Best Clinical Practice

CrossMark

BEST CLINICAL PRACTICE: CURRENT CONTROVERSIES IN EVALUATION OF LOW-RISK CHEST PAIN—PART 1

Brit Long, MD* and Alex Koyfman, MD†

*Department of Emergency Medicine, San Antonio Military Medical Center, Fort Sam Houston, Texas and †The University of Texas Southwestern Medical Center, Department of Emergency Medicine, Dallas, Texas

Reprint Address: Brit Long, MD, Department of Emergency Medicine, San Antonio Military Medical Center, 3841 Roger Brooke Drive, Fort Sam Houston, TX, 78234

□ Abstract—Background: Chest pain is a common presentation to the emergency department (ED), though the majority of patients are not diagnosed with acute coronary syndrome (ACS). Many patients are admitted to the hospital due to fear of ACS. Objective: Our aim was to investigate controversies in low-risk chest pain evaluation, including risk of missed ACS, stress test, and coronary computed tomography angiography (CCTA). Discussion: Chest pain accounts for 10 million ED visits in the United States annually. Many patients are at low risk for a major cardiac adverse event (MACE). With negative troponin and nonischemic electrocardiogram (ECG), the risk of MACE and myocardial infarction (MI) is < 1%. The American Heart Association recommends further evaluation in low- to intermediate-risk patients within 72 h. These modalities add little to further risk stratification. These evaluations do not appropriately risk stratify patients who are already at low risk, nor do they diagnose acute MI. CCTA is an anatomic evaluation of the coronary vasculature with literature support to decrease ED length of stay, though it is associated with downstream testing. Literature is controversial concerning further risk stratification in already low-risk patients. Conclusions: With nonischemic ECG and negative cardiac biomarker, the risk of ACS approaches < 1%. Use of stress test and CCTA for risk stratification of low-risk chest pain patients is controversial. These tests may allow prognostication but do not predict ACS risk beyond ECG and troponin. CCTA may be useful for intermediate-risk patients, though further studies are required. © 2016 Elsevier Inc. All rights reserved.

□ Keywords—chest pain; low risk; stress test; coronary computed tomography angiography

INTRODUCTION

Chest pain is a common presentation to the emergency department (ED), accounting for approximately 8 to 10 million visits in the United States per year, and $10 to $12 billion per year in health care expenditures (1). Approximately 10% of ED visits and 25% of hospital admissions are due to chest pain (1–6). The etiology of these presentations can range from benign to life-threatening, and heart disease is one of the major considerations for the emergency provider, as it is a leading cause of death in the United States (1,5,6).

The American Heart Association (AHA) endorses noninvasive cardiac imaging for further evaluation before

or within 72 h of discharge (6). Despite this recommendation, there is no evidence that this testing decreases risk of future cardiac events. Multiple options for noninvasive testing exist, each with specific advantages and disadvantages.

DISCUSSION

Risk with Chest Pain

Chest pain evaluation can lead to prolonged ED stays, provocative testing, and anxiety for the patient and physician. The ED evaluation of the patient with chest pain can present significant medicolegal risk to physicians, as approximately 20% of lawsuits are due to diagnosis and management of acute coronary syndrome (ACS). Missed myocardial infarction (MI) is one of the highest costs to insurers, with mortality rates ranging from 10% to 25% for patients discharged home (2,7–9).

However, upon ED evaluation, few patients are diagnosed with ACS (10–15). Unfortunately, overtesting can lead to false positives, further testing, and potential patient harm. Physicians admit a large percentage of patients with chest pain due to this risk, as one study demonstrates providers would not admit 30% of patients in a zero risk location and 29% of patients in a 1% miss-rate climate (11). These rates differ among separate specialties and locations, as EDs manage a higher-risk population than primary care providers (11–15). Despite these results, the true rate of misdiagnosis approximates 0.2%, rather than the commonly quoted 2% from a study by Pope et al. in 2000 (2). In 1996, Goldman et al. suggests that patients without hypotension, heart failure, known prior MI, or worsening chest pain,

have < 1% risk of death, need for revascularization, or ACS (16). A recent 2015 article by Weinstock et al. illuminates this risk further, finding that with two negative troponin tests and nonischemic electrocardiogram (ECG), the primary outcome of adverse cardiac event occurs in 0.18% of admissions (17).

Further testing does not necessarily lead to patient reassurance. One study evaluating low-risk chest pain, headache, and low back pain finds patients receiving more testing are in the short term more satisfied, but at longer-term follow-up, patient outcomes and satisfaction do not differ between groups receiving more testing and those with no intervention (18). The authors suggest addressing patient concerns and fears, rather than relying on imaging and laboratory testing. A separate study finds further diagnostic testing does not affect patient symptoms, anxiety, or concerns in the short or long term (19). Not only does further testing not improve patient reassurance and comfort, but it can be associated with iatrogenic injury and increased patient radiation exposure (20).

Stress Test Utility

Several noninvasive cardiovascular testing modalities allow further evaluation of patients with chest pain, specifically investigation of obstructive coronary artery disease (CAD) and inducible angina. Components of stress testing include stress mode and stress detection, shown in Table 1. Many of these modalities are institution-dependent, and there is no evidence of difference in rate of overall mortality or MI among these types of evaluations. Per the AHA, stress testing in low- to intermediate-risk chest pain patients increases sensitivity and negative predictive value (NPV) for risk assessment

Table 1. Stress Test Characteristics (21–27)

Modes	Stress Detection Modality

Exercise
  - Treadmill or stationary bicycle (25)
  - Increases cardiac demand
Vasodilatation (25)
  - Adenosine, dipyridamole, regadenoson
  - Increases coronary blood flow
Inotropy (21,23–25)
  - Dobutamine
  - Produces inotropic effects that increase cardiac demand and heart rate
	ECG
	  - All modalities may employ ECG, most commonly used test
	  - Positive if the patient has early chest pain, hyper-/hypotension, ST changes, or dysrhythmia
	  - Limited in patients with baseline abnormal ECG
	  - Sensitivity 44% to 68%, Specificity 77%
	Echocardiogram
	  - Used with exercise and inotropic stress test
	  - Inducible wall-motion abnormalities highly sensitive for coronary artery disease, approaching 80%
	  - Disadvantages include operator dependence and technical limitations due to body habitus
	MRI, PET, radionuclide imaging
	  - Injectable radioisotope (thallium-201, technetium99-m) with imaging to evaluate myocardial perfusion at rest and with ischemic challenge (chemically induced or exercise)
	  - Less operator-dependent than other testing, sensitivity for stenosis approaches 90%
	  - More expensive and time consuming than other tests, also includes radiation exposure

ECG = electrocardiogram; MRI = magnetic resonance imaging; PET = positron emission tomography.