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# BONE MINERAL CONTENT IN WOMEN WITH COLLES' FRACTURE: EFFECT OF CALCIUM SUPPLEMENTATION

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The effect of dietary calcium supplementation on bone mineral content was studied in 40 postmenopausal women with Colles' fracture. The participants were divided into two groups which were given either placebo or 1 g of calcium per day. The bone mineral content of the femur was determined before and after 1 year of medication.

Women with Colles' fracture were found to have the same mineral content in the femur as age-matched controls without fractures. Calcium supplementation had no significant effect on the bone mineral content.

*Key words:* osteoporosis; fractura radii; dietary calcium; bone mineral; absorptiometry

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Elderly women have a high incidence of Colles' fracture (Alffram & Bauer 1962). This may be at least partly explained by a reduced mechanical strength of the skeleton due to the age related loss of bone tissue and mineral, which in women normally begins in the fourth decade (Garn et al. 1969). The etiology of this loss of bone is not known, although various factors, such as dietary calcium deficiency, have been proposed (Nordin 1960).

The aim of the present investigation was twofold: (i) to collect data on the bone mineral content of women with Colles' fracture and, (ii) to study the effect of dietary calcium on the bone mineral content of these patients.

## MATERIAL AND METHODS

Forty postmenopausal women with previous fracture of the distal forearm volunteered for the study. All had sustained fractures approximately 3 years previously. Twelve patients had had repeated unilateral or bilateral Colles' fractures.

The mineral content of the patients with previous fractures, measured as described below, was compared with that of age-matched controls without fractures. The controls comprised 15 female staff members and 12 women drawn at random from the Stockholm population. The latter had participated in a study of the bone mineral content in a normal population (Dalén & Lamke 1974). The age was $60 \pm 3$ (mean $\pm$ s.d.) years in the fracture as well as the control groups.

In order to study the effect of calcium supplementation, the patients with Colles' fracture were divided randomly into two groups which were given either placebo or calcium tablets (Calcium Sandoz® 0.5 g, one tablet twice daily). Mineral measurements were made before and after 1 year of treatment. Four patients who discontinued the medication (1 calcium and 3 placebo) were excluded from the study. The actual daily supplement, on an average, was 0.8 g calcium, estimated on the basis of information received from the patients and from our records.

The bone mineral content was determined by X-ray spectrophotometry (Jacobson 1964, Gustafsson et al. 1974). In this method the

skeletal part under examination is positioned by fluoroscopy and automatically scanned with a beam of two energy levels from an X-ray tube. The attenuation of the beam is recorded as a profile giving the mineral content expressed in mg/mm. The femoral neck and shaft were chosen for measurement of the mineral content (cf., Dalén & Jacobson 1974). Earlier investigators have used the non-injured forearm as the measuring site. This was not done in the present study, since several patients had had bilateral Colles' fractures. The statistical evaluations were made according to Student's *t*-test.

## RESULTS

As seen in Table 1, there was no significant difference in the mineral content of women with and without Colles' fracture ($P > 0.05$).

Table 2 shows the percentage change in mineral content in the fracture group during 1 year. The patients given placebo lost on an average 1 per cent which is in accordance with the normal mineral loss in this age group (Dalén & Jacobson 1974). The patients given calcium supplement increased their mineral content by 3 per cent on an average. This difference between the placebo and calcium groups was, however, not significant ($P > 0.05$).

## DISCUSSION

In the present study women with Colles' fracture were found to have the same mineral content in the femur as the controls. The age related loss of mineral in the femur is of the same magnitude as in other parts of the skeleton (Dalén & Jacobson 1974), and the mineral content of the forearm correlates with that of the whole skeleton (Chestnut III et al. 1973). Thus, the lack of difference in femoral bone mineral content between women with fractures and controls is probably representative of the whole skeleton.

Westlin (1974) found that women with Colles' fracture were slightly leaner and had a somewhat lower mineral content in the uninjured forearm than controls. The rate of loss of bone mineral with age was however not increased. The author's interpretation of these findings was that women with Colles' fracture have a constitutionally low mineral

*Table 1. Bone mineral content in women with lower forearm fractures (n = 40) and controls without fractures (n = 27). The age was 60 ± 3 (mean ± s.d.) years in both groups*

| | Control group Mean ± s.d. | | Fracture group Mean ± s.d. | | Difference | | |
|---|---|---|---|---|---|---|---|
| | (mg/mm) | | (mg/mm) | | % | *t* | *P* |
| Femur, neck | 256 | 42 | 258 | 46 | +1 | 0.2 | > 0.05 |
| Femur, shaft | 430 | 69 | 422 | 58 | −2 | 0.5 | > 0.05 |

*Table 2. Percentage change in bone mineral content during a period of 1 year in women with Colles' fracture. The patients were divided randomly into two groups which were given either calcium supplement (n = 19) or placebo (n = 17). The age was 60 ± 3 (mean ± s.d.) years in both groups*

| | Placebo | | Calcium | | Difference | | |
|---|---|---|---|---|---|---|---|
| | Mean ± s.d. | | Mean ± s.d. | | % | *t* | *P* |
| Femur, neck | −1.6 | 7.8 | +2.9 | 11.3 | +4.5 | 1.4 | > 0.05 |
| Femur, shaft | −0.4 | 5.8 | +3.7 | 7.7 | +4.2 | 1.8 | > 0.05 |
| Femur, mean of both sites | −1.1 | 5.6 | +3.3 | 7.8 | +4.4 | 1.9 | > 0.05 |

content in the forearm rather than accelerated bone mineral loss.

Horseman (1976) also determined the mineral content of the distal forearm, but found no clear difference between a group with fractures and a control group.

The results of these studies indicate that women with Colles' fracture differ only slightly from controls and that the majority of patients with Colles' fracture have a mineral content within the normal range for their age. Women in this age group have a lower bone mineral content than premenopausal women. The high incidence of Colles' fracture in postmenopausal women may therefore be explained by the age related bone loss. Within this high risk group factors other than the bone mineral content probably determine which women will develop Colles' fracture. One such factor may be the degree or frequency of trauma.

In the prospective part of the present study, patients treated with calcium increased their mineral content, although not significantly. Thus, no definite conclusions can be drawn as to the beneficial effect from calcium supplementation. Certainly, calcium is a necessary component of the diet for the maintenance of a normal skeleton, but the exact requirements of calcium in various age groups are not known. Elderly people show a tendency to decrease their calcium intake (Hurxthal & Vose 1969), sometimes because of lactase deficiency (Birge et al. 1967), and their calcium intake is low compared to losses from the gut, kidneys and skin (Lutwak 1969).

Dietary calcium supplementation has been found to increase the bone mineral content in patients with periodontal disease (Lutwak & Coulston 1973) and in normal elderly people (Albanese et al. 1973), but not in patients with spinal osteoporosis (Shapiro et al. 1975). In this connection it is of special interest that populations with high calcium intake are not protected against bone loss (Garn et al. 1969). This indicates that calcium deficiency is not the only factor involved in the etiology of age related bone loss.

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