

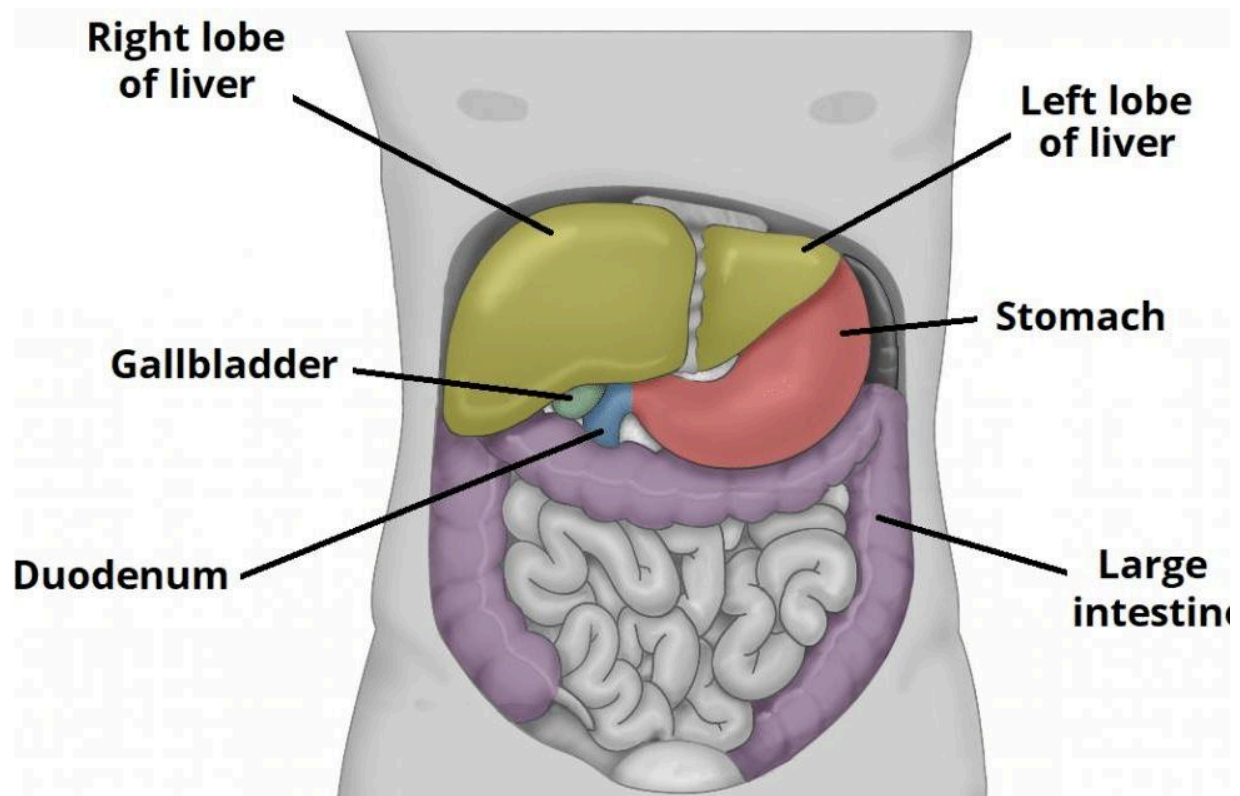
# The Liver

The liver is an organ situated within the peritoneal cavity, specifically located in the right upper quadrant of the abdomen. It stands as the largest visceral organ in this cavity and is also recognized as the most substantial gland in the human body.

Functioning as an accessory gland involved in digestion, the liver undertakes numerous roles, including the production of bile, the storage of glycogen, and the synthesis of clotting factors.

## Anatomical Position

The liver is mainly situated in the right upper quadrant and the epigastric region, with an extension into the left upper quadrant.



The liver lies in the right hypochondrium of the abdomen and is surrounded by numerous organs.

## Liver Surfaces

The anatomical surfaces of the liver are categorized based on their location and the neighboring structures. The liver possesses two distinct surfaces: the diaphragmatic surface and the visceral surface:

The diaphragmatic surface refers to the anterosuperior aspect of the liver. It is characterized by a smooth, convex shape that conforms closely to the curvature of the diaphragm. Notably, the posterior region of this surface is devoid of visceral peritoneum, allowing direct contact with the diaphragm, a feature often termed the 'bare area' of the liver.

Conversely, the visceral surface, which represents the posteroinferior aspect of the liver, is largely covered by peritoneum, except in the regions of the gallbladder fossa and the porta hepatis. This surface exhibits an irregular and flattened contour, shaped by the surrounding organs it adjoins. It establishes contact with several structures, including the right kidney, right adrenal gland, right colic flexure, transverse colon, the initial segment of the duodenum, gallbladder, esophagus, and stomach.

## **Ligaments of the Liver**

The liver is connected to adjacent anatomical structures via several ligaments, which are composed of a double layer of peritoneum.

The falciform ligament is a crescent-shaped structure that links the anterior face of the liver to the anterior abdominal wall. Its free edge houses the ligamentum teres, which is the remnant of the umbilical vein.

The coronary ligament consists of anterior and posterior folds that connect the superior surface of the liver to the inferior surface of the diaphragm, thus outlining the liver's bare area. The anterior and posterior sections converge to create the triangular ligaments associated with the right and left lobes of the liver.

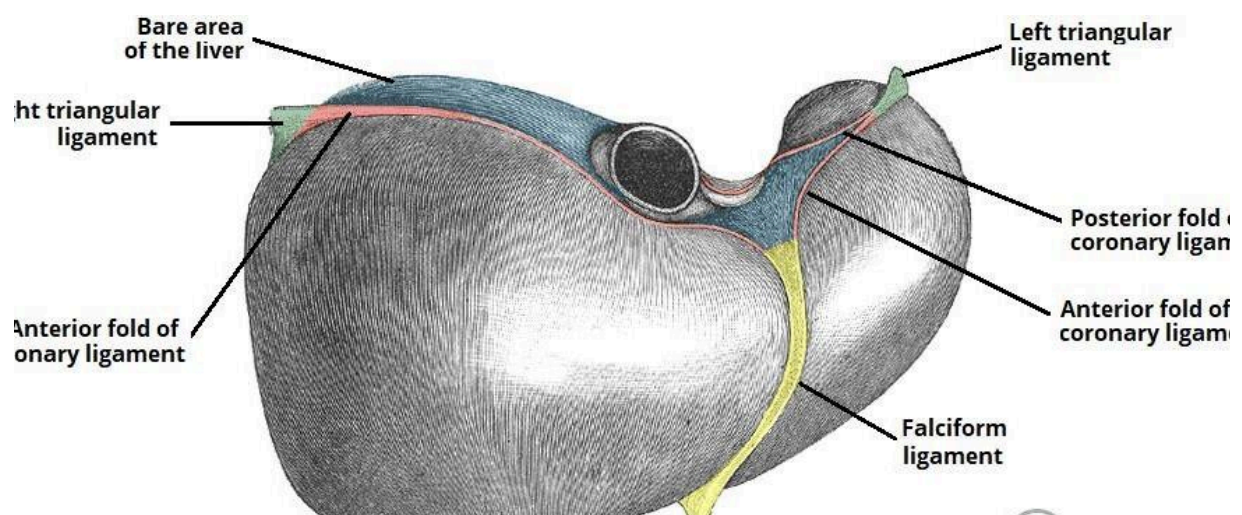
The triangular ligaments are of two types:

The left triangular ligament is formed by the convergence of the anterior and posterior aspects of the coronary ligament at the liver's apex, anchoring the left lobe to the diaphragm.

The right triangular ligament forms similarly on the right side near the bare area, securing the right lobe to the diaphragm.

The lesser omentum serves to attach the liver to the lesser curvature of the stomach and the initial segment of the duodenum. It comprises the hepatoduodenal ligament, which connects the duodenum to the liver, and the hepatogastric ligament, which extends from the stomach to the liver. Notably, the hepatoduodenal ligament encases the portal triad.

Furthermore, the liver's posterior aspect is anchored to the inferior vena cava through hepatic veins and fibrous connective tissue.



The diaphragmatic aspect of the liver displays the three primary ligaments. The liver's bare area is situated between the anterior and posterior segments of the coronary ligament.

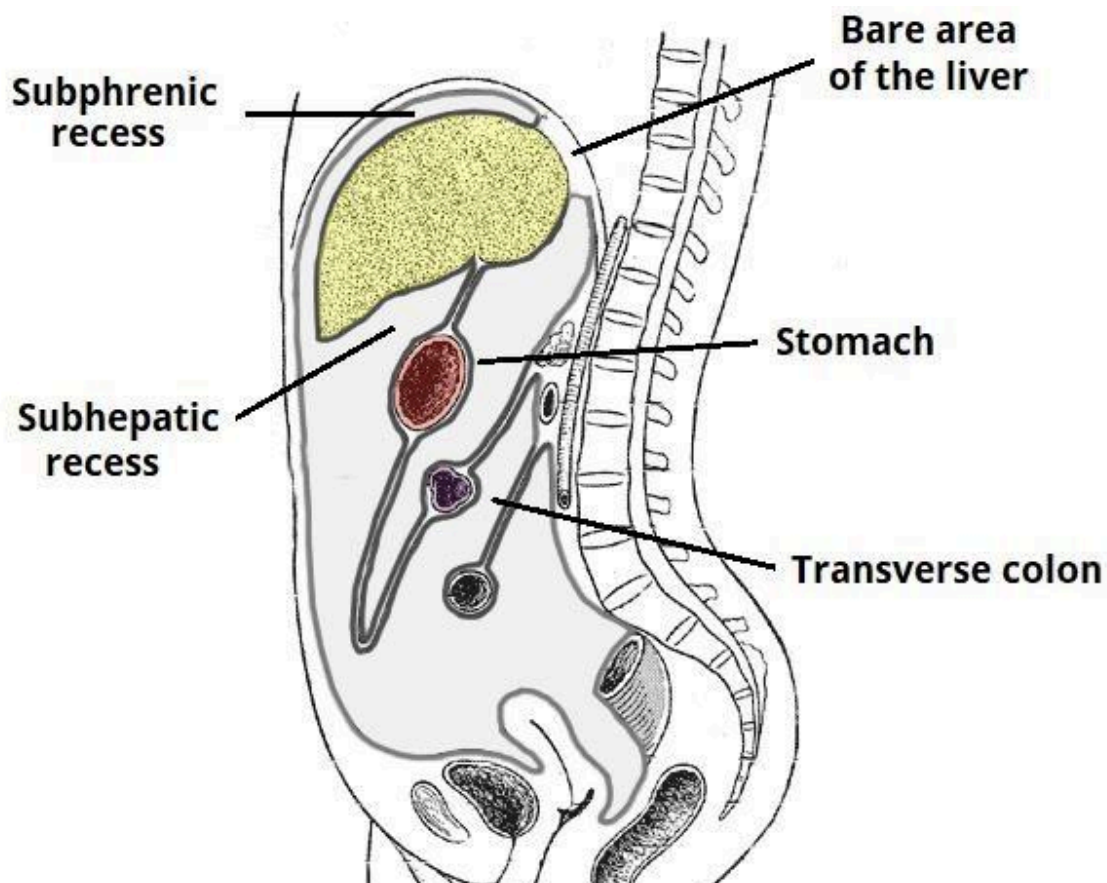
## Hepatic Recesses

The hepatic recesses refer to the anatomical spaces situated between the liver and adjacent anatomical structures. Their clinical significance lies in the fact that these areas can become sites for infections, potentially leading to the formation of abscesses.

The subphrenic spaces are positioned between the diaphragm and the anterior as well as superior borders of the liver and are demarcated into right and left compartments by the falciform ligament.

The subhepatic space, which is a part of the supracolic compartment (located above the transverse mesocolon), is the peritoneal area found between the liver's inferior surface and the transverse colon.

Morison's pouch, also known as the right subhepatic recess, is a potential space that exists between the visceral surface of the liver and the right kidney. This region represents the lowest part of the peritoneal cavity when a person is in a supine position, making it the most likely site for the accumulation of pathological abdominal fluids, such as blood or ascites, particularly in individuals who are bedridden.



The subphrenic and subhepatic recesses. Note the bare area of the liver.

## Anatomical Structure

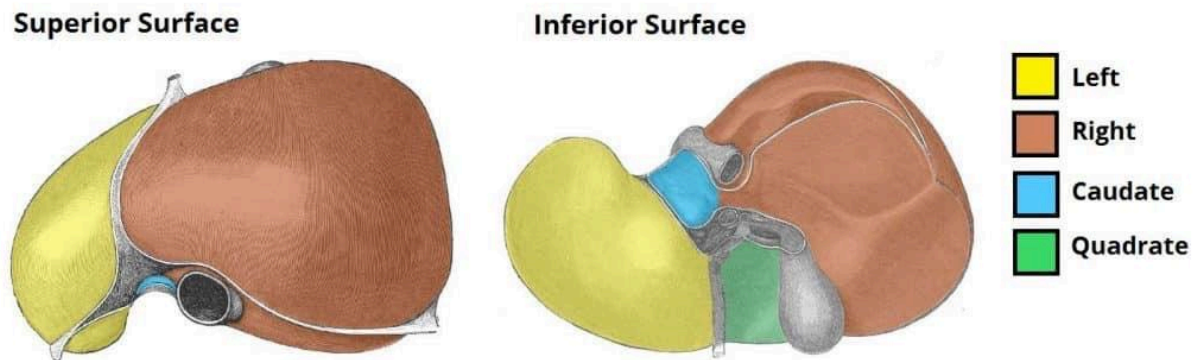
### Macroscopic

The liver is enveloped by a fibrous membrane referred to as Glisson's capsule and consists of a larger right lobe and a smaller left lobe.

In addition, two accessory lobes emerge from the right lobe, situated on the visceral surface of the liver:

1. The caudate lobe, positioned on the superior segment of the visceral surface, is situated between the inferior vena cava and a depression created by the ligamentum venosum, which is a remnant of the fetal ductus venosus.
2. The quadrate lobe, located on the inferior segment of the visceral surface, is found between the gallbladder and a recess formed by the ligamentum teres, a remnant of the fetal umbilical vein.

Separating the caudate and quadrate lobes is a pronounced transverse fissure known as the porta hepatis, which serves as a pathway for all vessels, nerves, and ducts that enter or exit the liver, excluding the hepatic veins.



The anatomical lobes of the liver.

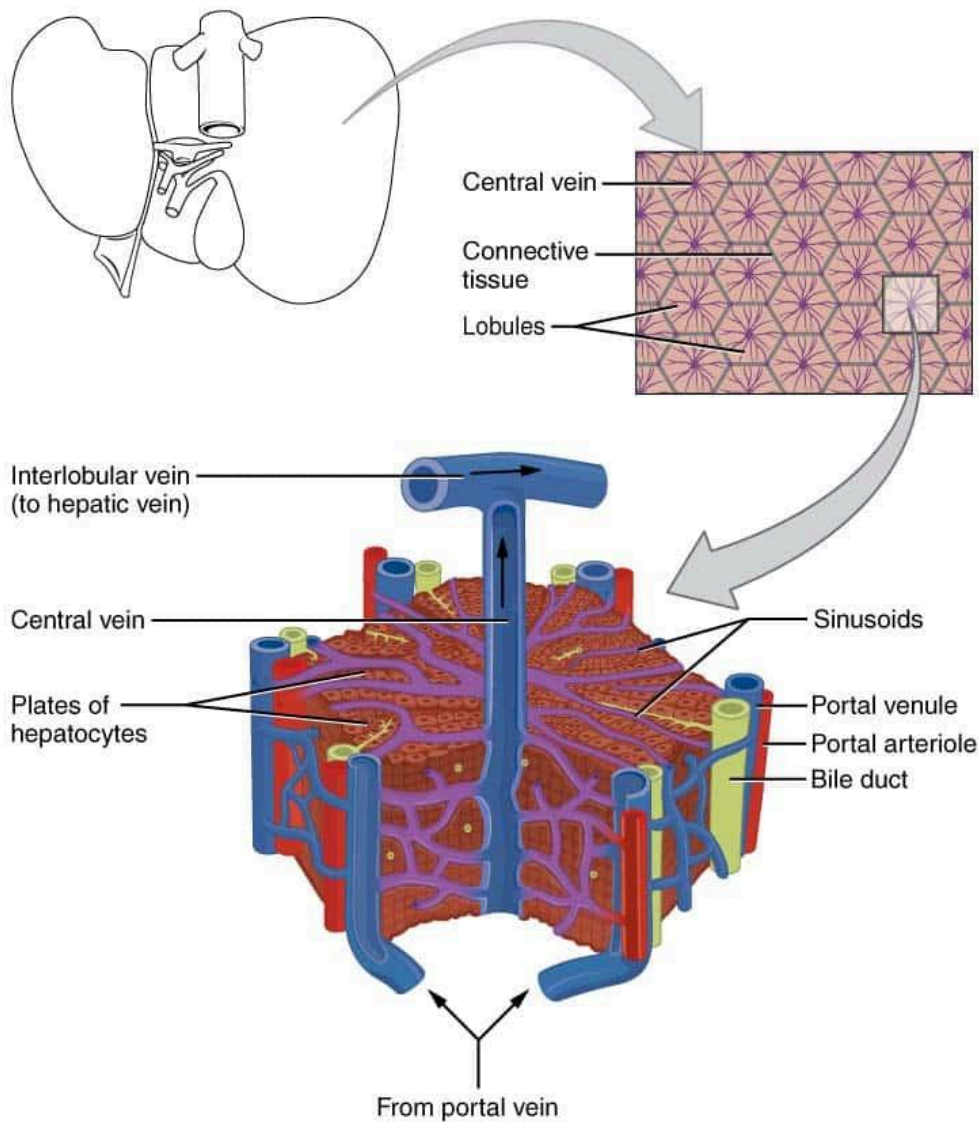
### Microscopic

At a microscopic level, liver cells, referred to as hepatocytes, are organized into functional units called lobules, which serve as the liver's structural components.

Each lobule is typically hexagonal in shape and features a central vein that facilitates drainage. Surrounding the hexagon's perimeter are three vital structures collectively termed the portal triad:

- Arteriole: a branch of the hepatic artery that supplies blood to the liver.
- Venule: a branch of the hepatic portal vein that brings blood to the liver.
- Bile duct: a structure that exits the liver, facilitating bile transport.

Additionally, the portal triad encompasses lymphatic vessels and fibers from the vagus nerve, which are part of the parasympathetic nervous system.



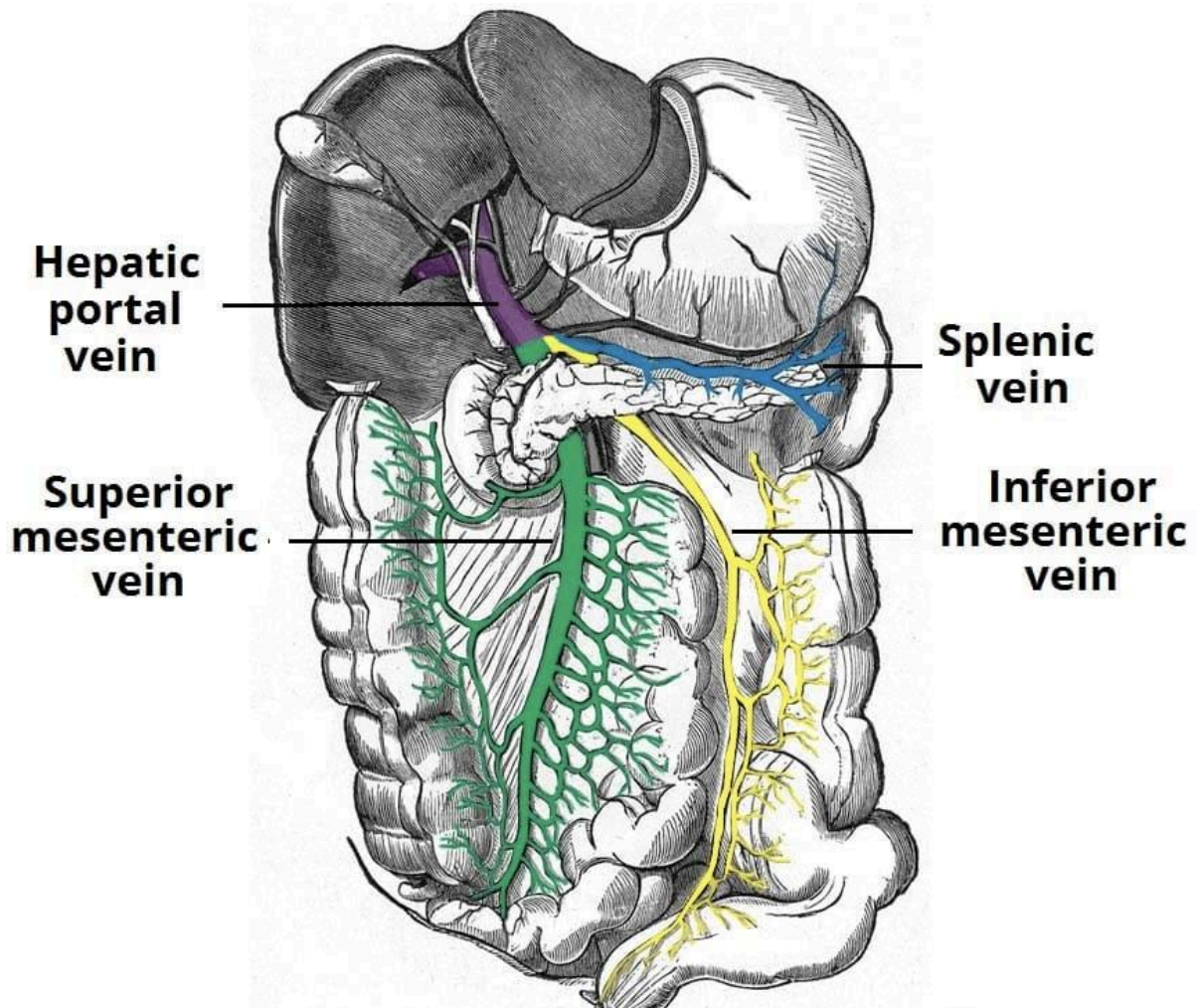
**The structures of a hepatic lobule.**

## Vasculature

The liver exhibits a distinctive blood supply system characterized by its dual sources:

1. The hepatic artery proper, which constitutes approximately 25% of the liver's blood supply, delivers oxygenated blood to the non-parenchymal structures of the liver and originates from the celiac trunk.
2. The hepatic portal vein, accounting for about 75% of the blood supply, provides the liver with partially deoxygenated blood enriched with nutrients absorbed from the small intestine. This pathway is critical for the functioning of the liver parenchyma, facilitating its roles related to gastrointestinal processing, including detoxification.

The drainage of venous blood from the liver is conducted through the hepatic veins. The central veins in the hepatic lobules converge to form collecting veins, which subsequently amalgamate to create multiple hepatic veins that ultimately drain into the inferior vena cava.



An overview of the venous portal system – draining into the hepatic portal vein.

## **Nerve Supply**

The liver parenchyma receives its nerve supply from the hepatic plexus, which is comprised of both sympathetic fibers originating from the celiac plexus and parasympathetic fibers from the vagus nerve. These nerve fibers penetrate the liver at the porta hepatis and trace along the routes of the hepatic artery and portal vein branches.

Glisson's capsule, the liver's fibrous outer layer, is supplied with nerve endings from the lower intercostal nerves. When this capsule is distended, it leads to a sharp and precisely localized pain sensation.

## **Lymphatic Drainage**

The lymphatic system of the liver's anterior region channels fluids into the hepatic lymph nodes, which are situated alongside the hepatic blood vessels and ducts within the lesser omentum. These nodes subsequently drain into the coeliac lymph nodes, which eventually lead to the cisterna chyli.

Conversely, lymphatic vessels from the liver's posterior region direct drainage towards the phrenic and posterior mediastinal lymph nodes, which then converge with the right lymphatic duct and thoracic duct.