

Lack of Correlation Between I¹³¹ Labeled Albumin Measurements of Blood Volume and Serum B-Natriuretic Peptide Levels in Heart Failure Patients



John E. Strobeck, MD, PhD and Robin Giordano, RN, MA, NP-C
Heart Failure Program, The Valley Hospital, Ridgewood, NJ

Abstract

Heart failure physicians utilize the serum B-Natriuretic Peptide (BNP) as a guide to determine the presence of fluid retention and the quantification of diuretic therapy. The manufacturers of BNP testing equipment make no claim that it is a surrogate for blood or plasma volume measurements. Since BNP is predominantly released by the ventricular myocytes in response to stretch or increases in wall tension caused by intrinsic myocardial abnormalities, its common use as a surrogate marker for fluid retention and/or decisions regarding the need for diuretic adjustments therapy, requires careful re-examination. The correlation between time-related venous BNP and Iodine-131 labeled Albumin measurement of blood volume (BVA-100, Daxor, NY) was made in 151 patients admitted to the heart failure service of a community hospital over the past 2.5 years. The patients entered in the study had ejection fractions by echocardiography, MUGA, or cardiac MRI that varied from 10% to 80%. There were 65 females and 86 males enrolled and the ages of the patients ranged from 38 to 94. There was no exclusion of patients or correction of the data for intrinsic renal function or body mass index. The results indicated that there was no significant correlation between serum BNP and Total Blood Volume measurement expressed either as a % deviation from Ideal Blood Volume or as the Absolute Blood Volume measurement. In addition, there was no correlation between serum BNP measurements and Total Blood Volume or the % deviation from Ideal Blood Volume when the data was stratified by gender or age. Over 60% of the patients enrolled had measured reductions in Red Cell Volumes of greater than 10% from the Ideal Red Cell Volume indicating the high prevalence of anemia in these patients. These data represent the largest study to date correlating serum BNP to Iodine-131 labeled Albumin blood volume measurements. In previous studies, hemodynamics correlated significantly with Blood Volume measurements. The current findings lend new credence to the use of Blood Volume measurements in conjunction with clinical assessment to guide diuretic therapy or other forms of renal replacement therapy in heart failure patients.

Background

Physicians treating congestive heart failure (CHF) patients utilize serum B-Type Natriuretic Peptide (BNP) levels as a guide for the suitability and quantification of diuretic therapy. The manufacturers of BNP testing equipment have never claimed that BNP is a surrogate for volume measurement. Nevertheless, BNP has become a commonly utilized surrogate for decisions regarding diuresis. Inappropriate use of loop diuretics, however, can precipitate severe prerenal azotemia and hypotension. Thus, it is critically important that the information used to guide diuretic therapy decisions provide accurate information regarding the patient's blood volume status.

Objective

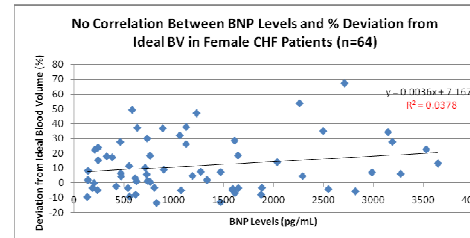
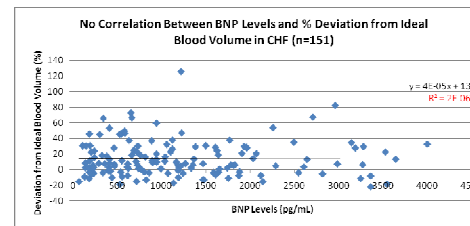
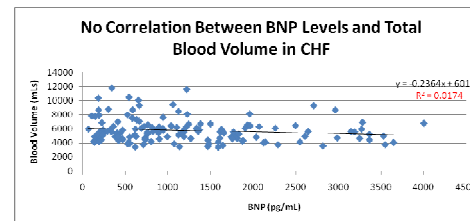
To determine whether serum BNP correlates with I¹³¹ Labeled Albumin Measurements of Blood Volume in Heart Failure Patients.

Materials & Methods

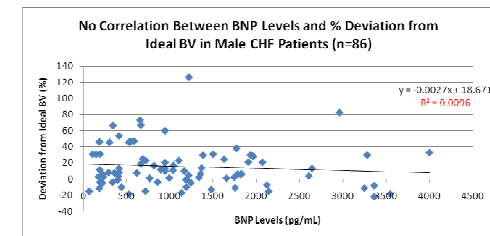
Plasma volume (PV) was measured using radioisotope iodine-131 labeled albumin injected over 1 minute with serial blood draws over 12, 18, 24, 30 and 36 minutes extrapolated to time zero (BVA- 100, Daxor, N.Y.). Simultaneous Hematocrit measurement (Red cell volume/plasma volume) allowed calculation of Blood Volume (BV = PV + Red cell volume) BV Values are expressed in mL as well as % deviation from ideal volumes. The predicted normal BV was determined from patient's height, weight and deviation from ideal body weight as described by Feldshuh and Enson. The range of normal values and degrees of deviation are presented below.

	Total Blood Vol.	Red Cell Volume	Plasma Volume
Normal	± 8%	± 10%	± 8%

Results



Results



Discussion

Over 60% of the patients enrolled had measured reductions in Red Cell Volumes of greater than 10% from the Ideal Red Cell Volume indicating the high prevalence of anemia in these patients.

These data represent the largest study to date correlating serum BNP to Iodine-131 labeled Albumin blood volume measurements. Previous studies have shown a lack of correlation between BNP and Blood Volume in acutely ill post-surgical patients and in a small cohort of patients undergoing pulmonary artery catheterization. In both studies, hemodynamics correlated significantly with Blood Volume measurements². These findings lend new credence to the use of Blood Volume measurements in conjunction with clinical assessment to guide diuretic therapy or other forms of renal replacement therapy in heart failure patients.

References

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