Coronary CT Angiography for Acute Chest Pain
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Each year, more than 6 million people in the United States go to emergency departments because of acute chest pain. Some of them have coronary artery disease, but most have diseases that are unrelated to the heart or they have no discernible physiological conditions. The vast majority will undergo various diagnostic tests, and many will be held for observation and may be admitted to the hospital. This approach, however, is guaranteed to lead to unnecessary stays in the emergency department and to overtreatment. More disturbingly, it is unclear whether this approach actually results in better outcomes than a more conservative one.

In this issue of the Journal, Hoffmann et al. describe an important comparative-effectiveness study of two diagnostic strategies for patients presenting to the emergency department with chest pain. They investigate the effect of using coronary computed tomographic angiography (CCTA) to evaluate patients with symptoms suggestive of acute coronary syndromes to determine whether CCTA can safely reduce the time such patients spend in the hospital. In their study, Rule Out Myocardial Infarction Using Computer Assisted Tomography II (ROMICAT-II), 1000 such patients were randomly assigned to either CCTA or standard diagnostic procedures, which were performed at the discretion of the physicians in the emergency department.

The authors found that the length of stay in the hospital in the CCTA group was 7.6 hours shorter than the length of stay in the standard-evaluation group, and a follow-up evaluation 28 days later showed no overlooked cases of acute coronary syndromes in either group — a fact consistent with the low-to-intermediate-risk status of the study patients. They also found that the CCTA group incurred only slightly higher costs, as compared with the standard-evaluation group. The authors' findings build on similar data from another study by Litt et al. that also randomly assigned patients with suspected acute coronary syndromes to CCTA or traditional care.

Both studies confirm the somewhat unremarkable fact that CCTA provides faster diagnostic results than standard evaluation (which meant some type of stress test in 74% of the patients in the study by Hoffmann et al. and 64% of the patients in the study by Litt et al.). It should be noted that ROMICAT-II enrolled patients only during “weekday daytime hours” at sites where a “dedicated accelerated diagnostic protocol” was performed; the costs (and wait time) increase when any service is provided on nights and weekends. Although shorter lengths of stay in the hospital are highly desirable, especially from the patient’s point of view, the ROMICAT-II study reveals a deeper flaw in the approach to chest pain in the emergency department.

The underlying assumption of the studies by Hoffmann et al. and Litt et al. is that some diagnostic test must be performed before discharging these low-to-intermediate-risk patients from the emergency department. This assumption is unproven and probably unwarranted. The rationale for any test, as compared with no testing, should be that it will lead to an improved outcome, and here there is no evidence that the tests performed led to improved outcomes. Indeed, event rates for major adverse cardiac events among all patients in the studies by Hoffmann et al. and Litt et al. (whether the patients underwent CCTA, stress testing, or no testing at all) were so low — less than 1% had a myocardial infarction and no patients died — that it is impossible to know whether the CCTA
groups received any benefit whatsoever. These very low event rates were observed in other similar studies.\textsuperscript{3,4} Moreover, in light of the certainty that the patients in the CCTA group were exposed to substantial doses of radiation (from both CCTA and nuclear stress tests) and were at risk for nephrotoxicity and adverse reactions from the CCTA contrast dye, clinicians may legitimately ask whether the tests did more harm than good.

Patients who have normal electrocardiographic (ECG) findings and negative troponin levels constitute a group at low risk for cardiac events, and multiple studies show no evidence that any additional testing further reduces that risk. In the study by Litt et al., the average age of the patients was 49 years, and 51% of the patients in the CCTA group and 56% of the patients in the traditional-care group were women. In the study by Hoffmann et al., the average age was 54 years, and 47% were women. On the basis of age, sex, and history of chest pain alone, the pretest probability is generally not high for coronary artery disease in patients with these demographic characteristics.\textsuperscript{5} Furthermore, the risk of cancer from radiation is higher in younger age groups and among women. In the study by Hoffmann et al., the radiation burden was clinically significant in the standard-evaluation group (4.7±8.4 mSv) and nearly tripled in the CCTA group (13.9±10.4 mSv). Exposures of 10 mSv have been projected to lead to 1 death from cancer per 2000 persons.\textsuperscript{6} Equally alarming, the testing may lead to an increased risk of breast cancer among these patients, many of whom are middle-aged women. A report from the Institute of Medicine showed that medical imaging is a leading environmental cause of breast cancer, more than any suspected toxins.\textsuperscript{7}

The decision regarding the need for diagnostic testing in these patients usually can be safely deferred to outpatient follow-up within a few weeks after the visit to the emergency department. The vast majority of patients have no cardiac causes for their chest pain, and many need no further testing. An acute coronary syndrome was a discharge diagnosis in less than 10% of the patients in the ROMICAT-II study. Patients in the CCTA group in both studies underwent more tests, received more radiation, and had more interventions than the standard-evaluation group. The increased likelihood of downstream testing after CCTA, which can lead to serious complications, cautions against choosing this test as the initial strategy.\textsuperscript{8}

The studies by Hoffmann et al. and Litt et al. showed that (assuming that a radiology department can read the computed tomographic [CT] scans promptly) it is faster to obtain a cardiac CT scan than a stress test. Of course, it is even faster to discharge these patients without any additional diagnostic test after determining that their ECG findings and troponin levels are normal. Thus, with no evidence of benefit and definite risks, routine testing in the emergency department of patients with a low-to-intermediate risk of acute coronary syndromes should be avoided.

In short, the question is not which test leads to faster discharge of patients from the emergency department, but whether a test is needed at all. The Choosing Wisely campaign reminds physicians to order testing only when the benefits will exceed the risks.\textsuperscript{9} I believe judicious clinical follow-up is safer and in the best interests of the majority of these patients.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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DOI: 10.1056/NEJMe1206040
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