Infective Endocarditis Caused by *Listeria monocytogenes* Forming a Pseudotumor

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**Abstract**

A 73-year-old woman with breast cancer and metastasis under chemotherapy suffered from fever, pleural effusion and pericardial effusion. Despite the administration of treatment with cefozopran and prednisolone, the patient’s fever relapsed. An electrocardiogram identified a new complete atrioventricular block and an echocardiogram revealed vegetation with an unusual pseudotumoral mass in the right atrium. Blood cultures grew *Listeria monocytogenes*. The patient was eventually diagnosed with right-sided infective endocarditis, which improved following the six-week administration of ampicillin and gentamicin. Homemade yoghurt was suspected to be the cause of infection in this case. Listeria endocarditis is rare; however, physicians should pay more attention to preventing this fatal disease in immunocompromised patients.

**Key words:** *L. monocytogenes*, endocarditis, pseudotumor

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**Introduction**

*Listeria monocytogenes* is a facultative anaerobic, nonspore-forming, short Gram-positive rod that can grow in various environments, including the refrigerator. Listeria is often transmitted via the ingestion of contaminated food and is an important cause of life-threatening infection among elderly individuals and immunocompromised patients (1). The use of proton pump inhibitors (PPIs) is also a risk factor for listeriosis (2). The most common clinical manifestations are bacteremia and meningitis; however, endocarditis is uncommon (1). Since the disease was first described in 1955, approximately 80 case reports of endocarditis due to *L. monocytogenes* have been published (3-5). Listeriosis has also been reported to be associated with a high rate of mortality due to septic complications, with a predominance of left-sided involvement (3, 4). However, there are only a few reports of cardiac masses forming in the right atrium (6, 7). In this report, we present a rare case of Listeria endocarditis that developed in a breast cancer patient under chemotherapy and specifically involved the right atrium with unusual cavity formation.

**Case Report**

A 73-year-old woman with a history of breast cancer and diabetes mellitus presented with a sustained fever lasting for one month with malaise and anorexia. She had undergone bilateral mastectomy and received chemotherapy for multiple bone metastases. She was currently under good glycemic control. Her former physician diagnosed her with pericarditis and pleuritis based on the presence of pleural and pericardial effusion. The laboratory findings at the time included a white blood cell count of 11,900/μL with 85.8% polymorphonuclear cells and a C-reactive protein level of 23.78 mg/dL. Cefozopran (1 g every 12 hours) and prednisolone (40 mg/day) were administered, and the patient’s symptoms improved. At that time, echocardiography showed only pericardial fluid without any masses in the cardiac chambers. An echocardiogram demonstrated a normal sinus rhythm (Fig. 1A). The patient was discharged on the eighth hospital
day and subsequently readmitted for fever within one week. Therefore, she was referred to our department. On a physical examination, her body temperature was 37.9°C and her respiratory sounds were attenuated in the right chest, with an oxygen saturation of 96% on room air. A cardiac examination revealed a grade III/VI systolic murmur without an aortic regurgitant murmur. Pitting edema in the legs and postoperative lymphedema in the upper limbs were observed. There were no abnormal neurological findings or peripheral signs of infective endocarditis. The laboratory findings included a white blood cell count of 7,520/μL with 93% polymorphonuclear cells. All other laboratory data were unremarkable, except for some elevated levels of serum tumor markers. Cardiomegaly and pleural effusion were present radiographically. Fluid was obtained from the pleural effusion via thoracentesis. The samples exhibited lymphocyte predominance, while the results of a chemical analysis were normal, including the level of adenosine deaminase. A culture of the pleural effusion was negative, and the cytodiagnosis identified malignant cells. Blood cultures obtained at that time were negative. An electrocardiogram identified a new complete atrioventricular block (Fig. 1B). Transthoracic and transesophageal echocardiograms revealed vegetation, a mass with a cavity in the right atrium and thickening of the intra-atrial septum with a normal ejection fraction (Fig. 2) and localized pericardial effusion in the front of the right atrium without evidence of compression. No abscesses or fistulae of the perivalvular annular region were detected. A patent foramen ovale was also observed on a Doppler flow and bubble study. The right atrium pressure was within the normal limits. Soon after undergoing transesophageal echocardiography, the patient developed significant sinus bradycardia requiring a temporary pacemaker. We assumed that the thickening lesion in the intra-atrium septum possibly affected atrioventricular node conduction. Repeated blood cultures grew \textit{L. monocytogenes} sensitive to ampicillin (minimum inhibitory concentration: MIC 0.25 (μg/mL)) and trimethoprim (MIC ≤10.0 (μg/mL)). According to modified Duke’s criteria, we diagnosed the patient with infective endocarditis caused by \textit{L. monocytogenes} and initiated the administration of ampicillin (2 g every four hours) for six weeks and gentamicin (40 mg every eight hours) for four weeks. During this treatment, the patient was afebrile, and the blood cultures were negative. The pacemaker lead was replaced every two weeks, and the cultures of its tip were negative. A transesophageal echocardiogram revealed that the area of vegetation on the right atrial free wall had disappeared, while the mass and area of focal thickening in the intra-septum region had decreased. However, the antibiotic therapy did not resolve the atrioventricular block. Without the support of the temporary pacemaker, an electrocardiogram showed a junctional rhythm of 40/min, which resulted in low-output heart failure, that is a decreased urine output and exacerbation of renal impairment within a few days, even under optimal medication. Therefore, we determined that pacemaker implantation was required to treat the patient’s symptomatic bradycardia. She completed a six-week course of antibiotic therapy and subsequently underwent permanent pacemaker implantation. During the treatment for infective endocarditis, she had stopped chemotherapy. Whole-body imaging with computed tomography scans showed no evidence of septic embolism or focal abscess formation; however, multiple metastases were detected in the liver. In spite of the readministration of chemotherapy, the patient died of exacerbation of the underlying disease.

**Discussion**

In previous reports, various underlying conditions have been noted in the majority of patients with Listeria endocarditis, including cardiac valve disease, cancer, a history of organ transplantation and the use of immunosuppressive agents (1-3). The present patient had only a patent foramen ovale as a cardiac condition, which is generally thought to carry a low risk of endocarditis. According to an analysis of the clinical characteristics of listeriosis patients with cancer, an advanced or relapsed state, the recent use of antineoplastic agents or systemic corticosteroids and the presence of advanced liver disease are significant risk factors (8). Correspondingly, we consider that the immunosuppression linked to recurrent breast cancer with bone metastases, chemotherapy and the administration of corticosteroids played a major role in the pathogenesis of invasive listeria infection in the present case.

In addition, the current patient had a previous history of questionable food exposure. We suspected that homemade yoghurt, which she often ate, may have promoted the infection. We therefore herein would like to highlight the importance of food safety. Listeriosis, although rare, can be fatal in immunocompromised individuals, with a fatality rate of over 20%. It is the third leading cause of death among major diseases transmitted by food (9). However, listeriosis has not yet been fully recognized to be a foodborne disease in Japan. Many outbreak-associated cases have been reported in the U.S. (10), while only one outbreak case has been documented in Japan (11). The rates of isolation of \textit{L. monocytogenes} from various retail foods, including meat, seafood products, raw milk and ready-to-eat foods (12), are not lower in Japan than those observed in other countries. Listeriosis is a preventable foodborne illness, and more care-
ful attention should be paid to food safety. However, practice guidelines for the management of immunocompromised hosts, such as patients with cancer or organ transplantation, do not mention the prevention of listeriosis in Japan. Refining professional training is required to achieve better protection against Listeria (13). Health care workers should more precisely instruct compromised patients not to consume foods contaminated with Listeria.

A clinically unique point regarding this case is the appearance of unusual echocardiographic findings in the right atrium. Making the differential diagnosis was confusing due to the patient’s atypical structure and the lack of information on the initial cultures. We considered differential diagnoses of infective endocarditis, an invasive cardiac tumor affected by the breast cancer and, less likely, nonbacterial thrombotic endocarditis (NBTE). It should be noted that our patient had a history of breast cancer with multiple bone metastases. In the literature, cardiac metastases have been reported to be found in 1.5 to 20% of patients with malignancy and in only 0.2 to 6.5% of the general population in autopsy series (14, 15). However, in the present case, considering that the mass was not detected one month earlier and also decreased in size following the administration of the antibiotics without chemotherapy, we suspected that the mass was infective.

Significantly similar cases have been described in the literature. In one case, endocarditis occurred in a 44-year-old woman with a history of multiple sclerosis (6). In another, an inflammatory pseudotumor (IPT) of the heart was detected in a previously healthy 5-year-old boy (7). In both cases, echocardiography revealed abnormal formation involving the right atrium, and the patients presented with sick sinus syndrome. The resected tissues demonstrated that the tumor pathology was associated with L. monocytogenes. The histological findings in the second case showed a fibroinflammatory proliferation consisting of fascicles of myofibroblasts with interspersed lymphocytes, plasma cells and neutrophils surrounding a large central necrotizing abscess. IPT of the heart is rare and its etiology is largely unknown. However, these two cases suggest that the atypical mass in the right atrium observed in the present case was also associated with IPT.

This is the first case report of endocarditis caused by L. monocytogenes in a patient with an unusual right atrial structure in Japan. L. monocytogenes is a rare cause of endocarditis that can induce the development of pseudotumors and conductive abnormalities. Clinicians should pay more careful attention to this organism in immunocompromised patients in order to avoid listeriosis, which is associated with a high rate of mortality.

The authors state that they have no Conflict of Interest (COI).

References

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