



Acute myocarditis and acute myopathy as the first manifestations of COVID-19; a case report

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ABSTRACT

Coronavirus disease 2019 (COVID-19) mainly manifests with flu-like and respiratory symptoms such as fever, chill, myalgia, cough, dyspnea and in severe cases, it leads to acute respiratory distress syndrome and respiratory failure. However, there is evidence of extra-pulmonary involvements in patients with COVID-19. Some case reports and studies have reported severe and life-threatening complications related to COVID-19 such as cardiovascular complications (acute heart failure, myocarditis, acute coronary syndrome, thromboembolic events) and neuromuscular complications (stroke, transient ischemic attack, myositis, myopathy, Guillain-Barre syndrome). Here, we report a 51-year-old woman without a previous history of cardiovascular disease or neuromuscular disease referred to the emergency department of our hospital with new onset severe respiratory distress and progressive symmetric quadriparesis. We concluded that, the patient was infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and we therefore have encountered acute myocarditis and acute myopathy due to COVID-19 disease. In the intensive care unit (ICU), the patient was treated with oxygen therapy without mechanical ventilation, dexamethasone, intravenous human immunoglobulin (IVIG), beta interferon and remdesivir. The clinical feature, cardiac, respiratory, neuromuscular and hemodynamic parameters improved clearly five days after taking above mentioned treatments. The troponin, N-terminal pro-B type natriuretic peptide (NT-proBNP), creatine phosphokinase (CPK), returned to normal values. Following improvement of cardiac and neurologic problems, the patient was transferred from ICU to general ward and then after 10 days, she was discharged with oral anticoagulant, anti-platelet, low-dose of corticosteroids and other conservative treatments.

Implication for health policy/practice/research/medical education:

Some case reports and studies have reported severe and life-threatening complications related to coronavirus infectious disease 19 such as cardiovascular complications (acute heart failure, myocarditis, acute coronary syndrome and thromboembolic events) and neuromuscular complications [stroke, transient ischemic attack (TIA), myositis, myopathy, Guillain-Barré syndrome]. In critical cases, the immediate use of immunomodulatory drugs in addition to conservative treatments and antiviral therapy can improve the clinical outcome and prognosis of the patient.

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Introduction

The first time, in December 2019, several cases of severe and new acute viral pneumonia were introduced in Wuhan, China. The virus was detected as a new strain of the coronaviruses which was nominated SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) (1-4).

The infectious disease due to SARS-CoV-2 is called COVID-19 disease which mainly manifests with flu-like and respiratory symptoms such as fever, chill, myalgia,

cough, dyspnea, and in severe cases, it leads to acute respiratory distress syndrome, respiratory failure and death (2-6).

However, there is evidence of extra-pulmonary involvement in the patients with COVID-19. Some case reports and studies have reported severe and life-threatening complications related to COVID-19, such as cardiovascular complications (acute heart failure, myocarditis, acute coronary syndrome

and thromboembolic events) and neuromuscular complications (stroke, transient ischemic attack, myositis, myopathy and Guillain Barre syndrome) (1-7). Here, we report a case of acute myocarditis and myopathy secondary to COVID-19 disease.

Case Presentation

A 51-year-old woman without a previous history of cardiovascular disease or neuromuscular disease was referred to the emergency department of our hospital with acute respiratory distress and progressive symmetric quadriparesis. Her recent illness started with fever, chills, general malaise, weakness, dry cough, dyspnea, palpitation, and chest discomfort for five days ago. She was no smoker or alcohol drinker. She did not take any drugs. However, her husband had been infected with COVID-19 about 2 weeks ago. On admission, she was in a sitting position with diaphoresis, and the patient's physical examination revealed hemodynamic instability and a marked decrease in the extremity's force. The initial vital signs were heart rate; 124 beats/min, blood pressure; 102/70 mm Hg, respiratory rate; 32 breaths/min, SaO_2 with pulse oximetry in air room; 72%, and body temperature; 38°C.

Cardiopulmonary examination revealed tachycardia, tachypnea, supraclavicular retraction, diffuse inspiratory crackles in lung auscultation. Her extremities were cold with filiform and fast pulses. Moreover, we found a severe symmetrical proximal and distal muscle weakness in upper and lower extremities (proximal upper and lower 3/5, distal upper and lower 2/5 medical research council score) and also, absence of deep tendon reflexes in clinical examination. We did not find evidence of sensory impairments in neurologic examination.

Nasopharyngeal and oropharyngeal swabs were taken to identify different respiratory tract microorganisms. Molecular reverse transcription polymerase chain reaction (RT-PCR) was positive for SARS-CoV-2.

Spiral lung CT scan showed bilateral and mainly alveolar and ground glass opacities especially in peripheral and basal segments, consistent with COVID-19 pneumonia. There was no pleural effusion, mass or lymphadenopathy. The patient was admitted in the respiratory intensive care unit (ICU) with SARS-CoV-2.

Blood test, on the first day, showed leukocytosis ($\text{WBC} = 26420 \times 10^9/\text{L}$), lymphopenia ($\text{Lymph} = 5\%$), mild anemia ($\text{Hb} = 12.2 \text{ g/dL}$), and normal platelet count ($\text{platelet} = 182000 \times 10^9/\text{L}$). Kidney function tests ($\text{BUN} = 18 \text{ mg/dL}$, $\text{Cr} = 1.1 \text{ mg/dL}$) and urine analysis were normal. The biomarkers of myocardial injury (troponin I, CK-MB and BNP) were significantly elevated on the first day, 2nd day and 3rd day. In spite of myalgia, generalized weakness, and quadriparesis, the patient did not have cola color urine, but she had significantly elevated creatine phosphokinase (CPK) levels. The first CPK level was 56371 units/L. Furthermore, serum liver enzyme

tests, lactate dehydrogenase (LDH), ferritin, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR) were too high. Hepatic viral markers, HIV antibody, procalcitonin, wright, and Coombs Wright were negative. Components of complement (C3, C4, CH50), ANA, anti double-stranded DNA (anti-dsDNA), perinuclear antineutrophil cytoplasmic antibody (p-ANCA), cytoplasmic-antineutrophil cytoplasmic autoantibody (c-ANCA), anti-phospholipid antibodies (Beta-2 glycoprotein 1, anti-cardiolipin and Lupus anticoagulant), anti human globulin test (Coombs) test (direct, indirect), partial thromboplastin time (PTT), prothrombin time (PT), international normalized ratio (INR), serum protein, serum albumin, anti-liver-kidney microsome antibodies (anti-LKM), and other rheumatologic tests, all were in normal ranges.

An electrocardiogram (ECG) showed significant non-specific changes on the first day, 2nd day, and 3rd day. A bedside transthoracic echocardiogram was conducted which showed a severe left ventricular systolic dysfunction without valvular heart disease or pericardial effusion. The ejection fraction of the left ventricle on admission day was 25-30%. The coronary angiography was conducted; however, it was normal, and the coronary arteries were patent.

Electromyography and nerve conduction study (NCS) were conducted, which revealed an acute inflammatory myopathic pattern especially in distal muscles. Sensory NCS was normal.

Finally, we concluded that the patient was infected with SARS-CoV-2, and we have encountered acute myocarditis and acute myopathy due to COVID-19 disease. In the ICU, the patient was treated with oxygen therapy without mechanical ventilation, dexamethasone (4 mg every 8 hours for 12 day), intravenous human immunoglobulin (IVIG) (25 g/d for 5 days), beta interferon (44 µg every other day for 5 times) and remdesivir (200 mg loading dose and 100 mg/d for 5 days). The cardiac support was also performed with starting popular treatments of the acute coronary syndrome, including ASA, clopidogrel, atorvastatin, carvedilol, losartan, enoxaparin, and intravenous furosemide and spironolactone. The clinical features, cardiac, respiratory, neuromuscular, and hemodynamic parameters, clearly improved five days after taking above mentioned treatments. The troponin, N-terminal pro-B type natriuretic peptide (NT-proBNP), CPK returned to normal values.

Follow-up echocardiography on the 6th day showed considerable improvement of left ventricular systolic function. Left ventricular ejection fraction of 45%-50% without any wall motion abnormality. Furthermore, in the neurologic examination, force and reflex of upper and lower extremities significantly increased and the patients could be out of bed.

With the improvement of cardiological and neurological

problems, the patient was transferred from ICU to the general ward, and then after 10 days, she was discharged with an oral anticoagulant, anti-platelet, low-dose of corticosteroids, and other conservative treatments.

Discussion

In addition to systemic and respiratory complications, a considerable minority of patients with acute COVID-19 may have a variety of patterns of acute cardiac injury, including acute myocarditis without obstructive CAD, ventricular arrhythmias, acute coronary syndrome, thromboembolic events, acute heart failure, instability hemodynamics, and even cardiac shock (5,6,8). The cause of acute heart damage is unknown, but may be related to viral myocarditis, hypoxemia, microvascular damage, cytokine-mediated systemic damage, or stress-related cardiomyopathy (1,3,6,8). Patients with acute myocardial damage due to an infectious process often have elevated cardiac biomarkers, electrocardiographic changes, and impaired cardiac function on echocardiography (6,7). Acute myocardial damage, often associated with a reduced left ventricular ejection fraction in the absence of obstructive coronary artery disease (1,7). This syndrome can be complicated by arrhythmias, clinical heart failure with or without associated hemodynamic instability, including shock (9,10).

Regarding the known relationship between myocarditis, the replication of SARS-CoV-2 in myocytes and also the production of autoantibodies, the use of antiviral and immunomodulatory agents (for example intravenous immunoglobulin and corticosteroids) is wise and even in severe case reports are also recommended above mentioned protocols for acute cardiac injury related to COVID-19 (1,7,10).

On the other hand, there have been some reports of encephalitis, encephalopathy, cranial neuropathy, Guillain-Barre syndrome, myasthenia Gravis, myopathy, and myositis or rhabdomyolysis in COVID-19 patients (11,12,14,16,17,22).

Olfactory and taste dysfunction is now accepted as an early manifestation of COVID-19 infection. The autopsy of the patients who died from COVID-19 showed inflammation, edema and axonal damage of the olfactory bulb (22). The olfactory signaling pathway is proposed as the gateway for SARS-CoV-2 to enter the brain. Similar to involvement of the olfactory bulb, isolated oculomotor, trochlear, and facial nerves have been described (13,22).

There are increasing reports of Guillain-Barre syndrome as a result of the release of COVID-19. Unlike typical Guillain-Barre syndrome, the majority of COVID-19-related GBS were elderly. In these situations, almost all patients had severe and life-threatening pneumonia or acute respiratory distress syndrome at the same time. The mortality rate was considerably high (11,13,15).

Myalgia is described as one of the most common

symptoms of COVID-19 after fever, cough, and sore throat. The duration of myalgia may be related to the severity of the COVID-19 disease (14,15,18). Few patients had muscle weakness and increased creatine kinase along with increased levels of acute phase reactants. All of these myositis / rhabdomyolysis patients had severe respiratory complications related to COVID-19 (16,17,19).

In addition to myositis and rhabdomyolysis, there have been a few reports of COVID-19 patients with critical illness myopathy. All patients had acute flaccid quadriplegia. Electrophysiological tests revealed a myopathic pattern. They had slightly elevated creatine kinase levels, and almost all of the patients did relatively well (15).

A handful of patients with myasthenia Gravis also indicated an adjustment of his illness after he received COVID-19 disease (20,21).

Conclusion

Patients with COVID-19 disease can present with a wide range of signs and symptoms due to the involvement of key organs. Treatment of patients with acute COVID-19 illness, especially in critical cases, must involve a multidisciplinary team made up of critical care physicians, infectious disease specialists, internists, pulmonologists, cardiologists, and even neurologists (1,7,9,15).

Acute myocardial damage associated with COVID-19 should be considered in patients with acute heart problems during the COVID-19 pandemic (1,9,10). Patients with severe COVID-19 disease are at risk of developing a variety of peripheral and central neurological complications (15,17,20). In critical cases, the immediate use of immunomodulatory drugs in addition to conservative treatments and antiviral therapy can improve the clinical outcome and prognosis of the patient.

Authors' contribution

FT and FY were the principal investigators of the study. FG and NA were included in preparing the concept of design. FT and DB revisited the manuscript and critically evaluated the intellectual contents. All authors participated in preparing the final draft of the manuscript, revisited the manuscript, and critically evaluated the intellectual contents. All authors have read and approved the content of the manuscript and confirmed the accuracy or integrity of any part of the work.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

This case report was conducted in accord with the World Medical Association Declaration of Helsinki. This case report was approved by the Ethics Committee of Tehran University of Medical Sciences approved

this study (Ethical code #IR.TUMS.MEDICINE.RES.1401.089). Written informed consent was obtained from the patient for publication of this report. Moreover, ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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