Respiratory variation in central venous pressure as a surrogate for stroke volume variation for predicting fluid responsiveness during noncardiac surgery

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【Background】

Stroke volume variation (SVV) is of diagnostic value for fluid responsiveness in patients monitored with the FloTrac/Vigileo system, whereas central venous pressure (CVP) is considered not very useful for predicting fluid responsiveness. However, few studies investigated whether the changes in the CVP amplitude induced by the respiratory cycle are in good agreement with pulse arterial pressure variation.

【Aim】

To investigate whether respiratory variation in CVP could be a surrogate for SVV in mechanically ventilated patients under general anaesthesia.

【Methods】

The study was approved by the Institutional Ethics Board of Kurashiki Central Hospital, and written consent was obtained from all patients.

Patients: Five patients with normal heart function and normal sinus rhythm undergoing abdominal aorta replacement

Study duration: 1st Jun 2017 to 30th Nov 2017

Measurements: Haemodynamic changes captured on the vital signs monitor and monitoring data including CVP and SVV recorded every minute

Respiratory variation in the CVP waveform over a single respiratory cycle was calculated as follows: $[(\text{maximum CVP} - \text{minimum CVP}) / \text{maximum CVP}] \times 100 (\%)$. Respiratory variation in CVP was compared by dividing SVV values into two groups: $\text{SVV} \geq 16\%$ (high SVV group) and $\text{SVV} \leq 10\%$ (low SVV group).

Statistical analysis: Spearman's test to determine correlation, and Mann-Whitney U test for two group comparison.

Table. Patient Background and Intraoperative Data

N=5	
Age, yr	75(63-76)
Height, cm	166(154-173)
Weight, kg	64(61-73)
Body mass index, kg/m ²	27(24-27)
Operation time, min	217(179-285)
Blood loss, mL	1587(1202-1663)

median (interquartile range)

【Results】

Fig. 1. Correlation between respiratory variation in CVP and SVV
Haemodynamic changes were captured 64 times in total. Respiratory variation in CVP was significantly correlated with SVV ($r=0.567$, $p<0.001$) and was significantly greater in the high SVV group than in the low SVV group ($p<0.001$).

Fig. 2. Correlation between the absolute value of CVP and SVV
Invasive haemodynamic monitoring data were recorded 1203 times in total. The absolute value of CVP was only slightly correlated with SVV ($r=-0.283$).

【Conclusion】

Respiratory variation in CVP can be a surrogate for SVV for predicting fluid responsiveness in mechanically ventilated patients under general anaesthesia during noncardiac surgery, but the absolute value of CVP was not.