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Prednisolone Induces an Increase in Serum Calcium Concentration: Possible Involvement of the Kidney, the Bone, and the Intestine

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Abstract

To evaluate the early effect of glucocorticoids on calcium metabolism, 15 subjects aged 22-58 years (5 males, 10 females) with chronic glomerulonephritis were orally treated with 40 mg daily of prednisolone. Five of these subjects were diagnosed with nephrotic syndrome and none had a serum creatinine concentration of more than 1.4 mg/dl. Serum specimens and 24-hour urine specimens were obtained just before and 24 hours after a single oral dose of prednisolone. Serum calcium, ionized calcium, phosphate, intact parathyroid hormone (PTH), intact osteocalcin and 1,25-dihydroxyvitamin D3 (1,25(OH)2D3), and urinary excretion of calcium, phosphate, and deoxypyridinoline were measured. Both serum calcium and ionized calcium concentrations were significantly increased from 4.39 ± 0.10 to 4.47 ± 0.09 mEq/liter ($P= 0.037$) and from 2.48 ± 0.04 to 2.55 ± 0.04 mEq/liter ($P= 0.002$), respectively, 24 hours following a single oral dose of prednisolone. Serum intact PTH concentration slightly decreased, but the difference was not significant by statistical analysis. Serum intact osteocalcin concentration was markedly suppressed. In contrast, no significant changes were observed in urinary excretion of deoxypyridinoline. Serum 1,25(OH)2D3 concentration measured in five patients was significantly increased. No significant changes in urinary excretion of calcium was observed in the face of these findings. It thus follows that a single oral dose of prednisolone administration increases serum calcium and ionized calcium concentrations, possibly mediated by suppressed bone formation, increased intestinal absorption of calcium, and impaired urinary excretion of calcium.

Key words: Calcium – Prednisolone – Glucocorticoids – Parathyroid hormone – Osteocalcin – Vitamin D.

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