

POSITIVE END EXPIRATORY PRESSURE AND MECHANICAL POWER: NEW PERSPECTIVES ON VENTILATOR INDUCED LUNG INJURY

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Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

Razionale

Positive-end-expiratory-pressure (PEEP) is usually considered protective against the ventilator-induced-lung-injury (VILI). However, PEEP, together with tidal volume (TV), respiratory rate (RR) and flow (F), is a component of the mechanical power (MP) delivered to the lung and therefore it may favor, instead of preventing, lung damage. We tested this hypothesis in an experimental setting.

Methods

We ventilated 36 healthy pigs divided into 6 groups for 50 hours. According to random allocation, we applied 6 levels of PEEP(0, 4, 7, 11, 14, 18 cmH₂O) keeping TV (equal to Functional Residual Capacity), RR and F constant. During the experiment we computed MP and ventilatory variables (e.g. elastance, stress). At the end of the experiment we performed histological analysis of the lungs looking for signs of VILI (e.g. inflammation, septal ropture)

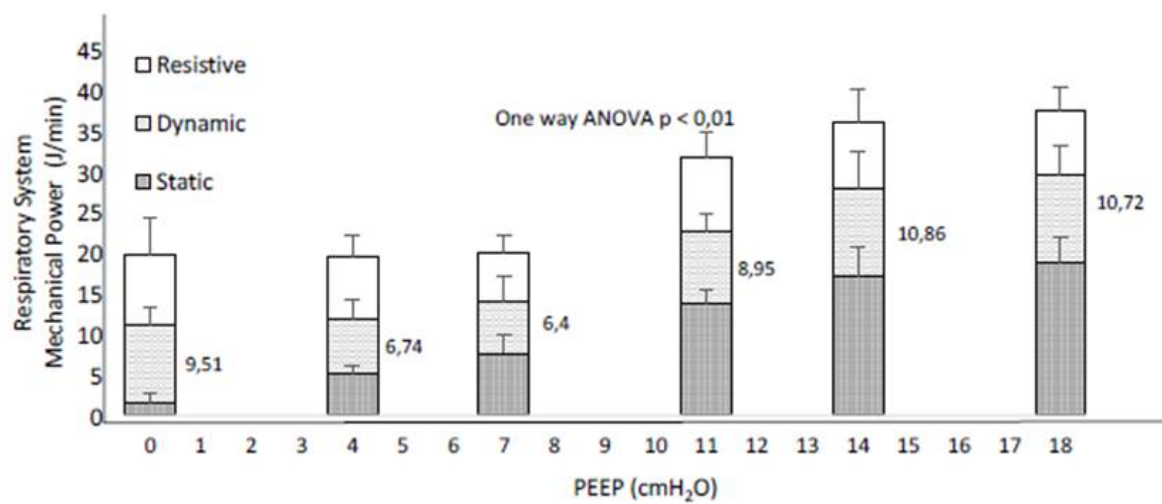
Results

The total MP applied to the lung was similar to PEEP levels of 0, 4,7 (lower group) as the increase due to PEEP (static power) was offset by the decrease in the dynamic power. By contrast, at PEEP 11, 14, 18 (higher group) the total MP increased proportionally to the applied PEEP while dynamic power increased to levels similar to ZEEP (Figure1). Lung stress, elastance and the histological pattern of VILI, worsened in the higher and ZEEP groups ($p < 0.001$).

Conclusions

Both ZEEP and the higher group were mainly associated with VILI. In the ZEEP group there was a predominant role of dynamic power while in the higher group, MP increased because of static power. This study may suggest that PEEP could not be protective *per se* but its putative benefit may be due to the associated reduction in dynamic power (i.e. tidal volume).

Figure 1



One way ANOVA $p < 0,01$