One More Step for Computed Tomography Coronary Angiography Before Heart Valve Surgery

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Coronary angiography (CA) to screen for the presence of coronary artery disease (CAD) is routinely performed before elective heart valve surgery. Its use is liberally advocated across a wide spectrum of patients by the writing committees for the treatment of patients with valvular heart disease (VHD) of the American College of Cardiology/American Heart Association and the European Society of Cardiology.1,2 Class I indications, all with level of evidence C, include men 35 to 40 years or older, postmenopausal women, and premenopausal women with coronary risk factors, in addition to the more traditional considerations of suspected myocardial ischemia, left ventricular systolic dysfunction, and any history or other signs of CAD. These recommendations are predicted on 2 major factors; namely, that clinical, ECG, echocardiographic, and radionuclide markers are less specific for CAD in the setting of severe VHD and that periprocedural and long-term outcomes are improved in patients with significant CAD undergoing combined valve and coronary bypass surgery compared with patients in whom revascularization is not performed. The evidence base for this latter claim derives primarily from older, single-center observational studies in patients with aortic stenosis (AS) and CAD.3,4 The more recent application of “hybrid” percutaneous coronary intervention with less invasive valvular heart surgery is gaining increasing acceptance,5 though there remains concern regarding the hazards and timing of dual antiplatelet therapy and institutional practices vary widely.

Technological advancements over the past 3 decades now allow for the safe and effective diagnosis and treatment of a variety of cardiovascular disorders using noninvasive or minimally invasive approaches. Lower procedural risks, faster recovery times, shorter hospital stays, reduced costs, and improved patient satisfaction underscore the increasing value of these innovations. As limited examples, consider the currently accepted roles of Doppler echocardiography for the evaluation of patients with valvular and congenital heart diseases, computed tomography (CT) and magnetic resonance angiography for the assessment of patients with aortic and peripheral vascular disease, percutaneous coronary intervention, endovascular stent graft therapy, implanted devices and radiofrequency ablation for rhythm management, and primary valve repair techniques. CT coronary angiography (CTCA) for the detection of CAD is no exception when applied to appropriately selected patient subsets, particularly because of its very high negative predictive value (NPV).

CTCA has been evaluated in a variety of clinical settings, ranging from suspected coronary artery anomaly to undifferentiated dilated cardiomyopathy. More extensively studied populations include stable patients with suspected CAD and patients with acute chest pain syndromes.6,7 To date, there have been comparatively fewer studies in patients with primary VHD. Gilard et al8 compared 16-slice CTCA with quantitative CA (QCA) in 55 patients (n=63 screened) with severe AS referred for elective surgery. Patients with irregular heart rhythms were excluded. Eight of the 55 patients (14%) received intravenous atenolol without incident if the resting heart rate exceeded 70 beats per minute. The prevalence of CAD was 20% (11/55). In a patient-based analysis, sensitivity, specificity, and NPV were 100%, 80%, and 100%, respectively. Technical problems related to calcification, motion artifact, and/or low signal-to-noise ratio prevented accurate luminal assessment in 25% of patients. Similar results using 16-slice CTCA were reported by Manghat et al9 for 40 patients with severe AS and by Reant et al10 for 40 patients with severe VHD, including 27 subjects with AS. Pouleur et al11 evaluated 82 patients with VHD using 40-slice CTCA with similar results. Meijboom et al12 screened 145 consecutive patients with VHD scheduled for elective surgery but excluded 75 (52%) for technical or clinical reasons. Specific criteria for administration of metoprolol, especially among patients with AS (n=31), were prespecified. Patient-based analysis of the diagnostic performance of 64-slice CTCA yielded a sensitivity, specificity, and NPV of 100% (78 to 100), 92% (81 to 98), and 100% (91 to 100), respectively. Vessel- and segment-based analyses for these 70 patients showed equally impressive results. The prevalence of CAD by QCA (≥50% stenosis) was 25.7% (18/70). The calculated radiation exposure for the CTCA protocol was calculated at 15.2 mSv for men and 21.4 mSv for women. Twenty-six patients with atrial fibrillation (AF) or undefined severe arrhythmia were excluded, and fewer than half the patients screened (n=145) were subsequently enrolled (n=70). Finally, Scheffel et al13 used 64-slice CTCA to evaluate 50 patients with aortic regurgitation, 26% (13/50) of whom had significant CAD by QCA (≥50% stenosis). Three patients were excluded because of a lack of sinus rhythm. By patient-based analysis, sensitivity, specificity, and NPV were
coronary artery calcification (CAC). The prevalence of CAD, patients underwent a preliminary low-dose scan to assess for total radiation exposure was 12.5 interpretative of invasive CA, was 18% (44/237). The mean rates, still poses technical challenges, and patients must be prove temporal resolution may allow expansion of the role of scan acquisition. The number of VHD patients with AF reported to date is far too small to draw firm conclusions. This risk is most significant for younger women, that is, the group with the lowest pretest probability of significant CAD. Caution is warranted at this stage in the development of CTCA to select VHD patients carefully and maximize efforts to limit radiation dose. In this regard, institutional best practices should be shared. Future advances in CTCA techniques will probably lead to its more widespread use in this population.

Disclosures

None.

References


statement from the American Heart Association Committee on Cardiovascular Imaging and Intervention, Council on Cardiovascular Radiology and Intervention, and Committee on Cardiac Imaging, Council on Clinical Cardiology. *Circulation.* 2006;114:1761–1791.


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