Nitroglycerin Ointment Strengthens Bone

BY MARY ANN MOON
FROM JAMA

Topical nitroglycerin ointment raises bone mineral density, cuts resorption, and alters bone structure so that bone strength is increased, according to results of a double-blind trial in 243 women.

The magnitude of improvement equals or exceeds that observed with other therapies, including bisphosphonates.

Major Finding: Compared with placebo, topical nitroglycerin ointment increased bone mineral density in the lumbar spine, total hip, and femoral neck by 7%; decreased bone resorption; and strengthened bone structure to the same or a greater degree than did other available therapies.

Data Source: A single-center, double-blind, placebo-controlled, randomized clinical trial involving 243 postmenopausal women followed for 2 years.

Disclosures: This study was supported by the Canadian Institutes of Health Research and Physicians’ Services Inc. Dr. Jamal reported receiving support from Novartis, Amgen, Warner-Chilcott, Genzyme, and Shire, and her associates reported ties to numerous drug, device, and technology companies.

“Together, these findings suggest that nitroglycerin may significantly decrease the risk of fractures, including fractures in long bones such as the hip, legs, and upper arm, which are largely composed of cortical bone,” wrote Dr. Sophie A. Jamal of the University of Toronto and her associates.

In a single-center double-blind clinical trial, they assessed the efficacy of daily application of 2% nitroglycerin ointment over the course of 2 years in increasing bone mineral density (BMD). The study was not large enough to directly determine the drug’s effects on fracture risk.

The study subjects were randomly assigned to apply active 15 mg/d nitroglycerin or a matching placebo ointment to a piece of onion skin that was taped to the upper outer arm overnight, every night.

The study subjects were women aged 50 years or older (mean age, 62 years) who were at least 1 year past menopause. None had osteoporosis, but all had BMD T scores of 0 to –2.0 at the lumbar spine and higher than –2.0 at the total hip.

A total of 400 women were enrolled, but only 243 remained in the study long enough to be included in the analysis; 126 in the nitroglycerin group and 117 in the placebo group. A total of 106 subjects dropped out because of headache, nausea, or allergic reaction, and another 51 “lost interest” or became ineligible.

After randomization, another 30 subjects in the nitroglycerin group (24%) and 15 in the placebo group (13%) discontinued treatment or were lost to follow-up, including 26 who cited adverse reactions including headache.

The primary end point was change in lumbar spine areal BMD after 2 years of treatment.

Compared with women in the placebo group, those who received active nitroglycerin showed a significant increase of approximately 7% in areal BMD at the lumbar spine.

They also showed comparable increases in areal BMD at the total hip (6%) and femoral neck (7%). Compared with placebo users, the nitroglycerin group also showed increases in volumetric trabecular BMD of 12% at the radius and 8.5% at the tibia; increases in cortical thickness of 14% at the radius and 25% at the tibia; and increases in periosteal circumference of 7% at the radius and 3% at the tibia.

The latter finding has not been reported with any other agent, the investigators said (JAMA 2011;305:800-07).

Nitroglycerin therapy also was associated with increases in measures of bone strength, with rises of 11% and 10% in polar section modulus and of 7% and 14.5% in polar moment of inertia at the radius and tibia, respectively. These findings indicate significant improvement in bone bending and twisting strength, which in previous research has correlated with fewer fractures.

With placebo, nitroglycerin treatment was associated with significant increases in bone-specific alkaline phosphate, a marker of bone formation. This rose 14% at 3 months, 21% at 12 months, and 35% at 24 months.

At the same time, urinary N-telopeptide level, a marker of bone resorption, decreased by 20% at 3 months, 33% at 12 months, and 54% at 24 months.

This concomitant change indicates that nitroglycerin uncouples bone formation from bone resorption. Moreover, “the differential effects of nitroglycerin on formation and resorption appear to widen with time, suggesting that its efficacy continues or even increases during 24 months of use,” the authors wrote.

In contrast, the effects of other antiresorptive and temparadisive either plateau or wane with time,” Dr. Jamal and her colleagues wrote.

The incidence of serious adverse effects did not differ between the two groups, at 4% in both.

Bisphosphonates: Absolute Risk of Atypical Fractures Is Low

BY NASEEM S. MILLER
FROM JAMA

Prolonged use of oral bisphosphonates is associated with an increased risk of subtrochanteric or femoral shaft fractures in older women. However, the absolute risk for these fractures is low, according to a large population-based study.

“This study adds another piece to the puzzle,” lead author Laura Y. Park-Wyllie, Pharm.D., said in an interview. “There wasn’t good research about what the absolute risk of the fractures was. This study adds that piece.”

During the 7-year study period, women aged 68 years or older who used bisphosphonates for 5 years or longer had an increased risk of bone-specific alkaline phosphate, a marker of bone formation. This rose 14% at 3 months, 21% at 12 months, and 35% at 24 months.

At the same time, urinary N-telopeptide level, a marker of bone resorption, decreased by 20% at 3 months, 33% at 12 months, and 54% at 24 months.

This concomitant change indicates that nitroglycerin uncouples bone formation from bone resorption. Moreover, “the differential effects of nitroglycerin on formation and resorption appear to widen with time, suggesting that its efficacy continues or even increases during 24 months of use,” the authors wrote.

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