Regional phrenic nerve block in patients with ARDS and high spontaneous breathing activity - a pilot study

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Abstract (263 words)

Rationale

The use of assisted ventilation in patients with acute respiratory failure may improve hemodynamics and oxygenation. These benefits, however, may be overshadowed by strong spontaneous inspiratory efforts that ultimately lead to the loss of protective mechanical ventilation, possibly causing lung injury. In this scenario, some may reinstate deep sedation and even neuromuscular blockade. These strategies, nevertheless, may have serious adverse effects

Objectives

To evaluate both in an animal model and in patients with acute respiratory distress syndrome (ARDS) the feasibility and safety of phrenic nerve blockade with the administration of perineural lidocaine under ultrasound guidance in order to reduce tidal volume and peak transpulmonary pressure in spontaneously breathing patients.

Methods

An established animal model of ARDS was used first in a proof-of-concept study. We then tested the effect of the technique in nine mechanically ventilated patients under pressure support with a driving pressure greater than 15 cmH_2O or a tidal volume (V_T) superior to 10 ml/Kg of predicted body weight. An ultrasound and a nerve stimulator were used to identify the phrenic nerve. Perineural lidocaine was administered, and subjects were followed until return to baseline.

Measurement and Main Results

Bilateral phrenic nerve block significantly reduced V_T (9.7±2.8 to 6.7±1.5 ml per kg of predicted body weight, $p<0.01$), peak transpulmonary pressure (28.0±12.0 to 20.1±6.2 cmH_2O, $p<0.05$), driving pressure (29.1±11.8 to 19.9±6.9 cmH_2O, $p<0.01$), as well ΔPes and electrical activity of the diaphragm. All variables returned to baseline after 763 [399-821] minutes.

Conclusions

Phrenic nerve block is feasible, lasts around 12 hours, and reduces tidal volume and driving pressure in patients under assisted ventilation.

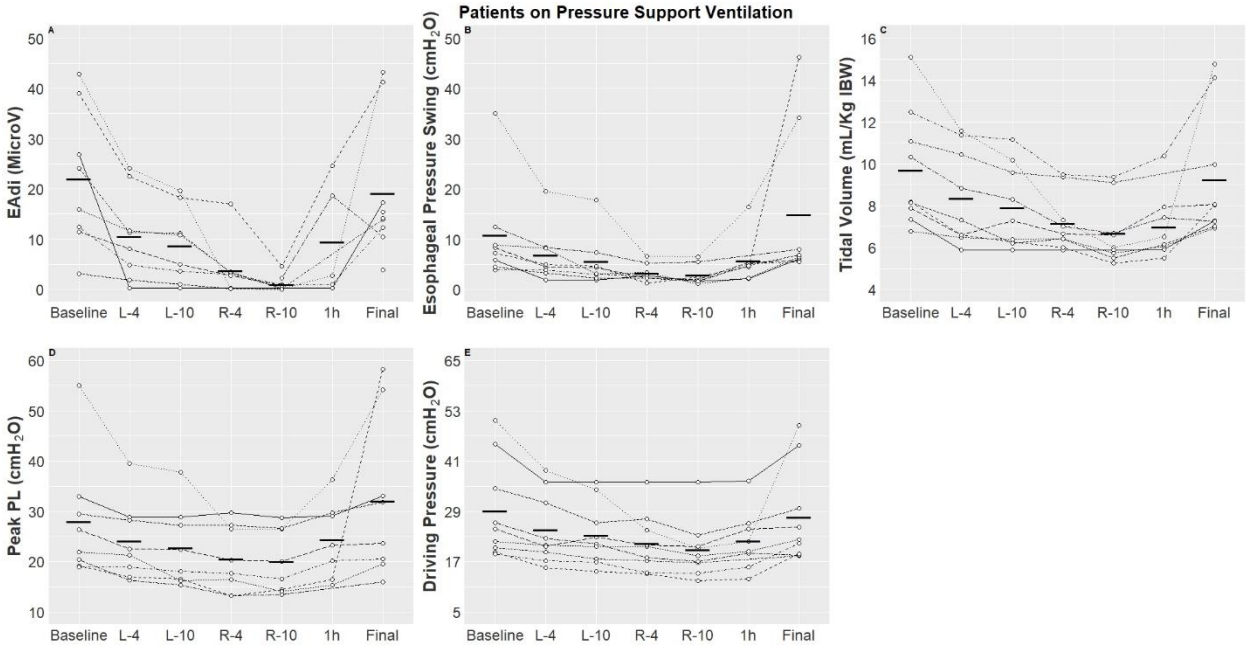

Figure – Progress of respiratory variables in patients on pressure support ventilation