

Mini Review

Volume 7 Issue 4 – August 2017
DOI: 10.19080/JOCCT.2017.07.555720

J Cardiol & Cardiovasc Ther

Copyright © All rights are reserved by Yousef Etoom

Pediatric Chest Pain: The Red Flags?



Abdulaziz Alnutayfi and Yousef Etoom*

The Hospital for Sick Children, University of Toronto, Canada

Submission: August 16, 2017; **Published:** August 30, 2017

***Corresponding author:** Yousef Etoom, Division of Emergency Medicine, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada, Email: yousef.etoom@sickkids.ca

Abstract

Chest pain (CP) in children is a common complaint encountered by many health care providers in deferent sittings. The causes of pediatric CP are largely benign in etiology. However, the possibility of a cardiac cause must always be entertained. Certain information gathered during the initial evaluation can help identify patients with increased risk for cardiovascular disease necessitating a more extensive workup.

Multiple risk factors and physical exam findings were found to be associated with an increased likelihood of cardiac etiology in children presenting with CP. Knowledge of these “red flags” can help the evaluating physician to risk stratify patients and decide on the appropriate disposition.

Keywords: Chest pain; Red flags; Children; Sudden death; HCM

Introduction

Chest pain (CP) is a relatively common complaint in the pediatric population [1,2]. Due to the well-recognized link between CP and cardiovascular disease in adults, the occurrence of CP in children often raises considerable concern and anxiety in parents. Numerous studies have consistently shown that most causes of pediatric CP are non-cardiac and benign in etiology [3]. The differential diagnosis of pediatric CP is very broad and in most cases no identifiable cause can be found [3]. However, the possibility of a cardiac etiology that might leave the child at risk of sudden cardiac death must always be excluded. A recent systematic review that included 36 epidemiological studies found that 9.63% of pediatric CP presentation was due to a cardiac cause [4]. The challenge facing the primary care provider and emergency physician is to differentiate the benign forms of CP from those associated with increased risk of sudden cardiac death requiring further evaluation. In this review, we aim to highlight the important information obtained from history, physical examination and electrocardiogram (ECG) that can alert the physician to a possible cardiac etiology of CP that will necessitate further evaluation.

Personal History

Several pieces of information obtained during the history gathering portion of the evaluation can suggest a cardiac etiology (Table 1). Exertional CP has been associated with several serious cardiac diseases such as hypertrophic cardiomyopathy (HCM) and

anomalous coronary artery origin [5]. The presence of syncope together with CP should draw the attention of the evaluating physician to the possibility of a serious cardiac arrhythmia leading to a compromised cerebral blood flow. CP associated with palpitation can also point to a possible cardiac arrhythmia, HCM or myocarditis especially when it's sudden in onset and termination. Vasculopathy and the resultant cardiac ischemia are a major cause of mortality in patients with a personal history of Kawasaki disease and cardiac surgery [6], therefore CP in this population should be taken very seriously. CP associated with fever can indicate the presence of pericarditis, myocarditis or endocarditis [7]. Obtaining a thorough family history is of utmost importance in the evaluation of children presenting with CP. A family (or personal) history of connective tissue disease such as Marfan syndrome or Ehlers-Danlos syndrome places that child at a higher than average risk for serious cardiac disease such as aortic dissection [8]. The history of sudden and unexplained death in a family member (particularly in relatives age <40 years) can point to the possibility of HCM, which is frequently inherited as an autosomal dominant disease [9].

Physical Examination

Many findings on physical exam can be concerning for the presence of cardiac disease. Sustained tachycardia should raise concern for the possibility of myocarditis, especially if signs of ventricular dysfunction such as raised jugular venous pressure

or hepatomegaly are present. Tachypnea, although common in the pediatric population, can be associated with pericarditis or cardiac ischemia [10]. An irregular heart rhythm (aside from the minor changes observed during the respiratory cycle) should prompt the evaluating physician to obtain an ECG to look for significant arrhythmia. The general habit of the child, (height, frame, and length of the upper extremities) can give clues suggesting connective tissue disease. The auscultation of the heart may yield valuable information and should be performed in any child presenting with CP. Systolic murmurs, although common in otherwise healthy children, can be associated with HCM. The characteristic murmur of HCM is described as a dynamic systolic murmur that increases in intensity with maneuvers that decrease the left ventricular preload such as the Valsalva maneuver. Other important cardiac sounds to look for include gallop rhythm (dilated cardiomyopathy), cardiac rubs (pericarditis) and any loud systolic murmur (severe left ventricular outflow tract obstruction) [11].

ECG Findings

Table 1: ECG findings indicating possible cardiac etiology in pediatric chest pain.

ECG Findings	Possible Cause(s)
ST segment changes	HCM
	Pericarditis
	Myocarditis
	Cardiac ischemia
Left ventricular hypertrophy	HCM
	Severe left ventricular outflow tract obstruction
Right ventricular hypertrophy	Pulmonary artery hypertension
Intraventricular conduction delay	Myocarditis
	Dilated cardiomyopathy
T-wave inversion	HCM
	Pericarditis
	Cardiac ischemia
Short PR interval	Wolff–Parkinson–White syndrome

Obtaining an ECG can provide important information to help in the risk stratification and disposition, especially

when concerns are raised based on the history and physical examination [12]. Knowledge of the normal ECG changes frequently observed in the pediatric population is essential in order to prevent confusion and unnecessary anxiety. Abnormal ECG findings that could suggest a primary cardiac etiology in the setting of acute CP are summaries in (Table 1).

Summary

Pediatric chest pain is a common entity that often causes immense worry among both the family and health care practitioners leading to great health sources utilization. Knowledge of the key findings obtained through history gathering, physical examination and relevant testing (ECG) can help identify children at risk of sudden cardiac death and other major adverse sequelae needing further testing and specialty referral.

References

- Balfour IC, Syamasudar Rao P (1998) Chest pain in children. *Indian J Pediatr* 65(1): 21-26.
- Eslick GD (2008) Classification, natural history, epidemiology, and risk factors of noncardiac chest pain. *Dis Mon* 54(9): 593-603.
- Hambook JT, Kimball TR, Khoury P, Cnota J (2010) Disparities exist in the emergency department evaluation of pediatric chest pain. *Congenit Heart Dis* 5(3): 285-291.
- Eslick GD (2010) Epidemiology and risk factors of pediatric chest pain: a systematic review. *Pediatr Clin North Am* 57(6): 1211-1219.
- Angelini P, Velasco JA, Flamm S (2002) Coronary anomalies: Incidence, pathophysiology, and clinical relevance. *Circulation* 105(20): 2449-2454.
- Hosenpud JD, Shipley GD, Wagner CR (1992) Cardiac allograft vasculopathy: current concepts, recent developments and future directions. *J Heart Lung Transplant* 11(1 Pt 1): 9-23.
- Veeram Reddy SR, Singh HR (2010) Chest pain in children and adolescents. *Pediatrics in Review* 31(1).
- Judge DP, Dietz HC (2005) Marfan's syndrome. *Lancet* 366(9501): 1965-1976.
- Cirino AL, Ho C (2008) Hypertrophic Cardiomyopathy Overview. *Gene Reviews* [Internet], Washington.
- Takahashi M (2010) Cardiac ischemia in pediatric patients. *Pediatr Clin North Am* 57(6): 1261-1280.
- Friedman KG, Alexander ME (2013) Chest pain and syncope in children: a practical approach to the diagnosis of cardiac disease. *J Pediatr* 163(3): 896-901.
- Saleeb S, Li W, Warren S, Lock J (2011) Effectiveness of Screening for Life-Threatening Chest Pain in Children. *Pediatrics* 128(5): e1062-e1068.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/JOCCT.2017.07.555720](https://doi.org/10.19080/JOCCT.2017.07.555720)

**Your next submission with Juniper Publishers
will reach you the below assets**

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission
<https://juniperpublishers.com/online-submission.php>