

Retrospective Analysis of Fast-Track Extubation Protocol for Cardiac Surgical Population in Tertiary Care Hospital: A 2 Years' Experience

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Abstract

Background: Fast-track cardiac anesthesia aims to reduce the extubation time after cardiac surgery. Reduction in extubation time results in massive cost saving in terms of reduction in intensive care unit stay. In this era of health-care cost escalation, this can effectively reduce the burden on health-care system without compromising patient outcome. We here present a retrospective analysis of fast-track extubation protocol followed in our hospital assessed for 2 years.

Materials and Methods: After ethical committee approval, patients were enrolled into study according to specified inclusion criterion. The patients who were included in the study were tried for fast-track extubation according to predefined protocol. If patient could be extubated at the end of 6 h, and without any post-operative complication, it was categorized into success of fast-track protocol.

Results: A total 192 patients were operation upon in our institute between the specified periods. Total 128 patients were identified for inclusion in fast-track protocol. All patients were tried for fast-track extubation according to weaning protocols. 76% of the total patients were male, while mean age was 64.20 ± 9.22 . Diabetes was present in 7% of the patients, whereas obesity was present in 53% of the patients. 33% patient had low ejection fraction. Previous myocardial infarction was seen in nearly 20%. The previous stenting was done in 6% of the patients. Nearly 60% of the patients in fast-track criterion underwent off-pump coronary artery bypass grafting (CABG), 0.7% on-pump CABG, 9.3% mitral valve replacement, 6.25% aortic valve replacement, 1.5% patent ductus arteriosus closure, and 18% with atrial septal defect closure. Most common reason for failure for fast tracking is hemodynamic instability (37.5%), whereas respiratory insufficiency was the second most common cause with 31.25% of the people having it. Bleeding complication was a reason in 18.75%, whereas 12.5% have rhythm disturbance as the cause of failure of fast tracking.

Conclusion: Nearly, two-third of the patients who underwent fast tracking could complete the protocol, reducing the health-care cost by equal percentage. With proper patient selection, fast tracking in cardiac surgery is simple and effective tool as a cost saving measure.

Key words: Cardiac surgery, Fast-track anesthesia, Protocol

INTRODUCTION

Fast-track cardiac anesthesia protocol is a perioperative anesthetic management that aims to facilitate tracheal extubation of patients within 1-6 h after cardiac surgery.

Most centers consider fast-track extubation up to 8-10 h postoperatively. Health-care costs are rising significantly. With the increasing number of patients subjected to cardiac surgery and less availability of resources is putting burden on the health-care system. There is a need to rationalize the system for efficient use of available resources. Lately, it has been demonstrated that it is safe, cost-effective, and can make efficient utilization of available resources.^{1,2}

In the last 10 years, there is exponential growth in the field of anesthesia, in the form of availability of newer modalities of monitoring, newer medications, and advancement in the knowledge about mechanism of anesthesia. All this

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knowledge makes anesthesia practice safer for the patient as well as anesthesiologist. With this added knowledge, it is necessary to avoid the extra burden on resources, so as to have efficient utilization simultaneously keeping the patient in safe hands.

Studies prove that fast-track cardiac anesthesia is safe³ and can be employed on a vast number of the patient population provided that there is no contraindication.⁴ We started the fast-track cardiac anesthesia protocol in our center (Prathima Hospital) in 2015 and completed nearly 190 patients over a period of 1-year in this institution. We retrospectively analyzed the data for the patients during this 1 year in this study; the data were analyzed to assess the impact of fast-track protocol on patient outcome and success of the protocol.

MATERIALS AND METHODS

This single-center study was performed at Prathima Institute of Medical Sciences, a tertiary cardiac care center catering the need of rural population. The study was approved by Ethics Committee of the Hospital. All cardiac surgical patients posted for surgeries were evaluated by primary investigator 1 day before surgery and enrolled into the study according to inclusion and exclusion criterion.

Inclusion Criteria for Fast-Track Anesthesia

Patients scheduled for isolated coronary artery bypass grafting (CABG), off-pump coronary artery bypass, isolated aortic valve replacement (AVR), or combined AVR with one coronary bypass graft, non-complex isolated cardiac surgical procedures (closure of atrial septal defect [ASD] or removal of an atrial myxoma).

Exclusion Criteria for Fast-Track Anesthesia

Physical status class of >3 (according to the American Society of Anesthesiologists Classification).

Patients undergoing reoperation, chronic obstructive pulmonary disease GOLD class ≥ 2 , left ventricular dysfunction, serum creatinine of ≥ 150 mmol, body mass index of ≥ 35 kg, emergency operations, and surgical complications necessitating prolonged cardiopulmonary bypass time (CPB) (>150 min).

The criteria were modified according to available resources in the hospital to better suit the need.

Anesthesia Technique

Preoperative medications were continued according to hospital policy. Tablet pantoprazole 40 mg and lorazepam 2 mg were given orally before night. Anesthesia was induced with midazolam 5 mg, fentanyl 7 $\mu\text{g}/\text{kg}$, and propofol 1 mg/kg. Vecuronium 0.2 mg/kg added and patient

ventilated with endotracheal tube. Anesthesia maintained with isoflurane, fentanyl 200 $\mu\text{g}/\text{h}$, and propofol.

All anesthetic medications were stopped at the time of skin closure. Cefoperazone and tazobactam were antibiotic continued till 3rd day post-operative. Post-operative pain management protocol consisted of paracetamol 1000 mg QID and tramadol 100 mg TID separated by dose timings.

Operative Technique

Normothermic non-pulsatile flow was used during CPB. According to the surgeon's preference, cold antegrade crystalloid cardioplegia or warm intermittent antegrade blood cardioplegia was used to induce and maintain cardioplegic arrest. Patients undergoing on-pump procedure received tranexamic acid 1000 mg before and after pump stoppage.

Patients were extubated in fast-track manner if following criteria were met:

1. Stable hemodynamic parameters without pharmacological or mechanical cardiac supports. Systolic blood pressure of >100 mmHg, diastolic blood pressure <90 mmHg
2. Awake and alert patients. Patients can follow orders
3. A stable sinus rhythm on the electrocardiogram without signs of ischemia. Heart rate of $<100/\text{min}$. No atrial fibrillation
4. Normal respiratory function with O_2 saturation of $>90\%$ with $\text{FiO}_2 <50\%$ and arterial pCO_2 level of <50 mmHg on arterial blood gas analysis
5. Blood loss of <50 ml/h via the chest tubes
6. Urine output of >0.5 ml/kg/h
7. Normothermia.

Patients are declared fast track successful when there is no reoperation, no reintubation, and no operative mortality or morbidity (death within 30 days of surgery).

Statistical Analysis

P value considered statistically significant if it is <0.05 . All statistical analysis performed using SPSS 17 percentages was drawn.

RESULTS

During the study period of 2-year, 192 patients were operated for different kind of cardiac surgical procedures. Demographic data of the patients have been shown in Table 1.

Nearly 76% of the patients were male, whereas the mean age of the patient was 64.20 ± 9.22 . Diabetes was present in 7% of the patients. 33% patient had low ejection fraction. Previous myocardial infarction was seen in nearly 20%. Previous stenting was done in 6% of the patients.

Out of total 192 patients, 128 fulfilled the criterion for fast-track extubation and were included in the study.

Operative parameters are presented in Table 2.

Nearly 60% of the patients in fast-track criterion underwent off-pump CABG, 0.7% on-pump CABG, 9.3% mitral valve replacement, 6.25% AVR, 1.5% patent ductus arteriosus closure, and 18% with ASD closure.

Most common reason for failure for fast tracking is hemodynamic instability (37.5%), whereas respiratory insufficiency was the second most common cause with 31.25% of the people having it. Bleeding complication was a reason in 18.75%, whereas 12.5% have rhythm disturbance as the cause of failure of fast tracking.

DISCUSSION

Health-care cost is ever increasing. The issue is more often related to a country where population is more and resources are limited as in India. Every effort to be

Table 1: Patient profile

Variable	Incidence	Percentage
Male gender	144	76
Age	64.20±9.22	
Diabetes	88	45
Hypertension	102	53
Obesity	14	7.2
Low ejection fraction (<50)	64	33.3
Previous myocardial infarction	39	20.31
Previous PCI	12	6.25

PCI: Percutaneous coronary intervention

Table 2: Operative parameters

Variable	Total number of cases (%)
Type of surgery	
Off-pump CABG	78 (60)
On-pump CABG	4 (0.7)
Mitral valve replacement	12 (9.3)
Aortic valve replacement	8 (6.25)
PDA closure	2 (1.5)
ASD closure	24 (18)
Mean pump time	52.4±12.44

CABG: Coronary artery bypass grafting, ASD: Atrial septal defect, PDA: Patent ductus arteriosus

Table 3: Reasons for failure of fast-track cardiac surgical procedures

Reason for not taking fast-track course	Number of patients (%)
Hemodynamic instability	24 (37.5)
Respiratory insufficiency	20 (31.25)
Bleeding	12 (18.75)
Rhythm disturbance	8 (12.5)

made for reduction in the cost of health care whenever and wherever possible, so as to penetrate the health-care benefit to the poorest man in society.^{1,5} One of the factors limiting the decrease in cost of cardiac surgery is length of intensive care unit (ICU) stay.⁶ If we can reduce the cost of ICU stay without hampering the patient outcome, it is one step ahead toward achieving our goal for health care for all. Our study shows that nearly 66% of our patients could be fast-tracked because of use of simple protocols which could be easily understood by even paramedical staff and easily followed.

Different combination of medications is possible to have early facilitation of extubation. One of the protocols is having the use of regional anesthesia including epidural technique. However, when we see basic aim of fast tracking, i.e., reduction of health-care costs, the aim is offset by the cost of medications and catheters used for epidural anesthesia, and anxiety of doctors regarding epidural hematoma, and increase in pre-anesthesia duration (for putting epidural). Various combinations of inhalational as well as intravenous opioids could be used, as used in different studies.⁷⁻⁹ We used isoflurane over sevoflurane again as a cost cutting measure and found out it to be a good one. We did not find a patient with intraoperative awareness though bispectral index monitoring was not used.

In the remaining 44% of the patients who could not be fast-tracked, most common reasons were hemodynamic instability and respiratory insufficiency (Table 3).

Various other authors also tried to evaluate the efficacy of fast tracking and found out success rate between 50% and 88%^{10,11} depending on study protocols, extubation protocols, and expertise of the system. Patient load is also an important factor which will determine efficacy of the system by improving overall expertise.

The difference between various studies between successes of the fast tracking could be secondary to assessment of the patient in pre-anesthesia clinic, as patient with high risk were excluded from the study at the initial period, reducing the burden on the ICU nurses. This underlies the fact that most important factor for the success of the fast tracking is proper selection of the patients.

Most of the patients from our study were from diverse range of cardiac surgeries in comparison with other studies, which include specifically CABGs. This shows other types of cases such as single valve surgeries, and septal defects also can be easily tackled by fast-track approach.

CONCLUSION

Fast-track extubation is easily possible in ICUs, have a high success rate and can be applied over a diverse range of cardiac surgical procedures. The main prerequisite is proper selection of the patients. If it is done, health-care cost can be reduced drastically without increasing patient risk.

LIMITATION OF THE STUDY

This study has got several limitations. First, this is single center retrospective study. The second limitation is a lack of adequate power to define the success of fast-track extubation. The third limitation is data were not collected regarding factors affecting the fast-track extubation.

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