

CASE REPORT

INTERMEDIATE

CLINICAL CASE

# Esophago-Pericardial Fistula as a Rare and Life-Threatening Complication of Epicardial Ventricular Tachycardia Ablation



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## ABSTRACT

We describe a rare complication of esophago-pericardial fistula after epicardial ventricular tachycardia ablation. Echocardiogram revealed evidence of pneumopericardium and additional imaging studies confirmed esophageal leak with evidence of fistula formation requiring prompt surgical repair. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2022;4:1180-1185) Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## HISTORY OF PRESENTATION

We report the case of a 59-year-old man who presented with 10 days of pleuritic left chest, back, and shoulder discomfort and 2 h of palpitations. The patient reported symptoms of shortness of breath, which was worse at night and when lying flat, and subjective fevers and chills. He denied a history of syncope.

Vitals signs on presentation were as follows: temperature 38.6 °C, blood pressure 153/88 mm Hg, heart rate 156 beats/min, respirations 18 breaths/min, and oxygen saturation of 97% on ambient air. The patient

was breathing comfortably without the use of accessory muscles and lungs were clear to auscultation in all fields. Cardiac auscultation revealed tachycardia but regular rhythm without significant murmurs, gallops, or rubs. Jugular venous pressure was not elevated and no lower extremity edema was seen. Electrocardiogram revealed a regular, wide complex rhythm consistent with ventricular tachycardia (VT) (**Figure 1A**). Intravenous metoprolol was administered with return of normal sinus rhythm with diffuse ST-segment elevations (**Figure 1B**).

## MEDICAL HISTORY

The patient had a history of paroxysmal atrial fibrillation (AF), hypertension, nonischemic cardiomyopathy with reduced ejection fraction, VT refractory to antiarrhythmic therapy, nonobstructive coronary artery disease, tobacco use disorder, and former cocaine use. He underwent a VT ablation 2 weeks before presentation with a combined endocardial and

## LEARNING OBJECTIVES

- To make a differential diagnosis of possible complications after epicardial VT ablation.
- To understand the role of imaging in the detection of an esophago-pericardial fistula.

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epicardial approach and subsequent placement of a dual-chamber implantable cardiac defibrillator (Figure 2C). He was discharged on colchicine 0.3 mg daily for postablation pericarditis and echocardiogram at the time of discharge revealed no evidence of pericardial effusion.

### DIFFERENTIAL DIAGNOSIS

The patient's differential diagnosis for chest discomfort and shortness of breath after endocardial/epicardial VT ablation included recurrent tachyarrhythmia, coronary artery injury with myocardial infarction, pericarditis with pericardial effusion, implantable cardiac defibrillator infection, esophageal injury and fistula formation, and mediastinitis.

### INVESTIGATIONS

Initial laboratory results were significant for a white blood cell count of  $14.1 \times 10^9/L$  with neutrophil predominance, serum creatinine 1.0 mg/dL, C-reactive protein >150 mg/dL, and erythrocyte sedimentation rate 88 mm/h. Transthoracic echocardiogram on admission showed a small, circumferential pericardial effusion without evidence of tamponade physiology. He was initially treated for pericarditis with colchicine and nonsteroidal anti-inflammatory medications. On day 5 of hospitalization, the patient reported dysphagia followed by an isolated episode of emesis. He developed hypotension, anuric renal failure (serum creatinine 3.4 mg/dL), liver dysfunction (aspartate transaminase 1,831 U/L and alanine transaminase 936 U/L), and serum venous lactate 6.8 mmol/L. Bedside transthoracic echocardiogram revealed a moderate-sized, circumferential pericardial effusion with pneumopericardium (Figure 3A).

### MANAGEMENT AND INTERVENTIONS

The patient was transferred to our cardiac intensive care unit. Urgent pericardiocentesis showed an initial pericardial pressure of 8 mm Hg without respiratory variation consistent with pericardial tamponade. Then 180 mL of purulent, foul-smelling fluid was removed via pericardiocentesis. Pericardial fluid culture revealed polymicrobial aerobic and anaerobic organisms. Blood cultures from admission showed no growth after 5 days. The patient was started on broad-spectrum antibiotics and antifungal medications. Computed tomography (CT) imaging showed findings concerning for pneumopericardium and possible evidence of esophageal leak (Figure 3B). Barium esophagram confirmed esophageal leak and presence of esophago-pericardial fistula (Figures 4A and 4B).

The patient underwent surgical repair through a left lateral thoracotomy approach to allow for wide visualization of the posterior left atrium and esophagus and was found to have a large quarter-sized defect connecting the esophagus and the pericardium (Figure 4C). The esophago-pericardial fistula was repaired using an intercostal muscle flap.

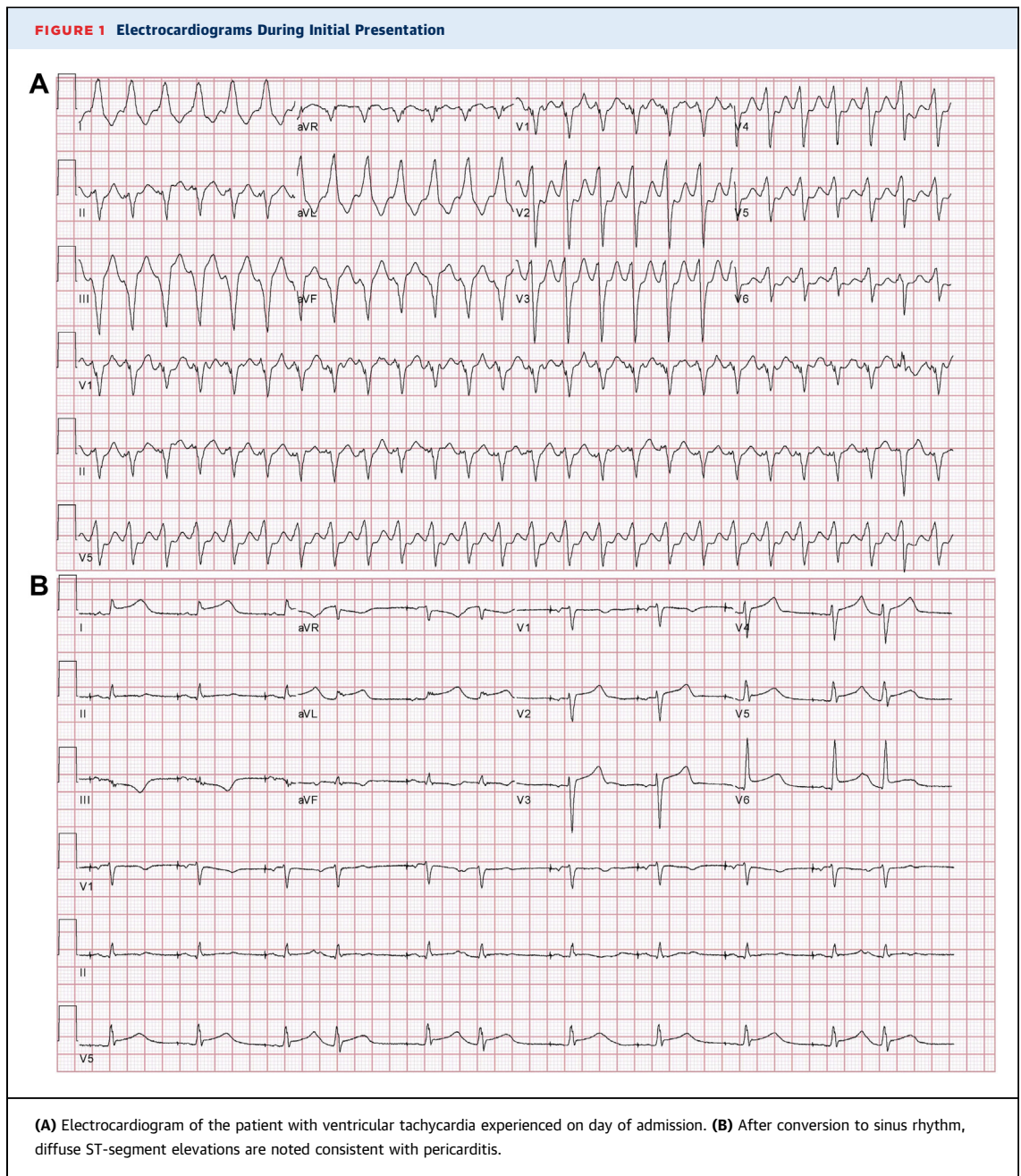
### DISCUSSION

Esophago-pericardial fistula formation after epicardial VT ablation is an extremely rare complication that has only been reported once and was diagnosed postmortem.<sup>1</sup> Complications from epicardial procedures have been well described and range from relatively common complications, such as pericardial effusion, to rare complications, such as phrenic nerve injury, hemoperitoneum, chronic refractory pericarditis, pleural injury, coronary vessel injury, and fistula formation.<sup>2</sup> Atrio-esophageal fistulas as a rare complication of AF ablation procedures has been well described with a median postprocedural symptom onset time of 21 days and an estimated mortality rate of 55%.<sup>3</sup> Chest pain is the most common presenting symptom (85% of cases) with esophageal perforation, and although it is often pleuritic in nature, the quality of chest pain can vary significantly.<sup>4</sup> Fistula formation after epicardial VT ablation has not been well characterized and has only been described previously in isolated case reports: esophago-mediastinal fistula,<sup>5</sup> esophago-pleural fistula,<sup>6</sup> peritoneal-pericardial fistula,<sup>7</sup> and pleuropericardial fistula.<sup>8</sup> Given the onset of symptoms 4 days after epicardial ablation in this case, epicardial ablation (ventricular or atrial) may have an earlier presentation.

During our patient's ablation procedure, we took care to map the course of the coronary arteries with a coronary angiogram, assess for pericardial effusions in real time and postprocedure, and performed continuous esophageal temperature monitoring. Despite these precautions, the patient experienced severe esophageal injury. In retrospect, our patient appears to have a more vertically oriented heart where the inferior base of the left ventricle was positioned adjacent to the esophagus (Figure 3B). It is possible that our esophageal temperature probe was not positioned to fully detect esophageal heating during ablation. In the future, it may be prudent to ensure proper positioning of an esophageal temperature probe during epicardial ablation at the inferior base of the myocardium, particularly in patients with more vertically oriented hearts. Furthermore, intra-pericardial balloon placement can be used during

### ABBREVIATIONS AND ACRONYMS

AF = atrial fibrillation  
CT = computed tomography  
VT = ventricular tachycardia

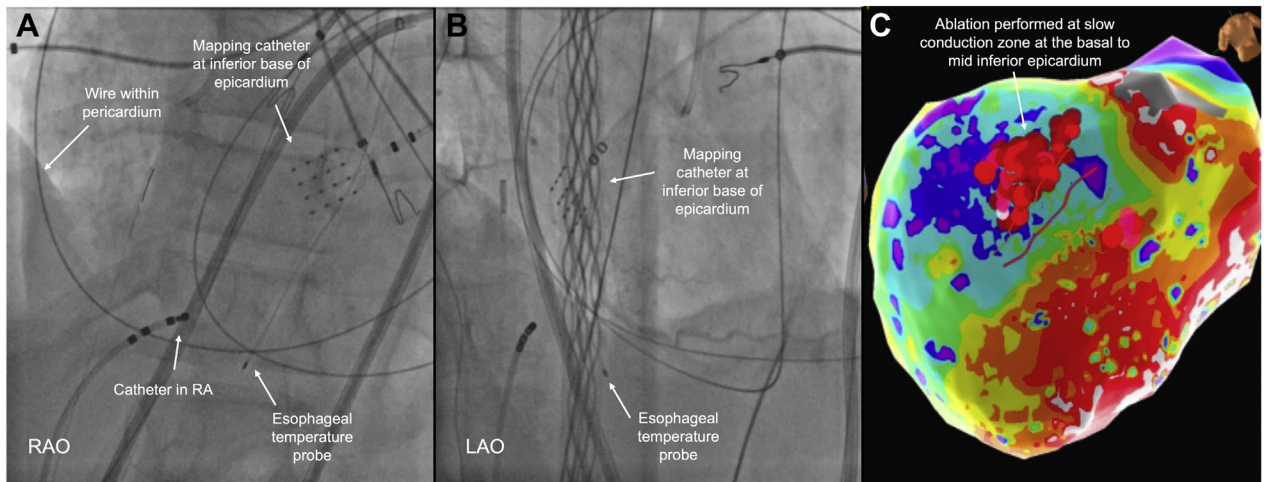


epicardial ablation to not only protect parietal pericardium and the esophagus, but also to prevent phrenic nerve injury.<sup>9</sup> To reduce the chance of fistula formation, the ablation catheter vector should be directed toward the myocardium. Epicardial ablation may also confer greater potential risk of direct injury to the esophagus. When compared with AF ablation, epicardial VT ablation requires longer ablation lesions that may result in potential injury to the esophagus if radiofrequency energy is delivered in close proximity

to the esophagus. During AF ablation, the time of ablation along the posterior wall of the atrium is limited to prevent esophageal injury. In this case, we ablated at powers ranging from 25-31 W using half-normal saline as the irrigant for up to 60 s at a time, with a total ablation time of 16 min and 33 s. The duration of these ablation lesions is significantly longer with potentially more current delivered when compared with ablation of the left atrium for AF.



**FIGURE 2** Intraoperative Fluoroscopy Images and 3-Dimensional Electroanatomic Map

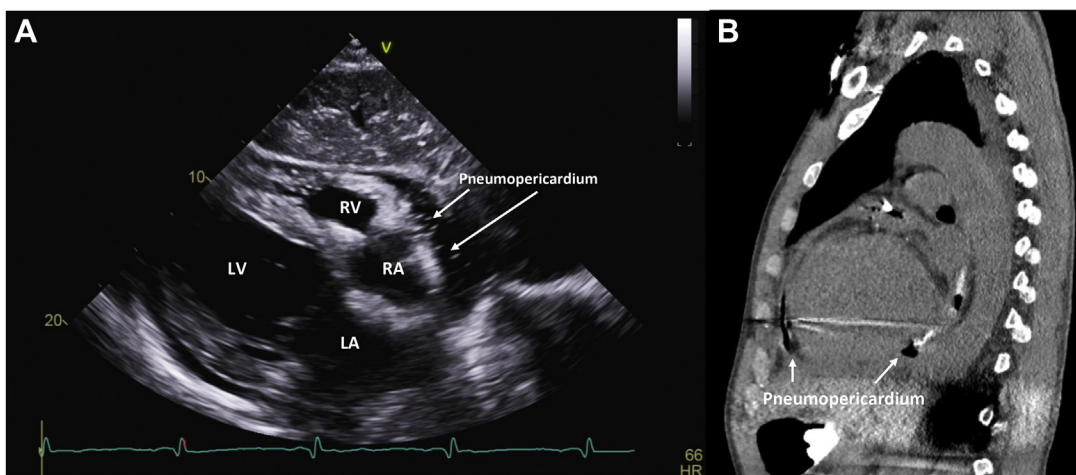


**(A)** Right anterior oblique (RAO) view of the catheter and probe positions. The multipolar catheter was positioned in the inferior base of the epicardial space. An esophageal temperature probe is also within view distally in the esophagus. **(B)** Left anterior oblique (LAO) view of the same catheter positions. The multipolar catheter can be seen adjacent to the esophagus as outlined by the esophageal temperature probe. **(C)** Electroanatomic map of the left ventricular epicardium with the large cluster ablation lesions in the inferior base of the left ventricular epicardium denoted by red circles.

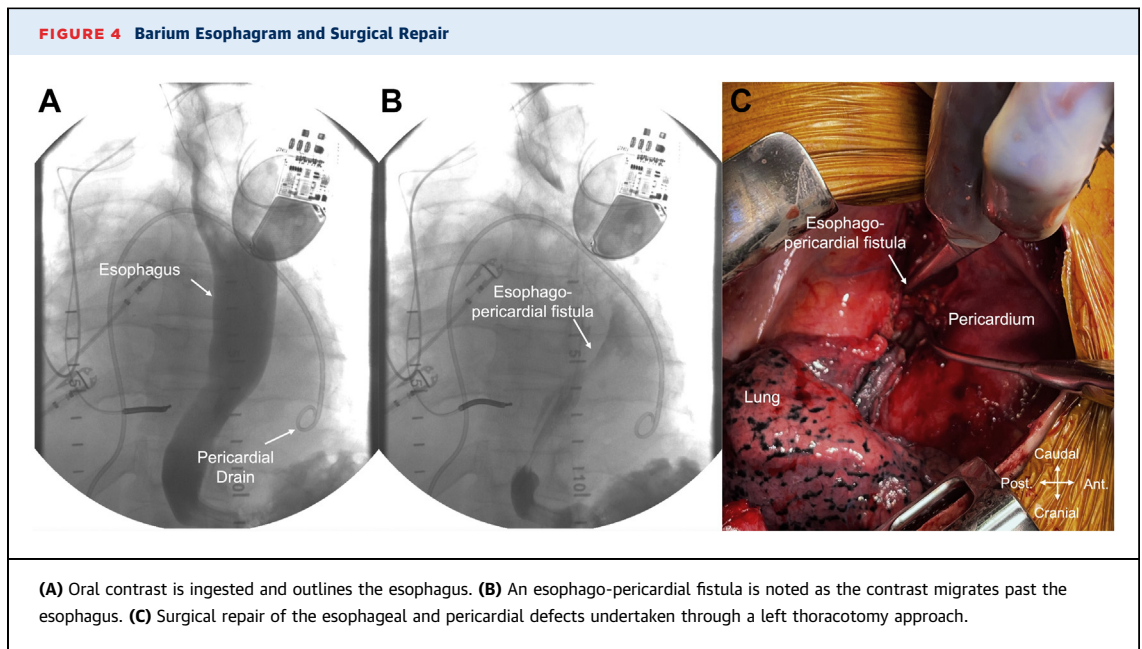
We also wish to highlight important clinical characteristics that should direct clinicians to evaluate for the presence of an esophago-pericardial fistula. Our patient presented with new symptoms of chest pressure, dyspnea, and subjective fevers roughly 2 weeks after ablation. Pertinent findings include

transthoracic echocardiography with pneumopericardium, purulent pericardial effusion with a polymicrobial infection, and an esophagram that outlines a fistula. A chest CT can be helpful to further define the level of the esophageal defect and help with surgical planning. Once a diagnosis is made,

**FIGURE 3** Transthoracic Echocardiographic Still and Sagittal Computed Tomography Chest Image



**(A)** A subcostal transthoracic echocardiographic image showing the presence of a pneumopericardium. **(B)** A sagittal computed tomography chest image also detailing pneumopericardium. LA = left atrium; LV = left ventricle; RA = right atrium; RV = right ventricle.



prompt surgical referral is needed to repair the esophageal and pericardial defects and improve survival.

#### FOLLOW-UP

The patient developed *Streptococcus anginosus* and *Gemella morbillorum* bacteremia immediately after surgery. After intravenous antibiotic treatment, follow-up blood cultures were negative. Echocardiogram revealed no evidence of lead vegetations or significant pericardial effusion. He was treated with antibiotics for a total duration of 6 weeks. He recovered well postoperatively without recurrence of VT during his hospitalization and he passed his swallow evaluation without dysphagia more than 12 months after follow up.

#### CONCLUSIONS

This case demonstrated a rare complication of epicardial VT ablation that resulted in the formation

of an esophago-pericardial fistula likely from thermal injury to the esophagus during the procedure. The use and proper positioning of an esophageal temperature probe near the site of ablation may help alert the proceduralist to indirect esophageal heating and allow adjustments to prevent esophageal injury. Recognition of pneumopericardium on echocardiogram should prompt additional imaging including a chest CT scan and esophagram to help further detect a possible esophageal defect, which requires immediate surgical attention.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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**KEY WORDS** ablation, complication, electrophysiology, ventricular tachycardia