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CLINICAL STUDY

Gastric lavage with normal saline: effects on serum electrolytes

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Abstract: *Objective:* The aim of this study is to determine the intensity of changes in serum calcium, ionized calcium, and magnesium levels after gastric lavage with normal saline in patients with amitriptyline intoxication.
Material and methods: In this study, thirty patients older than 16 years with the history of intoxication with amitriptyline were included. After the baseline serum calcium, ionized calcium, and magnesium levels had been measured, gastric lavage with normal saline was performed. Serum levels of calcium, ionized calcium, and magnesium were monitored at 15 minutes, 6 hours, and 12 hours.
Results: Serum calcium levels decreased significantly from 9.32±0.47 mg/dL to 8.40±0.61 mg/dL (15 minutes, p<0.001), 8.92±0.54 mg/dL (6 hours, p<0.001), and 8.93±0.54 mg/dL (12 hours, p<0.001). Serum ionized calcium levels decreased significantly from 1.26±0.10 mmol/L to 1.20±0.07 mmol/L (15 minutes, p=0.004), 1.21±0.08 mmol/L (6 hours, p=0.024), and 1.21±0.08 mmol/L (12 hours, p=0.034). Serum magnesium levels decreased from 2.41±0.43 mg/dL to 2.04±0.25 mg/dL (15 minutes, p<0.001), 2.14±0.26 mg/dL (6 hours, p<0.001), and 2.16±0.25 mg/dL (12 hours, p<0.001).
Conclusion: Our study demonstrated that gastric lavage with normal saline can cause a statistically significant decrease in serum calcium, ionized calcium, and magnesium *(Fig. 4, Ref. 8)*. Full Text (Free, PDF) *www.bmj.sk.*
Key words: gastric lavage, calcium, ionized calcium, magnesium.

Gastrointestinal lavage is a form of therapy, which is most commonly administered to patients who had acute oral exposure to poisons. The theory behind gastrointestinal decontamination is quite simple: poisons that are not absorbed through the bloodstream cannot cause systemic toxicity.

Although gastrointestinal decontamination is the critical part of the therapy, the subject is always controversial (1–3). These issues are usually related to complications and efficacy of the procedure. Gastric emptying either fails or finds benefit only in limited circumstances (4–6). Activated charcoal appears to be more effective than gastric emptying in many cases (7, 8).

Complications associated with gastric lavage include gastrointestinal tract perforation, hypoxia, and aspiration (4, 6).

We conducted this prospective study to evaluate the changes in serum calcium, ionized calcium, magnesium, and sodium after the gastric lavage in patients with intoxication in the emergency setting. This study is the first study about the effects of gastric lavage on serum calcium, ionized calcium, magnesium, and sodium levels. The data support the controversy of gastric emptying.

Materials and methods

The study designed as a prospective study included self-poisoned patients who were referred to our emergency department. Inclusion criteria were as follows: patients over 16 years of age, history of intoxication with amitriptyline, recent ingestion within 2 hours. Patients with respiratory failure or altered mental status were excluded. An intravenous (IV) line was inserted, and baseline laboratory studies, including serum calcium, ionized calcium, magnesium, sodium, albumin, blood urea nitrogen, creatinine, and glucose levels were studied.

Gastric lavage was performed by placing a large-bore (36–40 French) orogastric tube. Cardiac and pulse oximetric monitoring of the patients was applied. The patients were asked to phonate to assure that the tube had not been placed in the trachea. At this point, normal saline was instilled into the tube in amount of 8 ml/kg of and allowed to drain by gravity. This procedure was repeated five times until the pill fragments stopped being observed within the drainage material. 15 minutes, 6 hours, and 12 hours after the procedure, laboratory studies, including serum calcium, ionized calcium, magnesium, and sodium levels were studied. None of the patients received calcium, magnesium, and bicarbonate during the study period. All of them received 5 % dextrose and water (12 ml/kg) and normal saline (6 ml/kg) during the study period. Blood for laboratory studies was obtained from the IV line in the other arm. Informed consents were taken and the study protocol was approved by the local ethical committee. Baseline data including age, sex and clinical history were recorded.

Central tendency and uncertainty (mean and SD) were measured for all category parameters. SPSS V16 was used for data analysis. The measures were repeated and repeatedly analyzed to measure the change over time of serum calcium, ionized calcium, magnesium and sodium values. The simple contrast was

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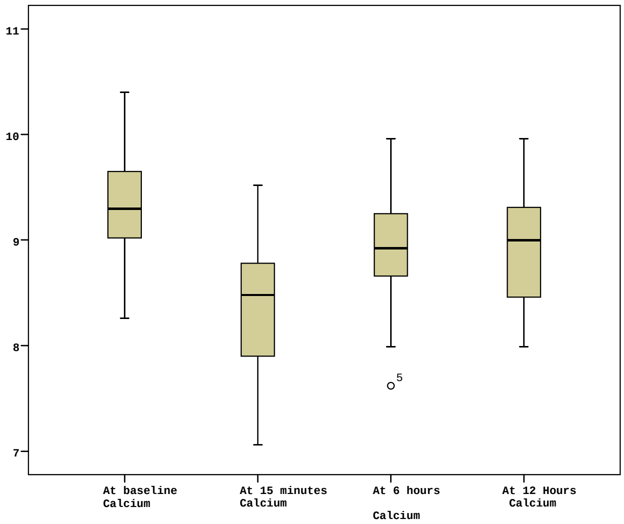

Fig. 1. Serum calcium levels decreased significantly from 9.32±0.47 mg/dL (baseline) to 8.40±0.61 mg/dL (15 minutes, p<0.001), 8.92±0.54 mg/dL (6 hours, p<0.001), and 8.93±0.54 mg/dL (12 hours, p<0.001).

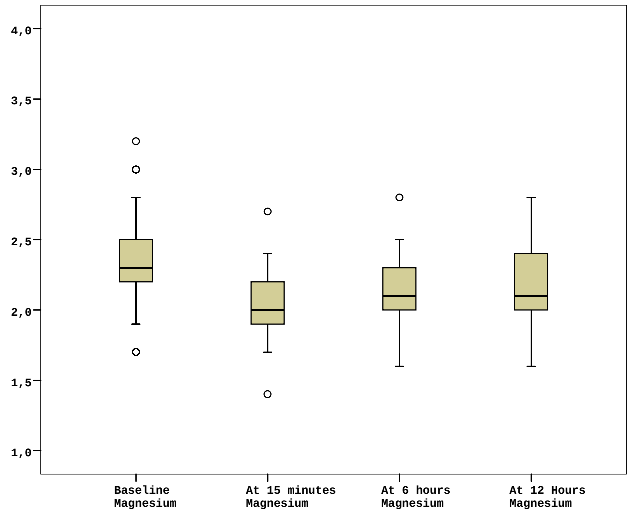

Fig. 3. Serum magnesium decreased from 2.41±0.43 mg/dL (baseline) to 2.04±0.25 mg/dL (15 minutes, p<0.001), 2.14±0.26 mg/dL (6 hours, p<0.001), and 2.16±0.25 mg/dL (12 hours, p<0.001).

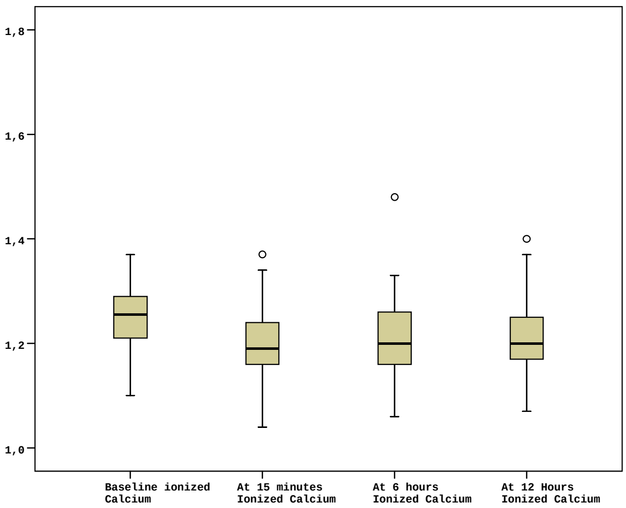

Fig. 2. Serum ionized calcium levels decreased significantly from 1.26±0.10 mmol /L (baseline) to 1.20±0.07 mmol/L (15 minutes, p=0.004), 1.21±0.08 mmol/L (6 hours, p=0.024), and 1.21±0.08 mmol/L (12 hours, p=0.034).

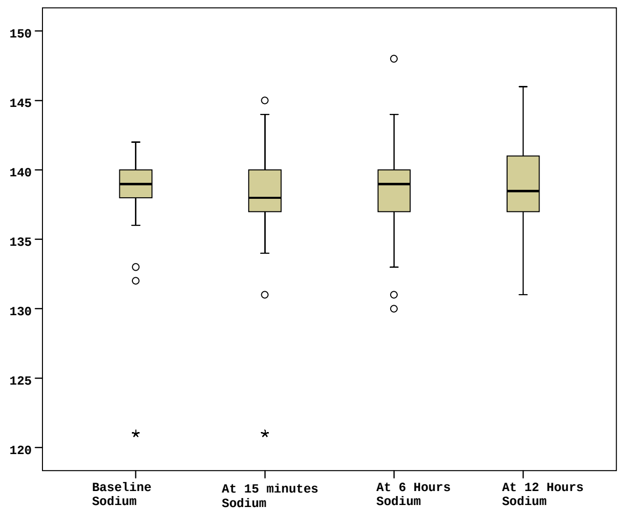

Fig. 4. Serum sodium levels did not change significantly (p>0.05) (138.10±4.03 mmol/L, baseline, 137.97±4.28 mmol/L at 15 minutes, 138.63±3.60 mmol/L at 6 hours, and 138.80±3.38 mmol/L at 12 hours.

used to observe statistically significant changes from baseline values. p<0.05 was considered statistically significant.

Results

Thirty patients were enrolled in the study. All of the eligible patients accepted their participation within our study. Mean patient age was 22.06±5.47 years (range, 16 to 38 years). Nineteen patients were women, and eleven patients were men. Two conditions potentially predisposing to electrolyte depletion, namely alcohol abuse and use of diuretics were ruled out in all patients. None of the patients had other comorbidities, such as diabetes mellitus and renal failure, and none of them was on routine medication. Baseline serum albumin, blood urea nitrogen, creatinine, and glucose levels were in normal limits in all patients.

Serum calcium levels decreased significantly from 9.32±0.47 mg/dL (baseline) to 8.40±0.61 mg/dL (15 minutes, p<0.001), 8.92±0.54 mg/dL (6 hours, p<0.001), and 8.93±0.54 mg/dL (12 hours, p<0.001) (Fig. 1). After the gastric lavage, true hypocalcemia (serum calcium levels <8.8 mg/dL) was determined in 22 patients at 15 minutes, in 14 patients at 6 hours, and in 13 patients at 12 hours. Serum ionized calcium levels decreased significantly from 1.26±0.10 mmol /L (baseline) to 1.20±0.07 mmol/L (15 minutes, p=0.004), 1.21±0.08 mmol/L (6 hours, p=0.024), and 1.21±0.08 mmol/L (12 hours, p=0.034) (Fig. 2). After the gastric lavage, true ionized hypocalcemia (serum ionized calcium levels <1.1 mmol/L) was seen in 5 patients at 15 minutes, in 3 patients at 6 hours, and in 2 patients at 12 hours. Serum magnesium levels decreased from 2.41±0.43 mg/dL (baseline) to 2.04±0.25 mg/dL (15 minutes, p<0.001), 2.14±0.26 mg/dL (6 hours, p<0.001), and 2.16±0.25 mg/dL (12 hours, p<0.00) (Fig. 3). After the gastric lavage, true hypomagnesemia (serum magnesium levels <1.70 mg/dL) was seen in 2 patients at 15 minutes, in 1 patient at 6 hours, and in 1 patient at 12 hours. Serum sodium levels did not change significantly, 138.10±4.03 mmol/L (baseline, p>0.05), 137.97±4.28 mmol/L (15 minutes, p=0.894), 138.63±3.60 mmol/L (6 hours, p=0.563), 138.80±3.38 mmol/L (12 hours, p=0.420) (Fig. 4).

None of the patients had clinical signs of hypocalcemia and hypomagnesemia such as seizures, paresthesis, Chvostek's sign.

All patients were hospitalized.

Discussion

This study expands the available information concerning the complications secondary to gastric lavage in patients with intoxication. The procedure resulted in a significant decrease in serum calcium, ionized calcium, and magnesium levels.

The average decrease in serum calcium was 0.92 mg/dL at 15 minutes, 0.40 mg/dL at 6 hours, and 0.39 mg/dL at 12 hours after the gastric lavage. The largest decrease was at 15 minutes after the gastric lavage. Although calcium levels tend to increase at 6 and 12 hours, the results are also significantly lower than the baseline levels. Furthermore, true hypocalcemia (serum calcium levels <8.8 mg/dL) was determined in 22 patients at 15 minutes, in 14 patients at 6 hours, and in 13 patients at 12 hours.

The average decrease in serum ionized calcium was 0.06 mmol/L at 15 minutes, 0.05 mmol/L at 6 hours, and 0.05 mmol/L at 12 hours. The most significant reduction was observed at 15 minutes. After the gastric lavage, true ionized hypocalcemia (serum ionized calcium levels <1.1 mmol/L) was determined in 5 patients at 15 minutes, in 3 patients at 6 hours, and in 2 patients at 12 hours.

There were no other accompanying conditions decreasing the calcium levels such as renal failure, acute pancreatitis, pregnancy, antibiotics and diuretic use, blood transfusion, respiratory distress, rhabdomyolysis, and hypoalbuminemia.

The average decrease in serum magnesium was 0.37 mg/dL at 15 minutes, 0.27 mg/dL at 6 hours, and 0.25 mg/dL at 12 hours. The largest decrease was at 15 minutes. After the gastric lavage, true hypomagnesemia (serum magnesium levels <1.70 mg/dL) was observed in two patients at 15 minutes and in one patient at 6 and 12 hours.

There were no other conditions decreasing the serum magnesium level such as renal failure, drugs, alcohol, acute pancreatitis and hypothermia.

Sodium levels did not change significantly.

This is the first study investigating the effects of gastric lavage on serum calcium, ionized calcium, magnesium, and sodium levels. Therefore, the mechanism and clinical significance of these findings are unknown and warrant further study. Our data support the hesitancy concerning the complications of the procedure.

This study is descriptive, and several possible limitations must be considered.

Firstly, the group of patients is small. The sample size was calculated to test the main hypothesis that gastric lavage was associated with a decrease in serum electrolytes. The sample size was not large enough to permit extensive subgroup analysis accordingly. No firm conclusions regarding the effects of age and sex can be drawn.

Secondly, we have demonstrated that gastric lavage is associated with a decrease in serum calcium, ionized calcium, and magnesium levels at 15 minutes, 6 hours, and 12 hours after the gastric lavage. We did not measure the levels later.

Finally, no control groups were studied. For ethical reasons, we did not study the temporal changes in electrolytes in cases who had been under amitriptyline therapy.

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