

Evaluation of diaphragmatic thickness with ultrasound in patients undergoing controlled and assisted mechanical ventilation

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Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

Introduction:

Ventilator Induced Diaphragmatic Dysfunction is known to be a contributor to weaning failure. Some data suggest that assisted ventilation might protect from loss of diaphragmatic thickness. The aim of this study is to evaluate by ultrasound (US) the change in diaphragm thickness and thickening in patients undergoing controlled and assisted mechanical ventilation (MV) and correlation of this change with outcome.

Methods:

We enrolled patients who underwent controlled MV (CMV) for at least 48 cumulative hours and then were switched to assisted mechanical ventilation (AMV). Patients < 18 years old, with neuromuscular diseases, phrenic nerve injury, abdominal vacuum dressing system and poor acoustic window were excluded. Diaphragm thickness and thickening were measured with US as described by Goligher [1] and clinical data were collected every 48 hours until ICU discharge.

Results:

We enrolled 28 patients who had more than 4 diaphragmatic measurements, out of whom 2 were excluded for low quality images. Diaphragmatic thickness decreased during CMV and went back to baseline during AMV [Fig. 1A]. Patients were stratified in two groups based on the improvement (>10% increase, 17 patients) or not (<10% increase, 9 patients) of diaphragmatic thickness when compared to the first day of CMV [Fig. 1B]. The improvement in diaphragmatic thickness was associated with less AMV days (10days [4,75-15] for improving diaphragms versus 30days for not improving diaphragms [23-42], $p=0,037$) and with a trend towards lower ICU stay (23days [16,75-25] for improving diaphragms versus 50days [39-65] for not improving diaphragms, $p=0,077$).

Conclusion:

In some patients AMV promotes an increase in diaphragm thickness, which is associated with shorter AMV. Clinical factors associated with diaphragm improvement are still under study.

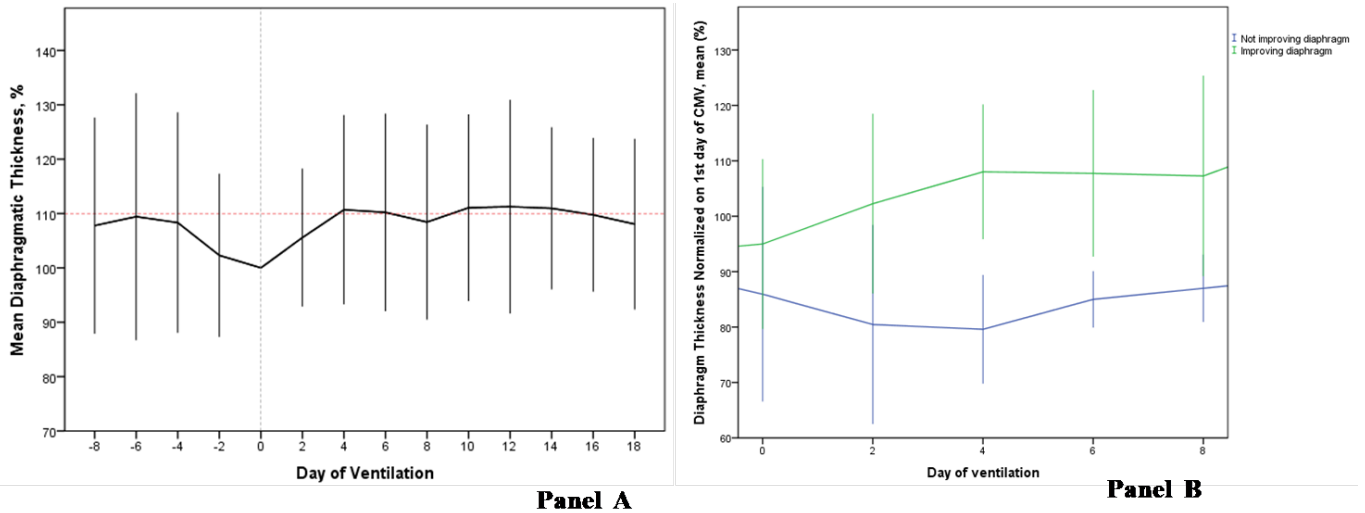


Figure 1 Panel A: Diaphragm Thickness during CMV and AMV. Day 0 represents the first day of AMV, thickness is expressed as percentage of change versus day 0. Panel B: Stratification of patients based on improving/not improving diaphragmatic thickness compared to basal thickness (first day of CMV)