The advance of technology imparts the final limitation on the study. Computed tomography with coronary artery calcium score with/without angiography offers a less-invasive method to increase the prestudy probability of finding significant coronary artery disease at the time of preoperative coronary angiography. Embolism happens. Know when to get the coronary angiogram and when not to.

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Commentary: Do we always need to look at the coronaries in infective endocarditis?

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Infective endocarditis (IE) is becoming more common, particularly in North America, where there is growing endemic of intravenous drug use.^{1,2} As such, understanding regarding the optimization of perioperative care for these often sick and unstable patients becomes increasingly relevant. The perioperative management of patients with IE includes preoperative coronary imaging according to both 2015 American and European guidelines (Class I, Level of Evidence: C)^{3,4}; however, the rationale for these guidelines was based on all patients undergoing valvular heart surgery, which may not be applicable to those with

CENTRAL MESSAGE

Routine coronary angiography is unnecessary in most patients undergoing surgery for infective endocarditis and should be reserved for selected patients.

IE. Patients with IE tend to be younger and less likely to have significant coronary artery disease (CAD) than older patients with degenerative valve disease. Furthermore, there are concerns for embolization risk among patients with aortic valve vegetations—aortic vegetations actually represent a relative contraindication to catheterization in the European guidelines. Given these population-specific considerations, the benefit-to-risk ratio for preoperative coronary angiography may be altered in those undergoing surgery for IE.

In this issue of the *Journal*, Spanneut and colleagues⁵ challenge the recommendations of the guidelines by examining outcomes from their single-center registry of 272 patients with acute IE undergoing surgery and compared

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those who underwent preoperative coronary angiography (n = 160) with those who did not (n = 112). Coronary artery bypass grafting was performed in 17% of patients. Overall, the authors found that there was no difference in the primary composite end point of all-cause mortality, new stroke, systemic embolism, or need for dialysis between the 2 groups. These findings were consistent when the authors performed a meta-analysis using their own data along with data from 2 other observational studies—the use of coronary angiography did not improve all-cause death. The other important finding was that the risk for systemic embolism from coronary angiography in patients with vegetations appeared low (<1%).

However, this study must be interpreted in the context of some important limitations. This is a retrospective observational study and, as such, the assignment of patients to coronary angiography may be confounded by indication and selection bias. Those who underwent angiography were older and were more likely to have risk factors for CAD, whereas those who did not undergo angiography were younger with less or no risk factors for CAD. In addition, patients with an urgent indication for surgery or aortic valve IE were also less likely to get angiography, which is also in keeping with European guideline recommendations.³ The authors did not adjust for differences in patient characteristics at baseline, which limits interpretation of the early and late results. Finally, follow-up of this study was limited to 2 years, and the benefits of revascularization may not be realized until later.

Overall, this study suggests that coronary angiography may not be necessary for all patients undergoing surgery for IE for a few reasons. First, the majority of patients had either normal coronaries (49%) or nonsignificant CAD (32%), whereas <20% of patients had significant coronary disease. Second, prognosis in those with IE is guarded, early perioperative mortality is >10%, and all-cause mortality at 2 years is high at approximately 25%. That said, the risk for new systemic embolism appears low in the patients selected to undergo coronary angiography and there did not appear to be a difference in acute renal failure between the 2 groups. The implications are that it is reasonable to perform coronary angiography

when clinically indicated, as coronary angiography appears safe. However, with the advent of improvements in computed tomography (CT), there may be less of a need to perform invasive coronary angiography and rather perform coronary CT instead. Coronary CT has been shown to be excellent for ruling out CAD: its negative predictive value is 99.4% (95% confidence interval, 98.3%-99.8%) and provides excellent spatial resolution to understand the relationship between coronary and valve anatomy.^{3,6} However, similar to conventional invasive angiography, contrast-induced nephropathy is a concern for coronary CT in patients with renal insufficiency.

This work by Spanneut and colleagues is an important contribution to the literature. Currently, the evidence to support routine conventional coronary angiography for surgical planning for IE is limited; also, a high-quality, large, randomized clinical trial to address this clinical question is unlikely. As such, this work is a step forward to defining the optimal workup of this challenging patient population before what is frequently high-risk surgery. This study suggests that while we don't always need to look at the coronaries in patients undergoing surgery for IE, there's also no harm in doing so.

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