

Objectives

Patients who receiving continuous renal replacement therapy (CRRT) due to their critical illnesses can be hemodynamically unstable because their peripheral resistance and blood volume changes frequently. Cardiac output (CO) is a key variable when describing and treating the cardiovascular system. Thermodilution via a pulmonary artery catheter is the most frequently used method, but it lacks accuracy. Non-invasive cardiac output monitoring (NICOM) measures CO based on chest bioimpedance. Validated data of NICOM in patients with CRRT are lacking. So we compared central venous pressure (CVP) with cardiac output monitored via NICOM system in patients with CRRT.

Methods

Stroke volume (SV) values using NICOM were recorded in patients with CRRT and CVP values were measured at the same time. The difference between measured and average values of CVP (Δ CVP) and SV (Δ SV) were calculated in each subject, because CVP values may be different depending on the person who measured. Correlation analysis was performed Δ SV with and Δ CVP.

Results

Twenty five subjects (12 males and 13 females; mean age, 70.3 ± 8.6 years) were enrolled. And mean treatment duration of CRRT were 6.3 ± 6.5 days. Seventeen of subjects were treated with inotropic agent and 11 of them were treated with mechanical ventilation. The SV and CVP values of subjects' were measured 157 times. There were poor correlation with Δ SV and Δ CVP ($R = 0.07$, $P = 0.37$, Figure 1).

Conclusions

Stroke volume measured by NICOM and CVP showed poor correlation. NICOM may be not effective as non-invasive method for circulating volume monitoring in patients with CRRT

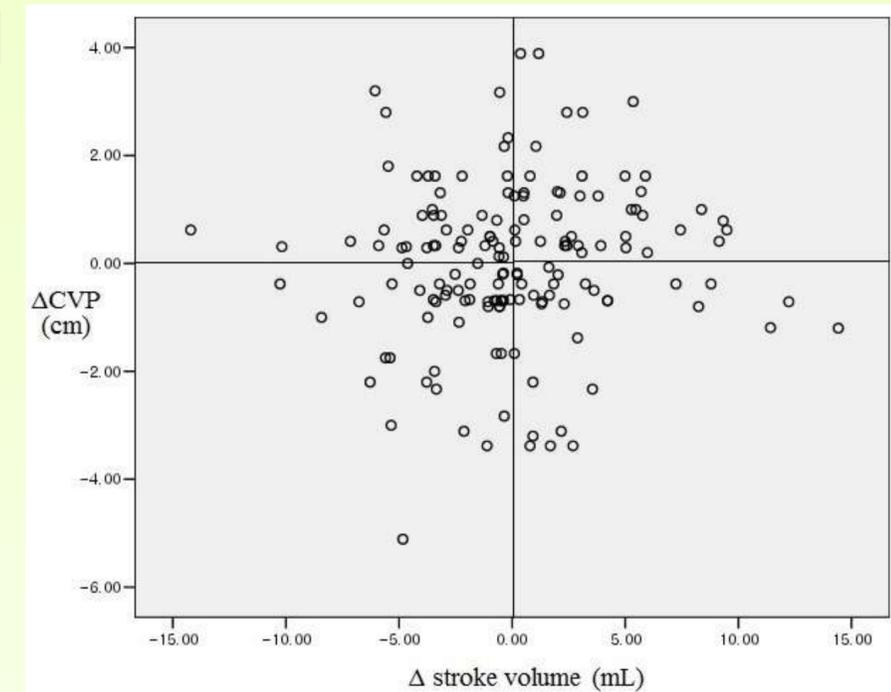


Figure 1. The scatter diagram between Δ stroke volume measured by NICOM and Δ central venous pressure in patient with continuous renal replacement therapy.

References

1. Marik PE et al. The use of bioimpedance and carotid doppler to determine volume responsiveness and blood flow redistribution following passive leg raising in hemodynamically unstable patients. *Chest* 2013 Feb 1;143(2):364-370
2. Rich JD et al. Noninvasive cardiac output measurements in patients with pulmonary hypertension. *Eur Respir J* 2013 Jul;42(1):125-133
3. Squara P et al. Noninvasive cardiac output monitoring (NICOM): a clinical validation. *Intensive Care Med* 2007 Jul;33(7):1191-1194
4. Squara P et al. Comparison of monitoring performance of Bioimpedance vs. pulse contour during lung recruitment maneuvers. *Crit Care* 2009;13(4):R125

Author	Year	Title	Summary
Marik PE, et al	2013	The use of bioimpedance and carotid doppler to determine volume responsiveness and blood flow redistribution following passive leg raising in hemodynamically unstable patients	Bioimpedance provides an accurate method of assessing volume responsiveness in critically ill patients. Sensitivity 94%, specificity 100%. N= 34
Rich JD, et al	2013	Noninvasive cardiac output measurements in patients with pulmonary hypertension	NICOM performed with more precision than Swan TD in vasodilator challenge ($p < 0.001$) & correlated in accuracy with Fick in CO. N=20
Squara P, et al	2007	Noninvasive cardiac output monitoring (NICOM): a clinical validation	NICOM had a 93% sensitivity and 93% specificity for detecting directional changes. NICOM correlated highly with thermodilution ($r = .82$). N=110
Squara P, et al	2009	Comparison of monitoring performance of Bioimpedance vs. pulse contour during lung recruitment maneuvers	NICOM & PICCO had equivalent CO & SV monitoring capabilities, including the ability to detect directional changes in CO. N=20