



Case Report

An Important Clinical Condition in Differential Diagnosis of Coronavirus Disease 2019: Crack Lung

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Abstract

Crack cocaine has been associated with a variety of pulmonary manifestations. We report a 44-year-old man been diagnosed with severe acute respiratory syndrome coronavirus 2 infection, presenting shortness of breath, non-productive cough, chest pain, headache, dizziness, and fever lasting for 2 days. At first, all findings of our patient called for an impression of coronavirus disease 2019. During admission, he presented with acute respiratory symptoms, patchy ground-glass opacities, and laboratory abnormalities, such as elevated acute phase response and lymphopenia. After, the presence of transient lung infiltrations in the follow-up triggered the cause for a re-evaluation of the diagnosis of coronavirus disease 2019. After a detailed inquiry, it was revealed that he had had a history of intense inhaled cocaine use 2 days before hospitalization. We speculate that the crack lung should also be considered in the differential diagnosis in patients with suspected coronavirus disease 2019 pneumonia.

KEYWORDS: Thorax CT, crack lung, crack cocaine, patchy ground-glass opacity, acute pulmonary injury

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INTRODUCTION

Cocaine is one of the most widely used illegal drugs in the world. Because of its great propensity for addiction, it is a common cause of drug-related death. When cocaine hydrochloride combines with sodium bicarbonate and is extracted with ether, it is heated and smoked to generate crack cocaine. Crack cocaine has been linked to a range of pulmonary symptoms when inhaled. Crack lung states an acute syndrome of diffuse alveolar damage and hemorrhagic alveolitis that appears within 48 hours of smoking crack and it is a rare type of cocaine-related respiratory illness with distinct radiographic features. These radiographic features are nonspecific and include diffuse alveolar infiltrations and ground-glass opacities that usually go away once the drug is discontinued.^{1,2}

In patients with coronavirus disease 2019 (COVID-19) pneumonia, crack lung should be considered in the differential diagnosis due to the similarity of its clinical, laboratory, and radiological findings.

CASE REPORT

A 44-year-old man was admitted to emergency department of Prof. Dr. Murat Dilmener Emergency Hospital with a history of shortness of breath, non-productive cough, chest pain, headache, dizziness, and fever lasting for 2 days. On examination, he was found to have tachypnea and tachycardia (respiratory rate was 24 bpm, pulse rate 100 bpm) with fever (37.7°C). On admission, his peripheral blood oxygen saturation (SpO₂) was 90% at room air. Peripheral blood oxygen saturation was measured as >93%, after starting with 5L/min oxygen by nasal cannula. He had no hemoptysis. During auscultation, in addition to diffuse expiratory rhonchi, inspiratory crackles were also detected in the bilateral basal fields. Physical examination did not reveal any other abnormality. There was no known history of any chronic disease. As a long-distance driver by profession, he had a cigarette smoking history of 40 packs a year and a moderate level of alcohol consumption. His electrocardiogram showed sinus tachycardia, but his echocardiography was normal. Complete blood count and comprehensive metabolic panel analyses were performed. Most of the laboratory findings were significantly high, such as C-reactive protein (478 mg/L), procalcitonin (3.28 ng/mL), D-dimer (2.49 µgFEU/mL), fibrinogen (684 mg/dL), troponin I (36 ng/mL), ferritin (4380 µg/L), aspartate transaminase (343 U/L), alanine transaminase (98 IU/L), gamma-glutamyl transpeptidase (52 U/L), lactate dehydrogenase (1171 U/L), and creatine phosphokinase (11357 U/L), suggesting COVID-19. Additionally, he had hyponatremia (125 mmol/L), lymphopenia (0.47 cells/mL), and low eosinophil (0.01 cells/mL) count. At the admission, arterial blood gases analysis showed respiratory alkalosis and hypoxemia. Serologic testing for autoimmune antibodies and vasculitis consist of rheumatoid factor, antinuclear antibodies, antibodies to double-stranded DNA, cytoplasmic antineutrophil cytoplasmic autoantibodies, perinuclear antineutrophil cytoplasmic autoantibodies, anti-cyclic citrullinated peptide antibodies, and serum complement components C3 and C4 levels

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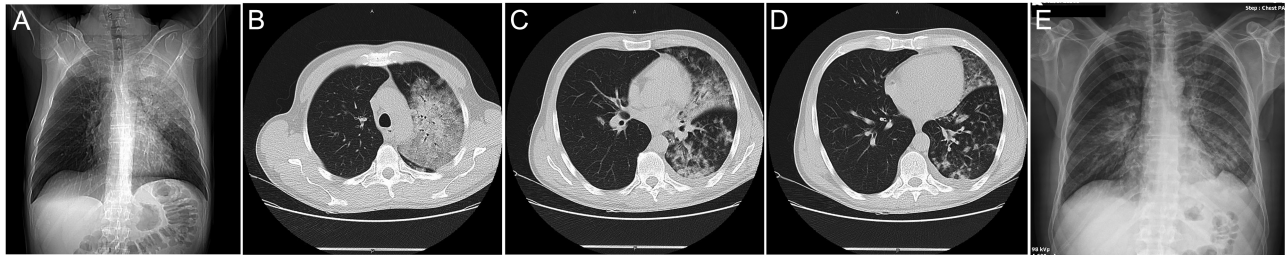


Figure 1. (A) Chest computed tomography (CT) on admission. Consolidation in the left upper and middle zone. (B-D) Chest CT scan on admission, showing diffuse ground-glass opacities containing air bronchograms in the left lung upper lobe, multifocal and patchy ground-glass opacities with nodular infiltration in the left lung lower lobe, left-sided minimal pleural effusion (13 mm), and ground-glass opacities in the anterior segment of the right lung lower lobe. (E) Control chest x-ray demonstrating consolidations with patchy bilateral ground-glass opacities on the fifth day.

yielded negative results. Viral hepatitis, HIV antigens, and a series of sputum for acid-fast bacilli smear and culture were also negative.

A computed tomography (CT) scan of the patient's chest revealed diffuse ground-glass opacities containing air bronchograms, predominantly perihilar in the left lung upper lobe, multifocal and patchy ground-glass opacities with nodular infiltration in the left lung lower lobe, left-sided minimal pleural effusion (13 mm), and ground-glass opacities in the anterior segment of the right lung lower lobe (Figure 1A-D).

The patient has been treated with a presumed diagnosis of COVID-19 and/or atypical pneumonia based on clinical, laboratory, and radiological findings, and after that, a real-time polymerase chain reaction (PCR) sample was requested under pandemic conditions. In accordance with the guideline of the Turkish Health Ministry's COVID-19 treatment protocol, he was started favipiravir (1.6 g twice daily on day 1, followed by 600 mg twice daily for 4 days), low-molecular-weight heparin (LMWH, enoxaparin sodium 4000 U/0.4 mL/day, subcutaneous) and parenteral methylprednisolone (1 mg/kg methylprednisolone for 5 days) was implemented due to acute hypoxemic respiratory failure.³ Additionally, he was

given an empirical antibiotic (moxifloxacin 400 mg/day for 5 days), and oxygen support by nasal cannula (5 L/min).

Despite the decrease in his complaints in the following days, his oxygen support continued. Control chest x-ray scan showed a marked regression of the infiltration in the left lung and the emergence of new infiltrations in the middle and lower zones of the right lung on the fifth day (Figure 1E). A decrease in acute phase response with an increase in transaminases and D-dimer (3.9 µgFEU/mL) values were observed in the subsequent laboratory results. Pulmonary CT angiography was performed in order to exclude the possibility of any pulmonary embolism on the eighth day following admission. No filling defect was observed but parenchymal imaging showed a significant reduction in left lung opacities, while new ground-glass opacities were appearing in the lower lobe of the right lung similar to that in the chest x-ray scan (Figure 2). After that, real-time PCR remained negative on 2 occasions. The patient was re-evaluated due to the rapidly changing radiological findings with clinical suspicion. After a detailed inquiry, it was revealed that he had a history of heavy inhaled cocaine use 2 days before hospitalization. He was a regular crack smoker at least for 5 years, but he had no complaints regarding the pulmonary system in the past. Also, he had smoked cannabis for 10 years. Afterward, his urine toxicology was found to be positive for cocaine. Considering all these findings, we thought that the diagnosis is crack lung.

Although there are no specific clinical or laboratory findings for crack lung which can help for its discrimination from COVID-19 pneumonia, treatment protocols are similar for these conditions. During the follow-up, his dyspnea was recovered and SpO₂ was found 98% at room air. His laboratory findings and his radiologic findings returned to normal within 10 days. He was discharged with a follow-up appointment and referred to a psychiatry clinic.

DISCUSSION

“Crack lung” has been defined as an acute pulmonary syndrome that occurs after smoking crack cocaine.^{1,4} Smoked cocaine leads to acute and chronic pulmonary complications including pulmonary edema, alveolar hemorrhage, eosinophilic pneumonia, bronchiolitis obliterans organizing pneumonia (BOOP), interstitial pneumonitis, alveolar hemorrhage, pneumothorax, barotrauma, bullous lung disease, thromboembolic disease, and pulmonary hypertension. Diagnosis can be difficult due to nonspecific clinical features

MAIN POINTS

- Cocaine is one of the most widely used illegal drugs in the world. Because of its great propensity for addiction, it is a common cause of drug-related death. Crack cocaine has been linked to a range of pulmonary symptoms when inhaled.
- Crack lung states an acute syndrome of diffuse alveolar damage and hemorrhagic alveolitis that appears within 48 hours of smoking crack. Crack lung is a rare type of cocaine-related respiratory illness with distinct radiographic features. These radiographic features are nonspecific and include diffuse alveolar infiltrations and ground-glass opacities that usually go away once the drug is discontinued.
- There are no specific differentiable clinical, laboratory, and radiological findings for crack lung which can help for its discrimination from coronavirus disease 2019 pneumonia.
- Most of the drug abusers deny cocaine use. Crack lung should also be considered within the differential diagnosis of patients presented with acute hypoxemic respiratory failure and bilateral pulmonary infiltrates.

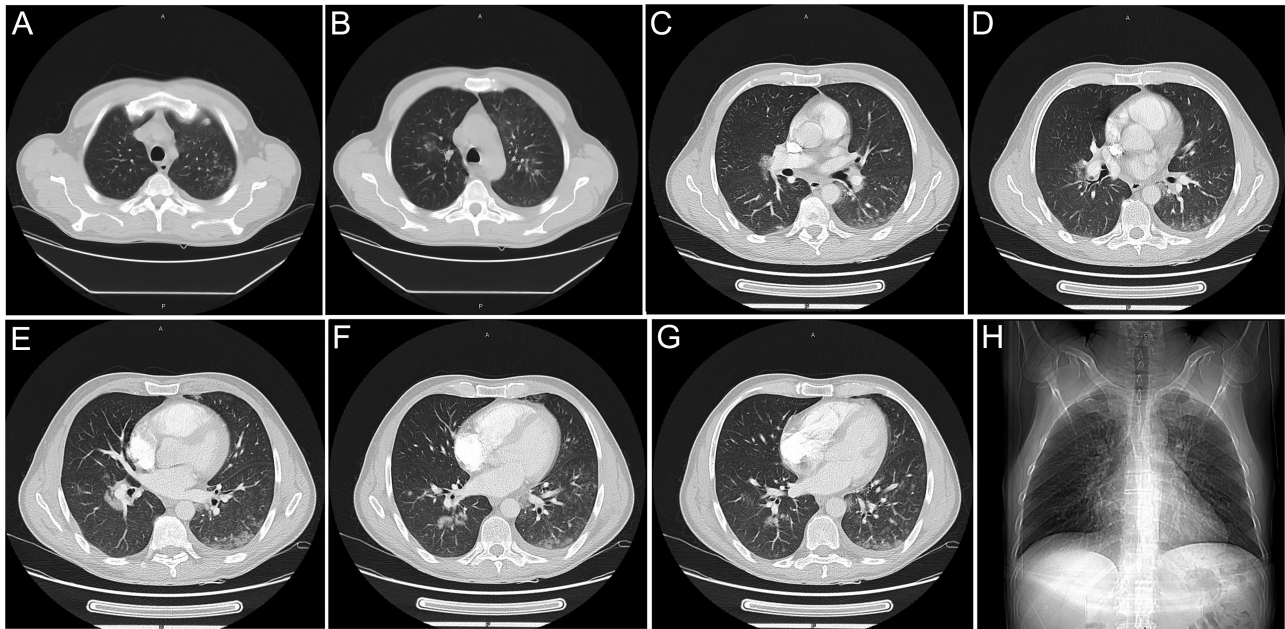


Figure 2. (A-G) Pulmonary computed tomography angiography on the eighth day. The left lung opacities regressed significantly, while new ground-glass opacities developed in the lower lobe of the right lung. (H) Complete radiological resolution, chest x-ray 10 days following presentation.

including acute pulmonary syndrome and chest imaging in crack lung.^{1,2,5,6} Suspicion, a detailed history, and physical examination are required to obtain a diagnosis.

At first, all clinical and laboratory findings of our patient suggested COVID-19. During admission, he presented with acute respiratory symptoms, patchy ground-glass opacities, and laboratory abnormalities, such as elevated acute phase response and lymphopenia. Interestingly, most laboratory findings that have been reported in the crack lung are similar to COVID-19, including elevated troponin,⁷ liver enzymes,⁸ C-reactive protein,⁹ and lymphopenia.¹⁰ Empirical antibiotics were given to the patient before the sputum test results because of probable bacterial etiology. A recently reported meta-analysis showed that high procalcitonin levels are associated with severe COVID-19¹¹; however, increased procalcitonin levels were also reported in amphetamine and sympathomimetic drug overdose.¹² In addition to that, another recent meta-analysis showed that procalcitonin levels are not sensitive enough to direct the decision of antibiotic usage in patients with community-acquired pneumonia.¹³

Our patient's consecutive real-time PCR tests were negative, and CT images were compatible with radiological findings of COVID-19. However, the presence of transient lung infiltrations in the follow-up prompted us to re-evaluate the diagnosis of COVID-19. Previous studies on crack lung and thorax CT findings reported that pathological findings such as consolidation, ground-glass opacities, cavitations, and air-space nodules were usually found bilaterally and in the upper lobes. The chronological association between crack cocaine usage and the symptoms observed at the beginning and the rapid resolution of pulmonary lesions discontinued after drug use enabled us to diagnose "crack lung".^{2,6}

The treatment approach for crack lung primarily consists of the use of supplemental oxygen, bronchodilators,

supportive fluid treatment, and ventilatory support if required.¹ Administration of LMWH is necessary for the thromboembolism prophylaxis of COVID-19, as well as in the treatment of cocaine-induced in situ thrombosis.¹⁴ There were reports about steroid benefits in severe cases.⁴ However, steroid usage is controversial.¹⁵

In our COVID-19 treatment protocol, the use of corticosteroids was recommended for patients who needed oxygen support, which is why corticosteroids were used in this patient.³ Rapid clinical improvement may be associated with corticosteroid therapy and/or cessation of drug use.

Finally, there are no specific pathognomonic clinical, laboratory, or radiological findings for crack lung which can help for its discrimination from COVID-19 pneumonia or other pathologies such as pneumonia, cryptogenic organized pneumonia or BOOP, eosinophilic pneumonia, and cardiogenic pulmonary edema. As information about recreational drugs is poorly transferred, a structured approach to taking a medication history would be of utmost importance when this condition is among the differential diagnosis. When a ground-glass opacity pattern is seen at a chest CT scan, crack lung should also be taken into consideration for a differential diagnosis.

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REFERENCES

1. Forrester JM, Steele AW, Waldron JA, Parsons PE. Crack lung: an acute pulmonary syndrome with a spectrum of clinical and histopathologic findings. *Am Rev Respir Dis.* 1990;142(2):462-467. [\[CrossRef\]](#)
2. Almeida RR de, Zanetti G, Souza Jr AS, et al. Cocaine-induced pulmonary changes: HRCT findings. *J Bras Pneumol.* 2015;41(4):323-330. [\[CrossRef\]](#)
3. Republic of Turkey Ministry of Health. COVID-19 (SARS-CoV-2 infection) guide. Available at: <https://covid19.saglik.gov.tr/TR-66926/eriskin-hasta-tedavisi.html>. Accessed March 21, 2022.
4. Devlin RJ, Henry JA. Clinical review: major consequences of illicit drug consumption. *Crit Care.* 2008;12(1):202. [\[CrossRef\]](#)
5. Restrepo CS, Carrillo JA, Martínez S, Ojeda P, Rivera AL, Hatta A. Pulmonary complications from cocaine and cocaine-based substances: imaging manifestations. *RadioGraphics.* 2007;27(4):941-956. [\[CrossRef\]](#)
6. Mançano A, Marchiori E, Zanetti G, Escuissato DL, Duarte BC, Apolinário L de A. Complicações pulmonares após uso de crack: achados na tomografia computadorizada de alta resolução do tórax. *J Bras Pneumol.* 2008;34(5):323-327. [\[CrossRef\]](#)
7. Riley ED, Hsue PY, Vittinghoff E, et al. Higher prevalence of detectable troponin I among cocaine-users without known cardiovascular disease. *Drug Alcohol Depend.* 2017;172:88-93. [\[CrossRef\]](#)
8. Pateria P, de Boer B, MacQuillan G. Liver abnormalities in drug and substance abusers. *Best Pract Res Clin Gastroenterol.* 2013;27(4):577-596. [\[CrossRef\]](#)
9. Meng Q, Lima JA, Lai H, et al. Elevated C-reactive protein levels are associated with endothelial dysfunction in chronic cocaine users. *Int J Cardiol.* 2003;88(2-3):191-198. [\[CrossRef\]](#)
10. Jankowski MM, Ignatowska-Jankowska B, Glac W, Swiergiel AH. Cocaine administration increases CD4/CD8 lymphocyte ratio in peripheral blood despite lymphopenia and elevated corticosterone. *Int Immunopharmacol.* 2010;10(10):1229-1234. [\[CrossRef\]](#)
11. Ji P, Zhu J, Zhong Z, et al. Association of elevated inflammatory markers and severe COVID-19: a meta-analysis. *Medicine.* 2020;99(47):e23315. [\[CrossRef\]](#)
12. Lovas A, Ágoston Z, Késmárky K, Hankovszky P, Molnár Z. Extreme procalcitonin elevation without proven bacterial infection related to amphetamine abuse. *Case Rep Crit Care.* 2014;2014:179313. [\[CrossRef\]](#)
13. Kamat IS, Ramachandran V, Eswaran H, Guffey D, Musher DM. Procalcitonin to distinguish viral from bacterial pneumonia: a systematic review and meta-analysis. *Clin Infect Dis.* 2020;70(3):538-542. [\[CrossRef\]](#)
14. Sharma T, Kumar M, Rizkallah A, Cappelluti E, Padmanabhan P. Cocaine-induced thrombosis: review of predisposing factors, potential mechanisms, and clinical consequences with a striking case report. *Cureus.* 2019;11(5):e4700. [\[CrossRef\]](#)
15. Haim DY, Lippmann ML, Goldberg SK, Walkenstein MD. The pulmonary complications of crack cocaine. A comprehensive review. *Chest.* 1995;107(1):233-240. [\[CrossRef\]](#)