An arterial faceoff classic: The “T off” between the right internal thoracic and radial arteries

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Central Message

The use of a second arterial graft may be more important than the type of arterial graft (RITA or radial artery) in many cases.

See Article page 1311.

In this issue of the *Journal*, Pevni and colleagues¹ report their single-center retrospective observational study comparing composite bilateral internal thoracic artery grafting (T-BITA) grafting (n = 1329) with composite single left internal thoracic artery and radial artery (RA) grafting (T-SITA-RA; n = 389) in patients undergoing left-sided multivessel coronary artery bypass grafting surgery (CABG) from 1996 to 2010. They performed multiple adjusted analyses, including propensity techniques, and concluded that long-term outcomes of T-SITA-RA were not inferior to those of T-BITA (10-year Kaplan-Meier survivals T-BITA, 61.6%; T-SITA-RA, 64.9%; $P = .65$). In the last decade, there has been growing support in the literature for arterial revascularization in CABG.²⁻⁴ The recently published Society of Thoracic Surgeons practice guidelines on arterial revascularization⁵ recommended a second arterial graft, namely either a right internal thoracic artery (RITA) or RA graft (class of recommendation IIa, level of evidence B), according to individual patient characteristics. The key question that Pevni and colleagues¹ are attempting to answer in their article is whether the RITA or RA is preferred as the second arterial conduit.¹

Most of the data comparing these arterial conduits have been derived from observational studies, and the results have been mixed.⁶⁻⁹ There are only 2 RCTs to our knowledge that have addressed this issue.^{10,11} The first was performed in a group of 120 patients with previous coronary stenting and found similar results for the RITA and RA grafts (and both better than the results with saphenous vein grafts).¹⁰ The second is the Radial Artery Patency and Clinical Outcomes study (RAPCO),¹¹ interim results of which have been published, showing similar event-free survivals and graft patencies in the RITA and RA cohorts, although numerically better in the RA group. Ten-year results are pending.

Furthermore, in the study of Pevni and colleagues,¹ all patients had composite arterial grafting. Composite arterial grafting with the left internal thoracic artery as inflow has

become more popular.¹² This strategy has many advantages, including efficient use of limited arterial conduits and decrease in aortic manipulation and thereby stroke¹³; disadvantages of this strategy include the possibility of steal from the second graft connected to the left internal thoracic artery and competitive flow from the native coronary artery.¹³ Kim and associates¹⁴ (SAVE RITA trial) reported excellent composite RITA patency at 1-year (97.1%). Glineur and coworkers¹⁵ investigated the causes of nonfunctioning composite RITAs and reported that the function of a Y-RITA is much better when grafted to branches of the circumflex coronary artery than the right coronary artery. Furthermore, Gaudino and colleagues¹⁶ showed that the RA is more vulnerable to the effects of competitive flow when anastomosed to the internal thoracic artery than to the aorta.

Pevni and colleagues¹ are to be congratulated on such a high rate of arterial revascularization in their institution; however, there are a number of points worth discussing. First, there were many important baseline differences between the T-BITA and T-SITA-RA group. Of the 3165 patients who underwent left-sided arterial revascularization, the great majority of the entire population (87.7%) and the T-graft cohort specifically (77.4%) had bilateral ITA grafting; Pevni and colleagues¹ mention that conduit choice was mainly by surgeon preference, but it is unclear whether additional factors like coronary anatomy and severity of target vessel disease were considered. The latter has been shown to be an important predictor of late radial patency.¹⁷ Although the prevalence of some individual risk variables was greater in the RITA cohort,¹ the RA cohort patients

were older and more likely female, and their mean euroSCORE was higher, suggesting that the RA was used preferentially in higher risk patients. There were also significant intraoperative differences in the matched comparison between the T-BITA and T-SITA-RA cohorts; the T-SITA-RA cohort underwent a higher proportion of off-pump CABG procedures (42.2% vs 16%; $P < .001$) and had fewer total grafts than the BITA cohort (72.4% vs 79.5%; $P = .03$). The latter is likely because of the use of more sequential grafts with the RA to both the circumflex and right coronary artery territories. In addition, it was not until 1999 that the center started performing T-SITA-RA revascularization, which may have introduced temporal and practice-based biases.

Finally, there were copious baseline differences between the T-BITA and T-SITA-RA cohorts in this study; Pevni and colleagues¹ attempted to adjust for the large selection bias with propensity techniques. In addition to the fact that propensity techniques cannot adjust for unknown confounders, one assumption of such techniques is that all variables that affect treatment assignment and outcome, even if only moderately, should be measured and included.¹⁸ In this study, intraoperative covariates were not included (even though it was known they were unbalanced) in the generation of the propensity model, which could explain the imbalance between the matched groups with respect to these variables. Moreover, their match resulted in 268 pairs; given that there were only 389 patients in the T-SITA-RA group, this represents more than a 30% loss from the population of interest. Perhaps another propensity technique would have been preferable, because such a loss could result in decreased generalizability and accuracy of the results.¹⁸ It is also worth noting that Pevni and colleagues¹ applied multiple propensity techniques (matching with propensity scores, covariate adjustment, and stratification) along with multiple logistic regression techniques (stepwise regression with forced variables) for modeling. Although having a sensitivity analysis for a particular model is appropriate, too many statistical adjusting mechanisms and tests can be difficult to interpret and can lead to problems of multiple comparisons.¹⁹ Furthermore, the goal of propensity matching is to create similar groups, comparing apples with apples rather than apples with oranges. In this study, the propensity-matched patients were more like the RA group than the BITA group, so external validity for the greater BITA cohort is in question.

Although there is growing evidence supporting the use of arterial grafting, this strategy has yet to be adopted as mainstream practice by cardiac surgeons; in the United States, slightly more than 5% of patients undergoing CABG receive a second arterial graft.²⁰ Recently, a study published by Gaudino and coworkers²⁰ commented that grafting strategies are more of “an art than science” and

provided an algorithm for graft selection for the second target vessel. In the pursuit of less art and more science,²⁰ Pevni and colleagues¹ should be commended for undertaking such a study of arterial revascularization. Although this study further adds to the conflicting evidence as to whether RITA is better than RA, what is evident in the literature is that a second arterial graft is important⁵; perhaps the type of arterial conduit is less of a factor. To this end, the multidisciplinary heart team can play an important role not only in patient selection²¹ but also in providing guidance regarding the type of grafting strategy that would be optimal for the individual patient.⁵

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May
2016*

On this month in...

1923 • 1931 • 1953 • 1960 • 1968 • 1978 • 1998

May 20, 1923,
Elliott Cutler
performed
the first mitral
valvotomy for
stenosis.

In 1931,
Evarts Graham
was named the
inaugural Editor
of the Journal
of Thoracic
Surgery,
renamed the
Journal of
Thoracic and
Cardiovascular
Surgery in 1959.

May 6, 1953,
John Gibbon
closed the first
atrial septal
defect using
cardiopulmonary
bypass.

May 12,
1960, the first
Honored Guest
Lecturer at the
Annual meeting
was Alfonso
Topete, "New
Findings in
the Coronary-
Encephalic
Perfusion in
Depressive
Surgical Cases."

May 2, 1968,
Will Sealy
performed a
Surgical Division
of an accessor
pathway for the
Wolff-Parkinson-
White Syndrome,
being the first
cardiac operation
ever performed
for a cardiac
arrhythmia.

May 9, 1978,
Mark Orringer
presented
the landmark
"Esophagectomy
without
thoracotomy" at
the 58th Annual
Meeting in New
Orleans.

In 1998,
Stephen Cassivi
became the
inaugural
winner of the
C. Walton
Lillehei Forum.

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