Adaptive Support Ventilation: Review of the Literature and Clinical Applications

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Abstract

Mechanical ventilation is a complex process involving interaction between pressure, flow, volume and time. Simply put, we classify the modes as one of either volume control, pressure control, or dual control. Adaptive support ventilation (ASV) is a newly developed dual control mode, using measured dynamic compliance and time constant, with an automated adjustment of tidal volume and respiratory rate combined to meet the preset minute ventilation. Several small randomized controlled or prospective observational studies have stressed that ASV can be used as a safe weaning mode for specific postoperative and chronically ventilated patient groups, save manpower and management, and reduce lung injury induced by mechanical ventilation. However, there is concern about the issue of asynchrony between ventilators and patients if there was no awareness of the underlying mechanism for respiratory distress in the patients, which would possibly worsen the patient's condition or prolong the weaning process. ASV should undergo large randomized controlled studies to clarify its role in clinical practice in the future.(J Intern Med Taiwan 2008; 19: 465-471)

Key Words: Respiratory mechanics, Strategy, Protective, Postoperative care, Weaning, Manpower management, Asynchrony

Introduction

Mechanical ventilation is frequently delivered to patients admitted to intensive care units to reduce the work of breathing (WOB), to improve oxygenation, or to assist ventilation. The interaction between patient and ventilator is complex with respect to a variety of variables including pressure, volume, flow, and time. Yet these variables can be adequately represented by a mathematical model, called the equation of motion for the respiratory system, which can be simplified as:

\[ \text{Airway opening pressure} + \text{Pmus} = (\text{Flow} \times \text{Resistance}) + (\text{Volume} \times \text{Elastance}) \]

Where Pmus is respiratory muscle pressure and is calculated based on the following general equation: \( \text{Pmus} = \text{Elastic Pressure} + \text{Resistive Pressure} \). The equation shows that for any mode, only one variable (i.e., pressure, volume, or flow) can be controlled at a time. So we can simplify the modes to pressure control versus volume control.