

Review: the accuracy of troponin T and I tests in acute myocardial infarction depends on timing after onset of symptoms

Ebell MH, Flewelling D, Flynn CA. A systematic review of troponin T and I for diagnosing acute myocardial infarction. *J Fam Pract* 2000 Jun;49:550-6.

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QUESTION: Are troponin T and troponin I tests accurate for detecting acute myocardial infarction (MI) at varying times from onset of symptoms or presentation to the emergency department (ED)?

Data sources

Studies were identified by searching Medline to December 1999 with terms and phrases related to troponin, diagnosis, and diagnostic use.

Study selection

English, German, French, and Spanish language studies were selected if troponin tests were used in the assessment of adults with acute chest pain, the study design included prospective data collection, assessment of acute MI was made by clinicians blinded to the results of the troponin tests, MI was diagnosed using the World Health Organisation or similar criteria, and sensitivity and specificity data were reported for ≥ 1 time point from the onset of pain or presentation to the ED.

Data extraction

Data were extracted on settings, consecutive or non-consecutive patient enrolment, patient characteristics, test manufacturer, cut point values for abnormal levels, and timing of the test from onset of pain or presentation to the ED. Study quality was classified as level I if patients were enrolled consecutively and the rest were classified as level II. Data on sensitivity, specificity, and likelihood ratios were extracted or calculated and combined in meta-analyses.

Main results

19 studies met the inclusion criteria. Of the 11 level-I studies (3736 patients), 7 increased troponin T, and 4 increased troponin I. Of the 8 level-II studies (1998 patients), 6 increased troponin T, 1 increased troponin I, and 1 increased both. The sensitivity of both tests increased from the time of onset of symptoms, whereas specificity stayed the same or decreased slightly. Sensitivity was highest at 8 hours and beyond for troponin T and at 6 hours for troponin I. Troponin T ≤ 0.2 ng/ml at 8 hours best ruled out MI. The table presents the summary data.

Conclusions

The sensitivity of troponin T and troponin I tests for detecting acute myocardial infarction is dependent on the timing of the test; the tests are insensitive within 6 hours of onset of symptoms. A negative test result 8 or more hours after onset best rules out myocardial infarction.

Test characteristics for troponin T and I for detecting acute myocardial infarction*

Test and cut point for abnormal levels	Time in hours from onset of symptoms	Sensitivity	Specificity	+LR	-LR
Troponin T >0.1 ng/ml	1	47%	87%	3.7	0.6
	6	74%	83%	4.4	0.3
	8	84%	81%	4.5	0.2
Troponin T >0.2 ng/ml	1	14%	87%	1.1	1.0
	6	86%	83%	5.1	0.2
	8	96%	81%	5.2	0.05
Troponin I >0.1 ng/ml (based on only 1 study)	1	13%	95%	2.7	0.9
	4	67%	95%	13	0.3
	6	90%	95%	18	0.1

*LRs defined in glossary.

COMMENTARY

Serum troponin T and I tests are often used to help to diagnose acute MI. The diagnostic performance of the tests varies greatly, however, depending on the cut point used to define abnormal levels and the timing of the test from onset of symptoms. The review by Ebell *et al* highlights the difficulties in using troponin tests for the diagnosis of MI and provides summary sensitivity and specificity data for specific cut point values and times from symptom onset. These values are derived by using data from studies of varying quality and from a wide spectrum of patients, including patients presenting to the ED with symptoms suggestive of MI and those admitted to coronary care units because of high suspicion of MI. The reported test sensitivities may be inflated by the inclusion of patients with a high likelihood of MI. The summary diagnostic performance values are "best fit" estimates from data from several studies and are not derived by statistically rigorous methods.

The only conclusions that should be drawn from this review are that a positive troponin T test result can be useful for ruling in MI when blood is drawn ≥ 6 hours after symptom onset and a negative troponin test result can effectively rule out MI when blood is drawn ≥ 8 hours after symptom onset.

The review fails to mention the difficulty in using these tests to diagnose patients with unstable angina; a negative test result that rules out MI should not necessarily be used to send patients home from the ED. Furthermore, the diagnostic performance of the tests is greatly affected by changing the cut points for abnormal values: a lower cutoff (0.1 ng/ml) increases sensitivity but decreases specificity.

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