tive right ventricle below the attachment of the valve or the right ventricle with the atrialized right ventricle? In most of the patients on whom my own group has operated, the right anterior wall was dilated and hypokinetic.⁴ I am interested to know whether this aspect was present in Chen and colleagues' series.¹

The postoperative decrease of right ventricular ejection fraction could be due to the section of abnormal muscular trabeculations. It is in my mind an additional reason to decrease the preload of the right ventricle with a partial Glenn procedure.

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Reply to the Editor:

My coauthors and I are in agreement with Dr Chauvaud's impression that the Ebstein anomaly is a combination of ventricular and valvular disease. In our study, the right ventricle, as analyzed by transthoracic echocardiography, was considered to be the effective right ventricle below the attachment of the valve. In several patients—most notably the adults—the right anterior wall was indeed hypokinetic. Care certainly must be taken not to assign hypokinetic areas of atrialized ventricle to the true right ventricle. We have not routinely used a Glenn cavopulmonary shunt in our Ebstein repair, but we recognize it as a viable strategy in those patients for whom reduc-

tion in right-sided volume loading may be beneficial.

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Pleural effusion and off-pump Fontan procedure

To the Editor:

We read with great interest the study by Gupta and colleagues¹ "Risk Factors for Persistent Pleural Effusions After the Extracardiac Fontan Procedure," published in the June 2004 issue. Prolonged and excessive pleural drainage after the Fontan procedure is still the subject of debate. In their series of 100 patients, Gupta and colleagues¹ reported prolonged duration of pleural drainage in 37% and increased volume of pleural drainage in 30% after the extracardiac Fontan operation.¹ Lower preoperative oxygen saturation, presence of postoperative infection, smaller graft size, and longer cardiopulmonary bypass time were significantly associated with prolonged and increased pleural drainage.

We have used an off-pump technique for the bidirectional Glenn shunt and the extracardiac Fontan operation in patients without intracardiac anomalies.^{2,3} Prolonged pleural effusion was seen in 2 of 30 patients undergoing the bidirectional Glenn shunt (6.6%). Among 10 patients undergoing the off-pump extracardiac Fontan operation, only 1 (10%) had pleural drainage for longer than 2 weeks.

Lower preoperative oxygen saturation and increased preoperative pulmonary arterial pressure may be consequences of increased pulmonary vascular resistance. We surmise that cardiopulmonary bypass causes prolonged and excessive pleural effusion with increase of pulmonary vascular resistance and pulmonary arterial pressure. In patients with cyanosis, the blood flow of the major aortopulmonary collateral arteries may increase during cardiopulmonary bypass, which causes prolonged pleural effusion in some patients.

In conclusion, cardiopulmonary bypass is significantly associated with increased volume of pleural drainage after both the Glenn shunt and the extracardiac Fontan procedure. We believe that pleural drain-

age will decrease with the use of an off-pump technique.

[Response declined]

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The difference is meaningful: Anatomic coronary-coronary bypass or physiologic coronary-coronary bypass?

To the Editor:

It was with great interest that I read the communication of Nežić and colleagues.¹ The authors have renewed interest in coronary-coronary bypass (CCB) grafting by highlighting its complementary technical issues, especially in the setting of multiple left anterior descending artery (LAD) stenosis, which might require a synchronous multisided revascularization. The authors have advanced the presumed physiologic advantages related to CCB, aiming thereby to promote their current surgical alternative. However, the current case points out the vigilance that should be paid in distinguishing anatomic CCB from physiologic CCB.

The physiologic advantage of CCB has been highlighted by Biglioli and associates.² However, these authors have imputed this physiologic advantage directly to the diastolic coronary flow rather than to its systolic fraction. Biglioli and associates used the initial portion of the right coronary artery as a donor site for the saphenous graft proximal anastomosis providing the LAD. From a physiologic point of view, Biglioli and asso-

ciates' procedure results in a functional interdependency between the right and left coronary systems, whereas its concrete functional consequences are unknown.

Nottin and coworkers³ later introduced the use of an arterial conduit mainly in a right-right CCB fashion. Although Nottin and coworkers had never argued about the physiologic aspects of CCB (just in view of arterial conduit sparing), their approach seems to be more physiologic, avoiding the creation of functional imbrications between the right and left coronary systems. The common point of the two aforementioned techniques is nevertheless that the proximal anastomosis takes off from a purely coronary physiology, which is partly caused by the coronary prompting effect of the sinus of Valsalva.^{4,5}

On the contrary, the inflow of the CCB that is proposed by the authors takes off from the midportion of the LAD. Because the mid-LAD is subserved itself by the in situ left internal thoracic artery, the authors' CCB is governed by an aorta-coronary physiology rather than by the coronary physiology.

Consequently and in a physiologic point of view, the CCB proposed by the authors is just an indirect prolongation of in situ left internal thoracic artery aorta-coronary bypass, which I suggest to call an *anatomic CCB*. This latter procedure should not carry the expected flow advantages of an authentic physiologic CCB, such as the procedure of Nottin and coworkers.³

In conclusion, I would congratulate Dr Nežić's team for their innovation and especially their interest in CCB grafting and its physiologic features.

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Reply to the Editor:

I read with great interest the comments of Dr Aazami about the article my colleagues and I recently published in *The Journal of Thoracic and Cardiovascular Surgery*.¹

We absolutely agree that the physiologic benefit (ie, diastolic blood flow closer to physiologic norms) of coronary-coronary bypass (CCB) grafting can be achieved only when the origin and initial segment of the targeted coronary artery are free of atherosclerotic lesions. In such a case we can use this region as a site of proximal anastomosis in a CCB graft procedure, thus using the advantages of the coronary prompting effect of sinuses of Valsalva.^{2,3}

We were able to use these advantages in 2 patients with multivessel coronary artery disease, including single distal stenosis on a large left anterior descending artery (LAD) running well over the cardiac apex. These distal LAD lesions were bypassed with the CCB grafting technique by using a short segment of the left internal thoracic artery⁴ and a short segment of the radial artery, respectively.⁵

There are very few articles in the literature discussing the CCB graft technique. In our article,¹ Biglioli and colleagues² were cited to assure the readers that such an approach had been tested and that normal or natural (physiologic rather than anatomic) flow could be expected in the distal third of the bypassed LAD (supported, of course, in this case with mid-LAD flow from the in situ left internal thoracic artery). From our point of view, this CCB is rather an imitation of the normal LAD vascular bed (especially if anastomoses were created in a terminoterminal fashion) than prolongation of an in situ left internal thoracic artery graft.

In our opinion, neither the procedure of Biglioli and colleagues² nor that of Nottin and coworkers⁶ is able to imitate pure physiologic coronary flow. With the proximal anastomosis of CCB grafting (in both procedures) at the origin of the right coronary artery (RCA; Figure 1 in Nottin and

coworkers⁶), there is at least an artificially created new double orifice, causing blood flow turbulence and thus affecting the physiology of natural blood flow and distribution.

I would go even beyond the guidelines, suggesting that CCB grafting is a possible solution for low-grade stenosis (50%-60%) of the RCA, of course in the presence of significant multivessel coronary artery disease. It is very widely known that such an RCA stenosis represents a real challenge for the cardiac surgeon. All the grafts (arterial and venous) that have been used have had the worst patency rate in such conditions.^{7,8} Perhaps CCB grafting (with the RCA region free of lesions below the orifice as a site of proximal anastomosis, even in a terminoterminal fashion) would be a good choice.

Finally, we have just refreshed the idea of Dr Barbosa and Dr Rusticali (they were cited in our article), and therefore they deserved Dr Aazami's congratulations for the innovation.

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