

Case Report

A Therapeutically Challenging Case of an Electronic Cigarette (E-cig) Ingestion

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Abstract

A 29-year-old woman with a history of bipolar disorder and major depression presented with psychosis and self-reported ingestion of a foreign body “listening device”, later revealing it to be an electronic cigarette (e-cig). In discussion with the poison control center, gastroenterology was consulted for possible endoscopic removal, though no direct recommendations were presented as this was a novel case reported. A trial of passage was initially elected, however ultimately the decision was made to retrieve the object manually.

The rise in popularity and availability of e-cig devices warrants a close review of management strategies and pertinent considerations. These strategies have historically focused on pulmonary injuries and solution inhalation effects. Currently, there is limited information available regarding the ingestions of e-cigs and/or their components. This case presents several situational uncertainties and the potential for adverse effects that have not been fully explored in the existing literature.

Introduction

Foreign body ingestions represent a significant number of Emergency Department (ED) visits, particularly in the pediatric world where foreign body ingestion ranks in the top five most common exposures (6.39%) [1]. As such, emergency physicians evaluate and treat a wide variety of ingestions, the majority of which undergo a trial of passage. Few exceptions exist, most notably those which are concerning for perforation, obstruction, or adverse event i.e. sharp objects, exceptionally large materials, disk batteries, multiple magnets, and toxic bezoars. On occasion, the management may not be so straight forward. Herein we present such a case that has not been previously described in the literature, one involving an electronic cigarette (e-cig) apparatus containing both potentially dangerous electronic components and chemical substances.

Case

A 29-year-old female with a history of bipolar disorder and major depression presented to the ED at 3AM with paranoia

and self-reported ingestion of swallowing a Central Intelligence Agency “Listening device”. She was covered in self-imposed blue ink script and had several abrasions which were circled and annotated by her. She endorsed non-compliance with her prescribed valproate for the last several days and reported snorting several Sudafed® tablets and drinking seven to eight beers prior to the ingestion of the ‘device’. She eventually revealed that she believed the listening device was inside an e-cig. She denied any physical complaints at the time of presentation. An electronic health record review listed multiple recent visits for homicidal ideation, anxiety, and heroin abuse.

Physical exam: Blood pressure 98/55 mmHg | Pulse 93 beats per min (pm) | Temperature 36.9 °C (98.4 °F) | Respirations 18 pm Oxygen saturation 100%. The patient was slightly agitated. Pupils were equal and reactive, without mydriasis or miosis, a small amount of blood was present in the nares, no abdominal tenderness to palpation, and cardiovascular exam was negative for abnormalities. Dermatologic exam showed no flushing and otherwise negative with exception of the drawings and abrasions aforementioned.

Chest and abdominal radiographs were obtained (Figure 1), revealing a foreign body overlying the proximal stomach versus the gastroesophageal junction, resembling an electronic device measuring just under six centimeters, and no other acute abnormality. Chemistry profile results were: Creatinine 0.4, Glucose 86, Potassium 3.7, Sodium 142, Bicarbonate 23, Chloride 104, Blood Urea Nitrogen 21, Hemoglobin 11.9, Hematocrit 35, Lactate <1 mmol/liter, Ethyl alcohol 0. Drug Screen was pending upon admission.

The poison control center was contacted for further recommendations. A photo of the film was requested for review by the center given the unusual nature of the ingestion. Several important questions arose, including whether a lithium ion battery was involved and whether the device contained concentrated nicotine with potential for serious harm. Unfortunately, these questions remained unanswered as the poison control center reported they were not aware of other cases of similar ingestions from which to provide precedent guidance. While the consensus was that the ingestion was unlikely to be toxic in nature, removal was recommended given the situational uncertainty and the size of the object theoretically preventing gastrointestinal transit.

Gastroenterology was consulted for emergent evaluation in the ED for retrieval. After evaluating the patient and taken into consideration her assured psychiatric hospitalization, initial recommendations were for daily serial abdominal radiographs and abdominal exams to evaluate for signs of obstruction. Rationale for this course of action was that the object did not meet indications for emergent endoscopy: esophageal obstruction, disk battery or magnetic involvement (although these were unknowns at the time), presence of sharp pointed objects, and size greater than six centimeters. The patient was admitted to the inpatient psychiatric service, with plans for intervention should her condition change.

After ten hours, a repeat abdominal radiograph was obtained and revealed no change in location of the object. The decision was then made to perform Esophagogastroduodenoscopy (EGD) for attempted extraction. EGD was uncomplicated and an e-cig USB charging port component was removed. No actual nicotine content was involved. The device did house a lithium battery, although it was embedded in the object, preventing direct contact with the gastrointestinal tract. She was restarted on a regular diet and remained free of abdominal or toxicologic complaints for the remainder of her stay in the hospital.

Of note, consent was unobtainable due to the patient's insufficient capacity to provide informed consent at the time of ED intervention.



Figure 1: Plain abdominal radiograph with near six-centimeter foreign body overlying the proximal stomach or gastroesophageal junction.

Discussion

E-cigs are comprised of multiple components, including a mouthpiece, a liquid containing cartridge, a microprocessor, and a battery, as well as other optional components. This case of e-cig ingestion presents two aspects of novel medical decision making: the possibility of concentrated nicotine ingestion as well as ingestion of an encapsulated lithium ion battery.

Nicotine poisoning can occur in children after ingestion of just one cigarette, manifesting as tremor, bronchorrhea, arrhythmias, seizure, respiratory failure, hypotension, and even death [2]. While nicotine is a stimulant at low doses, it can suppress the cardiovascular and nervous systems at higher doses [3]. The large majority of cigarettes contain a range of eight to twenty milligram (mg) of nicotine. The content of electronic cigarette cartridges is even more variable; some studies have found between zero and thirty-five mg/milliliters (mL) [4,5].

While the literature exploring 'vaping'-or inhalation-is slowly expanding, there are limited data exploring oral ingestion. In one published case report, a 15-month-old ingested e-cig liquid nicotine resulting in a pulseless electrical activity arrest requiring cardiopulmonary resuscitation, and ultimately resulting in anoxic brain injury and death [6]. In this case, the child had ingested approximately five mL of ten mg/mL liquid. The device itself was not ingested. Furthermore, nicotine is not the only toxic

substance contained therein. There are few studies exploring high levels of inhaled carcinogens and toxicants in e-cig vapor that are beyond the scope of this discussion [7]. The effects following oral ingestion have yet to be fully investigated.

An additional confounding factor to medical decision making was the presence of a lithium ion battery, which are well known for potential serious sequelae like gastrointestinal perforation. When ingested, they typically prompt aggressive management. In an e-cig, the battery is much smaller and embedded into the device, assuming the device is intact. A review of the literature reveals no documented case reports regarding the ingestion of such devices. In this case, the patient was unreliable and the exact device could not be identified via radiographs; as such, the benefits of retrieval may have outweighed the risks of a wait-and-see strategy, particularly given its stationary position after ten hours.

As e-cigs have become more popular and accessible, cases of oral nicotine ingestion have been published [4]. While it is likely safe to assume most patients are not swallowing whole devices to disable their surveillance functionalities, as in this case of the psychotic patient above, it is pertinent to review potentially important considerations until the standard of care is more clearly defined.

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