Cirrhosis and Portal Hypertension

Gastroenterology Teaching Project
American Gastroenterological Association
What is Cirrhosis?
Cirrhosis

- End stage of any chronic liver disease
- Characterized histologically by regenerative nodules surrounded by fibrous tissue
- Clinically there are two types of cirrhosis:
  - Compensated
  - Decompensated
Cirrhosis vs Normal Liver

- **Cirrhosis**
  - Irregular surface
  - Nodules

- **Normal**
Normal

Cirrhosis

Nodules surrounded by fibrous tissue
What is the Natural History of Cirrhosis?
Natural History of Chronic Liver Disease

Development of complications:
- Variceal hemorrhage
- Ascites
- Encephalopathy
- Jaundice

Chronic liver disease → Compensated cirrhosis → Decompensated cirrhosis → Death
Development of Complications in Compensated Cirrhosis

- Ascites
- Jaundice
- Encephalopathy
- GI hemorrhage

Probability of developing event vs. months.

Gines et al., Hepatology 1987; 7:122
Decompensation Shortens Survival

Gines et. al., Hepatology 1987;7:122
Complications of Cirrhosis Result from Portal Hypertension or Liver Insufficiency

- Portal hypertension
  - Variceal hemorrhage
  - Ascites
    - Spontaneous bacterial peritonitis
    - Hepatorenal syndrome
- Liver insufficiency
  - Encephalopathy
  - Jaundice

Cirrhosis
Most complications of cirrhosis result from portal hypertension.

What mechanisms lead to portal hypertension?
Cirrhosis - Diagnosis

- Cirrhosis is a histological diagnosis.
- However, in patients with chronic liver disease, the presence of various clinical features suggests cirrhosis.
- The presence of these clinical features can be followed by non-invasive testing, prior to liver biopsy.
In Whom Should We Suspect Cirrhosis?

- Any patient with chronic liver disease
  - Chronic abnormal aminotransferases and/or alkaline phosphatase

- Physical exam findings
  - Stigmata of chronic liver disease (muscle wasting, vascular spiders, palmar erythema)
  - Palpable left lobe of the liver
  - Small liver span
  - Splenomegaly
  - Signs of decompensation (jaundice, ascites, asterixis)
In Whom Should We Suspect Cirrhosis?

Laboratory

- Liver insufficiency
  - Low albumin (< 3.8 g/dL)
  - Prolonged prothrombin time (INR > 1.3)
  - High bilirubin (> 1.5 mg/dL)

- Portal hypertension
  - Low platelet count (< 175 x1000/µl)

- AST / ALT ratio > 1
In Cirrhosis:

Increased intrahepatic resistance is the initial mechanism leading to portal hypertension
In Whom Should We Suspect Cirrhosis?

Imaging studies

- Liver-spleen scan
  - Small liver, irregular uptake
  - Splenomegaly
  - Colloid shift to bone marrow

- CAT scan / Ultrasound
  - Nodular liver
  - Splenomegaly
  - Venous collaterals
Liver-Spleen Scan

**Normal**

**Cirrhosis**

- Small liver, irregular uptake
- Splenomegaly
- Colloid shift to bone marrow and ribs

DIAGNOSIS OF CIRRHOSIS - LIVER-SPLEEN SCAN
CAT Scan in Cirrhosis

- Liver with an irregular surface
- Collaterals
- Splenomegaly
Confirmatory Liver Biopsy Is Not Always Necessary in Cirrhosis

- Liver biopsy is **not** necessary in the presence of any of the following:
  - Decompensated cirrhosis (*variceal hemorrhage, ascites, encephalopathy*)
  - Liver-spleen and/or CAT scan diagnostic of cirrhosis

- Liver biopsy is **not** necessary for pre-transplant evaluation
NORMAL VASCULAR ANATOMY OF THE LIVER

- Hepatic vein
- Sinusoid
- Portal vein
- Inferior vena cava
- Superior mesenteric vein
- Hepatic artery
- Splenic vein
- Inferior mesenteric vein
- Coronary vein

Liver
The normal liver offers almost no resistance to flow.
ARCHITECTURAL LIVER DISRUPTION IS THE MAIN MECHANISM THAT LEADS TO AN INCREASED INTRAHEPATIC RESISTANCE.
Cirrhosis is the most common cause of portal hypertension.

The site of increased resistance in cirrhosis is sinusoidal.

Other causes of portal hypertension are classified according to the site of increased resistance.
## Portal Hypertension Is Classified According to the Site of Increased Resistance

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
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<tbody>
<tr>
<td>Pre-hepatic</td>
<td>Portal or splenic vein thrombosis</td>
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<tr>
<td>Pre-sinusoidal</td>
<td>Schistosomiasis</td>
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<tr>
<td>Sinusoidal</td>
<td>Cirrhosis</td>
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<tr>
<td>Post-sinusoidal</td>
<td>Veno-occlusive disease</td>
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<tr>
<td>Post-hepatic</td>
<td>Budd-Chiari syndrome</td>
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</table>
Pre-Hepatic Portal Hypertension

Hepatic vein

Sinusoid

Thrombus

Portal vein

Liver

Portosystemic collaterals

Splenomegaly
Sinusoidal Portal Hypertension

Cirrhotic liver

Portal vein

Portal systemic collaterals

Splenomegaly
Post-Sinusoidal Portal Hypertension

- Sinusoid
- Centrilobular fibrosis
- Portal vein
- Liver
- Portosystemic collaterals
- Splenomegaly
Post-hepatic Portal Hypertension

- Thrombus
- Portal vein
- Liver
- Sinusoid
- Splenic vein
- Portal vein