

Comparison of measured lean body mass (LBM_{DXA}) and estimated LBM_{BIA} in children with growth hormone deficiency (GHD)

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Background

Long standing GHD causes loss of muscle mass. DXA enables the measurement of LBM_{DXA} but is accompanied with a potentially harmful x-ray exposition. BIA measures the electric resistance of the body which correlates with LBM. A comparison of both methods in children with GHD has not been performed yet.

Aim

Calculation of a regression formula for LBM using resistance and anthropometry based on LBM measured by DXA in children with GHD.

Conclusion

Calculation of LBM with help of anthropometry and BIA shows a good correlation with measured LBM in the total group of GHD patients, but in individual patients there is a broad variation between measured and calculated LBM.

Method

We recruited 120 prepubertal children (31 females) with GHD defined as growth failure, bone age retardation, low IGF-I and two GH test peaks $<10 \mu\text{g/L}$ (mean \pm SD; age 7.68 ± 2.96 yrs, peak GH 5.72 ± 1.76 ng/ml). Height, weight, LBM by DXA (Lunar, DPXL/PED), Resistance (R) and Reactance (Xc) by BIA (BIA 2000-M) were measured before the start of GH therapy (see table). Using multiple stepwise regression analysis we established a formula to calculate LBM based on age, height, weight, R and Xc.

Results

The best equation formula calculated was:

$$LBM_{BIA} [\text{kg}] = 233.64 \times \text{height} [\text{cm}] + 181.41 \times \text{weight} [\text{kg}] - 6.89 \times R[\Omega] - 9421.74$$

Correlation of measured (LBM_{DXA}) and calculated (LBM_{BIA}) was high ($R=+0.98$, $p<0.001$) (see Fig. 1). Comparison of LBM_{DXA} and LBM_{BIA} by Blant-Altman plot gave a mean difference of -0.075 ± 0.923 kg within an LBM_{DXA} range of 7 to 30 kg. In an individual patient the delta between LBM_{BIA} and LBM_{DXA} were up to 3 kg at a LBM_{DXA} of 30 kg (see Fig. 2).

Patient characteristics

	mean	SD
Age [yrs]	7,68	2,96
Height [cm]	111,2	14,7
Height [SDS]	-2,89	0,55
Weight [kg]	19,5	7,3
Weight [SDS]	-1,99	0,68
BMI [kg/m^2]	15,23	1,90
BMI [SDS] _{LMS}	-0,72	0,86
LBM [g]	14745	5117
Fat mass [g]	4045	2672
Resistance (BIA) [Ω]	776	94
Reactance (BIA) [Ω]	71	10

Results

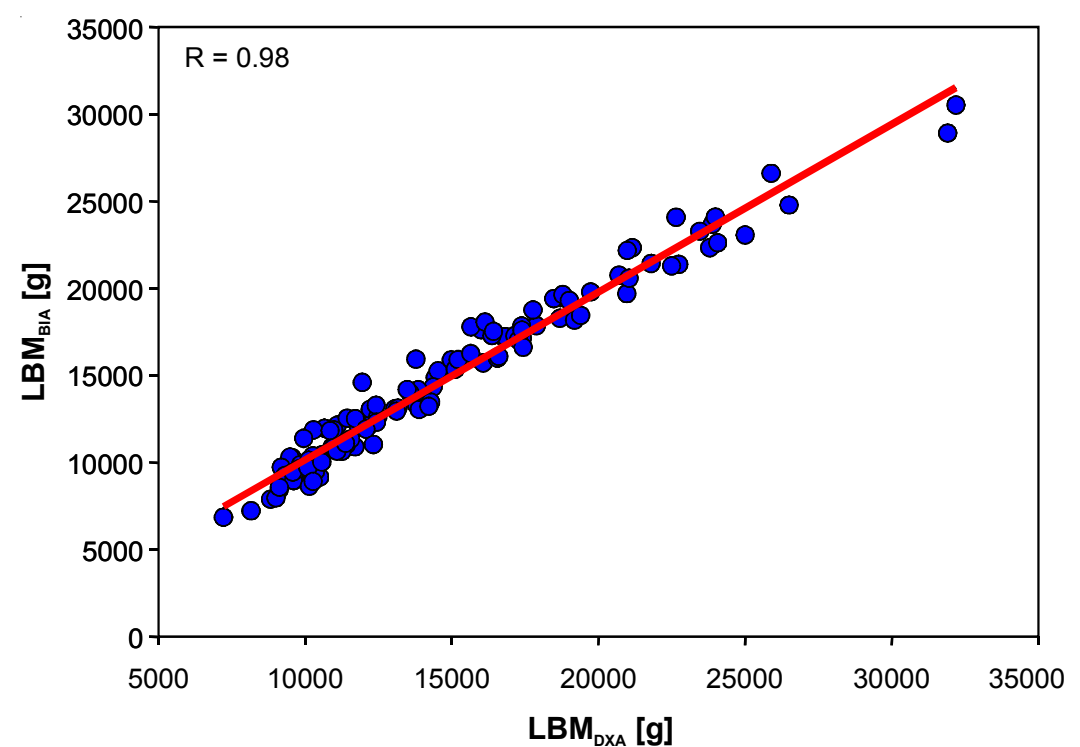


Figure 1: Correlation of measured and calculated LBM

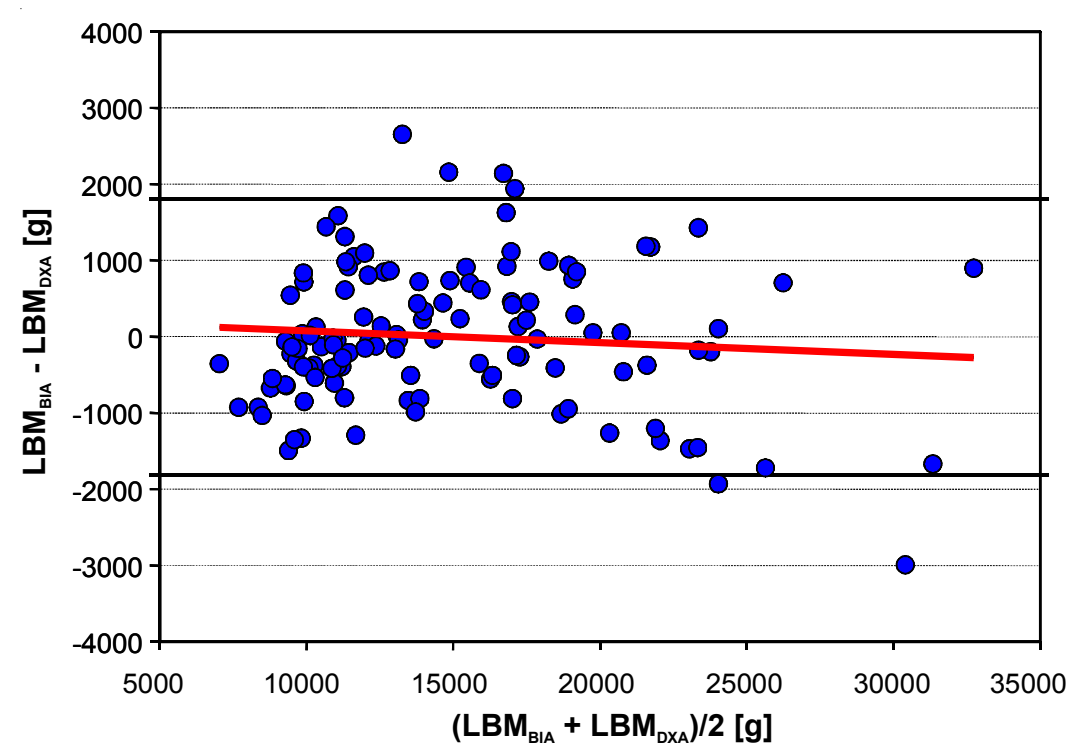


Figure 2: Blant-Altman-Blot of measured and calculated LBM