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## **Success and failure of Fast Track Extubation in cardiac surgery patients of tertiary care hospital: One year audit**

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### **Abstract**

**Objective:** To identify the causes of delayed extubation in patients planned for fast track extubation during cardiac surgery.

**Methods:** A prospective observational study was conducted at cardiothoracic unit of Aga Khan University Hospital for the period of one year. All elective coronary artery bypass graft (CABG) surgery patients, between the ages of 35-75 years with LVEF  $\geq$  40 percent were included. Patients with Intra aortic balloon pump, chronic renal failure, respiratory compromise and requiring high inotropic support were excluded from this audit. A performa was designed and later filled by the primary investigator. Patient demographics and various reasons for delayed extubation were noted in this proforma.

**Results:** Total 614 patients underwent CABG surgery and 388 (63.19%) patients were planned for fast track extubation. A total of 196 (49.5%) patients could be extubated within six hours of arrival in the cardiac ICU. Common reasons for delayed extubation included deep sedation in 80 (46.5%), confusion 44 (25%), excessive bleeding in 20 (11.3%) and high inotropic support in 10 (5.68%).

**Conclusion:** Major contributing factors for delayed extubation were identified by this audit. These factors need to be targeted accordingly by modifications in intra operative management (JPMA 59:154; 2009).

### **Introduction**

With the evolution of anaesthesia and surgical procedures, fast track extubation (FTE) has gained an increased interest, mainly based on the possibility of reducing health costs seemingly without compromising patient care.<sup>1</sup> Fast track extubation is defined as extubation within six hours following the end of surgery. As part of a comprehensive recovery plan, fast track extubation has been shown to reduce health care costs by almost 50% after cardiac surgery.<sup>2</sup> Studies show that early extubation of elective cardiac surgery patients does not increase perioperative morbidity.<sup>2,3</sup>

Fast track extubation is being practiced in almost all cardiothoracic units of the world for its associated advantages. By using an appropriate intraoperative anaesthetic technique and post operative management, CABG patients can be extubated within six hours without major complications.<sup>1</sup> It has been suggested and later proved by studies that patients do better if they are weaned from the ventilator and extubated early. Goals of fast tracking include early ambulation and rehabilitation, early discharge from CICU and prevention of potential complications of prolonged intubation. This concept was initially conceived for the healthiest of cardiac individuals but has since become the goal for many patients representing varying severity of illness.<sup>4,5</sup> Fast track extubation is not only cost effective but also reduces morbidity associated with respiratory and cardiac complications. It is now an established

that fact that fast track anaesthetic management is associated with decreased inotropic support and anti arrhythmic drugs.

Previous studies have revealed various factors in the failure of fast track extubation including obesity, female gender, excessive bleeding and high inotropic support.

This study was conducted to determine the factors that affect post-operative ventilation time using fast track recovery strategy.

### **Patients and Methods**

A prospective quality assurance audit was conducted for a period of one year at cardiothoracic unit of Aga Khan University Hospital. Anaesthesia consisted of etomidate, rocuronium/pancuronium, isoflurane and 10-20ugm/kg intraoperative fentanyl. Postoperatively, patients were sedated with propofol until ready for tracheal extubation, and received tramadol/morphine for analgesia. Failure of fast track extubation was defined as extubation in greater than six to eight hours. Data was collected in Cardiac intensive care unit (CICU) after completion of six hours. A third year resident/ primary investigator was responsible for collection of data by filling a proforma. Data variables included total number of CABG surgeries performed, patients who were planned for fast track extubation, number of patients extubated within six hours scattering according to gender and age in relation to success or failure of FTE, number of patient who were extubated after six

hours of arrival in CICU and causes of delayed extubation.

All elective CABG surgery patients (on pump or off pump) aged 35-75 years with LVEF  $\geq$  40 percent were included in the audit.

Patients with IABP inserted preoperatively or intraoperatively on high inotropic support after bypass (epinephrine  $>$  .08 microgram/ kg body weight/min) , dialysis dependent renal failure or serum creatinine  $>$ 2mg/dl with recent major neurological deficit (within six months), having lung disease that may compromise respiratory function and BMI greater than 35, were excluded from the audit.

All data was entered in a proforma and results were incorporated in percentages.

### Results

Of 614 CABG patients, 388 (63.19%) were selected for fast track extubation. There were 220 (56%) males and 168 (44%) females. Patients aged (35-55) were 300 (77%) and greater than 55 years were 88 (23%). Among the patients who were successfully extubated by FTE were 100 (56%) males and 76 (45%) females. The age range was 35-55 years in 155 (51%) and more than 55 years in 21 (23%).

The number and percentage of patients who failed fast track extubation were 176 (45.36%), the reasons for which are shown in the Table.

**Table: Reasons for delayed fast track extubation.**

Reasons	Number	%
Excessive bleeding resulting in reopening	20	11.3
Patient requiring high inotropic support	10	5.68
Patient deeply sedated	80	45.45
Patient confused	44	25.5
Haemodynamic Instability	22	12.5
Total	176	

### Discussion

Cost containment issues in the 1990's have promoted the implementation of fast-track cardiac surgery programmes. This attention has motivated clinicians and hospitals administrators to develop and implement strategies to contain or reduce costs, particularly in high-cost areas such as cardiac surgery. A perioperative anaesthetic management that facilitates early tracheal extubation is a key element of this process.<sup>6,7</sup> This approach has proved to be safe and cost beneficial by reducing Intensive Care Unit stay and has been successfully adopted in many hospitals around the globe.<sup>8,9</sup> Fast track extubation following cardiac surgery is commonly employed as a means to facilitate rapid recovery and discharge from an intensive care unit, thereby reducing costs of expensive resources.<sup>10</sup> As part of a comprehensive recovery plan, FTE has been shown to reduce

health care costs by almost 50% after cardiac surgery.<sup>11</sup> Studies have show that early extubation after elective cardiac surgery patients does not increase perioperative morbidity.<sup>9-12</sup>

Operating room (OR) extubation has generally been disregarded as an option in uncomplicated cardiac surgery, based on no evidence. OR time is the most expensive direct variable cost of CABG surgery,<sup>1</sup> and attempting to extubate a post-cardiac surgery patient in the OR undoubtedly increases OR time and delays turnover. This may increase OR nursing overtime costs and results in the cancellation of subsequent cardiac cases. This would easily negate any potential savings associated with decreased ventilator use in the ICU.

Extubation in the OR may increase respiratory and cardiac workload and potentially increases the incidence of cardiorespiratory complications such as myocardial ischaemia, tracheal re-intubation, hypothermia, shivering, inadequate analgesia, and mortality. Most cardiac events resulting from perioperative myocardial ischaemia, infarction and inadequate myocardial protection during cardiopulmonary bypass (CPB) usually manifest within the first postoperative hour. Before extubation, a period of observation with haemodynamic monitoring in an ICU setting should detect which patients will need intensive postoperative haemodynamic support. It has been demonstrated that the first hour after extubation is most crucial in respiratory care, as reflected by the apnoea index and the return to baseline of the tidal volume.<sup>1</sup> Weaning should start only when gas exchange has been confirmed to be adequate and pain is well controlled. Premature extubation in the OR may increase respiratory morbidity in these patients. However, early tracheal extubation (1 to 6 hours) after CABG has been demonstrated not to increase perioperative cardiac or respiratory morbidity, and to be well tolerated by the nursing staff recovering these patients.<sup>11,13</sup>

During the last several years new surgical techniques have been developed that allow certain cardiac surgical procedures to be performed through smaller incisions and sometimes without CPB.<sup>14</sup> The use of off-pump coronary artery bypass surgery (OPCAB) is increasing rapidly, and with the combined use of regional anaesthesia this technique could potentially allow certain patients to be extubated in the OR. But to date there is no published long-term, prospective, randomized study indicating that OPCAB with ultra-fast tracking is either safe or cost-effective in comparison to on-pump CABG surgery.

Excessive mediastinal bleeding requiring re-exploration is a potential problem in any cardiac surgical patient. The incidence after CABG surgery varies from 1.5 - 3%.<sup>15</sup> Concealed bleeding may lead to cardiac tamponade and catastrophic cardiovascular collapse, requiring emergent reopening of the chest.<sup>16</sup> A secured airway is obviously desirable in these circumstances.

Thermoregulation is also impaired during perioperative

period. Despite adequate rewarming, core temperature decreases after the operation ("afterdrop") due to persistent temperature gradients between the core and the periphery.<sup>17</sup> Postoperative hypothermia increases morbidity and can cause shivering, which leads to increased metabolic rate and potentially to myocardial ischaemia.<sup>18</sup> Central nervous system dysfunction is an unavoidable complication following cardiac surgery. The incidence of focal neurologic events is reported to be between 0.4 and 9%, with a strong correlation to age (less than 1% for patients under 65 years, 7 to 9 % in patients over 75 years).<sup>18,19</sup> Patients suffering a neurologic event have a nine fold increase in mortality,<sup>20</sup> and often need increased respiratory care and longer ventilator support. Extubation in the OR precludes the critical period of observation required to diagnose and assess the severity of the deficit, thus increasing the risks of aspiration and other respiratory complications.

At our institution, we employ FTE strategy for all patients undergoing elective CABG surgery fulfilling the fast track criteria, with the aim to wean and extubate patients within the first six hours following surgery. The purpose of this prospective continuous quality improvement audit was to determine the factors that have a major contribution in the failure of fast track extubation plan. The major factor that caused delay in FTE strategy was deep sedation and confusion. The reason for deep sedation was variable doses of intraoperative fentanyl ranging from 20-30u/kg and midazolam. The variable high dose of propofol, inhalational anaesthetic, fentanyl and midazolam can be avoided by the use of BIS (Bispectral Index) monitor but the cost factor needs to be considered in developing countries like Pakistan. The cause of confusion was multifactorial including old age, variable response to anaesthetic agents, thrombo-embolic phenomenon related to cross-clamping and debris from cardio pulmonary bypass machine. Other factors for delayed extubation following CABG surgery included old age, female gender, high inotrope use postoperatively, excessive bleeding resulting in reopening and haemodynamic instability.

### Conclusion

Cost effectiveness is of paramount importance in the developing countries. Fast-track cardiac surgery programmes have been established as the standard of cardiac surgical care. Early tracheal extubation (i.e., between 1-6 hours after arrival in the ICU) is a key element of this process and has been proven to be safe, cost-effective and an important means of reducing ventilator associated complications. Major contributing factors for delayed extubation were identified by this audit. These factors need to be targeted accordingly by modifications in intraoperative management. Monitoring the depth of

anaesthesia by BIS monitor is one measure for judicious use of anaesthetics thus avoiding awareness intraoperatively sedation and confusion post operatively.

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