Does Combining the Results from Multiple Bone Sites Measured by a New Quantitative Ultrasound Device Improve Discrimination of Hip Fracture?

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Abstract

There is a growing interest in the use of Quantitative Ultrasound (QUS) measurements as an alternative to current radiation-based bone densitometry techniques for the non-invasive assessment of fracture risk. While most of the commercialized ultrasound devices measure only single pre-defined peripheral skeletal sites, the Omnisense prototype (Sunlight LTD, Israel) can be used on multiple bones, including the spinous processes. In this study we examined the ability of speed of sound measured at list sites here to differentiate subjects with hip fractures from normal controls.

79 postmenopausal Caucasian Israeli women who had sustained an atraumatic fracture of the proximal femur within the last 6 months were recruited from the local population (mean age 80 ± 8.9). As controls, 295 postmenopausal Caucasian Israeli women without osteoporotic fractures were also included (mean age 70 ± 8.7). Discrimination of hip fractures with QUS at all ultrasound sites was highly statistically significant ($p<0.01$) (odds ratios = 1.4 to 3.0, area under the ROC curve: 77-92%), except for the hand metacarpal. Distal radius and calcaneus measurements (odds ratios = 2.4 and 3.0) were the best discriminators of hip fractures patients from controls. Using forward selective linear regression model, the discriminator value of combined assessment at two sites were investigated. There was moderate improvement in diagnostic value but the best combination was the calcaneus with the distal radius, which improved the area under the curve by 3% and raised both the sensitivity and specificity to 94%. These data demonstrate the encouraging potential of improving discrimination of hip fracture by using multiple-site ultrasonic measurements.

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