

Prospective Evaluation of Hip-Fracture Risk in Institutionalized Elderly by Measurement of Ultrasonic Velocity at the Radius and Phalanx

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Fractures constitute a major clinical problem in institutionalized elderly. Here, annual incidence rates for hip fractures usually range between 3% to 5%. Since bone mass or -density constitute an important factor of bone strength and DEXA measurements are limited in the majority of these patients (restricted mobility of patients and DEXA availability) we sought to investigate whether bone ultrasound measurements would help to characterize patients at very high risk for hip- and other non-vertebral fractures.

A total of 1085 female patients above 70 years of age who lived in 95 homes for elderly in the southern and eastern part of Austria were followed for an average of 1 year. We excluded patients with hypercalcemia and renal or hepatic dysfunction. Speed of sound (SOS) was measured with a portable quantitative ultrasound device (Sunlight Omnisense Ultrasound Bone Sonometer) at the distal one-third of the radius (RAD) and at the proximal phalanx of the third finger (PLX). So far a total of 147 non-vertebral fractures have occurred, 78 of these being hip fractures. Correlations between age and PLX- or RAD-SOS measurements were comparable ($r=-0.20$ and -0.19 , both $p<0.0001$). Over the 8th, 9th and 10th decade there was a significant decrease in mean SOS values of 0.84 SD (RAD) and 0.60 SD (PLX). RAD- and PLX-SOS values were correlated with each other ($r=0.45$, $p<0.001$). Using Cox-regression analysis and adjusting the data for age, body mass index and measurement device we found a significant increase in the relative risk of hip fracture for each standard deviation decrease in SOS: OR 1.51 (1.16-2.0) for the radial and OR 1.50 (1.16-1.93) for the phalangeal measurement. When all non-vertebral fractures were considered the odds ratios were 1.47 (1.22-1.8) for the radial and 1.19 (1.00-1.42) for the phalangeal measurements. Combining both radial and phalangeal measurements did not result in further improvement of fracture risk prediction.

We conclude that measurements of both phalangeal and radial SOS in a large high-risk patient cohort significantly predicted hip-fractures and other non-vertebral fractures. Compared to published data on prediction of hip fractures (neck bone mineral density (OR 2.1/SD decrease); calcaneal SOS and BUA (OR 1.5-1.7/SD decrease) peripheral bone ultrasound measurements may present an attractive screening tool for identification of institutionalized individuals at very high risk of fractures.

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