Assessment and management of elemental mercury poisoning—a case report

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Key Clinical Message
We describe a patient with elemental mercury aspiration and retention in the appendix after elemental mercury ingestion. Conservative management was proved to be successful for the removal of the mercury from the appendix while we do not suggest bronchoalveolar lavage in cases of small amount elemental mercury aspiration.

Keywords
Elemental mercury, mercury ingestion, mercury poisoning

Introduction
Mercury can be found in three forms: elemental mercury, inorganic salts and organic compounds. Elemental mercury (the only metal which is in liquid form at room temperature) is poorly absorbed (<0.01% of the dose) from gastrointestinal (GI) tract after ingestion so systemic toxicity is not expected [1]. On the other hand, inorganic mercury compounds are absorbed in about 7–15% of doses after ingestion, while approximately 95% of any ingested organic mercury (methylmercury) is absorbed from GI tract [1, 2]. In most cases, elemental mercury is excreted with feces within few days. However, cases in which elemental mercury has been retained in the appendix have been described [3–6]. Furthermore, cases of appendicitis after mercury ingestion have also been reported so prophylactic appendectomy has been proposed [6–8]. We describe a patient who ingested elemental mercury and was presented with elemental mercury aspiration and retention in the appendix. The patient was treated conservatively without development of appendicitis or clinical signs of mercury poisoning.

Case History/Examination
A 27-year-old forge worker was presented at the emergency department because of accidental ingestion of about 30 mL of elemental mercury (99.99% elemental mercury) in the previous day. He complained about atypical episodes of chest pain and episodes of numbness in legs. His medical history was unremarkable. His vital signs were within normal ranges (blood pressure: 125/70 mmHg, SPO2: 98%, pulses: 95/min, temperature: 36.8°C) while the clinical examination was unremarkable as well. Furthermore, the ECG was normal and the complete blood count and also the blood chemistries were within the laboratory’s normal values. Blood mercury levels at the day 2 after ingestion were 15.5 µg/L (normal value <10 µg/L) while the 24-h urine collection between days 2 and 3 after ingestion showed urine mercury levels 5.0 µg/L (normal values <20 µg/L). Blood mercury levels at the day 5 after ingestion were 8 µg/L. Chest and abdominal X-ray showed the presence of high-density elements in the left lung and in the intestines (Figs 1A, 2A). During hospitalization, the patient remained asymptomatic. The patient was given 75 mg of sennosides A+B orally for the first
3 days of hospitalization and succimer 1800 mg/day according the instructions of the local toxicology center. The serial abdominal X-rays are shown in Figure 1. In the evening of day 3 after ingestion, the mercury filled the appendix while the patient remained asymptomatic (Fig. 1C). A prophylactic appendectomy was considered due to the risk of appendicitis. However, we decided to treat the patient conservatively and the patient was advised to lie down in Trendelenburg position (30°) and left lateral decubitus position every night from day 4 after ingestion. The following abdominal X-rays at days 5 and 6 showed the excretion of mercury from appendix (Fig. 1D and E).

Except the presence of mercury in the intestines, we noticed a small amount of mercury in the left lower lobe. We supposed that the patient aspirated an amount of mercury while trying to induce vomiting directly after mercury ingestion. However, because of its specific gravity
and free-flowing properties, mercury can overcome the normal swallowing passing to the lungs and can lead to endobronchial hemorrhage and death [9]. Despite the fact that mercury was located in small bronchioles in the left lower lobe we tried to remove it with bronchoalveolar lavage (BAL) and mini-BAL at the day 6 after mercury ingestion. Unfortunately, chest X-ray after BAL procedure (Fig. 2B) showed that our efforts were unsuccessful so the patient was treated with succimer antidote.

**Discussion**

Elemental mercury ingestion is generally benign due to the low absorption levels from the GI tract. In fact, elemental mercury has been used traditionally in Hispanic communities as a therapeutic approach in cases of gastrointestinal symptoms known as “empacho.”[4] However, cases of systemic toxicity on the basis of a disrupted gastrointestinal mucosa or due to contamination of the peritoneum postoperatively have been reported [10, 11]. Furthermore, in some clinical conditions in which mercury remains for prolong periods in the GI tract, such as diverticulosis, there is a possibility of conversion of elemental mercury to organic by bacteria leading with that way to systemic toxicosis [9]. Gastrointestinal complications after mercury ingestion such as granulomas and abscesses have also been reported [3]. As mentioned above, appendicitis is a possible complication of sequestration of ingested mercury in the appendix [6–8]. Although prophylactic appendectomy is proposed as an invasive approach [5], there are reports that conservative approach can be efficient and safe for the patient [3, 4]. Additionally, we believe that appendectomy of an appendix filled with mercury may not be safe because of the possible effusion of the mercury in the peritoneal cavity and the subsequent systemic toxicity, although similar reports have not published.

To the best of our knowledge, it is the first report that an effort to remove aspirated mercury with BAL was made. Despite the fact that the procedure was not successful, we suggest that further criteria in using BAL in such cases should be set. In the literature, there are reports of both mercury ingestion and aspiration in which patients were treated conservatively with chelating agents [12–14]. The placement of the patient with aspirated mercury in a negative pressure room for the protection of the staff from toxic exhaled vapors has also been reported [12]. In a case of mercury aspiration, postmortem findings two decades after aspiration showed extensive fibrosis and granuloma formation which attributed to the local irritative action of mercury [15].

In our case, the increase in the mercury blood levels was primarily attributed to the inhaled mercury vapors from the aspirated mercury and secondarily to the absorption in the GI tract.

**Authorship**

GB: participated in management of the patient, conception of the work, writing the first draft of the article, drafting the article and final approval of the version to be published. SSP: participated in drafting the article, critical revision and final approval of the version to be published. PM: participated in drafting the article, critical revision and final approval of the version to be published. AF: participated in management of the patient, drafting the article, final approval of the version to be published. AY: participated in management of the patient, drafting the article, final approval of the version to be published.

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**Conflict of Interest**

The authors report no conflicts of interest.
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