

Abstract

Introduction: Since its initial description lung protective strategy using tidal volumes of less than or equal to 6 ml/kg predicted body weight, with high respiratory rates and maintaining plateau pressures less than or equal to 30 cmH₂O has been the standard ventilator management for ALI/ARDS patients, where a large number of randomized controlled clinical trials have proven it to reduce the mortality rates.

Airway pressure release ventilation (APRV) has been successfully used in neonatal, pediatric, and adult forms of respiratory failure. Experimental and clinical use of APRV has been shown to facilitate spontaneous breathing and is associated with decreased peak airway pressure and improved oxygenation¹.

Methods: Our study was conducted on twenty patients admitted in the Critical Care Department, Cairo University Hospital with proven diagnosis of ALI/ARDS, who were ventilated sequentially for twelve hours using Volume Control – Assisted Controlled mechanical ventilation with lung protective strategy settings and Airway pressure release ventilation. Every three hours haemodynamic variables, arterial blood gases, lung mechanics and need for sedation were assessed. Aiming to compare and evaluate the two modes as regards haemodynamic effects, impact on arterial blood gases, need for sedation and the effects on respiratory mechanics.

Results: We did not demonstrate any significant change in the haemodynamic variables (heart rate, mean blood pressure, central venous pressure, and pulmonary capillary wedge pressure) between both modes of ventilation. (p-value>0.05) Partial pressure of carbon dioxide, acid-base status, and serum bicarbonate level did not change significantly between the two modes of mechanical ventilation (p-value>0.05), there was a significant decrease in partial pressure of oxygen with APRV compared to twelve hours of controlled mechanical ventilation with lung protective strategy with a 21.3% reduction (CMV 166.1±46.3, APRV 130.8±47.9) p-value 0.046, there was a highly significant 20.1% reduction in Hypoxic Index after twelve hours of APRV following twelve hours of CMV (CMV 275±80.7, APRV 219.9±86.8) p-value 0.001, there was a significant increase in respiratory rate and minute ventilation by 29.3% and 26.7% respectively during the twelve hours of APRV compared to twelve hours of CMV with respiratory rate increase from 21.5±6.9 with CMV to 27.8±6.2 APRV, p-value 0.007. There was no significant changes in dynamic compliance between both modes of ventilation (53±25.8 CMV, 52.9±26.9 APRV) p-value > 0.718. Highly significant decrease of 38.9% in peak airway pressure was noted during ventilation with APRV compared to CMV, (APRV 19.8±4, 32.4±6.7 CMV), p-value 0.0001, Associated with that there was also a highly significant 19% decrease in mean airway pressure during ventilation with APRV compared to CMV with lung protective strategy (CMV 18.9±3.7, APRV 15.3±3.3), p-value 0.0001. The need for sedation by propofol during the twelve hour period of APRV significantly decreased by 56.2% compared to the twelve hours of application of lung protective ventilation using CMV, where the dosage of propofol decreased from 1.6±0.5mg/kg/hr with CMV to 0.7±0.8mg/kg/hr with APRV, p-value 0.0001

Conclusion: APRV can be used safely as one of the optimum ventilatory strategies in patients with ALI/ARDS as it decreases airway pressures significantly and decreases the need for sedation while maintaining adequate oxygenation without altering haemodynamics.

Key Words: Airway pressure release ventilation (APRV), Acute lung injury (ALI), Acute respiratory distress syndrome (ARDS), Assisted volume control mechanical ventilation (VC-CMV)