Plethysmographic Variation Index Predicts Fluid Responsiveness in Ventilated Patients in the Early Phase of Septic Shock in the Emergency Department: A Pilot Study

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Purpose

Feasibility study examining whether plethysmographic variability index (PVI) can predict fluid responsiveness in mechanically ventilated patients in the early phase of septic shock in the emergency department.

Materials and Methods

Monocentric, prospective, observational study that included 31 mechanically ventilated and sedated patients with septic shock in whom volume expansion was planned. The patients were equipped with a pulse oximeter that automatically calculated and displayed PVI. The intervention consisted in infusing 8 mL/kg of hydroxylethyl starch over a 20-minute period. Before and after intervention, we recorded PVI and measured the aortic velocity-time integral (VTIao) using transthoracic echocardiography. Responders were defined as patients who increased their VTIao by 15% or higher after fluid infusion.

Results

Sixteen patients were classified as responders, and 15 as nonresponders. Mean PVI values before intervention were significantly higher in responders vs nonresponders (30% ± 9% vs 8% ± 5%, $P < .001$). Plethysmographic variability index values before intervention were correlated with percent changes in VTIao induced by intervention ($R2 = 0.67$; $P < .001$). A PVI threshold value of 19% discriminates responders from nonresponders with a sensitivity of 94% and a specificity of 87% (area under the curve, 0.97; $P < .001$).

Conclusion

Our study suggests that PVI is a feasible and interesting method to predict fluid responsiveness in early phase septic shock patients in the emergency department.