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Case Reports

Successful Reuse of a Donor Heart

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Abstract

At a time when transplantable organs are in a shortage, few cases have noted the reuse of donor hearts in a second recipient in an effort to expand the donor network. Here, we present a case in which an O Rh-positive donor heart was first transplanted into a B Rh-positive recipient and later successfully retransplanted into a second O Rh-positive recipient 10 days after the initial transplant at the same medical center. On postoperative day 1, the first recipient, a 21-year-old man with nonischemic cardiomyopathy, sustained a devastating cerebrovascular accident with progression to brain death. With preserved left ventricle and mildly depressed right ventricle function, the heart was allocated to the second recipient, a 63-year-old male patient with familial restrictive cardiomyopathy. The bicaval technique was used, and the total ischemic time was 100 minutes. His postoperative course was uncomplicated with no evidence of rejection on 3 endomyocardial biopsies. Follow-up transthoracic echocardiogram revealed a left ventricular ejection fraction of 60% to 70%. Seven months posttransplant, the second recipient was doing well with appropriate left and right ventricular function. With careful organ selection, short ischemic time, and proper postoperative care, retransplant of donor hearts may be an option for select patients in need of heart transplant.

Keywords: Heart transplantation; organ donation; heart failure; allografts; donors; graft survival

Introduction

With an average 1-year posttransplant survival rate of approximately 90%, heart transplant continues to be an optimal treatment for select patients with end-stage heart failure.[1] Despite this relatively high survival rate, complications such as cerebrovascular accidents, cardiac allograft vasculopathy, rejection, postoperative infection, and primary graft dysfunction (PGD) can occur.[2] In an era in which transplantable organs are in a shortage, potential recipients with high waiting list mortality may benefit from the practice of reusing previously transplanted grafts.

Although donor hearts have been in high demand for patients with high waiting list mortality, few cases have examined the retransplantation of previously transplanted hearts to increase the donor pool. In addition, there is reasonable concern regarding this practice as organs are subjected to a second instance of arrest and cold ischemic time, which may lead to PGD.[3] A previous case report in 2010 described the successful retransplant of a previously transplanted heart after the first recipient sustained an intracranial hemorrhage with progression to brain death.[4] Given a preserved ejection fraction, a decision was made to retransplant the heart into a new recipient 15 days after the original transplant.[4] Both recipients and the original donor were blood type O.[4]

Here, we present a case in which an O Rh-positive donor heart was first transplanted into a B Rh-positive recipient and later successfully retransplanted into a second O Rh-positive recipient at the same medical center 10 days after the initial transplant.

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Case Report

The first recipient was a 21-year-old male patient with newly diagnosed nonischemic cardiomyopathy. He experienced an embolic stroke resulting from left ventricle (LV) thrombus with mild residual neurological deficits around the time of the diagnosis. He underwent orthotopic heart transplant (OHT) evaluation but was recommended to wait until at least 3 months after his stroke for elective transplant. He continued receiving dobutamine infusion at 4 μg/kg of body weight/min at home. However, he was emergently admitted to the hospital with acute decompensated heart failure with cardiogenic shock not responsive to inotropic support. Transthoracic echocardiogram (TTE) showed a left ventricular ejection fraction (LVEF) of 10% with significant akinesis of the LV, severely dilated right ventricle (RV), and severely depressed function. Right heart catheterization revealed a cardiac index of 1.1, pulmonary artery pressure of 38/31 mm Hg (mean, 34 mm Hg), pulmonary capillary wedge pressure (PCWP) of 30 mm Hg, and right atrial pressure of 24/18 mm Hg (mean, 20 mm Hg). He underwent urgent venoarterial extracorporeal membrane oxygenation insertion with aortic cannulation because of the small size of the femoral and axillary arteries. This procedure was complicated by mediastinal bleeding, which required repeated chest washout and transfusion of large amounts of blood products. Expedited transplant evaluation was performed, and he was listed as United Network for Organ Sharing status 1. His blood type was B Rh-positive, and he had no class I or class II panel reactive antibodies. He received intravenous immunoglobulin preoperatively given significant transfusions. He was listed for 2 days before receiving a suitable heart. The donor was a 30-year-old male with O Rh-positive blood type. Cause of death was anoxia secondary to methamphetamine and cannabinoid overdose. There was a total downtime of 35 minutes before the administration of cardiopulmonary resuscitation.

The patient underwent an uneventful OHT with the bicaval technique at our institution with an ischemic time of 188 minutes. Unfortunately, on postoperative day (POD) 1, he had a devastating brain infarction with signs of herniation and midline shift on imaging. Despite the poor prognosis, his immunosuppression regimen was continued. He received induction therapy with anti-thymocyte globulin along with a 3-drug regimen of tacrolimus, mycophenolate mofetil, and corticosteroids. His neurologic status continued to decline, and he was subsequently declared brain dead on POD 6. His transplanted heart demonstrated continued normal LV systolic function, mildly depressed RV systolic function, and mild tricuspid regurgitation. He did not require any inotropic support.

Abbreviations and Acronyms

LV	left ventricle
LVEF	left ventricular ejection fraction
OHT	orthotopic heart transplant
PGD	primary graft dysfunction
POD	postoperative day
RV	right ventricle
TTE	transthoracic echocardiogram

This heart was subsequently allocated to the second recipient: a 63-year-old man with a history of familial restrictive cardiomyopathy secondary to transthyretin amyloidosis, previous myocardial infarction, implantable cardioverter-defibrillator placement, and chronic kidney disease with a baseline creatinine level of 1 mg/dL.[4] He was listed as status 4 for OHT and had been on the waiting list for 366 days before undergoing elective transplant. Preoperatively, his TTE showed LVEF of 55% with severe LV hypertrophy and severe tricuspid regurgitation. Right heart catheterization demonstrated pulmonary artery pressure of 36/14 mm Hg with a mean of 24 mm Hg, pulmonary capillary wedge pressure of 25 mm Hg, and a cardiac index of 2.0. His blood type was O Rh-positive with negative panel reactive antibodies. His OHT took place 10 days after the donor organ was initially transplanted in the first recipient. The standard bicaval technique was used, and care was taken to remove all donor tissues from the first recipient. The ischemic time was 100 minutes. His postoperative course was mostly uncomplicated, except for aspiration pneumonia resulting in respiratory failure requiring reintubation on POD 3. He received induction immunosuppressive therapy with anti-thymocyte globulin because of his chronic kidney disease with standard steroid premedication, and he received a 3-drug regimen similar to that of the first recipient. There was no evidence of postoperative hemolysis. The patient was eventually discharged home on POD 17. Follow-up TTE demonstrated excellent LV and RV function, with an LVEF of 60% to 70%. Right heart catheterization also revealed normal cardiac index and right-sided filling pressures. There was no evidence of rejection on any posttransplant endomyocardial biopsies. The patient was alive and doing well at 7 months posttransplant.

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Discussion

The current case report describes a unique situation in which an original blood type O Rh-positive donor heart was initially transplanted into a blood type B Rh-positive recipient followed by retransplant into a second recipient with blood type O 10 days after the initial operation. The second recipient tolerated transplant with no instances of rejection or hemolysis. Despite being exposed to 2 ischemic periods within the span of 2 weeks, the allograft maintained excellent LV and RV function. Right heart catheterization was normal, with appropriate cardiac index and right-sided filling pressures.

Several factors may have contributed to the success of the second transplant described in the current case. First, in contrast to most previous case reports in which the transplanted donor heart was procured from another center, the procurement of the donor heart and the subsequent transplant into the second recipient took place at the same center.[4-7] As a result, the ischemic time for the second transplant was 100 minutes. In comparison, previous literature reported much higher total ischemic times, ranging from 197 to 295 minutes.[5-7] Only 1 study has reported a successful transplant reusing a donor heart from the same center, with an ischemic time of 50 minutes.[8] The shorter ischemic time may have had a positive impact on the survival of the graft after the second transplant without any PGD. Therefore, limiting travel and ischemic time when reusing donor hearts may be a key to graft survival.

Another consideration that may have led to the success of the procedure was the timeliness of the second transplant in relation to the first ischemic period. Prior case reports have reported durations ranging from 6 to 16 days between the first and second transplant.[4,5,7-9] The allograft in the current case was reused 10 days after the first transplant. In addition, care was taken to ensure that none of the tissues from the first recipient were left with the heart for the second recipient to minimize the possibility of other immunological reactions. A previous case report had noted that shorter aortic and pulmonary artery stumps may pose technical challenges during the second transplant.[6] This issue was not encountered in this case. The anastomosis from the first transplant was easily taken apart once sutures were cut, and no resection of actual tissue was required.

From an immunological standpoint, the original donor had O Rh-positive blood and was considered a universal donor. Cardiac endothelial cells express the same blood group carbohydrate antigens as the donor blood.[10] A heart from an O blood type donor does not express any carbohydrate antigens on its endothelial surface.[10] Even after transplant, the heart maintains the same carbohydrate antigens as the original donor. As a result, there was little concern for hyperacute rejection, because the original donor heart was transplanted into the first recipient with B Rh-positive blood. When the original O Rh-positive donor heart was reallocated to the second recipient with O Rh-positive blood, there was some concern that type B blood from the first recipient could be carried over and may result in hemolysis. However, there was no clinical or laboratory evidence of hemolysis. The original donor had 1 antigen match at HLA-DRB1 locus and 5 antigen mismatches at HLA-A, B, and DRB1 loci with the first recipient. There was no HLA match between the original donor and the second recipient.

Conclusion

In an era when organ availability is of utmost importance for a patient population with high waiting list mortality, retransplant of previously transplanted hearts may be an option to expand the donor network. With careful organ selection, short ischemic times, and proper postoperative care, this option should be considered for a select group of patients in need of heart transplant.

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