Intraventricular Pledged Sutures to Prevent Suction Events in Patients With the HeartWare Left Ventricular Assist Device

Diyar Saeed, MD, PhD, Bujar Maxhera, MD, Artur Lichtenberg, MD, PhD, and Alexander Albert, MD, PhD

Clinic for Cardiovascular Surgery, Heinrich-Heine University of Düsseldorf, Düsseldorf, Germany

Suction events are among the frequently encountered issues after the implantation of a left ventricular assist device and may induce malignant arrhythmias. Several factors may play a role in inducing these suction events. A proper inflow cannula insertion site at the time of surgery, particularly in hypertrophic left ventricles, plays a significant role in the prevention of these events. We describe a novel technique that helps avoid future suction events through the application of several intraventricular pledged sutures that displace the intraventricular muscle away from the inflow cannula, change the left ventricular geometry, and provide more room around the inflow cannula.


Technique

The cardiopulmonary bypass is initiated in the usual manner after performing the venous and arterial cannulation. The proposed technique and the HeartWare pump implantation at our institution are usually performed using a beating-heart technique. After sewing the apical ring to the left ventricular apex with a running polypropylene suture and performing a cruciform apical incision, the coring device is used. The ventricular cavity is then inspected and cleared from thrombi or free trabiculae that might obstruct the inflow cannula. Thereafter, four to six 2-0 polypropylene sutures with pledgets are placed circumferentially inside out and tied at the level of the apical ring cuff. After tying these sutures, a significant displacement in the intraventricular mass away from the inflow cannula of the pump can be achieved. Figure 1 shows the change in the left ventricular geometry before and after application of these sutures. The HVAD pump is then inserted in the usual manner followed by outflow graft anastomosis. The central alignment and the resulting space around the inflow cannula can be confirmed using transesophageal echocardiography.

Since October 2010, 38 patients with a mean age of 55 ± 13 years were supported with the HVAD pump at our institution using the described implantation technique. The majority of the patients were male (84%). The primary diagnosis was ischemic cardiomyopathy in 23 patients (61%) and dilative cardiomyopathy in 15 patients (39%). None of these patients encountered any form of SE after left ventricular assist device implantation except for...
1 patient, who had a few SE caused by a significant improvement in the ventricular function after left ventricular assist device implantation and underwent ultimately successful device explantation.

Comment

It has been observed that patients with rotary blood pumps may have undetected severe ventricular arrhythmias related to SE [2]. These SE may be more frequently encountered if the pump inflow cannula is not ideally placed at the time of surgery. Some patients may even need reoperation to correct a malplaced inflow cannula causing frequent SE and improper unloading of the left ventricle. We describe here a technique that can minimize these SE in patients with the HVAD by using several intraventricular pledgetted polypropylene sutures that displace the intraventricular mass outward toward the apical cuff. We are routinely using this technique during HVAD implantation and have not observed any patient with SE after HVAD implantation except for a patient who underwent device removal later after recovery of the ventricular function.

It has been reported that the outcome after ventricular assist device placement in patients with hypertrophic cardiomyopathy is comparable to that of patients with dilative cardiomyopathy [3]. We believe that this technique is particularly useful for patients with hypertrophic ventricles and patients with small ventricular cavity. Alternatively, extensive myomectomy has been proposed in patients with hypertrophic cardiomyopathy undergoing Thoratec HeartMate II VAD (Thoratec, Pleasanton, CA) [4].

In conclusion, the application of the described intraventricular pledgetted sutures changes the left ventricular geometry and helps in preventing future SE in patients undergoing HVAD implantation.

References