The Role of High-Sensitivity Cardiac Troponin T for Detection of Heart Disease in the Pediatric Emergency Department

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Abstract

Background: Providers in the pediatric emergency department frequently obtain serum troponin levels when there is concern for acute myocardial injury. There is debate on the usefulness of troponin testing in pediatric patients due to the lower incidence of myocardial injury.

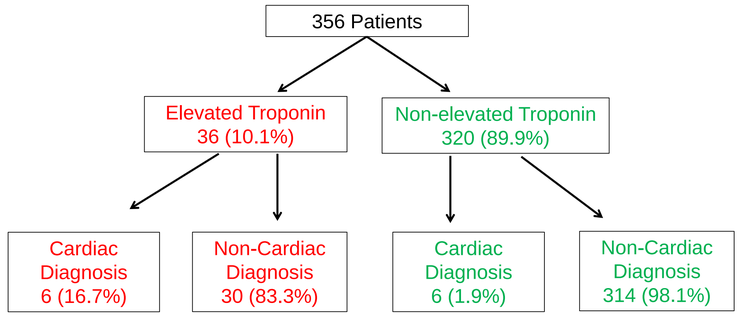
Objective: We sought to determine the contribution of an elevated high-sensitivity cardiac troponin T (hscTnT) in the diagnosis of heart disease in the pediatric emergency department.

Methods: A retrospective chart review was conducted on patients aged 0 - 18 years in whom hscTnT levels were obtained in the emergency department between 2018 and 2020. Clinical data, demographics, and diagnoses were analyzed. hscTnT levels of > 15 ng/L for males and > 10 ng/L for females were abnormal. Cardiac diagnoses included clinically significant arrhythmia, pericarditis, myocarditis, acute coronary syndrome, ventricular dysfunction, blunt cardiac trauma, and cardiac arrest.

Results: Overall, 356 patients were identified in whom hscTnT levels were obtained during emergency department evaluation of cardiac and non-cardiac presentations. hscTnT was elevated on initial presentation for 36 patients (10.1%). In patients with an elevated hscTnT, a final cardiac diagnosis was made in 6 patients (16.7%). Twelve patients (3.4%) out of our entire cohort had a cardiac diagnosis, of which hscTnT was elevated at presentation in 6 patients (50.0%). The patients who had a cardiac diagnosis, but normal hscTnT were diagnosed with pericarditis (5, 83.3%) and ventricular tachycardia (1, 16.7%). Serial hscTnTs were obtained in 106 patients with a normal initial level. Subsequent elevation occurred in 5 patients (4.6%), of which, none had a final cardiac diagnosis.

Conclusions: hscTnT has a low positive predictive value for myocardial dysfunction. Patients with an abnormal hscTnT have increased morbidity and mortality irrespective of final diagnosis. Serial hscTnT measurements did not assist in uncovering additional myocardial pathologies.

Cardiac Diagnosis Flowchart



Positive Predictive Value
16.7%

Sensitivity
50%

Negative Predictive Value
98.1%

Specificity
91.3%

Cardiac Diagnosis

Patient	Age/Sex	hscTnT Trending	Baseline hscTnT	Peak hscTnT	Discharge Diagnosis	Disposition
1	18/F	Y	< 6	< 6	Ventricular tachycardia	Hospital
2	5/F	N	< 6	< 6	Pericardial effusion	PICU
3	17/F	N	< 6	< 6	Pericarditis	Home
4	15/M	Y	10	11	Pericarditis	Home
5	15/M	N	< 6	< 6	Pericarditis	Home
6	16/M	N	12	12	Pericarditis	Home
7	14/F	Y	14	14	Pericardial effusion	PICU
8	17/M	Y	25	76	Cardiac Arrest	ICU
9	17/M	Y	540	623	Pericarditis	Hospital
10	15/M	Y	79	124	Endocarditis	PICU
11	14/M	Y	17	17	Pericarditis	Hospital
12	12/M	Y	46	46	Pericarditis	Hospital

Discharge Diagnosis

		Elevated Troponin (n = 36)	Non-elevated Troponin (n = 320)	Total
Gender				
	Male	25	150	175
	Female	11	170	181
Age (Years, mean)		14.0	16.2	
History of CHD[2]				
	Yes	8 (22.2%)	23 (7.2%)	31
	No	28 (77.8%)	297 (92.8%)	325
Chief Complaint				
	Respiratory	7 (19.4%)	44 (13.8%)	51
	Cardiac*	13 (36.1%)	211 (65.9%)	224
	Trauma/MSK	6 (16.7%)	14 (4.4%)	20
	Gastrointestinal	5 (13.9%)	17 (5.3%)	22
	Psychiatric[1]	1 (2.8%)	15 (4.7%)	16
	Other	4 (11.1%)	19 (5.9%)	23
Discharge Diagnosis				
	Respiratory	8 (22.2%)	63 (19.7%)	71
	Cardiac	6 (16.7%)	6 (1.9%)	12
	Trauma/MSK	9 (25.0%)	43 (13.4%)	52
	Gastrointestinal	2 (5.6%)	21 (6.6%)	23
	Psychiatric[1]	2 (5.6%)	21 (6.6%)	23
	Idiopathic Chest Pain	4 (11.1%)	85 (26.6%)	89
	Other	5 (13.9%)	81 (25.3%)	86

*Includes chest pain, syncope, palpitations; [1]Includes drug overdose; [2]structural congenitalheart disease only.

Cardiac Testing and Clinical Outcomes

	Patients with Elevated Baseline Troponin (n = 36)	Patients without Elevated Baseline Troponin (n = 320)	Relative Risk	*P*-Value*
Electrocardiogram	33 (91.7%)	310 (96.9%)	0.95	NS
Echocardiogram	16 (44.4%)	33 (10.3%)	4.31	< 0.001
Cardiac Consultation	16 (44.4%)	42 (13.1%)	3.39	< 0.001
Hospitalization	25 (69.4%)	45 (14.1%)	4.92	< 0.001
Hospitalization Duration (days, average)	6.4	3.5	-	0.03
Need for Mechanical Ventilation	6 (16.7%)	3 (0.9%)	18.6	0.03
Mortality	3 (8.3%)	1 (0.3%)	27.7	< 0.001

**P*-value via equal variance t-test.

Discussion

- Pediatric myocardial disease is rare in the acute setting. Even in patients whom providers were concerned with a cardiac etiology of their presenting complaint, hscTnT was elevated in only 10.1% of patients tested.
- Pediatric patients with elevated troponins have a low positive predictive value of cardiac pathology, but a non-elevated troponin has a high negative predictive value.
- Trauma, musculoskeletal, and respiratory etiologies were the most common causes of elevated troponin in our cohort of pediatric patients.
- Even though the majority of final diagnoses for patients with elevated troponins was not cardiac, this cohort of patients had a significantly increased need for hospitalization, duration of hospitalization, need for mechanical ventilation, and mortality.
- Clinicians often trend hscTnT when there is continued concern for myocardial involvement. In our study, serial hscTnT measurements in patients without a baseline elevation in hscTnT did not assist in yielding additional cardiac diagnoses.

Conclusion

- hscTnT has a low positive predictive value for myocardial dysfunction, but may have utility as a rule-out test.
- Patients with an abnormal hscTnT have increased morbidity and mortality irrespective of final diagnosis.
- Serial hscTnT measurements did not assist in uncovering additional myocardial pathologies.

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