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CENTRAL HEMODYNAMICS IN CHILDREN OF DIFFERENT AGE WITH COMPLICATED FORMS

ABSTRACT

The difficulty in diagnosing and treating complicated forms of appendicitis in children is determined by the limited compensatory capabilities of the child's organism and by the rapid involvement of various organs and systems in the process. Already from the first hours of development of peritonitis, there are violations from the cardiovascular system and other organs and systems, which are then aggravated and can lead to multi-organ failure and an unfavorable outcome. The article presents the results of the study of the peculiarities of central hemodynamics in complicated destructive appendicitis by the method of Podiedtsev-Voronova by the device «Cardiocode». As a result of the study, 3 hemodynamic parameters were detected, significantly changing their values depending on the stage of the inflammatory process in the appendix.

Keywords: appendicular peritonitis, central hemodynamics, «Cardiocode».

INTRODUCTION

Diagnosis and treatment of acute destructive appendicitis in children has always remained an urgent problem in emergency surgery. This circumstance is associated with a high incidence of acute appendicitis, a significant number of complications (up to 12.7%) and a frequency of diagnostic errors (up to 12) [1-3, 5].

Despite the vastness and variety of methods of diagnosis and treatment, mortality in acute appendicitis does not decrease, and remains stable - 0.1-0.2% [5]. Destructive forms of acute appendicitis are connected with the rapid development of the inflammatory process in the appendix, atypical clinical manifestations and the difficulty of diagnosis. The percentage of postoperative complications, especially severe ones, these are the development of sepsis (15%) and multiorgan insufficiency in children (21%) [1-6].

Because of the frequency of complicated forms of acute appendicitis, the absence of a tendency to reduce the frequency and severity of purulent-inflammatory complications, the issues of preventing the development of inflammatory complications acquire great medical and social significance.

The difficulty in diagnosing and treating complicated forms of appendicitis in children is determined by the limited compensatory capabilities of the child's organism and by the rapid involvement of various organs and systems in the process. Already from the first hours of development of peritonitis, there are disorders from the cardiovascular system and other organs and systems, which are then aggravated and can lead to multi-organ failure and an unfavorable outcome. These pathological changes are most pronounced in children of younger age group, in whom the

diagnosis of disorders by organs and systems is difficult. In this case, children are affected not only the organs of the abdominal cavity, but also due to endotoxemia, the cardiovascular system (pumping function of the heart) suffers significantly. Especially these disorders occur in children with complicated forms of destructive appendicitis [5, 7].

Many researchers consider peritonitis as peritoneal sepsis, in which the focus of infection is the abdominal cavity. Any septic state is also stressful, characterized by a typical violation of central hemodynamics (CH) and disorders of regional circulation in the form of centralization of blood flow and worsening of blood circulation at the periphery. First of all, at this mesenteric blood flow suffers. The main mechanism of disorders is spasm of the peripheral arterial bed, activation of arterio-venous shunting, venous plethora [3-7].

Objective of the research: to improve the results of treatment of children with complicated forms of destructive appendicitis by early detection of cardiovascular disorders and monitoring the efficiency of therapy.

Tasks:

1) to study the incidence of complicated forms of acute appendicitis in Voronezh region.

2) to study the characteristics of central hemodynamics by the device «CARDIODE» in patients with various forms of destructive appendicitis by analyzing the hydrodynamic of blood flow in the and third mode according to the method Poedintsev-Voronova.

3) to evaluate the diagnostic significance of disorders of the central hemodynamics in patients with destructive forms of appendicitis.

MATERIALS AND METHODS

From 2012 to 2016 in a surgical hospital of children surgery department

of The Regional Children's Clinical Hospital №2 N.N. Burdenko Voronezh State Medical University 1405 children with destructive forms of appendicitis, of which 115 with appendicular peritonitis (8.2 %) were hospitalized.

The present study was based on the observation and treatment of 74 children with destructive forms of appendicitis. Among them 36 patients with an acute phlegmonous appendicitis (I group) and 38 children with appendicular peritonitis in age from 3 to 17 years (II group). Also the study included 60 healthy children in age from 3 to 17 years (III group).

During the hospital stay for all children was conducted clinical and laboratory examination. We have carried out the assessment of the severity of the condition of children admitted to hospital, the need of preoperative preparation, the nature of operative treatment, duration of stay in the intensive care unit, the timing of drainage, laboratory values, bed days.

To determine the central hemodynamic parameters we used a certified device «Cardiocode» hemodynamic analyzer computer, based on the method Poedintsev-Voronova (patent No. 94031904/14(029471) from 5.08.1994).

ECG and rheogram were recorded simultaneously with the help of computer analyzer «Cardiocode». Then by the developed program, using the duration interval of the QRS, RS, PQc, QT, QTc, TT V and VI or II leads, calculated are the following parameters

UO (ml) - stroke volume;

IOC (ml) = UO x heart rate - cardiac output;

Ve.d. (ml) - volume of blood entering the left ventricle in a phase of slow filling, in result of the action of the suction function of the ventricle and the venous inflow (early diastole);

Vs.a. (ml) - volume of blood entering the left ventricle in the phase of systole of

the atria that characterize the contractile ability of myocardium of the left atrium (atrial systole);

In addition, diastolic volume-phase parameters $V_{e.d.}$ and $V_{s.a.}$ characterize the level of preload;

$V_{r.e.}$ (ml) - volume of blood ejected by the left ventricle in the rapid ejection phase (quick expulsion);

$V_{s.e.}$ (ml) - volume of blood ejected by the left ventricle in a phase of slow ejection (slow expulsion);

Systolic volume-phase parameters $V_{r.e.}$, $V_{s.e.}$ characterize the contractile ability of myocardium of the left ventricle;

$V_{t.a.}$ (ml) - volume of blood pumped by the ascending aorta as peristaltic pump (a phase of slow exile) and thus reduces the afterload of the left ventricle. The indicator characterizes the tone of the ascending aorta.

In addition, for an objective assessment of the obtained results, we conducted study in healthy children of different ages. We studied parameters of central hemodynamics in 60 healthy children in age from 3 to 17 years.

In patients with destructive forms of appendicitis central hemodynamic parameters were recording at admission to the hospital (before surgery), and then daily until discharge.

THE RESULTS AND DISCUSSION

36 children of the group I with destructive appendicitis, entered the first day from the onset of the disease, their condition was characterized as moderate. The increase in heart rate was noted, but the systolic and diastolic blood pressures were within normal figures, ECG without pathology. In the examination of children of this group by the device «Cardiocode» the disorders of the central hemodynamics was diagnosed in 14 (39%) patients which consists of reducing the volume of blood entering the left ventricle in the early diastole phase $V_{e.d.}$ (up to 20-25% of normal), increase in the volume of blood entering the left ventricle in systole of the atria $V_{s.a.}$ and tone of the ascending aorta, operating as a peristaltic pump $V_{t.a.}$ (up to 20-25% of normal), which recovered by 3 day after those appendectomy. While 10 (28%) patients were found with normal systolic and diastolic parameters of central hemodynamics, the index of $V_{t.a.}$ (up to 10-15% of normal) was recovered within a day after surgery.

38 children of the group II with destructive appendicitis complicated by peritonitis were admitted to hospital in a serious condition. ECG without pathology. Examination of children of

this group by the device «Cardiocode» revealed in all patients disorders of the central hemodynamics, which consists of reducing the volume of blood entering the left ventricle in the early diastole phase $V_{e.d.}$ (up to 35-50% of normal), increase in the volume of blood entering the left ventricle in systole of the Atria $V_{s.a.}$ and tone of the ascending aorta, operating as a peristaltic pump $V_{t.a.}$ (up to 35-50% of normal), despite of intensive therapy in most patients, these parameters slowly recovered only to the time of discharge from the hospital.

In 60 healthy children of the group III violations of the parameters of central hemodynamics were not revealed.

CONCLUSIONS

1. In hospitalized children with abdominal syndrome in a surgical hospital of children surgery department of The Regional Children's Clinical Hospital №2 N.N. Burdenko Voronezh State Medical University from 2012 to 2016 appendicular peritonitis was found in 8.2 % of cases.

2. In children with various forms of destructive appendicitis and appendicular peritonitis, recorded a significant decrease in the volume of blood in early diastole ($V_{e.d.}$) (up to 35-50% of normal) and a compensatory increase in the flow of blood in systole of the Atria ($V_{s.a.}$), and also revealed an increase of the tone of the aorta ($V_{t.a.}$).

3. Estimation of parameters of central hemodynamics by Poedintsev - Voronova method with the help of the device «CARDIOCODE» is the most informative in comparison with ECG and allows in the first minutes of admission of patient to diagnose CH disorders in children with peritonitis and effectively maintaining rational intensive therapy.

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