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Case Report

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A mortal Covid-19 case with SARS-CoV-2 variant VOC-202012/01 after two doses of CoronaVac® vaccination, case report

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Abstract

Many countries have started their vaccination program against the ongoing COVID-19 pandemic. One of these countries, the Republic of Turkey began to use the CoronaVac® vaccine and a large number of people in the country have been vaccinated so far. The efficacy rate of CoronaVac® vaccine 14 days after two doses was reported as 83% for cases requiring medical treatment and 100% for hospitalization or severe-mortal cases. In addition, in a recent study, it was reported that Coronavac vaccine prevented 86.5% death due to covid-19 in the population over 60 years old, 14 days after receiving two doses of CoronaVac. The effectiveness of the vaccine in subgroups such as patients exposed to SARS-CoV-2 virus in less than 14 days, advanced age, comorbidity, and immunosuppression is not yet known. In addition, its effectiveness against different variants of the SARS-CoV-2 virus is not clear. An 85-year-old female patient with a positive SARS-CoV-2 Variant VOC-202012/01 Polymerase Chain Reaction test was admitted to the emergency department with dyspnea. The patient, whose tachycardia, tachypnea and auxiliary respiratory muscle use continued despite 60 L / min of 100% oxygen therapy with a high flow nasal cannula and whose PaO2 / fiO2 ratio was 63, was intubated. Bilateral widespread multifocal ground glass densities consistent with COVID-19 were observed in the thorax computed tomography. The patient, who was followed up in the intensive care unit, died on the 11th day of her follow-up. There are no cases of severe COVID-19 disease reported in the literature yet after the CoronaVac® vaccine. In this case report, we present a severe COVID-19 patient with a positive PCR test for SARS-CoV-2 Variant VOC-202012/01 11 days after the second dose of CoronaVac® administration.

Keywords: covid-19, covid 19 vaccine, coronavac, severe covid-19 disease, acute respiratory syndrome coronavirus 2

1. Introduction

While the COVID-19 pandemic continues, at least seven vaccines have been approved to date for emergency use in various countries and there are many vaccines that are candidates (1). One of these vaccines, CoronaVac® (Sinovac Biotech Ltd.Beijing, China), is an inactive vaccine and the Sinovac company unofficially announced the results of the phase 3 study (2, 3). According to these results, 13.718 patients were randomized to the study, and the vaccine's effectiveness in preventing severe disease was 100% since there was no patient requiring medical treatment or hospitalization in the vaccine group (3). These results are promising. However, large studies have not yet been carried out to investigate the negative effects of mutations on the effectiveness of vaccines.

In this manuscript, a case mortal of COVID-19 with a positive result for the Polymerase Chain Reaction (PCR) test for SARS-CoV-2 Variant VOC-202012/01, 11 days after receiving two doses of CoronaVac® vaccine is reported.

1. Case Report

An 85-year-old female patient staying in a nursing facility was brought to the emergency department with shortness of breath. Three days before the patient's arrival, it was learned that the SARS-CoV-2 PCR test was positive for “VOC-202012/01” (United Kingdom variant). It was learned that the first dose of CoronaVac® vaccine was administered 41 days, and the second dose 11 days before the positive PCR test. The patient's history included dementia and coronary artery disease and use of donepezil, memantine, quetiapine, sertraline and clopidogrel. Oxygen saturation of the patient under 10 L/min oxygen with a non-rebreather mask was 85%, arterial blood pressure 165/98 mmHg, pulse 120 beats/min, respiratory rate 32/min and body temperature 36.7C° and the electrocardiography was within normal limits. The patient, whose Glasgow coma scale was 15, had decreased respiratory sounds bilaterally. Thorax computed tomography of the patient showed bilateral diffuse ground glass densities compatible with COVID-19 (Fig. 1) and the blood tests are summarized in table 1. The patient, whose PaO2/FiO2 ratio was calculated as 63 under 100% oxygen at 60L/min with high flow nasal cannula therapy (HFNC), was intubated due to persistent tachypnea despite HFNC support. The treatment protocol applied in the intensive care unit(ICU) is summarized in table 2. The patient died on the 11th day of the ICU follow-up. Informed consent was obtained from the patient for the publication of her information and images during the emergency care follow-up.

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Table 1. Results of the laboratory tests of the patient in the emergency department

Test	Result
C-Reactive protein	87 (0-5 mg/dL)
White blood cells	7190 (4000-10000 10^3 u/L)
Lymphocyte	640 (800-4000 10^3 u/L)
Troponin	0.024 (0-0.014 µ/g/L)
Lactate dehydrogenase	459 (125-220 U/L)
Arterial blood gas analysis	
pH	7.41
$PaCO_2$	44 (35-48 mmHg)
PaO_2 (under 60L/min oxygen with HFNC)	62.4 (83-108 mmHg)
SpO_2 (under 60L/min oxygen with HFNC)	91.3 (95-99 %)
Lactate level	1.1 (0.5-1.6 mmol/L)
Aspartate aminotransferase	58 (5-34 U/L)
Alanine aminotransferase	32 (0-33 U/L)
Creatinine	0.69 (0.57-1.11 mg/dL)

* HFNC: high-flow nasal cannula

Table 2. Treatment the patient received in the intensive care unit

Drugs	Doses, routes	Time (days)
Meropenem	3x500 mg, IV*	10
Enoxaparin sodium	4000 anti-Xa lU, SC*	11
Favipiravir	2x600 mg, PO*	7
Prednisolone	1x250 mg, IV	3
	1x80 mg, IV	3
	1x40 mg, IV	5
Norepinephrine†	N/A	N/A
Dopamine†	N/A	N/A

* IV: intravenous, SC: subcutaneous PO: peroral
The inotropic drug dose and duration given to the patient was titrated to a mean arterial pressure> 65 mmHg.

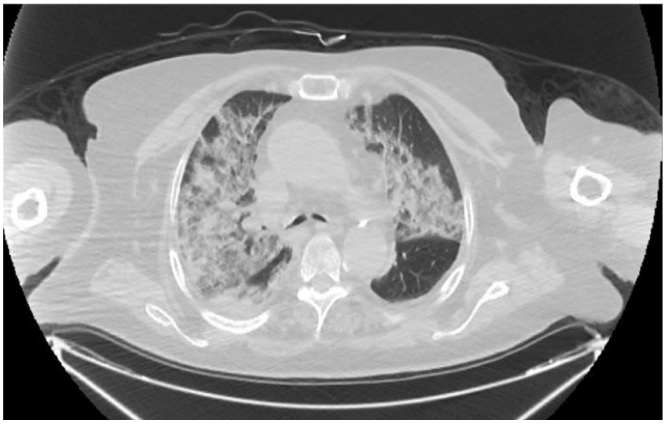

Fig. 1 Bilaterall diffuse ground glass densities are seen in the axial section of the patient's thoracic computed tomography

2. Discussion

In October 2020, a new mutation that occurred in the spike protein of the SARS-CoV-2 virus, known as VOC-202012/01 or "UK variant", was identified in the United Kingdom (4). The primary concern was whether the immunity against SARS-CoV-2 effective against the new mutation. It has been reported that neutralizing antibodies obtained from 12 patients with previously infected COVID-19 cases in Italy have the same neutralizing effect against the VOC-202012/01 variant in the laboratory (5). In addition, in a study conducted with 40 patients who received BNT162b2, an mRNA-based vaccine, showed sufficient neutralizing antibody titer against VOC-202012/01 mutation (6). Although it is predicted that vaccines will need to be updated due to multiple mutations in the future, there are opinions stating that a single mutation on the spike protein would not require such an update (4). However, there are no studies investigating the effectiveness of CoronaVac® vaccine in VOC-202012/01 mutation yet.

In the Republic of Turkey where our case is being reported, it's stated that there are 54 million people whose first dose and 47 million people whose second dose of CoronaVac® has been delivered, until the date of this report (7). Considering these numbers, it is noteworthy that no severe COVID-19 infection has been reported in the vaccinated population so far. This indicates that the cause of this severe COVID-19 may be related with patient-related factors. Our patient is likely to be immunosuppressive due to obesity, coronary artery disease, advanced age and staying in a nursing facility. Although there is no study on CoronaVac® vaccine yet, it has been reported that many vaccines have statistically significantly lower neutralizing antibody levels and low protective efficacy in immunosuppressive patients compared to the normal patient group (8). According to the results of the study investigating the safety, tolerability and immunogenicity of CoronaVac® in patients over 60 years old, the rate of seroconversion detection 28 days after the second dose vaccine was reported as 98% (9). Considering that sufficient neutralizing antibody generation efficiency of the vaccine is not 100%, our patient's positive COVID-19 PCR test 11 days after the second dose of vaccine may be related to the fact that she has not yet developed an adequate antibody response. However, the major limitation of this case report is that there was no antibody titer result after vaccination and before PCR positivity. In a recent study, it was reported that CoronaVac prevented 86.5% death due to covid-19 in the population over 60 years of age who had been vaccinated in two doses (10).

As with many other vaccines, the immune response that develops for CoronaVac® is multifactorial. The vaccine response may not be as effective in immunosuppressive patients as in the immunocompetent population. This article is the first reported case of mortal COVID-19 infection after the CoronaVac® vaccine in Turkey.

Conflict of interest

The authors declare no conflict of interest.

Acknowlenments

Informed consent was obtained from the patient for the publication of her information and images during the emergency care follow-up.

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