

# Low Spontaneous Breathing Effort during Extracorporeal Membrane Oxygenation in a Porcine Model of Severe Acute Respiratory Distress Syndrome

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## Abstract

Background: A lung rest strategy is recommended during extracorporeal membrane oxygenation in severe acute respiratory distress syndrome (ARDS). However, spontaneous breathing modes are frequently used in this context. The impact of this approach may depend on the intensity of breathing efforts. The authors aimed to determine whether a low spontaneous breathing effort strategy increases lung injury, compared to a controlled near-apneic ventilation, in a porcine severe ARDS model assisted by extracorporeal membrane oxygenation. Methods: Twelve female pigs were subjected to lung injury by repeated lavages, followed by 2-h injurious ventilation. Thereafter, animals were connected to venovenous extracorporeal membrane oxygenation and during the first 3 h, ventilated with near-apneic ventilation (positive end-expiratory pressure, 10 cm H<sub>2</sub>O; driving pressure, 10 cm H<sub>2</sub>O; respiratory rate, 5/min). Then, animals were allocated into (1) near-apneic ventilation, which continued with the previous ventilatory settings; and (2) spontaneous breathing: neuromuscular blockers were stopped, sweep gas flow was decreased until regaining spontaneous efforts, and ventilation was switched to pressure support mode (pressure support, 10 cm H<sub>2</sub>O; positive end-expiratory pressure, 10 cm H<sub>2</sub>O). In both groups, sweep gas flow was adjusted to keep Paco<sub>2</sub> between 30 and 50 mmHg. Respiratory and hemodynamic as well as electric impedance tomography data were collected. After 24 h, animals were euthanized and lungs extracted for histologic tissue analysis. Results: Compared to near-apneic group, the spontaneous

breathing group exhibited a higher respiratory rate (52 +/- 17vs.5 +/- 0 breaths/min; mean difference, 47; 95% CI, 34 to 59;P< 0.001), but similar tidal volume (2.3 +/- 0.8vs.2.8 +/- 0.4 ml/kg; mean difference, 0.6; 95% CI, -0.4 to 1.4;P= 0.983). Extracorporeal membrane oxygenation settings and gas exchange were similar between groups. Dorsal ventilation was higher in the spontaneous breathing group. No differences were observed regarding histologic lung injury. Conclusions: In an animal model of severe ARDS supported with extracorporeal membrane oxygenation, spontaneous breathing characterized by low-intensity efforts, high respiratory rates, and very low tidal volumes did not result in increased lung injury compared to controlled near-apneic ventilation.

## Palabras clave

**KeyWords Plus:**[ACUTE LUNG INJURY](#); [LOW TIDAL VOLUME](#); [MECHANICAL VENTILATION](#); [SUPPORT](#); [MORTALITY](#); [EVOLUTION](#); [WEAKNESS](#); [ATROPHY](#); [DISUSE](#)

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