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**Title:** Bone stiffness and failure load are related with clinical features of COPD

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**Body:** Background: Although a low bone mineral density (BMD) is frequently found in COPD patients, research on structural and mechanical properties of bone in COPD patients is sparse. Objective: To compare bone structure, stiffness and failure load between men with and without COPD after stratification for BMD, and to relate clinical parameters with bone stiffness and failure load in men with COPD. Methods: We included 30 men with COPD (normal BMD n=18, osteoporosis n=12) and 17 men without COPD (normal BMD n=9, osteoporosis n=8). We assessed body mass index (BMI) and fat-free mass index (FFMI), and we measured pulmonary function (e.g. FEV<sub>1</sub>, FEV<sub>1</sub>/FVC, DLCO) and extent of emphysema. Bone structure was assessed by high-resolution peripheral quantitative computed tomography of the distal radius and tibia, and bone stiffness and failure load were estimated from micro finite element analysis. Results: We found no differences in bone structure, stiffness and failure load between men with and without COPD after stratification for BMD. In univariate analyses, lower BMI (p≤0.01), FFMI (p≤0.002), DLCO (p≤0.004) and BMD (p≤0.001) and higher extent of emphysema (p≤0.05) were associated with lower bone stiffness and failure load of the radius and tibia in men with COPD. After correction for BMD, lower FFMI (p≤0.05) was associated with lower bone stiffness and failure load of the radius and tibia, and lower DLCO (p≤0.05) was associated with lower bone stiffness and failure load of the tibia in men with COPD. Conclusion: This study could not detect differences in properties of bone between men with and without COPD. FFMI and DLCO were associated with bone stiffness and failure load in men with COPD after correction for BMD.