

→ Liver is the largest gland in the body.
 → it is an exocrine (Bile) and endocrine organ (Albumin, Fibrinogen and Fibrinogen).

→ Weight in adults → 1kg/50kg in infant → 1kg/20kg.

→ Functions: 1. secretion of bile and bile salt → Digestion of Fat.

2. Metabolism (Carbohydrate, Fat, Protein)

3. Formation of heparin and ^{an} anticoagulants substances.

↳ The first drug that is used for a patient with stroke

4. Detoxification. 5. storage of glycogen and vitamins.

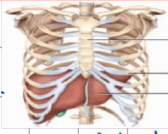
↳ such as morphine which is toxic, so can't be used for patient liver dysfunction

6. Activation of Vitamin D. 7. Coagulate substances (Fibrinogen).

→ it is the most important organ in the GI tract.

→ 1/2 of the liver is sufficient to act its function.

→ Anatomical Site:



↳ under the diaphragm.

↳ The right lobe → Along the right hypochondriac.

↳ The left lobe → located in the epigastric region and extends to the left hypochondriac region.

↳ Right+left hepatic ducts → common hepatic duct.

↳ common hepatic duct + cystic duct → common bile duct.

→ Shape: 5 surfaces

1. Postero-inferior surface (Visceral surface) → Related to visceral impression

2. Superior surface (Diaphragmatic)

3. Anterior. 4. Posterior 5. Right.

→ Surface Anatomy:

1. Upper border → right 5th rib and right 5th intercostal space.

2. The lower border → Right 9th rib → can feel it if you asked the patient to take a deep inspiration.

↳ The right lobe pushes the diaphragm upwards.

↳ The diaphragm covers a part of anterior, posterior, superior and right surface, except the visceral surface.

↳ the greater part of the liver is located under cover of the right costal margin.

→ Anteriorly:

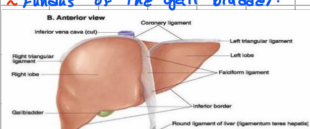
- View: → Right and left lobes.

↳ cut edge of falciform ligament that separates the right and left lobes

↳ Attracts the liver to the anterior abdominal wall and the diaphragm.

↳ Developing cut edges of superior pair of the coronary ligament.

↳ Fundus of the gall bladder:



- Relations:

1. Diaphragm. 2. Right and left Pleura of the lung.

3. Costal cartilage. 4. Xiphoid process. 5. Anterior abdominal wall.

↳ Posterior Relations:

1. Diaphragm. 2. I.V.C. 3. Right Kidney. 4. Right hepatic flexure.

5. Duodenum. 6. Gall bladder. 7. Esophagus. 8. Fundus of the stomach

↳ Postero-inferior:

- Covered by the visceral peritoneum except the bare area.

- Relations:

1. I.V.C. & Bare area.

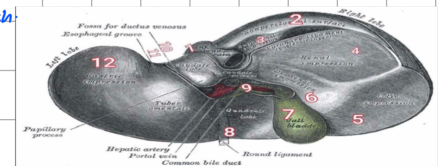
3. Right suprarenal gland.

4. Right Kidney. 5. Right colic flexure. 6. Duodenum.

7. Gall bladder. 8. Ligamentum reflex of fount ligament.

9. Porta hepatis. 10. Fissure for ligamentum venosum and lesser omentum.

11. esophagus. 12. Stomach.



↳ Superiorly:

- superior surface:

1. Right and left lobes. 2. Falciform ligament

3. Superior and inferior pairs of coronary ligament.

4. Left and Right triangular ligament.

5. Bare area → it is dull. Formed of anterior and posterior lips of coronary ligament and connects laterally to form right and left triangular ligament.

6. Groove for the I.V.C. and the hepatic veins.

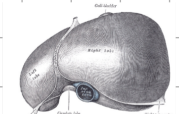
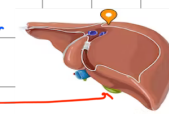
7. Quadrate lobe → hole or less wrapping around the groove of the I.V.C.

8. Fundus of gall bladder. 9. Ligamentum reflex.

↳ The liver lies superior

to the gall bladder and

the ligamentum reflex.



- Relations:

1. Diaphragm. 2. Pleura and lung. 3. Pericardium and heart.

Lobes of the liver:

1. Right lobe. 2. Left lobe. 3. Quadrate lobe.

4. Quadrate lobe.

- The separation of the four lobes is made by 2 vertical and

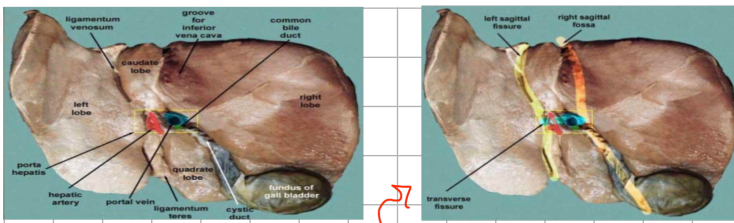
2 horizontal lines

↳ 2 Vertical: 1. Right → I.V.C. and gallbladder (inferior part of the line)

2. Left → Ligamentum Venosum and Ligamentum reflex.

↳ the inferior part.

↳ 2 Horizontal: The porta hepatis above and below.



Ligaments of the liver

1. Falciform ligament

- ↳ Double peritoneal layer
- ↳ sickle shape
- ↳ from the anterior abdominal wall (umbilicus) to the liver
- ↳ free border of the ligament contains the ligamentum teres (obliterated umbilical vein)

2. Ligamentum teres

3. Coronary ligament

- ↳ the area between its lower and upper leaf is the bare area that contact with the diaphragm

- ↳ Left and Right ligaments formed by left and right extremities of coronary ligament

4. Hepatogastric ligament

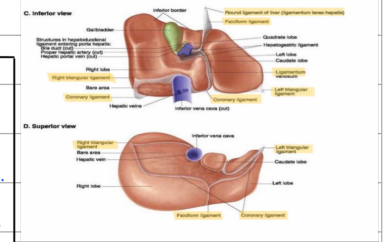
↳ Lesser omentum

5. Ligamentum venosum

- ↳ Fibrous band that remains of the ductus venosus
- ↳ Umbilical vein → Ductus venosum (in liver) → I.V.C.
- ↳ Attached to the left branch of the portal vein and ascends in fissure on the visceral surface to be attached above to the I.V.C.

Porta Hepatis

- ↳ the hilum of the liver
- ↳ found in the visceral surface
- ↳ Between the quadrate and caudate lobes



- ↳ Tabular omentum is an embryonic structure indicates the formation of the lesser omentum
- ↳ lesser omentum is attached to its margin contents
- ↳ contains: 1. gallbladder (common hepatic duct) → anteriorly
- ↳ 2. Hepatic artery, nerve, lymphatic nodes → middle
- ↳ 3. Portal vein → posteriorly
- ↳ 4. lymph vessels
- ↳ 5. Fat
- ↳ The omental → visceral omentum surrounds the porta hepatis

Blood supply

- ↳ 20-25% → Hepatic artery
- ↳ 75-80% → Portal vein
- ↳ Oxygenated blood
- ↳ Venous blood (rich digestive products from the GIT)
- ↳ After → Venous blood → Central vein of each lobule

Vein drainage

- ↳ The Portal vein (blood from the GIT, gallbladder, pancreas and spleen) → divides into right and left → enter the porta hepatis
- ↳ The hepatic veins emerge from the posterior surface → drain into the I.V.C.

- Right sagittal Fossa → Groove for the I.V.C and the gallbladder

- Left Sagittal Fossa → contains the ligamentum venosum and teres

- Transverse Fissure (Porta Hepatis) → Bile ducts, portal vein, hepatic arteries

Right lobe

- ↳ The largest
- ↳ Occupies the right hypochondrium
- ↳ Divided into anterior and posterior sections by the right hepatic vein
- ↳ Reidel's lobe extend as far caudally as iliac crest



Left lobe

- ↳ varied size
- ↳ Divided into lateral and medial segments by the left hepatic vein

- Right and left lobes separated by

- 1. Falciform ligament
- 2. Ligamentum venosum
- 3. Ligamentum teres

Caudate lobe

- ↳ in the posterior surface of the right lobe
- ↳ 2 processes: 1. Caudate process, 2. Papillary process → above the porta hepatis

Relations

Inferior → porta hepatis

Right → Fossa for the I.V.C

Left → Fossa for the ligamentum venosum

Quadrate lobes

- ↳ in the inferior surface of the right lobe

Relations

Superior → porta hepatis

Anterior → Anterior margin of the right lobe

Right → Fossa for the gallbladder

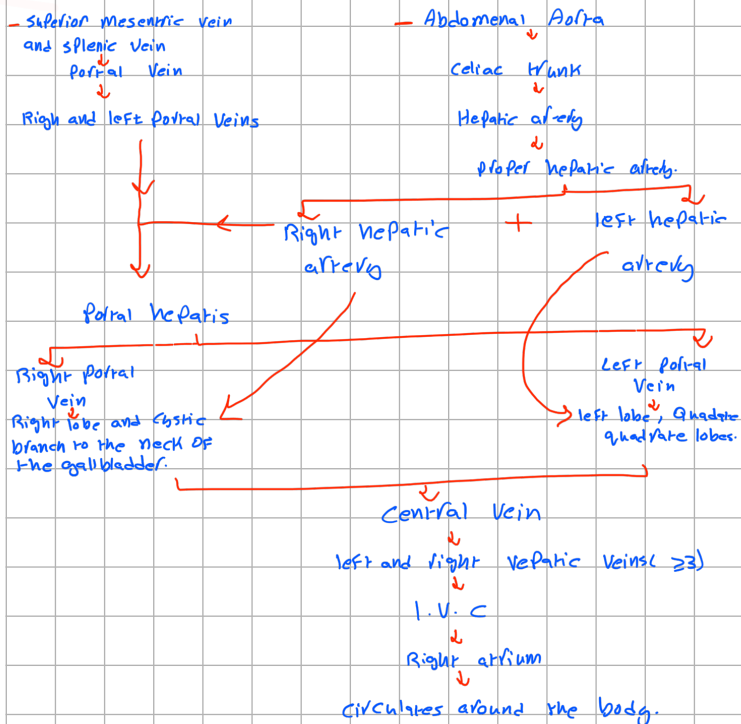
Left → Fossa for ligamentum teres

- While the caudate and quadrate lobes follow the right lobe anatomically, they follow the left lobe functionally (physiologically)

- Gallbladder → related to the right lobe anatomically and physiologically

Peritoneum of the liver

- it is interperitoneal organ except at bare area
- Bare area is origin from septum transversum, which separates heart from developing liver
- Inferior surface covered with peritoneum of greater sac except porta hepatis, gallbladder and ligamentum teres fissure
- Right lateral surface is covered by peritoneum related to diaphragm that separate it from right pleura, lung and right ribs (C-11)
- Cystic blood supply cut → direct blood supply from the liver to the gallbladder occurs → the gallbladder is not attached by ganglion
- ↳ An advantage of the gallbladder's impression in the liver



- Lymphatic drainage
 - ↳ 1/3 - 1/2 of total body lymph.
 - ↳ Hepatic lymph nodes in lesser omentum + Celiac lymph nodes
 - ↳ Celiac lymph nodes → Cisterna chyli → thoracic duct → left subclavian vein

- Nerve supply
 - ↳ Sympathetic → Celiac plexus → hepatic plexus → Thoracic ganglion (T1-T11)
 - ↳ Para-sympathetic → Vagus nerve (anterior part)
 - ↳ Sympathetic and para-sympathetic → Plexuses the are distributed with blood supply of the Celiac trunk.

Segmental anatomy of the liver

- Right and left lobes anatomically no morphological significance
- True morphological and physiological division is from the fossa from gallbladder to the I.V.C.
- ↳ Each has its own arterial blood supply, veins and biliary drainage
- ↳ No anastomosis.
- ↳ 8 segments based on hepatic and portal venous segments

Transplantation

- ancient → 4 lobes Modern → 8 lobes
- Most modern form → hepatocytes principle.

Callot's Triangle

- Right → Cystic duct Left → Common hepatic duct
- superior → Cystic vessels
- ↳ Important in cholecystectomy → cut blood vessels and cystic duct → gallbladder can be removed.
- ↳ 80% → blood vessels are located posteriorly 20% → anteriorly.

ERCP

- Endoscopy + Fluoroscopy to diagnose or treatment problems of the biliary or pancreatic duct systems.
 - ↳ stones, inflammatory strictures, leaks and cancer.
- Endocop → stomach and duodenum → inject dyes into the biliary tree and pancreas → X-ray.
- The catheter inserted retrogradely into the pancreatic or biliary ducts.

↳ In Egypt & bilharzia → liver fibrosis + hepatosplenomegaly.