



The Liver

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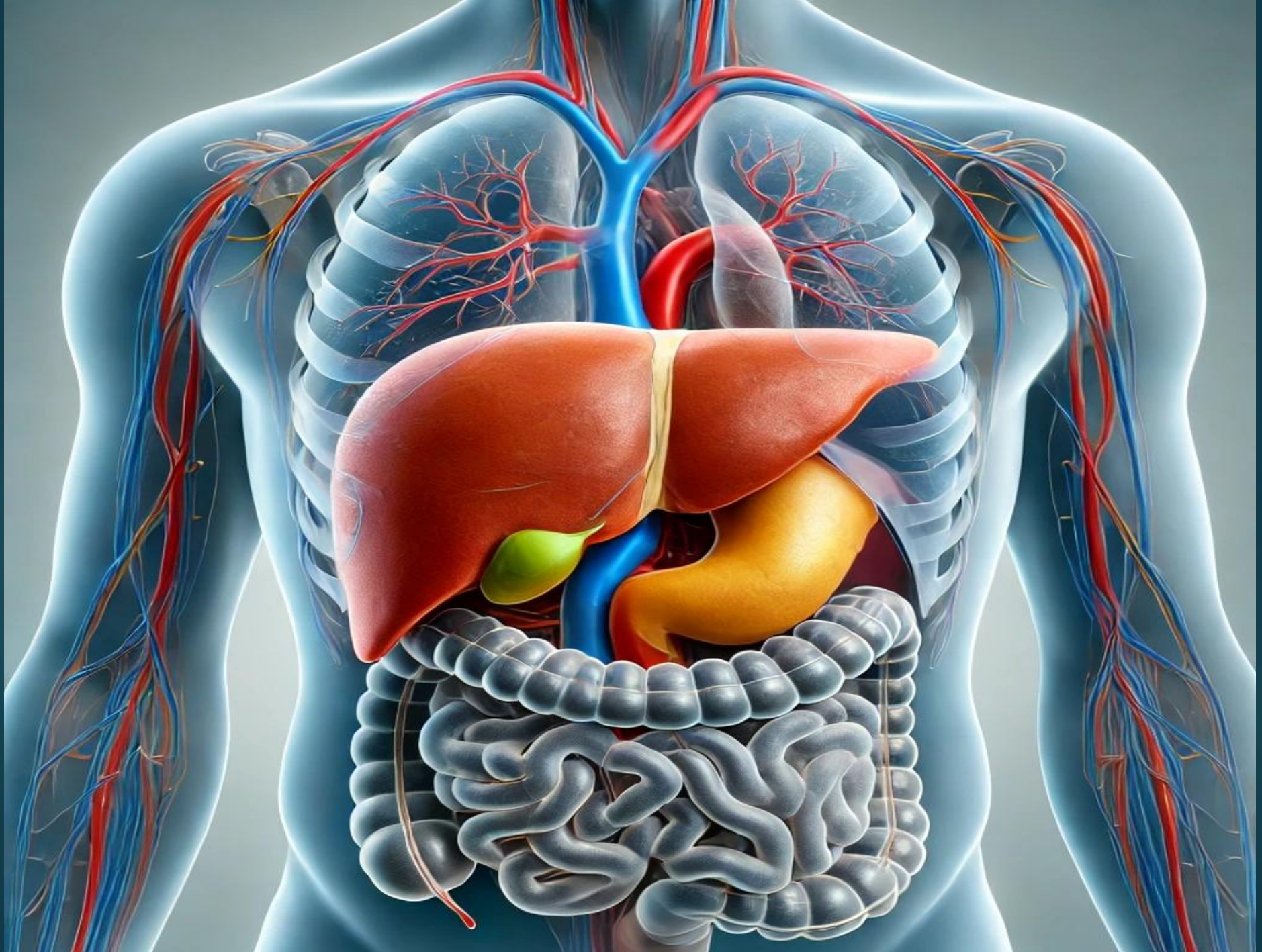
Introduction to the Liver

- ▶ The liver is the largest internal organ and plays a crucial role in metabolism, digestion, and detoxification.



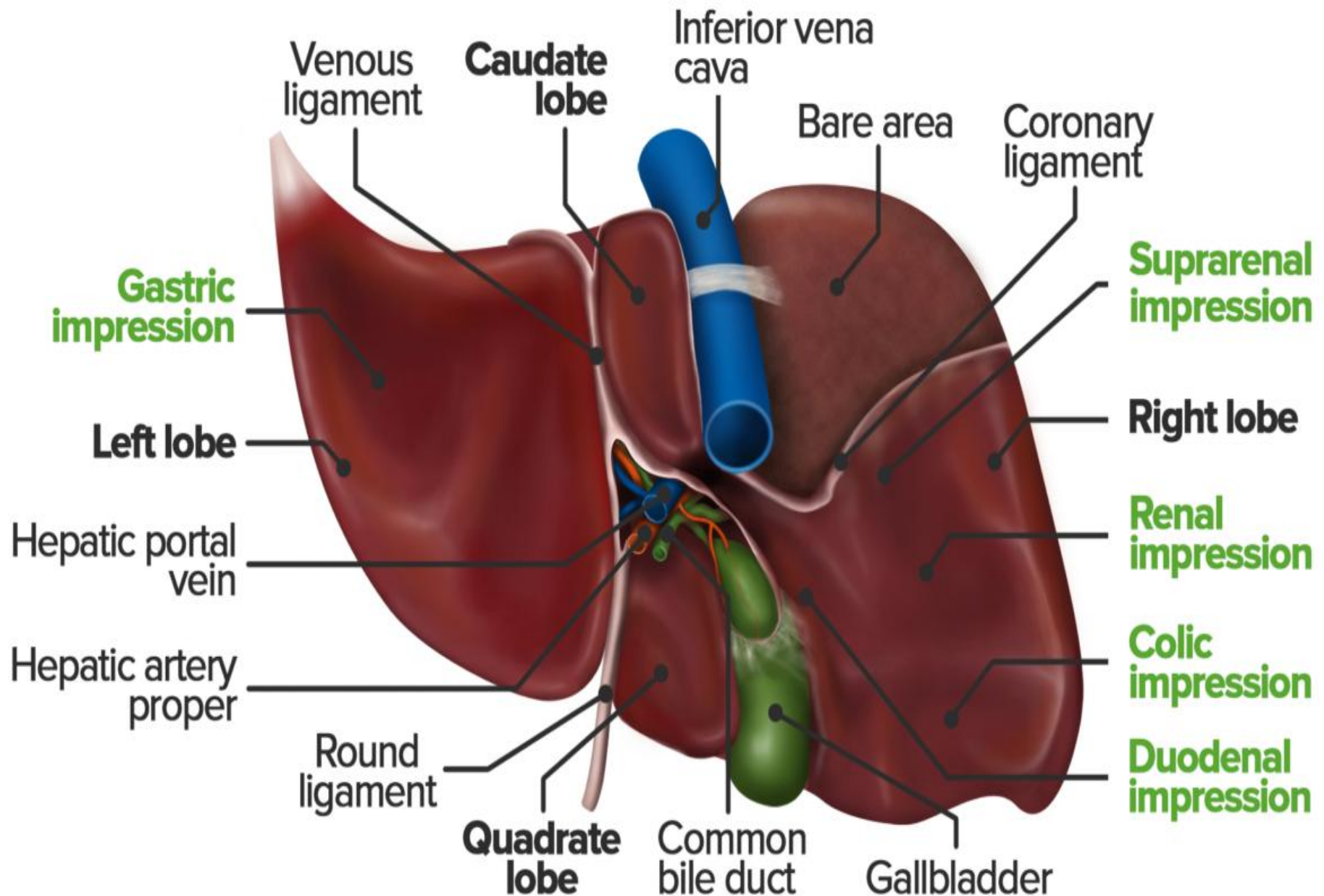
Liver Anatomy

- ▶ Located in the upper right abdomen.
- ▶ Divided into the right and left lobes.
- ▶ Connected to the gallbladder and intestines via bile ducts.



Liver Lobes

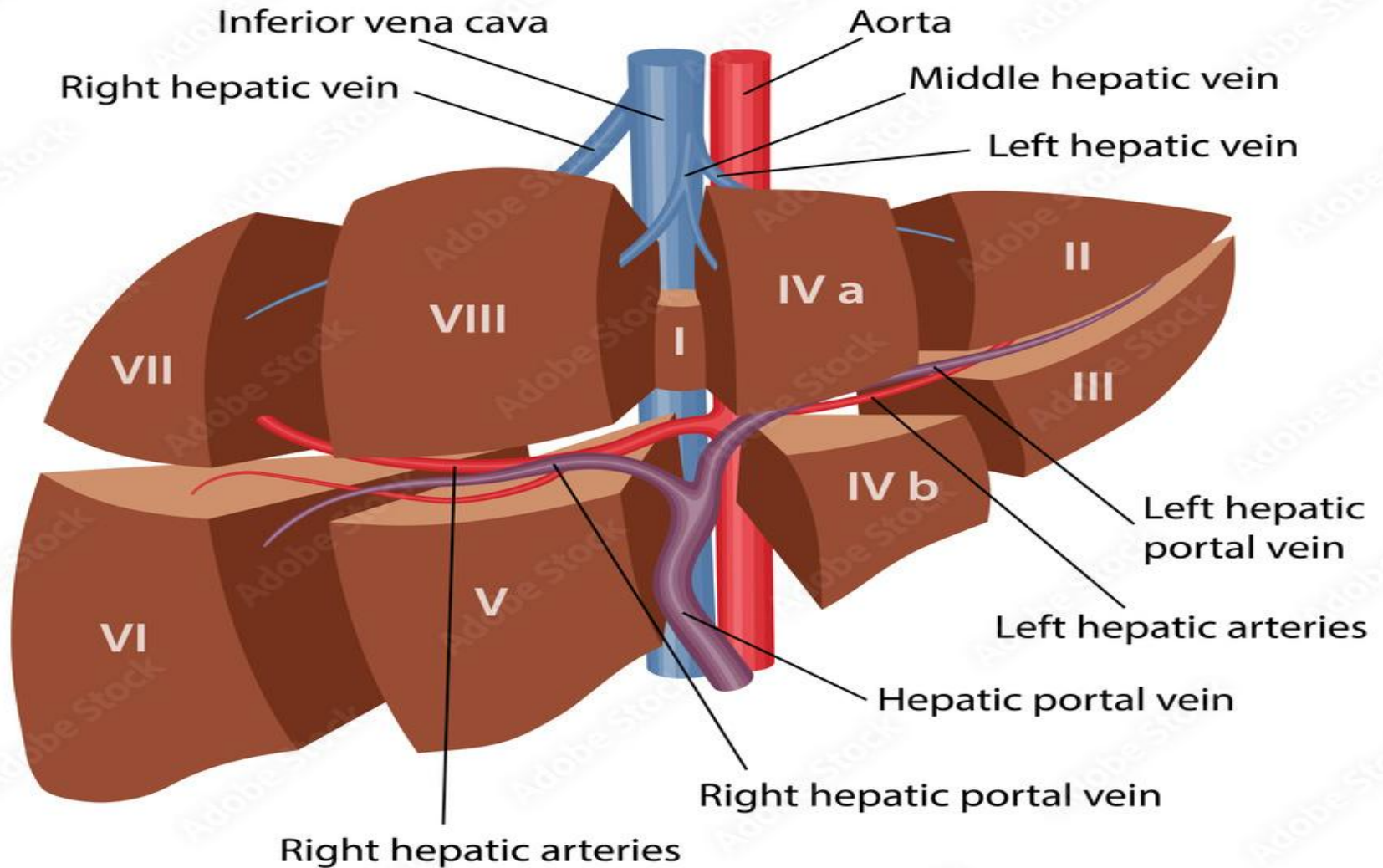
- ▶ - The liver is divided into two main lobes:
- ▶ Right lobe (larger)
- ▶ Left lobe (smaller)
- ▶ - Additional lobes:
- ▶ Caudate lobe (posterior)
- ▶ Quadrate lobe (anterior, near gallbladder)



Liver Segments (Couinaud Classification)

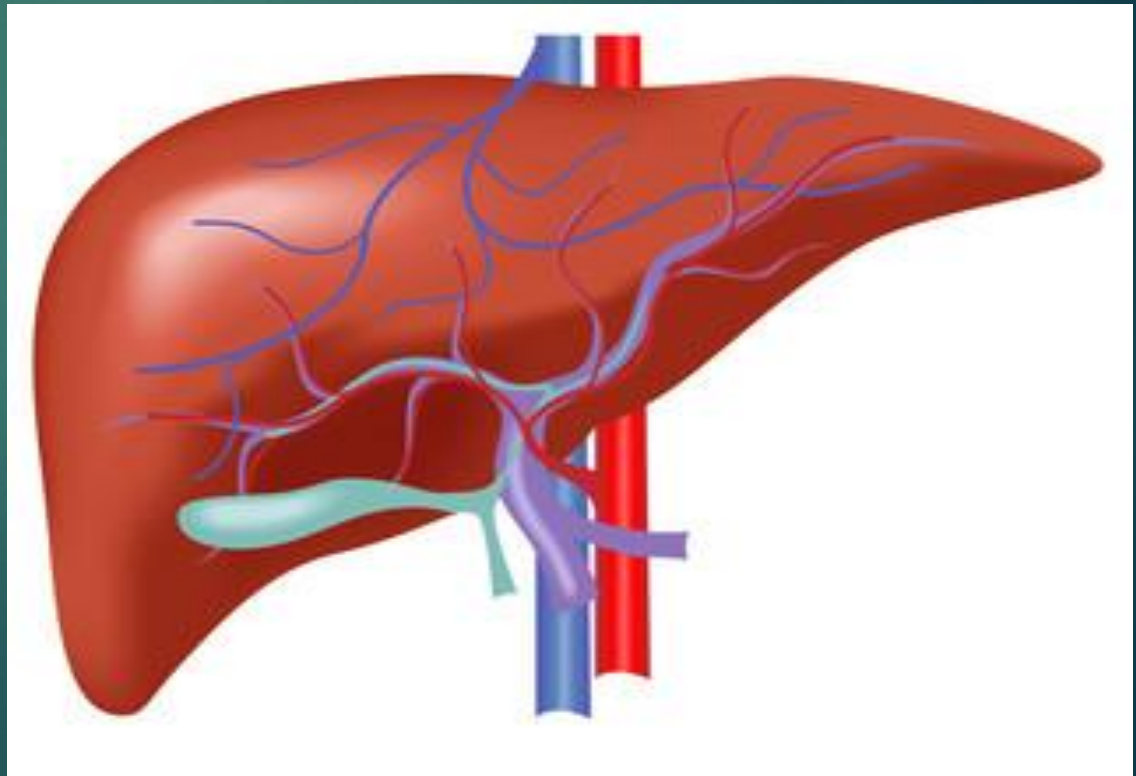
- ▶ - The liver is divided into 8 segments
- ▶ - Each segment has its own vascular inflow, outflow, and bile drainage
- ▶ - Segments:
 - ▶ • I – Caudate lobe
 - ▶ • II, III, IV – Left lobe
 - ▶ • V, VI, VII, VIII – Right lobe
- ▶ - Used in liver surgery for precise resections

Liver segments



Blood Supply to the Liver

- ▶ • Hepatic artery supplies oxygen-rich blood.
- ▶ • Portal vein supplies nutrient-rich blood from the intestines.
- ▶ • Hepatic veins drain blood into the inferior vena cava.



Major Functions of the Liver

- ▶ Metabolism of carbohydrates, fats, and proteins.
- ▶ Detoxification of drugs and toxins.
- ▶ Bile production for digestion.
- ▶ Storage of vitamins and minerals.
- ▶ Regulation of blood clotting.

Bile Production

via production
Metabolism of fats
absorption of fats,
the pattern of metabolism
and carbohydrates

Bile

Detoxification
of bile produced
in the liver
and absorbed
in the small
intestine

Detoxification

Detoxification
of the blood
and other
substances

LIVER

DETOXIFICATION

BILE

Metabolism
of fats,
and carbohydrates

Metabolism

Regulation
of the body
and the
metabolism
of the body
and the
regulation

Metabolism
of fats,
and carbohydrates

Storage of vitamins
and minerals

Blood clotting regulation

Metabolism
of fats, proteins

Bile production
and absorption

Liver's Role in Digestion

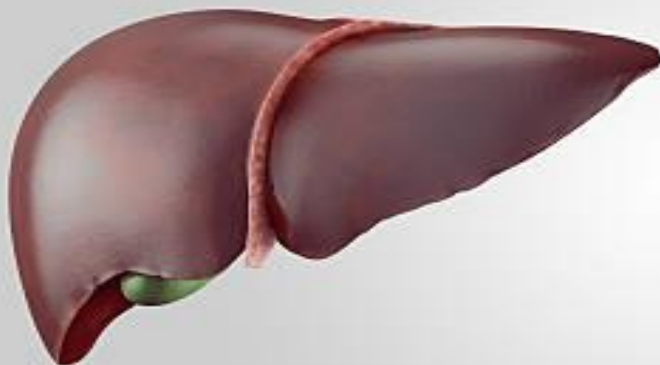
- ▶ Produces bile, which helps break down fats.
- ▶ Bile is stored in the gallbladder and released into the intestines.
- ▶ Helps in the absorption of fat-soluble vitamins (A, D, E, K).

Liver and Detoxification

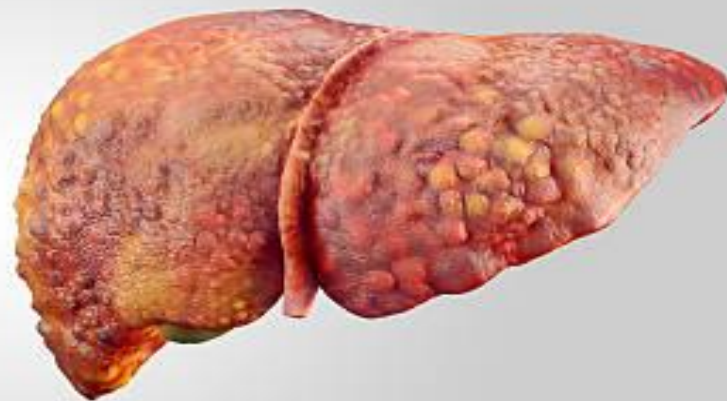
- ▶ Converts ammonia (toxic) into urea for excretion.
- ▶ Breaks down alcohol and drugs.
- ▶ Filters toxins from the bloodstream.

Common Liver Diseases

- ▶ Hepatitis (A, B, C, D, E)
- ▶ Cirrhosis (scarring of liver tissue)
- ▶ Fatty Liver Disease (alcoholic and non-alcoholic)
- ▶ Liver Cancer (Hepatocellular carcinoma)



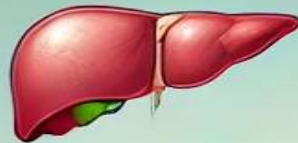
healthy liver



cirrhosis



Fatty Liver Disease



Hepatitis



Hirpatitis

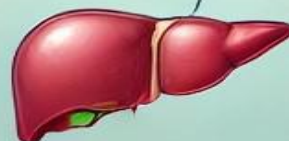
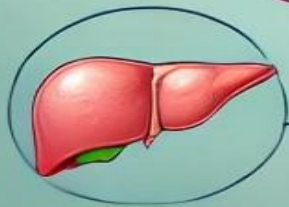
Senglad is a medical condition that affects the liver and is often associated with (other) diseases.

Cirrhosis

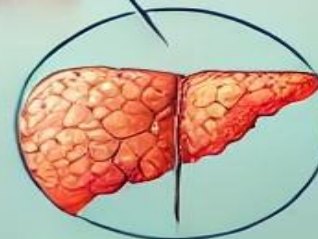
is a condition of the liver that causes the liver to become scarred and lose its ability to function properly.

Hirpatitis

is a condition of the liver that causes the liver to become inflamed and swollen.



Hepatitis
(Inflammation of the liver)



Liver cancer



Liver cancer



Hepati

(Inflammation of the liver)

Symptoms of Liver Disease

- ▶ Jaundice (yellowing of skin and eyes)
- ▶ Fatigue and weakness
- ▶ Swelling in the abdomen and legs
- ▶ Dark urine and pale stools
- ▶ Nausea and loss of appetite

Diagnosing Liver Diseases

- ▶ Liver function tests (ALT, AST, bilirubin levels).
- ▶ Imaging (Ultrasound, MRI, CT scan)
- ▶ Liver biopsy (to check for damage or disease)

Treatment and Prevention

- ▶ Healthy diet and weight management.
- ▶ Avoid excessive alcohol consumption.
- ▶ Medications for viral hepatitis.
- ▶ Liver transplant in severe cases.



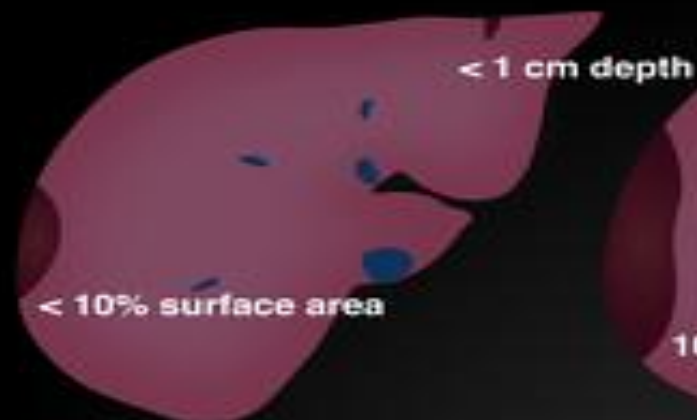
Liver Trauma: Types and Management

Introduction

- ▶ - The liver is the most commonly injured organ in abdominal trauma.
- ▶ - Liver trauma can result from blunt or penetrating injuries.
- ▶ - Management depends on injury severity and hemodynamic stability.

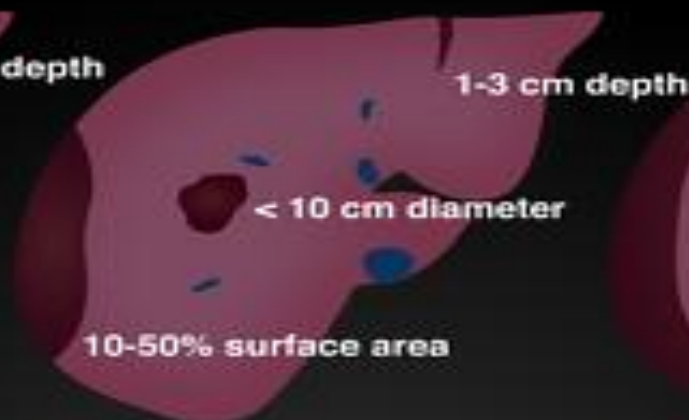
Classification of Liver Injuries (AAST Grading)

- ▶ - **Grade I:** Minor subcapsular hematoma (<10%) or capsular tear (<1 cm).
- ▶ - **Grade II:** Larger hematoma (10-50%) or laceration (1-3 cm).
- ▶ - **Grade III:** Hematoma (>50%) or deep laceration (>3 cm).
- ▶ - **Grade IV:** Parenchymal disruption (25-75%) or major vessel injury.
- ▶ - **Grade V:** Parenchymal disruption (>75%) or juxtahepatic venous injury.
- ▶ - **Grade VI:** Hepatic avulsion (non-survivable injury).



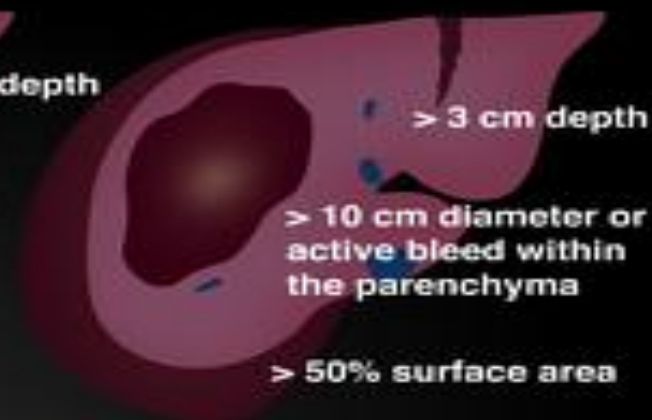
Grade I

- laceration
- subcapsular haematoma



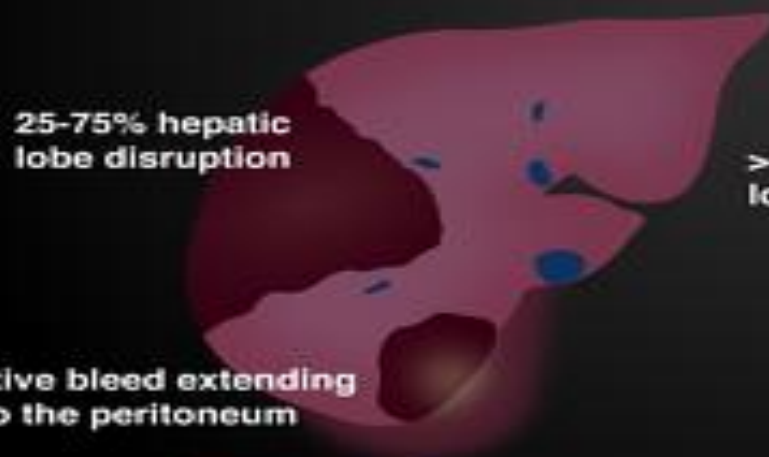
Grade II

- laceration
- intraparenchymal haematoma
- subcapsular haematoma



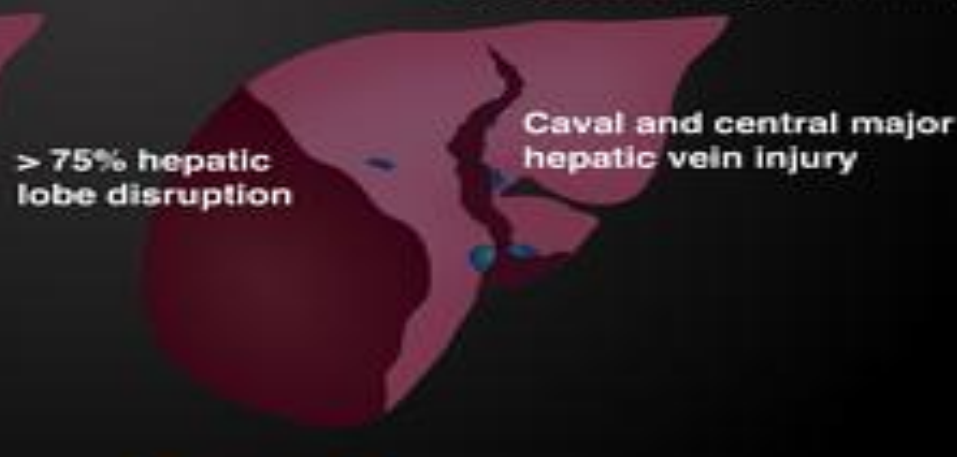
Grade III

- laceration
- intraparenchymal haematoma
- contained active bleed
- subcapsular haematoma
- vascular injury
e.g. pseudoaneurysm or AV fistula



Grade IV

- parenchymal disruption
- active bleeding



Grade V

- parenchymal disruption
- juxtahepatic venous injury

*Advance one grade for each additional injury upto grade III.

Mechanisms of Injury

- ▶ - ****Blunt Trauma:****
- ▶ - Motor vehicle accidents, falls, sports injuries.
- ▶ - ****Penetrating Trauma:****
- ▶ - Stab wounds, gunshot wounds.
- ▶ - May involve major vascular structures leading to hemorrhage.

Clinical Presentation

- ▶ - Right upper quadrant (RUQ) pain.
- ▶ - Signs of hemorrhagic shock (tachycardia, hypotension, pallor).
- ▶ - Rebound tenderness, distension, peritonitis.
- ▶ - Associated injuries (rib fractures, spleen trauma).

Diagnosis

- ▶ - **FAST (Focused Assessment with Sonography in Trauma):** First-line screening for hemoperitoneum.
- ▶ - **CT Scan with Contrast:** Gold standard for stable patients.
- ▶ - **Laboratory Tests:** Hemoglobin, hematocrit, liver enzymes (AST, ALT).
- ▶ - **Diagnostic Peritoneal Lavage (DPL):** Used selectively.

Management Overview

- ▶ - ****Non-Operative Management (NOM):**** For hemodynamically stable patients.
- ▶ - ****Surgical Intervention:**** For unstable patients with ongoing bleeding.
- ▶ - ****Angioembolization:**** Used for selective arterial bleeding.

Non-Operative Management (NOM)

- ▶ - Bed rest, hemodynamic monitoring.
- ▶ - Serial hemoglobin checks.
- ▶ - Repeat imaging if clinical deterioration occurs.
- ▶ - Used for Grades I-III in stable patients.

Surgical Management

- ▶ - ****Indications for Surgery:****
- ▶ - Uncontrolled hemorrhage.
- ▶ - ****Surgical Techniques:****
- ▶ - Hepatorrhaphy (suturing liver lacerations).
- ▶ - Liver packing with gauze.
- ▶ - Partial hepatectomy.
- ▶ - Damage control surgery in severe cases.

Postoperative Care & Complications

- ▶ - ****Monitoring:**** ICU admission, serial hematocrit monitoring.
- ▶ - ****Complications:****
 - ▶ - Bile leak, intra-abdominal abscess.
 - ▶ - Coagulopathy, sepsis.
 - ▶ - Liver failure (rare but serious).