

Letter

Erroneous measurement of haemodynamic parameters by PiCCO™ monitor in a critically ill patient with renal replacement therapy: a case report

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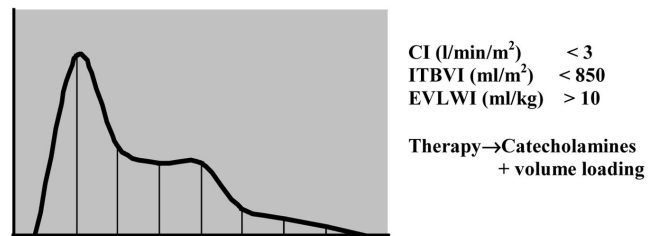
The PiCCO™ monitor (Pulsion Medical System, Melsungen, Hessen, Germany) has become an alternative method of haemodynamic invasive monitoring for the critically ill patient. The determination of the continuous cardiac output by arterial pulse contour analysis requires the periodic calibration of the monitor. This calibration is performed by the injection of a bolus of 15–20 ml cold saline through a central line catheter [1-3].

We present the case of a 54-year-old woman with breast cancer who underwent cord decompression surgery for bone metastasis. On the seventh postoperative day she developed multiorgan system failure (septic shock + respiratory insufficiency + acute renal failure + disseminated intravascular coagulopathy) due to nosocomial pneumonia. The patient was admitted to the intensive care unit and the PiCCO™ monitor was used for invasive haemodynamic monitoring. A Certofix™ Trio HF catheter (Braun, Munich, Bayern, Germany) was placed uneventfully in the right internal jugular vein to carry out continuous venous-venous haemodialysis (CVVH-D). The Certofix™ Trio HF is a triple-lumen catheter made of polyurethane with three lumens (first channel, distal = 16 G; second channel, middle = 12 G; and third channel, proximal = 12 G). The distal lumen was used for the calibrations of the PiCCO™ monitor due to the high-risk of insertion of another central line in a patient with severe coagulopathy. The analysis of the area under the thermodilution curve showed a hypodynamic state that was treated following the PiCCO™ monitor algorithm (Figure 1).

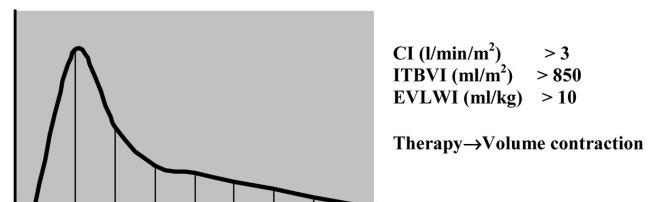
The clinical condition of the patient worsened so we performed echocardiography, which showed us a completely different clinical picture (hyperdynamic and hypovolemic state) compared with the PiCCO™ monitor results. The CVVH-D blood pump was stopped and a new calibration was performed (Figure 2). The newly obtained PiCCO™

measurements showed a different physiology and treatment (Figure 2), similar to that obtained by the echocardiogram.

In Figure 1 we can see how the area under the curve had a different morphology to the curve of Figure 2. The first curve had a plateau in the middle descendent line (Figure 1). Its risen curve caused an erroneous measurement of the haemodynamic parameters by the PiCCO™ monitor, with a smaller calculated cardiac output.

Figure 1

Calibration with continuous venous-venous haemodialysis.

Figure 2

Calibration without continuous venous-venous haemodialysis.

CVVH-D = continuous venous-venous haemodialysis.

We think that the alteration of the area under the curve was produced by the turbulent flow from the haemodialysis catheter. The turbulent flow decreases the velocity of the cold saline bolus in the vein. The area under the curve is larger because the cold saline needs more time to arrive at the thermometer through the long arterial line. Due to the high flow in the vein, there was an alteration of the area under the curve obtained by the injection of cool saline. We think the same alteration would be produced by any catheter, if calibration is done during haemodialysis, with a working pump. PiCCO™ calibration during haemodialysis through a central vein catheter may therefore produce erroneous measurements.

Based on these findings we recommend stopping CVVH-D during the calibration of the PiCCO™ monitor.

Key messages

The calibration of the PiCCO™ monitor during haemodialysis through a central vein catheter may produce erroneous measurements.

The CVVH-D pump must be stopped during the calibration.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

AM-S and PM were in charge of the intensive care unit the day that the patient was admitted. They discovered the erroneous measurement with the help of EC-A, who was in charge of the patient the following day. All authors participated in the draft of the manuscript, and read and approved the final version.

Acknowledgement

Verbal consent was obtained from the patient for the publication of this case report.

References

1. Joachim B: **Hemodynamic monitoring in the intensive care unit: Clinical review.** *Crit Care* 2002, **6**:52-59.
2. Sakka SG, Ruhl CC, Pfeiffer UJ, Beale R, MvLuckie A, Reinhart K, Meier-hellmann A: **Assessment of cardiac preload and extravascular lung water by single transpulmonary thermodilution.** *Intensive Care Med* 2000, **26**:180-187.
3. Sakka SG, Klein M, Reinhart K, Meier-Hellmann A: **Prognostic value of extravascular lung water in critically ill patient.** *Chest* 2002, **122**:2080-2086.