able learning curve, resulting in an undersizing or oversizing or the incomplete piercing of the saphenous vein, followed by rolling up of the intima and resulting thereby in graft stenosis or occlusion, mechanical alteration of the intima itself, or bioincompatibility of the device. The significance of the ACS in the genesis of proximal graft stenosis, thrombosis, or both has to be elucidated by means of further investigations.

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The last to die is hope: Prolonged mechanical circulatory support with a Novacor left ventricular assist device as a bridge to transplantation

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Bottio, Casarotto, Gerosa, Gambino, and Testolin (left to right)

In September 1996 a 31-year-old man was admitted to Padua Hospital, Padua, Italy, in cardiogenic shock that was not responsive to medical treatment and intra-aortic balloon pump insertion. The patient had Castleman disease, and in 1989 he was treated with cycles of cyclophosphamide, vincristine, mitoxantrone hydrochloride (INN: mitoxantrone), and interferon. In June 1996 at another hospital, he had postchemotherapy dilated cardiomyopathy diagnosed, with akinesia of septum and anterior left ventricle wall (end-diastolic volume 230 mL, end-systolic volume 180 mL, ejection fraction 20%, and left ventricular end-diastolic diameter 67 mm). Because of severe left ventricular failure, we started therapy with a BioMedicus left ventricular assist device (Medtronic BioMedicus, Inc, Minneapolis, Minn) and an intra-aortic balloon pump. In October 1996 we converted the centrifugal pump support to a Novacor left ventricular assist system (World Heart Novacor LVAS N100 PCq; World Heart Corporation, Ottawa, Ontario, Canada) because of the impossibility of weaning the patient from the BioMedicus pump and the risks

associated with heart transplantation related to potential relapse of neoplastic disease (chest computed tomographic scan with mediastinal lymph nodes > 2 cm).

The Novacor left ventricular assist system, a device used for patients with cardiogenic shock, is considered an interim system to be used before transplantation or to achieve left ventricular recovery for patients who are not candidates for transplantation.¹ In the long term the main disadvantages of this device are driveline infections, thromboembolism, and system failures affecting the pump and valves.²

During the patient's recovery period, he had several episodes of pocket driveline infections and one episode of cerebral embolism, all with complete recovery (no abnormal findings on cerebral computed tomographic scan at follow-up). After the patient had been supported by the Novacor device for 24 months, we attempted to wean him from the system but were unable to do so. In June 2000, the patient showed moderate dyspnea with symptoms of congestive heart failure that necessitated angiotensin-converting enzyme inhibitors and diuretics. A 2-dimensional Doppler echocardiographic evaluation showed moderate incompetence of the Novacor inflow valve. After 50 months of successful mechanical circulatory support (December 5, 2000), there were no signs indicating a relapse of Castleman disease, and we were able to perform orthotopic heart transplantation.

As a result of chemotherapy for Castleman disease, this patient had marked variations in myocardial cells, as seen in the endomyocardial biopsy specimen, with great areas of interstitial fibrosis that caused left ventricular dysfunction. Because of the possibility of myocardial function recovery and the high rate of neoplastic lesions seen in other transplant recipients after immunosuppressive therapy,³ rather than perform an orthotopic heart transplant we supported the patient with a mechanical Novacor device. With the

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Figure 1. Patient shown at 32 years old at work with the Novacor left ventricular assist device slung over his right shoulder (*left*) and at 37 years old after orthotopic heart transplantation (*right*).

initial acute phase overcome but without satisfactory midterm heart function recovery, the Novacor device allowed us to support the patient for a total of 1512 days. During this phase the patient had an acceptable quality of life and was out of the hospital for a total of 1280 days (Figure 1). To date this patient's experience with the mechanical circulatory support system has been the longest reported worldwide. After a 4-year period without any recurrence of neoplastic lesions, we were able to perform a successful heart transplant procedure.

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