Case Report

E-cigarettes: Out of the frying pan into the fire?

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ABSTRACT

Electronic nicotine delivery systems were developed over a decade ago to simulate the experience of smoking, although with a lower exposure to toxins than in conventional smoking. However, they have their own unique profile of side effects, some of which can be life threatening. We report the case of a young male, who in a desperate bid to de-addict himself from smoking developed a serious adverse effect related to the e-cigarettes.

KEY WORDS: E-cigarettes, e-cigarettes or vaping-associated lung injury, electronic nicotine delivery systems, lung injury, vaping

INTRODUCTION

Use of e-cigarettes has been on the rise in many countries including India. Apart from its use for the purpose of smoking cessation, recreational use by youth is alarming. With the recently reported outbreak of vaping associated lung injury, awareness amongst clinicians is in order.

CASE REPORT

A 31-year-old male, with no known comorbidities, presented with acute onset breathlessness and dry cough for 3 days. There was no history of fever, hemoptysis, chest pain, palpitations, or orthopnea. Symptoms attributable to influenza such as illness (upper respiratory, gastrointestinal, and constitutional symptoms) were not present. He had been smoking cigarettes for the past 6 years.

He had been diagnosed as acute bronchitis and treated with nebulized bronchodilators and short-acting beta-agonists elsewhere. However, his symptoms did not abate with the above measures, and he presented to us with worsening breathlessness.

On evaluation in our hospital, he was afebrile, had tachycardia (PR – 114/min) and tachypnea (RR – 26/min), blood pressure of 124/78 mm Hg. Oxygen saturation was 93% on room air with normal cardiorespiratory and other systemic examination.

Blood investigations were within the normal range. Electrocardiogram showed sinus tachycardia, and the chest radiogram was normal. Transthoracic echocardiography revealed right-sided chamber dilatation with a pulmonary artery systolic pressure of 54 mm Hg with normal biventricular function. With a high clinical probability of pulmonary thromboembolism, a computed tomography (CT) pulmonary angiography was done...
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which showed bilateral ground-glass opacities with centrilobular nodules in the upper and middle lobes with no evidence of an embolus[Figure 1]. Bronchoscopy was performed, which showed a normal tracheobronchial tree, and bronchoalveolar lavage (BAL) was negative for bacterial, fungal, and mycobacterial cultures. H1N1 polymerase chain reaction was negative, and CBNAAT for Mycobacterium tuberculosis was negative. While awaiting BAL reports, the patient was treated with a course of antibiotics and oseltamivir which were stopped after obtaining microbiological reports.

As the cause for sudden onset breathlessness was not clear, the patient’s history was reviewed when he revealed that in an attempt to quit smoking, he had been using e-cigarettes for the past 3 months with the last exposure being 4 days before symptom onset. The product used by him contained nicotine, glycerol, propylene glycol, and benzoic acid. He admitted to have tried multiple flavors of the product over the past 3 months. In view of this history and the investigation reports, a diagnosis of e-cigarettes or vaping-associated lung injury (EVALI) was made, and he was started on oral corticosteroids (0.5 mg/kg/day of prednisolone) for 5 days with which he showed significant improvement. He was advised not to resort to the use of e-cigarettes and was given appropriate advice for smoking cessation.

**DISCUSSION**

Electronic nicotine delivery systems (ENDS) or e-cigarettes are battery-operated devices used for aerosolized inhalation of nicotine and other substances such as tetrahydrocannabinol (THC) and cannabidiol. Although these devices were thought to contain lesser number of harmful chemicals compared to cigarette smoke, they are not entirely harmless.[11]

Since their introduction in 2007, e-cigarettes have undergone various changes in appearance and configuration. The first-generation of e-cigarettes was termed cig-a-likes as they resembled the cigarettes in size and shape. The second-generation was similar to pens with refillable cartridges. Third-generation e-cigarettes allow individualized control of device power and temperature.[1,2] The availability of different forms of e-cigarettes allow different flavors has made the use of these devices rampant, especially among youngsters. People are also resorting to their use as an alternative for cigarette smoking or as a means of smoking cessation. Analysis of trends in vaping shows the prevalence has more than doubled in school children from 2017 to 2019.[3]

In the past couple of years, multiple cases of EVALI have been reported with the US reporting a nationwide outbreak in 2019.[4] As of December 2019, 2561 cases of hospitalized EVALI with 55 deaths have been reported to the CDC.[5] These may be a result of the primary aerosolized product itself or by-products resulting from thermal degradation or metals released from the heating coils. In addition, flavorants such as diacetyl and 2,3-pentanediol have been reported to cause genetic variations in the cilia and cytoskeleton of the bronchial epithelium.[6] Although multiple causative agents have been postulated, Vitamin E acetate has been isolated in BAL samples of patients with EVALI and has shown a strong causal association.[5] Majority of cases with EVALI reported the use of THC-containing products or combinations (80%) with a small fraction (13%) reporting the use of exclusively nicotine-containing products similar to our patient.[4,5]

The clinical presentation of EVALI includes respiratory symptoms including dyspnea, cough, chest pain, and rarely hemoptysis; gastrointestinal symptoms such as nausea, abdominal pain, and diarrhea and constitutional symptoms of fever, malaise, and weight loss.[4] Although the initial reports were from severe cases of EVALI who required hospitalization and intensive care unit care, increasing awareness has led to early recognition and reporting of milder forms of the disease.[7]

Radiologically, bilateral infiltrates are noted in almost all the cases with nonspecific findings on chest radiograph and CT scans. Findings range from ground-glass opacities with subpleural sparing, pleural effusion, pneumothorax, and pneumomediastinum, consolidation, features consistent with organizing pneumonia, hypersensitivity pneumonitis, eosinophilic pneumonia pattern to acute lung injury, and acute respiratory distress syndrome in very severe cases.[8,9] Ill-defined centrilobular nodules giving a “tree in bloom” appearance have also been described.[10] Pathologically, a form of “airway centered chemical pneumonitis” with patterns of acute fibrinous pneumonitis, diffuse alveolar damage, and bronchiolocentric organizing pneumonia pattern have been reported. The presence of foamy macrophages and vacuolization of pneumocytes may point toward EVALI in the right clinical framework.[11]
The diagnosis is usually based on the temporal relation of the use of ENDS with the onset of clinical symptoms in the absence of infective and alternative etiology [Table 1]. Although treatment and response to steroids have been reported, the dose and duration of such therapy still remain unknown and have to be individualized based on the clinical severity. Clinical practice algorithms for the diagnosis and management suggested by some authors may be of great help inpatient care. Long-term outcomes remain unknown, with a proportion of patients requiring supplemental oxygen at discharge with residual radiological and pulmonary function abnormalities with a possibility of relapse as well.

EVALI cases have been exclusively reported form the US despite the global prevalence of vaping, suggesting a probable under-recognition of this entity in other parts of the world. The absence of specific symptoms or clinical and radiological signs and lack of diagnostic tests add to this uncertainty. Increasing public awareness can lead to earlier diagnosis, recognition of milder forms of disease, and better outcomes. Since the history of exposure may not always be forthcoming from the patients, the need for a high index of suspicion and a thorough knowledge of the possible clinical and radiological presentations among clinicians cannot be overemphasized.

Our patient presented with a milder form of EVALI and was promptly managed as he visited a tertiary care setting, where awareness of this entity is high. In addition, other causes of acute breathlessness were conclusively ruled out.

Thus, this case highlights the need for obtaining the relevant history of ENDS use in all patients presenting with unexplained dyspnea in the outpatient setting and those with acute lung injury in the critical care setting. In this regard, an expert committee of the Indian Council of Medical Research released a comprehensive white paper enumerating the details of the causes of concern with ENDS use. The subsequent prohibition of electronic cigarettes by the Indian government is a commendable move to curb the use, storage, advertisement, and sale of these products.

The fact that EVALI is more likely to affect healthy young adults resulting in life-threatening critical illnesses makes the knowledge of these compelling among health professionals and common man alike. The disease spectrum, causative agent, diagnosis, and treatment options are still evolving and need to be updated constantly.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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