

# The Liver

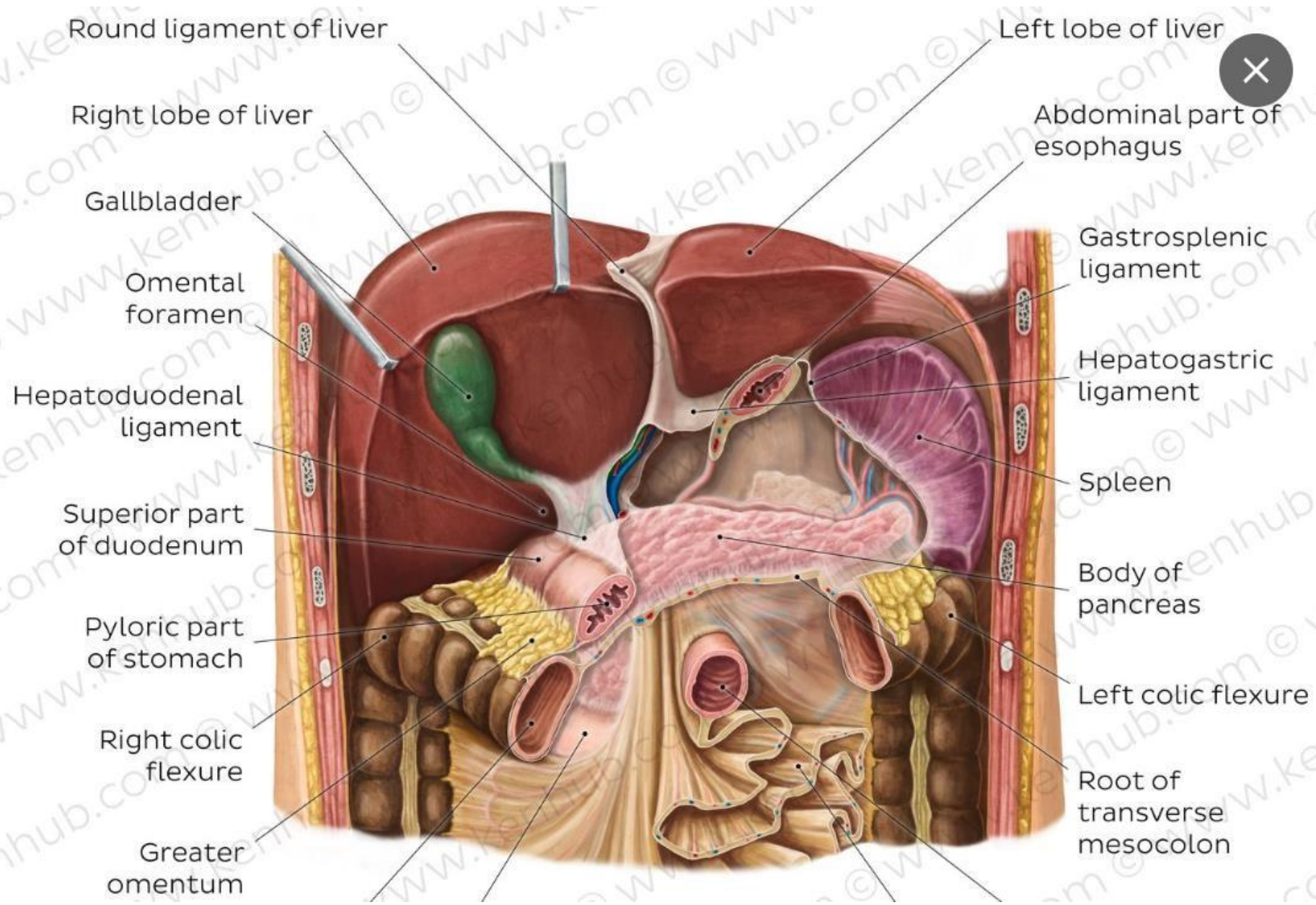
# Anatomy of the Liver

Is a reddish-brown, wedge-shaped organ with two lobes of unequal size and shape.

A human liver normally weighs approximately 1.5 kg and has a width of about 15 cm .

It is both the heaviest internal organ and the largest gland in the human body.

Located in the right upper quadrant of the abdominal cavity, it rests just below the diaphragm, to the right of the stomach and overlies the gallbladder.



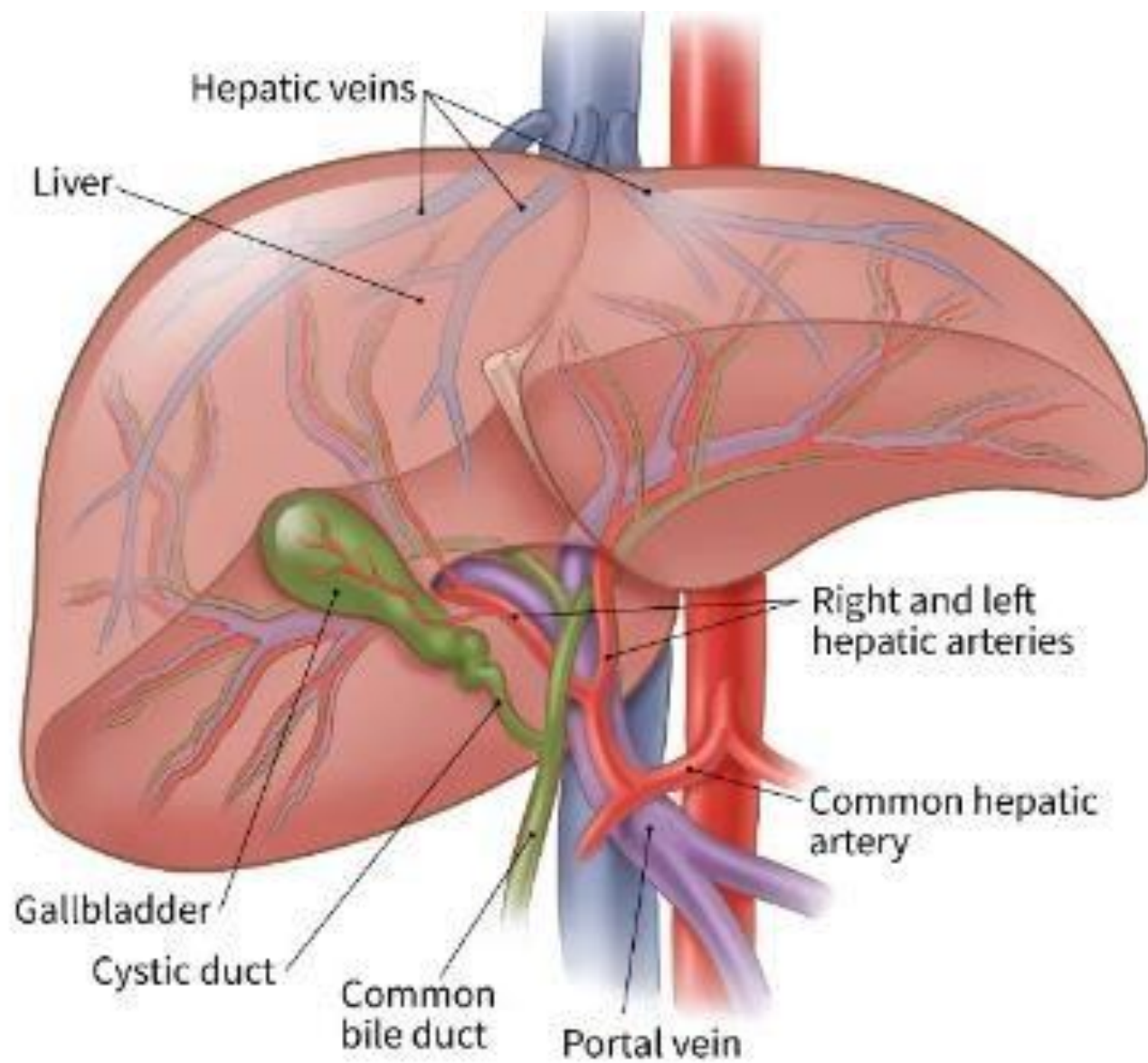
# Blood Supply

The liver is connected to two large blood vessels: **the hepatic artery and the portal vein.**

**The hepatic artery** carries oxygen-rich blood from the aorta via the celiac trunk.

**The portal vein** carries blood rich in digested nutrients from the entire gastrointestinal tract and also from the spleen and pancreas.

These blood vessels subdivide into small capillaries known as **liver sinusoids**, which then lead to lobules.



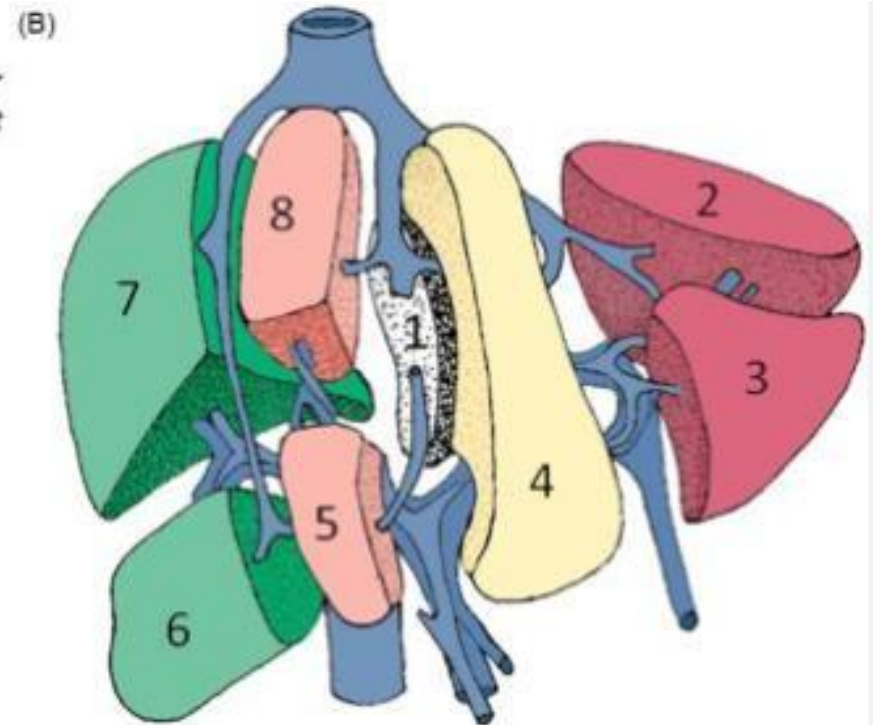
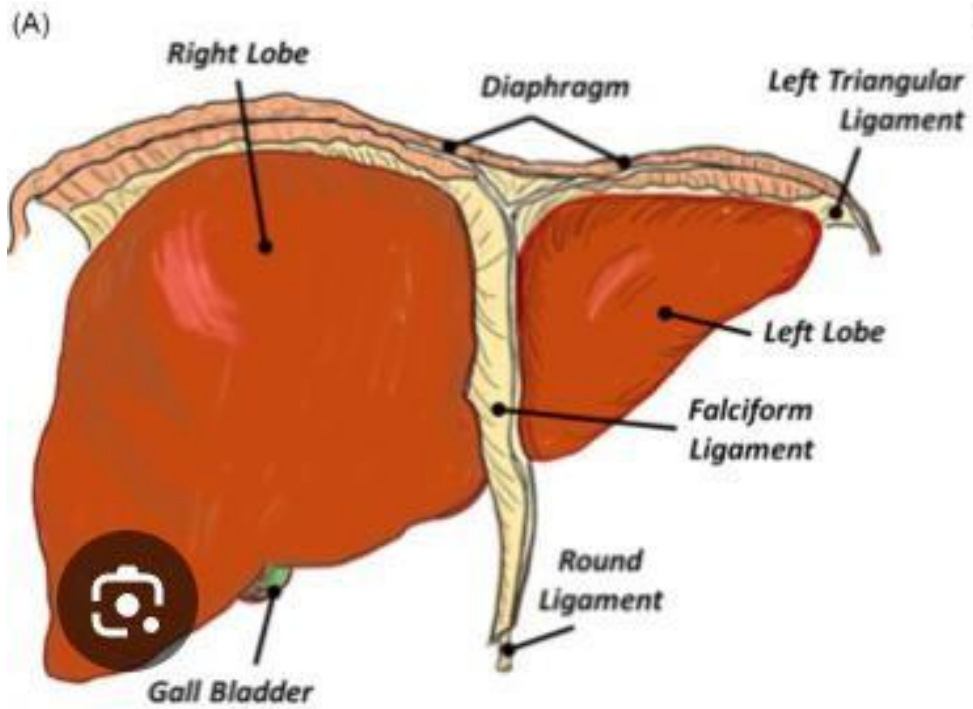
# Liver Anatomy

The human liver is divided grossly into four parts or lobes. **The four lobes are** the right lobe, the left lobe, the caudate lobe, and the quadrate lobe.

The two smaller lobes, the caudate lobe and the quadrate lobe, are known as superficial or accessory lobes, and both are located on the underside of the right lobe.

Other anatomical landmarks exist, such as the **ligamentum venosum and the round ligament of the liver (ligamentum teres), the porta hepatis, .**





# Liver Lobules

Lobules are **the functional units** of the liver. Each lobule is made up of millions of hepatic cells (hepatocytes), which are the basic metabolic cells.

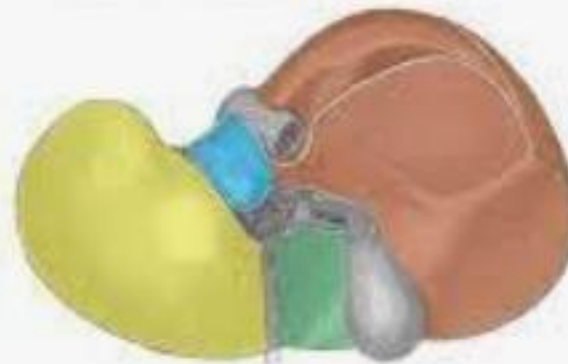
The lobules are held together by a fine, dense, irregular, fibroelastic connective tissue layer extending from the fibrous capsule covering the entire liver known as **Glisson's capsule**.



**Superior Surface**



**Inferior Surface**



- Left
- Right
- Caudate
- Quadrate

# The biliary tract

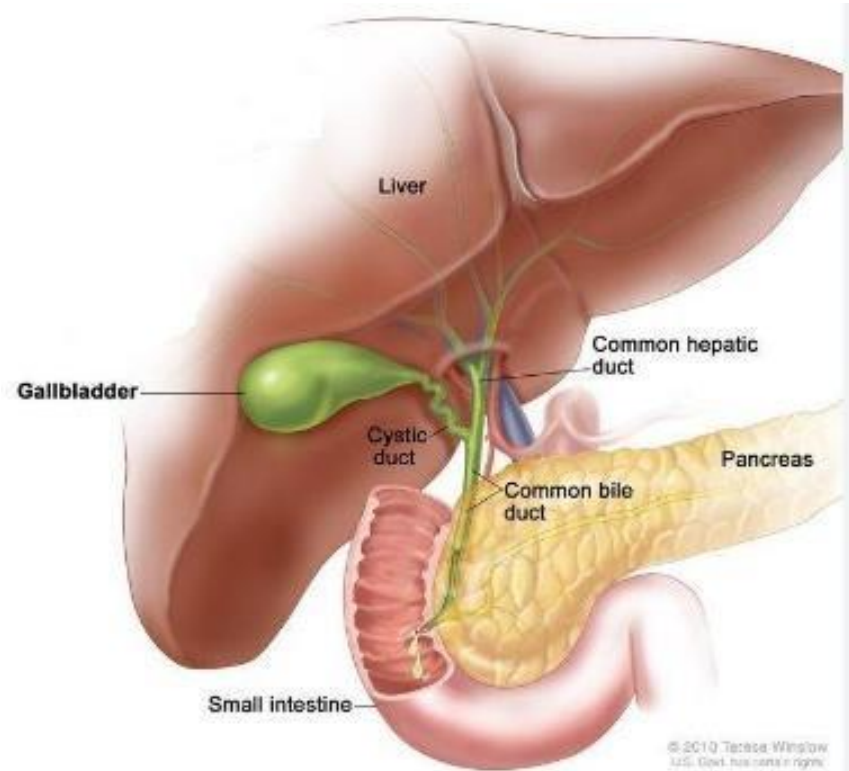
Is derived from the branches of **the bile ducts**.

The biliary tract, also known as the **biliary tree**, is the path by which bile is secreted by the liver then transported to the first part of the small intestine, the duodenum.

**The intrahepatic ducts** eventually drain into the right and left hepatic ducts, which exit the liver at the transverse fissure, and merge to form the **common hepatic duct**.

**The cystic duct** from the gallbladder joins with the common hepatic duct to form the common bile duct.

The common bile duct and the pancreatic duct enter the second part of the duodenum together at the hepatopancreatic ampulla, also known as the **ampulla of Vater**.



# Functions of the liver

The various functions of the liver are carried out by the liver cells or hepatocytes.

1-Carbohydrate metabolism

2-Protein metabolism

3-Lipid metabolism

4-Storage: The liver stores a multitude of substances, including vitamin A (1–2 years' supply), vitamin D (1–4 months' supply), vitamin B12 (3–5 years' supply), vitamin K, vitamin E, iron, copper, zinc, cobalt, molybdenum, etc.

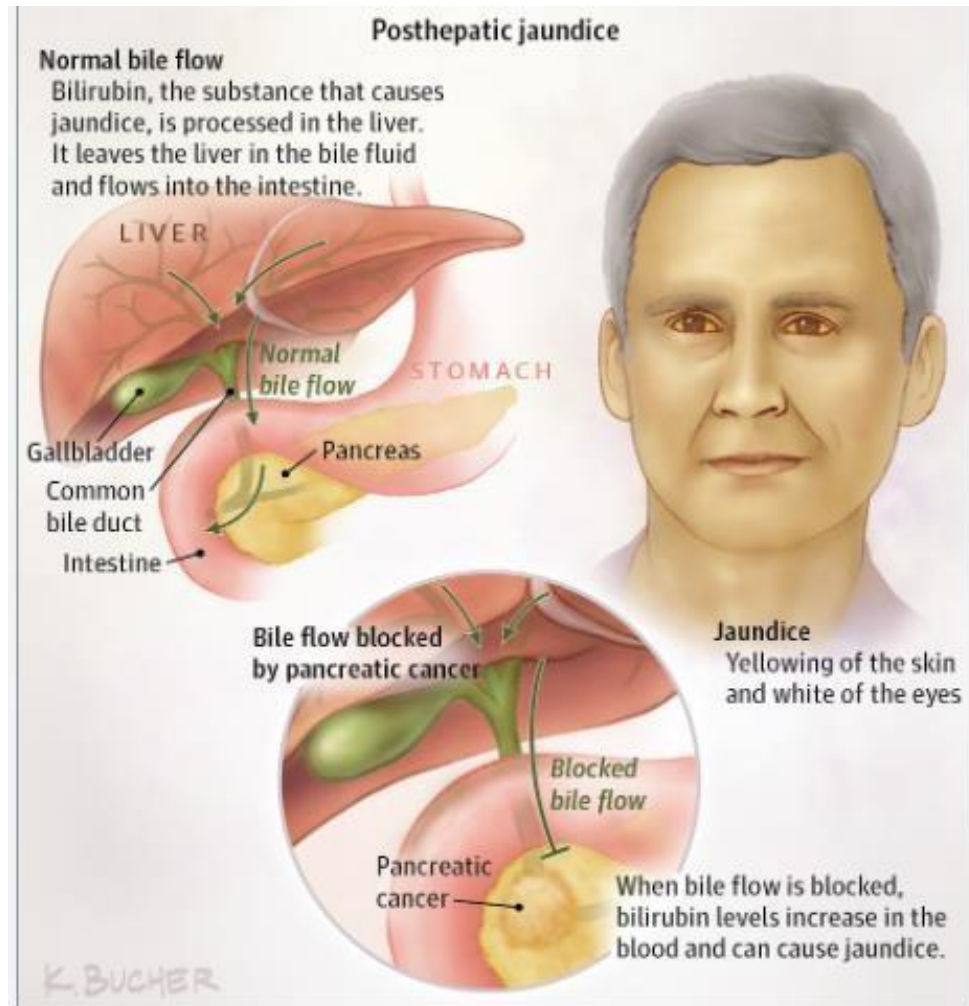
5- Albumin production

6- Detoxication. of hydrogen peroxide, a toxic oxidising agent, into water and oxygen.

# Obstructive Jaundice

The bilirubin results from the breakup of the hemoglobin of dead red blood cells.

Obstructive jaundice is caused by a blockage of bile ducts that transport bile containing conjugated bilirubin out of the liver for excretion.



# Jaundice

This is a list of conditions that can cause posthepatic jaundice:

**Choledocholithiasis** (common bile duct gallstones). It is the most common cause of obstructive jaundice.

**Pancreatic cancer of the pancreatic head**

**Biliary tract strictures**

**Primary biliary cholangitis**

**Cholestasis of pregnancy**

**Acute Pancreatitis**



# Symptoms

**The classic symptoms of liver damage include the following:**

- 1-Pale stools.
- 2-Dark urine occurs when bilirubin mixes with urine
- 3-Jaundice (yellow skin and/or whites of the eyes) This is where bilirubin deposits in skin, causing an intense itch.
- 4-Itching is the most common complaint by people who have liver failure. Often this itch cannot be relieved by drugs.
- 5-Swelling of the abdomen, and swelling of the ankles and feet occurs because the liver fails to make albumin.
- 6-Excessive fatigue occurs from a generalized loss of nutrients, minerals and vitamins.
- 7-Bruising and easy bleeding are other features of liver disease.
- 8-Pain in the upper right quadrant



# Diagnosis

The diagnosis of liver disease is made by liver function tests, groups of blood tests, that can readily show the extent of liver damage.

If infection is suspected, then other serological tests will be carried out.

A physical examination of the liver can only reveal its size and any tenderness.

# Imaging

**Ultrasound** is very important test to detect

Texture of the liver

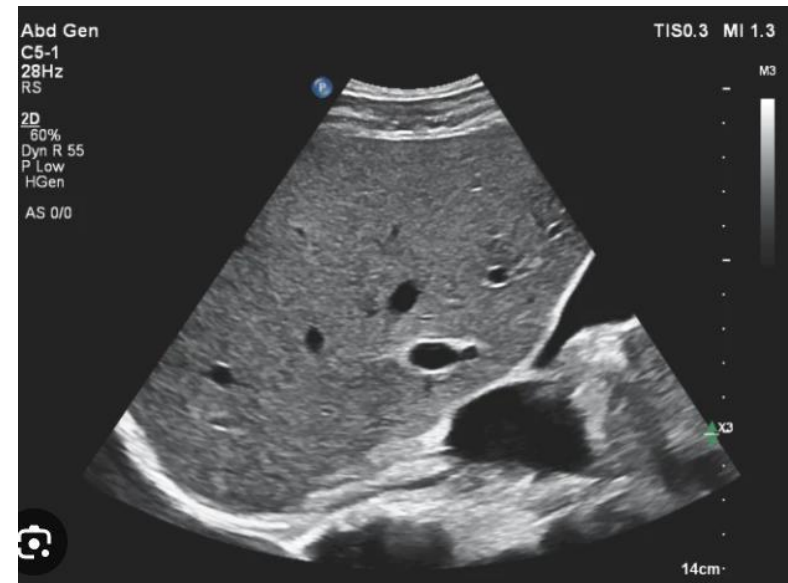
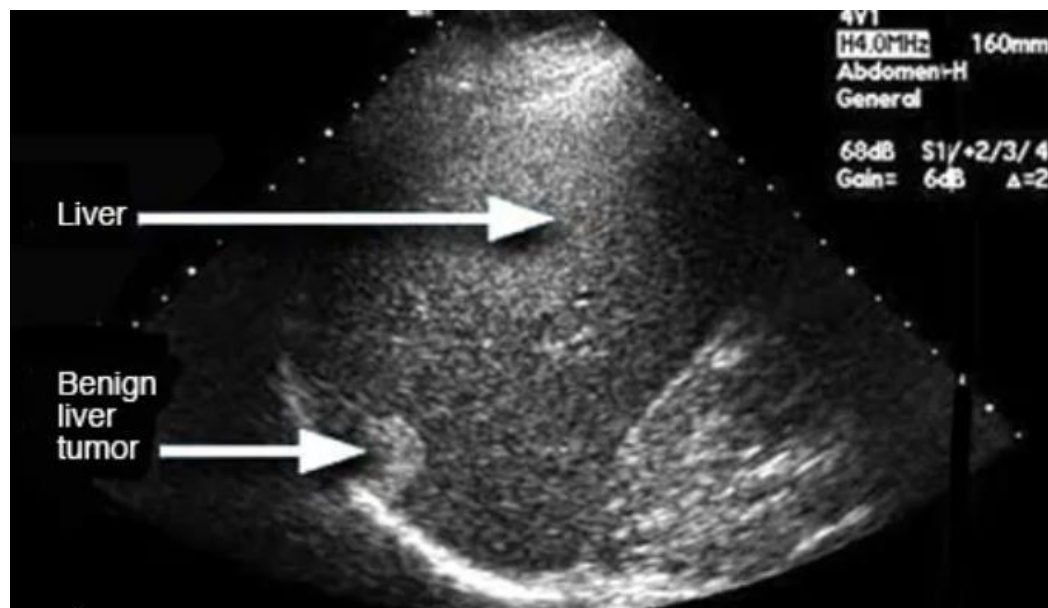
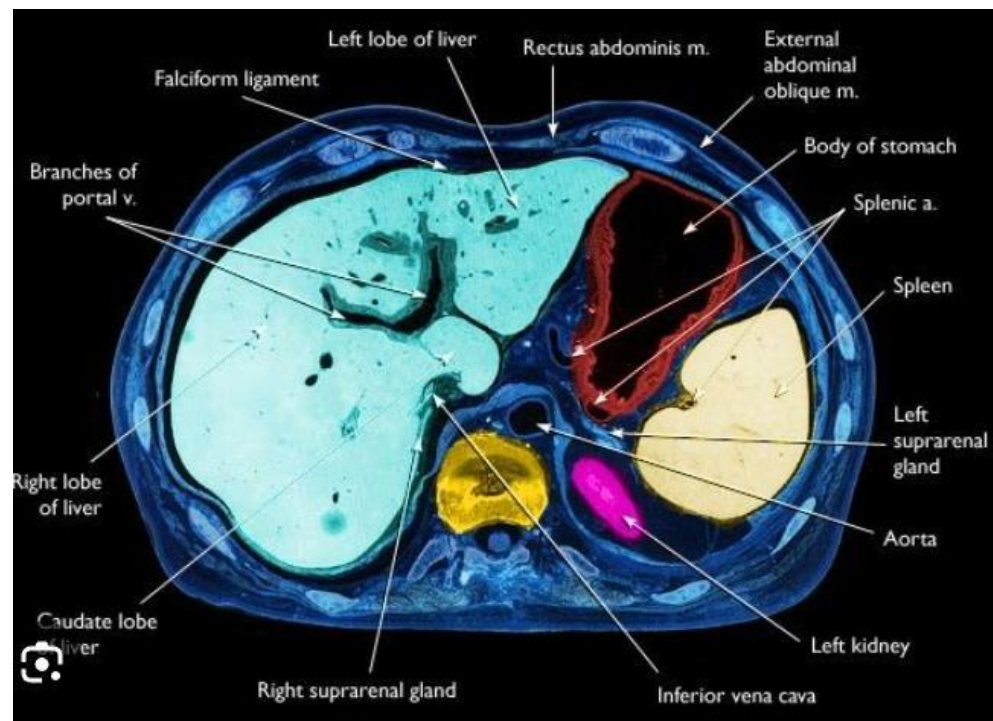
Masses or tumors

Abscess or cystic changes

Biliary duct diseases

**CT scan** may also be needed either with or without contrast.

**Sometimes a liver biopsy** will be necessary, and a tissue sample is taken through a needle inserted into the skin just below the rib cage.



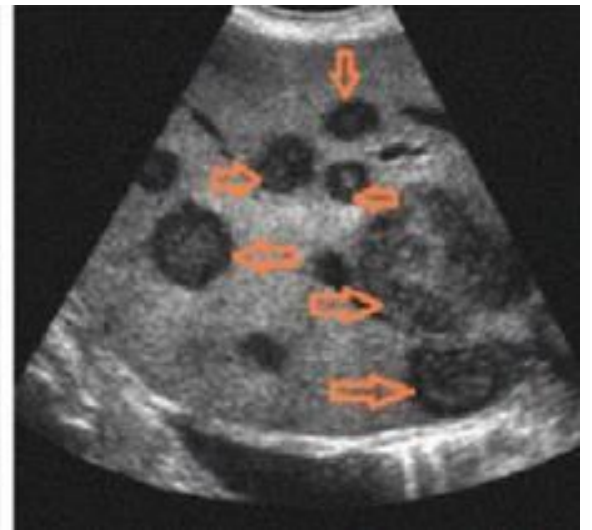
# Liver Cancer

Liver cancer (also known as hepatic cancer, primary hepatic cancer, or primary hepatic malignancy) is cancer that starts in the liver. Liver cancer can be **primary** (starts in liver) or secondary (meaning cancer which has spread from elsewhere to the liver, known as liver metastasis). **Liver metastasis** is more common than that which starts in the liver. Liver cancer is increasing globally.

The leading cause of liver cancer is cirrhosis due to hepatitis B, hepatitis C or alcohol.

The most common types are hepatocellular carcinoma (HCC), which makes up 80% of cases and intrahepatic cholangiocarcinoma.

The diagnosis may be supported by blood tests and medical imaging, with confirmation by tissue biopsy.

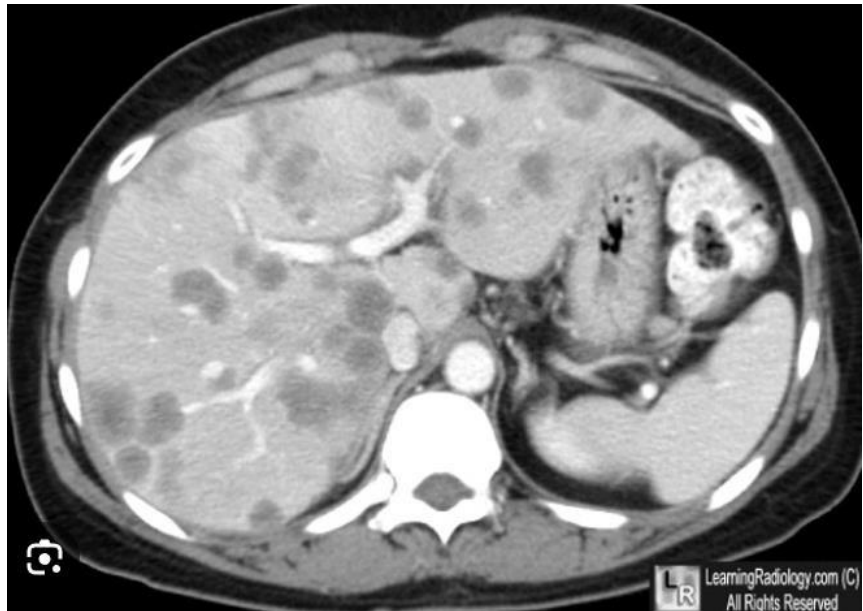
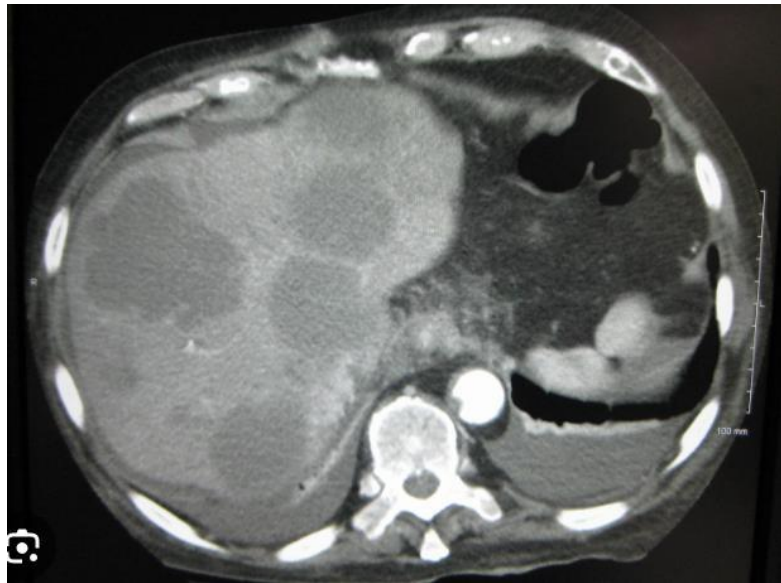


# Metastasis To Liver

Many cancers found in the liver are not true liver cancers but are cancers from other sites in the body that have spread to the liver (known as metastases).

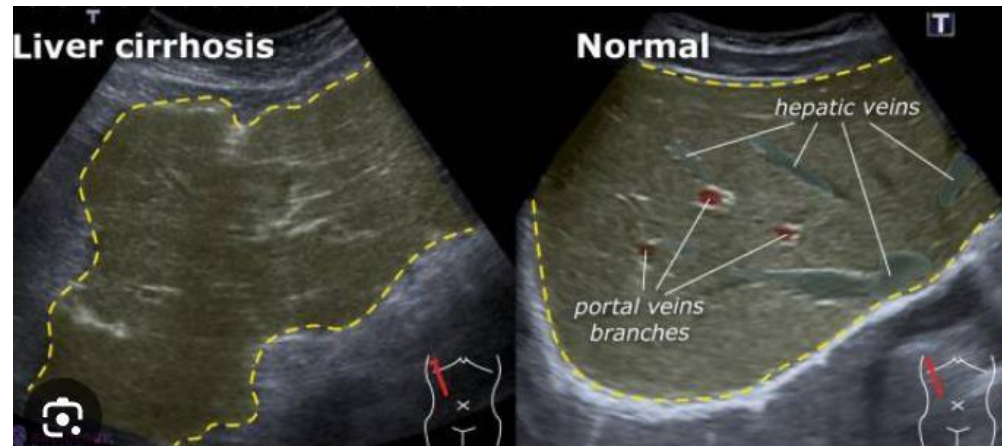
Frequently, the site of origin is the gastrointestinal tract, since the liver is close to many of these metabolically active, blood-rich organs near to blood vessels and lymph nodes (such as pancreatic cancer, stomach cancer, colon cancer and carcinoid tumors mainly of the appendix), but also from breast cancer, ovarian cancer, lung cancer, renal cancer, prostate cancer.





# Cirrhosis

liver cirrhosis or hepatic cirrhosis, and end-stage liver disease, is the impaired liver function caused by the formation of scar tissue known as fibrosis due to damage caused by liver disease, Damage causes tissue repair and subsequent formation of scar tissue, which over time can replace normal functioning tissue, leading to the impaired liver function of cirrhosis.





# Symptoms of Liver Cirrhosis

The disease typically develops slowly over months or years. Early symptoms may include tiredness, weakness, loss of appetite, unexplained weight loss, nausea and vomiting, and discomfort in the right upper quadrant of the abdomen.

As the disease worsens, symptoms may include itchiness, swelling in the lower legs, fluid build-up in the abdomen, jaundice, bruising easily, and the development of spider-like blood vessels in the skin.

The fluid build-up in the abdomen may become spontaneously infected.

More serious complications include hepatic encephalopathy, bleeding from dilated veins in the esophagus, stomach, or intestines, and liver cancer.

# Causes Of Liver Cirrhosis

Cirrhosis is most commonly caused by:

Chronic hepatitis B, and chronic hepatitis C.

Heavy drinking over a number of years can cause alcoholic liver disease.

Autoimmune hepatitis.

Primary biliary cholangitis.

Primary sclerosing cholangitis that disrupts bile duct function.  
genetic disorders such as Wilson's disease and hereditary hemochromatosis.

Chronic heart failure with liver congestion.

Diagnosis is based on blood tests, medical imaging, and liver biopsy.

# Portal Hypertension

Portal hypertension is abnormally increased portal venous pressure – blood pressure in the portal vein and its branches, that drain from most of the intestine to the liver.

Portal hypertension is defined as a hepatic venous pressure gradient greater than 5 mmHg. Cirrhosis (a form of chronic liver failure) is the most common cause of portal hypertension.



# Complications

**Signs and symptoms of portal hypertension include:**

**Lower esophageal varicosis** that may enlarge and perforate leading to severe bleeding

**Ascites** (free fluid in the peritoneal cavity)

**Abdominal pain or tenderness** (when bacteria infect the ascites, as in spontaneous bacterial peritonitis).

**Increased spleen size** (splenomegaly), which may lead to lower platelet counts (thrombocytopenia).

# Liver abscess

A liver abscess is a mass filled with pus inside the liver.

Common causes are abdominal conditions such as appendicitis or diverticulitis due to haematogenous spread through the portal vein. It can also develop as a complication of a liver injury.



# Hydatid Cyst

Echinococcosis is a parasitic disease of tapeworms of the Echinococcus type.

The disease often starts without symptoms and this may last for years.

The symptoms and signs that occur depend on the cyst's location and size.

It can spread to other parts of the body, such as the lungs or brain.

When the liver is affected, the patient may experience abdominal pain, weight loss, along with yellow-toned skin discoloration from developed jaundice.

# Diagnosis of Hydatid cyst

Ultrasound

computer tomography (CT)

Magnetic resonance imaging (MRI) may also be used.

