**Case
Report**

Infection of Pacemaker Lead by Penicillin-resistant *Streptococcus Pneumoniae*

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Penicillin-resistant *Streptococcus pneumoniae* (PRSP) infections have steadily increased worldwide; however, there are only a few reports of permanent pacemaker-related infections caused by PRSP. Here, we describe a patient who developed 7 episodes of endocarditis and sepsis from PRSP infection of the pacemaker lead in the right atrium. By periodic administration of vancomycin and extraction of both leads, we resolved the infection.

Key words: penicillin-resistant *Streptococcus pneumoniae*, pacemaker, surgery, vancomycin

Introduction

Penicillin-resistant *Streptococcus pneumoniae* (PRSP) infections are steadily increasing around the world.¹⁾ However, there are very few reports of permanent pacemaker-related infections caused by penicillin-resistant streptococci.²⁾ Here, we describe how the periodic administration of vancomycin and extraction of the right atrium lead resolved a PRSP infection in one patient.

Case Report

The patient was a 66-year-old man. A permanent, dual-chamber pacemaker was implanted for a complete atrioventricular block in 1998. The prognosis of the patient after the implantation had improved; however, the patient developed sepsis caused by PRSP (MIC, 1 µg/ml) that was triggered by periodontitis and dental caries in June 2005. The symptoms improved with carbapenem administration; however, the sepsis recurred repeatedly.

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The patient developed DIC and bacterial meningitis as complications of PRSP (MIC, 2 µg) infection, and a pacemaker lead infection was suspected. All of the patient's teeth were extracted in an attempt to remove all sources of infection other than that of the pacemaker lead. Subsequently, the symptoms improved temporarily, but sepsis occurred a seventh time. The patient temporarily recovered with antibiotic treatment but thereafter developed sepsis repeatedly. Symptoms improved with carbapenem administration; however, because the right atrium lead was most likely infected with PRSP, the patient was referred to Jichi Medical University Hospital for extraction of the pacemaker leads.

The permanent pacemaker in the left subclavicular subcutaneous area had no red flares or swelling at the site. The cardiothoracic ratio (CTR) was 42.3% in the chest X-ray that revealed 1 pacemaker lead in the right atrium and the other, in the right ventricle. The clinical examination of blood revealed a white blood cell count of 4,800 /µl, haemoglobin level of 11.3 g/dl, platelet count of 29.9×10^4 /µl and C-reactive protein level of 1.05 mg/dl.

The administration of 2 g of vancomycin per day was initiated. In October 2006, pacemaker leads were extracted, and implantation of an epicardial myocardial electrode and generator replacement was performed under extracorporeal circulation. During an ordinary sternotomy, cardiopulmonary bypass was initiated with ascending aortic perfusion and bicaval drainage. The aorta was cross-clamped with antegrade infusion from blood cardioplegia. Opening the right atrium revealed the

Fig. 1 Abrasion ~ 11 cm from distal end.

Fig. 2 Abrasion 7,2 cm from distal end.

part of the ventricle lead that was adjacent to the posterior tricuspid valve and adhering to the valve cusp. Furthermore, under the membrane, the entire lead had discolored to brown, thus leading us to regard this as the cause of infection. We cut the part of the ventricle lead that had adhered to the posterior tricuspid valve, and although the tip had been placed in the lower wall, we could easily remove it manually. We extracted the lead that was located in the auricle of the right atrium and buried in the wall and resected some right atrial tissue with it. The atrium lead exhibited no gross alterations. One epicardial myocardial lead was stitched to the anterior surface of the right ventricle, and a new generator was placed subcutaneously in the left upper abdominal quadrant.

Damage and wear were observed on the ventricle lead at 7.5 and 12 cm from the distal end, and the entire lead was infiltrated with body fluids (**Figs. 1 and 2**).

During the 6 weeks of vancomycin treatment after surgery, the inflammation decreased steadily. There were no complications. The patient remained completely asymptomatic 2 years after surgery with no recurrence of infection.

Discussion

Penicillin-resistant *Streptococcus pneumoniae* in the nasopharynx of healthy children and adults is usually harmless, though in young children, the elderly, or in people with severe illness or chronic health problems of the lung, heart, or kidney disease, PRSP may cause pneumonia, meningitis, or otitis media.

In recent years, there has been a dramatic, worldwide increase in the prevalence of PRSP, especially in some

European countries, certain regions of the USA, South America and South East Asia, with an increase in prevalence of around 40% to 50%, attributable to the excessive use of antibiotics, particularly β -lactams. In an attempt to address this problem, it has been proposed that prescribing of these drugs should be reduced or avoided altogether.³⁾

Pacemaker lead complications that develop due to compression of a lead between the first rib and clavicle have been described.⁴⁾ In this case, the cause of damage to the lead was considerable due to abrasion between the ventricle and atrium leads.

About 3.25 million patients worldwide have pacemakers. Initial cases of pacemaker endocarditis were described in the early 1970s, and pacemaker infections have been reported to occur in 0.13% to 19.9% of patients.⁵⁾ Most infections occur in the pacemaker generator pocket. Pacemaker endocarditis is less common and reportedly accounts for 10% of pacemaker-associated infections.⁵⁾

Conservative medical treatment or salvaging of the pacemaker system is strongly associated with relapsing endocarditis. Partial extraction of an infected segment of the pacemaker system has a risk of recurrent infection. Most surgeons concur that removal of the entire pacemaker system is necessary, regardless of the extent of the infection.⁶⁻⁸⁾

Coagulase-negative staphylococci (42%) and PRSP (29%) are predominantly responsible for permanent pacemaker-related infections, followed by gram-negative bacilli (9%) such as *Klebsiella pneumoniae*, *Serratia marcescens*, *Pseudomonas aeruginosa*, *Stenotrophomonas maltophilia*, *Acinetobacter xylosoxidans*,

Acinetobacter baumannii, *Citrobacter koseri*, *Morganella morganii*, *Haemophilus influenzae* and *Moraxella catarrhalis*. Infections caused by gram-positive bacilli such as PRSP are low at 4%.^{8, 9)} An increase in the administration dose of a third-generation cephem antibiotic can treat a PRSP infection in patients with pneumonia, endocarditis, or sepsis.^{5, 9)} In the case reported here, since the infection was caused by a foreign body, a pacemaker lead, we selected vancomycin. By preoperative administration of vancomycin, we were able to perform the surgery under conditions in which the infection was controlled. Furthermore, we decided to administer vancomycin for 6 weeks after the surgery.^{5, 6, 8)} The patient had no complications from the surgery, and the infection was resolved.

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