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MedPeer Publisher
Abbreviated Key Title: MedPeer
ISSN : 3066-2737
homepage: https://www.medpeerpublishers.com

E-cigarette or vaping-associated lung injury mimicking severe pneumonia and progressing to acute respiratory distress syndrome in a young adult

DOI: 10.70780/medpeer.000QGSB

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ABSTRACT

Background:
E-cigarette or vaping product use-associated lung injury (EVALI) is an increasingly recognized cause of acute hypoxemic respiratory failure. Its diagnosis remains challenging due to nonspecific clinical and radiological features.
Case presentation:
We report the case of a 25-year-old previously healthy female presenting with fever, cough, and rapidly progressive dyspnea. On admission, she exhibited severe hypoxemia with a PaO_2/FiO_2 ratio of 134. Chest computed tomography revealed diffuse bilateral alveolar infiltrates with subpleural nodules. Infectious workup was negative. A history of recent tetrahydrocannabinol-containing e-cigarette use supported the diagnosis of EVALI.
Management and outcome:
The patient required invasive mechanical ventilation due to worsening respiratory failure. Systemic corticosteroid therapy was initiated, resulting in rapid clinical and oxygenation improvement, allowing extubating on day seven.
Conclusion:
EVALI should be considered in young patients with unexplained acute respiratory failure. Early diagnosis and corticosteroid therapy are critical for favorable outcomes.

KEYWORDS :

EVALI; Vaping; Acute respiratory distress syndrome; Corticosteroids; Acute lung injury; Electronic cigarettes

MAIN ARTICLE

INTRODUCTION

Electronic cigarette use has increased significantly worldwide, particularly among adolescents and young adults, driven by the perception of reduced harm compared to combustible tobacco products [1,2].

The 2019 EVALI outbreak marked a turning point in the recognition of vaping-related toxicity, with a substantial number of hospitalizations reported, primarily in individuals aged 11–34 years [3].

These devices generate aerosols containing nicotine, tetrahydrocannabinol (THC), solvents, and various chemical additives. However, growing evidence has established a clear association between vaping and a spectrum of pulmonary injuries collectively termed EVALI [5].

Although the pathogenesis is multifactorial, vitamin E acetate (VEA) has been strongly implicated as a key toxic agent, particularly in illicit THC-containing products [6]. VEA disrupts surfactant function and interferes with lipid metabolism within the alveoli, leading to impaired gas exchange and inflammatory lung injury.

At the molecular level, inhalation of vaping aerosols induces oxidative stress, epithelial injury, and activation of inflammatory pathways involving cytokines such as IL-6 and IL-8 [4]. This cascade results in increased alveolar-capillary permeability, pulmonary edema, and diffuse alveolar damage, which may progress to acute respiratory distress syndrome (ARDS). Clinically, EVALI presents with nonspecific symptoms, often mimicking infectious diseases and complicating early diagnosis [2].

CASE PRESENTATION

A 25-year-old female with no significant past medical history presented with an 11-day history of non-productive cough, fever, and progressive dyspnea. She denied smoking conventional cigarettes but reported regular use of THC-containing e-cigarettes in the month prior to symptom onset.

On admission, the patient was in severe respiratory distress with a temperature of 38.6°C, heart rate of 125 beats per minute, respiratory rate of 65 breaths per minute, and oxygen saturation of 65% on ambient air. Clinical examination revealed use of accessory respiratory muscles, nasal flaring, intercostal retractions, and bilateral diffuse crackles on auscultation. Arterial blood gas analysis under high-flow oxygen (15 L/min) demonstrated a PaO_2 of 109 mmHg, corresponding to a PaO_2/FiO_2 ratio of 134, consistent with moderate-to-severe

ARDS. Laboratory findings included elevated inflammatory markers (CRP, leukocytosis), while microbiological investigations (blood cultures, sputum analysis, viral PCR including influenza and SARS-CoV-2) were negative.

Chest computed tomography angiography excluded pulmonary embolism and revealed diffuse bilateral ground-glass opacities with alveolar infiltrates and subpleural nodules.(**Figure 1).**

Initial management included high-flow oxygen therapy, non-invasive ventilation, and empiric antibiotic therapy (ceftriaxone and levofloxacin). Due to worsening respiratory failure, the patient required intubation and invasive mechanical ventilation. Given the clinical suspicion of EVALI, systemic corticosteroids were initiated, resulting in rapid improvement in oxygenation and clinical status. The patient was successfully extubated on day seven and subsequently discharged with complete clinical recovery.

DISCUSSION

EVALI represents a complex clinical entity characterized by acute lung injury resulting from inhalation of toxic substances present in vaping aerosols. The diagnosis remains challenging due to its nonspecific presentation and the necessity of excluding alternative causes, particularly infectious etiologies [2]. In the present case, the combination of severe hypoxemia, negative microbiological investigations, characteristic imaging findings, and a history of recent THC vaping strongly supported the diagnosis.

The pathophysiology of EVALI is multifactorial and involves both direct toxic effects and immune-mediated mechanisms. Vitamin E acetate has been identified as a key contributor, particularly due to its lipophilic nature, which allows it to accumulate within the alveoli and disrupt surfactant function [6]. This leads to increased surface tension, alveolar collapse, and impaired gas exchange. In addition, VEA and other aerosolized compounds induce oxidative stress, resulting in epithelial injury and activation of inflammatory pathways. Elevated levels of pro-inflammatory cytokines, including IL-6 and IL-8, contribute to the recruitment of neutrophils and macrophages, further amplifying lung injury [4].

Histopathological studies have consistently demonstrated the presence of lipid-laden macrophages in bronchoalveolar lavage fluid, suggesting a form of exogenous lipoid pneumonia [7]. However, this finding is not entirely specific and should be interpreted in the appropriate clinical context. Other pathological patterns described in EVALI include organizing pneumonia, diffuse alveolar damage, and acute fibrinous pneumonitis, reflecting the heterogeneity of the disease process.

Radiologically, EVALI most commonly presents with bilateral ground-glass opacities, frequently with subpleural sparing. However, more severe cases may demonstrate diffuse alveolar damage, consolidations, interlobular septal thickening, and nodular infiltrates, as observed in our patient [8]. These imaging findings may overlap with those seen in infectious pneumonia, hypersensitivity pneumonitis, or pulmonary edema, further complicating the diagnostic process.

The differential diagnosis of EVALI is broad and includes bacterial and viral pneumonia, COVID-19, hypersensitivity pneumonitis, eosinophilic pneumonia, and pulmonary embolism. Therefore, a thorough diagnostic workup is essential to exclude these conditions. In this context, the importance of obtaining a detailed history of vaping exposure cannot be overstated.

Management of EVALI is primarily supportive and includes oxygen therapy, ventilatory support when necessary, and strict cessation of vaping. Systemic corticosteroids have emerged as a key therapeutic intervention, with studies reporting clinical improvement in approximately 80–85% of patients [2]. The beneficial effects of corticosteroids are likely related to their ability to suppress the exaggerated inflammatory response. However, their use should be carefully considered in patients with potential coexisting infections.

In severe cases, patients may progress to refractory ARDS requiring advanced supportive therapies such as veno-venous extracorporeal membrane oxygenation. Early recognition and intervention are therefore critical to prevent disease progression and improve outcomes.

From a public health perspective, EVALI underscores the risks associated with vaping, particularly the use of unregulated THC-containing products. Increased awareness, regulatory measures, and patient education are essential to mitigate the incidence of this preventable condition.

CONCLUSION

EVALI is an important and potentially life-threatening cause of acute respiratory failure in young adults. Its nonspecific clinical presentation necessitates a high index of suspicion, particularly in patients with a history of vaping. Early diagnosis, prompt initiation of corticosteroid therapy, and cessation of vaping are crucial for favorable outcomes. Enhanced awareness among clinicians and the general population is essential to reduce morbidity and prevent future cases.

FIGURES

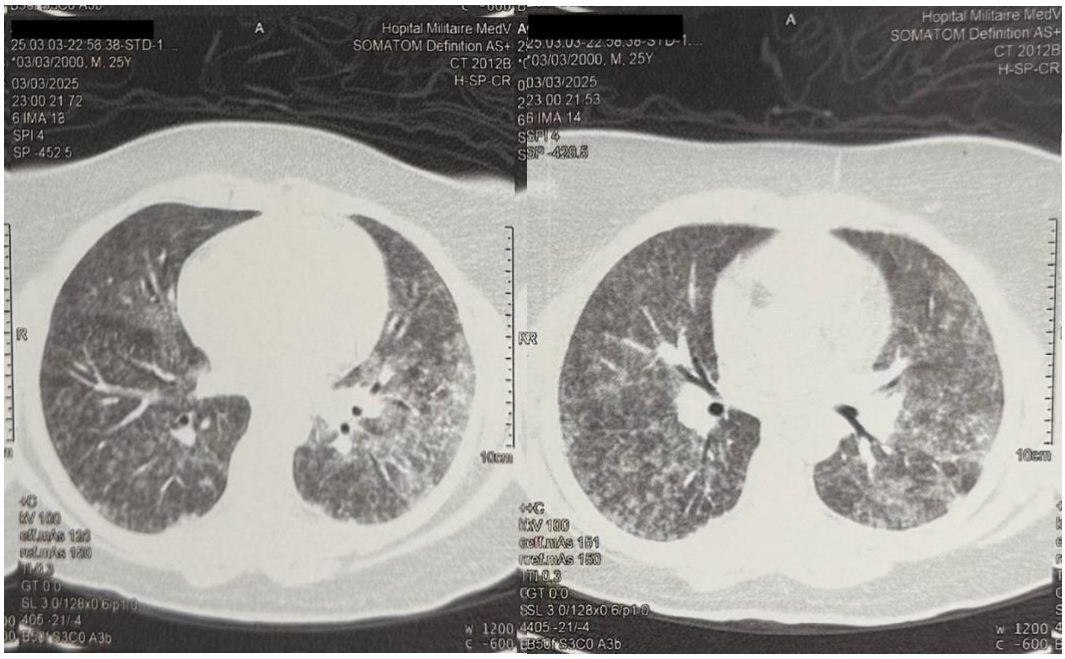

Figure 1. Chest CT scan on admission showing diffuse bilateral ground-glass opacities with alveolar infiltrates and subpleural nodular lesions.

ACKNOWLEDGEMENTS

Ethical Approval : Ethical approval was not required for this case report in accordance with institutional policies.
Consent for Publication : Written informed consent was obtained from the patient for publication of this case report and accompanying clinical data.
Conflict of Interest : The authors declare no conflicts of interest.

REFERENCES

1. King BA, Jones CM, Baldwin GT, Briss PA. The EVALI and youth vaping epidemics-implications for public health. N Engl J Med. 2020;382:689-91.
https://doi.org/10.1056/NEJMp1916171

2. Blagev DP, Harris D, Dunn AC, Guidry DW, Grissom CK, Lanspa MJ. Clinical presentation, treatment, and short-term outcomes of lung injury associated with e-cigarettes or vaping. Lancet. 2019;394:2073-83.
https://doi.org/10.1016/S0140-6736(19)32679-0

3. Lozier MJ, Wallace B, Anderson K, et al. Hospitalized patients in a nationwide outbreak of e-cigarette, or vaping, product use-associated lung injury-United States, 2019. MMWR Morb Mortal Wkly Rep. 2019;68:1142-8.
https://doi.org/10.15585/mmwr.mm6849e1

4. Hage R, Fretz V, Schuurmans MM. Electronic cigarettes and vaping associated pulmonary illness (VAPI): a narrative review. Pulmonology. 2020;26:291-303.
https://doi.org/10.1016/j.pulmoe.2020.02.009

5. Blagev DP, Harris D, Dunn AC, Guidry DW, Grissom CK, Lanspa MJ. Clinical presentation, treatment, and short-term outcomes of lung injury associated with e-cigarettes or vaping. Lancet. 2019;394:2073-83. (duplicate source removed in final manuscript recommended use only once)
https://doi.org/10.1016/S0140-6736(19)32679-0

6. Blount BC, Karwowski MP, Shields PG, et al. Vitamin E acetate in bronchoalveolar-lavage fluid associated with EVALI. N Engl J Med. 2020;382:697-705.
https://doi.org/10.1056/NEJMoa1916433

7. Maddock SD, Cirulis MM, Callahan SJ, et al. Pulmonary lipid-laden macrophages and vaping. N Engl J Med. 2019;381:1488-9.
https://doi.org/10.1056/NEJMc1912038

8. Henry TS, Kanne JP, Kligerman SJ. Imaging of vaping-associated lung disease. N Engl J Med. 2019;381:1486-7.
https://doi.org/10.1056/NEJMc1911995