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BIO-ELECTRICAL IMPEDANCE ANALYSIS: A VALID MEANS TO DIAGNOSE LOW MUSCLE MASS IN OLDER ADULTS

Amely M. Verreijen[1], Jantine van den Helder[1], Carliene van Dronkelaar[1], Mariëlle F. Engberink[1], Peter J.M. Weijs[1,2], M. Tieland[1]

[1]Nutrition and Dietetics, Faculty of Sports and Nutrition, Amsterdam University of Applied Sciences, Amsterdam, Netherlands,
[2]Nutrition and Dietetics, Department of Internal Medicine, Amsterdam University Medical Centers, VU, Amsterdam, Netherlands

Background

Diagnosis of sarcopenia, e.g. by measuring appendicular lean mass (ALM), is essential for early treatment of sarcopenia in older adults. Bio-electrical impedance analysis (BIA) may be a valid means to assess ALM in older adults, but evidence is limited. Therefore, we validated the BIA to assess ALM and to diagnose low muscle mass in older adults.

Methods

In 215 community dwelling older adults ALM was measured by BIA and compared with dual-energy X-ray absorptiometry (DXA).

Validity for assessing absolute values of ALM was evaluated by:

1) bias (mean difference),
2) mean absolute error (MAE)
3) % accurate predictions (within 5% of DXA)
4) Bland-Altman analysis

Validity of diagnosing low muscle mass was evaluated by calculating the sensitivity and specificity of diagnosing sarcopenia by BIA with DXA as reference. The lowest quintile of ALM by DXA was defined as low muscle mass (<22.8 kg for males, 16.2 kg for females), other quintiles are referred to as normal muscle mass.

Table 1: Evaluation of the validity to measure absolute values of ALM in older adults

	All subjects (n=215)	Males (n=64)	Females (n=151)
Mean ALM DXA in kg (±SD)	20.8 ± 4.5	26.1 ± 3.4	18.5 ± 2.6
Mean ALM BIA in kg (±SD)	20.2 ± 4.2	25.0 ± 3.5	18.1 ± 2.3
Mean Bias in kg (±SD)	-0.6 ± 1.2	-1.0 ± 1.2	-0.4 ± 1.2
Mean Bias in % (±SD)	-2.4 ± 5.8	-3.9 ± 4.6	-1.8 ± 6.2
Mean abs. error (kg)	1.1	1.3	1.0
Accurate predictions (%)	54.4	48.4	57.0


BIA (Tanita MC-780; 8-points)

DXA (Hologic Discovery A)

Table 2: Validity to diagnose low ALM in older adults

Low ALM by BIA	Low ALM by DXA (n, %) Yes	No	Total
Yes	n=33, **79%**	n=17, 10%	n=50
No	n=9, 21%	n=156, **90%**	n=165
Total	n=42	n=173	n=215

Results

Mean age of the subjects was 71.9±6.4y, with a BMI of 25.8±4.2kg/m^2, and 70% were females.

BIA slightly underestimated ALM compared to DXA with -0.6 kg. The percentage accurate predictions was low, 54%. **(Table 1, Figure 1)** Sensitivity was 79%, indicating that 79% of subjects that were diagnosed as having low muscle mass according to DXA were also diagnosed as low muscle mass by BIA. Specificity was 90%, indicating that 90% of subjects who were diagnosed as having normal muscle mass by DXA were also diagnosed as normal muscle mass by the BIA **(Table 2)**.

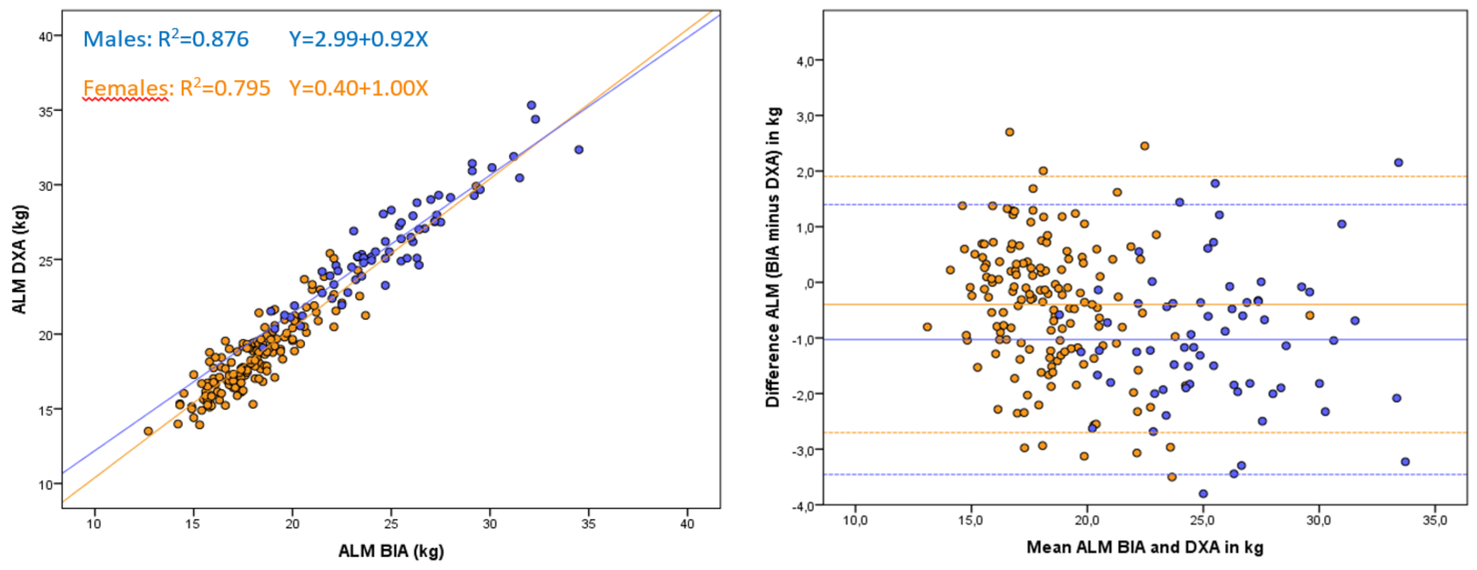

Figure 1 Left: Agreement of ALM by BIA and DXA. Right: Bland-Altman plot
Males in blue (n=64) Females in orange (n=151)

Conclusion

The BIA has a poor validity to assess absolute values of ALM, but a reasonable sensitivity and specificity to recognize the community-dwelling older adults with low muscle mass

Correspondence: a.verreijen@hva.nl, Faculty of Sports and Nutrition, Amsterdam University of Applied Sciences, Amsterdam, Netherlands

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