Successful Treatment of Pump Pocket Infection after Left Ventricular Assist Device Implantation by Negative Pressure Wound Therapy and Omental Transposition

Mitsutoshi Kimura, MD, PhD,1 Takashi Nishimura, MD, PhD1, Osamu Kinoshita, MD, PhD,2 Shuichi Okada, MD,3 Hitoshi Inafuku, MD,4 Shunei Kyo, MD, PhD1, and Minoru Ono, MD, PhD2

A 52-year-old man suffering from dilated cardiomyopathy underwent implantable left ventricular assist device (LVAD) insertion as a bridge to transplantation. He presented with evidence of LVAD-related mediastinitis and pump pocket infection 57 days after the LVAD implantation. The mediastinum was reopened and irrigated. A large amount of pus was observed around the outflow and inflow conduits and in the pump pocket. Negative pressure wound therapy (NPWT) was initiated. Methicillin-resistant Staphylococcus aureus (MRSA) was isolated from blood and mediastinal pus. Enterobacter cloacae was also isolated by mediastinal pus culture after the beginning of the NPWT. Three weeks after the start of the NPWT, the pus culture became negative, and omental transposition and sternal closure were performed. Intravenous antibiotics were administered until day 42, with the treatment subsequently switched to oral antibiotics. He was discharged from the hospital on day 57 and followed up at the outpatient clinic. Our findings suggest that NPWT followed by omental transposition be useful to treat mediastinitis or pump pocket infection after implantable LVAD insertion.

Keywords: pump pocket infection, mediastinitis, negative pressure wound therapy, implantable left ventricular assist device, omental transposition

Introduction

It is difficult to treat mediastinitis and pump pocket infection in patients who have undergone left ventricular assist device (LVAD) implantation because it is difficult to remove the infected artificial materials from the mediastinum or the pump pocket. There were reports that described successful treatment of LVAD pocket infection by omental transposition.1,2 However, a pump pocket infection remains a significant cause of mortality in patients after LVAD implantation.3 Negative pressure wound therapy (NPWT) has been reported to be useful for the treatment of mediastinitis after open heart surgery.4,5 Recently, NPWT has been successfully used to treat mediastinitis after paracorporeal LVAD implantation.6
However, it remains unclear whether NPWT is useful for the treatment of mediastinitis involving pump pocket infection in patients undergoing implantable LVAD insertion. We report a case in which NPWT followed by omental transposition successfully controlled pump pocket infection occurring as a complication after implantable LVAD insertion.

Case Report

The patient was a 52-year-old man suffering from dilated cardiomyopathy with a history of mitral valve replacement and tricuspid annuloplasty 3 years before, and implantation of biventricular pacemaker with defibrillator 2 years and 8 months earlier. He underwent an implantable LVAD (EVAHEART\textsuperscript{TM}; Sun Medical Technology Research Corp., Nagano, Japan) insertion via re-sternotomy as a bridge to transplantation. The postoperative course was uneventful. On day 46 after the LVAD implantation, he was discharged from the hospital without any symptoms.

After leaving the hospital, the patient developed generalized edema and gained 6 kg over a 10-day period. He developed a fever of 39°C 11 days after discharge (57 postoperative days), and he was readmitted. The clinical examination of blood revealed a white blood cell (WBC) count of 4,700/\text{\textmu}l and C-reactive protein (CRP) level of 32.2 mg/dl. Pus discharge was observed from the midsternal incision. The mediastinum was reopened and irrigated with a large amount of warm saline. There was a large amount of pus around the outflow and inflow conduits and in the pump pocket (Fig. 1). NPWT was initiated using Mepilex\textsuperscript{®} Border (Mönlycke Health Care, Gothenburg, Sweden) and Mepilex\textsuperscript{®} Transfer (Mönlycke Health Care, Sweden) as described by Kinoshita, et al.\textsuperscript{7} High negative pressure (−99 cmH\textsubscript{2}O) was applied using HAMA SERVO-DRAIN (INNOMEDICS Medical Instruments, Inc., Tokyo, Japan). Irrigation of the mediastinal space and exchange of dressing film was performed daily. The signs of infection resolved rapidly. The patient was extubated on day 13. The cardiac surface was covered with good granulation tissue by 2 weeks after the NPWT. NPWT was switched from the use of Mepilex\textsuperscript{®} Border and Mepilex\textsuperscript{®} Transfer to that using the V.A.C. ATS\textsuperscript{®} Therapy System (Kinetic Concepts, Inc., San Antonio, Texas, USA). He was fed via a gastric tube from day 2 and was started on oral nutrition on day 22. He was kept on bed rest until the sternal closure.

Methicillin-resistant \textit{Staphylococcus aureus} (MRSA) was isolated from blood and mediastinal pus. Antibiotic treatment was started with vancomycin, which was switched to linezolid due to renal dysfunction on day 9. Linezolid was further switched to teicoplanin because of thrombocytopenia on day 22. On day 11, \textit{Enterobacter cloacae} were also isolated from mediastinal pus. Cefepime was added. Finally, mediastinal and pump pocket culture became negative for infection. The frequency of mediastinal space irrigation and V.A.C.\textsuperscript{®} GranuFoam\textsuperscript{TM} exchange was reduced to every other day once the mediastinal culture became negative.

The NPWT was continued for 4 weeks. The WBC count was 6,000s /\text{\textmu}l, and the serum CRP level decreased to the range of 1.0 to 2.0 mg/dl. Omental transposition and sternal closure were performed on day 29. An omental pedicle graft with the left gastroepiploic artery was prepared through a midline abdomen incision. The back of the sternum and the blood pump was covered with the omental pedicle (Fig. 2), and the sternum was closed. Antibiotic treatment was continued until day 42. Then, oral sulfamethoxazole-trimethoprim combination was started. The patient was discharged from the hospital on day 57. The WBC count was 2,800 /\text{\textmu}l and CRP level was 1.1 mg/dl at the time of discharge. There was no sign of recurrence of mediastinitis four months after the sternal closure.

Discussion

Pump-related infection remains a significant cause of mortality in patients receiving an LVAD as a bridge to
Kimura M, et al.

transplantation.3,8) There were reports of successful treatment of pump pocket infection by omental transposition.1,2) Patients with sepsis after LVAD implantation have higher mortality those without sepsis.9) In the present case, the patient presented with high fever and positive blood and mediastinal pus culture.

Kurihara, et al. reported a case of outflow vascular prosthesis rerouting for the treatment of mediastinitis complicating LVAD implantation.10) Another report described a successful treatment of LVAD pump pocket infection by intra-abdominal relocation and omental transposition.11) However, relocation method might be limited to paracorporeal LVAD-related mediastinitis or small pump infection.

NPWT has been recognized as a useful treatment modality for post- sternotomy mediastinitis.4,5) Sjögren, et al. reported that NPWT reduced mortality of post- sternotomy mediastinitis compared with conventional treatment using omentum or pectoral muscle flap.5) There was a report of successful NPWT for mediastinitis developing after aortic arch replacement without removal of the prosthetic graft.12) In that case, the patient who underwent NPWT followed by omental transposition and sternal closure survived until discharge without recurrence. This report suggested that NPWT followed omental transposition yield good control of the graft infection.

Application of NPWT has recently been proposed for the control of mediastinitis in patients with paracorporeal LVAD implantation. Kawata, et al. reported two cases of mediastinitis developing after paracorporeal LVAD implantation treated successfully by NPWT.6) There is no robust clinical evidence to conclude whether the combination of NPWT with omental transposition is superior to omental transposition alone for LVAD pump pocket infection. However, based on clinical experience of treatment for post-sternotomy mediastinitis,5,13) the combination therapy of NPWT with omental transposition might be a reliable option in high-risk patients suffering pump pocket infection compared with conventional treatment. The appropriate duration of NPWT remains unknown. We propose that the treatment is continued until the mediastinal pus culture becomes negative. In the present case, the sternal closure with omental transposition was performed 8 days after the mediastinal culture became negative.

This case suggests that a patient developing mediastinitis or pump pocket infection after an implantable LVAD insertion could be rescued by NPWT, followed by omental transposition without removal of the infected device.

**Conclusion**

Negative pressure wound therapy followed by omental transposition may be useful to treat mediastinitis or pump pocket infection developing after insertion of an implantable LVAD.

**Disclosure Statement**

Mitsutoshi Kimura, Takashi Nishimura, and Shunei Kyo belong to Department of Therapeutic Strategy for Heart Failure, which is an endowed department sponsored by 13 companies including Sun Medical Technology Research Corp. (Nagano, Japan).

Osamu Kinoshita, Takashi Nishimura, and Shunei Kyo have been reimbursed by KCI KK (Tokyo, Japan) for attending several conferences.

The others have no conflict of interest.
References