What is the best second conduit for coronary artery bypass grafting? With no silver bullet study we should not ignore good regular bullets when we get them!

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The article by Shi and colleagues represents another important contribution by the group from Melbourne to the understanding of optimal conduits for coronary bypass grafting (CABG). It is particularly timely and important with the longer-term results of the Radial Artery Patency and Clinical Outcomes trial, from the same group, now imminent.

The ultimate goal of improving short- and long-term outcomes in CABG should be based on a 3-pronged approach. The first, not relevant to the study by Shi and colleagues, is to identify which patients require revascularization and which do not. The outcomes of the current Fractional Flow Reserve Versus Angiography fo Multivessel Evaluation trials, in identifying the importance of myocardial ischemia and the role of fractional flow reserve, will be particularly important in the future. Although these are currently focused on percutaneous coronary interventions (PCIs), they will also be highly relevant to decisions regarding CABG. The second measure, again not particularly relevant to the work by Shi and colleagues, is to identify which patients requiring revascularization and which do not. The outcomes of the current Fractional Flow Reserve Versus Angiography fo Multivessel Evaluation trials, in identifying the importance of myocardial ischemia and the role of fractional flow reserve, will be particularly important in the future. Although these are currently focused on percutaneous coronary interventions (PCIs), they will also be highly relevant to decisions regarding CABG. The second measure, again not particularly relevant to the work by Shi and colleagues, is to identify which patients requiring revascularization and which should have PCI. In this regard the Synergy Between PCI With Taxus and Cardiac Surgery trial provides the best prospective evidence. Finally, we need best evidence as to which conduit strategy is best for which patients.

It is important to consider that evidence derived from any study population cannot always be applied to a given individual patient. In the case of CABG, 2 patients of the same age with identical angiographic appearances might benefit from entirely different conduit strategies depending on their clinical presentation and comorbidities. In addition, different surgical approaches, such as on-pump versus off-pump coronary artery bypass, might provide different short- and long-term outcomes despite an identical conduit strategy. Nevertheless CABG conduit choice must be based on best evidence and not what is convenient or comfortable for the surgeon.

A silver bullet is a magic weapon that instantly solves a long-standing problem. A prospective, randomized trial of all arterial conduits versus left internal thoracic artery and veins will have a significant influence on current best evidence, and potentially strengthen the case for all arterial grafting. The long-term results of the Arterial Revascularisation Trial are eagerly awaited. However, it will not provide a silver bullet with regard to optimal conduit choice in CABG. There are 3 main reasons for this. The most important is that it will be years before longer-term results are confirmed. By then surgical strategies for the alternative losing arm will have changed; for example, pharmacologic and other means of improving vein graft patency, such as external stenting. Surgeons need look no further than the argument that better stents might improve PCI outcomes when evidence suggested benefit of CABG. Second, there are differences in arterial grafting strategies: use of Y-grafts or free right internal thoracic artery top ends with anastomosis directly to the aorta being 2 examples that might lead to different clinical outcomes. Third, are the results of expert surgeons in selected centers reproducible more widely? The same would apply to a prospective study comparing different arterial grafting strategies. It is for these reasons that the findings of well-researched
observational studies are crucial to the evidence base for current best practice in CABG conduit selection.

The study by Shi and colleagues1 assumes the premise, based on previous observational evidence,6 that total arterial conduit strategies are superior to those involving saphenous vein. It is a further observational study, using a propensity-score matching technique, to compare long-term survival between patients receiving single internal thoracic artery (SITA) and bilateral internal thoracic artery (BITA). The radial artery is the alternative conduit in the SITA group, but it is also used in more than 90% of BITA patients. The large study population (2821 patients undergoing operation over 15 years in 8 centers) was initially unbalanced, both numerically and in terms of patient risk factors, between the BITA and SITA groups. Using a well-supported and clearly explained propensity-score model, the authors identified 591 matched pairs for comparison of long-term survival between SITA and BITA arterial grafting strategies. Using this method they find a statistically improved survival in the BITA group and conclude that this is the superior arterial grafting strategy. Three further comparisons are undertaken—between BITA with free RITA versus SITA, bilateral in-situ BITA versus SITA, and between BITA with free RITA versus bilateral in-situ BITA. The number of propensity-score matched pairs is smaller in these 3 comparative groups and no statistically significant differences in survival were found.

Use of propensity-score matching probably provides the best observational evidence for drawing conclusions from a retrospective analysis.2 Propensity score methodologies employed in different studies vary and never eliminate bias completely. As is almost invariably the case, there were areas of weakness in the matching model employed in the study by Shi and colleagues.1 Body mass index data were not available—many surgeons regard body mass index as crucial when deciding on RITA versus radial artery for the second arterial conduit. The same applies to the study not including renal dysfunction or any other frailty score in the preoperative factors employed in selecting matching pairs. The only intraoperative matching pair criterion was number of anastomoses with no assessment of differences between surgeons or the 8 centers—although the authors do report consistency of approach between surgeons and over the course of the study. It is interesting that although the most common free RITA technique was direct RITA to aorta top-end anastomosis, this did not appear to negatively influence either the main BITA versus SITA or, importantly, BITA with free RITA versus bilateral in-situ BITA analysis. Finally, this was an all-cause mortality study because data on cardiac death, or other major cardiac clinical events such as myocardial infarction, were not available.

Nevertheless, Shi and colleagues1 present prospectively collected data on a large series of patients operated on over a 15-year period with a statistically significant advantage for BITA over SITA survival curves at 15 years.1 There are interesting nonsignificant differences in the 3 sub-analyses. The authors explain their surgical techniques, propensity-score model, statistical analyses, and study limitations clearly. Unlike the Lone Ranger, who had actual silver bullets, there is unlikely to be a silver bullet study that will fully resolve the question of best alternative conduit for CABG! If there is, the long-term outcome data are years away. However, observational evidence supporting the use of arterial conduits in improving long-term survival is mounting.3,4 It is therefore appropriate to take the next step and define the optimal arterial grafting strategy. Studies such as the 1 by Shi and colleagues1 add to our understanding of best CABG conduit strategy and, in the absence of a silver bullet answer, are all the more important.

References