

Case Report

The Role of Biventricular Assistance in Primary Graft Failure After Heart Transplantation

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Key words: Heart transplantation, heart failure, organ graft, heart-assist devices.

A 37-year-old man suffered from systolic heart failure as a result of idiopathic dilated cardiomyopathy since 1995 and was followed up in our cardiology department. In June 2006, the patient arrived at our outpatient clinic with an acute renal impairment and all manifestations of acute heart failure. He was already registered on the waiting list for heart transplantation (Eurotransplant) as a highly urgent request. The patient underwent heart transplantation but the reperfused allograft was totally akinetic and we decided to place a biventricular assist device immediately. The patient fully recovered after seven days of biventricular circulatory support and was discharged on the 38th day after the transplantation. Three years later, he is in good general condition without any manifestation of rejection. We conclude that biventricular assist device implantation is a good indication after post-cardiotomy failure and it should be started as early as possible before shock and possible irreversible organ damage.

Manuscript received:
May 25, 2010;
Accepted:
July 20, 2011.

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Primarily graft failure (post-cardiotomy failure) is an uncommon but fatal problem in cardiac transplantation. When this problem appears and does not resolve with the use of inotropic support, a ventricular assistance device must be used in order to support the patient until a retransplantation can be done or the graft recovers.¹ In a multi-centre report of 911 heart transplants, 22 perioperative deaths were attributable to early allograft failure; 15 of these 22 deaths (68%) were due to primary heart failure.² We report a case of the successful use of biventricular assistance for seven days, allowing recovery from post-cardiotomy failure immediately after heart transplantation. This case illustrates the potential recovery from extreme allograft dysfunction.

Case presentation

A 37-year-old man, who was suffering from systolic heart failure secondary to

idiopathic dilated cardiomyopathy which was diagnosed in 1995, was followed in our institution from April 2006. He had never been listed before because of his morbid obesity, even with normal renal function at that time (urea 71 mg/dl and creatinine 1.1 mg/dl). In June 2006, the patient arrived at our outpatient clinic with all the manifestations of heart failure under control of heart failure medications, with a body mass index (BMI) of 46; therefore, we first proposed medical treatment and diet to decrease and improve his body weight. Eight months later, the patient was admitted to our coronary care unit with acute renal impairment (urea 110 mg/dl, creatinine 1.7 mg/dl) because of low cardiac output and cardiac decompensation, despite his decreased body weight (BMI 29). Transthoracic echocardiography showed severe biventricular systolic dysfunction; his left ventricular ejection fraction was 20%, with global hypo-

kinesia and pulmonary hypertension (55 mmHg). Right heart catheterisation showed a cardiac index of 1.9 L/min/m², pulmonary vascular resistance at 2.5 Wood units, capillary wedge pressure at 31 mmHg and transpulmonary gradient 13 mmHg. We started intravenous dobutamine 10 µg/kg/min, intravenous enoximone 5 µg/kg/min, with furosemide up to 250 mg/day. His renal function improved progressively, although we could not wean him from inotropic support. Despite this treatment, we observed a low arterial pressure (90/40), liver dysfunction (bilirubin, 5.9 mg/dl), congestive hepatomegaly, and generalised anasarca. With all these formal circumstances, the patient was registered on the waiting list for heart transplantation (Eurotransplant) as a highly urgent request. The heart transplantation was performed uneventfully, from a very well functioning donor's heart, using a standard technique, with 178 min of total graft ischaemic time. The removal of the donor heart was carried out in a conventional way, without any technical problems. Nevertheless, the reperfused allograft was totally akinetic; the patient could not be weaned from bypass despite inotropic support (dopamine 10 µg/kg/min), epinephrine (0.2 µg/kg/min) and norepinephrine (0.2 µg/kg/min). We therefore decided to place a biventricular assist device, BVS 5000 both right and left (Abiomed, Danvers MA, USA; Figure 1). The post-operative course in the ICU was good, with excellent haemodynamic and renal function (creatinine 1 mg/dl). A conventional protocol of immunosuppression was started. Successive follow-up echocardiography studies showed progressive improvement of biventricular contractility until the 7th postoperative day, when the biventricular assist device was removed in the operating room. No major complications appeared in the ICU. The patient was transferred to the intermediate care unit, and was discharged on the 38th day after the transplantation with full physical recovery.

Three years later, the patient is in a good physical condition, without any manifestations of cardiac transplantation rejection.

Discussion

Primary cardiac allograft dysfunction is an uncommon but lethal problem. According to a multi-centre report by Bourge et al, post-cardiotomy failure causes 68% of deaths perioperatively.¹ A number of devices have been developed to diminish the mortality rate due to primary allograft dysfunction, including the

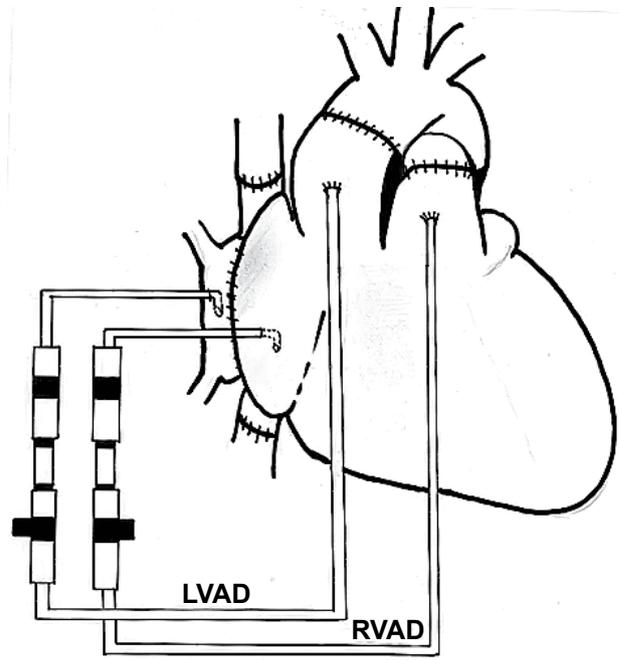


Figure 1. Left (LVAD) and right (RVAD) ventricular assist devices. Schematic of the implantation of the cannulas with the pump.

intra-aortic balloon pump, mono- or bi-ventricular assist device, or artificial heart. However, the results are worse than if these are used as a bridge to transplantation. The reasons for post-cardiotomy failure are multiple: the age of the donor, inotropic drugs for the donor, cross-match difference between donor and recipient, prolonged total graft ischaemic time, high pulmonary resistance, and finally the clinical status of the recipient.

The explanation for allograft failure in our case remains unknown, but it might have been due to malpreservation, as the functional state of this heart was very good (ejection fraction 65%) before its explantation. The choice of device (mono- or biventricular) is always difficult and depends on the patient's status. In cases like this one, with a "stone heart", Jagers et al showed better results in terms of survival rates with biventricular devices than with monoventricular ones.² The sooner the device is implanted, the better the potential recovery – especially when it is placed before the occurrence of multiple organ failure. In our case, we noticed that it was a good decision to place the biventricular assist device directly after failure of weaning from cardiopulmonary bypass. Its removal must be performed as soon as the clinical status permits, in order to avoid, as far as possible, complications related to the device: thromboembolic

events, bleeding, multi-organ failure, sepsis and neurological problems.³⁻⁸ In our case, no major complication was observed and the device was removed one week after the implantation. We conclude that biventricular assist device implantation is a good therapeutic option after post-cardiotomy failure, and it should be started as early as possible, before shock and possible irreversible organ damage.

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