ICU
MANAGEMENT & PRACTICE

New Mode of Adaptive Ventilation

For most patients who are admitted to the ICU and require mechanical ventilation, conventional modes of ventilation usually suffice. However, there are some patients who may require fine adjustments in ventilation so that the work of breathing is minimised, and the patient is still adequately ventilated and oxygenated.

Over the years, many types of ventilatory approaches to protect the lung have been developed, but none has proven to be reliable or consistent. In many cases, while the ventilation protects the lung, oxygenation is compromised. Simply lowering tidal volume is not the answer to preventing lung damage in ARDS. Several studies have shown that low tidal volumes do not have any benefit in this patient population. Some research suggests that mechanical power may be a key factor

Adaptive mechanical ventilation is a relatively old technique of ventilation where the machine automatically adjusts the tidal volume and respiration rate to deliver the clinically desired minute ventilation. The tidal volume and respiration rate are based on the Otis equation to minimise the work of breathing. However, this mode of ventilation may provide high tidal volumes, especially in patients with very compliant lungs. This may lead to barotrauma, air trapping, and excess work of breathing.

To avoid this problem, a new mode of adaptive ventilation was recently developed which automatically decreases the inspiratory force with the aim of ensuring lung protection by adequately selecting the right tidal volume and respiration rate. But does this lead to excess work of breathing?

In this study, investigators determine whether adaptive ventilation could lower tidal volume, mechanical power, driving pressure, and at the same time produce adequate gas exchange when compared to the older form of adaptive mechanical ventilation based on Otis equation.

The researchers conducted a prospective randomised crossover study involving 20 critically ill patients on controlled mechanical ventilation. Of these, 10 patients had been diagnosed with ARDS. Every patient underwent 60 minutes of mechanical ventilation with the new adaptive mode of ventilation, according to the Otis equation. At the end of each time period, data were collected on mechanical power, tidal volume, arterial blood gas, driving pressure, and haemodynamics.

The results revealed that the use of adaptive mechanical ventilation based on the Otis equation resulted in a significant decrease in tidal volume in the entire study group, including patients with ARDS. Researchers also observed a similar decrease in driving pressure, total mechanical power, a slight decrease in PaO_2/FiO_2 but no difference in pH, $PaCO_2$, and haemodynamics.

The conclusion of the study was that adaptive mechanical ventilation with automated minimisation of inspiratory power might lead to more protective lung ventilatory setting when compared with adaptive mechanical ventilation based on Otis equation.

Source: Critical Care
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