EFFECT OF MECHANICAL VENTILATION ON REGIONAL VENTILATION DISTRIBUTION AND RESPIRATORY MECHANICS

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Mechanical ventilation is a vital supportive measure, which allows maintaining alveolar ventilation and blood oxygenation both in routine anesthesia and in the care of the critically ill patient. However, mechanical stresses during positive pressure ventilation may cause injuries in the lungs and therefore increase mortality in mechanically-ventilated patients. It is not well known how ventilation modes might affect the regional distribution of ventilation, particularly within the injured lung.

In this study, we compared respiratory mechanics, lung aeration and regional specific ventilation distributions in healthy and injured lungs. Anaesthetized rabbits were ventilated with equal minute ventilation either with pressure regulated volume control mode (PRVC) with a decelerating inspiratory flow, or with volume control (VC) mode. Lung injury was caused by whole-lung bronchoalveolar lavage.

Synchrotron radiation computed tomography and K-edge subtraction method was used to measure regional lung aeration and specific ventilation during stable xenon wash-in [1]. Airway respiratory tissue mechanics were measured by low-frequency forced oscillations.

Lung lavage significantly elevated tracheal pressure ($p<0.001$), but less in PRVC compared to VC mode ($-14.0\pm1.7\%$, $p<0.001$). No significant differences in respiratory mechanics, regional ventilation distribution, strain or blood oxygenation could be detected between the 2 ventilation modes.

Our data suggest that PRVC mode produces smaller mechanical stress to the lungs and therefore causes less likely ventilator-induced injuries in the lungs during mechanical ventilation.

[1] Porra et al. Crit Care Med. 2011 Jul;39(7):1731-8.