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

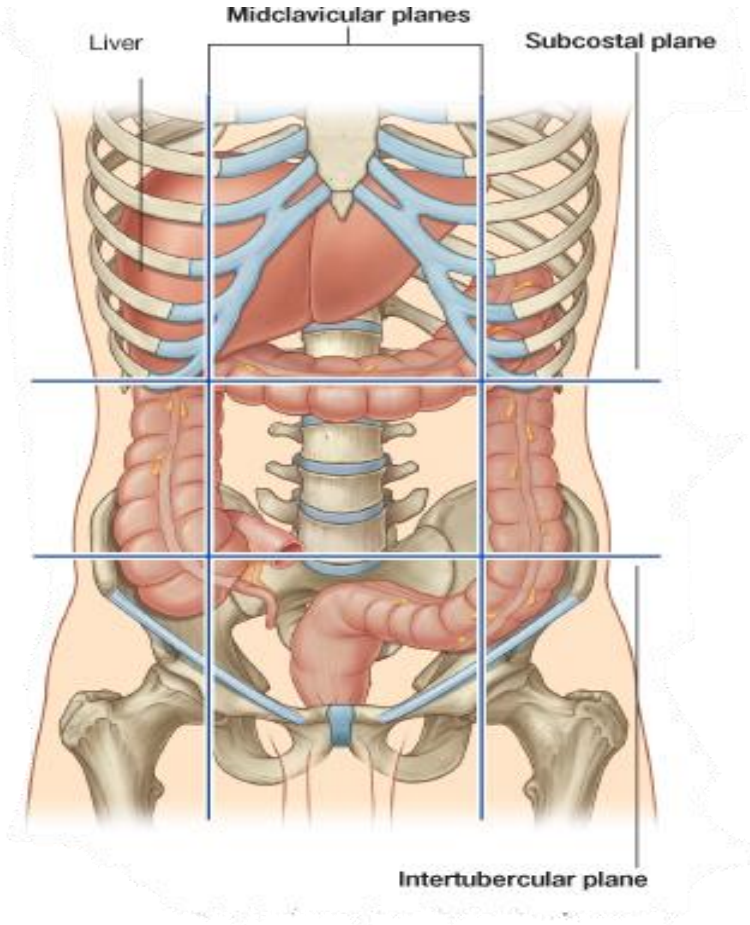
LIVER

DEFINITION:

It is the largest gland in the body. It weighs approximately 1500 g.

SURAFCE ANATOMY:

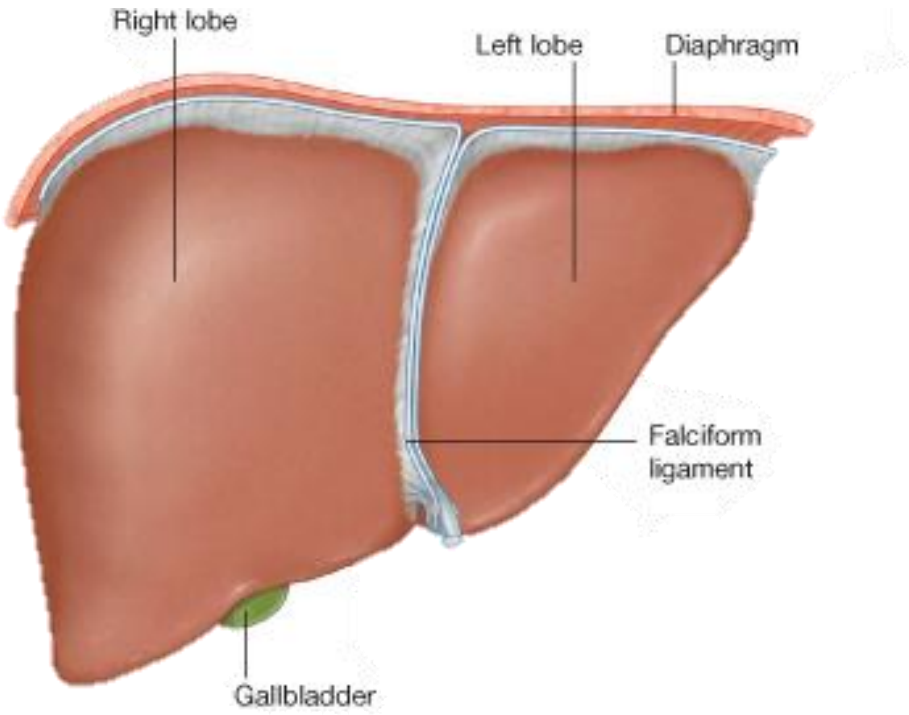
It occupies the ***whole right hypochondrium***, ***a part of the epigastrium*** and ***a part of the left hypochondrium***. Its lower border lies along the right costal margin and crosses the abdomen one hand breadth below the xiphoid process.



SURFACES OF THE LIVER

- **ANTERIOR:** related to diaphragm & anterior abdominal wall. The diaphragm separates it from pleurae & lungs

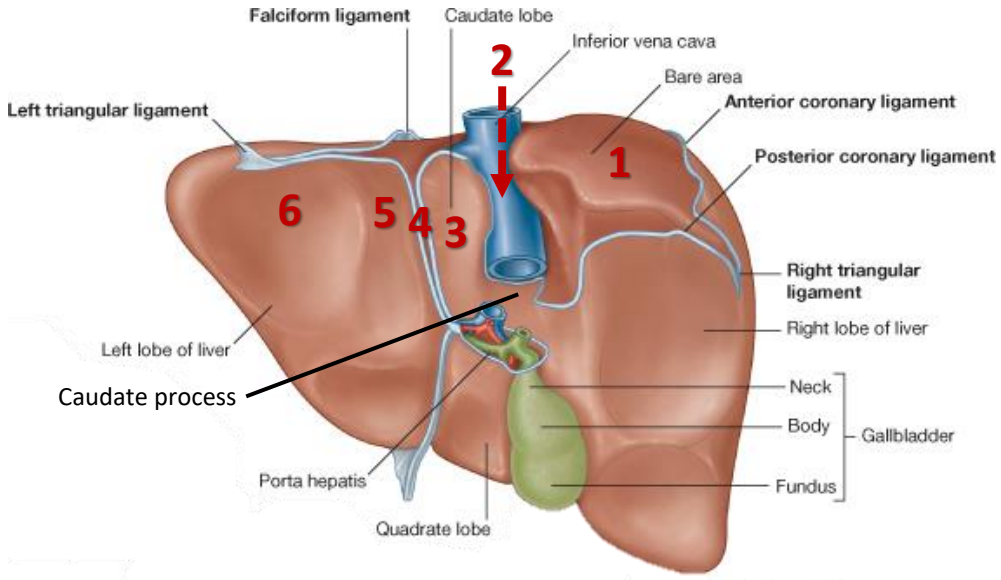
- **SUPERIOR:** related to diaphragm separating it from pericardium & heart (in the middle), pleurae & lungs (on each side)

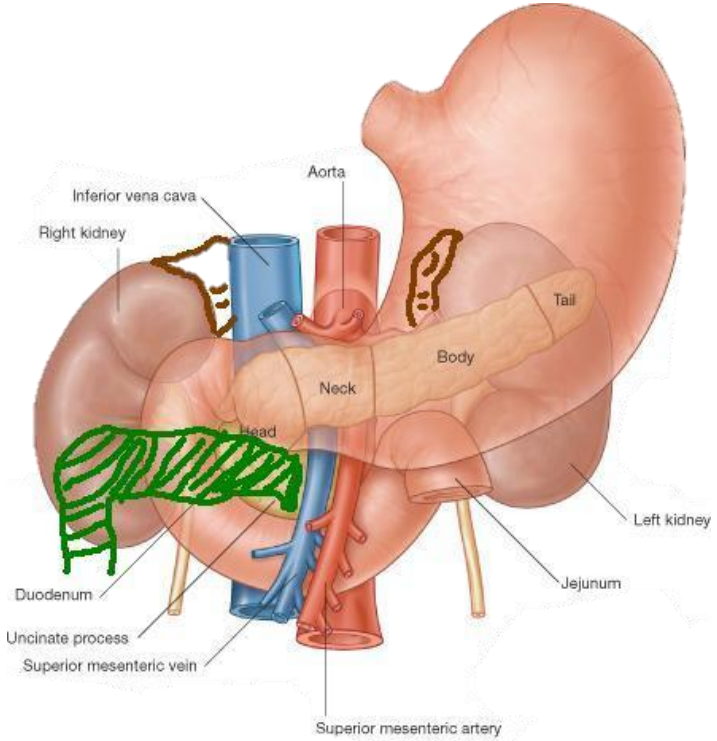


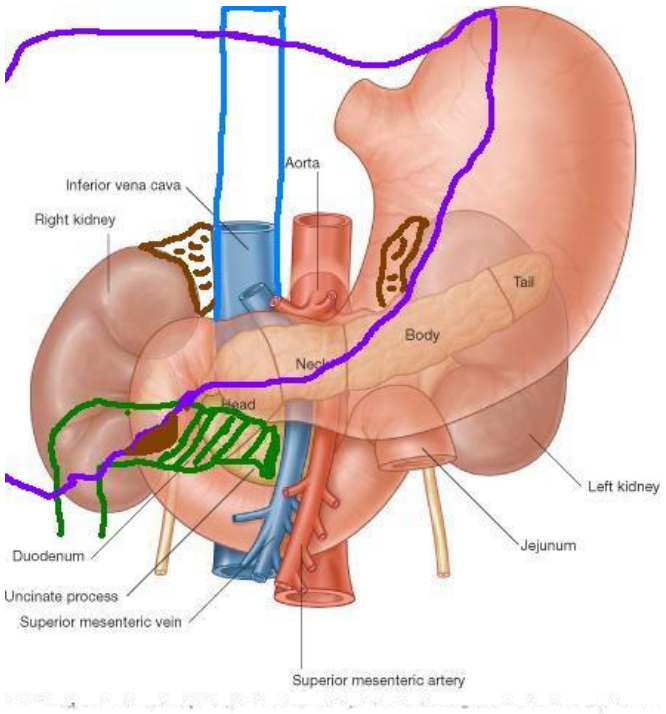
SURFACES OF THE LIVER

POSTERIOR: ***formed of (from right to left):***

1. **Bare area: triangular area related to diaphragm.**
2. **Groove for IVC.**
3. **Caudate lobe: related to diaphragm, projects downwards to form a process separating IVC from porta hepatis & forming upper boundary of epiploic foramen.**
4. **Fissure for ligamentum venosum (obliterated ductus venosus).**
5. **Esophageal notch.**
6. **Gastric impression: related to fundus of stomach.**




Inferior vena cava
Aorta
Right kidney
Tail
Body
Neck
Head
Left kidney
Jejunum
Duodenum
Uncinate process
Superior mesenteric vein
Superior mesenteric artery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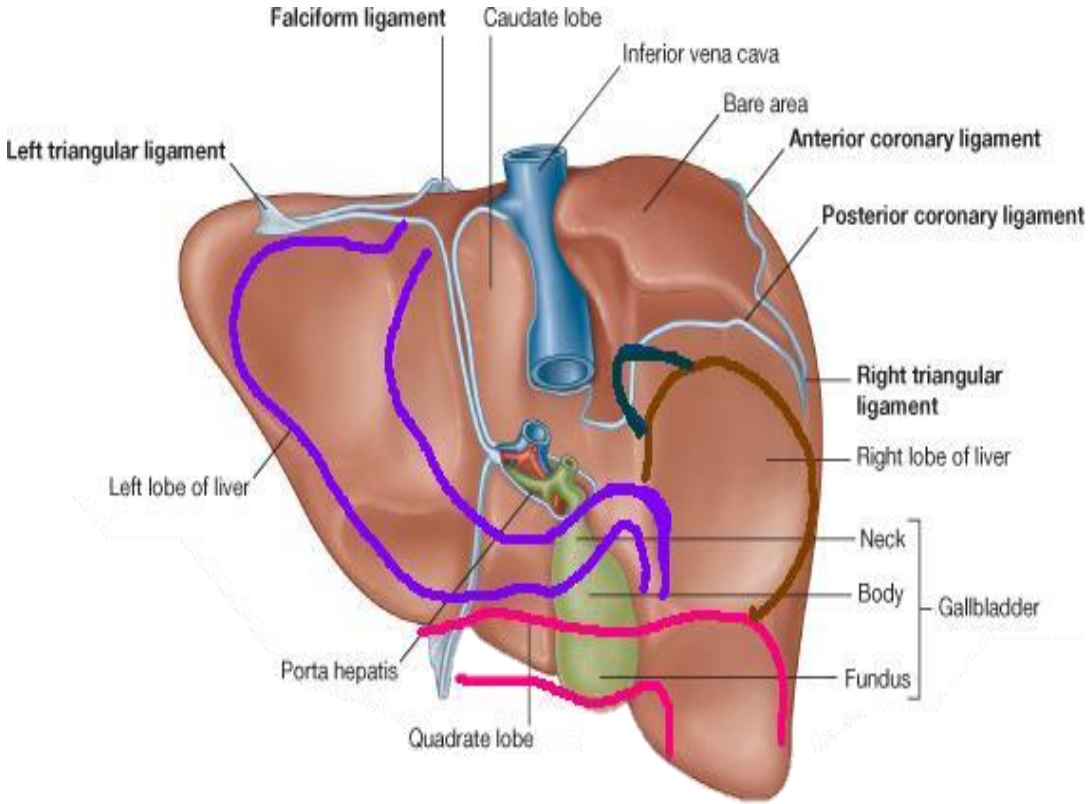

Falciform ligament
Caudate lobe
Inferior vena cava
Bare area
Left triangular ligament
Anterior coronary ligament
Posterior coronary ligament
Right triangular ligament
Left lobe of liver
Right lobe of liver
Neck
Body
Gallbladder
Fundus
Porta hepatis
Quadrate lobe

SURFACES OF THE LIVER

INFERIOR:

- Formed of *(from right to left):*

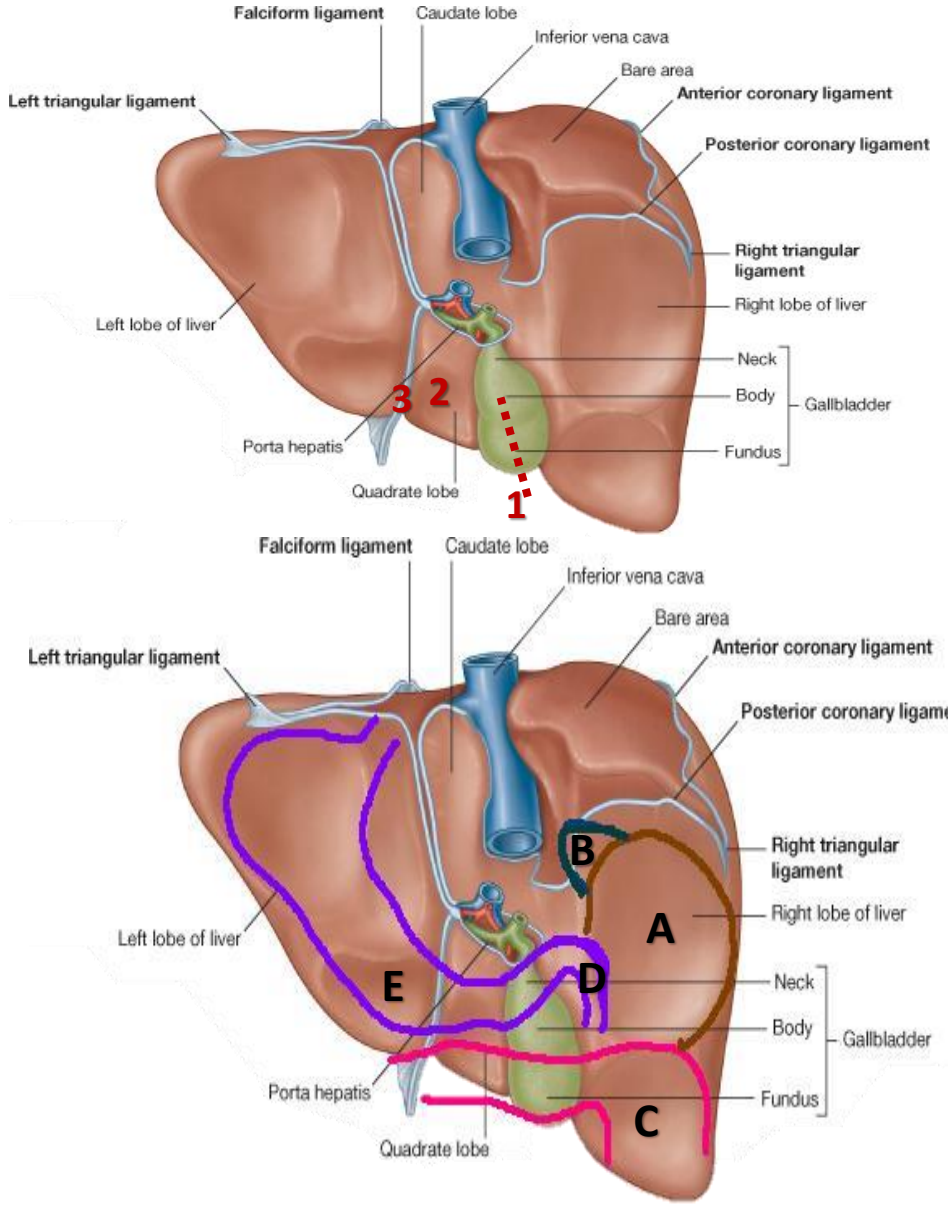
1. Gall bladder fossa.
2. Quadrate lobe: related to pylorus,

1st part of duodenum & transverse colon.

3. Fissure for ligamentum teres (obliterated left umbilical vein).

- Related to the following viscera:

A: Right kidney. B: Right suprarenal gland. C: Right colic flexure. D: 2nd part of duodenum. E: Body of stomach.



LIVER

ACCORDING TO ITS RELATIONS, THE LIVER IS DIVIDED INTO:

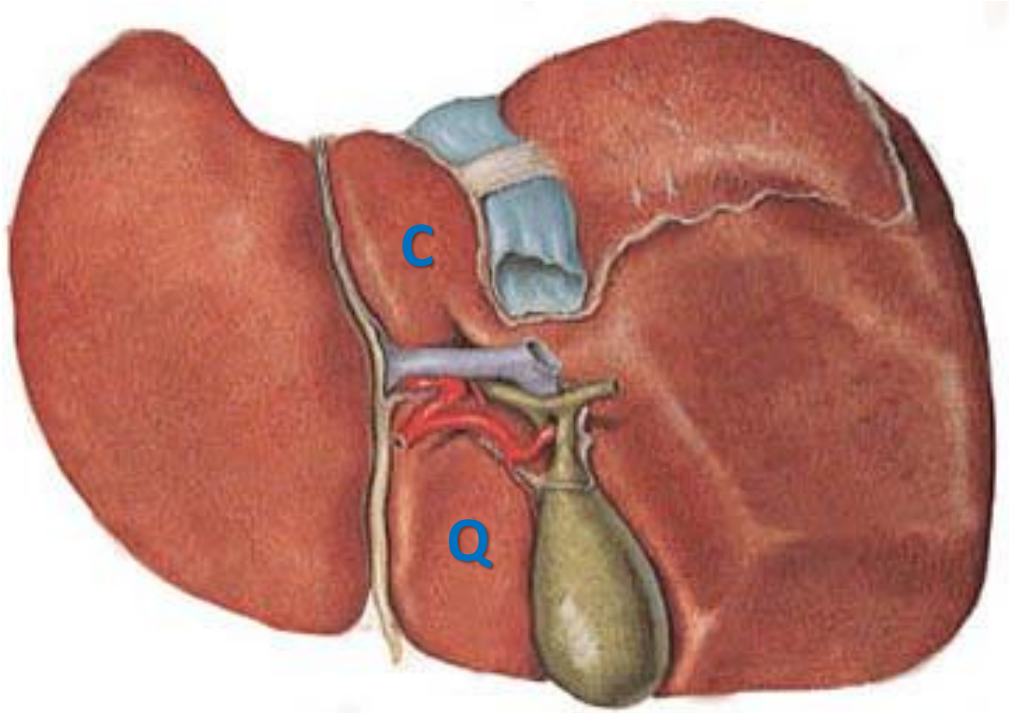
- **DIAPHRAGMATIC SURFACE:** includes *superior, anterior & most of posterior surface*.
- **VISCERAL SURFACE: includes inferior & a part of posterior surface.**

LIVER

PORTA HEPATIS (HILUM OF THE LIVER):

- A transverse fissure found on the posteroinferior surface and lies between the caudate and quadrate lobes.
- Structures passing through the porta hepatis include:

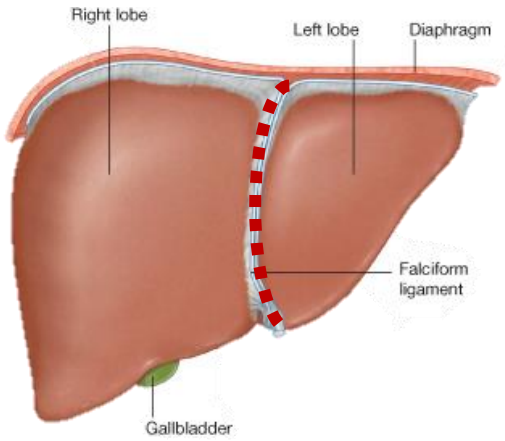
1. Right and left hepatic ducts.
2. Right and left branches of the hepatic artery proper.
3. Right and left branches of the portal vein.
4. Sympathetic (derived from celiac plexus) and parasympathetic (derived from anterior vagal trunk) nerve fibers.
5. A few hepatic lymph nodes draining the liver and gall bladder and sending their efferent vessels to the celiac lymph nodes.

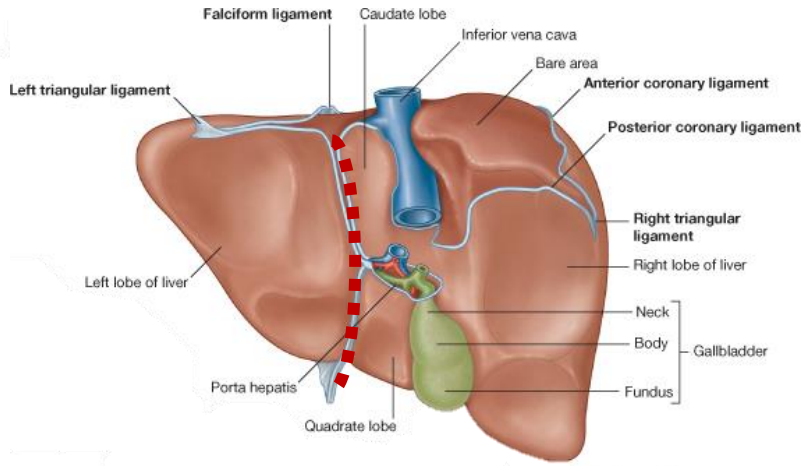


LOBES OF THE LIVER

ANATOMICAL DIVISION:

- The liver is divided into a smaller left & a larger right lobe by:
- Falciform ligament: anteriorly.
- Fissure for ligamentum venosum: posteriorly.
- Fissure for ligamentum teres: inferiorly.

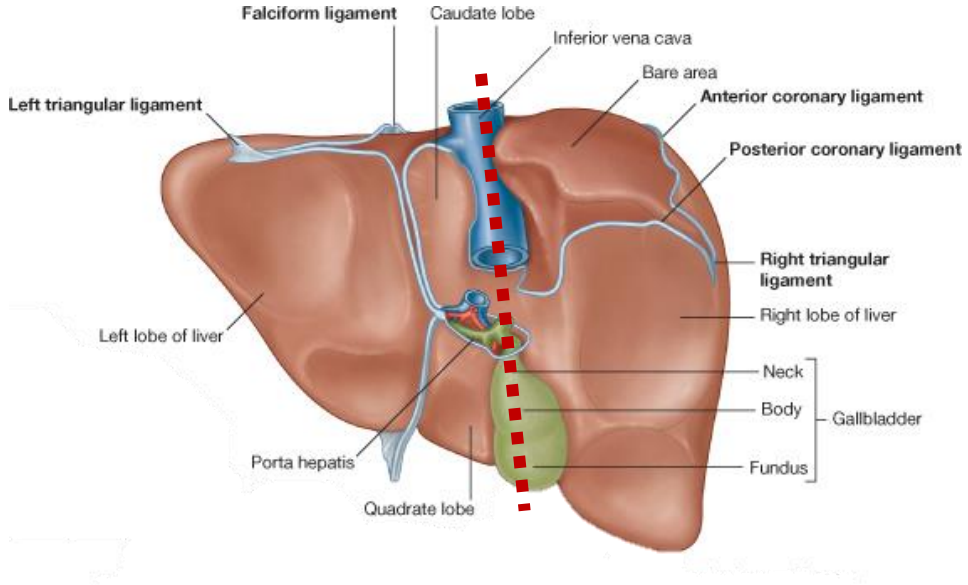




FUNCTIONAL DIVISION:

Based on the areas of supply of the right and left branches of the portal vein, and the hepatic artery proper, the liver is functionally divided into a nearly equal left & right lobes by a plane passing through groove for IVC & gall bladder fossa.

So in this division, the caudate & quadrate lobes are included into the left lobe because they are supplied by left branches of hepatic artery & portal vein.

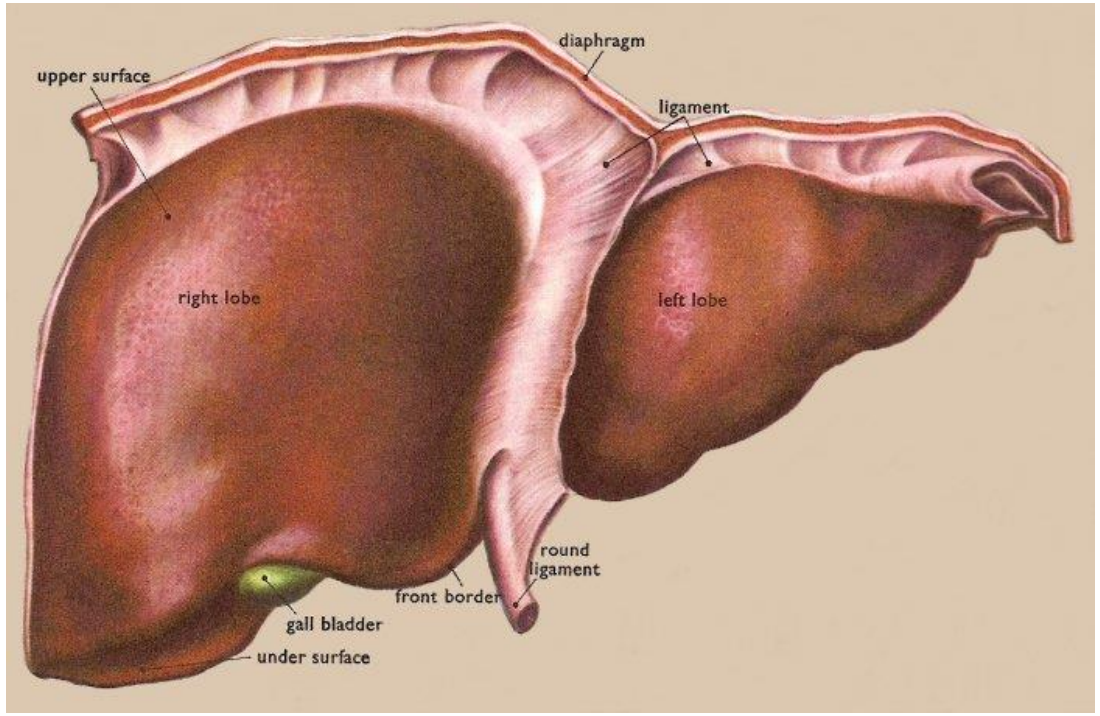


LIGAMENTS OF THE LIVER

FALCIFORM LIGAMENT

A triangular fold formed of two layers (right & left) with:

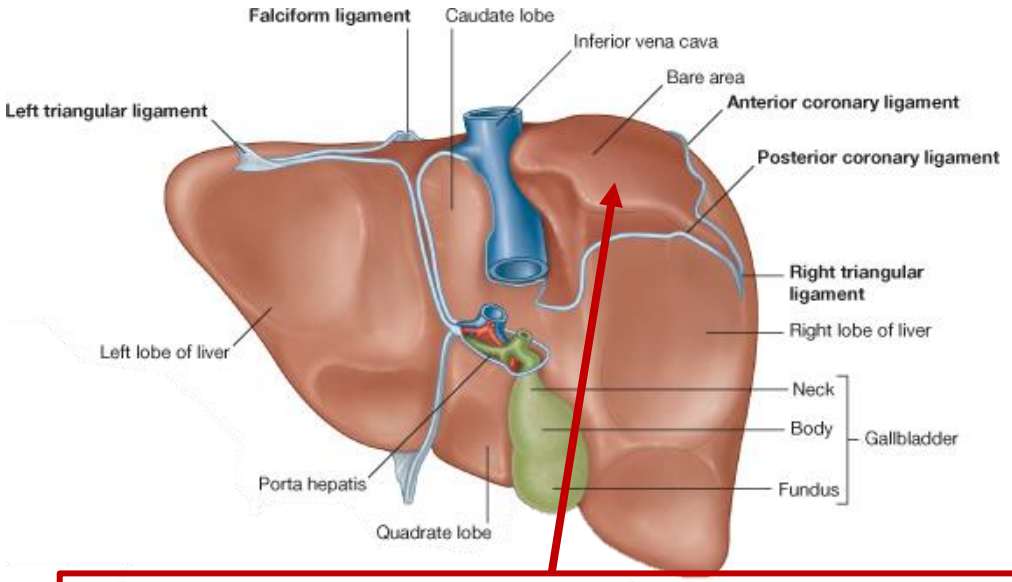
- **Anterior border:** attached to diaphragm.
- **Posterior border:** attached to anterior & superior surfaces of liver.
- **Lower free border:** extending from liver to umbilicus & enclosing ligamentum teres (round ligament) & paraumbilical veins.



LIGAMENTS OF THE LIVER

RIGHT & LEFT TRIANGULAR LIGAMENTS

- **To the right of falciform ligament,** the peritoneum is reflected from the diaphragm to the upper surface of the liver to form **the anterior coronary ligament** (continuous with right layer of falciform ligament). The peritoneum then covers anterior & inferior surfaces then becomes reflected to the front of right kidney to form **the posterior coronary ligament.** Both layers meet to form **the right triangular ligament.**
- **To the left of falciform ligament,** the peritoneum is reflected from the diaphragm to the upper surface of the liver to form **the anterior layer of left triangular ligament** (continuous with left layer of falciform ligament). The peritoneum then covers anterior, inferior & posterior surfaces & is reflected to the diaphragm to form **the posterior layer of left triangular ligament.** Both layers meet to form **the left triangular ligament.**



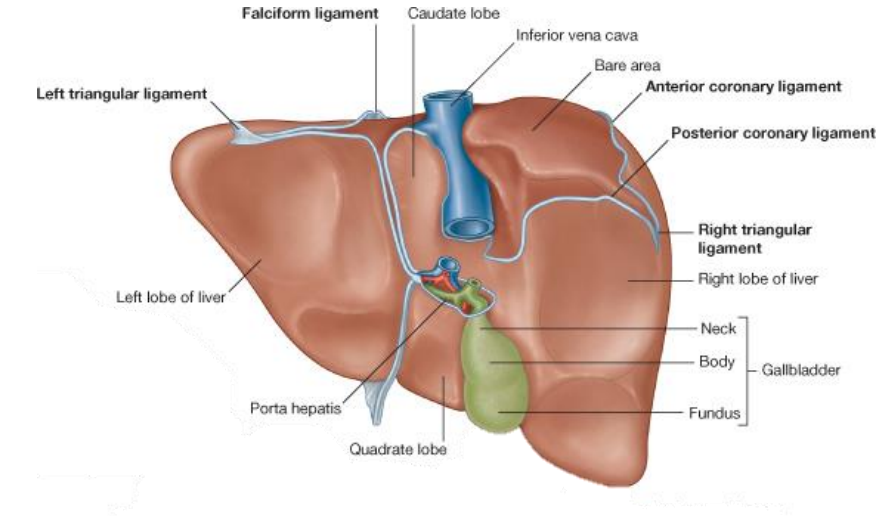
The bare area of the liver is a **triangular** area on **the posterior surface** of right lobe where there is no intervening peritoneum between the liver and the diaphragm. **Its sides** are anterior & posterior coronary ligaments. **Its base** is groove for IVC. **Its apex** is right triangular ligament.

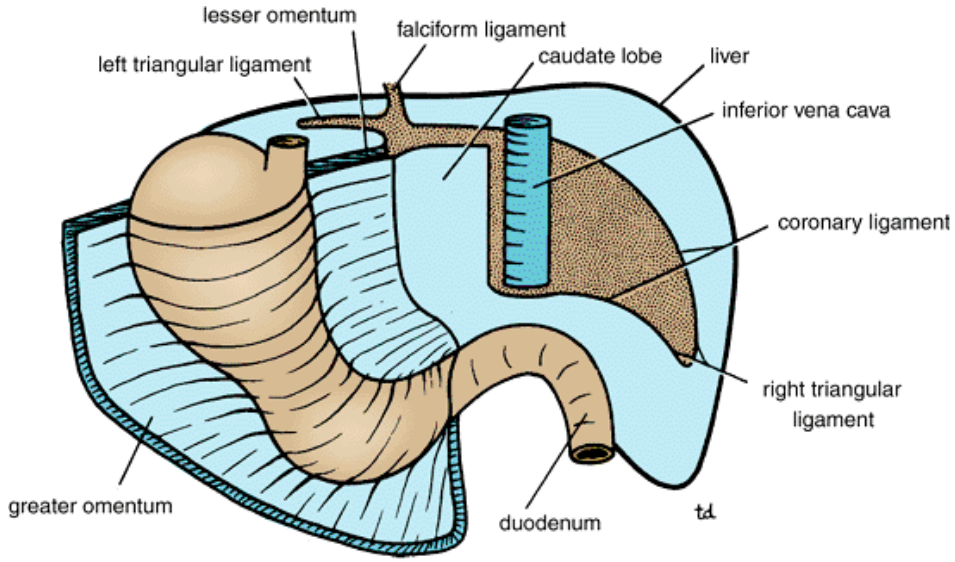
N.B.: Other bare areas: ***groove for IVC, gall bladder fossa, porta hepatis, fissure for ligamentum venosum.***

LIGAMENTS OF THE LIVER

LESSER OMENTUM (HEPATOGASTRIC & HEPATODUODENAL LIGAMENTS)

- It is attached to the margins of porta hepatis & fissure for ligamentum venosum.
- It extends to lesser curvature of stomach & upper border of 1st inch of 1st part of duodenum.





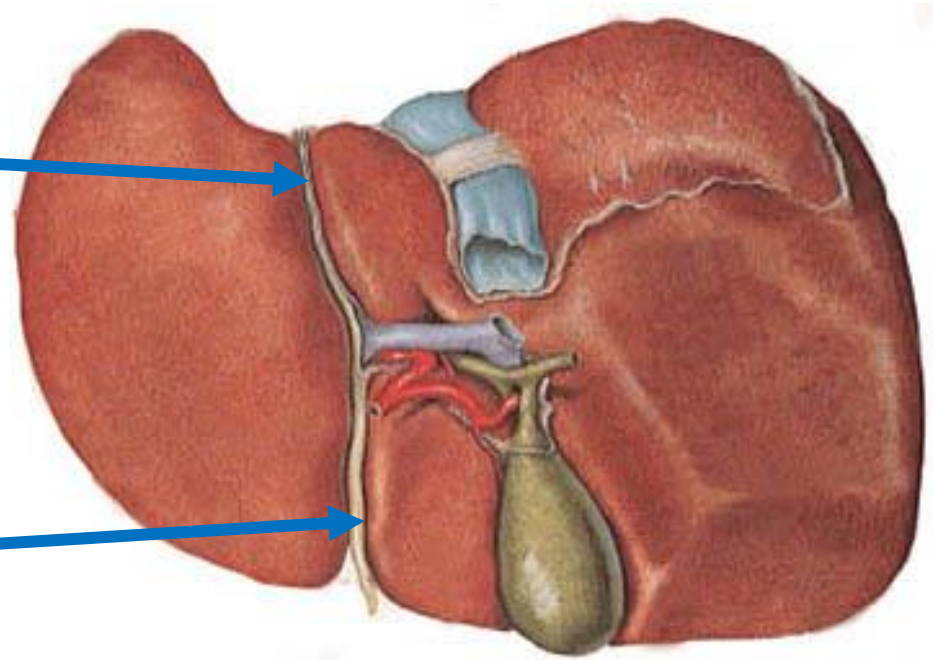
LIGAMENTS OF THE LIVER

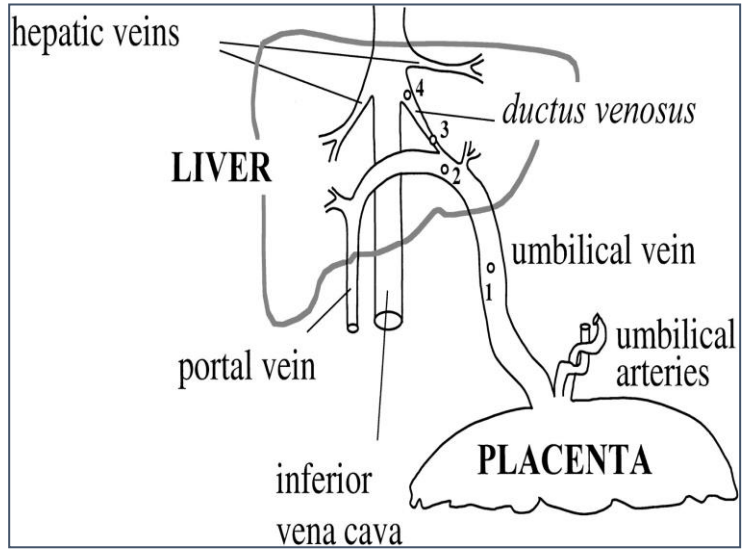
- **LIGAMENTUM VENOSUM:**

Represents the obliterated ductus venosus that originally connects IVC with left branch of portal vein.

- **LIGAMENTUM TERES:**

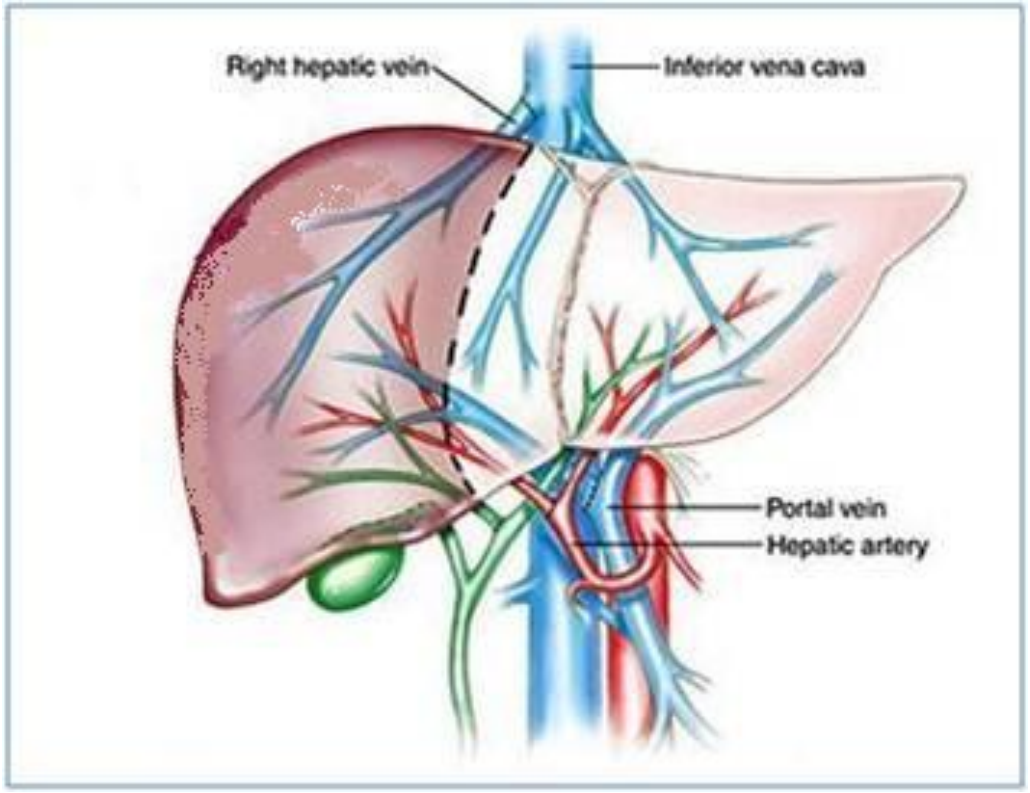
Represents the obliterated left umbilical vein that originally joins the branch of portal vein.





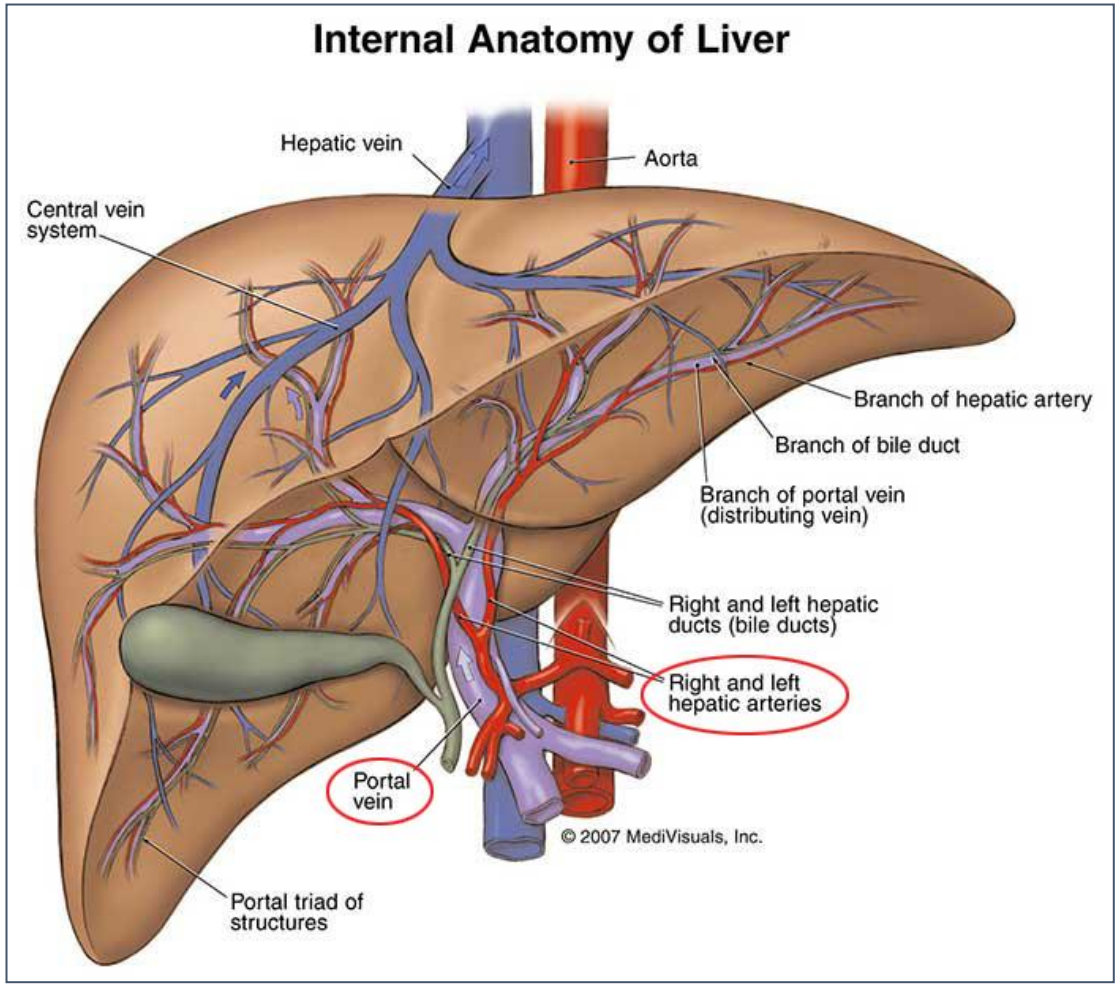
BLOOD SUPPLY OF THE LIVER

- **HEPATIC ARTERY:** brings oxygenated blood to the liver (30% blood reaching the liver).
- **PORTAL VEIN:** brings blood absorbed from GIT to the liver (70% blood reaching the liver).
- **ALL BLOOD PASS TO HEPATIC SINUSOIDS.**
- Blood leave the liver through **HEPATIC VEINS** to the **IVC.**



BLOOD SUPPLY OF THE LIVER

- **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 functional lobes 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. They also have no extrahepatic course (suspending the liver to the IVC). They are considered as the main support of the liver.**
- **N.B.: Additional (minor) support: *peritoneal folds, surrounding organs and tone of the anterior abdominal wall muscles.***



PORTO-SYSTEMIC (PORTACAVAL) ANASTOMOSES

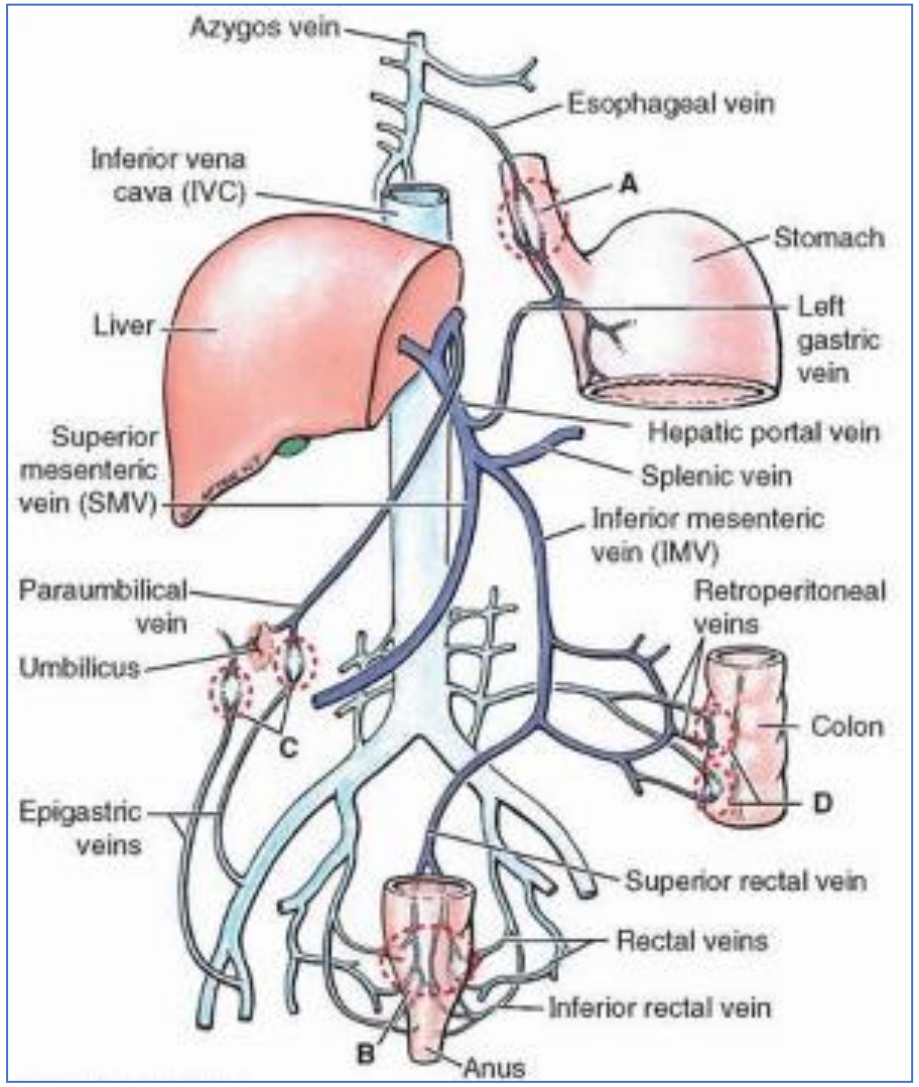
- They are specific types of anastomoses that occur **between the veins of portal circulation and those of systemic circulation.**
- In portal hypertension, these anastomosis open and form venous dilatation called **varices.**
- <u>Main sites</u>:

A. Lower part of Esophagus **(Esophageal Varices).**

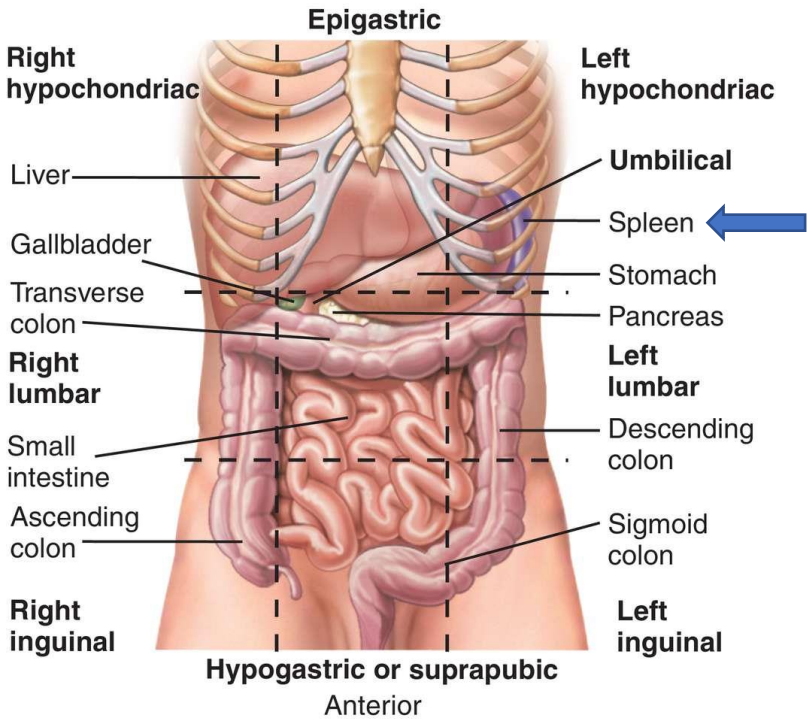
B. Upper part of Anal canal **(Hemorroids).**

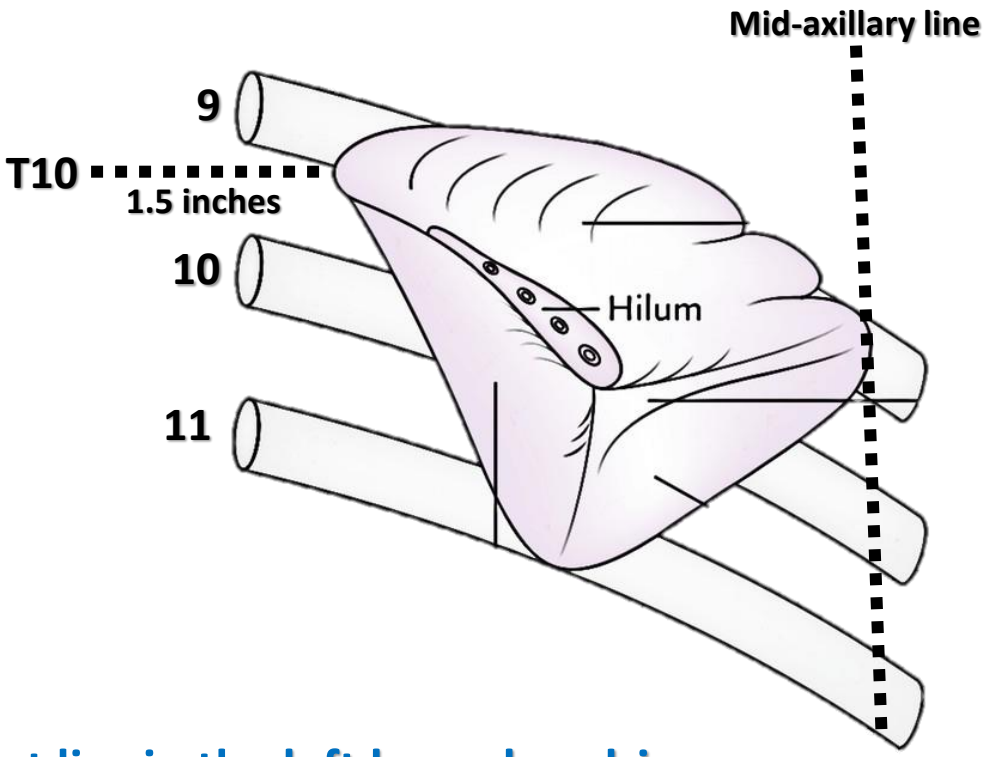
C. Paraumbilical region **(Caput Medusae).**

D. Retroperitoneal (Asymptomatic).



SPLEEN





The spleen is a large mass of lymphoid tissue that lies in the left hypochondrium.
It extends from the 9th to the 11th rib. Its long axis lies along the 10th rib.
Its medial end lies one and half inches from the spine of T10.
Its lateral end lies behind the mid-axillary line.
Normal size spleen cannot be palpated on clinical examination.

SPLEEN

The spleen has:

- **TWO BORDERS:**

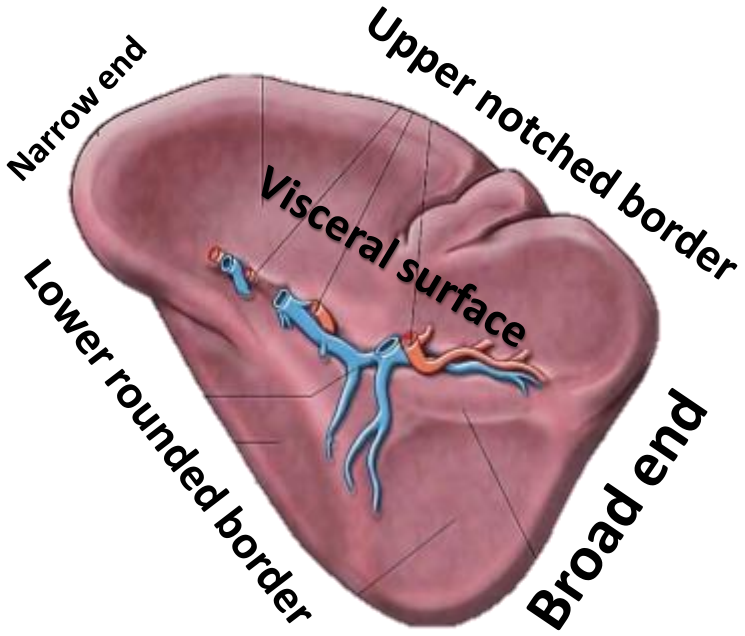
1. **Upper sharp and notched border.**
2. **Lower rounded border.**

- **TWO ENDS:**

1. **Narrow end:** directed ***upward, backward and medially.***
2. **Broad end:** directed ***downward, forward and laterally.***

- **TWO SURFACES:**

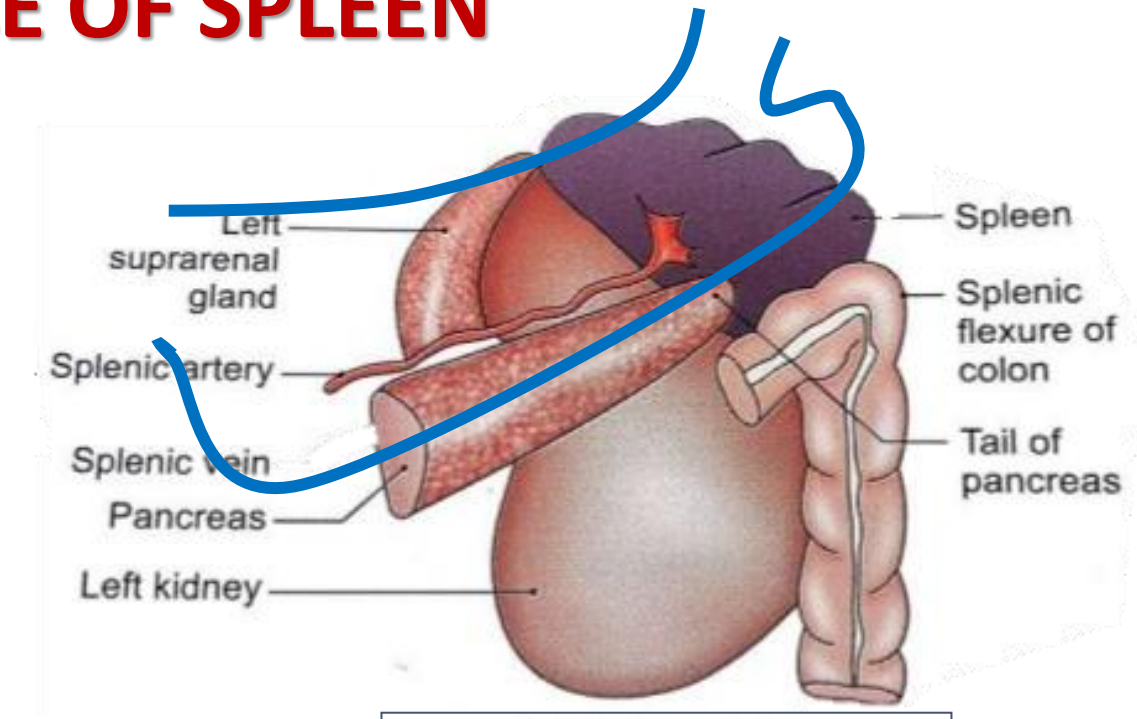
1. **Outer convex diaphragmatic surface related to diaphragm separating it from 9th, 10th and 11th rib.**
2. **Inner concave visceral surface.**

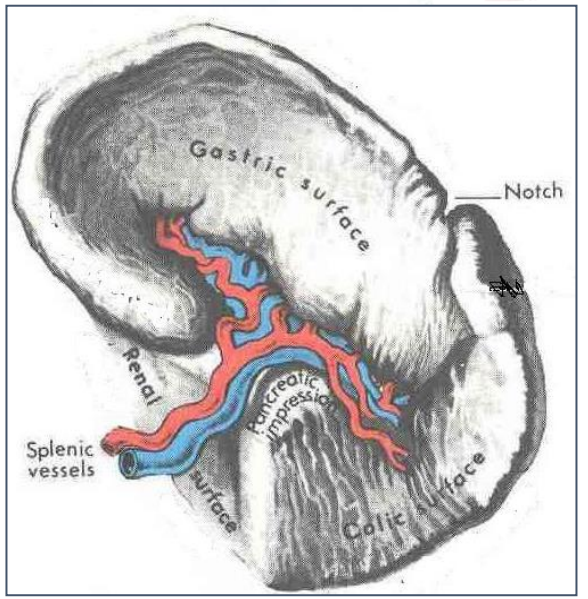


VISCERAL SURFACE OF SPLEEN

- It contains the hilum of the spleen.
- It is related to:

1. **Stomach:** just below the upper border.
2. **Left kidney:** just above the lower border.
3. **Left colic (splenic) flexure:** above the broad end.
4. **Tail of pancreas:** between hilum and left colic flexure.

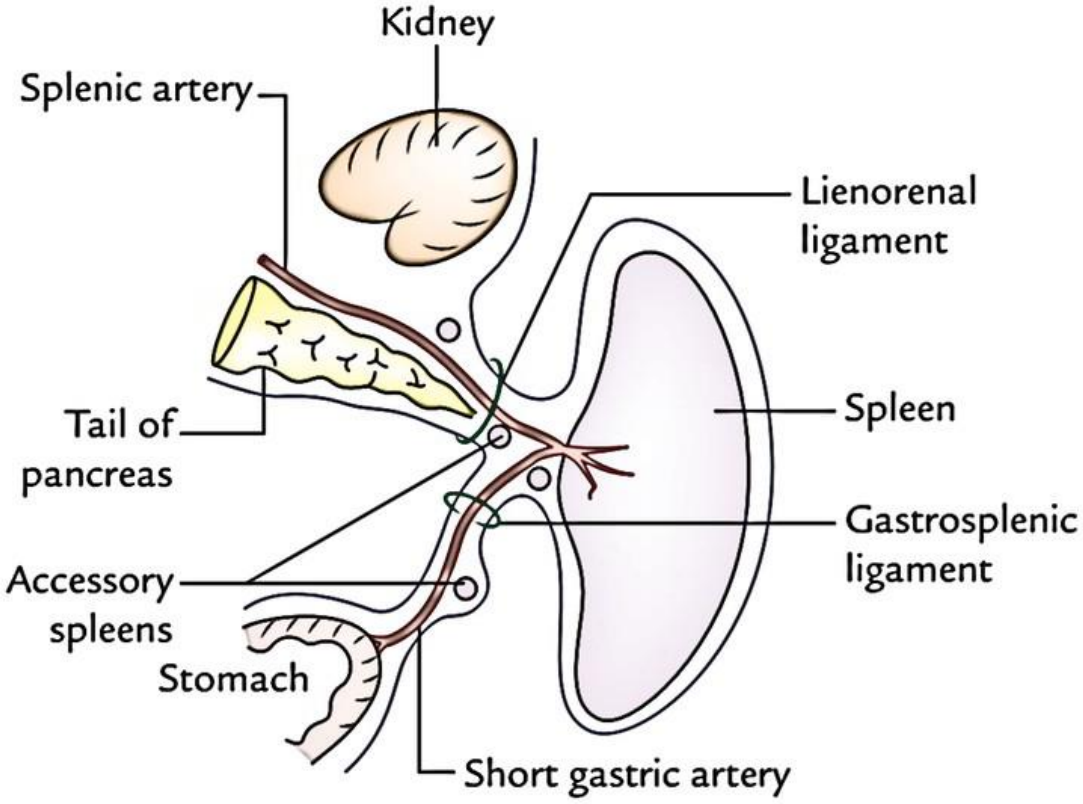




PERITONEAL COVERING/LIGAMENTS OF THE SPLEEN

- **The spleen is completely covered by peritoneum EXCEPT at the hilum where its margins give attachment to :**

1. **Gastrosplenic ligament to the greater curvature of stomach *(containing the short gastric and the left gastroepiploic vessels).***
2. **Lienorenal (splenorenal) ligament to the left kidney *(containing the splenic vessels and the tail of pancreas).***



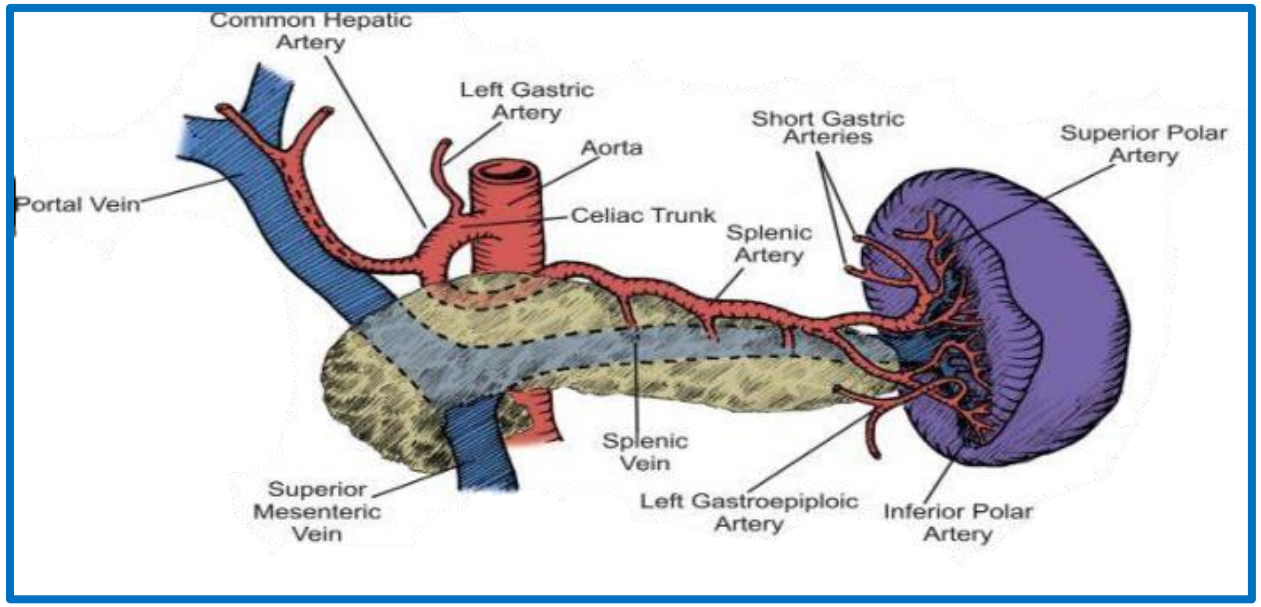
SPLENIC VESSELS

Splenic artery:

- Is the 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 hilum of the spleen.
- Is an end artery. 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.

Splenic vein:

- Leaves the hilum of the spleen and runs behind body of the pancreas.
- Joins the superior mesenteric vein to form the portal vein, behind the neck of pancreas.



- Efferent lymphatics from the spleen drain into celiac lymph nodes.
- Only sympathetic fibers from the celiac plexus reach the spleen along branches of the splenic artery and are vasomotor in function.

QUESTION 1

- **Which one of the following is included into the inferior surface of the liver?**

1. **Groove for inferior vena cava.**
2. **Fissure for ligamentum venosum.**
3. **Caudate lobe.**
4. **Quadrate lobe.** ⟵

QUESTION 2

- **Which one of the following parts of the liver is devoid of peritoneum?**

1. **Groove for inferior vena cava.** ⟵
2. **Fissure for ligamentum teres.**
3. **Caudate lobe.**
4. **Quadrate lobe.**

QUESTION 3

- **Which one of the following is related to the spleen?**

1. **Left suprarenal gland.**
2. **Stomach.** ⟵
3. **Body of pancreas.**
4. **Descending colon.**

THANK YOU