CHOICE OF PROPER LUNG VENTILATION METHOD

Marek Darowski, Tomasz Gólczewski, Marcin Michnikowski

Centre of Excellence ARTOG, Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Sciences, Warsaw, Poland

Abstract

In the article three different methods of lung ventilation have been analyzed: Continuous Positive Airways Pressure (CPAP), Proportional Assist Ventilation (PAV) and Pressure Support Ventilation (PSV). The aim of these analyses was to predict clinical situations when the considered modes of ventilation would play their role in the best, optimal way. The study on effective ventilatory support by CPAP, PAV and PSV was conducted using virtual respiratory system – a new, but yet verified model of the system, recently developed by our group. Computer simulation, done on a healthy lung model and on a pathologically changed lung model, has clearly shown the conditions under which CPAP, PAV or PSV could be really effective. CPAP is worth using in patients with a high airways resistance, in which case this mode of ventilatory support ensures breathing with normal frequency and less energy-consuming inspiration. PAV usually results in a smaller peak and the mean alveolar pressure than PSV which decreases a potentially harmful effect of the positive pressure ventilation on the cardiovascular system. On the other hand, PAV may be used safely when estimation of the parameters such as the lung/thorax compliance and the airway resistance is reliable, since the setting of the supporting pressure is based on this estimation.

Keywords: mechanical ventilation, barotrauma, virtual lungs, ventilatory modes, CPAP, PAV, PSV, computer simulation