

# Mechanical power and ventilator-induced lung injury: role of tidal volume, respiratory rate and PEEP

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Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

**Razionale:** Mechanical power is the amount of energy delivered over time from the ventilator to the lungs and it depends on tidal volume, driving pressure, flow, respiratory rate and PEEP. Each component of the mechanical power can cause lung damage, when the other components are held constant. A similar mechanical power, delivered with different combinations of its components, should determine a similar lung damage.

**Methods:** Forty-two healthy piglets,  $24,2 \pm 2$  Kg, were mechanically ventilated for 48 hours in prone position with a similar mechanical power, delivered by primarily increasing tidal volume (TV), respiratory rate (RR) or PEEP. The ventilation was set as follow:

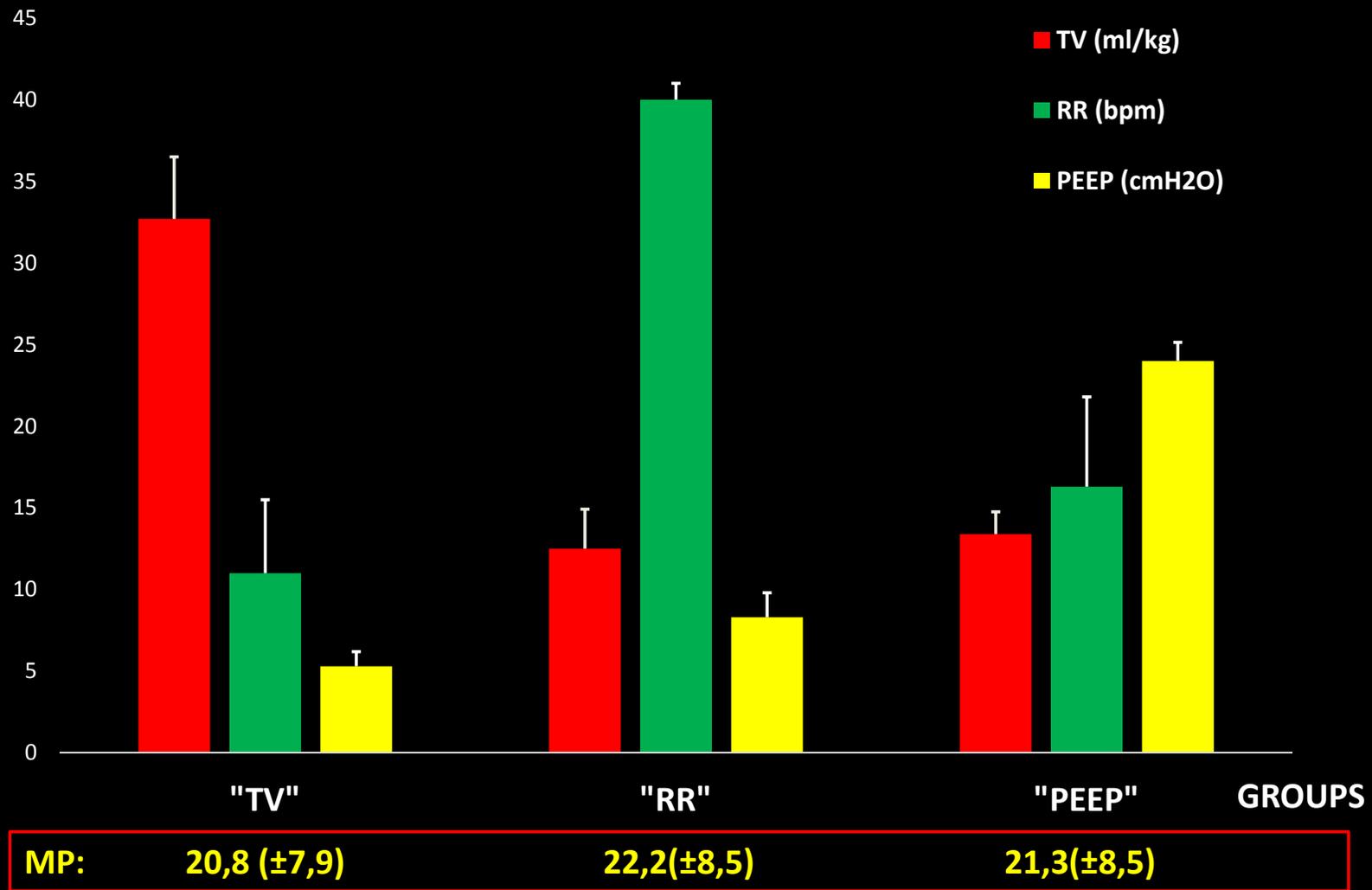
- High TV group (14 pigs): TV  $803 \pm 122$  ml/min, RR  $11 \pm 4,5$ , PEEP  $5,3 \pm 0,8$  cmH<sub>2</sub>O, mechanical power  $20,8 \pm 7,9$  J/min
- High RR group (14 pigs): TV  $299 \pm 61$  ml/min, RR  $40 \pm 1$ , PEEP  $8,3 \pm 1,5$  cmH<sub>2</sub>O, mechanical power  $22,2 \pm 8,5$  J/min
- High PEEP group (14 pigs): TV  $319 \pm 21$  ml/min, RR  $16,3 \pm 5,5$ , PEEP  $24 \pm 1,1$  cmH<sub>2</sub>O, mechanical power  $21,3 \pm 8,5$  J/min

Ventilator-induced lung injury was assessed via the analysis of lung weight, wet-to-dry ratio and mechanical, hemodynamic and gas exchange variables.

**Results:** Mortality in the high TV group was 3/14 pigs, 0/14 in the high RR group and 5/14 in the high PEEP group. Lung weight was  $649,6 \pm 156,4$  g in the high TV group,  $567,2 \pm 133,7$  g in the high RR group and  $633 \pm 131,8$  g in the high PEEP group. Wet-to-dry ratio of the lung was  $7,4 \pm 1,5$  for the high TV group,  $6,7 \pm 0,6$  for the high RR group,  $6,7 \pm 0,7$  for the high PEEP group. These variables were not statistically different among the groups.

**Conclusions:** In an animal experimental model, delivering a similar mechanical power at different tidal volume, respiratory rate and PEEP combinations determines similar lung damage, as assessed by wet-to-dry ratio and lung weight.

## VENTILATOR SETTING



# MECHANICAL POWER, LUNG WEIGHT AND WET-TO-DRY

