Arterial Conduits for Surgical Revascularization

The Answer Is . . .

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The pure and simple truth is rarely pure and never simple.

—Oscar Wilde

Coronary artery bypass grafting (CABG) remains a commonly performed procedure for obstructive coronary artery disease that is not treatable with either medical therapy or percutaneous intervention. It has been well studied and documented that using the left internal thoracic artery (LITA) reduces morbidity and mortality compared with using saphenous vein grafts (SVGs) when performing a CABG.1 One reason for the observed improved outcomes is the anatomic structure and the preserved and functional endothelium of the internal thoracic artery compared with an SVG. It was assumed that this inherent superiority of the LITA would also be true for the right internal thoracic artery (RITA) and other arterial conduits that could be safely procured and used for bypassing coronary arteries. However, this assumed inherent superiority of using any arterial conduit compared with using an SVG to targets other than the left anterior descending artery has been much harder to prove. Two recent reports of using a meta-analysis of radial artery versus SVG reached different conclusions.

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Benedetto and colleagues2 report a meta-analysis of randomized, controlled trials comparing radial artery and SVG patency and found no advantage for the radial artery. However, in their meta-analysis of radial artery versus SVG for CABG, Athanasiou and colleagues3 concluded that the evidence supports the use of radial artery in preference to saphenous vein for CABG. The most recent prospective randomized trial comparing 1-year angiographic patency of radial artery grafts and SVGs to the best recipient vessel after the left anterior descending artery has now been reported by Goldman et al.4 In this well-done prospective randomized study, the authors found that the use of a radial artery did not improve graft patency compared with the use of an SVG. Equally concerning is the recent report by Fukui et al5 that demonstrated only a 69.5% 1-year patency of the radial artery. These mixed results are not totally unexpected, given the known limitations of the radial artery: susceptibility to vasospasm, potential calcification and poor quality in elderly patients, and the need for a proximal anastomosis with a small-diameter conduit. What is surprising is the frequency with which the radial artery is used compared with the RITA as the second arterial conduit of choice for multiple arterial revascularization. Previous concerns about the RITA included its length, the ability to use it to revascularize the circumflex system, and the potential risk for increased sternal complications. Recent improvements in surgical techniques have addressed many of these issues. These changes include skeletonizing the internal thoracic artery for greater length and less trauma/ischemia to the chest wall, routing through the transverse sinus to reach circumflex targets as an in situ graft, and using as a T graft off the LITA for grafting the left coronary system. Thus, in the battle to determine which, if any, arterial conduit other than the LITA is the best choice to improve long-term graft patency while limiting adverse events, it seems that it is time to re-evaluate the RITA as the logical choice.

In the current issue of Circulation, Ruttmann and colleagues6 have provided new information to help clinicians make the decision concerning the use of a second arterial conduit for surgical revascularization. They have retrospectively reviewed 1001 patients between 2001 and 2010 who underwent a first, nonemergent CABG with either an RITA or radial artery as a second arterial conduit. There were 277 patients (27.7%) who received bilateral internal thoracic artery grafts (BITAs) with or without concomitant SVGs and 724 patients (72.3%) who received an LITA with at least 1 radial artery (LITA+RA) with or without concomitant SVGs. A propensity score–matched analysis was performed to compare the 2 groups (BITA±SVG and LITA+RA±SVG) for survival and major adverse cardiac and cerebrovascular events. Overall, perioperative major adverse cardiac and cerebrovascular events were significantly lower in the BITA±SVG group and survival and major adverse cardiac and cerebrovascular event–free survival were also significantly better in the BITA+SVG group compared with the LITA+RA±SVG group.

In patients receiving an RITA in the full unmatched population, ~68% were harvested as a skeletonized internal thoracic artery, and the majority were used as in situ grafts through the transverse sinus. The RITA conduits used as free grafts were anastomosed as a T graft to the LITA to bypass the left coronary system. With this approach, 23.1% of patients in the BITA group did not require any central anastomosis. The use of the RITA compared with the radial artery as the second arterial conduit clearly contributed to the decrease in major adverse cardiac and cerebrovascular events, demonstrated by fewer perioperative strokes and myocardial infarctions. In addition, there was no difference in sternal...
dehiscence between the 2 groups. In the propensity-matched groups, there were very few differences in preoperative characteristics. There was more severe chronic obstructive pulmonary disease and a higher creatinine level in the BITA ± SVG group. However, because the patients were not randomized, it is possible that there was some bias in patient selection between the 2 groups that was not identified.

It has long been believed that multiple arterial conduits would lead to better long-term graft patency and improved patient outcomes for surgical revascularization. However, this has been difficult to prove, resulting in the continued use of saphenous vein with its well-documented limitations. One explanation for the difficulty in demonstrating the superiority of arterial conduits is the choice of conduit used for comparison. Surprisingly, multiple arterial conduits are used in <15% of patients undergoing a CABG, and the radial artery is the most common choice for the second arterial conduit. Reasons for using the radial artery instead of the RITA frequently included the facts that it has a lower risk of sternal complications, is easy to harvest, is technically less challenging, and adds little time to the overall operation. The report by Ruttmann and colleagues now provides information that demonstrates no clinically significant additional time for the procedure with the benefit of reduced adverse events, improved survival, and no increase in sternal wound infections. In addition, Tatoulis and colleagues have just reported their outcomes using the RITA and refer to it as “the forgotten conduit.” In their experience, the late patencies of the RITA are excellent with outcomes similar to the LITA for identical territories. They go a step further and claim that the RITA is always better than radial arteries and SVGs.

Long-term outcome for surgical revascularization depends on multiple variables, including the choice of conduit. It has been well documented and demonstrated that using the LITA to the left anterior descending artery has significant benefits compared with using an SVG. There is now mounting evidence that using the RITA may also incrementally improve outcomes compared with using either the radial artery or saphenous vein. The report by Ruttmann and colleagues is a significant step forward, demonstrating that multiple arterial revascularization with the RITA can further improve long-term survival and reduce adverse events in patients requiring surgical revascularization.

Disclosures

None.

References


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