Effect of calcium or 25OH vitamin D3 dietary supplementation on bone loss at the hip in men and women over the age of 60

Dietary supplements that prevent bone loss at the hip and that can be applied safely in the elderly are likely to reduce hip fractures. A daily dietary supplement of 750 mg calcium or 15 microg 25OH vitamin D3 on bone loss at the hip and other sites, bone turnover and calcium-regulating hormones were studied over 4 yr in elderly volunteers using a randomized, double-blind, placebo-controlled trial. Bone mineral density (BMD) was measured by dual x-ray absorptiometry and bone structure by radiographs. Calcium biochemistry and bone turnover markers were measured in blood and urine. The 316 women entering the trial had a mean age of 73.7 yr and the 122 men of 75.9 yr. Baseline median calcium intake was 546 mg/day, and median serum 25OH vitamin D3 was 59 nmol/L. On placebo, loss of BMD at total hip was 2% and femoral medulla expansion was 3% over 4 yr. Calcium reduced bone loss, secondary hyperparathyroidism, and bone turnover. 25OH vitamin D3 was intermediate between placebo and calcium. Fracture rates and drop-out rates were similar among groups, and there were no serious adverse events with either supplement. A calcium supplement of 750 mg/day prevents loss of BMD, reduces femoral medullary expansion, secondary hyperparathyroidism, and high bone turnover. A supplement of 15 microg/day 25OH vitamin D3 is less effective, and because its effects are seen only at low calcium intakes, suggests that its beneficial effect is to reverse calcium insufficiency. Peacock M, Liu G, Carey M, McClintock R, Ambrosius W, Hui S, Johnston CC. J Clin Endocrinol Metab 2000 Sep;85(9):3011-9

Effect of calcium supplementation on bone loss in postmenopausal women

BACKGROUND. The use of calcium supplements slows bone loss in the forearm and has a beneficial effect on the axial bone density of women in late menopause whose calcium intake is less than 400 mg per day. However, the effect of a calcium supplement of 1000 mg per day on the axial bone density of postmenopausal women with higher calcium intakes is not known. METHODS. We studied 122 normal women at least three years after they had reached menopause who had a mean dietary calcium intake of 750 mg per day. The women were randomly assigned to treatment with either calcium (1000 mg per day) or placebo for two years. The bone mineral density of the total body, lumbar spine, and proximal femur was measured every six months by dual-energy x-ray absorptiometry. Serum and urine indexes of calcium metabolism were measured at base line and after 3, 12, and 24 months. RESULTS. The mean (+/- SE) rate of loss of total-body bone mineral density was reduced by 43 percent in the calcium group (-0.0055 +/- 0.0010 g per square centimeter per year) as compared with the placebo group (-0.0097 +/- 0.0010 g per square centimeter per year, P = 0.005). The rate of loss of bone mineral density was reduced by 35 percent in the legs (P = 0.02), and loss was eliminated in the trunk (P = 0.04). Calcium use was of significant benefit in the lumbar spine (P = 0.04), and in Ward's triangle the rate of loss was reduced by 67 percent (P = 0.04). Calcium supplementation had a similar effect whether dietary calcium intake was above or below the mean value for the group. Serum parathyroid hormone concentrations tended to be lower in the calcium group, as were urinary hydroxyproline excretion and serum alkaline phosphatase concentrations. CONCLUSIONS. Calcium supplementation significantly slowed axial and appendicular bone loss in normal post-menopausal women. Reid IR, Ames RW, Evans MC, Gamble GD, Sharpe SJ. N Engl J Med 1993 Feb 18;328(7):460-4.

Calcium, phosphorus and magnesium intakes correlate with bone mineral content in postmenopausal women

Qualitative and quantitative differences in the dietary habits of postmenopausal women were studied to assess their influence on bone health and osteoporosis. A total of 194 postmenopausal women were studied with forearm DEXA densitometry. 70 were osteoporotic and 124 served as controls. Women had been menopausal for 5-7 years, and had never been treated with hormone replacement or drug therapy. A 3-day dietary recall was completed on Sunday, Monday and Tuesday after the examination: the results were processed by computer and daily calcium, phosphorus and magnesium intakes were related to bone mineral content (BMC).
Data were compared with Student's t-test and significance was assessed at p < 0.05. Regression analysis was performed to correlate BMC and intake levels. The dietary intake of calcium, phosphorus and magnesium was significantly reduced in osteoporotic women and correlated with BMC. Calcium and magnesium intakes were lower than the recommended daily allowance even in normal women. The results suggest that nutritional factors are relevant to bone health in postmenopausal women, and dietary supplementation may be indicated for the prophylaxis of osteoporosis. Adequate nutritional recommendations and supplements should be given before the menopause, and dietary evaluation should be mandatory in treating postmenopausal osteoporosis. Tranquilli AL, Lucino E, Garzetti GG, Romanini C. Gynecol Endocrinol 1994 Mar;8(1):55-8.

Dietary Ca2+ prevents NaCl-sensitive hypertension in spontaneously hypertensive rats by a sympatholytic mechanism

The current study tested the hypothesis that dietary Ca2+ supplementation reverses the NaCl-sensitive component of hypertension and the associated neurochemical abnormalities in the NaCl-sensitive spontaneously hypertensive rat (SHR-S). Male SHR-S were begun on one of four diets at 8 weeks of age: control (0.75% NaCl/0.68% Ca2+); high NaCl (8.00% NaCl/0.68% Ca2+); high Ca2+ (0.75% NaCl/2.00% Ca2+); and high NaCl/high Ca2+ (8.00% NaCl/2.00% Ca2+). High NaCl SHR-S (X2 weeks) had higher mean arterial pressure (MAP) (161 +/- 4 mm Hg) than controls (149 +/- 3 mm Hg; P less than .05). Supplementation with Ca2+ prevented the rise in MAP in high NaCl rats, but did not alter MAP in controls. The 8% NaCl diet elevated plasma norepinephrine and reduced anterior hypothalamic (AHA) norepinephrine stores and turnover; concomitant Ca2+ supplementation restored both plasma norepinephrine and AHA norepinephrine turnover to normal. Clonidine was microinjected into the AHA of rats maintained on the four diets for 2 weeks to test the hypothesis that dietary Ca2+ supplementation prevents the previously observed NaCl-induced upregulation of alpha 2-adrenoceptors in AHA. Clonidine caused dose-dependent decreases in MAP that were greater in high NaCl rats than in controls. The Ca2+ supplementation prevented the exaggerated depressor response to clonidine in the high NaCl group, but not in the controls. The Ca2+ supplementation had no effect on pretreatment MAP or on MAP responses to clonidine in control NaCl-resistant SHR (SHR-R) or Wistar-Kyoto (WKY) rats. Thus, dietary Ca2+ supplementation prevents the NaCl-induced exacerbation of hypertension and augmented depressor response to clonidine in SHR-S by increasing noradrenergic input to AHA, thereby preventing the upregulation of AHA alpha 2-adrenoceptors. Oparil S, Wyss JM, Yang RH, Jin HK, Chen YF. Am J Hypertens 1990 Aug;3(8 Pt 2):179S-188S.

Effects on blood pressure of calcium supplementation of women

The relationship between dietary and supplemental (1.5 g/d) calcium intake and blood pressure was examined in 81 normotensive and 34 medicated hypertensive women between the ages of 35 and 65 years who completed a 4-yr clinical trial to assess age-associated bone loss in women. Calcium intakes were monitored during the entire study. Resting blood pressures and systolic blood pressure response (SBPR) to a stress test were recorded three times during the study. At the end of the study there was no relationship between systolic or diastolic blood pressure or SBPR and total calcium intake in normotensive women (n = 81). In the medicated hypertensive group (n = 34) there was a 13 mm Hg decrease in systolic pressure of supplemented women (n = 18) and a 7 mm Hg increase in unsupplemented women (n = 16) over the 4 yr (p less than .02). Johnson NE, Smith EL, Freudenheim JL. Am J Clin Nutr 1985 Jul;42(1):12-7.

Preliminary report of decreased serum magnesium in postmenopausal osteoporosis

Serum, red cell, urinary and bone Mg levels have been measured in 10 post-menopausal osteoporotics. Osteoporosis was confirmed by clinical fracture, histological analysis and dual-photon absorptiometry quantification. When compared to a healthy population matched for age and sex, serum Mg levels were statistically significantly (p less than 0.05) lower in osteoporotics (0.82 +/- 0.06 mmol/l) compared to normal subjects (0.87 +/- 0.04 mmol/l). No difference appeared for red cell, urinary or bone Mg determination. If these results are confirmed in a long-term study, serum Mg might be added to a batch of tests used to discriminate a subset of patients with an increased risk of developing postmenopausal osteoporosis. Reginster JY, Strause L, Deroisy R, Lecart MP, Saltman P, Franchimont P. Magnesium 1989;8(2):106-9.