BRAIN BLOOD AND COGNITIVE DISORDERS WITH HEART OPERATIONS

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Summary: The article analyzes the current understanding of the causes of the development of brain dysfunction during cardiac surgery performed in cardiopulmonary bypass. Considered therapeutic measures that contribute to the prevention of brain damage, ways to create new cerebroprotective strategies.

Key words: neuropsychiatric complications, extracorporeal circulation.

Introduction: During the last decade, mental disorders in cardiac surgery acquire the status of one of the factors that are of paramount importance for the quality of postoperative clinical and social rehabilitation of patients and prediction of survival. Since the 90s of the last century, mental disorders (along with cardiological and other somatic indicators) are considered as an obligate component of clinical and statistical models of outcomes of cardiac surgical interventions [5; 6; 7; 8]. The frequency of mental disorders in the preoperative period of CABG, according to various authors, is 40-60% [9; ten;]. According to data for 2000, about 3000 heart operations are performed annually in Russia [5].

Objective: To reduce the incidence of postoperative cognitive dysfunction in patients with stenosing atherosclerosis of the coronary arteries, operated on in conditions of artificial blood circulation, through the use of combined high-chest epidural anesthesia

Objectives of the study:

1. To study the cerebral arterial blood flow and the reactivity of cerebral vessels in IHD patients over 60 years old.

2. To study the dynamics of cerebral blood flow during surgery with artificial blood circulation under conditions of total intravenous and combined epidural anesthesia.
3. To determine the frequency of cognitive impairment in patients with coronary artery disease over 60 years of age with direct myocardial revascularization.
4. To determine the risk group for the development of postoperative cognitive dysfunction among IHD patients over 60 years old.

Material and methods: Surveyed 112 patients (men) with coronary heart disease who were undergoing surgical treatment, operated from July 2019 to December 2020. The average age of patients was 61.6 ± 0.4 years. All patients underwent coronary artery bypass surgery. To study the initial state of cerebral blood flow depending on age, the patients were divided into two groups. The main group consisted of elderly patients 61–71 years old (n = 90). In the comparison group - patients 49-59 years old (n = 22). The groups were comparable in severity of the underlying disease. To accomplish the main goal of the study, patients over 60 years old were divided, depending on the method of surgical myocardial revascularization, into two groups. The first group consisted of 70 men who were operated on in the IC condition; the second group included 20 patients operated on a working heart. In subgroup 1a, 50 men were included who were operated on under multi-component anesthesia in combination with a high thoracic epidural blockade (VGEB). Epidural catheterization was performed 3 hours before the operation at the level of Th3-Th5. Epidural blockade was provided by the introduction of a 0.5% solution of 15-20 ml of bupivacaine and 2-3 mg of morphine. Subgroup 1b consisted of 20 patients who underwent 7. In the group operated on the working heart, multicomponent anesthesia was performed in combination with a high thoracic epidural blockade. Transcranial dopplerography was performed on a Pioneer TC8080 Companion III ultrasound machine, manufactured by Nicolet Vascular, (USA), with Nic Vue software version 2.5.1. The M2 segment of the middle cerebral artery was located using a 2 MHz transducer in the pulsating (PW) mode. In the group operated on the working heart, multicomponent anesthesia was performed in combination with a high thoracic epidural blockade. Transcranial dopplerography was performed on a Pioneer TC8080

Companion III ultrasound machine, manufactured by Nicolet Vascular, (USA), with Nic Vue software version 2.5.1. The M2 segment of the middle cerebral artery was located using a 2 MHz transducer in the pulsating (PW) mode. To assess the embolic intraoperative load, monitoring was performed with the automatic microembolic signal counter (MES) turned on. Cerebrovascular reactivity, which characterizes the mechanisms of cerebral autoregulation, was studied twice: on the eve of the operation and after tracheal intubation, at the stage of anesthesia maintenance, in the preperfusion period. The content of CO2 in exhaled air was controlled using an Engstrem-Elisa capnograph. The study of higher nervous activity (GNI) in patients with IHD over 60 years old was conducted using standard, widely used techniques described in the works of A.R. Luria, A.A. Skoromets, N.A. Schneider The results of medical and psychological testing were compared twice. 2-3 days before surgery and 7 days after surgery. Medico-psychological testing was performed in the office of the functional diagnostics department. The study of higher nervous activity (GNI) in patients with IHD over 60 years old was conducted using standard, widely used techniques described in the works of A.R. Luria, A.A. Skoromets, N.A. Schneider The results of medical and psychological testing were compared twice. 2-3 days before surgery and 7 days after surgery. Medico-psychological testing was performed in the office of the functional diagnostics department.

Conclusions: Clinical assessment of cerebral blood flow in IHD patients depending on age showed that the linear cerebral blood flow rate in patients over 60 years old was 19.4% ($p < 0.05$) lower than in the group of patients 49-59 years old. At the same time, according to Echo KG, the left ventricular ejection fraction in both groups did not have a statistically significant difference, which indicates 9 that the atherosclerosis of the changed vascular wall influences the FSC in the elderly. Clinical assessment of cerebral blood flow in IHD patients depending on age showed that the linear cerebral blood flow rate in patients over 60 years old was 19.4% ($p < 0.05$) lower than in the group of patients 49-59 years old. At the same time, according to Echo KG, the left ventricular ejection fraction in both groups did not have a statistically significant difference, which indicates 9 that the atherosclerosis of the changed vascular wall influences the FSC in

the elderly. In order to prevent the effect of memorizing tests, we used various variants of their execution. The decrease in the test score by 10% or more was regarded as a manifestation of cognitive dysfunction. The groups analyzed the initial state of cerebral blood flow, the dynamics of indicators during surgery and in the early postoperative period; doses of drugs for anesthesia, time of treatment in the intensive care unit, the degree of cognitive impairment according to test data. Archiving and statistical processing of data was carried out on a PC using the program "STATISTICA 6.0".

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