Percutaneous Removal of Epicardial Pacing Wire: Nidus for Infective Endocarditis

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INTRODUCTION

Temporary epicardial pacing wires (TEPWs) are often placed at the completion of cardiac surgery. The overall morbidity of TEPW is extremely low, but complications related to retention have occurred. We report a case of tricuspid valve and right atrial endocarditis related to transmyocardial migration of a retained TEPW.

CASE PRESENTATION

A 66-year-old woman presented to the emergency department (ED) after her primary care physician notified her of positive blood cultures growing *Staphylococcus epidermidis*. The blood cultures had been obtained by the physician after the patient reported chills and was found to have leukocytosis of 20,000/mm^3 on a complete blood count. In the ED, the patient described experiencing intermittent chills and burning chest pain during the past 3 months. Over the past few days, she had developed rigors, but she denied objective fever, shortness of breath, cough, and dysuria. She denied any indwelling catheters or intravenous drug use. In the ED, she was febrile with a temperature of 102.2°F. All other vital signs were normal. Her physical examination was notable for a well-healed median sternotomy incision, a grade 3 early systolic murmur across the precordium, and an early diastolic sound heard best along the left sternal border. The remainder of her examination was unremarkable.

The patient had a medical history of essential hypertension, dyslipidemia, severe aortic stenosis, and atherosclerotic coronary artery disease. Her surgical history was relevant for coronary artery bypass grafting (left internal mammary artery to left anterior descending) and surgical aortic valve replacement with a 21 mm bioprosthetic valve at a different local hospital 3 years earlier.

Given the patient's surgical history, symptoms, fever, abnormal cardiac examination, leukocytosis, and blood cultures positive for an organism known to cause infective endocarditis, the top differential diagnosis was infective endocarditis. Sepsis of unknown etiology at the time of presentation also was among the differential diagnoses. Intravenous antibiotics were administered in the ED.

A chest x-ray, electrocardiogram, urinalysis, and sputum cultures were completed in the ED and were unremarkable. A transthoracic echocardiogram on admission demonstrated a large, mobile hyperechoic mass on the tricuspid valve prolapsing into the right ventricle. Transesophageal echocardiography (TEE) demonstrated a large (3.0 × 1.6 cm), multilobed, mobile, hyperechoic mass on her tricuspid valve as well as mild to moderate tricuspid regurgitation and moderately elevated right ventricular systolic pressure. Additionally, a separate, more sessile hyperechoic mass measuring 3.0 × 1.7 cm lay along the lateral wall of the right atrium and extended into the right atrial appendage (Videos 1 and 2). Given the clinical history, these masses were consistent with vegetations.

The patient was admitted to the cardiac unit, and a collaborative decision was made by the heart team to debulk these large masses using the AngioVac System (AngioDynamics, Latham, NY). Under fluoroscopic and TEE guidance, mechanical thrombectomy was performed on the tricuspid valve and right atrium, reducing the vegetation burden. Tricuspid leaflet integrity remained intact. During the procedure and after debulking, TEE imaging uncovered remnant leads that served as the nidus of infection (Figure 1A, Video 3). The patient was transferred to the intensive care unit in stable condition.

In addition to a thorough review of TEE images, cardiac computed tomography (CCT) with 3D reconstruction was completed to gain a full understanding of lead position in relation to anatomic structures. The surgical report during aortic valve replacement had mentioned placement of atrial and ventricular epicardial wires during surgery, and CCT images from the postoperative period at an outside institution were eventually obtained. As it has been a common practice to cut pacing wires flush with the skin, our hypothesis and diagnosis were that the remnant epicardial leads from earlier had migrated and perforated the right atrium (Figure 1B). Multimodality imaging determined the culprit remnant lead was located inside the right heart and a second lead was embedded within the right ventricular myocardium (Figure 2). To avoid redo sternotomy, the heart team concluded that percutaneous lead removal with a cardiothoracic surgeon present would be attempted.

The following day, the patient returned to the catheterization laboratory for attempted percutaneous extraction of the infected remnant lead (Figure 3A). The right femoral vein was accessed, and a 6 French, 55 cm sheath was inserted. Under fluoroscopic guidance, an EN Snare three-loop system (Merit Medical, South Jordan, UT) and four-loop CloverSnare (Cook Medical, Bloomington, IN) were introduced without successful lead extraction. Next, a multipurpose guide catheter was inserted into the pulmonary artery. An Amplatz Goose Neck Snare (Medtronic, Minneapolis, MN) was advanced as the guide catheter was retracted from the pulmonary artery into the right atrium with successful snaring and removal of the remnant lead (Figure 3B, Videos 4 and 5). With the patient still on the catheterization laboratory table, an echocardiogram was performed and confirmed the absence

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VIDEO HIGHLIGHTS

Video 1: Transesophageal echocardiography shows a large, multilobed vegetation in two orthogonal planes.
Video 2: The transgastric view on TEE reveals a metallic foreign body with a large vegetation attached.
Video 3: Transesophageal echocardiography shows the retained lead after the vegetation burden was reduced.
Video 4: Confirmation of remnant lead extraction.
Video 5: Successful extraction of TEPWs using four-loop CloverSnare.

View the video content online at www.cvcasejournal.com.

of pericardial effusion. A peripherally inserted central catheter was inserted prior to discharge. The patient received 6 weeks of intravenous antibiotics and was followed up regularly by her infectious disease specialist as an outpatient. The patient did not have recurrent bacteremia and remained afebrile during her follow-ups. A repeat transthoracic echocardiogram at 6 weeks showed no vegetations in the tricuspid valve, with only mild regurgitation.

DISCUSSION

We present a case of complete endovascular treatment of right atrial and tricuspid valve infective endocarditis using mechanical vegetation debulking and percutaneous snaring of an infected remnant lead.

Temporary epicardial pacing has become routine practice for the postoperative management of arrhythmias following cardiac surgery. The incidence of major complications following TEPW implantation is

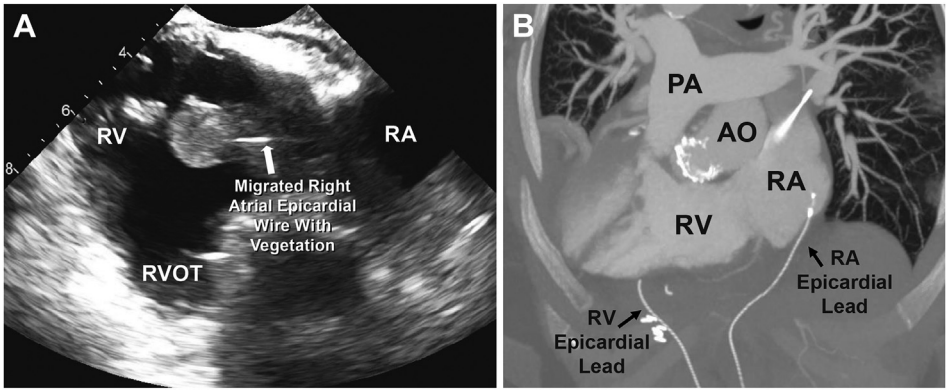

Figure 1 Initial diagnostic imaging. **(A)** Two-dimensional TEE, transgastric window, long-axis display (133°), diastolic phase reveals a metallic foreign body with a large mass in the right ventricle. **(B)** A CCT scan, maximal intensity projection (thick slice), oblique display obtained in the postoperative period demonstrates the position of the epicardial pacing leads. *AO*, Aorta; *PA*, pulmonary artery; *RA*, right atrium; *RV*, right ventricle; *RVOT*, right ventricular outflow tract.

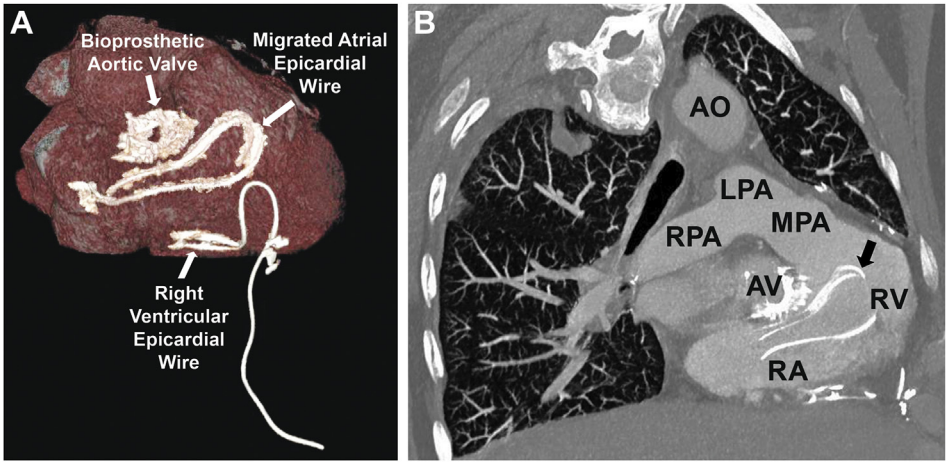

Figure 2 Cardiac computed tomography scan. **(A)** Volume-rendered three-dimensional whole-heart display confirming that the right atrial epicardial wire has migrated and is visualized inside the right heart. **(B)** Maximal intensity projection oblique coronal display shows the remnant lead in the right atrium and ventricle. *AO*, Aorta; *AV*, aortic valve; *LPA*, left pulmonary artery; *MPA*, main pulmonary artery; *RA*, right atrium; *RPA*, right pulmonary artery; *RV*, right ventricle.

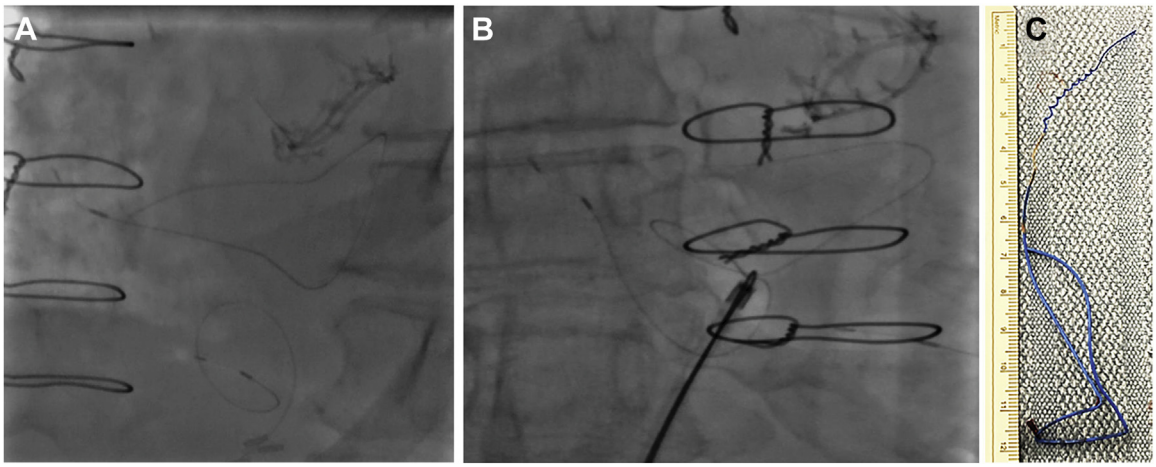

Figure 3 Fluoroscopic imaging and gross specimen. **(A)** The bioprosthetic aortic valve, infected remnant lead in the right atrial and ventricular cavities, and remnant right ventricular lead are seen on fluoroscopy. **(B)** Successful snaring and removal of the remnant lead are demonstrated. **(C)** Gross specimen. The retained TEPW is shown postprocedure.

low at 0.04%.[1] If the wires cannot be removed postoperatively, they may be cut at skin level and remain inside the thoracic cavity. This practice mitigates short-term risk to the patient, but the potential long-term adverse effects of this practice are poorly described in the literature.

Complications related to retained TEPW include ventricular tachycardia due to wire migration, infective endocarditis, wire migration to the lung and mediastinum, and skin or soft tissue infections.[2-4] In this reported case, the retained TEPW migrated into the right atrium and served as a nidus for late infective endocarditis. The mainstay of therapy, for complex cases similar to this, is open heart surgery with possible valve replacement on top of intravenous antibiotic therapy. In this case, a collaborative decision was made to attempt percutaneous extraction of the infected remnant lead to avoid the increased surgical risk associated with a second median sternotomy.

CONCLUSION

Although the incidence of infective endocarditis caused by a retained TEPW after cardiac surgery is extremely low, affected patients may require advanced medical and surgical care. After medical records were thoroughly reviewed and multimodality imaging was performed, the multidisciplinary team of cardiologists and cardiac surgeons successfully treated this patient without necessitating a second median sternotomy.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2021.09.004.

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