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Possible Re-infection with SARS-CoV-2 in a Splenectomized Patient from Kocaeli, Turkey

Kocaeli, Türkiye'den Splenektomi Uygulanan Bir Hastada SARS-CoV-2 ile Olası Re-enfeksiyon

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Abstract

Coronavirus disease-2019 (COVID-19) has affected more than 31 million individuals and has resulted in 965,000 deaths on September 21, 2020. As the number of cases increases, clinical conditions such as prolonged viral release, reinfection, and reactivation are encountered more frequently. This report presents the case of a patient who was reinfected with COVID-19 that had a more severe disease course unlike other previous cases reported in literature. Possible reinfection with Severe Acute Respiratory Syndrome Coronavirus-2 in a splenectomy case may help understand immunity against COVID-19 and can be a guide for development of vaccines and new treatments.

Keywords: COVID-19, reinfection, immunity, splenectomy

Öz

Koronavirüs hastalığı-2019 (COVID-19) salgını, 21 Eylül 2020'de teşhis edilen 31 milyondan fazla olguya ve 965.000'den fazla ölümle sonuçlandı. Olgu sayısı arttıkça, uzamış viral salınım, yeniden enfeksiyon ve reaktivasyon gibi klinik durumlarla daha sık karşılaşılıyor. Bu makalede, COVID-19 ile yeniden enfekte olmuş ve literatürdeki diğer olgulardan farklı olarak daha ağır ikinci hastalığı olan bir olgu sunulmuştur. Bir splenektomi olgusunda Şiddetli Akut Solunum Sendromu Koronavirüs-2 ile olası yeniden enfeksiyon, hastalığa karşı gelişen immüniteyi anlamaya yardımcı olabilir ve aşılar ve yeni tedaviler için bir rehber olabilir.

Anahtar Kelimeler: COVID-19, yeniden enfeksiyon, immünite, splenektomi

Introduction

In December 2019, cases of pneumonia with unknown causes were reported in Wuhan, China, and a new coronavirus named Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) was detected in lower respiratory tract samples as an etiological agent^[1]. The World Health Organization named the condition as coronavirus disease-2019 (COVID-19) and officially declared it a pandemic on March 11, 2020, as a result of the rapid

increase in the number cases and spread to other countries. As of September 22, 2020, 31,490,644 COVID-19 cases and 969,367 deaths were recorded globally^[2]. In Turkey, the first case was reported on March 11, 2020, and 314,413 cases were recorded as of September 26, 2020^[3].

The definitive diagnosis of COVID-19 is made by detecting viral RNA in the respiratory samples of patients. The currently recommended medical observation period or containment

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period for patients with COVID-19 is 14 days. However, prolonged viral RNA shedding is not a rare phenomenon, regardless of symptomatic relief^[4]. In addition, reinfection can be seen in patients who have recovered from COVID-19. There have been several case reports of patients getting reinfected with SARS-CoV-2, as they tested positive for the virus again after discharge^[5,6]. These cases add to the difficulty of controlling the pandemic. This report presents the case of a patient who was probably reinfected with SARS-CoV-2 that had a more severe disease course unlike other previous cases reported in the literature.

Case Report

On April 17, 2020, a 57-year-old man was admitted to our hospital with complaints of muscle pain and headache. He had hypertension and coronary artery disease. The result of the SARS-CoV-2 polymerase chain reaction (PCR) test of nasopharyngeal sample was positive, and the patient was started on hydroxychloroquine treatment. The patient's oxygen saturation on admission was 98% in room air. Thoracic computed tomography detected minimal ground-glass densities in the basal areas of the lower left lung lobe, and the findings were significant for early-stage COVID-19 pneumonia. No abnormality was detected in the patient's complete blood count and biochemistry parameters. He was on home isolation upon discharge.

However, on July 24, 2020, the patient presented to our hospital with complaints of muscle pain, cough, shortness of breath, and fever. The SARS-CoV-2 PCR test results were positive again. His medical history showed that he had undergone splenectomy as a result of trauma in 2019. At this time, his oxygen saturation was 80% in room air, and the thoracic computed tomography revealed peripheral and localized multifocal ground-glass infiltrations in the parenchyma all lung lobes. These findings were compatible with moderate/severe COVID-19. Figure 1 shows the patient's thoracic computed tomography images. Laboratory test results were as follows: total leukocytes, 20,800 K/ μ l (4–10 K/ μ l); neutrophils, 14,700 K/ μ l (2–7 K/ μ l); lymphocytes,

4000 K/ μ l (0.9–3.4 K/ μ l); aspartate aminotransferase, 63 U/l (0–50 U/l); alanine aminotransferase, 65 U/l (0–50 U/l); C-reactive protein (CRP), 160 mg/l (0–5 mg/l); ferritin, 499 ng/ml (4–204 ng/ml); fibrinogen, 7.65 g/l (2–4 g/l); and D-dimer, 0.73 μ g/ml (0–0.5 μ g/ml). Levofloxacin and favipiravir were started upon admission, and the patient received 4 l/min of nasal oxygen support. However, his oxygen saturation decreased further, so 8 l/min of oxygen was given through a reservoir mask. Favipiravir treatment was extended to 10 days. On day 10 of treatment, the patient's saturation level was 91% in room air, and CRP, ferritin, and D-dimer reached their normal threshold levels. The patient was discharged for a 14-day home isolation. The subsequent control SARS-CoV-2 PCR test was negative.

Discussion

COVID-19 has a high fatality rate, especially in the elderly population and patients with comorbidities such as hypertension, cardiovascular disease, chronic kidney failure, and cancer^[7]. As of May 1, 2020, the fatality rate of COVID-19 was 1.4% among all patients in Turkey^[8]. The transmissibility of the virus is indicated by its reproductive number (R_0), which shows how fast the virus spreads. The R_0 of SARS-CoV-2 was 3.77 according to clinical and epidemiological data from 8866 patients in 30 provinces, which was higher than the R_0 of 2–3 of the severe acute respiratory virus^[9]. For this reason, it is difficult to control the pandemic, despite isolation preventions.

Prolonged viral shedding and possibility of reinfection in some individuals are other problems that increase the challenge of pandemic management. RNAs of SARS-CoV-2 were isolated from the sputum and feces of patients a few weeks after their discharge^[10]. Another study from Wuhan reported that the virus was detected for a median of 20 days (up to 37 days among survivors) after symptom onset^[11]. In the present case, the interval of >3 months between two infections excludes the possibility of prolonged viral shedding.

Although the causes of SARS-CoV-2 reinfection are not yet fully clarified, the number of reported cases is increasing. Reinfection may be defined as clinical recurrence of symptoms compatible with COVID-19, accompanied by a positive PCR test (C_t ; <35), more than 90 days after the onset of the primary infection^[12]. Possible causes of reinfection include short-lived protective immunity and re-exposure to genetically different forms of the same viral strain^[13]. Another reason can be cross-contamination from another betacoronavirus, but as in the present case, COVID-compatible computed tomography findings support SARS-CoV-2 reinfection^[14]. Sequencing and phylogenetic analysis of the SARS-CoV-2 genome in reinfection cases may be useful.

The antibody response in patients with COVID-19 remains largely unknown. In most individuals with SARS-CoV-2

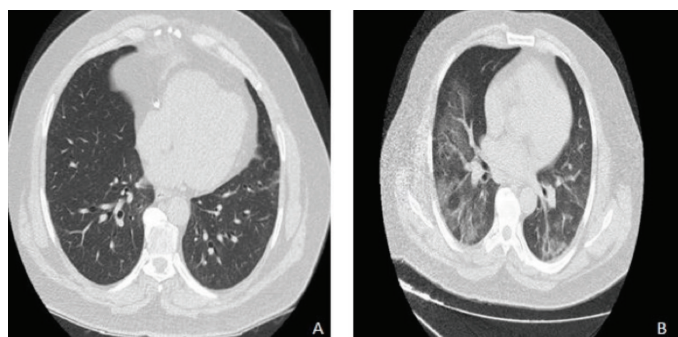


Figure 1. Thorax computed tomography images of the patient on April 2020 (A) and on July 2020 (B)

infection, neutralizing immunoglobulin (IgM and IgG) levels increase within days to weeks from symptom onset^[15]. Many human infections with other viral pathogens, such as the influenza virus, do not produce a durable immune response. The durability of IgG against SARS-CoV-2 has yet to be defined, but persistence up to 40 days from symptom onset was reported^[16]. In our patient, reinfection was expected because the antibody response was not effective because he had undergone splenectomy. By contrast, positive PCR tests have been reported despite seropositivity for IgG after the primary infection^[17]. An et al.^[18] also stated that patients who were re-admitted because of reinfection had mild symptoms regardless of the antibody response. However, in our patient, extensive lung involvement and severe symptoms developed in the second attack.

Although the detection of antibody levels is important for herd immunity and epidemiological data, natural killer and CD8+ T cells are the first defense mechanisms against all viral infections. In the absence of protective antibodies (due to splenectomy in the present case), protective mechanisms through other arms of the immune response (memory and cytotoxic T cells) have possibly altered the course of COVID-19 upon reinfection^[19]. Memory T cells were found to play a very important role in the long-term protection against infection with SARS-CoV-2^[20].

An antibody test was not performed on our patient because we thought that no antibody was effective because of his previous splenectomy. In this case, reinfection could be explained by a decrease in the amount of memory T cells or loss of function. Xu et al.^[21] demonstrated a drop in T lymphocyte subgroup count in patients with severe illness as well as in deceased cases. Moreover, Zeng et al.^[22] noted that this reduction could be explained by the atrophy of the spleen and lymph nodes, thereby highlighting the role of SARS-CoV-2 in potentiating cell degeneration.

Despite its value, this report has limitations. Sequence analysis was not performed, and a negative PCR result was not obtained between two attacks.

Conclusion

In conclusion, unlike most common cold viruses, immunity to SARS-CoV-2 involves both cell-mediated and humoral responses. This case of reinfection may help researchers understand the immunity against COVID-19 and can be a guide for the development of vaccines and new treatments.

Ethics

Informed Consent: Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Design: S.A., Data Collection or Processing: M.T.D., S.A.B., Analysis or Interpretation: M.B.E., Literature Search: M.S., Writing: M.T.D., S.A., M.B.E., M.S., S.A.B.

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