Rhabdomyolysis Caused by Rhinovirus

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Case Presentation

A 5-year and 9-month-old boy with previous history of being small for age, previous *Proteus mirabilis* urinary tract infection when 3 years old, and acute bronchitis with secondary bacterial infection when 5 years old presented to the children's emergency department with symptoms of cough for 1 week duration associated with fever for 1 day.

He complained of neck pain for 3 days before admission, but it resolved on admission. There was no history of trauma. There was no sick contact, no recent travel, no chest pain, and no pretreatment with antibiotics.

Initial examination demonstrated oxygen saturation of 96% in room air with pulse rate of 143 beats per minute and respiratory rate of 40 breaths per minute, and reduced air entry on the left base with crepitation on chest examination.

Investigations

Initial investigations on admission were the following:

- Chest X-ray (Figure 1) showed left lower lobe consolidation with small pleural effusion.
- C-reactive protein of 2.7 mg/L with raised white cell count of 26.25 × 10^9/L with neutrophil predominance (24.41 × 10^9/L).

During the third day of admission, he was noted to be persistently tachycardic and tachypneic even when apyrexial, reaching a maximum of 148 beats per minute. He was put on 5 liters of oxygen by face mask.

Then the following investigations were done:

- Raised cardiac enzymes (creatine kinase [CK] 50 741 U/L, CK-KB >300 mg/mL, and troponin-I 42 ng/L)
- Raised alanine transaminase (ALT; 595 U/L) and raised aspartate transaminase (AST; 1001 U/L)
- Aldolase >250 U/L
- Pro-BNP was normal
- Rhinovirus was positive on multiplex polymerase chain reaction analysis on the nasopharyngeal aspirate
- Urinalysis showed white cell count of 0, red cell count of 3, and epithelial cell of 0
- Urine myoglobin was 10 024 µg/L (raised)
- Electrocardiogram showed sinus tachycardia with no ST changes and normal QT interval
- Chest X-ray: no interval worsening
- Echocardiogram showed normal cardiac contractility

The patient was referred to the infectious disease team and investigations performed included Widal-Weil-Felix serology, urine streptococcus pneumonia antigen, mycoplasma pneumoniae particle agglutination test, urinary *Legionella* antigen, mantoux test, and anti-streptolysin O titer, which were all negative.

Differential Diagnosis

Differential diagnosis of sinus tachycardia:

1. Sepsis
2. Pneumonia with complication (worsening pleural effusion, empyema)
3. Acute myocarditis

Treatment

On admission, he was started on intravenous ampicillin. On day 3 of admission, he was transferred to the high

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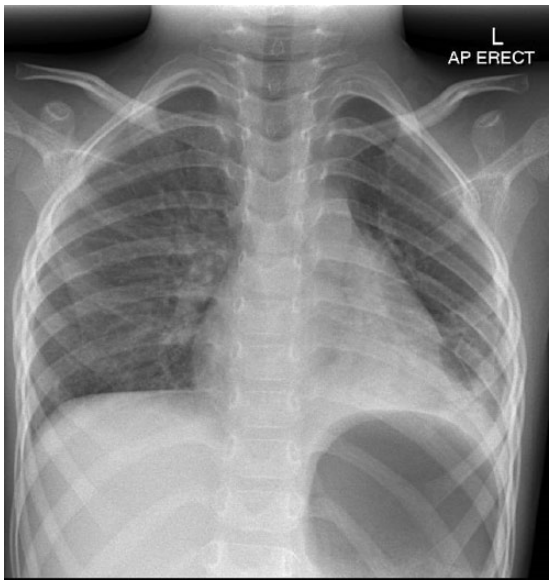

Figure 1. Patchy airspace opacification in the left retrocardiac region with obliteration of the left hemidiaphragm is suggestive of pneumonia. Blunting of the left costophrenic angle suggests small pleural effusion.

dependency unit for closer monitoring and was started on clarithromycin orally.

Outcome and Follow-up

The diagnosis of rhabdomyolysis was made. He was treated with intravenous fluid hydration. He complained of neck and right supraclavicular pain during high dependency stay but the pain did not get worse. CKMB, CK, AST, and ALT were trended and improved with time. CKMB came down to 53.6 mg/mL, and CK came down to 3897 U/L after 5 days.

He was weaned off oxygen since day 6 of admission, and he was sent home well with improved musculoskeletal pain on day 9 of admission with follow-up in 1 month.

He was reviewed at the outpatient setting 1 month after his hospitalization. His CK had normalized to 94 U/L with normal liver function test and interval improvement of the chest X-ray.

Discussion

Rhabdomyolysis was first described in the German medical literature by Fleischer in 1881. Rhabdomyolysis is the clinical syndrome resulting from significant skeletal muscle injury and breakdown.[1] Disruption of the sarcolemma results in disturbed sodium-calcium homoeostasis and leakage of intracellular components into the bloodstream, causing weakness, myalgia, muscle tenderness, edema, pigmenturia, and nonspecific systemic features such as fever, malaise, and vomiting.[2] Myoglobinuria (>1000 μg/mL) tends to peak within 24 hours, and a rise in the serum creatine kinase (>1000 IU/L) peaks 24 to 72 hours after onset of muscle injury. Electrolyte disturbances (hypocalcaemia, hyperkalemia, hyperphosphatemia, and metabolic acidosis) can also occur. In up to 42% of pediatric cases, these additive disturbances culminate in acute renal impairment.[1]

Causes of rhabdomyolysis in children include heat stroke, hypothermia, excessive muscular exertion, traumatic crushing soft tissue injury, infection, alcoholism, cocaine, methamphetamines, and congenital metabolic myopathies. Metabolic myopathies that may cause rhabdomyolysis include muscle phosphorylase deficiency (McArdle disease) and carnitine palmitoyltransferase deficiency. Viral agents that have been described to cause myoglobinuria include influenza virus, parainfluenza virus, human immunodeficiency virus, cytomegalovirus, Epstein-Barr virus, coxsackie virus, and adenovirus. Infection is the major cause of rhabdomyolysis in children younger than 10 years; however, the leading causes in the teenage group are trauma and exercise.[3]

Influenza is the most common viral etiology followed by HIV infection and enteroviral infection.[4] Two mechanisms of action have been postulated: direct viral invasion and toxin generation by virus. Rhinovirus has not been shown to cause rhabdomyolysis in the literature. Human rhinovirus is a member of the family Picornaviridae and the genus *Enterovirus.* It is a single-stranded RNA viruse of approximately 7200 base pairs, responsible for more than half of cold-like illnesses.[5]

When the diagnosis of rhabdomyolysis is established, regardless of cause, hydration and urine alkalinization are crucial to prevent acute renal failure. In addition, treating the underlying cause of rhabdomyolysis is important. Some patients will develop acute renal failure, often with severe acidosis and hyperkalemia, requiring renal replacement therapy to correct fluid, electrolyte, and acid-base abnormalities.

Learning Points

1. Infection is the major cause of rhabdomyolysis in children younger than 10 years.
2. This is the first known case of rhabdomyolysis in children caused by rhinovirus infection.
3. Hydration is crucial to prevent acute renal failure in rhabdomyolysis.

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Author Contributions

TLO: Contributed to conception and design; contributed to acquisition and analysis; drafted manuscript; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

TKC: Contributed to conception; contributed to interpretation; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

CCY: Contributed to conception and design; contributed to acquisition and analysis; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

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References

1. Watemberg N, Leshner RL, Armstrong BA, Lerman-Sagie T. Acute pediatric rhabdomyolysis. *J Child Neurol*. 2000;15:222-227.
2. Chan EK, Kornberg AJ, Ryan MM. A diagnostic approach to recurrent myalgia and rhabdomyolysis in children. *Arch Dis Child*. 2015;100:793-797.
3. Chen CY, Lin YR, Zhao LL, et al. Clinical spectrum of rhabdomyolysis presented to pediatric emergency department. *BMC Pediatr*. 2013;13:134.
4. Singh U, Scheld WM. Infectious etiologies of rhabdomyolysis: three case reports and review. *Clin Infect Dis*. 1996;22:642-649.
5. Jacobs SE, Lamson DM, St George K, Walsh TJ. Human rhinoviruses. *Clin Microbiol Rev*. 2013;26:135-162.