Brief Report

Severe Pneumonia Due to SARS-CoV-2 and Respiratory Syncytial Virus Infection: A Case Report

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Introduction

A kind of pneumonia caused by 2019 novel coronavirus (SARS-CoV-2) first reported to emerge in Huanan Seafood Wholesale Market of Wuhan, Hubei Province, in December 2019; the disease caused by SARS-CoV-2 was named coronavirus disease (COVID-19) by the World Health Organization. It was classified as a class B infectious disease and was managed as a class A infectious disease in China in January 2020, as COVID-19 is highly contagious with a certain mortality rate.[1] China has implemented infection control measures strictly, isolated the confirmed and suspected cases, and treated them according to international standards, constantly updated the diagnosis and treatment process, and carried out public education.[2]

So far, more than 200 000 cases of COVID-19 have been confirmed, and more than 8000 people have lost their lives, and it has been spreading in many countries now.[3,4] Nevertheless, details of children, younger than age 1 year, who suffered from severe pneumonia induced by SARS-CoV-2 infection and respiratory syncytial virus (RSV) has rarely been reported.[5] Thus, a patient with COVID-19 and also infected RSV, an extremely rare case, has been report in this study.

Case Report

A 2-month 21-day Chinese boy, born on November 13, 2019, was admitted to the Pediatric Intensive Care Unit (PICU) of Maternal and Child Health Hospital of Hubei Province (Women and Children's Hospital of Hubei Province), Wuhan, in China, on February 3, 2020. He presented cough and wheeze for 3 days, symptom with dyspnea in the past 12 hours, but not any other discomfort such as diarrhea, nausea, and vomiting. He had been treated with oral Bairui keli (half a pack, Tid [thrice a day]) for 2 days, which is a kind of Chinese patent medicine used for cold, before admission, but the symptoms had not significantly improved. Then, he was brought to the emergency room by his mother.

The boy's father, who had fever and cough since 3 days ago, was treated at another designated hospital for suspected COVID-19. Furthermore, the chest computed tomography (CT) scan report of his father, detected in another designated hospital, showed ground glass opacities in his lung, indicating the possibility of viral pneumonia. The boy's mother had no fever and cough, and there was no other family members living with them. In addition, the patient's family community is about 15 km away from the Huanan Seafood Wholesale Market in Wuhan, and there was no family history of contact with the Huanan Seafood Wholesale Market. However, 5 people in the community where the patient lived were diagnosed with COVID-19. The boy was born at term, and Bacillus Calmette-Guérin vaccination had been performed on the first day. In addition, the patient had no asthma relevant family history.

On the first day of admission (Day 1), a physical examination revealed the following: his temperature was 37°C; respiratory rate was 52 beats per minute; heart rate was 170 beats per minute; blood pressure was 89/46 mm Hg; his peripheral capillary oxygen saturation (SpO_2) was 89%; and his body weight was 6.4 kg. The cardiac examination was normal, but the sign of dyspnea was obvious and the sputum sound and wheezing rales could be heard by stethoscope. His abdomen was soft, splenomegaly was not palpated, but hepatomegaly 2 cm below costal margins was palpated.

The initial blood test showed the following: white blood cell (WBC) count 8.81 (normal range = 4-10) $\times$ 10^9/L; lymphocyte 6.14 $\times$ 10^9/L (normal range = 1-3);

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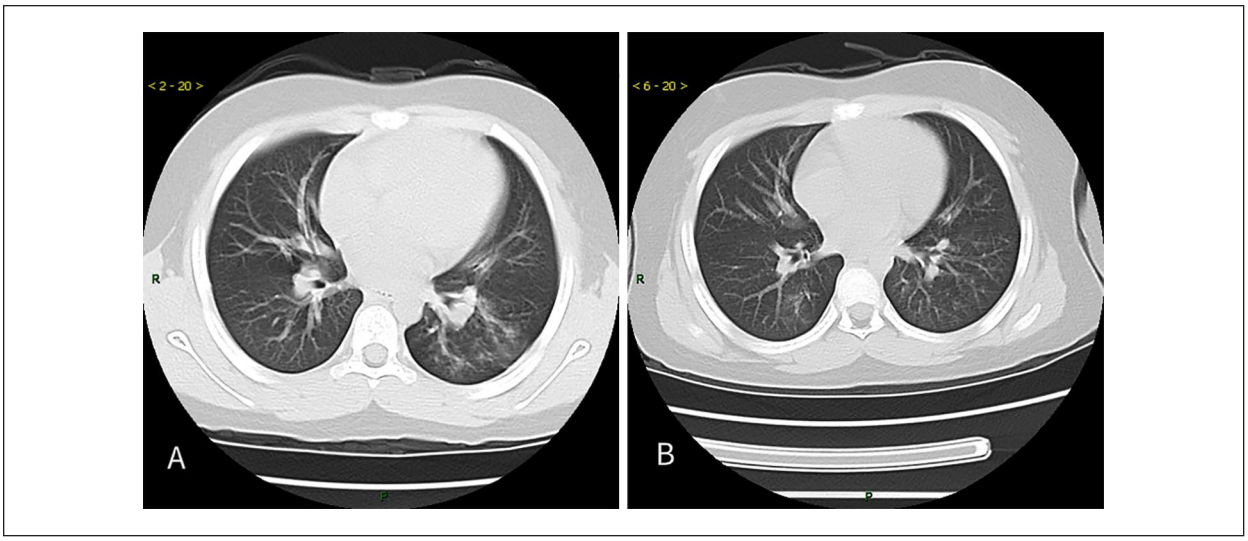

Figure 1. (A) The computed tomography (CT) scan of chest revealed bilateral lung infection and consolidation in part of the lower lobe of the left lung. (B) The repeat chest CT scan showed that the lung infection was basically absorbed.

neutrophil 1.41 × 10^9/L (normal range = 2-6); eosinophils 0.23 × 10^9/L (normal range = 0.02-0.52); platelet 603 × 10^9/L (normal range = 100-300); and hemoglobin 108 g/L (normal range = 110-120). Serum immunoglobulin (Ig) profile and complement was as follows: IgG 3.9 g/L (normal range = 2.6-6.9); IgM 0.37 g/L (normal range = 0.26-1); and IgA 0.11 g/L (normal range = 0.08-0.57); C3 0.96 g/L (normal range = 0.65-1.52); and C4 0.13 g/L (normal range = 0.16-0.38). The peripheral lymphocyte subsets analysis, assessed by flow cytometry, revealed the following: the total T-cells 66.2% (normal range = 55% to 78%); helper T-cells ($CD3^+CD4^+$) 32.7% (normal range = 27% to 53%); suppressor T-cells ($CD3^+CD8^+$) 27.4% (normal range = 19% to 34%); B-cells ($CD3^-CD19^+$) 28.5% (normal range = 10% to 31%); and natural killer cells 4.2% (normal range = 4% to 26%). In addition, procalcitonin was 2.0 ng/mL (normal range <0.5). Liver function tests were basically normal. The laboratory results of respiratory virus detection, tested by enzyme-linked immunosorbent assay (ELISA), including adenovirus, influenza A virus, influenza B virus, parainfluenza virus 1/2/3, were negative, but RSV virus was positive. A chest CT scan revealed bilateral lung infection and consolidation in part of the lower lobe of the left lung (Figure 1A). An arterial blood gas analysis showed the following: pH 7.33, partial pressure of oxygen (PaO_2) 65 mm Hg, $PaCO_2$ 38 mm Hg, oxygen saturation (SaO_2) 91%, BE −5.5 mmol/L, HCO_3 −20 mmol/L, glucose 5.3 mmol/L, and blood lactate 5.4 mmol/L. Thus, severe pneumonia was diagnosed, and noninvasive continuous positive airway pressure (CPAP) ventilation was immediately performed at admission. Antibiotic treatment with ceftizoxime (50 mg/kg, intravenous [IV] Bid [twice a day]) was started as bacterial pneumonia was suspected. Before the antibacterial therapy, both the venous blood sample of the patient and the sputum were sent for culturing, but another 5 days later, the reports were negative. In addition, he was treated with intravenous γ-globulins (IVIG; 2 g/kg body weight, divided in 2 doses) and methylprednisolone (2 g/kg, Bid, for 3 days). Though result of pharyngeal swab, via quantitative real-time polymerase chain reaction (qRT-PCR) assay, for SARS-CoV-2 was negative at 36 hours after admission, the α-interferon atomization inhalation was performed (0.5 million U/kg, in sterile injection water, Bid).

On day 5, because of the improved conditions, noninvasive CPAP was withdrawn and he began absorbing oxygen via nasal tube. In addition, the blood test was reviewed: WBC 4.60 × 10^9/L; lymphocyte 3.27 × 10^9/L; neutrophil 1.05 × 10^9/L; eosinophils 0.01 × 10^9/L; platelet 416 × 10^9/L; and hemoglobin 80 g/L. Moreover, we obtained the message, by phone interviews, that his parent's results of pharyngeal swabs tested by qRT-PCR assay, which was detected in another designated hospital, were negative, and a chest CT scan of his mother was normal.

On day 10, the patient had a slight cough, no sputum, no fever, and the signs of lungs was improved. However, pharyngeal swab sample via qRT-PCR assay for SARS-CoV-2 was reviewed, and the result was positive. Then, the patient continued to the supportive treatment.

On day 17, the patient had no fever, no cough, the signs of lungs was normal, and he stopped absorbing oxygen. Then, pharyngeal swab sample via qRT-PCR assay for SARS-CoV-2 was reviewed, and the result was negative.

On day 19, pharyngeal swab sample via qRT-PCR assay for SARS-CoV-2 was reviewed, and the result was negative.

On day 20, the repeat chest CT scan showed that the lung infection was basically absorbed (Figure 1B). Thus, he was discharged from the hospital and continued to be isolated with his mother for 2 weeks at home.

Discussion

Since the patient's father was suspected to be suffering from COVID-19 because he had fever, cough, and his chest CT scan presenting ground glass opacities in his lung, the patient had to be isolated in our hospital for treatment. The diagnosis of COVID-19 relies on the positive result via qRT-PCR assay of pharyngeal swab sample, blood sample, bronchoalveolar lavage fluid, or other sample of patient.[6] However, his pharyngeal swab sample via qRT-PCR assay for SARS-CoV-2 reported back as negative at admission. Studies about COVID-19 showed that the positive rate of SARS-CoV-2 detected by pharyngeal swab sample for SARS-CoV-2 is only about 50% and related to the patient's viral load.[7] And the patient might need to be tested at least twice at different stage of the disease to confirm if infected or not.[8] Thus, the second qRT-PCR assay was performed on 10th day of admission, and the patient was confirmed as the result was positive. Unfortunately, there was no other assay, such as next-generation sequencing and the SARS-CoV-2 antibody detection, performed in my patient.

The total WBC and leukocyte counts are usually normal in the early stage of COVID-19.[9] The blood test of our patient at admission showed that the WBC count was normal, which might reveal our patient was in the early stage. However, articles reported that RSV can lead to elevation of leukocyte counts.[10,11] Thus, the increased leukocyte counts might show that the patient was infected by RSV. In addition, patients with other viral infection such as RSV may be more susceptible to COVID-19.[5,12] However, we cannot confirm whether he had the COVID-19 or RSV first. The chest CT scan presenting ground glass opacities was regarded as typical performance in adult patient of COVID-19.[13] However, the children patients of COVID-19 are not usually presenting the typical signs in chest CT scan, but are presenting a variety of signs in chest CT scan, even normal.[14] Thus, the presenting of chest CT scan in our patient might be one of the signs in the children patient of COVID-19.

So far as we know, there is no specific medicine for COVID-19, but mainly relies on symptomatic and suportive treatments.[15] Oxygen therapy and respiratory support are the first choice for patients with severe respiratory infection and respiratory failure.[8,16] Thus, the patient received noninvasive CPAP ventilation at admission, considering that he had dyspnea, and the result of arterial blood gas analysis revealed hypoxemia at admission. Though there is no specific anti-coronavirus drug that has been confirmed so far, a recent study showed that empirical anti-coronavirus drug should be used as early as possible because it might reduce the mortality and glucocorticoid consumption.[5,8] Therefore, α-interferon atomization inhalation was performed at admission on the ground that he was suspected of suffering from COVID-19. Nevertheless, more cases would be needed to test whether the drug is effective in children patient of COVID-19.

Conclusion

In conclusion, a patient with SARS-CoV-2 and RSV infection was reported by us for the first time, emphasizing that the WBC and leukocyte counts, as well as chest CT scan might not be presenting the typical performance in children patient with COVID-19, for he might be also infected by RSV.

Author Contributions

BS conceived the ideal and wrote the initial draft of the manuscript. BS and ZX critically appraised and revised the overall content of the manuscript. All the authors were involved in the care of the patient. All authors read and approved the final manuscript.

Declaration of Conflicting Interests

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Informed Consent

Informed consent was obtained from the parent.

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