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CASE REPORT

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COVID-19 pneumonia suspected to be co-infection with *Mycoplasma pneumoniae* and improved by early administration of favipiravir and ciclesonide

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Abstract

A female nurse in her 40s caring for a patient with severe coronavirus disease 2019 (COVID-19) pneumonia treated with a high-flow nasal cannula (HFNC) presented with fever, cough and dyspnoea. Based on imaging findings and a positive reverse transcription-polymerase chain reaction (RT-PCR) for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), COVID-19 pneumonia was diagnosed, although her cohabiting family had similar symptoms and their RT-PCR tests were negative. Laboratory results showed Mycoplasma antigen (+). She was started on ciclesonide 1200 μg/day and favipiravir (3600 mg/day on the first day and 1600 mg/day from Day 2). As Mycoplasma antigen was positive on admission and her family had similar symptoms, levofloxacin 500 mg/day was started. The patient recovered and was discharged on Day 10. The patient did not have Mycoplasma infection because the Mycoplasma antibody measured by particle agglutination (PA) method was increased only up to 80 times after 4 weeks. This case highlights that healthcare workers wearing full personal protective equipment can nevertheless acquire COVID-19 from patients treated with HFNCs.

KEYWORDS
ciclesonide, COVID-19, favipiravir, high-flow nasal cannula, *Mycoplasma pneumoniae*

INTRODUCTION

A new type of coronavirus infection (coronavirus disease 2019 [COVID-19]) was reported in Wuhan, China, in December 2019, and as of March 2020, it spread explosively worldwide. Although no specific treatment for COVID-19 has yet been established, treatment with antiviral drugs, such as remdesivir, lopinavir and ritonavir, has recently been proposed to improve outcomes in severely ill patients. In addition, management of respiratory failure with a high-flow nasal cannula (HFNC) has also been developed. *Mycoplasma pneumoniae* is a well-recognized cause of atypical pneumonia and known to co-infect patients with viral pneumonia. The case of a patient with COVID-19 pneumonia who was suspected to have co-infection with *M. pneumoniae* and a nosocomial infection from a patient treated with an HFNC, and who did not worsen and was relieved by early administration of favipiravir and ciclesonide is presented.

CASE REPORT

From 9 March to 12 March 2020, a female healthcare worker (nurse) in her 40s had contact with a patient with severe COVID-19 pneumonia wearing an HFNC; personal protective equipment, including N95 mask, isolation gown, gloves, hair cap and face shield, was properly worn. In the evening of 17 March, fever of 37.6°C, cough and dyspnoea were noted, and she visited our hospital on 18 March. A chest x-ray showed an opacity infiltrating the left lower lung field, and chest computed tomography showed a ground-glass opacity in the left lower lobe

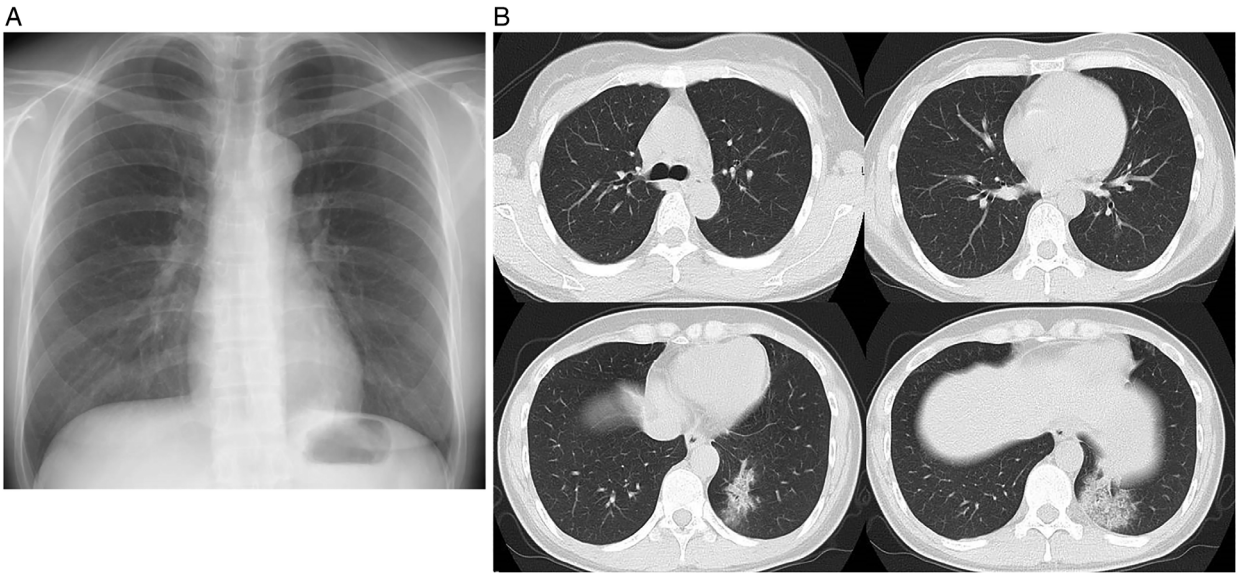

FIGURE 1 Imaging findings on admission. (A) Chest x-ray shows an opacity infiltrating the left lower lung field. (B) Chest computed tomography shows ground-glass opacity in the left lower lung field

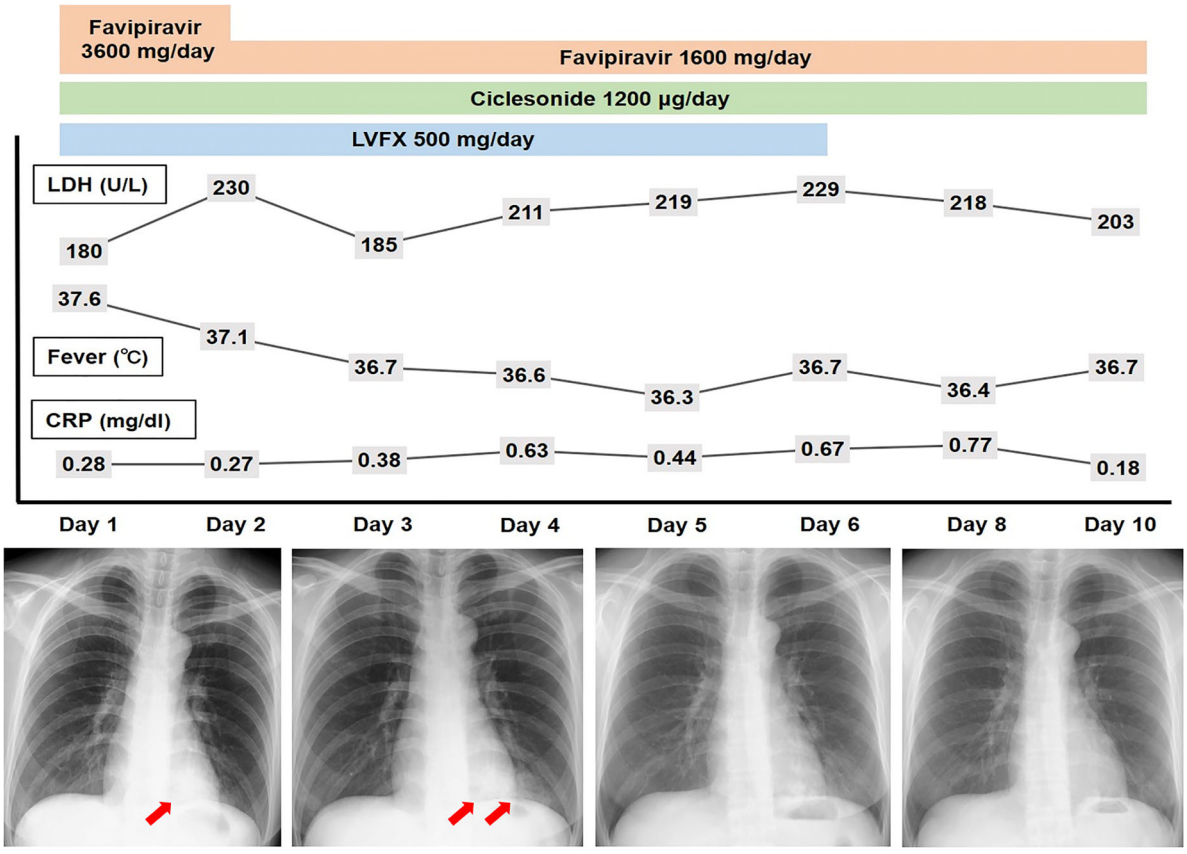

FIGURE 2 Clinical course of fever, LDH, CRP and chest x-ray findings. CRP, C-reactive protein; LDH, lactate dehydrogenase; LVFX, levofloxacin

(Figure 1). On the evening of the same day, the reverse transcription-polymerase chain reaction was positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Admission status and examination

The patient had clear consciousness, body temperature was 37.6°C, blood pressure was 113/83 mmHg, pulse rate

was 95 beats per minute, respiratory rate was 18/min and oxygen saturation was 97% on room air. No rales were heard on chest auscultation. The laboratory results on admission were: white blood cells 4200/μl (neutrophils 55.6%, eosinophils 1.1%, lymphocytes 26.5%), platelets 226,000/μl, lactate dehydrogenase 180 U/L, C-reactive protein 0.28 mg/dl, influenza antigen A (−), B (−), Mycoplasma antigen (+), Mycoplasma antibody (PA method) <40 times, cold agglutinins eight-fold, urinary pneumococcal capsular antigen (−) and urinary Legionella antigen (−).

Post-hospitalization course

Administration of ciclesonide 1200 μg/day and favipiravir (3600 mg/day on the first day and 1600 mg/day from Day 2) was started on the same day. As the Mycoplasma antigen was positive at the time of admission and her cohabiting family also had similar symptoms before the appearance of her symptoms, administration of levofloxacin 500 mg/day was started to cover the possible atypical pneumonia. Imaging findings showed an increase in ground-glass opacity in the left lower lung field on the second and third days of hospitalization. Her fever and oxygenation did not worsen, and her chest x-ray on the sixth day of hospitalization showed that the opacity infiltrating the left lower lung field had partially improved, and it had almost disappeared on Day 10. The patient was discharged on Day 10 of hospitalization (Figure 2).

DISCUSSION

The major problem in the present case was that the infection of a healthcare worker occurred despite appropriate precautionary measures against contact and droplets. One explanation is that the contacted COVID-19 patient had severe respiratory failure and was using HFNC for respiratory management. The effectiveness of HFNC on severe respiratory failure due to COVID-19 pneumonia has been reported in the observational study with a small number of cases.[1] However, as well as non-invasive positive pressure ventilation, it is important to recognize that HFNC use is also a high-risk procedure for the generation of aerosols.[1,2] Although HFNC was used wearing a surgical mask over the nasal interface, when performing sputum aspiration, the nurses removed the patient's surgical mask and performed the procedure at a close distance to the patient. As the nurse in the present case did not use goggles, we speculated that the face shield alone could not completely prevent the exposure of aerosols. Therefore, we believe that adequate eye protective measures and minimal surgical mask removal are especially important when performing aerosol generation procedures, and it may be necessary to recommend immediate management with intubation in some cases.

Early antiviral treatment is important to prevent deterioration of COVID-19. Favipiravir is being investigated globally in clinical trials as a potential therapeutic agent against COVID-19. A randomized, clinical trial with a small number of cases has recently shown efficacy in terms of duration of hospitalization and need for mechanical ventilation.[3] Regarding the efficacy of ciclesonide, there is only one retrospective study of a few severe cases that reported lower intubation rates in the group treated with ciclesonide,[4] and clinical trials are currently ongoing. Considering that favipiravir is given orally, and ciclesonide is administered locally and has few adverse events, if the efficacy of early administration of these drugs can be established, it will be a great advantage in the treatment of COVID-19.

Finally, the patient did not have Mycoplasma infection because the Mycoplasma antibody (PA method) was increased only up to 80 times after 4 weeks. Co-infection of COVID-19 and Mycoplasma is still rarely seen in case reports. However, a retrospective cohort review has recently been reported in which Mycoplasma co-infection was associated with the severity of COVID-19, showing the importance of its detection and treatment.[5] We need to consider the possibility of co-infection with other pathogens in patients with COVID-19 pneumonia, and this case is considered a good example that shows COVID-19 infection must not be ruled out even in situations suggesting infection with other pathogens.

ACKNOWLEDGMENTS

We would like to thank the ward staff and laboratory staff who are dedicated to providing medical care despite the risk of infection. There is a concern that the number of COVID-19 patients will increase in Japan in the future, and we hope that this report will help treatment.

CONFLICT OF INTEREST

None declared.

ETHICS STATEMENT

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

AUTHOR CONTRIBUTIONS

Keima Ito contributed to drafting the work; the acquisition, analysis and interpretation of data; and drafting the manuscript. Takako Yokoyama contributed to drafting the work and the acquisition, analysis and interpretation of data. Minoru Horiuchi contributed to the acquisition, analysis and interpretation of data. Munehiro Kato and Ikuji Usami contributed to the interpretation of data, revision of the manuscript and final approval of the version to be published.

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REFERENCES

1. Vianello A, Arcaro G, Molena B, Turato C, Sukthi A, Guarnieri G, et al. High-flow nasal cannula oxygen therapy to treat patients with hypoxemic acute respiratory failure consequent to SARS-CoV-2 infection. Thorax. 2020;75:998–1000.
2. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. Can J Anaesth. 2020;67:568–76.

3. Dabbous HM, Abd-Elsalam S, EI-Sayed M, Sherief AF, Ebeid FFS, El Ghafar MSA, et al. Efficacy of favipiravir in COVID-19 treatment: a multi-center randomized study. Arch Virol. 2021;166:949–54.
4. Yamasaki Y, Ooka S, Tsuchida T, Nakamura Y, Hagiwara Y, Naitou Y, et al. The peripheral lymphocyte count as a predictor of severe COVID-19 and the effect of treatment with ciclesonide. Virus Res. 2020;290:198089.
5. Gayam V, Konala VM, Naramala S, Garlapati PR, Merghani MA, Regmi N, et al. Presenting characteristics, comorbidities, and outcomes of patients coinfected with COVID-19 and *Mycoplasma pneumoniae* in the USA. J Med Virol. 2020;92:2181–7.

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