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**Хижняк К. А.<sup>1,2</sup>, Волкова Ю. В.<sup>1</sup>, Шарлай К. Ю.<sup>1</sup>, Хартанович М. В.<sup>3</sup>**

<sup>1</sup>Харківський національний медичний університет, м. Харків, Україна

<sup>2</sup>Національний інститут серцево-судинної хірургії імені М. М. Амосова НАМН України, м. Київ, Україна

<sup>3</sup>ДУ «Інститут серця МОЗ України», м. Київ, Україна

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**□ Khyzhniak K. A.<sup>1,2</sup>, Volkova Yu. V.<sup>1</sup>, Sharlai K. Yu.<sup>1</sup>,  
Khartanovych M. V.**

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<sup>1</sup>Kharkiv National Medical University, Kharkiv, Ukraine

<sup>2</sup>Amosov National Institute of Cardiovascular Surgery, Kyiv, Ukraine

<sup>3</sup>Institute of the Heart, Kyiv, Ukraine

# Changes in Neuropsychological Testing Results as a Response of Patients with Surgical Aortic Pathology to Cardiopulmonary Bypass Surgery

## Abstract

**Introduction.** The problem of the central nervous system (CNS) complications in the structure of cardiosurgical complications remains an urgent challenge.

**The objective** of the work was to analyze the changes in the results of neuropsychological testing as a response of patients with surgical aortic pathology to the surgical intervention using cardiopulmonary bypass (CPB).

□ **Materials and methods.** In 118 patients with surgical pathology of the aorta (SPA), under general anesthesia in the context of CPB, a comprehensive medical and psychological study of cognitive function was performed the day before the operation and on day 3, 7 and 14 of hospital stay. Patients were divided into 2 groups: group I included 46 patients who achieved solution of meglumine sodium succinate (reamberin), and group II included 46 patients who achieved D-fructose 1,6-diphosphate sodium hydrate solution (esophosphine) in addition to their intensive care regimen. MMSE scale, the 5-word test, the Doskin well-being scale, and the correction test using the Anfmov's tables were used to determine cognitive abilities of the patients.

□ **Results and discussion.** Statistical analysis of changes in cognitive abilities using the MMSE scale in the postoperative period in patients of control group, groups I and II with SPA found that surgery itself is an operational stress, and general anesthesia, as well as the use of the CPB device during surgery, adversely affect almost all indicators of higher nervous activity (HNA). It should be noted that no statistically significant differences were found in patients of group II in any of the control points between the total score on the MMSE scale and the baseline value. In group II, no statistically significant differences were found between the baseline indicators and the 5 words test results in any of the control points.

Regarding the Doskin scale used as a test to identify postoperative cognitive dysfunction (PCD), assessment of its component “expressiveness of patient activity” in the control group, groups I and II did not reveal any significant differences between its values and the baseline level. Statistical analysis of such components of the Doskin scale as “well-being” and “mood” showed significant differences ( $p < 0.05$ ) compared to the baseline values only in patients of the control group on the day 3 of hospital stay. Statistical analysis of the level of concentration and the rate of performance on the Anfimov’s table showed more significant differences ( $p < 0.05$ ) compared to the initial level of cognitive abilities.

Considering the negative dynamics of this indicator in the postoperative period in patients of the control group and group II with respect to average baseline values and the lack of significant difference in concentration between group II and average baseline values, it may be

assumed that pharmacodynamic effect of esophosphine is more pathogenetic due to the prevention of PCD in patients with SPA after operation.

**Conclusions.** Taking into account the specific changes observed for these markers when analyzing their values in the three control points, it can be noted that the indicator of PCD depends on the severity and mechanisms of hypoxia effect within the background of artificial brain perfusion, the most influential factor in assessing the patient's condition in the postoperative period.

**Keywords:** neuropsychological testing, surgical pathology of the aorta, surgical intervention, cardiopulmonary bypass.

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**Резюме.** Мета роботи – аналіз динаміки результатів нейропсихологічного тестування як реакції хворих з хірургічною патологією аорти на проведене оперативне втручання з використанням штучного кровообігу. У 118 хворих з хірургічною патологією аорти було проведене стартове оцінювання когнітивних можливостей на 3-ю, 7-у і 14-у добу перебування в стаціонарі за шкалою MMSE, тестом «5 слів», шкалою самопочуття Доскіна і таблицями Анфімова. Пацієнти були розподілені на 2

групи: у групу I увійшли 46 пацієнтів, яким додатково призначено розчин меглюміну натрію сукцинату (реамберин), у групу II – 46 пацієнтів, яким додатково призначено розчин D-фруктозо-1,6-дифосфату натрієвої солі гідрату (езофосфіна). Слід відзначити, що показник післяопераційної когнітивної дисфункції, який залежить від вираженості і механізмів реалізації впливу гіпоксії на тлі штучної перфузії головного мозку, є найвпливовішим фактором оцінювання стану хворого в післяопераційному періоді.

□ **Ключові слова:** нейропсихологічне тестування, хірургічна патологія аорти, оперативне втручання, штучний кровообіг.