

## Aspergillus Infection in a Large Thrombus of a Permanent Ventricular Pacing Lead

Pacemaker lead infection is a rare but a dangerous complication. Diagnosis can usually be established by the clinical picture and blood cultures. Transesophageal two dimensional echocardiography might be crucial in the diagnosis by visualizing pacing lead vegetations. Medical treatment alone is rarely successful, and several studies have suggested the infected pacemaker systems should be removed quickly for optimal management. We describe a case of *Aspergillus* infection in a permanent ventricular pacing lead, which appears to be the first reported case in Korea. A 30-yr-old man was evaluated for the symptoms and signs of congestive heart failure 3 yr after DDD pacemaker implantation. The transthoracic and transesophageal echocardiogram showed a large movable round shaggy mass attached to a ventricular lead in the right atrium. The atrial and ventricular leads were removed during cardiopulmonary bypass, and a new epicardial pacing system was implanted. The functional ventricular pacemaker lead was encased in a large organized thrombus. Histological findings were consistent with *Aspergillus* infection in a large thrombus attached to a pacemaker lead.

Key Words : *Aspergillus*; Pacemaker, Artificial; Echocardiography

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### INTRODUCTION

Pacemaker lead infection is a rare but a dangerous complication with a high mortality (1). The estimated incidence of the infection after permanent endocardial pacemaker implantation varies from 0.2% to 3% (2). Fungal infections of pacemakers are particularly rare. Diagnosis of pacemaker lead infection can be difficult; however, a recent report has suggested that the transesophageal echocardiography could be crucial in diagnosis by visualizing pacing wire vegetation (3). Several studies have reported that the medical treatment alone was rarely successful, and thus infected leads should be removed quickly for optimal management (4-6). In this article, we report a case of *Aspergillus* infection in a large thrombus on a pacemaker lead, which was well visualized on a two-dimensional transesophageal echocardiography.

### CASE REPORT

A 30-yr-old man with a chief complaint of exertional dyspnea for 3 months was admitted to our hospital. A DDDR permanent pacemaker had been implanted 3 yr before due to sick sinus syndrome with complete atrioventricular block. After three months of pacemaker insertion, no visible P waves nor A waves of transmitral or transtricuspid flow were observ-

ed on the electrocardiogram or Doppler echocardiogram, respectively. An electrophysiologic study did not reveal any electrical activity in either atria (so-called "atrial paralysis"). Thus, the pacing mode had been changed to VVIR. He has been well since that time.

On admission, the patient had no fever, but a systolic murmur at the left lower sternal border and a mild hepatomegaly were discovered on physical examination. Oxygen saturation was 90% to 96% at room temperature. Peripheral blood examination revealed 18,500 white cells per cubic millimeter with 43% eosinophils, and the total eosinophil count was 9,500 per cubic millimeter. Chest radiography film showed a moderate cardiomegaly and increased pulmonary vasculature. Transthoracic echocardiogram revealed a round mass attached to the ventricular lead in the right atrium, which extended across the tricuspid valve into the right ventricle during systole, and a moderate to severe degree of tricuspid regurgitation. Subsequently, transesophageal echocardiographic examination was performed with commercially available 5-MHz biplane transducer. A large round shaggy mass was attached to the ventricular lead, moving in the right atrium (Fig. 1).

The lead was removed during cardiopulmonary bypass, and a new epicardial pacing system was implanted. The functional ventricular pacemaker lead was encased in a large organized thrombus (Fig. 2). However there was no thrombus on the

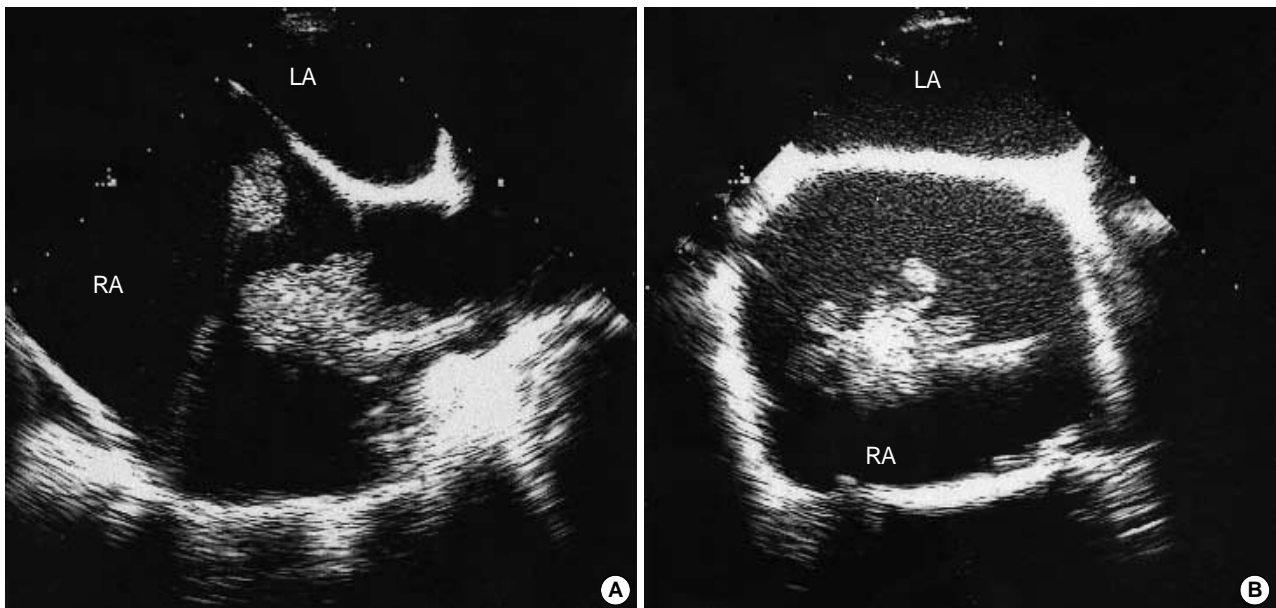


Fig. 1. Transesophageal echocardiographic view demonstrating a large round mass in the right atrium (RA), encased to the ventricular lead. A: longitudinal plane. B: horizontal plane. LA: left atrium.



Fig. 2. The functional ventricular pacemaker lead is encased by a large organized thrombotic material. However, there is no thrombus on the atrial pacemaker lead (upper wire).

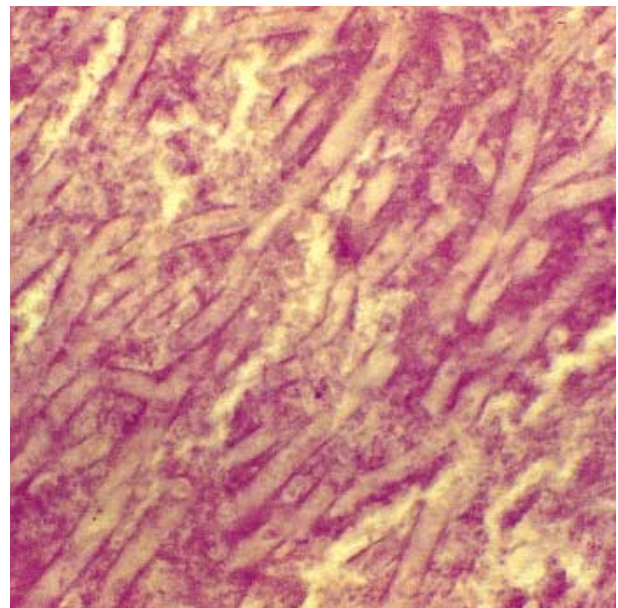


Fig. 3. A section of the right atrial thrombus reveals abundant branching septate hyphae within the thrombotic material (Hematoxylin and Eosin;  $\times 1,000$ ).

atrial pacemaker lead. The histological examination showed mycelial hyphae in the thrombus accompanied by a massive infiltration of eosinophils (Fig. 3). This pathologic finding was consistent with *Aspergillus* infection in the thrombus. On the 2nd postoperative day, white cell count was 11,700 per cubic millimeter with 80% neutrophils, 20% lymphocytes, and 2% eosinophils, and the total eosinophil count

decreased to 234 per cubic millimeter. On the 7th postoperative day, there was a sudden onset of hemoptysis. High resolution computed tomogram showed a consolidation with inflammatory infiltration in the right upper lobe. Intravenous amphotericin B was administered for 6 weeks (total dose 1,365 mg), and then the patient was discharged from the hospital under afebrile condition. The patient was well dur-

ing the 3 yr of follow-up.

## DISCUSSION

Implantation of a permanent transvenous pacemaker is a procedure well accepted for the treatment of cardiac conduction disturbance and arrhythmias. Pacemaker endocarditis is a less common but a severe complication that may threaten the patient's life (7). Though uncommon, infection associated with these permanently indwelling intravascular prostheses may occur with little local evidence of inflammation. Incidence of pacemaker system infection is estimated between 0.2% and 3% according to the literature (2). The infection process can affect any part of the pacemaker system, most commonly the pocket site. Pacemaker endocarditis most often arises from the infected pocket. But our patient had no evidence of pocket infection. The possible cause of significant eosinophilia in our patient is probably allergic reaction to *Aspergillus* infection. After removal of infected leads, the peripheral blood eosinophil counts markedly decreased to normal level.

Thrombi commonly form on the electrodes, and most of them remain asymptomatic (8, 9). The high incidence of thrombus formation is supported by the autopsy data (10). The endothelialization of an electrode causes a thickening of the wire, which can be detected by the two-dimensional echocardiography (11). However, if this thickening is redundant, it might be difficult to distinguish from a vegetation. Deposition of thrombi on the lead seeded by blood borne bacteria is another, probably less common, possibility for developing pacemaker endocarditis. In these cases, the source of infection can rarely be identified (12, 13).

Pacemaker-related fungal infection is extremely rare (14). A case of disseminated aspergillosis and pacemaker endocarditis has been described in a 65-yr-old woman with fever of unknown origin (16). The patient had no recognized risk factors for the development of fungal infection. A functional transvenous pacemaker lead was completely encased in a large infected thrombus and might have been the initial site of infection. However, most disseminated infection due to *Aspergillus* species has been reported only in patients with a compromised host defense system. *Aspergillus* endocarditis, on the other hand, affects patients with prosthetic cardiac valves who are not usually immunosuppressed (16). Infection could arise in several ways: airborne organisms may settle into the operative field during valve replacement; they may be introduced when intravascular catheters are placed; or they may enter the bloodstream from the lungs. In our patient, the source of the infection is not known. But the causative factor was a huge intracardiac thrombus formation due to blood stasis from atrial paralysis. He had not received anticoagulants after the implantation of the transvenous pacemaker. It must be emphasized that the presence of blood stasis due

to significant tricuspid regurgitation or paralysis of the right atrium, necessitates a long-term anticoagulant therapy and serial echocardiogram. Moreover, Zager et al. (17) suggested that the epicardial pacemaker electrodes be considered in patients at high risk of thrombosis.

One of the major advantages of echocardiography is non-invasive detection of a vegetation, a hallmark of the lead infection. Transthoracic echocardiography (TTE) demonstrated a vegetation in only 23% of patients, whereas transesophageal echocardiography (TEE) disclosed an abnormal appearance on the pacemaker lead in 94% (18). The major advantage of TEE is related to its ability to demonstrate tricuspid involvement, particularly in patients whose poor echogenicity rendered TTE unreliable (19). The high rate of uncontrolled infection or relapse among patients with septicemia in relation to pacemaker material infection rationalizes the need for an immediate removal of the entire pacing system (18). This is obvious for systemic infection related to lead contamination and is also important in obvious infection of the subcutaneous part of the lead. The choice of the technique of ablation (surgical or subcutaneous) was based on the size of the vegetation assessed on TEE, the presence of morphological change of the tricuspid valve, and the general condition of the patient.

Because the diagnosis of fungal infection has usually to be made premortem, recommendations for treatment of fungal endocarditis must be based upon indirect observation. These include the sensitivity of most fungi to amphotericin B, the known failure of antimicrobial therapy alone to cure either *Aspergillus* endocarditis or pacemaker infection (2), and the success of surgical removal of bacterially infected pacemaker systems (18). Therefore, the treatment of choice would be surgical removal of infected pacemaker system and associated vegetations combined with systemic administration of amphotericin B (14).

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