EDITORIALS

Radial Artery as the Preferred Second Conduit for Coronary Bypass

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Coronary-artery bypass grafting (CABG) remains one of the most effective methods of treatment for patients with coronary artery disease. Selection of the appropriate conduit for the bypass is key to achieving good short- and long-term procedural outcomes. The use of arterial grafts other than the left internal thoracic artery to the left anterior descending coronary artery for CABG remains very uncommon. In a recent report on nearly 1.5 million CABG procedures, the rates of use of both internal thoracic arteries and radial arteries for grafting in the United States were 4.9% and 6.5%, respectively.[1] The fact that a multiple-arterial grafting strategy has not been adopted is, in part, related to the lack of strong, unequivocal evidence that this strategy is associated with better clinical outcomes and higher patency rates that would justify the greater technical difficulty, longer operative times, and potential complications.

In this issue of the *Journal*, Gaudino and colleagues provide strong evidence that the radial artery is superior to the saphenous vein as a conduit.[2] Using a patient-level combined analysis incorporating six randomized trials with 1036 enrolled patients, the authors showed that the risk of graft occlusion was significantly lower with the radial artery than with the saphenous vein. Higher patency translated into lower rates of major adverse cardiac events, including the composite outcome of death from any cause, myocardial infarction, or repeat revascularization. The absence of a measurable effect on mortality by itself might be related to the small patient cohort, a median follow-up duration that was shorter than the time of anticipated decline in vein-graft patency, or the absence of a survival effect of occlusion of a graft to an artery other than the left anterior descending coronary artery.[3]

The radial artery became an attractive arterial conduit in the early 1970s because of several advantages.[4] It can be harvested simultaneously with the left internal thoracic artery, thus shortening the operative time; it is long enough to reach any coronary target; it is easy to handle because of its diameter and wall thickness; and it is associated with a low rate of harvest-related complications, particularly when harvested endoscopically.[5]

However, the radial artery was quickly abandoned because of early graft failure related to accelerated intimal hyperplasia and diffuse vasospasm.[6] The use of the radial artery was rejuvenated in the early 1990s, with encouraging results attributable to better understanding of its biology.[7] The radial artery is characterized by a thick tunica media that is rich in smooth-muscle cells, a small quantity of elastic fibers, and a dependency on the vasa vasorum for vessel-wall perfusion. These characteristics make the radial artery vulnerable to vessel-wall ischemia, vasospasm, and competitive flow. In light of these features, three major modifications in practice were introduced — a refined harvesting technique, routine administration of antispasmodic agents, and careful choice of the target vessel. To better preserve its structural integrity, including that of the vasa vasorum, harvesting of the radial artery has been modified from obtaining a skeletonized graft to obtaining a graft that includes a pedicle with the adjacent tissue, while carefully avoiding heat- and distention-induced endothelial injury.[5] Prolonged postoperative treatment of the recipient with calcium-channel block-

ers or nitrates to prevent vasospasm has become routine.[8] Finally, to minimize competitive flow, the radial artery is currently grafted to coronary arteries that have stenosis of 90% or more of the vessel diameter.[6] The superior long-term patency and clinical outcomes associated with the use of the radial artery that were observed in the present combined analysis are directly related to strict adherence by the surgeons in all six trials to these key points.

The Achilles' heel of the use of bilateral internal thoracic arteries is the risk of sternal-wound complications.[1] An increasing number of studies document similar outcomes when comparing the strategy of using the single internal thoracic artery with the radial artery versus that of using both internal thoracic arteries for grafting.[1,9] The data from Gaudino and colleagues provide further evidence that, in the presence of a suitable coronary anatomy, the radial artery should be strongly considered as the preferred second conduit to the left internal thoracic artery, particularly in younger patients, female patients, and patients without renal insufficiency. The radial artery should also be considered as the second arterial graft of choice in patients with diabetes, obesity, or chronic obstructive pulmonary disease, for whom the risk of deep sternal wound infection associated with the use of both internal thoracic arteries may outweigh the benefits.[1,10]

Disclosure forms provided by the author are available with the full text of this editorial at NEJM.org.

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A New Standard of Care for Advanced Lung Cancer

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In 1995, the Non-small Cell Lung Cancer Collaborative Group published a landmark meta-analysis involving eight randomized trials that compared chemotherapy with no therapy or best supportive care for the first-line treatment of metastatic non–small-cell lung cancer (NSCLC).[1] This meta-analysis not only showed the poor outcomes of patients with untreated NSCLC (5% overall survival at 1 year) but also showed that cisplatin-based chemotherapy could affect the natural history of this disease (15% overall survival at 1 year).

Multiple subsequent trials have since compared different chemotherapy regimens, with small but incremental improvements in overall survival. One phase 3 trial showed a median overall survival of 15.3 months with platinum-based chemotherapy followed by maintenance pemetrexed among patients with non–squamous-cell carcinoma, as compared with 10.3 months among patients randomly assigned to best supportive care.[2]

Perhaps the next major advancement in the treatment of NSCLC came with the identification of mutations that "drive" the development and progression of lung cancer and therefore are, theoretically, "targetable." Although the subset of patients with actionable mutations is small, progression-free survival was shown to be significantly longer among patients treated with