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Bioelectrical Impedance Vector Analysis (BIVA) in Slovak population: application in a clinical sample

Research Article

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Abstract: The purpose of this study is to provide new data on body composition in the Slovak population, particularly impedance vector components according to sex and age, relevant for bioelectrical impedance vector analysis (BIVA) in a clinical sample. The reference sample consisted of 1543 apparently healthy individuals (1007 females and 536 males), aged from 18 to 92 years and of 60 patients with Parkinson´s disease (PD) (26 females and 34 males), aged from 40 to 81 years. Bioelectrical parameters of resistance (R) and reactance (Xc) were measured with a monofrequency analyser (BIA 101). BIVA was used to analyse tissue electric properties in control subjects and patients with PD. The mean vector position differed significantly between PD patients and healthy controls in males of age subgroups 60-69 years and 70-79 years, respectively. These results were conterminous with significant Hotelling's T^2-test; 60-69 y T^2=7.8, P=0.024 and 70-79 y T^2=7.6, P=0.026. In the RXc-score graph three patients had values outside the 95% ellipse. Altered tissue electric properties were present in 23.5% of males and 15.4% of females. Distribution of impedance vector components in different age categories of healthy Slovak subjects are relevant to comparative population studies and to clinical practice.

Keywords: *Bioelectric impedance • Resistance • Reactance • Parkinson´s disease*

1. Introduction

Anthropometry was, for decades, the only method available for quantifying body size and proportions since Matiegka [1] developed an equation for predicting body fat from measurements of skinfold thickness. In Slovakia, anthropometry is still the most widely used method due to the fact that it is simple, inexpensive, and portable. The disadvantage is lack of standardization in methodology. During the past two decades, several reliable new techniques, such as dual-energy X-ray absorptiometry (DXA), magnetic resonance imaging (MRI), computerized tomography (CT) and bioelectrical impedance analysis (BIA) were developed and validated for measuring body composition [2-5]. The last method measures body composition by sending a low, safe electrical current through the body to determine the electric impedance (Z). The whole body impedance consists of two components, resistance (R, ohm) and reactance (Xc, ohm). These variables are displayed directly by the analyser; R is a measure of total body water and Xc a measure of body cell mass. From the determined impedance and by using the Bodygram program, Version 1.3 (Akern, S.r.l.) several number of BIA parameters can be estimated (FM, Fat Mass; FFM, Fat-Free Mass; BCM, Body Cell Mass; PA, Phase Angle, TBW, Total Body Water; ECW, Extra Cellular Water; ICW, Intra Cellular Water; MM, Muscle Mass; BMR, Basal Metabolic Rate; Na/K, Exchange Na/K) using the Bodygram program (Akern, S.r.l.).

The BIA can be further enhanced by combining it with bioelectrical impedance vector analysis (BIVA) [6] that offers clinical benefits [7]. This method has been shown to be effective to assess hydration status [8] and identify patients with a critical fluid overload [9]. Walter-Kroker *et al.* [10] using both the BIA and BIVA

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