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COVID-19 with spontaneous pneumothorax, pneumomediastinum, and subcutaneous emphysema in the intensive care unit: Two case reports

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ABSTRACT

Real-Time-reverse-transcription-Polymerase-Chain-Reaction from nasopharyngeal swabs and chest computed tomography (CT) depicting typically bilateral ground-glass opacities with a peripheral and/or posterior distribution are mandatory in the diagnosis of COVID-19. COVID-19 pneumonia may present though with atypical features such as pleural and pericardial effusions, lymphadenopathy, cavitations, and CT halo sign. In these two case-reports, COVID-19 presented as pneumothorax, pneumomediastinum and subcutaneous emphysema in critically ill patients. These disorders may require treatment or can be even self-limiting. Clinicians should be aware of their potential effects on the cardiorespiratory status of critically ill COVID-19 patients. Finally, pneumothorax can be promptly diagnosed by means of lung ultrasound. Although operator dependent, lung ultrasound is a useful bedside diagnostic tool that could alleviate the risk of cross-infection related to COVID-19 patient transport.

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Introduction

In December 2019 in Wuhan city, China, a novel coronavirus was identified and subsequently named the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) [1]. Since then SARS-CoV-2 disease (COVID-19) has been linked to over 1.100.000 deaths worldwide [2–4]. COVID-19 symptoms include fever, sore throat, fatigue, anemia, cough, shortness of breath, abdominal pain, and myalgias. Diagnosis is confirmed using nasopharyngeal swabs and real-time-reverse-transcription-polymerase-chain-reaction (RT-PCR) [5–7]. In terms of imaging, chest computed tomography (CT) findings include ground-glass opacities with a peripheral and/or posterior distribution and mainly involving the lower lobes, and variable infiltrates and consolidations [8–10]. Pleural and pericardial effusions, lymphadenopathy, cavitations, and CT halo sign were less commonly observed [11]. COVID-19 was previously associated with spontaneous pneumothorax, pneumomediastinum and subcutaneous emphysema [12–16]. We present two critically ill COVID-19 male patients: the first case with pneumothorax/pneumomediastinum and subcutaneous emphysema, while on mechanical ventilation, and the second case with the same findings, while on high-flow nasal cannula (HFNC).

Abbreviations: SARS-CoV-2 disease, COVID-19; RT-PCR, Real-Time-reverse-transcription-Polymerase-Chain-Reaction; CT, computed tomography; US, ultrasound; ED, emergency department; ICU, intensive care unit; ARDS, acute respiratory distress syndrome; MV, mechanical ventilation; PEEP, positive end-expiratory pressure; HFNC, high flow nasal cannula; SpO2, saturation of peripheral oxygen; PaO2/FIO2, partial arterial pressure of oxygen to fractional inspired concentration of oxygen; CRS, cytokine release syndrome.

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Case reports

Case 1

A fifty-three year-old previous healthy male was admitted to the intensive care unit (ICU) with COVID-19 pneumonia. The patient was diagnosed in the emergency department (ED) where he presented with recent onset fever (38.5 °C), dry cough, altered level of consciousness and chest pain a few days after being in contact with a recovered COVID-19 case. Throat swab RT-PCR assay confirmed the diagnosis [5–7]. His heart rate and respiration rate were 119 and 32 minute, respectively. Blood pressure was 96/70 mmHg and arterial oxygen saturation (SpO2) was 73%. The patient was intubated in the ED and his ratio of partial arterial pressure of oxygen to fractional inspired concentration of oxygen (PaO2/FiO2) was 170 post-intubation. Baseline laboratory examinations were unremarkable apart from lymphocytopenia (0.71 × 10^9/L, normal: 1.1–3.2 × 10^9/L), and increased serum C-reactive protein (CRP) 75.1 mg/liter, normal: 0–7 mg/L, lactate dehydrogenase (445 units/liter, normal: 100–190 units/L), and ferritin (802 ng/mL, normal: 23–336 ng/mL). Upon ICU admission, he received acute respiratory distress syndrome (ARDS)-net mechanical ventilation (MV) [tidal volume: 6 mL/kg and positive-end-expiratory-pressure (PEEP) of 13 cm H2O] and was placed in the prone position, but deteriorating further to a PaO2/FiO2 ratio of 150. On day-2 he became hemodynamically unstable necessitating noradrenaline administration (0.5 mcg/kg/ min). On physical examination he had neck subcutaneous emphysema and his chest X-ray, which was complemented by lung ultrasound (US), revealed right sided pneumothorax, pneumomediastinum and subcutaneous emphysema. A chest drain was placed bedside (Fig. 1). Subsequently, his oxygenation markedly improved (PaO2/FiO2: 230). Also, he received antiviral therapy (lopinavir/ritonavir: 400/100 mg twice daily for two weeks), moxifloxacin (400 mg once daily for five days), dexamethasone 6 mg intravenously that was given for two days (discontinued upon the discovery of pneumothorax and pneumomediastinum), prophylactic anticoagulation and supportive ICU care. He continued to improve and was gradually weaned from MV; while the chest drain was removed on day-10. He was discharged from the ICU on day-15. RT-PCR test and microbiology were negative on day-20. All work-up for systemic and other viral diseases was negative. He was discharged to home isolation in good condition on day-27. Informed consent was obtained from the patient for this case report.

Case 2

A sixty-year-old male diabetic and hypertensive presented to the ED with recent onset anosmia, myalgias, headache, persistent cough, and shortness of breath. Throat swab RT-PCR confirmed COVID-19. His heart rate and respiration rate were 114 and 27 per minute, respectively. Blood pressure was 112/65 mmHg. Baseline laboratory examinations were within normal apart from lymphocytopenia (0.85 × 10^9/L, normal: 1.1–3.2 × 10^9/L), and increased C-reactive protein [CRP] 62.2 mg/L, normal: 0–7 mg/L. He was admitted to the ICU with an arterial peripheral oxygen saturation (SpO2) of 72; thus, he was started on HFNC (flow: 60 L/min, fraction of inspired oxygen 40%) and prone. His PaO2/FiO2 ratio improved temporarily to 290. However, he subsequently deteriorated (PaO2/FiO2 ratio: 160) and thus was intubated. Post-intubation chest CT scan showed bilateral pneumothoraces, subcutaneous emphysema and pneumomediastinum along with bilateral patchy ground-glass opacities with peripheral distribution (Fig. 1). He received intravenously piperacillin–tazobactam (4.5 g/8 h) for ten days along with empiric antiviral therapy (lopinavir/ritonavir: 400/100 mg twice daily for two weeks), prophylactic anticoagulation and supportive ICU care. Conservative MV strategy with low tidal volumes and PEEP of 8–10 cm H2O was applied and his oxygenation improved gradually. The patient made an uneventful recovery and was extubated on day-14. RT-PCR test and microbiology were negative on day-20. All work-up for systemic and other viral diseases was negative. He was discharged to home isolation in good condition on day-31. Informed consent was obtained by the patient for this case report.

Discussion

Although the majority of COVID-19 patients are asymptomatic or exhibit mild symptoms, a minority can develop life-threatening disease characterized by ARDS, multi-system organ failure, cytokine release syndrome (CRS), and thromboem-
mitigating

Contributions

A.

COVID-19 compromise

A.

Our cases showed that pneumonia, pneumomediastinum, and subcutaneous emphysema can contribute to the profound hypoxia in critically ill COVID-19 patients. These rare features of COVID-19 pneumonia were diagnosed by portable chest X-ray, lung US, and CT scan. Lung US is a useful bedside diagnostic tool that could be used in the monitoring of severe COVID-19 pneumonia, mitigating thus the risk of cross-infection related to the transportation of critically ill patients to the radiology department.

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Competing interests

None declared.

Ethical approval

Not required.

Contributions

AA, AB, SAA, ZAM, and PGB contributed to the study conception and design, and drafted the initial version of the manuscript. Data collection and analysis were performed by AB, GB, and HB. SAA, ZAM, and DK edited the final version of the manuscript. All authors drafted equally, read, and approved the final version of the manuscript.

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