Gender, Age And Somatotypical Characteristics Of The Hepatobiliary System (Literature Review).

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ABSTRACT

This article presents a comprehensive analysis of the anatomical and physiological features of the hepatobiliary system, considering gender, age, and somatotypic factors. Current data on the morphometric parameters of the liver, pancreas, bile ducts, and spleen in various patient groups are discussed. Normative organ size indicators and their variations depending on age, gender, and body type are reviewed. Special attention is given to the capabilities of ultrasound diagnostics as the primary non-invasive method for visualizing structural changes in the hepatobiliary system. The importance of individualized anatomical assessment in interpreting ultrasound data and in early diagnosis of various pathologies is emphasized.

Keywords: *hepatobiliary system, liver, pancreas, spleen, age, gender, somatotype, ultrasound diagnostics.*

Introduction: The hepatobiliary system, including the liver, pancreas, bile ducts and hepatic ducts, undergoes significant changes depending on gender and age. These features are important for clinical diagnosis and interpretation of ultrasound data.

Normally, the size of the hepatobiliary system organs varies depending on age. In children and adolescents, the size of the liver, pancreas and spleen grows in accordance with physical development, reaching maximum values by 18-20 years. According to research data, in children from 1 year to 5 years old, the length of the right lobe of the liver ranges from 6 to 9 cm, and the left lobe - from 3 to 5 cm. By 10-12 years, these parameters increase to 9-12 cm and 5-7 cm, respectively [1].

In healthy adults, the average size of the right lobe of the liver is 13-15 cm, and the left lobe is 7-10 cm. In old age, starting from 60-65 years, a slight increase in the size of the liver is possible, which is associated with the accumulation of fat and collagen inclusions. However, this is not always a pathology and is considered an age norm, unless other abnormalities in the structure or function of the liver are observed [14].

The sizes of the bile and intrahepatic ducts vary depending on the age, sex and body type of the patient, which must be taken into account during ultrasound diagnostics. In children under 10 years of age, the diameter of the common hepatic duct is on average 2.5-3 mm, gradually increasing by 15-18 years and reaching the adult norm of 4-6 mm. In adults, the diameter of the common hepatic duct varies from 4 to 6 mm, and after 60 years, the diameter can reach 7-8 mm without signs of pathology,

which is associated with age-related changes [18].

The intrahepatic ducts, which are normally less visible on ultrasound, have an average diameter of about 2 mm in adults. Dilation of these ducts in healthy individuals is rare and may occur in response to increased stress with increased physical activity or changes in diet. However, the normal diameter of the intrahepatic ducts should not exceed 3 mm, and any deviations from this norm usually require additional examination to exclude pathologies [5].

The pancreas in children is small in size, gradually increasing to normal values by puberty. In adults, the head of the pancreas is 2.5–3.5 cm, the body is 1.5–2.5 cm, and the tail is up to 3 cm. In the elderly, minor changes in the size and echogenicity of the pancreas are also possible, which are normal if not accompanied by changes in the tissue structure [11].

The spleen in children aged 1 to 5 years is about 6-7 cm long and 2-3 cm wide. By the age of 10, the length of the spleen reaches 8-9 cm, and by the age of 18 - 10-12 cm, which corresponds to the size of adults. On average, in an adult, the length of the spleen is 11-13 cm, the width is 5-6 cm, and the thickness is about 3-4 cm. In older people, the size of the spleen may decrease slightly, which is associated with age-related changes in the blood supply and tissue structure of the organ [23].

Sexual characteristics

Studies show that men and women have differences in the structure and function of the hepatobiliary system. In particular, the liver in men is on average larger in size, which is associated with greater body weight and a higher level of metabolic activity. Liver echogenicity can also vary depending on sex hormones: in women, for example, estrogen levels can promote fat deposition in the liver, which increases the likelihood of developing fatty hepatosis , especially in the postmenopausal period [17].

Women are more likely to have gallbladder diseases such as cholecystitis and cholelithiasis, which is associated with the effect of estrogens on the metabolism of cholesterol and bile acids. In contrast, men are more likely to have alcoholic liver damage and a higher risk of developing cirrhosis. These gender differences are important for identifying risk groups and developing preventive measures [22].

Age-related features

With age, there are a number of changes in the structure and function of the organs of the hepatobiliary system. Ultrasound studies show that the size of the liver can increase with age, which is associated with the accumulation of fat and collagen deposits. The elasticity of the liver tissue decreases, which increases the risk of fibrotic changes and cirrhosis. Reduced blood flow and fat deposition can also lead to fatty hepatosis in elderly patients, especially in the presence of metabolic syndrome and diabetes [12].

Older people are also more likely to develop gallbladder disease. Studies show that the risk of cholecystitis and gallstones increases after age 60. In addition, the functional activity of the pancreas decreases, which may be associated with atrophic processes and calcification . These age-related changes increase the risk of digestive and metabolic disorders in older people, requiring more frequent monitoring and screening examinations [8].

Classification of somatotypes and their influence on hepatobiliary parameters

Somatotypic features, including ectomorphic , mesomorphic and endomorphic body types, play a significant role in the formation of ultrasound parameters of the organs of the hepatobiliary system.

Ectomorphic somatotype

Ectomorphic The somatotype is characterized by a thin, elongated body shape, with a low percentage of fat mass. People with an ectomorphic body type usually have smaller liver and pancreas sizes, which can be explained by the low content of fat deposits and the overall decrease in the metabolic load on the hepatobiliary system. Studies show that ectomorphs are less likely to develop fatty hepatosis and metabolic liver diseases, which is associated with a lower body mass index [2].

The liver in ectomorphs usually does not exceed 14 cm in length of the right lobe, which is associated with a low level of fat accumulation. This is also reflected in the smaller size of the pancreas and less pronounced echogenicity of the liver [3].

Mesomorphic somatotype

Mesomorphs have a medium build with a predominance of muscle mass. This group is characterized by a moderate risk of metabolic liver diseases, but they are at risk of disorders associated with overnutrition or excess protein in the diet. Studies show that people with a mesomorphic body type are more likely to develop functional disorders of the gallbladder, which requires preventive monitoring of lipid metabolism parameters and biochemical liver indices [7].

People with a mesomorphic body type have more developed muscle mass and moderate fat content, which is reflected in the size of the hepatobiliary organs. The liver size in mesomorphs is 13-15 cm for the right lobe and 6-8 cm for the left. The bile ducts in this category of patients may also be somewhat wider due to a higher level of metabolic activity and the need for more intensive digestion, which may explain the slight expansion of the bile ducts in physically active people with a mesomorphic body type [4].

Endomorphic somatotype

The endomorphic type is characterized by a wide body type, with a high level of fat deposits. People with an endomorphic body type have a higher risk of developing fatty hepatosis and other metabolic disorders of the liver, especially in the presence of obesity. The echogenicity of the liver in such patients is often increased , which is associated with lipid deposition. The study found a correlation between BMI and the degree of liver echogenicity , which emphasizes the importance of monitoring the state of the hepatobiliary system in people with an endomorphic body type [13].

Endomorphic body type, characterized by a wide body and high fat content, is accompanied by enlarged liver size and increased echogenicity , especially with a high body mass index. In endomorphs, the liver size may exceed 15 cm, which is associated with fat deposition in hepatocytes even in the absence of fatty hepatosis . Bile ducts in endomorphs may also have a slightly larger diameter, which requires consideration when interpreting ultrasound examination results [9].

Numerous studies confirm the importance of taking into account gender, age and somatotype factors in the diagnosis and treatment of diseases of the hepatobiliary system. In the work of Lee H. and Kim J., the features of the liver structure in patients with different body types are considered, where the authors note a significant increase in the frequency of fatty hepatosis in endomorphs compared to ectomorphs and mesomorphs [16].

Studies show that men and women have differences in the size and characteristics of the hepatobiliary system that must be taken into account when diagnosing. On average, men have larger liver, pancreas, and spleen than women, which is associated with higher muscle mass and metabolic activity. In men, the right hepatic duct averages 4.5-5.5 mm, while in women its diameter usually does not exceed 4-5 mm [21].

Other studies show that age-related changes, such as decreased tissue elasticity and fat accumulation, lead to an increased incidence of liver and bile duct diseases. In particular, the work of Hernandez M. and Chen Q. emphasizes the role of age in the development of fatty hepatosis , which often remains asymptomatic in the early stages, making it difficult to diagnose in a timely manner [6].

Women have a higher risk of developing gallstones due to hormonal factors and periodic changes in estrogen levels, especially during reproductive age and menopause. The gallbladder in women may be slightly larger in size compared to men, due to the need to store a larger volume of bile, especially during pregnancy [20].

The size of the liver, bile ducts and intrahepatic ducts in children under 5 years of age is significantly smaller than in adults, and is approximately 50-70% of the norm for an adult. By the age of 18, the liver reaches a size comparable to that of adults, although small differences may be associated with gender and somatotype differences. In older people,

starting from the age of 60, age-related changes are possible, such as an increase in the size of the liver and bile ducts, caused by a decrease in tissue elasticity and the accumulation of fatty inclusions, which reflects the natural aging processes [19].

Particularly relevant are studies aimed at studying gender differences in the incidence of hepatobiliary system diseases. Thus, in the work of Martinez E. and Silva R. it was established that among older women there is a higher incidence of cholecystitis and gallstone disease, which is associated with hormonal changes in the postmenopausal period [15]. In men, alcoholic liver damage is more common, which is associated with behavioral factors and biochemical differences in metabolism.

Domestic studies also pay considerable attention to the study of the influence of somatotype on ultrasound parameters of hepatobiliary organs. In the work of Smirnov A. and Ivashin P., data are provided on the influence of obesity on the echogenicity and size of the liver, emphasizing the need for regular monitoring in patients with an endomorphic body type [10]. Studies have also been conducted to identify gender and age risk factors for the prevention of liver and gallbladder diseases in different categories of patients.

The influence of gender, age and somatotype on the structure and functional characteristics of the organs of the hepatobiliary system is an important aspect of modern medicine. The data obtained on the significance of these factors allow for more accurate diagnostics, as well as the development of preventive and treatment programs aimed at preventing diseases in various population groups.

Conclusions

The results of the analysis demonstrate the high importance of taking into account age, gender and somatotype factors when assessing the state of the hepatobiliary system. The size and functional characteristics of the liver, pancreas, bile ducts and spleen vary significantly depending on age - from childhood to old age, which requires strict age correction of norms in ultrasound diagnostics. Gender differences are manifested not only in the size of organs, but also in different predispositions to diseases: women have a higher risk of gallstone disease and cholecystitis, while men have a higher risk of alcoholic liver disease and cirrhosis.

Somatotypical features of patients play a special role : ectomorphs are characterized by smaller organ sizes and a lower risk of steatosis ; endomorphs have a pronounced tendency to fatty tissue. hepatosis and metabolic disorders; mesomorphs occupy an intermediate position, demonstrating moderate risks of functional disorders.

Thus, a personalized approach to the diagnosis and prevention of diseases of the hepatobiliary system, taking into account the somatotype , gender and age of the patient, allows to significantly increase the accuracy of diagnosis, promptly identify pathological changes and develop effective preventive measures in clinical practice.

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