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Original Article

Intensive care unit psychosis after cardiac surgery

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Abstract

Background: Postoperative psychosis after cardiac surgery is associated with increased morbidity, length of hospital stay, and mortality. We aimed to assess the risk factors and outcomes of postoperative psychosis after cardiac surgery.
Methods: This research is a retrospective observational case-control study that included 100 patients divided into two groups. Group 1 included 50 patients with postoperative psychosis, and Group 2 included 50 patients with no postoperative psychosis. Data were collected from the Cardiac Surgery Department database from October 2020 to April 2021.
Results: The mean age was 67.94 ± 11.69 years in patients with psychosis and 68.98 ± 10.19 years in the control (P= 0.636). Male patients presented 66% (n= 33) in patients with psychosis versus 70% (n= 35) in the control group. Cardiopulmonary bypass (144.9 ± 35.61 vs. 109.1 ± 17.19 min, P<0.001) and ischemic times (61.96 ± 15.93 vs. 50.52 ± 9.62 min, P<0.001) were significantly longer in patients with psychosis. The mean arterial pressure (MAP) (61.93± 13.44 vs. 80.78 ± 5.91 mmHg, P<0.001) and oxygen saturation (79.82 ± 8.81 vs. 90.12 ± 4.91%; P<0.001) were significantly lower in patients with psychosis. Central venous pressure was 11.76± 2.33 in patients with psychosis versus 3.58± 1.70 mmHg in the control group (P<0.001). ICU was significantly longer in patients with psychosis (4.82 ±2.14 vs. 1.62 ± 0.55 days; P<0.001), while there was no difference in the hospital stay. By multivariable analysis, lower MAP was an independent predictor of postoperative psychosis (OR: 0.930 (95% CI: 0.737–0.999), P= 0.045).
Conclusion: Low mean arterial pressure could predict postoperative psychosis. Proper blood pressure control could decrease the incidence of psychosis after cardiac surgery.

KEYWORDS
Elderly; Delirium; Cardiac surgery; Mortality; Psychosis

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Introduction

Postoperative psychosis is common after cardiac surgery and is associated with increased morbidity and mortality. Postoperative psychosis could increase the length of hospitalization with negative consequences on the patients, families, and healthcare system [1]. Psychiatric complications after cardiac surgery include hallucination, agitations, confusion, acute brain syndrome, and postoperative psychosis [2].

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Data about postoperative psychosis are scarce, and it was previously described collectively among the psychiatric complications [3]. The standard definition of postoperative psychosis was introduced in the diagnostic and statistical manual of mental disorders III (DSM-III) [3].

Postoperative psychosis after cardiac surgery was found more common after valve surgery and surgery for congenital cardiac lesions than coronary artery bypass grafting (CABG) [3]. However, several other risk factors could be associated with an increased probability of postoperative psychosis. Factors affecting the occurrence of postoperative psychosis are not yet clear.

Therefore, we aimed to study the risk factors and outcomes of postoperative psychosis after cardiac surgery.

Patients and Methods

Design and patients

We performed a retrospective observational case-control study, including critically ill adult patients who had psychosis after cardiac surgery from October 2020 to April 2021. We excluded patients with stroke, atrial fibrillation, diabetes mellitus (DM), and cardiogenic shock. We also excluded patients who developed advanced heart failure and those who required prolonged mechanical ventilation after surgery.

The study included 100 patients divided into two groups. Group 1 included 50 patients with postoperative psychosis, and Group 2 included 50 patients with no postoperative psychosis.

Permission from the Faculty of Medicine Ethics Committee was obtained before the study. The Ethical Committee waived the need for the patient's consent because of the retrospective design.

Data and outcomes

The preoperative data included age, gender, smoking, and comorbidities. Operative data included cardiopulmonary bypass (CPB) and ischemic times, and the duration of anesthesia and surgery. Postoperative data included hemodynamic parameters (mean arterial pressure (MAP), central venous pressure (CVP), oxygen saturation (SaO2), and heart rhythm), length of intensive care, and hospital stay. We reported the daily assessment of the conscious level and patients' responses to antipsychotic drugs.

Evaluation of psychosis

A qualified nurse evaluated the confusion using CAM (confusion evaluation technique) approaches for diagnosing psychosis [4]. The psychosis diagnosis is contingent on DSM-IV-TR criteria and was established retrospectively using clinical records [5]. A case was judged to have psychosis if the professional clinical records sustained the DSM-IV-TR parameters and had a positive CAM rating. Anesthesiologists and nurses pre-operatively assessed these cases to assess preoperative psychosis. Data was gathered in standard data collection sheets using screening surveys concerning the psychosis risk factors. Data around every patient and risk factors for psychosis were collected from the preoperative, intra-operative, and postoperative data and entered into a database.

Statistical analysis:

Data analysis was performed using SPSS-20 (IBM Corp, Armonk, New York, USA). Quantitative variables were presented as mean and standard deviation. Qualitative variables were presented as numbers and percentages. For comparing parametric quantitative variables among two groups, the Student t-test was used. Qualitative variables were compared through the chi-squared (X^2) test or Fisher's exact test if the expected frequency was <5. Univariable and multivariable logistic regression was used to assess the risk factors of postoperative psychosis, and odds ratios were reported. A P-value of less than 0.05 was considered statistically significant.

Results

Preoperative data

There was no statistically significant difference between the studied groups regarding demographic data. (Table 1) The mean age was 67.94 ± 11.69 years in patients with psychosis and 68.98 ± 10.19 years in the control group (P=

0.636). Male patients presented 66% (n= 33) in patients with psychosis versus 70% (n= 35) in the control group.

Table 1: Comparison of the preoperative data between patients with psychosis (Group 1) and the control group (Group 2). Continuous data are presented as mean, standard deviation, and categorical data as numbers and percentages.

	Group 1 (n= 50)	Group 2 (n= 50)	*P*-value
Age (years)	67.94 ± 11.69	68.98 ± 10.19	0.636
Male	33 (66%)	35 (70%)	0.668
Smoking	5 (10%)	3 (6%)	0.461
Sleep disturbance	16 (32%)	11 (22%)	0.261

Operative data

Cardiopulmonary bypass (144.9 ± 35.61 vs. 109.1 ± 17.19 min, P<0.001) and ischemic times (61.96 ± 15.93 vs. 50.52 ± 9.62 min, P<0.001) were significantly longer in patients with psychosis. However, there were no differences in the duration of anesthesia or surgery. (Table 2)

Postoperative data

The MAP (61.93± 13.44 vs. 80.78 ± 5.91 mmHg, P<0.001) and SaO2 (79.82 ± 8.81 vs. 90.12 ± 4.91%; P<0.001) were significantly lower in patients with psychosis. CVP was 11.76± 2.33 in patients with psychosis versus 3.58± 1.70 mmHg in the control group (P<0.001). ICU was significantly longer in patients with psychosis (4.82 ±2.14 vs. 1.62 ± 0.55; P<0.001), while there was no difference in the hospital stay. (Table 3)

Risk factors for psychosis

By multivariable analysis, lower MAP was an independent predictor of postoperative psychosis (OR: 0.930(95% CI: 0.737–0.999), P= 0.045). (Table 4)

Outcomes of psychosis

Among the studied cases, 100% recovered, 40% had weight gain, 34% received sedation, 16% were complicated with diminished sociability, and 86% had increased sleep. Among the control group, 100% of cases recovered, 38% had weight gain, 16% received sedation, 4% complicated with diminished sociability, and 3% had increased sleep.

Discussion

Postoperative delirium is one of the commonest underdiagnosed complications of major surgery in the elderly. Moreover, several psychiatric conditions were described after cardiac surgery, such as acute brain syndrome and postoperative psychosis, that are currently included under the shared meaning of post-cardiac surgery delirium. Delirium is defined in DSM-III as a problem in attention associated with variations in knowledge and cognition that occurs acutely and has an unpredicted course [6]. We performed this study to assess the risk factors and outcomes of postoperative psychosis post-cardiac surgery.

The study included 100 patients grouped according to the occurrence of psychosis into two groups. Our study included 50 patients with psychosis, 33 were males, and their ages ranged from 51.0 and 85.0 years. We did not report differences in the preoperative characteristics between both groups.

The characteristics of our patients are similar to McPherson and associates' study participants [7]. The mean age of their participants was 65 years, the majority (66%) were males, and 13% were smokers.

Table 2: Comparison of the operative data between patients with psychosis (Group 1) and the control group (Group 2). Continuous data are presented as mean and standard deviation.

	Group 1 (n= 50)	Group 2 (n= 50)	*P*-value
Anesthesia duration (h)	5.24 ± 1.06	5.05 ± 0.89	0.334
Surgery duration (h)	4.19 ± 1.04	3.92 ± 0.98	0.185
CPB time (min)	144.9 ± 35.61	109.1 ± 17.19	<0.001
Ischemic time (min)	61.96 ± 15.93	50.52 ± 9.62	<0.001

CPB: cardiopulmonary bypass

Table 3: Comparison of the postoperative data between patients with psychosis (Group 1) and the control group (Group 2). Continuous data are presented as mean and standard deviation.

	Group 1 (n= 50)	Group 2 (n= 50)	*P*-value
MAP (mm Hg)	61.93 ± 13.44	80.78 ± 5.91	<0.001
CVP (mm Hg)	11.76 ± 2.33	3.58 ± 1.70	<0.001
SaO2 (%)	79.82 ± 8.81	90.12 ± 4.91	<0.001
Respiratory rate /min	18.76 ± 3.29	17.62 ± 3.25	0.084
ICU stay (days)	4.82 ± 2.14	1.62 ± 0.55	<0.001
Hospital stay (days)	11.0 ± 2.33	10.52 ± 2.48	0.321

CVP: central venous pressure, ICU: intensive care unit, MAP: mean arterial pressure, SaO2: arterial oxygen saturation

The characteristics of the patients are related to the nature of the cardiac disease since cardiac operations are more common in older males. In Raffa and coworkers' study, [8] the mean age of their studied group was 65.3 ± 12.1 years, and 60 (65.9%) were male.

The current study showed that the duration of anesthesia ranged from 3.4 to 7.1 hours with a mean of 5.24 ± 1.06. There were no differences in the duration of anesthesia and surgery between the studied groups; however, CPB and ischemic times were longer in patients with psychosis. The durations reported in our study were comparable to other studies [9]. Norkienė and associates [10] reported that the delirium group had statistically significant longer operative and anesthesia periods. Delirium was associated with a prolonged duration of ICU stay. Delirium cases were admitted to ICU twofold more than the control group. Patients with delirium had extended mechanical ventilation (MV) periods, more positive fluid balance, and elevated lactate levels early postoperatively [10].

In our study, MAP ranged from 37.2 to 80.8 (mmHg), CVP from 8 to 15 mmHg, SaO2 from 65 to 96, respiratory rate from 18.76 to 3.29, ICU stay from 2 to 9 days, and hospital stay ranged from 7 to 16 days. All our patients recovered; 40% had weight gain, 34% received sedation, 16% complicated with diminished sociability, and 86% had increased sleep.

The current findings were in line with Tilouche and coworkers [11], who found an association between length of hospital stay and delirium. A meta-analysis of 28 reports revealed that an ICU stay was significantly extended in delirium cases [12]. In a previous report, mechanical ventilation was prolonged by 8-day in hysterical cases. Their findings are similar to those of Lat and coworkers [13]. The latter reported a mean period of mechanical ventilation of 1.79 days extended in delirium cases.

Table 4: Univariable and multivariable logistic regression analysis for the parameters affecting postoperative psychosis

	Univariable		Multivariable	
	P-value	OR (95%CI)	*P*-value	OR (95%CI)
MAP	0.036	0.850 (0.731–0.989)	0. 045	0.930 (0.737–0.999)
CVP	0.013	1.966 (0.940 – 0.993)	0.473	0.983 (0.937–1.031)
SaO2	0.056	0.798 (0.633–1.006)	0.051	0.791 (0.603–1.014)
ICU stay	0.046	1.724 (1.528–1.994)	0.051	1.016 (0.99–1.701)
CPB time	0.053	1.066 (0.940 – 1.993)	0.473	1.083 (0.937–1.231)
Ischemic time	0.513	1.046 (0.980 – 1.391)	0.671	1.009 (0.50–1.531)

CPB: cardiopulmonary bypass, CI: confidence interval, CVP: central venous pressure, ICU: intensive care unit, MAP: mean arterial pressure, OR: odds ratio, SaO2: oxygen saturation

Norkiene and associates [14] elucidated that the duration of postoperative mechanical ventilation and ICU stay were associated with postoperative delirium after cardiac surgery. McPherson and coworkers [7] reported a 24% incidence of post-cardiac surgery delirium. Furthermore, Ogawa and colleagues [9] stated that postoperative delirium patients had a significantly extended period in the ICU at a mean of 4.2±5.1 days compared to 2 ±1.5 days in patients with no delirium (P<0.0001). Gottesman and coinvestigators [15] showed that postoperative delirium after cardiac surgery significantly predicted death up to 10 years following the operation. Another report confirmed that postoperative delirium was associated with a significant decline in cognitive capability throughout the first year after cardiac surgery [16].

Limitations of the study:

The study is limited by the retrospective case-control design, with its selection and referral biases. The study is also a single-center experience and the occurrence of psychosis could be related to institutional factors.

Conclusion

Several risk factors could be associated with postoperative psychosis, including low mean arterial pressure, high central venous pressure, low oxygen saturation, and prolonged ICU stay. Proper blood pressure control could decrease the incidence of psychosis after cardiac surgery.

Conflict of interest: Authors declare no conflict of interest.

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