



We investigated the agreement between transpulmonary thermodilution measurements obtained with bolus injection through peripherally inserted central catheter and centrally inserted central catheter (reference standard) using a transpulmonary thermodilution-calibrated Pulse Contour hemodynamic monitoring system (VolumeView/EV1000)” D’Arrigo et al (2019).

Abstract:

**OBJECTIVES:** Peripherally inserted central catheters are increasingly used in ICU as an alternative to centrally inserted central catheters for IV infusion. However, their reliability for hemodynamic measurements with transpulmonary thermodilution is currently unknown. We investigated the agreement between transpulmonary thermodilution measurements obtained with bolus injection through peripherally inserted central catheter and centrally inserted central catheter (reference standard) using a transpulmonary thermodilution-calibrated Pulse Contour hemodynamic monitoring system (VolumeView/EV1000).

**DESIGN:** Prospective method-comparison study.

**SETTING:** Twenty-bed medical-surgical ICU of a teaching hospital.

**PATIENTS:** Twenty adult ICU patients who required hemodynamic monitoring because of

hemodynamic instability and had both peripherally inserted central catheter and centrally inserted central catheter in place.

**INTERVENTION:** The hemodynamic measurements obtained by transpulmonary thermodilution after injection of a cold saline bolus via both centrally inserted central catheter and either a single-lumen 4F or a double-lumen 5F peripherally inserted central catheter using were compared. In order to rule out bias related to manual injection, measurements were repeated using an automated rapid injection system.

**MEASUREMENTS AND MAIN RESULTS:** A total of 320 measurements were made. Cardiac index was significantly higher when measured with double-lumen 5F peripherally inserted central catheter than with centrally inserted central catheter (mean, 4.5 vs 3.3 L/min/m;  $p < 0.0001$ ; bias, 1.24 L/min/m [0.27, 2.22 L/min/m]; bias percentage, 31%). Global end-diastolic index, extravascular lung water index, and stroke volume index were also overestimated ( $853 \pm 240$  vs  $688 \pm 175$  mL/m,  $12.2 \pm 4.2$  vs  $9.4 \pm 2.9$  mL/kg, and  $49.6 \pm 14.9$  vs  $39.5 \pm 9.6$  mL/m, respectively;  $p < 0.0001$ ). Lower, albeit significant differences were found using single-lumen 4F peripherally inserted central catheter (mean cardiac index, 4.2 vs 3.7 L/min/m;  $p = 0.043$ ; bias, 0.51 L/min/m [-0.53, 1.55 L/min/m]; bias percentage, 12.7%). All differences were confirmed, even after standardization of bolus speed with automated injection. **CONCLUSIONS:** Bolus injection through peripherally inserted central catheter for transpulmonary thermodilution using EV1000 led to a significant overestimation of cardiac index, global end-diastolic index, extravascular lung water index, and stroke volume index, especially when double-lumen 5F peripherally inserted central catheter was used (ClinicalTrial.gov NCT03834675).

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## Reference:

D'Arrigo, S., Sandroni, C., Cacciola, S., Dell'Anna, A.M., Pittiruti, M., Annetta, M.G., Colosimo, C. and Antonelli, M. (2019) Are Peripherally Inserted Central Catheters Suitable for Cardiac Output Assessment With Transpulmonary Thermodilution? *Critical Care Medicine*. July 25th. doi: 10.1097/CCM.0000000000003917. .

