

EDITORIAL COMMENT

Pre-Renal Transplant Risk Stratification

A Perpetual Quandary*

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The paper by Winther et al. (1) in this issue of *iJACC* addresses a quandary that physicians involved in the care of patients with end-stage renal disease (ESRD) have faced for years: what is the most appropriate way to risk stratify patients for coronary artery disease (CAD) before renal transplantation? A growing number of candidates for renal transplantation and the definite increased risk of fatal and nonfatal cardiovascular events in this population (2,3) make this a remarkably important question. There are numerous guidelines issued by professional associations that often do not agree with each other or do not give a clear indication of how to approach the issue of pre-transplant work-up. As a result, physicians in clinical practice frequently chose to manage their patients in a variety of ways, sometimes performing a direct coronary angiogram to exclude obstructive CAD despite the lack of guidelines support for this approach. As a physician involved in cardiovascular imaging, I have interpreted thousands of nuclear and echocardiographic stress tests over the years for patients undergoing pre-transplant evaluation often wondering whether these tests were truly adding anything of value to the quest for the high-risk patient.

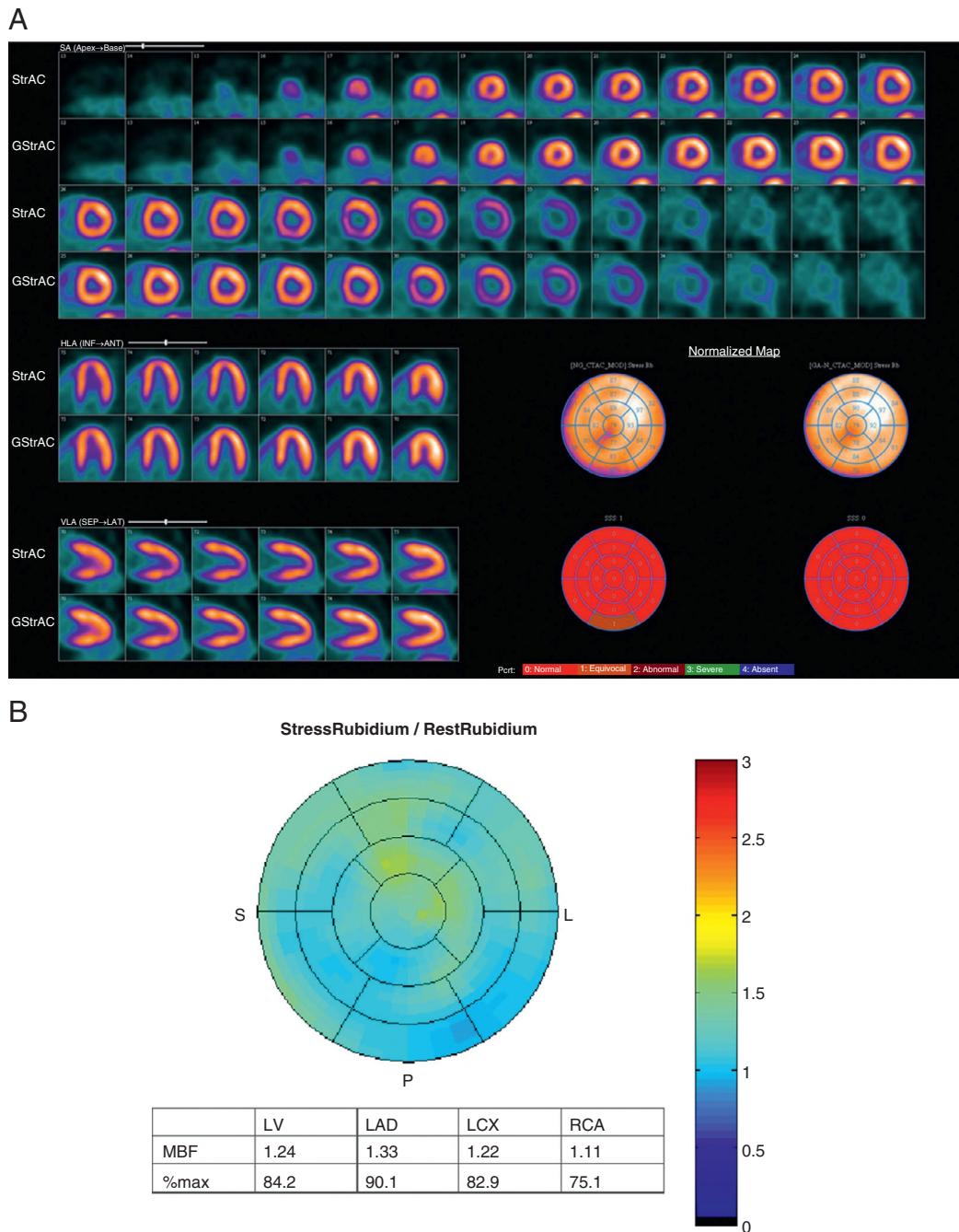
The appearance of noninvasive anatomic imaging modalities has brought new fire to the debate: do coronary artery calcium (CAC) scoring and coronary computed tomography angiography (CTA) give a more accurate estimate of risk compared with functional imaging? Or should every pre-kidney transplant patient undergo invasive coronary angiography

(ICA)? The article by Winther et al. (1) is very timely in addressing exactly this very poignant question. In a prospective outcome study of 154 patients with ESRD and no known CAD the investigators collected information on the number of risk factors each patient carried and performed several diagnostic imaging tests. All patients were required to complete 4 tests: CAC scoring, CTA, a myocardial perfusion scintigraphy (MPS) stress test with technetium-99 single-photon emission computed tomography (SPECT), and ICA; 138 of 154 patients underwent all studies, and the remaining had at least a few of them. At the end of a median follow-up of 3.7 years, Winther et al. (1) recorded 27 major adverse cardiac events (MACE) and 31 deaths. In unadjusted models, more than 3 risk factors, a CAC >400, and obstructive CAD in 2 to 3 vessels on CTA and ICA were predictive of both MACE and death or at least 1 type of event. Surprisingly, MPS did not predict either MACE or death, although a small subgroup of patients with at least moderate ischemia had an increased rate of MACE in unadjusted analyses. After adjustment for transplant during follow-up and the presence of more than 3 risk factors, CAC and abnormal CTA and ICA findings remained predictive of MACE but not death. Once again, MPS was not predictive of either type of event.

Therefore, it would appear that an anatomic noninvasive assessment of vascular disease is more relevant than myocardial perfusion abnormalities, but is it really that simple? The cohort was relatively small, 44% of the transplant candidates were undergoing hemodialysis, and 60% of the cohort was receiving beta-blockers and calcium antagonists. Winther et al. (1) do not clearly state whether the patients were instructed to stop taking beta-blockers and calcium antagonists before MPS, how many patients underwent vasodilator stress testing only, and how many patients undergoing hemodialysis had an arteriovenous fistula (AVF) or an arteriovenous shunt in place. Antianginal drugs mitigate the response to stress (4,5), and AVFs increase the cardiac

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FIGURE 1 Example of Hemodialysis Patient With Arteriovenous Fistula Nonresponsive to Vasodilator Stress

(A) Rubidium-82 positron emission tomography images show normal perfusion in all myocardial segments. **(B)** Flow map shows a poor response to vasodilator stress in all coronary artery territories with a relative increase in flow from baseline varying between 11% and 33%. This patient had an arterial venous fistula for hemodialysis and a coronary artery calcium score of 460; his antianginal medications were stopped the evening before testing, and he had not ingested any caffeinated beverages in the prior 12 h. L = lateral; LAD = left anterior descending coronary artery; LCX = left circumflex coronary artery; LV = left ventricular; MBF = myocardial blood flow; P = posterior; RCA = right coronary artery; S = septum.

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