

COMPARISON OF BODY COMPOSITION ANALYSIS AND FAT FREE MASS USING AIR DISPLACEMENT PLETHYSMOGRAPHY VERSUS BIOELECTRICAL IMPEDANCE ANALYSIS

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Abstract

Obesity is one of the leading causes of premature mortality and morbidity worldwide. Diagnosing and evaluating body composition is very important. The aim was to compare different methods of body composition analysis: air displacement plethysmography (ADP) versus multifrequency bioelectrical impedance analysis (MF-BIA) in a young healthy women.

Body composition analysis was performed in a group of young healthy women ($n = 33$) aged 21 to 27 years from the Slovak University of Agriculture in Nitra. The body density was estimated by ADP using the device BOD POD (Cosmed Inc., Concord, CA, USA). Data for the estimation of the body fat by plethysmographic method have been reported to agree closely with the traditional gold standard hydrodensitometry underwater weighing. ADP is accepted as a suitable alternative. The percentage of body fat was estimated from the body density using the Siri equation. ADP using BOD POD versus BIA were compared based on the determination of fat free mass (% FFM): ADP versus BIA using Bodystat QuadScan 4000 (Isle of Man, UK), ADP versus BIA using InBodyS10 (Biospace, Korea), ADP versus BIA using InBody720 (Biospace, Korea). For statistical evaluation we used ANOVA, nonparametric correlation analysis (Spearman's coefficient) and statistical software Statistica Cz 10 (Dell Statistica, USA).

The BIA method using the Bodystat QuadScan 4000 provided higher FFM values by an average of $6.25 \pm 4.64\%$ ($p < 0.001$) versus ADP. The values from the InBody S10 were higher by $1.48 \pm 3.83\%$ ($p < 0.05$) and by the InBody 720 method by $1.4 \pm 3.94\%$ ($p < 0.05$) versus ADP. We found a moderate correlation of FFM (%) obtained from the BIA methods with values from the ADP method ($r = 0.642$ to 0.78). BIA devices gave statistically significantly higher results than the ADP method ($p < 0.001$). When comparing the results of the % FFM in young adult healthy women, the correlation of FFM from the BIA method and the application of three different devices with the values from ADP was strong. The highest correlation coefficient was when evaluating the dependence of the BIA method using InBody S10 and ADP devices. FFM was significantly higher with the BIA method for all types of devices, but most markedly with the Bodystat QuadScan 4000 compared to ADP.

The body composition methods used BIA and ADP are very effective in assessing body composition, but are not interchangeable, providing different estimates in a sample of healthy young women.

Key words: *Body composition, Fat free mass, Air displacement plethysmography, Bioelectrical impedance analysis, Women.*