

Surgical extraction of a giant intracardiac lead vegetation and epicardial pacemaker reimplantation in a pacemaker-dependent hemodialysis patient

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Abstract

A 57-year old male with a dual-chamber pacemaker and 40-year history of hemodialysis and autoinflammatory disease developed a large, 35 × 35 mm intracardiac vegetation on the right ventricular pacing lead. As this mass was large enough to occlude the tricuspid valve orifice, transvenous lead extraction was deemed unsuitable. Instead, an urgent surgical extraction of the whole pacemaker system, including leads and vegetation, was conducted under cardiopulmonary bypass. In light of a high risk of recurrent blood infection, a new dual-chamber pacing system was then immediately re-established using epicardial pacing leads on the right atrium and ventricle instead of transvenous electrodes. This case of a rare, giant intracardiac lead vegetation lacked most known causal factors, except for renal failure, but a possibly immunosuppressed cardiac microenvironment due to long-term steroid therapy may have been an important influencing factor.

KEYWORDS

hemodialysis, pacemaker, vegetation

1 | INTRODUCTION

As cardiac implantable electronic device (CIED) usage expands due to an aging society, so does the threat of lead-related infective endocarditis (LRIE). While a transvenous approach is common for CIED implantation, LRIE remains a concern, especially in hemodialysis patients where large intracardiac lead vegetation (ILV) may develop. Such vegetation greatly increases pulmonary thromboembolism risk during a standard transvenous lead extraction.

Here, we report the surgical extraction with cardiopulmonary bypass (CPB) of such an infected pacing system in a hemodialysis patient with an enlarged ILV on the right ventricular (RV) lead. A new epicardial pacemaker was immediately reimplanted in consideration of a significant risk of recurrent blood infection.

2 | CASE REPORT

A 57-year-old man was admitted with intermittent fever and a past medical history of dual-chamber pacemaker implantation, 9 years prior to treat a complete atrioventricular block. He also had a 40-year history of hemodialysis and long-term oral steroid administration for systemic autoinflammatory disease. Blood cultures were positive for methicillin-resistant, coagulase-negative staphylococcus and *S. epidermidis* was confirmed shortly thereafter. The white blood cell count was 18 000/μL with an elevated C-reactive protein of 16 mg/dL but no signs of pocket infection were noted.

Echocardiography revealed a giant, echogenic lobular mass (about 35 × 35 mm) around the RV lead (Figure 1), large enough to almost totally occlude the tricuspid valve (TV) in diastole. The ejection fraction was 58% and the patient had no signs of heart failure. After an empiric, 2-week course of vancomycin (VCM) and gentamycin (GM) had no effect on the

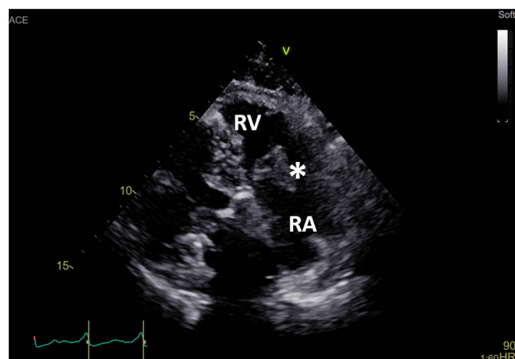


FIGURE 1 Transthoracic echocardiography showing giant vegetation (*) on the right ventricular lead. RA, right atrium; RV, right ventricle

mass, an urgent surgical extraction was performed as transvenous extraction of the pacing system was risky due to interference from the suspected ILV.

Under general anesthesia and a full sternotomy, CPB was established with ascending aortic and bicaval cannulation. Then, cardiac arrest was obtained. There seemed to be no severe adhesion between the two intracardiac leads and innominate veins. Upon opening of the right atrium (RA), a 35 × 35 mm ILV around the RV lead was seen occluding the TV (Figure 2), but the two pacing leads were normally located without abnormal loop formation. The giant ILV and tips of both leads were easily extracted without TV, RV, and RA wall injury. The pacemaker generator was removed from the right subclavian incision and remaining leads were also removed from the right subclavian vein without injury. No lead abrasion (externalization) was seen either macroscopically or microscopically. A new dual-chamber pacing system was immediately implanted using two epicardial leads on the RA and RV with a new generator positioned in the left hypochondrium. Pacing and sensing thresholds were acceptable.

Postoperative hemodynamics was stable and intensive care unit discharge occurred on postoperative day 3. Hemodialysis was resumed the day after surgery and inflammatory findings improved over time. GM was terminated at postoperative day 5 and VCM was continued for 6 weeks. The patient was transferred to a regional hospital for rehabilitation at postoperative week 4. There have been no signs of endocarditis recurrence during 12 months of the follow-up.

3 | DISCUSSION

LRIE occurs in approximately 1% to 7% of patients with CIED implantation.¹ Chronic hemodialysis patients, in particular, carry a high risk for LRIE due to frequent vascular access,^{2,3} with these patients experiencing an LRIE incidence of more than twice the overall CIED population.⁴

Giant ILV is scarcely reported in the literature⁵⁻⁷ but two recent reports suggest that intracardiac lead abrasion is an important factor for developing ILV.^{5,6} Polewczyk et al⁵ conducted a retrospective analysis of 500 LRIE cases and revealed that large ILV development is influenced by renal failure, heart failure, and procedural factors, including intracardiac lead abrasion, presence of defibrillation leads, and loops of the leads. In comparison, our case is consistent in terms of renal failure but lacks four of the other causal factors. However, we propose that an immunocompromised status from long-term oral steroid administration influenced the development of the ILV we encountered.

In our case, pacemaker implantation after long-term hemodialysis inevitably led to a pacing lead infection. Because of its giant size (>30 mm in diameter), a standard transvenous lead extraction with a percutaneous laser device was contraindicated. Instead, surgical extraction, followed by immediate epicardial lead implantation, was chosen in accordance with the Heart Rhythm Society guidelines that recommend open removal and debridement for vegetation larger than 20 mm.⁸

Immediate device extraction is essential for CIED infections, as the median time to death following diagnosis of CIED infection is 15.7 months (device extraction) vs 9.2 months (nonextractive therapy only).⁴ Regarding reimplantation in pacemaker-dependent patients, there are no differences in prognoses between immediate epicardial implantation and interim, epicardial pacing followed by delayed, definitive endocardial reimplantation after infection ablation.⁹ However, in pacemaker-dependent, hemodialysis patients, endocardial lead implantation should be avoided to minimize blood infection, making immediate epicardial implantation a best practice choice. Therefore, in our case, simultaneous epicardial lead implantation was the best solution. In transvenous extraction cases, however, a subxiphoid approach for immediate reimplantation is rational, while a left small thoracotomy may also be beneficial for dual-chamber pacing.

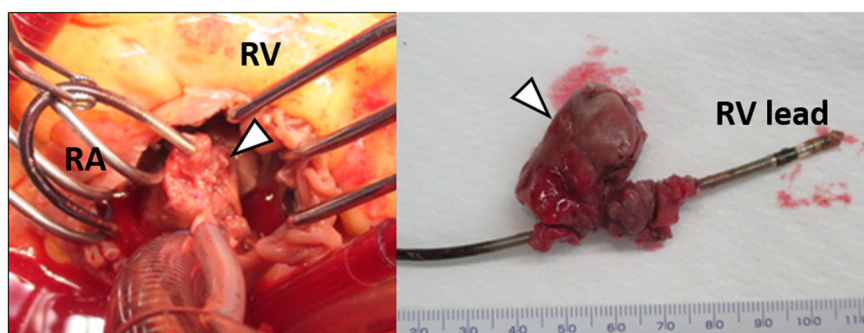


FIGURE 2 Vegetation on the right ventricular pacing lead (35 × 35 mm, white arrow), large enough to almost totally occlude the tricuspid valve. RA, right atrium; RV, right ventricle

4 | CONCLUSION

In summary, we presented the surgical extraction under CPB of an infected pacemaker system complicated by a giant ILV. As recurrent blood infection risks were high in this pacemaker-dependent hemodialysis patient, a new pacing system was immediately re-established via epicardial pacing leads. This case lacked most known factors for ILV formation except renal failure and a possibly immunosuppressant-related, cardiac microenvironment.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

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