Risk Factors for Myocarditis and Dilated Cardiomyopathy in Children Presenting to the Emergency Department

Leon Chen, BA; Brian Lee, MD; Niti Dham, MD; Sairah Khan, MD; Robert McCarter, Jr., Sc.D; James Chamberlain, MD

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

Children's National

Abstract

Myocarditis and dilated cardiomyopathy (M/DCM) are rare diseases of the myocardium which occur in a bimodal age distribution in the pediatric population. The clinical presentation tends to be variable, making diagnosis challenging. Here, we used a retrospective case control study at a quaternary care children's hospital to investigate the medical history, physical exam, and diagnostic testing in patients ≤21 years old diagnosed with and without myocarditis. Cases were more likely to have vomiting, tachypnea, tachycardia, and abnormal ECG, and less likely to have cough or congestion.

Objective

To compare clinical findings in patients with M/DCM to age- and chief-complaint-matched controls.

Introduction

- Myocarditis is the most common cause of heart failure in children, and mortality ranges from 6-24%.
- DCM has significant overlap with myocarditis, with many patients presenting with myocarditis progressing to DCM.
- Diagnosis of these diseases is challenging because of the heterogeneity of presenting symptoms.

Methods and Materials

- Retrospective case-control study of patients ≤21 years-old presenting between 2010 and 2019.
- Cases were identified using ICD 9/10 codes
- Patients with previously diagnosed heart disease or presenting with fulminant disease were excluded.
- Controls were identified in a 3:1 ratio to cases by random selection
- Matched on age and chief complaint category
- Medical history, physical exam, and diagnostic testing variables were identified from the medical record

Results

Table 1. Comparison of Clinical Findings in Patients Diagnosed with Myocarditis vs. Controls

		95% Conf. Interval	
Clinical Finding	Odds Ratio	Lower	Upper
History			
Fever	2.55	0.90	7.22
Nasal Congestion*	0.23	0.06	0.83
Cough*	0.19	0.05	0.69
Vomiting*	2.96	1.08	8.15
Decreased Appetite*	11.48	1.34	98.21
Exam Findings			
Tachypnea*	19.43	2.44	154.88
Retractions	2.64	0.61	11.44
Tachycardia*	10.98	3.09	39.06
Mottled skin	6.00	0.54	66.17
Delayed cap refill	6.62	0.60	73.42
Diagnostic Testing			
Abnormal ECG*	7.35	1.66	32.55
Abnormal Chest X-ray	1.91	0.38	9.66

**Denotes statistically significant findings*

- We identified 47 eligible cases and 147 matched controls.
- Median age was 15.3 years (IQR: 6.2-17.0 years) with a bimodal distribution of 64% >12 years and 21% <2 years.
- Chest pain was the most common chief complaint in older children
- Respiratory symptoms were common in younger children.

Conclusions

- Our results are largely consistent with prior descriptive studies performed without controls.
- Multivariable analyses are ongoing and will provide the strength of independent association with each variable.
- Future multi-centered studies are needed to confirm these findings with the final goal to create a clinical prediction rule.

Children's National

Special thanks to collaborators Brian Lee (M.D.), James Chamberlain (M.D.), as well as Children's National Medical Center.