

# Position-dependent distribution of ventilation measured with electrical impedance tomography

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**Introduction:** The therapeutic role of lateral and prone positioning during mechanical ventilation of patients with severe lung injury has been a matter of much debate. Although most clinical trials have failed to show a clear beneficial effect of prone positioning on outcomes (Gattinoni L. et al. N Engl J Med 2001), a recent clinical trial showed that prolonged prone-positioning decreased mortality (Guérin C et al. N Engl J Med 2013). However, the pathophysiologic and therapeutic mechanisms behind such effects remain unclear.

**Methods:** Measurements were performed in three pigs with healthy lungs and three with acute lung injury. A custom-built motorized table rotated the pigs lying in the supine position from  $-90^\circ$  to  $+90^\circ$  in steps of  $30^\circ$  under constant ventilator settings (volume controlled ventilation,  $V_t$  6 ml/kg, PEEP 5  $\text{cmH}_2\text{O}$ ). At each position the percentage of ventilation delivered to the right lung, was determined by electrical impedance tomography (EIT) while oxygenation and compliance were measured.

**Results and Conclusions:** Initial results show that the distribution of ventilation was highly gravity-dependent especially in sick lungs (Fig1). Furthermore, lateral rotation showed significant recruitment effects on previously collapsed lungs as witnessed by EIT and increases in oxygenation. The combined effects of PEEP and rotation angle were different in health and disease.

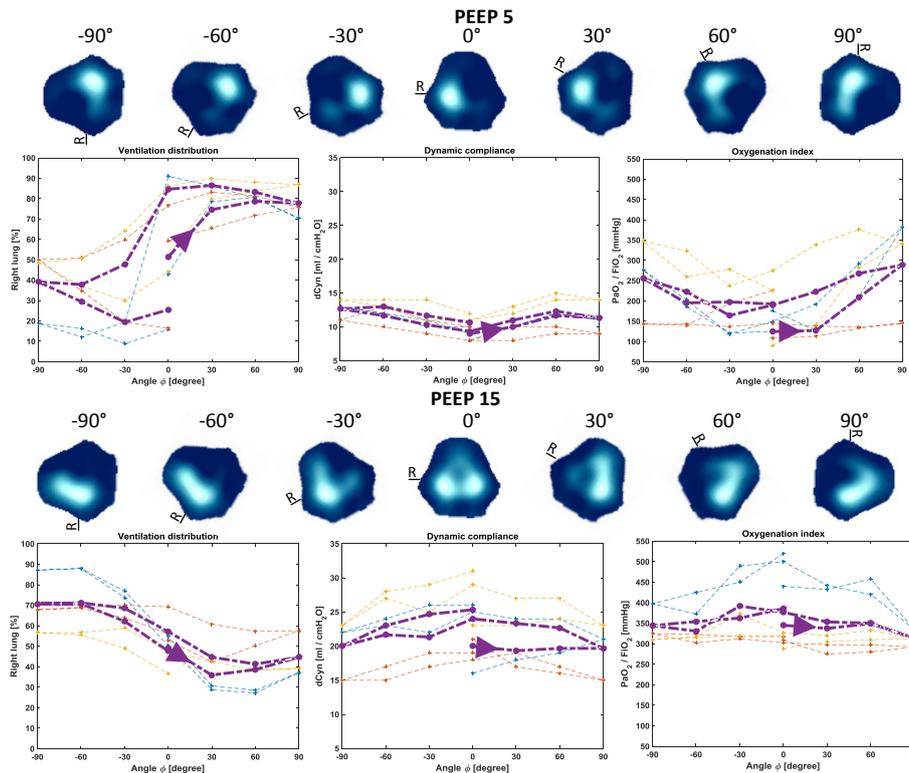
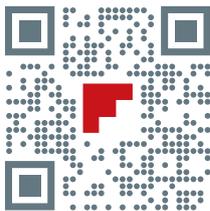


Fig. 1. **Sick lungs:** Percentage of ventilation delivered to the right lung, dynamic compliance and  $\text{PaO}_2/\text{FIO}_2$  for different body positions at PEEP 5 and 15 together with a representative sequence of EIT images. Data of three pigs with thin lines showing the individual pigs, the bold violet line representing the mean value.



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