

Anatomy of Liver & Spleen

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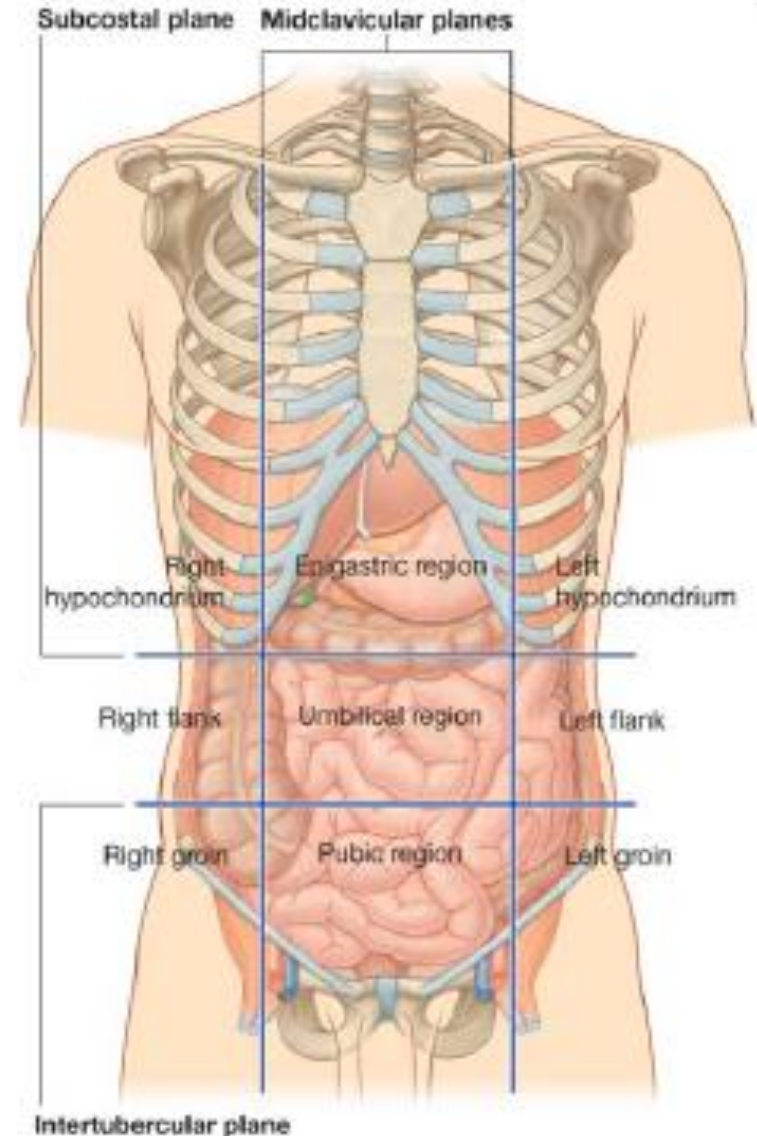
Objectives

By the end of the lecture, you should be able to describe the:

- Location, subdivisions and relations and peritoneal reflection of **liver** and **Spleen**.
- Blood supply, nerve supply and lymphatic drainage of the **liver** and **spleen**.

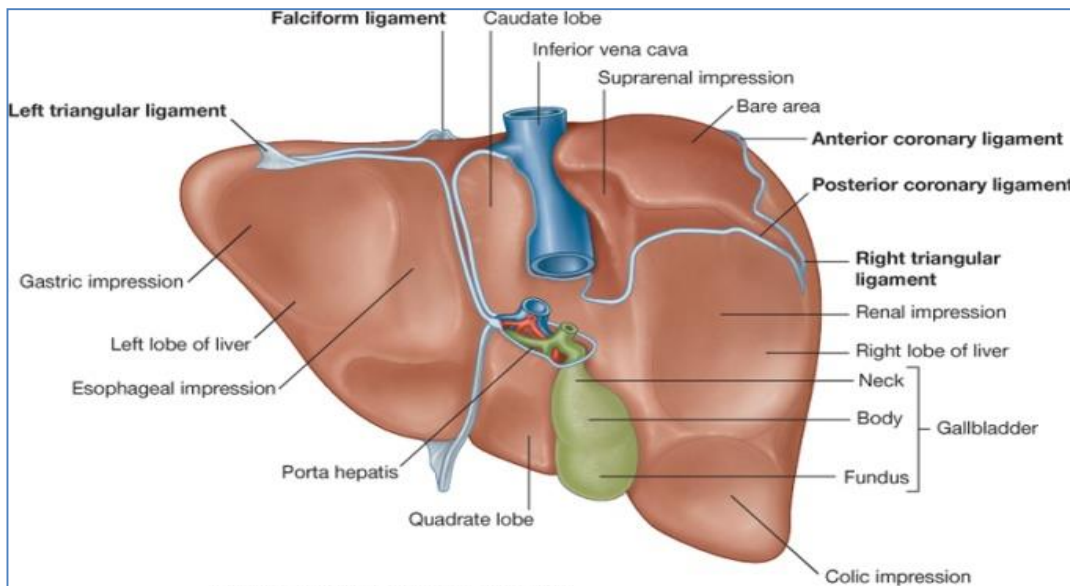
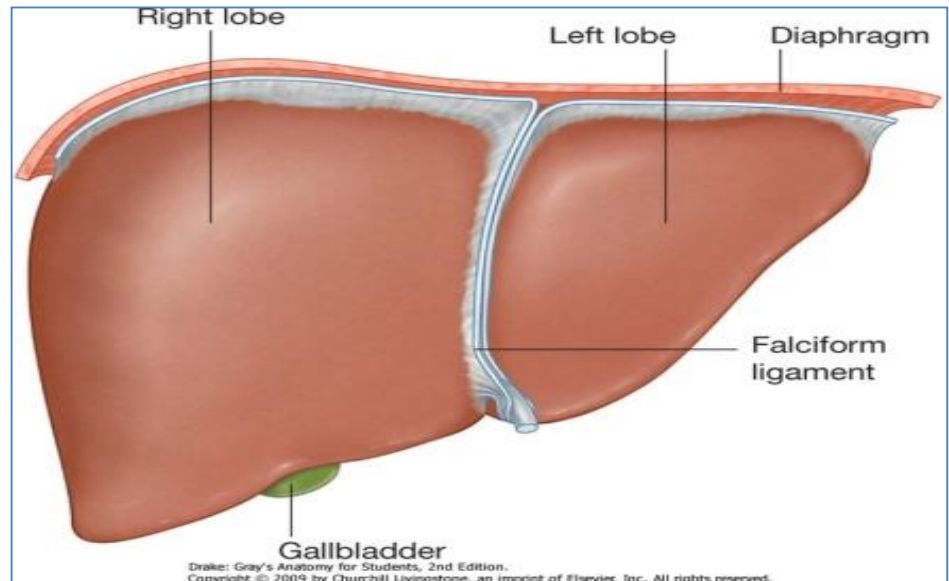
Liver

- The largest gland in the body
- Weighs approximately 1500 g. (approximately 2.5% of adult body weight).
- **Lies mainly in the:**
- Right hypochondrium,
- Epigastrium, and extends into the
- Left hypochondrium.
- Protected by the thoracic cage and diaphragm, lies deep to ribs 7-11 on the right side and crosses the midline toward the left nipple.
- Moves with the diaphragm and is located more inferiorly when one is erect because of gravity.



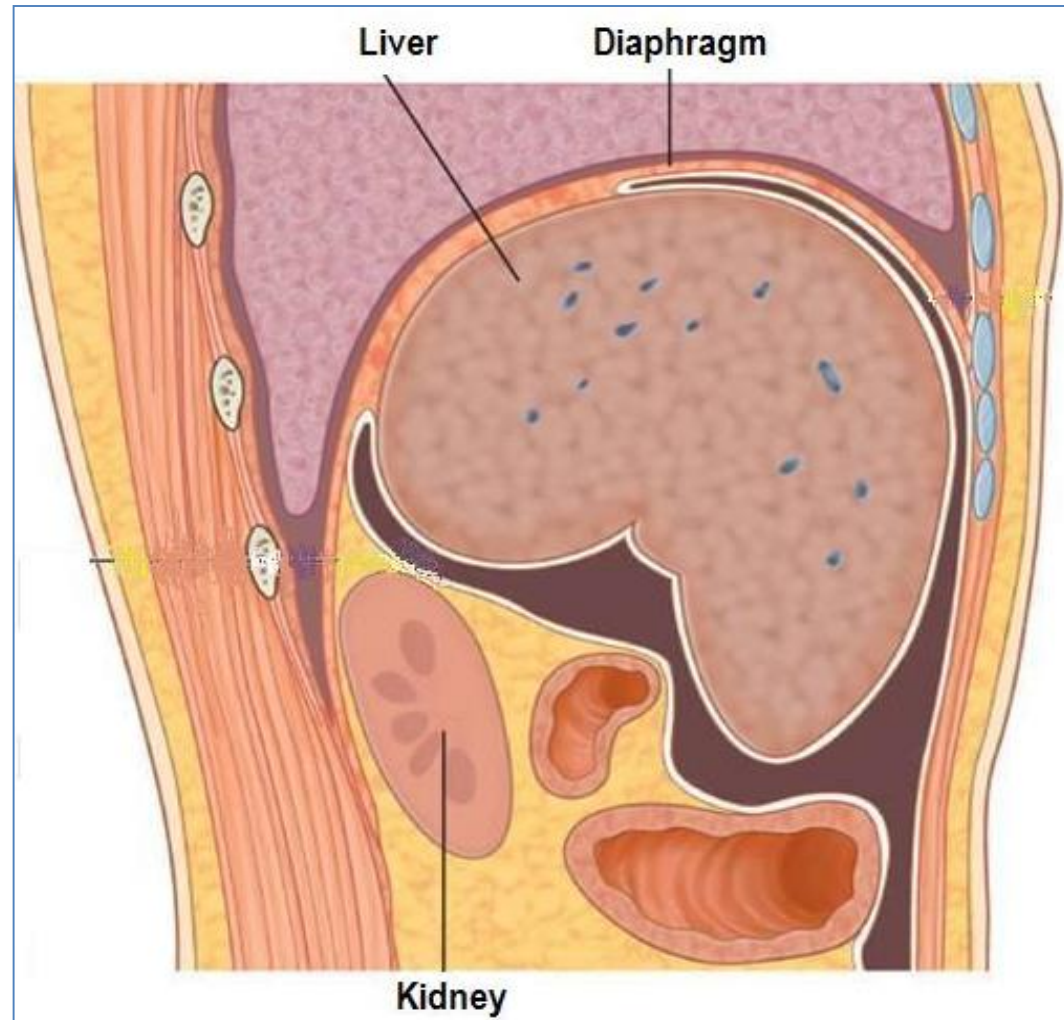
Surfaces of Liver

- It has two surfaces:
 1. **Diaphragmatic** surface, convex.
 2. **Visceral** surface relatively flat or even concave, (posteroinferior).



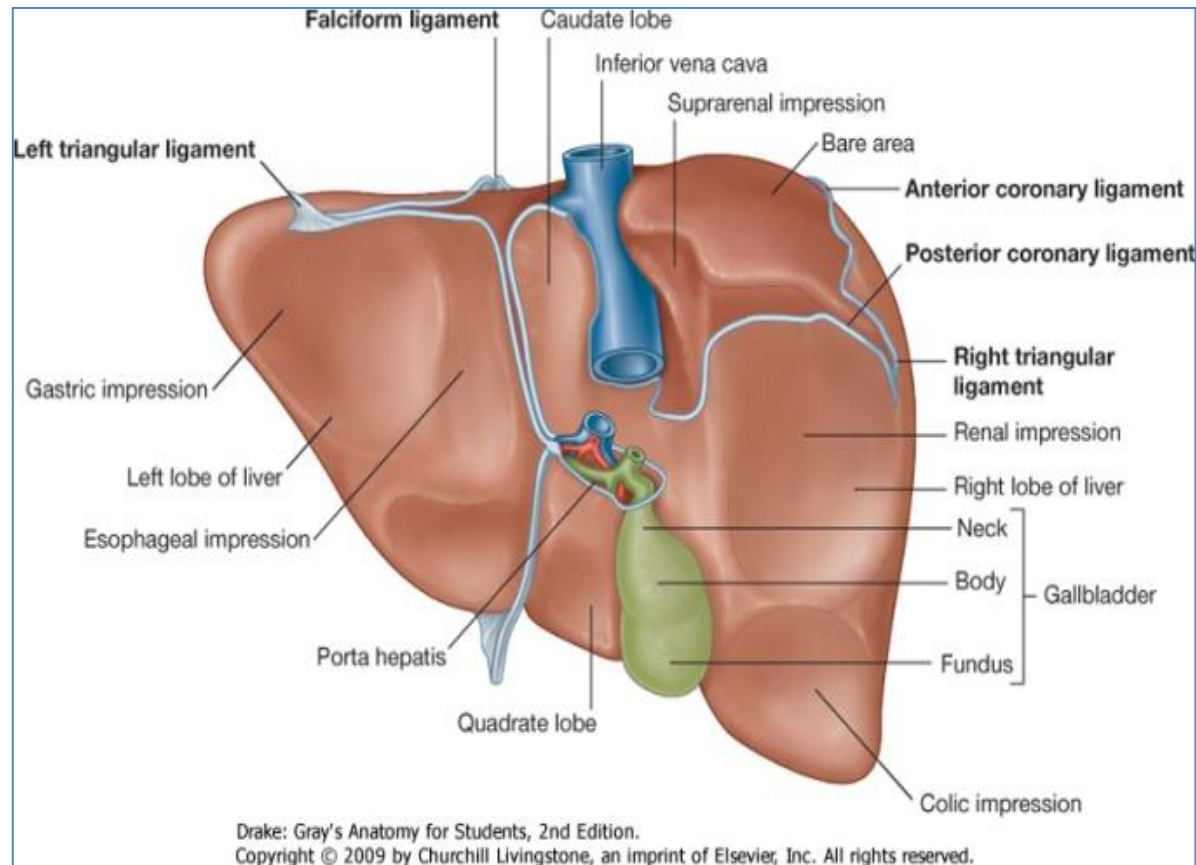
Diaphragmatic Surface

- The convex upper surface is smooth and molded to undersurface of domes of diaphragm which separates it from the base of pleurae, lungs, pericardium, and heart .
- Covered with visceral peritoneum, except posteriorly in **the bare area of the liver**, where it lies in direct contact with the diaphragm.



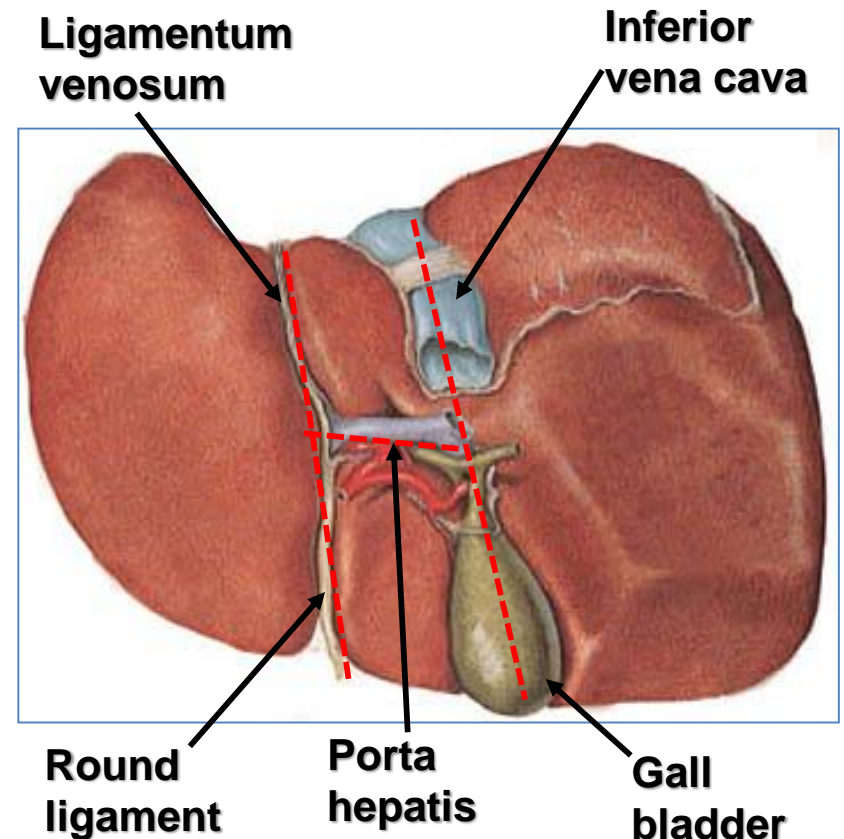
Visceral Surface

- It is the posteroinferior surface, related to abdominal viscera.
- It is covered with peritoneum, except at **the fossa for the gallbladder** and **the porta hepatis**
- It bears multiple fissures and impressions from contact with other organs.



Fissures

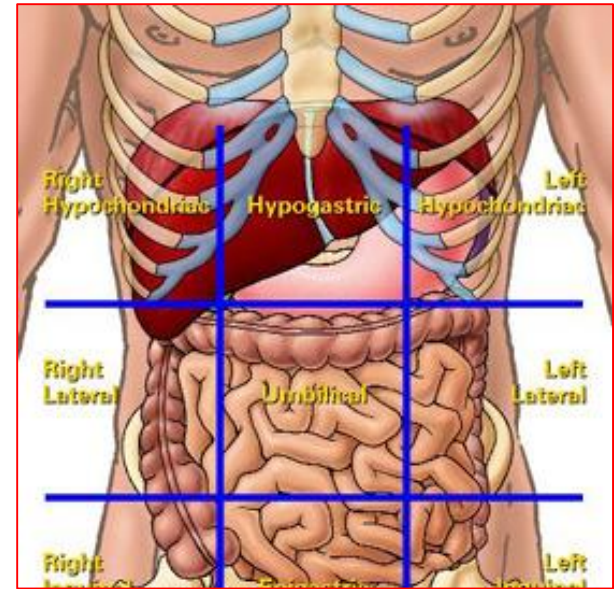
- Two sagittally oriented fissures, linked centrally by the transverse porta hepatis, to form the letter **H** on the visceral surface.
- The **left fissure** is the continuous groove formed:
 - **Anteriorly** by the **fissure for the round ligament**.
 - **Posteriorly** by the **fissure for the ligamentum venosum**.
- The **right fissure** is the continuous groove formed:
 - **Anteriorly** by the **fossa for the gallbladder**
 - **Posteriorly** by the groove for the **inferior vena cava**.



Relations

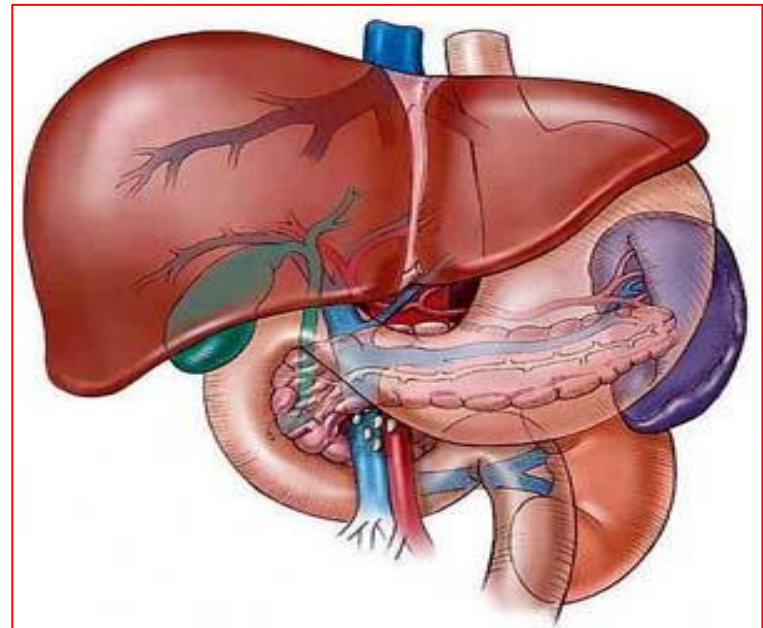
- **Anterior:**

1. Diaphragm,
2. Right & left costal margins,
3. Right & left pleura,
4. Right & left lower margins of both lungs,
5. Xiphoid process, and
6. Anterior abdominal wall.



- **Posterior:**

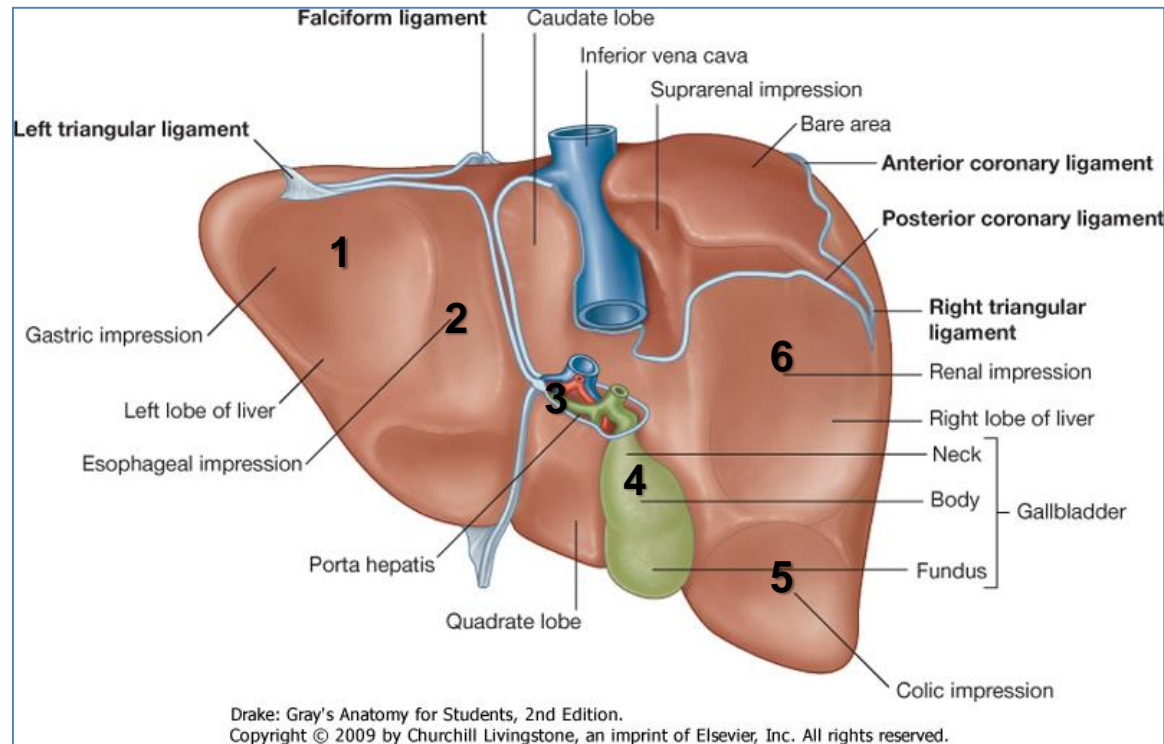
1. Diaphragm,
2. Right kidney,
3. Right hepatic flexure of the colon,
4. Duodenum,
5. Gallbladder,
6. Inferior vena cava,
7. Esophagus and fundus of stomach.



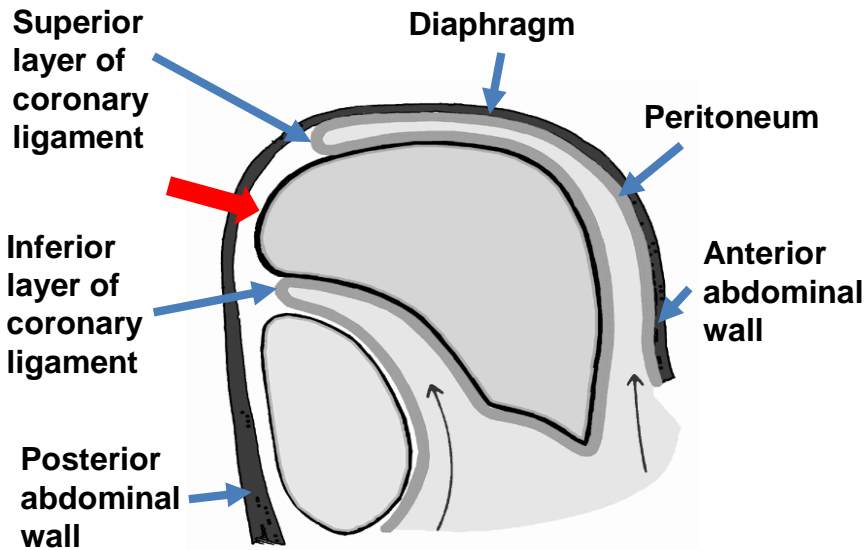
Relations of Visceral Surface of the Liver

The visceral surface is related to the:

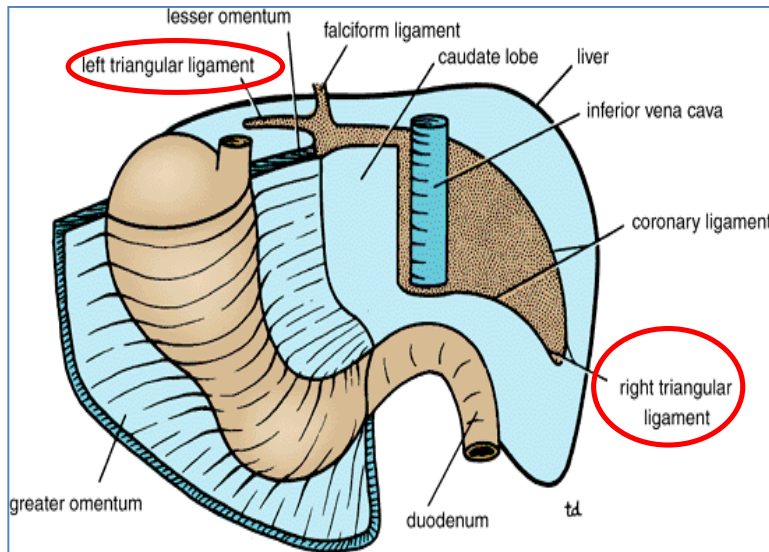
1. Stomach and duodenum.
2. Esophagus.
3. Lesser omentum.
4. Gallbladder.
5. Right colic flexure.
6. Right kidney and right suprarenal gland.



Peritoneal Reflection



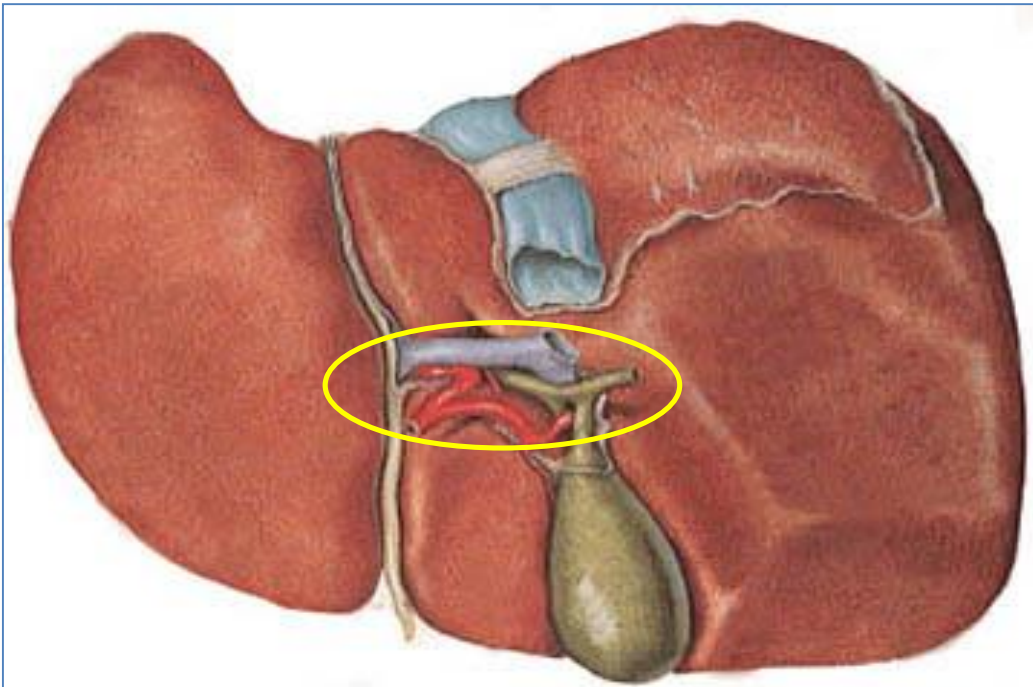
- The **liver** is completely surrounded by a fibrous capsule and covered by partially by peritoneum.
- The **bare area** of the liver is an area of the liver on the diaphragmatic surface where there is no intervening peritoneum between the liver and the diaphragm
- Boundaries of Bare area:
 - Anterior: **superior layer of coronary ligament**
 - Posterior: **inferior layer of coronary ligament**
 - Laterally: **right and left triangular ligaments.**



Other bare areas include porta hepatis, fossa for gall bladder & grooves for IVC.

Porta Hepatis (Hilum of the Liver)

- A transverse fissure found on the posteroinferior surface and lies between the **caudate** and **quadrate** lobes.
- The upper part of the free edge of the lesser omentum is attached to its margins.



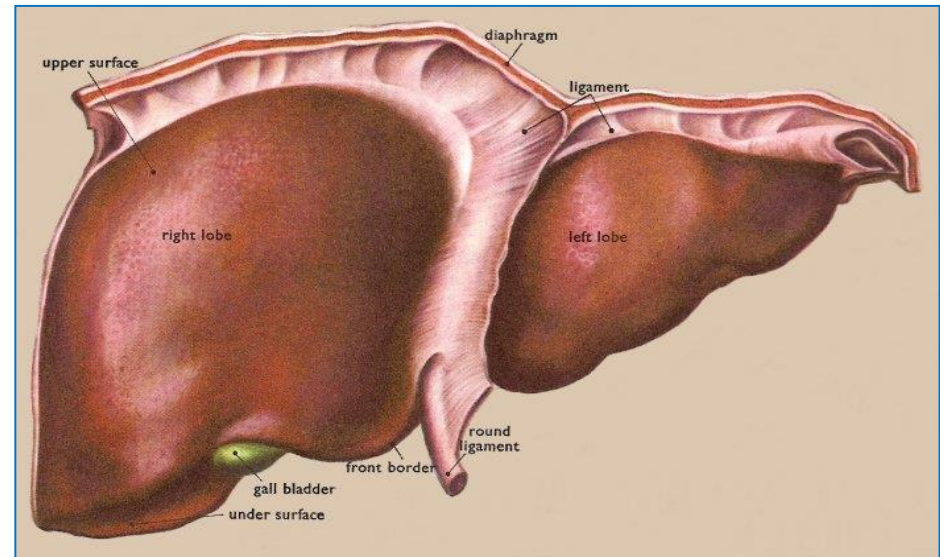
Structures passing through the porta hepatis:

- Right and left **hepatic ducts**.
- Right and left branches of the **hepatic artery**.
- Right and left branches of the **portal vein**.
- Sympathetic and parasympathetic **nerve fibers**.
- A few hepatic **lymph nodes** lie here; they drain the liver and gallbladder and send their efferent vessels to the celiac lymph nodes.

Ligaments of the Liver

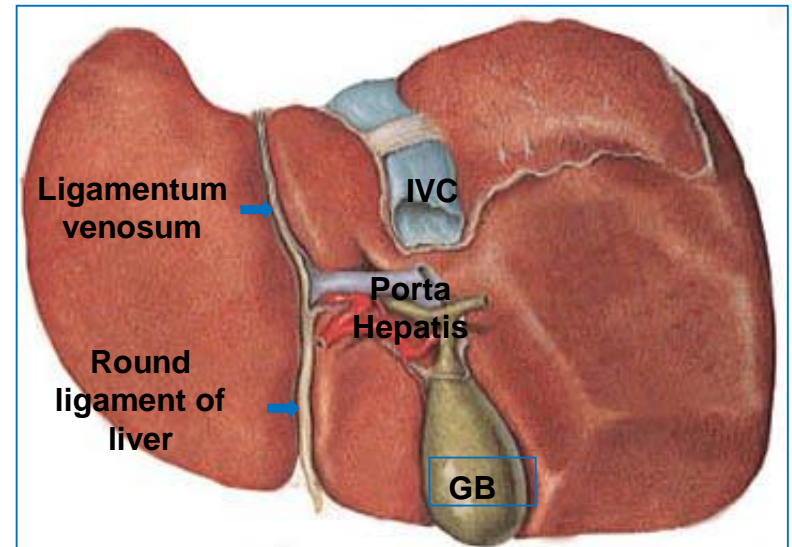
Falciform ligament

- It is a two-layered fold of the peritoneum, ascends from the umbilicus to the liver.
- Its sickle-shaped free margin contains the **ligamentum teres (round Ligament) of liver**.
- It is the remains of the **umbilical vein**, which carry oxygenated blood and nutrients from the placenta to the fetus.



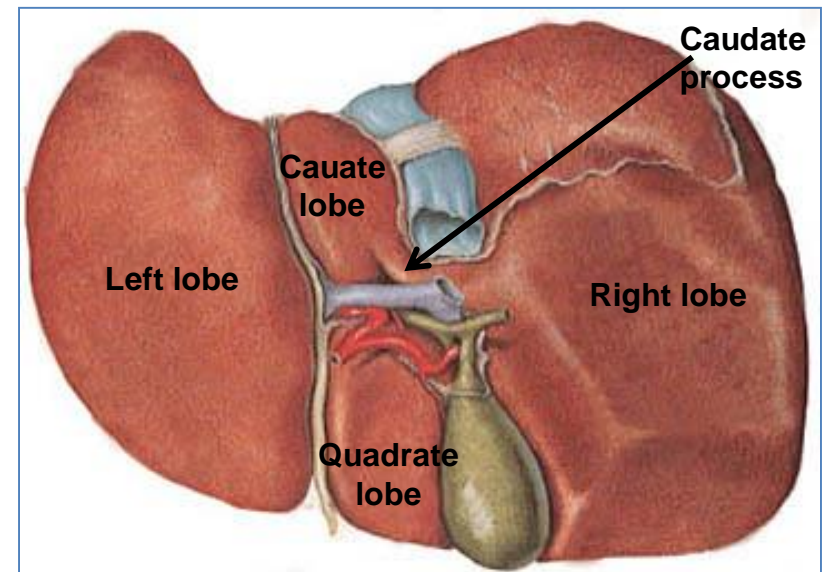
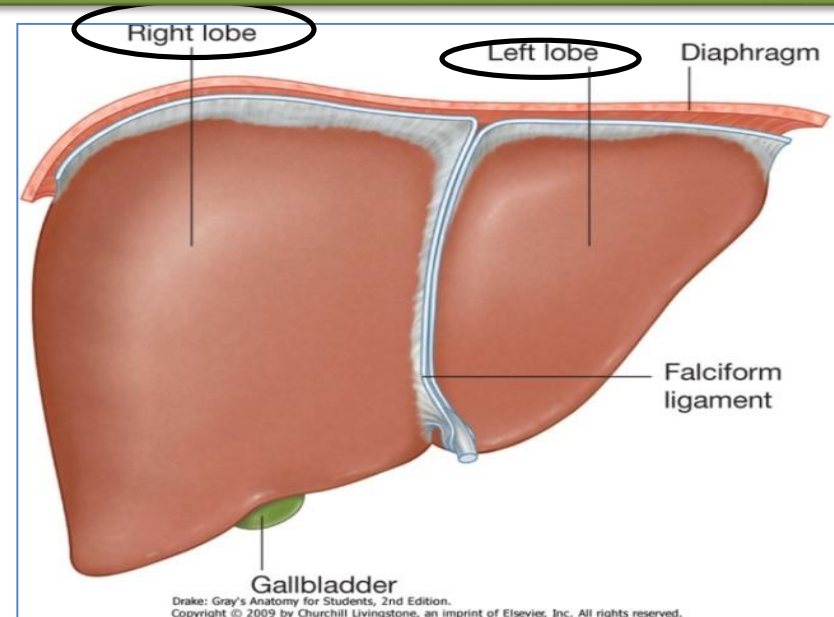
Ligamentum venosum

It is the fibrous remnant of the fetal **ductus venosus**, which shunted blood from the umbilical vein to the IVC, short-circuiting the liver.



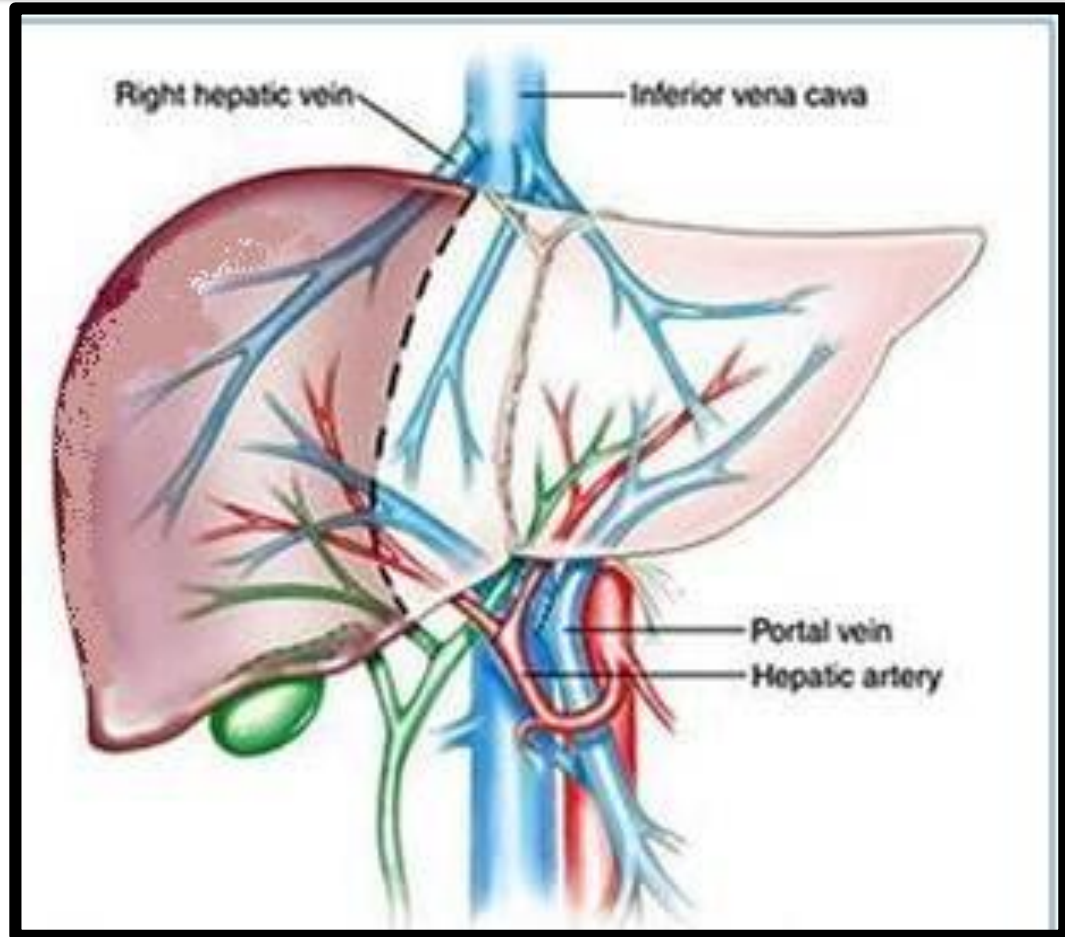
Lobes of The Liver

- The liver is divided into a large **right lobe** and a small **left lobe** by the attachment of the falciform ligament.
- The right lobe is further divided into a **quadrate lobe** and a **caudate lobe** by the presence of the gallbladder, the fissure for the ligamentum teres, the inferior vena cava, and the fissure for the ligamentum venosum.
- The caudate lobe is connected to the right lobe by the **caudate process**.
- **NB. The quadrate and caudate lobes are functionally parts of the left lobe of the liver.**



Blood Circulation through the Liver

- The blood vessels **conveying** blood to the liver are:
- **Hepatic artery (30%),**
- **Portal vein (70%).**
- The **hepatic artery** brings oxygenated blood to the liver.
- The **portal vein** brings venous blood rich in the products of digestion, which have been absorbed from the gastrointestinal tract.



The venous blood is drained by right & left **hepatic veins** which drain into the inferior vena cava

Blood Circulation through the Liver

- At or close to the porta hepatis, the **hepatic artery** and **portal vein** terminate by dividing into right and left primary branches which supply the right and left parts of liver, respectively.
- Within the liver, the primary branches divide to give secondary and tertiary to supply the hepatic segments independently

- The **hepatic veins**, are intersegmental in their distribution and function, draining parts of adjacent segments.
- **The attachment of these veins to the IVC helps to hold the liver in position.** (*The peritoneal ligaments and the tone of the abdominal muscles play a minor role in the support of liver*).

Lymph Drainage

- The liver produces a large amount of lymph—about one third to one half of all body lymph.
- The lymph vessels leave the liver and enter several lymph nodes in the porta hepatis.
- The efferent vessels pass to the **celiac nodes**.
- A few vessels pass from the bare area of the liver through the diaphragm to the **posterior mediastinal lymph nodes**.

Nerve Supply

- Sympathetic and parasympathetic nerves from the celiac plexus.
- The anterior vagal trunk gives rise to a large hepatic branch, which passes directly to the liver.

Portal-Systemic (Portacaval) Anastomoses

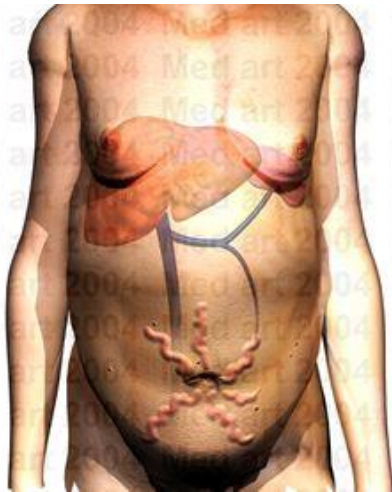
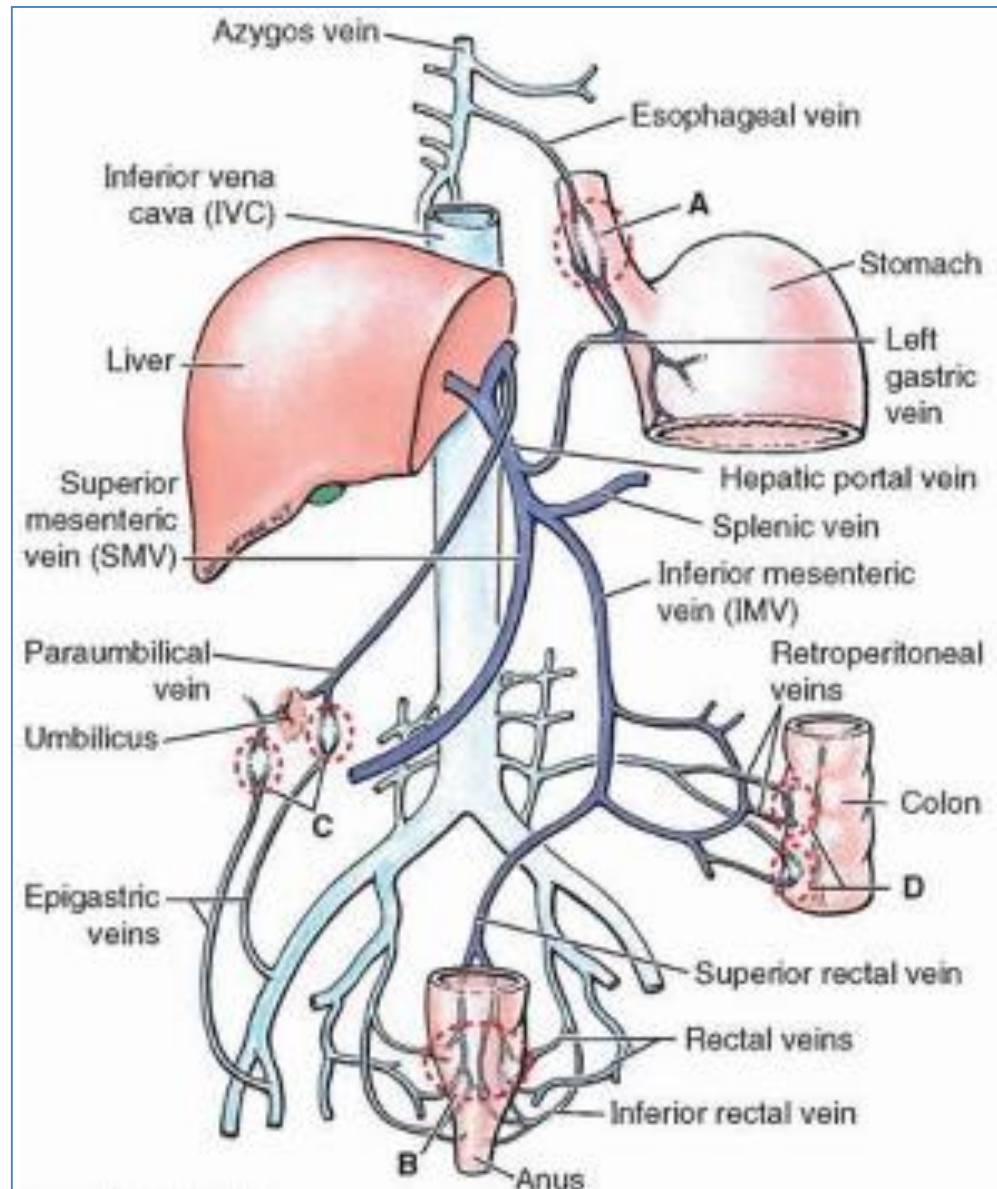


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Portal-Systemic (Portacaval) Anastomoses

- It is a specific type of anastomosis that occurs between the veins of portal circulation and those of systemic circulation
- In portal hypertension, these anastomosis open and form venous dilatation called varices.

- **Sites:**

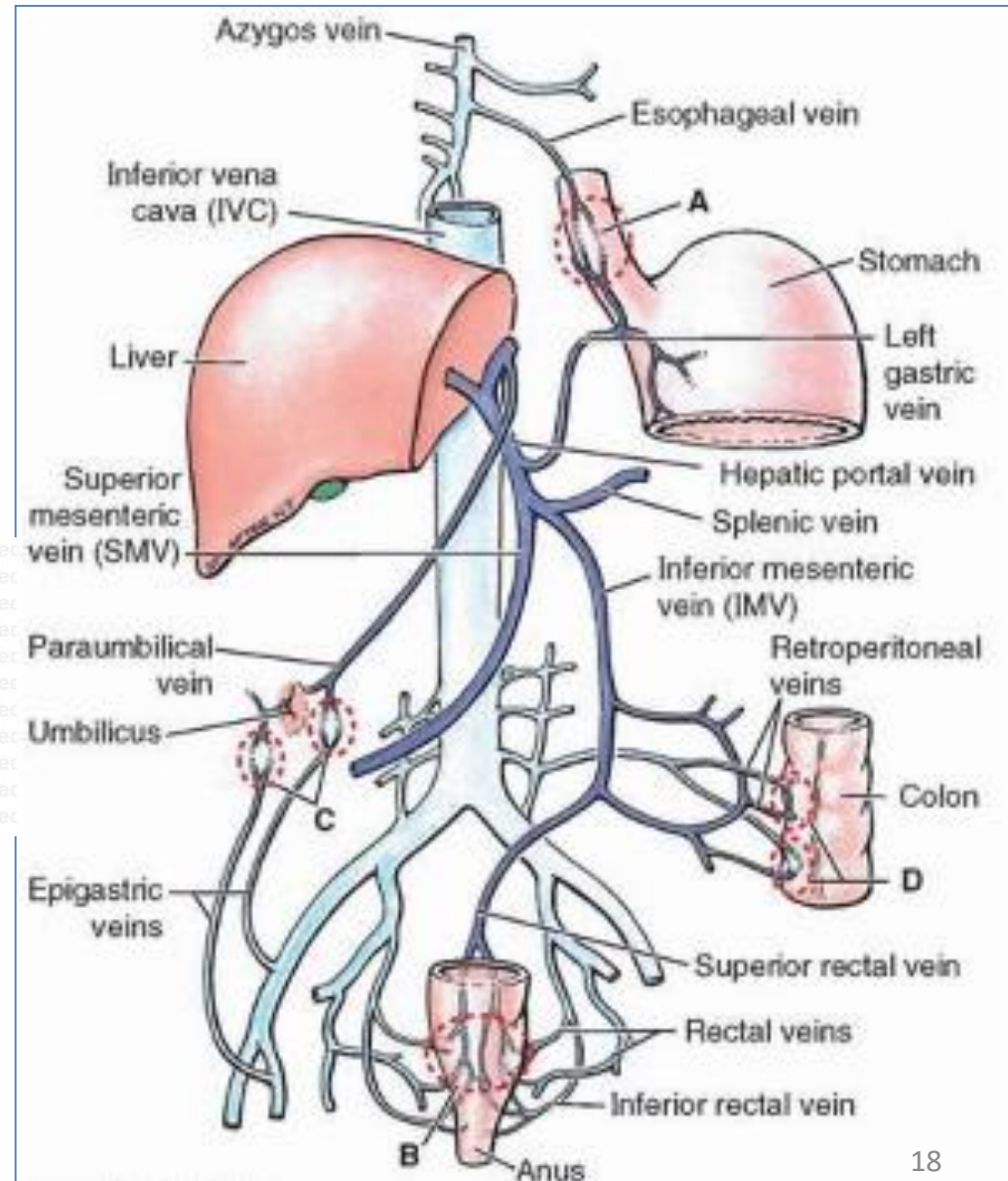
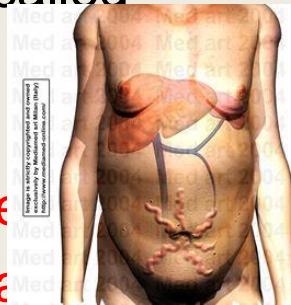
A. Lower end of esophagus

B. Lower end of rectum

C. Paraumbilical region.

D. Retroperitoneal

E. Intrahepatic (Patent ductus venosus)



Spleen

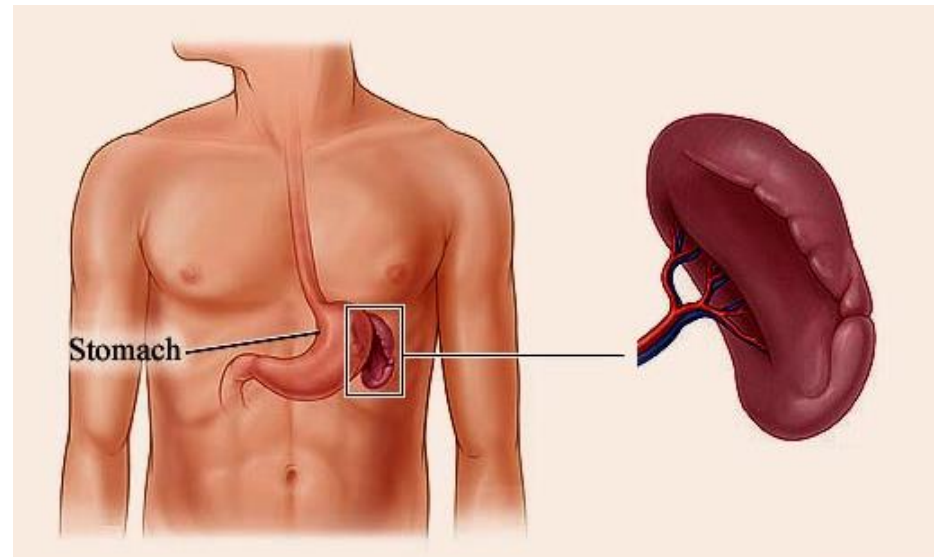
1,3,5,7,9,11

Measurement 1X3X5

Weighs 7 oz (210 gm)

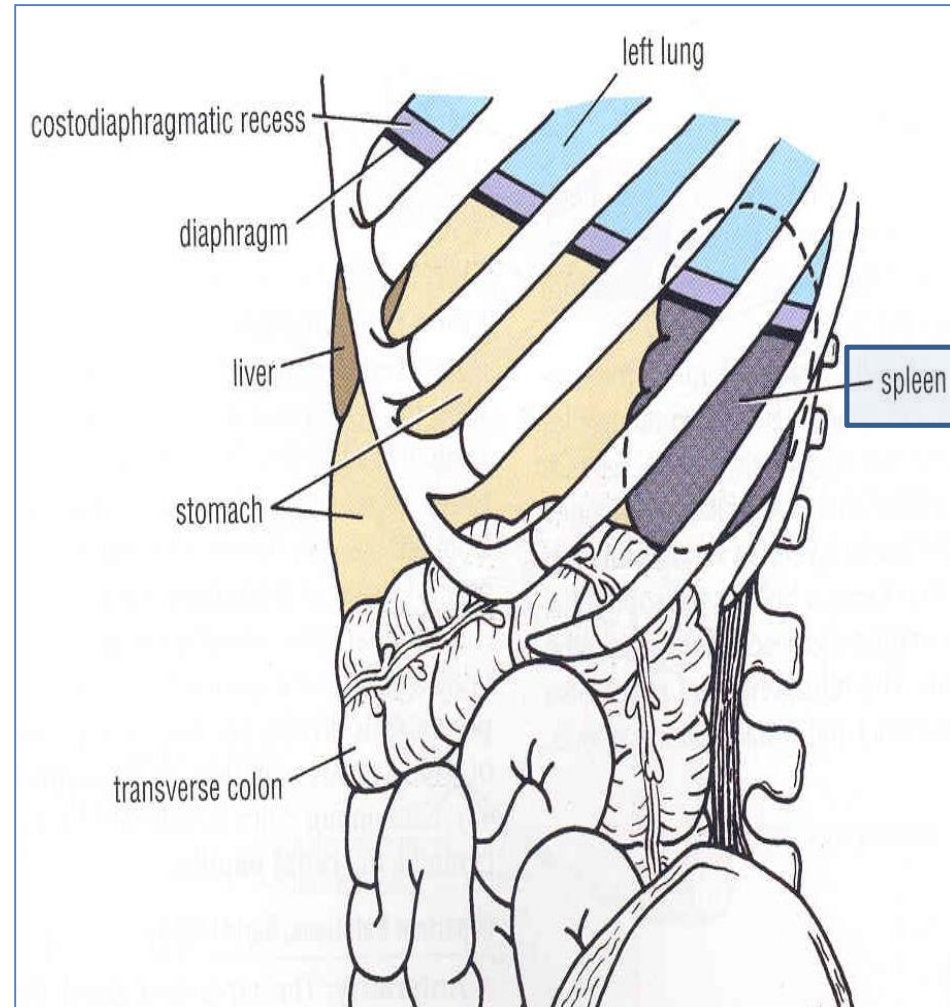
Lies between the 9th and 11th
ribs. or

“Clenched fist”

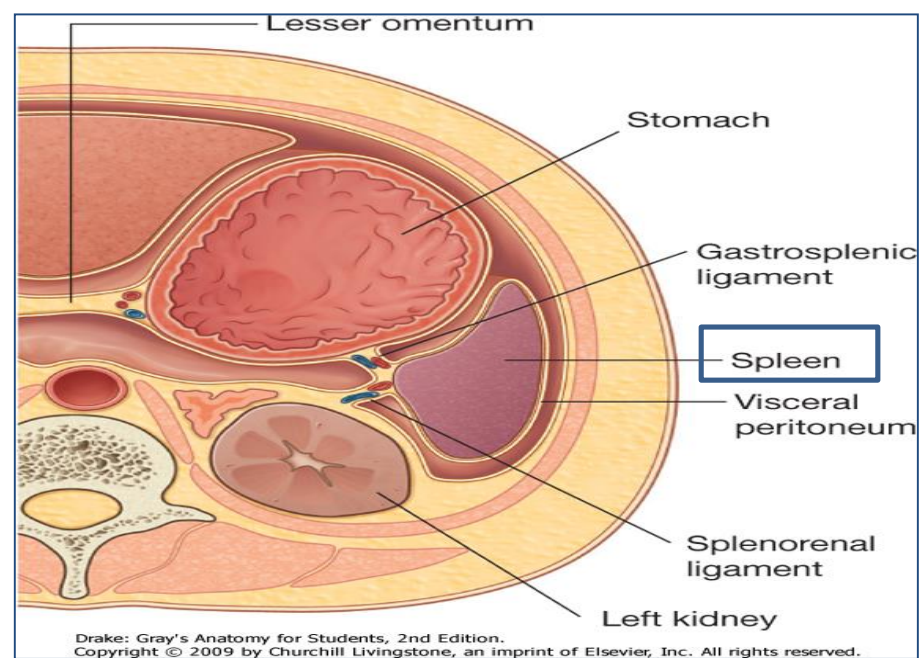


Spleen

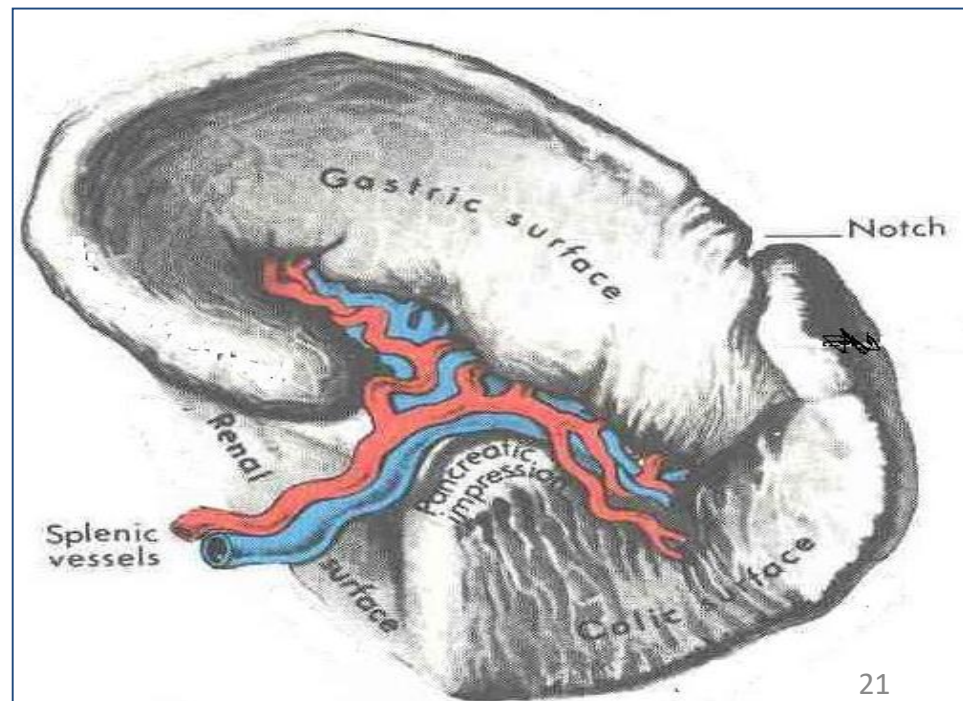
- Largest single mass of **lymphoid tissue**.
- Located in the **left hypochondrium**, deep to 9, 10 & 11 ribs
- Long axis lies along the shaft of the **10th rib** and separated from them by the diaphragm and the costodiaphragmatic pleural recess.
- Ovoid in shape with **notched anterior border**.
- Lower pole extends forward as far as the midaxillary line
- Normal size spleen **can not be palpated on clinical examination**.



- **Surfaces:**
- **Diaphragmatic surface:**
- It is convexly curved to fit the concavity of the diaphragm and curved bodies of the adjacent ribs.
- **Visceral surface:**
- It is related to the viscera.

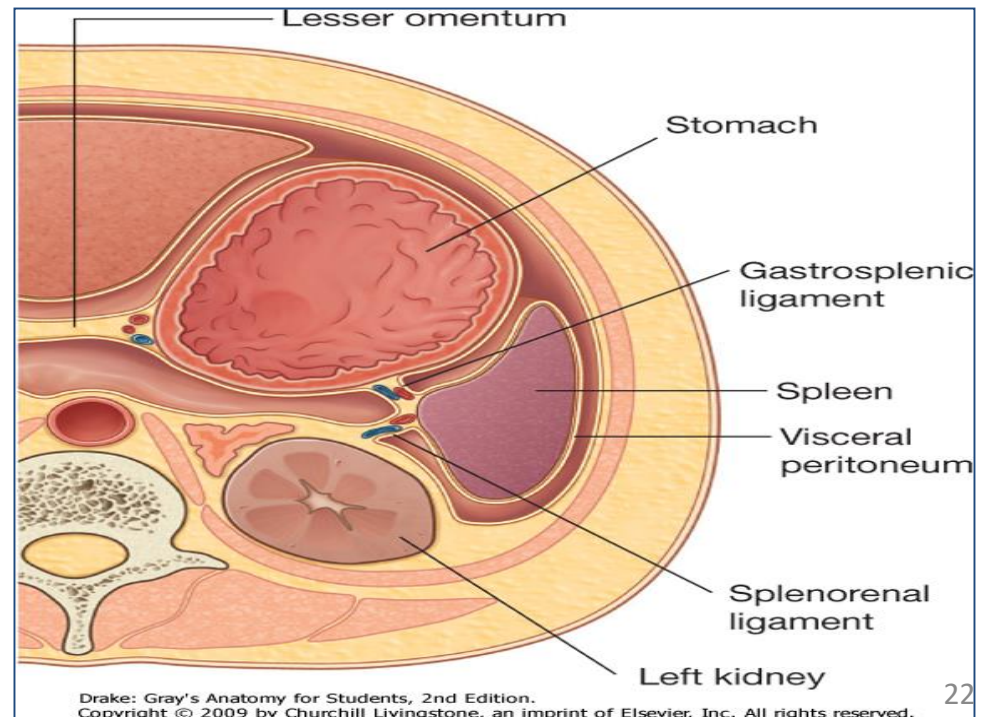
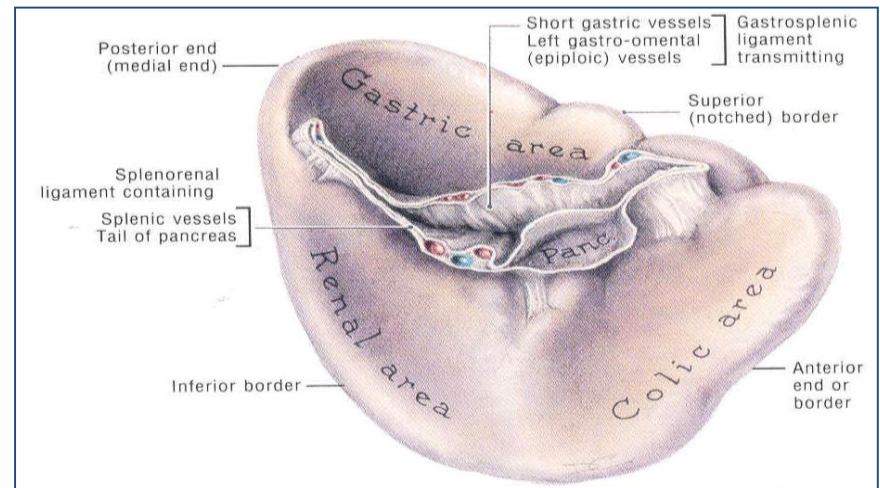


- **Borders:**
- The **anterior and superior** borders are sharp.
- **Anterior border** is notched
- The **posterior** (medial) and **inferior** borders are rounded.



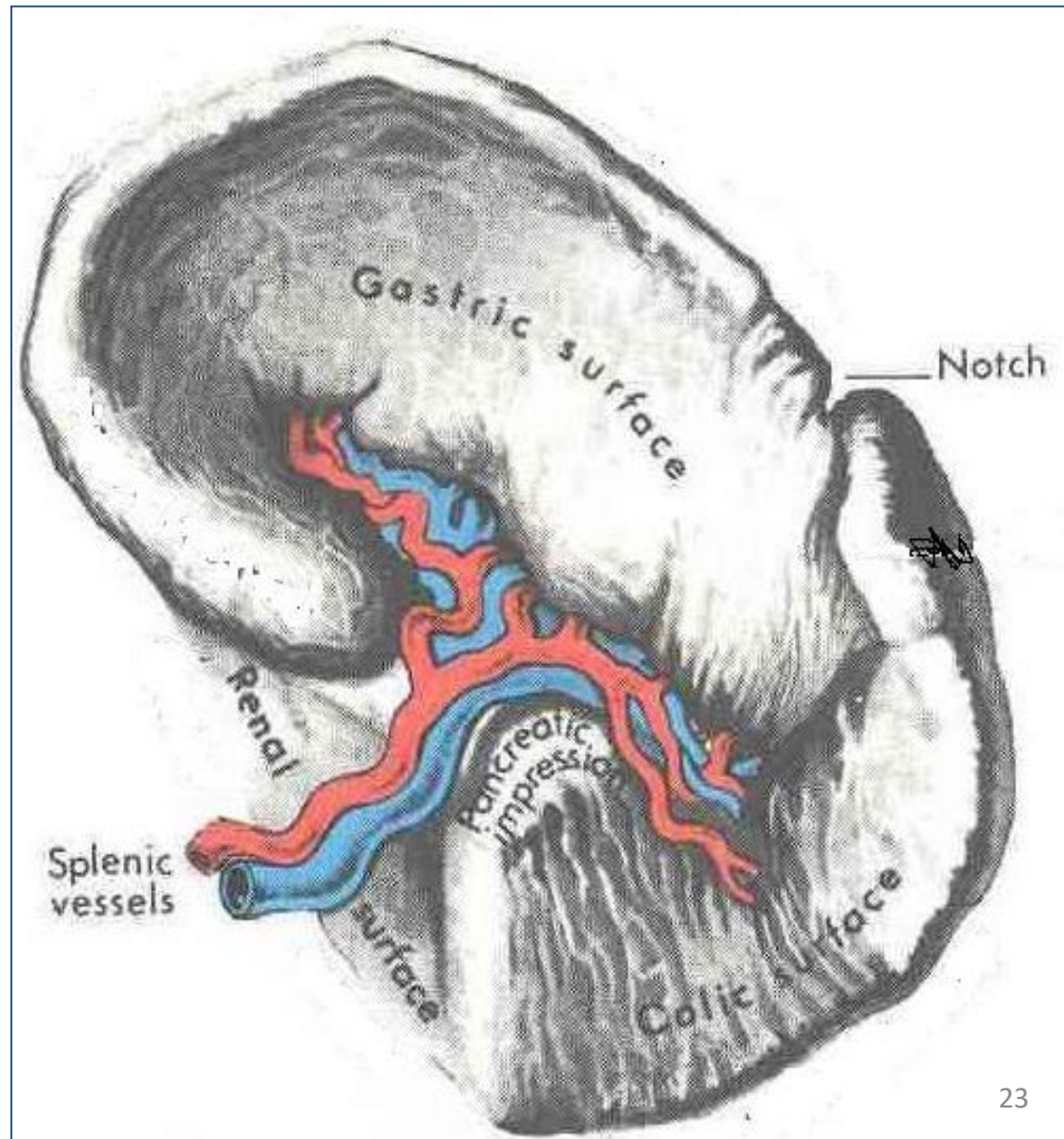
Peritoneal Reflections/Ligaments

- Spleen is completely surrounded by peritoneum which passes from its hilus as:
 - **Gastrosplenic ligament** to the greater curvature of stomach (carrying the **short gastric and left gastroepiploic vessels**).
 - **Lienorenal ligament** to the front of left kidney (carrying the **splenic vessels and the tail of pancreas**).



Relations

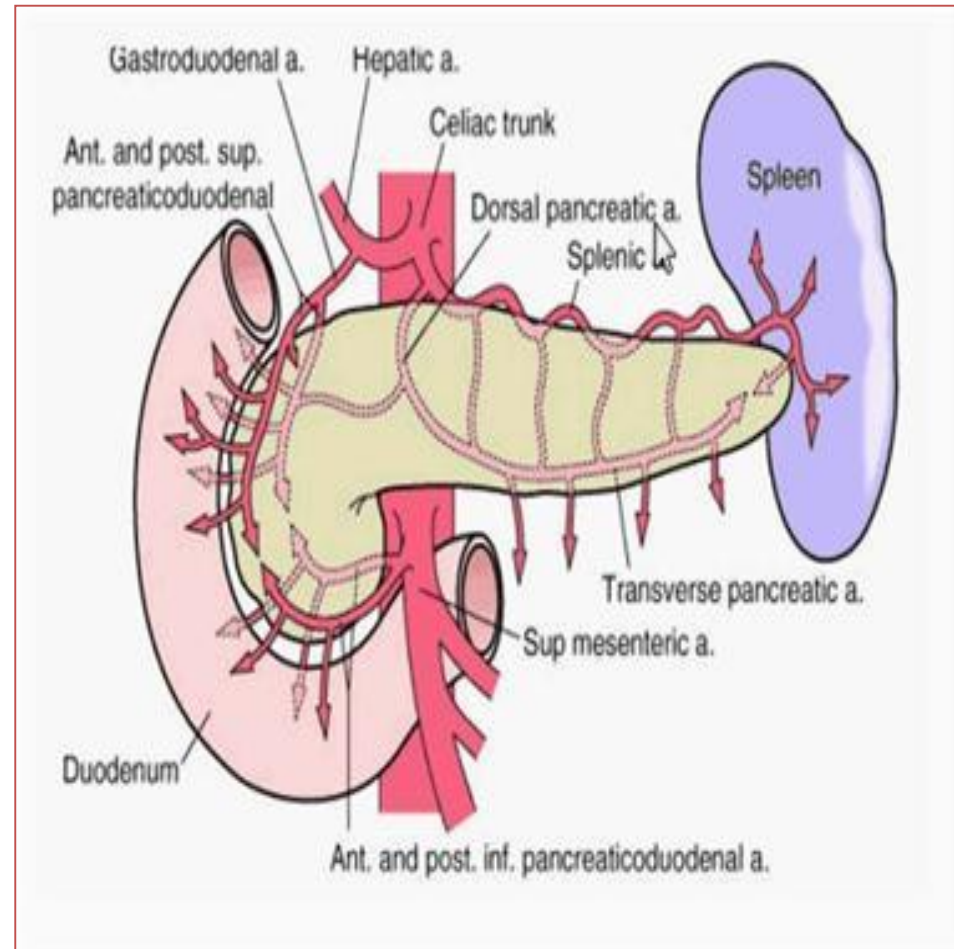
- **Anteriorly:**
 - Stomach,
 - Tail of pancreas,
 - Left colic flexure &
 - Left kidney.
- **Posteriorly:**
 - Diaphragm, that separates it from the left pleura (left costo-diaphragmatic recess), left lung & 9, 10 & 11 ribs.
- **Inferiorly:**
 - Left colic flexure.
- **Medially:**
 - Left kidney.



Arterial Supply

Splenic artery

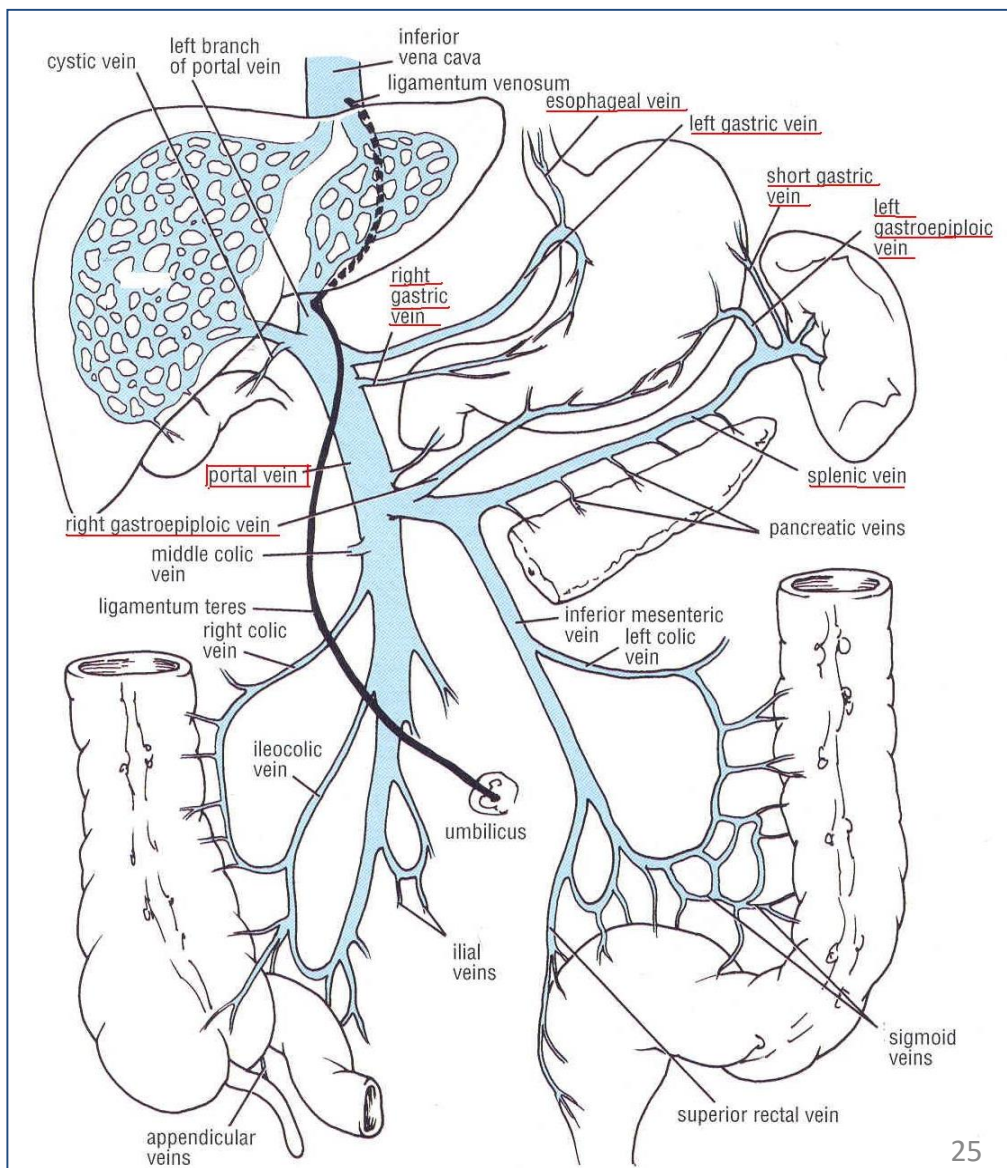
- Largest branch of the **celiac artery**.
- Runs a **tortuous course** along the **upper border of the pancreas**.
- Passes within the **lienorenal ligament**.
- Divides into 4-5 terminal branches, which enter the spleen at the **hilus**.
- The lack of anastomosis of these arterial vessels within the spleen results in the formation of vascular segments of the spleen with relatively avascular planes between them, enabling subtotal splenectomy.



Venous Drainage

Splenic vein

- Leaves the hilum.
- Runs horizontally behind the tail & body of the pancreas.
- Reaches behind the neck of pancreas, where it **joins** the **superior mesenteric vein** to form the **portal vein**.
- **Tributaries:**
 - Short gastric veins.
 - Left gastroepiploic vein.
 - Pancreatic veins.
 - Inferior mesenteric vein.



Lymph Drainage

- Lymphatics emerge from the hilus and drain into several nodes lying at the hilum.
- Efferents from the hilar nodes pass along the course of splenic artery, and drain into the **celiac lymph nodes**.

Nerve Supply

- Derived from the **celiac plexus**.
- Are distributed mainly along branches of the splenic artery, and are vasomotor in function.

Thank You