



# Liver & Spleen

Gastrointestinal block-Anatomy-Lecture 9

Editing file



# Objectives

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

- 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

**Color guide :**

Only in boys slides in **Green**

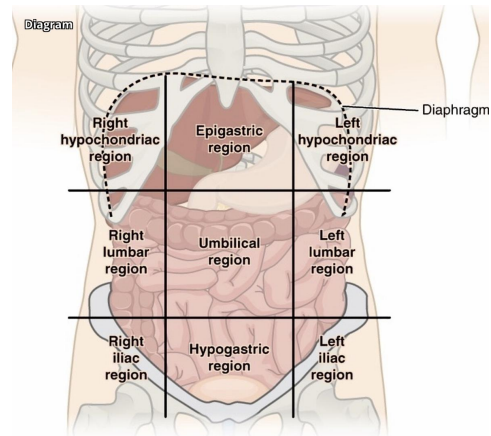
Only in girls slides in **Purple**  
important in **Red**

Notes in **Grey**



# Liver

- The **largest gland** in the body
- Weighs approximately 1500 g. (approximately 2.5% of adult body weight).
- Lies mainly in the: **Right hypochondrium, Epigastrum**, 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.
- The liver is completely surrounded by a fibrous capsule and partially covered by peritoneum
- Moves with the diaphragm and is located more inferiorly when one is erect because of gravity.
- It has two surfaces: 1. Diaphragmatic . 2. Visceral surface



(a) Abdominopelvic regions

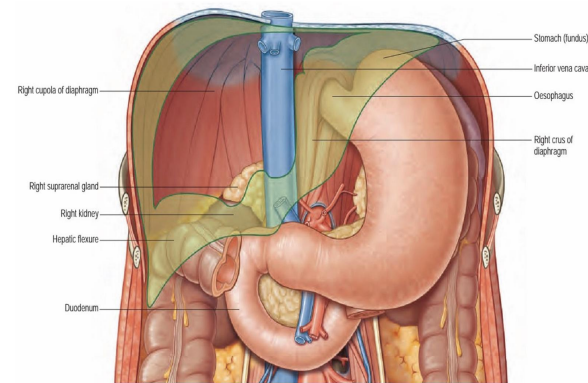
## Relations

### Anterior

1. Diaphragm
2. Right & left pleura and lower margins of both lungs
3. Right & left costal margins
4. Xiphoid process
5. Anterior abdominal wall in the **subcostal angle**

### Posterior

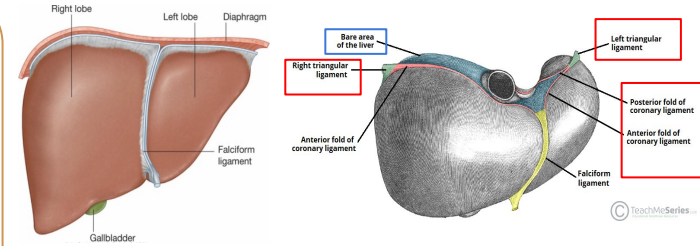
1. Diaphragm
2. Inferior Vena Cava
3. Right Kidney
4. Hepatic Flexure Of The Colon
5. Duodenum
6. Gallbladder
7. Esophagus
8. Fundus Of The Stomach



# Surfaces of Liver

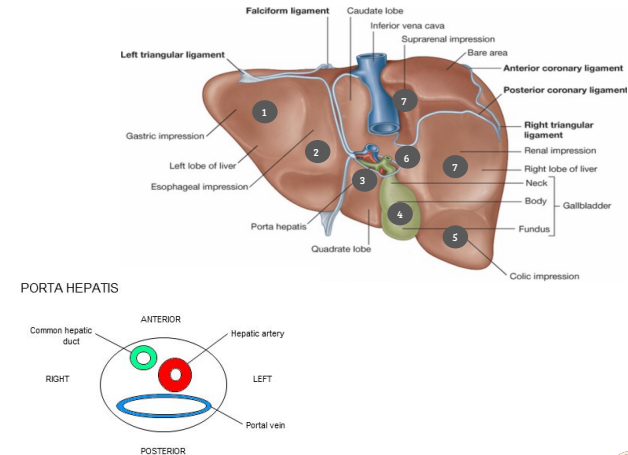
## Diaphragmatic Surface

- The **convex** upper, surface is smooth and molded to the undersurface of the domes of the 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.
- Boundaries of Bare area:**
  - Anterior:** superior layer of coronary ligament.
  - Posterior:** inferior layer of coronary ligament.
  - Laterally:** Right and left triangular ligaments.



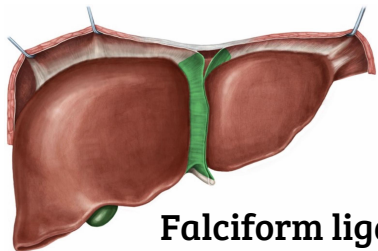
## Visceral Surface

- 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.
- Porta hepatis:** A transverse fissure found on the posteroinferior surface and lies between the caudate & quadrate lobes. **The upper part of 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
- The visceral surface bears multiple fissures and impressions **It is related to:**
  - Stomach.
  - Esophagus
  - lesser omentum
  - gallbladder
  - right colic flexure
  - Duodenum.
  - right kidney and suprarenal gland

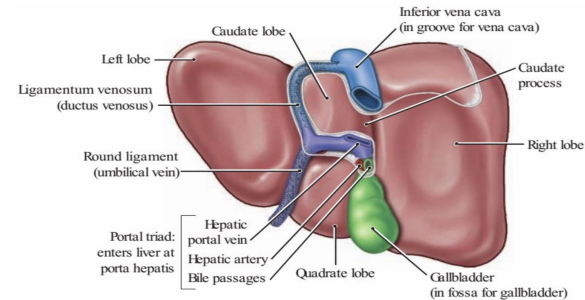
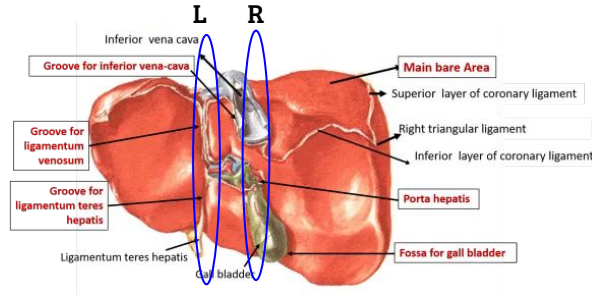


# Fissures and Ligaments of the Liver

In the diaphragmatic surface	In the visceral surface	
<p style="text-align: center;"><b>Falciform ligament</b></p>	<p style="text-align: center;"><b>The left fissure</b></p>	<p style="text-align: center;"><b>The right fissure</b></p>
<ul style="list-style-type: none"> <li>It is a two-layered fold of the peritoneum. <b>ascends from the umbilicus to the liver.</b></li> <li><b>It connects the liver with the diaphragm and anterior abdominal wall &amp; umbilicus..</b></li> <li>Its sickle-shaped free margin contains the <b>ligamentum teres</b> (round Ligament) of liver, the <b>remains</b> of the <b>umbilical vein</b>, which carried oxygenated blood from the placenta to the fetus.</li> </ul>	<ul style="list-style-type: none"> <li>Two sagittally oriented fissures, linked centrally by the transverse porta hepatis, form the letter <b>H</b> on the visceral surface.</li> <li><b>Anteriorly:</b> by the fissure for the <b>round ligament</b> (<b>Ligamentum teres</b>).</li> <li><b>Posteriorly:</b> by the fissure for the <b>ligamentum venosum</b>: It is the fibrous <b>remnant</b> of the <b>fetal ductus venosus</b> (obliterated ductus venosus), which shunted blood from the umbilical vein to the left branch of portal vein to the IVC. short-circuiting the liver</li> </ul>	<ul style="list-style-type: none"> <li><b>Anteriorly:</b> by the fossa for the gallbladder</li> <li><b>Posteriorly:</b> by the groove for the inferior vena cava.</li> </ul>



**Falciform ligament**



# Liver Lobes

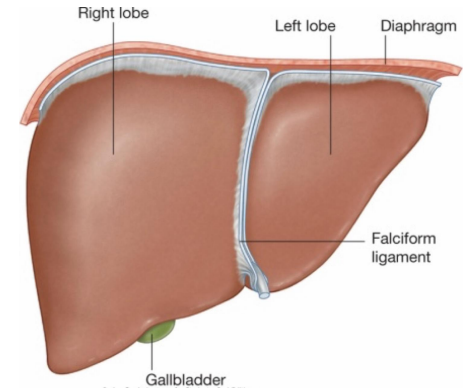
The liver is divided into a large **right lobe** and a small **left lobe** by the attachment of the falciform ligament.

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.

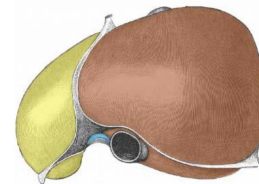
The caudate lobe is connected to the right lobe by the **caudate process**.

The Quadrate and caudate lobes are a **functional part of the left lobe of the liver**.

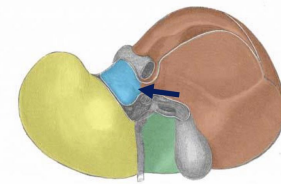
The functional anatomy divides the liver into left and right lobes based on their relation to the division of Quadrate common hepatic duct, hepatic portal vein, and hepatic lobe artery proper into right & left branches, so the areas of the liver supplied by these branches constitute the functional left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



Superior Surface



Inferior Surface



- Left
- Right
- Caudate
- Quadrate
- Caudate process

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# Liver blood circulation

★ The blood vessels conveying blood to the liver are the **hepatic artery (30%)** a branch of celiac trunk, and **portal vein (70%)**.

1.

The **hepatic artery** brings oxygenated blood to the liver.

2.

The **portal vein** brings venous blood rich in the products of digestion, which **have been absorbed** from the gastrointestinal tract to the liver.

3.

The venous blood is drained by right & left hepatic veins into the IVC

4.

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.

5.

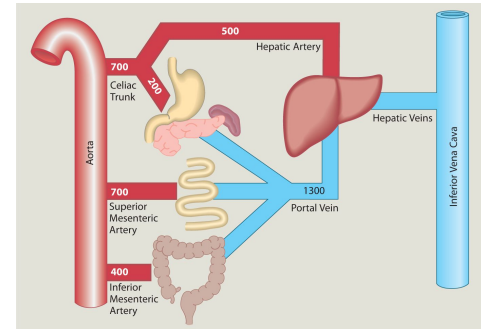
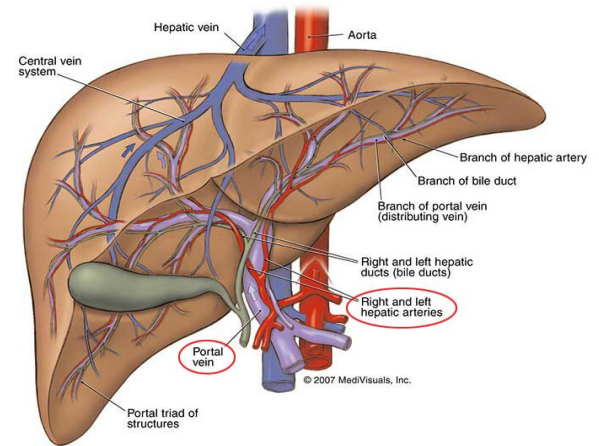
Within the liver, the primary branches divide to give secondary and Portal vein tertiary to supply the hepatic segments independently

6.

The hepatic veins, are **intersegmental** in their distribution and function, draining parts of adjacent segments, and they open in the posterior surface on the groove for IVC.

7.

The attachment of the two hepatic 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).





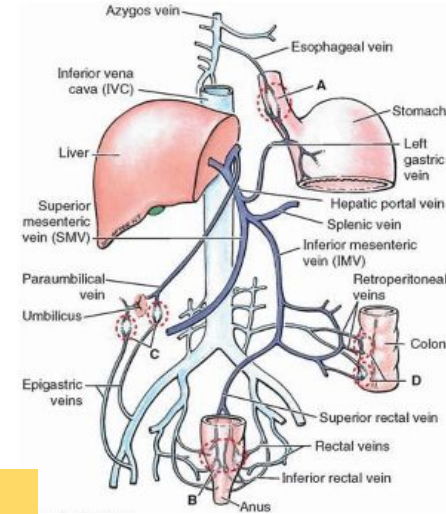
# Portal- systemic (portacaval) anastomosis

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:

1. Lower part of Esophagus (Varices)
2. Upper Anal canal (Hemorrhoids)
3. Para Umbilical region (Caput Medusae)
4. Retroperitoneal (Asymptomatic)
5. Intrahepatic (Patent ductus venosus).



## Liver supply

### Lymph drainage of GIT

- 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.

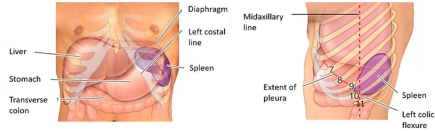




# Spleen

## Location

- in the left hypochondrium deep to 9,10 & 11 ribs , Its Long axis lies along 10th rib
- It is separated from the ribs by the diaphragm and the costodiaphragmatic recess (space in pleural cavity).



## Shape

- Ovoid in shape with notched anterior border
- Lower pole extends forward as far as the midaxillary line.
- Largest single mass of lymphoid tissue

## Size

- The "odd" spleen rule : 1-3-5-7-9-11 --> The spleen is 1 inch (thickness) ,3 inches (breadth) ,5 inches (length), weighs 7 ounces, and lies between the 9th and 11th ribs.
- "Clenched fist"
- Normal size spleen can not be palpated on clinical examination.

## Surfaces

### Diaphragmatic

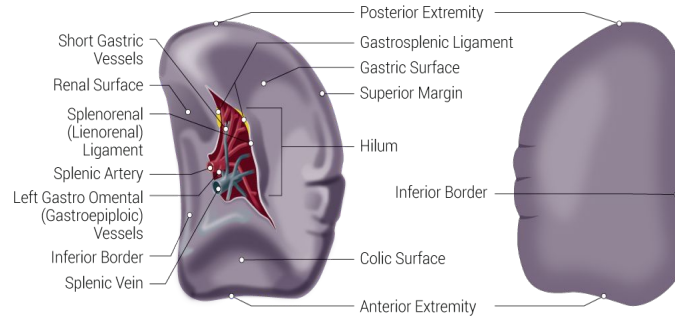
### Visceral

is **convexly** curved to fit the concavity of the diaphragm and curved bodies of the adjacent ribs

related to viscera.

VISCERAL SURFACE

DIAPHRAGMATIC SURFACE



## Border

superior and anterior

posterior and inferior

They are sharp

They are rounded

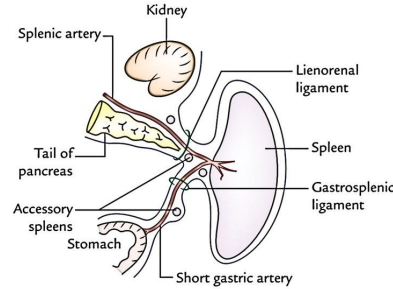
Anterior border is notched

# Ligaments of the spleen:

Spleen is completely surrounded by peritoneum EXCEPT at the hilum where its margins give attachment to :

## Lienorenal ligament (splenorenal)

Attached to the left kidney carrying the **splenic vessels** and the tail of pancreas

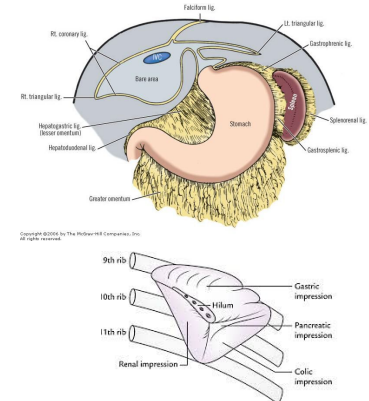


## Gastrosplenic ligament

Attached to the greater curvature of stomach carrying the short gastric and left gastroepiploic vessels

# Relations of the spleen :

Anterior	Posterior
<ol style="list-style-type: none"> <li>1. Stomach</li> <li>2. tail of pancreas</li> <li>3. left colic flexure</li> <li>4. left kidney</li> </ol>	<ol style="list-style-type: none"> <li>1. Diaphragm, that separates it from the left pleura (left costo diaphragmatic recess)</li> <li>2. left lung</li> <li>3. 9, 10 &amp; 11 ribs.</li> </ol>
Medially	Inferior
Left kidney.	Left colic flexure.

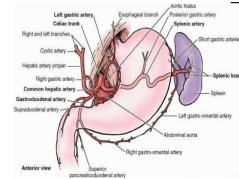


# Spleen supply

## Arterial Supply

### Splenic artery

- ❖ **Largest branch of the celiac artery**
- ❖ Runs a tortuous course along:
  - upper border of the pancreas (behind the stomach)
  - 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.



branches:  
branches to the pancreas  
short gastric  
**left** gastroepiploic  
posterior gastric (not always present)

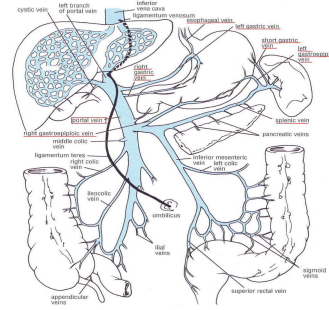
## Nerve Supply

- Derived from the celiac plexus (Innervation is **purely sympathetic**)
- Are distributed mainly along branches of the splenic artery, and are vasomotor in function.

## 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:**
  1. Short gastric vein
  2. left gastroepiploic vein
  3. Pancreatic veins
  4. Inferior mesenteric vein



## Lymph drainage of GIT

- 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**

# QUIZ



**Q1:** The lateral boundaries of the Bare area include:

- A. Superior triangular ligament
- B. Left coronary ligament
- C. Posterior triangular Ligament
- D. Right triangular ligament

**Q2:** Which of the following lies posterior to the liver:

- A. The body of the stomach
- B. The hepatic flexure
- C. The jejunum
- D. The splenic flexure

**Q3:** The liver lies mainly in the :

- A. Right lumbar region
- B. Left hypochondrium
- C. Right hypogastrum
- D. Right hypochondrium

**Q4:** If there was an erosion of the ulcer in the posterior wall of the stomach, which artery would be injured?

- A. Gastroduodenal
- B. Right gastric
- C. Splenic

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
D	B	D	C	B	D	C	A

**Q5:** The portal vein is form by joining of :

- A. Splenic vein and inferior mesenteric vein
- B. Splenic vein and superior mesenteric vein
- C. Hepatic vein and superior mesenteric vein
- D. Superior and inferior mesenteric veins

**Q6:** The left colic flexure is related to the spleen :

- A. laterally
- B. Medially
- C. Posteriorly
- D. Anteriorly

**Q7:** Which arteries could bleed if the posterior gastric artery was injured?

- A. Left gastroepiploic artery
- B. Short gastric arteries
- C. Splenic artery
- D. Hepatic artery

**Q8:** The ligament that attaches the hilum of spleen to the great curvature of stomach :

- A. Gastrosplenic ligament
- B. Splenorenal ligament
- C. Gastrohepatic ligament
- D. Lienorenal ligament

# Members board

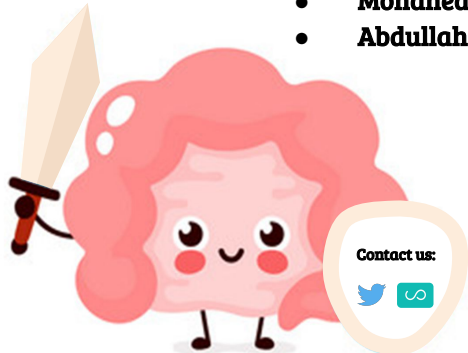


## Team leaders

### ● Abdulrahman Shadid

#### Boys team:

- Mohammed Al-huqbani
- Salman Alagla
- Ziyad Al-jofan
- Ali Aldawood
- Khalid Nagshabandi
- Sameh nuser
- Abdullah Basamh
- Alwaleed Alsaleh
- Mohaned Makkawi
- Abdullah Alghamdi



### ● Ateen Almutairi

#### Girls team :

- Ajeed Al Rashoud
- Taif Alotaibi
- Noura Al Turki
- Amirah Al-Zahrani
- Alhanouf Al-haluli
- Sara Al-Abdulkarem
- Renad Al Haqbani
- Nouf Al Humaidhi
- Jude Al Khalifah
- Nouf Al Hussaini
- Danah Al Halees
- Rema Al Mutawa
- Maha Al Nahdi
- Razan Al zohaifi
- Ghalia Alnufaei