Commentary: What matters more: Method of revascularization or completeness?

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The 2021 coronary revascularization and the 2023 chronic coronary disease guidelines have highlighted important differences between surgeon and cardiologist interpretations of the revascularization literature.1,2 One issue is the age of the available data leading to de-emphasis of prior clinical trials and reliance on new trials peripherally related to coronary artery bypass grafting (CABG). Although the recommendations downgraded earlier randomized trials of CABG versus medical therapy, beginning new trials in this area is not feasible. Therefore, studies such as this one by Alzahrani and colleagues3 are important to update the literature with contemporary CABG outcomes. Further, emphasis on the International Study of Comparative Health Effectiveness With Medical and Invasive Approaches (ISCHEMIA) trial, rather than prior percutaneous coronary intervention (PCI) versus CABG trials, suggests equivalence between the revascularization strategies. This overall equivalency is not supported by the data either in terms of revascularization quality or long-term outcomes.

This analysis by Alzahrani and colleagues3 is an important contribution that analyzes revascularization strategies for ischemic cardiomyopathy patients. Although the recommendation for CABG in this cohort did not receive a downgrade like those with moderate or better ventricular dysfunction, the data supporting the recommendation are largely derived from medical therapy versus CABG Surgical Treatment for Ischemic Heart Failure (STITCH) and not by direct comparison to PCI, making it at risk of being de-emphasized in upcoming guidelines.5 This study utilized a cohort of 5988 patients in the State of New Jersey with an ejection fraction \( \leq 35\% \) who underwent CABG (3673 [61.3%]) or PCI (2315 [38.6%]) for multivessel coronary disease between 2007 and 2018. The linkage between clinical and administrative datasets allows for a rich analysis.

The median follow-up time was 5.2 years (range, 0-13 years), so the long-term effects may be underestimated because the 10-year mark is often where the CABG and PCI treatment curves tend to diverge. Finally, the authors performed propensity score matching leading to well-balanced groups for the analysis.

This first important finding relates to revascularization quality. Whereas CABG was able to achieve complete revascularization in 93% of cases, PCI was only able to do so in 20% of cases. This is a stark difference considering the influence completeness of revascularization has on major adverse cardiovascular events. For CABG, post hoc (1-year angiography) defined complete revascularization in the Veterans Affairs Randomized On/Off Bypass trial led to lower rates of major adverse cardiovascular events (odds ratio, 0.44; 95% CI, 0.33-0.58; \( P = .01 \)).6 This effect may be more pronounced for PCI, as shown in the Second Medicine, Angioplasty, or Surgery Study. Complete revascularization was associated with higher survival free of cardiovascular mortality (90.6% vs 84.4%; \( P = .04 \)), but this was mainly driven by the PCI cohort (\( P = .05 \)).7 Given these effects, it is important for heart teams to consider completeness of revascularization with each strategy when deciding on a recommendation.

Secondly, the outcomes with CABG were superior to PCI in this ischemic cardiomyopathy group. With real-world
completeness of revascularization, CABG provides superior survival and lower rates of myocardial infarction or revascularization (Figure 1). These effect sizes are large for myocardial infarction and revascularization with hazard ratios of 2.4 and 2.2, respectively. The effect on mortality is also clinically very meaningful with a hazard ratio of 1.4.

The authors chose to also emphasize in their analysis where they included completeness of revascularization in the propensity score. The result was that complete revascularization in the CABG group decreased from 93% to 55% (and inversely, PCI increased from 20% to 55%). These data would be reasonable to consider when a heart team believes a patient’s multivessel coronary disease could be similarly treated with CABG and PCI (typically seen with low-complexity lesions). Both low rates of complete revascularization and low complexity of disease will underestimate the benefit of CABG as it is performed in practice. However, even considering these limitations, CABG had lower rates of myocardial infarction or revascularization (Figure 1). Further, these effect sizes are still large, with hazard ratios of 1.9 and 1.6 and consideration of CABG over PCI for these reasons is reasonable, even if PCI for a patient is believed to lead to complete revascularization. However, for high-risk surgical candidates, it would also be reasonable to consider PCI should a good result be possible.

These 2 factors—completeness of revascularization and long-term outcomes—both favor CABG over PCI for this cohort. The nuances of the results related to completeness of revascularization are important for heart teams to consider as they make multidisciplinary recommendations. In summary, these data provide further evidence for the superior of CABG in patients with severe left ventricular dysfunction and support keeping the current Class 1 recommendation in the guidelines.

**Conflict of Interest Statement**

The author reported no conflicts of interest.

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