Unusual late presentation of asymptomatic diaphragmatic hernia following ventricular assist device explantation

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Abstract

The role of left ventricular assist device (LVAD) in treatment options of congestive heart failure is becoming more important and the widespread application is imminent. There are, however, some serious complications associated with LVAD, which make patient management more challenging. We report a rare surgical case of asymptomatic diaphragmatic hernia, which was diagnosed 8.5 years after heart transplantation and LVAD explantation. A left mini (7 cm), muscle- and nerve-sparing thoracotomy was performed, and we found the splenic flexure of the colon herniated into the left pleural space through a small, circumferential defect of the diaphragm (~4 cm in diameter) created for the inflow cannula of LVAD. The hernia was reduced and the defect was repaired.

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Keywords: Diaphragm; Hernias; Heart failure; Left ventricular assist device; Transplantation-heart

1. Introduction

Although heart transplantation is on the mainstay of treatment of end-stage congestive heart failure, the role of left ventricular assist device (LVAD) has been emerging because of evolution of device technology as well as limited availability of donor hearts [1]. Since the U.S. Food and Drug Administration approved LVAD as a permanent treatment of end-stage heart failure (so-called 'destination' therapy), more patients on device support have required long-term support and multiple operations including device replacement. This places patients at risk of device-related complications, which are often devastating and even life-threatening [1]. Infection or abdominal complications such as abdominal wall hernia and/or bowel obstruction are often accompanied with long-term support and multiple operations.

We herein present our recent unusual case of asymptomatic diaphragmatic hernia, which occurred 8.5 years after successful LVAD explantation and heart transplantation.

2. Case report

A 57-year-old male was referred to our outpatient clinic for asymptomatic diaphragmatic hernia. Past medical history was significant for idiopathic dilated cardiomyopathy and end-stage congestive heart failure, for which he underwent HeartMate-IP® (Thoratec, Pleasanton, CA) LVAD implantation as 'a bridge-to-transplant' nine years prior to the presentation. After eight months of stable LVAD support, he successfully underwent heart transplantation and explantation of LVAD. Both operations were done at an outside hospital. Detailed chart review revealed that the device was placed in the preperitoneal space underneath the rectus abdominis muscle sheath, and a small hall was created on the left hemidiaphragm for the inflow cannula. When the device was explanted, the diaphragm was minimally dissected around the inflow cannula, and the small defect was not repaired. He had been doing well until 8.5 years after heart transplantation, when he returned to our cardiology clinic as a routine follow-up. Chest X-ray demonstrated a gas pattern consistent with diaphragmatic hernia (Fig. 1). Chest computed tomography scan demonstrated the herniation of the splenic flexure of the colon into the left pleural cavity. There was no evidence of bowel obstruction or incarceration. Previous chest X-ray films were retrospectively reviewed, and the hernia was not seen (Fig. 2). Due to potential risk of bowel strangulation, a decision was made to perform an elective surgery.

A left mini (7 cm), muscle- and nerve-sparing thoracotomy was performed along the anterior border of the latissimus dorsi muscle. The latissimus was reflected intact posteriorly and the serratus was reflected intact superiorly. The 6th intercostal nerve was incised off and the 6th intercostal space was entered on the top of the 7th rib. The hernia sac was easily identified and was adhered to the pericardium and the lung (Fig. 3). The circumferential defect of the diaphragm was ~4 cm in diameter, located on the...
Fig. 1. Chest X-ray demonstrating a new development of diaphragmatic hernia (arrow).

Fig. 2. Chest X-ray two years prior to the operation. Note that diaphragmatic hernia is not seen.

Fig. 3. Appearance of diaphragmatic hernia. Arrowhead: The left hemidiaphragm. Note that the hernia is adhesed to the pericardium (black arrow) and the prepericardial fat (white arrow).

3. Discussion

Our case is unique for several reasons. First, the patient was asymptomatic and the hernia was diagnosed at a routine follow-up visit. These hernias are usually symptomatic with abdominal complaints [2–6], and are considered potentially lethal due to the risk of bowel incarceration and strangulation [6]. Second, the device was placed preperitoneal, which presumably decreases chances of abdominal complications. Previous reports described that the devices were placed intraperitoneal space [2–5]. Third, the hernia was found 8.5 years after the device explantation, and the reason of such a late onset remains unclear. In the largest series by Chatterjee et al. [5], the duration between device explanation and onset of diaphragmatic hernia is 8–42 months (mean: 20 months). Finally, although the hernia occurred through a relatively small hole of the diaphragm, it may have been preventable if the defect was closed upon device removal.

Although surgical correction of the hernia is strongly recommended to prevent potential bowel [2, 4–6], and/or pulmonary complications [3], the optimal approach is controversial. Laparotomy is a preferred option, as previously described [3–6]. Nevertheless, we found mini, muscle- and nerve-sparing thoracotomy quite useful, based on the following reasons. First, it was easier and safer to dissect the hernia sac from the surrounding intra-thoracic components via the ‘virgin cavity’ rather than the infected preperitoneal space. Second, the muscle- and nerve-sparing approach was patient-friendly, and it allowed for the patient discharge on postoperative day 2 secondary to immediate return of bowel function and lack of ileus that a transabdominal approach would have likely accompanied. Although a video-assisted thoracoscopic approach might also have been a good option, it is unlikely to have resulted in a shorter length of hospital stay or improved patient comfort.

In conclusion, it is crucial to be aware of the rare yet serious complication following LVAD explantation, which may be preventable by careful closure of the diaphragmatic defect. Once the diagnosis is made, a prompt surgical
Intervention is mandatory to prevent incarcerated hernia and subsequent life-threatening sequelae. Despite previous reports using laparotomy, transthoracic approach using mini, muscle- and nerve-sparing thoracotomy seemed a good option.

References


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Multiple studies have documented successful use of different types of left ventricular assist devices in the treatment of congestive heart failure. But such complications as: bleeding, thrombosis, thromboembolism, infection and pump failure – are often associated with LVAD. The submitted report [1], which is devoted to the asymptomatic diaphragmatic hernia, seems very interesting, because it is a very rare surgical case which was diagnosed after LVAD explantation. It would be interesting to know what kind of LVAD was used and why the defect of the diaphragm wasn’t reduced during LVAD explantation.

Reference