Body water distribution in severe obesity and its assessment from eight-polar bioelectrical impedance analysis

A. Sartorio, M. Malavolti, F. Agosti, P.G. Marinone, O. Caiti, N. Battistini, G. Bedogni

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Objective: to measure body water distribution and to evaluate the accuracy of eight-polar bioelectrical impedance analysis (BIA) for the assessment of total body water (TBW) and extracellular water (ECW) in severe obesity.

Subjects: in all, 75 women aged 18-66 y, 25 with body mass index (BMI) between 19.1 and 29.9 kg/m^2 (ie not obese), 25 with BMI between 30.0 and 39.9 kg/m^2 (ie class I and II obese), and 25 with BMI between 40.0 and 48.2 kg/m^2 (ie class III obese).

Methods: TBW and ECW were measure by ^2H_2O and Br dilution. Body resistance (*R*) was obtaining by summing the resistances of arms, trunk and legs as measured by eight-polar BIA (InBody 3.0, Biospace, Seoul, Korea). The resistance index at a frequency of *x* kHz (RI_x) was calculated as height $^2/R_x$.

Results: ECW:TBW was similar in women with class III (46±3%, mean±s.d.) and class I-II obesity (45±3%) but higher than in nonobese women (39±3%, $P<0.05$). In a random subsample of 37 subjects, RI_{500} explained 82% of TBW variance ($P<0.0001$) and cross-validation of the obtained algorithm in the remaining 38 subjects gave a percent root mean square error (RMSE%) of 5% and a pure error (PE) of 2.11. In the same subjects, RI_5 explained 87% of ECW variance ($P<0.0001$) and cross-validation of the obtained algorithm gave a RMSE% of 8% and a PE of 1.41. The contribution of weight and BMI to the prediction of TBW and ECW was nil or negligible on practical grounds.

Conclusions: ECW:TBW is similar in women with class I-II and class III obesity up to BMI values of 48.2 kg/m^2. Eight-polar BIA offers accurate estimates of TBW and ECW in women with a wide range of BMI (19.1-48.2 kg/m^2) without the need of population-specific formulae.