

ABSTRACT

Assessment of cognitive and motor functions of geriatric patients after on pump cardiac surgery

Background: Modern medicine, including cardiac surgery, is increasingly dealing with an elderly patient. According to WHO estimates, over 2000-2050 the population over 60 years old will triple, from 600 million to 2 billion. Despite the enormous scientific and technological progress, that has been made since the first cardiac surgery with pump, complications of the central nervous system they are still a significant clinical problem. The current state of medical knowledge about the frequency of disturbances of cognitive and motor function in patients over the age of 60 after cardiac surgery with pump is insufficient and needs to be improved.

Goal: Assessment of the incidence of cognitive and motor impairment of cardiac surgery patients taking into account certain pre-, post- and intraoperative factors.

Material and methods: The prospective study involved 153 patients aged 60 to 83 years (mean age 69 years $SD \pm 5.9$, 26% women and 74% men) after cardiac surgery with pump. The study group consisted of 123 people (114 people were examined twice, 9 people did not complete the study). The control group consisted of 30 people (examined twice) after off pump cardiac surgery (OPCAB). The study was conducted in three stages: I. Preoperative assessment of cognitive and motor functions. II. Information collected during cardiac surgery in extracorporeal circulation III. Postoperative assessment of cognitive and motor functions. The following tests were used: own record, MMSE Questionnaire (Mini-Mental State Examination), TYM test (Test Your Memory test), Stand Up and Go Test, electronic hand force meter (Model EH 101), arterial blood gas was performed, echo data collected cardiac regurgitation (degrees of regurgitation of the heart valves), ASA, NYHA and CCS scales, data from extracorporeal circulatory card. The following surveys were used: author's own questionnaire, MMSE Questionnaire (Mini-Mental State Examination), TYM test (Test Your Memory), Test Up and Go (TUG), electronic handgrip strength meter (Model EH 101), arterial blood gases values, information from echocardiography, ASA, NYHA and CCS scales, information from "On Pump Cards".

Results: It was investigated that the worsening of TYM test results in people over 60 years on pump after cardiac surgery occurred in the case of: opening of the heart cavities ($p = 0.022$), when aortic occlusion time $\geq 1.5h$ ($p = 0.027$) and when on pump time $\geq 2h$ ($p = 0.024$). Non-operative factors included left ventricular ejection fraction $<50\%$ ($p = 0.027$) and 2 or more risk factors for postoperative delirium ($p = 0.015$). The mean gait speed results were significantly worse regardless of the size of the left ventricular ejection fraction ($<50\%$ and $\geq 50\%$) ($p_1 = 0.001$ and $p < 0.001$).

The average results of the MMSE test in people without co-morbidities were significantly better compared to the results before surgery ($p_1 = 0.034$).

Differences in right and left handgrip strength were observed, depending on age. After on pump cardiac surgery, the left handgrip strength only decreased in the group of people in early old age ($p < 0.001$). The right handgrip strength was reduced in people in both early and late old age (for both variables $p < 0.001$).

After on pump cardiac surgery, the number of people with high disability significantly increased (gait speed according to the Test Up and Go $> 20s$) compared to the condition of patients before surgery ($p = 0.004$).

The number of cognitive disorders after on pump cardiac surgery did not differ significantly compared to the number of disorders before surgery (measured by TYM test: $p = 1$, measured by MMSE test: $p = 0.412$).

After the cardiac surgery, differences in right handgrip strength were found between the group on pump and off-pump. People after off - pump cardiac surgery had a significantly greater right handgrip strength compared to those who was on pump ($p = 0.022$).

After the cardiac surgery, no differences were found between the group on pump and off pump in the Test Up and Go ($p = 0.974$), in the left hand grip strength ($p = 0.514$), in the TYM test ($p = 0.280$), in the MMSE test ($p = 0.091$).

Conclusions: 1. Specific factors of on pump cardiac surgery have a negative impact on TYM test results in people over 60 years of age. To be precise: people with heart cavity opening have worse TYM test results compared to people without heart cavity opening, people with aortic occlusion time ≥ 1.5 h have worse TYM test results compared to people with aortic occlusion time < 1.5 h. People with on pump time ≥ 2 h have worse TYM test results compared to people with on pump time < 2 h. Non-operative factors that worsen TYM test results include left ventricular ejection fraction $< 50\%$, and 2 or more post-operative delirium risk factors. 2. There was no effect of on pump cardiac surgery on the results of the MMSE test. It was only noted that people without comorbidities had better MMSE results after surgery. 3. On pump cardiosurgical surgery is a very strong stimulus that impairs motor function (gait speed) of people over 60 years of age. The decrease in walking speed (Test Up and Go) was affected by each of the operational and non-operational factors studied.

Keywords: on pump cardiac surgery, cognitive impairment, motor impairment, gait speed, hand grip strength, geriatrics