



Lecture 06

PORTAL VEIN & PORTAL SYSTEMIC ANASTOMOSES

BY

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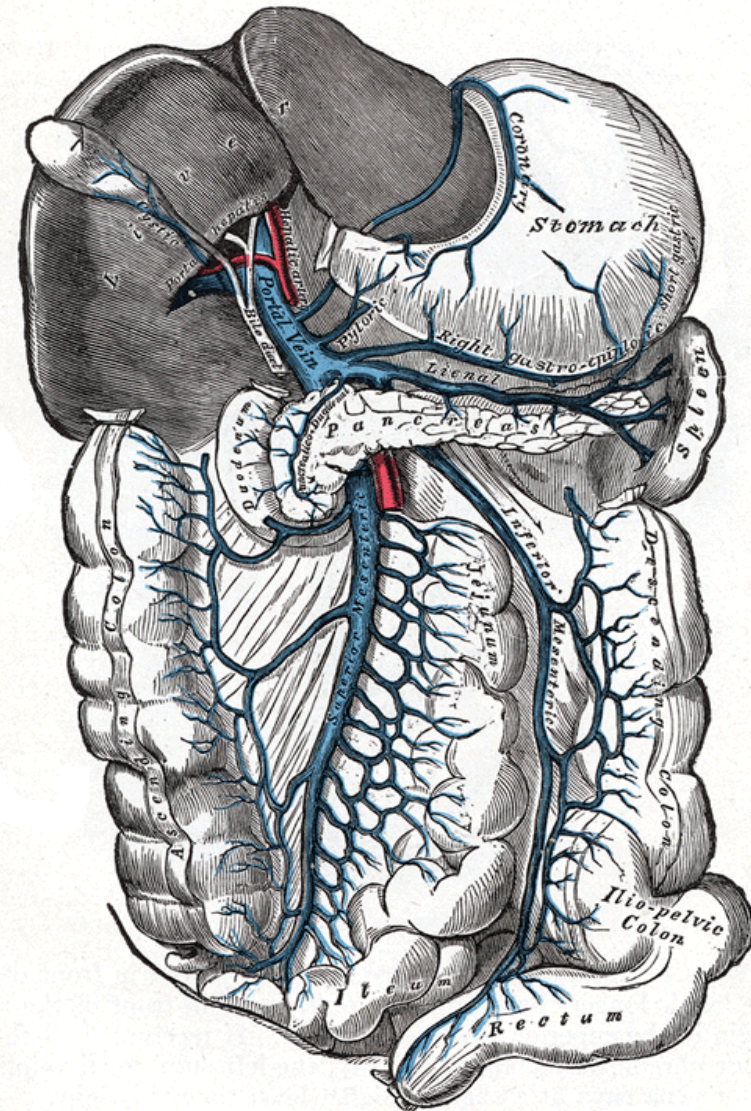
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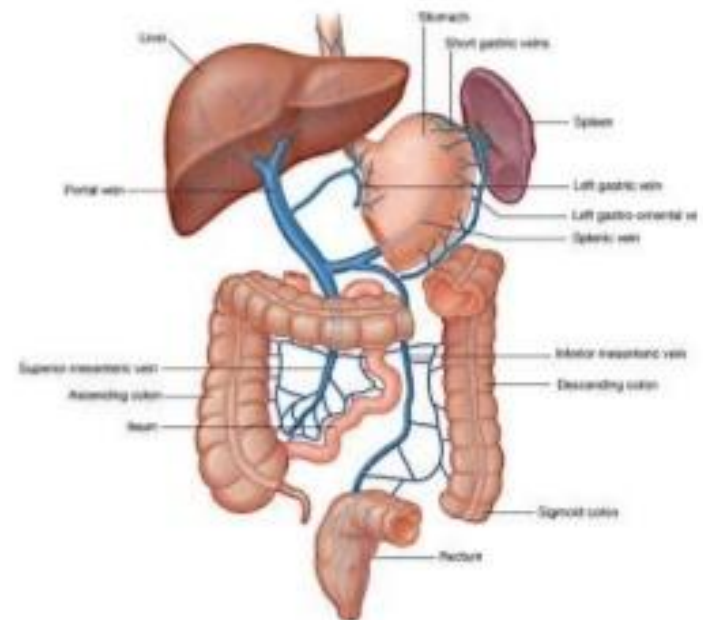
INTRODUCTION

- The portal vein is the large vein that collects blood from the:
- Abdominal part of the gastrointestinal tract
- From the lower third of esophagus to halfway down the anal canal.
- It also includes spleen, pancreas and gall bladder.
- It is also called hepatic portal vein.
- **NOTE:** It is called portal vein because it begins in one set of capillaries [in the gut] and ends in another set of capillaries [in the liver].



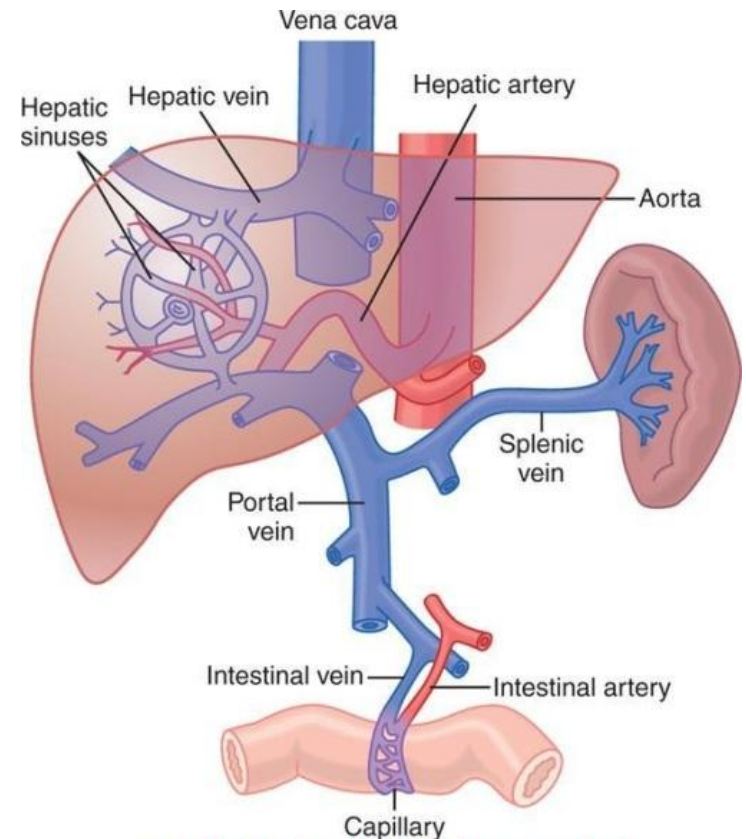
Hepatic Portal Vein

- Origin & end in capillaries / venous sinusoids
- Size: 8cm X 1 cm
- Drains
 - Abdominal part of alimentary tract (except lower part of anal canal)
 - Spleen & Pancreas
- Conveys absorbed products of digested food to liver
- Devoid of valves
- Reservoir of blood : 1200 ml / min



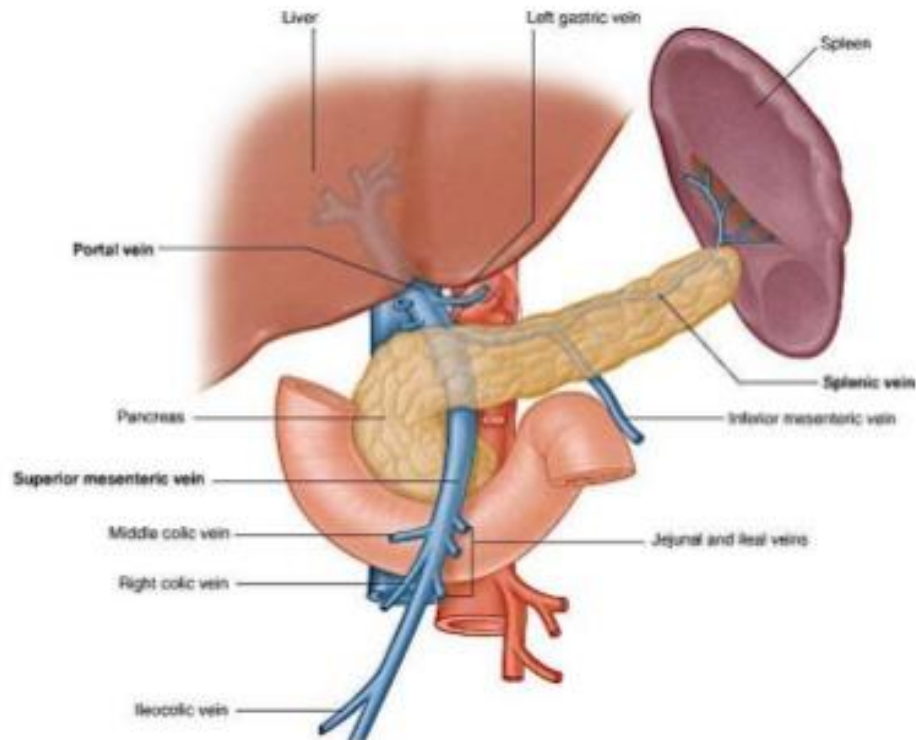
FORMATION OF PORTAL VEIN

- It is formed by the union of superior mesenteric vein and splenic vein behind the neck of the pancreas.
- The level of formation of PV is vertebra L2.
- It ascends to the right behind the first part of the duodenum and enters the free margin of the lesser omentum.
- These parts are known as infraduodenal, retroduodenal and supraduodenal parts.
- The vein ends at the right end of porta hepatis by dividing into right and left terminal branches which further break up into sinusoids.
- The blood from the sinusoids is collected by hepatic veins that join the inferior vena cava.



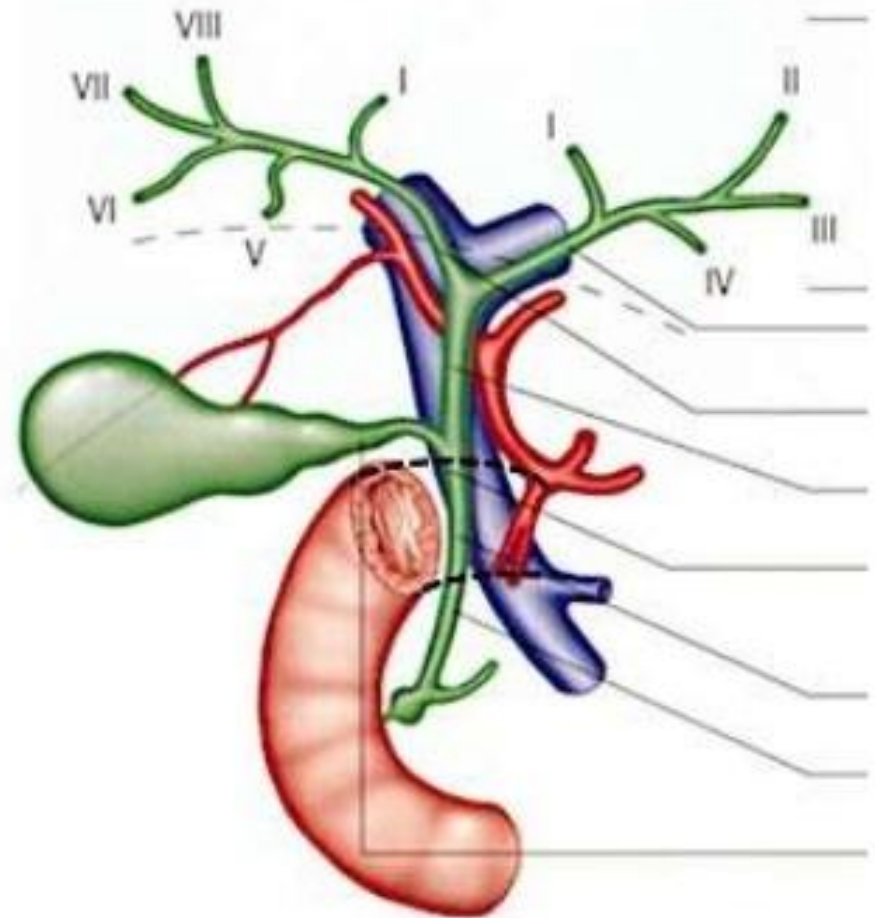
Formation

- Union of Sup mesenteric & Splenic vein
- Between neck of Pancreas & IVC at level L2



Course: Extrahepatic part

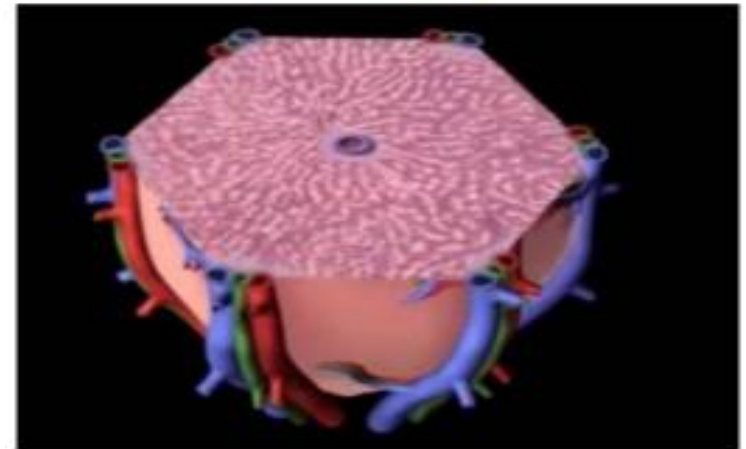
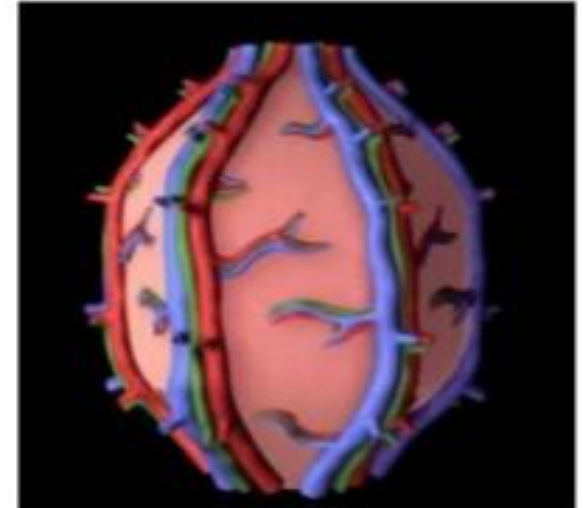
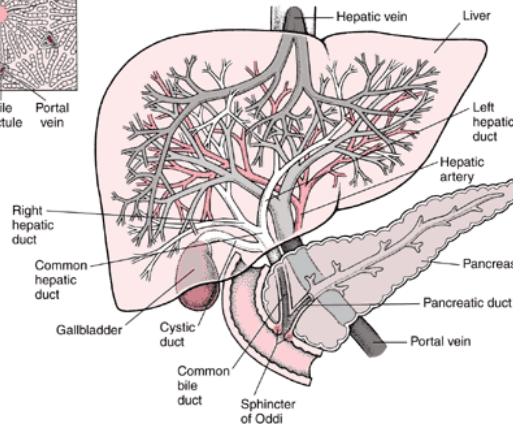
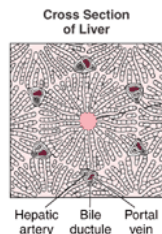
- Passes upwards & Rt, behind neck of pancreas & 1st part of duodenum
- Enters rt free margin of lesser omentum in front of epiploic foramen with BD & HA
- Reaches porta hepatis & divides into rt & Lt branches.



Course: Intrahepatic part

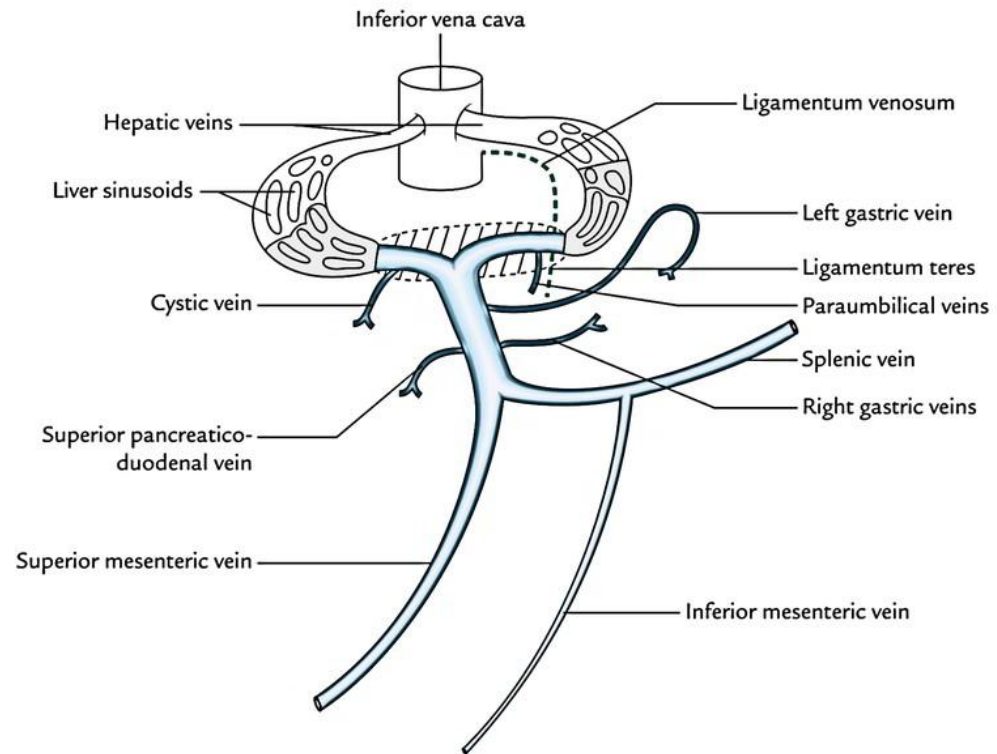
- Branches of portal vein
- Segmental brs
- Brs in Portal canal
- **Hepatic sinusoids**
- Central veins
- Sublobular veins
- Hepatic veins

↓
IVC



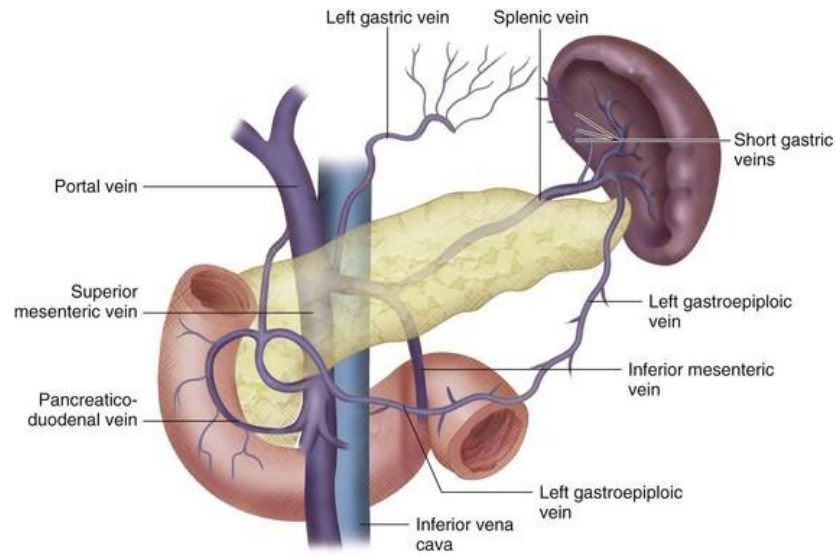
Tributaries

- Formative
 - Sup Mesenteric vein
 - Splenic vein
- Received by Trunk
 - Rt & Lt Gastric veins
 - Superior PD vein
- Received by branches
 - Cystic vein
 - Paraumbilical veins
- Occasional
 - Inf mesenteric
 - Rt gastro-epiploic
 - Pre-pyloric vein.



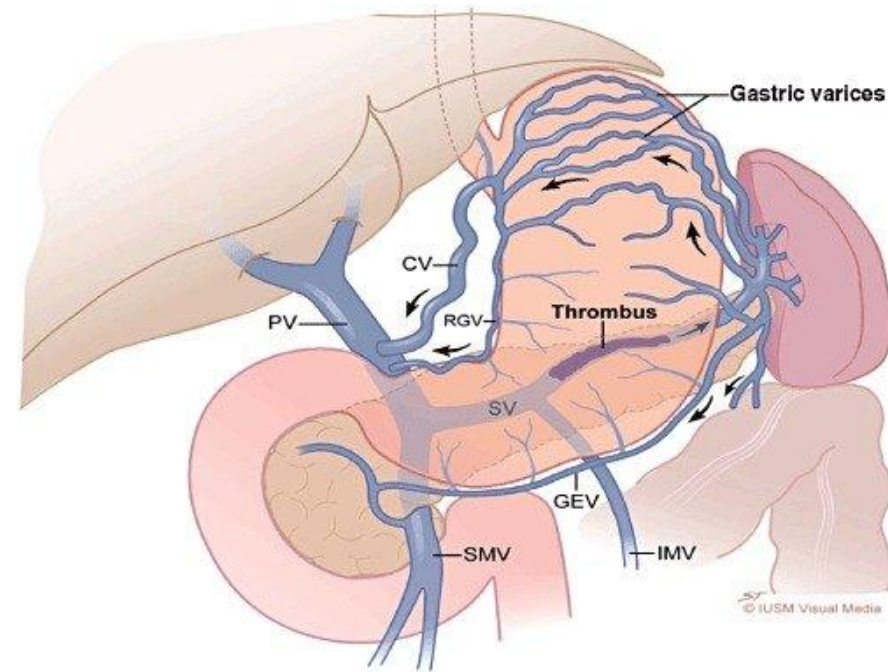
SPLENIC VEIN

- The **splenic vein** (formerly the **lienal vein**) is a blood vessel that drains blood from the spleen, the stomach fundus and part of the pancreas.
- It is part of the hepatic portal system.
- **Structure**
- The splenic vein is formed from small venules that leave the spleen.
- It travels above the pancreas, alongside the splenic artery.
- It collects branches from the stomach and pancreas, and most notably from the large intestine (also drained by the superior mesenteric vein) via the inferior mesenteric vein, which drains in the splenic vein shortly before the origin of the hepatic portal vein.
- The splenic vein ends in the portal vein, formed when the splenic vein joins the superior mesenteric vein.



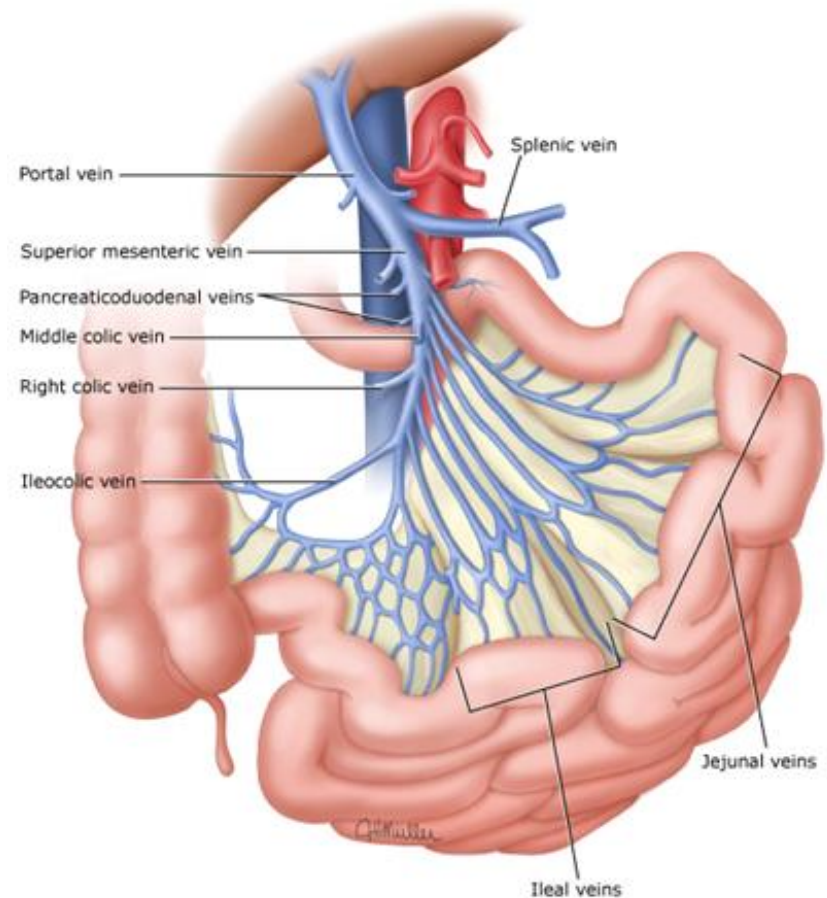
CLINICAL SIGNIFICANCE

- The splenic vein can be affected by thrombosis, presenting some of the characteristics of portal vein thrombosis and portal hypertension, but localized to part of the territory drained by the splenic vein.
- These include varices in the stomach wall due to hypertension in the short gastric veins and abdominal pain.
- This results in gastric varices, in which the treatment of choice would be splenectomy.
- The most common cause for splenic vein thrombosis is both chronic and acute pancreatitis.



SUPERIOR MESENTERIC VEIN

- The **superior mesenteric vein** is a blood vessel that drains blood from the small intestine (jejunum and ileum).
- At its termination behind the neck of the pancreas, the superior mesenteric vein combines with the splenic vein to form the hepatic portal vein.
- The superior mesenteric vein lies to the right of the similarly named artery, the superior mesenteric artery, which originates from the abdominal aorta.



SUPERIOR MESENTERIC VEIN TRIBUTARIES

Structure

Tributaries of the superior mesenteric vein drain the small intestine, large intestine, stomach, pancreas and appendix and include:

- Right gastro-omental vein (also known as the right gastro-epiploic vein)

- Inferior pancreaticoduodenal veins

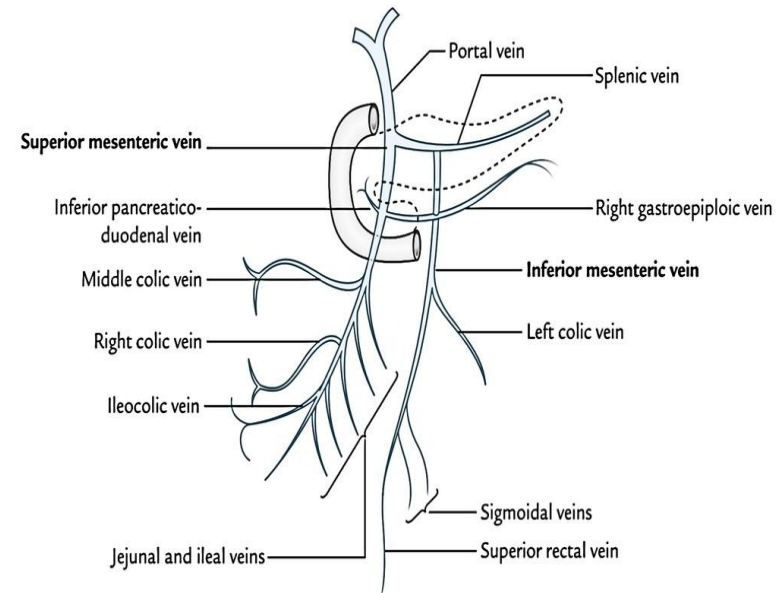
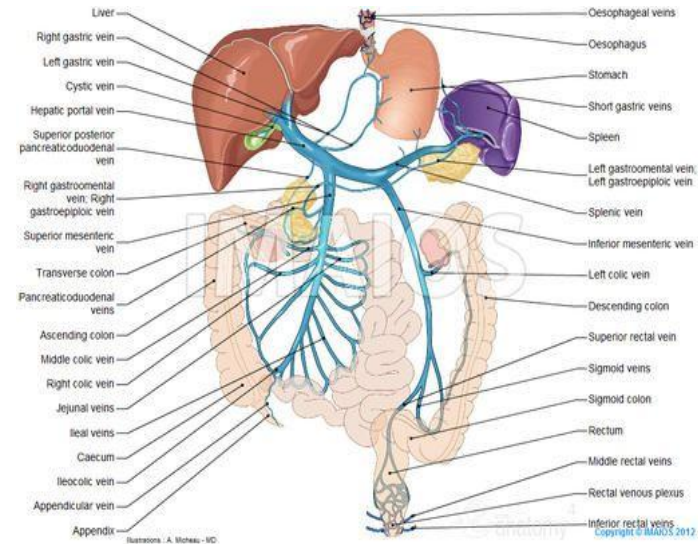
- Veins from jejunum

- Veins from ileum

- Middle colic vein - drains the transverse colon

- Right colic vein - drains the ascending colon

- Ileocolic vein

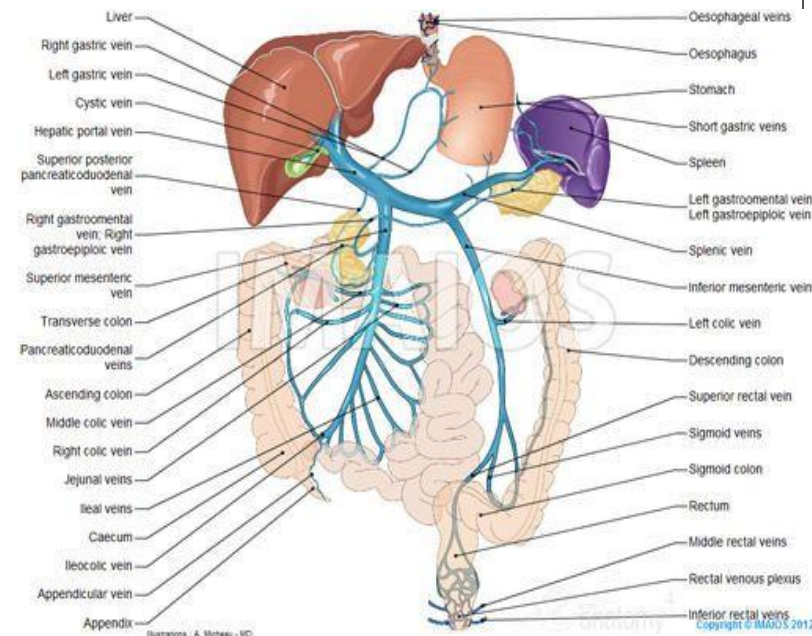


INFERIOR MESENTERIC VEIN

- The **inferior mesenteric vein** (IMV) is a blood vessel that drains blood from the large intestine.
- It usually terminates when reaching the splenic vein, which goes on to form the portal vein with the superior mesenteric vein (SMV).
- Anatomical variations include the IMV draining into the confluence of the SMV *and* splenic vein and the IMV draining in the SMV.

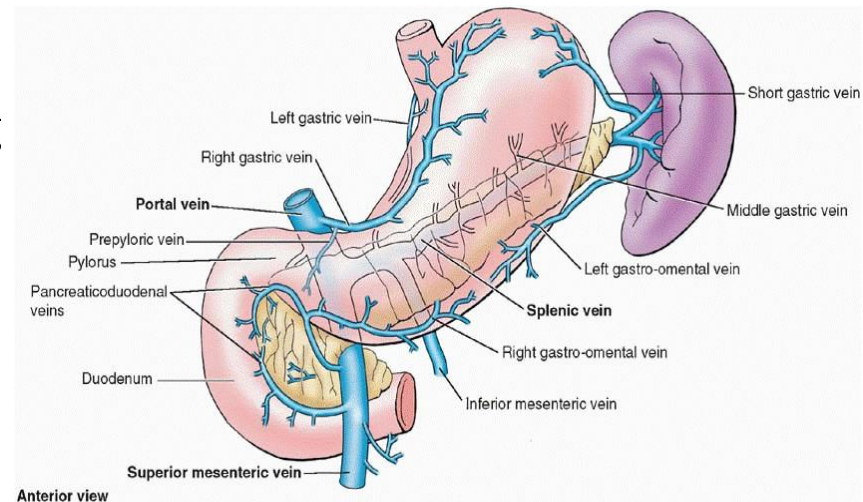
• Tributaries

- Tributaries of the inferior mesenteric vein drain the large intestine, sigmoid colon and rectum and
- It include the:
 - Left colic vein.
 - Sigmoid veins.
 - Superior rectal vein.
 - Rectosigmoid veins.



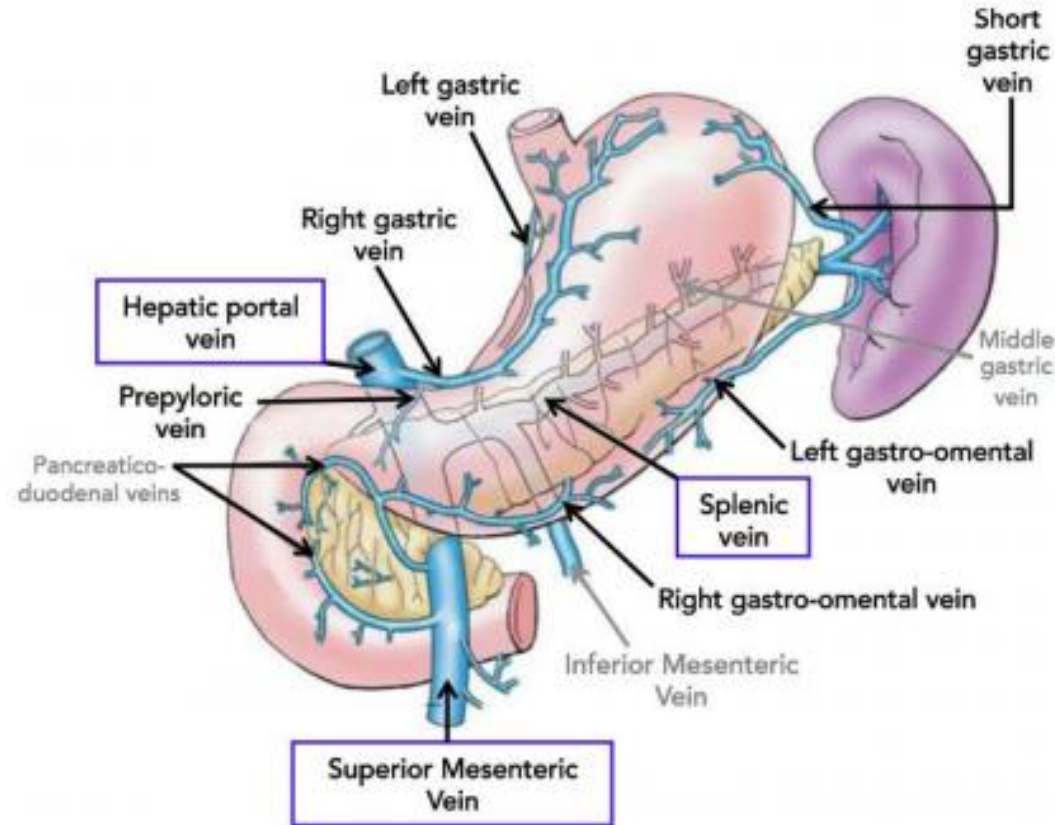
LEFT GASTRIC VEIN

- The **left gastric vein** (or **coronary vein**) is a vein carrying deoxygenated blood.
- It derives from tributaries draining both surfaces of the stomach.
- It runs from right to left along the lesser curvature of the stomach, between the two layers of the lesser omentum, to the esophageal opening of the stomach, where it receives some esophageal veins.
- It then turns backward and passes from left to right behind the omental bursa and drains into the portal vein.
- Thus, it acts as collaterals between the portal veins and the systemic venous system of the lower esophagus (azygos vein).
- **Esophageal and paraesophageal varices**
- They are supplied primarily by the left gastric vein (due to flow reversal) and typically drain into the azygos/hemiazygos venous system.



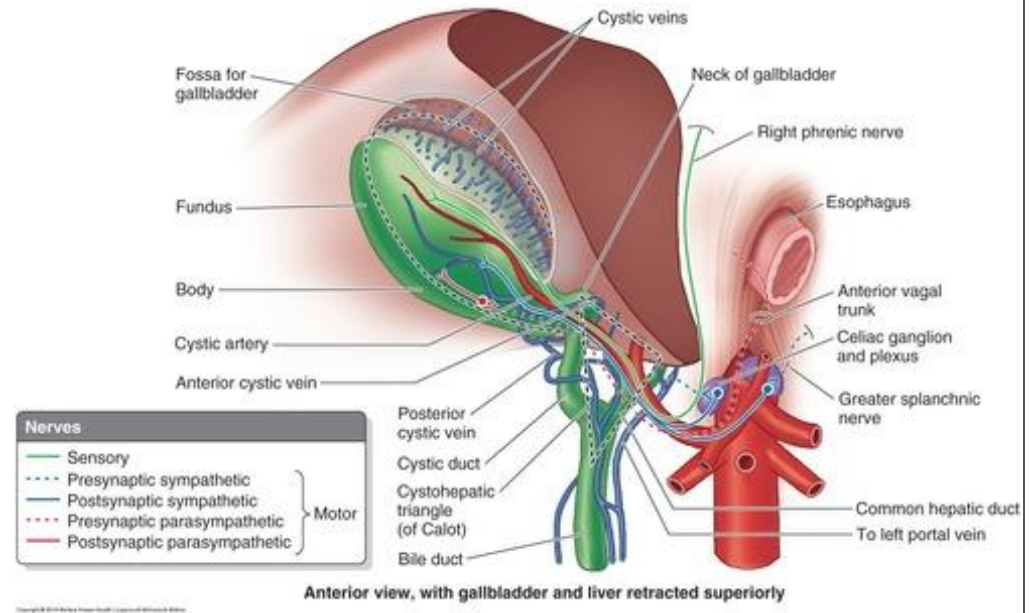
RIGHT GASTRIC VEIN

- Also called as **pyloric vein**.
- It drains blood from the lesser curvature of the stomach into the hepatic portal vein.
- It is part of the portal circulation.



CYSTIC VEIN

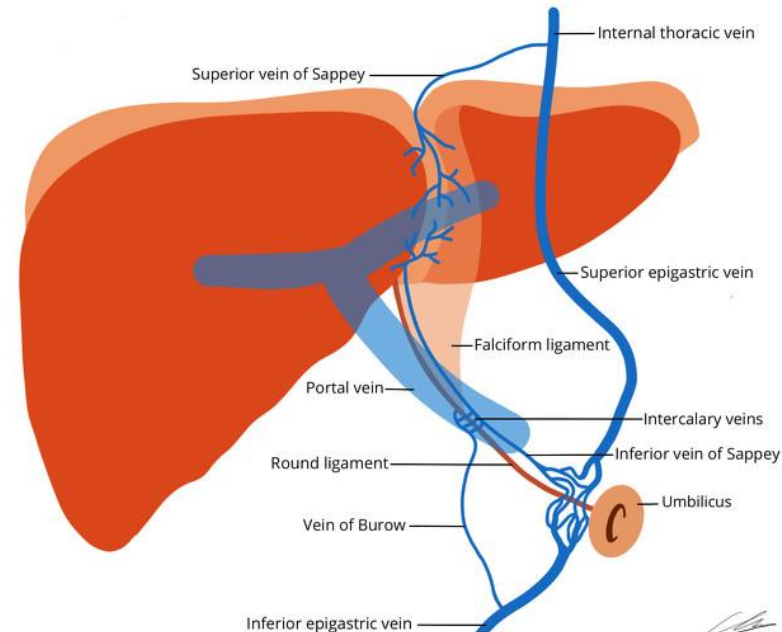
- When present the **cystic vein** drains the blood from the gall-bladder.
- It accompanies the cystic duct, usually ends in the right branch of the portal vein.
- It is usually not present, and the blood drains via small veins in the gall-bladder bed directly to the parenchyma of the liver.



PARAUMBILICAL VEINS

- The **paraumbilical veins** are small veins around the falciform ligament.
- It drain venous blood from the anterior part of the abdominal wall and diaphragm directly into the liver, and communicate with other anterior abdominal wall veins.
- This flow is considered the cause of focal fatty infiltration and focal fatty sparing of the liver, and when there is systemic venous obstruction, may cause hepatic pseudo lesions.

Paraumbilical veins



GROSS ANATOMY OF PARAUMBILICAL VEIN

The **superior vein of Sappey** drains the upper portion of the falciform ligament and medial part of the diaphragm.

It enters peripheral portal branches of the left hepatic lobe.

It also communicates with branches of the superior epigastric or internal thoracic veins.

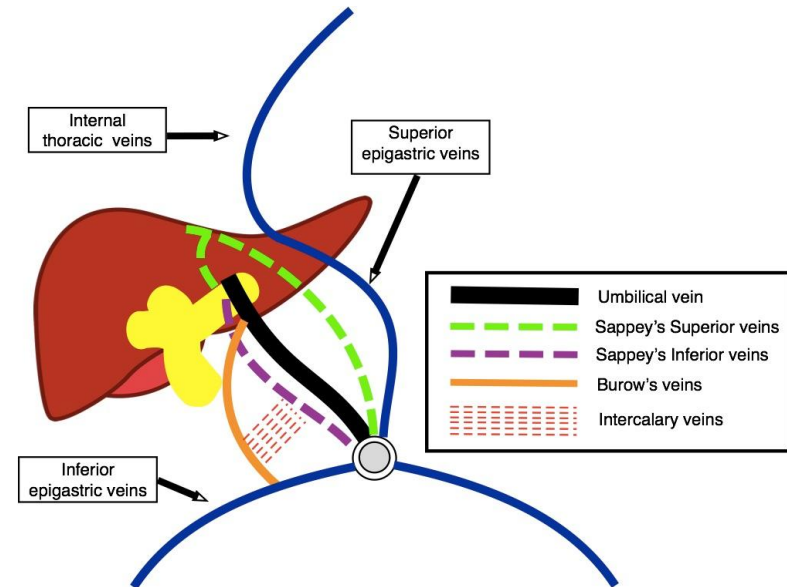
The **inferior vein of Sappey** drains the lower portion of the falciform ligament and enters peripheral portal branches of the left hepatic lobe.

It descends along the round ligament and communicates with branches of inferior epigastric veins around the umbilicus.

The **vein of Burow** is the third vein around the falciform ligament.

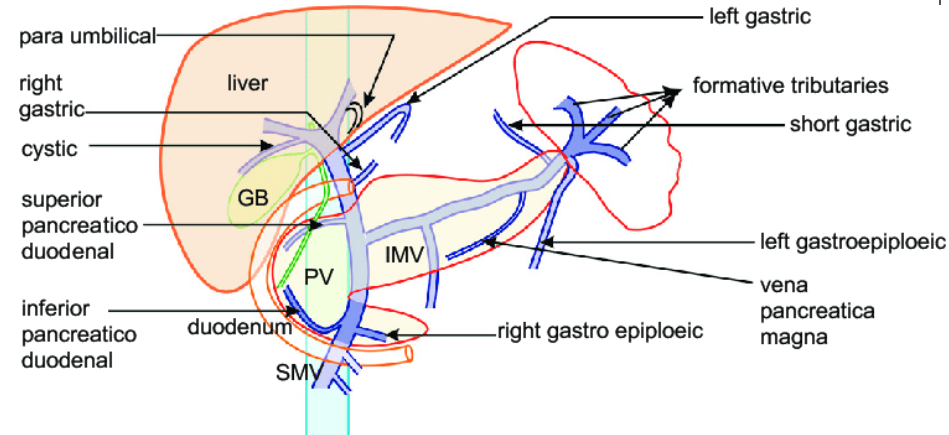
But it does not enter the liver directly.

However, it terminates in the middle portion of the collapsed umbilical vein, although some small communicating branches are present between it and the inferior vein of Sappey, namely, the intercalary veins.



Pancreaticoduodenal veins

- The **pancreaticoduodenal veins** accompany their corresponding arteries and act to drain the head of the pancreas and duodenum.
- **Gross anatomy**
- There are four small pancreaticoduodenal veins:
 - posterior superior pancreaticoduodenal vein
 - anterior superior pancreaticoduodenal vein
 - posterior inferior pancreaticoduodenal vein
 - anterior inferior pancreaticoduodenal vein
- They drain the head of the pancreas and the second and third parts of the duodenum.
- **Location**
- The pancreaticoduodenal veins lie on the surface of the pancreas and form anterior and posterior arcades via anastomoses between the inferior and superior veins.
- Duodenal branches extend inferiorly and to the right of the head of the pancreas.
- The superior veins are generally larger than the inferior veins and drain a greater portion of the pancreatic head



Relations of Portal Vein

- **Infraduodenal Part**

- **Anterior**

- Neck of pancreas

- **Posterior**

- Inferior vena cava

- **Retroduodenal Part**

- **Anterior**

- First part of duodenum

- Gastroduodenal artery

- **Posterior**

- Inferior vena cava

- **Supraduodenal part**

- **Anterior**

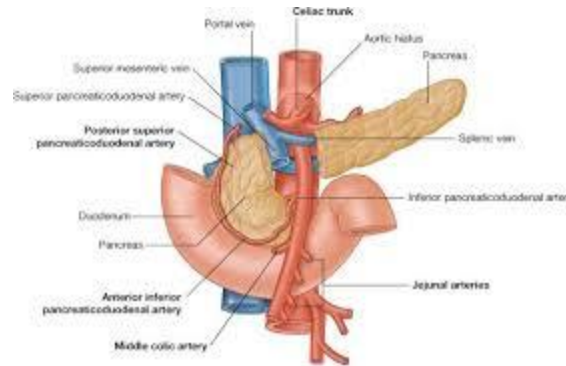
- Hepatic artery

- Bile duct within margin of lesser omentum

- **Posterior**

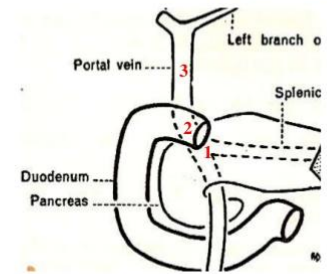
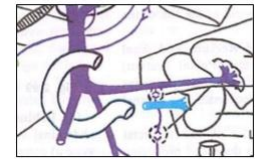
- Inferior vena cava [separated by foramen epiploicum]

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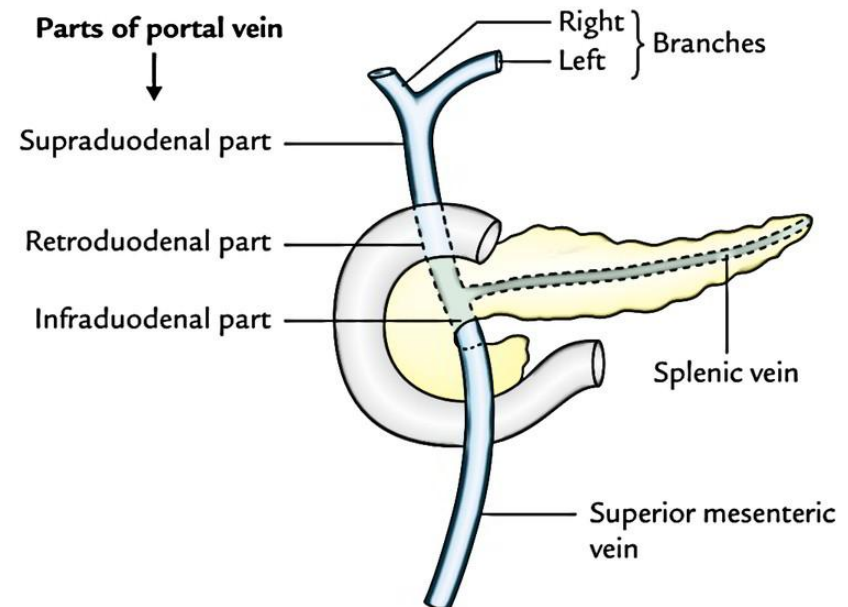


Parts

- Infraduodenal
- Retroduodenal
- Supraduodenal



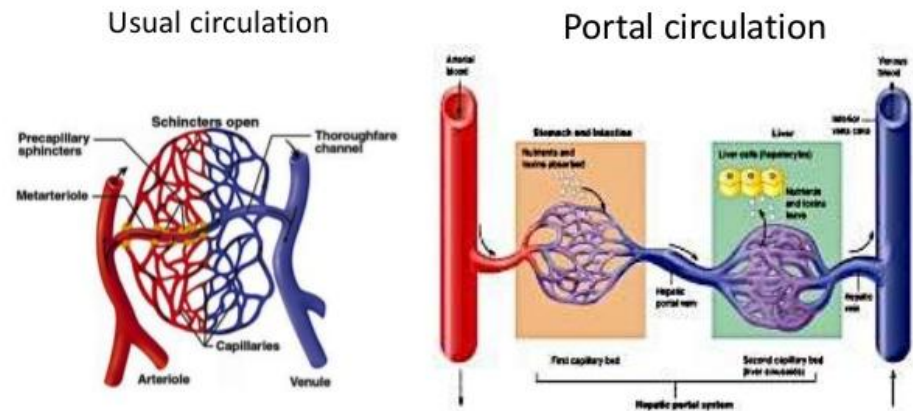
Parts of portal vein



Portocaval or Portosystemic anastomosis

- Under normal conditions, the portal venous blood traverses the liver and drains into the inferior vena cava of the systemic venous circulation through the hepatic veins.
- This is the direct route.
- However, other, smaller communications exist between the portal and systemic systems,.
- These small communications form important routes of collateral circulation in event of portal obstruction.
- These communications are as follows:

Portal system



COMMUNICATION OF THE PORTAL SYSTEM

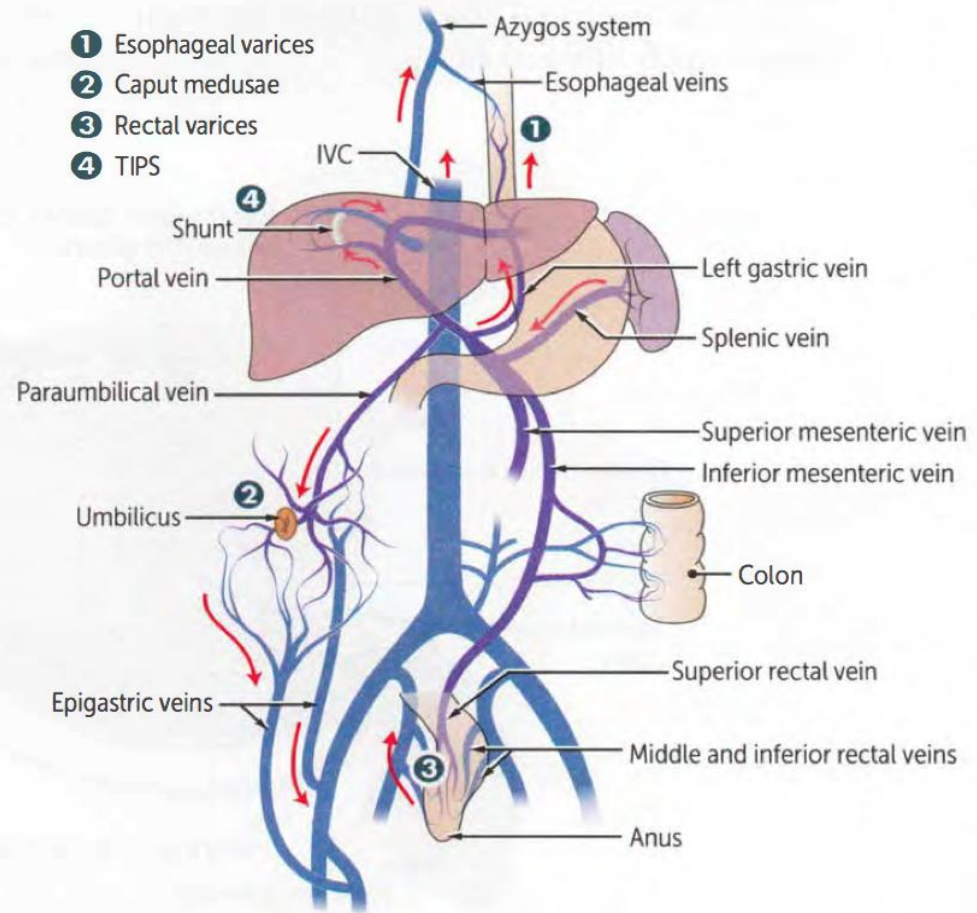
The portal venous system communicates with the systemic venous system in the following locations.

- ***Between the esophageal veins:***

Draining into either the azygos vein (systemic system) or the left gastric vein (portal system).

- ***Between the rectal veins:***

The inferior and middle draining into the inferior vena cava (systemic system), and the superior rectal vein continuing as the inferior mesenteric vein (portal system).

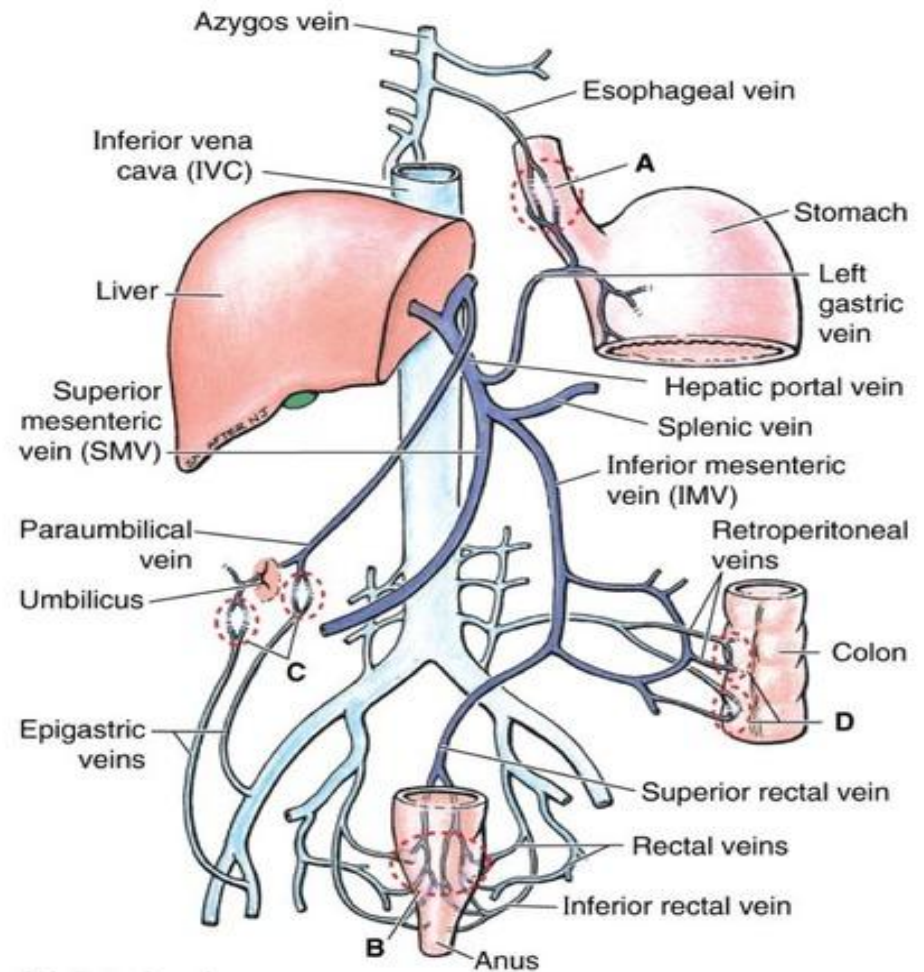


COMMUNICATION OF THE PORTAL SYSTEM

- ***Paraumbilical veins:***

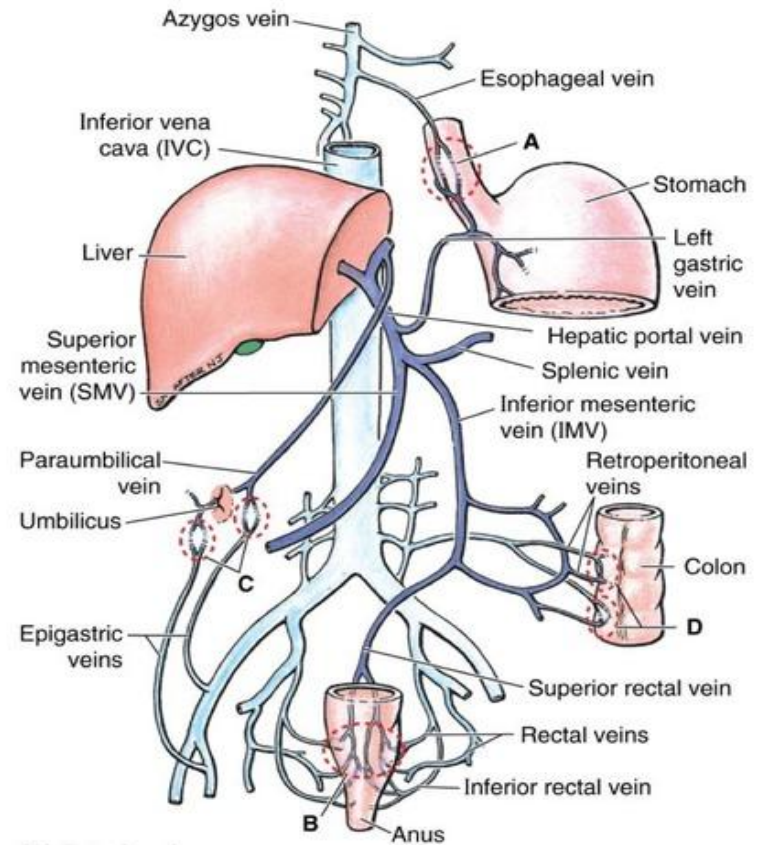
Of the anterior abdominal wall (portal system) anastomosing with the superficial epigastric veins (systemic system)

Paraumbilical veins establish anastomoses between the veins of the anterior abdominal wall and the portal and internal iliac veins.



COMMUNICATION OF THE PORTAL SYSTEM

- **Twigs of colic veins:**
(portal system) anastomosing with the retroperitoneal veins (systemic system).

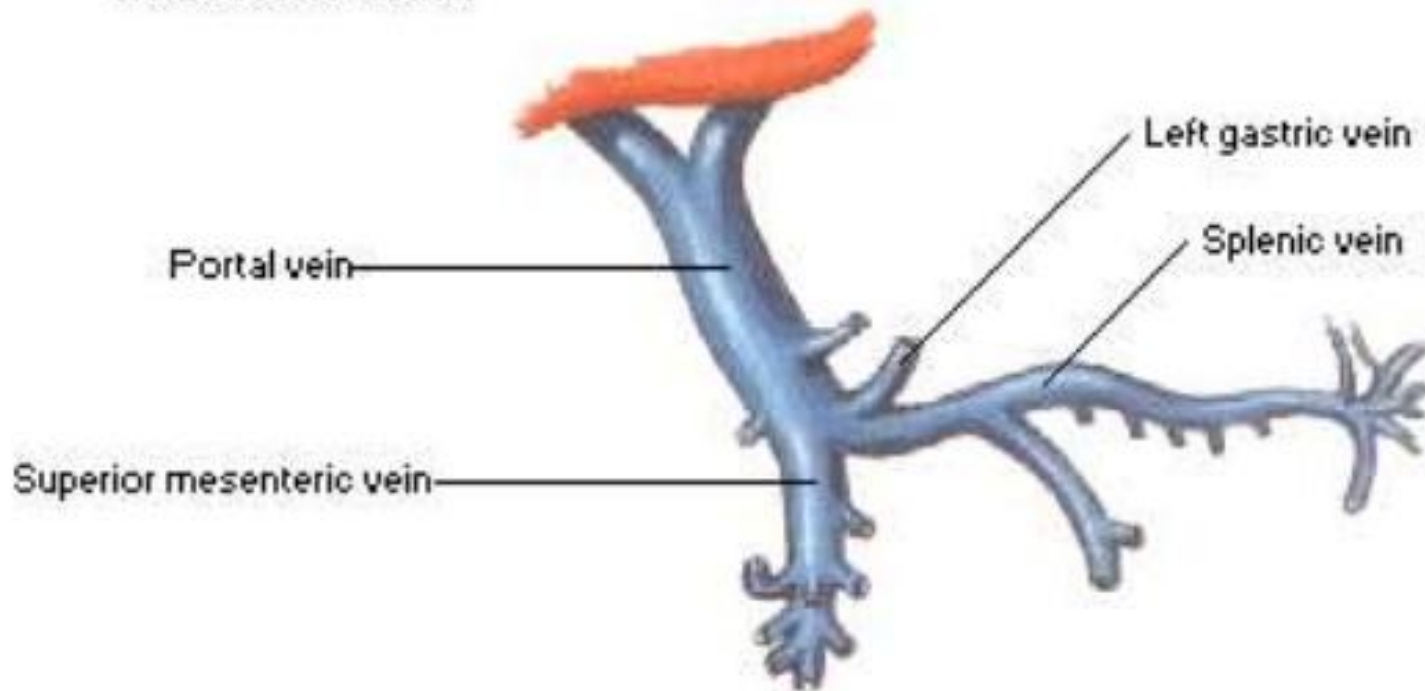


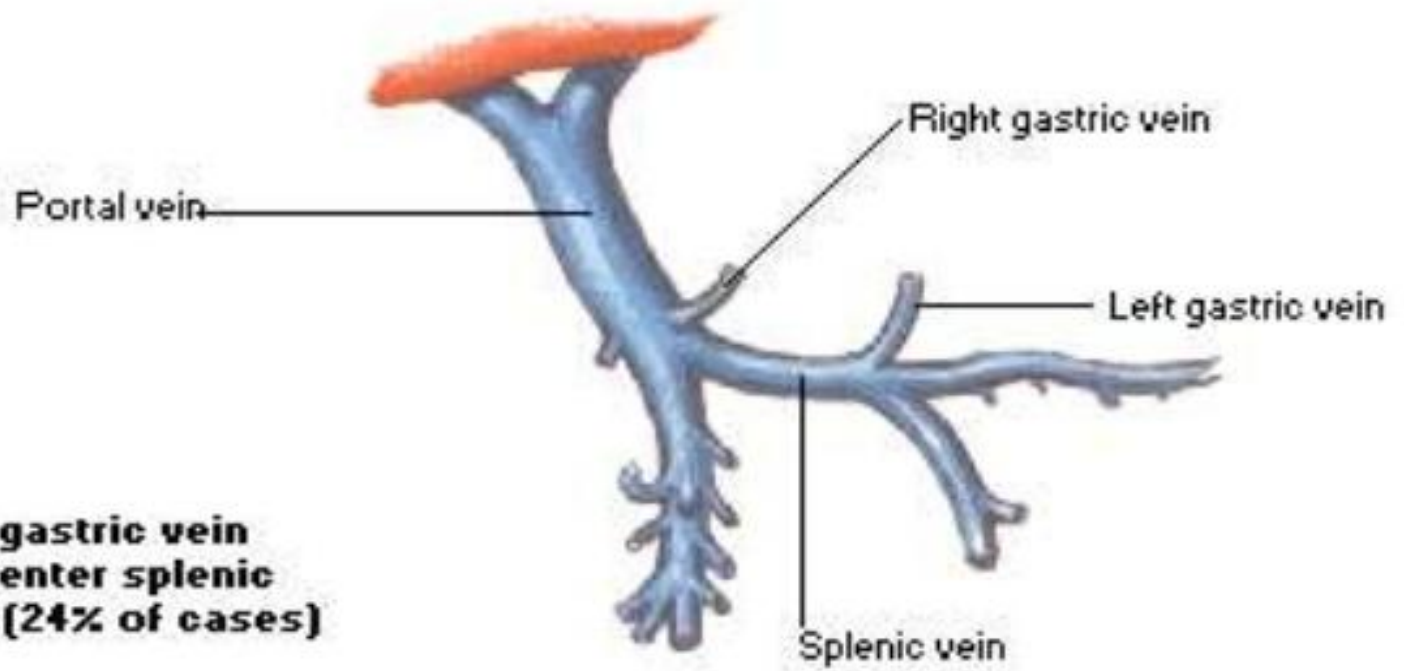
Site	Caval	Portal	Effect in PHT
Lower end of esophagus	Esophageal tributaries of hemiazygos V	Oesophageal tributaries of Lt gastric V	Oesophageal varices
Umbilicus	Veins of AAW	Paraumbilical veins (tributaries of Lt br of Portal V)	Caput medusae
Lower end of rectum & Anal canal	Middle & inf rectal Vs	Sup rectal V	Anorectal varices, Internal hemorrhoids

Site	Caval	Portal
Post abd wall	<ul style="list-style-type: none"> • Lt renal V • Veins of Post Abd wall 	<ul style="list-style-type: none"> • Splenic V • Veins of retroperitoneal organs like duodenum, Asc & Desc colon
Bare area of liver	Diaphragmatic veins	Hepatic brs of Portal V
Liver	Patent Ductus venosus (rare)	Lt br of portal v
Post wall of vagina	Vaginal venous plx	Sup rectal v
Falciform lig	Diaphragmatic v	Paraumbilical v

Variations

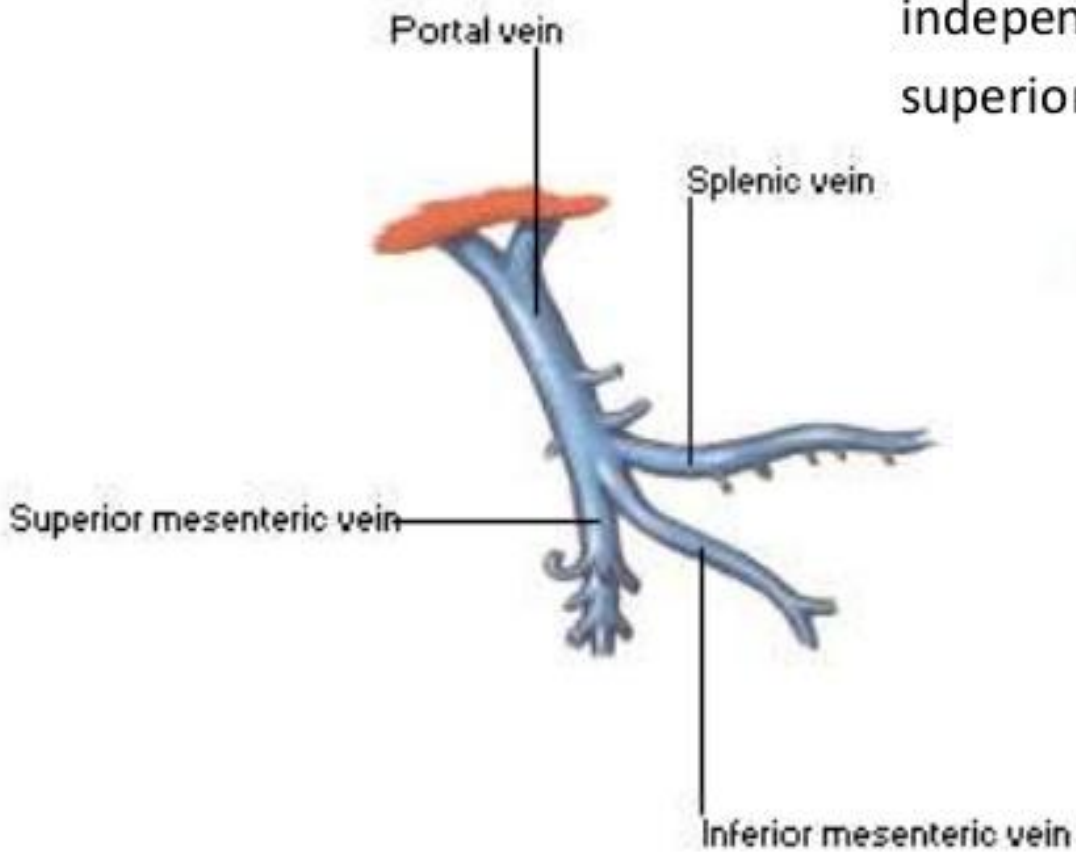
Left gastric vein often enters junction of splenic and superior mesenteric veins

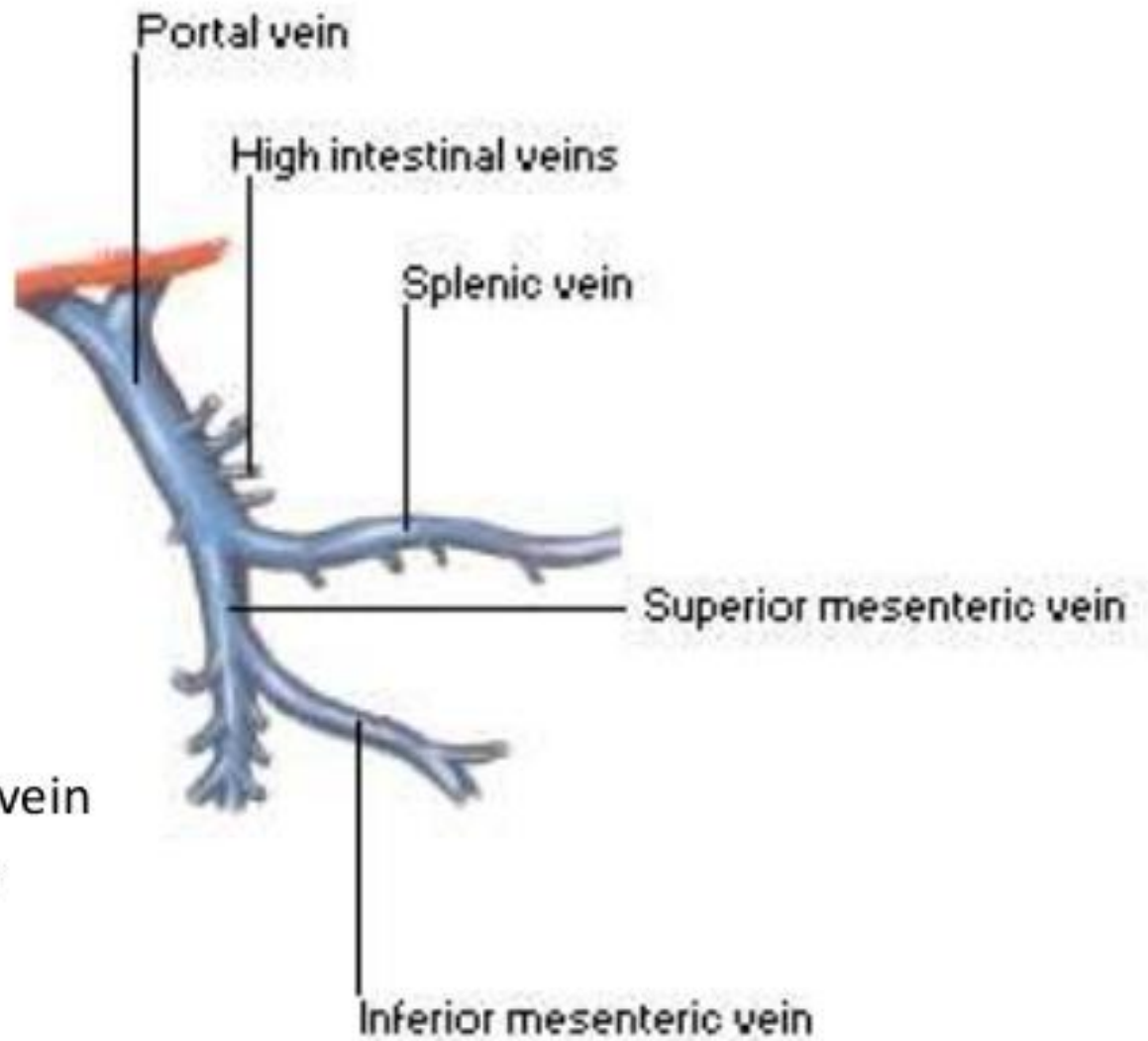




**Left gastric vein
may enter splenic
vein (24% of cases)**

Splenic vein & inferior mesenteric vein open independently into superior mesenteric vein

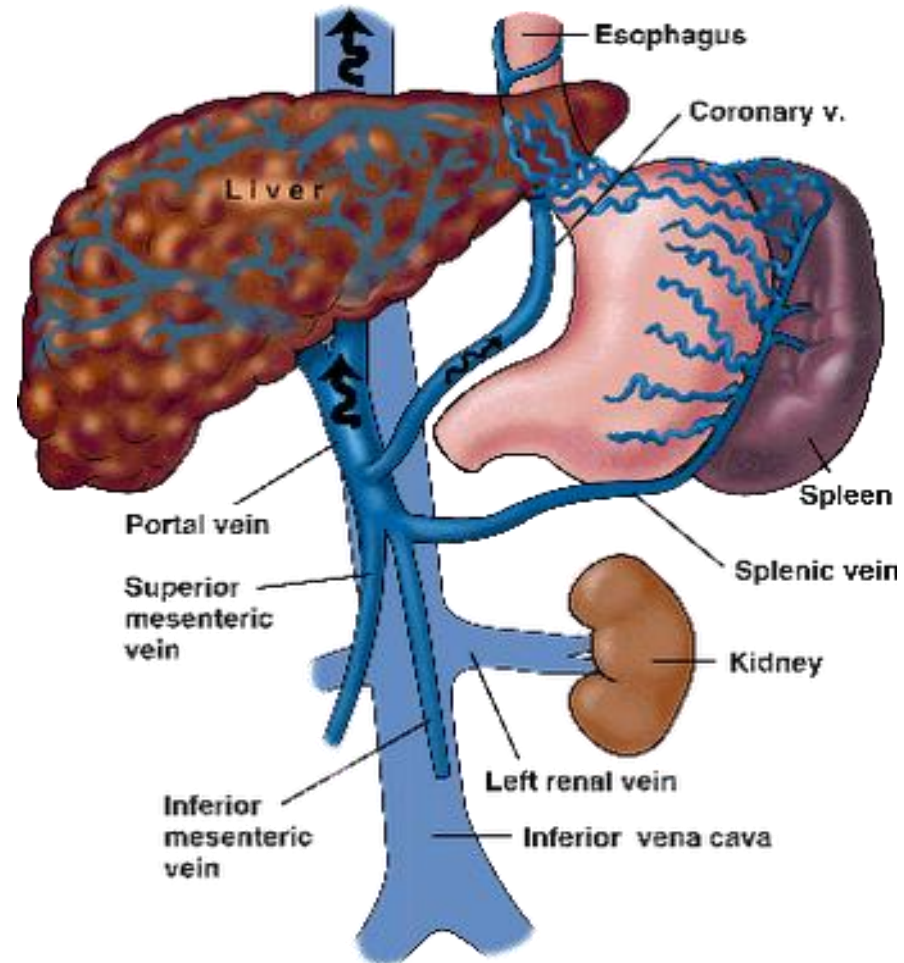




Inferior mesenteric vein
Opens into superior
mesenteric vein

CLINICAL SIGNIFICANCE

- The communication between the PVS and the SVS are important clinically.
- When portal circulation through the liver is diminished or obstructed in liver disease, blood from GIT can still reach the right side of the heart through the IVC by the way of several collateral routes.

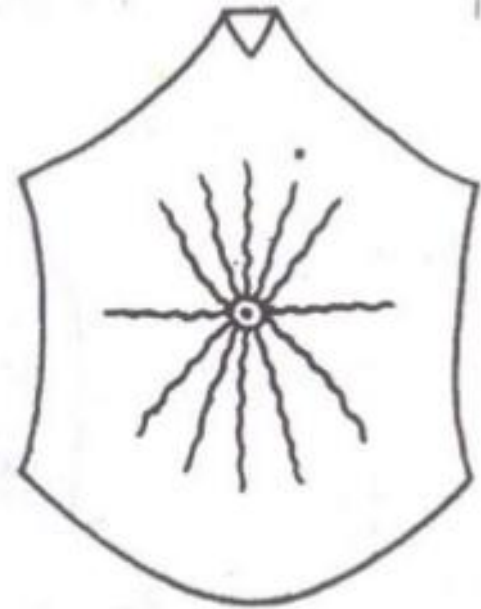
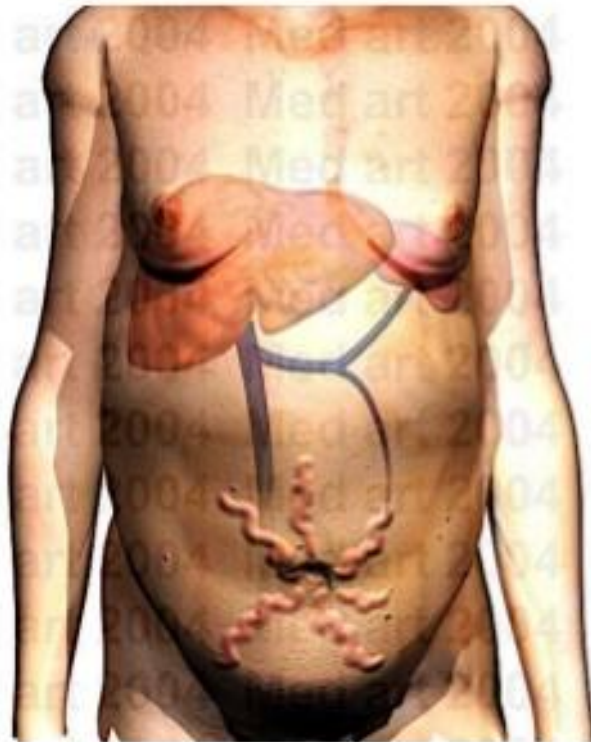


PORTAL HYPERTENSION

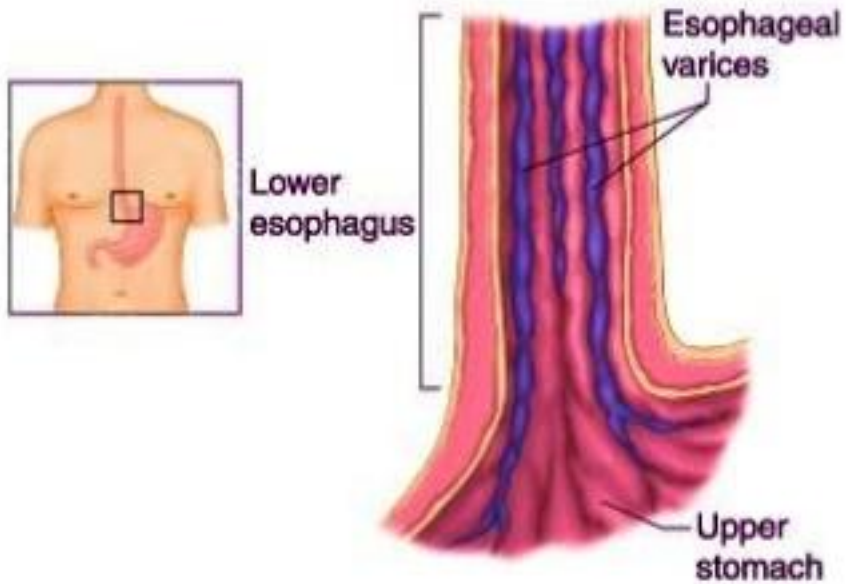
- The scarring and fibrosis of the liver resulting in the obstruction of portal vein in the liver, pressure rises in the portal vein and its tributaries producing *portal hypertension*.
- At the site of anastomoses between portal and systemic veins portal hypertension produces enlarged varicose veins.
- These veins becomes so dilated that their wall ruptures, resulting in the hemorrhage.



Caput Medusae



Esophageal varices





وسیلے اللہ بنا دیتا ہے
کوئی انسان کسی کے لیے وسیلہ نہیں بنتا
اللہ تعالیٰ کسی کو ذریعہ بنا دیتا ہے
ورنہ انسان کسی کو کچھ نہیں دے سکتا

Inspirational Urdu Quotes : Aqwaal e Zareen

اللہ پاک کا بنایا ہوا ہر شخص
مکمل اور خوبصورت ہے،
بس خامی اور کمی تو
ہمارے اخلاق اور رویوں میں ہے۔

