

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# Pancreas & Biliary System

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# Objectives

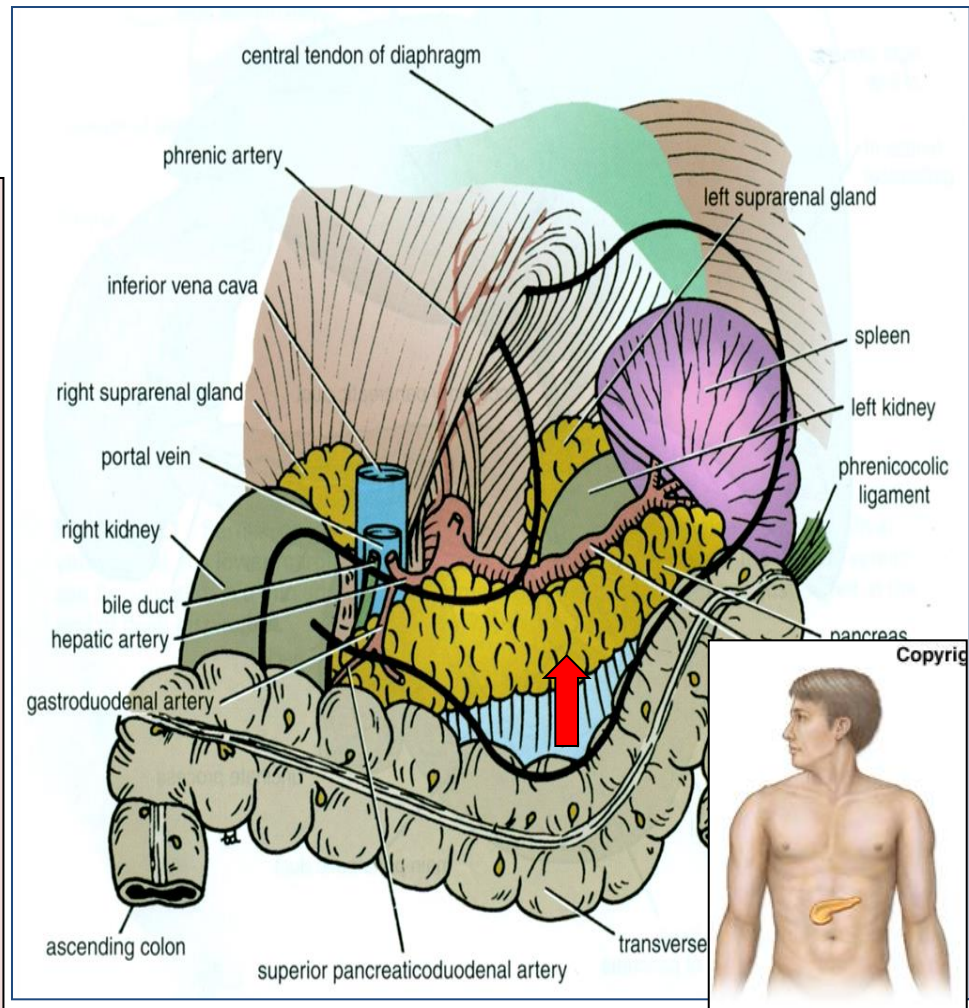
*At the end of the lecture, the student should be able to describe the:*

- Location, surface anatomy, parts, relations & peritoneal reflection of the pancreas and gall bladder.
- Blood supply, nerve supply and lymphatic drainage of pancreas and gall bladder.
- Course of each of common hepatic, cystic and common bile duct and pancreatic ducts

# PANCREAS

## LOCATION

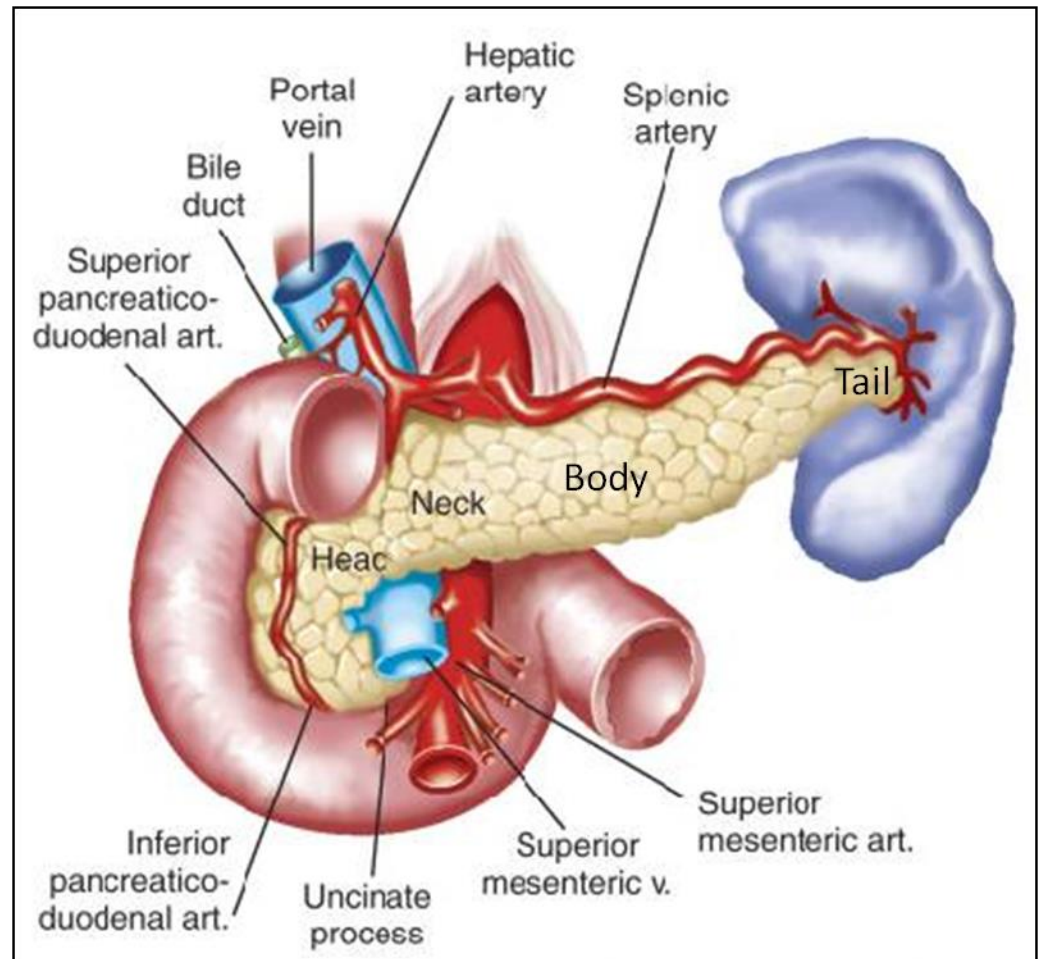
- Located in Epigastrium & Left upper quadrant of abdomen.
- Pancreas is a soft, lobulated elongated gland with both **exocrine** and **endocrine** functions.
- 6-10 inch in length and 60-100 gram in weight.
- Retro-peritoneal in position
- Lies across the posterior abdominal wall in an oblique directions at the transpyloric plane (L1 vertebra).



# PANCREAS

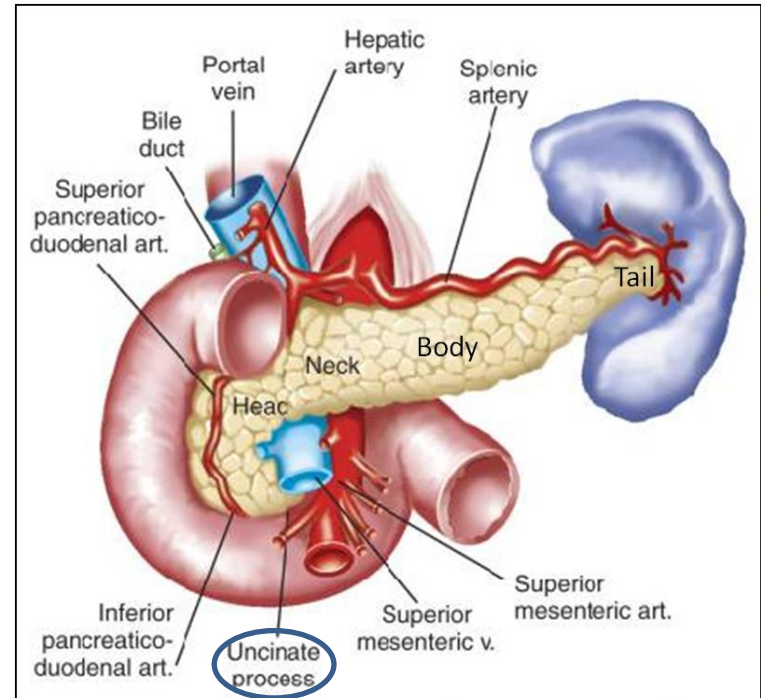
## PARTS

- It is divided into:
  - Head
  - Neck
  - Body
  - Tail



## Head

- Disc shaped, lies within the concavity of the duodenum
- Related to the 2<sup>nd</sup> and 3<sup>rd</sup> portions of the duodenum on the right & continues with the neck on the left
- Includes uncinete process (part extending to the left behind the superior mesenteric vessels)

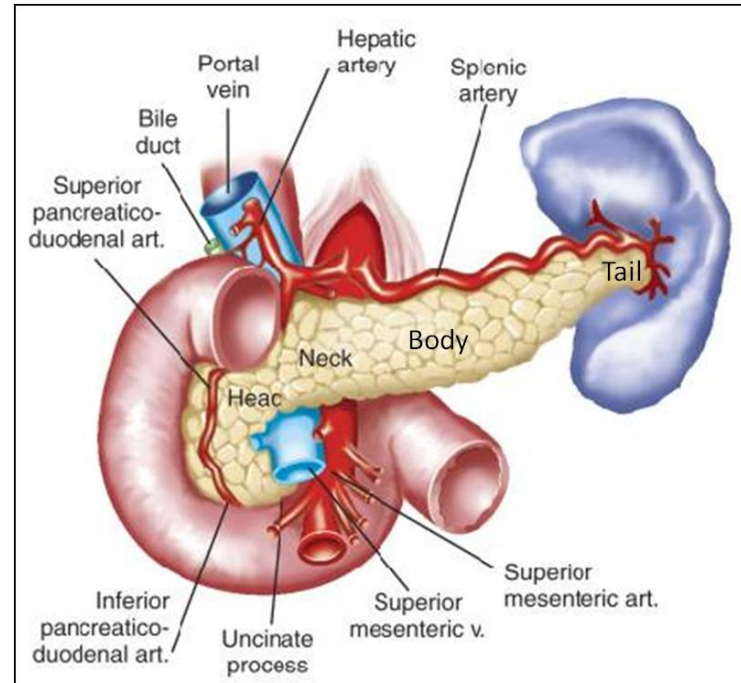


## Neck

- The constricted portion connecting the head & body
- Lies in front of origin of superior mesenteric artery and the confluence of the portal vein
- 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

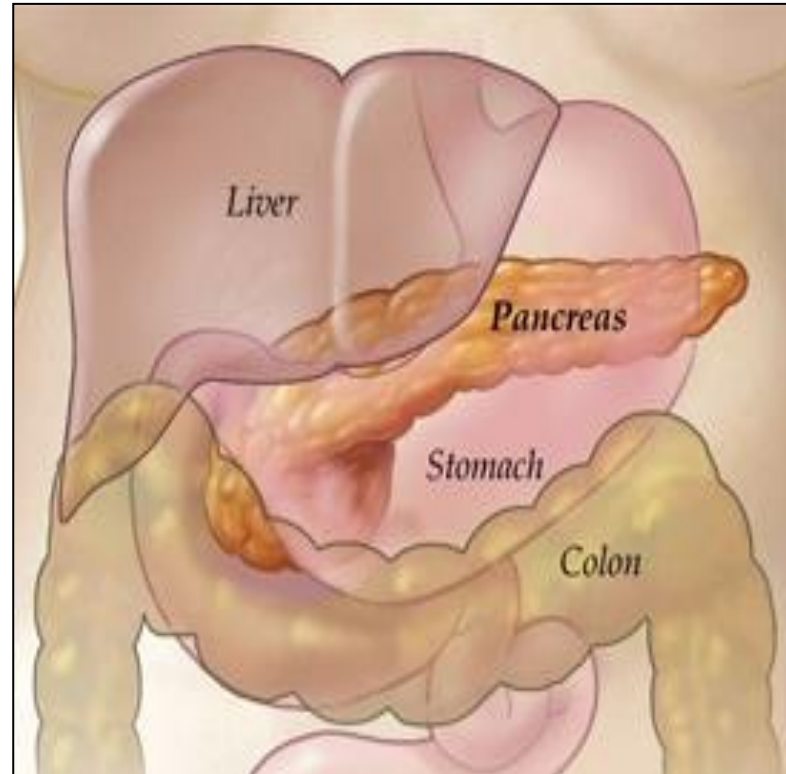


## Tail

- Narrow, short segment, ending at the splenic hilum
- Lies in the splenicorenal ligament (may get injured during splenectomy), at the level of the T12 vertebra
- Anteriorly, related to splenic flexure of colon

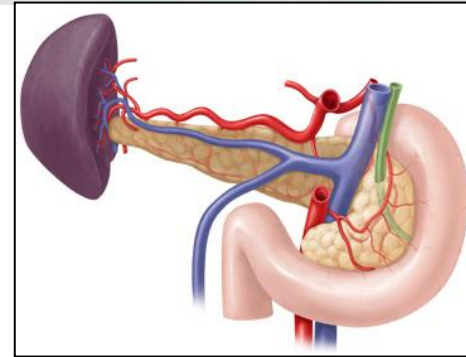
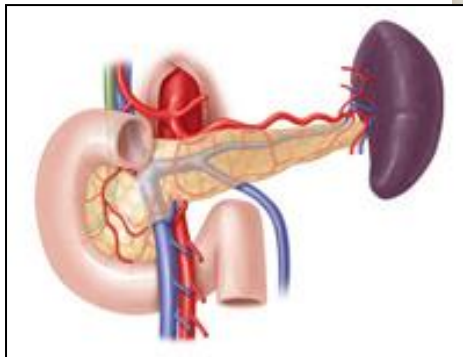
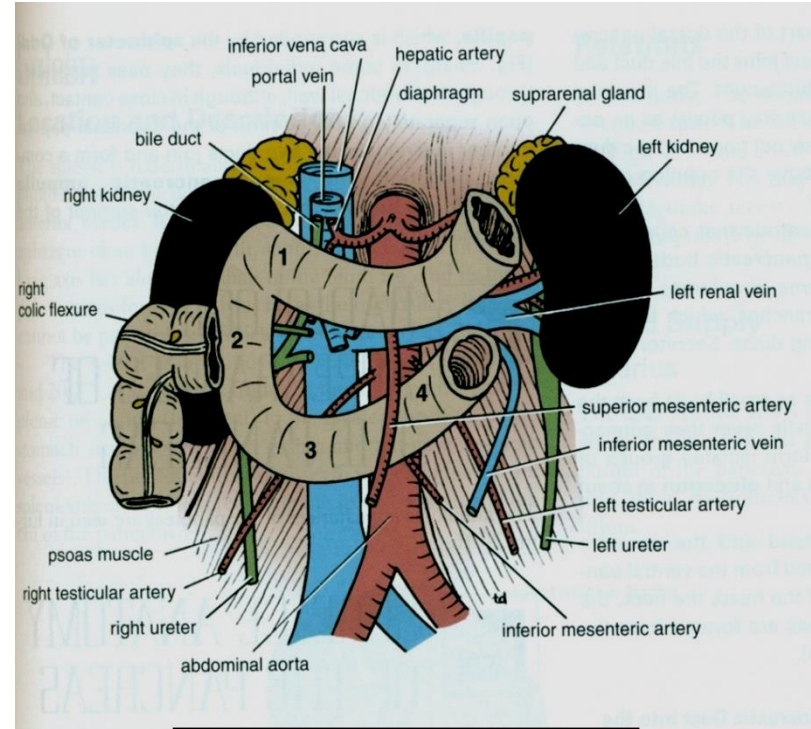
# Anterior Relations

- **Stomach separated by lesser sac**
- **Transverse colon & transverse mesocolon**



# Posterior Relations

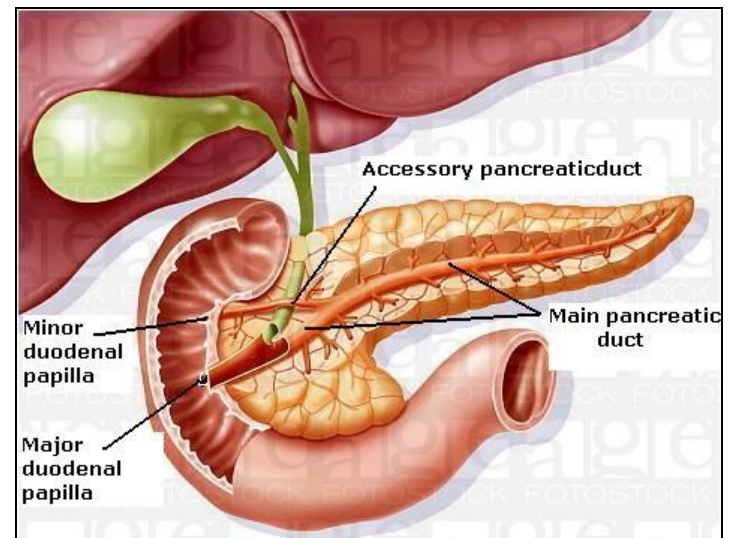
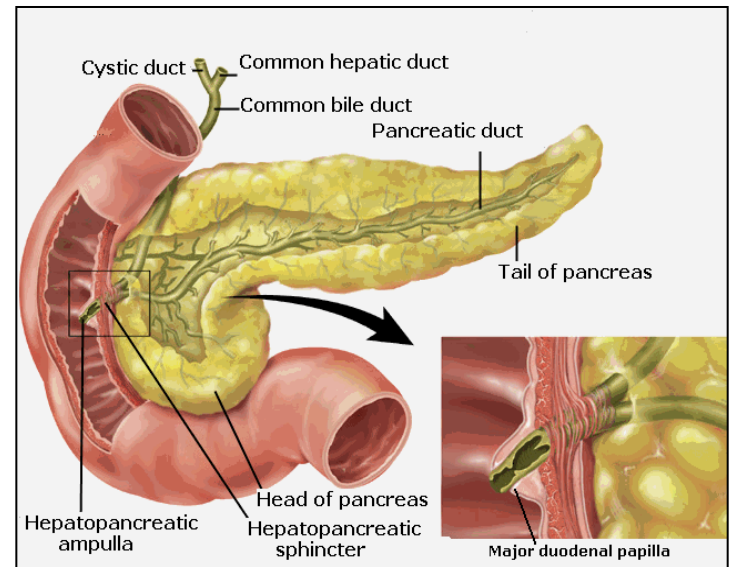
- Bile duct, portal & splenic veins, inferior vena cava, aorta & origin of superior mesenteric artery
- Left psoas muscle, left adrenal gland, left renal vessels & upper 1/3<sup>rd</sup> of left kidney
- Hilum of the spleen.





# Pancreatic Ducts

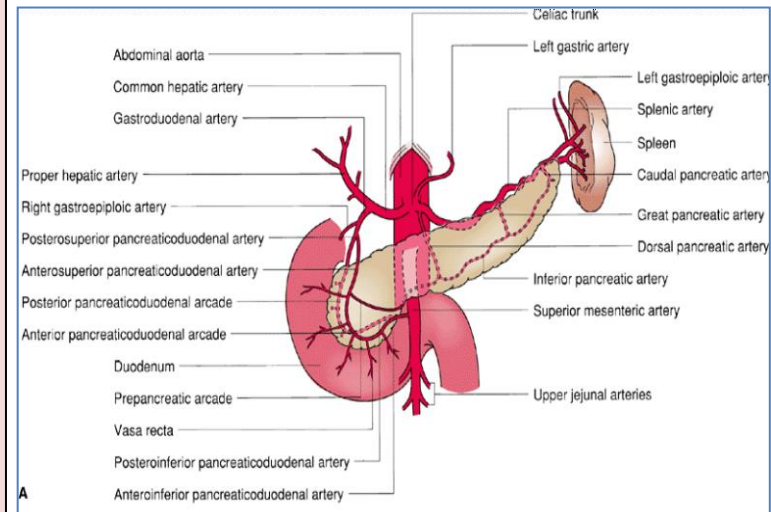
- **Main duct (of Wirsung)** runs the entire length of pancreas beginning from the tail.
  - It receives many tributaries from tail, body, neck, inferior portion of head & uncinata process.
  - Joins common bile duct & together they open into a small hepatopancreatic ampulla (Ampulla of Vater) in the duodenal wall
  - The ampulla opens into the lumen of the duodenum by means of a small Papilla, (Major duodenal papilla).
- **Accessory duct (of Santorini)** drains superior portion of the head
  - It empties separately into 2<sup>nd</sup> portion of duodenum at (minor duodenal papilla)



# Blood Supply of Pancreas

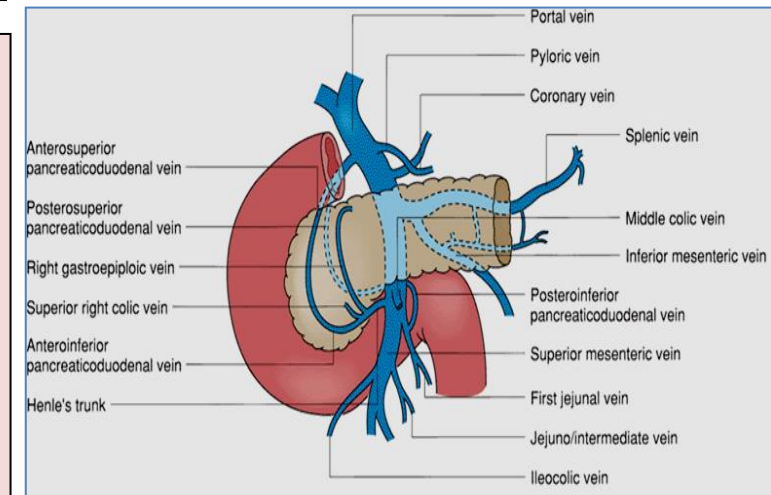
## Arteries

- Head & neck: Supplied by branches from:
  - Celiac trunk through **Superior pancreaticoduodenal artery**
  - Superior mesenteric artery through **Inferior pancreaticoduodenal artery**
- Body and tail: Supplied by Splenic artery through 8-10 branches



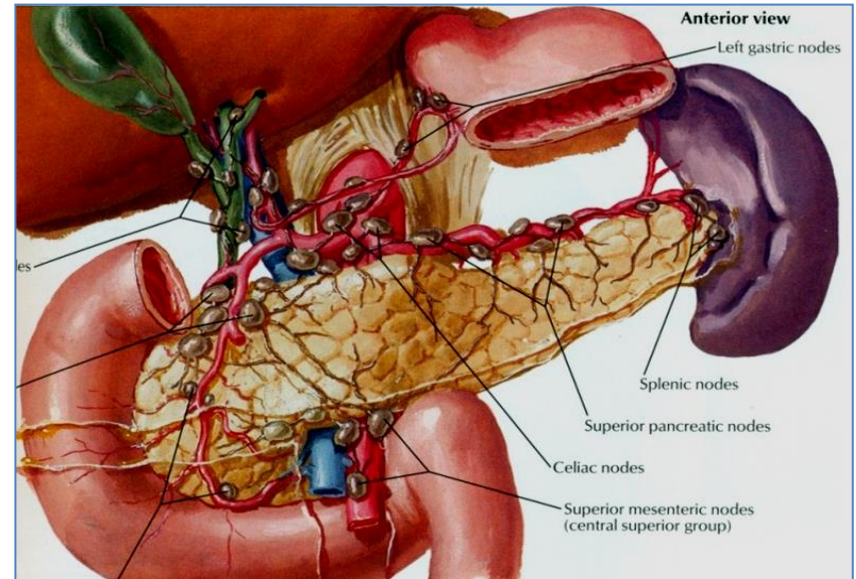
## Veins

- Head & neck: Drained by anterior and posterior venous arcades that form the **superior & inferior pancreaticoduodenal veins** which follow the corresponding arteries.
- Body and tail: Drained by splenic vein, which is a tributary of portal vein



## Lymphatic Drainage

- Rich network that drains into pyloric, hepatic and splenic nodes
- Ultimately the efferent vessels drain into the celiac & superior mesenteric lymph nodes.

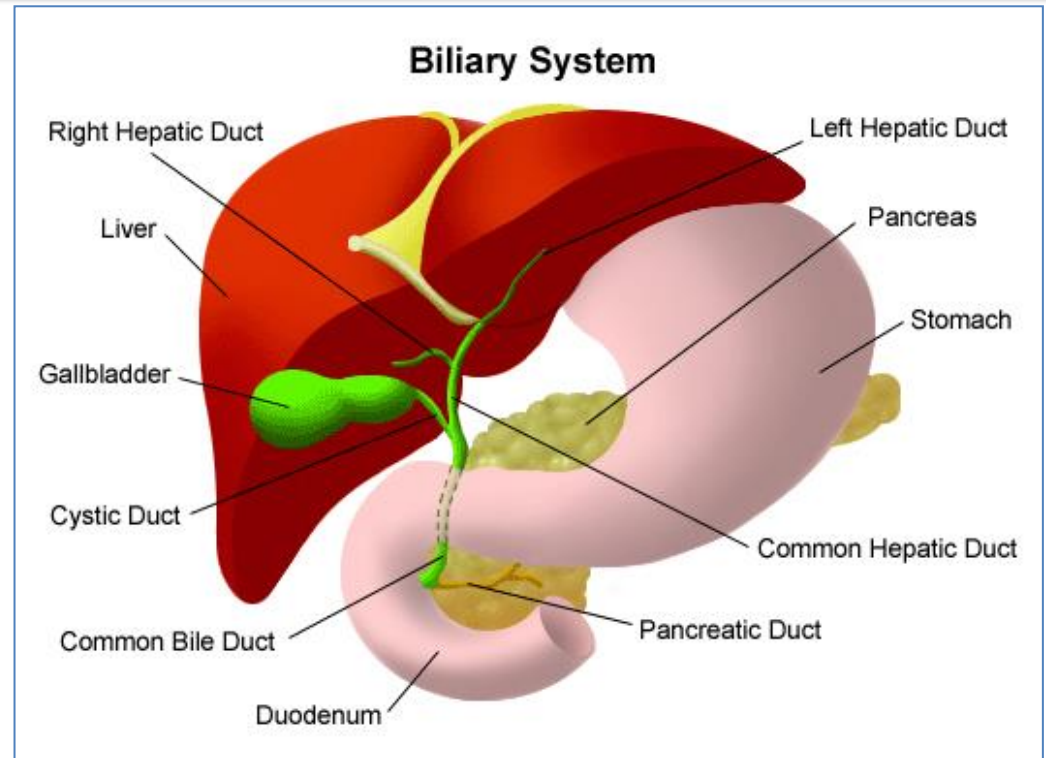


## Innervation

- Sympathetic fibers from the thoracic splanchnic nerves. Sympathetic fibers have a predominantly inhibitory effect
- Parasympathetic fibers from the vagus. Parasympathetic fibers stimulate both exocrine and endocrine secretions

# Biliary System

The biliary system consists of the ducts and organs (liver, gallbladder, & bile ducts,) that are involved in the production, storage & transportation of bile.

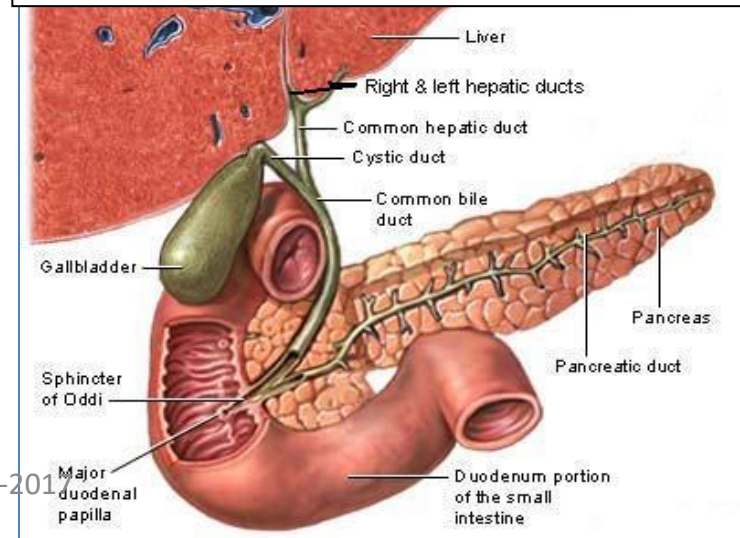
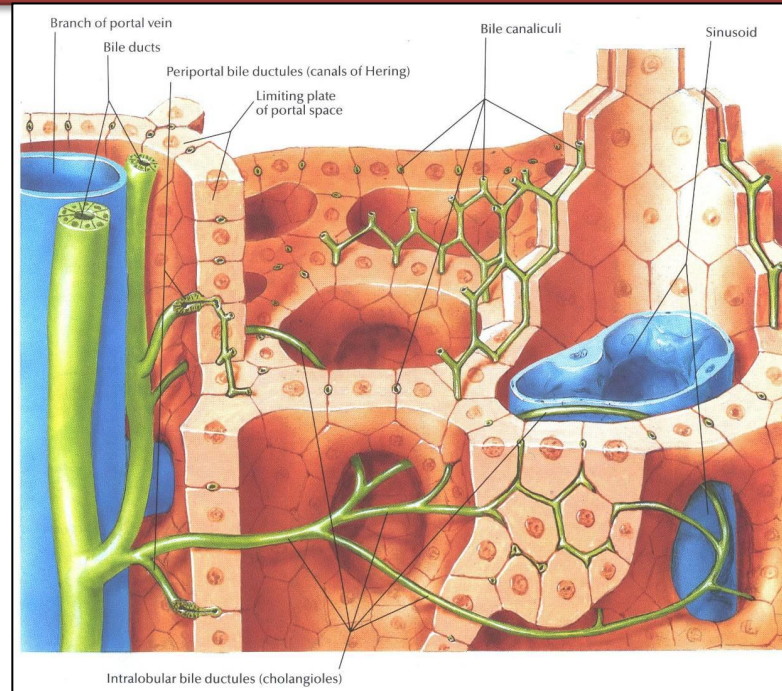


Bile is secreted by the liver cells at a constant rate of about 40 ml per hour. When digestion is not taking place, the bile is stored and concentrated in the gallbladder; later, it is delivered to the duodenum.

# The Bile Ducts

## The bile ducts consist of:

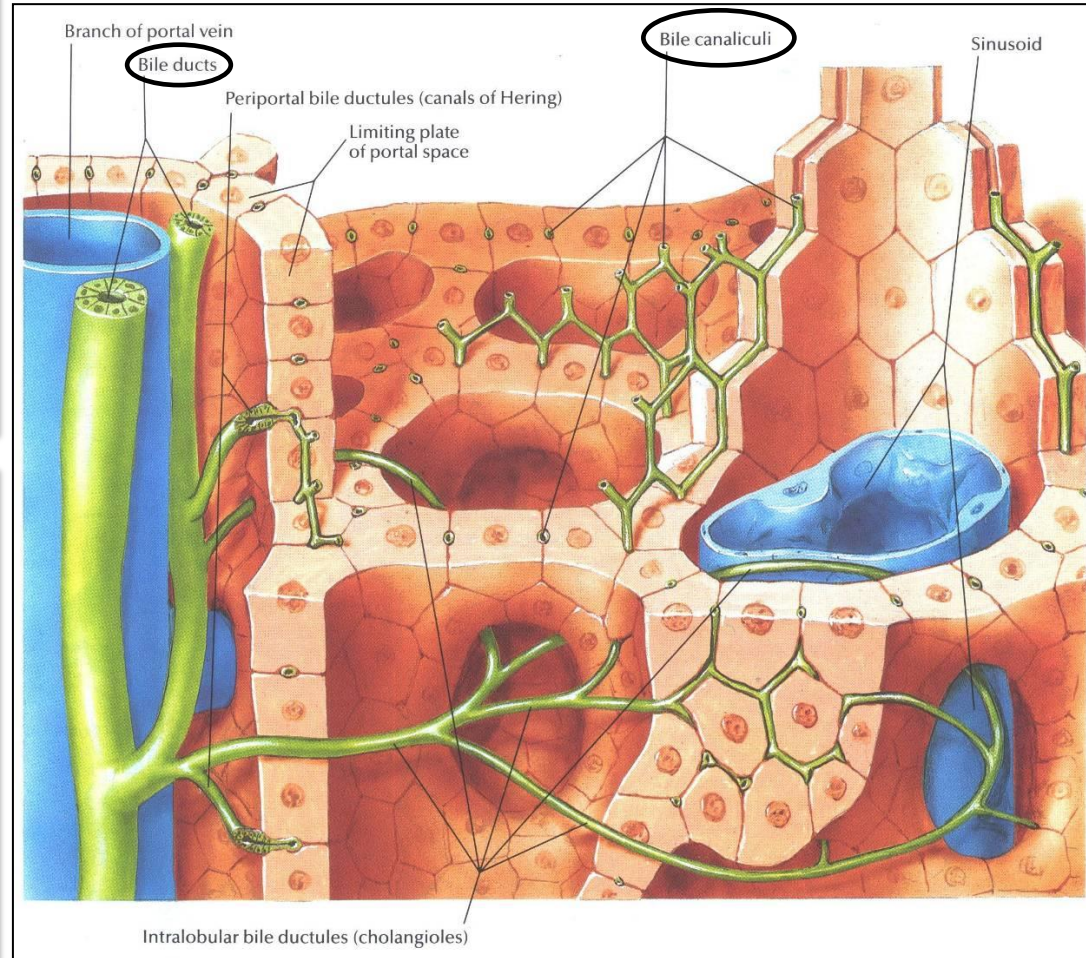
- Bile canaliculi
- Interlobular ducts
- Intrahepatic ducts
- Right and left hepatic ducts
- Common hepatic duct
- Cystic duct (From GB)
- Common bile duct (Bile duct)



# The Bile Ducts

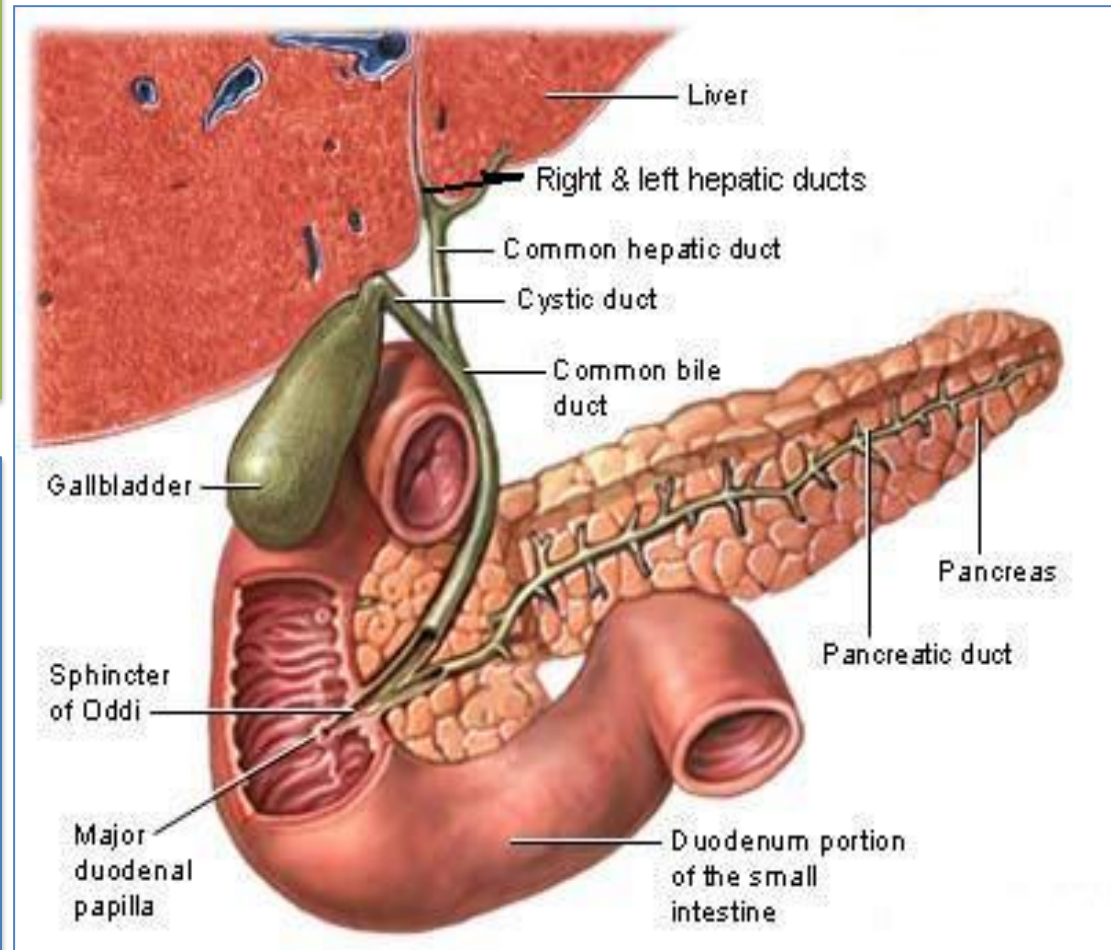
The smallest interlobular tributaries of the bile ducts are situated in the portal canals of the liver; they receive the bile canaliculi.

The interlobular ducts join one another to form progressively larger ducts and, eventually, at the porta hepatis, form the right and left hepatic ducts.



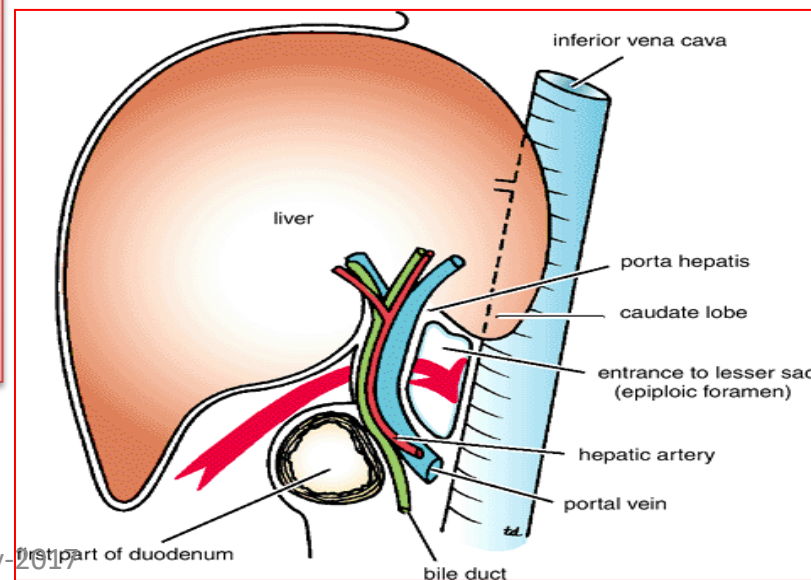
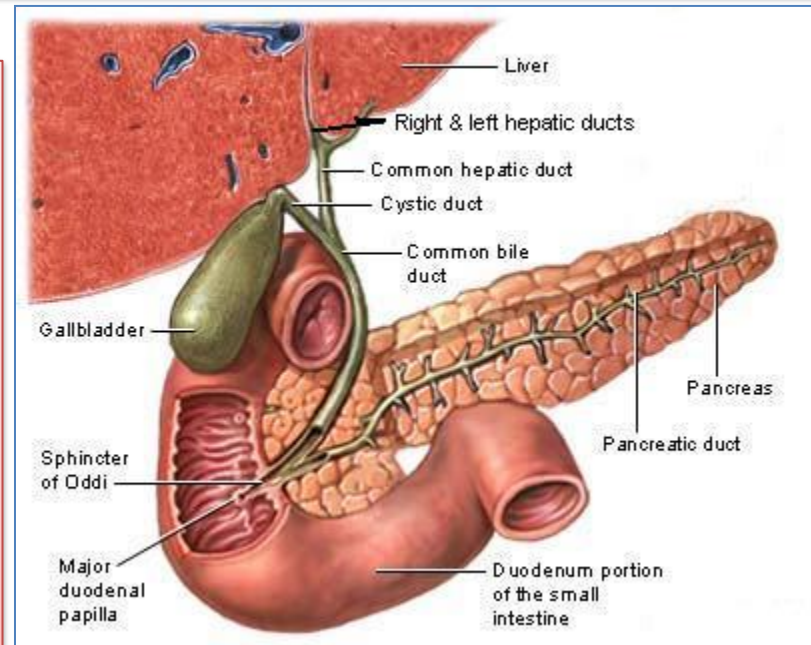
The **right hepatic duct** drains the right lobe of the liver and the **left duct** drains the left lobe, the caudate lobe, & quadrate lobe. After a short course, the hepatic ducts unite to form the **common hepatic duct**

The common hepatic duct is about 1.5 in. (4 cm) long and descends within the free margin of the lesser omentum. It is joined on the right side by the **cystic duct** from the gallbladder to form the **common bile duct**



# Common Bile Duct (Bile Duct)

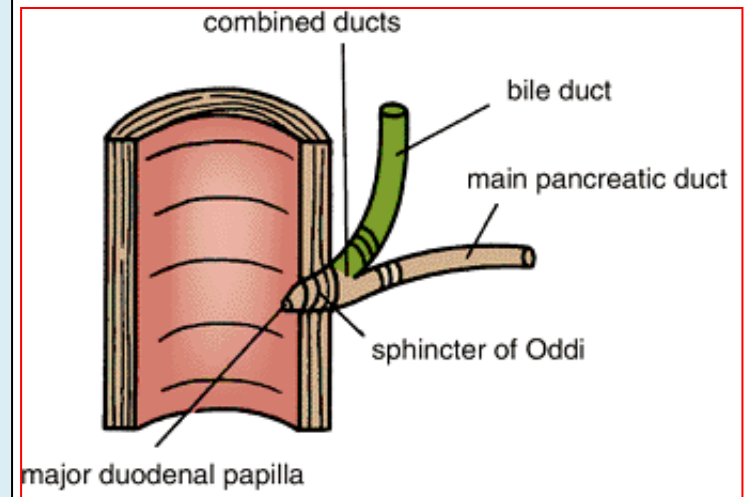
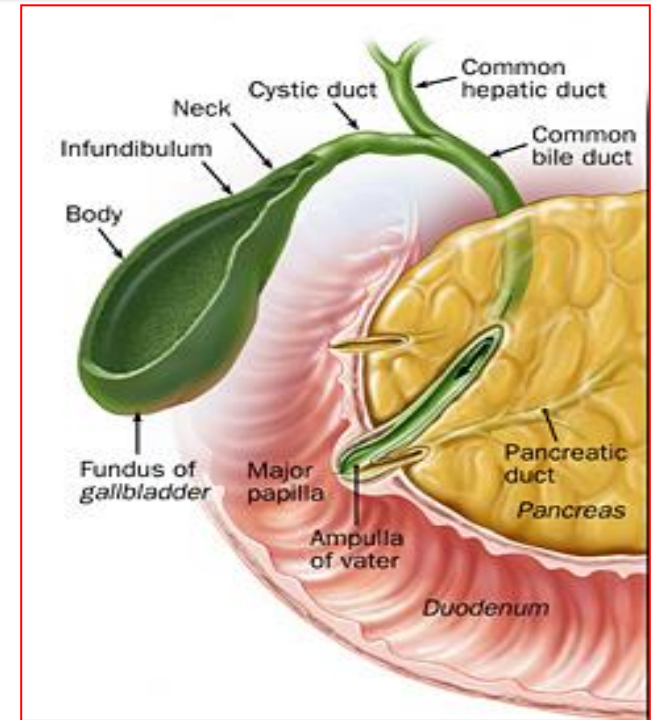
- The common bile duct is about 3 inches (8 cm) long.
- Course:
  - First it lies in the right free margin of the lesser omentum.
  - Then it runs behind the first part of the duodenum.
  - Lastly it lies in a groove on the posterior surface of the head of the pancreas. Here, the bile duct comes into contact with the main pancreatic duct





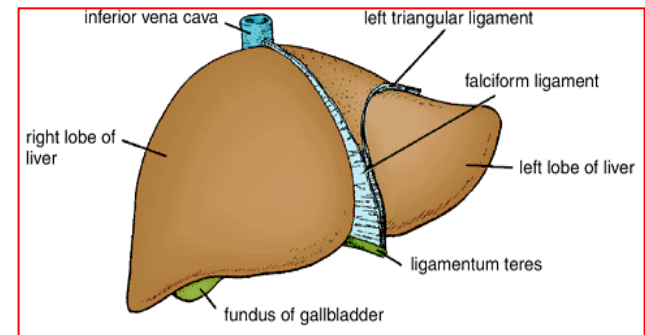
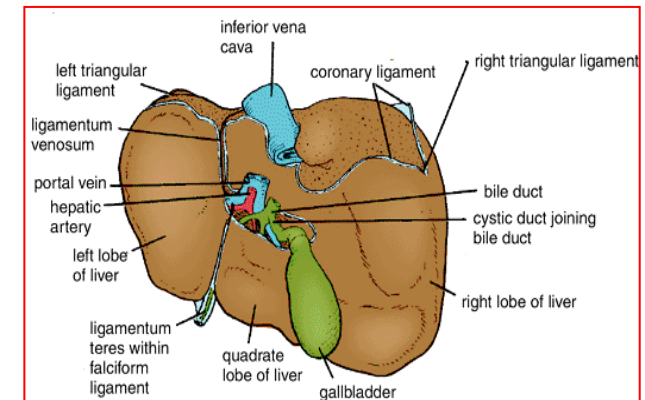
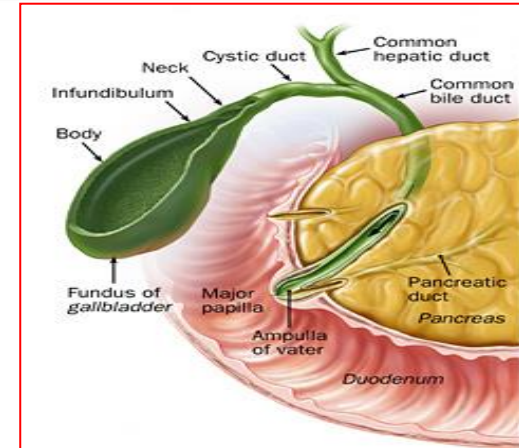
# Common Bile Duct (Bile Duct)

- 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, 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.**



# Gallbladder

- A pear-shaped sac lying on the undersurface of the liver.
- It has a capacity of 30 to 50 ml , it stores bile, which is concentrated by absorbing water.
- The gallbladder is divided into the fundus, body, and neck.
  - The fundus is 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**.
  - The body lies in contact with the visceral surface of the liver and is directed upward, backward, and to the left.
  - The neck becomes continuous with the **cystic duct**, which turns into the lesser omentum, joins **the common hepatic duct**, to form the **bile duct**

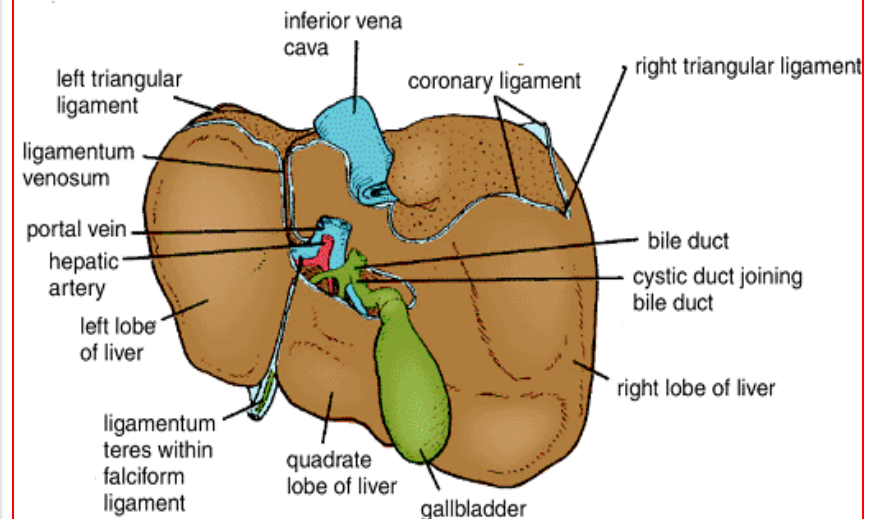


# Gallbladder

- The **peritoneum completely surrounds the fundus** of the gallbladder and binds the body and neck to the visceral surface of the liver.

## Relations

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

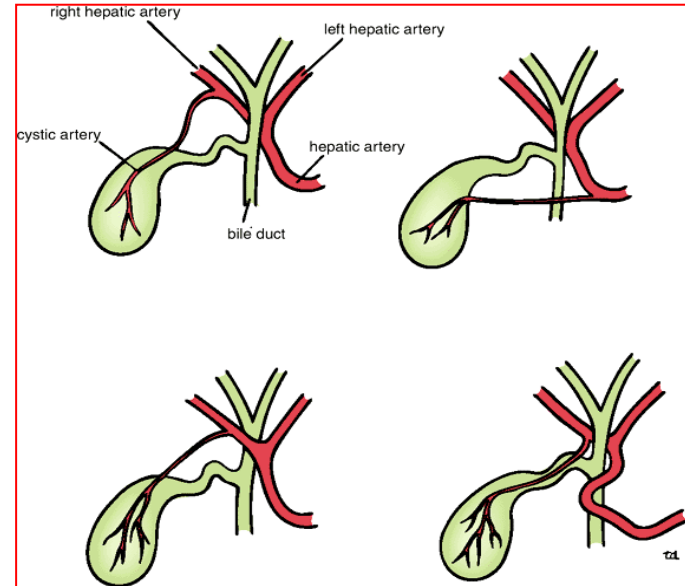


## Function of the Gallbladder

- When digestion is not taking place, the sphincter of Oddi remains closed and bile accumulates in the gallbladder. The gallbladder **concentrates** & stores bile; **selectively absorbs bile salts**, keeps the bile acid; it **excretes cholesterol**; and **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.

## 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 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.

## Nerve Supply

- Sympathetic and parasympathetic vagal fibers form the celiac plexus. The gallbladder contracts in response to the hormone cholecystikinin, which is produced by the mucous membrane of the duodenum on the arrival of fatty food from the stomach.

# Cystic Duct

- The cystic duct is about 1.5 in. (3.8 cm) long and 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.**” The function of the spiral valve is to keep the lumen constantly open.

