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ELECTRONIC CIGARETTE EXPLOSION RESULTING IN A C1 AND C2 FRACTURE: A CASE REPORT

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Abstract—Background: Electronic cigarettes have seen a drastic increase in use. A lithium-ion battery is often used as the rechargeable battery of the electronic cigarette device and has recently received much attention in terms of safety. There are several recent case reports in the scientific literature of injuries due to electronic cigarette explosions that involved soft-tissue injuries. Case Report: We report a significant spinal fracture from an electronic-cigarette explosion in a 27-year-old male. The electronic cigarette exploded during use, sending the mouthpiece through the pharynx and into the first cervical vertebra and resulting in fractures of the first and second vertebrae. An x-ray study of the neck showed a foreign body in the neck at the level of C1. A computed tomography scan of the neck showed fractures of C1. The foreign body was removed in the operating room. The patient was discharged home without neurologic sequelae.

Why Should an Emergency Physician Be Aware of This? Our case report is the first case of a cervical spine injury due to the explosion of an electronic cigarette. This case demonstrates that an electronic cigarette explosion can cause potentially serious penetrating neck injury. Emergency physicians should be aware of the potential danger of electronic cigarettes and to lower threshold to obtain radiographic testing and surgical consultation in the case of electronic cigarette explosion in the oral cavity. As the use of electronic cigarettes continues to increase, it is likely that injuries associated with them will also increase.

Electronic cigarettes (E-cigarettes) have seen a drastic increase in use (1). Centers for Disease Control and Prevention reported that E-cigarette use has increased substantially during the past 5 years, with a more than four-fold increase in youthful users (students in grades 6–12) (2). The discussion of the safety of E-cigarettes has been focused mostly on long-term issues. These devices are powered by a rechargeable lithium-ion battery that heats and atomizes nicotine solution within seconds. Lithium batteries are known to cause fire and explosions. There are several recent case reports of injuries due to E-cigarette explosions in the scientific literature that involved soft-tissue injuries (3–5). We report a significant spinal fracture from an E-cigarette explosion in a 27-year-old male. The E-cigarette exploded during use, sending the mouthpiece through the pharynx and into the first cervical vertebra and resulting in fractures of the first and second vertebrae.

CASE REPORT

A 27-year-old previously healthy man presented to the emergency department after his E-cigarette exploded in his mouth. The explosion occurred during use of the E-cigarette device after replacement with a new lithium-ion battery. Upon arrival in the emergency department, he complained of moderate neck and throat
pain and difficulty swallowing. He also described a foreign-body sensation. He had no complaints of chest pain or shortness of breath.

On initial examination, he was in no obvious distress, was wearing a cervical collar, and had normal vital signs. He had partial thickness burns to his lips and an abrasion on his tongue, as well as fractures of his bilateral upper incisors. The posterior oropharynx could not initially be visualized secondary to pain and limited jaw mobility. Cervical spine precautions were maintained with manual immobilization, and a Macintosh #3 blade was used to depress the tongue and illuminate the oropharynx, which revealed an 8-mm puncture wound in the posterior oropharynx. Respirations were clear and unlabored and his voice was normal. His cranial nerve examination was normal. The patient had intact strength and sensation of bilateral upper and lower extremities. An x-ray study of the neck showed a foreign body in the neck at the level of C1 (Figure 1). A computed tomography (CT) scan of the neck showed fractures involving the superior cortex of the anterior arch of C1 at the posterior aspect of the foreign body (Figure 2).

The patient was admitted to the hospital, given antibiotics, and taken to the operating room. Surgery on the cervical spine to remove the foreign body was performed jointly by a spine surgeon and otolaryngologist. A careful evaluation of the wound after the removal of the foreign body revealed a soft-tissue defect. The defect was approximately 10–15 mm in diameter and about 15–20 mm in depth. There was also a defect within the anterior bony elements of C1 and C2. There was no obvious cerebrospinal fluid leakage. The wound was then irrigated with large volumes of sterile normal saline. The C1 and C2 anterior fractures were treated conservatively and no further operative stabilization of the cervical spine was necessary.

The patient recovered from the surgery without any neurologic deficits or infection. The upper cervical spine fractures were treated with a hard collar and his hospital course was uneventful. He was discharged on antibiotics and told to use a hard collar for a week.

At the follow-up 8 days later, the patient was recovering well with no neurologic deficits or signs of infection, and with good alignment of the cervical vertebrae. He was advised to wear his collar as needed for comfort.

**DISCUSSION**

E-cigarettes were invented in 2003 in Hong Kong and became available in the United States in 2006 (6). E-cigarettes have gained popularity due to their ease and individualized customization of use. It is estimated that 2.5 million people in the United States have used E-cigarettes with increasing popularity among the youth (1,7). Most E-cigarette devices consist of a battery, an aerosol generator, a cartridge that holds the liquid consisting of nicotine, ethylene glycol, various flavors, and a
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