Colonic perforation from left ventricular assist device: a rare complication

Sara C. Herman, Jochen D. Muehlschlegel, Gregory S. Couper, Edward Kelly

Abstract

A patient with idiopathic non-ischemic cardiomyopathy had a left ventricular assist device (LVAD) implanted, while awaiting cardiac transplantation. The patient had been stable following a complicated and prolonged postoperative course, but was admitted to the hospital for suspected low-grade LVAD-related infection. Work-up for sepsis was suspicious for perforated viscus. An exploratory laparotomy revealed a perforated transverse colon with gross spillage of succus. Although infectious complications following LVAD implantation are common, sepsis as a result of gastrointestinal perforation secondary to LVAD erosion is not. This first report of viscus perforation despite the use of a Gore-Tex® wrap highlights a rare complication of LVAD therapy.

Keywords: Circulatory assist devices; Colonic perforation; Sepsis

1. Introduction

Over 5.3 million Americans are affected by heart failure each year, but only approximately 2200 heart transplants are performed for patients with end-stage heart failure due to the lack of suitable organs [1]. Left ventricular assist devices (LVADs) are often used to bridge end-stage congestive heart failure patients to cardiac transplantation or as a destination therapy. During this time, the LVAD functions as the pump of the failing left ventricle. The body of the pump is frequently implanted in the left upper quadrant of the abdomen using an intraperitoneal or preperitoneal technique. Though extremely reliable, LVADs are associated with complications. The main complications precluding transplantation after LVAD placement are related to sepsis, postoperative bleeding, and thromboembolism [2, 3]. Although infectious complications following LVAD implantation are common, LVAD erosion leading to perforation of the gastrointestinal tract and sepsis is only rarely reported in the medical literature [2–5]. This is the first report describing a LVAD-associated colonic perforation despite the use of a Gore-Tex® wrap, implemented as a result of prior reports of perforation.

2. Case presentation

A 50-year-old man with idiopathic non-ischemic cardiomyopathy underwent implantation of an intracorporeal Thoratec HeartMate XVE LVAD, while awaiting cardiac transplantation. The LVAD was implanted in the peritoneal cavity. A Gore-Tex® Dual Mesh Plus sheet was sutured along the left gutter, the inferior aspect of the diaphragm, and along the posterior right rectus fascia in order to effectively compartmentalize the device from intra-abdominal organs. This pocket housed the entire LVAD except the intraperitoneal section of the drive-line. The large and thick omentum was not dissected off the transverse colon. The tip of the omentum was wrapped around the intraperitoneal portion of the drive-line and sutured up to the peritoneum around the line. During the ensuing days and weeks, numerous reoperations were necessary for bleeding in the chest and abdomen, and for implantation and explantation of a centrifugal right (RVAD) and its cannulae. On the 25th day after LVAD implant, an AXIOM silicone drain was placed into a hematoma behind the Gore-Tex® pocket. It was removed within a week upon resolution of the hematoma. The patient’s recovery was also complicated by pulmonary embolism and recurrent infections, including persistent Candida fungemia and methicillin-sensitive Staphylococcus aureus requiring chronic suppressive antibiotic treatment. The patient was admitted to our institution on multiple occasions in the seven months following LVAD implantation with hypotension, high-grade fevers, and positive blood cultures. On all admissions, no obvious vegetations were identified by transesophageal echocardiography (TEE), and imaging of the LVAD and sternal wound was equally unrevealing.

On postoperative day 234 from initial LVAD implantation, the patient demonstrated a similar clinical picture of
refractory hypotension, fluctuating fevers as high as 103°F, and positive blood cultures. TEE was again negative for vegetations, but computed tomography (CT)-scan of the chest showed gas around the LVAD pocket with an air-fluid level suspicious for underlying infection or fistula. On postoperative day 236, the patient was transferred to the operating theater for emergent exploratory laparotomy.

Exploration revealed that the colon had migrated behind an intact Gore-Tex® wrapped LVAD. After the Gore-Tex® curtain was dissected away from the abdominal structures, a 3-cm colonic perforation, clearly caused by the weight of the device on the colon, was identified (Fig. 1). A partial colectomy was performed and an endoscopy was normal aside from an impression of the LVAD on the stomach. Given the patient’s severe sepsis, the abdomen was closed temporarily and the patient returned to the cardiothoracic intensive care unit on multiple vasoressors. The LVAD pocket was eventually reconstructed with Strattice bioprosthetic mesh after multiple abdominal debridements and antibiotic irrigation. An ileostomy was created and feeding jejunostomy was inserted during subsequent surgeries. However, the patient’s condition continued to worsen and he stopped responding to treatment. At this point, the patient and family determined to proceed with comfort measures only. The patient expired at home with hospice care approximately nine and a half months after the initial LVAD implantation.

3. Comment

Despite ongoing improvements in LVAD technology, implantation of ventricular-assist devices continues to be associated with adverse events. Infectious complications following an LVAD implantation are common, but we describe a case of viscous perforation secondary to LVAD erosion leading to septic shock and eventually death. The literature acknowledges the potential for serious injury to adjacent organs secondary to the physical design, weight, and anatomical location of the implanted device [2–5]. Patients supported with the HeartMate XVE are thought to be at particular risk due to the mild rotation of the pump housing associated with electric motor function. Previous reports of gastrointestinal perforation prompted the use of a Gore-Tex® wrap during device implantation to protect our patient’s adjacent viscera from damage [3–5]. Unfortunately, even this extra precaution did not prevent colonic perforation. In our estimation, no other preventative surgical measures could have been taken with this type of LVAD implant.

As LVAD therapy continues to improve patient outcomes [6–8], more implanted devices will be utilized as long-term treatments for end-stage congestive heart failure [8]. Patients undergoing bridge-to-transplant therapy with VAD devices are usually supported with pulsatile, volume-displacement devices like the HeartMate XVE. The development of second-generation axial flow pumps has overcome many of the limitations of the first-generation pulsatile flow devices. Recent reports of improved survival with newer continuous flow devices have demonstrated less mortality compared to older, larger pulsatile pumps [9]. However, despite significant reduction in size and weight of new devices, serious complications from implantation continue to account for significant patient morbidity in second-generation devices [8–10]. These experiences highlight the importance of ongoing research efforts to strengthen patient selection criteria and advance device technology in order to fashion both a safe and effective prosthetic cardiac support system.

References


Fig. 1. Intact Gore-Tex® wrap dissected away from left ventricular assist device (LVAD) and abdominal structures revealing 3 cm colonic perforation.