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Do Initial Tidal Volumes Impact ARDS Development in Patients Intubated in the Emergency Room?

Antonio F. Saad $^1$, Dirk M. Maybauer$^2$ and Marc O. Maybauer $^{2,3,*}$

$^1$ Department of Anesthesiology, Surgical Critical Care, and Maternal Fetal Medicine, University of Texas Medical Branch at Galveston, USA

$^2$ Department of Anaesthesiology and Intensive Care, Philipps University, Marburg, Germany

$^3$ Critical Care Research Group, University of Queensland, Brisbane, Australia

* Corresponding author: m.maybauer@uq.edu.au

In the current issue of the Journal of Critical Care, a retrospective study reports that patients intubated and ventilated in the emergency department (ED) are at high risk of acute respiratory distress syndrome (ARDS). This study included 182 eligible patients, from which 34 met the Berlin criteria (1) for ARDS within 48hrs of intubation. The authors report that intubated patients in the ED had received initial tidal volumes ($V_T$) of 1.5 ml/kg predicted body weight higher than the recommended standard of care of 4-6 ml/kg (2). The study later concluded that the majority of these patients had developed ARDS within 48 hours after intubation in the ED.

Being a small, retrospective and descriptive study, the authors fail to investigate the clinical impact of such small increases in $V_T$ on ventilator adverse events or survival. It is well known from the ARDS NET trial, that $V_T$ greater than 10 ml/kg is not beneficial and harmful during ventilatory support of ARDS patients. The conclusion of the present study that small initial incremental increase in $V_T$ as low as 1 ml/kg can lead to worse outcomes or ventilator induced lung injury (VILI) or ARDS is highly debatable, and not supported by well-designed prospective
randomized trials. One should keep in mind that in the ARDS NET trial, the initial $V_T$ was 8ml/kg and then reduced by 1ml/kg to goal $V_T$ of 6ml/kg. Despite the emphasis by the ARDS NET trial of keeping plateau pressures ($P_{Plat}$) < 30cm H$_2$O, the authors don't describe what $P_{Plat}$ were used in their trial. In addition, the study does not account for preexisting confounding risk factors that can lead to ARDS.

In the ED setting, community acquired pneumonia, sepsis, trauma, and transfusion related lung injury (TRALI) are common etiologies of respiratory failure requiring ventilator support, that may ultimately lead to ARDS (3,4). Whereas in the intensive care unit, ventilator-associated pneumonia (VAP) should be considered (5,6). VAP is associated with increased mortality, morbidity and health costs (7), hence a tiered surveillance definition of ventilatory adverse events was recently described (8). Based on the task force recommendations, VAP is likely when respiratory deterioration was accompanied with fever, elevated white count, new antibiotic regimen, positive cultures and purulent secretions. The possibility of VAP was not accounted for, nor described in the reported study. Interestingly, the incidence of ARDS in the study coincided with the reported VAP incidence of 10-20% (9). Did these patients develop VAP? Did these patients have positive blood or sputum cultures? These important confounding variables should have been considered in the trial. Moreover, comorbid conditions that might have affected $V_T$ selection in the ED were not accounted for; for example, physicians might have chosen lower tidal volumes for patients with asthma or chronic obstructive pulmonary disease to avoid auto-peep or higher tidal volumes for head trauma patients they wanted to hyperventilate. In addition, brain natriuretic peptide data and echocardiography were not available for cases that required intubation secondary to worsening cardiogenic pulmonary edema.
The authors’ concluded that the majority of patients intubated in the ED, subsequently developed ARDS because they had tidal volume settings 80 mL higher (1.5 mL/kg) than the recommended 6 mL/kg of PBW. This conclusion is based on low quality evidence due to the study’s low power, unaccounted confounding variables and pre-existing risk factors. A myriad of potential co-morbidities may have caused ARDS in these patients. A sole comparison of $V_T$ settings and not considering patients’ history, co-morbidities, or the indication for intubation, questions the strong conclusion of this manuscript. In our opinion, the scientific evidence for appropriate ventilation in the ED remains unknown. Lung protective strategies should be implemented as soon as ventilator support is initiated while taking into account the patient’s clinical presentation and co-morbidities. Future, well designed, studies are needed to elucidate which ventilation strategy is optimal in ED patients suffering from neuro trauma, heart failure or asthma.

References


