How are the Main Indicators of the Nutritional State Interrelated?

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Introduction, Patients, and Methods

Modern assessment of body composition is most often based on either a 2-compartment model comprising fat and fat-free mass (FFM) or a 3-compartment model comprising fat, body cell mass (BCM) and extracellular water. The question of whether and how muscle mass and function as well as serum albumin are related to FFM or BCM has not been answered satisfactorily so far.

Therefore, a nutritional assessment study was carried out on 32 healthy male subjects aged from 22 to 62 years. Bioelectrical impedance analysis (BIA) yielded information on total body water (TBW), total body fat (TBF), FFM, and BCM, the latter being derived additionally from counting total body potassium (TBK). Anthropometric (AM) data served to calculate TBF and total body muscle mass (TBMM). There were two further measures of muscle mass, i. e. the sum of the sonographically determined diameters of 3 muscles (biceps, triceps, quadriceps), and the creatinine index (CI). Muscle function was assessed by dyna-mometry (Dyn.). We also included the percentage of optimum body weight (% opt. BW) and serum albumin. In order to describe co-variations of the parameters investigated, correlation coefficients between the respective values were calculated and processed by factor analysis with subsequent varimax rotation.

Results

Four factors were obtained and are given in table 1. Only factor loadings amounting to more than ± 0.60 are listed. Each factor (with the exception of factor IV) demonstrates variables which were interrelated, the single factors being independent (!) of one another. Figure 1 supplements the factor pattern in that it illustrates the relationship between TBMM and sonographical data in a total of 51 healthy males.

Conclusions

As expected, TBW did co-vary with FFM and BCM.

% opt. BW was determined by TBF.

All the indices of muscle mass and function were interrelated and were independent (!) of FFM as well as of BCM.

Therefore, at least one of these indices has to be assessed, in addition to FFM or BCM, for an appropriate description of the nutritional state. (4) Since serum albumin varied likewise independently, its measurement is also indispensable.

Table 1. Factor pattern based on data which were obtained in 32 healthy male subjects

Factor I	Factor II	Factor III	Factor IV
TBW 0.90	TBF (BIA) 0.91	Sonograph 0.81	Albumin 0.88
FFM 0.90	TBF (AM) 0.83	TBMM 0.80	
BCM (BIA) 0.88	% opt. BW 0.80	CI 0.71	
BCM (TBK) 0.79	Dyn. 0.67		