A Unique Case of Accidental Ingestion of Potassium Permanganate

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Abstract

Potassium permanganate is a caustic agent used commonly for antiseptic purposes. When taken orally, in accidental and suicidal cases, it is known to induce local injury to the aerodigestive tract as well as other systemic conditions. A summary of symptoms as well as recommended treatment for potassium permanganate ingestion is discussed here. We present a case of a 75-year-old female who kept potassium permanganate for treatment of equine wounds on her farm. She stored it in her medicine cabinet, later mistaking it for her own medication. Improper storage of medication, in this case, led to a situation that could have become life-threatening. Causes and prevention of unintentional poisoning of the elderly are discussed.

Introduction

Potassium permanganate (KMnO₄) is a dark purple crystalline substance available in powder and tablet form. It decomposes to form potassium hydroxide, a strong alkali. Therefore, it is a powerful oxidant and highly caustic when ingested.¹ Historically, it been used as a deodorizer, abortifacient and treatment for eczema, gonorrhea (as a urethral irrigant) and snake-bite.²,³,⁴ In contemporary society, it is commonly used as a topical antiseptic in the care of both humans and animals. It is freely available, not requiring a prescription for purchase. Up to this point, the literature on the subject of potassium permanganate ingestion has been confined to either suicidal attempts or accidental ingestion by children.²,³,⁵,⁶,⁷ We describe here the first case report, to our knowledge, of an accidental ingestion of potassium permanganate by an adult.

Case Presentation

A 75-year-old rural West Virginia woman began to experience epigastric pain soon after swallowing what she believed was an Amish home remedy powder for cough and cold. After examining her medicine cabinet, she realized that she had mistakenly taken one-half teaspoon of potassium permanganate in

Figure 1. Left: 5 cm² mucosal and submucosal antral ulcer; Right- 2 cm² superficial fundal ulcer  
Courtesy of Yaser Rayyan, M.D.
the crystalline form. It had been intended for use as an antiseptic wound treatment for the horses on her farm. She went to her local hospital on the advice of Poison Control. She was subsequently transferred to an academic medical center where she obtained relief from her pain after drinking milk. She denied any other symptoms related to the ingestion such as difficulty swallowing or breathing. She was judged to be a reliable historian and denied suicidal ideation. She denied any use of alcohol or tobacco. Her only use of non-steroidal anti-inflammatory drugs was an occasional aspirin for body aches. Her gastroesophageal reflux disease was well-controlled with a proton pump inhibitor. She had never been diagnosed with peptic ulcer disease nor did she report previous \textit{Helicobacter pylori} infection. She was being treated for hypertension and diabetes but had not taken her home medications that day.

On arrival at our facility, the patient's vital signs, including heart rate, respiratory rate, and oxygen saturation, were normal apart from an elevated blood pressure. She was not hypoxic. On examination, neither oral lesions nor pharyngeal edema was noted. Her breathing was quiet and unlabored. Cardiopulmonary examination was unremarkable. Bowel sounds were normal, and no distention was observed. She was mildly tender to palpation in the epigastric area but exhibited no rebound or guarding. Her complete blood count and comprehensive chemical profile were within normal limits except for minimally low sodium and chloride and moderately elevated blood glucose. The lipase level was normal. Computed tomography (CT) of the abdomen was within normal limits. Her chest x-ray, obtained at the referring hospital, did not show any evidence of free air or infiltrate.

The patient was instructed not to eat or drink anything until gastroenterology evaluation was complete. She was also started on an intravenous proton pump inhibitor. Gastroenterology was consulted, and an esophagogastroduodenoscopy (EGD) was performed. EGD revealed normal esophagus and gastroesophageal junction but superficial ulceration of the gastric fundus and also deep mucosal and submucosal ulceration of the antrum. (Figure 1). Potassium permanganate crystals were visible, embedded over the inflamed mucosa. There was no evidence of bleeding, and the pylorus was widely patent. The duodenum was also normal. In anticipation of ulcer perforation, the surgical department was also made aware of the case. She was given supportive care. Neither activated charcoal nor systemic corticosteroids were administered. A repeat EGD two days later revealed stable findings without evidence of progression (Figure 2). In the absence of local or systemic complications, her normal diet was gradually advanced. She was sent home with an oral proton pump inhibitor. At a follow-up visit 4 months later, EGD revealed that the ulcers were 90% healed. (Figure 3) She has experienced no recurrence of symptoms 1½ years after her ingestion.

\textbf{Discussion}

Caustic ingestions are common in the United States with up to 15,000 cases reported annually. However, they are rare among the elderly. Most reported cases involve ingestion by children or by young adults either accidentally or with suicidal intent. In West Virginia
during the year 2014, only 0.07% of calls to the state poison control center were from those above the age of fifty. Although uncommon, ingestions among elderly often have poor outcomes, as their recuperative abilities have declined due to chronic disease processes. The majority of all poisoning in the elderly is unintentional and commonly caused by confusion, improper product use or improper product storage. In the case of our patient, she had probably become insensitive to the risks of storage of the substance in her home by virtue of its common usage in her rural farm context.

$\text{KMnO}_4$ ingestion is largely diagnosed by history. Because the tablet form of this substance is radiopaque, chest x-ray or abdominal films may aid in diagnosis when this form is ingested. Ingestion can also be recognized by purple staining of the lips and oral mucosa.

$\text{KMnO}_4$ has highly corrosive local effects on the upper airway and digestive mucosa. In the gastrointestinal tract, it can induce edema, ulceration, burn injury and bleeding. It can also cause pharyngeal and laryngeal edema. It is hypothesized that permanganate ions may also absorb free radicals, leading to systemic effects which include: tachycardia, hypotension, heart failure, methemoglobinemia, cyanosis, acidosis, hemolysis, pancreatitis, hepatic failure, renal failure, and hallucinations.

Supportive treatment is recommended in most cases of caustic ingestions, including potassium permanganate. Maintenance of the airway is always the first priority. Emergent endoscopy (within 12-24 hours) is important to evaluate the location, extent, and severity of injury to the upper GI tract after caustic ingestion and to guide management. Early dilution by taking in either water or milk has been shown to improve local effects slightly. The use of activated charcoal or corticosteroids is controversial for treatment of potassium permanganate ingestions. Blind nasogastric tube insertion, emetic agents, and neutralizing agents are also contraindicated. Follow-up endoscopy after two weeks is important to exclude and manage delayed complications such as esophageal and pyloric channel strictures.

The Centers for Disease Control and Prevention report an average of 38,851 deaths each year related to unintentional poisoning. Outcomes in cases of caustic ingestion largely depend on the type and amount of substance ingested as well as the degree of injury. The lethal dose for $\text{KMnO}_4$ is 10 g, or the equivalent of 1.5 teaspoons, approximately three times the dose taken in this case. Edema of the pharynx and larynx due to ingestion of $\text{KMnO}_4$ has been reported to lead to death. Cardiac failure is the most commonly reported systemic cause of death. Transmural burns to the esophagus are also associated with up to 20% mortality due to perforation.

**Conclusion**

Potassium permanganate is associated with potentially deadly caustic ingestion and must be treated judiciously. The unintentional ingestion of potassium permanganate by this elderly patient illustrates the risks that this age group can be exposed to in storing this caustic substance alongside oral remedies in the home medicine cabinet. It is important that physicians discuss the prevention of accidental toxic ingestions even with their elderly patients, especially in a rural farming context.

**References**