

Does This Patient With a Pericardial Effusion Have Cardiac Tamponade?

EBEM Commentator Contact

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RATIONAL CLINICAL EXAMINATION REVIEW SOURCE

This is a rational clinical examination abstract, a regular feature of the *Annals'* Evidence-Based Emergency Medicine (EBEM) series. Each features an abstract of a rational clinical examination review from the *Journal of the American Medical Association* and a commentary by an emergency physician knowledgeable in the subject area.

The source for this rational clinical examination review abstract is: Roy CL, Minor MA, Brookhart MA, et al. Does this patient with a pericardial effusion have cardiac tamponade? *JAMA*. 2007;297:1810-1818. The *Annals'* EBEM editors assisted in the preparation of the abstract of this rational clinical examination review, as well as selection of the Evidence-Based Medicine Teaching Points.

OBJECTIVE

To systematically review the accuracy of the medical history, physical examination, and basic diagnostic tests for the diagnosis of cardiac tamponade.

DATA SOURCES

A structured MEDLINE search from January 1, 1966, to December 31, 2006, was performed to identify English-language articles. Additional articles were identified by reviewing the reference lists of included articles and references cited in cardiology and physical diagnosis textbooks.

STUDY SELECTION

Two authors independently reviewed the articles. Included articles reported the results of original studies that evaluated the medical history, physical examination, and routine diagnostic tests such as ECG or plain chest radiography compared with reference standards such as pericardiocentesis with right-sided heart catheterization and echocardiography. Studies were excluded if they dealt with pericardial diseases other than

cardiac tamponade or with patients with cardiac tamponade after cardiac surgery or if they enrolled fewer than 15 patients.

DATA EXTRACTION AND ANALYSIS

Articles were graded for methodologic quality. The included studies were nonindependent comparisons of signs and symptoms versus a criterion standard among patients with (and perhaps without) cardiac tamponade. Studies were either retrospective reviews or prospective case series of small groups.

When 3 or more studies presented data on a particular finding, pooled sensitivities and confidence intervals (CIs) were calculated with a random-effects model.

MAIN RESULTS

There were insufficient data to comment on the pooled sensitivity of symptoms of cardiac tamponade.

One study of 65 patients demonstrated a positive likelihood ratio of 5.9 (95% CI 2.4 to 14) and a negative likelihood ratio of 0.03 (95% CI 0 to 0.21) when pulsus paradoxus was greater than 12 mm Hg.¹

There were insufficient data to provide likelihood ratios for other signs or tests of cardiac tamponade (Table 1).

CONCLUSIONS

The majority of patients with cardiac tamponade have pulsus paradoxus, tachycardia, increased jugular venous pressure, and cardiomegaly on chest radiograph. The minority will have diminished heart sounds, hypotension, or low voltage on electrocardiogram. Diagnostic certainty requires further testing.

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COMMENTARY: CLINICAL IMPLICATION

The diagnosis of cardiac tamponade is important for emergency physicians. Missing this diagnosis may result in

Table 1. Signs and tests of cardiac tamponade.

Signs and tests	Sensitivity	95% CI
Signs of cardiac tamponade		
Pulsus paradoxus >10 mm Hg	82	72–92
Tachycardia	77	69–85
Increased jugular venous pressure	76	62–90
Hypotension	26	16–36
Diminished heart sounds	28	21–35
Tests of cardiac tamponade		
Low-voltage ECG	42	32–53
Cardiomegaly on chest radiograph	89	73–100

patient mortality, yet the symptoms and signs of this diagnosis are nonspecific, making the diagnosis difficult for clinicians. In fact, the hallmark of cardiac tamponade, hemodynamic instability, is a late finding.

Using a systematic literature review, this article attempts to provide the best evidence for making the bedside diagnosis of cardiac tamponade. However, this systematic review is limited by low-quality evidence, including case series and small- to medium-sized chart reviews. In addition, patients in this review universally had known pericardial effusion before assessment, a factor that informed all diagnostic assessments and decisions. Pulsus paradoxus and other signs and symptoms classically associated with pericardial tamponade are often considered in clinical practice to assist in making a new diagnosis of pericardial effusion with tamponade, rather than to determine whether tamponade physiology has developed in the setting of a known effusion. However, with increasing use of emergency ultrasonography to confidently determine the presence of pericardial effusion, the information from this review may become more useful. This is particularly true, given the often limited availability of formal echocardiography and that ultrasonographic characteristics of cardiac tamponade (right-sided atrial systolic collapse, right-sided ventricular diastolic collapse, inferior vena cava plethora, and altered valvular flow velocities) exceed the typical emergency physician skill set, making clinical determinants potentially more important.

According to the data from this review, the signs and simple tests classically associated with cardiac tamponade may have limited utility for the emergency physician. Beck's triad, initially described in surgical patients, was observed in only a minority of patients in this review,² and the highest sensitivity values noted for any clinical variable or test finding do not reach 90%. Furthermore, the sensitivity values for these signs and tests are additional information to be included in the overall clinical decision but cannot, in isolation, alter probability of disease in a true bayesian manner.

TAKE-HOME MESSAGE

The sensitivities of certain clinical signs and ED tests can be added to the clinical reasoning of the emergency physician

Table 2. The characteristics of measures of tests.

Measure	Population	Subjects With Disease
Sensitivity	True positives/true positives+false negatives	All
Specificity	True negatives/true negatives+false positives	None
Positive predictive value	True positives/true positives+false positives	Mixed
Negative predictive value	True negatives/true negatives+false negatives	Mixed
Positive LR	Sensitivity/1-specificity	Mixed
Negative LR	1-Sensitivity/specificity	Mixed

LR, likelihood ratio.

considering the diagnosis of cardiac tamponade in a patient with a pericardial effusion. According to limited evidence, calculating the pulsus paradoxus in a patient with a pericardial effusion may alter the clinician's pretest probability of cardiac tamponade; however, the diagnosis of cardiac tamponade requires a formal echocardiogram.

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EBEM TEACHING POINT

Inability to calculate likelihood ratios. In this review, likelihood ratios could not be calculated. Why? The formula for calculating a likelihood ratio includes both the sensitivity and the specificity of the test. For the majority of the data provided in this review, no disease-negative population was reported—most reports were case series or chart reviews of patients with pericardial tamponade, the disease in question. Specificity calculations are done exclusively with data from subjects who do not have the disease, in contrast to sensitivity calculations, which include only those who have the disease, and calculations of positive and negative predictive values, which include those with and without disease. With no disease-negative population included, neither specificity nor likelihood ratios, nor predictive values, can be calculated. Sensitivity is the only calculable test characteristic (Table 2).

REFERENCES

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