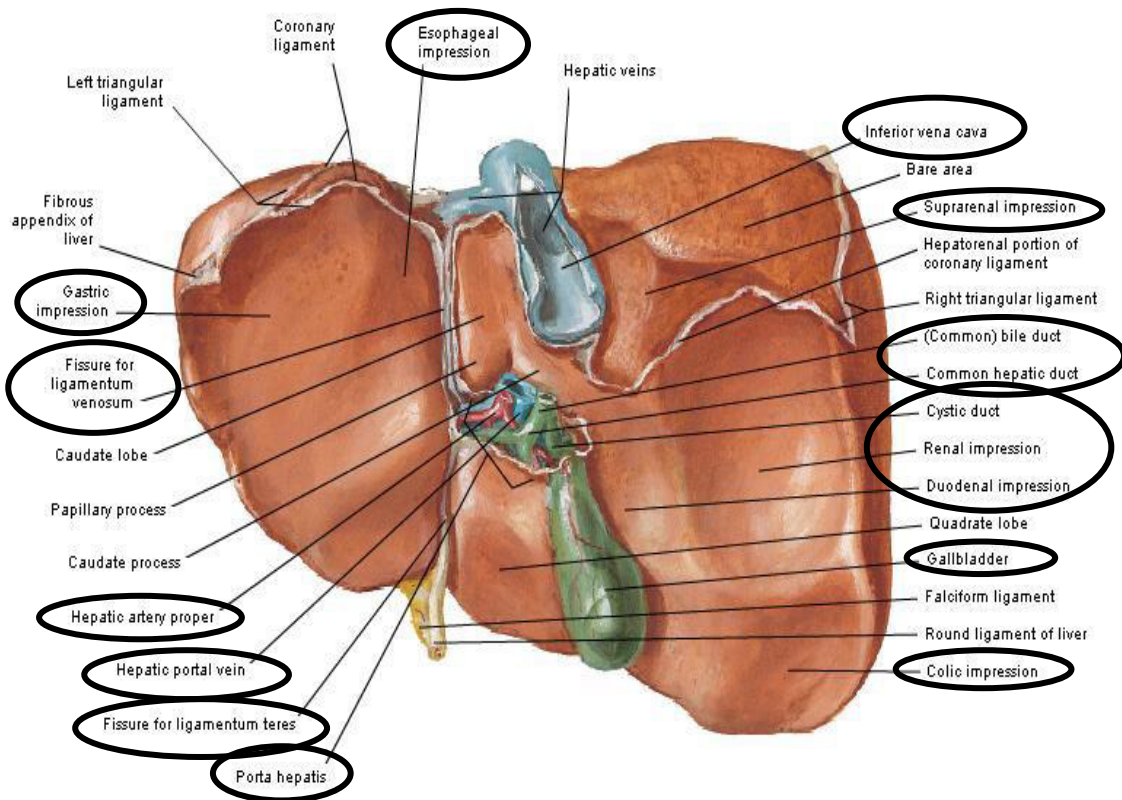
12- Porta Hepatis: [very **important**]

- It's the hilum of the liver.
- It's surrounded by 2 layers of peritoneum.
- Provides an entrance for the blood supply (hepatic artery and portal vein) and an exit for the bile duct, which receives the bile from right & left hepatic ducts.
- Porta hepatis receives the cystic duct which joins the common hepatic duct to form the common bile duct.
- **Contents:**
  1. Hepatic artery.
  2. Portal vein.
  3. Common bile duct.
  4. Nerve supply (sympathetic and parasympathetic).
  5. Lymph nodes and lymphatic vessels.

Make sure you can identify all the structures mentioned above using this figure:



## Surfaces and Bed of Liver Visceral Surface



➤ We said before that the liver has 2 lobes (right & left) but it actually consists of four lobes:

- 1- Right lobe.
- 2- Left lobe.
- 3- Caudate lobe.
- 4- Quadrate lobe.

➤ **Superior surface of the liver:** -

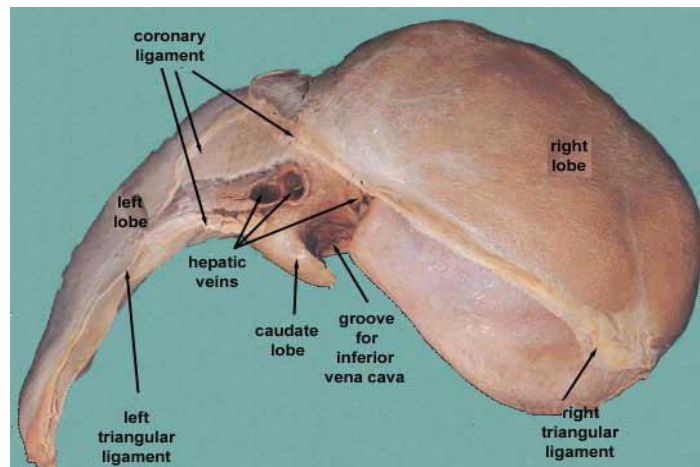
- It's where you find the bare area that lies between right & left coronary ligaments. (To be more specific, the bare area extends from the superior surface- between coronary ligaments- to the beginning of the posterior surface).

\*\* Endings of coronary ligaments on both sides form the triangular ligaments (right and left).

- Right coronary ligament ends as right triangular ligament.
- Left coronary ligament ends as left triangular ligament.

\*\* What are the structures that can be found on the sup. Surface of the liver? (From the slides, not mentioned by the dr).

- Groove for the inferior vena cava and hepatic veins
- Cut edges of the superior and inferior parts of right & left coronary ligaments with their endings (triangular ligaments).



- Caudate lobe of the liver more or less wrapping around the groove of inf. Vena cava.
- Fundus of gallbladder, ligamentum teres, right & left lobes.
- **The most important one is the BARE AREA** (where there is no peritoneum covering the liver, that's why it's called bare).

➤ Relations of superior surface of the liver :-

- Diaphragm (superiorly).
- Pleura and Lung (superiorly to the right side).
- Pericardium and Heart (above the middle of the liver).

- Relations of **anterior** surface of the liver :-
  - Diaphragm: because when the dome of diaphragm descends to cover the right cupola of diaphragm, it extends superiorly, anteriorly, and posteriorly.
  - Right & Left pleura and lung.
  - Costal cartilage                          - Xiphoid process.
  - Anterior abdominal wall.
  
- Relations of **posterior** surface of the liver, aka, **Visceral Relation** :-
  - Diaphragm.
  - Impressions for the right kidney & suprarenal gland.
  - Transverse colon, particularly the ***hepatic flexure***.
  - Gallbladder.                          - Duodenum.
  - Inferior vena cava.
  - Esophagus & fundus of the stomach.
  
- **Separation of the four lobes of the liver** :-
  - Anatomically, the separation between right & left lobes as well as caudate & quadrate lobes is through the **ligamentum venosum**.
  - Functionally, the separation is through the line between the impression of inferior vena cava and gallbladder.

**\*\*** The functional division is more important than the anatomical one, why?

Physiologically (functionally), caudate and quadrate lobes belong to (pertain to) the **left lobe**, not the right one. That's why we care about the functional division, which is obtained by means of the impression of inferior Vena cava along with that of the gallbladder.

So, based on the functional division:

The **left** hepatic duct receives bile from the left, caudate, and quadrate lobes. >> This means that the lymphatic drainage also is for the left lobe and caudate & quadrate lobes.

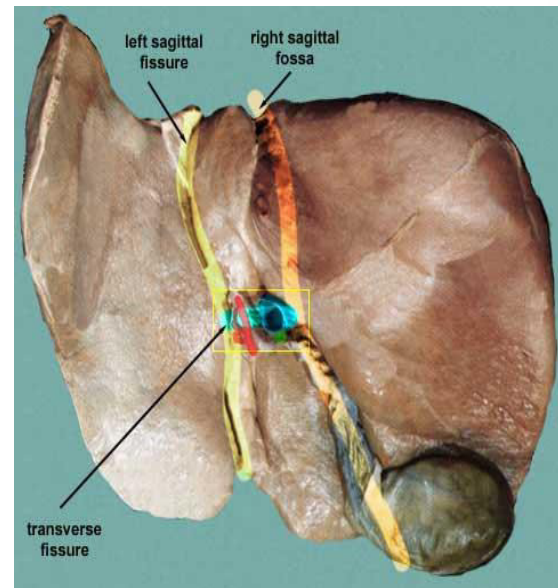
\*The same thing applies to the blood supply:

- **Hepatic artery** in porta hepatis divides into
  - *Right hepatic artery (goes to the right lobe only)*
  - *Left hepatic artery (goes to the left, caudate, and quadrate lobes)*
- **Venous drainage**: portal vein divides to supply the left lobe as well as caudate and quadrate lobes.
- **Hepatic vein**: when it opens into the inf. Vena cava, it appears to be in the form of 3 veins (right, left, and middle). >> see next

- **Right**: comes from the right lobe.
- **Left**: comes from the left lobe.
- **Middle**: from caudate and quadrate lobes.

\*\*\*\*\*

- This figure shows the following fissures: (the dr didn't say a word about them)
  - 1- Transverse fissure (also porta hepatis) - bile ducts, portal vein, hepatic arteries.
  - 2- Right sagittal fossa-groove for inf. Vena cava and gallbladder.
  - 3- Left sagittal fissure, which contains the ligamentum venosum and round (teres) ligament of the liver.



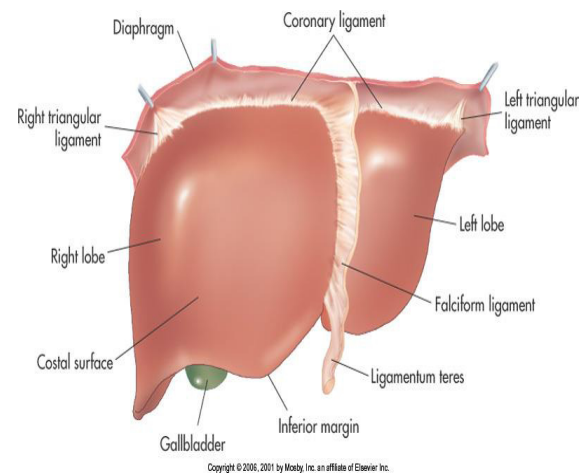
### ➤ Lobes of the liver :-

#### ✓ Right lobe :

- It's the largest lobe.
- Occupies the right hypochondrium.
- Divided into anterior & Posterior sections by the *right hepatic vein*.
- Reidel's lobe extends as far caudally as the iliac crest (not mentioned by the doctor).

#### ✓ Left lobe :

- Varies in size.
- Lies in the epigastric and left hypochondriac regions.





- Divided into lateral and medial segments by the ***left hepatic vein***.

\*\*Right & left lobes are separated by:

- 1- Falciform ligament.
- 2- Ligamentum venosum.
- 3- Ligamentum teres (found between caudate and quadrate lobes as well – correction is not sure of this info.)

✓ **Caudate lobe :**

- Present in the post. Surface from the right lobe.

- Has 2 processes:

- 1) C - process.
- 2) Papillary process.

- Relations:

Inf.: porta hepatis

The right: the fossa for the inf. Vena cava.

The left: the fossa for ligamentum venosum.

✓ **Quadrate lobe :**

- present on the inf. Surface from the right lobe.

- Relations:

- Ant. >> anterior margin of the liver.

- Sup. >> Porta hepatis.

- The right >> fossa for the gallbladder.

-The left >> fossa for ligamentum teres.

➤ **Porta Hepatis :**

- It's the hilum of the liver.

- Found on postero-inferior surface of the liver.



- Lies between caudate & quadrate lobes.
- Lesser omentum attaches to its margin.
- **Contents:**
  - Gallbladder (anteriorly).
  - Portal vein (posteriorly).
  - Hepatic artery + nerve + lymphatic nodes ( in the middle )
    - \*\* Hepatic artery divides into right and left
    - Right >> gives cystic artery to the gallbladder.

**Note:** we have right and left hepatic ducts which unite to form the common hepatic duct.

Cystic duct, 4cm in length, combines with the common hepatic duct to form the **common bile duct.**

### ➤ **Peritoneum of the liver :**

- We talked before about the lesser omentum, which is basically 2 layers of peritoneum extending from the liver ( from porta hepatis and fissure of ligamentum venosum ) to the diaphragm, then to the lesser curvature of the stomach and finally to the first inch of duodenum.
- The liver is covered by peritoneum (intraperitoneal organ) **except for the bare area.**
- Its inferior surface is covered by peritoneum of the greater sac **except for porta hepatis, gallbladder & ligamentum teres fissure**

- Its right lateral surface is covered by peritoneum related to the diaphragm which separates it from the right pleura, lung and the right [6\_11] ribs.

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➤ **Ligaments of the liver :-**

- 1- Falciform ligament.
- 2- Ligamentum teres hepatis (obliterated umbilical vein).
- 3- Coronary ligaments (right & left surrounding the bare area).
- 4- Right triangular ligament.
- 5- Left triangular ligament.
- 6- Hepatogastric ligament.
- 7- Hepatoduodenal ligament.
- 8- Ligamentum venosum, which is obliteration of ductus venosum in the embryo.

Parts of the lesser omentum

✓ **Falciform Ligament:**

- Consists of a double- peritoneal layer.
- Sickle - shaped.
- Extends from the anterior abdominal wall (umbilicus) to the liver.
- Its free border (edge) contains the ligamentum teres.
- Clinically, it's important because this ligament divides the subdiaphragmatic space into right & left subphrenic spaces which is considered as a site of accumulation of fluids and abscess.

### ✓ **Coronary Ligaments :**

- Appear as 2 layers; upper & lower around the bare area, which contracts with the diaphragm.

### ✓ **Left & Right triangular Ligaments :**

- formed by left and right extremity of coronary ligament.

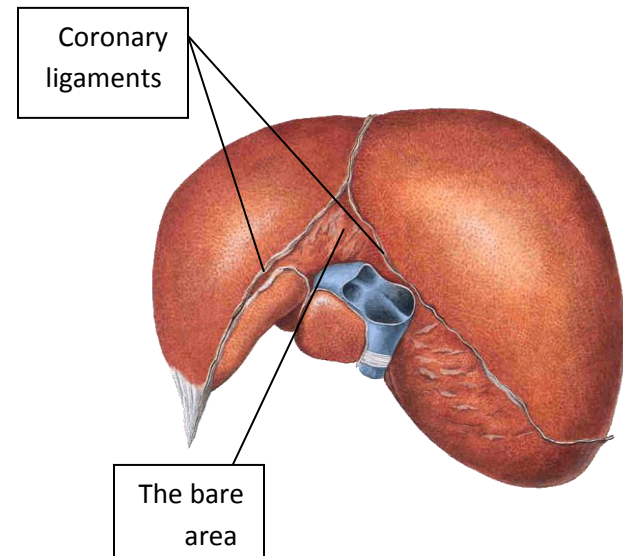
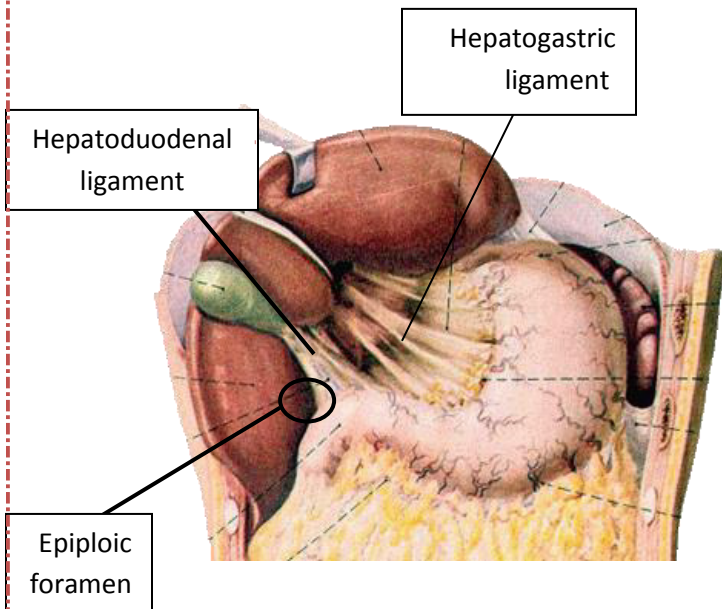
### ✓ **Hepatogastric and Hepatoduodenal Ligaments:**

- Parts of the lesser omentum.
- Under the hepatoduodenal ligament we have a foramen known as "*epiploic foramen*".

### ✓ **Ligamentum Venosum :**

- Fibrous band that is the obliteration of ductus venosum, which connects the inf. Vena cava to the portal vein.
- 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 inf. Vena cava.

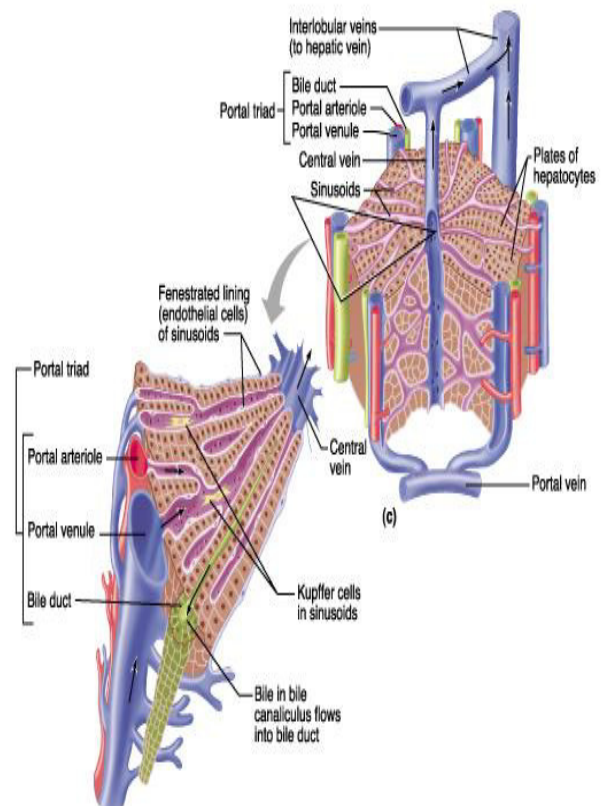
**P.S.: paraumbilical vein terminates into the left portal vein.**



➤ **Liver Histology :**

- Lobules, which are roughly hexagonal structures, consisting of hepatocytes.
- In the middle we have a central vein.
- \*\*The Central vein ends as hepatic vein (which becomes 3 veins [right, left, and middle] that will drain into the I.V.C.
- Hepatocytes radiate outward from a central vein.
- Liver sinusoids lie between the hepatocytes.

\*\*I.V.C = Inferior Vena Cava



- At each of the six corners (edges) of a lobule we have the **portal triad**, which consists of:

- Hepatic artery.
- Portal vein.
- Bile duct.

- The liver is surrounded by a thin capsule at portahepatic (it's thick) known as Glisson's capsule, which invests the liver and sends septa into the liver subset and subdivides the parenchyma into lobules.

➤ **Segmental Anatomy of The Liver :**

- Very important, especially in liver transplantation.
- As we said before, the anatomical division (right & left lobes) by falciform, lig. Teres and venosum has no morphological significance.
- True morphological and physiological division by a line extending from the fossa of gallbladder to the fossa of I.V.C. is much more significant.
- Each segment has its own blood supply, venous & lymphatic drainage, and biliary drainage.
- There is no anastomosis between the segments.
- There are 8 segments of the liver, based on the portal and hepatic venous drainage.

➤ **Blood supply of 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 in the GIT.
- The arterial and venous blood is conducted to the central vein of each nodule by the liver sinusoids.
- The central veins drain into right and left hepatic veins, and these leave the post. Surface of the liver & open directly into the inferior vena cava.

**\*\*Note:**

Hepatic artery proper is the hepatic artery after giving its 2 branches (right gastric and gastroduodenal). ~~Hepatic artery proper has two branches: right and left hepatics arteries.~~

\*\* 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 gallbladder.

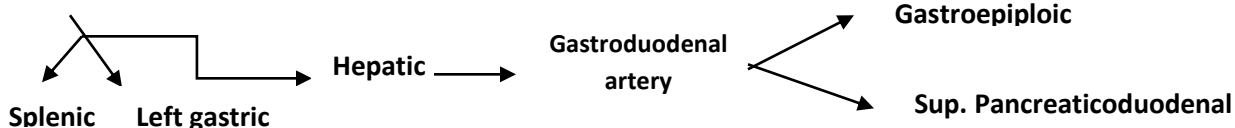
Common hepatic artery

Hepatic artery proper

- 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 I.V.C.

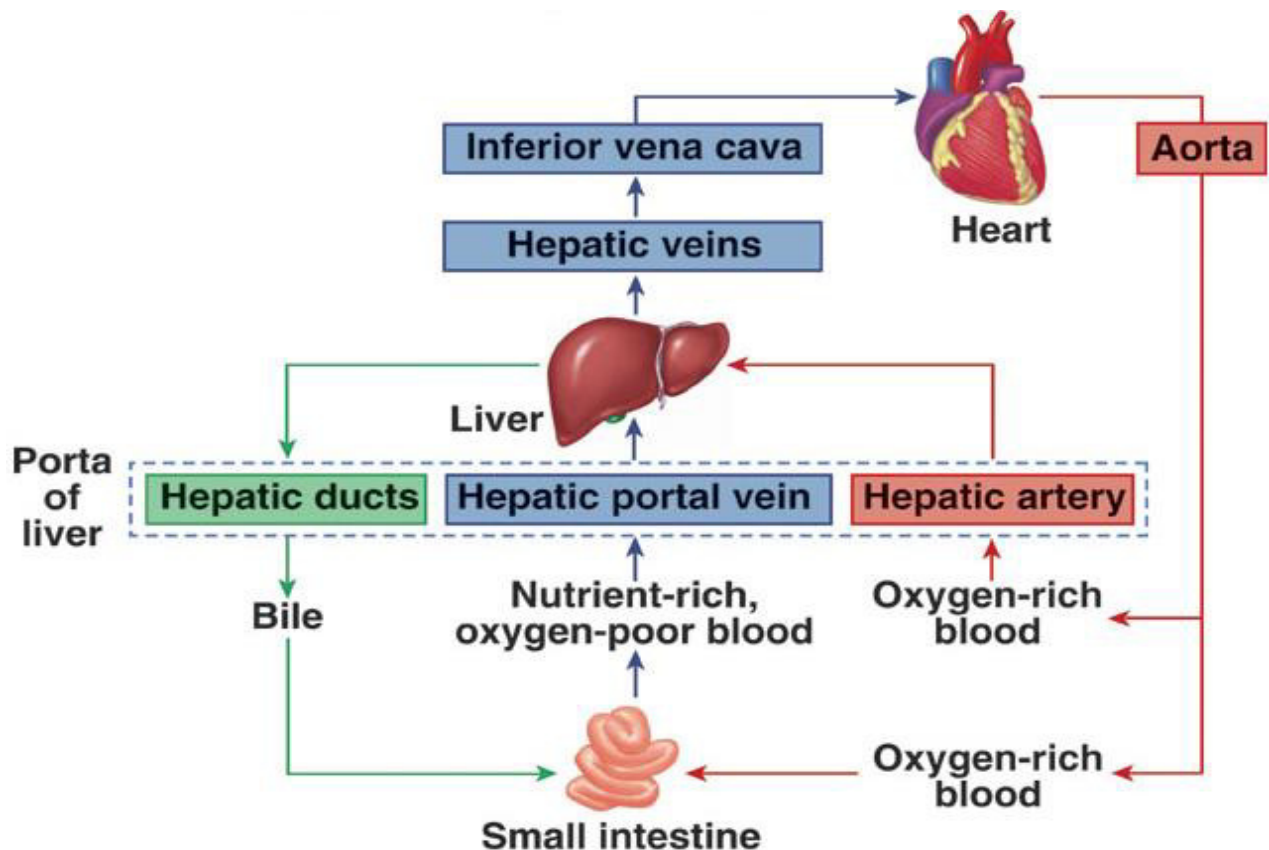
- The celiac trunk (celiac artery) gives off the following branches; ***left gastric***, ***splenic***, and ***hepatic*** arteries. One of the branches of hepatic artery is the gastroduodenal artery which also gives 2 branches: right gastroepiploic artery and superior pancreaticoduodenal artery.

**Celiac Trunk**





- Hepatic duct adopts the opposite way of hepatic artery & portal vein. It carries the bile from the liver to the second part of duodenum by means of the **common bile duct**.
- The figure below summarizes the blood supply and venous drainage of the liver.

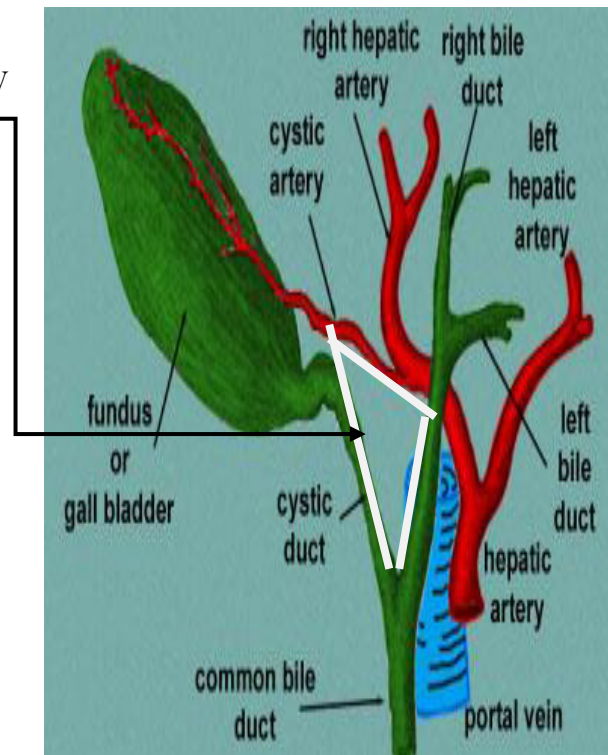


- Most of the cystic vessels and blood supply lie posterior to the bile duct (it's very rare to find them anteriorly).
- Cystic vein goes to the right portal vein.

- There's a triangle known as ***Calot's triangle*** that lies below the liver between cystic vessels and cystic duct.

- *What's the importance of this triangle?*

When a surgeon wants to perform cholecystectomy (surgical removal of the gallbladder), he cuts then ligates the cystic vessels in addition to the cystic duct through this triangle.



➤ **Lymphatic drainage of the liver :**

- Our liver produces large amount of lymph, approximately one third - one half of the total body lymph.
- Most of the lymph leave the liver and enter several lymph nodes in the **porta hepatis** >> to **hepatic lymph nodes** >> efferent vessels pass to the **celiac lymph nodes**.
- \*\* This doesn't apply to the bare area.

- The bare area has its own lymphatic drainage. The lymph ducts pass through the inferior vena caval orifice (opening) then to the right lymphatic duct on the right side of the chest and then drain into the right brachiocephalic vein.

➤ **Nerve supply of the liver :**

- Sympathetic and parasympathetic

\*\* Sympathetic: hepatic plexus >> celiac plexus >> thoracic ganglion chain T1-T12.

\*\* Parasympathetic: vagus nerve (**anterior** part).

- Sympathetic and parasympathetic nerves form the celiac plexus that is found between the 2 layers of lesser omentum and porta hepatis.

- **Note:** most of the nerves come from the anterior vagal trunk [in front of the stomach]. The anterior vagal trunk gives rise to a large hepatic branch, which passes directly to the liver.

\*\*\*\*\*

➤ **Endoscopic Retrograde Cholangiopancreatography [ERCP]:**

- It's a modern technique used in many cases related to gallbladder and pancreatic diseases.

- This technique 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 that they can be seen on X-rays.

- In the past, when a patient is diagnosed with having stones in the common bile duct, which may cause obstructive jaundice (characterized by yellowing of the sclera & skin, and itching) as a result of the bile being returned to the blood because the duct is obstructed, this case used to be treated by open surgery, cholecystectomy, in order to remove the stones from the common bile duct. In this case, the patient should stay in the hospital for 7 days under supervision and receiving drainage from the anterior abdominal wall.

However, nowadays, by using the ERCP technique, those stones can be removed easily, how?

An endoscope is injected through the oral cavity, then passes retrograde through the sphincter of Oddi till it reaches the common bile duct or pancreatic duct, after that if there is a stone, they insert a basket, so that the stone can descend to the duodenum and the body gets rid of it by drainage.

So the route of the endoscope is:

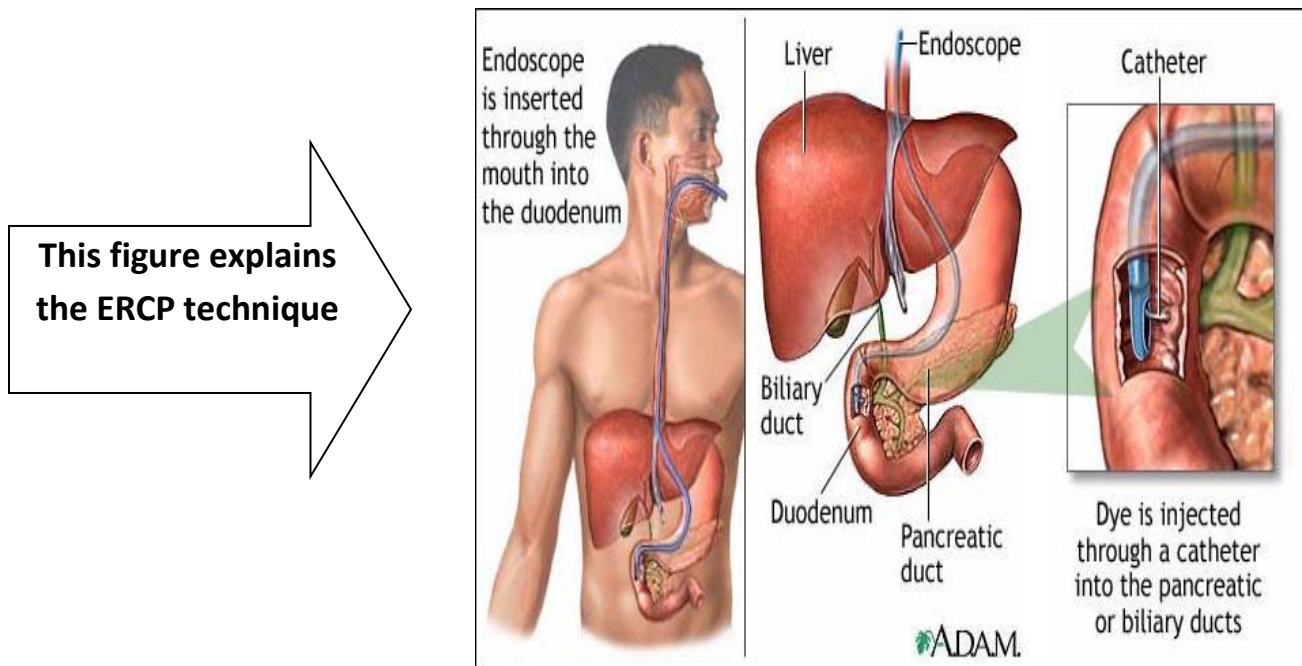
Oral cavity >> Esophagus >> Stomach >> duodenum >> sphincter of oddi >> the common bile duct or to the pancreatic duct.

NOTE: in some cases, the sphincter of oddi is cut [sphincterectomy] while inserting the endoscope, but healing occurs without any problem.

Sometimes, the obstruction results from thickening of secretions (described as a **mud**). This case can be solved by **irrigation** using saline, then all the muddy secretions

descend to the duodenum and the obstruction with its complications (like jaundice) will be released. The patient recovers within 3-4 hours.

**-Liver cirrhosis:** the most common cause is alcoholism.



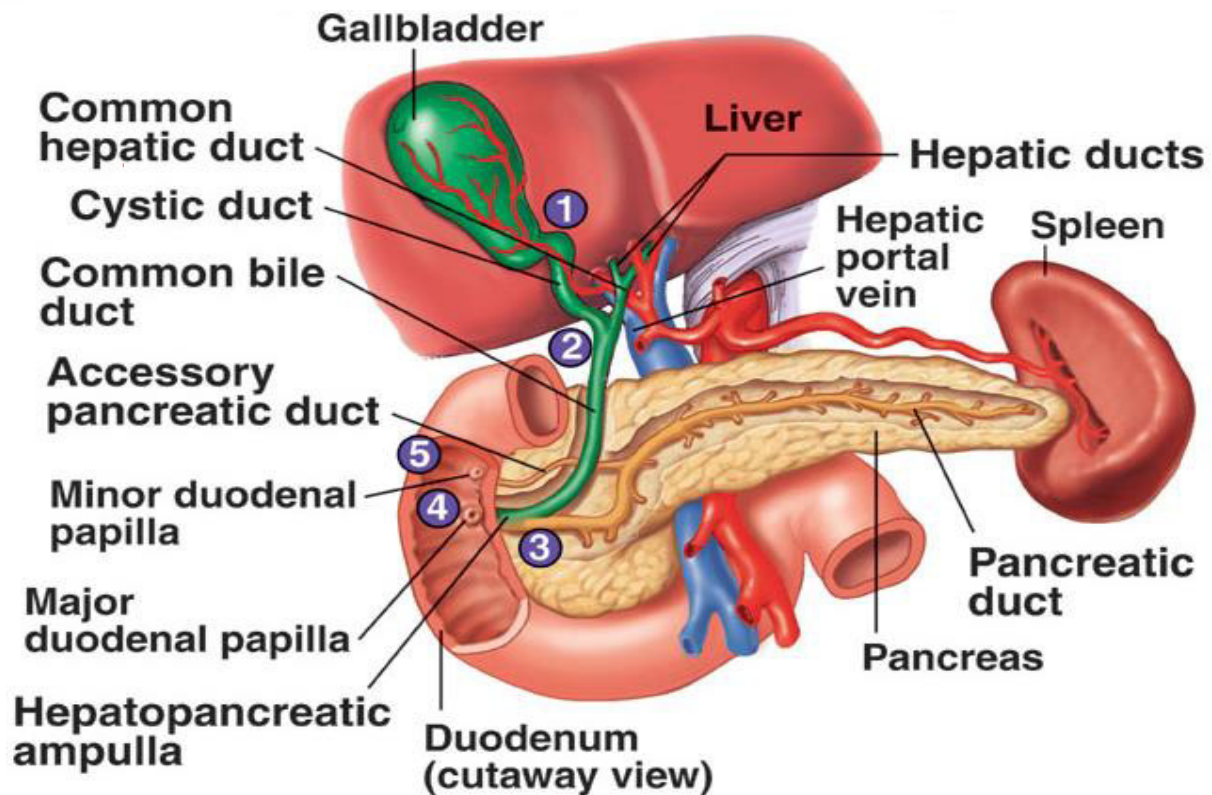
## - Gallbladder:

- It's a pear-shaped, hollow structure.
- Lies in the epigastric and right hypochondriac regions.
- At the tip of the 9<sup>th</sup> right costal cartilage.
- A green muscular organ.
- On the inferior surface of the liver between the quadrate and right lobes and is directed towards porta hepatis.
- Has a short mesentery.
- Function: concentration of bile with a capacity of 30-50 cc.
- Mechanism of function: The sphincter of oddi is always closed, so that all secretions of the liver return back to the gallbladder where they get concentrated.

When can we get secretions into the duodenum?

This depends on **cholecystikin hormone** secretion. When this hormone is secreted, there will be contraction in the wall of gallbladder and relaxation of the sphincter of oddi.





From the figure above, you should know the following:

- Cystic duct combines with the common hepatic duct (right and left) in the porta hepatis to form the common bile duct which opens into the major duodenal papilla.
- Notify the main pancreatic duct and the accessory pancreatic duct.

## **✚ Structure of the gallbladder :**

### **1- Fundus:**

Anteriorly >> ant. Abdominal wall.

Postero-inferiorly >> Transverse colon.

### **2- Body:**

Superiorly >> Liver.

Postero-inferiorly >> Transverse colon, end of the 1<sup>st</sup> part of duodenum, the beginning of the 2<sup>nd</sup> part of duodenum.

### **3- Neck:**

Forms the cystic duct >> 4 cm in length.

### **\*\* Hartmann's Pouch:**

- It's a pouch from the neck.
- Lies between the body & neck of gallbladder.
- There is a normal variation.
- May obscure the cystic duct.
- If it was very large, you may see the cystic duct arising from this pouch.
- Its importance lies in the development of *single stone*.

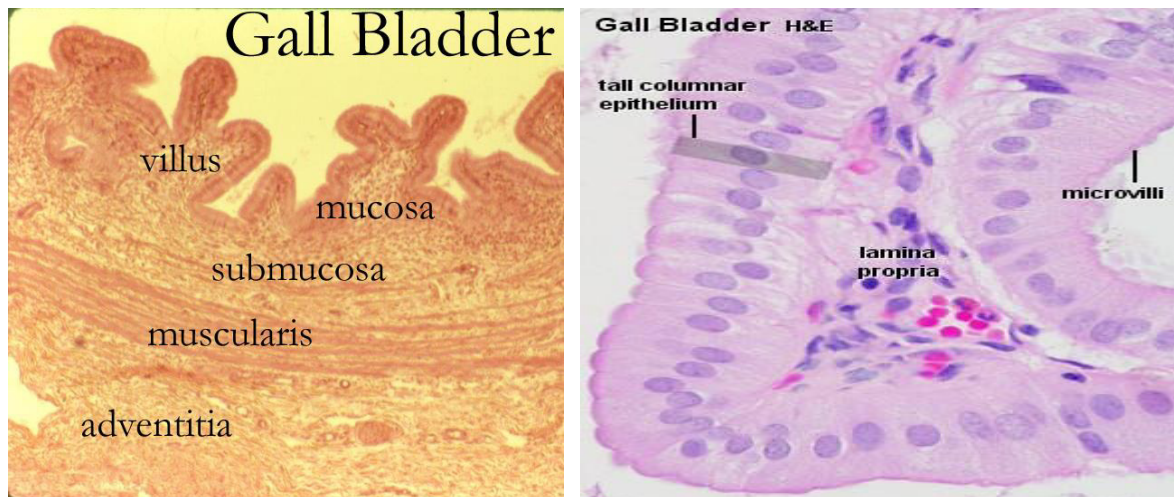
### ***Why?***

Because it's a pouch, secretions may accumulate there and cause a focus of bacteria (a nucleus that is surrounded by a stone).

## Histology of the gallbladder:-

- Contains abundant mucosa to increase surface area.
- Sometimes, the submucosa is absent.
- Muscularis layer is irregular.
- The lining epithelium is **simple columnar without goblet cells**.

\*\* The most important part is the **Foldings** in the simple columnar cells.



## Blood Supply of the gallbladder :

- Cystic artery, which is a branch of the ***right hepatic artery***.
- Cystic vein (The exact opposite of cystic artery), which ends in the **right portal vein**.
- Small branches (arteries and veins) run between the liver & gallbladder.

### **Lymphatic drainage of the gallbladder:**

- All the lymph go to the **cystic** lymph nodes, which are found at the neck of the gallbladder at the junction of cystic & common hepatic ducts, then to the **hepatic** nodes >> terminating into the **celiac lymph nodes**.

### **Nerve supply of the gallbladder :**

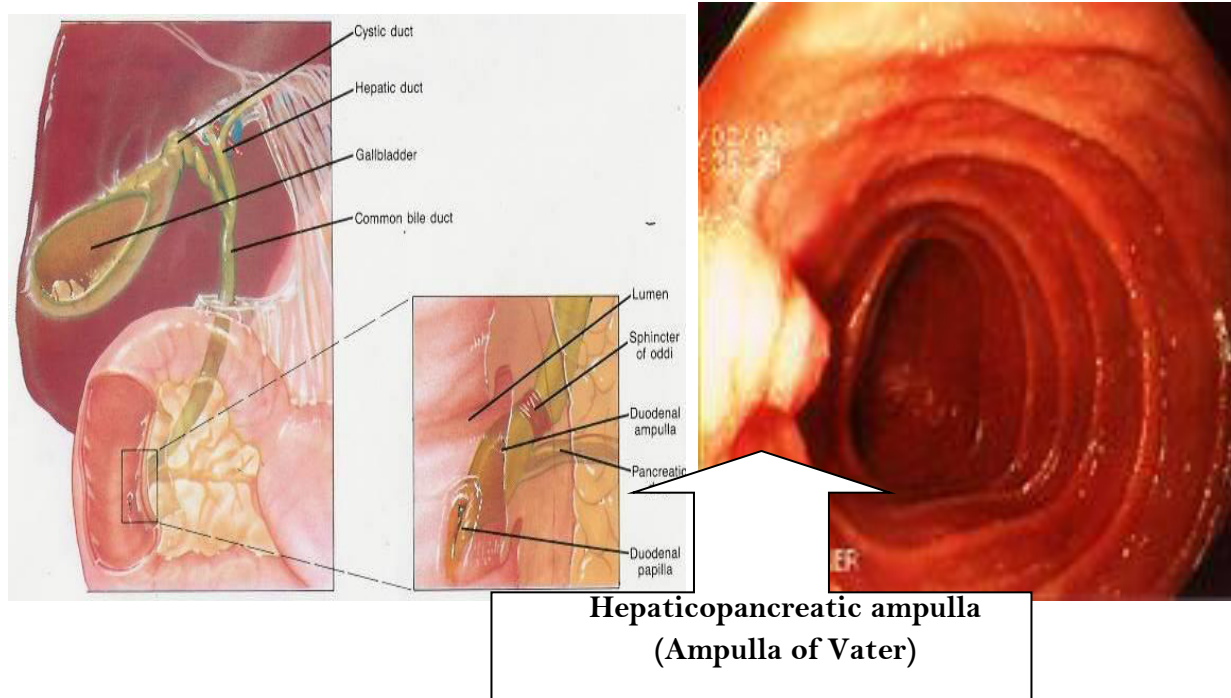
- Sympathetic and parasympathetic from **celiac plexus**
- Parasympathetic >> vagus nerve (anterior part)
- Hormones >> cholecystikinin (secreted in the duodenum).

\*\*\*\*\*

### **Common bile duct :**

- Length: 3 inches (10 cm).
- The extrahepatic biliary system:  
**Right & Left hepatic** ducts >> form the **common hepatic** duct >> joins the **cystic** duct >> forming the **common bile duct**.
- Divided into 3 parts:
  - 1- Above the duodenum (located in the free margin of lesser omentum in front of the opening into the lesser sac [epiploic opening]), right to hepatic artery & portal vein.
  - 2- Retroduodenal part (behind the 1<sup>st</sup> part of duodenum), right to the gastroduodenal artery.
  - 3- Retropancreatic part (behind and through the head of pancreas), in contact with the main pancreatic duct, related

to I.V.C, gastroduodenal artery and portal vein. Opens in the medial side of the 2<sup>nd</sup> part of duodenum at ampulla of Vater.



### **Blood Supply of the common bile duct:**

- Small arteries supplying CBD:
  - a. Arise from cystic artery
  - b. Posterior branch of superior pancreaticoduodenal artery.

### **What's the bile?**

- Bile composed of water, ions, bile acids, organic molecules (including cholesterol, phospholipids, and bilirubin).
- Gallstones are mostly cholesterol, but also contain Ca which is affected by bilirubin.



BIOCHEM

- 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).

### **✚ Gallbladder Diseases:**

1- Cholelithiasis & Cholecystitis:

Cholecystitis =  
inflammation of GB

Cholelithiasis = Stone(s) in GB

2- Obstructive jaundice: liver patterns.

3- Gangrene of gall bladder, very rare.

4- Congenital defects, for e.g.; having 2 cystic ducts or 2 gallbladders instead of one.

#### **\*\*Cholelithiasis:**

- GB shows likely sites of stone formation and deposition.
- Stones in the common bile duct lead to jaundice & pancreatitis.

## **- Pancreas:**

- Lies in the epigastric & left hypochondriac regions.

- Common relations:

<u>Anteriorly</u>	<u>Posteriorly</u>	
- Transverse colon.	- Bile duct	- Portal vein
- Transverse mesocolon.	- Splenic vein.	- I.V.C
- Lesser sac.	- Aorta	- Left kidney.
- Stomach.	- Origin of superior mesenteric artery	- left psoas muscle - left suprarenal gland
	- Hilum of the spleen.	



## ❖ Histology Of the Pancreas :

- It has 2 parts:

- 1- Exocrine (pancreatic acini): secretes pancreatic juice.
- 2- Endocrine (Islets of Langerhans): secretes insulin, glucagon, and somatostatin.

## ❖ Parts of the pancreas :

### 1] Head:

- Lies in the concavity of the duodenum.
- It's disc-shaped.
- A part of the head extends to the left behind the superior mesenteric vessels and is called the ***uncinate process***.

\*\*Superior mesenteric artery passes anteriorly to uncinata process.

### 2] 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 of the (the **portal vein lies behind the neck of pancreas**).

### 3] Body:

- Runs upward and to the left across the midline.
  - It is somewhat triangular in cross section.
  - It has 3 surfaces ( anterior , posterior, and inferior ) & 3 borders (ant. , post. , and inf. ).
- \*\* All these surfaces have a relation with the greater & lesser sacs.

**\*\* The posterior surface has a relation with I.V.C & abdominal aorta.**

#### **4] Tail:**

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

#### **❖ Pancreatic ducts:**

- All the small ducts (intercalated) in pancreas drain into the main pancreatic duct.

##### **○ 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*.

##### **○ The 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.

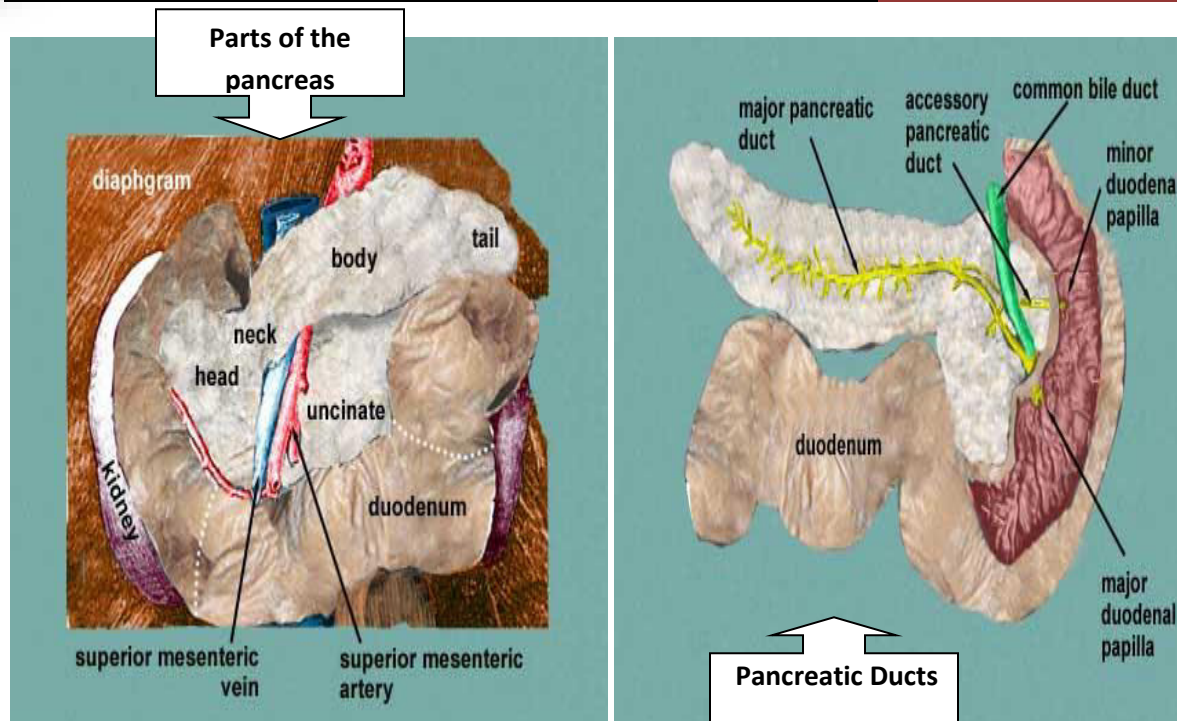
**NOTE:** There are no striated ducts in the pancreas.

#### **❖ Blood Supply of the pancreas :**

- Arteries:

- The splenic artery.
- The superior pancreaticoduodenal artery.

- Inferior pancreaticoduodenal arteries.
- Veins:
  - The corresponding veins drain into the portal system.
  - ❖ **Lymphatic drainage of the 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**.
  - ❖ **Nerve Supply of the pancreas:**
    - Sympathetic and parasympathetic chain.
    - Parasympathetic >> vagus nerve.
  - ❖ **Congenital Defects of pancreas: (discussed further in embryology)**
    - **Annular Pancreas (pancreas encircles duodenum) (rare).**
    - **Ectopic Pancreas (very common) =** Outside the gastrointestinal tract.
  - ❖ **Clinical Notes (IMPORTANT):**
    - Cancer of head of pancreas → Obstructive jaundices.
    - Cancer of body of pancreas → pressure → I.V.C & portal vein
    - Acute pancreatitis = inflammation of pancreas.



## -Spleen:

- Has 2 ends 





Upper medial end.

Lower lateral end (at the mid-axillary line).

- Has 2 surfaces:

1- Costal: related to the ribs (9, 10, and 11). The 10<sup>th</sup> rib is parallel to the longitudinal axis of the liver.

2- Visceral: has a relation with the stomach, left kidney, tail of pancreas, and the left colic flexure.

- Has 2 borders.

P.S. Lienorenal ligament (from the Ligament of the spleen) contains the tail of pancreas, splenic vessels & lymph nodes.

Please refer to the slides (84-101) for more info. About the spleen.

**END OF THE SHEET!**

I'm really sorry for this extremely long sheet, but the doctor explained 83 slides in one lecture!! fa ma ted3o 3alay ... I tried to make it as understandable as possible .

**GOOD LUCK 😊**

Dedication to : Batool Awaysheh , Marah Abu-Rumman , Aseel Ahmad , Reem AL-Shiyab , Raya Majali , Hana Tabanja , Ghadeer Sabateen , Ruba Qudah , Tasneem Melhem ,Sireen khatib , Shatha Tailakh, Ibtehal Hasanat ,Sura Mubarak , Sophia Haddadin ,” A.K “ :p ,Leen Younis, Hala Habashneh , Dina Sunnoqrot , and for sure to our lajneeh & correction team.