Pediatric Pericarditis Case Report

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KEY WORDS
Pediatric, pericarditis, effusion

Although pericarditis is uncommonly encountered and diagnosed in pediatric primary care, it has potentially life-threatening sequela. This article presents a case report that illustrates how evasive the diagnosis of pericardial effusion can be. The early symptoms of pericardial effusion resemble common viral conditions that can easily be overlooked. Subtle presenting symptoms and the importance of urgent multidisciplinary collaboration and emergent referral for the child with pericarditis are summarized.

CASE PRESENTATION

A 9-year-old Hispanic female presented to her medical home primary care provider (PCP) with a chief complaint of "follow-up for abdominal pain." The pediatric emergency department (ED) discharge summary was obtained and reviewed by the PCP. The child had been evaluated two days prior for intermittent abdominal pain, pallor, and fatigue at a local community ED and diagnosed with constipation and dehydration. While there, she described a slight sore throat and denied nasal symptoms, cough, or rash. She had been afebrile for the past 48 hours. An abdominal x-ray revealed a nonobstructed bowel gas pattern with moderate stool burden in the left colon. After a digital rectal examination and enema administration, she passed a soft stool with a small amount of gross blood, and her abdominal pain resolved. A rapid strep test was negative. A complete blood count was unremarkable, and serum electrolytes included a carbon dioxide level of 20 mEq/L and an anion gap of 13 mEq/L with normal renal function. Her vital signs in the ED showed a heart rate of 112–126 beats per minute with low blood pressures (BP; 68–80 mmHg/45–61 mmHg) despite three normal saline boluses.

During her health history in the primary care office, her maternal grandfather confirmed that she was well until three days ago when she developed a fever for one day. She then developed abdominal pain at which time her mother took her to the pediatric ED. The child was evaluated, treated, and discharged home with instructions to follow-up with her PCP in two days. Her grandfather reported that since her discharge, her abdominal pain had resolved, and she denied any further fever, nausea, vomiting, constipation, or diarrhea. Reportedly, the child had been drinking well but only water and not eating. She had urinated five times in the past 24 hours and was without dysuria. She had one soft bowel movement that day noted to have a small amount of gross blood. In addition, the grandfather reported that her eyelids were less puffy than the previous day.

Her history continued to be positive for continued fatigue; she had not left the couch to play since she returned home. She had a slight cough and soreness to her rectum for which her family applied Vaseline. Her weight was up 1.3 kg from her ED admission weight. Her remaining review of systems was otherwise negative.

Past Medical History

She was a term infant and otherwise healthy child. She had no hospitalizations, surgeries, or traumas. Her past medical history was significant only for constipation. Her medications included a daily multivitamin. She had no known drug allergies. Her immunizations were up-to-date; she had no travel history or exposures. Her family history included diabetes mellitus in her maternal grandfather. She lived with her employed mother and her maternal grandparents; there was no concern about meeting basic food, housing, or transportation needs. She was a developmentally appropriate, happy third grader.

Physical Exam

The child's weight was 27.7 kg (6th percentile), height was 127.6 cm (18th percentile), body mass index was 13.9 (6th

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percentile), and her oxygen saturation was 100%. She was afebrile with a resting heart rate of 135 beats per minute and a respiratory rate of 28 breaths per minute. Her BP was 86/42 mmHg (12th percentile/7th percentile) while sitting.

The physical exam showed a cooperative, afebrile, small, thin, slightly pale child sitting comfortably on the examination table without acute distress. Her mental status was appropriate for her age. Her neck was supple and nontender. Her eyes were without injection or exudate, and her bilateral upper eyelids were mildly edematous. Her mouth had no lesions or bleeding, and her mucous membranes were tacky with slightly dry lips. Cardiac examination findings included tachycardia, regular rhythm, without a murmur, and a capillary refill of 2–3 seconds. Her extremities were warm, well perfused, and without edema. She had mild tachypnea without retractions. Her bilateral breath sounds were equal and clear without wheezes, rhonchi, or crackles. Her abdomen was without distention, tenderness, guarding, masses, or hepatosplenomegaly. No anal redness or fissure was observed. Her skin was free from rashes or lesions. Nonbloody liquid stool was noted on her pants, underwear, and around her anus.

The grandfather was instructed to return home, encourage her to eat and drink, and call if she developed dizziness, worsening fatigue, or any other signs or symptoms of concern. He was asked to call the office the next morning if she was not feeling much improved and energetic later that day. However, that same evening, the provider continued to ponder the case with concern and a sense that there was something else not addressed that might better explain the fatigue, tachycardia, and lower BP. The provider called to check on her. The mother reported that the child was feeling only a little better after eating some dry cereal, a chocolate shake, beans, and rice. The child's mother denied worsening symptoms for her daughter but conveyed persistent fatigue with her just sitting on the couch and not playing. At the providers request, the mother agreed to call for any concerns that night and to bring her back to the office in the morning for re-evaluation. The on-call provider was made aware of the case.

The following morning the child was again evaluated by her PCP. Her weight and oxygen saturation were unchanged. She remained afebrile with a resting heart rate of 120 beats per minute and a respiratory rate of 28 breaths per minute. Her BPs did not demonstrate orthostatic changes. A clean-catch urinalysis was normal with clear yellow urine with a specific gravity of 1.020. Her examination was unchanged except for no further rectal oozing or blood in her stool.

Differential Diagnosis

Based on her chief complaints, history, laboratory and study results, examination findings, and her ED summary, the following differential diagnoses were considered. (1) Gastrointestinal infection: Abdominal pain, fever, bloody loose stool, and stool incontinence raise question of an infectious gastrointestinal organism. However, timing of the blood correlated closely with microtrauma from a digital examination and enema administration. A gastrointestinal polymerase chain reaction panel proved negative. (2) Pulmonary illness: Cough, fever, and fatigue with increased respiratory rate and abdominal pain can be symptoms of community-acquired pneumonia. A stat chest x-ray was reported to the PCP by the radiologist as having no focal consolidation, mild central pulmonary vascular congestion, and small bilateral pleural effusions, with a normal heart size. (3) Mononucleosis: Fever, sore throat, edematous eyelids, and abdominal pain can be associated with mononucleosis. An inconsistent examination and a negative rapid heterophile without evidence of neutropenia or leukocytosis ruled out mononucleosis. (4) Myocarditis or pericarditis: The child appeared to be comfortable and in no acute distress. She appeared well hydrated, with a urine specific gravity of 1.004. However, her persistent fatigue, mild tachycardia, and borderline low BP were puzzling. The vital signs documented during her ED visit were confusing because several normal saline boluses resulted in a further increased heart rate and unchanged BP, rather than the usual expected normalization of BP and heart rate with intravenous hydration. A screening electrocardiogram (EKG) was ordered to be done at a nearby collaborating pediatric cardiology office. Later that day, the EKG results reported a ventricular rate of 118 beats per minute with sinus rhythm and without ectopy, a variable but normal QTc interval with nonspecific ST/T-wave changes in inferior leads.

The findings of tachycardia with ST/T-wave changes together with small bilateral plural effusions prompted escalation for a complete and urgent pediatric cardiology evaluation. At the request of the PCP, the collaborating community pediatric cardiologist evaluated the child first thing the following morning. The pediatric cardiologist's examination was unchanged except for the noted presence of a grade I-II/VI systolic murmur. The EKG findings were unchanged from the screening EKG. An echocardiogram was performed and demonstrated a moderate–sized pericardial effusion that was imposing a disproportionate hemodynamic effect. Immediate hospitalization and consideration for pericardiocentesis to restore more optimal intracardiac hemodynamics was recommended.

Treatment Plan

The child was admitted to a pediatric hospital where she underwent an uncomplicated pericardiocentesis by a cardiothoracic surgeon who removed 170 mL of straw-colored fluid and placed a drain for several days. Pericardial fluid was not sent for analysis. Similar to the child in this case, 14% of children with viral or idiopathic pericarditis require a pericardiocentesis (Shakti, Hehn, Gauvreau, Sundel, & Newburger, 2014).

After a three-day hospitalization, the child was discharged home with a diagnosis of idiopathic pericardial effusion owing to viral pericarditis. She was discharged on colchicine and ibuprofen. Strenuous physical activity restrictions at home and school were placed for a minimum of three months and until the child was symptom free, with normal

TABLE 1. Comparison of myocarditis, pericarditis, and pericardial effusion

	Myocarditis	Pericarditis	Pericardial effusion
Symptoms	Chest pain Shortness of breath Trouble feeding Decreased appetite Fatigue Fever	Chest pain Shortness of breath Fatigue Fever Nausea/vomiting	Chest pain Shortness of breath Cough Fever Abdominal pain
Causes	Infectious • Viral[a] (Parvovirus, influenza, coxsackie, rubella, rubeola, HIV) • Bacterial infections (Lyme, RMSF, toxic shock) • Protozoan Noninfectious • Autoimmune • Drug hypersensitivity/toxicity	Infectious • Viral[a] (CMV, coxsackie, echoviruses, adenovirus, HIV) • Bacterial (Tuberculosis, *Staphylococcus aureus*, *Hemophilus influenzae*, *Neisseria meningitidis*, *Streptococcus pneumoniae*) • Protozoan Noninfectious • Autoimmune • Neoplastic • Metabolic • Trauma	Pericarditis
Treatment	Medication • Hemodynamic support • Heart failure • IVIG • Immuno-suppressive (if autoimmune etiology)	Medication • NSAID • Colchicine • Antibiotic • Heart failure Surgery	Medication • NSAID • Colchicine Pericardiocentesis

Note. *IVIG, intravenous immune globulin; RMSF, Rocky Mountain spotted fever.*
[a]*Most common in North America and Western Europe.*

inflammatory markers, EKG, and echocardiography findings (Adler et al., 2015). Nonsteroidal anti-inflammatory drugs are the mainstay of treatment for acute pericarditis in children, though there are limited studies and evidence-based guidelines. The European Society of Cardiology recommends high-dose nonsteroidal anti-inflammatory drugs as the first line therapy for pediatric pericarditis, with colchicine as a second line therapy (Adler et al., 2015). However, a 2016 systematic review demonstrated a lack of evidence to support or discourage the use of colchicine in pediatric pericarditis (Alabed, Pérez-Gaxiola, & Burls, 2016). Furthermore, a multicenter cohort study done by Imazio et al. (2016) demonstrated a significant decrease in the risk of recurrence of pericarditis, whereas the use of corticosteroids in adults has been associated with an increased risk of recurrence (Seferović et al., 2013). Recurrence of pericarditis in children ranges from 15% to 40% (Shakti et al., 2014). For adults and pediatric patients with refractory recurrent pericarditis, there are studies demonstrating safety and efficacy of interleukin-1 receptor antagonists (Baskar, Klein, & Zeft, 2016). Further studies are needed to address the role of colchicine and newer anti-inflammatory agents in pediatric pericarditis and pericardial effusion.

DISCUSSION

There is scarce epidemiological data on the incidence of pericarditis in children. Pericarditis accounts for < 0.2% of ED visits of children without previous heart disease presenting with chest pain (Drossner et al., 2011). The symptoms and possible causes of myocarditis, acute pericarditis, and pericardial effusion in children overlap (Abdel-Haq, Moussa, Farhat, Chandrasekar, & Asmar, 2018). Table 1 compares symptoms, etiologies, and treatments of myocarditis, pericarditis, and effusion. In a large number of cases, an etiology of pericardial effusion cannot be determined and are presumed to be viral or postviral. Distinguishing pericarditis from myocarditis is vital because myocarditis is more likely than pericarditis to rapidly cause death. Pericarditis with pericardial effusions can cause life-threatening cardiac tamponade depending on the size of the effusion and how rapidly it develops. A small effusion that accumulates quickly can cause tamponade, whereas a very large effusion that accumulates slowly may not (Tunuguntla, Jeewa, & Denfield, 2019).

Early identification of pericarditis, pericardial effusion, and differentiation from myocarditis is imperative to enable emergent intervention to improve prognosis and mitigate mortality. However, this goal is met with numerous challenges. Chest pain, the typical presenting symptom of pericardial effusion, is not a common symptom in pediatric primary or emergency care. When it is a presenting symptom, it is more commonly related to gastrointestinal reflux, costochondritis, or pleural conditions. The practice gap identified by Tunuguntla et al. (2019) is demonstrated in this case. Suspicion for and diagnosis of the pericardial effusion were delayed because symptoms in the early stages were overlooked in the context of a viral illness. Tachycardia is frequently a presenting symptom, whereas the cardiac exam may be normal or more classically display a friction rub or muffled heart sounds. Symptom presentation spans the

continuum from very mild to rare impending shock (Johnson & Cetta, 2016). A key observation in this case included the child having a medical home and a PCP who was familiar with the child's baseline, which facilitated astute provider concern over vague symptoms. This case also exemplifies that a significant pericardial effusion can be present without the typical signs or symptoms of anxiety, chest pain, and dyspnea in a child who resists lying down.

Even with suspicion for pericardial effusion, the necessary evaluation with EKG and chest x-ray may yield inconsistent results. ST-segment elevation with chest pain is more concerning for pericarditis and effusion, though not specific. The ST-segment changes may mimic benign early repolarization, which is commonly seen in children and adolescents (Tunuguntla et al., 2019). Similarly, on chest radiograph, in the setting of a pericardial effusion with pericarditis, the cardiac silhouette and pulmonary vascular markings may be normal or cardiomegaly present with pulmonary edema, enlarged pulmonary vessels, and/or pleural effusions (Tunuguntla et al., 2019).

The value of obtaining and reviewing urgent care or ED visit documentation was confirmed in this case. In a busy primary care practice setting, it would have been timelier and easier to ascertain from the child and her caretakers that she was feeling better and that after ED treatment, her abdominal pain was resolved, and any need to obtain ED records or further evaluation or follow-up could have been dismissed—except that her outcome would likely have been negatively impacted.

This uncommon, potentially life-threatening, condition that can be easily overlooked in the context of viral symptoms, which presents along a continuum of normal to abnormal symptoms, necessitates timely collaboration between the PCP and pediatric ED. Easy access to pediatric cardiologists and cardiothoracic surgeons was required to evaluate, diagnose, and perform interventions and treatment.

OUTCOME

Three days after hospital discharge, the child was seen by her pediatric cardiologist. Her postdischarge course was benign with absence of fever and chest pain, and she was no longer self-limiting her play. Upon physical examination, she had a normal heart rate and BP. Her cardiac examination findings included a regular rhythm, normal point of maximal impulse and S1 with variably split S2 and normal P2, a grade I–II/VI systolic murmur with a clear diastole, and a prominent diffuse friction rub but without click, S3, or S4. Her EKG showed improvement in the ST/T-wave changes. Her echocardiogram demonstrated preservation of left ventricular systolic function and persistence of a pericardial effusion, though it was much smaller in size. Ibuprofen and colchicine were continued with restricted exercise recommendation.

Follow-up

One month after discharge, she saw her PCP for follow-up. She remained free of fatigue. Her vital signs and growth were normal. Her cardiac exam revealed a regular rate and rhythm without an appreciable murmur or rub. The remainder of her exam was unremarkable.

Finally, 12 weeks after discharge, a repeat echocardiogram demonstrated preservation of left ventricular systolic function and no pericardial effusion. At that time, her activity restrictions were lifted, though the colchicine and ibuprofen were prescribed for a total of 6 months to reduce the risk of recurrence, which is approximately 10% (Tunuguntla et al., 2019). Like most cases of idiopathic or viral pericarditis, she continues to be without sequelae or reoccurrence 9 months after her diagnosis.

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