

Colles' fracture associated with reduced bone mineral content

Photon densitometry in 74 patients with matched controls

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In a prospective population-based investigation, we measured bone mineral density (BMD) of the forearm using single-photon absorptiometry at both a distal and a more proximal site in 74 Colles'-fracture patients who were compared with controls matched for age, sex, and years after menopause. For both groups there was a marked inverse relationship

between age and bone mass. However, over the entire age range, the probands had 11 percent reduced BMD when compared with the controls.

Our findings confirm that patients with fracture of the distal forearm have reduced BMD. They constitute an appropriate group for studies aimed at prevention of fracture in the elderly.

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There is a great need for early identification of fracture-prone subsets of the elderly population. Colles' fracture might be considered an osteoporotic event. We have studied bone-mineral density in patients with Colles' fracture and in matched controls.

Patients and methods

The study group was recruited from a prospective epidemiologic investigation in the County of Uppsala where all cases of fractures of the distal forearm were followed up (Mallmin and Ljunghall 1992). 74 consecutive patients, mean age 66 (SD 11) years (67 women 65 years, 7 men 71 years), who had sustained a displaced Colles' fracture due to low-energy trauma (Bengnér and Johnell 1985) and with no previous history of a fragility fracture, were referred for bone mineral measurements within 2 months after the event and in most cases at the time of removal of the dorsal plaster 4-5 weeks after the fracture. Controls, matched for age, sex, and years since menopause and without previous fragility fractures were taken from the Population Register.

The bone mineral content (BMC) and density (BMD) were measured in the uninjured distal forearm by single-photon absorptiometry, using a Bone Density Scanner (Nuclear Data, Schaumburg, Illinois) and a I-125 source. The values in the forearm are reported to correlate well with bone mass measurements at other sites as well as with total body calcium (Chris-

tiansen and Rødbro 1975), and this method is considered to be superior for research purposes (Hassager and Christiansen 1989). The uninjured distal forearm of each patient was measured. Whether this side was dominant or not was recorded, and the control individuals were studied accordingly.

From a reference point, defined as the point where the distance between radius and ulna was 8 mm, the average of 4 scans, 2 mm apart, each in the distal direction, and 6 scans, 4 mm apart, each in the proximal direction, constituted the distal and the proximal measuring sites, respectively. The relative trabecular contents at these sites are about 55 and 13 percent (Nilas and Christiansen 1987). BMD, obtained by dividing BMC by bone width, was expressed in arbitrary units (g/cm²). Two measurements were generally made and, when both were technically acceptable, the average of the two values was used. The coefficient of variation with this method in our hands is less than 1 percent.

The statistical package Statview II, Abacus Concepts, Inc., U.S.A., was used. Paired, two-tailed, *t*-tests were used for comparison between cases and controls and simple regression analysis for calculations of correlations.

Results

As a group the probands had a reduced bone mass at both the distal and the more proximal measuring sites,

Table 1. Bone mineral density (BMD) of the distal forearm in Colles' fracture patients and matched controls. Mean SD

	Distal site	Proximal site
Probands (n 74)	0.75 0.19	1.05 0.25
Controls (n 74)	0.85 0.21	1.17 0.25

and this pattern obtained for both sexes (Table 1). The average difference, for the entire material, was 0.099 mg/cm² ($P < 0.0001$) at the distal site, and 0.123 mg/cm² ($P < 0.0001$) at the proximal site. It was 0.094 mg/cm² ($P < 0.0005$) and 0.117 mg/cm² ($P < 0.0002$) for the women, and 0.153 mg/cm² ($P < 0.01$) and 0.181 mg/cm² ($P < 0.05$) for the few men.

For both the probands and controls there was a close inverse relationship between bone mass and age at both measuring sites. There was a considerable overlap for individual values, but at the distal measuring site only 13 of the 67 women had a BMD value that was above the age-adjusted mean of the controls (Figure 1).

Discussion

Previous investigations concerning bone mass in Colles' fracture have not arrived at a uniform conclusion (Krølner et al. 1982) and have generally been based on small numbers of patients (Krølner et al. 1982, Hesp et al. 1984, Härmä and Karjalainen 1986, Eastell et al. 1989). In the hitherto largest study comprising 64 women with Colles' fracture due to low-energy trauma, a reduced BMC was found only at a proximal site, not representing the actual fracture site, and then only in 7 percent (Nilsson and Westlin 1974).

We placed particular emphasis on the definitions of both probands and controls. Thus, only first fractures and displaced fractures due to low-energy forces were investigated, and none of the controls had a history of a previous fragility fracture. Furthermore, we investigated a consecutive series of patients in a prospective population-based study. These restrictions are more precise than those in previous investigations. It has been reported (Nilsson and Westlin 1974) that there is also bone loss of the uninjured forearm after Colles' fracture, but our measurements were performed early after the injury and before such a change might have affected the results.

Our findings that patients with Colles' fracture indeed have a reduced bone mass indicate that they are

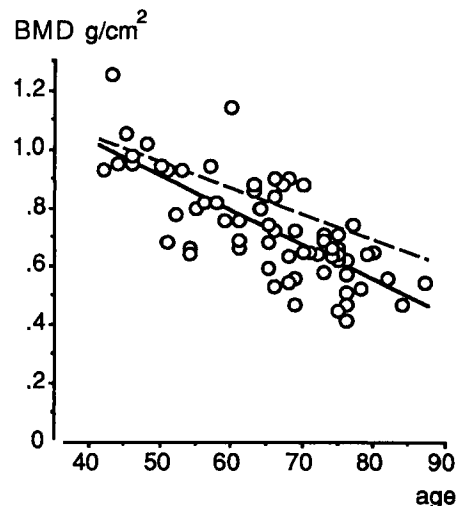


Figure 1. Relationship between bone mineral density (BMD) at the distal measuring site in the distal forearm and age in women with fracture of the distal forearm. The solid line indicates the regression line for the depicted values, while the interrupted line denotes a similar relationship in the age matched controls (individual values not shown).

at greater risk for subsequent and more severe fractures (Gärdsell et al. 1989, Hui et al. 1989). They may therefore constitute one target group for counselling about general and specific measures to prevent further bone loss.

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