

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# *Liver & Spleen*

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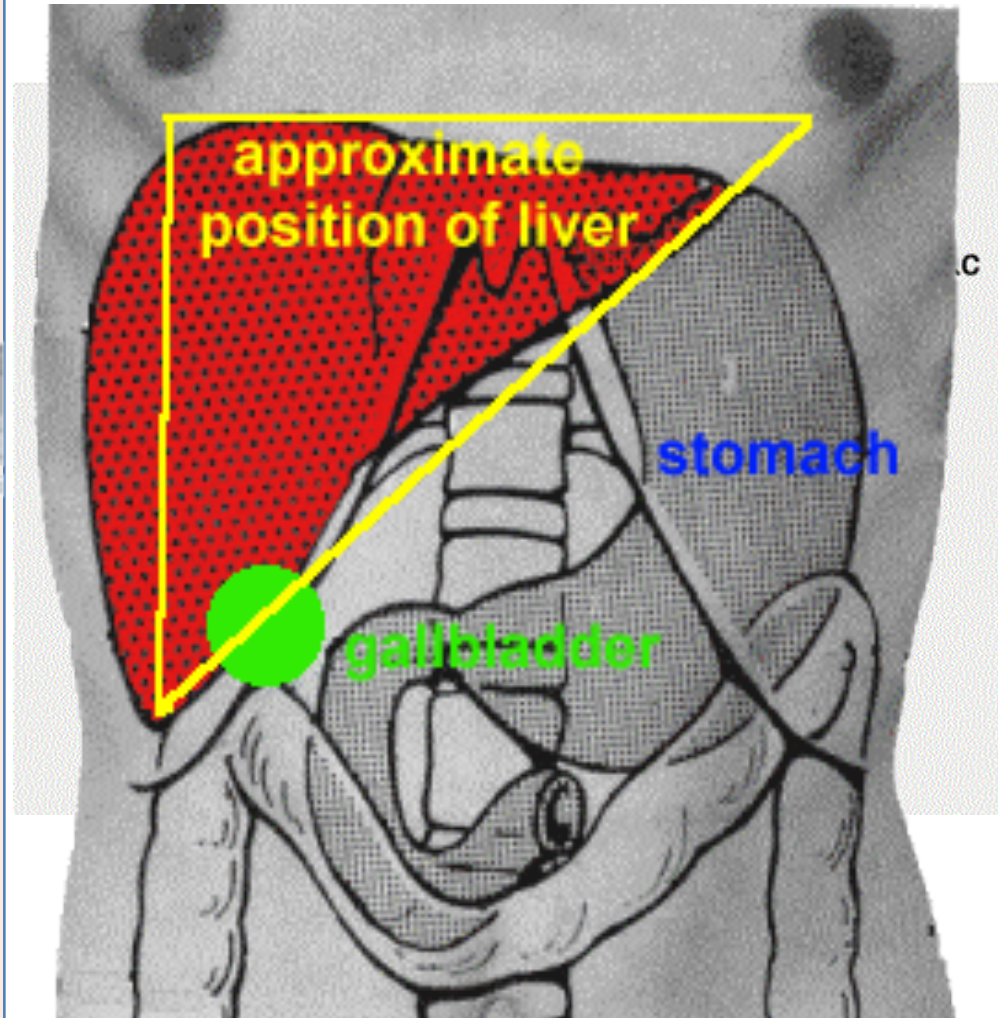
# Objectives

*At the end of the lecture, the student should be able to describe the:*

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

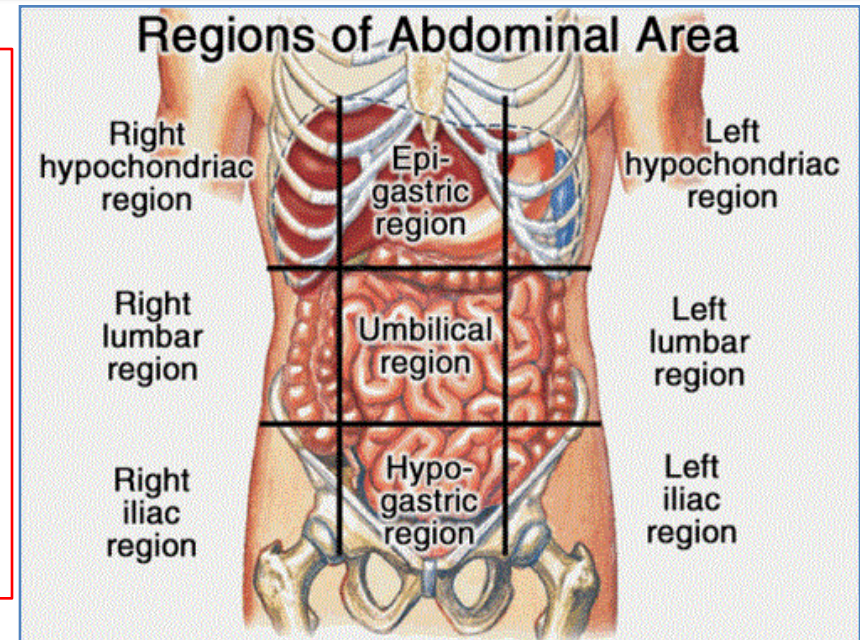
# Liver

- The **largest gland** in the body.
- Weighs approximately 1500 g (approximately 2.5% of adult body weight).
- **Lies mainly** in the **right hypochondrium** and **epigastrium** and extends into the **left hypochondrium**.
- **Protected by** the **thoracic cage** and **diaphragm**, its greater part **lies deep** to ribs 7-11 on the right side and crosses the midline toward the left below the nipple.

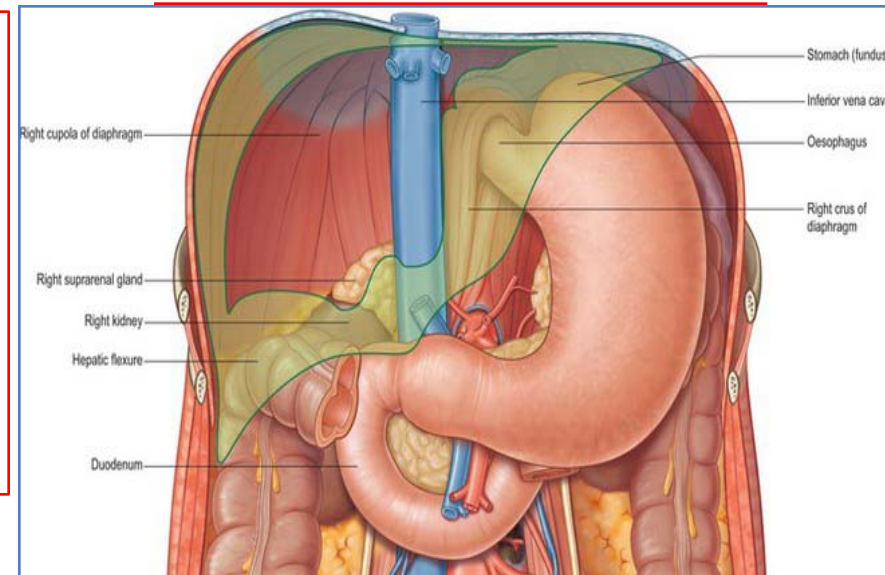


# Relations of Liver

- **Anterior:** Diaphragm, right & left pleura and lower margins of both lungs, right and left costal margins, xiphoid process, and anterior abdominal wall in the subcostal angle

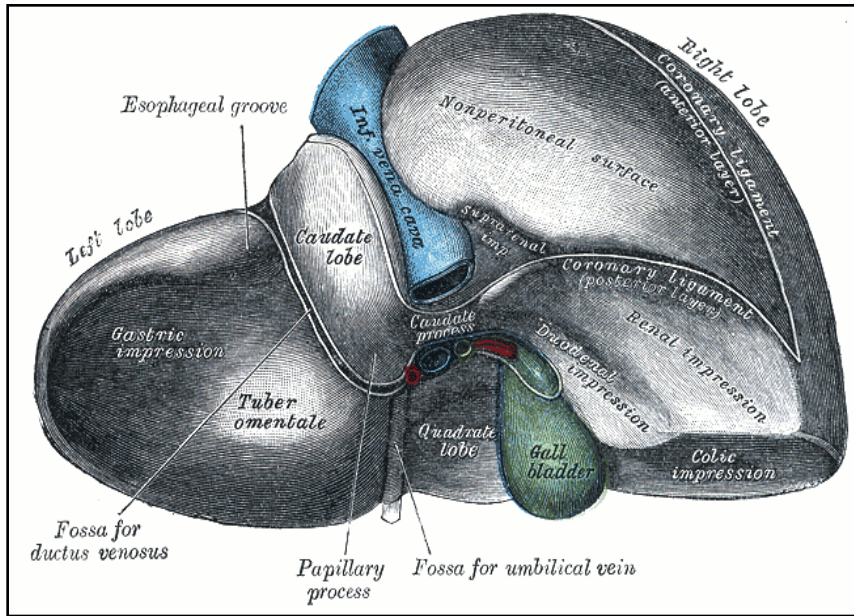


- **Posterior:** Diaphragm, right kidney, hepatic flexure of the colon, /duodenum, gallbladder, inferior vena cava, esophagus and fundus of the stomach





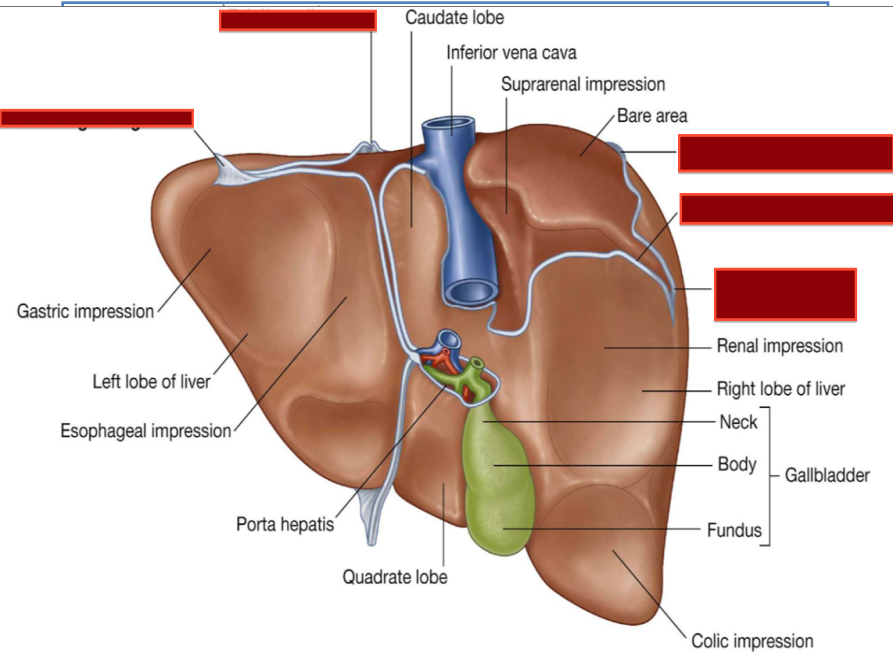
# Peritoneal Reflection



- The liver is surrounded by a fibrous capsule and **completely covered by peritoneum (except the bare areas)**.
- The **bare area** of the liver is **triangular area on the posterior surface of right lobe** where there is **no intervening peritoneum** between the **liver** and the **diaphragm**.

## Boundaries of Bare area:

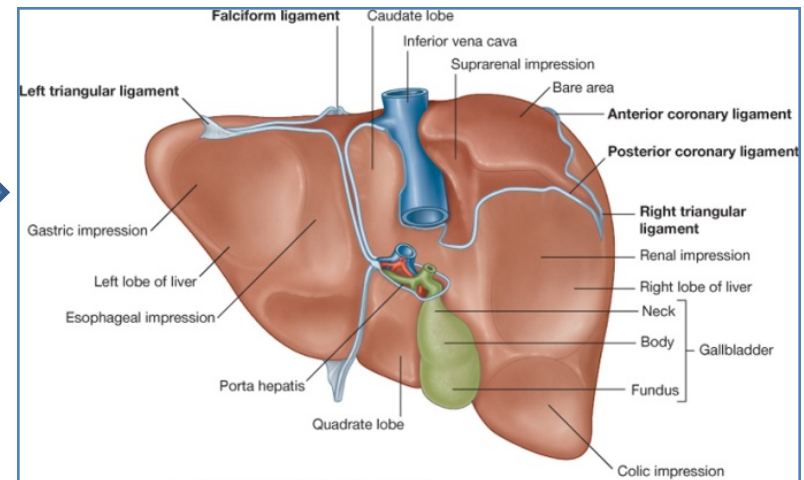
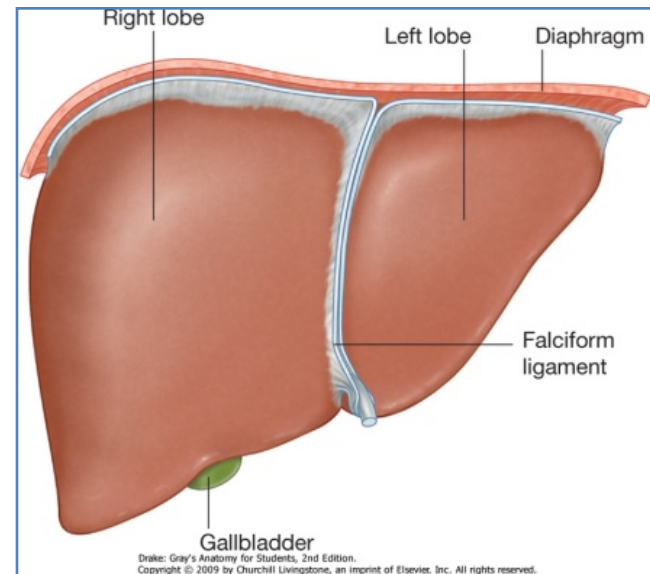
- **Anterior:** superior layer of coronary ligament.
- **Posterior:** inferior layer of coronary ligament.
- **Laterally:** right and left triangular ligaments.



**Other bare areas include :** porta hepatis; fossa for gall bladder & grooves for IVC

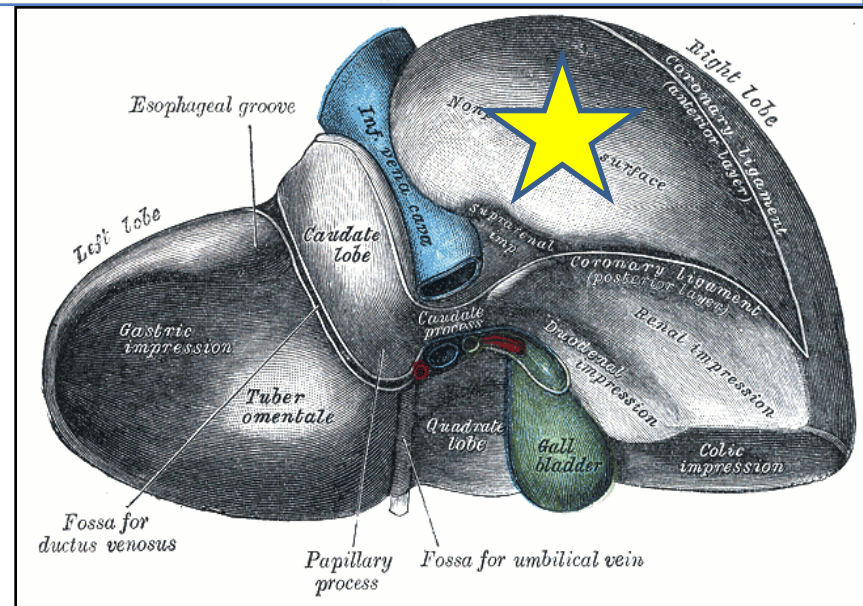
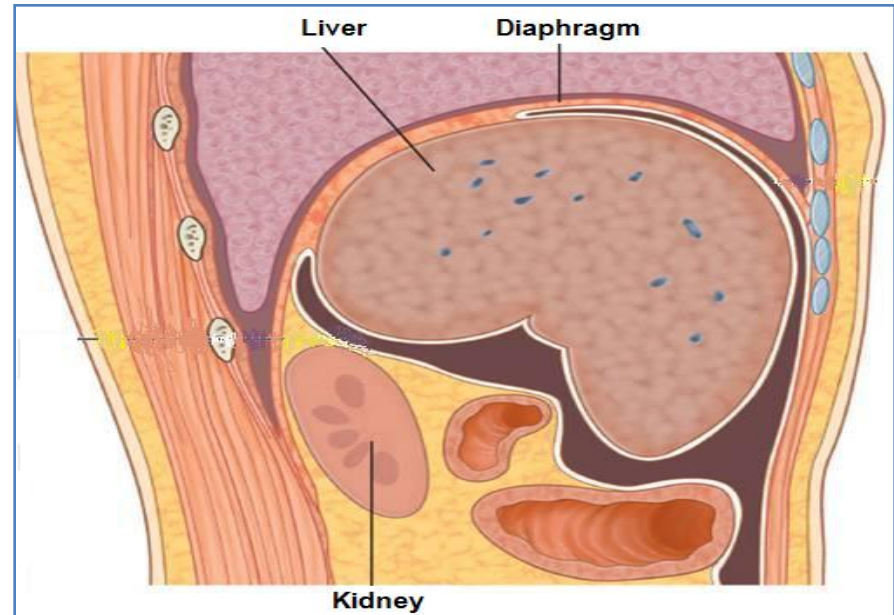
# Surfaces of Liver

- The liver has two surfaces:
  - A **convex** diaphragmatic surface (Antero-superior).
  - A relatively flat or even **concave** visceral surface (postero-inferior)



# Diaphragmatic Surface

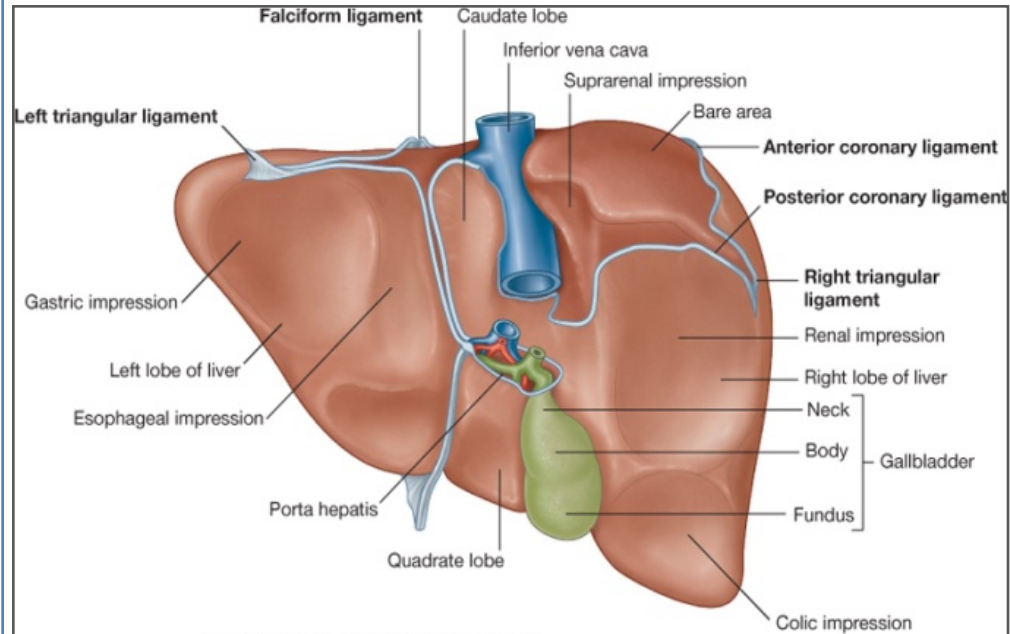
- **The convex upper surface** is **smooth** and molded to the **undersurface** of the domes of the **diaphragm** which separates it from the pleurae, lungs, pericardium, and heart .
- Covered with visceral peritoneum, **except posteriorly** in **the bare area of the liver**, where it lies in direct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





# Visceral Surface

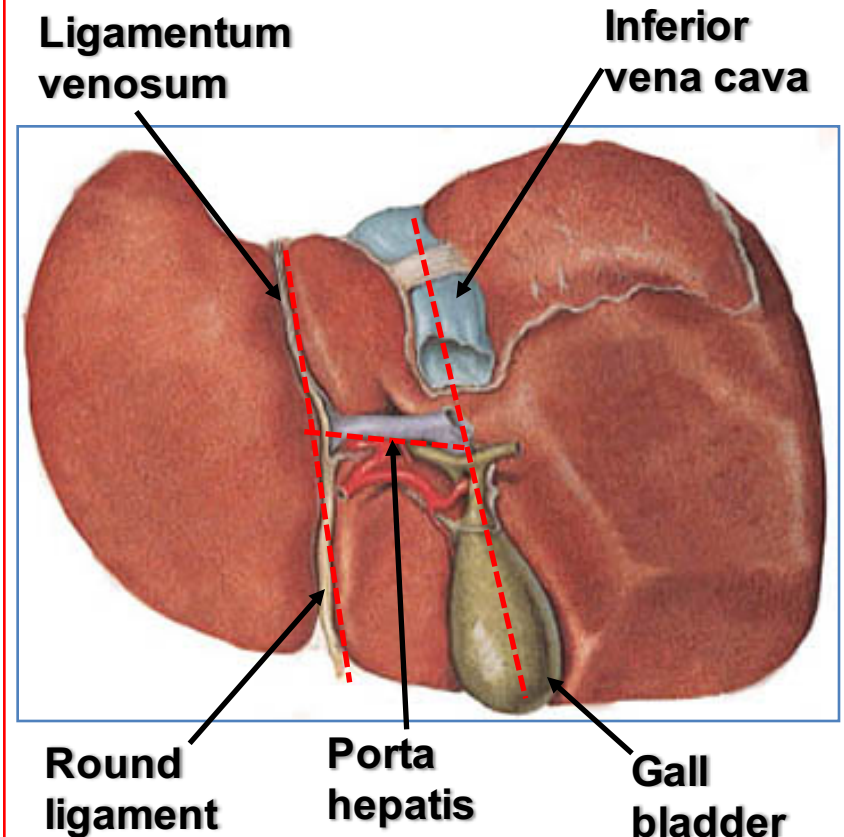
- It is the **posteroinferior surface**, related to **abdominal viscera**.
- It is covered with **peritoneum**, except at **the fossa for the gallbladder, the porta hepatis and IVC groove**.
- It bears multiple **fissures** and **impressions** for contact with other organs.





# Fissures of the Liver

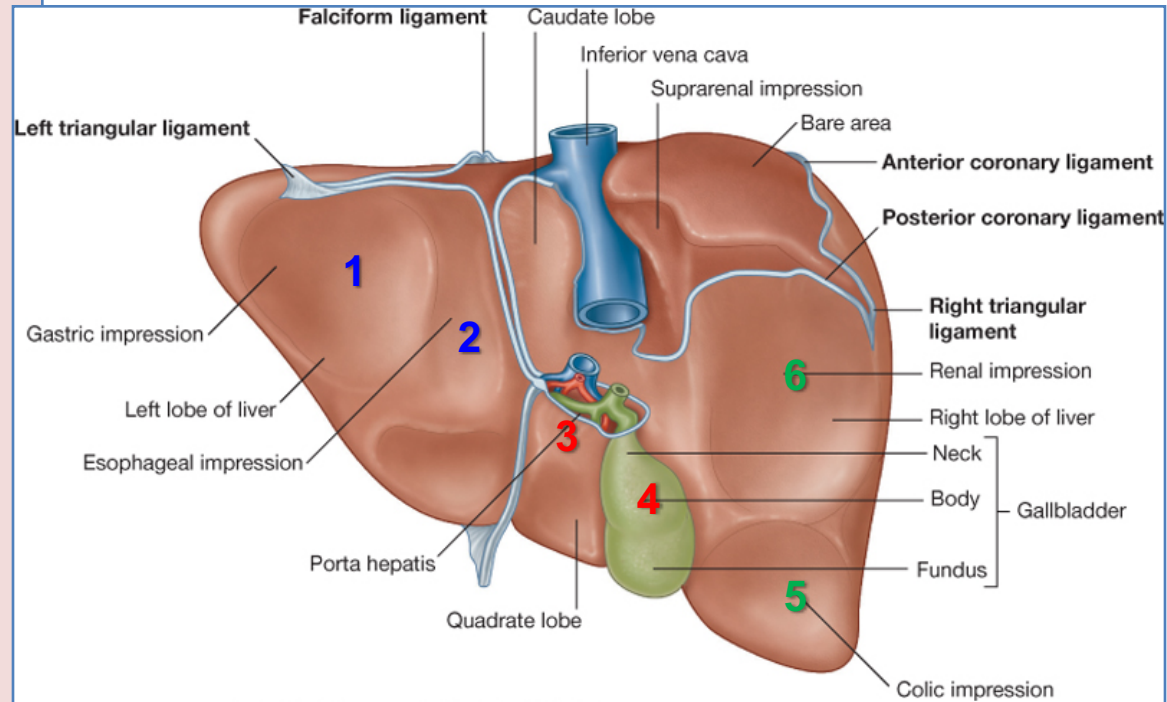
- **Two sagittally oriented fissures, linked centrally by the transverse porta hepatis, form the letter H on the visceral surface.**
- The **left fissure** is the continuous groove formed:
  - **Anteriorly** by the **fissure** for the **round ligament (lig.teres)**.
  - **Posteriorly** by the **fissure** 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 of Visceral Surface of the Liver

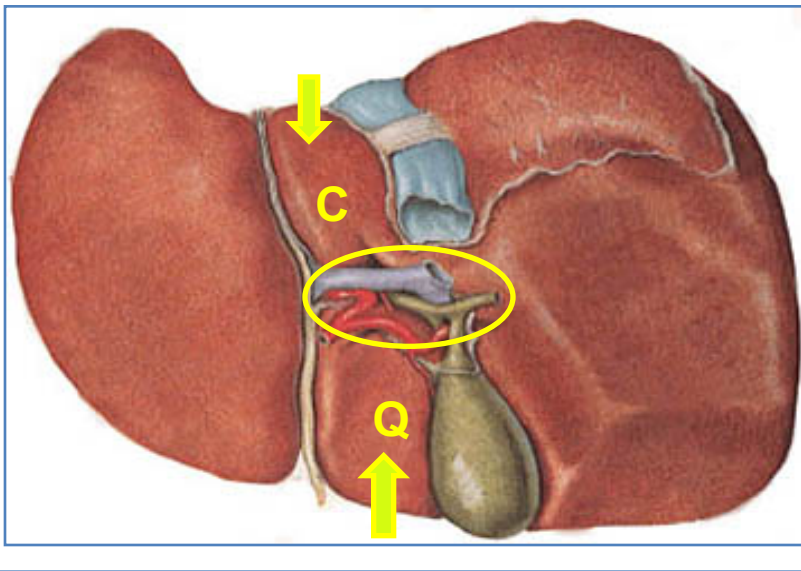
The visceral surface is related to the:

1. stomach and duodenum
2. Esophagus
3. lesser omentum
4. gallbladder
5. right colic flexure
6. right kidney and right suprarenal gland



# 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 the **lesser omentum** is attached to its margins.



## Structures passing through the porta hepatis include:

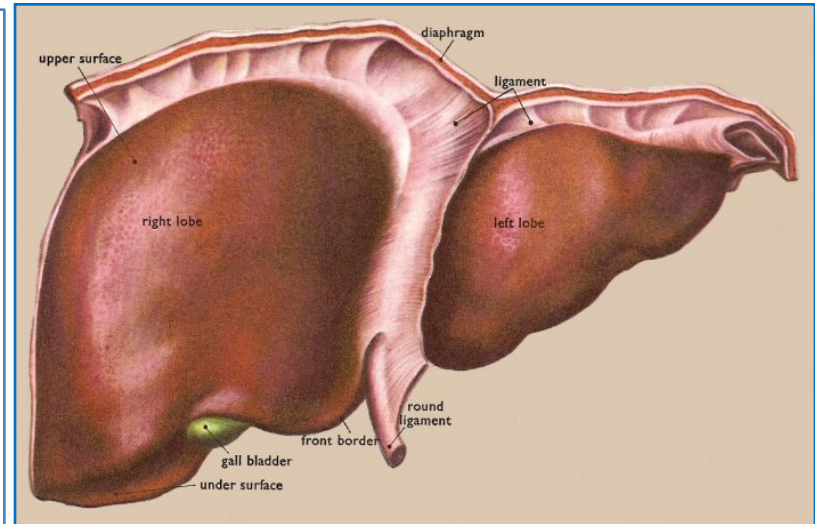
- Right and left **hepatic ducts**.
- Right and left branches of the **hepatic artery**
- Right and left branches of the **portal vein**
- Sympathetic and parasympathetic **nerve fibers**
- A few **hepatic lymph nodes** lie here; they drain the liver and gallbladder and send their efferent vessels to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



# Ligaments of the Liver

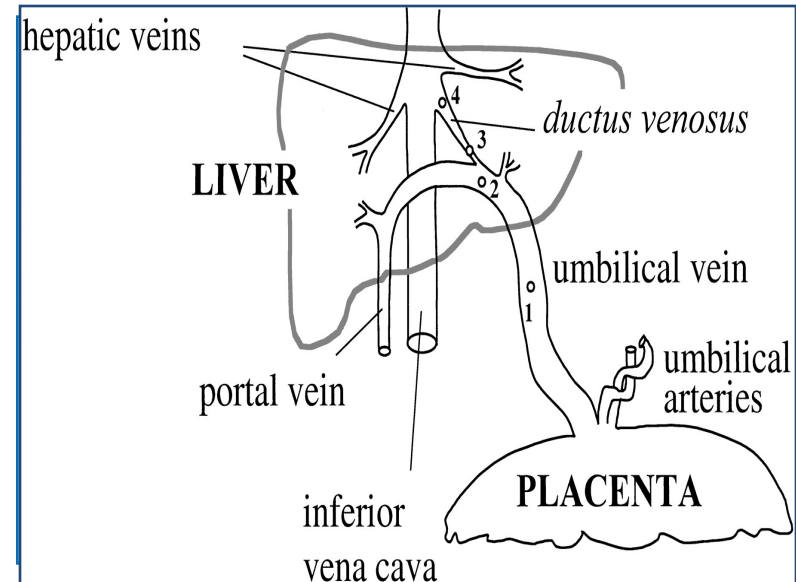
## Falciform ligament

- It is a two-layered fold of the peritoneum.
- **It connects** the liver with the diaphragm and anterior abdominal wall & umbilicus..
- Its sickle-shaped free margin contains the **ligamentum teres** (**round Ligament**) of liver, the remains of the umbilical vein (obliterated umbilical vein), which carried oxygenated blood from the placenta to the fetus.



## Ligamentum venosum

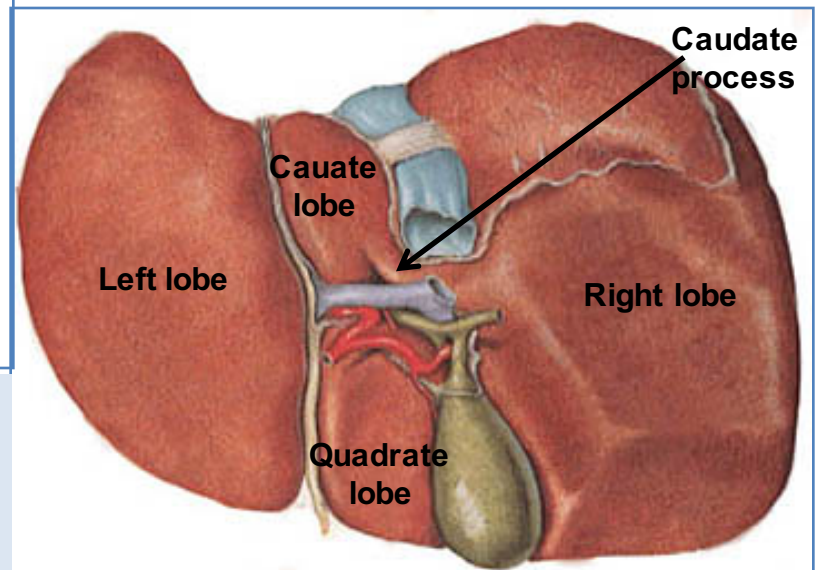
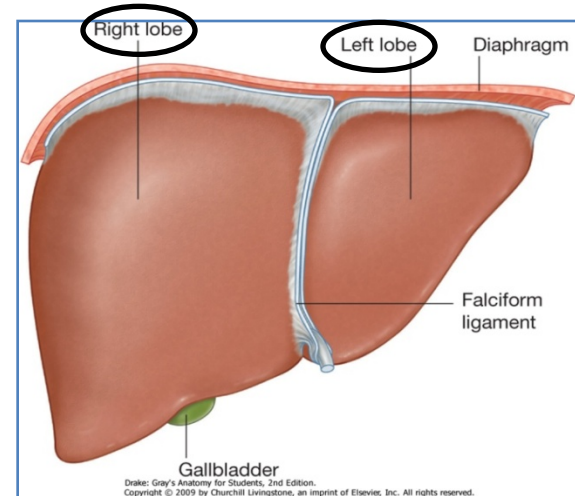
It is the fibrous remnant of the fetal ductus venosus (obliterated ductus venosus), which shunted blood from the umbilical vein to the IVC.



# Lobes of The Liver

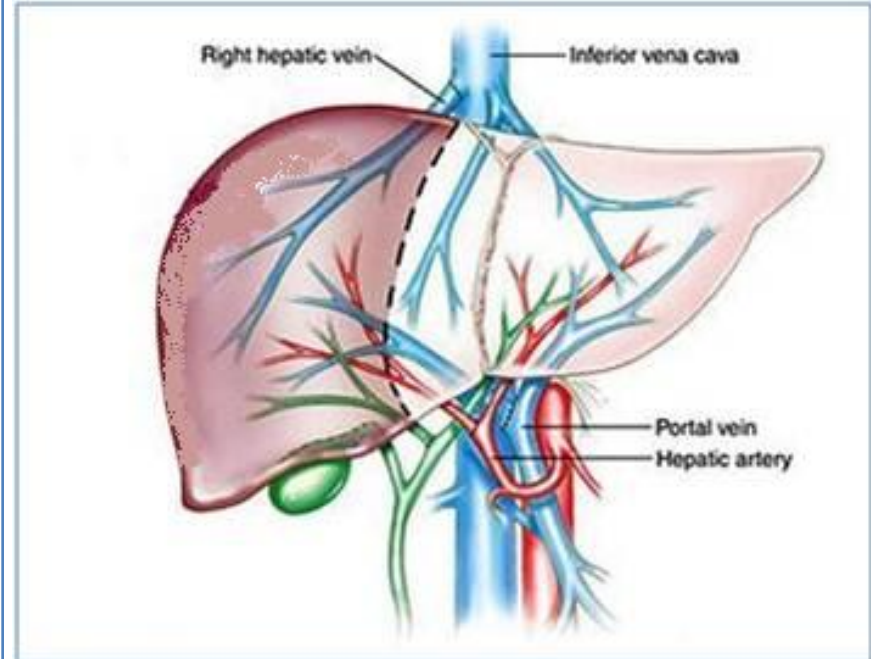
- The liver is divided into a large **right lobe** and a small **left lobe** by the attachment of the **falciform ligament**.
- The right lobe is further divided into a **quadrate lobe** and a **caudate lobe** by the presence of the **gallbladder**, the **fissure for the ligamentum teres**, the **inferior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

The **functional anatomy** divides the liver into left and right lobes **based on** their relation to the division of common hepatic duct, hepatic portal vein, and hepatic artery proper into right & left branches, so the areas of the liver supplied by these branches constitute the functional left and right lobes.



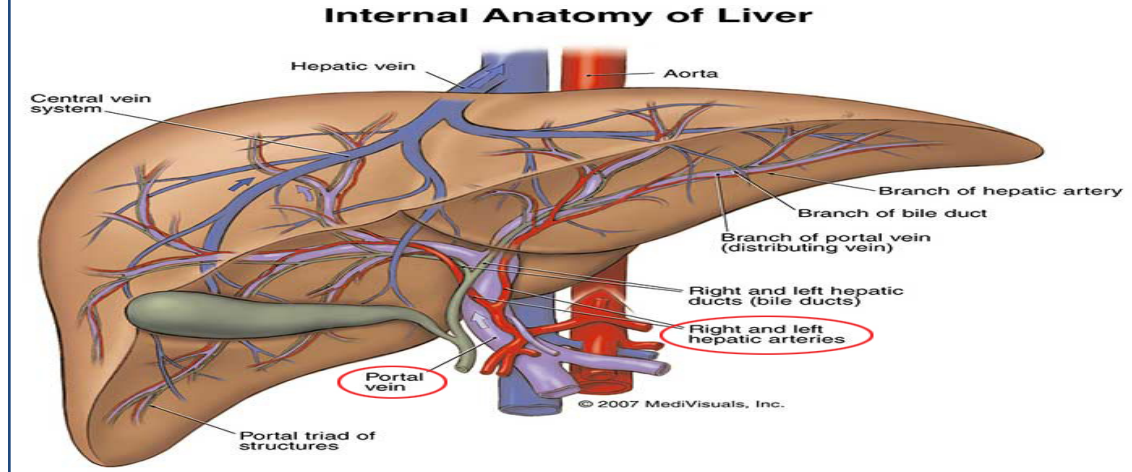
# Blood Circulation through the Liver

- The blood vessels **conveying** blood to the liver are the **hepatic artery (30%)** a branch of celiac trunk, and **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** to the **liver**.



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





- 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 hold the liver in position. (*The **peritoneal ligaments** and the tone of the **abdominal muscles** play a **minor role** in the **support of liver***).<sup>15</sup>

## Lymph Drainage

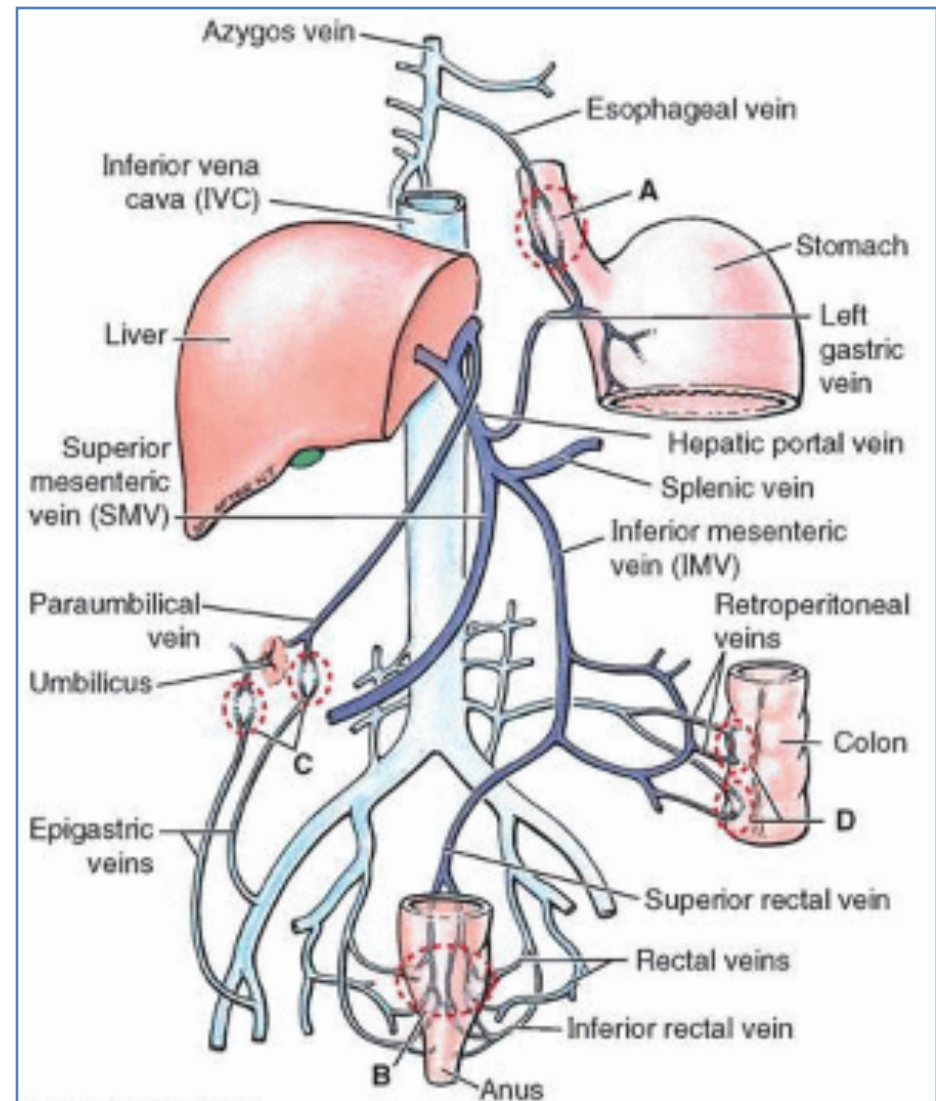
- The **liver produces** a large amount of **lymph**—about one third to one half of all body lymph.
- The **lymph vessels** leave the liver and enter several **lymph nodes** in the **porta hepatis**.
- The **efferent vessels** pass to the **celiac nodes**.
- **A few vessels pass** from the **bare area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

## Nerve Supply

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

# Portal-Systemic (Portacaval) Anastomoses

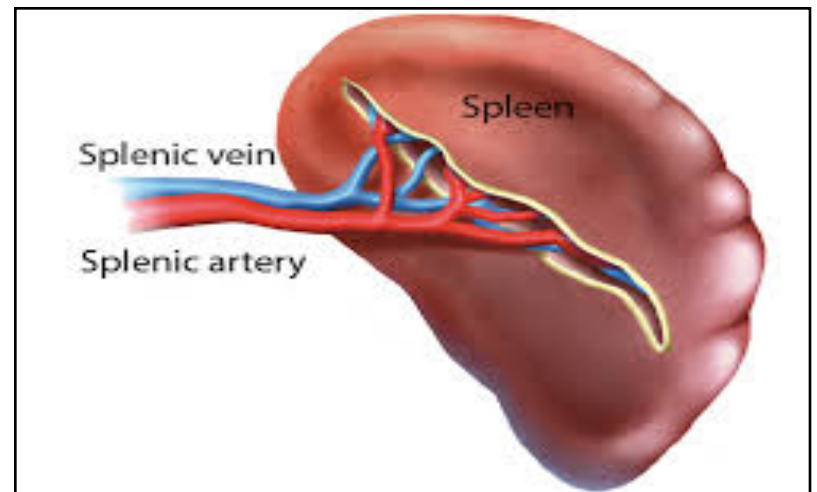
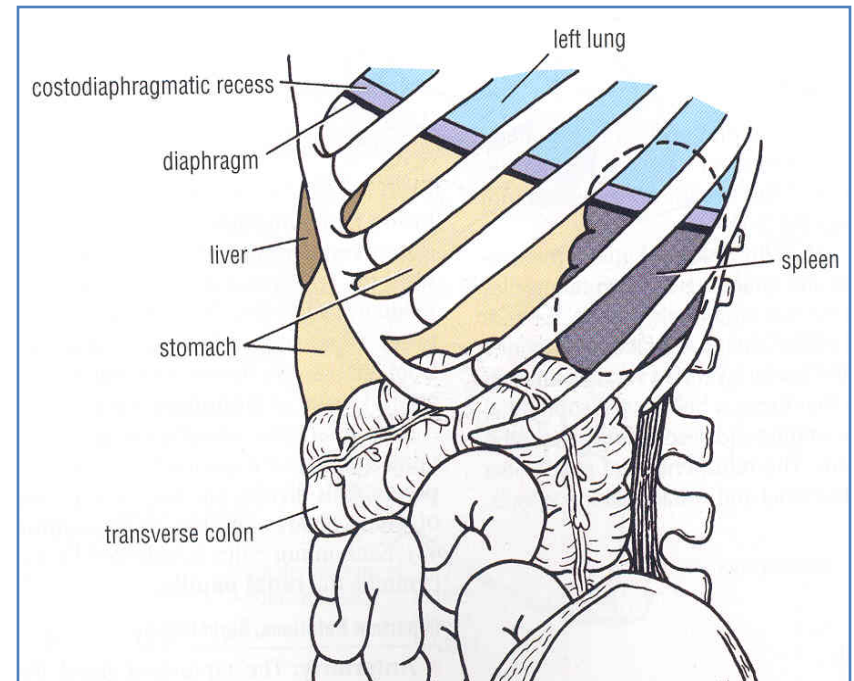
- It is a **specific type of anastomosis** that occurs **between the veins** of **portal** circulation and those of **systemic** circulation
- **In portal hypertion**, these anastomosis open and form **venous dilatation** called **varices**.
- **Sites:**
  - A. Esophagus (lower part).**
  - B. Upper Anal canal.**
  - C. Paraumbilical region.**
  - D. Retroperitoneal.**
  - E. Intrahepatic (Patent ductus venosus).**



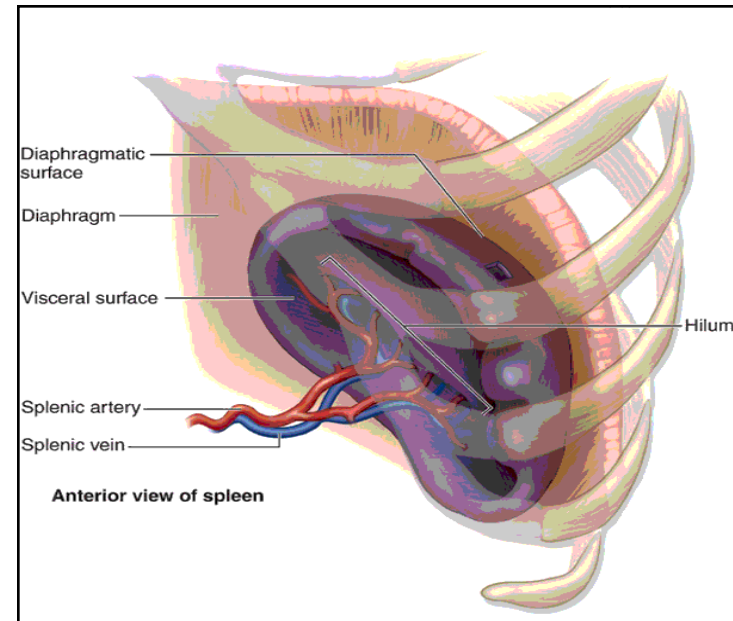


# Spleen

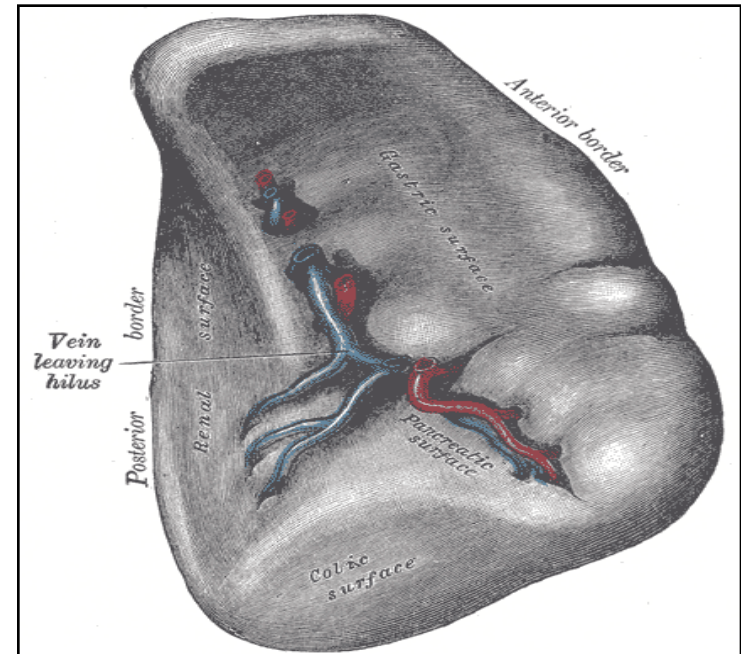
- Largest single mass of **lymphoid tissue**
- **Located in** the **left hypochondrium**, **deep to 9, 10 & 11 ribs**
- **Long axis** lies along the shaft of the **10<sup>th</sup> rib** and **separated from them** by the **diaphragm** and the **costodiaphragmatic recess** (space in pleural cavity).
- 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:** is **convexly curved** to fit the concavity of the **diaphragm** and **curved** bodies of the adjacent **ribs**
- **Visceral surface:** related to viscera.

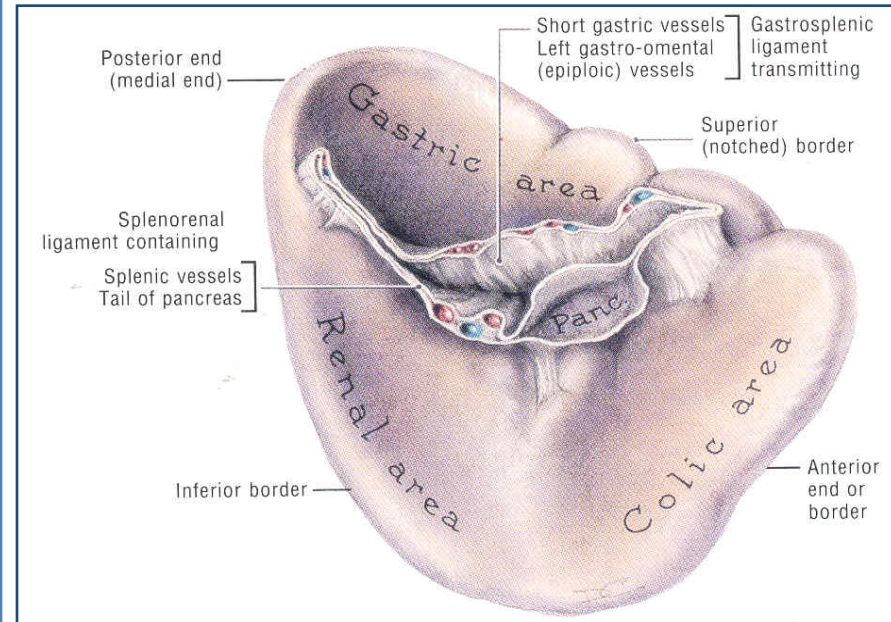


- **Borders:**
- The **superior and anterior** borders are sharp. **Anterior border** is notched.
- The **posterior** (medial) and **inferior** borders are rounded.



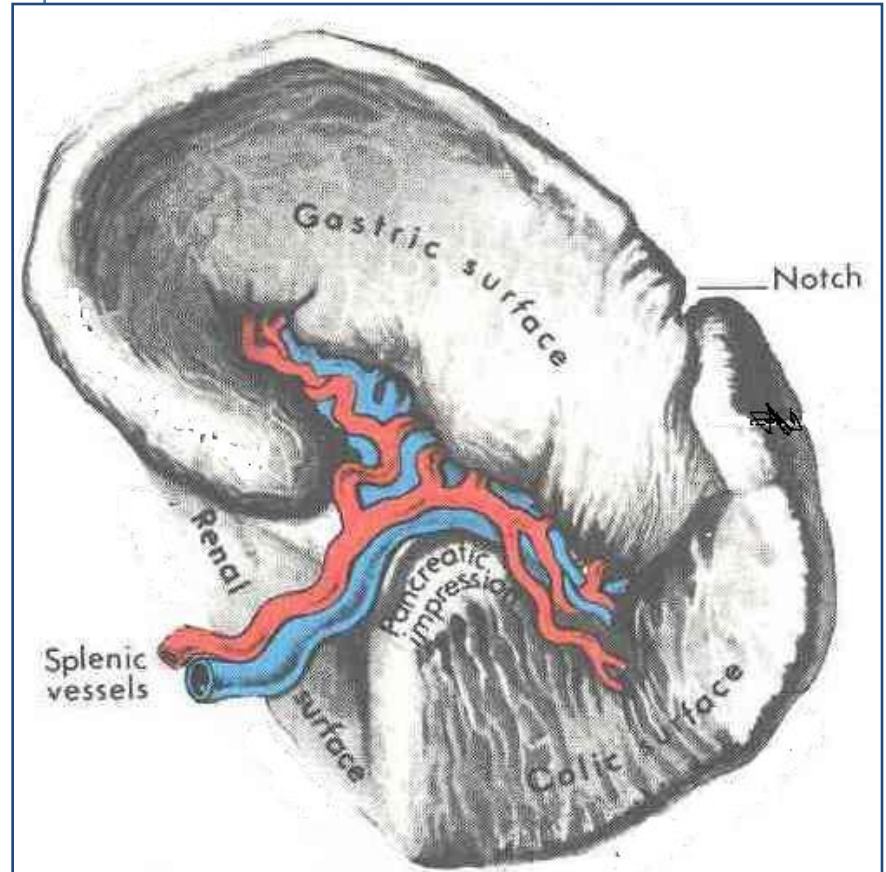
# Peritoneal Reflections/Ligaments

- Spleen is **completely** surrounded by **peritoneum** **EXCEPT** at the **hilum** where **its margins give attachment to** :
  - **Gastrosplenic ligament** to the **greater curvature of stomach** (carrying the **short gastric and left gastroepiploic vessels**)
  - **Lienorenal (splenorenal) ligament** to the **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.

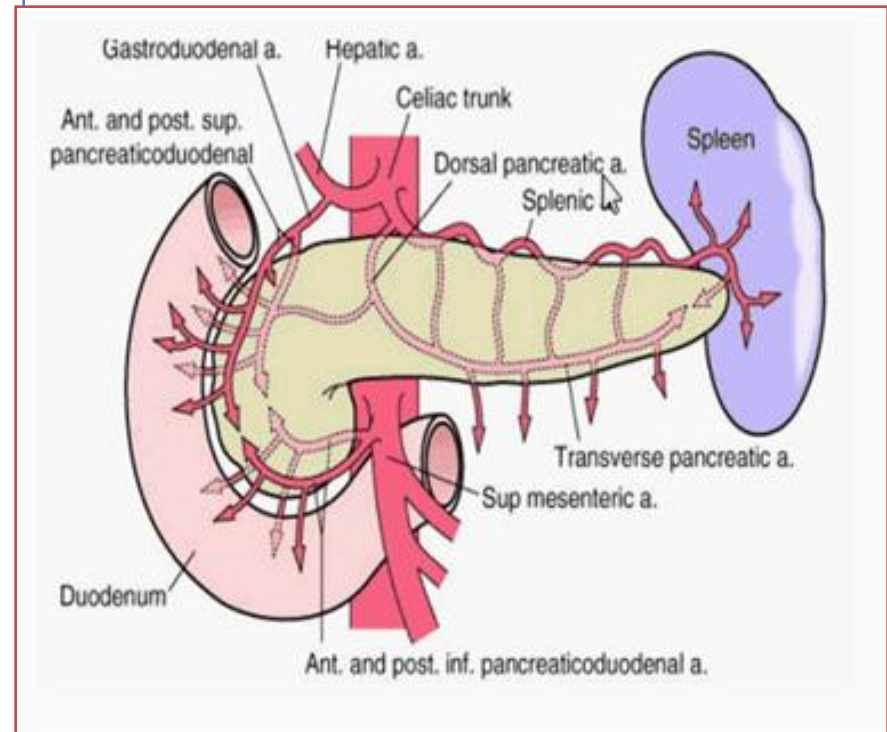




# Arterial Supply

## Splenic artery

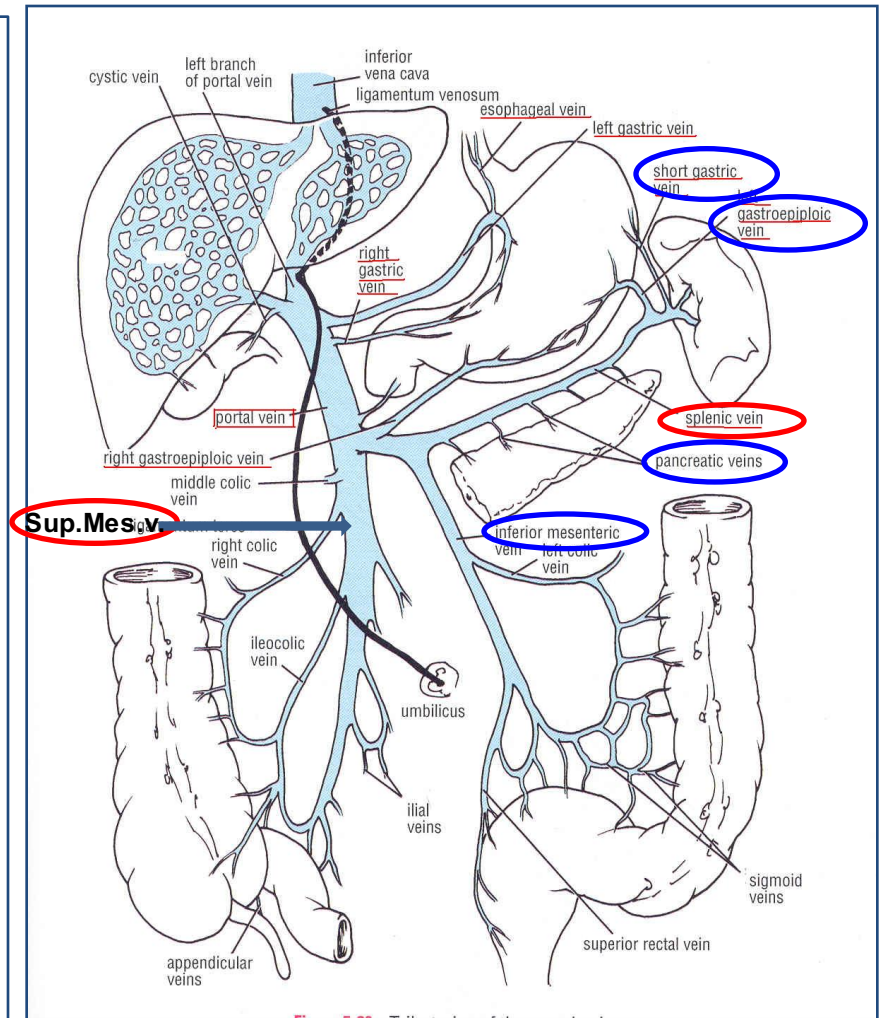
- Largest branch of the **celiac artery**
- Runs a **tortuous course** along the **upper border of the pancreas**
- **Passes within the lienorenal ligament**
- Divides into **4-5 terminal branches**, which enter the spleen **at the hilus**
- **The lack of anastomosis** of these **arterial vessels** within 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 hilus
- Runs 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 vein
  - 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** (Innervation is purely sympathetic).
- Are **distributed mainly along** branches of the **splenic artery**, and are **vasomotor in function**.

**Thank You**