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Tracheostomy for weaning prolonged mechanical ventilation in adult post cardiac surgical patients

Aly Makram Habib [a, b, c, *], Makhlouf Belghith [b]

[a] Cardiac Surgical Intensive Care Unit (CSICU), Heart Center, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia
[b] Prince Sultan Cardiac Center, Riyadh, Saudi Arabia
[c] Department of Critical Care Medicine, Faculty of Medicine, Cairo University, Cairo, Egypt

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ABSTRACT

Background: This is a retrospective observational study to show the role of tracheostomy in liberation of mechanical ventilation in adult post cardiac surgery.

Methods: Between January 2009 and December 2013, all post cardiac surgical patients who were ventilated for ≥7 days were allocated into: group (T) who had tracheostomy or group (PI) who did not have tracheostomy. Both groups were compared for ventilator free days at 30 (VFD-30) and 60 days (VFD-60) post Cardiac Surgical Intensive Care Unit (CSICU) admission, Length of Stay (LOS), and mortality.

Results: VFD-30 and VFD-60 were statistically significant higher in (PI) group compared to (T) group (7.5 ± 9.2 vs.0.9 ± 3.3, $P = 0.000$) and (22.3 ± 23.8 vs. 6.7 ± 13.3, $P = 0.007$) respectively. Comparing VFD at 30 and 60 days post tracheostomy (VFD-30T and VFD-60T) in (T) group to VFD at 30 and 60 days after admission in (PI) group, no difference was found (6.9 ± 8.9 vs. 7.5 ± 9.2, $P = 0.8$) and (29 ± 22.6 vs. 22.3 ± 23.8, $P = 0.5$) respectively. CSICU LOS was statistically significant higher in the (T) group compared to the (PI) group (71.6 ± 61.2 vs. 30.3 ± 35.6, $P = 0.04$). The hospital LOS and CSICU mortality, were not different between the 2 groups.

Conclusions: Tracheostomy for post cardiac surgery patients with prolonged mechanical ventilation did not improve VFD or CSICU LOS in our institute.

Abbreviations: APTT, Activated partial thromboplatin time; ARDS, Acute respiratory distress syndrome; CABG, Coronary Artery Bypass Grafting; COPD, Chronic Obstructive Pulmonary disease; CRRT, Continuous Renal replacement therapy; CSICU, Cardiac Surgical Intensive Care Unit; CVA, Cerebrovascular accidents; ECMO, Extracorporeal membrane oxygenation; ET, Early Tracheostomy; Euro-SCORE II, European System for Cardiac Operative Risk Evaluation II; GIT, Gastrointestinal Tract; Hb, hemoglobin; IHD, Ischemic heart disease; INR, International Normalized ratio; LOS, Length of Stay; LT, Late Tracheostomy; LVEF, Left Ventricular Ejection Fraction; MCS, Mechanical Circulatory Support; MV, Mechanical Ventilation; MV-T0, Days on MV after Tracheostomy till weaning; OR, Operating Room; PI, Prolonged intubation group; PT, Pro-thrombin time; RRT, Renal Replacement Therapy; T, Tracheostomy group; T-0, Days on MV from admission till tracheostomy; TIA, Transient Ischemic Attack; TPN, Total parenteral nutrition; VAD, Ventricular Assist device; VFD- 3, Ventilator Free days at day 30 post admission to CSICU; VFD (30-T), Ventilator free days at day 30 post tracheostomy time; WB, White blood counts.

* Corresponding author. Prince Sultan Military Medical City (PSMMC), Prince Sultan Cardiac Center (PSCC), Building 6, Intensive Care Department, 1st floor, Adult Cardiac Intensive Care Unit (ACICU), P.O. Box 7897- X966, Riyadh 11159, Saudi Arabia.
E-mail address: ahabib@pscc.med.sa (A.M. Habib).

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1. Introduction

Pulmonary complications and long mechanical ventilation (MV) are becoming more frequent after cardiac surgery. Although attributed early to interaction with cardiopulmonary bypass (CPB) [1]. Pleural effusions, atelectasis or phrenic palsy can also cause decrease in lung capacity [2]. In addition to poorer risk profiles and comorbid conditions that frequently shown in current cardiac patients [3].

Tracheostomy is a commonly performed procedure in CSICU to replace endotracheal tube for prolonged MV [4]. The suggested benefits of tracheostomy arise from decrease airway resistance, preservation of cough, improving oral hygiene, less sedative administration, and fewer pulmonary infections. This can lead to improvement of patient's comfort and weaning of MV [5,6].

Tracheostomy is not without complications. Bleeding, esophageal injury, perforation, pneumothorax, tracheal stenosis, or even death could happen. Sternal wound infection is of great concern when performing tracheostomy in post cardiac surgical patients [7].

Indications, techniques and timing of tracheostomy remain debatable and somehow subjective among physicians across CSICUs [8,9].

We aimed at this work to show the role of tracheostomy on the weaning in patients with long MV after cardiac surgery in our institution.

2. Patients and methods

The study was conducted in CSICU, (24 beds), King Faisal Heart Center, King Faisal Specialist Hospital and Research Center, Riyadh, Saudia Arabia.

2.1. Patients

Retrospectively, the medical charts of all adult patients who had undergone CABG surgery between January 2009 till December 2013 were screened using the heart center APOLLO data-base to identify those who had continuous non-interrupted MV for 7 or more days starting in cardiac surgical operating room (OR). Patients <18 years; pregnant women; those with preoperative intubation were excluded.

The included patients were then allocated into two groups: Group 1: Tracheostomy (T) group and Group 2: Prolonged intubation (PI) group. The study protocol was approved by institutional research center and ethics committee. Being retrospective chart review study, consent was waived by the ethical committee RAC # 2111002.

2.2. Ventilation and weaning off MV in CSICU

Patients were transferred from the operating room (OR) to the CSICU on positive pressure MV with a tidal volume of 6–8 mL/kg, positive end expiratory pressure (PEEP) of 5 cmH_2O, and fraction of inspired oxygen (FIO_2) that keeps arterial oxygen saturation (SaO_2) above 94%. In CSICU, hemodynamics were monitored hourly. Levels of serum, troponin, electrolytes and bilirubin were measured once daily. Blood gases (arterial and venous) and lactate were measured hourly in the first 6 h then every 2–4 h till extubation then twice daily till CSICU discharge.

After complete recovery from anesthesia and sedation, absence of significant bleeding, hemodynamic stability, and adequate blood gas values, weaning process could be started. The weaning protocol started with decrease in rate of mandatory breathing supplied by the ventilator till rate of 8–10 then switched to pressure-support ventilation at a level that achieve comfortable breathing for the patient. Then, the level of pressure support ventilation was decreased gradually until $\leq$10 cm H_2O, where extubation could be done. Spontaneous breathing trials were rarely used in selected patients. Patients were considered successfully weaned when they stay for 24 h with no recurrent need for mechanical ventilation.

For weaning after tracheotomy, we followed the same protocol until the pressure support level was $\leq$ 10 cm H2O and the positive end-expiratory pressure was $\leq$ 5 cm H2O when we could start with spontaneous breathing trials. We connected patients to a T-piece with 50% oxygen in humidified air applied. We started with two 2-h spontaneous breathing periods per day and then increased duration steadily. In case of desaturation, rapid shallow breathing, or signs of fatigue, patient was reconnected to MV with the last support before and a new trial was started later. Hemodynamic instability was a contra-indication to start spontaneous breathing trial.

2.3. Base line assessment and data collection

Demographic and data needed to calculate the Euro-SCORE II (European System for Cardiac Operative Risk Evaluation II) [10] were obtained for each patient.

Operative data included: type of surgical procedure, cardiopulmonary bypass (CPB), aortic cross clamping, and circulatory arrest times. Laboratory values on CSICU admission included hemoglobin, prothrombin time (PT), activated partial thromboplastin time (aPTT), international normalized ratio (INR), creatinine level, electrolyte levels, bilirubin level, white cell count and platelets count.

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