

## 症 例 報 告

# A case of chemical esophagitis due to accidental ingestion of a disinfectant containing benzalkonium chloride

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—Summary— (Jpn J Clin Toxicol 2019 ; 32 : 406-409)

We encountered an 84-year-old woman who developed chemical esophagitis due to accidental ingestion of benzalkonium chloride (BAC). She visited our emergency critical care center complaining of sore throat and difficulty in swallowing after accidentally ingesting 10 % BAC solution instead of water. Upper gastrointestinal endoscopy revealed ulceration in the middle and lower parts of the esophagus, leading to a diagnosis of chemical esophagitis. The patient was promptly given milk to dilute the solution as much as possible. Because of esophagitis and suspected airway constriction, the patient was restricted from oral food intake and underwent tracheal intubation. Her symptoms improved after intubation and administration of proton pump inhibitors, and she was discharged on Day 12. The subsequent clinical course was uneventful with no systemic involvement because of the localized effect of the BAC. Early treatment and systemic management are essential even in this poisoning case not more than lethal dose.

**Key words** : benzalkonium chloride, chemical esophagitis, accidental ingestion

## Introduction

Benzalkonium chloride (BAC) has a wide range of uses and is commonly used at a concentration of 0.01-0.2% as an antiseptic for skin and wounds and as a disinfectant for instruments and clothes. Common symptoms of poisoning due to oral exposure to

BAC are gastrointestinal (GI) irritation and respiratory, circulatory, and central nervous system symptoms. Here, we report a case of chemical esophagitis due to accidental ingestion of a non-lethal dose of BAC.

## Case

An 84-year-old woman, with an independence in activated of daily living and self-maintenance presented with sore throat and difficulty in swallowing

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due to accidental ingestion of a disinfectant containing 10% BAC solution. She had a history of biological heart valve replacement, coronary artery stenting, hypertension, dyslipidemia, and osteoporosis. Present medical history : Independence in activities of daily living and adequate self-maintenance until Day X–1. On Day X, she accidentally swallowed some 10% BAC solution left in a cup with her medication after dinner. Because of the immediate onset of numbness in the tongue and a feeling of throat obstruction, she attempted to induce emesis by putting a finger down the throat, and later visited our emergency critical care center due to persistent throat pain and excessive salivation.

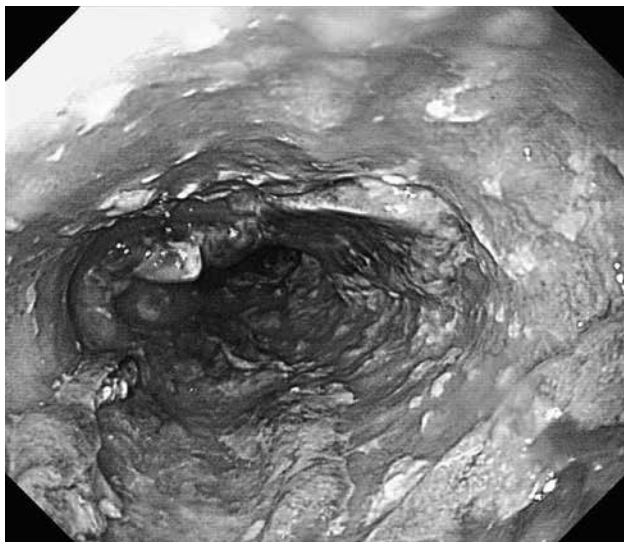
On her admission, she was lucid, interactive, and febrile (temperature, 37.9°C). Her blood pressure was 221/92 mmHg, heart rate 73 beats/min, blood oxygen saturation (SpO<sub>2</sub>) 97% (room air), and respiratory rate 16 breaths/min. The palate appeared whitish with visible erosion and continuous discharge of frothy blood-tinged saliva. Her height is 151cm, and body weight is 46 kg. Her white blood cell count was 9,620 cells/ $\mu$ L and blood urea nitrogen 30.2 mg/dL ; other tests results were within normal range. Chest computed tomography (CT) revealed edematous hypertrophy of the esophageal wall, suggesting chemical esophagitis and ground-glass opacity in the left lung near the S4–5 segment, suggesting aspiration following accidental ingestion. Because chemical esophagitis was suspected due to imaging findings of marked esophageal wall thickening and endoscopic findings of esophageal mucosal erosion, milk was promptly used to dilute the ingested solution as much as possible.

On Day X, from midnight through to the next morning, the patient had bright red vomitus and reddish-black stool, suggesting GI bleeding due to the accidental ingestion of the disinfectant. Because of severe pharyngalgia, dysphagia, and airway constriction likely due to swelling of the epiglottis and inter-

arytenoid region, she was placed on nil per os on Day X+1 ; tracheal intubation was performed with subsequent transfer to our intensive care unit. Because of the possibility of aspiration pneumonia, prophylactic sulbactam/ampicillin 1.5 g was administered 4 times daily for 6 days. Proton pump inhibitor (PPI) were added on the same day. On Day X+4, we performed repeat upper GI endoscopy (**Fig.1**) and found signs of severe chemical esophagitis. Enteral feeding began on the same day. Due to improvement in respiratory symptoms, the patient was transferred to a regular room after extubation on Day X+7. Oral intake resumed on Day X+11 due to marked improvement in esophagitis and no stenosis on repeat upper GI endoscopy (**Fig. 2**) ; she was discharged on Day X+12. Upper GI endoscopy performed on Day X+53 showed no signs of inflammation, and thus no chemical esophagitis.

## Discussion

BAC has a wide range of uses including as an antiseptic for skin and wounds and disinfectant for instruments and clothes, usually at a concentration of 0.01–0.2%. As a cationic surfactant, BAC alters the permeability of cell membranes and promotes migration of neutrophils, triggering cell necrosis in organs such as the liver, kidneys, and brain<sup>1</sup>. Oral ingestion of BAC in mice and rats results in subacute or chronic poisoning, seen as suppression of weight gain, poor appetite, acute gastritis, and mucosal necrosis<sup>2</sup>. In dogs, oral ingestion causes poor appetite, weight loss, gastric mucosal hyperemia, and small intestinal mucosal necrosis<sup>3</sup>. These findings suggest that BAC poisoning manifests as GI irritation and respiratory, circulatory, and central nervous system symptoms. The lethal dose (LD50) was reported to be 50–500 mg/kg. In the present case, assuming that the patient ingested at most 10 mL of the disinfectant (which would have contained 1,000 mg of BAC), the ingested amount did not reach the lethal dose.



**Fig. 1 Endoscopic findings on Day X+4**

Ulceration and relatively poor blood circulation are observed in the middle and lower parts of the esophagus. Numerous flat, insular ulcerative lesions surrounded by normal mucosa are seen. There is no stenosis.



**Fig. 2 Endoscopic findings on Day X+11**

No signs of ulceration are seen in the middle and lower parts of the esophagus, the same area shown in Fig. 1.

In addition to severe pharyngalgia and dysphagia as well as bright red vomitus and reddish-black stool, the CT findings of edematous hypertrophy in the esophageal wall and the endoscopic findings of ulceration in the middle and lower parts of the esophagus all indicated chemical esophagitis manifesting as GI symptoms. Esophagitis on endoscopy is generally classified into 3 grades of severity<sup>4)</sup>. In the present case, we made a diagnosis of grade 1 chemical esophagitis due to the presence of hyperemia, edema, and ulceration of the mucosal layer.

A literature search of articles reporting accidental ingestion of BAC between 1989–2017 extracted 10 and 5 articles from the Ichushi and PubMed databases, respectively. Review of these and even older articles revealed pharyngitis and esophagitis due to accidental ingestion<sup>5)</sup>; blood pressure decline, watery diarrhea, restlessness, and coma after ingesting 40 mL of 33.3% solution in suicide attempts<sup>6)</sup>; and tachycardia, cyanosis, pupillary dilatation, generalized convulsion, and eventually death only 25 min after ingesting approximately 30 mL of 50% solution<sup>7)</sup>. The present patient had only localized symptoms pre-

sumably because she ingested a relatively small amount of BAC.

In cases of oral ingestion, respiratory management is provided to patients presenting with airway constriction and suppressed spontaneous breathing, and circulatory management is provided to those with blood pressure decline and shock. In addition to dilution, gastric lavage, and the use of activated charcoal or laxatives, steroid therapy is also administered for circumferential deep chemical burns seen on endoscopy. Furthermore, hemodialysis may be considered for patients unresponsive to conventional treatment<sup>8)</sup>. In our case, based on clinical manifestations and imaging findings, the BAC was promptly diluted with milk to the maximum extent possible. Tracheal intubation was performed because of suspected airway constriction from laryngeal edema, in addition to severe pharyngalgia and dysphagia. Furthermore, because of endoscopic findings of chemical esophagitis, supportive care such as nil per os, enteral feeding via nasogastric intubation, and PPI administration (to suppress gastric acid secretion) were also provided. We attribute the favorable treatment outcome in this

case to the relatively small amount of BAC ingested and the prompt medical care provided.

#### Conflict of interest

The authors declare no conflict of interest.

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#### 要旨

84歳の高齢女性の塩化ベンザルコニウムの誤飲による化学性食道炎を経験した。本症例では、10%のベンザルコニウム液を水と間違えて誤飲し、咽頭痛と嚥下困難を主訴に救急受診した。上部消化管内視鏡検査で食道中部・下部の潰瘍の所見があり、化学性食道炎と診断された。ERでは速やかに、牛乳による可能な範囲での希釈を行った。気

道狭窄を疑い気管挿管を行い、食道炎に対し絶食のうえ、経管栄養管理、PPI内服の入院加療を行った。12日目に軽快退院した。本症例では局所症状にとどまり、全身状態悪化を認めず良好な経過をたどった。致死量に達しない少量の中毒であっても、迅速な処置と全身管理が重要である。