

Long Term Feasibility of Ultraprotective Lung Ventilation with Low-Flow Extracorporeal Carbon Dioxide Removal in ARDS Patients

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Introduction

Mechanical ventilation has been associated to ventilator induced lung injury clinically indistinguishable from the lung disease which increases the morbidity and mortality. In order to reduce the VILI has been suggested to reduce the tidal volume up to 3-4 ml/kg, and consequently both the plateau airway pressure and the minute ventilation. A strategy to avoid the negative effects of the respiratory acidosis could be to apply an extracorporeal support to remove the carbon dioxide (ECCO₂R) (*i.e.* ultraprotective lung ventilation).

Aim of the study

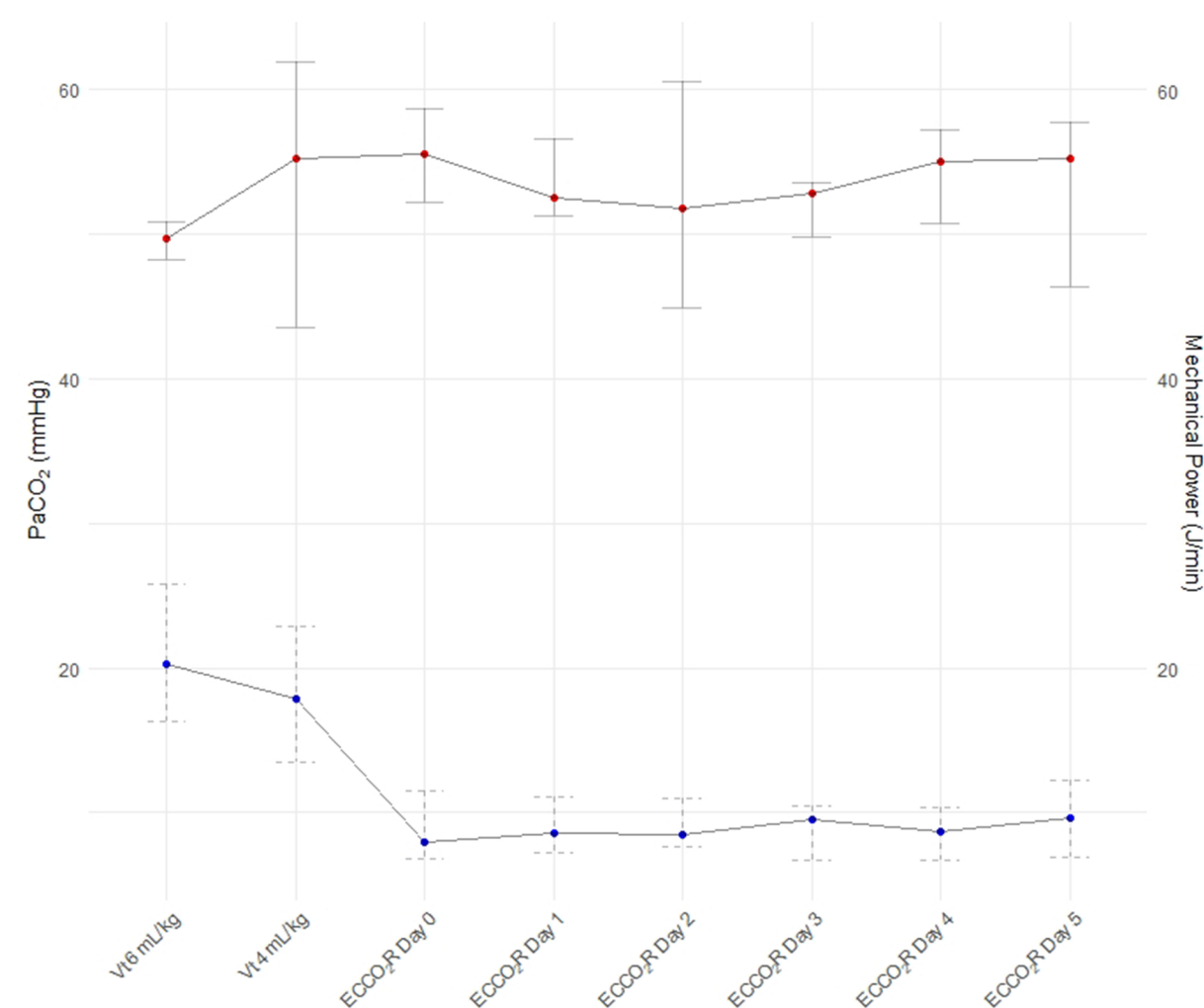
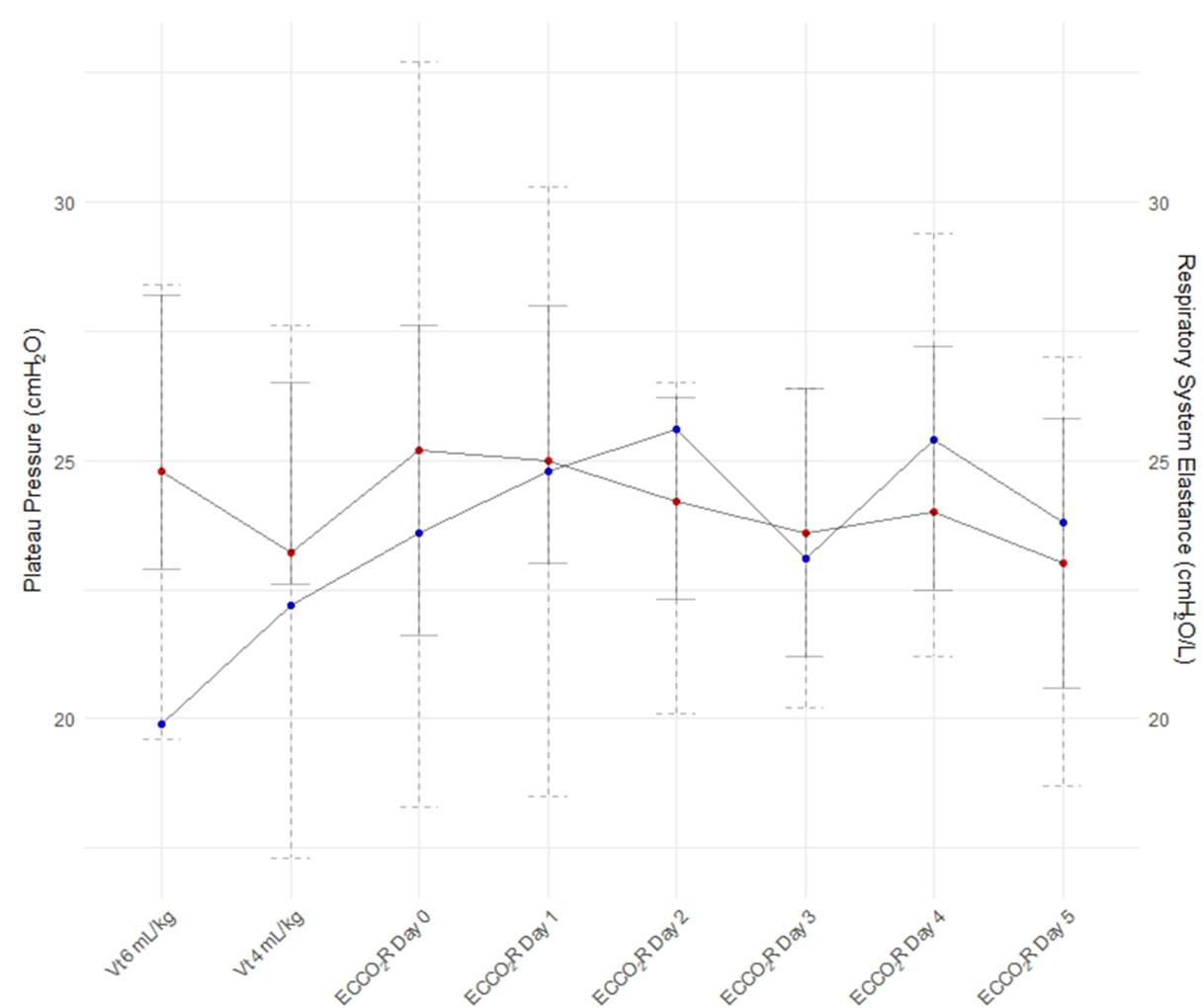
Aim of this study was to explore the feasibility of long-term application of ultraprotective ventilation with low flow ECCO₂R support in moderate-severe ARDS patients and to evaluate the reduction of mechanical power compared to lung protective ventilation.

Material and Methods

ARDS patients with PaO₂/FiO₂ < 200, PEEP of 10 cmH₂O, tidal volume 6 ml/Kg of predicted body weight, plateau pressure > 24 cmH₂O, MP > 17 J/min were prospectively enrolled. After 2 hours since enrollment, tidal volume was reduced to 4- 5 ml/Kg, respiratory rate (RR) and PEEP were changed to maintain similar minute ventilation and mean airway pressure (MAP) to those obtained at baseline. After 2 hours, ECCO₂R support was started, RR was decreased and PEEP was increased to maintain similar PaCO₂ and MAP, respectively.

Results

The only reduction of tidal volume with the increase in RR did not decrease MP. The application of low flow ECCO₂R support allowed the reduction of RR from 25 [24-30] to 11 [9-14] bpm and consequently MP from 18 [13-23] to 8 [7-11] J/min. During the following 5 days no changes in mechanics variables and gas exchange occurred.



Time course of plateau pressure and respiratory system elastance (left) and arterial carbon dioxide partial pressure and mechanical power (right) from baseline to day 5 of ECCO₂R support.

Conclusions

The application of low flow ECCO₂R support with ultraprotective ventilation was feasible minimizing the MP without deterioration in oxygenation in ARDS patients.

