

Pleth Variability Index Predicts Fluid Responsiveness in Critically Ill Patients.

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Objective

To investigate whether the pleth variability index, a noninvasive and continuous tool, can predict fluid responsiveness in mechanically ventilated patients with circulatory insufficiency.

Methods

Design: Prospective study. *Setting:* Surgical intensive care unit of a university hospital. *Patients:* Forty mechanically ventilated patients with circulatory insufficiency in whom volume expansion was planned by attending physician. Exclusion criteria included spontaneous respiratory activity, cardiac arrhythmia, known intracardiac shunt, severe hypoxemia ($P_{aO_2}/F_{iO_2} < 100$ mm Hg), contraindication for passive leg raising, left ventricular ejection fraction of $< 50\%$, and hemodynamic instability during the procedure. *Interventions:* Fluid challenge with 500 mL of 130/0.4 hydroxyethyl-starch if respiratory variations in arterial pulse pressure were $\geq 13\%$ or with passive leg raising if variations in arterial pulse pressure were $< 13\%$.

Results

Pleth variability index, variations in arterial pulse pressure, and cardiac output estimated by echocardiography were recorded before and after fluid challenge. Fluid responsiveness was defined as an increase in cardiac output of $\geq 15\%$. Twenty-one patients were responders and 19 were nonresponders. Mean \pm SD pleth variability index ($28\% \pm 13\%$ vs. $11\% \pm 4\%$) and arterial pulse pressure variation ($22\% \pm 11\%$ vs. $5\% \pm 2\%$) values at baseline were significantly higher in responders than in non-responders. The pleth variability index threshold value of 17% allowed discrimination between responders and non-responders with a sensitivity of 95% (95% confidence interval, 74% to 100%) and a specificity of 91% (95% confidence interval, 70% to 99%). The pleth variability index at baseline correlated ($r = .72$, $p < .0001$) with the percentage change in cardiac output induced by fluid challenge, suggesting that a higher pleth variability index at baseline will correlate with a higher percentage change in cardiac output after volume expansion.

Conclusions

The pleth variability index can predict fluid responsiveness noninvasively in intensive care unit patients under mechanical ventilation.