
Noninvasive Method to Detect Respiratory Effort



Inspiratory effort during mechanical ventilation can have both beneficial and deleterious effects on the patient. Inspiratory effort can increase the tidal volume, but at the same time, also increase global lung stress due to an increased transpulmonary driving pressure, which eventually leads to lung injury. Some studies indicate that the level of inspiratory effort during the first 48-72 hours of mechanical ventilation may predict the duration of ventilation and ICU stay. Respiratory effort and drive are commonly elevated in patients with respiratory failure because of anxiety, pain, dyspnoea, and inadequate ventilatory support.

Knowing the transpulmonary driving gradient and the lung effort may help provide clues to the amount of pressure during ventilation. By adjusting the pressure, one may be able to limit the lung trauma during ventilation. In general inspiratory effort is not regularly monitored in ventilated patients. While several mentoring techniques are available like diaphragmatic ultrasound, oesophageal manometry and diaphragm electrical activity, these techniques require time, experience and proficiency.

A rapid and non-invasive technique for detecting excess respiratory effort and dynamic lung stress could substantially increase the feasibility of detecting injurious spontaneous breathing during mechanical ventilation. In this study, researchers evaluate a noninvasive method of detecting excessively high respiratory effort and dynamic transpulmonary driving pressure during mechanical ventilation. They set out to determine if the changes in airway pressure, generated by respiratory muscle effort under assisted ventilation when the airway was occluded, could be used as a reliable noninvasive technique to screen for these conditions

The researchers measured respiratory muscle pressure and dynamic transpulmonary driving pressure (the difference between peak and end-expiratory transpulmonary pressure). Patients were enrolled in the present study if they were ventilated for less than 36 h and if the indication for ventilation was septic shock, acute respiratory distress syndrome, pneumonia or acute brain injury. The researchers made 52 daily recordings in 16 patients.

Findings show that the respiratory muscle pressure and transpulmonary driving pressure were often excessively high. The respiratory muscle pressure exceeded 10 cm of water on 84% of study days and the transpulmonary driving pressure exceeded 15 cm water on 53% of the study days.

Their conclusion was that measuring the airway pressure deflection generated by the patient's respiratory effort against the occluded airway (ΔP_{occl}) enabled accurate noninvasive diagnosis of elevated transpulmonary driving pressure and respiratory muscle pressure.

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