of cavoatrial tumors with hypothermic circulatory arrest. We previously reported on a similar series of 12 patients operated on between 1990 and 1995,² and we take this opportunity to outline several aspects not described in the previously published review.

Two of our patients died (multiorgan failure). Both showed a preoperative ejection fraction less than 30% and no cardiac condition amenable to surgical correction. Left ventricular dysfunction may therefore represent a relative contraindication for operation (at least, for prolonged circulatory support and deep hypothermic techniques). We had a substantially higher rate of postoperative complications. A serum creatinine level rise of more than 2 mg/dL was observed in 5 of 12 cases, although this condition was present before the operation in 3 of the 5, and dialysis was never required. Transient jaundice occurred in 9 of 12 patients. It can be speculated that tumor thrombus may impair hepatic venous drainage, and thus hepatic "functional reserve," despite normal results of preoperative liver function tests.

From a technical standpoint, we agree that hypothermic circulatory arrest is the optimal approach. We performed an atriotomy before cavotomy in all cases to gain open distal access and reduce embolic risks. This preceded en bloc tumor resection through the inferior vena cava (IVC). If the thrombus is unusually adherent to the IVC, infiltration should be suspected and a more aggressive resection considered; in our experience, 1 such patient died of local tumor recurrence. In addition, if circulatory support is not used, specific maneuvers may be hazardous; clamping of the porta hepatis can produce acute spleen rupture in patients without chronic portal hypertension.³ Chiappini and associates¹ used the chevron incision, whereas we preferred a median sternolaparotomy in all cases. The former is optimal to expose right-sided lesions, which are much more common because of the IVC location and shorter length of the renal vein. However, we encountered left-sided tumors with IVC extension in 25% of our patients.

Finally, all late deaths in our series were related to metastatic cancer. Chiappini and associates¹ reported that 4 of 13 patients had distant metastases identified before the operation. Although obstructive symptoms

may be successfully palliated, we believe that an operation is contraindicated in such cases. This does not apply to patients who require associated pulmonary tumor embolectomy.

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Reply to the Editor:

My colleagues and I thank Pocar and Donatelli for their appreciation of our article. None of our patients showed a low preoperative ejection fraction like that seen in 2 patients in their study, and we agree that left ventricular dysfunction may represent a relative contraindication for operation with prolonged circulatory support and deep hypothermic techniques. Early postoperative outcomes in our study population confirm that cardiopulmonary bypass with deep hypothermic circulatory arrest carries reduced risks of warm renal and hepatic ischemia.

As do Pocar and Donatelli, we prefer to perform atriotomy before cavotomy to gain open distal access and reduce embolic risks. In our experience the chevron incision is the best surgical approach, providing the safest and widest exposure for removing these tumors and tumor thrombus.

We agree with Pocar and Donatelli regarding the contraindication of surgery for patients with diffuse metastatic cancer because of the high risk/benefit ratio.

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Partial left ventriculectomy in patients with neoplasms and severe heart failure who are not candidates for cardiac transplantation To the Editor:

I read the article of Casarotto and colleagues¹ with great interest. The article described a patient with Castleman disease who was treated with chemotherapy, leading to a dilated cardiomyopathy. Because of the neoplasm, cardiac transplantation was contraindicated. Because of a progressive severe heart failure, the patient had to be supported with a Novacor (World Heart Corporation, Ottawa, Ontario, Canada) left ventricular assist device (LVAD). After a total of 1512 days, the patient had no signs of a relapse of Castleman disease and underwent orthotopic heart transplantation.

The number of patients with severe heart failure after chemotherapy for neoplasms should not be underestimated: from 1990 to 1996, cardiac transplantation was performed in 89 selected patients in the United States for this indication.² The number of patients in whom cardiac transplantation cannot be performed because there is no proof of cure of the neoplasm is probably much higher. Therefore these patients are not so rare as might be supposed, and alternative treatment concepts are necessary.

Recently, I introduced a canine model for research on partial left ventriculectomy (PLV).^{3,4} Heart failure was induced by intracoronary doxorubicin administration, leading to a dilated cardiomyopathy with histologic myocardial changes similar to those described by Casarotto and colleagues.¹ PLV was performed by resecting the interpapillary segment of the left ventricle (group 2). Measurement of hemodynamic and echocardiographic parameters demonstrated an improvement of left ventricular function relative to a control group without PLV (group 1; Table 1).

PLV thus may also work in chemotherapy-induced heart failure, and I propose it as an alternative treatment option. PLV has some advantages relative to LVAD implan-

TABLE 1. Hemodynamic and echocardiographic parameters before and after doxorubicin chemotherapy with (group 2) or without (group 1) PLV

	Before	After	6 wk later
LVEDV (mL)			
Group 1	55.7 ± 12.2	65.5 ± 5.7	67.3 ± 5.6
Group 2	54.6 ± 5.0	66.4 ± 4.6	60.2 ± 4.5
LVESV (mL)			
Group 1	22.0 ± 6.7	40.6 ± 8.2	46.6 ± 5.3*
Group 2	23.0 ± 2.7	41.5 ± 6.9	34.3 ± 4.9*
Cardiac output (L/min)			
Group 1	4.0 ± 0.3	3.3 ± 0.1	3.0 ± 0.2*
Group 2	3.9 ± 0.3	3.1 ± 0.2	3.3 ± 0.1*
Ejection fraction (%)			
Group 1	61.1 ± 5.1	37.7 ± 5.7	30.5 ± 5.8
Group 2	57.7 ± 9.0	37.2 ± 12.2	42.6 ± 10.5
Oxygen delivery (mL/min)			
Group 1	1130 ± 170	790 ± 65	728 ± 111
Group 2	1153 ± 155	765 ± 53	820 ± 95
Oxygen extraction			
Group 1	0.12 ± 0.01	0.24 ± 0.01	0.32 ± 0.01*
Group 2	0.13 ± 0.01	0.26 ± 0.01	0.26 ± 0.01*

LVEDV, Left ventricular end-diastolic volume; LVESV, left ventricular end-systolic volume.

* $P < .05$.

tation. Well-known drive line or device pocket infections, as well as mechanical failures (also described by Casarotto and colleagues¹), are not possible with PLV. Anticoagulation treatment is avoided, reducing the risk of bleeding complications. Thromboembolic events caused by clot formation within the LVAD are also avoided. Furthermore, PLV is much less invasive than LVAD implantation, and quality of life is enhanced by avoiding a transcutaneous drive line and dependence on a mechanical device. Regarding the economic aspect, costs for PLV are much lower than for LVAD implantation, and PLV can be performed in many more hospitals than can LVAD implantation, which is restricted to specialized centers.

I congratulate Casarotto and colleagues¹ on their successful management of this difficult case. However, I encourage cardiac surgeons to take alternative treatment options such as PLV into consideration in such challenging cases.

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Aortic insufficiency in patients with Marfan syndrome: A surgical dilemma

To the Editor:

The excellent article by de Oliveira and colleagues¹ and the related editorial by Miller² are vital reading for all those involved in the management of patients with Marfan syndrome (MFS). In their article, de Oliveira and colleagues¹ reported the results of surgery for aortic root aneurysm in patients with MFS. Sixty-one of these

patients underwent aortic valve-sparing operations, with reimplantation of the aortic valve in 39 patients and remodeling of the aortic root in 22. Patient age ranged between 12 and 59 years. Freedom from reoperation at 10 years was 100%, but only 2 patients had a full 10-year follow-up. Twenty-one percent of patients required re-exploration for bleeding (only 3% in the re-implantation group). Perhaps the most significant finding was that 25% of patients had more than 2+ aortic insufficiency during the follow-up period. Thus if aortic insufficiency continues to progress through a longer follow-up period, reoperation will be necessary in a significant number of patients.

Histologic evaluation of the leaflets of the aortic valve has demonstrated four different layers. The subendocardial ventricular layer is composed of elastic fibers oriented in various directions.³ The noncoaptational parts of the aortic leaflets are composed of an elastic grid reinforced with collagen fibers and bundles. The remaining layers have irregular amounts of arbitrarily oriented elastic fibers and collagen fibers.³ MFS is caused in part by mutations within the gene for fibrillin 1, which is the main protein of the microfibril network. Microfibrils play a crucial role in the tropicity and function of elastic tissue.⁴ In MFS, these mutations lead to the formation of thoracic aortic aneurysms⁵ and appear to be related to proteolytic degradation.⁶ If the progression of aortic insufficiency in de Oliveira and colleagues' series¹ is due to causes inherent in the surgical technique, this problem could probably be prevented by modifications in the surgical technique. David has already modified this technique several times,² and all these modifications are included in the cases in this study. If aortic insufficiency is due to a structural deficiency of the native aortic leaflets, however, then all patients are at a potentially high risk for reoperation.

Kon and associates⁷ have recently reported the results of root replacement with the Freestyle bioprosthesis (Medtronic, Inc, Minneapolis, Minn) in 104 consecutive patients with multiple etiologies of aortic valve disease who took part in the worldwide study for submission to the Food and Drug Administration for premarket approval of this valve. Patient age ranged from 48 to 87 years. Freedom from reoperation was 100% at 8 years, with no structural valve deterioration. More signifi-