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LIVER PHYSIOLOGY AND PATHOPHYSIOLOGY: THERAPEUTIC APPROACHES IN LIVER DISEASES

Umurov Erkin Utkirovich
Department of Pathological Physiology,
Bukhara State Medical Institute, Uzbekistan

Abstract
The liver plays a crucial role in metabolism, detoxification, and immune regulation. Disruptions in its physiological functions lead to a spectrum of liver diseases, including hepatitis, fatty liver disease, cirrhosis, and hepatocellular carcinoma. This article reviews the physiology and pathophysiology of the liver, highlighting current treatment modalities used in clinical practice.

Keywords: Liver Physiology, Pathophysiology, Therapeutic.

Introduction

The liver is one of the most metabolically active organs, regulating blood glucose, detoxifying xenobiotics, synthesizing plasma proteins, and storing essential nutrients. Liver diseases, which rank among the top causes of morbidity and mortality globally, can result from viruses, metabolic disorders, alcohol, or autoimmune reactions. Understanding liver physiology and its pathological alterations is vital for developing effective treatments.

2. Liver Physiology

The liver receives dual blood supply from the hepatic artery and the portal vein, facilitating nutrient and toxin processing. Hepatocytes are the main functional cells responsible for:

- Glucose metabolism (glycogenesis and gluconeogenesis)
- Bile production
- Drug detoxification through cytochrome P450 enzymes
- Protein synthesis (e.g., albumin, clotting factors)

Kupffer cells, the liver's resident macrophages, also contribute to innate immunity.

3. Pathophysiology of Liver Diseases

Liver pathologies often start with hepatocellular injury due to oxidative stress, inflammation, or viral infection. Chronic injury may lead to fibrosis and eventually cirrhosis or cancer. Key mechanisms include:

- **Steatosis**: Excessive fat accumulation in hepatocytes
- **Fibrosis**: Activation of hepatic stellate cells, leading to ECM deposition
- **Cirrhosis**: Disruption of liver architecture and impaired function

- **Hepatocellular carcinoma (HCC)**: Often arises in cirrhotic livers due to chronic inflammation

4. Therapeutic Approaches in Liver Diseases

4.1 Pharmacological Treatments

- **Antivirals**: For chronic hepatitis B and C (e.g., entecavir, sofosbuvir)
- **Anti-inflammatory agents**: For autoimmune hepatitis (e.g., corticosteroids, azathioprine)
- **Lipid-lowering drugs**: For non-alcoholic fatty liver disease (NAFLD) (e.g., pioglitazone)

4.2 Lifestyle and Nutritional Interventions

- Weight loss and dietary changes have shown benefit in NAFLD and alcoholic liver disease.

4.3 Surgical and Transplantation Options

- **Liver transplantation**: Indicated in end-stage liver disease and HCC
- **Ablation or resection**: For localized HCC

5. Conclusion

Liver diseases remain a global challenge, but advancements in our understanding of hepatic physiology and pathology have led to better treatment strategies. Combining lifestyle modifications with pharmacologic and surgical therapies offers hope for improved outcomes.

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