Why coronary artery bypass grafting remains the standard of care for patients with complex, multivessel coronary artery disease

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In the article by Mack and colleagues,¹ the authors review the Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery (SYNTAX) trial to demonstrate why coronary artery bypass grafting (CABG) and not percutaneous coronary intervention (PCI) is the best revascularization strategy for patients with complex coronary artery disease (CAD). They focus on several findings from SYNTAX. First, myocardial infarctions (MIs) are more prevalent in patients undergoing PCI, leading to a 10-fold higher incidence of cardiac death due to MI. Second, incomplete revascularization is greater in patients undergoing PCI. Third, incomplete revascularization is an independent predictor of major adverse cardiac and cerebrovascular events after PCI, but not after CABG. These observations drive the finding that by 5 years, CABG is superior to PCI due to both less repeat revascularization and a lower incidence of death, stroke, and MI.

The fact that more MIs and incomplete revascularizations occur after PCI was not a new finding in SYNTAX. In the Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) trial, CABG decreased the composite end point of death, MI, and stroke at 5 years compared with medical therapy, mostly due to a reduction in MIs (10% vs 17.6%; $P = .003$).² PCI did not. Recently, the superiority of CABG over PCI in decreasing MIs after revascularization was demonstrated in the Future Revascularization Evaluation in Patients With Diabetes Mellitus: Optimal Management of Multivessel Disease (FREEDOM) trial, a study of CABG versus PCI in diabetic patients with multivessel CAD. At 5 years, MIs occurred in 6.0% of patients undergoing CABG and in 13.9% of those receiving PCI ($P < .001$).³

Similarly, more incomplete revascularization has been observed after PCI than after CABG. This difference is directly proportional to CAD complexity, resulting in more residual ischemia (RI) in PCI patients with complex CAD.⁴ The relationship between the degree of RI and

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Central Message

The SYNTAX trial confirms what we already know: CABG is the standard of care for patients with multivessel coronary artery disease, and its advantages over PCI are increasing with time.

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worse long-term outcomes is well known. In the Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) trial, death and MI were directly related to RI, and an analysis of the Acute Catheterization and Urgent Intervention Triage Strategy (ACUTITY) trial demonstrated that as RI (represented by the residual SYNTAX score) increases, so too does the likelihood of cardiac death, all-cause death, MI, and repeat revascularization.^{5,6}

Why is CABG more effective than PCI in treating complex CAD? The answer is likely the inherent differences in the 2 revascularization techniques. Yock and colleagues⁷ wrote in their analysis of the BARI 2D trial results that “even if target lesion restenosis were to be completely eliminated, CABG would remain more effective than primary PCI stenting.” Unlike PCI, which treats only the stenosis present at the time of revascularization, CABG treats both the current stenosis and any future stenosis that develops proximal to the distal anastomoses. It is not surprising that Cutlip and colleagues⁸ observed that during the first year after PCI, repeat revascularization is due to a target lesion event, but after 1 year, it is likely due to a nontarget lesion event. In addition, whether a vessel is totally

occluded or the stenosis is complex, performing PCI may be difficult, dangerous, and even impossible, leading to incomplete revascularization and residual ischemia. Performing CABG to these vessels is no more difficult than for an isolated, noncomplex stenosis.

This review of SYNTAX confirms what we already know: CABG is the standard of care for patients with multivessel CAD. The authors should be congratulated for continuing this discussion and advocating for patients with complex CAD to receive the best revascularization therapy.

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