



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.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



A rare case of Pneumopericardium secondary to COVID-19

Kamal Kant Sahu^{a,*}, Ajay Kumar Mishra^a, Yaron Goldman^b

^a Department of Internal Medicine, Saint Vincent Hospital, Worcester, 01608, Massachusetts, United States

^b Division of pulmonary and critical care, Department of Internal Medicine, Reliant medical group, Worcester, 01608, Massachusetts, United States



ARTICLE INFO

Article History:

Received 15 June 2020

Revised 29 July 2020

Accepted 20 August 2020

Available online 21 August 2020

ABSTRACT

Coronavirus disease 2019 (COVID-19) has posed an unparalleled challenge to the medical communities and patients worldwide. This is the third coronavirus pandemic of the decade and worst so far in terms of the number of patients affected and related deaths. Although COVID-19 is a systemic illness, the respiratory system is obvious to be involved first, and takes most of the brunt of SARS-CoV-2 infection. Common upper and lower respiratory presentations could be sore throat, consolidation, ground glass opacities, and acute respiratory distress syndrome in severe cases. Pneumothorax, pneumomediastinum are uncommon clinical findings in association with COVID-19. We hereby report a rare case of spontaneous pneumomediastinum with a synchronous pneumopericardium.

© 2020 Elsevier Inc. All rights reserved.

Case description

This 61-year-old male, nonsmoker with past medical history significant for hypertension presented to the hospital with fever, and short of breath for one week. At presentation to emergency room, his vitals were: Temperature 100.8 F, pulse 90/min, blood pressure 147/80 mmHg, respiratory rate 19/min, SpO₂ 96% on 2 liters O₂ through nasal canula. Chest X ray showed bilateral peripheral patchy airspace opacities (Fig. 1A). Suspecting COVID-19 pneumonia, he was put in airborne and contact precautions. His laboratory tests showed a C-reactive protein concentration of 136 mg/L (normal range 0.00–4.9 mg/L), D-dimer value-2.90 mg/L (<0.5 mg/L), serum ferritin-2539 ng/ml (30–400). Complete blood count showed elevated leukocytes (11,400 cells per μ L [normal range 3900–1100 per μ L]), lymphocyte count 900 [700–4500 cells per μ L]). His nasopharyngeal swab for RT PCR for COVID-19 was sent which came back positive. Patient gradually started deteriorating with worsening hypoxia, increased work of breathing and requiring high level of oxygen. He was given remdesivir intravenously for 5 days and one unit of plasma therapy. The patient was also tested for other respiratory viruses like influenza A and B viruses, respiratory syncytial virus which were negative.

On day 7 of hospital stay, patient started worsening acutely with increase work of breathing. He was switched from high flow to BiPAP to support for his worsening breathing efforts and hypoxia. A repeat chest X ray showed pneumomediastinum and pneumopericardium (Fig. 1B). Patient continued to have worsening breathlessness, and some chest discomfort. Clinical Examination also suggested evidence

of subcutaneous emphysema. A decision was made to intubate the patient and a repeat chest X ray showed mild resolution of pneumomediastinum (Fig. 1C). Patient subsequently had followed up imaging studies which showed resolution of the pneumomediastinum and pneumopericardium (Fig. 1D). He received tocilizumab therapy (8 mg/kg body weight), however soon succumbed to illness.

Discussion

Most of the patients presenting with COVID-19 have a mild disease.¹ Only small percentage of patients present with severe form with hypoxia, dyspnea, and >50% lung involvement. A further smaller percentage progress to advanced illness, with cytokine storm syndrome, acute respiratory distress syndrome and death.²

Wali et al recently reported 5 cases of pneumomediastinum following intubation in COVID-19.³ The development of pneumomediastinum from the time of tracheal intubation ranged from 4 hours to 14 days. Four patients also had subcutaneous emphysema. Our patient also had developed subcutaneous emphysema along with pneumopericardium and pneumomediastinum. Wali et al suggested the increased risk of alveolar damage, tracheobronchial injury, and higher ventilation pressures as the possible mechanisms of development of pneumomediastinum. Three out of the five patients reported by Wali et al survived. Unlike Wali et al's case, our patient developed spontaneous pneumomediastinum and pneumopericardium without any direct trauma like intubation. The possible explanation of spontaneous pneumomediastinum can be explained by Macklin's phenomenon.⁴ This phenomenon is defined as the tracking of alveolar air from ruptured alveoli along peri-bronchial vascular sheaths towards the mediastinum and pericardium. Wang et al reported a single patient who developed combination of pulmonary pathologies with

* Corresponding author.

E-mail address: drkksahu85@gmail.com (K.K. Sahu).

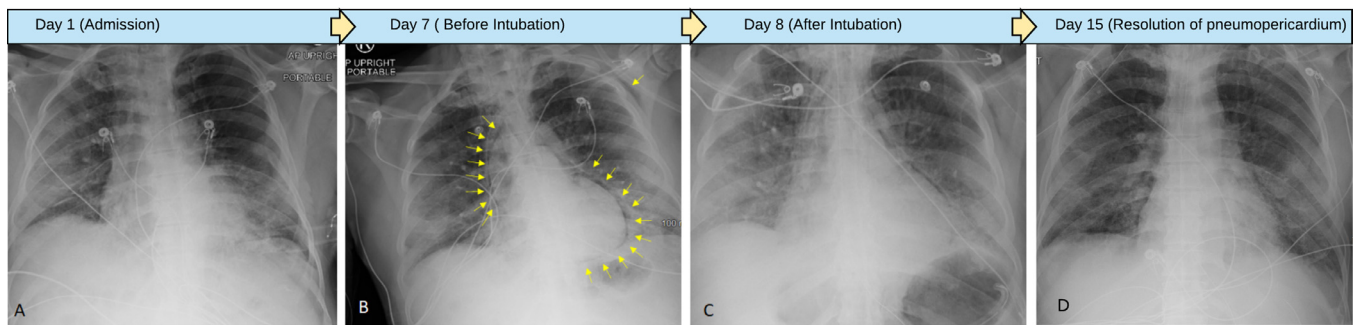


Fig. 1. A. Chest X ray showing bilateral peripheral patchy airspace opacities
 Fig. 1B. Chest X ray showing new air tracking along the pericardium and subcutaneous tissue
 Fig. 1C. Chest X ray (post intubation) showing mild resolution of the pneumopericardium.
 Fig. 1D. Chest X ray at follow up showing resolution of pneumomediastinum and pneumopericardium.

spontaneous pneumothorax, pneumomediastinum and subcutaneous emphysema at the same time.⁵

Spontaneous pneumopericardium is rarer than pneumomediastinum and so far, has not been reported in COVID-19. In past, individuals report of pneumopericardium after Whipple Procedure, thymic surgery, and lung transplantation.^{6–8} Drug abusers are exposed to variety of complications related to cardiovascular and pulmonary system.^{9,10} An interesting case of spontaneous pneumopericardium secondary to cannabinoid hyperemesis syndrome was reported by Hansen et al.¹¹

Conclusion

Our case endorses for the fact that any acute worsening in the clinical picture of the patient with rapid oxygen desaturation in a COVID-19 patient should be thoroughly evaluated and possibility of spontaneous pneumothorax, pneumomediastinum, and pneumopericardium should be considered in addition to other common differentials like worsening pneumonia, flash pulmonary edema, and cardiac tamponade.^{12–14}

Ethical statement

The article doesn't contain the participation of any human being and animal.

Verification

All authors have seen the manuscript and agree to the content and data. All the authors played a significant role in the paper.

Declaration of Competing Interest

Authors have no conflicts of interest to declare.

References

- Sahu K, Kumar R. Current perspective on pandemic of COVID-19 in the United States. *J Fam Med Prim Care*. 2020 May 20;9(4):1784. [Internet]. 2020 [cited Available from; <http://www.jfmpr.com/text.asp?2020/9/4/1784/283431>].
- Lal A, Mishra AK, Sahu KK. CT chest findings in coronavirus disease-19 (COVID-19). *J Formos Med Assoc*. 2020.
- Wali A, Rizzo V, Bille A, Routledge T, Chambers A. Pneumomediastinum following intubation in COVID-19 patients: a case series [published online ahead of print, 2020 May 6]. *Anaesthesia*. 2020. <https://doi.org/10.1111/anae.15113>.
- Wintermark M, Schnyder P. The Macklin effect: a frequent etiology for pneumomediastinum in severe blunt chest trauma. *Chest*. 2001;120(2):543–547.
- Wang W, Gao R, Zheng Y, Jiang L. COVID-19 with spontaneous pneumothorax, pneumomediastinum and subcutaneous emphysema [published online ahead of print, 2020 Apr 25]. *J Travel Med*. 2020;27(5).
- Stassen J, Frederiks P. Late onset pneumopericardium after lung transplantation [published online ahead of print, 2020 Apr 21]. *Acta Cardiol*. 2020;1–2. <https://doi.org/10.1080/00015385.2020.1756054>.
- Vrakopoulou GZ, Michalopoulou V, Kormentza CE, et al. Pneumomediastinum and pneumopericardium 11 days after Whipple procedure. A case report and review of the literature [published online ahead of print, 2020 May 8]. *Int J Surg Case Rep*. 2020;71:27–29. <https://doi.org/10.1016/j.ijscr.2020.04.012>.
- Yamamoto K, Sawada T, Kuwahara M, Yamamoto S. Kyobu Geka. 2020;73(2):124–126.
- Sahu KK, Mishra AK, Naraghi L. Erythema ab igne as a complication of cannabinoid hyperemesis syndrome. *BMJ Case Rep*. 2019;12(1) e227836. <https://doi.org/10.1136/bcr-2018-227836>. Published 2019 Jan 29.
- Sahu KK, Tsitsilianos N, Mishra AK, Suramaethakul N, Abraham G. Neck abscess secondary to pocket shot intravenous drug abuse. *BMJ Case Rep*. 2020;13(3) e234033. <https://doi.org/10.1136/bcr-2019-234033>. Published 2020 Mar 18.
- Hansen G.M. Asymptomatic pneumopericardium in a young male cannabis smoker. *Ugeskr Laeger*. 2020;182(12):V12190719.
- Lal A, Mishra AK, Sahu KK, Noreldin M. Spontaneous pneumomediastinum: rare complication of tracheomalacia. *Arch Bronconeumol*. 2020;56(3):185–186.
- Sahu KK, Sherif AA, Mishra AK, Vyas S, George SV. Perineal ulcer: a rare cause of extensive subcutaneous emphysema. *BMJ Case Rep*. 2019;12(4) e229918. <https://doi.org/10.1136/bcr-2019-229918>. Published 2019 Apr 20.
- Dalia T, Masoomi R, Sahu KK, Gupta K. Cardiac tamponade causing severe reversible hyponatraemia. *BMJ Case Rep*. 2018;2018:bcr2017222949. Published 2018 Jan 3.