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Case Report

Pediatric COVID-19 Associated Rhabdomyolysis

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ABSTRACT

The incidence of rhabdomyolysis secondary to various causes has been reported, especially for viral infections such as influenzas. It is well established that Coronavirus disease-2019 (COVID-19) can include a large array of symptoms during the disease course, but there have been few reports of COVID-19-related rhabdomyolysis. We report a 10-year-old boy who presented with fever, some dry cough, myalgias, and painful walking. His COVID-19 polymerase chain reaction test performed through the nasopharyngeal swab was positive. His first creatinine kinase level was 8,000 U/L. He was treated with isotonic intravenous fluids because of rhabdomyolysis. Muscle weakness and pain are common symptoms of the 2019 novel COVID, but physicians should be aware of the possibility of rhabdomyolysis, especially when patients complain of local pain and weakness in their muscles. Pediatric clinicians should be aware of this complication related to the novel 2019 coronavirus. Timely diagnosis and proper treatment improve the patient's prognosis.

Keywords: COVID-19, rhabdomyolysis, pediatric

Introduction

Coronavirus disease-2019 (COVID-19) is a worldwide health concern affecting people of all ages. The prevalent symptoms of COVID-19 are fever, dry cough, tiredness, and muscle pain; while headache, conjunctivitis, and diarrhea are less common. There have been few reports of COVID-19-related rhabdomyolysis in adults (0.2% of 1,099 patients in China) (1) and fewer in children (2). Rhabdomyolysis is defined as muscle necrosis that presents with muscle weakness, myalgia, and sometimes dark urine. Herein, we report a case of rhabdomyolysis in a patient diagnosed with COVID-19.

Case Report

A 10-year-old boy, previously healthy, initially presented to the pediatric urgent care unit with 2 days of fever and some dry cough and acute muscle weakness and pain of both lower limbs. He was unable to stand due to weakness and pain in both legs. He had no symptoms of diarrhea, vomiting, rhinorrhea, or decreased sense of smell or taste. His medications include azithromycin and acetaminophen.

On the initial examination, he had a fever of 38.5 °C and a respiratory rate of 18. Oxygen saturation was 95 percent in room air. On clinical examination, mild crackles were heard at the base of both lungs. His chest computerized tomography scan revealed small ground-glass nodules, indicating viral pneumonia, scattered across the left lower lung.

His lab testing revealed marked lymphopenia (absolute lymphocyte count: 900), elevated C-reactive protein (CRP) (20 mg/L) (neg <3 mg/L), and marked elevation of creatine phosphokinase (CPK) at 8,000 units per liter (U/L) (range: 24-170 U/L). Lactate dehydrogenase was 500 U/L (normal range: 120-250 U/L). Liver function tests were normal

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Table I. Patient's Laboratory Data

Lab tests	WBC (/mm³)	PMN (/mm³)	LYM (/mm³)	Hb (g/dL)	Plt (/mm3)	CRP (mg/l)	CPK (U/L)	Na (mEq/L)	K (mEq/L)	Bun (mg/dL)	Cr (mg/dL)	Ca (mg/dL)	Glucose (mg/dL)	Blood culture	AST (U/L)	ALT (U/L)	Urine PH
First	2,800	1,800	900	13	150,000	20	8,000	137	4/5	19	0.8	9	90	Neg	117	40	6
Last	5,200	1,900	2,900	12/8	284,000	2	170	135	3.8	12	0.5	9	100	Neg	35	32	7/5

WBC: White blood cell, PMN: Polymorphonuclear neutrophils, CRP: C-reactive protein, CPK: Creatine phosphokinase, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, Lab: Laboratory

except for aspartate aminotransferase which was 117 U/L (normal range: <37 U/L).

His creatinine was 0.8 milligrams per deciliter (mg/dL), which was in the normal range. His urine test demonstrated the presence of blood on a urine dipstick test without any red blood cells (testing of the unspun urine was positive for "heme" on the dipstick, but the visual and microscopic examination of the sediment from the fresh urine specimen was negative for red blood cells (RBC) which suggested myoglobinuria). Renal Doppler and abdominal ultrasound scans were normal. His electrocardiogram was normal and no arrhythmia was observed. The toxicology screen was negative. The patient's COVID-19 polymerase chain reaction test performed via nasopharyngeal swab was positive. His flu test was negative. He was given a 20 cc/kg normal saline bolus and started on isotonic intravenous fluids (at two times the maintenance rate) containing sodium bicarbonate. Fluids were titrated to achieve alkalinization of the urine with a goal urine pH of 8.0. The patient was prescribed hydroxychloroquine and azithromycin for five days. On hospital day 3, his fever stopped and myalgia improved relatively. On hospital day 4, his CPK was 2,000 U/L and his urine was negative for blood, so the fluid rate was decreased (Table I). Two days later, the patient was discharged as his clinical and laboratory symptoms had improved.

Discussion

Rhabdomyolysis is a life-threatening syndrome that is caused by the destruction of muscle cells for various reasons such as viral myositis, trauma, connective tissue disorders, pharmacological, and metabolic disorders (3,4). Viral-associated rhabdomyolysis especially due to influenza is a common cause of rhabdomyolysis in pediatric patients (5).

Several hypotheses explain the mechanism of rhabdomyolysis due to viral causes. First of all, a direct attack of the virus on muscle cells can lead to rhabdomyolysis (6). The second reason is due to the immune system's response to the viruses, which leads to a cytokine storm and eventually muscle destruction. The third factor is the circulating toxins of viruses that directly affect muscle cell membranes (4). However, the mechanism of COVID-19-induced rhabdomyolysis is not yet known.

Herein, we present a pediatric patient with severe rhabdomyolysis without renal involvement associated with COVID-19 infection. To our knowledge, only a few cases of COVID-19-associated rhabdomyolysis have been previously reported in children (2,7). Gilpin et al. (8) presented a case of a 16-year-old adolescent with rhabdomyolysis as an initial presentation of COVID-19, Anwar and Al Lawati (9) presented a 16-year-old boy with COVID-19-induced rhabdomyolysis who eventually died, and Ashley M. Gefen also presented a 16-year-old boy with severe rhabdomyolysis without renal involvement which was related to COVID-19 infection (similar to our case) (2) (Table II).

Another cause of rhabdomyolysis is metabolic diseases. In the above patient, due to the negative family history, unrelated parents, and no history of recurrent cramps or exercise intolerance, the possibility of associated metabolic disease was ruled out (10). Muscle pain and weakness are common symptoms of COVID-19 (11). Myalgias have been observed in more than half of patients with COVID-19 infection. Elevated serum CPK levels indicate the severity of the disease ranging from mild to frank rhabdomyolysis (11). CPK levels should be measured in suspected patients (12). The first step in treating rhabdomyolysis is intense fluid therapy to maintain urine volume and prevent acute renal failure, an early correction of electrolyte disorders, and a correction of

Table II. Summary of previous case reports

Characteristic / Author	Age (year)	Sex	Coexisting conditions	Fever (>38°C)	Cough & shortness of breath	Muscle pain	CT findings	COVID-19 RT-PCR test	CPK (U/L)	Corticosteroids or antiviral therapy	Survived
Gilpin et al. (8)	16	Male	Asthma	38/3	No	Shoulders and Thighs	Negative	Positive	116,640	No	Yes
Gefen et al. (2)	16	Male	Autism, Morbid Obesity	38/9	Yes	Arms, Legs, and Back	Not available	Positive	427,656	No	Yes
Anwar and Al Lawati (9)	16	Male	Negative	38/5	Yes	Myalgia and Leg Weakness	Not Available	Positive	Not Available	No	Died

CT: Computed tomography, COVID-19: Coronavirus disease-2019, CPK: Creatine phosphokinase

metabolic acidosis. Normal saline should be administered as soon as possible at the onset of muscle injury and continued until recovery. However, there is little clinical evidence for its effectiveness. Forced alkaline diuresis may be performed with bicarbonate administration to reduce the renal toxicity of heme (4). The best treatment and the amount and speed of bicarbonate administration are not well known (13). A large cohort study in adults showed the presence of rhabdomyolysis was associated with increased mortality (14). Therefore, the prompt diagnosis and timely treatment of rhabdomyolysis help to reduce complications of those patients with COVID-19.

Conclusion

Rhabdomyolysis can be the first symptom of COVID-19 or it can occur at any time during the course of the disease. Pediatric physicians should be aware of this complication. Timely diagnosis and proper treatment improve the patient's prognosis.

Ethics

Informed Consent: All participants gave written informed consent.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: Pari.A., P.A., Design: Pari.A., P.A., Data Collection or Processing: Pari.A., P.A., Analysis or Interpretation: Pari.A., P.A., Literature Search: Pari.A., P.A., Writing: Pari.A., P.A.

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