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UNIT-IV

ORGAN FUNCTION TESTS

Liver function tests. Liver diseases: Jaundice; Cirrhosis; Alcoholic liver disease; Hepatic tumor; Bilary tract diseases; Gall stones; Crigler-Najjar syndrome; Dubin Johnson syndrome.

Renal function tests. Acute and chronic renal failure; Glomerulonephritis; Nephrotic syndrome; Urinary tract obstruction; Nephrolithiasis.

Gastric function tests - Fractional test meal. Pentagastrin test; Insulin stimulation test. Gastritis

LIVER FUNCTION TESTS

Liver function tests are blood tests used to help find the cause of your symptoms and monitor liver disease or damage. The tests measure the levels of certain enzymes and proteins in your blood. Some of these tests measure how well the liver is performing its regular functions of producing protein and clearing bilirubin, a blood waste product. Other liver function tests measure enzymes that liver cells release in response to damage or disease.

Liver function tests can be used to:

- Screen for liver infections, such as hepatitis.
- Monitor a disease, such as viral or alcoholic hepatitis, and determine how well a treatment is working.
- Look for signs of serious disease, particularly scarring of the liver, called cirrhosis.
- Monitor possible side effects of medicines.

Liver function tests check the levels of certain enzymes and proteins in your blood. Levels that are higher or lower than usual can mean liver problems. The pattern and degree of elevation of these tests along with the overall clinical picture can provide hints to the underlying cause of these problems.

Some common liver function tests include:

- **Alanine transaminase (ALT).** ALT is an enzyme found in the liver that helps convert proteins into energy for the liver cells. When the liver is damaged, ALT is released into the bloodstream and levels increase. This test is sometimes referred to as SGPT.
- **Aspartate transaminase (AST).** AST is an enzyme that helps the body break down amino acids. Like ALT, AST is usually present in blood at low levels. An increase in AST levels may mean liver damage, liver disease or muscle damage. This test is sometimes referred to as SGOT.
- **Alkaline phosphatase (ALP).** ALP is an enzyme found in the liver and bone and is important for breaking down proteins. Higher-than-usual levels of ALP may mean liver damage or disease, such as a blocked bile duct, or certain bone diseases, as this enzyme is also present in bones.
- **Albumin and total protein.** Albumin is one of several proteins made in the liver. Your body needs these proteins to fight infections and to perform other functions. Lower-than-usual levels of albumin and total protein may mean liver damage or disease. These low levels also can be seen in other gastrointestinal and kidney-related conditions.

- **Bilirubin.** Bilirubin is a substance produced during the breakdown of red blood cells. Bilirubin passes through the liver and is excreted in stool. Higher levels of bilirubin might mean liver damage or disease. At times, conditions such as a blockage of the liver ducts or certain types of anemia also can lead to elevated bilirubin.
- **Gamma-glutamyltransferase (GGT).** GGT is an enzyme in the blood. Higher-than-usual levels may mean liver or bile duct damage. This test is nonspecific and may be elevated in conditions other than liver disease.
- **L-lactate dehydrogenase (LD).** LD is an enzyme found in the liver. Higher levels may mean liver damage. However, other conditions also may cause higher levels of LD.
- **Prothrombin time (PT).** PT is the time it takes your blood to clot. Increased PT may mean liver damage. However, it also can be higher if you're taking certain blood-thinning drugs, such as warfarin.

Jaundice

Jaundice is a disease that causes the yellowish discolouration of the skin, sclerae (white part of the eye) and other mucous membranes. Additionally, body fluids may also change to yellow colour. Technically, it is also called as icterus. It is caused due to the accumulation of bilirubin in the blood and body's tissues. Bilirubin is a waste product that is generated when red blood cells break down. It is then transported to the liver through the bloodstream where it is then combined with a digestive fluid called bile. Usually, bilirubin is discharged through the stool and remaining is excreted through urine. But if bilirubin cannot be propelled through the liver, it gets accumulated in the blood causing Jaundice.

Causes and Symptoms of Jaundice

Jaundice is more common in newborn babies and it is referred to as neonatal jaundice. This is mainly caused because a newborn's liver isn't fully developed and it is less effective at processing bilirubin from the blood.

Types of Jaundice

Jaundice can be classified into three categories. Treatment of jaundice depends upon the underlying cause of it. In other words, treatments target the symptoms rather than the disease itself.

1. **Hepatocellular jaundice:** It occurs as a result of liver damage or injury. The liver generally gets damaged due to infections, excessive consumption of alcohol and also due to parasitic infections.
    - **Treatment** for Hepatocellular jaundice: This can be treated by liver transplantation or repairing the liver. The aim of treatment is to control further damage.

2. **Hemolytic Jaundice:** It occurs when erythrocytes or red blood cells break down at an accelerated rate, resulting in the buildup of more bilirubin. This occurs due to infectious diseases such as malaria, anaemia etc.
    - **Treatment** for Hemolytic Jaundice: This can be treated by treating the specific cause.
3. **Obstructive Jaundice:** This occurs when bilirubin is blocked and is unable to be discharged from the liver.
    - **Treatment** for Obstructive Jaundice: Surgery is performed to clear the blockage and to clear the bile duct system. Surgery includes removing the gallbladder or a part of the bile duct system.

Jaundice Symptoms

Following are the prominent jaundice symptoms:

- Skin and sclerae colour changes to yellow
- Urine colour also changes to yellow
- Itching of the skin

Following symptoms may be observed in the initial stages of jaundice:

- Fever
- Abdominal pain
- Vomitings
- Weight loss
- Drowsiness, agitation, and confusion

The colour of the skin and sclera of the eyes turns yellow within one or two days. It is always advisable to check whether the baby is suffering from jaundice by pressing lightly on the chin of the baby. If the colour changes to yellow for a fraction of seconds, it is suspected that the child is suffering from jaundice.

Additional jaundice symptoms that can be observed in infants are

- Crying loudly
- Change in skin tone
- Poor feeding
- Urine colour changes to yellow
- Sleepiness and lethargic

Cirrhosis

Cirrhosis is severe scarring of the liver. This serious condition can be caused by many forms of liver diseases and conditions, such as hepatitis or chronic alcoholism.

Each time your liver is injured — whether by excessive alcohol consumption or another cause, such as infection — it tries to repair itself. In the process, scar tissue forms. As cirrhosis gets worse, more and more scar tissue forms, making it difficult for the liver to do its job. Advanced cirrhosis is life-threatening.

The liver damage caused by cirrhosis generally can't be undone. But if liver cirrhosis is diagnosed early and the underlying cause is treated, further damage can be limited. In rare cases, it may be reversed.

Symptoms

Cirrhosis often has no symptoms until liver damage is severe. When symptoms do occur, they may include:

- Fatigue.
- Easily bleeding or bruising.
- Loss of appetite.
- Nausea.
- Swelling in the legs, feet or ankles, called edema.
- Weight loss.
- Itchy skin.
- Yellow discoloration in the skin and eyes, called jaundice.
- Fluid accumulation in the abdomen, called ascites (uh-SAHY-teez).
- Spiderlike blood vessels on the skin.
- Redness in the palms of the hands.
- Pale fingernails, especially the thumb and index finger.
- Clubbing of the fingers, in which the fingertips spread out and become rounder than usual.
- For women, absence of or loss of periods not related to menopause.
- For men, loss of sex drive, testicular shrinkage or breast enlargement, known as gynecomastia.
- Confusion, drowsiness or slurred speech.

Causes

A wide range of diseases and conditions can damage the liver and lead to cirrhosis.

Some of the causes include:

- Long-term alcohol abuse.
- Ongoing viral hepatitis (hepatitis B, C and D).
- Nonalcoholic fatty liver disease, a condition in which fat accumulates in the liver.
- Hemochromatosis, a condition that causes iron buildup in the body.
- Autoimmune hepatitis, which is a liver disease caused by the body's immune system.
- Destruction of the bile ducts caused by primary biliary cholangitis.
- Hardening and scarring of the bile ducts caused by primary sclerosing cholangitis.
- Wilson's disease, a condition in which copper accumulates in the liver.
- Cystic fibrosis.
- Alpha-1 antitrypsin deficiency.
- Poorly formed bile ducts, a condition known as biliary atresia.
- Inherited disorders of sugar metabolism, such as galactosemia or glycogen storage disease.
- Alagille syndrome, a genetic digestive disorder.
- Infection, such as syphilis or brucellosis.

- Medications, including methotrexate or isoniazid.

Prevention

- Lower your risk of cirrhosis by taking these steps to care for your liver:
- Do not drink alcohol if you have cirrhosis. If you have liver disease, you should not drink alcohol.
- Eat a healthy diet. Choose a diet that's full of fruits and vegetables.
- Select whole grains and lean sources of protein. Cut down on the amount of fatty and fried foods you eat.
- Maintain a healthy weight. Too much body fat can damage your liver. Talk to your health care provider about a weight-loss plan if you are obese or overweight.
- Reduce your risk of hepatitis. Sharing needles and having unprotected sex can increase your risk of hepatitis B and C. Ask your provider about hepatitis vaccinations.

Treatment

Treatment for cirrhosis depends on the cause and extent of your liver damage. The goals of treatment are to slow the progression of scar tissue in the liver and to prevent or treat symptoms and complications of cirrhosis. You may need to be hospitalized if you have severe liver damage.

Treatment for the underlying cause of cirrhosis

In early cirrhosis, it may be possible to minimize damage to the liver by treating the underlying cause. The options include:

- **Treatment for alcohol dependency.** People with cirrhosis caused by excessive alcohol use should try to stop drinking. If stopping alcohol use is difficult, your health care provider may recommend a treatment program for alcohol addiction. If you have cirrhosis, it is very important to stop drinking since any amount of alcohol is toxic to the liver.
- **Weight loss.** People with cirrhosis caused by nonalcoholic fatty liver disease may become healthier if they lose weight and control their blood sugar levels.
- **Medicines to control hepatitis.** Medicines may limit further damage to liver cells caused by hepatitis B or C through specific treatment of these viruses.
- **Medicines to control other causes and symptoms of cirrhosis.** Medicines may slow the progression of certain types of liver cirrhosis. For example, for people with primary biliary cholangitis that is diagnosed early, medicine may significantly delay progression to cirrhosis.

Other medicines can relieve certain symptoms, such as itching, fatigue and pain. Nutritional supplements may be prescribed to counter malnutrition associated with cirrhosis. Supplements also can help prevent weak bones, known as osteoporosis.

Treatment for complications of cirrhosis

Your health care provider will work to treat any complications of cirrhosis, including:

- **A buildup of fluid in your body.** A low-sodium diet and medicine to prevent fluid buildup in the body may help control ascites and swelling. More-severe fluid buildup may require procedures to drain the fluid or surgery to relieve pressure.
- **Portal hypertension.** Certain blood pressure medicines may control increased pressure in the veins that supply the liver, called portal hypertension, and prevent severe bleeding. Your provider will regularly perform an upper endoscopy to look for enlarged veins in the esophagus or stomach that may bleed. These veins are known as varices.

If you develop varices, you likely will need medicine to lower the risk of bleeding. If you have signs that the varices are bleeding or are likely to bleed, you may need a procedure known as band ligation. Band ligation can stop the bleeding or reduce the risk of further bleeding. In severe cases, you may need a small tube — a transjugular intrahepatic portosystemic shunt — placed in your vein to reduce blood pressure in your liver.

- **Infections.** You may receive antibiotics or other treatments for infections. Your provider also is likely to recommend vaccinations for influenza, pneumonia and hepatitis.
- **Increased liver cancer risk.** Your provider will likely recommend regular blood tests and ultrasound exams to look for signs of liver cancer.
- **Hepatic encephalopathy.** You may be prescribed medicines to help reduce the buildup of toxins in your blood caused by poor liver function.

Liver transplant surgery

In advanced cases of cirrhosis, when the liver stops working properly, a liver transplant may be the only treatment option. A liver transplant is a procedure to replace your liver with a healthy liver from a deceased donor or with part of a liver from a living donor. Cirrhosis is one of the most common reasons for a liver transplant. Candidates for liver transplant have extensive testing to determine whether they are healthy enough to have a good outcome following surgery.

Historically, those with alcoholic cirrhosis have not been liver transplant candidates because of the risk that they will return to harmful drinking after transplant. Recent studies, however, suggest that carefully selected people with severe alcoholic cirrhosis have post-transplant survival rates similar to those of liver transplant recipients with other types of liver disease.

Alcoholic hepatitis

Alcoholic hepatitis is swelling, called inflammation, of the liver caused by drinking alcohol. Drinking alcohol destroys liver cells. Alcoholic hepatitis most often happens in people who drink heavily over many years. But the link between drinking and alcoholic hepatitis isn't simple. Not all heavy drinkers get alcoholic hepatitis. And some people who drink much less get the disease.

Symptoms

The most common sign of alcoholic hepatitis is yellowing of the skin and whites of the eyes, called jaundice. The yellowing of the skin might be harder to see on Black and brown people.

Other symptoms include:

- Loss of appetite.
- Nausea and vomiting.
- Belly tenderness.
- Fever, often low grade.
- Tiredness and weakness.

People with alcoholic hepatitis tend to be malnourished. Drinking large amounts of alcohol keeps people from being hungry. And heavy drinkers get most of their calories from alcohol.

Other symptoms that happen with severe alcoholic hepatitis include:

- Fluid buildup in the belly, called ascites.
- Being confused and acting oddly due to a buildup of toxins. The healthy liver breaks these toxins down and gets rid of them.
- Kidney and liver failure.

Causes

Alcoholic hepatitis is caused by damage to the liver from drinking alcohol. Just how alcohol damages the liver and why it does so only in some heavy drinkers isn't clear.

These factors are known to play a role in alcoholic hepatitis:

- The body's way of breaking down alcohol makes highly toxic chemicals.
- These chemicals trigger swelling, called inflammation, that destroys liver cells.
- Over time, scars replace healthy liver tissue. This keeps the liver from working well.
- This scarring, called cirrhosis, can't be fixed. It's the final stage of alcoholic liver disease.

Other factors that can be involved with alcoholic hepatitis include:

- **Other types of liver disease.** Alcoholic hepatitis can make chronic liver diseases worse. For instance, if you have hepatitis C and drink, even a little, you're more likely to get liver scarring than if you don't drink.
- **Lack of nutrition.** Many people who drink heavily don't get enough nutrients because they eat poorly. And alcohol keeps the body from using nutrients as it should. Lack of nutrients can damage liver cells.

Prevention

Drink alcohol in moderation, if at all. For healthy adults, moderate drinking means up to one drink a day for women and up to two drinks a day for men. The only certain way to prevent alcoholic hepatitis is to avoid all alcohol.

Protect yourself from hepatitis C. Hepatitis C is a liver disease caused by a virus. Without treatment, it can lead to cirrhosis. If you have hepatitis C and drink alcohol, you're far more likely to get cirrhosis than if you don't drink.

Check before mixing medicines and alcohol. Ask your healthcare professional if it's safe to drink alcohol when taking your prescribed medicines. Read the warning labels on medicines you can get without a prescription.

Don't drink alcohol when taking medicines that warn against drinking alcohol while taking them. This includes pain relievers such as acetaminophen (Tylenol, others).

Diagnosis

Diagnosing liver disease might involve these tests:

- Liver function tests.
- Blood tests.
- An ultrasound, CT or MRI scan of the liver.
- A liver biopsy, if other tests and imaging don't give a clear diagnosis or if you are at risk of other causes of hepatitis.

Treatment

Treatment for alcoholic hepatitis involves quitting drinking as well as therapies to ease the symptoms of liver damage.

Quitting drinking

If you've been diagnosed with alcoholic hepatitis, you need to stop drinking alcohol and never drink alcohol again. It's the only way that might reverse liver damage or keep the disease from getting worse. People who don't stop drinking are likely to have some life-threatening health problems.

If you depend on alcohol and want to stop drinking, your healthcare professional can suggest a therapy that meets your needs. It can be harmful to stop drinking all at once. So discuss a plan with your healthcare professional.

Treatment might include:

- Medicines.
- Counseling.
- Alcoholics Anonymous or other support groups.
- Outpatient or live-in treatment program.

Treatment for malnutrition

Your healthcare professional might suggest a special diet to fix poor nutrition. You might be referred to an expert in diet to manage disease, called a dietitian. A dietitian can suggest ways to eat better to make up for the vitamins and nutrients you lack.

If you have trouble eating, your care professional might suggest a feeding tube. A tube is passed down the throat or through the side and into the stomach. A special nutrient-rich liquid diet is then passed through the tube.

Medicines to reduce liver swelling, called inflammation

These might help severe alcoholic hepatitis:

- **Corticosteroids.** These medicines might help some people with severe alcoholic hepatitis live longer. However, corticosteroids have serious side effects. They're not likely to be used if you have failing kidneys, stomach bleeding or an infection.
- **Pentoxifylline.** Your healthcare professional might suggest this medicine f you can't take corticosteroids. How well pentoxifylline works for alcoholic hepatitis isn't clear. Study results differ.
- **Other treatment.** N-acetylcysteine may help some people with alcoholic hepatitis.

Hepatic tumor

Tumors are abnormal masses of tissue that form when cells begin to reproduce at an increased rate. Both noncancerous (benign) and cancerous (malignant) tumors can develop in the liver.

Noncancerous liver tumors

Noncancerous (benign) tumors are quite common and usually do not produce symptoms. Often, they are not diagnosed until an ultrasound, computed tomography scan, or magnetic resonance imaging scan is performed. There are several types of benign liver tumors, including the following:

- Hepatocellular adenoma. This benign tumor is linked to the use of certain drugs. Most of these tumors remain undetected. Sometimes, an adenoma will rupture and bleed into the abdominal cavity, requiring surgery. Adenomas rarely become cancer.
- Hemangioma. This type of benign tumor is a mass of abnormal blood vessels. Treatment is usually not required. Sometimes, infants with large liver hemangiomas require surgery to prevent clotting and heart failure.

Cancerous liver tumors

Cancerous (malignant) tumors in the liver have either originated in the liver (primary liver cancer) or spread from cancer sites elsewhere in the body (metastatic liver cancer). Most cancerous tumors in the liver are metastatic.

Hepatoma (primary liver cancer)

Also called hepatocellular carcinoma, this is the most common form of primary liver cancer. Chronic infection with hepatitis B and C increases the risk of developing this type of cancer. Other causes include certain chemicals, alcoholism, and chronic liver cirrhosis.

Symptoms

The following are the most common symptoms of a hepatoma. However, each individual may experience symptoms differently. Symptoms may include:

- Abdominal pain
- Weight loss
- Nausea
- Vomiting
- Large mass can be felt in upper, right part of abdomen
- Fever
- Jaundice. Yellowing of the skin and eyes.
- Persistent itching

The symptoms of a liver hepatoma may resemble other medical conditions or problems.

Diagnoses

In addition to a complete medical history and physical examination, diagnostic procedures for a liver hepatoma may include the following:

- Liver function tests. A series of special blood tests that can determine if the liver is functioning properly.
- Abdominal ultrasound (also called sonography). A diagnostic imaging technique that uses high-frequency sound waves to create an image of the internal organs. Ultrasounds are used to view internal organs of the abdomen, such as the liver, spleen, and kidneys and to assess blood flow through various vessels.
- Computed tomography scan (CT or CAT scan). A diagnostic imaging procedure using a combination of X-rays and computer technology to produce horizontal, or axial, images (often called slices) of the body. A CT scan shows detailed images of any part of the body, including the bones, muscles, fat, and organs. CT scans are more detailed than general X-rays.
- Hepatic angiography. X-rays taken after a substance in injected into the hepatic arteries.
- Liver biopsy. A procedure in which tissue samples from the liver are removed (with a needle or during surgery) from the body for examination under a microscope.
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Treatment for liver hepatoma

Specific treatment for liver hepatoma will be determined by your doctor based on:

- Your age, overall health, and medical history
- Extent of the disease
- Your tolerance of specific medicines, procedures, or therapies
- Expectations for the course of the disease
- Your opinion or preference

Treatment may include:

- Surgery. In some cases surgery may be used to remove cancerous tissue from the liver. However, the tumor must be small and confined.
- Radiation therapy. Radiation therapy uses high-energy rays to kill or shrink cancer cells.
- Chemotherapy. Chemotherapy uses anticancer drugs to kill cancer cells.
- Liver transplantation

Treatment for metastatic liver cancer

Specific treatment for metastatic liver cancer will be determined by your doctor based on:

- Your age, overall health, and medical history
- Extent of the disease
- Your tolerance of specific medicines, procedures, or therapies
- Expectations for the course of the disease
- Your opinion or preference

Treatment may include:

- Surgery. In some cases, surgery may be used to remove cancerous tissue from the liver. However, the tumor must be small and confined.

- Radiation therapy. Radiation therapy uses high-energy rays to kill or shrink cancer cells.
- Chemotherapy. Chemotherapy uses anticancer drugs to kill cancer c

Biliary disease

Biliary disease refers to diseases affecting the bile ducts, gallbladder and other structures involved in the production and transportation of bile. Bile is a fluid produced by the liver that aids digestion. Bile drains from the liver through bile ducts to the first part of the small intestine, or duodenum, and eventually back to the bile ducts and liver. If any duct in this complex system becomes diseased or blocked, a number of serious diseases may result.

Symptoms of biliary disease

Although symptoms may differ among bile duct disorders, symptoms common to many of the disorders include:

- Jaundice (yellowing of the skin and whites of the eyes)
- Abdominal pain, especially in the upper right side of the abdomen under the rib cage
- Nausea or vomiting
- Loss of appetite, which may result in weight loss
- Fatigue
- Fever or chills
- Itching
- Light brown urine
- Greasy or clay-colored stools

Detection and diagnosis

The tests performed vary according to the suspected bile duct disorder. However, tests commonly performed to diagnose many bile duct disorders may include:

- Blood tests
- Liver function tests
- Ultrasound
- Endoscopic ultrasound
- Computed tomography (CT) scan
- Magnetic Resonance Imaging (MRI)
- Endoscopic retrograde cholangiopancreatography (ERCP)
- Liver biopsy

Treatment

- **Medications/antibiotics:** Patients are treated with medications to increase the flow of bile from the liver and antibiotics are used to treat infection.
- **Hepatoportoenterostomy:** Surgery to drain bile from the liver when bile ducts are blocked.
- **Endoscopic retrograde choliangiopancreatography (ERCP):** This procedure may help identify and remove gallstones from the bile duct.

- **Cholecystectomy:** The GW Digestive Disorder Center offers single incision laparoscopic cholecystectomies (removal of the gallbladder). During this procedure, surgeons operates through a single port, located in an incision in the patient's belly button, that has three distinct openings. The flexible port allows the surgeons to operate three laparoscopic instruments simultaneously. This surgery may result in a scar that is invisible or barely visible, compared with traditional laparoscopic surgeries that may leave three to four small but visible scars. Additionally, some patients who have single-incision laparoscopic surgery have shorter hospital stays and use significantly less pain medication.

Prevention

Biliary disorders due to gallstones may be prevented by having the gallbladder surgically removed. The formation of gallstones may also be prevented by eating a well-balanced diet, maintaining a healthy weight and exercising regularly.

Gallstones

Gallstones (cholelithiasis) are hardened pieces of bile that form in your gallbladder or bile ducts. They're common, especially in women and people assigned female at birth. Gallstones don't always cause problems, but they can if they get stuck in your biliary tract and block your bile flow. If your gallstones cause you symptoms, you'll need treatment to remove them — typically, surgery.

Gallstones are hardened, concentrated pieces of bile that form in your gallbladder or bile ducts. "Gall" means bile, so gallstones are bile stones. Your gallbladder is your bile bladder. It holds and stores bile for later use. Your liver makes bile, and your bile ducts carry it to the different organs in your biliary tract. Healthcare providers sometimes use the term "cholelithiasis" to describe the condition of having gallstones. "Chole" also means bile, and "lithiasis" means stones forming. Gallstones form when bile sediment collects and crystallizes. Often, the sediment is an excess of one of the main ingredients in bile.

Symptoms

Gallstones generally don't cause symptoms unless they get stuck and create a blockage. This blockage causes symptoms, most commonly upper abdominal pain and nausea. These may come and go, or they may come and stay. You might develop other symptoms if the blockage is severe or lasts a long time, like:

- Sweating.
- Fever.
- Fast heart rate.
- Abdominal swelling and tenderness.
- Yellow tint to your skin and eyes.
- Dark-colored pee and light-colored poop.

Diagnosis

An ultrasound can find most gallstones in and around your gallbladder. But if a gallstone is stuck somewhere else in your biliary tract, you may need another kind of test to find it.

Other possible tests include:

- MRCP (magnetic resonance cholangiopancreatography).
- HIDA scan.
- Endoscopic ultrasound.
- ERCP (endoscopic retrograde cholangiopancreatography).

Treatment

If your gallstones never cause problems, you won't need treatment for them. But if gallstones cause a blockage in your biliary tract, your healthcare provider will want to remove them — not just the blockage, but all of them. Once gallstones have caused a blockage, they're highly likely to do so again.

Most people who need treatment for gallstones will have surgery to remove them. Surgery is the only way to ensure gallstones won't cause issues for you again. But if you can't or don't want to have surgery, there are some alternative treatments to try, including medications and other procedures.

Gallstone surgery

Gallbladder removal (cholecystectomy) is the only reliable long-term solution for gallstones. It's one of the most common procedures performed worldwide, usually as a laparoscopic surgery. You can live well without a gallbladder. From now on, bile will simply flow directly from your liver to your small intestine.

Occasionally, some people who need treatment for gallstones aren't in a safe condition to have gallbladder removal surgery. In these cases, cholecystostomy is one alternative. This minor procedure places a catheter in your gallbladder to drain it. It can remove the gallstones currently inside.

Medical treatments for gallstones

Healthcare providers don't prescribe medications for gallstones very often because they aren't very effective. Medications like ursidol and chenodiol only work on smaller cholesterol stones that haven't caused any complications yet. It can take months to years to dissolve them, and they often return.

Crigler-Najjar syndrome

Crigler-Najjar syndrome is a rare genetic condition that occurs when your liver can't break down bilirubin (a substance created by red blood cells). Children with this condition have jaundice, where their skin appears yellow. Some symptoms are life-threatening and cause irreversible brain damage if left untreated.

High levels of toxic bilirubin in your blood cause Crigler-Najjar syndrome, a rare genetic condition. Bilirubin is a substance that forms when red blood cells reach the end of their lifespan. Your liver breaks down bilirubin from a toxic substance to a nontoxic substance that you get rid of in your stool. If you're diagnosed with Crigler-Najjar syndrome, your liver can't break down bilirubin and it collects in your blood. As a result, Crigler-Najjar syndrome can cause life-threatening symptoms if left untreated.

Types of Crigler-Najjar syndrome

There are two types of Crigler-Najjar syndrome:

- Type 1 (CN1): Crigler-Najjar syndrome type 1 is very severe and life-threatening. Most children diagnosed with this condition don't survive past childhood from complications of the condition.
- Type 2 (CN2): Crigler-Najjar syndrome type 2 is less severe than type 1. Children diagnosed with type 2 have a normal life expectancy due to mild symptoms.

Symptoms

Symptoms of Crigler-Najjar syndrome range in severity based on the type, with type 1 being the most severe. Newborns with Crigler-Najjar syndrome will experience jaundice, where they have a yellow tint to their skin and eyes. It's common for newborns to experience jaundice because their livers aren't fully developed. This normally resolves during the first week of life. Children with Crigler-Najjar syndrome have persistent jaundice beyond the newborn period.

Kernicterus

Kernicterus causes brain damage and is life-threatening. These symptoms normally appear after one month or into early childhood. These symptoms can also occur later in life if treatment for Crigler-Najjar syndrome stops or another illness interrupts treatment progress.

Mild symptoms of kernicterus include:

- Clumsiness.
- Muscle spasms.
- Problems with sensory perception.
- Trouble with fine motor skills (grasping objects, fastening buttons).
- Twisting or squirming movements of their body (choreoathetosis).
- Underdeveloped enamel on teeth.

Severe symptoms of kernicterus include:

- Difficulty hearing.
- Extreme fatigue (lethargic).
- Feeding difficulties.
- Fever.
- Nausea or vomiting.
- Periods of weak muscle tone (hypotonia) and/or tight muscles (hypertonia).
- Issues with cognitive development.
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Causes Crigler-Najjar syndrome

A mutation of the *UGT1A1* gene causes Crigler-Najjar syndrome. The *UGT1A1* gene creates enzymes in the liver that break down bilirubin to remove it from your body.
Bilirubin is a yellow substance that forms when red blood cells reach the end of their life cycle. Bilirubin takes on two forms in your body. Unconjugated bilirubin is a toxic substance that forms from red blood cells. Your liver takes unconjugated bilirubin and breaks it down into conjugated bilirubin, the nontoxic form of the substance. Once bilirubin is in its nontoxic form, your body gets rid of it when you poop.

If you have a mutation on the *UGT1A1* gene, your body can't break down bilirubin, so its toxic form collects in your blood and tissues. If you have a toxic substance in your blood, it can cause life-threatening symptoms of Crigler-Najjar syndrome if left untreated.

Diagnosis
If your baby has jaundice, with a higher bilirubin level than expected in the newborn period, or jaundice develops rapidly within the first few days to weeks after your baby is born, their healthcare provider will offer tests, in addition to a physical exam, to determine what's causing your child's skin and the whites of their eyes to turn yellow. Tests to diagnose Crigler-Najjar syndrome include:

- Genetic testing to identify the mutated gene responsible for symptoms.
- Blood and/or stool tests to determine how much bilirubin (unconjugated) is in their blood and stool, such as a liver function test or a complete blood count.
- Bilirubin blood test to detect how much bilirubin is in their blood.

Their healthcare provider will also ask if you have a history of genetic conditions in your family to pinpoint the diagnosis before testing.

Treatment
Treatment for Crigler-Najjar syndrome focuses on lowering the levels of bilirubin in your body. Treatment could include:

- Phototherapy: Phototherapy uses bright lights to remove bilirubin from your body. During this procedure, you'll wear protective eyewear and have your skin exposed to bright lights. The lights move bilirubin through your body as waste without changing it into its non-toxic form.
- Taking medicine to treat infections or illnesses that cause fever.
- Plasmapheresis: Plasmapheresis removes toxic substances from the blood via a blood transfusion that removes the plasma from your blood and replaces it with healthy plasma, often from a donor.
- Liver transplant: A surgical procedure to remove your liver and replace it with a donor's healthy liver. This is an effective treatment for Crigler-Najjar syndrome type 1 and usually occurs before adolescence to prevent brain damage.
- Taking phenobarbital to prevent bilirubin from building up in your blood (hyperbilirubinemia). This treatment is effective for Crigler-Najjar syndrome type 2.

Dubin-Johnson syndrome

Dubin-Johnson syndrome is a rare condition that affects the liver. A genetic mutation causes a yellow substance (bilirubin) to collect in your liver instead of moving through your digestive tract (bile). People diagnosed with Dubin-Johnson syndrome have lifelong, mild symptoms of jaundice. Treatment isn't necessary but can relieve symptoms.

Dubin-Johnson syndrome is a rare genetic condition that affects your liver. A genetic mutation causes a buildup of bilirubin in your body. Bilirubin is a yellow substance produced when red blood cells reach the end of their lifespan. Bilirubin should release into your bile, a substance to help move waste out of your liver and digestive system. Instead, bilirubin collects in your liver and bloodstream and causes symptoms of jaundice, where your skin and the whites of your eyes appear yellow.

Symptoms

Nearly all people diagnosed with Dubin-Johnson syndrome will experience symptoms of jaundice caused by bilirubin collecting in their liver including:

- Yellow tone to your skin and the whites of your eyes.
- Changes to the color of your pee (urine).

Jaundice may worsen during times of stress to the body, such as other illnesses, pregnancy and if you take oral contraceptives. Other symptoms may occur but are usually mild and include:

- Fatigue.
- Abdominal pain.

Dubin-Johnson is a benign (not hurtful) condition.

Imaging and blood tests could show symptoms that include:

- Deposits that build up in your liver, making it look black (if a piece of tissue from your liver is taken during a biopsy).
- An enlarged liver (hepatomegaly).

Causes of Dubin-Johnson syndrome

A mutation of the ABCC2 gene causes Dubin-Johnson syndrome. The ABCC2 gene is responsible for making a protein that removes waste from cells, specifically, it removes bilirubin (a yellow substance made up of the remains of red blood cells at the end of a cell's lifecycle) from cells in your liver and moves it as bile (digestive fluid).

Diagnosis

Your provider will diagnose Dubin-Johnson syndrome after providing a physical exam to look at your symptoms and learn more about your medical and family history.

Your provider will order tests to verify your diagnosis including:

- Imaging tests (X-ray, ultrasound) of your liver.
- Blood tests (bilirubin test).
- Urine tests.
- Possibly a liver biopsy.

A high bilirubin test result will lead to a diagnosis of hyperbilirubinemia (too much bilirubin in your blood). If your symptoms persist, your provider will order a genetic blood test to identify the gene that causes your symptoms. The genetic test confirms a diagnosis of Dubin-Johnson syndrome.

Renal function tests

The main function of the kidney would be the excretion of water-soluble waste products from our body. The kidney has various filtration, excretion, and secretory functions. Derangement of any of these functions would result in either decreased excretion of waste products and hence their accumulation in the body or loss of some vital nutrient from the body. Based on the level of these excretory products and nutrients in the urine as well as in blood, we could make an accurate calculation to decipher the efficiency of the kidney to undertake its various functions.

Structural and functional unit

The structural and functional unit of the kidney is called the nephron. It consists of two main parts viz. the glomerulus and the tubular system. The glomerulus is composed of Bowman's capsule and a tuft of leaky blood vessels encapsulated by Bowman's capsule. The primary purpose of the glomerulus is filtration. The leaky vessels filter into the glomerulus almost all the water, electrolytes, small proteins, nutrients such as sugar etc and excretory products such as urea etc. The filtration is dependent on the size and charge of the particles. The average pore sizes is 8 mm and hence particles of only smaller size will pass through. Also, the basement membrane carries a negative charge, hence preventing negatively charged particles from passing through. The tubular system is responsible for the reabsorption of most of the water, electrolytes, and nutrients as well as the excretion of the remaining nutrients by means of secretion into the tubules. These tubules are responsible for the concentration of urine.

Components of Kidney Function Test

The components of the Kidney function test could be broadly divided into two categories.
The tests that are part of the Kidney Function test panel are:

- Urine examination
- Serum Urea
- Blood urea nitrogen (BUN)
- Calcium
- Serum creatinine
- Dilution Test

Urine Examination

This examination consists of a physical examination where the colour, odour, quantity, specific gravity etc of the urine is noted. Microscopic examination of urine is done to weed out any pus cells, red blood cells (RBC) casts, Crystals etc.

Serum Urea

Urea is the end product of protein catabolism. The urea is produced from the amino group of the amino acids and is produced in the liver by means of the Urea cycle. Urea undergoes filtrations at the glomerulus as well as secretion and reabsorption at the tubular level. The rise in the level of serum urea is generally seen as a marker of renal dysfunction especially glomerular dysfunction. Urea level only rises when the glomerular function is reduced below

50%. The normal serum urea level is between 20-45 mg/dl. But the level might also be affected by diet as well as certain non-kidney related disorders. A high protein diet might increase the blood urea level. Similarly, a low protein diet might decrease blood urea level.
Other causes of protein metabolism such as any hyper metabolic conditions, starvation etc also result in increased blood urea levels. Similarly, the level of urea might also be decreased in case of hepatic injury. So even though blood urea is not an excellent marker of renal dysfunction as it rises quite late in the dysfunction and its rise is also not exclusive to kidney dysfunction, for practical purposes, serum urea level is still one of the most suggested tests and forms an important place of the kidney function test.

Blood Urea Nitrogen (BUN)

Sometimes the Serum urea level is expressed as blood urea nitrogen. BUN can be easily calculated from the serum urea level. The molecular weight of urea is 60 and it contains two nitrogen atoms of combined atomic weight of 28. Hence the contribution of nitrogen to the total weight of urea in serum is 28/60 that is equal to 0.47. Hence the serum urea levels could be easily converted to BUN by multiplying it by decimal 0.47. A rise in blood nitrogen level is known as azotemia.

Calcium

This test is used to measure the amount of Calcium in the blood cells, not the presence of calcium in the bones. The body needs calcium to build and fix bones and teeth, help nerves work, make muscles contract etc. Also, it is needed for the formation of healthy bones and teeth. Most of the cells in the body need calcium to work properly. Raised calcium levels might cause headaches, nausea, sore eyes, aching teeth, itchy skin, mood changes, and confusion.

Normal Results: 8.5 to 10.2 mg/dlC

Serum Creatinine Level

Creatine is a small tripeptide found in the muscles. It stays in its phosphorylated form and releases energy for any burst of muscular activity. It is released from the muscles during regular wear and tear and is converted to creatinine (its internal anhydride). It is to be remembered that unlike urea, creatinine is not toxic waste. It is simply used as a marker of renal function. Creatinine is freely filtered at the glomerulus and is also to a very small extent secreted into the tubules. So, any problem with glomerular filtrations has a significant effect on the excretion of creatinine resulting in a much substantial rise in serum creatinine level.

Normal serum creatinine level is 0.6 to 1.5 mg/dl. Serum creatinine is a better indicator of renal function and more specifically glomerular function than urea. For a particular individual, the creatinine level is dependent on muscle mass and muscle wear and tear. There might be a significant difference in creatinine levels of individuals with vastly differing muscle mass. For example, a bodybuilder or athlete will have higher creatinine levels than a sedentary desk worker. Similarly, creatinine level will also increase in case of any muscle trauma or excessive wear and tear as seen in athletes and people involved in hard physical labour. Creatinine is most usually measured in laboratories colorimetrically by Jaffe's method.

Dilution Test

Like the concentration test, the dilution test is also a measure of the functioning of tubules. In cases of fluid overload of the body, the tubules reabsorb lesser amounts of water resulting in

the excretion of diluted urine. For this test, the subject is put on overnight fast and then in the morning, the subject is made to drink 1200 ml of water over a time period of 30 minutes. Then the urine samples are collected every hour for 4 hours. The specific gravity of the samples is measured and at least one of the samples should has a specific gravity of 1.003 or less. If none of the samples have the specific gravity of 1.003 or less, this could be termed as a sign of tubular dysfunction.

Renal Failure

The kidneys filter the blood and remove toxins from it. These toxins are passed to the bladder where they are removed during micturition. When the kidneys fail to remove toxic substances from the body, this is known as renal failure.

Let us have an overview of renal failure, its causes, types and symptoms.

Causes of Renal Failure

In usual scenarios, renal/kidney failure is caused due to certain infections-related illness. There would be no symptoms shown by the patients having an intrinsic renal disease or low-grade chronic obstruction. A person suffering from diabetes mellitus or with high blood pressure is more prone to renal failure.

Renal failure might be caused due to a number of factors:

- Certain acute and chronic diseases
- Excessive dehydration
- Kidney trauma
- Exposure to pollutants or excessive medicines

Types of Renal Failure

Renal failure is of two types:

- Acute Renal Failure or ARF
- Chronic Renal Failure or CRF

Acute Renal Failure

Acute renal failure occurs when the kidney suddenly stops filtering blood.

The major symptoms of acute renal failure include:

- internal bleeding
- confusion
- swelling of hands, face and feet
- high blood pressure
- seizures

Types of Acute Renal Failure

Acute renal failure is divided into three main categories:

1. Prerenal acute kidney injury
2. Intrinsic acute renal injury.
3. Post-renal Intrinsic renal injury.

Prerenal Acute Kidney Injury

A pre-renal failure is caused mainly by the reduction in the blood flow to the kidney. It is not due to the direct damage of the nephron itself. Other factors resulting in pre-renal failure are:

- Gastroenteritis, or loss of blood

- Vasodilation caused by the drug's reaction
- Active hypovolemia sepsis
- Decreased cardiac output
- Anaphylaxis
- Addisonian crisis
- Salt wasting syndrome
- Protein-losing enteropathy
- Altered hemodynamics or dynamics of blood flow caused by dehydration
- Deficiency of blood in kidneys by– Intrarenal redistribution, mainly caused by, vasoconstrictors, anaesthesia, stress and surgery

Intrinsic Acute Renal Injury

The intrinsic renal injury is characterized by direct damage to the nephrons. It is often complex and may be secondary to another illness. Prerenal factors noted above may lead to acute tubular necrosis (ATN). Additional causes include

- Glomerulonephritis (acute post-streptococcal and others)
- Microangiopathic states (hemolytic uremic syndrome, DIC, TTP)
- Vasculitis (polyarteritis nodosa, Lupus, Wegener's granulomatosis)

Post-renal Intrinsic Renal Injury

The post-renal injury is caused by a blockage to the flow of urine, resulting in back pressure to the kidney, which causes damage to

- Nephrons.
- Posterior urethral valves.
- Urethral strictures – narrowing of the urethra
- Bladder obstruction from clots (hemorrhagic cystitis),
- Formation of ureteral stones.

Chronic Renal Failure

The patient with chronic renal failure does not show any symptoms until the kidney function declines to 20%. It exhibits certain signs and symptoms:

- high blood pressure
- nausea
- vomiting
- seizures
- chest pain
- shortness of breath
- itching
- fatigue
- headache

Symptoms of Renal Failure

As mentioned above, patients having Renal failure or kidney failure symptoms would not show any symptoms in the early stages. The symptoms usually develop slowly or may not appear until both the kidneys are badly damaged by the accumulation of more wastes and extra fluid building up in the body. The common symptoms include:

- Fever
- Rashes

- Diarrhoea
- Insomnia
- Vomiting
- Muscle cramps
- Frequent urine
- Loss of Appetite
- Nausea and vomiting
- Trouble in breathing
- Abdominal and back pain
- Swelling of both feet and ankles

Prevention and Treatment of Renal Failure

As per the outcome of established renal /kidney failure, prevention is critical. In certain cases, the risk of developing renal failure could be predicted such as decreased perfusion secondary to abdominal surgery, coronary bypass surgery, acute blood loss in trauma, and uric acid nephropathy, where preventative strategies could prove effective.

When patients with risk factors for developing renal failure are scheduled for surgery, the doctor should be aware that the likelihood of the patient developing renal failure is high and should consider preventative measures, including discontinuation of medications that might enhance the likelihood of renal damage (e.g., NSAIDs, angiotensin-converting enzyme inhibitors).

Preventive Dialysis

A novel approach to reduce the incidence of nephrotoxicity is associated with radiocontrast dye administration. It is provided prophylactically to patients who are at high risk of acute renal failure.

Hemofiltration initiated prior to and continued for 24 hours after dye administration has resulted in a significant reduction in mortality and a reduced need for dialysis.

Dopamine and Diuretics

Given the dismal outcome of established acute renal failure, many drugs have been investigated for its prevention. Almost all of these approaches have been shown to be of little to no value. Low doses of dopamine (≤ 2 mcg/kg/min) increases renal blood flow and might be expected to increase GFR (glomerular filtration rate). Theoretically, this could be considered beneficial, as an enhanced GFR (glomerular filtration rate) might flush nephrotoxins from the tubules, minimizing their toxicity.

Glomerulonephritis

Glomerulonephritis (gloe-MER-u-loe-nuh-FRY-tis) is inflammation of the tiny filters in the kidneys (glomeruli). The excess fluid and waste that glomeruli (gloe-MER-u-lie) remove from the bloodstream exit the body as urine. Glomerulonephritis can come on suddenly (acute) or gradually (chronic).

Glomerulonephritis occurs on its own or as part of another disease, such as lupus or diabetes. Severe or prolonged inflammation associated with glomerulonephritis can damage the kidneys. Treatment depends on the type of glomerulonephritis you have.

Symptoms

Signs and symptoms of glomerulonephritis may vary depending on whether you have the acute or chronic form and the cause. You may notice no symptoms of chronic disease. Your first indication that something is wrong might come from the results of a routine urine test (urinalysis).

Glomerulonephritis signs and symptoms may include:

- Pink or cola-colored urine from red blood cells in your urine (hematuria).
- Foamy or bubbly urine due to excess protein in the urine (proteinuria).
- High blood pressure (hypertension).
- Fluid retention (edema) with swelling evident in your face, hands, feet and abdomen.
- Urinating less than usual.
- Nausea and vomiting.
- Muscle cramps.
- Fatigue.

Causes

Many conditions can cause glomerulonephritis. Sometimes the disease runs in families and sometimes the cause is unknown. Factors that can lead to inflammation of the glomeruli include the following conditions.

Infections

Infectious diseases can directly or indirectly lead to glomerulonephritis. These infections include:

- **Post-streptococcal glomerulonephritis.** Glomerulonephritis may develop a week or two after recovery from a strep throat infection or, rarely, a skin infection caused by a streptococcal bacteria (impetigo). Inflammation occurs when antibodies to the bacteria build up in the glomeruli. Children are more likely to develop post-streptococcal glomerulonephritis than are adults, and they're also more likely to recover quickly.
- **Bacterial endocarditis.** Bacterial endocarditis is an infection of the inner lining of your heart's chambers and valves. It isn't clear whether the inflammation in the kidneys is the result of immune system activity alone or other factors.
- **Viral kidney infections.** Viral infections of the kidney, such as hepatitis B and hepatitis C, cause inflammation of the glomeruli and other kidney tissues.
- **HIV.** Infection with HIV, the virus that causes AIDS, can lead to glomerulonephritis and progressive kidney damage, even before the onset of AIDS.

Autoimmune diseases

Autoimmune diseases are illnesses caused by the immune system attacking healthy tissues. Autoimmune diseases that may cause glomerulonephritis include:

- **Lupus.** A chronic inflammatory disease, systemic lupus erythematosus can affect many parts of your body, including your skin, joints, kidneys, blood cells, heart and lungs.
- **Goodpasture's syndrome.** In this rare disorder, also known as anti-GBM disease, the immune system creates antibodies to tissues in the lungs and kidneys. It can cause progressive and permanent damage to the kidneys.

- **IgA nephropathy.** Immunoglobulin A (IgA) is an antibody that's a first line of defense against infectious agents. IgA nephropathy occurs when deposits of the antibody accumulate in the glomeruli. The inflammation and subsequent damage may go undetected for a long time. The most common symptom is blood in the urine.

Vasculitis

Vasculitis is inflammation of blood vessels. Types of vasculitis that can cause glomerulonephritis include:

- **Polyarteritis.** This form of vasculitis affects medium and small blood vessels in many parts of your body, including the kidneys, skin, muscles, joints and digestive tract.
- **Granulomatosis with polyangiitis.** This form of vasculitis, formerly known as Wegener's granulomatosis, affects small and medium blood vessels in your lungs, upper airways and kidneys.

Sclerotic conditions

Some diseases or conditions cause scarring of the glomeruli that results in poor and declining kidney function. These include:

- **High blood pressure.** Long-term, poorly managed high blood pressure can cause scarring and inflammation of the glomeruli. Glomerulonephritis inhibits the kidney's role in regulating blood pressure.
- **Diabetic kidney disease (diabetic nephropathy).** High blood sugar levels contribute to scarring of the glomeruli and increase the rate of blood flow through the nephrons.
- **Focal segmental glomerulosclerosis.** In this condition, scarring is scattered among some of the glomeruli. This may be the result of another disease, or it may occur for no known reason.

Complications

Glomerulonephritis affects the ability of nephrons to filter the bloodstream efficiently. The breakdown in filtering results in:

- Accumulation of wastes or toxins in the bloodstream.
- Poor regulation of essential minerals and nutrients.
- Loss of red blood cells.
- Loss of blood proteins.

Possible complications of glomerulonephritis include:

- **Acute kidney failure.** Acute kidney failure is the sudden, rapid decline in kidney function, often associated with an infectious cause of glomerulonephritis. The accumulation of waste and fluids can be life-threatening if not treated promptly with an artificial filtering machine (dialysis). The kidneys often resume typical function after recovery.
- **Chronic kidney disease.** Persistent inflammation results in long-term damage and declining function of the kidneys. Chronic kidney disease is generally defined as kidney damage or decreased function for three or more months. Chronic kidney disease may advance to end-stage kidney disease, which requires either dialysis or a kidney transplant.
- **High blood pressure.** Damage to the glomeruli from inflammation or scarring can lead to increased blood pressure.

- **Nephrotic syndrome.** Nephrotic syndrome is a condition in which there is too much blood protein in urine and too little in the bloodstream. These proteins play a role in regulating fluids and cholesterol levels. A drop in blood proteins results in high cholesterol, high blood pressure and swelling (edema) of the face, hands, feet and abdomen. In rare instances, nephrotic syndrome may cause a blood clot in a kidney blood vessel.

Prevention

There may be no way to prevent some forms of glomerulonephritis. However, here are some steps that might be beneficial:

- Seek prompt treatment of a strep infection with a sore throat or impetigo.
- To prevent infections that can lead to some forms of glomerulonephritis, such as HIV and hepatitis, follow safe-sex guidelines and avoid intravenous drug use.
- Control high blood pressure, which lessens the likelihood of damage to your kidneys from hypertension.
- Control your blood sugar to help prevent diabetic nephropathy.

Diagnosis

Glomerulonephritis may be identified with tests if you have an acute illness or during routine testing during a wellness visit or an appointment managing a chronic disease, such as diabetes. Tests to assess your kidney function and make a diagnosis of glomerulonephritis include:

Urine test

A urinalysis can reveal signs of poor kidney function, such as red blood cells and proteins that should not be in urine or white blood cells that are a sign of inflammation. There also may be a lack of the expected levels of waste products.

Blood tests

Analysis of blood samples can reveal higher than expected levels of waste products in the bloodstream, the presence of antibodies that may indicate an autoimmune disorder, bacterial or viral infection, or blood sugar levels indicating diabetes.

Imaging tests

If your doctor detects evidence of kidney disease, he or she may recommend imaging tests that may show an irregularity in the shape or size of the kidney. These tests may be an X-ray, an ultrasound exam or a CT scan.

Kidney biopsy

This procedure involves using a special needle to extract small pieces of kidney tissue to look at under a microscope. A biopsy is used to confirm a diagnosis and to assess the degree and nature of tissue damage.

Treatment

Treatment of glomerulonephritis and your outcome depend on:

- Whether you have an acute or chronic form of the disease.
- The underlying cause.
- The type and severity of your signs and symptoms.

Some cases of acute glomerulonephritis, especially those that follow an infection with streptococcal bacteria, might improve on their own and require no treatment. If there's an underlying cause — such as high blood pressure, an infection or an autoimmune disease — treatment will be directed to the underlying cause.
In general, the goal of treatment is to protect your kidneys from further damage and to preserve kidney function.

Nephrotic syndrome
Nephrotic syndrome causes your kidneys to release too much protein in your urine. Causes include kidney diseases that affect the tiny filters inside your kidneys. Symptoms include swelling, high amounts of protein in your urine and low amounts of protein in your blood. Treatment includes medications that address its underlying causes.
Nephrotic (*neff-rot-ick*) syndrome is a condition in which your kidneys release an excessive amount of protein (proteinuria) in your urine (pee).
Nephrotic syndrome usually results from a problem with your kidneys' filters (glomeruli). Glomeruli (*glo-mare-yoo-lye*) are tiny blood vessels in your kidneys. They remove wastes and excess fluids from your blood and send them to your bladder as urine. Common waste products include nitrogen waste (urea), muscle waste (creatinine) and acids.
Nephrotic syndrome is a serious condition. Without treatment, nephrotic syndrome can affect your life expectancy due to secondary complications.
Nephrotic syndrome can affect anyone. However, it's most common in people with diabetes-related kidney disease, people who have allergies and people who have a biological family history of kidney disease with nephrotic syndrome.

Some proteins help prevent blood clots. When you lose those proteins in your pee, blood clots can form.
Immunoglobulins are proteins that help your immune system fight diseases and infection. When you lose immunoglobulins, you're at a greater risk of general infections that affect different body systems, including:

- Pneumonia.
- Cellulitis.
- Peritonitis.

Symptoms

Common nephrotic syndrome symptoms include:

- Large amounts (greater than 3.5 grams) of the protein albumin in your pee (albuminuria).
- High fat and cholesterol levels in your blood (hyperlipidemia).
- Swelling (edema), usually in your legs, feet or ankles. Swelling may also occur in your hands or face.
- Low levels of albumin in your blood (hypoalbuminemia).
- Loss of appetite.
- Feeling unwell or sick.

- Abdominal pain (pain anywhere from your ribs to your pelvis).
- Foamy pee.

Another symptom of nephrotic syndrome is a loss of minerals and vitamins that are essential to your health and development, including calcium and vitamin D. In children with nephrotic syndrome, this may affect their growth. You may develop osteoporosis, which weakens your hair and nails.

Complications

The most common complications of nephrotic syndrome include:

- Acute kidney injury. Your kidney suddenly stops functioning properly.
- Anemia. You don't have enough healthy blood cells to carry oxygen to your body's organs.
- Coronary artery disease. Plaque builds up in the arteries that supply blood to your heart.
- Hypertension (high blood pressure). The blood that flows through your blood vessels travels with a greater force than usual.
- Hypothyroidism. Your thyroid gland doesn't produce and release enough of the thyroid hormone into your bloodstream.

Causes

Kidney diseases often damage your glomeruli. The diseases target your glomeruli, though healthcare providers and medical researchers aren't sure why. Damaged glomeruli are the primary cause of nephrotic syndrome. These diseases include:

- **Amyloidosis**. This is a disease in which amyloid proteins build up in your vital organs. Amyloidosis most commonly occurs in your kidneys, affecting their ability to filter.
- **Diabetes-related nephropathy**. "Nephropathy" means that your kidney isn't working properly. In diabetes-related nephropathy, diabetes causes damage or dysfunction to one or more of the nerves in your kidneys. It typically causes numbness, tingling, muscle weakness and pain in your affected area.
- **Focal segmental glomerulosclerosis (FSGS)**. In FSGS, scarring affects small areas (segments) of some of your glomeruli. It may cause swelling, kidney failure and loss of proteins in your pee.
- **Lupus**. Lupus is an autoimmune disease that causes inflammation, swelling and pain throughout your body, including your kidneys.
- **Membranous nephropathy**. In membranous nephropathy, your body's immune system attacks the filtering membranes in your kidneys.
- **Minimal change disease (MCD)**. This is a type of nephropathy in which your kidneys aren't working properly. However, a kidney biopsy shows little or no damage to your glomeruli or kidney tissue. MCD may occur at any age, but it's most common in children.

Diagnosis

The following tests and procedures help diagnose nephrotic syndrome:

Urinalysis tests

A urinalysis (urine test) examines the visual, chemical and microscopic aspects of your pee. Your healthcare provider may recommend a few different types of urinalysis tests.

During a dipstick test, you'll pee into a special container at your healthcare provider's office or a hospital. Then, a healthcare provider will place a strip of paper coated with special chemicals (dipstick) into the container. The dipstick will change color if there's albumin in your pee.

If your healthcare provider needs a more precise measurement, they may recommend urine protein tests. Urine protein tests may include a single urine sample or a 24-hour collection of urine.

In a single urine sample, your container is sent to a lab. Lab technicians compare how much albumin and creatinine are in your pee (albumin-to-creatinine ratio). If your urine sample has more than 30 milligrams (mg) of albumin for each gram of creatinine, it may signal a problem.

In a 24-hour urine collection, your healthcare provider will give you a container to collect your pee from home. On the day of the test, you'll:

- Pee in the toilet as usual when you first wake up.
- Pee in the container the rest of the day until you go to sleep.
- Pee in the container one last time when you first wake up the following day.

You'll then drop your sample off at your healthcare provider's office or a lab. Lab technicians will only measure the amount of albumin in your sample.

Blood tests

During an albumin blood test, your healthcare provider will use a thin needle to withdraw a small amount of blood from a vein in your arm. The blood sample goes to a lab for testing. A low level of albumin or other proteins may indicate nephrotic syndrome.

Lab technicians may also test your blood cholesterol and blood triglyceride levels. Those levels may increase if your blood albumin level is low.

Kidney biopsy

During a kidney biopsy, your healthcare provider will remove a small piece of your kidney tissue to examine at a lab under a microscope.

Your healthcare provider will first numb the area with a local anesthetic so you won't feel any pain. They'll also give you a light sedative to help you relax. Then, they'll insert a needle through your skin and into your kidney to collect the tissue sample.

If you have diabetes and your healthcare provider suspects you have nephrotic syndrome, you likely won't need a kidney biopsy. Your medical history, urine tests and blood tests are often enough to help them diagnose nephrotic syndrome as a result of your diabetes.

Treatment

Treatment helps relieve your nephrotic syndrome symptoms and prevents further damage to your kidneys.

Nephrotic syndrome treatment includes addressing the underlying cause and taking steps to reduce high blood pressure, high cholesterol, swelling and infection risks. Treatment usually includes medications and changes to your diet.

Some blood pressure medications can slow down a kidney disease that causes nephrotic syndrome, including:

- Angiotensin-converting enzyme (ACE) inhibitors.
- Angiotensin receptor blockers (ARBs).

These medications reduce the pressure inside your glomeruli, which reduces albuminuria. Many people require two or more medications to regulate their blood pressure.

In addition to an ACE inhibitor or an ARB, your healthcare provider may recommend a diuretic. Diuretics help your kidneys remove fluid from your blood. Diuretics also help reduce blood pressure and swelling. Other medications that help lower your blood pressure include beta-blockers and calcium channel blockers.

To lower your cholesterol, your healthcare provider may recommend statin medications.

Gastric Function Test

The healthy functioning of our digestive system is very important for the body. Our stomach is a reservoir of ingested food, and it is through digestion that food breaks down and becomes a source of nourishment. One of the tests which are done to get evaluate how well the digestive system is functioning is the gastric function test. The test is done to assess the acid secretory potential of the stomach by evaluating gastric juices the body produces. The tests help to diagnose chronic problems such as diarrhea, constipation, bloating, and other gastrointestinal disorders.

Gastric juices are nothing but a variable mixture of water, hydrochloric acid, electrolytes, and mucus. They are clear, pale yellow, odorless fluids with acidic pH of around 1 and a gravity of approximately 1.007. The test is done through qualitative measures such as checking color, odor, and appearance and quantitative measures which implies estimating free and total acidity levels and chlorides.

Gastric fluids have various functions to perform. While these secretions contribute to protein digestion, gastric acidity improves the absorption of iron besides facilitating the dissociation of iron salts from the consumed food. Gastric acid also allows the formation of complexes with ascorbate and sugars which helps to enhance iron absorption by converting the gastric contents to a semi-liquid pulpy fluid (also called chyme). These juices get the food ready for further digestion which happens in the duodenum which is a part of the small intestine.

Role of Gastric Secretion

Gastric secretion is stimulated by the act of eating also called the cephalic phase and by the arrival of food in the stomach or the gastric phase. The arrival of the food in the intestine also controls gastric secretion, termed an intestinal phase. The following factors also contribute to the process of gastric secretion:

- The gastrin hormone
- Factors such as sight, taste, and smell
- In response to vagal stimulation
- Histamine is a stimulant found in some of the body's cells
- Alcohol stimulation

Types of Gastric Function Tests Fractional Test Meal

The test involves the collection of stomach contents with Ryle's tube. It is a long thin rubber tube 4 mm in diameter. It has a lead piece at the tip of the tube and perforations at a short distance away from the tip. The tube is passed into the stomach, and gastric juice is collected periodically. After the samples are thus collected, they are examined for free and total acidity.

Pentagastrin Stimulation Test

Pentagastrin is an artificial peptide that can stimulate gastric secretion. In this test, the contents of the stomach are aspirated with the Ryle's tube, collected at 15-minute intervals, and further analyzed for the next hour.

Augment Histamine Test Meal

One of the most powerful stimulants for gastric secretion, this is also aspirated at 15-minute intervals and collected for a detailed analysis. Through the test samples, the levels of acid content are measured.

Insulin Test Meal

It is mainly done to assess the results of vagotomy. Vagotomy is the process of cutting a branch of the vagus nerve to reduce stomach acid secretion. This test involves delivering electrical impulses to the vagus nerve in the brain. This is also known as Hollander's test and in this test, insulin is intravenously administered to the patient.

Tubeless Gastric Analysis

The test is helpful to ascertain the levels of gastric acidity without the use of complicated or cumbersome chemical procedures and intubation. This gastric acidity analysis is helpful to diagnose problems such as duodenal ulcers, achlorhydria, and pernicious anemia.

Test Preparation

There is no special preparation for the test besides fasting. The patient will have to fast for 12 hours overnight through the next morning till the test is completed. In most of the above types of testing, the patient is asked to swallow the bulbous end of the Ryle tube into the throat. When the first mark is at the level of the incisor teeth, the tip is at the esophagus. When the second mark is at the level of the incisor teeth, the tip has reached the stomach's pyloric region. When the third mark is at the level of the incisor teeth, the tip is at the duodenum.

Precautions and Side Effects

Though the test is an effective way to prevent an underdiagnosis of many problems such as atrophic gastritis and other gastrointestinal issues, the test can be an unpleasant experience for most patients. It can cause complications such as nausea, vomiting, and abdominal anomalies. There can be chances of pain following the removal of the gastric tube besides a potential risk of esophageal perforation.

Gastrointestinal Diseases

GERD, diarrhea and colorectal cancer are examples of gastrointestinal diseases. When examined, some diseases show nothing wrong with the GI tract, but there are still symptoms. Other diseases have symptoms, and there are also visible irregularities in the GI tract. Most gastrointestinal diseases can be prevented and/or treated.

Gastrointestinal diseases affect the gastrointestinal (GI) tract from the mouth to the anus. There are two types: functional and structural. Some examples include nausea/vomiting, food poisoning, lactose intolerance and diarrhea.

Functional Gastrointestinal Diseases

Functional diseases are those in which the GI tract looks normal when examined, but doesn't move properly. They are the most common problems affecting the GI tract (including the colon and rectum). Constipation, irritable bowel syndrome (IBS), nausea, food poisoning, gas, bloating, GERD and diarrhea are common examples.

Many factors may upset your GI tract and its motility (ability to keep moving), including:

- Eating a diet low in fiber.
- Not getting enough exercise.
- Traveling or other changes in routine.
- Eating large amounts of dairy products.
- Stress.
- Resisting the urge to have a bowel movement, possibly because of hemorrhoids.
- Overusing anti-diarrheal medications that, over time, weaken the bowel muscle movements called motility.
- Taking antacid medicines containing calcium or aluminum.
- Taking certain medicines (especially antidepressants, iron pills and strong pain medicines such as narcotics).
- Pregnancy.

Structural Gastrointestinal Diseases

Structural gastrointestinal diseases are those where your bowel looks abnormal upon examination and also doesn't work properly. Sometimes, the structural abnormality needs to be removed surgically. Common examples of structural GI diseases include strictures, stenosis, hemorrhoids, diverticular disease, colon polyps, colon cancer and inflammatory bowel disease.

Constipation

Constipation, which is a functional problem, makes it hard for you to have a bowel movement (or pass stools), the stools are infrequent (less than three times a week), or incomplete. Constipation is usually caused by inadequate "roughage" or fiber in your diet, or a disruption of your regular routine or diet.

Constipation causes you to strain during a bowel movement. It may cause small, hard stools and sometimes anal problems such as fissures and hemorrhoids. Constipation is rarely the sign that you have a more serious medical condition.

You can treat your constipation by:

- Increasing the amount of fiber and water to your diet.
- Exercising regularly and increasing the intensity of your exercises as tolerated.
- Moving your bowels when you have the urge (resisting the urge causes constipation).

If these treatment methods don't work, laxatives can be added. Note that you should make sure you are up to date with your colon cancer screening. Always follow the instructions on the laxative medicine, as well as the advice of your healthcare provider.

Irritable bowel syndrome (IBS)

Irritable bowel syndrome (also called spastic colon, irritable colon, IBS, or nervous stomach) is a functional condition where your colon muscle contracts more or less often than "normal." Certain foods, medicines and emotional stress are some factors that can trigger IBS.

Symptoms of IBS include:

- Abdominal pain and cramps.
- Excess gas.
- Bloating.
- Change in bowel habits such as harder, looser, or more urgent stools than normal.
- Alternating constipation and diarrhea.

Treatment includes:

- Avoiding excessive caffeine.
- Increasing fiber in your diet.
- Monitoring which foods trigger your IBS (and avoiding these foods).
- Minimizing stress or learning different ways to cope with stress.
- Taking medicines as prescribed by your healthcare provider.
- Avoiding dehydration, and hydrating well throughout the day.
- Getting high quality rest/sleep.

Gastritis

Gastritis is a general term for a group of conditions with one thing in common: Inflammation of the lining of the stomach. The inflammation of gastritis is most often the result of infection with the same bacterium that causes most stomach ulcers or the regular use of certain pain relievers. Drinking too much alcohol also can contribute to gastritis. Gastritis may occur suddenly (acute gastritis) or appear slowly over time (chronic gastritis). In some cases, gastritis can lead to ulcers and an increased risk of stomach cancer. For most people, however, gastritis isn't serious and improves quickly with treatment.

Symptoms

Gastritis doesn't always cause symptoms. When it does, the symptoms of gastritis may include:

- Gnawing or burning ache or pain, called indigestion, in your upper belly. This feeling may become either worse or better after eating.
- Nausea.
- Vomiting.
- A feeling of fullness in your upper abdomen after eating.