ulation, particularly including children with severe pulmonary hypertension.

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Reply to the Editor:

We appreciate the kind comments of Dr Corno in his letter regarding our article.¹ We also appreciate his astute delineation of the categories of congenital conditions in which our technique could be applied clinically. We wish to emphasize, however, that ours is at this point an experimental technique, confined to short-term application in the experimental laboratory. We are not advocating clinical application at this time.

To address Dr Corno's specific comments, we need to distinguish between two different experimental procedures developed in our laboratory, which are easily confused because both rely on surgical separation of the right and left ventricles into independent units. In the experiments to which the letter is addressed, we transplanted an accessory donor right heart onto a complete recipient heart, the accessory right heart transplantation procedure. This is being investigated as an alternative treatment for congenital hypoplastic lesions of the right side of the heart in children. In an

earlier series of experiments,² we reported an experimental right heart-sparing procedure in which the right ventricle of a recipient is preserved and a complete donor heart is implanted. This latter procedure is intended, in principle, for human recipients with severe ambient pulmonary hypertension, a setting in which right heart failure, possibly lethal, is frequently encountered. Both these experimental operations rely on the physical separation of right and left sides of the heart, but they represent essentially converse procedures for completely disparate indications.

Dr Corno enumerates other operations that may have application to patient groups with right ventricular hypoplasia or clinical decompensation after conventional palliative surgery. We agree that the one-and-a-half ventricular repair about which he and others have published has merit. This approach allows a bidirectional Glenn shunt to perfuse the lungs with the superior vena caval flow, while the diminutive right ventricle continues to pump the inferior vena caval flow to the pulmonary artery. We hasten to point out that this repair uses the *native* one-and-a-half ventricles and should not be confused with our right ventricle-sparing *transplant* operation,² which has at times been called the "heart-and-a-half" operation.

We agree fully that the acute experiments presented in our article did not subject the accessory right heart to ambient pulmonary hypertension. In related experiments currently in press,³ our converse procedure of right ventricle-sparing transplantation did successfully cope with severe induced iatrogenic pulmonary hypertension.

We agree that heterotopic transplantation represents a viable solution in many situations in which pulmonary hypertension precludes traditional orthotopic cardiac transplantation. In short-term experiments, Corno and colleagues used the left ventricle of a full heterotopic transplant to perfuse the right-sided circulation. There are several advantages to transplanting an isolated right heart. The operation can be done without cardiopulmonary bypass. Space issues are minimized, because there is no left ventricle. Finally, the potential donor pool is quite large and different from the standard donor pool, because hearts with left ventricular dysfunction may be acceptable. In fact, such hearts might even

be preferable, because they have "preconditioned" the right ventricle against left ventricular failure.

Standard heterotopic transplantation, described in the early era of clinical cardiac transplantation, continues to be quite limited in application, largely because of problems of embolization and arrhythmias originating in the preserved native left ventricle and because of mass effects of the heterotopic heart in the pulmonary space. Our right heart-sparing transplant procedure was designed to avoid these problems.

We congratulate Dr Corno on the important work he has highlighted and thank him for his insightful commentary on our recent article.

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The radial artery: Neither gold, nor silver, but bronze?

To the Editor:

I greatly appreciated reading Dr Lytle's insightful comments in his editorial on the radial artery (RA) versus the right internal thoracic artery (RITA) as a second arterial conduit for coronary surgery.¹ All that he says is true: the RITA graft, when considering its historical older brother the left internal thoracic artery (LITA) graft, should have the same long-term potential but technically poses a bigger challenge. Hence surgeons opt for a more user-friendly arterial conduit, the RA. I would like to suggest a differ-

ent comparison/substitute: the RA for the vein graft. Dr Lytle's comment in his editorial, "in my judgment, the RA graft is less predictable than the RITA graft in regard to patency," intrigued me. Over the past 15 years as a practicing cardiothoracic surgeon, I have become profoundly aware of the inadequacy of veins, and since my recent attendance at the enlightening and energy-invoking symposium "Arterial Conduits for Myocardial Revascularization" in Rome by Dr G. F. Possatti and Dr A. M. Calafiore, I believe the thrust should be to continue to use double ITA grafts whenever possible (especially in the young) but to substitute the RA for the vein graft. Since my return from this symposium, I have tried to do this; perhaps I did not see (or did not want to see) before, but many patients have serious venous disease of their legs precluding use of the saphenous vein. I think one of the turning points for me was when I recently (July 24, 2003) had to reoperate on an 83-year-old woman, on whom I had placed 2 grafts at age 81. Her LITA had gone down, I believe because I placed the graft inadvertently above a stenosis and her vein graft to a marginal artery occluded. If her vein graft had stayed open, she probably would not have needed reoperation at age 83. I used a sequential RA graft to the left anterior descending coronary artery and the marginal branch on-pump, and postoperatively she woke up stating that this was easier than her first operation. (Obviously this time both grafts were working!)

A second reason to substitute the vein for the RA graft could be the anticipated longer-lasting results of the drug-eluting stents used by interventional cardiologists. I know we are all interested in the same end—stamping out coronary artery disease effects—but it can be a little disconcerting for many surgeons currently in practice to see their favored coronary artery bypass grafts (LITA plus 2 veins) going the way of the dodo bird. I want to be so bold as to predict that the drug-eluting stents will rival our saphenous vein grafts (that is, by the time they figure out which drug, from which drug family, how much eluting, over what period of time, and so on, works; it might take 20 years). Although we should never be competitive with our interventional

colleagues because we have the same end point in common, we must as surgeons find something ancillary to their work. I believe total arterial grafting (be it bilateral ITA, LITA/RA, RITA, bilateral ITA/gastroepiploic artery) may well be the answer. As Dr Lytle most wisely stated at the 2003 meeting of The American Association for Thoracic Surgery in Boston (and I quote him often in this): "Did you think you were going to be doing the same operation for 100 years!?" Dr Lytle continues to be a driving force leading all our quests for the best coronary artery bypass conduit.

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Angiotensin-converting enzyme inhibitors predispose to hypotension refractory to norepinephrine but responsive to methylene blue To the Editor:

We read with interest the brief communication of Grayling and Deakin¹ describing the methylene blue administration in a patient with refractory hypotension during cardiac surgery. We're currently using this drug for patients with high cardiac output and hypotension unresponsive to norepinephrine at doses similar to those suggested by Grayling and Deakin (up to 3 mg/kg in 2 different administration instead of 2 mg/kg in a single dose). We would like to suggest a possible predisposing factor of vasoplegia that responds to methylene blue: in our experience² and in the literature³⁻⁵ it is evident that most episodes of refractory hypotension are related to preoperative intake of angiotensin-converting enzyme inhibitors (ACEI); even the patient described in this report was assuming ACEI (ramipril). After experiencing a dramatic refractory hypotension in a patient on a program of ACEI,² we started using

methylene blue in case of refractory hypotension and withdrawing ACEI the day before surgery. We observed an immediate and sustained response even at doses less than 1 mg/kg.

We would like to reinforce this kind of therapeutic approach and suggest a common predisposing factor that has been so far underestimated: preoperative intake of ACEI.

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Modified Fontan procedure in adults To the Editor:

At the outset I must congratulate and thank the authors of this article for this landmark work on the Fontan procedure in an adult population.¹ This is going to be a benchmark for adult Fontan procedure in years to come.

In the Western hemisphere the Fontan surgery is done in children; adult patients undergoing this procedure are exceptions, not the rule. But in developing countries adult patients for univentricular palliation, with or without prior surgical palliation, are quite common.² As the authors have addressed, the primary issue for these pa-