

Heart-lung interactions in the ICU: physiology, evaluation and clinical applications

This new issue of *Annals of Translational Medicine* is dedicated to the discussion of issues concerning the heart-lung interactions in critically-ill patients. This is indeed a key subject for several reasons: (I) many patients in the ICU are submitted to positive pressure ventilation; (II) the possible application of heart-lung interactions to bedside old but still very actual physiology makes for exciting study; (III) development of critical care echocardiography allows physicians to easily and accurately evaluate heart-lung interactions in the ICU; (IV) heart-lung interaction in itself may be responsible for hemodynamic compromise in patients with respiratory failure and one of the way to support these patients is to “play” with the ventilator by modifying the respiratory settings; (V) studying heart-lung interactions allows hemodynamic monitoring—a core of what some experts call “functional hemodynamic monitoring” (1). The best illustration of this concept of functional hemodynamic monitoring is the evaluation of the fluid-responsiveness status by testing the response of the cardiovascular system to a cyclic positive airway pressure.

This issue is separated into two distinct parts and is accompanied by an editorial by Prof. Didier Payen, one of the French pioneers in the study of heart-lung interactions. The first part explores the fundamental aspects of the following topics in heart-lung interactions physiology: cardiovascular effects of ventilation in spontaneously and mechanically ventilated patients; systemic venous return, with its determinants and the effect of positive pressure ventilation; and the potential of measuring esophageal pressure for an invasive evaluation of heart-lung interactions.

The second part of the issue is dedicated to discussing the main clinical applications. In patients with shock, optimizing the fluid status using the fluid-responsiveness approach allows physicians to give the right amount of fluids, avoiding persistent hypovolemia and fluid overload, both deleterious for outcome. Secondly, the right ventricle is especially overloaded in acute respiratory distress syndrome (ARDS) and the respiratory strategy may have a direct impact on hemodynamics and outcome (2). Thirdly, it is well-known during weaning that releasing the patient from the ventilator is like an exercise for the cardiovascular system, which may unmask cardiac dysfunction (systolic and diastolic) and induce pulmonary edema; conversely, applying non-invasive ventilation in a patient who develops a cardiogenic pulmonary edema improves respiratory status, cardiac function and outcome. Finally, in patients with potentially cardiac failure, applying a more complex “algorithm” in part based on heart-lung interactions may help physicians to evaluate preload, afterload and contractility.

Although it may contain some redundancy arising between manuscripts of overlapping material, this issue is still necessary reading for clinicians who want to better understand the full benefit of evaluating bedside heart-lung interactions in critically-ill patients. More than a way to monitor hemodynamics, this is definitively a very efficient and mandatory approach to optimize the care of our patients. Finally, I would like to extend sincere gratitude to all of the well-recognized experts in the field, as well as their collaborators, who agreed to write for this issue—Massimo Antonelli, Sheldon Magder, John Marini, Maurizio Cecconi, Didier Payen, Michael Pinsky, Jukka Takala, Jean-Louis Teboul and Philippe Vignon. I wish all of the readers have the same pleasure reading the issue as we did creating it.

Acknowledgements

None.

References

1. Pinsky MR, Payen D. Functional hemodynamic monitoring. *Crit Care* 2005;9:566-72.
2. Vieillard-Baron A, Matthay M, Teboul JL, et al. Experts' opinion on management of hemodynamics in ARDS patients: focus on the effects of mechanical ventilation. *Intensive Care Med* 2016;42:739-49.

(English Language Editor: John Gray, AME Publishing Company)



Antoine Vieillard-Baron

Antoine Vieillard-Baron

*Intensive Care Unit, Section Thorax-Vascular Disease-Abdomen-Metabolism,
Assistance Publique-Hôpitaux de Paris, University Hospital Ambroise Paré, Boulogne-Billancourt, France.*

(Email: antoine.vieillard-baron@aphp.fr)

doi: 10.21037/atm.2018.09.16

Conflicts of Interest: The author declares to have received financial support from GSK for conducting clinical research.

View this article at: <http://dx.doi.org/10.21037/atm.2018.09.16>

Cite this article as: Vieillard-Baron A. Heart-lung interactions in the ICU: physiology, evaluation and clinical applications. *Ann Transl Med* 2018;6(18):346. doi: 10.21037/atm.2018.09.16