Diagnostic Performance of Brain Natriuretic Peptide, Bioelectrical Impedance Analysis, and Left Ventricular End-Diastolic Diameter in the Determination of Fluid Overload and Mortality In Pediatric Sepsis

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ABSTRACT

Background:

Point of care testing of pediatric sepsis at the emergency department and subsequent monitoring may direct clinicians to focus efforts on timely interventions so that might be reduced morbidities, decrease the length of stay, and improve healthcare costs.

Objective:
This pilot study investigated whether serum B-type Natriuretic Peptide (BNP), Bioelectrical impedance analysis (BIA), and left ventricular end-diastolic diameter (LVEDD) can be used to predict clinical outcomes and fluid overload in pediatric sepsis.

Methodology:
This is a prospective observational study conducted at the pediatric emergency department. Patients more than 28 days to 18 years old that fulfilled criteria of sepsis were enrolled. Patients that had trauma, gastroenteritis, renal disorders, endocrine disorders, liver disorders, cardiac disorders, autoimmune disorders, steroid use, burns, hospital-acquired infection, and weight and Length Z-score below < -2 were excluded. BNP, BIA, LVEDD were obtained on admission and on Day 3 of hospital stay. Diagnostic performances of BNP, BIA, LVEDD were analyzed. The correlation between fluid status and ΔBNP, BIA, and LVEDD were tested using Pearson correlation test.

Pediatric sepsis patients were enrolled. BNP, BIA, LVEDD were obtained on admission and on Day 3. Diagnostic performances of BNP, BIA, LVEDD and correlation with fluid status were obtained.

Results:
Twenty-two patients were enrolled. Day 3 BNP was higher in non-survivors (9241 vs 682.2 pg/mL, p=0.04) and day 3 LVEDD Z-score was lower in non-survivors (-3.51 vs -0.01, p=0.023). There were no differences in the fluid balance between survivors and non-survivors. Admission BNP >670.34pg/mL predicted vasopressor use with a sensitivity of 85.71%, specificity 86.67% while ΔBNP >5388.13 pg/mL predicted mortality with 100% sensitivity. Day 3 LVEDD <22mm predicted mortality with a sensitivity of 94.74%. Cumulative fluid balance had a strong correlation with BIA and LVEDD ($r = 0.65$, $p = 0.001$; $r = 0.74$, $p < 0.001$ respectively).

Conclusion:
The rise in BNP levels appear to be independent of fluid status and is a good predictor of mortality, vasopressor use and mechanical ventilator use. LVEDD and BIA are good estimates of cumulative fluid balance but not as predictors of MV, vasopressor use, and mortality. These results were limited due to the small sample size.