



Comparison of drug concentrations in blood and gastric lavage fluid before and after gastric lavage: A case report

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Abstract

BACKGROUND

Gastric lavage (GL) is one of the most important early therapies to remove unabsorbed toxins from the gastrointestinal tract. However, the details of performing gastric lavage remain to be established. There is controversy in clinical practice regarding individual choice of the timing of GL and its efficiency.

CASE SUMMARY

We report the case of a young woman who presented to the Emergency Department with drug intoxication for four hours. We used the latest toxicological screening techniques to compare drug concentrations in the patient's blood and gastric lavage fluid before and after gastric lavage. The results confirmed that gastric lavage was effective in reducing drug concentrations in the stomach; a small amount of drug remained in the stomach at the end of gastric lavage.

CONCLUSION

Gastric lavage is effective in reducing drug concentrations in the stomach, with a small amount of drug remaining in the stomach at the end of gastric lavage.

Key Words: Gastric lavage; Drug concentrations; Oral poisoning; Case report

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Core Tip: Gastric lavage (GL) is one of the most critical early therapies for oral poisoning, but details of the treatment protocol remain to be established. Controversies remain in clinical practice regarding individual choice of the GL timing and its efficiency. We report the case of a young woman who presented to the Emergency Department with a drug intoxication for four hours. We used the latest toxicological screening techniques to compare drug concentrations in the patient's blood and GL fluid before and after GL. The results confirm that GL is effective at reducing drug concentrations in the stomach, and we found that a small amount of drug remained in the stomach when the indication for termination of GL was judged conventionally.

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INTRODUCTION

Gastric lavage (GL) is one of the most important early therapies to remove unabsorbed toxins from the gastrointestinal tract. However, the details of performing GL have yet to be determined[1]. The current consensus is that GL should only be considered within 60 min of drug ingestion, if the airway is protected and the overdose is potentially life-threatening [2].

However, in some cases it can be difficult to determine who may benefit from GL because different medications stay in the stomach for different lengths of time, such as tricyclic antidepressants, which tend to stay in the stomach for a long time[3]. According to current expert consensus in China, GL should be performed within 4-6 h after intoxication and should be repeated until the eluate is colorless and odorless, using water in a volume of not less than 5 liters as the gastric lavage solution[4]. However, controversies remain in clinical practice regarding the individual choice of the timing of lavage and its efficiency. This study aimed to evaluate the efficacy of GL by assessing blood and lavage fluid drug concentrations before and after GL in drug-poisoned patients using a high-content, nontargeted toxicology screening technique.

CASE PRESENTATION

Chief complaints

The patient had of overdose for four hours.

History of present illness

The patient was a 20-year-old woman who presented to the Emergency Department four hours prior with complaints of dizziness, headache, weakness, drowsiness and dull left upper abdominal pain following a self-administered overdose of valproate and alprazolam, which was swallowed in unspecified doses.

History of past illness

She had a three-year history of mood disorders and had been taking medication for a long time.

Personal and family history

The patient denied any family history.

Physical examination

On arrival at the hospital, she was alert and depressed. Her pupils were equal and round, approximately 3 mm in diameter, and reactive to light. The patient's vital signs were within normal limits.

Laboratory examinations

Biochemistry, coagulation and blood count tests were performed. When her condition became critical, rapid bedside blood gas analysis was performed; pH 7.476, Pco₂ 33.5 mmHg, Po₂ 103 mmHg, BE 2 mmol/L, Hco₃ 24.7 mmol/L, S_O₂ 98%, potassium chloride 3.5/L, hemoglobin 139 g/L, and blood glucose 4.8 mmol/L.

Imaging examinations

The patient was not imaged.

FINAL DIAGNOSIS

Drug poisoning.

TREATMENT

She underwent bedside monitoring and was breathing 3 Liters of oxygen per minute through a nasal cannula. Intravenous access was established. After signing the consent form for GL, the gastric tube was smoothly inserted to a depth of approximately 55 cm with the patient's cooperation, and well secured. Before starting the GL, we collected 3-4 mL of blood and gastric fluid samples. Then the stomach tube was connected to the GL machine and GL was performed until the gastric fluid was clear and clean without any odor. The GL was stopped and blood and GL fluid samples were again collected before the stomach tube was removed. The total volume of GL was 13700 mL. In the absence of certainty about the drug type and dose, we measured and compared drug concentrations in her blood and GL fluid samples before and after GL using a high-content, nontargeted toxicological screening assay. Before gastric lavage, the patient's blood concentrations were as follows: Valproate 98440 ng/mL, estazolam (EZ) 112.42 ng/mL, Chlorpheniramine 18.37 ng/mL, and Salicylic acid 303.75 ng/mL. After gastric lavage, Valproate was 87413 ng/mL, and EZ was 90.75 ng/mL, Chlorpheniramine 15.72 ng/mL and Salicylic acid 208.83 ng/mL. Before gastric lavage, the patient's gastric fluid contained EZ 312.43 ng/mL, Chlorpheniramine 245.24 ng/mL, and Salicylic acid 44.37 ng/mL. After gastric lavage, the patient's gastric fluid contained EZ 93.52 ng/mL, Chlorpheniramine 97.14 ng/mL and Salicylic acid 16.42 ng/mL (Table 1).

OUTCOME AND FOLLOW-UP

A computed tomography scan of the lungs was performed the next day, and the patient was discharged from the hospital after 3 d of observation without any complications of GL (*e.g.*, aspiration pneumonia).

DISCUSSION

In toxicological emergencies, history-taking is very often unreliable and sometimes even misleading[5]. When the patient arrived at the hospital, she mentioned taking valproate and alprazolam at an unknown dose. However, blood and gastric fluid tests showed that the patient had taken at least valproate, EZ, chlorpheniramine, and salicylic acid.

We found valproate in the blood sample but not in the gastric fluid from the lavage, suggesting that valproate is wholly absorbed into the blood 4 h after ingestion. In contrast, the other drugs are absorbed more slowly. Based on the drug concentration in the GL fluid, although the patient had been poisoned for 4 h. The drug concentration in the GL fluid after GL was significantly reduced compared with that before GL, and the drug concentration in the blood also showed a decreasing trend, which shows that GL is still an effective method for removing excessive drugs in the stomach.

Although the position statement published by the American Academy of Clinical Toxicology and the European Association of Poison Centers and Clinical Toxicologists on GL advises that it should only be considered within 1 h of drug ingestion, if the airway is protected and the overdose is potentially life-threatening[2]. Some researchers have noted that GL remains effective up to 4 h after ingestion of a toxic substance[6], and there are case reports of large amounts of drugs remaining in the stomach for more than 5 h after overdose[7]. Chinese expert consensus documents on the diagnosis and treatment of acute poisoning recommend that GL should be performed within 4-6 h[4]. In our study, except for sodium valproate, a large amount of the drug remained in the stomach for more than 4 h after ingestion. Therefore, further research is needed to determine the rate of absorption of different substances in the stomach.

However, it should be noted that the indication for the end of GL is when the washed-out gastric fluid is clear, colorless, and odorless. In this case, the patient's GL ended after she had received 13700 mL of water, and the gastric fluid produced was colorless and odorless. However, the specimen after the GL showed that although most of the drug had been removed, a small portion of the drug had not yet been washed out. Therefore, the indicator's accuracy in determining the end of gastric irrigation requires further investigation.

Our study is still at an early and exploratory stage. In the future, we will continue to conduct comparative studies of gastric fluid and blood before and after GL for different poisons to determine the effect of GL at different times after ingestion of different poisons, and to provide precise treatment protocols for clinical poisoning.

CONCLUSION

GL is one of the most important early therapies to remove unabsorbed toxins from the gastrointestinal tract. However, the details of performing GL have yet to be determined. In clinical practice, controversy still exists regarding individual choice of the timing of GL and its efficiency. Our results confirm that GL at 4 h after ingestion of a toxin is effective at reducing drug concentrations in the stomach, and we found that a small amount of drug remained in the stomach when the indication for the end of GL was judged conventionally.

Table 1 Concentration of blood and gastric lavage fluid before and after gastric lavage

	Blood ng/mL		Gastric lavage fluid ng/mL	
	Pre-GL	Post-GL	Pre-GL	Post-GL
Valproate	98440	87413	0	0
EZ	112.42	90.75	312.43	93.52
Chlorphenamine	18.37	15.72	245.24	97.14
Salicylic acid	303.75	208.83	44.37	16.42

GL: Gastric lavage; EZ: Estazolam.

FOOTNOTES

Author contributions: Zhou Y contributed to manuscript writing and editing, and data collection; Peng AH and Tong JL contributed to data analysis; Xu SY contributed to conceptualization and supervision; All authors have read and approved the final manuscript.

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