OSTEOSCOOP

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Determination of forearm fracture risk in postmenopausal women

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Areal bone mineral density (aBMD) at the distal radius can predict subsequent wrist fractures, but the actual basis for this association is uncertain. In particular, it is not clear whether fracture risk is determined by BMD per se or by some related parameter. Previously available technologies allowed some assessment of bone size (a confounder of aBMD) and geometry. However, it is now possible to explore this issue in more detail using high-resolution peripheral quantitative computerized tomography (pQCT), which can measure numerous micro- and macrostructural variables in the distal radius, along with volumetric BMD (vBMD) of cortical and trabecular bone separately. The purpose of this report [1] was to evaluate these diverse measures (BMD, bone geometry, bone microstructure, bone strength, and fall load to bone strength ratios) in a population sample of postmenopausal women with and without a prior distal forearm (Colles') fracture (n=18 in each group).

High-resolution pQCT was used to assess volumetric BMD (vBMD), geometry, and microstructure at the ultradistal radius, the site of Colles' fractures. Failure loads in the radius were estimated from microfinite element models (µFE) derived from pQCT. Differences between case and control women were assessed, and the risk of fracture associated with each variable was estimated by logistic regression analysis.

Given similar heights, estimated loading in a fall on the outstretched arm was the same in cases and controls. However, women with forearm fractures had inferior vBMD, geometry, microstructure, and estimated bone strength. Relative risks for the strongest determinant of fracture in each of the five main variable categories were as follows: BMD (total vBMD: OR per SD change, 4.2; 95% CI, 1.4–12), geometry (cortical thickness: OR, 4.0; 95% CI, 1.4–11), microstructure (trabecular number: OR, 2.3; 95% CI, 1.02–5.1), and strength (axial rigidity: OR, 3.8; 95% CI, 1.4–10); the factor-of-risk (fall load/µFE failure load) was 24% greater (worse) in cases (OR, 3.0; 95% CI, 1.2–7.5). Areas under ROC curves ranged from 0.72 to 0.82 for these parameters.

In conclusion, bone geometry, microstructure, and strength contribute to forearm fractures, as does BMD, and these additional determinants of risk promise greater insights into fracture pathogenesis.

1. Melton III LJ et al. *J Bone Miner Res.* 2007;22:1442–1448.

Determination of forearm fracture risk in postmenopausal women

High-resolution peripheral quantitative computarized tomography was used to assess volumetric BMD, geometry, and microstructure at the ultradistal radius, the site of Colles' fractures, in postmenopausal women with or without wrist fractures.

The strongest determinants of fracture were BMD, geometry of the bone measured by cortical thickness, microstructure evaluated by the trabecular number, and strength as reflected by axial rigidity.

It appears therefore that bone geometry, microstructure, and strength contribute to forearm fractures, as does BMD, and these additional determinants of risk, which can be evaluated from noninvasive bone imaging, promise greater insights into fracture pathogenesis.