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Original research article

Incidence and risk factors of delirium in patients after cardiac surgery: Modifiable and non-modifiable factors



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ABSTRACT

Background: Post cardiac surgery delirium is a severe complication. This study tried to evaluate the early postoperative delirium risk factors and to identify which of them can be modified in order to optimize perioperative management.

Methods: It is a prospective observational study. 250 consecutive cardiac surgery patients took part in the study. Cardiac surgery, the anesthetic regiment and the postoperative management were standardized. The incidence and the risk factors of the postoperative delirium were analyzed by univariate and multivariate analysis. Delirium was assessed with screening scale – The Confusion Assessment Method for the intensive care unit every 12 h postoperatively.

Results: Delirium developed in 52 patients (20.8%). Univariate analysis of the variables confirmed that older age ($p = 0.0001$), the higher EuroSCORE II value ($p = 0.0001$), longer CPB time ($p = 0.0001$), longer ACC time ($p = 0.0001$), and the sufentanil dose ($p = 0.010$) were strongly independently associated with postoperative delirium. The benzodiazepine administration was shown to be an intermediate predictor for developing postoperative delirium ($p = 0.055$).

Conclusions: Advanced age, higher EuroSCORE II value, longer CPB and ACC times, and higher sufentanil doses during anesthesia were all predictors for the development of postoperative delirium. The only modifiable risk factor was the use of larger doses of sufentanil which is related with the duration of the operation. New preventive strategies and use of reduced dose of sufentanil intraoperatively, or the use of different opioid should be studied and applied in order to reduce the incidence of the postoperative delirium.

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Introduction

Post cardiac surgery delirium is a severe complication which can occur in any patient during the early postoperative period and is characterized by altered consciousness and global cognitive disturbances. The onset of symptoms is typically rapid, the course fluctuating and accompanied by a disturbance of the sleep–wake cycle. Delirium after cardiac surgery is associated with increased morbidity and mortality as well as prolonged length of stay in the intensive care unit (ICU) and the hospital [1,2]. Postoperative cognitive dysfunction occurs in 3–79% of patients [3] and the delirium has been reported to occur in 10–60% of surgical patients. However, the incidence of delirium in older surgical patients may be as high as 73% depending on the diagnosis method used. Moreover in ICU, up to 81% of patients manifest delirium [4,5]. Patients with decreased cognitive function after cardiac surgery are at increased risk for long-term cognitive decline with especially elderly patients being at the increased risk for both short and long-term cognitive dysfunction after cardiac surgery [6].

Previous publications described a large number of risk factors such as advanced age, dementia, depression, hearing and visual impairment, diabetes mellitus, impaired left ventricular function, electrolyte derangement, hypertension, high preoperative creatinine level, alcoholism, smoking, cerebrovascular disease, prolonged mechanical ventilation, prolonged cardiopulmonary bypass time, longer aortic cross-clamp times, fentanyl dose, high perioperative transfusion requirements, preoperative and postoperative atrial fibrillation, postoperative renal failure and perioperative use of intra-aortic balloon pressure (IABP) [1–3,7–16].

Complicated delirium diagnostics determine that the relationship between the preoperative condition of the patient and the intra-operative or postoperative factors affecting the cardiac surgery still remains quite unclear.

The aim of this study was to evaluate the preoperative and early postoperative delirium risk factors and their impact on the postoperative outcome by a risk factor analysis and to identify which of them can be modified in order to optimize perioperative management.

Materials and methods

250 consecutive patients, who had various types of cardiac surgery in our institution and were operated in an elective or urgent regime, were included in this prospective observational study. Patients who were operated on an emergency regime were excluded from the study. Of the patients who participated, medical history and preoperative characteristics (concomitant diseases or risk factors such as hypertension, diabetes mellitus, hypercholesterolemia, smoking, alcoholism, previous psychiatric disease), perioperative details (type of operation, duration of cardiopulmonary bypass and aortic cross-clamp, doses of opiates and benzodiazepines administered during the operation) and postoperative details (duration of mechanical ventilation >24 h, ICU and hospital stay) were recorded.

Also the EuroSCORE II value was calculated for all patients and they were accordingly categorized into three groups as high, moderate and low risk of mortality after cardiac surgery (low risk <1.6%, moderate risk 1.6–6.7%, high risk >6.7%). Cut-off values of EuroSCORE II stratification come from literature [17].

The time frame for early post cardiac surgery delirium was defined 2–6 days after the operation.

Cardiac surgery, the anesthetic regimen and the postoperative management were standardized.

Ethics

Ethical approval for this study was provided by the local Ethical Committee of the Eastern Slovak Institute for Cardiovascular Diseases, Kosice, Slovakia (Chairman Juhas S., MD, PhD). All the study participants provided a written informed consent.

Anesthetic technique

All patients received premedication of 10 mg oxazepam the evening before surgery and 7.5 mg of midazolam 1–2 h before surgery. Anesthesia was induced by 2.5–5 mg midazolam, 2–2.5 mg/kg propofol, sufentanil 0.01–0.025 mg and isoflurane 4%. Tracheal intubation was facilitated by 0.6–1 mg/kg atracurium. Anesthesia was maintained with sufentanil infusion 0.0005 mg/kg/h and isoflurane 1–2%, while neuromuscular blockade was maintained with the administration of atracurium 50 mg every 40 min. No propofol was administered during anesthesia maintenance.

Surgery-conduct of cardiopulmonary bypass

All surgery procedures were performed through median sternotomy. For patients undergoing off-pump surgery, distal anastomoses were performed with the help of a tissue vacuum stabilizer (ACROBAT V, MAQUET Holding GmbH). No-touch aorta technique was used in off-pump surgery. Nasopharyngeal temperature was maintained above 35 °C and systolic blood pressure was kept at 80 mmHg or greater throughout the procedure.

For patients undergoing on-pump surgery anticoagulation was achieved with heparin to maintain an activated clotting time above 480 s and the cardiopulmonary bypass circuit was primed with 1 l of Ringer's Lactate and 250 ml of 20% mannitol. Mild hypothermia of 34–35 °C was induced during cardiopulmonary bypass, the pump flow rate was 2.4–2.8 l/min/m² and the mean perfusion pressure was between 70 and 75 mmHg. Hematocrit was kept between 25 and 35%. Myocardial protection was achieved with intermittent blood-enriched cold cardioplegic solution (3–6 °C of St. Thomas cardioplegic solution) using a blood to crystalloid ratio of 5:1. Fractional concentration of inspired oxygen was adjusted to keep arterial oxygen tension between 150 and 250 mmHg, and gas flow was adjusted to maintain arterial carbon dioxide tension between 35 and 40 mmHg without temperature correction (α -stat).

After all distal anastomoses were done, the aortic cross-clamp was removed and proximal anastomoses were then performed by means of a single side-clamp on the aorta.

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