

中文題目： 案例討論：使用心肺容積監視器協助診斷及治療非心因性肺水腫

英文題目： A Case Discussion: Use Pulse Contour Cardiac Output Technique as Diagnosis and Treatment Guide in Non-cardiogenic pulmonary edema

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Case report:

A 78-year-old woman with history of chronic kidney disease stage 5, diabetes mellitus and hypertension was admitted because of progressive dyspnea for one day. She had wheezing, consciousness drowsy and general malaise. She did not have fever or peripheral limbs edema. Laboratory studies revealed elevated blood urea nitrogen (BUN) and creatinine (BUN: 67 mg/dL, creatinine: 3.97 mg/dL), elevated N-terminal pro-brain natriuretic peptide (5259 pg/ml), hyponatremia (122 mmol/L), hypoalbuminemia (3.02 g/dL). Rapid test for influenza A and B were negative result. The chest plain film revealed bilateral perihilar consolidation (Fig. 1). Although pneumonia cannot be fully excluded, the chest radiography showed typical pattern of uremic lung. However, low fractional excretion of sodium (0.14 %) imply prerenal status. We use Pulse Contour Cardiac Output (PiCCO) to confirm her fluid status. The PiCCO revealed mild decreased cardiac index (CI): 2.89 L/min/m², global end-diastolic volume index (GEDVI): 782 ml/m² and high extravascular lung water index (ELWI): 23 ml/kg. The finding is relative rare but is compatible with her clinical presentation: prerenal status (no edema, mild elevation of GEDVI) but lung edema (high ELWI).

Continuous furosemide infusion and two times of hemodialysis on day 2 and day 4 were performed. The follow-up chest plain film revealed significant regression of perihilar consolidation (Fig. 2, 3), and the urine amount increased. Further elevation of BUN and creatinine (BUN: 96 mg/dL, creatinine: 5.5 mg/dL) were noted on day 4 of admission while PiCCO revealed adequated CI (3.27 L/min/m²), GEDVI (825 ml/m²) and decreased ELWI (17 ml/kg). The dose of furosemide was decreased and hemodialysis was terminated. The urine amount kept over 1500 ml per day. The furosemide was gradually decreased and shifted to oral form. IV hydration was given for prerenal azotemia. The creatinine gradually decreased after decreasing dose of furosemide and termination of hemodialysis, but BUN did not decrease until day 11. The chest plain film revealed total regression of perihilar consolidation on day 11 of admission (Fig. 4), and the patient was transferred to ordinary ward. Her renal function recovered to her general status and was discharged on day 17. We suppose that the condition of this patient may be trigger by virus infection at initial. No

definite pathogen was confirmed at last. Blood and sputum culture were negative result.

Discussion:

Transpulmonary thermodilution (TPTD) technique emerged in the early 2000s, and now it is used for advanced hemodynamic monitoring in severe shock and complex situations¹. The TPTD devices provide valuable information including cardiac output and several valuable pieces of hemodynamic information.

Among the indices that TPTD technique provides, ELWI, as a marker of pulmonary edema and GEDVI, which has been successfully established as an independent marker of cardiac preload in perioperative patients and patients in septic shock provided valuable information to guide the management of fluid status in patient with pulmonary edema for clinicians². However, both ELWI and GEDVI are measured and calculated theoretically in the base of cardio-pulmonary circulation; that means the two indices majorly represent the fluid status in thorax only.

As the case we presented, the BUN level elevated before the pulmonary edema regressed, and lasted for days after the pulmonary edema totally regressed. The situation indicated the unequal water distribution between pulmonary and systemic circulation. Furthermore, some expert experience recently also indicated that alteration of the pulmonary vascular permeability index with the systemic vascular permeability index in critically patient is unequal³. Both factors increase challenge to clinicians to decide the fluid strategy in different critically ill patient.

We still believed TPTD technique provided useful cardiopulmonary indices for guiding fluid strategy in complex critically ill patient. However, it requires adequate experiment and knowledge for clinicians to explain the data from TPTD devices and balance the fluid status between pulmonary and systemic circulation.

Figure 1



Figure 2



Figure 3



Figure 4



Figure legends

Fig. 1. Advanced bilateral perihilar consolidation suggested pulmonary edema on admission

Fig. 2. Significant resolution of perihilar consolidation after the first hemodialysis

Fig. 3. Further improvement of perihilar consolidation after furosemide infusion and two times of hemodialysis

Fig. 4. After the treatment course at intensive care unit, the pulmonary edema totally resolved

References

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