Case Reports

Bridge to Transplantation with the TandemHeart

Bending the Indications in a Chronic Aortic Dissection Patient with Postcardiotomy Shock

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Herein, we report a successful bridge to heart transplantation by use of the TandemHeart® percutaneous ventricular assist device (pVAD) in a chronic aortic dissection patient who was experiencing postcardiotomy shock. The patient had undergone an aortocoronary bypass to treat an acute, extensive myocardial infarction that had resulted from severe stenosis of a Cabrol-like graft to the left main coronary artery. The TandemHeart was used successfully, despite classic contraindications for pVAD support. The outcome shows that, in critically ill cardiogenic shock patients, a permissive approach to pVAD use is valuable in screening candidates for long-term ventricular assist device support or for heart transplantation. This case also reveals the validity of direct bridging to transplantation from a pVAD in carefully selected patients. ***(Tex Heart Inst J 2008;35(3):340-1)***

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The TandemHeart® (CardiacAssist, Inc.; Pittsburgh, Pa) percutaneous ventricular assist device (pVAD) is a percutaneously inserted device that is used for short-term left ventricular support. It includes an external, centrifugal, continuous-flow pump and 2 cannulae.[1] The inflow cannula is inserted transseptally from the femoral vein into the left atrium, and the outflow cannula returns blood to the iliac artery via the femoral artery. The pVAD has been used to treat several different conditions,[2] including postcardiotomy shock.[3] Herein, we report a case that reveals this device's versatility and the flexibility that it confers to clinicians who are seeking the best long-term treatment option for the patient.

Case Report

In April 2007, a 42-year-old man with chest pain was admitted to the emergency department. His medical history included a type-A acute aortic dissection 1 year previously. The dissection had been treated surgically by replacement of the ascending aorta and resuspension of the aortic valve. After this initial corrective surgery, the patient developed progressive dilation of the aortic root and severe aortic regurgitation. Six months before the current admission, the regurgitation worsened, and the patient had undergone a modified Cabrol procedure with a SJM® Masters Series Aortic Valved Graft with Gelweave Valsalva™ Technology (St. Jude Medical, Inc.; St. Paul, Minn). The right coronary artery was reimplanted directly to the aortic graft, but the left main coronary artery was not long enough to reach the aortic graft, and a short segment of an inverted saphenous vein graft had to be interposed.

When the patient arrived at our emergency department, his cardiac enzymes were positive for myocardial infarction, and an electrocardiogram showed T-wave inversions in the anterior and lateral leads. His coronary angiogram showed a 90% occlusion of the interpositional saphenous graft to the left main coronary artery. He underwent an emergency double coronary artery bypass, with a venous graft to the left anterior descending artery and another to the 1st obtuse marginal artery. Despite support with an intra-aortic balloon pump and multiple vasopressors, the patient went into postcardiotomy shock and developed progressive cardiac, pulmonary, renal, and hepatic failure. Because of his rapidly deteriorating clinical condition, we decided to implant a TandemHeart pVAD.

No complication occurred during the procedure. After the patient was supported by the pVAD (cardiac output, 2.5–3.5 L/min), his vasoactive support was reduced to low doses of milrinone, and his liver function test results and creatinine level be-

came normal over the next 5 days. Despite these improvements, the patient remained dependent on the pVAD. His heart's contribution to the cardiac output remained marginal (left ventricular ejection fraction, <0.20). Accordingly, he underwent an emergency cardiac transplantation evaluation and was accepted as a transplantation candidate. After 12 days of pVAD support, a heart became available and was transplanted without operative complications. The donor's aorta was anastomosed to our patient's aortic graft. The patient was extubated on postoperative day 5, left the intensive care unit on day 18, and was discharged from the hospital on day 26. A year later, he was doing well.

Discussion

Myocardial infarction can result from a critical stenosis or occlusion of a Cabrol graft.[4,5] In spite of rapid surgical reperfusion, our patient's condition worsened to a stage where mechanical circulatory support was required.

Use of the TandemHeart in this patient required us to overcome 2 classic contraindications. First, pVAD insertion and subsequent circulatory support carry the risk of worsening the dissection of the iliac vessels and aorta by perfusing the false lumen. Second, a prosthetic aortic valve greatly increases the risk of aortic valve thrombosis associated with the dramatic decrease in transvalvular flow that occurs when the failing left ventricle is unloaded with a pVAD. In these circumstances, the TandemHeart pVAD was nevertheless better than the other available options, because of the risks associated with left VAD insertion, and because the Impella® pVAD (ABIOMED Europe GmbH; Aachen, Germany) cannot be used if the patient has a prosthetic aortic valve.

Given limited donor availability, it is important to make the best use of available organs. In the case of heart transplantation candidates who are supported by VADs, transplantation should be performed when it is most likely to benefit the patient. The ideal duration of mechanical support before transplantation is debatable, but enough time should be given for multiple organ failure to resolve and for the patient's condition to improve.[6] Admittedly, it will not often happen that a patient will meet these requirements and that a heart will become available during the short period of support that a pVAD can provide. Nevertheless, when these conditions are met, it appears that bridging directly to transplantation from a pVAD is a valuable option in carefully selected patients.

Because the TandemHeart is inserted percutaneously, patients do not have to recover from a highly invasive VAD implantation procedure while they are experiencing multiple organ failure. The percutaneous approach also decreases the risk of allosensitization that is typically associated with multiple transfusions after surgical implantation of a VAD as a bridge to transplantation. Because the pVAD is a short-term assist device, the patient needs to be given a high priority for a donor heart. If no heart becomes available during the period of pVAD support, the more conventional bridge-to-bridge approach (pVAD to surgical VAD) is still an option, because a patient who is not a surgical candidate at the time of pVAD insertion can become one after stabilization with pVAD support.

We are uncertain whether it is possible to reproduce this successful use of the TandemHeart pVAD as a last resort in a patient who has experienced chronic aortic dissection. Regardless, this report illuminates a broader and more important point: a permissive approach to pVAD use in patients who are in profound cardiogenic shock is a promising way to identify candidates for long-term mechanical support. Furthermore, in carefully selected candidates who are on pVAD support, direct bridging to transplantation should be considered if a heart becomes available.

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