

Dietary Intake of Vitamin A and Osteoporosis

Melhus H, Michaelsson K, Kindmark A, Bergstrom R, Holmberg L, Mallmin H, et al. Excessive dietary intake of vitamin A is associated with reduced bone mineral density and increased risk for hip fracture. *Ann Intern Med* 1998;129:770-8.

Study Overview

Objective. To investigate whether excessive dietary intake of vitamin A (retinol) is associated with decreased bone mineral density and increased risk for hip fracture.

Design. Population-based, cross-sectional study and a nested case-control study.

Setting and participants. The setting was two counties in central Sweden. A total of 175 women aged 28 to 74 years of age were randomly selected for the cross-sectional study [1]. For the case-control study, 247 women who had a first hip fracture within 2 to 64 months after enrollment and 873 age-matched controls were selected from women aged 40 to 76 years participating in the Swedish Mammography Cohort [2].

Main outcome measures. Vitamin A intake was estimated using dietary records and a food-frequency questionnaire. Dual-energy x-ray absorptiometry was used to measure bone mineral density at the lumbar spine, the total body, and three regions of the proximal femur. Hip fracture was confirmed by reviewing hospital discharge records. Patients also completed questionnaires about risk factors for osteoporosis (eg, smoking); diabetes diagnosis and treatment; use of cortisone, hormone replacement therapy, or oral contraceptives; menopausal status; and physical activity.

Main results. After adjusting for potentially confounding variables, intake of vitamin A was associated with reduced bone mineral density and increased risk for hip fracture. No significant differences in bone mineral density were found at an intake up to 1.5 mg daily. For intake greater than 1.5 mg daily compared with intake less than 0.5 mg daily, bone mineral density was reduced by 10% at the femoral neck ($P = 0.05$), by 14% at the lumbar spine ($P = 0.001$), and by 6% for the total body ($P = 0.009$), and risk for hip fracture was doubled (odds ratio 2.1, 95% CI = 1.1 to 4.0). Every 1-mg increase in daily intake of retinol increased the risk for hip fracture by 68% (95% CI = 18% to 140%; $P = 0.006$).

Conclusion

High dietary intake of retinol is associated with osteoporosis.

Commentary

Although two different study designs were used in this research, results consistently showed a relationship between high retinol intake and lower bone mineral density and higher rates of bone fracture. Adjustment for other risk factors did not affect the impact of vitamin A on risk for either hip fracture or lower bone mineral density. These findings are consistent with previous experimental data showing that hypervitaminosis A causes bone resorption, bone fragility, and spontaneous fracture [3].

The mean daily intake of vitamin A in these cohorts was more than three times the 0.5-mg daily dose of retinol equivalents recommended by the Food and Agriculture Organization and World Health Organization [4]. The authors suggest that this high intake is related to the consumption in Scandinavian countries of cod liver oil and dairy products heavily fortified with vitamin A.

Applications for Clinical Practice

Rates of hip fracture vary by more than sevenfold across Europe, with the highest rates occurring in the Scandinavian countries. Dietary differences (eg, variation in vitamin A intake) rather than well-known risk factors [5] may partially explain such variation. In the United States, more than 1 million osteoporosis-related fractures occur each year [6]. Although excessive intake of vitamin A is not as prevalent in the United States as in northern Europe, a higher prevalence may occur in certain ethnic or cultural groups. Identification of risk factors and risk-factor modification through osteoporosis disease prevention programs may help to reduce the burden of osteoporosis in these and other groups.

References

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