



**Anatomy Team**  
**MED 439**

Revised & Approved



**MED439**  
KING SAUD UNIVERSITY

# Pancreas - Biliary System

GNT Block

**Color index:**

**Content**  
**Male slides**  
**Female slides**  
**Important**  
**Doctors notes**

Extra information, explanation

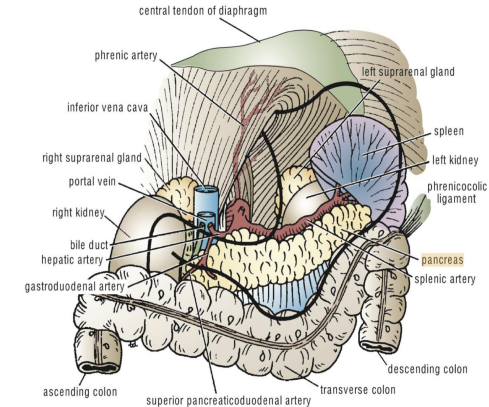
Don't forget to check the [Editing File](#)

**Contact us:**  
**Anatomy439@gmail.com**

# Pancreas

## Location

- Located in Epigastrium & **Left upper quadrant (left hypochondriac)** of abdomen behind the stomach. In front of spleen (from concavity of the duodenum to the hilum of spleen opposite the level of T12– L3 vertebrae).
- **12–15 cm** ,6-10 inch in length and **60-100 gram** in weight.
- **Soft, lobulated elongated gland, retroperitoneal in position with both endocrine and exocrine functions**
- The greater part is Retroperitoneal **behind the lesser sac.**
- **"J"-shaped or RETORT shaped** being set obliquely.
- **Lies across the posterior abdominal wall in a transverse/oblique directions at the transpyloric plane (L1 vertebra).** (except the tail it lies at the level of T12)



## Exocrine

- Makes and secretes digestive enzymes into the intestine (Exocrine pancreas).
- Comprise more than 95% of the pancreatic mass

*Males Slides only:*  
**Has exocrine and endocrine function**

## Endocrine

- Makes and secretes hormones (insulin, glucagon, somatostatin)
- Control energy metabolism and storage throughout the body (Endocrine pancreas Islet's of Langerhans).
- Comprise 1-2% of pancreatic mass

# Pancreas parts

## 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.
- Includes **Uncinate Process** (part extending to the left behind the **superior mesenteric vessels**).

### Males slides only:

- Anterior surface is related from above downward to:
  - ❖ The gastroduodenal artery (which supplies the stomach, and is further divided into gastroepiploic artery and pancreaticoduodenal arteries), Transverse colon, root of the transverse mesocolon & jejunum.
- Posterior surface is related to:
  - ❖ Inferior vena cava, left renal vein, bile duct & right crus of diaphragm
- **Uncinate process** is related to: (dr zahid hinted about this part to potential MCQ)
  - ❖ Anteriorly to **superior mesenteric vessels**.
  - ❖ Posteriorly to the abdominal aorta.

## Neck

- The **constricted portion connecting the head & body**.
- **Narrow band of pancreatic tissue** that lies in front of origin of **superior mesenteric artery** and the confluence of the **portal vein**. (made of union of **splenic & superior mesenteric veins**).
- Its antero-superior surface supports the pylorus of the stomach.
- The **superior mesenteric vessels** emerge from its inferior border.

## Body

- It runs upward and to the left.
- It is triangular in cross section.
- The **splenic vein** is embedded in its posterior surface.

### Males slides only:

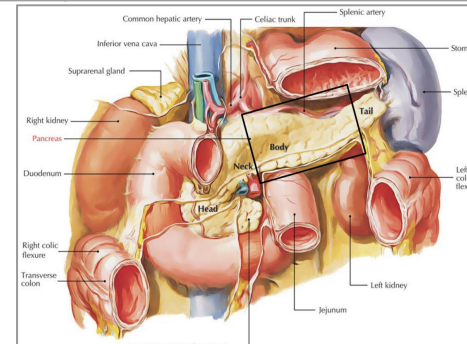
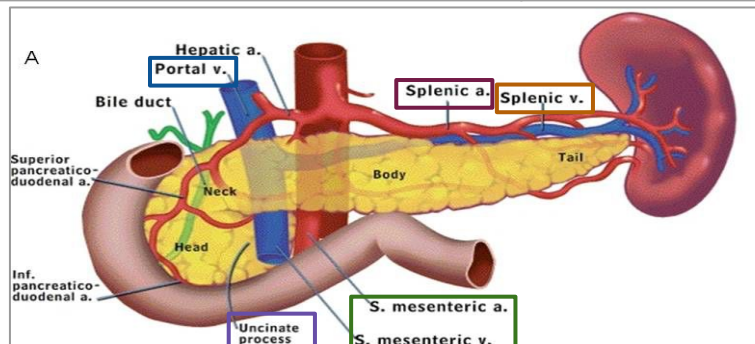
- lies in front of the vertebral column at or just below the transpyloric plane.
- One process: Tuber omentale (a part of the body projects above the lesser curvature of the stomach and comes in contact with the lesser omentum across the lesser sac).
- The **splenic artery** runs over its upper border.

## Tail

- **Narrow, short segment**, ending at the splenic hilum.
- Lies in the splenicorenal/lienorenal (lieno=spleen) ligament (may get injured during splenectomy or nephrectomy), at the level of the T12 vertebra.
- Anteriorly, related to splenic flexure of colon.

### Males slides only:

- It is mobile unlike the other major retroperitoneal parts of the gland.
- Contains the largest number of islets of Langerhans.



Dr notes: Body of the pancreas comes in contact with omental tuberosity of the left of the liver

# Pancreas

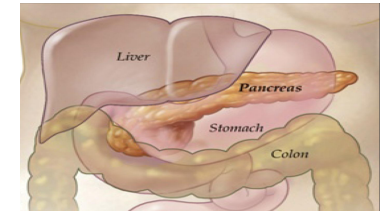
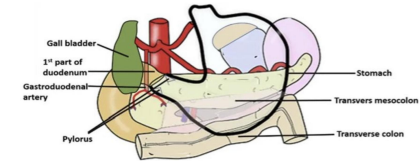
## Posterior

- Bile duct, Portal & Splenic veins, inferior vena cava, Aorta.& Origin of superior mesenteric artery.
- Left psoas muscle, left adrenal gland, left renal vessels, & upper 1/3 of left kidney.
- Hilum of the spleen.

## Relations

## Anterior

- Stomach separated by lesser sac.
- Transverse colon.
- Transverse mesocolon.



## Clinical anatomy

Males slides

### Carcinoma of the head of pancreas

common, Compresses the bile duct leading to persistent obstructive jaundice May press the portal vein or may involve the stomach due to close vicinity of these structures to the head of pancreas.

### Acute pancreatitis

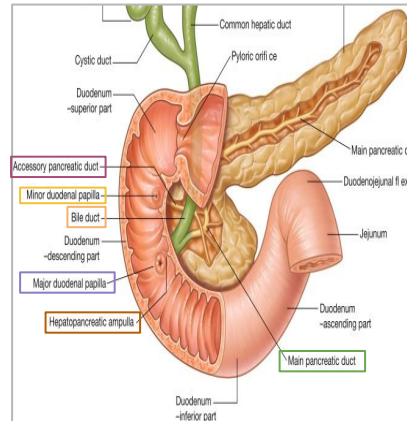
1. acute inflammation of the pancreas.
2. Occurs due to **obstruction of pancreatic duct**, ingestion of alcohol, viral infections (mumps), or trauma.
3. serious condition because activated pancreatic enzymes leak into the substance of pancreas and initiates the autodigestion of the gland
4. Clinically, it presents as very **severe pain in the epigastric region** radiating to the back, fever, nausea, and vomiting

# Pancreas ducts

## 2 ducts

### Main duct (of wirsung)

- Runs the entire length of pancreas beginning from the tail.
- It receives many tributaries from tail, body, neck, inferior portion of head & uncinete process **except upper portion of the head.**
- Joins **common bile duct** & together they open into a small **hepatopancreatic ampulla (Ampulla of Vater)** in **2nd part of duodenum wall.**
- The ampulla opens into the lumen of the duodenum by means of a small Papilla, (**Major duodenal papilla**). **8-10 cm distal to pylorus.**

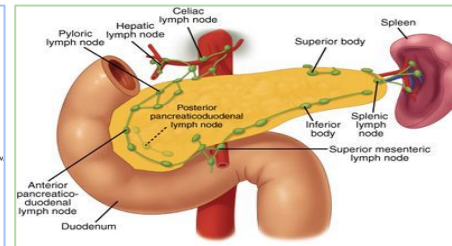
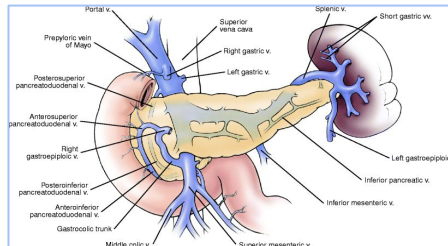
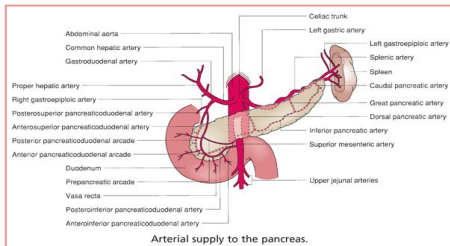


### Accessory duct of Santorini

- Drains superior portion of the head.
- It empties separately into 2nd portion of duodenum at (**minor duodenal papilla**). **about 2-3 cm above the opening of main pancreatic duct 6-8 cm distal to pylorus.**

# Pancreas supply

Artery	Veins	Lymphatic drainage	Innervation
<p align="center"><b>Head &amp; Neck</b></p>	<p align="center"><b>Head &amp; Neck</b></p>	<p align="center"><b>Rich network that drains into:</b></p>	<p align="center"><b>Sympathetic</b></p>
<p>Supplied by branches from:</p> <ol style="list-style-type: none"> <li>Celiac trunk through <b>hepatic artery</b> through <b>gastrooduodenal artery (GDA)</b> through <b>Superior pancreaticoduodenal artery</b></li> <li>Superior mesenteric artery through <b>Inferior pancreaticoduodenal artery</b></li> </ol>	<p>Drained by: anterior and posterior venous arcades that form the <b>superior &amp; inferior pancreaticoduodenal veins</b> which follow the corresponding arteries.</p>	<ol style="list-style-type: none"> <li>pyloric nodes</li> <li>hepatic nodes</li> <li>splenic nodes</li> </ol>	<ul style="list-style-type: none"> <li>from the <b>thoracic splanchnic nerves</b>.</li> <li>have a predominantly <u>inhibitory</u> effect</li> </ul>
<p align="center"><b>Body &amp; Tail</b></p>	<p align="center"><b>Body &amp; Tail</b></p>	<p align="center"><b>Ultimately the efferent vessels drain into:</b></p>	<p align="center"><b>Parasympathetic</b></p>
<p><b>Splenic artery</b> (main artery) through 8-10 branches.</p>	<p>Drained by <b>splenic vein</b>, which is a tributary of portal vein</p>	<ol style="list-style-type: none"> <li>celiac lymph nodes</li> <li>superior mesenteric lymph nodes.</li> </ol>	<ul style="list-style-type: none"> <li>from the <b>vagus</b>.</li> <li>stimulate both exocrine and endocrine secretions.</li> </ul>



**Note:**  
Upto the transverse colon all parasympathetic supply comes from the vagus nerve.

# Biliary system

- It consists of the organs and ducts that are involved in the Production, Storage, and Transportation of bile (Bile Ducts, Gallbladder, liver,)
- Bile is secreted by the Liver cells at a constant rate of about 40 ml per hour.
- When digestion is not taking place, bile is stored and concentrated in the Gallbladder; later, it is delivered to the Duodenum.
- The bile duct consists of: Bile canaliculi, Interlobular ducts, Intrahepatic ducts, Right and left hepatic ducts, Common hepatic duct, Cystic duct, Common bile duct (Bile duct).

**Extra info:** there is no extrahepatic course for the hepatic vein → meaning once it emerges from the liver it directly drains into the IVC.

## Bile Duct:

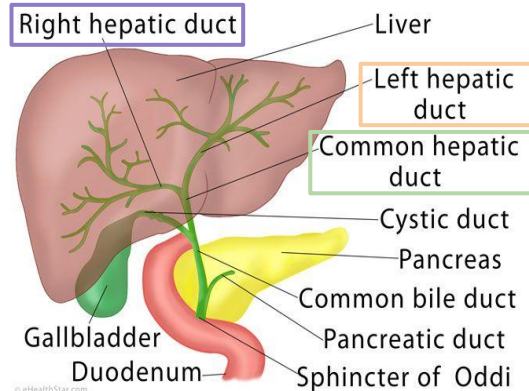
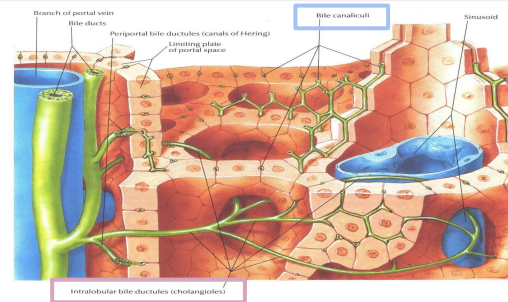
The **Bile Canaliculi** are the smallest Interlobular tributaries of the bile ducts. Situated in the portal canals of the liver. They receive bile from hepatocytes.

The **Interlobular Ducts** join one another to form progressively larger ducts. At the Porta Hepatis, the interlobular ducts form the **Right** and **Left** Hepatic ducts.

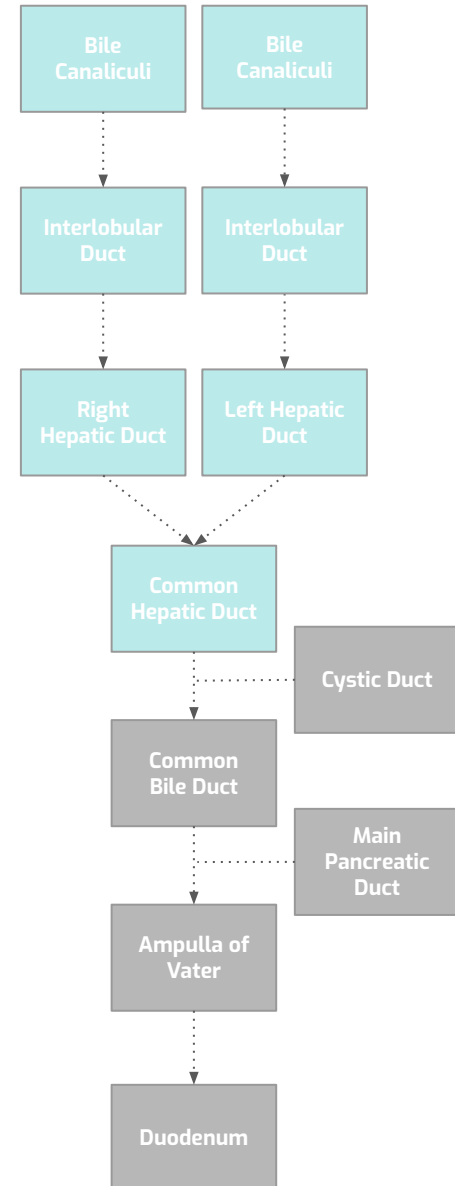
The **right hepatic duct** drains the right lobe of the liver

The **left duct** drains:  
 -The left lobe  
 -Caudate lobe  
 -Quadrate lobe

After a short course, the hepatic ducts unite to form the **Common Hepatic Duct**.



To help you keep track



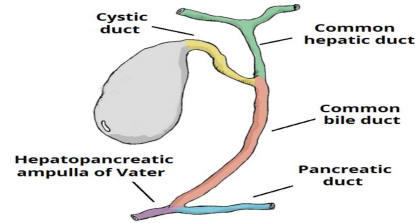
# Biliary System

## Common Hepatic Duct:

It is about 1.5 in. (4 cm) long.

It descends within the free margin of the lesser omentum.

It is joined on the right side by the **Cystic duct** from the gallbladder to form the **common Bile duct**.



## Common Bile Duct:

It is about 3 inches (8 cm) long.

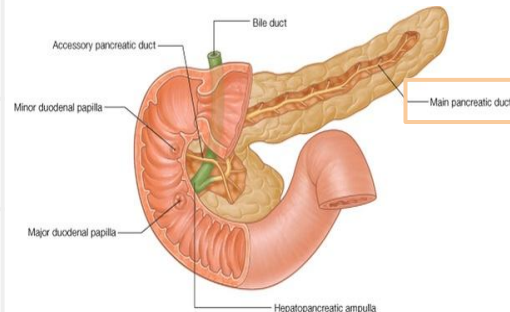
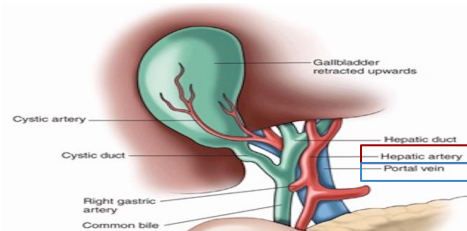
First it lies in the right free margin of the lesser omentum.

The duct lies anterior and to the right. The **Hepatic artery** (then becomes the gastroduodenal) lies anterior and to the left. The **Portal vein** lies posteriorly. □

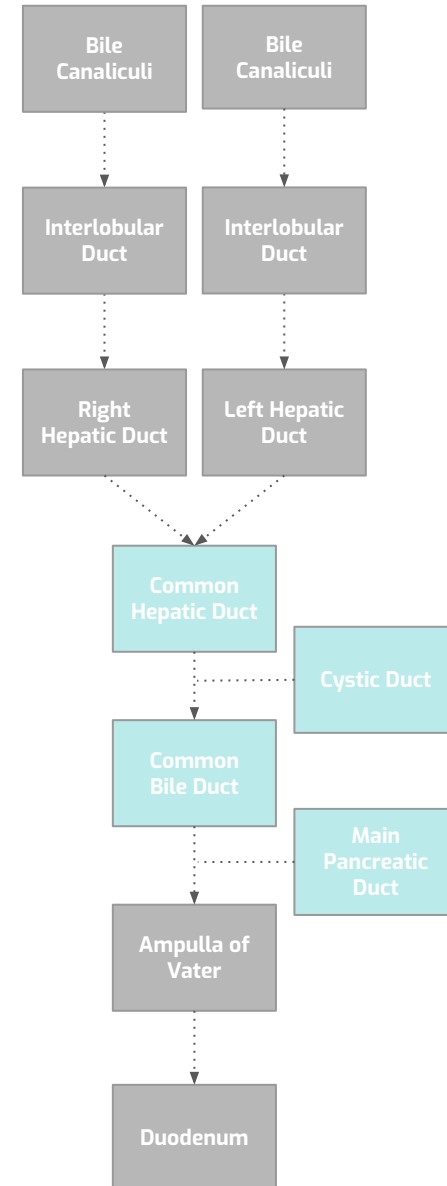
Then it runs behind the First part of the Duodenum.

Lastly It lies in a groove on the Posterior surface of the Head of the Pancreas.

Here, the bile duct comes into contact with the **main pancreatic duct**.



To help you keep track





# Biliary System

## Common Bile Duct:

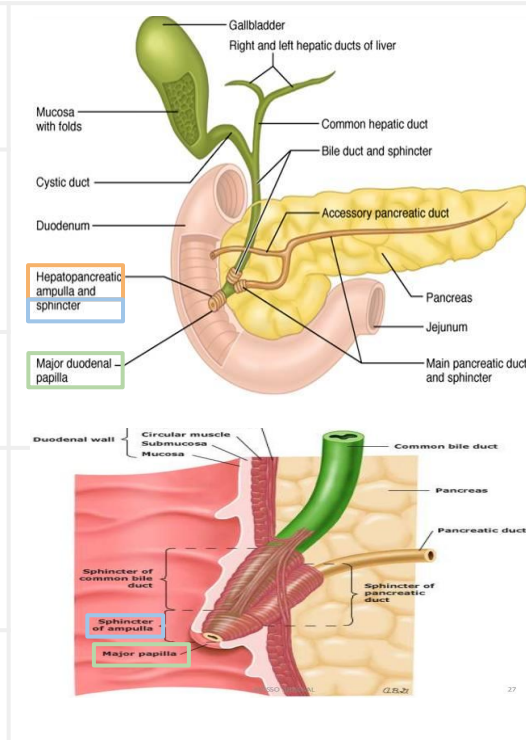
The bile duct ends below by piercing the medial wall of the second part of the duodenum about halfway down its length.

It is usually joined by the main pancreatic duct, and together they open into a small ampulla in the duodenal wall Hepatopancreatic ampulla (**Ampulla of Vater**).

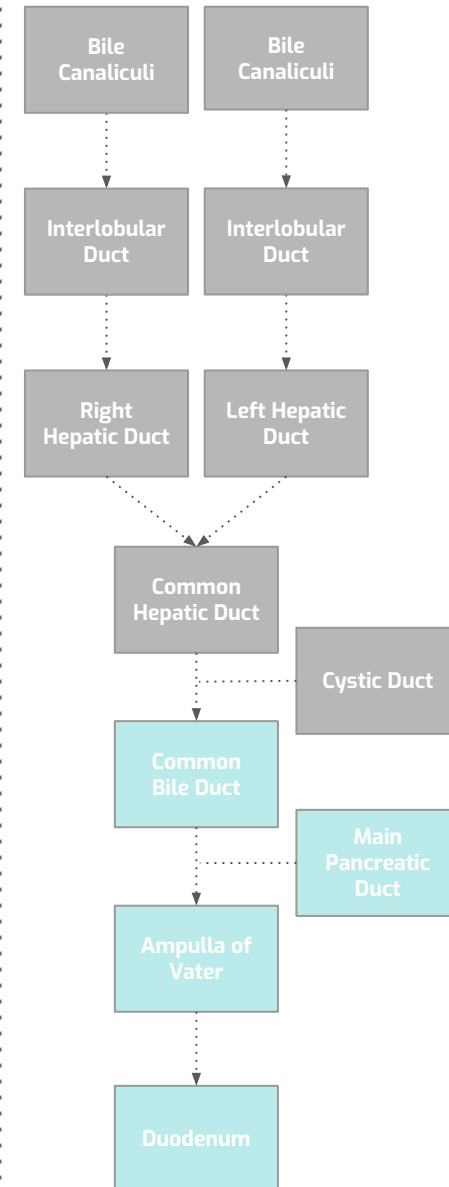
The ampulla opens into the lumen of the duodenum by means of a small Papilla, the **Major Duodenal Papilla**.

The terminal parts of the bile & main pancreatic ducts and the ampulla are surrounded by a circular muscle, that forms the sphincter of the hepatopancreatic ampulla (**sphincter of Oddi**).

Occasionally, the bile and pancreatic ducts open separately into the duodenum.



To help you keep track

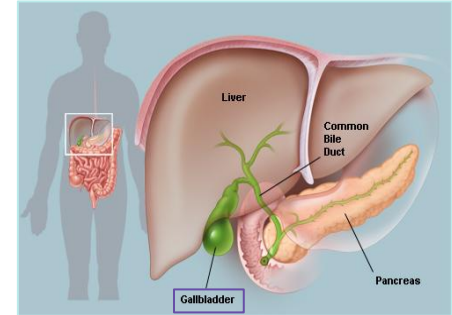


#438: Passage of the bile:

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

# Gallbladder

- ◆ It is a pear-shaped sac lying on the undersurface of the liver.
- ◆ It has a capacity of 30 to 50 mL.
- ◆ Stores and concentrate the bile, *which it concentrates by absorbing water.*



## Functions of the gallbladder

When digestion is not taking place, the sphincter of Oddi remains closed and bile accumulates in the gallbladder.

Concentrates &  
Stores bile

Selectively  
absorbs bile salts

Keeps the bile acid

Excretes  
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

## Parts:

The gallbladder is divided into:

### Fundus

Rounded and projects below the inferior margin of the liver, where it comes in contact with the anterior abdominal wall at the level of the **tip of the ninth right costal cartilage**.

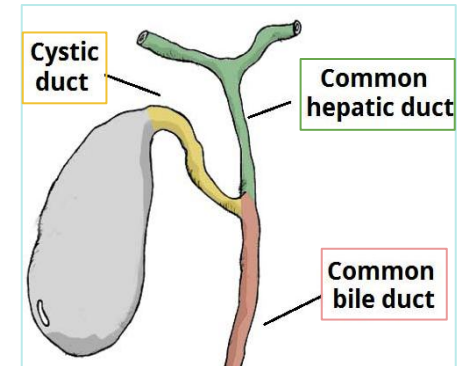
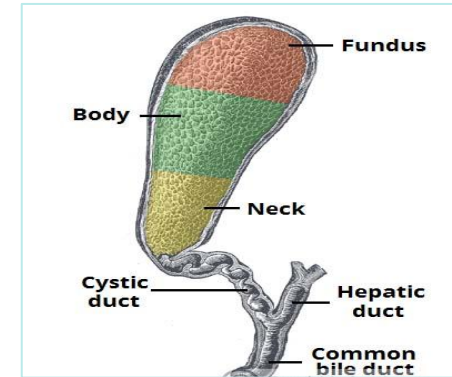
### Body

lies in contact with the visceral surface of the liver and is directed upward, backward, and to the left.

### Neck

Is continuous with the **Cystic duct**, which turns into the lesser omentum to join the **Common Hepatic duct**, and forms 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.



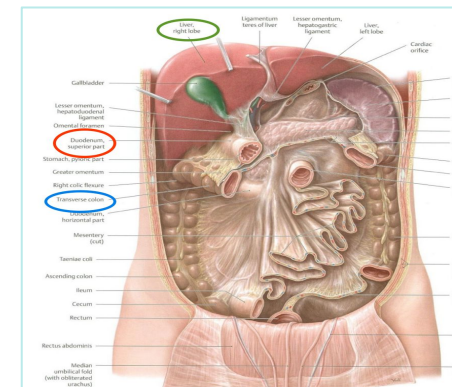
## Relations:

### Anterior

The anterior abdominal wall and the **inferior surface of the liver**.

### Posterior

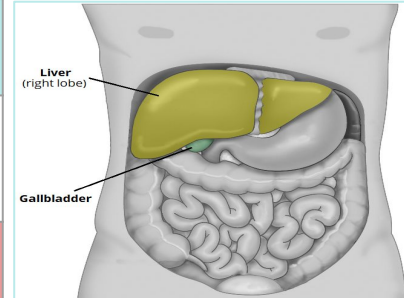
The **transverse colon** and the first and **second parts of the duodenum**.



# Gallbladder

## Surface Anatomy :

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



## Blood Supply :

The **Cystic artery**, a branch of the **Right Hepatic artery.**

The **Cystic vein** drains directly into the **Portal vein.**

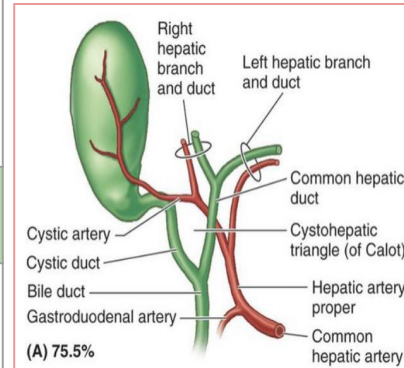
Several very small arteries and veins also run between the liver and gallbladder.

## Lymph Drainage :

The lymph drain 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 **Celiac nodes.**

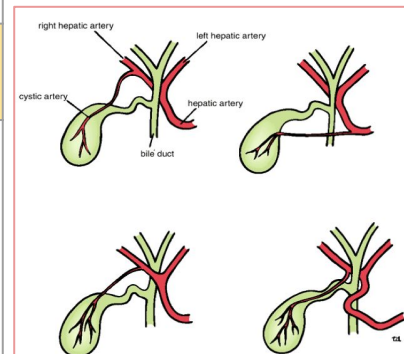


## Nerve Supply :

Sympathetic and parasympathetic (Vagal) fibers form the **Celiac plexus.**

### Note:

The gallbladder contracts in response to the hormone **cholecystokinin**, which is produced by the mucous membrane of the duodenum on the arrival of fatty food from the stomach.



# Gallbladder

## Cystic Duct

Is about 1.5 in. (3.8 cm) long

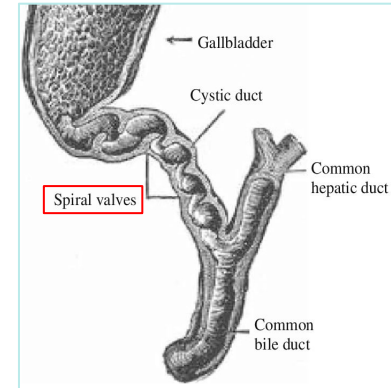
Connects the neck of the gallbladder to the common hepatic duct to form the bile duct.

Is usually somewhat S-shaped and descends for a variable distance in the right free margin of the lesser omentum.

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**."

The function of the spiral valve is to keep the lumen constantly open.



# MCQ

**Q1: During a splenectomy, which part of the pancreas is mostly at risk?**

**A: Head**

**B: Neck**

**C: Body**

**D: Tail**

**Q2: Which part of the pancreas is found behind the Superior mesenteric vessels?**

**A: Neck**

**B: Tail**

**C: Body**

**D: Uncinate Process**

**Q3: Which of the following is found anterior to the pancreas?**

**A: Bile duct**

**B: Left adrenal gland**

**C: Transverse colon**

**D: Hilum of the spleen**

**Q4: What is the first part of the bile passage?**

**A: Common bile duct**

**B: Bile canaliculi**

**C: Intralobular ducts**

**D: Pancreatic Duct**

**Q5: The Common Hepatic Duct and what other structure form the Common Bile Duct?**

**A: Cystic Duct**

**B: Bile canaliculi**

**C: Pancreatic Duct**

**D: Right hepatic duct**

**Q6: The terminal parts of the bile & main pancreatic ducts and the ampulla are surrounded by a circular muscle, that forms what sphincter?**

**A: Sphincter of Oddi**

**B: Pyloric sphincter**

**C: Ileocecal sphincter**

**D: Sphincter of pancreatic duct**

Answer key:  
1 (D) , 2 (D) , 3 (C) , 4 (B) , 5 (A) , 6 (A)

# MCQ

**Q7: It is a pear-shaped sac lying on the undersurface of the liver :**

**A: Pancreas**

**B: Bile duct**

**C: Gallbladder**

**D: Stomach**

**Q8: Which of the following is located at the anterior wall of gallbladder ?**

**A: Anterior abdominal wall**

**B: Second part of the duodenum**

**C: Inferior surface of the liver**

**D: A & C**

**Q9: it is a completely surrounds the fundus of the gallbladder and binds the body and neck to the visceral surface of the liver:**

**A: Body of Gallbladder**

**B: The peritoneum**

**C: Neck of Gallbladder**

**D: Common hepatic duct**

**Q10: Fundus comes in contact with the anterior abdominal wall at the level of the Tip of the :**

**A: Right 8th costal cartilage**

**B: Left 8th costal cartilage**

**C: Right 9th costal cartilage**

**D: Left 9th costal cartilage**

**Q11: Which of the following is the lymph drainage of gallbladder ?**

**A: Cystic lymph node**

**B: Hepatic nodes**

**C: Celiac nodes**

**D: All of them**

**Q12: The nerve that supply the gallbladder is :**

**A: Sympathetic from celiac plexus**

**B: Parasympathetic from celiac plexus**

**C: None**

**D: A & B**

Answer key:  
7(C) , 8(D) , 9(B) , 10(C) , 11(D) , 12(D)

# SAQ

**Q1: List the posterior relations of the pancreas.**

**Q2: List the constituents of the bile ducts.**

**Q3: Enumerate the parts of gallbladder :**

**Q4: What is the blood supply of gallbladder :**

## Answers

**1:**  
Bile duct, Portal & Splenic veins, inferior vena cava, Aorta.& Origin of superior mesenteric artery. Left psoas muscle, left adrenal gland, left renal vessels, & upper 1/3 of left kidney. Hilum of the spleen.

**2:**  
Bile canaliculi, intralobular ducts, intrahepatic ducts, right and left hepatic ducts, common hepatic duct, cystic duct, common bile duct.

**3:**

- The Fundus: Rounded and projects below the inferior margin of the liver.
- The Body: lies in contact with the visceral surface of the liver and is directed upward, backward, and to the left.
- The Neck : Is continuous with the Cystic duct, which turns into the lesser omentum to join the Common Hepatic duct, and forms the Bile duct

**4:**  
The Cystic artery, a branch of the Right Hepatic artery.  
The Cystic vein drains directly into the Portal vein.  
Several very small arteries and veins also run between the liver and gallbladder.



# Team leaders Rayan Jabaan Abeer Awwad

## Reviser

Abdulaziz Alrabiah

## Organizer

Mohamed Alquhidan

## Note taker

Mohammed Aldehaim

## Team Members

- **Aljoud Algazlan**
- **Albandari Alanazi**
- Arwa Alqahtani
- Asma Alamri
- Bodoor Almubarak
- Deemah Alotaibi
- Fatimah Saad
- Ghada Aljedaie
- Ghaida Alassiry
- Joud Alnujaidi
- May Barakah
- Norah Alasheikh
- Nouf Alsubaie
- Raghad Alasiri
- Raghad Soaeed
- Sarah Almuqati
- Sarah Alqahtani
- Shaden Alsaiedan
- Shahad Almezel
- Shayma Alghanoum
- Sumo Alzeer
- Abdulaziz Alghuligah
- Abdulaziz Alkraidah
- Abdulaziz Alrabiah
- Abdulaziz Alsuhaim
- Ahmed Alkhayatt
- Bader Alrayes
- Basel Fakeeha
- Faisal Alotaibi
- Hadi Alhemsy
- Hesham Alsqabi
- Mohammed Aldehaim
- Mohamed Alquhidan
- Mubarak Alanazi
- Osama Alharbi
- Saad Aldohaim
- Saleh Algarni

