Abnormal Liver Doppler Cases

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I have nothing to disclose

The Challenges of Hepatic Duplex

- Vessels are at different levels in the body
  - HV is shallow, Splenic Vein is deep
- Need to Doppler both arteries and veins in a study
- Need to Doppler vessels with different velocities
  - MPV and HA
- Vessels move with respiration
- Sonographer needs to constantly adjust the Doppler controls during the study
  - One "setting fits all" does not work

Hepatic Circulation

- Dual blood supply
  - Hepatic artery
    - Supplies > 50% of oxygenated blood
    - 20-30% of supply
  - Portal vein
    - Supplies poorly oxygenated but nutrient-rich blood
    - 70-80% of supply
- Two systems mix blood in the sinusoids

Portal Vein

- Separate system from systemic circulation
- Formed by the superior mesenteric and splenic veins
- Right side
  - Right portal
- Left side
  - Left portal
- Caudate lobe
- Both left and right portal branches

Portal Vein

- Portal vein
  - Hepatopetal flow
  - Flow into liver
  - Branches course within hepatic segments
  - Doppler signal
  - Continuous flow
Watch Your Color Velocity Scale

Why is there no flow in the portal vein?

1. Portal vein thrombosis
2. Color gain too low
3. Color velocity scale too high
4. Wall filter too high

Color velocity scale too high

At 53 cm/sec to eliminate aliasing in hepatic artery
Knocked out flow in portal vein

Normal or Abnormal

Is there a clue?
The secondary findings point you to the primary diagnosis

- Notice the color aliasing
- What would cause the flow to "speed up"?

Color Aliasing Pointed to Clot

Why is there a color signal in the gallbladder

- Color Doppler gain is too high
- Biliary fluid is moving
- Some type of artifact
- A fistula between the gallbladder and hepatic artery

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Portal Hypertension

- Increase in pressure gradient between portal vein and hepatic veins or IVC
- Impedance of blood flow through liver
- Main causes:
  - Alcoholic cirrhosis
  - Western countries

Causes of Portal Hypertension

- Prehepatic
  - Portal vein thrombosis
  - Mass compression
- Intrahepatic
  - Premsusoidal
    - Schistosomiasis
    - ETOH
  - Sinusoidal
  - ETOH
- Posthepatic
  - Aorto-Portal
  - Right sided heart failure
  - Constrictive pericarditis
Ultrasound Findings

- Hepatofugal flow
- Decreased flow in splenic vein
- Splenomegaly
- Recanalized umbilical vein
  - Arises from left portal vein
- Abdominal collaterals
  - Coronary
  - Gastroesophageal
  - Opening of embryonic channels

Portal Hypertension

Hepatofugal Flow

- Artery and Vein in different directions

Complications

- Reversed flow in splenic vein
- Recanalized umbilical vein
- Collaterals

Reversed Flow in Splenic Vein

Evaluate the part closest to the spleen

Recanalized Umbilical Vein

- Remnant of the umbilical vein
- Aids in flow away from the liver (hepatofugal)
- Reaction to portal hypertension
Recanalized Umbilical Vein

Gastroesophageal variceal hemorrhage most serious and lethal complication
- 30 - 60% mortality rate with each episode
- 70% chance of bleeding again
- 30% chance of death

Complications

Spleno-Renal Shunt

Reversed Flow in Portal Vein

Or is it???
- Watch course of vessel as related to how you are holding the transducer

What's your Diagnosis?
- Normal flow in the splenic vein
- Reversed flow in the splenic vein
- Collateral flow
Collateral flow

- This vessel is superior to the pancreas
- The portal confluence is seen posterior to this vessel

Is this a normal portal vein?

Portal Vein Thrombosis

- Hepatic artery is enlarged
- Hypertrophies due to volume overload

Sonogram ordered for RUQ discomfort

- PSA off of Aorta
- Portal Vein Aneursym
- Hepatic Artery Aneursym
- Choledochal cyst

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Aneurysm of common hepatic artery

4th most common site of intra-abdominal aneurysm
- Inferior vena cava
- IVC
- Splenic

40% rupture into peritoneum

Hepatocellular Carcinoma (HCC)

- 90% of primary liver cancers
- Develops in hepatocytes
  - Hepatoma
  - Cirrhosis underlying cause
  - 80% of cases in North America

Sonographic signs

- Focal
- Multi-nodular
- Diffuse
  - Hyper
  - Hypo
  - Iso
  - Mixed Echogenicity

- Ascites

What do you think will be the flow in the Portal Vein?

HCC Invading Portal Vein
Portal Vein Tumor Thrombus

Portal Vein Thrombosis

Causes
- Hypercoagulable states
- Intraperitoneal inflammation
- Pancreatitis
- Appendicitis
- Cirrhosis
- alcoholic most common
- Sibary
Sonographic Signs of Portal Vein Thrombosis

Acute stage
- Enlarged vein filled with echoes
- Lack of flow by color or power Doppler
- Remember, use low scale & filter settings

Chronic stage
- Hepatic Artery enlarges
- Look for two vessels in color Doppler
- If only one seen, Doppler vessel to determine which one

Portal Vein Thrombosis
Total occlusion

Hepatic Artery

Splenic Vein Thrombosis

Hepatic Vein Thrombosis
- Non-visualization of one or more hepatic veins
- Check hepatic vein drain into IVC
- Enlarged caudate lobe
  - Volume overload
- Portal vein flow sluggish or reversed (hepatopetal)
  - Due to outflow obstruction

What’s going on here?
Causes

- Hypercoagulable states
- Compression by tumors or masses

Conclusion

- Diagnose a variety of vascular disease in the liver
- Can be technically challenging
- Look at all those secondary signs before coming to a conclusion

Thank you

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