CONDITION

Hepatorenal syndrome

Hepatorenal syndrome is kidney dysfunction caused by circulation changes in people with severe liver disease.

WHAT IT IS
Kidney dysfunction caused by advanced liver failure

BODY SYSTEM
Liver, kidneys and blood circulation

MAIN SYMPTOMS
Less urine, swelling, fatigue, confusion

WHAT CAUSES IT
Severe liver disease disrupting kidney blood flow

HOW IT IS DIAGNOSED
Blood and urine tests after excluding other kidney injury

MAIN TREATMENT
Circulation-supporting medicines, albumin and liver transplantation

CAN IT BE CURED?
Sometimes - liver transplantation can restore kidney function

IS IT AN EMERGENCY?
Yes - acute kidney injury needs hospital assessment

LONG-TERM OUTLOOK
Serious; recovery is likelier with effective liver treatment

Overview

Hepatorenal syndrome, often shortened to HRS, is a serious kidney complication of advanced liver disease. It most often develops in people who have cirrhosis and ascites. Cirrhosis means extensive liver scarring. Ascites is a build-up of fluid in the abdomen.

In advanced cirrhosis, blood vessels supplying the digestive organs become unusually wide. The body tries to maintain blood pressure by tightening other blood vessels and retaining salt and water. Over time, this can greatly reduce blood flow through the kidneys.

The kidneys may not be physically damaged at first. Instead, they stop working properly because they are receiving too little effective blood flow. Waste products then build up in the blood, and the body may have trouble controlling fluid and minerals.

HRS can develop quickly as acute kidney injury, called HRS-AKI. Less commonly, kidney function declines over a longer period. Either pattern reflects severe liver dysfunction and needs specialist care. Acute HRS is usually assessed and treated in hospital.

Symptoms

HRS does not always cause a distinct set of symptoms. Many changes can also come from cirrhosis, infection or another form of kidney injury.

Possible symptoms include:

A blood test may show worsening kidney function before you notice a major change in urine output. This is one reason regular blood tests matter when cirrhosis has become advanced.

Confusion in liver disease may be caused by hepatic encephalopathy. This happens when the failing liver cannot clear certain substances from the blood. Kidney dysfunction, infection, bleeding and dehydration can trigger or worsen it.

- Producing much less urine than usual
- Increasing swelling in the legs or abdomen
- Rapid weight gain caused by retained fluid
- Tiredness, weakness or reduced appetite
- Nausea
- Confusion, unusual sleepiness or difficulty concentrating
- Yellow skin or eyes, called jaundice

Causes and risk factors

HRS results from severe liver dysfunction and major changes in blood circulation. It is not usually caused by a blockage in the urinary system or direct inflammation of the kidneys.

Most people who develop it have cirrhosis with ascites. It can also occur with severe acute liver failure, although this is less common.

Events that can trigger kidney decline in someone with advanced liver disease include:

Nonsteroidal anti-inflammatory drugs like ibuprofen or naproxen , or NSAIDs, can reduce blood flow through the kidneys. Examples include ibuprofen and naproxen. Some blood pressure medicines, diuretics and other treatments may also need review when kidney function declines. Do not stop prescribed medicines without medical advice unless you have been given

a specific plan.

Not every case of kidney injury in cirrhosis is HRS. Dehydration, infection, medication effects, shock and direct kidney damage are also possible. More than one cause may be present at the same time.

- Bacterial infections, including infection of ascitic fluid
- Bleeding from the digestive tract
- Vomiting, diarrhoea or poor fluid intake
- Large fluid shifts after procedures
- Medicines that reduce kidney blood flow
- Severe inflammation related to liver failure

Diagnosis

There is no single test that proves someone has HRS. The diagnosis is based on kidney test results, the presence of advanced liver disease and the careful exclusion of other likely causes.

Creatinine is a waste product measured in the blood. Rising creatinine can show that the kidneys are filtering less effectively. Clinicians compare the result with earlier tests because a change from your usual level can be important even when the number does not look extremely high.

The assessment may include:

When low circulating volume is possible, fluids may be given under close monitoring. Albumin, a protein normally made by the liver, may be used to support blood volume. A lack of kidney improvement after appropriate fluid correction can support the diagnosis. However, giving albumin automatically may be unsafe if there is already fluid overload or breathing difficulty.

HRS becomes more likely when kidney function remains impaired despite correcting reversible problems and there is no stronger explanation, such as shock, urinary obstruction or clear structural kidney damage.

- Repeated blood tests for creatinine, salts and liver function
- Measurement of urine output
- Urine tests for blood, protein or signs of infection
- Blood and urine cultures when infection is possible
- An ultrasound to look for obstruction or structural kidney problems

- A review of medicines, bleeding, fluid loss and recent procedures
- Assessment of blood pressure, circulation and fluid levels

Treatment and management

Acute HRS is generally treated in hospital. Treatment aims to improve circulation to the kidneys, address any trigger and determine whether liver transplantation is possible.

Medicines called vasoconstrictors tighten selected blood vessels. This can redirect blood toward the kidneys and improve effective circulation. Terlipressin is one such medicine and is commonly given with intravenous albumin where it is approved and suitable. Norepinephrine is another option, usually given with intensive monitoring.

These treatments are not appropriate for everyone. Terlipressin can cause serious breathing problems, especially in people with low oxygen levels or excess fluid. Vasoconstrictors can also reduce blood supply to areas such as the heart, skin or intestines. Oxygen levels, circulation and fluid balance therefore require close monitoring.

Treatment may also involve:

Liver transplantation treats the underlying liver failure and offers the best chance of lasting recovery from HRS. Kidney function often improves after a successful liver transplant, particularly when the decline was recent and the kidneys do not have permanent structural damage. Recovery is not guaranteed.

Dialysis uses a machine to remove waste and extra fluid from the blood. It may be used for severe fluid overload, dangerous mineral changes, acid build-up or other complications. In HRS, dialysis is often considered as support while awaiting liver recovery or transplantation. It does not correct the liver-related circulation problem.

Some people have both HRS and long-standing kidney disease. A combined liver and kidney transplant may be considered in selected cases according to transplant criteria and the likelihood of kidney recovery.

- Antibiotics like amoxicillin or doxycycline for a confirmed or suspected bacterial infection
- Control of bleeding from the digestive tract
- Careful correction of dehydration or fluid overload
- Pausing medicines that may worsen kidney blood flow
- Adjusting diuretics and other liver-related treatment
- Managing hepatic encephalopathy and abnormal blood salts

Complications

HRS can progress to severe kidney failure. The kidneys may no longer remove enough fluid, minerals or acidic waste from the blood.

Possible complications include:

HRS is also a sign that liver disease has become severely decompensated. Decompensated means the liver can no longer maintain important functions without causing major complications. The risk of death is substantial, particularly when kidney function worsens quickly or infection and other organ failures are present.

- Fluid in the lungs, causing breathlessness
- Dangerous changes in potassium or other blood salts
- Increasing ascites and leg swelling
- Worsening confusion or reduced consciousness
- Greater difficulty managing medicines and nutrition
- Failure of more than one organ
- A need for dialysis

Prevention

HRS cannot always be prevented once liver disease is advanced. The circulation changes that cause it arise from severe liver dysfunction and portal hypertension, which is increased pressure in the veins around the liver.

Reducing avoidable kidney stress may lower the risk of some episodes. This includes receiving prompt care for infection, vomiting, diarrhoea, bleeding or poor fluid intake. Treatment of certain infections in cirrhosis may include albumin to reduce kidney complications, but this is a hospital or specialist decision.

If you have cirrhosis, avoid starting NSAIDs or non-prescribed supplements without checking that they are safe for your liver and kidneys. Keep planned blood tests and follow-up appointments. These can identify changes in kidney function before symptoms become obvious.

Preventing further liver injury also matters. This may include avoiding alcohol when advised, treating viral hepatitis, and managing the specific cause of cirrhosis. These steps cannot reverse every case of advanced scarring, but they may reduce further deterioration.

Living with it and what to expect

The course of HRS is closely tied to the severity of the liver condition, how quickly kidney function changed and whether treatment improves circulation.

Some people respond to vasoconstrictor and albumin treatment within days. Kidney function may improve enough that dialysis is not needed. HRS can return after treatment stops because the underlying liver condition remains.

For others, kidney function continues to decline despite treatment. Long-standing kidney disease, severe infection, very low blood pressure or failure of other organs can reduce the chance of recovery.

After liver transplantation, kidney function may improve over days, weeks or months. Some people continue to need dialysis for a time, and a smaller group has lasting kidney impairment. The transplant team uses the duration and pattern of kidney problems to estimate whether recovery is likely.

If you are living with advanced cirrhosis, follow-up often includes blood tests, review of ascites and swelling, medication checks, nutrition support and discussion of transplant eligibility. Stable symptoms still need routine specialist follow-up. A sudden reduction in urine, new confusion or rapid fluid build-up is not something to save for a routine appointment.

When transplantation is not possible, care can still focus on treating reversible triggers, relieving symptoms and supporting comfort and daily priorities. Palliative care can be provided alongside active liver treatment; it is not limited to the final stage of illness.

When to get medical help

Seek urgent same-day medical assessment if you have advanced liver disease and notice:

Call emergency services for severe breathlessness, fainting, inability to wake, vomiting blood, black tar-like stools or severe confusion. These can signal bleeding, fluid in the lungs, severe encephalopathy or another emergency.

If symptoms are stable, attend routine liver and kidney follow-up as planned. Contact your care team before taking a new painkiller, herbal product or supplement.

- Much less urine than usual
- New or worsening confusion
- Fever, chills or new abdominal pain

- Rapidly increasing swelling or abdominal size
- Repeated vomiting, diarrhoea or inability to drink
- Worsening jaundice, weakness or dizziness

Common questions

Can the kidneys recover from hepatorenal syndrome?

Yes, recovery is possible. Kidney function may improve with circulation-supporting treatment or after liver transplantation. Recovery is less likely when kidney impairment has lasted a long time or there is separate structural kidney damage.

Is hepatorenal syndrome the same as kidney failure?

HRS is a particular cause of kidney dysfunction or failure. It starts because severe liver disease changes blood circulation to the kidneys. Other types of kidney failure may result from infection, dehydration, medicines, inflammation or direct kidney damage.

How quickly does hepatorenal syndrome progress?

HRS-AKI can worsen over days. Other forms develop over weeks or months. Blood test trends, urine output, infections, blood pressure and response to treatment help show how quickly it is progressing.

Can you have hepatorenal syndrome without cirrhosis?

Most cases occur in people with advanced cirrhosis and ascites. A similar syndrome can occur with severe acute liver failure. Kidney problems without major liver dysfunction usually have another cause.

Does dialysis cure hepatorenal syndrome?

No. Dialysis can remove waste and extra fluid, but it does not correct the failing liver or the circulation changes causing HRS. It may provide temporary support while other treatment or transplant assessment continues.

How long can someone live with hepatorenal syndrome?

There is no single reliable timeline for an individual. HRS is a serious sign of advanced liver failure. Outlook is affected by how rapidly the kidneys decline, infection, other organ problems, response to treatment and access to liver transplantation.

Sources

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