Successful Heart Transplantation After 13 Hours of Donor Heart Ischemia With the Use of HTK Solution: A Case Report


ABSTRACT

Introduction. For heart transplantation (HTx), the recommended ischemic time (IT) for donor heart is not to exceed 6 hours. Though Dr Christiaan Barnard used a donor heart with IT of 16 hours, 50 minutes with a portable hypothermic perfusion system in 1981, the recorded IT of donor hearts reported recently is 8 hours, with no adverse effects.

Case report. The patient, a 14-year-old boy of blood type O, was diagnosed with cardiomyopathy at age 12. In early September 2003, the patient was recommended for HTx. His condition deteriorated 18 days later with low CO, elevated pulmonary vascular resistance, and frequent ventricular tachycardia, further complicated by pneumonia and multiorgan infections, which were contraindications for HTx. On September 22, 2003, a donor heart of blood type O was available 370 km away. Another patient of blood type B with severe heart failure was matched for the HTx. During the intervening time, another donor heart of blood type B became available locally. We matched the type B donor heart to the type B recipient. Since the type O donor heart seemed to be wasted, we performed HTx for the boy. Though preserved for 12 hours in cold cardioplegia, the donor heart was implanted with biatrial anastomosis that took 1 hour. The total IT of this donor heart was 13 hours. The recipient recovered and was discharged 3 months later.

Conclusions. The IT of 13 hours for this donor heart is believed to be a world record. Our experience demonstrates that preservation time of donor heart may exceed 6 hours.

TO EXPAND DONOR AVAILABILITY, organs are being harvested from distant locations. For orthotopic heart transplantation (HTx), the recommended ischemic time (IT) for donor heart is not to exceed 6 hours. Though Dr Christiaan Barnard used a donor heart of IT of 16 hours, 50 minutes with a portable hypothermic perfusion system in 1981,1 the recorded time of IT of donor hearts reported in recent years is 8 hours, 17 minutes.

CASE REPORT

The patient, a 14-year-old boy of blood type O, had symptoms of exertional dyspnea since 9 years of age. He was diagnosed with cardiomyopathy (CMP) at age 12. In early September 2003, the patient underwent cardiac catheterization leading to the recommendation for HTx. His condition started to deteriorate 18 days later with complications of low cardiac index (1.4 L/min/M²), elevated pulmonary vascular resistance (PVR = 8 Wood units), and frequent episodes of ventricular tachycardia. The patient was hospitalized in the intensive care unit, supported with an intra-aortic balloon pump, a high dose of inotropes including milrinone lactate injections, and a mechanical ventilator due to respiratory failure. His condition was complicated by pneumonia with sputum and blood cultures showed infections by seven types of bacteria, all of which represented contraindications for HTx.

Meanwhile, at this hospital another patient (of blood type B) with severe heart failure, status post-coronary artery bypass grafting × 4, aortic and mitral valve replacement, also needed urgent HTx. On October 22, 2003, a heart donor of blood type O was available at a hospital 370 km away. We sent our heart procurement team immediately. In the intervening time, another heart donor of blood type B became available in the locally. We matched the type B donor heart to the type B recipient. Since the type O donor heart seemed to be wasted, we performed HTx for the boy. Though preserved for 12 hours in cold cardioplegia, the donor heart was implanted with biatrial anastomosis that took 1 hour. The total IT of this donor heart was 13 hours. The recipient recovered and was discharged 3 months later.

From the Heart Centre, Cheng Hsin Rehabilitation Medical Centre, Taipei, R.O.C.

Address reprint requests to Dr Jeng Wei, Heart Centre, Cheng Hsin Rehabilitation Medical Centre, 45 Cheng Hsin Street, Pei-Tou 112 Taipei, Taiwan, R.O.C. E-mail: chghjw@yahoo.com.tw

© 2005 by Elsevier Inc. All rights reserved.
360 Park Avenue South, New York, NY 10010-1710

Transplantation Proceedings, 37, 2253–2254 (2005) 2253
Under the situation that the life of a 14-year-old patient, who was not considered for HTx due to his septic condition, was in danger without hope for recovery, and the type O donor heart was going to be wasted, the team decided to go ahead with an HTx for him. Though this type O donor heart from the distant hospital was already stored for 12 hours, preserved in cold histidine-tryptophane-ketoglutarate (HTK) cardioplegia, orthotopic HTx was performed immediately. A biatrial anastomosis of the donor heart took 1 hour; the total IT of this donor heart was 13 hours. Despite pneumonia and transient right heart failure during the posttransplant period, the recipient was weaned off the ventilator and the right ventricular assist device and was discharged from the hospital 3 months later.

DISCUSSION

This patient had a high PVR and pneumonitis preoperatively, factors which probably contributed to his right heart failure after HTx. The left heart function, however, was normal after HTx. This suggests that the right heart failure was not due to the 13-hour ischemia alone.

Advances in immunotherapy, together with liberalization of eligibility criteria have contributed significantly to the increasing demand for donor organs. In an attempt to expand the donor pool, transplant programs are now accepting donors from more distant areas. Without the time constraint, there are advantages: (1) the cost of transportation will be much decreased and (2) the preoperative assessments of preformed antibodies can be done routinely.

Four hours has been considered to be the upper limit of ischemic time for donor heart during the initial period of HTx. Recently, the IT has been extended to 6 to 8 hours with observation of no adverse effects due to long IT.

Dr Barnard successfully used an hypothermic perfusion system to protect a donor heart for more than 16 hours in heterotopic HTx.1 However, surgeons are more conservative while performing orthotopic HTx. Few series are using donor hearts with IT longer than 6 hours. Long-term follow-up of HTx recipients at Columbia University in New York and Alfred Hospital in Australia have demonstrated that prolonged IT (average 5 hours) did not adversely affect the recipient while performing orthotopic HTx. Few series are using donor hearts with IT longer than 6 hours. Long-term outcomes of HTx recipients at Loma Linda University were not adversely affected by donor hearts preserved by single dose of cold crystalloid cardioplegia with 8 hours of cold ischemia.6–8 It remains to be determined at what level of myosin release (and hence, what duration of graft ischemia) is associated with irreversible myocardial damage that might result in permanent functional compromise. The degree of ischemic damage seems to be related to IT; we have yet to determine at the safety margin. From this recipient, we realize that a donor heart with such a lengthy IT may still function well.

Bretschneider's HTK solution (Dr Franz Kohler, Chemie GmbH, Germany) is commonly used for myocardial preservation in European countries. A multicenter study on a large series of HTx patients showed good long-term results.9

We conclude that IT of a donor heart for over 8 hours is no longer a contraindication to HTx. Successful HTx with even longer IT may be expected in the future. A further comparative study is needed to determine whether HTK solution is better than other cardioplegic solutions.

REFERENCES