

ASSESSMENT OF CARDIAC PERFORMANCE USING THORACIC BIOIMPEDANCE IN CRITICALLY INJURED OBESE PATIENTS

Carlos V. Brown, William C. Shoemaker, Matthew J. Martin, Kenneth Azarow, Demetrios Demetriades

Madigan Army Medical Center, Tacoma, WA

Purpose: Cardiac performance may be assessed noninvasively at the bedside with thoracic bioimpedance. Using a low amperage, high frequency electrical current, the change in impedance across the thorax is measured with each cardiac cycle which allows estimation of stroke volume, cardiac output and cardiac index. However, it is unclear if this technique can be reliably used in critically injured obese patients due to increased body habitus and chest wall mass.

Study Design: A prospectively maintained database was used to identify all trauma patients admitted to the ICU that underwent simultaneous measurement of cardiac performance using both thoracic bioimpedance and thermodilution. Patients were divided into two groups based on body mass index (BMI). Those with BMI < 30 kg/m² were classified as non-obese and those with BMI > 30 kg/m² were categorized as obese.

Results: There were 285 patients who underwent 1,138 simultaneous assessments of cardiac performance using both bioimpedance and thermodilution. There were 211 non-obese patients (BMI = 25 + 3 kg/m²) and 74 obese patients (BMI = 34 + 4 kg/m²). Bioimpedance estimation of cardiac output and index correlated well with thermodilution for the entire population (r=0.84, p<.0001), and was equally reliable in obese (r=0.85, p<.0001) and non-obese (r=0.82, p<.0001) patients. There was less test performance bias in the obese group (-0.06 + 0.69) than in the non-obese group (-0.16 + 0.75, p=0.04) across a wide range of cardiac output.

Conclusions: Thoracic bioimpedance technology may be reliably used as a noninvasive alternative to pulmonary artery catheterization for assessment of cardiac performance in critically injured obese patients.