# Evaluation of a new bioelectrical impedance instrument for the prediction of body cell mass independently of height or weight

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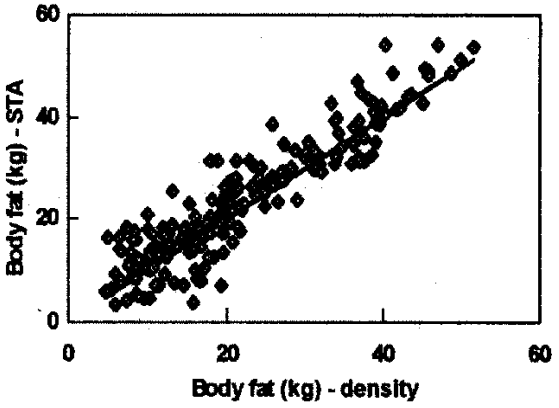
Bioelectrical impedance analysis (BIA) is a popular bed-side method for the estimation of body composition in which the impedance (Z) of the body to a harmless 50 kHz ac current is measured. Conductor volume (CV) or total body water (TBW) is proportional to height$^2$/Z, height being a surrogate measure of conductor length. $Ht^2/Z$ is highly correlated with TBW and fat-free mass (FFM). Current impedance analysers thus require a measurement of height and often weight as an independent variable. In sick patients these may be difficult or impossible to measure accurately. The new Soft Tissue Analyser (Akern, Florence), measures whole body (wrist-ankle) tetra-polar impedance, extracellular water (as % TBW) and body cell mass (BCM) independent of height.

Two hundred and five healthy Caucasian subjects (101 females, 104 males, age 16-78 years, BMI 16-40 kg/m$^2$) were studied over a 6 month period. Body weight, height and density (by underwater weighing) were determined. Total body mineral content was determined by DXA. Whole body impedance was measured using the STA after 30 min recumbency during the DXA scans and prior to underwater weighing. TBW was estimated from $D_2O$ dilution. Since these techniques alone do not provide an estimate of either ECW or BCM, evaluation of the STA was accomplished by comparison of body fat calculated according to a four-compartment model (1) and from model using the STA-derived measures of ECW and BCM and the DXA measure of total body mineral.




Body fat predicted by the STA-derived four compartment model was strongly correlated (fig) with that predicted by the TBW-DXA-four-compartment model (concordance $r = 0.913$, SEE = 4.54 kg). The mean body fat estimates were 23.64 and 21.93 kg (ie bias of 1.71 kg) for the two methods respectively. The limits of agreement (2SD) were 7.18 to 10.60 kg.

The STA method is a simple and versatile method for the estimation of ECW and BCM. Although correlating well with more complex methods, the relatively large SEE and limits of agreement may limit its usefulness for these estimations in an individual subject. Precision and accuracy are similar to those of other BIA methods and, since it does not require measurement of height or weight, it has great potential for use in the sick or infirm. Further validation studies in such subjects are required.

1. Fuller NJ, Jebb SA, Laskey MA, Coward WA and Elia M. Four-component model for the assessment of body composition in humans: comparison with alternative methods and evaluation of the density and hydration of fat-free mass. Clin Sci 1992; 82: 687-692.