

Reference Database for Bone Speed of Sound Measurement By a Novel Quantitative Multi-site Ultrasound Device

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ABSTRACT

The non-uniform skeletal involvement in osteoporosis argues for multi-site evaluation in osteoporosis. Sunlight Omnisense? (Sunlight Ultrasound Technologies Ltd., Israel [Omnisense]) is a multi-site device that measures speed of sound (SOS) at the appendicular skeleton. We report the reference-database for SOS at the radius (RAD), tibia (TIB), metatarsus (MTR) and phalanx (PLX). The database was obtained from 1521 healthy Israeli women (age 20-90) out of 2051 respondents. SOS was determined in 97.6% of the participants at the PLX, 96.4 % at the TIB, 93.6% at the RAD and 85.1% at the MTR but not measurable in 0.5%. Short-term CV was lowest at the RAD and always less than 1%. Maximal SOS was noted 35-45 years of age (RAD: 4169, MTR: 3663, PLX: 4047 m/sec, respectively) but 10 years earlier at the TIB (3939 m/sec). In the perimenopause period (age 46-55), SOS was always lower in post- as compared to pre-menopausal women ($p < 0.05$). Immediately following menopause, SOS annually declined close to the short-term CV: 16, 34, 37 and 13 m/sec at the RAD, PLX, MTR and TIB, respectively. The average age-stratified SOS at various measurement sites highly correlated at the population level (0.96-0.99), but less so at the personal level (0.40-0.57). Therefore, multi-site SOS measurements are better than single-site assessment. After 79 years of age, the average T-score at the RAD and PLX was < -2.5 . It is similar to that of DXA-determined spine- and somewhat lower than hip-BMD. Equivalent T-score curves obtained by percentile adjustment of SOS at various sites to that of the RAD (at age group 60-69) reveal convergence and indicate that 52-68% of women older than 79 years are osteoporotic. In conclusion, multi-site peripheral SOS measurements reveal age-dependent bone changes, with a high degree of measurement precision and indicate prevalence of osteoporosis similar to that obtained by DXA.