

EDITORIAL COMMENT

CABG Versus PCI for Complex Coronary Disease

Time to Close the Books*

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Over the past 30 years, extensive research has been dedicated to the comparison of coronary artery bypass graft (CABG) surgery with percutaneous coronary intervention (PCI) for the treatment of patients with multivessel or left main coronary artery disease (CAD). While randomized trials have identified that those with diabetes patients benefit more from CABG over PCI in terms of major adverse cardiovascular events (MACE), recent evidence has emerged that this same benefit exists for patients with complex CAD without diabetes (1-3). Guidelines have recommended a class I indication for bypass over PCI in patients with diabetes and multivessel disease and this has changed the practice of cardiology since the publication of the FREEDOM (Future Revascularization Evaluation in Patients with Diabetes Mellitus: Optimal Management of Multivessel Disease) trial in 2012 (4).

However, it is important that we present our patients with the evidence necessary to make an informed, individualized decision about their optimal revascularization strategy. Beyond patient preference, there are number of determinants as to whether PCI should even be attempted. The first is the extent of CAD. Evidence is overwhelming that the patients with more complex CAD and a higher SYNTAX (Synergy between PCI with Taxus and Cardiac Surgery) score will benefit from CABG (1). The second

consideration is potential for the procedure to achieve complete revascularization. If the patient has little opportunity for complete revascularization this would also favor CABG (5). Finally, the increased risk of periprocedural stroke with CABG is an important consideration and can often be the deciding factor in elderly patients who decide to forego CABG based on a risk-benefit decision (1). This is why studies of long-term quality-of-life outcomes remain important analyses to guide decision making.

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In this issue of the *Journal*, Abdallah et al. (6) present the 5-year findings of the prospective health status inventory, including both disease-specific and generic health status measures, of patients enrolled in the SYNTAX trial. The SYNTAX trial included patients with triple-vessel disease and left main CAD that were randomized to PCI with TAXUS (Boston Scientific, Marlborough, Massachusetts) drug-eluting stents or to CABG. This important secondary analysis was conducted by an experienced and internationally respected group of investigators. They assessed health status at 1, 6, 12, 36, and 60 months and compared CAD-specific outcomes using the Seattle Angina Questionnaire as well as the 36-Item Short Form Health Survey, a generic health status questionnaire. The methodology used in the analyses conducted is widely recognized and accepted by the cardiovascular community. The investigators confirmed that at 5 years of follow-up, CABG resulted in a statistically significant improvement in cardiovascular specific and generic health status quality of life, regardless of whether the patients qualified on the basis of triple-vessel CAD or left main disease. An important consideration for an individualized approach was a significant interaction between the

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baseline SYNTAX score and extent of angina relief at 5 years. There was a clear benefit reserved mostly for those with a SYNTAX score of 23 or greater (p value for interaction = 0.048).

In positioning these findings into perspective for physicians and their patients, it is important to go back to the report of MACE in the SYNTAX trial at 5 years (7). In the analysis of the triple-vessel disease subgroup at 5-years, PCI with drug-eluting stents resulted in a significantly higher rate of all-cause death when compared to CABG (14.6% vs. 9.2%; $p = 0.006$). This is a 5.4% excess in mortality at 5 years and correlates to a number needed to treat with CABG of 20 to prevent 1 death. Similarly, there was a 2-fold increase and a 12.8% excess of events at 5 years in repeat revascularization rates for PCI compared to CABG. This translates into a number needed to treat of 8 to prevent 1 additional repeat revascularization procedure with CABG. In SYNTAX, the triple-vessel disease patients had comparable stroke rates with the 2 procedures. In totality, not only were the CABG patients more likely to be alive at 5 years (5 lives saved per 100 treated), but they were also more likely to enjoy a higher quality of life. This confirms that CABG should be considered the front-line approach in these patients.

In the triple-vessel CAD cohort, an interaction with the SYNTAX score and hard outcomes was also observed. What remains is the question of the incremental benefit of CABG over PCI in those with a low SYNTAX score? A pooled analysis from the diabetic patients in COURAGE (Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation), BARI 2D and FREEDOM trials suggests that those with less extensive CAD are likely to benefit from CABG over PCI (8). As new, large, well-powered randomized trials are unlikely to be initiated in the near future, we should leave these decisions to the shared heart team-patient decision making with the recommendation that CABG be presented as a viable option. With rather small differences between CABG and PCI in those with a low SYNTAX score, the lack of a clinically significant difference emerges as a factor

supporting PCI as an option in these patients. At the same time, we should be particularly cautious in diabetic patients, as the FREEDOM trial did not observe an interaction with SYNTAX score and clinical or quality-of-life indices (9).

One important variable that characterizes the quality of life measures in both the SYNTAX and FREEDOM trials is that there is increasing benefit of CABG over PCI after 3 years of follow-up. This underscores the importance of longer follow-up in all of our revascularization trials. In patients with left main coronary disease with or without multivessel CAD, the EXCEL (Evaluation of XIENCE Versus Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization) trial showed no advantage of CABG over PCI for MACE but was limited to 3 years of follow-up (10). We anxiously await the 5-year findings to fully understand the durability of PCI for this indication. Clearly disease progression in the nontarget lesions is a key factor in the PCI cohort of the randomized trials and this may account for the emergence of quality-of-life differences in longer-term follow-up.

The Abdallah et al. (6) study is reassuring on 2 fronts. It is consistent with the substantial clinical outcomes evidence supporting the superiority of CABG over PCI, particularly with complex and extensive CAD regardless of diabetes status. As well, the study supports the notion that the decision of mode of revascularization is ultimately an individualized one as long as it incorporates a heart team approach. With this analysis, the patient is the winner because his or her decision can be based on robust and complete medical evidence. I believe it is time to close the books on the CABG versus PCI question and devote our precious resources to reduce the overall residual risk in our patients with complex CAD.

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