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Bone mineral density is associated with muscle mass in obese older adults with diabetes type 2

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Rationale: The number of obese older adults with diabetes type 2 is increasing worldwide. Weight loss treatment in this group seems beneficial for cardio-metabolic and other health outcomes, but it might reduce muscle mass and bone mineral density (BMD). The association between obesity and BMD is controversial, and the role of muscle mass and dietary protein intake is not fully clear. This study explores the association between body weight, muscle mass, dietary protein intake, and physical activity level on BMD in obese older adults with diabetes type 2.

Methods: For this cross-sectional analysis we used baseline data of a 13-week randomized trial evaluating the effect of a multi-modal intervention on muscle preservation and insulin sensitivity during a weight loss program in obese older adults (55-80y) with diabetes type 2 (PROBE). Body weight was measured using a calibrated scale (Life Measurement), appendicular lean mass (ALM) was used as a proxy for muscle mass and was measured by dual-energy X-ray absorptiometry (DXA, Hologic Discovery A), dietary protein intake was estimated by a 3-day food record, Physical Activity Level (PAL) was estimated by a 3-day activity record, and hip BMD was assessed by DXA. After determination of Pearson's correlation coefficients for body weight, ALM, protein intake, and PAL with BMD, linear regression analysis was performed with significantly correlating determinants (body weight [kg], ALM [kg], protein intake [g/kg/d], and/or PAL [-]) and hip BMD (g/cm²) as outcome variable.

Results: Mean age of the 122 included subjects was 67±6y, with a BMI of 33±4kg/m². 65% of subjects were male. Body weight and ALM correlated significantly with BMD (r=0.34, p<0.001; r=0.43, p<0.001) whereas protein intake and PAL did not (r=0.02, p=0.84; r=0.005, p=0.95). Linear regression analysis with the two determinants body weight and ALM identified ALM as being significantly associated with BMD, whereas body weight was not. Beta for ALM was +0.011 g/cm² (95% CI: 0.004 – 0.017; p<0.01), meaning that a 1 kg increase in ALM is associated with a +0.011 g/cm² increase in BMD.

Conclusion: In this explorative cross-sectional analysis appendicular muscle mass is positively associated with BMD, rather than body weight, protein intake, and physical activity level.