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An Unusual Case of Cardiovascular Collapse After EVALI

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Introduction

In July of 2019, a new respiratory illness emerged as a cluster of healthy, young adolescents developed profound hypoxic respiratory failure. Investigation revealed that it was related to e-cigarette and vaping use. A new clinical syndrome of e-cigarette and vaping use-associated lung injury (EVALI) emerged. Its development was linked to tetrahydrocannabinol (THC) use and Vitamin E acetate [1]. We present a case of vaping associated lung injury, resulting in severe acute respiratory distress syndrome with eventual, unexplained cardiovascular collapse and death.

Case Summary

- Patient is a 37 year-old male with migraines, obesity (BMI 34), chronic back pain, and tetrahydrocannabinol (THC) vaping who presented with **fever, shortness of breath, and altered mental status.**
- He arrived in distress, febrile, tachycardic, tachypneic, and profoundly hypoxic on room air

HR	Temp	RR	BP
148	38.6°C	66	54% RA 113/59

- Initial blood gas confirmed profound hypoxemia: pH 7.33, PCO₂ 35.5, PO₂ 32.9, and saturation of 63.8 with a lactate of 8.6 mmol/L.
- His initial labs are listed in **Table 1.**
- Initial chest x-ray showed bilateral infiltrates.
- He was trialed on CPAP, but remained hypoxic, requiring intubation and mechanical ventilation. His initial PaO₂ to FI_{O2} ratio was 111 on a PEEP of 12, consistent with moderate ARDS.
- He was treated empirically with vancomycin, piperacillin / tazobactam, and azithromycin.
- Infectious work-up showed a negative influenza and viral respiratory panel (BioFire) PCR. Respiratory culture grew few non-pneumoniae Streptococcus. Blood cultures were negative. Bronchoscopy showed diffuse, pink frothy secretions in the upper airways with bronchoalveolar lavage (BAL) growing commensal flora.
- There were no exam findings of autoimmune disease including synovitis, rash, erythema nodosum, etc. Laboratory data was without hemolysis. A peripheral smear was without schistocytes or spherocytes.
- Echocardiogram revealed a preserved EF (58%) with normal LV size and thickness and a negative bubble study, ruling out intracardiac shunt. It did show a mildly enlarged right ventricle and mildly reduced global RV systolic function with PAP of 42 mmHg and mild tricuspid regurgitation.
- A computed tomography (CT) of the chest with contrast was also obtained and negative for pulmonary embolism, but demonstrated extensive, bilateral ground glass and airspace opacities consistent with radiograph findings of EVALI [2] **Figure 1.**

Given his overall clinical picture including bilateral infiltrates and vaping of THC, there was a high suspicion for *EVALI*.

- He was started on methylprednisolone at 1 mg/kg/day and completed a 14-day course of both steroids and antibiotics.
- He gradually improved with diuresis and was extubated on hospital day 13.

Images

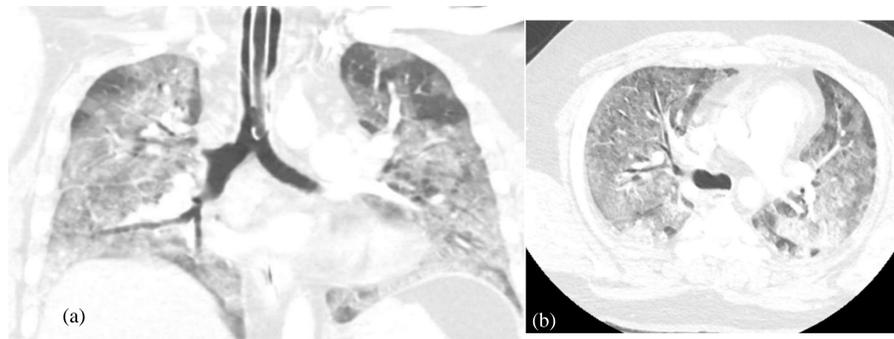


Figure 1: CT chest with contrast showing extensive ground glass and airspace opacities in (a) coronal and (b) axial slices of the lungs

Table One: Laboratory Values

Lab	Value
WBC (K/uL)	17.3
Absolute Neutrophils (K/uL)	15.60
D-dimer (ug/mL FEU)	3.03
C-Reactive Protein (mg/dL)	29.0
Procalcitonin (ng/mL)	2.69
BNP (pg/mL)	135
PaO ₂ (mmHg)	32.9
Lactate (mmol/L)	8.6
High Sensitivity Troponin (ng/L) (following decompensation)	>20,000

Table 1: Laboratory Values on initial presentation

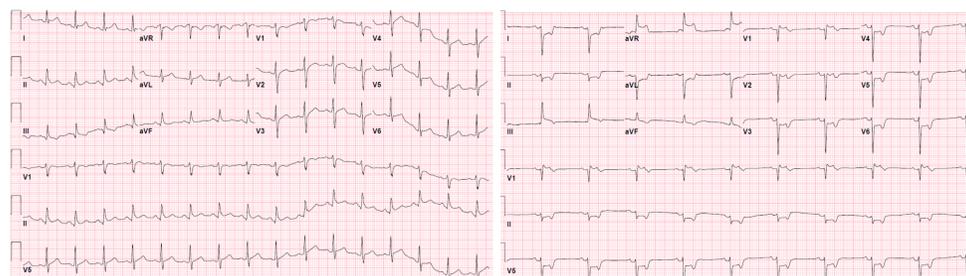


Figure 2. EKG on admission (left) and prior to arrest (right) showing ST elevations in AVR and V1 with diffuse depressions in I, AVL, V3-V6, and II

Case Summary Continued: Clinical Deterioration

- However, on Hospital Day 15, he decompensated
- He became tachycardic, tachypneic, and was re-intubated.
- He remained profoundly tachycardic and developed shock requiring vasopressors.
- He developed new EKG changes with ST elevations, reciprocal depressions, and a significant troponin elevation. **Figure 2.**
- While the cardiac catheterization lab was being activated, the patient suffered a PEA arrest.
- Cardiac catheterization was emergently performed which demonstrated non-obstructed coronary arteries and patent pulmonary vasculature.
- He was initiated on veno-arterial extracorporeal membrane oxygenation (VA ECMO).
- Over the next 12 hours, the patient further decompensated developing multi-organ failure with increasing vasopressor requirements despite VA ECMO support. Due to his poor prognosis, the decision was ultimately made to withdraw care.

Table Two: Criteria for Diagnosis of EVALI

- E-cigarette or vaping use within last 90 days
- Lung opacities on chest radiograph or CT imaging
- Exclusion of lung infection
 - Negative influenza testing
 - Negative viral respiratory panel
 - If clinically indicated, negative testing for *Legionella* and *Streptococcus pneumoniae*, blood cultures, sputum culture, bronchoalveolar lavage, and testing for HIV-related opportunistic infections
- No likely alternative diagnosis (cardiac, rheumatologic, etc.)

Discussion

This patient fulfills diagnostic criteria for EVALI listed in **Table 2**, including e-cigarette use within the last 90 days, lung opacities on chest radiograph or CT, exclusion of lung infection, and absence of alternative diagnosis [3]. This case report highlights an instance of acute cardiovascular collapse in a patient with EVALI after initial course of improvement and extended treatment with antibiotics and steroids. Studies have shown certain clinical characteristics such as asthma, cardiac disease or psychiatric conditions place patients at greater risk of hospitalization and mortality in EVALI [4,5]. Patients recovering from EVALI, particularly those with chronic medical conditions, should undergo close monitoring for rapid deterioration with a low threshold to resume treatment in the appropriate clinical setting.

References

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