

# What is Liver Disease?

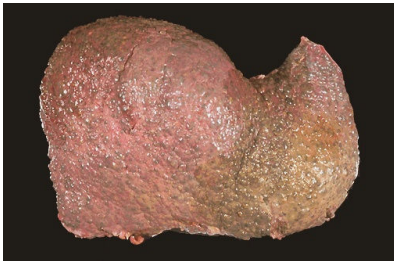
## Liver Function

It is estimated that the liver performs over 500 different functions. Among other things, the liver:

### NORMAL HUMAN LIVER



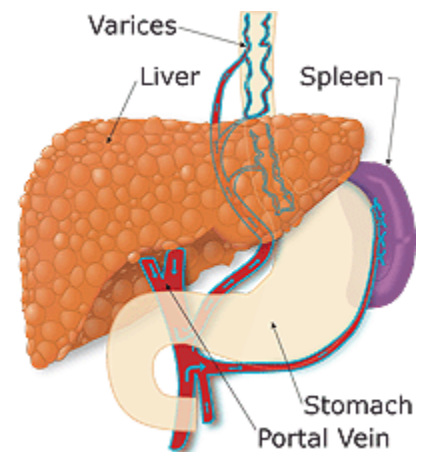
### END-STAGE CIRRHOSIS



- Processes blood containing digested food brought to the liver from the stomach & intestines by the portal vein
- Manufactures bile needed for the digestion of fat
- Helps with the breaking down of carbohydrates, proteins and fats in digestion
- Detoxifies and excretes substances that would otherwise be poisonous
- Regulates blood sugar
- Regulates cholesterol
- Stores certain vitamins, minerals and sugars
- Manufactures new body proteins
- Regulates the transport of fat stores
- Regulates blood clotting
- Monitors and maintains the proper level of many chemicals and drugs in the blood
- Cleanses the blood and discharges waste products into bile
- Maintains hormone balance
- Produces immune factors
- Removes bacteria from the bloodstream

## Liver Disease

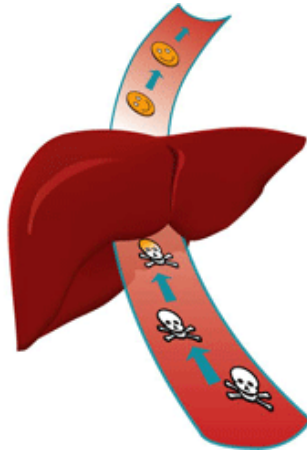
Chronic Liver Disease causes inflammation and scarring in the liver called fibrosis. When the whole liver is scarred and function is impaired, it is called cirrhosis. This is called cirrhosis. The portal vein normally brings nutrient-rich blood to the liver from the stomach and intestines. Because the liver's consistency becomes progressively altered in fibrosis and cirrhosis, blood cannot flow through it easily and pressure builds up in the portal vein. This build up of pressure is called portal hypertension. In response, portal blood is shunted through and around the liver. It bypasses the liver via a collateral circulation that forms in response to the backpressure. In particular, collateral veins called varices form in the esophagus and can become enlarged and rupture. Other clinical manifestations of the altered portal circulation are ascites (fluid in the abdomen), encephalopathy (confusion), and jaundice (yellowing of the eyes and skin). Multiple liver functions become impaired. The key change leading to clinical complications is alteration of the portal circulation.



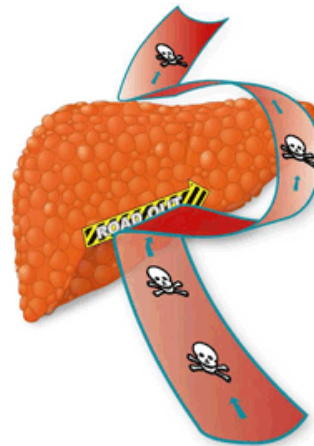
## Compensated & Decompensated Liver Disease

The liver is the only organ of the body that can repair and re-grow itself after damage, Further; it can operate with significant disease for years and not produce any outward symptoms. This is called compensation. The presence of outward symptoms indicates decompensation, In decompensation, the liver is no longer able to make up for the damage caused by disease. Too often the liver disease diagnosis is missed in the compensated stage. An accurate assessment of impairment of function in both compensated and decompensated states would lead to early detection of disease progression and worsening stage of disease, and potentially more effective treatment for a larger number of patients.

### COMPENSATED DISEASE

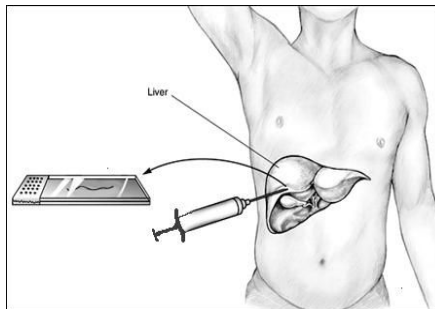


### DECOMPENSATION



# Current Diagnostic Standards

## LIVER BIOPSY



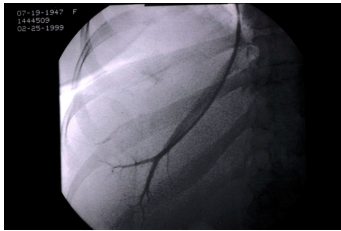
### Liver Biopsy

At present, the most widely accepted method of gauging degree of fibrosis or cirrhosis is by liver biopsy. Liver biopsy is invasive, sometimes painful, and involves:

- Fasting for six hours before the procedure
- Having an IV line placed
- Receiving pain and sedative medications
- Receiving a local anesthetic injection
- Receiving a tiny incision at the biopsy needle site
- Insertion of a biopsy needle into the liver at several locations to retrieve samples
- Remaining in the hospital for a two hour observation
- Remaining inactive for the balance of the day
- Restricted activities for five to seven days

Liver biopsy is not without risk. Approximately 1 to 3 percent of patients require hospitalization after a liver biopsy. About 25 percent of patients experience discomfort at the biopsy site lasting less than 24 hours. Low blood pressure immediately after a liver biopsy occurs in about 10 to 20 percent of patients. Significant bleeding after a liver biopsy occurs in approximately 0.3 to 1.0 percent of biopsies. The biopsy needle may pierce organs that are adjacent to the liver. These include the lungs, kidney, small intestine, and gallbladder. Finally and importantly, the results of liver biopsy can be indeterminate for severity of disease due to sampling error.

## HVPG



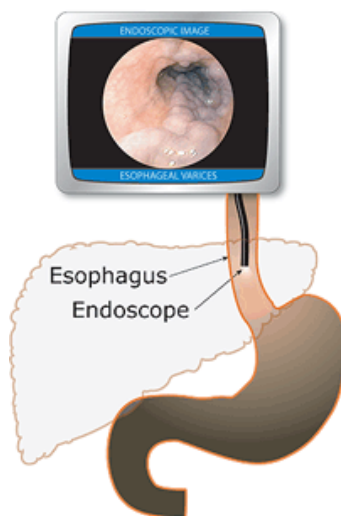
### Hepatic Venous Pressure Gradient (HVPG)

Portal hypertension, or abnormally high portal venous pressure, is associated with chronic liver disease. At present, portal hypertension is routinely measured by a procedure called Hepatic Venous Pressure Gradient (HVPG). In HVPG, the jugular vein is accessed through a puncture in the patient's neck. A probe is guided via the jugular vein, through the heart, to the liver where portal venous pressure measurements are taken and compared against a norm.

While effective in measuring portal hypertension and assessing risk of varices, HVPG has drawbacks:

- It is invasive and carries risk
- It requires expensive specialized technical support
- It requires expensive specialized equipment
- It is performed in the hospital radiology department
- The patient loses of a full day of work
- It only yields pressure; it does not measure shunt

### ENDOSCOPIC VIEW OF VARICES



### Other Alternative Testing

#### Standard laboratory tests (liver panel)

Standard blood tests measure levels of certain enzymes that if elevated, could indicate damaged liver cells. While labeled "liver function tests", these tests do not measure liver function. They are a marker of the integrity of liver cells. Other blood tests check the ability of the liver to manufacture vital proteins. In each case, standard laboratory tests lack sensitivity and specificity.

#### Ultrasonography – Ultrasound of the spleen

The spleen can become enlarged in advanced liver disease. In cirrhosis, high pressure in the portal vein backs up into the spleen, which becomes enlarged and destroys more platelets than usual. The spleen can be imaged using ultrasound; however, other conditions can affect spleen size.

#### Endoscopy

Varices are extremely dilated veins in the esophagus which can hemorrhage. Endoscopic viewing of the esophagus is performed when varices are suspected; however, the inaccuracy of current screening tests often misdirects management.