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0990. Role of amplitude and rate of deformation in ventilator-induced lung injury

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Introduction

Increasing both Tidal Volume (V_T) (*amplitude* of lung deformation) and Inspiratory Flow (V') (*rate* of lung deformation) augments incidence of Ventilator-Induced Lung Injury (VILI) [1].

Objectives

To clarify whether increasing V' at constant V_T augments incidence of VILI.

Methods

Twenty-eight healthy piglets were mechanically ventilated for up to 54 hours. Each animal was assigned to one of three groups of V_T (300-400 ml; 500-600 ml; 750 ml) and one of two groups of V'. Lower and higher V' were obtained by setting inspiratory-to-expiratory time ratio as high as 1:2 or as low as 1:9. Respiratory rate was always 15 breaths per minute. Interplay between V_T and V' was assessed at the beginning of the study as airway pressure-volume loop area (or dynamic respiratory system hysteresis). VILI was defined as pulmonary oedema (lung weight gain ≥10% across the study period).

Results

Main findings are reported in Table 1.

Conclusions

Increasing V' (*rate* of lung deformation) while maintaining V_T (*amplitude* of lung deformation) constant augments incidence of VILI. Further studies are needed to clarify whether dynamic respiratory system hysteresis is an independent predictor of VILI.

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Reference

1. Protti A, *et al*: Lung stress and strain during mechanical ventilation: any safe threshold? *Am J Respir Crit Care Med* 2011, **183**:1354-1362.

Table 1 Inspiratory flow and incidence of VILI

	V_T 300-400 ml		V_T 500-600 ml		V_T 750 ml	
	Lower V´	Higher V´	Lower V´	Higher V´	Lower V´	Higher V´
Tidal volume (ml)	338±48	335±42	530±27	520±27	750±0	750±0
Inspiratory flow (ml/sec)	272±36	838±105*	398±21	1278±38*	600±84	1242±95*
Hysteresis (ml*cmH_2O)	6260±2236	12938±3356*	11101±4508	34126±4508*	18415±3520	46915±7954*
Incidence of VILI	0/4	1/5	0/5	4/5*	2/5	4/4

Data are presented as mean±standard deviation. * p< 0.05 *vs.* Lower V' within the same V_T group (Student's *t*, Mann-Whitney Rank Sum or Fisher's exact tests). Hysteresis was associated with incidence of VILI (R=0.68, p< 0.0001) (Spearman Rank Order Correlation).

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