

Bioelectrical Impedance (BIA) compared to Dual Energy X-Ray (DXA) in elderly patients admitted with acute pneumonia

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Background & Aims:

In stress-metabolic conditions, we know that lean body mass (LBM) decreases and that change in water compartments is significant.

Accordingly, weight is not an optimal variable for monitoring and the aim of this investigation was to elucidate if bioelectrical impedance analysis (BIA) could be of use for that purpose compared to Dual Energy X-ray (DXA) as the golden standard, and to investigate the importance of fasting for the BIA measurements. Furthermore to establish if Phase Angle is of use as an inflammation marker.

Methods:

Body composition was assessed using BIA (Maltron BioScan) and DXA (Hologic Discovery) within 24 hours after admission with pneumonia in 36 non-fasting patients > 65 years of age.

BIA was repeated in 29 of the patients at discharge. To measure the effect of fasting, BIA was performed in 17 patients before and 1 hour after intake of 300 ml glucose solution (oral glucose tolerance test).

Results:

Measurements with DXA and BIA showed significant correlations between LBM, fat mass (FM) and fat percent (F%)($p = 0.001$), but the Bland-Altman Plot showed no agreement between measures in the individual patient regardless of age, BMI or gender. Limits of agreement were wide (LBM = ± 7.24 kg, FM = ± 7.55 kg, F% = ± 8.05 kg). In 41.6% of the patients LBM deviated more than 100% from the mean (2.41 kg ± 2) between BIA and DXA.

BIA at admission and discharge showed correlations between changes in LBM/TBW (total body water) ($r = 0.97$, $p = 0.001$) and FFM/FM ($r = -0.667$, $p = 0.001$). There was a positive correlation between changes in extracellular water and hemoglobin concentration ($r = 0.779$, $p = 0.001$).

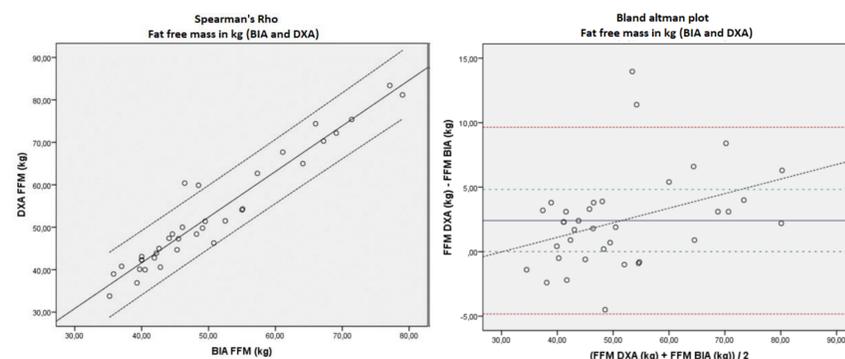
Intake of glucose solution showed changes in LBM, FM, F%, TBW, ECW (extra cellular water) and ICW (intra cellular water) after one hour parallel to glucose absorption (blood-glucose).

Conclusions:

BIA cannot substitute DXA directly in the individual patient with pneumonia but correlates well on group level.

The correlation between ECW and hemoglobin concentrations suggests reliability in estimation of body water with BIA. Changes in TBW can probably explain weight changes in these patients.

Water compartments change as glucose is absorbed, so BIA should only be used in fasting patients. Phase angle is not a good inflammation-marker in patients with pneumonia.



Spearman's rho, N = 36
rho = 0,954**
Sig. = ,000

Bland-Altman plot
N = 36
Mean = 2.41
Std. dev = 3,69
95% Limits of agreement = $\pm 7,243$
95% Limits of agreement (upper) = 9,65
95% Limits of agreement (lower) = -4,83

BIA

low frequency high frequency

