Case report

Acute rhabdomyolysis in a young woman with moderate COVID-19

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\textbf{A B S T R A C T}

The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is having serious medical, social, and economic impacts worldwide. COVID-19 may lead to a variety of complications, including rhabdomyolysis. Although rhabdomyolysis is a rare complication, it can lead to severe kidney damage. Recent studies suggest that rhabdomyolysis caused by SARS-CoV-2 is more common in middle-aged and older men with severe COVID-19. Herein we report a case of rhabdomyolysis in a young woman with moderate COVID-19. She had a habit of muscle training. She presented with moderate COVID-19 and acute rhabdomyolysis that required a large volume of fluid infusion in addition to dexamethasone and remdesivir. Clinicians should pay attention to the development of rhabdomyolysis in patients with COVID-19, especially those with a habit of strenuous exercise or muscle training, even if they are young and have moderate COVID-19.  
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\section*{Introduction}

Rhabdomyolysis is a syndrome characterized by muscle necrosis and the release of intracellular muscle constituents into the systemic circulation. The most common complication is acute kidney injury (AKI). A prompt diagnosis is essential for successful treatment. Although trauma due to accidents or disasters is a well-known cause of rhabdomyolysis, drug-induced adverse reactions and infections can also be triggers.

Creatine kinase (CK) is the most sensitive indicator of muscle damage [1]. Rhabdomyolysis should be suspected if CK levels are above 5000 U/L [2]. Early fluid rehydration is the most important measure for the prevention of AKI [2].

Various viral infections such as influenza A and B, herpes simplex, adenovirus, echovirus, human immunodeficiency virus, and cytomegalovirus, can cause rhabdomyolysis [3,4]. Recently, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), has also been reported as a cause of rhabdomyolysis [5–7]. Previous reports have shown that rhabdomyolysis in COVID-19 patients typically occurs in middle-aged men and those with severe COVID-19 [5–7]. The present case differs from ones in these previous reports in that she was a young woman with moderate COVID-19. Current knowledge of the complications of COVID-19 is limited, and so the accumulation of case reports is important to establish optimal management of COVID-19 patients. Here, we present a rare case of acute rhabdomyolysis in a young woman with moderate COVID-19.

\section*{Case presentation}

A 19-year-old woman was admitted to our hospital with dry cough, high fever (\textgreater{}38°C), and fatigue lasting 3 days. She also had difficulty raising her arms due to muscle pain. Chest X-ray showed an abnormal shadow in the left lower lung zone (Fig. 1A). Computed tomography revealed a patchy infiltrative shadow in the left lower lobe (Fig. 1B, C). She was tested for SARS-CoV-2 using a polymerase chain reaction test, which was positive, confirming the diagnosis of COVID-19. She was living in a dormitory of police training academy, but none of her roommates were infected. Her parents and siblings, whom she saw on weekends, were also not infected. Unfortunately, the route of infection was unknown. Blood biochemistry on admission revealed markedly elevated levels of serum CK (55,613 U/L), lactate dehydrogenase (1,583 U/L),

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myoglobin (3,031 ng/mL), aspartate aminotransferase (1,013 U/L), and alanine aminotransferase (252 U/L). Her urinary myoglobin level (9,070 ng/mL) was also high, but her renal function remained normal. There were no abnormalities in her thyroid function. Her anti-nuclear, anti-RNP, anti-SM, anti-Scl-70, anti-Jo-1, and ds DNA antibodies were all negative, ruling out a diagnosis of autoimmune myositis. She was a student of police training academy, and as part of training, she routinely practiced daily muscle training. She had been doing 50 push-ups, 50 sit-ups, and 50 squats every morning and evening as part of her training. Treatment for both COVID-19 and rhabdomyolysis was initiated after admission. The clinical course is shown in Fig. 2. For COVID-19 treatment, she received a combination of dexamethasone for 7 days and remdesivir for 5 days. A chest X-ray on day 8 confirmed improvement of her pneumonia (Fig. 1D). Her respiratory symptoms also improved. For rhabdomyolysis treatment, she received a five-day continuous infusion of a large volume of fluid to prevent AKI. She was able to establish sufficient urine flow during transfusion and maintain normal renal function. Her serum CK levels dropped from 55,613 U/L on day 1 to 856 U/L on day 10. Her illness improved, and she was discharged on day 11.

Discussion

The COVID-19 pandemic has impacted human health as well as global economy. COVID-19 causes not only pneumonia, but has various other manifestations, such as neurologic manifestations.
Consent

We obtained written consent form the patient and her family.

Author contributions

KF drafted and revised the manuscript.
KF, OK, KN, NE, HH, KS, and TO treated the patient and reviewed the manuscript.
All authors approved the manuscript for submission.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

Our institution does not require IRB approval for case reports.