Chest Pain in Children

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Chest Pain in Children

General

- 16 year old boy
- Sharp non radiating mid parasternal chest pain at rest and with exertion
- Associated symptoms: Shortness of breath
- No: palpitations or rapid heart rate, dizziness
- No history of syncope
- Family history: unremarkable
- Plan: ?
Chest Pain in Children

Cardiac

- Common referral to emergency department
- Common referral to cardiology clinic
- Cardiac causes are extremely rare
- Tremendous anxiety from patient & family
- United states: media coverage
- Universal concern: Sudden cardiac death
Chest Pain in Children
Common Causes

• Musculoskeletal: (30-40%) costochondritis, trauma, overuse
• Pulmonary: (15-20%) pneumonia, effusion, bronchitis, EIA
• Psychogenic: (5-10%) panic attack, life stressors, depression, somatization disorder
• Gastrointestinal: (5-7%) GE reflux, esophagitis, ulcer, pancreatitis,
• Other:
  – Ingestion, breast pain, endocrine (DM, Hypothyroid), SSD
  – Idiopathic (12-85%)
• Cardiac: (0-4%) coronary, HCM, Inflammatory, Arrhythmia
Etiology of Chest Pain in Children and Adolescents Referred to Cardiology Clinic

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ABSTRACT

Objective: To determine the proportion of children referred to pediatric cardiology clinic for chest pain diagnosed with a cardiac cause for the pain.

Design: Medical records of patients evaluated for chest pain at the University of Wisconsin Children's Hospital from 1994 to 2006 were reviewed, including the studies performed and final diagnosis.

Results: A total of 157 patients, including 78 boys, ranging from 1 to 19 years were evaluated. Electrocardiogram (ECG) and chest x-ray were performed on all patients. No patient (0%) was found to have a cardiac cause for the pain. In patients (27%), there was possible non-cardiac chest pain based on history, but no evidence of ischemia on subsequent testing. Ninety-five percent of patients were discharged with no cardiac chest pain.

Conclusions: The incidence of cardiac chest pain in our study population is less than previously reported. Many patients were referred to cardiology clinic despite having had normal testing by the referring physicians. Primary care physicians should be reassured when patients have a normal history, physical examination, and testing. Referral to pediatric cardiology is not necessary under these circumstances.

INTRODUCTION

Chest pain is a common presenting complaint in children, and can be a source of concern for both parents and physicians. Although many children with chest pain have an identifiable cause for their symptoms, the majority of these children are ultimately diagnosed with non-cardiac chest pain. The purpose of this study was to determine the proportion of children referred to our cardiology clinic for chest pain who were ultimately diagnosed with a cardiac cause for their pain.

METHODS

We performed a retrospective medical record review of patients referred for chest pain from January 1, 2004 through December 31, 2006. At the University of Wisconsin Children's Hospital Pediatric Cardiology Clinic, patients up to but not exceeding 18 years were included if they were evaluated for the chief complaint of chest pain during the study period.

Patients were included if they were referred for evaluation of chest pain, and if the medical record included all of the following: a detailed history, physical examination, laboratory tests, electrocardiogram, and chest x-ray. The diagnosis of chest pain was based on the absence of other potential causes of chest pain, such as musculoskeletal, psychological, or gastrointestinal causes.

RESULTS

A total of 167 patients were referred to our cardiology clinic during the study period. Of these patients, 87 (52%) were subsequently diagnosed with a cardiac cause for their chest pain. The most common cardiac diagnoses were pericarditis, Kawasaki disease, and congenital heart disease.

CONCLUSIONS

Our study found that the majority of patients referred to our cardiology clinic for chest pain were ultimately diagnosed with non-cardiac chest pain. Primary care physicians should be reassured when patients have a normal history, physical examination, and testing. Referral to pediatric cardiology is not necessary under these circumstances.

AUTHOR AFFILIATIONS

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Chest Pain in Children
Cardiac: Wisconsin Study

- Retrospective review 2004-2006
- Referred to a cardiology clinic for chest pain
- Demographics: 135 patients, 4-17 years, 58% males
- Workup:
  - History, physical and ECG: 100%
  - Echocardiogram: 80%

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Chest Pain in Children
Cardiac: Boston Study

Chest Pain in Children
Cardiac: Boston Study

- Retrospective review 2000-2009
- Referred to Boston Children’s Hospital for chest pain
  - Chest pain as billing code, not primary cardiac disease
- Demographics: 3700 patients, median 13.4 years, f/u 4.4 yrs
- Work-up:
  - History and physical- Exertion or rest
  - Electrocardiograms: 100%
  - Echocardiograms: 38%
- End point: cardiac death

Chest Pain in Children

Chest Pain Characteristics:

**Wisconsin**
- Activity: exercise - 30%
- Associated Symptoms:
  - Palpitations - 43%
  - Dyspnea - 33%

**Boston**
- Activity: exertion - 33%
- Associated Symptoms:
  - Palpitations - 22%
  - Shortness of breath - 16%
  - Dizziness - 11%
  - Exertional LOC - 0.4%
Chest Pain in Children

Electrocardiograms:

Wisconsin
- Abnormal ECG: 45%
- Many borderline findings
- Chamber Hypertrophy:
  - most common in both studies
  - all normal on echo

Boston
- Abnormal ECG: 4.5%
- Many borderline findings
Chest Pain in Children

Echocardiograms:

**Wisconsin**
- Performed on 80% (108/135)
- Normal 77%
- 23% abnormal (25/108)
- 0.25% maybe CP/cardiac:
  - Pericarditis
  - ST segment abnormal
- MV abnormality most common
- Some septal defects

**Boston**
- Performed on 38% (1406/3700)
- Normal: 88.1%
- 12% abnormal (168/1406)
- 6.5% maybe CP/cardiac
  - Coronary abnormal 3
  - Pericardial effusion 5
  - Myocarditis: 1
  - Hypertrophic CM 1
  - Dilated CM 1
Chest Pain in Children

Conclusions:
- Pediatric chest pain is common
- **Cardiac etiology** is very uncommon
- If exam and studies are normal- referral to pediatric cardiologist probably not needed
- **Usually suggestive** history, family history, exam or ECG
- Many borderline findings
- Can find mild CV disease unrelated to chest pain
- Tremendous anxiety and resource utilization
- No incidence of sudden cardiac death (Boston Study)
Chest Pain in Children
Most Not Cardiac
Chest Pain in Children
Cardiac: SCAMP

Management of Pediatric Chest Pain Using a Standardized Assessment and Management Plan
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The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://pediatrics.aappublications.org/content/128/2/239.full.html

Chest Pain in Children
Cardiac: SCAMP

- Standardized Clinical Assessment and Management Plan
- Quality Improvement
- Reduce practice variation-standardized approach
- Improved patient outcomes
- Reduce unnecessary resource use
- Decreased patient care costs
- Improved efficiencies

Chest Pain in Children
Cardiac: SCAMP

• Retrospective review 2009
• Referred to Boston Children’s Hospital for chest pain
  – Chest pain as billing code, not primary cardiac disease
• Demographics: 406 patients
• Work-up:
  – History and physical- Exertion or rest
  – Electrocardiograms: 100%
  – Echocardiograms: 43%
  – Exercise Stress Test: 28%
  – Event monitor: 10%
  – Holter monitor: 7%

Chest Pain in Children
Cardiac: SCAMP

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Cardiac: SCAMP

- Abnormal Cardiac Exam: 16 patients (4%)
  - Pathologic murmurs: 6
  - Systolic Click: 4
  - Friction Rub: 3
  - Abnormal S2: 1; Gallop: 1
- Cardiac Etiology of Chest Pain: 5 patients (1%)
  - Pericarditis: 2 patients (Rub, ECG +, Echo +)
  - Supraventricular Tachycardia: 2 patients
  - Ventricular Tachycardia: 1 patient

Chest Pain in Children
Cardiac: SCAMP

- Testing decreased by 20% ($245,000)
- Recommend:
  - History, exam and ECG
  - Possible Echo: concerning H&P, Past or family history, ECG
  - Possible Arrhythmia Monitoring: if palpitations or syncope
  - Exercise Stress Testing: little/no valve (even with exertional CP)

Chest Pain in Children

Summary

- Pediatric chest pain creates **much anxiety**
- Pediatric chest pain evaluation is **very expensive**
- Pediatric chest pain is **almost never** cardiac in etiology (Idiopathic, musculoskeletal)
- Pediatric chest pain evaluation:
  - H&P, ECG
  - Selective further testing is above abnormal
- SCAMP algorithms create conformity of care and increase quality while decreasing cost