
بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

PORTACAVAL ANASTOMOSIS

By

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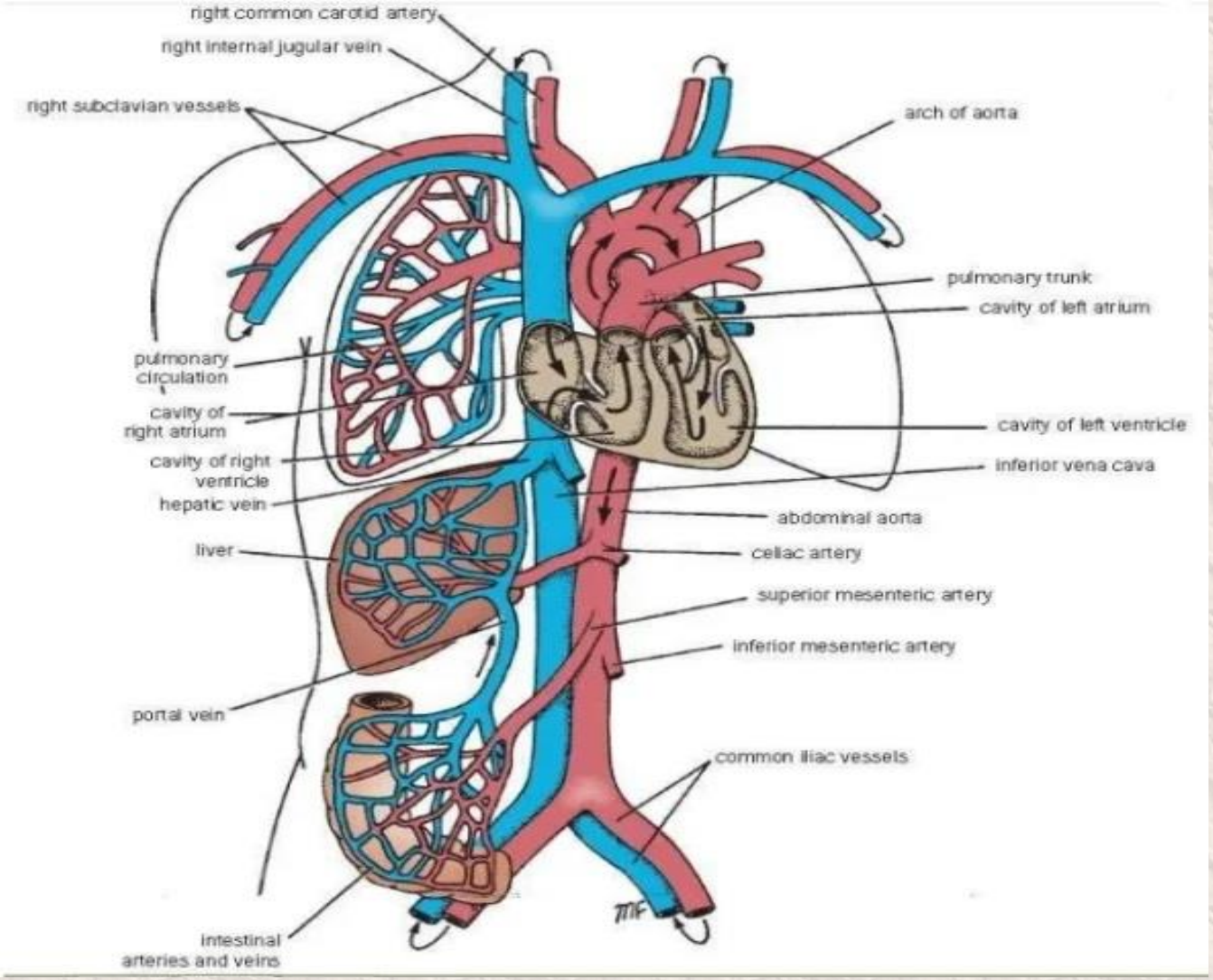
A **portocaval anastomosis** or porto-systemic anastomosis is a specific type of anastomosis that occurs between the veins of the portal circulation and those of the systemic circulation. When there is a blockage of the portal system, portocaval anastomosis enables the blood to still reach the systemic venous circulation. The inferior end of the esophagus and the superior part of the rectum are potential sites of a harmful portocaval anastomosis.

In portal hypertension, as in the case of cirrhosis of the liver, the anastomoses become congested and form venous dilatations. Such dilatation can lead to esophageal varices and anorectal varices. Caput medusae can also result.

General Plan of Blood Circulation

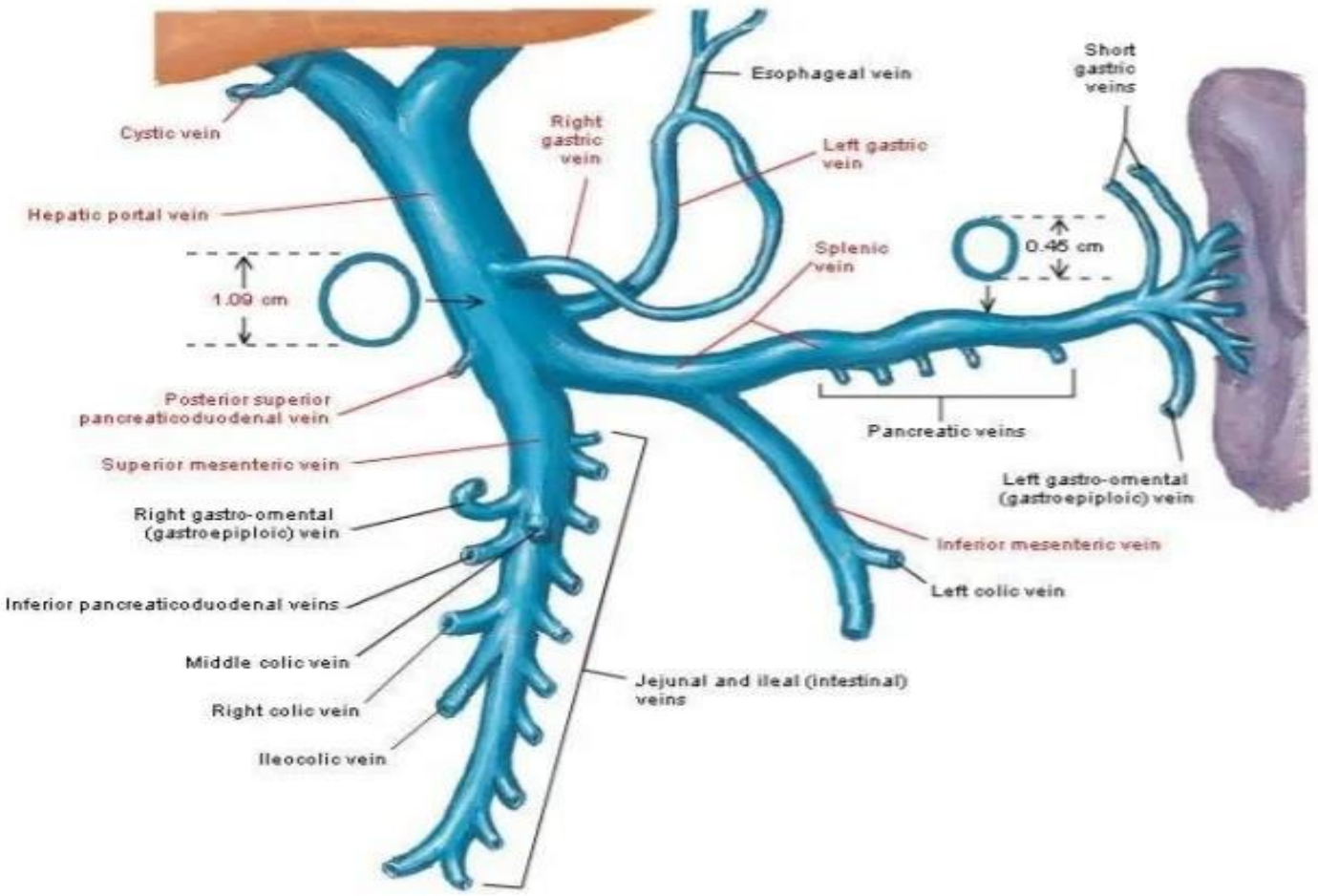
PORTAL CIRCULATION

Blood is collected from one set of capillaries and is passed to a larger vessel which then again divides into capillaries before the blood is returned to systemic circulation.



Portal Vein

Typical Arrangement of Hepatic Portal Vein



Formed by union of (behind the neck of pancreas)

1. **Superior Mesenteric Vein**
2. **Splenic vein**

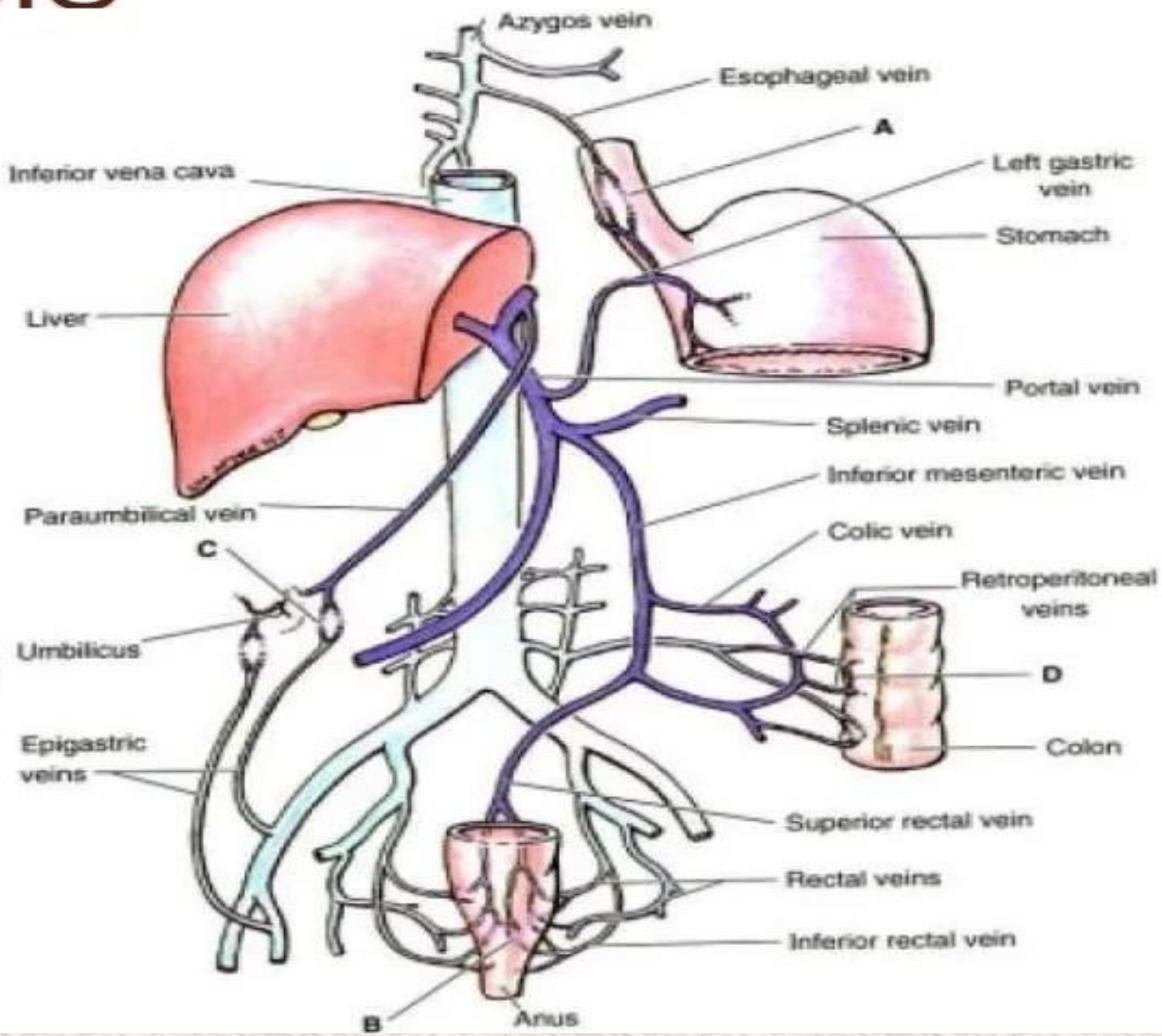
Tributaries:

1. Left gastric vein
2. Right gastric vein
3. Cystic veins
4. Posterior superior pancreaticoduodenal vein

SITES OF PORTACAVAL ANASTOMOSIS

Five sites of portal/systemic circulation :

1. Lower third of the Esophagu
2. Paraumbilical Area
3. Upper end of Anal canal
4. Retroperitonial
5. Bare area of liver



- Porto-systemic anastomosis also known as portocaval anastomosis is the collateral communication between the portal and the systemic venous system. The portal venous system transmits deoxygenated blood from most of the gastrointestinal tract and gastrointestinal organs to the liver.
- When there is a blockage of the portal system, portocaval anastomosis enable the blood to still reach the systemic venous circulation. Even though this is useful, bypassing the liver may be dangerous, since it is the main organ in charge for detoxication and breaking down of substances found in the gastrointestinal tract, such as mediactions but the poisons as well.

1. Lower third of the Esophagus

- The esophageal branches of the left gastric vein (portal tributaries) anastomose with the esophageal veins draining the middle third of the esophagus into the azygos veins. (systemic tributaries)

2. Paraumbilical Area

They connect the left branch of the portal vein with the superficial veins of the anterior abdominal wall. (systemic tributaries)

3. Anal canal

The superior rectal veins (portal tributary) draining the upper half of the anal canal anastomose with the middle and inferior rectal veins (systemic tributaries), which are tributaries of the internal iliac and internal pudendal veins, respectively.

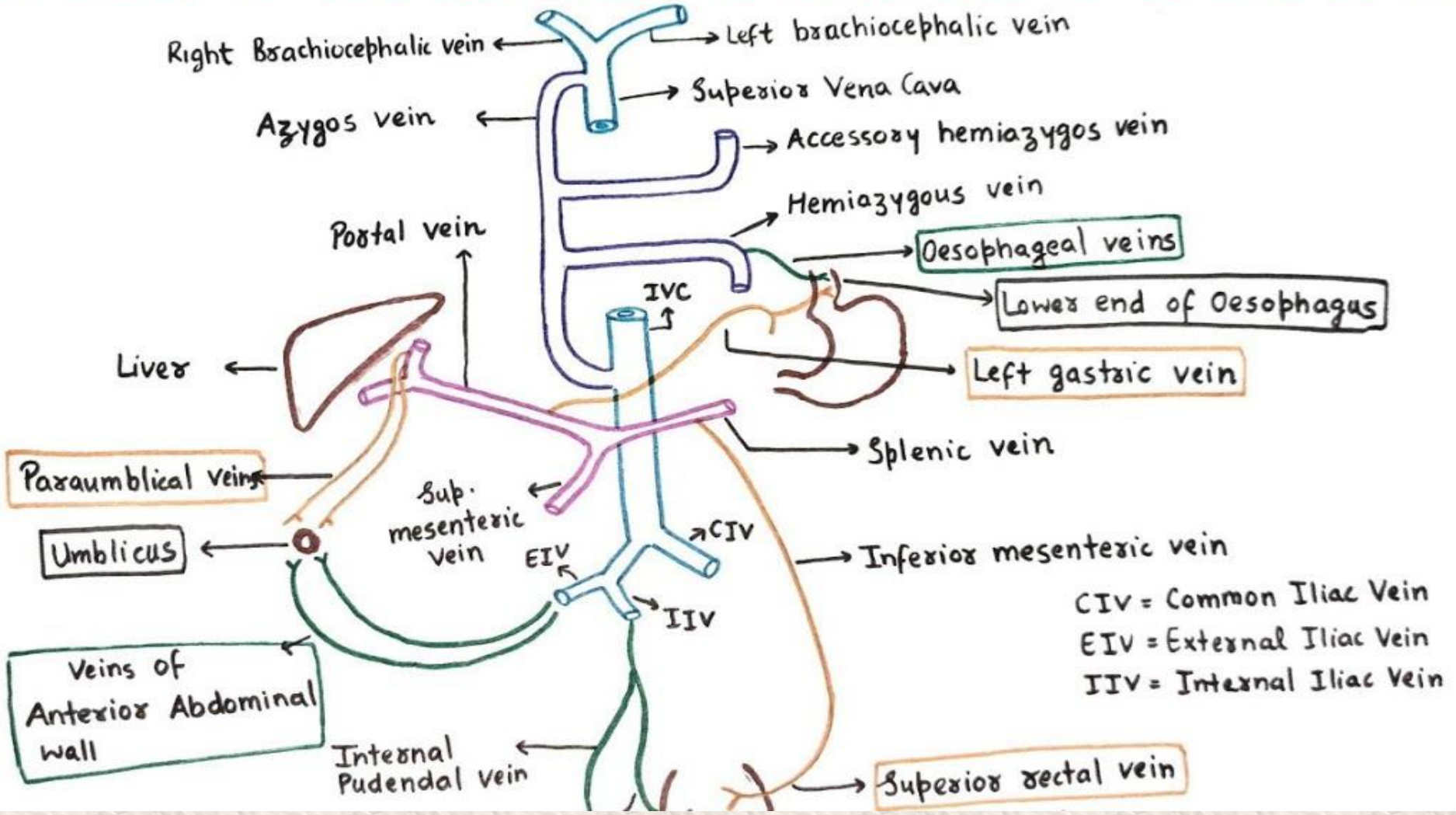
4. Retroperitonial

The veins of the ascending colon, descending colon, duodenum, pancreas, and liver (portal tributary) anastomose with the renal, lumbar, and phrenic veins (systemic tributaries).

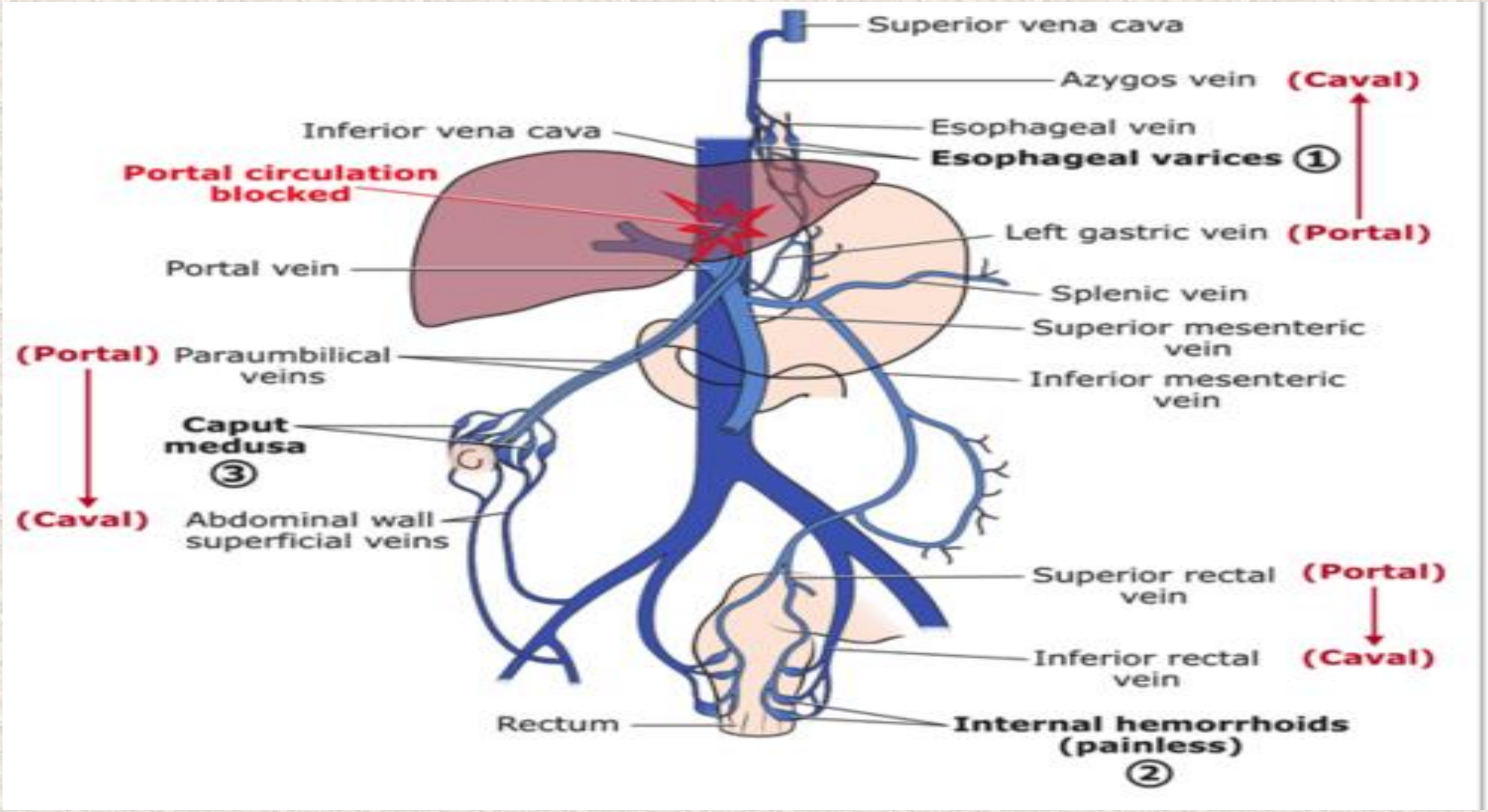
5. Bare area of liver

There is some anastomosis between portal venous channels in the liver and azygous system of veins above the diaphragm across the bare area of liver.

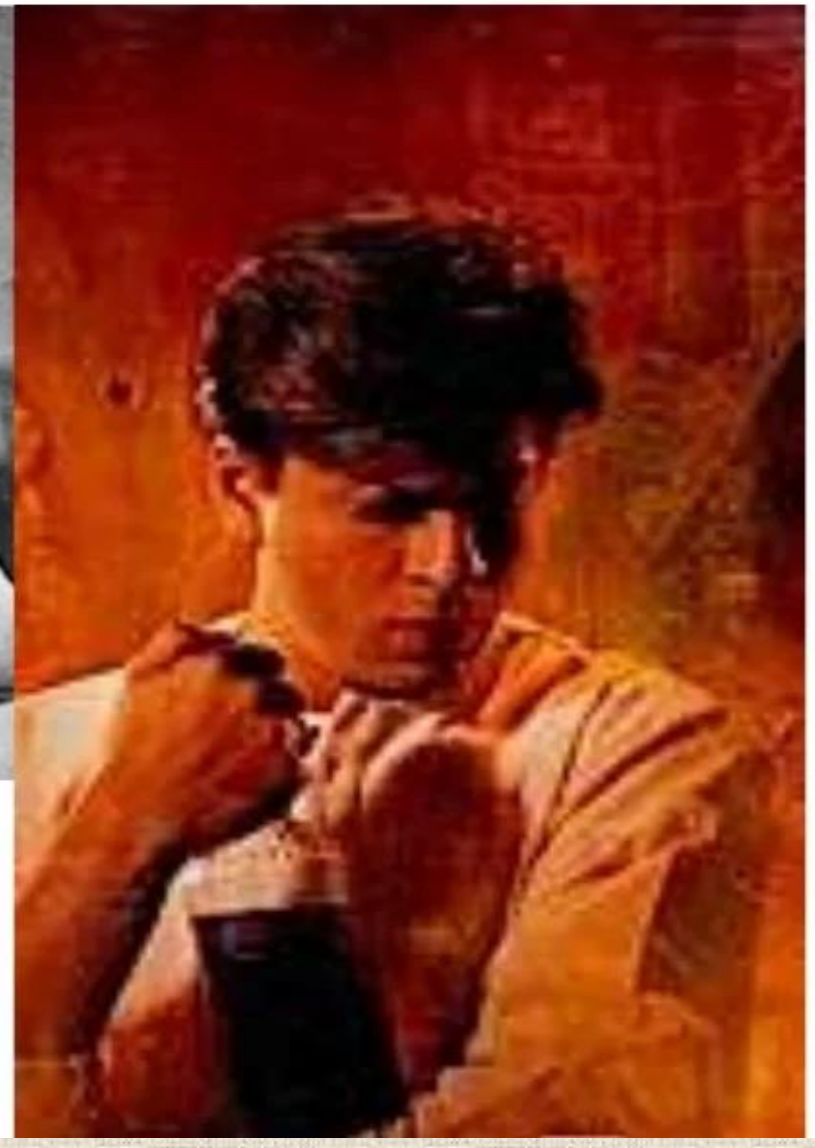
PORTOCAVAL ANASTOMOSIS



KEY FACTS ABOUT PORTO-SYSTEMIC ANASTOMOSE	
Lower esophagus	Left gastric veins (portal system) -> lower branches of oesophageal veins (systemic veins)
Upper part of anal canal	Superior rectal veins (portal) -> inferior and middle rectal veins (systemic)
Umbilicus	Paraumbilical veins (portal) -> epigastric veins (systemic)
Area of the liver	Intraparenchymal branches of right division of portal vein (portal) -> retroperitoneal veins (systemic)
Hepatic and splenic flexures	Omental and colonic veins (portal) -> retroperitoneal veins (systemic)
Function of the porto-systemic anastomosis	Provide alternative routes of venous blood circulation when there is a blockage in the liver or portal vein. Ensure that venous blood from the gastrointestinal tract still reaches the heart through the inferior vena cava without going through the liver.


Superior vena cava
Azygos vein
(Caval)
Inferior vena cava
Esophageal vein
Esophageal varices ①
Portal circulation blocked
Left gastric vein
(Portal)
Portal vein
Splenic vein
Superior mesenteric vein
(Portal)
Paraumbilical veins
Inferior mesenteric vein
Caput medusa ③
(Caval)
Abdominal wall superficial veins
Superior rectal vein
(Portal)
Inferior rectal vein
(Caval)
Rectum
Internal hemorrhoids (painless) ②

How did...



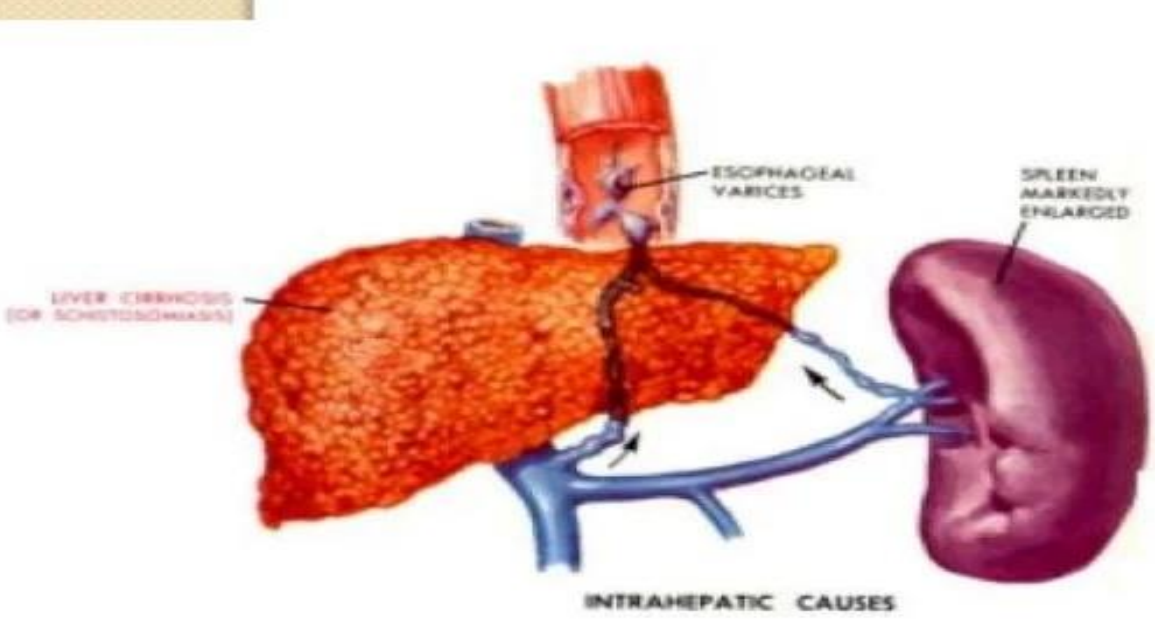
...Devdas die?

Portal Hypertension

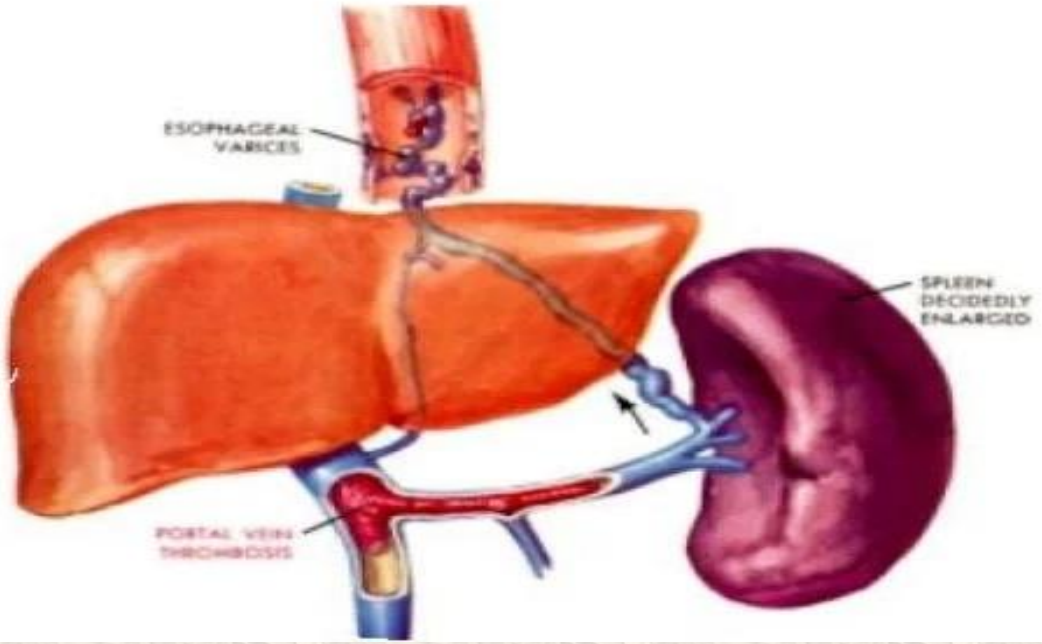
It is defined as increase in **blood pressure** in the **veins of the portal system** caused by obstruction in the liver (due to cirrhosis, thrombophlebitis), causing enlargement of **collateral veins** and **splenomegaly.**

It is caused by :

1. Liver Cirrhosis (Interahepatic)
2. Thrombosis of Portal vein. (Extrahepatic)



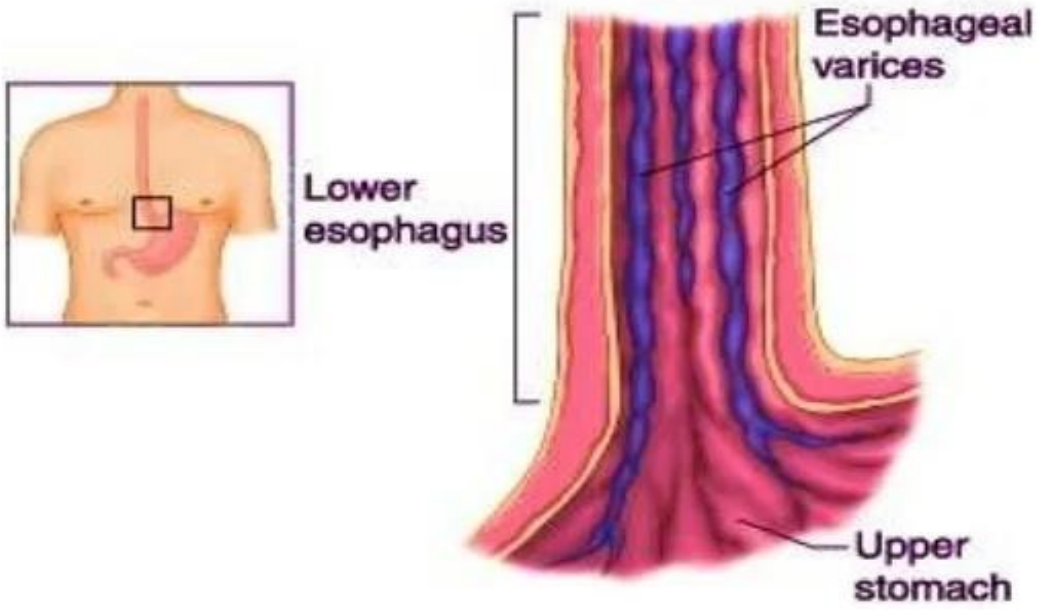
INTRAHEPATIC CAUSES



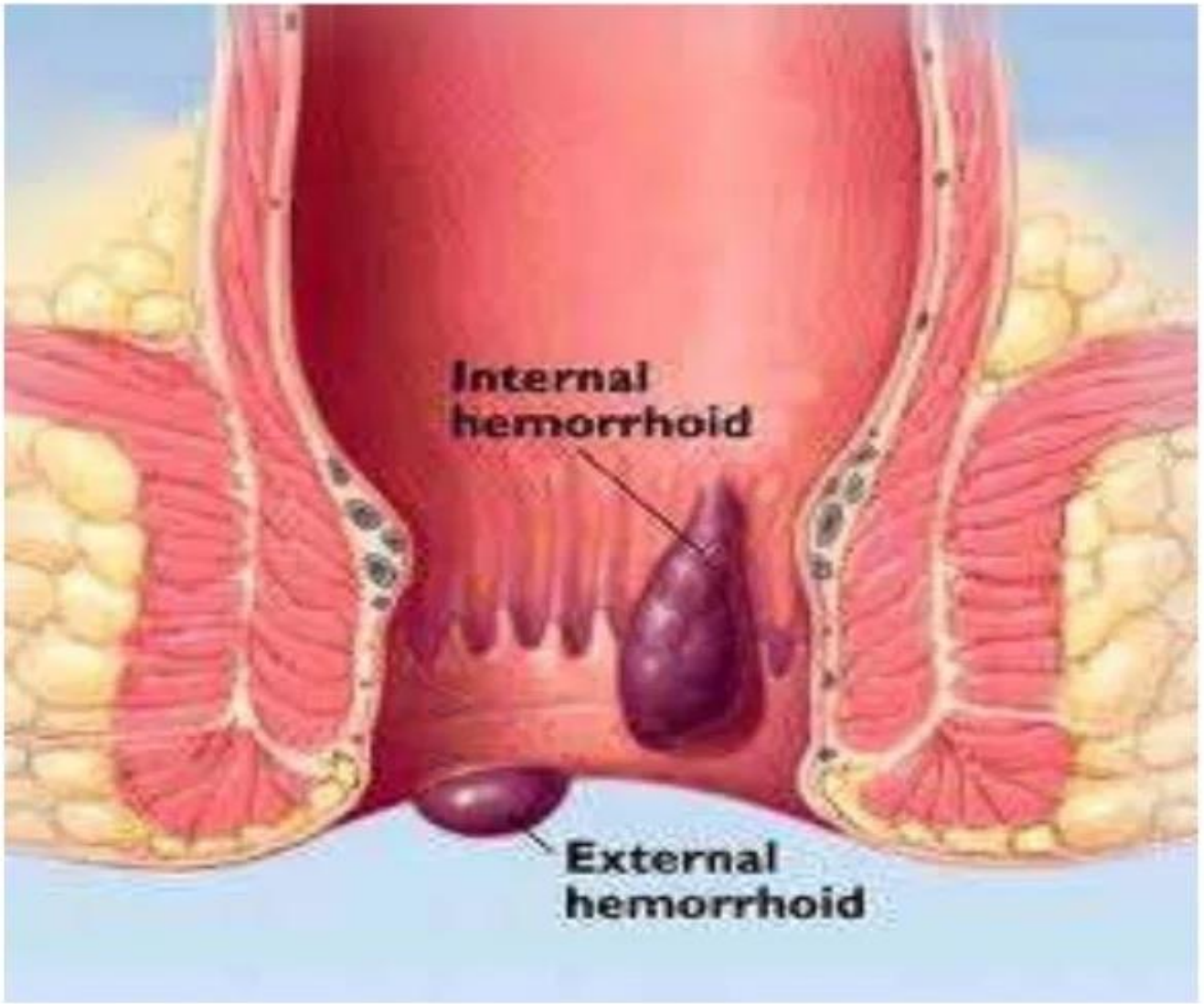
Consequences of Portal Hypertension

1. Esophageal varices
2. Caput Medusae
3. Hemorrhoids
4. Ascites
5. Splenomegaly

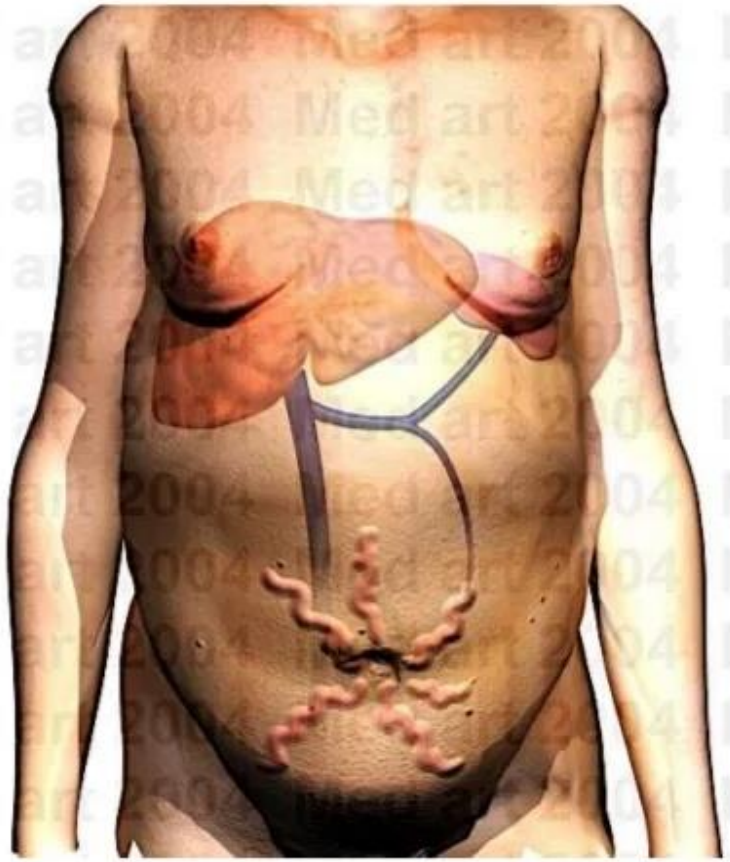
Esophageal varices

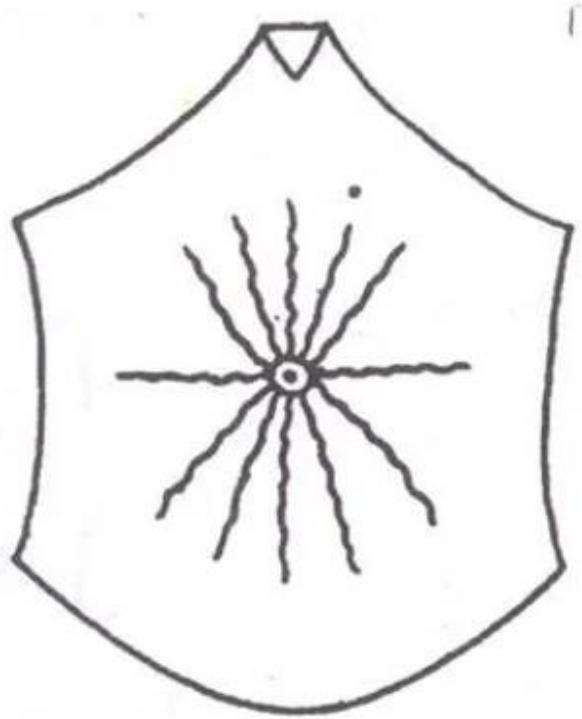


Internal piles (Hemorrhoids)



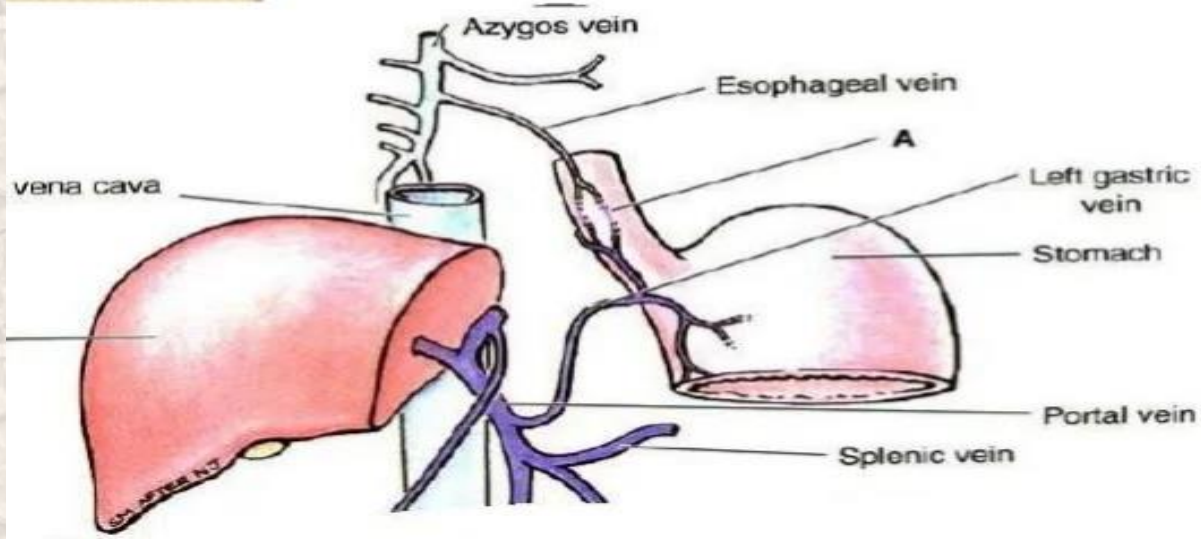
Caput Medusae

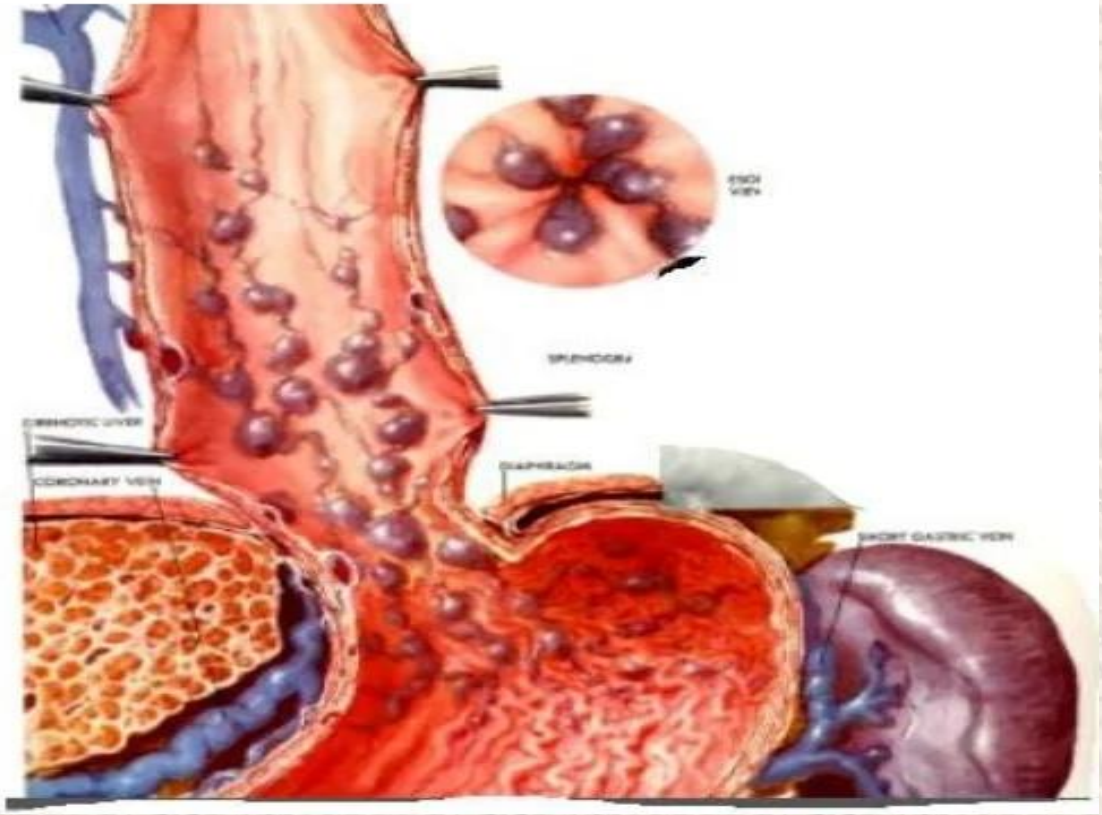




Esophageal varices

- Patient typically presents with Haematemesis & Black tarry stools.
- It can be visualized using Esophagogastroduodenoscopy (endoscopy).



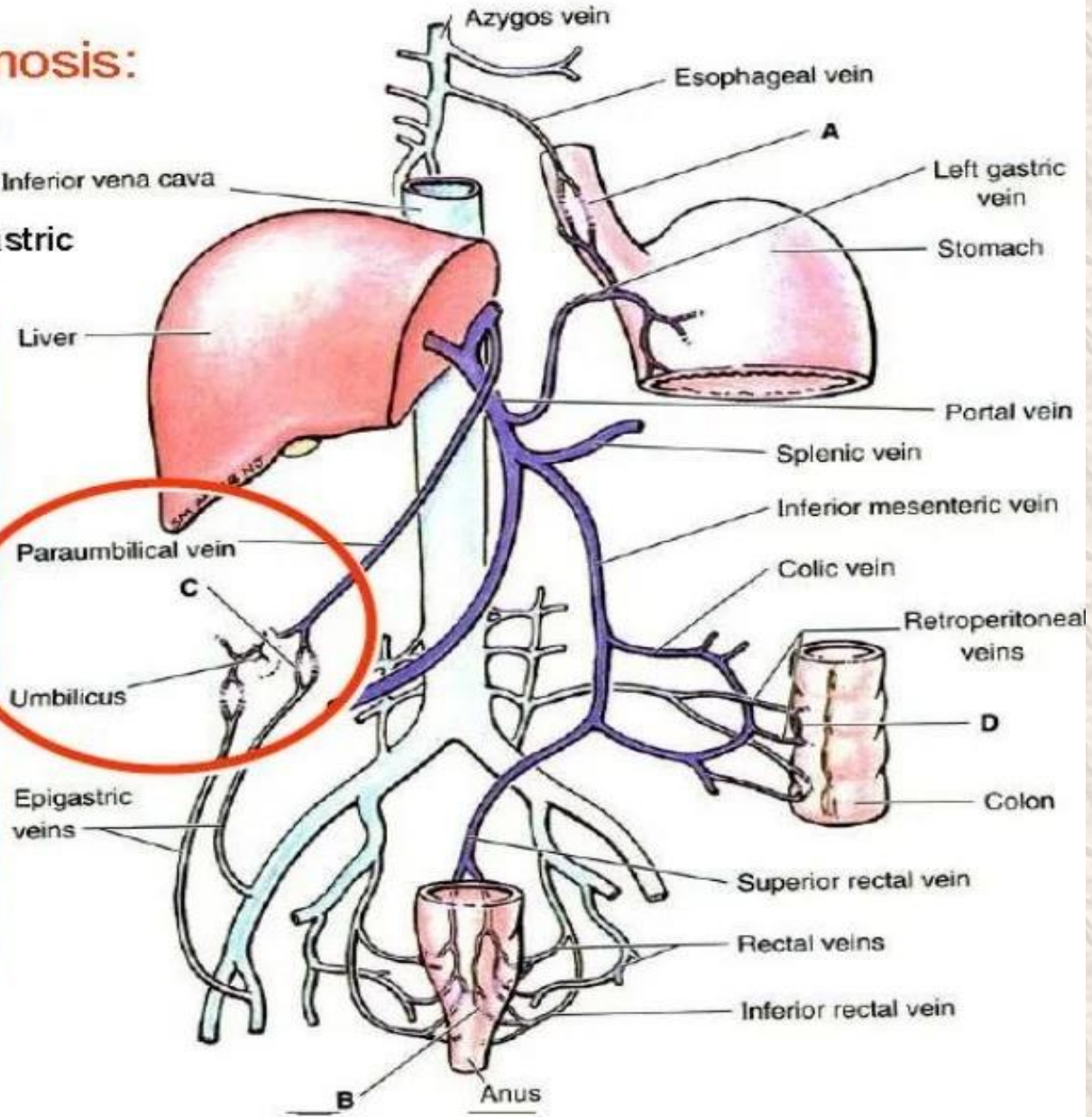


Caput Medusae

Paraumbilical Anastomosis: Caput medusae

Paraumbilical vv. (portal) — Superficial, superior, & inferior epigastric vv. (caval)

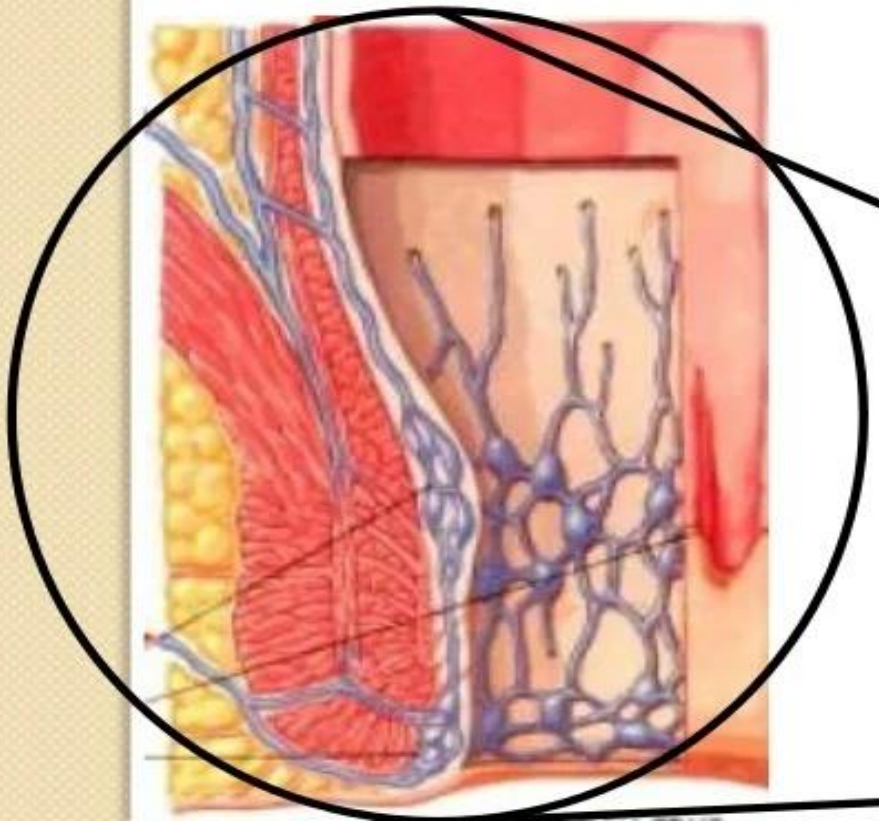
CAPUT MEDUSAE

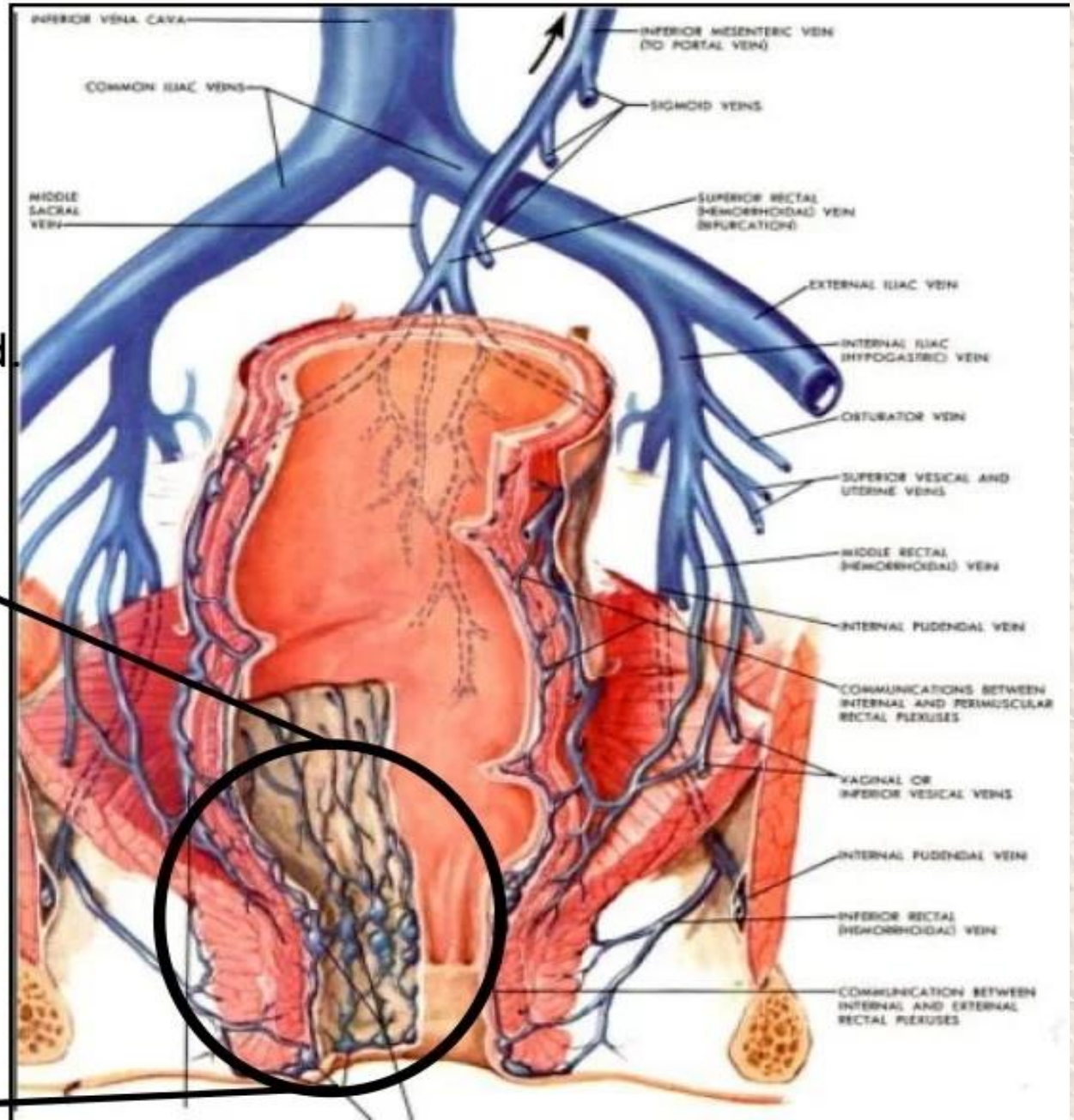


Hemorrhoids

Hemorrhoids are painful, swollen veins in the lower portion of the rectum or anus.

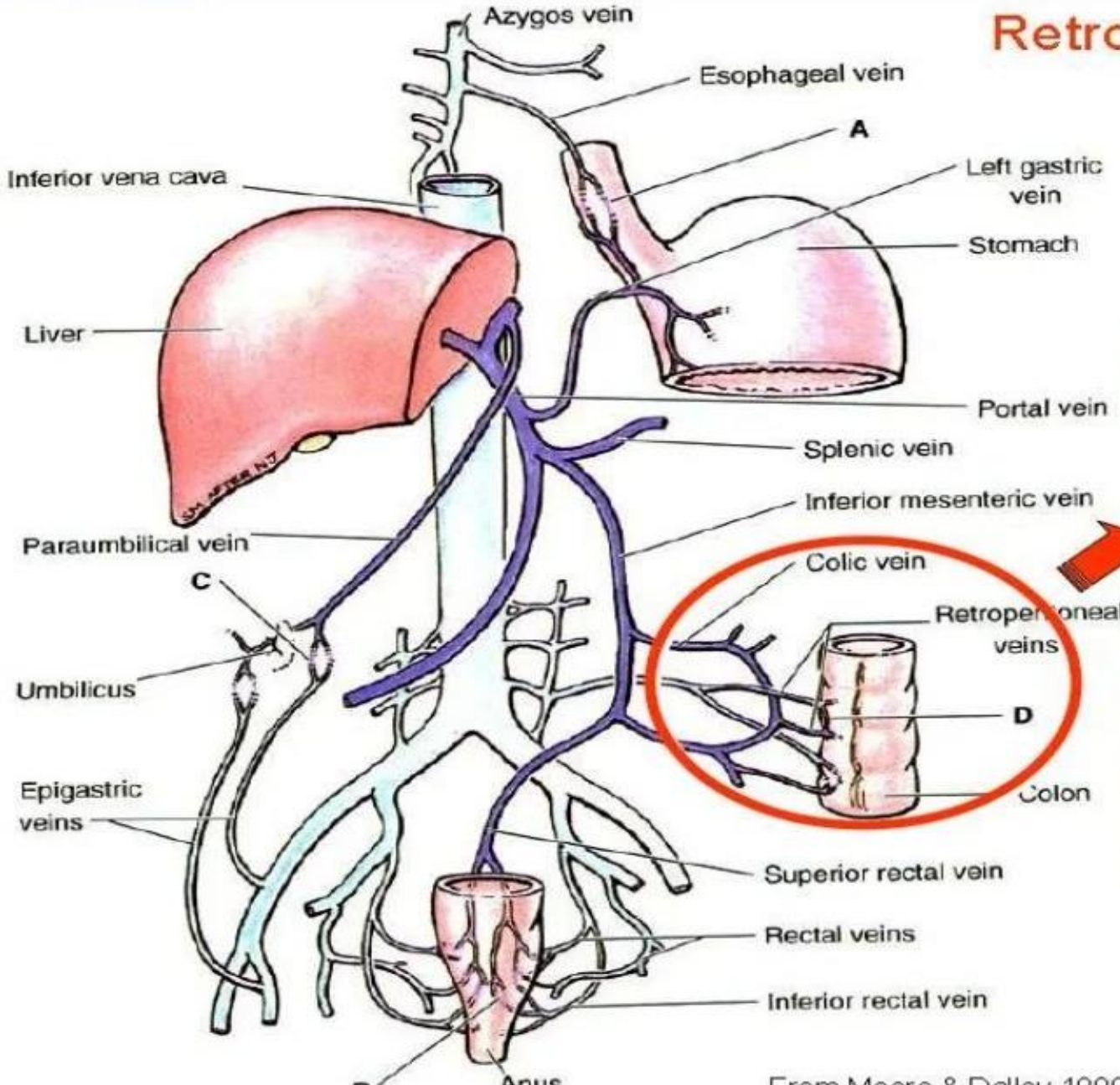
Hematochezia / fresh blood.





Ascites

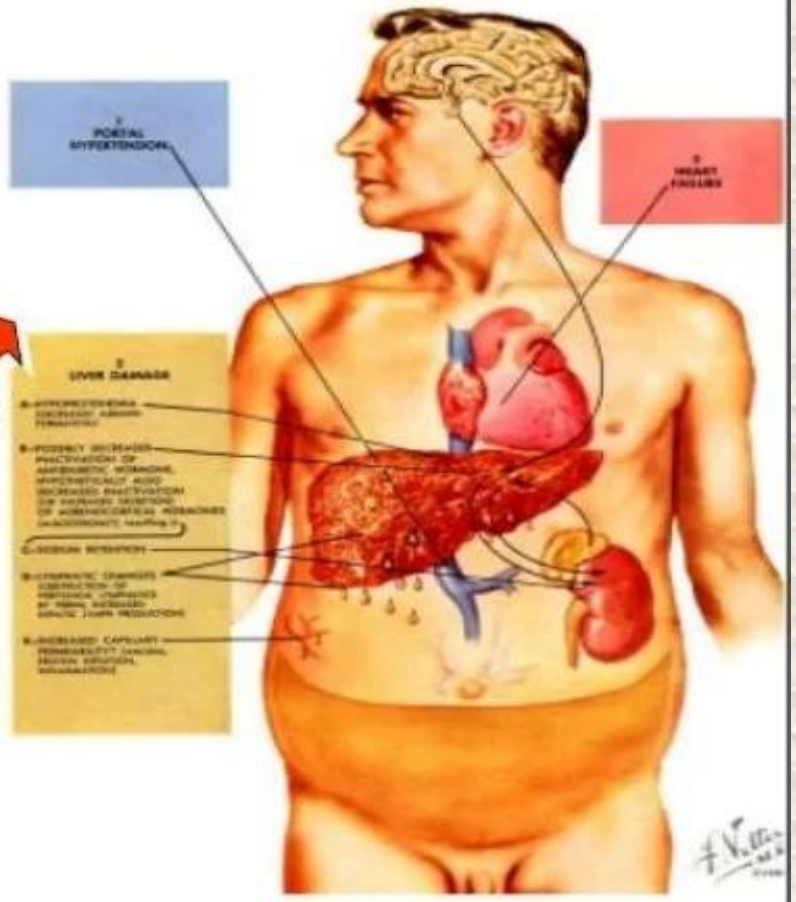
accumulation of fluid in the peritoneal cavity



From Moore & Dalley 1999

Retroperitoneal Anastomosis: Ascites

Visceral vv. of Retzius (portal) —
Retroperitoneal parietal vv. (caval)



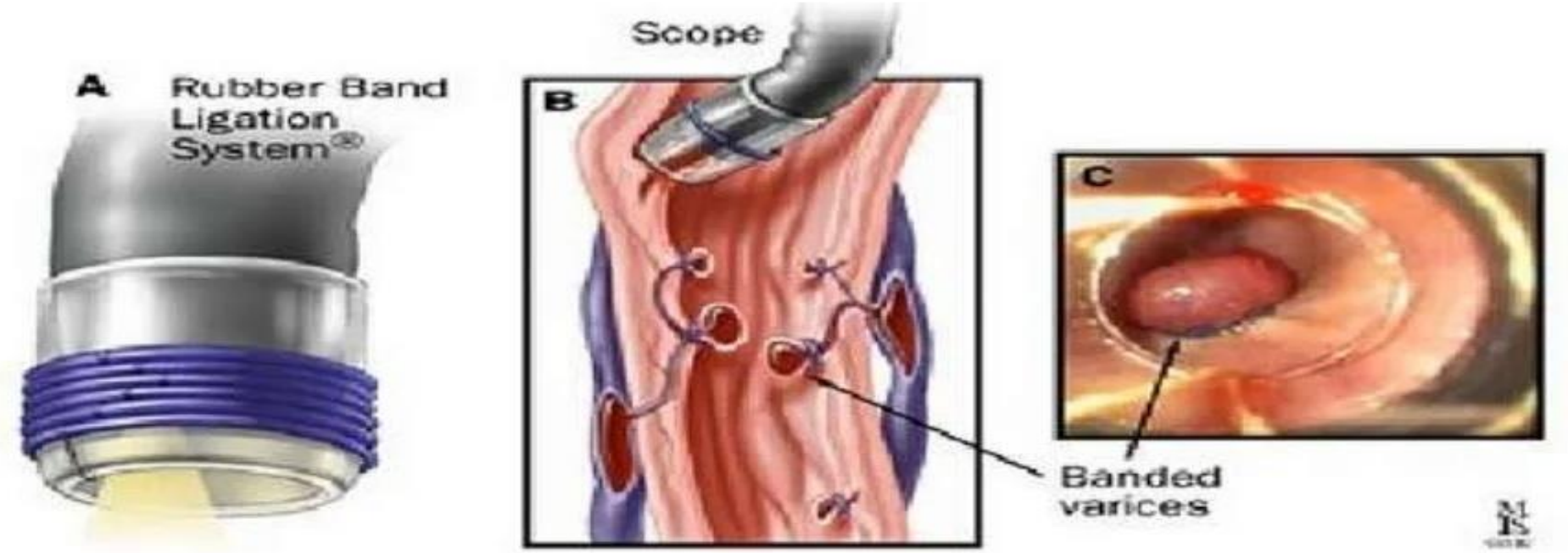
from Netter 1957

Treatment

- Band Ligation
- Sclerotherapy
- Portosystemic Shunts
- TIPSS (Transjuglar Intrahepatic PortoSystemic Shunting)

Band Ligation

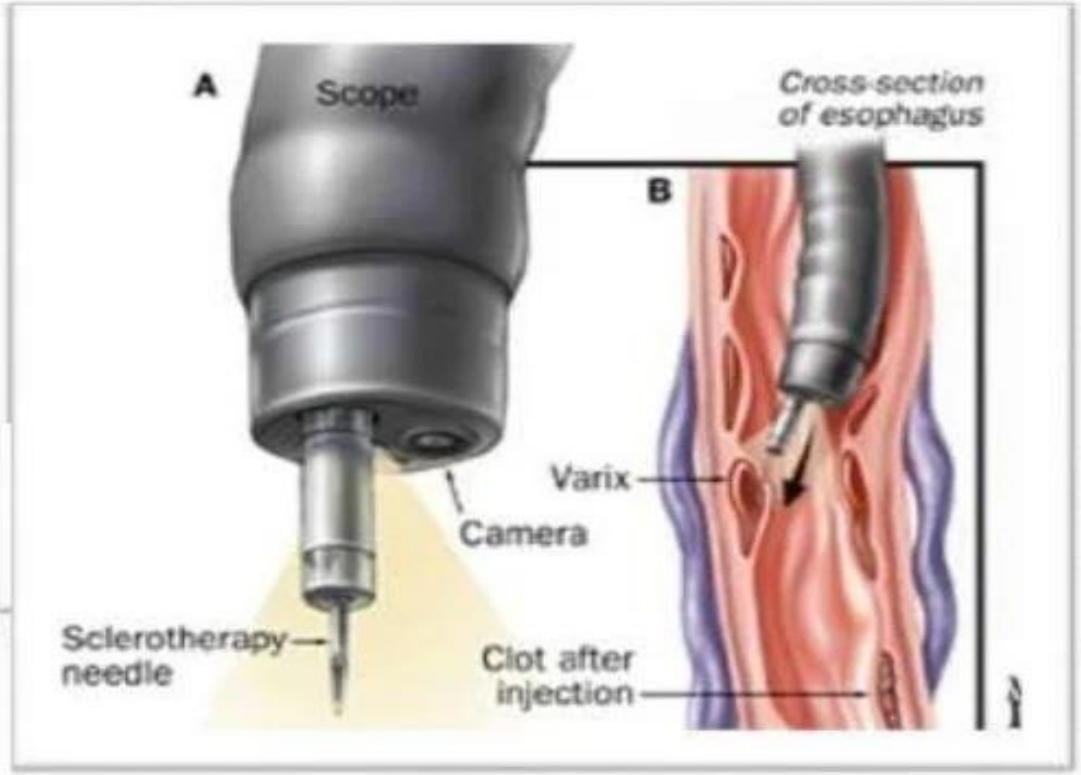
A small band is applied to the base of the varix, stopping the blood supply to it. It will shrink and die within a few days and the shriveled tissue along with the band will fall off during normal peristaltic movements.



Sclerotherapy

A solution of Sodium Morrhuate and Ethanolamine oleate is introduced into the varix.

- Intravariceally : to obliterate the varix
- Paravariceally : induce submucus fibrosis



ANASTOMOSES

- The importance of portosystemic anastomoses is to provide alternative routes of circulation when there is a blockage in the liver or portal vein. These routes ensure that venous blood from the gastrointestinal tract still reaches the heart through the inferior vena cava without going through the liver.

ANASTOMOSES

The various anastomoses and the sites in which they occur are described below:

- The anastomosis between the left gastric veins, which are portal veins, and the lower branches of oesophageal veins that drain into the azygos and hemiazygos veins, which are systemic veins. The site of this anastomosis is the lower oesophagus.
- The anastomosis between the superior rectal veins, which are portal veins, and the inferior and middle rectal veins, which are systemic veins. The site of this anastomosis is the upper part of the anal canal.

ANASTOMOSES

- The anastomosis between the paraumbilical veins, which run in the ligamentum teres as portal veins, and small epigastric veins, which are systemic veins. The site of this anastomosis is the umbilicus.
- The anastomosis between the intraparenchymal branches of the right division of the portal vein and retroperitoneal veins (systemic veins) that drain into the azygos, hemiazygos and lumbar veins (systemic veins). The site of this anastomosis is the bare area of the liver.
- The anastomosis between omental and colonic veins (portal veins) with the retroperitoneal veins (systemic veins) in the region of hepatic and splenic flexure.

Clinical presentations of portal hypertension include:

REGION	NAME OF CLINICAL CONDITION	PORTAL CIRCULATION	SYSTEMIC CIRCULATION
Esophageal	Esophageal varices	Esophageal branch of left gastric vein	Esophageal branches of azygos vein
Rectal	Rectal varices	Superior rectal vein	Middle rectal veins and inferior rectal veins
Paraumbilical	Caput medusae	Paraumbilical veins	Superior epigastric vein
Retroperitoneal	Splenorenal shunt	Splenic vein	Renal vein, suprarenal vein, paravertebral vein, and gonadal vein
	(no clinical name)	Right colic vein, middle colic vein, left colic vein	Retroperitoneal veins of Retzius

CLINICAL ANATOMY

PORTAL HYPERTENSION

- This is increase in blood pressure in the veins of the portal system. It is caused by blockage in the veins of the liver due to pathological conditions such as liver cirrhosis and the inability of the blood to flow through.
- Signs and symptoms are varicose veins on the abdominal wall called caput medusae, oesophageal varices, enlargement of the spleen, accumulation of fluid in the peritoneal cavity and bleeding in the gastrointestinal tract.


THANK
YOU!

CLINICAL ANATOMY
PORTOSYSTEMIC SHUNTS

- This is an abnormal connection between the veins of the portal and systemic system. In portosystemic shunts, blood is shunted directly to the systemic circulation from the portal vein without reaching the liver. Porto systemic shunts occur naturally in the developing fetus because blood from the placenta flows through the ductus venosus into the system without going through the liver; the ductus venosus is meant to close on the first week after birth but persistence leads to a pathological condition called congenital portosystemic shunts. There is an extrahepatic congenital portosystemic shunt as well which is the developmental abnormality of the vitelline vein connecting the portal vein to the caudal vena cava.
- Signs and symptoms are tremors, epileptic seizures, weight loss, bladder stones and vomiting. Portosystemic shunts are also performed in the clinical setting to reduce the effects of portal hypertension and this can be done surgically by creating a link between the portal vein and the inferior vena cava or by creating a link between the splenic vein and left renal vein.