Coronary Computed Tomographic Angiography for Preoperative Risk Improved Area Under Curve Is Not Enough

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The past several years have been a tumultuous and humbling time for those of us who manage and study perioperative patients. Not long ago, preoperative cardiac testing was almost routine, and large numbers of patients were treated with prophylactic coronary revascularization and β-blockers. However, few fields in medicine have experienced the seismic shifts seen in recommendations surrounding perioperative care, as recent randomized trials and registry studies† have prompted us to be far more cautious in thinking about how and when to test and treat preoperative patients.

In this issue of Circulation: Cardiovascular Imaging, Hwang et al‡ examined 844 consecutive patients referred for coronary computed tomographic angiography (CTA) to screen for coronary artery disease before noncardiac surgery. Included patients had >1 cardiovascular risk factor or used cardiovascular medications, whereas patients with contraindications to computed tomography or previous coronary revascularization were excluded. A clinical score, the revised cardiac risk index, was compared with the revised cardiac risk index plus coronary CTA for prediction of perioperative major cardiac events, defined as cardiac death, myocardial infarction, or pulmonary edema within 30 days. Events occurred in 25 patients (3.0%), with mortality in only 9 patients (1.0%). On receiver–operator curve analysis, the presence of significant coronary artery disease on CTA as measured by ≥2 scores significantly improved the area under the curve as compared with the revised cardiac risk index alone (0.76 versus 0.63; *P* <0.05).

One the face of it, coronary CTA sounds appealing in preoperative patients. It has high diagnostic accuracy to identify and exclude coronary artery disease in comparison with invasive coronary angiography, and observational data suggest it conveys prognostic significance in general populations. But we need much more than a test that is accurate, and improves risk stratification; the burden of proof for any proposed strategy requires it to demonstrate a cost-effective improvement in clinical outcomes. There are 2 key questions that this article cannot address, but which must be answered when considering a potential role for this modality:

First, does routine coronary CTA in preoperative patients improve outcomes? Patients and their physicians were not blinded to results, and the authors do not report how patients were managed after testing. It is unclear how many patients with abnormal or even normal studies underwent invasive coronary angiography and revascularization, and it is possible that some patients had high-risk findings that resulted in cancellation of surgery (and exclusion from this study). But even if we had this data, the lack of a comparison group limits any conclusions we could draw.

Furthermore, what are potential mechanisms by which coronary CTA could change outcomes? We know that prophylactic coronary revascularization before vascular surgery does not improve mortality, as demonstrated in the Coronary Artery Revascularization Prophylaxis (CARP) trial. Given its elevated rates of false positives, it is probable that routine coronary CTA would result in excess downstream testing and revascularization. There is no compelling evidence that such a strategy would improve outcomes, and it could even cause harm. Furthermore, there is no compelling evidence that changes in pharmacological therapy based on coronary CTA findings would reduce perioperative events. So where does this leave us? Perhaps coronary CTA could identify some patients at such high risk (eg, severe left main stenosis) that they should not undergo surgery or should undergo coronary revascularization first. But this was not studied. We cannot answer the question from this data.

Second, if coronary CTA could benefit a selected group of preoperative patients, who would those patients be? If we use current American College of Cardiology/American Heart Association guidelines as a starting point, it is considered reasonable (class IIa indication) to perform pharmacological stress testing in patients at elevated risk of perioperative adverse events and with poor or unknown functional capacity. It is possible that coronary CTA could be effective in these patients as an alternative test, and this might be a useful cohort to study.

But this is not the population examined in this article. Instead, this study included a significant number (20.5%) of low-risk patients based on revised cardiac risk index score, ignoring Reverend Bayes’ theorem that prompts us to consider the pretest probability before ordering a diagnostic test. Furthermore, an overwhelming majority (90.4%) of individuals had moderate or good functional capacity. In other words, ≥9 in 10 patients in this study should not have undergone testing based on current guidelines and the data provided. So this question remains unanswered by this study.

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For decades, we have been intrigued by new technologies and their promises, and have rushed to embrace their use. Coronary CTA provides beautiful images of the interior of coronary arteries, and can help us identify coronary stenoses and plaque characteristics. In the past, determining the accuracy of a diagnostic test was often enough to disseminate its clinical use. But our recent history has taught us that just because we can do something—such as prophylactic revascularization before surgery—does not mean there is a benefit from doing so. And just because there is limited evidence and a physiological basis for a treatment—such as perioperative β-blockade—does not mean it improves outcomes.7

This study finds that coronary CTA improves risk stratification as measured by the area under the receiver–operator curve or reclassification improvement in a cohort referred for testing before surgery. But what do these findings really mean unless we also have evidence that the results inform management and change outcomes? In this case, we are exposing the patient to iodinated contrast, ionizing radiation, and financial cost without proof of a benefit. Current guidelines state that routine preoperative coronary angiography (including coronary CTA) is not recommended,1 and this article does not provide data that would support any change. Future study should examine meaningful end points that make real differences for our patients. In perioperative medicine, we have had to unlearn much of what we thought we knew, as much that we thought we knew did not stand up to rigorous randomized trials. Hopefully this has taught us that we must move the bar higher. If studies of risk prediction do not lead to widely accepted therapeutic responses that, in turn, improve outcomes, then they are of little of no value. This study fits into this category.

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**References**


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