〈Case Report〉

A hemodialysis patient who escaped aggravation of COVID-19 after SARS-COV-2 infection

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ABSTRACT Dialysis patients are compromised hosts; thus, they might become even more seriously ill in the case of infection with severe acute respiratory syndrome coronavirus 2 (SARS-COV-2).

A man in his 50s under maintenance dialysis was accidentally a close contact of someone with SARS-COV-2 infection. Therefore, he received the PCR test for SARS-COV-2 three days a week at the time of his visit to our hospital for his hemodialysis session. He was admitted the day after the result of the PCR test was positive. This patient belongs to a high-risk group with severe illnesses, including the fact that he had not been vaccinated against SARS-COV-2. He received antibody cocktail therapy (casirivimab/imdevimab) on the day he was hospitalized. As a result, he escaped aggravation of COVID-19. This case suggests the important of early diagnosis and early treatment with this cocktail therapy for prevention of aggravation of COVID19 in high-risk hemodialysis patients.

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Key words：ACOVID-19, Hemodialysis patients, Cocktail therapy

INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 （SARS-S-COV-2） was first reported from Wuhan (Hubei Province, China) in December, 2019, and it spread rapidly all over the world[1)]. In August, 2020, the number of people infected with COVID19 (new coronavirus disease) was the highest ever in Japan. As a result, medical care was tight, and the death toll increased. Hemodialysis patients usually must visit a dialysis facility three times a week, and because those facilities tend to become crowded, patients are at high risk of contracting any infection. Hemodialysis patients with diabetes, hypertension, dyslipidemia, or cerebrovascular disease belong to the highest risk group of this disease[2)]. In our hospital, dialysis patients are allowed to enter the dialysis center after they have their body temperature measured and are checked for any illness. It is thought that this system allows us to identify patients with an infectious disease

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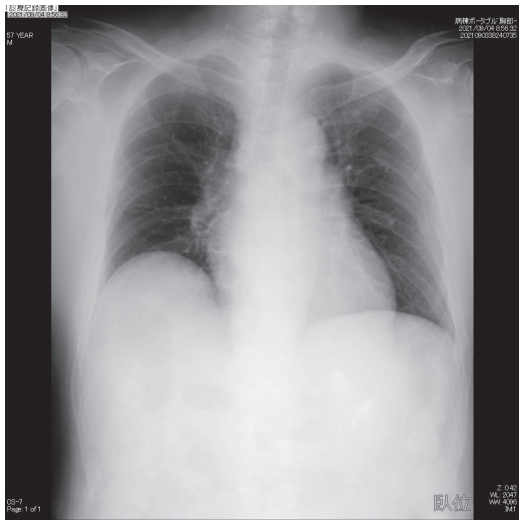
at an early stage. We report the case of a patient for whom careful health observation and PCR test for COVID-19 were performed as soon as he had been a close contact of someone with COVID-19, diagnosis could be made early, antibody cocktail therapy (casirivimab/imdevimab), was provided, and aggravation of COVID-19 was avoided.

CASE REPORT

The patient was a man in his 50s who had suffered from end-stage renal disease due to diabetic nephropathy for 9 years and had been on hemodialysis three times a week ever since. On X-4 day, he had a conversation with a person he had had a business meeting without wearing a mask. On X-2 day, his partner was found to be positive for COVID-19 by PCR test. The PCR test of the patient himself was negative on X-1 day, but became positive on X day and thus, he was admitted to our hospital on X day. He had not been vaccinated against SARS-COV-2. On admission, his height was 172cm, body weight was 72.0kg, body temperature was 37.2℃, blood pressure was 172/98 mmHg, pulse rate was regular at 70 and respiratory rate was 20/min. His arterial oxygen saturation (SPO_2) was 98% on room air. His consciousness level was clear, and he had presented no other symptoms. Chest X-ray and computed tomography (CT) examination showed no pneumonia images, including interstitial pneumonia (Fig. 1). Laboratory findings on admission did not show an increase or decrease in white blood cells, an increase in CRP, or an increase in d-dimers. Elevation of serum creatinine (CRE), blood urea nitrogen (UN) and uric acid (UA) is associated with chronic renal failure. Only serum procalcitonin was elevated (Table 1). Antibody cocktail therapy was given on the day after admission, which was the X+1 day. Fever and elevated CRP (C-reactive protein) were transiently observed at admission. Fever, respiratory symptoms and increase of WBC and CRP rarely appeared during subsequent hospitalization. PCR test was performed five times during hospitalization. The result of PCR-test was positive on day X, X+8 day and X+12 day. PCR examination became negative on X+16 day and X+20 day (Fig. 2). Thus, 10 days passed since the onset of COVID19, and 72 hours or more passed since clinical symptoms disappeared. Based on these results, he was discharged on X+21 day. Dialysis was performed in an isolated room



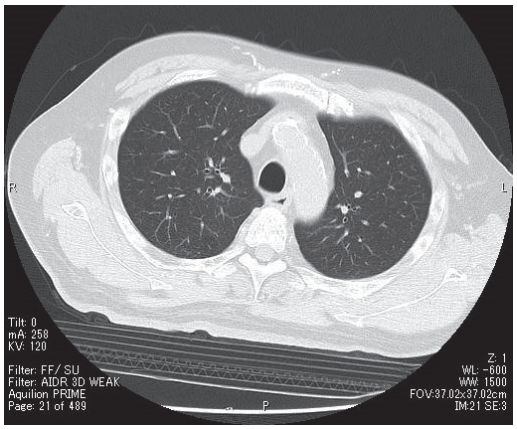


Fig. 1. a Chest X-ray on admission, b Chest CT on admission
No pneumonia shadow was observed.

Table 1. Laboratory findings on admission.

Blood cell count	
WBC	5280 /μL
RBC	513×10^4 /μL
Hb	16.0 g/dL
Ht	48.5 %
Plat	33.0×10^4 /μL

Bleeding Tendency	
PT-INR	0.90
APTT	26.3 sec
Fibrinogen	380 mg/dL
D-dimer	0.8 μg/mL

Blood chemistry	
Glu	106 mg/dL
TP	6.5 g/dL
T-Bil	0.3 mg/dL
ALP	68 U/L
Tcho	119 mg/dL
γGTP	18 U/L
LD	226 U/L
Alb	3.8 g/dL
ChE	185 U/L
ALT	18 U/L
AST	14 U/L
CRE	16.90 mg/dL
UN	91 mg/dL
UA	9.9 mg/dL
CRP	0.2 mg/dL

Na	141 mmol/L
K	5.3 mmol/L
Cl	104 mmol/L
IP	5.4 mg/dL
Ca	8.0 mg/dL
Procalcitonin	0.47 ng/mL

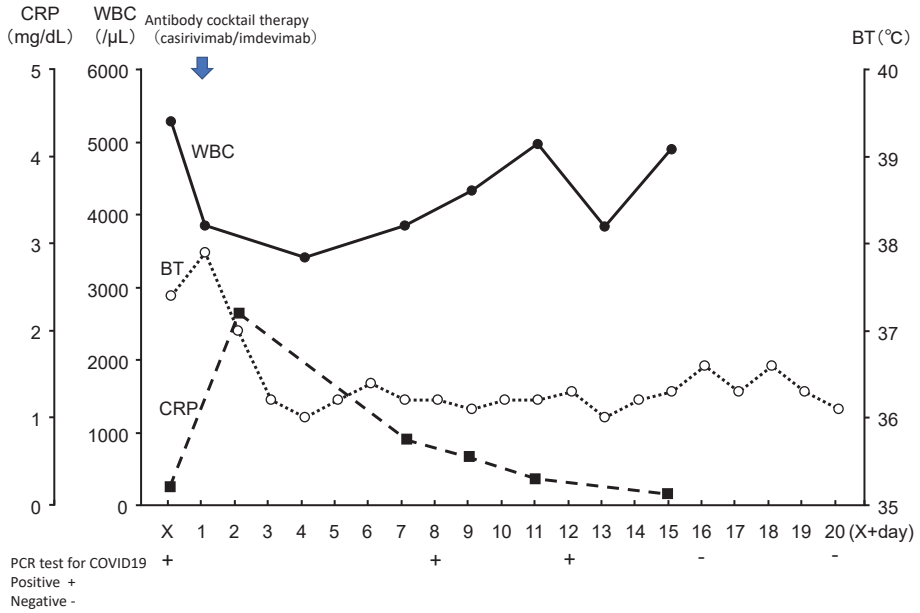


Fig. 2. Fever and elevated CRP were transiently observed at admission. Fever, increase of WBC and CRP rarely appeared during subsequent hospitalization.
Antibody cocktail therapy was performed only on day 0.
The PCR-test for COVID19 was positive on days 0, 8 and 12, but negative on day 16 and 20.

at the high care unit (HCU) or the Dialysis Center. No sign of pneumonia was observed on chest CT after discharge (Data is not shown). No nosocomial infections, including cluster infections, were reported while he was hospitalized.

DISCUSSION

This report is important in two respects. One is prevention of aggravation of COVID-19 and the other prevention of the spread of this infectious disease, including nosocomial infection. Our patient is undergoing hemodialysis due to chronic

renal failure, as a consequence of Type 2 diabetes and hypertension, so it was highly likely that his general condition would have become severely compromised[2]. Treatment for COVID19 generally consists of remdesivir or dexamethasone, and anticoagulant therapy to prevent thrombosis. However, remdesivir is not recommended for patients with severe renal dysfunction. Treatment with REGN-COV2 antibody combination (casirivimab/imdevimab), the so-called antibody cocktail therapy, was granted emergency use authorization by the US FDA (United States Food and Drug Administration) on November 9, 2020, for COVID 19 patients at high risk of aggravation. In Japan, special approval was granted on July 19, 2021, and it can be used under certain conditions. REGN-COV2 has been shown to reduce viral load by day 7 of its administration, suggesting that it is more effective in patients who have not started an immune response or who have a high viral load at baseline[3]. At the time of infection of this patient, there were no reports of omicron type in Japan. Therefore, it is unlikely that the type of COVID19 in this patient is due to the omicron type. In clinical trials, this treatment has not been administered to vaccinated patients. This patient happened to have no history of vaccination. Thus, there were no contraindications for administering this treatment to the patient. We thought this patient had developed COVID-19 because of fever up and elevated procalcitonin on admission. Since no lung lesions appeared during clinical course, we think this treatment prevented aggravation of the disease. Thus, the patient was discharged without complications.

As for the prognosis of hemodialysis patients with COVID-19, it was reported that in Wuhan, China, seven out of 37 hemodialysis patients (18.9%) died between January 14 and February 17, 2020[4]; in Paris, France, 12 of 44 patients (27.3%) died between March 11 to April 11, 2020[5]; and in Spain, 11 of 36 patients (30.5%) died between March 12 and April 10[6]. Evidently, dialysis patients are a high-risk population. In addition, the test results within one week after diagnosis, long dialysis vintage, high lactate level, high CRP level, and low lymphocyte count are cited as poor prognosis factors[6]. From this point as well, early diagnosis and treatment are important for dialysis patients; besides, in some asymptomatic patients with a positive PCR, pre-symptomatic intervention may be necessary.

We have always instructed our patients to avoid conversation without a mask. However, this patient was not able to comply with this instruction. And he had not been vaccinated out of his own will, despite explaining to him that dialysis patients are at high risk of aggravation. We think that we need to give more guidance to this patient.

The reason we were able to prevent nosocomial infection with COVID 19 was that when this patient became a close contact, we separated this patient from other patients regarding the route of entry to the Dialysis Center and performed his hemodialysis in an isolated room, so that he did not meet other patients while he was at the Dialysis Center.

From our experience, we think it is possible to prevent aggravation of a hemodialysis patient infected with COVID-19, if the infection is detected at an early stage and the patient is promptly administered REGN-COV2 antibody combination therapy.

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AVAILABILITY OF DATA AND MATERIALS

The data and materials were all included in the

manuscript.

AUTHORS' CONTRIBUTIONS

YO and DY took care of this patient. YO prepared this manuscript.

DECLARATIONS

ETHICAL APPROVAL

This article does not contain any studied with human participants or animals performed by any of the authors.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

INFORMED CONSENT

Informed consent was obtained from a participant includes in this study.

CONSENT FOR PUBLICATION

Not applicable.

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