

Elevated Liver Tests and Common Liver Diseases

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OBJECTIVES

- To define blood tests that evaluate liver/biliary tract injury
- To identify measures of liver function
- Review PSC images

MEASURES OF LIVER CELL INJURY

- AST (SGOT)
- ALT (SGPT)
- Alkaline phosphatase
- Gamma-glutamyltransferase

ASPARTATE AMINOTRANSFERASE (AST)

- formerly known as serum glutamic oxaloacetic transaminase (SGOT)
- enzyme found in hepatocytes
- marker of liver cell injury – when cells are lysed open
- also found in cardiac muscle, brain, pancreas, and kidney cells

ALANINE AMINO- TRANSFERASE (ALT)

- formerly known as serum glutamic pyruvic transaminase (SGPT)
- enzyme found exclusively in hepatocytes
- marker of liver cell injury

ALKALINE PHOSPHATASE

(alk phos)

- enzyme found on the hepatocyte membrane bordering bile canaliculi (the smallest branches of the bile ducts)
- widely distributed throughout tissue including liver, bone, intestine, kidney, placenta, leukocytes, various neoplasms
- most useful in detecting cholestasis
- may be increased in bone disorders, pregnancy, chronic renal failure, malignancy
- can be fractionated to determine source – liver, bone, intestine

GAMMA-GLUTAMYL- TRANSFERASE (GGT)

- similar to alkaline phosphatase
- found in kidney, spleen, heart, lung, brain
- etiologies include MI, neuromuscular disease, pancreatic disease, pulmonary disease, diabetes, ingestion of ethanol
- may be used to corroborate liver origin when elevated in setting of elevated alk phos

MEASURES OF HEPATIC SYNTHETIC FUNCTION

- Prothrombin time
- Albumin

PROTHROMBIN TIME (PT)

- measures proteins produced by the liver which are involved in clotting of blood
- dependent on Vitamin K intake, absorption, and production
- elevated PT may be due to malnutrition, malabsorption, antibiotics, medications, disseminated intravascular coagulation, liver disease

ALBUMIN

- quantitatively the most important protein synthesized by the liver
- regulated by changes in nutritional status, osmotic pressure, systemic inflammation, thyroid and glucocorticoid hormones

MEASURES OF CLEARANCE OF METABOLITES

- liver is strategically placed to remove toxins from the blood
- function may be compromised due to loss of parenchymal cells, obstruction of bile flow, impaired cellular uptake, reduced hepatic blood flow

MEASURES OF CLEARANCE OF METABOLITES

- Bilirubin
- Ammonia

BILIRUBIN

- derived primarily from the degradation of hemoglobin released from RBCs
- primarily conjugated hyperbilirubinemia (direct) is more typical for patients with hepatocellular dysfunction or cholestasis
- unconjugated hyperbilirubinemia (indirect) results from either increased bilirubin production (hemolysis) or from inherited or acquired defects in hepatic uptake or conjugation (Gilbert's phenomenon)

AMMONIA

- potentially toxic substance produced by colonic bacteria
- absorbed into portal circulation, removed by the liver, metabolized and secreted by the kidneys
- rises in the setting of severe liver disease or portosystemic shunting
- used to confirm hepatic encephalopathy

INTERPRETATION

- screening of healthy, asymptomatic individuals reveals that 6 to 25 % of people will have abnormal liver tests
- often one time elevations
- prevalence of liver disease in general population is significantly lower

TERMINOLOGY

- Hepatitis: inflammation of the liver

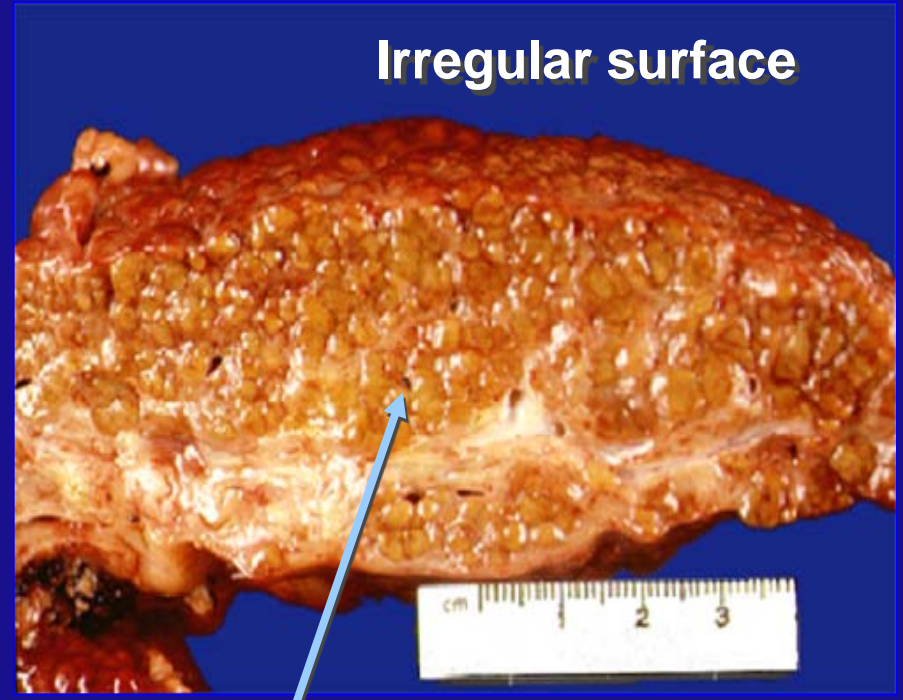
TERMINOLOGY

- **Cirrhosis:**
 - » Permanent scarring of the liver
 - » Associated with a spectrum of clinical manifestations
 - » May be asymptomatic

Normal



Cirrhosis



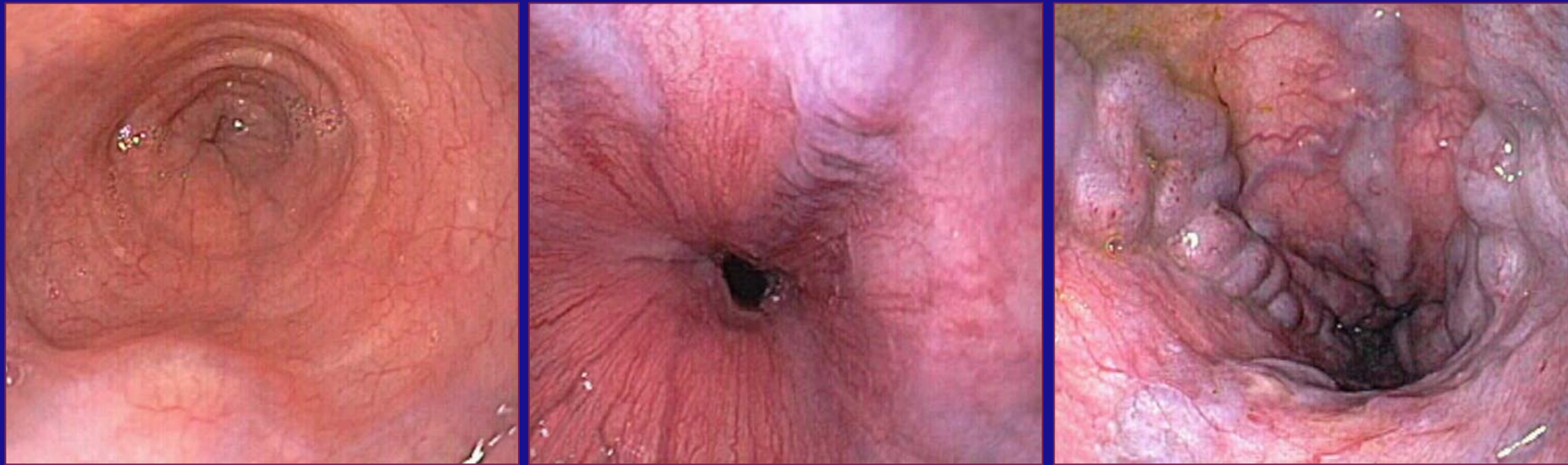
Irregular surface

Nodules

TERMINOLOGY

- Complications of cirrhosis
 - » **Esophageal varices:**
 - 20% of patients with esophageal varices will bleed
 - Each bleeding episode carries a 20-30% mortality rate
 - Patients who have had one bleed are likely to have a recurrence
 - Can be treated with variceal banding, sclerotherapy, shunts, or liver transplantation.
 - May be prophylactically treated with beta blockers or serial bandings.

Varices Increase in Diameter Progressively



No varices

Small varices

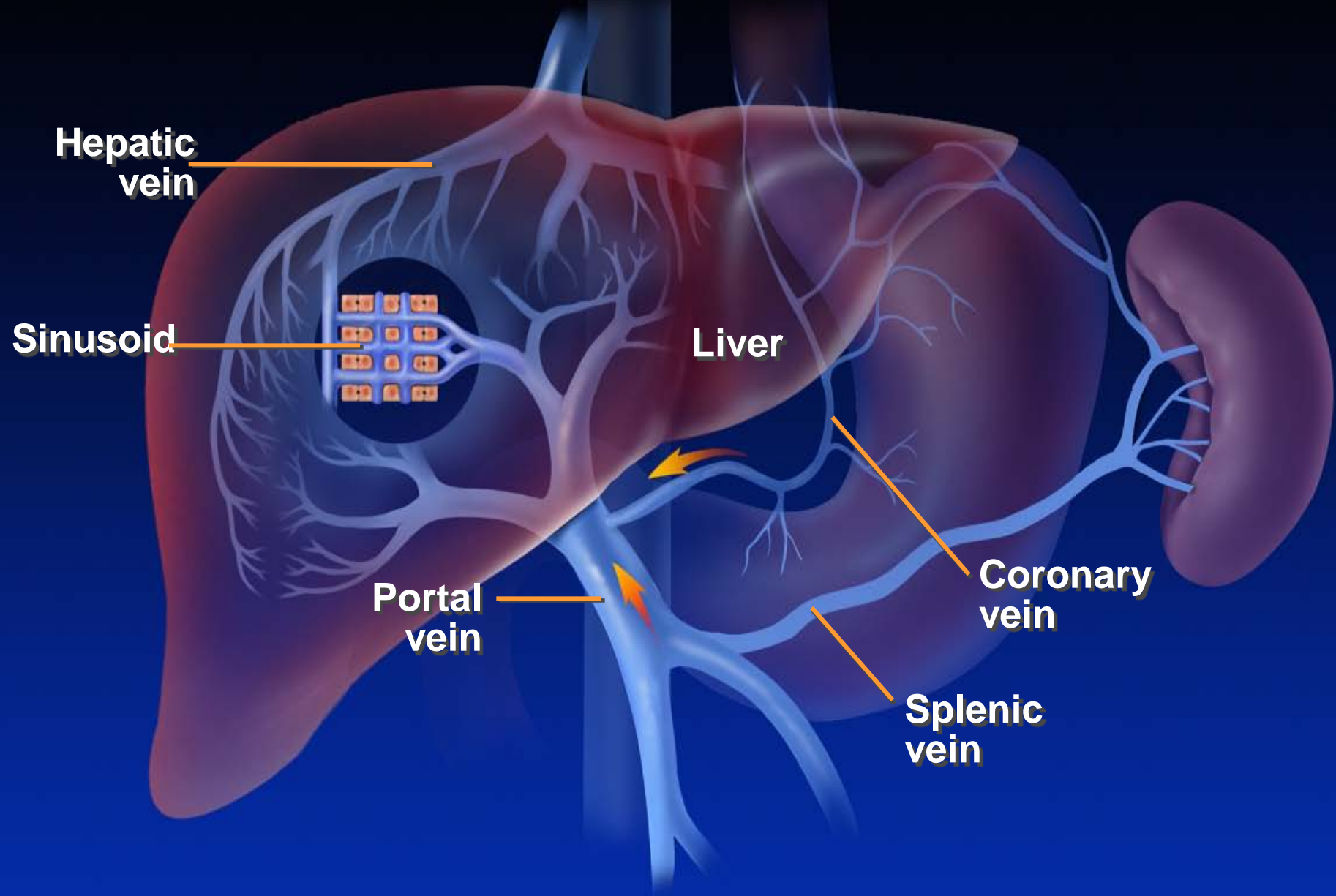
Large varices



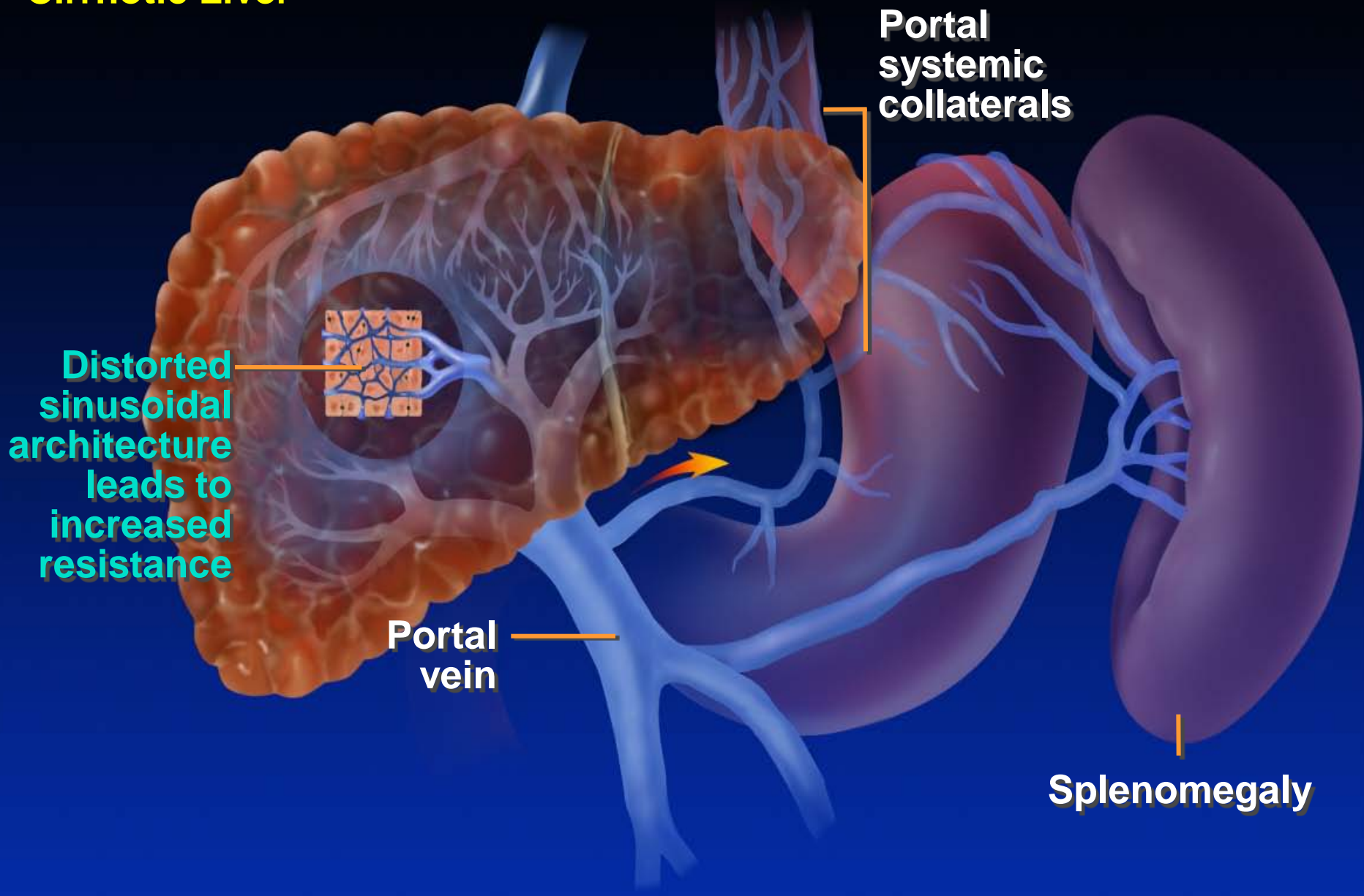
7-8%/year

7-8%/year

Normal Liver



Cirrhotic Liver



Distorted sinusoidal architecture leads to increased resistance

Portal systemic collaterals

Portal vein

Splenomegaly

TERMINOLOGY

- Complications of cirrhosis

- » **Splenomegaly:**

- Portal hypertension leads to congestion of spleen, usually asymptomatic. May lead to hypersplenism with thrombocytopenia, leukopenia, and anemia
- Splenectomy not indicated.

- » **Collateral vessels:**

- Due to increased resistance in the liver - portal blood seeks alternative routes to get to the heart.
- The most important collaterals are esophagogastric varices.
- Collaterals may be seen on ultrasound or CT scan.

TERMINOLOGY

- Complications of cirrhosis

- » ascites:

- due to sodium retention by kidney in response to vasodilatation. Hypoalbuminemia exacerbates fluid retention.
- Treated with sodium restriction and diuretics.

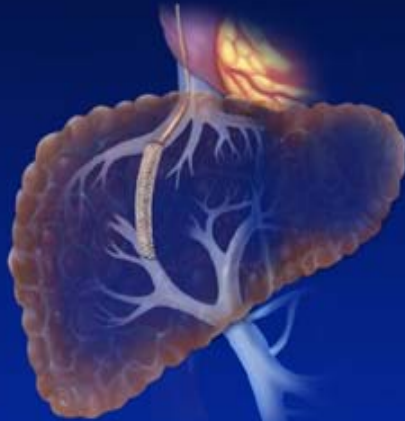
- » portal systemic encephalopathy:

- disturbances range from subtle mental status changes to coma.
- associated with an elevation of serum ammonia.
- Predisposing factors include gastrointestinal bleed, infection, and electrolyte abnormalities.

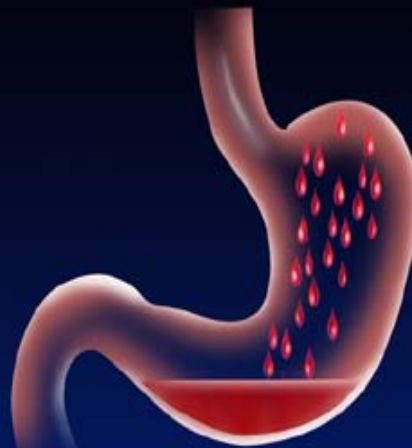
Hepatic Encephalopathy Precipitants



**Excess
Protein**



TIPS



**GI
Bleeding**



Temperature

Sedatives/Hynoti



Diuretics



Infections



Cholestatic Disease

- predominantly affect the biliary system
- alkaline phosphatase is most important marker



Primary Sclerosing Cholangitis

Definition

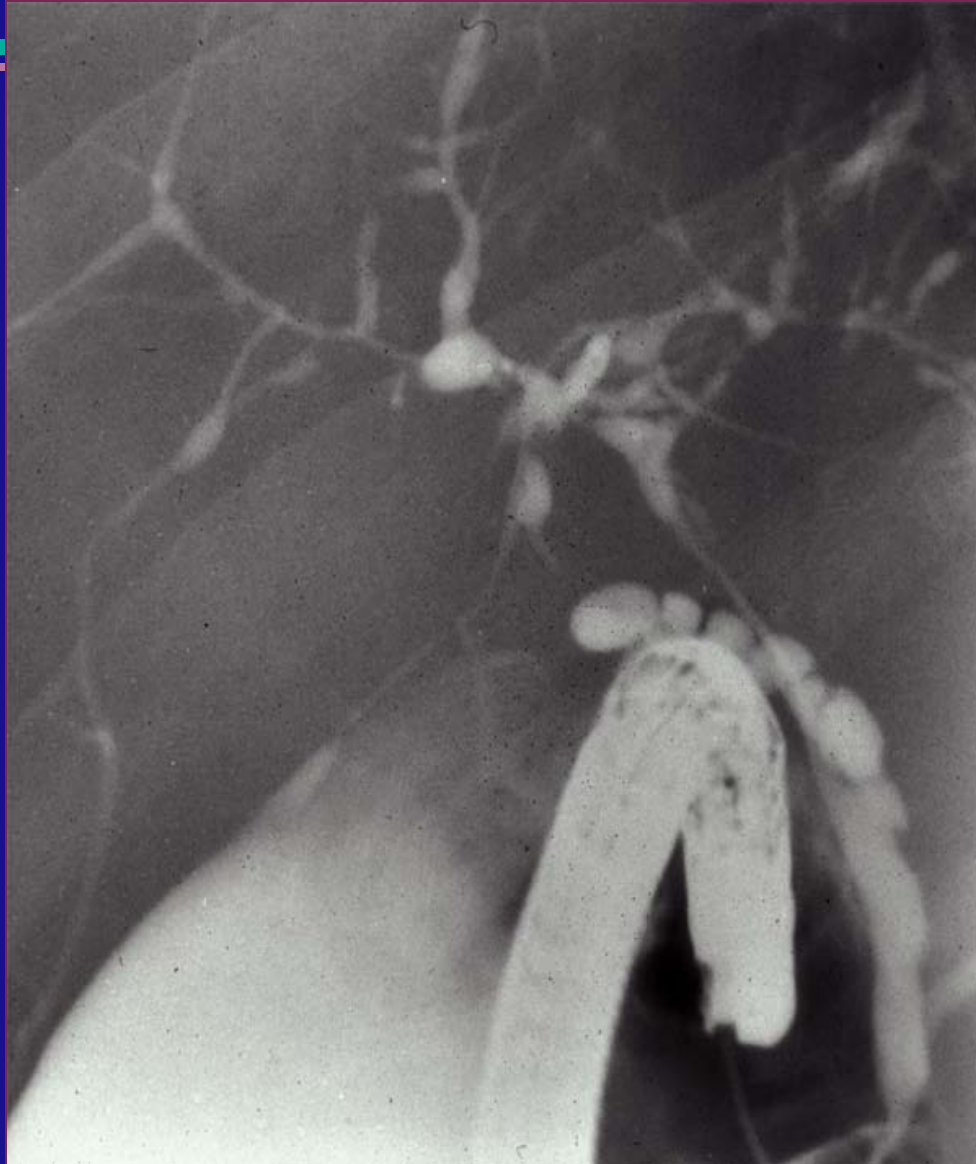
- Chronic cholestatic liver disease
- Unknown etiology, frequently associated with IBD
- Diffuse inflammation and fibrosis of the biliary tree
- Leads to biliary cirrhosis and portal hypertension



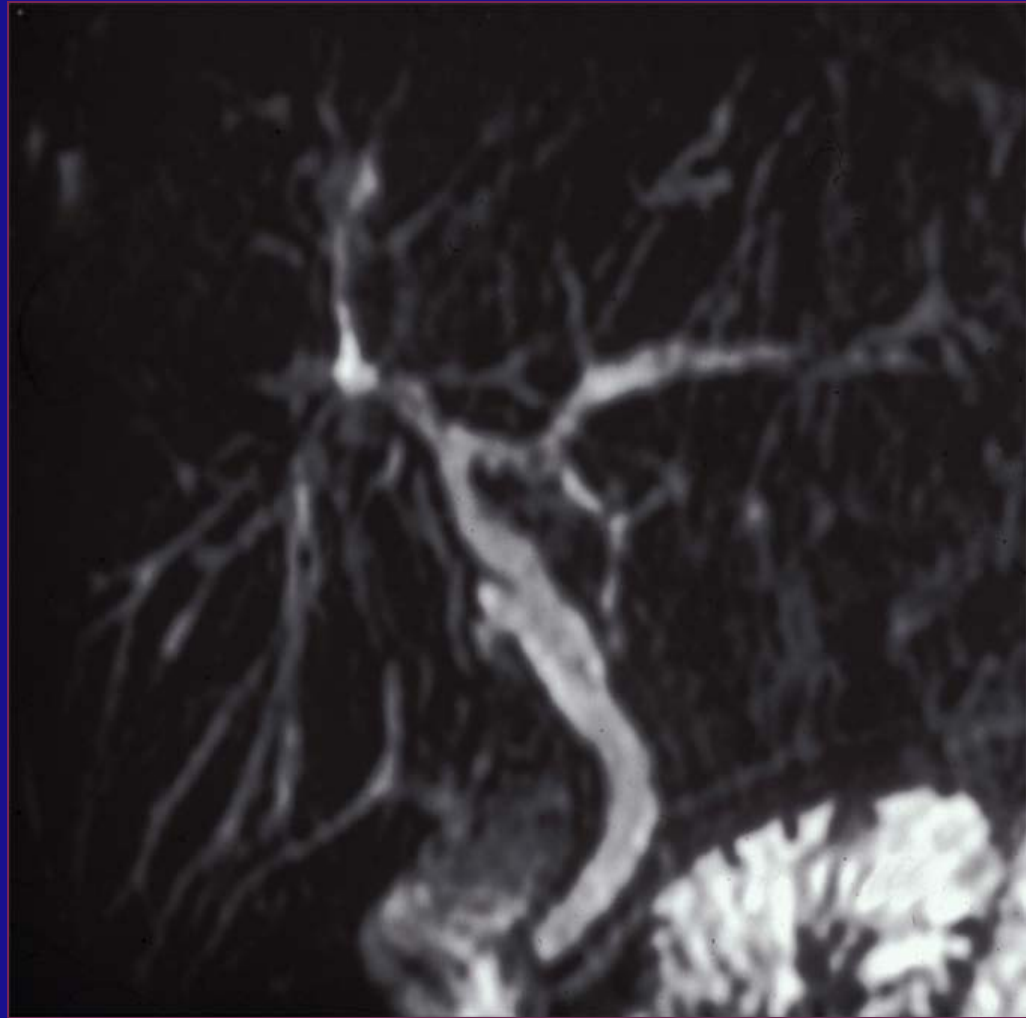
Diagnosis - Cholangiography

- ERCP most commonly used
- Percutaneous cholangiography infrequently used
- Magnetic resonance cholangiography
 - » non-invasive
 - » no radiation
 - » cost-effective

Classic Case of PSC



Comparison of ERC and MRC





Small-Duct PSC

- 5% of PSC
- Normal cholangiogram but biopsy showing PSC
- Can progress to classic PSC
- May exist with or without colitis