

Determinants of VILI in ARDS: effect of inspiratory airflow, preliminary results in mild and moderate patients

Dott.ssa DONATELLA TORTOLANI (1)(2), Dott. TOMMASO MAURI (1), Dott. ALESSANDRO SANTINI (1), Dott.ssa ELENA SPINELLI (1), Dott.ssa ELEONORA CARLESSO (1), Dott. MARCO ALBANESE (2), Dott. AMEDEO GUZZARDELLA (1), Dott. CHIARA DEL PRETE (1), Dott. MASSIMILIANO MARIANI (1), Dott. ALFREDO LISSONI (1), Dott. NICOLA ROSSI (1), Dott. GIACOMO GRASSELLI (1), Prof. ANTONIO PESENTI (1)

(1) Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Università di Milano, Milano, Italia.

(2) Università di Ferrara, Ferrara, Italia.

Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

INTRODUCTION

Mechanical ventilation (MV) can itself increase lung injury (VILI). The effects of inspiratory airflow in determining VILI are largely unknown.

OBJECTIVES

We analysed the effects of inspiratory airflow on transpulmonary pressure measured by esophageal pressure (Pes) and ventilation heterogeneity measured by electrical impedance tomography (EIT). Study hypothesis was that lower flow rates could result in lower values.

METHODS

We conducted a prospective interventional randomized cross-over study on 6 patients with mild and moderate ARDS (Berlin definition). We randomly set two PEEP levels (5 and 15 cmH₂O), while keeping Vt 6-8 ml/Kg PBW, set the ventilator I:E ratio to obtain inspiratory airflow of 400±100 ml/sec, 800±100 ml/sec and 1200±100 ml/sec at each PEEP level. Pes, airway pressure (Paw), airflow and EIT data were continuously monitored. We measured at each step: Vt; end-inspiratory Paw after 2-3 seconds occlusion (Pplat); positive end-expiratory pressure (PEEPtot); respiratory system compliance (Crs = Vt/Pplat-PEEPtot); Paw at zero flow during an end-inspiratory occlusion (P1); transpulmonary pressure (PI = Paw - Pes) at P1 and at Pplat. EIT data were analyzed to measure heterogeneity in distribution of ventilation in dependent and non-dependent lung regions.

RESULTS

Patient were 62 [54-64] yo, undergoing mechanical ventilation since 2 [2-3] days. On the day of enrollment, PaO₂/FiO₂ was 212 [188-244] and 3 patients (50%) had moderate ARDS. Table 1 summarizes relevant results: Pplat and Crs were not affected by modification of inspiratory airflow, instead P1 increased significantly. While PI at Pplat didn't change, increasing PI values were registered at P1 at higher airflow. The difference between P1 and Pplat, sign of lung heterogeneity, increased with airflow, as well as and EIT-based measure of ventilation heterogeneity.

CONCLUSION

Although preliminary, the present results suggest that increasing inspiratory airflow could yield higher transpulmonary pressure and heterogeneity, two possible determinants of VILI.