Predictors and Outcomes of Ultra-Fast Exubtation of Patients after Open Heart Surgeries

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Abstract
Ultra-Fast tracking exubtation in cardiac surgery is an accepted technique due to improvement in resource utilization. It is not associated with increased postoperative morbidity or mortality. Nevertheless, it significantly reduces costs and resource utilization. A retrospective study of 240 patients operated upon between Jan, 2016 and Jan, 2019. Patients were divided into two groups: Group A, provided ultra-fast-track exubtation (n = 120) and group B, provided conventional exubtation (n = 120). There was no significant difference between both groups as regard age and body weight. The type of operation and the degree of preoperative pulmonary hypertension were also not significantly different. The post-operative intensive care and hospital stay was significantly less in the fast-track group. Ultra-Fast tracking exubtation in cardiac surgery is an accepted technique due to improvement in resource utilization, decreased intensive care and hospital stay without increasing operative morbidity or mortality.

Keywords: Predictors and Outcomes of Ultra-fast Exubtation of Patients after Open Heart Surgeries.

1. Introduction
After open-heart surgeries, patients are directly transferred to the intensive care unit (ICU) and remain under careful control of experienced nurses, who are equipped with special knowledge and skills in managing and looking after such patients, until they recover consciousness and enjoy sufficient oxygenation and homodynamic.

Early exubtation of patients after open-heart surgery is supposed to have beneficial clinical effects besides economic advantages. Among these effects are comfort of patients, reduced respiratory complications, savings in costs, earlier return of patients to normal life, and easier engagement in activities (which in itself will prevent complications resulting from low mobility). It will be possible to decrease effectively the negative effects of positive pressure ventilation by reducing the period patients require for mechanical ventilation [2].

2. Patients and methods
This study was retrospective observational study. Data were collected from Cardiac Surgery Department data base. This research was intending to estimate the predictors& outcome of ultra-fast track exubtation (on the table or within 2 hours in the ICU) versus ordinary exubtation (after 6 hours in the ICU). Data collected for patients who underwent open heart surgeries from January 2016 until January 2019. The studied sample was 240 patients after open heart surgeries meeting the entry criteria of the study divided into 2 equal groups, based on time of exubtation, calculated from the moment the patient entered the ICU until the exubtation time:

* ultra-fast exubtation (On table or Within 2 hours in ICU).
* Ordinary exubtation (After 6 hours in ICU).

The patients excluded were Patients with EF less than 50%, Patients with severe pulmonary hypertension, Patients with complex cardiac disease, Adults patients requiring more than single valve replacement, Previous open heart surgeries, Patients who will return to the operating room for any reason (such as bleeding) and Patients who will need cardiopulmonary resuscitation after surgery.

The surgery of the studied sample was not urgent, and they had no previous open-heart surgery. The patients underwent the same protocols of anaesthesia, cardioplegia, and medications before surgery. In all of them, surgery had been performed through median sternotomy using cardiopulmonary bypass pumps. Their temperatures had been lowered to 32°C during CPB and cold Ringer’s solution used for cardioplegy. At the completion of surgery, patients had been immediately transferred to ICU and attached to volumetric ventilators with the identical specifications of intermittent mandatory ventilation, 10-12 breaths/min, tidal volume of 10 cc/kg, and 100% FiO2. Nurses looking after patients provided all postoperative care under the supervision of charge nurses. After the patients woke up, they were extubated if they met all the standard clinical exubtation criteria.

3. Results
There was non-significant value as regarding demographic characteristics between 2 groups.

Analysis of the association of sex between groups using Pearson chi-square test, in group 1 (UFTE) there were 82 males (68.3%) & 38 females (31.7%) while in group 2 (conventional group) there were 80 males (66.7%) & 40 females (33.3%) with P value 0.7 (non-significant) Table (1).

The independant t-test was used to characterize the sample and to analyze the variables of body weight of the studied groups giving P value 0.06 (table 2). Body weight in group 1 (UFTE) was ranging from 15 to 40 kg with mean value 22.21 and 17.26 standard deviation. Body weight in group 2 (conventional group) was ranging
from 17 to 44 kg with mean value 17.98 and 16.82 standard deviation. The age of UFTE group was ranging from 0.8 year to 42 years with mean value 6.94 years and 8.84 SD. The age of convenial group was ranging from 0.7 year to 42 years with mean value 5.36 years and 8.95 SD.

Table (1) is showing Comparison between the studied groups as regard demographic characteristics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (no.=120)</th>
<th>Group 2 (no.=120)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>82</td>
<td>68.3</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>38</td>
<td>31.7</td>
<td>40</td>
</tr>
<tr>
<td>Age (years)</td>
<td>Mean ±SD</td>
<td>6.94 ± 8.84</td>
<td>5.36 ± 8.95</td>
<td>Independent t-test</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(0.8 - 42)</td>
<td>(0.7 - 42)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>4</td>
<td>2</td>
<td>t=1.37</td>
</tr>
<tr>
<td>Body Weight</td>
<td>Mean ±SD</td>
<td>22.21 ± 17.26</td>
<td>17.98 ± 18.62</td>
<td>Independent t-test</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>6.5 - 68</td>
<td>7 - 72</td>
<td>t=1.9</td>
</tr>
</tbody>
</table>

The independent t-test was used to characterize the sample and to analyze the association of extubation time with ICU stay of the studied groups giving P value 0.01 (table 3), highly significant value.

The patients who underwent ordinary extubation; group 2 were longer in ICU stay in time ranging from 26 hours to 380 hours with mean value 81.6 hours and 70.2 standard deviation.

Patients who underwent UFTE in group 1 group 2 were shorter in ICU stay in time ranging from 26 hours to 280 hours with mean value 54.9 hours and 43.4 standard deviation.

Table (2) Comparison between the studied groups as regard CBP & Ish. Time.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (no.=120)</th>
<th>Group 2 (no.=120)</th>
<th>Independent t-test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>Range</td>
<td>Mean ± SD</td>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>CBP</td>
<td>67.9±18.37</td>
<td>32 - 150</td>
<td>67.75±18.64</td>
<td>32 - 105</td>
</tr>
<tr>
<td>Ischaemic Time</td>
<td>42.02±19.57</td>
<td>0 - 85</td>
<td>42.53±19.57</td>
<td>0 - 85</td>
</tr>
</tbody>
</table>

The independent t-test was used to characterize the sample and to analyze the association of extubation time with hospital stay of the studied groups giving P value 0.03 (table 3), significant value.

As regarding hospital stay; group 2 (convenial group) was longer than group 1 (ultra-fast track extub. group) in the period of hospital admission.

Group 1, ultra-fast track extubation group was hospitalized in a range from 5 to 12 days with mean value 6.85 days with 1.4 standard deviation.

Group 2, convenial group was hospitalized in a range from 5 to 18 days with mean value 7.43 days with 2.65 standard deviation.

Table (3) Comparison between the studied groups as regard ICU stay and hospital stay.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (no.=120)</th>
<th>Group 2 (no.=120)</th>
<th>Test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ±SD</td>
<td>Range</td>
<td>Mean ±SD</td>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>ICU stay</td>
<td>54.9 ± 43.4</td>
<td>26 – 280</td>
<td>81.6 ± 70.2</td>
<td>26 - 380</td>
</tr>
<tr>
<td></td>
<td>t= - 3.52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital stay</td>
<td>6.85±1.4</td>
<td>5 – 12</td>
<td>7.43±2.65</td>
<td>5 – 18</td>
</tr>
</tbody>
</table>

Analysis of the association of extubation timing and mortality rate between groups using Pearson chi-square test gave non-significant P value 0.7 Table (4).
Group 1; ultra-fast track extubation group had mortality rate 4.2% as 5 patients died from 120 patients.
Group 2; convetional group had mortality rate 5% as 6 patients died from 120 patients.

Table (4) Comparison between the studied groups as regard mortality.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (no.=120)</th>
<th>Group 2 (no.=120)</th>
<th>Pearson chi square test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>4.2</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>No</td>
<td>115</td>
<td>95.8</td>
<td>114</td>
<td>95</td>
</tr>
</tbody>
</table>

4. Discussion
In the current study, there was a significant reduction in mean (SD) length of ICU stay between the UFTA and the conventional group, 54.9 (18.62) hours and 81.4 (33.58) hours respectively (p-value <0.001).

This is consistent with [5] which revealed that they found that early extubation was associated with a shorter ICU and total hospital stay, without differences in rates of tracheotomy or reintubation. These findings suggest that in our patient demographic, fast track post-operative management is both safe and effective [3].

Similar findings have been previously reported in [8] which revealed that the implementation of UFTA protocol appears to be feasible and safe. It has led to significant reduction in the length of ICU stay of adult patients undergoing elective cardiac surgical operations [4].

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. This is consistent with [5] attributing the high costs of these surgeries to the lengthy period of mechanical ventilation, which requires a long stay in the ICU, and they believe moderating these two factors will make it possible to control the costs and prevent complications resulting from long ventilation periods and lengthy stay in the ICU while in their study; [2] which revealed that OR time is the most expensive direct variable cost of CABG surgery [5], [6].

In our study there was no significant value with demographic data & BMI therefore according to our study ultrafast tracking is not significantly affected by age, sex&BMI while in study conducted by [5] which revealed that age is one of the variables related to the duration of mechanical ventilation in coronary artery bypass surgery. Therefore, nurses should exercise greater care and caution when deciding on extubation time for old patients [5].

S. Bansal et al., [3] reported two preoperative variables (increased age and female gender) and four postoperative variables (usage of intra-aortic balloon pump, inotropes, excessive bleeding, and atrial arrhythmia) to be associated with delayed extubation. Furthermore, it is to be stated that “every patient who is free of those predictors is a potential candidate for UFTA until proven otherwise [7].

Absence of sever pulmonary HTN in ultrafast tracking sample was not statistically significant while in study by [2] which revealed that absence of severe PHT found to be associated with early extubation and were statistically significant [8].

Once ultra-fast tracking in our study playing an important role in reducing ICU stay there were increasing rate of icu readmission with ultra-fast tracking compared to group of ordinary extubation which required close observation of hemodynamics this is consistent with studies argued against ultra-fast tracking; [2] which revealed that 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 [6].

This study revealed no statistical significance between 2 groups in mortality rate but there significant difference as regard ventilator related complication that affected only the ordinary group.

5. 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.

References
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