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Opportunistic AI-enabled Automated Bone Mineral Density Measurements In Lung Cancer Screening And Coronary Calcium Scoring CT Scans Are Equivalent

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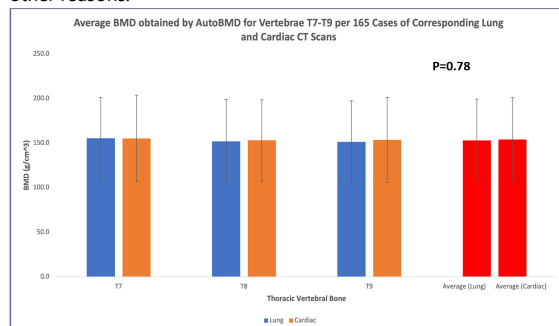
Abstract:

Introduction: We previously reported a novel manual method for measuring bone mineral density (BMD) in coronary artery calcium (CAC) scans and validated our method against Dual X-Ray Absorptiometry (DEXA). Furthermore, we have developed and validated an artificial intelligence (AI) based automated BMD (AutoBMD) measurement as an opportunistic add-on to CAC scans that recently received FDA approval. In this report, we present evidence of equivalency between AutoBMD measurements in cardiac vs lung CT scans.

Methods: AI models were trained using 132 cases with 7649 (3mm) slices for CAC, and 37 cases with 21918 (0.5mm) slices for lung scans. To validate AutoBMD across both cardiac and lung scans against manual measurements, we used only one reference set comprising 991 cases of BMD measured manually on CAC scans from the Harbor UCLA Lundquist Institute. We then used 165 additional cases who underwent both cardiac and lung scans on the same day.

Results: Mean±SD for age was 69 ± 9.4 years with 52.4% male. AutoBMD in lung and cardiac scans, and manual BMD in cardiac scans were 153.7 ± 43.9, 155.1 ± 44.4, and 163.6 ± 45.3 g/cm^3, respectively (p=0.09). Bland-Altman agreement analysis between AutoBMD lung and cardiac scans resulted in 1.37 g/cm^3 mean differences. Pearson correlation coefficient between lung and cardiac AutoBMD was R^2 = 0.95 (p < 0.0001).

Conclusions: Opportunistic BMD measurements using AutoBMD in CAC and lung cancer screening scans is promising and yields similar results. No extra radiation plus the high prevalence of asymptomatic osteoporosis makes AutoBMD an ideal screening tool for osteopenia and osteoporosis in CT scans done for other reasons.

Average BMD obtained by AutoBMD for Vertebrae T7-T9 per 165 Cases of Corresponding Lung and Cardiac CT Scans

Category (Complete): Artificial Intelligence/Machine Learning ; Non contrast cardiac CT: Coronary calcium
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