Comparison of non-invasive (ClearSight®) and invasive (Pulsioflex®) pulse contour analysis to measure stroke volume during major surgery

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INTRODUCTION

Fluid management strategies have shown to improve postoperative outcomes in major surgery.¹ French guidelines recommend to titrate intraoperative volume expansion (VE) by measuring stroke volume index (SVI).² We compared a new non-invasive pulse contour device using photoplethysmography (ClearSight) with a minimally invasive one (Pulsioflex) to measure SVI and its changes after VE during major surgery.

MATERIALS AND METHODS

Adult patients undergoing elective major surgery requiring continuous invasive arterial pressure with monitoring of cardiac output were included. Cardiac index (CI), SVI, SVI variation, blood pressure (BP) and VE-induced changes in SVI were measured. SVI measured by Pulsioflex after auto-calibration was used as the reference. Absolute accuracy was assessed with Bland-Altman plots. Agreement between Pulsioflex and ClearSight to track changes of SVI after VE was assessed with Cohen's kappa coefficient.

In comparison with Pulsioflex, ClearSight, a non-invasive pulse contour device, was reliable for tracking VE-induced changes in SVI during major surgery

RESULTS

After informed consent, thirty patients were included in the study with 6 087 pairs of measures analyzed and 62 VE. Bias and limits of agreements for SVI were 0.02 ± 19.8 mL for ClearSight compared to Pulsioflex (Figure). Considering the response of VE, the coefficient of agreement between the two devices was strong ($\kappa = 0.81$, $p < 0.05$). In responder patients (10-percent increase for SV), VE induced a similar increase in SV between ClearSight and Pulsioflex (7 ± 4 mL vs 9 ± 4 mL, $p < 0.05$) (Table).

Figure Bland-Altman with bias and limits of agreement

	Before VE		After VE	
	Pulsio	Clear	Pulsio	Clear
MAP (mmHg)	76 ± 14	74 ± 12	82 ± 12	86 ± 10 *
CI (L/min/m²)	2,7 ± 0,8	2,9 ± 1,2	2,9 ± 1,0	3,0 ± 1,2
SVI (mL/m²)	33 ± 8	35 ± 9	42 ± 12 *	42 ± 13 *
SVV (%)	14 ± 3	14 ± 3	9 ± 3 *	9 ± 3 *

Data are given as median ± confidence interval
VE, volume expansion; MAP, mean arterial pressure; CI, cardiac index; SVI, stroke volume index; SVV, stroke volume variation
*p<0.05 (comparison between before and after VE)

Table Hemodynamic changes induced by volume expansion

References:

¹Corcoran T. et al., *Anesth Analg* 2012

²Vallet B. et al. *Ann Fr Anesth Reanim* 2013