Chest wall loading during supine and prone position in patients with COVID-19 ARDS: effects on respiratory mechanics and gas exchange

Dott. MICHELE UMBRELLO (1), Dott. SERGIO LASSOLA (2), Dott. ANDREA SANNA (2), Dott. ROCCO PACE (2), Dott. SANDRA MAGNONI (2), Dott. GIACOMO BELLANI (2)(3), Dott. SARA MIORI (2)

(1) SC Anestesia e Rianimazione II, Ospedale San Carlo Borromeo, ASST Santi Paolo e Carlo, Milano, Lombardia, Italia.

(2) Anesthesia and Intensive Care, Santa Chiara Regional Hospital, APSS, Trento, Italy, Italia.

(3) Centre for Medical Sciences-CISMed, University of Trento, Via S. Maria Maddalena 1, 38122, Trento, Italy, Italia.

Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

Background: Late-stage C-ARDS with reduced respiratory system compliance described paradoxical decreases in plateau pressure and increases in respiratory system compliance in response to anterior chest wall loading. We aimed to assess the effect of chest wall loading during supine and prone position in ill patients with COVID-19-related ARDS and to investigate the effect of a low or normal baseline respiratory system compliance on the findings.Methods:Single-center, prospective, cohort study conducted in mechanically ventilated C-ARDS patientswho were classified as higher (≥ 40 ml/cmH2O) or lower respiratory system compliance (< 40 ml/cmH2O), as higher (≥ 40 ml/cmH2O) or lower respiratory system compliance (< 40 ml/cmH2O).The study included four steps, each lasting 6 h:Step 1, supine position,Step 2, 10-kg continuous chest wall compression (supine + weight),Step 3, prone position,Step 4, 10-kg continuous chest wall compression (prone + weight).Results:In a cohort 40 patients, neither oxygenation nor respiratory system compliance changed between supine and supine + weight;both increased during prone positioning and were unaffected by chest wall loading in the prone position.Alveolar dead space was unchanged during all the steps. In 16 patients with reduced compliance, P/F significantly increased from supine to supine + weight and further with prone and prone + weight (107 ± 15.4 vs. 120 ± 18.5 vs. 146 ± 27.0 vs. 159 ± 30.4; p < 0.001);alveolar dead space decreased from both supine and prone position after chest wall loading, and respiratory system compliance significantly increased from supine to supine + weight and from prone to prone + weight (23.9 ± 3.5 vs. 30.9 ± 5.7 and 31.1 ± 5.7 vs. 37.8 ± 8.7 ml/cmH2O, p < 0.001).The improvement was higher the lower the baseline compliance.Conclusions:Chest wall loading had no effects on respiratory system compliance, gas exchange or alveolar dead space in an unselected cohort of critically ill patients with C-ARDS.

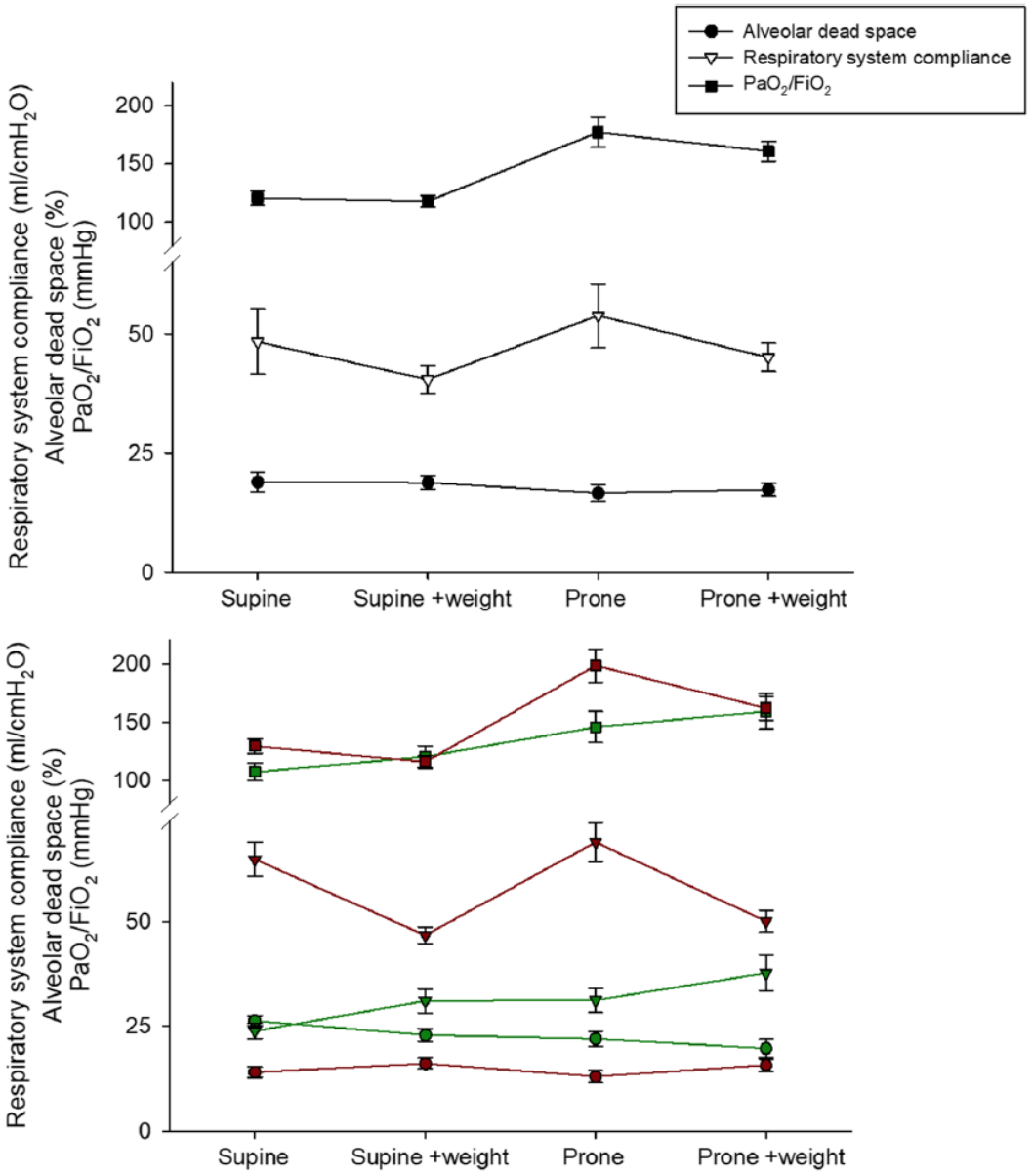

Fig. 1 Comparison of gas exchange and mechanical properties of the respiratory system in different phases of the study. Upper panel: whole cohort. Lower panel: patients with lower (green) or higher (red) respiratory system compliance at enrolment