Liver health monitoring tests

What is the purpose of liver health monitoring tests?

Liver health monitoring tests measure:

- how much the hepatitis C virus is damaging the liver
- how quickly the damage is happening
- whether the liver is functioning differently

There are many different tests that are used to measure liver damage.

Why is liver health monitoring important?

Monitoring the liver is important because the hepatitis C virus causes inflammation and scarring of the liver cells. Fibrosis is the medical term for this injury. Over time it can cause so much damage that the liver stops working properly.

Regular liver health monitoring helps to determine whether someone is at risk of developing more serious liver problems, such as severe liver injury (cirrhosis), liver failure or liver cancer. If a person develops cirrhosis, even if they have been cured of hepatitis C, they need to have their liver monitored for liver cancer regularly.

Knowing the degree of liver injury can also help people make decisions with their doctor or nurse about treatment.

In order to get hepatitis C treatment paid for by government programs or private health insurance, people may need to have a certain level of fibrosis. The results from these tests will be sent in as part of the application for treatment coverage.

What are the different stages of fibrosis?

When fibrosis, or liver injury, is measured through different tests, the results are compared to scales that define the injury based on the extent of scarring in the liver.

Across Canada, the METAVIR scale is most commonly used to describe liver injury for people with hepatitis C.

Stages of liver damage - METAVIR Scale

<table>
<thead>
<tr>
<th>Fibrosis stage</th>
<th>What it means</th>
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<tbody>
<tr>
<td>F0</td>
<td>The liver has no injury or scarring.</td>
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<tr>
<td>F1</td>
<td>The liver has started to become injured and there is minimal scarring.</td>
</tr>
<tr>
<td>F2</td>
<td>The liver is moderately injured and scarring occurs in more parts of the liver.</td>
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</table>
The liver is significantly injured and the many scarred areas begin to join together. The functioning of the liver may be affected.

F4

The liver is severely injured with large, extensive scars. This stage is also called cirrhosis. The liver may still work or it may stop working.

Other scales that may be used include the Knodell HAI and the Ishak or Modified HAI.

**What tests are used to measure liver health?**

Liver health can be measured in many different ways, including:

**Using sound waves:**
- Transient elastography (Fibroscan)
- Ultrasound

**Using blood tests:**
- AST to Platelet Ratio Index (APRI)
- Fibrosis 4 (Fib-4)
- Fibrotest
- Liver function tests (INR, bilirubin, albumin)
- Liver enzyme tests

Removing a sliver of the liver and examining it:
- Biopsy

Which tests are used will depend on what is available in the region and what type of test results are required by treatment coverage programs or insurance companies.

**Transient elastography (Fibroscan)**

Transient elastography is an advanced form of ultrasound.

**The procedure** - The person lies on his or her back with the right arm raised behind the head. A probe is placed on top of the skin over the ribcage, which sends out a sound wave that travels through the liver and echoes back to the probe. A computer calculates the speed and strength of the echo to measure the elasticity or stiffness of the liver.

**Risks** - There are no risks associated with this technology.

**How to interpret results** - Fibroscan measures fibrosis using the elasticity or stiffness of the liver; the stiffer the liver is, the more severe the degree of fibrosis.

The liver stiffness result is measured in kilopascals (kPa).

The healthcare provider then uses a reference chart to identify the degree of fibrosis that corresponds to the result. The healthcare provider might also take into consideration results from other tests when identifying the corresponding fibrosis level on the reference chart.

Fibroscan is very effective at identifying the absence of fibrosis or the presence of severe fibrosis and cirrhosis but it
is not as accurate at identifying less severe stages of liver damage.

**Ultrasound**

For someone with hepatitis C, the purpose of an ultrasound is to:

- determine the liver’s shape and size
- rule out any causes of abnormal liver tests
- determine if there is any evidence of a cause other than hepatitis C
- see if there is any sign of advanced fibrosis or cirrhosis
- screen for liver (hepatocellular) cancer

**The procedure** - The person lies on his or her back with the right arm raised behind the head. A probe is placed on top of the skin over the ribcage, which sends out a sound wave that travels through the liver and echoes back to the probe.

A computer measures the speed and strength of the echo to create a picture of tissues and organs inside the body. The whole process takes a few minutes.

**Risks** - There are no risks associated with ultrasound.

**How to interpret results** - The healthcare provider reviews the ultrasound images for any liver issues. Ultrasound is often used to screen for liver cancer. If the healthcare provider thinks he or she sees a tumour in the picture created by the ultrasound, he or she will order an X-ray to investigate further.

An ultrasound does not measure fibrosis directly. The healthcare provider will use the ultrasound to measure the elasticity or stiffness of the liver and identify a corresponding level of fibrosis. Lower levels of fibrosis are often not visible on ultrasounds.

**AST to Platelet Ratio Index (APRI)**

The AST to Platelet Ratio Index is a measurement of liver injury based on two blood tests:

- Aspartate aminotransferase (AST) level
- Platelet count

**The procedure** - These tests require a blood sample to be taken by a healthcare provider, which he or she sends to a lab for analysis. The healthcare provider then calculates the test results using a formula to determine the level of liver fibrosis.

**Risks** - The main risks associated with blood tests are bruising and some pain around the needle’s entry point.

**How to interpret results** - The higher the test result, the higher degree of fibrosis a person has. The APRI score is not reliable enough to be used on its own but may be combined with other test results to confirm a liver injury level.

**Fibrosis 4 (Fib-4)**

The Fib-4 test is a measurement of liver injury based on age and three blood tests:

- ALT (alanine transaminase)
- AST (aspartate aminotransferase)
- platelet count

**The procedure** - These tests require a blood sample taken by a healthcare provider, which he or she sends to a lab for analysis. The healthcare provider then calculates the test results using a formula to determine the level of liver fibrosis.

**Risks** - The main risks associated with blood tests are bruising and some pain around the needle’s entry point.
How to interpret results
The healthcare provider will compare the test result with values that confirm cirrhosis or exclude fibrosis. This test is useful for confirming cirrhosis but should be used with other testing methods to determine mild or moderate levels of fibrosis.

FibroTest

The FibroTest measures liver injury level using age, gender and six blood tests:

- alanine transferase (ALT)
- alpha-2 macroglobulin
- apolipoprotein A1
- gamma-glutamyl transpeptidase (GGT)
- haptoglobin
- total bilirubin (TB)

The procedure - These tests require a blood sample to be taken by a healthcare provider, which he or she sends to a lab for analysis. The healthcare provider then sends the test results to a private lab and they calculate the fibrosis score.

Risks - The main risks associated with blood tests are bruising and some pain around the needle’s entry point.

How to interpret results - The FibroTest gives a value from 0.00 – 1.00 and this is converted into a fibrosis score.

Liver function tests

The more damage the liver sustains, the less able it is to complete its 500-plus functions. There is a battery of tests that healthcare providers can use to check how well the liver is working, including:

- prothrombin time or INR – prothrombin is a protein that is responsible for helping blood to clot
- bilirubin - this substance is produced when the liver breaks down old red blood cells; it is the cause of the yellow colour of jaundice
- albumin – a major blood protein, albumin is produced by the liver and is used in transporting some molecules through the body and maintaining fluid levels in the blood

The procedure - These tests require a blood sample taken by a healthcare provider, which he or she then sends to a lab for analysis.

Risks - The main risks associated with blood tests are bruising and some pain around the needle’s entry point.

How to interpret results - The healthcare provider will compare the person’s test scores with a normal range. When one or more scores are outside the normal range, this may indicate that the liver is not working as well as it should be and that something is damaging it. However, scores can be affected by many factors other than hepatitis C, including other viruses, diet, alcohol, medicines and other toxins. More testing may be needed to identify what is damaging the liver.

Liver enzyme tests

These tests measure levels of liver enzymes (such as ALT and AST) in the blood. Liver damage can lead to higher-than-normal levels of liver enzymes in the blood, so these tests can flag if something is damaging the liver and alert a healthcare provider to do more testing. The damage can be caused by any number of factors, including hepatitis viruses, diet, alcohol, medicines and other toxins. Other liver enzyme tests include ALP, LDH and GGT.

People taking treatment for hepatitis C may have liver enzyme tests to monitor how their body is responding to treatment.

Liver enzyme tests follow the same procedure, risks and interpretation of results as liver function tests (see above).
Biopsy

A liver biopsy measures the degree of scarring and the amount of inflammation. It was considered the gold standard for measuring the extent of liver damage because it looks directly at the scarring present in the liver. However, because biopsy has drawbacks, many healthcare providers are choosing to do less invasive tests.

The procedure – A small piece of the liver is removed with a needle. Before doing this, the healthcare provider numbs the skin and area under the skin around the needle’s entry point. The needle is only inserted into the body for a very short time (less than a second).

Biopsies are done as an outpatient procedure, meaning the person gets to go home the same day. In the case of liver biopsies, the person is usually sent home two to six hours after the procedure.

Risks – About half of the people who have a liver biopsy do not have any pain at all. The other half experience some pain around the needle’s entry point and in the right shoulder. Severe complications are very rare but they exist. Less than 1% of people who have a liver biopsy experience internal bleeding as a result.

More tests

There are other tests a healthcare provider might recommend in order to monitor what is going on in a person’s body. The list could include:

- complete blood count
- creatinine test
- alpha fetoprotein test
- thyroid test
- iron test
- lipid profile or total cholesterol
- ceruloplasmin
- ANA
- AMA
- glucose
- urinalysis
- pregnancy test
- HIV test
- Hep A antibody test
- Hep B antibody test
- Magnetic resonance imaging (MRI)

Information on any of these tests and others—including why and how they are administered and what the results mean—is available through Lab Tests Online’s Test Index. This index is published by the American Association for Clinical Chemistry.

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