

Arterio-vena caval fistula detected by monitoring of transpulmonary thermodilution curves

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To the Editor:

The pulmonary artery catheter (PAC) and PiCCO monitor (Pulsion Medical Systems, Munich, Germany) use the thermodilution technique to measure cardiac output [1]. Because the indicator injection site (central vein) and temperature measurement site (femoral artery) are more distant in PiCCO than in PAC (right atrium and pulmonary artery), PiCCO can potentially detect a wider variety of left-to-right shunts (LRS) than PAC.

A 68-year-old man was admitted to the ICU for presumed diagnoses of septic shock and acute kidney injury resulting from an infected right common iliac artery (CIA) aneurysm. He was treated with continuous veno-venous hemodialysis (CVVHD) and vasopressin infusion with massive fluid resuscitation and noradrenaline infusion for septic shock. Ten days after ICU admission, he still required a small amount of noradrenaline and CVVHD. To evaluate his cardiac function and manage his shock state more meticulously, a 5-Fr. catheter (Pulsioncath; Pulsion Medical Systems, Munich, Germany) was inserted in his

left femoral artery and was connected to the PiCCO Plus monitor. Despite the absence of hypoxemia and lung infiltrates in the chest X-ray, hemodynamic variables showed low cardiac index (CI, 1.37 l/min/m²) and very low intrathoracic blood volume index (ITBVI, 336 ml), with massively increased extravascular lung water index (EVLWI, 43.7 ml/kg) for an average value of two measurements. The thermodilution curve showed a significantly prolonged flattening of the descending portion of the curve, suggesting an LRS. A dynamic computed tomography (CT) scan of the abdomen was subsequently conducted, which revealed an arteriovenous fistula between the right CIA aneurysm and the inferior vena cava. To repair the fistula, endovascular stenting was planned. However, on the day of surgery, the patient suddenly developed cardiac arrest and could not be resuscitated. Although an autopsy was not performed, the cause of cardiac arrest was thought to be rupture of the aneurysm.

The dilution curve of LRS is characterized by an early recirculation of the cold indicator, which results in premature flattening of the descending portion of the curve. Previously, only two cases of LRS detected by PiCCO have been reported [2]. One patient had a ventricular septal defect and the other had an aorto-vena caval fistula. One patient had an ITBVI of 857 ml/m², EVLWI of 31.7 ml/kg, and CI of 2.66 l/min/m². Our case showed even more abnormal values of ITBVI and EVLWI than the previous cases. Retrospectively, our patient had probably developed the LRS before ICU admission, when his condition deteriorated. The persistent LRS could have contributed to the sustained shock state and acute kidney injury and might have deteriorated gradually during his stay in the ICU. We think that this is the reason why we found exceptionally low ITBVI and high EVLWI values compared with previous cases.

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In conclusion, we experienced a case of a fistula between a right CIA aneurysm and the inferior vena cava detected by PiCCO. Physicians should be aware that the PiCCO monitoring system is able to detect a wide variety of LRS by showing a significantly prolonged flattening of the descending portion of the thermodilution curve.

References

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