Chest pain in the emergency room: evaluation and triage with CT coronary angiography

By Aamer Chughtai, M.D., and Ella A. Kazerooni, M.D.

A n estimated 1.1 million people in the U.S. are expected to have a new or recurrent myocardial infarction annually, with an additional 150,000 cases of unstable angina diagnosed. While the incidence of myocardial infarction increases with age and the number of atherosclerosis risk factors, it can occur at any age, with approximately half of all myocardial infarcts in the U.S. occurring in patients under the age of 65 years, and in people without risk factors. Public health campaigns over the last 25 years aimed at developing early recognition of such symptoms of myocardial infarction as chest pain, shortness of breath, nausea/vomiting, and diaphoresis, have increased public awareness of this too often fatal disease process.

At the time of cardiac catheterization, the majority of patients are found to have coronary atherosclerotic disease. Stent placement has become the standard of care for patients with acute myocardial infarction treated with primary angioplasty. By Aamer Chughtai, M.D., and Ella A. Kazerooni, M.D.

1. Compare the accuracy of 64-slice CT in assessment of chest pain in the ER.
2. Define the algorithm for the management of chest pain.
3. Explain the role of stress echocardiography in the evaluation of chest pain.
4. Review the algorithm for the diagnosis of acute myocardial infarction.
5. Review the algorithm for the diagnosis of acute coronary syndromes.

LEARNING OBJECTIVES

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Chest pain centers have evolved that can see large numbers of chest pain patients, the minority of whom will have an acute coronary syndrome, such as ST elevation myocardial infarction (24/100,000 persons/yr) vs. the majority of acute chest pain presentations which are non-cardiac in nature (90-95%). Chest pain syndrome, in the context of a busy emergency department (1000 presentations/yr), accounts for only 2% of patients with chest pain. By Aamer Chughtai, M.D., and Ella A. Kazerooni, M.D.

Chest Pain in the Emergency Room

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Similarly, Mollet et al of patients undergoing coronary CTA had a noncardiac CT finding, of which 40% were significant or potentially serious, including 26% aneurysm, pseudoaneurysm, or dissection; and 16% had lung nodules, two of which so far have proven to be lung cancers.

Raff et al demonstrated specificity, sensitivity, and positive predictive value and negative predictive value for the presence of significant coronary artery stenosis. Sensitivity and specificity for establishing a cardiac cause of chest pain were 83% and 96%, respectively, and 87% and 96%, respectively, for both cardiac and noncardiac causes of chest pain.

Since many of these patients may have a prior history of coronary artery disease, cardiomyopathy, arrhythmia, body mass index greater than 38, and serum creatinine greater than 1.5, patients in the CT group had a higher rate of medical management compared to patients in the nuclear medicine group (median 6.2 hours vs. 14.1 hours, p < 0.0001), a shorter time to cardiac ac...
Coronary CTA in the Emergency Department

Use the development of MSCT, perfusion imaging with radionuclide SPECT was one of the triage methods used in the emergency department for patients with chest pain. Technetium-99m sestamibi SPECT has been shown to have a high NPV (99%) for excluding acute cardiac events. For this scan, however, patients have to be moved from the emergency department to the nuclear medicine department, which may be some distance away, often the most vulnerable patient. While the service is usually not available all day, every day. Stress echocardiography can also be used and is believed to be equivalent to nuclear perfusion testing. With the advent of 16-slice MSCT, coronary CTA is more and more used as a standard of care as coronary CTA, allowing diagnosis or exclusion of coronary disease, is a primary indication for MSCT. More and more MSCT scanners are therefore positioned in or near emergency rooms.

Coronary CTA has a sensitivity of 95.9% and specificity of 88.6% for stenoses ≥50% diameter at the patient level, even when accounting for the impact of missing patient data due to such technical limitations as nonvisible coronary segments secondary to motion or calcification.

Sensitivity and specificity for establishing a cardiac diagnosis were 83% and 96%, respectively, and 87% and 96%, respectively, for both cardiac and noncardiac causes of chest pain. This important work described both the success and failures of 16-slice ECG-gated MSCT for chest pain patients without an obvious acute coronary syndrome. The authors demonstrated feasibility and suggested that the protocol be adopted for evaluating cardiac and noncardiac chest pain in stable emergency department patients. Their closing comment was that further hardware and software improvements will be necessary for adoption of this paradigm in clinical practice.

FIGURE 3. 52-year-old man who presented to the emergency department with exertional dyspnea and chest pain. Coronary CTA revealed a midwall nonobstructive coronary artery stenosis in the proximal LAD, as shown on curved planar reformatted (right) and multiplanar reformatted (left) images of the coronary tree. Note the presence of an atherosclerotic plaque with calcified and large noncalcified components in the proximal LAD, as shown on curved planar reformatted (right) and multiplanar reformatted (left) images of the coronary tree.
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