INCIDENCE AND RISK FACTORS OF DELERIUM AFTER CARDIAC SURGERY

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ABSTRACT

Objective: To determine the incidence and associated risk factors for post-operative delirium after cardiac surgery.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: Adult cardiac anesthesia department of Armed Forces Institute of Cardiology, Rawalpindi, from Mar to Apr 2015.

Material and Methods: A total of 176 patients who had undergone cardiac surgery were studied in our descriptive-cross sectional study lasting 02 months at Armed Forces Institute of Cardiology, Rawalpindi. Age more than 18 years, elective cardiac surgery, and post cardiac surgery stay in ICU more than 24 hours. Post-operative CVA or intracranial bleed, Pre-operative cognitive impairment.

Results: Out of 176 patients, 20 (11.4%) developed post-operative delirium. Mean mechanical ventilation time in patients who developed delirium was 10.8 hours ± 6.13 and was 6.47 ± 4.75 hours in patients who did not developed delirium (p= 0.000). The 14 (70%) patients who developed delirium were found to be hyperglycemic in our study versus 59 (37.8%) patients who had neither delirium nor hyperglycemia (p=0.006). ICU stay was prolonged in patients with delirium was 3.52 days ± 5.12 as compared to patients who did not developed delirium 2.45 ± 3.21 days (p=0.002).

Conclusion: Our study revealed that advanced age, prolonged mechanical ventilation and hyperglycemia are significant risk factors of delirium in post cardiac surgery patients.

Keywords: Post operative delirium, Cardiac surgery

INTRODUCTION

Delirium is defined as a disturbance of consciousness, a change in cognition or the development of a perceptual disturbance; with acute onset and fluctuating course with an evidence from the history, physical examination, or laboratory findings that the disturbance is caused by a medical condition, substance intoxication or medication side effect[1]. Post operative delirium is one of the common problems after cardiac surgery[1] Post op delirium is associated with morbidity, mortality and longer hospital stay[3,4]. It can be very disturbing and distressing for patients and their families and nursing staff[5]. Patients who have undergone cardiac surgery, delirium may increase post-operative complications like respiratory insufficiency, sternum instability and need for re-opening of sternum, self extubation, exit of catheters and asynchrony between patient and ventilator[6,7]. The incidence of post-operative delirium varies from (10-46%) in general surgical population and reaches (50-67%) in patients after cardiac surgery[8,9]. There is wide variation because of methodology differences between studies and study population[10-12]. The purpose of our study was to study the frequency and risk factors of delirium in patients undergoing cardiac surgery for earlier detection and reduction in the complications associated with this seemingly benign disorder.

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MATERIAL AND METHODS

After approval by the ethical committee of our institute; 176 patients who had undergone open heart surgery were studied in our comparative cross sectional study lasting 02 months (March- April 2015). Before surgery, pre-anesthesia assessment was done by cardiac anesthetist as per institute protocol. The

assessment forms were scrutinized for the presence of risk factors for delirium as well as history of any alcohol or drug use pre-operatively. None of the patients suffered from pre-operative dementia or cognitive impairment. Preoperative evaluation, premedication, anesthesia and surgery were performed according to institutional protocols; no adjustments were made for study participants. After the surgery patients were immediately transported to the ICU. All the patients were assessed for risk stratification and diagnosis of post-operative delirium by the investigators.

Patients of age more than 18 years with planned open heart surgery, post cardiac surgery stay in ICU more than 24 hours were included in the study.

Patients with pre-operative and post-operative CVA or intracranial bleed, pre-operative cognitive impairment were excluded from study. Post-operative clinical and cognitive assessment was carried out using confusion assessment method (CAM). The patient was deemed to be in post-operative delirium if CAM score was positive. Risk factors of delirium were recorded and statistically analyzed.

Data Analysis

The data was analyzed by descriptive statistics (number, percentage, mean and standard deviation) and Chi square was used for analysis of variance. In our study *p*-value of less than 0.05 was considered as statistically significant. The statistical analysis was done by using SPSS 21.

Operational Definitions

According to the diagnostic and statistical manual of mental disorders fourth edition, the key characteristics are a change in mental status with reduced awareness of environment and a disturbance in attention; along with perceptual symptoms (hallucinations) or cognitive symptoms (including disorientation or temporary memory dysfunction). (CAM ICU) confusion assessment method was used to diagnose delirium.

RESULTS

The study included total 176 patients out of which 20 (12%) developed delirium. The demographic profile of our study population is tabulated as table-I. One hundred and forty one (80.1%) were male and 35 (19.9%) were female. Out of 176 patients, 20 (11.4%) developed post-operative delirium. Risk factor association was calculated by using chi-square test. The 17 out of the 20 (85%) of patients who developed delirium were aged more than 50 years, while 87 out of 156 (49.4%) non delirium patients were aged more than 50 years (p=0.012). Mean mechanical ventilation time in patients who developed delirium was 10.8 hours ± 6.135 and was 6.47 ± 4.75 hours in patients who did not developed delirium (p=0.000). The 14 (70%) patients who developed delirium were found to be hyper-glycemic in our study versus 59 (37.8%) patients who had neither delirium nor hyper-glycemia (p=0.006). ICU stay was prolonged in patients with delirium was 3.52 days ± 5.12 as compared to patients who do not delirium 2.45 ± 3.21 days (p=0.022). Mean Cardiopulmonary bypass time in

Table-I: Demographics of study population.

		n=176	Percentage (%)
Gender	Male	141	80.1
	Female	35	19.9
Age	<50 years	71	40.9
	>50 years	104	59.1
Surgery type	CABG surgery	125	71.0
	Valvular surgery	50	28.4
	Myxoma excision	1	0.5

patients with delirium was 125.85 min ± 47.298 and in patients who do not developed delirium was 110.93 minutes ± 103.756 (p=0.903). In our study, 15 (75%) patients who had delirium were males, whereas, in delirium free group 126 (80.7%) were males (p= 0.774). The incidence of carotid artery disease in delirium group was 15%, whereas, in non-delirium patients it was 10.6% in non-delirious patients (p=0.586). All patients in both delirium and non-delirium groups suffered from pre-operative com-morbidities including hypertension, diabetes mellitus (p=0.579). In the delirium group, 3 (15%) had peri-operative IABP insertion whereas 100 (63.3%) patients who did not develop delirium had IABP insertion, (p=0.216). The postoperative ionotropes were used in 18 (90%) of patients who developed delirium, whereas ionotropes were used in 130 (83.3%) patients in non-delirium group (p= 0.443). The results have been tabulated in table-II.

Table-II: Clinical variables of study participants.

Variable		Delirium (n=20)	Non delirium (n=156)	p-value
Age	<50 years	n=3	n=69	0.012
	<50 years	n=17	n=87	
Gender	Male	n=15	n=126	0.774
	Female	n=5	n=30	
Carotid artery disease		n=3	n=17	O.586
Co-morbidity		n=20	n=156	0.579
Intra-aortic balloon pump		n=3	n=100	0.216
Inotropes		n=18	n=130	0.443
Mean Mechanical ventilation time		10.8 ± 6.135 hours	6.47 ± 4.75 hours	0.001
Hyperglycemia		n=14	n=59	0.006
Mean cardiopulmonary bypass time		125.85 ± 47.29 mins	110.93 ± 103.756 mins	0.903
Mean ICU stay		3.52 days ± 5.12	2.45 ± 3.21 days	0.022

DISCUSSION

Delirium is defined as an acute cognitive impairment and neglect which fluctuates in level of consciousness or altered level of consciousness with unorganized thinking[13]. The patients may express hypoactive, hyperactive or mixed psychosocial behaviors. Delirium has been hypothesized to occur as a result of the inflammatory response associated with the stress of surgery. Postoperative chemokines have been found to be more elevated in patients who became delirious than in matched controls. This difference was non-significant by forth postoperative day. The mechanism for delirium might include initial leucocytes migration into the central nervous system (CNS) and potentially a breakdown of the blood–brain barrier[14]. There are several tests for diagnosing and grading of delirium. These include the confusion assessment method (CAM), The Delirium Rating Scale Revised-98, and the delirium symptom interview[11,12]. A recent study from Japan used NEECHAM Confusion Scale and the Estimation of Physiologic Ability and Surgical Stress (E-PASS) for diagnosis and found it useful[15]. Although the disorder occurs acutely, but the condition may wax and wane during the course of a day. The diagnosis is further complicated by the presence of pre-existing dementia, psychosis anxiety or depressive disorders. CAM-ICU is a simple and easy diagnostic tool for delirium[15]. It has a high sensitivity (93-100%) and specificity (89-100%). It is currently the only validated delirium tool for patients on mechanically ventilator support. It

was used by us in our study for the diagnosis of delirium. In our study, the 176 patients were studies during their admission to the surgical intensive care unit postoperatively after various cardiac surgeries of these 20 patients (11.4%) developed post-operative delirium. The incidence of post-operative delirium in cardiac surgery was 23% and 31% in studies conducted by Reissmuller and Norkiene respectively[16,17]. The incidence of post-operative delirium in our population was found to be higher in patients who had undergone CABG surgery as compared to valvular surgeries (12% vs 10% of cases).

In Kazmierski study of 563 patients, the incidence of post-operative delirium according to DSM-IV was 16.3%. Advanced age, pre-operative cognitive impairment, ongoing major depression, anemia, atrial fibrillation, prolonged intubation and post-operative hypoxia were independent risk factors for delirium[18]. Advanced age and prolonged intubation and mechanical ventilation as risk factors are in line with our study. However, none of our patients had pre-operative cognitive impairment or major depression. Reissmuller studied 107 patients who had undergone cardiac surgeries. The incidence of post-operative delirium was 23.4%. The risk factors were age over 60 years, longer mechanical ventilation and longer cardiopulmonary bypass time[16]. In our study, advanced age and prolonged mechanical ventilation were found to be significant risk factors for delirium. However, we have taken more than 50 years as advanced age, whereas Reisssmuller took more than 60 years as advanced age.

Koster review of risk factors for delirium revealed 27 risk factors; 12 predisposing and 15 precipitating factors for delirium after cardiac surgery[6]. The most established risk factors were: a trial fibrillation, cognitive impairment, depression, history of stroke, older age and peripheral vascular disease. Our study also established older age as significant risk factor. Whereas, history of stroke, peripheral vascular disease was not found to be associated with delirium. In our study, prolonged mechanical ventilation 10.8 ± 6.13 hours in patients with delirium and 6.47 ± 4.75 hours in non-delirium patients was found to a highly significant risk factor for delirium (p<0.001) but bias may be present in this regard due to the fact that institutional trend towards intubating and mechanically ventilating a patients who has altered sensorium with risk of respiratory compromise. In addition, delays maybe present in extubating a delirious patient. Additionally, none of our patient had pre-operative obvious cognitive impairment nor does an institutional protocol exist for detailed cognitive impairment assessment during pre-anesthesia assessment. Additionally, 176 patients were included in our study. More reliable results would be expected if the study were to be done on a larger sample size.

RECOMMENDATIONS

Pre-operative identification of patients at high risk of developing post-operative delirium can help in earlier detection of delirium. Post-operatively, daily scoring of patient with CAM-ICU by care giver, which is a simple and quick method that can be helpful in earlier diagnosis and treatment of delirium, thus preventing complication and sequelae of delirium.

CONCLUSION

Our study has revealed significant risk factors of delirium i.e. advanced age, prolonged mechanical ventilation and hyperglycemia in post cardiac surgery patients. Thus prevention, early detection and timely management of the modifiable risk factors may be helpful in reducing the length of ICU stay, morbidity and mortality.

CONFLICT OF INTEREST

This study has no conflict of interest to be declare by any author.

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