

EDITORIAL COMMENT

Surgeons and Interventional Cardiologists in a Collaborative Environment*

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The concept of an interventional cardiologist coming to help or correct a surgical problem during or shortly after coronary artery bypass surgery (CABG) was first introduced in 1998 by Reifart et al. (1). In their original report, Reifart et al. (1) performed emergency angiography, and when feasible, percutaneous coronary intervention (PCI) in 55 patients with clinical ischemia within 24 h of CABG. With the knowledge that many patients may experience asymptomatic failure of a recently implanted graft or malfunctioning of a left internal mammary artery (LIMA) graft, it is now time to go 1 step further.

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In the interest of our patients, it does not seem acceptable to see that over one-fourth of vein grafts and 8% of LIMA grafts may fail within 1 year of implantation (2). The interventional cardiologist should not unconstructively criticize CABG by stressing early graft failure to compensate for restenosis or stent thrombosis. When we put the patient at the center of our work, we take into account the problems and try to solve them. The Vanderbilt Heart and Vascular Institute reports in this issue of the *Journal* the results of a constructive collaboration (3).

The team (surgeons and/or interventional cardiologists) performed an angiogram in a hybrid operating room in 366 patients who underwent CABG before chest closure. The characteristics of this population were not benign, with 39% of the patients being diabetics, more than one-half presenting with unstable angina, and one-fourth with significant left main vessel narrowing. In the event that a defect in a vein graft or the LIMA graft was detected, the operators proceeded immediately to its correction with a percutaneous approach or with surgical revision. Among these 366 pa-

tients, 67 (18%) underwent a planned PCI procedure as well. Antiplatelet medications were given with a loading dose of 300 mg clopidogrel immediately before surgery for the patients who underwent elective PCI (hybrid procedures) or by nasogastric tube at the time that the decision for unplanned open-chest PCI was made. Aspirin was given to all patients immediately after CABG, and heparin was reversed with protamine in all patients.

Overall, the operators found angiographic defects in 89 patients (i.e., 12% of grafts) described in Table 4 (3), and this provides interesting insights into the mechanisms of early graft failure. Adjustments had to be performed in 22 grafts and in 25 LIMA grafts. In Table 4 (3), the investigators describe in detail the specific PCI or surgical adjustments that were made. However, a question remains regarding whether correcting these angiographic defects will improve graft patency. We look forward to the follow-up of these grafts, which has been planned at 12 months with multislice computed tomography. Including the patients who underwent a planned intervention, the 112 patients treated with additional PCI received 1.8 stents on average, and 84% of them were drug-eluting stents. The operative mortality was 2.6% in the hybrid group and 1.5% in the standard CABG group. A reoperation to control bleeding was required in 3% of patients, and the median need for transfusions was 1 unit per patient, with a similar number of reoperations and transfusions in the patients who received clopidogrel and the ones without. Creatine-kinase MB and troponin I levels were higher in patients who underwent additional PCI. There was only 1 case of stent thrombosis. An interesting remark the investigators make is the fact that many of the findings detected on angiography performed after CABG may help highlight to the surgeon possible technical issues that could be utilized to prevent future inaccuracies. The fact that the graft defect rate decreased from 15% to 11% during the study may be a small sign in the right direction. An issue that remains open to debate is the fact that sometimes some defects seen immediately after surgery such as haziness or kinking may correct spontaneously with time, making the need for an intraoperative PCI a useless action. Only mature judgment and profound experience will likely allow the surgeon to tell up front which are the malignant or the benign defects.

A separate evaluation and discussion should be devoted to the planned hybrid procedures. In particular, what are the advantages of a planned hybrid procedure for the patient? In the present study, a hybrid CABG/PCI was associated with less aortic cross-clamp and cardiopulmonary bypass time, as well as a greater use of off-pump CABG. However, this was at an expense of greater myocardial injury as detected by cardiac enzymes and larger doses of contrast in the perioperative period. In addition, there was no significant difference in operative mortality between patients having hybrid surgery compared with those having a standard CABG. Similarly, other studies have shown that that hybrid

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CABG/PCI results in shorter hospital stays and intubation times without an increased risk of bleeding and without clear evidence of benefit on hard clinical end points (4–6). The field of hybrid coronary revascularization, except in some very selected cases, is open to debate because most experienced interventionists believe that the only restriction to achieving adequate percutaneous revascularization is a total occlusion of the left anterior descending artery, which cannot be opened. The best way to avoid an unproductive debate is for the interventional cardiologist and the cardiac surgeon to sit together in front of the angiogram, keeping in mind the clinical scenario of the patient to be treated, and openly discuss the issues around the best revascularization strategy that can be offered. The final decision should take into consideration the important clinical and social aspects specific to that patient. It is interesting to point out that this approach, which has been utilized in the SYNTAX (Synergy between Percutaneous Coronary Intervention with TAXUS and Cardiac Surgery) trial, has created a surgical registry of 1,077 patients. These patients were judged by an interventional cardiologist to be unsuitable for optimal revascularization with PCI, whereas they were considered very appropriate for surgical revascularization. We wonder whether the already excellent results of the surgical registry could have been further improved with the hybrid option. On the other hand, there is the group randomized to PCI or CABG. A more advanced analysis of these patients will highlight subgroups of patients with very complex anatomy requiring multiple stents, sometimes more than 7 stents. Again we need to ask ourselves whether the results could have been improved with the option of a hybrid procedure being offered to some patients randomized to PCI. The objective of this Editorial Comment is not to examine and discuss the large field of hybrid surgery, and therefore we will not extend our comments. An important practical question that should not be dismissed is: Does hybrid surgery need to be performed in 1 setting, or can we perform the PCI in a second session? As pointed out by the investigators, this second strategy allows verification of correct performance of the LIMA graft with angiography. Despite some good rationales, we cannot dismiss the fact that neither of the 2 approaches, that is, true hybrid revascularization or deferred PCI, has encountered much favor with cardiologists and patients. As an example, a report from Hamburg, Germany, reported only 57 patients over a 4-year period undergoing hybrid revascularization consisting of LIMA implantation to the left anterior descending artery with PCI on the other vessels (6).

This is the practical final message to take home from this important work. 1) Despite the interesting findings reported in the study of Zhao et al. (3), we are not convinced that all CABG should be checked with immediate angiography. There are no data at present to suggest that this approach will improve graft patency. 2) The fact that the option of a control angiogram followed by a surgical PCI procedure can be effectively and safely performed, as shown in this study, gives the surgeon and interventional cardiologist a further possibility of improving the final result in specific cases.

As seen very frequently in medicine, the strategy for lowering the number needed to treat (angiography for all CABG) lies in the skill and willingness of the surgeon to establish in which specific cases the complexity or some technical problems may have prevented the performance of a procedure as exactly and smoothly as planned. Knowing the result, even if not as expected, is always more effective than ignoring a problem. As shown in this article, the correction always comes after having seen the defect.

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