Weight loss and bone mineral content

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Weight Loss and Bone Mineral Content

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Weight loss is accompanied by a decrease in bone mineral content. The main explanation is probably a reduction of the mechanical strain on the skeleton. Thus, the addition of exercise to weight-loss programs may reduce the risk for bone loss (1). However, exercise training during energy restriction seems to be compensated by a reduction of activity outside of training sessions (2,3). A diet intervention to reduce the weight-loss induced decrease in bone mineral content could be more appropriate. The most straightforward intervention is calcium supplementation. Indeed calcium supplementation, even if the diet contains the officially recommended amounts of calcium, partly inhibits weight loss accompanied bone loss (4). Interestingly, Skov et al. (5) show a similar protective effect of protein intake on weight-loss induced bone loss.

Protein intake has been shown to be important in maintaining bone or minimizing bone loss in elderly persons (6). After controlling for weight loss, women and men with a relatively higher protein intake had decreased bone loss. Initially, it was thought that a high protein intake caused bone loss instead of protection against bone loss. A higher dietary protein intake leads to higher urinary calcium excretion. The increase in urinary calcium was a function of the amount and type of protein intake because dietary acid load is slightly influenced by the ratio of meat to vegetable protein intake (7). Later studies showed that total calcium balance is positively affected by nitrogen intake despite the higher urinary calcium excretion because of a lower calcium excretion in feces (8). The study of Skov et al. (5) reflects the positive effect of nitrogen on calcium balance in bone mass.

The conclusion of the study of Skov et al. (5) is that body-fat loss was the major determinant of loss of bone mineral content. Unfortunately, no mechanism for the relation was mentioned or discussed. The mediator between body fat and bone may be leptin. Serum leptin concentrations have been shown to be associated with bone mass (9). Leptin stimulates mineralization of the bone matrix. A reduction of body fat could affect bone mass through the effect of fat mass on serum leptin concentrations.

In conclusion, the effect of weight loss on bone mass is 2-fold: a reduction of the mechanical strain on the skeleton and a reduction through fat loss with leptin as the potential mediator. Nitrogen intake can partly reduce the effect through a positive effect on net calcium balance.

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