

IMAGES IN PULMONARY, CRITICAL CARE, SLEEP MEDICINE AND THE SCIENCES

Obstructive Bronchial Fibrin Cast Formation in COVID-19 Severe Respiratory Failure

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A 17-year-old female with a medical history significant only for obesity presented with approximately 1 week of viral symptoms and acute-onset shortness of breath. Diagnostic work-up revealed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, with associated severe coronavirus disease (COVID-19) pneumonia. Because of progressing acute hypoxemic respiratory failure, she was admitted directly to the ICU for mechanical ventilation and standard COVID-19 treatments available at the time (remdesivir, dexamethasone, tocilizumab, anakinra, and prophylactic enoxaparin). Admission chest computed tomography showed scattered foci of airway filling within areas of airspace disease in a patchy distribution (Figures 1A–1C). Despite 2 weeks of escalating support, the patient developed refractory hemodynamic instability resulting in cardiorespiratory failure and death. Examination of the lungs at autopsy showed evidence of numerous acute and focally organizing thrombi in the pulmonary artery distribution, as well as bronchial/bronchiolar casts (Figure 1D). The casts were present in a heterogenous distribution throughout small- and medium-sized airways. Histopathologic evaluation revealed the casts to be composed of fibrin and scattered inflammatory cells (Figures 1E and 1F). Lumen obstruction by casts was partial and incomplete. Obstructive fibrin airway cast formation, or plastic bronchitis, has been described in patients after Fontan procedure, sickle cell disease, influenza infection, severe asthma, and smoke and chemical inhalation injuries (1). The patient did not have any of these classically described risk factors. The exact contribution of the airway casts to the patient's demise is difficult to discern, but their contribution to the patient's overall hypoxia is likely important. This is the first report of airway fibrin cast obstruction in a patient with fatal severe COVID-19 pneumonia. Bronchial circulation dysfunction found in COVID-19 infection (2–5) may play a role in bronchial cast formation because of SARS-CoV-2. ■

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Author Contributions: J.L.B. and J.W.: acquisition of data or analysis and interpretation of data, drafting and revising the article, and direct involvement in patient care and management. L.A.V.: conception and design, acquisition of data or analysis and interpretation of data, and drafting and revising the article. C.G.: conception and design, acquisition of data or analysis and interpretation of data, drafting and revising the article, and direct involvement in patient care and management.

Am J Respir Crit Care Med Vol 207, Iss 3, pp 349–350, Feb 1, 2023

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Originally Published in Press as DOI: 10.1164/rccm.202201-0225IM on September 29, 2022

Internet address: www.atsjournals.org

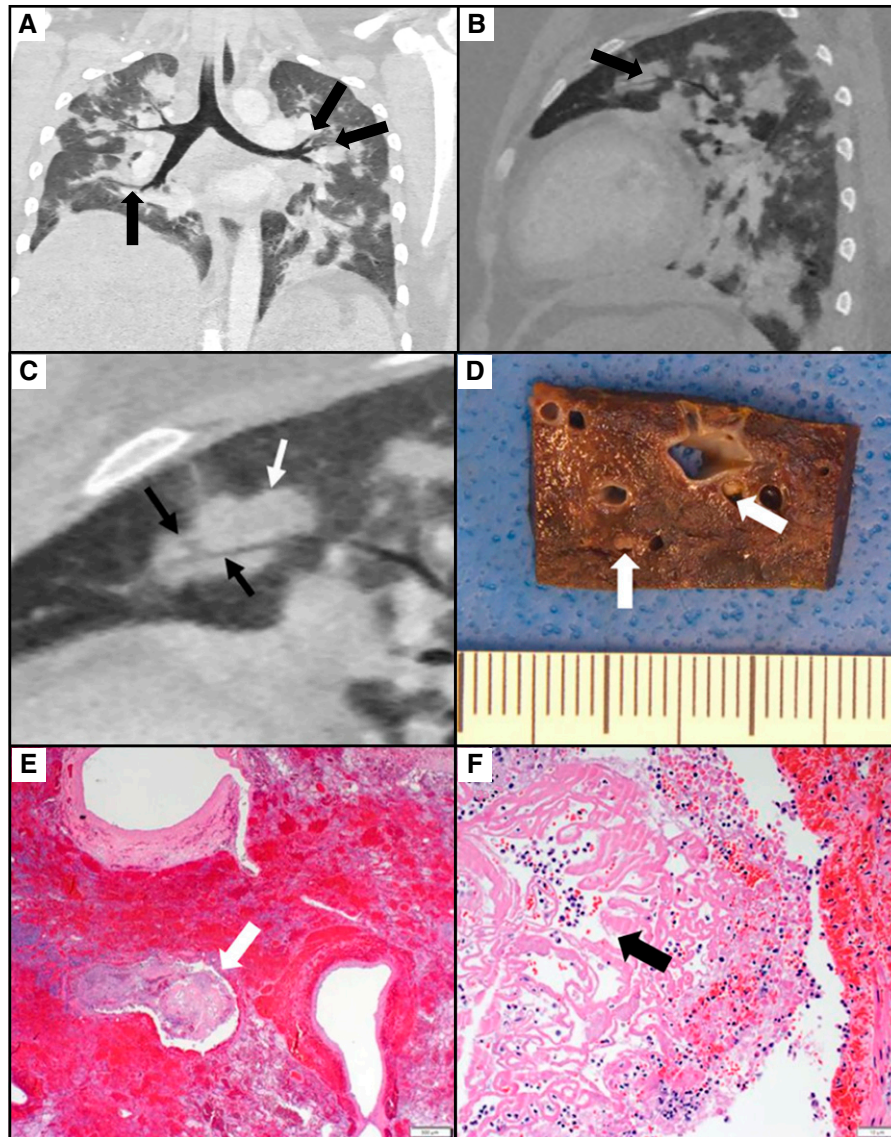


Figure 1. (A–C) Chest computed tomography with 3 mm (A) coronal and (B) sagittal minimum intensity projection reconstruction demonstrates areas of airway opacification (black arrows in A and B) within areas of airspace disease. (C) A higher magnification of the sagittal reconstruction of the left upper lobe in B, in which there is filling and mild expansion of the airway (black arrows) in a focal area of airspace disease (white arrow). (D) A similar-sized airway, as depicted in A, is shown in a gross photograph of lung tissue at autopsy, with partial obstruction by tan–yellow friable material (white arrow). (E) Micrograph of hematoxylin and eosin-stained section (20× magnification) showing the airway in B: a small airway with fibrin cast (white arrow). (F) Micrograph of hematoxylin and eosin-stained section (400× magnification) confirming the presence of bronchial cast in B and C and highlighting its components, including fibrin (black arrow) and inflammatory cells.

Author disclosures are available with the text of this article at www.atsjournals.org.

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