

# Letters to the Editor

## Case Reports: Rhabdomyolysis Associated with COVID-19

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**To the Editor:** Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19), has caused a global health crisis. COVID-19 can present with a variety of complications during the course of infection. Rhabdomyolysis is characterized by muscle necrosis and the release of intracellular muscle constituents into the systemic circulation. A prompt diagnosis is a prerequisite for successful treatment and avoiding complications.

We report on 10 patients with rhabdomyolysis associated with COVID-19 who presented to our hospital through the emergency department. COVID-19 diagnosis was made by polymerase chain reaction assay. Pertinent clinical characteristics are summarized in *Table 1*.

The median age of the patients was 55 years and all were male. Presenting symptoms included cough, shortness of breath, fever, myalgias, and confusion. None of the patients were receiving statins or other medications known to cause rhabdomyolysis or had risk factors for rhabdomyolysis. The median creatine kinase level on presentation was 4,460 U per L (74.48  $\mu$ kat per L). Three patients had acute kidney injury on presentation and liver enzymes were elevated in all patients except one. Inflammatory markers (erythrocyte sedimentation rate, C-reactive protein, fibrinogen, and ferritin) were elevated in all patients. Influenza was negative in five patients and other viral causes of rhabdomyolysis (e.g., parainfluenza, enterovirus, adenovirus) were negative in four patients.<sup>1</sup> Eight out of 10 patients died.

Acute viral infections associated with rhabdomyolysis include influenza A and B, coxsackieviruses, Epstein-Barr virus, herpes simplex, parainfluenza, adenovirus, echovirus, HIV, and cytomegalovirus.<sup>2</sup> Others have reported cases of rhabdomyolysis associated with COVID-19.<sup>3,4</sup> The pathologic mechanism leading to this complication is currently unknown. Clinicians should be aware of this life-threatening manifestation of COVID-19 so that prompt and appropriate interventions can be undertaken if it is suspected or confirmed. Further studies are needed to characterize the muscle injury consequences of SARS-CoV-2 infection.

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TABLE 1

**Clinical Characteristics of Patients with COVID-19 and Rhabdomyolysis**

Characteristics	Case 1	Case 2	Case 3	Case 4
Age (years)	54	54	34	71
Sex	Male	Male	Male	Male
Race	Hispanic	White	White	Black
Medical history	Asthma, diabetes mellitus, hypertension, obesity	None	Obesity, prediabetes,	Hypertension, schizophrenia, seizures
Presenting signs and symptoms	Cough, SOB, fever	Myalgias, fever, cough, SOB	Fever, cough, SOB, weakness	Fever, cough, SOB
CK on presentation (U per L/ $\mu$ kat per L)	4,590 (76.65)	3,068 (51.24)	623 (10.40)	5,498 (91.82)
Peak CK total/corresponding day	7,337 (122.53)/4	3,068 (51.24)/1	5,454 (91.08)/4	10,247 (171.12)/3
Potassium (mEq per L) on presentation	5	3.9	3.6	3.8
Phosphorus (mg per dL/mmol per L) on presentation	3.6 (1.16)	ND	2.8 (0.90)	5.5 (1.78)
Creatinine (mg per dL/ $\mu$ mol per L) on presentation	0.7 (61.88)	1.1 (97.24)	0.89 (78.68)	4.1 (362.44)
Acute renal replacement therapy	No	No	Yes	No
Aspartate transaminase/alanine transaminase on presentation (U per L)	25/28	100/48	100/86	125/44
Peak aspartate transaminase/alanine transaminase (U per L)	161/59	91/231	100/86	128/120
C-reactive protein (mg per dL/mg per L)	48 (480)	2.14 (213.6)	12.89 (128.9)	30.90 (309)
Erythrocyte sedimentation rate (mm per hour)	69	111	87	73
Ferritin (ng per mL)	602	4,462	639	327
Fibrinogen (mg per dL/g per L)	ND	992 (29.16)	797 (23.43)	675 (19.84)
Outcome	Died	Discharged	Died	Died

**Note:** Reference ranges are creatine kinase 30 to 223 U per L (0.50 to 3.72  $\mu$ kat per L), potassium 3.5 to 5 mEq per L (3.50 to 5.0 mmol per L), phosphorus 2.5 to 5 mg per dL (0.81 to 1.61 mmol per L), creatinine 0.6 to 1.30 mg per dL (53.04 to 114.92  $\mu$ mol per L), aspartate transaminase 13 to 39 U per L (0.22 to 0.65  $\mu$ kat per L), alanine transaminase 7 to 52 U per L (0.12 to 0.87  $\mu$ kat per L), erythrocyte sedimentation rate 0 to 32 mm per hour, C-reactive protein less than 10 mg per dL (100 mg per L), fibrinogen 183 to 503 mg per dL (5.38 to 14.79 g per L), and ferritin 12 to 300 ng per mL (12 to 300 mcg per L).

CK = creatine kinase; COVID-19 = coronavirus 2019; ND = not done; SOB = shortness of breath.

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Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
88	56	57	64	36	39
Male	Male	Male	Male	Male	Male
White	Hispanic	Hispanic	White	White	Black
Diabetes, hypertension	Hypertension, prediabetes	None	None	None	Hypertension
Confusion	Fever, cough, SOB	Cough, fever	Myalgias, fever, cough, SOB	Fever, cough, SOB	Myalgias, fever, cough, SOB
2,628 (43.89)	5,388 (89.98)	4,643 (77.54)	1,793 (29.94)	5,388 (89.98)	4,330 (72.31)
2,628 (43.89)/1	5,388 (89.98)/1	37,524 (626.65)/14	6,435 (107.46)/4	5,531 (92.37)/5	4,330 (72.31)/1
3.9	3.1	4	4.8	4	4
2.8 (0.90)	3.4 (1.10)	2.4 (0.78)	8.5 (2.75)	2.4 (0.78)	ND
2.25 (198.90)	0.8 (70.72)	1.1 (97.24)	1.01 (89.28)	1.03 (91.05)	3.8 (335.92)
No	No	No	No	Yes	No
115/60	299/170	125/44	101/80	154/111	131/65
117/63	299/170	511/153	113/79	177/101	131/65
6.76 (67.6)	9.58 (95.8)	15.4 (154)	24.7 (247)	29.7 (297)	8.5 (85)
33	81	40	34	35	43
106	836	7,500	ND	4,746	1,170
392 (11.52)	ND	760 (22.34)	559 (16.43)	784 (23.05)	ND
Died	Discharged	Died	Died	Died	Died