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Fasttrack V/S Conventional Extubation In Off Pump Coronary Artery Bypass Graft: A Retrospective Observational study Comparing Pain Scores and Postoperative Outcomes

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ABSTRACT

Introduction: Fasttrack extubation following coronary artery bypass surgery facilitates fast recovery and discharge from the Intensive Care Unit (ICU). It has shown to decrease the expenditure of expensive resources and is safe with better pulmonary functions.

Aims & Objectives : To determine if implementation of fasttrack extubation protocol in Off Pump CABG has any benefit on analgesic requirement and postoperative outcomes.

Materials and Methods: 100 patients undergoing elective off pump coronary artery bypass graft repair in the period of last 3 years were included in the study. The fast track group patients were extubated within 6hrs, while the other group was extubated within 12 to 24 hrs after surgery. Postoperative analgesia was by inj. Tramadol 2mg/kg and inj. Paracetamol 20mg/kg iv 8 hourly for the next 24 hours. IV morphine 0.05mg/kg was administered as rescue analgesia when VAS at rest was ≥ 4 (max dose allowed in 24 hour was 10 mg).After 20 min. of extubation ABG was done . Pain was assessed according to VAS score and recorded at 20 min,1,6, 12, 18, and 24 hrs post extubation.

Results: Demographic data were similar among the two groups.Total consumption of morphine as rescue analgesia in 24 hrs in group A was (2.77 ± 1.19mg) while in group B it was (3.05 ± 1.11 mg), which was statistically insignificant. Mean duration of hospital stay (in days) in group A was (6.10 ± 0.89) while in group B it was (9.84 ± 1.36) which was statistically highly significant($p<0.001$).1 patient in each group had nausea and vomiting and 1 patient in group B needed ionotropic support.

Conclusion: Implementation of fasttrack extubation reduced the duration of hospital stay but there were no difference in analgesic requirement or in immediate postoperative complications .

Key words: Off Pump CABG, Postoperative analgesia ,recovery

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Introduction-In the past decade, coronary artery bypass grafting surgery was linked with long acting anaesthetic drug usage associated with prolonged post-operative mechanical ventilation in the intensive care unit (ICU)(1).“In order to achieve a rapid recovery and discharge from ICU, fast tracking is used commonly after a cardiac surgery, thus, reducing the expenditure of expensive resources and has been shown to be safe. (2). In Fast-track cardiac care approach to anesthesia during surgery requires an interdisciplinary team effort. A coordinated approach is necessary after surgery to achieve early extubation and an overall streamlined approach to recovery and hospital discharge. Protocol driven specific goals and criteria for extubation and an interdisciplinary team approach is an even more important determinant of success than the specific anesthetic agents chosen. A coordinated fast-track approach optimizes resource utilization in the perioperative setting while also improving patient outcomes, which ultimately translates to an overall improvement in value not only for patients, but also for healthcare professionals, hospitals, and health systems. Other advantages of fast tracking include earlier mobilization, better pulmonary function and improved hemodynamics.(3)

Wong et al. described in Cochrane Database Systematic Review the use of a time- directed extubation protocol was associated with reduced time to extubation (reduction of 3.7 to 8.8 hours, 16 trials, 2024 participants, low level of evidence) and length of stay in the intensive care unit (reduction of 3.9 to 10.5 hours, 13 trials, 1888 participants, low level of evidence) without increasing the risk of postoperative complications compared to standard care. Following cardiac surgeries, patients encounter an incisional pain, generally due to the chest drain tube insertion, sternotomy and associated incision on the arm or leg (4). Mac Leod et al demonstrated that fast tracking, using either low dose opioid use or time-directed extubation, is not associated with differences in major post-operative complications including stroke (transient or permanent), renal failure, wound infection or hospital readmission. They further demonstrated that rates of atrial fibrillation, the most common post-operative complication seen in patients undergoing cardiac surgery, was not affected by fast tracking.(5) In the recent years, several people have used early tracheal extubation and postoperative management of patients who underwent CABG procedure in a step down or recovery unit (10,11).Now-a-days early extubation is possible owing to improved anesthetic management alongwith advanced techniques in surgery, protective measures to myocardium, and hemostasis postoperatively.

We implemented the fast-track cardiac anesthesia protocol in our center in 2016 . We retrospectively analyzed the data for patients undergoing off pump CABG(OPCABG) during a period of 3 years using a fast-track extubation protocol(1 to 6 hours) versus conservative extubation protocol(12 to 22 hours).We compared pain score and the incidence of immediate post operative complications and outcomes in these patients

MATERIALS And METHODS: This retrospective observational study was done in the Department of Cardiac Vascular and Thoracic Surgery Anesthesiology, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun Uttarakhand, over a time period of 6 months. Data was reviewed from a group of patients who underwent elective off pump coronary artery bypass grafts repair in the period of last 3 years(December 2016 – December 2019) presenting in the Department of CTVS, HIMS, Dehradun. The study was approved by Institutional Ethical Committee .(HIMS/RC/2020/67)

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Adult patients>18-60 years of both sex male and female, scheduled for primary elective off pump coronary artery bypass grafting surgery were reviewed for data.

Amongst the patients reviewed , patient undergoing redo or emergency procedures, already intubated patients, patients who have undergone procedures like prophylactically intra-aortic balloon pump insertion, patients with history of recent myocardial infarction with in last 15 days,or having left ventricular ejection fraction < 40% were excluded from study. Patients who are diabetic, hepatic, renal abnormality, any coagulopathy,any history of any mental or psychiatric illness, any neuromuscular disorder,any known allergy or contraindication to study drugs such as paracetamol, tramadol, or morphine, history of smoking, COPD, any other respiratory disorder, pregnant or lactating mothers ,patient with history of stroke or transient ischemic attack within the last 6 months, alcoholic, long-term analgesic therapy were also excluded from study

Methodology used:

- All patients were kept nil orally 6 hrs for solid food and 2 hours for clear fluid prior to surgery and were premedicated with tablet lorazepam 0.05mg/kg night before and tablet pantoprazole 40 mg night before & 2 hours prior to surgery.On preoperative visit, all the patients were explained regarding the procedure and were taught to interpret the visual analogue scale (VAS)
- Intraoperatively, patients were monitored by five-lead electrocardiogram with ST analysis, central venous pressure monitoring, invasive arterial pressure monitoring, pulse oximetry, end-tidal carbon dioxide monitoring, urine output, and nasopharyngeal temperature monitoring and ABG .
- In all patients Preoxygenation was done for 3 minutes using 100 % oxygen for 3 minutes,Inj fentanyl 6 mcg/kg iv given slowly and for induction Inj Etomidate 0.4 mg/kg iv was given immediately after inj fentanyl in both groups, After check ventilation inj succynylchloine 2mg/kg iv was given and airway was secured by cuffed endotracheal tube, after checking bilateral air entry endotracheal tube was fixed.Maintenance of anaesthesia was done with oxygen and air in 1 : 1 ratio, isoflurane was used as inhalational agent, and vecuronium 0.1mg/kg iv for maintenance of muscular relaxation. Inj.fentanyl 1mcg/kg and inj.vecuronium 0.02mg/kg was repeated after every 30 minutes during surgery. Patients were observed carefully for their intraoperative behavior in terms of hemodynamics, urine output, requirement of inotropes, bleeding and body temperature .
- Care was taken to maintain the patient's body temperature within normal limits. Ambient temperature inside the OR was maintained between 20°C and 22°C. Temperature monitoring was done vigilantly .In operating room active temperature control was done with forced-air body warmer, warm IV fluids. Furthermore, all the measures to avoid hypothermia were exercised postoperatively in the ICU also like patient covered properly, use of forced-air body warmer and fluid warmer.
- In both groups, just before sternotomy inj. Fentanyl 2mcg/kg i.v and vecuronium 0.02 mg/kg i.v was given. At the time of chest closure using sternal steel wires, inj.fentanyl was repeated in a dose of 2 mcg/kg and vecuronium was repeated in a dose of 0.02mg/kg I.V.Inj. Paracetamol 15mg/kg iv along with inj.ondansetron 0.1 mg/kg i.v given and patient was shifted to CVTS ICU, and standard monitoring (ECG,SPO2,IBP,ETCO2,Temp), were connected. Patient was shifted on SIMV mode of mechanical ventilation (Vt 8ml/kg, Fio2 50%,PS 12 mmhg, PEEP 5 mmhg, R.R 14/min.) once patient started following verbal command like eye opening and had

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adequate muscle power 5/5 in both upper and lower limbs , inj. Neostigmine 0.05mg/kg and inj. Glycopyrolate 0.01mg/kg was given .Ventilation and assessment protocol (Table/fig1). The criteria followed for tracheal extubation (Table/Fig 2)

Patients extubated within 6hrs of admission to CTVS ICU (group A). After 20 min. of extubation, postextubation ABG was done and recorded. Pain was assessed according to VAS score.VAS score was also recorded at 60 minutes, 6 , 12, 18, and 24 hrs post extubation. Any complications in the next 24 hours of extubation was recorded. For postoperative pain management inj. Tramadol 2 mg/kg 8 hourly and inj. Paracetamol 20 mg/kg iv 8 hourly were administered for the next 24 hours. Arterial blood gas was done 4^{th} hourly for the next 24 hours in CTVS ICU.As rescue analgesia iv morphine (0.05 mg/kg) was administered if VAS at rest was more than 4 (max dosage allowed in 24 hour was 10 mg).

Patients who were not extubated within 6 hrs of CTVS ICU (Group B) were sedated with inj morphine 0.1mg/kg iv slowly then repeated every 4th hourly in CTVS ICU on SIMV mode and conventional extubation protocol was followed .Patient was kept on SIMV mode ((Vt 8ml/kg, Fio2 50%,PS 12 mmhg, PEEP 5 mmhg, R.R 14/min). Assessment for tracheal extubation done after 12 hour of mechanical ventilation, and ABG was recorded. On the next morning at 4 am last dose of inj.morphine was repeated in the above mentioned dosage. Once patient started following verbal commands like eye opening and had adequate muscle power 5/5 in both upper and lower limbs, assessment for tracheal extubation was done and ABG was recorded (if Vt> or equal to 8ml/kg, R.R 12-20 per minute and regular, PaCo2 < 50 mmhg, PaO2 > 90 mmHg) , then patient was put on CPAP mode (PS 10 mmhg, PEEP 5 mmhg, FiO2 0.5). After 20 minutes of CPAP , ABG was done and recorded. Patient extubated after following extubation criteria as mentioned above and ABG was recorded after 20 minutes and 4 hours of extubation.

- Pain was assessed according to VAS score as mentioned above and postoperative pain management was same as done in group A.
- Post-operative complication such as bleeding, arrhythmias, reoperation, re-intubation and ventilation, stroke, deep sternal infection and in hospital mortality.

Data Management and Statistical Analysis:

The statistical analysis of baseline characteristics was conducted with the SPSS(statistical package for the social science system)version 17.0. Continuous variables were presented as mean ± SD or median if the data was unevenly distributed. Categorical variables were expressed as frequencies and percentages. The comparison of continuous variables between the groups were performed using Student's t test. Nominal categorical data between the groups were compared using Chi-squared test. For all statistical tests, a p value less than 0.05 was taken to indicate a significant difference

Results-Total of 100 patients were recruited who fulfilled the criteria for inclusion. No significant differences was noted among two groups in regard to the demographic variables like age, weight,gender, preoperative arterial blood gas (ABG) and duration of surgery. [Table/Fig 3]. The mean duration in time taken for extubation in Group A was 132.80 ± 7.84minutes, while in Group B was1174.30 ± 65.79 minutes, statistically highly significant difference was observed. (p-value<0.001)

Total consumption of morphine as rescue analgesia in 24 hours in group A was 2.77 ± 1.19mg while in group B it was 3.05 ± 1.1mg (p value- 0.235).(Table/ fig 4)

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Mean duration of hospital stay was 6.10 ± 0.89 days in group A while in group B it was 9.84 ± 1.36 days, p value <0.001which was statistically highly significant.(Table/Fig 4) VAS was insignificant statistically at 20mins,1hr and 6hrs after extubation (p-value >0.05). VAS score evaluated at 12 ,18 and 24hrs was statistically significant p value <0.05.[Table/Fig 5].

1 patient in each group had nausea and vomiting and 1 patient required inotropic support in group B .

Discussion-With the advances in anaesthesia and cardiac surgery promotion of fast track extubation protocol is being advocated in off pump CABG. Post operative pain management has also become a primary requirement in cardiac surgeries, both for the wellbeing of the patient and to avoid negative consequences provokes by pain itself. (6,7). However issues related to early and late extubation in CABG cases, such as morbidity and expenditure have been questioned and are under debate(8,9)

The current time standard for defining fast track extubation varies between 4 and 8 hours after ICU admission In present study, extubation aim was either early (after 1-6 hrs after surgery) or delayed (12 hrs after surgery) (10).Several studies have reported shorter ICU stay following early extubation protocol using different design and population group. Salah M et al. demonstrated that extubation by ultra fast track anaesthesia associated with a shorter ICU stay and lesser complication comparing with conventional extubation, (11),Camp S L et al. did a retrospective study on 2735 patients who had undergone cardiac surgeries, of which 1164 patients had either immediate or early extubation, concluded that early extubation is associated with smooth postoperative course and decreased complications after surgery.(12).

In our study, the demographic data did not differ significantly including the surgery time and this is well supported by the fact that similar number of side effects were seen in both groups. However, it cannot be excluded that the results might be influenced by the difference in surgery duration between the groups. The coordination and communication of an analgesic plan is central to safe, effective, and efficient perioperative care. The evidence indicates that the use of multi-modal analgesia in the perioperative period effectively addresses many of the issues necessary for fast track surgery. Multimodal analgesia includes regional anesthesia, non-opioid systemic analgesics, and opioid analgesia. In this study difference in the postoperative morphine consumption or in pain perception between two groups was insignificant although VAS score evaluated after 12 hrs of extubation was mildly significant in early group, but it is well supported by the fact that all other scores were not significant in groups at all other intervals. Loyd-Donald et al identified that 12.5% of patients failed to be discharged from ICU secondary to concerns regarding analgesia, their study identified pain management as an important area to address for fast track cardiac anaesthesia success. It is to be noted that a wide variation was observed with regard to the amount of morphine administered .Thus it proves that the need of opioid analgesic agents varies greatly among the individuals even when there is similar degree of surgical trauma.

In our study, no fast-tracked patients required reintubation or readmission to the ICU. As such, the low rate of fast-track failure in our study may have contributed to fast track patients experiencing a shorter overall hospital LOS.

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Limitations-

i) Our study is retrospective and is observed in a single institute. However all the entries of data elements was done prospectively into a cardiac surgery research database implying with strict definitions. We did not identify time from ICU to ward discharge.

ii) VAS score were taken at fixed time interval, therefore the effect before or after analgesic administration was not investigated; neither the duration of analgesia achieved was assessed.

Conclusion—The use of protocols that help standardize care and set expectations for the post-cardiac care team has resulted in OPCABG patients treated in a fast-track manner allowing rapid recovery and early extubation and discharge from the hospital. Early recognition of complications that may delay recovery including hypothermia, hypotension, and bleeding is treated aggressively to prevent unwanted complications and intensive care delays. Finally, care of these patients has shifted to the post-anesthesia recovery room, making knowledge of the care of these patients in the early postoperative period essential for cardiac anesthesiologists and support staff.

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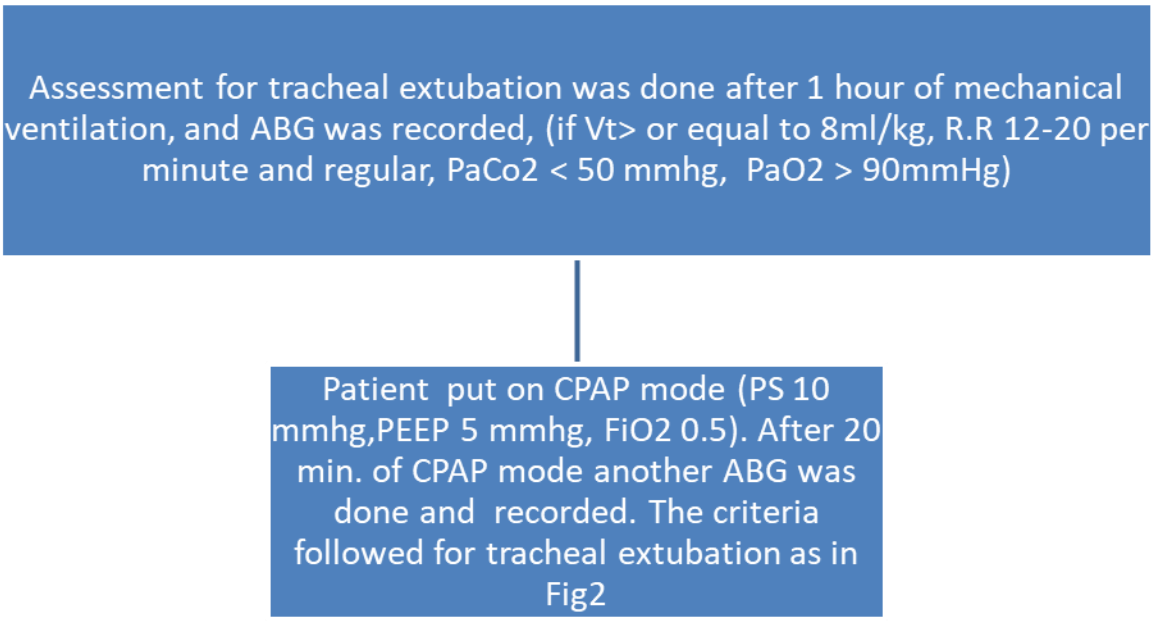
Table/Fig 1 Ventilation Protocol



Table/Fig 2 Criteria For Extubation

The criteria followed for tracheal extubation:-

1.Patient awake and following commands

2.Body temperature > 36.0 degree C

3.Haemodynamically stable (H.R < 100 bpm, MAP >70mmhg,stable cardiac rhythm)

4.Adequate oxygenation and ventilation.(PaO2 > 80mmhg,FiO2 < 0.5, R.R > 10 /min. but not > 30/min., PaCo2 < 50 mmhg

5.PH > 7.30

6.No excessive bleeding or collection in drains.

7.Urine output > 1ml/kg/hr.

8.Good muscle tone(hand grip present).

9.Good bilateral chest movement.

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Table/Fig 3 .Demographic Data

	Group A (n=60)	**Group B(n=40)**	**P Value**
Age years (Mean ± SD)	60.98 ± 8.35	57.46 ± 10.26	0.063*
SEX M : F	52:08	32:08:	
Weight(Mean ± SD)	65.58 ± 8.29	67.78 ± 9.44	0.218*
Duration of Surgery(Mean ± SD)	243.20 ± 46.28	247.80 ± 45.72	0.618*
Time taken for extubation (in minutes)	132.80 ± 7.84	1174.30 ± 65.79	<0.001*
Type Of Grafts			
LIMA + Venous Graft	**40(66.6%)**	**26(65%)**	
Only Venous graft	**20 (33.3%)**	**14(35%)**	

*Student's t test, LIMA - Left internal mammary artery graft

Table/Fig 4 : Morphine consumption and hospital stay duration.

	Group A	**Group** B	**P Value**
	Mean ± SD	**Mean ± SD**	
Rescue Analgesia (Morphine 0.05 Mg /Kg)	2.77 ± 1.19	3.05 ± 1.11	0.235*
Mean duration of hospital stay (in days	6.10 ± 0.89	9.84 ± 1.36	<0.001

*Student's t test

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Table/Fig 5 .Comparision of VAS between the two groups

Time of assessment after extubation	Group A	Group B	p value
	Mean ± SD	Mean ± SD	
20min	3.92 ± 0.63	4.04 ± 0.64	0.348
60 min	2.78 ± 0.55	2.7 ± 0.61	0.493
6hrs	2.46 ± 0.73	2.24 ± 0.72	0.133
12hrs	2.64 ± 0.63	2.3 ± 0.71	0.013
18hrs	2.26 ± 0.75	2.68 ± 0.59	0.002
24hrs	2.3 ± 0.76	1.9 ± 0.65	0.006