Case report

Rapidly developing large pneumatocele and spontaneous pneumothorax in SARS-CoV-2 infection

Raghavendra R. Sanivarapu, MD a,⁎, Kristen Farraj, MD b, Najia Sayedy, MD a, Fatima Anjum, MD a

a Department of Pulmonary & Critical Care Medicine, Nassau University Medical Center, East Meadow, NY, United States
b Department of Internal Medicine, Nassau University Medical Center, East Meadow, NY, United States

ARTICLE INFO

Keywords:
SARS-CoV-2
COVID-19
Pneumatocele
Pneumothorax
ARDS

ABSTRACT

Coronavirus disease 2019 (COVID-19) has spread to more than 70 countries around the world since its discovery in 2019. More than 2.5 million cases and more than 130,000 deaths have been reported in the United States alone. The common radiological presentation in this disease is noted to be the presence of ground glass opacities and/or consolidations. We report a case of 40-year-old male admitted for COVID-19 and rapidly deteriorated into severe acute respiratory distress syndrome requiring intubation and mechanical ventilation with no prior history of smoking or lung disease. The patient had normal imaging 3 days prior to admission to the hospital and rapidly developed a large pneumatocele with pneumothorax requiring chest tube placement that later on resolved. This is a unique radiologic finding in COVID-19 and likely related to severe inflammation secondary to SARS-CoV-2 infection.

1. Background

The clinical syndrome caused by novel corona virus is termed as severe acute respiratory syndrome coronavirus-2 (SARS-CoV2) and the disease is called as coronavirus disease-19 (COVID-19) [1]. The radiographic findings of COVID-19 patients studied in 69 patients showed about 31% presenting with normal chest x-ray and rest presenting with consolidations or ground glass opacities (GGO) [2]. A systematic review by Bao et al. showed the CT-findings in COVID-19 can present as GGO (83%), GGO with consolidation (58%), pleural thickening (52%), interlobular septal thickening (48%), and air bronchograms (46%) [3]. A retrospective analysis of CT-findings in COVID-19 patients from China by Wu et al. reported presence of pneumatocele in only two cases; however no images are available [4]. Here we present the first case of SARS-CoV-2 infection causing pneumatocele formation and spontaneous pneumothorax in the USA.

1.1. Case presentation

A 40-year-old male with no medical history presented to the emergency room in April of 2020, during the peak of COVID-19 infection in NY with shortness of breath, dry cough, and body aches for 2 weeks duration. On admission, he was hemodynamically stable and afebrile. His chest X-ray showed diffuse reticular markings and bilateral mid-lung field airspace opacities concerning for atypical multifocal pneumonia (Fig. 1). He tested positive for SARS-CoV-2 RNA. He was discharged a day later on hydroxychloroquine. Three days post discharge he got readmitted with acute onset shortness of breath and right-sided chest pain which worsened with inspiration. His vitals were blood pressure: 125/74 mmHg, heart rate: 160 bpm, and was tachypneic at 35 breaths per minute. On physical examination, the patient was in respiratory distress with shallow respirations with decreased breath sounds in bilateral lower lung fields.

A repeat chest x-ray showed moderate to large sized right-sided pneumothorax with right middle lobe pneumatocele and worsening bilateral airspace opacities (Fig. 2). A right-sided pig tail catheter was placed. His condition worsened requiring intubation and mechanical ventilation. A CT-thorax was performed showing multilobar bilateral ground-glass opacities with bilateral lower lobe consolidations and a 7.3 × 6.6 cm pneumatocele is noted in mid right posterior hemi thorax (Fig. 3). His hospital course was complicated with acute respiratory distress syndrome requiring proning. The patient received azithromycin, hydroxychloroquine, tocilizumab, steroids, and convalescent plasma as part of COVID-19 treatment.

⁎ Corresponding author.
E-mail address: rsanivar@numc.edu (R.R. Sanivarapu).

https://doi.org/10.1016/j.rmcr.2020.101303
Received 17 September 2020; Received in revised form 18 November 2020; Accepted 19 November 2020
Available online 2 December 2020
2213-0071/© 2020 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license.
1.2. Outcome & follow-up

The patient eventually was transitioned to tracheostomy after prolonged intubation. His repeat chest x-ray 2 months later showed near complete resolution of pneumatocele (Fig. 4). He was finally decannulated and discharged home.

2. Discussion

SARS-CoV-2 infection is known to cause a cytokine storm causing intense inflammatory reaction [5]. The most common radiological findings in COVID-19 are the presence of ground glass opacities. Pneumatoceles are air-filled, thin-walled cystic lesions in lung that commonly develop after a severe infection like empyema [6]. The common noninfectious etiologies include trauma, positive pressure ventilation and hydrocarbon ingestion. The inflammatory reaction causes obstruction and dilation of bronchi which ruptures causing air-filled cysts [7]. The pneumatocele in some instances can dissect through the pleural membrane and cause pneumothorax [8]. Imaging findings of thin-walled cyst on chest X-ray usually appear 5–6 days after infectious process. CT scan is usually performed and helps to differentiate an abscess. The imaging findings in COVID-19 pneumonia rarely showed the

Fig. 1. Chest X-ray on first admission showing diffuse reticular markings with bilateral airspace opacities.

Fig. 2. Chest X-ray on second admission showing moderate to large sized right sided pneumothorax with right middle lobe pneumatocele and worsening bilateral airspace opacities (on left) and expanded lung post pig tail catheter placement (on right).

Fig. 3. CT thorax showing multi focal bilateral ground-glass opacities and a 7.3 × 6.6 cm pneumatocele in mid right posterior hemithorax in axial view (on left) and coronal view (on right).
presence of pneumatocele. The treatment is usually focused on controlling the infection, in rare cases of tension pneumatocele a percutaneous drainage is performed [9]. In our case the pneumatocele resorbed once the inflammation subsided and did not require any surgical intervention.

Declaration of competing interest

Are there any relevant conflicts of interest? NO.

Relevant financial activities outside submitted work: None.

No other relationships/conditions/circumstances that present a potential conflict of interest.

All authors read the manuscript and approved for submission.

References

[1] World Health Organization, Director-General’s remarks at the media briefing on 2019-nCoV on 11 February. https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020, 2020. (Accessed 12 February 2020).
[2] H.Y.F. Wong, H.Y.S. Lam, A.H. Fong, et al., Frequency and distribution of chest radiographic findings in COVID-19 positive patients [published online ahead of print, 2019 Mar 27], Radiology (2019) 201160, https://doi.org/10.1148/radiol.2020201160.
[3] C. Bao, X. Liu, H. Zhang, Y. Li, J. Liu, Coronavirus disease 2019 (COVID-19) CT findings: a systematic review and meta-analysis, J. Am. Coll. Radiol. 17 (6) (2020) 701–709, https://doi.org/10.1016/j.jacr.2020.03.006.
[4] J. Wu, L.C. Feng, X.Y. Xian, et al., [Novel coronavirus pneumonia (COVID-19) CT distribution and sign features]. Zhonghua jie he he hu xi za zhi = Zhonghua Jiehe he Huxi Zazhi, Chinese Journal of Tuberculosis and Respiratory Diseases 43 (4) (2020 Apr) 321–326, https://doi.org/10.3766/cma.j.cn112147-20200217-00106.
[5] C. Huang, Y. Wang, X. Li, et al., Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China [published correction appears in Lancet. 2020 Jan 30:], Lancet 395 (10223) (2020) 497–506, https://doi.org/10.1016/S0140-6736(20)30183-5.
[6] V. Kunyoshi, D.C. Catanee, A.J. Catanee, Complicated pneumonias with empyema and/or pneumatocele in children, Pediatr. Surg. Int. 22 (2) (2006) 186–195, https://doi.org/10.1007/s00383-005-1620-5.
[7] G.F. Boisset, Subpleural emphysema complicating staphylococcal and other pneumonias, J. Pediatr. 81 (2) (1972 Aug) 259–266.
[8] I. Amitai, P. Mogle, S. Godfrey, I. Aviad, Pneumatocele in infants and children. Report of 12 cases, Clin. Pediatr. 22 (6) (1983) 420–422, https://doi.org/10.1177/000992288302200605.
[9] M.K. Zuhdi, R.M. Spear, H.M. Worthen, B.M. Peterson, Percutaneous catheter drainage of tension pneumatocele, secondarily infected pneumatocele, and lung abscess in children, Crit. Care Med. 24 (2) (1996 Feb) 330–333.