Does the Pleth Variability Index Indicate the Respiratory- Induced Variation in the Plethysmogram and Arterial Pressure Waveforms?

Cannesson M., Delannoy B., Morand A., Rosamel P., Attof Y., Bastien O., Lehot J.J.

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Background

Respiratory variations in the pulse oximeter plethysmographic waveform amplitude (POP) are sensitive to changes in preload and can predict fluid responsiveness in mechanically ventilated patients. However, they cannot be easily calculated from a bedside monitor. Pleth variability index (PVI, Masimo Corp., Irvine, CA) is a new algorithm that automatically calculates ΔPOP. The aim of our study was to test the ability of this new device to automatically and continuously monitor ΔPOP.

Methods

Twenty-five patients were studied after induction of general anesthesia. PVI automatically and continuously calculates the respiratory variations in the plethysmography waveform amplitude (perfusion index). Data (mean arterial blood pressure, central venous pressure, respiratory variations in arterial pulse pressure, POP, and PVI) were recorded at baseline in anti-Trendelenburg position and, finally, in Trendelenburg position.

Results

There was a significant relationship between PVI and ΔPOP ($r = 0.92$; $P < 0.05$). Over the 75 measurements, 42 (56%) presented a ΔPOP value >13%. A PVI threshold value of 11.5% was able to discriminate between ΔPOP >13% and ΔPOP <13% with a sensitivity of 93% and a specificity of 97%. Area under the curve for PVI to predict ΔPOP >13% was 0.990 ± 0.07.

Conclusion

This study is the first to demonstrate the ability of PVI, an index automatically derived from the pulse oximeter waveform analysis, to automatically and continuously monitor ΔPOP. This new index has potential clinical applications for noninvasive fluid responsiveness monitoring.