

Using Hounsfield Units to Assess Osteoporotic Status on Wrist CT Scans: Comparison with Dual X-Ray Absorptiometry

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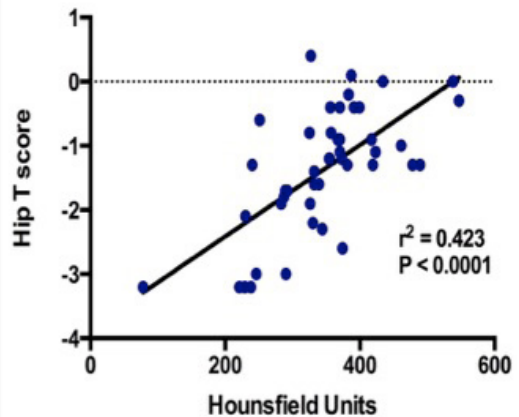
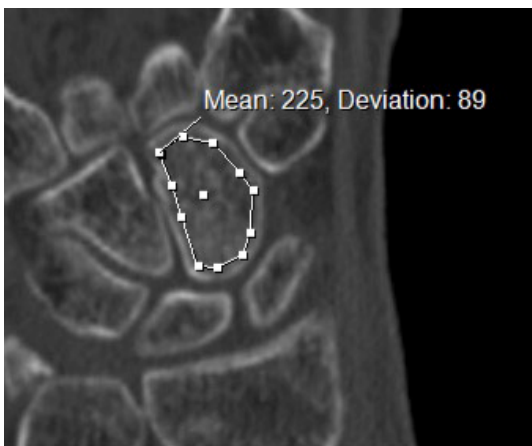
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Purpose: Rates of evaluation and treatment for osteoporosis following distal radius fragility fractures remain low. As a subset of patients with these fractures undergo diagnostic CT scan of the wrist, utilizing bone mineral density (BMD) measurements available with this imaging can be used to detect osteopenia or osteoporosis. This information may consequently prompt intervention to prevent a subsequent fracture. The purpose of this study was to determine if Hounsfield unit (HU) measurements at the wrist correlate with BMD measurements of the hip, femoral neck, and lumbar spine, and to assess the ability of these HU measurements to detect osteoporosis of the hip.

Methods: 45 female patients with distal radius fractures who underwent CT scan and dual x-ray absorptiometry (DXA) scan as part of the management of their wrist fracture were identified. The region of interest (ROI) tool in Sectra IDS7 PACS (picture archiving and communication system) was utilized to calculate HU values within the capitate. A two-tailed Pearson r analysis was used to assess the correlation between HU and BMD and T-scores. A threshold cutoff value of HU that optimized sensitivity and specificity was identified using a receiver operating characteristic curve.

Results: Within our institution, 907 distal radius fractures were identified on CT scans, but only 50 of these patients (45 female) underwent DXA scans within 12 months of the fracture (5.5%). Interobserver reliability of the measurement of HU at the capitate was excellent ($r = 0.918$; $P < 0.0001$). HU values were positively correlated with BMD as measured at the hip ($r^2 = 0.406$, $P < 0.0001$), femoral neck ($r^2 = 0.475$, $P < 0.0001$), and lumbar spine ($r^2 = 0.225$, $P = 0.001$). An HU threshold of 307 in the capitate optimized sensitivity (86%) and specificity



The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

(94%) for discerning patients with osteoporosis, as defined as a T-score below -2.5, from patients with a normal T-score. Patients with mean HU capitate values below this threshold were significantly more likely to be osteoporotic (odds ratio = 14.6, $P = 0.0013$).

Conclusion: The results of this study demonstrate that a patient's bone quality can be inferred based on a diagnostic imaging study that may already be available. As HU values measured by wrist CT correlate with BMD as determined by DXA, orthopaedic surgeons have another tool for determining the patients at high risk who require further evaluation and intervention for osteoporosis.