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# Bedside Mediastinotomy for Tension Pneumomediastinum With Tamponade in COVID-19



Andrew M. Fleming, MD,  
Benjamin R. Zambetti, MD, and  
Ganpat S. Valaulikar, MD

Department of Surgery, University of Tennessee Health Science Center, Memphis, Tennessee; and Division of Cardiothoracic Surgery, University of Tennessee Health Science Center, Memphis, Tennessee

Tension pneumomediastinum is a rare but life-threatening cause of tamponade. Mechanical ventilation is a described source of tension pneumomediastinum. Here, we present a case of a 72-year-old man who developed cardiovascular collapse from tension pneumomediastinum in the setting of coronavirus disease 2019–related acute respiratory distress syndrome. We successfully performed bedside mediastinotomy and mediastinal tube placement under local anesthetic to alleviate his hemodynamic instability. Bedside mediastinotomy can be used to relieve tension pneumomediastinum in this setting.

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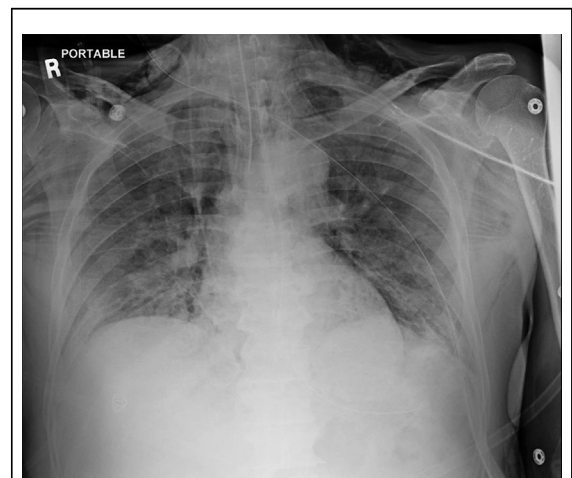
**P**neumomediastinum is the presence of extraluminal air within the mediastinum. Barotrauma-related pneumomediastinum has been described in the setting of positive-pressure ventilation and coronavirus disease 2019 (COVID-19). Tension pneumomediastinum is a rare cause of cardiac tamponade in which mediastinal air compresses cardiovascular structures. A variety of modalities have been described for mediastinal decompression.

A 72-year-old gentleman was transferred to our hospital with alcohol-induced pancreatitis and COVID-19. He was subsequently intubated for acute respiratory failure, which was worsened by acute respiratory distress syndrome and superimposed bacterial pneumonia. Our team was consulted for a new finding of pneumomediastinum on chest x-ray film (Figure 1). The source of the air was unknown. No pneumothorax was noted. The patient underwent bronchoscopy, which revealed no obvious tracheal injury or signs of airway trauma in the distal trachea or proximal main bronchi. The patient did not undergo investigation of the upper digestive

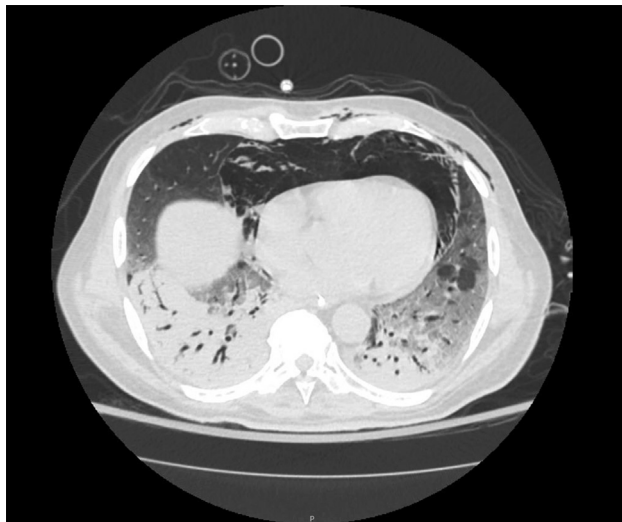
tract during his hospitalization, as there were no risk factors for esophageal injury. His pneumomediastinum was initially treated conservatively.

The patient then developed cardiovascular collapse. A computed tomography scan was obtained by the primary team, which revealed massive pneumomediastinum and anteroposterior compression of the heart (Figure 2). No pneumopericardium was noted. Subxiphoid aspiration of air via micropuncture needle was performed by the critical care team, and the patient's hemodynamics transiently improved. The patient subsequently required 3 rounds of direct cardioversion and was started on amiodarone for new onset atrial fibrillation. Given concern for ongoing tension pneumomediastinum with tamponade physiology, mediastinal decompression was indicated.

After donning personal protective equipment, we performed a left parasternal anterior mediastinotomy in the manner described for a Chamberlain procedure. This was performed at the bedside under local anesthetic without the use of a scope. An incision was made in the left third intercostal space just lateral to the sternum. We carried this dissection through the subcutaneous tissues and intercostal muscles. The pericardium was noted deep to our dissection and care was taken to proceed medially and superficially to this. We dissected bluntly into the anterior mediastinum and were met with an immediate rush of air. The patient's heart rate dropped from 151 beats/min to 80 beats/min, now in normal sinus rhythm, and the patient became normotensive. A 28F mediastinal tube was introduced into the mediastinum and placed to -20 suction via the chest drainage unit. A postoperative chest roentgenogram was ordered to



**FIGURE 1** Anteroposterior chest x-ray film revealing subcutaneous emphysema and pneumomediastinum.



**FIGURE 2** Computed tomography (CT) of the chest (axial plane) revealing pneumomediastinum with compression of cardiovascular structures.

evaluate tube placement. Postprocedurally, there was no air leak noted.

#### COMMENT

Both spontaneous and barotrauma-related pneumomediastinum in COVID-19 have been described.<sup>1,2</sup> This has been hypothesized to be an indicator of poor

prognosis and is attributed to the widespread alveolar injury seen in COVID-19 pneumonia. Likely causes in our case include airway instrumentation during intubation and positive-pressure ventilation in the setting of restrictive pulmonary disease. Authors have historically theorized the translocation of air from ruptured alveoli along the great vessels as a source of mediastinal air. This is known as the Macklin effect, first described by Macklin in 1939 and further characterized with computed tomography scans in more modern case series.<sup>3-5</sup>

Several methods of decompression for tension pneumomediastinum have been described, including transverse cervicotomy with Penrose drain placement, placement of bilateral chest tubes, repeated fluoroscopic-guided percutaneous pneumomediastinal decompressions, and thoracoscopic mediastinotomy.<sup>6-8</sup> Given the respiratory and hemodynamic instability of our patient, as well as the concern for coronavirus aerosolization, bedside mediastinotomy in the intensive care unit with negative pressure capabilities was performed. This was a safe and effective method for decompression in this setting.

This is a rare case of tension pneumomediastinum in the setting of COVID-19 acute respiratory distress syndrome with no obvious trauma. A modified Chamberlain procedure with mediastinal tube placement provided immediate resolution of the patient's cardiovascular instability. Bedside mediastinotomy can be used to relieve tension pneumomediastinum in this setting.

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