Multisite Bone Ultrasound Measurements on a North American Reference Population

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Quantitative bone ultrasound has been validated prospectively as a valid predictor of fracture. Most ultrasound devices measure only a single bone site whereas central skeletal DXA can measure multiple sites. The decline in bone mass with age varies considerably between measurement technologies and the site measured. The Sunlight device precisely measures speed of sound (SOS) at phalanx, radius, tibia, and metatarsal. Normative databases to ascertain peak bone mass and cross-sectional decline with age are essential in the validation of such new technology and may provide insights into biological changes in different bones with age and with menopausal status.

We studied 573 healthy Caucasian North American women at 5 North American centers with the Sunlight Omnisense multi-site bone ultrasound device. Patients were distributed from age 20 to 90 (mean 47.7 ± 17.2 years). Recruitment was by advertisements; those with diseases or on medications known to affect bone metabolism were excluded. Peak SOS was achieved at age 25-35 at lower extremity sites (tibia 3945 ± 151 m/sec; metatarsal 3799 ± 202 m/sec), while at upper extremity sites peak SOS was achieved at age 35-45 (radius 4167 ± 102 m/sec; phalanx 4092 ± 161 m/sec). Similar values were seen for peak SOS between recruiting centers. Declines in SOS with age were seen at all sites. At the oldest age, the radius reached a T-score of -2.82; tibia -1.36; metatarsal -2.80 and the phalanx -2.68. A rapid decline was observed at age 55-65: phalanx 0.16, radius 0.16, metatarsal 0.09 and tibia 0.06 T-score units per year. After age 65, declines at all sites continued at a reduced rate, about 0.04 T-score units per year.

We conclude that, with age, changes in bone ultrasound measurements vary at different skeletal sites. This may have important implications in selecting the most appropriate site for fracture risk assessment and for determining a response to therapy. By measuring multiple sites with different characteristics, it may be possible to increase the specificity of fracture risk assessment. Because of their precision, ultrasound SOS measurements may prove useful in following postmenopausal women on therapy.

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