

FATTY LIVER DISEASE: MODERN PERSPECTIVES AND TREATMENT STRATEGIES

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Abstract. Nonalcoholic steatohepatitis (NAS) is a chronic disease characterized by the accumulation of excess fat in liver cells, the progression of which can lead to serious hepatocellular pathologies, including fibrosis and cirrhosis. In recent years, modern approaches to the pathophysiology, risk factors, and diagnostic methods of this disease have been developed. The main risk factors include metabolic syndrome, overweight, diabetes, and lifestyle-related risks. Although treatment strategies are mainly focused on lifestyle changes, diet, and increased physical activity, the effectiveness of new agents is being studied in pharmacotherapy and clinical trials. Early detection of the disease and individualized treatment plans can significantly improve the long-term prognosis of patients. At the same time, scientific research is aimed at determining the role of genetic and biological markers in the management of NASH.

Keywords: Fatty liver, nonalcoholic steatohepatitis, pathophysiology, metabolic syndrome, treatment strategies, dietary therapy, physical activity, pharmacotherapy, diagnostics, chronic disease.

Nonalcoholic steatohepatitis (NASH) has gained attention in recent years as one of the most common chronic liver diseases worldwide. This disease develops as a result of excessive fat accumulation in liver cells and may initially present with mild clinical symptoms, which complicates its early detection. Metabolic

syndrome, overweight, diabetes, and malnutrition are recognized as the main risk factors for the development of fatty liver. Modern research shows that lifestyle changes and dietary therapy in the early stages of the disease give effective results, and new pharmacological agents are also being tested in clinical trials. It is important to develop an individual treatment strategy for high-risk patients, as this will prevent serious complications such as cirrhosis and liver failure. At the same time, scientific research is aimed at a deeper understanding of the mechanisms of disease development by identifying genetic and molecular markers. This article is devoted to analyzing the pathophysiology, diagnostic methods, and modern treatment approaches of fatty liver disease.

One of the main causes of fatty liver disease is insulin resistance. In this case, the body's cells do not fully respond to insulin, which makes it difficult to regulate blood sugar.

As a result, the liver begins to store excess glucose and fat, which leads to the development of steatosis (fat accumulation in liver cells).[1]

Increased visceral fat (fat around the internal organs) disrupts liver metabolism.

Obesity exacerbates metabolic disorders, which leads to the accumulation of triglycerides in liver cells.

A diet high in calories, sugar and trans fats "loads" the liver with excess fat.

Fast food, sugary drinks and fatty foods increase the risk of steatosis.

Certain genetic variants (for example, PNPLA3, TM6SF2) increase susceptibility to the disease.[2]

These genes control hepatic lipid metabolism and fat storage.

Diabetes, hypertension, and dyslipidemia increase the risk of fatty liver.

Certain medications (corticosteroids, some antibiotics) also contribute to the development of fatty liver.[3]

Fatty liver disease (non-alcoholic steatohepatitis, NASH) is characterized by excessive accumulation of triglycerides and other fats in liver cells. This process leads to damage to hepatocytes and the development of inflammatory reactions. Pathophysiologically, fatty liver develops in two stages: the initial stage of steatosis and the second stage - the formation of inflammation and fibrosis. In the initial stage, liver function is often preserved, so the disease is mostly asymptomatic. In the second stage, cell death, fibrosis and, ultimately, cirrhosis can develop as a result of oxidative stress, cytokines and inflammatory mediators. At the same time, genetic factors also play an important role: genes such as PNPLA3, TM6SF2 and MBOAT7 increase susceptibility to the disease. At the molecular level, fatty liver is closely related to lipid metabolism and insulin resistance, and these processes determine the rate of disease progression.[4]

The main risk factors for the development of fatty liver disease are associated with components of the metabolic syndrome. Overweight, diabetes, hypertension, dyslipidemia and increased visceral fat significantly increase the risk of the disease. At the same time, an unhealthy diet - high calorie, trans-fat and sugar intake - also contributes to the development of steatosis in liver cells. Patients with insufficient physical activity are also at high risk. Genetic predisposition and hereditary factors also play a role, as well as certain medications (e.g. corticosteroids) and chronic diseases (e.g. polycystic kidney disease) affect the development of the disease. Age and gender factors are also important in the spread of the disease: NASH is most often found in middle-aged men, but in women the risk increases during menopause.

It is important to detect fatty liver disease at an early stage, as the symptoms are often vague. The diagnostic process involves assessing the amount of fat in the liver tissue and the degree of fibrosis using laboratory tests (AST, ALT, GGT, lipid profile, glucose), ultrasound, elastography and computed tomography. Currently, non-invasive methods - FibroScan, CAP (Controlled Attenuation Parameter) and biomarkers are widely used to assess liver status. Liver biopsy is the most accurate

method, but is used in limited cases due to its invasiveness and risk of complications. At the same time, genetic and molecular markers are important in the early detection of liver disease and the development of an individual treatment strategy.[5]

The main focus of treatment is lifestyle changes. Controlling calorie and fat intake through diet therapy, limiting sugar intake, and a diet rich in fruits and vegetables protect the liver. Physical activity - 150 minutes of moderate-intensity exercise per week reduces fat and increases insulin sensitivity. In the field of pharmacotherapy, drugs that regulate diabetes and lipid metabolism, such as pioglitazone, GLP-1 analogues and vitamin E, have shown efficacy in clinical trials. At the same time, new molecularly targeted therapies, such as antifibrotic and anti-inflammatory drugs, are aimed at slowing the progression of the disease. An individual treatment strategy is tailored based on the patient's overall health, level of fibrosis, and risk factors.

Prevention plays a key role: a healthy diet, weight control, and physical activity prevent fatty liver disease. In treatment, early detection is becoming increasingly possible through new diagnostic tools, biomarkers, and genetic tests. In the future, personalized medicine—a treatment approach tailored to an individual's genetic and metabolic profile—is expected to significantly improve the prognosis of the disease. At the same time, scientific research is focused on identifying the link between fatty liver and other chronic diseases.

In conclusion, Fatty liver disease is one of the chronic diseases that requires serious attention in modern medicine. The development of the disease is mainly associated with metabolic syndrome, overweight, diabetes mellitus and unhealthy lifestyle, and genetic factors also play an important role. Since symptoms are not noticeable in the early stages, early diagnosis and regular monitoring are vital for patients. Modern diagnostic methods, in particular non-invasive technologies and biomarkers, are highly effective in determining the state of the liver. Treatment strategies are multifaceted and include tools ranging from diet and physical activity

to pharmacotherapy and new molecular approaches. At the same time, complications can be prevented by developing individual treatment plans, taking into account the patient's overall health and risk factors. In the future, personalized treatment approaches based on genetic and molecular markers will significantly improve the prognosis of the disease. In this regard, early detection, prevention and integrated treatment strategies are of great importance in the fight against fatty liver disease.

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