supported on the TAH for a total of 278 days prior to successful repeat HT.

While awaiting a transplant, physical and occupational therapy were initiated, and he progressed to independent ambulation. An intensive aerobic and strength training protocol was initiated 1 month after TAH implantation. Aerobic interval training was introduced; 100 feet fast-paced walking followed by 100 feet slow walking. After 6 weeks, he progressed from 4 to 6 intervals, and the mean fast pace increased from 0.99 to 1.4 m/s. (Fig. 1) His 6 min walk test (6MWT) increased from 276.15 to 370.03 m during this time.

**DISCUSSION**

We present a case of successful physical rehabilitation in the smallest patient to-date to receive the 50 cc TAH as a bridge to HT. Our patient received ongoing, intensive inpatient physical rehabilitation with significant and functional improvement in his gait speeds and 6MWT. Physical rehabilitation can safely be performed in small patients supported with a TAH and can improve patient overall functional status prior to HT.

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**Sixteen-Hour Ex Vivo Donor Heart Perfusion During Long-Distance Transportation for Heart Transplantation**

To the Editor,

As we know, the organ care system (OCS) is an alternative method of donor organ preservation to the cold storage standard of care. It provides ex vivo heart perfusion and preservation in a warm, beating, near-physiologic functioning state. By shortening cold ischemia time, it might allow for distant procurement (1).

To our knowledge, there was a case report of a successful heart transplant after 10-h out-of-body time using OCS (2). We report a case of 16-h cross-clamp to cross-clamp time for cardiac transplant. Our recipient was a 48-year-old, 181-cm, and 65-kg male with dilated cardiomyopathy. He had New York Heart Association class IV symptoms and underwent implantation of a HeartMate3 left ventricular assist device. Clinical status was complicated by drive line infection necessitating urgent enlisting for heart transplantation. A suitable donor heart became available. Poor weather conditions prevented donor transfer by medical or commercial aircraft, nor by ambulance; consequently the allograft was transported by a passenger train. Travel time on a return journey approximated 12 hours (>500 km).

The donor heart procurement took place as per conventional and company protocols for the OCS. Upon arrival at our center, the donor heart is arrested with approximately 1 L of normothermic blood cardioplegia, as opposed to cold Custodiol, and is disconnected from the OCS for implantation into the recipient. For cardioplegia, we used blood and crystalloid solution at the ratio of 1:5. In the OCS, in order to protect and improve donor heart function, the allograft was conditioned with levosimendan 45μg/kg and hemofiltration (Medos Medizintechnik AG, Heilbronn, Germany), which can lead to a significant reduction in circulating inflammatory mediators, blood loss, and transfusion requirements (3).

Total ischemia time was 68 min and perfusion was 955 min. This resulted in a total cross-clamp to...
novel, fully magnetically levitated centrifugal pump designed for enhanced hemocompatibility. Clinical trial results have demonstrated improved survival and functional status in patients with advanced stage heart failure (1). The very low rate of pump thrombosis and fewer neurologic adverse events indicate that hemocompatibility has been improved appreciably over prior LVAD designs (2,3). We report a case of long-term discontinuation of oral anticoagulation therapy due to recurrent gastrointestinal bleeding in a patient supported by the HeartMate device.

The HeartMate 3 LVAD was implanted in a patient with end-stage heart failure due to ischemic cardiomyopathy. Following an uneventful postoperative course and discharge from the hospital, the patient was readmitted 9 months later due to recurrent gastrointestinal bleeding. At the time of readmission, the patient was prescribed warfarin (average INR: 2.5; range: 2.3–3.15) and aspirin 100 mg/day. Gastroscopy revealed a bleeding, mucosal lesion in the region of the gastric fundus. Despite treatment by hemostatic clipping, gastrointestinal bleeding ceased only after discontinuing oral anticoagulation (both warfarin and aspirin) and intermittent low molecular weight heparin therapy. Capsule endoscopy revealed the presence of duodenal arteriovenous malformations as the source of recurrent bleeding. Decreased high molecular von Willebrand monomers indicated that the bleeding was the result of acquired von Willebrand syndrome (vWS). Without anticoagulation or antiplatelet therapy (INR: 1.26; range: 1.17–1.30) the patient remained free from any bleeding and thromboembolic events for 298 days and was listed for urgent cardiac transplantation. Function of the HeartMate 3 device was uneventful. Unfortunately, therapy tragically ended as the patient committed suicide by disconnecting the driveline. Pump thrombosis was excluded during forensic examination.

DISCUSSION

Pump thrombosis, thromboembolic, and hemorrhagic stroke are complications of mechanical circulatory support that have persisted for decades. With the exception of early-generation HeartMate I devices, implantable devices require anticoagulation and antiplatelet therapy to avoid thrombosis and thromboembolism. The HeartMate 3 was designed for enhanced hemocompatibility with the anticipated benefit of fewer thrombotic-related adverse events. Wide blood flow gaps and a magnetically suspended rotor allow the blood to pass through the pump with lower shear stress and less platelet activation and red blood cell damage.