

Normative reference data study for Dual X-ray and Laser (DXL) Calscan bone densitometer

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Introduction

In order to measure the bone mineral density without influences of fatty tissues, three different quantities have to be measured separately. Since the total thickness of the object being measured is composed of the individual thickness of bone mineral, lean soft tissue and fat, it is possible to combine the thickness measurement with two X-ray measurements and get a unique solution of the three different components at the measurement site. The DXL technique uses two X-ray energies in combination with laser measurement of the object thickness in order to determine all three tissue components, see Figure 1.

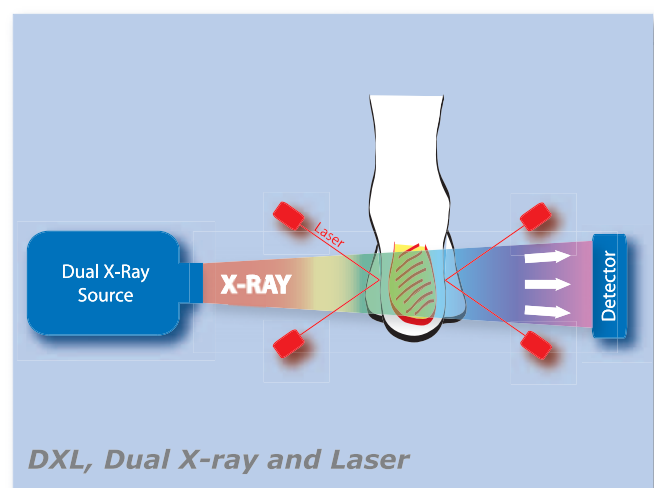


Figure 1. Schematic diagram of the DXL technology.

The purpose of this study was to establish a database of bone mineral density (BMD) measured at the calcaneus for women and men. A DXL Calscan device (Demetech AB, Stockholm, Sweden) was used for the study.

Methods

Healthy Swedish Caucasians, 15–85 years of age for women and 19–85 years of age for men, were enrolled in the study. The candidates were recruited from workplaces, universities, nursing homes and pensioner associations in southern Sweden. Exclusion criteria that were applied during the data analysis were: history of osteoporosis treatment by active agents such as bisphosphonate or calcitonine, use of corticosteroids for more than 3 months, and extended bed rest.

BMD was measured at the left heel using a DXL Calscan, Figure 2. This device uses fan-beam X-rays at 35 and 68 kV and the heel thickness is measured with a triangular laser technology [1,2,3].



Figure 2. The DXL Calscan device.

Results

The characteristics and anthropometric data of the study population are shown in Table 1.

Table 1. Characteristics and anthropometric data of the study population.

	Women	Men
Number	993	459
Mean age (\pm SD)	48.2 \pm 15.2	47.0 \pm 15.2
Weight (kg), mean (\pm SD)	67.3 \pm 11.1	82.8 \pm 12.0
Height (cm), mean (\pm SD)	165.6 \pm 6.3	179.1 \pm 6.8
Body mass index (kg/m ²), mean (\pm SD)	24.5 \pm 3.8	25.8 \pm 3.4

The age dependent BMD values in ten-year bands for women and men are shown in Figure 3.

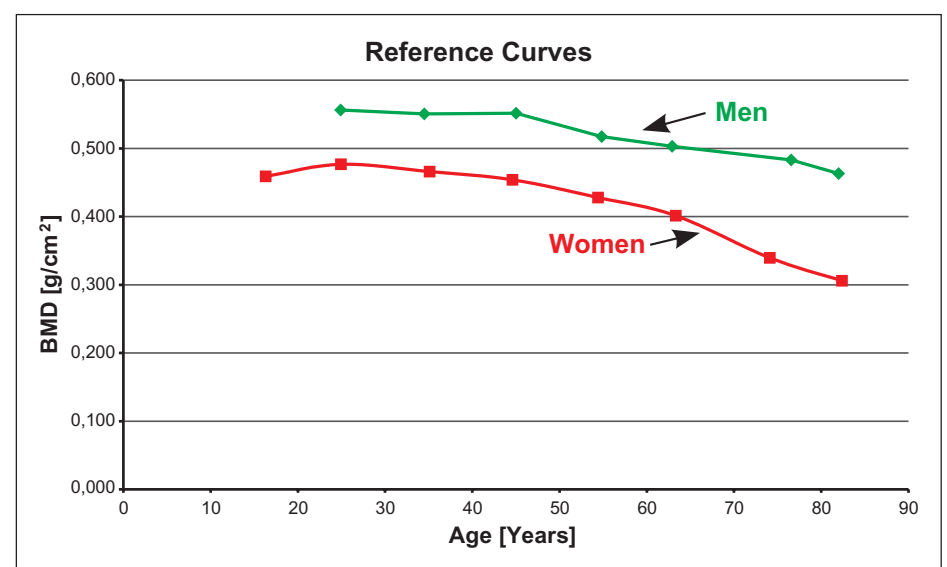


Figure 3. BMD values for women and men plotted as a function of age for the DXL Calscan device.

The peak bone mass for women was found to be 0.485 ± 0.066 g/cm² at an age of 22 years and for men 0.556 ± 0.074 g/cm² at an age of 25 years. The age-adjusted Odds Ratio for women aged 50 years and over for BMD and a history of fracture was 3.7. The DXL Calscan device used for the study was calibrated weekly against a heel bone phantom. The precision of these measurements was 0.5%. The *in vivo* precision was 1.2%, as assessed by duplicate measurements on 35 healthy individuals (mean age 52 years, range 25–72 years).

Conclusion

The data obtained in this age-related study of the BMD of the reference population with DXL Calscan allows analysis of different behaviors of the bone mineral density over lifetime for both women and men.

References

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