BIOIMPEDANCE ANALYSIS: EVALUATION OF LEG-TO-LEG SYSTEM BASED ON PRESSURE CONTACT FOOT-PAD ELECTRODES

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Practical Implications:

- The Tanita foot-to-foot pressure contact electrodes give results that are comparable with conventional BIA arm-to-leg systems without the gels and training conventional systems require.
- Tanita BIA results correlate highly with both DXA and hydrostatic weighing (Underwater Weighing).

ABSTRACT

Objective: Bioimpedance analysis: evaluation of leg-to-leg system based on pressure contact foot-pad electrodes. Conventional single frequency bioimpedance analysis (BIA) systems require technician placement of arm and leg gel electrodes, a suitable location for recumbent measurements, and a separate measurement of body weight. The aim of this study was to evaluate a new single frequency 50 kHz leg-to-leg bioimpedance analysis (BIA) system combined with a digital scale that employs stainless steel pressure-contact foot pad electrodes for standing impedance and body weight measurements.

Materials & Method: Healthy adults were evaluated for **1)** electrode validity and **2)** potential for body component estimation. Pressure-contact foot-pad electrode measured impedance was highly correlated with (N = 9, r = 0.99, P<.001) impedance measured using conventional gel electrodes applied to the plantar surface of both lower extremities; mean (±SD) impedance was systematically higher by about 15 ohms for pressure contact electrodes (526 ± 56 ohms vs. 511 ± 59 ohms; P<0.001). Second, the relationship between stature-adjusted leg-to-leg impedance (H^2/Z) measured by the new system and two body composition components (total body water by ^3H_2O dilution (N = 144); and fat-free body mass, by underwater weighing and dual x-ray absorptiometry (N = 231)) was modeled using multiple regression analysis.

Results: Correlation coefficients for H^2/Z alone versus body composition components were lower for leg-to-leg BIA than for arm-to-leg BIA; correlation coefficients and SEEs became similar for the leg-to leg and arm-to-leg BIA systems with addition of three covariates (age, gender, and waist/hip circumference ratio) to regression models. The leg-to-leg pressure contact electrode BIA system has overall performance characteristics for impedance measurement and body composition analysis similar to conventional arm-to-leg gel electrode BIA and offers the advantage of increased speed and ease of measurement.

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