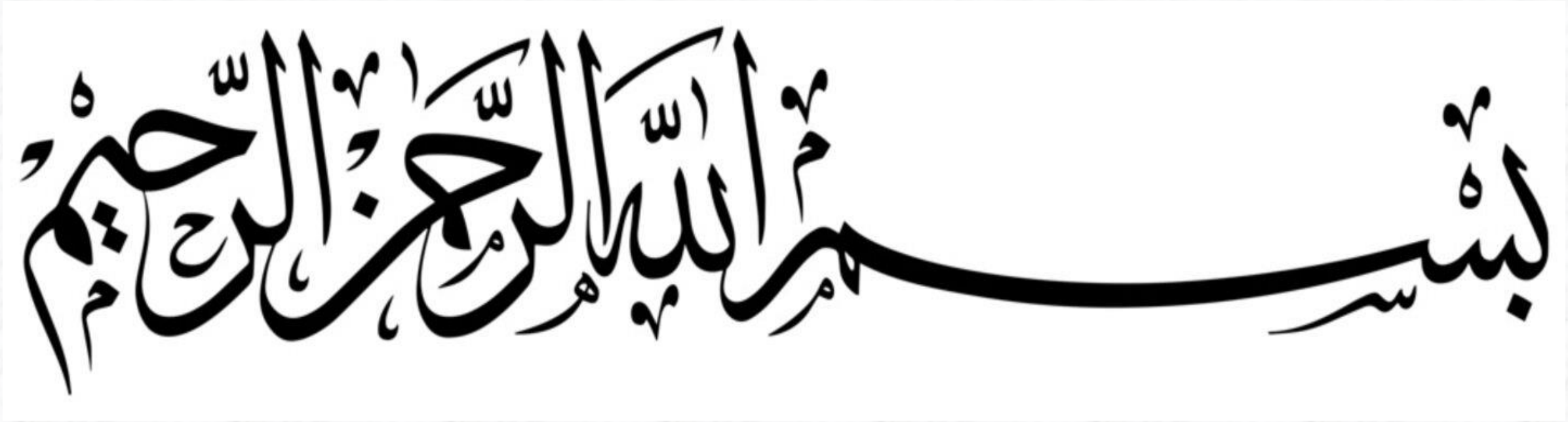

بسم الله الرحمن الرحيم

Anatomy of the liver

Dr Mahvish javed 22.4.2022

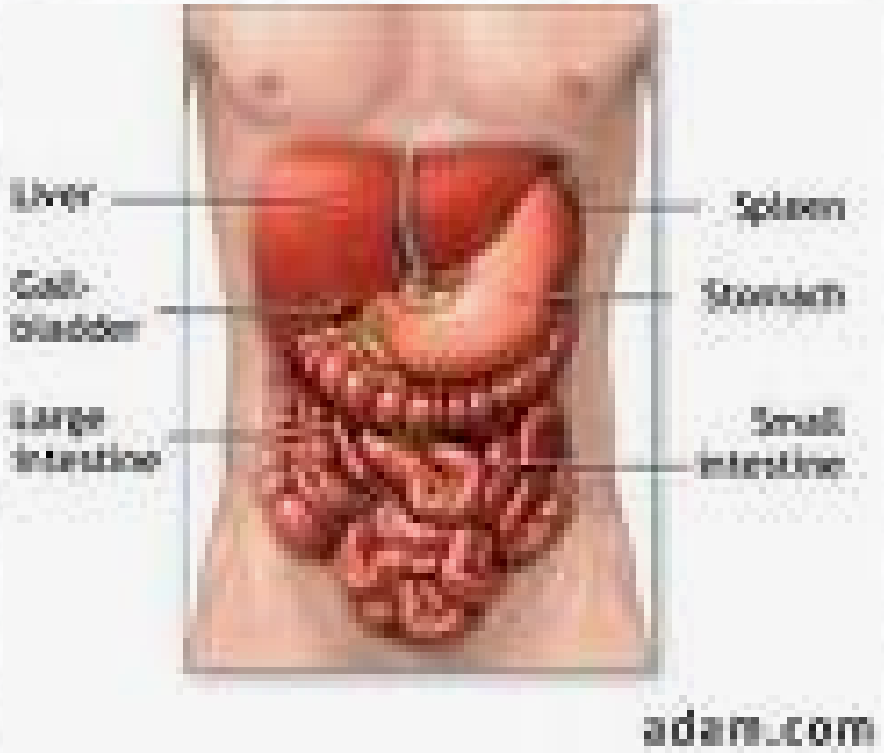
Liver

- The liver is the largest gland in the body and has a wide variety of functions
- Weight: 1/50 of body weight in adult (1.5kg) & 1/20 of body weight in infant

Function of the liver

- Secretion of bile & bile salt
- Metabolism of carbohydrate, fat and protein
- Formation of heparin & anticoagulant substances
- Detoxification
- Storage of glycogen and vitamins
- Activation of vita .D

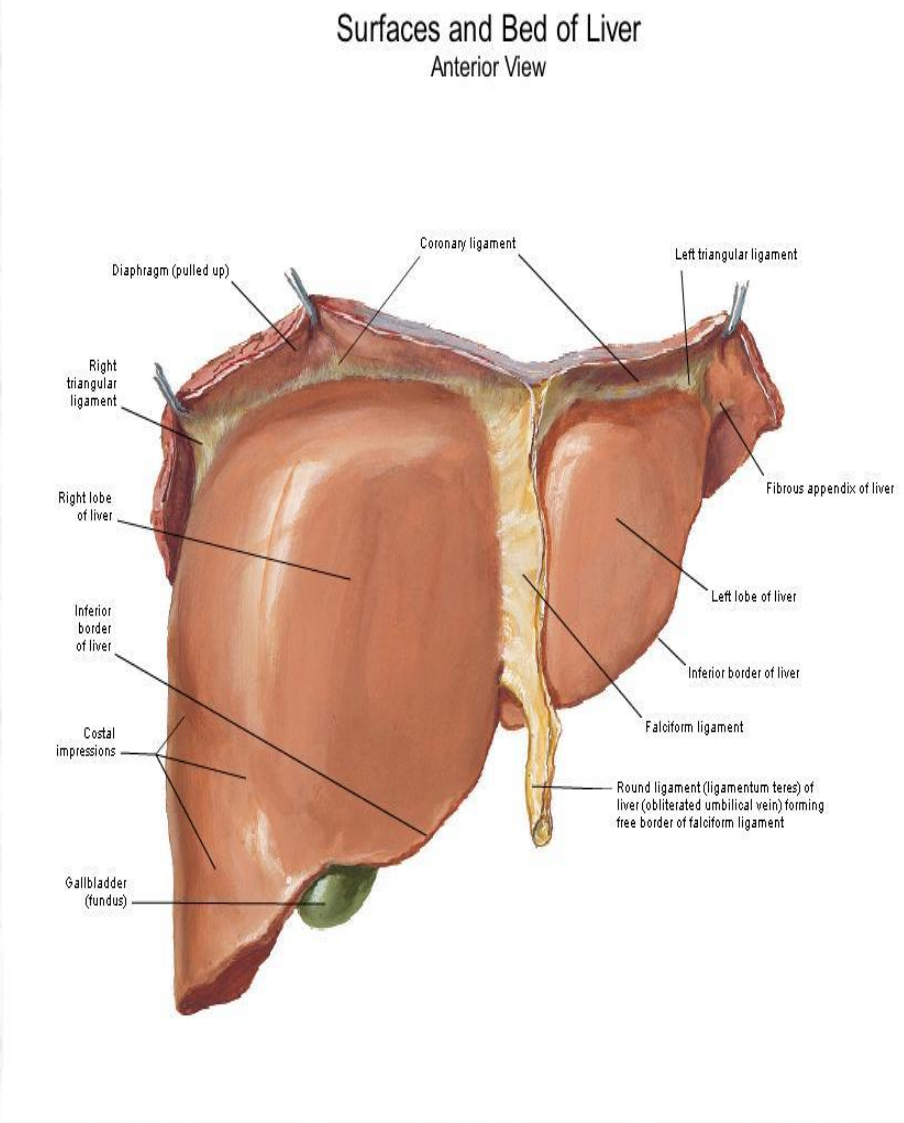
Location …



- **Occupies right hypochondrium + epigastrium …**
- **May extends to left hypochondrium…**

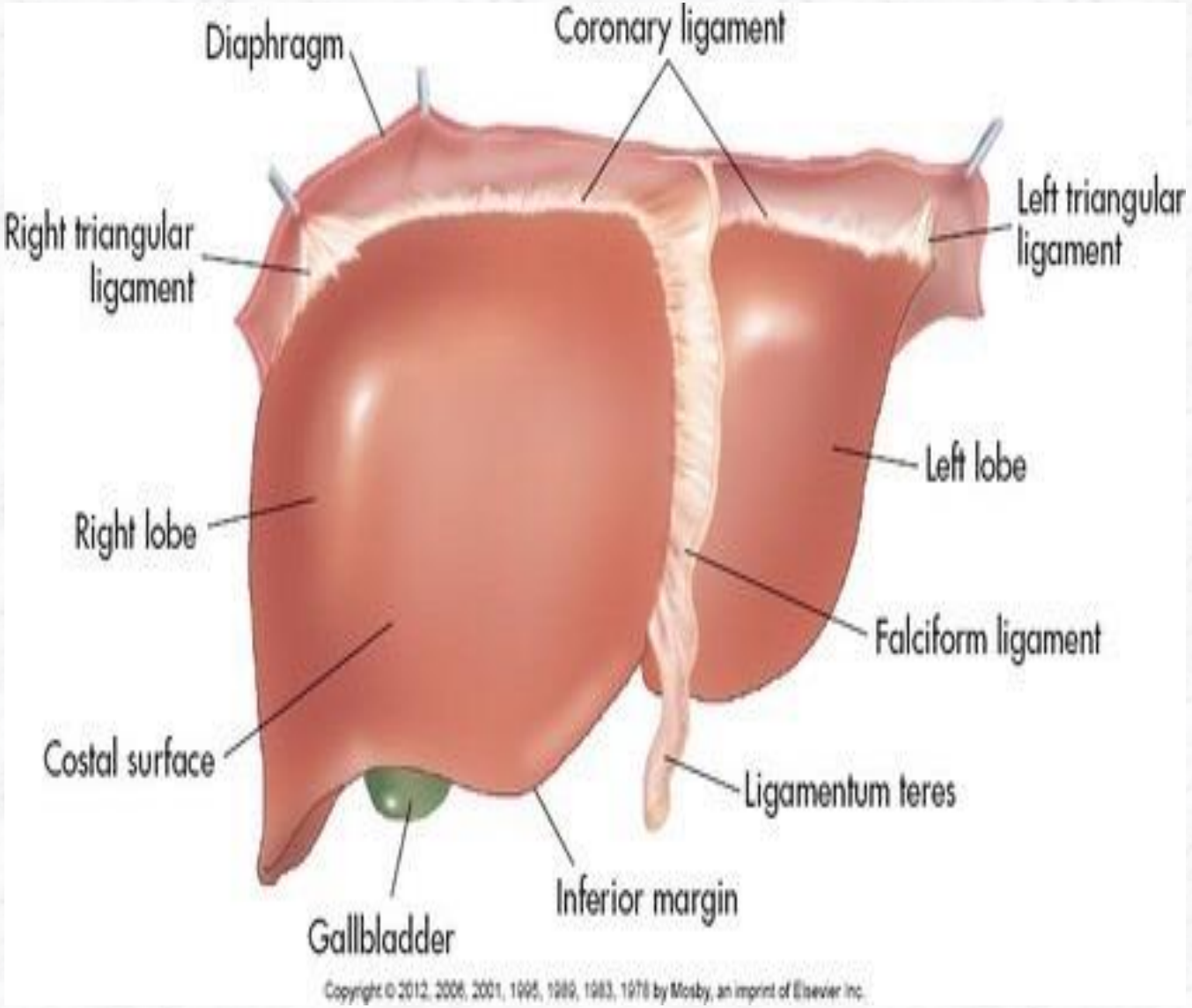
Surfaces of the liver, their relations & impressions

- Postero - inferior surface= visceral surface
- Superior surface = Diaphragmatic surface



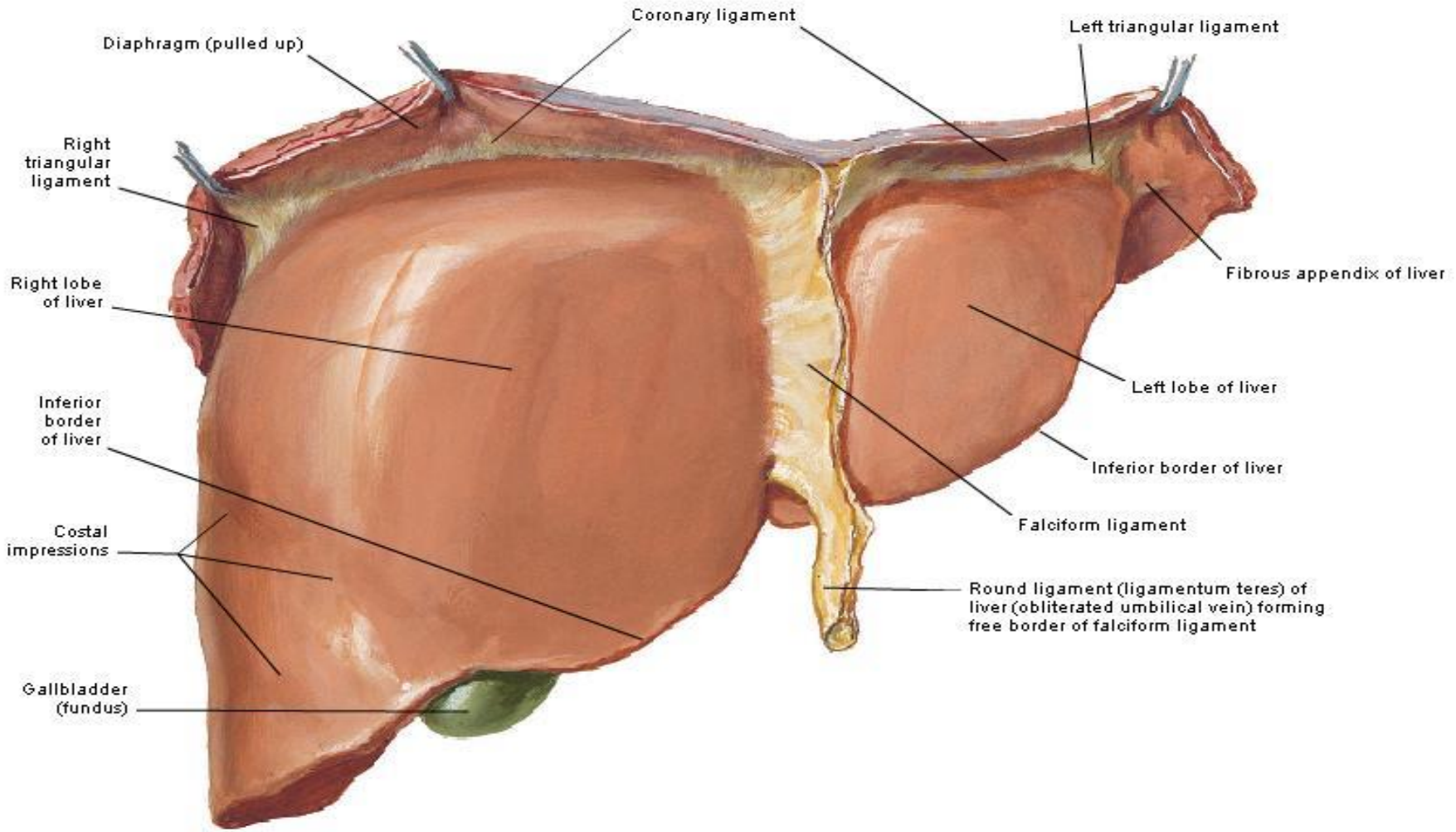
Ant. View of the liver

- Right lobe
- Left lobe
- Cut edge of the Falciform ligament left lobe
- Diverging cut edges of the superior part of the coronary ligament
- Fundus of the gall bladder
- Costal impression



Surfaces and Bed of Liver

Anterior View

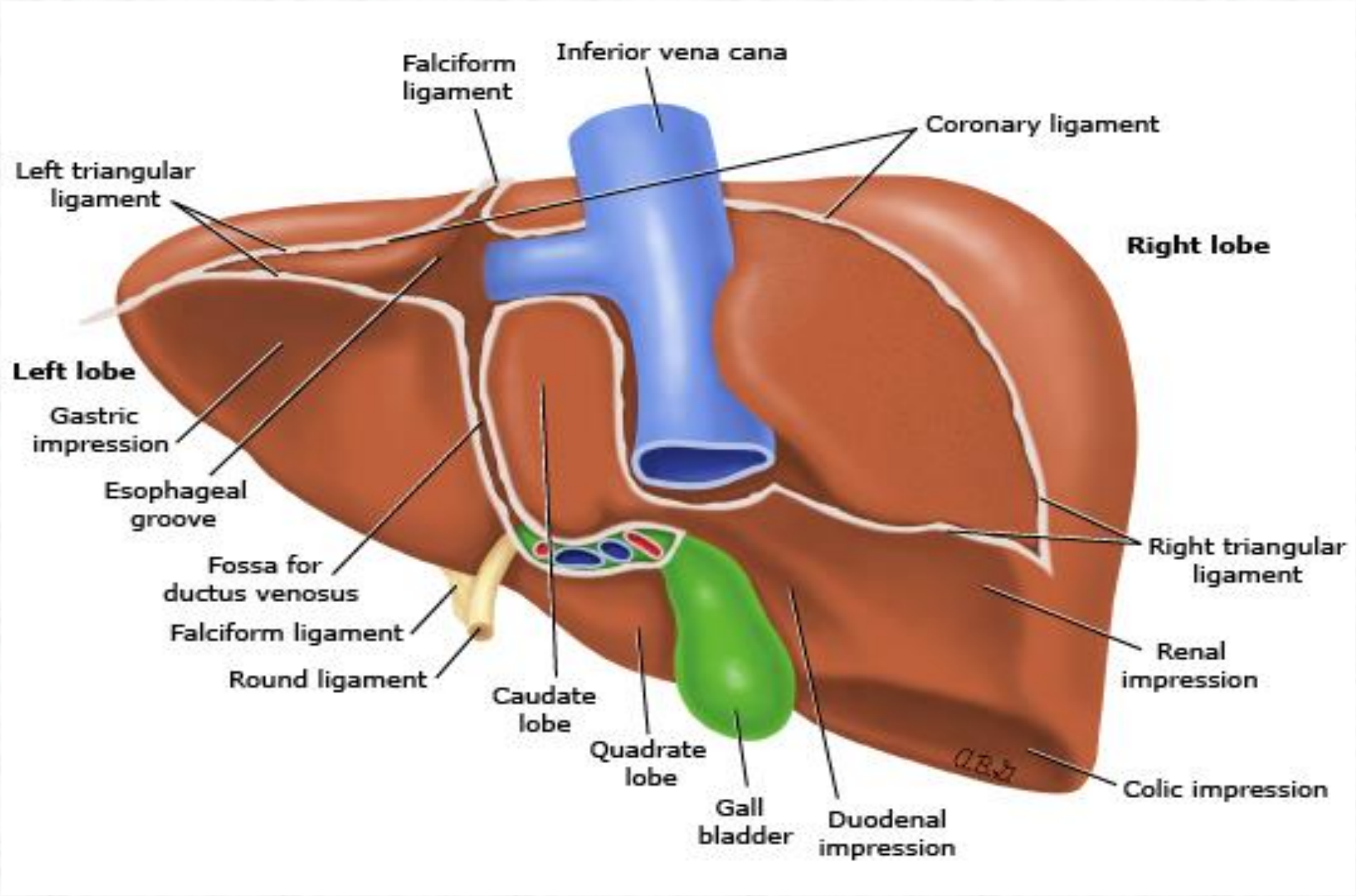


Relations of the liver Anteriorly

- Diaphragm
- Rt & Lt pleura and lung
- Costal cartilage
- Xiphoid process
- Ant. abdominal wall

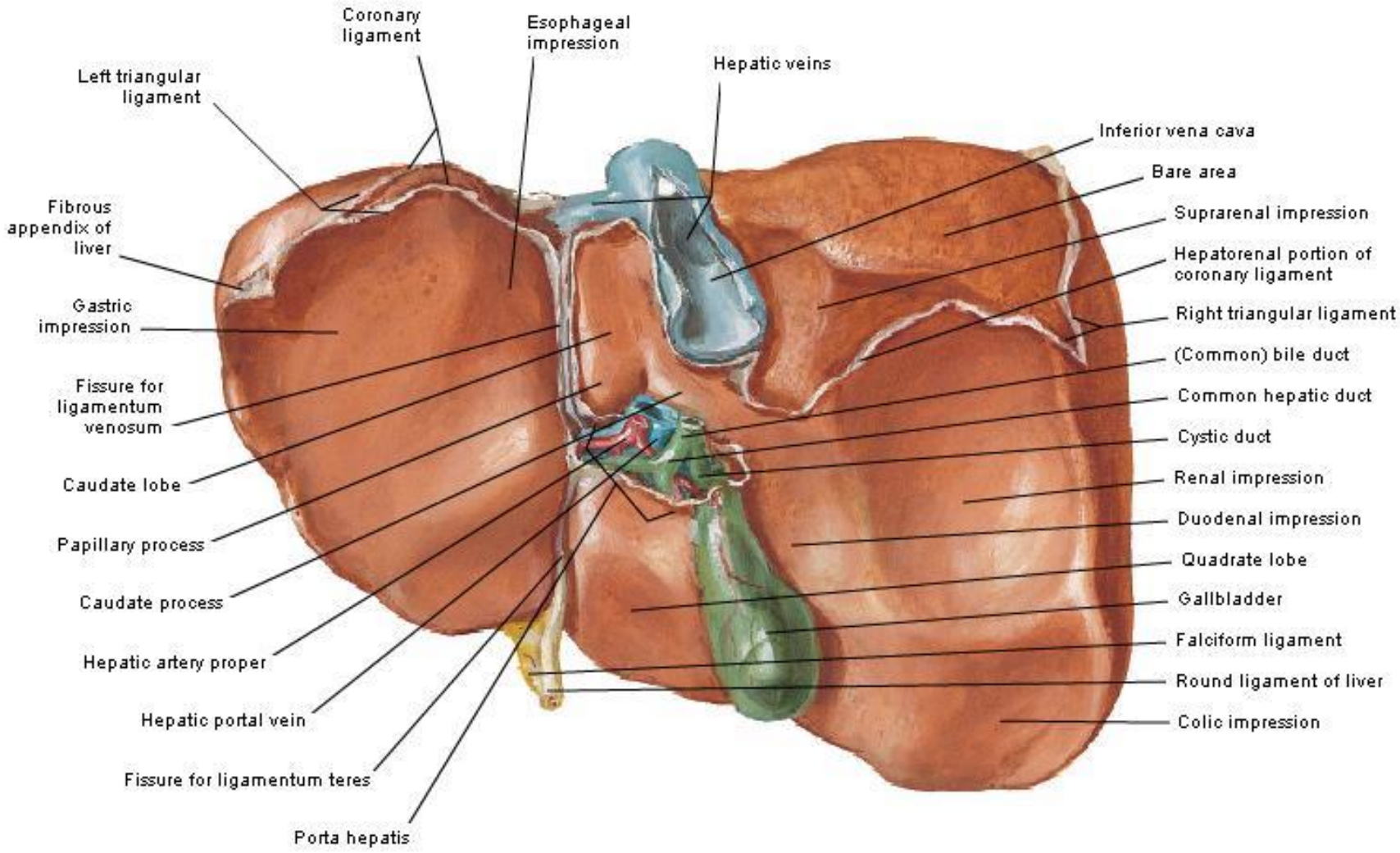
Postero- infero surface= visceral surface

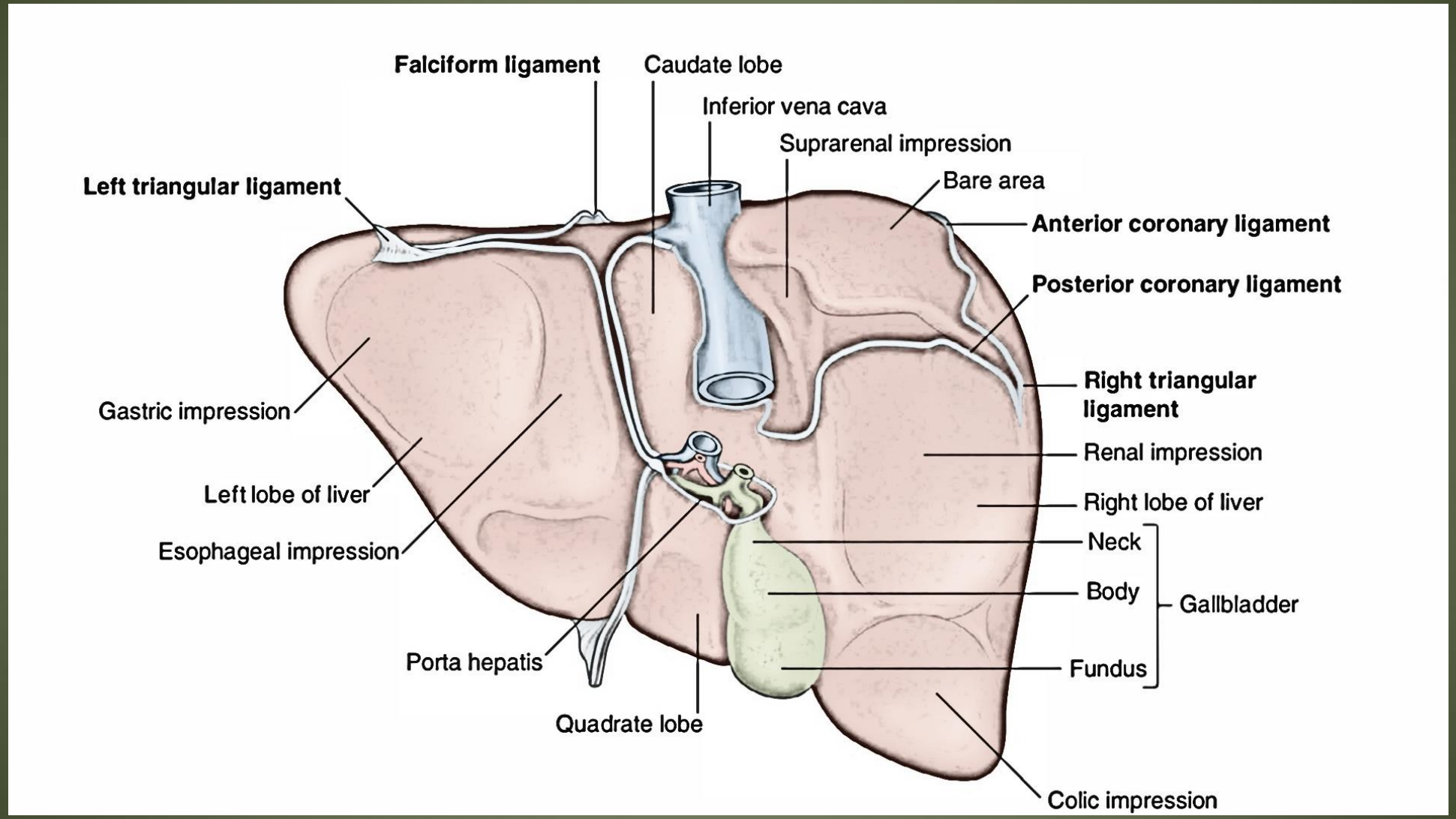
- I.V.C
- Esophagus
- Stomach
- Duodenum
- Right colic flexure
- Right kidney
- Rt. Suprarenal gland
- Gallbladder.
- Porta hepatic(bile duct,H.a.H.V)
- Fissure for lig. Venoosum & lesser omentum
- Lig.teres


Falciform ligament
Inferior vena cana
Coronary ligament
Left triangular ligament
Right lobe
Left lobe
Gastric impression
Esophageal groove
Fossa for ductus venosus
Falciform ligament
Round ligament
Caudate lobe
Quadrate lobe
Gall bladder
Duodenal impression
Right triangular ligament
Renal impression
Colic impression

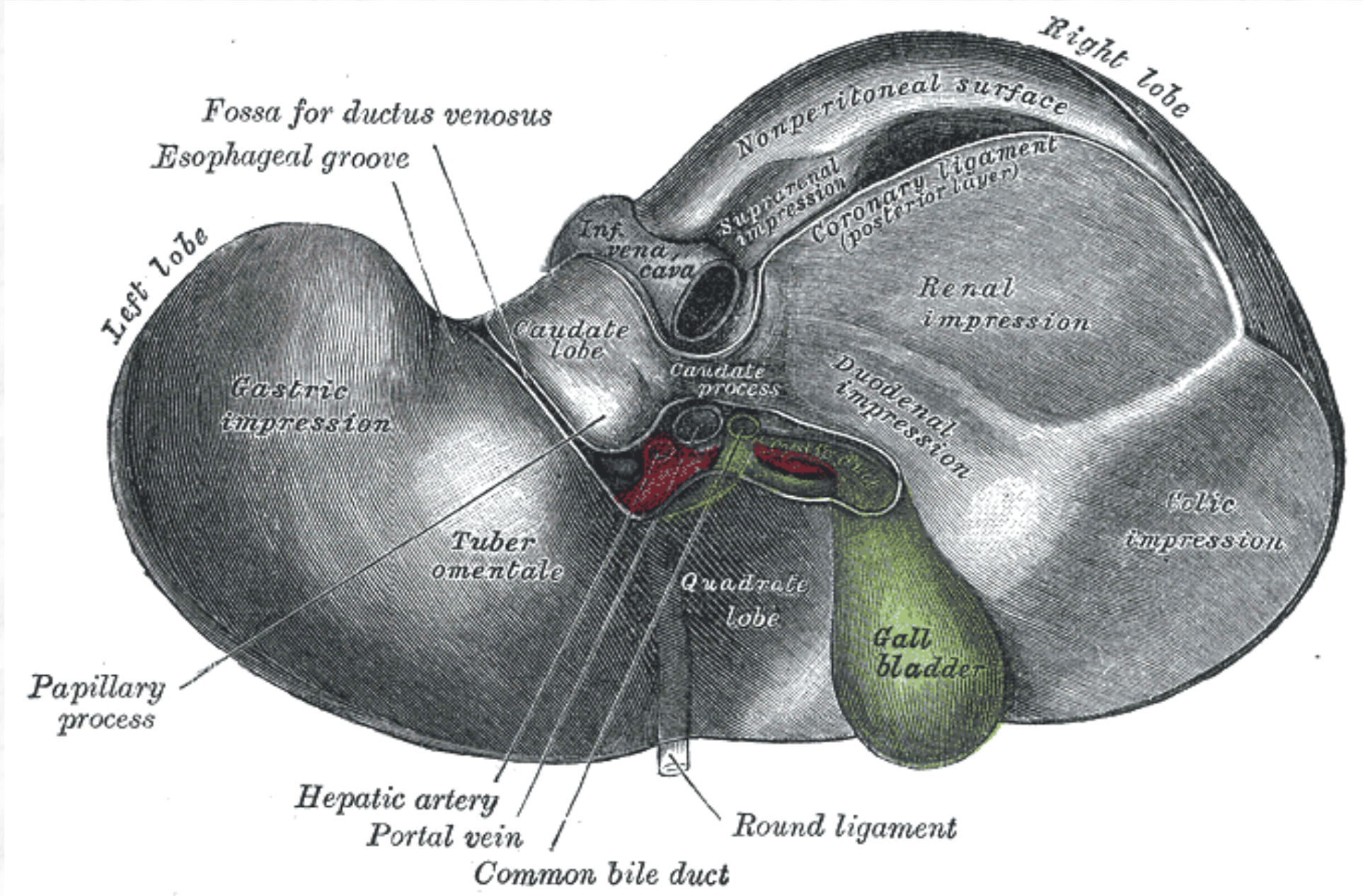
Surfaces and Bed of Liver

Visceral Surface



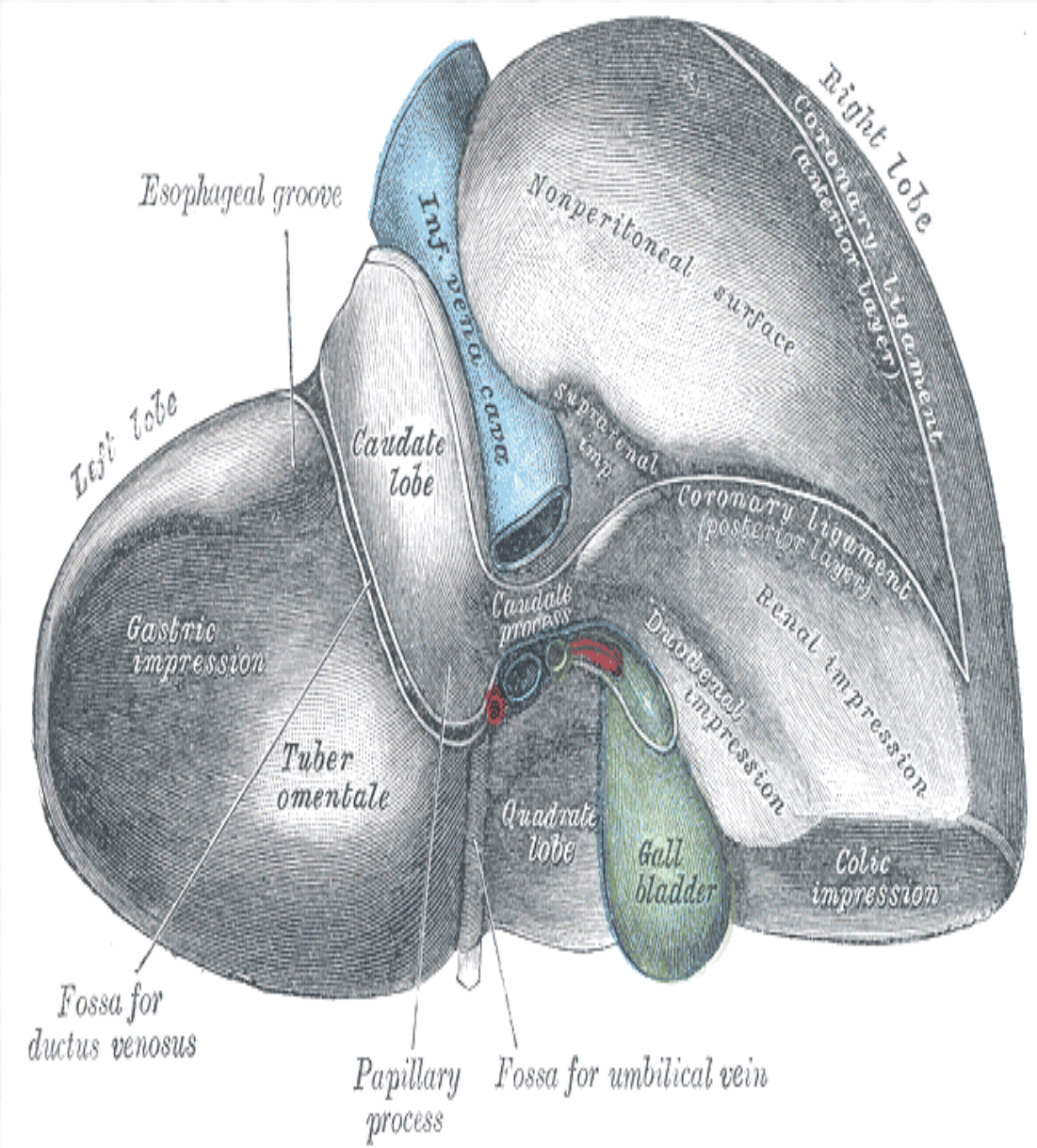

Falciform ligament
Caudate lobe
Inferior vena cava
Suprarenal impression
Bare area
Left triangular ligament
Anterior coronary ligament
Posterior coronary ligament
Right triangular ligament
Gastric impression
Renal impression
Left lobe of liver
Right lobe of liver
Esophageal impression
Neck
Body
Gallbladder
Porta hepatis
Fundus
Quadrate lobe
Colic impression

Postero-inferior surface of the liver



Posterior relation of the liver

- Diaphragm
- Rt. Kidney
- Supra renal gland
- T.colon (hepatic flexure)
- Duodenum
- Gall bladder
- I.V.C
- Esophagus
- Fundus of stomach

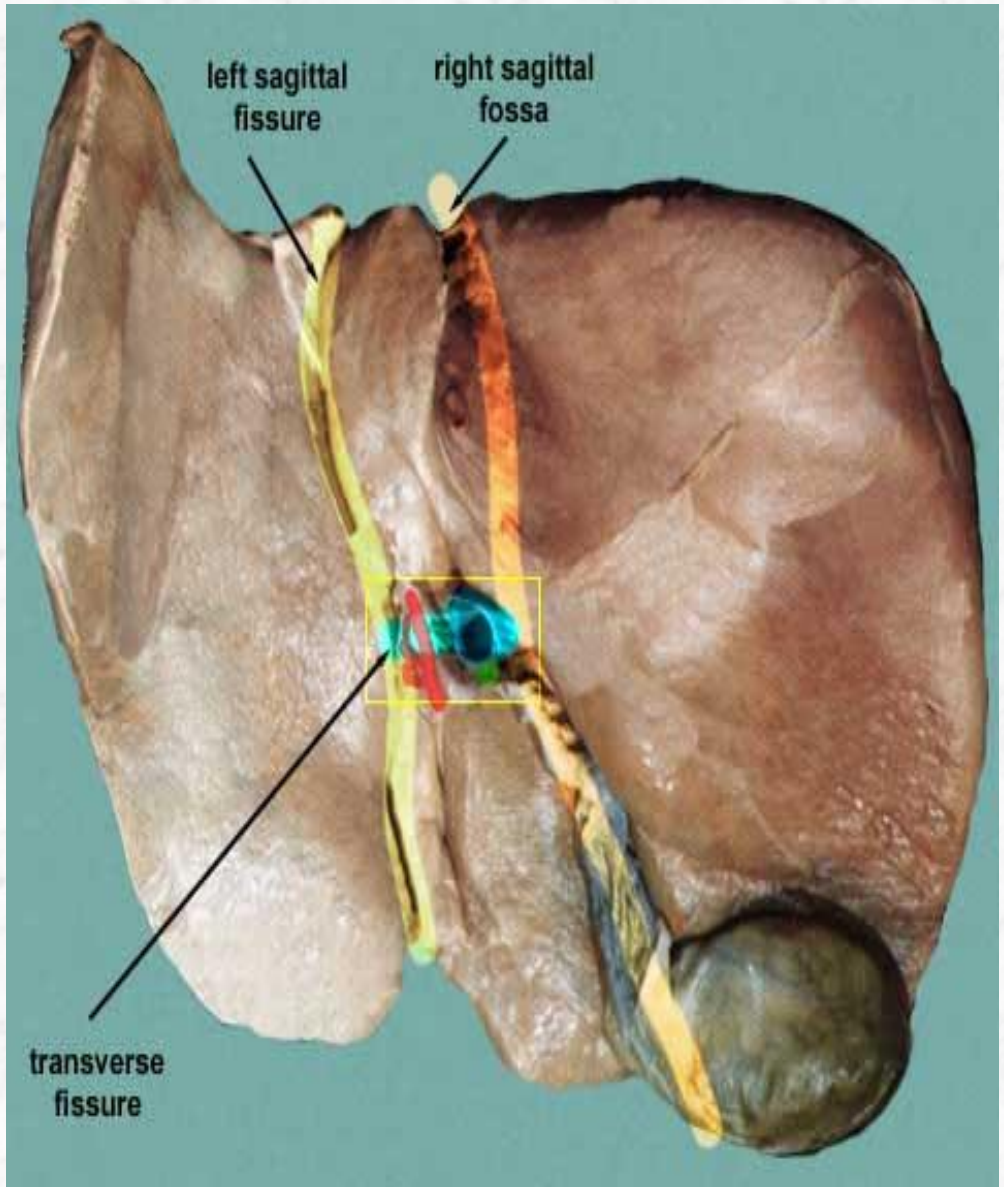


Lobes of the liver

- Rt. Lobe
- Lt .lobe
- Quadrate lobe
- Caudate lobe

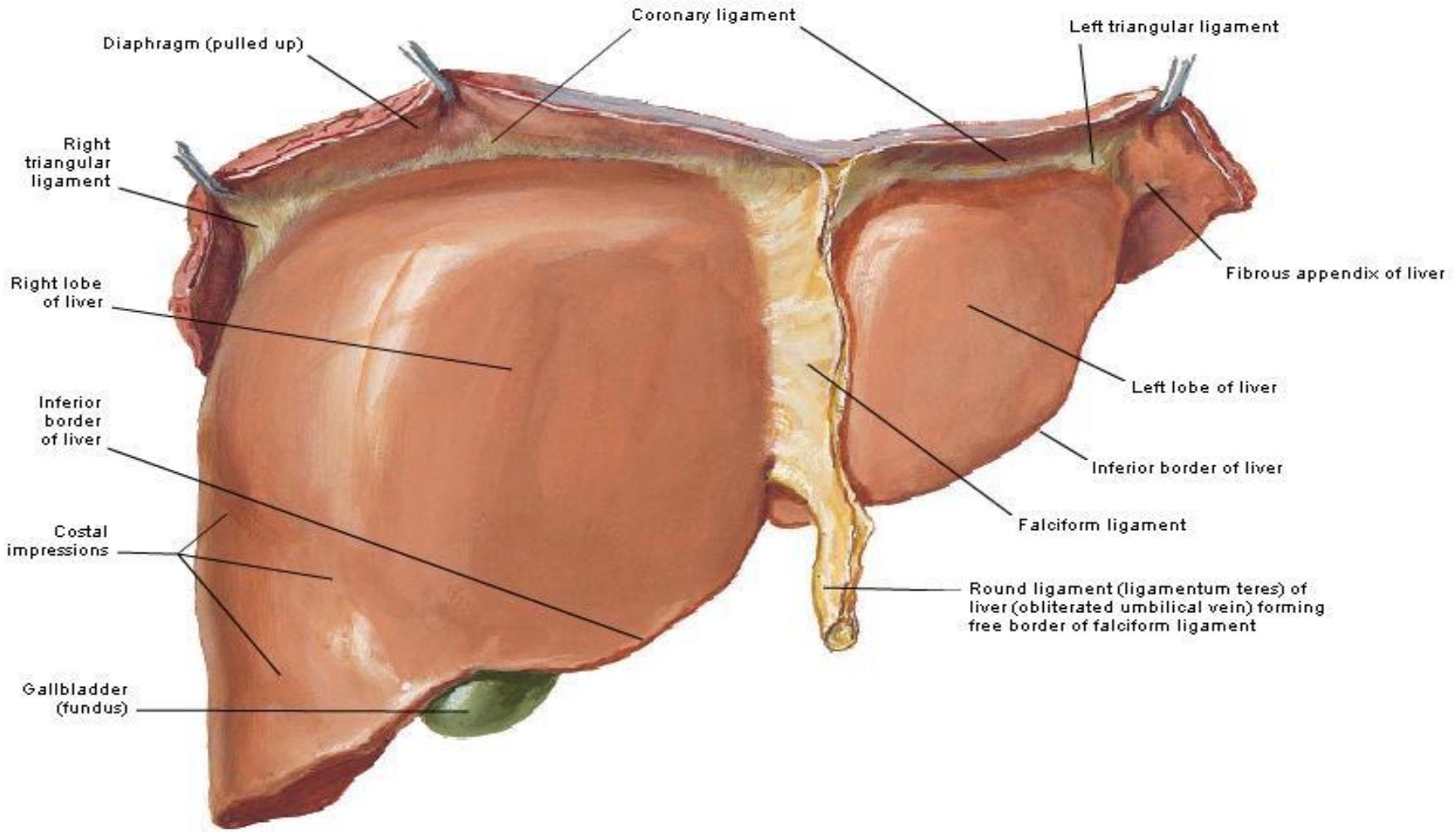
Separation of the four lobes of the liver (Visceral)

1) Right sagittal fossa - groove for inferior vena cava and gall bladder
2) left sagittal fissure - contains the Ligamentum Venoosum and round ligament of liver
3) Transverse fissure (also porta hepatis) - bile ducts, portal vein, hepatic arteries



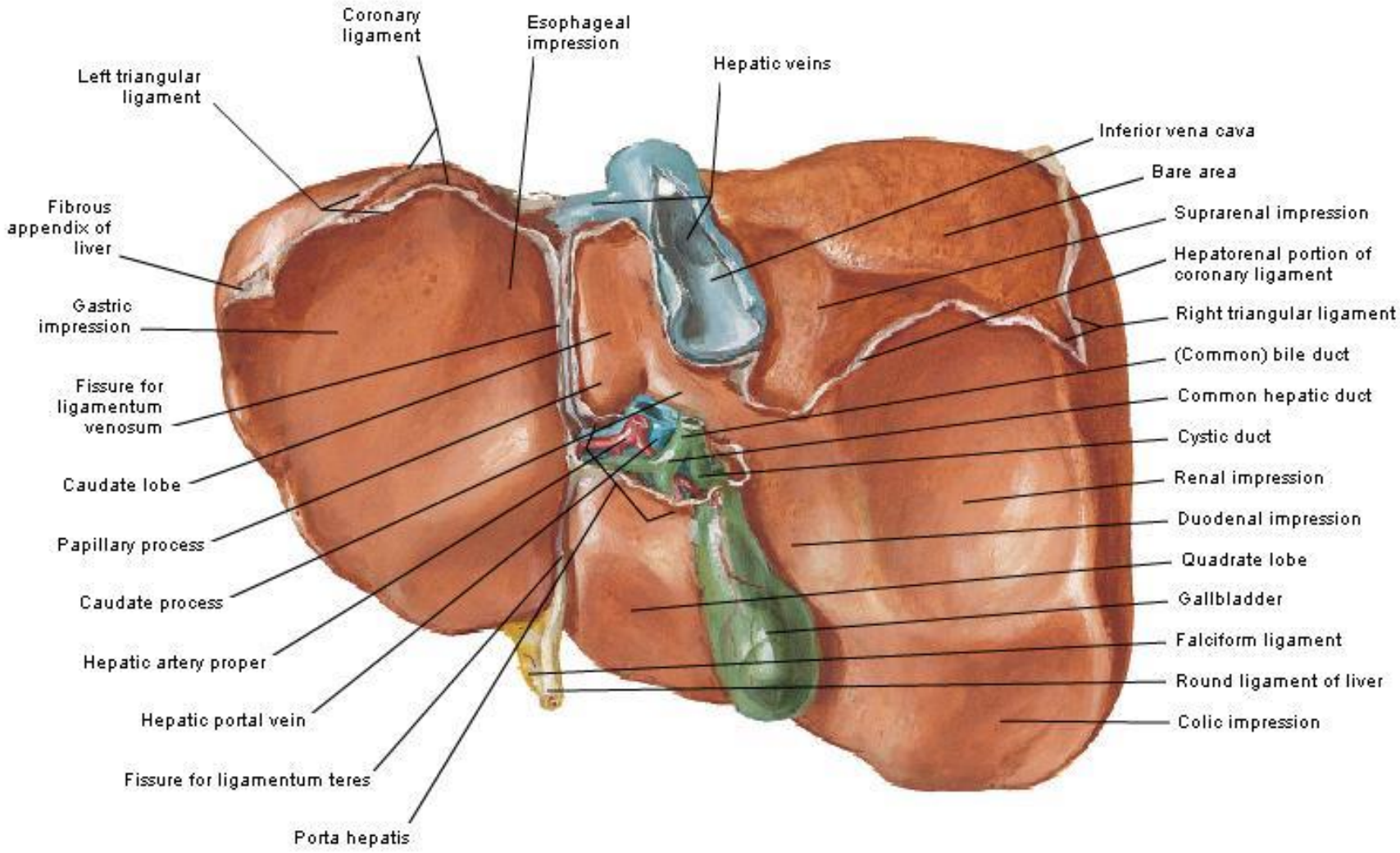
Surfaces and Bed of Liver

Anterior View



Surfaces and Bed of Liver

Visceral Surface



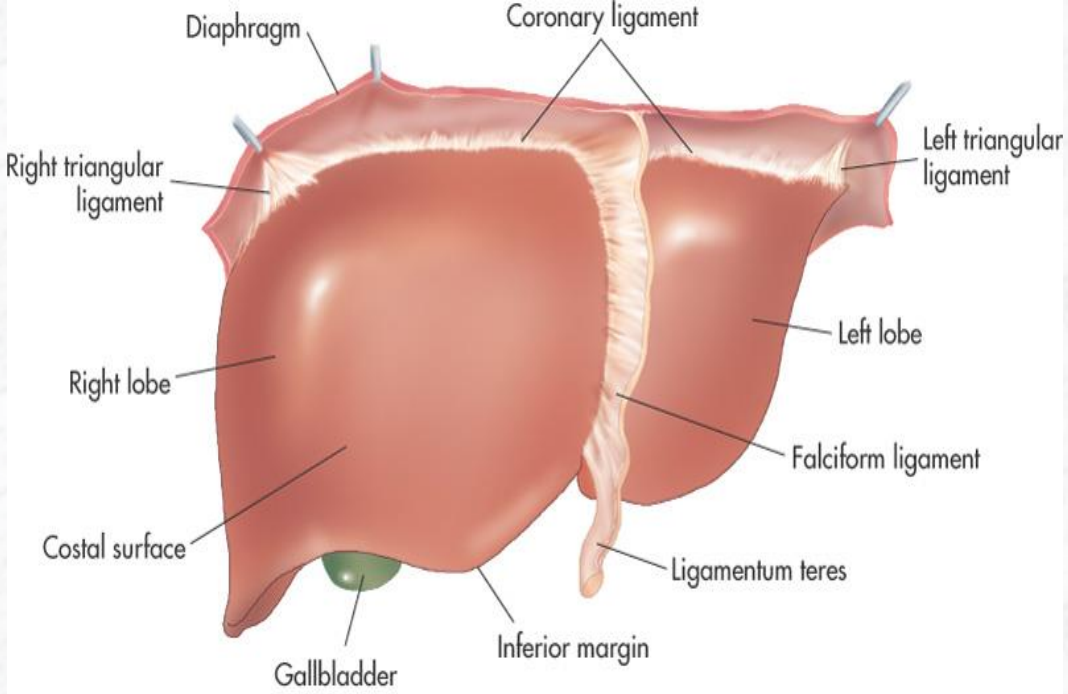
Rt. Lobe

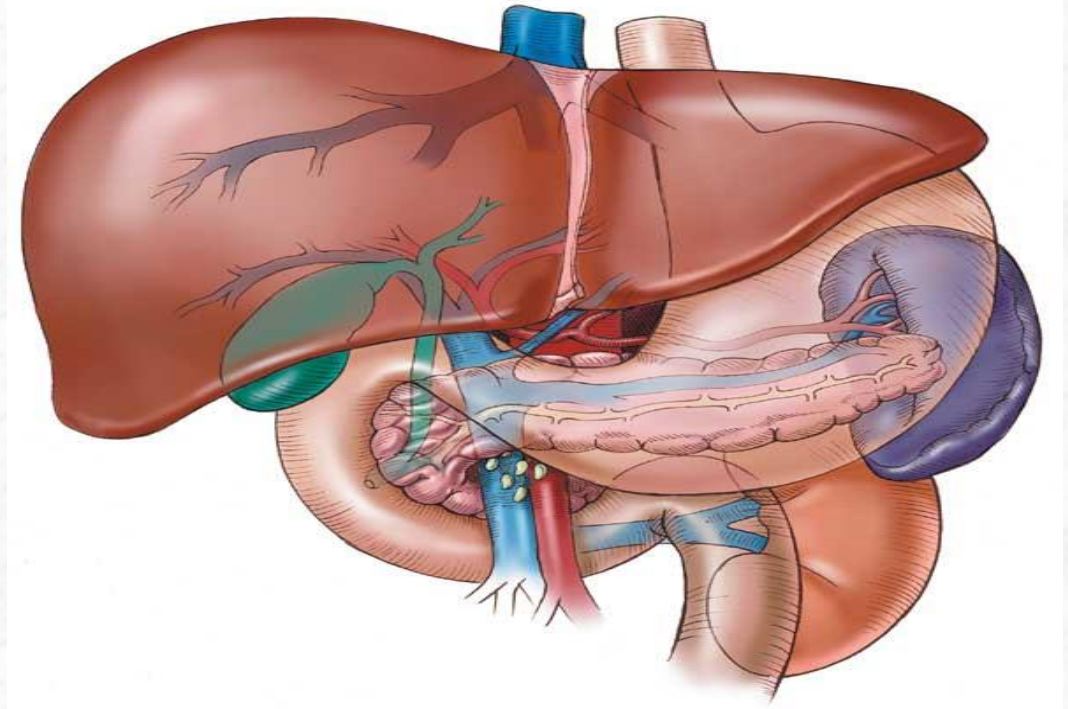
-Largest lobe

-Occupies right hypochondrium

- Divided into anterior and posterior sections by the <u>right hepatic vein</u>

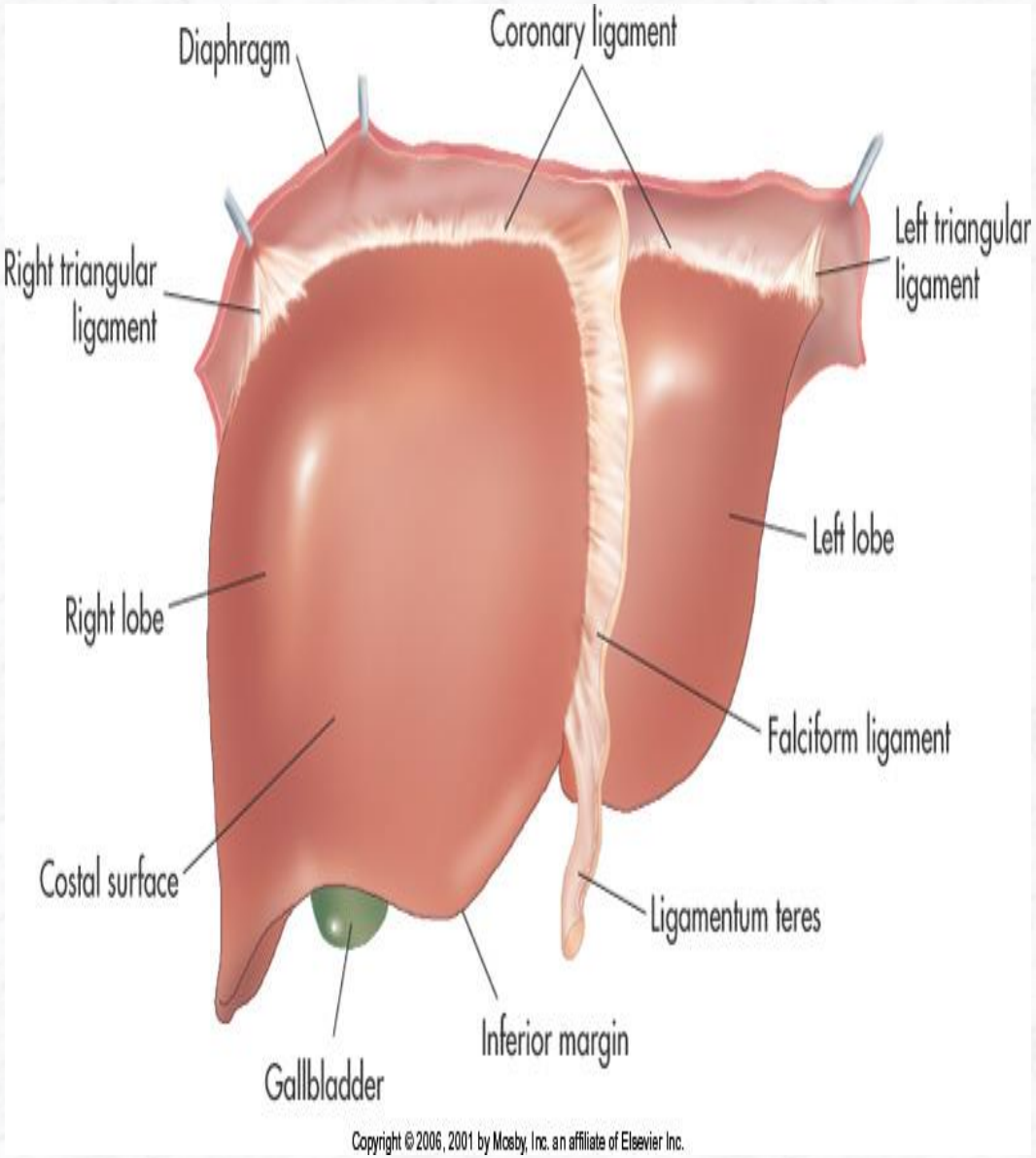
- <u>Riedel's Lobe</u> extend as far caudally as the iliac crest





Left Lobe

- Varied in size
- Lies in the epigastric and left hypochondriac regions
- Divided into lateral and medial segments by the left hepatic vein



Lobes of the liver…..cont

Rt. & Lt lobe separated by

- Falciform ligament
- Ligamentum Venosum
- Ligamentum teres

Caudate Lobe

-present in the posterior surface from the Rt. Lobe

Two processes

1- caudate process

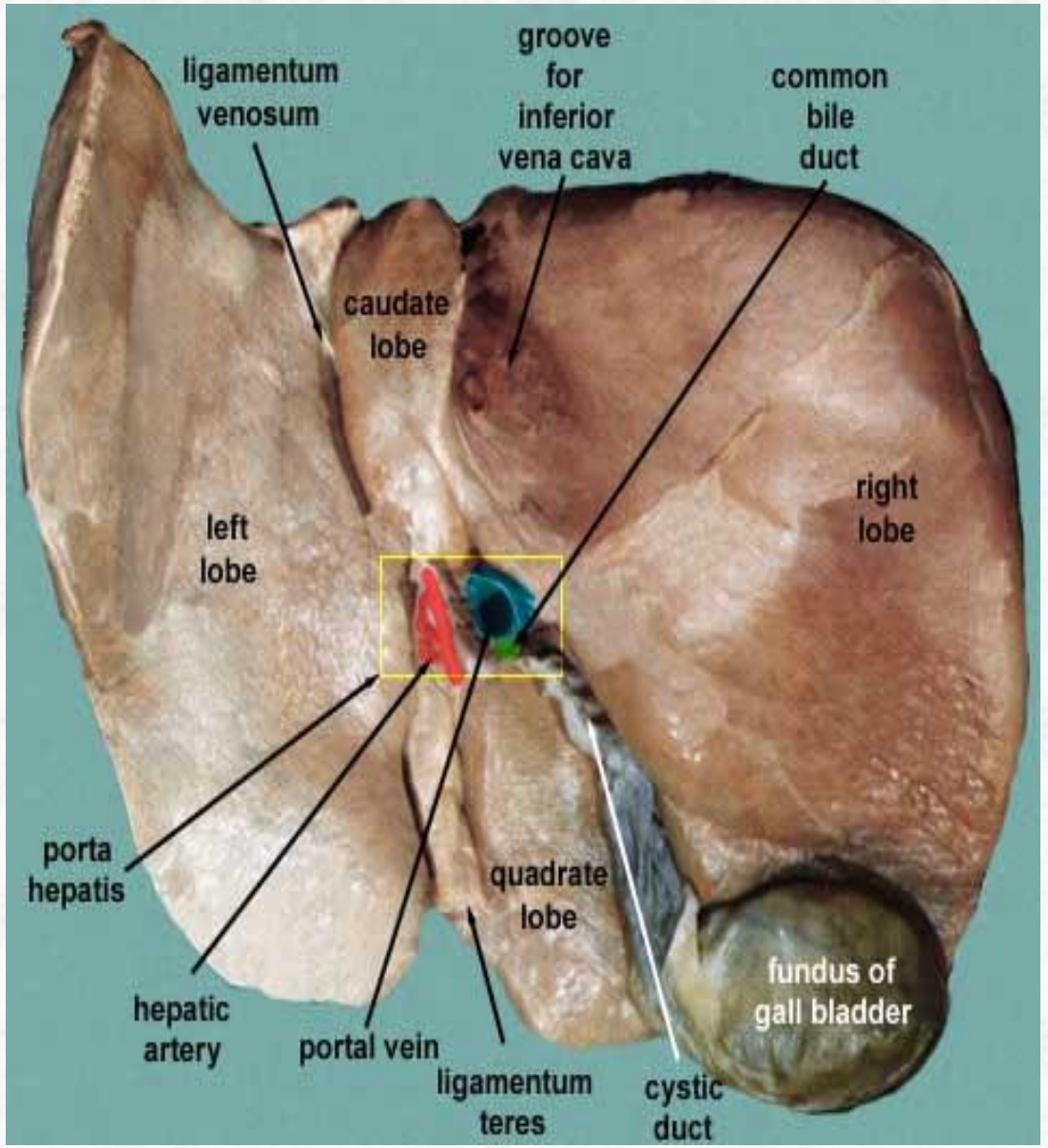
2- papillary process

Relations of caudate lobe

- Inf. → the porta hepatis

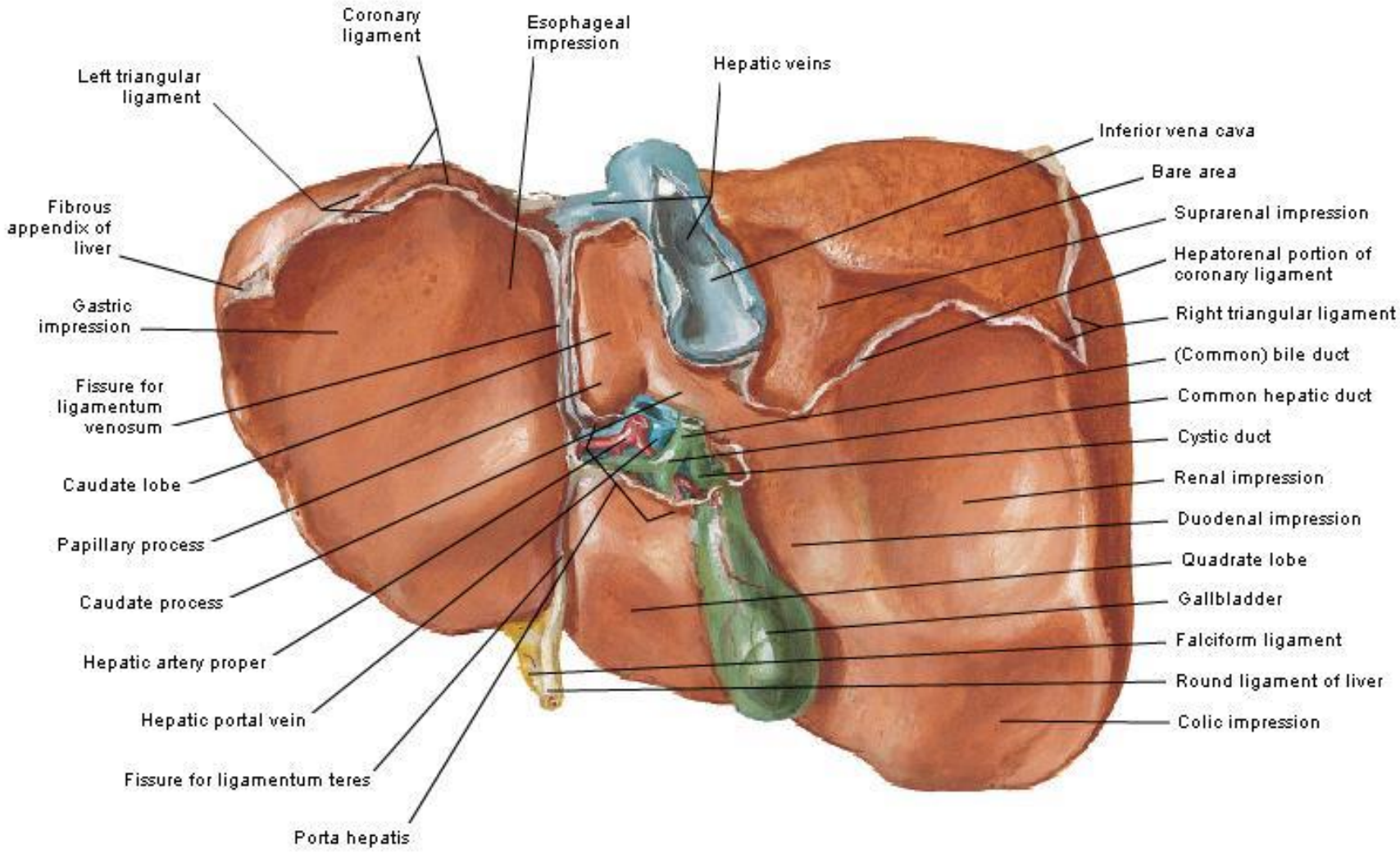
- The right → the fossa for the inferior vena cava

- The left →the fossa for the lig.venosum.



Surfaces and Bed of Liver

Visceral Surface



Quadrate lobe

Present on the inferior surface

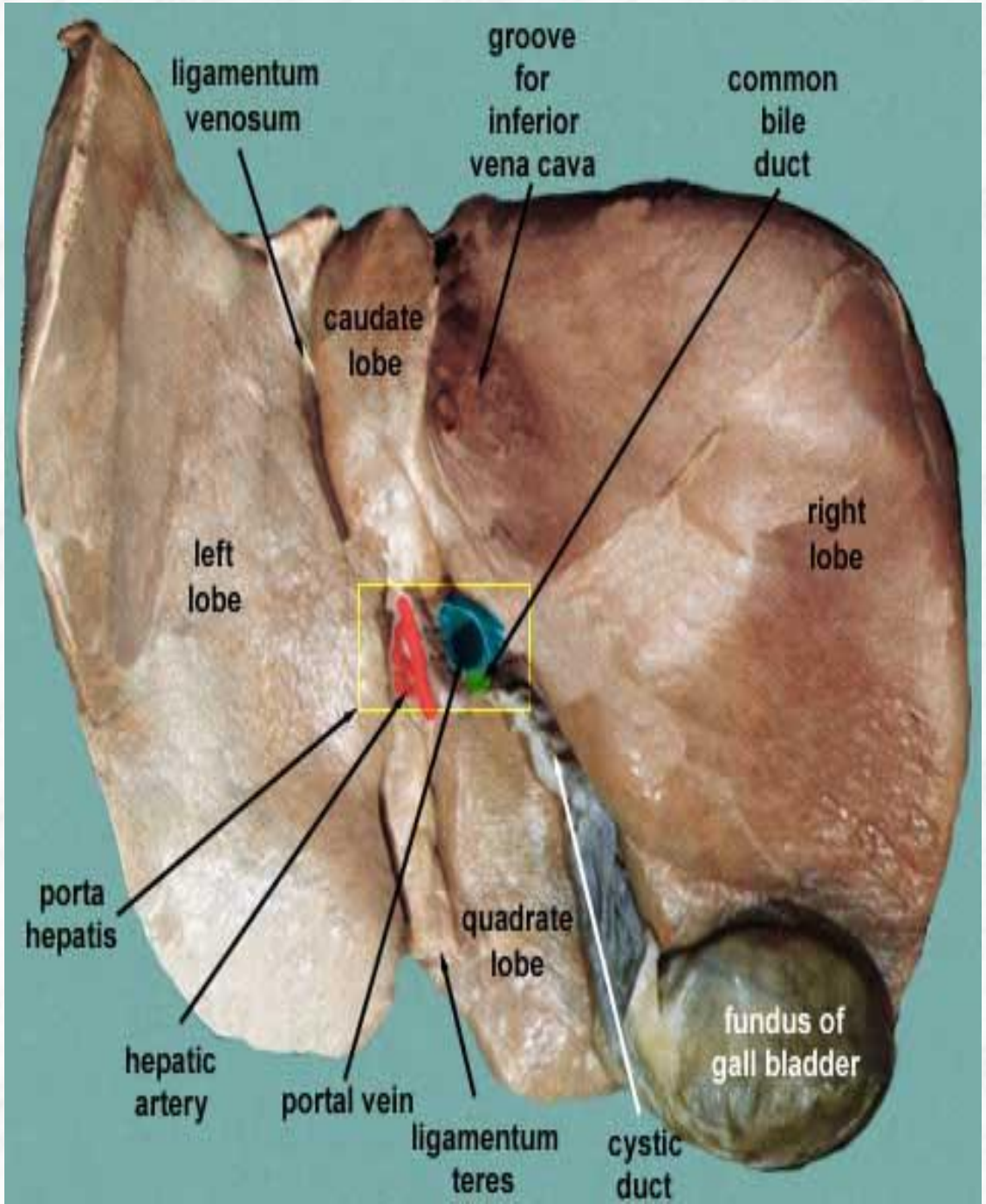
from the Rt. Lobe

Relation

- Sup.→ porta hepatis

- Rt. →fossa for the gallbladder

- Lt→ by the fossa for lig.teres



Porta hepatis

-It is the hilum of the liver

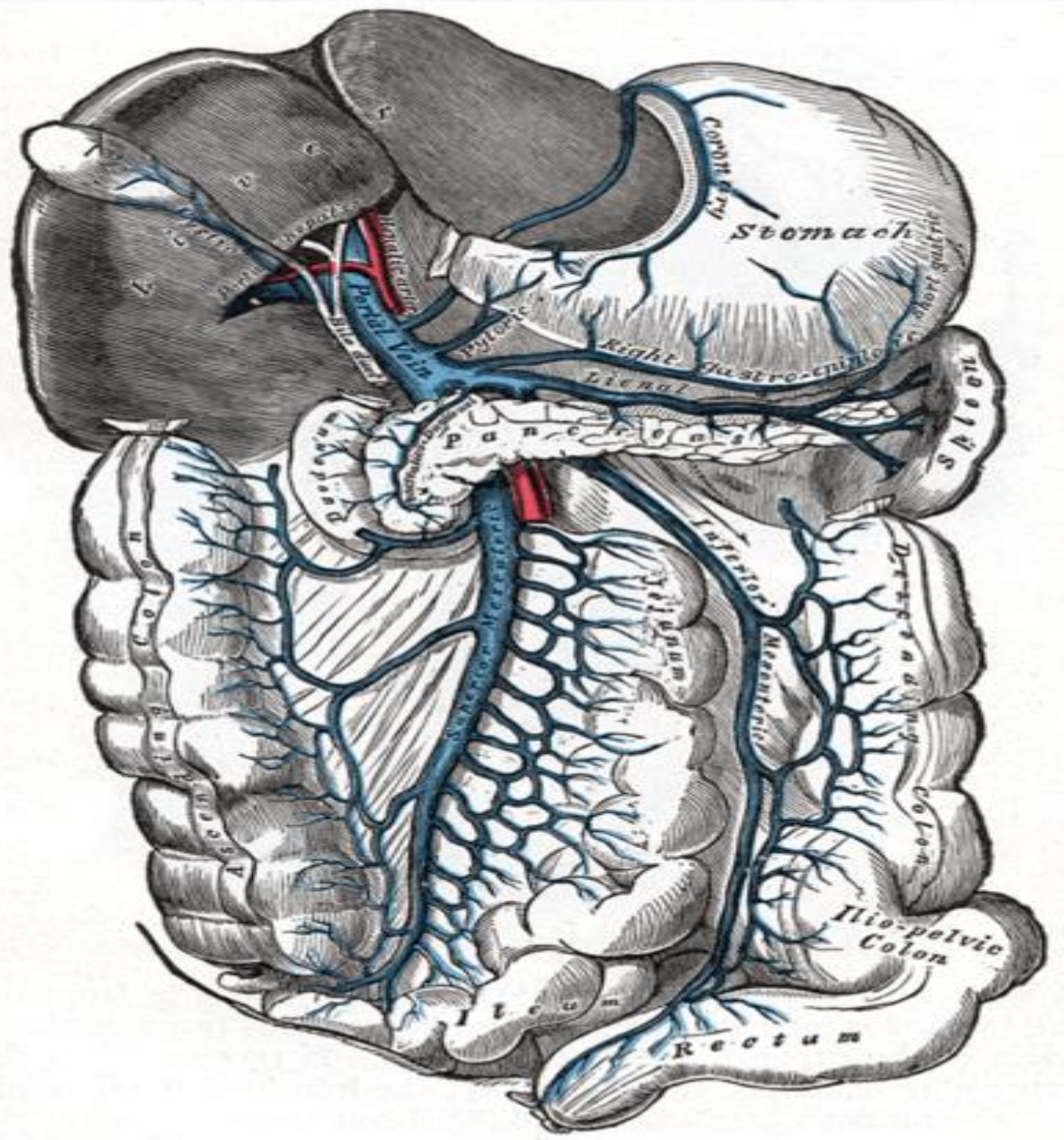
-It is found on the posteroinferior surface

- lies between the caudate and quadrate lobes

-Lesser omentum attach to its margin

Contents

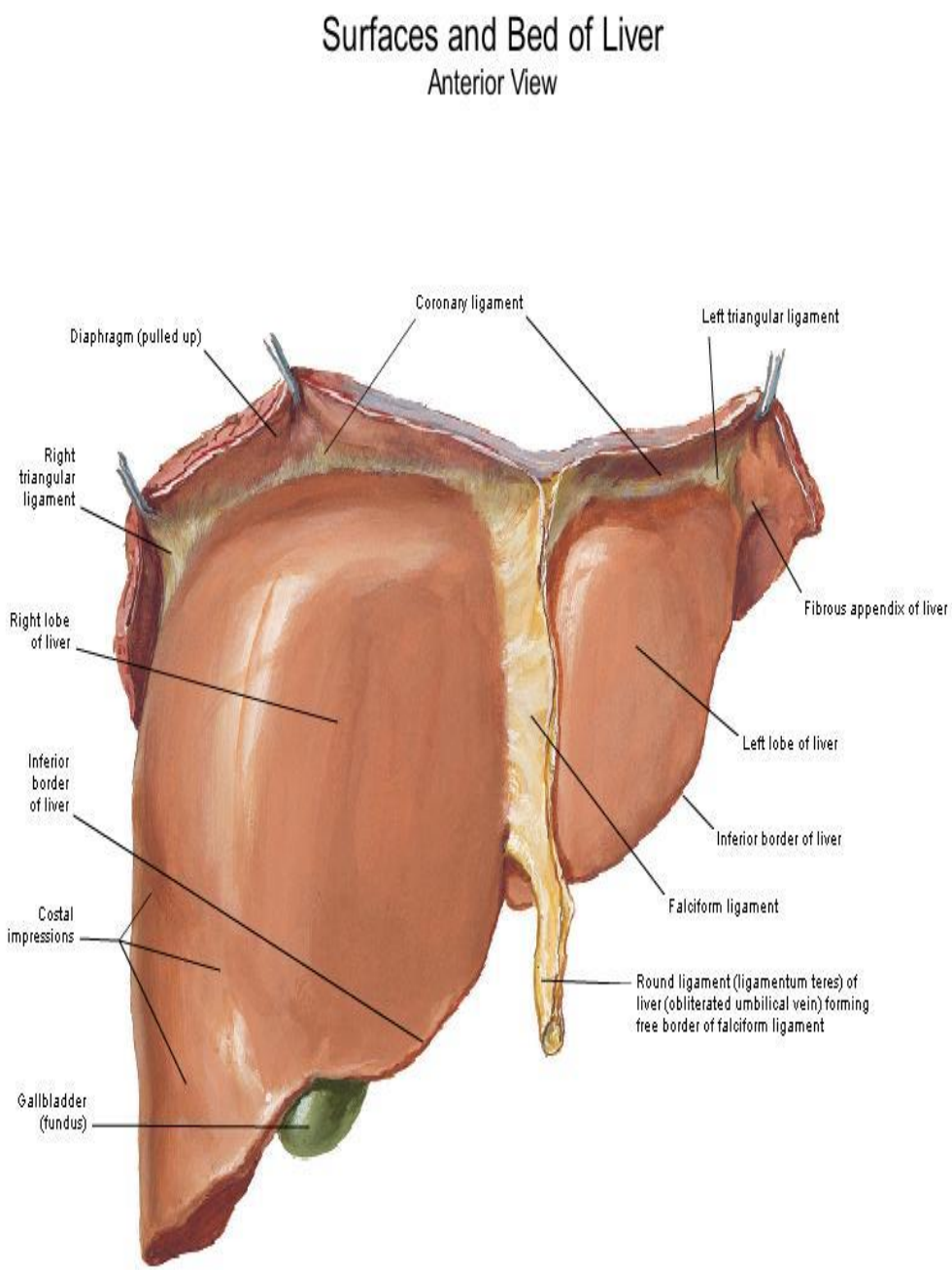
- Rt and Lt hepatic ducts
- Rt and Lt branches of hepatic artery along with nerves+ lymphatic node
- Portal vein



1. The ligaments of the liver

1- The **Falciform ligament of liver**
2- The **Ligamentum teres hepatis**
3- The **coronary ligament**
4- The **right triangular ligament**
5- The **left triangular ligament**
6- The **Hepatogastric ligament**
7- The **hepatoduonedenal ligament**
8- The Ligamentum Venoosum

- **Falciform ligament of liver**
  - Consists of double peritoneal layer
  - Sickle shape
  - Extends from anterior abdominal wall (umbilicus) to liver
  - Free border of the ligament contains Ligamentum teres (obliterated umbilical vein)

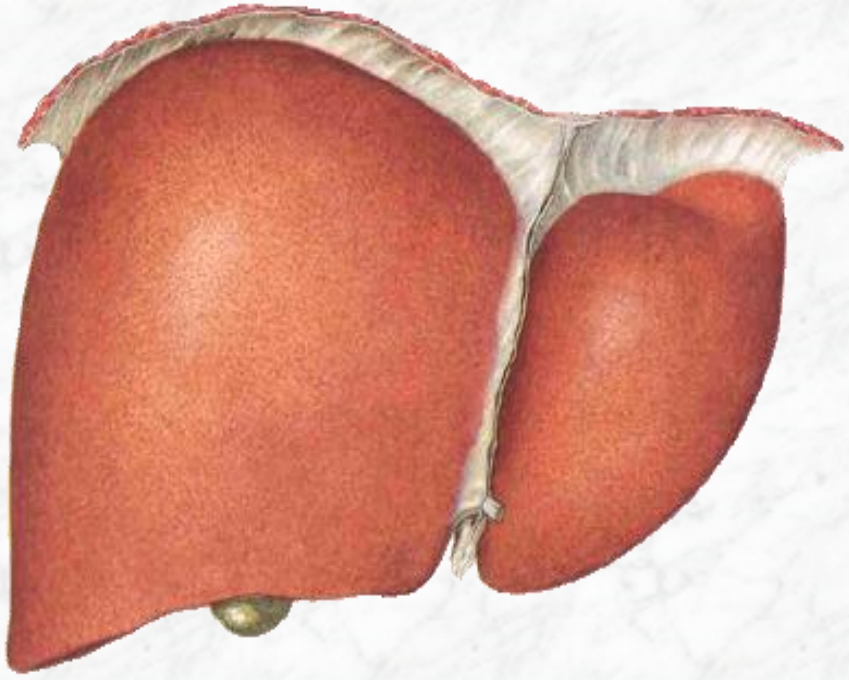


- **Ligamentum teres hepatis:**

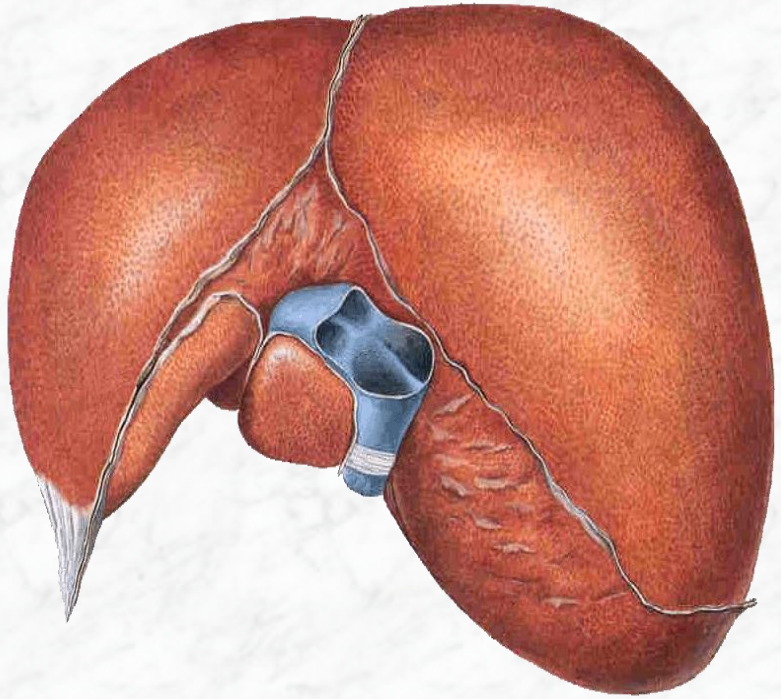
Contains umbilical vein

- **Coronary ligament:**

The area between upper and lower layer of the coronary ligament is the bare area of liver



- **Left and right triangular ligaments** formed by left and right extremity of coronary ligament



The Ligamentum Venoosum

-Fibrous band that is the remains

of the ductus venosus

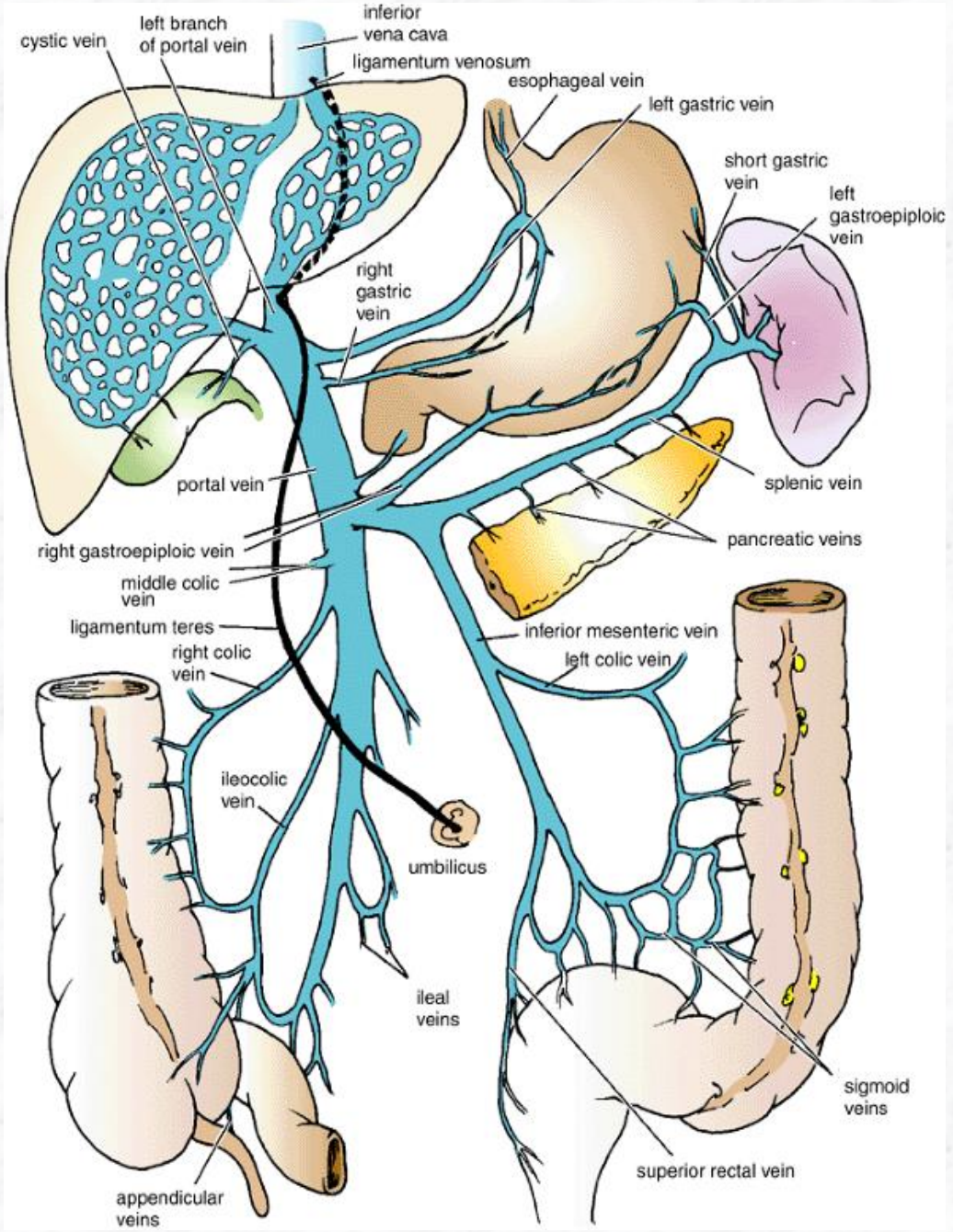
- Is attached to the left branch of

the portal vein and ascends in a

fissure on the visceral surface of

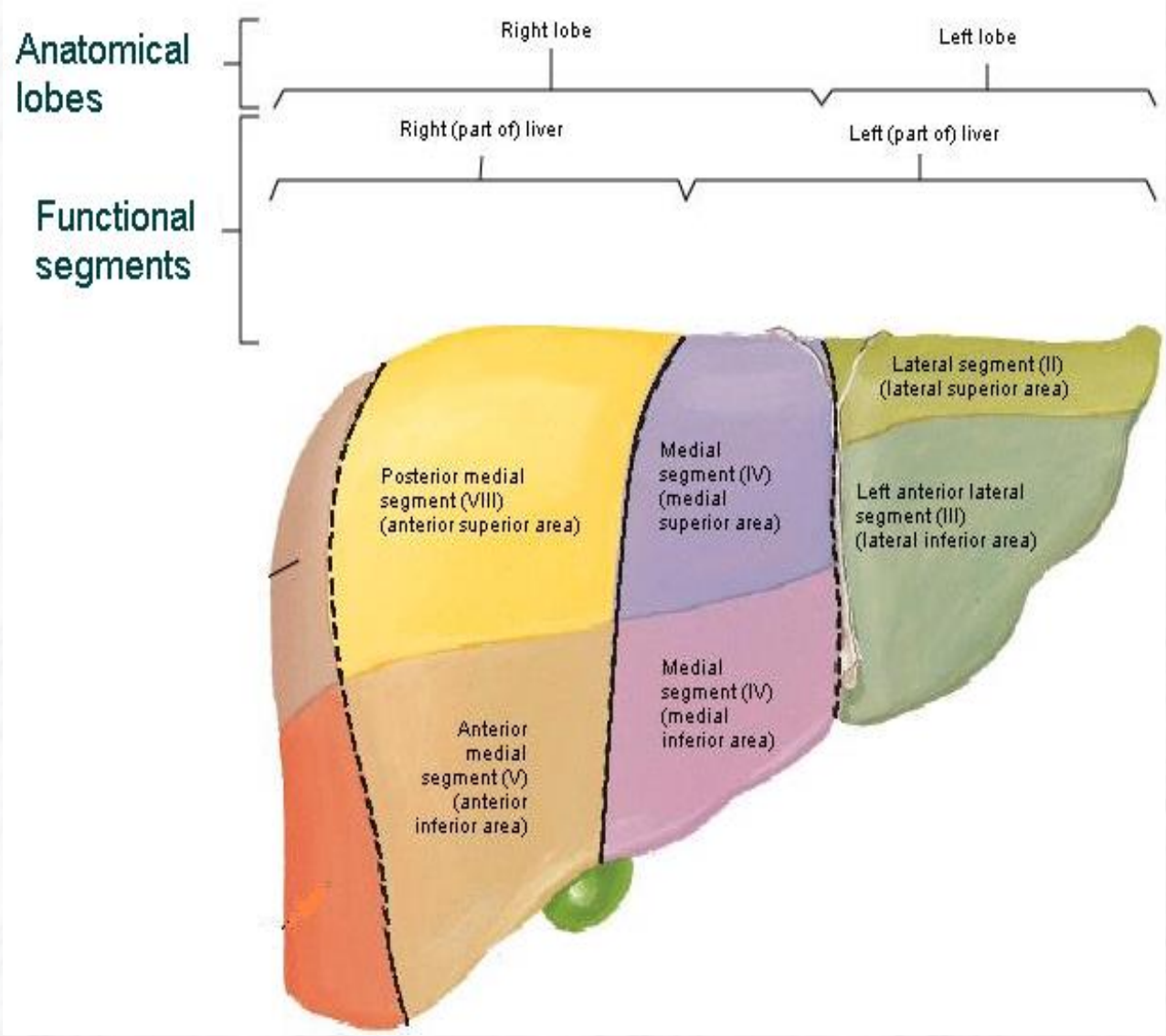
the liver to be attached above to

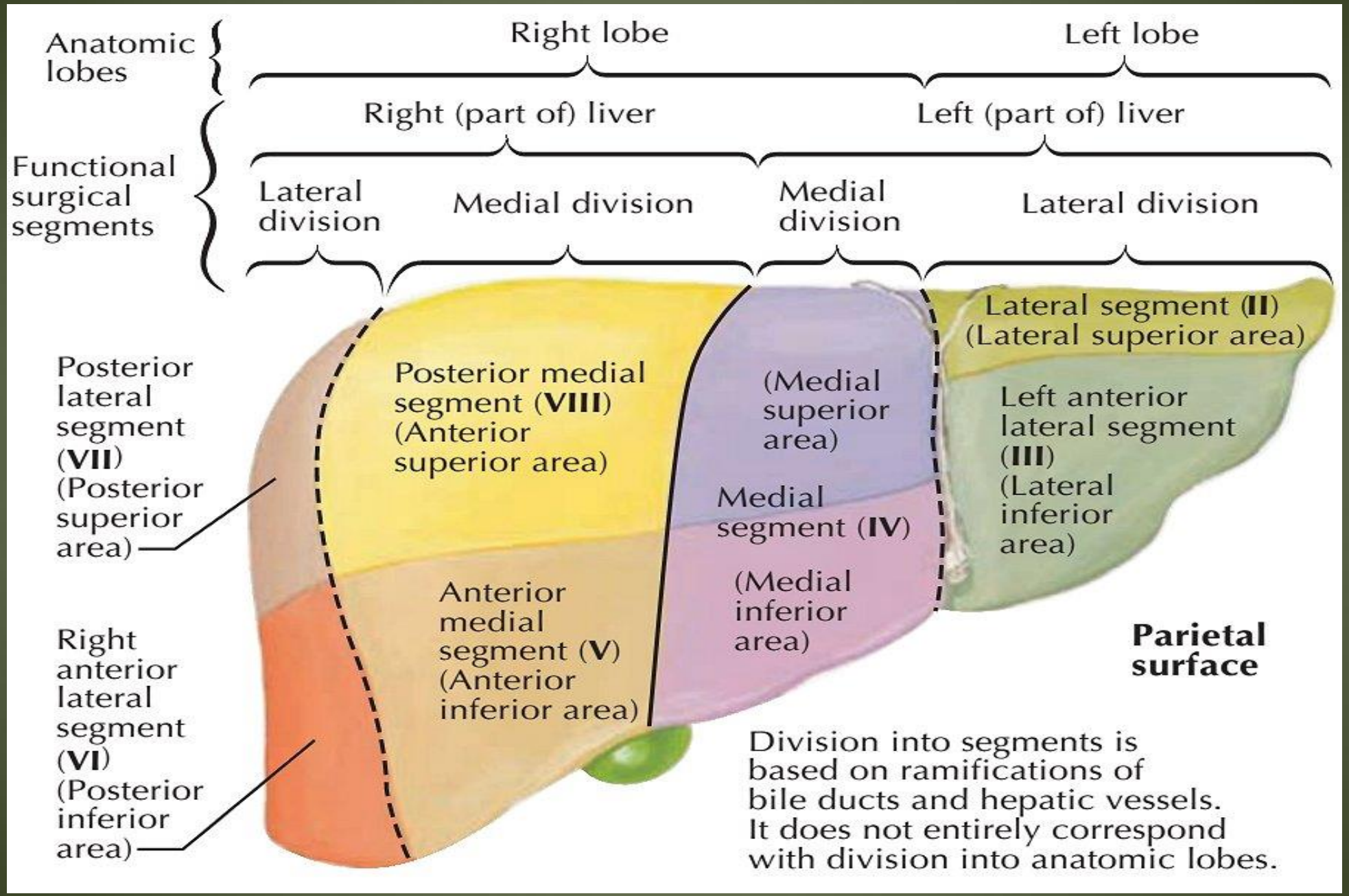
the inferior vena cava

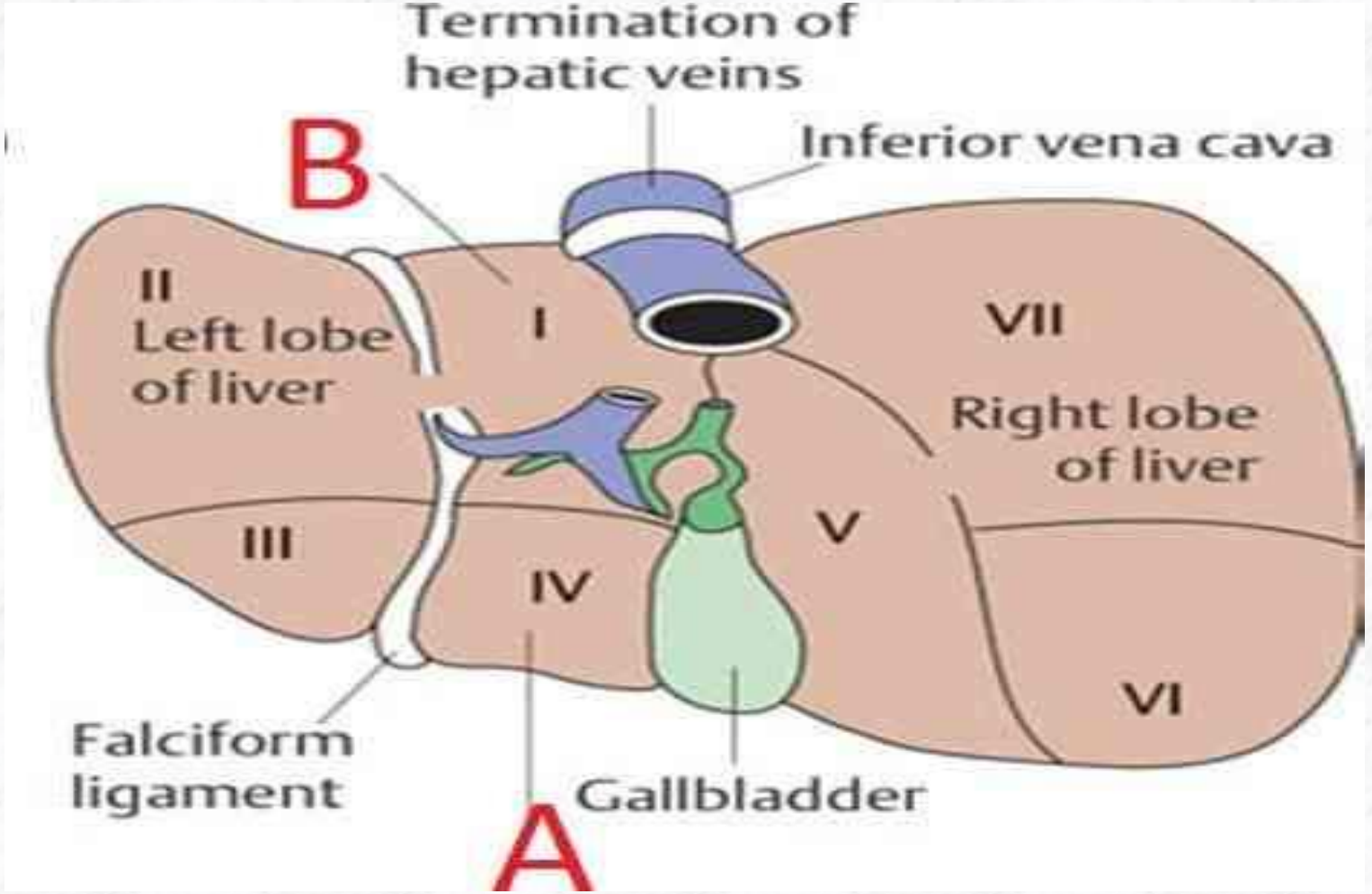


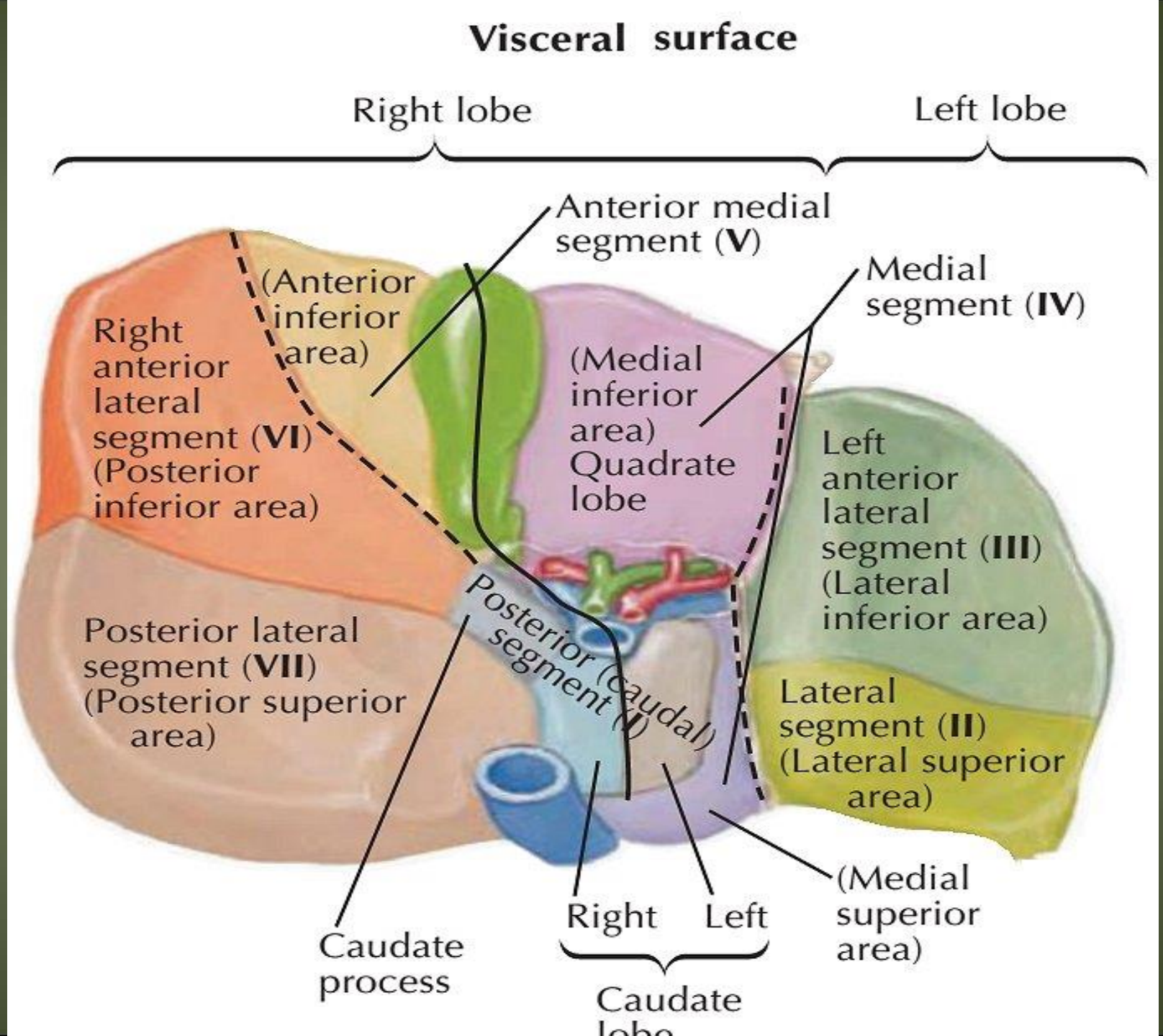
Segmental anatomy of the liver

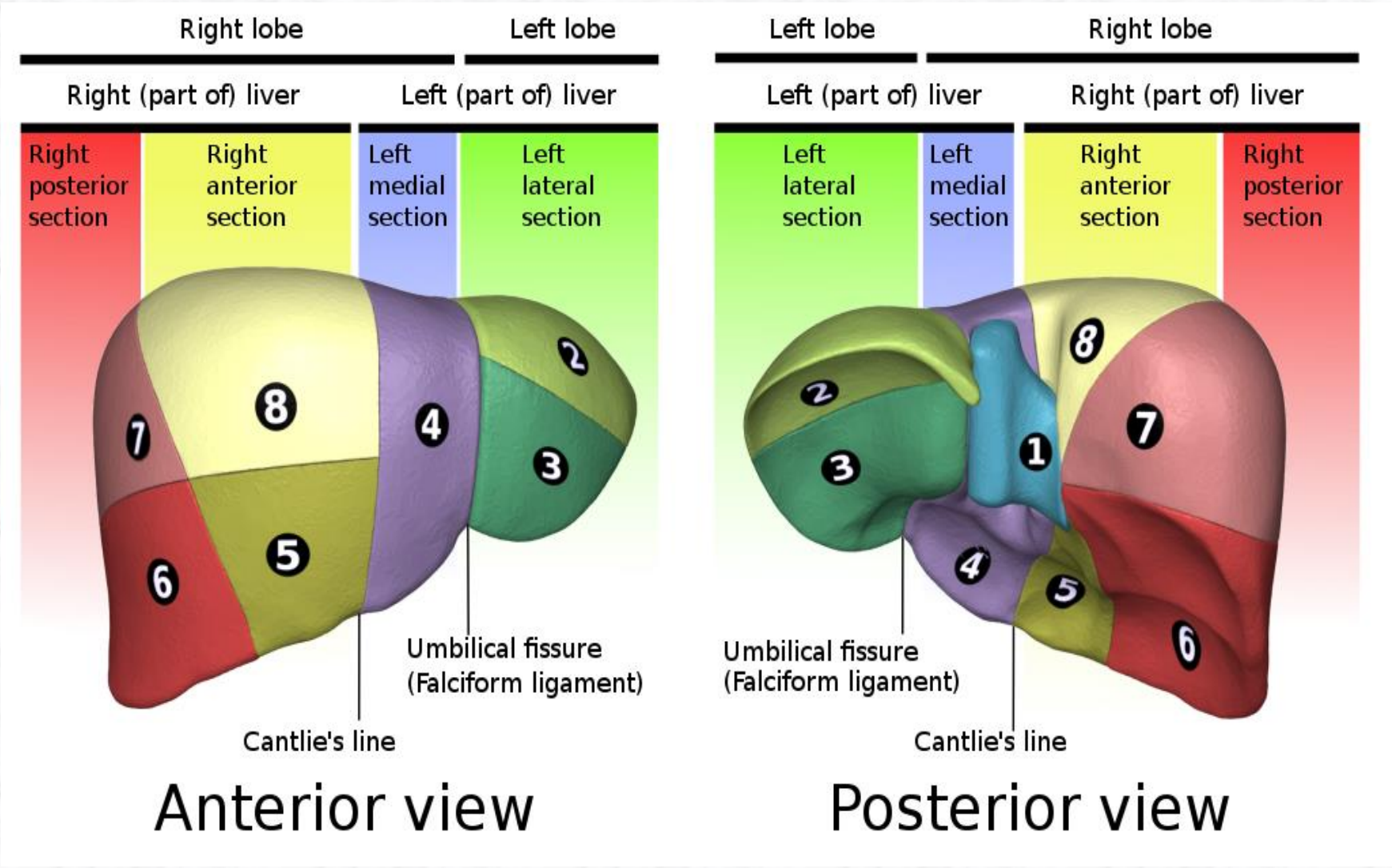
- Rt .& Lt. lobes anatomically.
- Separation by ligaments (Falciform, lig. Venoosum & Lig.teres)
- True morphological and physiological division by a line extend from fossa of GD to fossa of I.V.C each has its own arterial blood supply, venous drainage and biliary drainage
- No anastomosis between divisions
- 3 major hepatic veins → Rt, Lt & central
- 8 segments based on hepatic and portal venous segments

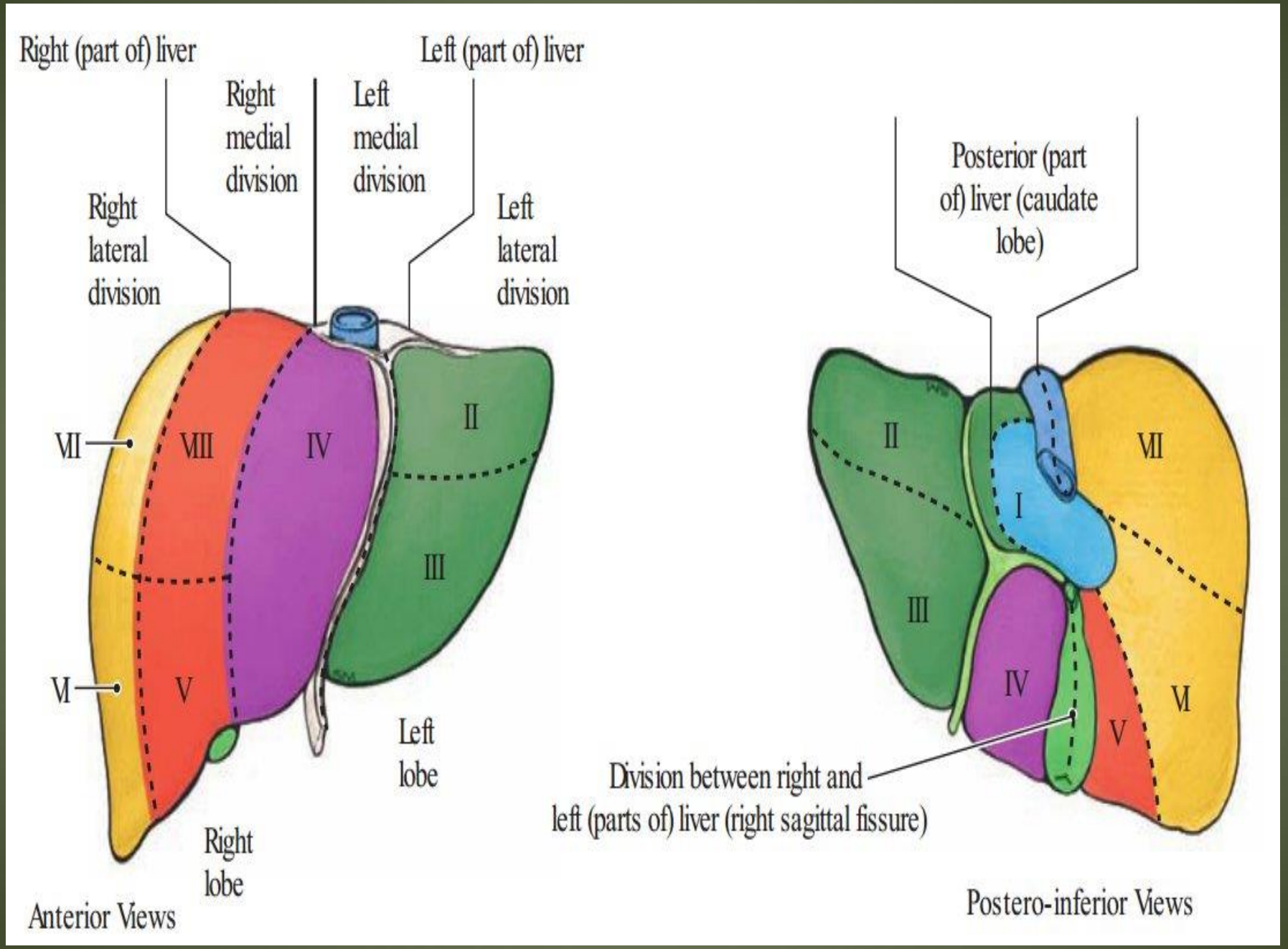


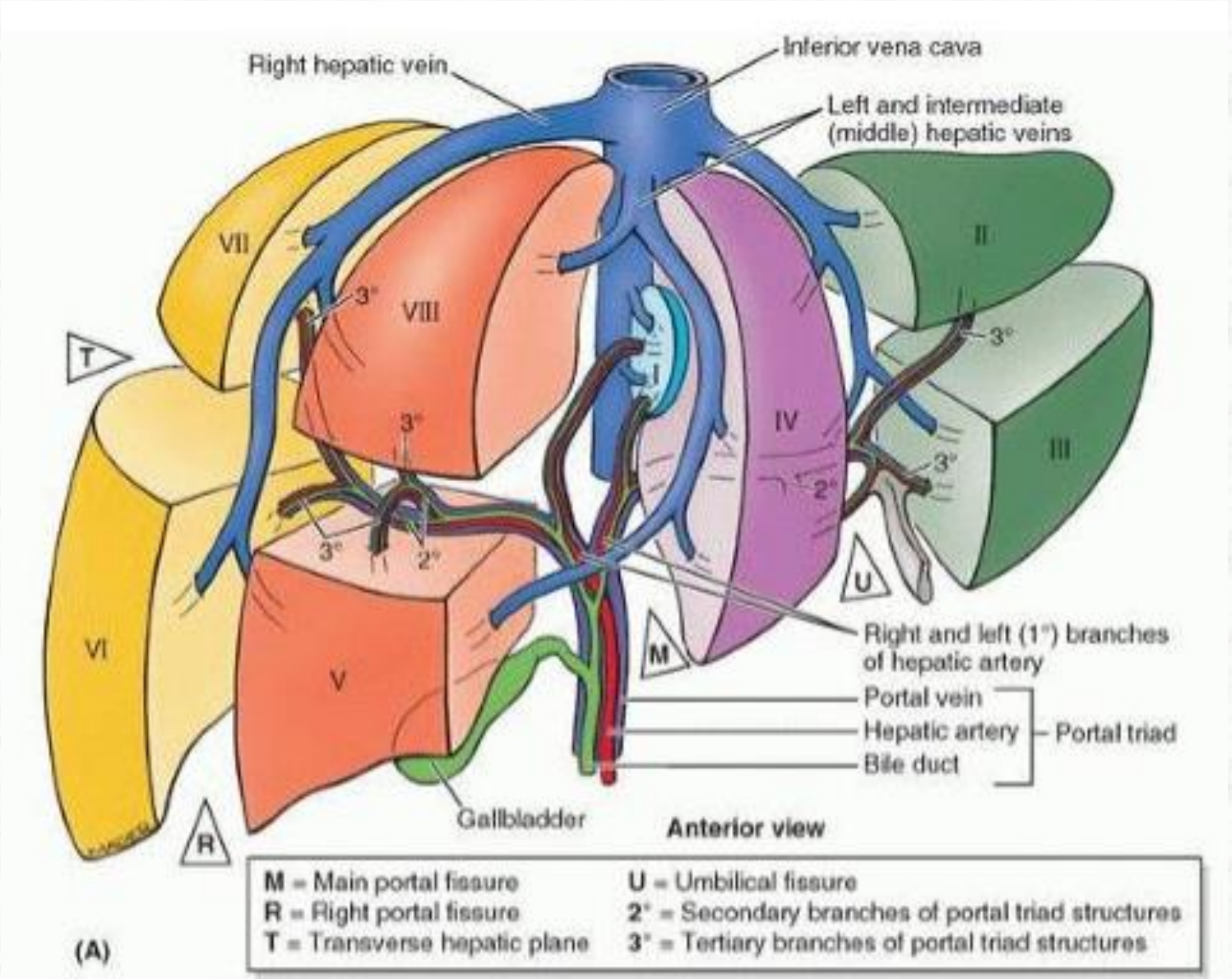

Anatomic lobes
Right lobe
Left lobe
Functional surgical segments
Right (part of) liver
Left (part of) liver
Lateral division
Medial division
Medial division
Lateral division
Posterior lateral segment (VII) (Posterior superior area)
Posterior medial segment (VIII) (Anterior superior area)
(Medial superior area)
Lateral segment (II) (Lateral superior area)
Left anterior lateral segment (III) (Lateral inferior area)
Medial segment (IV)
Anterior medial segment (V) (Anterior inferior area)
(Medial inferior area)
Right anterior lateral segment (VI) (Posterior inferior area)
Parietal surface
Division into segments is based on ramifications of bile ducts and hepatic vessels. It does not entirely correspond with division into anatomic lobes.


Termination of hepatic veins
B
Inferior vena cava
II
Left lobe of liver
I
VII
Right lobe of liver
III
IV
V
VI
Falciform ligament
Gallbladder
A


Visceral surface
Right lobe
Left lobe
Anterior medial segment (V)
Medial segment (IV)
(Anterior inferior area)
Right anterior lateral segment (VI) (Posterior inferior area)
(Medial inferior area) Quadrate lobe
Left anterior lateral segment (III) (Lateral inferior area)
Posterior lateral segment (VII) (Posterior superior area)
Posterior (caudal) segment (I)
Lateral segment (II) (Lateral superior area)
(Medial superior area)
Right
Left
Caudate process
Caudate lobe

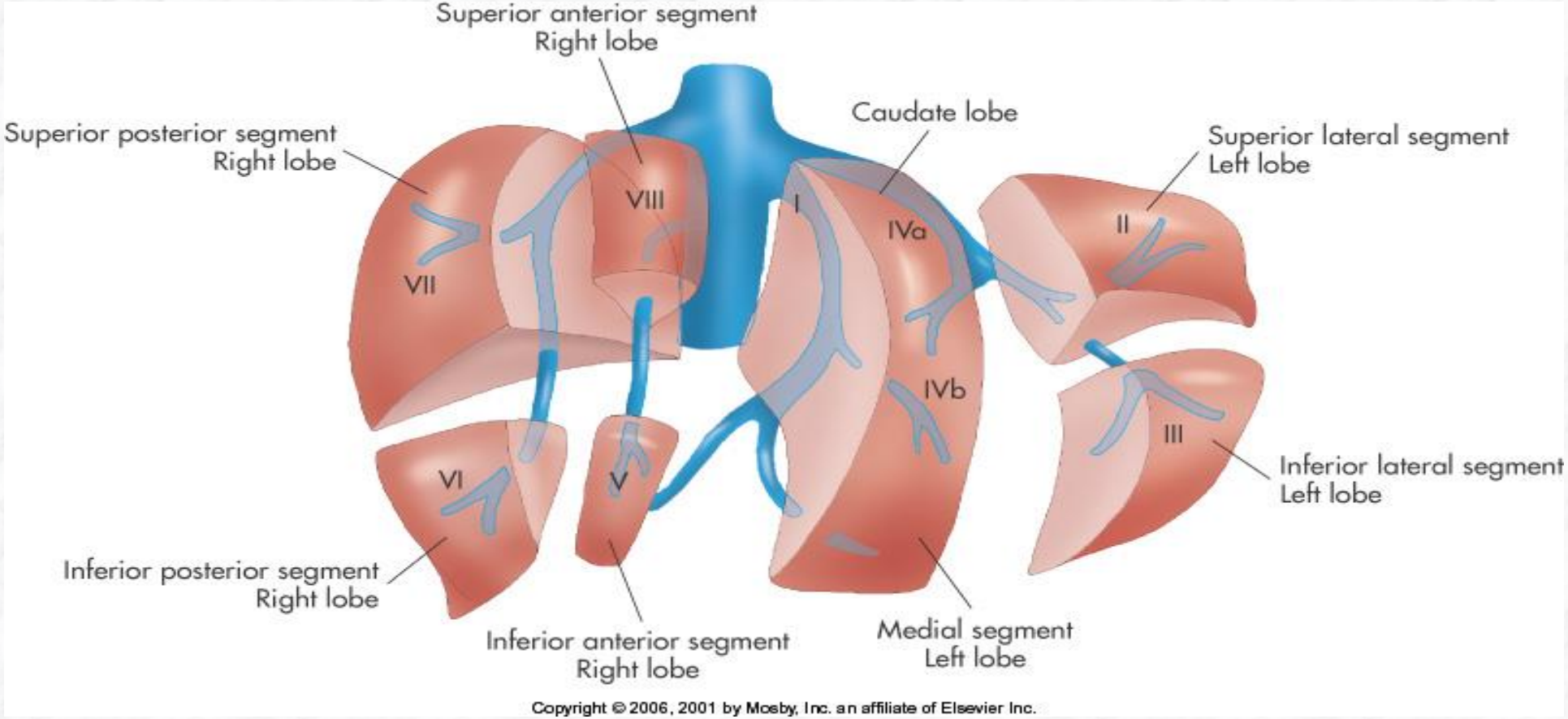

Right lobe
Left lobe
Right (part of) liver
Left (part of) liver
Right posterior section
Right anterior section
Left medial section
Left lateral section
8
7
4
2
3
6
5
Umbilical fissure (Falciform ligament)
Cantlie's line
Anterior view
Left lobe
Right lobe
Left (part of) liver
Right (part of) liver
Left lateral section
Left medial section
Right anterior section
Right posterior section
8
2
7
3
1
4
5
6
Umbilical fissure (Falciform ligament)
Cantlie's line
Posterior view

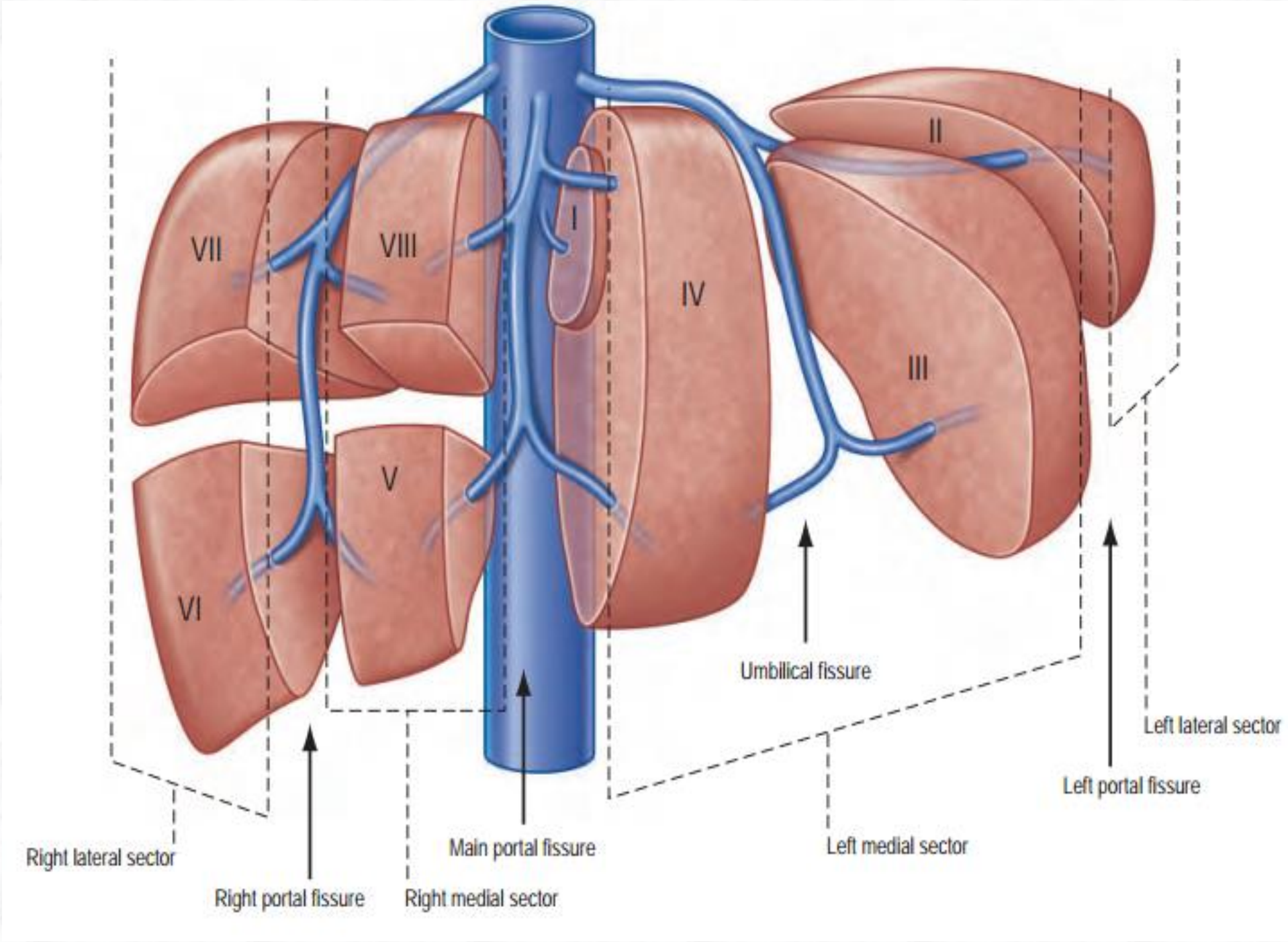

Right (part of) liver
Left (part of) liver
Right medial division
Left medial division
Right lateral division
Left lateral division
VII
VIII
IV
II
III
VI
V
Left lobe
Right lobe
Anterior Views
Posterior (part of) liver (caudate lobe)
II
VII
I
III
IV
V
VI
Division between right and left (parts of) liver (right sagittal fissure)
Postero-inferior Views


Right hepatic vein
Inferior vena cava
Left and intermediate (middle) hepatic veins
VII
VIII
II
III
IV
V
VI
3°
2°
T
M
U
R
Right and left (1°) branches of hepatic artery
Portal vein
Hepatic artery
Bile duct
Portal triad
Gallbladder
Anterior view
M = Main portal fissure
R = Right portal fissure
T = Transverse hepatic plane
U = Umbilical fissure
2° = Secondary branches of portal triad structures
3° = Tertiary branches of portal triad structures
(A)

Segmental anatomy of the liver

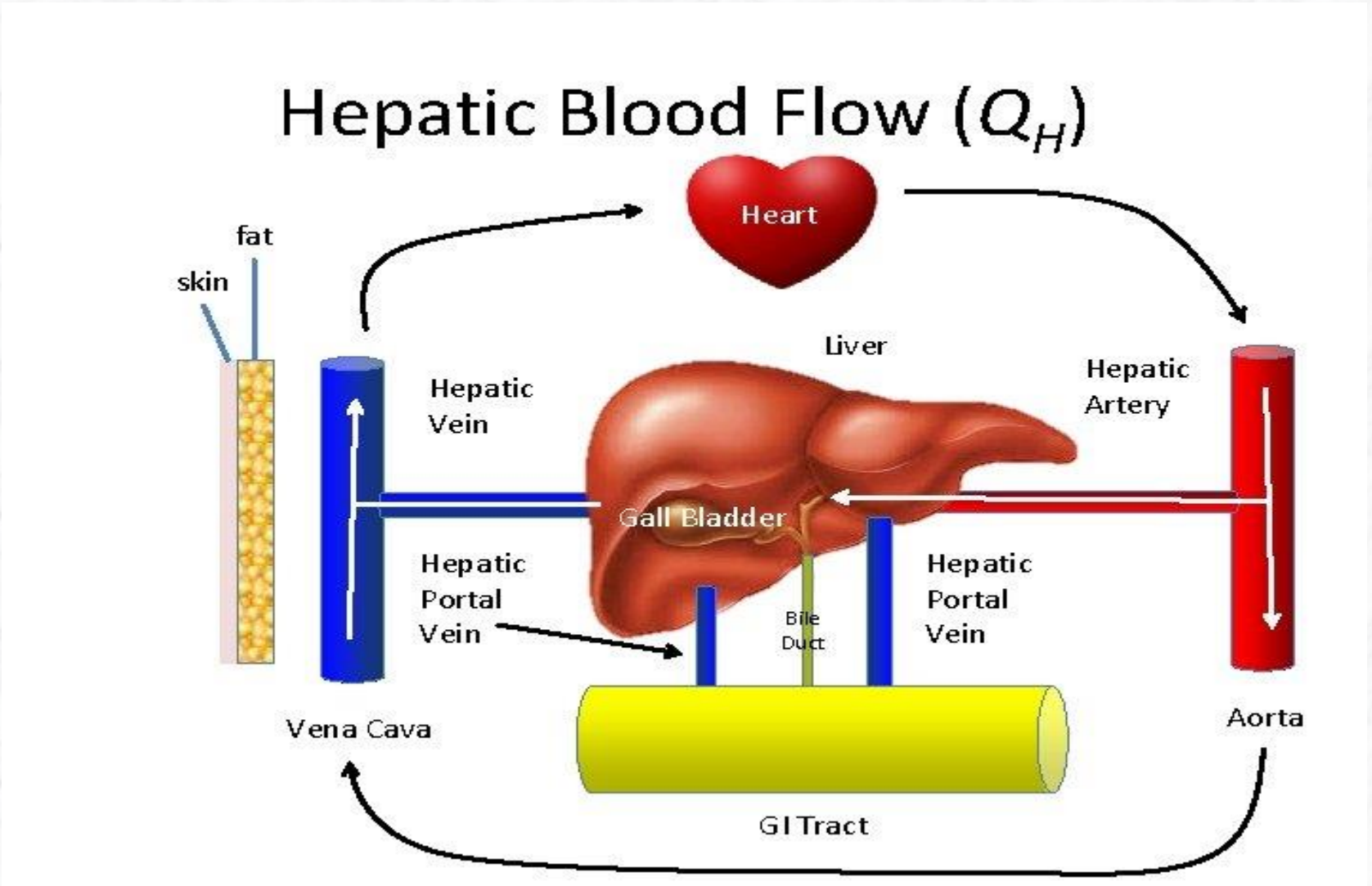
- Liver segments are based on the portal and hepatic venous segments




VII
VIII
I
IV
II
III
V
VI
Umbilical fissure
Left lateral sector
Left portal fissure
Right lateral sector
Right portal fissure
Main portal fissure
Right medial sector
Left medial sector

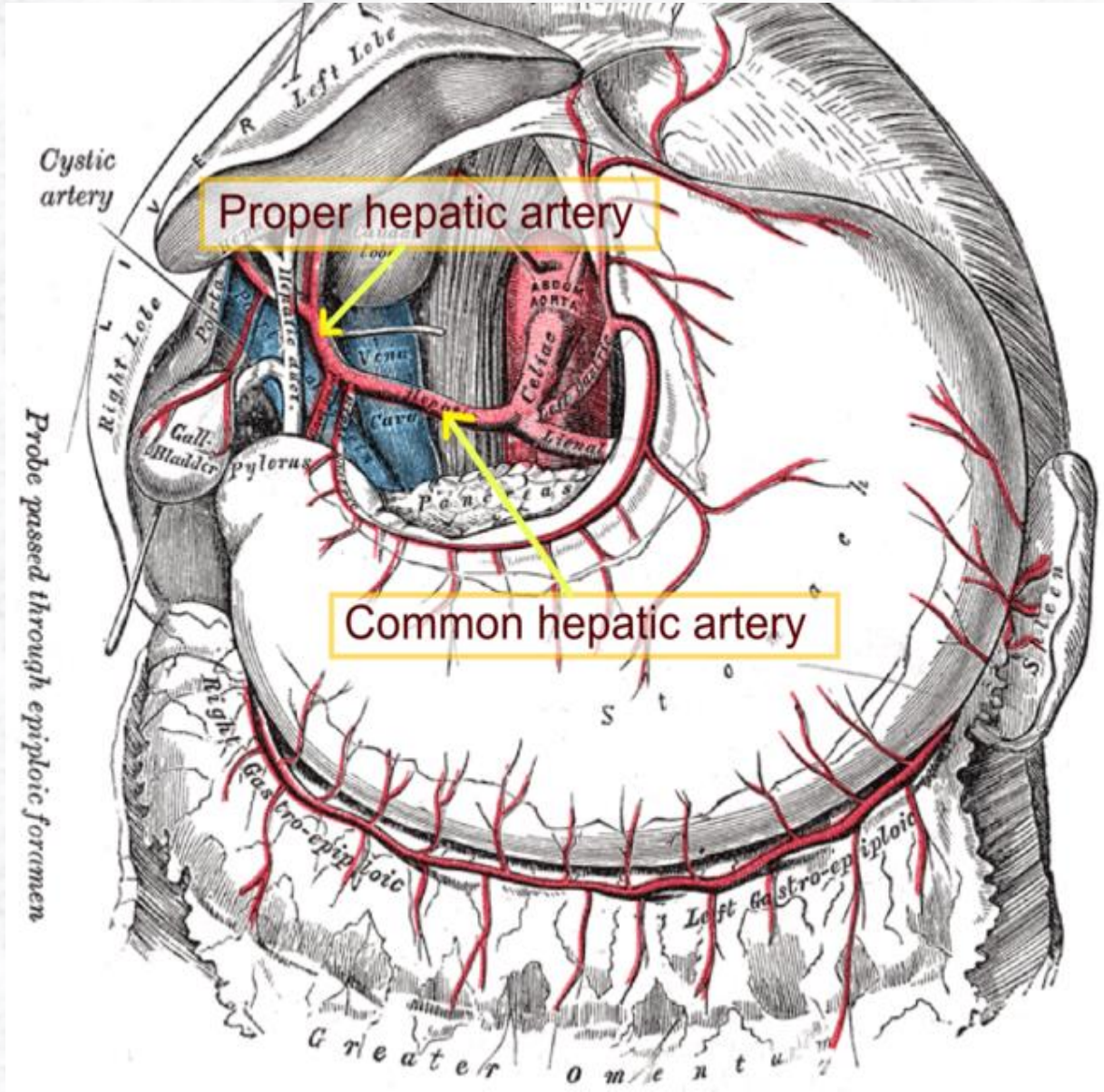
Blood Circulation through the Liver

- 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
- The arterial and venous blood is conducted to the central vein of each liver lobule by the liver sinusoids.
- The central veins drain into the right and left hepatic veins, and these leave the posterior surface of the liver and open directly into the inferior vena cava.


Hepatic Blood Flow (Q_H)
Heart
fat
skin
Liver
Hepatic
Vein
Hepatic
Artery
Gall Bladder
Hepatic
Portal
Vein
Bile
Duct
Hepatic
Portal
Vein
Vena Cava
Aorta
GI Tract

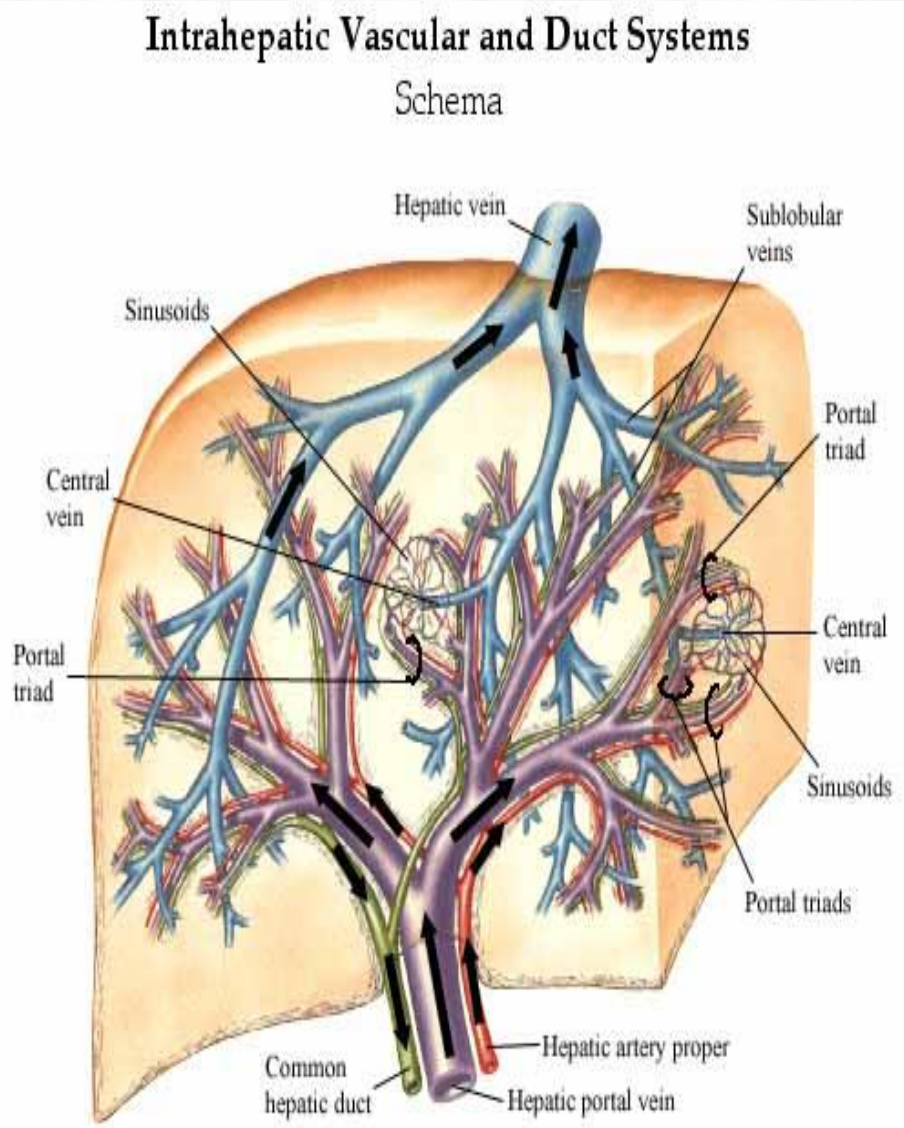
Blood supply of the liver

- Proper hepatic artery → The 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 the gallbladder.

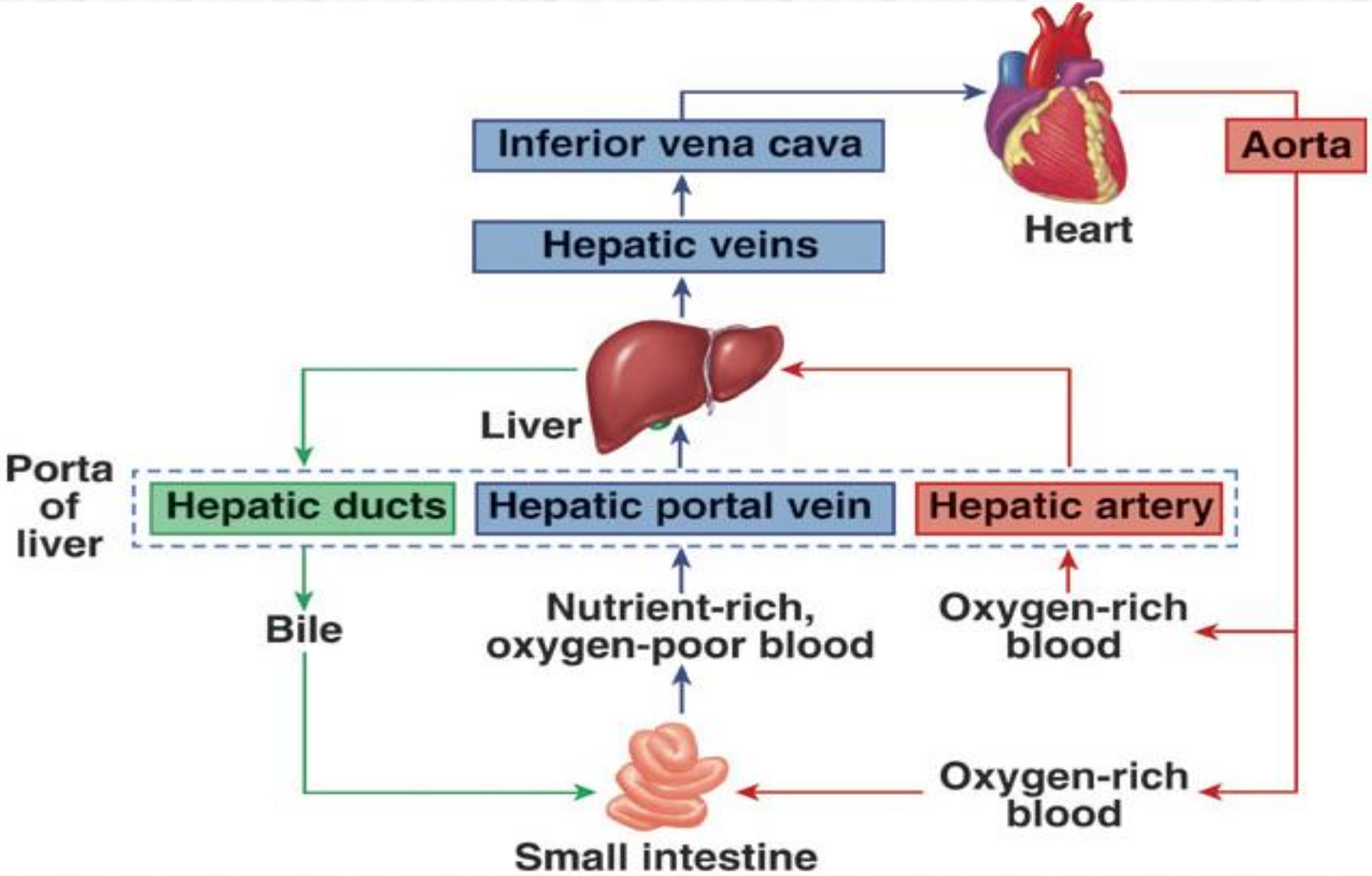


Veous drainage of the liver

- 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 inferior vena cava.

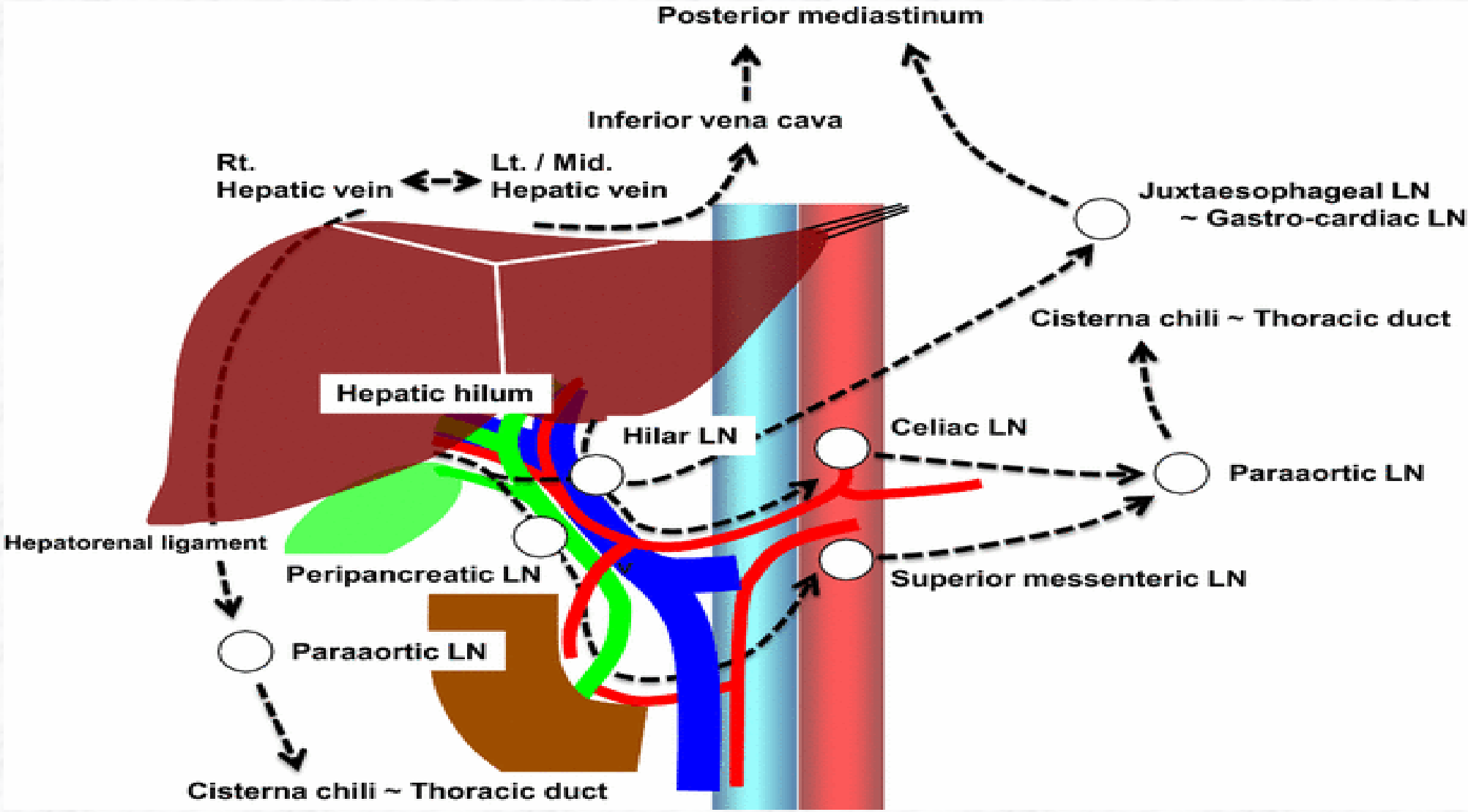


Blood supply of the liver



Lymphatic drainage & nerve supply of the liver

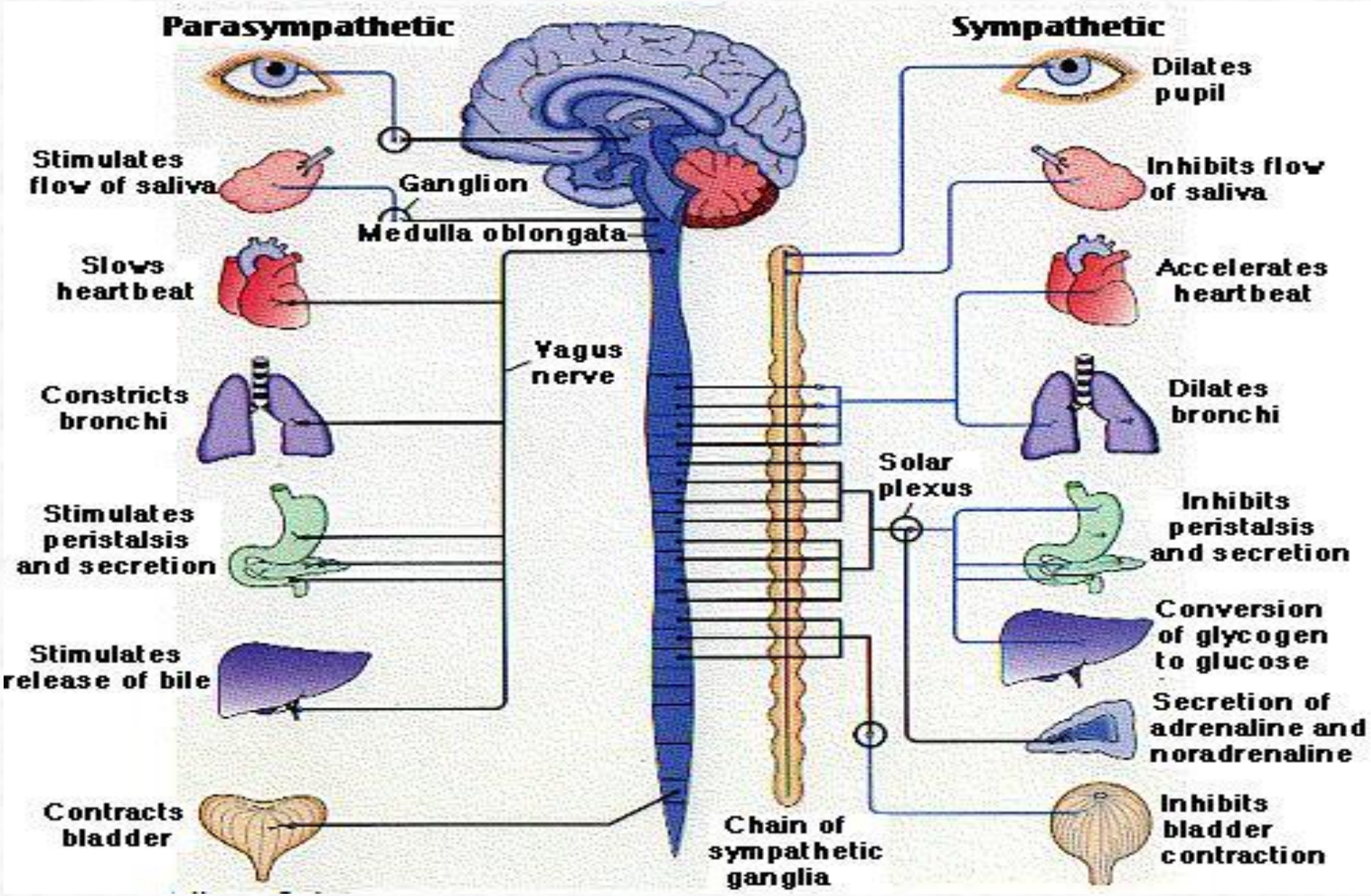
- Liver produce large amount of lymph~ one third – one half of total body lymph
- Lymph leave the liver and enters several lymph nodes in porta hepatis→ efferent vessels pass to celiac nodes
- A few vessels pass from the bare area of the liver through the diaphragm to the posterior Mediastinal lymph nodes.

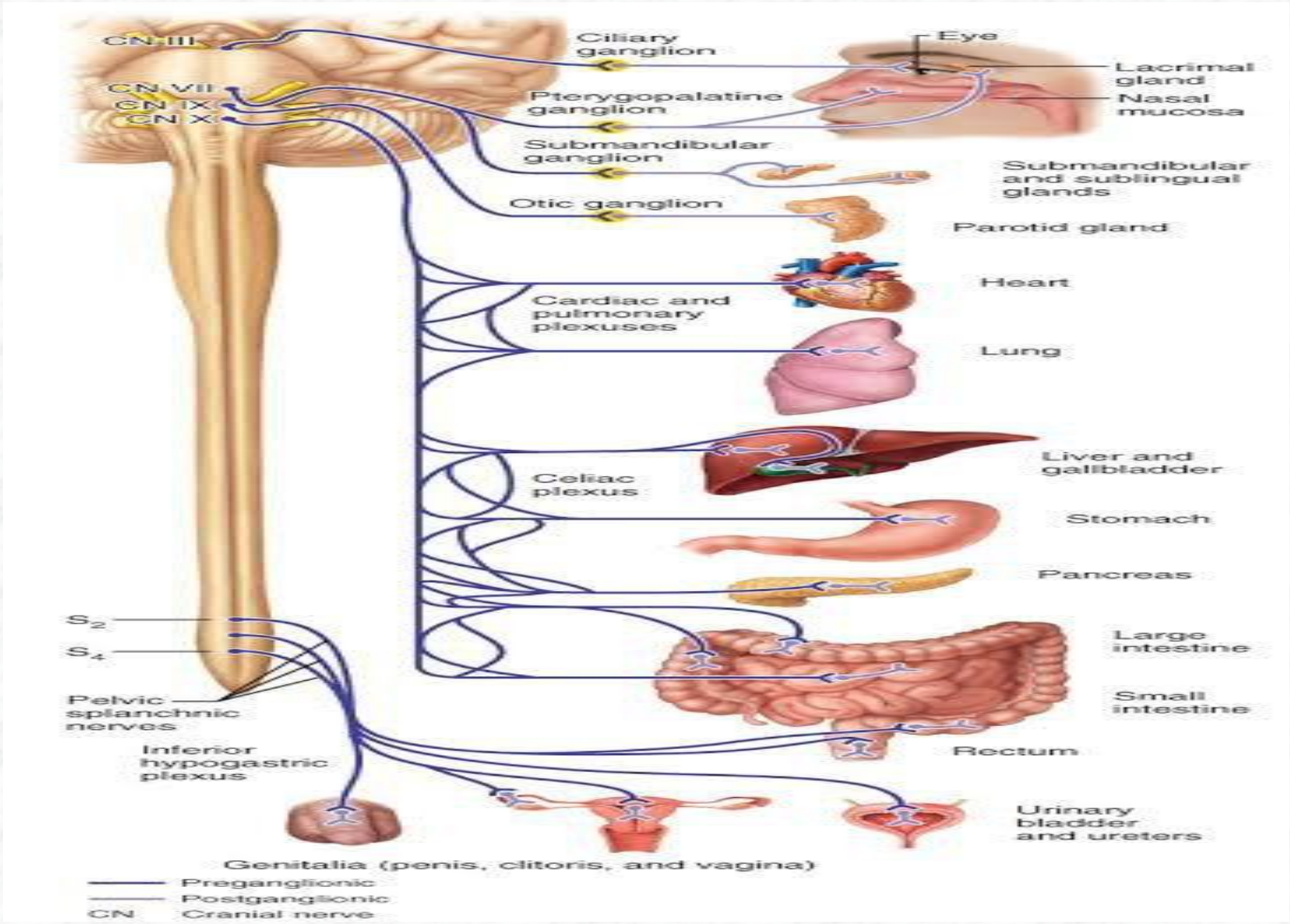

Posterior mediastinum
Inferior vena cava
Rt.
Hepatic vein
Lt. / Mid.
Hepatic vein
Juxtaesophageal LN
~ Gastro-cardiac LN
Cisterna chili ~ Thoracic duct
Hepatic hilum
Hilar LN
Celiac LN
Paraaortic LN
Hepatorenal ligament
Peripancreatic LN
Superior messenteric LN
Paraaortic LN
Cisterna chili ~ Thoracic duct

Nerve supply:

- Sympathetic -----hepatic plexus>>> celiac plexus
- Parasympathetic ---- vagous nerve(anterior part)

- Sympathetic system form the celiac plexus.
- The anterior vagal trunk gives rise to a large hepatic branch, which passes directly to the liver


Parasympathetic
Sympathetic
Stimulates flow of saliva
Ganglion
Medulla oblongata
Slows heartbeat
Vagus nerve
Constricts bronchi
Stimulates peristalsis and secretion
Stimulates release of bile
Contracts bladder
Chain of sympathetic ganglia
Dilates pupil
Inhibits flow of saliva
Accelerates heartbeat
Dilates bronchi
Solar plexus
Inhibits peristalsis and secretion
Conversion of glycogen to glucose
Secretion of adrenaline and noradrenaline
Inhibits bladder contraction


CN III
CN VII
CN IX
CN X
Ciliary ganglion
Eye
Lacrimal gland
Pterygopalatine ganglion
Nasal mucosa
Submandibular ganglion
Submandibular and sublingual glands
Otic ganglion
Parotid gland
Heart
Cardiac and pulmonary plexuses
Lung
Liver and gallbladder
Celiac plexus
Stomach
Pancreas
S_2
S_4
Large intestine
Small intestine
Pelvic splanchnic nerves
Inferior hypogastric plexus
Rectum
Urinary bladder and ureters
Genitalia (penis, clitoris, and vagina)
Preganglionic
Postganglionic
CN Cranial nerve

The end