ORIGINAL ARTICLE

FAST TRACKING IN ADULT CARDIAC SURGERY AT PAKISTAN INSTITUTE OF MEDICAL SCIENCES

Naveed Ahmed, Faridullah Khan, Mahrukh Zahoor, Badar-ul-Samad*, Muhammad Rafique, Muhammad Faisal, Rana Imran Sikander*

Department of Cardiac Surgery, *Department of Anaesthesia, Pakistan Institute of Medical Sciences, Islamabad, Pakistan

Background: Early extubation after cardiac operation is an important aspect of fast-track cardiac anaesthesia. The length of stay in ICU limits utilisation of operation theatre in cardiac surgery. Increasing cost, limited resources, and newer surgical strategies have stimulated effectiveness of all routines in cardiac surgery, anaesthesia, and intensive care. Aim of this study was to determine the feasibility of fast-tracking in adult cardiac surgery and its effects on post operative recovery in our setup. **Methods:** This descriptive study was conducted over 14 months between 16th Jul 2007 to 16th Sep 2008. All the open heart cases were included unless absolute contraindications were there. We applied the rapid recovery protocol adopted from Oslo Hospital Norway in an attempt to achieve fast-tracking in our setup. **Results:** Two-hundred-seventy-four consecutive cases out of 400 operated cases were included in this study. Mean age was 47.69±15.11 years, 27.7% were females, 5.8% were emergency cases, 5.1% were COPD, 11.1% were atrial fibrillation, and 6.9% were NYHA class-III cases. CABG was done in 66.1% cases and mean CPB-time was 75.92±16.20 min. Mean Ventilation-time was 4.47±4.48 hrs, 86% patients were fast-tracked to be extubated within 6 hours, and 85.4% patients remained free of post-op complications. Six (2.2%) re-intubatIions, 2.6% arrhythmias, 6.6% pleural effusions and 2.2% consolidation were observed post-operatively. Mean ICU stay was 2.49±0.95 days and in-hospital mortality was 2.2%. **Conclusion:** Fast-tracking with extubation within 6 hours is feasible approach which minimises the post-operative complications significantly in adult cardiac surgical patients.

Keywords: Fast-tracking, Adult cardiac surgery, early extubation

INTRODUCTION

Fast tracking after open cardiac surgery is achieved by extubation with in 6 hours of the shifting of the patient to cardiac surgical intensive care unit (ICU). Postoperative ventilation in the context of fast tracking cardiac surgery is usually limited to less than 6 hour period, instead of routine overnight ventilation adopted in the 1960s.[1,2] Immediate extubation is an extension of this concept which helps in minimising the post operative ICU stay.[3] The safety of early extubation practice has been extensively reported in the last 20 years[4] and growing experience shows that early extubation is possible and safe in low risk cardiac surgery cases.[5] International studies report that extubation in fewer than 4 hours may offer accelerated recovery, suggesting that efforts to reduce extubation times further might be worthwhile.[6] The length of stay in ICU is one of the factors limiting utilisation of operation theatre in cardiac surgery.[7] Increasing cost of hospital procedures, limited resources, and newer surgical strategies have stimulated effectiveness in all routines of cardiac surgery, anaesthesia, and intensive care.[8]

Determinants of early extubation have been studied extensively including perioperative variables like age, gender, cardiac status pulmonary hypertension[9–12] opiod use and pain control.[13] Absolute contraindications reported in international literature to fast tracking are mainly prolonged cardiopulmonary bypass (CPB) (>2.5 hours), haemodynamic instability, uncontrolled bleeding, morbid obesity, severe pulmonary hypertension, congestive cardiac failure, or if the operation was emergent.[8]

As soon as cardiac surgery started at our institute, every effort was made to keep this et par with the international standards. Adopting a policy of fast tracking is one of the practices greatly helping us in achieving our goal of early recovery and shorter ICU stay. We applied 'The rapid recovery protocol', emphasising preoperative education, low-dose opioids anaesthesia, limited cross clamp and pump times, mild hypothermia, active respiratory and physical training from postoperative day one.[8] Our aim was to determine the applicability and feasibility of fast tracking in adult cardiac surgery at PIMS and to provide all the proposed beneficial effects of this technique to our patients.

MATERIAL AND METHODS

This descriptive study started on July 16, 2007. Till this date 86 patients were already operated at Cardiac Surgery Department in PIMS, Islamabad. All following open heart cases were included in the study. They were all assumed to be potential candidates for fast tracking. Primary end-points were ventilation time, post-op complications forcing to exclude the case from study, length of ICU stay and mortality.

Surgical procedures were carried out according to standard practices. Particular attention was given to minimise cross-clamp and bypass time. Cold blood

cardioplegia was used for valvular, adult congenital cases, combined coronary and valvular procedures. Coronary artery bypass grafting was mainly done using intermittent cross clamp-fibrillation technique. Autologous blood transfusion was employed to keep bleeding complications to minimum.

All patients were premedicated with lorazepam 2–3 mg orally. Co-induction was done with morphine 0.3–0.5 mg/Kg, midazolam 0.04–0.06 mg/Kg and muscle relaxation was achieved by using vecuronium 0.02–0.04 mg/Kg. Amnesia was induced using propofol boluses 5–10 ml. Anaesthesia was maintained with oxygen, air, sevoflourane 1–2% and vecuronium 1–2 mg if required. Active monitoring of patient was carried out according to the PIMS cardiac anaesthesia protocol. Peri-operativly low to moderate doses of opiods were used instead of high doses to allow rapid recovery. Postoperatively muscle paralysing or sedative agents were avoided whenever possible. Thoracic epidural anaesthesia was also employed in many cases according to standard practices.

All patients were shifted to cardiac ICU and monitored haemodynamically. All the biochemical investigations and blood gases were repeated and temperatures maintained above 36 degree central. Blood loss was monitored to remain below 150–100 ml/hour. Extubation criteria was awake patient with adequate muscle strength, Fi_{O_2} less than 50%, Tidal volume more than 5 ml/Kg, Vital capacity more than 10 ml/Kg, respiratory rate less than 30 and satisfactory arterial blood gases.

Patients with prolonged cardiopulmonary bypass (CPB) (>150 min), haemodynamic instability, uncontrolled bleeding, morbid obesity, severe pulmonary hypertension, congestive cardiac failure, postoperative ischemic changes in ECG were excluded from the fast track protocol.

All data were recorded on performas and entered on software data sheets using SPSS-12. Results were described in frequencies and percentages for descriptive variables and in mean values with standard deviation for numeric variables. Graphical analysis was also done.

RESULTS

In the specified duration 360 cases were done out of which 274 were included in the study. The demographic profile of the population showed a mean age of 47.69±15 years with 198 (72.3%) males and 76 (27.7%) females. This study included 5.8% urgent cases, but main bulk of cases was formed by elective operations (94.2%). Co-morbid conditions were present in 70% of cases including 35.8% hypertension, 10.6% Diabetes Mellitus Type II, 5.1% Chronic Obstructive Airway Disease, 11.1% chronic atrial fibrillation. 6.9% of the cases in NYHA class III were also included in our study (Table-1).

Table-1: Percentage distribution of co-morbidities among the patient population

Co-morbidity	Frequency	Percentage
None	82	30.0
Hypertension	99	36.0
Diabetes	30	11.0
COPD	13	5.0
Chronic AF	30	11.0
NYHA III/IV	20	7.0

Different cardiac procedures were included in the study with Coronary artery Bypass grafting forming the main bulk of cases being 66.1% cases followed by Mitral valve replacements 13.1% cases (Table-2). Mean cross-clamp time was 47.65±10 min. Cardiopulmonary bypass time ranged from 40–140 min, the mean being 75.92±16 min. Myocardial preservation was carried mainly by intermittent cross- clamp fibrillation in 64.6% cases to minimise duration of ischemia.

Table-2: workload distribution (n=274)

Operation	Frequency	Percentage
CABG	181	66.1
VSD	3	1.1
MVR	36	13.1
DVR	13	4.7
ASD	17	6.2
Atrial myxoma	1	0.4
AVR	10	3.6
CABG+MVR	2	0.7
CABG+AVR	1	0.4
MVR+Tricuspid repair	10	3.6

Ventilation time was calculated for all the patients after shifting to ICU. Mean Ventilation time was 4.47±4.48 hours. More than 34% patients were extubated at 2 hours (Table-3). A total of 86.8% patients were successfully fast tracked and extubated within 6 hours of arrival to ICU, 13.2% patients were ventilated for more than 6 hrs due to unsuccessful attempt at fast tracking not meeting the exclusion criteria (Table-3).

Table-3: Ventilation time (n=274)

Ventilation time (Hr)	Frequency	Percentage
1.00	5	1.8
2.00	94	34.3
3.00	60	21.9
4.00	45	16.4
5.00	15	5.5
6.00	19	6.9
8.00	6	2.2
10.00	6	2.2
14.00	6	2.2

Post operative complications were recorded in all the patients during ICU stay. Out of 274 cases, 234 (85.4%) patients remained free of post operative complications. Six (2.2%) patients were re-intubated and 2.6% patients developed arrhythmias after early extubation. Pleural effusions (6.6%) and consolidation (2.2%) were also observed (Table-4). Postoperative complications were also plotted against ventilation time and the results show that except for arrhythmias all other

complications were directly related to the ventilation time (Figure-1).

Mean ICU stay was found to be 2.49±0.95 days. In-hospital mortality was 2.2% in this study.

Table-4: Post operative complications (n=274)

Post op complications	Frequency	Percentage
None	234	85.4
Re-intubation	6	2.2
Pulmonary oedema	2	.7
Arrythmias	7	2.6
Pleural effusions	18	6.6
Consolidation/lung collapse	6	2.2

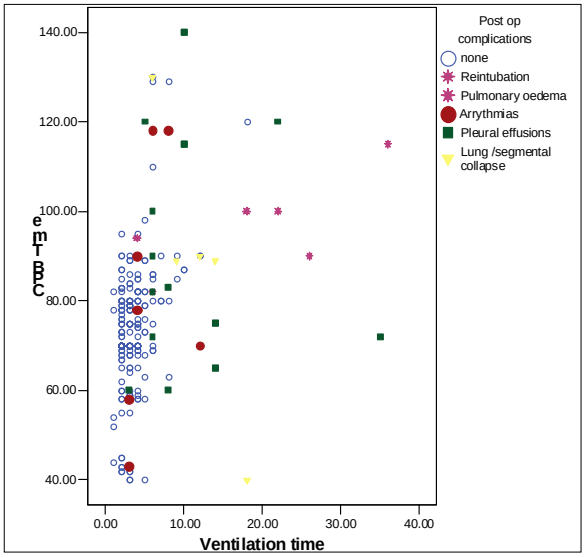

Figure-1: Postoperative complication

DISCUSSION

Cardiac surgery has progressed immensely in past 4–5 decades. Now there is a better understanding of the pathophysiologic dynamics associated with the use of cardiopulmonary bypass. Increasing cost of hospital procedures, limited resources, and newer surgical strategies have stimulated effectiveness of all routines in cardiac surgery and anaesthesia. Conventional methods are now being replaced with newer protocols. Fast tracking in adult cardiac surgery is proving to be successful internationally[1] and pioneer work at our institute at national level has also demonstrated that early mobilisation and rapid rehabilitation after cardiac surgery has a potential benefit of better patient turnover and lesser postoperative complications in our population.

Our study shows the demographic profile of the patients presenting for cardiac surgery at PIMS. Middle aged (mean age 47 years), male population both electively and urgently operated are being successfully fast tracked and increasing age was not found to be significantly influencing in terms of mortality and morbidity after early extubation.[12] Co-morbid conditions have effect on outcomes of surgery and fast tracking but our study shows that COPD and higher NYHA class can be successfully fast tracked. Maureen Meade also established that COPD is not a risk factor after cardiac surgery.[1,14]

Almost all types of cardiac surgical procedures were followed by successful fast tracking including mitral valve replacement with associated pulmonary hypertension. Safety and feasibility of fast tracking has also been reported in the setting of pulmonary hypertension in paediatrics by Vida *et al*[12] and after minimally invasive procedures by Dovy and Tomas Vanek *et al*[15].

International studies report that extubation in fewer than 4 hours may offer a substantial advantage in terms of accelerated recovery. Ventilation time for fast tracking has been reported between 6–8 hrs.[1–6] Our study reported mean ventilation time of 4.47 hours and we took 6 hours as our cut off time for fast tracking. This time was successfully achieved in 86.6% cases, showing the safety and feasibility of the technique in newer setups like our institute as well.

In our study 85.5% cases remained free from post operative complications. Atrial arrhythmias developed after fast tracking in 2.6% cases. Lazar from the University of Boston reports that atrial arrhythmias are most common risk factors which impedes early extubation after cardiac surgery.[16] Most of the pulmonary complications were directly related to the duration of ventilation (Figure-1) thus highlighting the fact that fast tracking prevents most of the pulmonary complications successfully and leads to short ICU stay (Mean 2.4 days) with mortality of 2.2% (high risk cases included) meeting the international standards successfully.

CONCLUSION

Fast tracking with extubation within 6 hours is a feasible approach in adult cardiac surgical patients in our setup. It greatly minimises the postoperative complications in patients, leading to benefits of early recovery and short ICU stay. Further studies are needed to monitor efforts at reducing extubation time as these efforts might be worthwhile in benefiting our patients.

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Address for Correspondence:

Dr. Naveed Ahmed, Department of Cardiac Surgery/ICU, Pakistan Institute of Medical Sciences, Islamabad Pakistan. **Cell:** +92-300-5197615
Email: naved.dr@gmail.com