Case Report

Emergency physician diagnosis of pediatric infective endocarditis by point-of-care echocardiography

Abstract

Infective endocarditis is an uncommon infection in children and may rarely present to the emergency department. The clinical diagnosis of infective endocarditis in children can be challenging, especially in children without a history of underlying cardiac disease. Misdiagnosis or delayed diagnosis may lead to substantial morbidity and mortality. The modified Duke criteria for diagnosing infective endocarditis include echocardiographic findings as major criteria, vegetations on valves or supporting structures, periannular abscess, or new valvular regurgitation. Use of focused point-of-care echocardiography is growing in acute care settings such as emergency departments and can assist in the immediate diagnosis of endocarditis. Focused point-of-care echocardiography is noninvasive, is painless, and can be performed at bedside. Diagnosing infective endocarditis in a pediatric patient by focused point-of-care echocardiography has not been previously reported. We report a case of infective endocarditis in a 16-year-old girl diagnosed by focused point-of-care echocardiography in the emergency department.

A 16-year-old girl with no medical history, born in the Dominican Republic, presented to the pediatric emergency department with a complaint of continual fevers, headache, and dizziness for 8 weeks. The patient had been unable to attend school through most of the course of this illness. The patient had had several visits to the pediatrician and local emergency departments and was initially diagnosed with mononucleosis. On the day of admission, the pediatrician had detected a new heart murmur and referred the patient to our emergency department. She denied any chest pain, shortness of breath, rash, recent travel, or other symptoms. The patient had no history of any heart murmur or heart disease.

Vital signs were temperature of 101.3°F; heart rate (HR), 140 beats per minute; blood pressure, 108/63; respiratory rate (RR), 16 per minute; and pulse oximetry saturation, 100% on room air. Physical examination revealed a mildly ill-appearing adolescent. The fundi were normal. Chest examination revealed clear lungs on auscultation and was notable for a 3/6 holosystolic murmur at the apex, radiating to the axilla and back. Abdomen was soft and nontender without organomegaly. No skin lesions were noted on the extremities. Patient’s neurologic examination was nonfocal. Laboratory tests were significant for a hematocrit of 26.6%; white blood cell count, 8600 per mm³; and erythrocyte sedimentation rate, 86 mm/h. A chest radiograph was unremarkable. The electrocardiogram revealed sinus tachycardia without evidence of chamber dilation or hypertrophy.

Point-of-care echocardiography was performed visualizing a grossly, anatomically normal heart with an echodense mass arising from the anterior leaflet of the mitral valve in parasternal long and short axis views (Figs 1 and 2. Figure 3 is normal for comparison). Preliminary bedside diagnosis led to immediate pediatric cardiology consultation, which confirmed the 9×8-mm mitral vegetation associated with moderate mitral insufficiency and a presumptive diagnosis of infective endocarditis.

Patient was started on intravenous penicillin, nafcillin, and gentamicin and admitted to a hospital with cardiothoracic surgical capabilities. She was monitored carefully for risk of embolization and progression of her mitral insufficiency. Her blood cultures subsequently grew Haemophilus parainfluenzae (HACEK group).

The diagnosis of infective endocarditis in children is difficult because of the nonspecific symptoms such as fatigue, weakness, and prolonged low-grade fevers [1]. The diagnosis of infective endocarditis in patients without structural heart disease is rare and may go undetected until late in the course of the disease. Clinical findings such as cutaneous signs and splenomegaly occur infrequently in children with endocarditis [1]. Laboratory markers such as leukocytosis, thrombocytopenia, and elevated erythrocyte sedimentation rate and C-reactive peptide are nonspecific [1]. The growth of certain fastidious and slow-growing organisms such as Haemophilus parainfluenzae from blood culture can take up to 72 hours or more and require special microbiology techniques [2]. Misdiagnosis is common [1]. Focused point-of-care echocardiography used by emergency physicians can facilitate the earlier diagnosis and initiation of medical therapy to prevent further morbidity and mortality [3,4].

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Diagnostic schema using clinical and pathologic variables in the von Reyn and the original Duke criteria have significant limitations [5]. This led to the subsequent inclusion of echocardiographic findings in the modified Duke criteria to increase sensitivity [6]. Use of focused point-of-care echocardiography in children by noncardiologist physicians is growing in acute care, especially in the setting of cardiac arrest, trauma, and shock [4,6-10]. Curricula for training in point-of-care echocardiography have been published and are available for physicians wishing to learn [11].

Transthoracic echocardiography is the initial imaging modality of choice for detecting endocardial infection in children. Major criteria in the Duke criteria relying on echocardiography include visualizing (1) an oscillating, echodense, intracardiac mass attached to valvular leaflets or mural endocardium; (2) perianular abscesses; (3) new dehiscence of a valvular prosthesis; or (4) new valvular regurgitation [6]. Echocardiography can determine the location of infection, assess valvular dysfunction, as well as monitor cardiac function serially over time. The hallmark echocardiographic finding—valvular vegetation—may not always be detectable by transthoracic echocardiography. However, transthoracic echocardiography for endocarditis has been reported to have a sensitivity ranging from 81% to 93% and is more accurate in children than in adults [12,13]. Transesophageal echocardiography is the alternative in children with poor transthoracic windows [13].

This patient’s endocarditis was caused by *Haemophilus parainfluenzae*, an oropharyngeal gram-negative bacterium. *Haemophilus parainfluenzae* is part of the HACEK (includes other species of *Haemophilus*, *Actinobacillus*, *Cardiobacterium*, *Eikenella*, and *Kingella*) group of rare pathogens responsible for 3% of all endocarditis cases [14]. The prompt diagnosis of endocarditis ensures early administration of antibiotics and possible surgical interventions such as excision to prevent embolization, stroke, and cardiac failure. Vegetations caused by organisms such as *Haemophilus parainfluenzae* tend
to be large, and reports suggest 40% to 50% embolization rates [4,14].

Focused point-of-care echocardiography can expedite diagnosis and management of infective endocarditis. Our case illustrates the typical sonographic appearance of valvular vegetation of infective endocarditis and demonstrates another novel application of point-of-care ultrasound in the pediatric emergency department.

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References


Fig. 3  Normal mitral valve—parasternal long and short axis views. Arrowhead points to normal anterior leaflet of mitral valve.