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ORIGINAL INVESTIGATIONS

Use of Coronary Computed Tomographic Angiography to Guide Management of Patients With Coronary Disease

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ABSTRACT

BACKGROUND In a prospective, multicenter, randomized controlled trial, 4,146 patients were randomized to receive standard care or standard care plus coronary computed tomography angiography (CCTA).

OBJECTIVES The purpose of this study was to explore the consequences of CCTA-assisted diagnosis on invasive coronary angiography, preventive treatments, and clinical outcomes.

METHODS In post hoc analyses, we assessed changes in invasive coronary angiography, preventive treatments, and clinical outcomes using national electronic health records.

RESULTS Despite similar overall rates (409 vs. 401; $p = 0.451$), invasive angiography was less likely to demonstrate normal coronary arteries (20 vs. 56; hazard ratios [HRs]: 0.39 [95% confidence interval (CI): 0.23 to 0.68]; $p < 0.001$) but more likely to show obstructive coronary artery disease (283 vs. 230; HR: 1.29 [95% CI: 1.08 to 1.55]; $p = 0.005$) in those allocated to CCTA. More preventive therapies (283 vs. 74; HR: 4.03 [95% CI: 3.12 to 5.20]; $p < 0.001$) were initiated after CCTA, with each drug commencing at a median of 48 to 52 days after clinic attendance. From the median time for preventive therapy initiation (50 days), fatal and nonfatal myocardial infarction was halved in patients allocated to CCTA compared with those assigned to standard care (17 vs. 34; HR: 0.50 [95% CI: 0.28 to 0.88]; $p = 0.020$). Cumulative 6-month costs were slightly higher with CCTA: difference $462 (95% CI: $303 to $621).

CONCLUSIONS In patients with suspected angina due to coronary heart disease, CCTA leads to more appropriate use of invasive angiography and alterations in preventive therapies that were associated with a halving of fatal and non-fatal myocardial infarction. (Scottish COmputed Tomography of the HEART Trial [SCOT-HEART]; NCT01149590) (J Am Coll Cardiol 2016;67:1759–68) © 2016 by the American College of Cardiology Foundation. Published by Elsevier. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

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ABBREVIATIONS AND ACRONYMS

CCTA = coronary computed tomography angiography

HR = hazard ratio

IQR = interquartile range

OR = odds ratio

Patients who present with chest pain of suspected cardiac origin require accurate and timely diagnosis to guide the implementation of appropriate investigations and therapeutic interventions. Current U.S. (1) and European (2) guidelines describe a range of potential noninvasive imaging modalities to investigate patients with suspected stable angina pectoris due to coronary heart disease. However, there is little definitive or consistent evidence of superiority of 1 imaging modality over another, and none has yet demonstrated improvements in downstream clinical outcomes attributable to better diagnostic performance. Moreover, American guidelines (1) specifically favor stress testing as the initial diagnostic test of choice and reserve coronary computed tomography angiography (CCTA) for patients who are unable to undergo stress testing.

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The SCOT-HEART (Scottish COmputed Tomography of the HEART) trial showed that, when used in addition to standard care, CCTA markedly clarified the diagnosis for patients with suspected angina due to coronary heart disease (3). This diagnostic improvement was associated with alterations in downstream investigations and treatments and with potential improvements in clinical outcome. However, whether CCTA-guided changes in diagnosis led to appropriate improvements in invasive coronary angiography and initiation of preventive treatments, and whether these changes could be attributable to an improvement in clinical outcome, has not been explored.

It would be neither practical nor ethical to undertake invasive coronary angiography in all patients within a large trial of a noninvasive diagnostic test for angina pectoris due to coronary heart disease. However, a reasonable proxy for the assessment of diagnostic accuracy is to compare the rates of normal coronary arteries or obstructive coronary artery disease at the time of invasive coronary angiography. To assess the appropriateness of therapy would again be inferential and requires the assessment of improvements in clinical outcomes directly attributable to coronary heart disease. For these clinical improvements to occur, the changes in management consequent on the diagnostic test have to be implemented and temporally associated with any observed benefits. Clearly, it is not sufficient for the test to be merely performed.

In this study, we aimed to assess the diagnostic utility of CCTA against the findings at invasive coronary angiography, and to investigate the timing and therapeutic implementation of CCTA-guided changes in preventive treatment. Finally, we explored the beneficial effects of these investigative and therapeutic implementations on coronary heart disease events.

METHODS

STUDY DESIGN. The SCOT-HEART study was a prospective, open-label, parallel group, multicenter, randomized controlled trial that assessed the role of CCTA in patients with suspected angina due to coronary heart disease who attended a cardiology clinic. The study design has previously been described in detail (4) and the primary study findings published (3). The study was conducted in accordance with the Declaration of Helsinki and with research ethics committee approval.

PARTICIPANTS. Participants were recruited from dedicated cardiology chest pain clinics where they were referred with suspected angina due to coronary heart disease. A total of 4,146 patients age 18 to 75 years were recruited as described previously (4). Participants were randomized 1:1 to standard care or standard care plus ≥64-slice CCTA using a web-based randomization system with minimization for age, sex, body mass index, diabetes, history of coronary heart disease, atrial fibrillation, and the baseline diagnosis of angina due to coronary heart disease. Standard of

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