EVALUATION OF DXL versus DXA IN RADIUS AND HUMERUS FRACTURES

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Objectives

A wrist fracture is often the first clinical sign of osteoporosis in middle-aged women. Fracture of the proximal humerus following low-energy trauma is also related to osteoporosis. If osteoporosis is diagnosed at an early stage it can be treated and the risk of future fractures can be decreased. Only a few women with wrist fracture do however receive a referral for diagnostic bone densitometry. In clinical practise most bone densitometry is performed on hip and spine. The WHO criterion on osteoporosis is also defined for those regions. The bone densitometers used for spine and hip measurements are rather expensive, require quite a lot of space and skilled personnel. A device which is small, not so expensive and which is easy to use also for unskilled personnel would therefore be of value.

The objective of this study was to evaluate how BMD in calcaneus, measured by using a Demetech DXL (Dual X-ray and Laser) Calscan device correlates with BMD in whole body, hip and radius in 40 + women referred for a suspected wrist or humerus fracture.

Material and methods

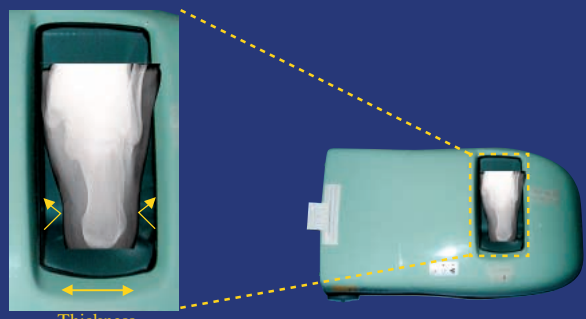
Females older than 40 years referred to the emergency X-ray department for suspected wrist or humeral fracture were asked to participate in the study. The calcaneal BMD was evaluated using a Demetech (Demetech AB, Stockholm, Sweden) DXL Calscan device during the time that the X-ray films of radius or shoulder were evaluated. The DXL technique uses two X-ray energies and laser measurement of the object thickness. In this way the resulting BMD will be unaffected by various lean-soft tissue and adipose tissue composition. The patients did thereafter receive a referral for bone densitometry of whole body, femoral neck and radius. For those measurements a Hologic QDR 2000 (Hologic Inc., Waltham, Massachusetts, USA) was used. In total 32 individuals (mean age 61 years, range 40-75 years) underwent all DXA measurement of all regions.

Results

Calcaneal BMD showed a strong correlation to whole body BMD (r = 0.72) and femoral neck BMD (0.69). The relationship between calcaneal BMD and radius BMD was weaker (with proximal radius r was 0.58 and with distal radius r was 0.63). Calcaneal BMD did not vary with body height. The variation in calcaneal BMD with body weight was less than that for femoral neck (r = 0.52 and r = 0.59 for calcaneus and hip respectively).

Conclusions

There was a good relationship between calcaneal BMD and BMD in other regions. The DXL technique has a good potential for screening for osteoporosis in patients with radius and humerus fractures. Further studies evaluating the value of calcaneal BMD measurements using the DXL technique on prediction of hip fractures are planned.



1. The DXL technique allows measurement of heel thicknesss by using a laser.

DXL mathematics

$$N_1 = N_{01} * \exp(-\nu_{b1} * t_b * \sigma_b - \nu_{S1} * t_s * \sigma_s - \nu_{f1} * t_f * \sigma_f)$$

$$N_2 = N_{02} * \exp(-\nu_{b2} * t_b * \sigma_b - \nu_{S2} * t_s * \sigma_s - \nu_{f2} * t_f * \sigma_f)$$

$$T = t_b + t_s + t_f$$

bone (b)

lean soft tissue (s)

adipose tissue (f)

T = thickness of the heel

2. By using the aquired thickness a theoretically better quantification of BMD can be assessed.

3. In this study 32 females with suspected wrist or humerus chirurgicum fracture were examined by using DXL calscan at the time of the trauma followed up with a subsequent DXA of whole body, femoral neck and radius.

	Whole Body	Femoral Neck	Radius distal	Radius proximal	Body Height	Body Weight
Calcaneus	0.72	0.69	0.63	0.58	0.28	0.52
Whole Body		0.61	0.73	0.74	0.36	0.45
Femoral Neck			0.67	0.51	0.26	0. 59

4. The correlation of calcaneal BMD to whole body, femoral neck, and radius as well as the influence from body weight is comparable to those of DXA aquired by the Hologic QDR 2000.