A ventricular assist device (VAD) is a mechanical circulatory device that is used to support or replace pump function of the failing heart. Although left ventricular assist devices (LVADs) are intended for short term use, studies have shown success in long term use, especially in irreversible congestive heart failure (CHF). We report a case of a LVAD suitable for the pediatric population with irreversible CHF.

Case

A 12 year old male with a past medical history of epidermolysis bullosa and dilated cardiomyopathy was admitted to the inpatient pediatric service for treatment of decompensated CHF. One month prior to this admission, the patient underwent AICD placement for management of severe ventricular dysrhythmias. The etiology of his CHF was familial, as an older sister also died from CHF. The patient required urgent intubation due to shortness of breath and fatigue, and his echocardiogram demonstrated a globular heart with a left ventricular ejection fraction of 20%. The patient’s clinical condition continued to deteriorate, and an intra-aortic balloon pump was placed without significant clinical improvement (Fig 1). Subsequently, the patient was scheduled for urgent LVAD placement with a size-appropriate HeartWare® device and listed for orthotopic heart transplant (OHT) (Fig 2).

In surgery, he underwent general anesthesia. The airway was secured with a 6.0 endotracheal tube, and an 8 Fr pulmonary artery catheter was introduced through the right internal jugular vein guided by ultrasound. The patient remained hemodynamically stable throughout LVAD placement, only requiring postoperative epinephrine (0.04 mcg/kg/min) and milrinone (0.5 mcg/kg/min) infusions. The patient’s chest was not closed to minimize development of obstructive shock. The patient was transported sedated and intubated to the Pediatric Intensive Care Unit for postoperative care, and he returned to the OR for chest closure the next day. Although the patient was initially extubated on postoperative day 4, the patient required reintubation later that day following development of acute respiratory distress with heart failure. The postoperative course was further complicated by the development of acute renal failure requiring CRRT and with pulmonary and upper GI hemorrhages. However, the patient’s clinical course slowly improved. He was discharged to home two months later and was managed by pediatric cardiology and the transplant services. Three months after LVAD placement, the patient underwent successful OHT with an unremarkable postoperative course (Fig 3).

Introduction

A ventricular assist device (VAD) is a mechanical circulatory device that is used to support or replace pump function of the failing heart. Although left ventricular assist devices (LVADs) are intended for short term use, studies have shown success in long term use, especially in irreversible congestive heart failure (CHF). We report a case of a LVAD suitable for the pediatric population with irreversible CHF.

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Discussion

Children listed for OHT experience higher mortality rates while waiting for transplantation when compared to adults [1]. Studies of LVADs as a bridge to OHT are reported in rescuing patients with advanced heart failure who continue to deteriorate despite maximal medical therapy [1, 2]. A study examining the mortality of pediatric patients listed for OHT between 1999 and 2006 reported mortality in 17% of patients, recovery in 8% of patients, and survival to OHT in 6% of patients [2]. Although both LVAD and ECMO therapies have been used as a bridge to pediatric OHT, LVAD therapy results in less mortality, especially when required for greater than two weeks [3]. Additionally, children and adults treated with LVADs often are able to ambulate and undergo cardiac rehabilitation prior to OHT, which improves survival [3]. Furthermore, LVAD therapy in children can cause reverse myocardial remodeling [4]. While both bridge therapies are associated with thromboembolic complications, LVAD therapy is associated with a lower risk of such complications and is a live-saving option for the pediatric population [6]. However, LVAD therapy in the pediatric population is limited by availability of devices for smaller children with a body surface area of less than 1.2 m² [7]. The HeartWare® ventricular assist system used in this case is a miniaturized centrifugal device, which is suitable in these conditions. The internal design of this pump decreases turbulent flow, reduces hemolysis and thrombus formation, and is potentially beneficial in adults [8].

Works Cited

[8] [HeartWare® Ventricular Assist Device – Products and Technology: Overview.” HeartWare® Ventricular Assist Devices, 2011. [https://www.heartware.com.au/IRM/content/usa/products_overview.html]