Clinical Study Summary

The Ability of Pleth Variability Index to Predict the Hemodynamic Effects of Positive End-Expiratory Pressure in Mechanically Ventilated Patients Under General Anesthesia

Desebbe O, et al. *Anesthesia and Analgesia.* 2010; 110:792-798.

Background

Pleth variability index (PVI) is a new algorithm allowing automated and continuous monitoring of respiratory variations in the pulse oximetry plethysmographic waveform amplitude. PVI can predict fluid responsiveness noninvasively in mechanically ventilated patients during general anesthesia. We hypothesized that PVI could predict the hemodynamic effects of 10 cm H_2O positive end-expiratory pressure (PEEP).

Methods

We studied 21 mechanically ventilated and sedated patients in the postoperative period after coronary artery bypass grafting. Patients were monitored with a pulmonary artery catheter and a pulse oximeter sensor attached to the index finger. Hemodynamic data (cardiac index [CI], PVI, pulse pressure variation, central venous pressure) were recorded at 3 successive tidal volumes (VT) (6, 8, and 10 mL/kg body weight) during zero end-expiratory pressure (ZEEP) and after addition of a 10 cm H_2O PEEP for each VT. Hemodynamically unstable patients were defined as those with a > 15% decrease in CI after the addition of PEEP.

Results

PEEP induced changes in CI and PVI for VT of 8 and 10 mL/kg. Hemodynamic instability occurred in 5 patients for a VT of 6 mL/kg, in 6 patients for a VT of 8 mL/kg, and in 9 patients for a VT of 10 mL/kg. For VT of 8 mL/kg, a PVI threshold value of 12% during ZEEP predicted hemodynamic instability with a sensitivity of 83% and a specificity of 80% (area under the receiver operating characteristic curve 0.81; P = 0.03). For VT of 10 mL/kg, a PVI threshold value of 13% during ZEEP predicted hemodynamic instability with a sensitivity of 78% and a specificity of 83% (area under the receiver operating characteristic curve 0.83; P = 0.01).

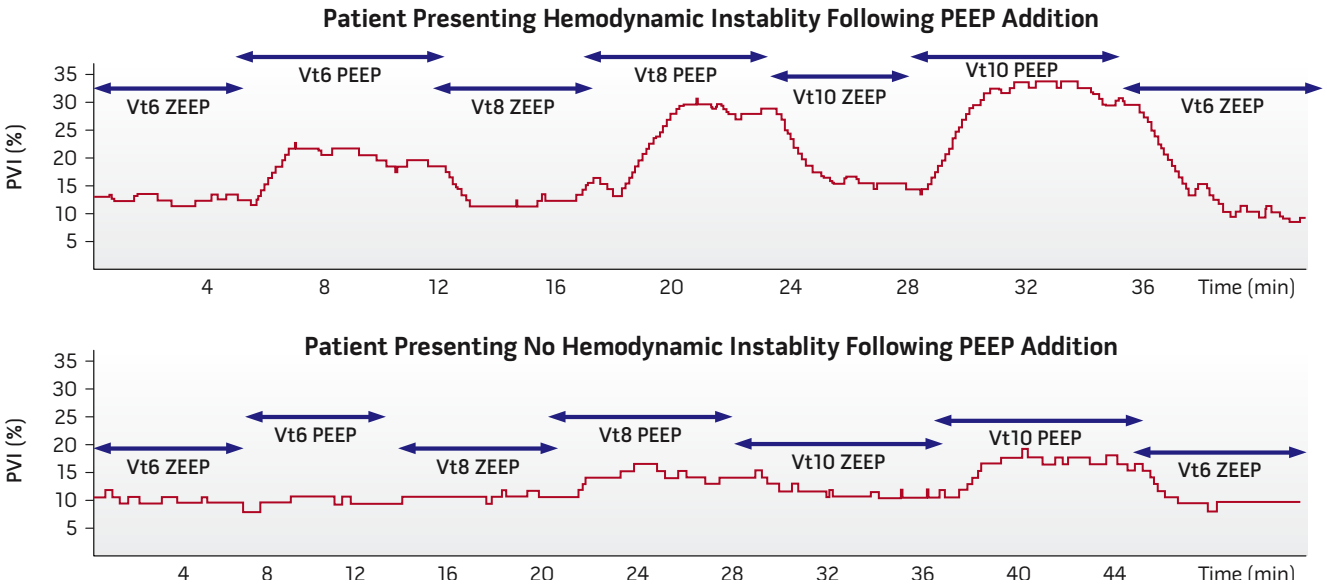

Figure 1 *– Pleth variability index (PVI) evolution during tidal volumes (VT) and positive end-expiratory pressure (PEEP) variations in a hemodynamically unstable patient (top) and in a hemodynamically stable patient (bottom).*

Conclusions

PVI may be useful in automatically and noninvasively detecting the hemodynamic effects of PEEP when VT is > 8 mL/kg in ventilated and sedated patients with acceptable sensitivity and specificity.

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