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Commentary: Complete revascularization in coronary artery bypass grafting—sometimes it pays to be conservative

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In this issue of *The Journal*, Bianco and colleagues¹ provide us with timely and provocative data on incomplete revascularization in coronary artery bypass grafting (CABG). While there is consensus that complete revascularization (CR) should be a key objective in CABG, how a surgeon achieves CR remains debatable. Some studies have demonstrated benefit,² but CR has not consistently been correlated with improvement in long-term outcomes,^{3,4} probably due to heterogeneity in its definition. Previous definitions of CR have included anatomical, territorial, functional, completeness of revascularization index, as well as the residual SYNTAX score.³⁻⁵

Keeping in mind the limitations of retrospective analyses, Bianco and colleagues provide evidence for a correlation between CR and a lower incidence of major adverse cardiac and cerebrovascular events (MACCE) at median follow-up of 3.6 years. The validity of their findings is enhanced using inverse proportional treatment weighting to balance the comparison groups.

The authors' main analysis used a largely anatomic-based definition, in which grafting of all stenotic vessels was considered CR. Their secondary analysis used a more conservative, territory-based approach where grafting of all affected "main-branch" vessels was considered CR.

Marc Ruel, MD, MPH (left), David Glineur, MD, PhD (middle), and Thin X. Vo, MD, MSc (right)

CENTRAL MESSAGE

Patients who receive complete revascularization do better than patients who do not. Whether these outcomes are due to the completeness of revascularization remains unproven.

Both analyses found statistically significant correlations between CR and a reduction in MACCE.

Interestingly, incomplete revascularization of nonmain-branch vessels such as an acute marginal, diagonal, or obtuse marginal did not adversely correlate with MACCE. This suggests that there may be a confounding effect that was not accounted for in the inverse proportional treatment weighting analyses or, somewhat provokingly, that nonmain-branch vessels may not necessarily require grafting.

We should not forget the fact that incomplete revascularization itself is a surrogate for severity of disease and patient comorbidities that may have made achieving CR less attractive in any given patient. No surgeon starts a CABG operation on an otherwise-healthy 60-year-old patient thinking "I'll incompletely revascularize today." Therefore, it is important to realize that it is the patients who receive CR, according to their clinical status or for other reasons, who do better long-term. Whether CR is the mechanism responsible for these outcomes remains uncertain, given the lack of prospective randomized data. Nonetheless, such data on this matter would be challenging to obtain.

Notably, the study by Bianco and colleagues did not have angiographic or imaging data, which would have helped correlate cardiac events with native disease progression versus graft failure. The reasons why patients were incompletely revascularized also are not known, although one can assume that those patients likely had worse coronary disease or comorbid burden. We also do not have information on the number of grafts performed per patient or per territory, which would have provided more detail regarding the revascularization strategies adopted by the surgeons.

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Finally, more stringent definitions of “important” or “dominant” vessels would provide further clarity on target myocardial perfusion and ischemic burden. For instance, the amount of myocardium supplied by obtuse marginals and diagonals may vary depending on anatomy, vessel diameter, and vessel length, and revascularization of “important” vessels may improve long-term survival.⁶

Altogether, Bianco and colleagues suggest, based on their key finding that incomplete revascularization of nonmain-branch vessels did not correlate with MACCE, that a territorial-based definition (ie, main-branch revascularization) of CR may be sufficient to prevent MACCE, and that grafting of nonmain-branch vessels might be superfluous.

What about other considerations? Functional-guided revascularization via fractional flow reserve has not demonstrated convincing advantages and is not yet ready for primetime.⁷ There is also a body of evidence suggesting that multiple arterial grafting may limit the adverse outcomes observed with incomplete revascularization.^{8,9} Could it be that a simple strategy of multiple arterial grafts with 1 graft per territory be enough for most patients?

We thank Bianco and colleagues for sharing their important findings and hope to see further research in this field, so that we can develop a more unified approach to defining and guiding CR in CABG.

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