

Respiratory system elastance monitoring during PEEP titration

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Introduction

PEEP selection during mechanical ventilation (MV) for patients with acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) remains a challenge for clinicians. Clinicians often rely on experience and intuition in setting MV, resulting in a more variable treatment and outcome. We hypothesises that, monitoring patient-specific respiratory system elastance (Ers) during PEEP change may provide an insight to patients' condition.

Methods

13 patients with ALI/ARDS underwent a step-wise PEEP increase (5cmH₂O) recruitment manoeuvre (RM) until peak airway pressure reaches 45cmH₂O. Airway pressure and flow were recorded using a pneumotachometer. The change of patient's respiratory system elastance ($E_{rs}=1/\text{compliance}$) and end of expiratory lung volume (EELV) during RM were estimated and studied. The trials were approved by New Zealand South Island Regional Ethics Committee.

Results

Median [IQR] Ers over all patients was 34.0cmH₂O/l [26.1-51.0], reflecting the heterogeneity of the patients and their response to PEEP. This outcome supports the idea that MV/PEEP should be individualised. During RM, patients' Ers decreased with PEEP increase until a specific minimum and increase later at higher PEEP. The decreased of Ers suggest alveolar recruitment whereas increase of Ers at higher PEEP shows potential over-inflation. An example is shown in Figure (a). A clear inflection/ minimum Ers can be found in (a), indicating a potential method to optimise PEEP selection for particular patient. Figure (b) shows the change of patient's EELV with PEEP increase. As PEEP increases, the potentially recruitable collapsed lung decreases.

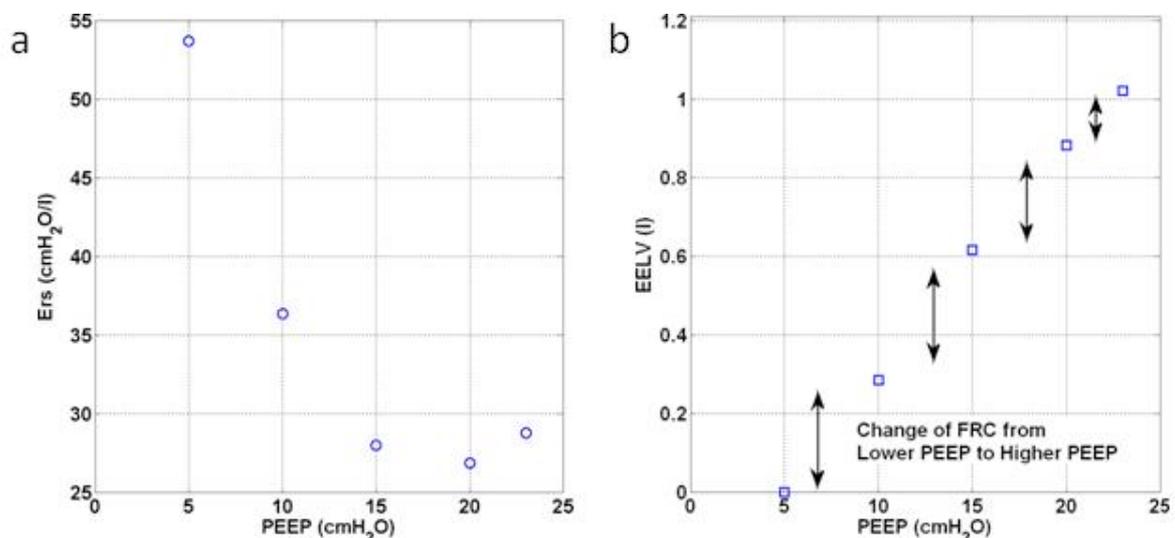


Figure: Ers and EELV change with PEEP increase

Conclusion

The change of patient-specific Ers and EELV during minimally invasive PEEP titration provides an insight to the patient's lung condition, thus could potentially be used as a method to individualise MV treatment and in particular, PEEP selection.