Effect of changing posture on bioelectrical impedance assessment of whole-body resistivity

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Whilst bioelectrical impedance (BIA) technology accurately and reliably measures model circuitry and the fluid distribution of anaesthetised rats, the assessment of humans has resulted in inconsistent findings. Resistance measured with single frequency tetrapolar BIA is unstable during the first 60 minutes of recumbency due to the absorption of interstitial fluid into the intravascular compartment as a result of the diminished effect of gravity. Although standardisation of the period of recumbency prior to taking BIA measurements has been recommended, to date the optimal preparatory rest time has not been identified. The aim of this study was to assess the effect of an acute posture change, from upright to supine, on multi-frequency bioelectrical impedance measures of whole-body resistivity to determine the optimal time of rest prior to testing.

Twelve healthy volunteers (eight males, four females, aged 18-35 yrs, height 172.3 ± 6.9 cm, body weight 71.0 ± 7.7 kg) were measured using a swept multi-frequency bioimpedance meter (SFB2.2(3), SEAC, Australia) in the manner explained elsewhere (1). After standing for at least 20 minutes prior to testing, subjects assumed a supine position, and remained lying whilst measurements were taken at 0, 2, 5, 10, 15, 20, 30, 45 and 60 minutes.

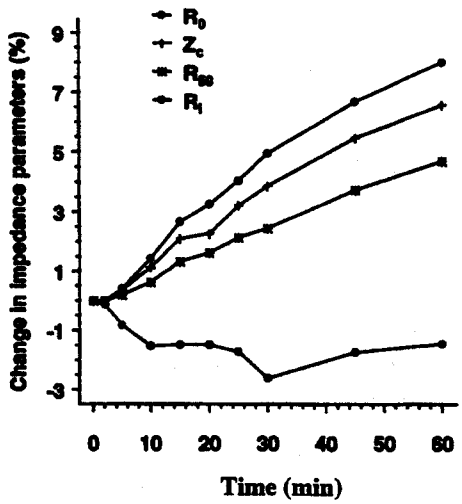

Figure. Percent changes in whole-body impedance measurements of extracellular resistance (R_0),impedance at the critical frequency (Z_c), resistance at 50 kHz, and intracellular resistance (R_i) as a function of time lying supine

While absolute ($F = 23.4$; $P<0.001$) and percent change ($F = 28.4$; $P<0.001$) in whole-body resistivity increased significantly over the 60 minutes supine, the increases did not become significant from baseline until after 15 minutes. The change in whole-body resistivity at R_{50} peaked at 24.1(6.3 to 36.5)Ω, reflecting a 4.7(1.3 to 6.7)% increase from baseline. These results demonstrate that due to the effect of changing posture on body-fluid distribution and hence measurements of body resistivity, it seems appropriate that a preparatory rest time of up to 10, but no longer than 15 minutes be employed.

1. Ward LC, Byrne NM, Rutter K, Hennoste L, Hills AP, Cornish BH, Thomas BJ. Reliability of multiple frequency bioelectrical impedance analysis: an intermachine comparison. Am J Hum Biol 1996 (in press).