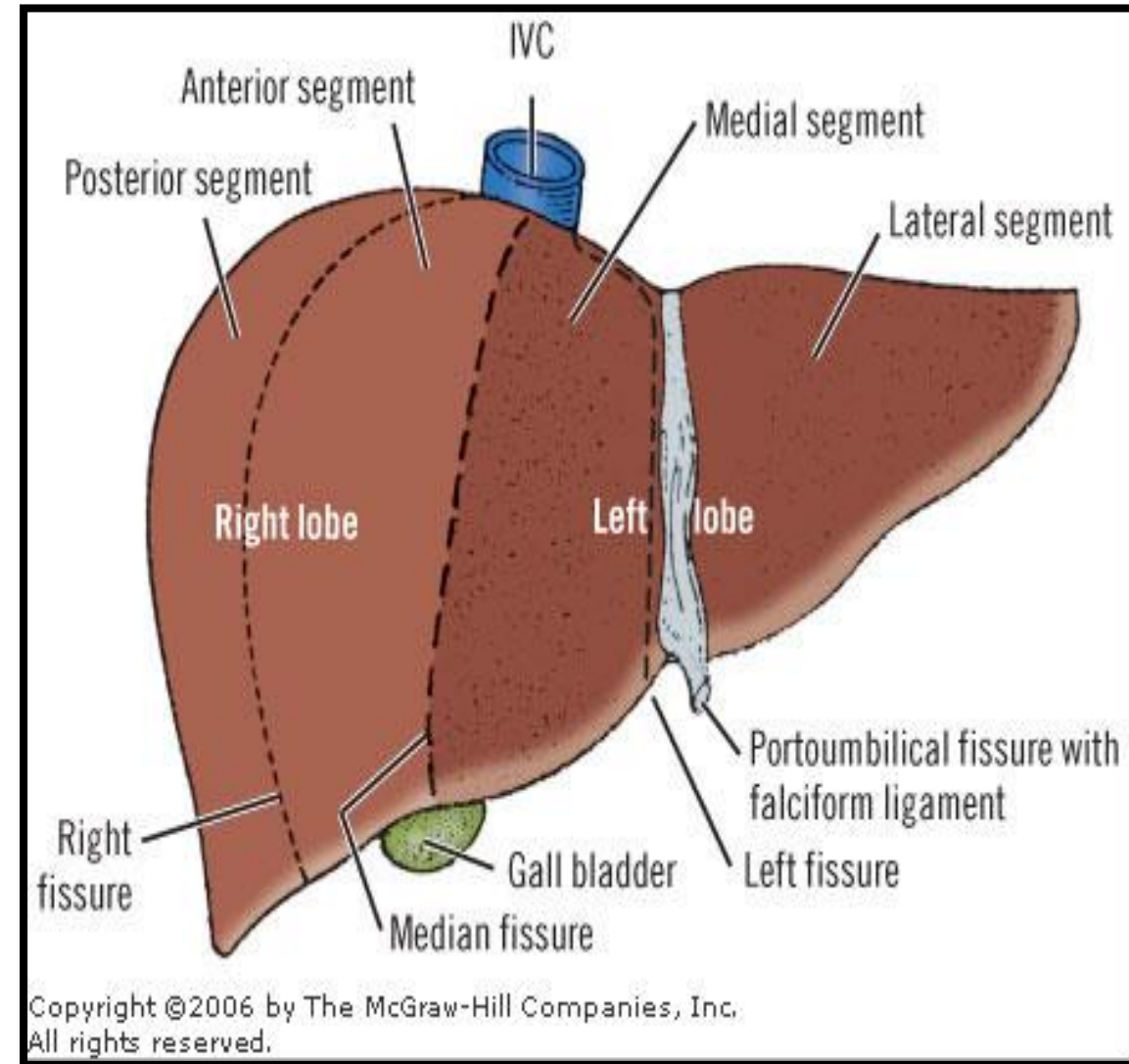


Liver segmentation
portal vein
portosystemic anastomosis

By DR. DALIA MAHMOUD BIRAM

Functional Divisions and Surgical Segments of the liver

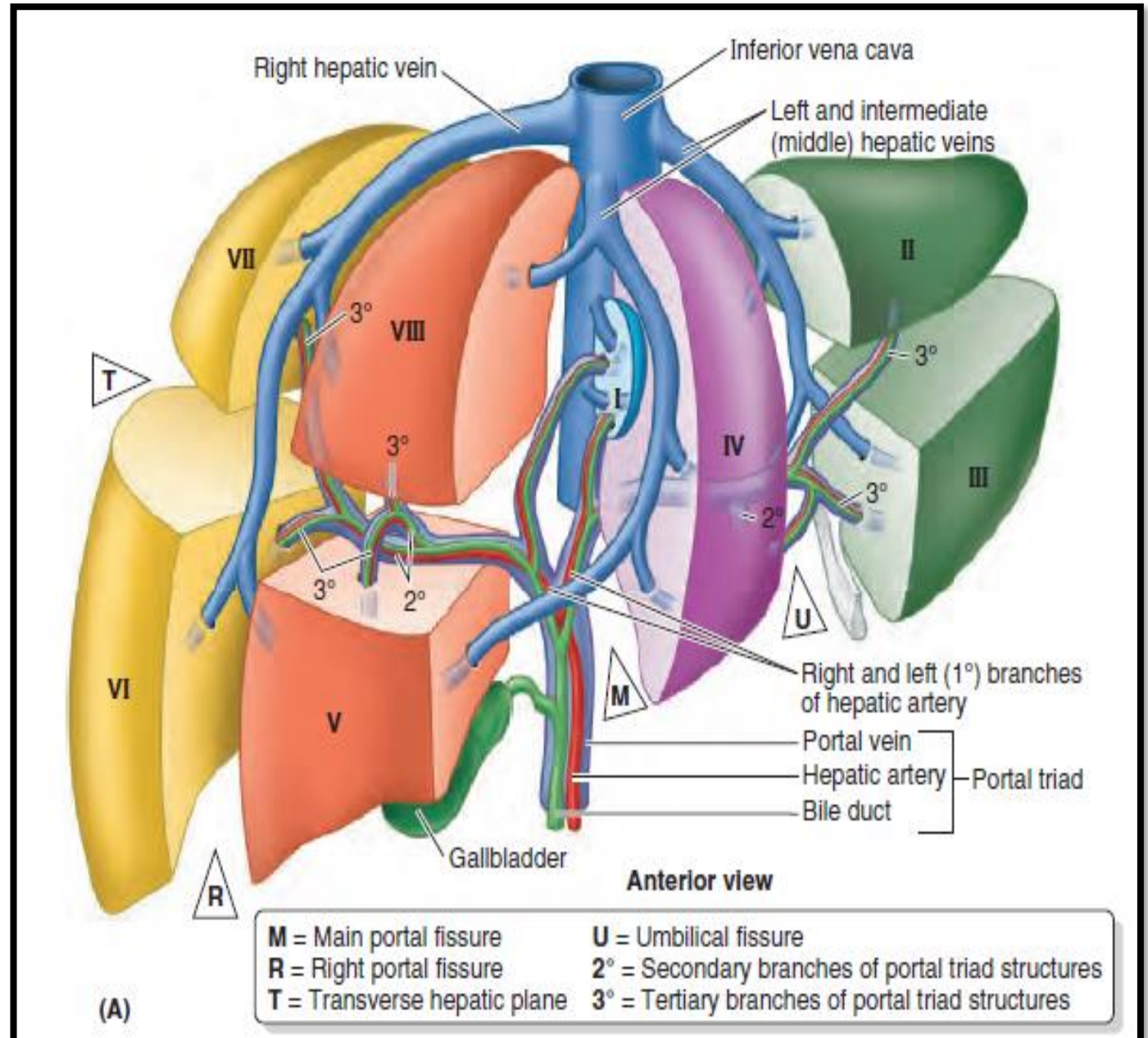
- **The liver is divided** into **right and left true functional surgical lobes** based on the primary division of the **portal triad** into **right and left branches** .
- The plane between the 2 lobes of the liver is the **main portal fissure** in which lies the **middle hepatic vein**. On the surface of the liver , this plane is **the Cantlie line** which extends from the notch of the fundus of the **G.B. to the I.V.C.**
- The right and left lobes are subdivided **vertically** into **medial and lateral divisions** by the **right and left portal fissures** respectively , in which the right and left hepatic veins lie respectively . Each of these **4 divisions** receives a **secondary branch** of the portal triad.
- The **right portal fissure** has no external demarcation while the **left portal fissures** is marked by the attachment of **falciform** ligament to the liver .



FUNCTIONAL SUBDIVISION OF LIVER

A **transverse hepatic plane** divide the abovementioned divisions into **7 segment** (segments II to VIII , numbered clockwise) , each segment receiving **tertiary branches** of the portal triad.

Segment I: (Caudate lobe). It is **exceptionally** supplied by **both** the right and left primary branches of the portal triad and is drained by its own minor hepatic veins (to IVC).

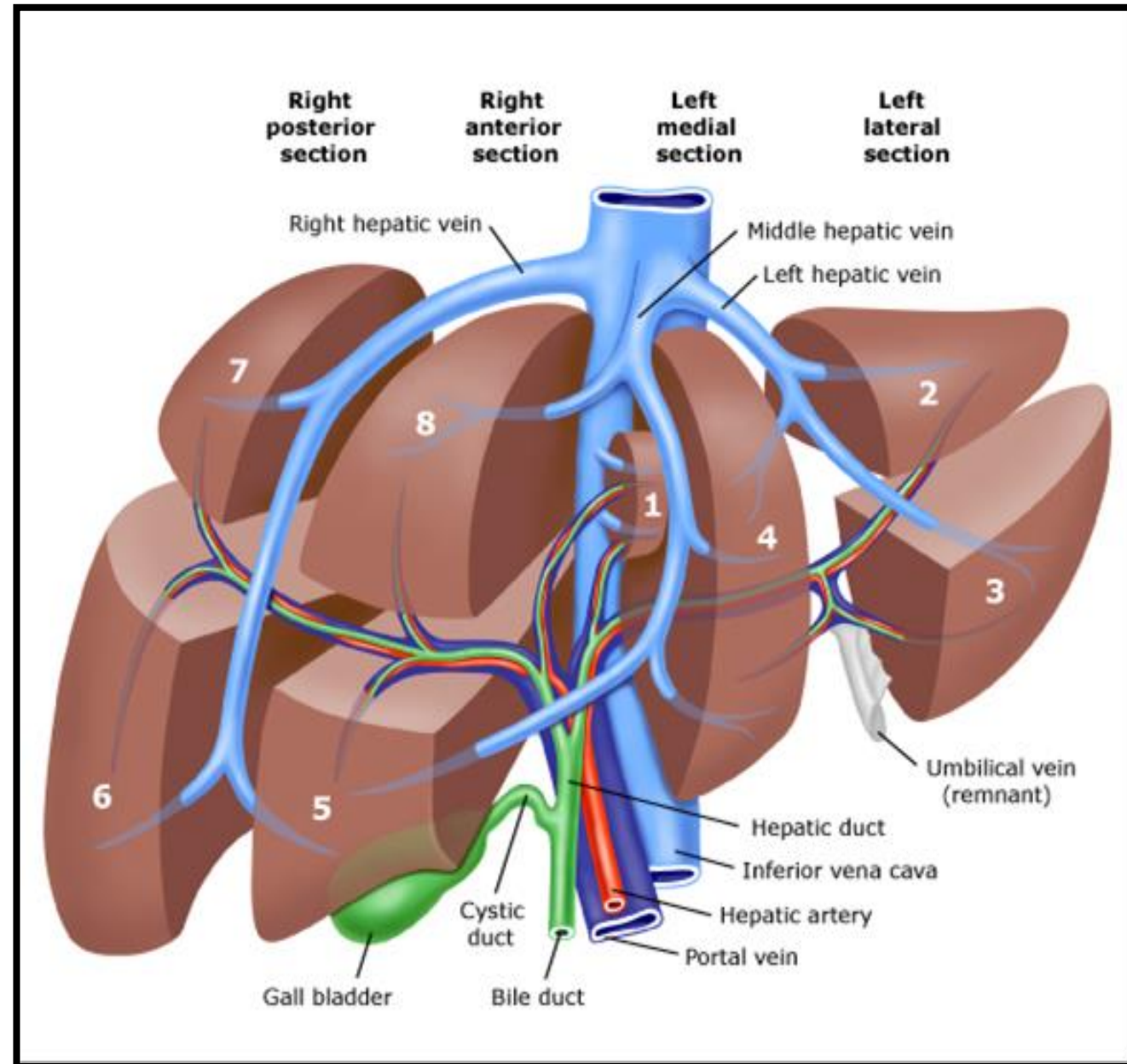


FUNCTIONAL SUBDIVISION OF LIVER

- ❑ Although not distinctly demarcated internally, where the parenchyma appears continuous.
- ❑ The liver has functionally independent right and left livers (parts or portal lobes) that are much more equal in size than the anatomical lobes.
- ❑ caudate , quadrate lobes as parts of left lobe

HOWEVER,

- ❖ the right liver is still somewhat larger
- ❑ Each part receives its own primary branch of the hepatic artery and hepatic portal vein and is drained by its own hepatic duct.
- ❑ vascular surgical segments of the liver were essential for performance of partial hepatectomy (lobectomy or segmentectomy) and partial liver transplantation.



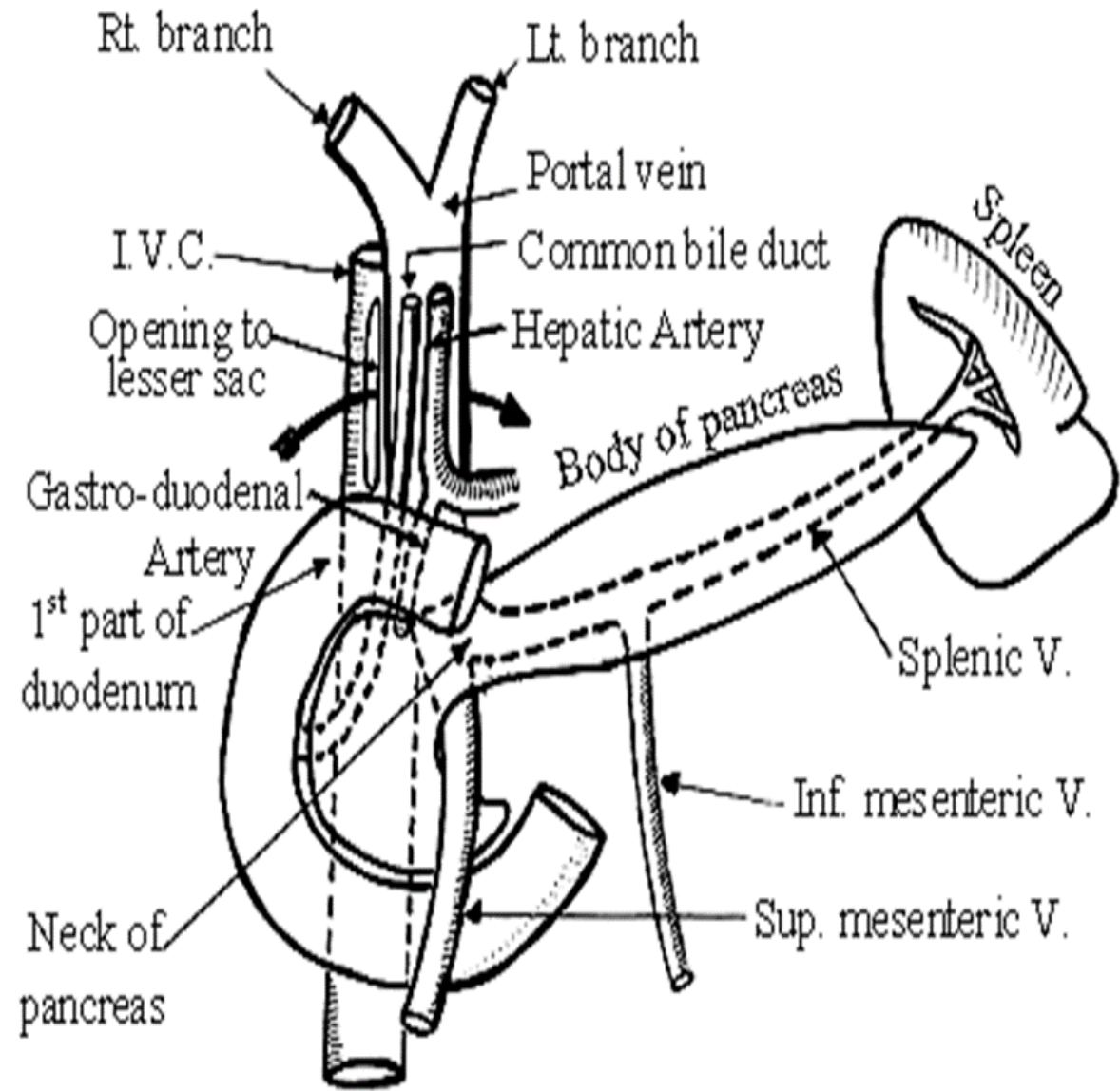
Portal vein

BEGINNING:

It is formed by union of the superior mesenteric and splenic veins behind the neck of pancreas and in front of IVC.

Course & relations:

- It is about **3 inches** long and up to **12 mm.** in diameter.
- It has **no valves.** So, it allows the passage of blood in the two directions.
- It **ascends** behind the 1st part of duodenum and in front of IVC, then in the free border of lesser omentum with the hepatic artery (left) and bile duct (right) anterior to it.
- At the porta hepatis, it divides into right and left branches which enter its corresponding lobe.



* PORTAL VEIN *

Relations: (From below upwards).

1) Before it reaches the lesser omentum : It is related to :

- Anteriorly: The 1st. part of duodenum, separated from it by:

- a- The common bile duct , to the right.

- b- The gastro-duodenal artery, to the left.

- Posteriorly: The inferior vena cava.

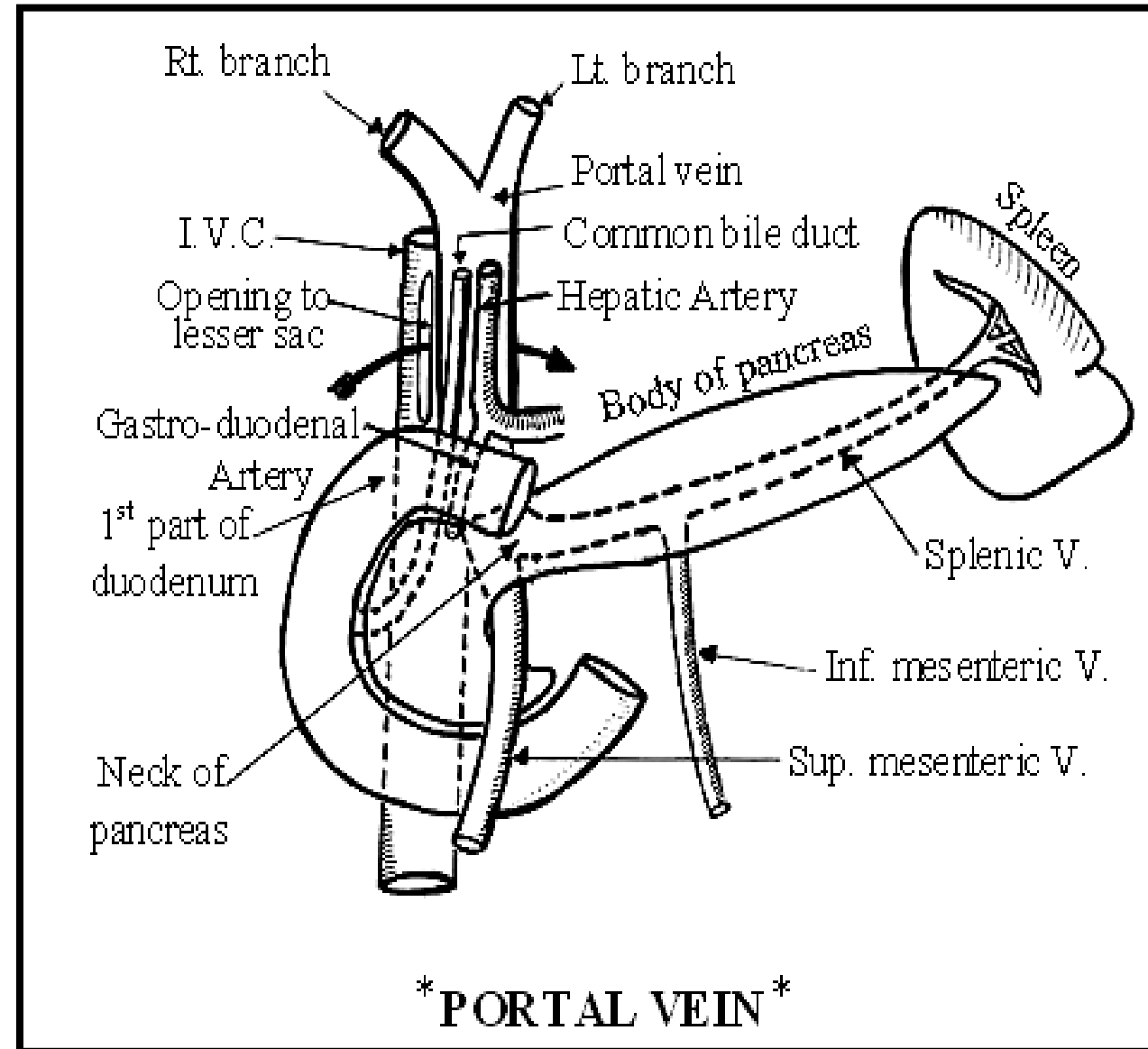
2) In the lesser omentum: It is related to:

- Anteriorly:

- a- The bile duct, anterior and to the right

- b- The hepatic artery, anterior and to the left.

- Posteriorly: The inferior vena cava, separated from it by the epiploic foramen.

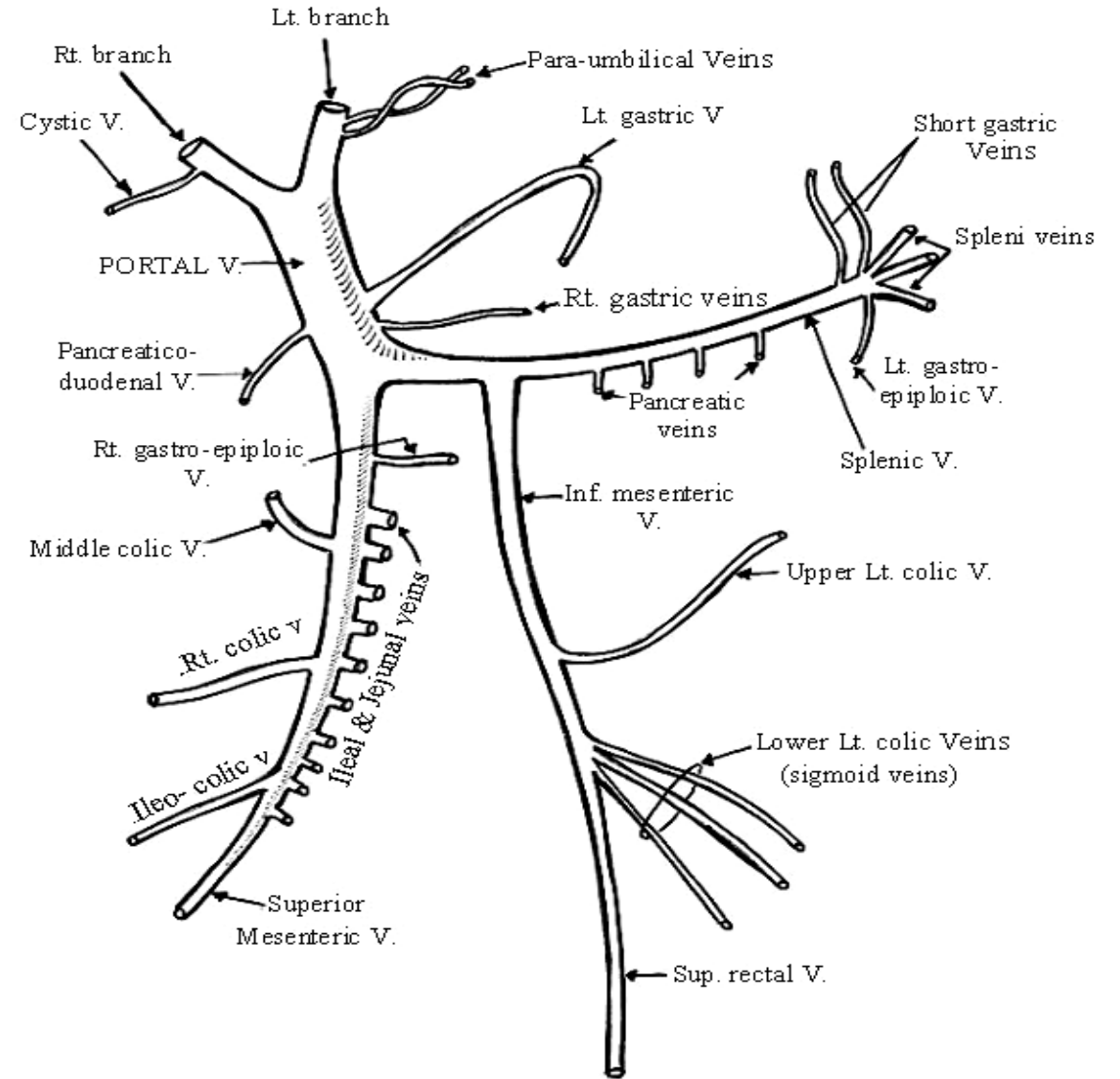


• **3) In the porta hepatis:** It is related to:

• **Anteriorly:** Terminal branches of hepatic artery.

• **Posteriorly:** The caudate process of caudate lobe of liver which separates it from the inferior vena cava.

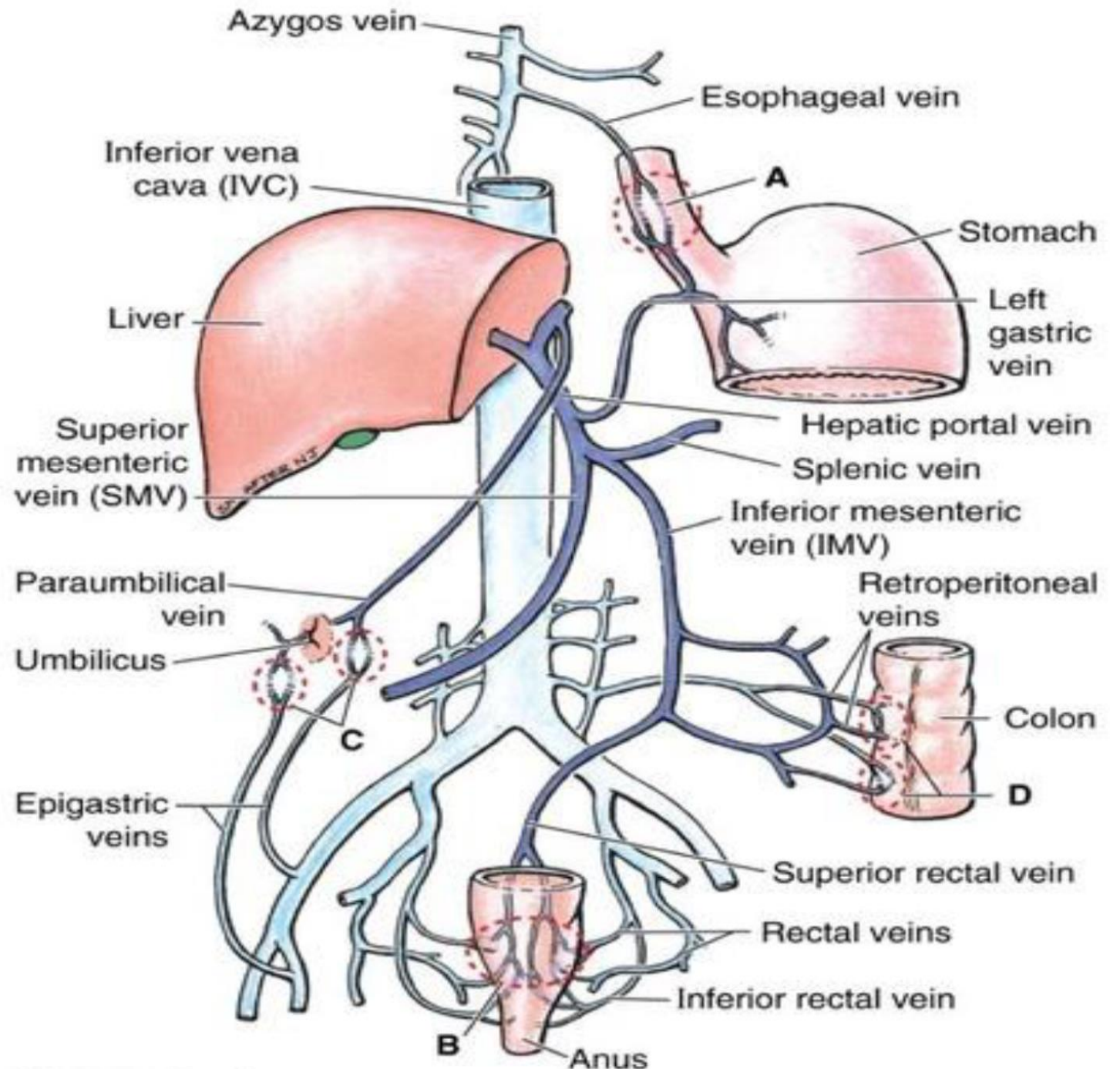
• It is formed by union of 2 veins, ends by dividing into 2 veins and its main trunk receive 2 veins ,its 2 terminal branches have 2 tributaries, and its left terminal branch gives attachment to 2 ligaments (**Rule of 2 in portal vein**)



PORTAL VEIN & ITSTRIBUTARIE

Tributaries:

- 1- Superior mesenteric vein.
- 2- Splenic vein (receives the inferior mesenteric vein).
- 3- Right gastric vein.
- 4- Left gastric vein.
- Both to the main trunk
- 5- Paraumbilical vein (in the left branch).
- 6- Cystic vein (in the right branch).



Portal venous system

The portal circulation receives venous blood from four sites:

- 1) Abdominal part of the GIT (from abdominal part of esophagus to the upper 1/2 of anal canal).
- 2) Pancreas.
- 3) Gall bladder.
- 4) Spleen.

These veins collect into the portal vein which **breaks** into the liver sinusoids.

Blood pass through portal vein to the liver where metabolism occurs.

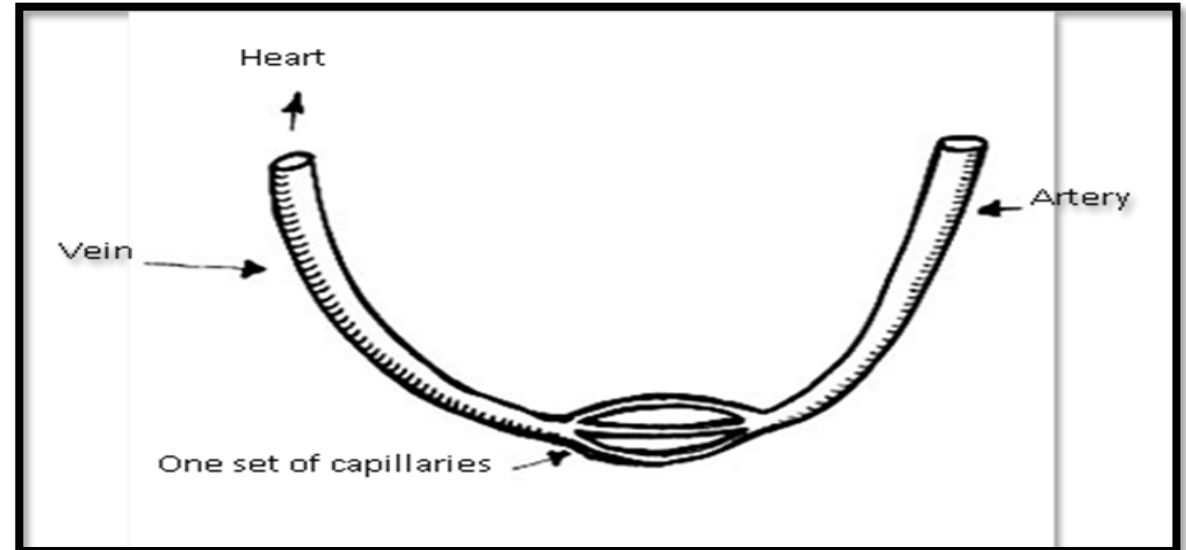
Portal circulation begins by capillaries and ends by sinusoids i.e. arterial blood which leaves the heart has to pass through two peripheral networks before it reaches the heart as follows:

(a) The 1st. network of capillaries lies in the drained organ e.g. submucosa of the GIT.

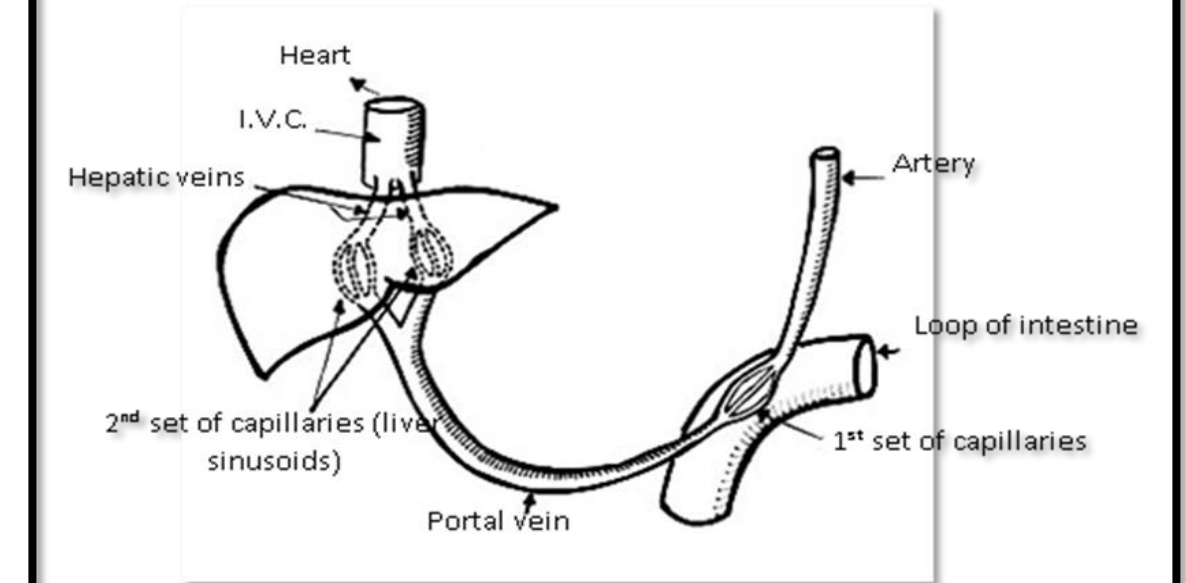
(b) The 2nd network of sinusoids in the liver.

blood circulates in the sinusoids of the liver, pass to central veins which are collected in 3 hepatic veins which end in the inferior vena cava.

- General circulation



* Portal Circulation*



Hepatic Portal Circulation

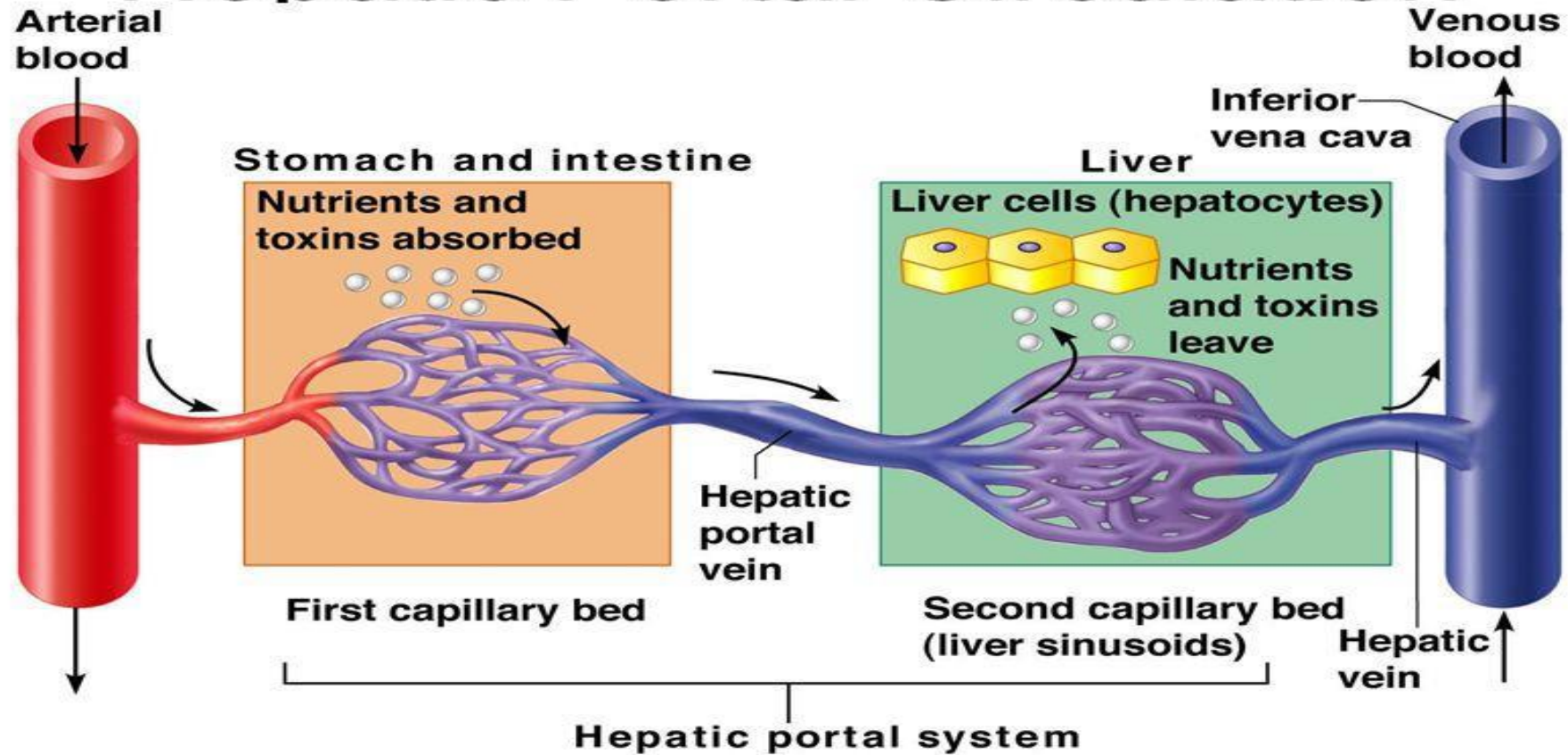
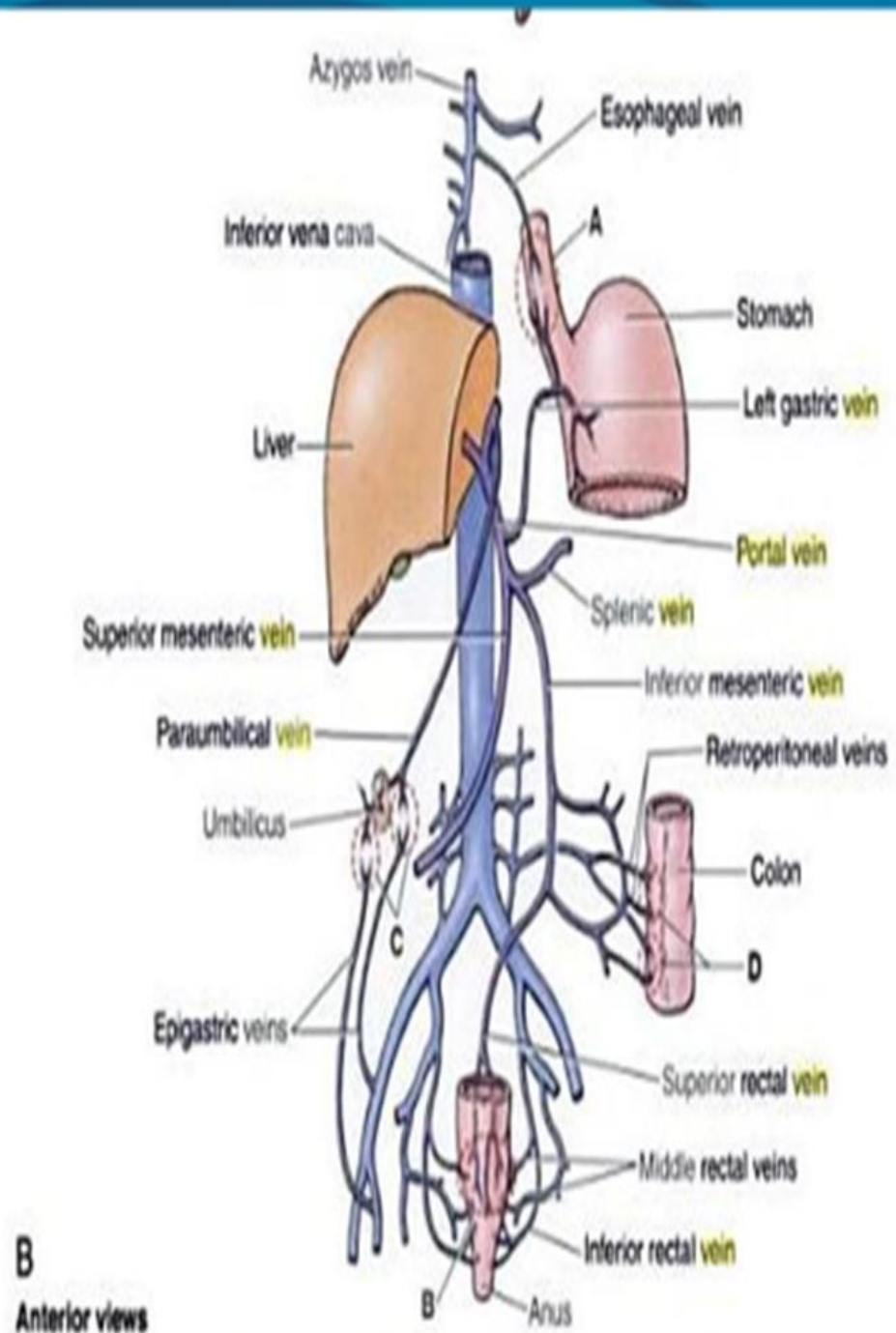


Figure 11.16

Portosystemic anastomosis

- These are the sites where veins belong to portal venous system anastomose with veins belong to systemic circulation.
- They are important Surgically because in case of **liver cirrhosis**, the pressure in the portal vein and its tributaries increases . The anastomotic veins will be enlarged , tortuous and engorged with blood which will pass from these veins to the systemic circulation.



Sites of portosystemic anastomosis

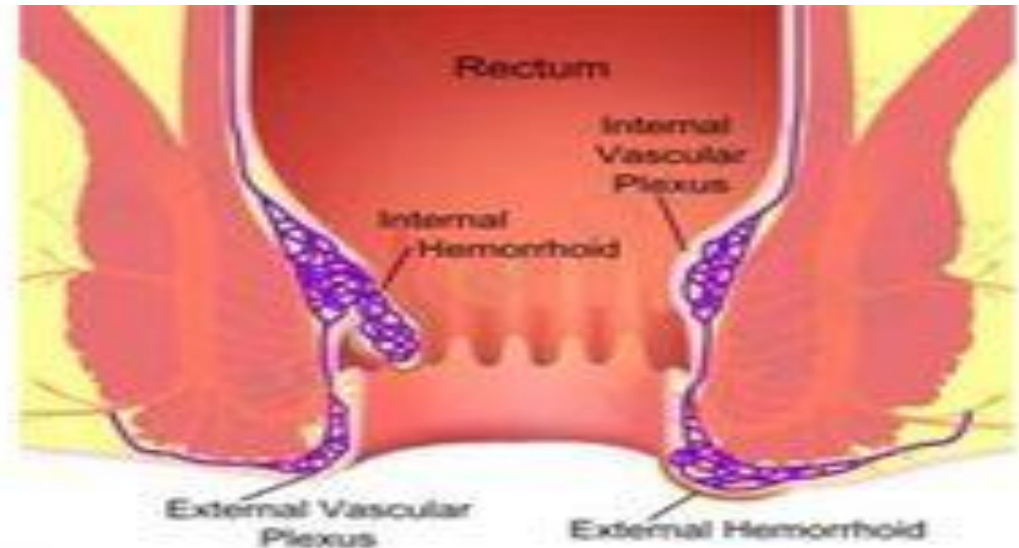
A] Anastomoses at lower part of esophagus between:

- Esophageal veins of left gastric vein (portal).
- Esophageal veins of vena azygos (systemic).
- ❖ In portal hypertension opening of this anastomosis, leads to esophageal and gastric varices. Its rupture leads to hematemesis and melena.



B] Anastomoses at lower end of rectum and upper end of anal canal between:

- Superior rectal vein (portal).
- Middle and inferior rectal veins (systemic).
- ❖ In portal hypertension opening of this anastomosis leads to formation of piles (hemorrhoids) and bleeding per rectum.



c] Anastomoses around the umbilicus:

- Para- umbilical veins (portal).
- Superior & inferior epigastric veins (systemic).

In portal hypertension opening of this anastomoses leads to dilatation of the veins in a radial direction around the umbilicus, a condition called **caput medusa**.

d] Other areas of anastomoses:

1- At the **bare areas of the liver**:

- Between capillaries inside the liver (portal) .
- Phrenic veins of the diaphragm (systemic).

2- At the **posterior abdominal wall**:

- Between the pancreatico-duodenal , splenic and colic veins (portal).
- Phrenic and Lumbar veins (systemic).



Portal Vein Tributaries: Portacaval Anastomoses

