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Influence of Anomalies of the Gall Bladder and Bile Tracts on the Development of Pathological Conditions of the Bile Executive System in Children

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Abstract Diseases of the biliary tract are a common pathology in children. 142 children with functional and inflammatory diseases of the biliary system were examined. Ultrasound examination revealed a high prevalence of minor developmental anomalies. Anomalies of the biliary tract play an important role not only in the development of diseases, but also contribute to more pronounced disorders of bile formation and bile secretion, the formation of biliary sludge, which indicates the initial stage of cholelithiasis.

Keywords Functional and inflammatory diseases of the biliary system, Developmental anomalies, Biliary sludge

1. Introduction

Diseases of the biliary system (IVS) play a significant role in the structure of children's pathology, as they are characterized by a wide prevalence, the possibility of developing a chronic course and the formation of the main types of pathology during the period of growth and development of the child's body. Diseases of the gallbladder and biliary tract in children compared to adults proceed more favorably, are diagnosed in most school-age children, and the main type of lesion is dysfunction of the biliary tract. Functional disorders of the biliary system develop on the basis of a violation of the regulatory function of the central nervous system, in violation of the activity of the autonomic nervous system, under the influence of other factors, when dyskinesias develop according to the type of viscero-visceral reflexes, including in the presence of pathology of other parts of the digestive system.

Chronic cholecystitis is a fairly common pathology and, according to various authors, accounts for 17-19% of chronic diseases of the gastrointestinal tract. At present, the prevailing opinion is that the development of gallbladder diseases is predominantly sequential. Therapists and pediatricians admit the existence of CBC without stones in the gallbladder (GB), considering it as a probable pre-stage of biliary sludge and cholelithiasis.

Various factors contribute to the development of the pathology of the biliary system: malnutrition, anomalies and malformations of the biliary tract, the presence of food allergies, a history of past intestinal infections, parasitic and helminthic invasions, etc.

Anomalies are congenital defects and malformations of the biliary tract and in most cases are accompanied by impaired motility of the gallbladder [1-6]. Most studies show that anomalies and malformations of the biliary tract are a risk factor for the development of functional and organic pathology of this organ [1,3,7,8,9,10]. Anomalies in the development of the gallbladder occur in the general population in 6-8% of cases. In adults, in some regions, the frequency of detection of various deformities of the gallbladder reaches 60–75% during ultrasound examination [11].

In clinical practice, anomalies of the biliary tract can be congenital and acquired in nature, which develops with a prolonged and pronounced inflammatory process and the development of functional disorders. In childhood, anomalies of the biliary tract are mainly congenital.

Currently, among diseases of the biliary tract in childhood, anomalies and malformations of the biliary tract are leading [12,13].

Congenital anomalies of the gallbladder and bile ducts contribute to the violation of the evacuation function of the billiary system, the formation of congestion, impaired contractile function and are a risk factor for the development of functional and organic pathology of this organ.

2. Purpose of the Study

Identification of anomalies in the development of the biliary system in children with functional disorders and inflammatory diseases, their impact on the course of the disease and the development of biliary disorders.

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3. Materials and Research Methods

During the work, 142 children aged 3-16 years with biliary dyskinesia and chronic acalculous cholecystitis were examined and observed. A comprehensive study of children was carried out, taking into account hereditary factors, the study of anamnestic data to identify factors that contribute to impaired function of the biliary tract. For the diagnosis of diseases of the biliary system, ultrasound, cholecystography, biochemical blood tests were used to detect the presence of an inflammatory process and signs of biliary dysfunction.

4. Results

In clinical practice, anomalies of the biliary tract can be congenital and acquired, when gallbladder deformities are associated with a prolonged inflammatory process, the development of pericholecystitis, which is rare in childhood. In children aged 3–6 years, functional disorders of the biliary tract were observed more often (7%) than chronic cholecystitis (2%), in the group 7–11 years old, dyskinesia and CBC were detected with the same frequency (17%), and at the age of 12–16 years CBC was detected more frequently (21%) than functional disorders (16%). Dyskinesia and organic changes in the biliary tract in childhood are interdependent, in connection with this, functional disorders were detected in children with CHD. In children, the formation of pathological changes in the biliary tract is aggravated by the high frequency of anomalies and malformations of the gallbladder and ductal system along its entire length, which are detected in almost every second child [10].

When examining children, attention was paid to the peculiarities of the constitution and the presence of other external signs of connective tissue anomalies, which are quite often combined with anomalies in the development of internal organs. Minor developmental anomalies can be detected in healthy individuals; the conditional stigmatization threshold, according to different authors, ranges from 3 to 7 [14]. It should be noted that in 4 children with functional disorders of the biliary tract, external signs of connective tissue anomalies were not expressed, with the exception of the definition of an asthenic constitution, in other cases, the children had an asthenic type of constitution, hypermobility of the joints, impaired posture, soft auricles, flat feet.

When conducting an ultrasound examination of 71 children with an established diagnosis of biliary dyskinesia, 21 (30%) anomalies in the development of the biliary tract and 25 (35%) of 71 children with chronic cholecystitis were detected. 5 (11%) children had a double inflection of the gallbladder, 9 (20%) had a constriction of the body of the gallbladder, 27 (58%) had an inflection of the gallbladder, and 5 (11%) had a deformity of the bladder neck. Thus, in 46 (33%) of the total number of children examined, functional and inflammatory diseases developed against the background of an existing congenital anomaly of the biliary system.

UCTD is often combined with vegetative-vascular disorders when emotional disorders are observed: neurotic reactions, anxiety-phobic, asthenic manifestations [15]. Autonomic dysfunction contributes to the development of gastrointestinal tract (GIT) motility disorders, mainly of a hypokinetic nature. Children form a risk group for the development of cholecystitis, pancreatitis, cholelithiasis, since a violation of the coordinated work of the biliary tract leads to a violation of bile circulation, a delay in its evacuation from the gallbladder and the formation of stones in it [12].

With hypomotor type of dyskinesia, the gallbladder is not able to remove all particles that have undergone agglomeration. A positive correlation between the severity of hypokinetic dysfunction and the bile lithogenicity index has been proven. In addition, motor-tonic disorders can cause the development of inflammation and congestion in the biliary tract, leading to the formation of biliary sludge, which indicates the initial stage of cholelithiasis [11,12,15].

Risk factors for the development of pathology of the biliary tract and the formation of biliary sludge include heredity; a feature of the diet that contributes to a decrease in the contractility of the gallbladder and spasm of the sphincter of Oddi; anomalies of the gallbladder and biliary ducts; acalculous cholecystitis, leading to a decrease in the contractility of the gallbladder; intestinal diseases leading to disruption of the enterohepatic circulation of bile acids and disruption of their absorption, etc. [8-10].

In the group of children with functional disorders of the bile duct, developmental anomalies were diagnosed in 21 (30%) children, and in chronic acalculous cholecystitis, developmental anomalies were diagnosed in approximately 1/3 of children (30% and 35%). Biliary slide was observed in children with biliary dyskinesia in 35 (49%) children, of which 16 (46%) had developmental anomalies. In children with chronic cholecystitis, biliary sludge was diagnosed by ultrasound in 39 (54%) children, of which 20 (52%) developed biliary sludge. Thus, anomalies of the biliary tract play an important role not only in the development of functional and inflammatory diseases of the biliary system, but also contribute to more pronounced disorders of bile formation and biliary excretion and the development of cholelithiasis.

Anomalies of the biliary tract play an important role in the violation of the passage of bile [1]. Various variants of gallbladder deformities interfere with the normal function of the organ and disrupt motility, mainly in the hypotonic type. Against the background of dyskinetic disorders, it is possible to develop dyscholia with severe manifestations, which, in accordance with the concept of the pathogenesis of cholecystitis, is a prestage of the inflammatory process in the gallbladder. The resulting congestion over time leads to the development of degenerative changes in the wall of the bladder, its contractile function [3]. Small anomalies of the biliary tract due to the preserved outflow of bile are recognized later, but they affect the formation of diseases of the biliary tract. The final outcome of this process is the formation of cholecystitis and gallstone disease (GSD) [14,15].

The presence of a combination of pathological changes: congenital anomalies of the biliary tract, dyskinesia or

chronic acalculous cholecystitis are the cause of the development of biliary sludge, which indicates the need for therapy that helps restore the buffer function of the biliary tract, regulate the processes of bile secretion and bile formation, and dissolve biliary sludge.

Children with signs of impaired cholelithiasis and the formation of biliary sludge were treated with the underlying disease, followed by the appointment of ursodeoxycholic acid, which has a pronounced effect on cholesterol metabolism, causing a decrease in the secretion of the latter into bile, a decrease in intestinal absorption of cholesterol and stimulation of the release of cholesterol into bile from stones. At the same time, therapy was carried out aimed at correcting the motor function of the biliary tract (hymecromon, mebevirin), polyenzyme preparations, and probiotics. The duration of UDCA therapy depended on the nature of changes in biliary sludge.

5. Conclusions

Congenital anomalies of the gallbladder and bile ducts contribute to the violation of the evacuation function of the billiary system, the formation of congestion, impaired contractile function and are a risk factor for the development of functional and organic pathology of this organ. Against the background of congenital anomalies, involvement in the pathological process of other organs (hepatitis, pancreatitis), cholelithiasis is more often observed. The identified anomalies in the development of the biliary system can contribute to the development of more severe changes, require a long and in-depth examination of children.

In children with congenital anomalies of the bile duct with the development of functional disorders and chronic acalculous cholecystitis, in most cases, the formation of biliary sludge is observed, which is a precursor of cholelithiasis and requires treatment to normalize the processes of bile formation and bile secretion.

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