The Liver

Dr Maan Al-Abbasi
PhD, MSc, MBChB, MD

Learning Objectives

- Describe the position and functional anatomy of the liver, its lobes, segments and their key anatomical relations.
- Explain the peritoneal reflections of the liver and its movement during ventilation.
- Summarise the functional anatomy of the portal vein, the portal venous system, porto-systemic anastomoses and their significance in portal hypertension.

Learning Objectives

- Describe the position, functional anatomy and vasculature of the gall bladder and biliary tree; explain their relations in the abdomen and the clinical significance of inflammation of the biliary system and biliary (gall) stones.

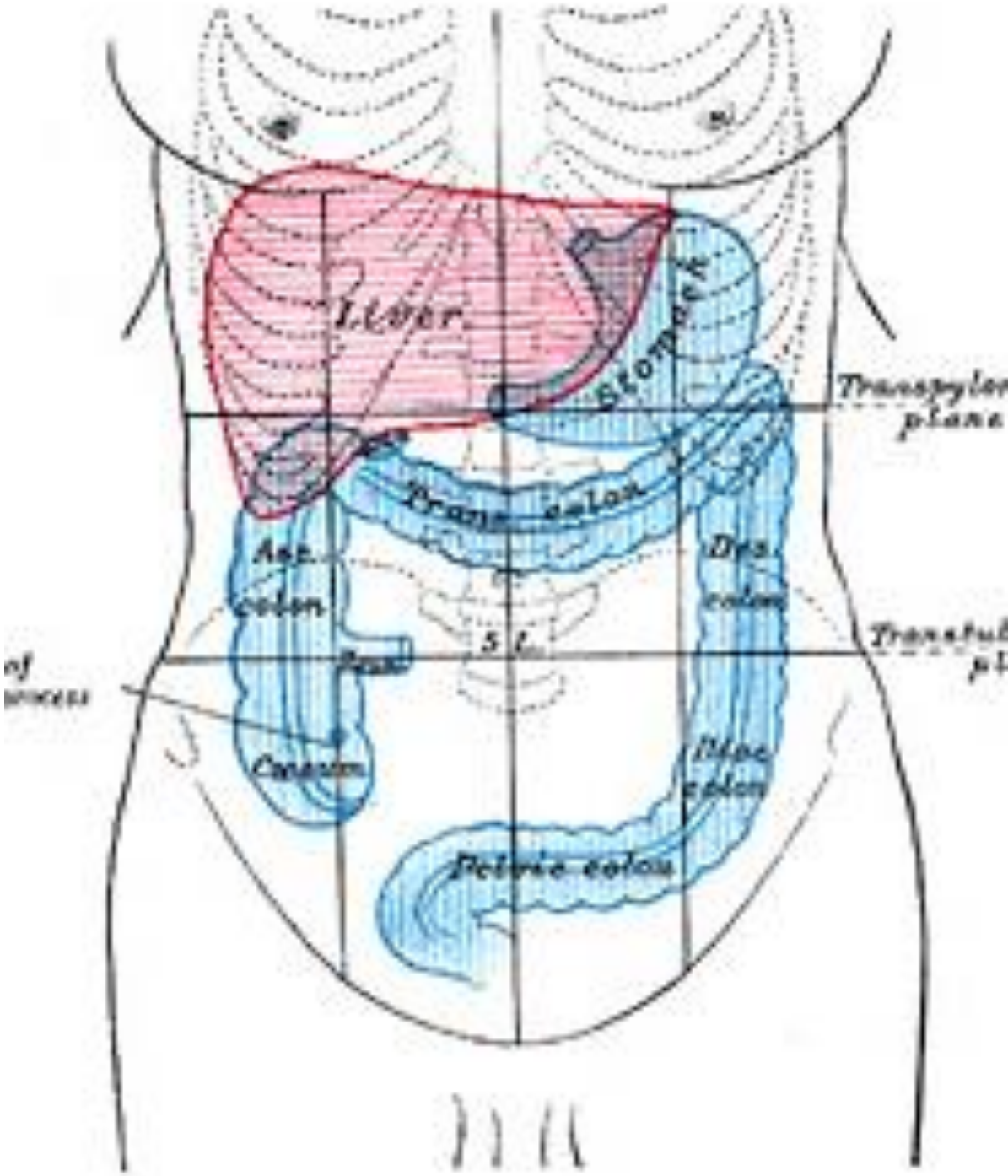
Small Group Task

Functions

- Bile production and secretion
- Detoxification
- Storage of glycogen
- Protein synthesis
- Production of heparin and bile pigments
- Erythropoiesis (in fetus)

Surface Anatomy

- Location
- Shape
- Weight
- Role of Five
- Surfaces
- Borders
- Fissures
- Lobes
- Peritoneal Lig



Liver surfaces

- Divided into 2 anatomical regions:

1. Diaphragmatic surface:

✓ Smooth and dome-shaped surface

✓ Anterior liver part

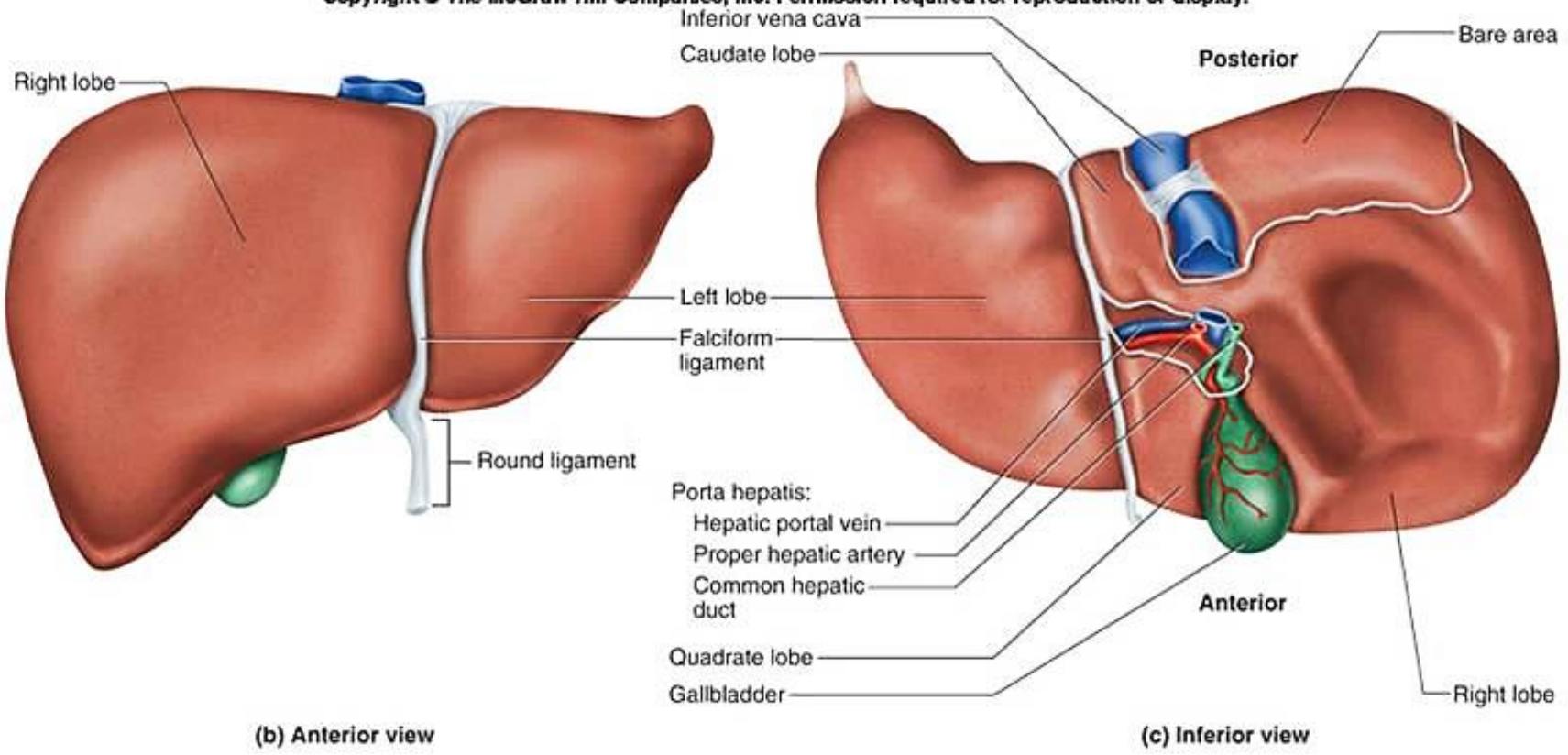
✓ Inferior to diaphragm

✓ Separated from diaphragm by subphrenic recess and from posterior organs {kidney and suprarenal glands} by hepatorenal recess

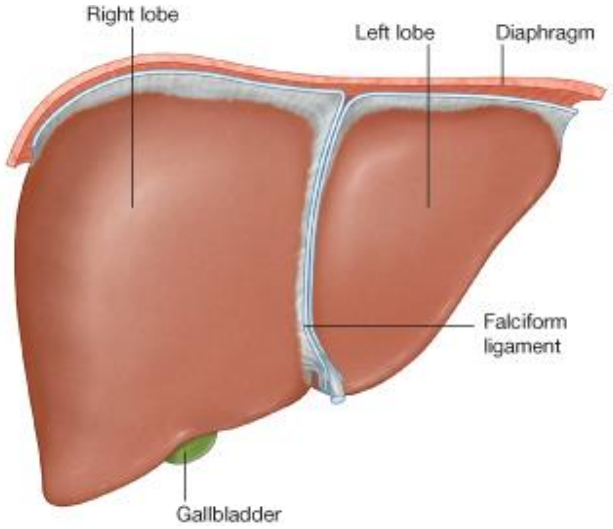
✓ Covered by peritoneum except

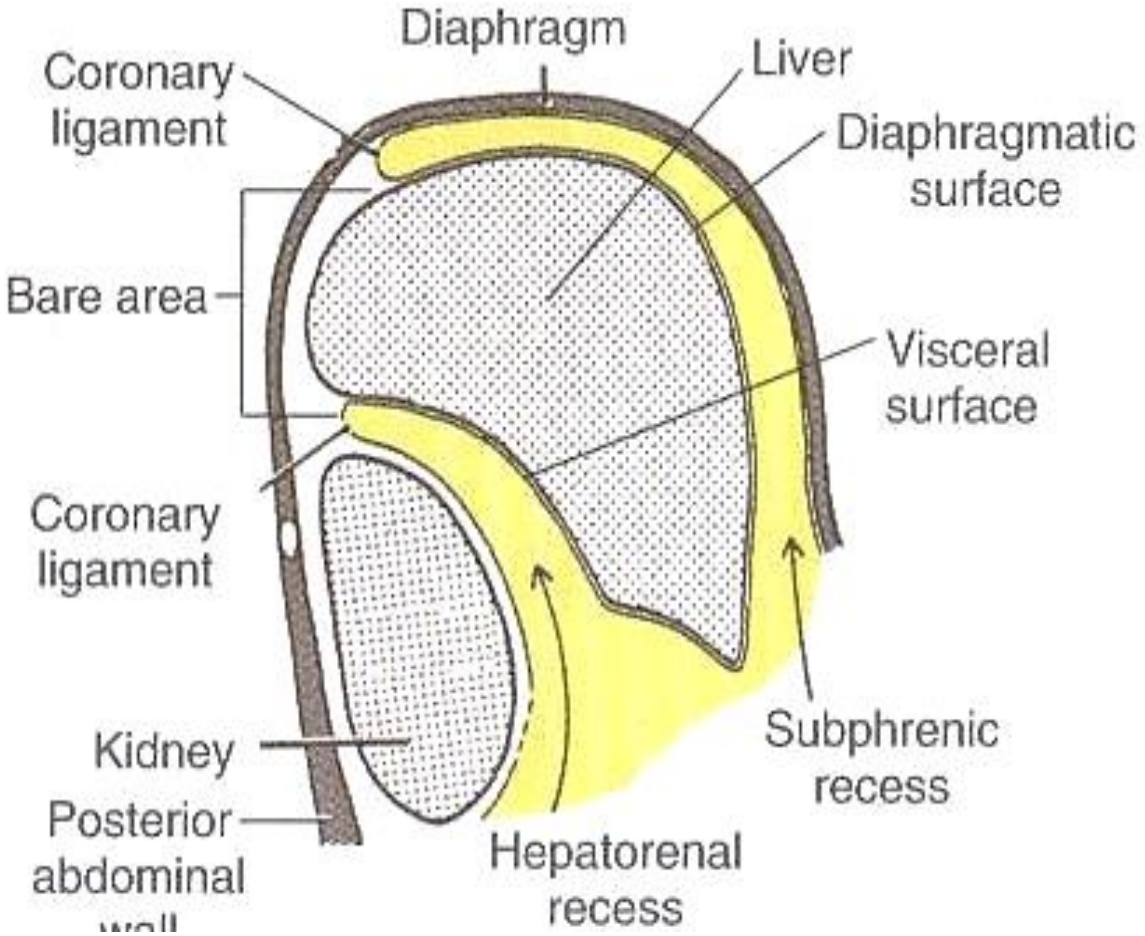
Surfaces and Borders

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

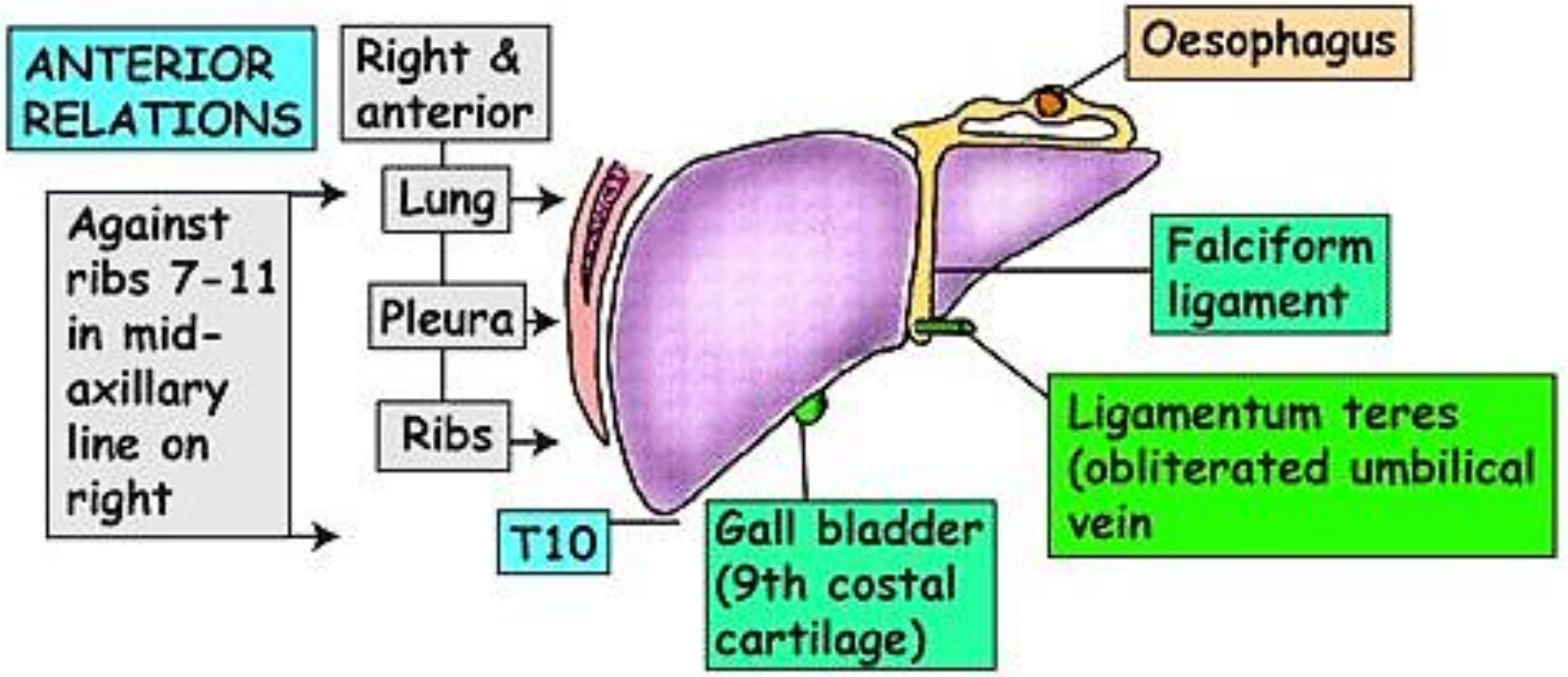


1.Diaphragmatic surface

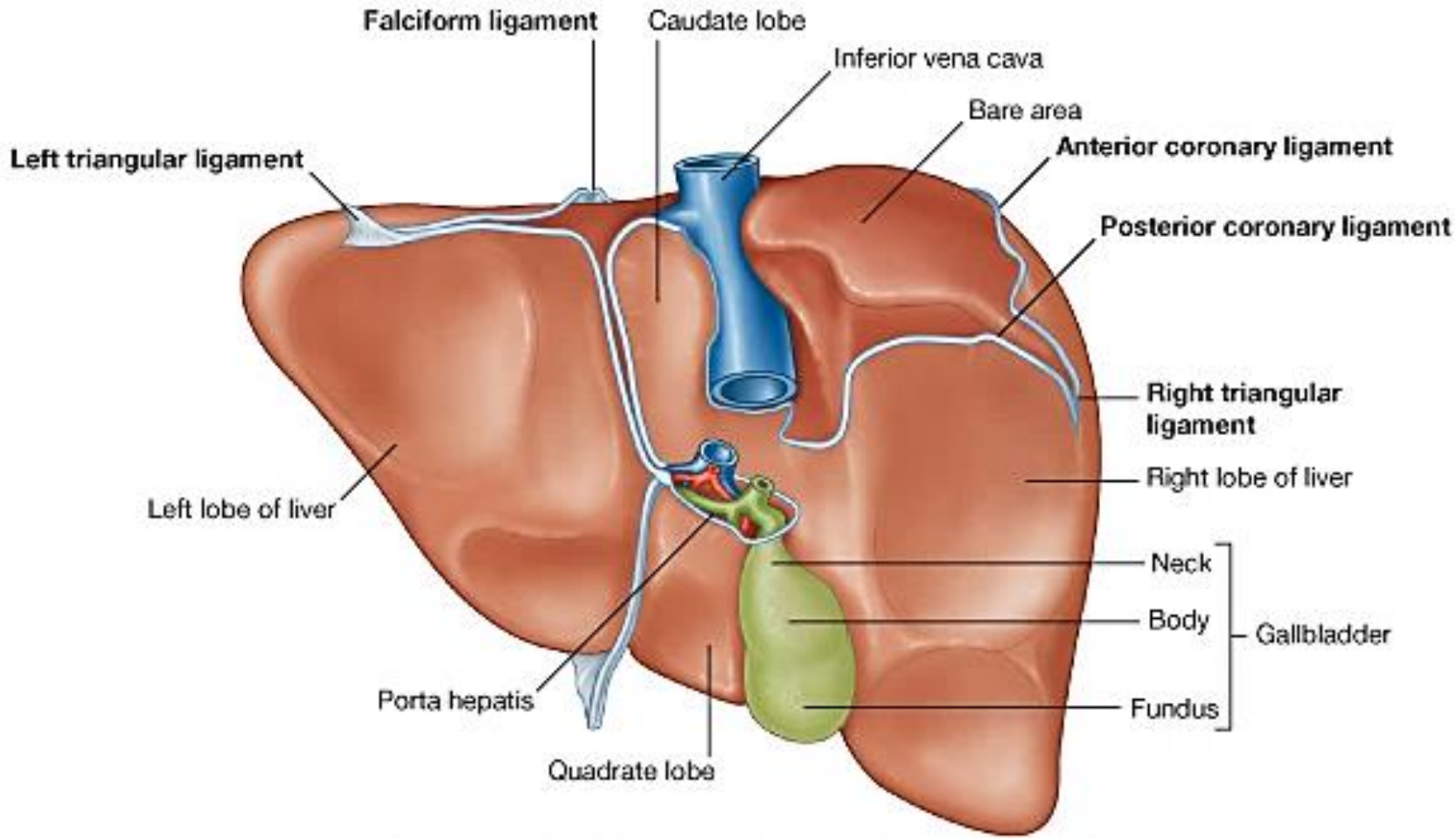




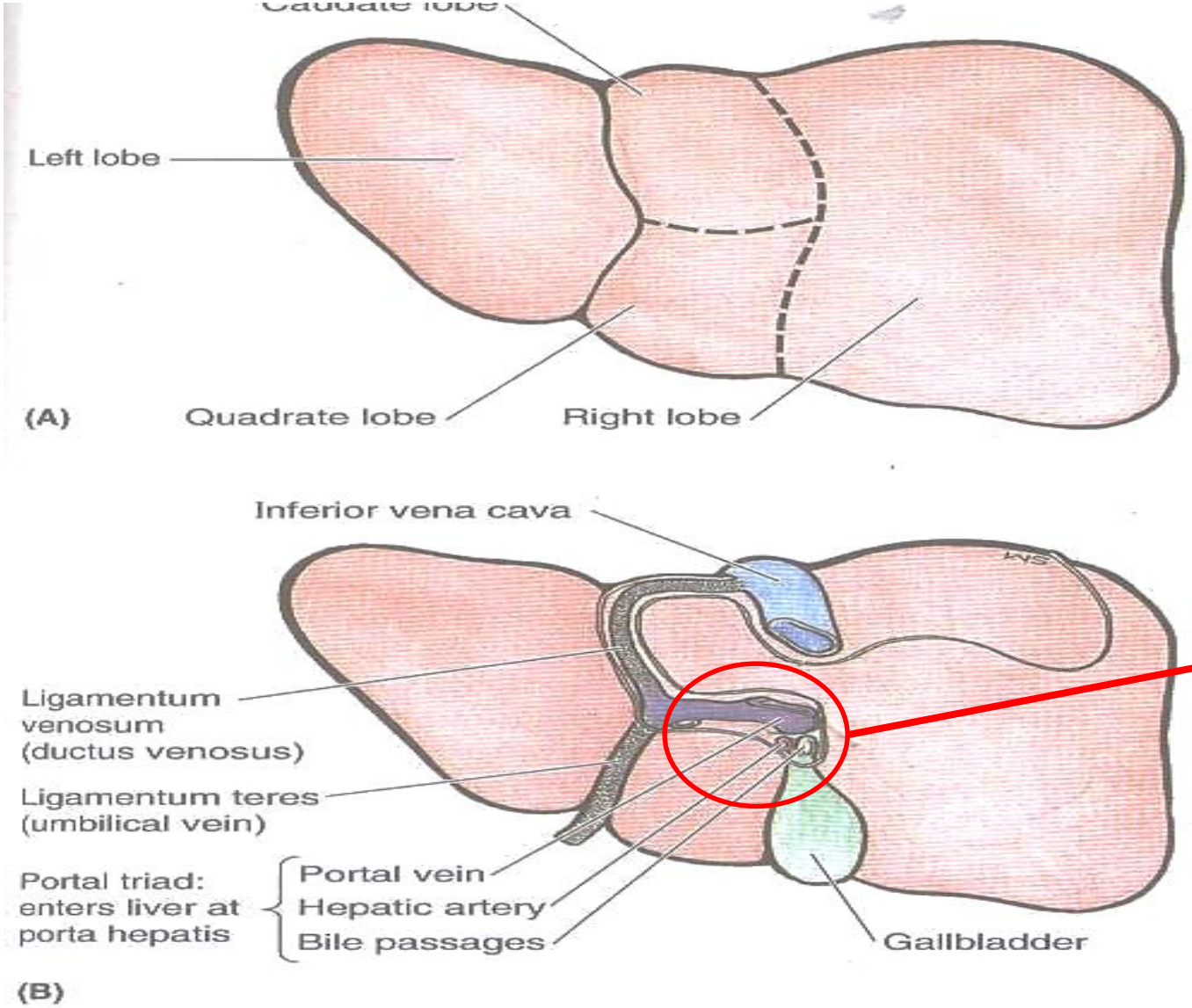
Anterior Relations



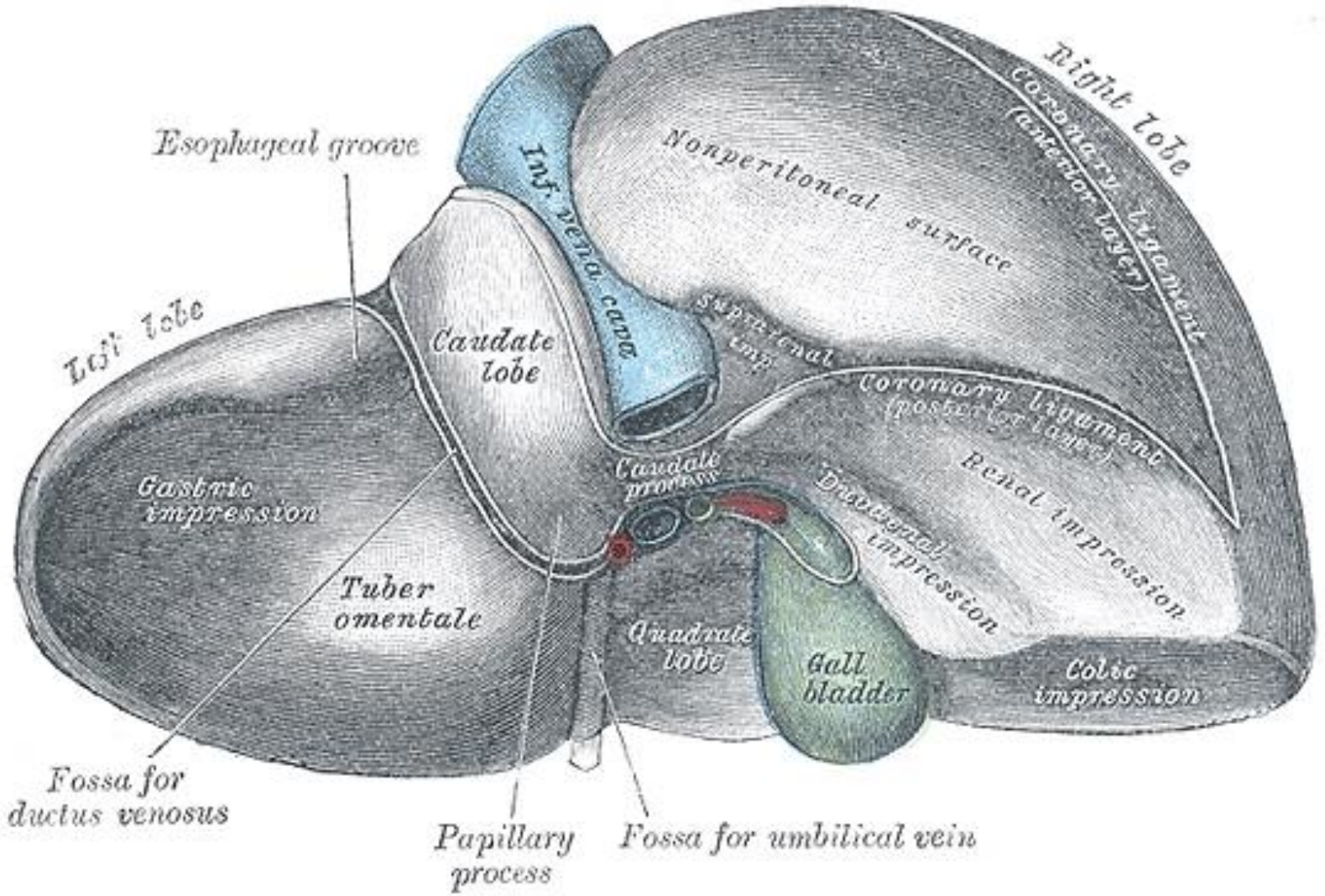
Visceral Relations



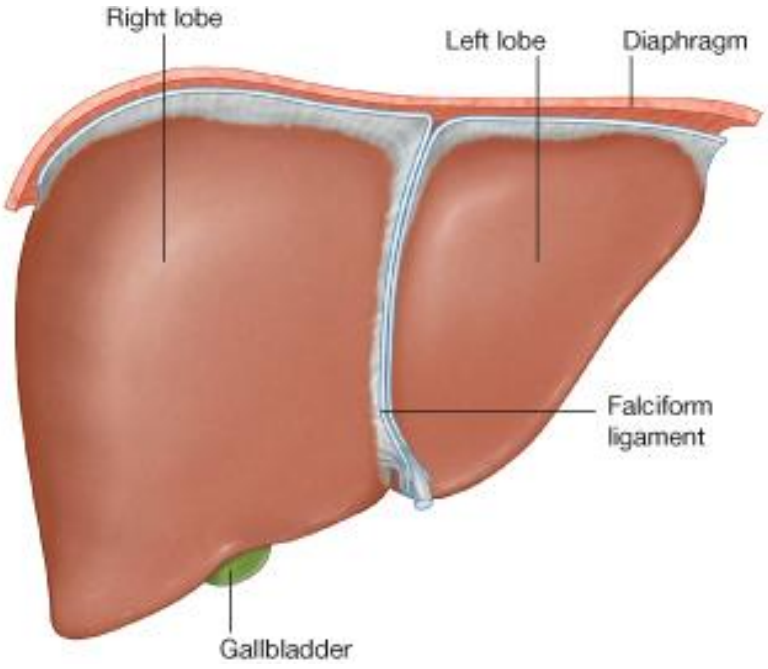
Posterior liver view

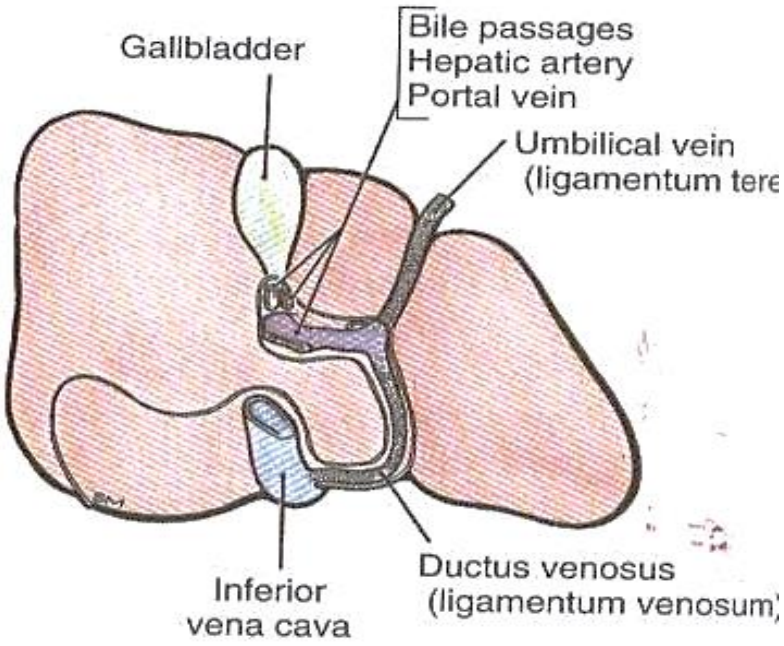


Bare Areas - 5


Esophageal groove
Inf. vena cava
Nonperitoneal surface
Right lobe
Coronary ligament (anterior layer)
Suprarenal impr.
Left lobe
Caudate lobe
Coronary ligament (posterior layer)
Caudate process
Renal impression
Duodenal impression
Gastric impression
Tuber omentale
Quadrate lobe
Gall bladder
Colic impression
Fossa for ductus venosus
Papillary process
Fossa for umbilical vein

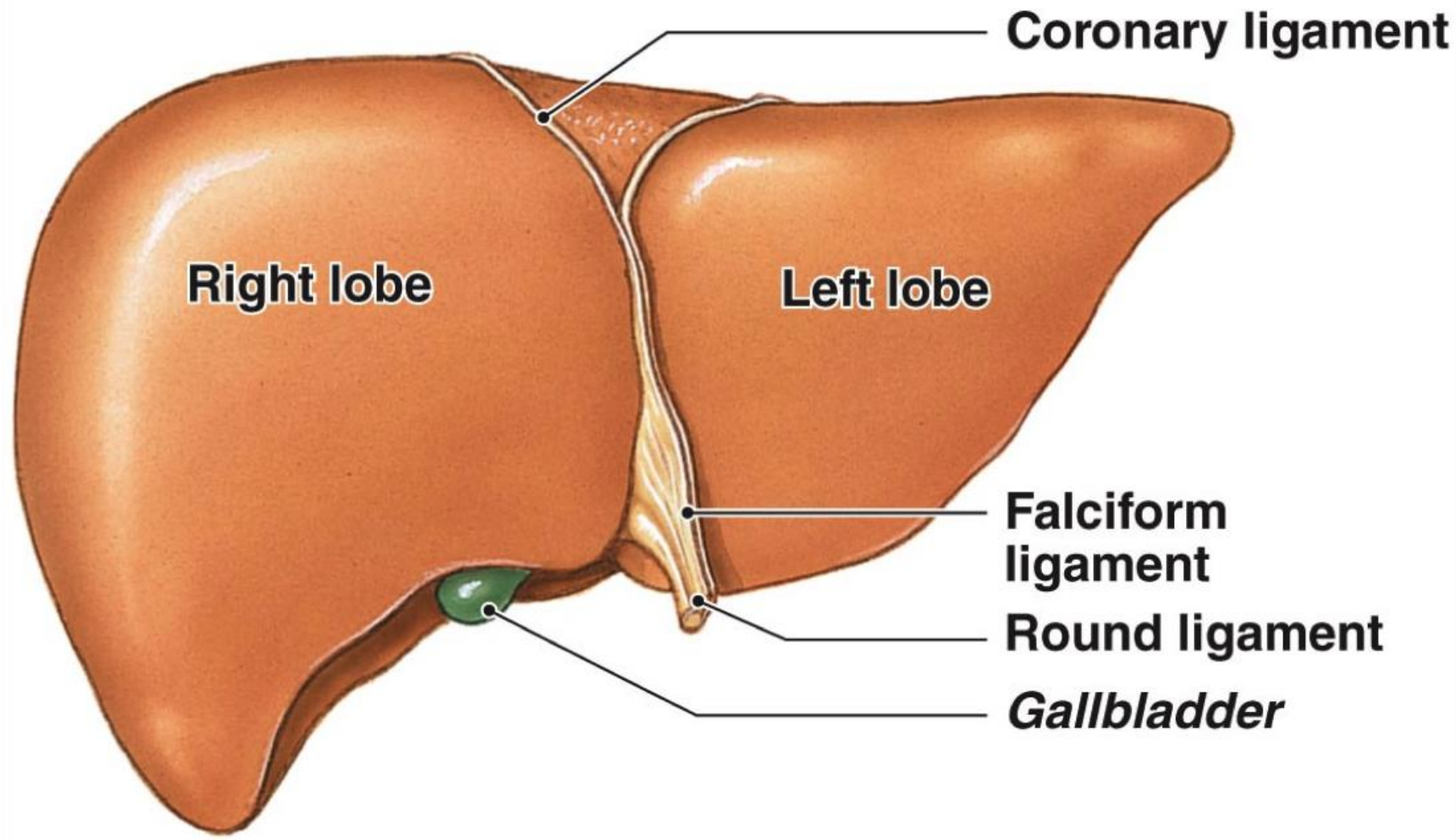
Rt & Lt Lobe





- ✓ **The lateral segment** is separated from the medial segments by:
- ✓ **On visceral surface:**
  1. fissure of **ligamentum teres (round ligament)**
  2. fissure of **ligamentum venosum**
- ✓ **On diaphragmatic** surface:
  1. Attachment of falciform ligament

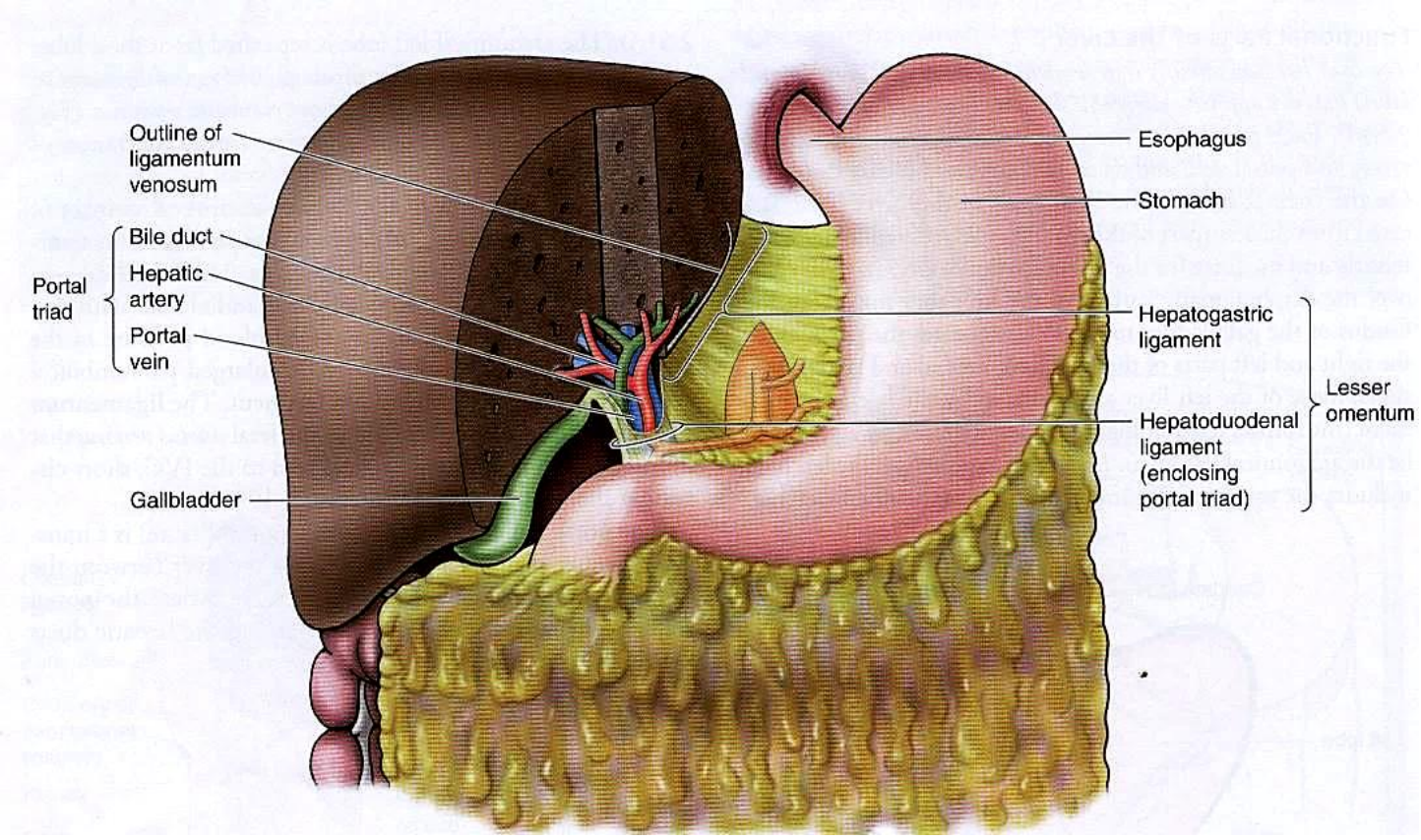
Ligaments


Coronary ligament
Right lobe
Left lobe
Falciform ligament
Round ligament
Gallbladder
(b) Anterior surface

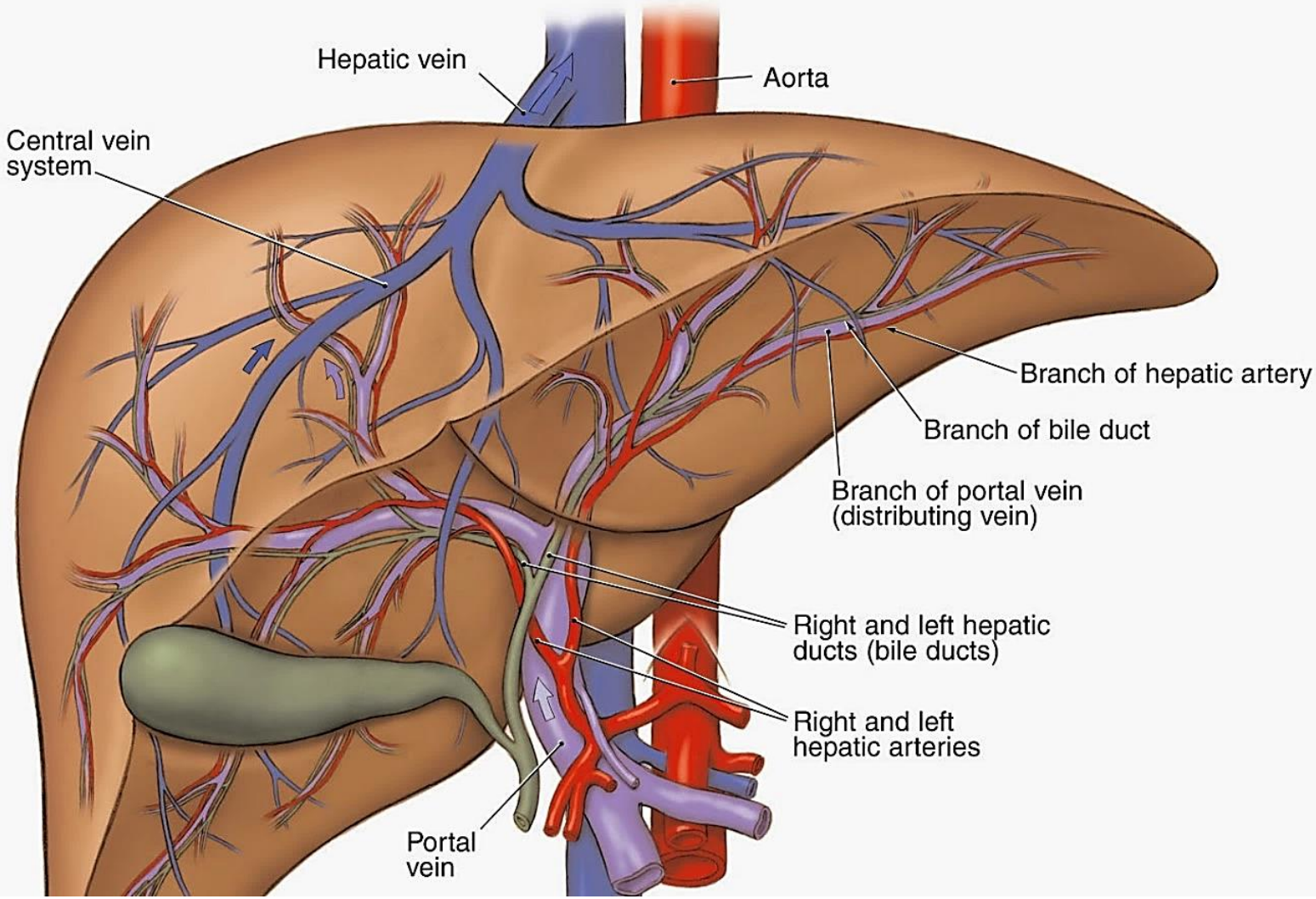
Peritoneal relations of the Liver

The Lesser omentum

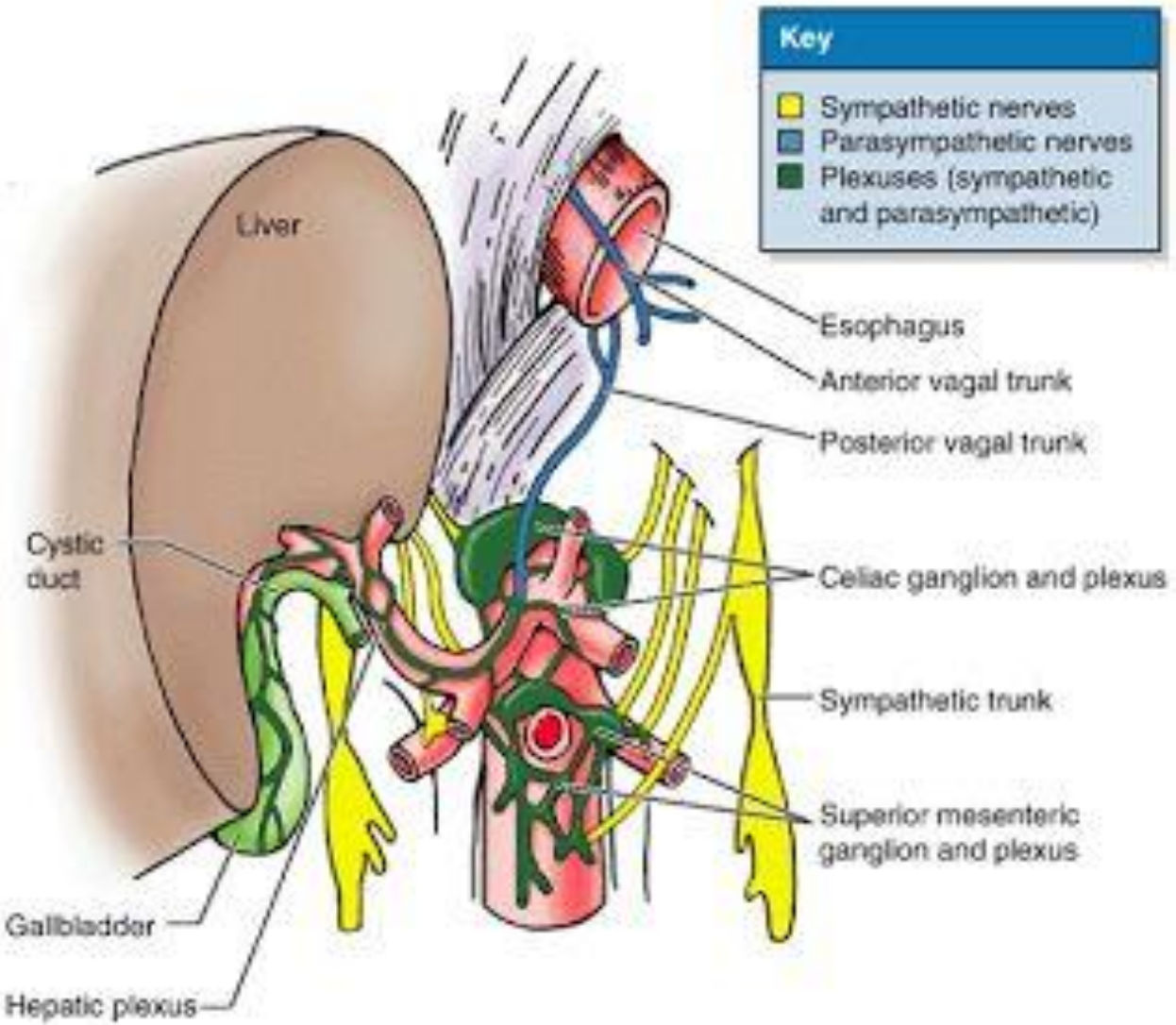
- Encloses the ***portal triad*** (bile duct, hepatic artery and portal vein)
- Passes from the liver to lesser curvature of the stomach + 2 cm of duodenum
- Thick free edge -- **hepatoduodenal ligament**
- Sheet like remainder – **hepatogastric ligament**



blood supply to liver

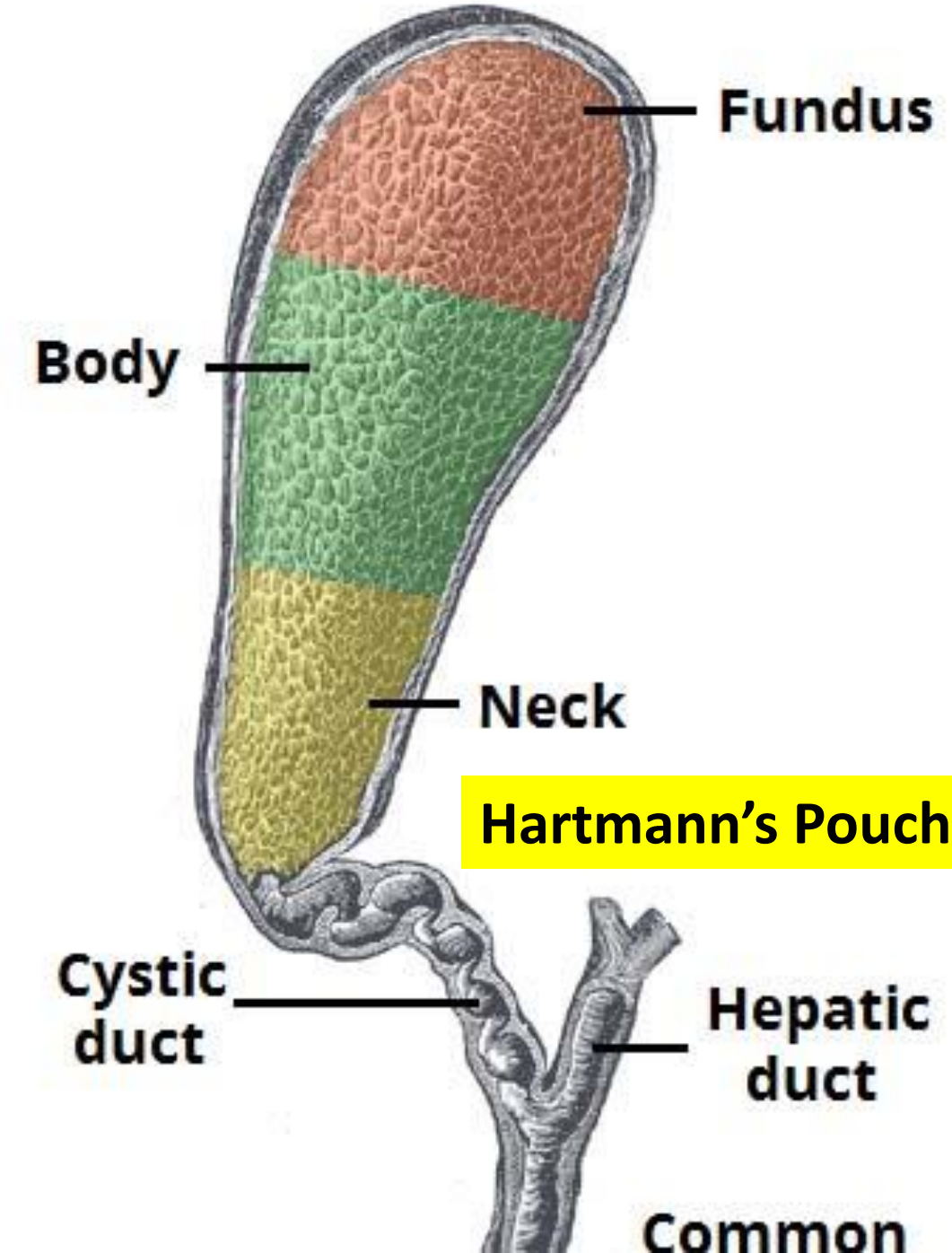


Nerve Supply



Gallbladder

- pear-shaped sac, about 7–10 cm long
- lying on the visceral surface of the right lobe of the liver in a fossa between the right and quadrate lobes Divided into four anatomic areas:
  - fundus
  - the corpus (body)
  - the infundibulum
  - the neck

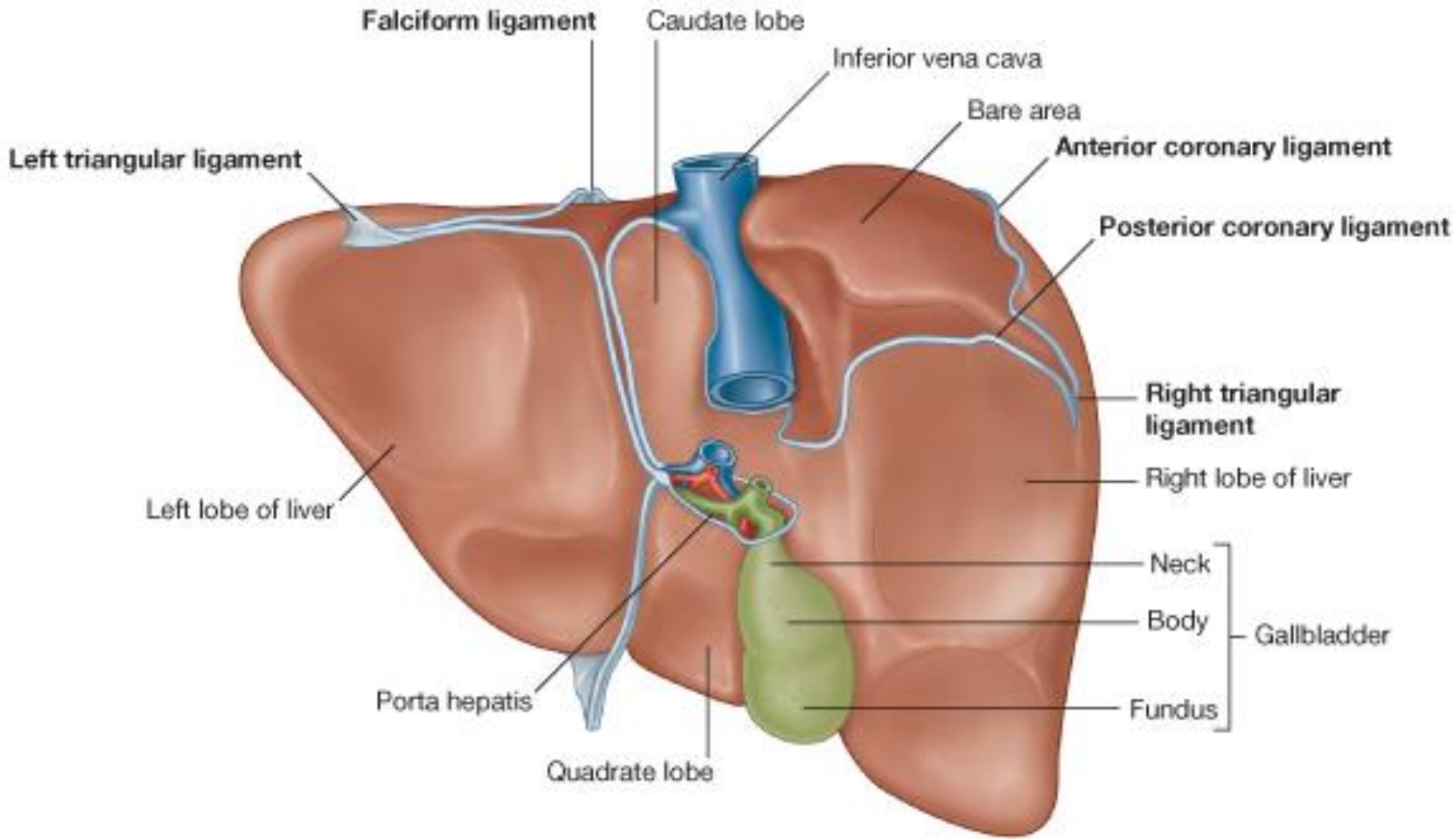


Bile Function

1. Aid in the digestion and absorption of lipids and lipid soluble vitamins

2. Eliminate waste products (bilirubin and cholesterol) through secretion into bile and elimination in feces.

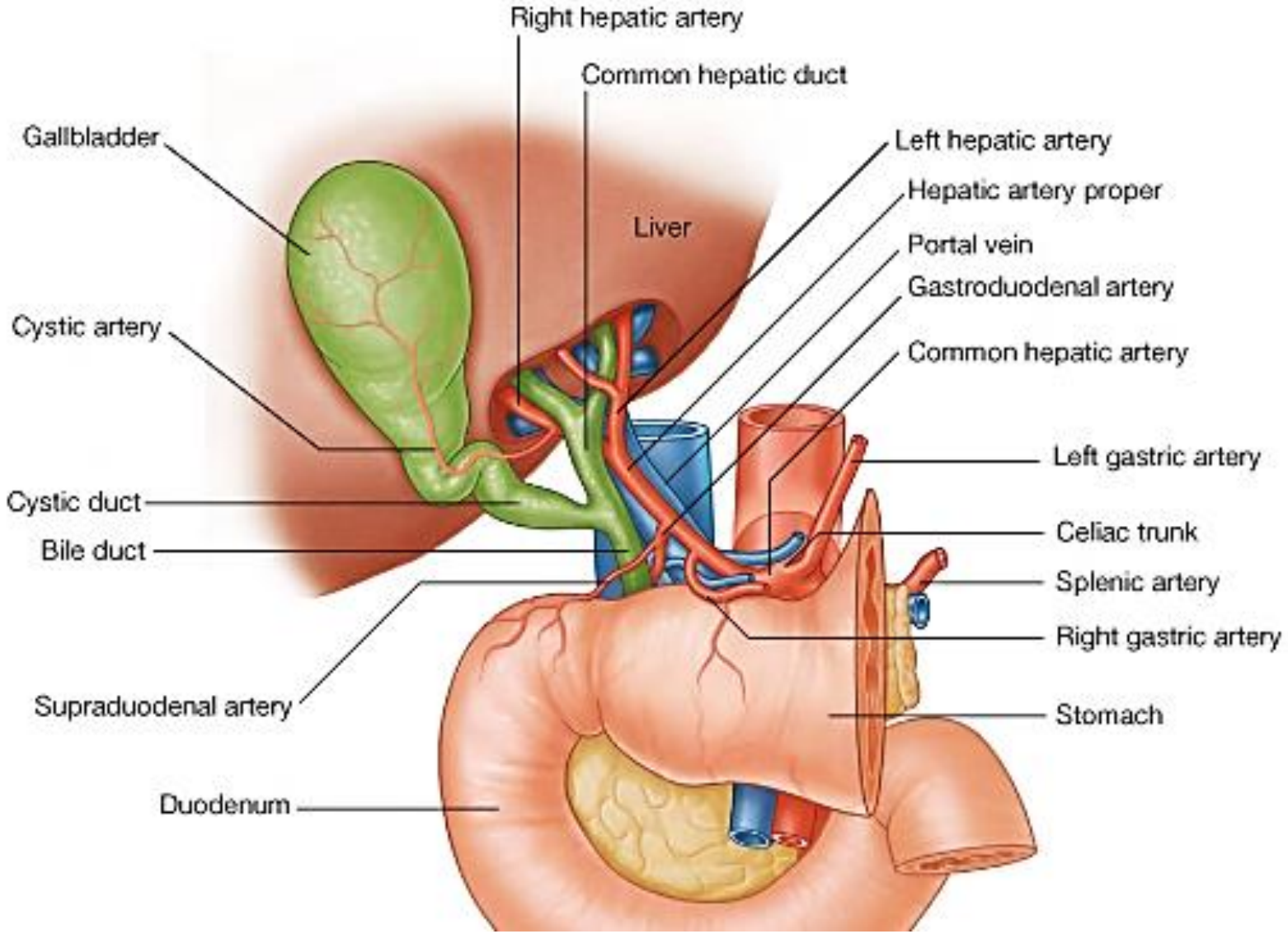
Relations



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

Blood supply within triangle of Calot



- Venous drainage:
  - either through:
    - small veins that enter directly into the liver
    - large cystic vein that carries blood back to the portal vein (rarely)
- lymphatic drainage
  - nodes at the neck of the gallbladder.
  - Frequently, a visible lymph node overlies the insertion of the cystic artery into the gallbladder wall.
- Nerve supply:
  - vagus
  - sympathetic branches that pass through the celiac plexus

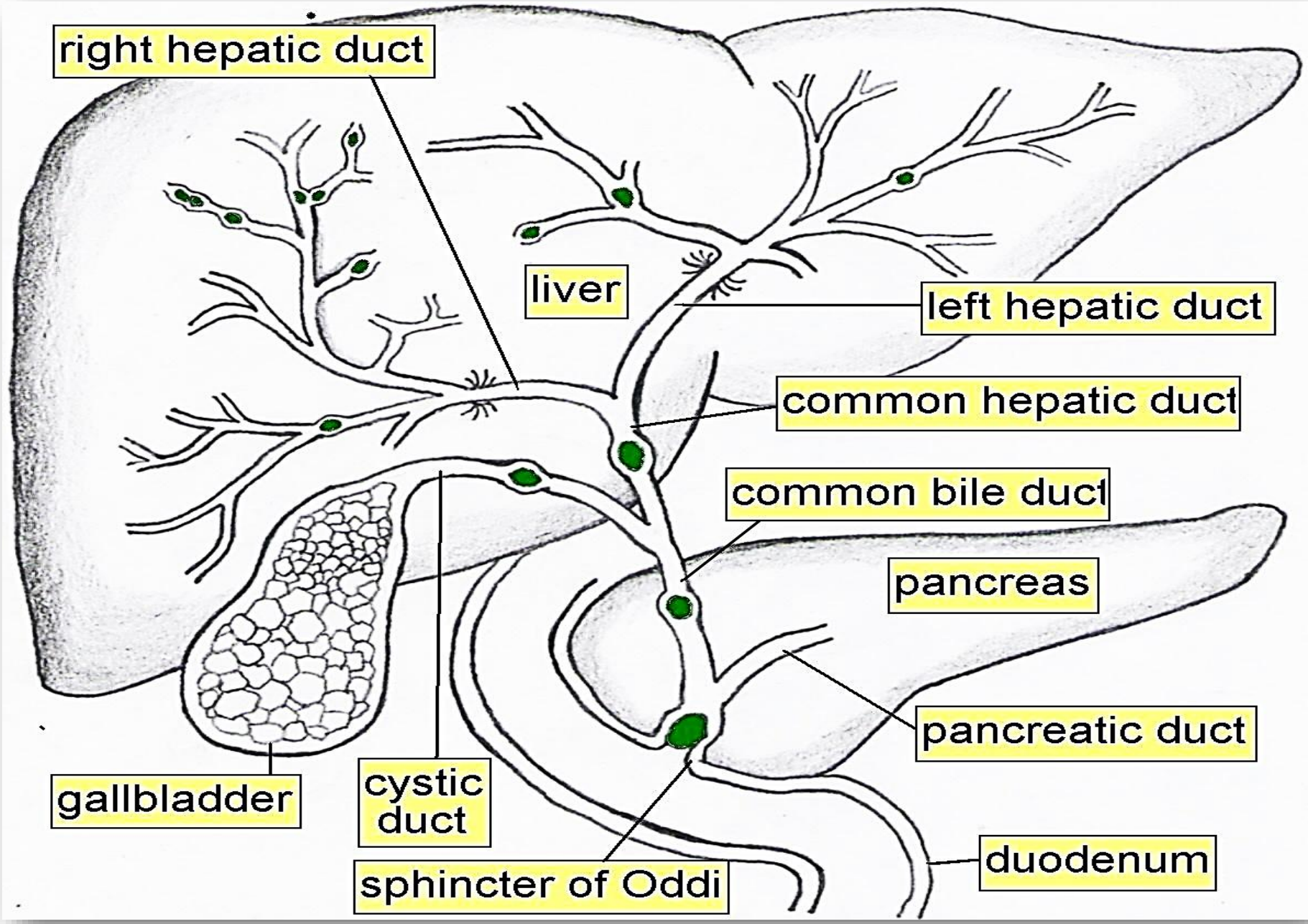
Bile ducts

Intrahepatic

- formed from the larger bile canaliculi which come together to form segmental ducts.
- fuse close to the porta hepatis into right and left hepatic ducts.

Extrahepatic

- right and left hepatic ducts
- the common hepatic duct
- cystic duct
- common bile duct or choledochus.
- The common bile duct enters the second portion of the duodenum through a muscular structure, the sphincter of Oddi

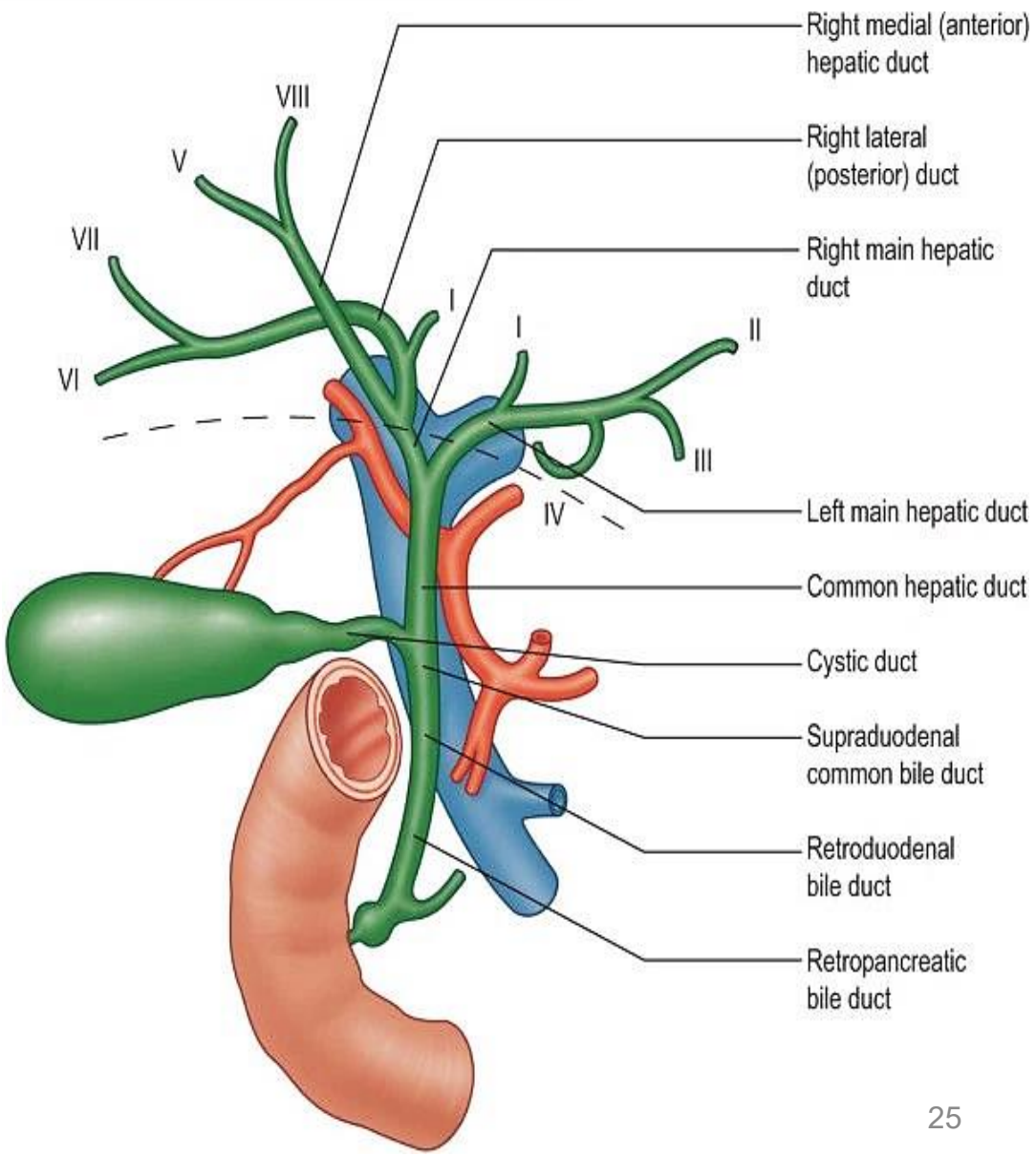

right hepatic duct
liver
left hepatic duct
common hepatic duct
common bile duct
pancreas
pancreatic duct
gallbladder
cystic duct
sphincter of Oddi
duodenum

common hepatic duct

- 1 to 4 cm in length and
- approximately 4 m of diameter

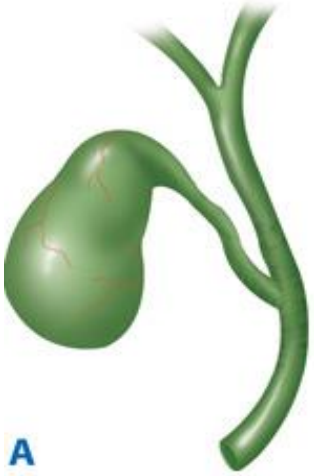
- lies in :
  - front of the portal vein
  - to the right of the hepatic artery.

- The common hepatic duct is joined at an acute angle by the cystic duct to form the common bile duct.



cystic duct

- length is quite variable
- **Variations** of the cystic duct and its point of union with the common hepatic duct are surgically important.

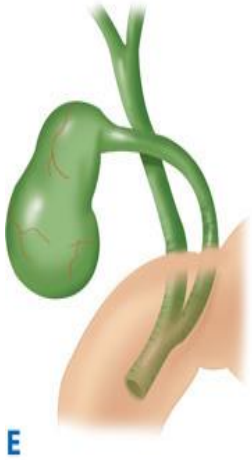


A. Low junction between the cystic duct and common hepatic duct

B. Cystic duct adherent to the common hepatic duct

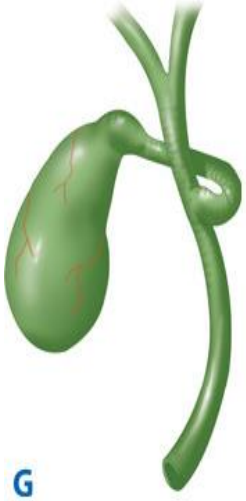
C. High junction between the cystic and the common hepatic duct

D. Cystic duct drains into right hepatic duct.

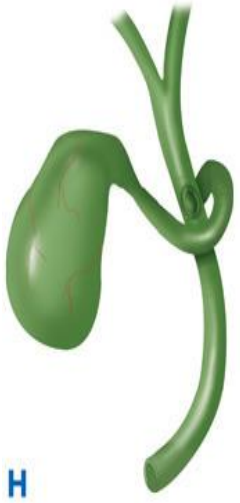


E. Long cystic duct that joins common hepatic duct behind the duodenum

F. Absence of cystic duct.



G. Cystic duct crosses posterior to common hepatic duct and joins it anteriorly.



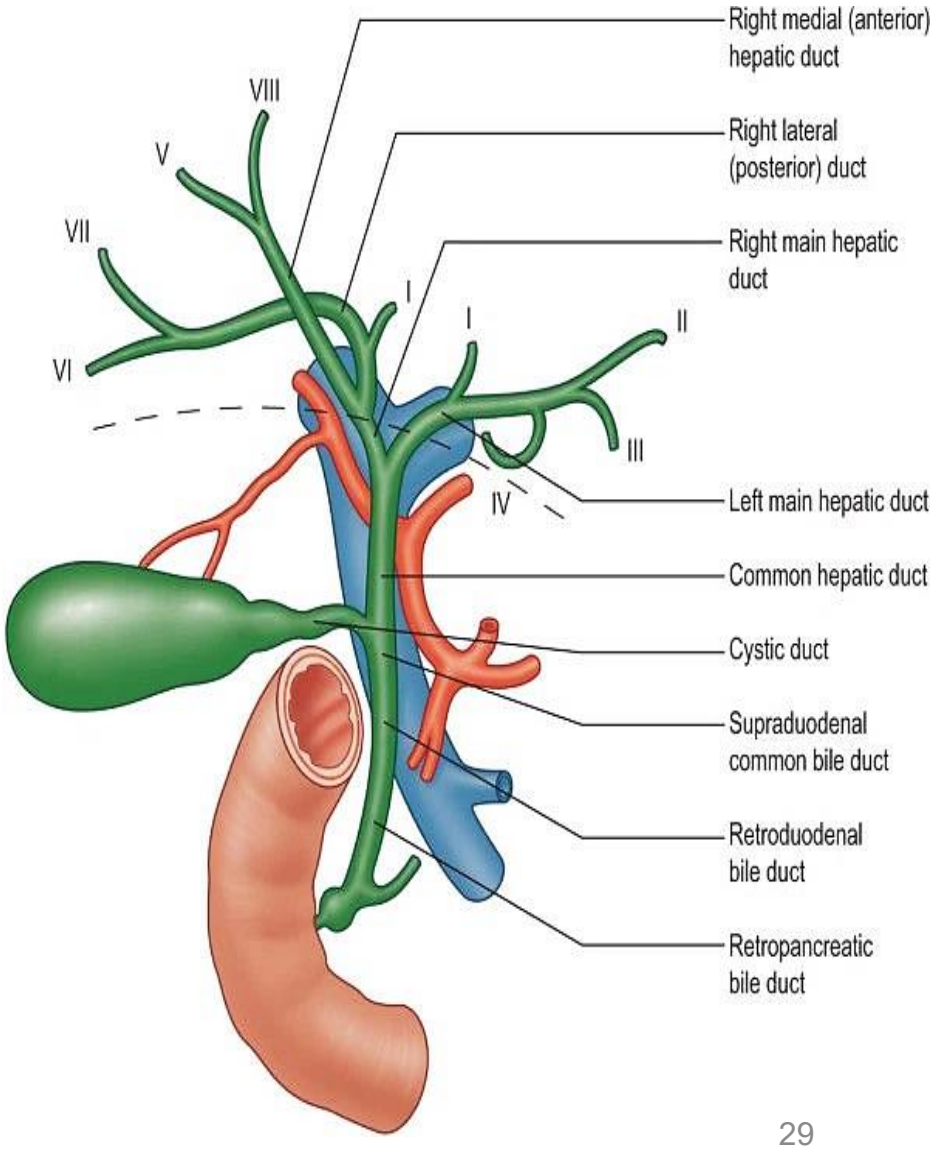
H. Cystic duct courses anterior to common hepatic duct and joins it posteriorly

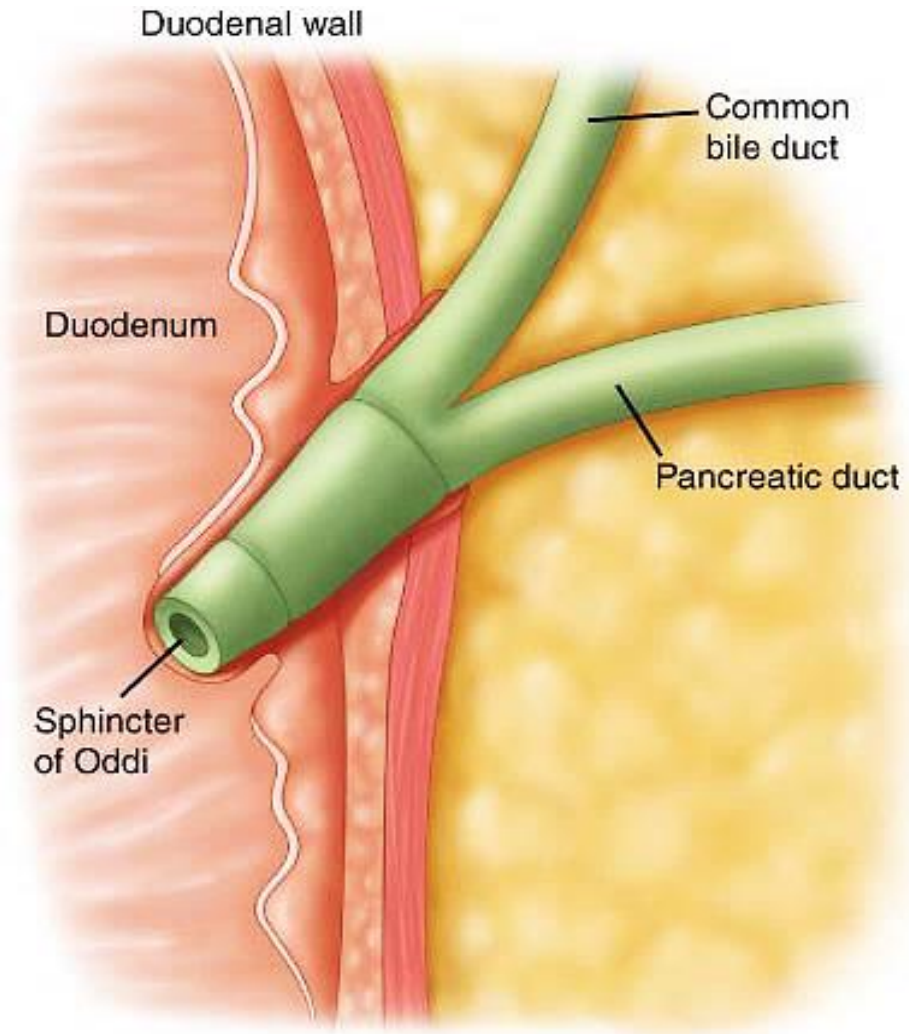
common bile duct CBD

- about 7 to 11 cm in length
- 5 to 10 mm in diameter.

- The upper third (supraduodenal)
- The middle third (retroduodenal)
- The lower third (pancreatic)

- Runs obliquely downward within the wall of the duodenum for 1 to 2 cm before opening on a papilla of mucous membrane (ampulla of Vater).





Source: Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB, Pollock RE: *Schwartz's Principles of Surgery, 9th Edition:* http://www.accessmedicine.com

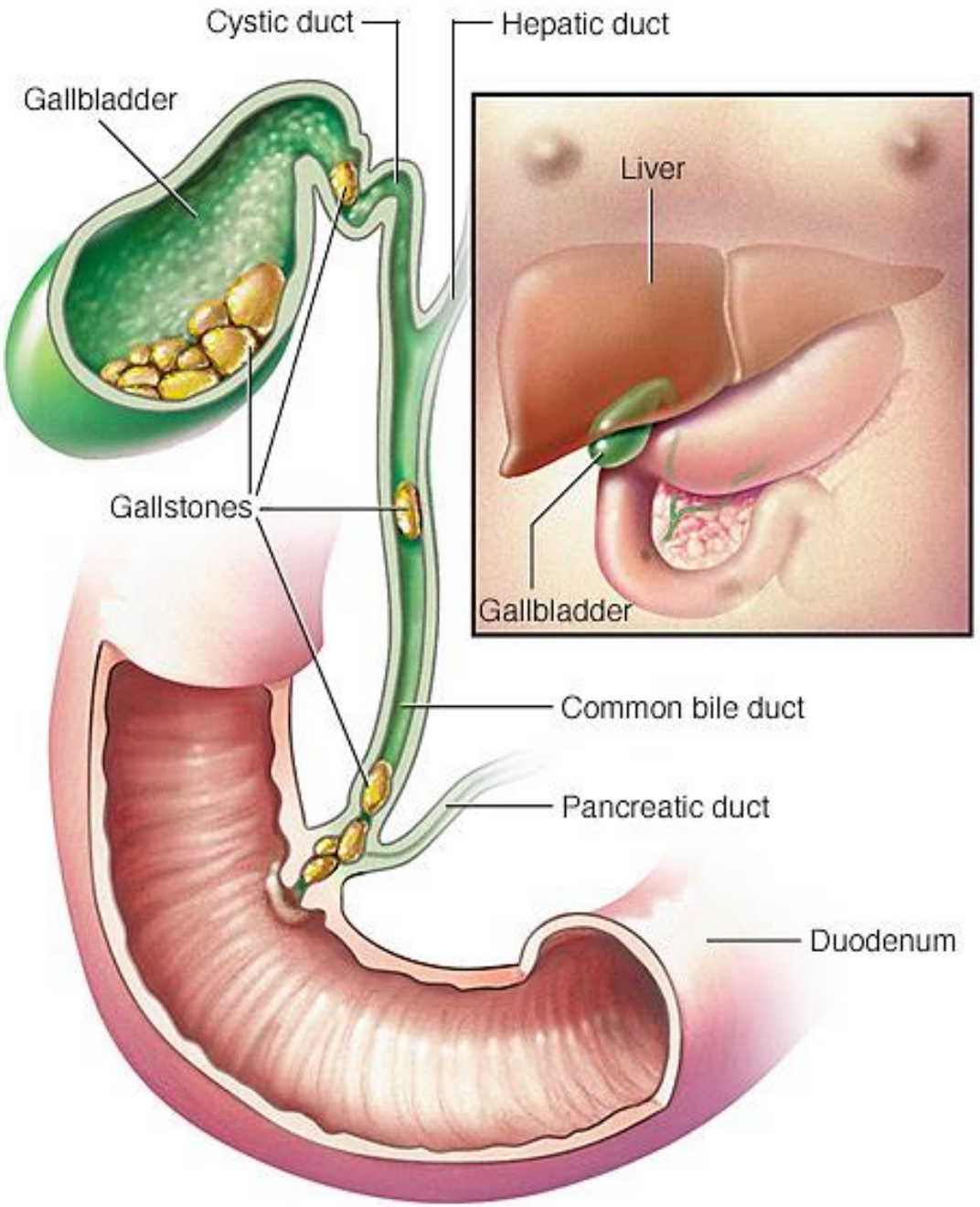
Copyright © The McGraw-Hill Companies, Inc. All rights reserved.

The common bile duct enters the second portion of the duodenum through a muscular structure, the sphincter of Oddi

union of the common bile duct and the main pancreatic duct

- The follows one of three configurations:
  - In about 70%
    - unite outside the duodenal wall and traverse the duodenal wall as a single duct.
  - In about 20%,
    - they join within the duodenal wall and have a short or no common duct, but open through the same opening into the duodenum.
  - In about 10%,
    - they exit via separate openings into the duodenum.

Gall Stones



© MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED.