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증 례

빙초산 음독 후 발생한 위천공: CT 소견을 중심으로

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CT Findings of Perforation of the Stomach after Ingestion of Glacial Acetic Acid

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The ingestion of corrosive substances often leads to severe morbidity and mortality. Acids produce coagulation necrosis with a lesser degree of penetration, whereas alkalis produce liquefactive necrosis with penetration. Acetic acid is a clear, colorless organic acid with a pungent, vinegar-like odor. The ingestion of highly concentrated acetic acid (glacial acetic acid) may cause a range of complications. On the other hand, perforation of the stomach is extremely rare but it has a high mortality rate. This paper reports a case of perforation of the stomach after the ingestion of glacial acetic acid with suicidal intent in an otherwise healthy 76-year-old woman.

Key Words: Acetic acid, Ingestion, Gastric perforation

INTRODUCTION

Ingestion of caustic substances often leads to severe morbidity and mortality. Depending on concentration, pH, and duration of contact with mucosa, the corrosive agents tend to inflict severe injuries on visceral organs[1,2]. Acids produce coagulation necrosis with lesser degree of penetrating, where alkalis produce liquefactive necrosis with penetration[1]. Thus, perforation of gastrointestinal tract in ingestion of acid ingestion is uncommon event. We herein present a case of perforated stomach after ingestion of glacial acetic acid.

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CASE

A 76-year-old female was admitted to the emergency room after deliberately ingesting 180 mL of glacial acetic acid. It took three hours to arrive at hospital after corrosive injury. Her past medical history included depression. She ingested glacial acetic acid with suicidal intent. She had presented blood pressure of

130/80 mmHg, the tachycardia (124/min), and dyspnea (respiration rate 28/min) with a Glasgow Coma Scale (GCS) of 11. Laboratory data, including liver function tests and renal function tests, were unremarkable. Initial arterial blood gas analysis demonstrated compensated mild metabolic acidosis (pH 7.359, PO_2 209 mmHg, PCO_2 31.2 mmHg, HCO_3 17.8 mM, base excess -6.0) and increased lactate (4.0 mmol/L). A chest and abdomen computed tomography (CT) scans showed diffuse wall thickening of upper esophagus (Fig. 1) and gastric submucosal edema and defect of the posterior wall of the stomach with fluid collection, which was consistent with a perforation of the stomach (Fig. 2, 3). Accordingly, we decided to perform exploratory laparotomy. Unfortunately, the patient and her family refused the surgical treatment and demand only medical and supportive treatment. The patient was transferred to the intensive care unit, where she died despite vigorous supportive care on the hospital day 7th.

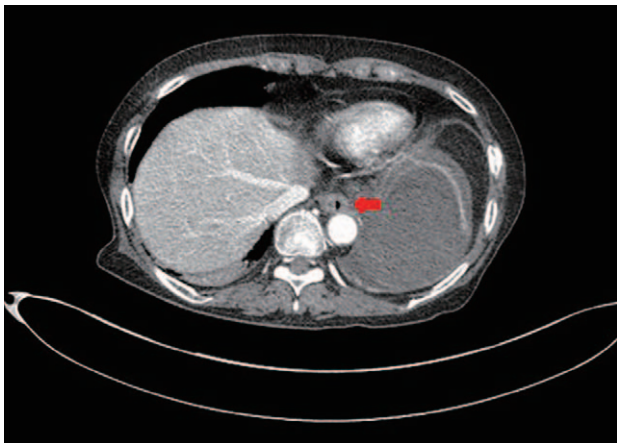

Fig. 1. Chest computed tomography scans showed a diffuse wall thickening of upper esophagus (arrow).

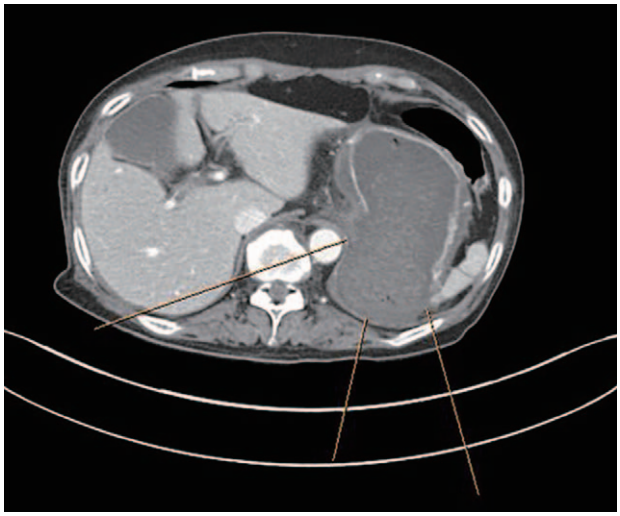

Fig. 2. Abdomen computed tomography scans windowed for a defect of the posterior wall of the stomach (between lines).

DISCUSSION

Many authors reported various cases of ingestion of acidic substances (Table 1)[1,3-5]. Acetic acid is an ingredient of vinegar; pure acetic acid has a high melting point (temperature, 16-16.5° C) and is solid at room temperature. Therefore pure solid acetic acid is named glacial acetic acid. Ingestion of acid substance can often cause the esophagus and the stomach injury. In severe cases, the small intestine, the large intestine, and the solid organs, including liver, spleen, and pancreas, can also be injured by the development of ischemia[3]. Nevertheless, perforation of the stomach due to acetic acid ingestion is very rare (Table 1)[1,3-5]. In case reviews examined 400 cases of highly concentrated acetic acid, there is no case which revealed a perforated stomach[5]. In our case, however, the wall of stomach was perforated.

In addition to these local complications, various systemic complications can be displayed. Concentrated

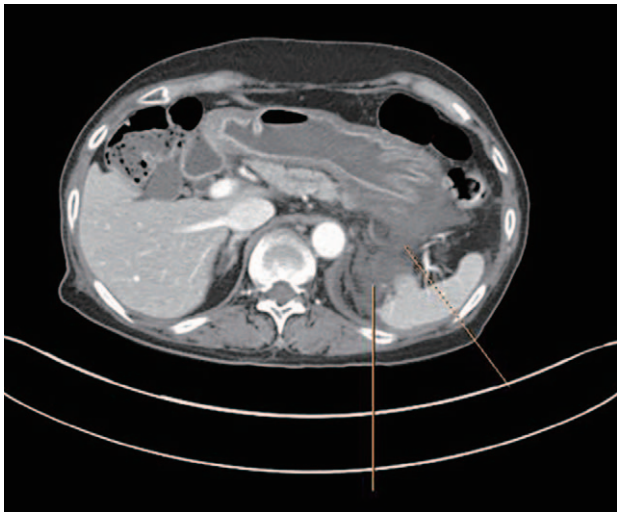

Fig. 3. Abdomen computed tomography scans showed a perigastric fluid collection in accordance with a perforation of the stomach (between lines).

Table 1. Summary of clinical features of reported series of perforation of the stomach due to acid ingestion

Author (Year, No. of cases)	Age (yrs)	Sex	Substance	Perforation of stomach	Treatment of perforated stomach	Outcome of case with perforated stomach
Kim et al.[3] (2007, 5 cases)	43 (2-84)	M: 2 F: 3	Glacial acetic acid	None	N/A	N/A
Brusin et al.[5] (2012, 400 cases)	47 (14-89)	M: 178 F: 222	Highly concentrated acetic acid	None	N/A	N/A
Wijeratne et al.[4] (2015, 9 cases)	29 (18-42)	M: 4 F: 5	- Sulphuric acid: 5 - Acetic acid: 1 - Nitric acid: 1 - Unknown: 2	1 Case (11.1%)	Surgery (+)	Succumbed to the injuries
Chibishev et al.[1] (2017, 71 cases)	N/A (18-74)	M: 24 F: 47	Acetic acid	2 Cases (2.8%)	N/A	N/A
Present case (2018, 1 case)	76	F	Glacial acetic acid	1 Case	Surgery (-)	Expire

M: male, F: female, N/A: not applicable

acetic acid ingestion can result in systemic complication such as respiratory and renal insufficiency, hemolysis, and disseminated intravascular coagulation as well as the local effects on the upper gastrointestinal tract[2]. However, these systemic complications were not observed in our case.

Prompt diagnosis and management are of outmost importance in decreasing mortality and achieving optimal long-term outcomes in cases of caustic ingestion[6]. However, diagnosis may be elusive, as the patient may present with varying clinical symptoms and give an inconclusive history. Often the signs and symptoms with which a patient initially presents can generally be unreliable in indicating the degree of the injury. Upper GI endoscopy is an important diagnostic tool to demonstrate the anatomical extent and the degree of burn injury[7]. Early endoscopy can demonstrate the full thickness injuries which usually needs surgical intervention[7]. However, performing immediate UGI endoscopy may not be feasible when the patient is critically ill with signs of peritonitis and there is no evidence or suspicion of caustic substance ingestion. The CT images can be performed to evaluate the presence and the extent of wall thickening of gastrointestinal tract, the presence of hemorrhage or perforation of gastrointestinal tract[3]. In a recent study, CT did better than endoscopy in selecting patients for surgery or non-operative treatment, suggesting that CT can replace endoscopy in the management of caustic injuries[8]. In our patient, although endoscopy was not carried out, CT scan demonstrated a diffuse wall thickening of upper esophagus, a defect of the posterior wall of the stomach, and a perigastric fluid collection in accordance with a perforation of the stomach.

Management involves urgent resuscitation with correction of fluid and electrolyte and acid-base abnormalities and immediate surgical exploration in those patients with signs of perforation[6]. Nevertheless, the prognosis of caustic injury due to ingestion of the glacial acetic acid is generally poor. Overall mortality was reported as 21%[5]. The outcomes of caustic injury depend on the severity of the lesions, the patient's overall condition at presentation, and the promptness of medical management. The higher the concentration of acetic acid ingested and the more the amount ingested result in the greater probability of death[5].

CONCLUSION

In conclusion, although corrosive acid ingestion is rare, we believe that perforation of stomach should be taken into consideration as a differential diagnosis of an ingestion injury of highly concentrated acid substance.

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