Airway Pressure-Release Ventilation vs Conventional Ventilation

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Introduction

I've always thought the debate between airway pressure-release ventilation (APRV) and more conventional modes (mainly variations of assist-control) was focused on 2 questions. First, are you more concerned with the lower or the upper inflection point on the pressure-volume curve? Second, does sound physiology trump the rigid application of evidence-based medicine?

If you think derecruitment is worse than baro- or volutrauma, you're more concerned about the lower inflection point and might favor APRV. If you're confident in your knowledge of lung physiology and aren't concerned about the lack of clinical evidence for benefit, you'd be more likely to use APRV. If you reject "protocolized" care and favor an individualized, physiology-based approach, then "APRV for everyone" may make sense.

Now there is a third question: Is spontaneous breathing harmful? The APRV proponents claim the ability to breathe spontaneously, even at high-pressure settings, is critical to its efficacy. Forcing patients to use their diaphragm to create negative pleural pressure allows them to recruit more lung (particularly the dependent areas critical for ventilation), improve venous return, and prevent diaphragmatic muscle atrophy. [1]

Recently published data challenge this premise. In a randomized controlled trial, patients with moderate-to-severe acute respiratory distress syndrome (ARDS) who were given cisatracurium besylate for 48 hours had reduced mortality. [2] The authors found an increase in barotrauma in the placebo group, and although transpulmonary pressure (PL) was not measured, they speculated that spontaneous breathing may have increased PL and caused lung injury. Spontaneous breathing, particularly when associated with higher tidal volumes, has also been associated with lung injury in experimental animal models. [3,4] Reviews, [5] editorials, [6] and debates [7] have all suggested that spontaneous breathing may be harmful, particularly in severe ARDS.

Questioning APRV

This raises some important questions when it comes to APRV. PL might be expected to increase to dangerous levels when spontaneous breathing is promoted at high airway pressures. Furthermore, with APRV, tidal volume isn't routinely targeted and can vary significantly from breath to breath. [8] Though proponents may argue that asynchrony promotes lung injury and excessive PL more so than spontaneous breathing, per se, it's not a given that patients on APRV will breathe comfortably at high pressures with only intermittent release.

While I wouldn't rule out the possibility that APRV has physiologic advantages, particularly in the hands of a critical care team with experience, uncertainty remains. We've seen before that sound physiologic rationale doesn't necessarily translate to superior clinical outcomes. While I'm not wed to the rigid application of evidence-based medicine, the available clinical data on conventional or assist-control ventilation dwarf that for APRV. Because the drop-and-stretch approach to weaning lacks standardization, it's conceivable that APRV could prolong the process, especially when applied to all patients in a large intensive care unit. [9] Eight years ago, Nader Habashi, MD, [1] called for clinical studies comparing a conventional protective ventilation strategy to APRV using a validated, protocolized approach. Until that study is done, I'd stick with what we know and avoid using APRV.

References

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Cite this article: Aaron B. Holley. Airway Pressure-Release Ventilation vs Conventional Ventilation. *Medscape*. Jan 30, 2014.