Reliability of Noninvasive Cardiac Output Measurement by Whole-Body Electrical Bioimpedance: Comparison to Thermodilution in Diverse Clinical Settings

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Non-invasive measurement of cardiac output (CO) is a promising alternative to thermodynamics. The Nicas 2001 system is an innovative device for measuring continuous noninvasive CO based on whole-body electrical bioimpedance and analysis of impulse with a novel semi-empirical formula correcting for age, sex and body composition. The purpose of the study was to determine its reliability in diverse medical settings.

Methods: One hundred and fifty patients (with acute congestive heart failure (CHF) - 29, during and after coronary bypass surgery (CABG) - 81, during coronary catheterization - 4), underwent over 542 simultaneous paired, independent measurements of cardiac output (CO) by Nicas 2001 (Nicas-CO) and thermodilution (Th-CO).

Results: We have found good agreement between Nicas-CO and Th-CO: Linear regression is r=0.91 (p<0.05). Bias (mean between-method difference) is -0.02 L/min and precision (bias +/- 2SD) is 1.45 to +1.37 L/min. This correlation is maintained throughout the different clinical settings and in a wide range of CO measurements (Figure). The correlation is r=0.86 in patients with acute CHF, 0.94 during coronary catheterizations and 0.9 after and during CABG.

Conclusions: For cardiac and cardiac surgery patients, Nicas-CO measurement using whole-body bioimpedance is accurate. It may have important application for noninvasive on-line monitoring and treatment for such patients.

Accuracy and Reproducibility of Noninvasively Determined Left Ventricular End Diastolic Pressure in the Catheterization Laboratory and the Office Setting

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Background: We have previously reported that Vericor® is a noninvasive system that measures the aortic pressure curve during a Valsalva maneuver, can be used to measure left ventricular and diastolic pressure (LVEDP).

Methods: In order to assess the accuracy and reproducibility of the results we tested Vericor® in the catheterization laboratory in patients during elective left heart catheterisation and in the office setting in cardiac patients during outpatient evaluations. Paired LVEDP measurements by invasive left heart catheterisation and Vericor methods were obtained in the catheterization laboratory (N=20) and by Vericor in the office-setting (N=75) by sequential testing (Tests 1 and 2).

Results: Results: Show that Vericor measurements of LVEDP in the catheterization laboratory correlate well (r=0.90) with catheter measured LVEDP and that sequential Vericor tests in the office-setting correlate well with each other (r<0.80).

Conclusions: Vericor can accurately and reproducibly measure LVEDP and can be used in the office setting for management of cardiac patients.

Reliability of Noninvasive Cardiac Output Measurement by Whole-Body Electrical Bioimpedance in Patients Treated for Acute Congestive Heart Failure

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The Nicas 2001 system is a new device for non-invasive, continuous measurement of cardiac output (CO) based on whole-body electrical bioimpedance and analysis of impulse with a novel semi-empirical formula correcting for age, sex and body composition. We evaluated its reliability in monitoring patients with acute congestive heart failure (CHF).

Methods: Thirty patients submitted for invasive hemodynamic monitoring with Swan-Ganz catheters due to acute CHF where enrolled in this study. CO was measured repeatedly in the Catheterization Laboratory and the Office Setting.

Results: Out of 30 patients, 10 were monitored while mechanically ventilated and 2 while treated with LBNP. We have found good agreement between Nicas-CO and Th-CO: Linear regression is r=0.86 (p<0.05). Bias (mean between-method difference) is -0.05 L/min and precision (bias +/- 2SD) is 1.36 to +1.27 L/min. In the subgroup of patients monitored while treated with IV LSN, The Nicas 2001 system correctly detected the CO increase induced by IV LSN (R=0.95, p<0.05, Figure).

Conclusions: Nicas 2001 is reliable for monitoring CO in patients admitted due to acute CHF.