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FLUID THERAPY EFFECTS ON THE DYNAMICS OF MYOCARDIAL DAMAGE BIOMARKERS AND CARDIAC COMPLICATIONS IN THE PERIOPERATIVE PERIOD IN PATIENTS WITH ISCHEMIC HEART DISEASE

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Patients with ischemic heart disease (IHD) are a risk group of complications even when performing noncardiac surgery [1]. Myocardial infarction occurs in only about 1% of patients, but other complications such as ischemic myocardial damage, arrhythmias, the onset and progression of heart failure are much more common and can pose a real threat to the patient's life and health [2]. At the moment, the literature describes methods for assessing cardiac complications and the main measures for their prevention and treatment [3]. The most controversial point in the perioperative management of these patients is fluid therapy, which on the one hand, is an important component of anesthetic management, and on the other hand, it can itself be a source of complications [4]. Potentially dangerous conditions caused by fluid overload lead to interstitial edema and deterioration of myocardial contractility [5]. At the same time, excessive restriction of fluid therapy can be dangerous due to organ hypoperfusion (ischemic myocardial damage and acute renal injury) [6]. Most researchers emphasize the importance of restriction the injected fluid in the perioperative period for the cardiac complications prevention [7]. This is not always easy to implement due to the fact that many patients have a fluid deficit before surgery, as well as excessive losses during open abdominal surgery. A possible solution to this issue is to maintain a "zero" fluid balance at the stages of the postoperative period using diuretics as needed to escalate excess fluid and prevent renal dysfunction [8]. This approach may allow the anesthesiologist to administer fluid therapy in a relatively restrictive or liberal manner, depending on the clinical situation. However, it remains unclear how safe this approach is with respect to postoperative cardiac complications. Purpose. To assess the biomarker's of myocardial damage dynamics and the incidence of perioperative complications in patients with coronary artery disease under conditions of relatively restrictive and liberal infusion therapy regimens with a "zero" balance.

Materials and methods. The study included 83 patients who underwent major abdominal surgical interventions mainly for oncoproctologycal diseases (hemicolonectomy, resection of the sigmoid colon, abdominal anal resections, rectal extirpation). The patients were randomly divided into two groups depending on the way of intraoperative fluid therapy, the group of liberal fluid therapy N = 41 (13.9 ± 0.6 ml / kg / h) and restrictive N = 42 (7.0 ± 0.2 ml / kg / hour). Study inclusion criteria: age over 60 years, history of chronic coronary heart disease with NYHA I - II degree, RCRI risk – 2 degree , ASA class I – II, intraoperative blood loss is not more than 10% of the blood volume and indications for extended abdominal surgery. There were no significant differences in anthropometric datas, surgery management and the type of anesthesia in both groups. Control of routine hemodynamic parameters and quantitative assessment of the dynamics of myocardial damage biomarkers by the method of enzyme-linked immunosorbent assay (ELISA) were performed at two stages - before surgery and in the early postoperative period 18-24 hours after surgery. Statistical processing of the data was carried out by nonparametric Wilcoxon methods (for comparison over time in patients of one group) and Mann-Whitney (to

assess the differences between groups). Data are presented as medians and 25%, 75% quartiles (Me[Q1;Q3]).

Results. All patients underwent elective surgery under general inhalation anesthesia with sevofluran. The main methods of monitoring and perioperative management of patients with cardiac pathology were used. There were no critical incidents during the operation and in the early postoperative period. In the study of myocardial damage biomarkers in patients of both groups before the operation, normal values were revealed for this age group and pathology (table 1). In the early postoperative period, significant changes were revealed in both groups, but they were most often within the reference values

Table 1. Dynamics of biomarkers of myocardial damage in patients with concomitant coronary artery disease at the research stages.

	Group	Research stages	
		1	2
Troponin I	1	0,08 [0,07;0,09]	0,11* [0,1;0,12]
	2	0,07 [0,06;0,08]	0,1* [0,1;0,11]
NT-proBNP	1	22,9 [13,3;34,1]	68,0** [58,6;76,7]
	2	18,1 [13,0;26,7]	123,1**† [97,9;142,9]

Note. * - significant differences compared with the initial data; † - significant differences between groups

When studying the level of troponin I, it was found to increase both in the 1st and 2nd groups (table). This was apparently due to the development of ischemic myocardial damage in some patients (5 people in the 1st group and 6 in the 2nd). At the same time, according to the ECG data, no changes in the ST segment were detected, which would confirm the development of ischemia. There were no differences between the groups in terms of troponin I concentration at the study stages. When studying the dynamics of atrial natriuretic peptide, an increase in its concentration was found in both groups of patients, but it was within the normal range for this age group (table). A significant increase in NT-proBNP concentration above normal values was found only in 3 patients of group 2. According to ECG monitoring, no signs of myocardial ischemia were detected in patients of both groups; transient rhythm disturbances were recorded in 5 patients of the 1st group and 7 patients of the 2nd group. These changes were benign and did not require additional correction. Clinical manifestations of heart failure were not detected in any of the patients in both groups. In our study, an increase in the concentration of biomarkers of myocardial damage within the normal range or slightly increased values was noted. An increase in the level of cardiac troponin I without clinical and ECG manifestations, that is, the so-called ischemic myocardial injury, was detected in 12-15% of patients, which approximately coincides with the data of other studies. The concept of MINS was proposed by Botto F. et al. in 2014 and directed doctors to increase attention to the patient's condition [9]. Even an isolated elevation in troponin I / T concentration increases the number of complications in the postoperative period [10]. Considering the fact that the frequency of MINS detection approximately coincided with the literature data in both groups, it can be assumed that fluid therapy in the selected modes does not significantly contribute to the deterioration of ischemic damage. More research is needed to clarify the effect of fluid regimens on outcomes in patients with more severe baseline heart failure. An increase in the

level of NT-proBNP in the patient's blood is associated with overstretching of the cardiac cavities and can be caused by any interference with the body's water regime (fluid overload) [11]. The study of this biomarker has shown its high sensitivity in predicting complications such as heart failure, myocardial ischemia [12]. In our study, an increase in NT-proBNP was noted in both groups of patients, but in second group it was significantly higher. The fact that in the patients of the 2nd group the NT-proBNP values were at the level of the upper limit of the norm for their age, and in 3 patients they exceeded it, indicates the emergence of tension in the adaptive mechanisms of maintaining the hemodynamic regime. It can be assumed that such way of fluid therapy may be dangerous in patients with underlying heart failure. Thus, this study has demonstrated the relative safety of fluid therapy regimens in patients with concomitant coronary artery disease without manifestations of congestive heart failure. The regime with relative fluid restriction appears to be preferable because it induces less response from compensatory mechanisms with normal NT-proBNP's values. The question remains open about the safety of such options for fluid management in patients with manifestations of heart failure, even if the "zero" fluid balance is observed.

All authors declare that no conflict of interest exists.

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