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Short-Term Effect of Vitamin K Administration on Prednisolone-Induced Loss of Bone Mineral Density in Patients with Chronic Glomerulonephritis

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Abstract

Glucocorticoid-induced osteoporosis has been reported to be caused by enhanced bone resorption and suppressed bone formation. To clarify whether administration of vitamin K, which enhances bone formation, prevents prednisolone-induced loss of bone mineral density (BMD), a randomized, prospective, controlled study was conducted on 20 patients with chronic glomerulonephritis scheduled for treatment with prednisolone. All patients were initially treated with 0.8 mg/kg body weight/day of prednisolone (maximum of 40 mg) for 4 weeks, tapering to 20 mg/day over approximately 6 weeks. Ten patients received prednisolone alone (Group 1), and the other 10 patients received prednisolone plus 15 mg of menatetrenone, vitamin K, three times per day (Group 2). BMD of the lumbar spine measured by dual-energy X-ray absorptiometry (DXA) and biochemical markers of bone metabolism in blood and urine were evaluated before and 10 weeks after administration of prednisolone alone or with menatetrenone. In Group 1, treatment with prednisolone significantly reduced BMD of the lumbar spine from 1.14 ± 0.12 to 1.10 ± 0.11 g/cm2 (P= 0.0029). Serum intact osteocalcin and procollagen type I C-peptide (PICP) concentrations, biochemical markers of bone formation, were markedly reduced. A biochemical marker of bone resorption, urinary excretion of deoxypyridinoline, was significantly reduced. In Group 2, prednisolone-induced reduction of BMD was prevented by menatetrenone administration (1.09 ± 0.09 to 1.07 ± 0.07 g/cm2, P= 0.153). Menatetrenone prevented reduction of PICP concentration by prednisolone but not in serum intact osteocalcin concentration and urinary excretion of deoxypyridinoline. Thus, treatment with prednisolone resulted in loss of BMD of the lumbar spine associated with suppression of both bone formation and bone resorption. Menatetrenone is a useful agent in preventing prednisolone-induced loss of BMD.

Key words: Glucocorticoids — Osteoporosis — Prednisolone — Vitamin K.
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