Fatal Influenza B Myocarditis in a 34-Year-Old Female

Taylor Dickey, MSIII*
Melanie Schweir, MSIII*
Matthew Hysell, MD†

*Michigan State University College of Osteopathic Medicine, East Lansing, Michigan
†Lakeland Health, Department of Emergency Medicine, Saint Joseph, Michigan

INTRODUCTION

Myocarditis can be an exceptionally challenging diagnosis to make due to its multiple etiologies, highly variable nonspecific presentations, and the lack of universal treatment standards. Therefore, it is also highly under-reported. The most common mechanism of myocarditis involves an invading virus through either the respiratory or gastrointestinal tract. These viruses infect cardiac myocytes causing an inflammatory reaction. Native macrophages and dendritic cells then form a response that triggers the release of cross-reactive self-antigens, leading to a T-cell mediated autoimmune response that further injures cardiac myocytes. Delayed cardiac manifestations such as arrhythmias, congestive heart failure, sinus tachycardia, and embolic events can occur days or even weeks after the initial viral infection. Untreated, this may eventually lead to unfavorable outcomes such as dilated cardiomyopathy, ventricular tachycardia, and sudden cardiac death.

The classic culprits of viral myocarditis historically include Coxsackie virus, cytomegalovirus, and echovirus. However, there has been increasing evidence of influenza virus causing myocarditis in recent years. Based on the results of Karjalainen et al., the true incidence of myocarditis could be as high as 9%. Influenza B carries the lowest risk of developing myocarditis at 0.7% compared to type A (1.3%) and type C (3.6%). Additionally, 69% of patients who died due to an influenza B infection had some evidence of myocardial injury on autopsy report. However, most of these patients were younger than 18 years of age. Myocarditis caused by influenza B has rarely been reported in adults.

CASE REPORT

A 34-year-old female was brought to the emergency department (ED) by family with a chief complaint of epigastric pain. Initial rapid screening was negative for both influenza A and B. The patient eventually developed myocarditis that led to pulseless ventricular tachycardia and death within 24 hours of admission. Viral smear was positive for influenza B postmortem despite the initial negative rapid screen. This case demonstrates the need for a new diagnostic criteria and treatment strategy for viral myocarditis due to influenza while concisely illustrating how the disease can progress in adults despite commonly presenting as a disease in adolescents. [Clin Pract Cases Emerg Med. 2018;2(3):219–222.]
Fatal Influenza B Myocarditis in a 34-Year-Old Female

Dickey et al.

CPC-EM Capsule

What do we already know about this clinical entity?
Myocarditis is one of the more rare, but potentially fatal, complications of influenza typically seen in the adolescent population.

What makes this presentation of disease reportable?
Viral myocarditis typically presents in the adolescent population. However, in this case the patient was an adult with multiple negative diagnostic tests.

What is the major learning point?
It is essential to keep viral myocarditis on the differential in adults and even when diagnostic tests come back negative.

How might this improve emergency medicine practice?
This case points out the challenges and inefficiencies of diagnosing viral myocarditis in the emergency setting.

Fluid resuscitation was started upon arrival to the ED. Despite infusing four liters of normal saline over the course of four hours, the patient’s blood pressure never increased above a systolic pressure of 100 and she remained borderline hypotensive. Her admitting diagnosis was systemic inflammatory response syndrome (SIRS) due to a presumed viral but undetermined etiology with hypovolemia. At the time of admittance, her vital signs were a temperature of 97.5°F, a heart rate of 116 BPM, a respiratory rate of 18 breaths per minute, and a blood pressure of 94/67. She received ondansetron for nausea.

The next morning, the patient complained of worsening symptoms of malaise and weakness while denying any shortness of breath, cough, chest pain, headache, diarrhea, or anxiety. Except for her blood pressure, which had dropped to 80/50, her vitals were stable. She was given a seventh liter of fluid with modest improvement of her blood pressure, but she remained clammy and required a central line placement in the intensive care unit (ICU). Physical examination was significant for mild epigastric tenderness and acrocyanosis. At this time, she was diagnosed with dehydration secondary to severe sepsis with septic shock. She was given ceftriaxone, vancomycin, and doxycycline to cover meningococcus, methicillin-resistant Staphylococcus aureus, and rickettsia. Additionally, blood cultures and an electrocardiogram (ECG) were ordered and revealed questionable 0.5mm ST-segment elevation of lateral chest leads (Image). Troponin I was elevated at 0.47 ng/ml.

The patient was sent for abdominal computed tomography (CT) to look for a cause of sepsis. The imaging showed some atelectasis/bibasilar infiltrates with small bilateral pleural effusions as well as patchy enhancement of the kidneys concerning for pyelonephritis, but no significant pulmonary edema or cause of sepsis. After completing the CT, the patient decompensated into pulseless ventricular tachycardia and eventual death despite attempts at resuscitation. A postmortem influenza smear was negative for influenza A, parainfluenza A1-A4, and positive for influenza B. This finding, coupled with

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<th>Table. Notable components of complete blood count, blood metabolic panel, liver enzymes, and lipase.</th>
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inflammation of the myocardium on the autopsy, led to the
diagnosis of fatal myocarditis caused by influenza B.

**DISCUSSION**

A review of literature revealed few confirmed, documented
cases of myocarditis secondary to influenza, and even fewer
cases of myocarditis specifically caused by influenza B. The
case shared some common themes with the other presentations.
For example, hypotension refractory to IV fluids was a common
finding. Additionally, ST-segment elevations on ECG are a
common theme related to myocarditis. Finally, a positive
culture is a required part of diagnosing myocarditis secondary
to infection. However, there were some aspects of this case that
deviated from the norm: Most cases of viral infection causing
myocarditis are seen in the young adult population, while our
patient was 34 years old. Furthermore, influenza B is a rare
cause of myocarditis compared to the more common offenders
such as Coxsackie virus.

Furthering the difficulty of this diagnosis lies in accuracy
of testing. Diagnosis of influenza B via reverse transcriptase
polymerase chain reaction relies on a sensitivity of 54% in
adults and 62% overall, which is lower than the sensitivity for
influenza A (65% overall). Diagnosis of viral myocarditis is
based on the Dallas criteria, which require an endomyocardial
biopsy consisting of an inflammatory infiltration with necrosis
and/or degeneration of adjacent myocytes. This pathologic
definition has been criticized for inaccuracy in the medical
community, especially considering that endomyocardial
biopsies only meet these specific definitive criteria with
successful diagnosis rates of 25%.

In the treatment of influenza, oseltamivir phosphate is
thought to be most efficacious within 48 hours from the
onset of symptoms. In patients admitted to the ICU with
hemagglutinin type 1 and neuraminidase type 1 influenza,
there was a reported 75% survival rate in patients given
oseltamivir phosphate within the time constraint (compared to
58% survival rate if left untreated). However, oseltamivir
phosphate administered within five days still showed some
benefit in disease progression. The combination of
these factors makes the diagnosis of myocarditis caused
by influenza B an exceptionally difficult, yet dangerous,
diagnosis to miss.

**CONCLUSION**

We present an adult female with myocarditis secondary
to influenza B infection. The case was complicated by
low sensitivity of rapid influenza screening, inconsistent
diagnosing criteria, and questionable treatment strategies.
To better serve the population of patients that develop
myocarditis from influenza, we need better-defined strategies
to approach, diagnose, and treat myocarditis due to influenza
B. Additionally, it must be recognized that, although rare, viral
myocarditis should be considered in the differential diagnosis
of both adults and adolescents.

Documented patient informed consent and/or Institutional Review
Board approval has been obtained and filed for publication of this
case report.
Fatal Influenza B Myocarditis in a 34-Year-Old Female

Dickey et al.

Address for Correspondence: Taylor Dickey, MSIII, Michigan State University College of Osteopathic Medicine, 1234 Napier Ave, St Joseph, MI 49085. Email: mhyssell@lakelandhealth.org.

Conflicts of Interest: By the CPC-EM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. The authors disclosed none.

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REFERENCES