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CASE REPORT

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Management of a chronically infected left ventricular assist device with heart transplantation: Two-step simplified approach

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Abstract

Background: The surgical approach for the treatment of a left ventricular assist device with severe infection may be controversial.

Material & Methods: We present the case of a patient implanted with a HeartWare™ HVAD as a bridge to transplant and chronic infection of the device by Pseudomonas who underwent a conservative partial treatment of the driveline tunnel and subsequently a heart transplantation and device removal were done.

Conclusions: The two-step simplified approach allowed the patient to be transplanted in a short period of time, with the abdominal wall healed and almost two-thirds of the driveline subcutaneous tunnel sterilized.

KEYWORDS
transplant

1 | INTRODUCTION

The device-related infection continues to be a problem and represents a major limitation to long-term use of the devices, with only 48% of LVAD recipients being free from major infection at 24 months.[1] The infection is the cause of death for 8% of patients in the STS INTERMACS database, although the frequency of major infections causing death may be underrepresented.[2]

LVAD-specific infections are related to the device itself and the driveline infection is the most frequent. The long-term suppressive antimicrobial treatments lead to the appearance of drug-resistant organisms and the mere explantation of the device is not an option in most cases; the definitive treatment includes a radical approach to the infected area, removal of the device, and heart transplantation, with posttransplant survival not decreased at 1 year.[3]

2 | CASE PRESENTATION

Consent was obtained from the patient to report the case anonymously.

We present the case of a 54-year-old man with ischemic dilated cardiomyopathy since 2008. In March 2019, he experienced a heart attack in Paris with percutaneous revascularization complicated by multiple interventional procedures and torpid evolution for three months, being transferred to a center with a transplantation program.

The patient required a VA ECMO implant, and an Impella was placed via the subclavian artery 2 weeks later. On July 31, a bridge-to-decision HeartWare HVAD was implanted, complicated with immediate right ventricular failure and torpid evolution with a tracheotomy, critically ill patient neuropathy, and driveline infection (Enterococcus and multi-resistant Pseudomonas).

The patient was discharged 4 months after the implant and was admitted to his reference hospital in Spain due to persistent driveline infection. Multi-resistant *Pseudomonas aeruginosa* was cultured and ^{18}F-FDG PET/CT showed pump infection and an intense and homogeneous uptake along driveline cable (Figure 1A).

He was transferred to our center for transplant evaluation with two infectious foci (driveline exit site and a fistula of the subcutaneous tunnel of the cable) (Figure 1B) with positive cultures for Pseudomonas. No systemic infection data or growth of microorganisms in blood cultures were found and antibiotic treatment was instituted (ceftazidime and ciprofloxacin).

3 | RESULTS

3.1 | Step 1: Surgical management of infection

No absolute contraindications to transplantation were found. We considered various technical options and decided on a non-radical approach, first conservatively addressing the externalized cable infection, and subsequently performing the heart transplant and device explantation.

Excision of the abdominal fistula and the exit site of the percutaneous cable was done and the skin and subcutaneous tissue over the cable was removed. The driveline was dissected and released, the surrounding infected tissue was removed, and 5 cm of the muscular fascia was opened towards the horizontal tunneling of the cable (Figure 2A). The surgical field and the driveline were washed with a hypertonic solution and the tissues and polyester of the cable were impregnated with diluted amikacin. Everything was covered with GranuFoam dressing and connected to a vacuum-assisted closure (VAC) Therapy System.

P. aeruginosa was grown from the samples taken; the bed was cleaned and the VAC was replaced on the fourth and eighth day; all the samples taken were sterile, so definitive closure was scheduled for day 12th after the initial surgery: the surgical bed and the skin edges were refreshed and a new tunnel on the muscular plane and a new exit site for the driveline was created (Figure 2B).

The pre-transplant evaluation was completed, and the patient was discharged fifteen days later (Figure 3A), on oral ciprofloxacin, being included on the heart transplant waiting list (nonelective, nonemergent) 2 weeks after discharge.

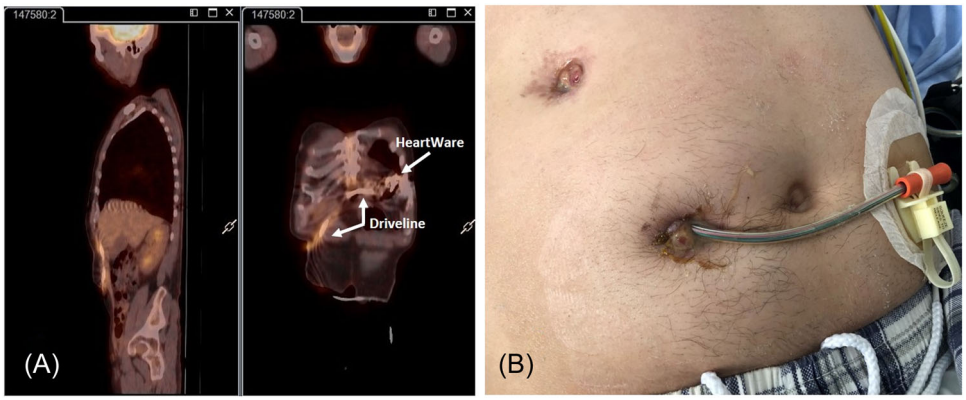

FIGURE 1 (A) Preoperative PET/CT. (B) Purulent exit site and driveline externalization fistula (admission in our center).

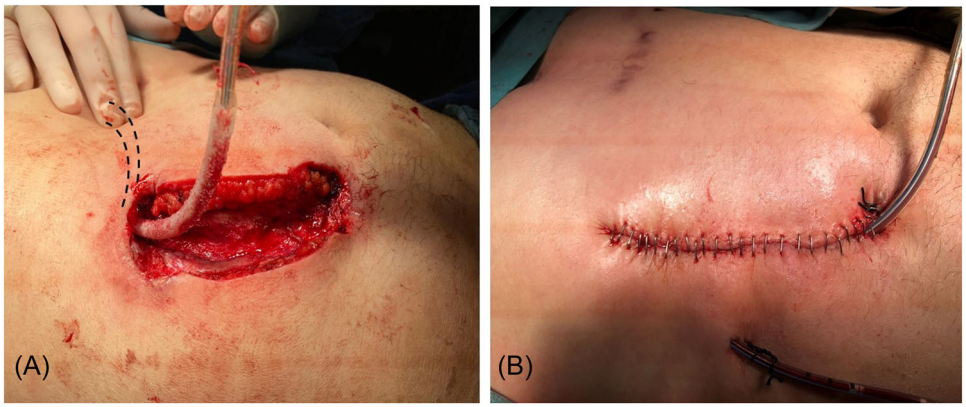

FIGURE 2 (A) Resection of infected tissues and mobilization of the driveline. (B) Abdominal wall reconstruction: intramuscular tunnel and new exit site for the driveline.

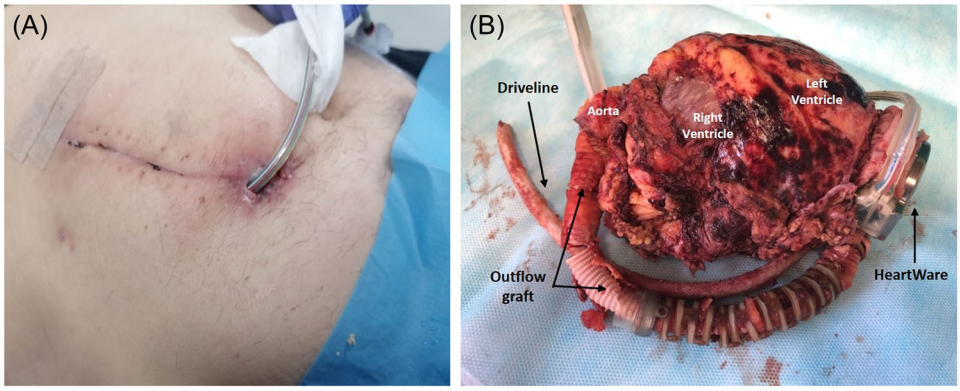

FIGURE 3 (A) Abdominal wound at pre-transplant discharge. (B) Explanted heart with HeartWare HVAD, outflow graft, and cut the percutaneous cable.

3.2 | Step 2: Cardiac transplantation

A compatible donor was offered 3 weeks later: under femoral extracorporeal circulation cardiac adhesions were excised and the pump was released together with the outflow graft and the percutaneous cable cut at 10 cm to remove it en bloc after cardiectomy (Figure 3B); macroscopic infection was not observed but Pseudomonas was grown from the samples taken (pump, mediastinal driveline, cardiac apex). The pericardial cavity and the tunnel were flushed with diluted amikacin and the donor's heart was implanted.

The postoperative course was uneventful, and the patient was discharged 20 days after the transplant with the abdominal wound fully healed. The immunosuppressive therapy was the usual one according to the group protocol: induction therapy with Basiliximab and maintenance with Tacrolimus + Mycophenolate Mofetil + Prednisone (6 months post-TX). Two years later he is alive (NYHA class II) without episodes of rejection.

4 | DISCUSSION

The approach for managing severe LVAD infection as a bridge to transplantation can be done in two ways: (a) radical surgery of the abdominal infection using several techniques, as proposed by Pieri et al.[4] and a cardiac transplant in a second time months later, (b) heart transplantation and LVAD explant at the same surgical procedure followed by treating the abdominal infection with vacuum-assisted therapy and plastic reconstruction with or without omental flaps.[5] Both situations require aggressive abdominal wall surgery that needs weeks or months to resolve.

Our patient had an infectious complication on a HeartWare device implanted in another center with single tunneling of the driveline. We prefer the doubled driveline tunneling and use it since 2015. Wert et al.[6] have demonstrated a reduction in the number of driveline infections with this tunneling technique.

Given the findings of the preoperative images, we consider that the bacterial load was greatly reduced after surgery and the driveline infection was controlled, according to the 2019 EACTS Expert Consensus on long-term mechanical circulatory support.[7] The ideal time for transplantation would be at least 4 weeks after surgical treatment, once the abdominal wound was completely healed and the patient was in good functional condition after 1 and 2 weeks as an outpatient. In that moment the patient was listed for transplant.

The experience with long-term ventricular assist devices in our country is small (30–35 annual implants in total) compared to that in Europe and USA. Therefore, the approach to VAD problems is very sporadic and no surgical group has experience in dealing with them. This is the first case in our institution and would be the first national report.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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