Accuracy of Stroke Volume Variation Compared with Pleth Variability Index to Predict Fluid Responsiveness in Mechanically Ventilated Patients Undergoing Major Surgery

Zimmermann M, et al. *European Journal of Anaesthesiology.* 2010; 27:555-561.

Background

Accurate assessment of a patient's volume status is an important goal for an anaesthetist. However, most variables assessing fluid responsiveness are either invasive or technically challenging. This study was designed to compare the accuracy of arterial pressure-based stroke volume variation (SVV) and variations in the pulse oximeter plethysmographic waveform amplitude, as evaluated with the noninvasively calculated pleth variability index (PVI), along with central venous pressure to predict the response of stroke volume index (SVI) to volume replacement in patients undergoing major surgery.

Methods

We studied 20 patients scheduled for elective major abdominal surgery. After induction of anaesthesia, all haemodynamic variables were recorded immediately before (T1) and subsequent to volume replacement (T2) by infusion of 6% hydroxyethyl starch (HES) 130/0.4 (7 ml/kg) at a rate of 1ml/kg/min.

Results

The volume-induced increase in SVI was at least 15% in 15 patients (responders) and less than 15% in five patients (nonresponders). Baseline SVV correlated significantly with changes in SVI (ΔSVI; r=0.80; P<0.001) as did baseline PVI (r=0.61; P<0.004), whereas baseline values of central venous pressure showed no correlation to ΔSVI. There was no significant difference between the area under the receiver operating characteristic curve for SVV (0.99) and PVI (0.97). The best threshold values to predict fluid responsiveness were more than 11% for SVV and more than 9.5% for PVI.

Table 1 – Area Under the ROC Curves and Cut-Off Values

	AUC	Standard error	Lower limit (95% CI)	Upper limit (95% CI)	P	Cut-off	Sensitivity (%)	Specificity (%) (95% CI)
SVV	0.99	0.01	0.97	1.0	0.0001	11.0%	100 (78-100)	80 (28-99)
PVI	0.97	0.03	0.91	1.0	0.002	9.5%	93 (68-99)	100 (48-100)
CVP	0.55	0.14	0.27	0.83	0.73	10.5 mmHg	66 (38-88)	40 (5-85)

CI = Confidence Interval

Areas under the receiver operating characteristic (ROC) curves and cut-off values to discriminate between volume-loading responders and nonresponders for stroke volume variation (SVV), pleth variability index (PVI), and central venous pressure (CVP).

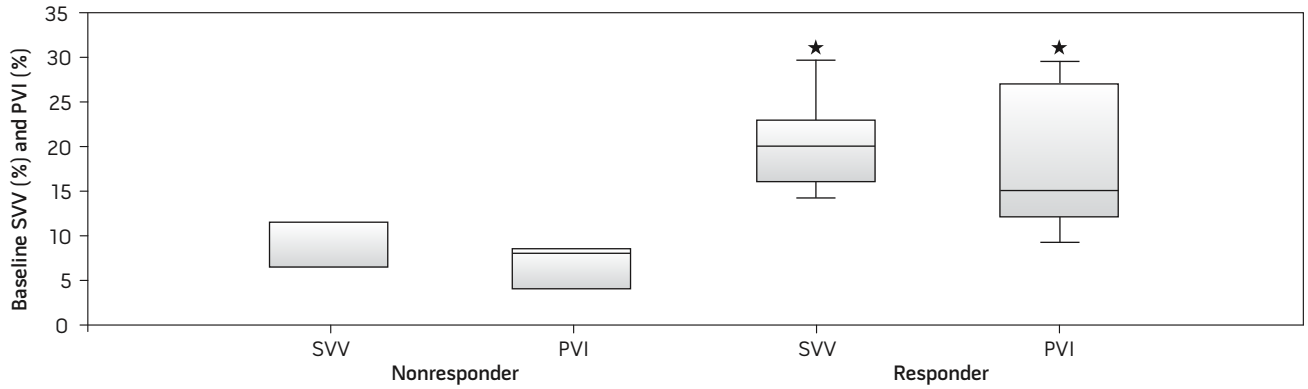

Figure 1 *– Median values and interquartile range of baseline values of stroke volume variation and pleth variability index in responders and nonresponders (P<0.001).*

Conclusions

Although arterial pressure-derived SVV revealed the best correlation to volume-induced changes in SVI, the results of our study suggest that both variables, SVV and PVI, can serve as valid indicators of fluid responsiveness in mechanically ventilated patients undergoing major surgery.

7986-6493A-0610