Short Editorial

Mechanical Ventilation: Friend or Foe in Cardiac Surgery?

Felipe Saddy

Hospital Pró-Cardiaco, Rio de Janeiro, RJ – Brazil

Editorial referring to the article: Mechanical Ventilation Time and Mortality After Coronary Artery Bypass Grafting: A Cohort Study

In this number of the journal, the study "Mechanical ventilation time and mortality after coronary artery bypass grafting: A cohort study"[1] evaluated retrospectively 110 patients of a single center, who had no previous lung or kidney disease, submitted to elective open bypass surgery between January 2018 and February 2020. Their aim was to evaluate the impact of mechanical ventilation (MV) on mortality using multivariate analysis of MV time, age, sex and cardiopulmonary bypass (CPB) time. The patients were divided into two groups: patients who needed more than eight hours on MV and those who needed less than eight hours on MV. There was no difference in weaning protocol or in demographic data except for CPB bypass time: 90 ± 12 minutes in the first group (less than eight hours on MV) and 112 ± 16 minutes in the second group (more than eight hours on MV) ($p = 0.03$). In the univariate analysis, MV time was associated with mortality (HR 0.7 (0.3-0.9), $p = 0.01$). The authors concluded that MV time longer than eight hours was a predictor of mortality after cardiac surgery.

I wish things could be simple in intensive care, however it is not. Let's have a deeper approach and make a fair judgement if MV is the real foe. Let's begin from the beginning: MV is a key part of advanced life support that may directly interfere with patient's prognosis, for good and for bad. This is not only because of the duration of MV, but also why and how it is used. First, we must evaluate patient's characteristics:[2] gender, age, body mass index, frailty, EuroSCORE,[3] transfusion, immunosuppression, previous lung disease (which was excluded in the present study), extravascular lung water (to determine lung edema) and both local (bronchoalveolar lavage) and systemic mediators of inflammatory response. Genetics also play an important role and it is worthwhile to mention that CPB, MV (alveolar pressure and/or mechanical distension), transfusion, sepsis, shock and trauma may increase the risk for lung injury.

From the perspective of the cardiac surgery patient, Fernandez-Zamora et al.[4] studied 3,588 adult patients submitted to cardiac surgery and found that prolonged MV (>24 hours) was required by 11.6% of patients, with an intensive care unit (ICU) mortality of 44.3%. Prolonged MV was required by 4.5% of subjects with EuroSCORE < 5, 11.2% with a score of 5-7, 27.2% with a score of 8-10, and 32.2% with a score > 10. These data support that previous factors, related to the patient, may influence the dependence on MV during the postoperative period and its outcome.

Concerning MV, we should analyze the transfer of patients from the operating room (OR) to the ICU to optimize MV parameters and promote a safe transfer. These parameters include ventilator settings like tidal volume, inspiratory flow, peak inspiratory pressure, plateau pressure, respiratory rate, positive end expiratory pressure (PEEP), auto-PEEP and oxygen inspiratory fraction and are intrinsically related to outcome.[5] There are also derivative parameters like driving pressure[6] transpulmonary pressure and mechanical power,[7] which have direct implications on mortality. This is a continuum of supportive treatment, which ends with the assessment of spontaneous ventilation, level of support, work of breathing, synchrony, absence of pendelluft, level of consciousness (sedation), muscle strength (and level of muscle atrophy) and upper airway permeability to proceed to extubation.[8]

In conclusion, cardiac surgery patients are complex, who should be closely monitored during the transfer from the OR to the ICU. By optimizing the ventilator settings based on patients' individual characteristics, we may interfere positively in patient's prognosis. Simplistic approaches are not recommended, and further studies are needed to answer open questions, such as how to prevent and how to identify patients who will require prolonged ventilation, and how we can improve the outcomes after cardiac surgery. The real foe is the unknown.

Keywords

Artificial Respiration; Acute Lung Injury; Cardiac Surgical Procedures.

Mailing Address: Felipe Saddy •
Hospital Pró-Cardiaco. Rua General Polidoro, 192. Postal code: 22280-003. Botafogo, Rio de Janeiro, RJ – Brazil
E-mail: fsaddy@gmail.com

DOI: https://doi.org/10.36660/ijcs.20250048

References

1. Dezidério TLA, Cordeiro ALL, Silva VO, Macedo VN. Mechanical Ventilation Time and Mortality after Coronary Artery Bypass Grafting: A Cohort Study. Int J Cardiovasc Sci. 2025;38:e20240236. doi: 10.36660/ijcs.20240236.
2. Grasselli G, Calfee CS, Camporota L, Poole D, Amato MBP, Antonelli M, et al. ESICM Guidelines on Acute Respiratory Distress Syndrome: Definition, Phenotyping and Respiratory Support Strategies. Intensive Care Med. 2023;49(7):727-59. doi: 10.1007/s00134-023-07050-7.
3. Nashef SA, Roques F, Michel P, Gauducheau E, Lemeshow S, Salamon R. European System for Cardiac Operative Risk Evaluation (EuroSCORE). Eur J Cardiothorac Surg. 1999;16(1):9-13. doi: 10.1016/s1010-7940(99)00134-7.
4. Fernandez-Zamora MD, Gordillo-Brenes A, Banderas-Bravo E, Arboleda-Sánchez JA, Hinojosa-Pérez R, Aguilar-Alonso E, et al. Prolonged Mechanical Ventilation as a Predictor of Mortality after Cardiac Surgery. Respir Care. 2018;63(5):550-7. doi: 10.4187/respcare.04915.
5. Slutsky AS, Ranieri VM. Ventilator-Induced Lung Injury. N Engl J Med. 2013;369(22):2126-36. doi: 10.1056/NEJMra1208707.
6. Amato MB, Meade MO, Slutsky AS, Brochard L, Costa EL, Schoenfeld DA, et al. Driving Pressure and Survival in the Acute Respiratory Distress Syndrome. N Engl J Med. 2015;372(8):747-55. doi: 10.1056/NEJMsa1410639.
7. Gattinoni L, Collino F, Camporota L. Mechanical Power: Meaning, Uses and Limitations. Intensive Care Med. 2023;49(4):465-7. doi: 10.1007/s00134-023-06991-3.
8. Saddy F, Sutherasan Y, Rocco PR, Pelosi P. Ventilator-Associated Lung Injury During Assisted Mechanical Ventilation. Semin Respir Crit Care Med. 2014;35(4):409-17. doi: 10.1055/s-0034-1382153.