Effects of Furosemide Administration on Ionized Calcium in Normal Subjects

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Dear Sir,

There is evidence that furosemide, when given orally to normal subjects, can induce an increase in serum parathyroid hormone (PTH), even though changes in serum calcium have not been observed [1, 2]. Calcium-lowering effects have been reported in hypercalcemia [3] and in hypoparathyroidism [4].

We have studied the response to furosemide infusion (0.5 mg/kg) in 8 normal subjects who had been instructed to follow a diet of 800–1,000 mg of calcium for 3 days before the study and of 3 g of NaCl the day before the study. Blood samples were taken before and 2 h after infusion. Urine samples were collected before (two 45-min periods) and after (three 60-min periods) furosemide administration. We measured in both blood samples: serum calcium (atomic absorption spectrophotometry), phosphorous, ionized calcium (Ca^{++}), pH, and Ca^{++} at pH 7.4 (ICAI radiometer) [5], as well as C-terminal PTH (IRE). Urine samples were analyzed for calcium. Laboratory data obtained are shown in table I.

In our study we found an initial fall in Ca^{++} 2 h after administration of furosemide. This decrease in Ca^{++} may be caused by the hypercalciuria that furosemide induces [6]. It is known that furosemide tends to produce metabolic alkalosis [7], and, since alkalosis may, in turn, reduce Ca^{++} [8], a fall in Ca^{++} could also be justified by this mechanism. We found a significant increase in serum pH, together with a decrease in Ca^{++} , whilst Ca^{++} at pH 7.4 showed no change. Our data suggest that alkalosis induced by furosemide can play a role in its calcium-lowering effect.

Table I. Serum and urinary values before and after furosemide infusion

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The fact that a serum calcium fall has not been reported by other authors could be due to methodology differences in Ca^{++} determination, to oral instead of parenteral administration of the drug, or to a much later evaluation of Ca^{++} changes. 5

Our study also showed a significant rise in serum PTH, supporting the possibility of an early parathyroid activation.

In short, we report an initial fall in Ca^{++} after furose-6mide administration which may, indeed, induce the secondary hyperparathyroidism that has been observed. Moreover, we conclude that an additional mechanism to Ca^{++} urinary losses, which can explain the reduction in Ca^{++} , is the rise in serum pH. 8

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