The relationship between sarcopenic obesity, functional strength and bone mineral density

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Muscle mass and strength are important factors to maintain healthy aging, yet have not been adequately investigated in older populations suffering from obesity. Concomitant obesity with lowered muscle mass and strength may place older adults at a higher risk of poor physical function and increased morbidity and mortality. The combined impact these conditions have upon bone mineral density (BMD) and inherent bone strength are unclear.

Sixty-six (34.3% Male) community dwelling adults (age 62.8 ± 8.0; mean ± SD) completed blood biochemical analysis, physical strength assessments, and muscle and bone composition by dual-energy x-ray absorptiometry (DXA) and peripheral quantitative computed tomography (pQCT). Individuals were classed as obese using total body fat percentage cut offs (≥30% Men ≥40% Women) or overweight (<29.9% Men <39.9% Women), and as sarcopenic based on definitions according to the European Working Group on Sarcopenia in Older people (EWGSOP). Sarcopenia was defined as appendicular lean mass/height (m) squared| <8.9kg/m^2 for men and <6.36kg/m^2 for women in addition to: gait speed of <0.8m/s and/or low hand grip strength (HGS; <30kg men <20kg women).

Males (38.2 ± 8.5kg *vs* female value) had significantly greater hand grip strength (HGS) (P=0.003) than females, however there was no difference in knee extension strength (KES) or average stair climb speed. All DXA derived bone mineral density (BMD) measures were significantly higher in males whilst calf intermuscular adipose tissue was not different between sexes. HGS was significantly positively correlated with increased proximal (66%) radial bone area (r=0.714, P<0.001) and cortical thickness (r=0.486, P<0.001) for all classification groups. High KES was positively correlated with increased proximal tibial cortical bone area (r=0.335, P=0.010) and cortical thickness (r=0.310, P=0.017) and significance was maintained after adjusting for body weight. Overweight participants (63.6%) had significantly lower whole-body BMD (P=0.001) and T-scores (P=0.008) compared to obese. Sarcopenic participants (61.5%) had significantly lower whole-body BMD (P=0.013) than non-sarcopenic, but there were no difference's for BMD T-score. Individuals classified as non-sarcopenic had significantly higher (P=0.021) HGS than sarcopenic individuals as should be expected, however there was no significant HGS difference between obesity classifications.

These results suggest that the effects which sarcopenia and obesity have on BMD may counteract each other; sarcopenia however may have a significant impact upon bone geometry at certain sites. Obesity may not play a significant role in strength loss during aging, and may mask the negative impact sarcopenia may have on BMD through increased load bearing.