

Arterial Grafts in Coronary Artery Bypass Surgery: Who, When, and Why

Natalia Roa-Vidal, BS¹; Lauren K. Barron, MD^{2,3}

¹School of Medicine, University of Puerto Rico, Medical Science Campus, San Juan, Puerto Rico

²Division of Cardiothoracic Surgery, Michael E. DeBakey Department of Surgery, Baylor College of Medicine, Houston, Texas

³Department of Cardiothoracic Surgery, The Texas Heart Institute, Houston, Texas

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When selecting conduits for coronary artery bypass, long-term patency, survival benefit, and patient factors such as coronary atherosclerotic burden and comorbid conditions are the primary influences on surgical decision-making (Fig. 1). Previous studies have shown that multiple arterial conduits offer a survival benefit,¹ but the observational design of this work makes the findings subject to patient selection bias.

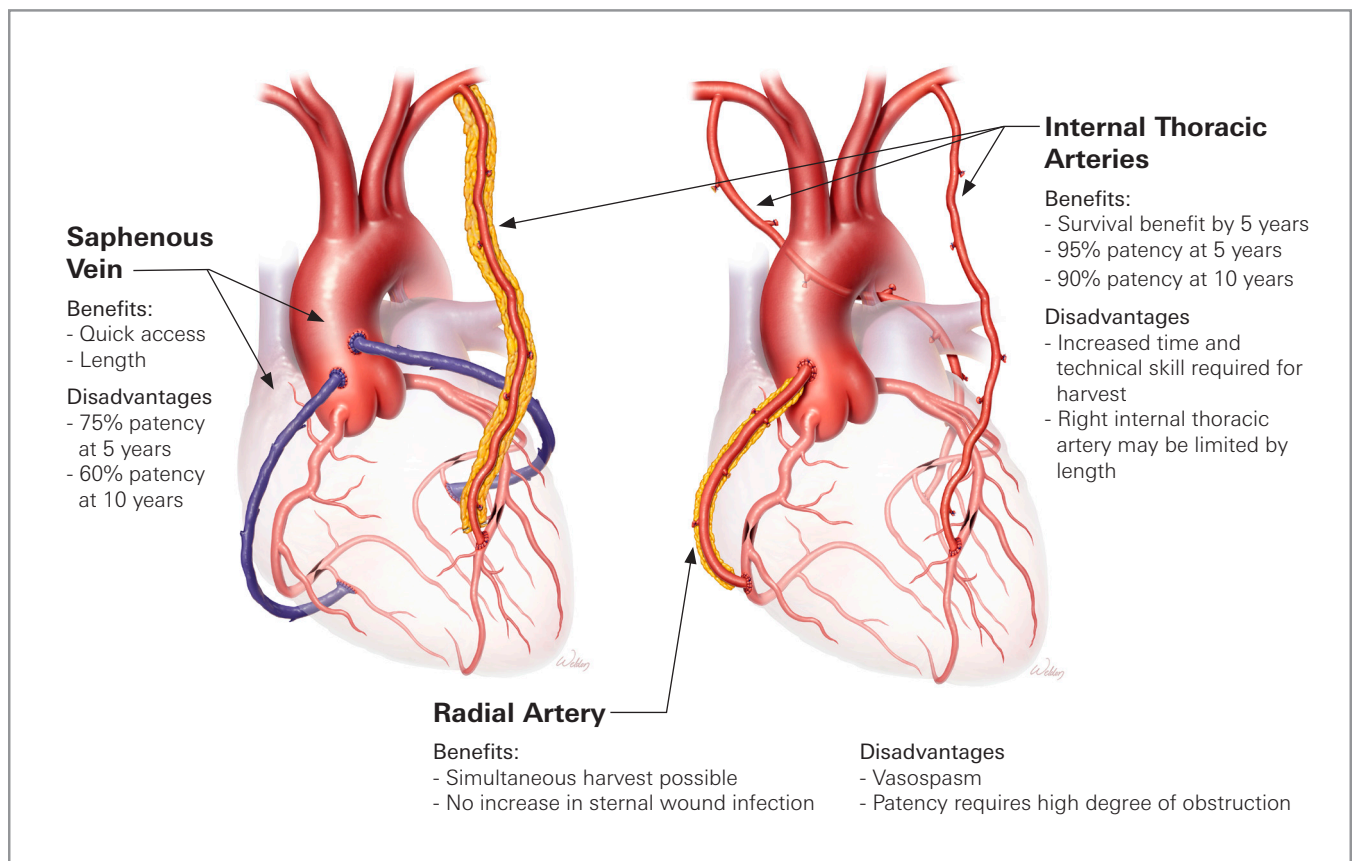


Fig. 1 Conduit options for coronary artery bypass grafting. Artwork used with permission of Baylor College of Medicine.

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Corresponding author: Lauren K. Barron, MD, Division of Cardiothoracic Surgery, Michael E. DeBakey Department of Surgery, Baylor College of Medicine, 6770 Bertner Ave, Suite C330, Houston, TX 77030 (lauren.barron@bcm.edu)

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The Arterial Revascularization Trial was a prospective, randomized trial comparing bilateral internal thoracic arteries (ITAs) with single ITA conduits plus either a vein or radial artery (RA) conduit.² The study did not demonstrate the survival benefit that observational studies have shown. With a crossover rate of 14% and 21.8% of patients in the single-ITA group receiving RA grafts, the findings are far from conclusive. In a post hoc, as-treated analysis, a survival benefit was seen with 2 arterial grafts—left ITA (LITA) plus right IT or RA—compared with a single arterial graft, but this type of analysis has the same limitations regarding selection bias as the previous observational findings. The need for a randomized controlled trial aimed at understanding the benefits and limitations of multiple arterial grafting (MAGs) is clear. The Randomization of Single vs Multiple Arterial Grafts trial has concluded enrollment (N=4300) and is expected to help clarify the benefits of MAG in nonemergent coronary artery bypass graft procedures,³ with a nested trial focused on female patients (N=2000) expected to follow in 2023.⁴

Review of Conduit Options

The oldest and most commonly used conduit in the United States is the greater saphenous vein. It offers quick and less technically demanding harvest and minimal length restrictions, but with 5-year and 10-year patencies of only 75% and 60%, respectively, there are clear limitations to its use in younger patients.⁵ The LITA is the gold-standard conduit, with patencies of 95% and 90% at 5 and 10 years, respectively.⁶ Although LITA to left anterior descending coronary artery is a Society of Thoracic Surgeons class I recommendation,⁷ the time and technical skill required for harvesting make the left anterior descending coronary artery unsuitable for emergencies or salvage procedures and limit its use in patients with subclavian stenosis. The right ITA has long-term patency similar to that of the LITA but is often limited by physical distance to the lesion.⁸ The RA provides yet another option for arterial graft conduits. Harvest requires less time than with bilateral thoracic arteries, and its use does not increase the rate of sternal wound infection. The RA requires a high degree of stenosis (>90%) to achieve patency rates that compare with ITA, limiting the lesions it can be used to bypass. The artery's muscular walls and intact internal elastic lamina are prone to vasospasm, making it less ideal for patients with heavily calcified arteries, patients who smoke, and

Abbreviations and Acronyms

ITA	internal thoracic artery
LITA	left internal thoracic artery
MAG	multiple arterial grafting
RA	radial artery

patients with heart failure who are likely to require inotropic/pressor support postoperatively.⁹

Patient Selection

To determine which graft is best, the surgeon must consider conduit suitability, lesion anatomy, patient age, comorbidities, and level of risk. Lesion severity and location are also primary determinants of conduit selection, as described earlier. Although lesion location can limit conduit options based on length, composite grafts may be considered; however, these can increase technical complexity and operative time. Patient age and life expectancy also contribute to conduit selection. With the data demonstrating that patients older than 70 years of age do not gain a mortality benefit from MAG,¹⁰ the risk-benefit ratio favors the quicker, less-complex saphenous vein conduits. Finally, high-risk patients with multiple comorbidities, such as kidney failure, low ejection fraction, shock, and diabetes, have no additional benefit from MAG.⁷

Conclusion

Multiple arterial grafts are beneficial when there is a balance of anatomy, flow dynamics, and comorbid conditions. Current available evidence shows that arterial grafts improve survival and reduce adverse events in the right patient, for the right reason, and in the right setting.

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