

Prediction of Fluid Responsiveness Following Conventional Cardiac Surgery: A Comparison between Arterial Pulse Pressure Variation and Plethysmographic Variability Index

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Introduction

Plethysmographic variability index (PVI, Masimo Corp., Irvine, CA) is a new non-invasive dynamic indice used to predict fluid responsiveness. Initial proof -to-concept studies including selected patients in stable hemodynamic condition reported encouraging results.¹ The present study aimed to compare the clinical utility of arterial pulse pressure variation (PPV) and PVI to predict fluid responsiveness following conventional cardiac surgery.

Methods

After approval by the local Ethics Committee, 87 patients admitted to the cardiac intensive care unit following conventional cardiac surgery were prospectively investigated. Measurements of PPV and PVI were simultaneously performed before and after a fluid challenge with 500 ml tetrastarch 130/0.4 (6%) over 15 min. Transpulmonary thermodilution cardiac index (CITP-TD) was used to define the positive response to fluid challenge as an increase in CITD of at least 15%. The discrimination of both PPV and PVI in predicting fluid responsiveness was compared by performing areas under the receiver operating characteristics curves (ROCAUC). Sensitivity analyses were conducted after exclusion of patients with a low perfusion index (PI), patients receiving norepinephrine, and patients with infra-clinic right ventricular dysfunction (RVD) assessed by echocardiography.

Results

Fifty-seven (71%) patients were responders and twenty-three (29%) were non-responders. Seven patients were excluded because of abnormalities in cardiac rhythm or technical reasons. ROCAUC were 0.73 [95% CI: 0.63-0.83] vs. 0.60 [95% CI: 0.48-0.71] for PPV and PVI in the whole cohort of patients. The limits of the grey zone were 7% to 17% for PPV values and 9% to 23% for PVI values. The inconclusive class of responses included 47 (59%) and 62 (77%) patients, respectively (P=0.010). Whereas the discrimination of PVI remained low whatever the subgroup of patients, the discrimination of PPV markedly increased after exclusion of patients with $PI \leq 1.3$ (ROCAUC = 0.83 [95% CI: 0.68-0.93]) and patients with RVD (ROCAUC = 0.85 [95% CI: 0.67-0.95]).

Conclusions

PVI is not discriminant and probably useless to predict fluid responsiveness after conventional cardiac surgery. The discrimination of PPV is globally poor, but could be markedly improved after exclusion of patients with a low PI and/or infra-clinic RVD.

References

1. *Br J Anaesth* 2008; 101: 200-6