Comparison of Cardiac Output Measurement Using LiDCOrapid™ and Pulmonary Artery Catheters in an Asian Population

Sho Ohno M.D., Yusuke Yoshikawa M.D., Naoyuki Hirata M.D., Ph.D., Michiaki Yamakage M.D., Ph.D.
Sapporo Medical University School of Medicine, Department of Anaesthesiology, Sapporo, Japan

Background

LiDCOrapid™ is an uncalibrated device for calculating cardiac output (CO). The LiDCOrapid™ nomogram uses autopsy data of aortic volume and compliance obtained from studies conducted in Western countries. The accuracy of LiDCOrapid™ in an Asian population has not been elucidated. In the present study, we compared CO measured by LiDCOrapid™ (CO_{lidco}) with that measured by pulmonary artery catheters (CO_{pac}) in Japanese patients undergoing cardiac surgery.

Fig. 1. LiDCOrapid™.

Materials and Methods

- **Patients:** patients scheduled to undergo elective cardiac surgery
- **Exclusion:** atrial fibrillation, severe aortic regurgitation, chronic renal failure on hemodialysis
- **Measurements:** CO_{pac} calculated by the thermodilution technique and CO_{lidco} were recorded at predefined points during anesthesia (Fig. 2)
- **Statistical analysis:** Bland-Altman analysis, four-quadrant plots and polar plot methodology

Fig. 2. Predefined points of CO measurement.

Results

Table 1. Patients characteristics (n = 18).

Age (yr)	62.0 [53.3 - 75.8]	
Sex (M/F)	12/6	
Height (cm)	162.7 [154 - 169]	
Body weight (kg)	61.2 [49.4 - 72.8]	
BSA (m ²)	1.70 [1.45 - 1.79]	
LVEF (%)	64.0 [51.9 - 69.2]	
Operation time (min)	443 [381 - 596]	
Type of operation		
Valve	9	
CABG	5	
Valve + CABG	3	
Aortic root	1	

BSA; body surface area, LVEF; left ventricular ejection fraction, CABG; coronary artery bypass grafting.
Data were shown as medians [interquartile range] or numbers.

Percentage error (1.96 SD / mean of reference method) = **54.0 (%)**
95% limits of agreement = **± 2.09 (L/min)**

Figure 3. Bland-Altman analysis comparing CO_{pac} with CO_{lidco} . Percentage error of within 15% to 20% and 95% limit of agreement of within ± 1.0 L/min are acceptable ranges.¹⁾

Figure 4. Four-quadrant plots comparing CO trending ability. Concordance rate of above 90% to 95% indicates reliable trending ability.²⁾

Figure 5. Polar plots comparing CO trending ability. Concordance rate of below 90% indicates poor trending ability. Radial limit of agreement of less than $\pm 30^\circ$ suggests acceptable limit.³⁾

Conclusion

Value and trending of CO measured by LiDCOrapid™ were not accurate in an Asian population. A specific nomogram that is based on clinical studies in Asian patients is required.

References

- 1) J Clin Monit Comput.1999;15:85-91
- 2) Anesth Analg.2010;5:1180-92
- 3) J Cardiothorac Vasc Anesth.2003;17:217-20