



## **Q: Can calcium and vitamin D supplementation adequately treat most patients with osteoporosis?**

**CHAD DEAL, MD**

Department of Rheumatic and Immunologic Disease,  
Cleveland Clinic

**A:** ALTHOUGH CALCIUM AND VITAMIN D play an important role, they are not sufficient when used alone. Rather, they should be used in combination with an antiresorptive agent such as estrogen, raloxifene, alendronate, risedronate, or calcitonin.

### ■ CATEGORIES OF BONE LOSS

The World Health Organization<sup>1</sup> has defined three levels of low bone mass; the definitions are based on T scores, which are standard deviation units below peak bone mass:

- **Osteopenia**—a T score between  $-1$  and  $-2.5$
- **Osteoporosis**—a T score less than  $-2.5$
- **Severe osteoporosis**—a T score less than  $-2.5$  with a fracture.

The National Osteoporosis Foundation<sup>2</sup> recommends treatment with an antiresorptive agent in patients with a T score less than  $-2.0$ ; patients with T scores less than  $-1.5$  to  $-2.0$  should also be treated if they have any of the following risk factors:

- Family history of osteoporosis
- Previous fracture
- Current tobacco use
- Body weight less than 127 pounds.

Many other risk factors such as steroid use are also important and should be considered.

### ■ STUDIES OF CALCIUM AND VITAMIN D

In almost all randomized controlled trials of antiresorptive agents, the control groups took calcium and vitamin D supplements. In these trials, patients who took alendronate, risedronate, or raloxifene<sup>3-5</sup> had significantly fewer fractures than those who took calcium and vitamin D alone. Thus, we conclude that supplements alone are not adequate.

Still, calcium and vitamin D are important in treating age-related bone loss, as they reduce the rate of bone loss and possibly reduce fracture risk.

Heaney<sup>6,7</sup> reviewed 43 studies of calcium published between 1988 and 1993. Although 16 studies showed that calcium had no effect on bone loss, 16 of the 19 placebo-controlled studies in which calcium intake was controlled did show that the mineral prevented or slowed bone loss. In the 12 studies that excluded women who were within 5 years of menopause—a period when estrogen deficiency overwhelms the effect of calcium supplementation<sup>8</sup>—all showed that calcium had a significantly beneficial effect.

Several well-controlled studies showed that calcium and vitamin D can reduce hip and nonvertebral fractures in elderly patients. Chapuy et al<sup>9</sup> gave healthy elderly women either 800 IU of vitamin D<sub>3</sub> and 1.2 g of elemental calcium or a double placebo every day for 18 months. The number of hip fractures was 43% lower and the number of nonvertebral fractures was 32% lower in the supplement group compared to the placebo group. In addition, the hip bone density in the supplement group increased by 2.7%.

Dawson-Hughes et al<sup>10</sup> gave supplements to men and women age 65 and older who had low calcium intakes (400–650 mg/day); the supplements contained calcium 500 mg and vitamin D<sub>3</sub> 700 IU. At 36 months, bone density was higher and the nonvertebral fracture rate was 50% lower in the supplement group.

In a 2-year study of women who were already calcium-replete (ie, who had an average daily calcium intake of 750 mg) and who had reached menopause at least 3 years before enrollment, Reid et al<sup>11</sup> found that total body bone loss was 43% lower in those given a calcium supplement of 1,000 mg/day than in those given a placebo. In a follow-up study, 86

**By itself,  
supplementation  
is not enough**





of the original 122 patients were followed for another 2 years (4 years total); the amount of bone loss and the number of fractures was lower in those who continued receiving calcium supplements than in those who continued receiving a placebo.<sup>12</sup>

In a 3-year study by Tilyard et al,<sup>13</sup> women with vertebral fractures at enrollment who were treated with calcitriol (1,25 dihydroxy-vitamin D<sub>3</sub> 0.25 µg twice a day) had a lower rate of new vertebral fractures during the second and third year than did women treated with calcium 1,000 mg/day.

### ■ MORE RESEARCH IS NEEDED

In the treatment of age-related bone loss, numerous questions remain unanswered. Are the effects of calcium supplements more (or only) significant in patients with calcium-deficient diets? Research suggests that patients with calcium intakes lower than 500 mg/day are more likely to respond to calcium supplementation. In addition, is vitamin D therapy more effective in those with low calcium intake or low vitamin D levels? And is calcitriol more effective than vitamin D<sub>3</sub>?

Following are a few points that can be stated with some certainty:

- Most postmenopausal women have a deficient intake of dietary calcium. In addition, serum vitamin D levels are low in at least 20% of women who live in North America and Northern Europe.<sup>14</sup>
- Laboratories consider the lower limit of normal for blood levels of 25-hydroxyvitamin D to be 9 ng/mL. Physiologically, however, values at the low end of the "normal" range are too low because parathyroid hormone levels rise as vitamin D levels fall below 20 to 25 ng/mL, and elevated parathyroid hormone increases bone turnover. Therefore, the RDA for vitamin D (400 IU/day) is probably too low and should be increased to 600 to 800 IU/day.<sup>14</sup>
- A postmenopausal woman who is not on estrogen therapy should take 1,500 mg of calcium a day; those on estrogen therapy should take 1,000 mg a day.<sup>15</sup>
- Calcium and vitamin D have a substantial effect on age-related bone loss in elderly women. It is likely that supplementation could prevent a proportion of bone fractures.

### ■ REFERENCES

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ADDRESS: Chad Deal, MD, Department of Rheumatic and Immunologic Disease, A50, The Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195; e-mail dealc@ccl.org.

The RDA for vitamin D is probably too low

### CME ANSWERS



Answers to the CREDIT TEST on page 775 of this issue

1 E 2 D 3 D 4 E 5 D 6 E 7 C 8 B 9 A 10 C  
11 B 12 A