

## Case Report

## Caustic Ingestions: Feel the burn

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## Abstract

A 56-year-old male with a past medical history of depression presented with intentional caustic ingestion. This resulted in lactic acidosis, intubation for impending airway compromise, and ultimately to gastrectomy due to the extent of the gastric injury. Caustic ingestions cause either coagulative (acidic substance) or liquefactive (alkaline substance) necrosis. Management and treatment include observation, labs, imaging, endoscopy, and may require more urgent interventions such as intubation and vasopressors. Consider consulting the local poison control center early and GI, ENT or surgery depending on severity and types of injuries. Endoscopy is useful for prognosis, but early CT imaging may also be useful and more readily available.

**Keywords:** Caustic ingestion; Gastric injury; Lactic acidosis

## Case

A 56 year old male with a past medical history of alcohol abuse, Post-Traumatic Stress Disorder (PTSD) and depression presented via EMS to the emergency department for persistent abdominal pain. Per EMS, the patient drank approximately half a cup of battery acid one hour prior to arrival. On initial evaluation, the patient was hemodynamically stable but was complaining of burning epigastric abdominal pain. Initial vitals were temperature 36°C, heart rate 72 beats per minute, respirations 18 breaths per minute, blood pressure 128/82 mmHg, and O<sub>2</sub> saturation 98% on room air. Physical exam was significant for mild tenderness in the epigastric region without rebound tenderness or guarding. Chart review indicated a previous history of depression and PTSD, but no previous suicide attempts/ideation. A call was made to the Regional Poison Control Center and toxicology, GI and medical ICU consultations were initiated. Patient's labs were remarkable for metabolic acidosis with a CO<sub>2</sub> of 9 mmol/L, anion gap of 22 mmol/L; initial Venous Blood Gas (VBG) with pH of 6.99, pCO<sub>2</sub> of 48.5, Base Excess (BE) of -21.6, and lactic acid of 4.7 mmol/L. The next VBG showed worsening pH of 6.9, pCO<sub>2</sub> of 54.1, BE of -24.8, and lactic acid of 5.1. Patient was intubated as his airway began to display whitened ulcerations in combination with his impending inability to compensate for his metabolic acidosis. He was admitted to medical ICU. The patient suffered acute decompensation and was taken for emergent endoscopy by general surgery which revealed grade 3 caustic esophagitis that mandated gastrectomy.

## Discussion

Caustic ingestions resulting in critical injury to the gastrointestinal tract are a common toxicological occurrence in both adults and children. According to the American Association of

Poison Control Centers 230,517 cases of household cleaning substance ingestion were reported during 2018 [1]. Hall, et al reported 10,860 hydrochloric acid ingestions over a 7 year time frame and another 20,983 alkali ingestions over a 6 year time frame, resulting in 13 and 5 deaths, respectively [2]. In general, the mortality rate for caustic ingestion ranges from 7 to 14%, with a small-volume accidental ingestion more common in pediatric cases while adult ingestions are usually intentional and involve larger volumes [2,3].

A small set of caustic ingestions can result in severe morbidity and mortality including severe metabolic derangements, extreme pain, mucosal injury, perforation, chemical mediastinitis, and esophageal strictures, cancer, and death [3,4].

## Mechanism of Action

Depending on the agent ingested, patients may experience either liquefactive necrosis (alkaline substances) or coagulative necrosis (acidic substances). Liquefactive necrosis causes extensive damage as saponification occurs allowing further penetration of the caustic material deeper into the tissues while coagulative necrosis denatures tissue proteins that form a coagulum that walls off the acidic substance resulting in limited, but perhaps intense, damage. According to Hoffman et al, guidelines recommend treating all significant ingestions as severe. The quantity, composition, and concentration of the ingested substance directly affect how much damage may be inflicted [3,4]. For example, ingestion of more than 100 mL of a substance with a pH under 2 or over 12 causes severe permanent injury to the mucosal membrane [2-4].

## Management

Patients present with signs and symptoms ranging from minor nausea/vomiting to concerning physical examination findings including stridor, dysphagia, drooling, oropharynx ulcerations, soft tissue edema, and refractory pain [2,4]. It is important to note that ingestion injuries continue to evolve after initial presentation so frequent reexamination is warranted [4]. Initial evaluation depending on the suspected degree of severity may include xrays (upright chest xray for free air), laboratory analysis (including a complete blood count, basic chemistry panel, plus lactic acid), ABG/VBG, and advanced imaging (endoscopy and/or CT of thorax and abdomen/pelvis) [4]. If the history is concerning for self-harm, consider co-ingestions and their relevant toxicology screens. While most patients will have unremarkable labs, severe ingestions are marked by elevated lactic acid and metabolic acidosis, along with probable active tissue damage. More specifically, hydrochloric acid ingestions will be marked by a non-elevated anion gap acidosis, while other caustic ingestions will show an elevated anion gap [4,5].

When caustic ingestion is suspected, the patient should be placed on continuous cardiac and pulse oximetry monitoring. Focused physical examinations should be repeated periodically based on clinical changes especially of the oropharynx and abdomen, as some sources have observed the initial symptoms may not correlate with the extent of damage [2,4]. Medical management in the emergency department includes pain management, vasopressor support, and buffering agents such as sodium bicarbonate to correct pH abnormalities. Most importantly, early intubation should be considered as extensive burns, edema or uncontrolled secretions threaten airway patency [4]. Many sources suggest early initiation of intravenous Proton Pump Inhibitors (PPI) and H2 blockers to protect the gastric mucosa, and antibiotics, however there is disagreement on the effectiveness of these therapies [2,4]. In a review of multiple sources by Hall et al, there appears to be no agreement on when to initiate antibiotics, with some advocating for immediate administration while others recommend administration only if the patient shows signs of perforation or goes to surgery [2]. Caustic ingestions cases benefit from early consultations with the Poison Control Center, Gastroenterology, and possibly General Surgery, particularly in cases of suspected perforation or extreme damage. Most patients warrant admission and diagnostic endoscopy [2,4,5].

Placing a nasogastric tube or attempting neutralization should be avoided, as this increases the likelihood of iatrogenic perforation and exothermic thermal injuries, respectively. [2,4] Additionally, charcoal, emetics agents, and corticosteroids are no longer recommended as first line treatments [2,4].

## Endoscopy vs CT

While endoscopy is the primary method for assessing the extent of damage and therefore determining the prognosis of caustic ingestions, there is debate about when the procedure should be done [2]. There are arguments for early endoscopy (6 to 24 hours post ingestion) versus late (48 hours post ingestion).

The concern for delayed endoscopy is the inherent increased risk of perforation secondary to tissue necrosis. The argument against early endoscopy is the likelihood of gross underestimation of the extent of tissue injury [2,4,6]. There is growing evidence that CT of the thorax and abdomen can be useful in the management of emergent and acute cases. While these studies still suggest endoscopy is still the better alternative, CT's are definitely safer especially in patient with suspected impending perforation or airway concerns [6,7].

## Take Home Points:

- Physical examination especially of airway and abdomen are crucial.
- Obtain basic labs, and consider blood gases and lactic acids if severe ingestion is suspected.
- Consult other services early especially poison control/toxicology, GI or ENT, and surgery if patient may require emergent interventions.
- Endoscopy is important for evaluation, however CT of thorax and abdomen may be easier to obtain and useful for early evaluation.
- DO consider intubation for airway support, antibiotics, vasopressors and buffering solutions.
- DO NOT place gastric tubes, give steroids, or attempt to neutralize ingestants.

## Case Resolution

Despite multiple surgeries over a month's time, the patient continued to decline and ultimately discharged to hospice.

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