ICU
MANAGEMENT & PRACTICE

HEMOPRED Study: Fluid Responsiveness in ARDS

Optimal fluid management in patients with acute respiratory distress syndrome (ARDS) poses significant challenges. A positive fluid balance is linked to extended mechanical ventilation, longer ICU stays, and increased mortality due to increased pulmonary capillary pressure, which exacerbates inflammation and causes alveolar flooding. On the other hand, haemodynamic instability is common in ARDS patients and correlates with high mortality rates, making the restoration of cardiac preload essential.

Currently, there is no definitive evidence regarding fluid-restrictive strategies in ARDS. Many studies fail to assess fluid responsiveness (FR) properly, relying on static haemodynamic measures that are often unreliable. This oversight can obscure the potential benefits of a personalised fluid management approach. Right ventricular (RV) injury in ARDS is associated with poorer outcomes, complicating the assessment of FR. Low tidal volumes and RV dysfunction may affect the reliability of dynamic indices used to predict FR.

A post hoc analysis of the HEMOPRED study aimed to evaluate the prevalence of FR in ARDS patients, the influence of ARDS on dynamic indices, and the impact of RV injury on FR status. The secondary goal was to explore the relationship between FR status, dynamic indices, and patient outcomes, hypothesising that maintaining FR after initial fluid resuscitation could lead to better outcomes.

The study was conducted in France and involved sedated patients on mechanical ventilation who required echocardiographic evaluation for acute circulatory failure. Patients underwent transthoracic and transoesophageal echocardiography while in a semi-recumbent position.

Fluid responsiveness (FR) was assessed using pulse pressure variations (ΔPP), superior vena cava collapsibility index (ΔSVC), respiratory variations of the maximal Doppler velocity of the left ventricular (LV) outflow tract (ΔVmaxAo), and variations in the inferior vena cava diameter (ΔIVC).

FR was defined as a ≥10% increase in the LV outflow tract velocity-time integral (aortic VTI) after passive leg raising (PLR), indicating fluid expansion. A subjective threshold for hypovolaemia was set at an increase in aortic VTI >32%, corresponding to a ΔSVC collapse >60%. Haemodynamic, respiratory, and biological parameters were collected at the time of echocardiographic assessment. ARDS was defined per Berlin criteria, with severity classified as mild, moderate, or severe based on the PaO2/FiO2 ratio. RV injury was categorised as RV systolic dysfunction or RV dilation, including acute cor pulmonale.

In the study, 117 out of 540 patients (22%) were diagnosed with ARDS, categorised as mild (13%), moderate (44%), and severe (43%). Patients with ARDS had significantly higher respiratory rates, PEEP levels, and driving pressures compared to those without ARDS, with a trend towards lower tidal volumes. Sepsis or septic shock was notably more prevalent among ARDS patients (80%) compared to non-ARDS patients (48%).

FR was observed in 39% of ARDS patients, similar to the 44% in non-ARDS patients. Among fluid responders, the increase in aortic VTI after PLR was more significant in ARDS patients (34%) than in non-ARDS patients (25%). Both groups exhibited similar central venous pressure (CVP) and venous congestion prevalence.

Dynamic indices to predict FR were evaluated, showing statistically significant differences between fluid responders and non-responders, with ΔSVC performing best in both groups. A ΔSVC > 24% indicated high specificity for predicting FR in ARDS patients. FR was less common in those with RV systolic dysfunction, and the paradoxical septal motion was linked to a lower likelihood of FR.

© For personal and private use only. Reproduction must be permitted by the copyright holder. Email to copyright@mindbyte.eu.

Despite the fluid expansion decisions not differing significantly between ARDS and non-ARDS patients, FR status did not correlate with ICU mortality in ARDS patients. However, hypovolaemia and ΔPP were associated with ICU mortality in ARDS, unlike in non-ARDS patients. Other dynamic parameters did not show significant associations with ICU mortality in ARDS patients.

In a post hoc analysis of the HEMOPRED study, 22% of patients had ARDS, predominantly due to septic shock. FR was present in about 40% of ARDS patients, comparable to non-ARDS patients. Notably, ARDS patients showed a larger increase in aortic VTI after PLR compared to non-ARDS patients, potentially due to the higher incidence of septic shock.

The reliability of predictive parameters for FR in ARDS patients is questioned, particularly due to the effects of low tidal volumes and high PEEP. While dynamic indices like ΔSVC predicted FR effectively in both groups, RV dysfunction was associated with reduced responsiveness. The study highlighted the concept of fluid tolerance, emphasising the need to balance fluid administration with the risks of volume overload, particularly in ARDS, due to the potential for alveolar leakage and RV injury.

Despite the expectation that FR would correlate with better outcomes in ARDS patients, ICU mortality did not significantly differ between those with and without FR, while hypovolaemia was a significant predictor of mortality. ΔPP was associated with ICU mortality across ARDS patients, underscoring the need for careful monitoring in this population.

The findings suggest that while FR prevalence is similar in ARDS and non-ARDS patients, managing hypovolaemia remains crucial for improving outcomes. The study calls for more research to refine fluid management strategies in ARDS, taking into account diverse haemodynamic profiles.

Source: Intensive Care Medicine

Image Credit: iStock

Published on : Mon, 23 Sep 2024

© For personal and private use only. Reproduction must be permitted by the copyright holder. Email to copyright@mindbyte.eu.