Prediction of fluid responsiveness in mechanically ventilated patients in surgical intensive care unit by pleth variability index and inferior vena cava diameter.

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Abstract

Background

Patients may have signs of hypovolemia, but fluid administration is not always beneficial. We are in need of bedside devices and techniques, which can predict fluid responsiveness effectively and safely. This study is aiming to compare the effectiveness and reliability of the pleth variability index (PVI) and IVC distensibility index (dIVC) as predictors of fluid responsiveness by simultaneous recordings in all sedated mechanically ventilated patients in the surgical intensive care unit (ICU). We used the passive leg raising test (PLR) as a harmless reversible technique for fluid challenge, and patients were considered responders if the cardiac index (CI) measured by transthoracic echocardiography (TTE) increased ≥ 15% after passive leg raising test (PLR).

Results

This observational cross-sectional study was performed randomly on 88 intubated ventilated sedated patients. Compared with CI measured by transthoracic echocardiography, the dIVC provided 79.17% sensitivity and 80% specificity at a threshold value of > 19.42% for fluid responsiveness prediction and was statistically significant ($P < .0001$), with an area under the curve (AUC) of 0.886 (0.801–0.944), while PVI at a threshold value of > 14% provided 93.75% sensitivity and 87.5% specificity and was statistically significant ($P < .0001$), with an AUC of 0.969 (0.889–0.988).

Conclusion

PVI and dIVC are effective non-invasive bedside methods for the assessment of fluid responsiveness in ICU for intubated ventilated sedated patients with sinus rhythm, but PVI has the advantage of being continuous, operator-independent, and more reliable than dIVC.