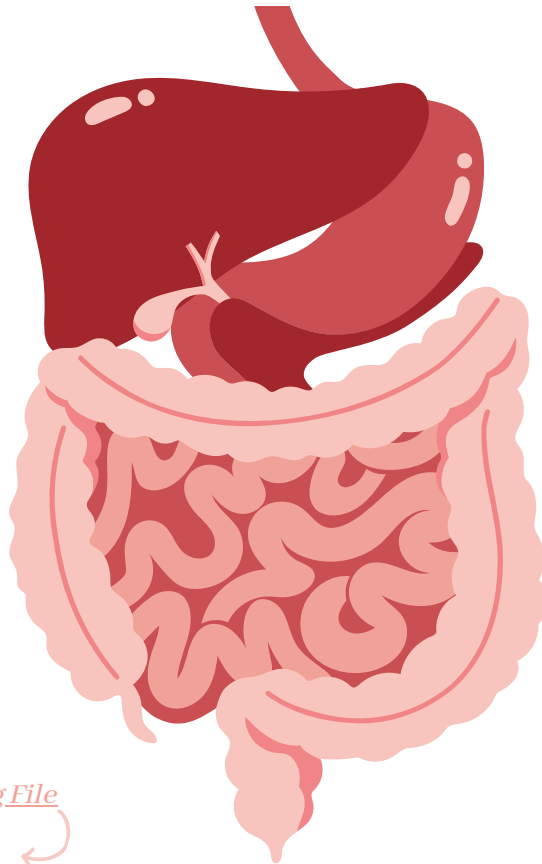




Anatomy of Pancreas & Biliary System

GNT Block



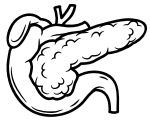
Color Index

- ◆ Main Text
- ◆ Female Slides
- ◆ Male Slides
- ◆ Drs' Notes
- ◆ Important
- ◆ Extra info

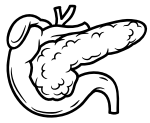
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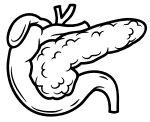
Objectives



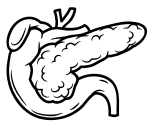
Describe the (topographical anatomy of the pancreas & biliary system) location, surface anatomy, parts, relations & peritoneal reflection of the pancreas and gallbladder.



Describe blood supply, nerve supply and lymphatic drainage of pancreas and gallbladder.



Describe Course of each of common hepatic, cystic and common bile duct and pancreatic ducts.



Clinical correlations.

This lecture was presented by :

Dr. Zahid Kaimkhani

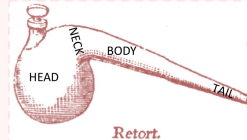
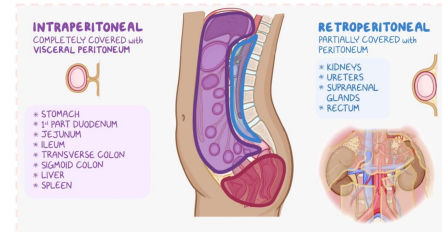
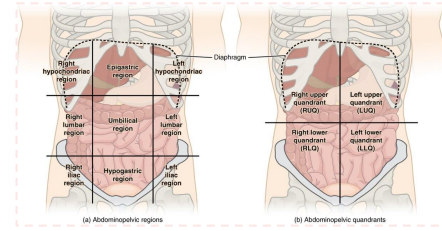
Dr. Tahani Al Matrafi



You can find Atlas by [Clicking HERE!](#)

The Pancreas “All Flesh”

- ❖ Lies in the upper abdomen behind the stomach.
- ❖ Located in the epigastric and left hypochondriac regions.
(from concavity of the duodenum to the hilum of spleen opposite the level of T12– L3 / L1 vertebrae).
- ❖ **Peritoneum:** The greater part is retroperitoneal behind the lesser sac.
- ❖ **Shape:** The pancreas is “J”-shaped or **RETORT** (قطارة) shaped being set obliquely.
- ❖ **Length:** 12–15 cm (6–10 inch).
- ❖ **Weight:** 60–100 g.



The Pancreas Has Both an Exocrine & Endocrine Functions

<p>Exocrine Secretes into ducts</p>	<ul style="list-style-type: none"> • Makes and secretes digestive enzymes into the intestine (Exocrine pancreas). • Comprise more than 95% of the pancreatic mass. 	
<p>Endocrine Hormones into blood directly</p>	<ul style="list-style-type: none"> • Makes and secretes hormones (insulin, glucagon, somatostatin). • Control energy metabolism and storage throughout the body (Endocrine pancreas Islets of Langerhans). • Comprise 1-2% of pancreatic Mass. 	

Pancreatic Ducts

<p>Main Duct (of Wirsung)</p>	<ul style="list-style-type: none"> • Runs the entire length of pancreas beginning from the tail. • It drain whole pancreas except upper portion of the head i.e (tail, body, neck, inferior portion of head & uncinate process). • Joins common bile duct & together they open into a small hepatopancreatic ampulla (Ampulla of Vater) in 2nd part of the duodenum.. • The ampulla opens by a narrow mouth on the summit of major duodenal papilla 8–10 cm distal to the pylorus. 	
<p>Accessory Duct (of Santorini)</p>	<ul style="list-style-type: none"> • Drains superior portion of the head. • It empties separately into 2nd part of duodenum at (minor duodenal papilla) about 2–3 cm above the opening of main pancreatic duct (6–8 cm distal to pylorus). 	

Clinical Anatomy

<p>Carcinoma of The Head of Pancreas</p>	<ul style="list-style-type: none"> • Is common. • It compresses the bile duct leading to persistent obstructive jaundice. • May press the portal vein or may involve the stomach due to close vicinity structures to the head of pancreas. 	
<p>Acute Pancreatitis</p>	<ul style="list-style-type: none"> • It's the acute inflammation of the pancreas. • Occurs due to obstruction of pancreatic duct, ingestion of alcohol, viral infections (mumps), or trauma. • It's a serious condition because activated pancreatic enzymes leak into the substance of pancreas and initiates the autodigestion of the gland. • Clinically, it presents as very severe pain in the epigastric region radiating to the back, fever, nausea, and vomiting. 	

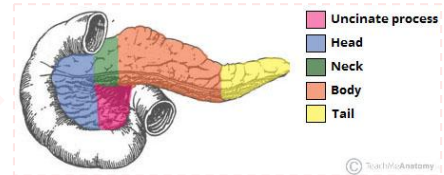
Parts of Pancreas

1. Head
with Uncinate process

2. Neck

3. Body
with Tuber omentale

4. Tail



Head

- Enlarged, disc-shaped right end of the pancreas.
- Lies in the concavity of the C-shaped duodenal loop **in front of the L2 vertebra.**
- Related to the 2nd and 3rd portions of the duodenum on the right & continues with the neck on the left

Anterior surface is related from above downward to: possible MCQ

1. The gastroduodenal artery
2. Transverse colon
3. Root of the transverse mesocolon
4. Jejunum

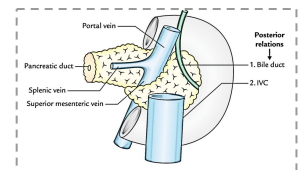
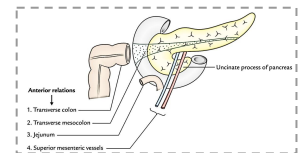
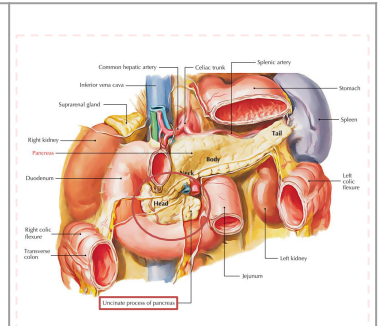
Posterior surface is related to: possible MCQ

1. Inferior vena cava (IVC)
2. Left renal vein
3. Bile duct
4. Right crus of diaphragm

Include **Uncinate process** which is a part extending to the left behind the superior mesenteric vessels.

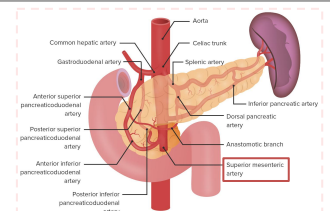
Uncinate process is related to: possible MCQ

1. Anteriorly to superior mesenteric vessels
2. Posteriorly to the abdominal aorta



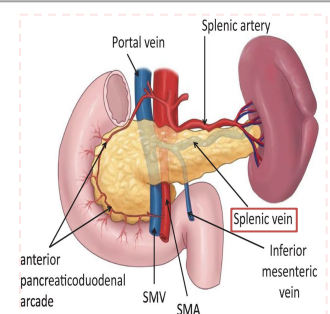
Neck

- The constricted portion connecting the head & body.
- **Narrow band of pancreatic tissue** that lies **in front of** Superior mesenteric and the **portal vein** (Portal vein is formed by the union of: superior mesenteric vein & splenic vein).
- Its antero-superior surface supports/related to the pylorus.
- The superior mesenteric vessels emerge from its inferior border.



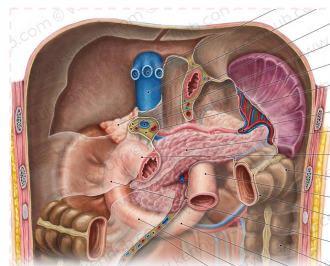
Body

- It runs upward and to the left.
- Lies in front of the vertebral column at or just below the transpyloric plane.
- One process: **Tuber omentale** (a part of the body projects above the lesser curvature of the stomach and comes in contact with the lesser omentum across the lesser sac). **Not imp.**
- It is triangular in cross section.
- The **splenic vein** is embedded in its **posterior surface.**
- The **splenic artery** runs over its **upper border.**



Tail

- Narrow, short segment, ending at the **splenic hilum.**
- It is mobile unlike the other major retroperitoneal parts of the gland.
- Contains the **largest number of islets of Langerhans.**
- Lies in the **splenorenal ligament** (lienorenal) (may get injured during splenectomy or nephrectomy) along splenic vessels, at the level of the **T12 vertebra.**
- Anteriorly, related to splenic flexure of colon. **Left colic flexure.**



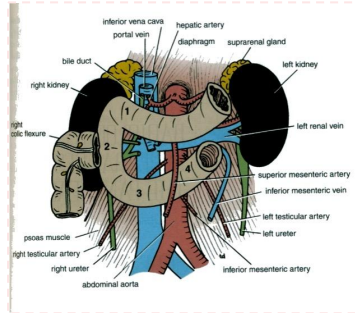
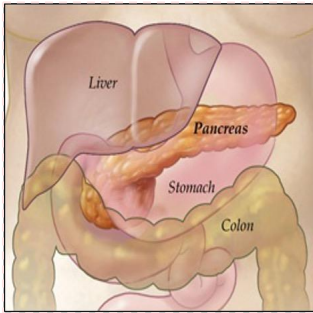
Pancreas Relations & Supply

General Relations MCQ

splanchnic = Viscera
Splenic = spleen

Anterior Relations

1. Stomach separated by lesser sac
2. Transverse colon
3. Transverse mesocolon



Posterior Relations

From Right to Left (from head to tail)

1. Bile duct
2. Portal vein
3. Splenic vein
4. Inferior vena cava
5. Aorta
6. Origin of superior mesenteric artery
7. Left psoas muscle
8. left adrenal gland
9. left renal vessel
10. Upper 1/3 of left kidney
11. Hilum of the spleen

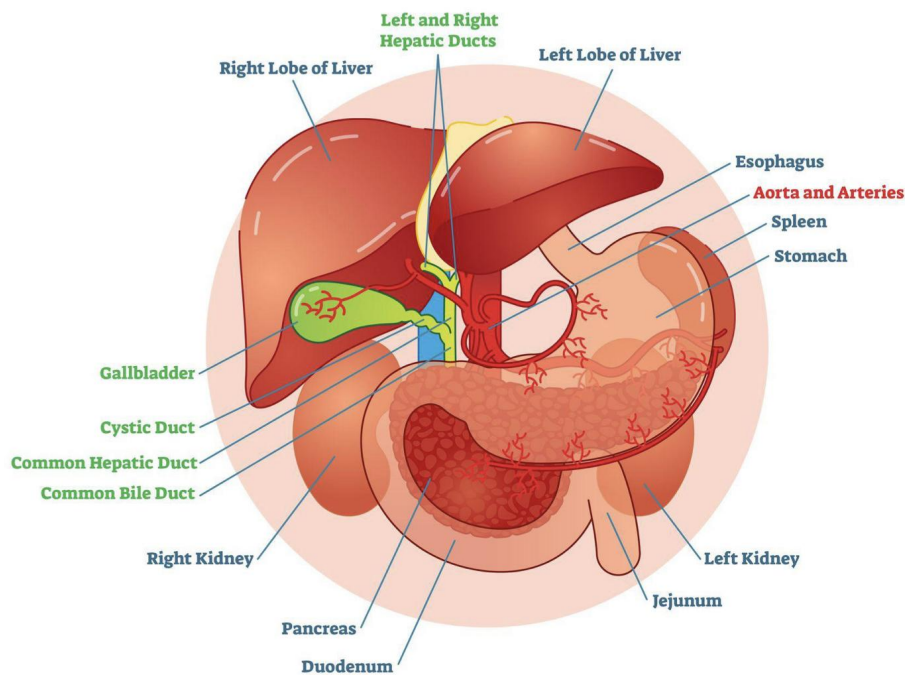
Arterial Supply	Head & Neck	<ol style="list-style-type: none"> 1. Superior pancreaticoduodenal artery branch of gastroduodenal artery (GDA), branch of hepatic artery, branch of celiac trunk. 2. Inferior pancreaticoduodenal artery, branch of superior mesenteric artery. 	
	Body & Tail	Splenic artery (main artery) through 8-10 branches.	
Venous Drainage <i>Follow arteries</i>	Head & Neck	Drained by: anterior and posterior venous arcades that form the superior & inferior pancreaticoduodenal veins which follow the corresponding arteries.	
	Body & Tail	Drained by splenic vein , which is a tributary of portal vein .	
Lymphatic Drainage	Rich network that drains into: <ol style="list-style-type: none"> 1. Pyloric nodes 2. Hepatic nodes 3. Splenic nodes 		
	Ultimately the efferent vessels drain into: <ol style="list-style-type: none"> 1. Celiac lymph nodes (<i>from hepatic nodes</i>) 2. Superior mesenteric lymph nodes (<i>from splenic nodes</i>) 		
Innervation	Sympathetic	from thoracic splanchnic nerves . (have a predominantly inhibitory effect).	
	Parasympathetic	from the vagus . (stimulate both exocrine and endocrine secretions).	

Biliary System

- ❖ It consists of the **Ducts and Organs** (bile ducts, liver & gallbladder)
- ❖ Involved in the **production** (liver), **storage** (gallbladder) & **transportation of bile**.
- ❖ **Bile** is secreted by the **liver** cells at a constant rate of about **40 ml per hour**.
- ❖ In between digestion, it is **stored and concentrated** in the **gallbladder**; later, it is delivered to the duodenum.

Inferior mesenteric vein يصب في splenic vein.

BILIARY TRACT



When digestion is not taking place, the sphincter of Oddi remains closed and the bile is stored and concentrated in the gallbladder; later, it is delivered to the duodenum.

Bile Duct

Consists of (passage) :

1 Bile canaliculi

- The **smallest tributaries** of the bile ducts; situated in the **portal canals of the liver**.
- Receives bile from the hepatocytes.

2 Interlobular ducts

- Join one another to form progressively larger ducts and, eventually, at the porta hepatis, form the **right and left hepatic ducts**.

3 Intrahepatic ducts

4 Right & Left hepatic ducts

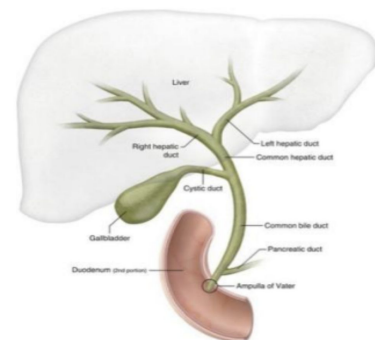
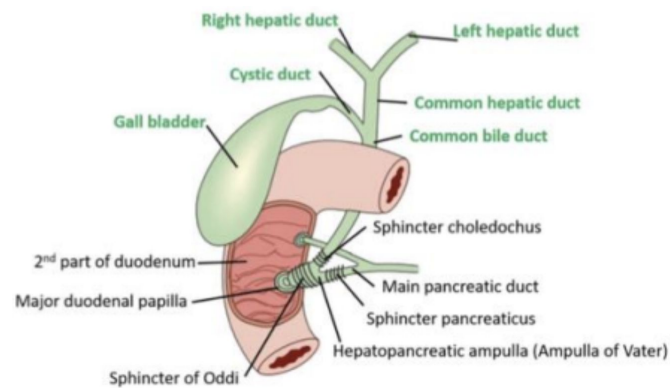
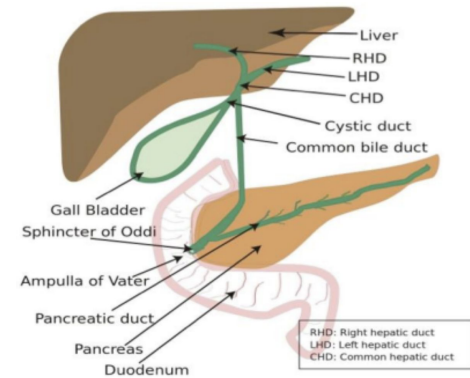
- Right drains the right lobe of the liver.
- Left drains the left lobe, the caudate lobe, & quadrate lobe.
- After a short course, the hepatic ducts unite to form the **common hepatic duct**.

5 Common hepatic duct

- It's about 1.5 inches (4 cm) long.
- Descends within the free margin of the lesser omentum.
- It's joined on the right side by the **cystic duct** from the gallbladder to form the **common bile duct**.

6 Cystic duct

- The cystic duct is about 1.5 inches (3.8 cm) long
- connects the neck of the gallbladder to the common hepatic duct to **form the bile duct**.
- It is usually somewhat S-shaped and descends for a variable distance in the right free margin of the lesser omentum .
- The mucous membrane of the cystic duct is raised to form a **spiral fold** that is continuous with a similar fold in the neck of the gallbladder.
- The fold is commonly known as the "**spiral valve**". Which its function is to **keep the lumen constantly open**.



Bile Duct Cont.

7 Common bile duct (Bile duct)

- It is about 3 inches (8 cm) long.

Course :

1- First it lies in the right **free margin** of the lesser omentum.

2- Then it runs behind the **first part of the duodenum**.

3- Lastly it lies in a groove on the posterior surface of the head of the pancreas.

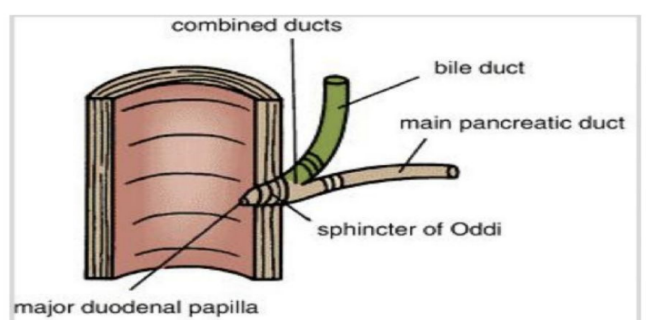
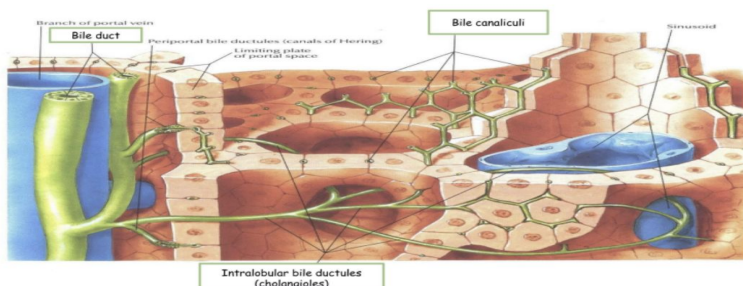
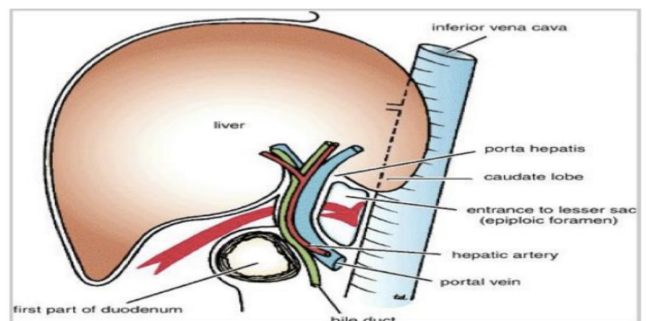
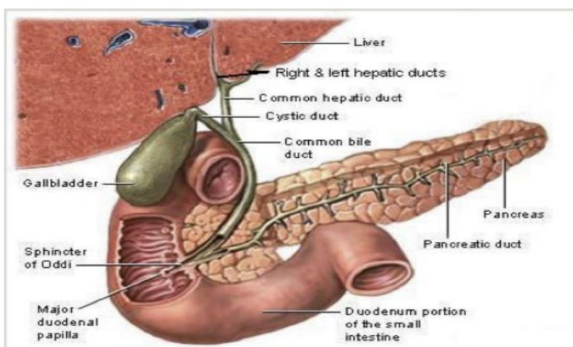
(cancer of the head of the pancreas will press on the bile duct which results in blockage of bile passage through it, bile will go back in the opposite direction causing Jaundice) Here, the bile duct comes into contact with the **main pancreatic duct**

4- Ends below by **piercing the medial wall of the second part of the duodenum** about halfway down its length.

- It is usually joined by the main pancreatic duct, and together they open into a small ampulla in the duodenal wall, called the hepatopancreatic ampulla (**ampulla of Vater**).
- The ampulla opens into the lumen of the duodenum by means of a small papilla, the major duodenal papilla.
- The terminal parts of both ducts and the ampulla are surrounded by circular muscle, known as the sphincter of the hepatopancreatic ampulla (**sphincter of Oddi**).
- **Occasionally, the bile and pancreatic ducts open separately into the duodenum.**

438 Note\ Passage of the bile:

- In storage : common hepatic duct to cystic duct then gallbladder.
- After fatty meal : gallbladder to cystic duct then bile duct.



Gallbladder

A

A pear-shaped sac lying on the undersurface of the liver.

B

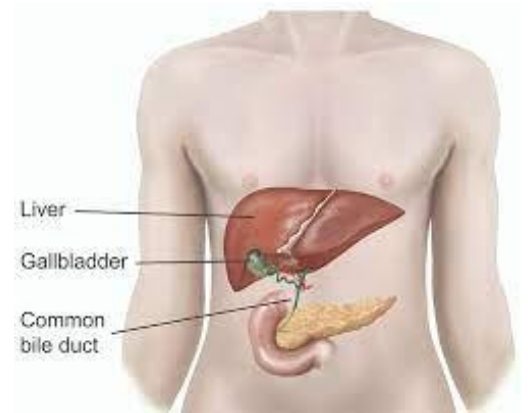
It has a capacity of 30 to 50 ml.

C

It stores and concentrates bile.

D

Surface anatomy of the gallbladder: The Fundus comes in contact with the anterior abdominal wall at the level of the **Tip of the Right Ninth costal cartilage.**



Gallbladder Functions

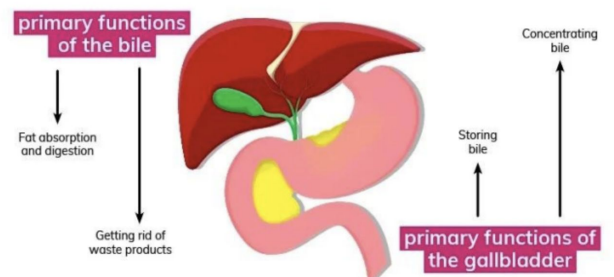
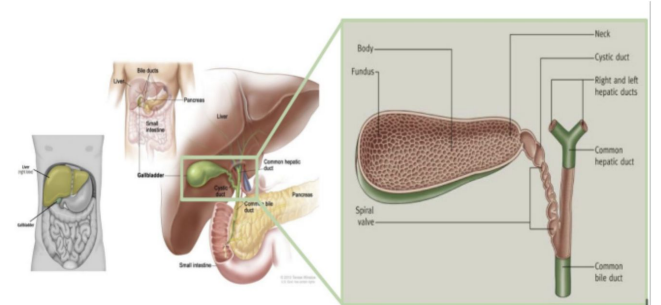
Concentrates & stores bile.

Selectively absorbs bile salts.

Keeps the bile acid.

Excretion cholesterol.

Secretes mucus.



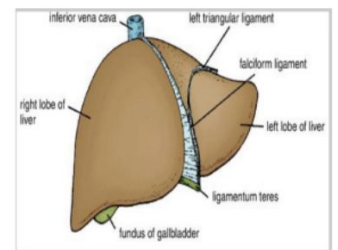
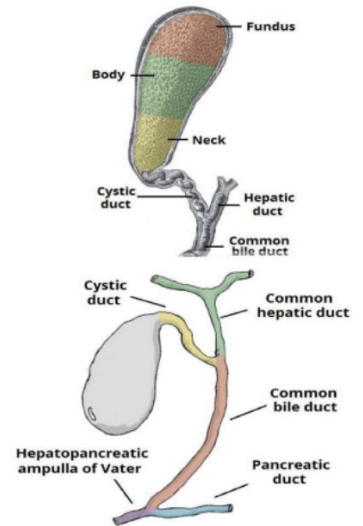
- To aid in these functions, the mucous membrane is thrown into permanent folds that unite with each other, giving the surface a **honeycombed appearance.**

Gallbladder Cont.

MCQ

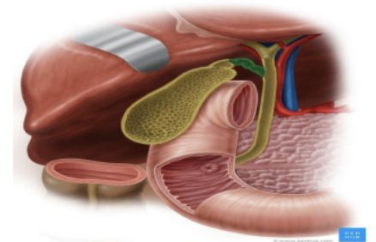
It's Divided Into

Fundus	Body	Neck
is rounded and projects below the inferior margin of the liver, it comes in contact with the anterior abdominal wall at the level of the tip of the ninth right costal cartilage.	lies in contact with the visceral surface of the liver and is directed upward, backward, and to the left.	It becomes continuous with the cystic duct , which turns into the lesser omentum, joins the common hepatic duct , to form the bile duct.
The Peritoneum completely surrounds the fundus of the gallbladder and binds the body and neck to the visceral surface of the liver.		

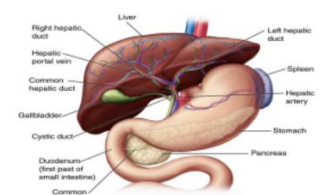


Gallbladder Relations

Anterior	Posterior
Anterior abdominal wall and the inferior surface of the liver.	The transverse colon and the first and second parts of the duodenum.



Gallbladder Supply



Blood supply

Venous drainage

Lymphatic drainage

Nerve supply

- **Cystic artery**, branch of the right hepatic artery.

Note: Several very small arteries and veins run between the liver and gallbladder.

- The **cystic vein** drains directly into the portal vein.

- The lymph drains into a **cystic lymph node** situated near the neck of the gallbladder.
- From here, the lymph vessels pass to the **hepatic nodes** along the course of the hepatic artery and then to the **celiac nodes.**

- Sympathetic and parasympathetic vagal fibers form the celiac plexus.

Note: The **gallbladder contracts** in response to the **hormone cholecystikinin (CCK)**, which is produced by the mucous membrane of the duodenum on the arrival of fatty food from the stomach.

When the bile is secreted by the liver cells, it contains water, salts, and acids, so after it arrives to the gallbladder, which absorbs the water and salts, and keeps the acids unchanged. At the same time its wall secretes mucus and cholesterol. The longer the bile stays in the gallbladder the more it secretes mucus and cholesterol (which may lead to the formation of stones)

MCQs

Q1. The pancreas is located at the:

- | | | | |
|---------------|--------------|----------------|---------------|
| A. Epigastric | B. Umbilical | C. Hypogastric | D. Left iliac |
|---------------|--------------|----------------|---------------|

Q2. Which part of the pancreas contains the largest number of islets of langerhans ?

- | | | | |
|---------|---------|---------|---------|
| A. Body | B. Head | C. Tail | D. Neck |
|---------|---------|---------|---------|

Q3. Which of these structure is related to the pancreas anteriorly ?

- | | | | |
|--------------|----------|---------------------|-----------|
| A. Bile duct | B. Aorta | C. Transverse colon | D. Spleen |
|--------------|----------|---------------------|-----------|

Q4. The fundus of the gallbladder comes in contact with anterior abdominal wall at the:

- | | | | |
|---|--|--|--|
| A. Tip of the left 7th costal cartilage | B. Tip of the left 10th costal cartilage | C. Tip of the Right 8th costal cartilage | D. Tip of the Right 9th costal cartilage |
|---|--|--|--|

Q5. The gallbladder contracts in response to which hormone ?

- | | | | |
|------------|------------|--------------------|-------------|
| A. Gastrin | B. Insulin | C. Cholecystokinin | D. Cortisol |
|------------|------------|--------------------|-------------|

Q6. Which of the following veins drain the gallbladder ?

- | | | | |
|-----------------|----------------|-----------------------|-----------------------|
| A. Splenic vein | B. Cystic vein | C. Short gastric vein | D. Right gastric vein |
|-----------------|----------------|-----------------------|-----------------------|

A1. **A** A2. **C** A3. **C** A4. **D** A5. **C** A6. **B**

FOR ANKI FLASHCARDS



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