

Cirrhosis - A Simplified Outline



What is Cirrhosis?

Cirrhosis is a chronic disease of the liver which has many causes, and may eventually lead to liver failure and oesophageal varices. A chronic disease is one which begins insidiously and usually progresses very slowly, usually over a period of many years. By contrast, an acute disease starts suddenly and progresses quickly, usually over a few days or even hours. Appendicitis and pneumonia are examples of acute diseases. The liver may also have acute diseases: for example some viruses can cause acute viral hepatitis.

What are the Causes of Cirrhosis?

Many diseases can lead to cirrhosis. The most common is alcoholic liver disease, but some hepatitis viruses lead to cirrhosis, as do some autoimmune diseases. The common feature is that the liver cells are damaged and destroyed a few at a time, but repeatedly, and over a long time period, rather than in acute liver disease where all the millions of liver cells are damaged or destroyed at the same time. Wilson's disease and the iron storage disorder (haemochromatosis) are rare causes of cirrhosis.

What happens in the Liver in Cirrhosis?

There are four main changes in cirrhosis, which occur in the following sequence:-

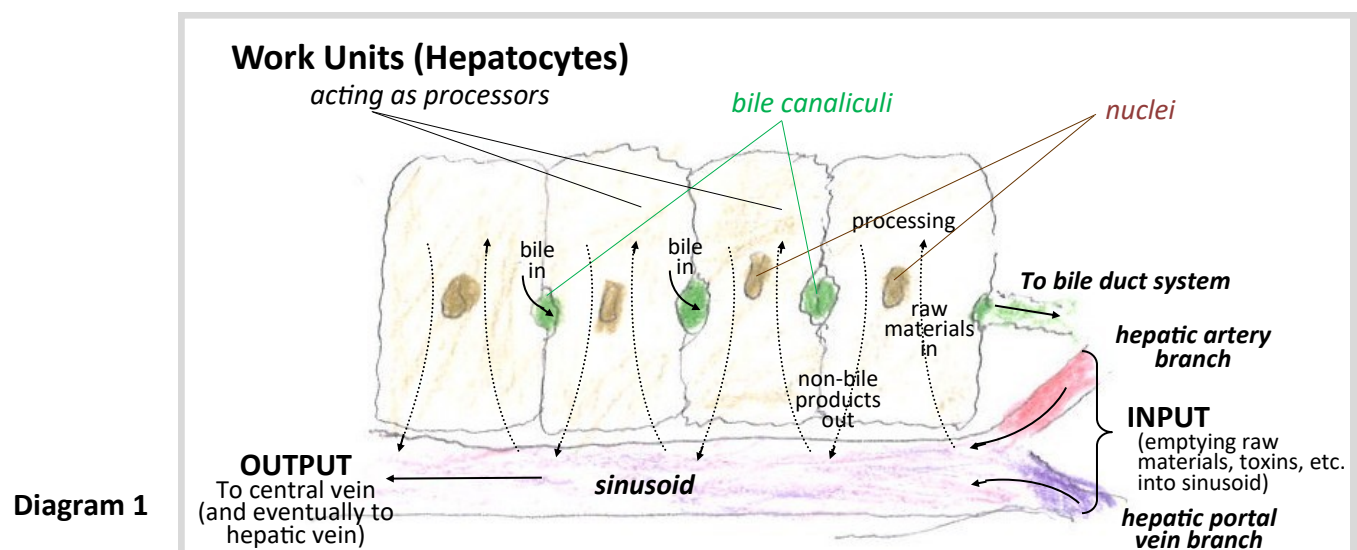
- groups of liver cells (hepatocytes) are killed by the causative disease
- scars form in the space formerly occupied by the dead liver cells
- the scars can disrupt the architecture of the liver, interfering with the input and output systems
- the surviving liver cells in the region multiply to try to compensate for the liver cells which have been killed. These form so-called "regeneration nodules."

Why do These Changes Interfere with the Function of the Liver

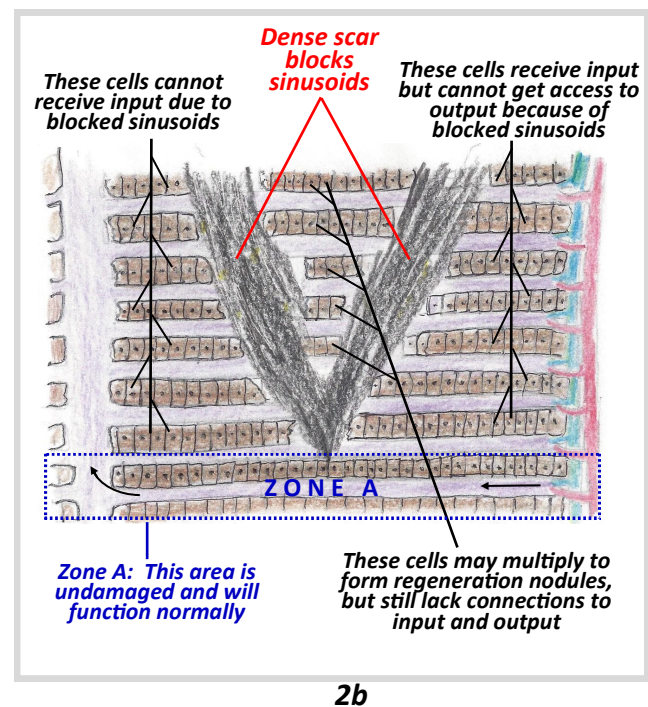
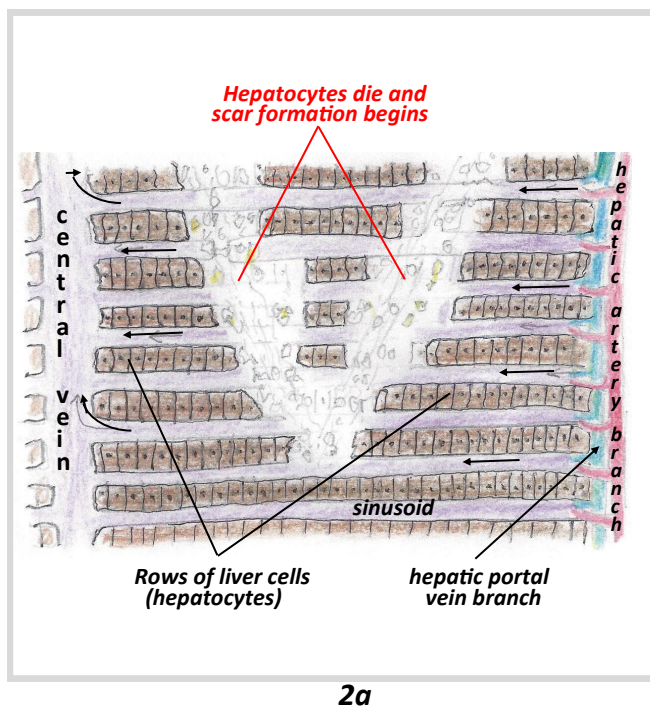
In the 2014 edition of the Newsletter, I illustrated (on *pp 8 & 9*) how the functions of the liver as a sort of chemical factory depended on the perfect interrelationship between:-

- the **input system**, bringing raw materials (via the hepatic artery and hepatic portal vein) to the liver to be worked on by
- the **work units (the liver cells, called hepatocytes)** which carry out the chemical processes and then pass the products into
- the **output system** which carries the products (via the central and hepatic veins) into the blood circulation to be transported to the parts of the body where they are needed.

Diagram 1, which also appeared in my previous article about the normal liver, shows in greatly simplified form how this system works normally.



Diagrams 2a and 2b show (also in simplified form) what happens in cirrhosis. In **Diagram 2a** two groups of liver cells have been destroyed by disease, and thin scars are beginning to form at the sites of the dead liver cells.



In **Diagram 2b** the scar is fully established and is interfering with the input and output systems. In this tiny area of the liver therefore, there are some hepatocytes which are receiving raw materials and processing them but cannot pass the products into the output system, and there are other hepatocytes which have access to the output system but are cut off from the input system and therefore cannot receive the raw materials to work on. The effects on liver function on a single episode at one site in the liver like this is, of course, minimal, but over the years it occurs in many thousands of places in the liver, and eventually the normal liver functions outlined in my last article will become impaired.

The impairment of liver function is the result of a combination of great reduction in functioning hepatocytes, and the distortion of the input and output systems by the extensive scarring. Reduction of the numbers of hepatocytes means that there are fewer to carry out the vital chemical functions of synthesis and detoxification (see my 2014 article), and the obstructions to input and output flow has a number of consequences (see below.)

What problems arise because scarring affects the input and output systems?

There are three main problems:-

- The flow of raw materials in and synthesised products out is impaired, reducing the efficiency of the hepatocytes;
- The physical obstruction to the outflow of bile from the liver to the bile duct system means that the bile gets stuck in the liver, and some can pass into the blood stream to cause **jaundice**;
- The obstruction to flow of the branches of the hepatic portal vein within the liver leads to a great increase in the blood pressure in the hepatic portal vein, and this leads to the formation of **oesophageal varices**, (see separate article).

Why don't the new hepatocytes in the regeneration nodules take over the functions of the dead hepatocytes?

They do to an extent. However, the problem is that the cells in the regeneration nodules may not have proper connections to the input and output systems, and therefore not all of them can work efficiently, if at all.

The loss of output from the remaining hepatocytes leads to severe metabolic upset in the rest of the body, the features of biochemical liver failure.

Dr A Stevens
(Retired Consultant Pathologist and Medical Author)