FIBROSCAN

How can Fibroscan assess the severity of Liver Disease?

What you should know about Liver Elastography (Fibroscan)

Kaiser Raja MD, DM
Consultant in Liver Diseases
King's College Hospital London, Dubai, UAE

What is a Fibroscan

A Fibroscan is a type of scan that measures the 'stiffness' of your liver, which in turn reflects the degree of scarring (fibrosis) in your liver. It is a simple, painless test which gives immediate results. It does not have any potential complications or risks and is non-invasive, which means that it does not break the skin or enter your body.

What preparation is needed for the Fibroscan and what happens during the scan?

It is recommended not to eat or drink anything for three hours before the Fibroscan. If needed, you can have small sips of water or clear fluid. You will be asked to lie flat on your back on an examination couch and to place your right arm behind your head. The examiner will feel the area overlying the liver on the right side of the chest and abdomen to find the right place to perform the scan. A water-based gel will be applied to your skin and a probe will be placed with minimal pressure. The examiner will take a minimum of 10 readings. You will feel a slight vibration against the skin each time a reading is taken. This will not hurt you. The scan takes about 5 to 10 minutes to perform. The results of the scan are available immediately after the procedure. You can go straight home after your scan and can resume work.

What is Liver fibrosis?

Many chronic liver diseases such as fatty liver, hepatitis B, hepatitis C, or excessive alcohol use can cause persistent inflammation of the liver and lead to progressive liver damage. Over a period or time, healthy liver tissue is replaced by scars. Scarring of the liver is known as liver fibrosis. Liver fibrosis results in diminished blood flow through the liver. As healthy liver tissue is lost, the liver loses its ability to function. When liver fibrosis progresses to an advanced stage it is known as liver cirrhosis.

How does Fibroscan measure liver stiffness?

Fibroscan uses ultrasound waves using a technique called transient elastography. Liver stiffness is evaluated by measuring the speed of a vibration wave as it travels through the liver. The speed of the vibration wave is slower in a soft (normal) liver and faster in a firm or hard (fibrotic) liver. Liver stiffness is eventually expressed in kPa (kilopascals). The stiffer the liver, higher is the kPa value. The normal stiffness is between 2 and 6 kPa. Values above 8 kPa generally indicate presence of liver fibrosis. The highest possible result is 75 kPa. Liver fibrosis progress through four stages and with each stage the liver becomes more fibrotic.

Liver fibrosis has 4 stages:

- F0 means no fibrosis (less than 6.5 kPa)
- F1 is mild fibrosis (less than 8 kPa)
- F2 is moderate fibrosis (8 – 10 kPa)
- F3 is severe fibrosis (10 – 14 kPa)
- F4 is advanced fibrosis or cirrhosis (more than 14 kPa)

The correlation between the kPa values and degree of liver fibrosis also depends to some extent on the cause of liver disease. Therefore, to estimate liver fibrosis, the liver stiffness values should be interpreted in the context of the cause of liver disease. For example, patients with alcohol induced liver disease develop liver cirrhosis at higher kPa values (above 20 kPa). The liver stiffness value is only an estimate of liver fibrosis

and changes in liver stiffness values over a short period should be interpreted with caution.

Can Fibroscan estimate liver fat content?

Fibroscan is also used to estimate liver fat content semi-quantitatively. Liver fat content is assessed by CAP score. The CAP score is measured in decibels per meter (dB/m). It ranges from 100 to 400 dB/m.

CAP Score	Steatosis Grade	Amount of Liver with Fatty Change
238 to 260 dB/m	S1	11% to 33%
260 to 290 dB/m	S2	34% to 66%
Higher than 290 dB/m	S3	67% or more

Why is it important to know if there is liver fibrosis?

Liver fibrosis does not cause any symptoms and routine blood tests and ultrasound scan cannot detect liver fibrosis. It is important to detect liver fibrosis at an early stage so that its progression can be prevented. If untreated, liver fibrosis may progress to cirrhosis of the liver, liver failure, and liver cancer.

Which diseases cause liver fibrosis and cirrhosis?

The three most common diseases that cause chronic liver disease, liver fibrosis and cirrhosis are alcoholic liver disease, chronic viral hepatitis (hepatitis B and C), and non-alcoholic fatty liver disease that is usually associated with diabetes and obesity. Other diseases such as autoimmune hepatitis, and excess of iron in the body known as hemochromatosis can also cause chronic liver damage. There are several other rarer causes of chronic liver disease that can cause cirrhosis

What happens when liver fibrosis progresses to cirrhosis?

Liver fibrosis progress to cirrhosis over several years. Non-alcoholic fatty liver progresses to cirrhosis very slowly over 30 - 40 years. On the other hand, liver cirrhosis can develop quite rapidly within 10-15 years in individuals who drink excess alcohol. Once liver cirrhosis develops, it is irreversible, and patients have a risk of developing liver failure and liver cancer. The only treatment for advanced liver cirrhosis is a liver transplant.

When is a liver biopsy needed?

Traditionally, when liver disease is suspected, a liver biopsy is needed for further investigation. A liver biopsy is done by inserting a needle into your liver through the skin and body wall. It allows to remove a small piece of liver tissue that can then be examined under a microscope. A liver biopsy is an important test to confirm the exact cause of liver disease. It also helps determine the severity of inflammation and degree of damage to the liver. It is the most accurate test to determine liver fibrosis. However, if the cause of liver disease and presence of liver fibrosis can be determined by other tests, then biopsy is not always needed.

What are the disadvantages of a liver biopsy?

A liver biopsy is an invasive procedure, requires day-care hospital admission and is expensive. There are certain risks, like pain, infection, bleeding, and rarely more serious complications. It is also not possible to do liver biopsies in everyone suffering from fatty liver since the number of people having this disease is huge.

How is Fibroscan different from a traditional liver biopsy?

Like other ultrasound exams, Fibroscan is painless, easy, and takes only a few minutes to complete. It is non-invasive, and it does not have any of the risks as a traditional liver biopsy. A Fibroscan does not require any special preparation. After a Fibroscan, you will be back on your feet in minutes with no recovery time or special instructions.

Can Fibroscan replace a Liver Biopsy?

Fibroscan is a rough measure of the liver stiffness that indirectly correlates with liver fibrosis.

Fibroscan cannot determine the cause of liver disease. Liver biopsy is the only test that can accurately determine the degree of liver damage and the cause of liver disease. Fibroscan is however, a very good screening test to select patients who may have advanced liver disease and need further investigations.

How is Fibroscan useful in non-alcoholic fatty liver disease?

The accumulation of excess fat in the liver cells may lead to inflammation that eventually damages the liver and causes liver fibrosis. Not all patients with fatty liver will develop liver fibrosis. However, those patients who do develop liver fibrosis are at high risk of progression to liver cirrhosis. Fibroscan can be used for early detection of fibrosis and monitoring the progression of fatty liver disease. Patient with fatty liver and fibrosis need specific treatment.

How is Fibroscan useful in alcoholic liver disease?

Excess alcohol can damage the liver and lead to liver fibrosis and cirrhosis. However, not all individuals who drink excessive alcohol will develop significant liver disease. Early liver fibrosis and even cirrhosis do not cause any symptoms and therefore can be missed. Fibroscan helps in diagnosing liver fibrosis and if individuals can stop alcohol use at early stages of liver fibrosis, further liver damage can be prevented. In those who continue to consume excessive alcohol, Fibroscan can help in determining if liver fibrosis is developing.

How is Fibroscan useful in chronic viral hepatitis?

There are two common viruses (hepatitis B, hepatitis C) that infect the liver. These viral infections are chronic infections and last for decades. Over a period of several years, the liver gets damaged and liver fibrosis occurs that progresses to liver cirrhosis. Patients have no symptoms, and these infections are usually incidentally detected (visa medical, blood donation, pregnancy screening, routine health check). It is important to know the stage of liver fibrosis since this determines need for treatment and long-term risk of complications including risk of development of liver cancer.

How is Fibroscan useful in individuals with liver test abnormalities of unknown cause?

Many individuals have mild abnormalities of liver tests, the exact reason for which is not known. Fibroscan helps in assessing whether there is presence of liver fibrosis which will determine the need for further testing. Individuals who have mildly abnormal liver tests, but persistently normal Fibroscan values have an extremely low risk of progressive liver disease.

Can Fibroscan be used to assess response to treatment?

Fibroscan is an excellent non-invasive test to determine if liver disease is remaining stable or showing reversal of fibrosis after specific treatment is given. For example, after weight loss, fibrosis can reverse in individuals with fatty liver. Treatment of hepatitis B and C may also lead to reversal of liver fibrosis. Advanced liver fibrosis and cirrhosis, however, do not reverse with treatment. However, these can be stabilized, and further progression delayed or prevented.

How to interpret minor variations in Fibroscan values?

The liver stiffness value is only an estimate of liver fibrosis and changes in liver stiffness values over a short period should be interpreted with caution. The liver stiffness values can vary when the test is repeated on a different day. Minor changes in values should not be interpreted as improvement or worsening of liver fibrosis. The operator usually takes a minimum of 10 readings and the machine calculates an average value.

What are the limitations of a Fibroscan?

Fibroscan is accurate in 90% of individuals. It may be difficult to get accurate measurements in excessively obese individuals. Fibroscan is also not accurate when there is severe ongoing inflammation of the liver. Liver inflammation can lead to falsely high liver stiffness values. Liver inflammation is reflected by high liver enzyme (ALT and AST) values. When liver enzyme values are quite high (more than 150-200 units), the accuracy of Fibroscan reduces.

Are there other forms of accurate non-invasive tests that can assess severity of fibrosis in fatty liver disease?

MRI based liver elastography is a non-invasive test that can estimate liver fat as well as determine the exact stage of liver fibrosis. This is much more accurate than Fibroscan. However, this is not widely available, is expensive, requires an MRI machine with special features and cannot be performed in the clinic setting.