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SOME RISK FACTORS FOR DIGESTIVE COMPLICATIONS IN CHILDREN AFTER CARDIAC SURGERY WITH ARTIFICIAL CIRCULATION

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Abstract Purpose: to analyze some risk factors for the development of complications from the digestive system in children after cardiac surgery with artificial circulation.

Materials and methods: The material of the research was 452 sick children aged from 3 months to 16 years, who underwent open-heart surgery using artificial circulation. The level of volatile fatty acids in feces was determined and bacteriological analysis of feces was performed.

Results: Risk factors for disorders of the digestive system are: early age of the child, prolonged stay on artificial circulation and in the ICU, the initial state of the gastrointestinal tract (dysbiosis, impaired intestinal absorption). The level of volatile fatty acids in feces can be considered one of the markers that determine the possibility and degree of damage to the digestive organs. Bacteriological confirmation of the presence of a certain microflora in the feces makes it possible to concretize the therapy of such patients.

Keywords: complications from the digestive system, risk factors, volatile fatty acids, heart-lung surgery

INTRODUCTION

In recent years, the number of specialized centers capable of carrying out high-tech interventions, including operations using artificial blood circulation, has been growing in Uzbekistan. It is clear that after such operations, a certain percentage of various complications are inevitable.

Thus, the incidence of complications from the digestive system after cardiac surgery with artificial circulation according to the literature varies widely, due to the different initial status of patients, some characteristics of the operation and the postoperative period [1,2,3,4]. At the same time, abdominal complications after heart surgery are not considered leading, however, they are always associated with a high degree of mortality and the development of multiple organ failure [4,5,6]. It should be noted that the percentage of such complications has significantly decreased due to improved prevention and effective pharmacotherapy with proton pump inhibitors, PDE III, dobutamine, dopamine, adequate volumetric load, selective bowel decontamination and optimization of artificial circulation [7].

The development of complications from the digestive system depends, first of all, on the length of the preoperative hospital stay, recent previous hospitalizations and antibiotic therapy, which is accompanied by the replacement of the usual flora with hospital-resistant strains.

Taking into account the state of asepsis and antiseptics in cardiac surgery hospitals, the endogenous pathway of infection predominates in the future [1,8,12], largely due to artificial circulation and hypothermia. The latter, especially with long-

term interventions, lead to pronounced changes in homeostasis and microcirculation, tissue hypoxia and, as a consequence, to a weakening of the barrier properties of the mucous membranes with the translocation of bacteria and their fragments into the systemic circulation. The gastrointestinal tract plays a leading role in this process.

According to the literature, the risk factors for abdominal complications should be considered an early age, a decrease in ejection fraction, the duration of artificial circulation and the time of aortic clamping, the time spent in the ICU for more than a day [1,2,4,5,7].

On the other hand, there is no doubt that bacteria are involved in the normal functioning of various body functions. Anaerobes play a special role. Volatile fatty acids can be considered one of the products of their vital activity. "short certain fatty acids" (SCFA) are short-chain fatty acids such as acetic, propionic, isobutyric, butyric, isovaleric, valeric, isocaproic and caproic acids.

The main place of production of shortcertainfattyacids is the intestine, where 200-1000 mmol of certain short fatty acids are formed daily. The role of certain short fatty acids is diverse and ambiguous, but it is of interest to us that they can be markers of a disturbance in the composition of the normal intestinal microflora, and an increased amount of this indicator in the blood helps to understand the relationship between intestinal changes and changes from other organs and systems [9].

Purpose: to analyze some risk factors for the development of complications from the digestive system in children after cardiac surgery with artificial circulation.

MATERIALS AND METHODS.

Our study was carried out on the basis of the cardiac surgery department of the Samarkand regional multidisciplinary medical center. The material of the study was 452 sick children aged from 3 months to 16 years, who underwent open-heart surgery using artificial circulation.

From laboratory examinations, the level of short certain fatty acids in feces was determined by gas-liquid chromatography on a chromatograph "Color 100, model 165" and bacteriological analysis of feces.

RESULTS AND DISCUSSION

Starting from the early postoperative period, all patients underwent such preventive measures as fractional nutrition, the appointment of proton pump inhibitors, probiotics.

When sorting the examined, taking into account the severity of changes in the digestive system, 441 (97.6%) patients with adequate withdrawal from open-heart surgery, however, some of them had functional disorders of the gastrointestinal tract.

Thus, functional constipation was observed in 65 (14.7%), simple dyspepsia - 9 (2.0%), bloating - in 101 (22.9%), nausea - in 21 (4.8%), vomiting - in 7 (1.6%), abdominal pain - in 137 (31.1%) examined in the postoperative period.

Constipation almost always occurred in children over 3 years old (59 (13.4%)), disappeared within a month after surgery, only 4 (0.9%) continued to be persistent in the future, constipation was observed in these children and before surgery. Simple

dyspepsia, on the contrary, was typical for children of the first life, was quickly stopped by a sparing diet, a short course of enzyme therapy and probiotics even before the patients were discharged from the hospital. Bloating, the most common disorder, usually occurs immediately after surgery in the ICU, after being transferred to the department, the patients no longer bother. However, in 2 (0.5%) of our patients, significant bloating was noted after a violation of the diet, which led to a deterioration in the general condition of the patient with the development of severe shortness of breath and anxiety. Older children complained of nausea, vomiting was observed only in young children. The most common complaint was abdominal pain, although this symptom cannot be considered gastroenterological, since children cannot clearly localize pain, therefore, abdominal pain could be directly related to pain in the postoperative wound.

Objectively, patients with gastroenterological symptoms revealed: dry skin, pallor, yellowness (in 6 (1.4%)), rapid breathing (due to bloating), tachycardia, swollen painful abdomen, enlarged liver and spleen. General symptoms: moodiness, lethargy, decreased or increased appetite, decreased activity could be associated not only with changes in the digestive system, but with digestive disorders, they are undoubtedly aggravated.

Significant complications from the digestive system were detected in the early postoperative period in 11 (2.4%) patients, which generally does not contradict the data of domestic and foreign literature. Of 11 patients, 4 had toxic hepatitis, which was one of the manifestations of multiple organ failure, and 7 had enterocolitis.

According to the literature, enterocolitis, as a complication after open heart surgery, occurs more often in newborns, in percentage terms it can be up to 37% [5]. In our study, there were no newborns; manifestations of enterocolitis were observed mainly in low birth weight children of the first year of life with pulmonary hypertension. 3 out of 7 patients with developed enterocolitis previously received treatment for enterocolitis (2), sepsis (1). In the ICU department, patients with enterocolitis were kept for at least 3 days, with toxic hepatitis - for more than 5 days.

Determination of the level of certain short fatty acids was carried out selectively in 46 patients, including all 11 who had significant changes in the digestive system, they made up the main group. Of these, 19 significant changes and complaints from the gastrointestinal tract were not noted, they constituted the control group. 16 children who had functional transient changes in the gastrointestinal tract were included in the comparison group.

Indicators of certain short fatty acids in the subjects are presented in Table 1. One of the indicators characterizing the predominance of facultative anaerobic flora is the level of acetic acid [9], which was significantly high in patients with functional and even more organic damage to the digestive system. This indicator was especially high in 4 patients with hepatitis, which was one of the manifestations of multiple organ failure. In the literature, the pathogenesis of this phenomenon is explained from the standpoint of a decrease in the bacteriostatic effect of bile, due to a decrease in its separation in patients with hepatitis, as a consequence of intestinal dysbiocenosis, leading to an increase in the content of acetic acid [9]. In addition, in the main group,

butyric and propionic acids ($p < 0.001$) are increased in feces, which indicates the activation of opportunistic flora and strict anaerobes (bacterioids, eubacteria, fusobacteria, coprococci, etc.).

The results of the study of anaerobic indices, reflecting the redox potential in the intestinal lumen, show that with functional disorders (comparison group), the anaerobic index shifts to the region of weakly negative values, and with organ lesions (main group), it is shifted to the region of sharply negative values, according to compared with the indicators of the control group, which indicates the suppression of obligate anaerobes - lacto- and bifidoflora.

The study of the ratio of the content of isoacids and the ratio of isovaleric acid to valeric acid in functional disorders showed a decrease in the iC_n , iC_5 / C_5 ratio, while in organ lesions, a sharp increase in this indicator was noted, indicating an increase in the activity of aerobic microflora with proteolytic activity in the intestinal lumen in patients with hepatitis and enterocolitis.

Table 1. The quantitative content of short certain fatty acids, anaerobic indices in feces in the examined subjects with and without digestive disorders, $M \pm m$

Groups	Aceticacid, mg / g	Propionicacid, mg / g	
Control group (n=19)	0,632 \pm 0,003	0,189 \pm 0,002	
Main group (n=11)	0,721 \pm 0,002***	0,315 \pm 0,004***	
Comparisongroup (n=16)	0,564 \pm 0,004***	0,193 \pm 0,005***	
Groups	Butyricacid, mg / g	Aerobicindex (negative)	IC5/C5
Control group (n=19)	0,175 \pm 0,002	0,575 \pm 0,011	1,2 \pm 0,1
Main group (n=11)	0,312 \pm 0,004***	0,884 \pm 0,010***	5,2 \pm 1,2*
Comparisongroup (n=16)	0,152 \pm 0,002***	0,471 \pm 0,012***	3,09 \pm 0,11

Note: for $p < 0.05$. * - $p < 0.05$ when compared with the norm group; ** - $p < 0.05$ when compared between the comparison groups and the main

Consequently, in the early postoperative period, there is one or another degree of violation of the quantitative and qualitative composition of the microbiota. We compared our conclusions on the results of indicators of short certain fatty acids with the results of bacteriological examination of feces.

In a bacteriological study of biomaterials in cardiac surgery patients, conditionally pathogenic flora is isolated in 36.8% of cases [4]. In the structure of pathogenic microbes causing infectious complications in patients after open heart surgery, the proportion of gram-negative microorganisms was 62%, gram-positive, mainly staphylococcus - 47%, fungi - 19% [1,2].

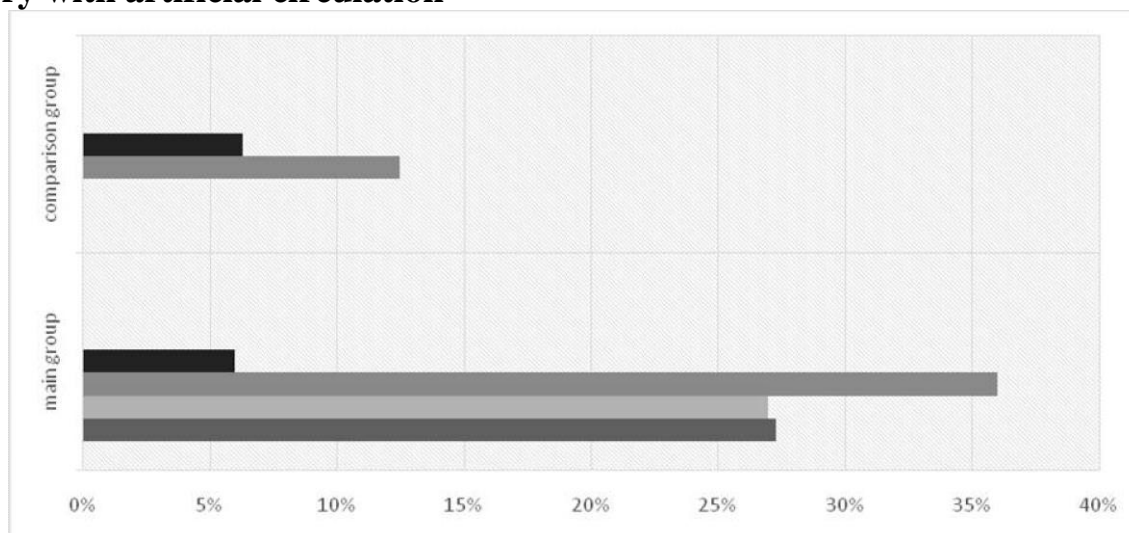
According to N.V. Granichnaya. et al. [8] in patients with cardiac surgery profile, Staphylococcus epidermidis is isolated in most cases. Kasatov A.V. et al. identified along with staphylococcus various types of Pseudomonas [10,11].

In our bacteriological study of feces from patients in the comparison group, representatives of the normal intestinal flora were isolated (bifidobacteria, lactobacilli in reduced titers, E. coli in increased titers). Staphylococcus epidermidis (facultative anaerobe) was detected in 1 (6.3%) patient of this group, in 2 (12.5%) - fungi of the genus Candida (facultative anaerobic) in titers exceeding 10⁴ (Fig. 1). In the main group, 3 (18.7%) patients had Staphylococcus aureus (facultative anaerobe), 3 (27.3%) - Proteus vulgaris (facultative anaerobic), 4 (36.4%) - Candida fungi, 1 (9%) were dominated by Clostridia (obligate anaerobic). Flora was not detected in 4 out of 11 patients (Fig.1).

If we consider the sowing of microbial representatives by nosological forms, then in 3 patients with lesions of the digestive system in the form of hepatitis out of 4, representatives of conditionally pathogenic flora were sown: Staphylococcus aureus (2), Candida (1), Clostridia (1).

Of 7 patients with enterocolitis, conditionally pathogenic flora was found in 6: Staphylococcus aureus (1), Candida (3), Proteus vulgaris (3). Taking into account the results of bacteriological examination, out of 7 children with enterocolitis, five were prescribed, in addition to standard methods of therapy, Sextaphage, apolyvalent bacteriophage capable of lyzing bacteria of staphylococci, streptococci, Proteus, Klebsiella, Pseudomonas aeruginosa and Escherichia coli. At the same time, it was noted: faster elimination of symptoms of diarrhea, bloating, lower body temperature, improvement in general condition, restoration of appetite compared to children who did not receive this drug.

Fig. 1 Composition of intestinal microflora in children after cardiac surgery with artificial circulation



CONCLUSION

1. The frequency of organ complications from the digestive system after operations with artificial circulation in children was only 2.4%; however, these complications worsened and lengthened the course of the postoperative period.

2. Risk factors for digestive disorders are: early age of the child, prolonged stay on artificial circulation and subsequently in the ICU, the initial state of the gastrointestinal tract (symbiosis, impaired intestinal absorption)

3. The leading symptoms of functional disorders of the gastrointestinal tract in children were constipation or simple dyspepsia, bloating, abdominal pain.

4. the most frequent organ lesions of the digestive system in children after cardiac surgery on an open heart can be considered enterocolitis and hepatitis.

5. The level of certain short fatty acids in feces can be considered as biochemical markers that determine the degree of damage to the digestive system. The level of certain short fatty acids in feces can be used in the practice of predicting the severity of complications from the organs, as well as for choosing the correct method of management in the postoperative period.

6. With bacteriological confirmation of the presence of opportunistic microflora in the feces, targeted dextrotropic treatment with immunomodulatory drugs is preferable.

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