Scanning for Portal Hypertension

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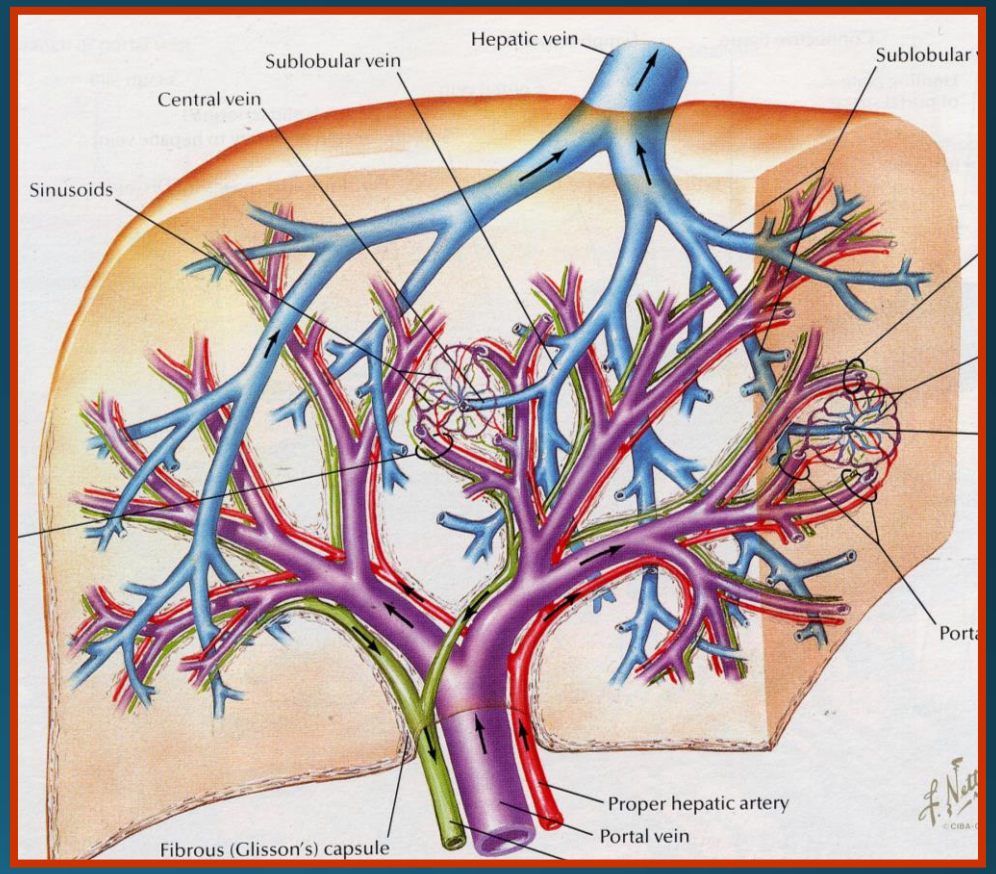
I have no disclosures relevant to the content of this presentation

The Amazing Circulation of the Liver

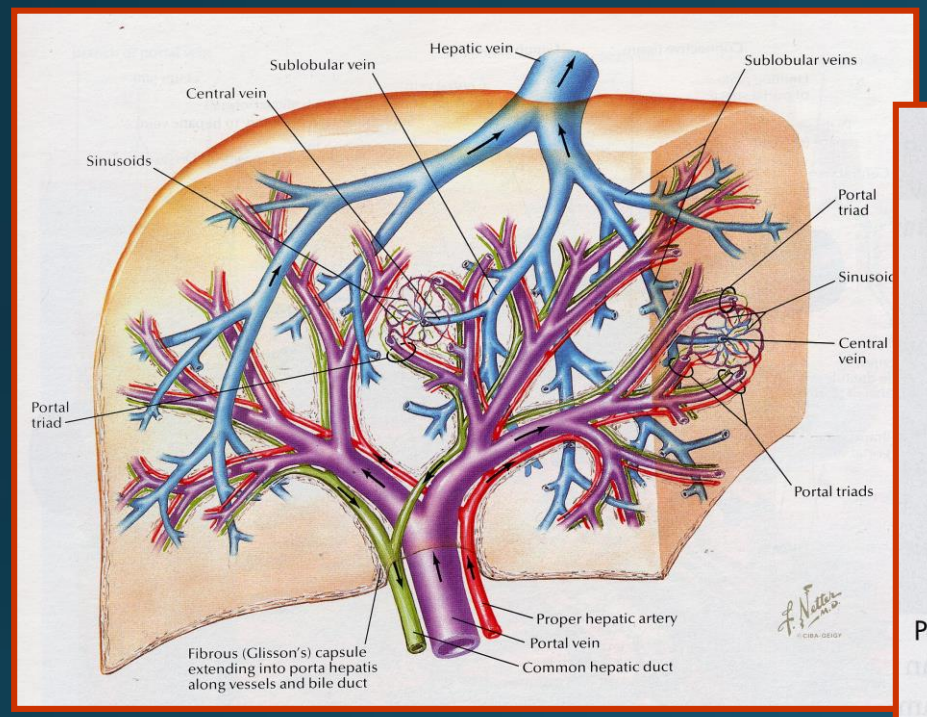
- One of the most fascinating circulatory systems

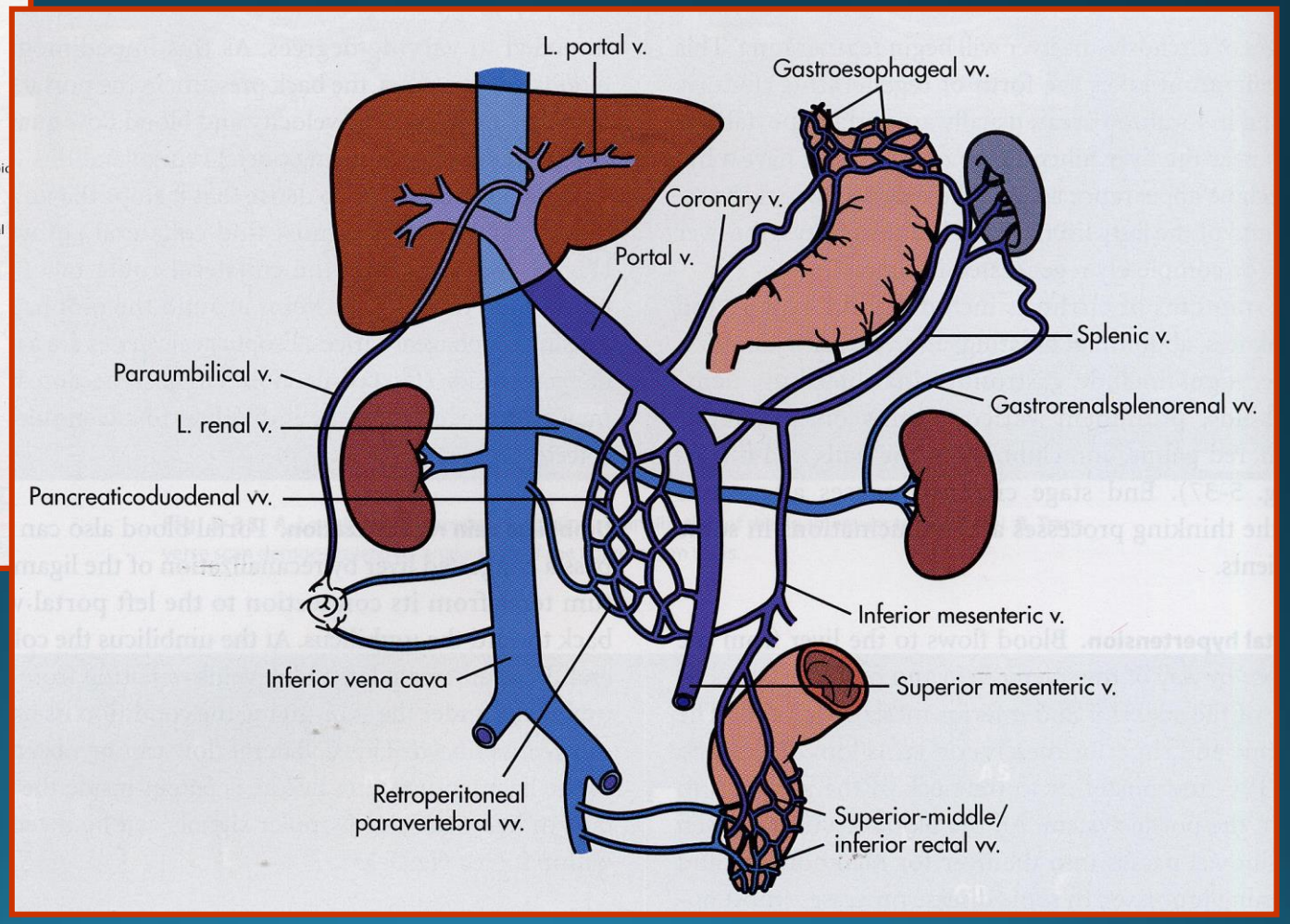
- Complex network of veins
  - Dain the liver
  - Feed the liver

- Assisted by the hepatic artery and its branches



Extensive Network of Collateral Vessels





The Hepatic Venous System and The Inferior Vena Cava

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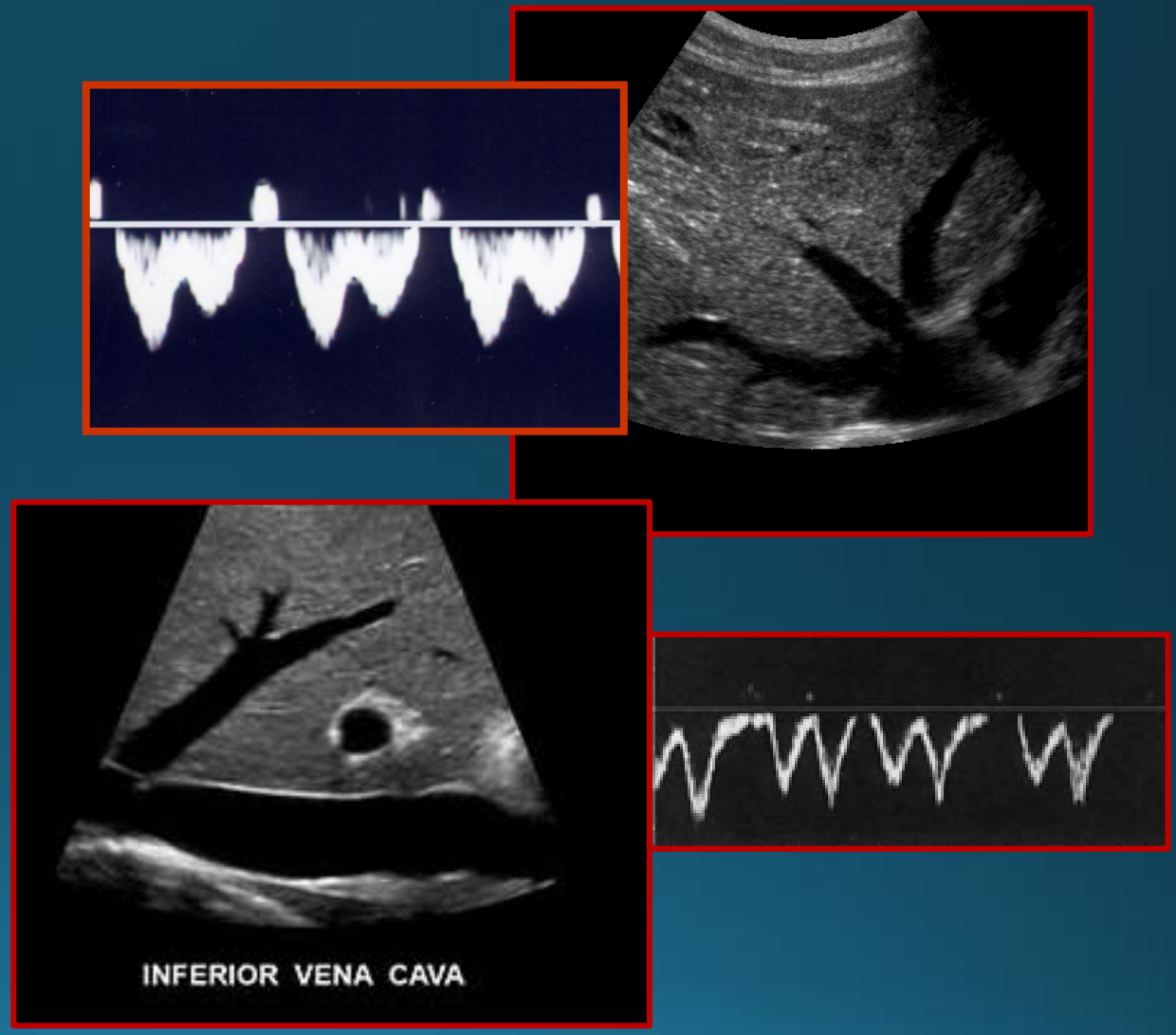
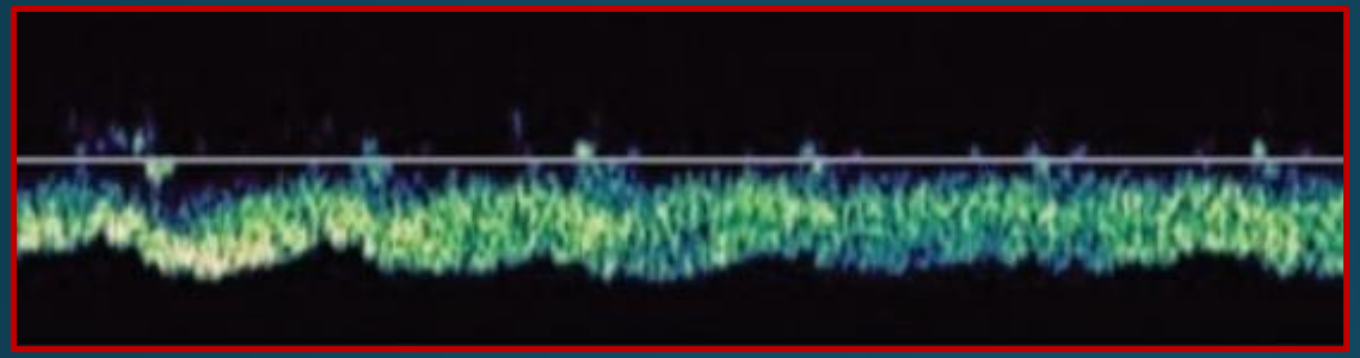
Hepatic Veins and IVC

- Hepatofugal flow direction
- Bi-directional flow
- Pulsatile due to cardiac influence
- Flow toward the heart during ventricular systole
- Flow reversal during atrial systole



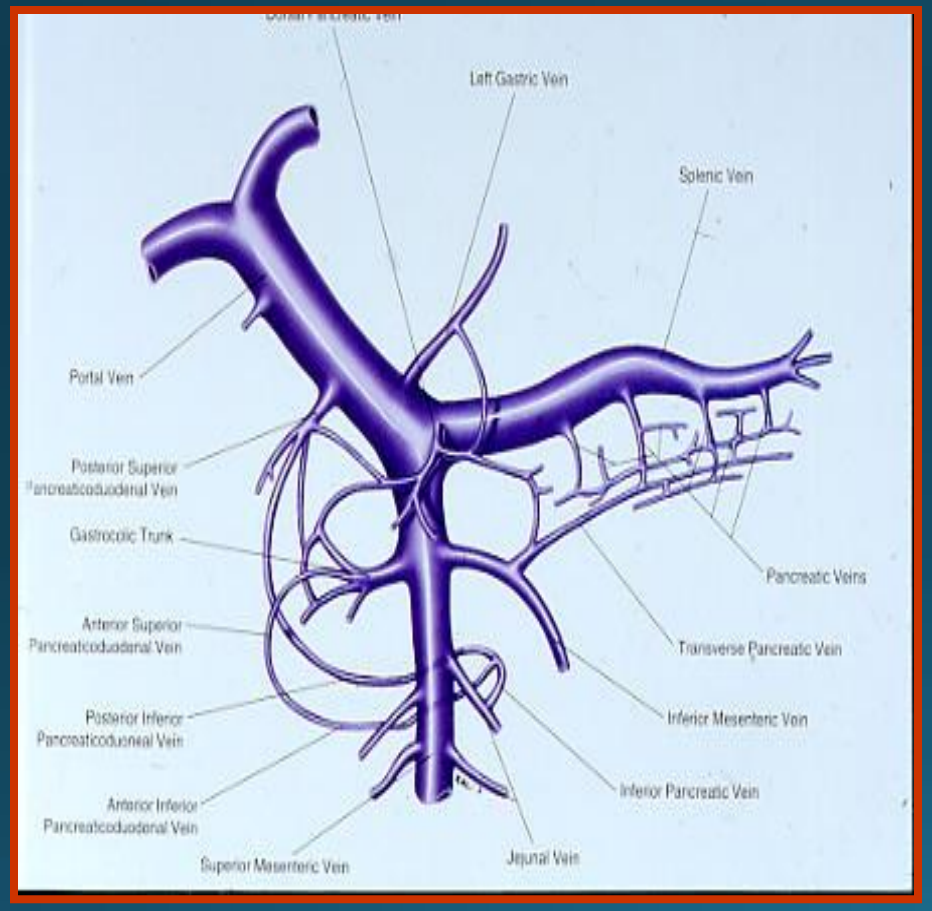
Extrinsic Compression of the Hepatic Veins



- Dense liver tissue most often due to cirrhosis
- Space occupying lesion that compresses the veins

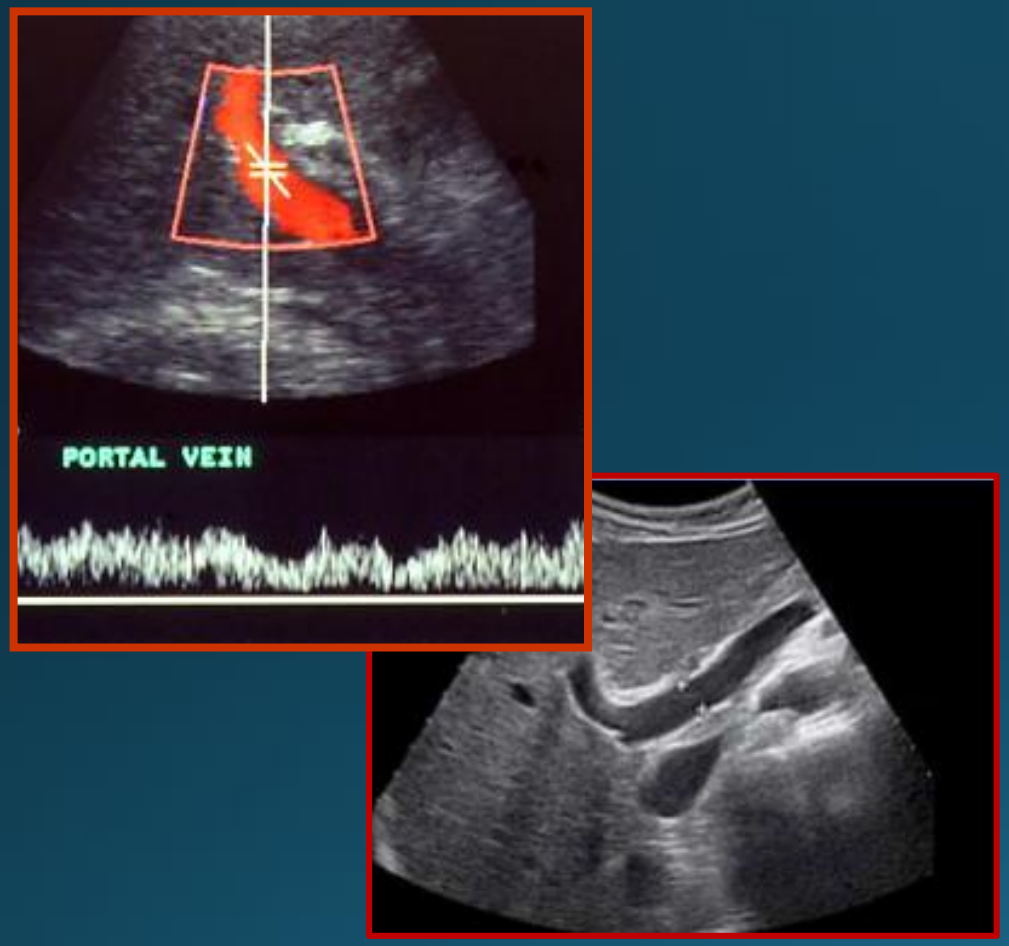
The Portal Venous System

Portal Venous Anatomy



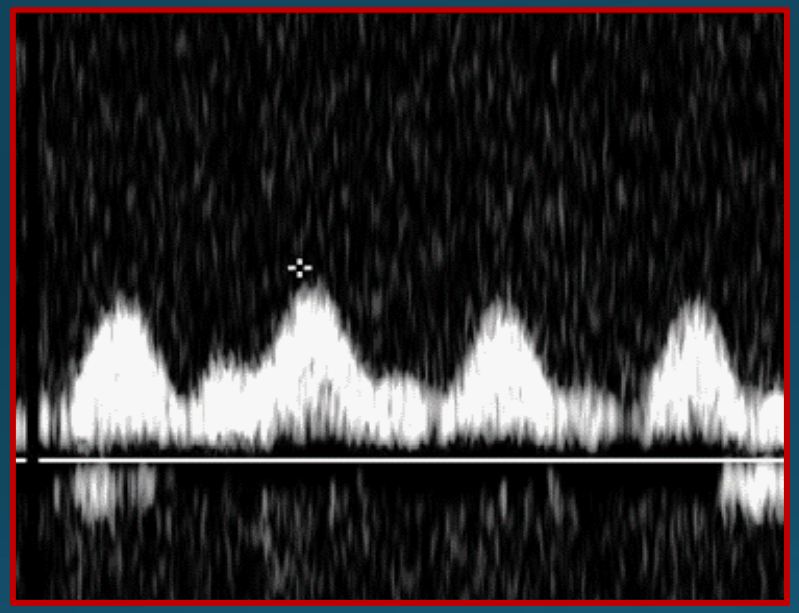
- Splenic and superior mesenteric veins converge to form the main portal vein
- Main portal divides into the right and left portal veins

Portal Venous Anatomy



- Flow is similar to the lower extremity veins
- Nonpulsatile; minimally phasic
- Hepatopetal flow direction; supplies approximately 70% of deoxygenated blood to the liver
- Low velocity (PSV 20-40 cm/sec)
- Diameter < 13 mm at the level of the IVC

Pulsatile Portal Venous Flow



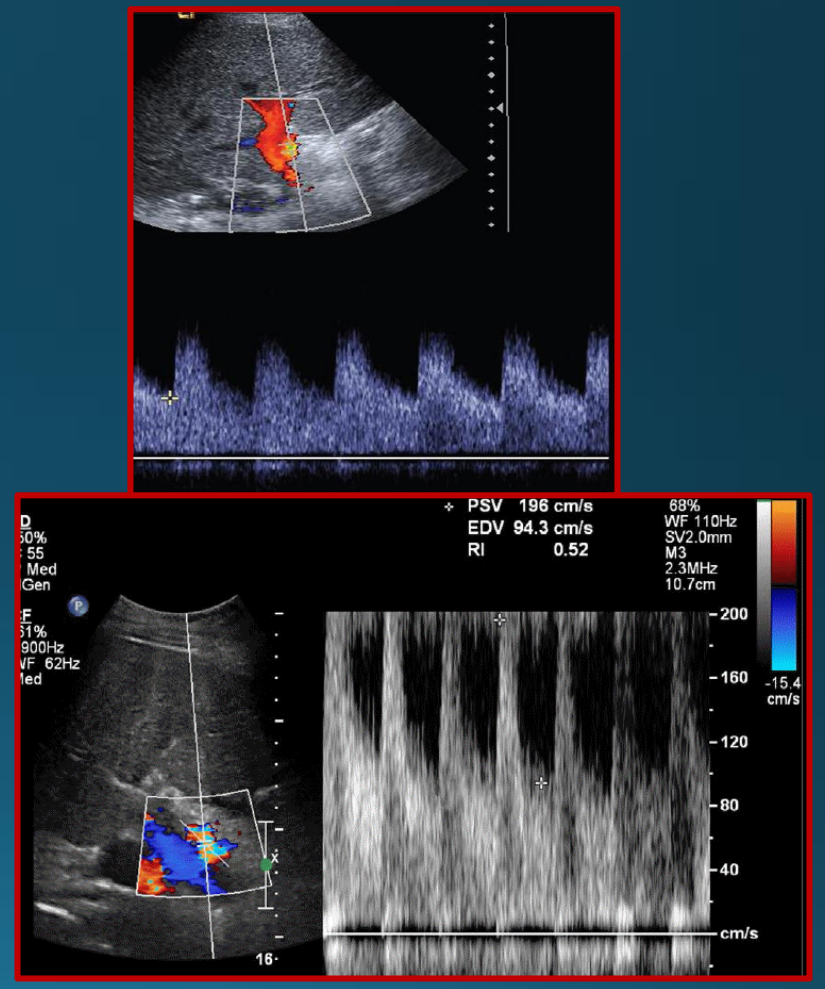
Tricuspid Regurgitation

Right heart failure

The Hepatic Artery

Hepatic Artery

- When portal venous flow is compromised, hepatic artery flow / velocity may increase
  - Normal velocity averages 100 cm/sec
- Rule out hepatic artery stenosis



So, how can we tell when the circulation of the liver is compromised?

Portal Hypertension

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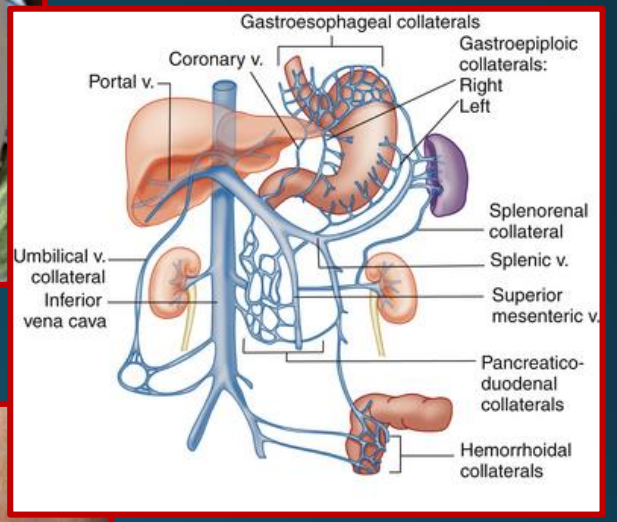
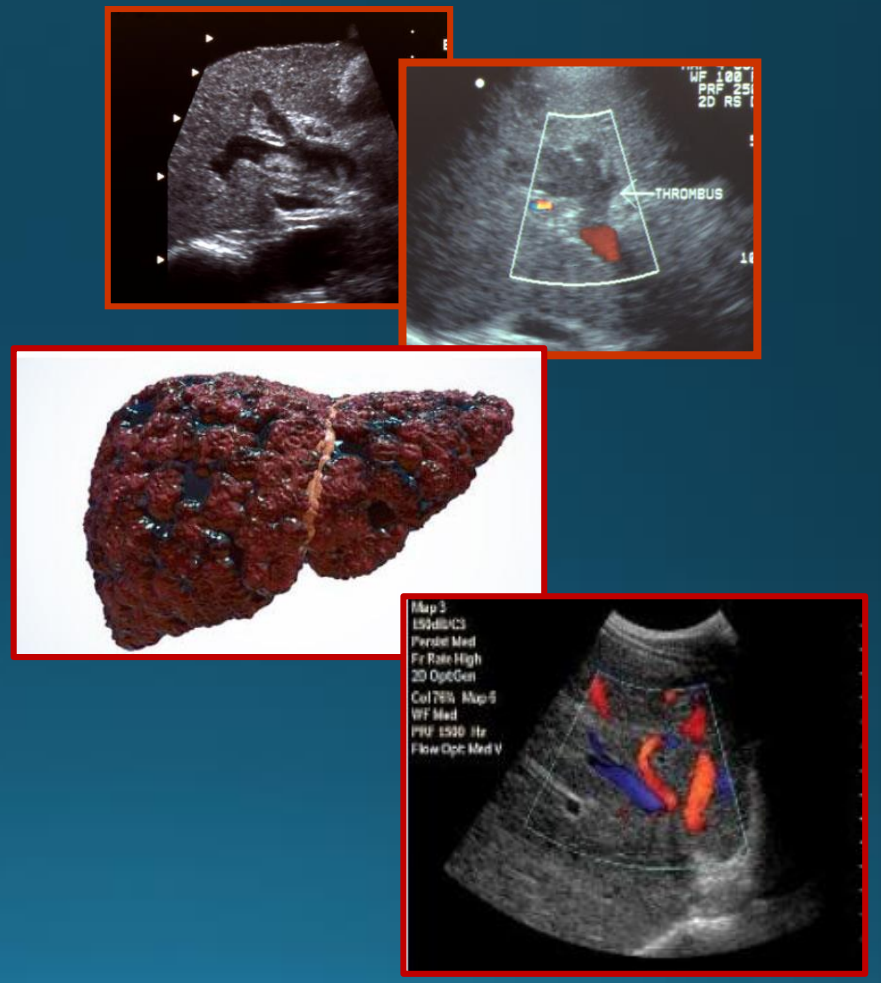
Portal Hypertension

- Defined as an increase in the portal venous pressure
- Result of many diseases; most commonly caused by cirrhosis
- Associated with ascites, splenomegaly, hepatic encephalopathy, and portal systemic shunts
  - Collateral pathways may be apparent on physical exam



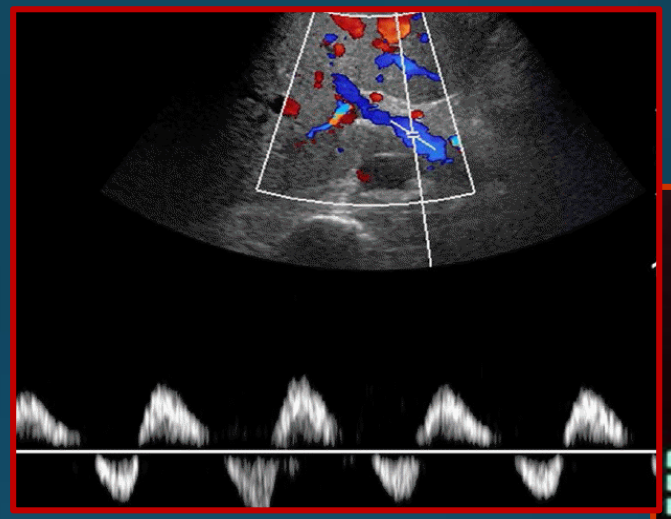
Portal Hypertension

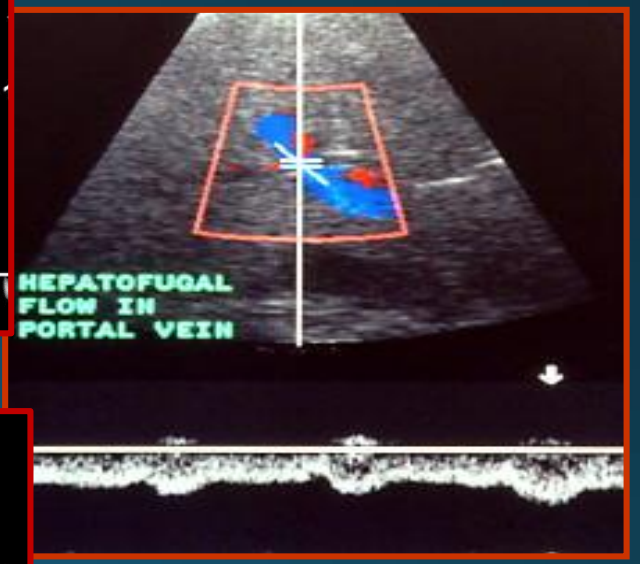
- Pre-Hepatic
  - Portal vein thrombosis
- Intra-Hepatic
  - Cirrhosis
- Post-Hepatic
  - Budd-Chiari syndrome

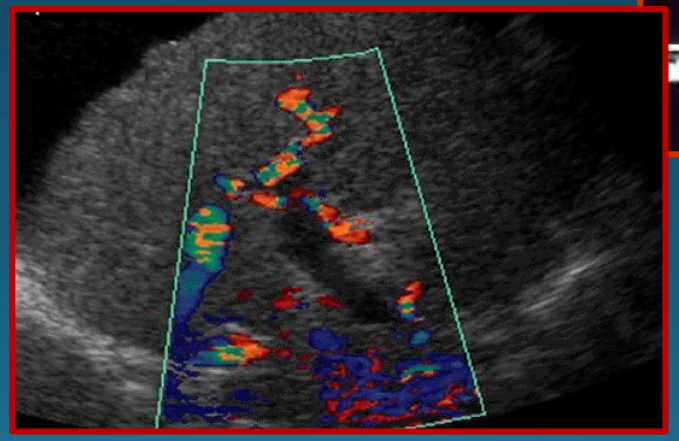


Portal Hypertension

- To decompress the liver, flow may reverse in the main portal vein and its branches
  - Initial decrease in velocities leads to a to-fro flow pattern in sync with respiration
  - In severe cases, flow becomes hepatofugal in direction or the vein thromboses

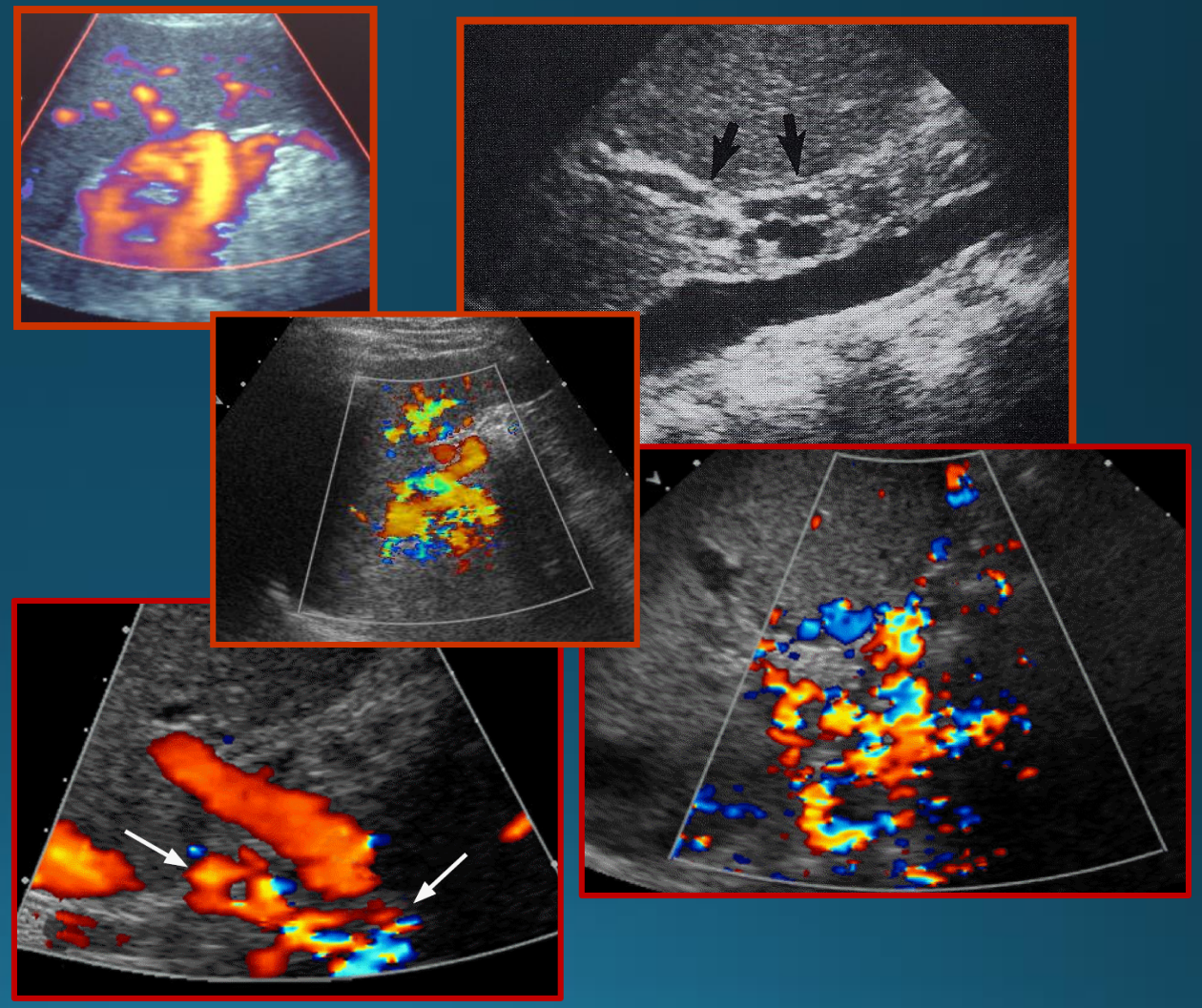






Portal Vein Thrombosis

- Cavernous transformation
  - Replaces main portal vein
- Formation of varices due to increased vascular resistance
- Collateral formation
  - May exhibit hepatofugal flow



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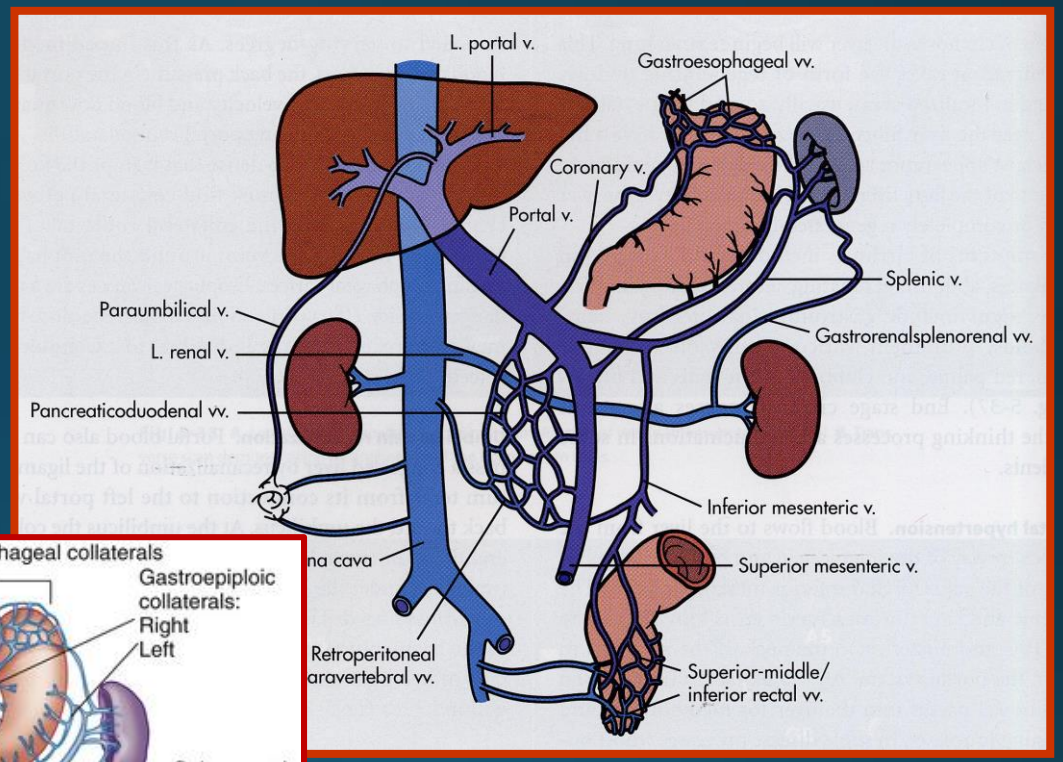
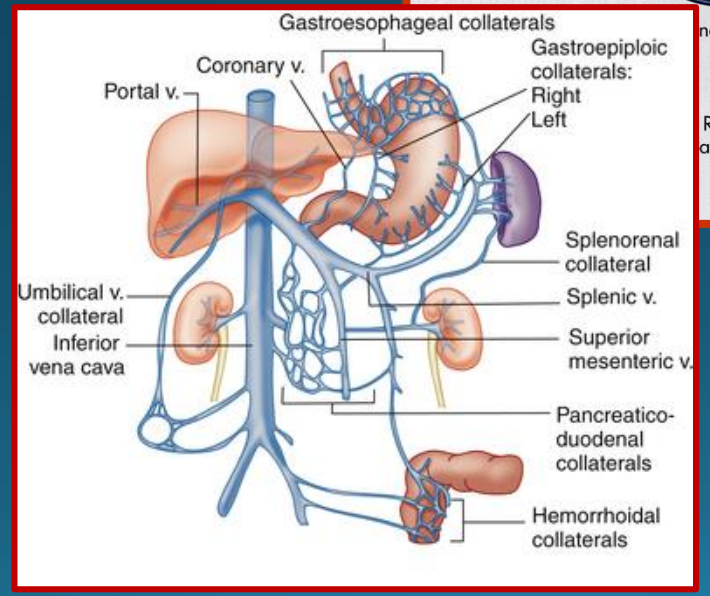
Portal Hypertension

Common Collateral Pathways

- Gastroesophageal varices
- Paraumbilical veins
- Spleno-renal shunts
- Retroperitoneal shunts





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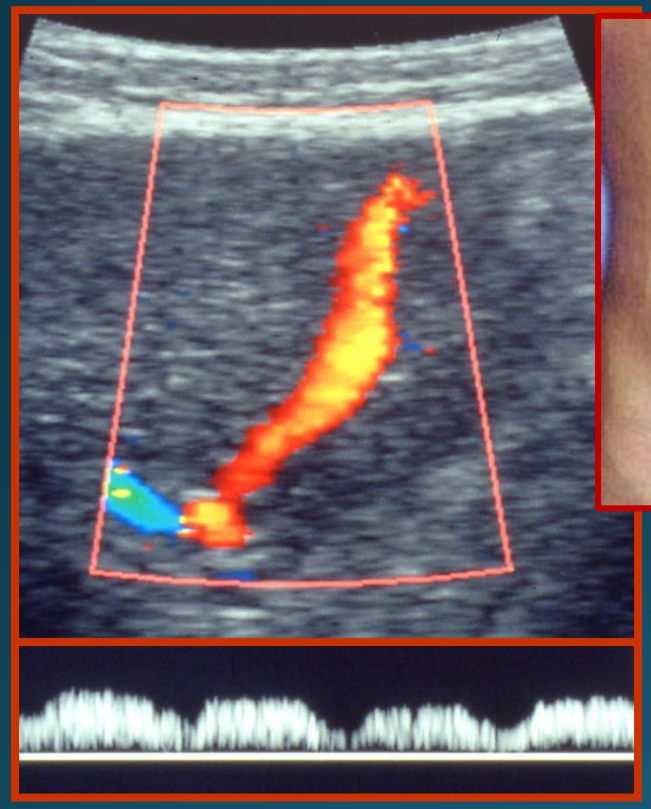
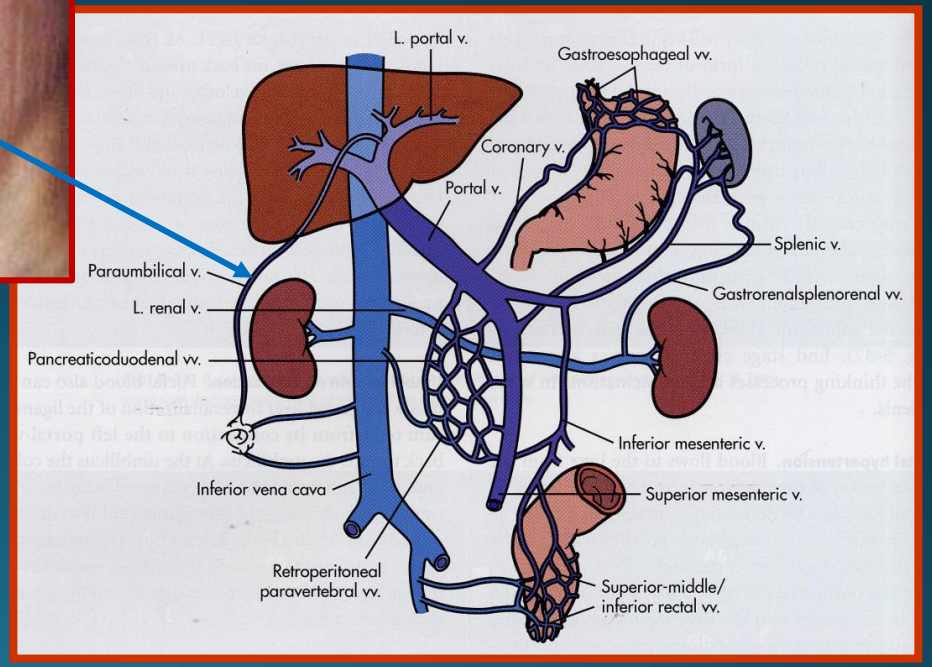
Portal Hypertension





Paraumbilical Vein

Confirmation of Portal Hypertension

- Hepatofugal portal venous flow; No respiratory variation noted in portal vein
- Portal vein diameter > 13 mm at level of the inferior vena cava
- Cavernous transformation of portal vein
- Collateral veins imaged in the region of gallbladder, splenic hilum, umbilicus
- Paraumbilical vein imaged; apparent coronary vein
- Enlarged caudate lobe, > 8 cm in length

Summary

- The liver can be thought of as an amazing maze
- If we think of portal hypertension as the puzzle, then the collateral veins that divert blood away from the liver provide the clues that we must follow to find the solution
- Finding our way through this maze and solving the puzzle, provides a valuable noninvasive, cost-effective diagnostic tool for patients with portal hypertension and helps to define the therapeutic options