Prescription of Calcium Carbonate to Nondialyzed Patients with a Supranormal Serum 1,25(OH)₂D₃ Concentration

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Dear Sir,

We have reported that kidneys in patients with chronic renal failure at the predialytic stage (non-D patients) can produce adequate doses of 1,25(OH)₂D₃ by reducing their serum phosphate concentration sufficiently as a result of the prescription of a phosphate binder [1]. Since we selected non-D patients with a 24-hour creatinine clearance of between 10 and 30 ml/min, their serum 1,25(OH)₂D₃ concentration was below the normal range at the beginning of the study. It has been demonstrated that the serum 1,25(OH)₂D₃ concentration may be supranormal in some patients with early to moderate renal failure [2]. Accordingly, we wondered what would happen to the levels of serum 1,25(OH)₂D₃, if a phosphate binder was prescribed to non-D patients with a supranormal level of serum 1,25(OH)₂D₃.

We administered phosphate binder to 2 non-D patients exhibiting a high serum 1,25(OH)₂D₃ concentration in an attempt to resolve this question. A 45-year-old female with a serum creatinine concentration of 3.4 mg/dl (case 1) and a 53-year-old male with a serum creatinine concentration of 4.1 mg/dl (case 2), not treated with a phosphate binder and vitamin D metabolite, were administered calcium carbonate (3 g/day) for a period of 4 weeks. Their renal function had been relatively stable for more than 6 months and there was no diabetes mellitus. The patients came to the investing room at 9.00 a.m. after a light breakfast for blood sampling. The changes in levels of serum phosphate, 1,25(OH)₂D₃, ionized calcium, mid portion-parathyroid hormone, calcitonin, pH and bicarbonate at weeks 0 and 4 were 3.5 vs. 2.9 mg/dl, 85.1 vs. 45.9 pg/ml, 2.30 vs. 2.38 mEq/l, 1.8 vs. 0.8 ng/ml, 56 vs. 49 pg/ml, 7.376 vs. 7.388 and 20.0 vs. 20.4 mEq/l in case 1, and 4.5 vs. 3.8 mg/dl, 62.8 vs. 30.4 pg/ml, 1.88 vs. 2.12 mEq/l, 4.8 vs. 3.6 ng/ml, 71 vs. 120 pg/ml, 7.313 vs. 7.319 and 15.2 vs. 17.9 mEq/l in case 2, respectively.

Although the serum phosphate concentration was decreased by the administration of calcium carbonate, the serum 1,25(OH)₂D₃ concentration was not increased, in contrast to our previous report [1]. However, there was another difference between the two studies. Previously, non-D patients with a subnormal serum 1,25(OH)₂D₃ concentration were employed, whereas in the present study, non-D patients with a supranormal serum 1,25(OH)₂D₃ concentration were used. The reason why the high serum 1,25(OH)₂D₃ concentration was reduced to the normal range despite a decrease in serum phosphate concentration remains unclear, but a possibility exists.

Since it has been reported that thyroparathyroidectomy inhibits 1α -hydroxylase activity [3], a slightly decreasing parathyroid hormone concentration may also inhibit 1α -hydroxylase activity. Since it has been indicated that metabolic acidosis suppresses 1α -hydroxylase activity [4], slight improvement of metabolic acidosis may stimulate 1α -hydroxylase activity. Therefore, inhibition of 1α -hydroxylase activity by decreasing parathyroid hormone concentration needs to overcome stimulation of 1α -hydroxylase activity by reducing serum phosphate concentration and by improving metabolic acidosis. Further research is needed to solve this problem.

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