

Long-term survival with pocket-defected permanent pacemaker after conservative management of pacemaker infection



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Introduction

Infection of a cardiac implantable electrophysiological device (CIED) is a life-threatening condition. The prevalence of CIED-related infections is reportedly around 1.0% and continues to increase.¹ CIED-related infections are not limited to generator pocket infections; in some cases, bloodstream infections (bacteremia, lead infection, or endocarditis) may occur, resulting in mortality.² The mortality and recurrence rates are higher with conservative management, so complete CIED removal is strongly recommended.³ Here, we report the case of a CIED-related infection with long-term survival by conservative management in the absence of a definitive treatment.

Case report

An 89-year-old Japanese woman presented to our hospital with swelling and heat surrounding a CIED pocket. Eleven years previously, she had been diagnosed with sick sinus syndrome and underwent a permanent double-chamber pacemaker implantation in the left prepectoral area. Two years before the current presentation, there was a routine change of the pacemaker generator. Other past medical history included Alzheimer disease and hypothyroidism, so there was difficulty in judging the condition owing to dementia. Her vital signs on admission were stable. The skin surrounding the generator was erythematous and warm. Fluid collection was suspected upon palpitation. A 12-lead electrocardiogram showed atrial pacing and ventricular sensing by the permanent pacemaker. Chest radiography, computed tomography, and transthoracic echocardiography revealed no evidence of heart failure, vegetation, or septic embolism (Figure 1). Importantly, however, the increased ad-

KEY TEACHING POINTS

- Our patient has survived long term with conservative management after cardiac implantable electrophysiological device (CIED) infection.
- Pacemaker leads were directly protruding from the chest epidermis owing to complete pocket deflection.
- Complete removal is strongly recommended for CIED infection.
- In conservative treatment, careful protection of the lead body and generator is needed.

ipose tissue density surrounding the pacemaker was indicative of inflammation. Blood tests revealed an elevated white cell count (11,200/ μ L) and C-reactive protein level (6.19 mg/dL).

We diagnosed a CIED-related infection and recommended the necessity of complete device removal. Owing to the patient's advanced age, dementia, and frailty, however, her family opted against invasive treatment. We speculated that her prognosis was very poor and intravenously administered an antibiotic (vancomycin, 250–1000 mg/day). The CIED pocket gradually enlarged and pocket rupture occurred on the fourth day of hospitalization. A large amount of pus discharged from the pocket and culture revealed methicillin-susceptible *Staphylococcus aureus*. Three sets of subsequent blood cultures on admission showed no evidence of bacteremia. The pocket was washed out with saline and iodine and gauze dressing was changed every day. Blood test results improved, and after 50 days of hospitalization she was discharged with long-term antimicrobial suppressive therapy.

Serial images of the pacemaker pocket site are shown in Figure 2. The pacemaker pocket was partially defective at

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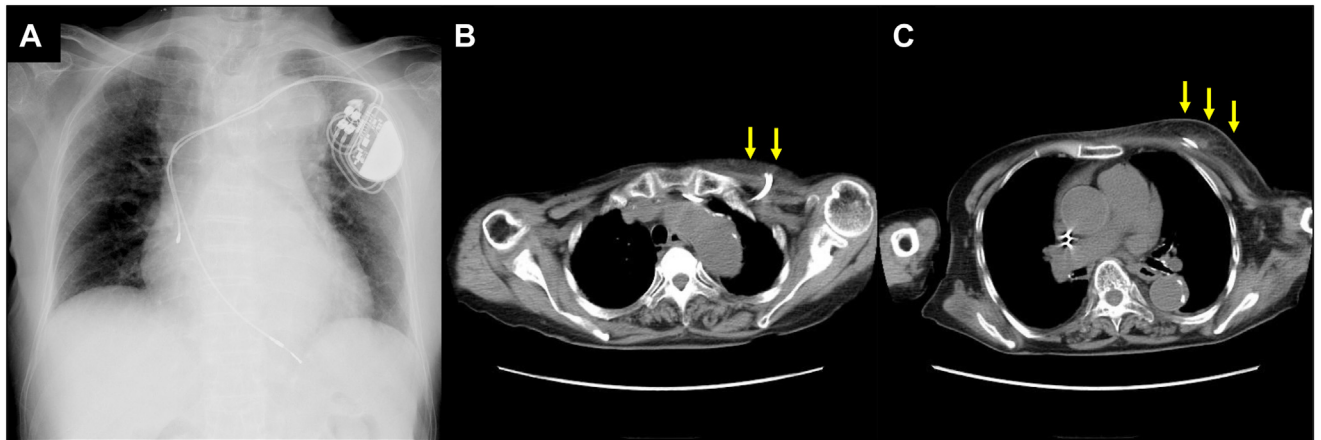


Figure 1 Chest radiography and computed tomography on admission. **A:** Chest radiography. **B, C:** Inflammation was suspected (yellow arrow).

discharge. She had a biannual checkup at our outpatient clinic. Eighteen months after discharge, the pocket was seen to have completely disappeared and subsequently granulation was observed. Finally, near-complete skin formation was observed at 2 years. At the time of writing, 2.5 years after the CIED pocket infection, the patient's condition has remained good, with favorable skin formation. Pacemaker leads are directly protruding from the chest epidermis owing

to complete pocket deflection, so the generator and pacemaker lead are protected with a gauze to avoid injury. Despite the originally poor prognosis, the patient has lived for 3.5 years.

Discussion

In this case, the CIED pocket ruptured and finally deflected owing to CIED-related infection. Isolated generator pocket

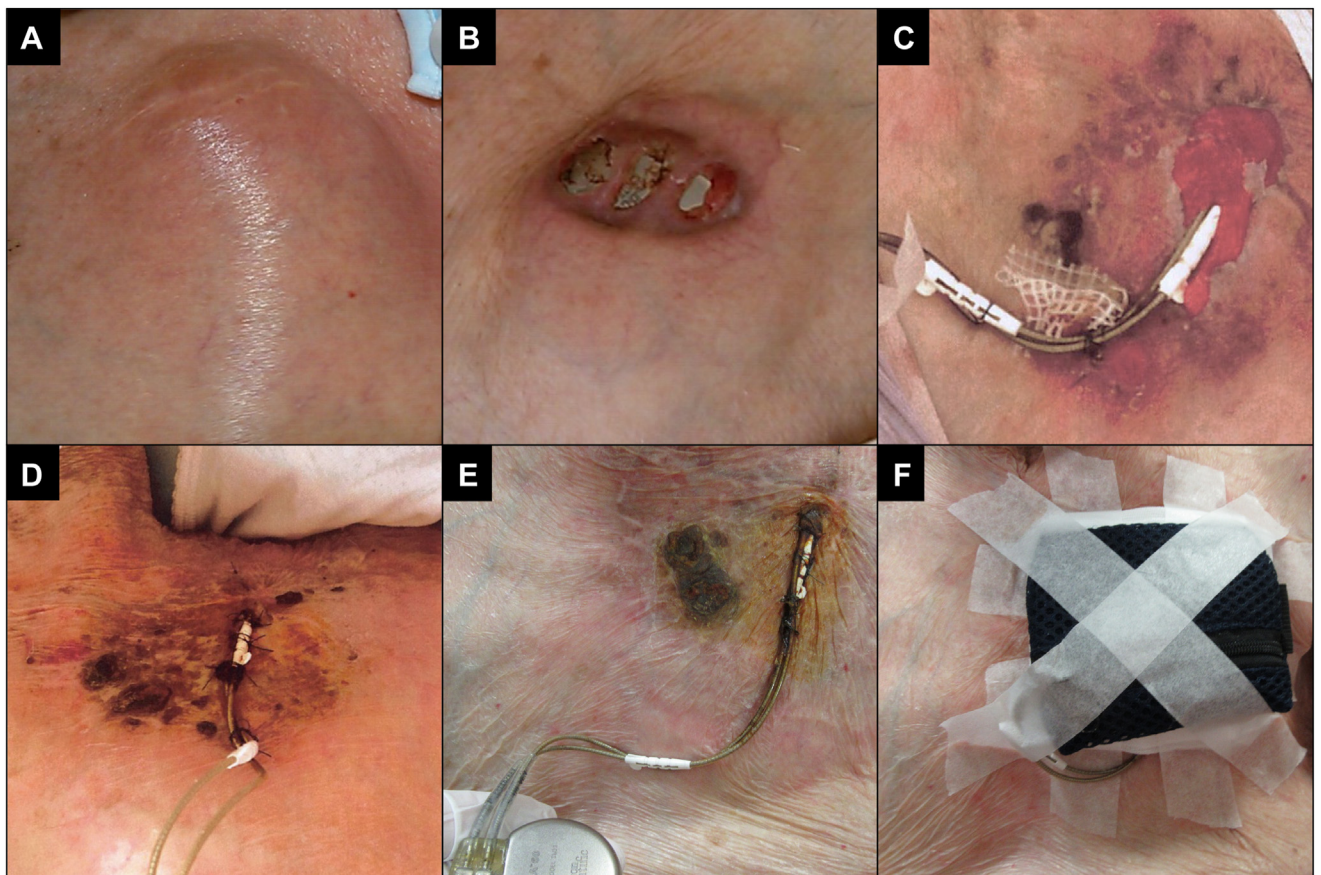


Figure 2 Serial clinical appearance of the site of the implanted device. **A:** At admission. **B:** At discharge (50 days after admission). **C:** Eighteen months later. **D:** Two years later. **E:** Thirty-six months later. **F:** Protection of the lead body and generator.

infection and erosion without bacteremia were diagnosed. Conservative treatment might therefore have comprised partial generator removal with reimplantation of a new sterilized generator, or an all-new pacemaker implantation on the contralateral site.⁴ However, conservative treatment of CIED-related infections without complete CIED removal reportedly resulted in high rates of mortality in a large cohort population.⁵ Recent studies have proven the safety and efficacy of laser-assisted lead extraction.⁶ We therefore acknowledge the strong recommendation for complete CIED removal, including the pacing leads, which might have been the most suitable treatment, even in our patient. Elsewhere, favorable outcomes of conservative treatment were reported in a case of pacemaker pocket infection by a 2-stage surgical revision technique with a continuous infusion of antibiotics.⁷ In addition, long-term survival has been reported in cases of conservative treatment consisting of removing infected and necrotic tissue.^{8,9} Our case is unique because pacemaker leads directly protruded from the chest epidermis owing to complete pocket deflection and we were able to achieve long-term survival. To the best of our knowledge, there are no similar case reports in literature. We initially speculated the infection could not be controlled and that it would lead to early death. However, contrary to our expectations, the patient has been able to survive for a long time. As a lesson from this case, even if a CIED system exists outside of the body, careful wound management may enable long-term survival. Complete CIED removal should therefore have been considered again after achievement of infection control. Even if conservative therapy is ultimately chosen, as in this case, there is a possibility of pacemaker lead damage outside the body and subsequent cardiac arrest. Careful protection of the patient's lead insulation is necessary.

There are several potential explanations as to why infection control was achieved in the current case despite loss of the pacemaker pocket. First, the pacemaker pocket may have been made too shallow at the time of the initial surgery. Abundant subcutaneous tissue existed between the pocket and the greater pectoral muscle, which may have contributed to the protection from infection. Second, the relatively early discharge of pus may also have been a factor in infection control. Third, the pacemaker lead has no lumen through which blood can pass, and so bloodstream infections do not

commonly occur, unlike central vein catheter infections. Finally, the patient was in a nursing care health facility in which she was carefully monitored and cared for full time by medical doctors.

Conclusion

Our patient presented a rare case of a pacemaker lead protruding directly from her chest wall owing to pocket deflection after conservative treatment for CIED-related infection. Complete CIED removal is strongly recommended, but if treatment is conservative, careful protection of the lead body and generator outside the body is required.

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