

Comparison of Cardiac Output Measurements by TEB vs. Intermittent Bolus Thermodilution in Mechanical Ventilated Patients

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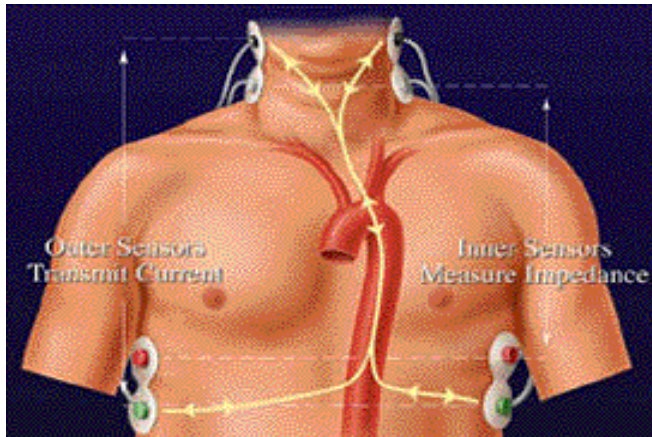
Objective

To determine if the Cardiac Output (CO) measurements obtained by Thoracic Electrical Bioimpedance (TEB) correlated with measurements obtained by intermittent bolus thermodilution (IBTD) from a pulmonary artery catheter (PAC) in patients needing mechanical ventilation.

Methods

- Patients requiring mechanical ventilation and a PAC were studied in a combined surgical and medical intensive care unit
- Simultaneous measurements of CO were obtained, utilizing the IBTD (Baxter-Edwards, Irvine, CA) and TEB (BioZ[®], CardioDynamics, San Diego, CA) at the time of initial PAC placement and again in 24 hours

Thoracic Electrical Bioimpedance (TEB)



- An alternating current is transmitted through the chest
- The current seeks the path of least resistance: the blood filled aorta
- The BioZ Systems measure the baseline impedance to this current
- With each heartbeat, blood volume & velocity in the aorta change
- The BioZ Systems measure the corresponding change in impedance
- The BioZ Systems use the baseline & changes in impedance to measure & calculate hemodynamic parameters

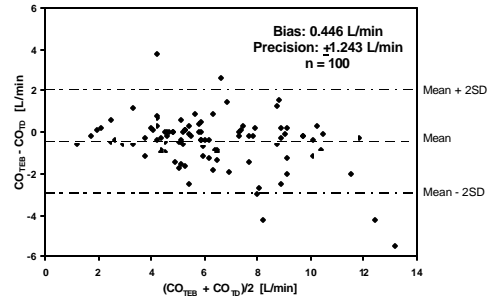
Results

- 52 patients from July 1998 to April 1999 were studied
- The average PaO₂/FiO₂ ratio was 191 ± 54 (range 78 to 302)

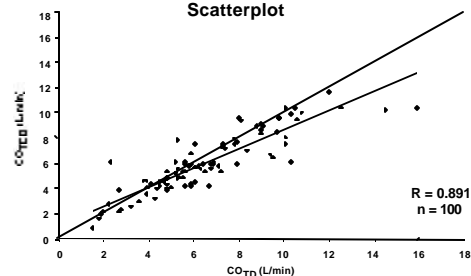
- 36 of 52 (69%) patients were on vasopressors and/or inotropes at the time of cardiac measurements
- 4 patients had only one measurement for comparison; one because the patient expired, and three as a consequence of equipment unavailability
- There were 100 simultaneous CO measurements from TEB and IBTD that were compared for analysis
- TEB vs. IBTD Correlation Coefficient $r = 0.89$
Mean Bias L/min = -0.446
- Six of the 100 measurements fell outside of the 95% limits of agreement range. During the study period, there were 4 patients for which TEB could not measure CO and 2 patients in which a PAC could not be placed

CO_{TEB} vs. CO_{TD}

Bland-Altman Analysis



Scatterplot



Conclusion

The CO measured by TEB has good correlation with IBTD in most patients requiring mechanical ventilation.

Clinical Implications

The TEB system is noninvasive and virtually risk free. Further studies are needed to determine if TEB can be used for clinical decisions that will affect outcome.