

# POSTOPERATIVE NEUROLOGICAL COMPLICATIONS FOLLOWING CARDIAC SURGERY

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## Abstract

Postoperative psychosis is a leading complication following open heart surgery. We review the incidence and risk factors of psychosis in patients experiencing heart surgery in a single surgeon's practice. We prospectively reviewed 572 patients between March 2015 to March 2017. Majority of patients experiencing heart surgery were male (73.02%) and mean age of was 60.05 years. The incidence of comorbidity like HTN (94.44%), stroke (12.96%), atrial fibrillation (33.33%), and vision impairment (75.92%) was significantly higher in psychosis group. However, number of graft and endarterectomized vessels were higher in psychosis group. Most of the patients, in psychosis group have poor ASA score (81.48%) and LV dysfunction, also long duration of ICU stays (40.5±5.5). The frequency of psychosis following heart surgery is considerable, with almost 9% incidence rate. Special consideration ought to be paid during preoperative patient's selection and postoperative care following cardiac surgery.

**Key Words:** Psychosis, heart surgery.

## INTRODUCTION

Postoperative psychosis is a typical complication following open heart surgery<sup>1</sup>. Scenes of psychosis are related with increase rate of morbidity, mortality, and a more extended hospital stay and can be hazardous for patients, their families, and health staff.<sup>2,3</sup> Perceiving psychosis and those at hazard can diminish the effect of psychosis through proper medications and hazard reduction<sup>5</sup>. Understanding the recurrence of psychosis and the complication related with it, can help maintain resource allocation and research in future. From documented source, various psychiatric side effects have been distinguished after cardiac surgery: agitation, hallucination, and confusion have been marked post-cardiotomy psychosis, acute brain syndrome and postoperative psychosis<sup>1,4</sup>. Earlier investigations of postoperative patients did not characterize psychosis reliably on the grounds that a standard definition has just been accessible since the publication of the DSM-III<sup>7</sup>.

Majority of the previous study observed that repairing valves and congenital anomalies are more common<sup>4</sup>. Coronary artery bypass graft (CABG) is presently the most common kind of cardiovascular surgery and may have bring lower incidence of psychosis than other heart surgery<sup>4,11</sup>. However, bypass graft and different sorts of cardiovascular surgery are progressively being performed on patients who are older and have a more prominent number of comorbidity, which may make them more prone for psychosis<sup>12</sup>. Now-a-days the mortality following open heart surgery is decreasing but it is uncertain whether the occurrence of psychosis remains same<sup>12</sup>. In spite of the advancement of standardized measurements and a consistent definition of psychosis, there are significant errors between studies on the incidence of psychosis, and making it trouble some to predict what rates of psychosis will happen in a given population<sup>11</sup>.

The study was intended to determine the risk factors and incidence of postoperative psychosis by exploiting the

extensive data gathered on heart surgery patients in a single surgeon's practice.

## METHODS

In the period from March 2015 to March 2017, 572 patients were submitted to heart surgery in a single surgeon's practice. This study evaluates post-operative psychosis following heart surgery in connection to age, sex, comorbidity, surgical procedure, ICU stay and also ventricular function, however there was a measurable distinction in regard to the NYHA class, ASA score, LVEF and comorbidity is shown in Table-1 with the pre-operative information from the patients. These patients were preoperatively evaluated by anesthesiologists and nurses to rule out preoperative psychosis. Data was collected in a standardized data collection sheet using screening questionnaires regarding the risk factors of psychosis. Data about each case- including variables that have been distinguished as risk factors for psychosis in different reviews- are accumulated from the preoperative, intraoperative, and postoperative period and gone into a common health database. Data was analyzed utilizing the chi-square test and T test. Intra-operative and Post-operative information assembled are shown in Table-2 and Table-3 respectively.

## Psychosis assessment

The attendant nurse had been trained in assessment of confusion using CAM (confusion assessment method) methods to rule out and diagnose psychosis<sup>6</sup>. The diagnosis of psychosis depended on DSM-IV-TR criteria and was confirmed retrospectively utilizing clinical notes<sup>9</sup>. A patient was regarded to have psychosis if the DSM-IV-TR criteria were met by the professional clinical notes, and also have positive CAM rating of the patients.

## RESULTS

Majority of patients experiencing open heart surgery were

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male (75.67% in no psychosis group and 70.37% in psychosis group) and the mean age of study population was 60.05 years. The incidence of comorbidity like HTN (94.44%), stroke (12.96%), atrial fibrillation (33.33%), and vision impairment (75.92%) was significantly higher in psychosis group of patients. 7.41% patients of psychosis group having positive family history. In no psychosis group of patients having better NYHA functional class (1 and 2) in majority of patients 72.20%.

However, in psychosis group of patients having poor ASA score (score 4 or 5) in majority of patients 81.48% and also poor LV function (EF<30%) in 40.74% of patients which is significantly high.

There was no significant difference of surgical procedure except intracardiac repair of ASD (17.76%) and VSD (8.49%), which was performed only in no psychosis group of patients. However, regarding CABG procedure number of

**Table 1** Preoperative variable of study population

Variables	No psychosis (n = 518)	Psychosis (n = 54)	
Age (years)	58.4±1.5	61.7±1.25	
Gender (M : F)	392 (75.67%) : 126 (24.33%)	38 (70.37%) / 16 (29.63%)	
Smoking (Yes / No)	448 (86.48%) / 70 (13.52%)	48 (88.89%) / 6 (11.11%)	
Diabetes mellitus (Yes / No)	387 (74.71%) / 131 (25.29%)	43 (79.63%) / 11 (20.37%)	
Hypertension (Yes / No)	435 (83.98%) / 83 (16.02%)	51 (94.44%) / 3 (5.56%)	
Prior stroke (Yes / No)	0 (0%) / 518 (100%)	7 (12.96%) / 47 (87.04%)	
Atrial fibrillation (Yes / No)	26 (5.01%) / 492 (94.99%)	18 (33.33%) / 36 (66.67%)	
Peripheral vascular disease	38 (7.33%) / 480 (92.67%)	6 (11.11%) / 48 (88.89%)	
Vision impairment (Yes / No)	291 (56.17%) / 227 (43.83%)	41 (75.92%) / 13 (24.08%)	
Family History	0 / 518 (100%)	4 (7.41%) / 50 (92.59%)	
Current psychiatric medication (Yes/No)	465 (89.77%) / 53 (10.23%)	49 (90.74%) / 5 (9.26%)	
Operative criteria	Emergency	8 (1.54%)	3 (5.56%)
	Urgent	112 (21.62%)	14 (25.93%)
	Elective	398 (76.83%)	37 (68.51%)
LVEF %	EF >50%	283 (54.63%)	18 (33.33%)
	EF 30-50%	176 (33.98%)	14 (25.93%)
	EF <30%	59 (11.39%)	22 (40.74%)
Pre-op hemoglobin (g/dL)	11.9±1.25	11.2±1.1	
Pre-op creatinine (µmol/L)	89.7± 2.5	110.7± 1.25	
NYHA functional class	2-Jan	374 (72.20%)	22 (40.74%)
	4-Mar	144 (27.80%)	32 (59.26%)
ASA* score of 4 or 5 (Y / N)	292 (56.37%) / 226 (43.63%)	44 (81.48%) / 10 (18.52%)	

**Table 2** Intraoperative data of study population

Variables	No psychosis (n = 518)	Psychosis (n = 54)	
Types of Surgery	Off Pump CABG	209 (40.36%)	32 (59.26%)
	On Pump CABG	29 (5.59%)	5 (9.26%)
	AVR	48 (9.27%)	2 (3.70%)
	MVR	87 (16.79%)	11 (20.37%)
	DVR	9 (1.74%)	4 (7.41%)
	ASD	92 (17.76%)	0 (0 %)
VSD	44 (8.49%)	0 % (0 %)	
Number of vessel Graft	2.85±0.5	3.55±0.5	
Number of Coronary endarterectomy	1.12±0.5	1.35±0.5	
Surgical complications (Yes / No)	0 (0%) / 518 (100%)	6 (11.11%) / 48 (88.89%)	
Cross-clamp time (minutes)	68±2.5	72±2.15	
Pump time (minutes)	93.65±2.5	97.5±2.5	
Blood transfused (units)	2.1±0.5	2.25±0.5	
Cardiopulmonary bypass (Yes / No)	309 (59.65%) / 209 (40.35%)	22 (40.74%) / 32(59.26%)	

**Table 3** Post-operative data of study population

Variables	No psychosis (n = 518)	Psychosis (n = 54)
Ventilation time (hours)	9.8±2.5	10.5±2.5
ICU stay (hours)	33.5±2.5	40.5±5.5
Hospital stay (days)	10±1.25	12±2.5
Use of IABP (Intra-aortic balloon pump)	6 (1.16%)	11 (20.37%)
Morphine IV in first 24 h (mg)	15± 1.5	25.5± 2.5
Fentanyl in first 24 h (µg)	0.93 (SD 4.81)	0.0 (SD 0.0)
Sedative (mg)	2.5± 1.25	7.5± 1.25
Post-operative blood transfusion (units)	1.2±0.5	1.85±0.5
Post-op hemoglobin (g/dL)	10.89±1.2	10.5±1.1
Post-op creatinine (µmol/L)	91.7± 1.25	115.5± 1.15
Renal failure	13 (2.51%)	3 (5.55%)
Post-operative Acute MI	7 (1.35%)	5 (2.7%)
Respiratory complications	8 (1.54%)	18 (33.33%)
Neurological complications	11 (2.12%)	5 (9.26%)

graft and endarterectomized vessels were higher in psychosis group of patients. Duration of ICU stay was longer in psychosis group of patients. Majority of the patient's in both group having normal postoperative hematological findings. Only 9.26% patients having neurological problem in psychosis group of patients with complete recovery at the time of discharge from hospital.

## DISCUSSION

In this study, most of the patients having HTN, atrial fibrillation and vision impairment in psychosis group of study population. Nonetheless, only psychosis group of population have positive family history and previous attacks of stroke. Despite of having better NYHA class (class 1 and 2) in no psychosis group, most of the patients of psychosis group population has poor ASA score (score 4 or 5) and higher LV dysfunction. In our review, there was no psychosis following ASD and VSD repair. Coronary endarterectomy ( $1.35 \pm .5$ ) and number of vessel graft ( $3.55 \pm .5$ ) was more in psychosis group of patients. Postoperative serum creatinine level was higher ( $115.5 \pm 1.15$ ) in psychosis group of patients in comparison to other group. Postoperative ICU stay duration was more longer in psychosis group population.

Eriksson *et al.* observed that in retrospective study, psychosis may be under-evaluated and its incidence frequently goes unrecorded and unrecognized, especially in cases involving the hypoactive subtype.<sup>10</sup> Nonetheless, in our review the occurrence of psychosis same compare to other prospective studies, but in another study that surveyed risk factors for psychosis and CABG sample, the rate of psychosis is constant with a measure of 32%.<sup>5</sup> In our review, we didn't find out a specific association with various risk factors that we focused would be related with psychosis. We evaluated postoperative benzodiazepines, opioids doses and, suspecting that these medicines may be related with psychosis, but we didn't discover evidence for this.<sup>7,8</sup>

We considered the surgical procedure, functional class of the patients and also ICU stay duration, as these are especially concerning occasions for staff and patients. However, psychosis comes due to complex connection of multiple factors, and it is very difficult to figure out which one is the basic pathology for psychosis! For instance, prolong intubation and mechanical ventilation makes an individual more prone to a respiratory tract infection that can then add to psychosis.<sup>13</sup> In case of high risk patients and with complex surgery would probably have higher incidences of psychosis which is concordance to our findings.<sup>13</sup> Special attentions should to be made when causes are related to these factors. However, in our review we also found the similarity with previously recognized risk factors, for example, age or earlier stroke.<sup>14</sup> Our study results support all the past findings published by several authors. In our review, male patients are more prone to develop psychosis rather female patients and this is probably due to increased incidence of cardiac diseases in male gender. As a whole post-operative psychosis was very minimum in this study but prevalence of psychosis was higher with comorbidity like HTN, previous stroke, atrial fibrillation, and vision impairment. Among the off pump CABG and coronary endarterectomized group of patients, psychosis rate is higher probably due to atheroma embolism, air embolism and also lack of proper post-operative anti-coagulation medication and monitoring of coagulation profile. Though intubation time and ICU stay was low in our

review, however early extubation and hospital discharge is encouraged. From this review, psychosis is more prone to develop in a patient with multiple comorbidities, poor functional class, long duration of ICU stays and also complex cardiac surgery.

## CONCLUSION

This review particularly emphasis on the importance of high quality of medical care, patient education and also proper post-operative care. Further prospective study with large number of population are justified that will evaluate the pathology, consequence and severity of the psychosis.

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