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The clinical benefit of bioimpedance body composition measurement on correction of hypernatremia

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Objectives : Hypernatremia is associated with poor outcomes in critically ill patients. Volume assessment is a crucial step in correcting hypernatremia. Recently, bioimpedance spectroscopy (BIS) has been used as a new, noninvasive, and easy tool to measure volume status.

Methods : This study included 23 patients with hypernatremia (mean sodium value of 155.8 mmol/L; min 150, max 172). Laboratory test using serum and urine, was done simultaneously at the first and the third day. BIS was estimated using the Body Composition Monitor (BCM, Fresenius Medical Care, Germany). The BCM showed excessive body fluid volume with a value indicating over-hydration (OH, liter). Considering the reference range of BCM measurement, OH<-1 was diagnosed as hypovolemia. Total body water (TBW), extracellular water (ECW), intracellular water (ICW), lean tissue index (LTI), lean tissue mass (LTM), body cell mass, adipose tissue mass (ATM), and fat tissue Index (FTI) were measured by BCM. Water deficit was also calculated with classic water deficit equation using serum sodium and plasma osmolality. We analyzed whether the data from BCM could represent water content in dehydrated patients.

Results : Applying classic water deficit equation, average of 2.87 L of water was dehydrated in each patient. However, the calculated OH from BCM showed euvolemia; the mean OH is zero. Although there was no correlation between OH and water deficit equation, TBW, ECF and ICF in BCM were positively correlated with classic water deficit equation (Pearson coefficient 0.505, 0.521 and 0.458, P -value 0.010, 0.005 and 0.016 respectively). The volume changes of the first day and the third day was measured with BCM components and water deficit equation. Between the volume changes there was no significant correlation.

Conclusions : Mean OH value of BCM was inaccurate in dehydrated patients. The increased resistance of impedance in dehydrated patients might have caused error in the results. Except OH, TBW, ECF and ICF of BCM could be

good markers that represent water content in dehydrated patients. Physicians have to be careful when performing BCM in dehydrated patients.

Keywords : bioimpedance spectroscopy, Body Composition Monitor, hypernatremia