Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Visual Case Discussion

Spontaneous pneumothorax in COVID-19–A delayed complication

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1. Discussion

Pneumothorax is a known complication of mechanically ventilated patients[1] and has been seen in mechanically ventilated SARS-Cov-2 patients,[2] however this patient never received any positive pressure ventilation. Case reports describe young and old COVID-19 patients with pneumothorax.[1,3] Pneumothorax occurred in two patients about four weeks after symptom onset,[1,3] and contained large bullae similar to those found in our patient.

These findings warrant further investigation and reporting of pulmonary complications during and after recovery from COVID-19 infection. More research is needed to understand the incidence of pneumothorax among patients with COVID-19 infection, as well as the timeframe in which this is most likely to occur, and whether there are clinical characteristics that are associated with the development of this complication. As an increasing number of patients recover from COVID-19, some are returning to emergency departments with complications stemming from infection. Many of these patients are reporting new or worsening symptoms similar to their initial presentation. Emergency clinicians should remain vigilant for spontaneous pneumothorax as a potential delayed sequelae of COVID-19 infection, as prompt identification and treatment of pneumothorax have considerable impact on morbidity and mortality.

2. Visual case discussion

In early April 2020, a 25-year-old man with asthma presented to the emergency department with one week of fever, myalgias, and cough. He denied history of smoking, vaping or illicit drug use. He was dyspneic with an oxygen saturation of 86% breathing room air which improved to 96% with application of 15 liters of non-rebreather. He was febrile to 38.9 °C with a heart rate (HR) of 121 beats per minute and a respiratory rate (RR) of 26 breaths per minute. Laboratory tests demonstrated leukocytosis at 16,100 per microliter with 4% lymphocytes, c-reactive protein (CRP) 238 mg per liter, lactate dehydrogenase (LDH) 424 units per liter, aspartate transaminase (AST) 41 units per liter, and SARS-CoV-2 PCR was positive. His-chest x-ray was consistent with viral pneumonia (Fig. 1A), and he was admitted for hypoxia. During his hospitalization, he received 40 mg of subcutaneous enoxaparin daily and completed a five day course of ceftriaxone, doxycycline, hydroxychloroquine and zinc. He was encouraged to use an incentive spirometer and perform self proning. After 13 days of hospitalization, he tolerated room air and was discharged with a continued ten day supply of enoxaparin. He never required intubation or positive pressure ventilation.

24 days after his initial presentation, he returned to the emergency department with one day of acute onset, pleuritic, right sided chest pain. He was comfortable and reported prior improvement of his symptoms. He was afebrile and normotensive with an oxygen saturation of 94% on room air, heart rate of 99 beats per minute, and respiratory rate of 22 breaths per minute. Laboratory values improved from prior admission (WBC 11,100 per microliter with 23% lymphocytes, CRP 11 mg per liter, LDH 256 units per liter, AST 19 units per liter) and SARS-CoV-2 PCR was negative. A chest x-ray revealed a large, right sided pneumothorax (Fig. 1B). An 8 French pigtail catheter was placed, and a repeat x-ray demonstrated resolution of the pneumothorax. On subsequent chest computed tomography (CT), the pigtail catheter had decompressed the right pleura, however there was a large posterior bulla containing a small amount of fluid (Fig. 2A). On the left, there was a moderate-sized fluid-containing bulla along the major fissure and a small pneumothorax (Fig. 2B). The patient was admitted on room air with stable vital signs.

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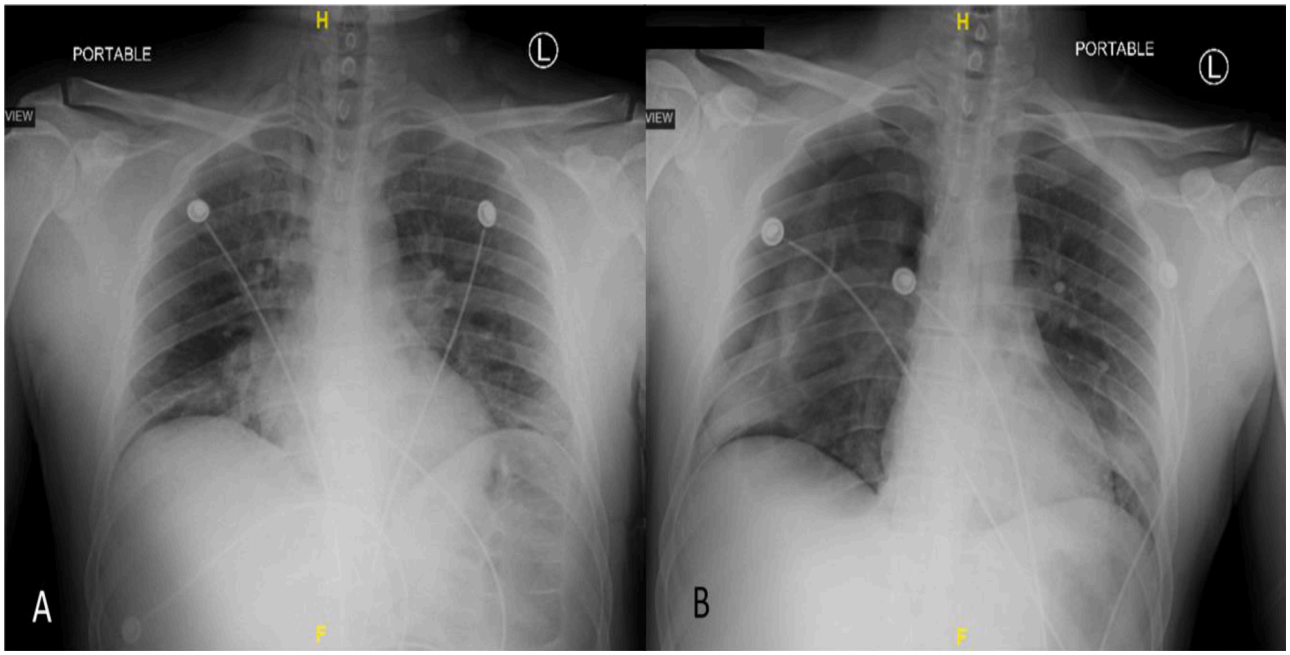

Fig. 1. A: Chest x-ray at initial presentation showing hazy bibasilar opacities with increased interstitial lung markings suggestive of viral pneumonia **Fig. 1B:** Chest x-ray at follow up showing moderate right sided pneumothorax

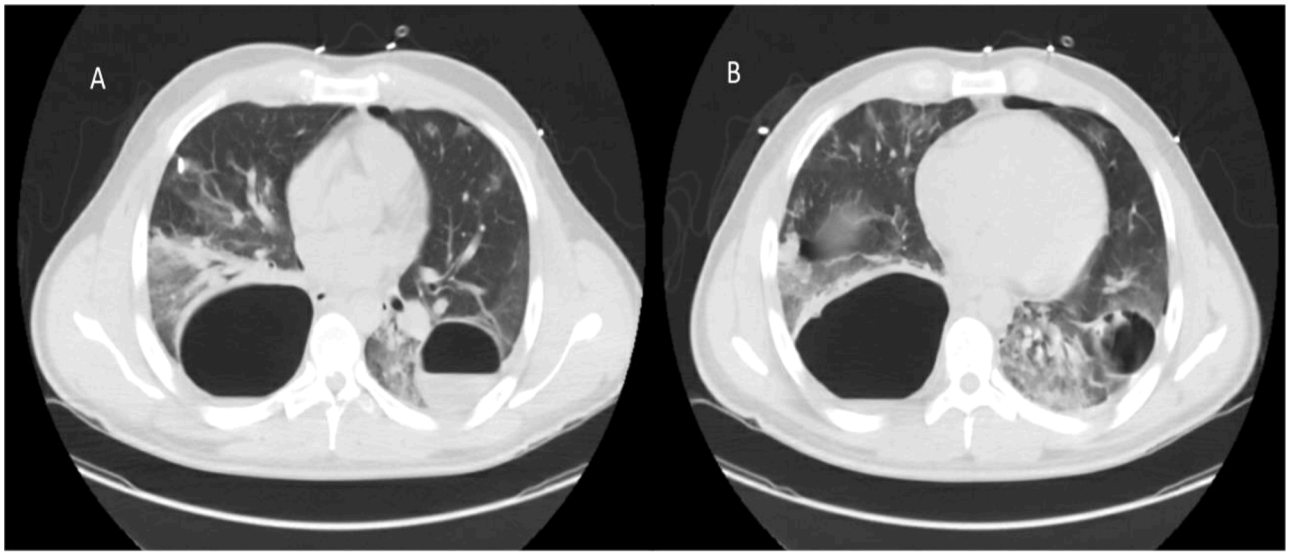

Fig. 2. A: Chest CT following right chest tube placement showing decompression of the pleura with large posterior fluid containing bulla. **Fig. 2B:** Chest CT showing left sided fluid containing bullae along the major fissure with small pneumothorax

3. Questions and answers with a brief rationale

Question 1

Which of the following is the best location for chest tube placement in a patient with spontaneous pneumothorax?

a Above the 7th rib in the anterior axillary line
b Below the 4th rib in the mid axillary line
c Above the 6th rib in the posterior axillary line
d Below the 3rd rib in the anterior axillary line
e Above the 5th rib in the anterior axillary line

Answer: E

Explanation: The ideal site for chest tube placement is in the "triangle of safety" delineated anteriorly by the lateral border of the pectoralis major muscle, posteriorly by the mid axillary line (or anterior border of the latissimus dorsi muscle), and inferiorly by the horizontal level of the nipple which typically correspond to the space between the 4th and 5th rib. It is crucial to insert the tube just superior to the rib in order minimize risk of damage to the neurovascular bundle which runs along the inferior border of each rib.

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Question 2

True or False: Patients with a small primary spontaneous pneumothorax (<15% of hemithorax) who are treated conservatively should be placed on supplemental oxygen.

Answer: True

Explanation: Air that has leaked into the pleural space is resorbed by the pleura at a rate of about 2% per day in patients breathing room air. This rate is accelerated by a factor of 4 in patients breathing supplemental oxygen.

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Declaration of Competing Interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property. We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs. We confirm that we have provided a current, correct email address which is accessible by the Corresponding Author and which has been configured to accept email from esg83@njms.rutgers.edu

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