

Cannabis Smoking Induced Diffuse Alveolar Hemorrhage in a Young Adult

Suraj Santosh Nalage¹ 

¹ Internal Medicine, Hind Institute of Medical Sciences, Sitapur, Uttar Pradesh, India.
Corresponding author: Suraj Santosh Nalage; Email: suraj.nalage12@gmail.com

Abstract

Background: Diffuse alveolar hemorrhage (DAH) is a rare but potentially life threatening pulmonary syndrome caused by bleeding into the alveolar spaces, leading to acute respiratory compromise. It commonly presents with hemoptysis, hypoxemia, infiltrates and rapidly progressive respiratory failure. **Case description:** A 25 year old male presented with fever, cough, mild hemoptysis and altered sensorium. On arrival, he was breathless, hypoxic and requiring airway protection with a tube in the Emergency department (ED). He had no known comorbidities, was not on anticoagulant therapy, and had a history of cannabis smoking. High-resolution computed tomography (HRCT) of the chest revealed diffuse ground-glass opacities with a crazy-paving. A pattern suggestive of diffuse alveolar hemorrhage. The patient was managed with corticosteroids, lung-protective mechanical ventilation, and supportive care. Despite aggressive treatment, his clinical condition worsened and he succumbed to the illness. **Conclusion:** This case highlights cannabis smoking as a rare but significant possible cause of diffuse alveolar hemorrhage in young adults.

Keywords: Diffuse alveolar hemorrhage; Cannabis smoking; Hemoptysis; Bronchoalveolar lavage; Ground -glass opacities; Crazy-paving pattern; Acute respiratory failure

Introduction

Diffuse alveolar hemorrhage (DAH) is a life-threatening clinicopathological syndrome caused by disruption of the alveolar microcirculation, leading to bleeding into the alveolar spaces and rapid impairment of gas exchange [1-2]. Clinically patients may present with dyspnea, cough, hemoptysis, anemia, and diffuse pulmonary infiltrates, although hemoptysis may be absent in a substantial proportion of cases.

Due to its characteristic radiological findings that lack specificity, DAH remains a diagnostic challenge and warrants an early bronchoscopic evaluation with BAL fluid sampling. Haemorrhaging BAL fluid samples collected sequentially, along with hemosiderin-laden macrophages, provide strong evidence for DAH diagnosis [3].

The causes of DAH are extensive. In classic cases, autoimmune diseases of the pulmonary capillaries are common including ANCA-associated vasculitis, anti-glomerular basement membrane disease and connective tissue diseases [4].

In addition, infections coagulopathies medications toxins and inhalation exposures have been associated with the disease. Computed tomography is commonly used to identify bilateral ground-glass opacities and consolidation. A 'crazy paving' pattern can also be observed but there is an overlap between pulmonary oedema infections and other diffuse airspace diseases [5].

Cannabis-related pulmonary injury is increasingly being recognized, especially in younger patients [6-8]. While chronic cannabis smoking has long been associated with airway irritation and inflammation, DAH remains an

uncommon but important complication. Several case reports now describe acute hemoptysis, respiratory failure, diffuse infiltrates, and hemorrhagic BAL after marijuana inhalation, including use through improvised smoking devices or heavy inhalational exposure [9-11]. These reports suggest that cannabis smoking should be considered in the differential diagnosis of DAH in young adults when autoimmune, cardiac, infectious, and coagulations-related causes are not apparent. Against this background, the present case illustrates a fulminant and ultimately fatal presentation of suspected cannabis smoking-induced DAH in a previously healthy young male.

Case Presentation

A 25-year-old male presented to the emergency department (ED) with fever, cough, mild hemoptysis, and altered sensorium. On examination, he was tachypneic and had severe hypoxia and hypotension, prompting endotracheal intubation in the emergency room. He had no known comorbidities, was not receiving anticoagulants, and had a history of smoking cannabis. Chest X-Ray and High-resolution computed tomography (HRCT) of the chest showed diffuse ground-glass opacities with a crazy-paving pattern (**Figure 1 and 2**), which was considered suggestive of diffuse alveolar hemorrhage.

Bronchoalveolar lavage was subsequently performed. The serial lavage samples were hemorrhagic, supporting the diagnosis of alveolar hemorrhage. The washings sent for analysis were reportedly negative for cultures. Further evaluation for collagen vascular disease and vasculitis was normal. A 2-dimensional echocardiogram was normal, and there were no other features to suggest heart failure.

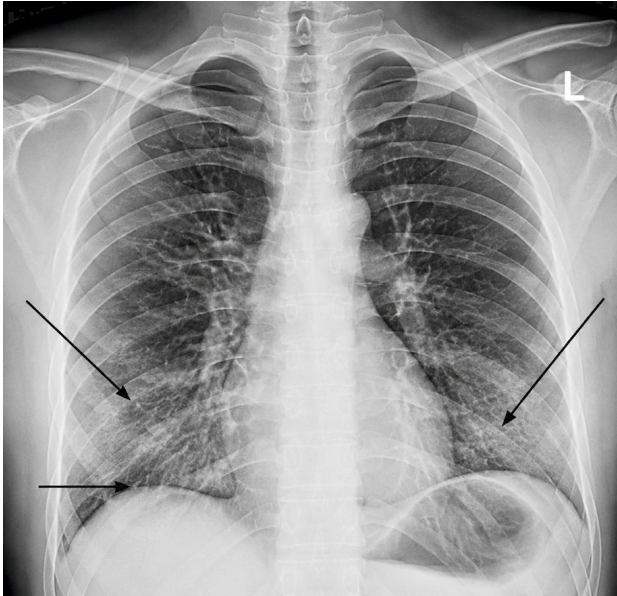


Figure 1: Chest radiograph showing bilateral diffuse patchy air-space opacities, predominantly in the mid and lower lung zones, consistent with alveolar hemorrhage.

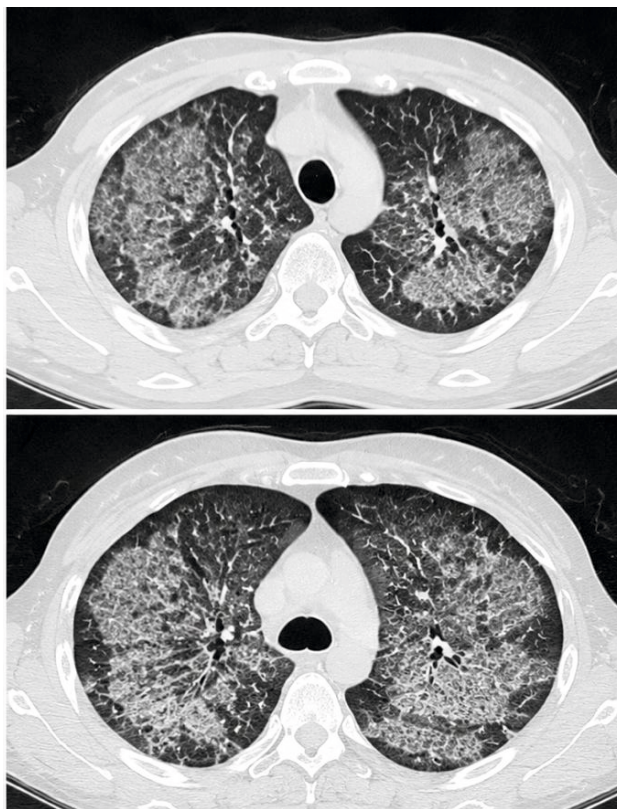


Figure 2: High-resolution CT chest showing diffuse bilateral ground-glass opacities with interlobular septal thickening (crazy-paving pattern), suggestive of diffuse alveolar hemorrhage.

The PT-INR was also within normal limits. Taken together, these findings argued against common autoimmune, infectious, cardiac, and coagulation-related causes of DAH. In the context of the patient's addiction history, cannabis smoking was considered the most likely precipitating factor.

Supportive care, steroids, and lung-protective ventilation were used for this patient, but he failed to respond positively to these efforts. Sadly, his condition became worse until he eventually succumbed to death. As we can see from the case above, DAH can be a very severe disease that presents itself especially in cases where the damage to the alveolar-capillary barrier is extensive.

Discussion

This case is clinically important because it demonstrates a classic syndromic presentation of DAH in a young adult with a relevant inhalational exposure and without an obvious traditional systemic cause. The combination of hemoptysis, acute hypoxemic respiratory failure, diffuse bilateral ground-glass opacities with crazy-paving, and hemorrhagic BAL is highly compatible with DAH. Although imaging findings in DAH are not pathognomonic, the radiologic pattern in the appropriate clinical setting should promptly trigger bronchoscopy and an urgent etiologic work-up. The present case also reinforces the value of BAL, since progressively hemorrhagic lavage remains one of the most practical tools for confirming alveolar bleeding [12].

A major strength of this case is the exclusion of several important differential diagnoses.

Autoimmune pulmonary capillaritis, especially ANCA-associated vasculitis, is among the best-recognized causes of DAH, and connective tissue disease, antiphospholipid syndrome, infection, coagulopathy, and cardiac causes must also be considered. In this patient, the reported normal vasculitis and collagen vascular work-up, normal coagulation profile, absence of anticoagulant exposure, negative cultures, and normal echocardiography reduced the likelihood of these alternative explanations. The clinical reasoning therefore rests on a diagnosis of exclusion supported by a consistent exposure history and compatible radiologic and bronchoscopy findings.

The association between cannabis smoking and DAH, though rare, is increasingly represented in the literature. Cases reported have included haemoptysis, dyspnoea, diffuse infiltrates and bronchoalveolar lavage-identified bleeding immediately following cannabis smoke inhalation [13]. Possible mechanisms include toxic effects on cells and organs from combustion products, airway and alveolar inflammation, increased alveolar permeability and barotrauma-related effects from deep inhalation and/or breath-holding during cannabis inhalation which can damage the alveolar-capillary membranes.

The management of DAH depends on the severity of the condition and the cause, although it mainly revolves around providing respiratory support, dealing with the trigger, and immunomodulation if there is evidence of inflammation or immune system involvement in the disease. Steroids are

commonly prescribed in severe cases, even though the prognosis largely relies on the etiology and how early the condition is diagnosed. Intubated patients are usually among the more seriously ill cases and may not have a favorable outcome despite receiving maximum medical intervention. The current case is another example of the aggressive form of DAH that requires the early consideration of substance-induced lung damage among younger patients presenting with diffuse infiltrates and hemoptysis.

A limitation of current report was that team unable to elaborate on other factors, including toxicology analysis, percentage of hemosiderin-laden macrophages on BAL, sequential hemoglobin values, and histopathology. As such, the association of DAH with cannabis use should be considered to be strongly suspected but not definitively proven. Nevertheless, the presentation described herein supports cannabis-induced DAH as the most likely diagnosis.

CLINICAL, ETHICAL AND SOCIAL IMPLICATIONS

1. Cannabis smoking and vaping are considered non-harmful activities by teenagers but both these practices lead to lung disorders.
2. Stigma attached to cannabis consumption might lead to delayed diagnosis of the disease.
3. Non-judgemental approach is essential while dealing with cases pertaining to any substance abuse.
4. History of cannabis consumption must not restrict doctors from clinical decision-making.
5. Timely empathy and counseling would help in saving time required for excluding other causes of bleeding such as trauma or hemorrhage

Conclusion

Diffuse alveolar hemorrhage is a rare but potentially fatal pulmonary emergency that requires early recognition and prompt supportive management. This case highlights cannabis smoking as an uncommon yet important possible trigger of DAH in young adults, particularly after other autoimmune, infectious, cardiac, and coagulation-related causes have been excluded. The presence of hemoptysis, diffuse ground-glass opacities with crazy-paving on imaging, and hemorrhagic bronchoalveolar lavage should raise strong suspicion for this diagnosis. Clinicians should maintain a high index of suspicion for substance-related lung injury in similar presentation, as timely diagnosis may help guide appropriate management and improve outcomes.

Declarations

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ORCID

Suraj Santosh Nalage 

<http://orcid.org/0009-0006-2021-979X>

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