Commentary: Why I’m biased toward bilateral internal mammary artery

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Selection bias is the Achilles heel of retrospective studies, but it can potentially illustrate and inform clinical practice. One such example is the long-running debate over the merits of single versus multiarterial revascularization, continued in this issue of the Journal with a post-hoc analysis of patients in the Arterial Revascularization Trial (ART).1

At 10 years, ART showed no survival difference in 3102 patients randomized to single versus bilateral internal mammary artery (BIMA) revascularization.2 This was attributed to crossover between study arms, where 14% of patients assigned to BIMA only received a single artery, compounded by the use of radial artery as a second arterial conduit in 22% of patients in the single mammary artery arm. However, like the retrospective analysis published in this issue of 2484 patients from that trial, the ART as-treated analysis suggested a survival benefit with multiarterial revascularization. Clearly, these results could be explained by the tendency of some surgeons to select a strategy based on operative risk and life expectancy even within a randomized trial. This is confirmed by differences between patients in the single and multiple arterial cohorts in this study, and in the as-treated ART analysis, where single arterial patients were older, had worse symptoms, and had more extensive disease.1,2 Sophisticated statistics are designed to mitigate this bias, but quite how well they do so depends not just on the choice of statistical methodology but also on the ability to adjust for all relevant confounders. For example, if HbA1c >10%, frailty, or noncompliance drove a single arterial strategy for any surgeon, such unmeasured confounding variables could explain the survival difference. The only way to eliminate selection bias, and prove greater efficacy of one strategy, is reporting an intention-to-treat analysis, ie, results according to how patients were randomized.

However, nonrandomized data are still valuable. First, they may provide important mechanistic insights—such a recent analysis of preoperative angiograms in 6127 patients who received a BIMA, which suggested that grafting the second internal mammary artery to “important” targets defined as those “with >75% terminal reach towards the left ventricular apex” was associated with better long-term survival compared with using a single internal thoracic artery.3 This study also identified multiarterial strategies that may be associated with worse outcomes. Second, nonrandomized data can show whether the results from randomized trials translate into clinical practice by examining practice variation and real-world outcomes. A notable feature of ART was the extreme variation (from 98% to 0%) between an individual surgeon’s ability to deliver BIMA to the assigned patients: technical reasons were cited in one third of such crossovers, explaining similar variation seen in clinical practice, where individual surgeon multiarterial revascularization rates range from zero to 100%.4 Technical experience is likely one of several factors explaining similar variation seen in clinical practice, where individual surgeon multiarterial revascularization rates range from zero to 100%.5 Finally, selection bias can provide useful insights. Specifically, the selection bias toward favorable outcomes in multiarterial patients helps identify groups that may not benefit from a multiarterial strategy. The fact that a retrospective analysis of 26,124 patients showed no survival benefit with multiarterial revascularization in patients...
older than 70 years, or with ejection fraction less than 30%, despite potential selection bias, strongly suggests these groups derive no benefit from this strategy.\(^5,6\)

This is why I am biased toward BIMA for patients with a long life expectancy, and why this author group deserves great credit for their ongoing efforts to inform our practice with unbiased randomized trial data.

References

CENTRAL MESSAGE
Total arterial revascularization may improve outcomes in selected low-risk patients, but further studies are needed.