Artificial Intelligence Can Effectively Predict Low Bone Density on DEXA Using Simple Hip and Pelvis Radiographs

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Purpose: Identifying older adults with low bone mineral density (BMD) allows for initiation of effective treatments to prevent fragility fracture. Dual-energy X-ray absorptiometry (DEXA) is the current standard imaging method for diagnosing osteoporosis; however, widespread utilization is limited by cost, time, requirement of specialized equipment, and need for trained providers. This study assesses the ability of artificial intelligence (AI)-assisted imaging analysis to identify decreased BMD using standard of care hip radiographs compared to DEXA.

Methods: Clinical and imaging data were retrospectively collected from a single center to identify patients age 50 years or older with a DEXA and radiographs of the hip or pelvis from within 12 months. Patients with existing fracture fixation implants or hip replacement were excluded. Radiographs were analyzed by the Naitive OsteoSight™ software to generate a BMD score that was compared to T-scores as determined by DEXA. A receiver operating characteristic (ROC) curve was generated to measure the ability of OsteoSight™ to detect patients with DEXA T-scores of less than –1.0, consistent with a diagnosis of low BMD.

Results: Of the 208 cases identified, 136 distinct patients met inclusion criteria, passed the image processing pipeline, and were included in the final analysis. OsteoSight™ analysis of hip radiographs had a specificity (95% CI) of 0.97 (0.90–1.00]), sensitivity of 0.40 (0.25–0.76), and an area under a receiver operating characteristic (AUROC) of 0.85 (0.78–0.92) for detecting patients with low BMD as determined by DEXA.

Conclusion: AI-assisted radiograph analysis has high specificity for detecting decreased BMD compared to DEXA. This technique could be implemented as a convenient, accessible, and low-cost screening tool to identify patients with decreased BMD at risk of fragility fracture.