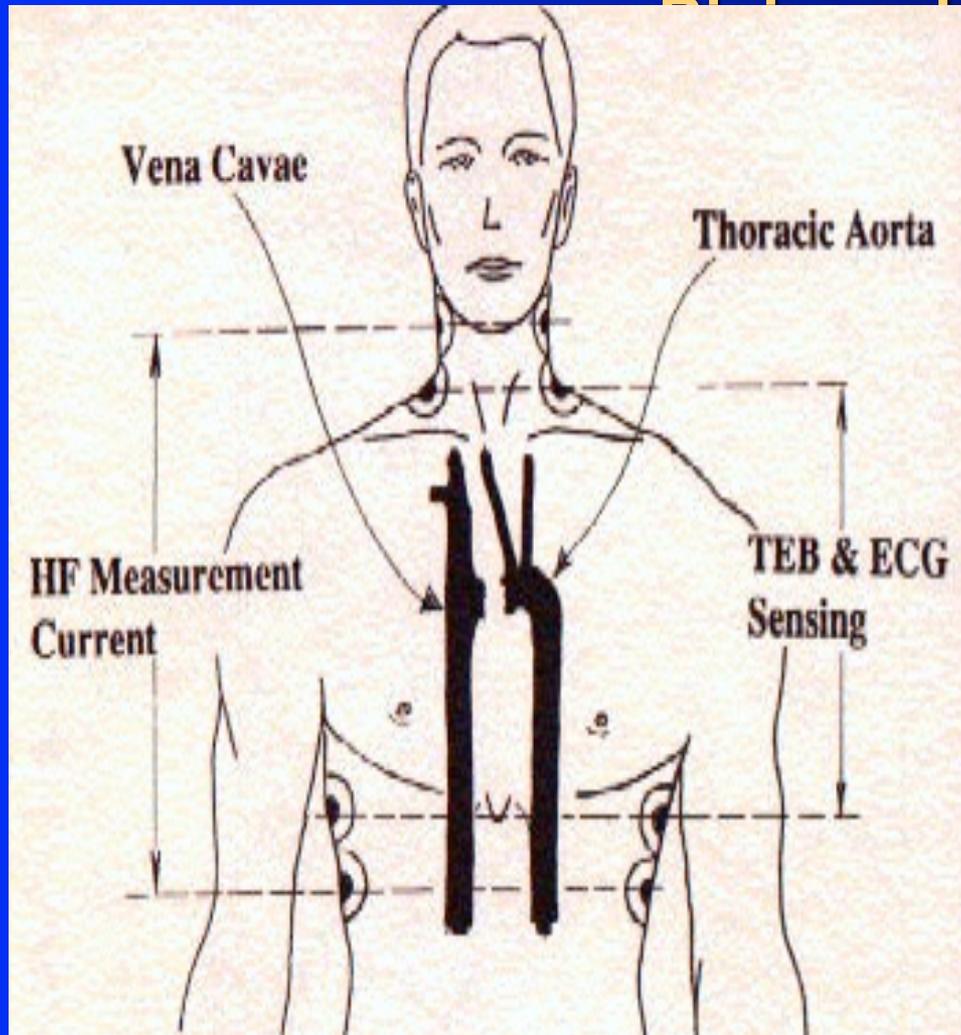


Bio-Impedance Plethysmography Analysis

Cardiac Output Monitoring by Electrical



- Cardiac output monitoring by electrical bioimpedance, is a form of Plethysmography.
- Electrical bioimpedance measures changes in electrical resistance (impedance) associated with fluctuations of blood volume (mostly H₂O) in the thoracic great vessels.
- Blood volume, and therefore, impedance, varies with the cardiac cycle.
- Impedance variations consistently correlate with cardiac output, thoracic fluid volume, cardiac index, stroke volume, stroke volume index, and systemic vascular resistance.

Cardiac output monitoring by Electrical Bioimpedance may be used in any setting for the

- - Noninvasive diagnosis or monitoring of hemodynamics in a patient with suspected or known cardiovascular disease, including management of chronic congestive heart failure and/or hypertension on multiple medications.
 - Differentiation of cardiogenic from pulmonary causes of acute dyspnea.
- - A patient who may need intravenous inotropic/pressor therapy
 - A patient who needs fluid management, including a patient with chronic congestive failure, chronic renal failure, severe illness, sepsis, or hypotension.

Introduction/question:

Can bio impedance data be utilized as an indication for echocardiography, early inotropic support, or guide diuresis in Congestive Heart Failure?

Impedance Cardiography is a proven technique in noninvasive measurement of stroke volume (SV), cardiac output (CO), cardiac index (CI), Systemic vascular resistance (SVR), and thoracic fluid content (TFC).

The purpose of this observational study was to determine if bioimpedance data can be used to guide diuresis, inotropic support, and possible indication for comparison of bio impedance values with values from echocardiograms.

ICG parameters

SVR- The resistance to the flow of blood in the arterial system (considered an estimate of “afterload”, the load the ventricle must overcome to eject blood into the aorta).

TFC- The electrical conductivity of the chest cavity, which is primarily determined by the intravascular, intraalveolar and interstitial fluids in the thorax.

TFC is a gross indicator of the amount of fluid in the patient’s chest cavity. The more the fluids in the chest, the higher the TFC. It is suggested that TFC > normal range be further assessed by auscultation and CXR.

CO- Amount of blood pumped by the left ventricle each minute. Reduced CO occurs in many patients with heart damage or CHF.

CI- Cardiac output normalized for body surface area. CO is the the absolute volume of blood pumped per minute and CI is CO indexed by BSA.

Methods

- Over a 6 month period, 100 patients that presented to the coronary intensive care unit with any general medical condition not limited to acute coronary syndrome had bio impedance Plethysmography.
- Cardiodynamics measurements of thoracic fluid content, cardiac output, cardiac index, and systemic vascular resistance were obtained on patients that were not on inotropic support, ventilated, or had chest tube insertion or removal, within 24 hours surrounding bioimpedence.
- Patients were placed with extremity in full extension and head of bed at 15 degrees. After reequilibration of 5 minutes, bio impedance was completed using manufacturers recommendations.

Results/Conclusions:

New data to be included as of April 2006:

Populated data to now include creatinine, BNP, and history of diabetes.

N=89

EF < 50% = 27

EF > 51% = 28

Mean EF 46%

Mean CI 2.3 (normal 2.5-4.2)