Cardiac CTA in the Management of Patients with Suspected Obstructive Coronary Artery Disease

- The Prospective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) compared health and economic outcomes in >10,000 patients with stable chest pain following randomization to either CT angiography (CTA) or functional testing. The main findings are:
  - No significant differences in primary outcome measures (death, myocardial infarction, major procedural complications, or hospitalization for unstable angina)
  - CTA identified twice as many patients with obstructive coronary artery disease (CAD) than functional testing
  - After CTA more patients underwent catheter angiography and coronary revascularizations
  - After CTA more patients received preventive therapy, for example with statins
  - No significant differences in costs of care over a period of three years

In the past few years, several clinical trials have established that coronary CT angiography (CTA) has high sensitivity and specificity for detecting obstructive coronary artery disease (CAD). Furthermore, three large randomized clinical trials in patients who presented to emergency departments (ED) with low to intermediate suspicion for acute coronary syndrome (ACS), including the ROMICAT II trial published in The New England Journal of Medicine in 2012, have shown that when a coronary CTA is negative for CAD, patients can be safely discharged from the ED with a rate of <1% of major adverse cardiovascular events during follow up. Compared with the standard of care, these trials also demonstrated the cost effectiveness of coronary CTA and its greater care efficiency because patients did not need to be admitted into hospitable for overnight observation.

Prospective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE)
The latest study, the Prospective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE), set out to determine how functional testing and coronary CTA compare in terms of clinical outcome and cost of care in patients with stable chest pain presenting in an outpatient setting. In this study, 10,003 patients were enrolled in 193 health centers in North America and randomly assigned to functional testing or coronary CTA as a first step in diagnosis. None of the patients in the study had an earlier diagnosis of CAD, and all had symptoms that met the recommended pretest likelihood guidelines. In those that were assigned to functional testing, the type of test (nuclear stress imaging, stress electrocardiography, or exercise ECG) depended on the choice of the physician or institution. The median follow-up period was 25 months (range, 18 to 34 months).

PROMISE revealed that there were no differences between coronary CTA and functional testing in the study’s primary endpoints: death, myocardial infarction, major procedural complications, or hospitalization for unstable angina. Such events were observed in 164 patients (3.3%) in the coronary CTA group and 151 (3.0%) of those assigned to functional testing (hazard ratio, 1.04; 95% confidence interval, 0.83 to 1.29; P = 0.75).
Overall, 609 of 4,996 patients (12.2%) in the CTA group received invasive catheter angiography within 90 days of initial testing, compared to 406 of 5,007 (8.1%) patients in the functional testing group. Coronary CTA was superior in detecting CAD as determined by invasive catheter angiography, which demonstrated that 72.1% of those in the coronary CTA group had obstructive CAD compared to only 47.5% (P<0.001) in the functional testing group. (Given the randomized nature, a similar burden of CAD in the two arms can be assumed.) The trial was designed to be generalizable across the US with implications for health policy, but the accuracy of coronary CTA is dependent on experience. In hospitals such as Massachusetts General Hospital that have a long tradition of coronary CTA, over 90% of patients who are sent to catheter angiography after coronary CTA show obstructive CAD.

Although the study was a comparison of strategies and not designed to compare individual steps in the management of patients, it is notable that twice as many patients in the CTA group compared to the functional group were revascularized within 90 days of initial testing (6.4 vs. 3.2%). The study was not powered to determine whether this difference resulted in health benefits.

There were also no significant differences in costs between the two arms of the study during the period of the study, which confirmed earlier studies of CTA’s cost effectiveness.

The median exposure to radiation was lower in the CTA group compared to the functional testing group (10.0 mSV vs. 11.3 mSV) although the mean radiation exposure was higher (12.0 mSV vs. 10.1 mSV). This disparity can be explained by differences in functional testing strategies, in which 32.6% had no exposure to ionizing radiation. Moreover, a nuclear stress test is associated with greater radiation exposure than a coronary CTA.

The trial featured mainly 64-slice technology for CTA. As more institutions adopt advanced CT technology, it can be expected that the mean radiation dose from coronary CTA will decrease. For example, at Massachusetts General Hospital, the median dose for a CTA is already at 3 mSv.

**Contraindications for Coronary CTA**
Relative contraindications for coronary CTA include renal dysfunction and contrast allergy.

**Standard of Care**
Functional testing has long been regarded as the standard first test for patients who present with new onset chest pain and meet the pretest likelihood of CAD, although there is little consensus on which form of functional testing is preferable. Coronary CTA is an alternative that leads to equally good outcomes. The results of the PROMISE trial are likely to bring the level of evidence and appropriateness for CTA (currently 2b) up to the level of functional testing (currently 1a).

**Clinical Perspective on the PROMISE Trial**
For cardiologists and internists, the PROMISE trial will expand the options for testing in patients with symptoms suggestive of underlying CAD. For many clinicians, coronary CTA is currently used after a functional test with equivocal or discordant results. As appropriateness criteria evolve to incorporate the results of this landmark study, clinicians will be able to consider individual patient characteristics when choosing between anatomic and functional testing for the initial diagnostic evaluation. Whether the presence of non-obstructive CAD on coronary CTA leads to better risk-factor management and improves longer-term outcomes will require additional study.

**Scheduling**
Cardiac CTA is offered on the main campus of the Massachusetts General Hospital in Boston. Appointments can be made through ROE (inside Partners network) or ROE Portal (outside Partners network) or by calling 617-726-8396.

**Further Information**
For further information on CTA for patients with suspected CAD, please contact Udo Hoffmann, MD, MPH, Chief, Division of Cardiovascular Imaging and Director of the Cardiac MR PET CT Program, Department of Radiology, Massachusetts General Hospital, at 617-726-1255.

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References


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