Opportunistic CT Screening for Osteoporosis in Patients with Pelvic and Acetabular Trauma: Technique and Potential Clinical Impact

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Purpose: Our objective was to present a novel technique for the use of CT scans in opportunistic screening for osteoporosis in patients with pelvic and acetabular fractures, and to quantify the potential clinical impact in a geriatric trauma population.

Methods: Records of patients >60 years of age presenting to a Level I trauma center with pelvic and acetabular fractures evaluated with a CT scan between 2010-2016 were reviewed. A subset of patients with both a CT scan and DEXA (dual-energy x-ray absorptiometry) scan performed within 12 months were selected, and the Hounsfield Units (HU) measured using a standardized, ovoid section of the femoral neck. Livewire segmentation was then used to collect the HU for the entire bone at the respective slice and in the medullary cavity. Both methods were used independently to run a discriminant function analysis using the HU parameters to establish a normal bone mineral density (BMD), osteopenia, and osteoporosis according to the accepted T-score parameters. The CT scans of 335 patients were evaluated using the discriminant function equation and the medical records reviewed for documentation of osteoporosis, osteopenia, or history of fragility fracture.

Results: 255 patients were identified with both CT scan of the pelvis and DEXA. CT thresholds were 345 HU for osteopenia and 262 HU for osteoporosis. The discriminant function equation using the fitted ovoid over the femoral neck had the highest overall percent correct (71.8%). Nonpathological individuals were identified correctly 71% of the time, and osteopenic individuals were identified correctly 67.5% of the time (18.3% were grouped with osteoporotic). Osteoporotic patients were identified correctly 88.9% of the time (the remaining 11.1% were assigned to osteopenic). The overall chi-squared test was significant (Wilks λ = .462, chi-square = 194.383, 2 degrees of freedom, canonical correlation .733, P <0.001). 11.3% of geriatric patients (38 of 335) with pelvic/acetabular trauma presented to our trauma center with a preexisting diagnosis of osteoporosis. After applying the CT screening model, 48 patients were identified as having osteopenia (14.3%) and 188 as having osteoporosis (56.1%). The potential number of newly diagnosed patients with osteoporosis was 156, representing a 387.5% increase in diagnosis.

Conclusion: CT imaging can identify patients with osteoporosis without additional radiation exposure or cost. Routine screening with this protocol may lead to earlier detection and treatment of osteoporosis, thus decreasing the incidence of fragility fractures.