Does Taking Calcium and Vitamin D Prevent Fractures? Commentary by Alan R. Gaby, M.D.

A study published February 16 in the New England Journal of Medicine concluded that supplementation with calcium and vitamin D did not significantly reduce the risk of hip fractures in postmenopausal women, but did significantly increase their risk of having a kidney stone. This study, which was widely publicized in the media, has led some people to question the widely held belief that supplementing with calcium and vitamin D is safe and effective for preventing osteoporosis-related hip fractures.

However, closer analysis of the study reveals that calcium and vitamin D do have an important role to play in osteoporosis prevention, although the results should lead us to consider the potential adverse effects of excessive calcium intake, and whether supplementing with just calcium and vitamin D is sufficient to prevent osteoporosis.

In the new study, 36,282 postmenopausal women (mean age, 62 years) were randomly assigned to receive calcium (500 mg twice a day) plus vitamin D (200 IU twice a day) or placebo for a mean duration of seven years. During the study, there were 12% fewer hip fractures in the group assigned to take the supplements than in the placebo group. That difference was not statistically significant, which led the researchers to conclude that the supplements "did not significantly reduce hip fractures."

However, as all statisticians know, the failure to demonstrate statistical significance is not the same as demonstrating lack of efficacy. The correct conclusion from the data is that calcium and vitamin D reduced the risk of hip fractures by 12%, but there is at least a 5% probability that the results were due to chance. Furthermore, the reduction in fractures was even greater, and statistically significant, when women who were not adhering to the program (i.e., taking less than 80% of the study medication) were excluded from the analysis. In that subgroup, there were 29% fewer fractures in the supplement group than in the placebo group.

The reduction in fracture risk may have been greater still, if the study had excluded women who were already consuming large amounts of calcium. At the start of the study, mean daily calcium consumption in both the active-treatment and placebo groups was about 1,150 mg, which is close to the currently recommended intake for postmenopausal women. Throughout the study, the women were permitted to take their own calcium supplements, in addition to their assigned calcium/vitamin D or placebo regimen, so calcium intake remained relatively high, even in the placebo group. Women who are already consuming an adequate amount of calcium are less likely to benefit from a calcium supplement than are women whose calcium intake is low. In the new study, calcium plus vitamin D supplementation reduced hip fracture risk by about 22% in women whose baseline calcium intake was low or moderate, but increased fracture risk by 12% in women whose baseline calcium intake was high (1,200 mg per day or more). The researchers ignored this effect of baseline calcium intake on treatment outcome, because it was not statistically significant. However, those findings support the hypothesis that the inclusion of women who were consuming large amounts of calcium diluted the beneficial effect of the calcium and vitamin D.

The relatively modest benefits observed in this study may also be due to the fact that calcium and vitamin D are only two among many nutrients that play a role in promoting bone health. Other important nutrients include magnesium, vitamin K, silicon, manganese, strontium, zinc, copper, folic acid, vitamin B6, vitamin C, vitamin B12, boron, and phosphorus. It is likely that assuring adequate intake of all of these nutrients would provide greater protection than the 12-29% reduction in fracture risk that was seen with calcium and vitamin D alone.

The results of the new study suggest that consuming adequate amounts of calcium and vitamin D supports bone health, but that excessive calcium intake provides no further benefit and may even be harmful. Studies have shown that calcium supplementation inhibits the absorption or utilization of magnesium, zinc, silicon, manganese, and phosphorus, each of which plays a key role in promoting healthy bones. The beneficial effect of calcium supplementation on bone might, therefore, be counterbalanced by marginal deficiencies of other nutrients, unless those nutrients are supplied as well.

The new study reported a 17% higher incidence of kidney stones in women receiving calcium and vitamin D than in those assigned to placebo. Based on what we know from earlier research, taking moderate amounts of supplemental calcium at meals inhibits the absorption of oxalate from food, potentially decreasing the risk that calcium oxalate kidney stones will form. However, very large intakes of calcium might increase urinary calcium excretion more than it decreases urinary oxalate, potentially increasing the risk of stones. Thus, a total daily calcium intake of more than 2,100 mg, as was consumed by the calcium-supplemented women in this study, might be too much for some women. On the other hand, supplementing with magnesium (300-500 mg per day), with or without vitamin B6 (10 mg per day) has been shown to decrease the risk of calcium oxalate kidney stones by 90%. Therefore, taking magnesium and vitamin B6 along with calcium would not only enhance the benefits of calcium on bone, it would also likely prevent any increase in risk of kidney stones associated with taking large doses of calcium.

References: