Editorial

Incomplete coronary revascularization: a cautionary tale

Lindsey L. Saint, Spencer J. Melby

Division of Cardiothoracic Surgery, Department of Surgery, Washington University, St. Louis, MO, USA

Correspondence to: Spencer J. Melby, MD. Division of Cardiothoracic Surgery, Washington University School of Medicine, Barnes Jewish Hospital, 660 S. Euclid Avenue, Campus Box 8234, St. Louis, MO 63110, USA. Email: melbys@wustl.edu.

Provenance: This is an invited Editorial commissioned by the Section Editor Yue Liu (Associate Professor, Department of Cardiology, The First Affiliated Hospital of Harbin Medical University, Harbin, China).

Comment on: Chang M, Ahn JM, Kim N, *et al*. Complete versus incomplete revascularization in patients with multivessel coronary artery disease treated with drug-eluting stents. Am Heart J 2016;179:157-65.

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Recently, Chang *et al*. found that incomplete coronary revascularization using drug-eluting stents demonstrated similar mortality to complete coronary revascularization in multivessel coronary artery disease (1). The authors found a higher risk of post-intervention myocardial infarction in patients with incomplete revascularization, but other important outcomes such as death, stroke, and repeat revascularization were no different. These results suggest that a less rigorous approach to percutaneous revascularization might be tolerable, but must be interpreted with caution due to several significant limitations of the study.

The definition of completeness of revascularization used in the study was based on angiographic criteria, which notoriously over-estimates the functional significance of stenotic lesions. In one study, only 35% of angiographically-significant stenoses were found to be flow-limiting by fractional flow reserve (FFR) measurements (2). This discrepancy has substantial impact on outcomes following percutaneous coronary intervention. Indeed, when used to guide percutaneous coronary revascularization, angiography alone has not shown a differential advantage with regard to risk of death, myocardial infarction, or stroke compared with optimal medical treatment (3). In contrast, FFR-based percutaneous coronary revascularization not only demonstrated improved clinical outcomes with regard to death, but also with regard to myocardial infarction, and repeat revascularization when compared to angiography-based intervention (2). In the present study, the authors state that many of the lesions that were deemed to represent angiographically-significant stenoses were actually not found to be functionally-significant on FFR testing, making it difficult to know how many patients truly had "incomplete" revascularization (1).

The authors report a median follow-up period of 4.9 years. The study's patient population is young, with an average age of less than 65 years, and represents a cohort with a life expectancy in excess of 20 years. It is therefore imperative that long-term outcomes in this population be evaluated. For example, in coronary artery bypass grafting, late divergence of morbidity and mortality curves at over ten years occurs when assessing different interventions (4,5). We would advise against a limited revascularization strategy until more long-term data are acquired.

Finally, in an attempt to identify a cohort of patients with similar baseline characteristics for comparison, the authors utilized a propensity-score matching strategy. Although this statistical method has certain merit in comparing large samples with substantial overlap between treatment and control groups, it is nonetheless a relatively weak design. Propensity-score matching only accounts for observed variables, leaving analysis vulnerable to significant bias introduced from unidentified confounding variables (6). Indeed, hidden bias may actually increase following matching on observed variables, as dormant unobserved confounders may be unknowingly introduced.

Although the authors have certainly provided a thought-provoking piece in the current manuscript, the potential benefits of complete revascularization are certainly mitigated by the analysis and interpretation of the presented data. Due to the several significant limitations of the study,

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we advocate caution with interpretation of these results, and believe further investigation should include functional measures of coronary ischemia with importance placed on long-term outcomes from statistically-strong models.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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