Y vein? Y not? The underdog of the composite arterial world

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Central Message

Discussion of Hwang and colleagues' study comparing myocardial perfusion and thickness between RITA and saphenous vein composite grafts.

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Despite growing evidence for arterial grafting in coronary artery bypass grafting surgery (CABG),^{1,2} saphenous vein grafts (SVGs) still remain the most commonly used graft.³ This is likely due to the length of the venous conduit, availability, and ease of harvesting. In patients with severely calcified aortas or lack of conduits, composite Y grafting from the left internal thoracic artery (LITA) can be an important strategy to achieve more complete revascularization.^{4,5} Although composite grafting is typically used with arterial conduits, the use of the SVG as a Y from the internal thoracic artery is regarded as combining the “best and worst conduit”⁶ and has not been well accepted to date.^{5,7} To this end, Kim and colleagues⁸ conducted a randomized trial (SAVE RITA) that compared the SVG (harvested with an atraumatic no touch technique) with the right internal thoracic artery (RITA; harvested in a skeletonized fashion) as a composite Y-graft from the LITA in off-pump CABG with minimal aortic manipulation and reported that at 1-year, SVG was not inferior to RITA with respect to graft patency; clinical outcomes were also similar between the 2 groups at 1 and 4 years. Size mismatch between the LITA and SVG was minimized by using vein from the lower leg, as opposed to the thigh, and by avoidance of dilatation. A morphologic analysis by this group by means of intravascular ultrasonography and quantitative angiography of the SVGs of a subset of these patients showed that these SVGs underwent appropriate negative remodeling at 1 year.⁹ In this issue of the *Journal*, the investigators of the SAVE RITA trial report their conduct of a separate substudy to compare postoperative changes in serial nuclear studies between the SVG and RITA cohorts.¹⁰

More specifically, Hwang and colleagues¹⁰ investigated 116 patients (SVG, n = 65; RITA, n = 51) from the 224 patients (51.8%) initially enrolled in the SAVE RITA trial; these patients had patent grafts at 1-year angiography and also underwent myocardial single photon emission computed tomography (SPECT) preoperatively and then

at 3 months and 1 year after CABG, as per their routine practice. The LITA was targeted to the left anterior descending territory, whereas the SVG or RITA (the second limb of the conduit) was used to revascularize first the lateral territory, followed by the inferior territory, by means of a sequential anastomosis technique. Hwang and colleagues¹⁰ investigated changes in myocardial perfusion and segmental thickening, along with temporal and regional associations. The major findings of this study were that both myocardial perfusion and segmental thickening improved after surgery, and that these improvements were similar between the SVG and RITA groups at 1 year after surgery.

This study highlights some pertinent discussion points. Although in general, both the SVG and RITA cohorts had similar performance with respect to reversibility at 1 year after CABG, analysis by territory revealed that, in the right inferior territory, improvement in myocardial perfusion was less pronounced in the RITA group than in the group grafted with SVGs. One possible reason for this finding could be the smaller distal diameter of the RITA that is required to reach the right coronary target, which is more susceptible to spasm, as mentioned in the article.¹⁰ Another mechanistic cause could be the presence of competitive flow, which is often a problem with arterial grafts, especially in the right coronary territory.¹¹ Glineur and colleagues¹² performed a randomized trial comparing grafting of the SVG, RITA (with a composite Y technique), and right gastroepiploic artery to the right coronary system and showed that SVG performed superiorly relative to the other arterial grafts at 3 years after CABG.¹² Their group

has shown that competitive flow is more frequent with composite Y grafting in the right territory.¹¹ Whereas the larger, nonresistant SVG fares well in this environment, the composite RITA grafting to the right territory may negatively remodel,¹¹ especially in targets with lesser degree of proximal stenosis.¹³ This study did not account for proximal target stenosis, and the existence of these flow dynamic changes could explain the lessened perfusion improvement seen with RITAs than with SVGs. Furthermore, such changes could contribute to the lessened perfusion improvement seen in the right territory at 3 months relative to the LAD (temporally slower increase in perfusion).

In addition to perfusion, improvements in myocardial thickness were similar between the SVG and RITA groups. It has been shown that SVGs perform poorly relative to arterial grafts,¹⁴ especially in patients with diabetes.² In the study of Hwang and colleagues,¹⁰ almost 50% of patients in the SVG cohort had diabetes; despite this, SVGs performed well. One reason for this could be the no touch atraumatic harvesting of the SVG. Relative to conventional skeletonized SVGs, which undergo manual dilation, SVGs harvested with the atraumatic no touch pedicled technique have been shown to have preservation of the endothelial layer and biochemical properties that are associated with decreased neointimal hyperplasia and atherosclerosis.¹⁵⁻¹⁷ Samano and colleagues¹⁸ conducted a randomized trial comparing no touch to conventional SVG harvesting in CABG with standard aortocoronary proximal anastomoses with longitudinal angiographic follow-up. In their most recent analysis, they reported that patency of no touch SVGs was comparable to patency of the LITA grafts at 16 years (conventional SVG, 64%; no touch SVG, 83%; LITA, 88%).

The main strengths of the study of Hwang and colleagues¹⁰ include its objective measurement of myocardial status and its advanced statistical analyses. Although angiographic and clinical outcomes are commonly reported in CABG studies, myocardial perfusion and segmental analysis are not. This study measures these variables by means of myocardial SPECT, which has been shown to be a strong predictive diagnostic tool for predicting cardiac death after CABG.¹⁹ Furthermore, advanced statistical analysis was performed involving mixed models, which accounted for repeated perfusion and thickness measurements in the same patients. Although this type of complex modeling was necessary, some of the results from these models, including certain interaction terms, were difficult to explain or may be spurious. Pertinent limitations of this study included the presence of biases associated with an observational study, along with selection bias because almost 50% of the SAVE RITA trial patients were excluded. Furthermore, target vessel characteristics, including target vessel size, quality and severity of target vessel stenosis, were not reported. Finally

patients in whom a third conduit was required to reach a distal target were excluded, which was necessary in many more patients in the RITA group than in the SVG group.

Overall, Hwang and colleagues¹⁰ should be congratulated for this substudy, which required objective follow-up diagnostics as well as an advanced statistical approach. It highlights the concept that conduit selection for a specific target is an important consideration, especially for arterial grafts in the revascularization strategy. Moreover, as surgical revascularization is evolving with rapidly growing evidence for arterial grafting, this study serves as an encouraging reminder that even the historically used SVG grafts can perform well with the use of modern, atraumatic harvesting techniques like the no touch technique.

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