

Prediction of Volume Responsiveness using Pleth Variability Index in Patients Undergoing Cardiac Surgery after Cardiopulmonary Bypass.

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Background

The pleth variability index (PVI) is derived from analysis of the plethysmographic curve and is considered to be a noninvasive parameter for prediction of volume responsiveness. The aim of our prospective clinical study was to evaluate if volume responsiveness can be predicted by PVI in patients undergoing cardiac surgery after cardiopulmonary bypass.

Methods

Eighteen patients were prospectively studied. Directly after cardiac surgery, PVI, stroke volume variation (SVV), and cardiac index (CI) were recorded. Colloid infusion (4 ml/kg body weight) was used for volume loading, and volume responsiveness was defined as increase of CI more than 10 %.

Results

SVV and PVI measures were found to be highly correlated at $r = 0.80$ ($p < 0.001$). Receiver operating characteristics curve (ROC) analysis resulted in an area under the curve of 0.87 for SVV and 0.95 for PVI, which values did not differ statistically significant from each other ($p > 0.05$). The optimal threshold value given by ROC analysis was ≥ 11 % for SVV with a sensitivity and specificity of 100 % and 72.2 %. For PVI, optimal threshold value was ≥ 16 % with a sensitivity and specificity of 100 % and 88.9 %. Positive and negative predictive values estimating an increase of CI ≥ 10 % for SVV were 44.4 % and 100 % and 66.7 % and 100 % for PVI.

Conclusions

For consideration of fluid responsiveness PVI is as accurate as SVV in patients after cardiopulmonary bypass. Methodological limitations such as instable cardiac rhythm after cardiopulmonary bypass and right- or left ventricular impairment seem to be responsible for low specificity and positive predictive values in both parameters PVI and SVV.