

Lung parenchyma modifications after mechanical ventilation and fluid load

Marina Protasoni¹, Cristiana Marcozzi¹, Andrea Moriondo¹, Eleonora Solari¹, Paolo Severgnini², Elena Caravà¹, Daniela Negrini¹, Carlo Dell'Orbo¹, Marcella Reguzzoni¹

¹ Department of Surgical and Morphological Sciences, Insubria University, Varese, Italy - ² Department of Biotechnology and Life Sciences, Insubria University, Varese, Italy

Mechanical ventilation with or without positive pressure in the airways (PEEP) and with or without mild fluid load can cause some modification on the morphology of the lung matrix in the ventral and dorsal lung regions of supine healthy rats.

To evaluate the differences between dorsal and ventral areas of the lungs after different strategies of ventilation we subdivided rats in two sets of animals, one without any intravenous infusion, the other one with intravenous infusion of phosphate buffered saline (PBS) maintained during all the mechanical ventilation. Each set was further subdivided in groups which underwent different ventilation strategies, varying the end-expiratory pressure (0 or 5 mmH₂O) and the spontaneous/mechanical breathing.

At the morphological analysis no signs of parenchyma injury were collected in all the groups of either sets, although were evident differences in alveolar septa thickness: in all the not-infused groups submitted to mechanical ventilation was observed a thinning of the alveolar septa combined with a enlargement of the perivascular fluid cuffs both in ventral and dorsal regions. The infused specimens demonstrate a more congested parenchyma with irregular development of perivascular fluid cuffs around lung microvessels. In all groups, the maintaining of the PEEP during the mechanical ventilation induced significative corner and alveolar septa thinning respect to the controls, more accentuate in the ventral regions. In infused groups, we observed general alveolar septa and corner thickening, with reduction of the differences between dorsal and ventral regions.

Mechanical ventilation and fluid load may cause injuries to the lung parenchyma, mainly in the ventral region, injuries that seems to be reduced using a positive pressure on the airways, as the PEEP, which seemed to be protective for the extracellular matrix of the lung during the mechanical ventilation.

The authors gratefully acknowledge the "Centro Grandi Attrezzature per la Ricerca Biomedica" of Insubria University for instruments availability.

References

- [1] Pelosi p, Rocco P (2008) Effects of mechanical ventilation on the extracellular matrix. *Int Care Med* 34: 631-39.
- [2] Moriondo A et al (2012) Impact of mechanical ventilation and fluid load on pulmonary glycosaminoglycans. *Respir Physiol Neurobiol* 181: 308-20

Keywords

Extracellular matrix; lung; mechanical ventilation.