Comparing doppler-echocardiography and thermodilution for cardiac output measurements in resuscitated out-of-hospital cardiac arrest patients undergoing targeted temperature management

Authors:
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Topic(s):
Cardiac Arrest

Background: Cardiovascular dysfunction is common after out-of-hospital cardiac arrest (OHCA). Cardiac output measurements can be used to guide treatment during post-resuscitation care and echocardiography allows noninvasive cardiac output estimation.

Purpose: The aim of the present study was to compare Doppler echocardiography (doppler_CO) with thermodilution using pulmonary artery catheters (PAC_CO) for cardiac output estimation in a large and consecutively included cohort of comatose OHCA-patients undergoing targeted temperature management (TTM).

Methods: Single-center substudy of 171 patients included in the TTM-trial randomly assigned to 33 or 36 degrees C for 24 hours after OHCA. We measured PAC_CO and doppler_CO simultaneously shortly after admission and again after 24 hours.

Measurements and Main Results: We excluded 19 (11%) patients without PAC-measurement and 31 (18%) without doppler-measurements resulting in 120 paired measurements at admission. Patients were 61 (±11) years old, 86% were men and 91% had a witnessed OHCA. At ICU-admission, PAC_CO was 4.81 (±1.81) L/min. and doppler_CO was 3.74 (±1.38) L/min., with a mean bias of 1.07 (±1.65) L/min (with 95% limits of agreement of −2.16 to 4.04) L/min. Examining the Bland-Altman plot, precision fell with higher cardiac output (figure). A statistically significant, but moderate correlation was found between doppler_CO and PAC_CO at admission (r = 0.49), p < 0.0001). After 24 hours, PAC_CO was 4.63 (±1.38) L/min. and doppler_CO was 3.61 (±1.14) L/min, with a mean bias of 0.96 L/min. Assessing the change from admission to 24 hours, PAC_CO decreased averagely -0.12 (±2.22) L/min. and doppler_CO decreased -0.19 (±1.91) L/min. The changes from admission to 24 hours correlated between doppler_CO and PAC_CO (r = 0.55), p < 0.0001) with a mean bias of the changes of 0.07 L/min, with 95% limits of agreement of −3.76 to 3.91 L/min.

Conclusions: Changes in cardiac output during TTM may be evaluated with Doppler echocardiography with little mean bias compared to changes in CO measured with thermodilution, but relatively large changes are needed in the individual patient before it can be considered as real.
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