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Case Report

Concurrent Epicardial Cardiac Resynchronization at Time of Complicated Biventricular Device Extraction: A Potentially Life-Saving Option

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ABSTRACT

A 60-year-old man with cardiac resynchronization therapy defibrillator (CRT-D) lead endocarditis underwent transvenous lead extraction that was complicated by coronary sinus laceration and tamponade. Severe left ventricular dysfunction and unstable hemodynamic parameters persisted after emergent sternotomy, drainage, and repair. Reinstitution of cardiac resynchronization therapy with an epicardial device resulted in immediate hemodynamic improvement. Our case illustrates the potentially life-saving nature of single-stage extraction and reimplantation in resynchronization responders.

RÉSUMÉ

Un homme âgé de 60 ans présentant une endocardite sur sonde de défibrillateur avec resynchronisation a subi une extraction de la sonde transveineuse qui a été compliquée par une lacération du sinus coronaire et une tamponnade. Une dysfonction ventriculaire gauche grave et une instabilité hémodynamique ont persisté après une sternotomie d'urgence pour, drainage et réparation. La réinstauration de la thérapie de resynchronisation cardiaque par un dispositif épicardique a entraîné une amélioration hémodynamique immédiate. Le cas que nous présentons montre que l'extraction en une étape suivie d'une réimplantation peut sauver la vie des patients répondant à la resynchronisation.

Lead extraction is associated with feared acute complications such as cardiovascular laceration and tamponade that require emergent cardiac surgery.[1] We describe a patient in whom complicated lead extraction with tamponade and hemodynamic instability was perpetuated by the loss of cardiac resynchronization (CRT) and for whom concurrent epicardial biventricular device reimplantation improved hemodynamic parameters.

Case

A 60-year-old man with dilated cardiomyopathy and previous CRT-D implantation was referred for lead endocarditis. CRT had improved his clinical status from New York Heart Association (NYHA) class IV to II with an ejection fraction improved from 15% to 35%. QRS shortened from ~190 to ~140 ms (Fig. 1, A and B). He never received any shocks or antitachycardia pacing therapies.

The patient had a 4-month history of fever and chills. Transthoracic echocardiogram revealed a 2-cm–long vegetation in the right atrium. The positron emission tomography (PET) scan was positive around the leads. Blood cultures were negative, as the patient was on oral antibiotics. Complete system extraction was recommended (Fig. 2A).

Soon after general anesthesia and lead mobilization, hemodynamic status declined, which was probably related to sepsis (temperature 38.9°C [102.02°F]) and loss of cardiac resynchronization. Right atrial and ventricular leads were extracted without complications (laser). As for the left ventricular (LV) lead, it was firmly attached distally into the coronary sinus. Transesophageal echocardiogram (TEE) showed extensive vegetations on the atrial side of the LV lead. The use of Evolution sheaths (Cook Medical, Bloomington, IN) freed the lead up to the coronary sinus. Ultimately, the lead broke (leaving a 3-cm section distally in the posterior vein). The patient's blood pressure dropped. TEE revealed LV contractility deterioration followed by pericardial effusion.

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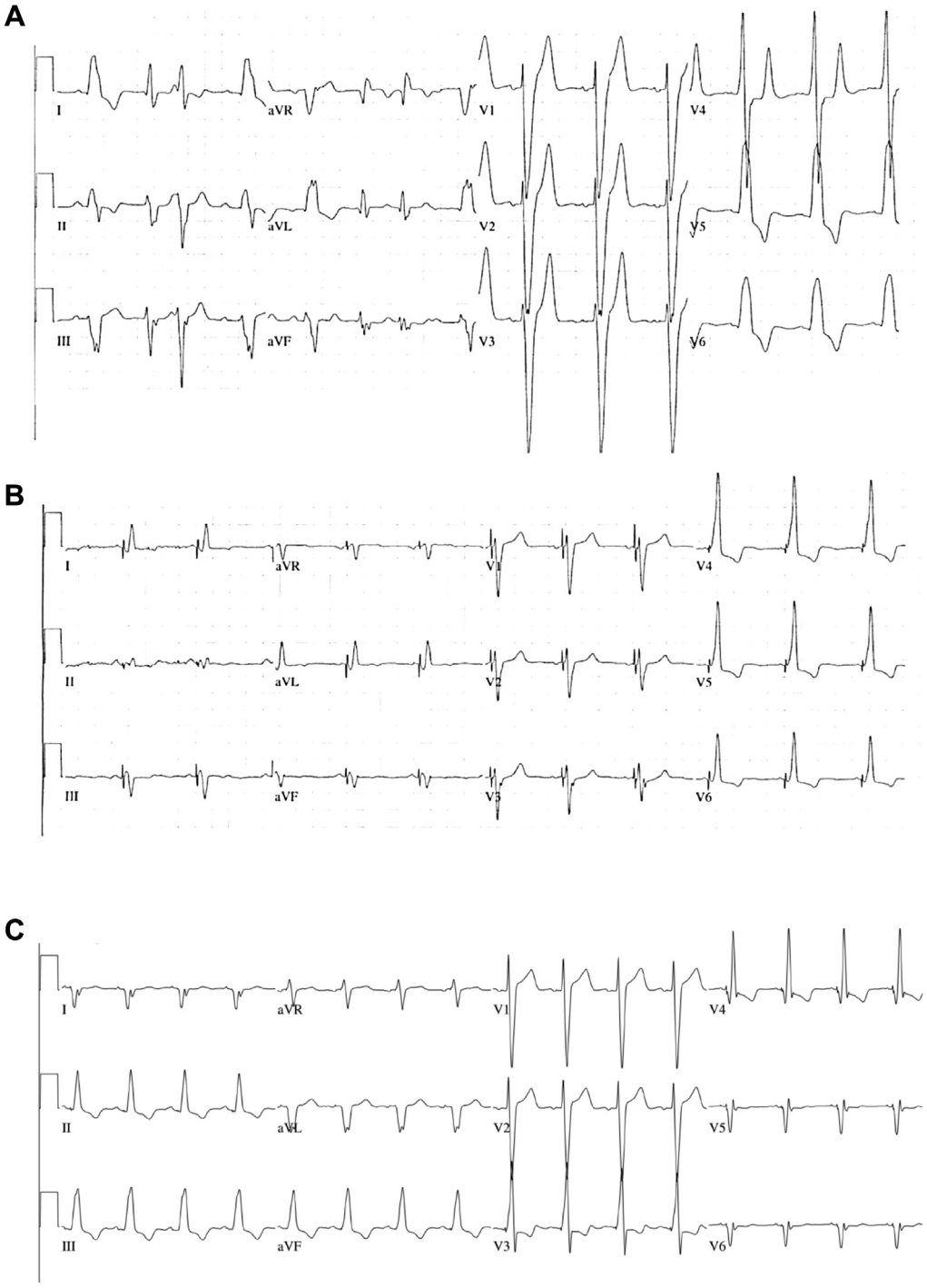

Figure 1. Electrocardiograms (ECGs): (**A**) ECG before transvenous cardiac resynchronization therapy (CRT); (**B**) ECG with transvenous CRT before extraction; (**C**) ECG after epicardial CRT reimplantation.

Emergent sternotomy was performed, the coronary sinus was repaired, and a bipolar 4968 epicardial lead (Medtronic, Minneapolis, MN) was placed on the lateral wall of the left ventricle to be used at a second-stage reimplantation. Coming off cardiopulmonary bypass was difficult. TEE showed severe LV and right ventricular (RV) dysfunction. Vasopressors and inotropic dosage were quickly increased with limited response (vasopressin 10 U/min, norepinephrine 0.3 μg/kg/min and epinephrine 0.2 μg/kg/min). Blood pressure increased, but biventricular contractility remained poor. Under such life-threatening circumstances, immediate resynchronization with permanent epicardial leads was performed (Fig. 2B). Epicardial leads were added to the RV and right atrium. All 3 leads were connected to a Viva CRT-P (Medtronic,

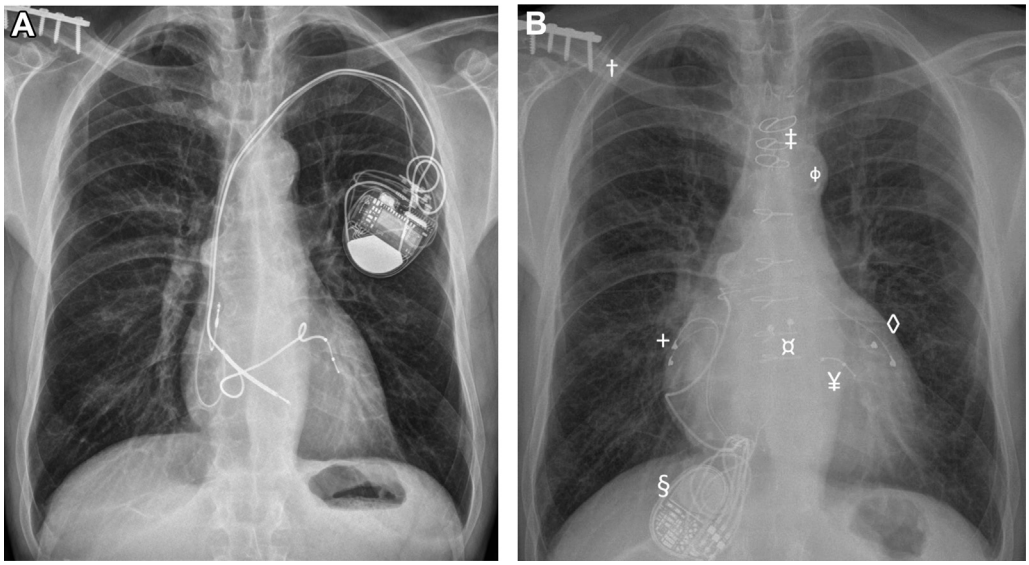

Figure 2. Roentgenogram images with transvenous CRT (**A**) and epicardial CRT (**B**). †: Clavicular plaque and screws; ‡: Sternotomy closing wires; Φ: Calcified aortic arch; +: Epicardial right atrial lead; ¤: Epicardial right ventricular lead; ¥: Coronary sinus lead remnant; ◊: Epicardial left ventricular lead; §: Pacemaker generator.

Minneapolis, MN) generator. Biventricular function improvement allowed for epinephrine to be weaned off and to come off cardiopulmonary bypass. Vasopressin and norepinephrine dosages were also lowered to 0.04 U/min and 0.6 μg/kg/min, respectively. The patient was extubated the following day, and vasopressors were stopped on postoperative day 5. Culture of the leads revealed a *Propionibacterium acnes* infection.

Two years later, electrocardiographic (Fig. 1C) and pacemaker interrogation showed a functioning biventricular epicardial pacemaker with all leads' thresholds below 1 volt. There was no ventricular arrhythmia detected. A follow-up echocardiogram (2.5 years) showed LV function that had recovered to baseline. Patient's clinical status also returned to the baseline with a NYHA class II status.

Discussion

Prompt cardiac surgery is not always sufficient to mitigate risks associated with cardiovascular lacerations occurring during lead extraction.[1] In this case, surgical repair and the use of vasopressors/inotropes were not enough to restore hemodynamic stability. In fact, hemodynamic parameters were perpetually deteriorating. A permanent epicardial LV lead had already been planned to avoid the need for later transvenous LV lead reimplantation. As this patient had never received any therapy from his defibrillator and had dilated cardiomyopathy (lower risk of sudden cardiac death, **D**efibrill**a**tor Implantation in Patients With **N**oni**s**chemic **S**ystolic **H**eart Failure [DANISH] trial), it was thought that, in this critical situation, only an epicardial CRT pacing system would be appropriate. A subcutaneous implantable defibrillator could have been considered later if defibrillation therapy were required. Upon reinstitution of CRT, clinical status quickly improved, confirmed by a decrease in inotropic support and improvement in LV contractility on TEE.

Concurrent epicardial CRT system implantation appeared to be a decisive element in the management of this patient and his clinical outcome. Most reimplantation procedures after lead extraction for infection are performed in a second procedure, even in pacemaker-dependent patients.[2] However, single-stage epicardial reimplantation has been recently shown to be safe and effective.[3,4]

Reimplantation with epicardial leads are reported as a predictor of mortality and often associated with higher pacing thresholds compared with transvenous placement[5] and have made their use a less-popular option. This case shows the potential usefulness of concurrent epicardial resynchronization in selected cases to improve hemodynamic stability and for long-term CRT.

Disclosures

The authors have no conflicts of interest to disclose.

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