



LIVER: STRUCTURE, TOPOGRAPHY, DISEASES AND MODERN TREATMENT APPROACHES

Author:

Xayitova Mehribon

Institution: Samarkand state medical university

Fakulty of general medicine

Abstract: The liver is the largest internal organ in the human body and plays a central role in metabolism, detoxification, and biochemical synthesis. Its unique dual blood supply, complex cellular structure, and remarkable regenerative capacity are essential for life. At the same time, liver diseases represent a major global health problem, causing millions of deaths each year. This article provides a comprehensive scientific analysis of liver anatomy, topography, physiology, major diseases, and modern treatment approaches.

Key words: human body, hepatic lobule, clinical complications.

Introduction

The liver is a key organ responsible for regulating metabolism, digestion, immune defense, and detoxification processes. It serves as a crucial interface between the gastrointestinal tract and the circulatory system.

Dysfunction of the liver affects multiple organ systems and may lead to severe clinical complications.

Anatomical Structure of the Liver

2.1 Gross Anatomy

The liver is the largest gland in the human body, with an average weight of 1.2–1.5 kg, accounting for approximately 2% of total body weight.

It is divided into four lobes:

Right lobe

Left lobe

Caudate lobe

Quadrante lobe

2.2 Microscopic Structure

The functional unit of the liver is the hepatic lobule.

It consists of:

Hepatocytes

Sinusoidal capillaries

Central vein

Portal triad (portal vein, hepatic artery, bile duct)

Hepatocyte Zones:



Zone I (periportal) — oxidative metabolism

Zone III (perivenous) — detoxification processes

Non-parenchymal Cells:

Kupffer cells — phagocytosis

Stellate cells — regulation of fibrosis

Endothelial cells

3. Topography of the Liver

The liver is located in the right upper quadrant of the abdominal cavity, beneath the diaphragm.

Relations:

Superior — diaphragm

Inferior — stomach, duodenum, colon

Posterior — right kidney

Ligaments:

Falciform ligament

Coronary ligament

Blood Supply

The liver has a unique dual blood supply:

Portal vein (75–80%)

Hepatic artery (20–25%)

4. Liver Physiology

4.1 Metabolic Functions

Carbohydrate metabolism (glycogen synthesis and breakdown)

Lipid metabolism (cholesterol synthesis)

Protein synthesis (albumin, clotting factors)

4.2 Detoxification

The liver neutralizes toxic substances through:

Phase I reactions (CYP450 enzyme system)

Phase II reactions (conjugation)

4.3 Bile Production

Bile is essential for the digestion and absorption of fats.

4.4 Immune Function

Kupffer cells eliminate pathogens and contribute to immune defense.

5. Liver Diseases

5.1 Hepatitis

Viral (A, B, C, D, E)

Characterized by liver inflammation

5.2 Liver Cirrhosis

Key features:

Fibrosis



Disruption of normal architecture

Portal hypertension

5.3 Non-Alcoholic Fatty Liver Disease (NAFLD)

Associated with obesity and metabolic syndrome

Increasing worldwide

5.4 Hepatocellular Carcinoma

Primary malignant tumor of the liver

Often develops on the background of cirrhosis

5.5 Autoimmune and Cholestatic Diseases

Autoimmune hepatitis

Primary biliary cholangitis

6. Modern Treatment Approaches

6.1 Pharmacological Treatment

Antiviral drugs

Immunosuppressive agents

Hepatoprotective drugs

6.2 Lifestyle Modifications

Alcohol cessation

Weight management

Balanced diet

6.3 Surgical Treatment

Tumor resection

Liver transplantation (most effective for end-stage disease)

6.4 Interventional Methods

TIPS (Transjugular Intrahepatic Portosystemic Shunt) for portal hypertension

6.5 Advanced and Future Approaches

Gene therapy

Nanotechnology

Personalized medicine

Discussion

The liver is a structurally complex and functionally diverse organ. The interaction between hepatocytes, vascular structures, and immune cells ensures systemic homeostasis.

Chronic liver diseases disrupt this balance, leading to severe complications such as portal hypertension and liver failure.

Modern medicine is increasingly shifting toward personalized and molecular-level treatment approaches, which significantly improve patient outcomes.

Conclusion



The liver is one of the most essential organs in the human body, playing a vital role in metabolism, detoxification, and immune defense. Liver diseases are a major global health concern. Advances in modern science and medicine are expected to significantly improve diagnostic and therapeutic strategies in hepatology.

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