Bone mineral density values derived from routine lumbar spine multidetector row CT predict osteoporotic vertebral fractures and screw loosening.

Abstract:
Established methods of assessing bone mineral density are associated with additional radiation exposure to the patient. In this study, we aimed to validate a method of assessing bone mineral density in routine multidetector row CT of the lumbar spine. In 38 patients, bone mineral density was assessed in quantitative CT as a standard of reference and in sagittal reformations derived from standard multidetector row CT studies without IV contrast. MDCT-to-quantitative CT conversion equations were calculated and then applied to baseline multidetector row scans of another 62 patients. After a mean follow-up of 15 ± 6 months, patients were re-assessed for incidental fractures and screw loosening after spondylodesis (n = 49). We observed conversion equations bone mineral density\(_{\text{MDCT}} = 0.78 \times \text{Hounsfield unit}_{\text{MDCT}}\) mg/mL (correlation with bone mineral density\(_{\text{quantitative CT}}\), \(R^2 = 0.92, P < .001\)) for 120 kV(peak) tube voltage and bone mineral density\(_{\text{MDCT}} = 0.86 \times \text{Hounsfield unit}_{\text{MDCT}}\) mg/mL (\(R^2 = 0.81, P < .001\)) for 140 kVp, respectively. Seven patients (11.3%) had existing osteoporotic vertebral fractures at baseline, while 8 patients (12.9%) showed incidental osteoporotic vertebral fractures. Screw loosening was detected in 28 patients (57.1% of patients with spondylodesis). Patients with existing vertebral fractures showed significantly lower bone mineral density.
mineral densityMDCT than patients without fractures (P< .01). At follow-up, patients with incidental fractures and screw loosening after spondylodesis, respectively, showed significantly lower baseline bone mineral densityMDCT (P< .001 each). This longitudinal study demonstrated that converted bone mineral density values derived from routine lumbar spine multidetector row CT adequately differentiated patients with and without osteoporotic fractures and could predict incidental fractures and screw loosening after spondylodesis.