

Incidence and impact of pendelluft measured by Electrical Impedance Tomography (EIT) in difficult to wean patients

Dott. ANDREA COPPADORO (1), Dott.ssa ALICE GRASSI (2), Dott.ssa CECILIA GIOVANNONI (2), Dott.ssa NILDE ERONIA (1), Dott. DAVIDE CELSI (2), Prof. GIUSEPPE FOTI (1)(2), Prof. GIACOMO BELLANI (1)(2)

(1) San Gerardo Hospital - ASST Monza, Department of Anesthesia and Intensive care, Monza, Italia.

(2) Milan-Bicocca University, School of Medicine and Surgery, Monza, Italia.

Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

Background: In animal models of acute respiratory failure, inspiratory effort may cause pendelluft, defined as intra-tidal movement of gas within the lung from “fast” regions to “slow” ones, which may cause hidden overstretching of lung regions. Moreover, pendelluft might decrease ventilation efficiency, since pendelluft gas has different CO₂ and O₂ contents as compared to fresh gas. We reasoned that pendelluft might play a negative role during the weaning phase, when patient’s inspiratory effort must increase due to withdrawal of ventilator support.

Methods: 16 adult patients undergoing pressure support ventilation (PSV) and defined as difficult weaning (considered “ready to wean” but unable to tolerate 2h of PSV=2cmH₂O), were enrolled. PSV was progressively reduced from clinical level (baseline) to 2cmH₂O; electrical impedance tomography (EIT) signal was recorded and pendelluft was measured over 4 ventral-to-dorsal regions of interest. Presence of pendelluft was defined as regional gas volume movement (>5ml) occurring in a direction opposite to the global signal.

Results: Pendelluft was detected by EIT in 7/16 patients already at baseline (7.1 [4-9.7] vs. 2.8 [1.4-3.4] mL, p=0.002). In these patients reduction of PSV tended to increase pendelluft (from 7.1 [4-9.7] to 13.4 [4.72-23.5], p=0.063), in the others it did not (Figure 1). Tidal volumes decreased (p=0.018) and respiratory rates increased (p=0.027) in patients with pendelluft to maintain a stable minute ventilation, while no change was recorded in the no-pendelluft group. EtCO₂ increased in the pendelluft (p=0.043) group as opposed to the no-pendelluft group; P_{0.1} increased only in patients with no pendelluft (p=0.015).

Conclusions: Pendelluft is frequently present in difficult to wean patients, and tends to increase with the reduction in ventilator support. The presence of pendelluft is associated with a significant change of the ventilatory pattern. Pendelluft-associated ventilatory inefficiency might play a role in weaning failure.

