FAST TRACK CARDIAC SURGERY

*Rehana S. Kamal**

INTRODUCTION

Fast Track Cardiac Surgery management is an approach involving early extubation and rapid transit through I.C.U.. Early extubation is the one common factor at all institutions, however this does not constitute Fast Track. Fast Track requires a well co-ordinated interdisciplinary action resulting in early extubation and early discharge from I.C.U. *PJCTS 1999;1: 14-17*

TEXT

In the early days of Open Heart Surgery high doses narcotic anaesthesia and prolonged post operative mechanical ventilation were recommended. Quasha et al (1) showed in the early 80's that pulmonary complications were markedly diminished when patients assumed an upright position and had their E/T tube removed early. There was better return of mucociliary action, less atelectasis, less pneumonia and overall improved pulmonary outcome. Others have shown that there may be potential benefits for the heart with the elimination of positive pressure ventilation. Diastolic compliance is improved and overall cardiac performance may be enhanced with early extubation (2,3). As bypass cardiac surgery become routine it also became more expensive. Costs of these operations have increased tremendously due to technical improvements in monitoring. The perioperative cost primarily include the operating room and intensive care unit, as they are expensive in terms of supplies, equipment, instruments and personnel. Approaches in cardiac surgery which decrease time in O.R.. and I.C.U.. have emerged as important tools to measure a program's commitment to quality improvement and cost reduction. The fast track management of the cardiac surgical patient must involve the entire patient care team, i.e. surgeons, anaesthesiologists, operating room and intensive care nurses.

1. PATIENTS SELECTION

Patient selection is very important especially when starting Fast Track programmes. The selection of patients can be modified with experience. It is important to select the right kind of patients and avoid fast track in high risk patients i.e. patients with poor left ventricular function, patients with severe valvular disease and those with severe associated disease such as pulmonary and renal disease. Those patients in need of emergency surgery or re-operations should also be considered high risk. These patients require more intensive perioperative haemodynamic support and they are more likely to require prolonged postoperative ventilation. Intra-operatively patients are excluded if they have a long CPB time i.e. > 120 minutes, patients who have or develop severe myocardial dysfunction, patients who develop coagulopathy, or in patients who need deep hypothermia i.e. temperature < 25º during surgery. After the operation patients who bleed excessively, or haemodynamically unstable, who develop hypoxia and those who develop strokes, are all excluded for early extubation.

2. ANAESTHETIC TECHNIQUE

The aim of anaesthesia is to achieve normal physiological function at the end of surgery. The key there is the reduction in total opioid dose so that postoperative respiratory depression is reduced. There are many techniques described in the literature. At the Aga Khan University Hospital we administer 10-15 ug/kg fentanyl with 0.15 mg Midazolam and 0.1 mg/kg Pancuronium. Anaesthesia is maintained with either Propofol or Isoflurane. No narcotics are used after bypass.

3. OPERATIVE MANAGEMENT

Smooth uncomplicated surgical management is extremely important. The success of fast track depends on good myocardial re-vascularization, careful myocardial protection and uniform body

*Address for correspondence: Rehana S. Kamal
Professor Chairperson Department of Anaesthesiology
The Aga Khan University Hospital
Stadium Road, Karachi. P.O. Box 3500
Fax: 92-21-4934294, 4932095
E-mail: rehana.kamal@aku.edu

warming.

4. I.C.U.. MANAGEMENT FOR FAST TRACK

Propofol infusion is continued in the ICU at the rate of 1-2 mg/kg/hr and is titrated to keep the patient drowsy but rousable. All attempts are made to keep the patient warm, one of the causes of failed early extubation is inadequate body temperature. Sedation with propofol is stopped when the patient is haemodynamically stable and not bleeding, patients must also be able to maintain oxygenation and ventilation, with a PO_2 of > 100 with an FIO_2 of 50 or less, PEEP < 7.5 and respiratory rate of 10-15 per minute. Pain control during sedation is achieved with a morphine infusion of 1-2 mg/ hr. and i/v bolus of 1-2 mg morphine if needed. One hour before extubation morphine and propofol infusions are discontinued and a NSAID is administered.

EXTUBATION CRITERIA

Haemodynamically stable, fully rewarmed and no shivering. Patient is well perfused with adequate urinary output.

RESPIRATORY CRITERIA FOR EXTUBATION

Patient is awake and responsive to command presence of adequate gag reflex and ability to maintain airway, able to maintain PH > 7.35 on T piece or CPAP.

POST EXTUBATION MONITORING

O_2 saturation is measured continuously with a pulse oximeter and the RR is counted every 15 minutes for 2 hours post extubation. Patients are encouraged to breath deeply. Arterial blood gases are measured 15, and 45 minutes post extubation. Chest physiotherapy and deep breathing exercises are started as soon as the patient is extubated. Jacek et al (4) have recommended a lot of extra nursing attention for the patient 1 to 2 hours post extubation in the form of encouraging the patient to breath deeply, move in bed and remain awake. The optimal time for extubation has not yet been analysed. Extubation can be achieved at the end of surgery, or immediately on admission in the I.C.U. However, there are some risks involved in immediate extubation, i.e., haemodynamic instability, hypermetabolism, shivering, excessive mediastinal bleeding and pain especially after discontinuing morphine. It takes almost 3 to 4 hours for the above risks to decrease, the patient is re-warmed, has achieved adequate ventricular function, has eliminated intraoperative drugs, i.e., narcotics and muscle relaxants. Mediastinal bleeding tends to settle in 3 hours. Delaying extubation for more than eight hours increases patient discomfort, ciliary dysfunction, atelectasis and inability to cough, requires further sedation and increases cost. Window of opportunity opens at 3-4 hours. Best time for extubation therefore, appears at 4-8 hours when risks are minimal and patient's stay in I.C.U. is decreased.

OUTCOME OF FAST TRACK CARDIAC SURGERY

Very few audits of Fast Track Cardiac Surgery have been published. One study by Marque in 1995 reported on 405 fast track coronary artery graft patients, who were matched against 986 historical controls (5). His results showed that ventilation time decreased from 24 $\pm$ 8 hours to 10 $\pm$ 4.3 hours ($p<0.95$) and I.C.U. stay decreased from 40 $\pm$ 18 to 24 $\pm$ 10 hours ($p< 0.05$). There were no reintubations and no increase in M & M compared with control patients. Fig. 1 shows the percentage of patients extubated in Fast Track studies. Exact comparisons are not possible because different times for extubation have been used in different studies. However, majority of the patients have been extubated within 10 hours. One important point to remember is the ability of a given hospital to follow the strict criteria of early extubation. Many of these patients had low preoperative risk factors. Now even high risk patients who have a fast and smooth intraoperative course can be extubated early. Intraoperative awareness and fast track with low dose opioid technique awareness could be a problem. A recent report on closed claims in cardiac surgery had no mention of this serious outcome (6). Similarly at the AKUH we have had no incidence of awareness.

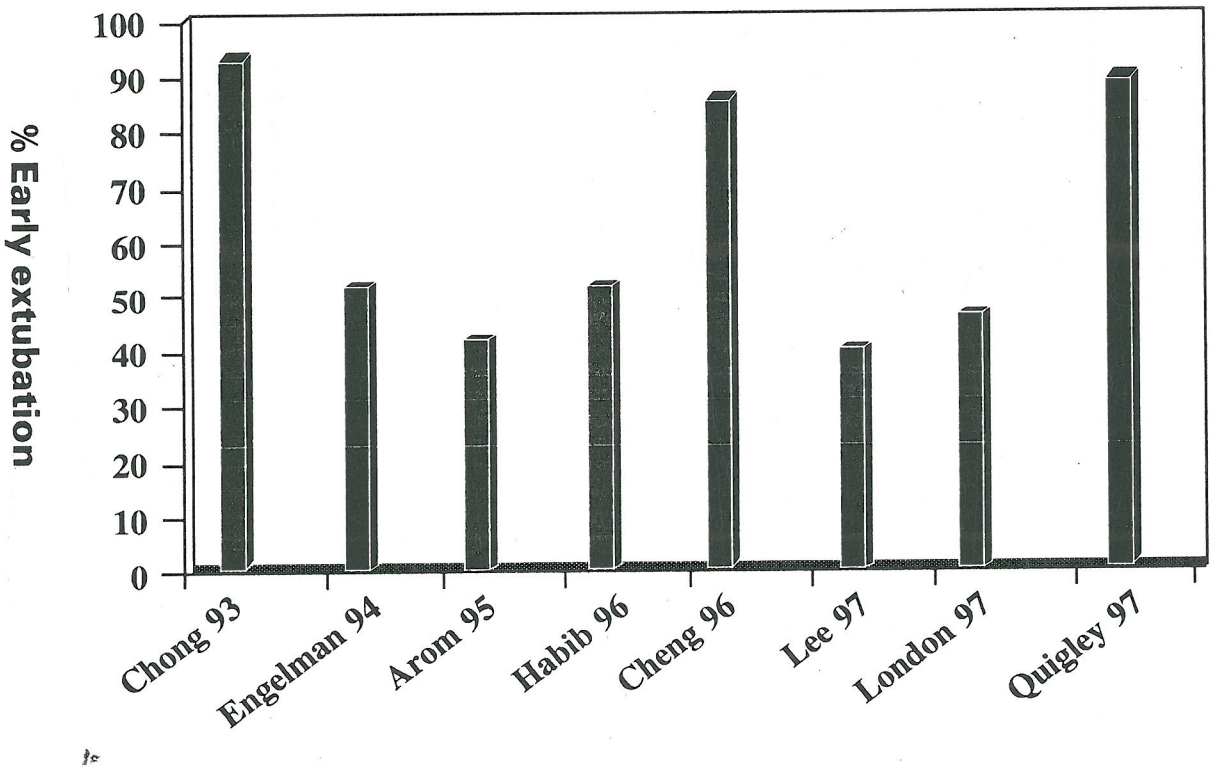
COMPLICATIONS RELATED TO FAST TRACK MANAGEMENT

There could be complications and even death associated with poorly timed extubation. Respiratory complications include re-intubation, risk of aspiration or hypoxaemia. Accelerated re-

Table 1

Percentage of patients extubated in Fast Track surgeries

Total Study N	193	280	645	492	60	362	304	266
Time Frame (Hr)	10	11.5	12	8	6	8	10	12



covery can place increased stress on the myocardial function, especially in patients with poor left ventricular function or residual myocardial ischaemia resulting in arrhythmias, ventricular function failure, and even myocardial infarction. Any one of these complications would increase the cost by ten fold.

REDUCTION IN COST OF SURGERY

Fast track not only reduces cost of surgery but it also improves quality of care. There are three types of costs for patients under going surgery:

Direct fixed costs	-	Independent of length of stay i.e., salaries of nursing staff
Direct variable costs	-	Depend on length of stay i.e., drugs, medical & surgical supplies
Indirect (overhead) costs	-	Independent of patient care related to maintenance of facility, administration and physical plant support, i.e., lighting, heating, cooling, etc.

Cardiac surgery is an expensive form of treatment. In the United State the average cost of bypass surgery ranges from US$ 10-50,000/- per case depending on different hospitals. As a general rule in the US general costs account for 70% and professional fee about 30%. Of the hospital costs, operating room costs account for 40% whereas, pre and postoperative care account for 60%. In Pakistan cost of bypass surgery ranges from Rs. 175,000 - 240,000/-. The breakdown of the total cost in percentage is: 77% accounts for hospital costs and 23% accounts for the professional fee. Of the hospital costs 42% is accounted for pre and post operative care and the remaining 58% for operating room costs.

CONCLUSION

Cardiac anaesthesia is emerging from the high dose opioid techniques with prolonged ventilation to approaches that are aimed to facilitate earlier extubation. Key factors in the success of early extubation is meticulous attention to detail, an excellent team which works together and includes anaesthesia, surgery and Intensive care nursing. Educating the team, as well as the patients, and flexibility in approach to patient care.

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