CIRRHOSIS

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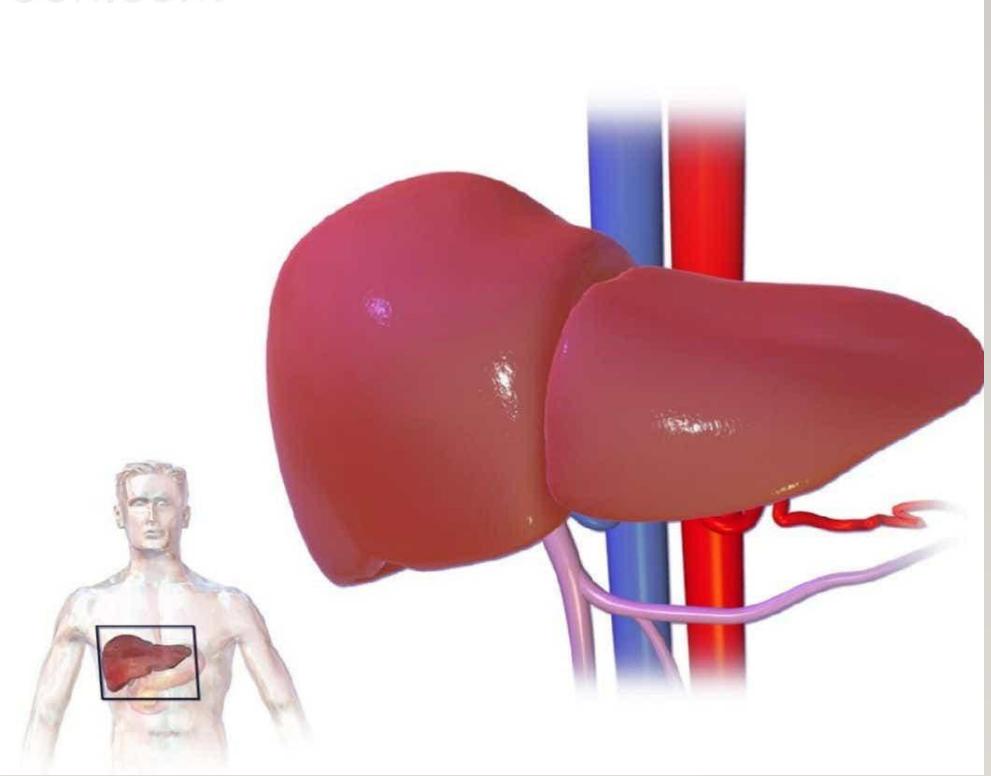
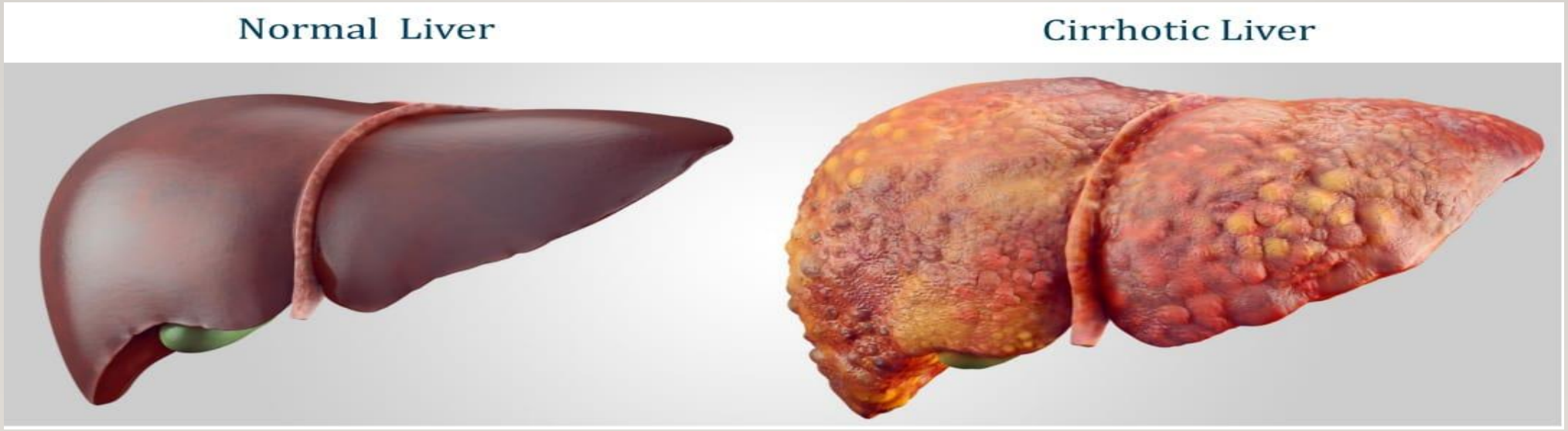
CIRRHOSIS

- End stage liver disease (irreversible)
- Result from many causes of chronic liver disease:
  - Viral Hepatitis (especially B and C)
  - Alcoholic liver disease
  - Non-alcoholic fatty liver disease



CIRRHOSIS

- Liver tissue replaced by **fibrosis** and **nodules**
- Smooth liver surface replaced by nodules
- In advanced cirrhosis, liver becomes shrunken



CLINICAL FEATURES

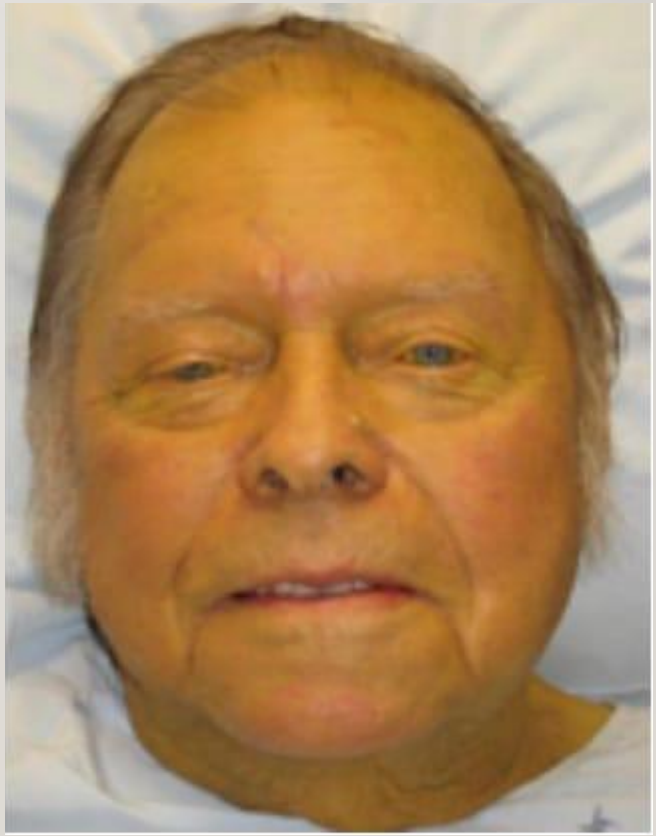
- **Hyperammonemia**
  - Asterixis, confusion, coma

HYPERAMMONEMIA
TREATMENT

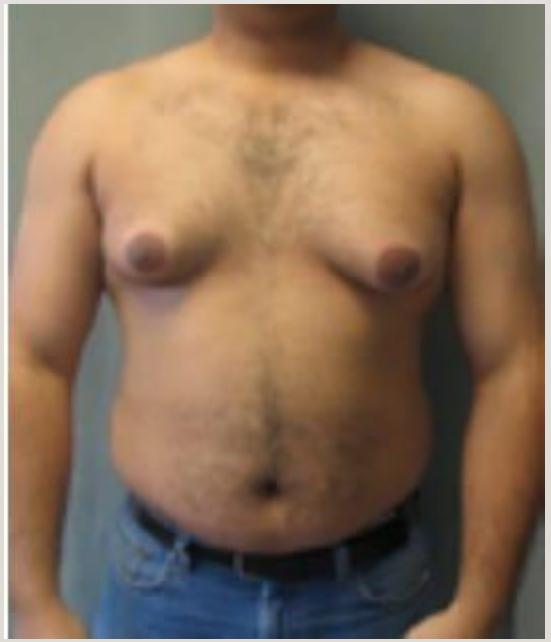
- Low protein diet
- **Lactulose**
  - Synthetic disaccharide (laxative)
  - Colon breakdown by bacteria to fatty acids
  - Lowers colonic pH; favors formation of NH_4^+ over NH_3
  - NH_4^+ not absorbed → trapped in colon
  - Result: ↓plasma ammonia concentrations

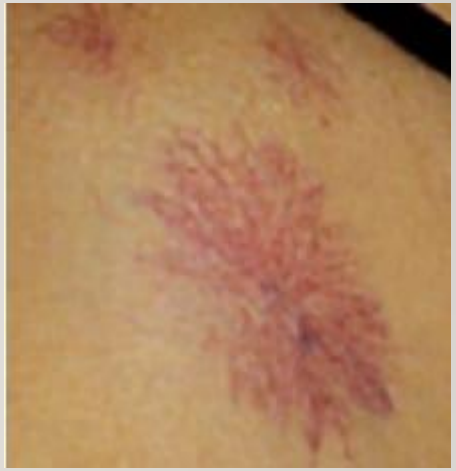
CIRRHOSIS
CLINICAL FEATURES

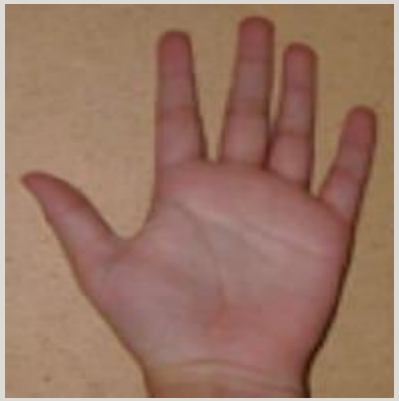
- **Jaundice**
  - Loss of bilirubin metabolism
- **Hypoglycemia**
  - Loss of gluconeogenesis
- **Coagulopathy**
  - Loss of clotting factors
  - Elevated PT/PTT
- **Hypoalbuminemia**
  - May cause low oncotic pressure
  - Contributes to ascites, edema



- Elevated **estrogen**
  - Normally removed by liver
- Gynecomastia in men
- Testicular atrophy
- Spider angiomata
- Palmar erythema

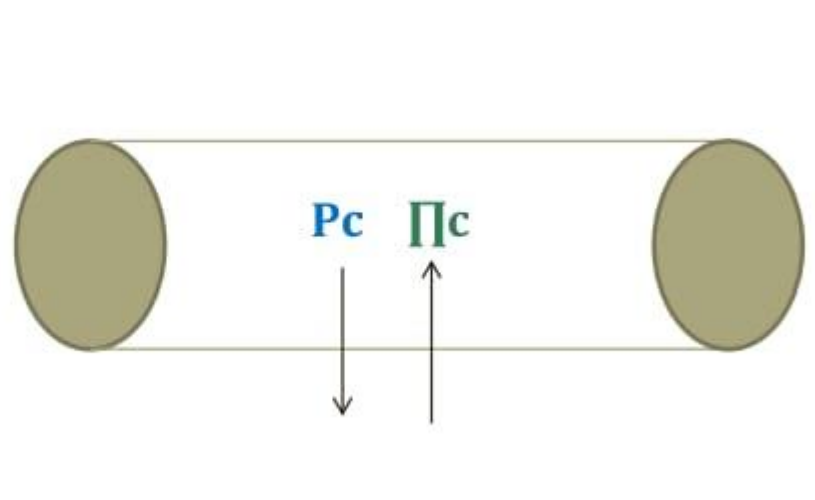






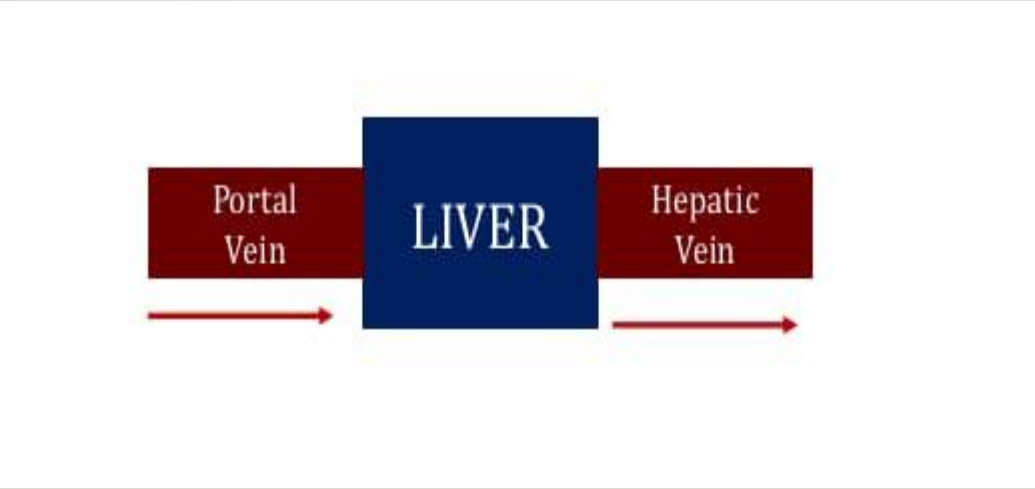
CAPILLARY FLUID SHIFTS

- Capillary **hydrostatic** pressure (Pc)
  - Drives fluid out of capillaries into tissues
- Capillary **oncotic** pressure (∏c)
  - Proteins (albumin) pull water into capillaries
  - Resists movement of fluid out of capillaries

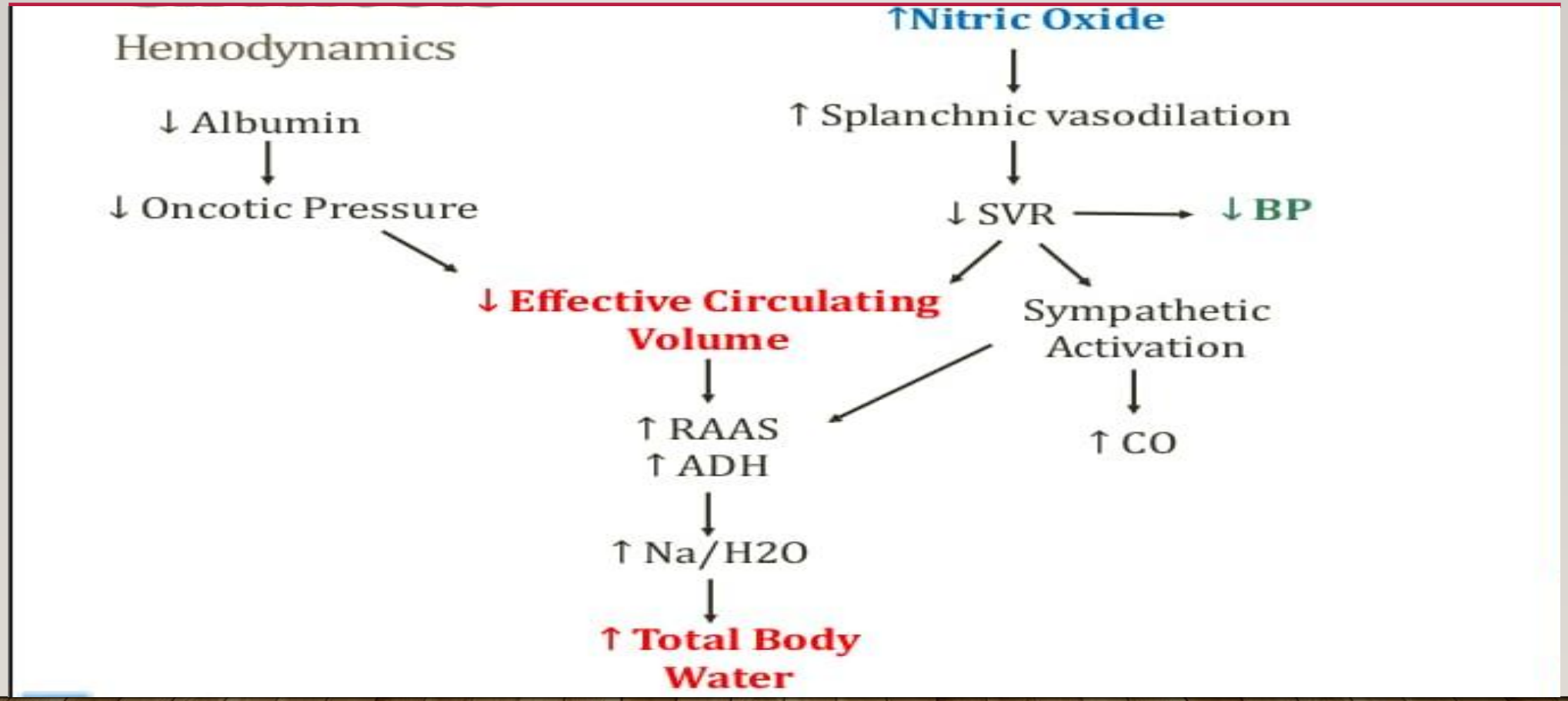


PORTAL HYPERTENSION

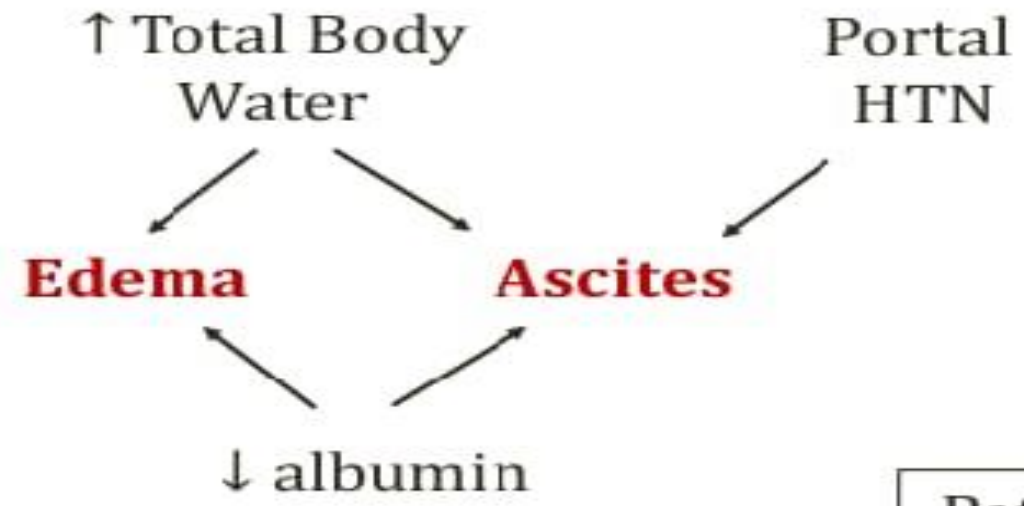
- Blood flows portal vein → liver → hepatic vein
- Cirrhosis → obstructed flow through liver
- High pressure in portal vein ("hypertension")



CIRRHOSIS


Hemodynamics
↓ Albumin
↓ Oncotic Pressure
↑Nitric Oxide
↑ Splanchnic vasodilation
↓ SVR
↓ BP
↓ Effective Circulating Volume
Sympathetic Activation
↑ RAAS
↑ ADH
↑ CO
↑ Na/H2O
↑ Total Body Water

ASCITES AND EDEMA



Patients with cirrhosis but without portal HTN do not develop ascites

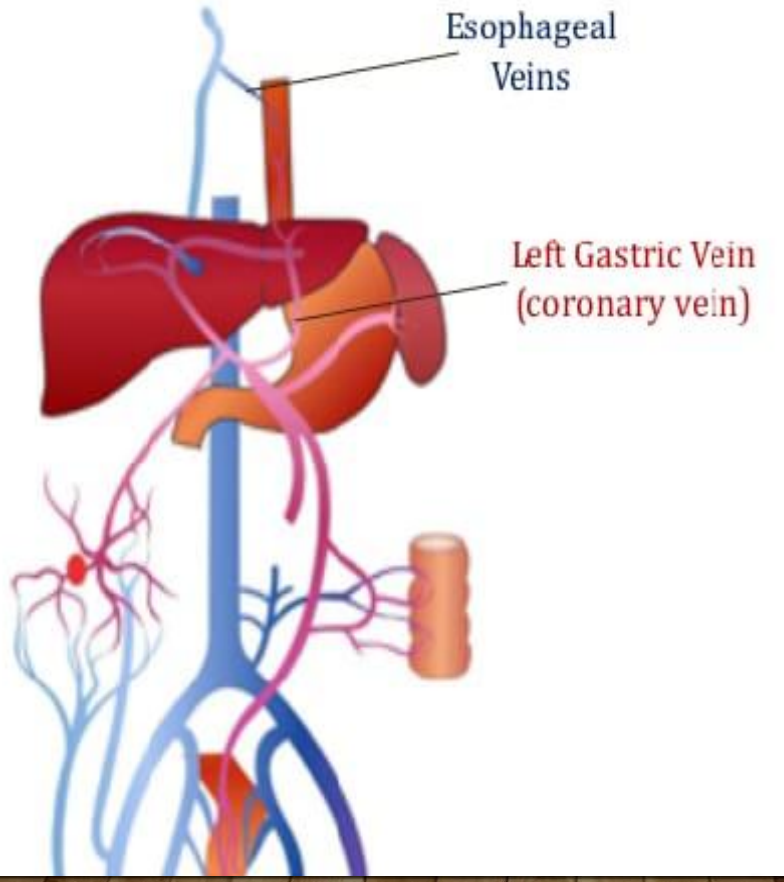
VENOUS COLLATERALS
VENOUS ANASTAMOSES

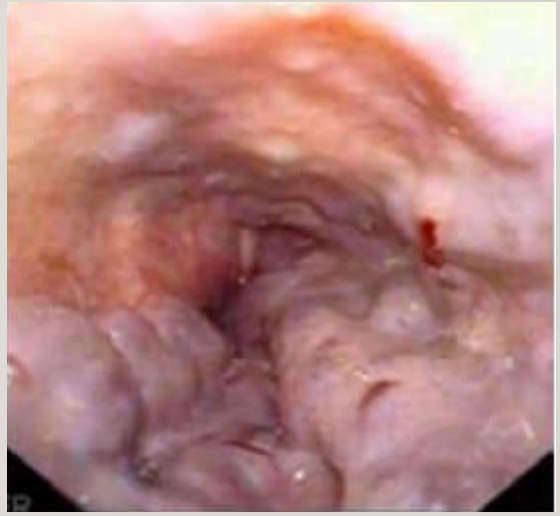
- High portal pressure opens "venous collaterals"
- Connection between portal-systemic veins
- Normally small, collapsed vessels
- Engorge in portal hypertension
- Key collaterals:
  - **Umbilicus** – physical exam finding: "caput medusa"
  - **Esophagus** – upper gastrointestinal bleeding
  - **Stomach** – upper gastrointestinal bleeding
  - **Rectum** – hemorrhoids which may also bleed

ESOPHAGEAL VARICES

Most esophageal venous drainage via esophageal veins to SVC

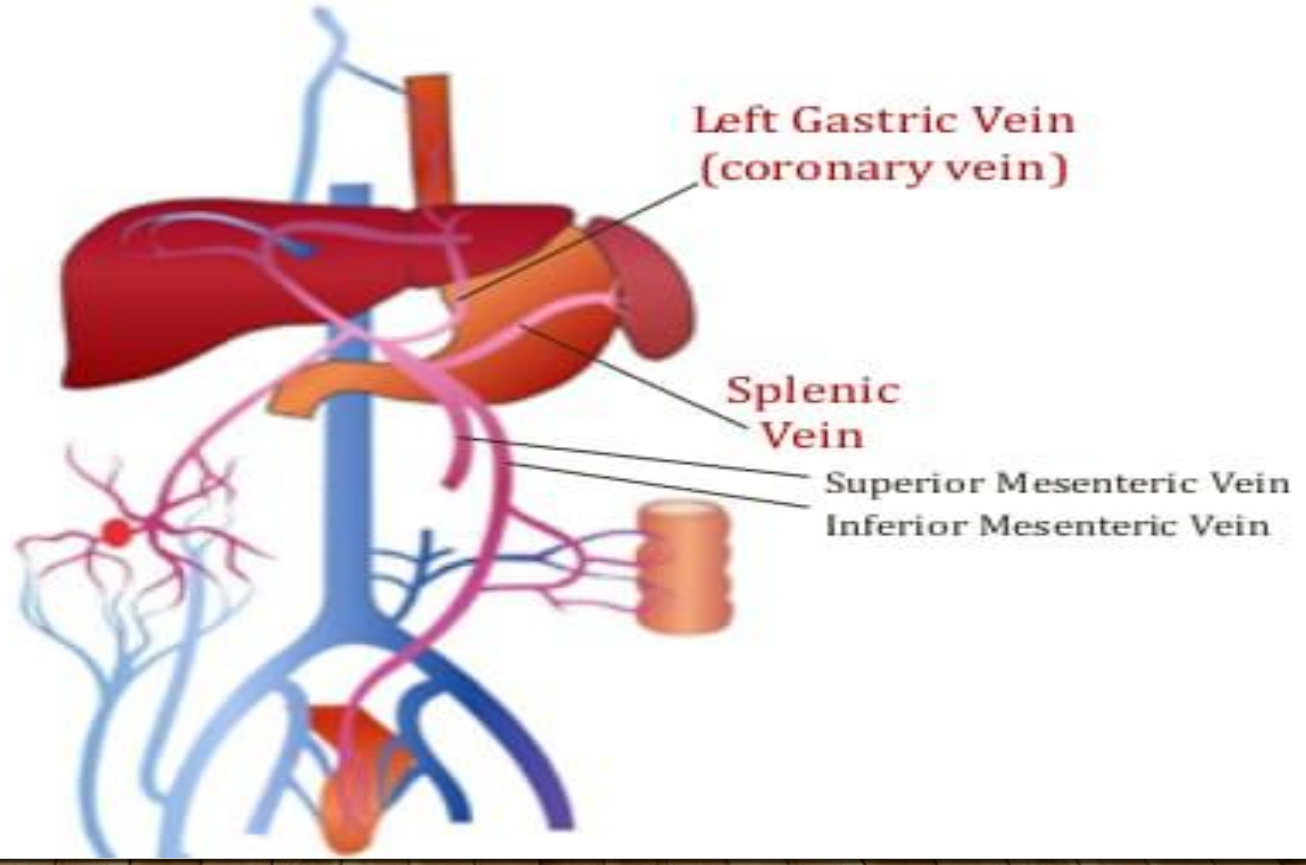
Small amount of superficial blood via left gastric vein to portal vein



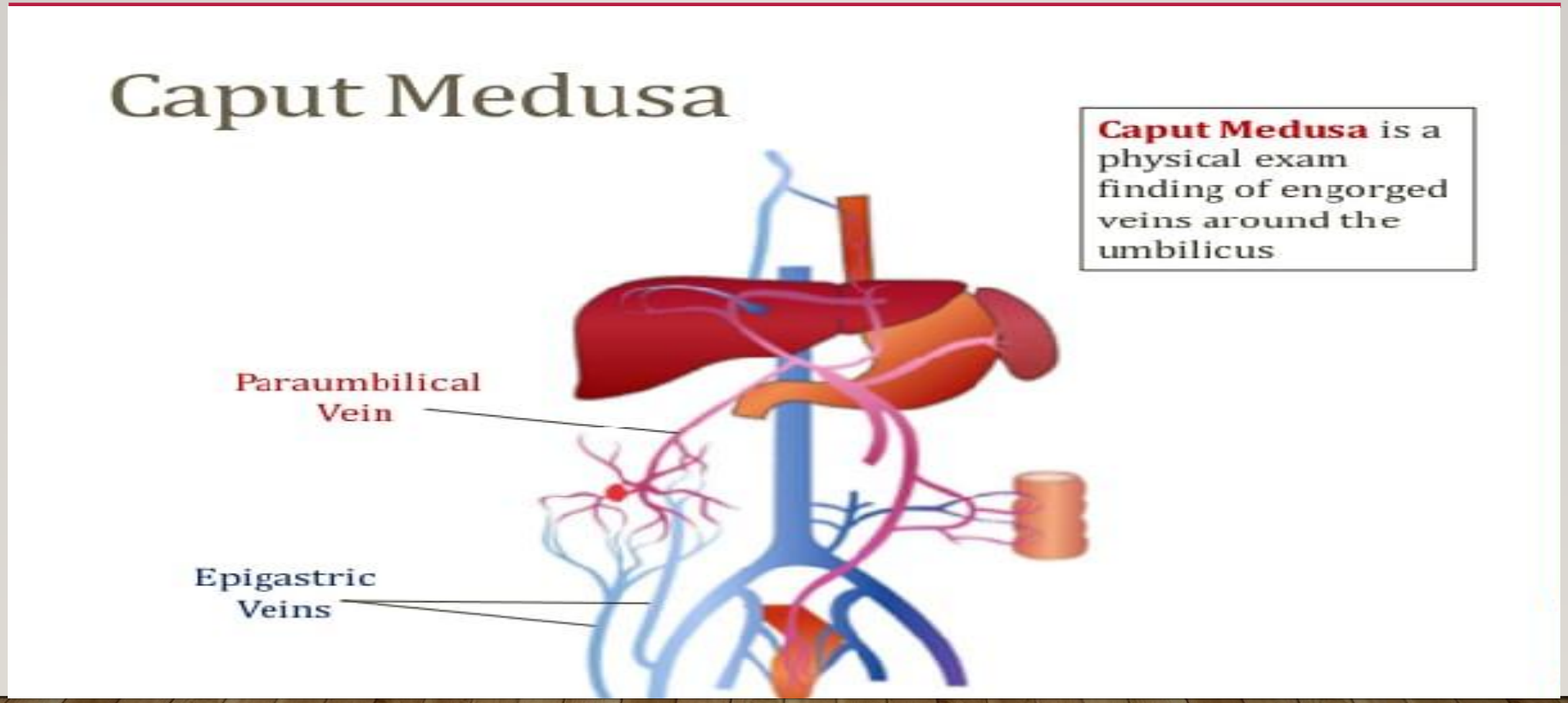


GASTRIC VARICES

Short gastric veins drain blood from stomach fundus to left gastric vein and splenic vein (both part of portal system)

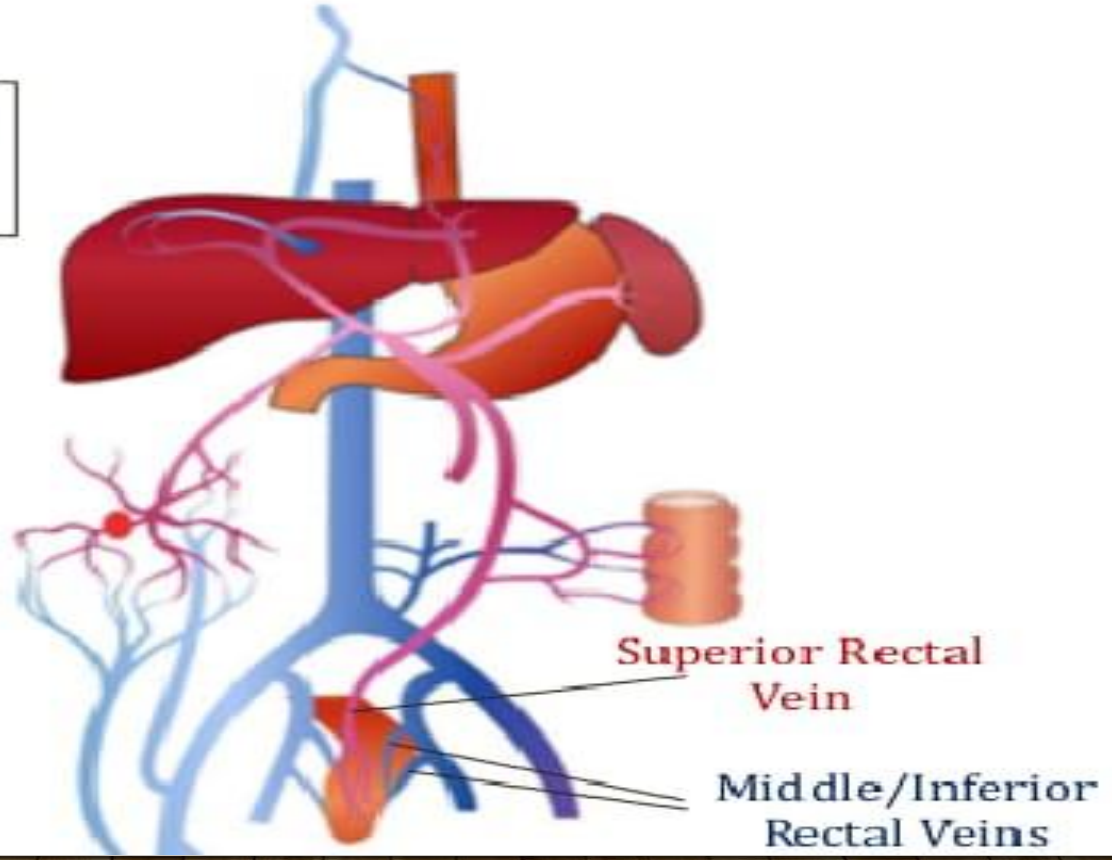


CAPUT MEDUSA



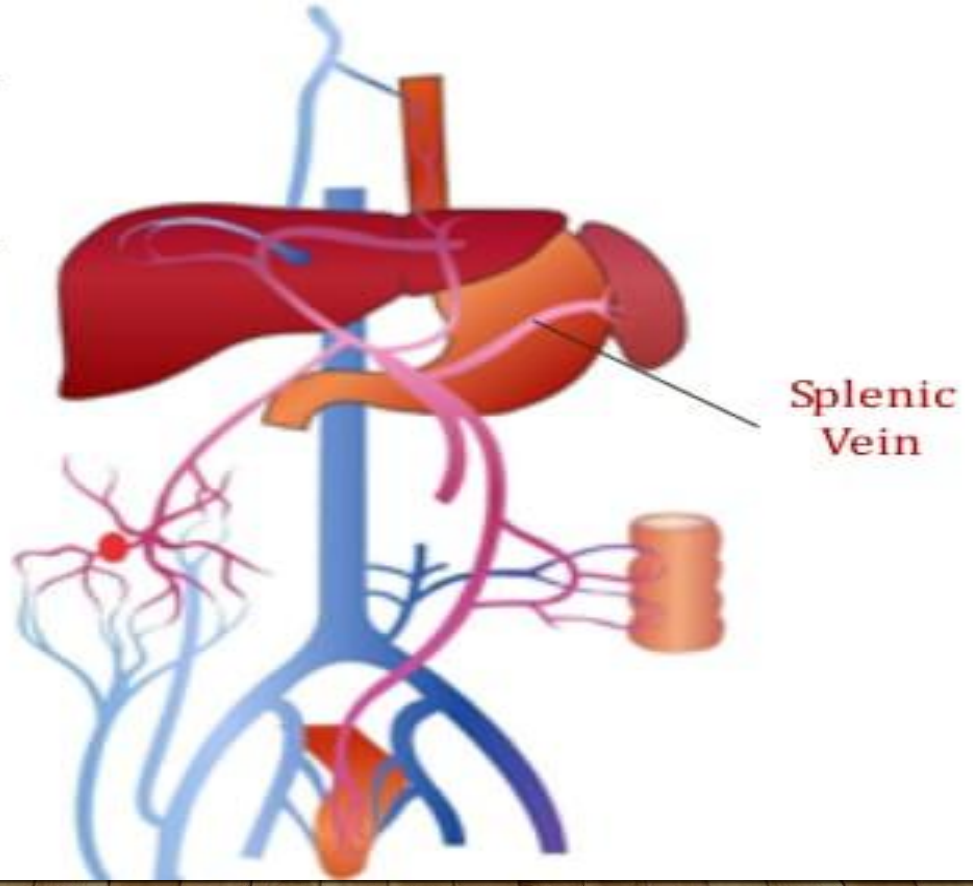
INTERNAL HEMORRHOIDS

Internal hemorrhoids
(above dentate line)
occur in portal HTN



HYPERSPLENISM

Engorgement of the spleen in portal HTN leads to **low platelets**

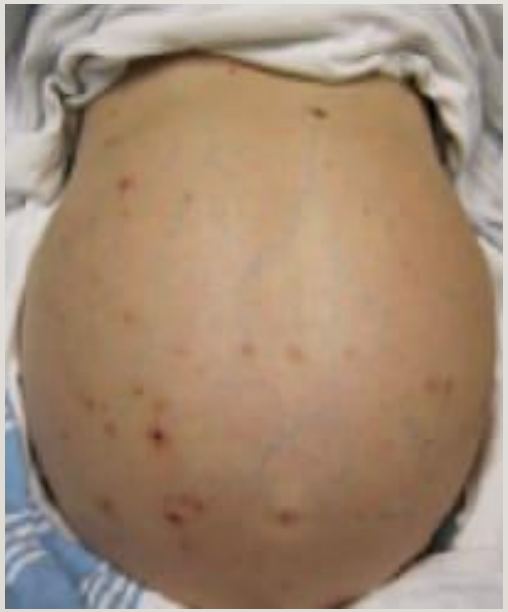


PORTAL VEIN THROMBOSIS

- Rare cause of portal hypertension
- Acute onset **abdominal pain**
- Splenomegaly (**palpable spleen** one exam)
- May result in gastric varices with **bleeding**
- Liver biopsy will be normal

ASCITES

- Accumulation of fluid in **peritoneal cavity**
- In liver disease, from portal hypertension +/- low albumin



SAAG
SERUM ASCITES ALBUMIN GRADIENT

- Test of ascitic fluid
- Two reasons for new/worsening ascites
  - Portal hypertension
  - Malignancy (leaky vasculature)
- Sample of ascitic fluid via paracentesis
- Serum albumin – ascites albumin = SAAG

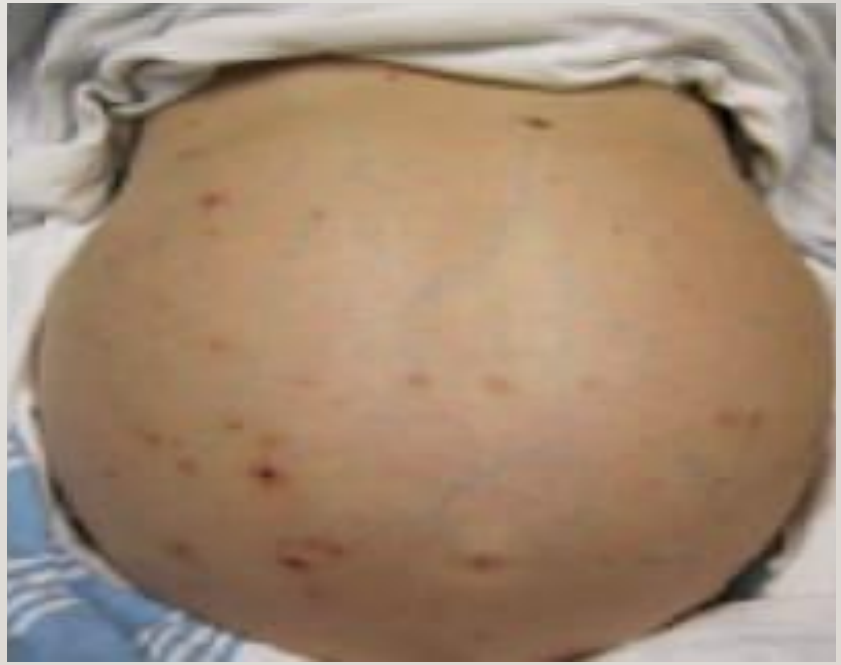
SAAG
SERUM ASCITES ALBUMIN GRADIENT

- SAAG >1.1 g/dL
  - Large difference between serum and ascites albumin
  - High pressure driving fluid (not albumin) into peritoneum
  - Seen in **portal hypertension**

- SAAG <1.1 g/Dl
- Albumin levels similar between serum and ascites
- Leaky vasculature leading to fluid/albumin into peritoneum
- Seen in **malignant ascites** (malignant cells in peritoneal cavity)

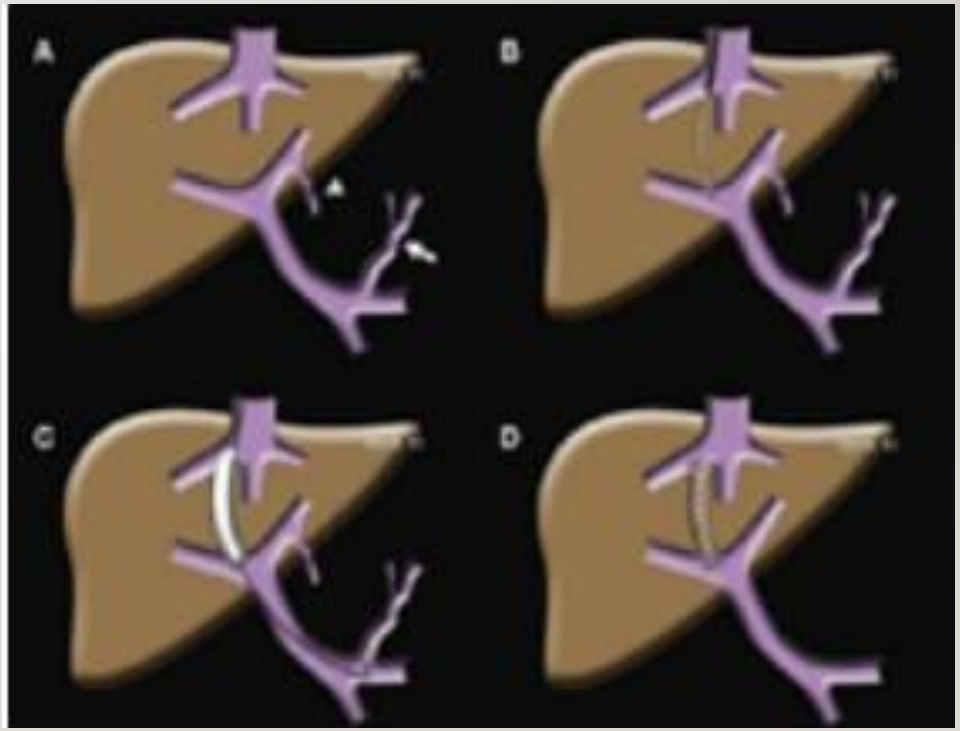
ASCITES TREATMENT

- Sodium restriction
- **Spironolactone** (drug of choice)
  - Potassium-sparing diuretic
  - Blocks aldosterone distal tubule
  - Most effective drug for ascites
- Loop diuretics (2nd line)
- Large volume **paracentesis**
- TIPS



TIPS
TRANSJUGULAR INTRAHEPATIC PORTOSYSTEMIC SHUNT

- Transjugular Intrahepatic Portosystemic Shunt
- Treatment of portal hypertension
- Creation of channel in liver
- Connects portal vein to hepatic vein



SBP
SPONTANEOUS BACTERIAL PERITONITIS

- Ascitic fluid infection
- Bacteria in gut gain entry into ascitic fluid
  - Usually **E. coli and Klebsiella**; rarely strep/staph
  - Fever, abdominal pain/tenderness
- ↑ ascitic absolute PMNs (≥250 cells/mm3)
- Common treatment:
  - 3rd generation cephalosporin (cefotaxime)
  - Gram positive and gram negative coverage
  - Achieves good levels in ascitic fluid

MELD SCORE
MODEL FOR END-STAGE LIVER DISEASE

- **Scoring system** for chronic liver disease or cirrhosis
- Estimates 3-month mortality from liver disease
- Point system using:
  - Bilirubin level
  - Creatinine level
  - INR
- >40 = 71% mortality
- <9 = 2% mortality

CHILD-PUGH CLASSIFICATION

- Five variables to predict risk/survival
  - Points for encephalopathy, ascites, bilirubin, albumin, PT
- Score ranges from 5 to 15
  - 5 or 6: Child-Pugh class A cirrhosis
  - 7 to 9: Child-Pugh class B cirrhosis
  - 10 to 15: Child-Pugh class C cirrhosis (worst)

CIRRHOSIS
DIAGNOSIS

- Gold standard is **liver biopsy**
  - Not required if diagnosis is clear from history
  - Done only when biopsy will change management
- Imaging (ultrasound, CT, MRI)
  - May show **small, nodular liver**
  - Not sensitive or specific for diagnosis
  - More helpful for detection of hepatocellular carcinoma
- Clinical diagnosis (common)
  - Presence of ascites
  - Low platelet count
  - Spider angiomata

STELLATE CELLS

- Perisinusoidal cell
- Storage site for retinoids (vitamin A metabolites)
- Activated in liver disease
- Secrete TGF-β
- Proliferate and produce fibrous tissue
- Major contributor to cirrhosis