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Calcium Scoring and Cardiac Computed Tomography

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KEYWORDS

- Atherosclerosis • Angiography • Risk stratification • Outcomes • Cardiac computed tomography
- Calcium score

KEY POINTS

- Computed tomography (CT) angiography is now the most accurate noninvasive assessment tool for heart disease, with the highest concordance to invasive angiography.
- The use of CT angiography in the emergency department will undoubtedly become the dominant strategy, with emphasis on diagnosis, cost, and prognosis.
- Coronary artery calcium can be accurately depicted on nongated studies, such as those performed for lung cancer screening, and can help doctors identify patients at high risk for future cardiovascular disease.

INTRODUCTION

Accurate and efficient evaluation of acute chest pain remains clinically challenging because traditional diagnostic modalities have many limitations. Recent advances in noninvasive imaging technologies have potentially improved both diagnostic efficiency and clinical outcomes of patients with acute chest pain while reducing unnecessary hospitalizations. However, controversy remains regarding much of the evidence for these technologies. This article primarily reviews the role of coronary computed tomography (CT) angiography (CTA) in the assessment of an individual's coronary risk, and its usefulness in the emergency department (ED) in facilitating appropriate disposition decisions. Also discussed is coronary artery calcification (CAC) incidentally found on CT scans when done for indications such as evaluation of pulmonary embolism or lung cancer. The evidence base and clinical applications for both techniques are described, together with cost-effectiveness and radiation exposure considerations.

BACKGROUND

In the United States more than 6 million patients with chest pain present to the ED each year.¹ The limited predictive value of clinical history and physical examination complicates accurate risk stratification, particularly in patients with normal cardiac biomarkers and nondiagnostic electrocardiograms (ECG).² Consequently, more than 60% of patients admitted to the hospital for evaluation of acute coronary syndrome (ACS) are discharged with a noncardiac diagnosis.³ Conversely, the rate of missed diagnosis of ACS in the ED remains unacceptably high, ranging from 2% to 8%, with missed diagnoses associated with a 2-fold increase in mortality.^{4,5}

Effectively ruling out an acute myocardial infarction is difficult. The standard 12-lead ECG has inadequate sensitivity and negative predictive value (NPV) in ruling out any form of ACS.⁶ Troponin measurement has a low sensitivity in excluding myocardial ischemia or early manifestations of ACS.⁷ Rest echocardiography has limited

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