An autocalibrating algorithm for non-invasive cardiac output determination based on the analysis of an arterial pressure waveform recorded with radial artery applanation tonometry: a proof of concept pilot analysis.

We aimed to describe and evaluate an autocalibrating algorithm for determination of cardiac output (CO) based on the analysis of an arterial pressure (AP) waveform recorded using radial artery applanation tonometry (AT) in a continuous non-invasive manner. To exemplarily describe and evaluate the CO algorithm, we deliberately selected 22 intensive care unit patients with impeccable AP waveforms from a database including AP data obtained with AT (T-Line system; Tensys Medical Inc.). When recording AP data for this prospectively maintained database, we had simultaneously noted CO measurements obtained from just calibrated pulse contour analysis (PiCCO system; Pulsion Medical Systems) every minute. We applied the autocalibrating CO algorithm to the AT-derived AP waveforms and noted the computed CO values every minute during a total of 15 min of data recording per patient (3 × 5-min intervals). These 330 AT-derived CO (AT-CO) values were then statistically compared to the corresponding pulse contour CO (PC-CO) values. Mean ± standard deviation for PC-CO and AT-CO was 7.0 ± 2.0 and 6.9 ± 2.1 L/min,
respectively. The coefficient of variation for PC-CO and AT-CO was 0.280 and 0.299, respectively. Bland-Altman analysis demonstrated a bias of +0.1 L/min (standard deviation 0.8 L/min; 95% limits of agreement -1.5 to 1.7 L/min, percentage error 23%). CO can be computed based on the analysis of the AP waveform recorded with AT. In the selected patients included in this pilot analysis, a percentage error of 23% indicates clinically acceptable agreement between AT-CO and PC-CO.

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