Case Report

Vaping-associated pulmonary disease (VAPD): An unusual pattern of CT findings

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ABSTRACT

There has been a recent increase in vaping which has been accompanied by an increase in otherwise unexplained acute pulmonary disease in young people. Case series and expert opinion suggest there is a correlation.

This case involves "Vaping-Associated Pulmonary Disease" in a man who vapes and has no other medical history. The patient improved with steroids, similar to other recent cases. However, CT findings demonstrated a different pattern than those described in the literature.

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Introduction

Vaping – the use of electronic cigarettes – has recently widely increased in the United States recently. The prevalence of vaping among US high school students increased from 1.5% in 2011 to 11.7% in 2017 to 20.8% in 2018 [1]. Concomitantly there has been a rise in vaping-associated pulmonary disease [2]. These patients present with the signs and symptoms of pneumonia, but generally without any evidence of infection [2]. Furthermore, this phenomenon tends to occur in teenagers and young adults, a group which is generally at low risk for such pulmonary issues [2].

Case report

A 19-year-old male with a recent history of vaping and no other significant medical history presented to the emergency room with a four-day history of fever, mild cough, and chest tightness. He also endorsed mild nausea and upper abdominal pain. His vaping involved daily use of both nicotine (half a Juul pod per day) and marijuana (1 gram per week) vaping devices. (Juul Labs Inc. San Francisco, California)

The patient denied any noticeable dyspnea at home but became dyspneic while in the ER. Initial vital signs included a fever of 39.5°C, an elevated heart-rate of 136 beats-per-minute...
and SpO2 of 89% with a respiratory rate of 26 breaths-per-minute. A CT scan on the day of admission demonstrated diffuse ground-glass pulmonary infiltrates involving all lobes bilaterally with upper lobe and anti-dependent predominance.

(Fig. 1)

Later on the day of admission, the patient's oxygenation dropped into the 70s while on nasal canula oxygen, and he was subsequently transferred to the ICU and placed on 100% FiO2 nonrebreather. An ABG performed in the ICU revealed a PaO2 of 146 mmHg while on 100% FiO2. The patient was then switched to CPAP which subjectively improved his breathing.

Initial blood-work demonstrated a neutrophilic leukocytosis which increased despite antibiotics. After 36 hours without any improvement on broad-spectrum antibiotics, the patient was initiated on 40mg of methylprednisolone TID on hospital day 2. He subsequently demonstrated improvement both clinically and on serial chest radiographs. By hospital day 3 his fevers and tachycardia resolved. On hospital day 4 he was able to come off of CPAP and his FiO2 requirement steadily declined. On hospital day 7 the patient was maintaining SpO2 in the high 90s while on room air, and on hospital day 8 he was discharged home. The patient reported mild dyspnea at home which resolved within 1 week of discharge. He has since quit vaping and has had no further pulmonary episodes.

**Discussion**

A recent case series found a median age of 19 years and a male predominance among 53 patients who developed pulmonary disease following vaping [2]. These patients generally presented with respiratory symptoms and neutrophilic leukocytosis, and required hospitalization [2]. All 48 patients who had CT imaging were found to have bilateral pulmonary opacities [2]. A recent article describing the imaging appearances of pulmonary disease associated with vaping noted basilar and dependent predominance of consolidation and ground-glass opacity, often with areas of lobular or subpleural sparing [3].

The patient in the reported case is of a typical demographic profile and had a similar clinical presentation to the patients described in recent literature. Bilateral ground-glass opacities were seen on CT, and subpleural sparing was noted; however, in contrast to the patterns described in the literature, this patient’s pathology had an upper lobe and anti-dependent predominance. (Fig. 1) As more and more cases of vaping-associated pulmonary disease emerge, it is important to catalog and characterize constellations of findings in order to better tease out disease patterns and their associations.

Case series and expert opinion suggest that vaping-associated pulmonary disease is a real phenomenon and clinical syndrome [1–4]. This is worrisome given that vaping has become a popular means of quitting smoking and reducing tobacco use [4,5]. There also appears to be an assumption among young adults that vaping is a safer and healthier alternative to smoking cigarettes. Further investigation and formal studies are needed to identify the disease process or processes which are at work. Given that no single ingredient has as of yet been determined as the inciting agent, and given the current recommendation of the CDC, the authors of this paper would categorically advise against vaping.

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